Agreement Failure #2:

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My test program output

Condition 3

Input retinal illuminance of 340.0 uWatts/cm2

Wavelength 580 nm

Stimulus diamter 2.0 degrees

Stimulus duration 100.0 seconds

Eye length 17.0 mm

Pupil diameter 2.0 mm

Assuming ANSI standard eye length of 17.0 mm

Assuming ANSI pupil diameter of 3.0 mm

Excluding limiting cone angle calculation

Converts to retinal illuminance of 15.0 log10 quanta/[cm2-sec] (cf. 15.0)

Converts to 5.77 log10 photopic trolands (cf. 5.77)

Converts to 5.31 log10 scotopic trolands (cf. 5.31)

Converts to 185848.3 cd/m2 (cf. 190000.0)

Converts to radiance 31.3 mWatts/[cm2-sr] (cf. 31.3)

Converts to corneal irradiance 29.9 uWatts/cm2 (cf. 29.9)

Converts to total radiant power in the pupil of 0.00094 mW (cf. 0.00094)

MPE calculations

Using pupil factor 5.44 (cf. 5.44)

Effective pupil diameter is 3.0 mm (cf. 3.0)

Using Cb 398.11 (cf. 398.00)

Using Ce 23.27 (cf. 23.30)

Using Ct 1.00 (cf. 1.00)

Using T2 21.83 (cf. 10000.00)

MPE power in pupil limit 1.37 mWatts (cf. 0.936)

MPE retinal illuminance limit computed as 0.496 Watts/cm2 (cf. 0.339)

Limit - Stimulus log10 difference: 3.2 log10 units\*\*\*\*

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BY HAND:

Size is 2 degrees -> 34.9 mrad.

Duration is 20000 seconds.

Wavelength is 700 nm.

-> Need to check thermal limits from Table 5b.

Thermal limit:

T2 = 21.8316 seconds [differs from Delori’s spreadsheet number, T2 = 10000]

MPE = 1.8 Ce T2-0.25\*1e-3 W/cm-2 – corneal irradiance

Ce = 23.27

MPE = 0.0194 W/cm-2 – corneal irradiance

For this case, we get a pupil diameter of 7 mm assumed by the standard as I understand the 2007 JOSA paper equation 8 and surrounding material (pupil factor 1). If the spreadsheet incorporates this factor, which I think it does, then we end up with the conclusion that we can tolerate power in the 7 mm pupil of 0.0075 W = 7.5 mW, which is what my program gives (0.0075 = 0.0194\*0.3848).

Maybe Delori’s spreadsheet really uses T2 = 10000, as it indicates, in which case he’d compute the thermal limit as

MPE = 1.8 Ce 10000-0.25 \*1e-3 J/cm-2 = 0.0042 W/cm-2 – corneal irradiance. Factoring in

the pupil factor, this leads to power in the pupil of 0.00161 W = 1.61 mW, which is what the spreadsheet gives. So I think the T2 value explains the discrepancy.