DOT HS-801 437

ICLE-IN-USE LIMIT PERFORMANCE
TIRE FACTORS.
TIRE IN USE.

APPENDIX D,E,F,G

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March 1975
Final Report

PREPARED FOR:
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16. Abstract The influence of tire-in-use factors (inflation pressure, replacement mixes, and wear) on the steering and braking response of automobiles is examined through analysis, simulation, laboratory and over-the-road tire testing, and vehicle testing. Results for a 1971 Mustang and a 1973 Buick station wagon illustrate the influence of tire-in-use factors on (a) the open-loop braking and/or turning performance in drastic maneuvers on wet and dry surfaces, and (b) the understeer/oversteer factor for maneuvers involving lateral accelerations below 0.3 g.

This investigation shows that differences in tire mechanical properties between the front and rear wheels (as caused by tire-in-use factors) can cause significant and potentially dangerous changes in limit response and from the stability and control characteristics intended by the vehicle manufacturer. The report recommends that (1) inspection limits for inflation pressure be within ±1 psi of the manufacturer's recommended level, (2) minimum tread-groove depth exceed 2/32", and (3) further research be conducted to develop a cost-effective means for indicating the lateral force characteristics of a tire.

17. Key Words Tire shear force, vehicle mechanics, tire wear, tire inflation pressure, replacement tire mixes, emergency maneuvers, linear analysis of directional response, vehicle simulation.

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APPENDIX D

TIRE TEST DATA

Robert E. Wild

ACKNOWLEDGEMENTS

Special thanks are due to Mr. D. Brown of HSRI for collecting the flat-bed tire data, to Mr. D. Lyons for doing the "Lyon's" share of the organizing and reduction of all the tire data, and to Ms. Jeannette Nafe who typed all of the tables.

D1. INTRODUCTION

Tire force and moment measurements were obtained from two sources, the HSRI flat-bed tire tester and the HSRI mobile tire tester. The flat-bed tester is a low speed (1 mph) indoor machine, while the mobile tire tester is a high-speed (0 to 70 mph) over-the-road device. Each is fully described in Reference [1].

D2. FLAT BED TEST PROGRAM

D2.1 GENERAL PLAN

The data collected from the flat-bed machine consisted of free-rolling lateral force and aligning moment generated at (a) small angles of slip and inclination to arrive at the tire stiffnesses, and, for some tires (b) at larger angles to explore the ultimate cornering properties. All slip angle data was obtained at zero inclination angle. Likewise, all inclination angle data was obtained at zero slip angle. The test parameters for each tire were vertical load, inflation pressure, slip angle, and inclination angle, and were incremented in that order; i.e., at fixed values of pressure and angle, data was collected at all desired vertical loads before incrementing to the next value of inflation pressure and repeating the load sequence.

D.2.2 TEST PARAMETER VALUES

All of the "H" load rating tires were tested at vertical loads of 800, 1100, 1400, and 1700 pounds, and at inflation pressures of 10, 18, 26, and 34 psi. The OE tire in this size, the Firestone Deluxe Champion Sup-R-Belt, was tested at slip angles of 0°, ±1°, ±2°, 4°, 8°, 12°, 18°, and inclination angles of 0°, ±1°, ±2°, 4°, 6°, 8°. All other tires of this size were tested at slip and inclination angles of 0°, ±1°, ±2° only.

All of the "E" load rated tires were tested at vertical loads of 500, 800, 1100, and 1400 pounds, and at inflation pressures of 11, 16, 22 and 28 psi. The slip and inclination angles were the same as those used for the "H" size tires.

The rim widths used were 6 inches for all "H" tires and 5 1/2 inches for all "E" tires. Pre-test tire preparation consisted of rolling the tire at rated load for 600 feet at both +6° and -6° slip angle; inflation pressure was 24 psi for "E" tires and 28 psi for "H" tires.

D3. MOBILE TEST PROGRAM

The data generated by the mobile tire tester consisted of (a) free-rolling lateral force, (b) braking force at 0° slip angle, and (c) braking force and lateral force at 4° slip angle. The test parameters were speed, slip angle, vertical load, and road surface. The speeds used were 20, 40, and 50 mph; the road surfaces were a dry asphalt skid pad (a lightweight aggregate hot mix) and a wetted jennite skid pad; the slip angles were 0°, 2°, 4°, 8°, 16° on the dry surface, and 0°, 1°, 3°, 7°, 15° on the wet surface; the vertical loads were 800, 1100, and 1400 pounds for the E-size tires and 800, 1100, and 1700 pounds for the H-size tires. The parameters were incremented in the order given, i.e., at fixed values of slip angle and load, on a given surface, data was collected at all desired speeds before incrementing to the next value of slip angle and repeating the speed sequence.

It should be noted that not all possible combinations of speed and load were used. Table D3.1, Mobile Tire Tester Tests, shows the complete mobile test program. The two OE tires were each tested at four inflation pressures, similar to those pressures used for the flat-bed tests. In addition, some special-purpose tests Number 2, 3, and 4 in Table D3.1, were run as part of the mobile test program.

In order to minimize the effects of shoulder wear on the data, a new specimen of each tire was used for each vertical load on dry asphalt. No shoulder wear was evident while operating on the wet jennite surface; therefore, one specimen was used on this surface for all loads.

All H-size tires were tested on 6" wide rims, while 5 1/2" rims were used for the E-size tires. Pre-test tire preparation consisted of five lock-up cycles on dry pavement at +6° slip angle and five more lock-up cycles at -6°. Tire inflation pressure was 24 psi and the vertical load was 800 pounds. The speed was 20 mph.

Table D3.1 Mobile Tire Tester Tests

Tires	Regular Tests[1]		Shoulder Wear[2]		C_α Speed/psi[3]	Screening[4]
Buick O.E. Firestone H78-14	X	At 4 inflation pressures	X	7 cycles	X	X
Mustang O.E. B.F. Goodrich E78-14	X	At 4 inflation pressures	X	5 cycles	X	X
Firestone HR78-14 Town & Country	X					
Firestone H78-14 Town & Country	X					
Bridgestone 225R-14	X		X	3 cycles		
Firestone 500 H78-14	X		X	3 cycles		
General H78-14 Belted Jumbo	X					
Pirelli 185R-14	X		X	4 cycles		
Firestone 500 E78-14	X					
Goodyear E78-14 Custom Power Cushion Polyglas	X	On wet jennite plus μ-slip at 0° and 4° on dry asphalt	X	5 cycles	X	
6/32 Mustang O.E.	X	One speed 40 One load 800				
4/32 Mustang O.E.	X	One speed 40 One load 800				
2/32 Mustang O.E.	X	One speed 40 Two loads 800, 1100				
2/32 Buick O.E.	X	One speed 40 Two loads 800, 1100				

1. Regular Tests: free-rolling lateral force measurements (X) at slip angles of 0°, 2°, 4°, 8°, 16° on dry asphalt and 0°, 1°, 3°, 7°, 15° on wet jennite and μ-slip curves (μ) at 0° and 4° for the following loads and speeds:

	"E-78" Tires				"H-78" Tires		
	800	1100	1400		800	1100	1700
20	μ,X			20		μ,X	
40	μ,X	μ,X	X	40	μ,X	μ,X	X
50	X (wet only)			50		X (wet only)	

2. Shoulder Wear: free-rolling lateral force measurements on dry asphalt only at 40 mph (800 pounds load on E-78 tires, 1100 on H-78 tires) at slip angles of 0°, 2°, 4°, 8°, 16°, maintaining tire-pavement contact for 500 feet at each angle. The 0°-16° cycle is repeated until lateral force increases at 16° over the previous 16° test are 3% or less.

3. C_α Speed/psi: one series of free-rolling lateral force measurements at standard load and inflation pressure, 0°, ±2° slip angle, 20 mph, on dry asphalt to establish baseline C_α; the inflation pressure was then reduced to 12 psi and the measurements repeated at velocities of 3, 10, 20, 30, and 40 mph.

4. Screening: free-rolling lateral force measurements at 0°, 2°, 4°, 8°, 16° and braking force measurements at 0°, all at 20 mph and standard load and inflation pressure on dry asphalt. These tests were performed on four Mustang O.E. tires and on six Buick O.E. tires to ascertain the traction uniformity of the O.E. tire sample.

D4. DATA

To facilitate inspection of the data, they have been numerically indexed according to the following convention. The data is arranged first by tire:

I. B.F. Goodrich Silvertown E78-14 (Mustang OE)

II. Pirelli 185R-14

III. Firestone 500 E78-14

IV. Goodyear Custom Power Cushion Polyglas E78-14

V. Mustang OE ground to 6/32 inch tread depth

VI. Mustang OE ground to 4/32 inch tread depth

VII. Mustang OE ground to 2/32 inch tread depth

VIII. Firestone Deluxe Champion Sup-R-Belt H78-14 (Buick OE)

IX. Firestone 500 H78-14

X. Bridgestone 225R-14

XI. General Belted Jumbo H78-14

XII. Firestone Town & Country radial snow HR78-14

XIII. Firestone Town & Country snow H78-14

XIV. Buick OE ground to 2/32 inch tread depth

Then, under each tire heading, the data is arranged in order of increasing inflation pressure, identified by capital letters: A Lowest Pressure (usually 10 or 12 psi)

B .

C .

D Highest Pressure (usually 30 or 36 psi)

Finally, the type of data to be found under each inflation pressure heading is identified as follows:

1. Free-rolling flat-bed data

   a. lateral force vs. slip angle

   b. aligning moment vs. slip angle

   c. lateral force vs. inclination angle

2. Free-rolling lateral force, mobile tire tester

3. Braking force, mobile tire tester.

Thus, a heading of V.B.1.a would indicate lateral force vs. slip angle data, generated on the flat-bed machine, at the next to lowest inflation pressure, for the Mustang OE tire ground to 6/32 inch tread depth.

Data from the "special tests," using the mobile tire tester, are labeled

E. Shoulder Wear

F. C_α Speed/psi

G. Screening

and will be found along with the more usual data under the applicable tire headings.

A special test series was run on the flat-bed machine only. This series consisted of measuring the cornering and inclination stiffnesses of several of the above tires that had been ground to three specific tread depths. This data follows the above data and is arranged according to tire, using the same numerals as above plus an asterisk.

II* Pirelli Cinturato 185R-14 ground to 6/32 inch tread depth
Pirelli Cinturato 185R-14 ground to 4/32 inch tread depth
Pirelli Cinturato 185R-14 ground to 2/32 inch tread depth

III* Firestone 500 E78-14 ground to 6/32 inch tread depth
Firestone 500 E78-14 ground to 4/32 inch tread depth
Firestone 500 E78-14 ground to 2/32 inch tread depth

IV* Goodyear Custom Power Cushion Polyglas ground to 6/32 inch
Goodyear Custom Power Cushion Polyglas ground to 4/32 inch
Goodyear Custom Power Cushion Polyglas ground to 2/32 inch

VIII* Firestone Deluxe Champion Sup-R-Belt H78-14 ground to 6/32 inch
Firestone Deluxe Champion Sup-R-Belt H78-14 ground to 4/32 inch
Firestone Deluxe Champion Sup-R-Belt H78-14 ground to 2/32 inch

IX* Firestone 500 H78-14 ground to 6/32 inch tread depth
Firestone 500 H78-14 ground to 4/32 inch tread depth
Firestone 500 H78-14 ground to 2/32 inch tread depth

X* Bridgestone 225R-14 ground to 6/32 inch tread depth
Bridgestone 225R-14 ground to 4/32 inch tread depth
Bridgestone 225R-14 ground to 2/32 inch tread depth

XI* General Belted Jumbo H78-14 ground to 6/32 inch tread depth
General Belted Jumbo H78-14 ground to 4/32 inch tread depth
General Belted Jumbo H78-14 ground to 2/32 inch tread depth

XII* Firestone Town & Country Radial Snow ground to 6/32 inch
Firestone Town & Country Radial Snow ground to 4/32 inch
Firestone Town & Country Radial Snow ground to 2/32 inch

XIII* Firestone Town & Country Snow ground to 6/32 inch
Firestone Town & Country Snow ground to 4/32 inch
Firestone Town & Country Snow ground to 2/32 inch

Often in the tables containing free-rolling lateral force measurements from the mobile tire tester, i.e., sections wherein the identification number contains a 2, an entry such as 641/733 will be found under 15° or 16°. Such an entry in a table means that the slip angle sequence used was 0°, 15°, 1°, 3°, 7°, 15° on wet jennite or 0°, 16°, 2°, 4°, 8°, 16° on dry asphalt. The first value of lateral force, 641 pounds in the example, is the result of the first test at 15° or 16°, and will be free of shoulder wear influences. The second entry, 733 pounds in the example, is the result of the second test at 15° or 16° and reflects the shoulder wear accrued during the 1°, 3°, and 7° or 2°, 4°, and 8° tests.

In sections labeled with a 3, braking data from the mobile tire tester, the notations MBF, LWBF, MLF, and LWLF are found and are interpreted as:

MBF = maximum braking force

LWBF = locked-wheel braking force

MLF = maximum lateral force

LWLF = locked-wheel lateral force

Complete μ-slip curves follow these braking data sections.

I. B.F. Goodrich Silvertown E78-14 (Mustang OE)

I.A.1 Free-Rolling Measurements from the Flat Bed Tire Tester - 10 psi Inflation

a. Lateral Force vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	156	74	7	-101	-174	-277	-367	-395	-414
800	149	66	9	- 95	-171	-305	-479	-561	-621
1100	138	61	8	- 91	-164	-276	-427	-607	-774
1400	110	53	7	- 83	-137	-187	-320	-536	-815

b. Aligning Moment vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	-23	-12	0	15	22	21	8	3	0
800	-42	-20	0	27	44	56	38	20	7
1100	-57	-27	0	37	62	91	98	63	19
1400	-68	-33	1	46	77	118	148	137	56

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°
500	-44	-35	-7	0	12	58	88	106
800	-46	-25	-9	0	16	64	98	124
1100	-52	-29	-8	0	20	79	117	152
1400	-56	-32	-7	1	27	92	143	180

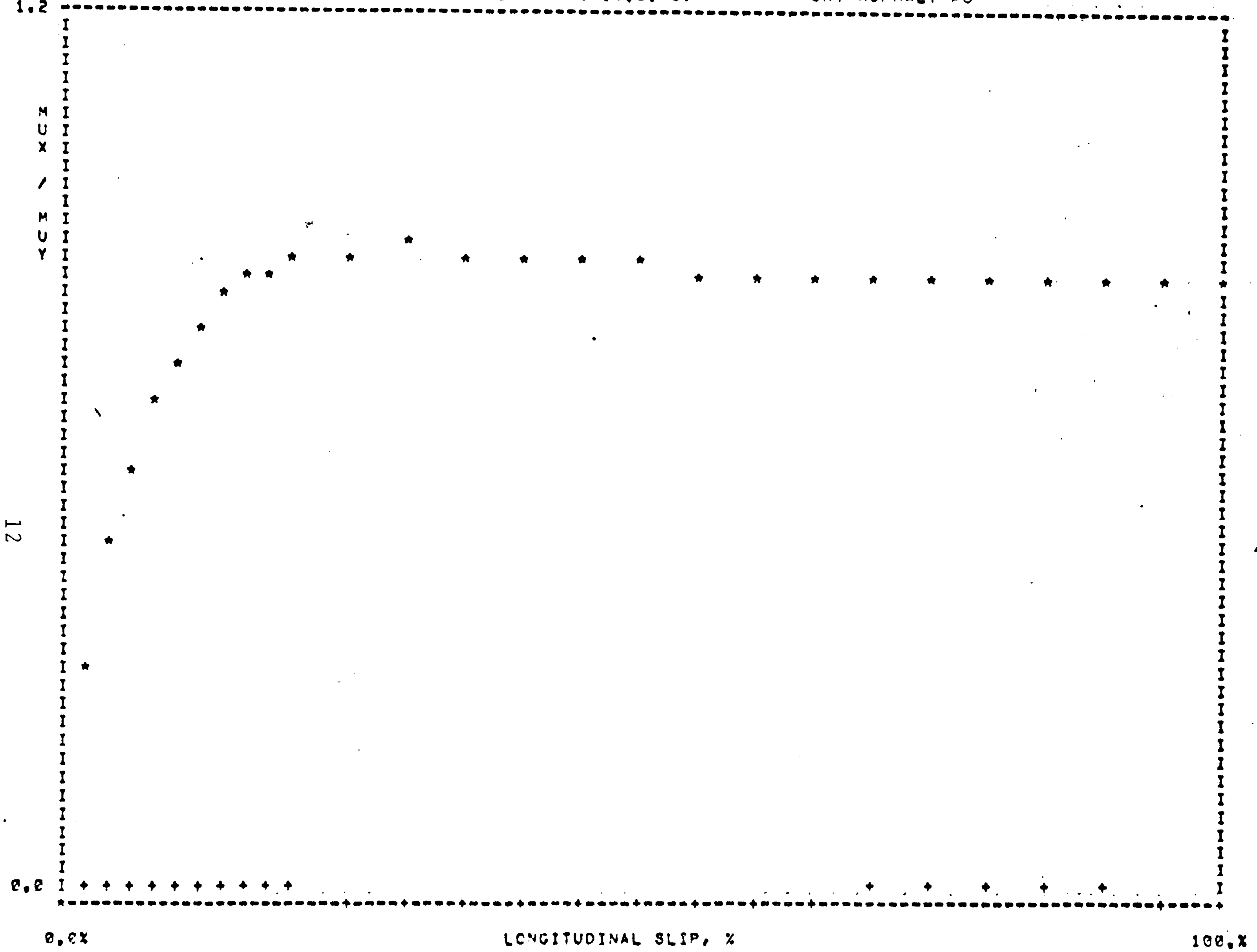
I.A.2 Free-Rolling Lateral Force Measurements from Mobile Tire Tester - 12 psi Inflation

		Dry Asphalt					Wet Jennite				
Load	Speed	0°	2°	4°	8°	16°	0°	1°	3°	7°	15°
800	20 mph	-18	191	367	594	736	-15	110	296	458	472
	40 mph	-18	211	386	595	641/733	-18	108	290	413	392/369
1100	50 mph						-18	115	292	388	365
	40 mph	0	195	355	584	786/862	- 2	105	277	440	457/489
1400	40 mph	8	182	273	462	868/868	0	62	250	425	562/581

I.A.3 **Braking Data from the Mobile Tire [illegible]er**

	Dry Asphalt				Wet Jennite			
	0°			4°	0°			3°
	800 lbs.		1100 lbs.	800 l[illegible]	800 lbs.		1100 lbs.	800 lbs.
	20 mph	40 mph	40 mph	40 m[illegible]	20 mph	40 mph	40 mph	40 mph
MBF	699	724	969	733	441	376	530	355
LWBF	660	692	913	72	277	237	320	237
MLF				37				275
LWLF				5				29

FILE 758.   SILVERTOWN E78 - 14   (M.O.E.-5)   DRY ASPHALT #8

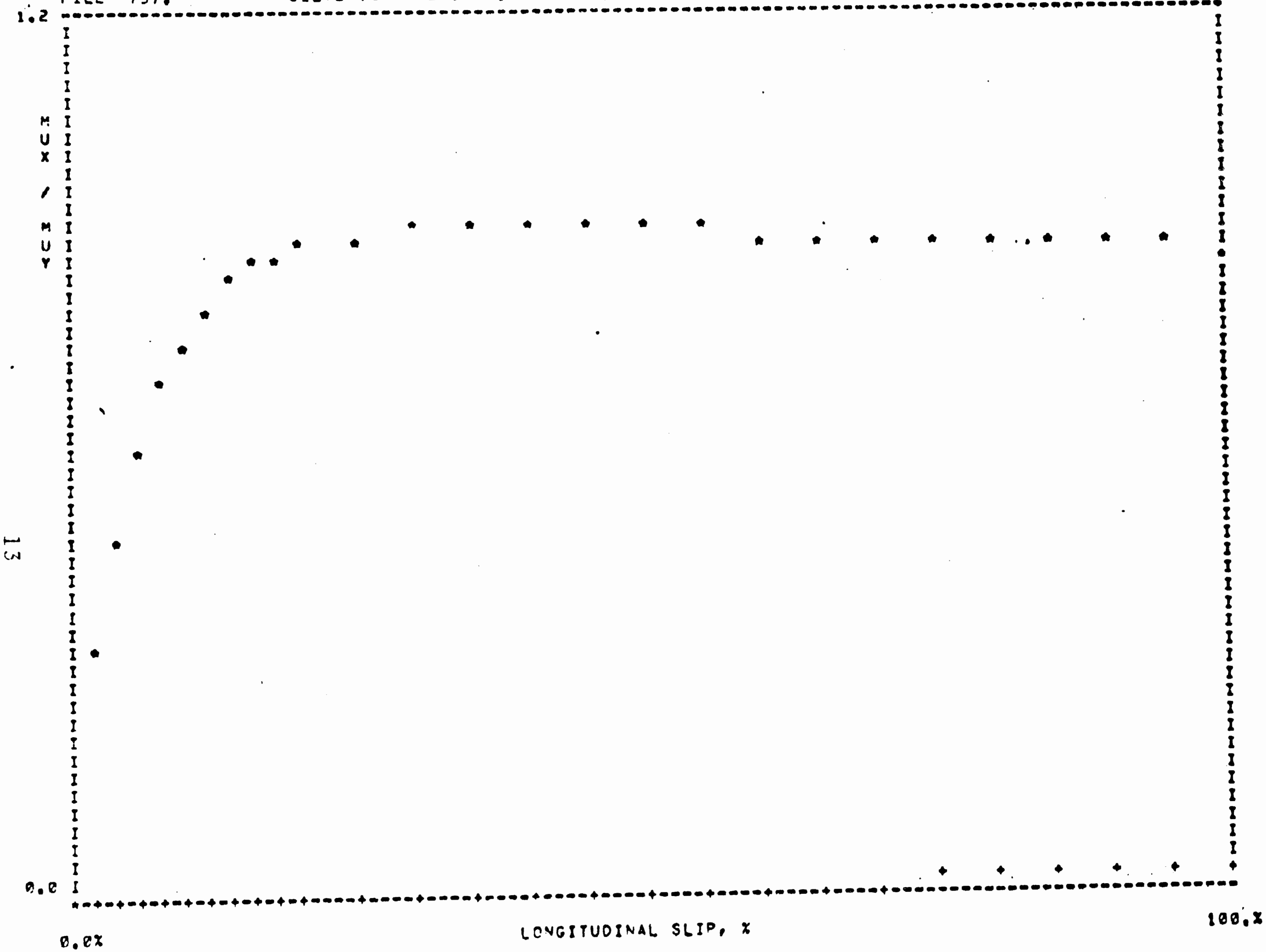


SLIP	FX-LBS
0.00	0.0
0.02	257.9
0.04	380.7
0.06	467.1
0.08	532.0
0.10	580.8
0.12	617.5
0.14	644.7
0.16	664.5
0.18	678.2
0.20	685.5
0.25	694.8
0.30	698.6
0.35	697.4
0.40	692.6
0.45	686.8
0.50	681.2
0.55	675.8
0.60	670.8
0.65	666.8
0.70	664.2
0.75	663.5
0.80	664.3
0.85	664.7
0.90	663.5
0.95	661.9
1.00	660.2

TP- 3.   RUN# 244.   LOAD= 8[illegible]. LBS.   VEL.= 20. MPH   ALPHA= 0. DEG

TIRE PRESSURE= 12. PSI

FILE 757. SILVERTOWN E78 - 14 (M.O.E.-5) DRY ASPHALT #8

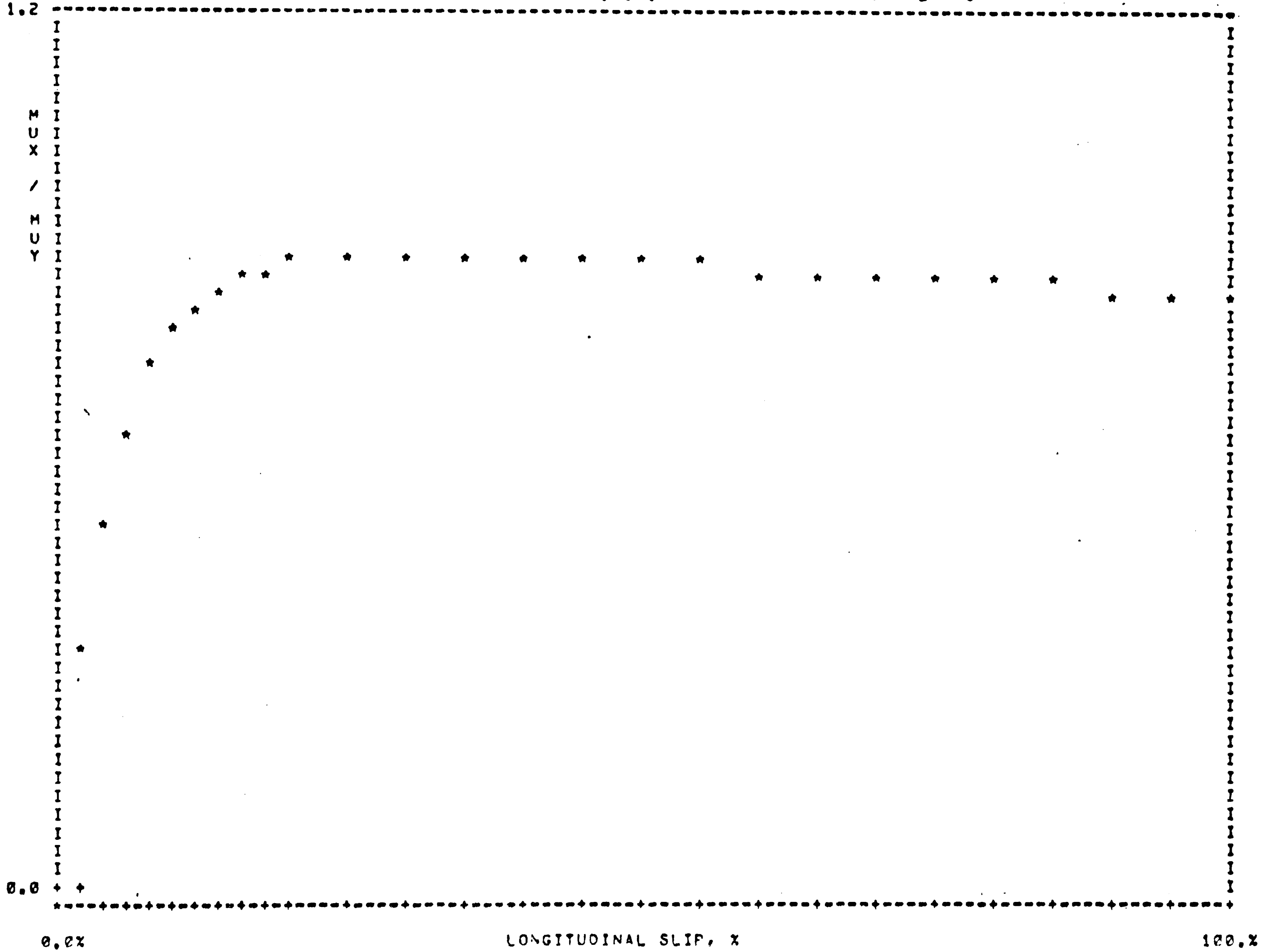


SLIP	FX-LBS
0.00	0.0
0.02	262.5
0.04	383.2
0.06	476.1
0.08	547.6
0.10	599.8
0.12	638.0
0.14	665.6
0.16	685.2
0.18	698.3
0.20	705.0
0.25	715.3
0.30	721.3
0.35	724.1
0.40	724.9
0.45	724.2
0.50	722.4
0.55	719.2
0.60	715.6
0.65	714.4
0.70	715.1
0.75	715.8
0.80	716.1
0.85	713.9
0.90	708.2
0.95	702.9
1.00	691.8

TP- 3. RUN# 243. LOAD= [illegible] LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 12. PSI

FILE 771. SILVERTOWN E78 - 14 (M.O.E.-6) DRY ASPHALT #8

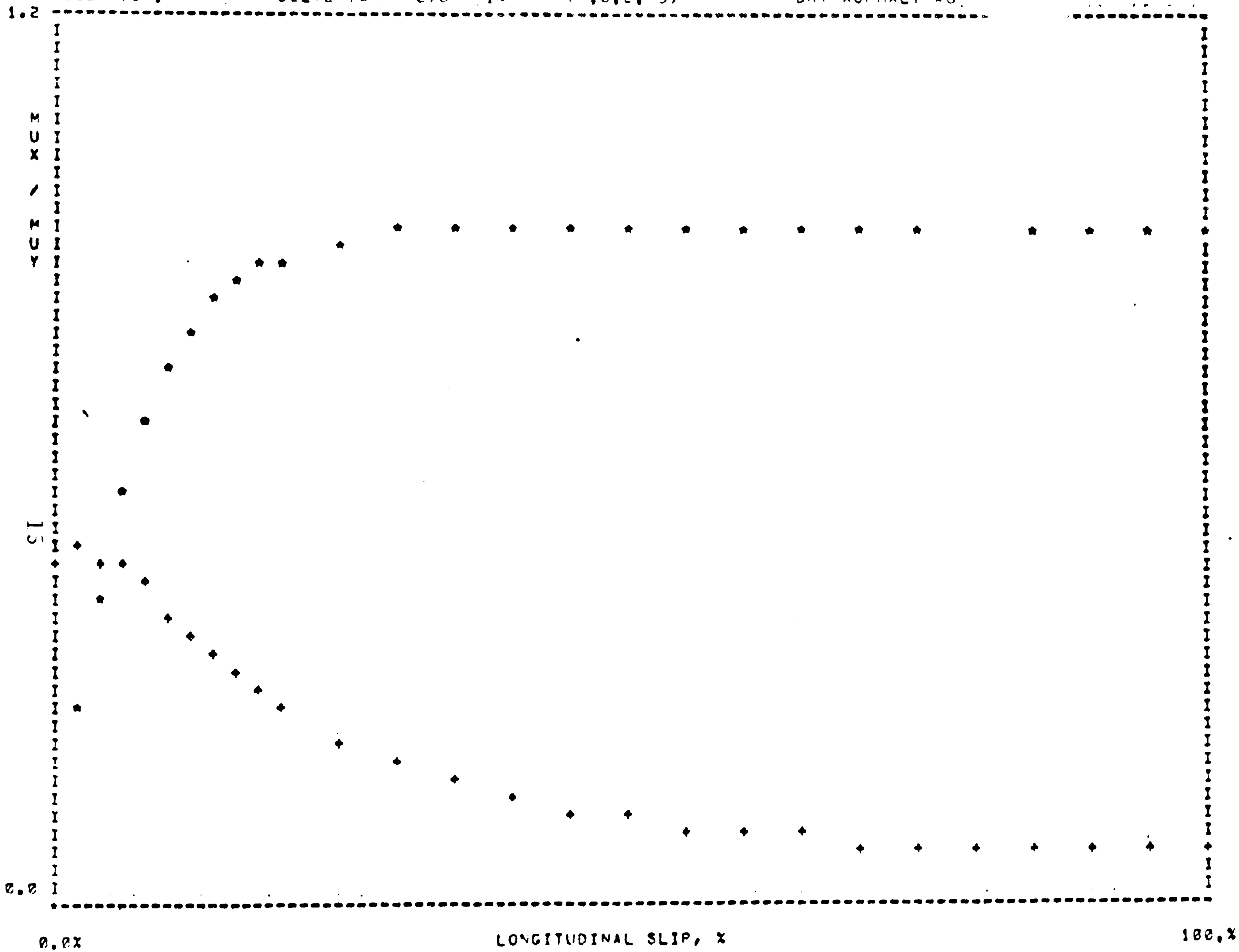


SLIP	FX-LBS
0.00	0.0
0.02	377.9
0.04	569.0
0.06	704.2
0.08	798.3
0.10	860.6
0.12	900.8
0.14	926.4
0.16	942.5
0.18	952.3
0.20	956.6
0.25	962.1
0.30	965.6
0.35	968.0
0.40	969.4
0.45	967.9
0.50	963.2
0.55	957.0
0.60	951.5
0.65	948.8
0.70	947.2
0.75	944.1
0.80	939.0
0.85	932.6
0.90	925.9
0.95	919.3
1.00	913.0

TP- 3. RUN# 257. LOAD= 1100. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 12. PSI

FILE 759. SILVERTOWN E78 - 14 (M.O.E.-5) DRY ASPHALT #8

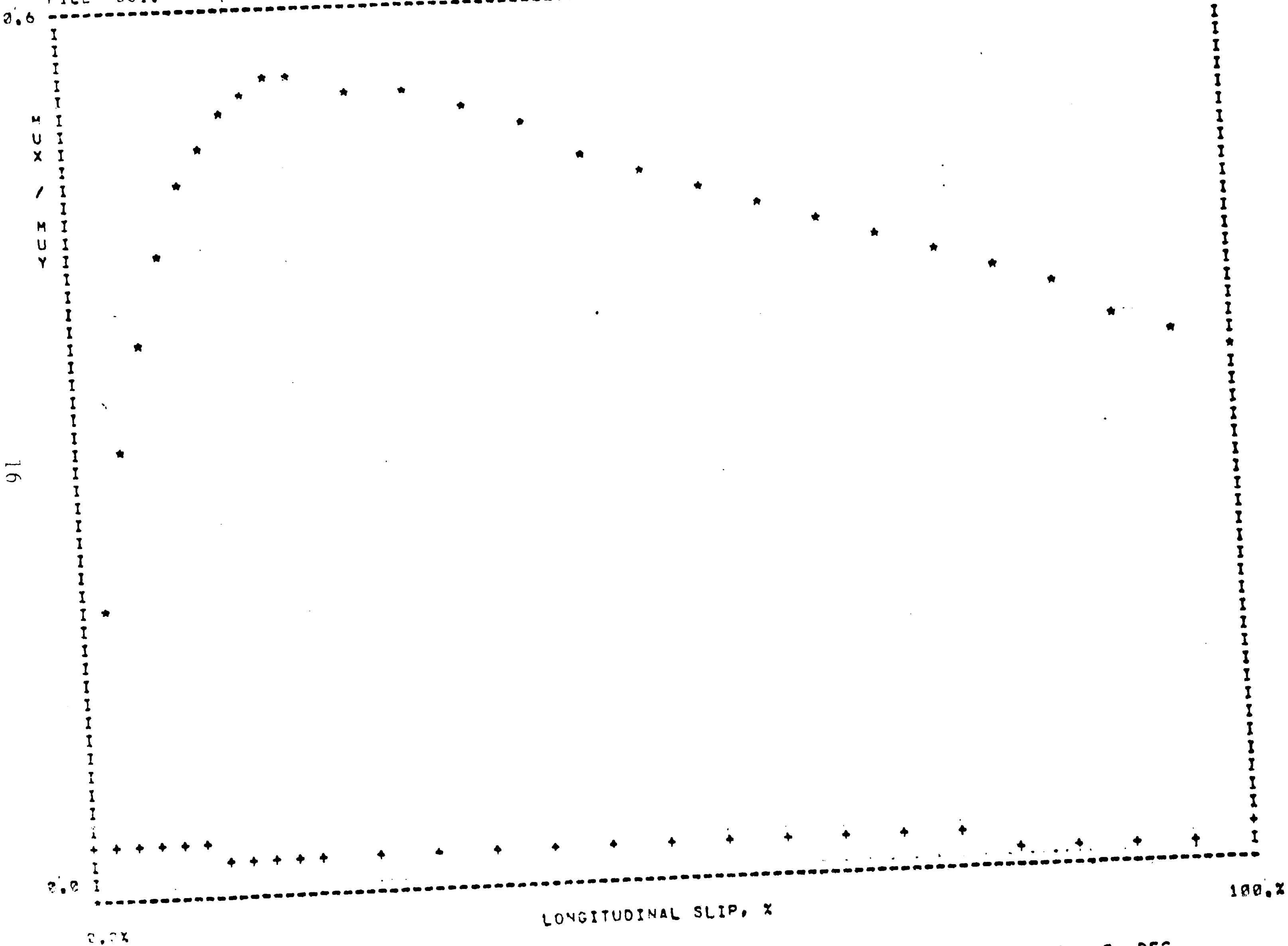


SLIP	FX-LBS	FY-LBS
0.00	0.0	359.4
0.02	202.9	374.5
0.04	332.5	368.4
0.06	433.5	354.5
0.08	511.8	336.0
0.10	571.2	314.7
0.12	615.2	291.7
0.14	646.8	269.1
0.16	669.6	248.1
0.18	686.2	229.3
0.20	696.0	213.3
0.25	709.8	179.6
0.30	718.7	152.5
0.35	724.4	131.5
0.40	727.9	115.4
0.45	729.0	103.2
0.50	728.4	93.3
0.55	727.2	84.8
0.60	726.8	77.1
0.65	727.0	72.7
0.70	729.3	66.0
0.75	730.7	62.2
0.80	732.1	60.5
0.85	732.8	60.9
0.90	731.5	61.2
0.95	727.7	59.8
1.00	722.7	55.6

TP- 3. RUN# 245. LOAD= 800. LBS. VEL.= 40. MPH ALPHA= 4. DEG

TIRE PRESSURE= 12. PSI

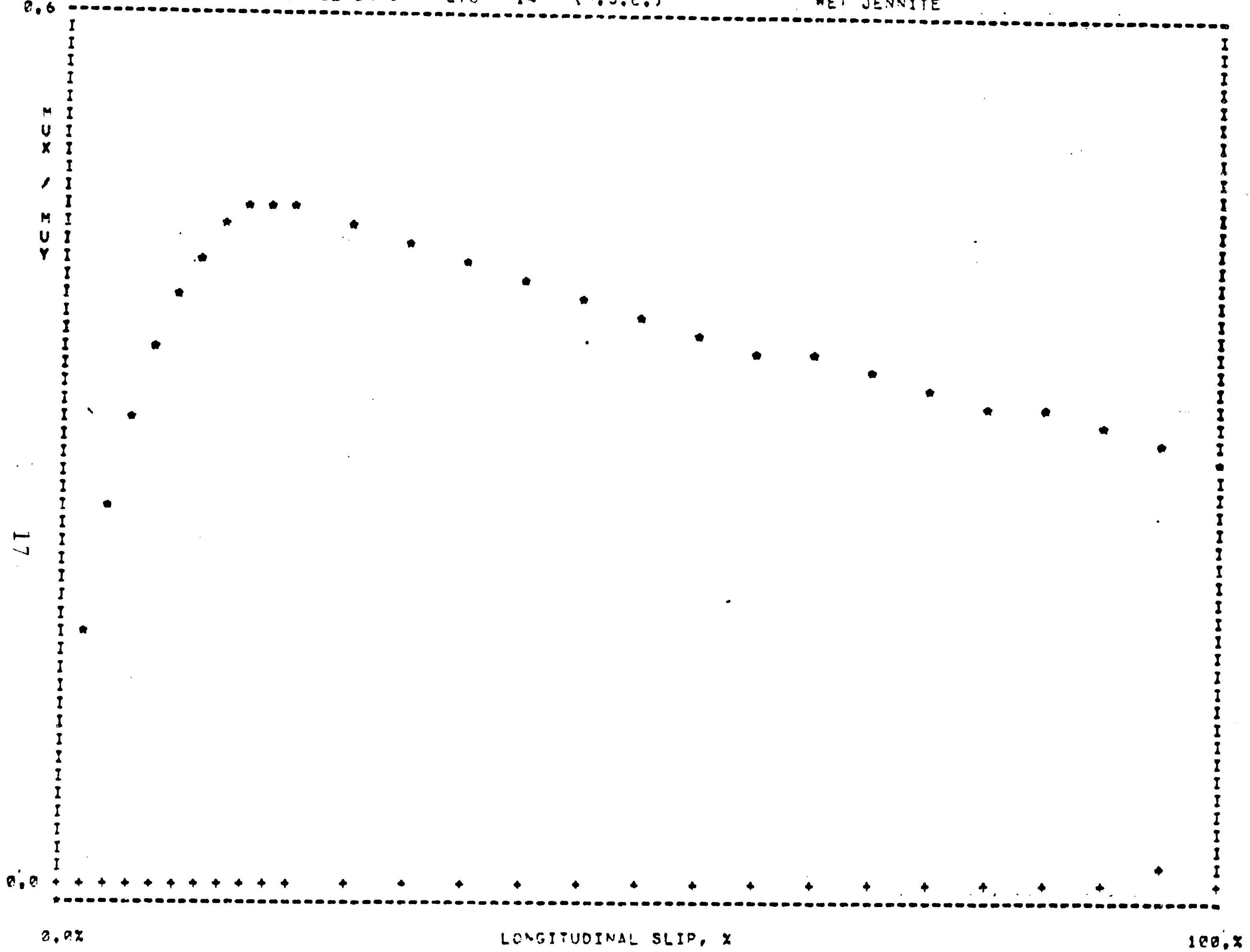
FILE 861.   SILVERTOWN E78 - 14 (M.O.E.)   WET JENNITE



SLIP	FX-LBS
0.00	0.0
0.02	158.7
0.04	24[illegible].1
0.06	301.3
0.08	348.3
0.10	383.9
0.12	408.8
0.14	425.4
0.16	435.3
0.18	440.6
0.20	441.6
0.25	437.6
0.30	430.4
0.35	420.9
0.40	410.4
0.45	399.8
0.50	389.6
0.55	379.6
0.60	369.6
0.65	359.2
0.70	348.2
0.75	336.7
0.80	325.3
0.85	314.1
0.90	3[illegible]2.3
0.95	29[illegible].1
1.00	277.4

... 3.   RUN= 353.   LOAD= 8[illegible]0. LBS.   VEL.= 20. MPH   ALPHA= 0. DEG

FILE 862. SILVERTOWN E78 - 14 (M.D.E.) WET JENNITE

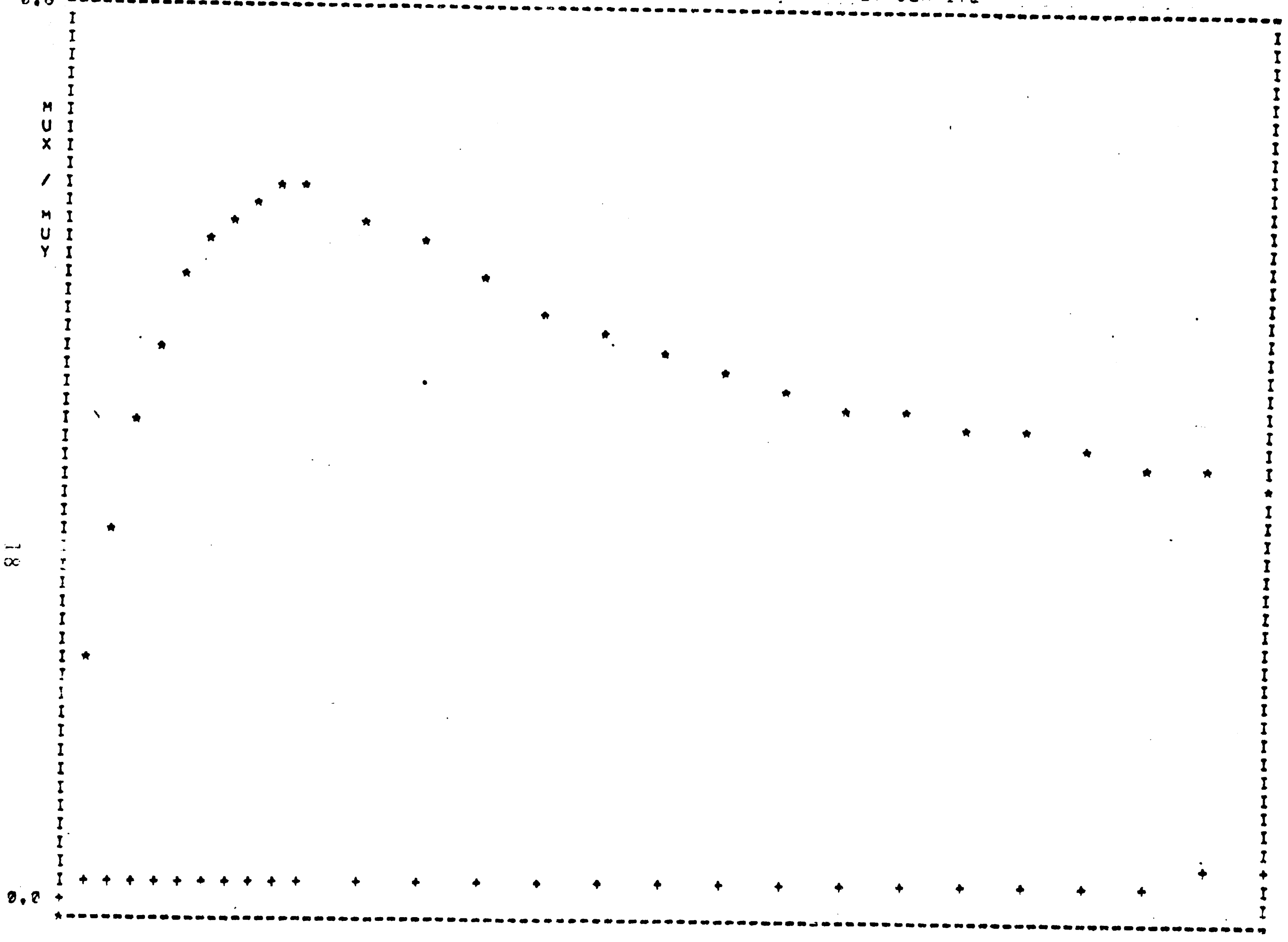


SLIP	FX-LBS
0.00	0.0
0.02	140.9
0.04	215.1
0.06	265.4
0.08	303.2
0.10	331.2
0.12	351.3
0.14	364.7
0.16	372.8
0.18	376.8
0.20	376.3
0.25	369.0
0.30	359.0
0.35	347.6
0.40	336.4
0.45	326.1
0.50	316.8
0.55	308.1
0.60	300.7
0.65	294.8
0.70	288.9
0.75	282.1
0.80	274.2
0.85	266.0
0.90	256.8
0.95	247.0
1.00	236.7

TP- 3. RUN# 354. LOAD= 5[illegible]. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 12. PSI

FILE 880.   SILVERTOWN E78 - 14   (M.C.E.)   WET JENNITE

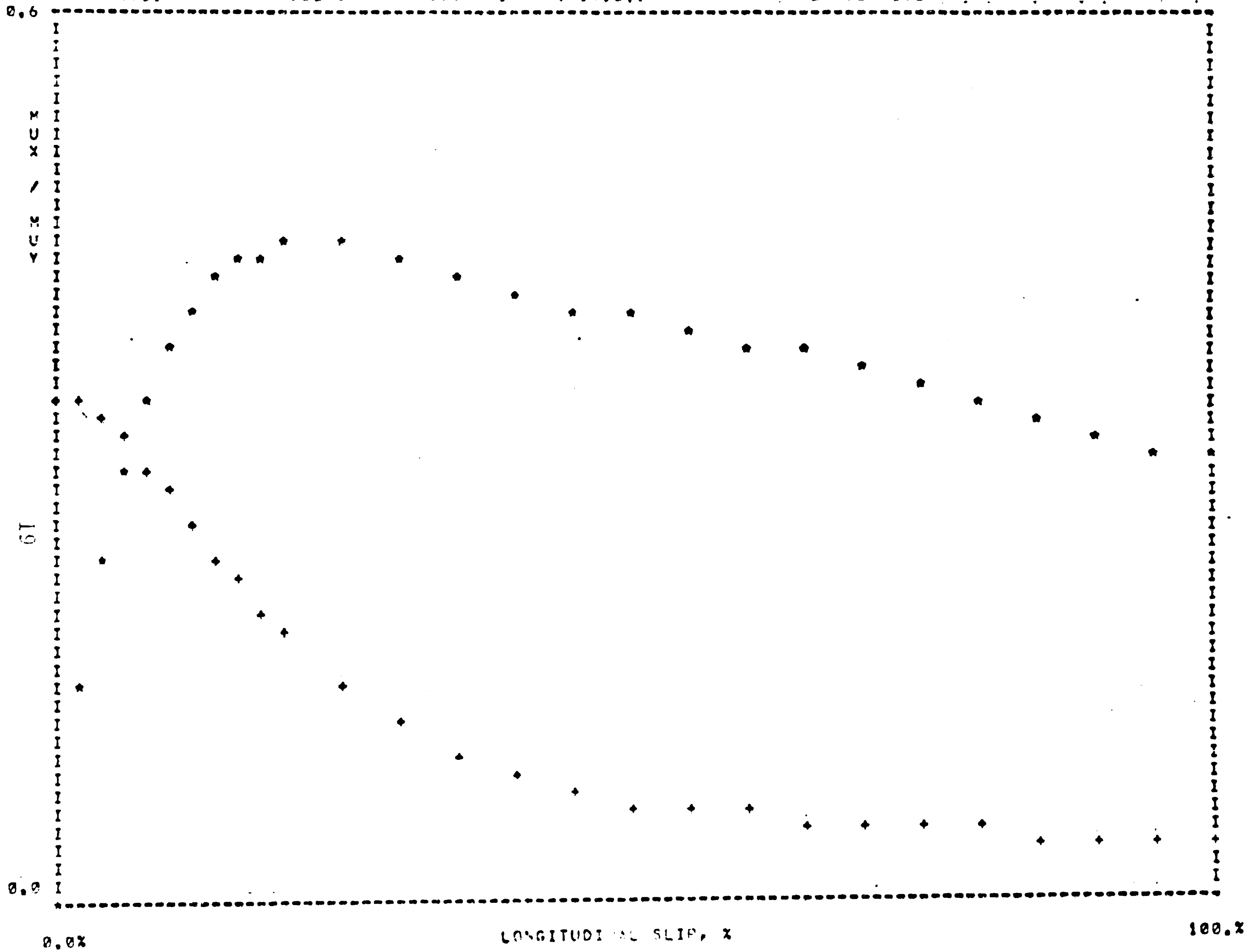


SLIP	FX-LBS
0.00	0.0
0.02	184.1
0.04	282.4
0.06	357.9
0.08	416.8
0.10	461.6
0.12	492.8
0.14	513.1
0.16	525.0
0.18	530.3
0.20	528.5
0.25	512.6
0.30	491.0
0.35	466.6
0.40	443.4
0.45	423.9
0.50	408.6
0.55	396.8
0.60	387.4
0.65	379.8
0.70	372.3
0.75	364.3
0.80	355.7
0.85	346.9
0.90	337.9
0.95	329.1
1.00	320.3

TP= 3.   RUN# 372.   LOAD= 1100. LBS.   VEL.= 40. MPH   ALPHA= 0. DEG

TIRE PRESSURE= 12. PSI

FILE 873. SILVERTOWN E78 - 14 (M.O.E.) WET JENNITE



SLIP	FX-LBS	FY-LBS
0.00	[illegible]	278.2
0.02	117.2	275.2
0.04	182.8	264.0
0.06	231.8	249.7
0.08	269.5	234.2
0.10	298.3	218.1
0.12	319.7	201.8
0.14	334.9	185.7
0.16	345.4	170.0
0.18	352.3	155.2
0.20	354.7	142.0
0.25	353.1	115.1
0.30	347.7	93.5
0.35	339.9	77.3
0.40	331.3	65.4
0.45	323.0	56.9
0.50	315.1	50.9
0.55	308.0	46.8
0.60	301.8	43.7
0.65	295.2	41.0
0.70	287.3	38.3
0.75	278.9	36.0
0.80	270.0	33.9
0.85	260.5	31.9
0.90	252.0	30.4
0.95	244.2	29.2
1.00	237.4	28.6

TP= 3. RUN# 365. LOAD= [illegible] LBS. VEL.= 40. MPH ALPHA= 3. DEG

TIRE PRESSURE= 12. PSI

I.B.1 Free-Rolling Measurements from the Flat Bed Tire Tester - 16 psi Inflation

a. Lateral Force vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	182	91	-6	122	208	300	384	408	-427
800	190	85	-6	124	225	370	584	607	-661
1100	178	79	-6	115	216	376	579	755	-872
1400	166	76	-6	110	204	355	623	786	-1004

b. Aligning Moment vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	-17	-10	-0	11	16	13	3	2	-1
800	-37	-18	-1	23	36	41	41	13	-6
1100	-53	-26	-2	33	54	75	42	39	-17
1400	-67	-33	-2	41	71	104	110	85	-41

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°
500	-48	-28	-7	1	16	66	92	105
800	-52	-29	-6	1	19	76	112	141
1100	-55	-30	-6	0	23	80	115	155
1400	-60	-32	-6	0	27	91	118	179

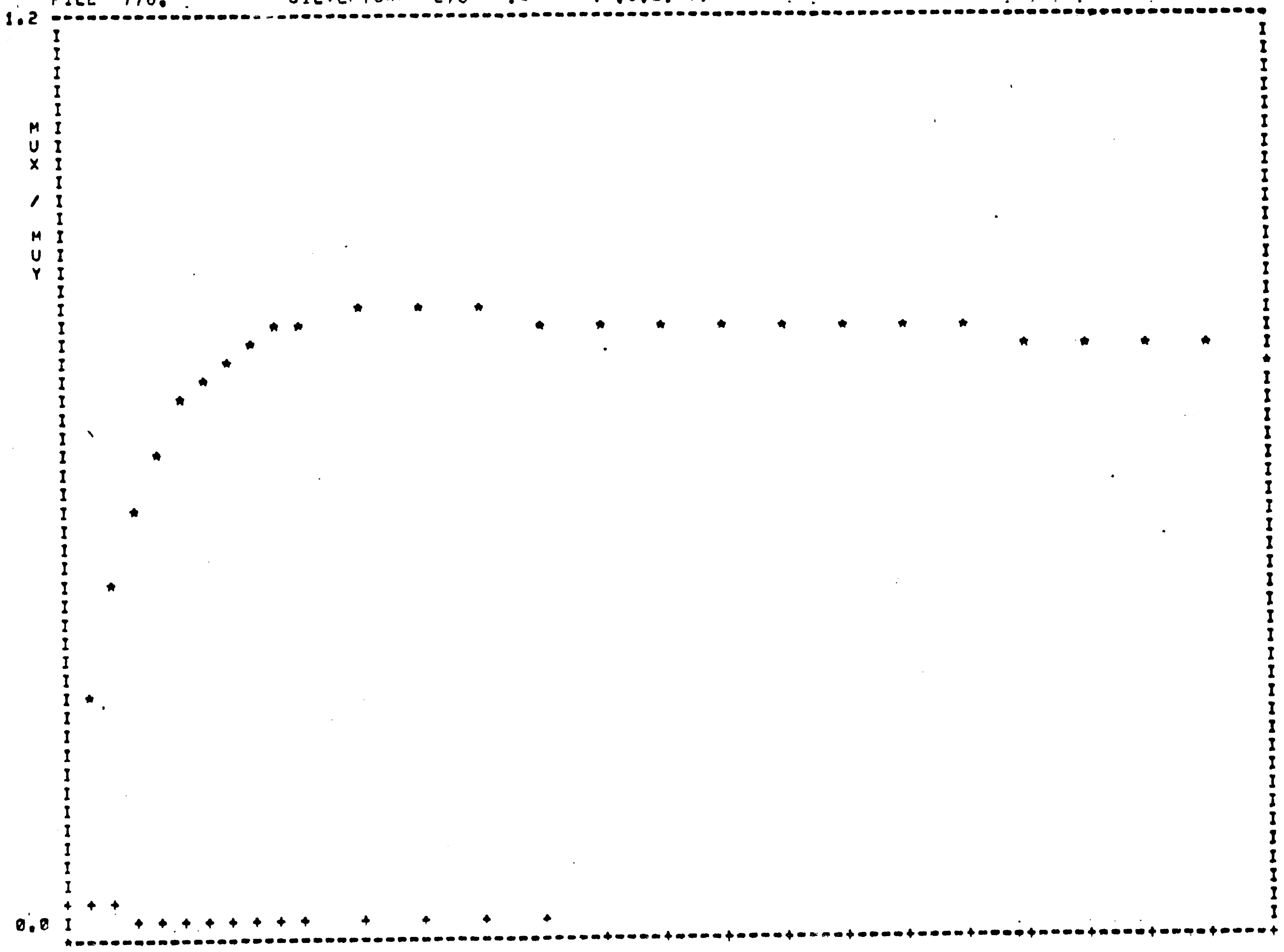
I.B.2 Free-Rolling Lateral Force Measurements fr[illegible]bile Tire Tester - 20 psi Inflation

		Dry Asphalt					Wet Jennite				
Load	Speed	0°	2°	4°	8°	16°	[illegible]	1°	3°	7°	15°
800	20 mph	20	267	420	579	720	8	142	317	437	429
	40 mph	0	295	448	617	539/719	5	142	312	426	455
	50 mph						10	142	298	391	357
1100	40 mph	0	266	463	760	824/934	5	125	308	472	494
1400	40 mph	18	272	442	755	950/1085	15	125	324	554	661

I.B.3 Braking Data from the Mobile Tire Tester

	Dry Asphalt				Wet Jennite			
	0°			4°	0°			3°
	800 lbs.		1100 lbs.	800 lbs.	800 lbs.		1100 lbs.	800 lbs.
	20 mph	40 mph	40 mph	40 mph	20 mph	40 mph	40 mph	40 mph
MBF	653		949	637	423	403	487	389
LWBF	606		898	608	293	254	303	265
MLF				414				280
LWLF				49				12

FILE 778. SILVERTOWN E78 - 14 (M.O.E.-7) DRY ASPHALT #8

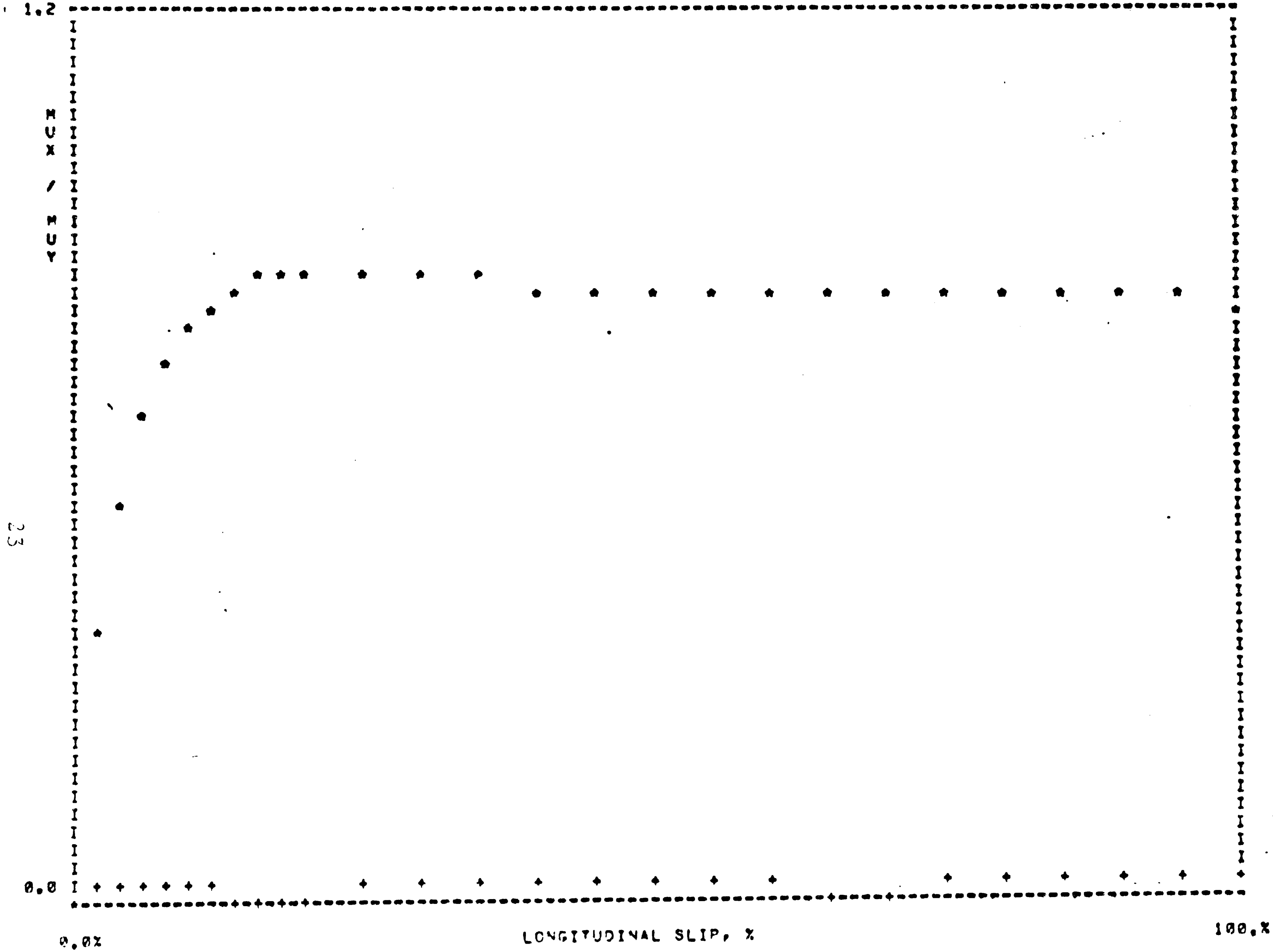


SLIP	FX-LBS
0.00	0.0
0.02	257.5
0.04	365.9
0.06	445.3
0.08	504.8
0.10	549.3
0.12	582.4
0.14	606.6
0.16	624.1
0.18	636.5
0.20	643.6
0.25	651.5
0.30	652.9
0.35	648.9
0.40	642.3
0.45	635.5
0.50	630.5
0.55	627.5
0.60	626.8
0.65	627.3
0.70	627.3
0.75	626.4
0.80	625.2
0.85	623.6
0.90	620.0
0.95	614.3
1.00	605.7

TP= 3. RUN# 265. LOAD= 800. LBS. VEL.= 20. MPH ALPHA= 0. DEG

TIRE PRESSURE= 20. PSI

FILE 791. SILVERTOWN E78 - 14 (M.O.E.-8) DRY ASPHAL #8

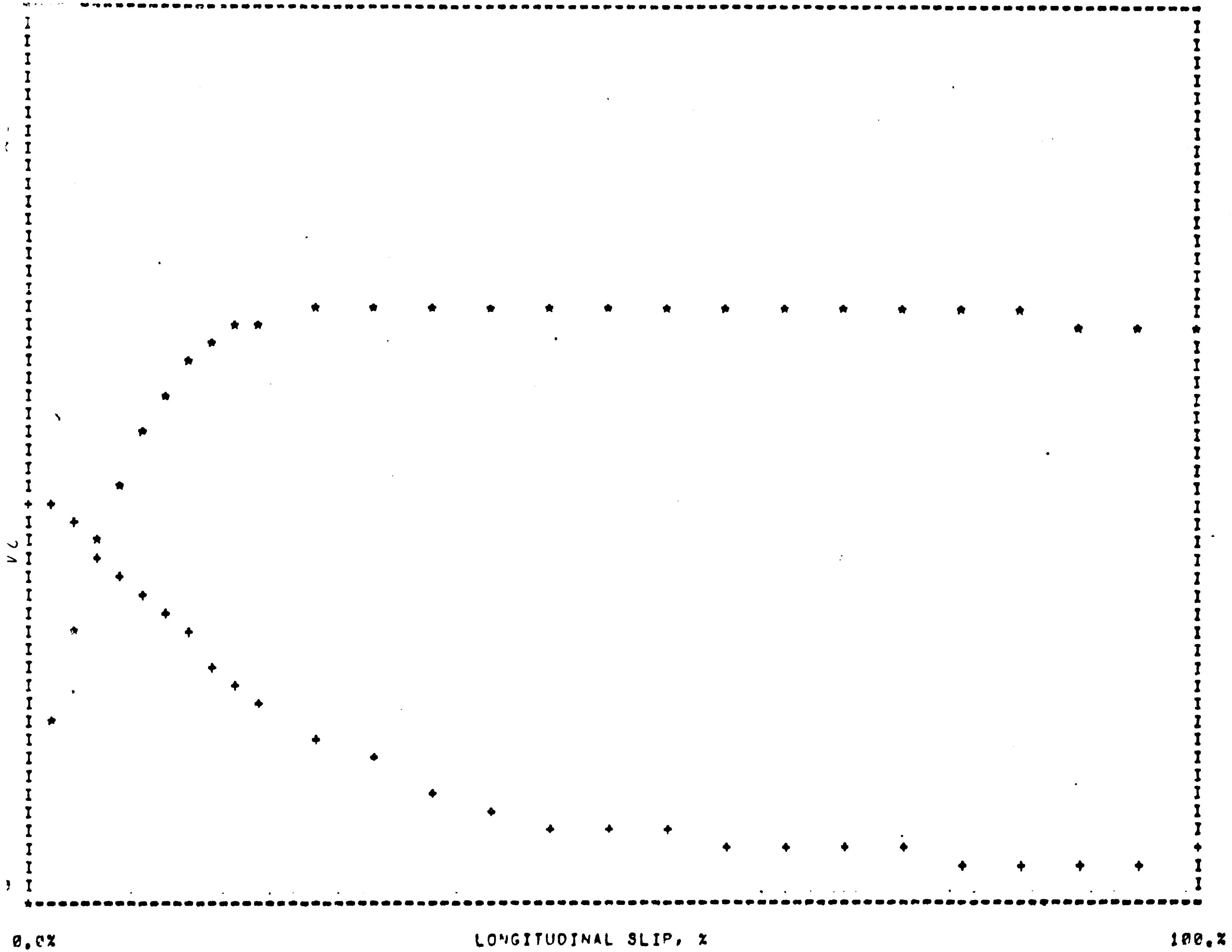


SLIP	FX-LBS
0.00	0.0
0.02	412.0
0.04	592.6
0.06	714.2
0.08	799.2
0.10	857.6
0.12	897.2
0.14	923.4
0.16	939.2
0.18	947.5
0.20	949.8
0.25	944.4
0.30	936.3
0.35	927.2
0.40	919.2
0.45	912.6
0.50	908.6
0.55	907.2
0.60	907.8
0.65	910.1
0.70	913.0
0.75	915.2
0.80	916.1
0.85	914.2
0.90	909.2
0.95	903.6
1.00	898.0

TP- 3. RUN# 279. LOAD= 1100. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 20. PSI

779. SILVERTOWN E78 - 14 (M.O.E.-7) DRY ASPHALT #8

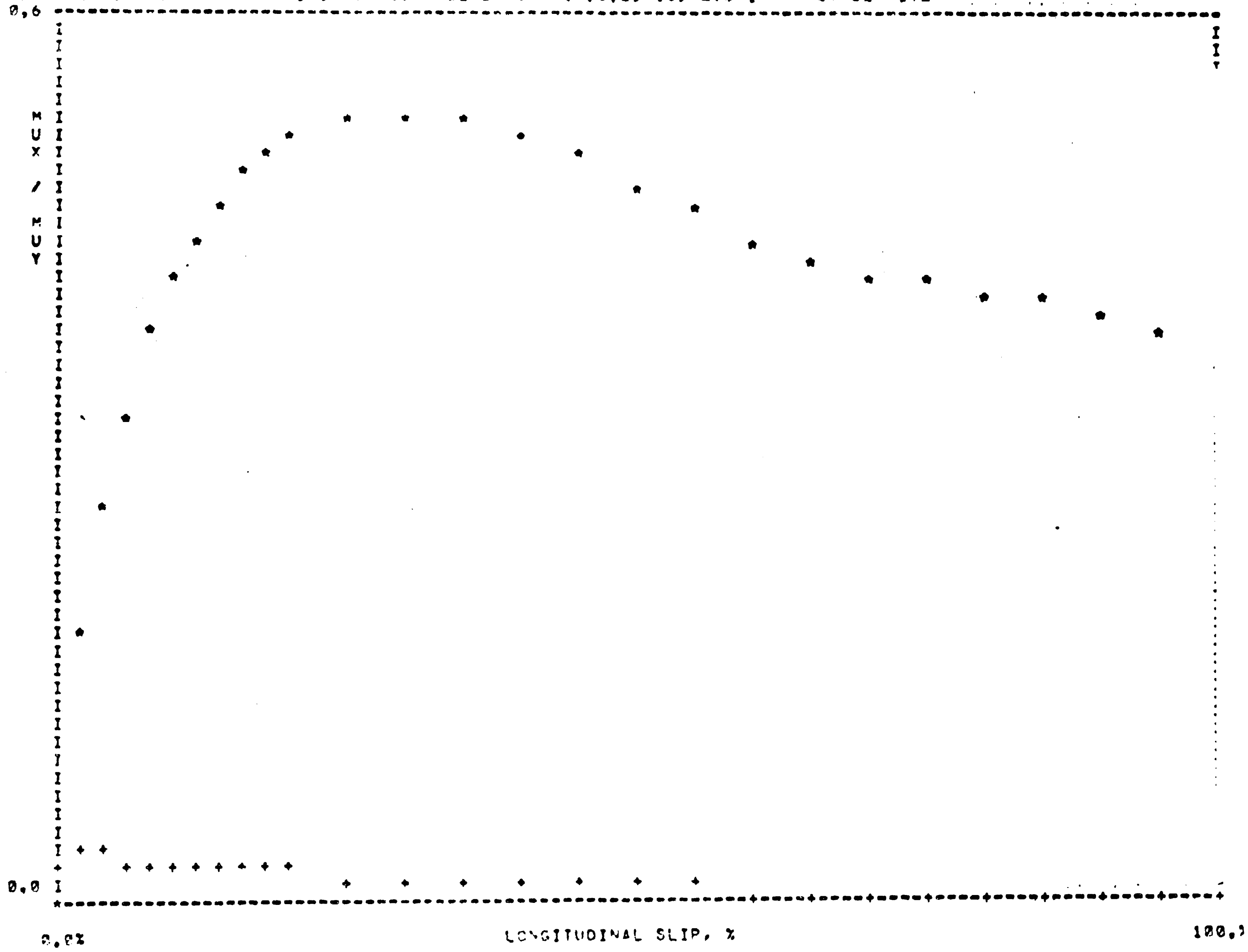


SLIP	FX-LBS	FY-LBS
0.00	0.0	414.2
0.02	184.0	413.8
0.04	292.4	395.1
0.06	380.1	373.4
0.08	449.8	351.2
0.10	503.7	328.4
0.12	544.4	305.0
0.14	574.7	281.5
0.16	597.0	258.7
0.18	613.1	237.6
0.20	622.3	219.8
0.25	633.2	182.2
0.30	637.3	149.2
0.35	637.4	122.6
0.40	636.3	102.2
0.45	635.4	86.5
0.50	635.8	75.4
0.55	638.0	67.6
0.60	640.2	61.6
0.65	641.6	56.7
0.70	641.5	52.4
0.75	639.3	48.6
0.80	635.7	45.6
0.85	631.4	43.3
0.90	624.8	42.6
0.95	616.9	44.1
1.00	607.6	48.7

TP= 3. RUN# 266. LOAD= 830. LBS. VEL.= 40. MPH ALPHA= 4. DEG

TIRE PRESSURE= 20. PSI

FILE 1096.   B.F.GOODRICH SILVERTOWN (M.O.E.-16) E78-14   WET JENNITE

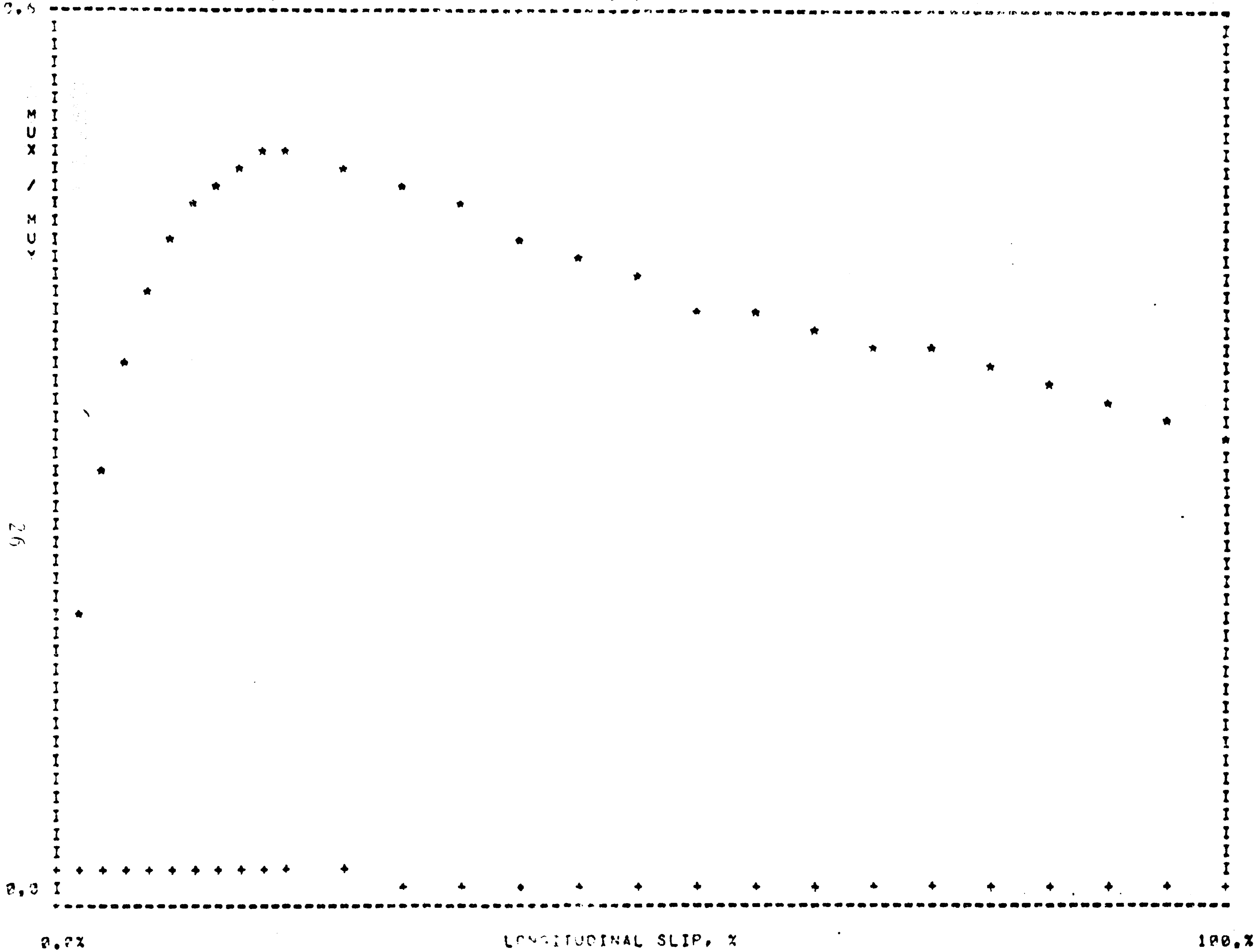


TP= 4.   RUN# 223.   LOAD= ???. LBS.   VEL.= 20. MPH   ALPHA= 0. DEG

TIRE PRESSURE= 18. PSI

SLIP	FX-LBS
0.00	0.0
0.02	142.0
0.04	211.2
0.06	262.7
0.08	303.4
0.10	334.9
0.12	359.4
0.14	377.9
0.16	391.9
0.18	403.2
0.20	410.5
0.25	419.7
0.30	422.9
0.35	420.0
0.40	412.9
0.45	400.0
0.50	385.2
? CONVERSION ERROR EQ 0136	
0.55	370.2
0.60	357.4
0.65	347.4
0.70	339.9
0.75	334.1
0.80	329.1
0.85	323.1
0.90	314.3
0.95	304.2
1.00	293.7

FILE 1095.   B.F.GOODRICH SILVERTOWN (M.O.E.=16) E78-14   WET [illegible]

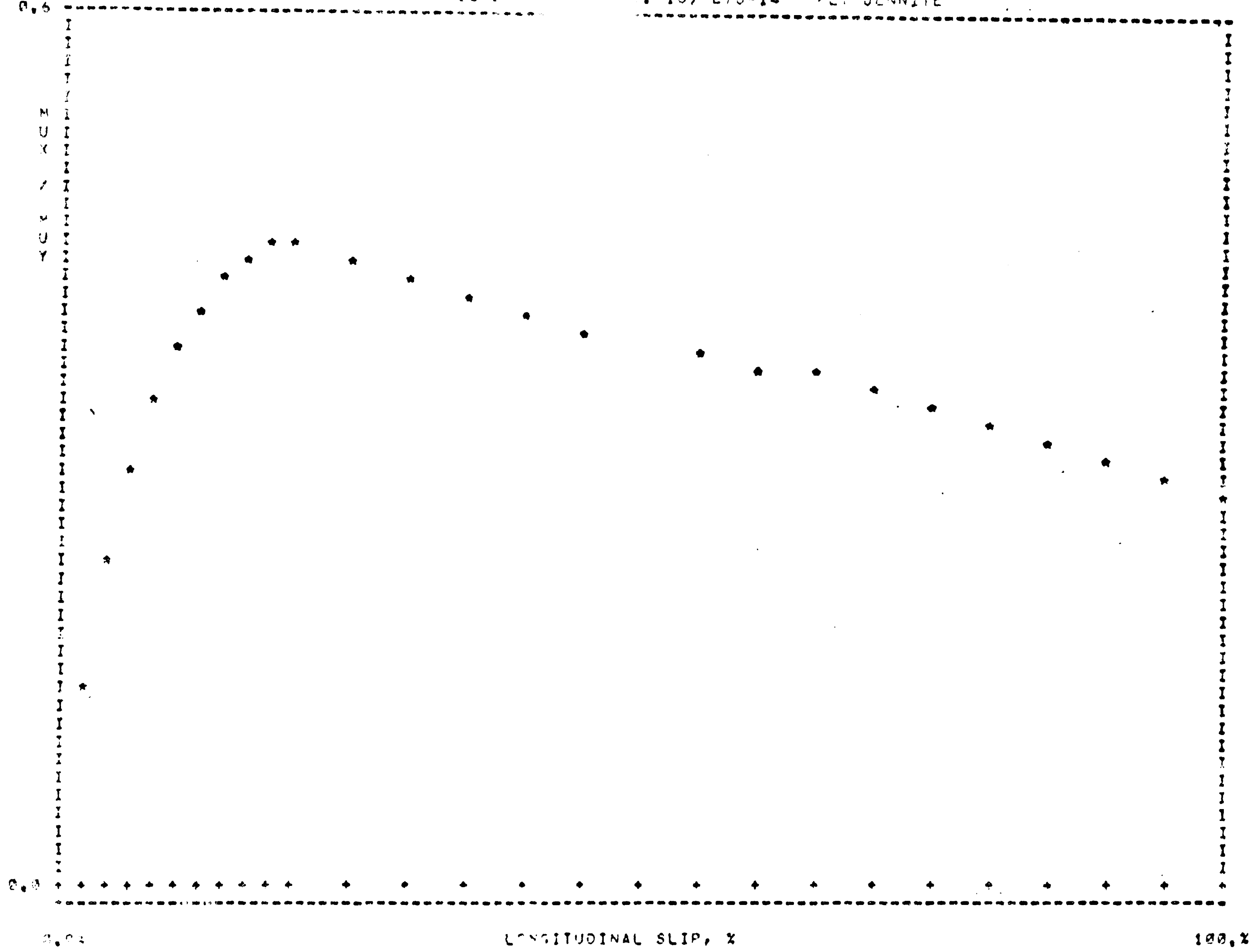


TP= 4.   RUN# 222.   LOAD= [illegible]. LBS.   VEL.= 40. MPH   ALPHA= 0. DEG

TIRE PRESSURE= 18. PSI

SLIP	FX-LBS
0.00	0.0
0.02	153.7
0.04	230.0
0.06	284.9
0.08	325.9
0.10	354.9
0.12	375.1
0.14	388.7
0.16	397.7
0.18	402.6
0.20	403.3
0.25	396.8
0.30	385.2
0.35	370.8
0.40	356.9
0.45	344.5
0.50	332.9
0.55	322.2
0.60	314.2
0.65	308.6
0.70	302.8
0.75	295.7
0.80	288.0
0.85	279.8
0.90	271.3
0.95	262.5
1.00	253.7

FILE 1089. B.F.GOODRICH SILVERTOWN (?-16) E78-14 WET JENNITE

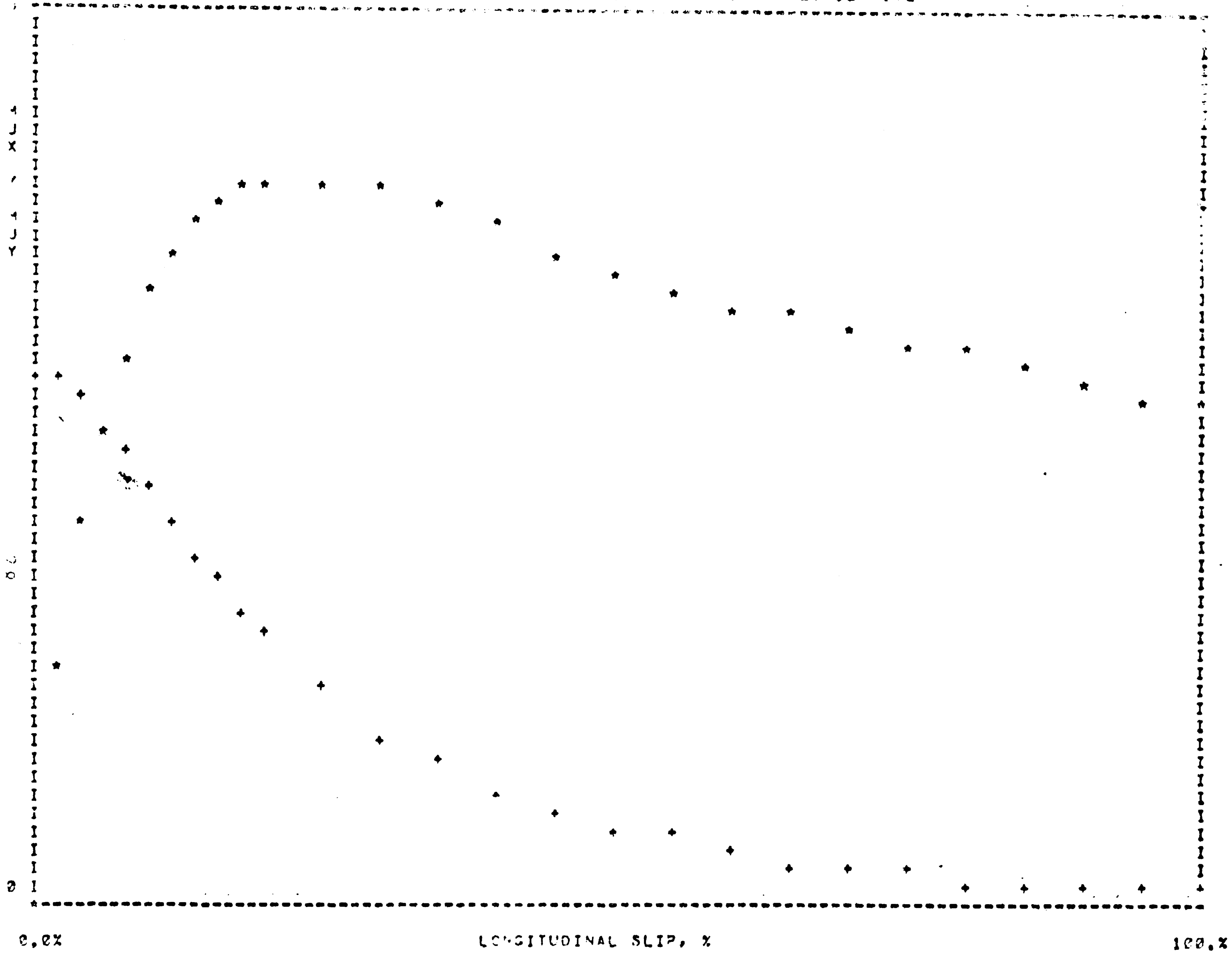


SLIP	FX-LBS
0.00	0.0
0.02	164.5
0.04	252.1
0.06	314.6
0.08	365.5
0.10	405.7
0.12	436.8
0.14	459.8
0.16	475.4
0.18	484.7
0.20	486.8
0.25	479.4
0.30	465.6
0.35	448.6
0.40	432.3
0.45	419.4
0.50	409.9
0.55	402.5
0.60	396.6
0.65	390.8
0.70	383.3
0.75	373.3
0.80	361.3
0.85	347.9
0.90	333.5
0.95	318.6
1.00	303.2

TP= 4. RUN# 216. LOAD= 1100. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE 24. PSI

FILE 1997, B.F.GOODRICH SILVERTOWN (W,C,E,-16) E78-14 WET JENNITE



TP= 4. RUN# 224. LOAD= 800. LBS. VEL.= 40. MPH ALPHA= 3. DEG

TIRE PRESSURE= 18. PSI

SLIP	FX-LBS	FY-LBS
0.00	0.0	280.4
0.02	127.8	280.0
0.04	197.7	268.9
0.06	250.3	254.0
0.08	291.6	237.4
0.10	323.2	220.3
0.12	347.2	203.3
0.14	365.0	186.5
0.16	377.8	171.1
0.18	386.3	156.2
0.20	389.4	142.5
0.25	388.5	113.9
0.30	383.3	90.6
0.35	374.8	72.3
0.40	363.6	58.5
0.45	351.4	48.7
0.50	340.1	41.0
0.55	330.3	34.2
0.60	322.0	28.2
0.65	315.1	23.3
0.70	309.1	19.0
0.75	302.8	15.3
0.80	295.5	12.8
0.85	287.4	11.5
0.90	279.5	11.0
0.95	271.9	11.0
1.00	264.9	11.5

I.C.1 Free-Rolling Measurements from the Flat Bed Tire Tester - 22 psi Inflation

a. Lateral Force vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	190	96	-7	127	211	306	382	403	-420
800	237	118	-9	151	266	408	560	633	-680
1100	252	115	-8	150	274	448	683	819	-912
1400	236	108	-7	141	264	444	756	950	-1121

b. Aligning Moment vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	-12	- 7	-0	8	12	10	3	1	-1
800	-29	-17	-0	19	29	31	18	10	-5
1100	-47	-26	-1	29	48	60	43	29	-12
1400	-63	-33	-2	37	65	90	81	56	-29

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°
500	-46	-29	-7	-1	12	57	78	90
800	-54	-32	-9	8	18	84	126	149
1100	-62	-38	-8	8	18	89	136	177
1400	-61	-38	-7	9	28	95	144	190

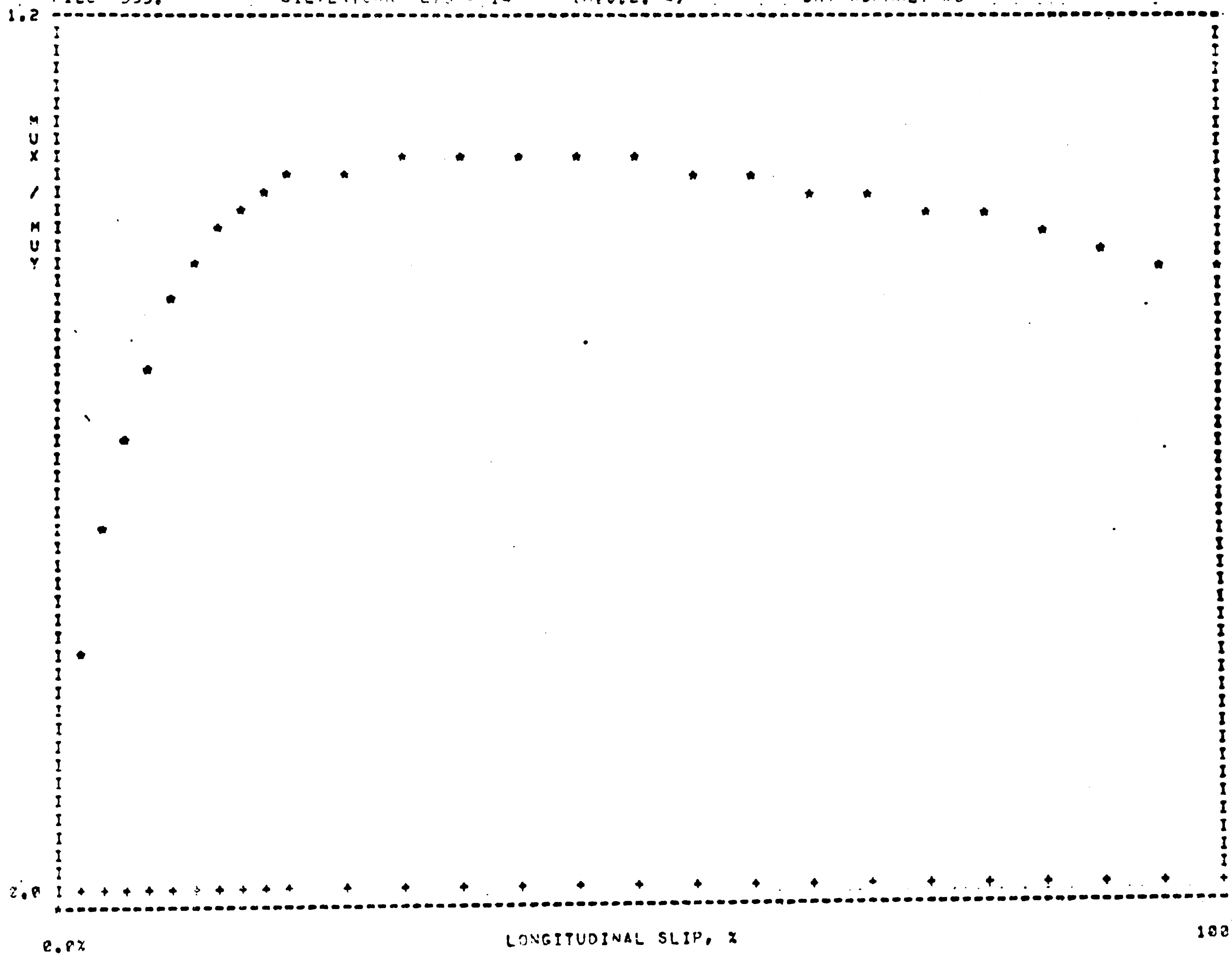
I.C.2 Free-Rolling Lateral Force Measurements from Mobile Tire Tester - 24 psi Inflation

		Dry Asphalt					Wet Jennite				
Load	Speed	0°	2°	4°	8°	16°	0°	1°	3°	7°	15°
800	20 mph	-12	267	447	658	713/783	24	172	373	497	471
	40 mph	- 5	272	452	645	733	10	174	366	446	411/375
	50 mph						12	194	351	395	390
1100	40 mph	- 8	308	546	837	890/980	-10	150	368	507	560
1400	40 mph	10	290	547	892	1000/1200	12	162	390	596	596/620

I.C.3 Braking Data from the Mobile Tire Tester

	Dry Asphalt				Wet Jennite			
	0°			4°	0°			3°
	800 lbs.		1100 lbs.	800 lbs.	800 lbs.		1100 lbs.	800 lbs.
	20 mph	40 mph	40 mph	40 mph	20 mph	40 mph	40 mph	40 mph
MBF	788	769	1003	783	464	379	508	366
LWBF	666	694	931	587	299	245	304	250
MLF				466				318
LWLF				56				22

FILE 553. SILVERTOWN E78 - 14 (M.O.E.-4) DRY ASPHALT #8

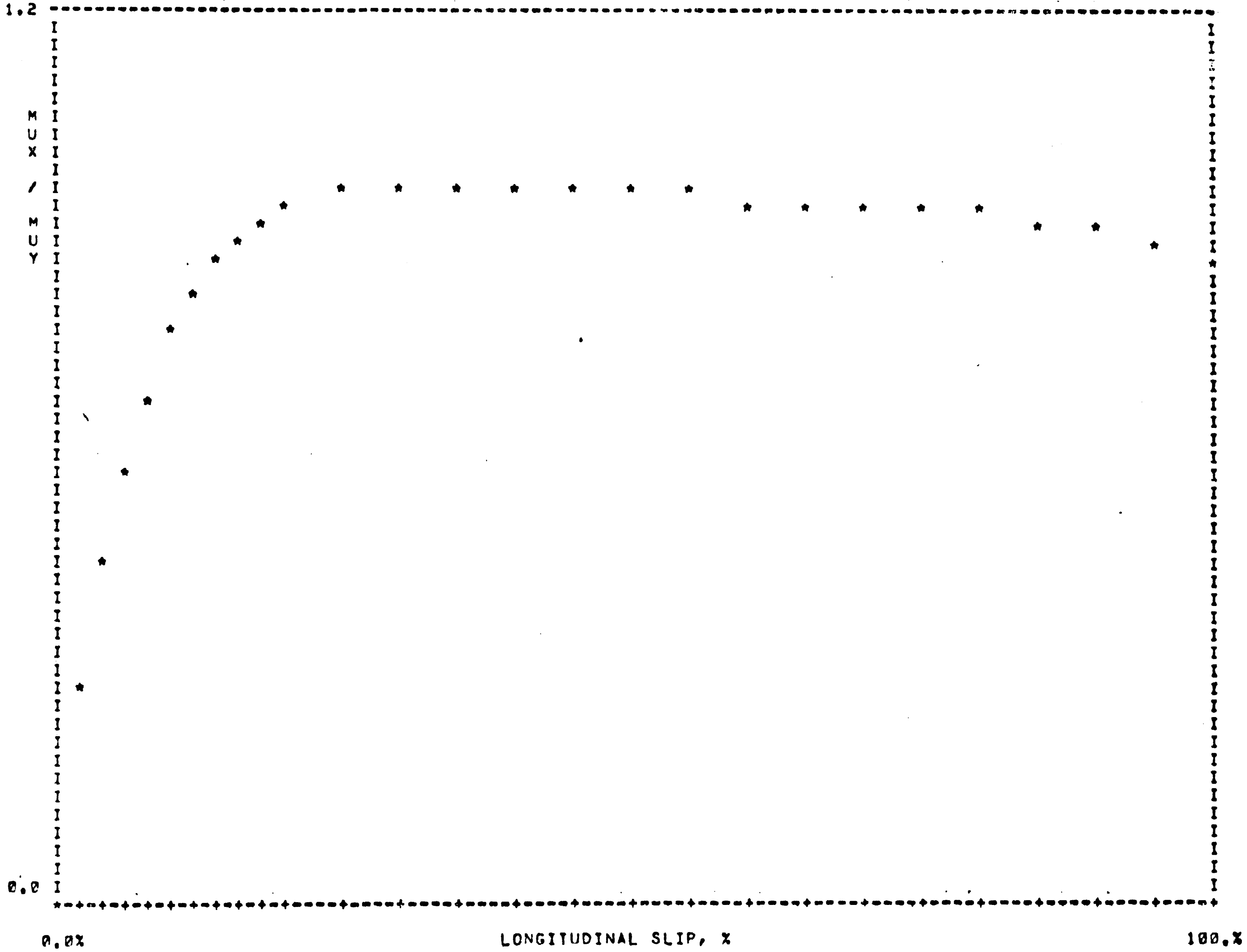


TP# 3. RUN# 23. LOAD= 800. LBS. VEL.= 20. MPH ALPHA= 0. DEG

TIRE PRESSURE= 24. PSI

SLIP	FX-LBS
0.00	0.0
0.02	263.1
0.04	392.7
0.06	491.9
0.08	569.0
0.10	627.9
0.12	672.4
0.14	705.9
0.16	731.0
0.18	749.2
0.20	759.9
0.25	775.2
0.30	784.4
0.35	788.0
0.40	787.9
0.45	783.8
0.50	777.1
0.55	768.7
0.60	759.2
0.65	749.3
0.70	739.5
0.75	730.0
0.80	720.0
0.85	709.0
0.90	696.4
0.95	682.1
1.00	665.8

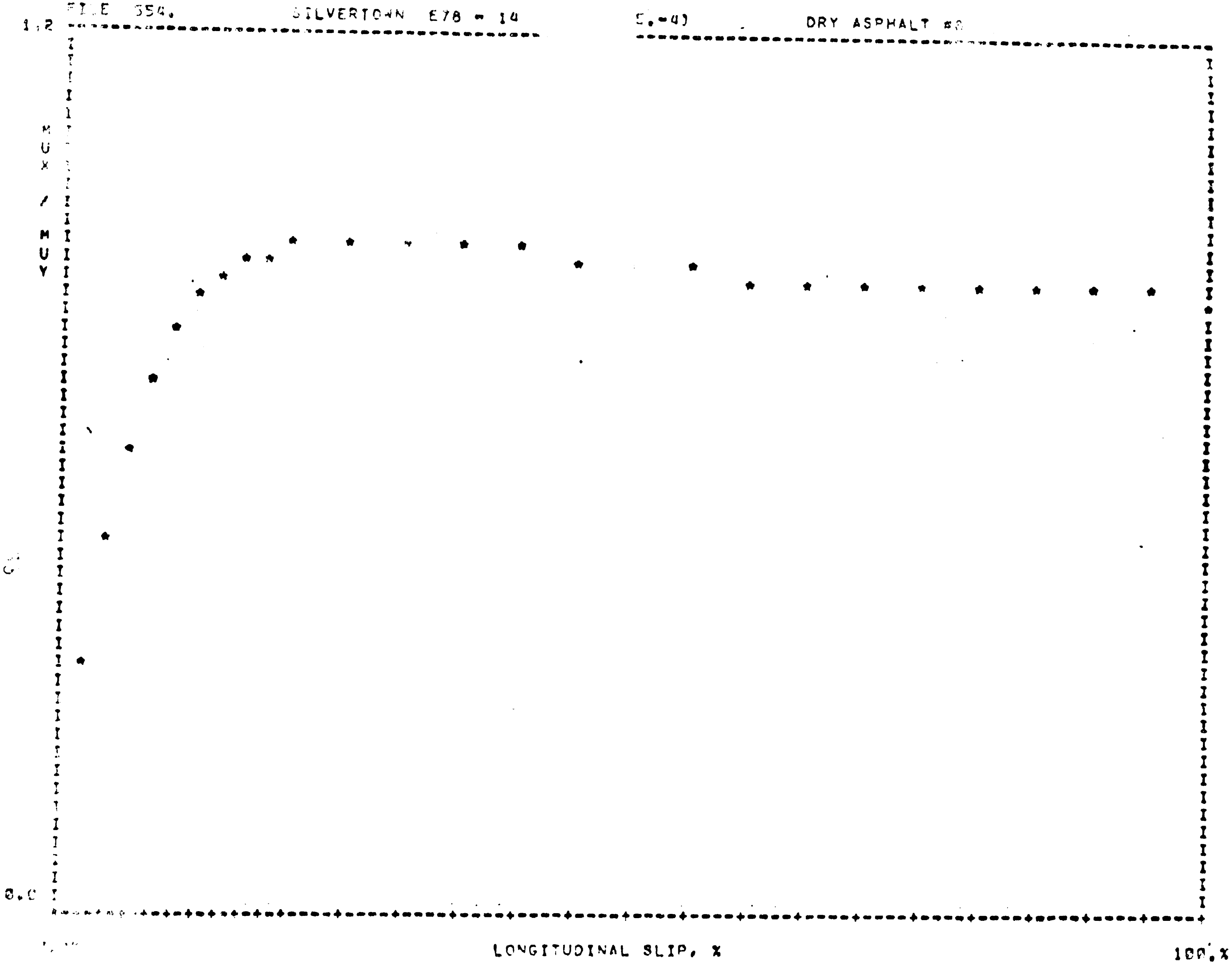
FILE 555. SILVERTOWN E78 - 14 (M.O.E.-8) DRY ASPHALT #6



SLIP	FX-LBS
0.00	0.0
0.02	234.7
0.04	365.0
0.06	465.7
0.08	545.3
0.10	606.9
0.12	654.0
0.14	689.7
0.16	716.0
0.18	734.7
0.20	746.0
0.25	761.2
0.30	768.0
0.35	769.0
0.40	768.0
0.45	766.9
0.50	764.6
0.55	760.9
0.60	757.3
0.65	755.2
0.70	753.5
0.75	750.2
0.80	744.6
0.85	736.6
0.90	725.0
0.95	711.0
1.00	694.1

TP- 3. RUN# 25. LOAD= 800. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 24. PSI

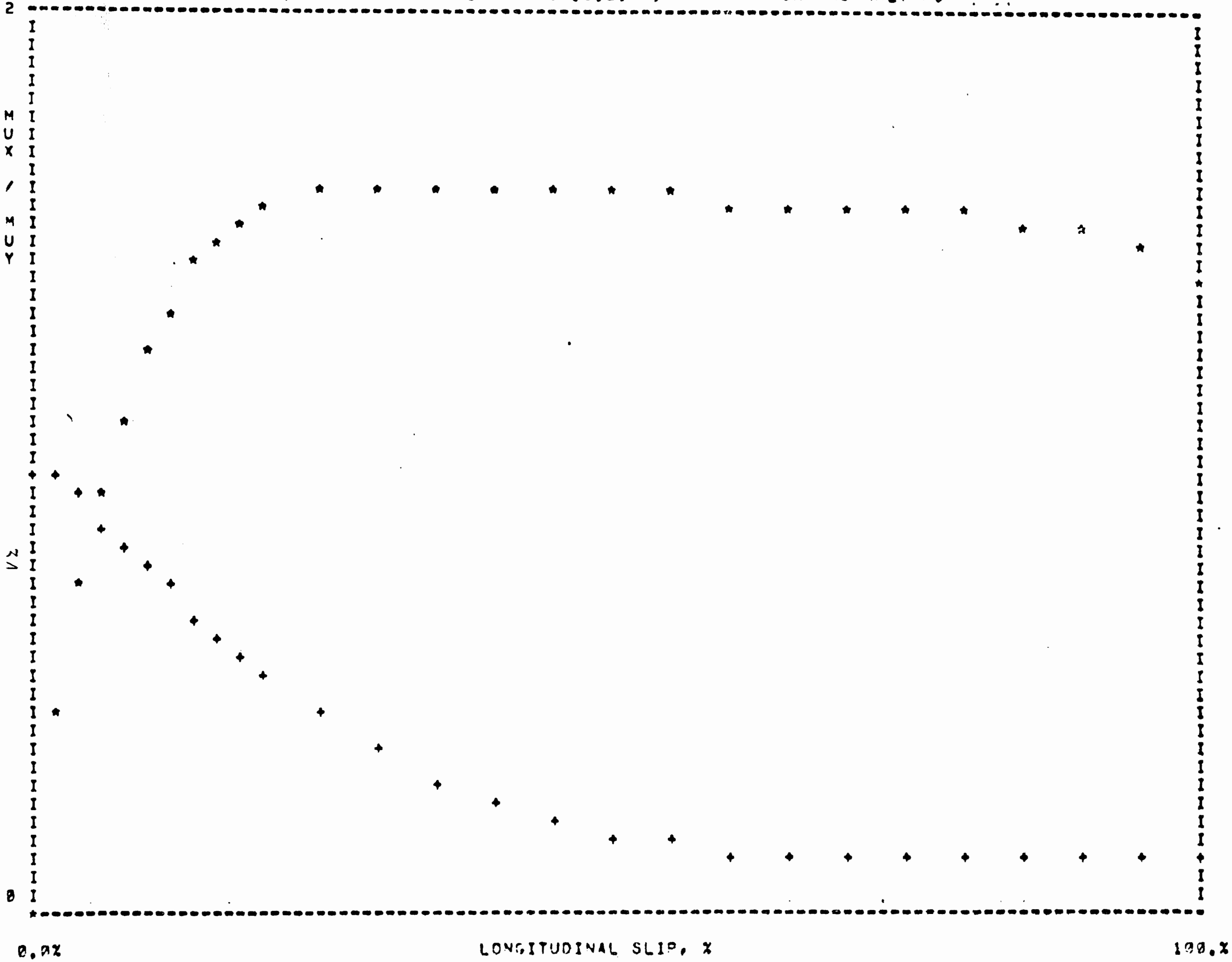


SLIP	FX-LBS
0.00	0.0
0.02	370.5
0.04	558.7
0.06	690.4
0.08	789.1
0.10	860.8
0.12	912.3
0.14	948.0
0.16	971.9
0.18	987.4
0.20	994.7
0.25	1002.6
0.30	1003.7
0.35	998.3
0.40	989.5
0.45	980.4
0.50	971.6
0.55	963.2
0.60	957.1
0.65	953.6
0.70	952.2
0.75	952.0
0.80	952.2
0.85	951.5
0.90	947.6
0.95	941.2
1.00	931.4

TP# 3. RUN# 24. LOAD= 1100. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 24. PSI

FILE 738. SILVERTOWN E78 - 14 (M.O.E.=4) DRY ASPHALT #8

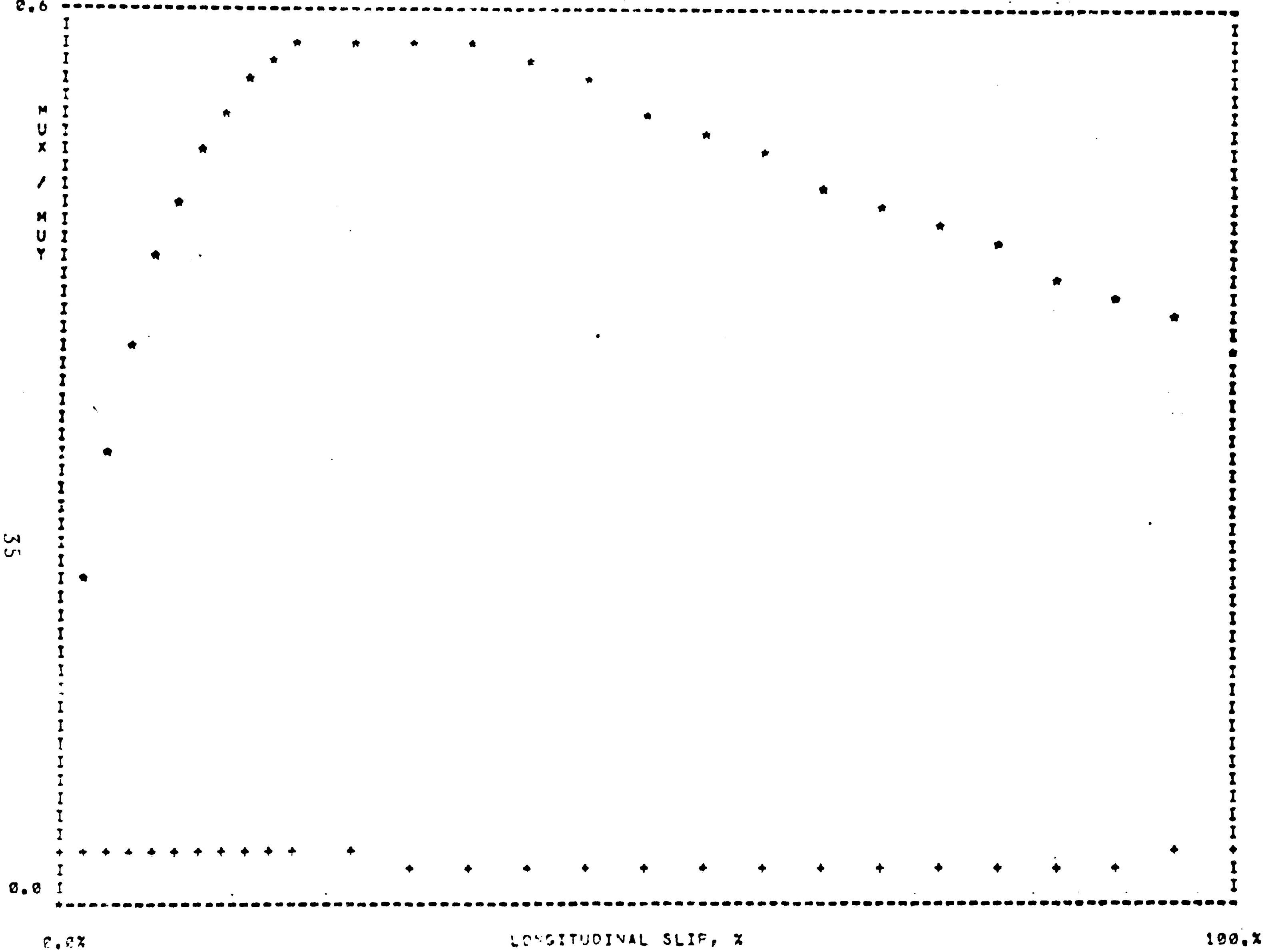


SLIP	FX-LBS	FY-LBS
0.00	0.0	465.9
0.02	217.4	461.0
0.04	342.7	440.3
0.06	444.4	416.9
0.08	527.9	392.8
0.10	595.7	368.4
0.12	648.8	343.7
0.14	689.3	318.6
0.16	719.7	293.7
0.18	742.0	269.9
0.20	755.2	249.3
0.25	773.4	205.8
0.30	781.7	168.2
0.35	783.5	137.5
0.40	782.8	114.3
0.45	779.7	97.1
0.50	774.1	84.0
0.55	767.5	73.6
0.60	762.8	65.8
0.65	761.7	60.6
0.70	762.5	58.0
0.75	761.2	56.9
0.80	756.4	56.8
0.85	746.4	56.7
0.90	730.1	56.0
0.95	712.4	55.5
1.00	686.8	55.6

TP= 3. RUN# 223. LOAD= 822. LBS. VEL.= 40. MPH ALPHA= 4. DEG

TIRE PRESSURE= 24. PSI

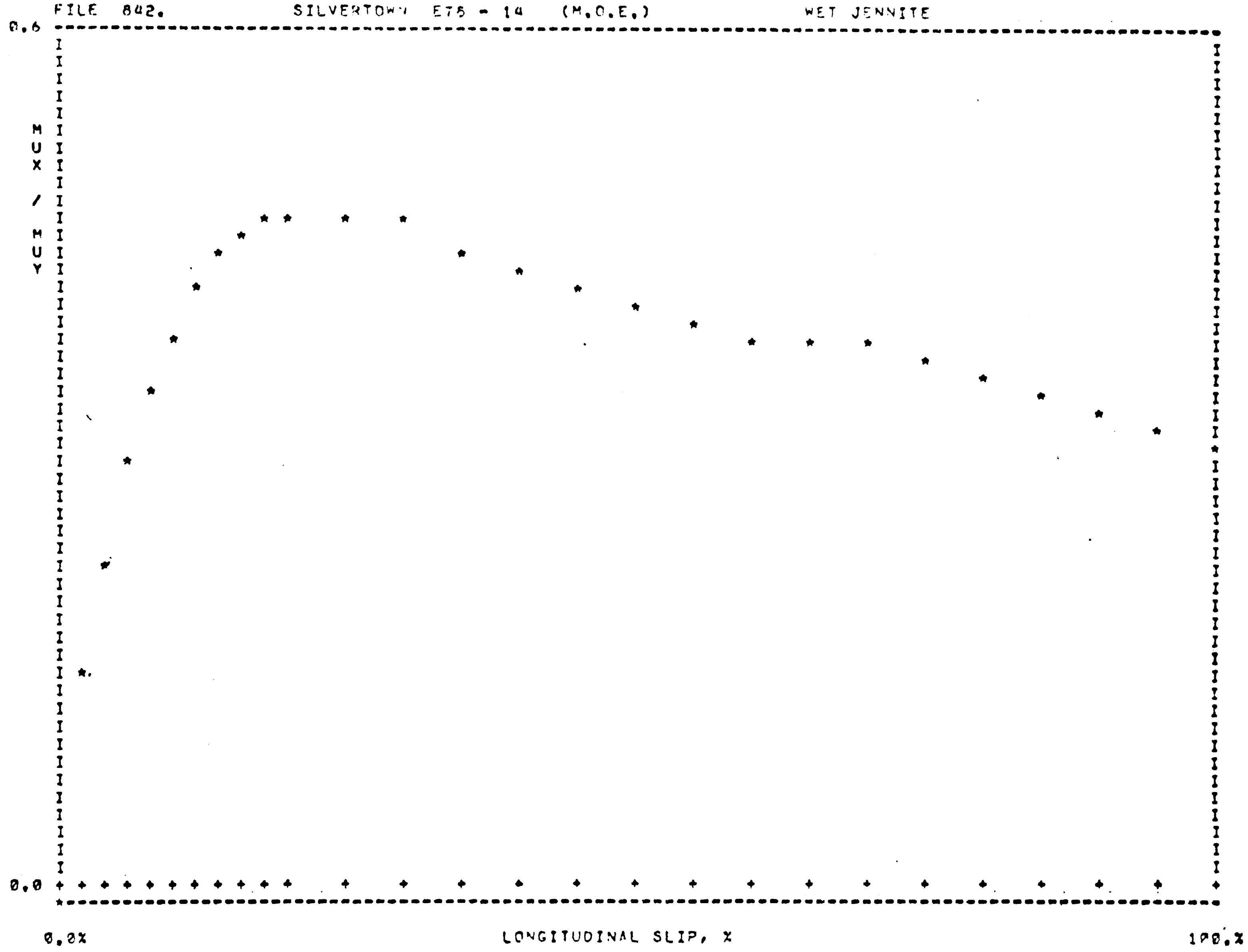
FILE 843. SILVERTOWN E78 - 14 (M.O.E.) WET JENNITE



TP- 3. RUN# 335. LOAD= [illegible] LBS. VEL.= 20. MPH ALPHA= 0. DEG

TIRE PRESSURE= 24. PSI

SLIP	FX-LBS
0.00	0.0
0.02	169.5
0.04	241.5
0.06	297.9
0.08	343.2
0.10	378.5
0.12	405.4
0.14	425.9
0.16	440.9
0.18	451.7
0.20	457.8
0.25	462.9
0.30	463.9
0.35	459.6
0.40	450.8
0.45	438.9
0.50	425.7
0.55	412.5
0.60	399.9
0.65	387.5
0.70	375.3
0.75	363.1
0.80	351.4
0.85	339.9
0.90	327.1
0.95	313.6
1.00	299.1

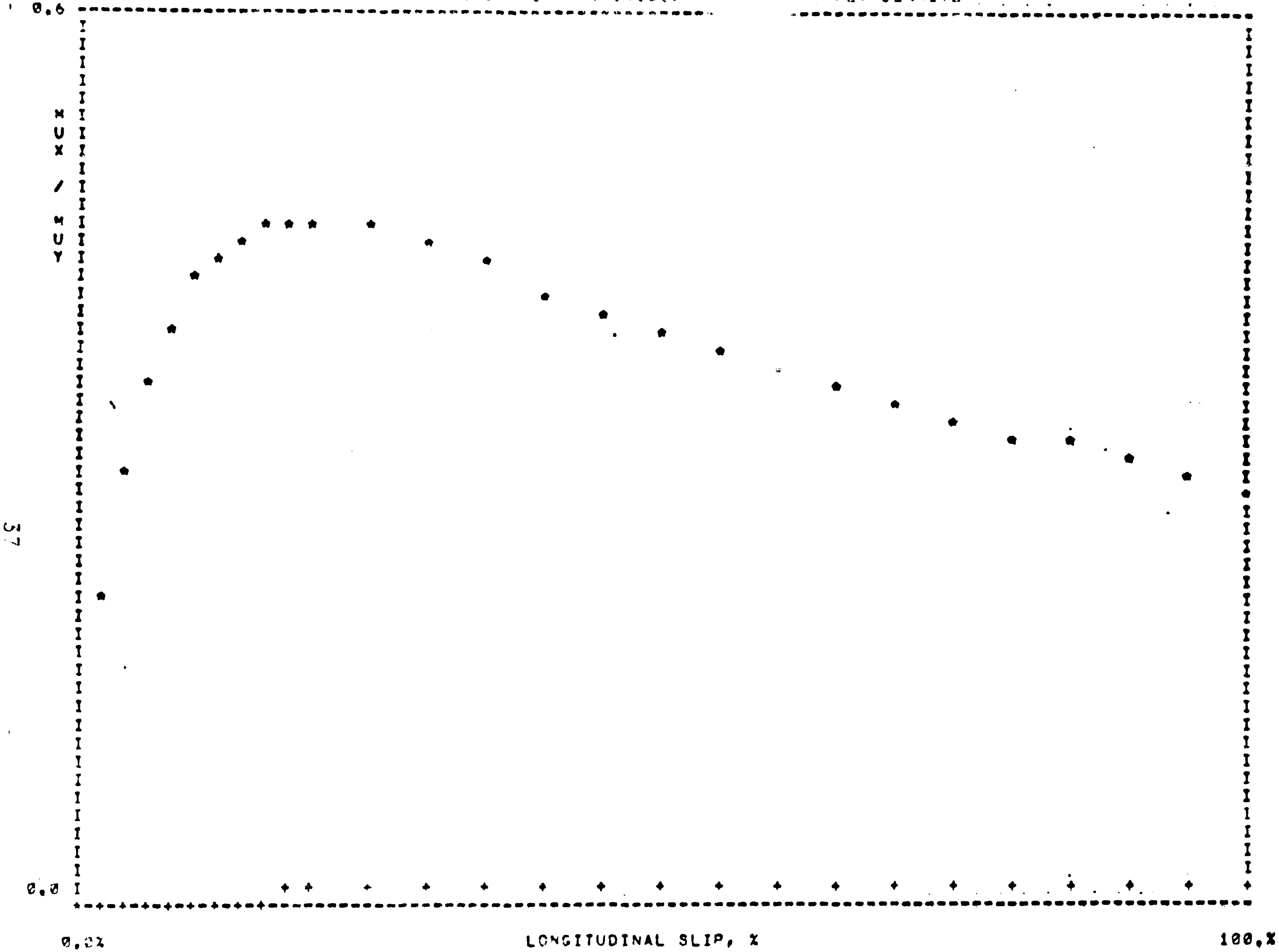


SLIP	FX-LBS
0.00	0.0
0.02	122.6
0.04	185.7
0.06	236.1
0.08	278.1
0.10	311.8
0.12	338.0
0.14	356.9
0.16	369.7
0.18	377.0
0.20	378.9
0.25	377.0
0.30	370.0
0.35	359.5
0.40	347.6
0.45	336.4
0.50	325.8
0.55	315.2
0.60	308.1
0.65	305.2
0.70	302.7
0.75	297.9
0.80	291.0
0.85	281.9
0.90	272.5
0.95	258.3
1.00	245.2

TP= 3. RUN# 334. LOAD= 8[illegible] LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 24. PSI

FILE 900. SILVERTOWN E78 - 14 (M.O.E.) WET JENNITE

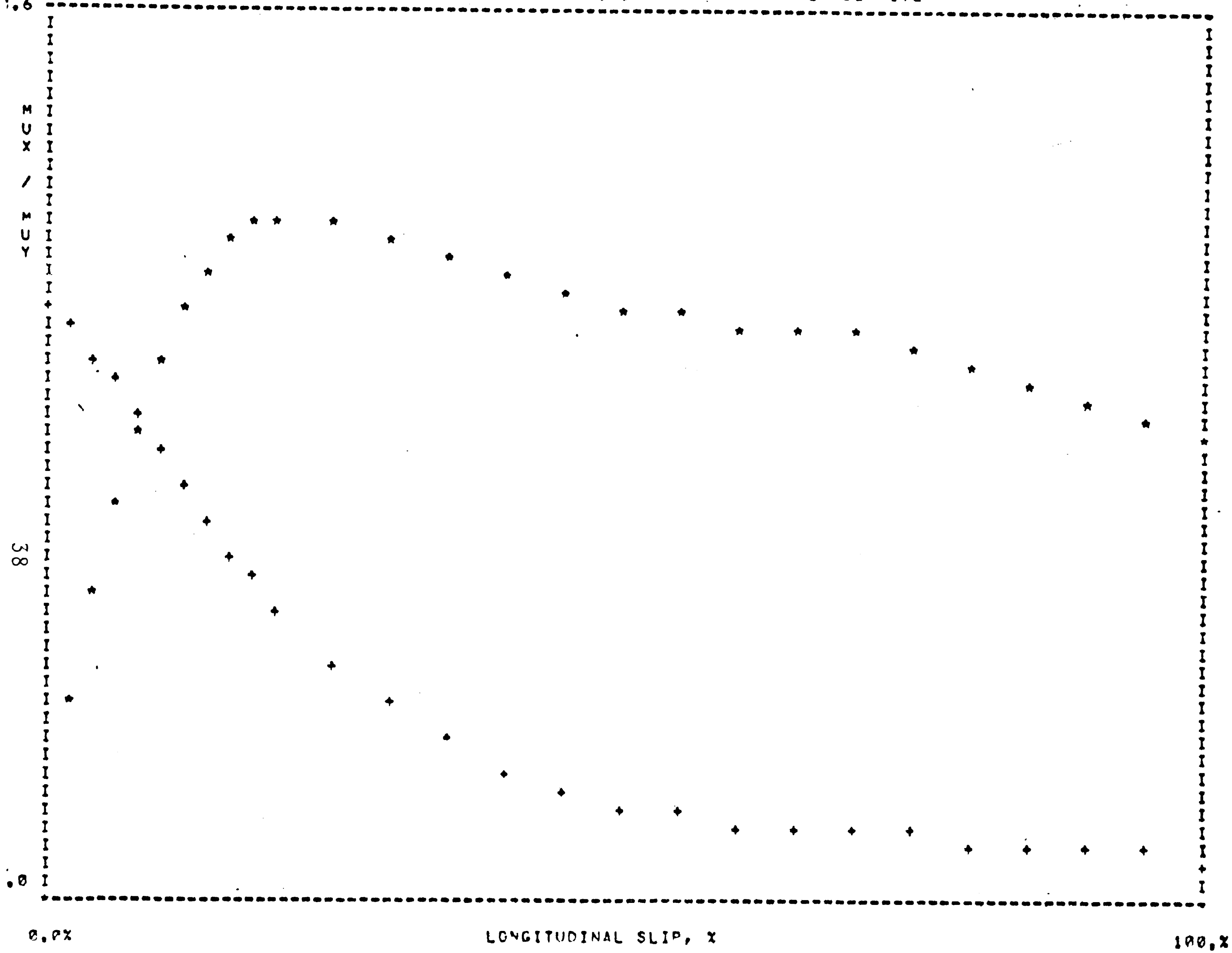


TP- 3, RUN# 392. LOAD= 1100. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 24. PSI

SLIP	FX-LBS
0.00	0.0
0.02	225.4
0.04	320.5
0.06	386.6
0.08	432.6
0.10	463.1
0.12	482.8
0.14	495.0
0.16	502.5
0.18	506.8
0.20	503.0
0.25	503.0
0.30	492.2
0.35	477.2
0.40	459.2
0.45	440.1
0.50	422.6
0.55	408.8
0.60	397.8
0.65	387.1
0.70	375.5
0.75	364.5
0.80	353.8
0.85	342.4
0.90	330.1
0.95	317.5
1.00	304.5

FILE 854.   SILVERTOWN E78 - 14 (M.O.E.)   WET JENNITE



TP= 3.   RUN# 346.   LOAD= 000. LBS.   VEL.= 40. MPH   ALPHA= 3. DEG

TIRE PRESSURE= 24. PSI

SLIP	FX-LBS	FY-LBS
0.00	0.0	317.6
0.02	106.2	308.8
0.04	165.4	292.8
0.06	212.3	274.7
0.08	252.0	256.2
0.10	286.2	238.5
0.12	314.4	221.0
0.14	336.2	203.5
0.16	351.8	185.8
0.18	361.8	168.9
0.20	365.6	154.5
0.25	366.0	126.9
0.30	359.9	102.8
0.35	348.1	82.4
0.40	334.7	66.9
0.45	324.3	56.2
0.50	318.8	48.6
0.55	315.7	43.6
0.60	312.1	42.6
0.65	307.8	38.6
0.70	303.2	37.0
0.75	296.1	35.5
0.80	285.8	33.1
0.85	274.7	30.0
0.90	265.2	27.1
0.95	256.9	24.6
1.00	252.1	22.4

I.D.1 Free-Rolling Measurements from the Flat Bed Tire Tester - 28 psi Inflation

a. Lateral Force vs. Slip Angle and Load

Load	-2°	-1°	0°	1°		4°	8°	12°	18°
500	178	92	5.6	-118	-	-291	-370	-402	-425
800	248	124	-10.1	-158	-2	-419	-568	-640	-693
1100	269	127	- 7.8	-166	-2	-495	-721	-838	-939
1400	263	123	- 7.4	-160	-29	-596	-813	-992	-1148

b. **Aligning Moment vs. Slip Angle and Load**

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	- 9	- 5	0	6	9	8	2	2	1
800	-24	-13	0	16	24	24	15	8	5
1100	-42	-22	0	25	42	48	38	24	12
1400	-58	-30	0	35	60	74	66	47	22

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°
500	-43	-25	- 6	1	13	45	64	71
800	-69	-36	-10	4	33	85	122	143
1100	-72	-37	- 8	6	41	98	148	186
1400	-71	-36	- 7	5	43	102	157	203

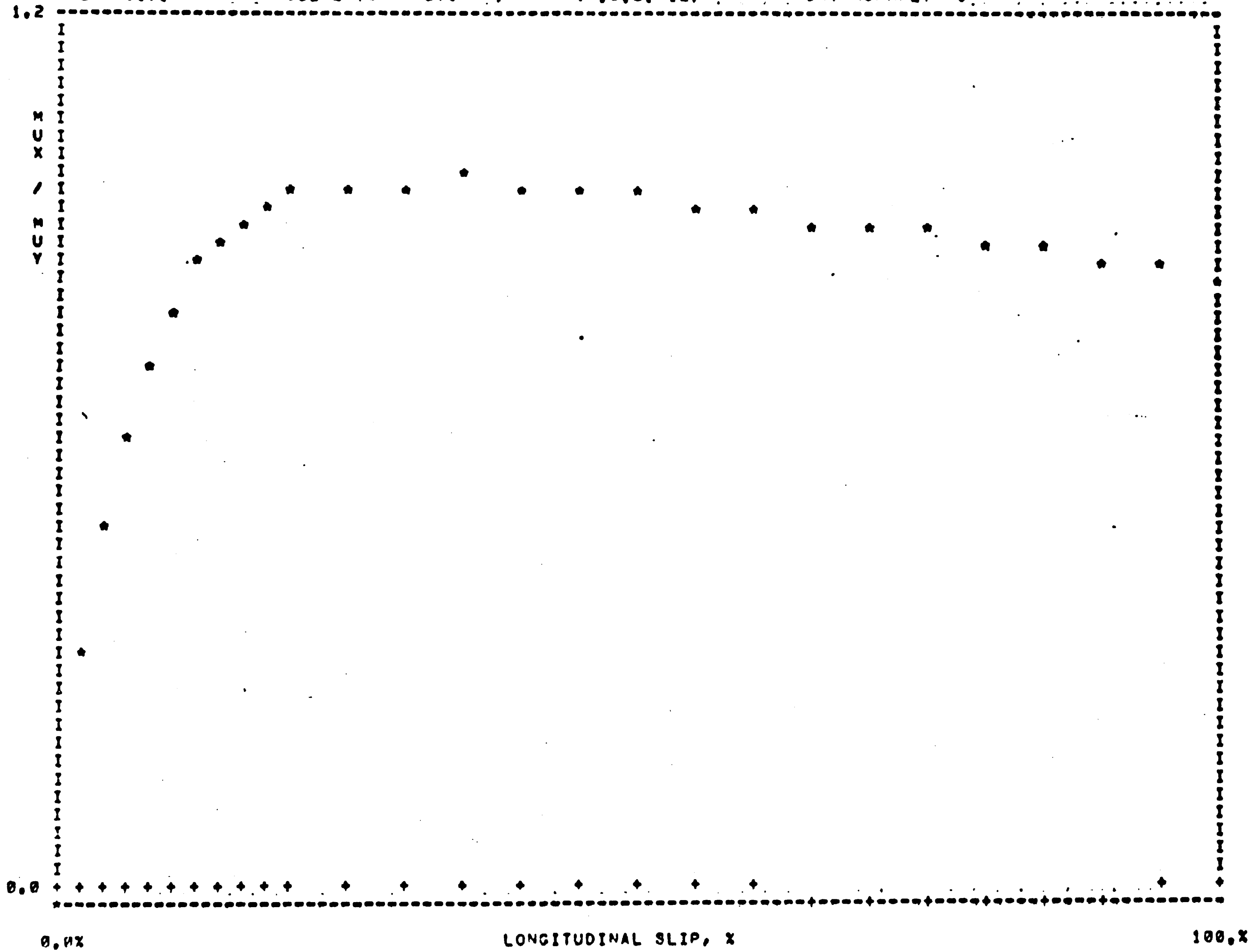
I.D.2 Free-Rolling Lateral Force Measurements from Mobile Tire Tester - 30 psi Inflation

		Dry Asphalt					Wet Jennite				
Load	Speed	0°	2°	4°	8°	16°	0°	1°	3°	7°	15°
800	20 mph	0	275	452	640	767	12	161	371	508	458
	40 mph	15	292	465	663	639/708	5	162	366	448	415
	50 mph						0	145	358	443	377
1100	40 mph	-8	298	524	748	811/946	10	187	418	556	507
1400	40 mph	8	342	576	918	1030/1179	20	172	435	619	625

I.D.3 Braking Data from the Mobile Tire Tester

	Dry Asphalt				Wet Jennite			
	0°			4°	0°			3°
	800 lbs.		1100 lbs.	800 lbs.	800 lbs.		1100 lbs.	800 lbs.
	20 mph	40 mph	40 mph	40 mph	20 mph	40 mph	40 mph	40 mph
MBF		784	1041	782	468	378	588	403
LWBF		681	925	701	299	246	324	244
MLF				422				324
LWLF				70				18

FILE 817. SILVERTOWN E78 - 14 (M.O.E.-12) DRY ASPHALT #8

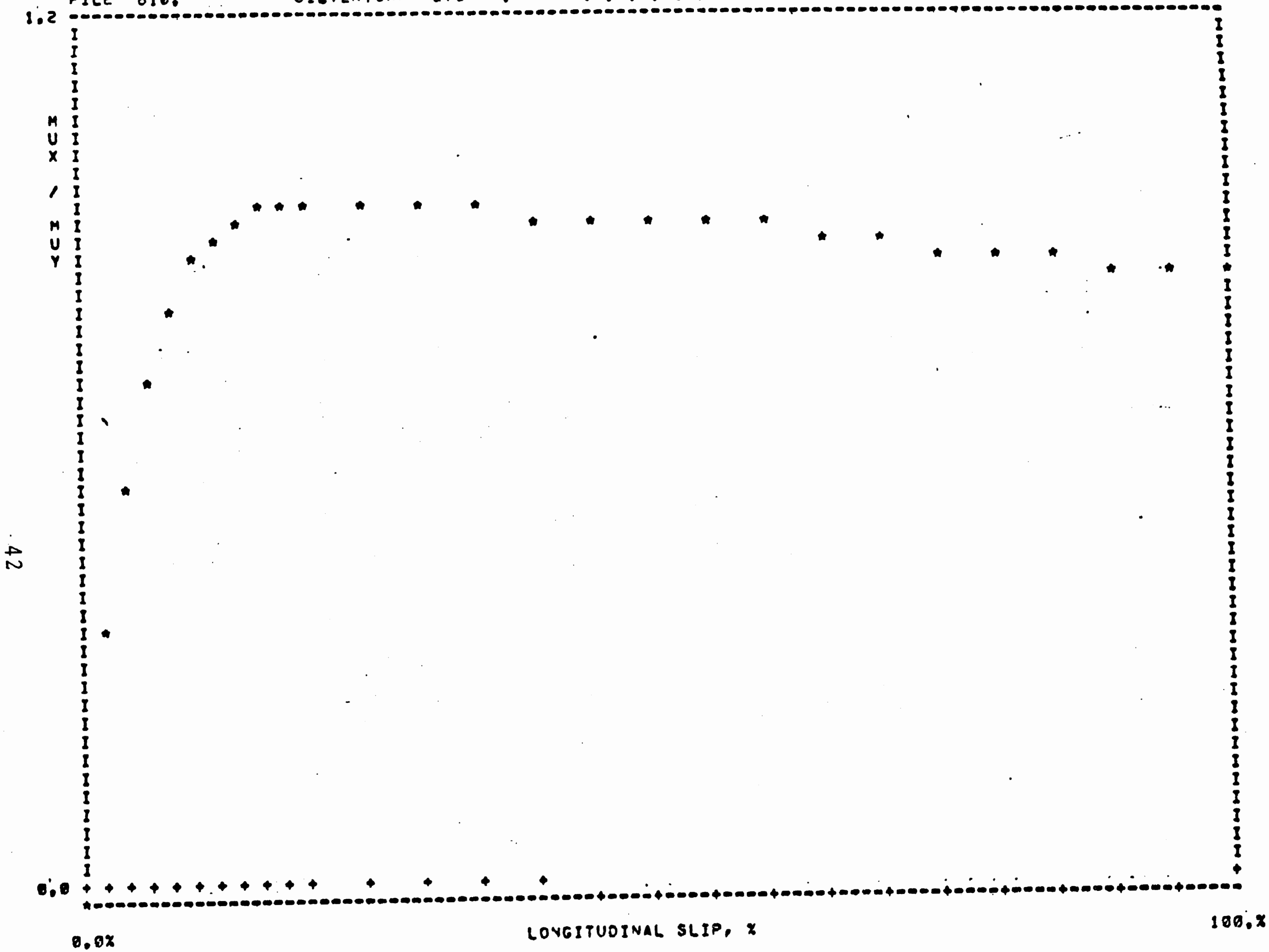


SLIP	FX-LBS
0.00	0.0
0.02	262.1
0.04	405.5
0.06	507.1
0.08	584.2
0.10	642.8
0.12	686.3
0.14	715.6
0.16	736.5
0.18	753.3
0.20	763.6
0.25	773.3
0.30	779.4
0.35	783.7
0.40	780.8
0.45	772.3
0.50	764.5
0.55	758.2
0.60	750.6
0.65	742.1
0.70	735.7
0.75	731.0
0.80	723.1
0.85	711.8
0.90	700.9
0.95	690.5
1.00	680.8

TP- 3. RUN# 308. LOAD= 870. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 30. PSI

