

**PRECISION ENERGY MEASUREMENTS OF  
GAMMA RAYS OCCURRING IN THE DECAYS OF  $^{165}\text{Dy}$  AND  $^{193}\text{Os}$ \***

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A curved-crystal spectrometer has been utilized to obtain energy measurements of 22 gamma rays between 73 keV and 715 keV occurring in the decays of  $^{165}\text{Dy}$  ( $T_{1/2} = 2.4$  h) and  $^{193}\text{Os}$  ( $T_{1/2} = 31$  h). Some of these energy measurements have sufficiently small uncertainties associated with them to make them useful for the calibration of Ge(Li) spectra.

The University of Michigan 2m-Ge(0 $\bar{2}2$ ) curved-crystal spectrometer was utilized in obtaining the gamma ray energy measurements reported in this paper. A description of the design of this spectrometer and the various experimental techniques associated with its use has been given elsewhere<sup>1,2</sup>). For the most frequently used source with the crystal had an energy resolution given by  $\Delta E(\text{fwhm}) = (2.2 \times 10^{-5}) (E^2/n)$ , where  $n$  is the order of reflection and  $E$  is the gamma ray energy in keV. The crystal was calibrated using the  $411.794 \pm 0.008$  keV gamma ray occurring in the decay of  $^{198}\text{Au}^{3-5}$ ).

All samples were produced in the University of Michigan Ford nuclear reactor (thermal neutron flux  $\approx 10^{13}$  neutrons/sec·cm<sup>2</sup>). The osmium sample was fabricated using enriched material obtained from Oak Ridge National Laboratory, the enrichment was 98.7%.

Measurements were taken in the highest order permitted by gamma ray intensity and counting time. Most final energy values are the average of the values obtained in several runs.

The results of the present investigation are given in table 1. Five of the  $^{165}\text{Dy}$  measurements listed in table 1 were given in a "note added in proof" of a recent paper by one of the present authors<sup>6</sup>). Three of these five values have been revised on the basis of more extensive data (the previously reported values were:  $361.670 \pm 0.018$  keV,  $633.432 \pm 0.060$  keV;  $715.345 \pm 0.076$  keV).

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TABLE I

Curved-crystal spectrometer energy measurements of some of the gamma rays occurring in the decays of  $^{165}\text{Dy}$  and  $^{193}\text{Os}$  (units: keV).

$^{165}\text{Dy}$	$^{193}\text{Os}$
$94.692 \pm 0.003$	$73.044 \pm 0.003$
$115.092 \pm 0.010$	$107.016 \pm 0.008$
$119.490 \pm 0.005$	$138.947 \pm 0.008$
$259.533 \pm 0.011$	$280.457 \pm 0.035$
$279.759 \pm 0.020$	$321.627 \pm 0.035$
$361.676 \pm 0.030$	$387.509 \pm 0.058$
$405.392 \pm 0.037$	$460.501 \pm 0.065$
$456.080 \pm 0.050$	
$479.525 \pm 0.057$	
$545.848 \pm 0.070$	
$565.77 \pm 0.15$	
$620.585 \pm 0.088$	
$633.425 \pm 0.058$	
$660.038 \pm 0.086$	
$715.31 \pm 0.11$	

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