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## Evaluations of in-traffic performance of high-intensity discharge headlamps

It would have been useful for the authors of the above paper[1] to have included tests on the effect of HID headlamps on oncoming traffic, and visibility in fog.

How does oncoming traffic perceive the difference in glare between hid and tungsten headlamps in the following circumstances:

— dipped headlights on s straight dry road?

— dipped headlights on a dry road when crossing a bridge or road-calming hump

which changes the elevation of the beam to cause maximum discomfort for a short time?

— dipped headlights on a dry road when driving around a nearside bend?

— the above with wet roads?

— all the above with undipped headlamps to simulate poorly adjusted headlamps or selfish drivers who do not dip their lights?

How do the different spectral compositions of the lamp output affect the back-scatter and visibility in mist, smog and fog of different densities and globular sizes?

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*Authors' reply*

We agree that possible differences in the glare effects of high-intensity discharge (HID) and tungsten-halogen (TH) headlamps are worth a look. We have done some work on the differential effects of these lamps on the subjective discomfort aspects of glare[3,4]. These studies indicate that subjective discomfort is equal when light from TH lamps is about 1.5 times greater than light from HID lamps, in terms of photopic lux at the eye. The possibility of a difference in effects on objective seeing ability (often called 'disability glare') has not yet been studied. Previous investigations of other types of lamp have shown that differences in subjective discomfort do not necessarily predict differences in disability glare (most notably in the case of the yellow headlamps that were mandated in France from 1936 to 1993; see for example Reference 5. Furthermore, in our judgement, there are not strong theoretical reasons to expect differences in disability glare. Nevertheless, we believe that possibility should be investigated.

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## Modulation of fluorescent light: Flicker rate and light source effects on visual performance and visual comfort

The study by Veitch and McColl[6] ('the authors') primarily investigated the consequences of flicker in fluorescent lamps on a visual task, with a secondary evaluation of the effects of light spectrum. Examination of the protocols and data reveals that the primary study shows an effect that is probably greater than that reported in the paper, while the secondary study is weaker than described.

In this work both the horizontal illuminance at the task and the task luminance were measured. The luminances indicated in Table 1[6] are generally about 15% higher for the low-frequency (LF) operation than for the high-frequency (HF) operation, even though the task horizontal illuminance is set to the same value for both LF and HF conditions. The authors note this discrepancy and state that it might be due to 'artefacts of the speed of the detector array' of the luminance instrument (Photo Research, Pritchard Model 703A, Northridge, CA). However, the instrument maker, in telephone conversations, claims that this model records accurately in both LF and HF conditions. Likewise, the United States representative for the Hagner illuminance meter (Cooke Corp, Hagner Model S2, Buffalo, NY) claims their meter is accurate when measuring both LF and HF sources. A possible explanation for the discrepancy between results from the meters could be electromagnetic interference (EMI) from the HF ballasts. In Figure 2[6] the illuminance probe is shown resting just above the lamp housing, and might be quite near the ballast. Various degrees of EMI can occur, depending on the quality of grounding and the amount of shielding of the fixture, as well as the integrity of the shielding of the probe-to-meter cable (since the electrical current carried by the probe cable is very small). Cooke Corp. also indicated to us that meters have malfunctioned under high-EMI conditions associated with high-voltage switching. Since the task luminance is the psychophysically appropriate measure of stimulus, and the luminance meter was placed much further away from the ballasts with less opportunity for an EMI problem, we consider its values to be the more representative of the test lighting conditions. In which case, according to Table 1[6], the subjects are provided with 13% to 22% less luminance under HF conditions, and yet they perform better on the visual task. Furthermore, the data in Table 2[6] show that the effect is present for each lamp, despite the fact that each lamp's effects were studied with a separate set of 16 subjects. This result, which might be an