FILE 810. SILVERTOWN E78 - 14 (M.O.E.-11) DRY ASPHALT #8

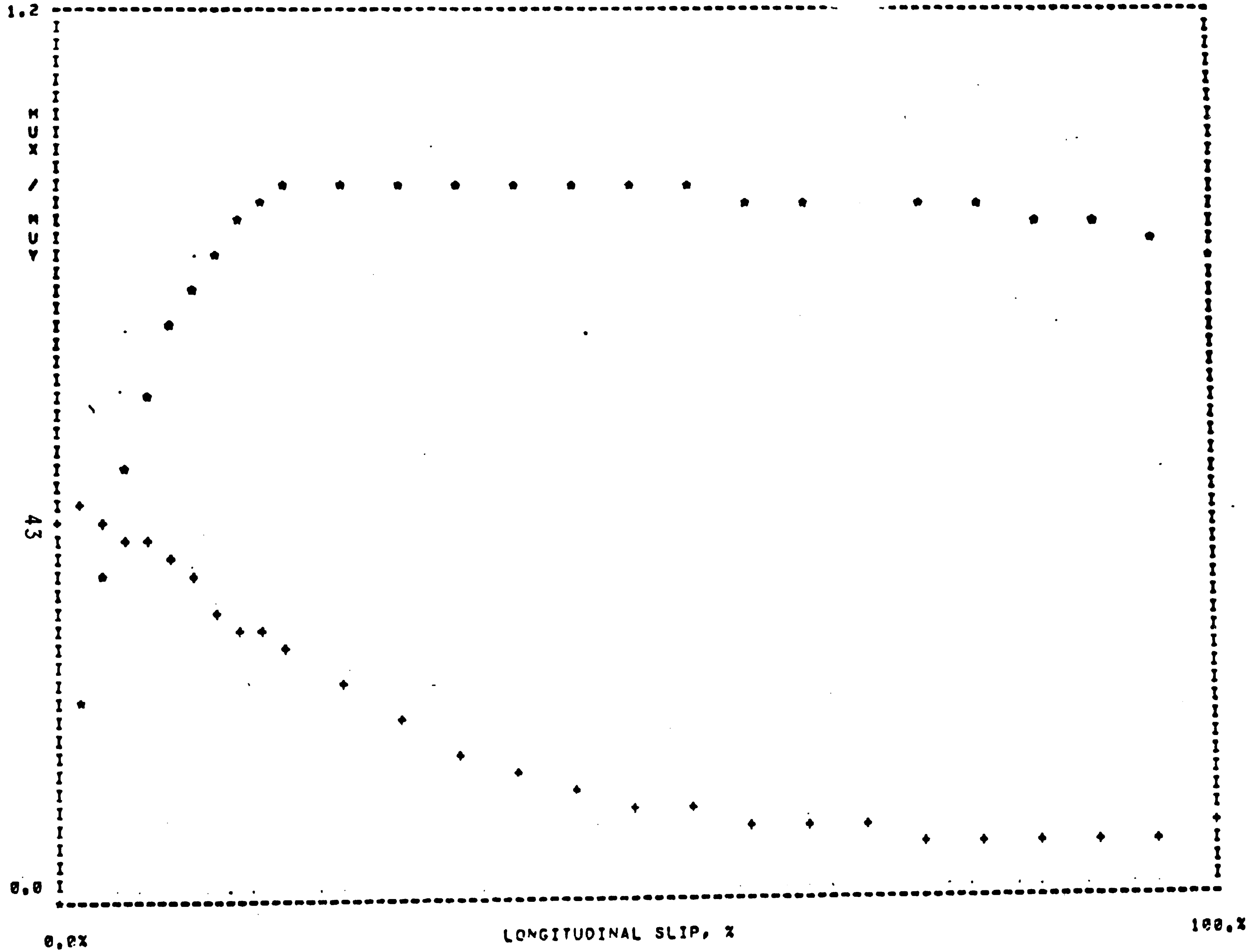


SLIP	FX-LBS
0.00	0.0
0.02	393.5
0.04	621.8
0.06	775.7
0.08	880.4
0.10	948.8
0.12	993.1
0.14	1020.3
0.16	1034.4
0.18	1039.9
0.20	1040.6
0.25	1038.7
0.30	1034.2
0.35	1028.5
0.40	1022.0
0.45	1014.6
0.50	1008.4
0.55	1003.8
0.60	998.6
0.65	991.3
0.70	981.7
0.75	970.3
0.80	958.2
0.85	946.3
0.90	936.0
0.95	928.5
1.00	925.1

TP- 3. RUN# 300. LOAD= 1170. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 30. PSI

FILE 823. SILVERTOWN E78 - 14 (M.O.E.-12) DRY ALT #8

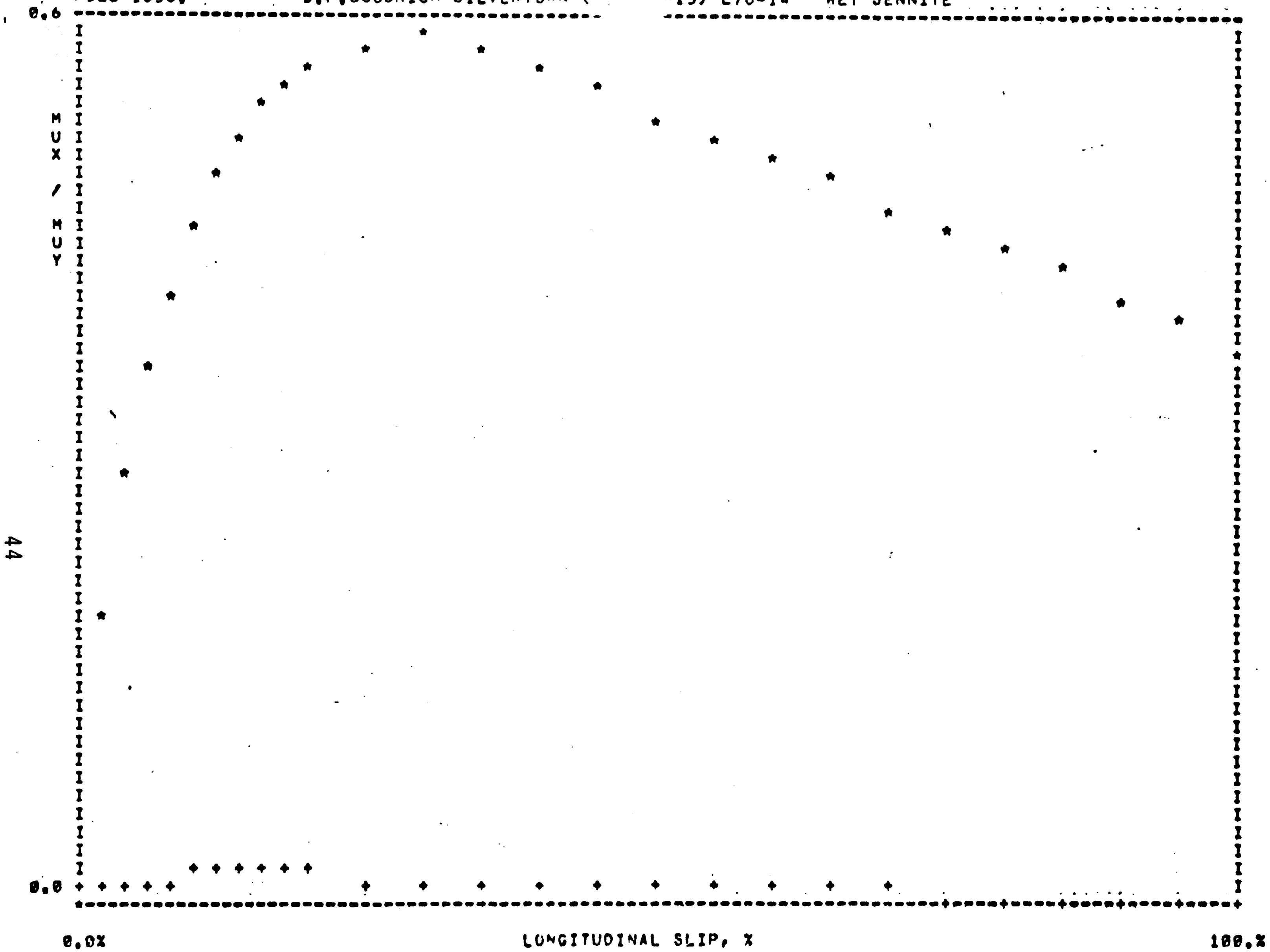


SLIP	FX-LBS	FY-LBS
0.00	0.0	418.8
0.02	219.3	422.8
0.04	350.3	411.9
0.06	455.4	395.9
0.08	541.9	379.2
0.10	611.3	360.7
0.12	665.1	342.1
0.14	705.4	319.0
0.16	735.8	299.9
0.18	750.0	283.2
0.20	769.9	260.7
0.25	779.2	238.3
0.30	782.5	190.6
0.35	783.4	164.5
0.40	780.4	139.1
0.45	775.7	118.0
0.50	772.2	101.5
0.55	767.3	89.3
0.60	761.5	79.8
0.65	758.6	72.8
0.70	757.2	68.6
0.75	753.6	65.8
0.80	748.8	62.9
0.85	744.4	60.2
0.90	735.2	59.5
0.95	721.3	62.2
1.00	721.1	69.8

TP- 3. RUN# 315. LOAD= 800. LBS. VEL.= 40. MPH ALPHA= 4. DEG

TIRE PRESSURE= 30. PSI

FILE 1056.   B.F.GOODRICH SILVERTOWN (-   -15) E78-14   WET JENNITE

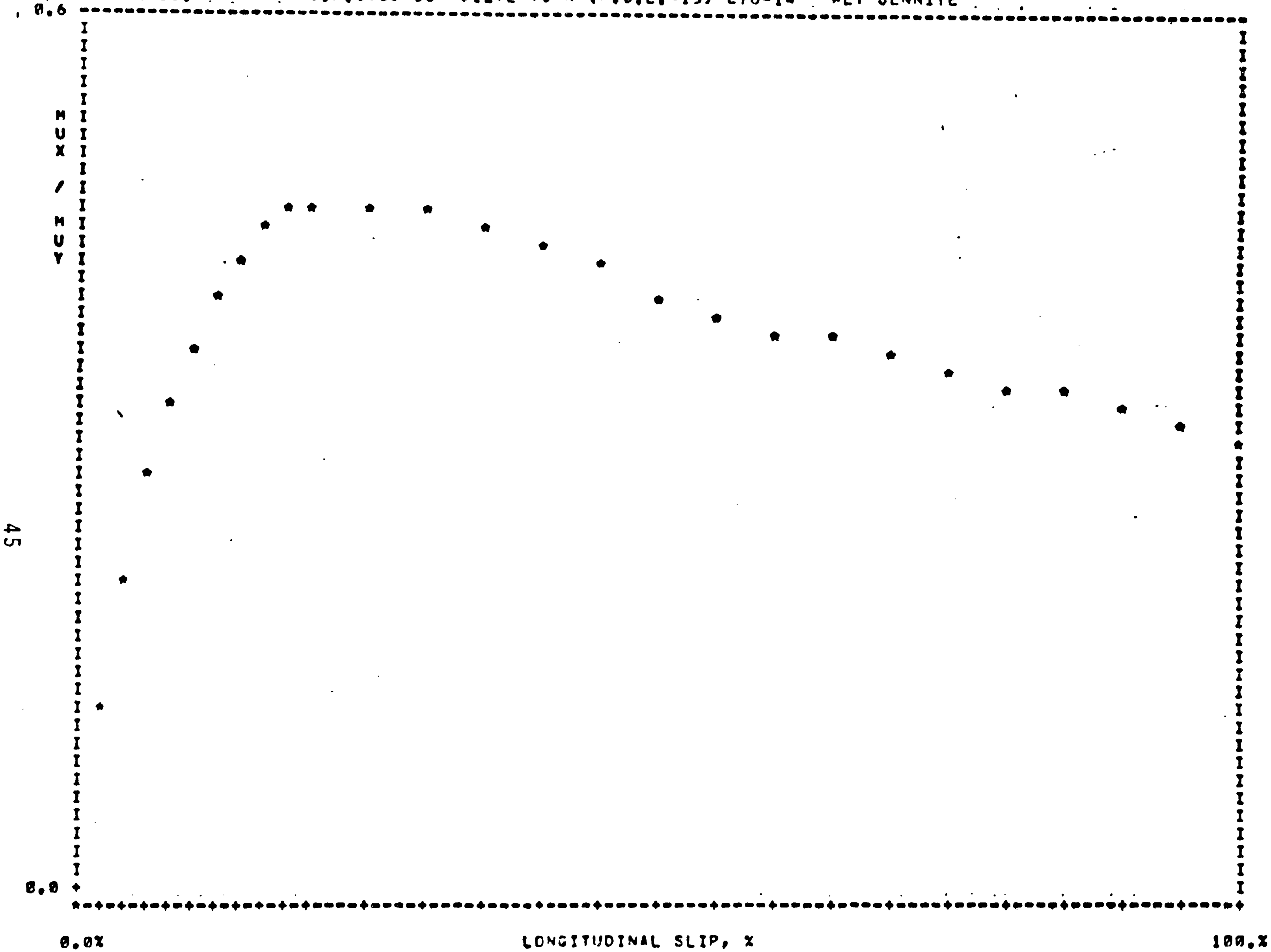


SLIP	FX-LBS
0.00	0.0
0.02	155.2
0.04	228.5
0.06	284.3
0.08	328.5
0.10	363.6
0.12	391.8
0.14	413.5
0.16	429.3
0.18	441.2
0.20	449.5
0.25	462.2
0.30	467.9
0.35	465.4
0.40	455.8
0.45	441.7
0.50	426.8
0.55	413.5
0.60	401.7
0.65	389.3
0.70	376.2
0.75	364.1
0.80	353.9
0.85	344.1
0.90	330.9
0.95	315.8
1.00	298.7

TP= 4.   RUN# 182.   LOAD= [illegible] LBS.   VEL.= 20. MPH   ALPHA= 0. DEG

TIRE PRESSURE= 30. PSI

FILE 1055.   B.F.GOODRICH SILVERTOWN (M.O.E.=15) E78-14   WET JENNITE

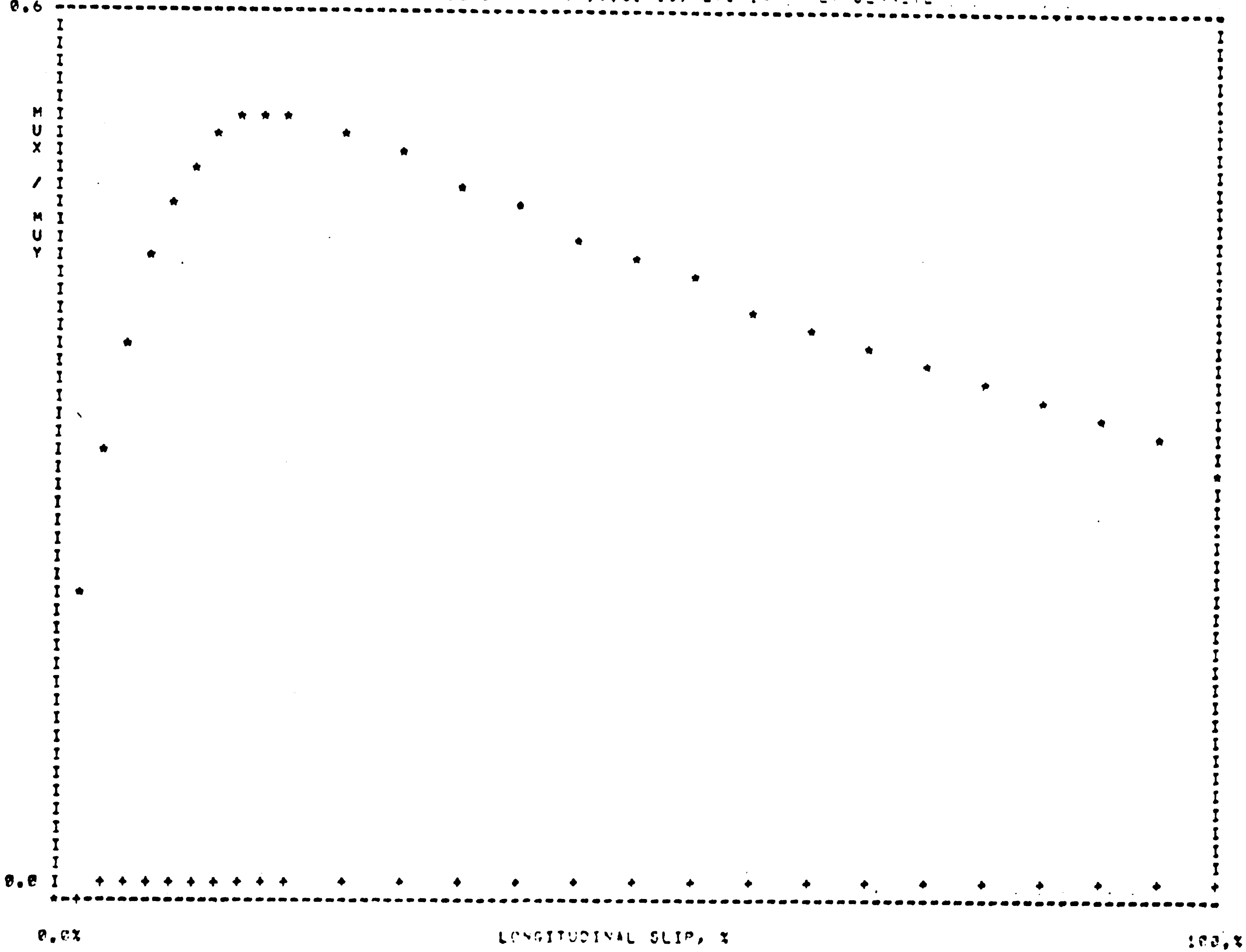


SLIP	FX-LBS
0.00	0.0
0.02	110.3
0.04	175.6
0.06	226.0
0.08	266.8
0.10	299.5
0.12	325.5
0.14	346.0
0.16	361.4
0.18	372.3
0.20	377.7
0.25	378.7
0.30	372.3
0.35	362.6
0.40	352.8
0.45	342.6
0.50	330.9
0.55	319.6
0.60	311.1
0.65	303.9
0.70	296.0
0.75	287.9
0.80	281.0
0.85	274.4
0.90	266.2
0.95	256.9
1.00	246.4

TP= 4.   RUN# 181.   LOAD= [illegible]. LBS.   VEL.= 40. MPH   ALPHA= 0. DEG

TIRE PRESSURE= 30. PSI

FILE 1073.   B.F.GOODRICH SILVERTOWN (M.O.E.=15) E78-14   WET JENNITE

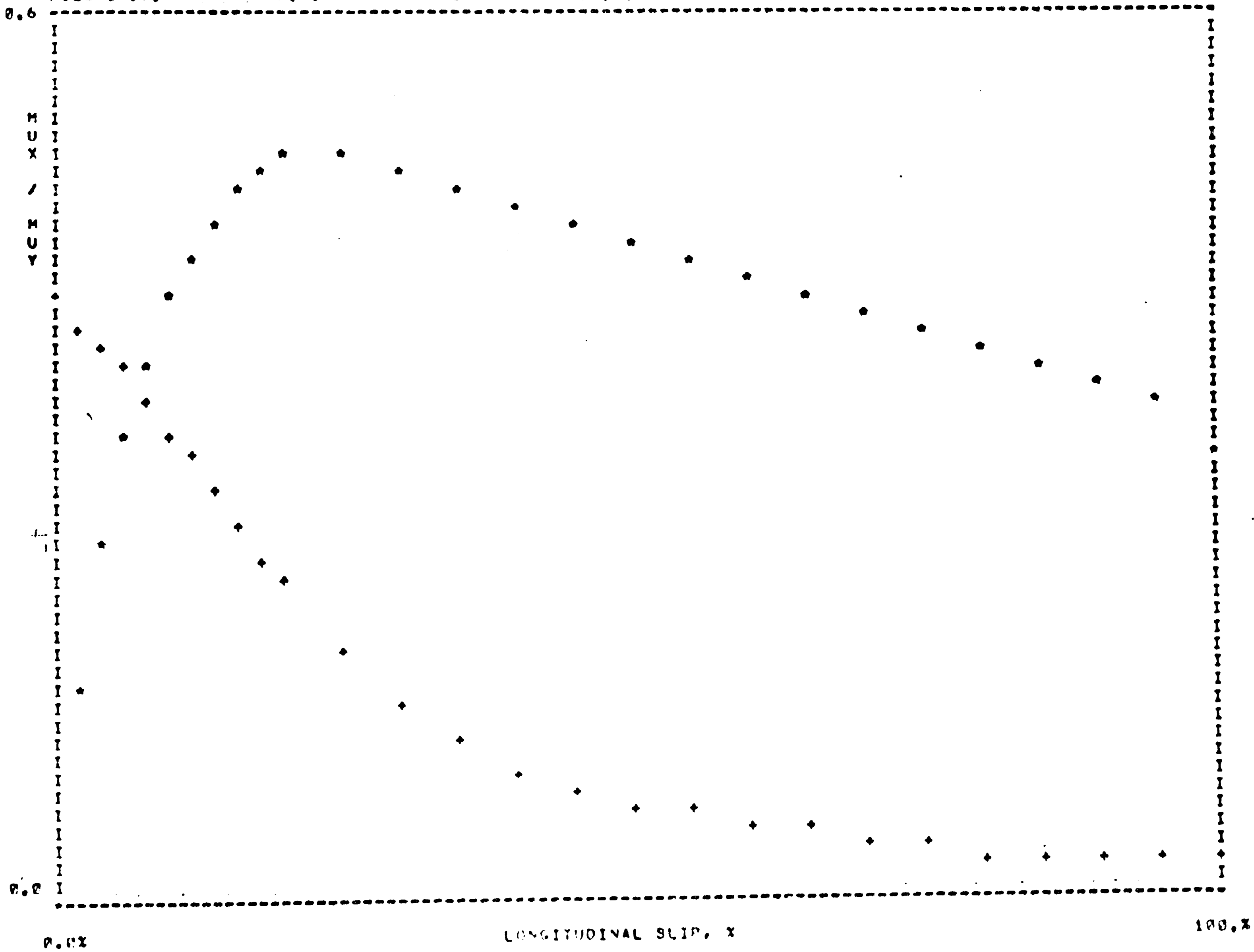


SLIP	FX-LBS
0.00	0.0
0.02	228.6
0.04	337.7
0.06	419.0
0.08	477.5
0.10	522.6
0.12	552.5
0.14	572.3
0.16	582.3
0.18	588.3
0.20	587.8
0.25	574.9
0.30	557.1
0.35	536.9
0.40	516.8
0.45	497.7
0.50	479.8
0.55	463.2
0.60	447.2
0.65	430.6
0.70	413.6
0.75	397.5
0.80	384.5
0.85	373.9
0.90	360.1
0.95	343.6
1.00	323.8

TP= 4.   RUN# 199.   LOAD= 1100. LBS.   VEL.= 40. MPH   ALPHA= 0. DEG

TIRE PRESSURE= 30. PSI

FILE 1057.   B.F.GOODRICH SILVERTOWN (M.O.E.-15) E78-14   WET JENNITE



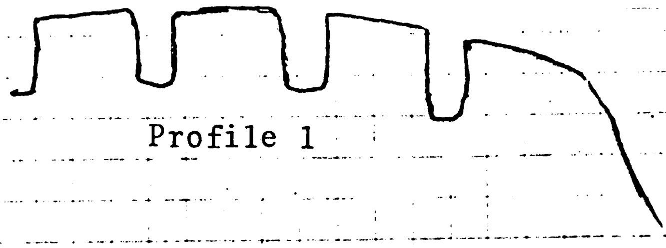
SLIP	FX-LBS	FY-LBS
0.00	0.0	324.1
0.02	116.7	310.3
0.04	190.1	297.2
0.06	245.6	283.3
0.08	289.5	268.6
0.10	323.6	252.6
0.12	349.6	234.8
0.14	369.2	219.1
0.16	384.0	202.5
0.18	390.9	186.2
0.20	401.0	171.3
0.25	402.6	138.2
0.30	395.4	109.2
0.35	384.0	85.9
0.40	373.0	69.2
0.45	363.4	58.3
0.50	353.0	52.8
0.55	341.6	45.3
0.60	332.0	40.2
0.65	325.9	34.5
0.70	320.3	29.0
0.75	311.1	24.9
0.80	300.4	22.1
0.85	291.4	20.2
0.90	279.0	19.1
0.95	264.1	18.2
1.00	244.1	17.5

TP- 4.   RUN# 183.   LOAD= [illegible] LBS.   VEL.= 40. MPH   ALPHA= 3. DEG

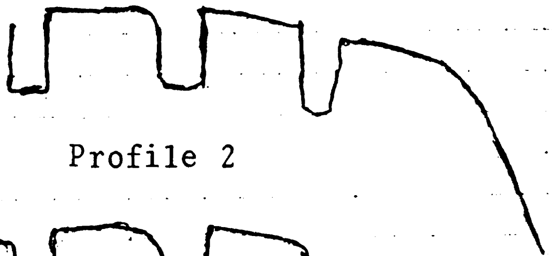
TIRE PRESSURE= 30. PSI

I.E Lateral Force Shoulder Wear Data, 800 lbs., 40 mph, 24 psi, Dry Asphalt - Mobile Tire Tester

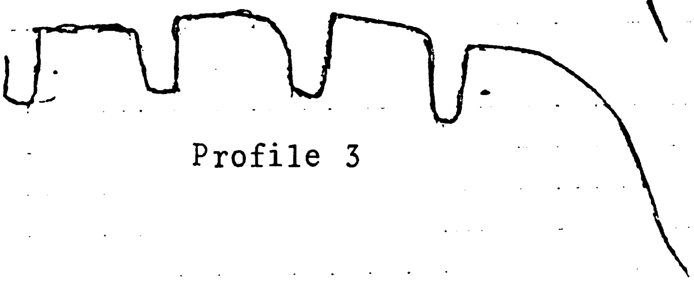
Wear Cycle	0°	1°	2°	4°	8°	16°	
1	0	102	264	442	592	652	Profile 1 Taken
2	-32	102	231	403	623	702	Profile 2 Taken
3	-38	75	209	408	640	752	Profile 3 Taken
4	-75	75	203	407	641	739	Profile 4 Taken
5	-75	68	204	417	651	774	



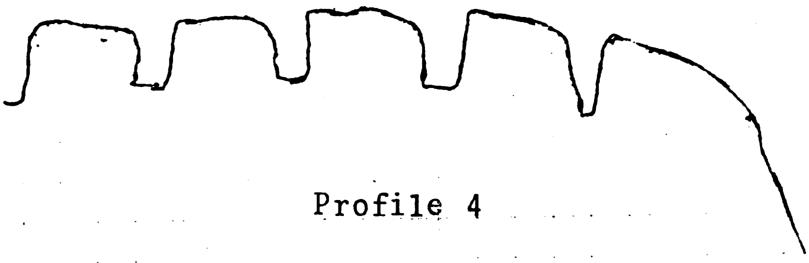
Profile 1



Profile 2



Profile 3



Profile 4

I.F Cornering Stiffness Data from the Mobile Tire Tester Dry Asphalt, 800 Pounds Load

Inflation	Speed	-2°	0°	+2°
24 psi	20 mph	275	8	-295
12 psi	3 mph	208	-2	-185
	10 mph	205	-2	-189
	20 mph	200	2	-199
	30 mph	222	2	-179
	40 mph	212	22	-189

I.G Screening Data, 800 Pounds Load, Dry Asphalt, 20 mph 24 psi, Mobile Tire Tester

	Free-Rolling Lateral Force					0° Braking Force	
Specimen	0°	2°	4°	8°	16°	MBF	LWBF
1	30	374	554	682	738	785	675
2	40	322	533	646	734	787	665
3	12	327	534	664	699	781	669
4	12	327	523	676	697	788	666

II. Pirelli 185R-14

II.A.1 Free-Rolling Measurements fr Flat Bed Tire Tester - 10 psi Inflation

a. Lateral Force vs. Slip Angle Load

Load	-2°	-1°	0°		2°	4°	8°	12°	18°
500	224	136	5	-	223				
800	234	112	6	-	217				
1100	193	92	5	-	-171				
1400	167	87	6	- 65	-149				

b. Aligning Moment vs. Slip Angle Load

Load	-2°	-1°	0°	1°	°	4°	8°	12°	18°
500	-15	-15	-1	12	8				
800	-47	-33	-2	27	48				
1100	-78	-45	-3	38	77				
1400	-100	-56	-4	45	96				

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°
500	2	3	5	4	10			
800	- 5	2	6	9	15			
1100	-11	2	5	14	25			
1400	-18	0	6	18	35			

II.B.1 Free-Rolling Measurements from the Flat Bed Tire Tester - 16 psi Inflation

a. Lateral Force vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	244	161	6	-134	-241				
800	305	164	8	-128	-276				
1100	290	140	9	-107	-235				
1400	244	117	9	- 86	-197				

b. Aligning Moment vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	- 9	-12	0	8	12				
800	-33	-28	-3	22	37				
1100	-65	-42	-3	32	65				
1400	-91	-52	-4	41	87				

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°
500	3	3	6	6	12			
800	- 2	5	8	10	19			
1100	- 8	3	9	13	24			
1400	-13	1	9	16	34			

II.C.1 Free-Rolling Measurements from the Flat Bed Tire Tester - 22 psi Inflation

a. Lateral Force vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	246	153	5	-130	-245				
800	336	192	10	-142	-317				
1100	350	182	12	-141	-315				
1400	318	162	12	-129	-278				

b. **Aligning Moment vs. Slip Angle and Load**

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	- 8	- 9	0	6	8				
800	-27	-24	-2	19	28				
1100	-54	-38	-3	30	54				
1400	-81	-49	-4	40	78				

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°
500	4	3	5	7	10			
800	3	4	10	14	22			
1100	-2	4	12	15	30			
1400	-7	2	12	19	36			

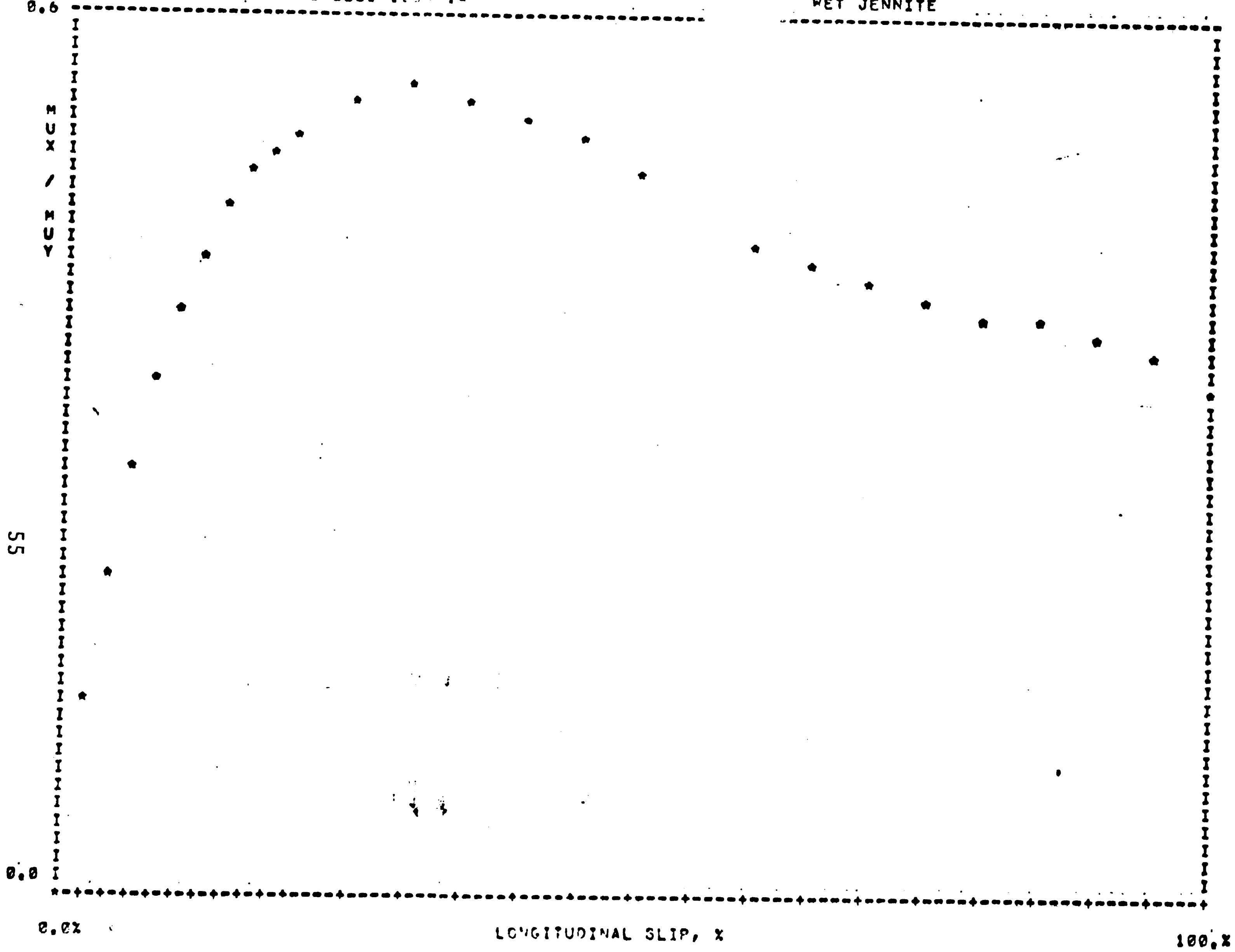
II.C.2 Free-Rolling Lateral Force Measurements from Mobile Tire Tester - 24 psi Inflation

		Dry Asphalt					Wet Jennite				
Load	Speed	0°	2°	4°	8°	16°	0°	1°	3°	7°	15°
800	20 mph			574	722	776	-25	145	397	458	409
	40 mph			571	686	690	-25	150	385	411	333
	50 mph						-15	175	377	395	288
1100	40 mph	20	365	650	794	906	-25	150	436	530	468
1400	40 mph	0	293	673	995	1142/1162	10	138	479	618	562

II.C.3 Braking Data from the Mobile Tire Tester

	Dry Asphalt				Wet Jennite			
	0°			4°	0°			3°
	800 lbs. 20 mph	800 lbs. 40 mph	1100 lbs. 40 mph	800 lbs. 40 mph	800 lbs. 20 mph	800 lbs. 40 mph	1100 lbs. 40 mph	800 lbs. 40 mph
MBF		682	965	679	434	349	518	382
LWBF		612	797	609	280	213	264	240
MLF				460				334
LWLF				34				- 6

FILE 1240.   PIRELLI 185R-14   WET JENNITE

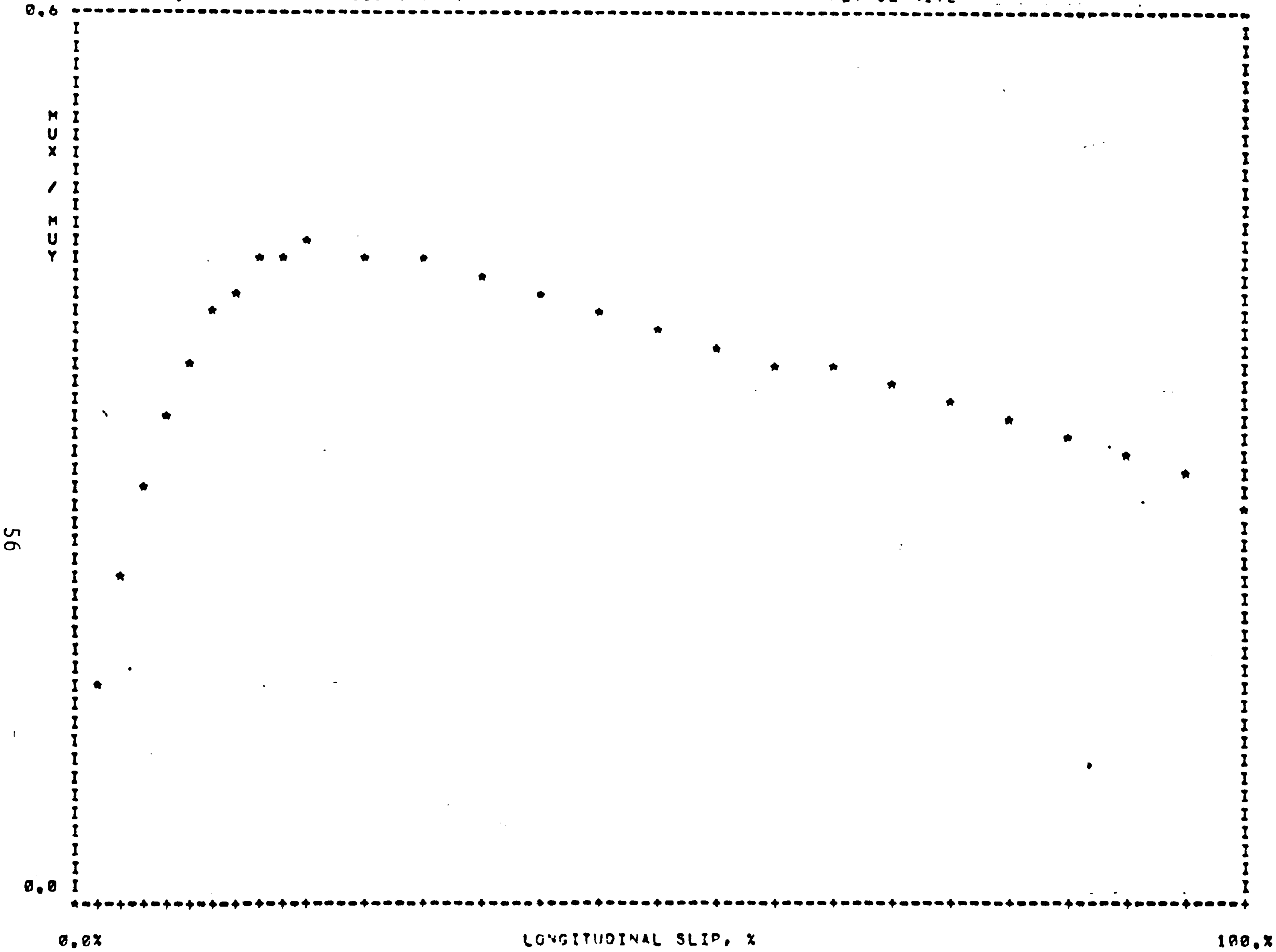


TP= 4.   RUN# 384.   LOAD= 8??. LBS.   VEL.= 20. MPH   ALPHA= 0. DEG

TIRE PRESSURE= 24. PSI

SLIP	FX-LBS
0.00	0.0
0.02	106.1
0.04	175.7
0.06	231.1
0.08	277.3
0.10	314.7
0.12	344.7
0.14	369.5
0.16	389.3
0.18	404.7
0.20	414.5
0.25	429.0
0.30	434.2
0.35	431.1
0.40	421.2
0.45	426.7
0.50	389.5
0.55	371.2
0.60	353.8
0.65	339.7
0.70	329.8
0.75	323.0
0.80	317.7
0.85	312.3
0.90	303.7
0.95	293.1
1.00	279.9

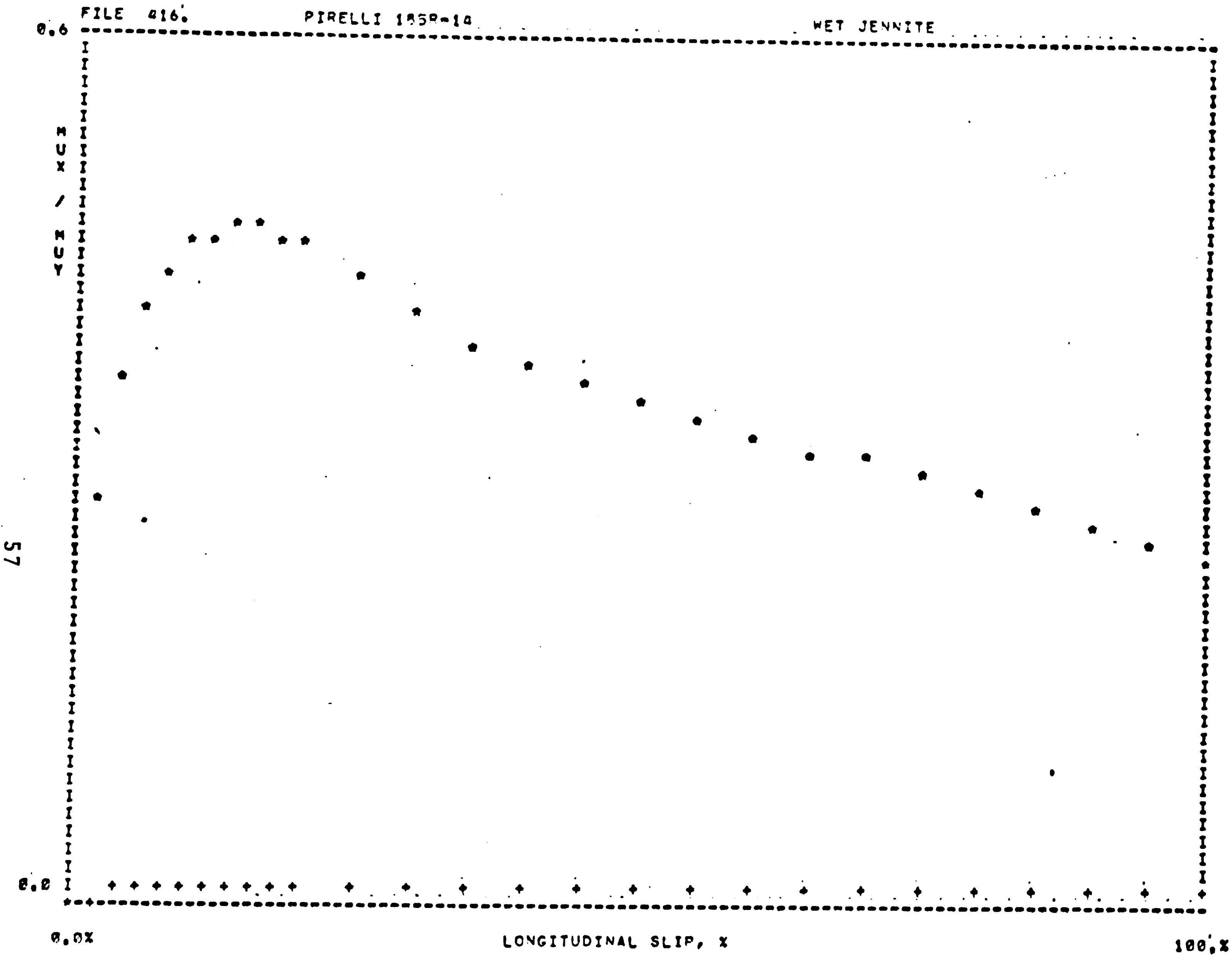
FILE 1239.   PIRELLI 1859-14   WET JENNITE



TP= 4.   RUN# 383.   LOAD= [illegible] LBS.   VEL.= 40. MPH   ALPHA= 0. DEG

TIRE PRESSURE= 24. PSI

SLIP	FX-LBS
0.00	0.0
0.02	112.1
0.04	173.4
0.06	220.7
0.08	258.2
0.10	288.1
0.12	311.4
0.14	328.3
0.16	339.8
0.18	346.5
0.20	349.0
0.25	345.9
0.30	339.0
0.35	330.2
0.40	322.4
0.45	310.3
0.50	301.2
0.55	293.8
0.60	287.5
0.65	281.4
0.70	275.2
0.75	268.8
0.80	261.6
0.85	252.1
0.90	242.2
0.95	227.2
1.00	213.3

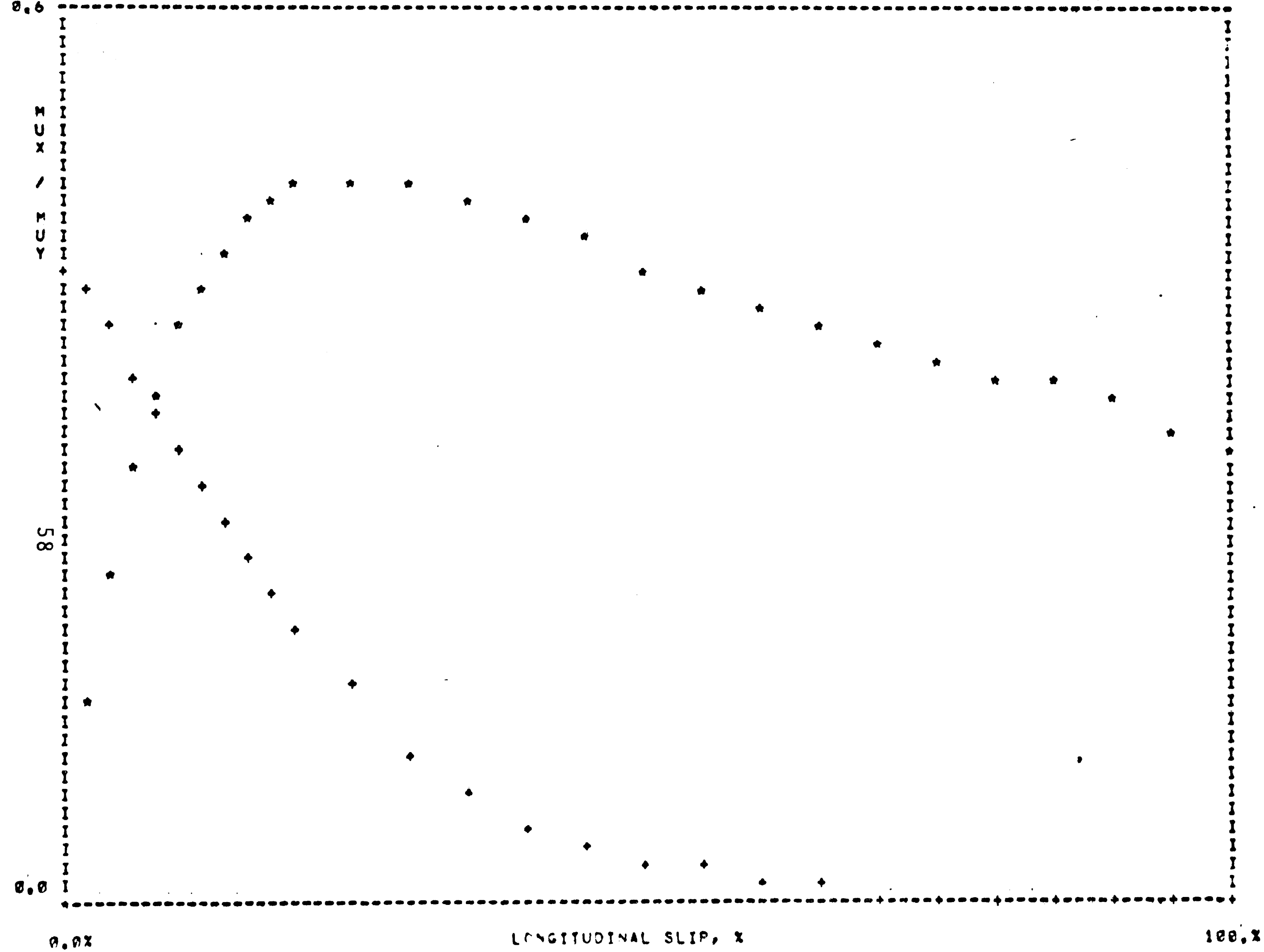


SLIP	FX-LBS
0.00	0.0
0.02	312.1
0.04	399.7
0.06	452.5
0.08	486.0
0.10	505.5
0.12	515.1
0.14	517.8
0.16	515.7
0.18	510.4
0.20	502.7
0.25	479.8
0.30	456.3
0.35	434.7
0.40	416.2
0.45	[illegible]
0.50	386.9
0.55	373.9
0.60	362.6
0.65	353.0
0.70	343.9
0.75	334.1
0.80	322.7
0.85	328.5
0.90	292.8
0.95	277.6
1.00	263.7

TP- 2. RUN# 256. LOAD= 1100. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 24. PSI

FILE 1241. PIRELLI 185R-14 WET JENNITE

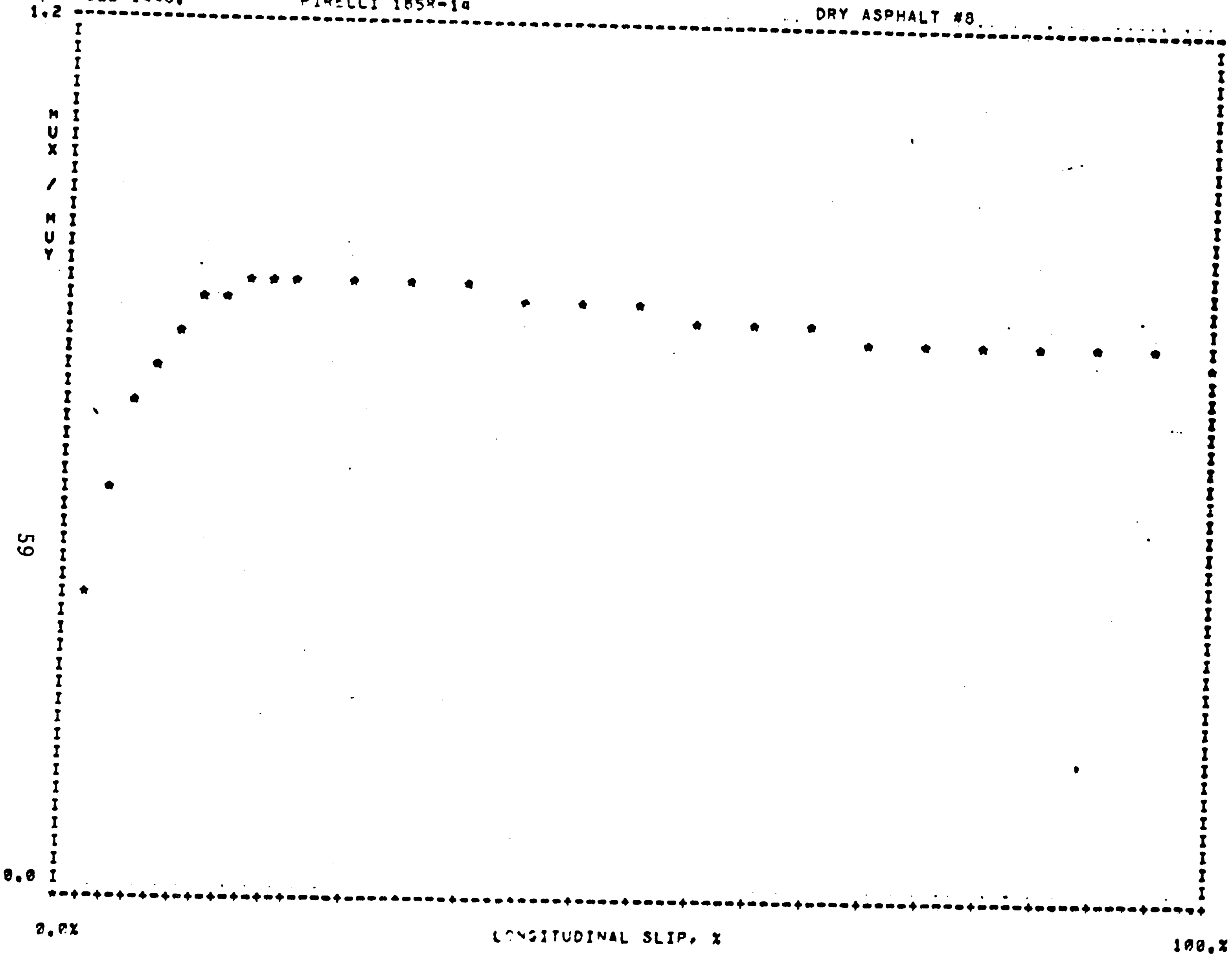


TP= 4. RUN# 385. LOAD= 822. LBS. VEL.= 40. MPH ALPHA= 3. DEG

TIRE PRESSURE= 24. PSI

SLIP	FX-LBS	FY-LBS
0.00	0.0	334.2
0.02	108.4	329.1
0.04	176.3	321.0
0.06	227.7	282.2
0.08	268.4	259.4
0.10	302.5	239.0
0.12	325.7	219.2
0.14	345.4	200.0
0.16	362.0	181.0
0.18	372.3	163.4
0.20	378.8	146.2
0.25	382.5	122.8
0.30	378.5	82.2
0.35	372.5	58.0
0.40	362.4	42.0
0.45	349.4	30.0
0.50	338.0	22.0
2 CONVERSION ERROR		
EO		
0136		
0.55	326.5	15.7
0.60	316.0	10.3
0.65	306.8	5.8
0.70	298.0	2.7
0.75	288.5	1.2
0.80	279.5	0.1
0.85	271.8	-1.4
0.90	262.9	-2.9
0.95	252.4	-4.5
1.00	247.1	-6.2

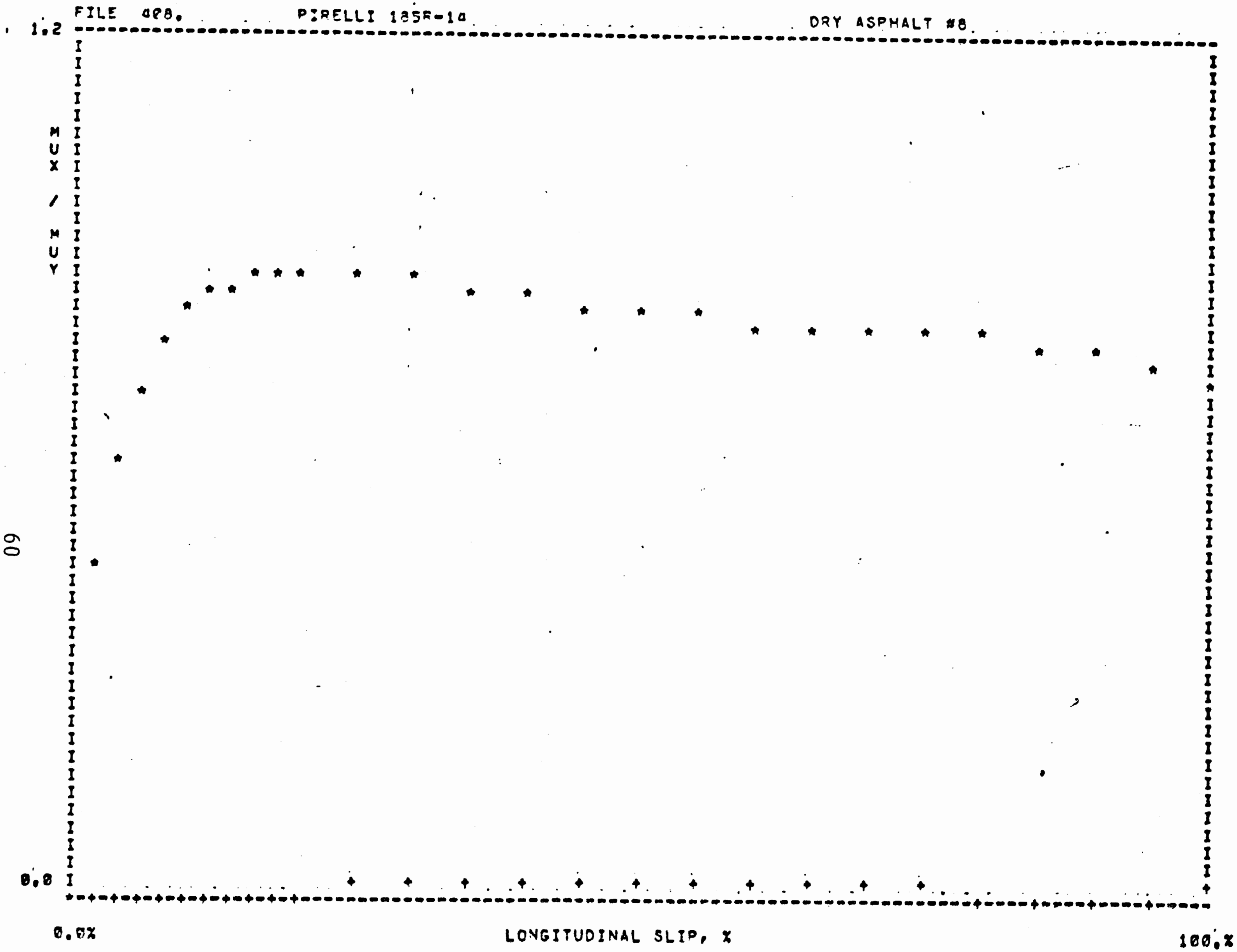
FILE 1446. PIRELLI 185R-14 DRY ASPHALT #8



TP- 5. RUN# 124. LOAD= 8[illegible]. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 24. PSI

SLIP	FX-LBS
0.00	0.0
0.02	331.7
0.04	454.8
0.06	537.0
0.08	593.4
0.10	631.2
0.12	655.2
0.14	669.6
0.16	677.5
0.18	681.4
0.20	682.8
0.25	680.0
0.30	677.1
0.35	673.9
0.40	673.2
0.45	664.5
0.50	656.3
0.55	647.6
0.60	640.6
0.65	635.8
0.70	632.7
0.75	631.7
0.80	631.8
0.85	629.9
0.90	624.9
0.95	619.0
1.00	612.3

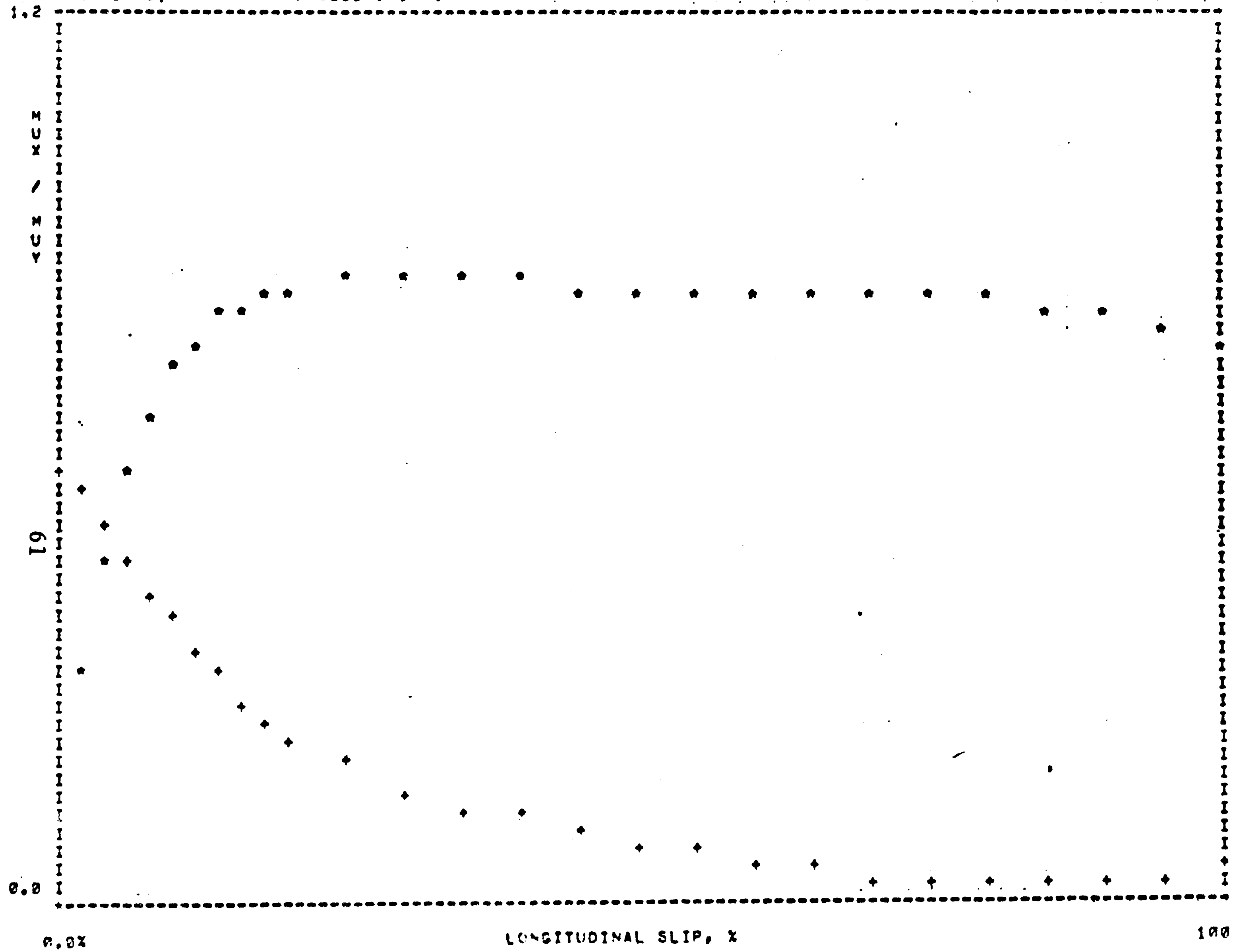


TP= 2.   RUN# 247.   LOAD= 1100. LBS.   VEL.= 40. MPH   ALPHA= 0. DEG

TIRE PRESSURE= 24. PSI

SLIP	FX-LBS
0.00	0.0
0.02	516.3
0.04	675.8
0.06	780.4
0.08	851.2
0.10	898.3
0.12	928.6
0.14	947.6
0.16	959.1
0.18	965.1
0.20	965.9
0.25	961.5
0.30	954.9
0.35	947.0
0.40	935.5
0.45	921.4
0.50	909.3
0.55	903.1
0.60	893.5
0.65	890.3
0.70	888.3
0.75	884.0
0.80	875.8
0.85	863.3
0.90	846.3
0.95	824.7
1.00	796.9

FILE 1445, PIRELLI 185R-14 DRY ASPHALT #8



SLIP	FX-LBS	FY-LBS
0.00	0.0	459.7
0.02	247.3	437.3
0.04	369.2	405.0
0.06	458.3	370.1
0.08	524.8	335.8
0.10	573.2	303.2
0.12	628.0	273.1
0.14	632.8	245.5
0.16	653.1	228.6
0.18	662.1	199.6
0.20	668.8	181.3
0.25	676.5	149.9
0.30	678.6	124.9
0.35	676.4	100.7
0.40	671.9	87.5
0.45	666.5	72.6
0.50	662.0	60.2
0.55	659.3	49.6
0.60	658.3	40.7
0.65	658.7	33.3
0.70	658.9	27.2
0.75	656.7	23.1
0.80	652.1	21.0
0.85	644.7	21.3
0.90	634.4	24.1
0.95	622.5	28.1
1.00	608.6	33.5

TP- 5. RUN# 123. LOAD= 872. LBS. VEL.= 40. MPH ALPHA= 4. DEG

TIRE PRESSURE= 24. PSI

II.D.1 Free-Rolling Measurements from the Flat Bed Tire Tester - 28 psi Inflation

a. Lateral Force vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	237	152	6	-132	-238				
800	342	200	9	-170	-329				
1100	383	203	13	-170	-354				
1400	371	190	14	-148	-334				

b. Aligning Moment vs. Slip Angle and Load

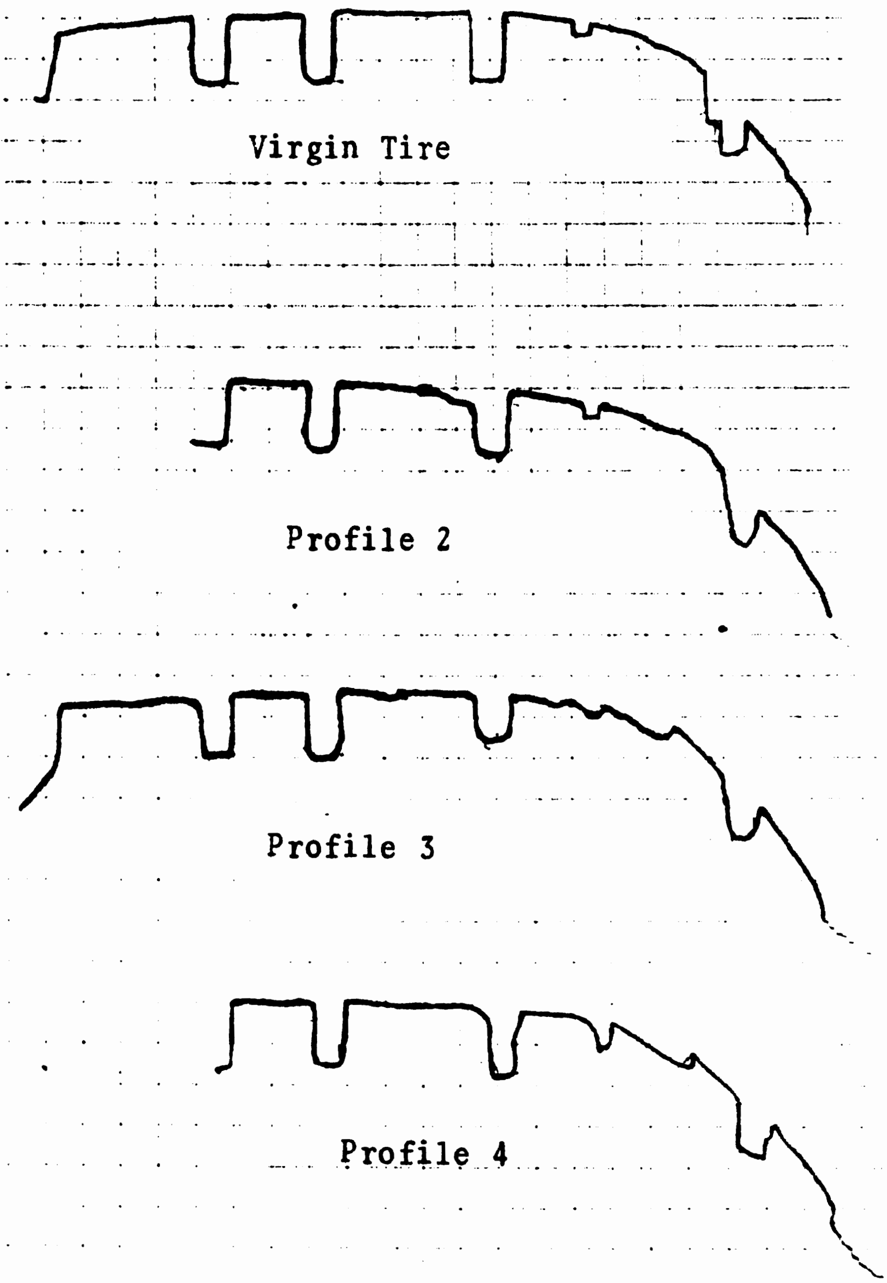
Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	- 6	- 8	0	4	6				
800	-22	-21	0	15	23				
1100	-46	-34	-2	27	46				
1400	-73	-46	-4	37	71				

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°
500	3	4	6	3	7			
800	5	8	9	12	20			
1100	1	8	13	19	30			
1400	-6	10	14	20	37			

II.E Lateral Force Shoulder Wear Data, Dry Asphalt, 800 Pounds Load, 40 mph, 24 psi - Mobile Tire Tester

Wear Cycle	0°	2°	4°	8°	16°	
1	- 5	329	542	614	608	Profile 2 Taken
2	-10	304	516	631	645	Profile 3 Taken
3	-50	299	504	650	647	
4	-18	273	526	642	658	Profile 4 Taken



III. Firestone 500 E78-14

III.A.1 Free-Rolling Measurements from the Fla ire Tester - 10 psi Inflation

a. Lateral Force vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	162	81	-13	-117	-183				
800	169	79	-14	-122	-197				
1100	161	76	-18	-121	-190				
1400	107	58	-16	-115	-116				

b. Aligning Moment vs. Slip Angle and Loa

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	-14	-10	0	10	14				
800	-33	-19	0	20	33				
1100	-47	-25	2	29	49				
1400	-60	-32	2	34	60				

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°
500	-46	-31	-13	-2	10			
800	-51	-35	-14	0	15			
1100	-56	-39	-18	0	17			
1400	-62	-43	-16	1	22			

III.B.1 Free-Rolling Mea ements from the Flat Bed Tire Tester - 16 psi Inflation

a. Lateral Force vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	186	95	-11	-128	-205				
800	216	106	-15	-140	-240				
1100	214	102	-13	-136	-243				
1400	205	96	-13	-133	-234				

b. Aligning Moment vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	-12	- 8	0	10	12				
800	-28	-17	0	19	29				
1100	-45	-25	1	29	47				
1400	-60	032	2	37	62				

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°
500	-52	-34	-11	-4	9			
800	-59	-36	-15	-3	16			
1100	-62	-40	-13	-.8	20			
1400	-68	-39	-13	1	24			

III.C.1 Free-Rolling Measurements from the Flat Bed Tire Tester - 22 psi Inflation

a. Lateral Force vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	186	95	-12	-130	-208				
800	242	119	-20	-160	-272				
1100	257	123	-17	-164	-291				
1400	253	121	-13	-160	-288				

b. Aligning Moment vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	- 9	- 5	0	8	10				
800	-22	-13	1	18	24				
1100	-39	-22	1	26	41				
1400	-54	-30	2	35	58				

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°
500	-50	-36	-12	-4	6			
800	-68	-45	-20	-4	14			
1100	-72	-46	-17	-3	19			
1400	-75	-47	-13	-1	25			

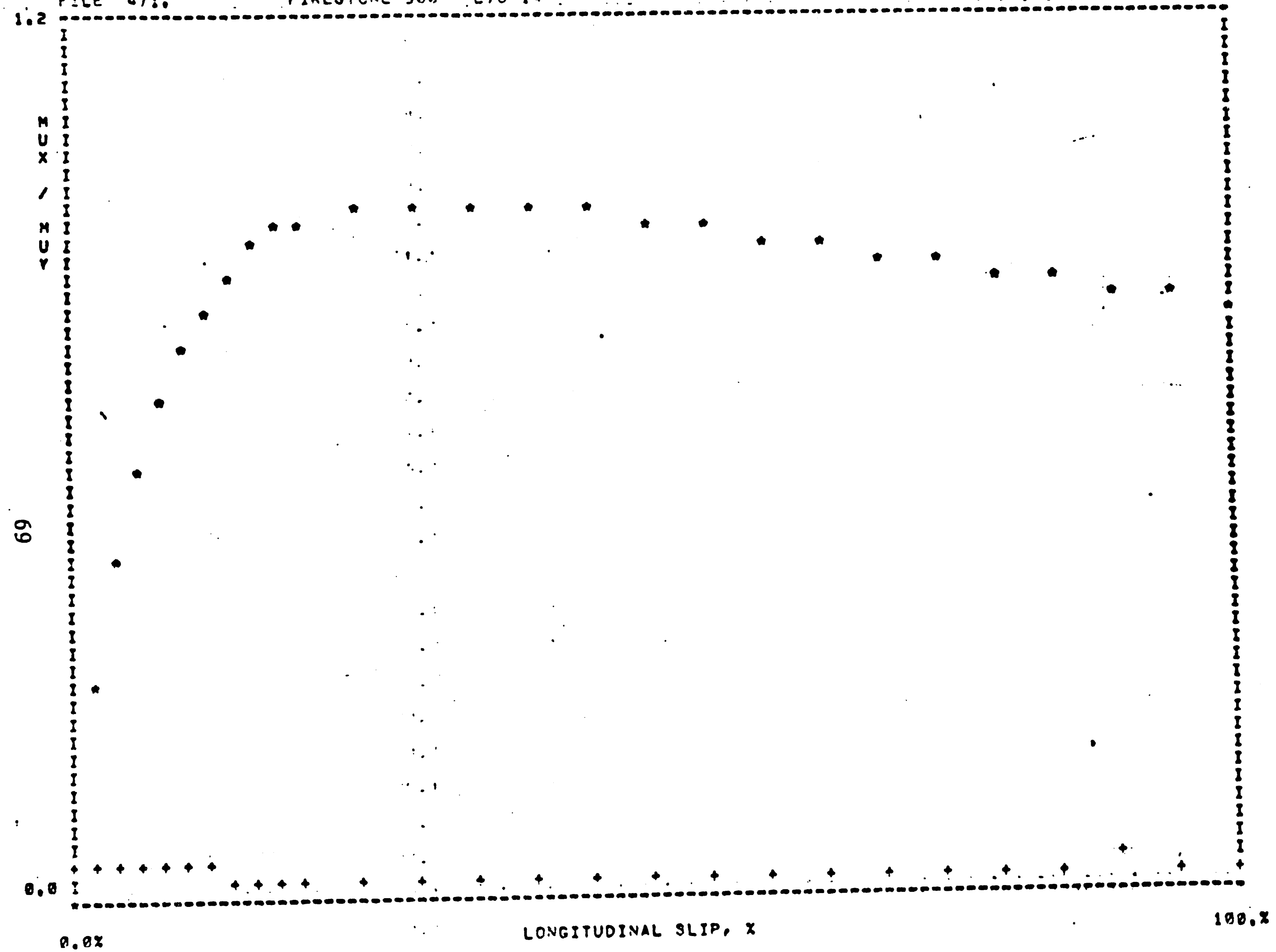
III.C.2 Free-Rolling Lateral Force Measurements from Mobile Tire Tester - 24 psi Inflation

		Dry Asphalt					Wet Jennite				
Load	Speed	0°	2°	4°	8°	16°	0°	1°	3°	7°	15°
800	20 mph	25	285	447	632	672/803	12	145	346	470	438
	40 mph	- 5	286	465	629	755	0	150	340	455	409
	50 mph						8	162	333	446	365
1100	40 mph	10	270	517	815	1006/1039	-88	82	336	522	506
1400	40 mph	-25	277	537	889	1008	-100	90	377	625	626

III.C.3 Braking Data from the Mobile Tire Tester

	Dry Asphalt				Wet Jennite			
	0°			4°	0°			3°
	800 lbs.		1100 lbs.	800 lbs.	800 lbs.		1100 lbs.	800 lbs.
	20 mph	40 mph	40 mph	40 mph	20 mph	40 mph	40 mph	40 mph
MBF	769	724		733	476	432	523	371
LWBF	652	712		723	314	264	325	250
MLF				426				364
LWLF				69				29

FILE 471. FIRESTONE 500 E78-14 DRY ASPHALT #8

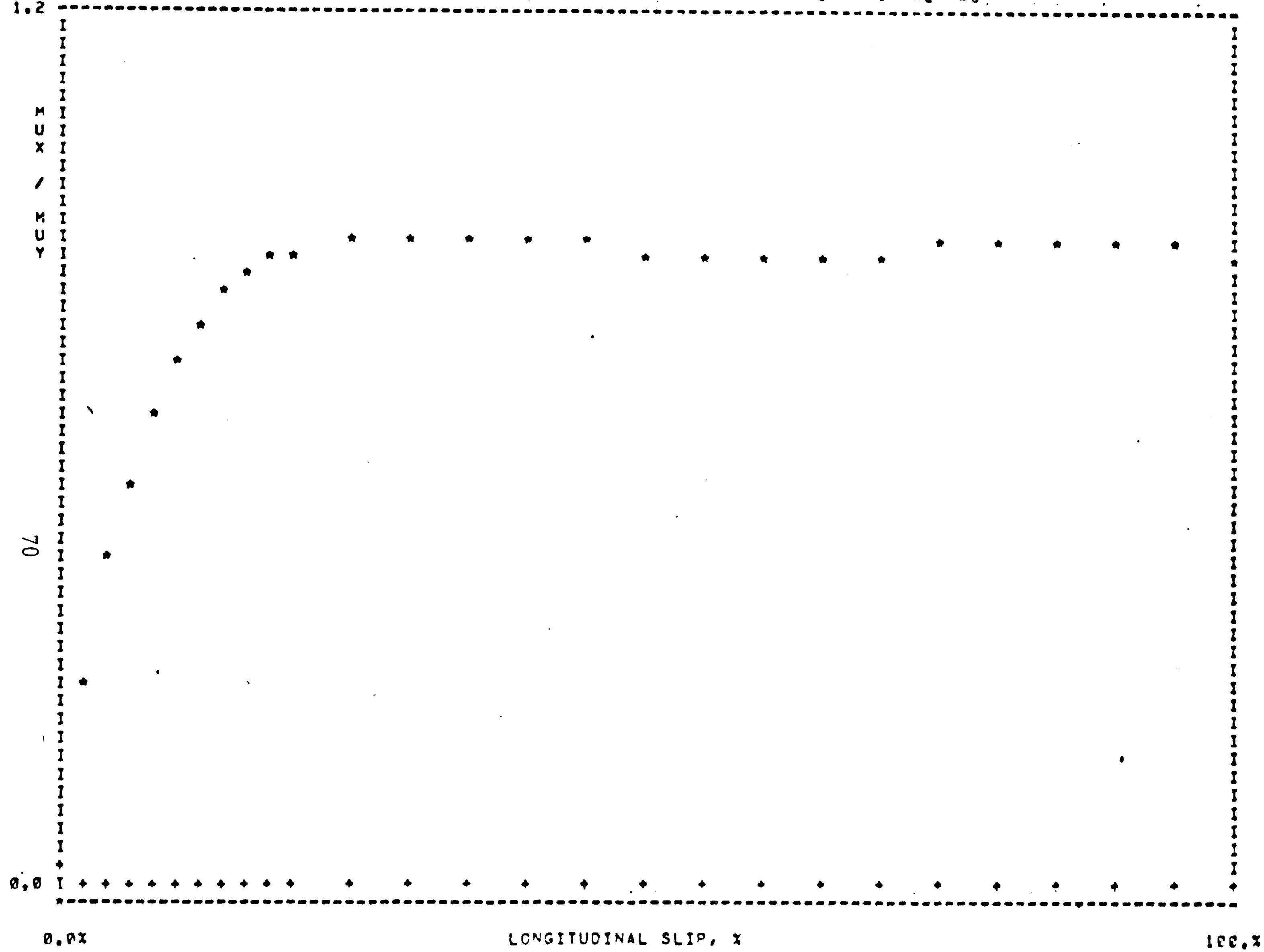


SLIP	FX-LBS
0.00	0.0
0.02	236.7
0.04	366.5
0.06	466.0
0.08	544.2
0.10	605.0
0.12	652.1
0.14	687.9
0.16	715.1
0.18	735.8
0.20	747.8
0.25	762.5
0.30	768.6
0.35	768.1
0.40	763.3
0.45	756.0
0.50	747.1
0.55	737.4
0.60	727.7
0.65	718.3
0.70	709.2
0.75	700.3
0.80	690.9
0.85	681.1
0.90	671.9
0.95	662.0
1.00	652.1

TP- 2. RUN# 315. LOAD= 800. LBS. VEL.= 20. MPH ALPHA= 0. DEG

TIRE PRESSURE= 24 PSI

FILE 470. FIRESTONE 500 E78-14 DRY ASPHALT #8

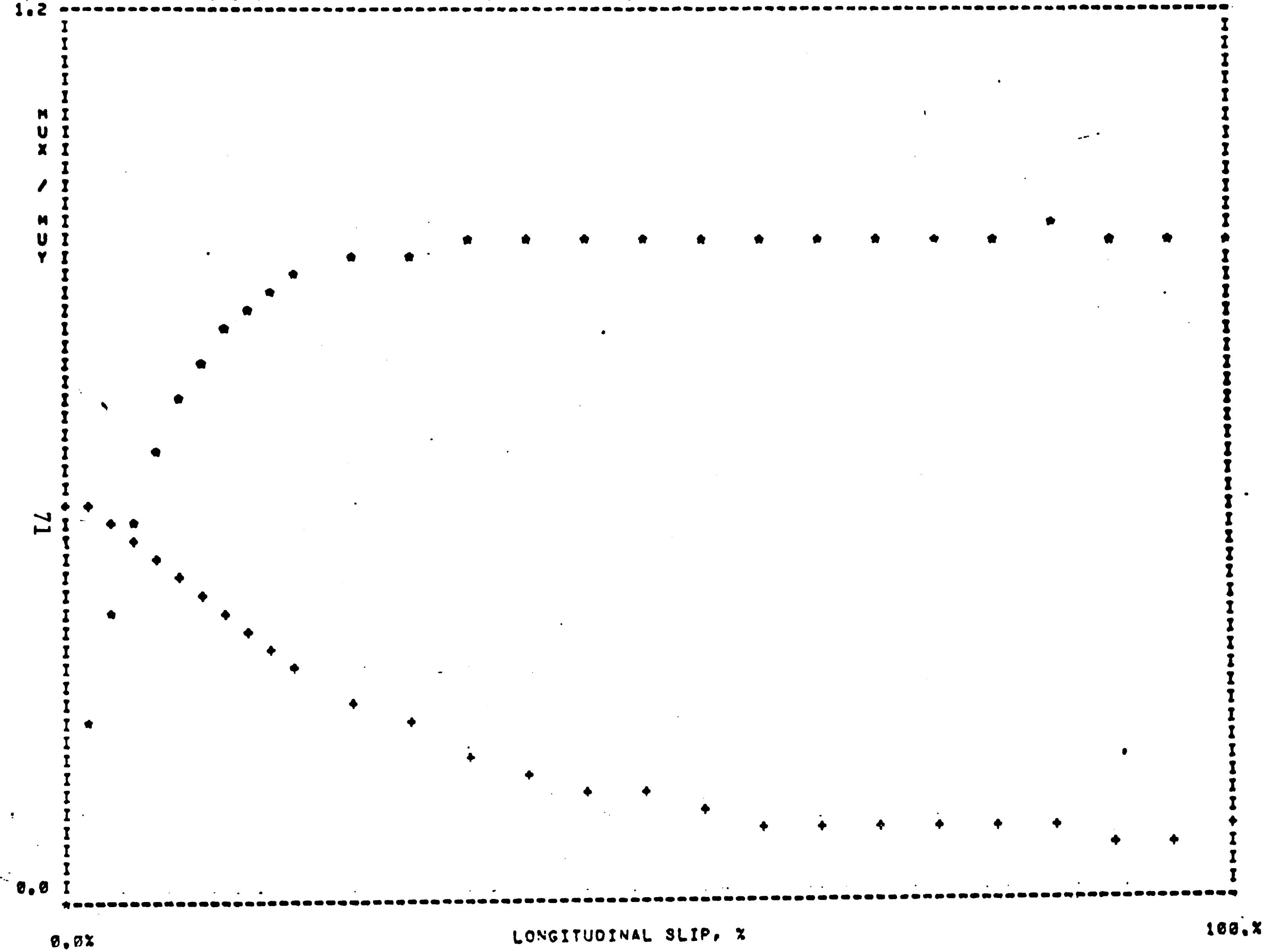


TP- 2. RUN# 314. LOAD= 800. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 24. PSI

SLIP	FX-LBS
0.00	0.0
0.02	238.8
0.04	351.4
0.06	456.1
0.08	532.1
0.10	587.2
0.12	632.7
0.14	653.0
0.16	686.6
0.18	723.2
0.20	711.6
0.25	721.0
0.30	724.1
0.35	722.7
0.40	718.8
0.45	713.9
0.50	729.3
0.55	726.5
0.60	725.9
0.65	726.8
0.70	729.0
0.75	713.8
0.80	718.2
0.85	721.2
0.90	722.2
0.95	719.6
1.00	712.0

FILE 472.   FIRESTONE 500   E78-14   DRY ASPHALT #8

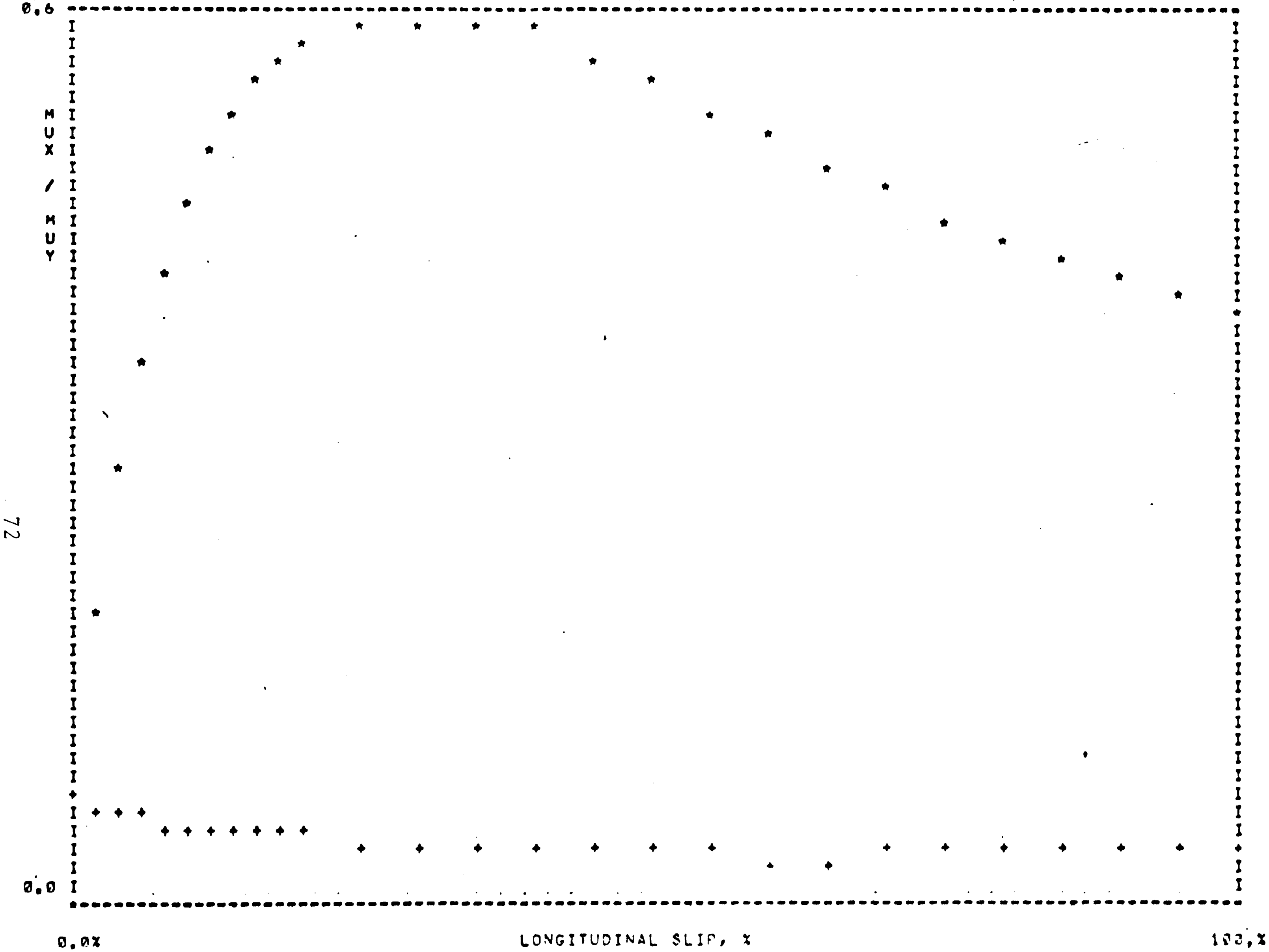


TP- 2.   RUN# 316.   LOAD= 800. LBS.   VEL.= 40. MPH   ALPHA= 4. DEG

TIRE PRESSURE= 24. PSI

SLIP	FX-LBS	FY-LBS
0.00	0.0	426.0
0.02	201.2	422.6
0.04	316.4	409.6
0.06	409.0	394.1
0.08	481.7	375.8
0.10	539.6	355.4
0.12	584.2	334.5
0.14	618.8	314.3
0.16	645.5	295.5
0.18	665.9	277.8
0.20	679.0	261.3
0.25	697.3	223.1
0.30	707.9	190.2
0.35	714.8	163.8
0.40	717.1	142.2
0.45	717.9	123.7
0.50	717.7	108.1
0.55	718.6	95.8
0.60	720.8	86.6
0.65	723.8	80.1
0.70	726.7	76.0
0.75	729.4	73.3
0.80	731.9	71.0
0.85	733.4	68.5
0.90	732.2	66.6
0.95	728.8	66.4
1.00	722.8	68.9

FILE 412. FIRESTONE 500 E78-14 WET JENNITE

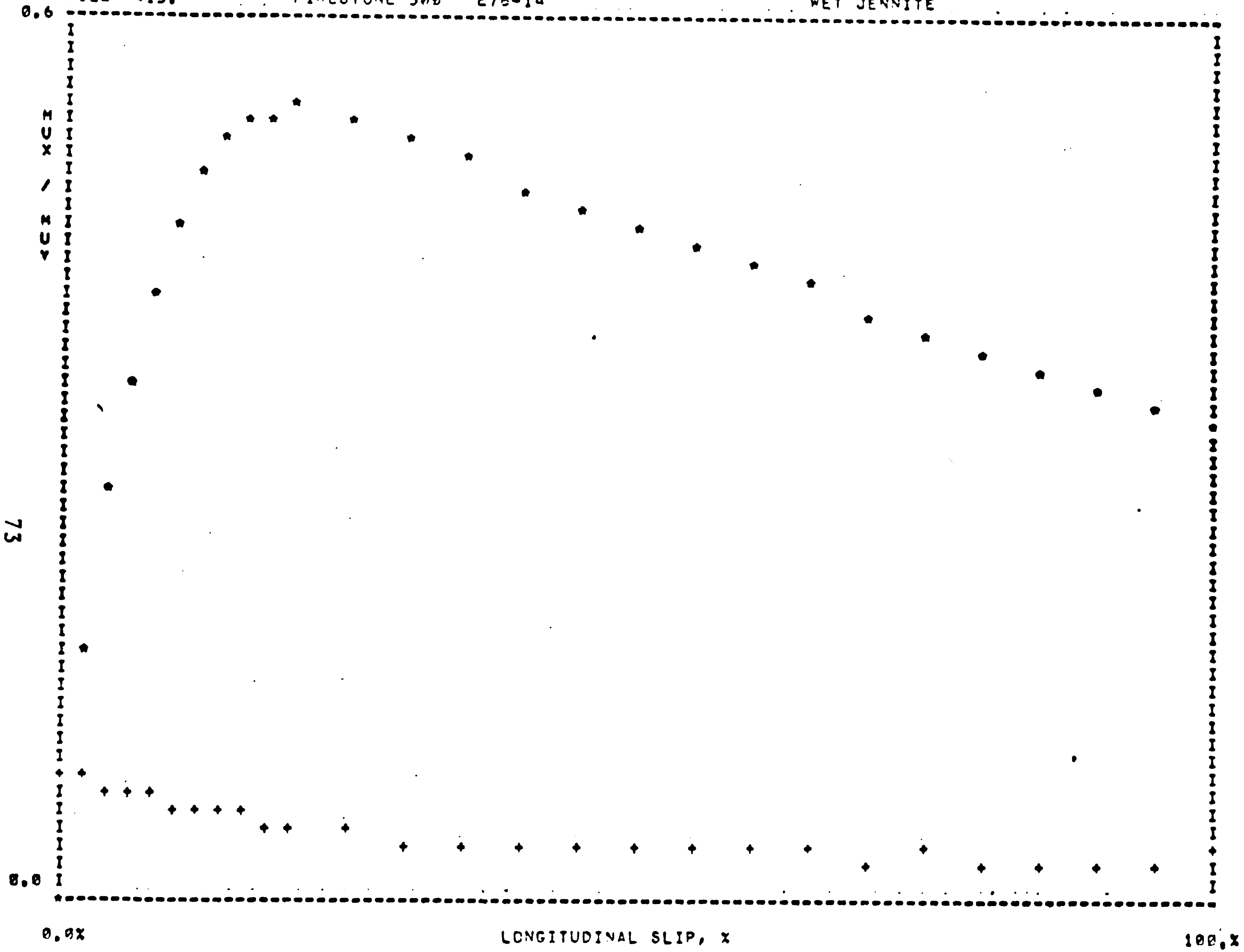


TP- 2. RUN# 251. LOAD= 800. LBS. VEL.= 20. MPH ALPHA= 0. DEG

TIRE PRESSURE= 24. PSI

SLIP	FX-LBS
0.00	0.0
0.02	158.0
0.04	235.0
0.06	290.0
0.08	340.8
0.10	377.3
0.12	405.2
0.14	426.5
0.16	443.0
0.18	455.7
0.20	463.0
0.25	472.0
0.30	476.2
0.35	475.5
0.40	468.7
0.45	456.9
0.50	442.6
0.55	427.5
0.60	412.4
0.65	397.7
0.70	384.1
0.75	371.6
0.80	360.0
0.85	348.9
0.90	337.5
0.95	326.0
1.00	314.3

FILE 413. FIRESTONE 500 E78-14 WET JENNITE

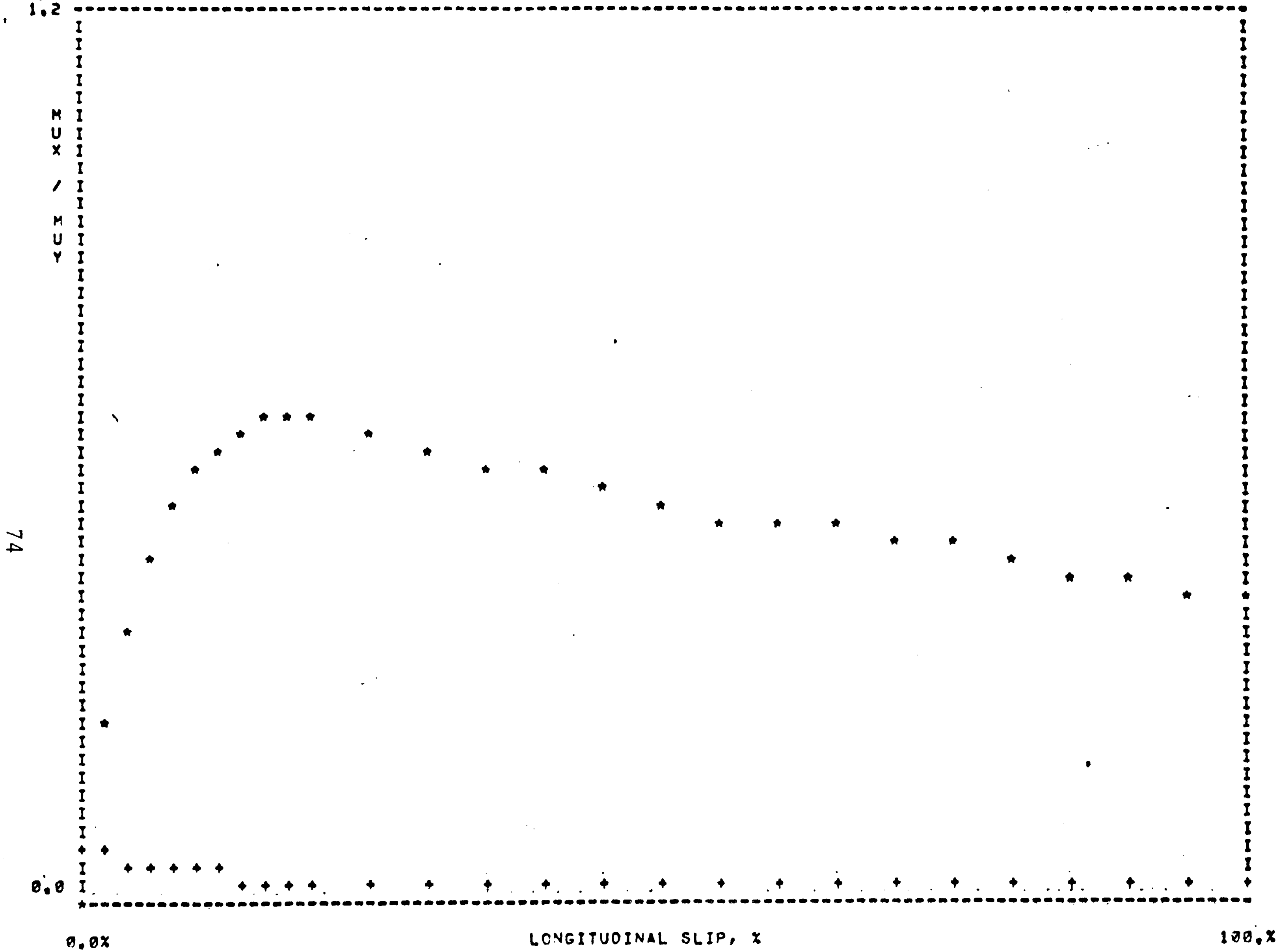


TP- 2. RUN# 253. LOAD= 800. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 24. PSI

SLIP	FX-LBS
0.00	0.0
0.02	138.8
0.04	228.4
0.06	282.8
0.08	331.9
0.10	369.7
0.12	395.1
0.14	412.8
0.16	423.5
0.18	429.6
0.20	432.1
0.25	428.7
0.30	417.8
0.35	403.6
0.40	390.7
0.45	378.8
0.50	367.4
0.55	356.6
0.60	345.8
0.65	334.8
0.70	324.2
0.75	314.3
0.80	304.2
0.85	293.8
0.90	283.7
0.95	273.7
1.00	264.0

FILE 415.   FIRESTONE 500 E78-14   WET JENNITE

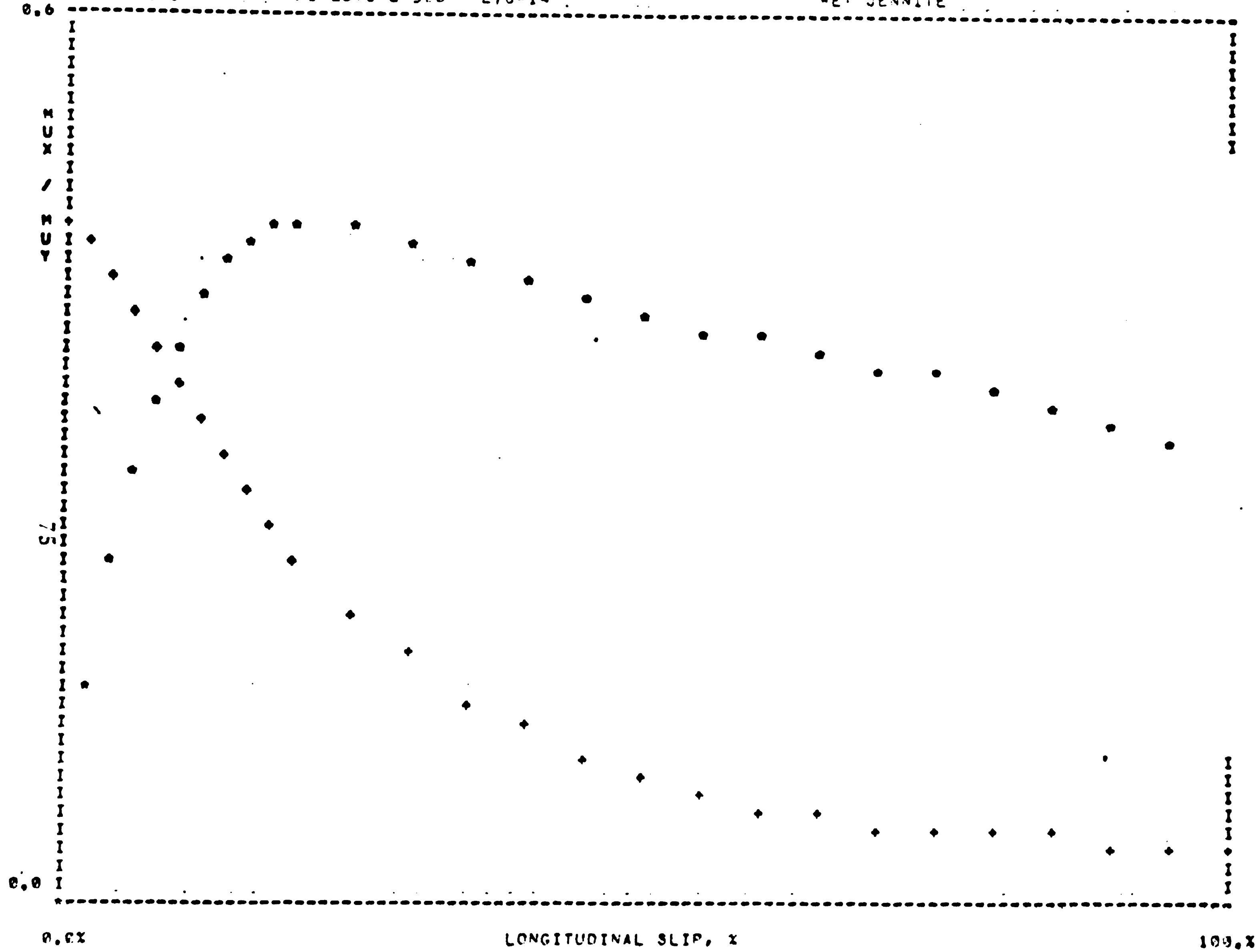


TP= 2.   RUN# 255.   LOAD= 1100 [redacted]. LBS.   VEL.= 40. MPH   ALPHA= 0. DEG

TIRE PRESSURE= 24. PSI

SLIP	FX-LBS
0.00	0.0
0.02	188.6
0.04	285.8
0.06	361.3
0.08	419.4
0.10	462.1
0.12	491.0
0.14	509.2
0.16	519.4
0.18	523.4
0.20	521.1
0.25	507.1
0.30	490.6
0.35	474.6
0.40	460.2
0.45	445.2
0.50	429.1
0.55	414.6
0.60	405.2
0.65	398.7
0.70	390.2
0.75	379.1
0.80	368.4
0.85	358.5
0.90	347.9
0.95	336.6
1.00	324.7

FILE 414.   FIRESTONE 500   E78-14   WET JENNITE



SLIP	FX-LBS	FY-LBS
0.00	0.0	364.0
0.02	117.0	355.5
0.04	181.9	338.9
0.06	231.9	319.0
0.08	272.0	299.8
0.10	303.6	279.2
0.12	327.0	259.6
0.14	345.0	239.6
0.16	359.3	219.2
0.18	367.9	201.2
0.20	371.1	185.9
0.25	369.9	155.7
0.30	361.8	130.0
0.35	351.3	110.8
0.40	339.0	92.3
0.45	327.4	78.5
0.50	318.3	68.1
0.55	311.4	59.4
0.60	305.6	52.0
0.65	299.8	46.7
0.70	294.0	42.6
0.75	287.8	38.9
0.80	280.5	36.1
0.85	272.2	34.1
0.90	264.3	32.4
0.95	256.9	30.8
1.00	253.1	29.2

TP- 2.   RUN# 254.   LOAD= 800. LBS.   VEL.= 40. MPH   ALPHA= 4. DEG

TIRE PRESSURE= 24. PSI

III.D.1 Free-Rolling Measurements from the Flat Bed Tire Tester - 28 psi Inflation

a. Lateral Force vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	183	94	-11	-123	-204				
800	246	122	-19	-166	-280				
1100	278	134	-20	-184	-320				
1400	285	136	-15	-186	-332				

b. Aligning Moment vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	- 8	- 4	0	6	8				
800	-19	-11	0	14	20				
1100	-34	-18	1	22	35				
1400	-49	-27	2	31	51				

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°
500	-44	-33	-11	- 5	2			
800	-68	-47	-19	- 6	11			
1100	-78	-53	-20	- 5	15			
1400	-83	-54	-15	- 4	21			

IV. Goodyear Cus [illegible] shion Polyglas E78-14

IV.A.1 Free-Rolling Measurements from the Flat Bed Tire Tester - 10 psi Inflation

a. Lateral Force vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	164	77	-17	-121	-192				
800	140	57	-13	-102	-182				
1100	91	38	-13	- 69	-119				
1400	35	4	- 1	- 26	- 60				

b. Aligning Moment vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	-21	-12	2	18	19				
800	-42	-19	5	31	45				
1100	-52	-24	6	38	63				
1400	-61	-26	2	40	69				

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°
500	-46	-28	-17	-4	- 2			
800	-51	-32	-13	-3	5			
1100	-54	-26	-13	-8	7			
1400	-32	- 5	- 1	-2	15			

IV.B.1 Free-Rolling Measurements from the Flat Bed Tire Tester - 16 psi Inflation

a. Lateral Force vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	202	104	-16	-144	-221				
800	215	100	-16	-147	-240				
1100	185	80	-18	-128	-216				
1400	155	19	-18	-113	- 62				

b. Aligning Moment vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	-14	- 9	1	13	14				
800	-36	-20	4	28	38				
1100	-55	-27	6	39	59				
1400	-66	-29	7	46	70				

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°
500	-46	-25	-16	- 8	- 3			
800	-56	-31	-16	-12	0			
1100	-61	-32	-18	- 4	6			
1400	-66	-38	-18	- 2	10			

IV.C.1 Free-Rolling Measurements from the Flat Bed Tire Tester - 22 psi Inflation

a. Lateral Force vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	190	107	-19	-137	-218				
800	244	129	-23	-174	-270				
1100	240	123	-26	-166	-274				
1400	209	110	-25	-149	-315				

b. Aligning Moment vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	-29	-20	7	22	30				
800	-63	-38	12	49	66				
1100	-103	-58	17	76	108				
1400	-134	-67	19	95	147				

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°
500		-30	-19	- 8				
800		-39	-23	-14				
1100		-40	-26	-14				
1400		-36	-25	-18				

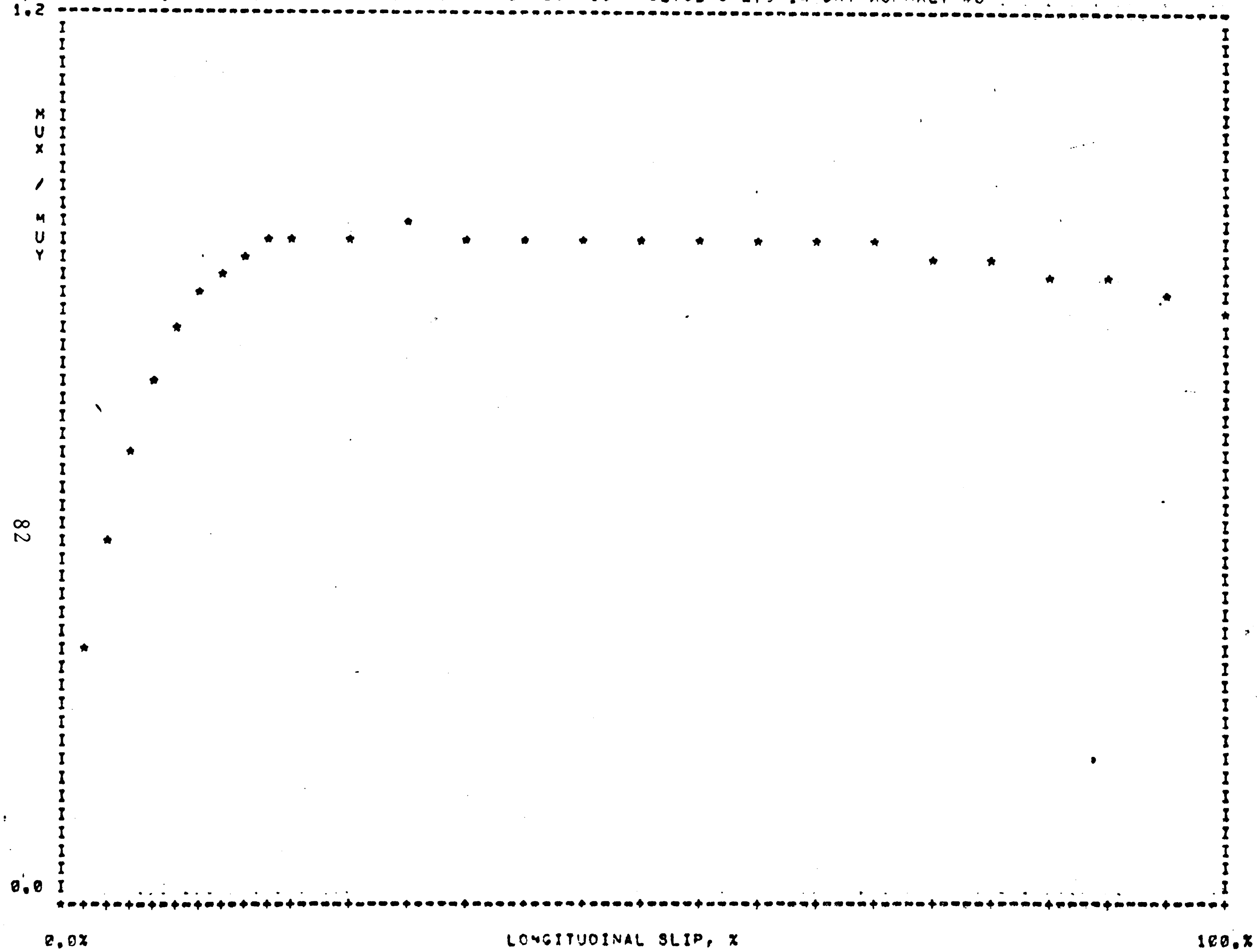
IV.C.2 Free-Rolling Lateral Force Measurements from Mobile Tire Tester - 24 psi Inflation

		Dry Asphalt					Wet Jennite				
Load	Speed	0°	2°	4°	8°	16°	0°	1°	3°	7°	15°
800	20 mph						8	158	326	435	415
	40 mph						5	164	312	379	366
	50 mph						10	150	316	361	330
1100	40 mph						-22	150	361	532	496
1400	40 mph						5	158	391	578	624

IV.C.3 Braking Data from the Mobile Tire Tester

	Dry Asphalt				Wet Jennite			
	0°			4°	0°			3°
	800 lbs.		1100 lbs.	800 lbs.	800 lbs.		1100 lbs.	800 lbs.
	20 mph	40 mph	40 mph	40 mph	20 mph	40 mph	40 mph	40 mph
MBF		720		746	426	385	496	348
LWBF		629		683	283	242	303	235
MLF				380				272
LWLF				21				8

FILE 1443.   GOODYEAR CUSTOM POWER CUSHION POLYGLAS E78-14 DRY ASPHALT #8

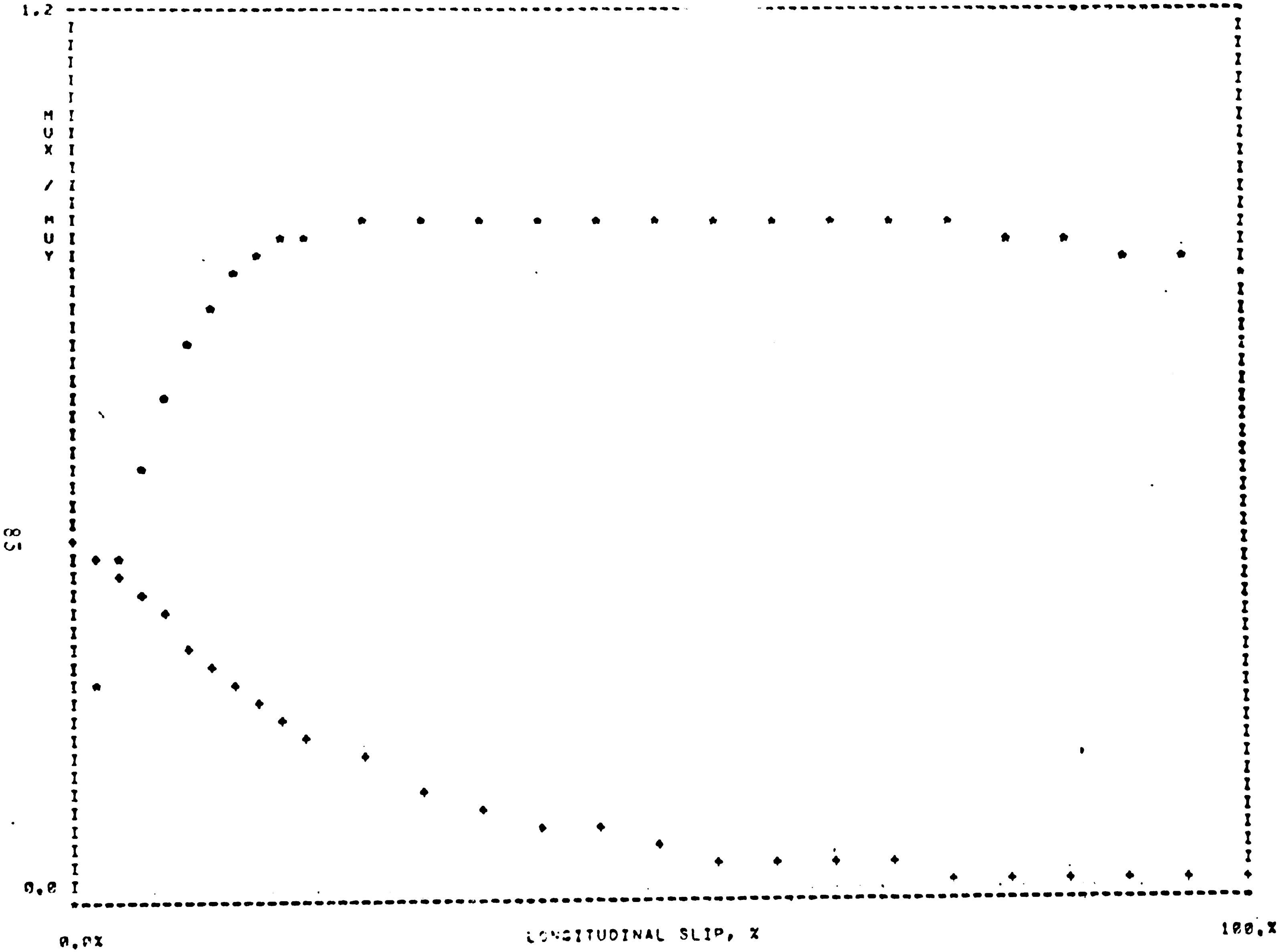


TP= 5.   RUN# 121.   LOAD= 800. LBS.   VEL.= 40. MPH   ALPHA= 0. DEG

TIRE PRESSURE= 24. PSI

SLIP	FX-LBS
0.00	0.0
0.02	260.2
0.04	393.0
0.06	489.4
0.08	560.0
0.10	611.0
0.12	647.7
0.14	674.3
0.16	693.3
0.18	706.2
0.20	712.0
0.25	717.5
0.30	720.1
0.35	719.3
0.40	715.2
0.45	710.8
0.50	728.8
0.55	707.7
0.60	706.4
0.65	706.2
0.70	705.3
0.75	700.2
0.80	691.0
0.85	678.6
0.90	663.3
0.95	646.7
1.00	628.7

FILE 1444. GOODYEAR CUSTOM POWER CUSHION POL 78-14 DRY ASPHALT #8

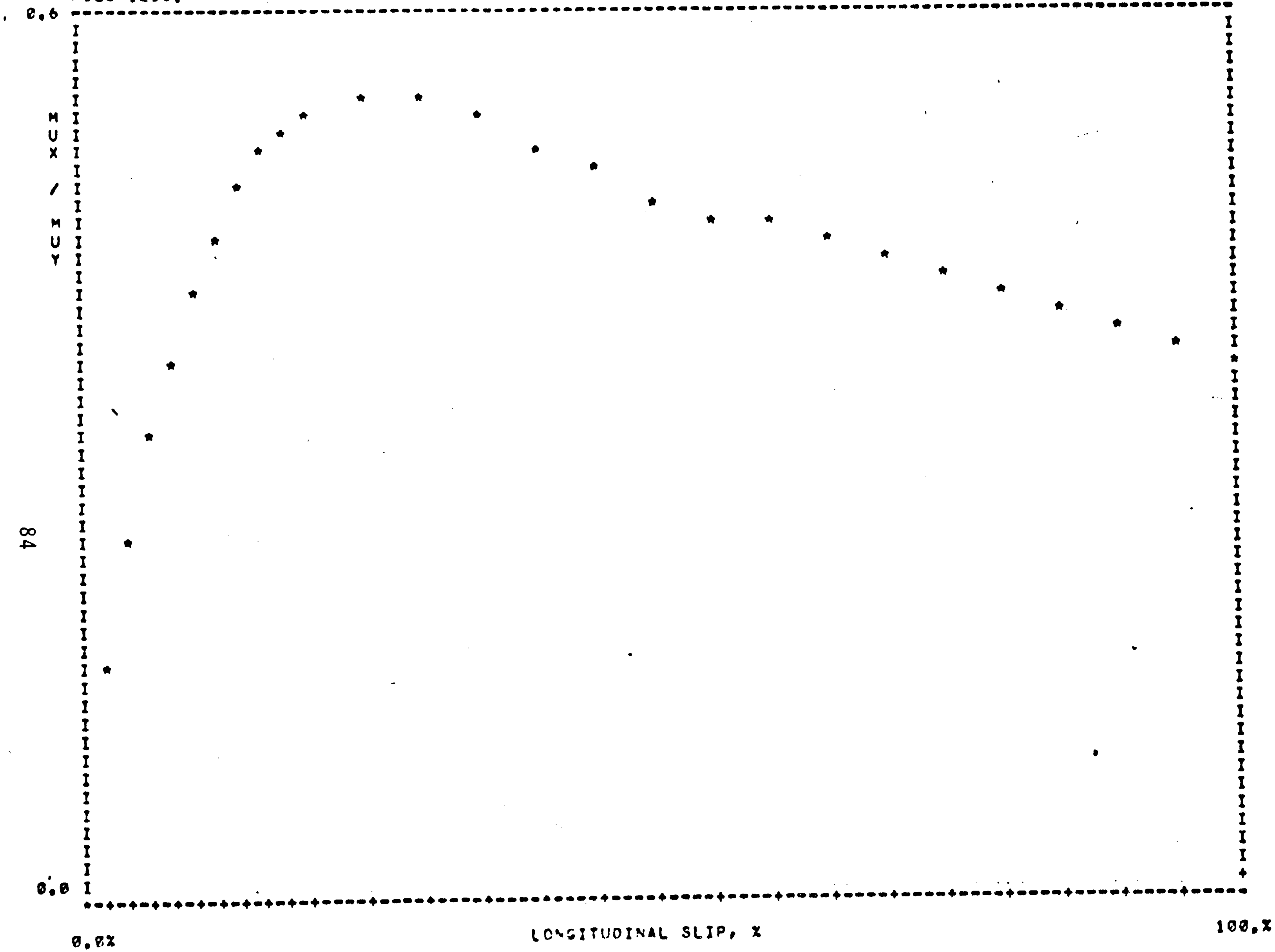


SLIP	FX-LBS	FY-LBS
0.00	0.0	382.4
0.02	232.3	378.1
0.04	362.9	356.9
0.06	460.7	332.0
0.08	539.5	326.9
0.10	622.7	282.2
0.12	645.9	258.6
0.14	692.4	236.4
0.16	724.1	215.6
0.18	727.3	196.7
0.20	728.7	181.6
0.25	739.8	152.4
0.30	744.9	123.2
0.35	745.9	101.0
0.40	742.7	83.6
0.45	742.9	69.1
0.50	736.7	57.2
0.55	734.7	47.7
0.60	735.3	42.8
0.65	736.5	33.9
0.70	736.5	29.7
0.75	734.0	27.1
0.80	727.2	26.0
0.85	716.6	25.5
0.90	720.0	24.6
0.95	693.0	23.1
1.00	683.0	21.0

TP- 5. RUN# 122. LOAD= 800. LBS. VEL.= 40. MPH ALPHA= 4. DEG

TIRE PRESSURE= 24. PSI

FILE 1258. GOODYEAR CUSTOM POWER CUSHION POLYGLAS E78-14 WET JENNITE

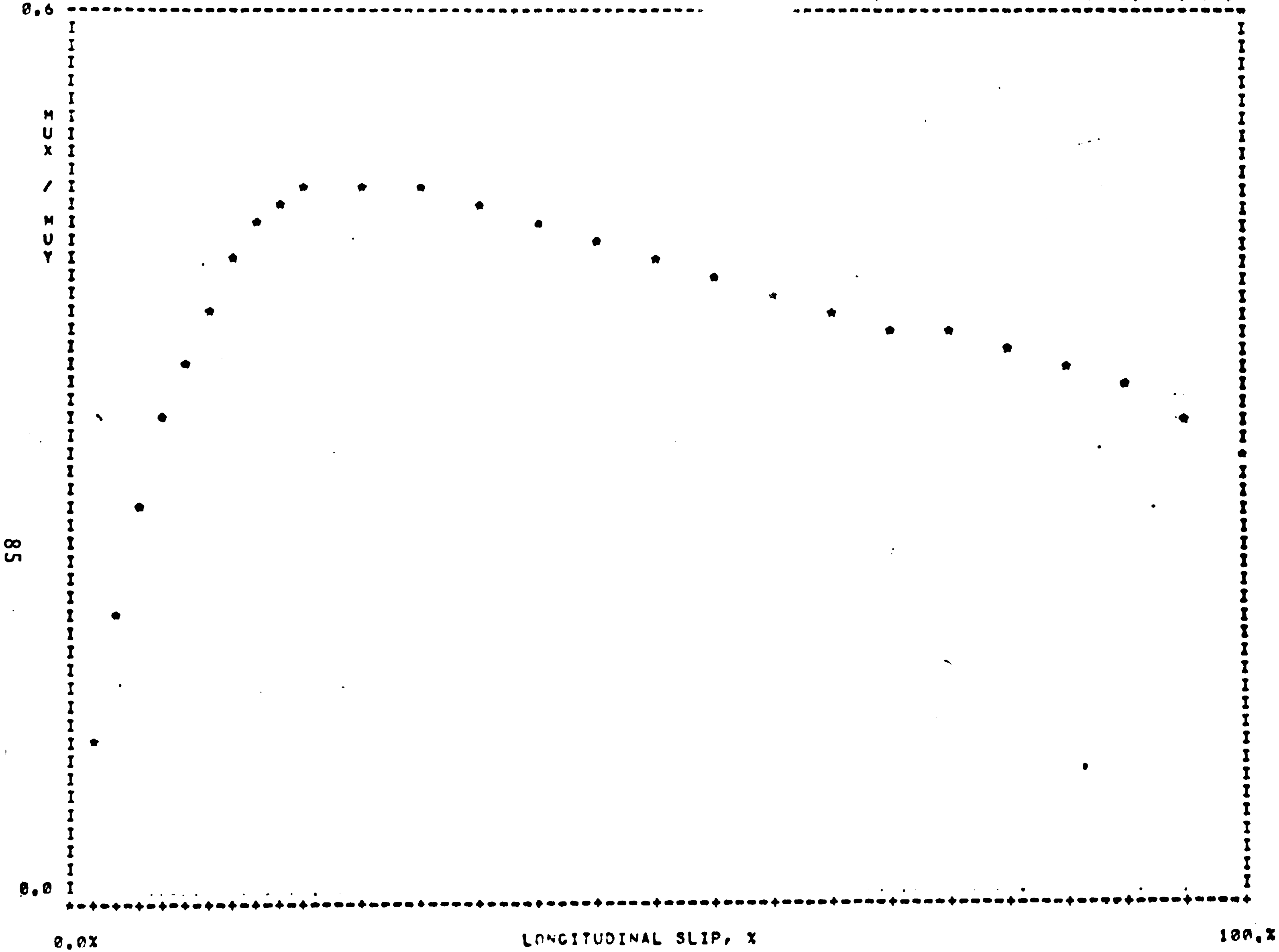


SLIP	FX-LBS
0.00	0.0
0.02	125.2
0.04	192.4
0.06	244.3
0.08	287.3
0.10	323.9
0.12	353.6
0.14	377.4
0.16	396.5
0.18	411.1
0.20	418.9
0.25	426.0
0.30	425.1
0.35	416.6
0.40	403.4
0.45	389.2
0.50	376.7
0.55	366.7
0.60	358.3
0.65	350.1
0.70	341.4
0.75	332.0
0.80	322.3
0.85	312.5
0.90	302.6
0.95	292.6
1.00	282.6

TP= 4. RUN# 402. LOAD= [illegible] LBS. VEL.= 20. MPH ALPHA= 0. DEG

TIRE PRESSURE= 24. PSI

FILE 1257. GOODYEAR CUSTOM POWER CUSHION POLY[illegible] 10 WET JENNITE

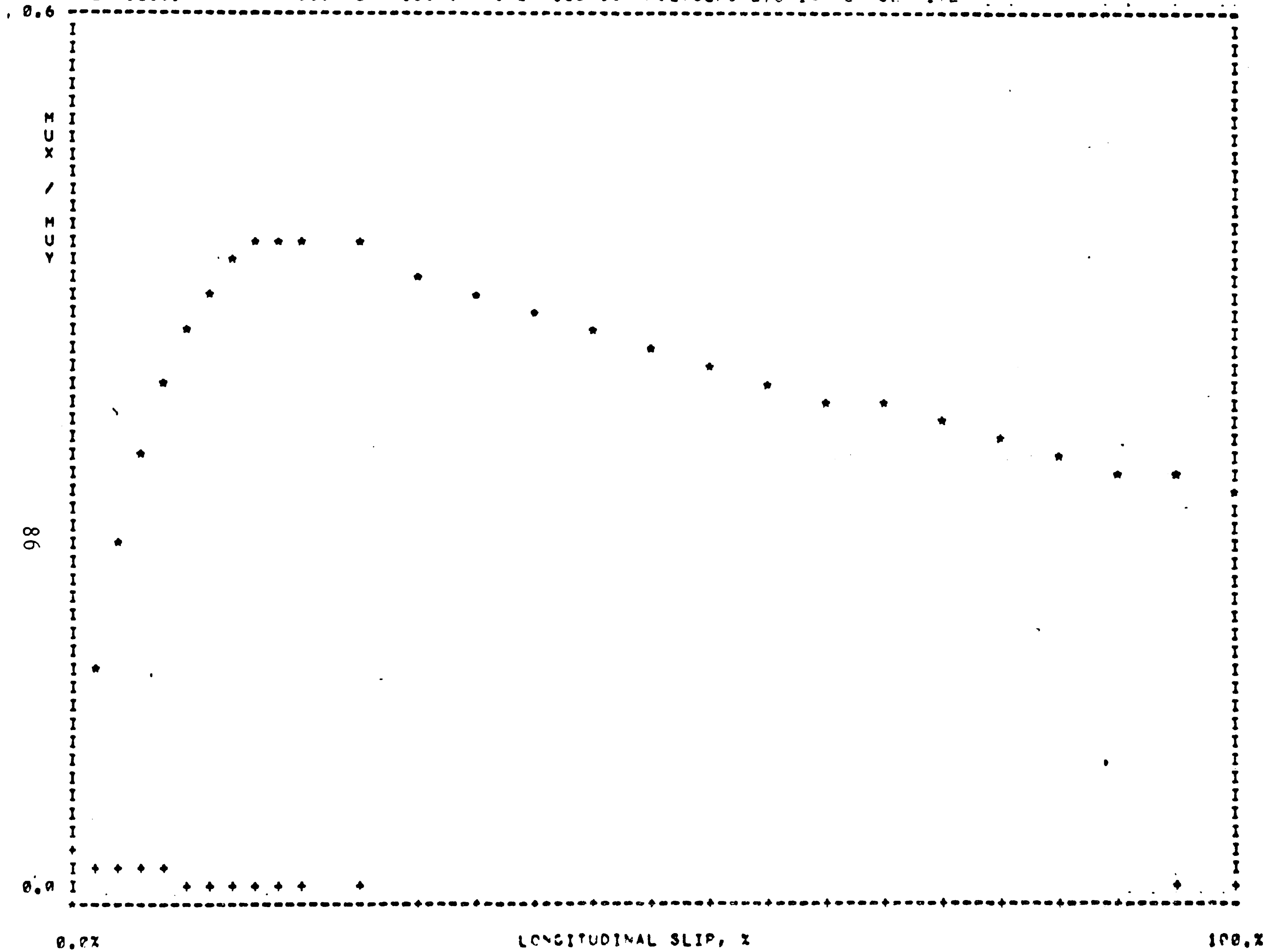


TP= 4. RUN# 401. LOAD= ???. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 24. PSI

SLIP	FX-LBS
0.00	0.0
0.02	85.3
0.04	155.8
0.06	229.3
0.08	252.9
0.10	288.4
0.12	317.8
0.14	342.1
0.16	358.9
0.18	372.7
0.20	382.5
0.25	385.2
0.30	381.1
0.35	372.1
0.40	362.3
0.45	352.6
0.50	341.7
0.55	332.3
0.60	320.3
0.65	312.7
0.70	306.8
0.75	301.7
0.80	295.9
0.85	287.6
0.90	275.0
0.95	267.1
1.00	242.4

FILE 1218.   GOODYEAR CUSTOM POWER CUSHION POLYGLAS E78-14 WET JENNITE

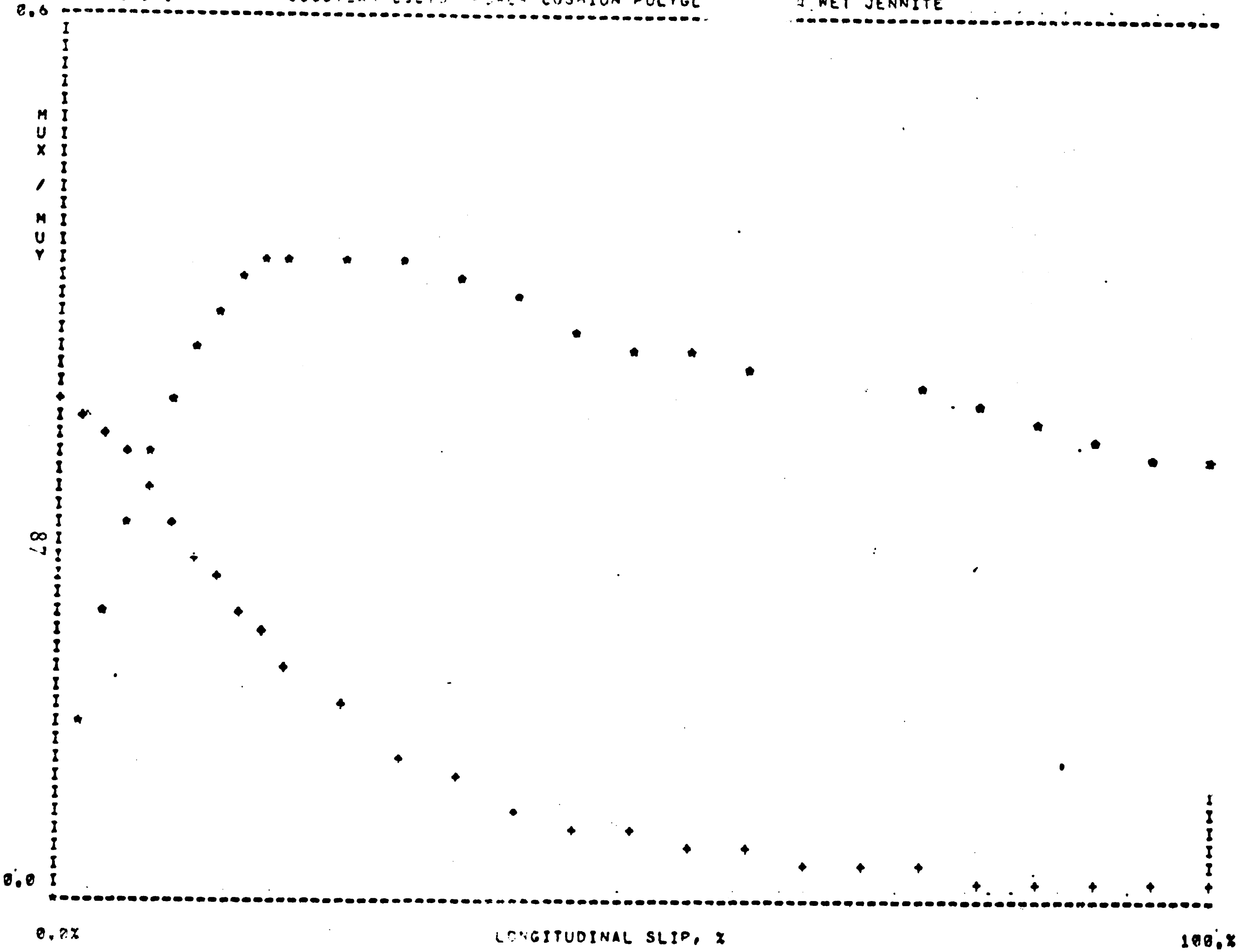


TP- 4.   RUN# 360.   LOAD= 1100. LBS.   VEL.= 40. MPH   ALPHA= 0. DEG

TIRE PRESSURE= 24. PSI

SLIP	FX-LBS
0.00	0.0
0.02	176.5
0.04	262.8
0.06	328.4
0.08	383.7
0.10	421.7
0.12	452.3
0.14	474.1
0.16	487.9
0.18	495.5
0.20	496.2
0.25	488.0
0.30	473.9
0.35	455.6
0.40	437.2
0.45	421.8
0.50	409.3
0.55	398.7
0.60	388.9
0.65	378.7
0.70	368.4
0.75	358.6
0.80	348.5
0.85	337.3
0.90	326.0
0.95	314.7
1.00	303.4

FILE 1259. GOODYEAR CUSTOM POWER CUSHION POLYGL 4 WET JENNITE



SLIP	FX-LBS	FY-LBS
0.00	0.0	272.2
0.02	94.5	262.5
0.04	153.0	252.2
0.06	200.4	235.2
0.08	239.5	219.1
0.10	271.0	202.4
0.12	296.1	185.7
0.14	315.5	169.6
0.16	330.0	154.5
0.18	342.3	140.3
0.20	345.7	127.6
0.25	348.4	101.3
0.30	344.8	79.7
0.35	333.9	63.1
0.40	321.2	58.6
0.45	309.4	41.3
0.50	302.0	34.4
0.55	292.5	29.1
0.60	287.0	24.3
0.65	283.3	19.8
0.70	279.5	16.5
0.75	273.7	14.5
0.80	266.5	12.6
0.85	258.9	10.8
0.90	251.2	9.5
0.95	243.3	8.5
1.00	235.1	7.8

TP= 4. RUN# 403. LOAD= [illegible] LBS. VEL.= 40. MPH ALPHA= 3. DEG

TIRE PRESSURE= 24. PSI

IV.D.1 Free-Rolling Measurements from the Flat Bed Tire Tester - 28 psi Inflation

a. Lateral Force vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	200	107	-16	-140	-221				
800	276	142	-19	-188	-308				
1100	295	142	-22	-195	-335				
1400	279	130	-22	-185	-324				

b. Aligning Moment vs. Slip Angle and Load

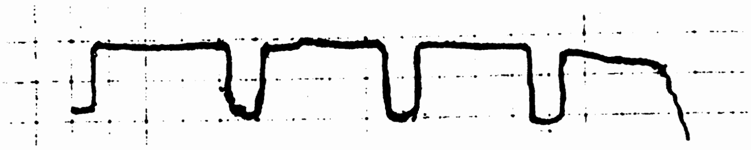
Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	- 9	- 6	0	10	8				
800	-25	-15	1	19	25				
1100	-45	-25	3	32	44				
1400	-63	-33	5	44	64				

c. Lateral Force vs. Inclination Angle and Load

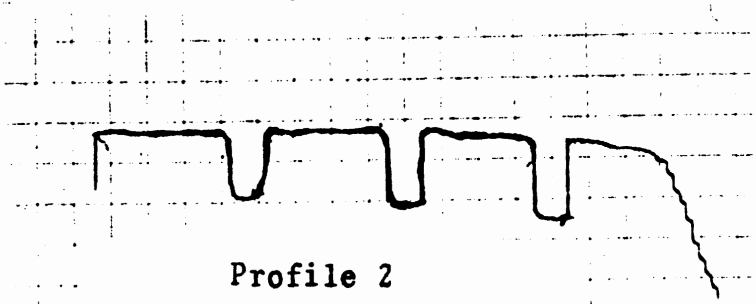
Load	-2°	-1°	0°	1°	2°	4°	6°	8°
500	-38	-24	-16	-5	-4			
800	-59	-39	-19	-4	4			
1100	-67	-45	-22	-2	6			
1400	-54	-47	-22	-6	7			

IV.E. Lateral Force Shoulder Wear Data, Mobile Tire Tester,
800 lbs, 24 psi, 40 mph, Dry Asphalt

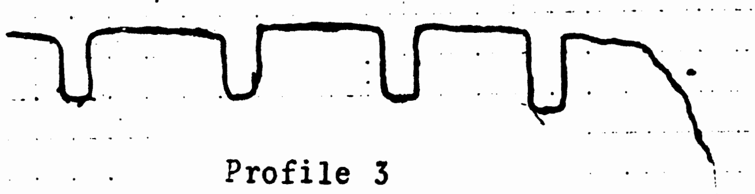
Wear Cycle	0°	2°	4°	8°	16°	
1	-18	247	437	555	600	Profile #2 Taken
2	-42	247	405	561	673	Profile #3 Taken
3	-32	219	408	578	694	
4	-58	214	390	621	723	Profile #4 Taken
5	-48	184	392	628	736	Profile #5 Taken



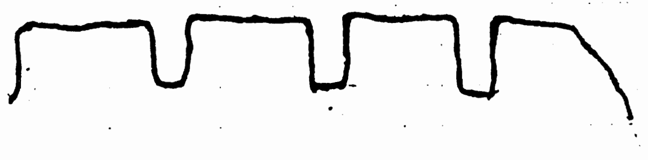
Virgin Tire



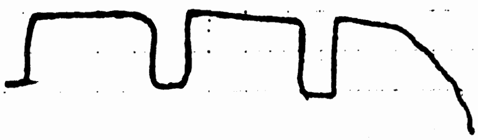
Profile 2



Profile 3



Profile 4



Profile 5

IV.F. Cornering Stiffness Data from Mobile Tire Tester, 800 lbs. Dry Asphalt

Inflation	Speed	-2°	0°	+2°
24 psi	20 mph	315	25	-277
15 psi	5 mph	202	2	-206
	10 mph	215	8	-205
	20 mph	225	0	-188
	30 mph	235	15	-209
	40 mph	250	22	-211

V. Mustang GL Ground to 6/32 Inch Tread Depth

V.A.1 Free-Rolling Measurements from the Flat Bed Tire Tester - 22 psi Inflation

a. Lateral Force vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	250	131	-15	-174	-279				
800	296	148	-15	-197	-337				
1100	286	134	-11	-177	-326				
1400	265	122	-12	-163	-302				

b. Aligning Moment vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	-16	-10	0	13	17				
800	-39	-22	1	29	42				
1100	-62	-32	2	41	65				
1400	-80	-40	3	52	85				

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°
500	-65	-44	-15	-2	14			
800	-80	-49	-15	1	30			
1100	-76	-45	-11	3	33			
1400	-74	-43	-12	4	32			

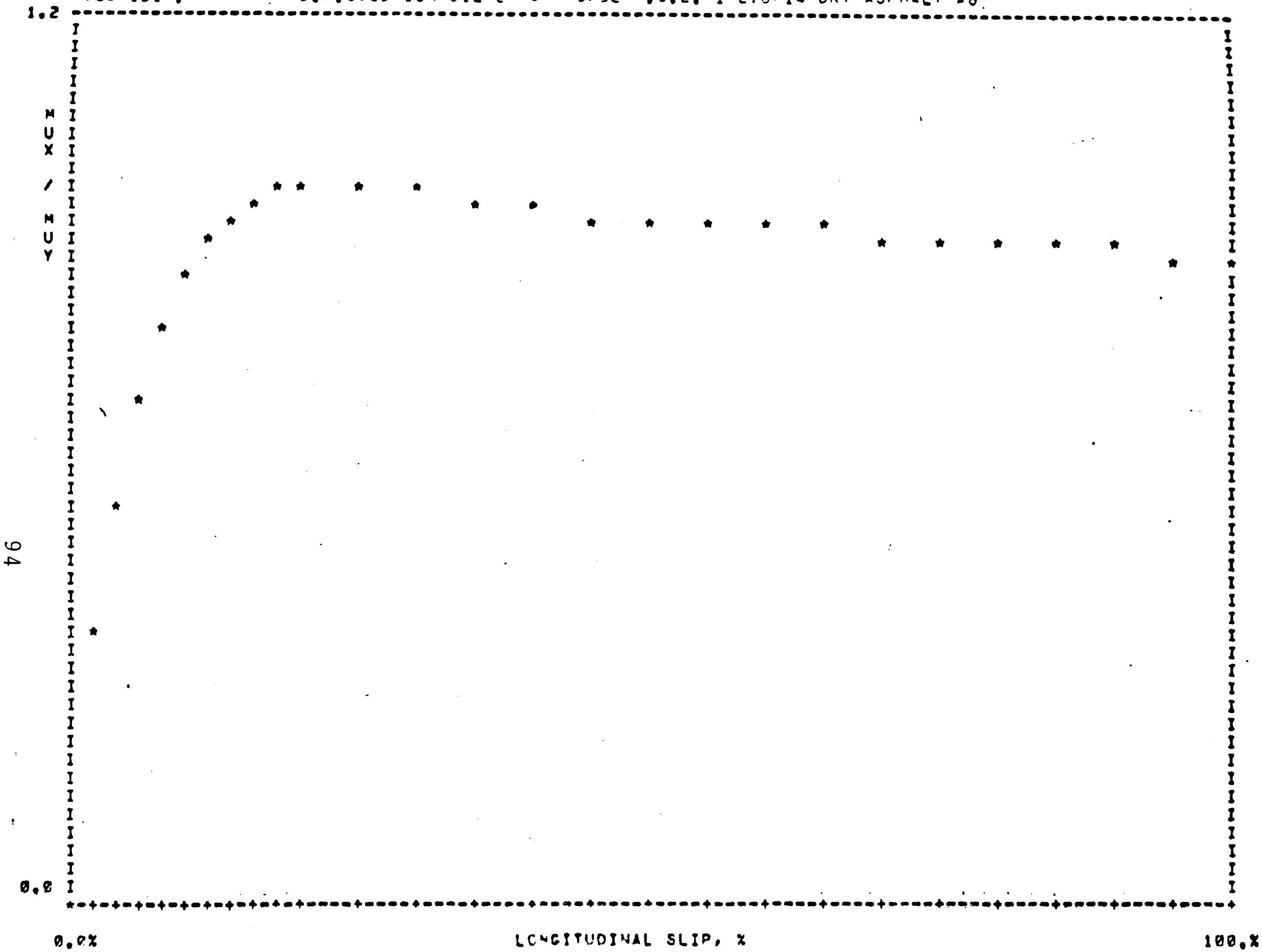
V.A.2 Free-Rolling Lateral Force Measurements [illegible] Mobile Tire Tester - 24 psi Inflation

		Dry Asphalt						Wet Jennite				
Load	Speed	0°	1°	2°	4°	8°	16°	0°	1°	3°	7°	15°
800	40 mph	-20	182	331	567	7[illegible]	752	-8	187	379	460	386

V.A.3 Braking Data from the Mobile Tire Tester - 24 psi

	Dry Asphalt 0° 800 lbs. 20 mph	Dry Asphalt 0° 800 lbs. 40 mph	Dry Asphalt 0° 1100 lbs. 40 mph	Dry Asphalt 4° 800 lbs. 40 mph	Wet Jennite 0° 800 lbs. 20 mph	Wet Jennite 0° 800 lbs. 40 mph	Wet Jennite 0° 1100 lbs. 40 mph	Wet Jennite 3° 800 lbs. 40 mph
MBF		755		740		363		
LWBF		671		701		230		
MLF				491				
LWLF				12				

FILE 1314, B.F.GOODRICH SILVERTOWN 6/32 M.O.E.=1 E78-14 DRY ASPHALT #8

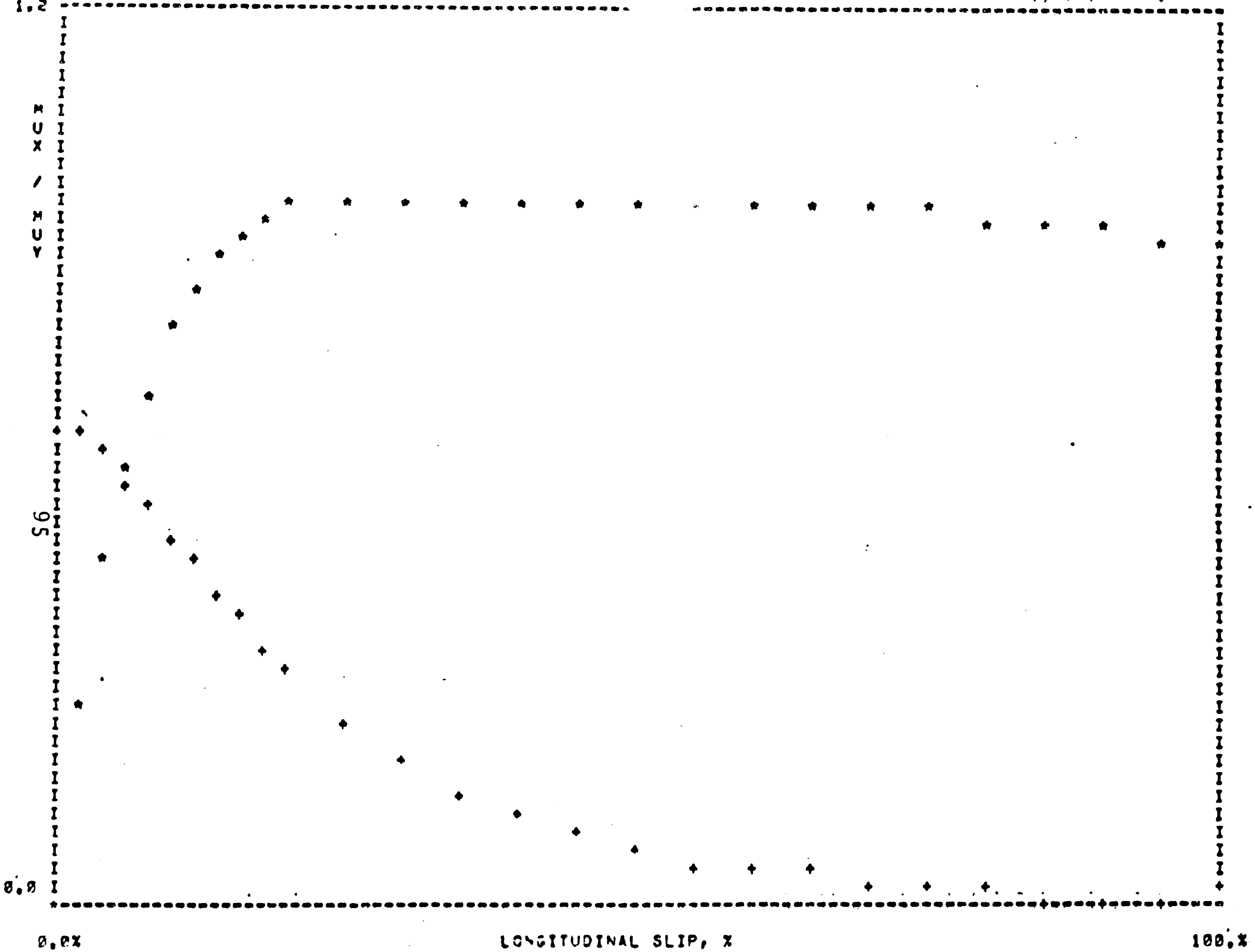


TP= 4, RUN# 460, LOAD= APP. LBS, VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 24. PSI

SLIP	FX-LBS
0.00	0.0
0.02	273.8
0.04	417.0
0.06	522.0
0.08	600.0
0.10	656.0
0.12	694.8
0.14	721.6
0.16	739.9
0.18	751.2
0.20	754.9
0.25	752.6
0.30	746.6
0.35	738.8
0.40	730.9
0.45	724.7
0.50	719.8
0.55	714.9
0.60	710.5
0.65	708.0
0.70	707.0
0.75	706.5
0.80	706.0
0.85	704.5
0.90	698.2
0.95	687.6
1.00	671.4

FILE 1315.   B.F.GOODRICH SILVERTOWN 6/32   -1 E78-14 DRY ASPHALT #8

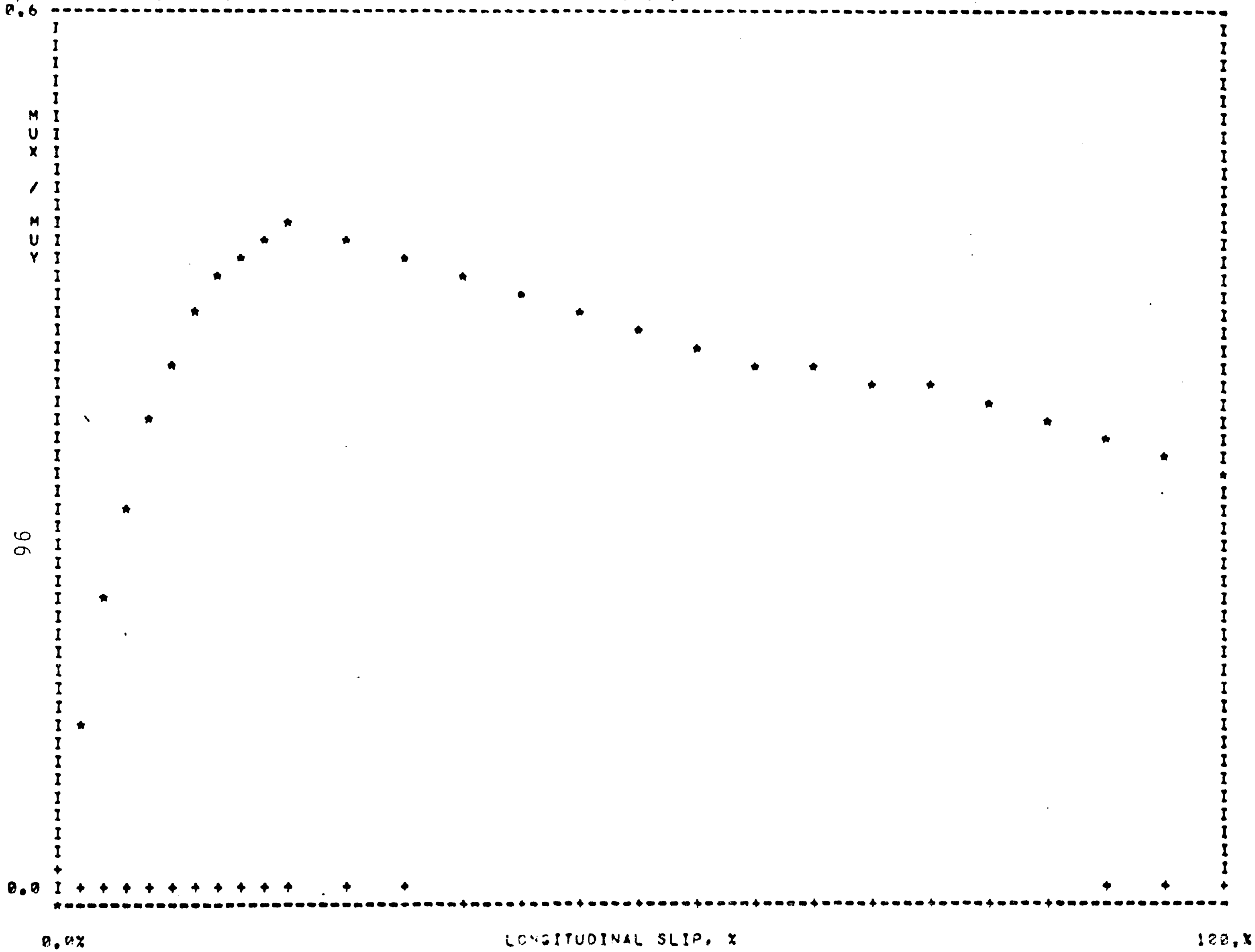


SLIP	FX-LBS	FY-LBS
0.00	0.0	482.6
0.02	216.9	490.9
0.04	349.5	468.2
0.06	453.8	442.0
0.08	536.0	414.6
0.10	599.0	385.6
0.12	645.2	355.0
0.14	678.7	323.9
0.16	702.6	294.1
0.18	719.1	267.0
0.20	727.9	243.?
0.25	736.8	191.5
0.30	739.8	149.1
0.35	739.9	115.8
0.40	738.7	89.9
0.45	737.3	70.5
0.50	736.5	56.2
0.55	736.1	45.7
0.60	736.0	37.6
0.65	735.2	30.6
0.70	733.0	23.8
0.75	730.1	17.0
0.80	726.0	11.2
0.85	72?.4	7.2
0.90	714.0	6.0
0.95	707.4	7.1
1.00	700.6	11.5

TP= 4.   RUN# 461.   LOAD= [illegible] LBS.   VEL.= 40. MPH   ALPHA= 4. DEG

TIRE PRESSURE= 24. PSI

FILE 1113.   B.F.GOODRICH SILVERTOWN 6/32M.O.E.=1 E78-14 WET JENNITE



SLIP	FX-LBS
0.00	0.0
0.02	97.3
0.04	160.4
0.06	216.2
0.08	257.6
0.10	290.5
0.12	315.7
0.14	334.9
0.16	349.5
0.18	359.7
0.20	363.4
0.25	359.5
0.30	349.9
0.35	338.8
0.40	328.2
0.45	317.3
0.50	307.1
0.55	299.5
0.60	293.5
0.65	287.0
0.70	280.7
0.75	275.4
0.80	269.8
0.85	262.4
0.90	252.8
0.95	242.2
1.00	232.4

TP= 4.   RUN# 240.   LOAD= 800. LBS.   VEL.= 40. MPH   ALPHA= 0. DEG

TIRE PRESSURE= 24. PSI

Testing OE Ground to 4/32 Inch Tread Depth

VI.A.1 Free-Rolling Measurements from the Flat Bed Tire Tester - 22 psi Inflation

a. Lateral Force vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	262	136	-22	-194	-292				
800	304	149	-20	-202	-343				
1100	283	132	-17	-178	-322				
1400	256	116	-16	-160	-292				

b. Aligning Moment vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	-18	-12	1	15	18				
800	-43	-25	2	32	47				
1100	-66	-35	4	45	71				
1400	-83	-42	6	55	91				

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°
500	-81	-52	-22	1	17			
800	-99	-59	-20	1	38			
1100	-93	-55	-17	4	40			
1400	-91	-52	-16	6	42			

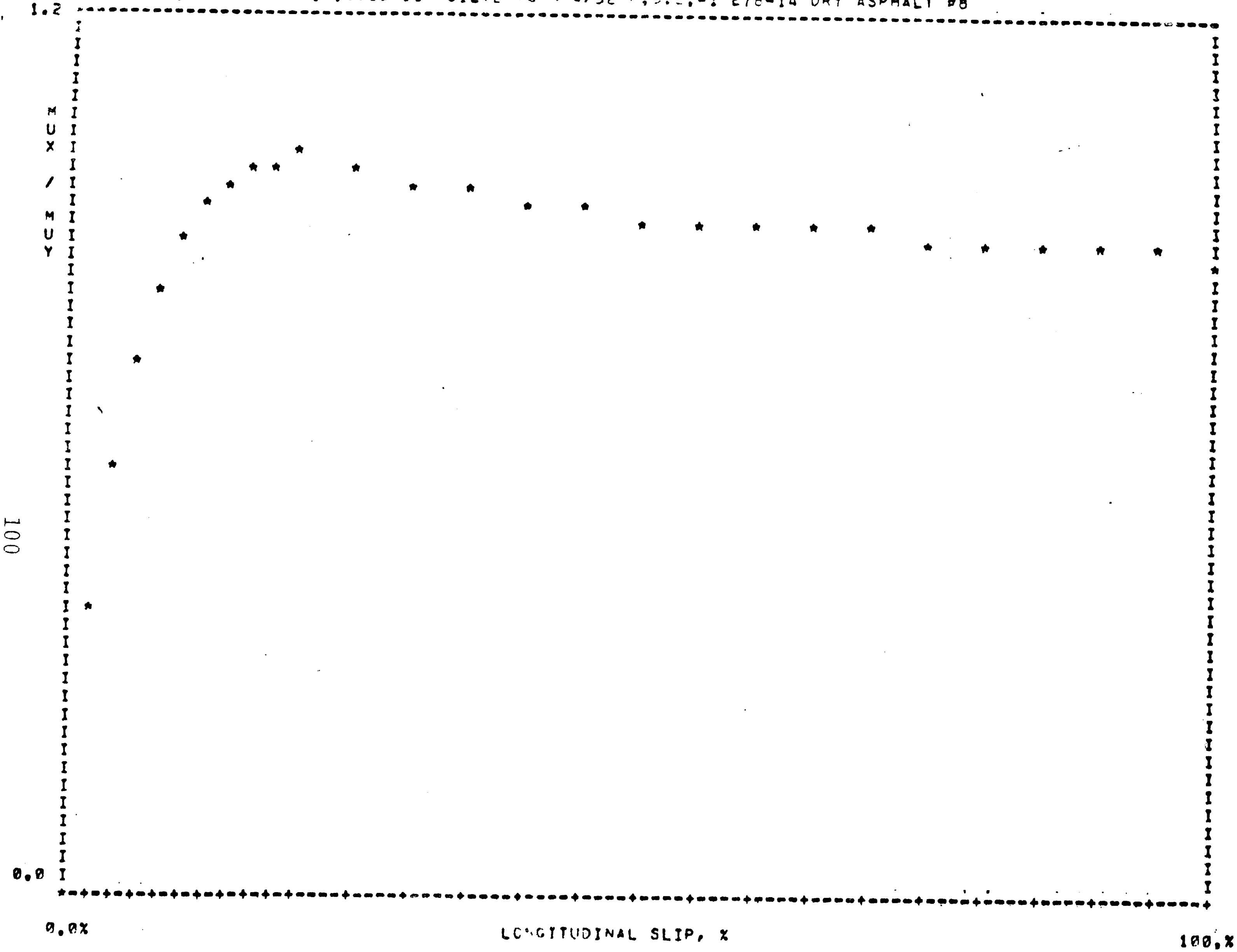
VI.A.2 Free-Rolling Lateral Force Measurements from Mobile Tire Tester - 24 psi Inflation

		Dry Asphalt						Wet Jennite				
Load	Speed	0°	1°	2°	4°	8°	16°	0°	1°	3°	7°	15°
800	40 mph	6	189	354	584	758	756	-25	186	371	435	322

VI.A.3 Braking Data from the Mobile Tire Tester - 24 psi

	Dry Asphalt 0° 800 lbs. 20 mph	Dry Asphalt 0° 800 lbs. 40 mph	Dry Asphalt 0° 1100 lbs. 40 mph	Dry Asphalt 4° 800 lbs. 40 mph	Wet Jennite 0° 800 lbs. 20 mph	Wet Jennite 0° 800 lbs. 40 mph	Wet Jennite 0° 1100 lbs. 40 mph	Wet Jennite 3° 800 lbs. 40 mph
MBF		787		749		350		
LWBF		685		711		201		
MLF				516				
LWLF				19				

FILE 1316. B.F.GOODRICH SILVERTOWN 4/32 M.O.E.-1 E78-14 DRY ASPHALT #8

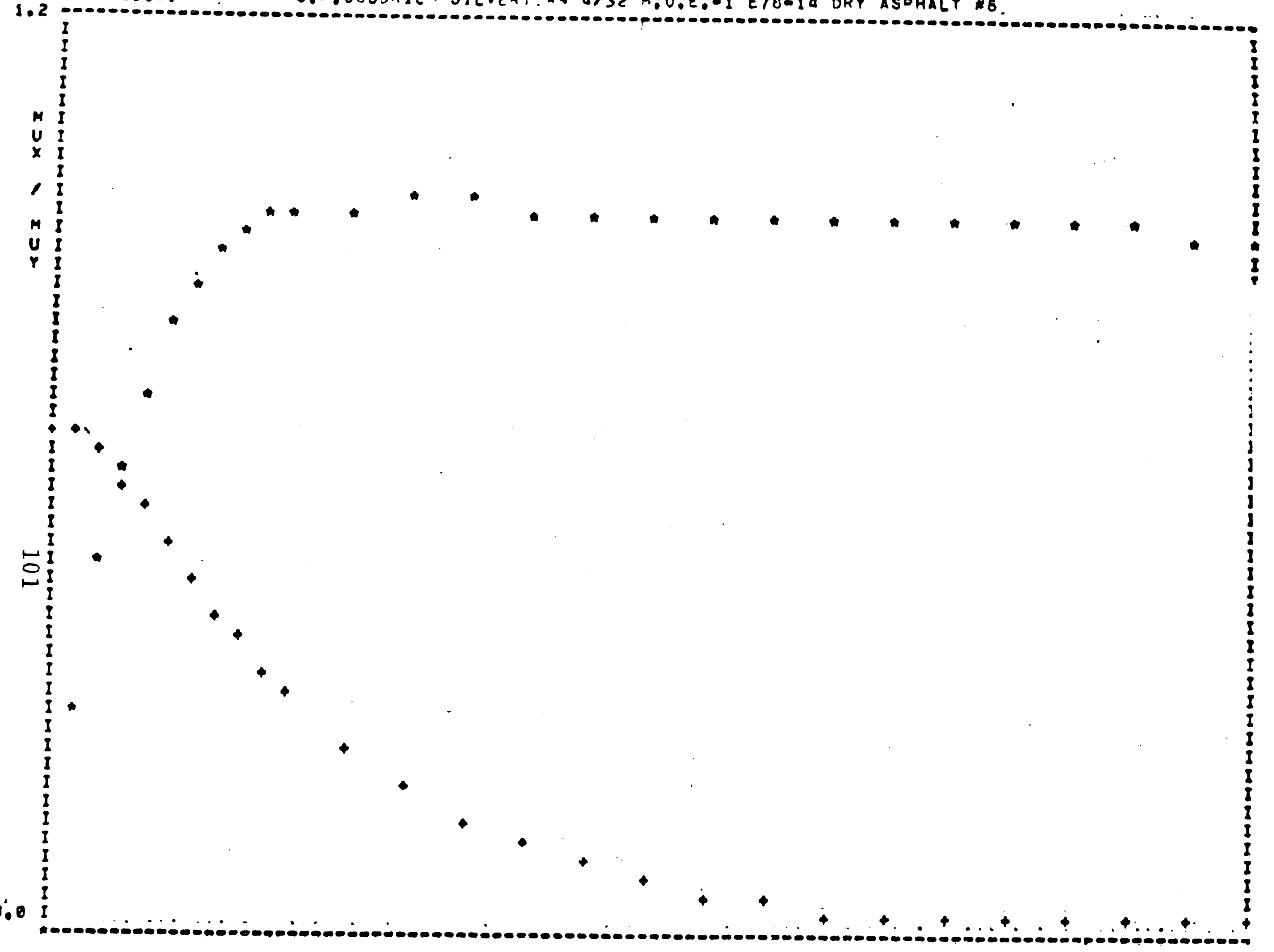


SLIP	FX-LBS
0.00	0.0
0.02	297.8
0.04	452.7
0.06	562.8
0.08	643.1
0.10	699.7
0.12	737.7
0.14	762.3
0.16	777.4
0.18	785.8
0.20	787.2
0.25	779.6
0.30	767.4
0.35	754.6
0.40	743.1
0.45	733.3
0.50	726.7
0.55	722.7
0.60	719.5
0.65	717.0
0.70	714.2
0.75	710.3
0.80	707.4
0.85	705.1
0.90	700.6
0.95	694.0
1.00	684.8

TP= 4. RUN# 462. LOAD= [illegible] LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 24. PSI

FILE 1317. B.F.GOODRICH SILVERTOWN 4/32 M.O.E.-1 E78-14 DRY ASPHALT #6

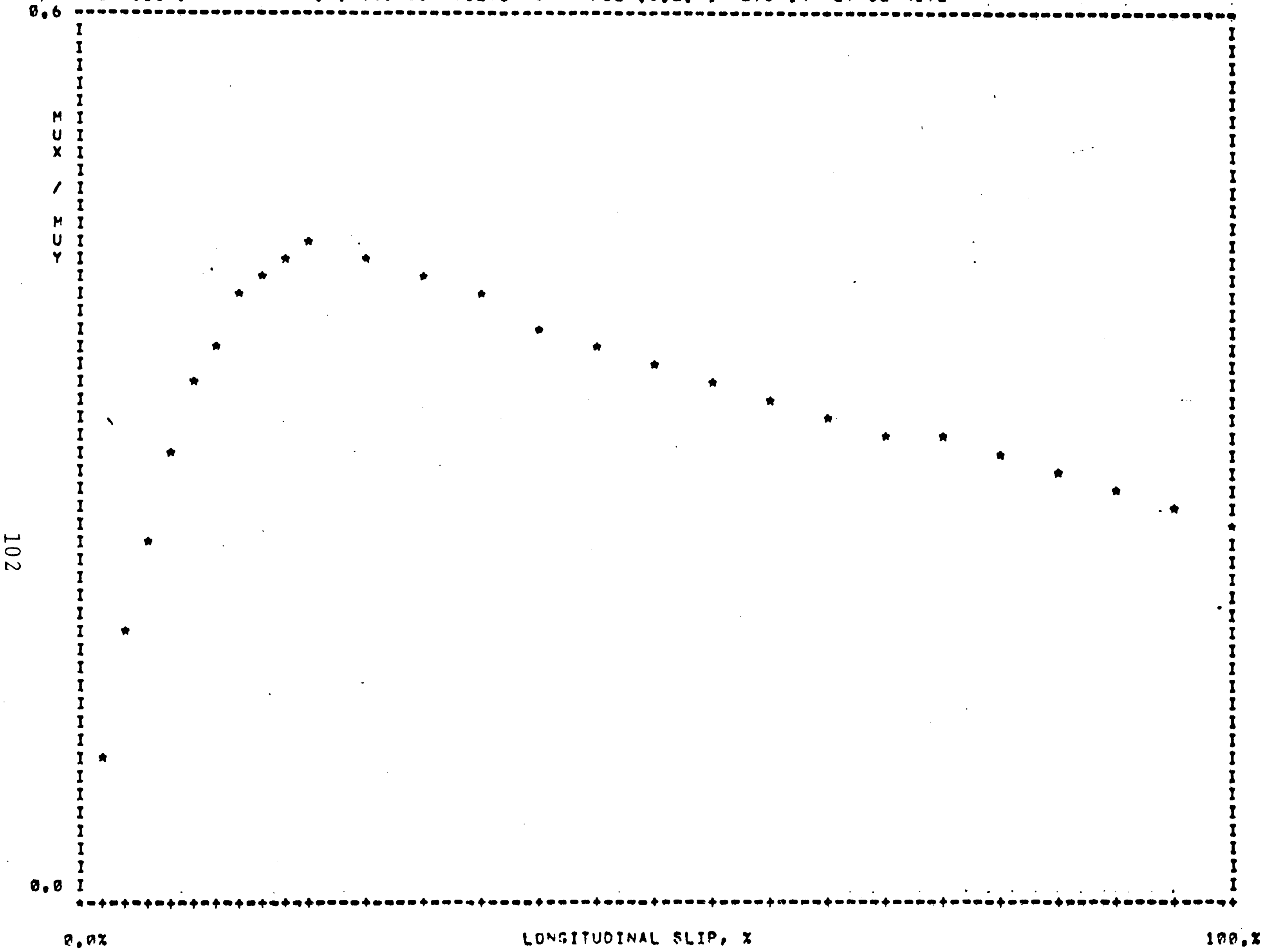


SLIP	FX-LBS	FY-LBS
0.00	0.0	504.4
0.02	233.4	515.8
0.04	370.5	492.1
0.06	476.0	461.7
0.08	558.0	428.5
0.10	619.8	393.7
0.12	665.1	359.3
0.14	697.3	326.6
0.16	719.8	296.6
0.18	735.1	269.2
0.20	742.2	245.1
0.25	747.7	193.5
0.30	749.3	150.2
0.35	748.5	115.4
0.40	746.6	88.7
0.45	745.5	68.9
0.50	744.7	53.8
0.55	744.2	42.2
0.60	743.5	32.9
0.65	742.7	25.4
0.70	741.6	19.4
0.75	739.5	14.6
0.80	737.5	11.6
0.85	734.9	11.0
0.90	729.8	12.8
0.95	722.3	15.0
1.00	711.4	18.7

TP- 4. RUN# 463. LOAD= 673. LBS. VEL.= 40. MPH ALPHA= 4. DEG

TIRE PRESSURE= 24. PSI

FILE 1119. B.F.GOODRICH SILVERTOWN 4/32M,O.E.-1 E78-14 WET JENNITE



TP- 4. RUN# 249. LOAD= [illegible] LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 24. PSI

SLIP	FX-LBS
0.00	0.0
0.02	77.5
0.04	143.7
0.06	195.1
0.08	237.5
0.10	272.5
0.12	299.6
0.14	319.9
0.16	334.9
0.18	345.3
0.20	349.9
0.25	346.8
0.30	336.0
0.35	322.1
0.40	308.8
0.45	297.1
0.50	286.6
0.55	276.0
0.60	265.4
0.65	256.8
0.70	250.9
0.75	245.6
0.80	239.5
0.85	233.0
0.90	224.3
0.95	213.8
1.00	200.9

VII. Mustang OE [illegible] /32 Inch Tread Depth

VII.A.1 Free-Rolling Measurements from the Flat Bed Tire Tester - 22 psi Inflation

a. Lateral Force vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	299	159	-22	-210	-333				
800	316	155	-20	-203	-356				
1100	282	132	-22	-172	-320				
1400	253	117	-12	-152	-285				

b. Aligning Moment vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
500	-24	-16	1	19	24				
800	-51	-30	2	36	54				
1100	-71	-38	3	43	75				
1400	-86	-45	3	53	92				

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°
500	-84	-58	-22	-10	25			
800	-94	-51	-20	3	41			
1100	-84	-45	-22	3	40			
1400	-82	-47	-12	4	41			

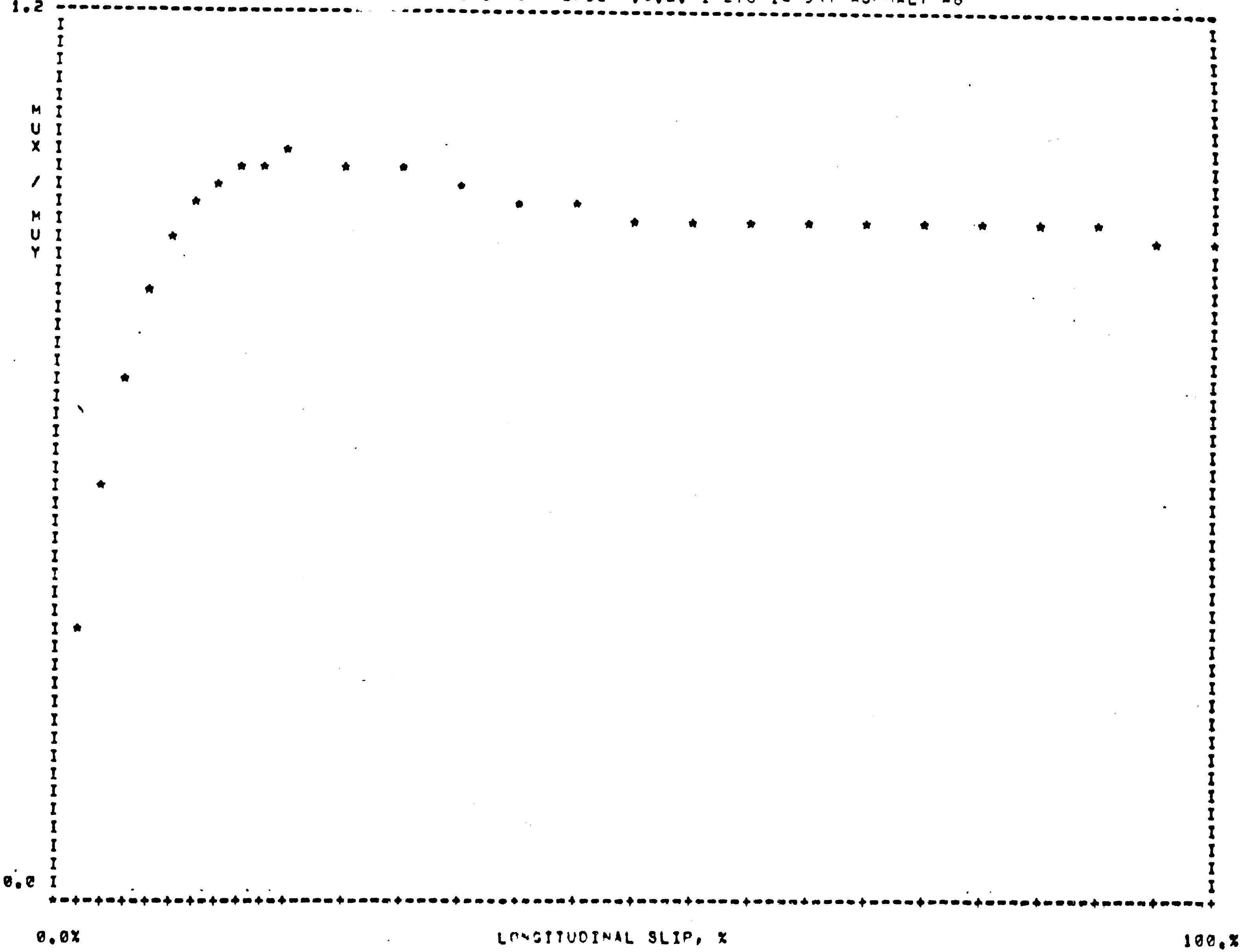
VII.A.2 Free-Rolling Lateral Force Mea[illegible]ments from Mobile Tire Tester - 24 psi Inflation

		Dry Asphalt						Wet Jennite				
Load	Speed	0°	1°	2°		8°	16°	0°	1°	3°	7°	15°
800	40 mph	38	203	363	5[illegible]	790	744	12	184	381	365	386
1100	40 mph	5		355	5[illegible]	915	982	- 8	156	404	486	467

VII.A.3 Braking Data from the Mobile Tire Tester - 24 psi, 40 mph

	0°		4°		0°			
	800 lbs.	1100 lbs.	800 lbs.	1100 lbs.	800 lbs.	1100 lbs.	800 lbs.	1100 lbs.
MBF	792	1058	755	1005	312	484	283	425
LWBF	700	926	736	956	205	287	218	289
MLF			546	582			295	327
LWLF			26	34			18	14

FILE 1275. B.F.GO[illegible] [illegible]H SILVERTOWN 2/32 M.C.E.-1 E78-14 DRY ASPHALT #8

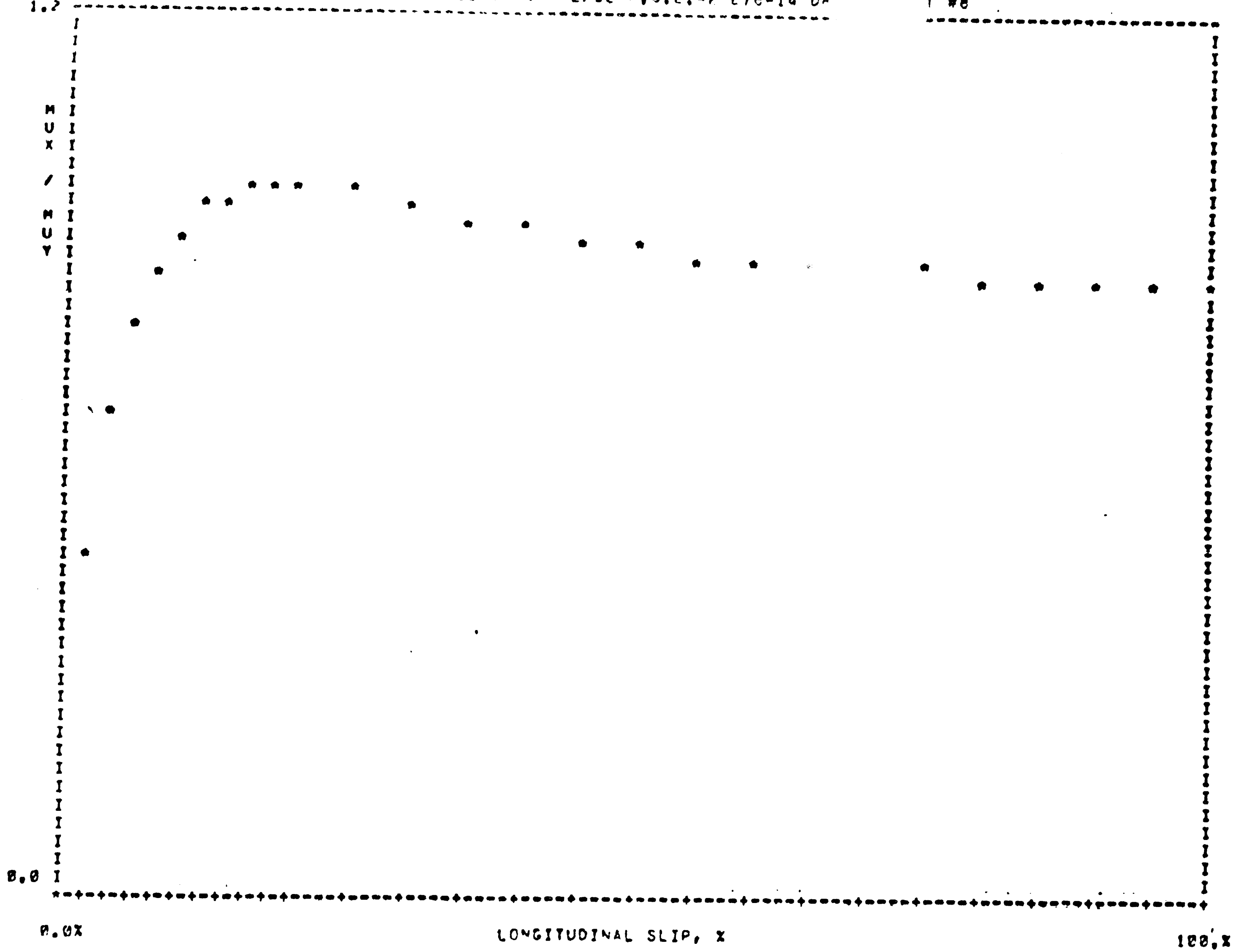


SLIP	FX-LBS
0.00	0.0
0.02	292.2
0.04	446.1
0.06	557.7
0.08	640.5
0.10	699.5
0.12	740.2
0.14	766.4
0.16	782.4
0.18	790.7
0.20	791.7
0.25	786.5
0.30	776.1
0.35	762.5
0.40	749.4
0.45	738.9
0.50	732.8
0.55	730.4
0.60	730.2
0.65	731.9
0.70	733.1
0.75	731.6
0.80	728.7
0.85	725.0
0.90	719.0
0.95	710.9
1.00	700.1

TP- 4. RUN# 419. LOAD= [illegible] LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 24. PSI

FILE 1283. B.F.GOODRICH SILVERTOWN 2/32 M.O.E.-2 E78-14 DF T #8

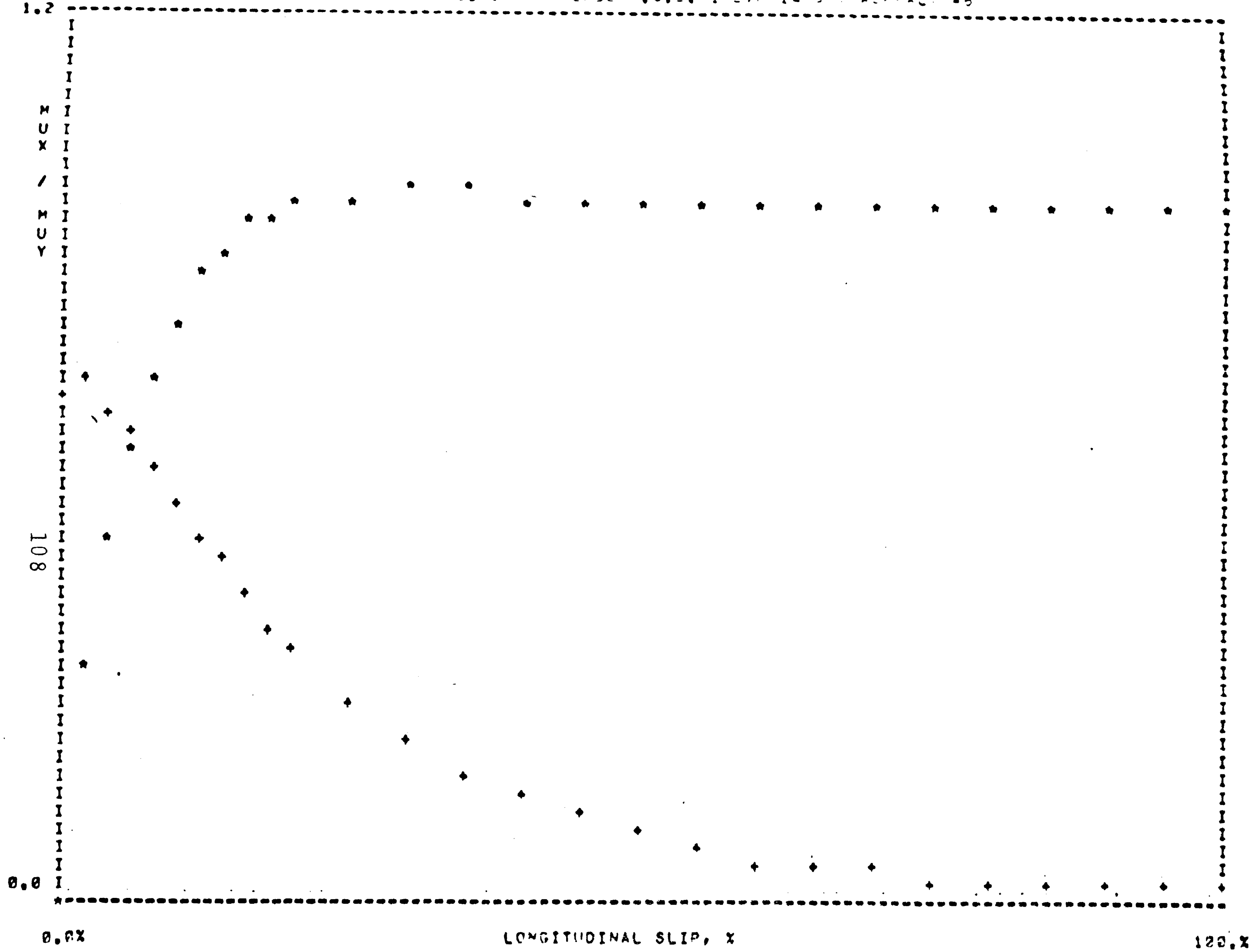


SLIP	FX-LBS
0.00	0.0
0.02	512.6
0.04	721.3
0.06	852.0
0.08	936.8
0.10	989.7
0.12	1021.8
0.14	1041.2
0.16	1052.5
0.18	1059.4
0.20	1058.3
0.25	1046.0
0.30	1029.0
0.35	1010.1
0.40	993.5
0.45	979.9
0.50	969.8
0.55	961.5
0.60	952.6
0.65	945.3
0.70	941.4
0.75	938.0
0.80	934.0
0.85	930.8
0.90	929.3
0.95	927.8
1.00	925.8

TP- 4. RUN# 427. LOAD= 1147. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 24. PSI

FILE 1276.   B.F.GOODRICH SILVERTOWN 2/32 M.O.E.=1 E78-14 DRY ASPHALT #5

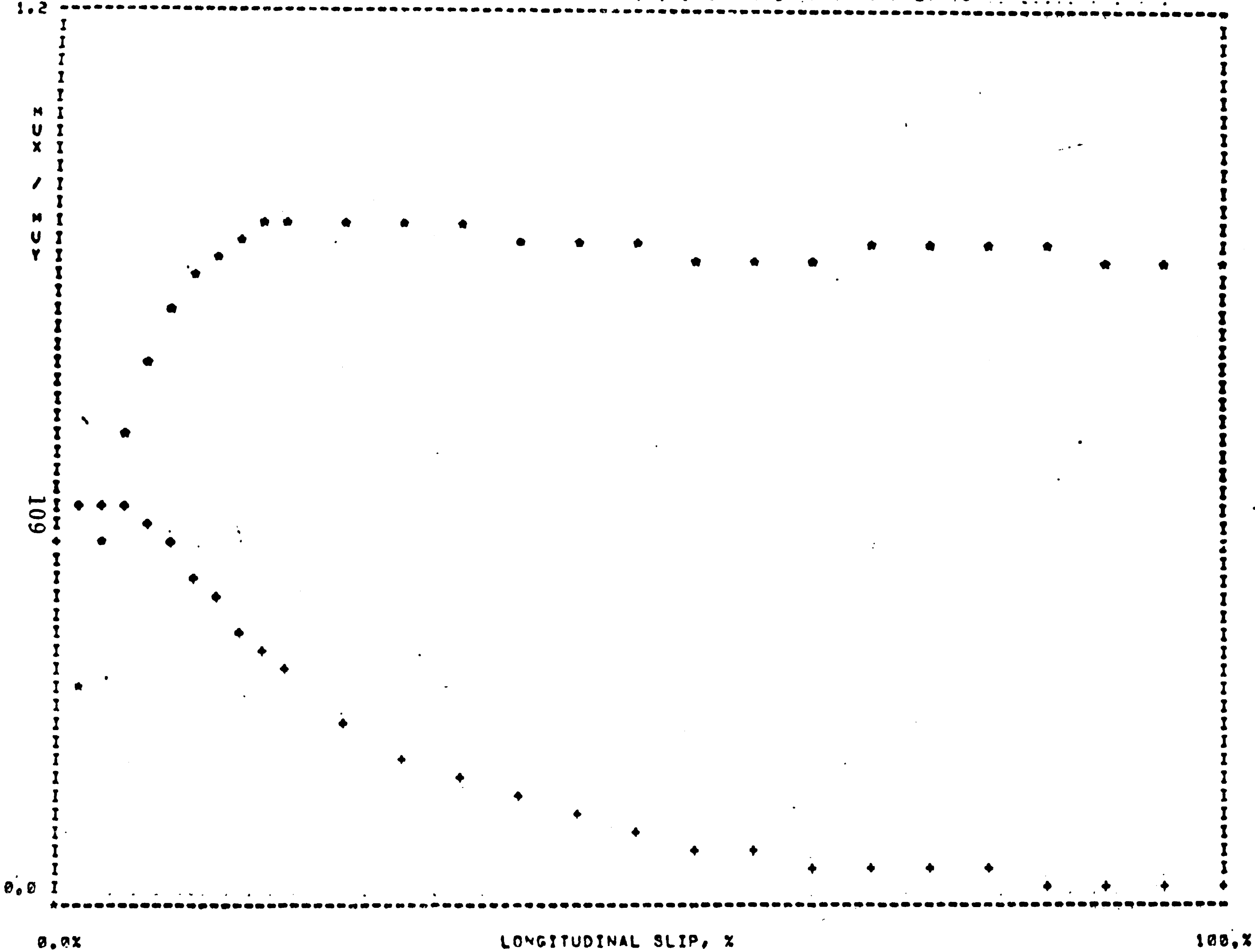


TP= 4.   RUN# 420.   LOAD= [illegible] LBS.   VEL.= 40. MPH   ALPHA= 4. DEG

TIRE PRESSURE= 24. PSI

SLIP	FX-LBS	FY-LBS
0.00	0.0	532.2
0.02	242.7	546.7
0.04	374.1	523.1
0.06	475.1	492.5
0.08	554.6	459.0
0.10	615.1	424.1
0.12	659.8	389.0
0.14	692.3	354.7
0.16	715.2	321.8
0.18	731.1	291.6
0.20	739.9	265.7
0.25	751.1	212.6
0.30	755.4	168.1
0.35	755.0	133.1
0.40	752.2	106.5
0.45	746.4	85.0
0.50	740.4	69.9
0.55	736.9	57.0
0.60	736.7	47.2
0.65	739.5	38.5
0.70	743.0	32.3
0.75	745.9	27.8
0.80	747.3	25.3
0.85	747.2	24.9
0.90	745.6	25.3
0.95	742.3	25.9
1.00	734.5	24.1

FILE 1284. B.F.GOODRICH SILVERTOWN 2/32 M.O.E.-2 E78-14 DRY ASPHALT #8

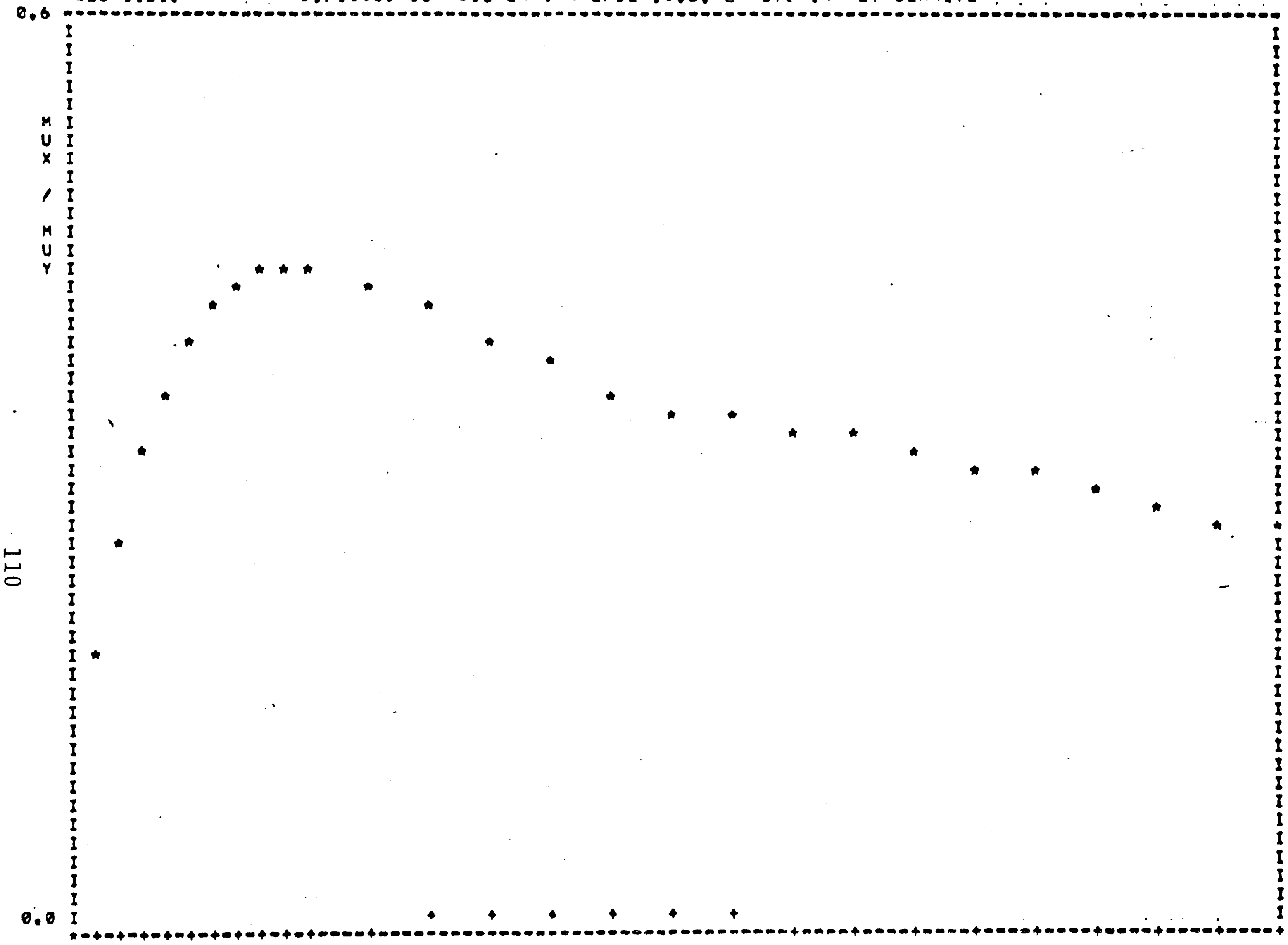


SLIP	FX-LBS	FY-LBS
0.00	0.0	539.3
0.02	320.9	577.3
0.04	524.9	581.6
0.06	683.7	569.7
0.08	800.6	546.2
0.10	879.6	515.2
0.12	930.7	479.6
0.14	962.0	442.0
0.16	983.1	404.5
0.18	995.6	367.7
0.20	1000.6	333.4
0.25	1005.1	269.7
0.30	1004.1	219.1
0.35	996.0	177.6
0.40	985.2	145.2
0.45	975.1	121.8
0.50	965.8	101.8
0.55	959.8	86.7
0.60	958.4	74.9
0.65	960.7	64.1
0.70	964.7	54.6
0.75	966.9	47.1
0.80	966.7	42.2
0.85	964.5	38.7
0.90	960.9	36.0
0.95	957.8	34.8
1.00	956.2	34.1

TP= 4. RUN# 428. LOAD= [illegible] LBS. VEL.= 40. MPH ALPHA= 4. DEG

TIRE PRESSURE= 24. PSI

FILE 1131.　　B.F.GOODRICH SILVERTOWN 2/32M.O.E.-2　E78-14 WET JENNITE

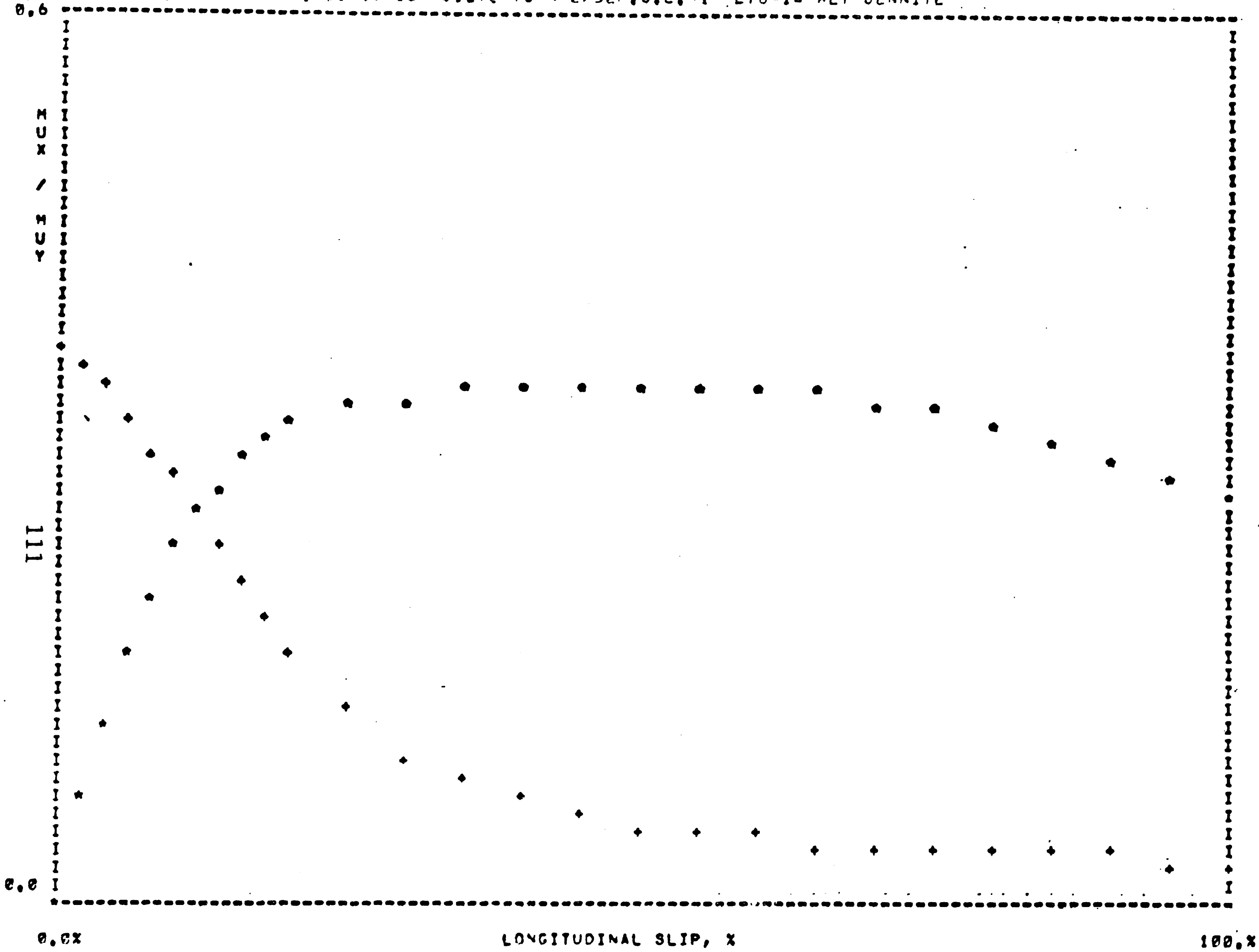


SLIP	FX-LBS
0.00	0.0
0.02	197.3
0.04	281.6
0.06	344.9
0.08	392.8
0.10	427.9
0.12	452.8
0.14	469.6
0.16	479.6
0.18	484.0
0.20	482.4
0.25	468.5
0.30	449.2
0.35	427.4
0.40	406.6
0.45	389.3
0.50	376.2
0.55	366.7
0.60	359.9
0.65	353.8
0.70	346.1
0.75	337.2
0.80	328.4
0.85	319.3
0.90	308.9
0.95	298.0
1.00	286.6

TP= 4.　　RUN# 264.　　LOAD= 1100. LBS.　　VEL.= 40. MPH　　ALPHA= 0. DEG

TIRE PRESSURE= 24. PSI

FILE 1125.   B.F.GOODRICH SILVERTOWN 2/32M.O.E.-1 E78-14 WET JENNITE

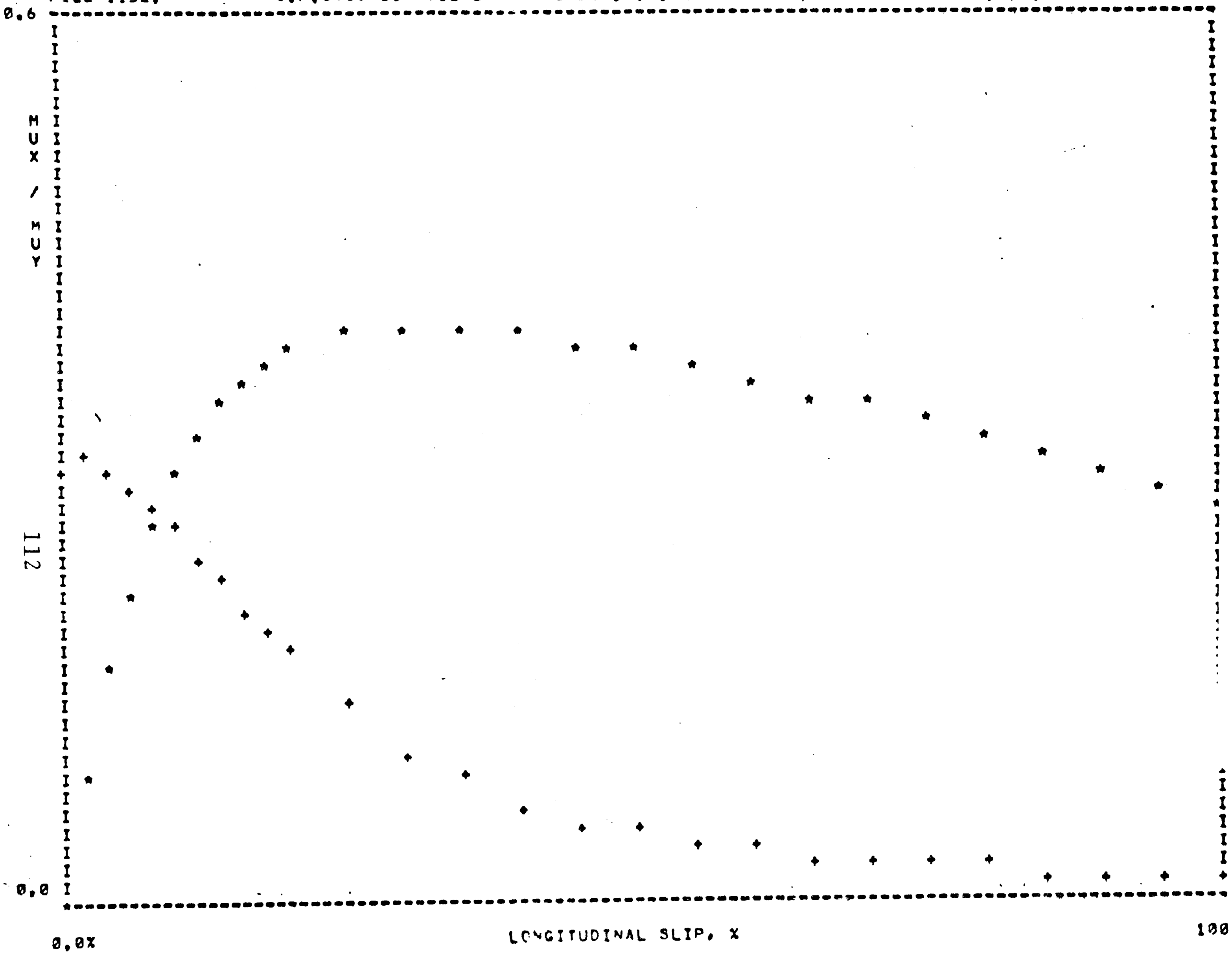


SLIP	FX-LBS	FY-LBS
0.00	0.0	295.4
0.02	54.5	287.8
0.04	99.9	277.0
0.06	135.1	262.2
0.08	164.9	245.2
0.10	189.5	226.9
0.12	209.6	208.3
0.14	226.1	189.7
0.16	239.4	171.2
0.18	249.8	153.5
0.20	257.0	137.4
0.25	268.0	100.8
0.30	274.0	81.8
0.35	276.5	65.5
0.40	278.0	55.6
0.45	280.9	48.3
0.50	283.7	42.7
0.55	283.3	38.8
0.60	280.4	35.9
0.65	277.9	33.3
0.70	275.0	31.9
0.75	268.4	32.1
0.80	259.6	33.0
0.85	251.5	32.1
0.90	242.0	28.5
0.95	231.0	23.9
1.00	218.3	18.2

TP= 4.   RUN# 258.   LOAD= [illegible] LBS.   VEL.= 40. MPH   ALPHA= 3. DEG

TIRE PRESSURE= 24. PSI

FILE 1132.   B.F.GOODRICH SILVER[illegible] 2/32M.O.E.-2 E78-14 WET JENNITE



SLIP	FX-LBS	FY-LBS
0.00	0.0	322.9
0.02	95.9	326.9
0.04	169.2	320.7
0.06	228.5	309.1
0.08	277.4	294.3
0.10	316.6	277.2
0.12	347.1	258.5
0.14	370.9	239.0
0.16	389.5	219.2
0.18	403.5	199.5
0.20	412.1	181.0
0.25	421.9	142.5
0.30	424.8	111.6
0.35	423.3	88.5
0.40	419.9	71.7
0.45	415.1	59.6
0.50	407.9	50.0
0.55	398.8	41.9
0.60	389.0	35.4
0.65	379.2	31.1
0.70	369.1	28.1
0.75	358.3	25.1
0.80	346.6	21.6
0.85	334.3	18.1
0.90	320.4	16.0
0.95	305.5	14.7
1.00	289.0	14.5

TP= 4.   RUN# 265.   LOAD= 11[illegible]. LBS.   VEL.= 40. MPH   ALPHA= 3. DEG

TIRE PRESSURE= 24. PSI

...e Champion Sup-R-Belt H78-14 (Buick OE)

VIII.A.1 Free-Rolling Measurements from the Flat Bed Tire Tester - 10 psi Inflation

a. Lateral Force vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
800	220	97	-13	-149	-254	-406	-564	-648	-704
1100	209	92	-13	-145	-249	-428	-652	-758	-885
1400	203	88	-12	-143	-249	-367	-578	-773	-1008
1700	179	84	-12	-143	-182	-270	-449	-670	-977

b. Aligning Moment vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
800	-45	-24	3	32	47	47	24	12	0
1100	-65	-33	4	45	72	91	74	48	12
1400	-83	-40	4	56	94	133	139	99	43
1700	-99	-48	5	66	112	167	203	157	60

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°
800	-69	-42	-13	-3	16	91	130	177
1100	-76	-46	-13	-3	23	101	146	198
1400	-85	-52	-12	0	30	118	163	235
1700	-90	-56	-12	3	37	130	182	258

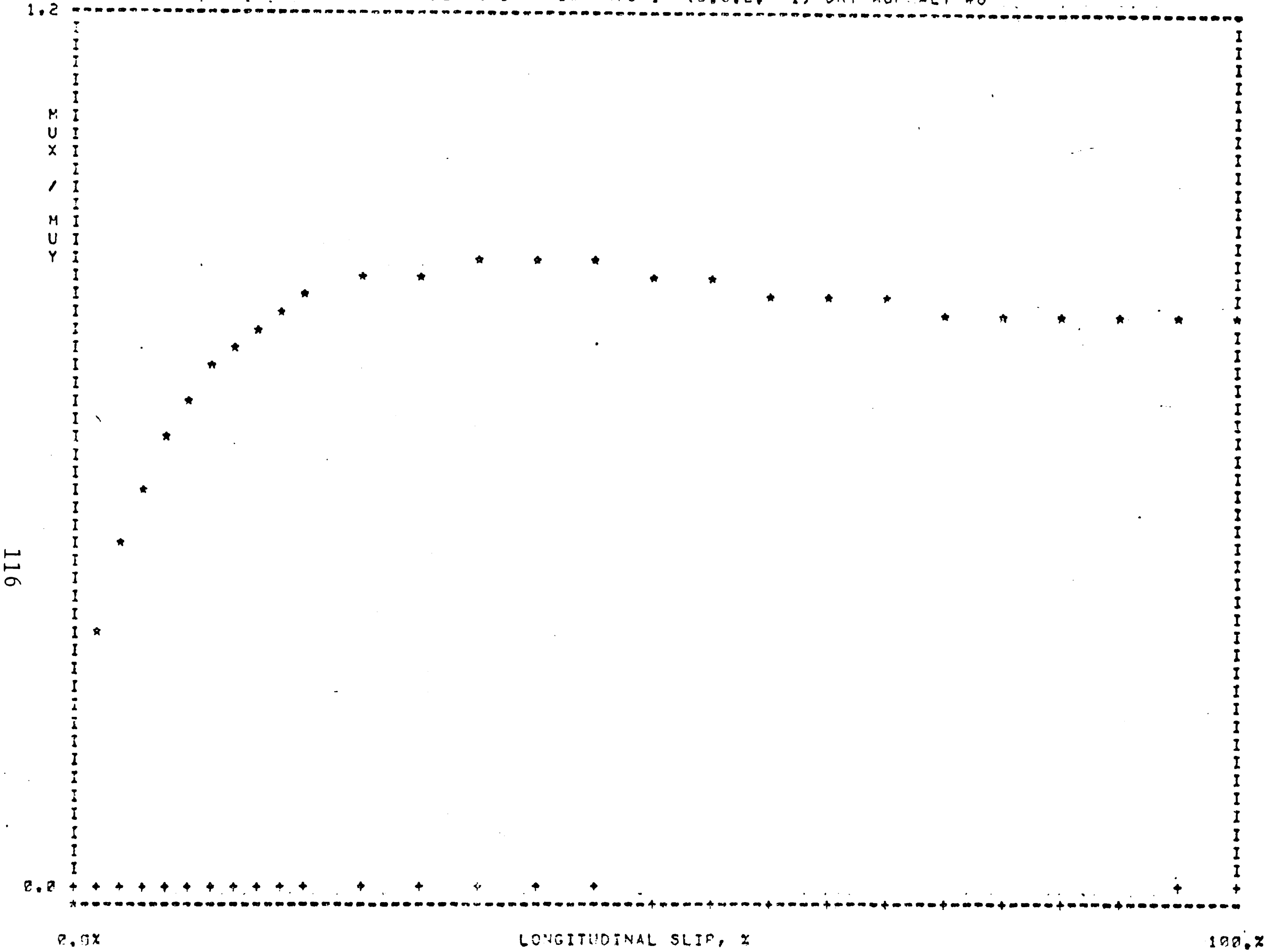
VIII.A.2 Free-Rolling Lateral Force Measurements from Mobile Tire Tester - 12 psi Inflation

		Dry Asphalt					Wet Jennite				
Load	Speed	0°	2°	4°	8°	16°	0°	1°	3°	7°	15°
800	40 mph	- 5	262	488	670	684/710	0	138	292	399	392
1100	20 mph						0	138	341	552	588
	40 mph	8	260	469	7[illegible]	821/859	8	145	345	496	478
	50 mph						5	145	353	539	506
1700	40 mph	15	209	318	53[illegible]	1012/1038	-8	128	300	482	700/700

VIII.A.3 Braking Data from the Mobile Tire Tester - 12 psi

	Dry Asphalt					Wet Jennite				
	0°				4°	0°				3°
	800 lbs.		1100 lbs.		1100 lbs.	800 lbs.		1100 lbs.		1100 lbs.
	20 mph	40 mph	20 mph	40 mph	40 mph	20 mph	40 mph	20 mph	40 mph	40 mph
MBF		730	959	974	992		403	554	517	444
LWBF		708	878	850	951		230	344	296	275
MLF					503					366
LWLF					88					18

FILE 594.   FIRESTONE DELUXE CHAMPION H78-14 (B.C.E.- 1) DRY ASPHALT #8

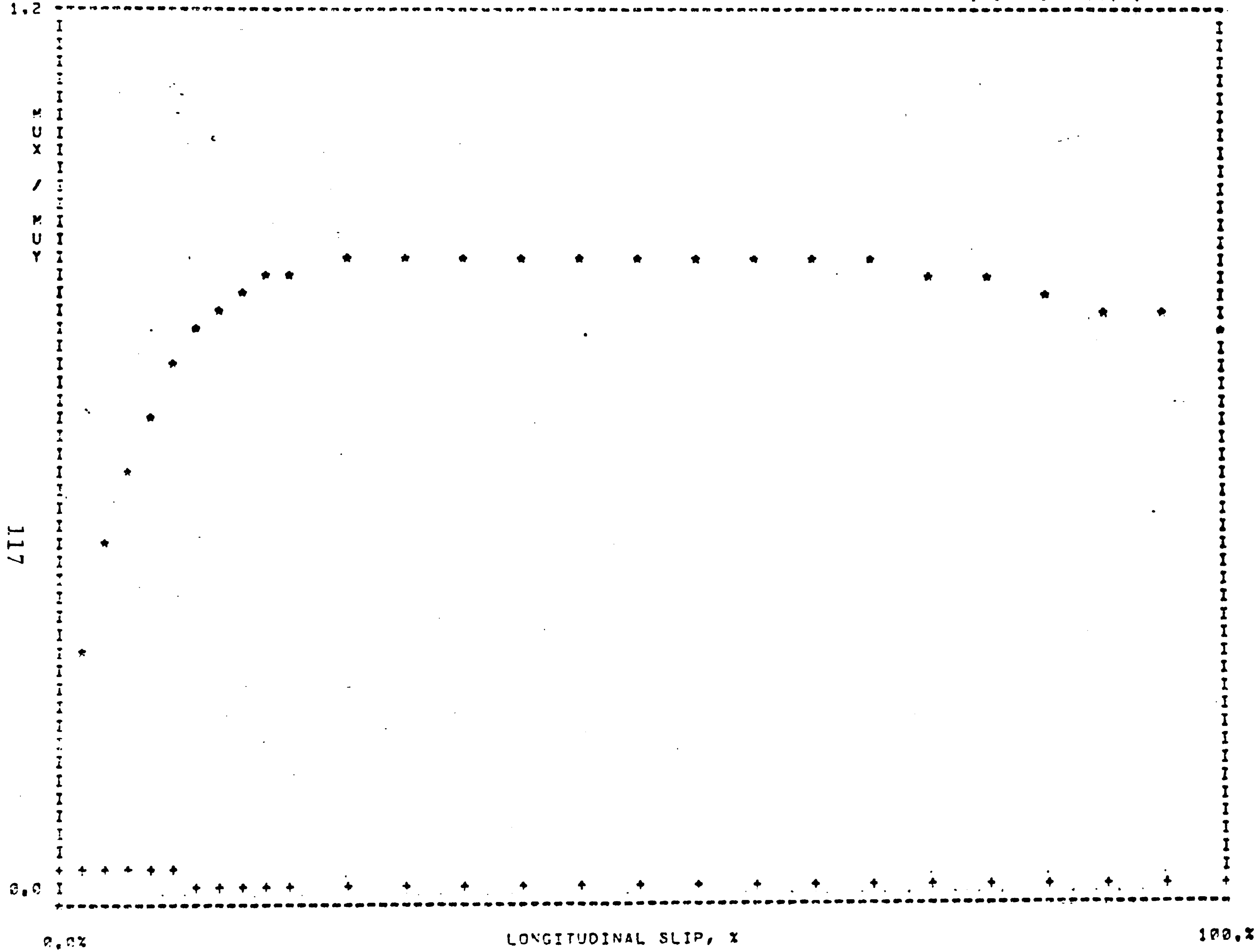


TP- 3.   RUN# 65.   LOAD= 1100. LBS.   VEL.= 20. MPH   ALPHA= 0. DEG

TIRE PRESSURE= 12. PSI

SLIP	FX-LBS
0.00	0.0
0.02	391.5
0.04	532.7
0.06	631.4
0.08	706.6
0.10	764.1
0.12	807.9
0.14	842.4
0.16	870.3
0.18	893.0
0.20	909.3
0.25	934.5
0.30	949.7
0.35	957.3
0.40	959.0
0.45	955.8
0.50	948.4
0.55	938.5
0.60	928.1
0.65	917.7
0.70	908.1
0.75	899.8
0.80	893.1
0.85	888.5
0.90	885.6
0.95	882.3
1.00	878.0

FILE 593. FIRESTONE DELUXE CHAMPION H78-14 (B.O.E.- 1) DRY ASPHALT #8

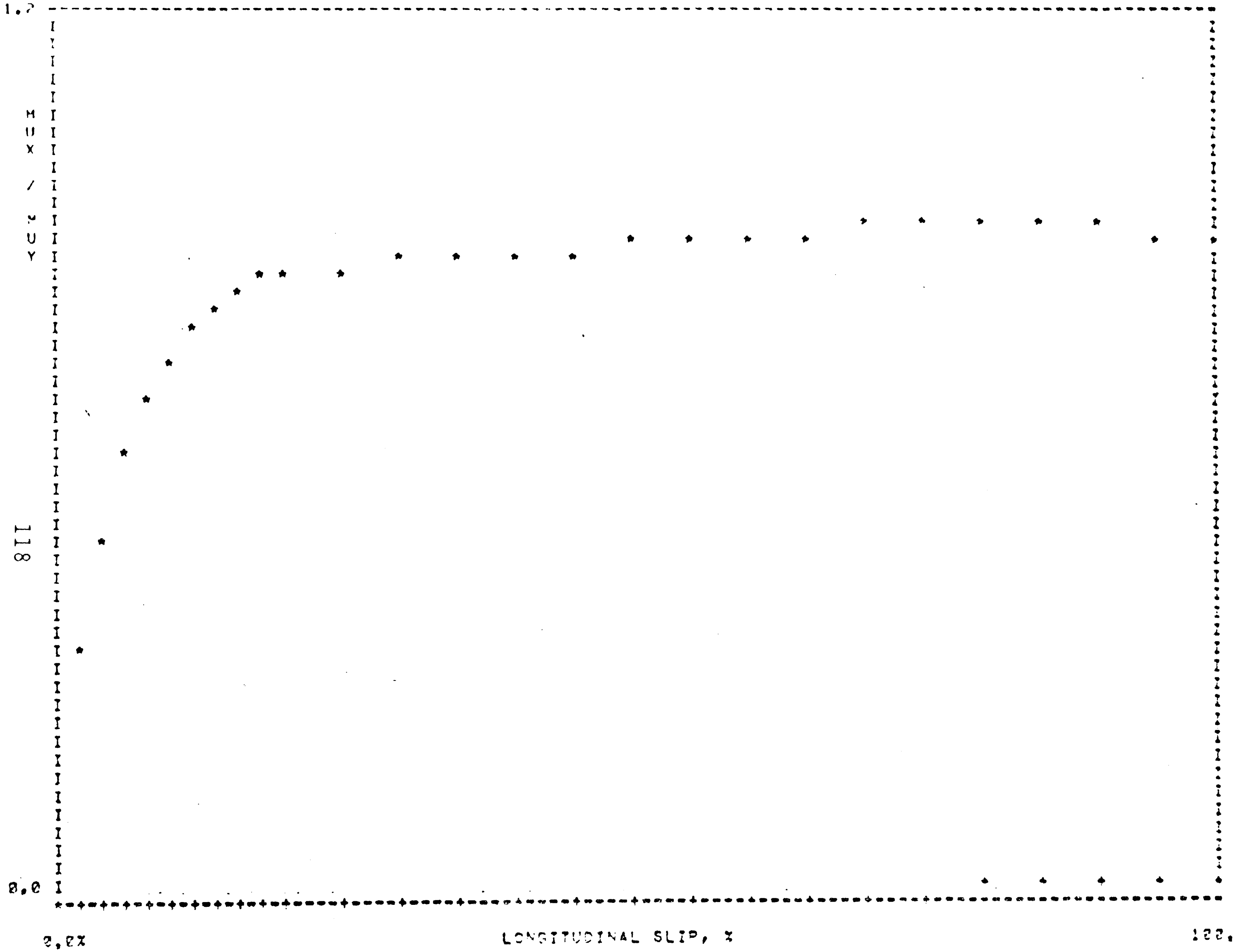


SLIP	FX-LBS
0.00	0.0
0.02	366.9
0.04	529.3
0.06	646.9
0.08	735.5
0.10	801.7
0.12	859.2
0.14	885.4
0.16	911.0
0.18	929.8
0.20	941.8
0.25	959.4
0.30	969.2
0.35	973.2
0.40	974.4
0.45	973.7
0.50	971.4
0.55	968.7
0.60	966.5
0.65	963.6
0.70	957.8
0.75	948.6
0.80	936.4
0.85	921.0
0.90	901.4
0.95	878.2
1.00	850.4

TP- 3. RUN# 64. LOAD= 1100. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 12. PSI

FILE 596.   FIRESTONE DELUXE CHAMPION H78-14 (B,S,E,- 1) DRY ASPHALT #8

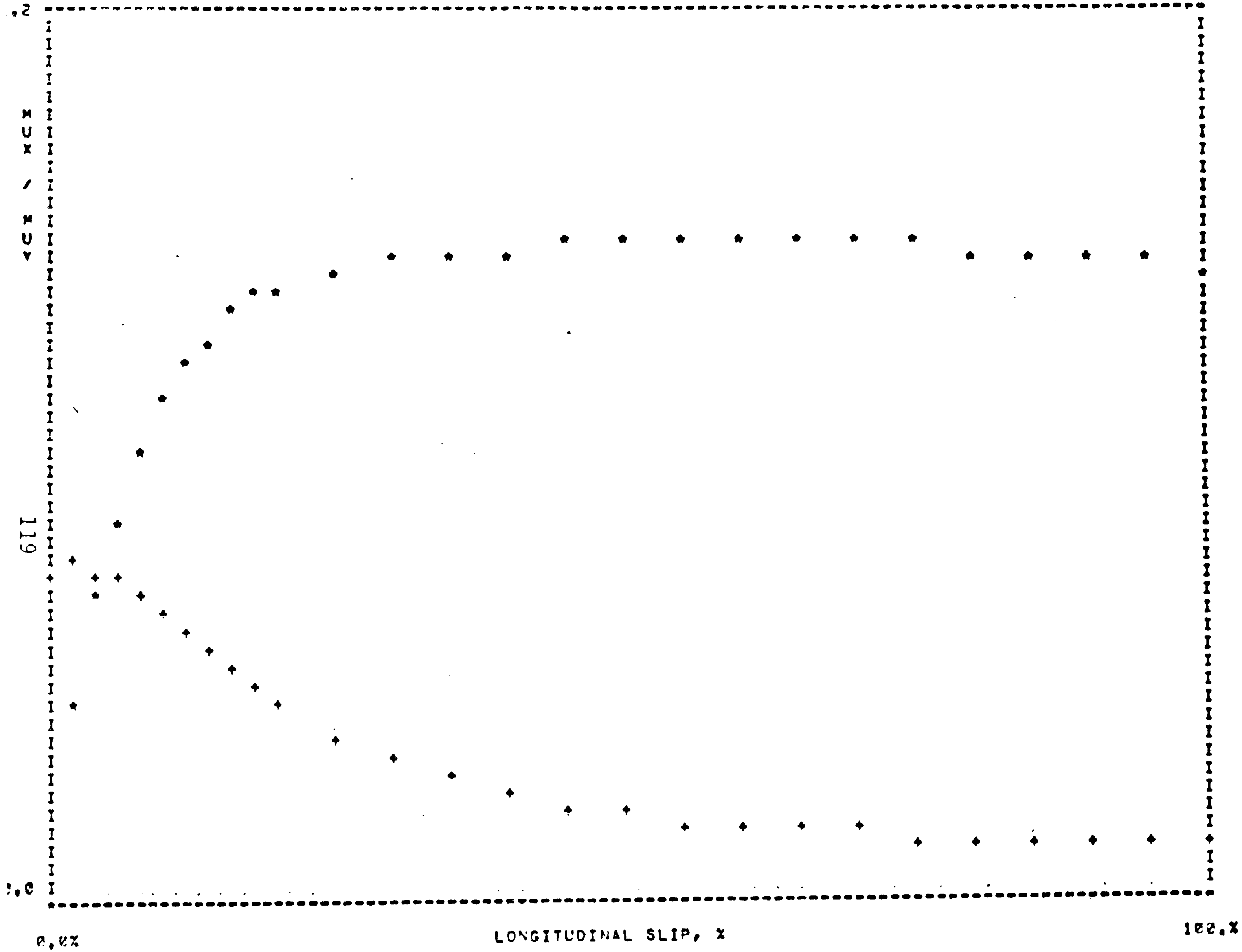


SLIP	FX-LBS
0.00	0.0
0.02	274.9
0.04	393.2
0.06	473.9
0.08	541.8
0.10	586.7
0.12	617.2
0.14	639.1
0.16	655.2
0.18	666.4
0.20	673.1
0.25	682.1
0.30	687.6
0.35	692.4
0.40	698.2
0.45	704.1
0.50	709.2
0.55	713.8
0.60	718.9
0.65	723.5
0.70	724.4
0.75	728.2
0.80	729.4
0.85	727.6
0.90	726.5
0.95	719.7
1.00	[illegible]

TP- 3.   RUN# 67.   LOAD= [illegible] LBS.   VEL.= 40. MPH   ALPHA= 0. DEG

TIRE PRESSURE= 12. PSI

FILE 335. FIRESTONE DELUXE CHAMPION H78-14 (B.O.E.- 1) DRY ASPHALT #8

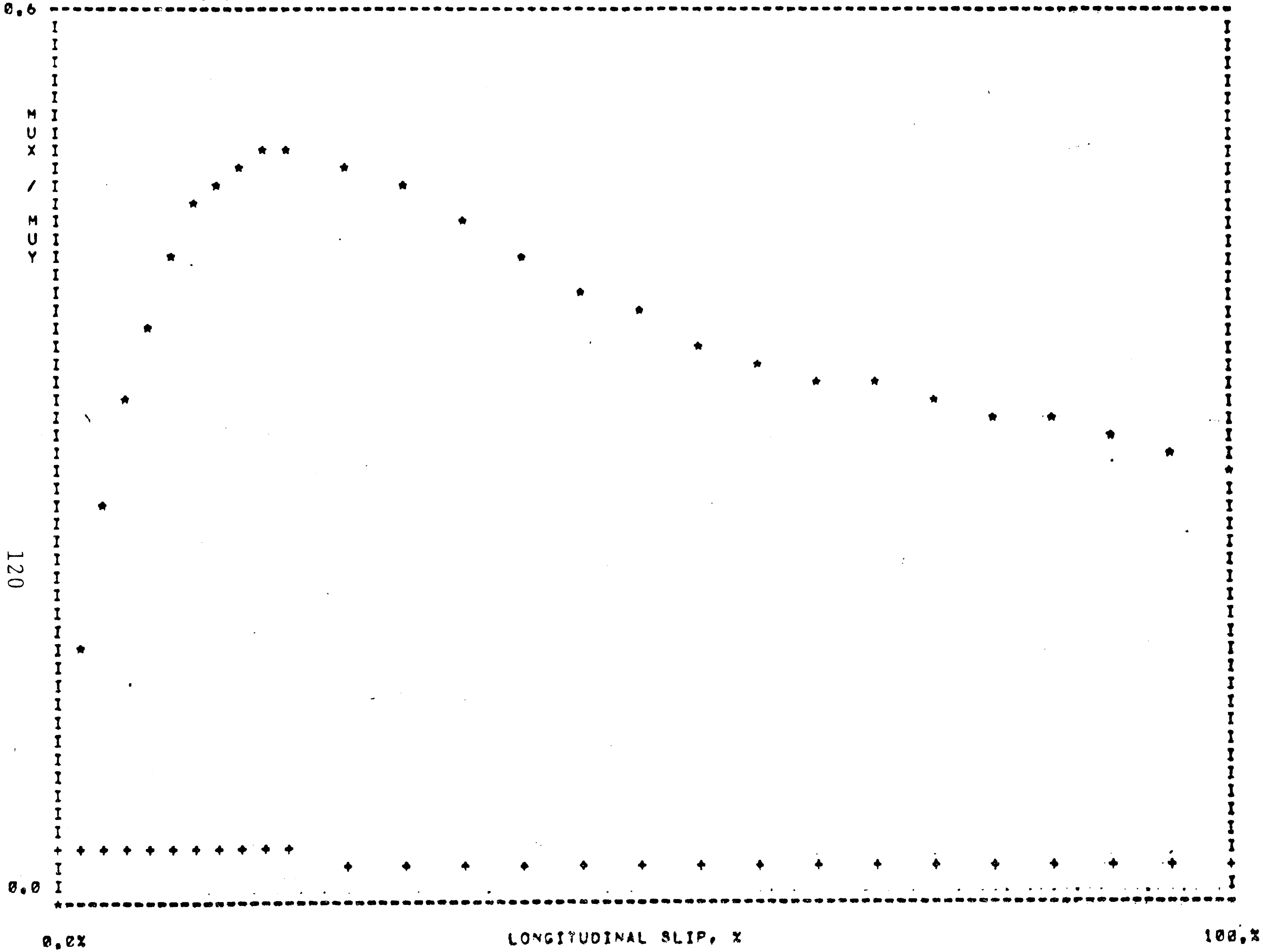


SLIP	FX-LBS	FY-LBS
0.00	0.0	485.8
0.02	295.6	502.7
0.04	452.9	491.0
0.06	573.1	471.1
0.08	667.3	447.2
0.10	740.3	421.0
0.12	796.7	394.1
0.14	842.4	367.4
0.16	874.2	341.6
0.18	899.8	317.6
0.20	915.9	296.3
0.25	941.5	252.4
0.30	959.3	215.8
0.35	972.8	185.4
0.40	979.2	161.8
0.45	984.4	143.9
0.50	987.2	132.2
0.55	989.1	119.6
0.60	992.8	111.0
0.65	991.8	103.2
0.70	990.1	96.0
0.75	985.3	92.1
0.80	978.4	84.9
0.85	970.7	81.3
0.90	962.8	80.6
0.95	955.9	82.5
1.00	952.8	87.9

TP= 3. RUN# 66. LOAD= 1122. LBS. VEL.= 40. MPH ALPHA= 4. DEG

TIRE PRESSURE= 12. PSI

FILE 970. FIRESTONE DELUXE CHAMPION (B.O.E.-11) H78-14 WET JENNITE

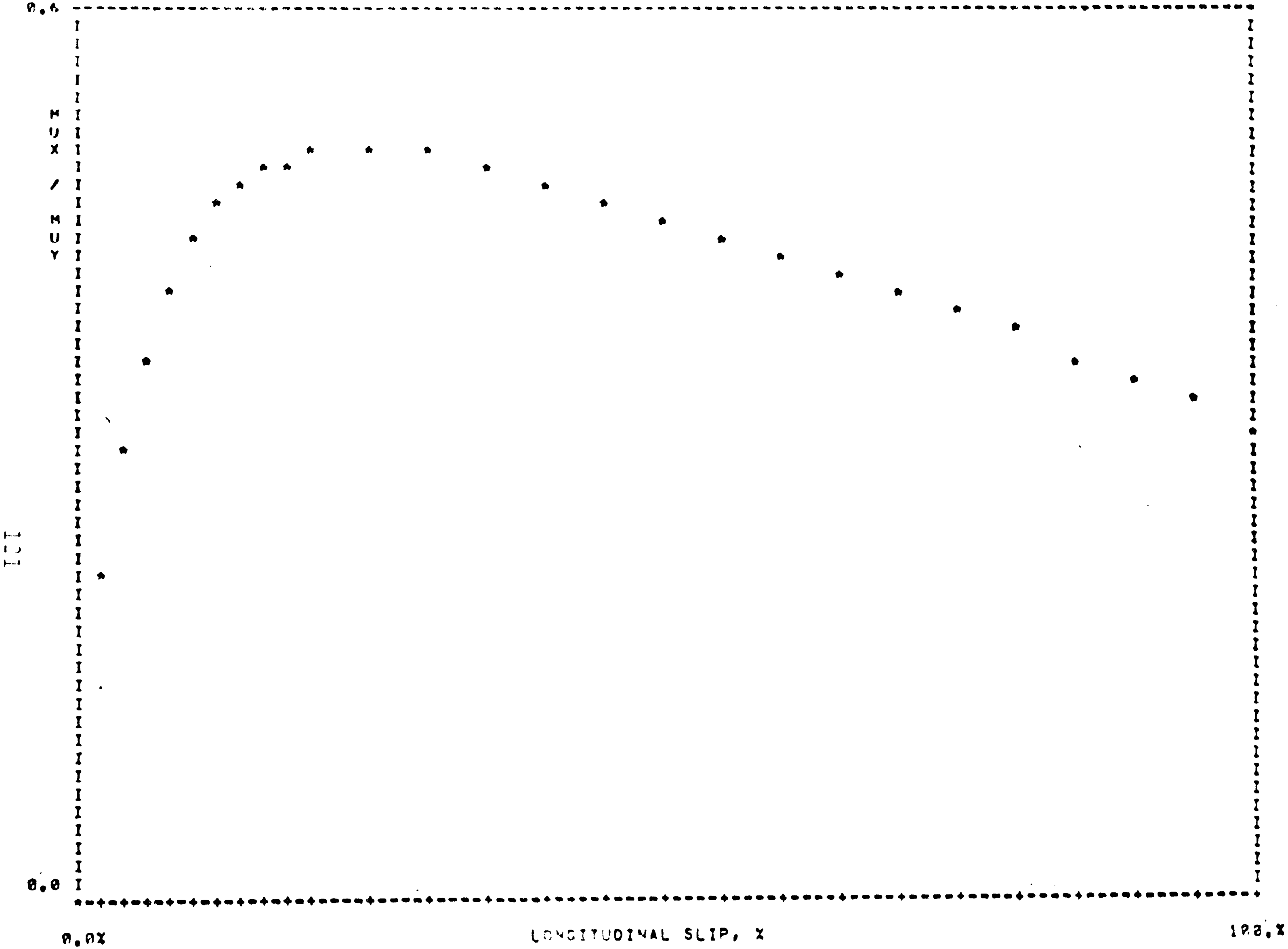


TP- 4. RUN# 66. LOAD= 823. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 12. PSI

SLIP	FX-LBS
0.00	0.0
0.02	134.1
0.04	209.2
0.06	265.8
0.08	310.8
0.10	345.3
0.12	370.3
0.14	387.2
0.16	397.6
0.18	402.7
0.20	402.4
0.25	393.9
0.30	381.0
0.35	364.1
0.40	345.5
0.45	327.8
0.50	313.1
0.55	301.7
0.60	292.0
0.65	283.2
0.70	275.4
0.75	269.0
0.80	263.6
0.85	257.8
0.90	250.0
0.95	240.7
1.00	229.7

FILE 946. FIRESTONE DELUXE CHAMPION (B.O.E.-B) H78-14 WET JENNITE

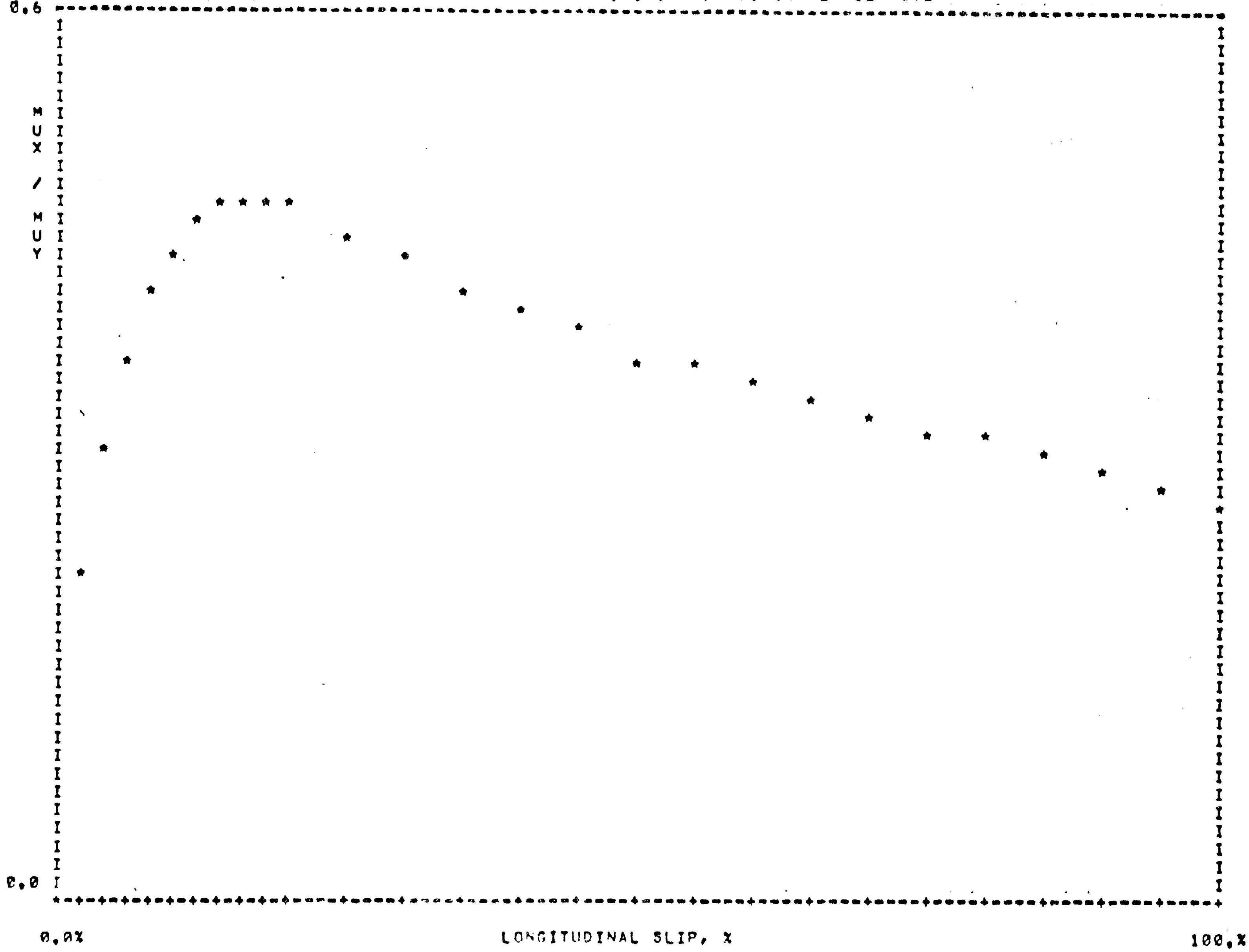


SLIP	FX-LBS
0.00	0.0
0.02	244.4
0.04	337.2
0.06	403.2
0.08	452.0
0.10	487.2
0.12	511.5
0.14	528.2
0.16	539.9
0.18	548.4
0.20	552.3
0.25	553.6
0.30	557.2
0.35	541.7
0.40	529.3
0.45	514.1
0.50	498.2
0.55	483.3
0.60	472.4
0.65	458.8
0.70	446.9
0.75	433.7
0.80	419.1
0.85	403.2
0.90	384.9
0.95	365.2
1.00	343.9

TP- 4. RUN# 42. LOAD= 1100. LBS. VEL.= 22. MPH ALPHA= 0. DEG

TIRE PRESSURE= 12. PSI

FILE 947. FIRESTONE DELUXE CHAMPION (B.O.E.=8) H78-14 WET JENNITE

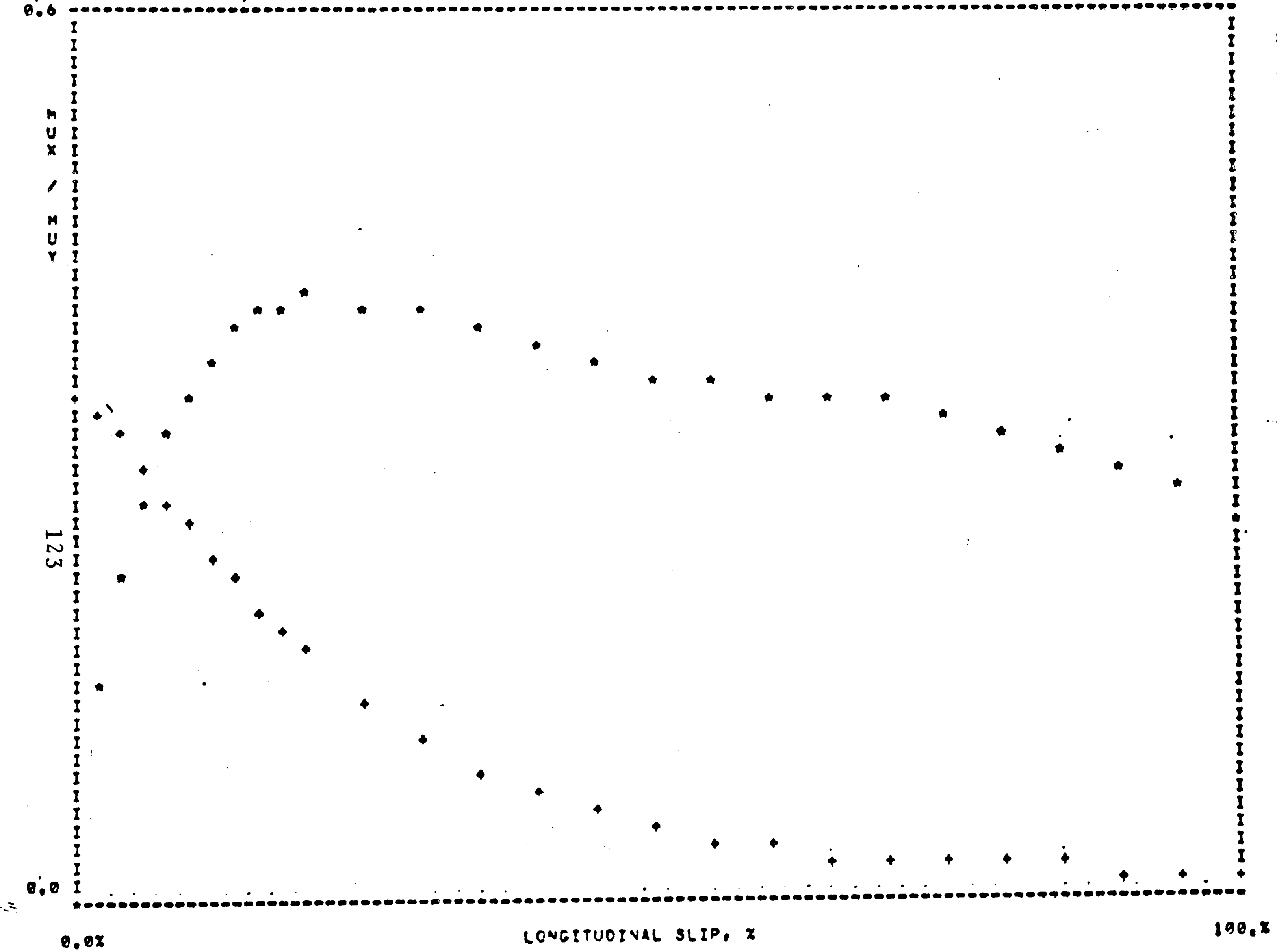


SLIP	FX-LBS
0.00	0.0
0.02	233.1
0.04	331.5
0.06	400.7
0.08	449.1
0.10	481.3
0.12	501.2
0.14	512.4
0.16	517.2
0.18	517.4
0.20	513.0
0.25	494.9
0.30	474.4
0.35	453.4
0.40	433.8
0.45	417.0
0.50	403.2
0.55	390.6
0.60	378.0
0.65	365.8
0.70	354.7
0.75	345.4
0.80	337.7
0.85	330.1
0.90	320.4
0.95	309.2
1.00	296.2

TP= 4. RUN# 43. LOAD= 1100. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 12. PSI

FILE 948. FIRESTONE DELUXE CHAMPION (B.O.E.-8) H78-14 WET JENNITE



SLIP	FX-LBS	FY-LBS
0.00	0.0	365.7
0.02	156.7	361.0
0.04	232.6	341.0
0.06	291.6	318.7
0.08	339.1	296.4
0.10	375.9	274.6
0.12	402.9	253.5
0.14	421.8	233.2
0.16	434.7	213.7
0.18	442.3	195.4
0.20	444.2	179.2
0.25	441.0	145.1
0.30	432.8	116.8
0.35	420.7	94.4
0.40	407.6	76.7
0.45	396.0	62.6
0.50	387.1	51.5
0.55	380.3	42.9
0.60	375.7	36.1
0.65	372.1	30.6
0.70	367.8	27.[illegible]
0.75	360.9	25.[illegible]
0.80	350.7	24.2
0.85	336.8	21.[illegible]
0.90	319.0	19.[illegible]
0.95	298.6	17.[illegible]
1.00	274.7	17.[illegible]

TP- 4. RUN# 44. LOAD= 1100. LBS. VEL.= 40. MPH ALPHA= 4. DEG

TIRE PRESSURE= 12. PSI

VIII.B.1 Free-Rolling Measurements from the Flat Bed Tire Tester - 18 psi Inflation

a. Lateral Force vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
800	277	134	-30	-193	-319	-463	-606	-638	-674
1100	287	134	-29	-191	-332	-531	-764	-842	-918
1400	278	126	-29	-184	-326	-552	-876	-1017	-1136
1700	270	120	-30	-180	-318	-547	-884	-1103	-1281

b. Aligning Moment vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
800	-32	-18		25	32	30	12	2	- 2
1100	-56	-30		40	58	64	39	16	2
1400	-76	-39		52	82	104	77	44	13
1700	-93	-46		64	103	141	131	89	27

c. Lateral Force vs. Inclination Angle and Load

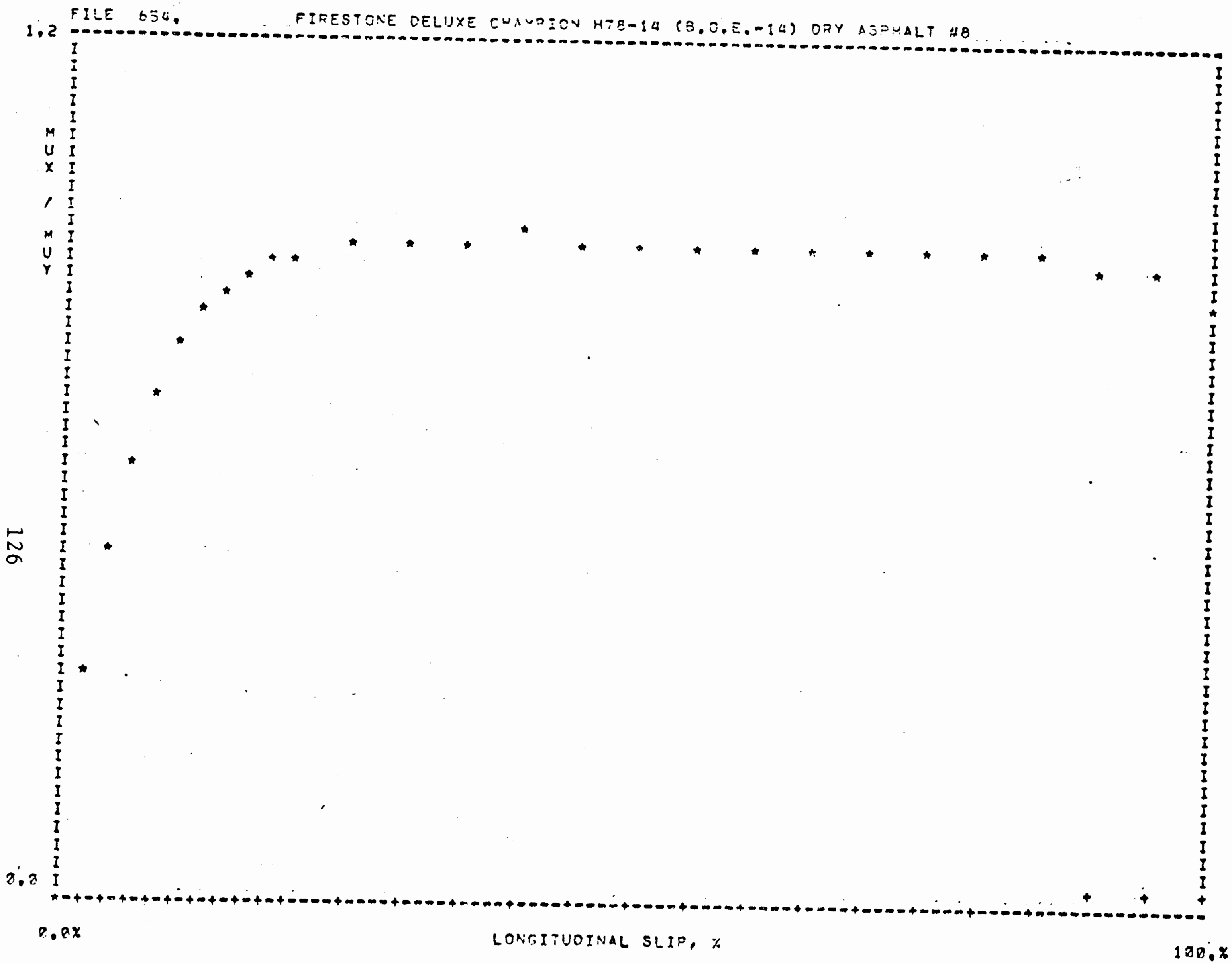
Load	-2°	-1°	0°	1°	2°	4°	6°	8°
800	- 92	-58	-30	-3	16	110	151	189
1100	- 93	-59	-29	-3	21	120	175	230
1400	- 97	-60	-29	-3	26	127	184	248
1700	-102	-64	-30	-3	32	137	198	254

VIII.B.2 Free-Rolling Lateral Force Measurements from Mobile Tire Tester - 20 psi Inflation

		Dry Asphalt					Wet Jennite				
Load	Speed	0°	2°	4°	8°	16°	0°	1°	3°	7°	15°
800	40 mph	-18	323	499	662	641/679	-8	130	361	437	395/[illegible]
1100	20 mph	-10	329	596	906	1027	-3	197	428	571	57[illegible]
	40 mph	-10	343	635	900	864/979	8	186	408	515	53[illegible]
	50 mph						8	184	440	536	548
1700	40 mph	0	302	559	1000	1188/1312					
		Wet Jennite									
1700	40	0	334	568	758	779/738					

VIII.B.3 Braking Data from the Mobile Tire Tester - 20 psi

	Dry Asphalt					Wet Jennite				
	0°				4°	0°				3°
	800 lbs.		1100 lbs.		1100 lbs.	800 lbs.		1100 lbs.		1100 lbs
	20 mph	40 mph	20 mph	40 mph	40 mph	20 mph	40 mph	20 mph	40 mph	40 mph
MBF		737	1005	984	974		375	575	517	508
LWBF		678	864	882	904		252	380	334	334
MLF					554					367
LWLF					93					32

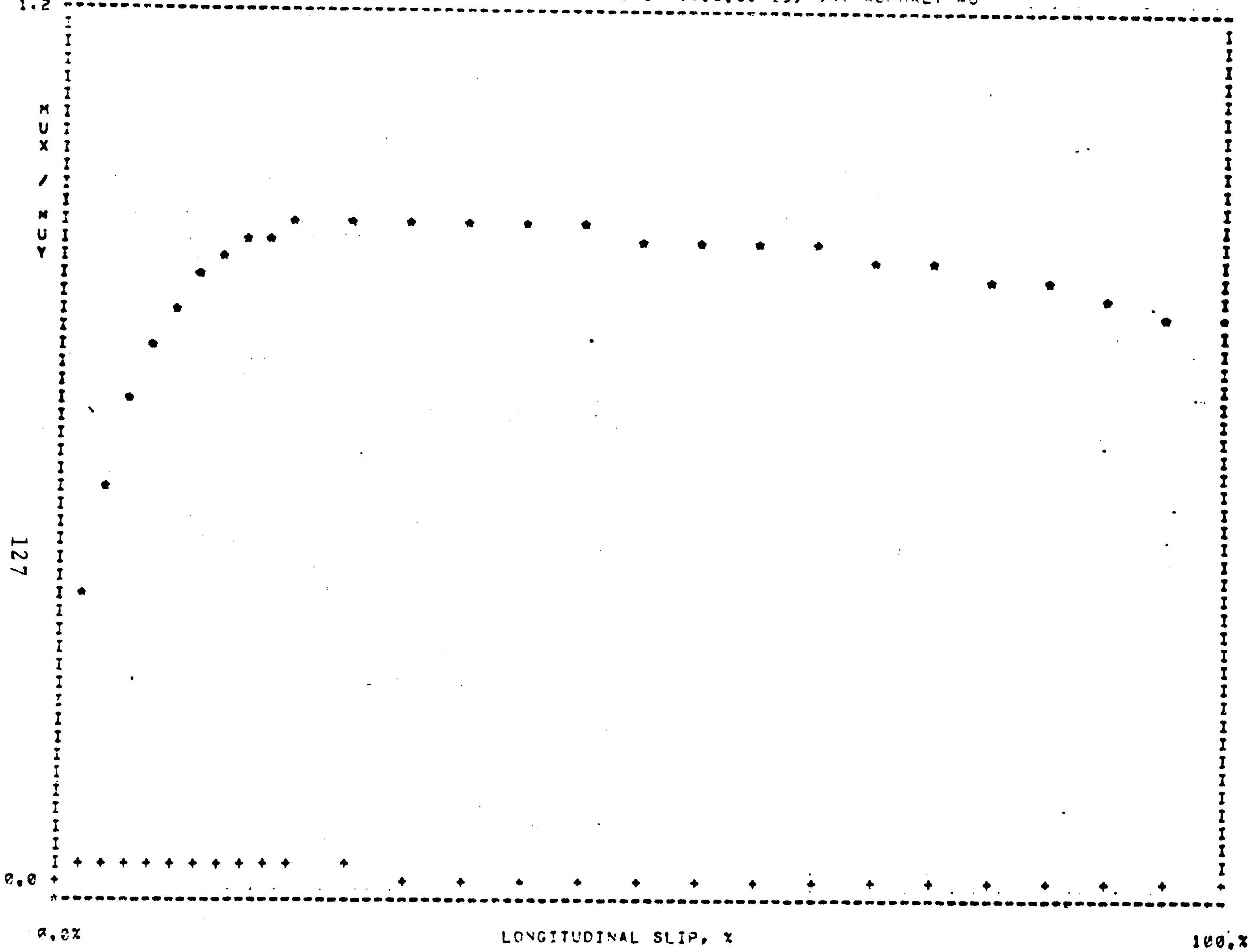


TP= 3. RUN# 134. LOAD= 800. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 20. PSI

SLIP	FX-LBS
0.00	0.0
0.02	253.5
0.04	387.6
0.06	483.7
0.08	554.9
0.10	606.7
0.12	644.1
0.14	671.2
0.16	691.7
0.18	706.8
0.20	715.1
0.25	725.0
0.30	730.9
0.35	735.1
0.40	736.7
0.45	734.6
0.50	731.5
0.55	730.2
0.60	730.3
0.65	730.9
0.70	731.8
0.75	732.0
0.80	730.0
0.85	723.9
0.90	712.8
0.95	697.8
1.00	677.6

FILE 703. FIRESTONE DELUXE CHAMPION H78-14 (B.O.E.-15) DRY ASPHALT #8

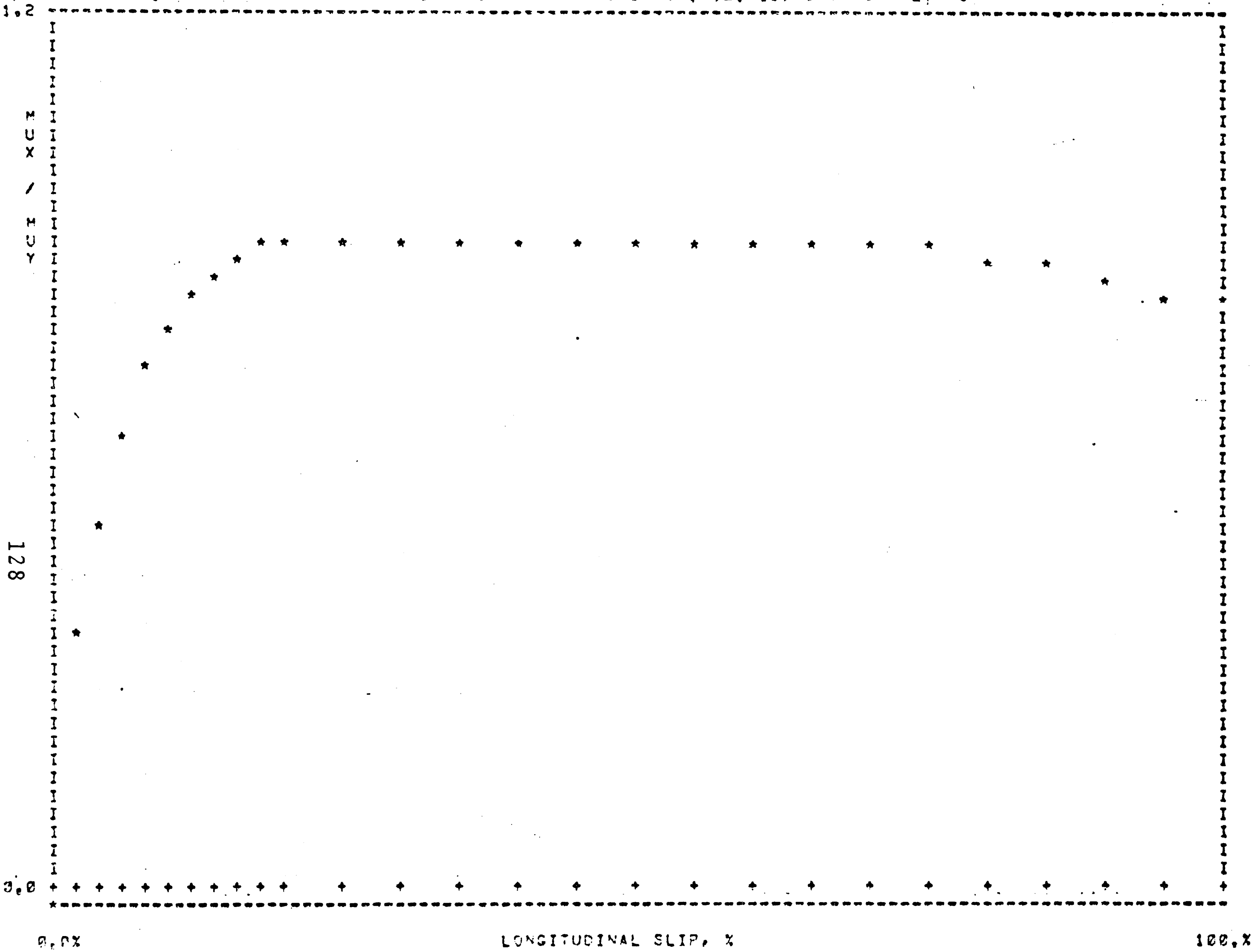


TP- 3. RUN# 186. LOAD= 1100. LBS. VEL.= 20. MPH ALPHA= 0. DEG

TIRE PRESSURE= 20. PSI

SLIP	FX-LBS
0.00	0.0
0.02	443.0
0.04	614.7
0.06	734.5
0.08	819.9
0.10	879.7
0.12	928.4
0.14	948.8
0.16	967.8
0.18	982.2
0.20	987.3
0.25	998.9
0.30	1004.8
0.35	1004.5
0.40	1000.7
0.45	994.5
0.50	986.0
0.55	977.2
0.60	969.8
0.65	962.5
0.70	952.7
0.75	939.8
0.80	925.0
0.85	909.4
0.90	894.1
0.95	878.9
1.00	863.7

FILE 734. FIRESTONE DELUXE CHAMPION H78-14 (B,O,E,-15) DRY ASPHALT #8

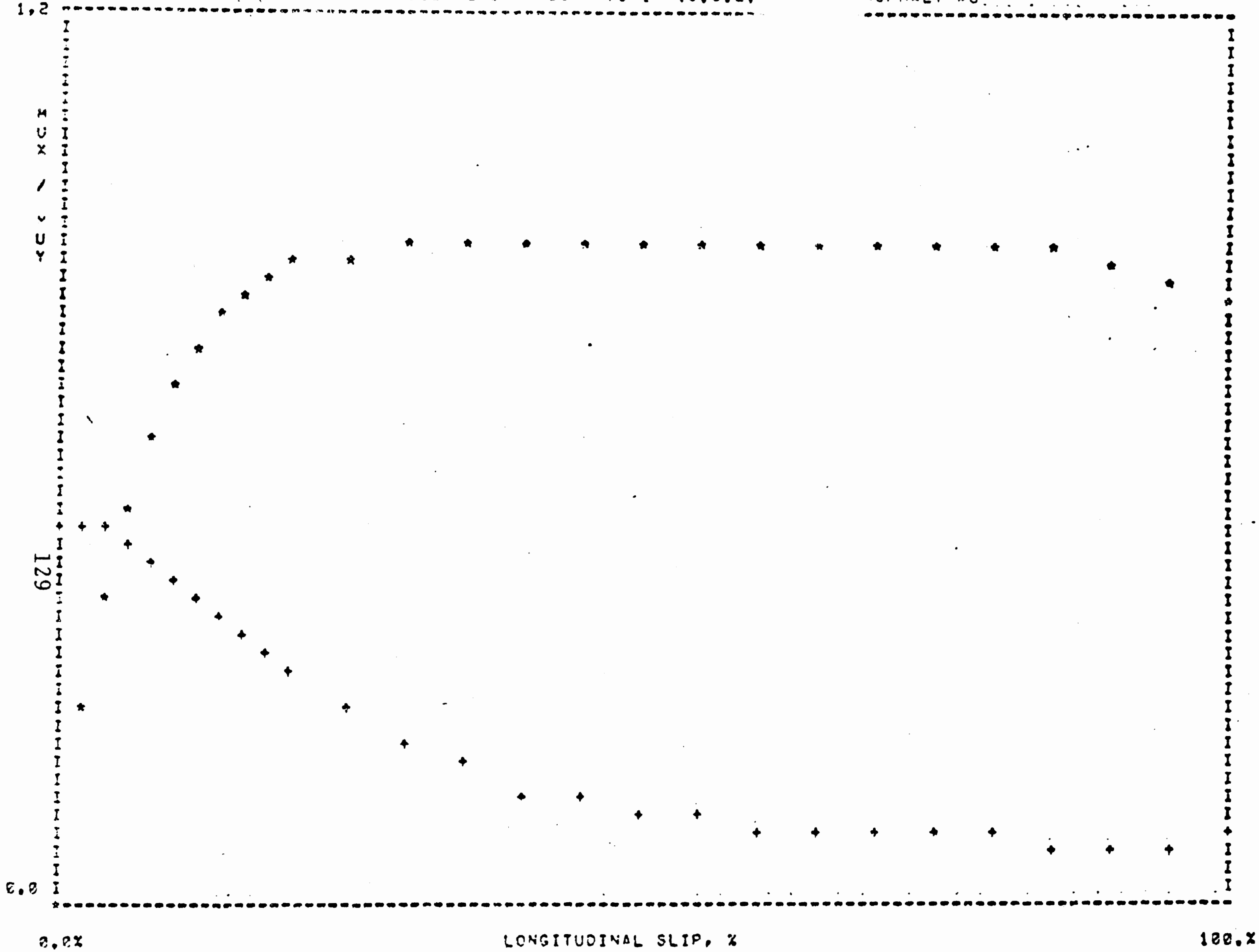


TP- 3. RUN# 187. LOAD= 1100. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 20. PSI

SLIP	FX-LBS
0.00	0.0
0.02	395.2
0.04	565.2
0.06	687.7
0.08	777.9
0.10	843.2
0.12	889.0
0.14	921.4
0.16	944.6
0.18	961.2
0.20	970.5
0.25	980.2
0.30	983.5
0.35	982.5
0.40	977.8
0.45	972.0
0.50	967.7
0.55	965.2
0.60	964.9
0.65	965.8
0.70	965.3
0.75	962.5
0.80	956.3
0.85	945.4
0.90	928.3
0.95	907.3
1.00	881.7

FILE 785. FIRESTONE DELUXE CHAMPION H78-14 (B.C.E. ASPHALT #8

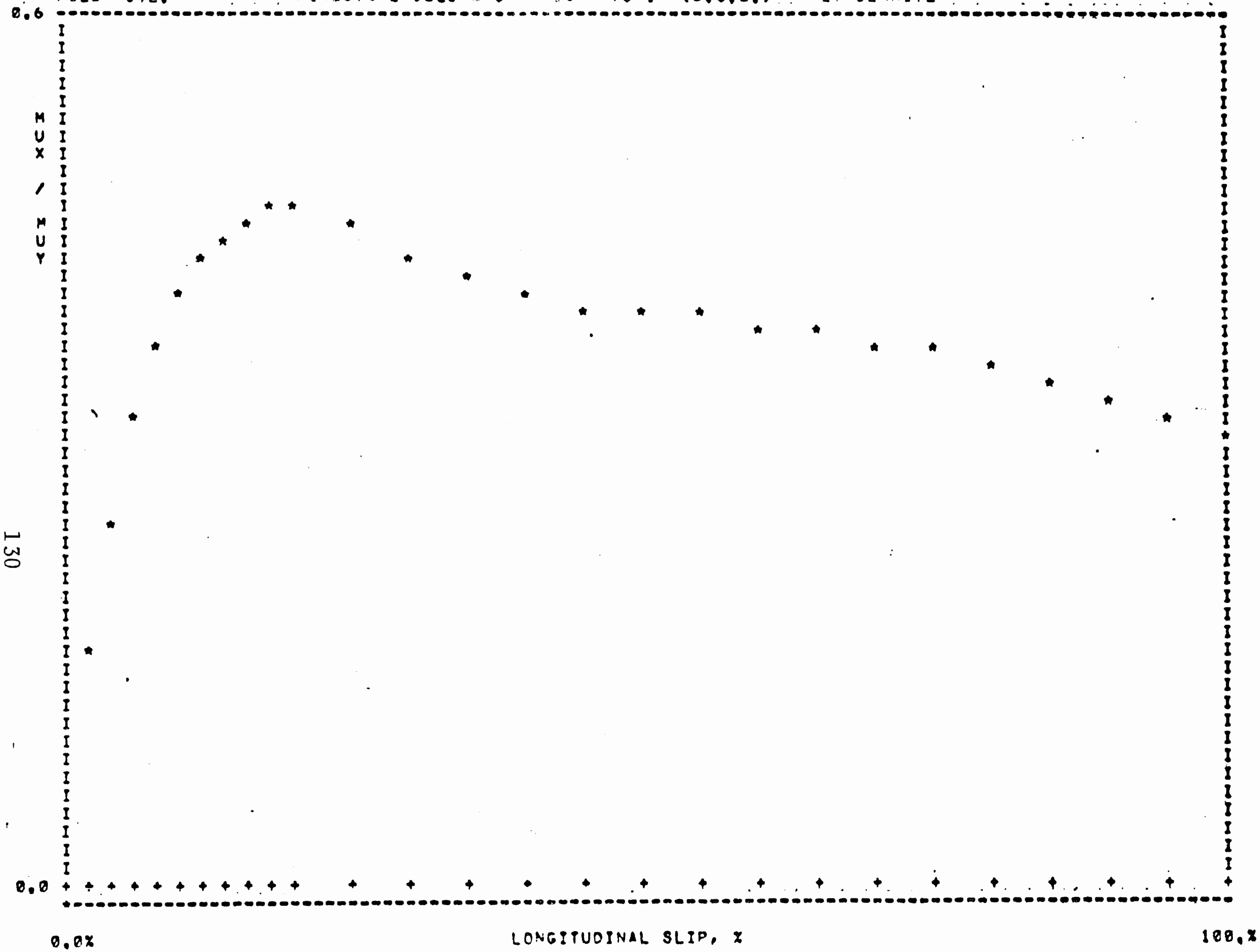


TP= 3. RUN# 188. LOAD= 1100. LBS. VEL.= 40. MPH ALPHA= 4. DEG

TIRE PRESSURE= 2[illegible]. PSI

SLIP	FX-LBS	FY-LBS
0.00	0.0	549.1
0.02	281.8	553.7
0.04	452.9	542.1
0.06	586.4	523.4
0.08	692.0	499.9
0.10	768.9	473.5
0.12	828.0	445.2
0.14	871.4	416.5
0.16	903.1	388.2
0.18	926.2	361.3
0.20	939.9	336.7
0.25	956.2	284.5
0.30	963.0	239.0
0.35	963.8	200.1
0.40	962.1	168.5
0.45	961.2	145.5
0.50	962.0	129.9
0.55	963.5	118.5
0.60	966.6	110.1
0.65	970.6	103.9
0.70	973.5	98.7
0.75	973.9	94.9
0.80	970.7	92.4
0.85	962.4	90.8
0.90	947.4	90.2
0.95	928.2	90.[illegible]
1.00	903.9	93.3

FILE 692. FIRESTONE DELUXE CHAMPION H78-14 (B.O.E.) WET JENNITE

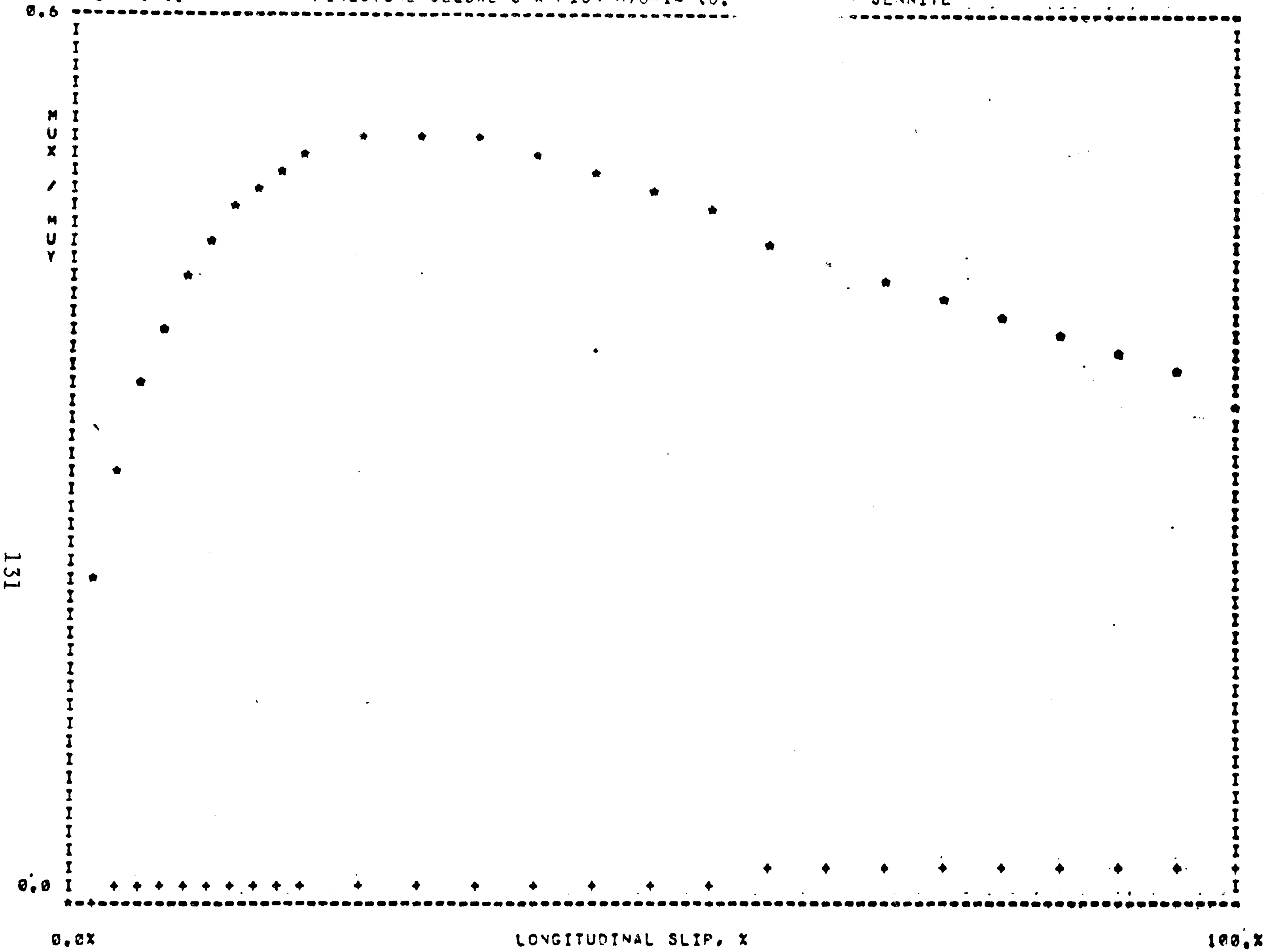


SLIP	FX-LBS
0.00	0.0
0.02	131.1
0.04	203.6
0.06	258.4
0.08	299.1
0.10	327.9
0.12	346.7
0.14	359.1
0.16	367.5
0.18	373.1
0.20	374.9
0.25	366.2
0.30	352.4
0.35	339.6
0.40	330.5
0.45	323.4
0.50	318.0
0.55	315.4
0.60	314.2
0.65	310.7
0.70	304.4
0.75	297.3
0.80	289.3
0.85	279.8
0.90	270.4
0.95	261.2
1.00	252.3

TP- 3.   RUN# 174.   LOAD= [illegible] LBS.   VEL.= 40. MPH   ALPHA= 0. DEG

TIRE PRESSURE= 20. PSI

FILE 690.   FIRESTONE DELUXE CHAMPION H78-14 (B.   JENNITE

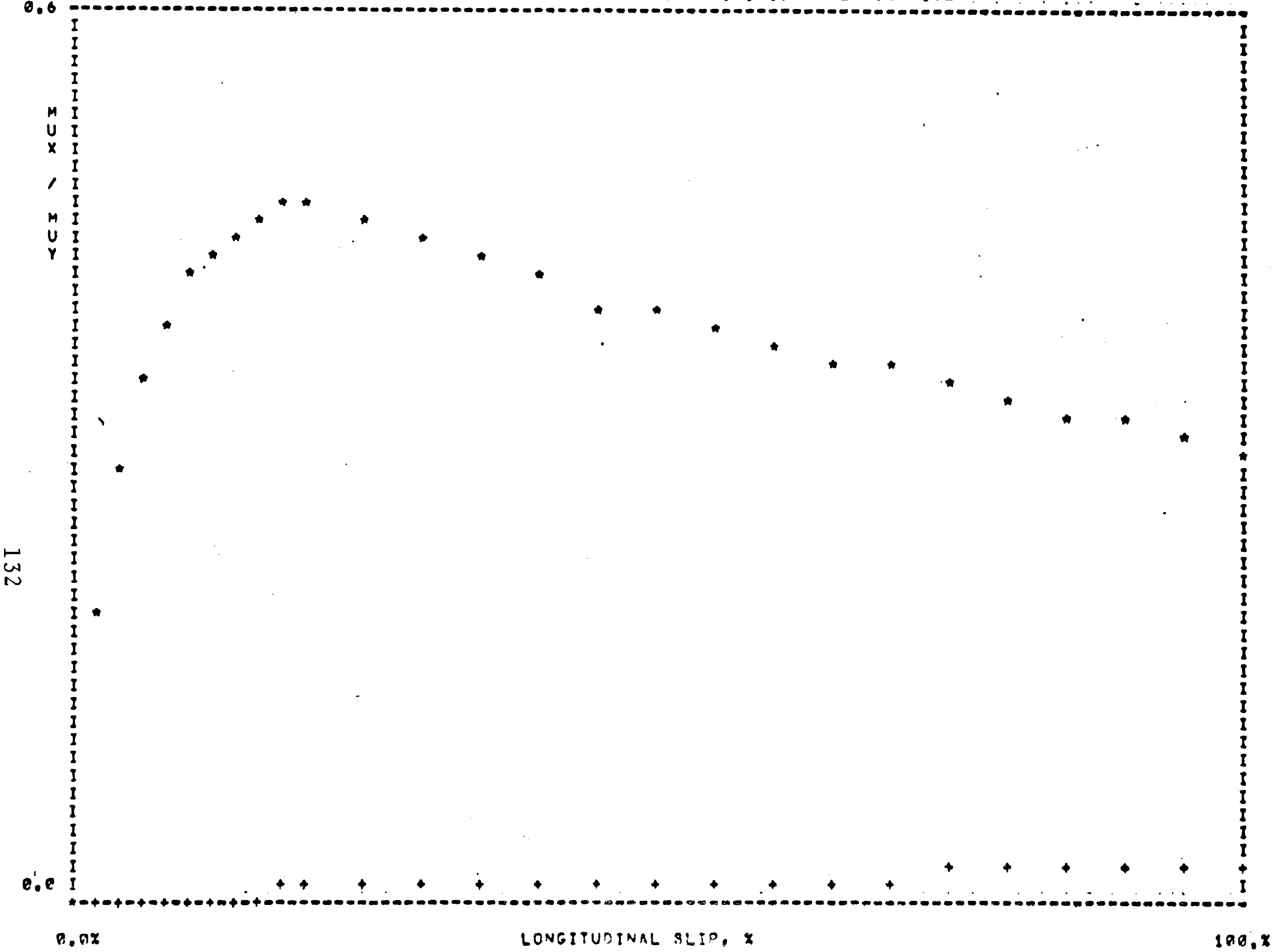


SLIP	FX-LBS
0.00	0.0
0.02	237.1
0.04	324.3
0.06	386.5
0.08	433.7
0.10	470.0
0.12	498.1
0.14	520.9
0.16	539.4
0.18	553.2
0.20	561.9
0.25	572.1
0.30	575.1
0.35	571.1
0.40	561.5
0.45	547.7
0.50	531.8
0.55	515.3
0.60	499.0
0.65	483.1
0.70	467.5
0.75	452.8
0.80	439.5
0.85	426.7
0.90	412.4
0.95	397.0
1.00	380.3

TP= 3.   RUN# 172.   LOAD= 1120. LBS.   VEL.= 20. MPH   ALPHA= 0. DEG

TIRE PRESSURE= 20. PSI

FILE 689. FIRESTONE DELUXE CHAMPION H78-14 (B.O.E.) WET JENNITE

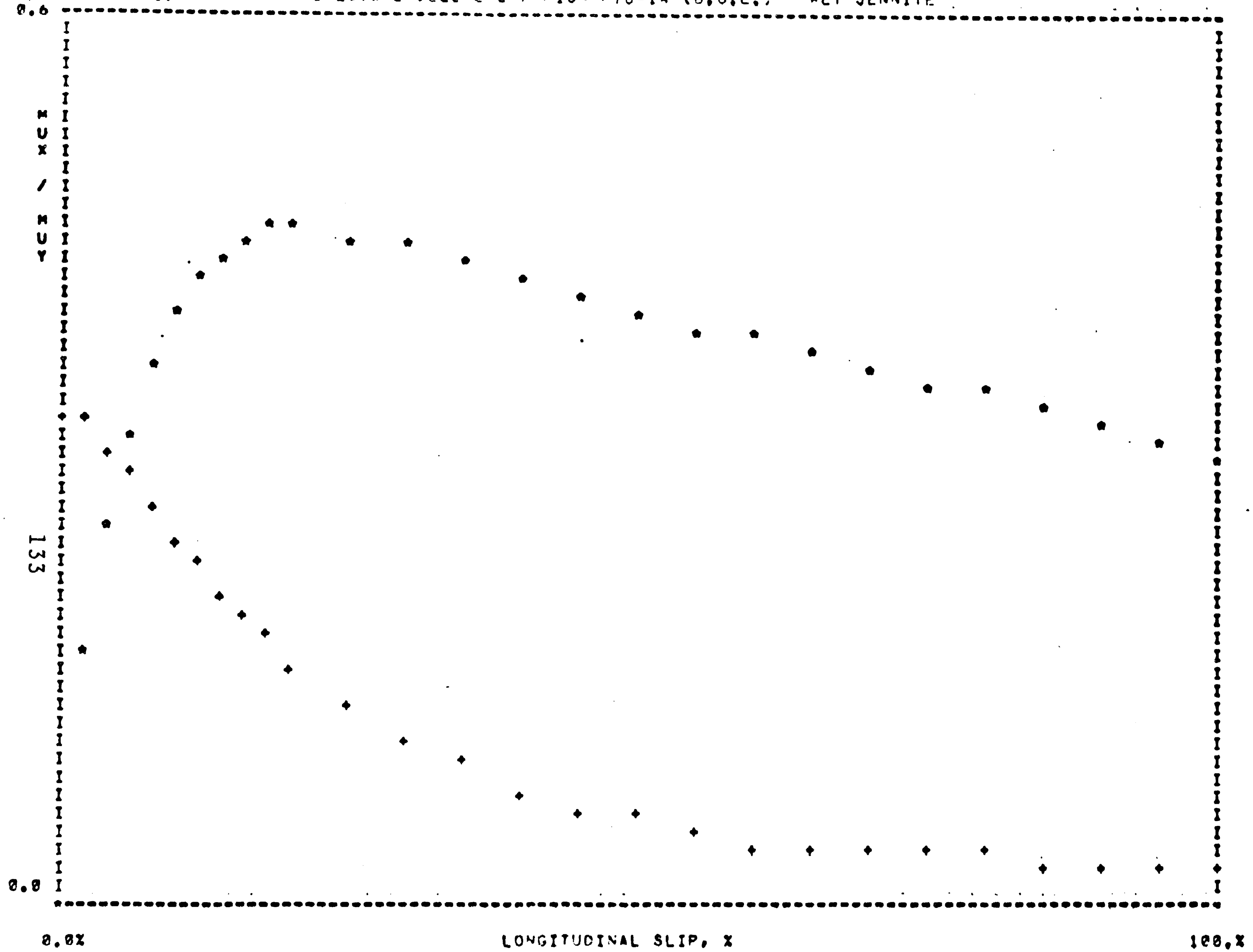


SLIP	FX-LBS
0.00	0.0
0.02	216.5
0.04	319.1
0.06	386.6
0.08	433.0
0.10	464.9
0.12	486.6
0.14	501.3
0.16	511.2
0.18	517.1
0.20	517.7
0.25	508.9
0.30	495.3
0.35	478.8
0.40	462.4
0.45	447.9
0.50	435.1
0.55	424.2
0.60	415.5
0.65	407.8
0.70	399.0
0.75	388.5
0.80	377.1
0.85	366.0
0.90	355.3
0.95	344.7
1.00	334.0

TP- 3. RUN# 171. LOAD= 1100. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 24. PSI

FILE 691. FIRESTONE DELUXE CHAMPION H78-14 (B.O.E.) WET JENNITE



SLIP	FX-LBS	FY-LBS
0.00	0.0	367.0
0.02	189.5	363.8
0.04	278.6	342.2
0.06	347.2	316.7
0.08	420.3	290.3
0.10	439.7	272.7
0.12	468.5	251.6
0.14	488.3	231.1
0.16	500.7	211.9
0.18	507.1	194.8
0.20	507.8	182.6
0.25	501.5	150.9
0.30	491.1	124.4
0.35	477.3	102.0
0.40	462.5	84.5
0.45	449.4	71.2
0.50	438.9	62.6
0.55	430.4	52.5
0.60	422.5	46.4
0.65	414.3	42.4
0.70	405.1	39.5
0.75	394.6	36.5
0.80	383.4	33.6
0.85	371.7	31.5
0.90	359.3	32.7
0.95	346.6	32.8
1.00	333.5	32.3

TP= 3. RUN= 173. LOAD= 1100. LBS. VEL.= 40. MPH ALPHA= 3. DEG

TIRE PRESSURE= 20. PSI

VIII.C.1 Free-Rolling Measurements from the Flat Bed Tire Tester - 26 psi Inflation

a. Lateral Force vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
800	291	146	-30	-210	-338	-476	-610	-652	-688
1100	339	165	-33	-235	-392	-586	-797	-889	-958
1400	351	164	-34	-236	-404	-644	-940	-1085	-1196
1700	346	157	-35	-228	-398	-667	-1048	-1248	-1407

b. Aligning Moment vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
800	-24	-14	2	19	24	20	7	1	- 1
1100	-42	-24	4	33	45	46	27	12	3
1400	-63	-34	5	46	68	77	54	60	10
1700	-83	-43	5	57	90	113	91	54	21

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°
800	- 94	-62	-30	-6	16	104	135	167
1100	-111	-71	-33	-4	23	137	190	239
1400	-116	-74	-34	-4	25	147	211	282
1700	-118	-77	-35	-4	30	152	221	298

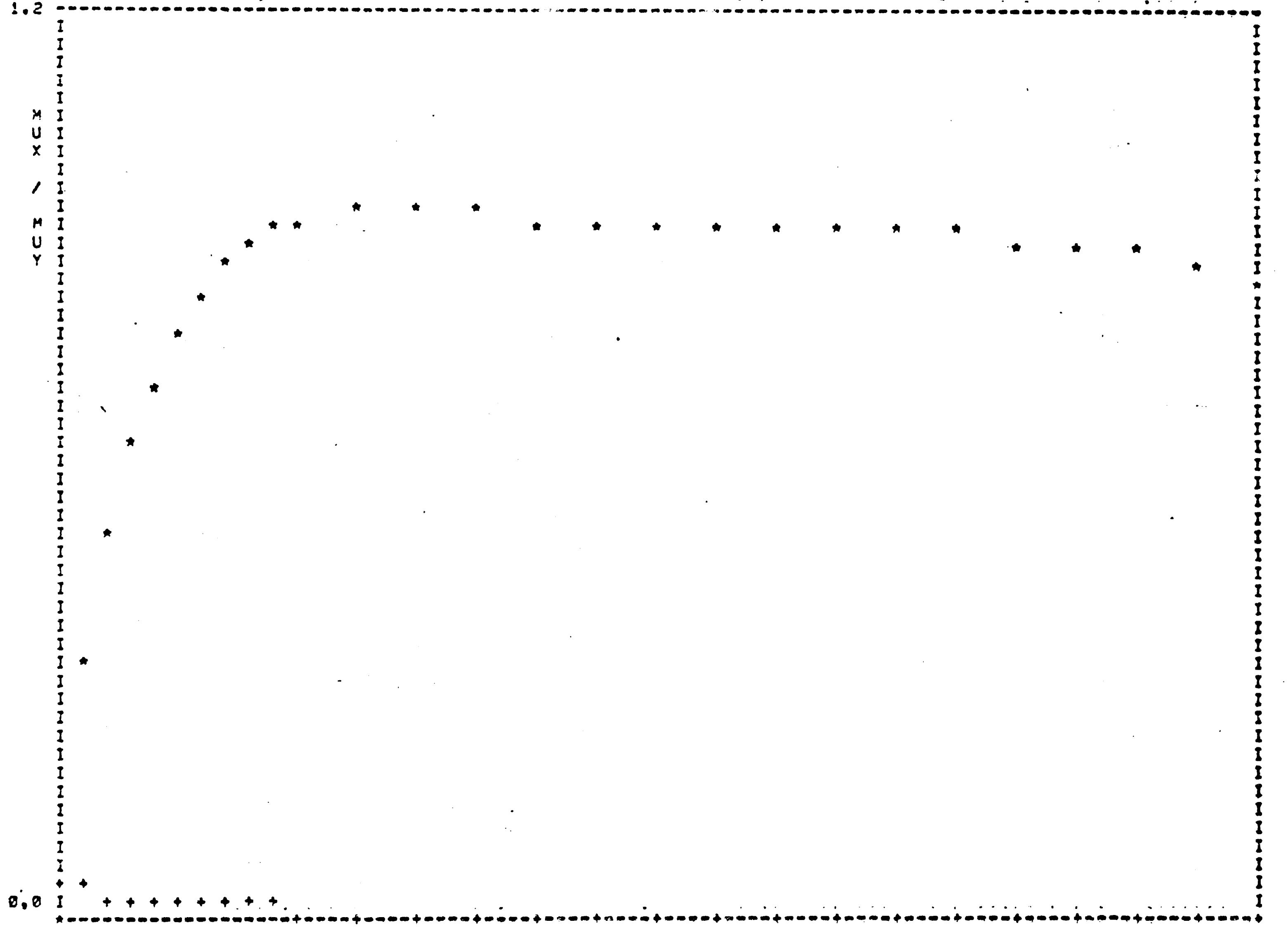
VIII.C.2 Free-Rolling Lateral Force Measurements from Mobile Tire Tester - 28 psi Inflation

		Dry Asphalt					Wet Jennite				
Load	Speed	0°	2°	4°	8°	16°	0°	1°	3°	7°	15°
800	40 mph	-5	319	516	695	701/778	0	162	370	489	417/[illegible]
1100	20 mph						20	214	460	635	61[illegible]
	40 mph	5	326	583	859	936/1025	0	207	445	571	543/[illegible]
	50 mph						12	219	438	585	540
1700	40 mph	8	343	678	1094	1400/1430					
		Wet Jennite									
1700	40 mph	0	376	639	812	812/732					

VIII.C.3 Braking Data from the Mobile Tire Tester - 28 psi

	Dry Asphalt					Wet Jennite				
	0°				4°	0°				3°
	800 lbs.		1100 lbs.		1100 lbs.	800 lbs.		1100 lbs.		1100 lbs
	20 mph	40 mph	20 mph	40 mph	40 mph	20 mph	40 mph	20 mph	40 mph	40 mph
MBF		748	1002	971	978		394	606	491	534
LWBF		678	846	892	963		286	365	328	328
MLF					589					428
LWLF					64					32

FILE 569. FIRESTONE DELUXE CHAMPION H78-14 (B.O.E.= 6) DRY ASPHALT #8

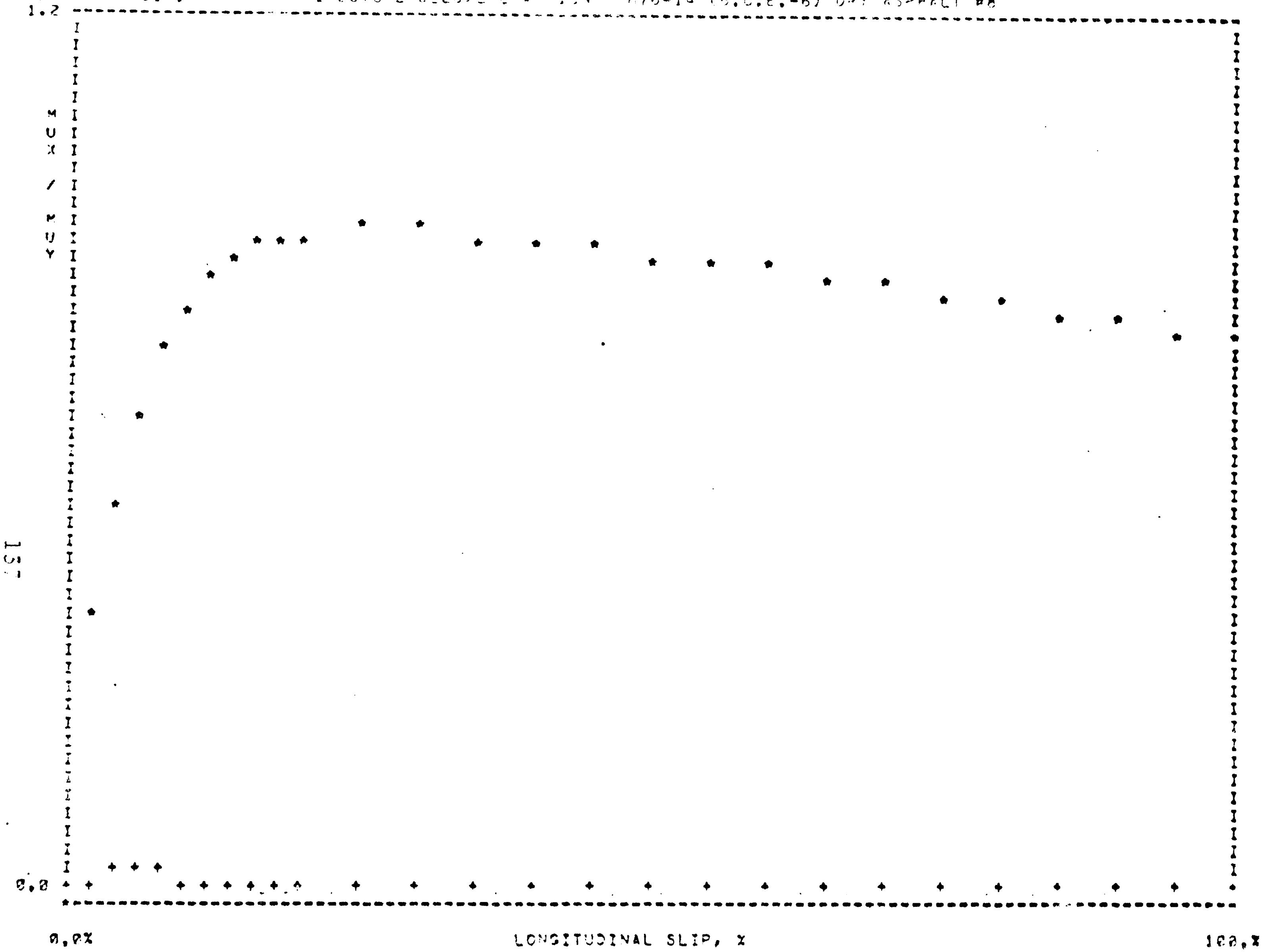


TP= 3. RUN# 39. LOAD= 600. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 28. PSI

SLIP	FX-LBS
0.00	0.0
0.02	264.3
0.04	395.8
0.06	491.0
0.08	562.7
0.10	617.3
0.12	659.6
0.14	691.9
0.16	715.5
0.18	731.1
0.20	737.8
0.25	744.9
0.30	748.3
0.35	746.6
0.40	749.0
0.45	733.4
0.50	730.5
0.55	730.4
0.60	729.2
0.65	725.6
0.70	722.2
0.75	721.4
0.80	722.8
0.85	716.1
0.90	707.4
0.95	695.3
1.00	678.9

FILE 518. FIRESTONE DELUXE CHAMPION H78-14 (B.C.E.-6) DRY ASPHALT #8

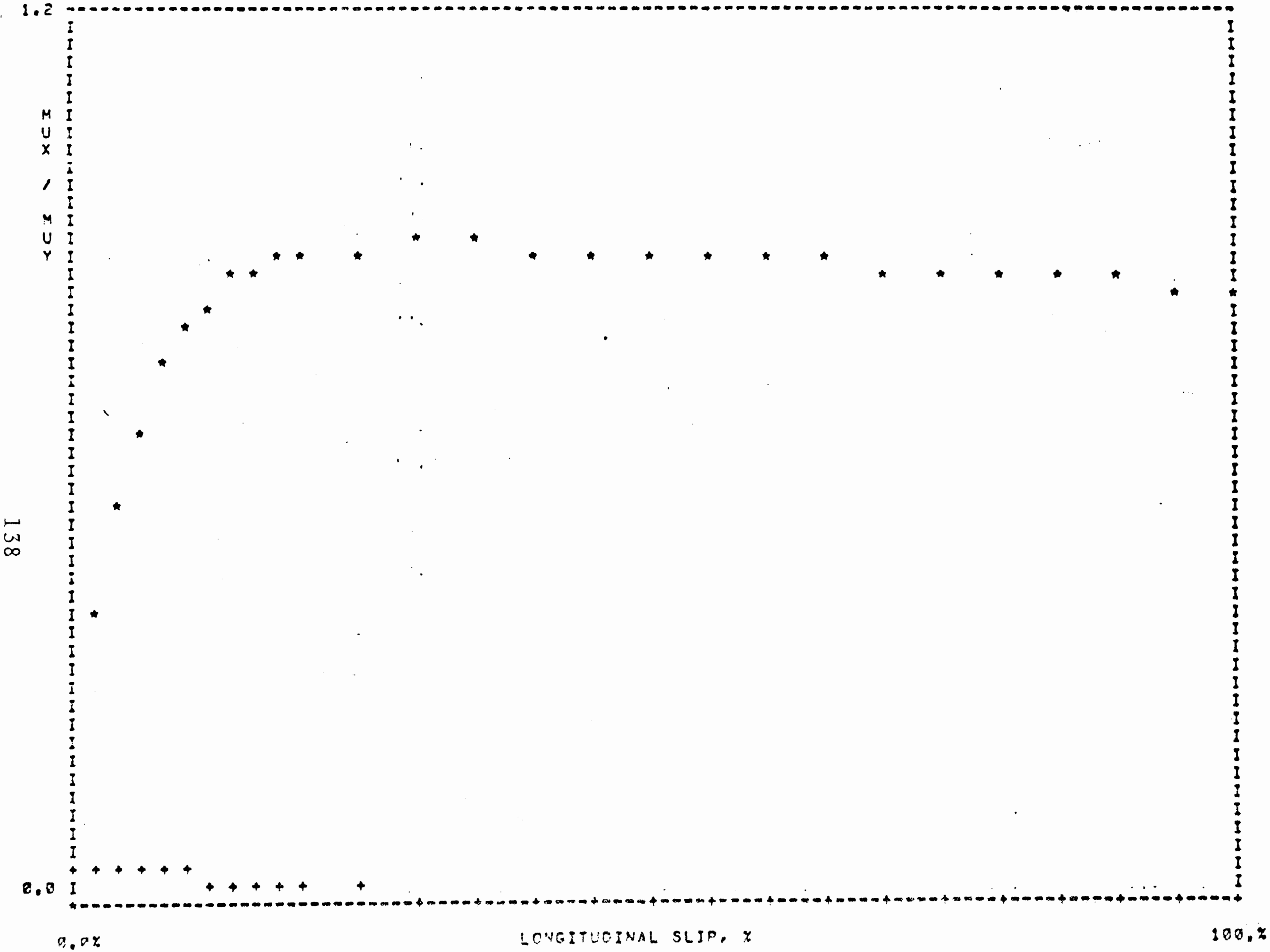


TP= 2. RUN# 364. LOAD= 1100. LBS. VEL.= 20. MPH ALPHA= 0. DEG

TIRE PRESSURE= 28. PSI

SLIP	FX-LBS
0.00	0.0
0.02	422.4
0.04	597.1
0.06	722.7
0.08	812.1
0.10	876.5
0.12	922.2
0.14	953.7
0.16	975.4
0.18	989.6
0.20	996.5
0.25	1002.3
0.30	1002.1
0.35	997.1
0.40	988.8
0.45	978.8
0.50	968.0
0.55	957.1
0.60	946.2
0.65	935.3
0.70	924.2
0.75	912.6
0.80	900.9
0.85	889.2
0.90	876.5
0.95	862.3
1.00	845.2

FILE 563. FIRESTONE DELUXE CHAMPION H78-14 (B.O.E.- 6) DRY ASPHALT #8

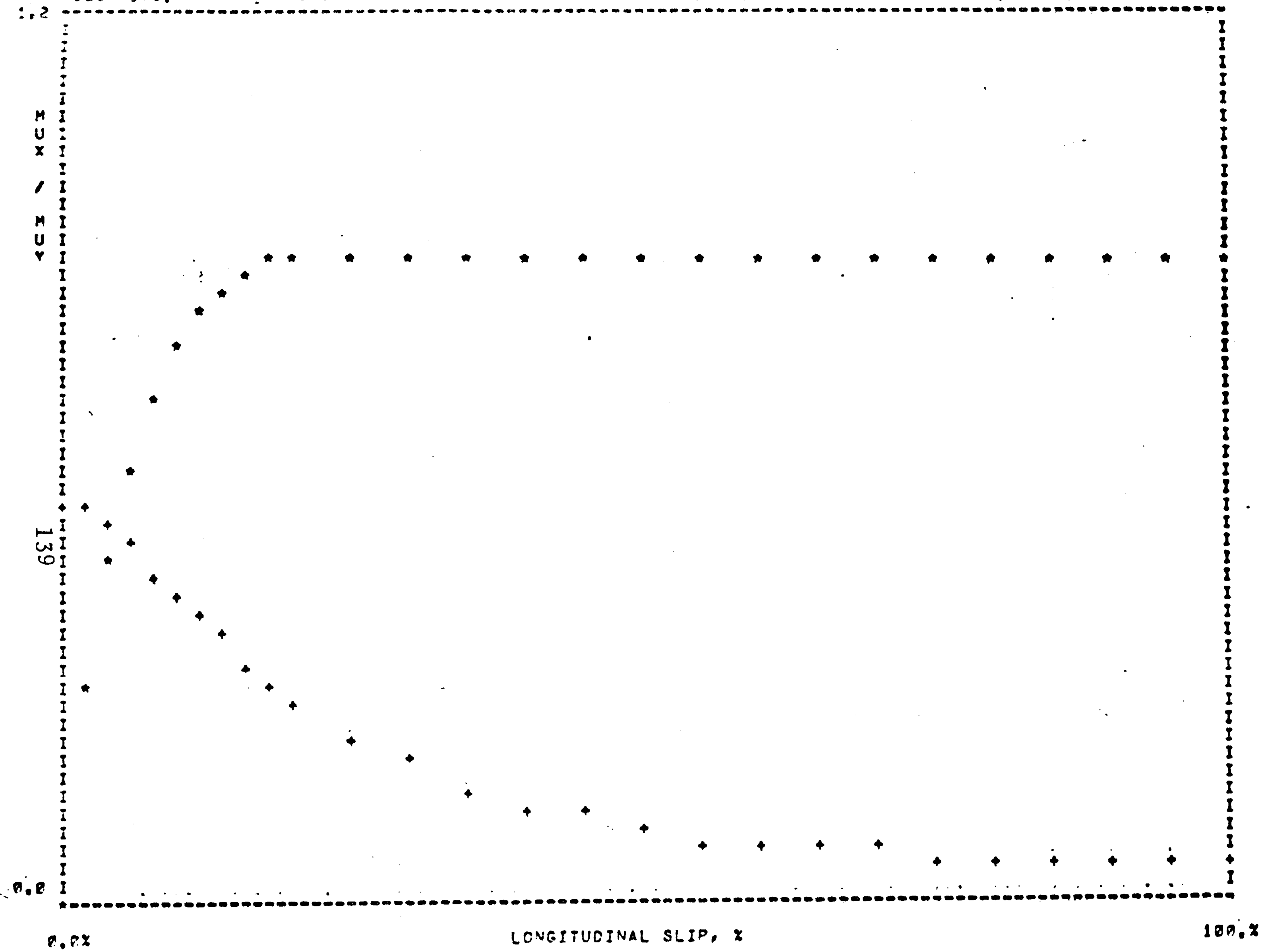


TP- 3. RUN# 3?. LOAD= 1100. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 28. PSI

SLIP	FX-LBS
0.00	0.0
0.02	420.1
0.04	585.1
0.06	701.9
0.08	786.1
0.10	844.8
0.12	886.2
0.14	915.7
0.16	935.7
0.18	948.5
0.20	955.0
0.25	965.7
0.30	970.6
0.35	969.7
0.40	965.9
0.45	962.3
0.50	959.0
'00 CONVERSION ERROR SEQ 2?136	
0.55	953.8
0.60	947.8
0.65	943.4
0.70	941.3
0.75	939.5
0.80	935.6
0.85	928.8
0.90	919.1
0.95	907.1
1.00	891.9

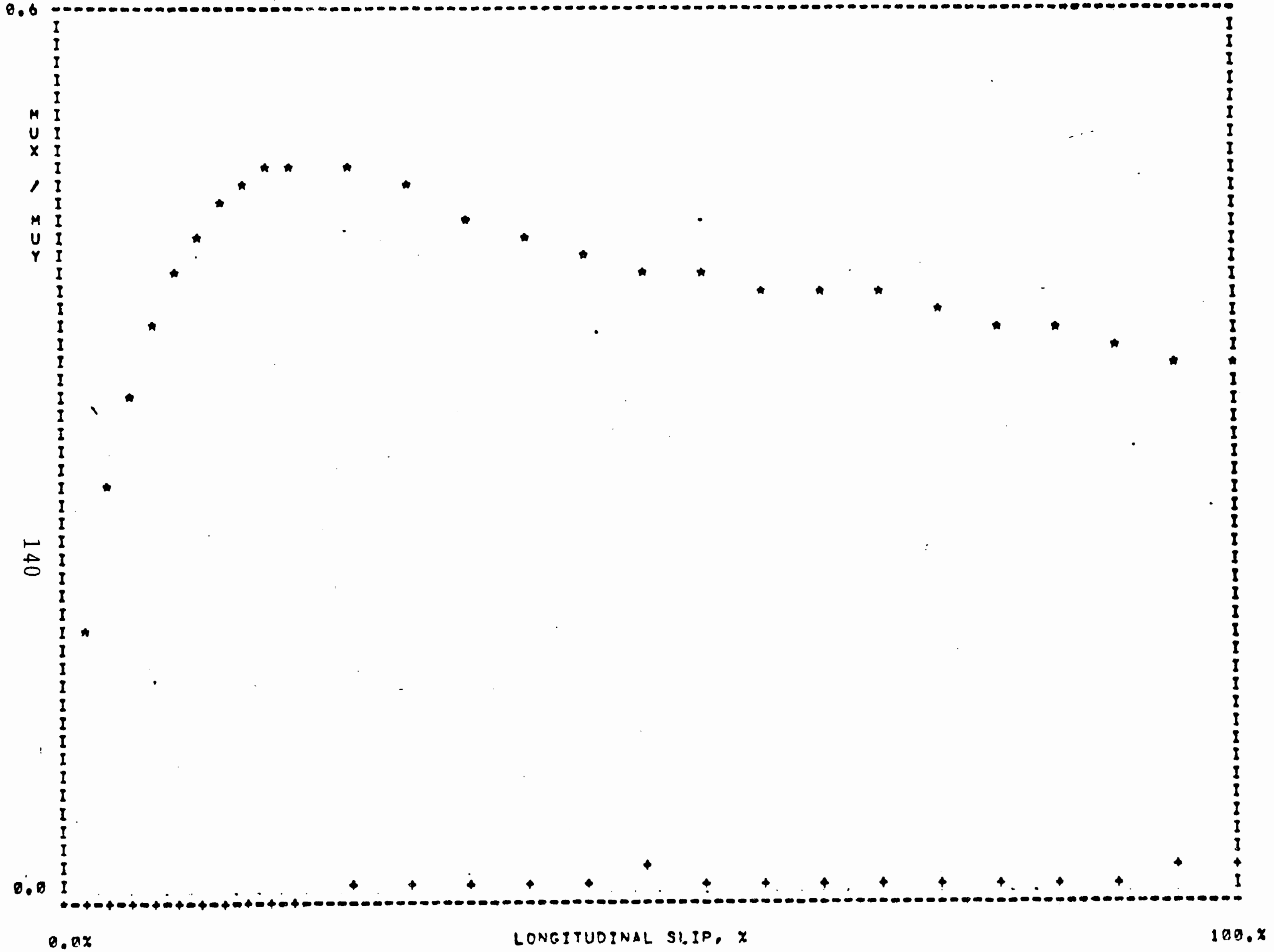
FILE 578. FIRESTONE DELUXE CHAMPION H78-14 (B.O.E.- 6) DRY ASPHALT #8



SLIP	FX-LBS	FY-LBS
0.00	0.0	588.8
0.02	329.0	588.2
0.04	512.0	557.9
0.06	659.3	523.9
0.08	754.7	489.1
0.10	831.8	455.5
0.12	885.6	423.2
0.14	920.8	390.4
0.16	942.0	358.2
0.18	954.3	327.7
0.20	960.8	302.5
0.25	969.7	251.8
0.30	974.7	206.5
0.35	977.5	170.4
0.40	976.0	143.9
0.45	974.3	123.2
0.50	971.2	105.2
0.55	969.2	90.3
0.60	966.5	79.4
0.65	965.2	72.0
0.70	964.1	67.6
0.75	962.4	65.3
0.80	959.7	64.5
0.85	957.2	64.5
0.90	957.5	64.4
0.95	959.4	64.3
1.00	963.1	64.

TP- 3. RUN# 48. LOAD= 1100. LBS. VEL.= 40. MPH ALPHA= 4. DEG

TIRE PRESSURE= 28. PSI

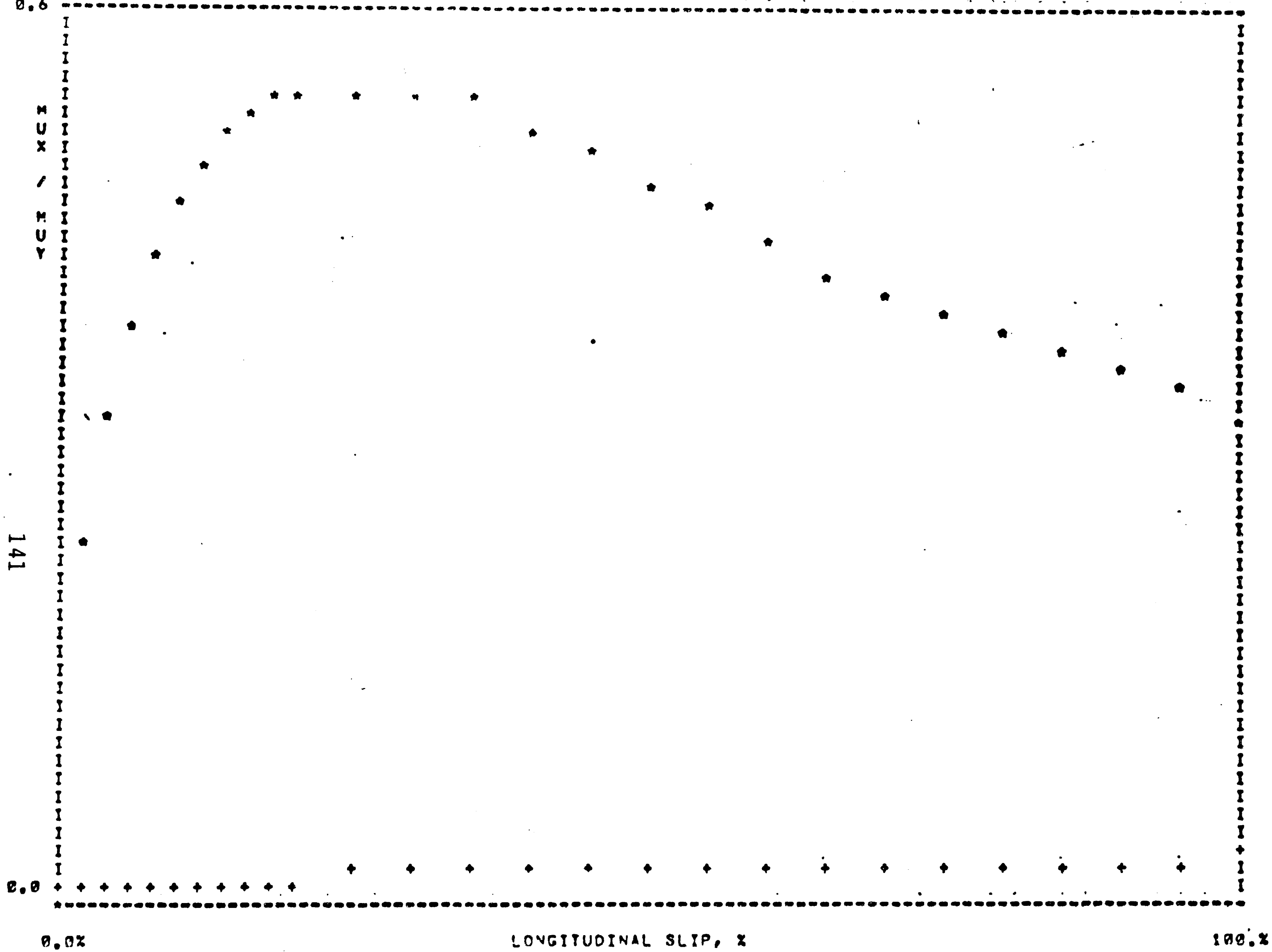


TP= 3.   RUN# 143.   LOAD= 8[illegible]. LBS.   VEL.= 40. MPH   ALPHA= 0. DEG

TIRE PRESSURE= 28. PSI

SLIP	FX-LBS
0.00	0.0
0.02	146.8
0.04	216.1
0.06	266.6
0.08	305.6
0.10	335.1
0.12	357.1
0.14	373.2
0.16	384.5
0.18	391.8
0.20	394.0
0.25	389.6
0.30	379.5
0.35	366.5
0.40	354.3
0.45	344.3
0.50	336.7
0.55	331.2
0.60	327.3
0.65	324.0
0.70	320.5
0.75	315.8
0.80	309.1
0.85	301.4
0.90	295.0
0.95	289.8
1.00	286.2

FILE 687. FIRESTONE DELUXE CHAM- H78-14 (B.O.E.) WET JENNITE

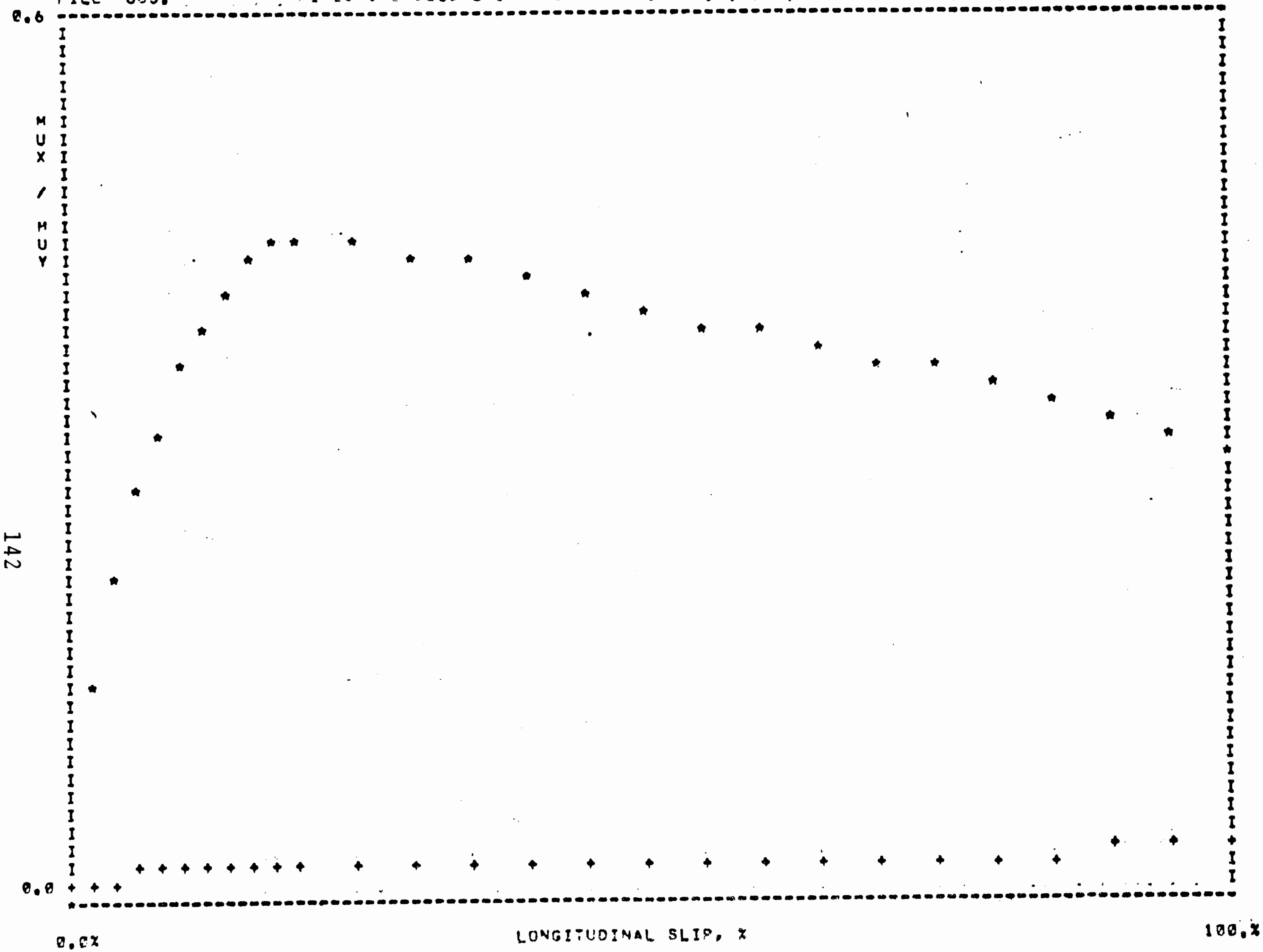


SLIP	FX-LBS
0.00	0.0
0.02	260.9
0.04	361.1
0.06	431.1
0.08	483.1
0.10	521.6
0.12	550.2
0.14	571.3
0.16	587.3
0.18	597.5
0.20	602.3
0.25	605.7
0.30	602.5
0.35	593.4
0.40	579.5
0.45	560.7
0.50	538.6
0.55	514.4
0.60	490.6
0.65	470.3
0.70	454.2
0.75	440.9
0.80	427.8
0.85	413.3
0.90	397.6
0.95	381.5
1.00	364.9

TP= 3. RUN# 168. LOAD= 1100. LBS. VEL.= 20. MPH ALPHA= 0. DEG

TIRE PRESSURE= 28. PSI

FILE 686.   FIRESTONE DELUXE CHAMPION H78-14 (B.O.E.)   WET JENNITE

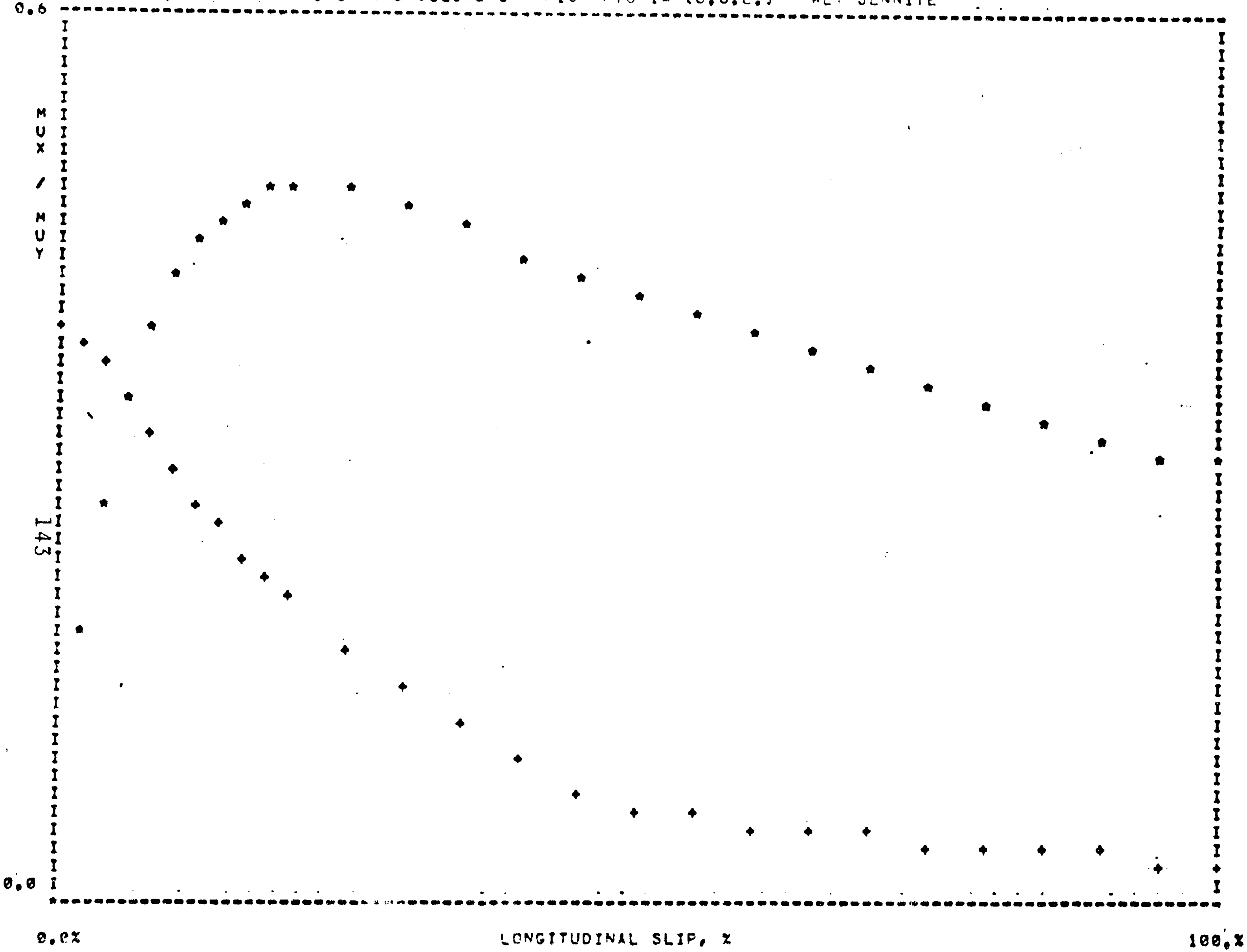


TP= 3.   RUN# 167.   LOAD= 1100. LBS.   VEL.= 40. MPH   ALPHA= 0. DEG

TIRE PRESSURE= 28. PSI

SLIP	FX-LBS
0.00	0.0
0.02	156.4
0.04	237.9
0.06	300.4
0.08	351.5
0.10	393.7
0.12	428.2
0.14	455.1
0.16	474.9
0.18	487.3
0.20	490.2
0.25	490.7
0.30	485.7
0.35	475.0
0.40	463.5
0.45	454.6
0.50	444.8
0.55	432.0
0.60	419.9
0.65	411.4
0.70	404.3
0.75	395.1
0.80	382.8
0.85	368.7
0.90	354.6
0.95	340.9
1.00	327.6

FILE 688.   FIRESTONE DELUXE CHAMPION H78-14 (B.O.E.)   WET JENNITE



SLIP	FX-LBS	FY-LBS
0.00	0.0	428.1
0.02	201.8	417.0
0.04	298.7	396.1
0.06	370.5	372.0
0.08	424.0	346.7
0.10	461.1	321.6
0.12	486.7	297.4
0.14	504.2	275.5
0.16	517.2	256.6
0.18	527.3	239.7
0.20	534.4	223.9
0.25	533.9	187.8
0.30	522.1	157.0
0.35	505.2	128.8
0.40	486.3	102.9
0.45	468.0	83.2
0.50	452.2	70.9
0.55	440.6	63.0
0.60	430.4	56.5
0.65	416.6	51.5
0.70	400.7	48.3
0.75	386.0	45.6
0.80	372.5	42.0
0.85	359.7	38.0
0.90	348.5	34.6
0.95	338.0	32.6
1.00	327.8	32.5

TP= 3.   RUN# 169.   LOAD= 1130. LBS.   VEL.= 40. MPH   ALPHA= 4. DEG

TIRE PRESSURE= 28. PSI

VIII.D.1 Free-Rolling Measurement from the Flat Bed Tire Tester - 34 psi Inflation

a. Lateral Force vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
800	285	145	-28	-200	-325	-459	-590	633	678
1100	350	174	-32	-247	-407	-592	-793	873	950
1400	383	187	-31	-267	-452	-683	-960	1086	1200
1700	392	186	-28	-272	-467	-737	-1094	1275	1425

b. Aligning Moment vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
800	-19	-12	2	14	18	17	6	2	0
1100	-36	-21	4	26	36	36	20	9	3
1400	-54	-31	5	38	56	61	41	23	8
1700	-73	-39	5	50	76	92	70	43	16

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°
800	-84	-56	-28	-6	6	87	113	143
1100	-114	-75	-32	-7	22	134	178	221
1400	-125	-81	-31	-5	30	160	226	285
1700	-130	-83	-28	-4	33	169	242	318

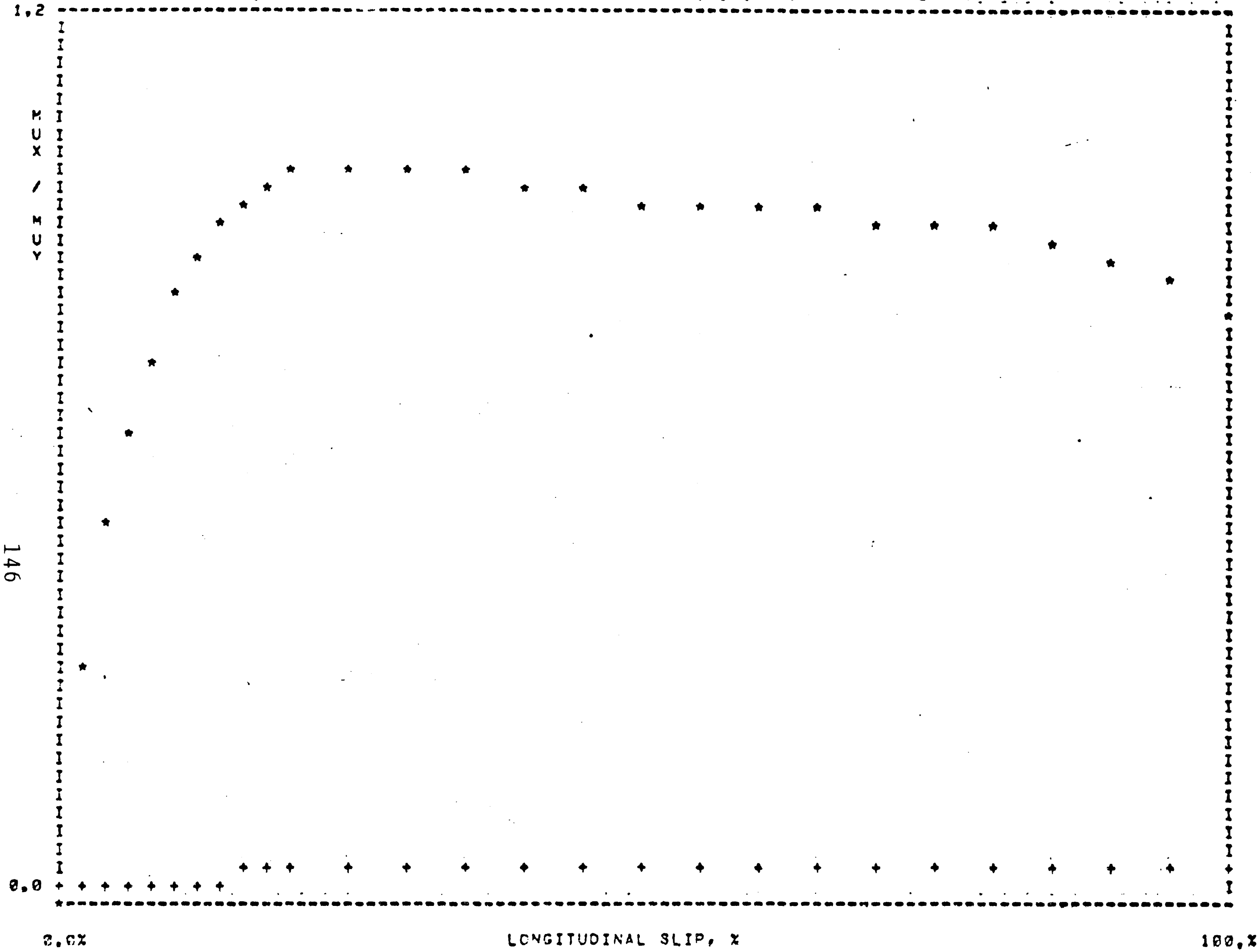
VIII.D.2 Free-Rolling Lateral Force Measurements from Mobile Tire Tester - 36 psi Inflation

		Dry Asphalt					Wet Jennite				
Load	Speed	0°	2°	4°	8°	16°	0°	1°	3°	7°	15°
800	40 mph	10	335	486	690	655/732	- 8	181	341	453	356
1100	20 mph	-22	352	598	861	1025	-25	197	320	613	649
	40 mph	0	371	624	892	879/1000	5	206	334	567	545
	50 mph						15	162	350	459	504
1700	40 mph	-20	417	716	1125	1300/1462					
		Wet Jennite									
1700	40 mph	0	415	646	800	778/742					

VIII.D.3 Braking Data from the Mobile Tire Tester - 36 psi

	Dry Asphalt					Wet Jennite				
	0°				4°	0°				3°
	800 lbs.		1100 lbs.		1100 lbs.	800 lbs.		1100 lbs.		1100 lbs
	20 mph	40 mph	20 mph	40 mph	40 mph	20 mph	40 mph	20 mph	40 mph	40 mph
MBF		788	1049	1012	1049		422	571	547	510
LWBF		643	872	876	895		238	366	301	311
MLF					578					447
LWLF					84					21

FILE 731. FIRES E DELUXE CHAMPION H78-14 (B.D.E.-17) DRY ASPHALT #8

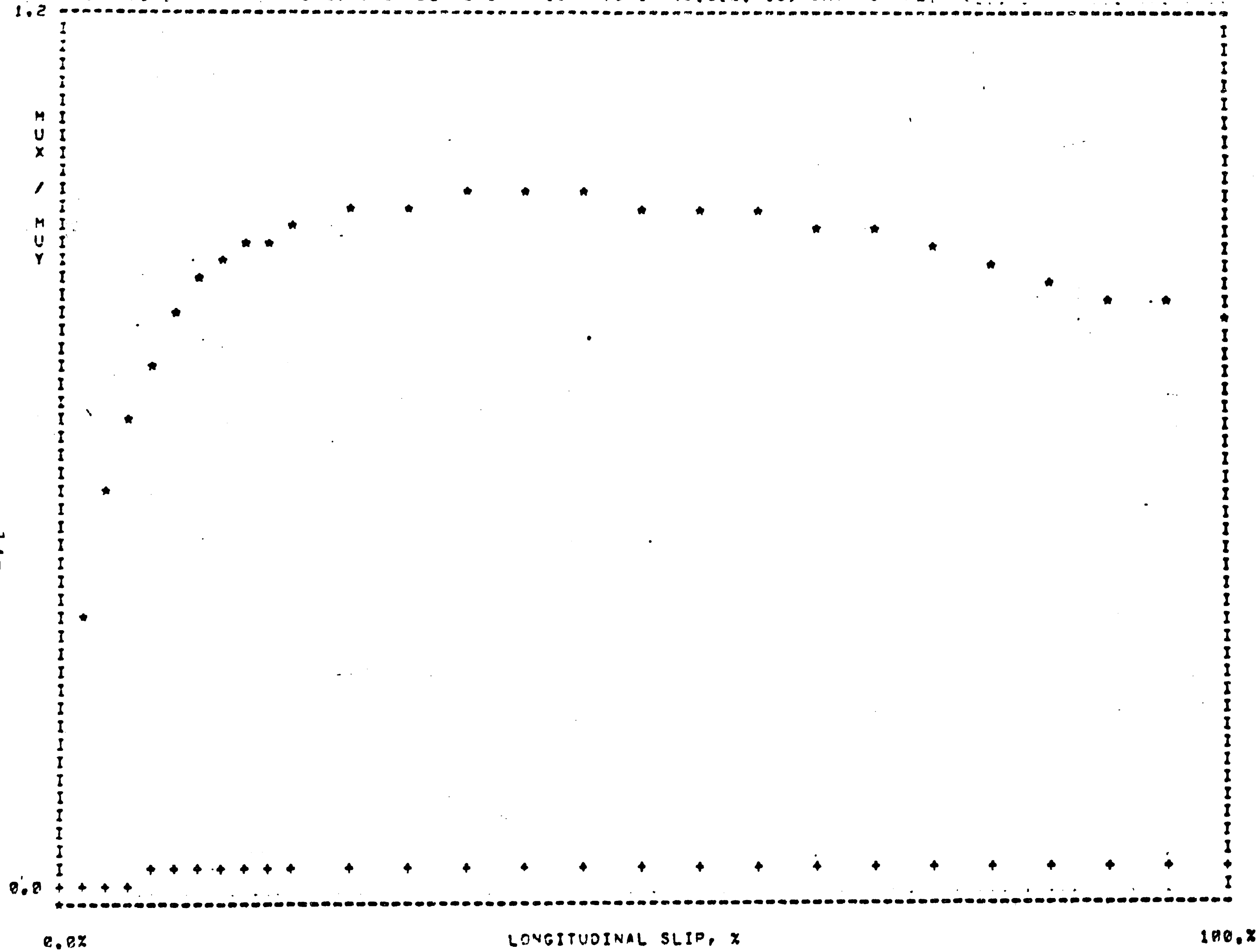


TP- 3. RUN# 215. LOAD= 8[illegible]. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 36. PSI

SLIP	FX-LBS
0.00	0.0
0.02	257.6
0.04	396.3
0.06	502.1
0.08	584.6
0.10	647.2
0.12	692.8
0.14	725.9
0.16	759.2
0.18	767.7
0.20	777.8
0.25	786.3
0.30	787.6
0.35	783.0
0.40	773.9
0.45	763.9
0.50	755.4
0.55	749.1
0.60	745.3
0.65	742.6
0.70	737.9
0.75	730.3
0.80	720.3
0.85	708.1
0.90	690.9
0.95	669.7
1.00	643.2

FILE 718. FIRESTONE DELUXE CHAMPION H78-14 (B.O.E.-16) DRY ASPHALT #8

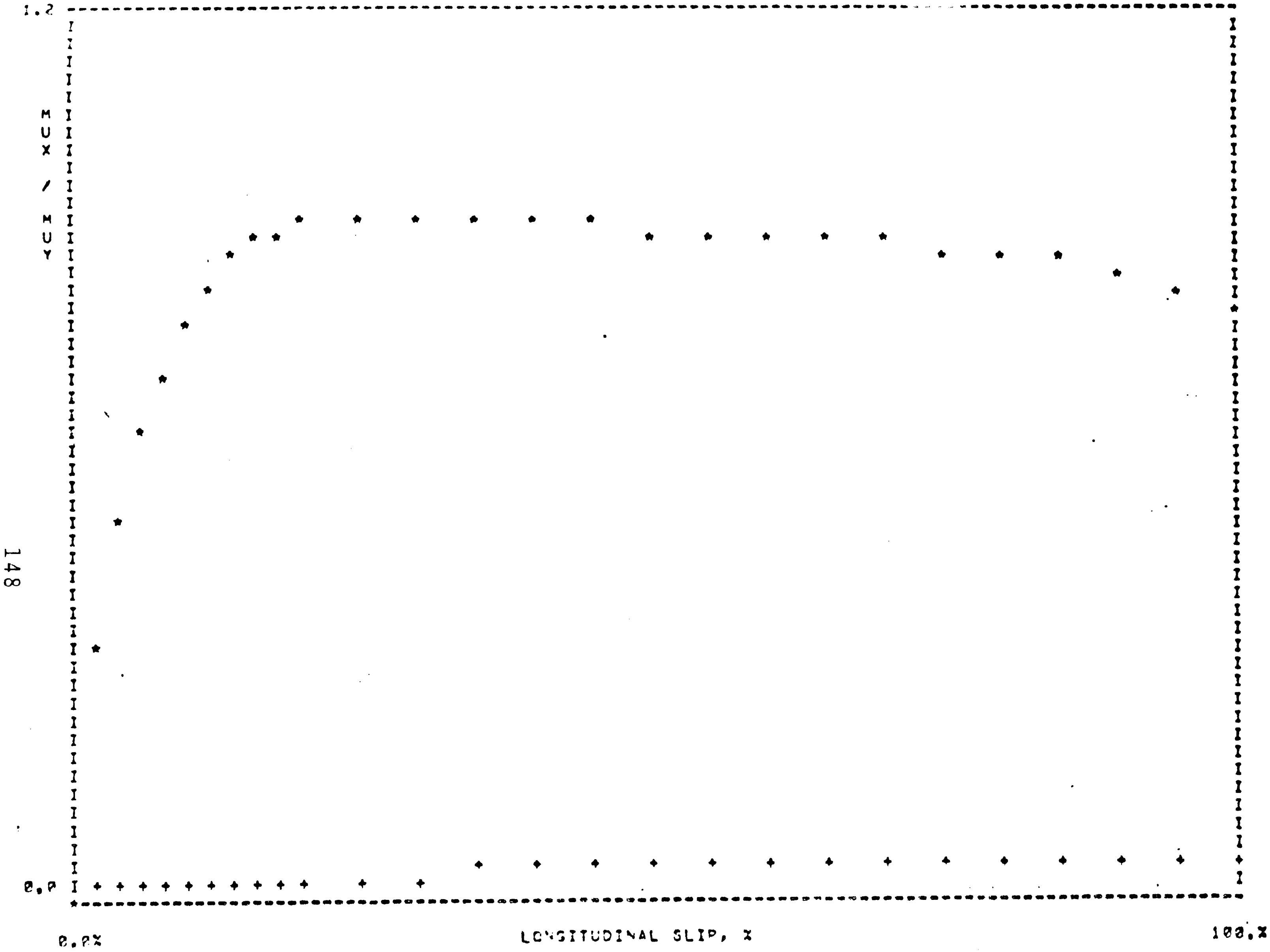


SLIP	FX-LBS
0.00	0.0
0.02	423.1
0.04	595.5
0.06	714.8
0.08	802.7
0.10	866.8
0.12	912.8
0.14	946.5
0.16	971.8
0.18	990.6
0.20	1003.1
0.25	1023.9
0.30	1038.4
0.35	1046.8
0.40	1049.1
0.45	1046.9
0.50	1043.0
0.55	1035.9
0.60	1024.5
0.65	1009.5
0.70	991.1
0.75	969.8
0.80	946.9
0.85	925.3
0.90	907.1
0.95	889.6
1.00	872.3

TP- 3. RUN# 202. LOAD= 1102. LBS. VEL.= 20. MPH ALPHA= 0. DEG

TIRE PRESSURE= 36. PSI

FILE 717. FIRESTONE DELUXE CHAMPION H78-14 (B.O.E.-16) DRY ASP

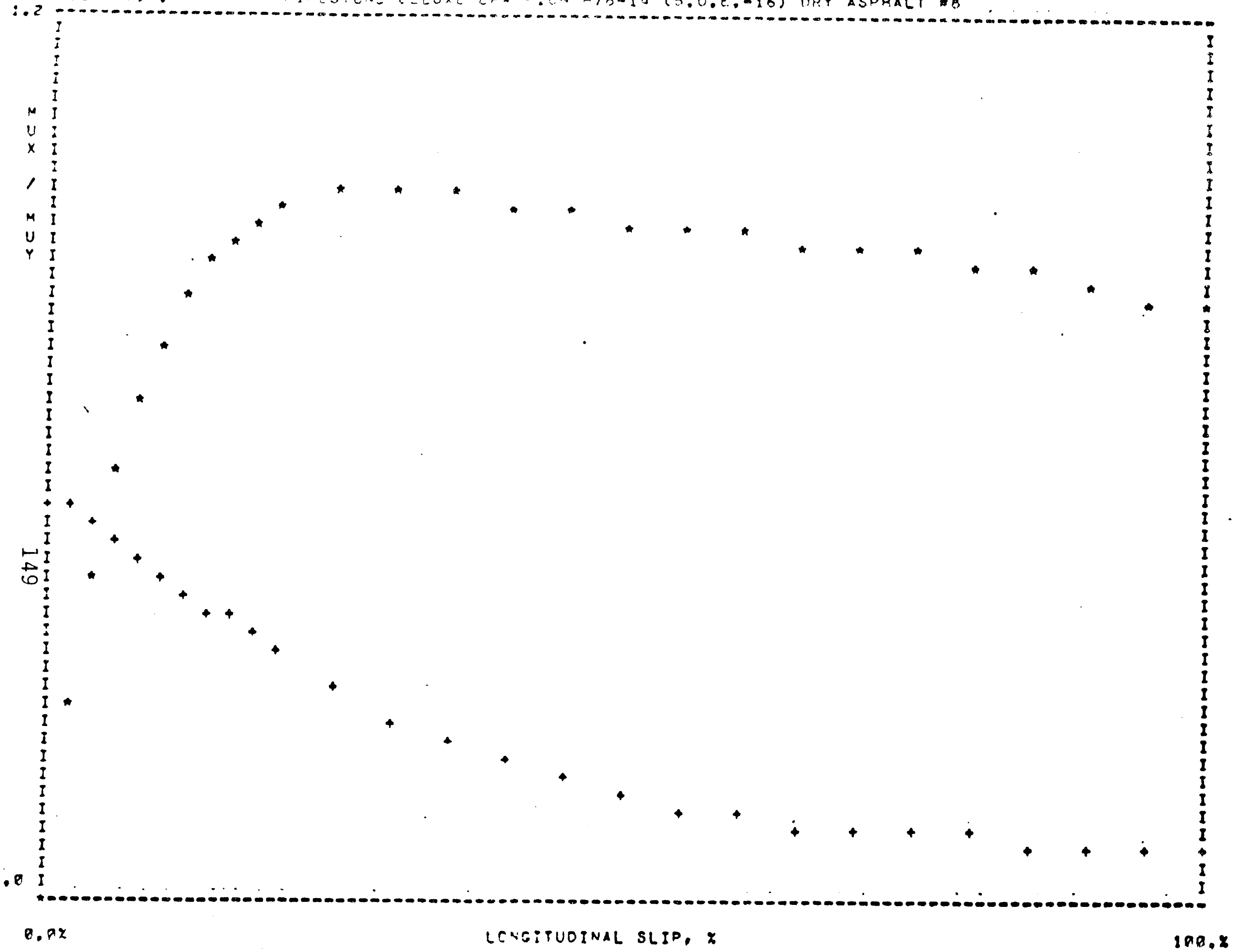


TP- 3. RUN# 200. LOAD= 1172. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 36. PSI

SLIP	FX-LBS
0.00	0.0
0.02	369.2
0.04	548.7
0.06	678.7
0.08	776.0
0.10	848.2
0.12	900.9
0.14	938.5
0.16	965.1
0.18	983.9
0.20	995.9
0.25	1008.7
0.30	1011.6
0.35	1012.2
0.40	1024.2
0.45	995.6
0.50	989.5
0.55	984.2
0.60	977.8
0.65	973.0
0.70	968.6
0.75	961.9
0.80	952.9
0.85	941.5
0.90	925.2
0.95	923.8
1.00	875.6

FILE 719.   FIRESTONE DELUXE CHAMPION H78-14 (B.O.E.-16) DRY ASPHALT #8

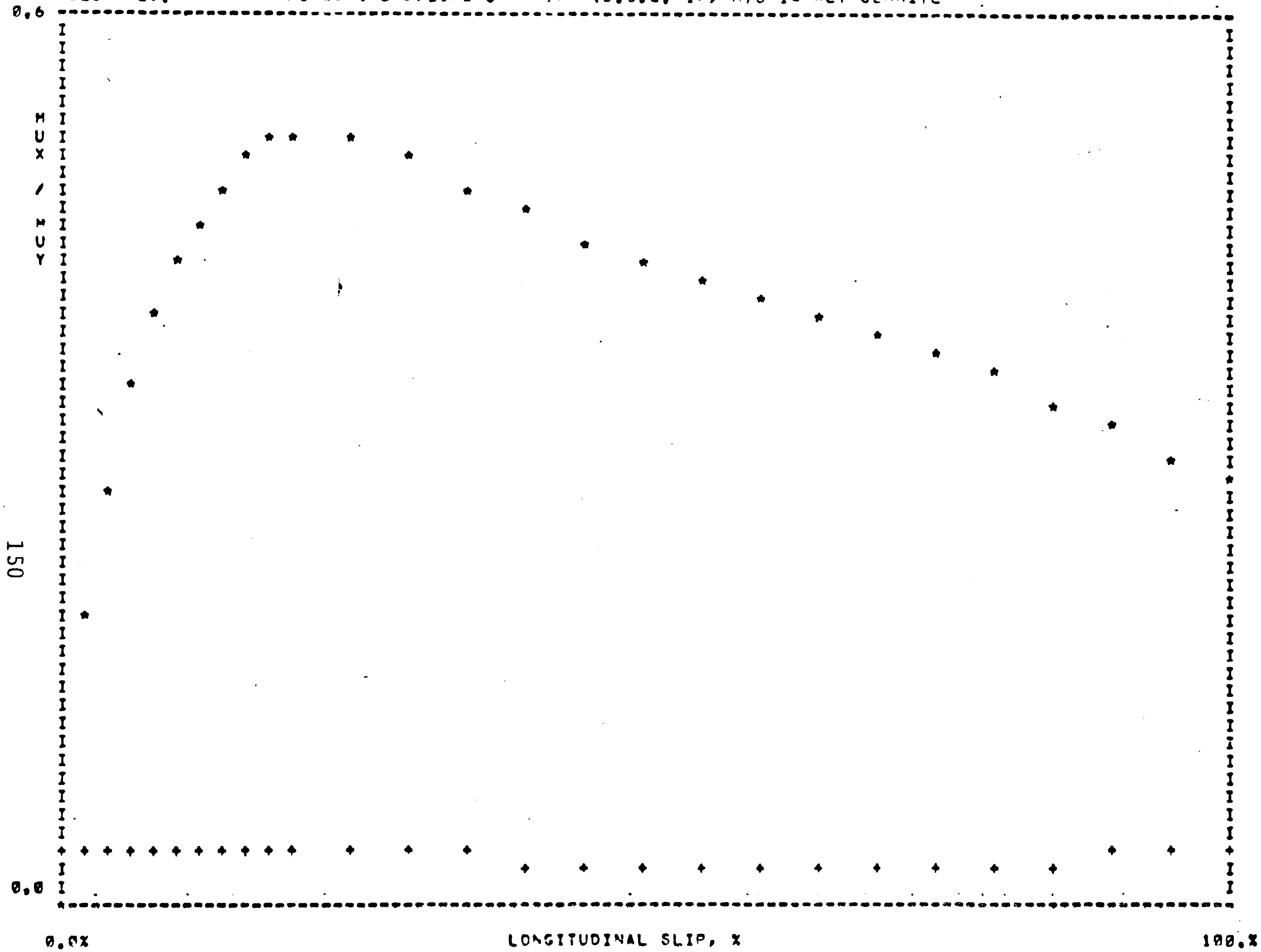


TP= 3,   RUN# 203,   LOAD= 1100. LBS.   VEL.= 40. MPH   ALPHA= 0. DEG

TIRE PRESSURE= 36. PSI

SLIP	FX-LBS
0.00	0.0
0.02	295.8
0.04	477.7
0.06	623.5
0.08	741.2
0.10	832.6
0.12	901.4
0.14	952.5
0.16	990.0
0.18	1016.9
0.20	1032.2
0.25	1046.1
0.30	1049.1
0.35	1045.4
0.40	1034.9
0.45	1020.3
0.50	1007.5
0.55	998.6
0.60	993.9
0.65	990.5
0.70	982.8
0.75	971.6
0.80	958.3
0.85	942.9
0.90	927.6
0.95	911.8
1.00	894.9

FILE 928. FIRESTONE DELUXE CHAMPION (B.O.E.=10) H78-14 WET JENNITE

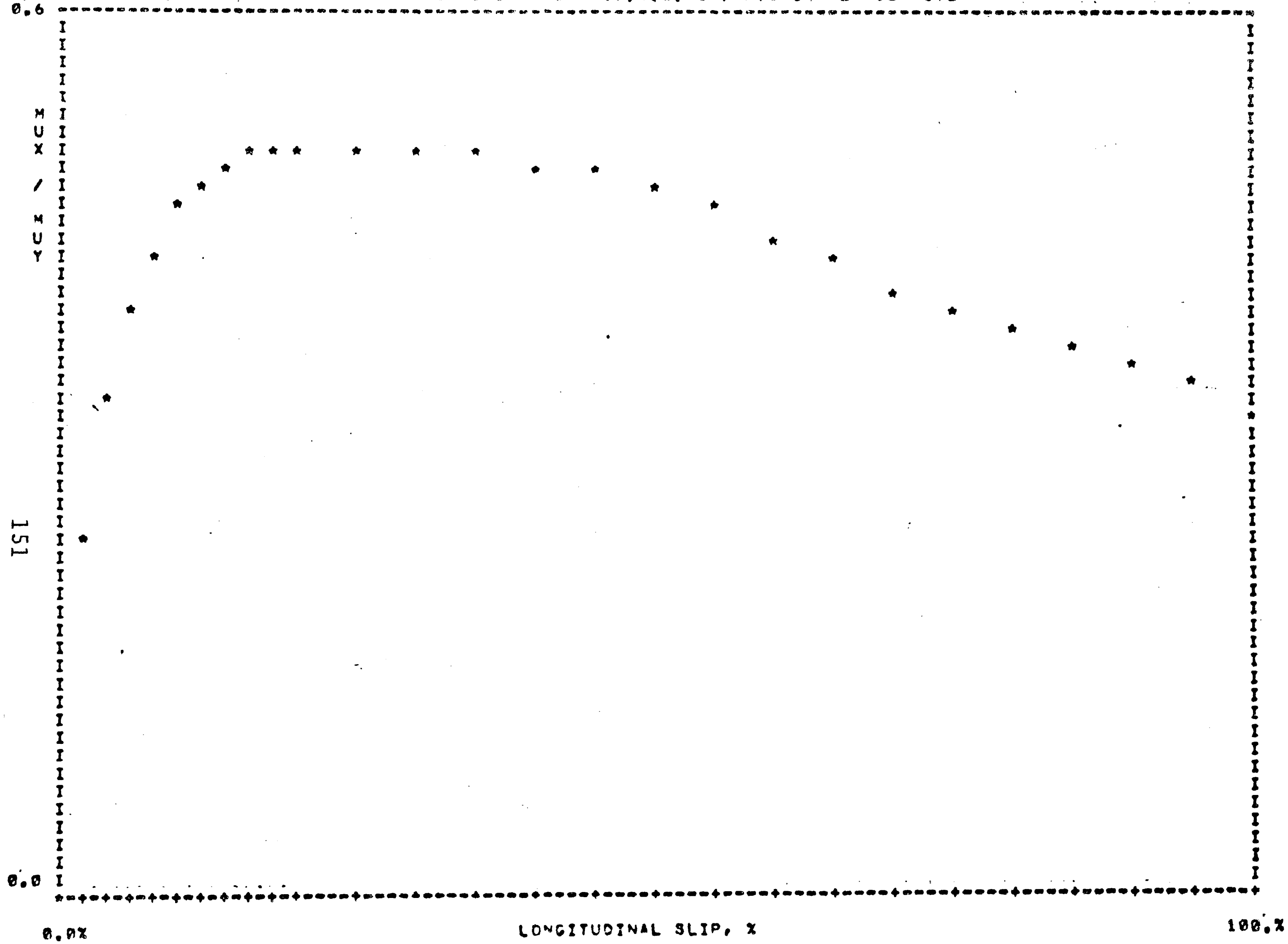


TP= 4. RUN# 24. LOAD= 620. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 36. PSI

SLIP	FX-LBS
0.00	0.0
0.02	156.9
0.04	228.1
0.06	280.3
0.08	319.9
0.10	350.2
0.12	374.1
0.14	393.3
0.16	408.5
0.18	419.0
0.20	421.6
0.25	416.3
0.30	406.2
0.35	392.7
0.40	379.1
0.45	364.8
0.50	350.7
0.55	341.5
0.60	334.4
0.65	324.1
0.70	314.0
0.75	303.3
0.80	289.0
0.85	273.8
0.90	260.7
0.95	248.8
1.00	238.3

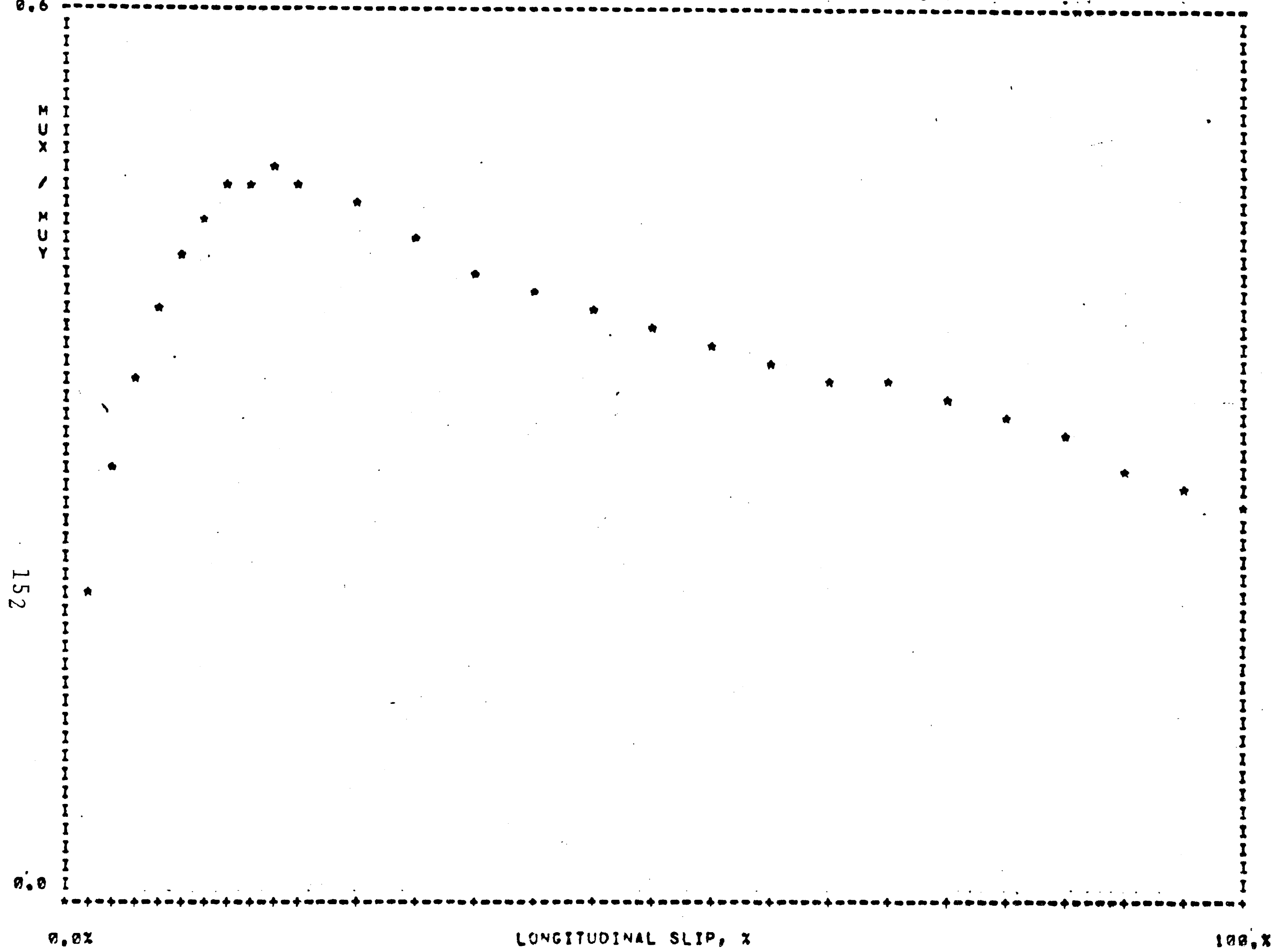
FILE 905.   FIRESTONE DELUXE CHAMPION (B.O.E.-10) H78-14 WET JENNITE



SLIP	FX-LBS
0.00	0.0
0.02	270.0
0.04	372.3
0.06	438.8
0.08	485.8
0.10	518.3
0.12	540.5
0.14	555.1
0.16	564.2
0.18	569.4
0.20	570.8
0.25	570.3
0.30	569.0
0.35	565.4
0.40	557.6
0.45	546.9
0.50	534.4
0.55	519.7
0.60	502.2
0.65	482.8
0.70	463.6
0.75	446.5
0.80	431.7
0.85	417.2
0.90	401.2
0.95	384.4
1.00	366.5

TP= 0.   RUN# 1.   LOAD= 11[illegible]2. LBS.   VEL.= 20. MPH   ALPHA= 0. DEG

FILE 906. FIRESTONE DELUXE CHAMPION (B.O.E.-10) H78-14 WET JENNITE

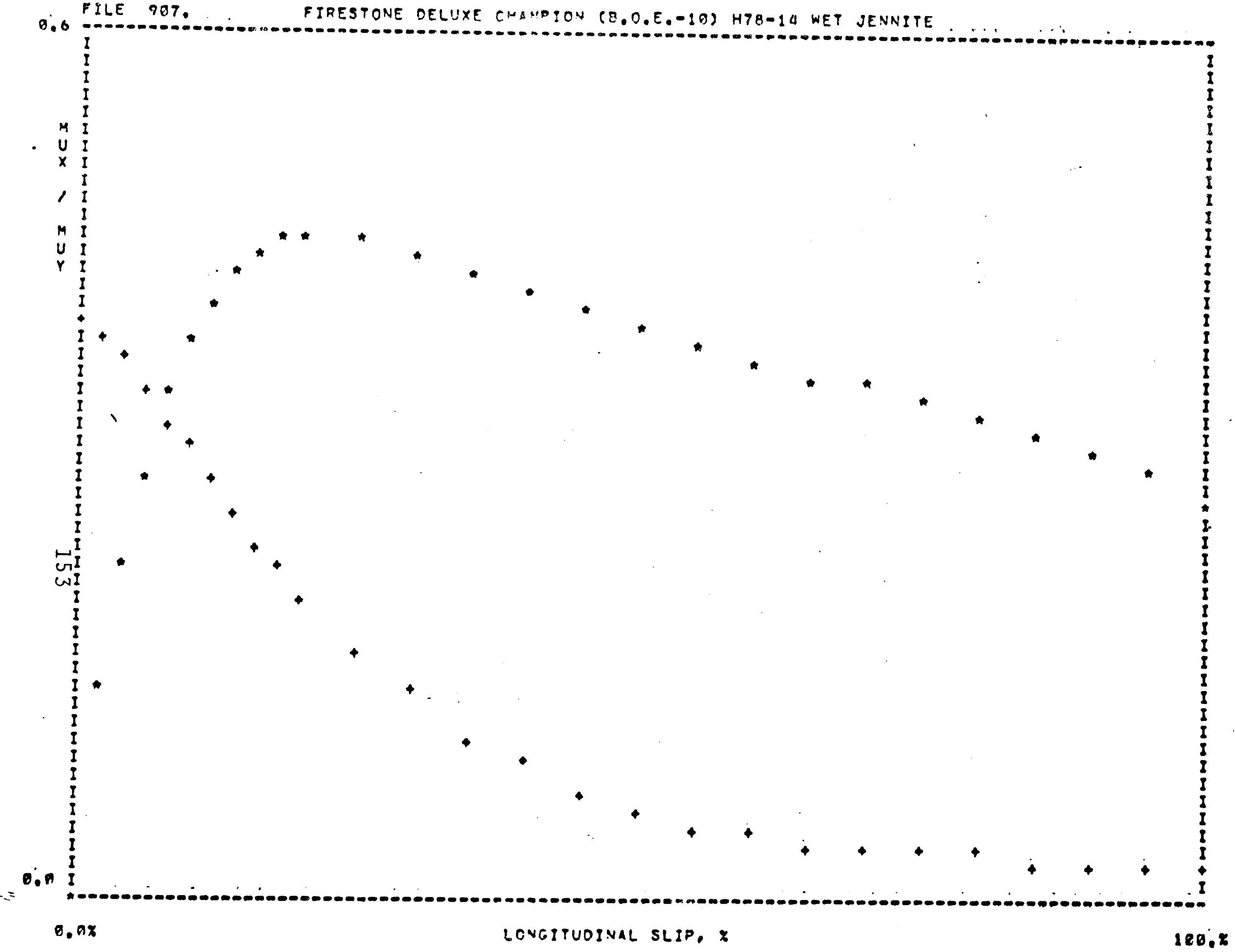


SLIP	FX-LBS
0.00	0.0
0.02	230.9
0.04	325.4
0.06	394.5
0.08	448.1
0.10	488.4
0.12	516.1
0.14	533.5
0.16	543.1
0.18	546.7
0.20	544.3
0.25	524.5
0.30	499.3
0.35	473.9
0.40	453.7
0.45	438.3
0.50	425.5
0.55	415.7
0.60	407.4
0.65	396.2
0.70	384.3
0.75	373.8
0.80	361.5
0.85	346.5
0.90	329.7
0.95	314.1
1.00	301.0

TP- 4. RUN# 2. LOAD= 1170. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 36. PSI

FILE 907. FIRESTONE DELUXE CHAMPION (B.O.E.-10) H78-14 WET JENNITE



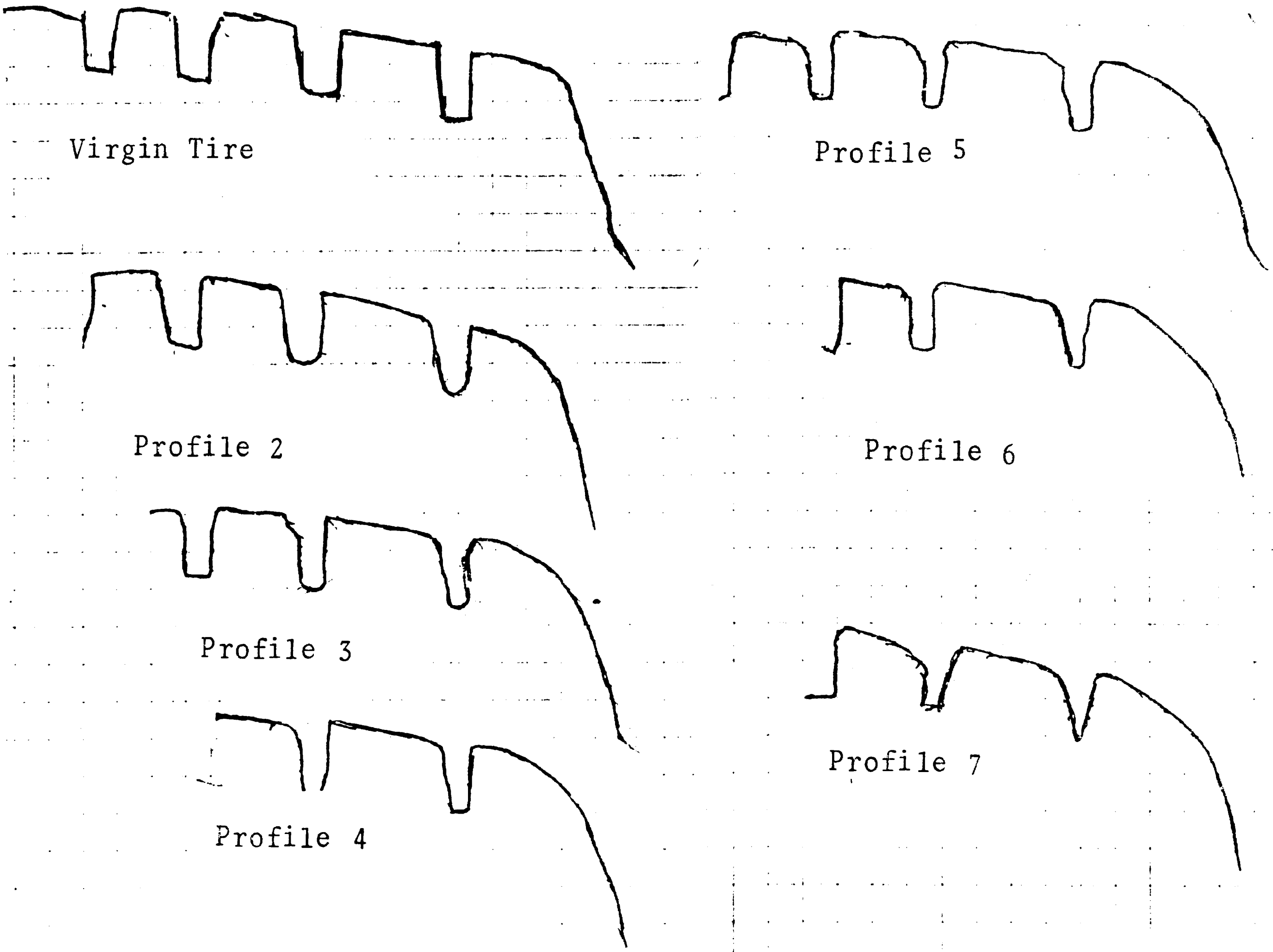
TP= 4. RUN# 3. LOAD= 1182. LBS. VEL.= 40. MPH ALPHA= 4. DEG

TIRE PRESSURE= 36. PSI

SLIP	FX-LBS	FY-LB
0.00	0.0	446.
0.02	163.1	435.3
0.04	255.2	413.1
0.06	328.9	390.
0.08	386.3	367.
0.10	429.9	343.
0.12	460.6	319.
0.14	481.7	295.8
0.16	496.3	273.
0.18	505.9	251.
0.20	510.4	233.
0.25	509.1	193.1
0.30	500.9	157.5
0.35	488.2	127.3
0.40	473.6	103.4
0.45	459.5	85.4
0.50	446.6	71.8
0.55	432.9	60.5
0.60	419.1	50.7
0.65	409.5	43.
0.70	401.9	39.7
0.75	391.6	37.3
0.80	381.3	34.1
0.85	369.9	30.
0.90	353.2	26.
0.95	333.8	23.
1.00	311.1	20.

VIII.E. Lateral Force Shoulder Wear Data, 1100 lbs. Load, 40 mph, Dry Asphalt, 28 psi, Mobile Tire Tester

Wear Cycle	0°	1°	2°	4°	8°	16°	
1	10	185	393	627	807	926	Profile #2 Taken
2	-32	154	314	586	865	976	
3	-35	138	299	577	871	1003	Profile #3 Taken
4	-75	100	295	552	870	1041	Profile #4 Taken
5	-88	95	272	552	877	1030	Profile #5 Taken
6	-118	50	258	560	892	1049	Profile #6 Taken
7	-100	62	273	519	880	1066	Profile #7 Taken



VIII.F. Cornering Stiffness Data from Mobile Tire Tester, Dry Asphalt, 1100 lb. Load

Inflation	Speed	-2°	0°	2°
28 psi	20 mph	375	5	-369
12 psi	3 mph	275	- 2	-241
	10 mph	255	0	-270
	20 mph	270	-12	-260
	30 mph	265	0	-272
	40 mph	275	-15	-258

VIII.G. Screening Data, 1100 lbs. Load, Dry Asphalt, 20 mph, 28 psi, Mobile Tire Tester

	Free-Rolling Lateral Force					0° Braking Force	
Specimen	0°	2°	4°	8°	16°	MBF	LWBF
1	20	419	632	826	890	1017	869
2	0	432	648	828	911	1062	870
3	0	398	646	864	899	1019	854
4	12	404	621	801	937	1045	866
5	10	411	631	849	882	1006	834
6	5	406	622	809	914	1002	846

IX. Firestone 500 H78-14

IX.A.1 Free-Rolling Measurements from the Flat Bed Tire Tester - 10 psi Inflation

a. Lateral Force vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
800	220	108	-10	-148	-259				
1100	210	102	-12	-142	-253				
1400	171	87	- 9	-123	-207				
1700	115	50	- 3	- 77	-142				

b. Aligning Moment vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
800	-36	-22	2	26	38				
1100	-55	-31	3	37	60				
1400	-70	-37	4	46	80				
1700	-84	-42	2	50	91				

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°
800	-67	-43	-10	5	23			
1100	-68	-44	-12	6	21			
1400	-65	-38	- 9	6	20			
1700	-43	-22	- 3	7	27			

IX.B.1 Free-Rolling Measurements from the Flat Bed Tire Tester - 18 psi Inflation

a. Lateral Force vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
800	305	155	-26	-203	-330				
1100	317	154	-23	-199	-340				
1400	306	145	-20	-189	-329				
1700	292	139	-20	-177	-304				

b. Aligning Moment vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
800	-27	-17	12	24	31				
1100	-48	-28	19	37	54				
1400	-68	-36	27	48	75				
1700	-85	-45	35	58	94				

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°
800	-80	-59	-26	1	24			
1100	-85	-57	-23	4	27			
1400	-82	-58	-20	7	26			
1700	-68	-60	-20	6	27			

IX.C.1 Free-Rolling Measurements from t Bed Tire Tester - 26 psi Inflation

a. Lateral Force vs. Slip Angle a d

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
800	334	167	-28	-226	69				
1100	369	177	-32	-248	20				
1400	378	175	-31	-249	36				
1700	369	168	-28	-240	29				

b. Aligning Moment vs. Slip Angle a Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
800	-24	-15	3	21	26				
1100	-42	-24	4	33	45				
1400	-62	-33	5	45	66				
1700	-81	-41	6	55	87				

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°
800	-98	-67	-28	-2	21			
1100	-111	-72	-32	-2	26			
1400	-114	-76	-31	-2	29			
1700	-114	-77	-28	-1	25			

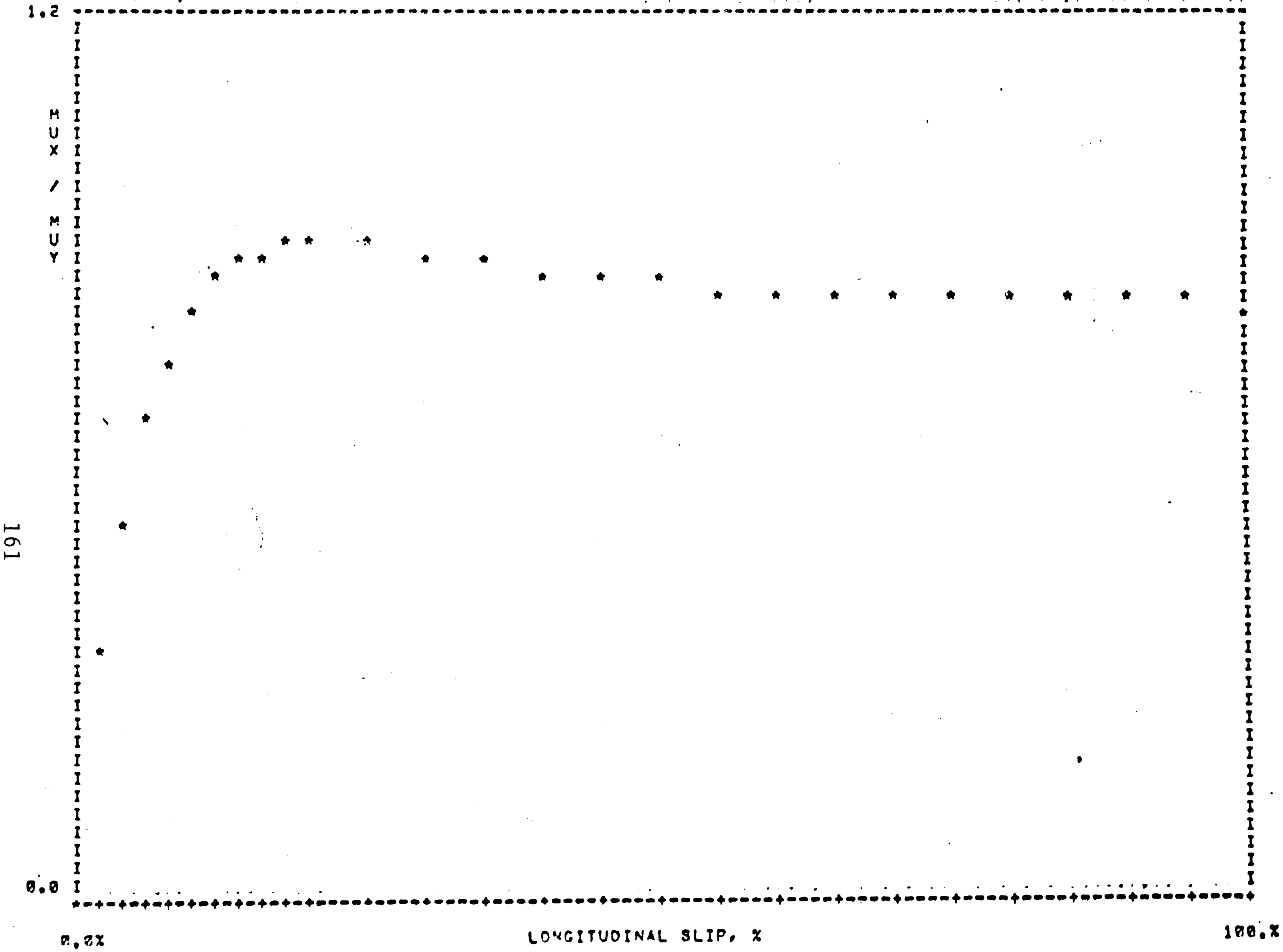
IX.C.2 Free-Rolling Lateral Force Measurements from Mobile Tire Tester - 28 psi Inflation

		Dry Asphalt					Wet Jennite				
Load	Speed	0°	2°	4°	8°	16°	0°	1°	3°	7°	15°
800	40 mph						0	208	386	455	388
	50 mph		436	639	799	886					
1100	20 mph						0	229	442	561	552
	40 mph	-20	410	705	1050	1180	0	203	422	538	465
	40 mph	-42	390	711	1024	1167	0	225	425	501	473
1700	20 mph	45	465	750	1255	1582					
	40 mph						-18	250	498	785	761
	50 mph	40	476	745	1275	1668					

IX.C.3 Braking Data from the Mobile Tire Tester - 28 psi

	Dry Asphalt					Wet Jennite				
	0°				4°	0°				3°
	800 lbs.		1100 lbs.		1100 lbs.	800 lbs.		1100 lbs.		1100 lbs.
	20 mph	40 mph	20 mph	40 mph	40 mph	20 mph	40 mph	20 mph	40 mph	40 mph
MBF				982	970		364	558	498	480
LWBF				888	917		240	344	329	320
MLF					538					409
LWLF					56					34

FILE 1000, FIRESTONE 500 DRY ASPHALT #8

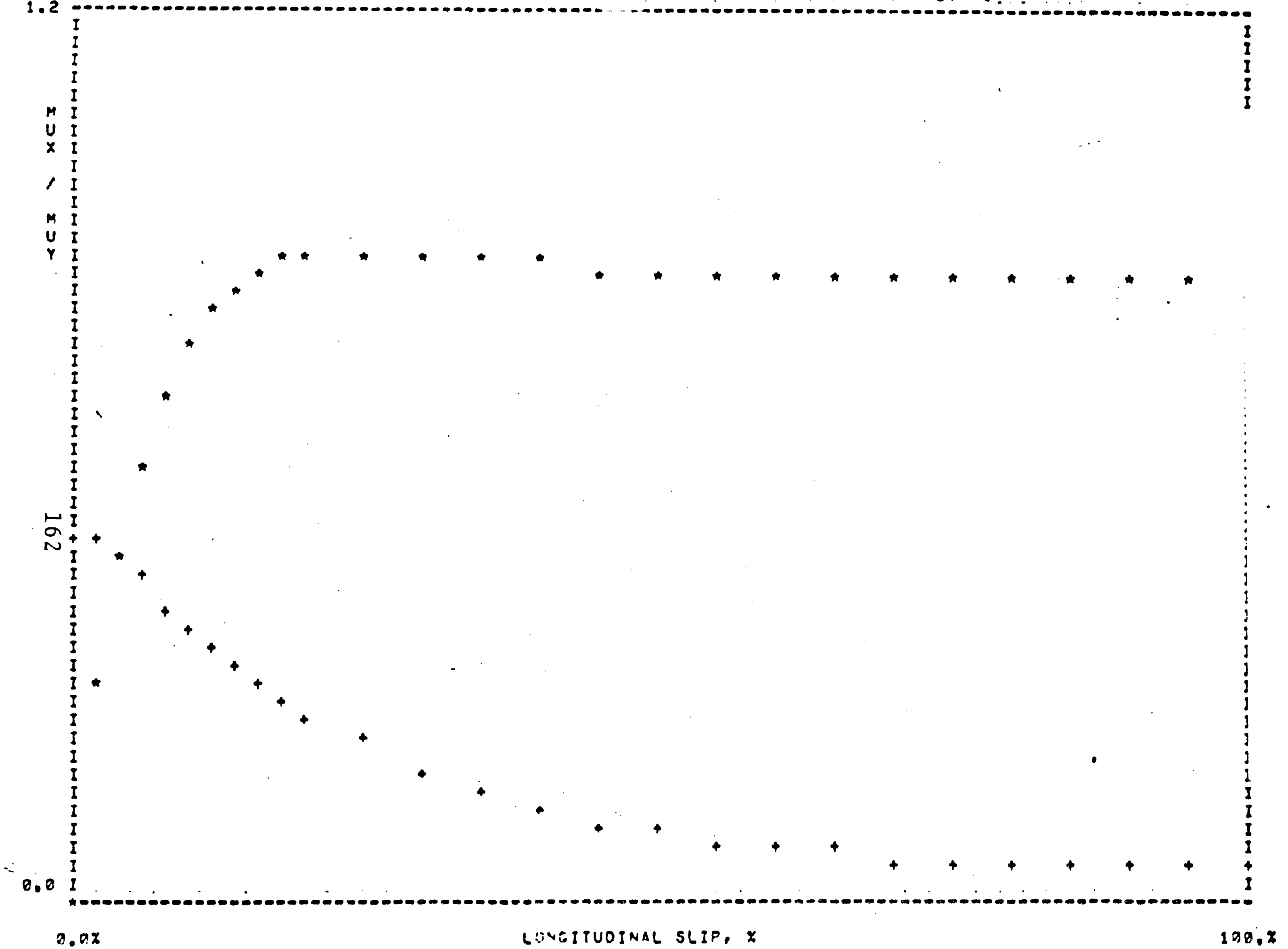


SLIP	FX-LBS
0.00	0.0
0.02	365.8
0.04	564.8
0.06	705.5
0.08	806.0
0.10	874.6
0.12	920.5
0.14	950.6
0.16	969.4
0.18	979.7
0.20	981.7
0.25	975.6
0.30	964.2
0.35	950.8
0.40	937.7
0.45	926.7
0.50	918.8
0.55	913.8
0.60	911.2
0.65	910.5
0.70	910.5
0.75	909.9
0.80	907.7
0.85	902.9
0.90	897.7
0.95	892.6
1.00	887.9

TP= 5. RUN# 117. LOAD= 1102. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 28. PSI

FILE 1001.   FIRESTONE 520   DRY ASPHALT #8

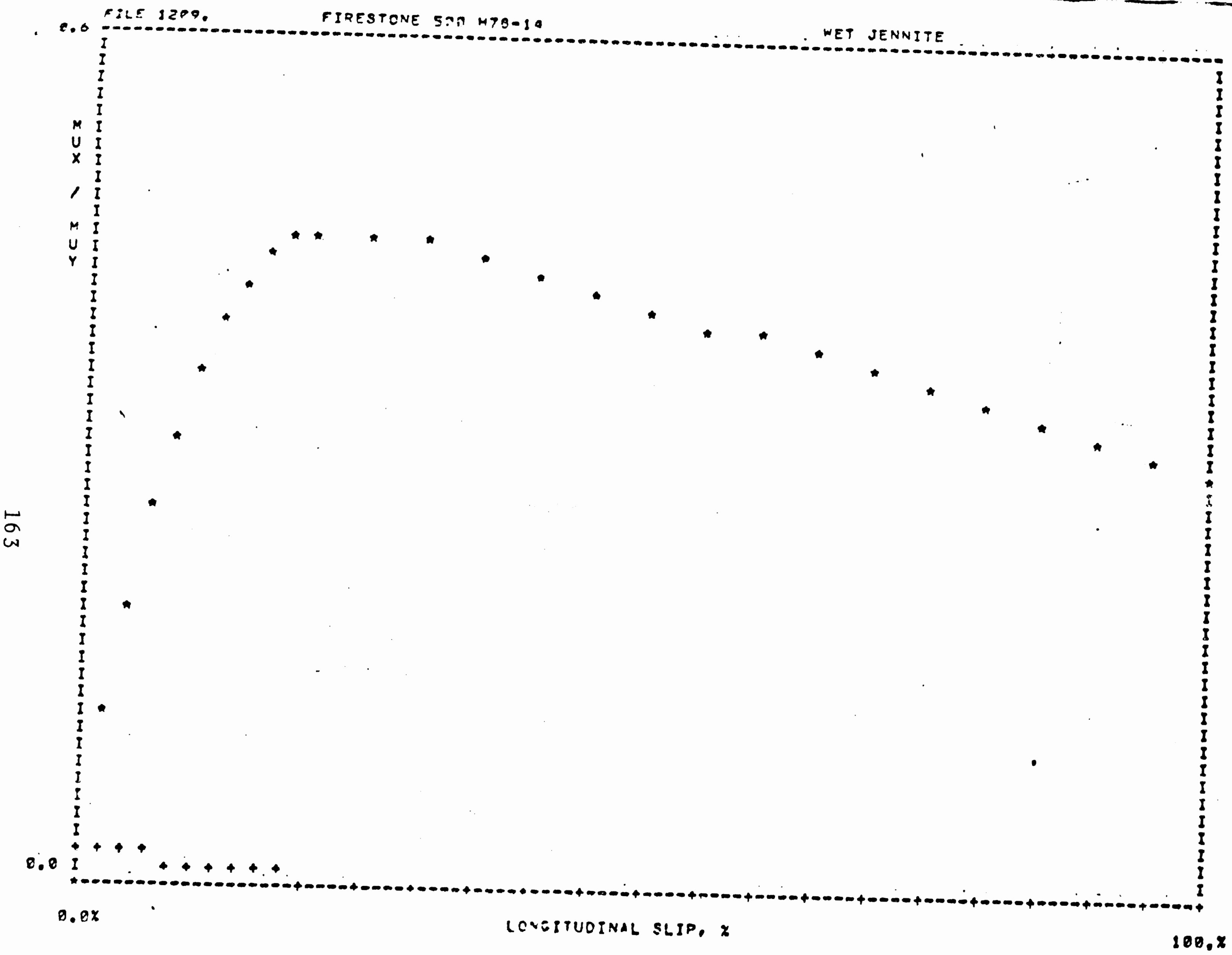


TP- 5.   RUN# 118.   LOAD= 1100. LBS.   VEL.= 40. MPH   ALPHA= 4. DEG

TIRE PRESSURE= 28. PSI

SLIP	FX-LBS	FY-LBS
0.00	0.0	530.4
0.02	324.1	538.5
0.04	513.0	506.3
0.06	651.9	471.0
0.08	753.8	436.4
0.10	826.8	403.1
0.12	877.6	370.2
0.14	912.9	339.9
0.16	936.7	312.6
0.18	952.8	288.4
0.20	961.8	269.3
0.25	970.2	227.1
0.30	967.7	190.2
0.35	958.7	159.1
0.40	948.8	134.[illegible]
0.45	939.5	113.[illegible]
0.50	931.9	97.[illegible]
0.55	928.5	84.[illegible]
0.60	928.1	74.[illegible]
0.65	927.6	67.
0.70	928.1	61.
0.75	928.4	58.
0.80	927.4	56.
0.85	924.1	55.
0.90	921.2	55.
0.95	918.9	56.
1.00	917.4	55.

FILE 1299. FIRESTONE 500 H78-14 WET JENNITE

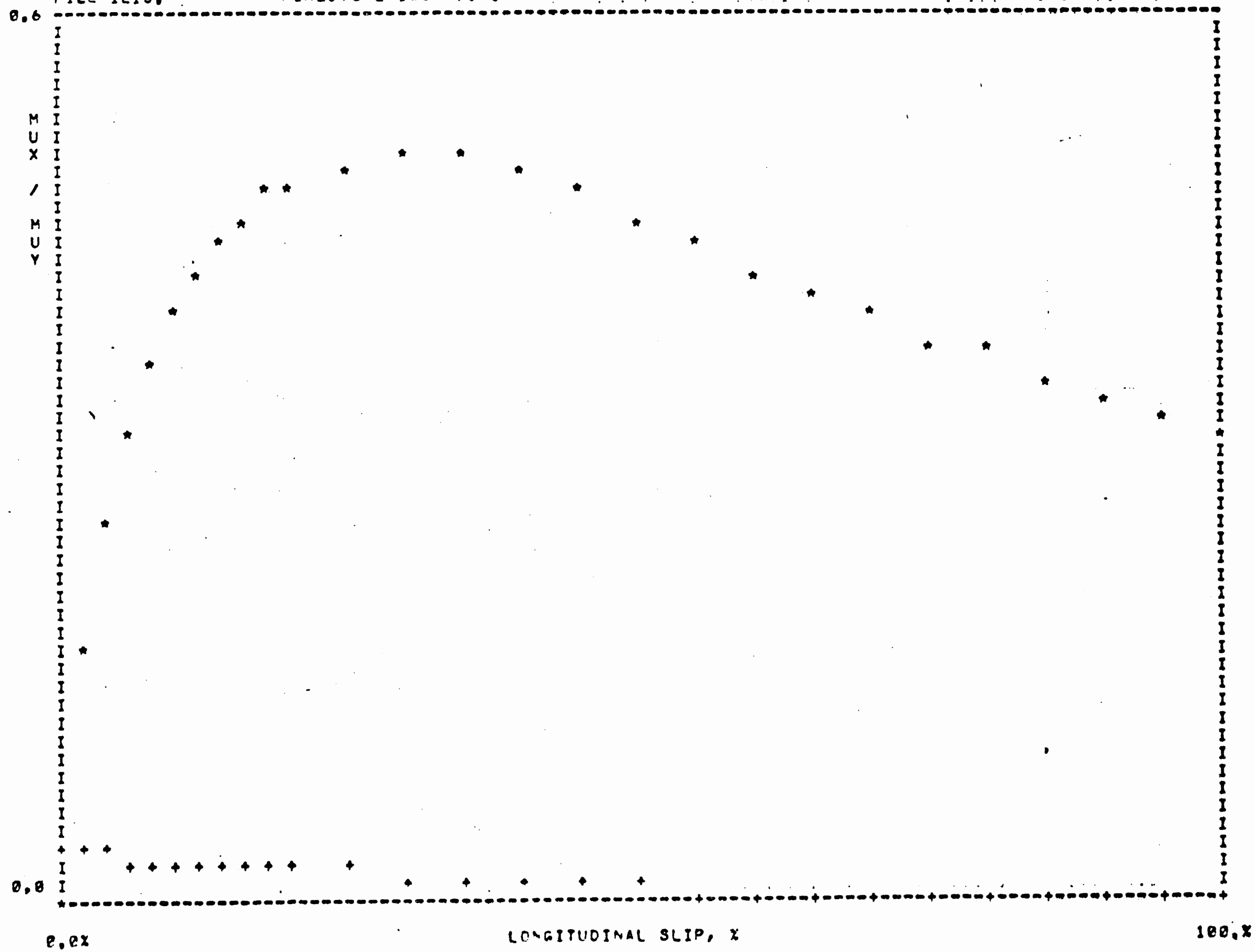


TP- 4. RUN# 351. LOAD= [illegible] LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 28. PSI

SLIP	FX-LBS
0.00	0.0
0.02	97.7
0.04	157.7
0.06	207.4
0.08	249.6
0.10	284.8
0.12	313.3
0.14	335.4
0.16	351.1
0.18	360.8
0.20	364.0
0.25	365.4
0.30	360.5
0.35	351.2
0.40	341.7
0.45	330.1
0.50	327.3
0.55	319.9
0.60	312.8
0.65	305.7
0.70	297.0
0.75	286.3
0.80	275.6
0.85	265.7
0.90	256.5
0.95	247.9
1.00	239.[illegible]

FILE 1216. FIRESTONE 520 H78-14 WET JENNITE

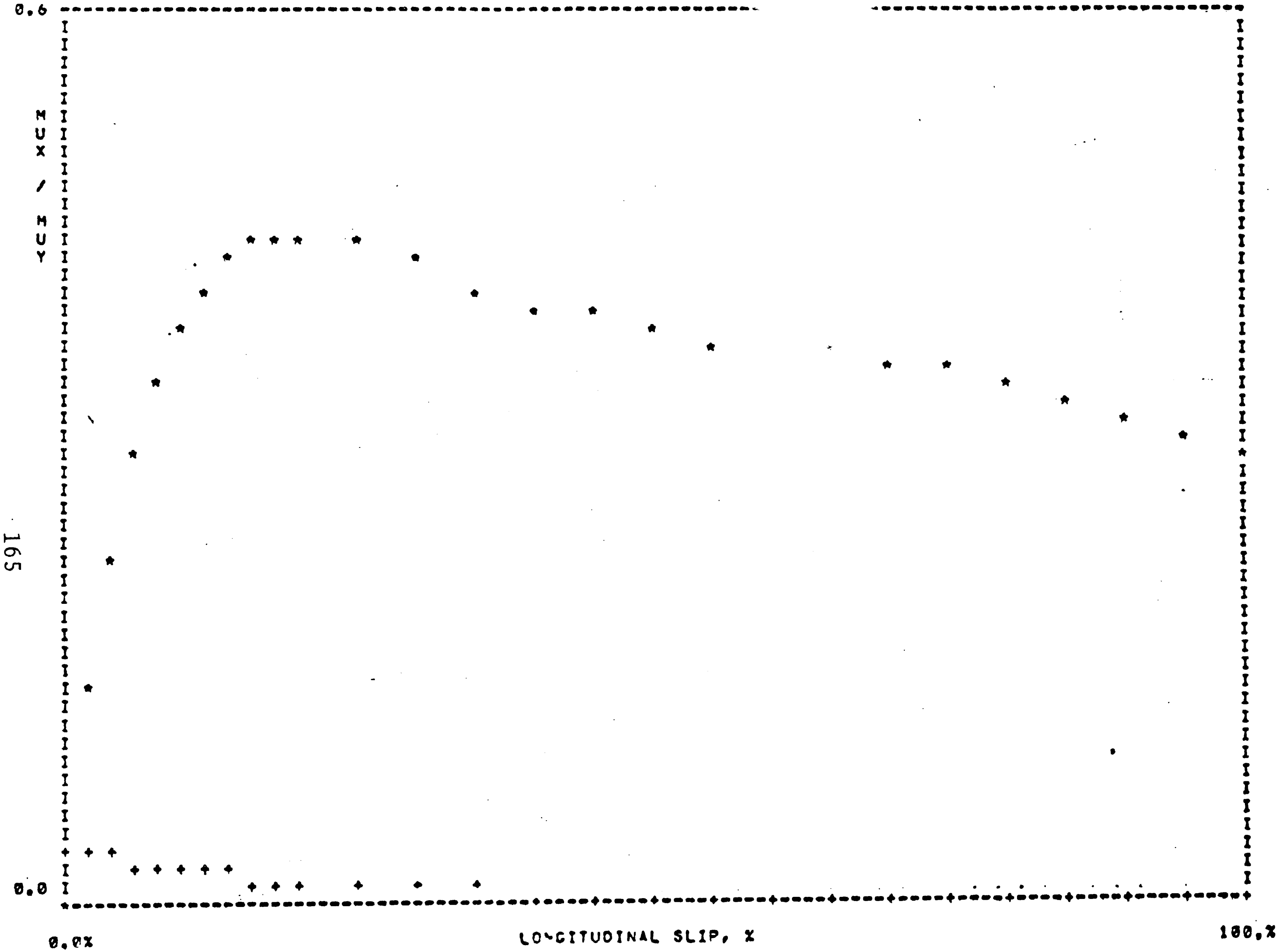


SLIP	FX-LBS
0.00	0.0
0.02	191.8
0.04	280.4
0.06	344.9
0.08	395.7
0.10	435.4
0.12	466.6
0.14	491.5
0.16	511.5
0.18	527.0
0.20	537.3
0.25	551.6
0.30	557.8
0.35	555.2
0.40	545.3
0.45	529.4
0.50	510.0
0.55	489.5
0.60	470.1
0.65	451.8
0.70	434.6
0.75	419.5
0.80	406.2
0.85	392.3
0.90	376.6
0.95	360.5
1.00	344.2

TP= 4. RUN# 358. LOAD= 1100. LBS. VEL.= 20. MPH ALPHA= 0. DEG

TIRE PRESSURE= 28. PSI

FILE 1215.   FIRESTONE 500 H78-14   JENNITE



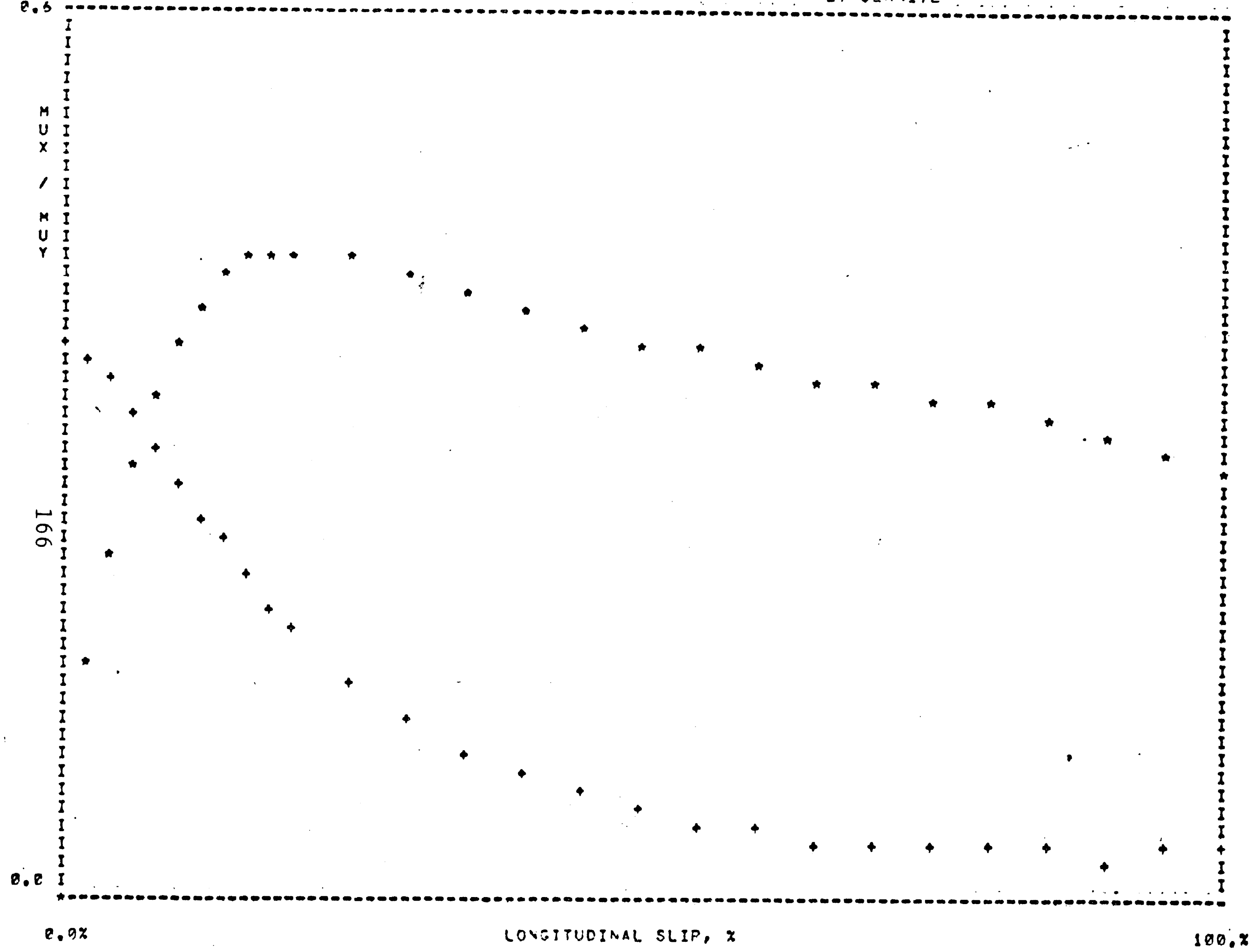
LONGITUDINAL SLIP, %

TP- 4.   RUN# 357.   LOAD= 1124. LBS.   VEL.= 40. MPH   ALPHA= 0. DEG

TIRE PRESSURE= 28. PSI

SLIP	FX-LBS
0.00	0.0
0.02	165.7
0.04	258.1
0.06	329.6
0.08	385.4
0.10	427.1
0.12	456.7
0.14	476.5
0.16	488.6
0.18	495.4
0.20	497.6
0.25	491.6
0.30	477.2
0.35	459.5
0.40	444.9
0.45	435.3
0.50	427.3
0.55	419.0
0.60	411.9
0.65	407.0
0.70	402.4
0.75	394.5
0.80	382.7
0.85	369.9
0.90	356.9
0.95	343.4
1.00	329.1

FILE 1217.　　FIRESTONE 5?? H78-14　　WET JENNITE



SLIP	FX-LBS	FY-L
0.00	0.0	409
0.02	168.8	401
0.04	256.5	381
0.06	323.9	358
0.08	376.1	334
0.10	415.1	309
0.12	443.2	284
0.14	461.8	262
0.16	473.3	238
0.18	479.6	218
0.20	480.4	200
0.25	473.7	163
0.30	462.3	132
0.35	448.3	108
0.40	434.2	92
0.45	422.9	76
0.50	414.1	65
0.55	406.4	57
0.60	398.9	50
0.65	392.0	44
0.70	385.0	40
0.75	376.4	36
0.80	366.1	34
0.85	355.6	33
0.90	340.7	33
0.95	333.1	33
1.00	320.4	34

TP= 4.　　RUN# 359.　　LOAD= 11??. LBS.　　VEL.= 40. MPH　　ALPHA= 3. DEG

TIRE PRESSURE= 28. PSI

IX.D.1 Free-Rolling Measurements from the Flat Bed Tester - 34 psi Inflation

a. Lateral Force vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
800	324	171	-26	-225	-364				
1100	384	194	-33	-265	-437				
1400	412	204	-36	-282	-479				
1700	421	206	-36	-290	-495				

b. Aligning Moment vs. Slip Angle and Load

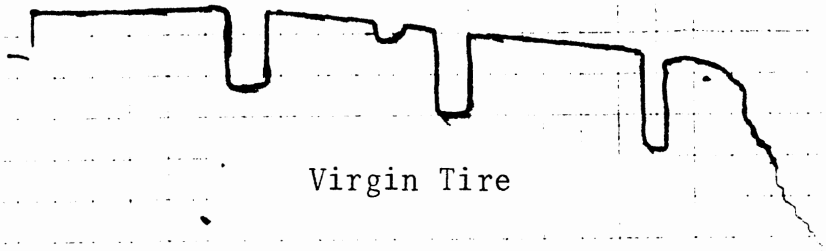
Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
800	-20	-13	2	18	22				
1100	-35	-21	4	29	38				
1400	-52	-30	5	40	58				
1700	-69	-38	6	52	76				

c. Lateral Force vs. Inclination Angle and Load

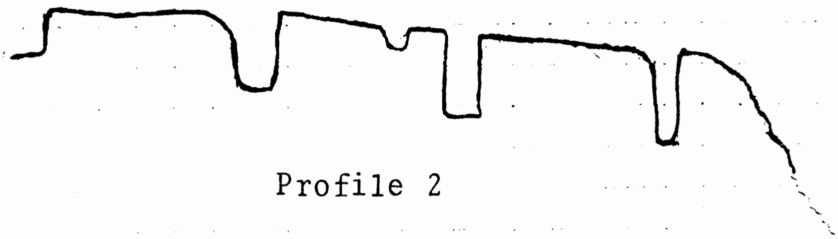
Load	-2°	-1°	0°	1°	2°	4°	6°	8°
800	-86	-59	-26	-5	15			
1100	-113	-75	-33	0	29			
1400	-128	-83	-36	-1	34			
1700	-135	-87	-36	1	39			

IX.E.3 Lateral Force Shoulder Wear Data, 1100 lbs., 40 mph, 28 psi, Dry Asphalt

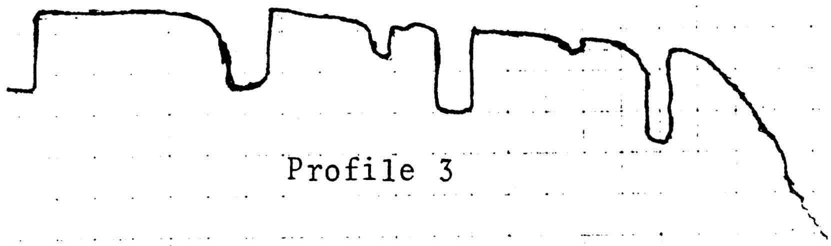
Wear Cycle	0°	2°	4°	8°	16°
1	-25	408	655	800	952
2	-42	354	603	893	1000
3	-42	319	630	894	1002



Virgin Tire



Profile 2



Profile 3

X. Bridgestone 225R-14

X.A.1 Free-Rolling Measu ents from the Flat Bed Tire Tester - 10 psi Inflation

a. Lateral Force vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
800	372	188	1	-182	-378				
1100	352	167	- 9	-181	-386				
1400	312	138	-18	-180	-369				
1700	271	115	-27	-174	-351				

b. Aligning Moment vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
800	- 48	-40	-10	24	38				
1100	- 84	-58	-15	32	62				
1400	-117	-71	-21	41	83				
1700	-145	-86	-25	46	106				

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°
800	-19	- 9	1	16	23			
1100	-36	-24	- 9	4	13			
1400	-52	-39	-18	- 8	5			
1700	-67	-18	-27	-20	3			

X.B.1 Free-Rolling Measurements from the Flat Bed Tire Tester - 18 psi Inflation

a. Lateral Force vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
800	449	266	13	-234	-439				
1100	509	266	10	-249	-497				
1400	520	256	3	-245	-508				
1700	487	227	- 6	-241	-483				

b. Aligning Moment vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
800	- 35	-33	- 6	26	33				
1100	- 64	-50	-10	35	56				
1400	- 97	-67	-14	40	80				
1700	-128	-79	-17	48	100				

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°
800	-25	- 3	13	26	30			
1100	-15	- 6	10	23	31			
1400	-29	-17	3	19	24			
1700	-45	-28	- 6	7	19			

X.C.1 Free-Rolling Measurements from the Flat Bed Tire Tester - 26 psi Inflation

a. Lateral Force vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
800	403	250	16	-219	-403				
1100	496	289	30	-250	-428				
1400	545	256	55	-255	-554				
1700	568	289	75	-262	-540				

b. Aligning Moment vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
800	- 46	- 26	- 8	47	62				
1100	- 92	- 79	-10	65	86				
1400	-145	-117	-16	90	132				
1700	-197	-125	-20	108	164				

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°

X.C.2 Free-Rolling Lateral Force Measurements fr[illegible] Mobile Tire Tester - 28 psi Inflation

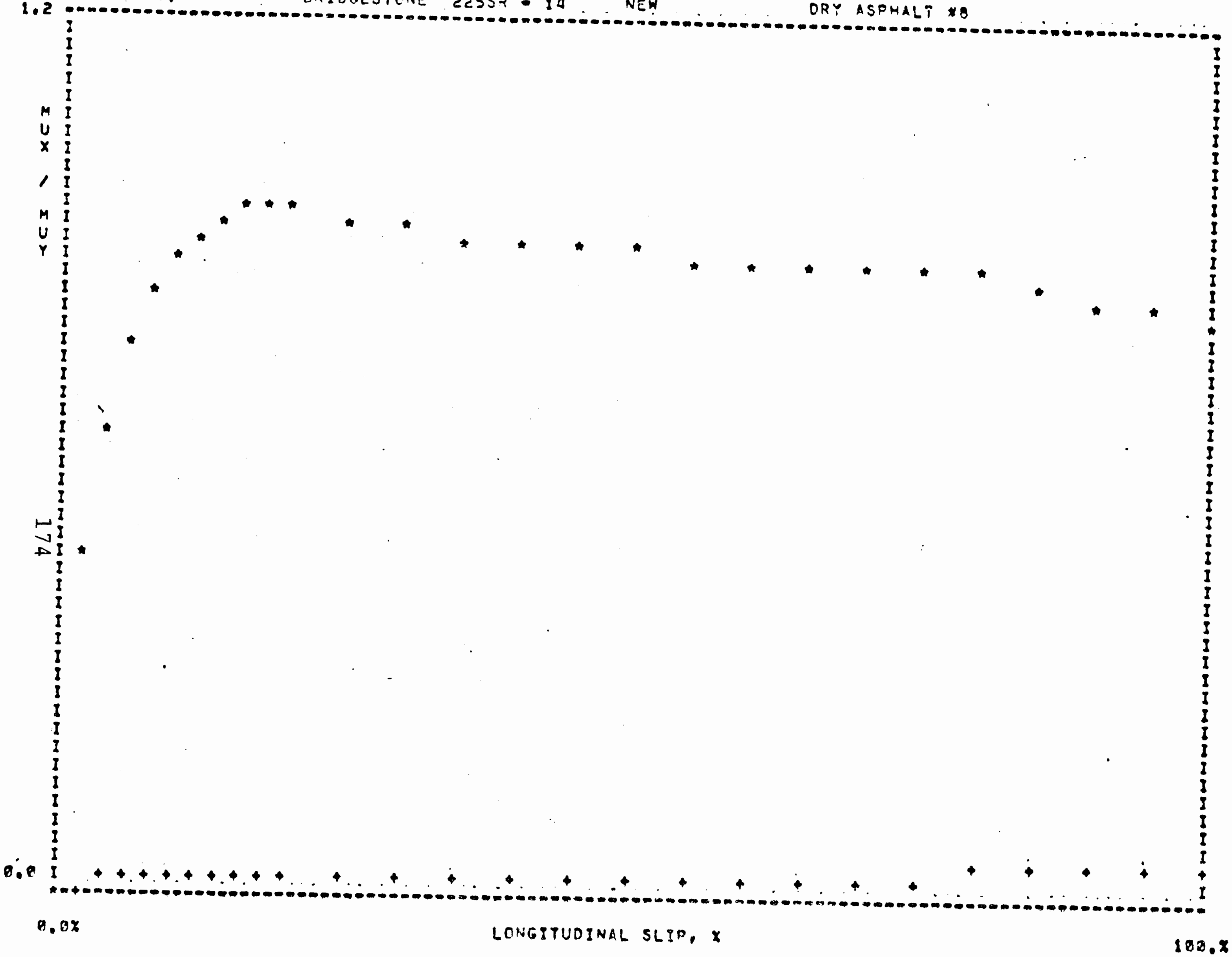
Load	Speed	Dry Asphalt 0°	2°	4°	8°	[illegible]°	Wet Jennite 0°	1°	3°	7°	15°
800	*40 mph	-10	431	654	677	[illegible]3	- 5	210	441	478	502
1100	*20 mph	14	417	770	917	[illegible]24	-18	276	597	589	510
	*40 mph	16	390	709	877	830	-38	238	594	610	483
	*50 mph	0	317	742	864	812	3	315	601	618	375
1700	40 mph	0	567	1135	1379	1442	-25	228	788	836	690

*Dry asphalt data is obtained from μ-slip curves at 0 slip.

X.C.3 Braking Data from the Mobile Tire Tester - 28 psi

	Dry Asphalt					Wet Jennite				
	0°				4°	0°				3°
	800 lbs.		1100 lbs.		1100 lbs.	800 lbs.		1100 lbs.		1100 lbs
	20 mph	40 mph	20 mph	40 mph	40 mph	20 mph	40 mph	20 mph	40 mph	40 mph
MBF		749	1119	1001	987			583	470	468
LWBF		629	820	886	884			353	282	298
MLF					709					509
LWLF					140					30

FILE 90. BRIDGESTONE 225SR - 14 NEW DRY ASPHALT #8

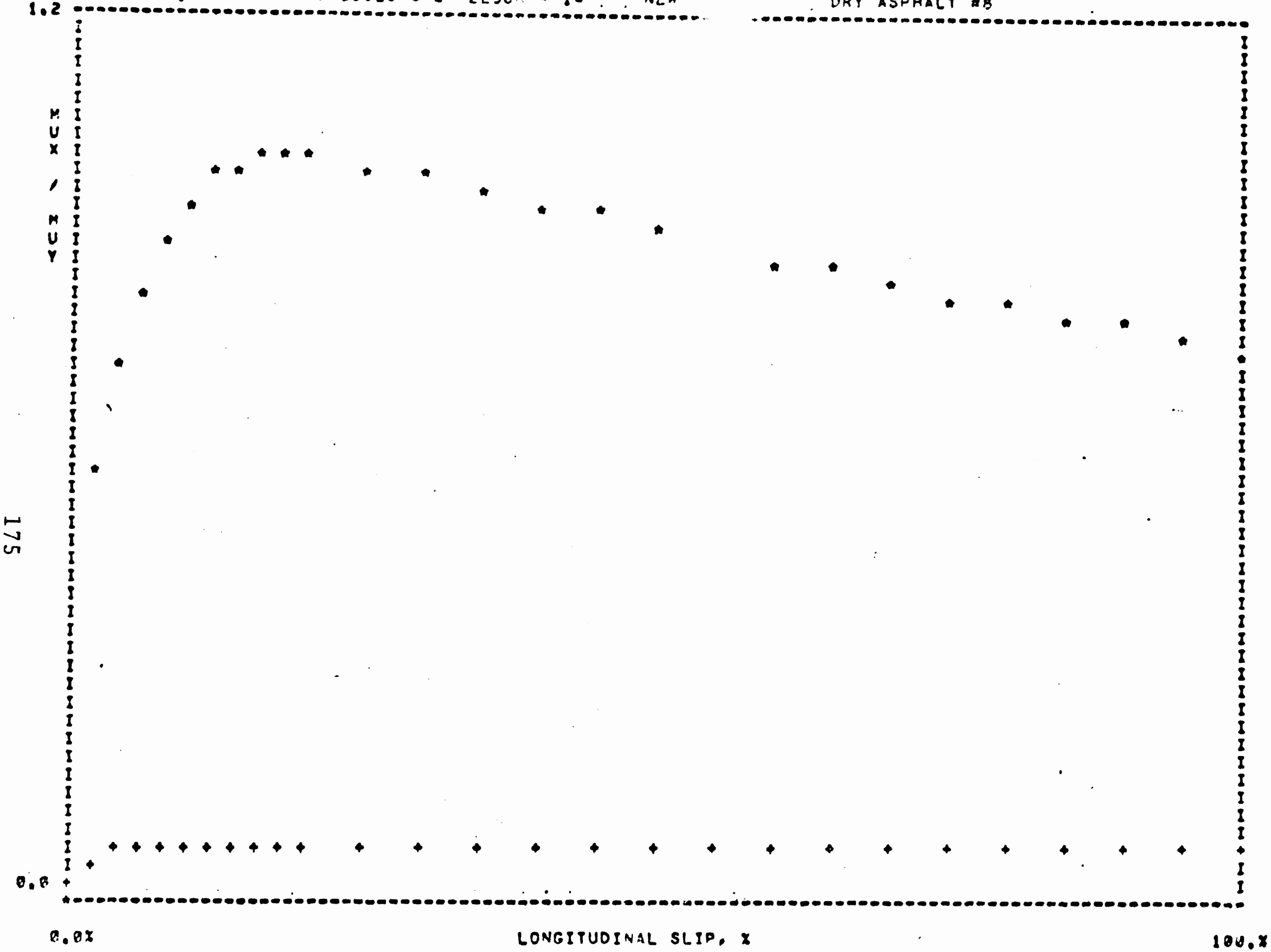


TP= 1. RUN# 95. LOAD= 000. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 28. PSI

SLIP	FX-LBS
0.00	0.0
0.02	370.6
0.04	506.6
0.06	594.7
0.08	654.6
0.10	694.5
0.12	720.5
0.14	736.9
0.16	745.7
0.18	748.6
0.20	746.0
0.25	736.7
0.30	727.7
0.35	719.2
0.40	711.7
0.45	706.6
0.50	703.6
0.55	701.2
0.60	700.5
0.65	701.5
0.70	701.0
0.75	696.1
0.80	687.0
0.85	675.5
0.90	661.9
0.95	646.7
1.00	629.2

FILE 76. BRIDGESTONE 225SR - 14 NEW DRY ASPHALT #8

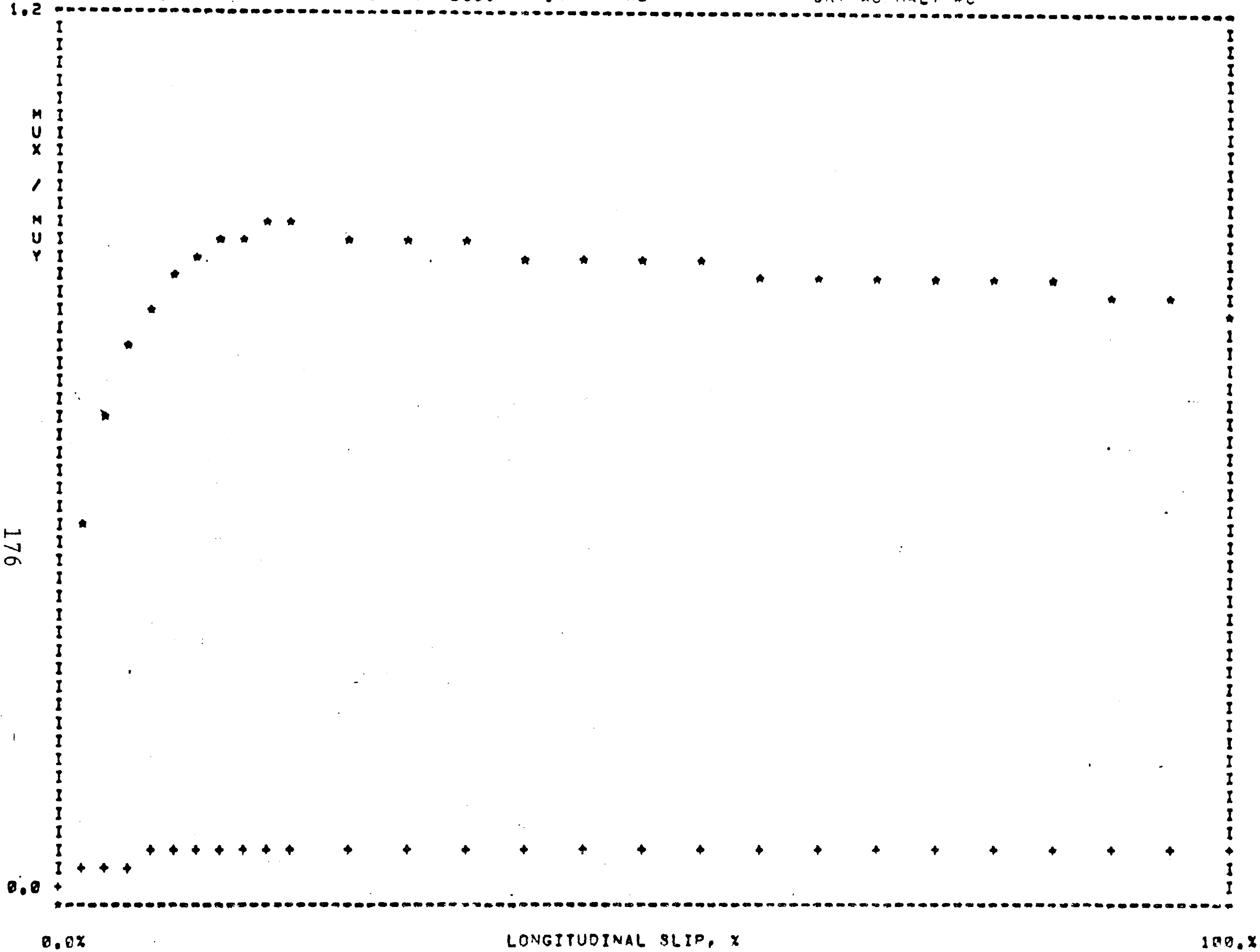


TP= 1. RUN# 81. LOAD= 1100. LBS. VEL.= 20. MPH ALPHA= 0. DEG

TIRE PRESSURE= 28. PSI

SLIP	FX-LBS
0.00	0.0
0.02	645.4
0.04	806.6
0.06	914.5
0.08	990.3
0.10	1043.0
0.12	1078.7
0.14	1101.3
0.16	1113.8
0.18	1119.1
0.20	1117.3
0.25	1102.8
0.30	1084.5
0.35	1064.8
0.40	1045.2
0.45	1025.8
0.50	1006.4
0.55	987.8
0.60	969.8
0.65	952.1
0.70	934.7
0.75	918.0
0.80	902.3
0.85	886.7
0.90	868.2
0.95	846.3
1.00	819.7

FILE 75. BRIDGESTONE 225SR - 14 NEW DRY ASPHALT #8

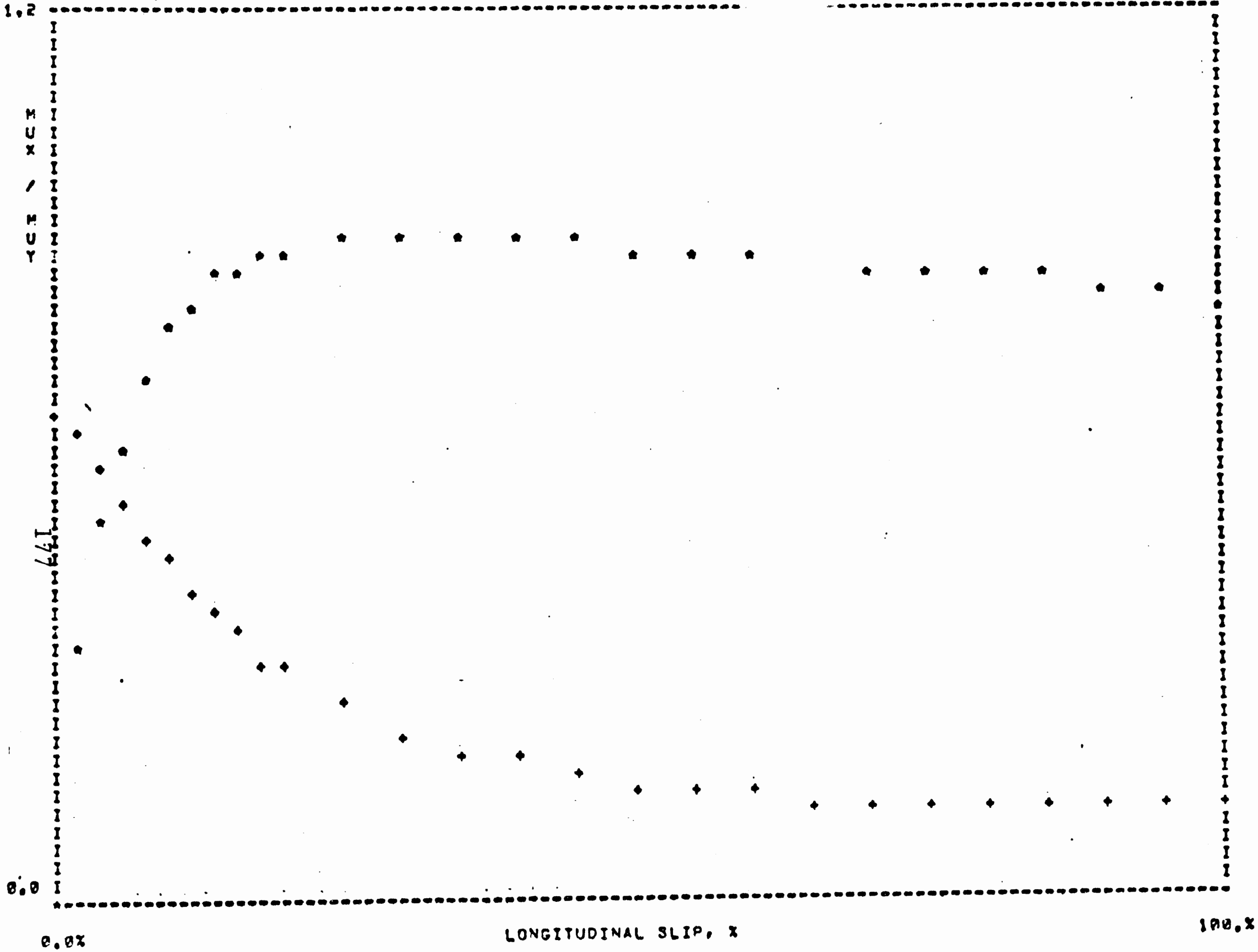


TP= 1. RUN# 80. LOAD= 1102. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 28. PSI

SLIP	FX-LBS
0.00	0.0
0.02	570.4
0.04	724.4
0.06	822.2
0.08	889.1
0.10	934.9
0.12	965.4
0.14	984.8
0.16	995.9
0.18	1000.7
0.20	999.3
0.25	991.0
0.30	982.1
0.35	974.3
0.40	969.4
0.45	966.0
0.50	960.7
0.55	953.1
0.60	945.0
0.65	938.2
0.70	934.2
0.75	932.1
0.80	928.4
0.85	921.9
0.90	912.9
0.95	901.3
1.00	886.1

FILE 81. BRIDGESTONE 225SR - 14 NEW ASPHALT #6

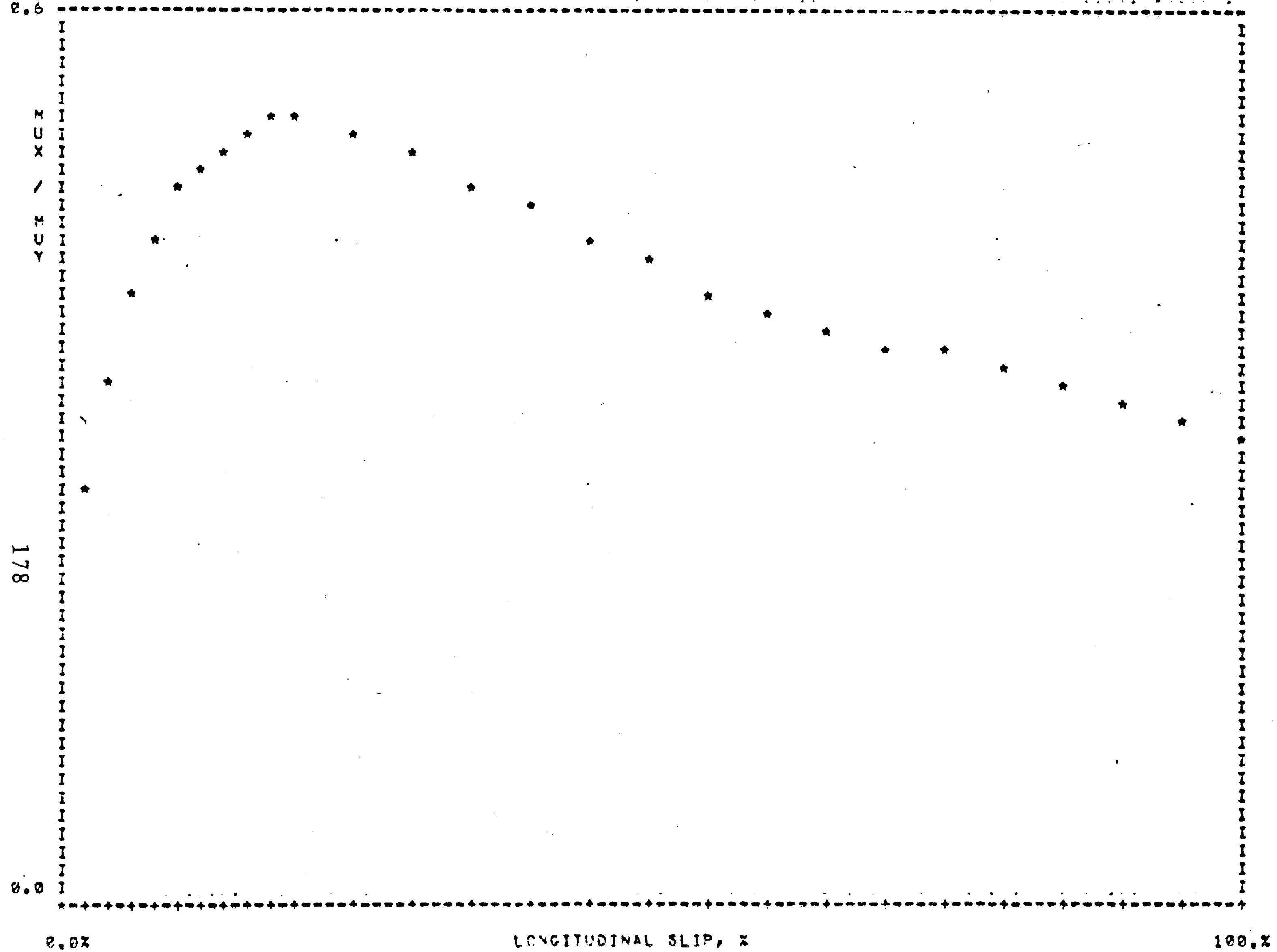


SLIP	FX-LBS	FY-LBS
0.00	0.0	709.2
0.02	368.6	681.7
0.04	549.6	637.3
0.06	679.2	589.7
0.08	774.2	543.2
0.10	842.6	500.0
0.12	891.0	460.6
0.14	924.4	424.5
0.16	946.8	390.9
0.18	961.6	360.1
0.20	969.1	334.3
0.25	978.9	287.1
0.30	985.0	250.5
0.35	987.4	222.6
0.40	984.8	202.0
0.45	977.8	186.2
0.50	969.0	172.6
0.55	959.6	161.0
0.60	951.4	151.7
0.65	945.0	144.3
0.70	939.7	138.5
0.75	934.6	134.7
0.80	929.0	133.2
0.85	921.1	133.6
0.90	910.3	135.5
0.95	898.0	137.8
1.20	884.1	140.4

TP- 1. RUN# 86. LOAD= 1100. LBS. VEL.= 40. MPH ALPHA= 4. DEG

TIRE PRESSURE= 28. PSI

FILE 1153.   BRIDGESTONE 225SR/13   WET JENNITE

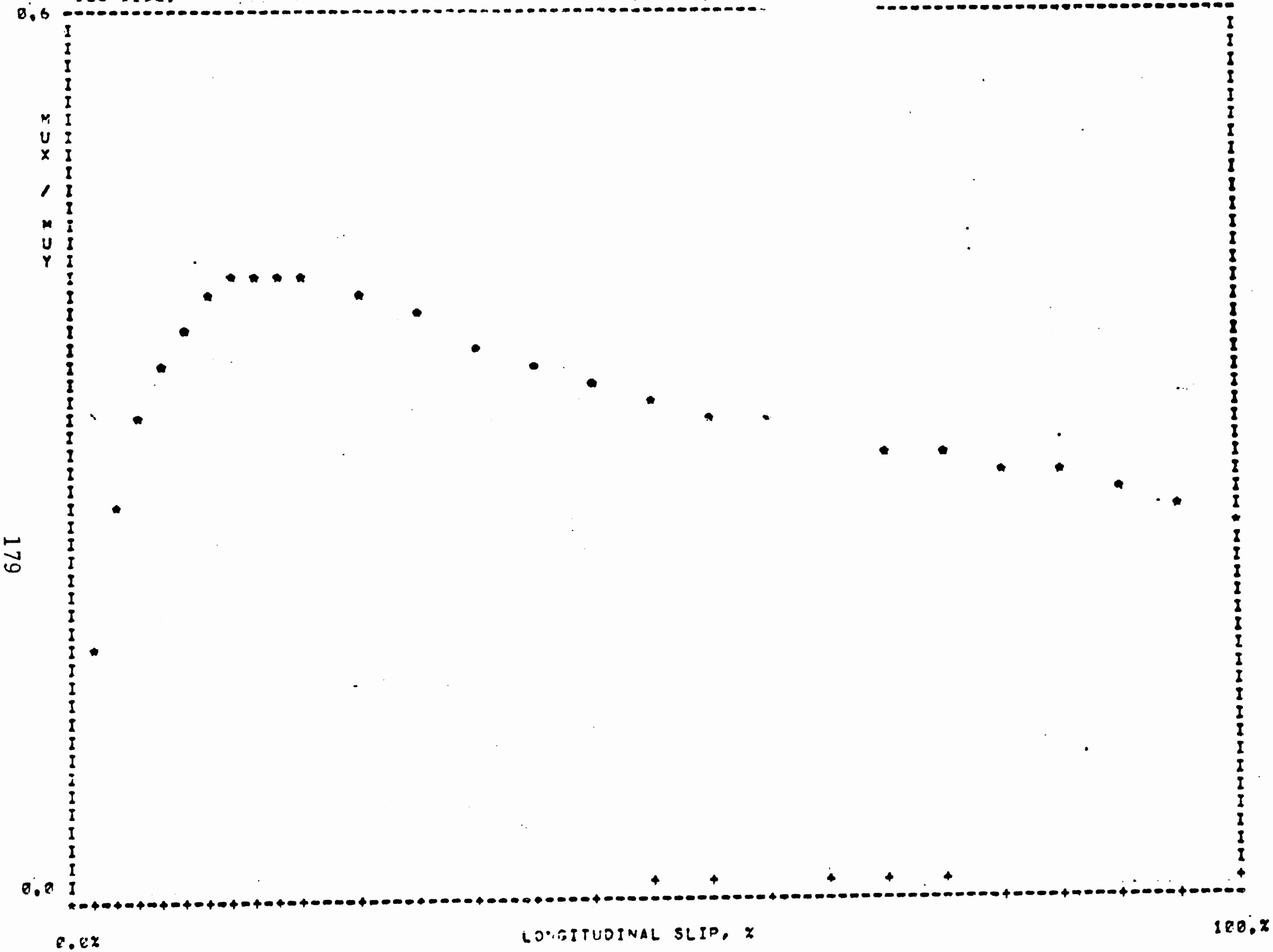


SLIP	FX-LBS
0.00	0.0
0.02	307.2
0.04	392.9
0.06	453.7
0.08	498.4
0.10	530.6
0.12	553.2
0.14	568.2
0.16	578.[illegible]
0.18	583.4
0.20	583.1
0.25	572.4
0.30	557.1
0.35	538.4
0.40	518.4
0.45	498.1
0.50	478.3
0.55	459.9
0.60	443.0
0.65	429.6
0.70	418.7
0.75	409.8
0.80	401.5
0.85	392.2
0.90	380.3
0.95	367.3
1.00	353.1

TP- 4.   RUN# 291.   LOAD= 1100. LBS.   VEL.= 20. MPH   ALPHA= 0. DEG

TIRE PRESSURE= 28. PSI

FILE 1152. BRIDGESTONE 225SR/14 TENNITE

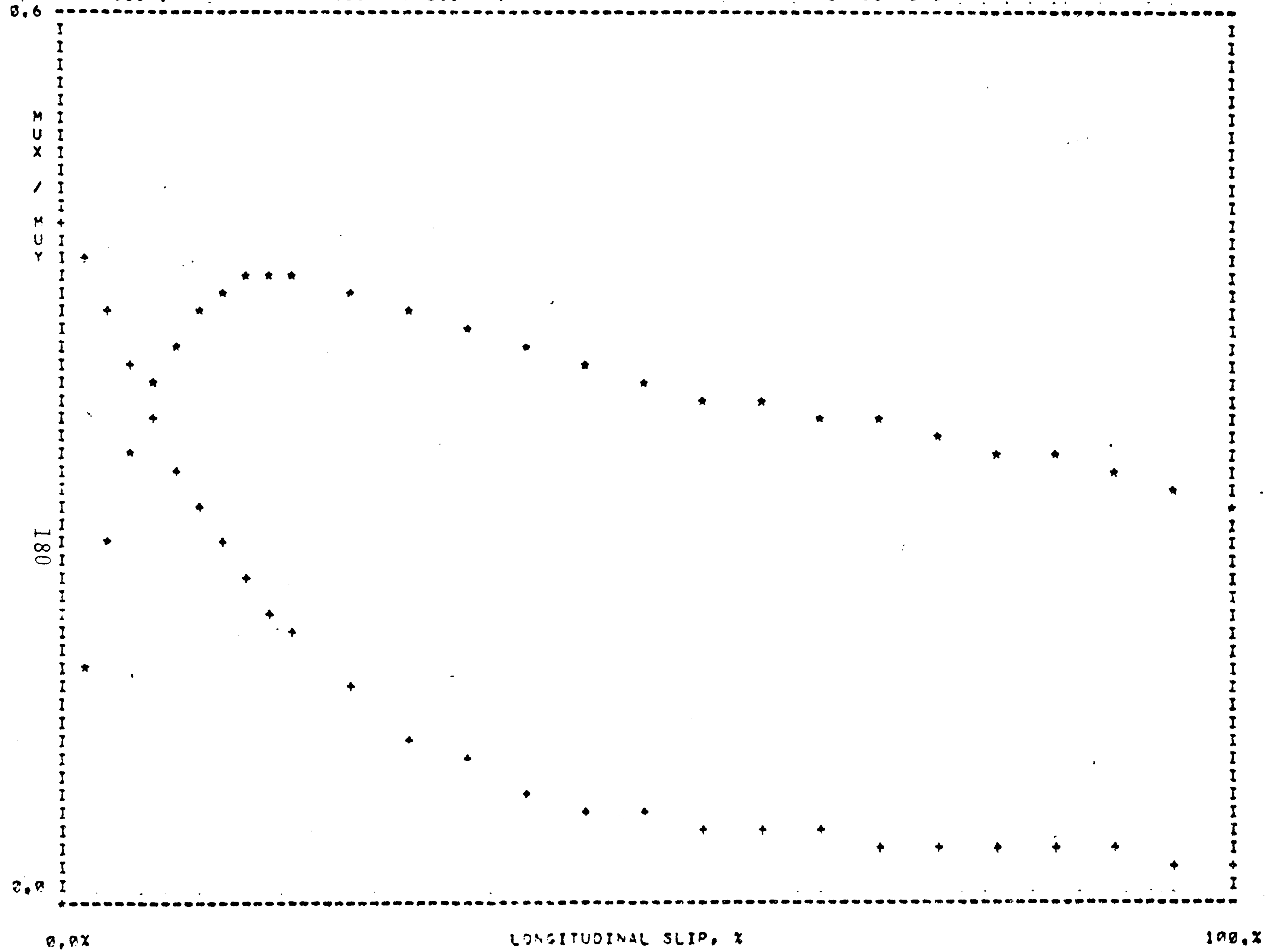


SLIP	FX-LBS
0.00	0.0
0.02	190.3
0.04	290.2
0.06	356.6
0.08	402.8
0.10	434.8
0.12	453.7
0.14	468.6
0.16	469.5
0.18	470.3
0.20	466.8
0.25	452.5
0.30	435.4
0.35	417.2
0.40	407.0
0.45	385.1
0.50	372.9
0.55	363.0
0.60	354.8
0.65	347.3
0.70	339.5
0.75	331.8
0.80	323.8
0.85	314.7
0.90	304.0
0.95	293.6
1.00	282.2

TP= 4. RUN# 290. LOAD= 1100. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 28. PSI

FILE 1154,   BRIDGESTONE 225SR/14   WET JENNITE



TP= 4,   RUN# 292,   LOAD= [illegible] LBS,   VEL.= 40, MPH   ALPHA= 3, DEG

TIRE PRESSURE= 28, PSI

SLIP	FX-LBS	FY-L
0.00	0.0	509
0.02	174.2	481
0.04	270.9	436
0.06	337.6	396
0.08	386.0	358
0.10	420.0	324,
0.12	442.3	293,
0.14	456.1	265,
0.16	464.1	239,
0.18	467.8	216,
0.20	466.9	196,
0.25	456.9	157,
0.30	443.1	126,
0.35	427.9	102,
0.40	413.3	84,
0.45	400.2	72,
0.50	388.4	64,
0.55	378.0	57,
0.60	369.6	53,
0.65	362.8	49,
0.70	356.6	46,
0.75	349.8	44,
0.80	341.8	41.
0.85	332.2	38.
0.90	321.3	35.
0.95	310.0	32.
1.00	298.1	30.

180

X.D.1 Free-Rolling Measurements from the Flat Bed Tire Tester - 34 psi Inflation

a. Lateral Force vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
800	444	254	9	-242	-446				
1100	575	325	17	-296	-569				
1400	662	364	18	-331	-652				
1700	702	375	14	-340	-690				

b. Aligning Moment vs. Slip Angle and Load

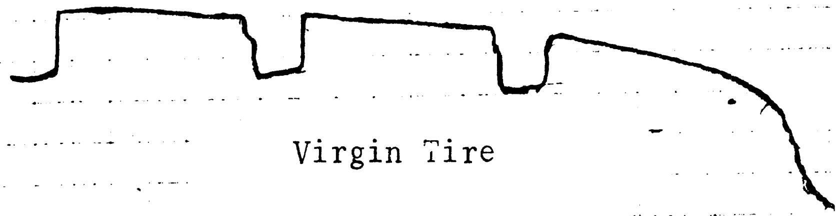
Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
800	-22	-19	- 1	16	22				
1100	-44	-35	- 4	27	42				
1400	-70	-50	- 7	38	63				
1700	-96	-66	-10	45	84				

c. Lateral Force vs. Inclination Angle and Load

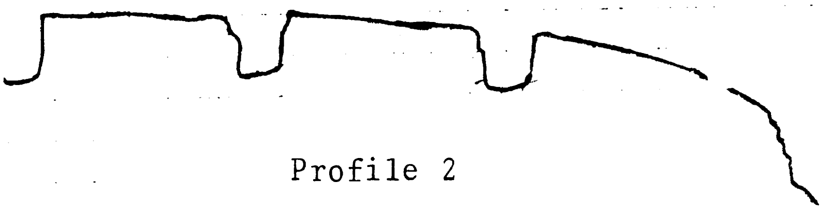
Load	-2°	-1°	0°	1°	2°	4°	6°	8°
800	- 3	4	9	15	19			
1100	- 2	8	17	25	31			
1400	- 5	7	18	30	41			
1700	-12	-2	14	30	44			

X.E.3 Lateral Force Shoulder Wear Data, 1100 lbs., 40 mph, 28 psi, Dry Asphalt

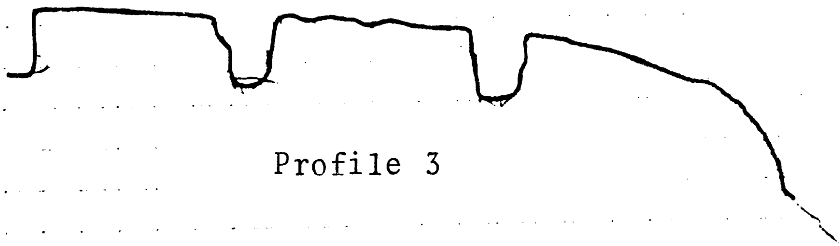
Wear Cycle	0°	2°	4°	8°	16°	
1	-87	450	791	882	831	
2	-100	417	759	902	843	Profile #2 Taken
3	-95	321	793	917	830	Profile #3 Taken



Virgin Tire



Profile 2



Profile 3

lted Jumbo H78-14

XI.A.1 Free-Rolling Measurements from the Flat Bed Tire Tester - 10 psi Inflation

a. Lateral Force vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
800	194	94	-3	-102	-196				
1100	184	89	-1	- 91	-183				
1400	175	88	0	- 81	-168				
1700	131	78	1	- 53	-109				

b. Aligning Moment vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
800	- 48	-29	0	32	50				
1100	- 70	-38	-1	41	73				
1400	- 89	-47	-1	49	91				
1700	-106	-57	-2	60	101				

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°
800	-44	-19	-3	11	36			
1100	-47	-18	-1	16	46			
1400	-48	-17	0	23	56			
1700	-51	-17	1	24	62			

XI.B.1 Free-Rolling Measurements from the F ... :d Tire Tester - 18 psi Inflation

a. Lateral Force vs. Slip Angle and Lc

Load	-2°	-1°	0°	1°		4°	8°	12°	18°
800	294	155	-6	-161	-2				
1100	286	144	-6	-147	-2				
1400	267	131	-5	-135	-2[illegible]				
1700	251	125	-4	-122	-246				

b. **Aligning Moment vs. Slip Angle and Load**

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
800	-36	-26	0	29	39				
1100	-61	-38	0	42	65				
1400	-82	-47	1	52	88				
1700	-99		2	59	104				

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°
800	-70	-32	-6	12	50			
1100	-70	-32	-6	14	51			
1400	-70	-32	-5	16	53			
1700	-65	-31	-4	21	59			

XI.C.1 Free-Rolling Measurements from the Flat Bed Tire Tester - 26 psi Inflation

a. Lateral Force vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
800	329	181	- 8	-200	-346				
1100	362	186	- 9	-208	-373				
1400	356	177	-10	-199	-363				
1700	337	162	-10	-184	-342				

b. Aligning Moment vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
800	-28	-21	0	24	31				
1100	-51	-33	1	38	54				
1400	-73	-44	2	51	79				
1700	-94	-53	2	61	101				

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°
800	-80	-41	- 8	15	55			
1100	-93	-48	- 9	15	62			
1400	-96	-48	-10	16	62			
1700	-95	-47	-10	16	64			

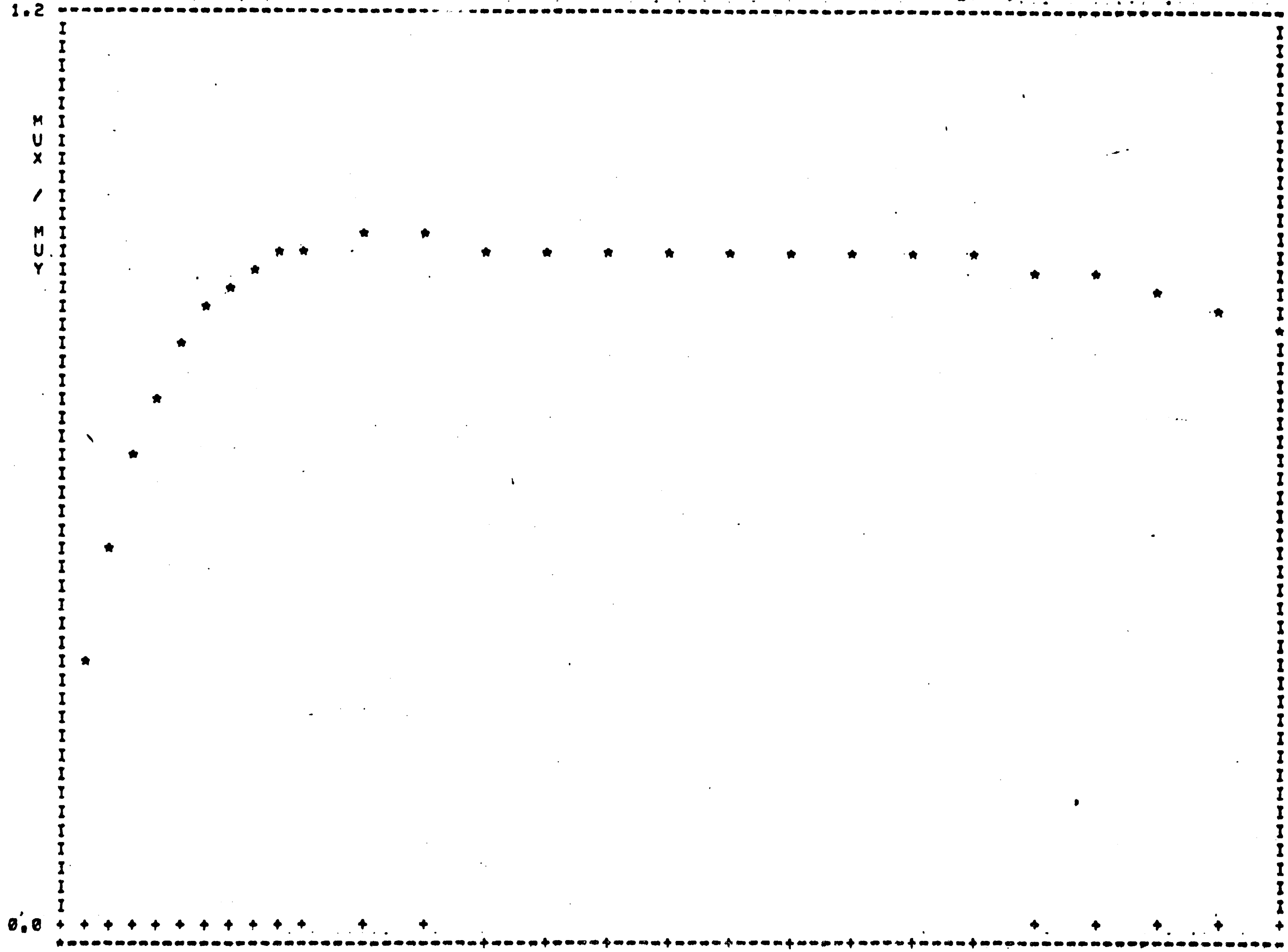
XI.C.2 Free-Rolling Lateral Forc urements from Mobile Tire Tester - 28 psi Inflation

		Dry Asphal					Wet Jennite				
Load	Speed	0°	2°	4°	8°	16°	0°	1°	3°	7°	15°
800	40 mph	13	292	52	82	822	-13	124	320	458	417
1100	20 mph	48	463	735	42	1062	32	182	426	594	62
	40 mph	36	463	729	00	1012	12	171	430	541	54
	50 mph	40	440	725	16	1062	26	171	392	512	476
1700	40 mph	-42	272	623	8	1518	25	161	478	757	81

XI.C.3 Braking Data from the Mobile Tire Tester - 28 psi

	Dry Asphalt					Wet Jennite				
	0°				4°	0°				3°
	800 lbs.		1100 lbs.		1100 lbs.	800 lbs.		1100 lbs.		1100 lbs
	20 mph	40 mph	20 mph	40 mph	40 mph	20 mph	40 mph	20 mph	40 mph	40 mph
MBF		730	1113	1061	765		431	597	492	504
LWBF		650	875	972	740		253	366	315	299
MLF					528					430
LWLF					68					50

FILE 318. GENERAL BELT JUMBO H78-14 DRY ASPHALT #8

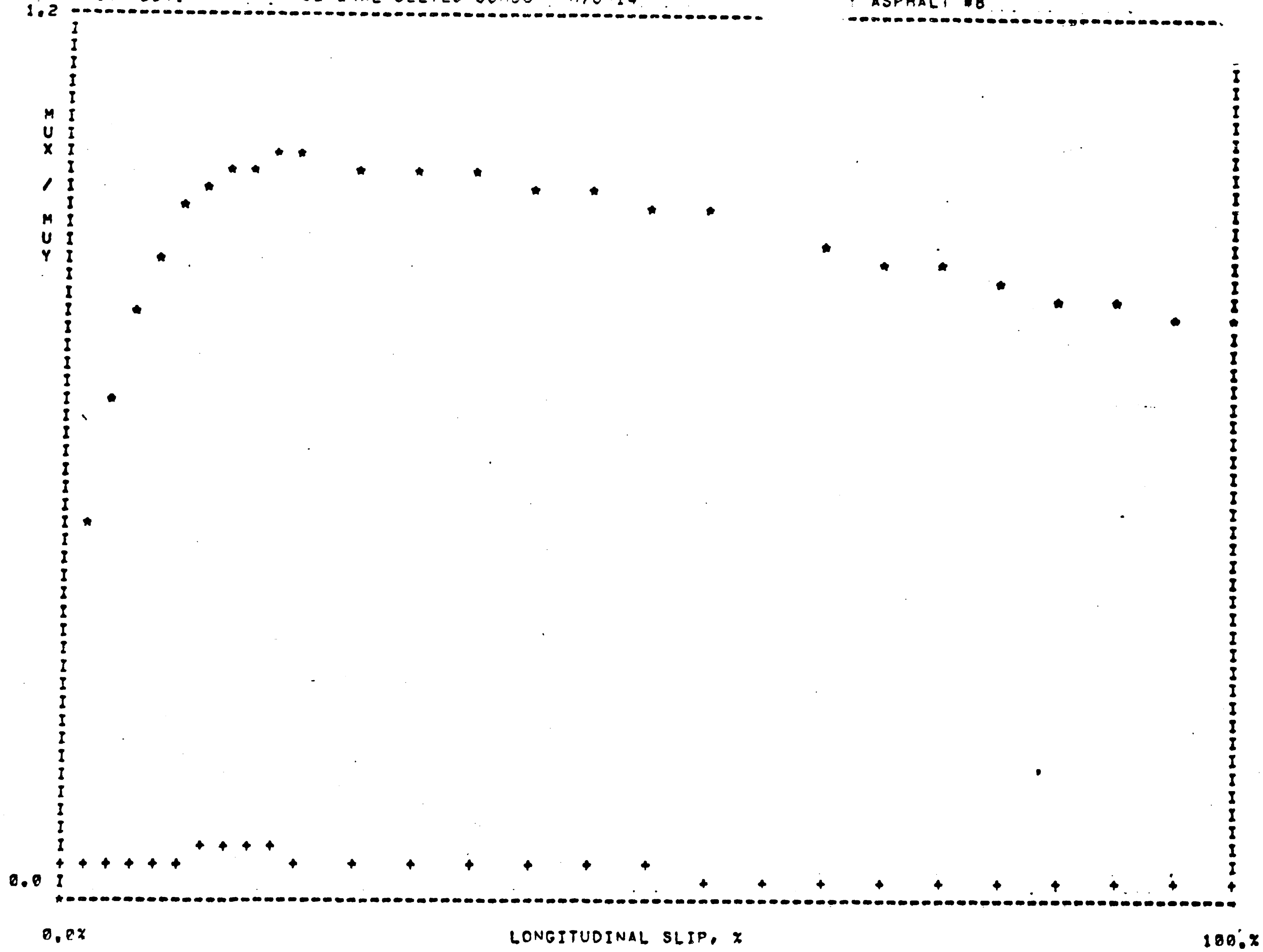


SLIP	FX-LBS
0.00	0.0
0.02	286.2
0.04	411.0
0.06	501.5
0.08	569.8
0.10	621.1
0.12	659.6
0.14	687.5
0.16	706.7
0.18	719.0
0.20	724.2
0.25	728.9
0.30	728.6
0.35	724.4
0.40	719.2
0.45	716.3
0.50	715.1
0.55	714.4
0.60	716.9
0.65	720.4
0.70	719.5
0.75	714.3
0.80	705.7
0.85	693.0
0.90	678.2
0.95	663.7
1.00	650.2

TP= 2. RUN# 147. LOAD= 800. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 28. PSI

FILE 359. GENERAL BELTED JUMBO H78-14 Y ASPHALT #8

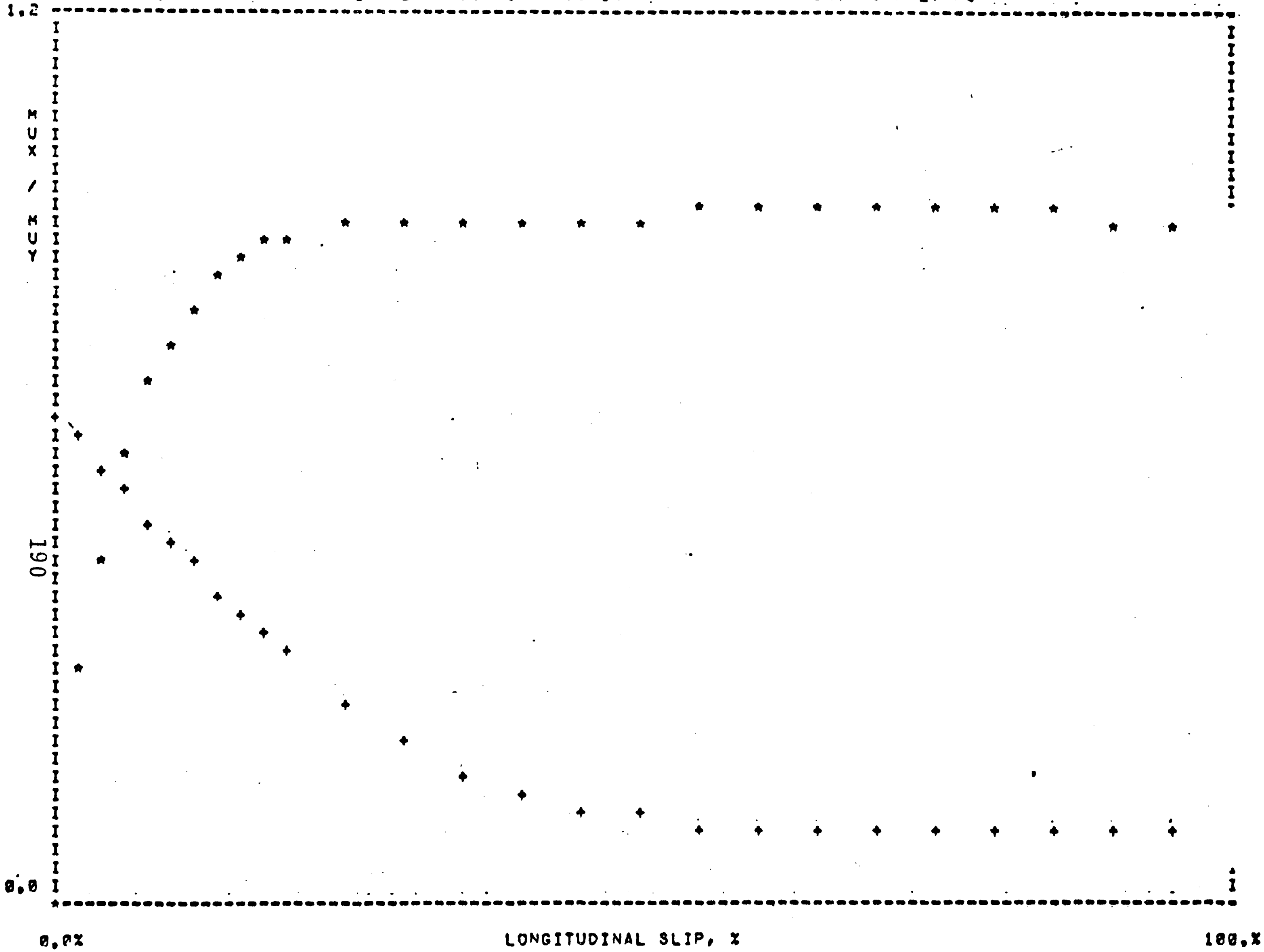


TP- 2. RUN# 193. LOAD= 1100. LBS. VEL.= 20. MPH ALPHA= 0. DEG

TIRE PRESSURE= 28. PSI

SLIP	FX-LBS
0.00	0.0
0.02	549.7
0.04	746.2
0.06	878.6
0.08	969.1
0.10	1029.5
0.12	1067.4
0.14	1090.4
0.16	1103.7
0.18	1110.7
0.20	1112.6
0.25	1107.3
0.30	1097.6
0.35	1086.8
0.40	1076.5
0.45	1064.7
0.50	1049.1
0.55	1029.5
0.60	1008.4
0.65	988.1
0.70	970.2
0.75	954.1
0.80	938.3
0.85	921.7
0.90	905.2
0.95	889.5
1.00	874.9

FILE 324. GENERAL BELTED JUMBO H78-14 DRY ASPHALT #8

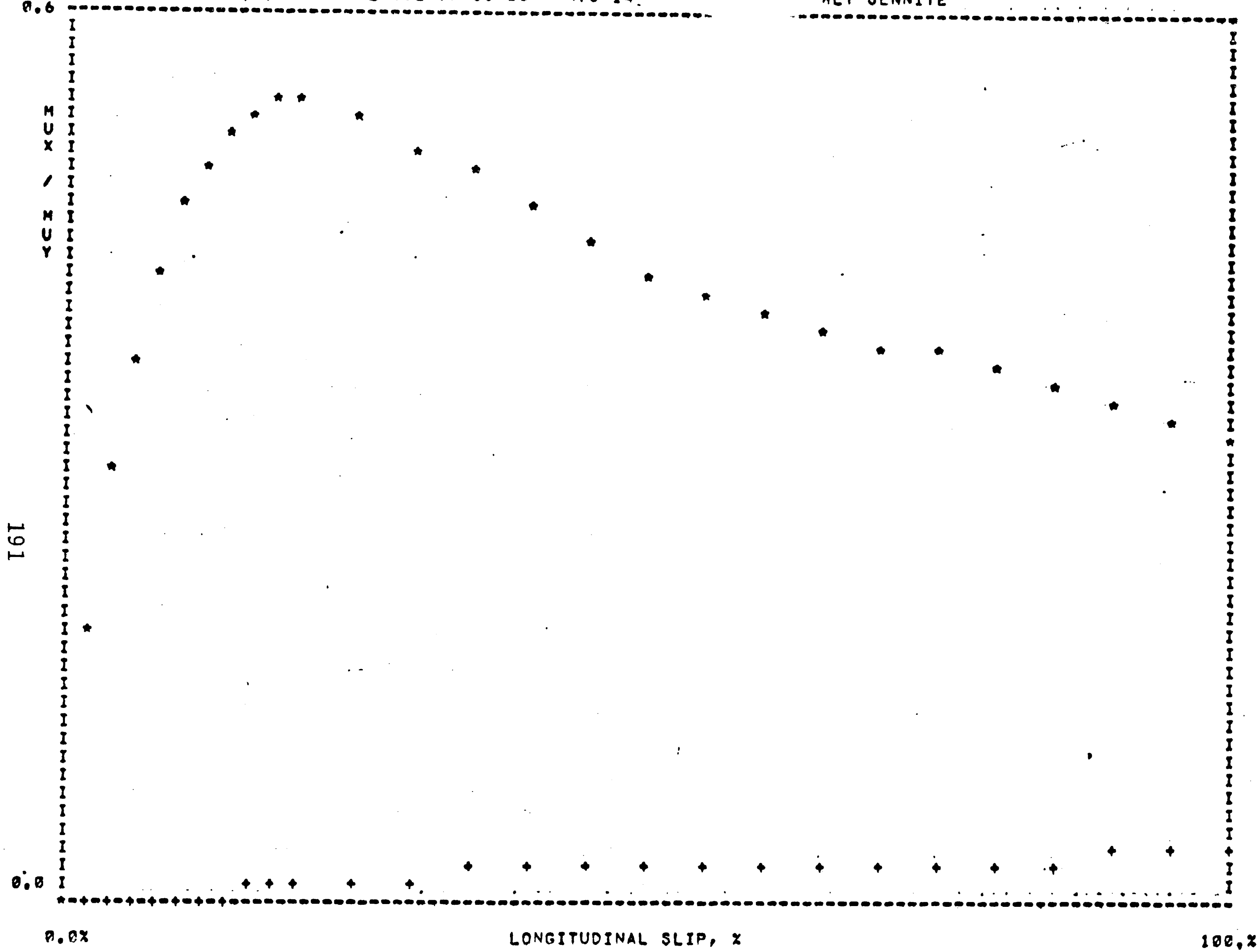


SLIP	FX-LBS	FY-LBS
0.00	0.0	527.1
0.02	246.4	505.8
0.04	379.4	476.1
0.06	480.0	446.9
0.08	554.8	415.4
0.10	609.7	386.0
0.12	650.5	361.4
0.14	681.3	338.8
0.16	703.7	314.4
0.18	717.9	288.0
0.20	723.9	264.6
0.25	732.6	219.5
0.30	734.7	178.7
0.35	734.1	145.7
0.40	737.2	122.0
0.45	741.5	104.9
0.50	745.8	93.0
0.55	751.0	85.5
0.60	756.2	80.9
0.65	760.1	78.2
0.70	764.4	77.0
0.75	764.9	76.5
0.80	759.2	75.6
0.85	752.6	73.5
0.90	746.8	71.2
0.95	742.3	69.2
1.00	739.8	67.8

TP= 2. RUN# 153. LOAD= 800. LBS. VEL.= 40. MPH ALPHA= 4. DEG

TIRE PRESSURE= 28. PSI

FILE 269. GENERAL BELTED JUMBO H78-14 WET JENNITE

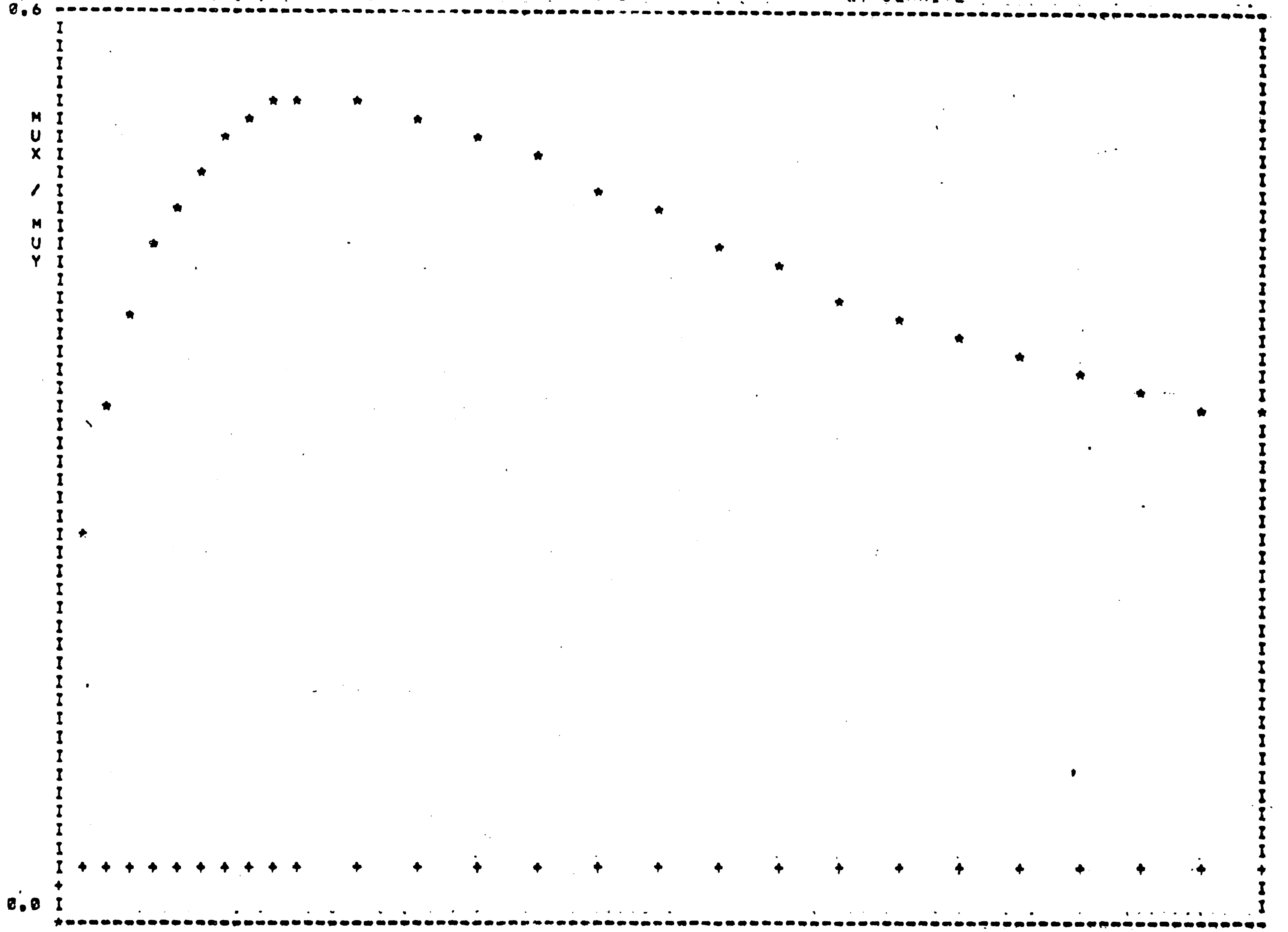


TP= 2. RUN# 95. LOAD= 800. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 28. PSI

SLIP	FX-LBS
0.00	0.0
0.02	143.8
0.04	227.2
0.06	290.2
0.08	338.3
0.10	373.7
0.12	398.8
0.14	415.7
0.16	426.0
0.18	430.7
0.20	430.2
0.25	420.2
0.30	407.3
0.35	391.3
0.40	371.9
0.45	352.6
0.50	338.3
0.55	329.3
0.60	321.2
0.65	311.9
0.70	303.5
0.75	296.8
0.80	288.8
0.85	278.6
0.90	269.1
0.95	260.4
1.00	252.7

FILE 253. GENERAL BEL[illegible] JUMBO H78-14 WET JENNITE

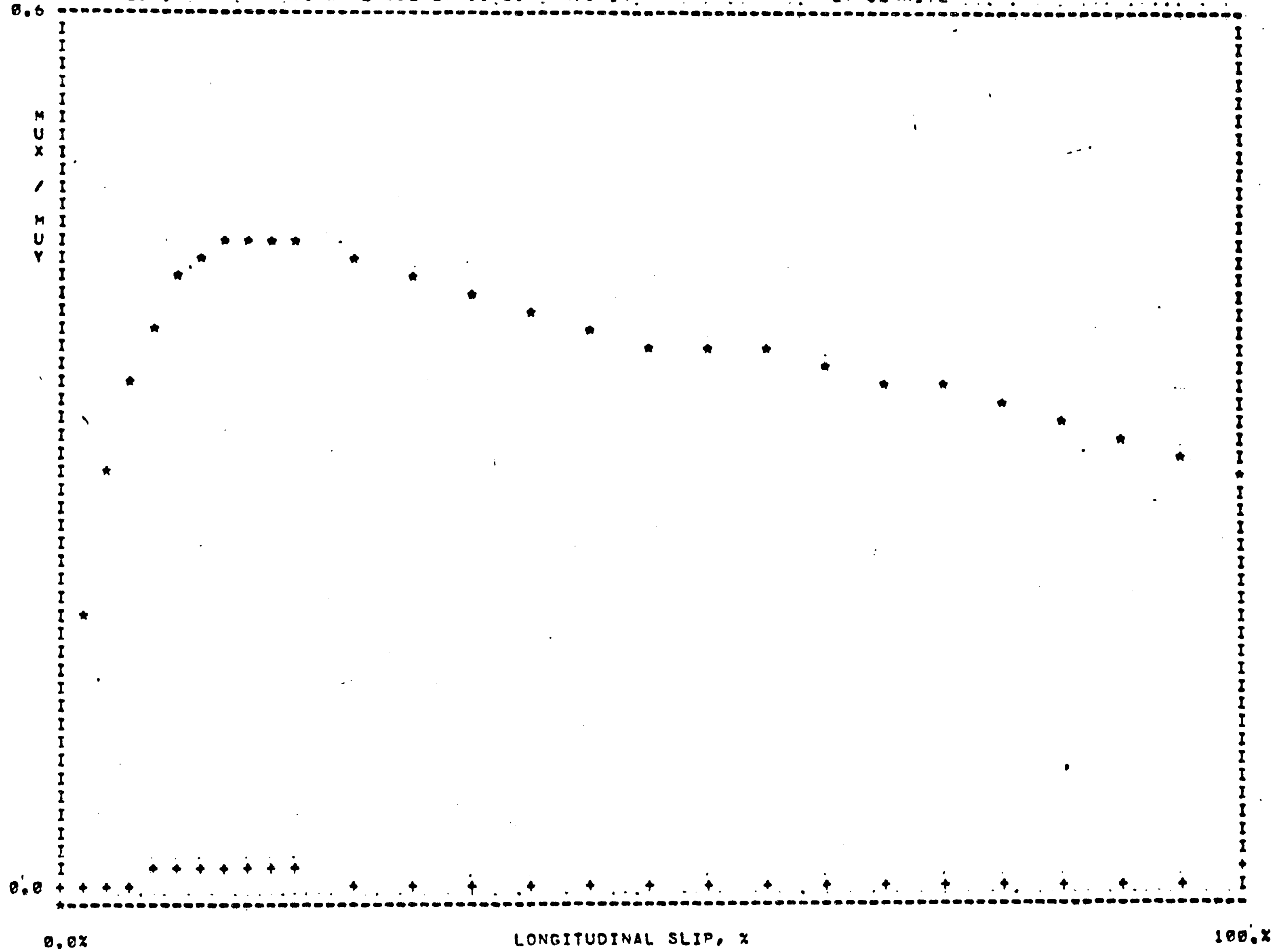


SLIP	FX-LBS
0.00	0.0
0.02	281.4
0.04	371.5
0.06	435.6
0.08	483.5
0.10	519.6
0.12	547.1
0.14	567.8
0.16	583.1
0.18	593.6
0.20	597.1
0.25	592.8
0.30	581.8
0.35	567.0
0.40	549.5
0.45	530.0
0.50	509.8
0.55	490.3
0.60	472.0
0.65	454.4
0.70	437.7
0.75	422.0
0.80	407.6
0.85	394.8
0.90	384.1
0.95	374.4
1.00	366.0

TP= 2. RUN# 79. LOAD= 1100. LBS. VEL.= 20. MPH ALPHA= 0. DEG

TIRE PRESSURE= 28. PSI

FILE 254. GENERAL BELTED JUMBO H78-14 WET JENNITE

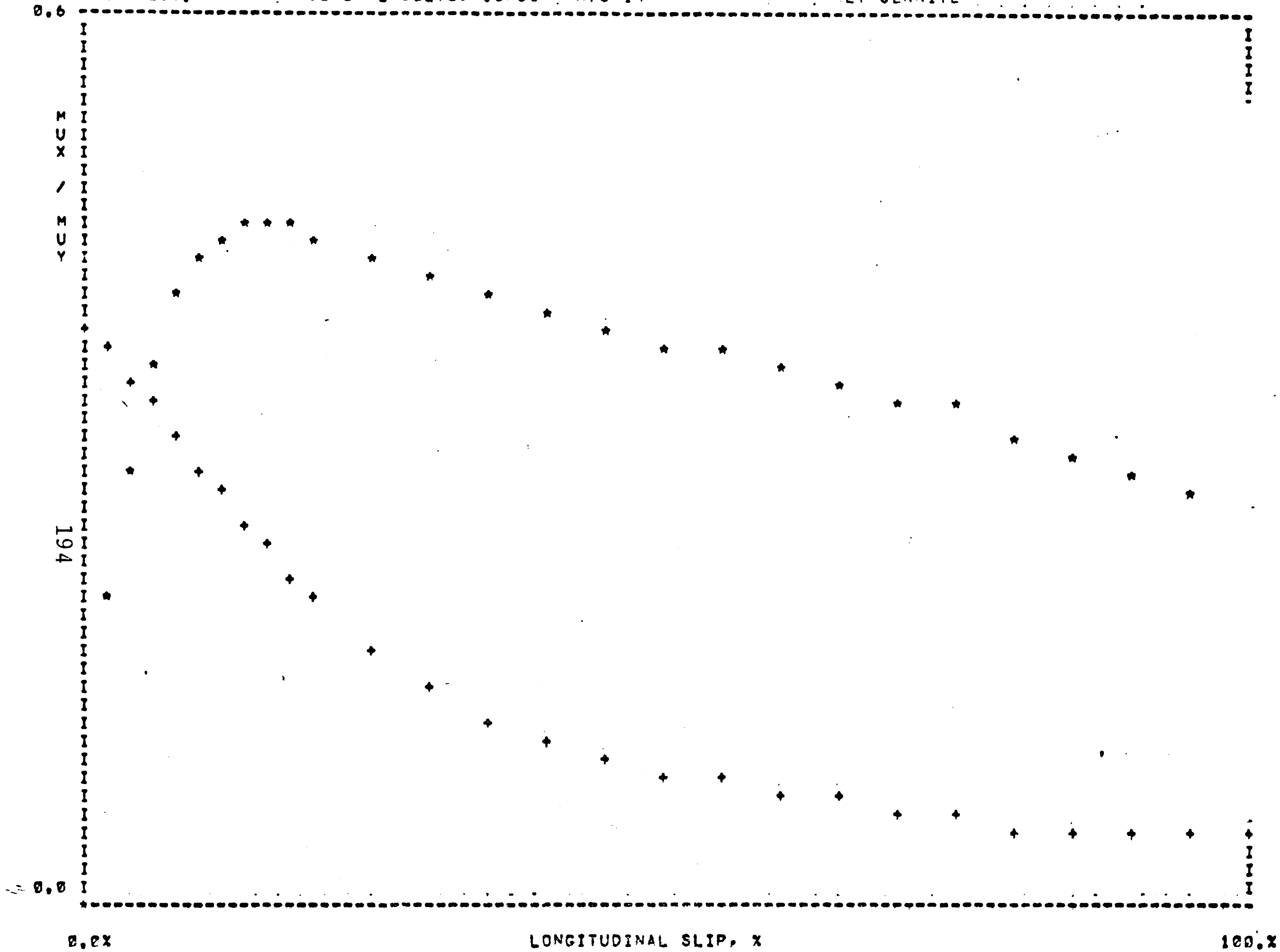


SLIP	FX-LBS
0.00	0.0
0.02	216.5
0.04	310.8
0.06	377.4
0.08	425.3
0.10	457.7
0.12	477.4
0.14	488.2
0.16	492.5
0.18	492.1
0.20	487.8
0.25	473.8
0.30	459.2
0.35	444.6
0.40	431.6
0.45	422.4
0.50	416.9
0.55	411.1
0.60	404.8
0.65	397.9
0.70	389.7
0.75	379.4
0.80	366.6
0.85	352.9
0.90	339.9
0.95	327.3
1.00	315.2

TP= 2. RUN# 80. LOAD= 1100. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 28. PSI

FILE 260. GENERAL BELTED JUMBO H78-14 WET JENNITE



SLIP	FX-LBS	FY-L
0.00	0.0	429
0.02	219.9	409
0.04	323.7	390
0.06	396.9	369
0.08	447.1	346
0.10	478.5	322
0.12	495.7	299
0.14	503.1	278
0.16	504.4	259
0.18	501.7	241
0.20	495.4	224
0.25	478.2	188
0.30	461.4	157
0.35	446.3	133
0.40	434.1	116
0.45	424.8	104
0.50	416.3	94
0.55	407.0	86
0.60	397.1	79
0.65	387.4	73
0.70	376.7	67
0.75	364.2	61
0.80	349.8	56
0.85	334.2	52
0.90	319.7	50
0.95	307.5	49
1.00	298.8	50

TP- 2. RUN# 86. LOAD= 1100. LBS. VEL.= 40. MPH ALPHA= 3. DEG

TIRE PRESSURE= 28. PSI

XI.D.1 Free-Rolling Measurements from the F[illegible] Tire Tester - 34 psi Inflation

a. Lateral Force vs. Slip Angle and Lo[illegible]

Load	-2°	-1°	0°	1°		4°	8°	12°	18°
800	337	189	- 5	-205	-				
1100	396	215	- 9	-240	-4				
1400	414	214	-11	-249	-4				
1700	414	206	-12	-244	-4				

b. Aligning Moment vs. Slip Angle and [illegible]d

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
800	-24	-19	0	19	25				
1100	-44	-30	1	33	45				
1400	-64	-35	2	45	67				
1700	-84	-50	3	57	89				

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°
800	- 74	-38	- 5	12	49			
1100	- 98	-52	- 9	18	64			
1400	-112	-60	-11	17	69			
1700	-116	-62	-12	16	70			

XII. Firestone Town & Country Radial Snow HR78-14

XII.A.1 Free-Rolling Measurements from the ;ed Tire Tester - 10 psi Inflation

a. Lateral Force vs. Slip Angle and

Load	-2°	-1°	0°	1°	4°	8°	12°	18°
800	225	99	-24	-161				
1100	205	86	-20	-142				
1400	177	75	-16	-124				
1700	154	65	-12	-107				

b. Aligning Moment vs. Slip Angle and d

Load	-2°	-1°	0°	1°		4°	8°	12°	18°
800	-28	-13	6	26	38				
1100	-51	-19	8	37	62				
1400	-65	-24	10	48	82				
1700	-77	-30	12	56	99				

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°
800	-28	-27	-24	-21	-19			
1100	-32	-27	-20	-13	- 8			
1400	-38	-27	-16	- 6	- 4			
1700	-46	-31	-12	- 4	5			

XII.B.1 Free-Rolling Measurements from the Flat Bed Tire Tester - 18 psi Inflation

a. Lateral Force vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
800	280	123	-35	-201	-332				
1100	320	135	-38	-219	-376				
1400	334	134	-37	-207	-372				
1700	308	123	-33	-192	-340				

b. Aligning Moment vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
800	-20	- 9	4	20	26				
1100	-33	-15	7	32	45				
1400	-47	-21	10	44	67				
1700	-63	-26	13	55	86				

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°
800	-36	-39	-35	-33	-35			
1100	-44	-42	-38	-36	-39			
1400	-42	-44	-37	-30	-20			
1700	-52	-43	-33	-20	-15			

XII.C.1 Free-Rolling Mea[illegible]ents from the Flat Bed Tire Tester - 26 psi Inflation

a. Lateral Force vs [illegible]ip Angle and Load

Load	-2°	-1°		1°	2°	4°	8°	12°	18°
800	278	160		-138	-271				
1100	362	200	1	-170	-340				
1400	406	217	13	184	-377				
1700	415	217	12	183	-387				

b. Aligning Moment vs. Slip [illegible]le and Load

Load	-2°	-1°	0°	[illegible]	2°	4°	8°	12°	18°
800	-17	-13	-2	3	14				
1100	-30	-22	-4	6	28				
1400	-45	-31	-5	20	40				
1700	-61	-40	-8	24	52				

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°

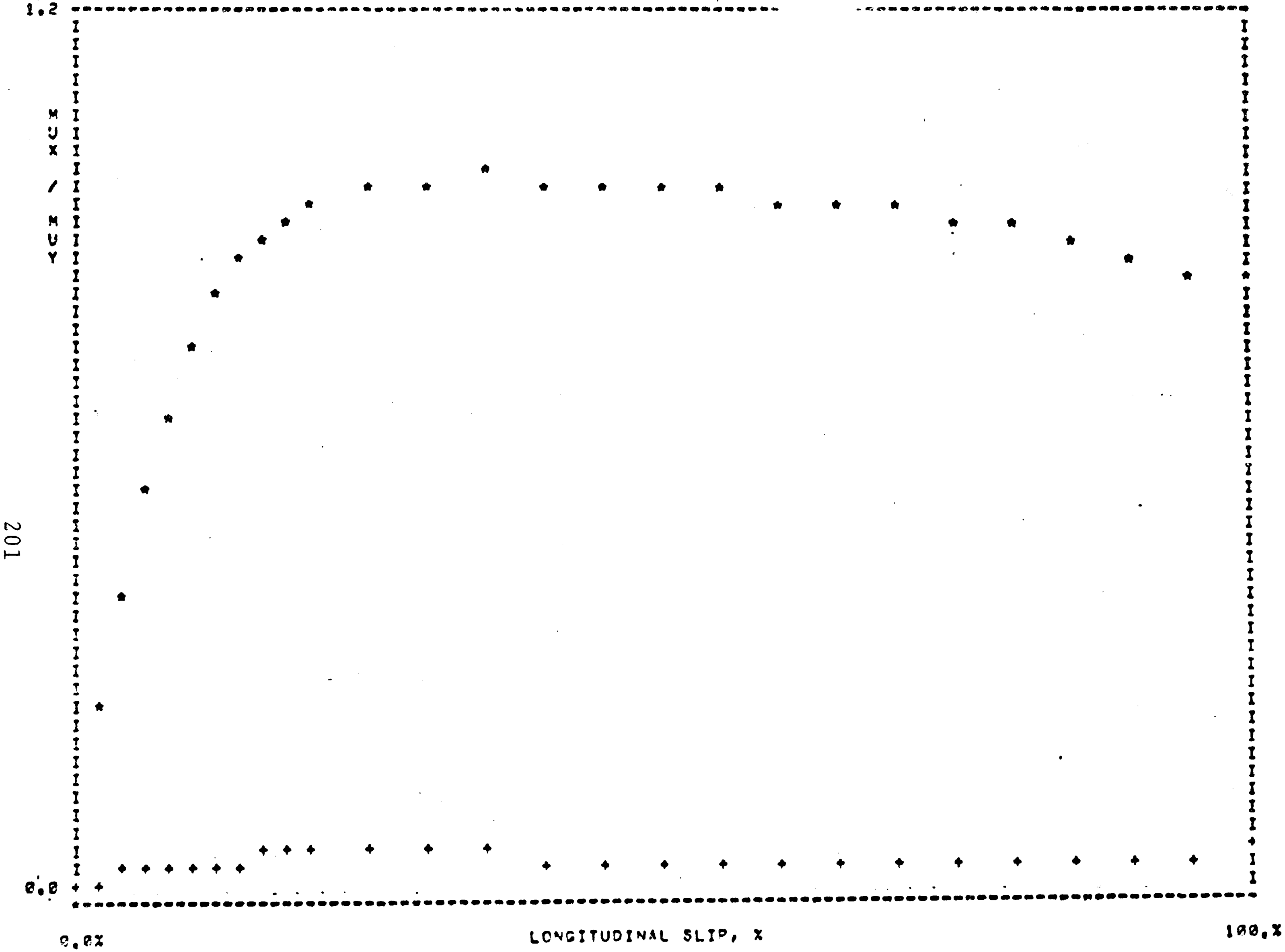
XII.C.2 Free-Rolling Lateral Force Measurements from Mobile Tire Tester - 28 psi Inflation

		Dry Asphalt					Wet Jennite				
Load	Speed	0°	2°	4°	8°	16°	0°	1°	3°	7°	15°
800	40 mph	26	287	479	665	683	-36	102	329	431	341
1100	20 mph	11	318	570	800	942	- 4	154	481	631	620
	40 mph	-20	330	575	800	910	-25	143	416	563	454
	50 mph	-30	318	575	795	905	-20	146	398	555	451
1700	40 mph	0	380	688	1051	1275	-30	215	621	857	762

XII.C.3 Braking Data from the Mobile Tire Tester - 28 psi

	Dry Asphalt					Wet Jennite				
	0°				4°	0°				3°
	800 lbs.		1100 lbs.		800 lbs.	800 lbs.		1100 lbs.		1100 lbs.
	20 mph	40 mph	20 mph	40 mph	40 mph	20 mph	40 mph	20 mph	40 mph	40 mph
MBF		788	990	956	794		432	616	573	543
LWBF		671	804	872	726		236	400	323	325
MLF					481					416
LWLF					107					32

FILE 36. FIRESTONE HR78 - 14 NEW ASPHALT #8

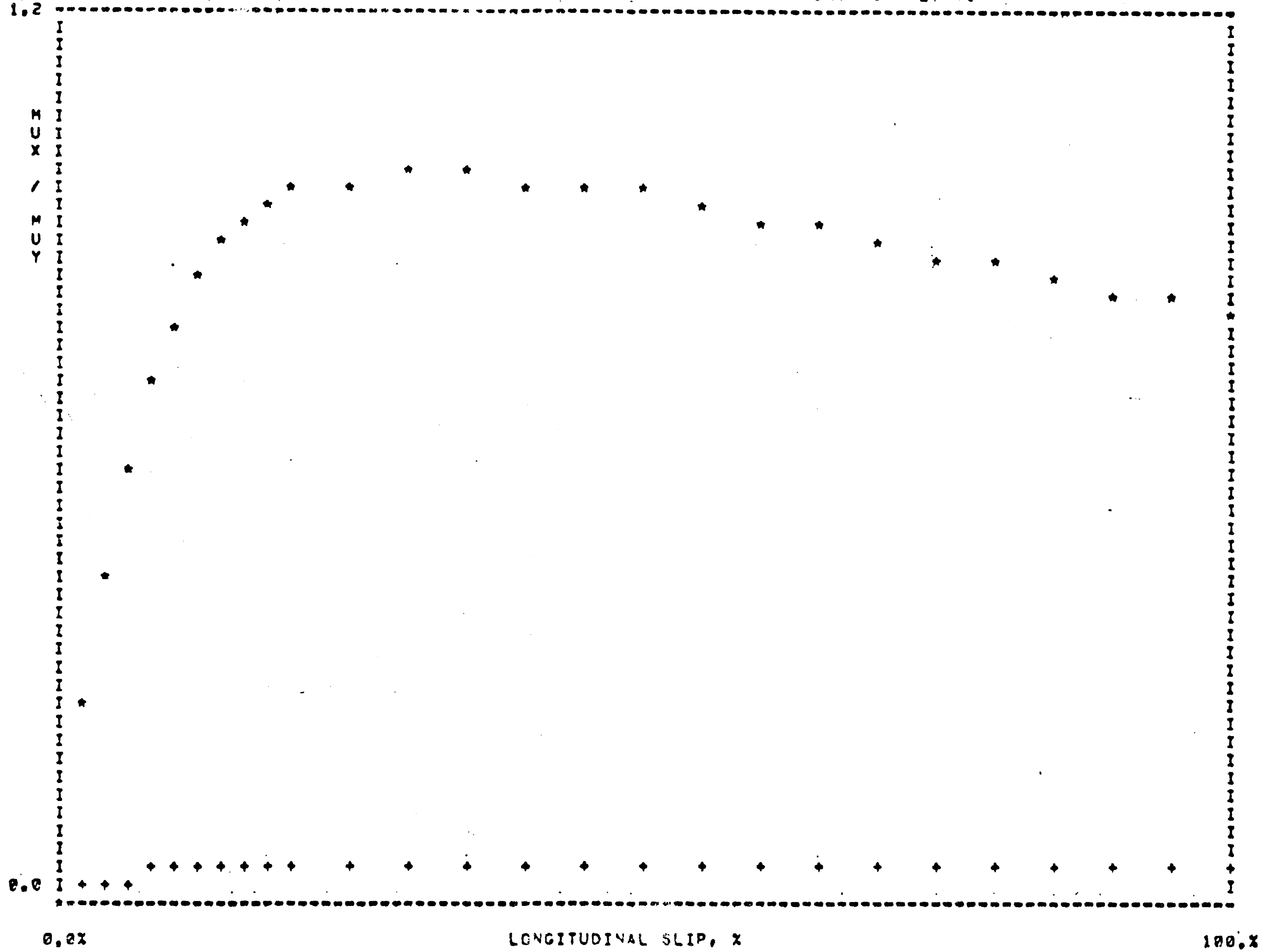


SLIP	FX-LBS
0.00	0.0
0.02	207.6
0.04	339.2
0.06	445.1
0.08	531.6
0.10	600.1
0.12	652.9
0.14	693.4
0.16	724.3
0.18	747.1
0.20	760.7
0.25	778.2
0.30	786.6
0.35	788.0
0.40	785.5
0.45	780.8
0.50	775.5
0.55	770.5
0.60	766.3
0.65	761.8
0.70	755.6
0.75	747.2
0.80	736.1
0.85	722.3
0.90	706.3
0.95	689.2
1.00	671.1

TP= 1. RUN# 30. LOAD= 800. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 28. PSI

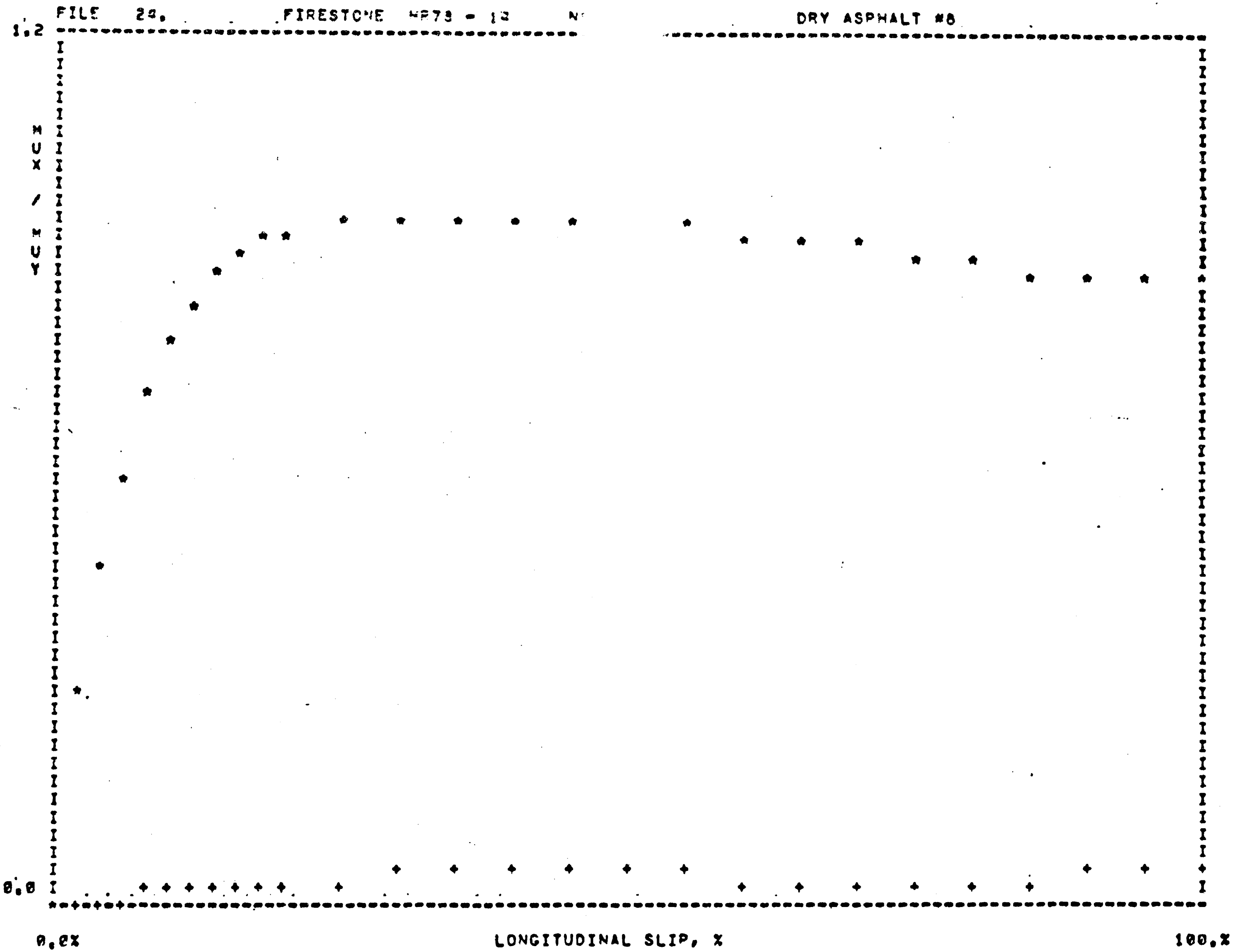
FILE 25. FIRESTONE HR78 - 14 NEW DRY ASPHALT #8



TP= 1. RUN# 25. LOAD= 1100. LBS. VEL.= 20. MPH ALPHA= 0. DEG

TIRE PRESSURE= 28. PSI

SLIP	FX-LBS
0.00	0.0
0.02	269.9
0.04	439.9
0.06	579.8
0.08	693.4
0.10	789.5
0.12	845.6
0.14	893.8
0.16	928.8
0.18	953.3
0.20	966.5
0.25	982.9
0.30	989.7
0.35	989.2
0.40	983.4
0.45	974.1
0.50	962.1
0.55	948.1
0.60	932.4
0.65	915.8
0.70	899.2
0.75	882.9
0.80	867.3
0.85	852.4
0.90	836.8
0.95	822.7
1.00	803.8

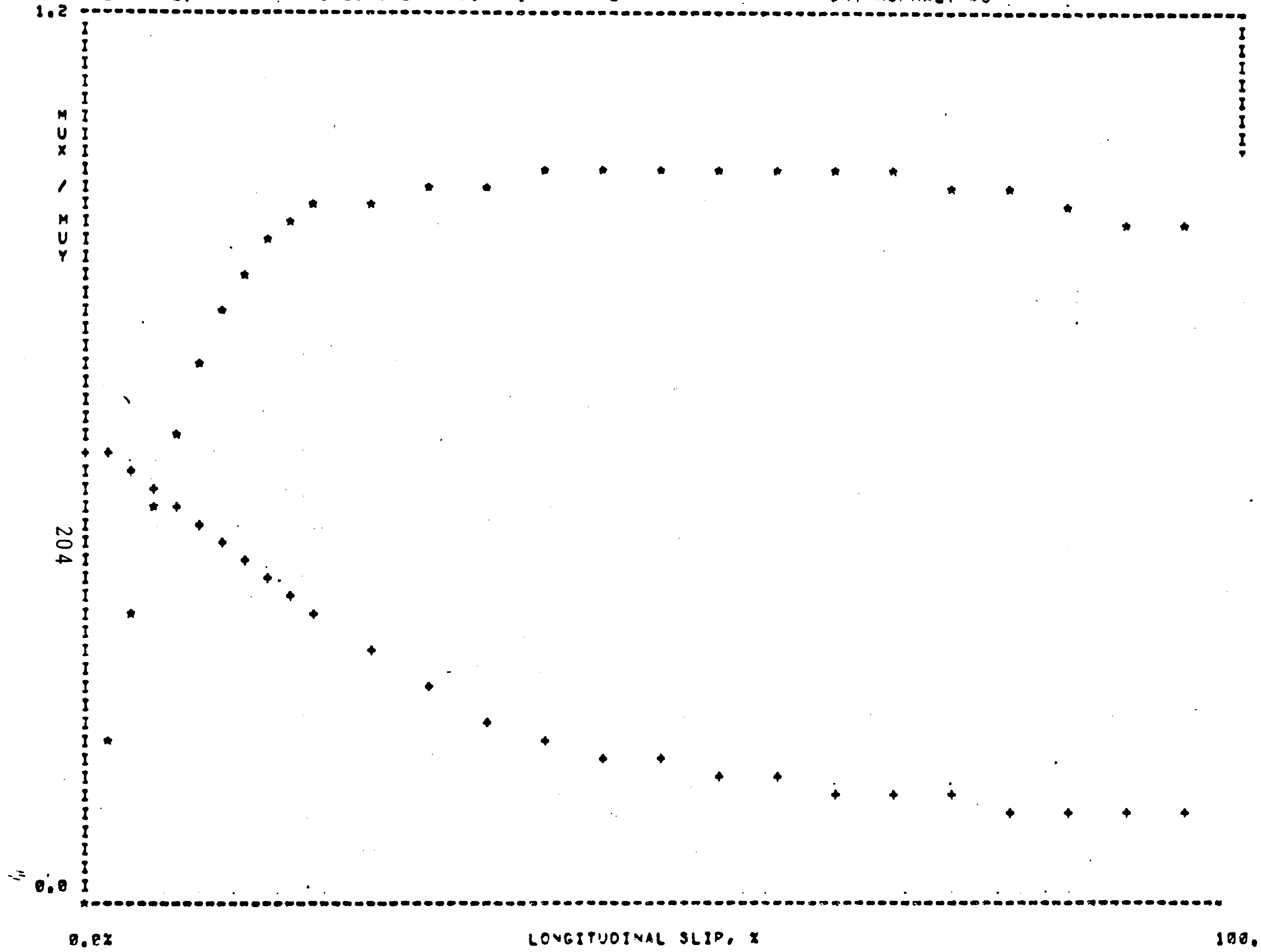


TP- 1. RUN# 24. LOAD= 1100. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 28. PSI

SLIP	FX-LBS
0.00	0.0
0.02	287.2
0.04	454.7
0.06	588.1
0.08	692.8
0.10	772.8
0.12	831.9
0.14	874.1
0.16	903.9
0.18	924.2
0.20	934.7
0.25	949.2
0.30	955.8
0.35	956.0
0.40	952.9
0.45	948.7
0.50	944.1
0.55	938.7
0.60	933.0
0.65	926.9
0.70	918.7
0.75	908.1
0.80	896.9
0.85	886.0
0.90	878.5
0.95	873.5
1.00	871.7

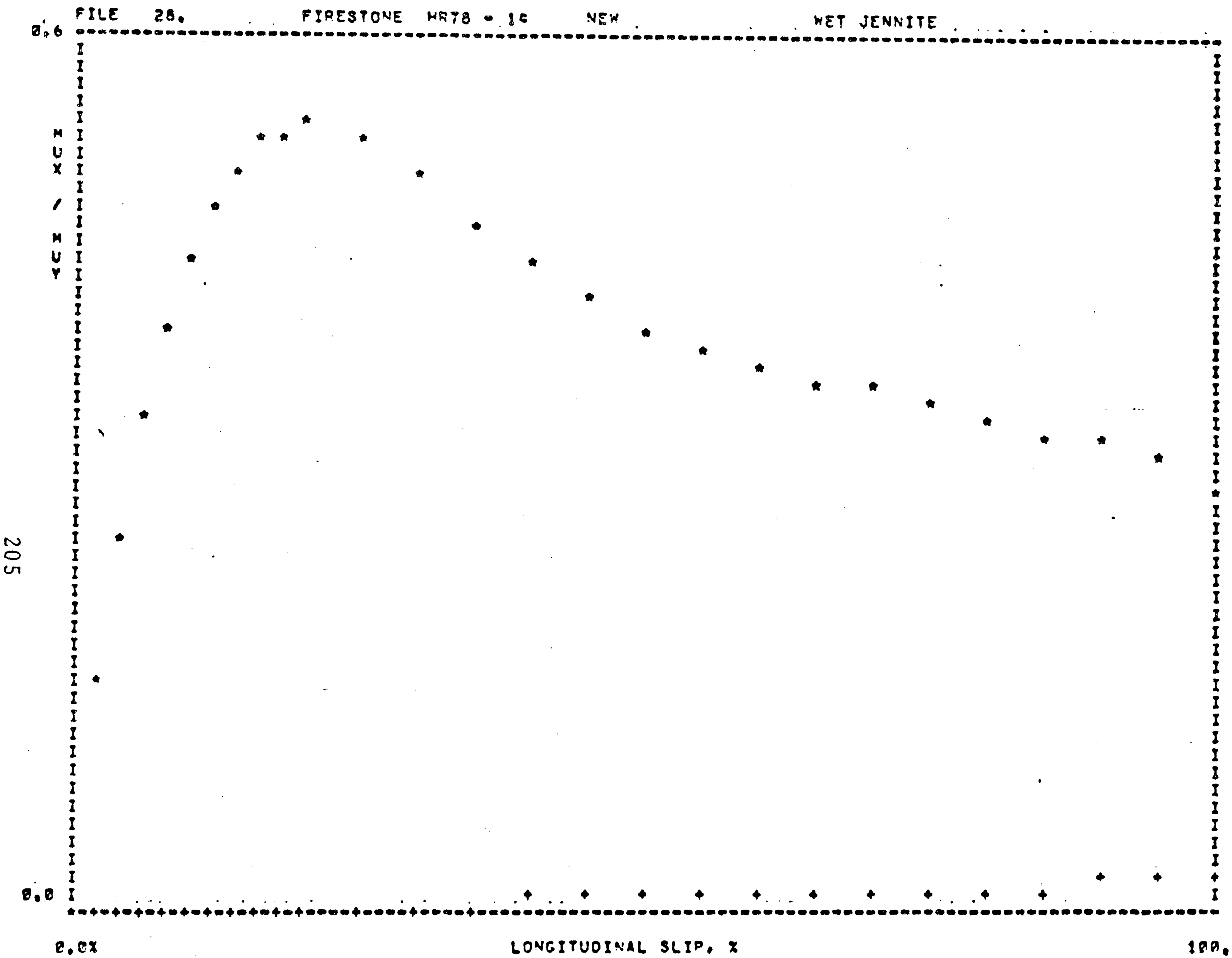
FILE 42. FIRESTONE HR78 - 14 NEW DRY ASPHALT #8



TP= 1. RUN# 44. LOAD= 800. LBS. VEL.= 40. MPH ALPHA= 4. DEG

TIRE PRESSURE= 28. PSI

SLIP	FX-LBS	FY-LB
0.00	0.0	479.
0.02	183.1	480.
0.04	311.4	466.
0.06	419.7	448.
0.08	509.6	429.
0.10	582.3	409.
0.12	639.8	390.
0.14	683.8	370.
0.16	716.4	350.
0.18	739.8	330.
0.20	751.9	311.
0.25	768.3	270.
0.30	778.7	234.
0.35	784.9	204.
0.40	788.7	181.
0.45	791.8	163.
0.50	794.0	150.
0.55	794.2	139.
0.60	793.6	129.
0.65	792.4	121.
0.70	788.8	115.
0.75	781.1	110.
0.80	770.0	106.
0.85	756.9	104.
0.90	744.8	103.
0.95	734.7	104.
1.00	727.6	106.

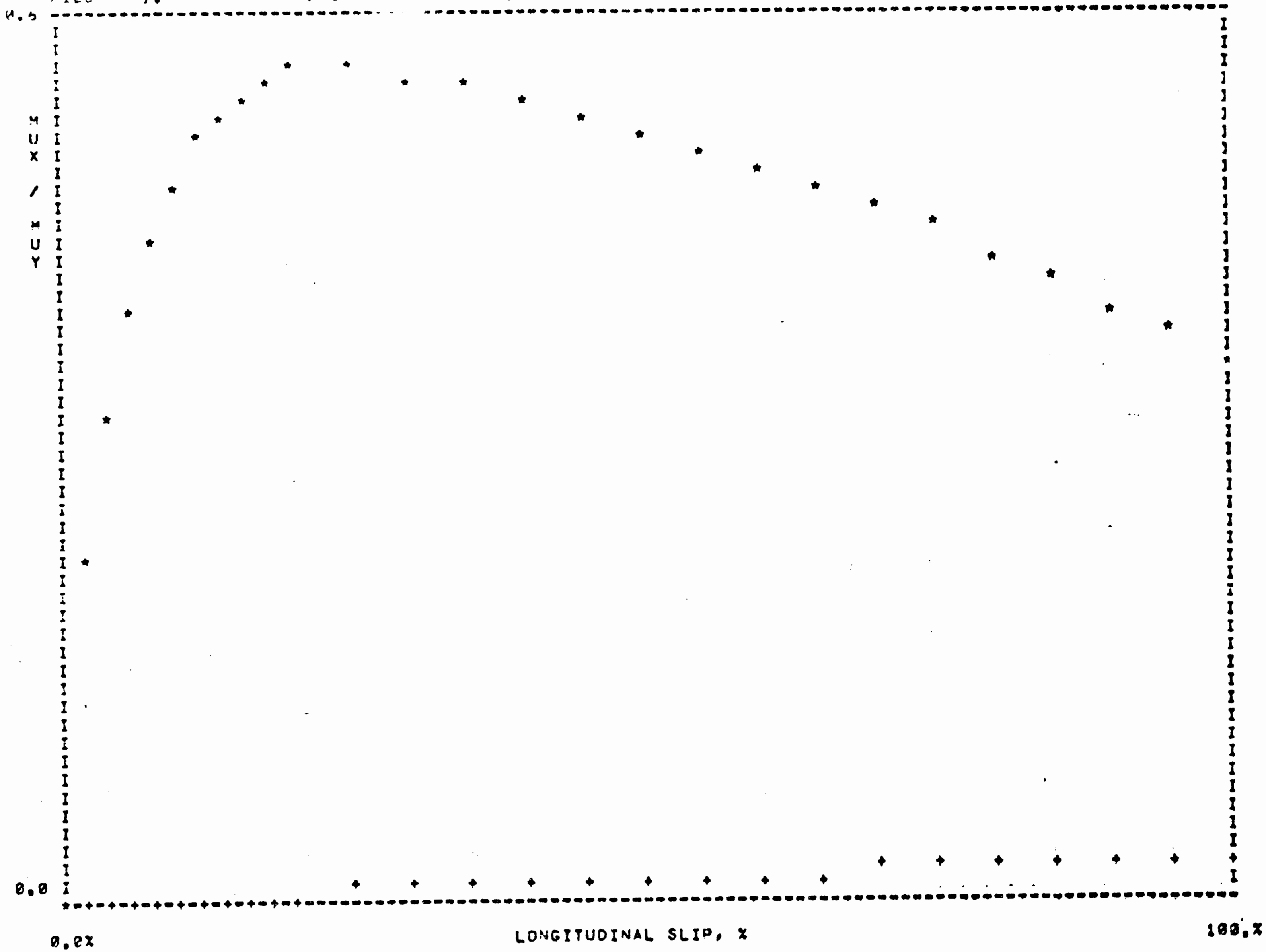


TP= 1. RUN# 29. LOAD= 800. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 28. PSI

SLIP	FX-LBS
0.00	0.0
0.22	129.5
0.04	206.0
0.06	267.9
0.08	317.8
0.10	357.5
0.12	387.5
0.14	409.1
0.16	423.5
0.18	431.3
0.20	432.1
0.25	422.1
0.30	404.8
0.35	382.3
0.40	359.6
0.45	340.3
0.50	324.2
0.55	311.4
0.60	302.2
0.65	295.6
0.70	289.3
0.75	281.9
0.80	274.0
0.85	266.4
0.90	257.4
0.95	247.4
1.00	236.1

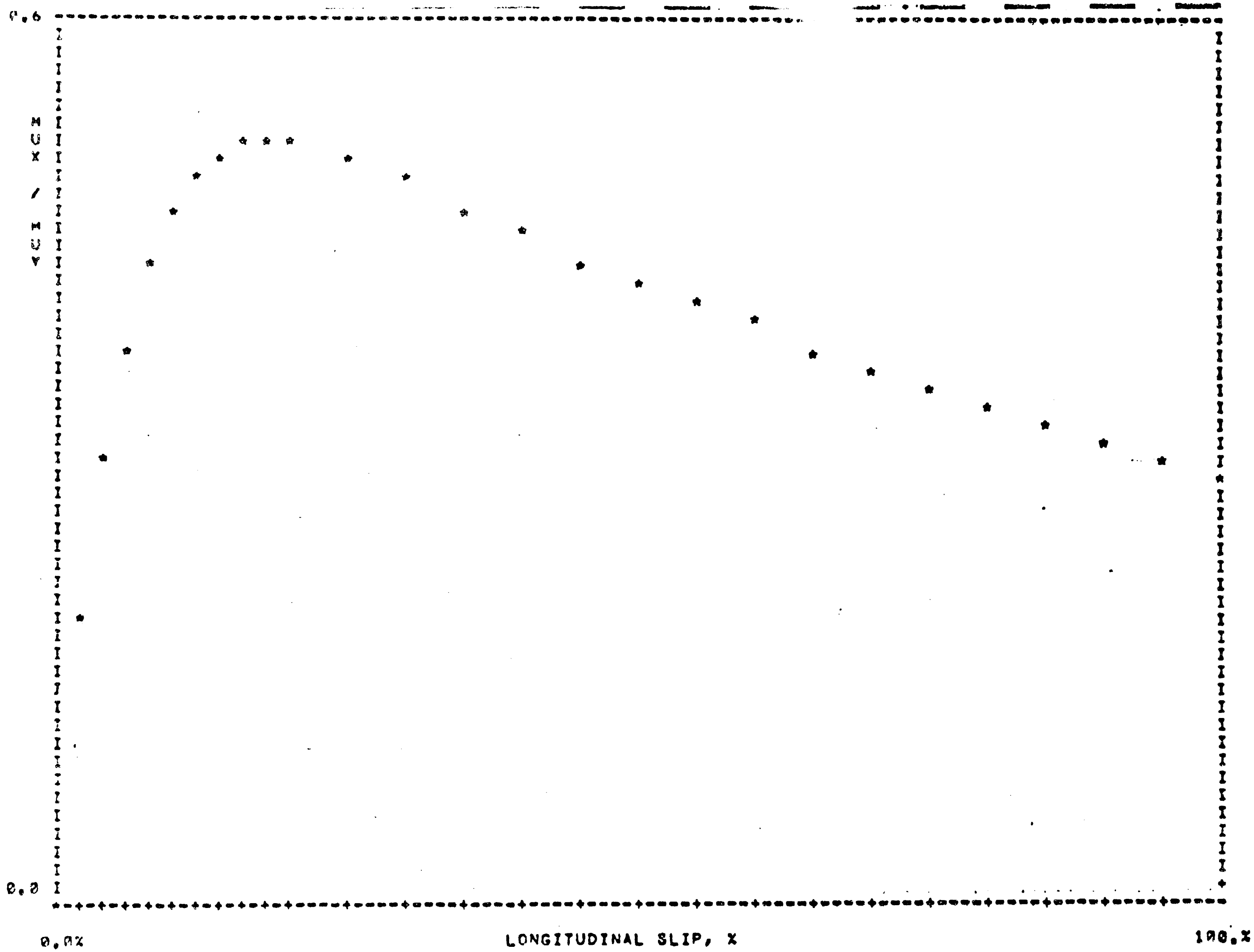
FILE 1. FIRESTO HR78 - 14 NEW WET JENNITE



SLIP	FX-LBS
0.00	0.0
0.02	256.5
0.04	362.7
0.06	437.4
0.08	492.5
0.10	533.3
0.12	562.9
0.14	584.6
0.16	600.2
0.18	610.7
0.20	615.7
0.25	614.5
0.30	611.9
0.35	603.4
0.40	591.1
0.45	576.7
0.50	563.3
0.55	552.0
0.60	540.6
0.65	527.5
0.70	512.7
0.75	496.4
0.80	478.6
0.85	459.5
0.90	439.8
0.95	419.9
1.00	400.0

TP= 1. RUN# 1. LOAD= 1100. LBS. VEL.= 20. MPH ALPHA= 0. DEG

TIRE PRESSURE= 28. PSI

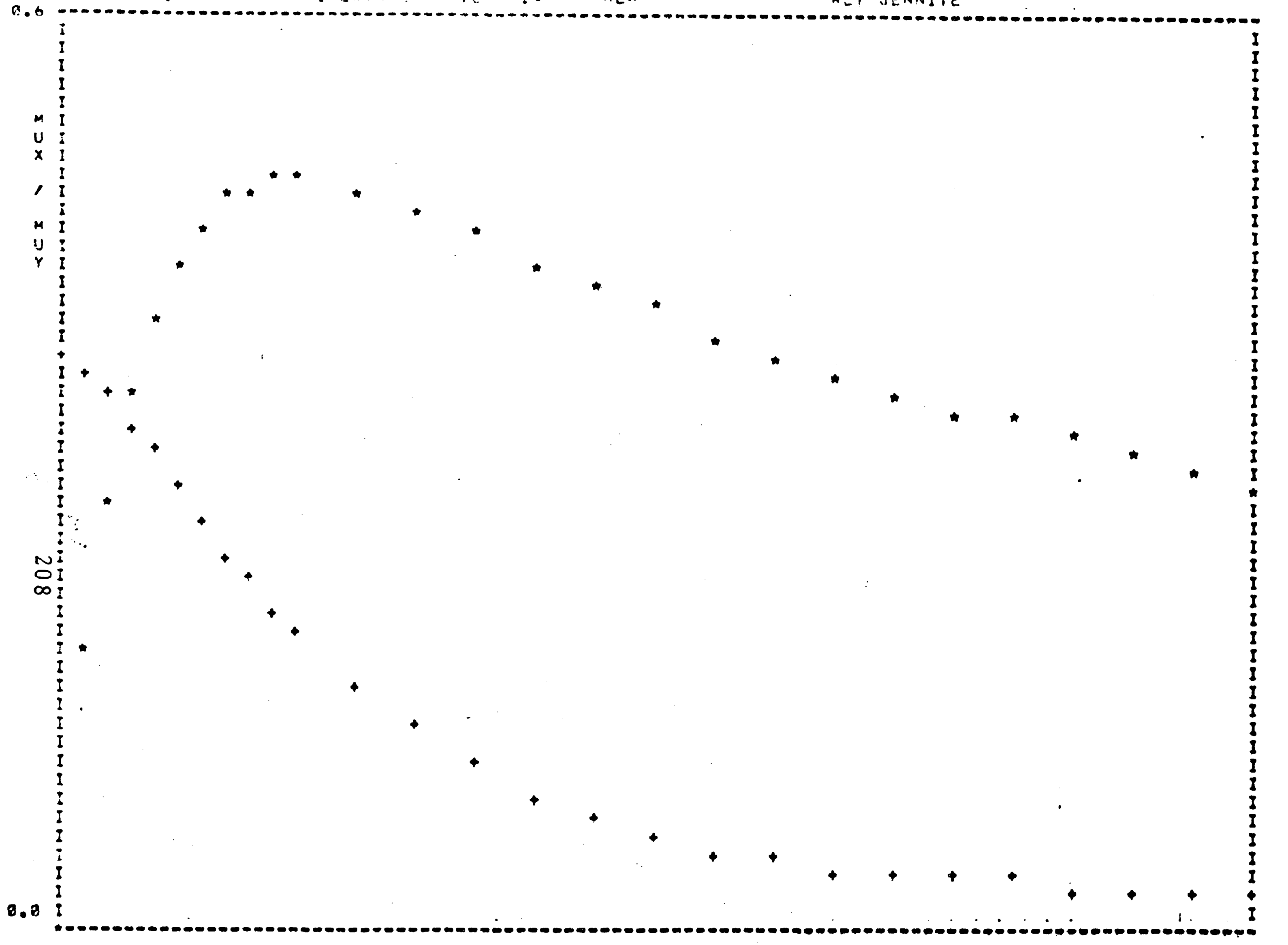


TP= 1.   RUN# 2.   LOAD= 1100. LBS.   VEL.= 40. MPH   ALPHA= 0. DEG

TIRE PRESSURE= 20. PSI

SLIP	FX-LHS
0.00	0.0
0.02	229.6
0.04	329.2
0.06	410.6
0.08	475.4
0.10	517.7
0.12	545.1
0.14	561.5
0.16	569.9
0.18	572.7
0.20	570.7
0.25	559.4
0.30	542.1
0.35	519.9
0.40	497.1
0.45	478.2
0.50	463.4
0.55	448.8
0.60	431.9
0.65	414.7
0.70	400.4
0.75	387.8
0.80	375.4
0.85	363.1
0.90	350.0
0.95	336.7
1.00	323.0

FILE 6. FIRESTONE HR78 - 14 NEW WET JENNITE



LONGITUDINAL SLIP, %

TP= 1. RUN# 8. LOAD= 1100. LBS. VEL.= 40. MPH ALPHA= 3. DEG

TIRE PRESSURE= 28. PSI

SLIP	FX-LBS	FY-LB
0.00	0.0	416.
0.02	198.7	402.
0.04	303.4	381.
0.06	382.1	361.
0.08	441.3	339.
0.10	483.0	315.
0.12	511.3	291.
0.14	528.9	268.
0.16	538.6	247.
0.18	542.0	228.
0.20	542.7	212.
0.25	534.6	177.
0.30	523.5	145.
0.35	502.6	118.
0.40	484.0	97.
0.45	465.4	81.
0.50	446.8	68.
0.55	429.0	59.
0.60	413.0	51.
0.65	399.1	45.
0.70	387.0	40.
0.75	376.4	37.
0.80	367.4	34.
0.85	358.3	33.
0.90	347.7	32.
0.95	336.7	32.
1.00	325.3	32.

XII.D.1 Free-Rolling Measurements from the Flat Bed Tire Tester - 34 psi Inflation

a. Lateral Force vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
800	250	111	-26	-176	-293				
1100	330	148	-39	-235	-394				
1400	391	170	-46	-277	-466				
1700	421	179	-50	-304	-509				

b. Aligning Moment vs. Slip Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	8°	12°	18°
800	-11	- 5	1	10	14				
1100	-20	-10	3	19	27				
1400	-32	-16	6	29	42				
1700	-45	-21	8	38	58				

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°
800	-26	-31	-25	-23	-23			
1100	-39	-44	-39	-37	-39			
1400	-48	-53	-46	-46	-46			
1700	-57	-59	-50	-47	-47			

XIII. Firestone Town & Country Snow H78-14

XIII.C.1 Free-Rolling Measurements from the F Tire Tester - 26 psi Inflation

a. Lateral Force vs. Slip Angle and Lo

Load	-2°	-1°	0°	1°		4°	8°	12°	18°
800	239	127	-26	-163	-2				
1100	277	134	-27	-192	-3				
1400	289	137	-27	-198	-				
1700	285	136	-32	-196	-				

b. Aligning Moment vs. Slip Angle and d

Load	-2°	-1°	0°	1°		4°	8°	12°	18°
800	- 43	-28	9	36	[illegible]				
1100	- 76	-45	12	60	87				
1400	-114	-47	12	76	121				
1700	-151	-72	14	100	162				

c. Lateral Force vs. Inclination Angle and Load

Load	-2°	-1°	0°	1°	2°	4°	6°	8°

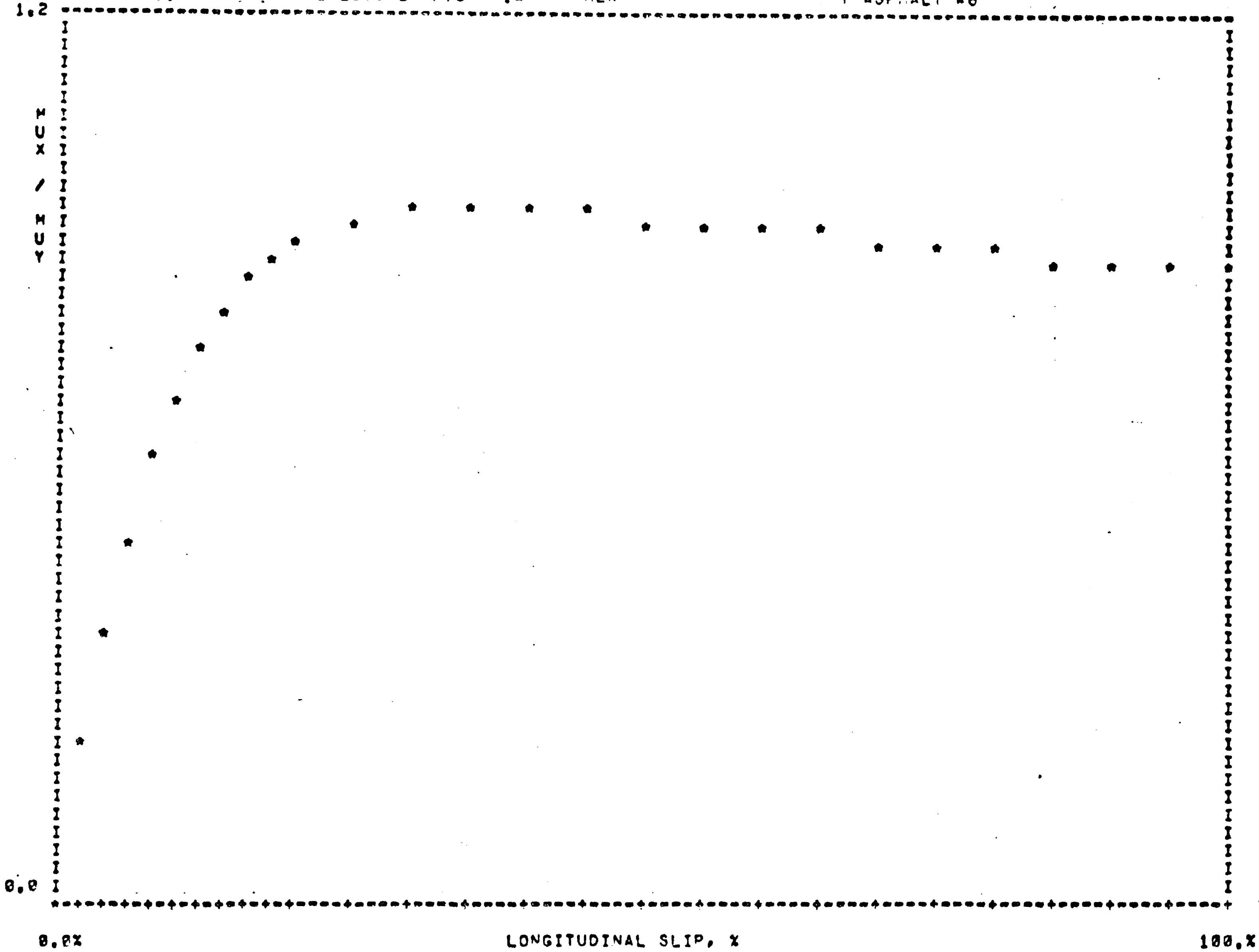
XIII.C.2 Free-Rolling Lateral Force Measurements from Mobile Tire Tester - 28 psi Inflation

		Dry Asphalt					Wet Jennite				
Load	Speed	0°	2°	4°	8°	16°	0°	1°	3°	7°	15°
800	40 mph	-8	267	425	602	698	15	170	394	424	338
1100	20 mph	67	242	507	791	958	28	236	521	726	570
	40 mph	8	241	512	756	899	9	226	466	558	
	50 mph	-61		499	786	903	5	227	414	471	
1700	40 mph	0	298	640	1150	1440	53	257	512	796	763

XIII.C.3 Braking Data from the Mobile Tire Tester - 28 psi

	Dry Asphalt					Wet Jennite				
	0°				4°	0°				3°
	800 lbs.		1100 lbs.		1100 lbs.	800 lbs.		1100 lbs.		1100 lbs.
	20 mph	40 mph	20 mph	40 mph	40 mph	20 mph	40 mph	20 mph	40 mph	40 mph
MBF		753	1044	1040	1053		336	564	496	455
LWBF		694	889	860	923		231	344	301	296
MLF					512					466
LWLF					96					48

FILE 51. FIRESTONE H78 - 14 NEW Y ASPHALT #8

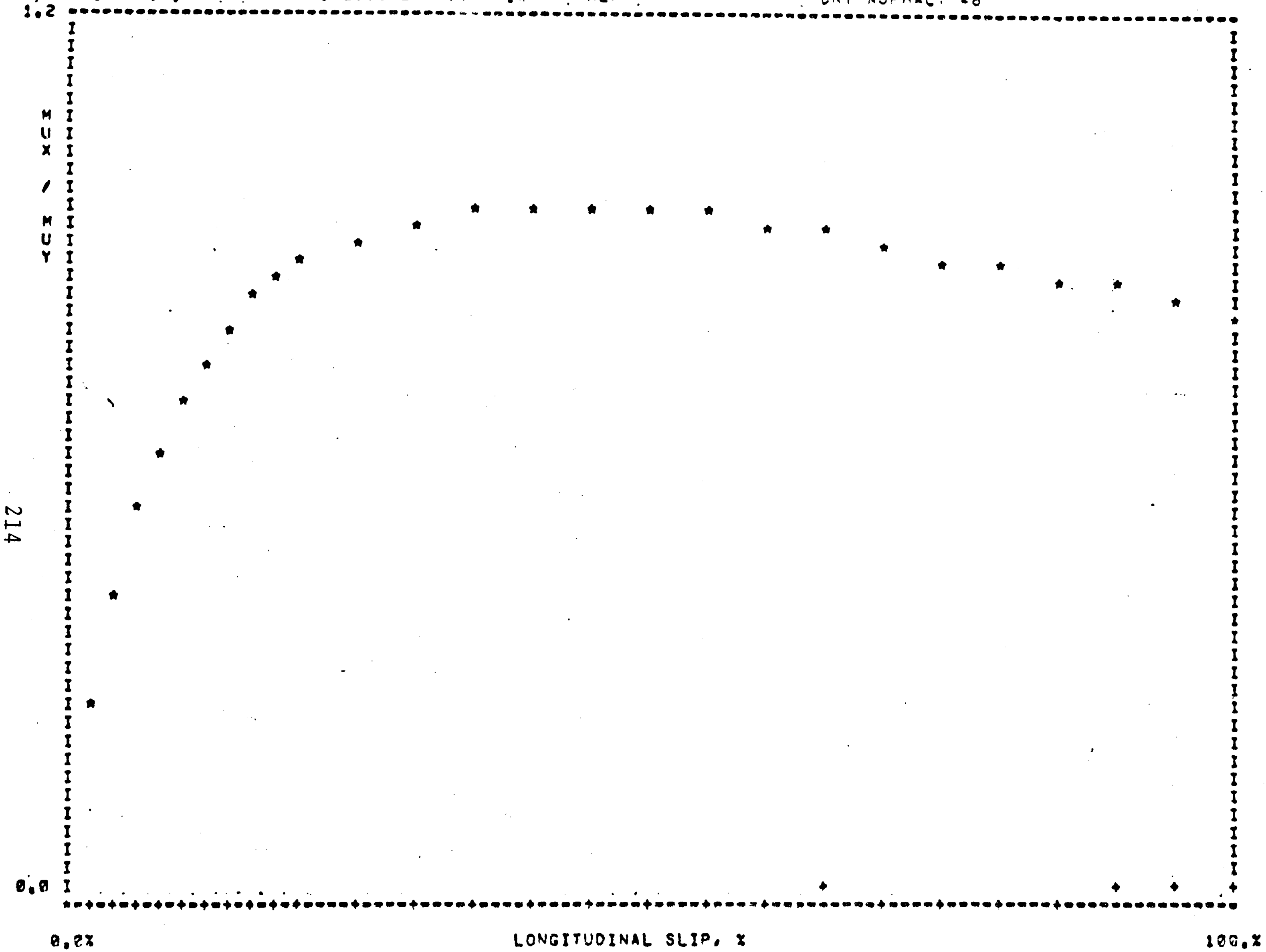


TP- 1. RUN# 53. LOAD= 800. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 28. PSI

SLIP	FX-LBS
0.20	0.0
0.02	178.5
0.04	296.1
0.06	394.9
0.08	478.5
0.10	547.0
0.12	601.6
0.14	644.1
0.16	676.4
0.18	700.5
0.20	716.2
0.25	737.5
0.30	748.3
0.35	753.2
0.40	753.4
0.45	748.9
0.50	743.1
0.55	738.2
0.60	732.7
0.65	726.9
0.70	721.3
0.75	714.8
0.80	707.0
0.85	701.2
0.90	697.0
0.95	694.9
1.00	694.0

FILE 63. FIRESTONE H78 - 14 NEW DRY ASPHALT #8

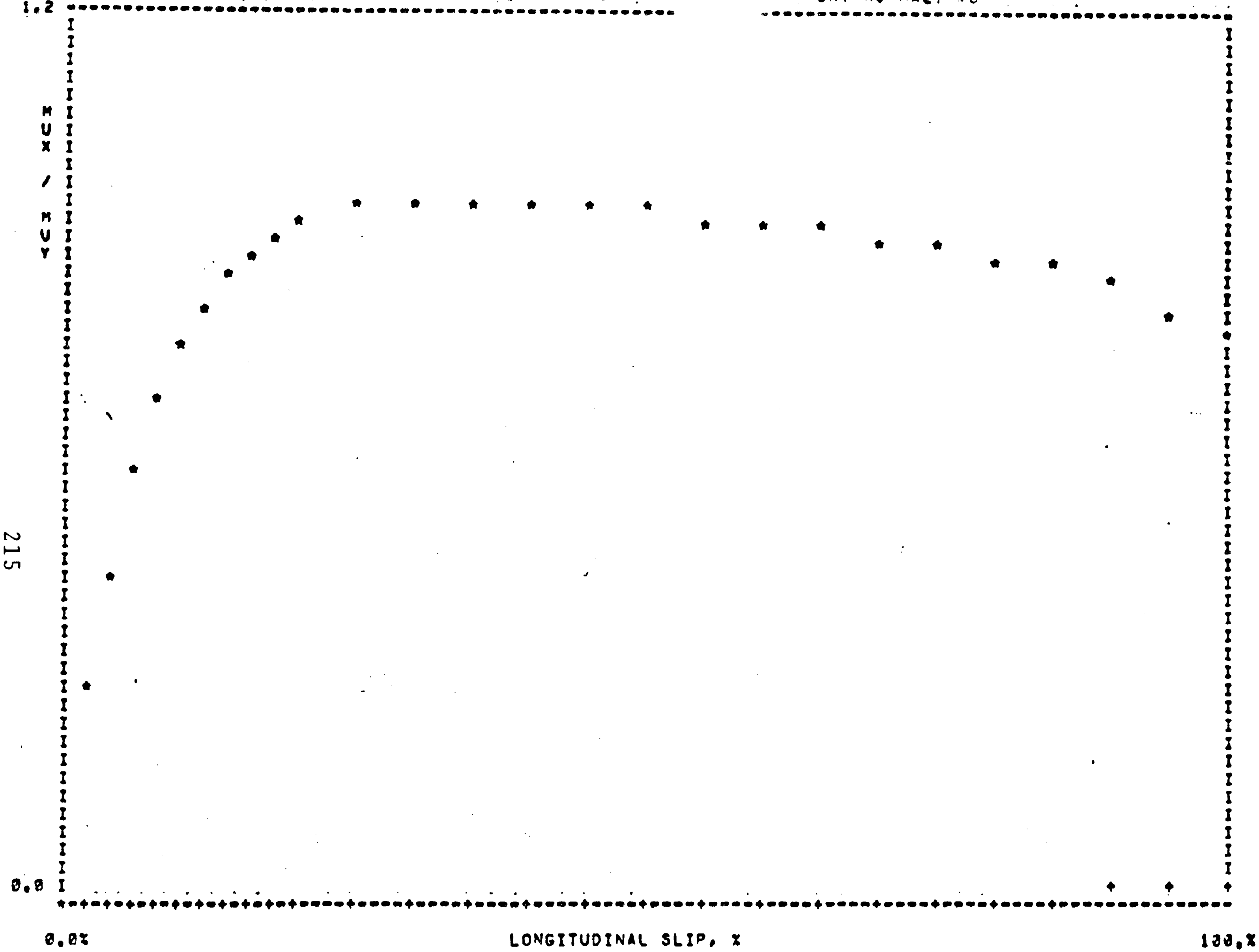


TP= 1. RUN# 64. LOAD= 1100. LBS. VEL.= 20. MPH ALPHA= 0. DEG

TIRE PRESSURE= 28. PSI

SLIP	FX-LBS
0.00	0.0
0.02	298.9
0.04	457.5
0.06	576.2
0.08	670.7
0.10	745.3
0.12	805.2
0.14	853.2
0.16	892.1
0.18	923.7
0.20	947.5
0.25	988.3
0.30	1016.1
0.35	1033.4
0.40	1042.2
0.45	1043.7
0.50	1038.7
0.55	1028.4
0.60	1014.2
0.65	998.8
0.70	984.1
0.75	970.2
0.80	955.6
0.85	939.6
0.90	923.6
0.95	906.8
1.00	888.8

FILE 61. FIRESTONE H78 - 14 NEW DRY ASPHALT #8

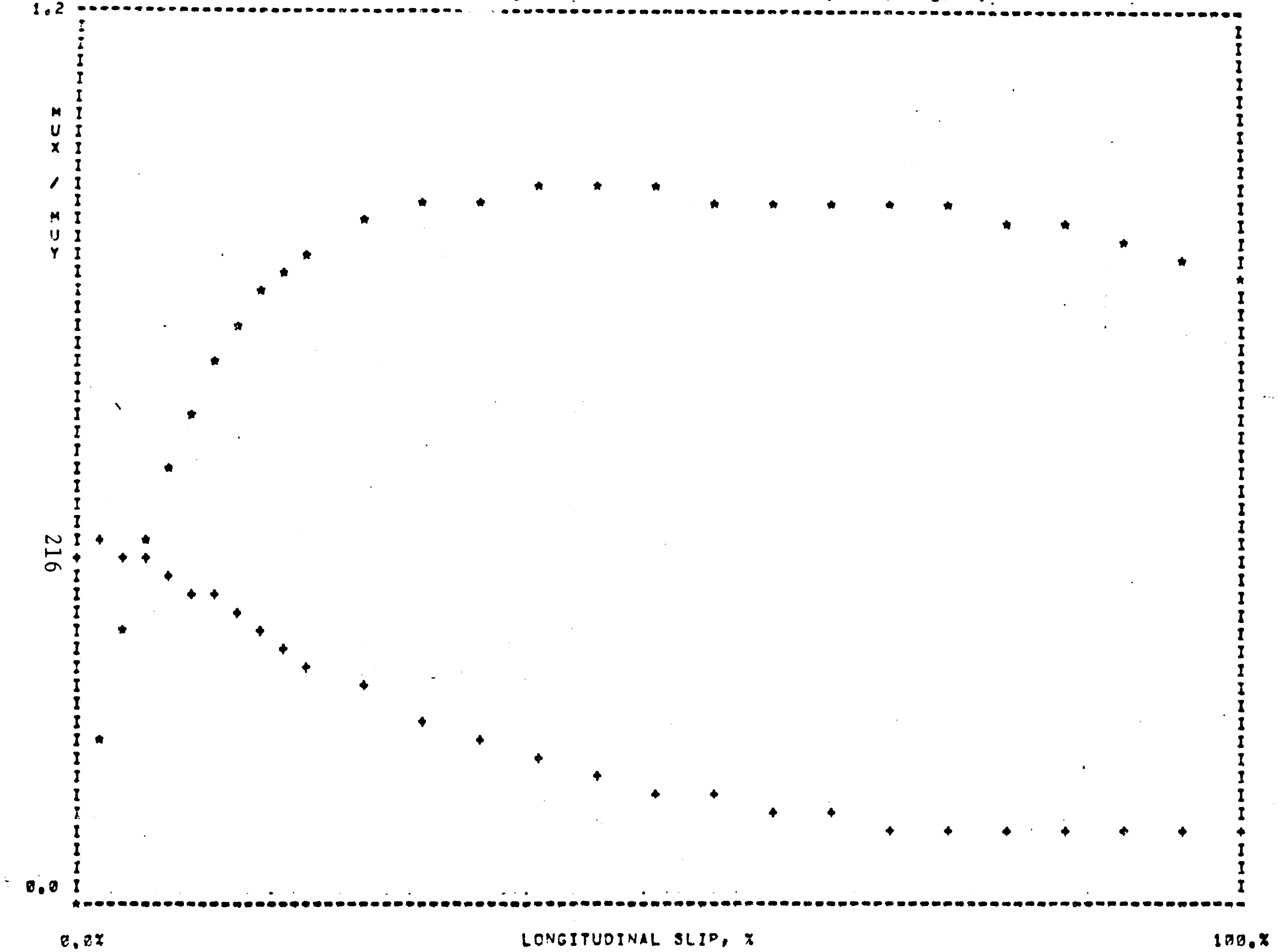


TP- 1. RUN# 65. LOAD= 1100. LBS. VEL.= [illegible] MPH ALPHA= 0. DEG

TIRE PRESSURE= 28. PSI

SLIP	FX-LBS
0.00	0.0
0.02	310.4
0.04	489.5
0.06	627.9
0.08	734.7
0.10	816.3
0.12	878.6
0.14	925.8
0.16	961.0
0.18	987.1
0.20	1004.2
0.25	1026.0
0.30	1036.2
0.35	1039.8
0.40	1038.7
0.45	1033.5
0.50	1027.7
0.55	1021.8
0.60	1015.1
0.65	1007.4
0.70	995.9
0.75	980.6
0.80	965.2
0.85	946.0
0.90	920.3
0.95	891.7
1.00	862.0

FILE 66. FIRESTONE H7 - 14 NEW DRY ASPHALT #8

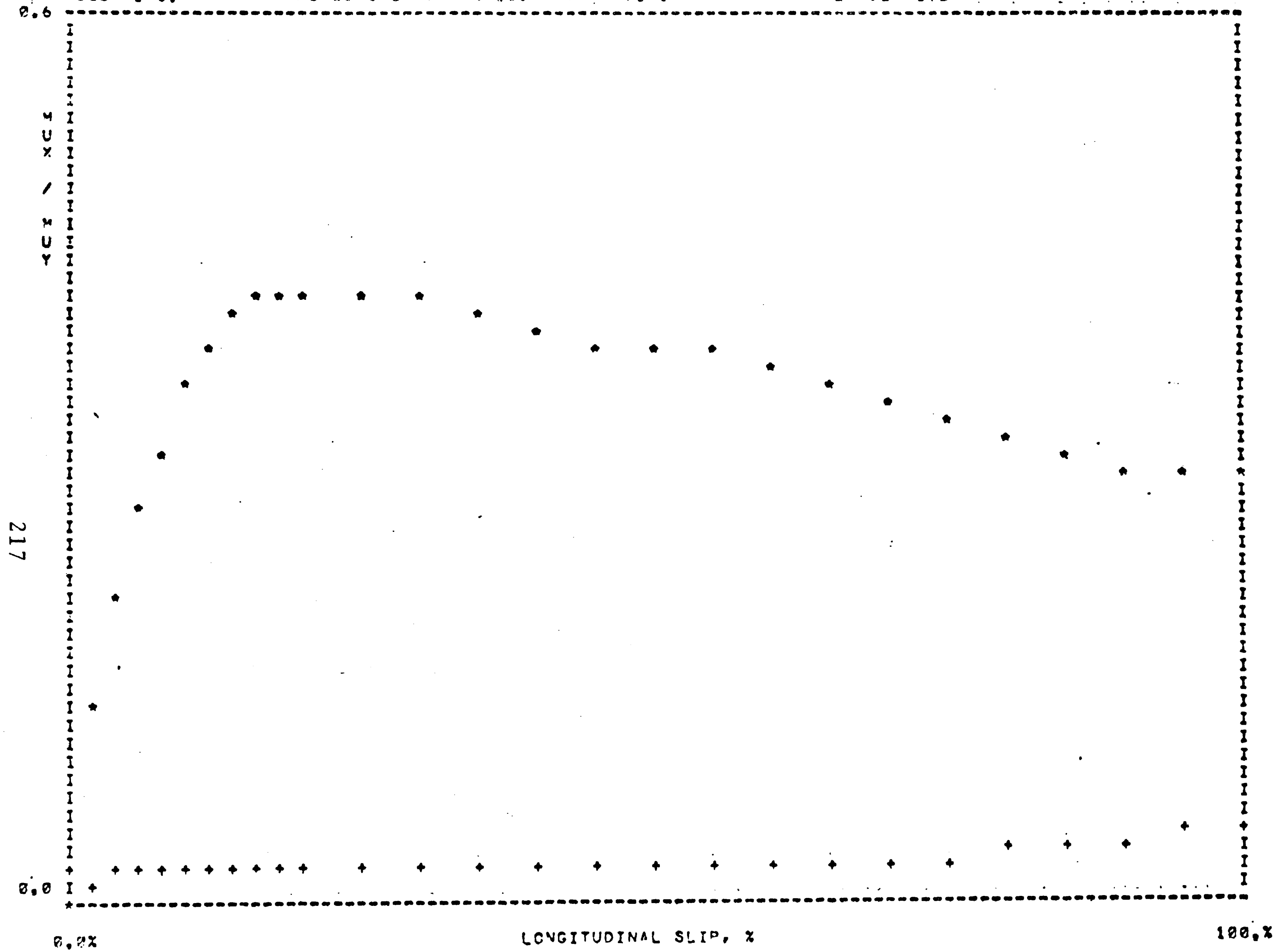


SLIP	FX-LBS	FY-LBS
0.00	0.0	511.6
0.02	229.8	522.3
0.04	390.1	514.3
0.06	524.3	500.8
0.08	636.6	483.3
0.10	727.9	462.6
0.12	800.8	439.5
0.14	858.4	415.7
0.16	904.1	392.3
0.18	939.9	370.8
0.20	964.7	351.9
0.25	1002.4	306.9
0.30	1027.1	267.1
0.35	1043.4	233.9
0.40	1051.8	205.4
0.45	1053.3	182.1
0.50	1050.6	163.5
0.55	1047.2	148.6
0.60	1043.4	136.6
0.65	1038.6	127.4
0.70	1034.1	119.3
0.75	1027.2	111.8
0.80	1016.6	105.6
0.85	1002.3	100.1
0.90	981.7	96.7
0.95	955.8	94.9
1.00	923.0	95.6

TP= 1. RUN# 71. LOAD= 1100. LBS. VEL.= 40. MPH ALPHA= 4. DEG

TIRE PRESSURE= 28. PSI

FILE 198. FIRESTONE TOWN & COUNTRY H78-14 WET JENNITE

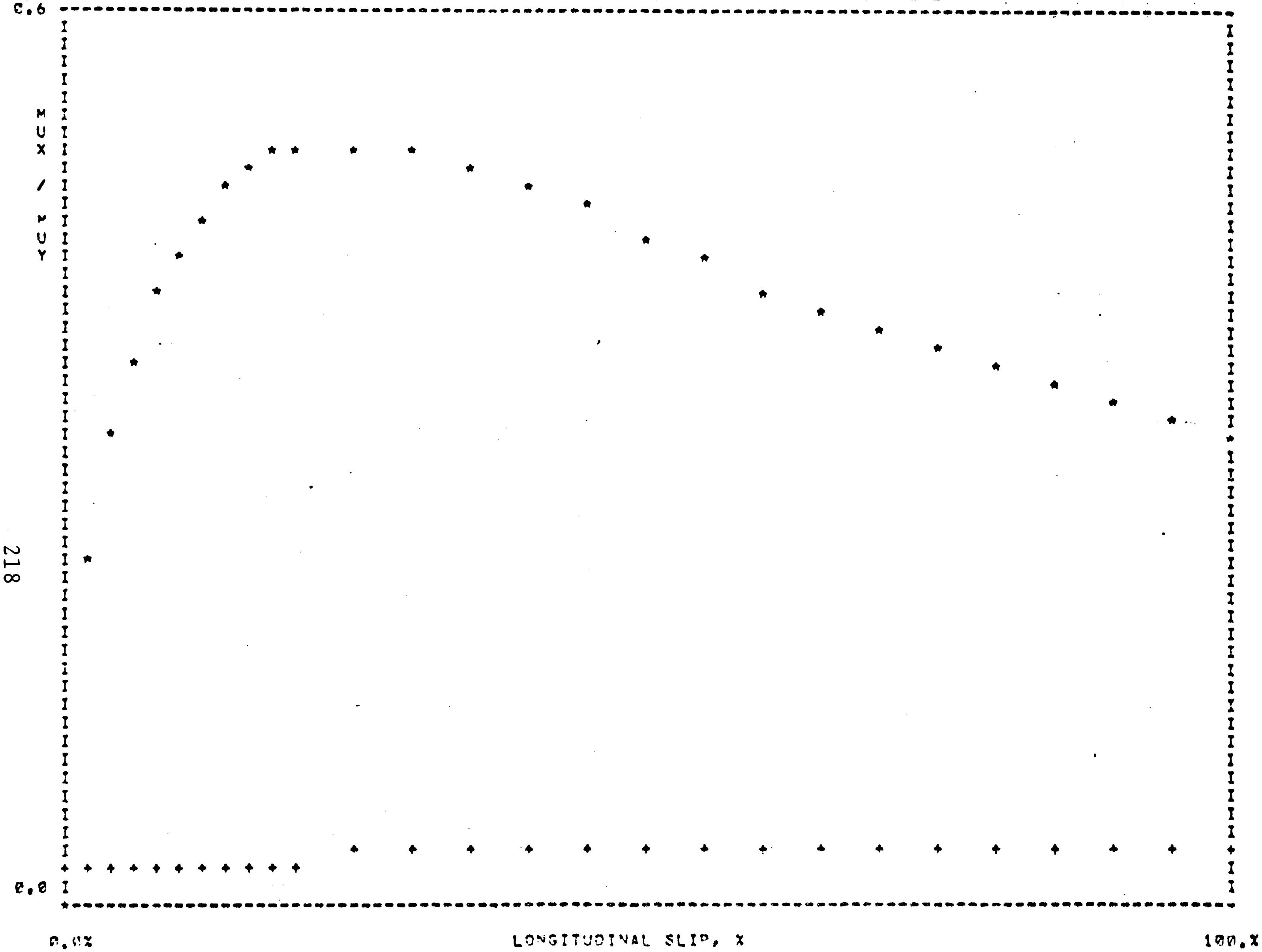


TP- 2. RUN# 23. LOAD= 800. LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 28. PSI

SLIP	FX-LBS
0.00	0.0
0.02	100.5
0.04	164.5
0.06	209.8
0.08	249.2
0.10	280.2
0.12	305.6
0.14	322.4
0.16	332.1
0.18	335.1
0.20	335.2
0.25	332.3
0.30	327.2
0.35	318.7
0.40	311.0
0.45	306.4
0.50	303.4
0.55	299.6
0.60	294.1
0.65	286.6
0.70	276.0
0.75	262.9
0.80	250.5
0.85	241.5
0.90	236.3
0.95	232.8
1.00	231.4

FILE 185. FIRESTONE TOWN & COUNTRY H78-14 WET JENNITE

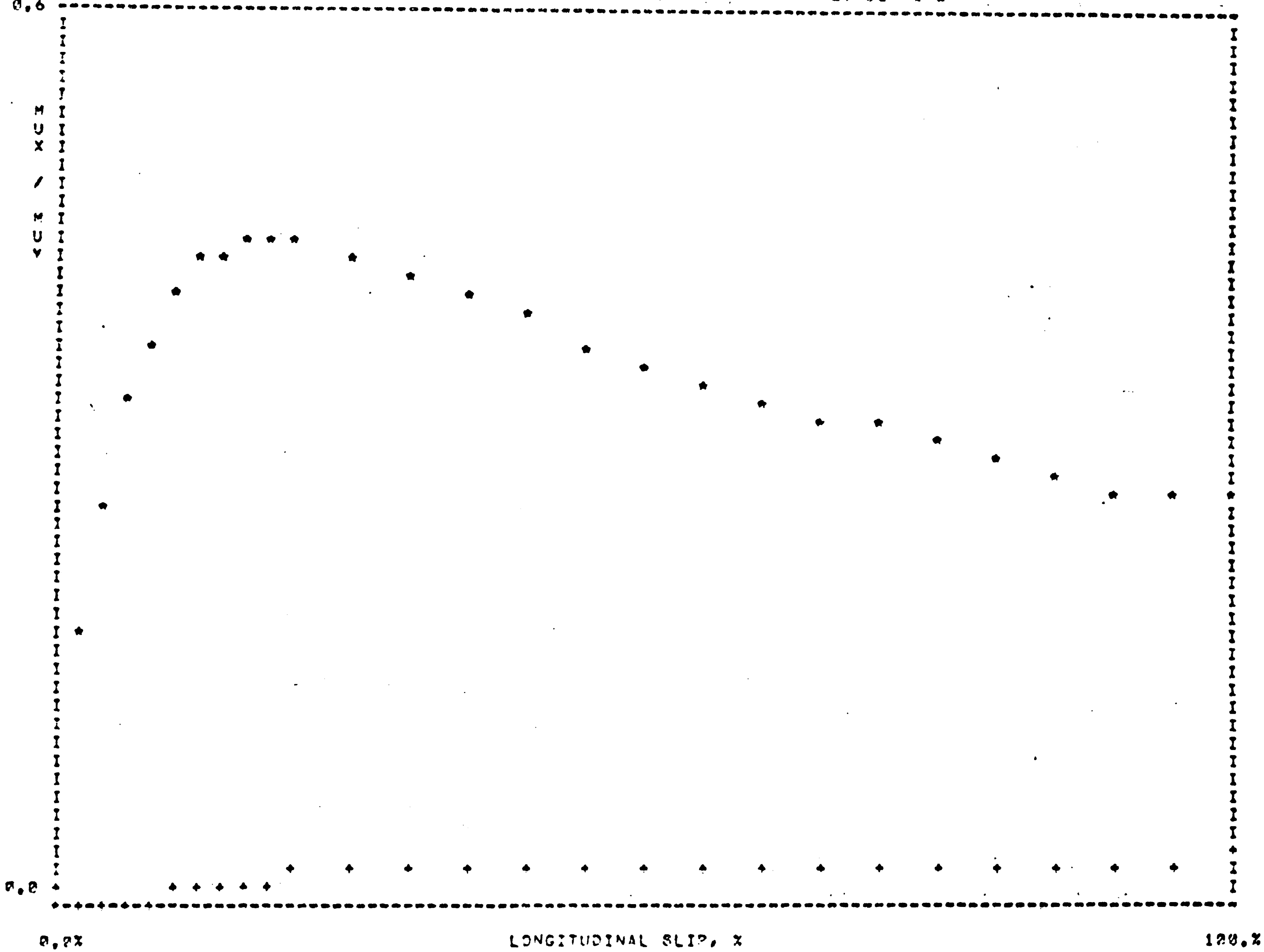


SLIP	FX-LBS
0.00	0.0
0.02	253.2
0.04	342.1
0.06	404.3
0.08	450.2
0.10	484.5
0.12	511.0
0.14	531.2
0.16	545.7
0.18	556.0
0.20	561.4
0.25	563.6
0.30	559.0
0.35	548.8
0.40	533.8
0.45	515.1
0.50	494.3
0.55	474.0
0.60	456.6
0.65	442.6
0.70	430.5
0.75	418.3
0.80	404.7
0.85	392.0
0.90	375.0
0.95	359.8
1.00	344.4

TP= 2. RUN# 7. LOAD= 1100. LBS. VEL.= 20. MPH ALPHA= 0. DEG

TIRE PRESSURE= 28. PSI

FILE 186.   FIRESTONE TOWN & COUNTRY   H78-14   WET JENNITE

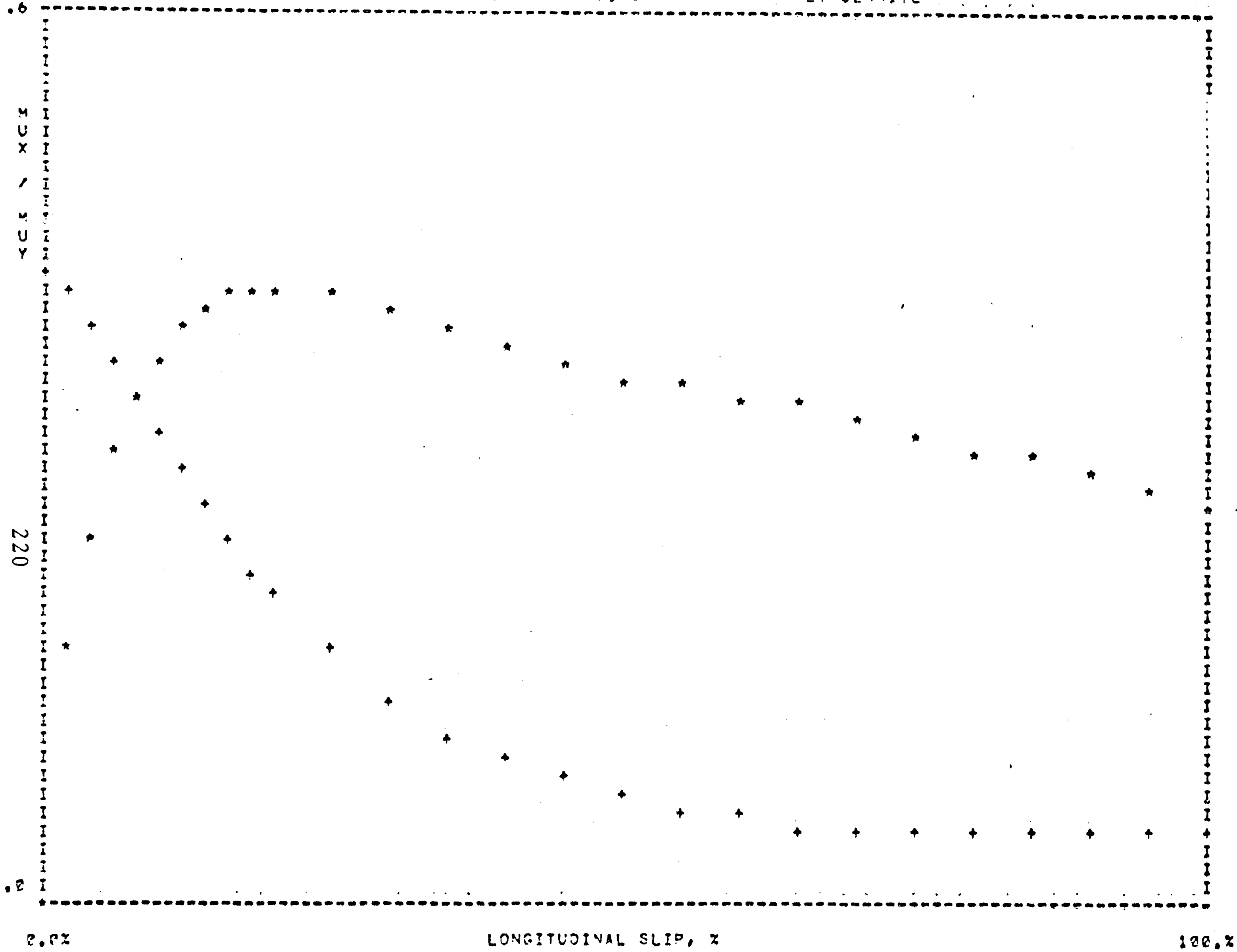


TP- 2.   RUN# 8.   LOAD= 1100. LBS.   VEL.= 40. MPH   ALPHA= 0. DEG

TIRE PRESSURE= 28. PSI

SLIP	FX-LBS
0.00	0.0
0.02	200.9
0.04	299.0
0.06	369.0
0.08	418.7
0.10	452.2
0.12	473.7
0.14	486.3
0.16	492.9
0.18	495.8
0.20	495.3
0.25	485.8
0.30	470.5
0.35	452.2
0.40	434.6
0.45	418.6
0.50	423.0
0.55	388.0
0.60	375.6
0.65	365.1
0.70	353.7
0.75	341.0
0.80	329.6
0.85	320.5
0.90	312.8
0.95	306.[illegible]
1.00	300.6

FILE 192. FIRESTONE TOWN & COUNTRY H78-14 WET JENNITE



TP- 2. RUN# 14. LOAD= 1100. LBS. VEL.= 40. MPH ALPHA= 3. DEG

TIRE PRESSURE= 28. PSI

SLIP	FX-LBS	FY-LBS
0.00	0.0	465.7
0.02	181.5	450.2
0.04	266.5	427.7
0.06	327.9	401.5
0.08	373.0	373.8
0.10	404.4	345.7
0.12	425.5	318.3
0.14	439.2	292.3
0.16	448.1	267.8
0.18	453.5	244.9
0.20	455.3	224.2
0.25	449.7	180.9
0.30	438.8	146.6
0.35	425.9	121.2
0.40	412.4	102.3
0.45	399.9	88.0
0.50	389.7	77.1
0.55	381.3	69.0
0.60	374.1	63.2
0.65	367.9	58.8
0.70	360.7	55.2
0.75	351.3	52.3
0.80	340.5	50.1
0.85	329.3	48.9
0.90	318.1	48.4
0.95	307.0	48.1
1.00	296.0	48.2

XIV. Buick OE Ground to 2/32 Inch Tread Depth

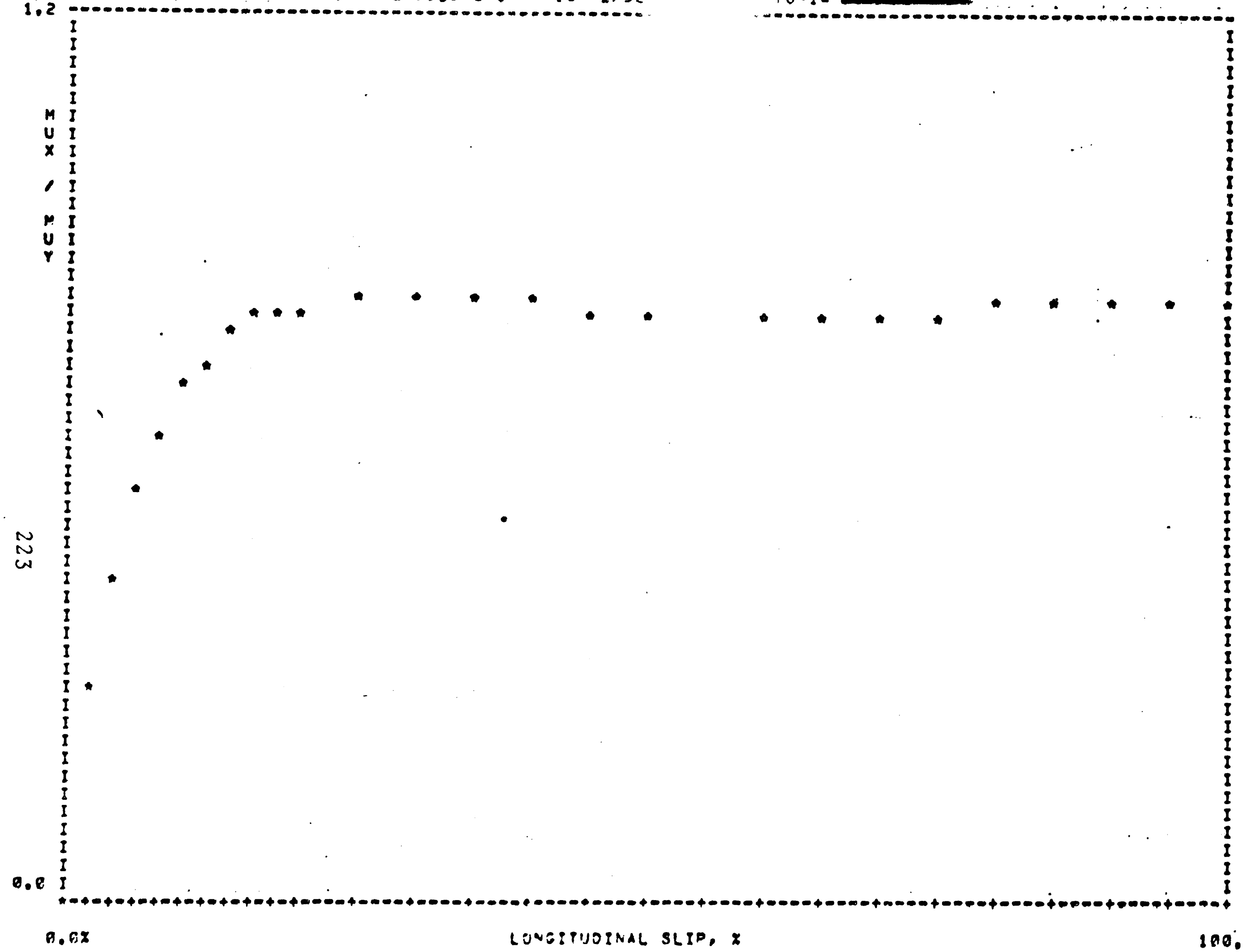
XIV.C.2 Free-Rolling Lateral Force Measurements from Mobile Tire Tester - 20 psi Inflation

		Dry Asphalt					Wet Jennite				
Load	Speed	0°	2°	4°	8°	16°	0°	1°	3°	7°	15°
800	40 mph	-32	454	495	692	483	-38	200	369	427	291
1100	40 mph						18	238	479	492	458

XIV.C.3 Braking Data from the Mobile Tire Tester - 28 psi

	Dry Asphalt					Wet Jennite				
	0°				4°	0°				3°
	800 lbs.		1100 lbs.		800 lbs.	800 lbs.		1100 lbs.		1100 lbs.
	20 mph	40 mph	20 mph	40 mph	40 mph	20 mph	40 mph	20 mph	40 mph	40 mph
MBF		644			711		323		414	370
LWBF		644			681		232		243	259
MLF					608					366
LWLF					70					30

FILE 1201. FIRESTONE DELUXE CHAMPION 2/32 78-14 [redacted] DRY ASPHALT

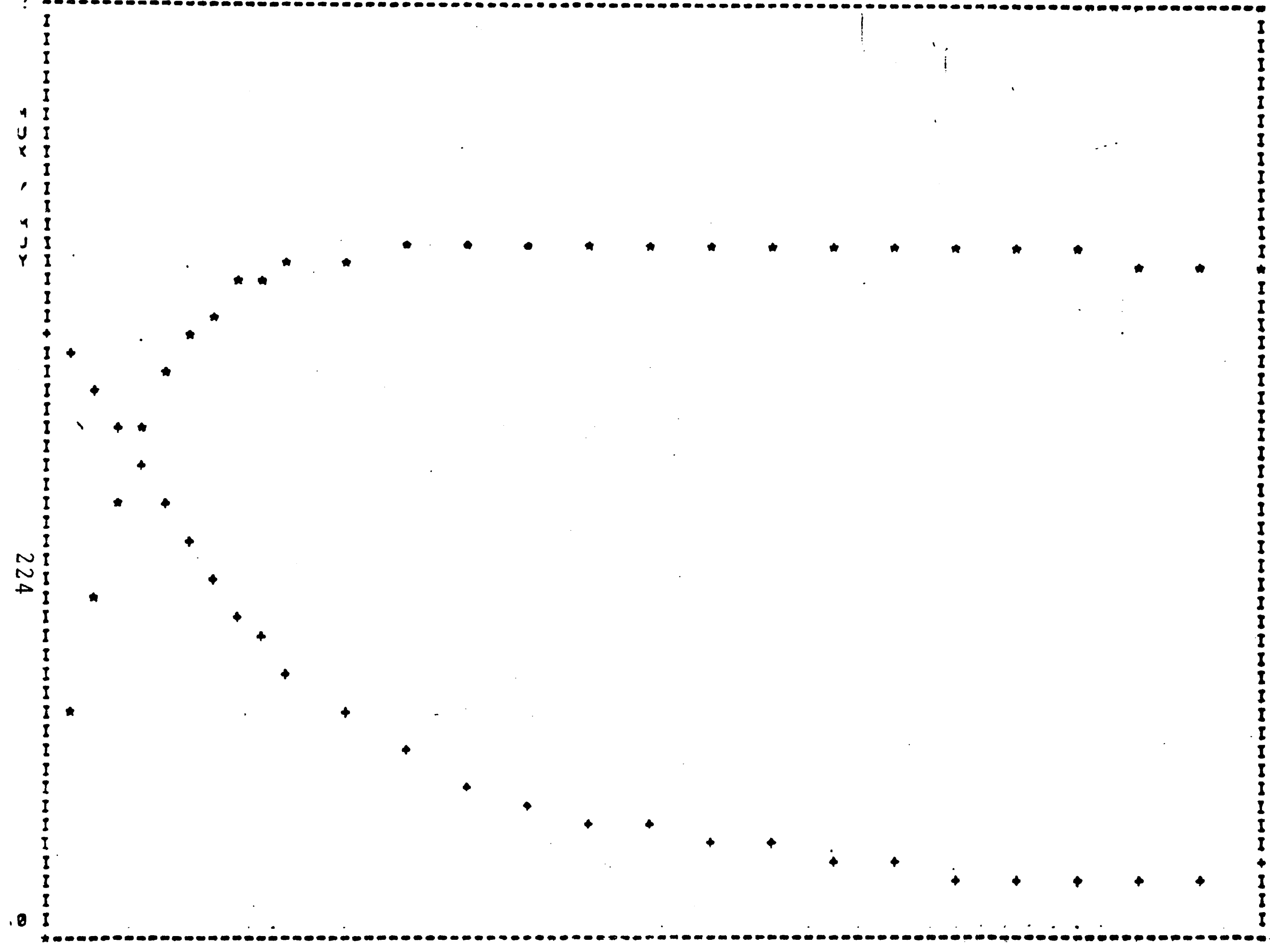


SLIP	FX-LBS
0.00	0.0
0.02	225.1
0.04	344.3
0.06	432.2
0.08	498.4
0.10	546.2
0.12	580.4
0.14	604.6
0.16	621.6
0.18	633.6
0.20	640.0
0.25	643.7
0.30	644.4
0.35	644.5
0.40	641.3
0.45	635.7
0.50	631.8
0.55	629.7
0.60	628.1
0.65	628.4
0.70	632.2
0.75	637.6
0.80	641.2
0.85	643.7
0.90	646.1
0.95	646.9
1.00	644.8

TP= 4. RUN# 341. LOAD= [illegible] LBS. VEL.= 40. MPH ALPHA= 0. DEG

TIRE PRESSURE= 28. PSI

FILE 1222.   FIRESTONE DELUXE CHAMPION 2/32 B.O.E.-2 H78-14 [redacted] DRY ASPHALT



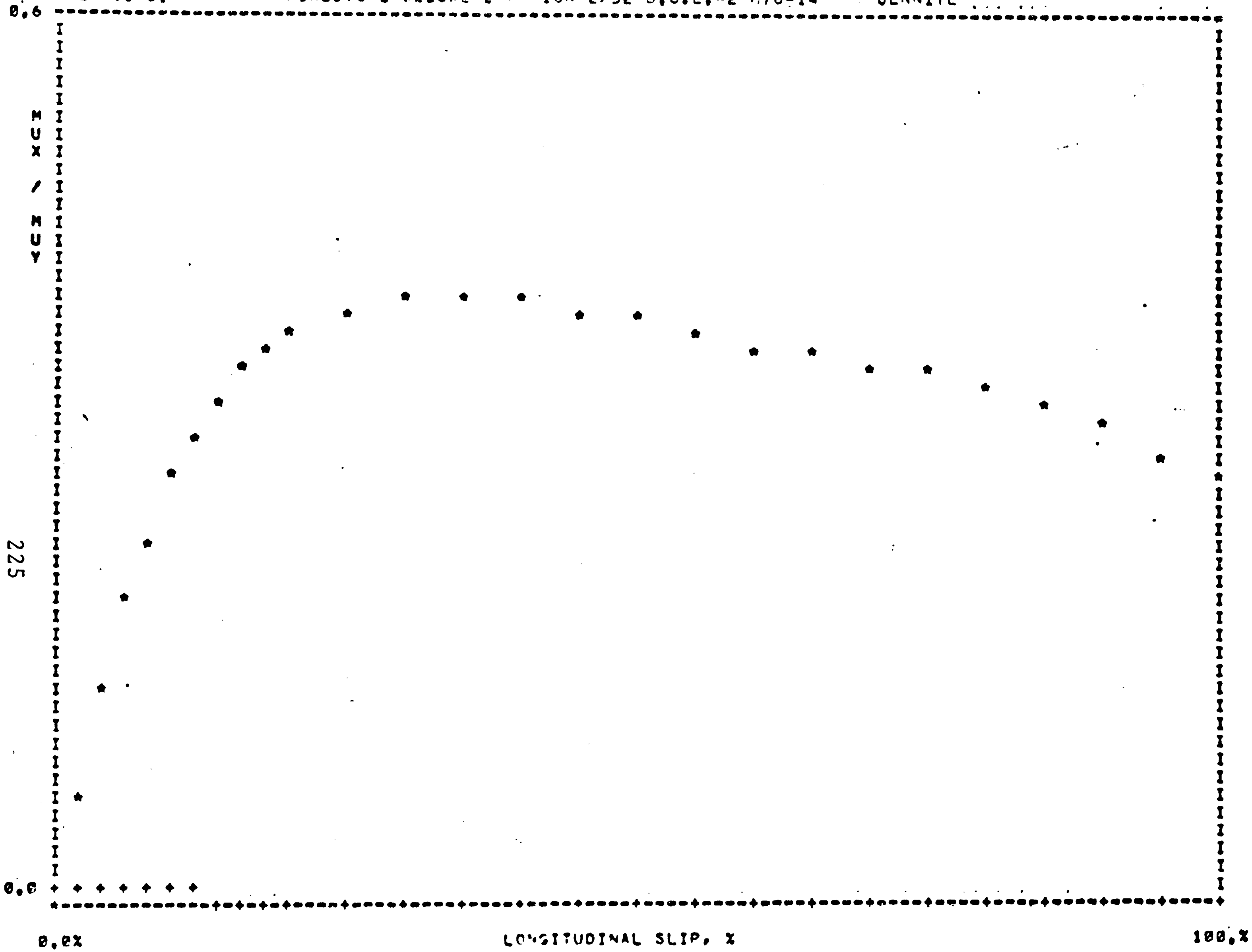
0.0%   LONGITUDINAL SLIP, %   100.%

TP= 4.   RUN# 343.   LOAD= [illegible] LBS.   VEL.= 40. MPH   ALPHA= 4. DEG

TIRE PRESSURE= 28. PSI

SLIP	FX-LBS	FY-LBS
0.00	0.0	627.9
0.02	219.9	596.7
0.04	340.9	561.0
0.06	435.4	519.3
0.08	508.9	476.6
0.10	564.7	435.9
0.12	606.5	398.1
0.14	637.3	362.9
0.16	660.1	329.9
0.18	676.0	320.0
0.20	684.2	275.0
0.25	693.9	228.2
0.30	698.9	188.1
0.35	701.4	157.5
0.40	703.1	135.7
0.45	704.3	119.2
0.50	706.1	106.4
0.55	708.4	96.2
0.60	710.2	87.2
0.65	710.5	78.5
0.70	709.3	70.7
0.75	708.0	65.2
0.80	706.5	62.5
0.85	703.1	62.3
0.90	697.5	64.0
0.95	690.2	66.6
1.00	680.7	72.3

FILE 1145.   FIRESTONE DELUXE CHAMPION 2/32 B.O.E.-2 H78-14   ' JENNITE

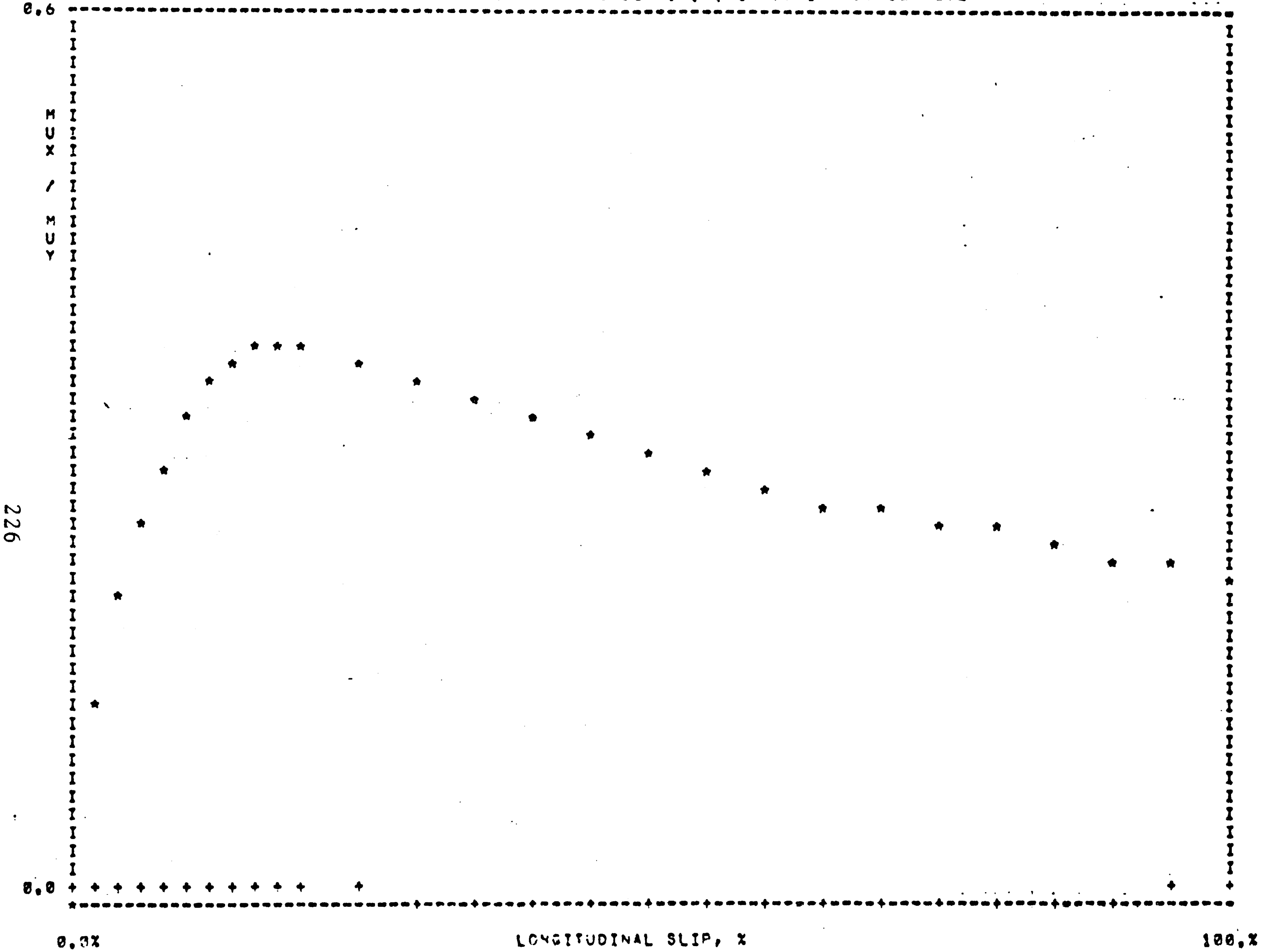


SLIP	FX-LBS
0.00	0.0
0.02	61.6
0.04	114.8
0.06	158.5
0.08	195.7
0.10	226.6
0.12	252.1
0.14	272.9
0.16	289.3
0.18	301.9
0.20	310.0
0.25	319.9
0.30	323.2
0.35	322.9
0.40	321.6
0.45	319.3
0.50	314.7
0.55	308.2
0.60	302.2
0.65	297.4
0.70	292.2
0.75	285.2
0.80	276.2
0.85	266.2
0.90	255.6
0.95	244.3
1.00	232.2

TP= 4.   RUN# 278.   LOAD= [illegible] LBS.   VEL.= 40. MPH   ALPHA= 0. DEG

TIRE PRESSURE= 28. PSI

FILE 1138.   FIRESTONE DELUXE CHAMPION 2/32 B.O.E.-1 H78-14 WET JENNITE

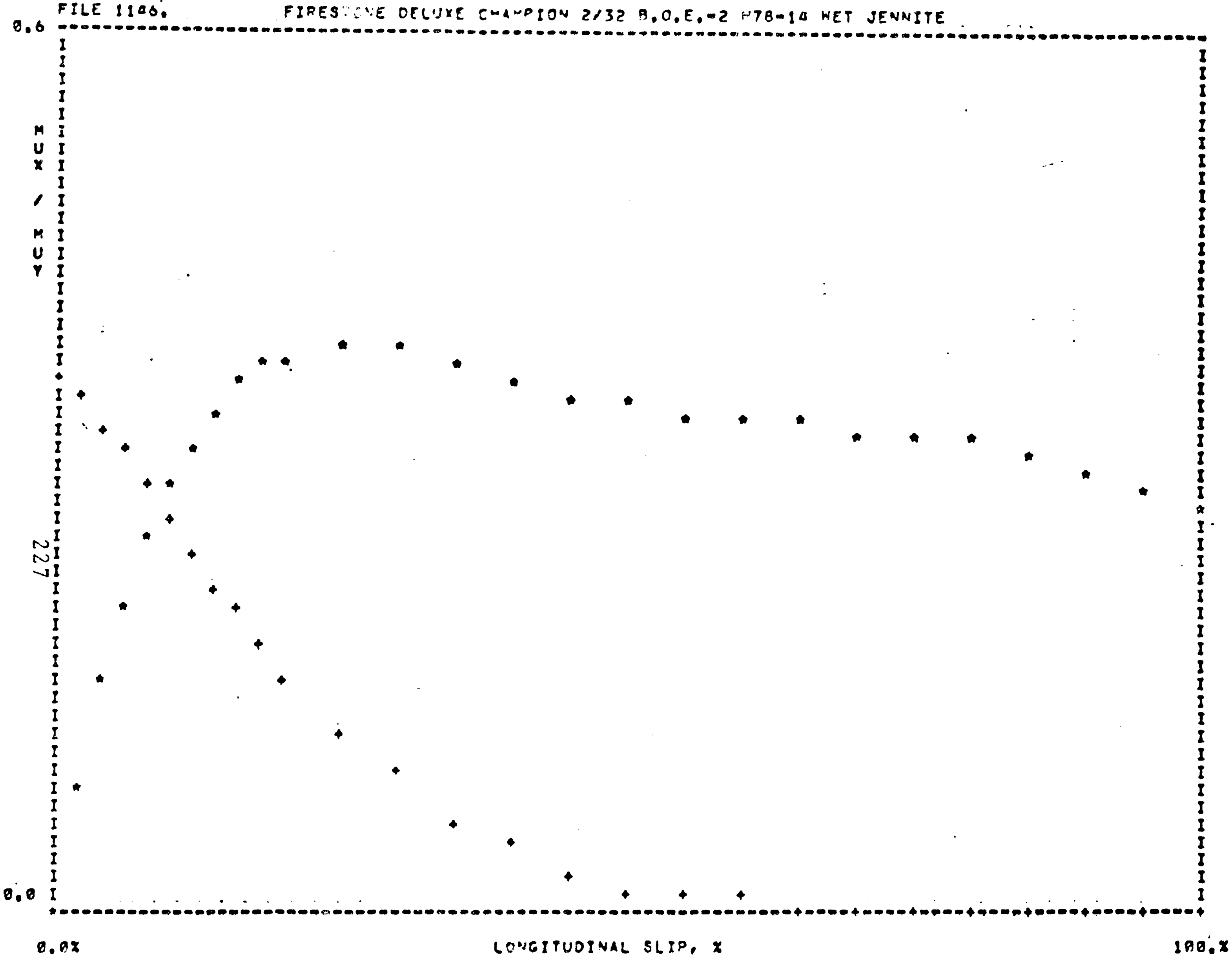


SLIP	FX-LBS
0.00	0.0
0.02	145.3
0.04	222.1
0.06	280.6
0.08	325.0
0.10	357.7
0.12	381.0
0.14	397.1
0.16	407.6
0.18	413.4
0.22	413.6
0.25	405.2
0.30	391.5
0.35	374.0
0.40	356.1
0.45	340.6
0.50	327.8
0.55	317.3
0.60	307.9
0.65	299.0
0.70	290.6
0.75	282.8
0.80	275.3
0.85	267.3
0.90	259.1
0.95	251.0
1.00	242.8

TP= 4.   RUN# 271.   LOAD= 1104. LBS.   VEL.= 40. MPH   ALPHA= 0. DEG

TIRE PRESSURE= 28. PSI

FILE 1146. FIRESTONE DELUXE CHAMPION 2/32 B.O.E.-2 F78-14 WET JENNITE

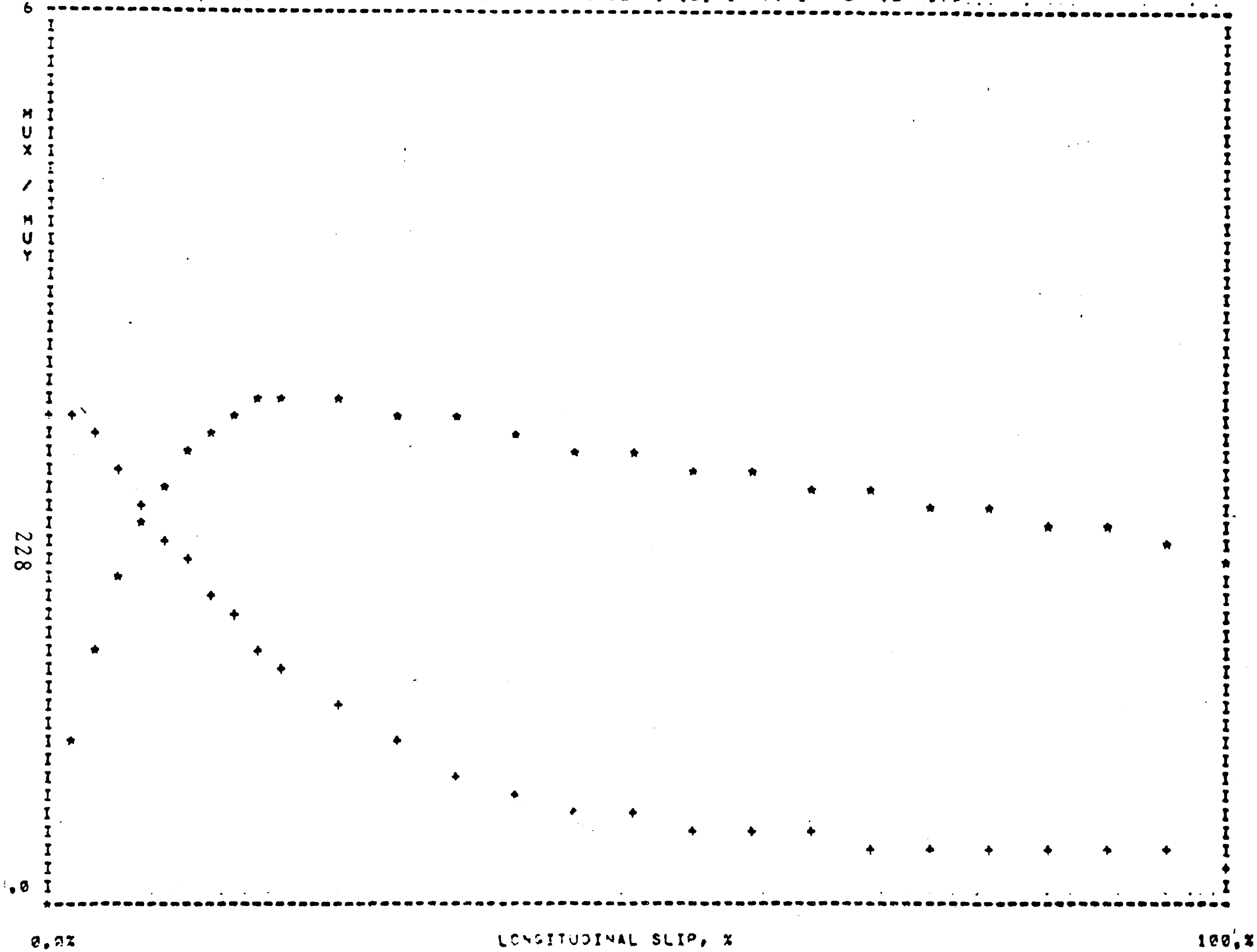


TP= 4. RUN# 279. LOAD= 822. LBS. VEL.= 40. MPH ALPHA= 3. DEG

TIRE PRESSURE= 28. PSI

SLIP	FX-LBS	FY-LBS
0.00	0.0	284.1
0.02	66.3	274.8
0.04	120.1	262.0
0.06	163.5	246.7
0.08	199.6	238.0
0.10	229.3	212.6
0.12	252.9	194.7
0.14	270.9	176.8
0.16	284.5	159.6
0.18	294.0	143.4
0.20	300.2	129.0
0.25	305.5	99.8
0.30	304.0	73.3
0.35	297.3	52.0
0.40	288.8	35.0
0.45	281.2	22.3
0.50	275.5	13.6
00 CONVERSION ERROR SEG 00136		
0.55	271.4	8.4
0.60	268.5	5.3
0.65	265.4	2.9
0.70	262.2	0.9
0.75	259.4	-0.9
0.80	255.7	-2.6
0.85	250.1	-4.3
0.90	241.3	-5.9
0.95	230.8	-7.4
1.00	218.6	-8.7

FILE 1139.   FIRESTONE DELUXE CHAMPION 2/32 8.0.E.-1 H78-14 WET JENNITE



SLIP	FX-LBS	FY-LBS
0.00	0.0	365.7
0.02	115.0	360.3
0.04	181.5	341.0
0.06	235.6	318.0
0.08	279.5	295.0
0.10	311.2	271.9
0.12	333.9	249.4
0.14	350.0	227.9
0.16	360.8	207.6
0.18	367.4	189.1
0.20	369.5	173.5
0.25	367.9	142.4
0.30	362.3	116.7
0.35	354.6	96.5
0.40	346.7	81.3
0.45	339.6	70.4
0.50	333.0	62.6
0.55	326.0	57.2
0.60	319.1	53.0
0.65	312.9	49.3
0.70	306.8	46.0
0.75	300.0	43.6
0.80	292.8	41.5
0.85	286.0	39.2
0.90	278.0	36.5
0.95	269.1	33.5
1.00	259.1	30.4

TP= 0.   RUN# 272.   LOAD= 1100. LBS.   VEL.= 40. MPH   ALPHA= 3. DEG

TIRE PRESSURE= 28. PSI

Cornering Stiffness, C_α, and Inclination Stiffness, C_γ in Pounds per Degree as a Function of Tread Depth and and Vertical Load

	Tread Depth						
	6/32		4/32		2/32		
Load	C_α	C_γ	C_α	C_γ	C_α	C_γ	
500	176	8	215	12	182	8	
800	191	10	202	13	196	14	II* Pirelli Cinturato
1100	173	9	168	15	175	11	185R-14 24 psi
1400	152	11	141	17	152	15	
500	194	36	179	31	218	38	
800	210	38	210	37	232	47	III* Firestone 500
1100	196	35	200	36	210	45	E78-14 24 psi
1400	178	35	182	39	192	43	
500	192	26	189	29	181	27	
800	193	26	192	30	200	33	IV* Goodyear Polyglas
1100	163	27	161	32	174	32	E78-14 24 psi
1400	135	27	139	31	150	32	
800	235		255	45	303	61	
1100	247		263	55	293	59	VIII* Firestone Deluxe
1400	237		245	52	278	56	Champion Sup-R-Belt H78-14 28 psi
1700	231		231	49	247	56	
800	232	38	230	40	257	42	
1100	253	45	253	50	272	54	IX* Firestone 500
1400	258	46	258	48	268	55	H78-14 28 psi
1700	252	47	251	48	254	56	
800	266	18	292	10	317	12	
1100	296	17	314	14	316	16	X* Bridgestone
1400	300	17	307	16	297	16	225R-14 28 psi
1700	287	21	292	20	285	24	
800	240	40	243	45	241	39	
1100	235	46	240	51	238	46	XI* General Belted Jumbo
1400	215	44	220	48	218	45	H78-14 28 psi
1700	197	43	199	46	201	43	

	Tread Depth						
	6/32		4/32		2/32		
Load	C_α	C_γ	C_α	C_γ	C_α	C_γ	
800	217	10	209	9	224	8	
1100	247	10	237	9	236	12	XII* Firestone Radial
1400	245	13	237	12	220	18	Snow HR78-14 28 psi
1700	230	17	222	15	196	25	
800	216	35	264	47	249	47	
1100	243	43	274	52	255	54	XIII* Firestone Snow
1400	243	45	266	53	243	48	H78-14 28 psi
1700	234	44	250	52	227	45	

D5. REFERENCES

1. Dugoff, H. and Brown, B.J., "Measurement of Tire Shear Forces," SAEpaper 700092.

APPENDIX E

THE VEHICLE TEST PROGRAM

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E1. GENERAL

A major objective of this study was to quantify the effects of tire-in-use factors on vehicle handling performance. The factors considered were in the realm of tire operational conditions found on our nation's city streets and highways and included tire wear, tire construction, tire pressures, tire loadings, and mixtures of tire wear and construction. The baseline condition consisted of original equipment (O.E.) tires at O.E. pressure and loading for each vehicle. Vehicles tested were a 1971 Ford Mustang and a 1973 Buick Century station wagon.

The tests were conducted on two different surfaces; dry asphalt and wet jennite. The asphaltic concrete is of the hot mix type with siliceous rock aggregate and has a locked wheel skid number at 40 mph (SN_{40}) of 75, dry. Jennite is actually a clay filled coal tar emulsion with latex rubber sprayed over an existing pavement as a seal coat. TTI's jennite pad was sprayed with enough sand content to produce a SN of 29 when wetted by the skid trailer's onboard watering system, commonly referred to as "internal water."

All six of the basic Vehicle Handling Test Procedures (VHTP's) as defined by the Highway Safety Research Institute [1]*were performed on dry pavement and three of the six were performed on wet jennite. Tables E1 and E3 constitute the full test matrices for the Mustang and Buick, respectively, and Tables E2 and E4 describe the various tire configurations in more detail. The VHTP's were modified or "tailored" to this study as explained in the section on Test Procedures.

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*[ ] refers to the references listed at the end of this Appendix.

E2. TEST GUIDELINES

It has been shown in previous studies [2], [3] that tire side force increases with tire shoulder wear and seldom stabilizes before the shoulder is well rounded. This creates a data gathering dilemma in that experimental results are without a fixed frame of reference until stabilization of the side force is achieved but, at the same time, the stabilized tire geometry is an extreme case of rare occurrence in a random cross section of the motoring public. Therefore, in this study, it was decided that tires would not be shoulder worn (except as a separate test configuration), but that tires would be changed frequently (especially on dry asphalt) to minimize the influence of wear on the test data. Also in this regard the following rules were observed:

1. The vehicle driver and radio link operator (automatic system) were careful to avoid fast starting, quick stopping and hard cornering of the test vehicles at any time except as required for proper execution of the actual data gathering phase of any maneuver. The drivers and operators advised test observers and support personnel of minimum distances necessary for recovering from a maneuver without squealing tires.
2. Whenever a particular tire configuration for either vehicle was to be used in several maneuvers, the order of execution progressed from the maneuver which inflicted the least tire shoulder wear first, to that which caused the most last. The maneuvers are listed in their proper order of execution as they appear in the Tables E1 and E3 from top to bottom. <u>Note</u>: They are <u>not</u> numbered according to intended order of execution.
3. If trial runs had to be performed for any purpose, e.g., instrument checkout etc., these were made with the shoulder worn tires, i.e., tire configuration 28 for the Mustang and 34 for the Buick.

4. After each tire change, the driver or operator did not proceed from the shop area before requesting that the test supervisor verify the tire configuration.
5. Vehicle inspection was done regularly to maintain the vehicle as close as possible to the manufacturer recommended specifications. Since the test vehicles undergo severe maneuvers, regular inspections of the suspension system, steering system and the brake system were performed. Wheel bearings and brake linings or discs were inspected prior to the full scale testing and the ball joint play, steering box play and the front-end alignment were checked regularly during the test program. For the driver system brake maneuvers (VHTP 1,2,7,8) brakes were checked and bled everyday prior to testing. Brake balancing was done prior to any new tire configuration testing. Fifth wheel accuracy of 1% was checked periodically on the standard mile and was found to be fairly consistent. Other vehicle conditions were controlled by mounting statically balanced wheels on the vehicle and by performing tests with at least a 3/4 tank full of gasoline.

Tire pressures, as specified on the list of tire configurations, were maintained within ± 1 psi during testing. This was accomplished as follows:

1. Pressure was set at desired level, cold.
2. Vehicle was driven until tires were warmed up (just prior to start of testing).
3. Pressures were re-set, testing was begun.
4. Pressures were checked after every four runs and adjusted as necessary.

Pressures were checked after every run during the initial phases of wet testing until the pattern of tire pressure variations emerged and the desired frequency of checking was established. It was determined that a four run frequency was found to be acceptable for both wet and dry conditions.

The loaded condition corresponded to manufacturer's recommended maximum loading. This was inclusive of instrumentation, driver and fuel. Driver and automatic systems required different amounts and arrangement of added weight to meet the maximum load condition. However, in both cases the Buick was loaded to 2480 lbs, front, and 3090 lbs, rear.

To minimize the possibility of mistakes, the test matrices were arranged in terms of Tire Configuration numbers with an accompanying list describing these configurations in detail (see Tables E1 through E4). This same system enabled a convenient method of identifying each individual test by way of a test number having four parts as VN-MN-CN-RN where,

VN = Vehicle number;

MN = Maneuver number;

CN = Configuration number; and

RN = Run number, starts over with 01 when any of above change.

All numbers are defined on the test matrix (Tables 1 and 3) for each vehicle, with the exception of run number which starts over with 01 whenever VN, MN or CN changes. As an example, the test number for the fifth run on the Buick in braking-in-a-turn wet for the "Wear 1" configuration would be 2-8-21-05.

The full test number was written on the visicorder record and was part of the annotation on magnetic tape for each run. Also, annotated on tape were brake pressure for Maneuvers 1, 2, 7 & 8; steer input for Maneuvers 4, 5 & 9; frequency of road disturbance grids for Maneuver 3; and velocity, steer input, brake application time, and brake release time for Maneuver 6.

All runs for both automatic and driver systems were displayed on visicorder paper and carefully reviewed before shipping magnetic tapes to HSRI. Acceptance criteria on initial conditions were $\pm$ 1 mph on initial velocity and $\pm$ 0.01 g's on lateral acceleration. Automatic controller inputs were held within $\pm$ 5% of values specified in Test Procedures.

E3. TEST PROCEDURES

As mentioned above, the six basic VHTP's were used in this study. These were modified, as described below, to accommodate several factors peculiar to this study. First, the unnecessary tire wear was prevented by discontinuing repeat runs wherever possible. Secondly, low friction testing (wet jennite) required that initial conditions (especially velocity) be altered before meaningful or repeatable test results could be obtained.

It was found for Maneuver 8 (braking in a turn, wet), that a steady state turn could not be maintained prior to application of the brakes for V_o = 40 mph and A_y = 0.3 g's. This was not surprising since the locked wheel skid number of the wet jennite at 40 mph is 29 which can loosely be interpreted as a nominal surface friction coefficient of 0.29, slightly lower than the desired A_y of 0.30. Only a loose comparison is justified here since peak levels of lateral acceleration as high as 0.6 g's were recorded during transient portions of Maneuver 9 (sinusoid) on the same wet surface. However, a steady state turn at 0.3 lateral g's could definitely not be achieved repeatedly, therefore, the desired g level was reduced to 0.2. For this value of A_y, it was found that V_o = 30 mph produced a radius of turn which was compatible with TTI's jennite pad measuring 200 x 360 feet. Finally, to be able to compare results of Maneuver 8 with those of Maneuver 7 (straight line braking) it was decided that the latter should also be run at 30 mph. Hence, the braking maneuvers described below in detail reflect these changes for low friction or wet testing (see section on methodology).

In executing Maneuver 9 (sinusoid, wet), it was found that the initial conditions suggested for dry testing produced saturation of the lateral acceleration (limit of cornering) at about the second or third value of steer amplitude. After experimenting with the maneuver at different speeds, it was found that V_o = 30 mph with the same steer amplitudes as used for 45 mph produced saturation of A_y at about the fourth or fifth value of steer amplitude which is consistent with results obtained for the sinusoid steer on dry pavement. Hence V_0 = 30 mph was adopted at the onset of the testing program. Unfortunately, it was later determined that at this speed, tires worn to 2/32 inch tread depth responded no differently than the O.E. tires. This prompted a comparison of the two tires at higher speeds and ultimately led to the methodology described below, for Maneuver 9.

E4. TEST FINDINGS

Although detailed results of comparing the numerous conditions tested in this study can only be obtained after careful scrutiny of the data, there were a few obvious results which are noteworthy.

It was demonstrated repeatedly in this study that two new tires having identical serial numbers can differ in circumferential and side force generating capability to the point of introducing markedly unsymmetrical vehicle response. This was discovered when, as a last resort, tires were switched from left to right on the vehicle in an effort to explain braking anomalies with the Mustang. After testing several tire configurations on that vehicle in both Maneuvers 7 and 8, two successive tire configurations suddenly became plagued with an outside front wheel locking in Maneuver 8. No vehicle adjustment whether hydraulic or mechanical was successful in correcting or explaining the problem, therefore, the researchers switched the front tires left for right and the problem disappeared. This occurred for both configurations 16 (Pirelli radial fronts with O.E. rears) and 17 (Goodyear Custom Power Cushion Polyglas fronts with O.E. rears). Note that switching the front tires did not cause a complete reversal of results but merely alleviated the problem. This could be due to inherent vehicle asymmetries or perhaps to the fact that the rear tires were not switched. That simple exercise conclusively illustrated marked differences in the circumferential force capability of two new tires from the same manufacturer's lot.

Another example of the above occurred in Maneuver 5 when the Buick was equipped with Bridgestone radials on the front and with O.E. rears (tire configuration 42). This configuration caused such an unsymmetrical vehicle response initially that testing was stopped and the function generator commands were double checked, but were found to be correct. The vehicle's response was such that for the same steer amplitude, one polarity was causing a drastic overcorrection on the second half of the sine wave while in the other polarity the first half of the sinusoid was so dominant that the second half was virtually ineffective. The rear tires were first suspected to be the culprits, hence they were switched first, but to no avail. The front tires were then switched, causing the asymmetry to be markedly reduced.

Another obvious finding was that the Buick in its fully loaded condition with low rear tire pressure (20 psi as opposed to the manufacturer's recommended 32 psi) has the problem of its outside rear tire coming off the rim in all of the turning maneuvers including braking in a turn.

TABLE E1. TEST MATRIX FOR VEHICLE #1 - MUSTANG

NOTE: See Table 2 for description of tire configuration

Maneuver Numbers And Names			TIRE CONFIGURATION HEADINGS AND NUMBERS: O. E.	P.S.I.	Mix 1	Mix 2	Wear 1	Wear 2	Wear 3	Shoulder	Approx. No. of Runs	Sub-Total
WET	7	St. Line Braking	11	12	X	X	13	14	15	X	15 for O.E. 7 for others	15 28
WET	8	Braking In A Turn	11	12	16	17	18	19	20	X	40 for O.E. 10 for others	40 60
WET	9	Sinusoidal Steer	21	22	23	24	25	26	27	28	16 for each	128
DRY	1	St. Line Braking	11	12	X	X	13	X	X	X	15 for O.E. 7 for others	15 14
DRY	2	Braking In A Turn	11	12	16	17	18	X	X	X	20 for O.E. 10 for others	20 40
DRY	5	Sinusoidal Steer	29,30	31	32	33	34	X	X	28	32 for O.E. 16 for others	32 80
DRY	4	Trapezoidal Steer	35,36	37	38	39	40	X	X	28	28 for O.E. 14 for others	28 70
DRY	3	Turning on a Rough Road	X	X	X	X	X	X	X	X		
DRY	6	Drastic Steer and Brake	41	42	X	X	X	X	X	X	10 for each	20

Approx. Total Runs 590

TABLE E2

MUSTANG TIRE CONFIGURATIONS

Tire Configuration	Tire Type	Tire I. D. No.	Pressure	Comment
11	MOE Series are Mustang O.E. Tires*	F - MOE 6, 8 R - MOE 9, 10	24 24	F - Front R - Rear
12		F - MOE 6, 8 R - MOE 9, 10	18 18	
13	M200 Series are MOE's cut to 2/32 in. tread depth	F - M201, 202 R - M205, 206	24 24	
14	M400 Series are MOE's cut to 4/32 in tread depth	F - M401, 402 R - M403, 404	24 24	
15	M600 Series are MOE's cut to 6/32 in. tread depth	F - M601, 602 R - M603, 604	24 24	
16	PR series are Pirelli radials	F - PR101, 102 R - MOE 9, 10	24 24	
17	CPCP Series are Custom Power Cushion Polyglas (Goodyear)	F - CPCP1, 2 R - MOE 9, 10	24 24	
18		F - MOE 6, 8 R - M205, 206	24 24	
19		F - MOE 6, 8 R - M403, 404	24 24	
20		F - MOE 6, 8 R - M603, 604	24 24	
21		F - MOE 23, 24 R - MOE 25, 26	24 24	
22		F - MOE 23, 24 R - MOE 25, 26	24 18	
23		F - PR101, 102 R - MOE 25, 26	24 24	

*Goodrich Silvertown, E78-14

TABLE E2 (Cont.)

Tire Configuration	Tire Type	Tire I.D. No.	Pressure	Comment
24		F - CPCP1, 2 R - MOE 25, 26	24 24	
25		F - MOE 23, 24 R - M205, 206	24 24	
26		F - MOE 23, 24 R - M403, 404	24 24	
27		F - MOE 23, 24 R - M603, 604	24 24	
28		F - MOE 17, 18 R - MOE 19, 20	24 24	Shoulder Worn Tires
29		F - MOE 27, 28 R - MOE 29, 30	24 24	
30		F - MOE 31, 32 R - MOE 33, 34	24 24	
31		F - MOE 35, 36 R - MOE 37, 38	24 18	
32		F - PR106, 107 R - MOE 39, 40	24 24	Front Tires have been used in linear study
33		F - CPCP1, 2 R - MOE 41, 42	24 24	
34		F - M203, 204 R - MOE 43, 44	24 24	
35		F - MOE 102, 103 R - MOE 104, 105	24 24	MOE 101 - 112 different lot than 01 - 53
36		F - MOE 106, 107 R - MOE 108, 109	24 24	
37		F - MOE 110, 111 R - MOE 47, 48	24 18	

TABLE E2 (Cont.)

Tire Configuration	Tire Type	Tire I.D. No.	Pressure	Comment
38		F - PR103, 104	24	
		R - MOE 49, 50	24	
39		F - CPCP3, 4	24	
		R - MOE 51, 52	24	
40		F - M207, 208	24	
		R - MOE 45, 46	24	
41		F - MOE 01, 02	24	
		R - MOE 06, 07	24	
42		F - MOE 01, 02	24	
		R - MOE 06, 07	18	

TABLE E3. TEST MATRIX FOR VEHICLE #2 - BUICK

NOTE: See Table 4 for description of tire configurations.

		Maneuver Numbers And Names	O. E.	P.S.I. 1	P.S.I. 2	Loaded O.E.	Loaded P.S.I.	Snow	Mix	Wear 1	Wear 2	Wear 3	Shoulder	Approx. No. of Runs	Sub-Total
			TIRE CONFIGURATION HEADINGS AND NUMBERS												
WET	7	St. Line Braking	11	12	X	13	54	14	X	15	16	17	X	15 for O.E. 7 for others	15 49
WET	8	Braking In A Turn	11	12	18	13	19	14	20	21	22	23	X	40 for O.E. 10 for others	40 90
WET	9	Sinusoidal Steer	24	25	26	27	28	29	30	31	32	33	34	16 for each	176
DRY	1	St. Line Braking	11	12	X	13	54	14	X	15	X	X	X	15 for O.E. 7 for others	15 35
DRY	2	Braking In A Turn	11	12	18	13	19	14	20	21	X	X	X	20 for O.E. 10 for others	20 70
DRY	5	Sinusoidal Steer	35,36	37	38	39	40	41	42	43	X	X	34	32 for O.E. 16 for others	32 128
DRY	4	Trapezoidal Steer	44,45	46	47	48	49	50	51	52	X	X	34	28 for O.E. 14 for others	28 112
DRY	3	Turning on Rough Road	11	18	X	X	X	X	X	X	X	X	X	20 for each	40
DRY	6	Drastic Str. & Brake	X	X	X	X	X	X	X	X	X	X	X		

Approx. Total Runs 870

TABLE E4

BUICK TIRE CONFIGURATIONS

Tire Configuration	Tire Type	Tire I.D. No.	Pressure	Comment
11	BOE Series are Buick O.E. tires*	F - BOE 7, 8 R - BOE 9, 10	24 28	
12		F - BOE 7, 8 R - BOE 9, 10	20 20	
13		F - BOE 7, 8 R - BOE 9, 10	26 32	Maximum Load
14	BSN Series are snow tires	F - BOE 7, 8 R - BSN1, 2	24 28	
15	B200 series are BOE's cut to 2/32 Tread Depth	F - B201, 202 R - B203, 204	24 28	
16	B400 Series are BOE's cut to 4/32 Tread Depth	F - B401, 402 R - B403, 404	24 28	
17	B600 Series are BOE's cut to 6/32 Tread Depth	F - B601, 602 R - B603, 604	24 28	
18		F - BOE 7, 8 R - BOE 9, 10	24 16	
19		F - BOE 7, 8 R - BOE 9, 10	26 20	Maximum Load
20	BR Series are Bridgestone Radials	F - BR 1, 2 R - BOE 9, 10	24 28	
21		F - BOE 9, 10 R - B201, 202	24 28	

*Firestone Sup-R Belt H78-14

TABLE E4 (Cont.)

Tire Configuration	Tire Type	Tire I.D. No.	Pressure	Comment
22		F - BOE 9, 10 R - B401, 402	24 28	
23		F - BOE 9, 10 R - B601, 602	24 28	
24		F - BOE 29, 30 R - BOE 31, 32	24 28	
25		F - BOE 29, 30 R - BOE 31, 32	20 20	
26		F - BOE 29, 30 R - BOE 31, 32	24 16	
27		F - BOE 29, 30 R - BOE 31, 32	26 32	Maximum Load
28		F - BOE 29, 30 R - BOE 31, 32	26 20	Maximum Load
29		F - BOE 29, 30 R - BSN 3, 4	24 28	
30		F - BR1, 2 R - BOE 31, 32	24 28	
31		F - BOE 29, 30 R - B 205, 206	24 28	
32		F - BOE 29, 30 R - B403, 404	24 28	
33		F - BOE 29, 30 R - B 603, 604	24 28	
34		F - BOE 1, 2 R - BOE 3, 5	24 28	Shoulder Worn Tires
35		F - BOE 33, 34 R - BOE 35, 36	24 28	
36		F - BOE 37, 38 R - BOE 39, 40	24 28	

TABLE E4 (Cont.)

Tire Configuration	Tire Type	Tire I.D. No.	Pressure	Comment
37		F - BOE 24, 25 R - BOE 26, 27	20 20	
38		F - BOE 45, 46 R - BOE 47, 48	24 16	
39		F - BOE 111, 112 R - BOE 113, 114	26 32	Maximum Load
40		F - BOE 53, 54 R - BOE 55, 56	26 20	Maximum Load
41		F - BOE 57, 58 R - BSN 1, 2	24 28	BOE 56-76 are different lot than 01-55. Also BOE 111-118 are separate lot
42		F - BR1, 2 R - BOE 59, 60	24 28	
43		F - B205, 206 R - BOE 61, 62	24 28	
44		F - BOE 41, 42 R - BOE 43, 44	24 28	
45		F - BOE 49, 50 R - BOE 51, 52	24 28	
46		F - BOE 101, 102 R - BOE 103, 104	20 20	
47		F - BOE 107, 108 R - BOE 109, 110	24 16	
48		F - BOE 115, 116 R - BOE 117, 118	26 32	Maximum Load
49		F - BOE 71, 72 R - BOE 74, 75	26 20	Maximum Load
50		F - BOE 105, 106 R - BSN 3, 4	24 28	

TABLE E4 (Cont.)

Tire Configuration	Tire Type	Tire I.D. No.	Pressure	Comment
51		F - BR 3, 4 R - BOE 11, 12	24 28	
52		F - B207, 208 R - BOE 13, 14	24 28	
53				Intended for Maneuver #3 but was replaced
54		F - BOE 7, 8 R - BOE 9, 10	20 20	Maximum Load

Methodology for Limit Maneuvers

Maneuver #1 - STRAIGHT LINE BRAKING - DRY (high friction)

Initial Conditions: V_o = 40 mph

δ_{sw} = 0°

Incremental Controls: P_B -- Brake Line Pressure

General Constraints:

1. All brake lines are to be controlled by one pressure limiter assembly.
2. Brake lining temperatures are not to exceed 250°F prior to any run.

Minimum Signals Required: A_x, V_5, ω_1, ω_2, ω_3, ω_4, P_b, MC

Procedure:

1. Set initial brake line pressure level to 400 psi or lower if this level produces lockup of any wheel.
2. Approach test pad above initial velocity.
3. Manually initiate test mode.
4. Coast down to initial velocity.
5. Rapidly depress brake pedal to the physical limit of its stroke, holding steering wheel fixed.
6. Allow vehicle to decelerate to a complete stop and hold for 2 seconds minimum after any pitch motion has settled out.
7. Terminate test mode.
8. Increase brake line pressure by 100 psi increments and repeat steps 2 through 7 until a positive wheel lockup is detected, above 10 mph.
9. Decrease brake line pressure by 100 psi and execute steps 2 through 7.

10. Increase brake line pressure by 25 psi increments and repeat steps 2 through 7 twice at each pressure setting until two wheels indicate positive wheel lockup above 10 mph on a single axle.

11. Note line pressure P_{min}, the minimum pressure leading to positive wheel lockup in #10 for O.E. tires.

12. Change tires to next configuration and run line pressure P_{min} twice. If lockup of both wheels does not occur proceed to step 14 below.

13. If lockup of two tires on an axle is noted in step 12 above, decrease line pressure in 25 psi increments and run steps 2 through 7 until the pressure is low enough so that two wheels on same axle unlock and repeat, above 10 mph. Proceed to step 15.

14. If lockup does not occur on two wheels as explained in step 12, increase line pressure in 25 psi increments and run steps 2 through 7 until lockup on two wheels above 10 mph is noted and repeated.

15. Repeat steps 12 through 14 until all tire configurations have been tested.

Maneuver # 7 - STRAIGHT LINE BRAKING - WET (low friction)

Initial Conditions: V_0 = 30 mph

$\delta_{sw} = 0°$

General Constraints: Same as Maneuver #1 (Straight-Line-Braking-Dry)

Minimum Signals Required: Same as Maneuver #1

Procedure:

1. Set initial brake line pressure level to 200 psi or lower if this level produces lockup of any wheel.
2. Execute steps 2 through 15 of Maneuver #1.

Maneuver #2 - BRAKING-IN-A-TURN - DRY (high friction)

Initial Condition: V_o = 40 mph

δ_{sw} = angle required for initial lateral acceleration to be 0.3 g

Incremental Controls: P_B -- Brake Line Pressure

General Constraints:

1. All brake lines are to be controlled by one pressure limiter assembly.
2. Brake lining temperatures are not to exceed 250°F prior to any test run.
3. Perform trial tests to determine steering wheel angle required to obtain initial lateral acceleration of 0.3 g at 40 mph for both left and right turns.

Minimum Signals Required: A_x, A_y, r, V_5, ω_1, ω_2, ω_3, ω_4, P_B, MC

Procedure:

1. Set initial brake line pressure to 400 psi or lower if this level produces lockup of any wheel.
2. Approach test pad above initial velocity.
3. Manually initiate test mode.
4. Rapidly apply steering input to limit stop.
5. Coast down to initial velocity.
6. Rapidly depress brake pedal to the physical limit of its stroke, holding steering wheel fixed.
7. Allow vehicle to decelerate to a complete stop and hold for 2 seconds minimum after any pitch motion has settled out.

8. Terminate test mode.

9. Repeat steps 2 through 8 for opposite polarity steering input.

10. Increasing brake line pressure in 100 psi increments, repeat steps 2 through 9 until a positive wheel lockup is detected above 10 mph.

11. Decrease brake line pressure 100 psi and repeat steps 2 through 8.

12. Increase brake line pressure by 25 psi increments and repeat steps 2 through 8 twice at each pressure until two wheels indicate lockup above 10 mph.

13. Note line pressure P_{min}, the minimum pressure leading to positive wheel lockup in step 12 for O.E. tires.

14. Change tires to next configuration and run line pressure P_{min} twice. If lockup of two wheels on same axle (above 10 mph) does not occur, proceed to step 16 below.

15. If lockup of two tires on an axle is noted in step 14, decrease line pressure in 25 psi increments and run steps 2 through 8 until the pressure is low enough so that two wheels on same axle unlock and repeat, above 10 mph. Proceed to step 17.

16. If lockup does not occur on two wheels in step 14, increase line pressure in 25 psi increments and run steps 2 through 8 until lockup on two wheels (same axle) above 10 mph is noted and repeated.

17. Change to next tire configuration and repeat steps 14 through 16 until all configurations are tested.

Maneuver #8 - BRAKING-IN-A-TURN - WET (low friction)

Initial Conditions: V_0 = 30 mph

δ_{SW} = angle required for initial lateral acceleration to be 0.2 g

Incremental Controls: P_B -- Brake Line Pressure

General Constraints:

1. All brake lines are to be controlled by one pressure limiter assembly.
2. Brake lining temperatures are not to exceed 250°F prior to any test run.
3. Perform trial tests to determine steering wheel angle required to obtain initial lateral acceleration of 0.2 g at 30 mph for both left and right turns.

Minimum Signals Required: Same as Maneuver #2

Procedure:

1. Set initial brake line pressure to 200 psi or lower if this level produces lockup of any wheel.
2. Execute steps 2 through 17 of Maneuver #2.

Maneuver #3 - TURNING-ON-A-ROUGH-ROAD - DRY (high friction)

Initial Conditions: V_o = 30 mph

δ_{sw} = angle required for initial lateral acceleration to be 0.4 g

Incremental Controls: Three road disturbance grids fundamental frequencies of 9, 11, and 14 Hz.

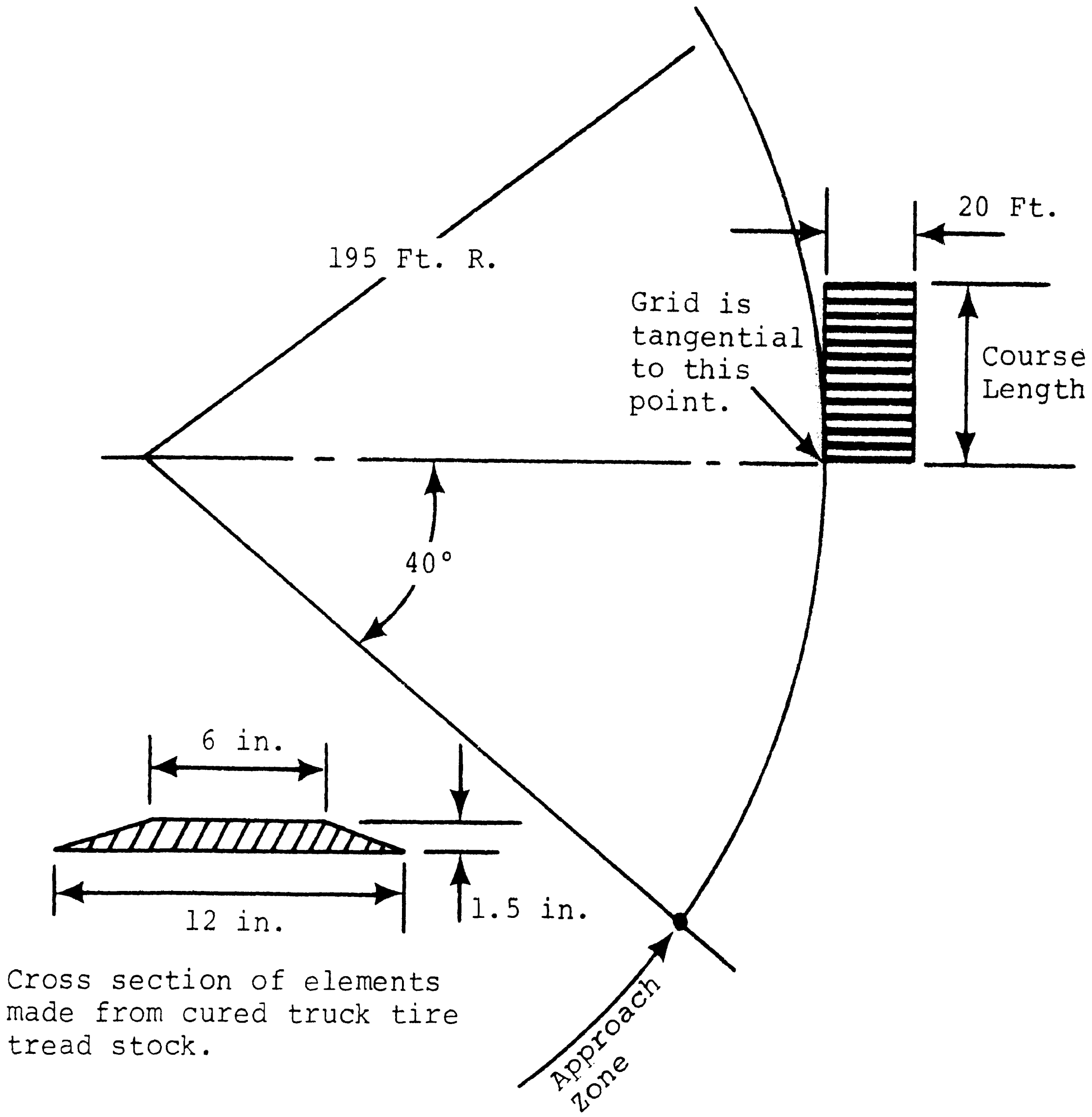
General Constraints:

1. Perform trial tests to determine steering wheel angle required to obtain initial lateral acceleration of 0.4 g at 30 mph.
2. Velocity and lateral acceleration initial conditions are to be achieved upon initial contact with the disturbance grid.
3. Road disturbance grids are to be laid out as in Figure II-1.

Minimum Signals Required: A_x, A_y, r, V_5, MC

Procedure:

1. Approach the test area above the initial velocity.
2. Manually initiate test mode.
3. Apply steering input to limit stop, timed to aim the vehicle at the center of the first grid.
4. Manually lift fifth wheel prior to traversing grids.
5. Terminate test mode after exiting from the grid and prior to changing the steering angle.
6. Each of the three grids (of 9, 11, and 14 Hz construction) is to be successfully traversed five times. A successful traversal requires that all four wheels remain on the grid until vehicle exits.



Fundamental Frequency	9 Hz	11 Hz	14 Hz
Center Spacing - Feet	4.8	4.0	3.14
Course Length - Feet	38.4	40	40.8

Figure E1. Road disturbance course layout.

Maneuver #4 - TRAPEZOIDAL STEER - DRY (high friction)

Initial Conditions: V_o = 40 mph

δ_{sw} = 0°

Incremental Controls: $\delta_{sw} = N_g \frac{\ell}{10} \sigma'$

for σ' = 4, 6, 8, 12, 16, 20, 24

where ℓ = wheel base in feet

N_g = overall steering ratio.

General Constraints:

1. All function generator time settings are fixed for all vehicles.

   .00 sec (100)

   Ramp Time = .40 sec (40)

   Steer Trapezoid Stop = 4.50 sec (450)

   Total Time = 5.50 sec (550)

   NOTE: Controller settings refer to the HSRI Automatic Vehicle Controller

2. All unused function generator controls are to be set at zero magnitude, with start times set at values greater than 9.00 sec (900).

Minimum Signals Required: A_x, A_y, r, V_5, MC

Procedure:

1. Knowing the overall steering ratio, compute δ_{sw} corresponding to σ' = 24, and set trapezoid level accordingly.
2. Set steering trapezoid controls for 0.4 second ramp time, with δ_{sw} polarity to "left turn".
3. Maneuver vehicle with drone controls into approach path above initial velocity criterion.

4. Initiate function generator cycle (tape recorder, test mode and maneuver execution cycle automatically).
5. Execute maneuver once (steps 3 and 4) for a left turn and once for a right turn.
6. Compute δ_{sw} value for the next lower value of σ'.
7. Repeat steps 2 through 6 until all σ' values have been exhausted.
8. Change to a new set of O.E. tires.
9. Set trapezoid level to δ_{sw} corresponding to $\sigma' = 4$.
10. Execute steps 2 through 5.
11. Set trapezoid level to δ_{sw} corresponding to next higher value of σ'. Execute steps 2 through 5.
12. Repeat step 11 until all σ' values have been exhausted.
13. Change tires to next configuration of test plan.
14. Repeat steps 9 through 13 until all desired tire configurations have been tested.

Maneuver #6 - SINUSOIDAL STEER - DRY (high friction)

Initial Conditions: $V_0 = 45$ mph

$\delta_{sw} = 0°$

Incremental Controls:

$$\delta_{sw} = \frac{\ell}{10} \sigma N_g$$

for $\sigma = 4, 6, 8, 10, 12, 14, 16, 18$

where ℓ = wheel base in ft

N_g = overall steering ratio

General Constraints:

1. All function generator time settings are fixed for all vehicles:

   Steer Start = 1.00 sec (100)

   Sine Period = 2.00 sec (200)

   Total Time = 5.00 sec (500)

2. All unused function generator controls are to be set at zero magnitude with start times set at values greater than 9.00 sec (900).
3. This test is not to be executed when wind velocity normal to the initial path exceeds 15 mph.

Minimum Signals Required: A_x, A_y, r, V_5, MC

Procedure:

1. Knowing the steering gear ratio and vehicle wheel base, compute δ_{sw} corresponding to $\sigma = 18$.
2. Set steering sinusoid amplitudes to calculated δ_{sw}.
3. Set initial velocity threshold on function generator.

4. Set steering sinusoid controls for 2.0 sec period and "left turn" polarity.

5. Maneuver vehicle with drone controls into approach path, above initial velocity.

6. Initiate function generator cycle (tape recorder, test mode, and maneuver execution cycle automatically).

7. Execute maneuver once (steps 5 and 6) for each polarity of sinusoid control.

8. Compute δ_{sw} for next lower value of σ.

9. Repeat steps 2 through 8 until all values of σ have been exhausted.

10. Change to a new set of O.E. tires.

11. Set steering sinusoid amplitudes to δ_{sw} corresponding to $\sigma = 4$.

12. Execute steps 3 through 7.

13. Set steering sinusoid amplitudes to δ_{sw} corresponding to next higher of σ. Execute steps 3 through 7.

14. Repeat step 13 until all values of σ have been exhausted.

15. Change tires to next configuration of test plan.

16. Repeat steps 11 through 15 until all desired tire configurations have been tested.

<u>NOTE</u>: The above maneuver normally has incremental controls of $V_o = 45$ and 60 mph, with $\delta_{sw} = \frac{66}{V} \frac{\ell}{10} \sigma N_g$, where V is V_o in ft/sec.

Maneuver #9 - SINUSOIDAL STEER - WET (low friction)

Initial Conditions: V_0 = value obtained as explained in procedure below

$\delta_{sw} = 0°$

Incremental Controls: $\delta_{sw} = \frac{\ell}{10} \sigma N_g$

for σ = 4, 6, 8, 10, 12, 14, 16, 18

where ℓ = wheel base in ft

N_g = overall steering ratio

General Constraints:

1. All function generator time settings are fixed for all vehicles:

   Steer Start = 1.00 sec (100)

   Sine Period = 2.00 sec (200)

   Total Time = 5.00 sec (500)

2. All unused function generator controls are to be set at zero magnitude with start time set at values greater than 9.00 sec (900).
3. This test is not to be executed when wind velocity normal to the initial path exceeds 15 mph.

Minimum Signals Required: A_x, A_y, r, V_5, MC

Procedure:

1. Knowing the steering gear ratio and the vehicle wheel base, compute δ_{sw} corresponding to σ = 12 (midrange value).
2. Put baseline tires (probably O.E.) on vehicle and execute steps 2 through 7 of Maneuver #5, (SINUSOIDAL STEER, DRY) for initial velocities of 30, 35, 40 and 45 mph.

3. Put "estimated worse case" tire configuration on vehicle and execute steps 2 through 7 of Maneuver #5 for initial velocities of 30, 35, 40 and 45 mph.
4. Compare results of steps 2 and 3 (above) and choose lowest velocity for which differences in vehicle response are obvious and proceed to step 8 below. If no such difference is apparent, proceed to step 5.
5. If step 4 is inconclusive, compute δ_{sw} corresponding to $\sigma = 18$ and repeat steps 2 and 3 above.
6. Compare the results of step 5 for both tire configurations and choose lowest velocity for which differences in vehicle response are obvious and proceed to step 8 below. If no such differences are apparent, proceed to step 7.
7. If step 6 is inconclusive set V_0 = 45 mph and execute steps 11 through 14 of Maneuver #5 for both tire configurations under consideration only. Terminate testing for this maneuver.
8. Set V_0 equal to the velocity chosen from either step 4 or step 6.
9. Repeat steps 11 through 15 of Maneuver #5 until all desired tire configurations have been tested.

   <u>NOTE</u>: Incremental velocities of steps 2 and 3 above were best suited for this study which had a top test speed of 45 mph. These should be adjusted to best satisfy the needs of whatever study is in question.

Maneuver #6 - DRASTIC STEER AND BRAKE - DRY

Initial Conditions: V_0 = 50 mph (1 complete set)

V_0 = 60 mph (1 complete set)

$\delta_{sw} = 0°$

Incremental Controls: 1) V_0 = 50, 60 mph

2) $\delta_{sw} = \delta_{sw}^* \gamma$

for γ = 0.75, 1.00

and $\delta_{sw}^* = 360 \left(\frac{N_g}{22.5}\right) \left(\frac{\ell}{10}\right)$

3) Brake release times, selected after viewing response data in procedure steps #9 and #16

General Constraints:

1. These function generator time settings are fixed for all vehicles:

   Steer Start = 1.00 sec (100)

   Sine Period = 2.00 sec (200)

   Total Time = 5.00 sec (500)

   Brake Ramp = 0.05 sec (005)

2. Brake application and release times are "tuned" to the vehicle response.

3. All unused function generator controls are to be set at zero magnitude with start times set at values greater than 9.00 sec (900).

4. The brake force should be large enough to lock all four wheels but shall not exceed 250 lbs.

Minimum Signals Required: A_x, A_y, r, V_5, $\dot{\phi}$, MC

Procedure:

1. Set first initial velocity threshold.
2. Knowing the overall steering ratio and vehicle wheel base (see Table I-3), compute δ_{sw}*.
3. Set steering sinusoidal controls for a 2.0 second period with first half amplitude set to (δ_{sw}* times first γ value) and second half amplitude set to zero.
4. Set δ_{br} controls to zero.
5. Maneuver vehicle with drone controls into approach path above initial velocity criterion.
6. Initiate function generator cycle.
7. Repeat steps 5 and 6.
8. Examine the response data from the previous two runs, determining the time at which the yaw rate time history was seen to have reached 95% of its peak value.
9. Select brake application time, t_5, to coincide with timing of 95% peak yaw rate value, and brake release time, t_6, equal to (t_5+2.0).
10. Set brake ramp time to 0.050 sec.
11. Set brake level for amplitude of full brake pedal stroke, with force not to exceed 250 lbs.
12. Maneuver vehicle with drone controls into approach path above initial velocity criterion.
13. Initiate function generator cycle.

14. Repeat steps 12 and 13.

15. Play back tape recorder signal of roll rate, $\dot{\phi}$, onto the pen recorder, along with function generator time base, t_{ac}.

16. Examine the response data from the previous two runs, determining the values for brake release time, t_6, from the roll rate response. Two release timings are to be selected, t_p and t_z, coinciding with 2nd sympathetic polarity peak and 3rd zero crossing, respectively.

17. Set brake release time, t_6 to t_p; repeat steps 5 and 6 twice for each value of γ.

18. Set brake release time, t_6 to t_z; repeat steps 5 and 6 twice for each value of γ.

19. Repeat steps 17 and 18 for second velocity threshold.

20. A rollover is counted and logged if an outrigger wheel touches the test surface. A rollover occurrence terminates the test sequence.

REFERENCES

1. Dugoff, H., Ervin, R.D., and Segel, L. "Vehicle Handling Test Procedures". Highway Safety Research Institute, Univ. of Michigan, Ann Arbor, 2 Vol., A Report to NHSB, Nov. 1970.

2. Ervin, R.D. *et al*. "Vehicle Handling Performance", Highway Safety Research Institute, Univ. of Michigan, Ann Arbor, 3 Vol., A Report to NHTSA, Nov. 1972.

3. Roland, R.D. *et al*. "The Influence of Tire Properties on Passenger Vehicle Handling", Calspan Corporation, Buffalo, New York, 4 Vol., Final Report to NHTSA, June 1974.

APPENDIX F

VEHICLE TEST DATA

ES C. MacADAM

F1. VEHICLE RESPONSE NUMERICS

The tables presented in this appendix represent the numerics calculated from the digitized vehicle response data. Each numeric was chosen to reflect some vehicle response characteristic considered important or noteworthy for that particular test maneuver.

The following sections explain the numeric tables and the symbols used therein. The driver series numerics are cross-tabulations of tire configuration with brake line pressure, while the automatic series numerics are cross-tabulations of tire configuration with normalized steel angle (σ').

F1.1 DRIVER SERIES (BRAKING) NUMERICS

The driver series or braking maneuver (VHTP #'s 1, 2, 7, and 8) numerics are contained in Tables F1-1 through F1-6 for the Mustang, and in Tables F1-10 through F1-15 for the Buick. Each of these tables is a cross-tabulation between tire configuration and brake line pressure for a given numeric. The name of the vehicle, test maneuver, and numeric are given for each table. For the braking-in-a turn maneuver, a left or right direction is also specified. More than one entry for a given configuration and brake pressure indicates test repeats.

The following listing is a brief explanation for each of the numerics appearing in the driver series tables. For a more explicit definition of each numeric see Section F2.6.

$\underline{AX_{AV}}$ - the average vehicle deceleration in g's from 35 mph to 10 mph (25 mph to 10 mph for wet tests).

<u>Wheel Lock</u> - Numerals 1, 2, 3, and 4 corresponding to the left-front, right-front, left-rear, and right-rear wheels respectively, indicate which

wheel(s) locked during the braking maneuver.

$\underline{\beta_P}$ - the maximum side-slip angle incurred between 35 mph to 10 mph (25 mph to 10 mph for wet).

$\underline{\dot{\beta}_P}$ - the maximum time rate of change of side-slip angle incurred between 35 mph to 10 mph (25-10 for wet).

F/S - the occurrence of any fifth-wheel lifts (F) or vehicle spin-outs (S).

The asterisks (*) appearing next to the tire configuration codes for the Buick in Tables F1-13 through F1-15 indicate that those tire configurations were performed prior to a brake adjustment. It was found necessary to repeat the stright-line brake configurations already completed. These repeats are shown as '(re-runs)' at the bottom of the tables. The repeat of the braking-in-a-turn O.E. and snow tire configurations are included and labeled as '(O.E. Repeat)' and '(Snow R Repeat)'.

F1.2 AUTOMATIC SERIES NUMERICS

The automatic series (VHTP #'s 4, 5, and 9) numerics are shown in Tables F1-7 through F1-9 for the Mustang and Tables F1-16 through F1-18 for the Buick. Each of these tables is a cross tabulation between tire configuration and normalized steer angle (σ') for a given numeric. The vehicle's name, test maneuver, and numeric are shown at the bottom of each table. Two entries separated by a slash (/) are shown for each normalized steer level. For the trapezoidal steer maneuver, the first entry represents the left-turn value; the second entry, the right-turn value. For the sinusoidal steer maneuver, the first entry is for a left-right steer sequence; the second entry for a right-left steer sequence. More than one pair of values represents repeats.

The symbols appearing as numerics for the automatic series tests are briefly explained below. For a more complete definition of each numeric see Section F2.6.

$\underline{A_{yp}}$ - the maximum lateral acceleration in g's.

$\underline{1/R}$ - (the average path curvature from the time of the steering input to 2 seconds following the steering input) × 100 in $feet^{-1}$.

$\underline{\beta_p}$ - the maximum side-slip angle.

<u>TINF</u> - the time from the beginning of the steering input to the occurrence of an inflection point in the vehicle's x-y trajectory.

<u>YINF</u> - the lateral (y) vehicle displacement occurring at time TINF.

<u>MEASURE</u> - a numeric reflecting the degree to which the vehicle performed a 12-foot lane change. A value of 0. would indicate a 12-foot <u>step</u> lane change. See Section F2.6 for the explicit definition.

$\underline{\psi_F}$ - the final heading angle of the vehicle with respect to its initial heading at the time of the steer input.

<u>A_{yp} (1st)</u> - the maximum lateral acceleration of the 1st peak for the sinusoidal steer maneuver.

<u>A_{yp} (2nd)</u> - the maximum lateral acceleration of the 2nd peak for the sinusoidal steer maneuver.

<u>r_p (1st)</u> - the maximum yaw rate of the 1st peak for the sinusoidal steer maneuver.

<u>r_p (2nd)</u> - the maximum yaw rate of the 2nd peak for the sinusoidal steer maneuver.

All configurations shown in Table F1-18 for the Buick, sinusoidal steer - wet, were run at 30 mph, except where indicated in parentheses as 35 mph or 40 mph. The latter are repeats of previous configurations run at 30 mph.

Any 'X' symbols appearing in the automatic series tables represent a loss of data due to some testing malfunction or signal dropouts on the tape recorder during playback. The letter 'S' denotes vehicle spin-outs.

A repeat of the configuration 42 for the Buick (sinusoidal steer - dry) in Table F1-17 is shown as '(L/R Switch)'. The notation indicates a repeat with both left and right tires switched. Only runs for the upper four steer levels were repeated.

F1.3 VEHICLE RESPONSE NUMERIC TABLES

Table F1-1. Mustang -- Straight Line Braking -- Dry

Tire Configuration \ P_b (psi)	400	500	575	600	625	650	675	700
11 (O.E.)	None	None		3,4 3 3 3 3	3,4			3,4 3,4,1
12 (psi all 18)			3 3	3,4 3,4	3,4,1			
13 (Wear all 2/32)					4 1,3		3,4,1 3,4,1	

VEHICLE - MUSTANG

NUMERIC - WHEEL LOCK

VHTP - #1, Straight Line Braking

Table F1-1. Mustang -- Straight Line Braking -- Dry

Tire Configuration \ P_b (psi)	400	500	575	600	625	650	675	700
11 (O.E.)	.51 .50	.65 .62		.69-S .73 .72 .73 .71	.79-S			.75-S .76-S
12 (psi all 18)			.73 .72	.75 .76	.77-S			
13 (Wear all 2/32)					.76 .75		.73-S .74-S	

VEHICLE - MUSTANG

NUMERIC - AX_{AV}

VHTP - #1, Straight Line Braking

Table F1-2. Mustang -- Braking in a Turn -- Dry

Tire Configur. \ P_b (psi)	400	500	575	600	625	650	675	700
11 (O.E.)	3 3	1,3		1,3 1,3,4	1,3,4 1,3,4			1,3,4
12 (psi all 18)				1,3 1,3	1,3,4	All	All All All	
16 (Mix PR F)				All 1,3	All			
17 (Mix CPCP F)					1,3	All	All	
18 (Wear 2/32 R)					1,3 1,3	1,3,4	All	

<u>VEHICLE</u> - MUSTANG <u>DIRECTION</u> - LEFT

<u>VHTP</u> - #2, Braking in a Turn <u>NUMERIC</u> - WHEEL LOCK

Table F1-2. Mustang -- Braking in a Turn -- Dry

Tire Configur. \ P_b (psi)	400	500	575	600	625	650	675	700
11 (O.E.)	.46 .46	.57		.67 .64	.67 .65			.67
12 (psi all 18)				.68 .69	.69	.71	.76 .71 .71	
16 (Mix PR F)				.65 .68	.64			
17 (Mix CPCP F)					.70	.70	.69	
18 (Wear 2/32 R)					.73 .72	.67	.66	

VEHICLE - MUSTANG

DIRECTION - LEFT

VHTP - #2, Braking in a Turn

NUMERIC - AX_{AV}

Table F1-2. Mustang -- Braking in a Turn -- Dry

Tire Configur. \ P_b (psi)	400	500	575	600	625	650	675	700
11 (O.E.)	9 10	12		13 39	34 40			36
12 (psi all 18)				20 20	37	43	X 40 40	
16 (Mix PR F)				33 12	39			
17 (Mix CPCP F)					12	38	33	
18 (Wear 2/32 R)					6 5	X	32	

VEHICLE - MUSTANG DIRECTION - LEFT

VHTP - #2, Braking in a Turn NUMERIC - $|\beta_p|$

Table F1-2. Mustang -- Braking in a Turn -- Dry

Tire Configur. \ P_b (psi)	400	500	575	600	625	650	675	700
11 (O.E.)	2.93 3.09	3.32		3.30 1.98	2.48 2.16			1.31
12 (psi all 18)				2.36 2.71	1.82	1.32	X 1.23 1.45	
16 (Mix PR F)				1.73 2.90	1.41			
17 (Mix CPCP F)					2.30	0.9	0.56	
18 (Wear 2/32 R)					2.23 2.00	1.08	1.69	

VEHICLE - MUSTANG

VHTP - #2, Braking in a Turn

DIRECTION - LEFT

NUMERIC - RATIO

Table F1-2. Mustang -- Braking in a Turn -- Dry

Tire Configur. \ P_b (psi)	400	500	575	600	625	650	675	700
11 (O.E.)	25 36	39		43 34	28 32			29
12 (psi all 18)				20 27	31	37	105 33 34	
16 (Mix PR F)				23 33	32			
17 (Mix CPCP F)					13	31	28	
18 (Wear 2/32 R)					14 11	40	32	

VEHICLE - MUSTANG

VHTP - #2, Braking in a Turn

DIRECTION - LEFT

NUMERIC - $|\dot{\beta}_p|$

Table F1-3. Mustang -- Braking in a Turn -- Dry

Tire Configur. \ P_b (psi)	400	500	575	600	625	650	675	700
11 (O.E.)		4		2,4 2,4	2,4	2,4	All S	
12 (psi all 18)					2,4 2,4	All		
16 (Mix PR F)			4 4	All	All	All	All All	
17 (Mix CPCP F)					All 2,4	All	All All	
18 (Wear 2/32 R)							2,3,4 2,3,4	

VEHICLE - MUSTANG DIRECTION - RIGHT

VHTP - #2, Braking in a Turn NUMERIC - WHEEL LOCK

Table F1-3. Musta[illegible] Braking in a Turn -- Dry

Tire Configur. \ P_b (psi)	400	500	5[illegible]	600	625	650	675	700
11 (O.E.)		.56		.68 .71	.71	.72	.75 S	
12 (psi all 18)					.71 .71	.78		
16 (Mix PR F)			.68 .68	.67	.67	.69	.71 .71	
17 (Mix CPCP F)					.70 .71	.71	.73 .72	
18 (Wear 2/32 R)							.71 .69	

<u>VEHICLE</u> - MUSTANG　　　<u>DIRECTION</u> - RIGHT

<u>VHTP</u> - #2, Braking in a Turn　　　<u>NUMERIC</u> - AX_{AV}

Table F1-3. Mustang -- Braking in a Turn -- Dry

Tire Configur. \ P_b (psi)	400	500	575	600	625	650	675	700
11 (O.E.)		5		6 8	7	5	13 S	
12 (psi all 18)					4 3	4		
16 (Mix PR F)			5 4	13	24	22	19 24	
17 (Mix CPCP F)					26 4	27	20 33	
18 (Wear 2/32 R)							36	

VEHICLE - MUSTANG DIRECTION - RIGHT

VHTP - #2, Braking in a Turn NUMERIC - $|\beta_p|$

Table F1-3. Must Braking in a Turn -- Dry

Tire Configur. \ P_b (psi)	400	500	57	600	625	650	675	700
11 (O.E.)		2.95		2.82 3.40	3.44	2.30	0.61 S	
12 (psi all 18)					1.44 1.86	0.71		
16 (Mix PR F)			2.8[illegible] 2.99	2.50	2.19	2.01	1.39 1.43	
17 (Mix CPCP F)					1.88 2.42	1.32	1.37 0.58	
18 (Wear 2/32 R)							-0.87 1.66	

VEHICLE - MUSTANG

VHTP - #2, Braking in a Turn

DIRECTION - RIGHT

NUMERIC - RATIO

Table F1-3. Mustang -- Braking in a Turn -- Dry

Tire Configur. \ P_b (psi)	400	500	575	600	625	650	675	700
11 (O.E.)		10		12 11	19	12	14 S	
12 (psi all 18)					8 8	15		
16 (Mix PR F)			19 20	42	24	21	17 18	
17 (Mix CPCP F)					23 26	22	19 25	
18 (Wear 2/32 R)							22 34	

VEHICLE - MUSTANG

VHTP - #2, Braking in a Turn

DIRECTION - RIGHT

NUMERIC - $|\dot{\beta}_p|$

Table F1-4. Mus -- Straight-Line Braking -- Wet

Tire Configur. / P_b (psi)	300	325	50	375	400	425	500
11 (O.E.)	None				None	1,2,4 1,2 1,2,4	1,2,4
12 (psi all 18)				1 1	None 1,2	None 1,2 1,2,4	
15 (Wear all 6/32)	None None	1,2	1,2	1,2	1,2	1,2 1,2	
14 (Wear all 4/32)				1,2 2 2	1,2	1,2 1,2	
13 (Wear all 2/32)	2 2	2 1,2	1,2	1,2	1,2,4	1,2,4 1,2,4	

<u>VEHICLE</u> - MUSTANG <u>NUMERIC</u> - WHEEL LOCK

<u>VHTP</u> - #7, Straight-Line Braking (Wet)

Table F1-4. Mustang -- Straight-Line Braking -- Wet

Tire Configur. \ P_b (psi)	300	325	350	375	400	425	500
11 (O.E.)	.38				.53 .58	.45 .50 .46	.46
12 (psi all 18)				.52 .56	.63 .50	.64 .50 .45	
15 (Wear all 6/32)	.41 .39	.38	.38	.43	.42	.47 .46	
14 (Wear all 4/32)				.43 .45 .41	.40	.43 .39	
13 (Wear all 2/32)	.37 .36	.39 .39	.41	.44	.45	.44 .41	

VEHICLE - MUSTANG

NUMERIC - AX_{AV}

VHTP - #7, Straight-Line Braking (Wet)

Table F1-5. Mustang -- Braking in a Turn -- Wet

Tire Configur.	P_b (psi) 275	300	325	350	375	400	425	450	475	500
11 (O.E.)		None 1	1	1		1,2,4 1 1 1,4 1,2,4				
12 (psi all 18)			1 1	1,2 1,2	1,2,3	1,2,3				
16 (Mix PR F)		1 1 1 1	1,2 1,2	1,2,3 1,2,3 1,2,3	1,2 1,2,3 1,2	All 1,3 1,3 All	All All			
17 (Mix CPCP F)			1	1,2	1,3 1,2	1,2,3				
18 (Wear 2/32 R)						1,3 1,2,3 1,3	1,2,3 1,2,3 All	All		
19 (Wear 4/32 R)				1 1,2 1,2	1,2 1,2,3 1,2,3	1,2,3 1,2,3 1,3 1	1,2,3			
20 (Wear 6/32 R)			1 1	1,2	1,2	1 1,3 1,2,3 1,2,3	1,2,3 1,2,3			

VEHICLE - MUSTANG

DIRECTION - LEFT

VHTP - #8, Braking in a Turn (Wet)

NUMERIC - WHEEL LOCK

Table F1-5. Mustang -- Braking in a Turn -- Wet

Tire Configur.	P_b (psi) 275	300	325	350	375	400	425	450	475	500
11 (O.E.)		.38 .37	.40	.44		.40 .50 .50 .47 .41				
12 (psi all 18)			.44 .44	.40 .43	.31	.41				
16 (Mix PR F)		.39 .39 .41 .41	.39 .40	.37 .38 .38	.47 .40 .44	.36 .50 .50 .39	.37 .42			
17 (Mix CPCP F)			.41 .40	.40	.43 .42	.37				
18 (Wear 2/32 R)						.43 .38 .44	.36 .41 .32	.34		
19 (Wear 4/32 R)				.41 .40 .40	.42 .37 .44	.37 .40 .43 .47	.40			
20 (Wear 6/32 R)			.41 .39	.39	.41	.46 .42 .38 .39	.38 .39			

VEHICLE - MUSTANG　　DIRECTION - LEFT

VHTP - #8, Braking in a Turn (Wet)　　NUMERIC - AX_{AV}

Table F1-5. Mustang -- Braking in a Turn -- Wet

Tire Configur.	P_b (psi) 275	300	325	350	375	400	425	450	475	500
11 (O.E.)		11 2	2	3		8 4 1 5 11				
12 (psi all 18)			8 1	2 4	2	2				
16 (Mix PR F)		4 3 5 4	10 4	10 1 10	6 4 2	2 5 4 2	3 2			
17 (Mix CPCP F)			3 2	1	9 3	1				
18 (Wear 2/32 R)						2 3 1	2 11 8	6		
19 (Wear 4/32 R)				3 3 9	5 5 1	2 7 2 4	5			
20 (Wear 6/32 R)			4 2	3	4	1 3 5 2	1 1			

VEHICLE - MUSTANG

DIRECTION - LEFT

VHTP - #8, Braking in a Turn (Wet)

NUMERIC - $|\beta_p|$

Table F1-5. Mustang -- Braking in a Turn -- Wet

Tire Configur.	P_b (psi) 275	300	325	350	375	400	425	450	475	500
11 (O.E.)		1.8 .67	.51	.59		.36 .58 .25 .58 .52				
12 (psi all 18)			.90 .78	.15 -.10	-.17	-.24				
16 (Mix PR F)		.33 .68 .15 .21	-.37 -.31	-.67 -.17 -.72	-.33 -.48 -.14	.06 .19 .14 .03	0.0 -.46			
17 (Mix CPCP F)			.48 .42	.05	.06 .06	-.23				
18 (Wear 2/32 R)						.65 -.13 .36	-.43 .03 .15	.10		
19 (Wear 4/32 R)				.25 -.06 .95	-.14 -.43 .54	-.30 .10 .64 .41	-.27			
20 (Wear 6/32 R)			.72 .67	.01	-.21	.62 .53 0.0 -0.4	-.16 .20			

VEHICLE - MUSTANG DIRECTION - LEFT

VHTP - #8, Braking in a Turn (Wet) NUMERIC - RATIO

Table F1-5. Mustang -- Braking in a Turn -- Wet

Tire Configur.	P_b (psi) 275	300	325	350	375	400	425	450	475	500
11 (O.E.)		7 2	5	2		8 3 4 4 5				
12 (psi all 18)			6 2	4 4	3	2				
16 (Mix PR F)		5 2 7 5	12 6	13 2 12	9 7 3	3 9 4 3	3 2			
17 (Mix CPCP F)			5 5	2	13 3	2				
18 (Wear 2/32 R)						1 2 2	3 11 9	4		
19 (Wear 4/32 R)				2 4 7	5 7 4	3 6 2 5	6			
20 (Wear 6/32 R)			1 1	2	7	2 4 3 4	2 2			

VEHICLE - MUSTANG DIRECTION - LEFT

VHTP - #8, Braking in a Turn (Wet) NUMERIC - $|\dot{\beta}_p|$

Table F1-6. Mustang -- Braking in a Turn -- Wet

Tire Configur.	P_b (psi) 275	300	325	350	375	400	425	450	475	500
11 (O.E.)		.74 1.64 1.61	1.65 .88	.99		.14				
12 (psi all 18)			.68 .25	.69 .55 .60	-.21	1.5				
16 (Mix PR F)	1.41	.25 .12 .22 1.50	.08 .08	0.0	.15 .10 .24	-.14 -.10				
17 (Mix CPCP F)			1.64 1.68		.23 .24	-.08 -.12				
18 (Wear 2/32 R)						.64 .89	.66 .49	-.12 .09		
19 (Wear 4/32 R)						.64 .04 .75 .88 .99	-.19 .50 .13 .52 1.30	.20 .15		
20 (Wear 6/32 R)		.43 1.30 2.0 1.8 .33	.21	.15	.66 .54 .62	.81 .82 .31 .77 .53	.15 .73		0.0	0.0

VEHICLE - MUSTANG

DIRECTION - RIGHT

VHTP - #8, Braking in a Turn (Wet)

NUMERIC - RATIO

Table F1-6. Mustang -- Braking in a Turn -- Wet

Tire Configur.	P_b (psi)									
	275	300	325	350	375	400	425	450	475	500
11 (O.E.)		.47 .40 .40	.46 .43	.44		.40				
12 (psi all 18)			.49 .47	.50 .43 .50		.44				
16 (Mix PR F)	.38	.42 .40 .40 .41	.44 .43	.41		.45 .43				
17 (Mix CPCP F)			.42 .43		.43 .41	.40 .40				
18 (Wear 2/32 R)						.46 .47	.49 .46	.37 .44		
19 (Wear 4/32 R)						.47 .40 .46 .51 .47	.41 .50 .45 .48 .53	.44 .43		
20 (Wear 6/32 R)		.36 .38 .38 .39 .35	.38	.41	.55 .45 .44	.48 .42 .40 .45 .46	.41 .48		.51	.44

VEHICLE - MUSTANG

DIRECTION - RIGHT

VHTP - #8, Braking in a Turn (Wet)

NUMERIC - AX_{AV}

Table F1-6. Mustang -- Braking in a Turn -- Wet

Tire Configur.	P_b (psi)									
	275	300	325	350	375	400	425	450	475	500
11 (O.E.)		11 12 12	8 6	15		11				
12 (psi all 18)			5 3	8 18 4	2	45				
16 (Mix PR F)	5	15 5 9 9	9 5	9	10 2 6	2 13				
17 (Mix CPCP F)			9 7		8 7	5 5				
18 (Wear 2/32 R)						2 10	10 1	5 10		
19 (Wear 4/32 R)						4 8 5 6 9	4 4 9 2 13	9 10		
20 (Wear 6/32 R)		20 21 21 15 10	9	10	12 13 19	3 6 19 21 14	9 8		2	10

VEHICLE - MUSTANG

DIRECTION - RIGHT

VHTP - #8, Braking in a Turn (Wet)

NUMERIC - $|\beta_p|$

Table F1-6. M[illegible]ng -- Braking in a Turn -- Wet

Tire Configur.	P_b (psi) 275	300	325	350	375	400	425	450	475	500
11 (O.E.)		2 None None	None 2	2		1,2,4				
12 (psi all 18)			2 2	2 1,2 2	1,2	1,2,4				
16 (Mix PR F)	1	1,2 1,2 1,2 1	1,2 1,2	1,2,4	1,2 1,2 1,2	1,2,4 All				
17 (Mix CPCP F)			1 1		1,2 1,2	1,2,4 1,2,4				
18 (Wear 2/32 R)						2,4 2,4	2,4 2,4	All 1,2,4		
19 (Wear 4/32 R)						2,4 1,2,4 2,4 2 2	1,2,4 2,4 1,2,4 2,4 2	1,2,4 1,2,4		
20 (Wear 6/32 R)		1,2 2 1 1 1,2	1,2	1,2	2 1,2 1,2	2 2,4 1,2,4 1,2 1,2	1,2,4 2,4		2,4	1,2,4

VEHICLE - MUSTANG

DIRECTION - RIGHT

VHTP - #8, Braking in a Turn (Wet)

NUMERIC - WHEEL LOCK

Table F1-6. Mustang -- Braking in a Turn -- Wet

Tire Configur.	P_b (psi) 275	300	325	350	375	400	425	450	475	500
11 (O.E.)		12 10 8	8 5	14		11				
12 (psi all 18)			4 4	6 19 4	3	46				
16 (Mix PR F)	5	13 3 7 8	8 6	10	11 3 6	2 13				
17 (Mix CPCP F)			8 6		8 7	4 6				
18 (Wear 2/32 R)						2 11	10 1	4 11		
19 (Wear 4/32 R)						4 8 4 6 9	3 4 10 2 15	12 12		
20 (Wear 6/32 R)		17 17 17 13 9	9	10	13 14 17	2 7 17 19 14	8 9		2	10

VEHICLE - MUSTANG

DIRECTION - RIGHT

VHTP - #8, Braking in a Turn (Wet)

NUMERIC - $|\dot{\beta}_p|$

Table F1-7. Mu -- Trapezoidal Steer -- Dry

Tire Configur. \ σ'	4°	6°		12°	16°	20°	24°
35 (O.E.)	.41/.40	.58/.56	.[illegible]5	.77/.74	.79/.76	.78/.76	.75/.75
36 (O.E.)	.42/.38	.55/.52	.[illegible]62	.85/.73	.80/X	.74/.75	.75/.74
37 (psi 18 rear)	.44/X	.63/.56	.67	.79/.76	.77/.78	.79/.79	.79/.78
38 (Mix PR front)	.48/.60	.69/.67	.[illegible]/.73	.82/.80	.83/.84	.83/.82	.84/.83
39 (Mix CPCP front)	.42/.39	.57/.52	.65/.63	X/.73	.78/.74	.78/.77	.79/.76
40 (Wear 2/32 front)	.48/.40	.70/.66	.88 .90/.85	.87/.82	.86/.90	.83/.85	.83/.83
28 (Shoulder wear)	.38/.40	.57/.55	.68/.67	.88/.84	.94/.94	.92/.95	.90/.90

VEHICLE - MUSTANG

NUMERIC - A_{yp}

VHTP - #4, Trapezoidal Steer

Table F1-7. Mustang -- Trapezoidal Steer -- Dry

Tire Configur. \ σ'	4°	6°	8°	12°	16°	20°	24°
35 (O.E.)	.36/.41	.52/.57	.66/.68	.78/0.8	.75/.83	.79/.89	.80/.88
36 (O.E.)	.33/.38	.50/.50	.62/.59	.74/.76	.70/X	.75/.85	.80/.80
37 (psi 18 rear)	.41/X	.57/.56	.65/.68	.74/.79	.77/.81	.73/.84	.80/.88
38 (Mix PR front)	.45/.56	.61/.64	.71/.72	.81/.84	.83/.90	.85/.92	.86/1.0
39 (Mix CPCP front)	.38/.37	.50/.50	.59/.59	X/.71	.77/.81	.81/.90	.85/.88
40 (Wear 2/32 front)	.43/.39	.57/.57	.60 .55/.68	.77/.85	.86/.81	.85/.98	.87/.95
28 (Shoulder wear)	.36/.38	.52/.54	.65/.66	.84/.87	.93/.99	.98/1.1	.97/1.1

VEHICLE - MUSTANG NUMERIC - |1/R|

VHTP - #4, Trapezoidal Steer

Table F1-7. Mustang -- Trapezoidal Steer -- Dry

Tire Configur. \ σ'	4°	6°	8°	12°	16°	20°	24°
35 (O.E.)	3/10	3/10	7/10	14/14	16/16	15/19	20/19
36 (O.E.)	2/8	2/5	4/5	21/10	14/X	10/12	9/12
37 (psi 18 rear)	2/X	6/9	8/11	17/20	16/23	16/25	15/25
38 (Mix PR front)	2/3	4/4	4/5	17/13	9/9	11/11	8/15
39 (Mix CPCP front)	1/2	1/2	3/2	X/3	3/9	4/10	5/13
40 (Wear 2/32 front)	2/8	4/6	12 21/18	21/22	17/25	14/18	14/25
28 (Shoulder wear)	1/2	2/2	2/3	6/7	11/11	14/12	5/20

VEHICLE - MUSTANG NUMERIC - $|\beta_p|$

VHTP - #4, Trapezoidal Steer

Table F1-7. Mustang -- Trapezoidal Steer -- Dry

Tire Configur. \ σ'	4°	6°	8°	12°	16°	20°	24°
35 (O.E.)	13/18	21/23	26/29	35/36	37/38	36/39	39/40
36 (O.E.)	14/15	19/20	23/24	35/32	34/34	32/36	35/36
37 (psi 18 rear)	15/17	23/23	30/30	37/37	38/41	37/43	38/44
38 (Mix PR front)	15/21	23/25	26/27	38/37	33/36	34/37	31/38
39 (Mix CPCP front)	13/13	17/18	22/23	29/27	27/31	32/34	32/37
40 (Wear 2/32 front)	16/17	23/24	34/34	39/40	41/42	38/42	38/46
28 (Shoulder wear)	12/15	18/20	23/24	31/34	38/39	41/41	32/45

VEHICLE - MUSTANG NUMERIC - $|r_p|$

VHTP - #4, Trapezoidal Steer

Table F1-8. Mustang -- Sinusoidal Steer -- Dry

Tire Configur. \ σ'	4°	6°	8°	10°	12°	14°	16°	18°
29 (O.E.)	X/1.18	1.21/1.23	1.31/1.31	[illegible]8/1.36	1.50/1.41	1.58/S	1.63/S	S/S
30 (O.E.)	1.13/1.19	1.16/1.23	1.25/1.32	[illegible]7/1.45	1.37/1.38	1.43/1.48	1.43/1.43	S/S
31 (psi 18 rear)	1.1/1.22	1.23/1.34	1.39/X	[illegible]46	1.56/1.5	1.59/1.63	1.58/S	S/S
32 (Mix PR front)	1.23/1.26	1.33/1.34	1.42/1.32	1.48/1.42	1.49/X	1.58/1.50	1.58/S	1.49/S
33 (Mix CPCP front)	1.13/X	1.17/1.2	1.27/1.33	1.33/1.39	1.39/1.41	1.4/1.43	1.51/S	S/S
34 (Wear 2/32	1.16/1.18	1.28/X	1.45/1.41	1.67/1.58	2.07/1.62	X/S	2.05/S	1.77/S
28 (Shoulder)	1.16/1.01	X/1.16	1.3/1.23	1.4/1.26	X/1.33	1.48/1.36	1.5/S	S/S

VEHICLE - MUSTANG

VHTP - #5, Sine Steer

NUMERIC - T_{INF}

S - Denotes Spin-out

Table F1-8. Mustang -- Sinusoidal Steer -- Dry

Tire Configur. \ σ'	4°	6°	8°	10°	12°	14°	16°	18°
29 (O.E.)	X/5.0	7.2/7.3	10.1/10.1	12.2/11.6	15.6/12.6	17.2/S	18.2/S	S/S
30 (O.E.)	4.9/4.0	6.1/7.9	8.6/10.6	11.2/13.2	12.2/13.4	14.0/15.9	13.8/14.8	S/S
31 (psi 18 rear)	4.8/5.7	6.8/9.4	10.4/X	X/13.1	17.1/15.2	16.4/16.7	17.4/S	S/S
32 (Mix PR front)	5.5/6.9	10.7/8.7	12.2/11.8	14.9/14.2	15.1/X	15.2/17.5	17.2/S	16.0/S
33 (Mix CPCP front)	4.5/X	6.9/7.2	9.0/9.4	11.3/10.8	12.4/12.1	13.7/13.1	14.7/S	S/S
34 (Wear 2/32	6.5/5.9	9.6/X	14.8/12.5	21.7/17.1	35.3/20.7	X/S	35.2/S	26.0/S
28 (Shoulder)	5.6/2.9	X/5.4	10.6/7.6	13.3/9.4	X/11.1	17.5/12.8	18.0/S	S/S

<u>VEHICLE</u> - MUSTANG

<u>VHTP</u> - #5, Sine Steer

<u>NUMERIC</u> - $|Y_{INF}|$

S - Denotes Spin-out

Table F1-8. Mustang Sinusoidal Steer -- Dry

σ' / Tire Configur.	4°	6°	8°		12°	14°	16°	18°
29 (O.E.)	X/3	5/5	8/8	10	16/11	18/S	20/S	S/S
30 (O.E.)	3/2	4/4	7/5	/8	16/11	19/18	33/23	S/S
31 (psi 18 rear)	4/5	7/7	11/X	/14	19/15	25/17	31/S	S/S
32 (Mix PR front)	5/4	7/6	9/8	13/10	16/X	19/16	23/S	27/S
33 (Mix CPCP front)	4/X	7/7	9/8	12/10	17/13	22/14	31/S	S/S
34 (Wear 2/32	5/5	8/X	11/9	11/13	15/15	X/S	16/S	18/S
28 (Shoulder)	2/2	X/3	7/5	9/6	X/10	14/15	20/S	S/S

VEHICLE - MUSTANG

VHTP - #5, Sine Steer

NUMERIC - $|\beta_p|$

S - Denotes Spin-out

Table F1-8. Mustang -- Sinusoidal Steer -- Dry

σ' / Tire Configur.	4°	6°	8°	10°	12°	14°	16°	18°
29 (O.E.)	X/5.3	5.0/5.3	6.9/6.7	8.7/7.6	11.0/7.9	11.8/S	12.4/S	S/S
30 (O.E.)	7.9/4.8	4.4/5.9	5.5/7.5	7.2/8.8	8.4/9.2	9.1/10.2	8.5/10.2	S/S
31 (psi 18 rear)	6.3/4.8	4.8/6.1	7.4/X	X/8.9	11.3/10.1	11.4/10.5	12.1/S	S/S
32 (Mix PR front)	4.8/4.9	7.5/7.1	8.8/7.9	10.6/9.4	11.6/X	9.7/12.4	10.2/S	11.0/S
33 (Mix CPCP front)	5.7/X	4.5/4.5	6.0/6.3	7.6/6.8	8.0/7.6	9.2/8.0	10.1/S	S/S
34 (Wear 2/32	4.2/4.5	6.1/X	10.8/8.6	16.7/11.9	22.6/14.5	X/S	23.0/S	18.1/S
28 (Shoulder)	4.7/9.3	X/6.0	8.6/4.7	9.9/5.5	X/6.5	12.8/7.8	13.1/S	S/S

VEHICLE - MUSTANG

NUMERIC - MEASURE

VHTP - #5, Sine Steer

S - Denotes Spin-out

Table F1-8. Mu g -- Sinusoidal Steer -- Dry

Tire Configur. \ σ'	4°	6°	8°	10°	12°	14°	16°	18°
29 (O.E.)	X/3	2/4	4/3	-2	14/-20	19/S	25/S	S/S
30 (O.E.)	2/2	2/3	3/2	0	18/-9	29/-36	78/-63	S/S
31 (psi 18 rear)	5/5	5/6	8/X	′0	25/-12	45/-49	62/S	S/S
32 (Mix PR front)	3/5	0/3	3/-1	8/-5	16/X	29/-18	42/S	60/S
33 (Mix CPCP front)	2/X	5/6	7/6	9/3	16/-3	23/-19	49/S	S/S
34 (Wear 2/32	3/4	5/X	5/0	-9/-5	-29/-13	X/S	-28/S	5/S
28 (Shoulder)	-3/-3	X/-2	-2/-2	-1/-5	X/-12	4/-52	24/S	S/S

VEHICLE - MUSTANG

VHTP - #5, Sine Steer

NUMERIC - ψ_F

S - Denotes Spin-out

Table F1-8. Mustang -- Sinusoidal Steer -- Dry

Tire Configur. \ σ'	4°	6°	8°	10°	12°	14°	16°	18°
29 (O.E.)	.35/.40	.54/.53	.62/.63	.70/.68	.74/.73	.75/S	.77/S	S/S
30 (O.E.)	.35/.39	.50/.52	.58/.63	.70/.68	.70/.74	.74/.78	.73/.75	S/S
31 (psi 18 rear)	.39/.39	.52/.54	.62/.61	.68/.66	.7/.70	.73/.70	.75/S	S/S
32 (Mix PR front)	.44/.44	.63/.60	.71/.65	.71/.74	.81/.79	.82/.80	.81/S	.83/S
33 (Mix CPCP front)	.37/.37	.49/.49	.58/.59	.65/.66	.69/.70	.72/.72	.76/S	S/S
34 (Wear 2/32	.47/.48	.59/.62	.73/.70	.77/.74	.8/.8	.81/S	.91/S	.85/S
28 (Shoulder)	.39/.31	.56/.48	.65/.61	.72/.66	.77/.71	.82/.82	.83/S	S/S

VEHICLE - MUSTANG

VHTP - #5, Sine Steer

NUMERIC - $|A_{yp}|$ (1st)

S - Denotes Spin-out

Table F1-8. Mustang -- Sinus Steer -- Dry

Tire Configur. \ σ'	4°	6°	8°	10°	°	14°	16°	18°
29 (O.E.)	.40/.36	.55/.52	.65/.64	.71/.70	[illegible]0	.79/S	.79/S	S/S
30 (O.E.)	.39/.35	.52/.50	.64/.61	.70/.70	[illegible].77	.80/.82	.83/.80	S/S
31 (psi 18 rear)	.40/.38	.54/.50	.61/.62	.67/.68	[illegible].75	.77/.85	.78/S	S/S
32 (Mix PR front)	.43/.43	.57/.57	.66/.69	.73/.76	[illegible]/.85	.84/.86	.86/S	.94/S
33 (Mix CPCP front)	.36/.35	.51/.48	.61/.62	.68/.68	.73/.73	.77/.78	.83/S	S/S
34 (Wear 2/32	.49/.44	.62/.63	.70/.72	.62/.80	.23/.79	X/S	.28/S	.87/S
28 (Shoulder)	.34/.41	.48/.55	.59/.65	.69/.64	.80/.80	.89/.90	.90/S	S/S

<u>VEHICLE</u> - MUSTANG

<u>VHTP</u> - #5, Sine Steer

<u>NUMERIC</u> - $|A_{yp}|$ (2nd)

S - Denotes Spin-out

Table F1-8. Mustang -- Sinusoidal Steer -- Dry

Tire Configur. \ σ'	4°	6°	8°	10°	12°	14°	16°	18°
29 (O.E.)	15/17	21/22	27/28	30/32	34/34	37/S	38/S	S/S
30 (O.E.)	13/16	18/22	23/27	30/27	28/34	32/39	33/37	S/S
31 (psi 18 rear)	13/16	20/22	25/28	29/33	33/35	34/35	37/S	S/S
32 (Mix PR front)	15/16	22/23	27/27	31/31	44/43	37/39	37/S	28/S
33 (Mix CPCP front)	14/15	18/20	23/25	27/29	27/33	30/33	33/S	S/S
34 (Wear 2/32	16/18	22/24	28/30	35/34	38/36	41/S	41/S	37/S
28 (Shoulder)	12/10	17/18	23/23	25/23	27/31	31/30	30/S	S/S

VEHICLE - MUSTANG

VHTP - #5, Sine Steer

NUMERIC - $|r_p|$ (1st)

S - Denotes Spin-out

Table F1-8. Mustang -- Sinusoidal Steer -- Dry

Tire Configur. \ σ'	4°	6°	8°	10°	12°	14°	16°	18°
29 (O.E.)	17/14	25/21	36/30	45/39	58/47	63/S	67/S	S/S
30 (O.E.)	17/13	22/19	32/26	36/42	51/45	58/57	65/60	S/S
31 (psi 18 rear)	16/14	24/21	29/32	43/42	52/50	57/55	66/S	S/S
32 (Mix PR front)	17/16	25/24	29/33	45/41	52/50	62/57	66/S	68/S
33 (Mix CPCP front)	14/13	20/18	29/27	39/35	46/42	53/49	62/S	S/S
34 (Wear 2/32	18/15	28/25	39/34	43/44	24/49	X/S	35/S	63/S
28 (Shoulder)	10/13	15/18	25/24	34/29	42/42	48/45	54/S	S/S

VEHICLE - MUSTANG

VHTP - #5, Sine Steer

NUMERIC - $|r_p|$ (2nd)

S - Denotes Spin-out

Table F1-9. Mustang -- Sinusoidal Steer -- Wet

Tire Configur. \ σ'	4°	6°	8°	10°	12°	14°	16°	18°
21 (O.E.)	1.13/1.03	1.13/1.16	1.23/1.16	1.23/1.26	X/1.18	1.26/1.23	1.18/1.26	1.21/1.21
22 (psi 18 rear)	1.16/1.08	1.23/1.16	1.26/1.23	1.28/1.26	X/X	1.28/X	1.26/1.23	1.23/1.26
23 (Mix PR front)	1.11/1.11	1.18/1.21	1.21/1.28	1.21/1.23	1.18/1.23	1.21/1.23	1.18/1.18	1.18/1.21
24 (Mix CPCP front)	1.06/X	X/1.08	1.16 1.18/1.08	1.21/1.11	1.16/1.16	X/1.08	1.13 1.28/1.11	1.16 /1.18
25 (Wear 2/32 rear)	1.01/X	X/1.08	1.16/1.16	S/S	S/	———	———	———
26 (Wear 4/32 rear)	1.08/X	1.08/1.06	1.16/X	1.16/X	X/X	X/X	1.21/1.21	1.16/1.18
27 (Wear 6/32 rear)	1.09/X	1.13/1.11	1.18/X	1.23/1.16	1.18/1.16	1.16/1.16	1.18/1.13	1.18/1.16
28 (Shoulder	1.16/X	1.16/X	1.21/1.13	1.24/1.26	1.26/1.21	1.22/1.18	1.20/1.18	1.23/1.19

<u>VEHICLE</u> - MUSTANG

<u>VHTP</u> - #9, Sine Steer (Wet)

<u>NUMERIC</u> - T_{INF}

S - Denotes Spin-out

Table F1-9. Mustang -- Sinusoidal Steer -- Wet

Tire Configur. \ σ'	4°	6°	8°	10°	12°	14°	16°	18°
21 (O.E.)	4.5/2.5	5.1/5.0	7.1/5.1	6.9/6.5	X/5.6	7.1/6.8	6.1/6.9	6.6/5.7
22 (psi 18 rear)	4.8/3.1	5.7/4.7	6.3/5.8	7.6/6.0	X/X	7.6/X	7.1/6.5	6.4/6.4
23 (Mix PR front)	4.1/3.6	5.7/5.6	6.3/7.2	5.8/6.2	5.6/6.7	6.1/6.6	5.8/5.2	5.6/6.0
24 (Mix CPCP front)	3.7/1.9	X/3.5	5.3 5.8/3.3	6.0/3.5	5.4/5.0	X/3.7	5.3 8.7/3.9	5.3 X/5.7
25 (Wear 2/32 rear)	3.2/2.6	X/4.2	5.5/5.1	S/S	S/	———	———	———
26 (Wear 4/32 rear)	3.8/X	4.8/3.8	6.2/4.3	6.1/X	X/X	X/X	7.0/5.7	5.9/5.2
27 (Wear 6/32 rear)	4.3/2.3	5.9/4.3	6.8/X	7.6/6.2	6.5/5.4	6.5/5.6	6.8/5.5	6.2/5.4
28 (Shoulder	4.8/2.4	4.9/X	6.8/5.2	6.8/6.7	7.8/6.6	7.4/6.2	7.1/6.1	6.3/5.7

<u>VEHICLE</u> - MUSTANG

<u>VHTP</u> - #9, Sine Steer (Wet)

<u>NUMERIC</u> - $|Y_{INF}|$

S - Denotes Spin-out

Table F1-9. Mustang -- Sinusoidal Steer -- Wet

Tire Configur. \ σ'	4°	6°	8°	10°	12°	14°	16°	18°
21 (O.E.)	3/4	4/3	6/4	7/5	X/5	7/4	7/6	7/7
22 (psi 18 rear)	3/2	4/3	7/4	10/5	X/X	12/X	10/6	8/6
23 (Mix PR front)	3/3	5/4	4/6	5/4	6/5	6/5	6/4	5/4
24 (Mix CPCP front)	3/4	X/3	5 5/4	4/4	6/3	X/4	5 6/2	4 X/4
25 (Wear 2/32 rear)	2/1	X/1	4/3	S/S	S/	—	—	—
26 (Wear 4/32 rear)	2/X	3/4	4/3	4/X	X/X	X/X	5/6	4/5
27 (Wear 6/32 rear)	3/4	4/4	6/X	6/3	5/5	5/6	5/6	5/6
28 (Shoulder	1/2	2/X	3/3	5/5	4/4	3/3	4/3	3/3

VEHICLE - MUSTANG

VHTP - #9, Sine Steer (Wet)

NUMERIC - $|\beta_p|$

S - Denotes Spin-out

Table F1-9. Mustang -- Sinusoidal Steer -- Wet

σ' / Tire Configur.	4°	6°	8°	10°	12°	14°	16°	18°
21 (O.E.)	5.3/9.3	5.3/5.4	4.7/5.6	4.2/5.0	X/6.1	4.4/4.6	4.8/5.0	4.5/5.9
22 (psi 18 rear)	5.1/8.5	5.2/6.6	4.7/5.7	4.6/5.6	X/X	5.0/X	4.9/5.2	5.4/5.2
23 (Mix PR front)	6.2/7.5	4.9/5.1	4.4/4.6	5.4/4.6	6.3/4.9	5.2/4.6	5.7/6.1	5.6/5.3
24 (Mix CPCP front)	6.5/10.3	X/7.5	4.7 4.9/8.9	4.6/8.7	5.2/5.9	X/8.1	6.0 5.4/8.0	5.1 X/6.0
25 (Wear 2/32 rear)	6.9/8.7	X/8.1	5.6/6.9	S/S	S/	———	———	———
26 (Wear 4/32 rear)	6.5/X	5.0/6.9	4.4/6.4	4.2/X	X/X	X/X	4.1/6.4	5.8/6.6
27 (Wear 6/32 rear)	5.3/9.4	4.7/6.9	5.1/X	4.8/4.2	4.1/5.2	4.0/5.7	4.1/5.8	4.8/5.6
28 (Shoulder	5.1/9.5	4.7/X	4.6/5.7	4.3/4.4	4.7/4.3	4.2/4.5	4.1/4.8	5.1/5.5

VEHICLE - MUSTANG

VHTP - #9, Sine Steer (Wet)

NUMERIC - MEASURE

S - Denotes Spin-out

Table F1-9. Mustang -- Sinusoidal Steer -- Wet

Tire Configur. \ σ'	4°	6°	8°	10°	12°	14°	16°	18°
21 (O.E.)	-1/-1	1/1	2/1	4/-3	X/-3	5/-2	6/-4	6/-1
22 (psi 18 rear)	-1/-2	-1/-2	5/-12	11/-14	X/X	23/X	15/-11	12/-18
23 (Mix PR front)	2/0	3/2	5/0	5/1	8/-4	7/0	7/0	6/0
24 (Mix CPCP front)	0/-1	X/1	1 -1/-2	2/-2	2/0	X/-2	5. 3/-2	2 X/-5
25 (Wear 2/32 rear)	0/-2	X/0	3/-4	S/S	S/	———	———	———
26 (Wear 4/32 rear)	0/X	0/2	1/0	2/X	X/X	X/X	3/-1	6/0
27 (Wear 6/32 rear)	-1/0	0/1	0/X	2/2	3/1	3/1	4/0	4/2
28 (Shoulder	-4/-3	-3/X	-3/-1	1/-2	-2/-4	-2/-4	-1/-3	0/-4

VEHICLE - MUSTANG

VHTP - #9, Sine Steer (Wet)

NUMERIC - ψ_F

S - Denotes Spin-out

Table F1-10. Buick -- Straight-Line Braking -- Dry

Tire Config.	P_b (psi) 400	500	600	625	650	675	700	725	750	775	800	825	850	875	900	925	950	975	1000	1025
11 (O.E.)	None	4	4	4 3,4 4			3,4 3,4													
12 (psi all 20)			4 4	3,4 3,4	3,4 3,4															
15 (Wear 2/32)					None None	None	3	3	4	3,4 3,4										
14 (Snow R)					3 3	3	3,4 4	3,4 3,4												
13 (Loaded O.E.)					None None		None		None		None		None		None		4 4	3,4 3,4		
54 (Loaded all 20)					None None				None		3 4	4	None 3,4 4	3,4 4	3 3,4 3,4 4	4	1,3,4 4	4	4	3,4 3,4

VEHICLE - BUICK

VHTP - #1, Straight-Line Braking

NUMERIC - WHEEL LOCK

Table F1-10. Buick -- Straight-Line Braking -- Dry

Tire Config.	P_b (psi) 400	500	600	625	650	675	700	725	750	775	800	825	850	875	900	925	950	975	1000	1025
11 (O.E.)	.53	.63	.63	.65 .63 .62			.70 .69													
12 (psi all 20)			.61 .60	.62 .63	.61 .63															
15 (Wear 2/32)					.66 .66	.68	.72	.71	.72	.72 .71										
14 (Snow R)					.67 .68	.67	.70 .71	.72 .72												
13 (Loaded O.E.)					.55 .56		.61		.67		.71		.76		.78		.79 .78	.77 .78		
54 (Loaded all 20)					.58 .58				.65		.67 .67	.68	.74 .71 .69	.76 .66	.78 .77 .75 .67	.65	.76 .69	.73	.74	.71 .71

VEHICLE - BUICK

VHTP - #1, Straight-Line Braking

NUMERIC - AX_{AV}

Table F1-11. Buick -- ing in a Turn -- Dry

(psi)

Tire Config.	400	500	600	650	675	700	725	750	77	00	825	850	875	900	925	950	975	1000	1025
11 (O.E.)	None	3	3			1,3 1,3	1,3 1,3												
12 (psi all 20)									3 1, 1,	1,3									
18 (psi 16 R)							1,3 1,3 1,3												
21 (Wear 2/32 R)									1 1 1										
20 (Mix Br F)									1,3 1,3 1,3 1,3										
14 (Snow R)								1,3 1,3											
13 (Loaded O.E.)									1,3 1,3		1,3		1,3		1,3 1,3 1,3	1,3 1,3			
19 (Loaded 20 R)									1,3 1,3	1,3		1,3			1,3				

VEHICLE - BUICK

VHTP - #2, Braking in a Turn

DIRECTION - LEFT

NUMERIC - WHEEL LOCK

Table F1-11. Buick -- Braking in a Turn -- Dry

Tire Config.	P_b (psi) 400	500	600	650	675	700	725	750	775	800	825	850	875	900	925	950	975	1000	1025
11 (O.E.)								F S		S									
12 (psi all 20)										F	F S								
18 (psi 16 R)								F	F										
21 (Wear 2/32 R)										F									
20 (Mix Br F)										F S									
14 (Snow R)									F										
13 (Loaded O.E.)																F	F		
19 (Loaded 20 R)														F		F			

VEHICLE - BUICK

VHTP - #2, Braking in a Turn

DIRECTION - LEFT

NUMERIC - F/S

Table F1-11. Buick -- Braking in a Turn -- Dry

Tire Config.	P_b (psi) 400	500	600	650	675	700	725	750	775	800	825	850	875	900	925	950	975	1000	1025
11 (O.E.)	.42	.53	.58			.66 .69	.69 .69												
12 (psi all 20)									.60 .69 .71	.67									
18 (psi 16 R)							.68 .68 .69												
21 (Wear 2/32 R)									.70 .70 .71										
20 (Mix Br F)									.67 .67 .67 .65										
14 (Snow R)								.70 .71											
13 (Loaded O.E.)									.66 .65		.67		.71		.75 .74 .72	.76 .74			
19 (Loaded 20 R)									.63 .65	.65		.68			.72				

VEHICLE - BUICK

VHTP - #2, Braking in a Turn

DIRECTION - LEFT

NUMERIC - AX_{AV}

Table F1-11. Buick -- Braking in a Turn -- Dry

Tire Config.	P_b (psi) 400	500	600	650	675	700	725	750	775	800	825	850	875	900	925	950	975	1000	1025
11 (O.E.)	1.70	2.51	2.65			2.08 2.39	2.46 2.41												
12 (psi all 20)									2.53 2.36 2.38	2.37									
18 (psi 16 R)							1.88 1.67 1.88												
21 (Wear 2/32 R)									2.40 2.31 2.35										
20 (Mix Br F)									2.68 2.64 2.39 2.43										
14 (Snow R)								2.73 2.67											
13 (Loaded O.E.)									2.78 2.63		2.58		2.45		2.43 2.50 2.43	2.73 2.45			
19 (Loaded 20 R)									2.77 2.32	2.18		2.37			2.24				

VEHICLE - BUICK

DIRECTION - LEFT

VHTP - #2, Braking in a Turn

NUMERIC - RATIO

Table F1-11. Buick -- Braking in a Turn -- Dry

Tire Config.	P_b (psi) 400	500	600	650	675	700	725	750	775	800	825	850	875	900	925	950	975	1000	1025
11 (O.E.)	11	4	3			6 6	7 5												
12 (psi all 20)									13 6 14	12									
18 (psi 16 R)							6 6 8												
21 (Wear 2/32 R)									17 18 21										
20 (Mix Br F)									21 18 12 9										
14 (Snow R)								12 12											
13 (Loaded O.E.)									26 22		25		28		26 30 28	38 28			
19 (Loaded 20 R)									16 14	13		15			16				

VEHICLE - BUICK　　　DIRECTION - LEFT

VHTP - #2, Braking in a Turn　　　NUMERIC - $|\beta_p|$

Table F1-11. Buick -- Braking in a Turn -- Dry

Tire Config.	P_b (psi) 400	500	600	650	675	700	725	750	775	800	825	850	875	900	925	950	975	1000	1025
11 (O.E.)	9	6	6			9 11	12 11												
12 (psi all 20)									14 20 18	15									
18 (psi 16 R)							8 8 9												
21 (Wear 2/32 R)									21 22 26										
20 (Mix Br F)									26 21 16 11										
14 (Snow R)								30 28											
13 (Loaded O.E.)									29 24		27		35		33 34 29	46 34			
19 (Loaded 20 R)									26 22	18		22			23				

VEHICLE - BUICK

DIRECTION - LEFT

VHTP - #2, Braking in a Turn

NUMERIC - $|\overset{\circ}{\beta}_p|$

Table F1-12. Buick -- Braking in a Turn -- Dry

Tire Config.	P_b (psi) 400	500	600	650	675	700	725	750	775	800	825	850	875	900	925	950	975	1000	1025
11 (O.E.)	None	4	4 2,4	2,4	2,4	All 2,3,4 2,3,4 2,4	2,4	2,3,4 2,3,4											
12 (psi all 20)									2,4 2,4 2,4 2,4	2,4 2,3,4 2,3,4 2,3,4	2,4 2,3,4	2,4 2,3,4	2,4 2,3,4	234					
18 (psi 16 R)				All 2,4	2,3,4 2,4	2,3,4 All 2,3,4	2,3,4	2,3,4	2,3,4 2,3,4 2,3,4										
21 (Wear 2/32 R)									2,4 2,4	All All									
20 (Mix Br F)							2,4 2,4	2,4 2,4 All	All All All										
14 (Snow R)								2,4 2,4	2,3,4 2,3,4										
13 (Loaded O.E.)									2,4 2,4		2,4		2,4		2,4		2,4 2,4	2,4 1,2,4 1,2,4	1,2,4
19 (Loaded 20 R)									2	2,4		2,4		2,4	2,4	2,4			

VEHICLE - BUICK

DIRECTION - RIGHT

VHTP - #2, Braking in a Turn

NUMERIC - WHEEL LOCK

Table F1-12. Buick -- Braking in a Turn -- Dry

Tire Config.	P_b (psi)																		
	400	500	600	650	675	700	725	750	775	800	825	850	875	900	925	950	975	1000	1025
11 (O.E.)						S		S											
12 (psi all 20)																			
18 (psi 16 R)						F		F	F										
21 (Wear 2/32 R)																			
20 (Mix Br F)								S	S										
14 (Snow R)									S										
13 (Loaded O.E.)																			
19 (Loaded 20 R)																	F		

VEHICLE - BUICK

VHTP - #2, Braking in a Turn

DIRECTION - RIGHT

NUMERIC - F/S

Table F1-12. Buick -- Braking in a Turn -- Dry

Tire Config.	P_b (psi) 400	500	600	650	675	700	725	750	775	800	825	850	875	900	925	950	975	1000	1025
11 (O.E.)	.42	.51	.60 .60	.63	.63	.55 .58 .60 .68	.64	.63 .65											
12 (psi all 20)									.57 .63 .71 .69	.55 .70 .70 .69	.59 .70	.58 .71	.59 .72	.69					
18 (psi 16 R)				.63 .66	.64 .65	.63 .65 .63	.63	.64	.63 .62 .64										
21 (Wear 2/32 R)									.70 .71	.68 .68									
20 (Mix Br F)							.65 .65	.65 .65 .57	.59 .58 .58										
14 (Snow R)								.68 .69	.66 .65										
13 (Loaded O.E.)									.65 .65		.67		.69		.73		.74 .75	.76 .73 .71	.74
19 (Loaded 20 R)									.63	.64		.67		.69	.69	.71			

VEHICLE - BUICK

VHTP - #2, Braking in a Turn

DIRECTION - RIGHT

NUMERIC - AX_{AV}

Table F1-12. Buick -- Braking in a Turn -- Dry

Tire Config.	P_b (psi) 400	500	600	650	675	700	725	750	775	800	825	850	875	900	925	950	975	1000	1025
11 (O.E.)	2.20	2.59	2.34 2.23	2.34	2.30	1.91 1.95 1.82 2.07	2.15	1.79 1.69											
12 (psi all 20)									1.90 1.95 1.69 1.11	1.97 1.17 1.15 1.06	2.01 1.19	2.10 1.19	1.99 1.22	1.13					
18 (psi 16 R)				1.80 1.92	1.72 1.99	1.67 1.94 1.77	1.75	1.74	1.86 1.78 1.70										
21 (Wear 2/32 R)									1.79 1.61	1.56 1.48									
20 (Mix Br F)							1.74 1.69	2.23 2.15 1.28	0.96 0.99 1.53										
14 (Snow R)								2.05 1.90	1.53 1.10										
13 (Loaded O.E.)									1.66 1.54		1.43		1.54		1.48		0.93 0.95	1.36 0.94 0.71	0.56
19 (Loaded 20 R)									1.35	1.92		1.73		1.75	1.58	2.18			

VEHICLE - BUICK

VHTP - #2, Braking in a Turn

DIRECTION - RIGHT

NUMERIC - RATIO

Table F1-12. Buick -- Braking in a Turn -- Dry

Tire Config.	P_b (psi) 400	500	600	650	675	700	725	750	775	800	825	850	875	900	925	950	975	1000	1025
11 (O.E.)	15	8	7 13	18	18	45 45 42 16	9	42 38											
12 (psi all 20)									5 4 7 38	3 45 45 45	4 43	6 44	4 43	38					
18 (psi 16 R)				24 8	26 7	39 20 35	38	39	44 45 45										
21 (Wear 2/32 R)									6 3	43 43									
20 (Mix Br F)							9 11	8 9 45	45 45 45										
14 (Snow R)								11 11	45 45										
13 (Loaded O.E.)									4 4		6		2		2		10 5	2 1 8	9
19 (Loaded 20 R)									3	3		3		4	3	7			

VEHICLE - BUICK

VHTP - #2, Braking in a Turn

DIRECTION - RIGHT

NUMERIC - $|\beta_p|$

Table F1-12. Buick -- Braking in a Turn -- Dry

Tire Config.	P_b (psi) 400	500	600	650	675	700	725	750	775	800	825	850	875	900	925	950	975	1000	1025
11 (O.E.)	12	8	8 16	21	20	47 41 33 22	13	34 31											
12 (psi all 20)									6 7 11 24	6 45 50 52	7 37	8 40	6 35	27					
18 (psi 16 R)				19 12	18 18	30 18 26	29	31	34 36 40										
21 (Wear 2/32 R)									9 5	40 39									
20 (Mix Br F)							12 15	12 14 61	46 44 49										
14 (Snow R)								15 15	44 44										
13 (Loaded O.E.)									4 6		8		4		4		15 9	5 4 12	14
19 (Loaded 20 R)									4	6		4		5	5	8			

VEHICLE - BUICK

VHTP - #2, Braking in a Turn

DIRECTION - RIGHT

NUMERIC - $|\mathring{\beta}_p|$

Table F1-13. Buick -- Straight-Line Braking -- Wet

Tire Configur.	P_b (psi) 200	300	400	425	450	475	500	525	550	575	600	625
*11 (O.E.)	None		3				3 2,3,4				All All	
*12 (psi all 20)	None	None None	3,4 3,4 4	4 4	4 4	All						
*14 (Snow R)			3 3	3,4	3,4			3 3,4 3 3,4				
16 (Wear 4/32 all)				3 3	3 3	3,4 3,4						
17 (Wear 6/32 all)				None None	4 4	3,4 3,4						
*15 (Wear 2/32 all)			All 1,3,4	3,4	3 1,3,4	3 All All		3,4				
13 (Loaded O.E.)				None None	None	None	2	None	None	4	4	
54 (Loaded all 20)				None None	None	None	2,4 4	2,3,4 2,3,4				
11 (rerun)	None	None	4									
12 (rerun)				3,4 4 4								
14 (rerun)				4								
15 (rerun)				None None	4 4	3,4 4	3,4	3,4				

VEHICLE - BUICK

VHTP - #7, Straight-Line Braking - Wet

NUMERIC - WHEEL LOCK

*Denotes configuration runs performed prior to brake adjustment.

Table F1-13. Buick -- Straight-Line Braking -- Wet

Tire Configur.	P_b (psi) 200	300	400	425	450	475	500	525	550	575	600	625
*11 (O.E.)							F	F				
*12 (psi all 20)						F						
*14 (Snow R)				F	F	F	F	F	F			
16 (Wear 4/32 all)												
17 (Wear 6/32 all)					F							
*15 (Wear 2/32 all)				F	F		F	F				
13 (Loaded O.E.)												F
54 (Loaded all 20)												
11 (rerun)				F			F					
12 (rerun)					F							
14 (rerun)					F							
15 (rerun)								F				

VEHICLE - BUICK

VHTP - #7, Straight-Line Braking - Wet

NUMERIC - F/S

*Denotes configuration runs performed prior to brake adjustment.

Table F1-13. Buick -- Straight-Line Braking -- Wet

Tire Configur.	P_b (psi) 200	300	400	425	450	475	500	525	550	575	600	625
*11 (O.E.)	.23		.41				.50 .48				.37 .38	
*12 (psi all 20)	.22	.40 .38	.42 .43 .44	.47 .46	.48 .47	.33						
*14 (Snow R)			.39 .41	.39	.37			.41 .40 .42 .40				
16 (Wear 4/32 all)				.44 .43	.45 .45	.45 .45						
17 (Wear 6/32 all)				.50 .47	.47 .45	.46 .47						
*15 (Wear 2/32 all)			.31 .33	.41	.42 .36	.49 .34 .32		.41				
13 (Loaded O.E.)				.37 .40	.44	.48	.45	.51	.56	.46	.53	
54 (Loaded all 20)				.43 .46	.53	.55	.49 .51	.42 .38				
11 (rerun)	.23	.35	.39									
12 (rerun)				.38 .44 .47								
14 (rerun)				.41								
15 (rerun)				.45 .48	.46 .44	.43 .47	.47	.47				

VEHICLE - BUICK

VHTP - #7, Straight-Line Braking - Wet

NUMERIC - AX_{AV}

*Denotes configuration runs performed prior to brake adjustment.

Table F1-14. Buick -- Braking in a Turn -- Wet

Tire Configur.	200	300	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725
									P_b (psi)									
*11 (O.E.)		None			3 3 3	1,3 All All												
*12 (psi all 20)					3 3		3 3											
*18 (psi 16 R)				3 3		3												
*14 (Snow R)							3 3 3 3	3 3 3 3	3 2,3,4 3	3 2,3,4 All								
*20 (Mix BR F)									1,3 3 3 1,3	All 1,3 1,3	All							
11 (O.E. Repeat)	None	None			3													
14 (Snow R Repeat)					3 3													
21 (Wear 2/32 R)					3 3													
22 (Wear 4/32 R)							3 3	3 1,2,3										
23 (Wear 6/32 R)								3 3										
13 (Loaded O.E.)								3 1,3	None 3 1,2,3 3	1,2,3 1,2,3 3 3	1,2,3 1,2,3	2,3						
19 (Loaded 20 R)								3 3	3 3	1,2,3 2,3	1,3 3	3 1,3	3	1,2,3 3				

VEHICLE - BUICK

VHTP - #8, Braking in a Turn (Wet)

DIRECTION - LEFT

NUMERIC - WHEEL LOCK

Table F1-14. Buick -- Braking in a Turn -- Wet

Tire Configur.	P_b (psi) 200	300	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725
*11 (O.E.)									F S									
*12 (psi all 20)						F	F S	F	F									
*18 (psi 16 R)					F	F	F S	F S	F									
*14 (Snow R)								F S	F									
*20 (Mix BR F)										S	F							
11 (O.E. Repeat)						F S			F S									
14 (Snow R Repeat)						S	F S	S										
21 (Wear 2/32 R)						F S	F S	S										
22 (Wear 4/32 R)								F										
23 (Wear 6/32 R)								F	F									
13 (Loaded O.E.)											F	F	F	F				
19 (Loaded 20 R)												F	S		F			

VEHICLE - BUICK DIRECTION - LEFT

VHTP - #8, Braking in a Turn (Wet) NUMERIC - F/S

Table F1-14. Buick -- Braking in a Turn -- Wet

Tire Configur.	P_b (psi) 200	300	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725
*11 (O.E.)		.30			.37 .47 .44	.45 .38 .37												
*12 (psi all 20)					.43 .38		.41 .45											
*18 (psi 16 R)				.47 .48		.44												
*14 (Snow R)							.40 .42 .38 .38	.45 .43 .42 .42	.48 .37 .43	.51 .38 .34								
*20 (Mix BR F)									.44 .50 .48 .40	.33 .42 .43	.34							
11 (O.E. Repeat)	.22	.33			.43													
14 (Snow R Repeat)					.40 .44													
21 (Wear 2/32 R)					.43 .47													
22 (Wear 4/32 R)							.46 .47	.50 .37										
23 (Wear 6/32 R)								.49 .52										
13 (Loaded O.E.)								.47 .48	.53 .50 .38 .49	.38 .37 .48 .52	.40 .39	.46						
19 (Loaded 20 R)								.49 .49	.50 .49	.39 .44	.47 .51	.52 .46	.52	.43 .52				

VEHICLE - BUICK

VHTP - #8, Braking in a Turn (Wet)

DIRECTION - LEFT

NUMERIC - AX_{AV}

Table F1-14. Buick -- Braking in a Turn -- Wet

Tire Configur.	P_b (psi) 200	300	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725
*11 (O.E.)		1.36			1.95	1.08												
					1.97	0.11												
					1.86	0.12												
*12 (psi all 20)					1.67		2.13											
					1.86		1.55											
*18 (psi 16 R)				2.38		1.99												
				2.05														
*14 (Snow R)							1.95	2.38	2.60	2.35								
							1.92	2.01	0.02	0.08								
							2.52	2.85	2.74	0.23								
							2.54	2.86										
*20 (Mix BR F)									1.19	0.15	0.11							
									1.76	1.84								
									2.45	2.23								
									1.38									
11 (O.E. Repeat)	1.21	1.20			1.69													
14 (Snow R Repeat)					2.12													
					1.88													
21 (Wear 2/32 R)					1.35													
					1.44													
22 (Wear 4/32 R)							0.45	0.17										
							0.50	-0.60										
23 (Wear 6/32 R)								1.37										
								1.17										
13 (Loaded O.E.)								1.13	0.78	-0.12	-0.50	1.22						
								0.68	1.23	-0.54	-0.34							
									-0.34	1.35								
									1.38	1.81								
19 (Loaded 20 R)								1.88	1.73	-0.09	0.90	1.77	1.87	0.77				
								1.89	1.81	1.48	2.24	0.63		1.87				

VEHICLE - BUICK DIRECTION - LEFT

VHTP - #8, Braking in a Turn (Wet) NUMERIC - RATIO

Table F1-14. Buick -- Braking in a Turn -- Wet

Tire Configur.	200	300	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725
	P_b (psi)																	
*11 (O.E.)		7			5 5 1	5 6 1												
*12 (psi all 20)					3 4		4 3											
*18 (psi 16 R)				5 6		4												
*14 (Snow R)							1 4 10 9	3 6 9 10	11 9 10	8 13 6								
*20 (Mix BR F)									12 4 6 2	4 5 8	5							
11 (O.E. Repeat)	8	4			9													
14 (Snow R Repeat)					6 2													
21 (Wear 2/32 R)					1 1													
22 (Wear 4/32 R)							22 19	22 17										
23 (Wear 6/32 R)								3 6										
13 (Loaded O.E.)								4 3	6 5 3 4	9 8 3 1	6 4	2						
19 (Loaded 20 R)								2 2	2 2	2 2	3 2	2 1	2	2 3				

VEHICLE - BUICK

VHTP - #8, Braking in a Turn (Wet)

DIRECTION - LEFT

NUMERIC - $|\beta_p|$

Table F1-14. Buick -- Braking in a Turn -- Wet

Tire Configur.	P_b (psi)																	
	200	300	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725
*11 (O.E.)		3			4 4 2	4 4 3												
*12 (psi all 20)					7 4		8 6											
*18 (psi 16 R)				8 6		5												
*14 (Snow R)							3 4 8 7	6 4 9 9	12 6 11	9 7 13								
*20 (Mix BR F)									11 3 6 5	7 7 9	4							
11 (O.E. Repeat)	6	3			6													
14 (Snow R Repeat)					4 3													
21 (Wear 2/32 R)					1 1													
22 (Wear 4/32 R)							20 18	20 12										
23 (Wear 6/32 R)								3 8										
13 (Loaded O.E.)								5 3	7 6 3 6	8 7 5 3	6 4	2						
19 (Loaded 20 R)								4 3	2 2	6 2	4 6	3 4	3	5 3				

VEHICLE - BUICK

DIRECTION - LEFT

VHTP - #8, Braking in a Turn (Wet)

NUMERIC - $|\overset{\circ}{\beta}_p|$

Table F1-15. Buick -- Braking in a Turn -- Wet

Tire Configur.	P_b (psi) 200	300	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725
*11 (O.E.)		None			4 4	4 4	4 2,4	4 4										
*12 (psi all 20)							4 4											
*18 (psi 16 R)					4 4	4 2,4	4											
*14 (Snow R)			None None			3												
*20 (Mix BR F)					4 4	4												
11 (O.E. Repeat)	None	4			4	2,4	4											
14 (Snow R Repeat)					2,4 4													
21 (Wear 2/32 R)				4 4														
22 (Wear 4/32 R)						2,4 4												
23 (Wear 6/32 R)								2,4										
13 (Loaded O.E.)								2,4 2,4	2,4		2,4 2,4	2,4	2,4	2,4	2,4 2,4	All All All		
19 (Loaded 20 R)								4 2,4	2,4 4	2,4 2,4	4 2,4	2,4 2,4	4 2,4	All 2,4	2,4	2,4	2,4 All 2,4	All

VEHICLE - BUICK

VHTP - #8, Braking in a Turn (Wet)

DIRECTION - RIGHT

NUMERIC - WHEEL LOCK

Table F1-15. Buick -- Braking in a Turn -- Wet

Tire Configur.	P_b (psi) 200	300	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725
*11 (O.E.)							S		F S									
*12 (psi all 20)								F	F S									
*18 (psi 16 R)						S	S	S	S									
*14 (Snow R)				S	F	S	S	F	F									
*20 (Mix BR F)						F S	S	S	F S	F								
11 (O.E. Repeat)								F S	F S									
14 (Snow R Repeat)					S	S	S	S										
21 (Wear 2/32 R)					S	S	F S	S										
22 (Wear 4/32 R)							F	F										
23 (Wear 6/32 R)									F									
13 (Loaded O.E.)																		
19 (Loaded 20 R)															F	F		F

VEHICLE - BUICK DIRECTION - RIGHT

VHTP - #8, Braking in a Turn (Wet) NUMERIC - F/S

Table F1-15. Buick -- Braking in a Turn -- Wet

Tire Configur.	P_b (psi) 200	300	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725
*11 (O.E.)		.30			.40 .39	.39 .38	.40 .45	.43 .43										
*12 (psi all 20)							.41 .41											
*18 (psi 16 R)					.43 .42	.47 .41	.41											
*14 (Snow R)			.37 .40			.39												
*20 (Mix BR F)					.41 .41	.43												
11 (O.E. Repeat)	.24	.32			.40	.40	.45											
14 (Snow R Repeat)					.38 .42													
21 (Wear 2/32 R)				.42 .40														
22 (Wear 4/32 R)						.38 .46												
23 (Wear 6/32 R)								.43										
13 (Loaded O.E.)								.37 .40	.40		.43 .45	.42	.45	.44	.47 .52	.36 .35 .36		
19 (Loaded 20 R)								.41 .42	.44 .49	.43 .44	.49 .44	.41 .43	.49 .43	.36 .45	.44	.46	.51 .35 .47	.36

VEHICLE - BUICK

DIRECTION - RIGHT

VHTP - #8, Braking in a Turn (Wet)

NUMERIC - AX_{AV}

Table F1-15. Buick -- Braking in a Turn -- Wet

Tire Configur.	P_b (psi) 200	300	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725
*11 (O.E.)		1.50			2.15 2.28	2.01 2.00	1.94 1.03	2.17 2.46										
*12 (psi all 20)							1.76 1.86											
*18 (psi 16 R)					1.70 1.30	2.20 1.93	1.66											
*14 (Snow R)			1.38 1.55			1.93												
*20 (Mix BR F)					1.17 1.20	1.37												
11 (O.E. Repeat)	1.51	2.29			2.18	2.06	2.30											
14 (Snow R Repeat)					2.43 2.63													
21 (Wear 2/32 R)				1.96 1.68														
22 (Wear 4/32 R)						.76 1.44												
23 (Wear 6/32 R)								1.94										
13 (Loaded O.E.)								1.33 2.08	1.31		1.16 1.18	1.17	2.11	1.11	1.11 2.13	.25 .26 .56		
19 (Loaded 20 R)								2.63 1.99	1.10 2.42	1.54 2.06	2.75 1.11	1.26 1.92	2.78 2.20	.25 1.31	.79	.97	.68 .05 .85	.23

VEHICLE - BUICK DIRECTION - RIGHT

VHTP - #8, Braking in a Turn (Wet) NUMERIC - RATIO

Table F1-15. Buick -- Braking in a Turn -- Wet

Tire Configur.	P_b (psi) 200	300	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725
*11 (O.E.)		6			2 3	4 8	1 2	3 5										
*12 (psi all 20)							4 6											
*18 (psi 16 R)					5 6	4 4	5											
*14 (Snow R)			2 1			11												
*20 (Mix BR F)					8 7	5												
11 (O.E. Repeat)	3	2			4	4	2											
14 (Snow R Repeat)					8 6													
21 (Wear 2/32 R)				2 5														
22 (Wear 4/32 R)						6 7												
23 (Wear 6/32 R)								11										
13 (Loaded O.E.)								13 13	13		13 10	11	12	10	10 13	6 8 3		
19 (Loaded 20 R)								6 4	7 4	9 7	7 4	8 12	13 6	2 15	1	6	3 6 3	2

VEHICLE - BUICK

DIRECTION - RIGHT

VHTP - #8, Braking in a Turn (Wet)

NUMERIC - $|B_p|$

Table F1-15. Buick -- Braking in a Turn -- Wet

Tire Configur.	P_b (psi) 200	300	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	725
*11 (O.E.)		4			4 4	5 9	3 2	4 11										
*12 (psi all 20)							5 5											
*18 (psi 16 R)					4 7	4 6	5											
*14 (Snow R)			3 2			7												
*20 (Mix BR F)					7 8	6												
11 (O.E. Repeat)	2	3			4	8	4											
14 (Snow R Repeat)					14 7													
21 (Wear 2/32 R)				2 6														
22 (Wear 4/32 R)						7 7												
23 (Wear 6/32 R)								11										
13 (Loaded O.E.)								12 12	12		11 10	10	12	9	10 12	7 12 10		
19 (Loaded 20 R)								8 6	6 5	9 7	10 3	6 12	16 7	6 14	3	4	3 3 4	5

VEHICLE - BUICK

DIRECTION - RIGHT

VHTP - #8, Braking in a Turn (Wet)

NUMERIC - $|\mathring{\beta}_p|$

Table F1-16. Buick -- Trapezoidal Steer -- Dry

Tire Configur. \ σ'	4°	6°	8°	12°	16°	20°	24°
44A (O.E.)	.48/.41	.57/.56	.62/.64	.68/.75	.76/.80	.76/.80	.78/.80
45A (O.E.)	X/X	.59/X	.64/X	.76/.71	.78/.75	.77/.77	.70/.73
46 (psi all 20)	.44/X	.56/.53	.62/.68	.73/.78	.81/.79	X/.85	.84/.83
47 (psi 16 R)	.53/.47	.69/.71	.75/.79	.79/.86	.91/.85	.81/.87	.82/.86
48 (Loaded O.E.)	.52/.47	.68/.64	.77/.76	.84/.80	.85/.83	.84/.79	.84/.80
49 (Loaded 20 R)	.65/.67	.74/.80	.78/.83	.78/.81	X/.82	.81/.92	.88/.85
50 (Snow R)	.44/.42	.61/.55	.68/.63	.76/X	X/.81	.80/.80	X/.81
51 (Mix BR F)	.71/.66	.76/.74	.77/.79	.80/.80	.80/.81	.78/.78	X/.79
52 (Wear 2/32 F)	.47/.47	.66/.60	.75/.69	.82/.80	.88/.82	.81/X	.81/.81
34 (Shoulder)	.45/.46	.60/.64	.65/.66	.76/X	.84/.86	.92/.86	.79/.82
44 (O.E.)	.43/X	.53/.58	.62/X	.71/.76	.74/X	.82/.88	.77/.85
45 (O.E.)	.52,.46/.42	.52,.61/.54	.70,.83/.65	.92/.76	.86/.78	.79/.80	.76/.71

VEHICLE - BUICK

NUMERIC - $|Ay_p|$

VHTP - #4, Trapezoidal Steer

Table F1-16. Buick -- Trapezoidal Steer -- Dry

Tire Configur. \ σ'	4°	6°	8°	12°	16°	20°	24°
44A (O.E.)	.28/.35	.40/.48	.49/.56	.57/.64	.55/.69	.65/.77	.68/.80
45A (O.E.)	X/X	.47/X	.53/X	.60/.62	.63/.70	.60/.72	.62/.69
46 (psi all 20)	.40/X	.49/.49	.53/.53	.58/.63	.67/.78	X/.78	.74/.77
47 (psi 16 R)	.43/.43	.53/.55	.59/.63	.58/.67	.62/.77	.70/.74	.65/.78
48 (Loaded O.E.)	.45/.42	.54/.57	.55/.64	.67/.75	.72/.81	.73/.83	.71/.78
49 (Loaded 20 R)	.49/.51	.56/.63	.57/.71	.61/.76	X/.79	.70/.85	.81/.83
50 (Snow R)	.39/.37	.50/.50	.54/.58	.64/X	X/.73	.65/.65	X/.88
51 (Mix BR F)	.54/.59	.64/.68	.63/.71	1.1/1.1	.94/1.0	.95/1.1	X/1.0
52 (Wear 2/32 F)	.42/.44	.56/.60	.61/.66	.73/.76	.74/.85	.77/X	.79/.90
34 (Shoulder)	.37/.38	.48/.47	.52/.58	.66/X	.64/.74	.76/.78	.76/.77
44 (O.E.)	.36/X	.44/.47	.50/X	.59/.67	.60/X	.62/.75	.72/.77
45 (O.E.)	.38,.34/.36	.39,.47/.46	.53,.58/.46	.62/.65	.64/.70	.68/.69	X/X

VEHICLE - BUICK

NUMERIC - |1/R|

VHTP - #4, Trapezoidal Steer

Table F1-16. Buick -- Trapezoidal Steer -- Dry

Tire Configur. \ σ'	4°	6°	8°	12°	16°	20°	24°
44A (O.E.)	2/2	2/3	3/5	6/14	11/21	11/21	13/19
45A (O.E.)	X/X	1/X	3/X	6/7	13/9	10/10	10/9
46 (psi all 20)	1/X	3/3	5/6	10/9	16/13	X/20	21/21
47 (psi 16 R)	3/3	9/15	13/18	23/32	21/32	25/35	25/34
48 (Loaded O.E.)	1/2	7/5	19/8	42/16	36/20	30/24	23/23
49 (Loaded 20 R)	4/8	11/33	17/43	23/42	X/44	24/34	17/26
50 (Snow R)	1/2	1/4	4/7	8/X	X/18	22/24	X/16
51 (Mix BR F)	7/5	7/12	12/14	X/6	6/8	7/9	X/8
52 (Wear 2/32 F)	1/2	2/3	6/5	11/11	19/14	16/X	15/13
34 (Shoul-der)	2/2	2/4	4/6	7/X	12/9	9/15	14/14
44 (O.E.)	1/X	2/2	3/X	7/8	10/X	17/18	13/17
45 (O.E.)	X,1/1	6,2/4	5,5/5	10/8	15/8	19/10	X/X

VEHICLE - BUICK

NUMERIC - $|\beta_p|$

VHTP - #4, Trapezoidal Steer

Table F1-16. Buick -- Trapezoidal Steer -- Dry

Tire Configur. \ σ'	4°	6°	8°	12°	16°	20°	24°
44A (O.E.)	13/13	18/18	20/24	26/29	29/36	33/39	35/39
45A (O.E.)	12/12	18/17	22/22	27/27	30/29	31/32	30/31
46 (psi all 20)	13/13	20/19	23/23	27/28	35/34	39/39	40/40
47 (psi 16 R)	16/17	26/28	29/33	36/42	41/46	41/46	40/47
48 (Loaded O.E.)	15/16	24/23	34/31	50/34	39/39	42/42	42/42
49 (Loaded 20 R)	22/27	X/X	33/46	38/48	39/50	42/51	42/46
50 (Snow R)	15/14	20/20	24/24	29/29	34/35	36/37	40/40
51 (Mix BR F)	24/24	29/31	33/34	33/34	35/36	35/37	36/35
52 (Wear 2/32 F)	14/16	21/21	26/26	34/34	38/39	39/39	40/40
34 (Shoulder)	13/13	20/20	23/25	28/30	31/35	35/38	39/40
44 (O.E.)	12/13	20/20	20/22	25/28	29/35	30/38	35/40
45 (O.E.)	12/13	18/18	23/24	29/28	35/32	35/33	X/32

VEHICLE - BUICK　　NUMERIC - $|r_p|$

VHTP - #4, Trapezoidal Steer

Table F1-17. Buick -- Sinusoidal Steer -- Dry

Tire Configur. \ σ'	4°	6°	8°	10°	12°	14°	16°	18°
35 (O.E.)	X/X	X/1.31	1.38/X	X/1.38	1.56/1.38	1.53 1.33/1.51	1.36/X	1.41/1.51
36 (O.E.)	1.26/1.14	1.41/1.33	1.38/1.33	1.46/1.38	1.53/1.43	1.41/1.51	1.48/1.46	1.36/1.41
37 (psi 20 R)	1.21/X	1.36/1.34	X/X	1.38/1.38	1.43/1.41	1.43/1.53	1.36/1.51	1.46/1.58
38 (psi 16 R)	1.41/1.36	1.61/1.48	1.73/1.68, 1.58	1.88/X	1.95/1.80	1.90/1.95	1.98/1.93	1.95/1.93
39 (Loaded O.E.)	1.38/1.29	1.49/1.43	1.53/1.53	1.66/1.58	1.78/1.63	1.76/1.68	1.78/1.66	1.80/1.71
40 (Loaded psi)	1.56/1.34	2.05/1.61	X/2.06	2.97/X	2.77/2.97	X/2.67	2.67/2.97	2.40/2.62
41 (Snow R)	1.21/X	X/X	1.36/1.36	1.41/1.38	1.41/1.46	1.41/1.51	1.28/1.58, 1.61	1.38/X
42 (Mix BR FT)	1.61/1.34	X/X	2.03/1.57	1.72/1.66	1.81/1.75	1.61/1.70	1.66/S	1.60/S
43 (Wear 2/32 F)	1.27/X	1.44/1.21	1.51/1.31	1.63/1.33	1.41/1.41	1.49/1.61	X/S	1.48/S
34 (Shoulder)	1.21/1.19	1.26/1.28	X/1.31	1.43/1.51	1.41/1.46	1.43/1.53	1.31/X	1.46/1.56
42 (L/R Switch)	———	———	———	1.58/1.66	1.60/1.64	1.75/S	1.58/S	1.52/S

VEHICLE - BUICK

VHTP - #5, Sine Steer

NUMERIC - TINF

S - Denotes Spin-Out

Table F1-17. Buick -- Sinusoidal Steer -- Dry

Tire Configur. \ σ'	4°	6°	8°	10°	12°	14°	16°	18°
35 (O.E.)	X/X	X/8.1	10.2/X	X/11.0	13.9/11.9	11.2 14.6/14.1	11.6/X	13.0/15.0
36 (O.E.)	5.3/4.2	9.9/7.7	9.8/8.5	11.9/9.9	13.7/11.7	12.2/14.3	13.1/12.9	11.7/12.6
37 (psi 20 R)	4.4/X	6.8/8.6	X/X	10.4/10.4	10.9/11.0	11.9/13.3	10.5/14.4	12.7/14.9
38 (psi 16 R)	8.2/6.8	12.8/10.3	16.1/12.9, 12.2	21.0/X	22.7/19.9	21.8/23.7	23.7/24.4	24.5/24.8
39 (Loaded O.E.)	7.2/4.8	11.3/9.6	13.4/11.9	17.1/14.1	20.8/14.3	20.5/17.5	22.1/16.4	22.8/17.9
40 (Loaded psi)	10.3/5.3	21.7/11.6	X/24.4	57.9/X	51.7/55.3	X/46.8	47.9/56.4	39.3/45.4
41 (Snow R)	10.8/X	X/X	10.2/9.9	10.6/11.5	11.5/13.8	12.2/14.9	17.6 10.2/15.5	11.6/X
42 (Mix BR FT)	12.9/9.0	X/X	28.3/16.2	20.9/19.6	22.5/24.0	18.2/20.4	20.0/S	18.9/S
43 (Wear 2/32 F)	6.1/X	11.5/8.8	12.8/9.8	16.1/10.5	13.6/14.6	13.0/16.6	X/S	14.6/S
34 (Shoulder)	4.4/5.5	6.9/8.7	X/9.6	11.0/14.4	11.9/13.5	13.1/15.2	11.1/X	13.2/17.0
42 (L/R Switch)	———	———	———	18.8/24.3	18.0/19.6	20.8/S	16.8/S	15.7/S

VEHICLE - BUICK

VHTP - #5, Sine Steer

NUMERIC - |YINF|

S - Denotes Spin-Out

Table F1-17. Buick -- Sinusoidal Steer -- Dry

Tire Configur. \ σ'	4°	6°	8°	10°	12°	14°	16°	18°
35 (O.E.)	X/X	X/3	8/X	X/8	14/11	17 17/14	19/X	27/26
36 (O.E.)	2/2	7/3	8/5	11/7	13/9	16/14	17/18	22/41
37 (psi 20 R)	3/X	5/4	X/X	12/8	13/10	16/14	18/18	22/19
38 (psi 16 R)	6/3	8/6	8/11	10/X	11/14	12/16	13/17	15/19
39 (Loaded O.E.)	4/3	6/6	8/7	10/9	10/11	12/12	15/15	15/15
40 (Loaded psi)	4/4	10/7	X/12	15/X	15/18	X/19	18/23	18/21
41 (Snow R)	4/X	X/X	9/5	11/8	13/12	20/14	19 22/32	28/X
42 (Mix BR FT)	5/4	X/X	9/11	12/15	14/15	12/34	13/S	20/S
43 (Wear 2/32 F)	4/X	X/5	9/8	10/9	11/23	16/15	X/S	22/S
34 (Shoul-der)	4/5	7/4	X/6	12/7	15/8	18/11	20/X	21/17
42 (L/R Switch)	—	—	—	10/13	X/13	12/S	16/S	33/S

VEHICLE - BUICK

VHTP - #5, Sine Steer

NUMERIC - $|\beta_p|$

S - Denotes Spin-Out

Table F1-17. Buick -- Sinusoidal Steer -- Dry

Tire Configur. \ σ'	4°	6°	8°	10°	12°	14°	16°	18°
35 (O.E.)	X/X	X/5.0	7.6/X	X/7.1	8.6/7.6	8.5 9.2/9.7	9.7/X	11.1/10.4
36 (O.E.)	5.0/6.9	6.9/4.7	7.5/5.1	8.3/6.2	8.4/7.4	8.6/9.2	8.7/9.2	8.9/9.6
37 (psi 20 R)	5.9/X	5.0/4.6	X/X	7.5/6.8	7.5/7.1	8.3/7.9	8.6/9.7	9.4/9.4
38 (psi 16 R)	6.3/5.0	8.6/6.6	8.5 11.6/9.1	13.9/X	14.1/14.1	13.7/14.1	13.9/14.9	14.9/15.4
39 (Loaded O.E.)	5.5/6.9	8.0/6.7	9.8/8.2	12.2/9.8	14.4/9.4	14.0/11.8	14.9/11.1	15.3/11.7
40 (Loaded psi)	7.8/6.1	13.4/8.1	X/15.3	19.5/X	19.8/18.6	X/19.2	16.6/19.1	19.3/19.2
41 (Snow R)	5.2/X	X/X	7.5/6.1	7.0/7.7	7.6/9.2	8.8/9.9	10.8 9.1/10.1	8.7/X
42 (Mix BR FT)	10.5/5.5	X/X	18.0/11.6	17.5/13.4	18.1/17.7	16.8/14.1	15.7/S	15.0/S
43 (Wear 2/32 F)	5.5/X	8.1/5.7	9.3/5.8	11.0/6.7	13.0/9.8	9.4/10.2	X/S	10.3/S
34 (Shoul-der)	6.1/5.3	5.3/6.0	X/6.3	7.2/8.6	8.7/8.6	9.2/9.8	9.8/X	9.4/11.6
42 (L/R Switch)	———	———	———	18.6/19.0	16.4/13.8	14.4/S	11.6/S	12.7/S

VEHICLE - BUICK

VHTP - #5, Sine Steer

NUMERIC - MEASURE

S - Denotes Spin-Out

Table F1-17. Buick -- Sinusoidal Steer -- Dry

Tire Configur. \ σ'	4°	6°	8°	10°	12°	14°	16°	18°
35 (O.E.)	X/X	X/0	2/X	X/-9	11/-19	19 19/-30	23/X	45/-44
36 (O.E.)	-2/-1	0/-2	1/-4	4/-8	10/-12	20/-27	18/-42	40/-73
37 (psi 20 R)	-1/X	-2/-2	X/X	6/-6	9/-11	14/-21	20/-30	27/-32
38 (psi 16 R)	-2/0	-1/-5	-10 -7/-10	-10/X	-8/5	-1/2	2/-2	1/-7
39 (Loaded O.E.)	-2/-1	-1/-2	0/-2	0/-6	-4/-9	2/-19	9/-31	8/-32
40 (Loaded psi)	-6/-5	-19/-5	X/19	-39/X	-35/41	X/36	-33/42	-29/35
41 (Snow R)	-1/X	X/X	2/-2	8/-7	11/-14	29/-20	-41 40/-59	68/X
42 (Mix BR FT)	-9/-10	X/X	-22/-26	-22/-35	-25/-28	-7/-61	4/S	29/S
43 (Wear 2/32 F)	-2/X	-2/-4	-1/-15	0/-34	-1/-63	19/-39	X/S	48/S
34 (Shoulder)	2/3	5/6	X/6	7/8	9/8	9/10	10/X	9/12
42 (L/R Switch)	____	____	____	-17/-19	-12/-30	6/S	34/S	68/S

VEHICLE - BUICK

VHTP - #5, Sine Steer

NUMERIC - ψ_F

S - Denotes Spin-Out

Table F1-17. Buick -- Sinusoidal Steer -- Dry

Tire Configur. \ σ'	4°	6°	8°	10°	12°	14°	16°	18°
35 (O.E.)	.4/.35	.52/.49	.56/X	.6/.59	.6/.61	.64/.63	.66/X	.70/.65
36 (O.E.)	.35/.34	.5/.45	.55/.51	.6/.55	.6/.6	.62/.65	.65/.66	.65/.67
37 (psi 20 R)	.35/.33	.46/.44	.53/.50	.58/.52	.60/.55	.60/.56	.62/.60	.70/.60
38 (psi 16 R)	.44/.37	.53/.47	.57/.52	.61/.57	.62/.6	.64/.62	.65/.63	.68/.64
39 (Loaded O.E.)	.37/.33	.51/.46	.58/.54	.62/.57	.66/.60	.69/.65	.68/.68	.72/.70
40 (Loaded psi)	.4/.35	.5/.5	.55/.57	.64/.6	.64/.64	.66/.65	.68/.68	.68/.69
41 (Snow R)	.42/.37	.54/.49	.59/.56	.61/.61	.65/.63	.66/.64	.67/.66	.68/.64
42 (Mix BR FT)	.51/.50	.64/.65	.7/.69	.7/.71	.7/.75	.75/.74	.75/S	.75/S
43 (Wear 2/32 F)	.46/.35	.56/.52	.63/.56	.68/.61	.69/.62	.70/.66	.74/S	.73/S
34 (Shoulder)	.37/.37	.5/.5	.56/.53	.60/.57	.65/.59	.68/.64	.7/X	.71/.68

VEHICLE - BUICK

VHTP - #5, Sine Steer

NUMERIC - $|Ay_p|$ (1st)

S - Denotes Spin-Out

Table F1-17. Buick -- Sinusoidal Steer -- Dry

Tire Configur. \ σ'	4°	6°	8°	10°	12°	14°	16°	18°
35 (O.E.)	.36/.42	.51/.51	.57/X	.62/.63	.66/.69	.70/.75	.71/X	.74/.75
36 (O.E.)	.35/.37	.45/.50	.55/.56	.60/.65	.66/.68	.70/.72	.75/.75	.80/.75
37 (psi 20 R)	.35/.37	.43/.50	.52/.56	.56/.60	.60/.66	.66/.70	.66/.72	.73/.74
38 (psi 16 R)	.35/.43	.44/.56	.42/.61	.39/.57	.41/.54	.51/.58	.54/.63	.57/.66
39 (Loaded O.E.)	.34/.40	.45/.52	.52/.60	.58/.65	.55/.69	.59/.71	.66/.73	.69/.75
40 (Loaded psi)	.30/.41	.15/.47	0/.25	0/0	0/0	0/.05	0/0	.10/.06
41 (Snow R)	.39/.43	.52/.54	.58/.61	.62/.67	.66/.73	.75/.77	.76/.78	.77/.84
42 (Mix BR FT)	.34/.56	.20/.69	.22/.75	.30/.80	.27/.75	.63/.82	.68/S	.80/S
43 (Wear 2/32 F)	.38/.46	.58/.58	.57/.68	.62/.76	.66/.85	.69/.81	.80/S	.83/S
34 (Shoulder)	.37/.39	.49/.51	.59/.57	.64/.67	.69/.70	.73/.75	.79/X	.79/.82

VEHICLE - BUICK

NUMERIC - $|Ay_p|$ (2nd)

VHTP - #5, Sine Steer

S - Denotes Spin-Out

Table F1-17. Buick -- Sinusoidal Steer -- Dry

Tire Configur. \ σ'	4°	6°	8°	10°	12°	14°	16°	18°
35 (O.E.)	13/12	17/19	22/X	24/25	25/27	28/30	31/X	33/33
36 (O.E.)	12/12	17/17	22/22	25/25	26/27	27/30	30/32	28/32
37 (psi 20 R)	12/13	17/17	22/22	23/24	26/27	28/28	30/32	33/34
38 (psi 16 R)	14/15	21/22	25/27	29/31	32/34	33/38	35/40	38/41
39 (Loaded O.E.)	16/16	24/23	29/29	32/34	38/35	40/39	42/41	45/38
40 (Loaded psi)	17/15	26/25	30/33	36/37	35/39	37/42	38/45	40/44
41 (Snow R)	13/14	18/19	21/23	24/26	26/28	28/32	29/33	32/34
42 (Mix BR FT)	22/20	27/27	33/32	34/33	35/35	35/37	37/S	37/S
43 (Wear 2/32 F)	14/14	21/19	25/23	30/28	33/30	36/34	35/S	38/S
34 (Shoulder)	11/14	16/19	20/21	23/26	27/27	29/30	31/X	32/36

<u>VEHICLE</u> - BUICK

<u>VHTP</u> - #5, Sine Steer

<u>NUMERIC</u> - $|r_p|$ (1st)

S - Denotes Spin-Out

Table F1-17. Buick -- Sinusoidal Steer -- Dry

Tire Configur. \ σ'	4°	6°	8°	10°	12°	14°	16°	18°
35 (O.E.)	14/13	23/21	30/X	38/32	42/38	50/43	52/X	57/52
36 (O.E.)	13/12	22/20	30/25	36/32	43/38	49/43	52/46	54/50
37 (psi 20 R)	14/12	22/22	32/27	37/33	40/40	49/45	52/49	57/52
38 (psi 16 R)	17/16	26/27	29/32	32/32	35/34	42/40	36/43	48/48
39 (Loaded O.E.)	18/18	25/27	33/34	37/39	41/44	48/50	53/55	57/52
40 (Loaded psi)	16/18	13/23	2/17	0/3	5/0	7/7	11/6	17/11
41 (Snow R)	15/14	23/21	30/27	38/35	43/40	50/47	53/30	59/54
42 (Mix BR FT)	15/21	15/32	22/37	26/44	26/42	47/56	52/S	56/S
43 (Wear 2/32 F)	15/15	25/23	34/31	38/38	39/43	46/51	54/S	60/S
34 (Shoulder)	14/12	22/19	30/25	37/33	43/38	47/44	53/X	55/54

VEHICLE - BUICK

NUMERIC - $|r_p|$ (2nd)

VHTP - #5, Sine Steer

S - Denotes Spin-Out

Table F1-18. Buick -- Sinusoidal Steer -- Wet

Tire Configur. \ σ'	2°	4°	6°	8°	10°	12°	14°	16°	18°
24 (O.E.)	1.06/X	1.16/1.11 1.06/1.06	1.26/1.15 1.16/X	1.27/1.16 1.21/1.16	1.17/1.24 1.19/1.21	1.29/1.25 1.26/1.38	1.24/1.31 1.26/1.24	—	—
25 (psi all 20)	1.01/1.06	1.06/X	1.18/1.19	1.28/X	1.29/1.16	1.33/1.31	1.24/1.21	—	—
26 (psi 26-16)	X/1.14	1.19/1.16	1.26/1.34	1.28/1.31	1.41/1.38	1.33/1.48	1.41/1.38	—	—
27 (Loaded O.E.)	1.17/1.01	1.19/1.19	1.21/1.19	1.26/1.21	1.28/X	1.26/1.38	1.29/1.38	—	—
28 (Loaded 26-20)	1.21/1.14	1.24/1.31	1.31/X	1.41/1.43	1.41/X	X/1.61	1.51/X	—	—
29 (Snow R)	1.01/X	1.16/1.14	X/1.19	X/1.24	1.28/X	1.29/1.24	1.31/1.34	—	—
30 (Mix BR F)	1.11/X	1.11/1.24	1.32/1.22	1.37/1.32	1.37/1.38	1.38/1.45	1.31/1.42	—	—
31 (Wear 2/32 R)	—	1.05/1.04	1.16/1.12	1.11/1.18	1.15/1.19	1.15/1.25	1.19/1.23	—	—
32 (Wear 4/32 R)	—	1.04/X	1.13/1.13	X/1.19	1.10/1.09	X/1.25	1.26/X		
33 (Wear 6/32 R - 40 mph)	—	1.12/1.31	1.12/1.15	1.27/1.16	1.29/X	1.27/1.38	1.23/1.38	—	1.31/1.28
34 (Shoulder 40 mph)	1.03/1.02	1.12/1.18	X/1.28	1.21/1.30	1.19/1.30	1.23/1.36	1.29/X	X/1.30	1.21/1.29
24 (35 mph)	—	1.14/X	1.21/X	1.35/X	1.29/1.35	1.30/1.32	1.22/1.36	X/1.35	1.19/X
31 (35 mph)	—	1.11/X	1.23/1.14	X/1.25	X/1.25	1.35/1.34	X/1.30	1.47/1.34	X/1.27
31 (40 mph)	1.11/X	1.06/1.18	X/1.48	1.25/S	—	—	—	—	—
32 (40 mph)	—	1.20/1.09	1.13/1.15	1.19/1.19	1.26/X	1.21/1.26	1.28/1.14	1.21/1.27	1.23/1.30
24 (40 mph)	—	1.05/1.20	1.20/1.26	X/1.24	1.20/1.30	1.18/1.25	X/1.35	1.27/1.30	1.26/1.13

<u>VEHICLE</u> - BUICK

<u>VHTP</u> - #9, Sine Steer - Wet

<u>NUMERIC</u> - TINF

S - Denotes Spin-Out

Table F1-1 Buick -- Sinusoidal Steer -- Wet

Tire Configur. \ σ'	2°	4°	6°	8°	10°	12°	14°	16°	18°
24 (O.E.)	2.8/X	2.3/3.7 1.9/3.4	6.8/5.0 4.0/X	5.6/3.9 5.1/5.9	6.1/6.1 5.3/7.4	5.7/6.1 6.1/9.8	8.0/6.8 5.7/7.6	—— ——	—— ——
25 (psi all 20)	.7/2.2	1.8/X	3.6/5.1	4.7/X	5.2/5.9	6.6/8.0	5.5/6.7	——	——
26 (psi 26-16)	X/2.6	2.4/4.4	4.0/7.1	4.9/7.3	7.1/8.5	6.0/9.4	7.1/9.7	——	——
27 (Loaded O.E.)	1.6/1.8	3.1/3.5	4.7/5.0	5.4/5.9	7.1/X	6.5/8.6	7.2/8.4	——	——
28 (Loaded 26-20)	1.8/2.1	3.5/4.9	5.5/X	7.2/8.4	8.2/X	X/10.0	9.4/X	——	——
29 (Snow R)	1.1/X	2.6/3.6	X/5.0	X/6.1	6.0/X	6.4/6.7	6.5/8.4	——	——
30 (Mix BR F)	3.5/X	5.6/7.3	7.9/7.7	11.9/8.7	10.6/6.2	8.0/13.9	8.6/10.6	——	——
31 (Wear 2/32 R)	——	1.4/4.4	4.2/6.0	4.4/7.5	3.9/6.1	3.4/5.7	5.7/5.8	——	——
32 (Wear 4/32 R)	——	4.0/3.1	5.0/5.0	X/5.2	4.3/5.0	X/5.3	8.1/X	——	——
33 (Wear 6/32 R 40 mph)	——	4.0/8.7	4.9/6.1	6.5/6.2	5.9/X	6.0/8.1	6.3/7.4	——	7.4/5.6
34 (Shoulder 40 mph)	1.3/1.8	4.0/5.0	X/7.0	4.1/5.6	6.2/5.6	6.3/7.2	6.0/X	X/6.5	5.9/9.9
24 (35 mph)	——	2.1/X	8.0/X	8.3/X	6.3/10.9	7.3/9.2	7.2/8.0	X/5.8	7.2/X
31 (35 mph)	——	4.3/X	7.1/5.7	X/11.1	X/5.2	9.7/7.2	X/8.5	12.3/7.3	X/5.6
31 (40 mph)	2.7/X	3.8/4.4	X/8.6	5.2/S	——	——	——	——	——
32 (40 mph)	——	7.0/4.1	5.4/4.7	8.6/3.1	6.6/X	7.6/6.8	7.6/4.9	5.3/6.5	5.6/7.7
24 (40 mph)	——	2.9/8.3	6.3/8.1	9.8/7.0	3.8/9.6	4.3/7.1	X/7.9	5.7/7.1	6.8/4.4

VEHICLE - BUICK

VHTP - #9, Sine Steer - Wet

NUMERIC - | YINF |

S - Denotes Spin-Out

Table F1-18. Buick -- Sinusoidal Steer -- Wet

Tire Configur. \ σ'	2°	4°	6°	8°	10°	12°	14°	16°	18°
24 (O.E.)	—	4/2 1/1	X/4 2/X	2/X 3/2	2/2 4/3	5/3 4/5	4/4 3/5	—	—
25 (psi all 20)	1/1	1/X	1/1	2/X	3/4	4/4	5/4	—	—
26 (psi 26-16)	X/1	3/2	4/3	5/4	5/6	7/7	8/9	—	—
27 (Loaded O.E.)	1/1	2/1	2/2	3/3	5/X	6/6	6/7	—	—
28 (Loaded 26-20)	1/1	2/2	4/X	6/5	X/7	—	X/10	—	—
29 (Snow R)	X/2	3/1	X/1	X/2	X/3	3/3	3/3	—	—
30 (Mix BR F)	—	—	3/X	X/5	—	—	X/6	—	—
31 (Wear 2/32 R)	—	2/6	3/6	1/7	3/1	7/6	2/4	—	—
32 (Wear 4/32 R)	—	6/6	3/1	X/2	4/1	X/7	6/X	—	—
33 (Wear 6/32 R 40 mph)	—	—	3/3	X/3	3/X	X/5	X/4	—	5/7
34 (Shoul-der 40 mph)	2/2	3/2	X/2	4/5	7/X	X/4	10/X	X/3	9/7
24 (35 mph)	—	—	—	—	5/X	6/7	6/5	X/8	9/X
31 (35 mph)	—	5/X	X/2	—	X/5	X/3	X/6	X/4	5/X
31 (40 mph)	—	1/1	X/5	7/S	—	—	—	—	—
32 (40 mph)	—	X/2	2/2	X/6	3/X	X/3	X/2	4/3	3/2
24 (40 mph)	—	2/X	5/X	X/5	5/X	5/7	X/4	5/5	6/3

VEHICLE - BUICK NUMERIC - $|\beta_D|$

Table F1-18. Buick -- Sinusoidal Steer -- Wet

Tire Configur. \ σ'	2°	4°	6°	8°	10°	12°	14°	16°	18°
24 (O.E.)	6.4/X ____	9.2/7.5 8.6/7.2	5.6/5.0 6.5/X	5.4/7.2 5.2/4.2	4.9/4.5 5.1/5.2	6.2/5.2 4.5/6.2	5.2/4.6 5.8/5.7	____	____
25 (psi all 20)	10.5/9.2	9.1/X	7.2/5.1	6.5/X	6.4/4.5	4.7/4.9	5.5/4.7	____	____
26 (psi 26-16)	X/9.0	8.8/6.2	7.0/4.7	6.0/4.7	4.9/5.0	5.3/5.4	5.1/6.6	____	____
27 (Loaded O.E.)	10.0/9.7	7.7/8.2	5.6/5.5	5.2/4.4	5.5/4.7	4.7/5.6	5.2/4.9	____	____
28 (Loaded 26-20)	9.5/9.3	7.3/6.2	5.0/X	6.0/5.8	7.1/7.0	X/6.0	6.7/X	____	____
29 (Snow R)	10.5/X	8.9/7.2	X/5.6	X/4.5	6.2/X	5.1/4.5	5.4/5.3	____	____
30 (Mix BR F)	7.0/X	5.0/5.1	5.5/5.6	9.8/6.0	8.8/5.8	5.3/9.3	5.7/5.1	____	____
31 (Wear 2/32 R)	____	9.6/5.1	5.9/4.8	5.9/5.7	6.4/4.4	7.6/5.8	4.8/4.8	____	____
32 (Wear 4/32 R)	____	5.3/6.5	5.4/6.4	X/5.6	6.3/4.4	X/6.3	5.4/X	____	____
33 (Wear 6/32 R 40 mph)	____	6.5/6.7	6.5/4.6	4.4/4.2	6.7/X	4.8/4.8	4.4/4.6	____	5.3/6.4
34 (Shoul-der 40 mph)	10.6/10.1	6.5/6.3	X/4.6	7.9/6.1	6.3/6.4	5.6/4.8	5.3/X	X/8.3	5.0/6.8
24 (35 mph)	____	9.6/X	7.0/X	5.3/X	5.0/8.4	4.5/5.6	4.6/4.8	X/70	4.8/X
31 (35 mph)	____	5.1/X	5.7/4.6	X/9.5	X/5.6	5.7/4.6	X/5.7	6.8/5.3	X/5.0
31 (40 mph)	7.1/X	7.2/6.3	X/4.8	5.8/S	____	____	____	____	____
32 (40 mph)	____	5.4/6.0	5.4/5.6	7.5/8.2	4.8/X	4.0/5.0	4.2/4.7	6.6/4.8	6.2/5.0
24 (40 mph)	____	7.1/6.8	5.2/6.7	5.4/4.5	6.6/6.7	7.1/4.7	X/4.7	6.6/4.5	5.5/6.8

VEHICLE - BUICK

VHTP - #9, Sine Steer - Wet

NUMERIC - MEASURE

S - Denotes Spin-Out

Table F1-18. Buick -- Sinusoidal Steer -- Wet

Tire Configur. \ σ'	2°	4°	6°	8°	10°	12°	14°	16°	18°
24 (O.E.)	-2/X ———	-2/0 -2/0	-1/0 0/X	-1/2 -1/1	-1/1 2/1	0/-1 1/1	-1/1 3/-3	———	———
25 (psi all 20)	-1/0	0/X	0/2	-1/X	0/-1	1/0	4/-2	———	———
26 (psi 26-16)	X/-1	-2/0	-1/0	0/0	0/-5	5/-5	9/-10	———	———
27 (Loaded O.E.)	-1/-1	-2/0	-2/0	-1/0	0/X	6/-5	11/-6	———	———
28 (Loaded 26-20)	-2/0	-1/2	0/X	-3/2	-2/X	X/-6	7/X	———	———
29 (Snow R)	-1/X	-1/0	X/1	X/1	0/X	2/-1	2/0	———	———
30 (Mix BR F)	1/X	-1/1	-4/0	-2/-1	2/-5	7/-20	32/-17	———	———
31 (Wear 2/32 R)	———	0/0	0/1	1/1	0/2	1/2	1/1	———	———
32 (Wear 4/32 R)	———	-1/-1	-1/0	X/2	-1/1	X/2	0/X	———	———
33 (Wear 6/32 R 40 mph)	———	4/1	3/1	5/1	2/X	6/0	6/-2	———	6/3
34 (Shoulder 40 mph)	-1/1	1/3	X/2	6/-2	8/-2	12/-6	13/X	X/6	11/0
24 (35 mph)	———	-3/X	2/X	0/X	4/-3	3/-4	4/-5	X/-4	11/X
31 (35 mph)	———	-1/X	1/2	X/-3	X/0	4/-3	X/-3	5/-2	X/-2
31 (40 mph)	0/X	[illegible]	X/-5	15/S	———	———	———	———	———
32 (40 mph)	———	-1/1	0/3	2/1	1/X	9/-1	4/0	3/-2	2/2
24 (40 mph)	———	0/-1	0/0	4/-2	6/-4	9/-2	X/-3	7/-4	7/-4

<u>VEHICLE</u> - BUICK

<u>VHTP</u> - #9, Sine Steer - Wet

<u>NUMERIC</u> - ψ_F

S - Denotes Spin-Out

F2. HYBRID ANALYSIS AND DIGITIZATION

F2.1 HYBRID SYSTEM

The FM magnetic data tapes were processed on the HSRI Hybrid Computer facility. This facility consists of an Applied Dynamics AD-4 analog computer and a Digital Equipment Corporation (DEC) PDP 11/45 digital computer. Various peripheral devices are associated with each basic computer as shown in Figure F2-1.

1. Ampex FR 1900 FM 14-channel tape machine for reproducing data tapes.
2. Hewlett-Packard 101A Dual Beam Oscilloscope for monitoring tape data and validity checks.
3. Brush Mark 200 Recorder (2), total of 16 channels for plotting time history data.
4. Hewlett-Packard 2FA Dual Pen X-Y plotter for plotting trajectory data.
5. HSRI hybrid interface unit for hybrid communication signals and data transfer.
6. DEC CR11 card reader-punch for input data.
7. Data Products 2410 line printer for listing edited tape files.
8. DEC TU10 tape drive, 9 track, 800 BPI, for digitized data storage.
9. DEC RK05 disc drives for program storage.
10. LA 30 DEC writer keyboard for operator interaction and control of the program sequence.
11. Calcomp 565 digital plotter for final analysis and validity checks.

The basic program is designed to be highly interactive. Each of these hardware devices is utilized at the appropriate times in the program sequence. The program sequence is directed by the operator and can be interrupted at any time.

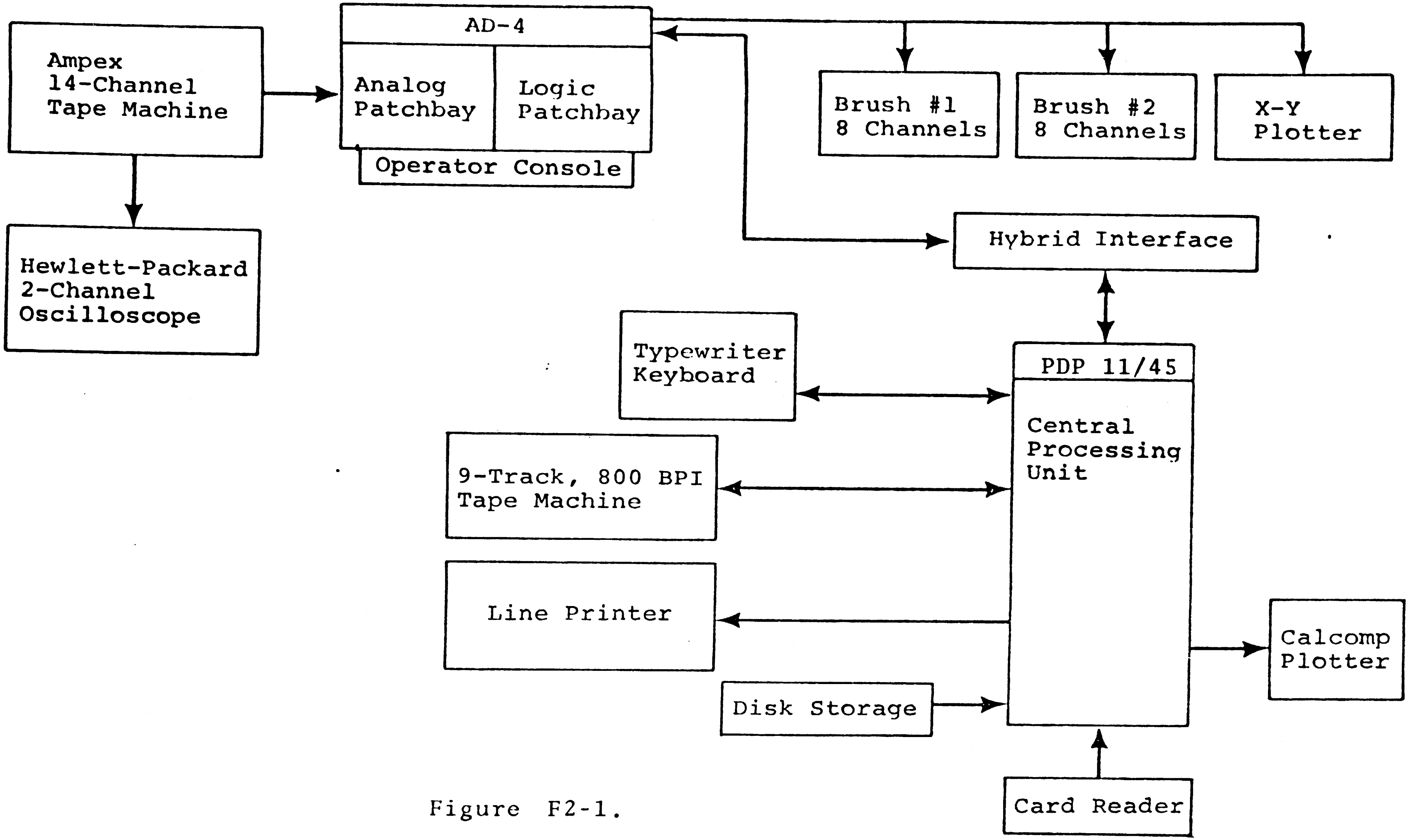


Figure F2-1.

Hybrid Data Processing Equipment

F2.2 TEST SEQUENCE MODE CONTROL

A test sequence is defined to be a single car executing a single maneuver in a single condition. Three calibration modes [Zero Calibration (ZC), Full Scale Calibration (FSC), and Zero Data (ZD)] were recorded immediately preceding and following a test sequence. All vehicle test runs were recorded in "data" mode. These four modes are switch-selected on the interface module. A fifth mode, test mode, is generated uniquely in each vehicle series at a time immediately preceding the control input application. A typical test sequence would be recorded as follows:

1.	Zero Calibration	15 seconds
2.	Full Scale Calibration	15 seconds
3.	Zero Data Calibration	15 seconds
4.	Data - Test Mode	as required

NOTES: (1) Zero data is recorded while the vehicle is standing still on a level surface with all instrumentation activated.

(2) Test mode was initiated when the vehicle was traveling in a straight line above the initial velocity requirements, 2 seconds prior to control input execution.

(3) Every data sample recorded on the tape, including all sequencing and calibration modes, was assigned a unique sample number on the log sheets.

(4) All transducer calibrations are referenced as FSC equivalents.

A typical data sequence would be analyzed as shown in Figure F2-2. During the initial phases of the program execution, the digital computer has main control over the analog; during the actual data analysis, the analog computer has main control. Modified sequencing or control mode selection can be

BASIC DIGITAL BLOCK DIAGRAM
TYPICAL SEQUENCING

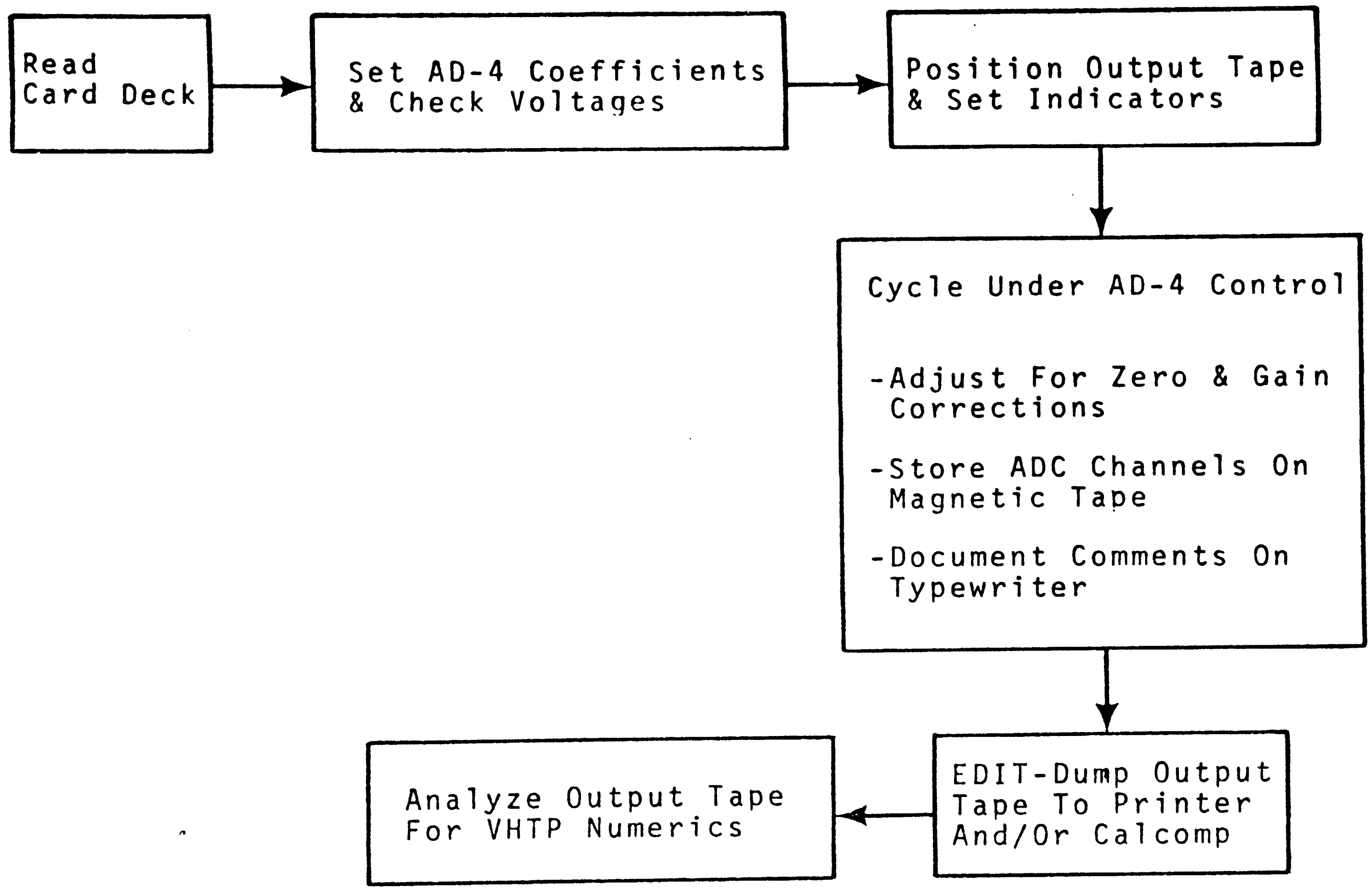


Figure F2-2.

selected at the operator's discretion by manually over-riding the automated logic sequencing during the data analysis phase. Several error recovery options are also included to aid in rapid trouble-shooting of any unanticipated problems. Program-generated comments and operator control options are listed on the typewriter-keyboard to document the processing and catalog the digitized tapes.

F2.3 ANALOG ANALYSIS

The data signals recorded on the magnetic tape fall into three basic categories:

1. Primary vehicle response data to be analyzed with basic kinematics equations.
2. Vehicle control inputs and informational data.
3. Control channel logic to be decoded for mode control.

A basic functional block diagram for the analog computer is shown in Figure F2-3. All data signals are initially processed through data calibration circuits, which provide necessary zero and gain corrections and filtering.

The primary vehicle response data are processed with the following equations:

$$u = \int (A_x + vr)dt$$

$$v = \int (A_y - ur)dt$$

$$\psi = \int r dt$$

$$\phi = \int \dot{\phi} dt$$

$$x = \int (u \cos\psi - v \sin\psi)dt$$

$$y = \int (v \cos\psi + u \sin\psi)dt$$

$$\tan\beta = v/u$$

$$1/R = \frac{\dot{\beta} + r}{(u^2 + v^2)1/2}$$

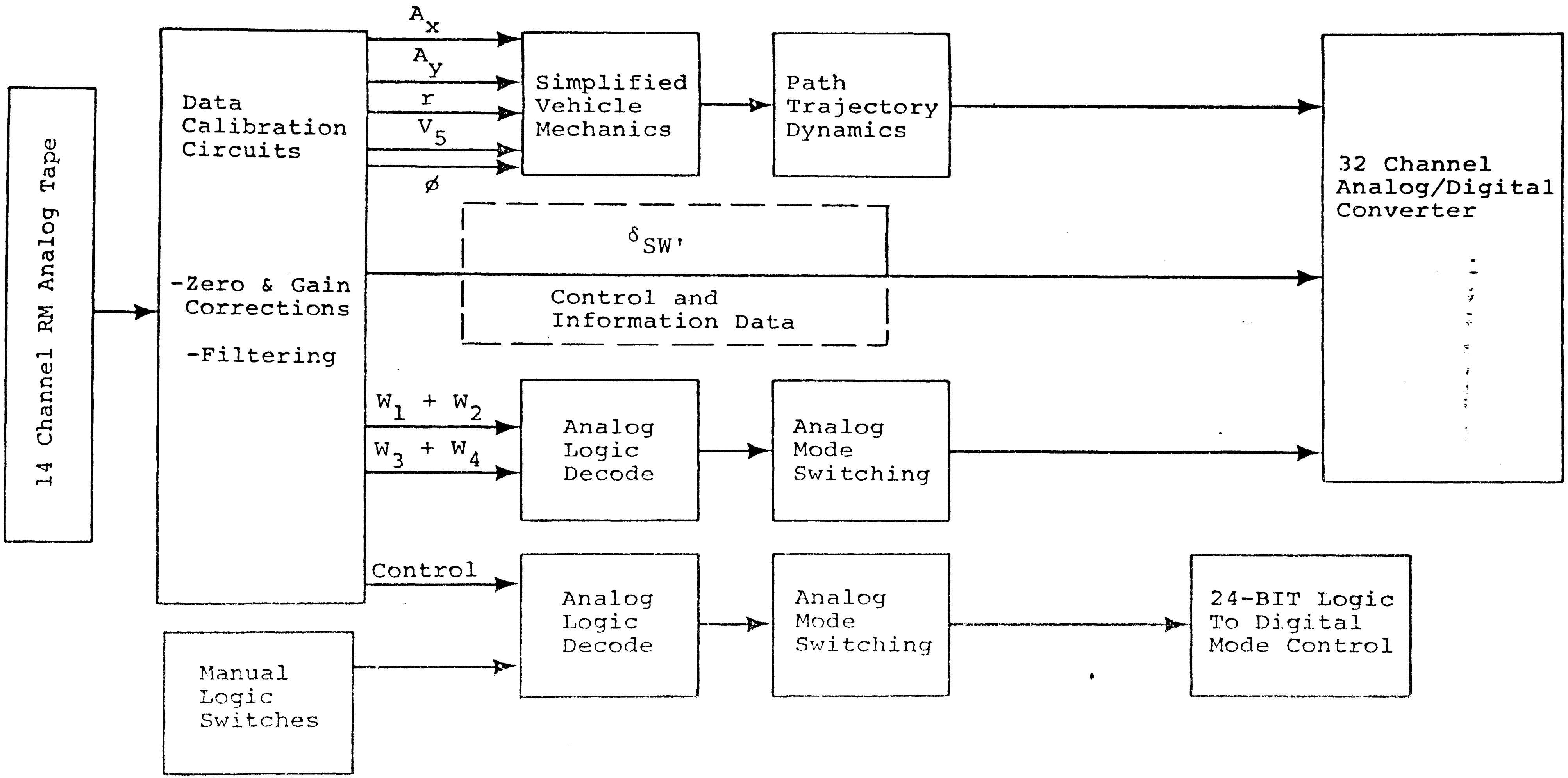


Figure F2-3.

Basic Analog Block Diagram

Definition of these terms can be found in Table F2-1. All of these computations are initiated at the beginning of test mode by logical switching; all integral computations are initialized at zero except for u, which is initialized by the instantaneous fifth wheel velocity, V_5.

The wheel rotation detectors are triggered by light-sensitive photo-cells to create discrete voltage levels. Each wheel generates a square wave with a period equal to the wheel's rotational period; the square waves from an axle of wheels are assigned different magnitudes and then added together (analog multiplexed) to form one signal and conserve tape channels.

The control channel information is decoded by a set of analog comparators. The control signal is a DC voltage with a unique value for each mode. This signal drives a set of analog logic elements to switch states in the vehicle mechanics circuits, control the peripheral equipment, and signal the digital computer.

F2.4 TYPICAL SEQUENCE

It will be illustrative to consider the computer activities for a typical sequence. As shown in Figure F2-2, the digital computer has a primary control in the initial phases. Parameter data are read from punched cards to identify the analog elements in use and to specify various data values for filtering effects, calibration magnitudes, etc. The digital computer then sets the analog coefficient devices to the proper magnitudes and performs a static check of all analog voltage elements to test the analog circuit. When these steps are completed satisfactorily, the analog and digital tape machines, the Brush recorders, and X-Y plotter are readied. Main control is then passed to the analog computer and decoded logic signals, based on the control channel, control the sequence.

During Zero Calibration (ZC) mode, the digital computer reads the initial analog stage ten times and computes the

TABLE F2-1. Identification of Variables

Identification Number	Symbol	Description
1	A_x	Longitudinal acceleration
2	A_y	Lateral acceleration
3	r	Yaw rate
4	V_5	Fifth wheel velocity
5	$\delta_{s\omega}/\omega_{12}$	For automatic series tests steering angle ($\delta_{s\omega}$) and roll rate ($\dot{\phi}$). For driver series tests multiplexed front wheel rotations (ω_{12}) and multiplexed rear wheel rotations (ω_{34}).
6	ϕ/ω_{34}	For automatic series tests steering angle ($\delta_{s\omega}$) and roll rate ($\dot{\phi}$). For driver series tests multiplexed front wheel rotations (ω_{12}) and multiplexed rear wheel rotations (ω_{34}).
7	Cont	Control channel
8	P_b	Brake line pressure
9	ϕ	Roll angle
10	t_{AD}	Time base on AD-4
11	ψ	Vehicle heading angle, computed
12	u	Longitudinal vehicle velocity, body axis
13	v	Lateral vehicle velocity, body axis
14	$\tan\beta$	Tangent of sideslip angle (β)
15	$1/R$	Path curvature
16	x	x-displacement, fixed axis
17	y	y-displacement, fixed axis
18	$\dot{x}$	x-direction velocity, fixed axis
19	$\dot{y}$	y-direction velocity, fixed axis
20	$\dot{\beta}$	rate of change of sideslip angle (β)

necessary voltage offset to correct for tape machine and signal processing errors. The offset values are set into the analog and the voltages are read again as a check. All of this information is stored on the digital output tape.

During Full Scale Calibration (FSC) mode, the digital computer again reads the initial analog stages ten times and computes the gains through these amplifiers. The desired gain is known from the input deck; the actual gain will be slightly wrong due to variations in the complete system hardware. Gain control digital-analog converters are reset to correct for these errors, and the voltages are read again as a check. All of this information is also stored on the digital output tape.

During Zero Data (ZD) mode, the digital computer repeats the procedure and equations of the ZC mode. Voltage offset errors generated by the transducers are nulled at this time.

The hybrid system is now ready for vehicle test samples. The next mode is data, and the digital computer switches to read the first 20 ADC channels. At the start of test mode, these channels are digitized and stored on the magnetic tape at a rate of 50 samples per second per channel until the end of the test mode. Table F2-1 identifies the samples stored. This digitizing process creates an output tape file for each test sample.

F2.5 DIGITAL ANALYSIS

The output of the analog-to-digital conversion process consists of digital magnetic tapes containing the 20 digitized variables stored in sequential files. Each data file represents one test sample and contains a discretized time history of each of the 20 variables. At the beginning of each file is a header record containing information on that file's contents. The information contained in this header gives the type of maneuver being performed, the vehicle identification, the sample number, the file number, and the file type. Calibration data associated with each data sequence are stored in calibration files before and after every sequence of data files.

The structure of the digital processing programs is shown in Figure F2-4. The overall operation is controlled by a main-option control program which reads the header record of a file and determines what branching or tape control is required. At the next lowest level are six subprograms which are accessed from the main-option control program. Each subprogram performs the required numeric calculations associated with a particular VHTP maneuver. These subprograms, in turn, interact with various subroutines which are used for smoothing, finding maximum values, and printing out the results.

The processing operation is completely automatic with no need for any operator interaction. The numerics computed for each VHTP test sample are printed out in tabular form on the line printer during this mode. However, the processing may be interrupted at any time and controlled completely from the keyboard/typewriter, with additional options available such as Calcomp plotting of any two variables, complete control of the tape unit, and arbitrary subprogram branching.

The following sequence is typical of the operations that the digital processing program performs. The main-option control program first reads the header record of the present file and determines whether or not it is a data file. If it is not (hence, a calibration file), it skips over the present file to the next file. Once a data file is encountered, the program determines what type of maneuver is being performed and then branches to the subprogram associated with that particular VHTP maneuver. The VHTP subprogram identifies the variables needed for its particular numeric calculations and passes this information to the variable selection and smoothing subroutine, which reads these required variables from the tape to core storage, smooths, and returns them to the VHTP subprogram. The VHTP subprogram then performs the necessary numeric calculations, using these smoothed variables, and outputs the results to the

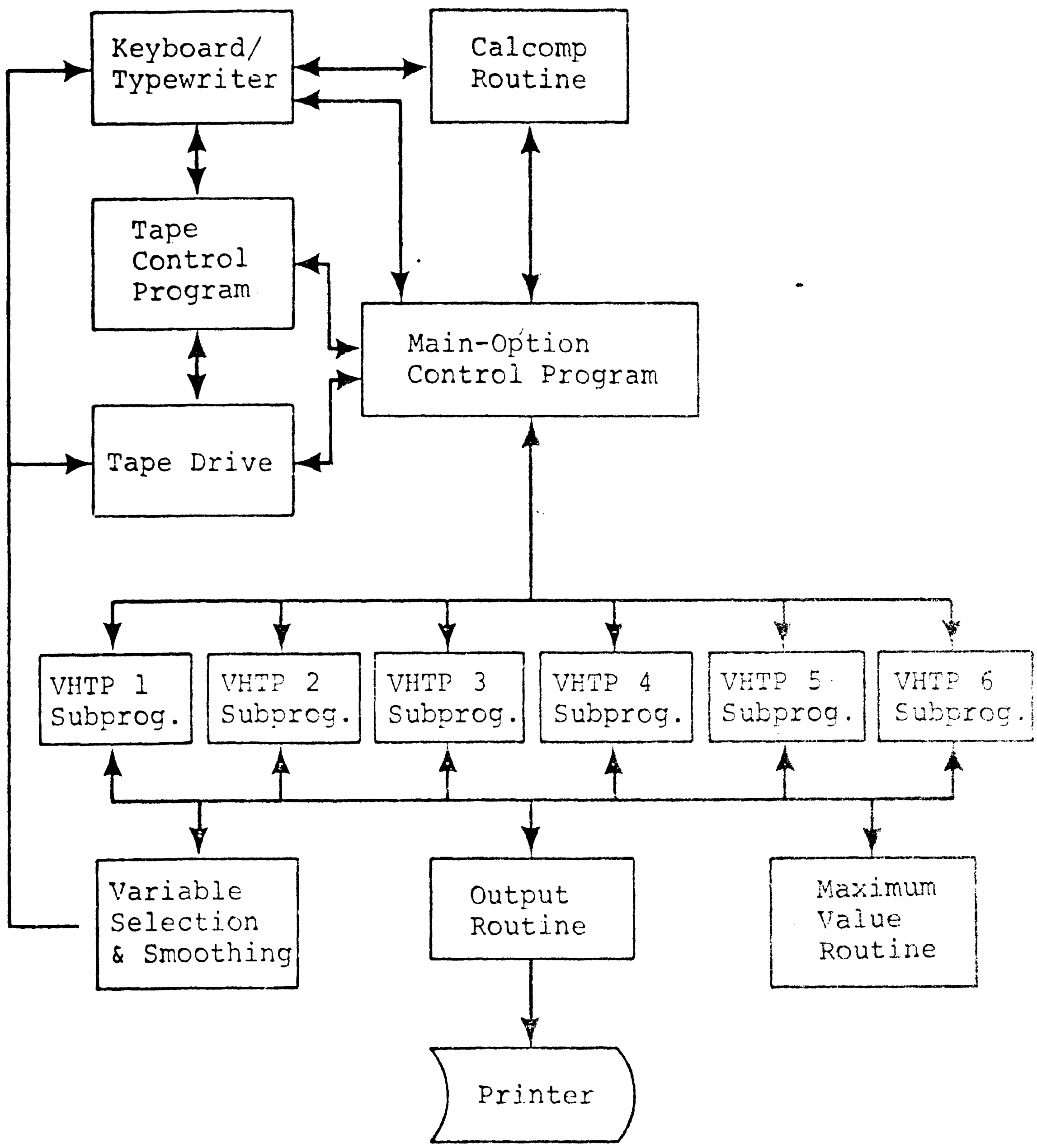


Figure F2-4.

BLOCK DIAGRAM OF DIGITAL PROGRAM STRUCTURE line printer. Program control is then returned to the main-option control program which reads the next file header record, and the above cycle is repeated. If the processing is interrupted for keyboard/typewriter control, the variables used in numeric calculations for the last data file remain in core storage and are not lost until the next file is processed. This eliminates any requirement to re-position the tape and read data that normally would have been lost upon completion of the calculations of the last file. Hence, many operations may be performed on this same data from the keyboard/typewriter such as Calcomp plotting, printing, searching for maximum values, or even further smoothing.

F2.6 NUMERIC DEFINITIONS

The following defines and explains the individual numerics that were calculated for each VHTP maneuver:

VHTP 1: a) $$AX_{AV} = \frac{1}{t_1 - t_o} \int_{t_o}^{t_1} A_x dt \cong \frac{1}{N} \sum_{i=1}^{N} A_{x_i}$$

= average longitudinal deceleration

where

A_x is the longitudinal deceleration

A_{x_i} is the discretized representation of longitudinal deceleration

t_o is the initial time at V = 35 mph

t_1 is the final time at V = 10 mph

N is the integer count of data points over the summation interval

V is the velocity

t is time

VHTP 2: a) $AX_{AV} = \frac{1}{t_1 - t_o} \int_{t_o}^{t_1} A_x \, dt \cong \frac{1}{N} \sum_{i=1}^{N} A_{x_i}$

= average longitudinal deceleration

where

A_x, A_{x_i}, t_1, t_o, N, V, t are defined the same as under VHTP 1 a).

VHTP 2: b) $\text{RATIO} = \frac{(\frac{1}{R})_{av}}{(\frac{1}{R})_o}$ = average path curvature ratio

where

$$(\tfrac{1}{R})_{av} = \frac{1}{t_3 - t_2} \int_{t_2}^{t_3} (\tfrac{1}{R}) dt \cong \frac{1}{N} \sum_{i=1}^{N} (\tfrac{1}{R})_i$$

$$(\tfrac{1}{R})_o = \frac{1}{R}\Big|_{t_2} \cong (\tfrac{1}{R})_i \, , \quad i=1$$

and

$(\frac{1}{R})_i$ is the discretized representation of path curvature

$(\frac{1}{R})$ is path curvature

$(\frac{1}{R})_o$ is the path curvature at the time the brakes are applied

$(\frac{1}{R})_{av}$ is the average path curvature from 35 mph to 10 mph

t_2 is the time at V = 35 mph

t_3 is the time at V = 10 mph

s_f is the digitizing rate in samples/second

$$N = s_f(t_3 - t_2)$$

VHTP 2: c) $\beta_p(t)$ = Maximum absolute value of sideslip angle

where

t is defined over the interval $[t_2, t_3]$

t_2, t_3 are defined as under b)

VHTP 2: d) $\dot{\beta}_p(t)$ = Maximum absolute value of rate of change of sideslip angle

where

t is defined over the interval $[t_2, t_3]$

t_2, t_3 are defined under b)

VHTP 4: a) A_{yp} = Maximum lateral acceleration over the entire maneuver time interval

VHTP 4: b) r_p = Maximum yaw rate over the entire maneuver time interval

VHTP 4: c) $\frac{1}{R}$ = Average path curvature ratio

where

$$\frac{1}{R} = \frac{1}{2}\int_{t_4}^{t_4+2} \left(\frac{1}{R}\right)dt = \frac{1}{2s_f}\sum_{i=1}^{2s_f} \left(\frac{1}{R}\right)_i$$

and

t_4 is the time of the steering input

t_4+2 is the time 2 seconds after the steering input

VHTP 4: d) $\beta_p(t)$ = Maximum absolute value of sideslip angle over t

where

t is defined over the interval $[t_4, t_4+2]$

t_4, t_4+2 is defined as in c)

VHTP 5: a) $\text{MEASURE} = \frac{1}{T}\int_{t_5}^{t_5+T} |y-12|dt = \frac{1}{T\cdot s_f}\sum_{i=1}^{T\cdot s_f} |y_i-12|,$

for right-left steer

$$= \frac{1}{T}\int_{t_5}^{t_5+T} |Y+12|dt = \frac{1}{T\cdot s_f}\sum_{i=1}^{T\cdot s_f} |y_i+12|,$$

for left-right steer

where

t_5 is the time of the steering input

T is the length of time of the maneuver, usually 3.4 seconds

y is the time history of the lateral displacement of the vehicle after t_5

y_i is the discretized representation of y

s_f is the digitizing rate

VHTP 5:b) $\beta_p(t)$ = Maximum absolute value of sideslip angle

where

t is defined over the interval $[t_5, t_5+T]$

t_5, t_5+T is defined as in a)

VHTP 5: c) ψ_F = Heading angle at the time (t_5+T)

where

t_5, T are defined as in a)

VHTP 5: d) A_{yp} (1st) = Maximum lateral acceleration achieved for the 1st half of the sine wave steer input

VHTP 5: e)	A_{yp} (2nd)	= Maximum lateral acceleration achieved for the 2nd half of the sine wave steer input
VHTP 5: f)	r_p (1st)	= Maximum yaw rate achieved for the 1st half of the sine wave steer input
VHTP 5: g)	r_p (2nd)	= Maximum yaw rate achieved for the 2nd half of the sine wave steer input
VHTP 5: h)	TINF	= The time interval from the start of the steer input to the occurrence of an inflection point in the vehicle x-y path trajectory
VHTP 5: i)	YINF	= The lateral vehicle displacement (y) at the time TINF
VHTP 6:	ϕ_p	= Maximum absolute value of roll angle over the entire maneuver time interval

F2.7 DRASTIC BRAKE-STEER (VHTP #6) - MUSTANG

Table F2-2 is a listing of the peak roll angle achieved during the drastic brake-steer maneuver (VHTP #6) for the Mustang in tire configuration 41 (O.E.). Table F2-3 is a similar listing but for tire configuration 42 (24-18 psi).

TABLE F2-2. Mustang/Tire Configuration 41 (O.E.)/Drastic Brake-Steer

ϕ_p
6.5
7.0
6.0
7.0
6.5
8.0
7.0
6.5

TABLE F2-3. Mustang/Tire Configuration 42 (PSI)/Drastic Brake Steer

ϕ_P
8.0
8.5
8.0
8.5
8.0
8.0
7.8
7.8

F2.8 ROAD HOLDING (VHTP #3) - BUICK

Table F2-4 is a listing of two numerics (Ratio_1 and Ratio_2) for the Buick in tire configuration 11 (O.E.). The grid frequency is also listed for each run. Ratio_1 is the ratio of minimum lateral acceleration achieved while traversing the grid to the steady state lateral acceleration, in the turn, prior to encountering the grid. Ratio_2 is the ratio of the maximum lateral acceleration (over-shoot) achieved in coming off the grid, to initial steady state lateral acceleration, in the turn, prior to encountering the grid. If Ratio_2 was less than 1.0, an X is listed, indicating no over-shoot characteristic in coming off the grid.

Table F2-5 is similar but applies to tire configuration 18 (PSI).

TABLE F2-4. Buick/Tire Configuration 11 (O.E.)/Road Holding

$Ratio_1$	$Ratio_2$	Grid Frequency (H_Z)
.5	1.5	9
.5	1.5	9
.6	1.3	9
.5	1.5	9
.6	1.3	9
.5	1.5	9
.5	1.5	11
.4	1.1	11
.5	1.4	11
.5	1.2	11
.5	1.3	11
.6	1.6	14
.5	1.5	14
.5	1.4	14
.6	1.3	14
.5	1.4	14
.5	1.2	14

TABLE F2-5. Buick/Tire Configuration 18 (PSI)/Road Holding

$Ratio_1$	$Ratio_2$	Grid Frequency (H_Z)
.6	1.1	9
.6	1.1	9
.6	1.1	9
.6	1.1	9
.7	1.1	9
.5	X	11
.5	X	11
.4	X	11
.4	X	11
.3	X	11
.9	X	14
.8	X	14
.6	X	14
.6	X	14
.6	X	14

F2.9 O.E. SAMPLE PLOTS

Figures F2-5 through F2-27 are sample plots of the O.E. data for both the Mustang and Buick. Figures F2-5 through F2-17 pertain to the Mustang; Figures F2-18 through F2-27 pertain to the Buick. For turning maneuvers, circles indicate right-turn values; squares indicate left-turn values. For the sinusoidal-steer maneuver, circles indicate a right-left steer sequence; squares indicate a left-right steer sequence.

Wheel locks are indicated by shading one or more of four sections of each symbol. (See below.) Sections 1, 2, 3, 4 indicate left-front, right-front, left-rear, and right-rear wheels, respectively.

Any symbol which overlapped another is denoted by the letters "A" or "B" and defined on the right side of the plot.

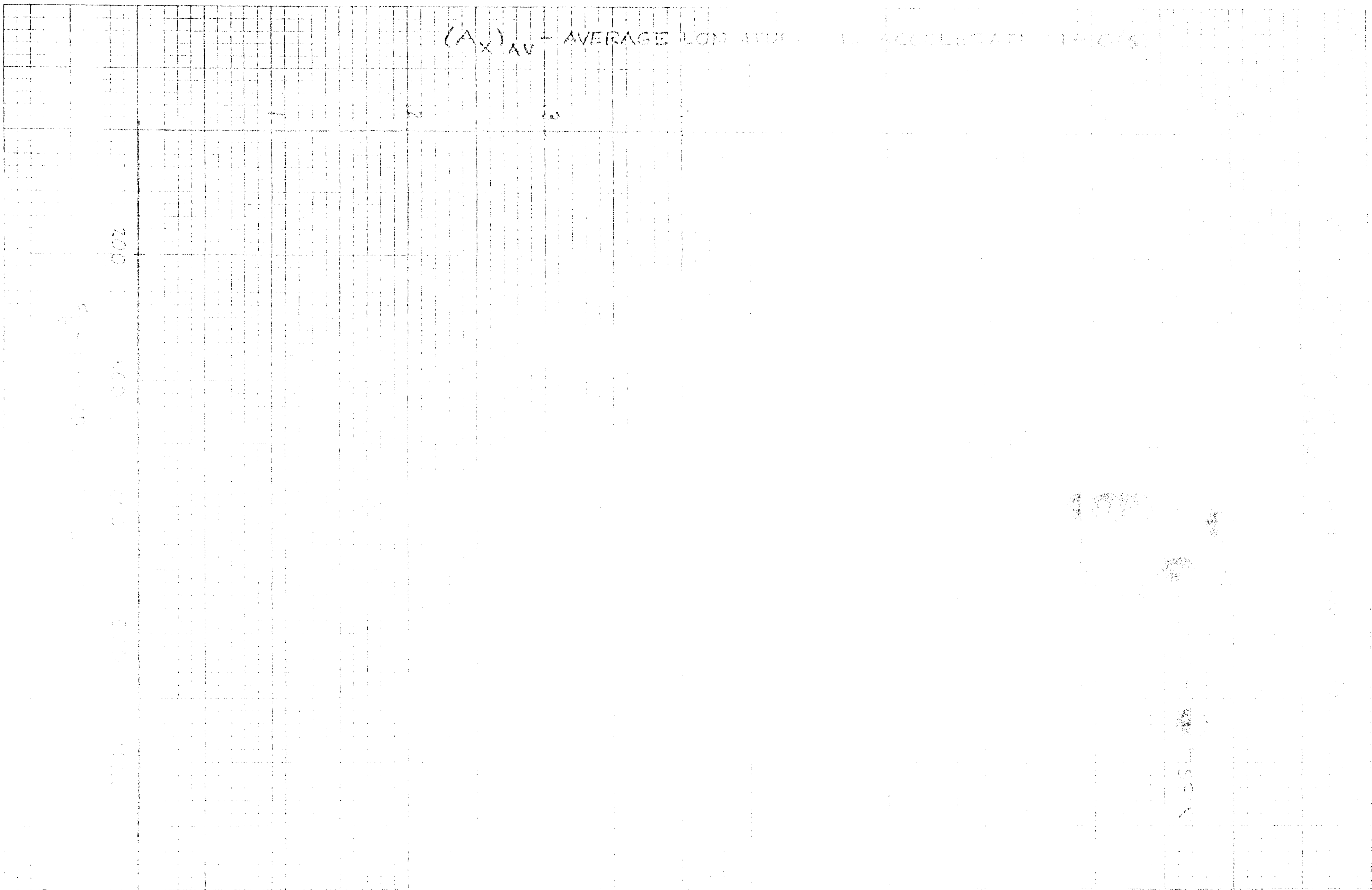
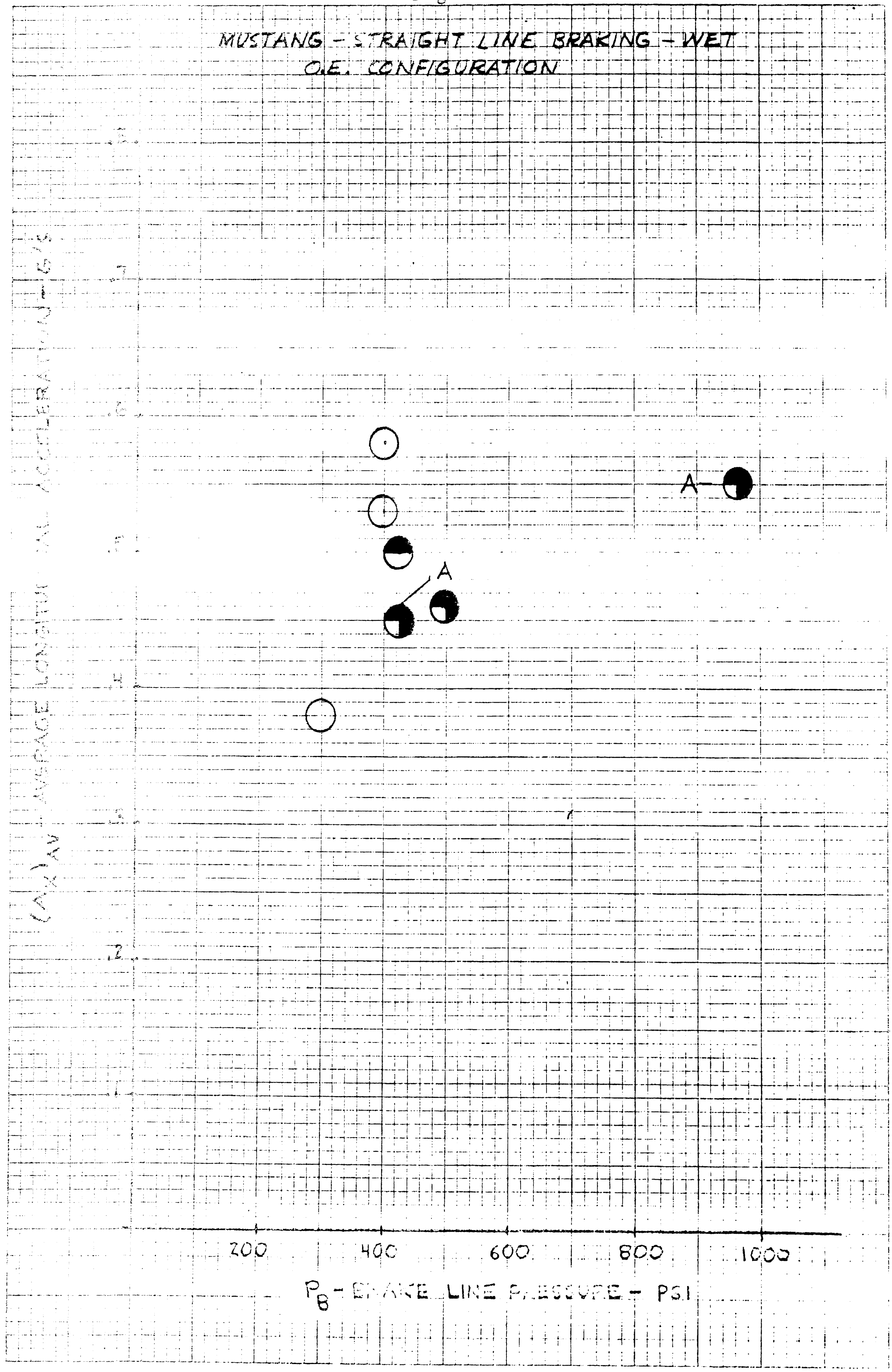

(Ax)AV - AVERAGE
1
2
3
200

Figure F2-6.



MUSTANG - STRAIGHT LINE BRAKING - WET
O.E. CONFIGURATION
.8
.7
.6
.5
.4
.3
.2
.1
$(A_X)_{AV}$ - AVERAGE LONGITUDINAL ACCELERATION - G'S
A
A
200
400
600
800
1000
P_B - BRAKE LINE PRESSURE - PSI

Figure F2-7.

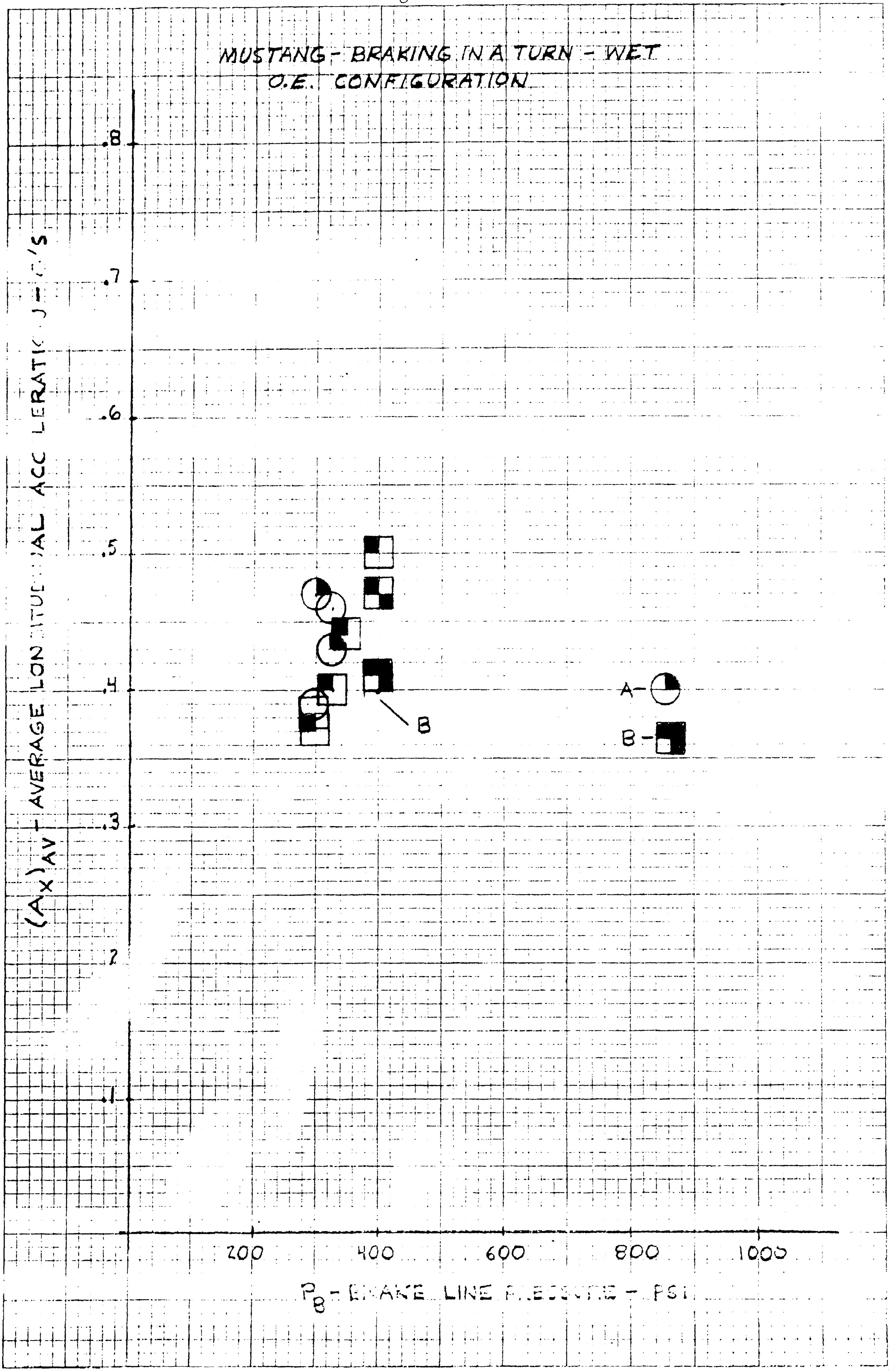

MUSTANG - BRAKING IN A TURN - WET
O.E. CONFIGURATION
.8
.7
.6
.5
.4
.3
.2
.1
B
A-
B-
200
400
600
800
1000

Figure F2-8.

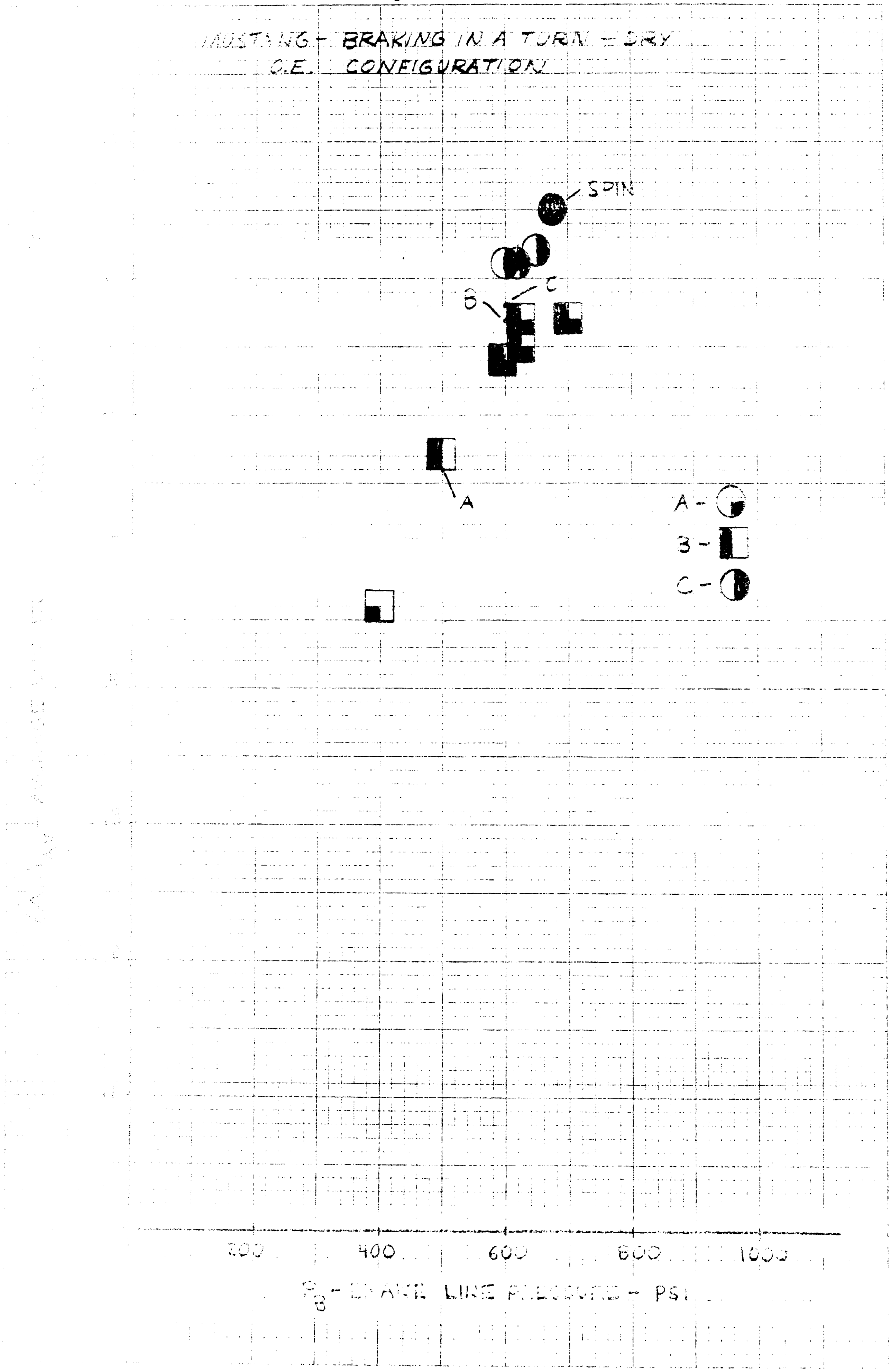
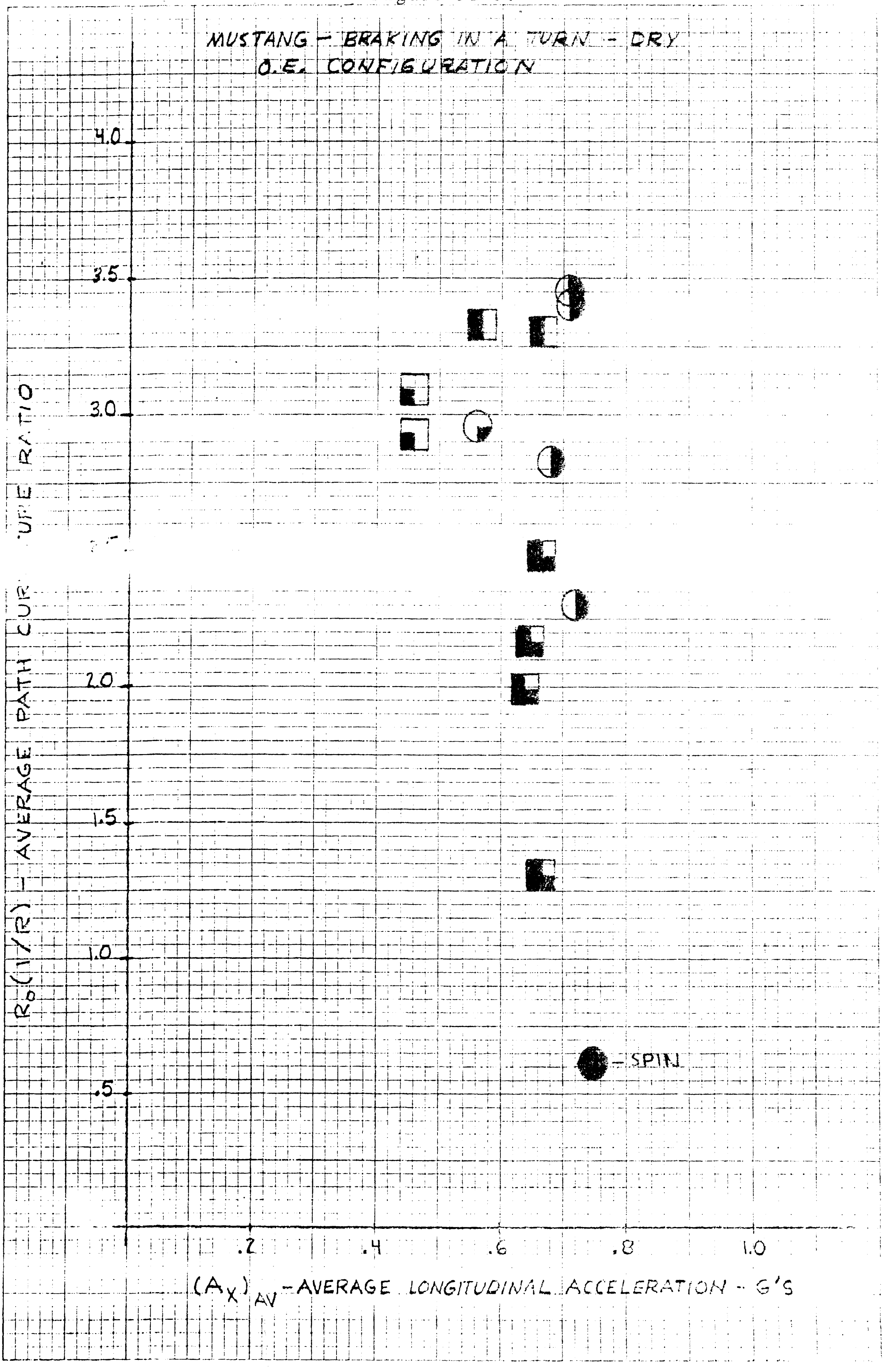


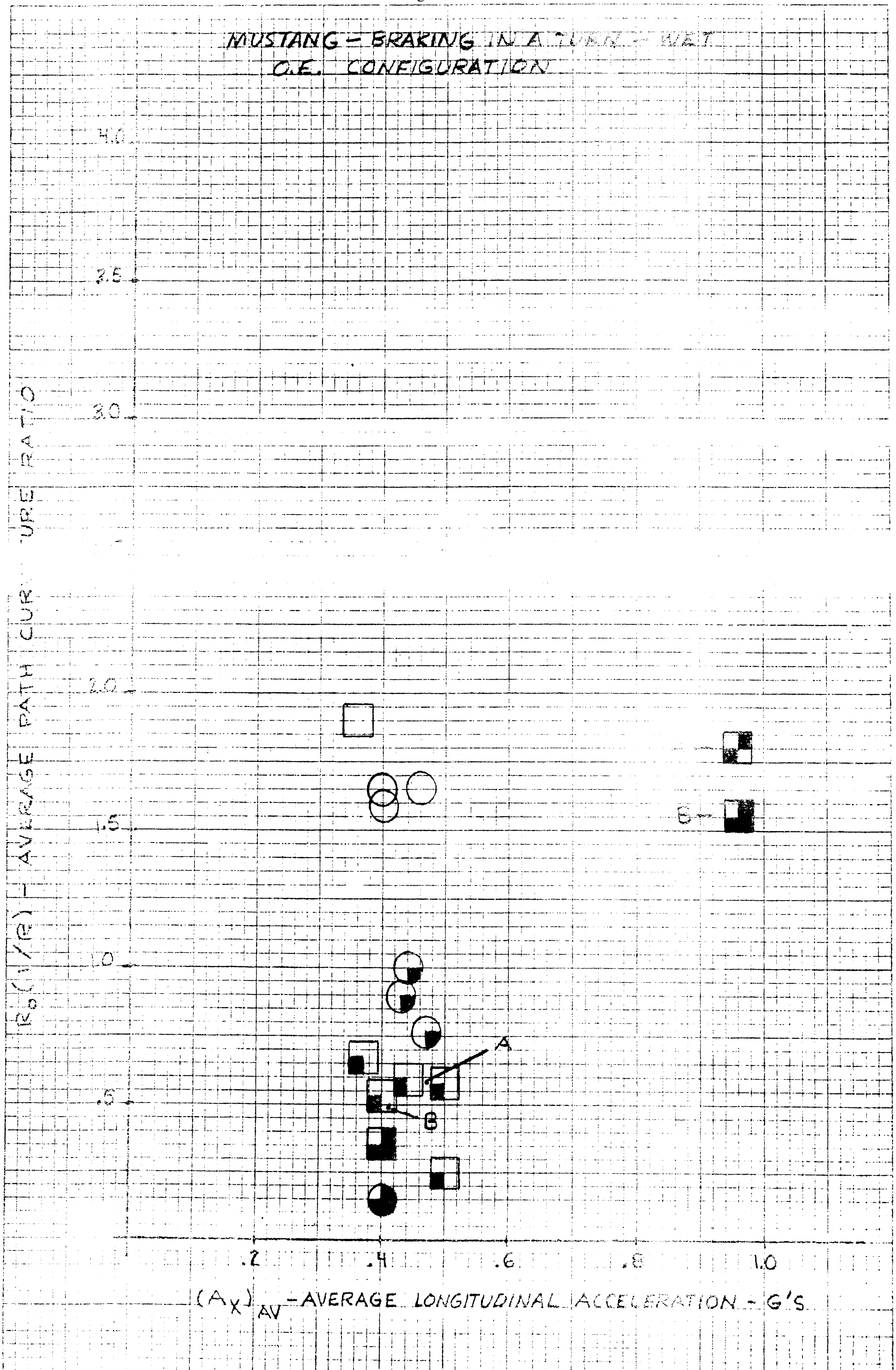
Figure F2-9.



46 0860

5 X 5 TO 1/2 INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

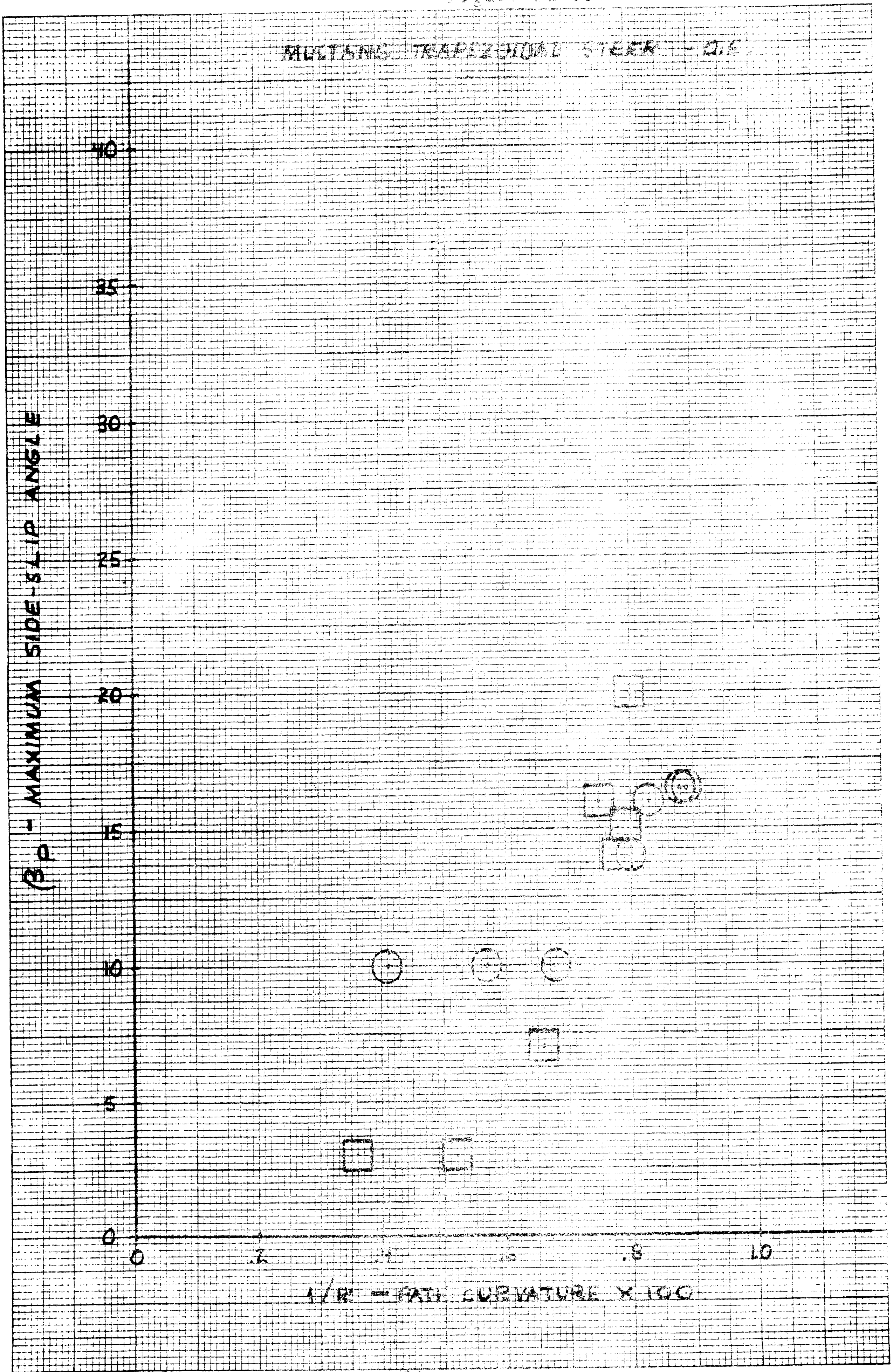
Figure F2-10.



46 0800

K+E 5 X 5 TO 1/2 INCH • 7 X 10 INCHES KEUFFEL & ESSER CO. MADE IN U.S.A.

Figure F2-11.


βo - MAXIMUM SIDE-SLIP ANGLE
40
35
30
25
20
15
10
5
0
0
.2
.4
.6
.8
1.0
1/R - PATH CURVATURE X 100

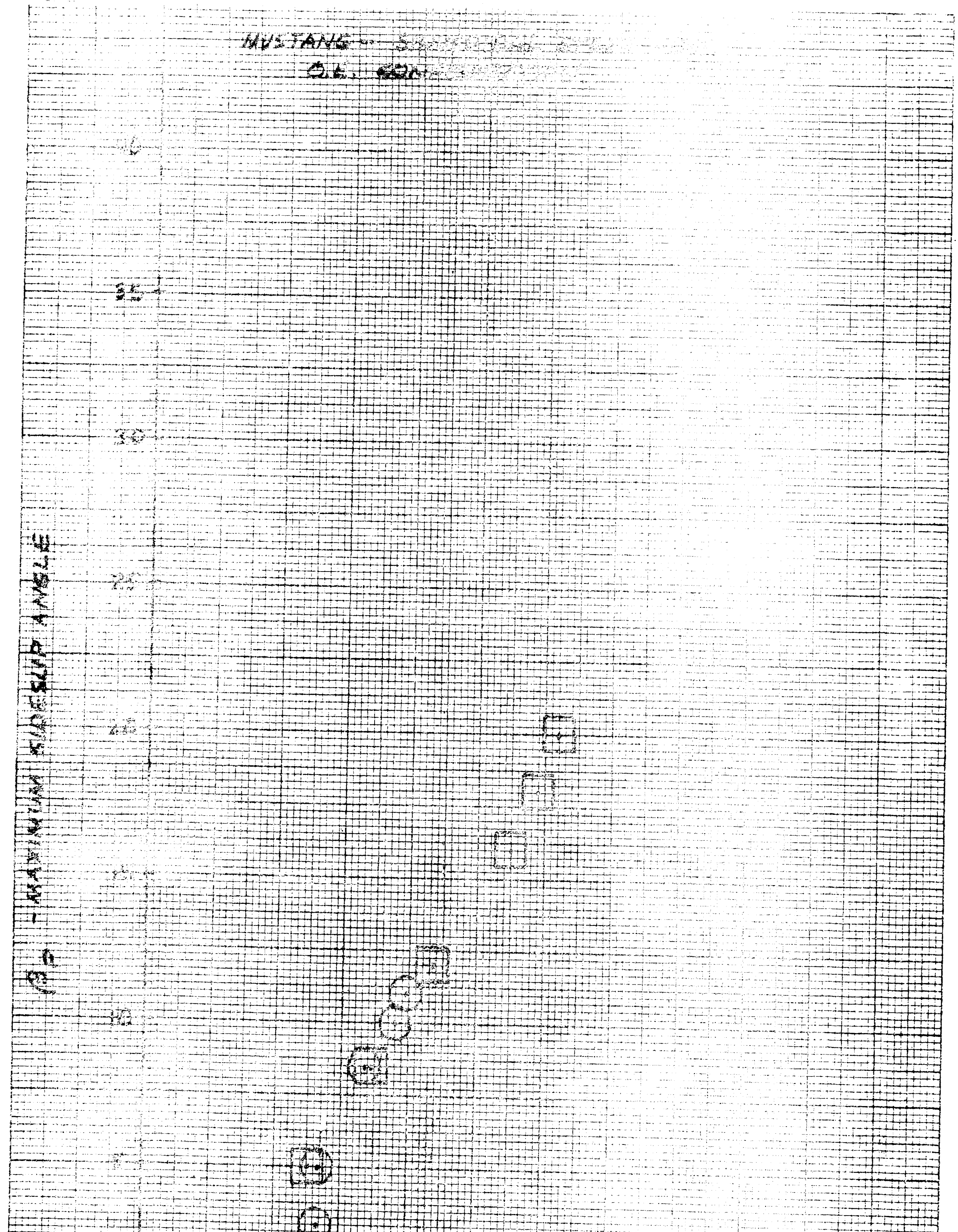

MUSTANG
β - MAXIMUM SIDESLIP ANGLE

Figure F2-17.

MUSTANG — SINUSOIDAL STEER — WET

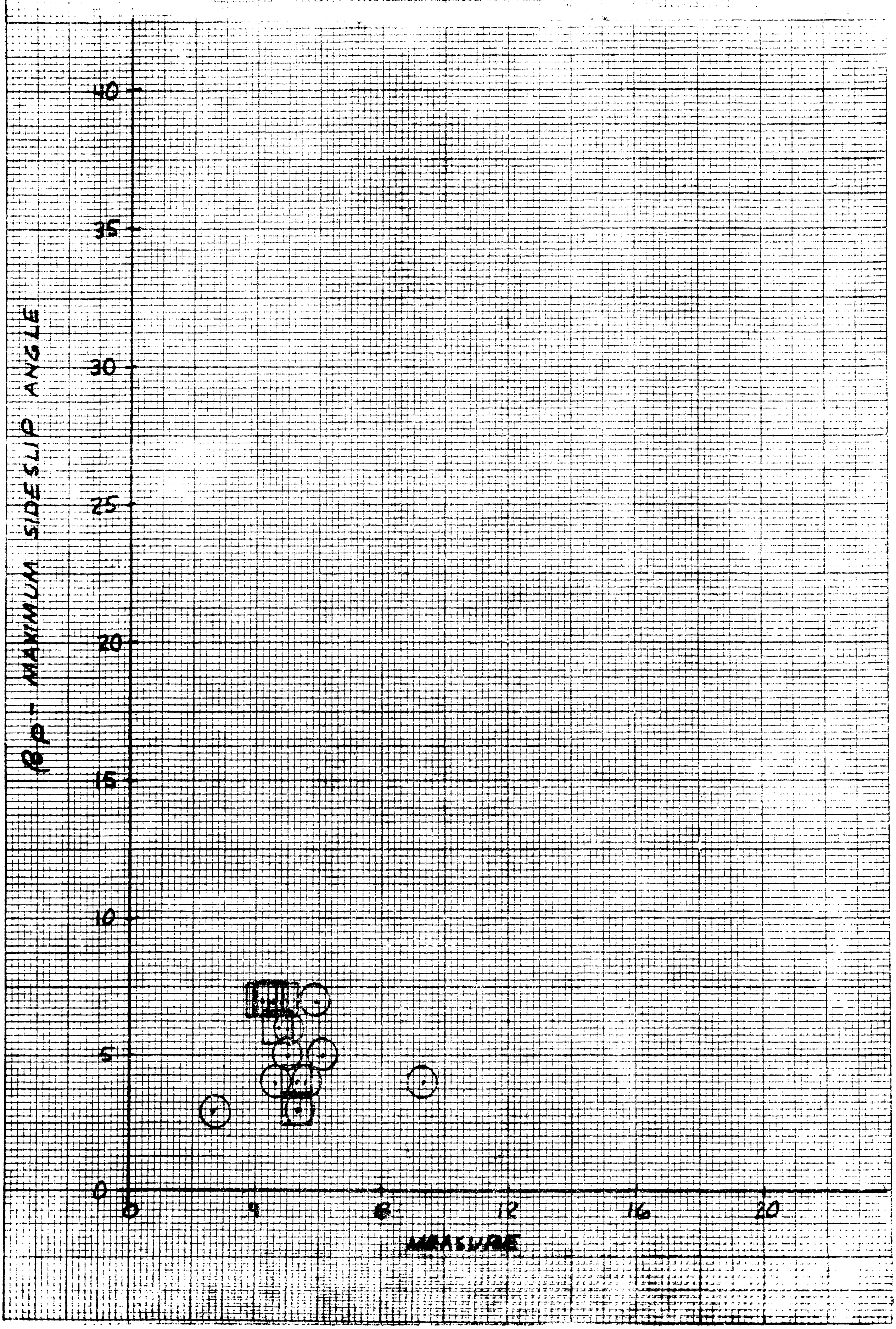


Figure F2-14.

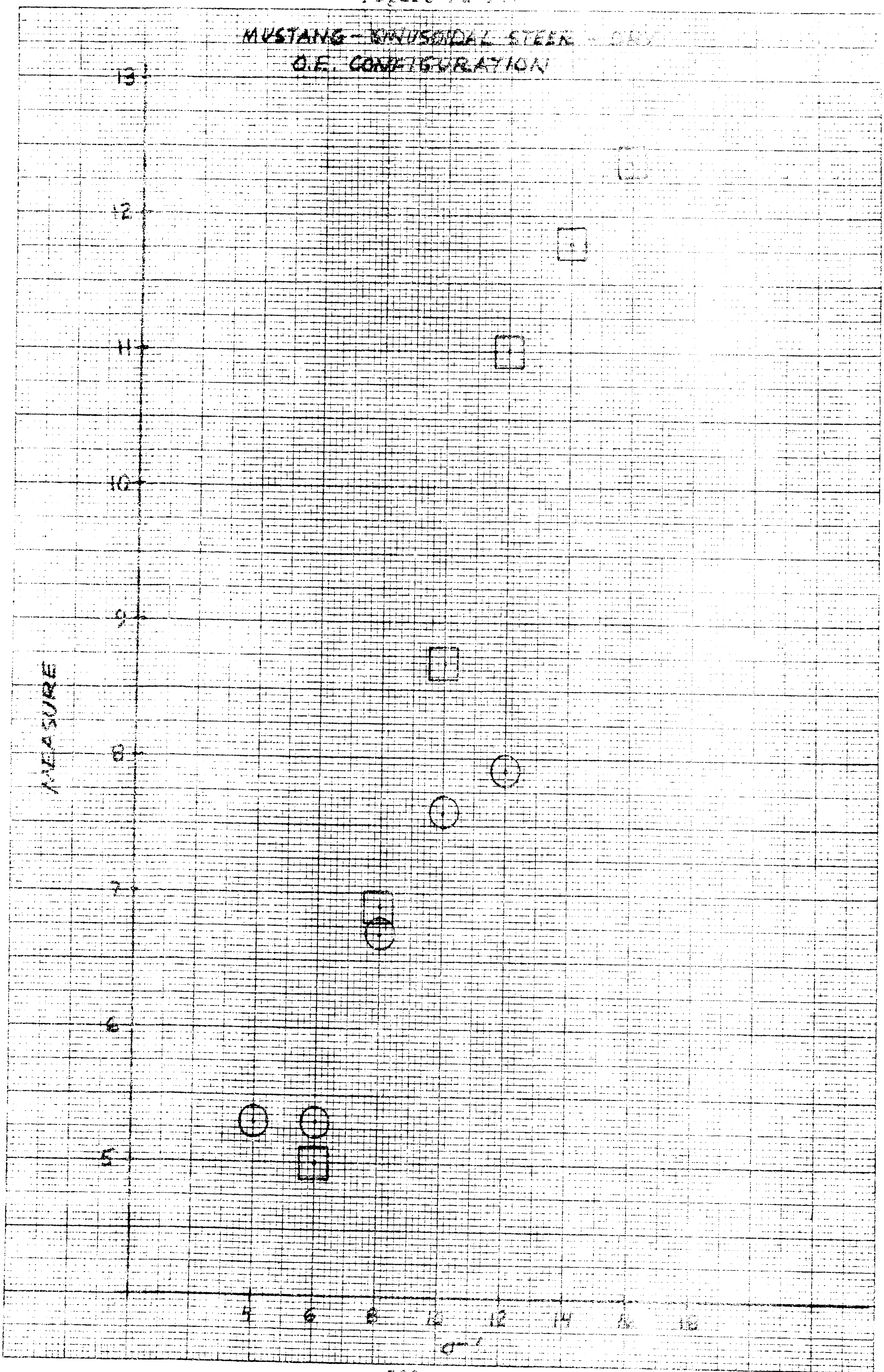

MUSTANG - SINUSOIDAL STEER
O.E. CONFIGURATION
MEASURE
13
12
11
10
9
8
7
6
5
5
6
8
10
12
14
16
18

Figure F2-15.

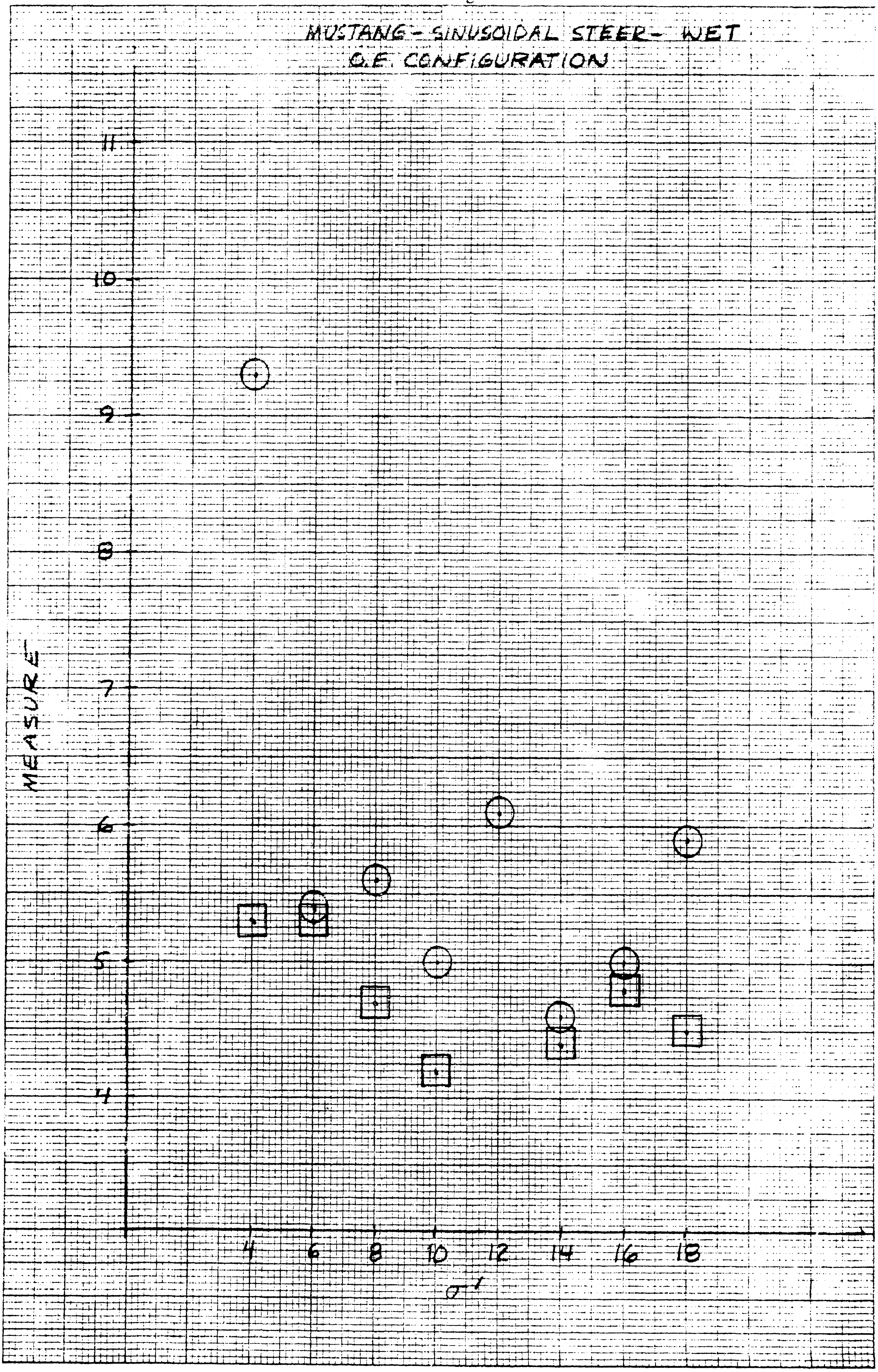
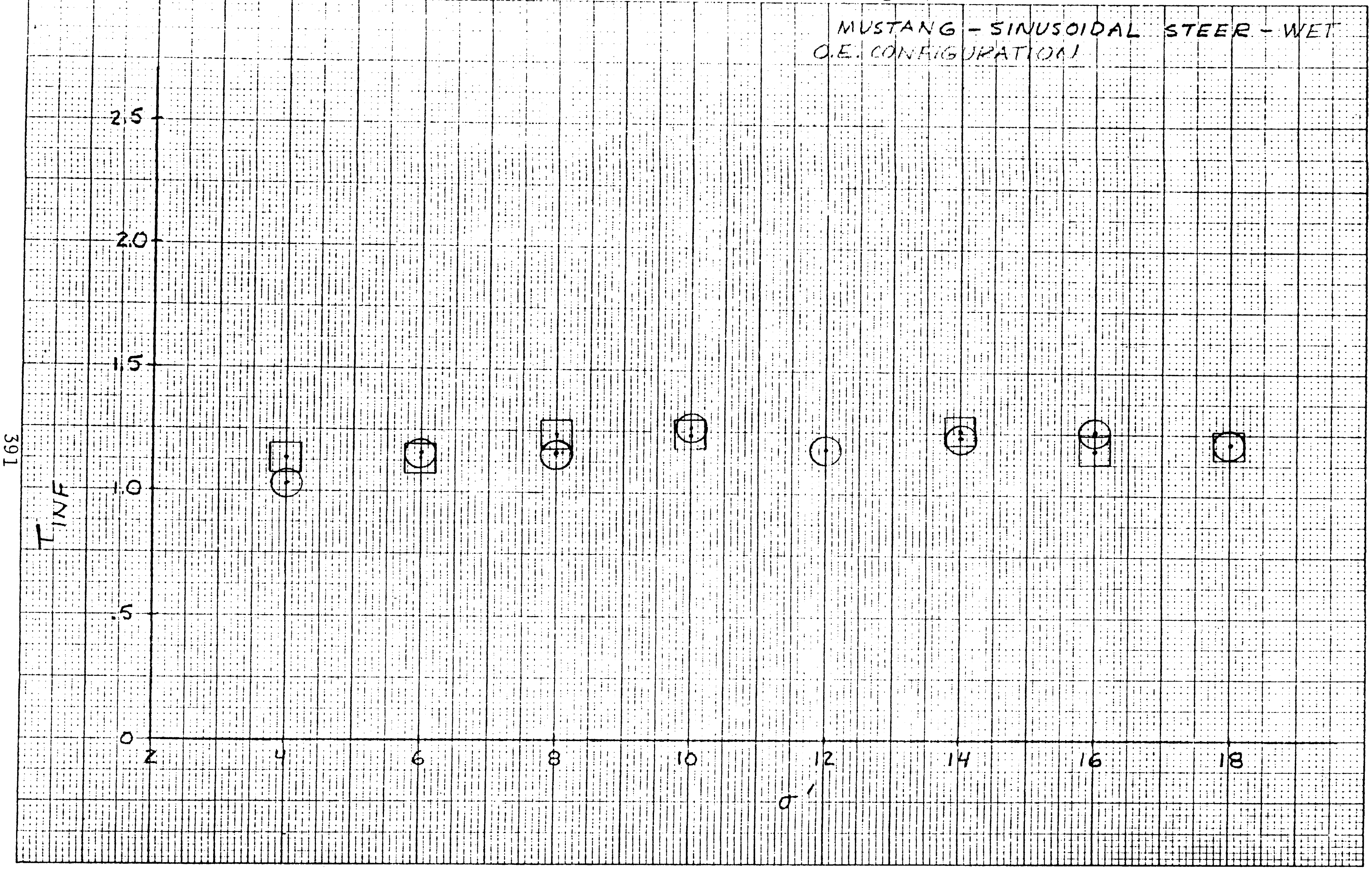

MUSTANG - SINUSOIDAL STEER - WET
O.E. CONFIGURATION
MEASURE
11
10
9
8
7
6
5
4
4
6
8
10
12
14
16
18
σ^{-1}

Figure F2-16.



46 1320

Figure F2-17.
MUSTANG - SINUSOIDAL STEER - DRY

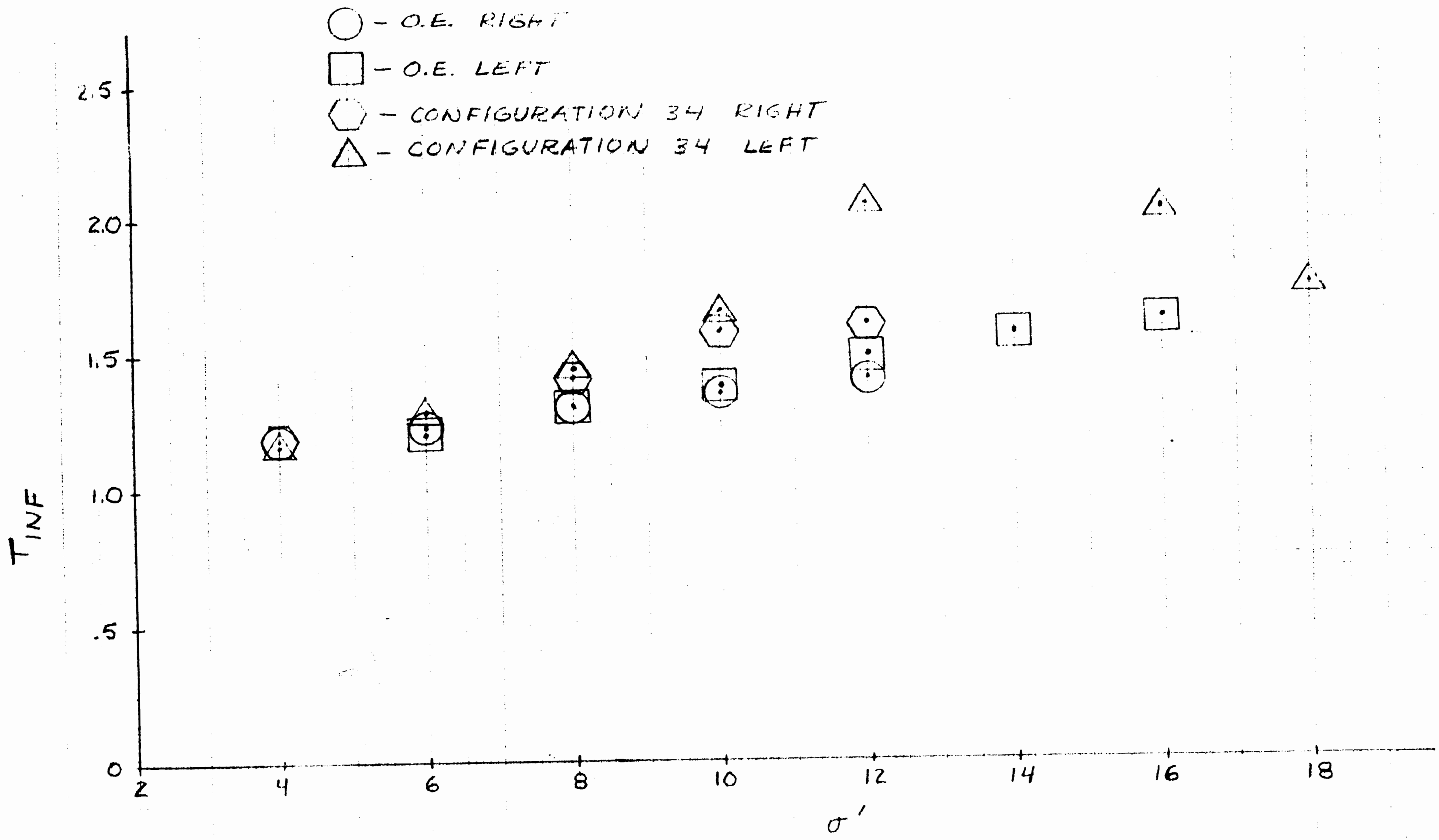


Figure F2-18.

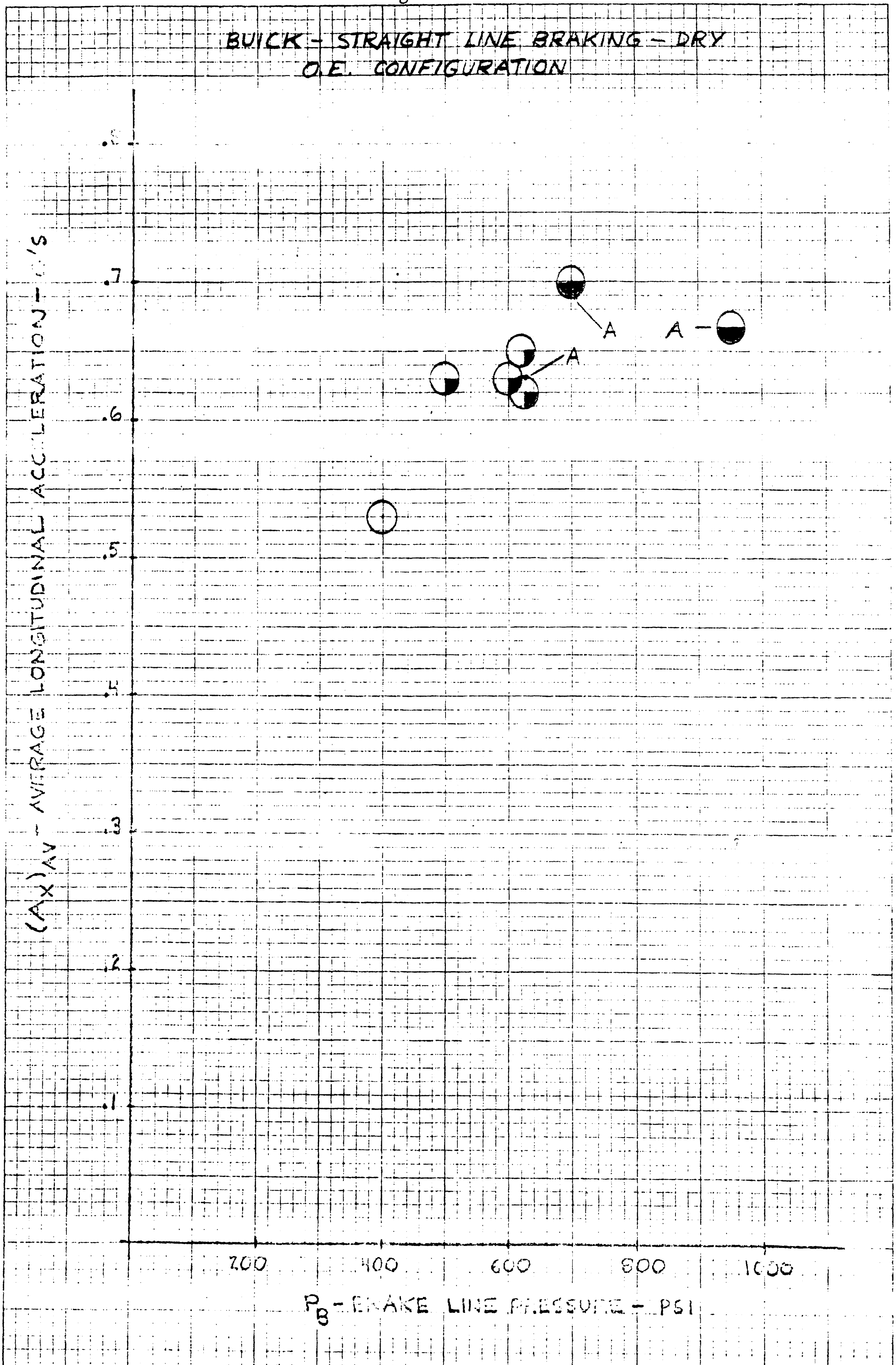

BUICK - STRAIGHT LINE BRAKING - DRY
O.E. CONFIGURATION
$(A_X)_{AV}$ - AVERAGE LONGITUDINAL ACCELERATION - G'S
.7
.6
.5
.4
.3
.2
.1
A
A
A
200
400
600
800
1000
P_B - BRAKE LINE PRESSURE - PSI

Figure F2-19.

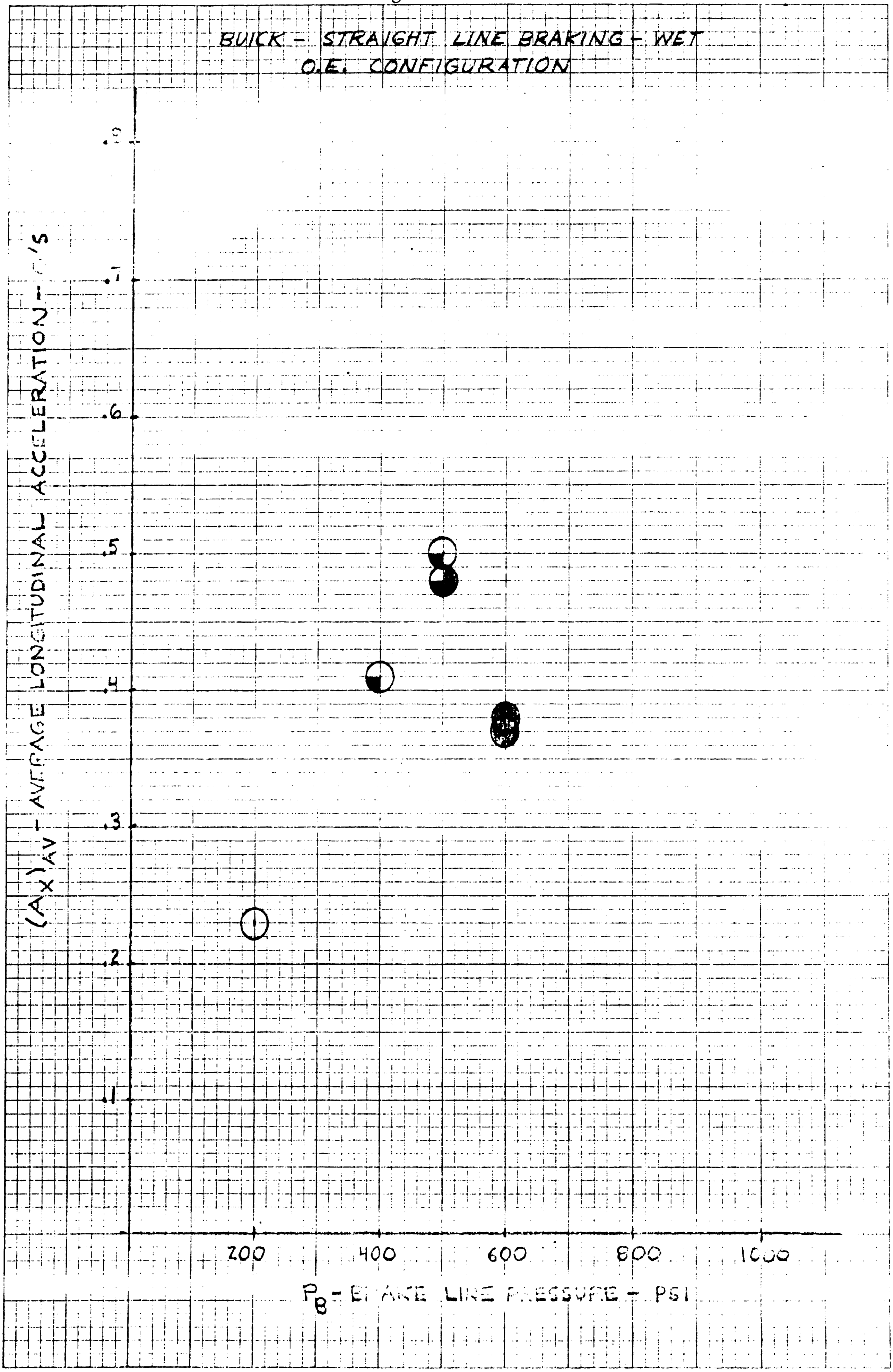

BUICK - STRAIGHT LINE BRAKING - WET
O.E. CONFIGURATION
$(A_X)_{AV}$ - AVERAGE LONGITUDINAL ACCELERATION - G'S
.8
.7
.6
.5
.4
.3
.2
.1
200
400
600
800
1000
P_B - BRAKE LINE PRESSURE - PSI

Figure F2-20.

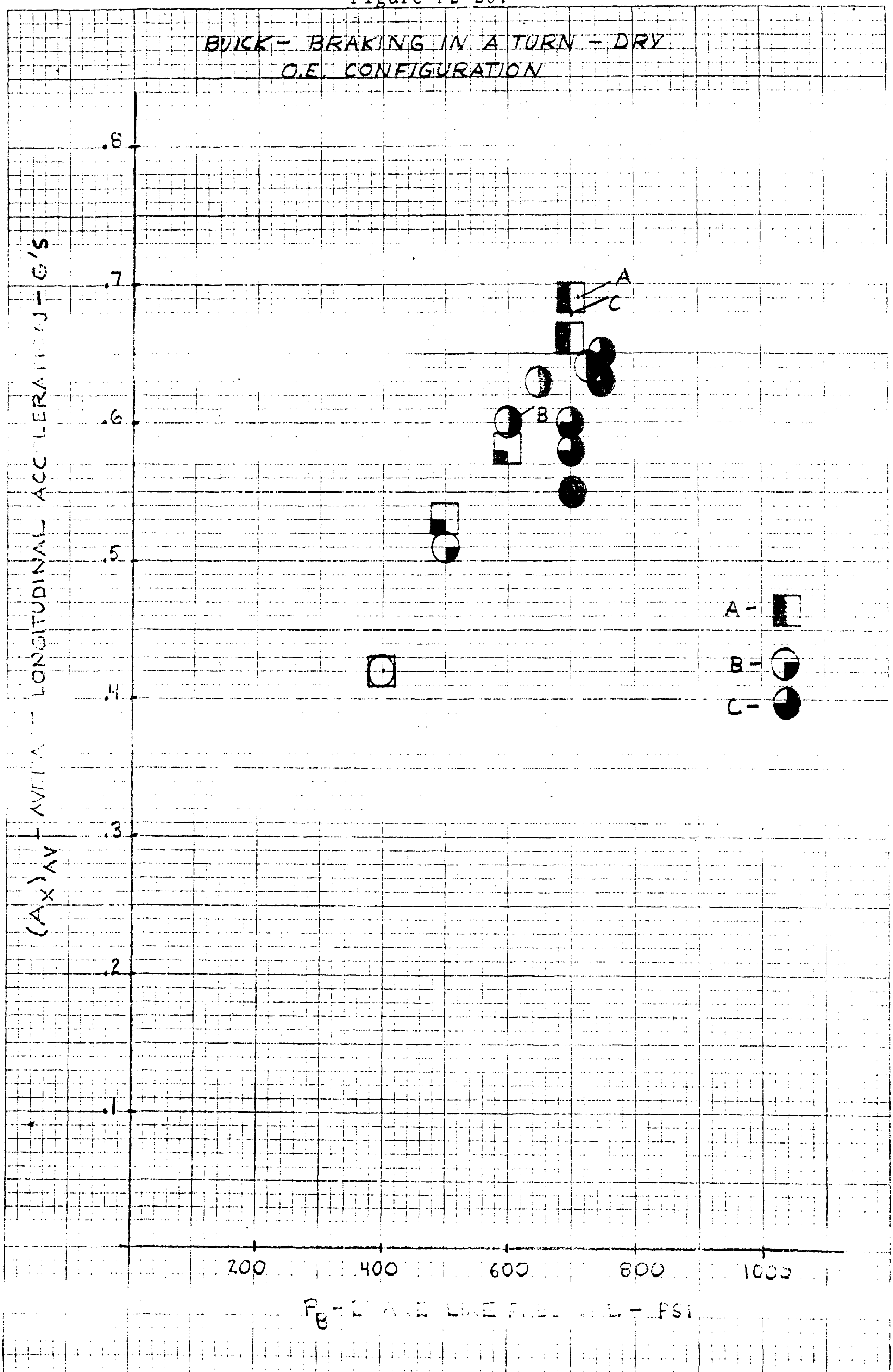
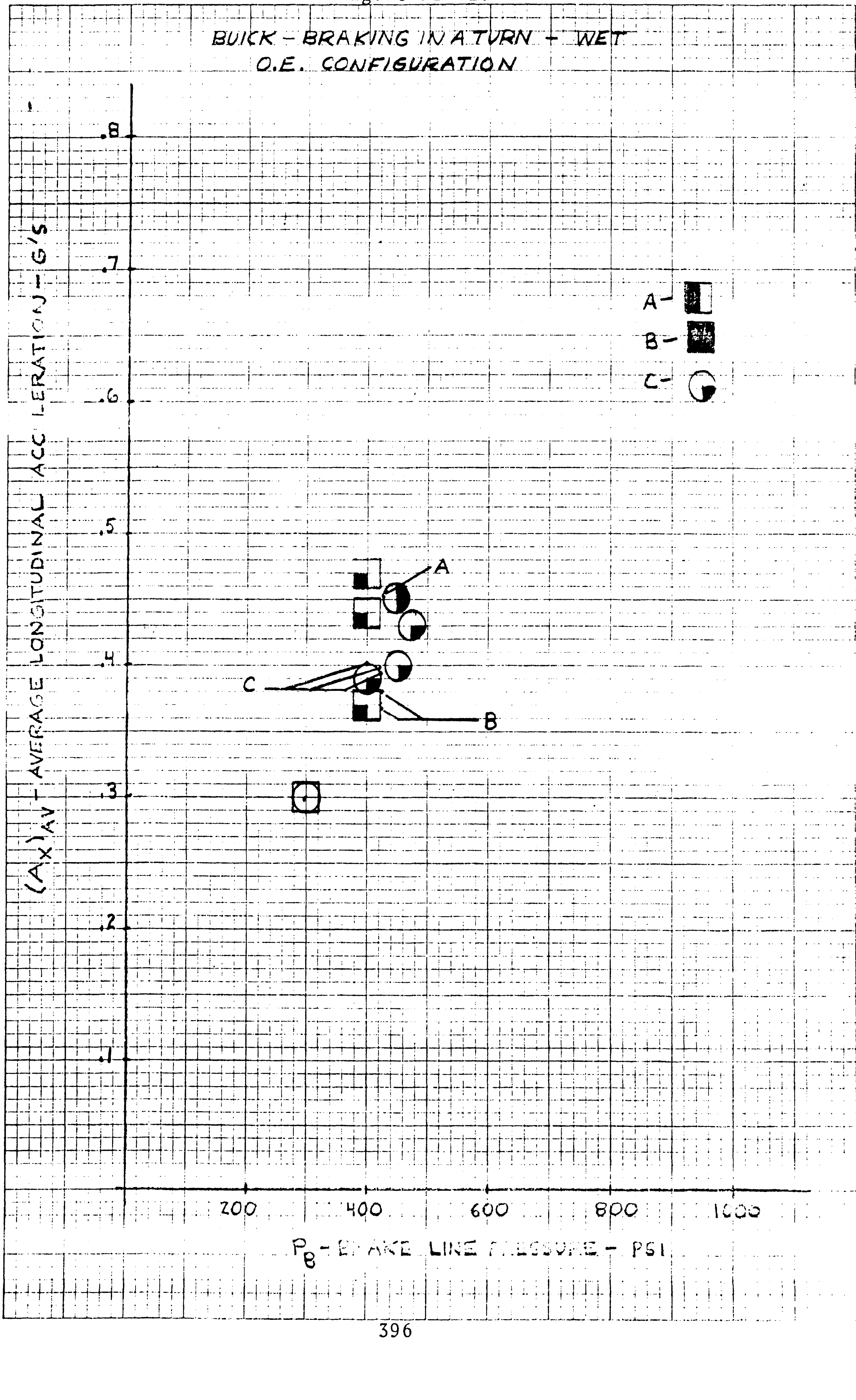
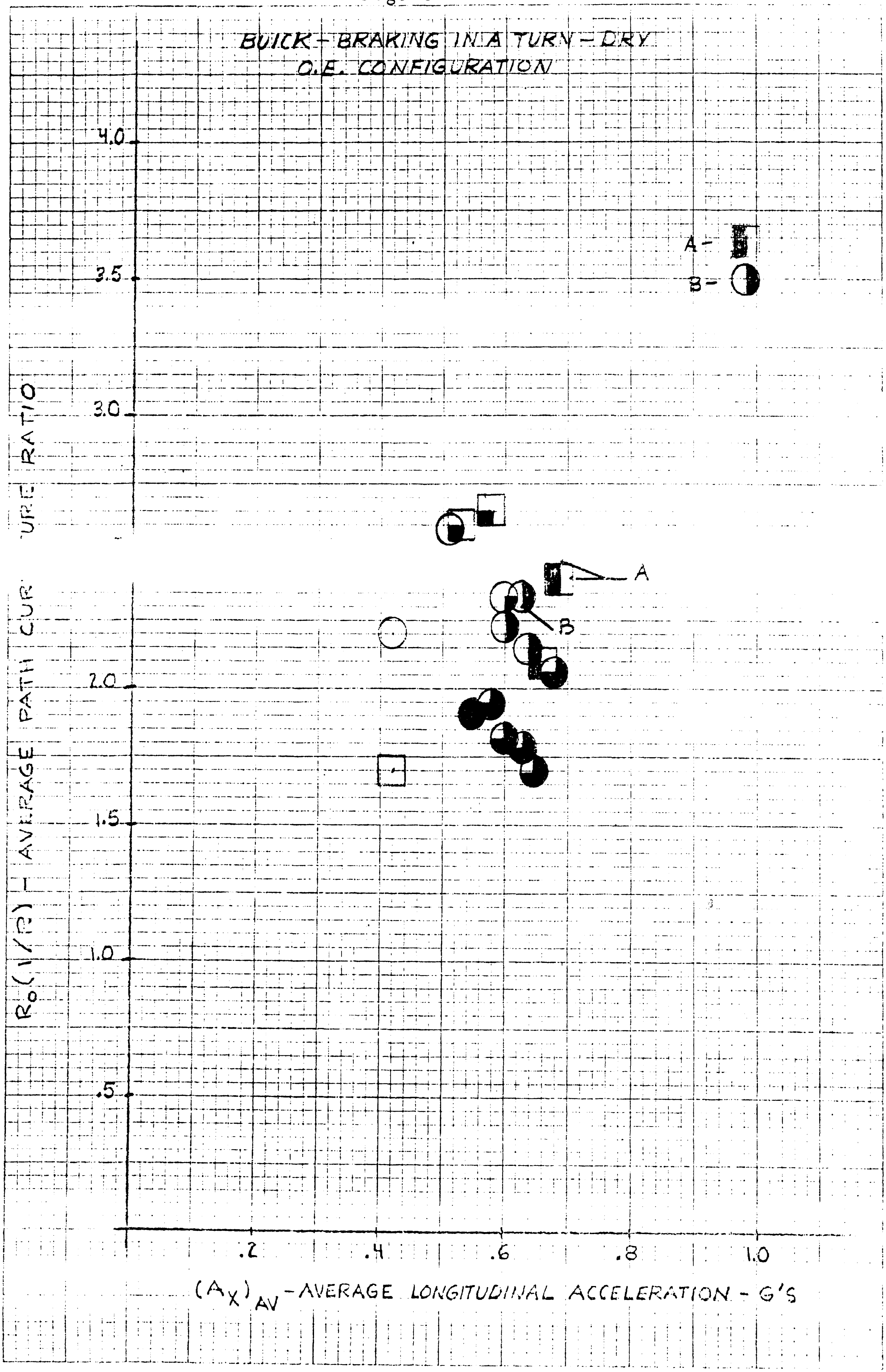

BUICK - BRAKING IN A TURN - DRY
O.E. CONFIGURATION
.8
.7
.6
.5
.4
.3
.2
.1
A
B
C
200
400
600
800
1000
A -
B -
C -

Figure F2-21.



BUICK - BRAKING IN A TURN - WET
O.E. CONFIGURATION
.8
.7
.6
.5
.4
.3
.2
.1
$(A_X)_{AV}$ - AVERAGE LONGITUDINAL ACCELERATION - G'S
A
B
C
200
400
600
800
1000
P_B - BRAKE LINE PRESSURE - PSI

Figure F2-22.



46 0860

K&E 5 X 5 TO 1/2 INCH • 7 X 10 INCHES KEUFFEL & ESSER CO. MADE IN USA

Figure F2-23.

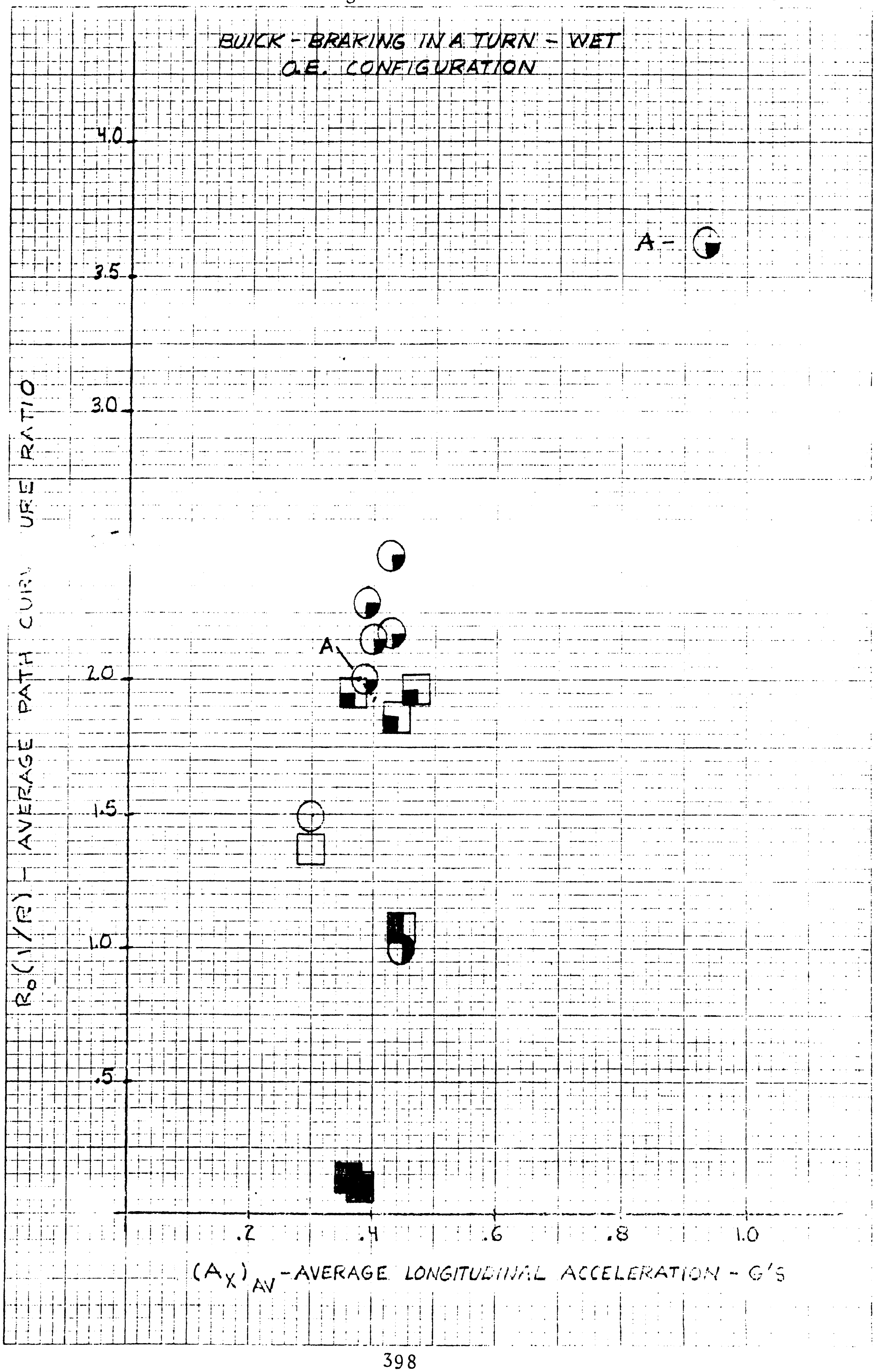

BUICK - BRAKING IN A TURN - WET
O.E. CONFIGURATION
A -
A
4.0
3.5
3.0
2.0
1.5
1.0
.5
.2
.4
.6
.8
1.0
$R_o(1/R)$ - AVERAGE PATH CURVATURE RATIO
$(A_X)_{AV}$ - AVERAGE LONGITUDINAL ACCELERATION - G'S

Figure F2-24.

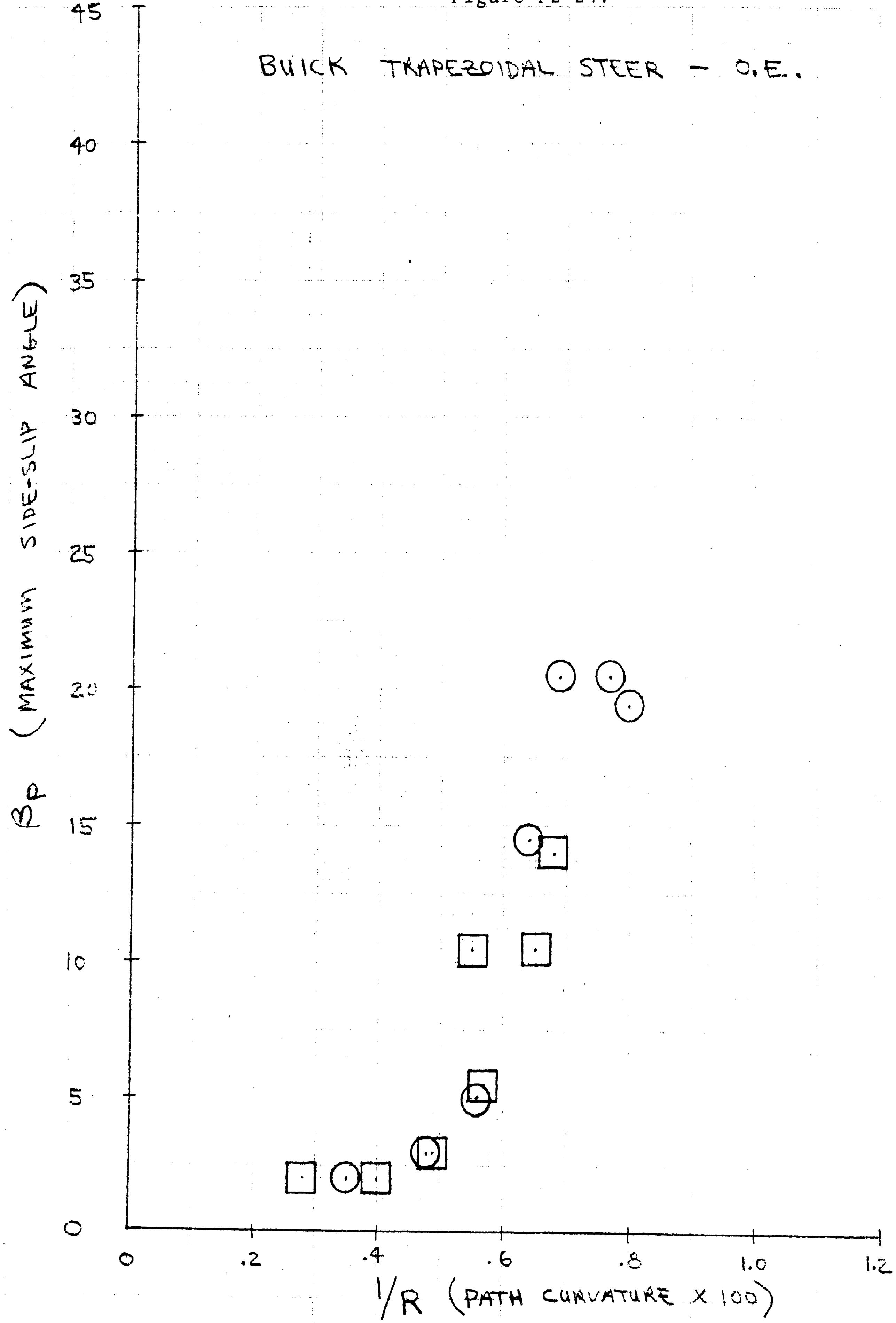

BUICK TRAPEZOIDAL STEER - O.E.
45
40
35
30
25
20
15
10
5
0
β_P (MAXIMUM SIDE-SLIP ANGLE)
0
.2
.4
.6
.8
1.0
1.2
1/R (PATH CURVATURE X 100)

Figure F2-25.

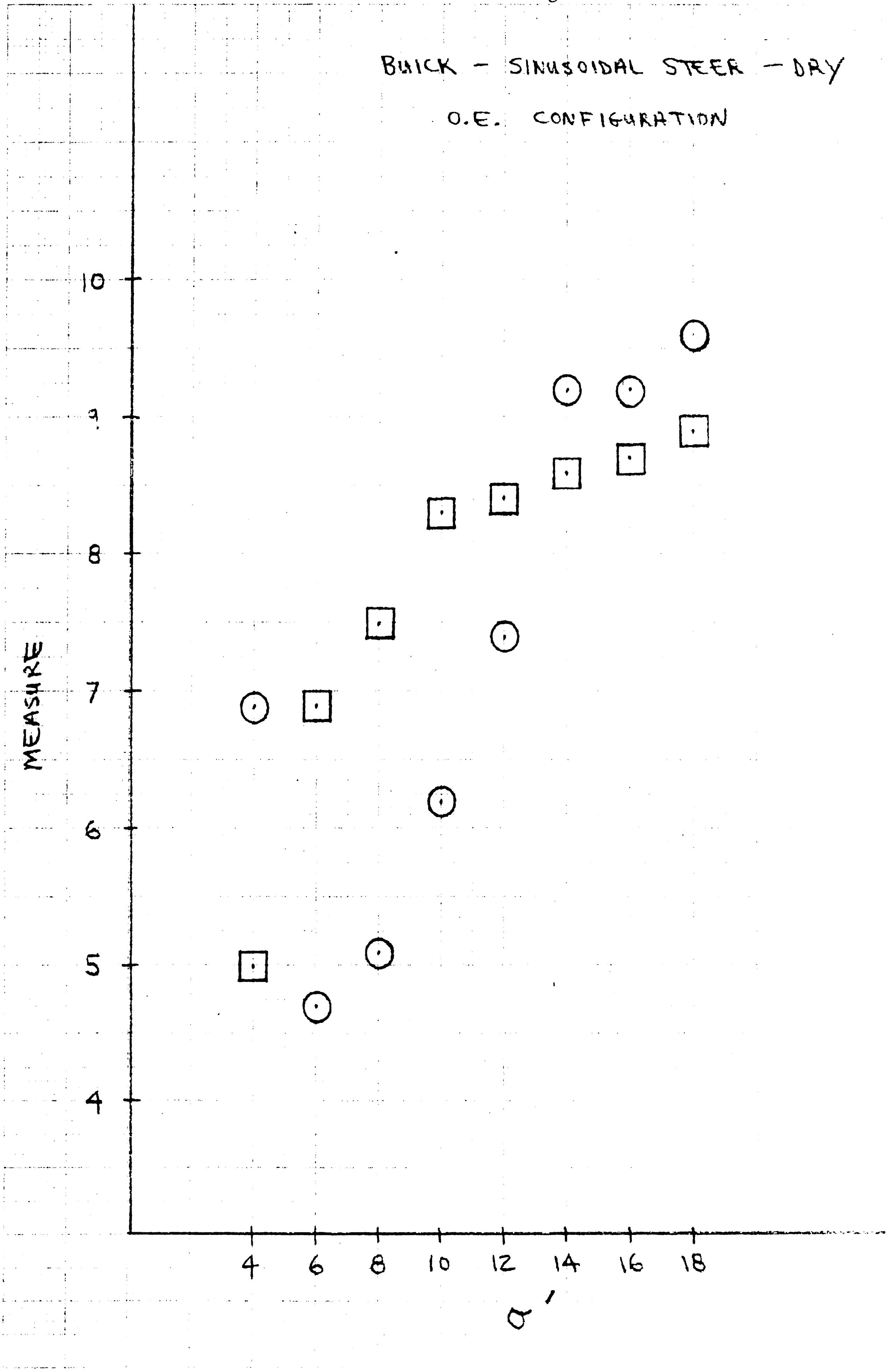

BUICK - SINUSOIDAL STEER - DRY
O.E. CONFIGURATION
MEASURE
10
9
8
7
6
5
4
4
6
8
10
12
14
16
18
σ'

Figure F2-26.

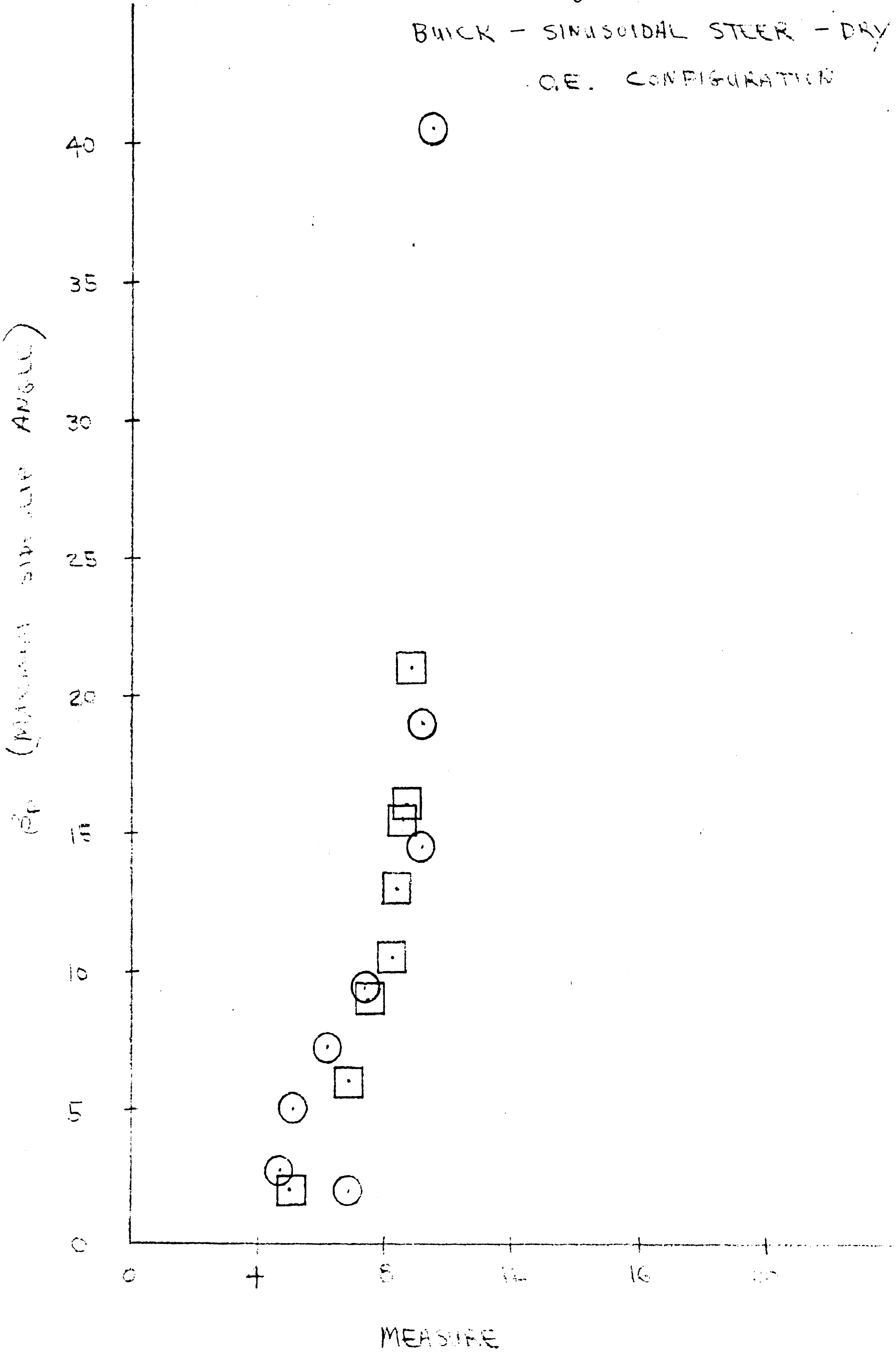
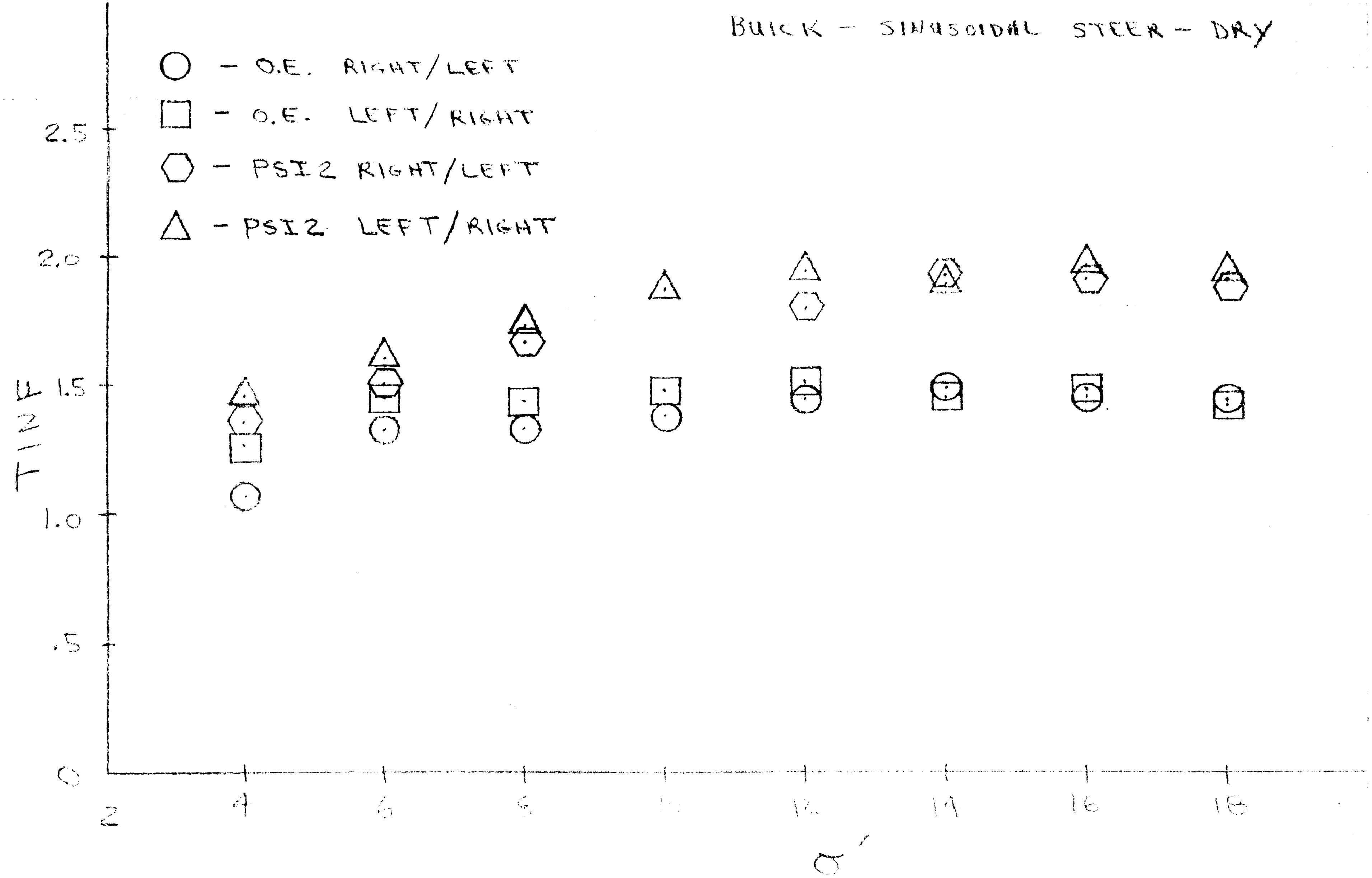

BUICK - SINUSOIDAL STEER - DRY
O.E. CONFIGURATION
40
35
30
25
20
15
10
5
0
0
4
8
16
MEASURE

Figure F2-27.

BUICK - SINUSOIDAL STEER - DRY



APPENDIX G

VEHICLE PARAMETER MEASUREMENTS

RAJIV GUPTA

G1. INTRODUCTION

Parameters required for the purpose of vehicle simulation can be divided into five categories:

1. Vehicle geometry
2. Steering ratio and system compliance
3. Suspension stiffnesses and geometry
4. Inertial properties
5. Tires

This Appendix describes the test procedure used to obtain the vehicle parameters for the 1971 Ford Mustang and the 1973 Buick Century stationwagon. The results obtained are also presented.

G2. VEHICLE GEOMETRY

This includes all parameters that are strictly dimensional such as the wheelbase, track, separation between suspension springs, static kingpin offset, mechanical trail, suspension height above ground, etc. The projected cross-sectional area measurements are also included for computing the aerodynamic drag coefficient.

The results for the two test vehicles are presented below.

Parameter description	Mustang	Buick
Wheelbase (in)	109.0	116.0
Front Track (in)	61.5	61.0
Rear Track (in)	61.0	61.0
Separation between rear springs (in)	43.0	41.0
Rear axle height above ground (in)	12.7	13.0
Drag Coefficient (C_D)	0.0224	0.024

The Drag Coefficient is obtained from the formula

$$C_D = 1/2\ \rho\ C_w A$$

where

A = projected cross sectional area (ft^2)

C_w = wind drag constant = 0.45

ρ = air density = 0.0024 $slugs/ft^3$

G3. STEERING RATIO AND SYSTEM COMPLIANCE

G3.1 STEERING GEAR RATIO TEST

The objective of this test is to obtain a direct functional relation between the steering wheel angle and the wheel angles for the left and right front wheels.

The test is conducted by resting the front wheels on a calibrated slide and turn-table with the car horizontally leveled. In the straight-ahead-steering wheel lock position the turn-table calibrations are set to zero angular displacement. The steering wheel angle is read on a protractor on the steering wheel, and the corresponding wheel angles are read on the turn-table calibrations.

The results of this test include the effects of variable gear ratio, steering linkage ratio, Ackerman geometry, and the steering system play. Typical sets of data obtained for the test vehicles are shown in Figures G1 and G2.

G3.2 STEERING SYSTEM COMPLIANCE MEASUREMENT

The objective of this test is to obtain the steering column and the steering linkage stiffnesses.

The test is conducted using a laboratory set-up designed at HSRI. The design permits a pure torque to be applied to one front wheel on the vehicle, with the steering wheel held fixed,

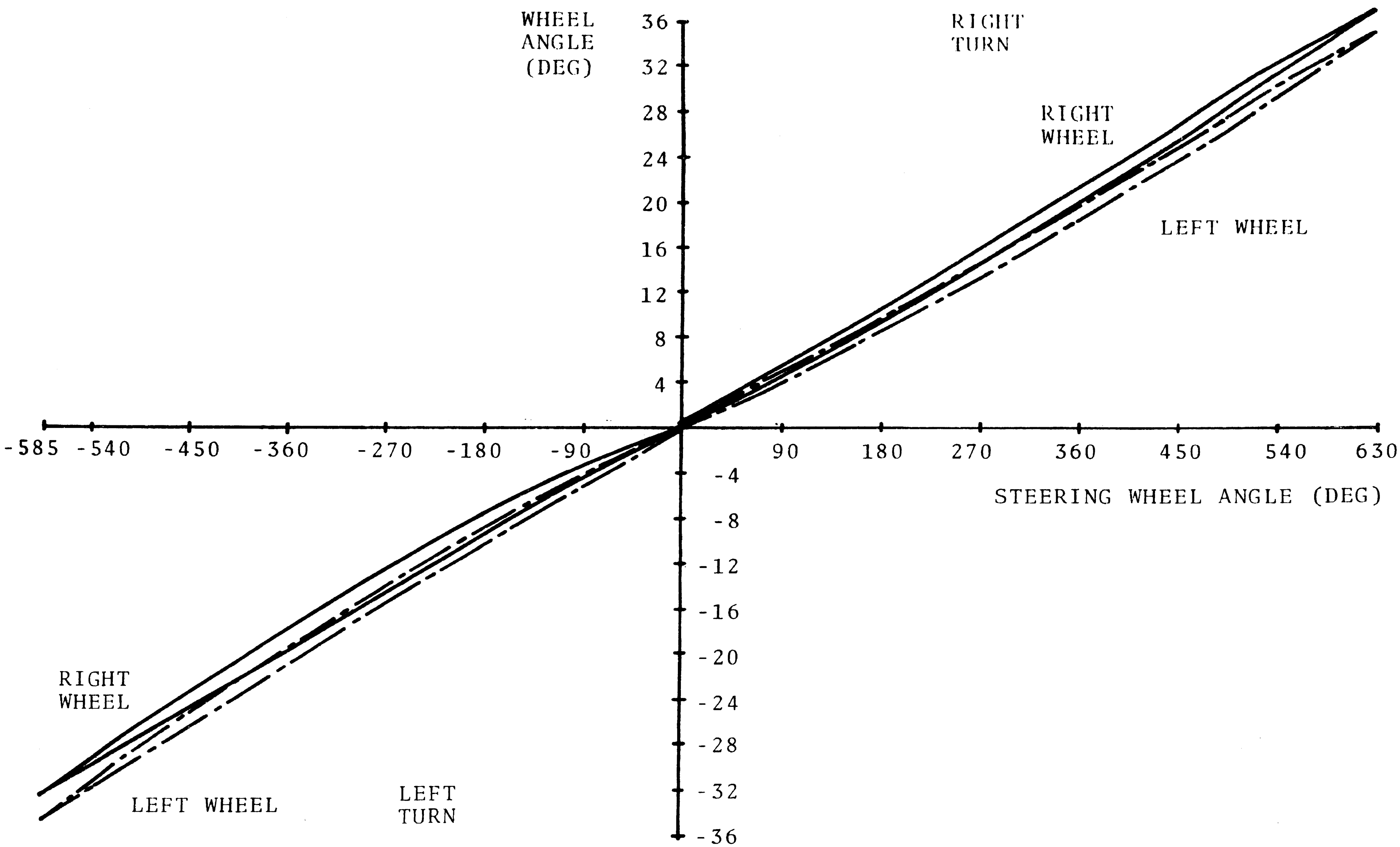


Figure G1. Results of the Gear Ratio Test for Buick Stationwagon.

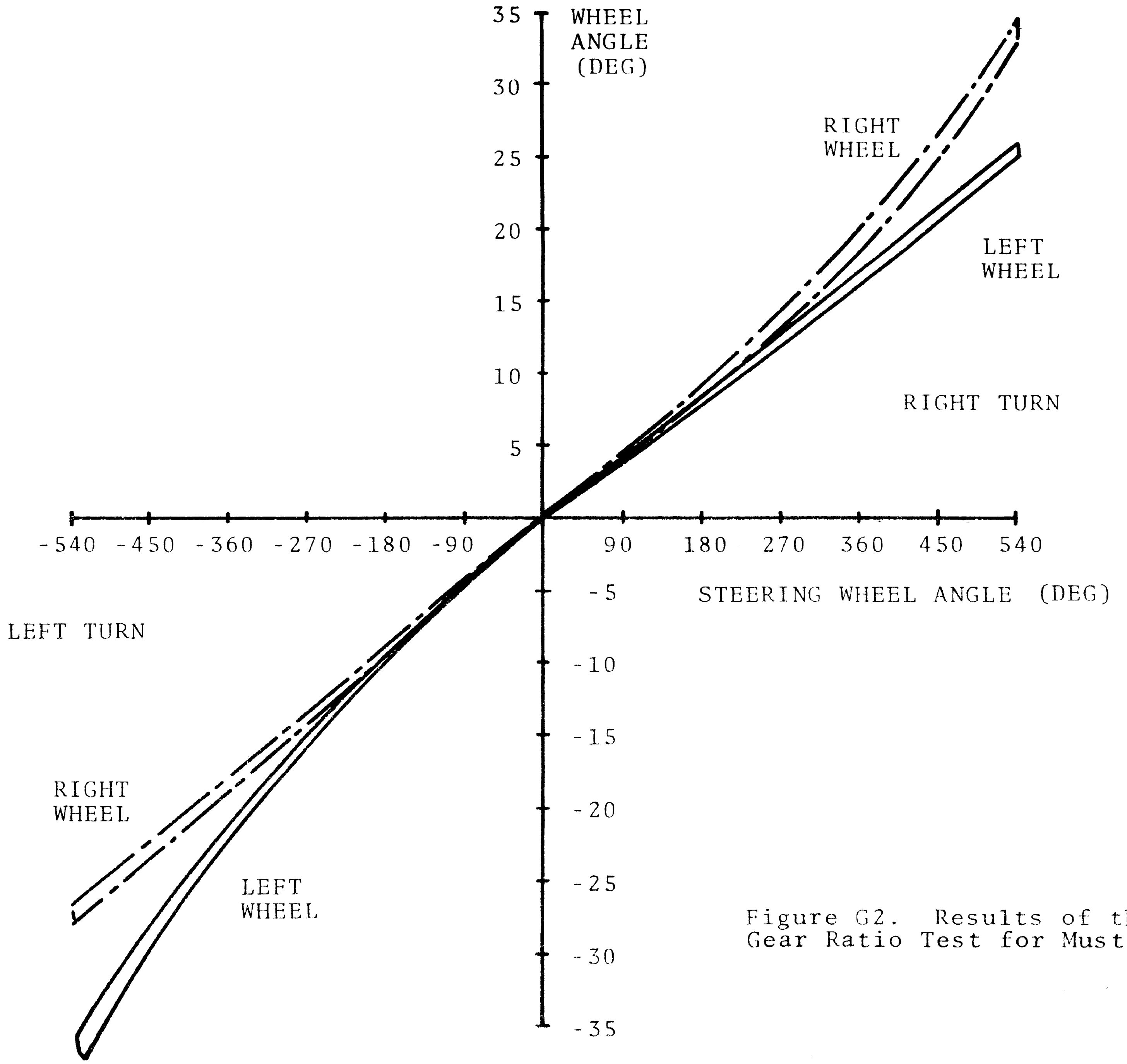


Figure G2. Results of the Gear Ratio Test for Mustang.

and the other wheel free to rotate about its kingpin axis. The front wheels rest on a turn-table exerting normal static vertical load. A turnbuckle is used to increase or decrease the tension in the cable thereby increasing or decreasing the torque applied to the wheel. (The internal friction of the turn-table requires about 8 ft-lbs torque to rotate under a load of 800 lbs.) Cable tension is measured with the load cell and the wheel angles by using slip gages. By measuring the wheel angles as a function of the applied torque, the steering column and steering linkage compliances can be calculated, provided the steering gear ratio and the linkage ratio are known.

The results for the test vehicles are shown in Figure G3. The experimental set-up is shown in Figure G4. The values calculated for the test vehicles are:

	Mustang	Buick
Steering column compliance (in lb/rad)	549.0	300.0
Steering linkage compliance (in lb/rad)	267000.0	150000.0

G4. SUSPENSION STIFFNESS TESTS

The objectives of these tests are to obtain the functional relation between the spring force and spring displacement, the auxiliary roll stiffness of the stabilizer bar, and the suspension displacement changes as related to vertical spring deflection.

To obtain the suspension characteristics, the sprung mass is held in place, while the axle is free to move between the rebound and bump stops.

For the front suspension, with a stabilizer bar, the right wheel is held at the rebound stop, while the left wheel is free to move. The hydraulic jack and the load cell adapter assembly rest on a slide and turn-table so as to insure vertical orientation for the jack. Vertical load is read on the digital readout for the load cell, and vertical displacement is read from the

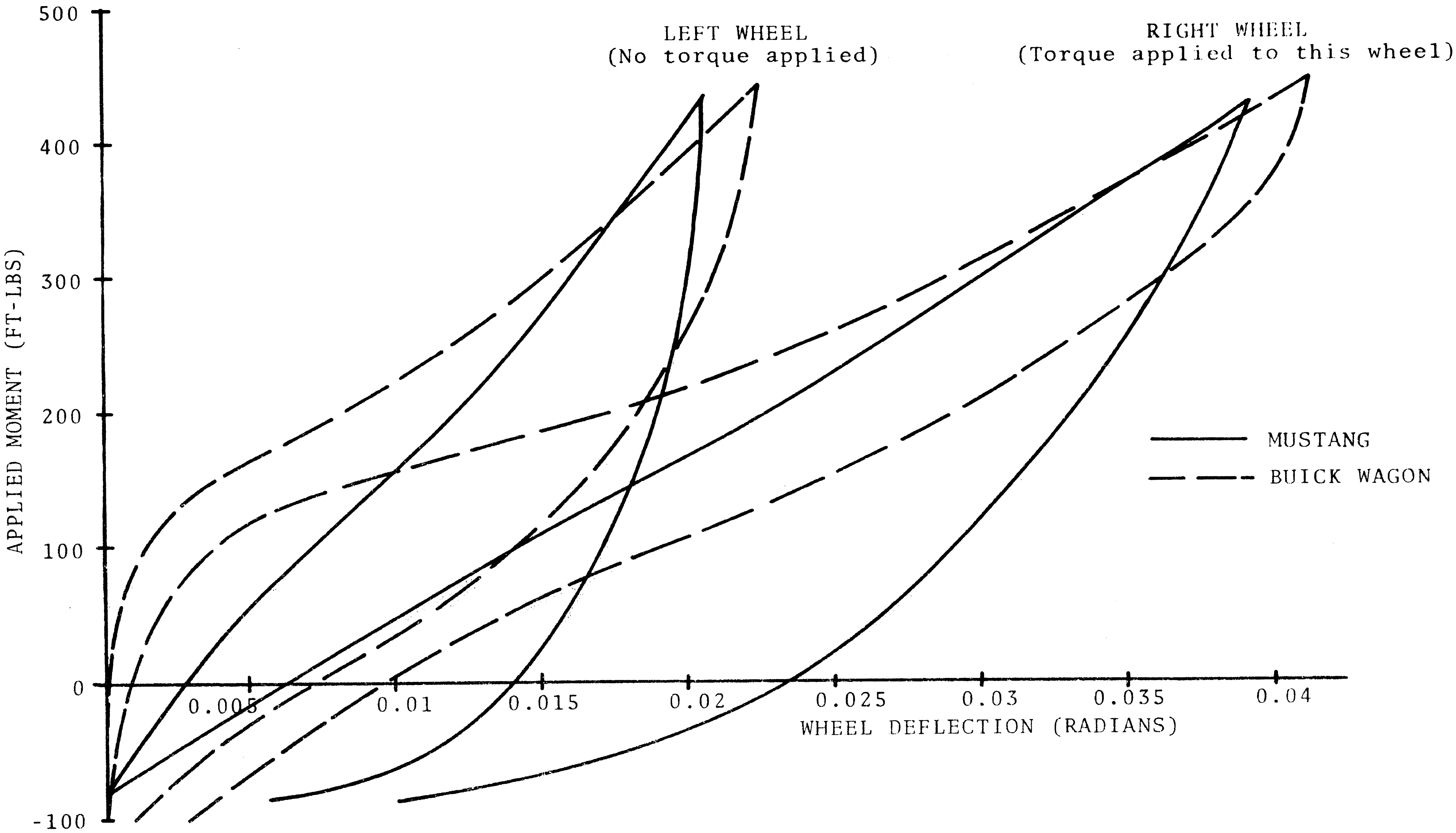


Figure G3. Results of Steering Compliance Test for Buick and Mustang.

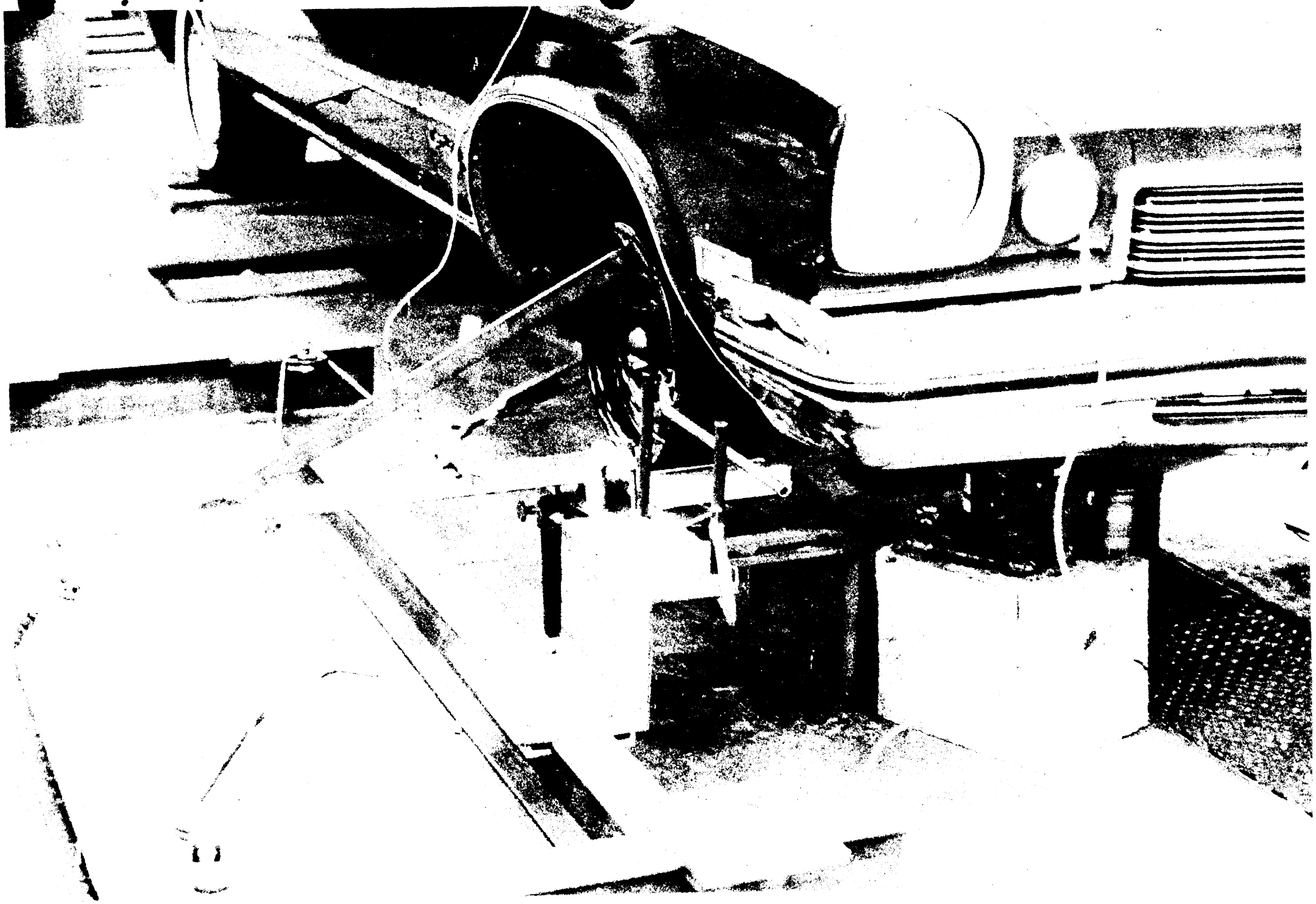


Figure G4. Experimental Set-up for Steering Compliance Measurement.

calibrations on the jack. Experimental set-up for this test is shown in Figure G5. The test is repeated with the stabilizer bar disconnected and the load-displacement curves with and without the stabilizer bar are used for the computation of spring stiffness and the auxiliary roll stiffness.

It should be noted that these are wheel load vs. wheel deflection curves, and the spring stiffness obtained is for an equivalent spring translated to the wheel plane. Results of the test for the test vehicles are shown in Figure G6. The computed stiffnesses are:

	Mustang	Buick
Front spring stiffness (lb/in)	90.0	113.0
Auxiliary roll stiffness (in lb/deg)	2630.0	5779.5

Angular changes in toe-in, camber, and caster for vertical deflection of the front wheel are also measured using slip gages. The results obtained for the test vehicles are shown in Figures G7, G8, and G9. Knowing the static wheel alignment specifications, curves for absolute changes in toe-in, camber angle, and caster angle can be computed for each front suspension.

For the solid rear suspension, a special fork-like support is attached to facilitate load application on the axle. Load deflection curves are used to obtain the spring stiffness. It should be noted that the spring stiffness is for both the rear springs, effective at the spring. Longitudinal axle displacement is also recorded to compute the roll-steer coefficient. Figure G10 shows the experimental set-up used. Figures G11 and G12 show the results obtained for the test. The spring stiffness and roll steer coefficient for the test vehicles are:

	Mustang	Buick
Rear spring stiffness	105.0	144.0
Roll steer coefficient	0.14	-0.10

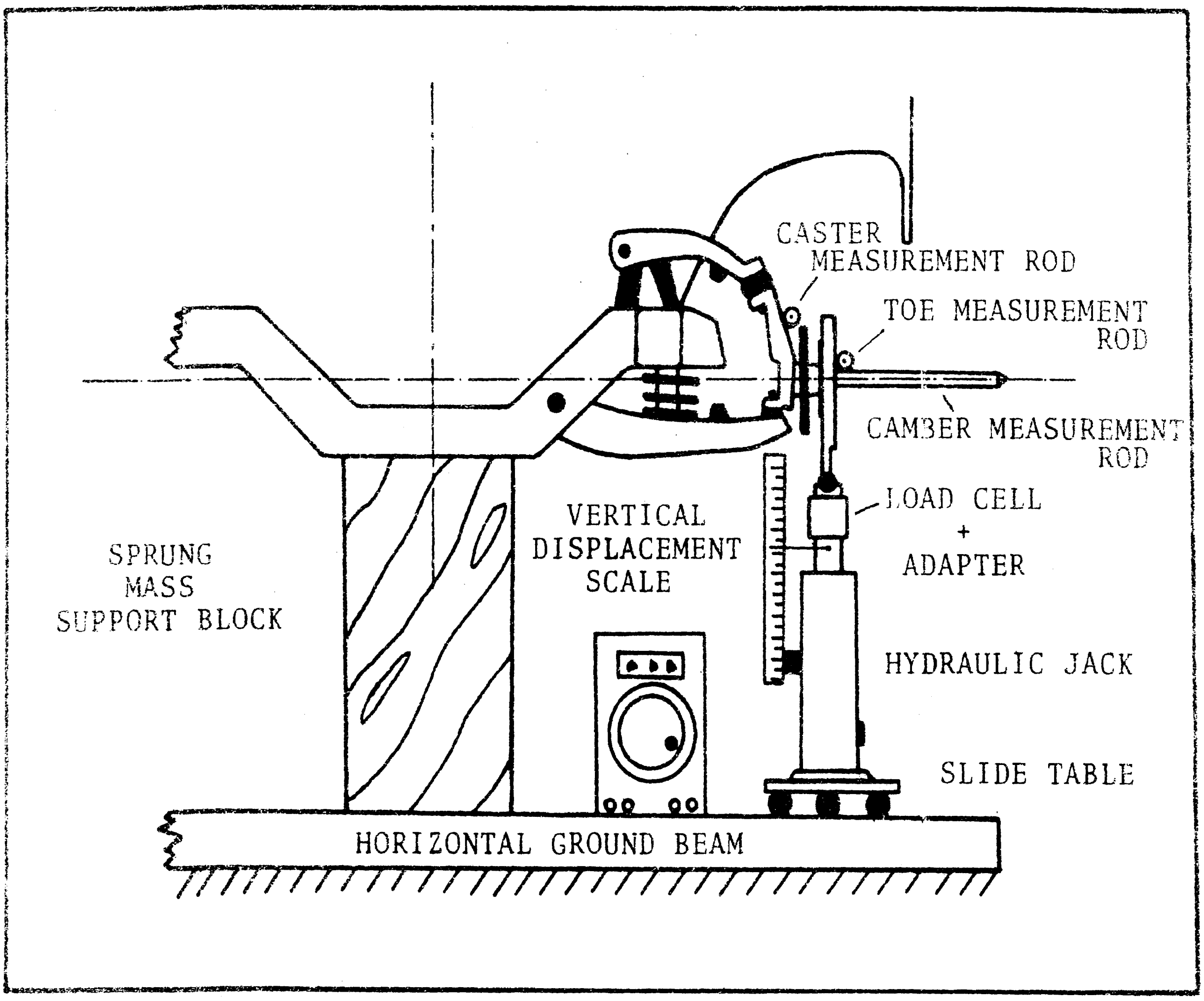


Figure G5. Experimental Set-up for Front Suspension Measurements.

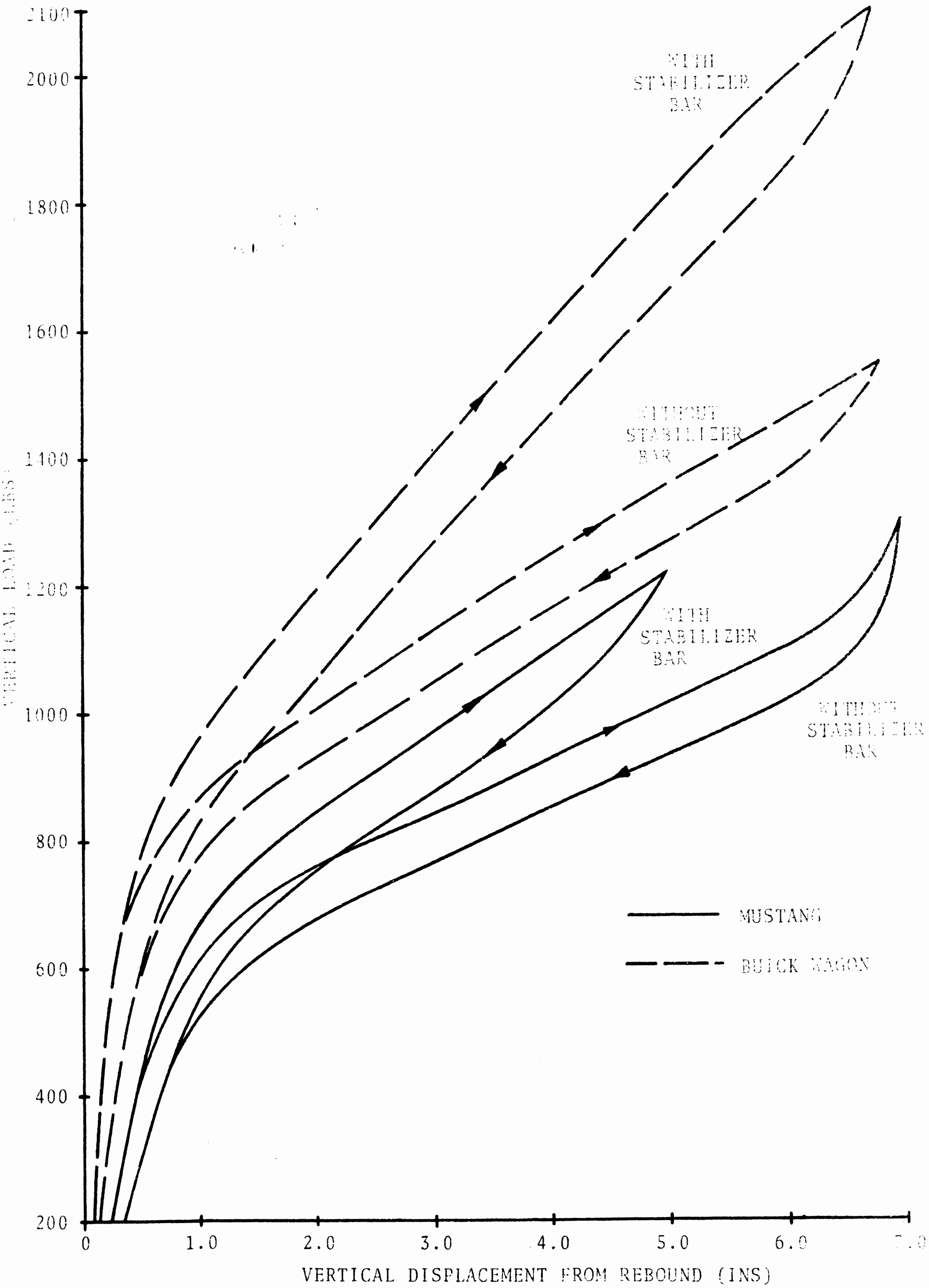


Figure G6. Results of the Front Suspension Stiffness Measurement for Buick and Mustang.

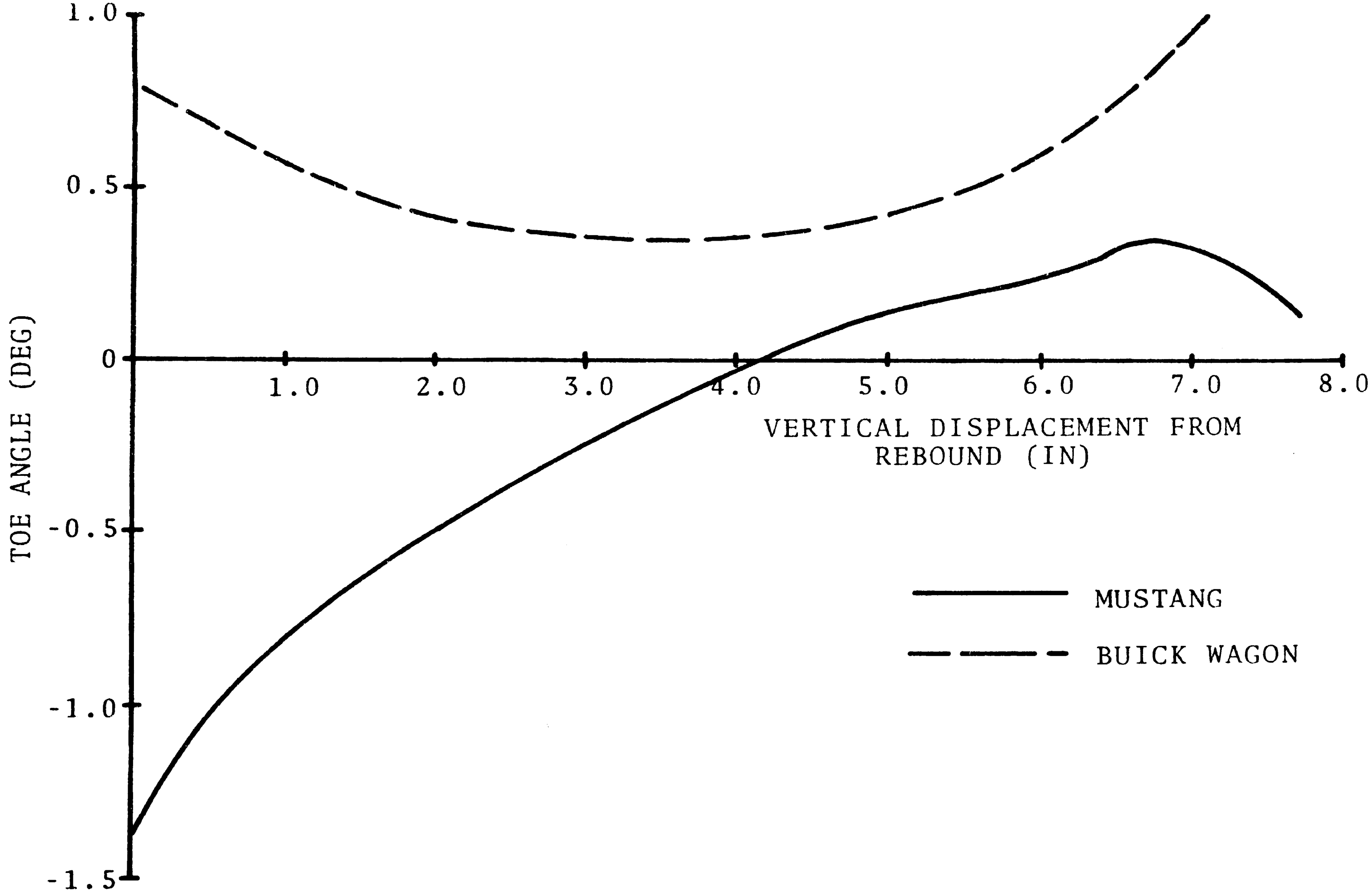


Figure G7. TOE-IN Change vs. Vertical Deflection for Buick and Mustang.

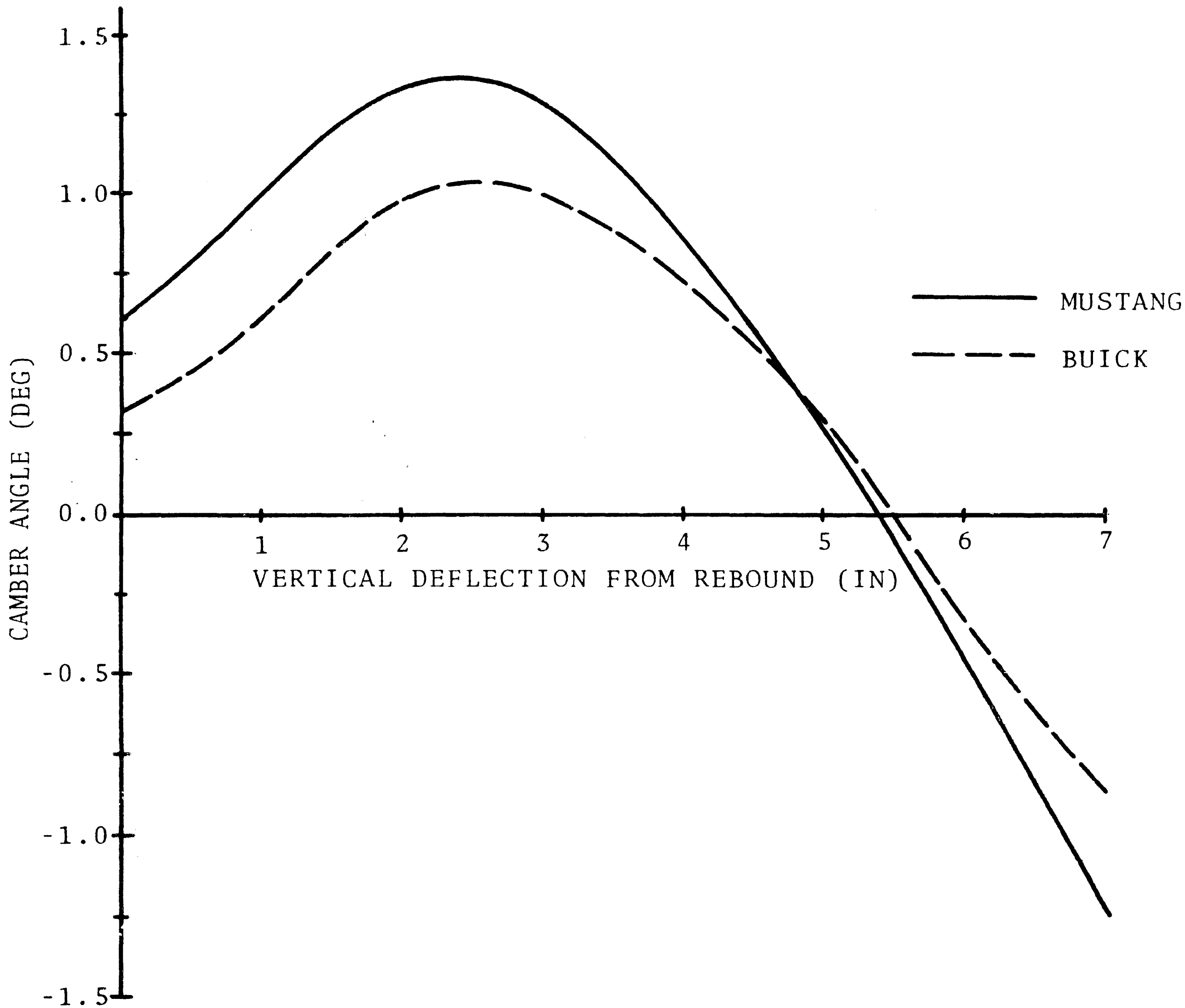


Figure G8. CAMBER Change vs. Vertical Deflection for Buick and Mustang.

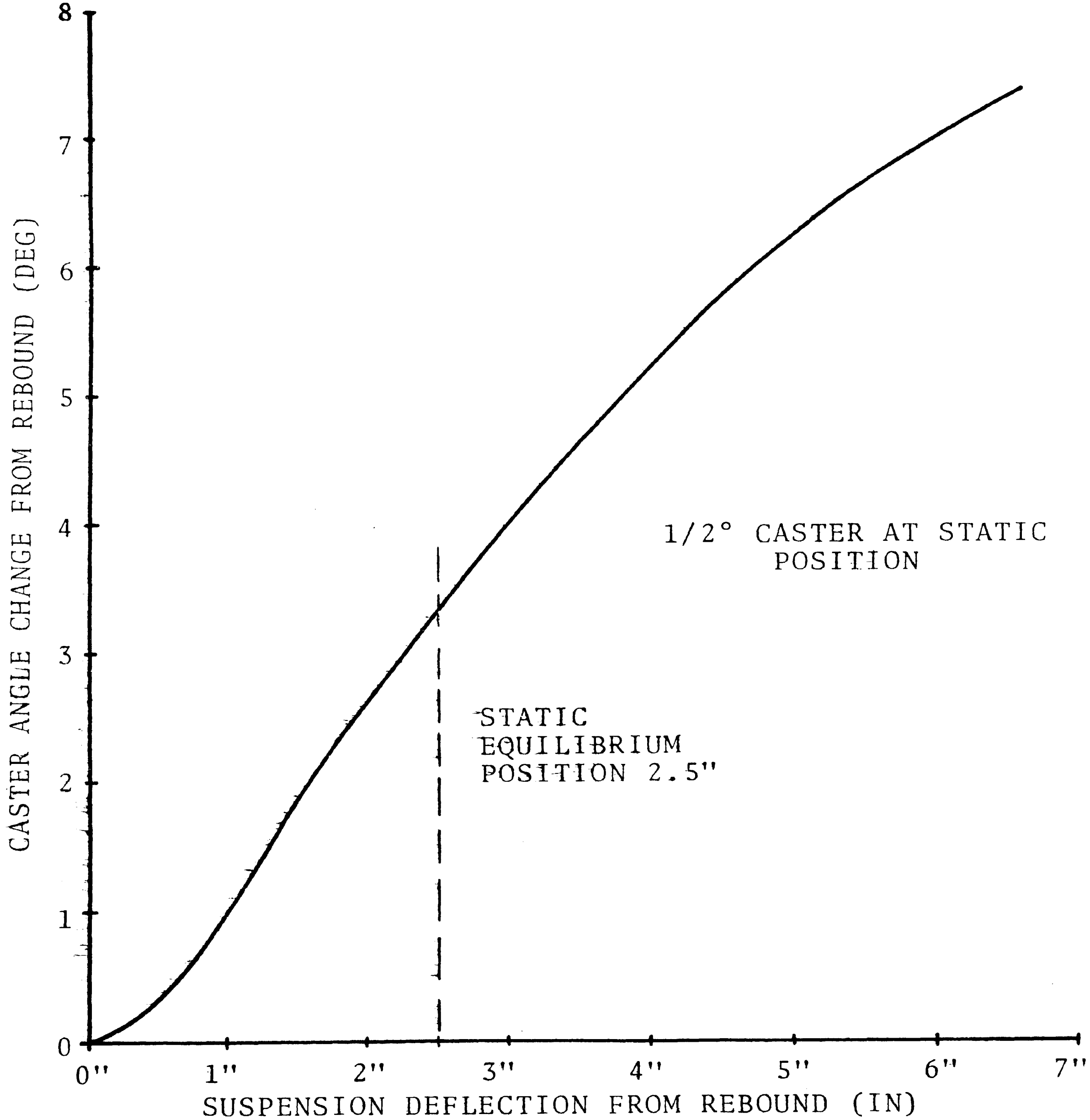


Figure G9. CASTER Change vs. Vertical Deflection for Buick.

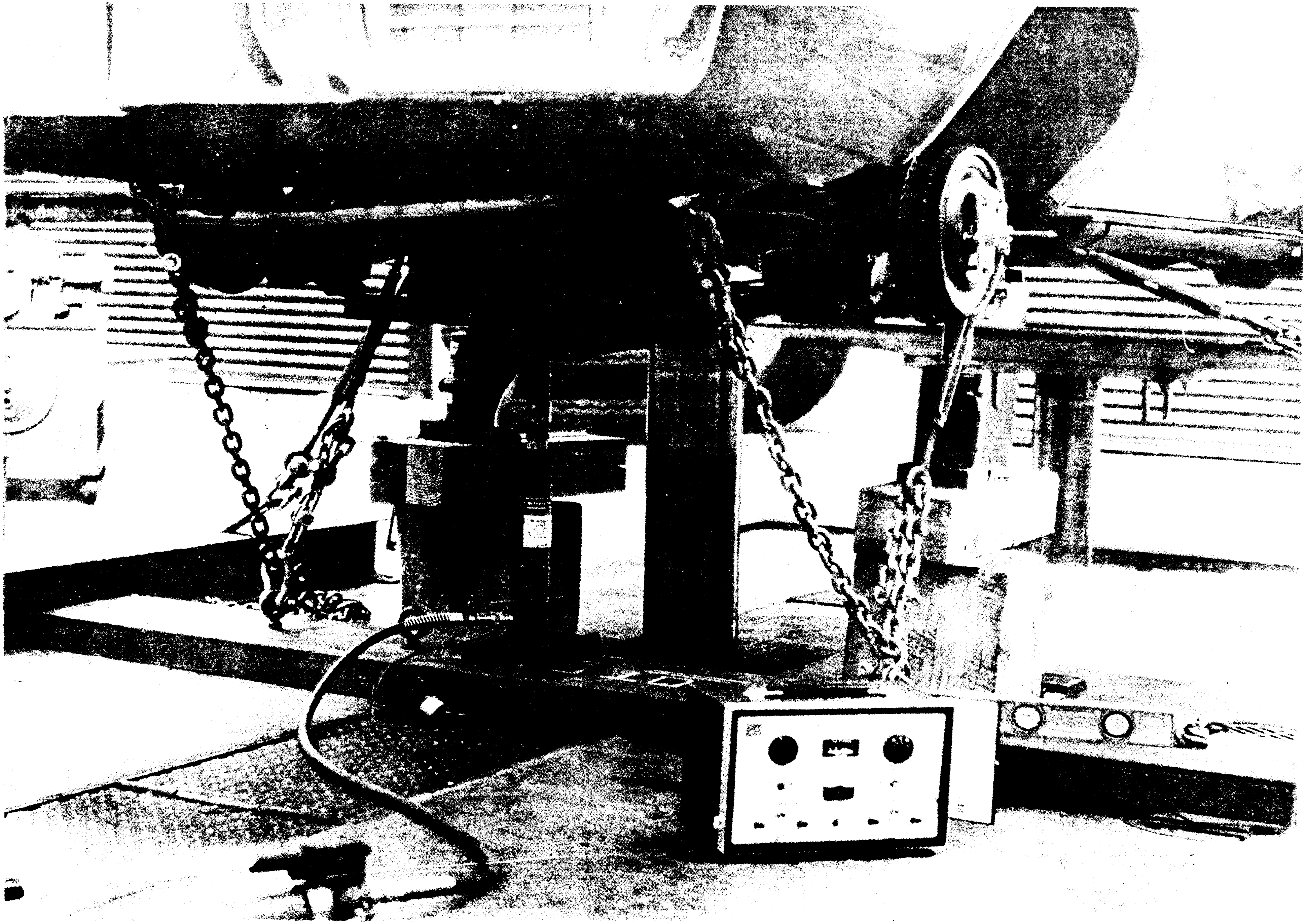


Figure G10. Experimental Set-up for Rear Suspension Measurements.

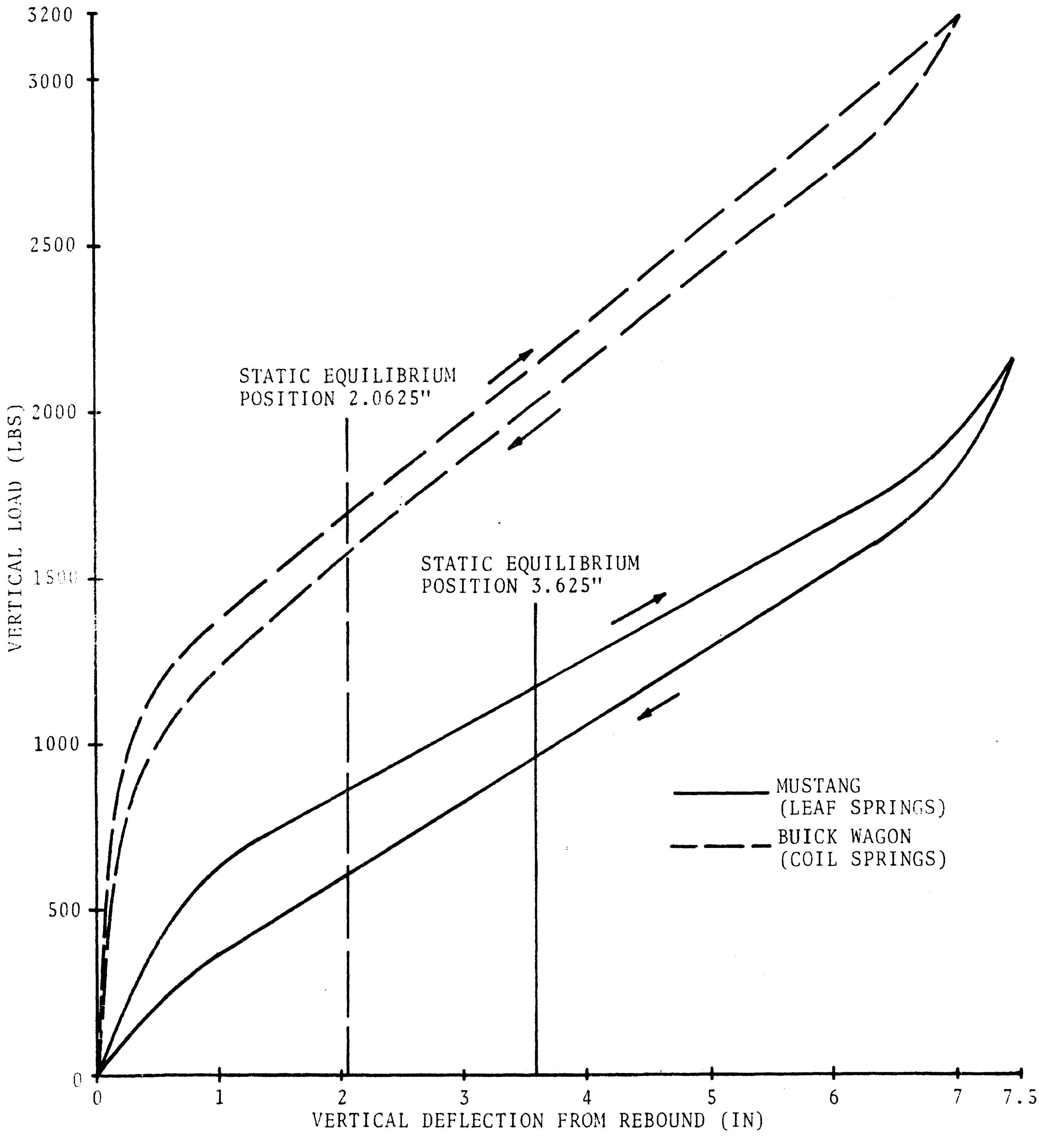


Figure G11. Results of Rear Axle Spring Measurements for Buick and Mustang.

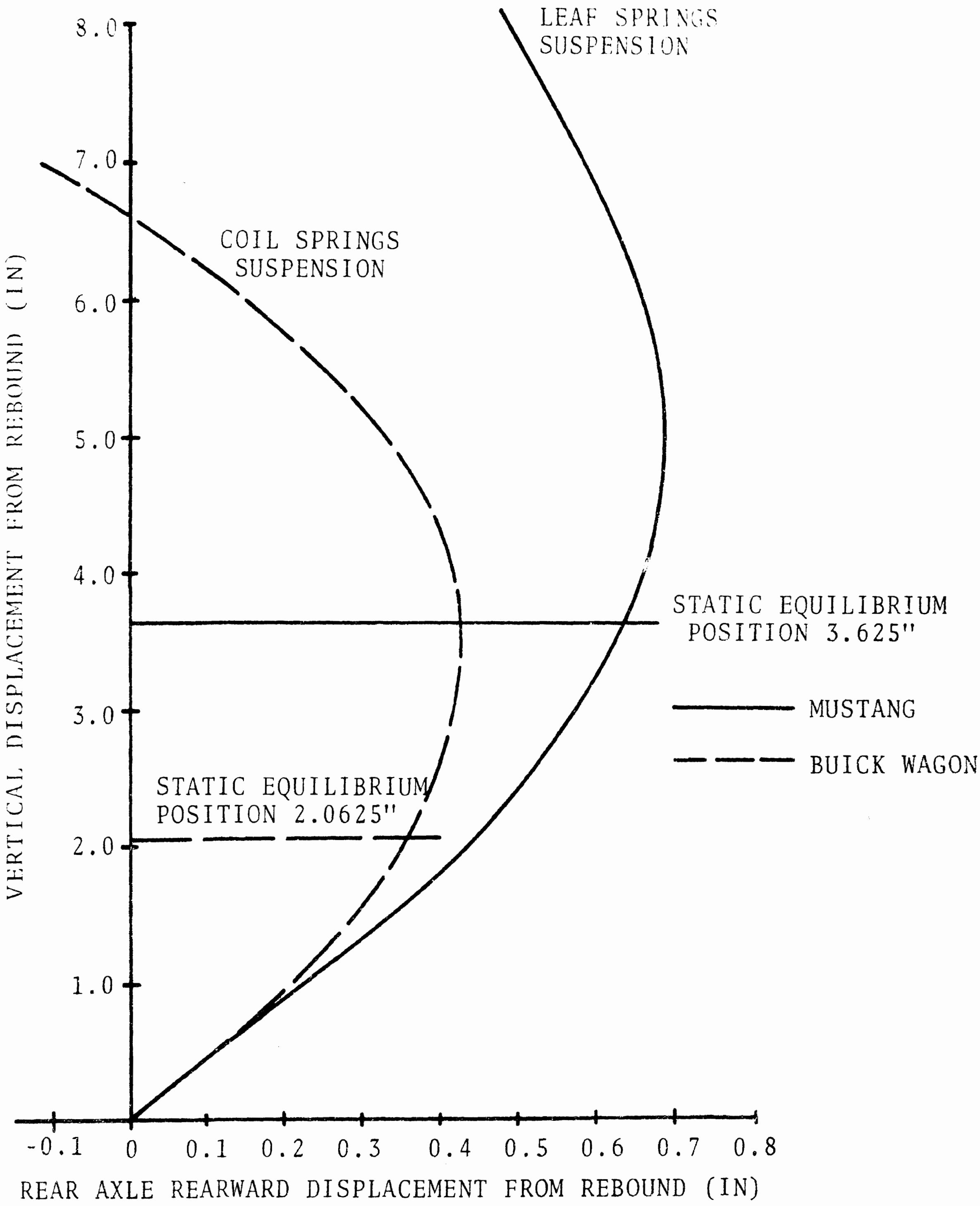


Figure G12. Results of Rear Axle Roll Steer Measurements.

G5. CENTER OF GRAVITY AND INERTIAL PROPERTIES MEASUREMENT

The objective of these tests is to obtain the exact location of the center of gravity and the pitch, roll, and yaw moments of inertia for the sprung mass.

The computer simulation model requires as input data:

a) Fore/aft location of sprung mass c.g.

b) Vertical location of sprung mass c.g.

c) Pitch moment of inertia of sprung mass

d) Roll moment of inertia of sprung mass

e) Yaw moment of inertia of sprung mass

f) Roll moment of inertia of unsprung mass

The HSRI c.g. and pitch inertia measurement swing was used for this test, as shown in Figure G13. C.g. and the pitch moment of inertia were measured for the vehicle, and the sprung mass properties were computed knowing the properties of the unsprung mass.

G5.1 CENTER OF GRAVITY TEST

The fore/aft location of c.g. is obtained by placing knife edges, laterally to the vehicle, at the point of balance.

Vertical c.g. location required measurement of the tilt angle [1]. With the knife edges slightly shifted from the fore/aft c.g. position, the vehicle tilt angle is measured using an accurate inclinometer. Known torques are applied to the swing and corresponding tilt angles recorded. Figure G14 shows the terminology used in the experimental set-up. Given the weight, fore/aft c.g. location, tilt angles, and the torques, the vertical c.g. location above ground plane can be calculated, using the equation:

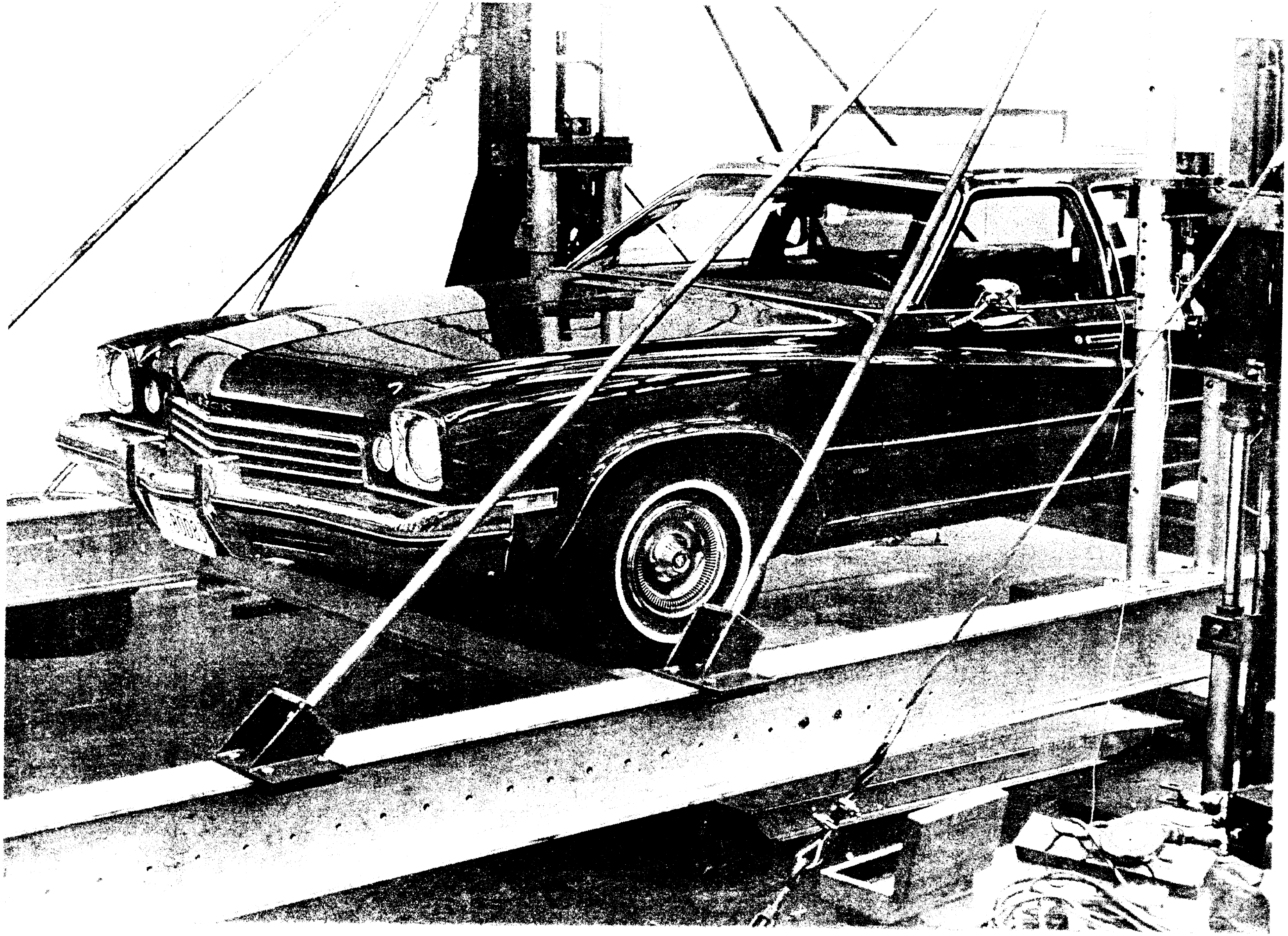


Figure G13. HSRI Center of Gravity and Pitch Inertia Swing.

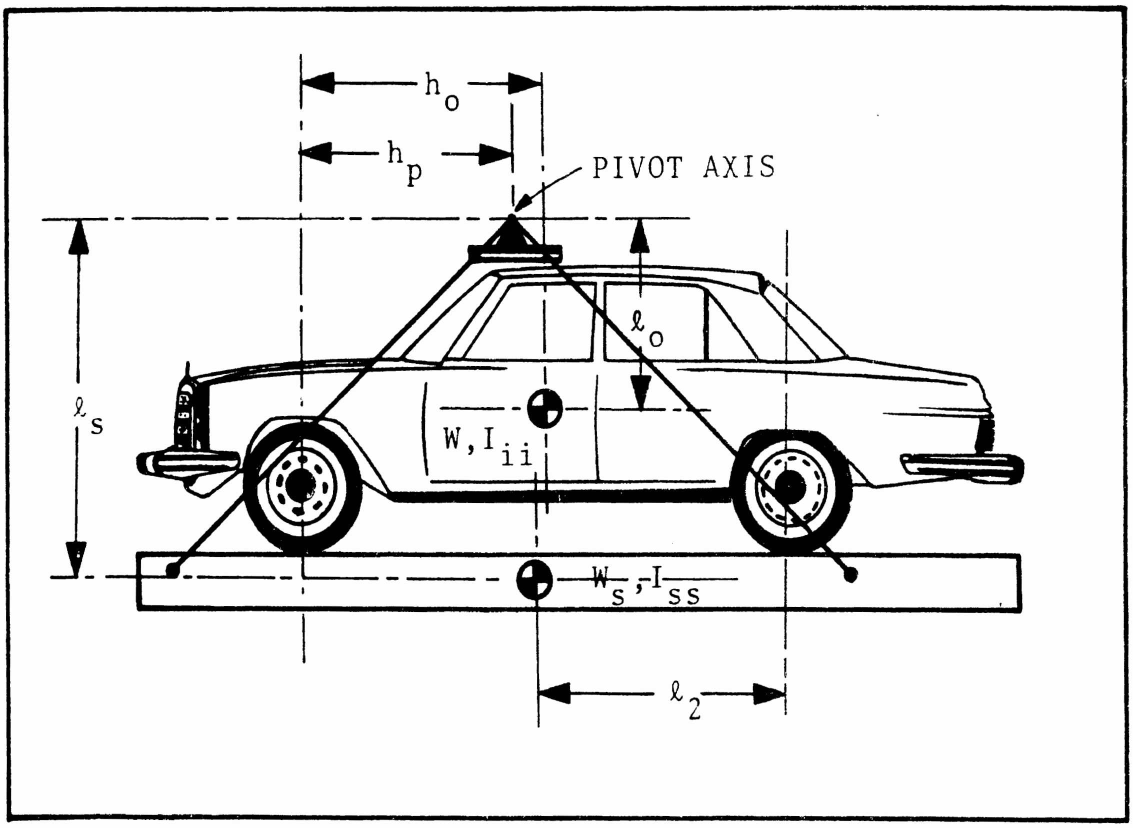


Figure G14. Schematic of the Terminology Used for C.G. and Inertia Measurements.

$$\ell_o = \frac{1}{W}\left(\left(\frac{\tau_i}{\sin\theta_i - \cos\theta_i \tan\theta_o}\right) - W_s \ell_s\right)$$

$$h_o = h_p + \left(\frac{W_s \ell_s + W \ell_o}{W_s + W}\right) \tan\theta_o$$

where

h_o = fore/aft location of vehicle c.g.

h_p = front axle to pivot point distance

ℓ_o = vehicle c.g. from pivot points

ℓ_s = swing c.g. from pivot point

W = vehicle total weight (lbs)

W_s = weight of swing (lbs)

θ_o = initial balance angle (deg) for i^{th} sample

θ_i = resulting tilt angles (deg) for i^{th} sample

τ_i = applied torque (in lbs) for i^{th} sample

From the vehicle c.g. position the c.g. for the sprung mass can be computed knowing the unsprung mass. For direct measurements of unsprung mass, the suspension components of interest must be removed and weighed. However, reasonable formulas for estimating the unsprung weights for standard front engine, rear axle drive passenger cars have been documented in the literature [2]. These formulas are

$$W_{uf} = 0.04\ W_t + 60$$

$$W_{ur} = 0.067\ W_t + 90$$

where

W_{uf} = unsprung weight in front (lbs)

W_{ur} = unsprung weight in rear (lbs)

W_t = total vehicle weight (lbs)

Results for the two test vehicles are:

	Mustang	Buick
Sprung mass c.g. behind front axle (in)	44.68	51.6
Sprung mass c.g. above ground (in)	22.05	28.5
Total vehicle weight (lbs)	3328.0	4422.7
Front unsprung mass weight (lbs)	187.0	247.4
Rear unsprung mass weight (lbs)	305.0	405.3

G5.2 MOMENT OF INERTIA MEASUREMENT

G5.2.1 PITCH AND ROLL MOMENT OF INERTIA. The classical simple pendulum technique was applied to determine the pitch and roll moments of inertia. The HSRI center of gravity and inertia measurement swing, shown in Figure G13, was used for pitch inertia measurement. In addition to the measurements for the c.g. location, periods for oscillations with and without the vehicle are recorded for the swing. Using the terminology of Figure G14, the pitch and roll moments of inertia for the vehicle can be calculated using the formula:

$$I_{ii} = W \ell_o \left[\frac{t^2}{4\pi^2} - \frac{\ell_o}{g} \right] + \frac{W_s \ell_s}{4\pi^2} \left[t^2 - t_s^2 \right]$$

where

i = x (for roll moment) or y (for pitch moment)

t = period of oscillation for swing with the vehicle (sec)

t_s = period of oscillation for swing along (sec)

W = vehicle weight (lbs)

W_s = swing weight (lbs)

Knowing the vehicle inertias, the sprung mass inertia values can be obtained using the parallel axis theorem.

Purely empirical formulae, founded on a large data base, exist in the literature [2].

For pitch moment of inertia:

$$I_{yt}^{cgt} \simeq 1.13\ W_t - 2020$$

$$I_{ys}^{cgs} \simeq I_{yt}^{cgt} - \frac{W_{uf}}{32.2}(1 + a^2) - \frac{W_{ur}}{32.2}(1 + b^2)$$

where

I_{yt}^{cgt} = total pitch moment of inertia relative to total vehicle centroidal axes (slug ft^2)

W_t = total vehicle weight (lbs)

I_{ys}^{cgs} = sprung mass pitch moment of inertia relative to sprung mass centroidal axes

W_{uf} = unsprung front weight (lbs)

W_{ur} = unsprung rear weight (lbs)

a = horizontal distance from front wheels to total vehicle center of gravity (ft)

b = horizontal distance from total vehicle center of gravity to rear wheel centerline (ft)

For roll moment of inertia:

$$I_{xs}^{cgs} = 0.16\ W_t - 265$$

where

I_{xs}^{cgs} = sprung mass roll moment of inertia relative to the sprung mass centroidal axes

G5.2.2. YAW MOMENT OF INERTIA MEASUREMENT. Compound pendulum principles are used to obtain the vehicle yaw moment of inertia. The vehicle is suspended by cables arranged symmetrically about the vehicle c.g. Small yawing oscillations are introduced and the period of oscillations determined. Using the notation of Figure G15, the yaw moment of inertia for the vehicle can be calculated using the formula:

$$I_{zz} = \frac{Wr^2t^2}{4\pi^2\ell} + \frac{W_s r^2}{4\pi^2\ell}\left[t^2 - t_s^2\right]$$

where

ℓ = length of cables (in)

t = period of oscillation for swing and vehicle (sec)

t_s = period of oscillation for swing alone (sec)

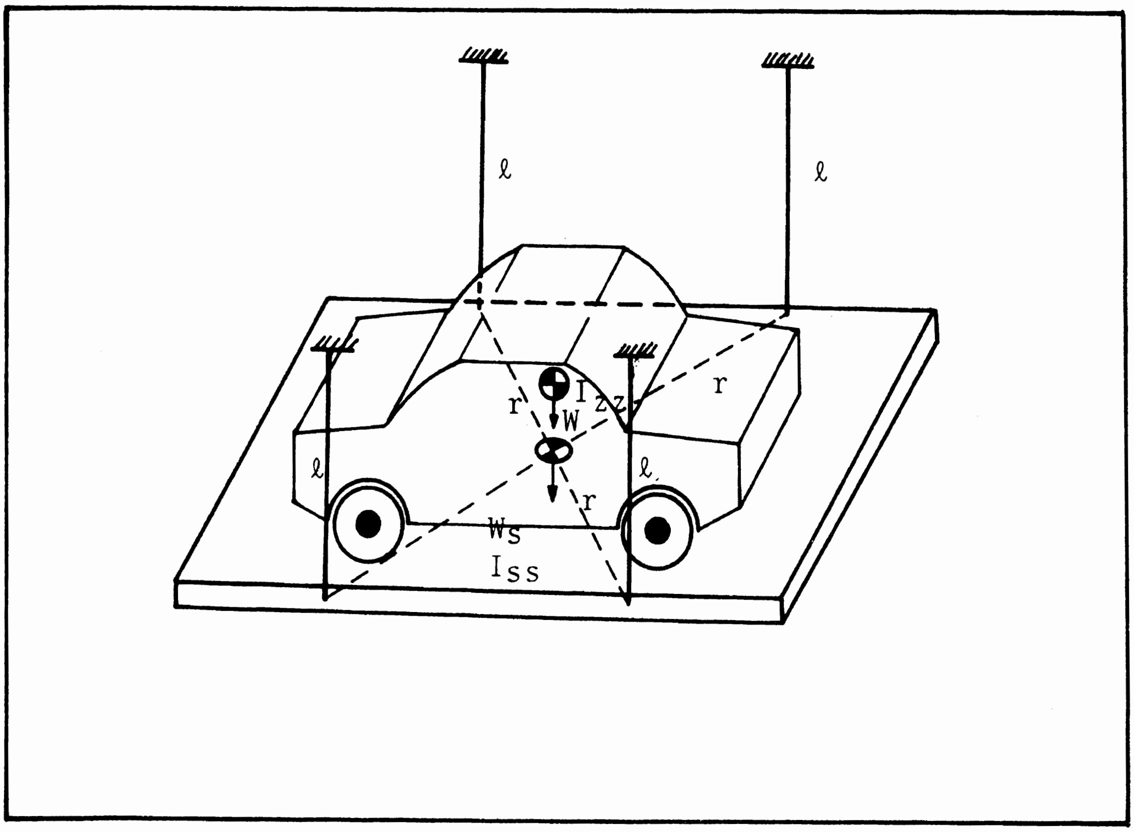


Figure G15. Schematic of Yaw Inertia Measurement Set-Up.

The above equation is based on small angle approximations; and the accuracy of results can be improved by maintaining small oscillations and long cables. A sensitivity analysis of the equation shows that large valuesof ℓ and small values of r and W_s are desirable. Knowing the total vehicle yaw moment of inertia, the sprung mass yaw inertia value can be computed.

For yaw moment of inertia, the empirical formula given in Reference [2] is:

$$I_{zt}^{cgt} \simeq 1.25\ W_t - 1750$$

$$I_{zs}^{cgs} \simeq 1.05\ W_t - 1470$$

where

I_{zt}^{cgt} = total vehicle yaw moment of inertia with respect to the total vehicle centroidal axes

I_{zs}^{cgs} = sprung mass moment of inertia with respect to the sprung mass centroidal axes

The results obtained for the test vehicles are:

	Mustang	Buick
Sprung mass pitch moment of inertia (in-lb-sec^2)*	11080.0	31781.0
Sprung mass roll moment of inertia (in-lb-sec^2)**	2940.0	5312.0
Sprung mass yaw moment of inertia (in-lb-sec^2)**	22500.0	39900.0

G6. TIRES

The measurement of tire performance characteristics are discussed in detail in Appendix D entitled "Tire Test Data".

G7. A SUMMARY OF PARAMETER MEASUREMENTS FOR USE IN SIMULATION

A sample set of input parameters required for the vehicle handling performance model is attached in Table G1 and G2 for the Mustang. A similar set of data for the Buick is listed in Section 5 of Appendix B.

* Values obtained using the HSRI inertia measurement swing.

** Values obtained using equations in Reference [2] for the Buick and experimentally measured values for the Mustang.

TABLE G-1.

INPUT DATA LIST
FOR THE FORD MUSTANG (COMPLICATED CASE)

INPUT CARD NO.	COLUMN NO. IN THE CARD 123456789012345678901234567890123456789012345...		COMMENTS	
1	FORD MUSTANG: COMPLICATED CASE, ETC.,.....		HEAD	(20A4) FORMAT
2	44.68000		A1	(F15.5) FORMAT
3	64.32000		A2	
4	12.70000		ALPHA1	
5	12.70000		ALPHA2	
6	0.25000		AN1	
7	0.25000		AN2	
8	3.66000		C1	
19	5.30000		C2	
10	4.00000		C3	
11	6.67000		C4	
12	-1.00000		CALF1	
13	36.00000		CF1	
14	50.00000		CF2	
15	15.00000		CGAMMA	
16	9.35000		DELTA1	
17	0.00200		FA1	
18	0.00200		FA2	
19	0.00000		G1	
20	0.00000		G2	
21	22.05000		GR	
22	2940.00000		J1	
23	11080.00000		J2	
24	22500.00000		J3	
25	0.00000		IXZ	
26	600.00000		JA2	
27	17.00000		JS1	
28	17.00000		JS2	
29	-1.00000		K1	
30	-1.00000		K2	
31	3.52000		KPOFF	
32	549.00000		KSC	
33	267000.00000		KSL	
34	03		KSW	(I2) FORMAT
35	1420.00000		KT1	(F15.5) FORMAT
36	1420.00000		KT2	
37	397.00000		PW	
38	0.00000		PJ1	
39	0.00000		PJ2	
40	0.00000		PJ3	
41	56.15000		PX	
42	15.00000		PZ	
43	0.00000		RCH1	
44	12.70000		RCH2	
45	2630.00000		ROLLF	
46	0.00000		ROLLR	
47	-2.00000		RSCKEY	
48	30.75000		SY1	
49	21.50000		SY2	
50	4.40000		TIME	
51	30.75000		TRA1	
52	30.50000		TRA2	
53	0.00000		TRAIL	
54	64.50000		VEL	
55	0.02240		WIND	
56	2836.00000		W	
57	187.00000		WS1	
58	305.00000		WS2	
59	00		KEYTQ	(I2) FORMAT
60	01		TIME VS. BRAKE PRESSURE	
61	0.00	0.00	(2F10.2)	
62	23		BRAKE PRESSURE VS. TORQUE	
63	0.00	0.00	(2F10.2) FRONT LEFT	
64	50.00	0.00		
65	100.00	55.50		
66	150.00	130.50		
67	200.00	205.50		
68	250.00	280.50		
69	300.00	355.50		
70	350.00	430.00		
71	400.00	505.00		

TABLE G-1 (Continued).

INPUT CARD NO.	COLUMN NO. IN THE CARD 12345678901234567890123456789012345678901234 5...		COMMENTS
71	400.00	505.00	
72	450.00	580.50	
73	500.00	655.50	
74	550.00	730.50	
75	600.00	805.50	
76	650.00	880.50	
77	700.00	955.50	
78	750.00	1030.50	
79	800.00	1105.50	
80	850.00	1180.50	
81	900.00	1255.00	
82	950.00	1293.00	
83	1000.00	1330.50	
84	1050.00	1405.00	
85	1100.00	1480.00	
86	23		BRAKE PRESSURE VS. TORQUE
87	0.00	0.00	(2F10.2) FRONT RIGHT
88	50.00	0.00	
89	100.00	55.50	
90	150.00	130.50	
91	200.00	205.50	
92	250.00	280.50	
93	300.00	355.50	
94	350.00	430.00	
95	400.00	505.00	
96	450.00	580.50	
97	500.00	655.50	
98	550.00	730.50	
99	600.00	805.50	
100	650.00	880.50	
101	700.00	955.50	
102	750.00	1030.50	
103	800.00	1105.50	
104	850.00	1180.50	
105	900.00	1255.00	
106	950.00	1293.00	
107	1000.00	1330.50	
108	1050.00	1405.00	
109	1100.00	1480.00	
110	13		BRAKE PRESSURE VS. TORQUE
111	0.00	0.00	(2F10.2) REAR LEFT
112	100.00	0.00	
113	150.00	38.40	
114	250.00	134.40	
115	350.00	230.40	
116	450.00	326.40	
117	550.00	422.40	
118	650.00	518.40	
119	750.00	624.40	
120	850.00	720.40	
121	1000.00	816.40	
122	1050.00	864.40	
123	1100.00	912.40	
124	13		BRAKE PRESSURE VS. TORQUE
125	0.00	0.00	(2F10.2) REAR RIGHT
126	100.00	0.00	
127	150.00	38.40	
128	250.00	134.40	
129	350.00	230.40	
130	450.00	326.40	
131	550.00	422.40	
132	650.00	518.40	
133	750.00	624.40	
134	850.00	720.40	
135	1000.00	816.40	
136	1050.00	864.40	
137	1100.00	912.40	
138	11		SPRING COMPRESSION VS. FORCE
139	-2.00	-2000.00	(2F10.2) FRONT ONE SIDE
140	0.00	-93.50	
141	1.00	531.50	
142	2.00	650.50	
143	3.00	741.50	
144	4.00	830.50	
145	5.00	920.50	

TABLE G-1 (Continued).

INPUT CARD NO.	COLUMN NO. IN THE CARD 123456789012345678901234567890123456789012345...					COMMENTS
146		6.00	1010.50			
147		7.00	1110.50			
148		7.50	1360.50			
149		10.00	4000.00			
150	11					SPRING COMPRESSION VS. FORCE
151		-2.00	-2000.00			(2F10.2) REAR ONE SIDE
152		0.00	-150.00			
153		1.00	187.00			
154		2.00	297.00			
155		3.00	402.00			
156		4.00	507.00			
157		5.00	617.00			
158		6.00	721.00			
159		7.00	837.00			
160		7.50	957.00			
161		8.50	1800.00			
162	23					TIME VS. STEER (OPTION 3)
163		25.00000				PLAY (F15.5)
164		0.00000	0.00000			(2F15.5)
165		0.10000	0.00000			
166		0.26670	38.75000			
167		0.35000	54.75000			
168		0.43330	67.00000			
169		0.51660	74.80000			
170		0.59930	77.50000			
171		0.68320	74.80000			
172		0.76650	67.00000			
173		0.84980	54.75000			
174		0.93310	38.75000			
175		1.00980	0.00000			
176		1.26650	-38.75000			
177		1.34980	-54.75000			
178		1.43310	-67.00000			
179		1.51640	-74.80000			
180		1.59970	-77.50000			
181		1.68300	-74.80000			
182		1.76630	-67.00000			
183		1.84960	-54.75000			
184		1.93290	-38.75000			
185		2.09360	0.00000			
186		4.40000	0.00000			
187	13					STEERING VS. WHEEL ANGLE
188		-540.00000	-36.00000	-26.00000		
189		-450.00000	-28.50000	-23.00000		
190		-360.00000	-21.50000	-18.00000		
191		-270.00000	-15.50000	-13.50000		
192		-180.00000	-10.00000	9.00000		
193		-90.00000	-4.50000	-4.00000		
194		0.00000	0.00000	0.00000		
195		90.00000	4.00000	4.50000		
196		180.00000	8.00000	9.00000		
197		270.00000	12.50000	13.50000		
198		360.00000	16.50000	19.00000		
199		450.00000	21.00000	25.50000		
200		540.00000	25.50000	34.00000		
201	10					SUSP. COMPRESSION VS. CAMBER
202		-10.00	0.600			(2F10.3)
203		0.00	0.600			
204		1.00	0.950			
205		2.00	1.330			
206		3.00	1.280			
207		4.00	0.850			
208		5.00	0.280			
209		6.00	-0.450			
210		7.00	-1.260			
211		10.00	-1.260			
212	04					LOAD VS. LATERAL STIFFNESS
213		0.00	166.00	1.70	6.00	(4F10.2) FRONT ONE SIDE
214		800.00	166.00	1.70	6.00	
215		1100.00	175.50	0.45	8.00	
216		1400.00	161.00	0.50	8.00	
217	04					LOAD VS. LATERAL STIFFNESS
218		0.00	166.00	1.70	6.00	(4F10.2) REAR ONE SIDE
219		800.00	166.00	1.70	6.00	
220		1100.00	175.50	0.45	8.00	

TABLE G-1 (Continued).

INPUT CARD NO.	COLUMN NO. IN THE CARD 12345678901234567890123456789012345...	COMMENTS
221	1400.00 161.00 0.50 8.00	
222	01	LOAD VS. LONGITUDINAL STIFFNESS
223	0.00 16000.00	(2F10.2) FRONT ONE SIDE
224	01	LOAD VS. LONGITUDINAL STIFFNESS
225	0.00 16000.00	(2F10.2) REAR ONE SIDE
226	04	LOAD VS. MUZERO, FRONT
227	1.00 0.95	(2F10.2)
228	800.00 0.95	
229	1100.00 0.94	
230	1400.00 0.93	
231	04	LOAD VS. MUZERO, REAR
232	1.00 0.95	(2F10.2)
233	800.00 0.95	
234	1100.00 0.94	
235	1400.00 0.93	
236	05	ALIGNING TORQUE, FRONT, ONE SIDE
237	0.00000 1	LOAD, NO. (F15.5,I2)
238	0.00 0.00	ANGLE, TORQUE (2F10.2)
239	500.00000 5	
240	0.00 0.00	
241	1.00 7.70	
242	2.00 11.60	
243	4.00 9.80	
244	18.00 1.00	
245	800.00000 5	
246	0.00 0.00	
247	1.00 17.60	
248	2.00 29.20	
249	4.00 30.70	
250	16.00 4.90	
251	1100.00000 5	
252	0.00 0.00	
253	1.00 27.10	
254	2.00 47.80	
255	4.00 59.90	
256	18.00 12.40	
257	1400.00000 5	
258	0.00 0.00	
259	2.00 63.80	
260	4.00 90.00	
261	8.00 81.30	
262	18.00 29.10	
263	05	ALIGNING TORQUE, REAR, ONE SIDE
264	0.00000 1	LOAD, NO. (F15.5,I2)
265	0.00 0.00	ANGLE, TORQUE (2F10.2)
266	500.00000 5	
267	0.00 0.00	
268	1.00 7.70	
269	2.00 11.60	
270	4.00 9.80	
271	18.00 1.00	
272	800.00000 5	
273	0.00 0.00	
274	1.00 17.60	
275	2.00 29.20	
276	4.00 30.70	
277	16.00 4.90	
278	1100.00000 5	
279	0.00 0.00	
280	1.00 27.10	
281	2.00 47.80	
282	4.00 59.90	
283	18.00 12.40	
284	1400.00000 5	
285	0.00 0.00	
286	2.00 63.80	
287	4.00 90.00	
288	8.00 81.30	
289	18.00 29.10	
290	10	SUSP. COMPRESSION VS. TOE
291	-10.00000 -1.40000	(2F15.5)
292	0.00000 -1.40000	
293	1.00000 -0.81000	
294	2.00000 -0.59000	
295	3.00000 -0.25000	

TABLE G-1 (Continued).

INPUT CARD NO.	COLUMN NO. IN THE CARD 12345678901234567890123456789012345678901234 5...		COMMENTS
296	4.00000	-0.03000	
297	5.00000	0.15000	
298	6.00000	0.24000	
299	7.00000	0.34000	
300	10.00000	0.34000	
301	18		ROLL STEER
302	0.00000	0.00000	(2F15.5)
303	0.50000	-0.08000	
304	1.00000	-0.22000	
305	1.50000	-0.35000	
306	2.00000	-0.44000	
307	2.50000	-0.51500	
308	3.00000	-0.57500	
309	3.50000	-0.63000	
310	4.00000	-0.66500	
311	4.50000	-0.68500	
312	5.00000	-0.69000	
313	5.50000	-0.68000	
314	6.00000	-0.66000	
315	6.50000	-0.62500	
316	7.00000	-0.58500	
317	7.50000	-0.54000	
318	8.00000	-0.49000	
319	10.00000	-0.49000	
320	0.05000		TINC (F15.5)
321	00		NCAR (I2)

TABLE G-2.

INPUT DATA LIST
FOR THE FORD MUSTANG (SIMPLE CASE)

INPUT CARD NO.	COLUMN NO. IN THE CARD 12345678901234567890123456789012345678901234 5...	COMMENTS	
1	FORD MUSTANG: SIMPLE CASE, ETC., ...	HEAD	(20A4) FORMAT
2	44.60000	A1	(F15.5) FORMAT
3	64.32000	A2	
4	12.70000	ALPHA1	
5	12.70000	ALPHA2	
6	0.25000	AN1	
7	0.25000	AN2	
8	3.66000	C1	
9	5.30000	C2	
10	4.00000	C3	
11	6.67000	C4	
12	166.00000	CALF1	
13	175.50000	CALF2	
14	36.00000	CF1	
15	50.00000	CF2	
16	25.00000	CGAMMA	
17	16000.00000	CS1	
18	16000.00000	CS2	
19	9.35000	DELTA1	
20	0.00200	FA1	
21	0.00200	FA2	
22	0.00000	G1	
23	0.00000	G2	
24	22.05000	GR	
25	2940.00000	J1	
26	11080.00000	J2	
27	22500.00000	J3	
28	0.00000	IXZ	
29	600.00000	JA2	
30	17.00000	JS1	
31	17.00000	JS2	
32	90.00000	K1	
33	105.00000	K2	
34	3.52000	KPOFF	
35	540.00000	KSC	
36	267000.00000	KSI	
37	01	KSW	(I2) FORMAT
38	1420.00000	KT1	(F15.5) FORMAT
39	1420.00000	KT2	
40	0.95000	MUZERO1	
41	0.94000	MUZERO2	
42	397.00000	PW	
43	0.00000	PJ1	
44	0.00000	PJ2	
45	0.00000	PJ3	
46	56.15000	PX	
47	15.00000	PZ	
48	0.00000	RCH1	
49	12.70000	RCH2	
50	2630.00000	ROLLF	
51	0.00000	ROLLR	
52	0.14000	RSC	
53	30.75000	SY1	
54	21.50000	SY2	
55	4.40000	TIME	
56	30.75000	TRA1	
57	30.50000	TRA2	
58	0.00000	TRAIL	
59	64.50000	VEL	
60	0.02240	WIND	
61	2836.00000	W	
62	187.00000	WS1	
63	305.00000	WS2	
64	5.40000	ZBAR	
65	00	KEYTO	(I2) FORMAT
66	01	TIME VS. BRAKE PRESSURE	
67	0.00 0.00	(2F10.2)	

TABLE G-2 (Continued).

INPUT CARD NO.	COLUMN NO. IN THE CARD 12345678901234567890123456789012345678901234 5...			COMMENTS
68	02			BRAKE PRESSURE VS. TORQUE
69	0.00	0.00		(2F10.2) FRONT LEFT
70	1100.00	1480.00		
71	02			BRAKE PRESSURE VS. TORQUE
72	0.00	0.00		(2F10.2) FRONT RIGHT
73	1100.00	1480.00		
74	02			BRAKE PRESSURE VS. TORQUE
75	0.00	0.00		(2F10.2) REAR LEFT
76	1100.00	912.40		
77	02			BRAKE PRESSURE VS. TORQUE
78	0.00	0.00		(2F10.2) REAR RIGHT
79	1100.00	912.40		
80	05			TIME VS. STEER
81		0.00000	0.00000	(2F15.5)
82		0.10000	0.00000	
83		0.40000	12.00000	
84		3.60000	12.00000	
85		4.60000	0.00000	
86	01			SUSP. COMPRESSION VS. CAMBER
87	0.00	0.00		(2F10.2)
88		0.05000		TINC (F15.5)
89	00			NCAR (I2)

REFERENCES

[1] Summer Conference Notes on "Motor Vehicle Performance Measurement and Prediction", Highway Safety Research Institute, July 22-26, 1974.

[2] Rasmussen, R.E. "Typical Vehicle Parameters for Dynamic Studies", General Motors Proving Ground, A-2542, April, 1970.