

## Brightness compensated color vision tests on computer controlled CRT display

PhD work

### Thesis

**T1** Both the lin-log + MSE gamma calculation and the non-spectral CT method are applicable for the calibration of CRT displays used for color vision tests if there is prior information on the spectral distribution of the display's phosphors.

**T2** The equivalent luminance values in common CRT luminance ranges ( $L_R=2\dots40$  cd/m<sup>2</sup>,  $L_B=1,5\dots10$  cd/m<sup>2</sup>) can be described with the following equations:

- $L_G = a_{RG} + b_{RG} \cdot L_R$  (red-green) and
- $L_G = a_{BG} + b_{BG} \cdot L_B$  (blue-green)

These equations represent equibrightness-perception lines.

**T3** The *Modified Minimal Apparent Motion (MMAM)* brightness-perception matching method which is a further development of the *Minimal Apparent Motion (MAM)* has significantly better repeatability and smaller relative error than the following brightness-perception matching methods: *Minimum Flicker (MF)*, *Direct Matching (DM)*, *Minimal Distinct Border (MDB)*, *Minimal Apparent Motion (MAM)*.

**T4** The following equations describe the luminances evoking equal brightness-perceptions at the *Modified Direct Matching (MDM)* method from the luminances created by the CRT primaries at the brightness-perception measurement of the *Minimal Apparent Motion (MMAM)* method:

- $L_{R,DM} = -0,996 + 1,454 \cdot L_{R,MMAM} - 0,025 \cdot L_{R,MMAM}^2$
- $L_{G,DM} = -0,620 + 1,431 \cdot L_{G,MMAM} - 0,010 \cdot L_{G,MMAM}^2$
- $L_{B,DM} = -0,818 + 1,472 \cdot L_{B,MMAM} - 0,048 \cdot L_{B,MMAM}^2$

The equations can be applied at the following luminance ranges:

$L_{R,MMAM}=2\dots15$  cd/m<sup>2</sup>,  $L_{G,MMAM}=2\dots40$  cd/m<sup>2</sup>,  $L_{B,MMAM}=2\dots10$  cd/m<sup>2</sup>.

**T5** The equibrightness-perception lines measured with the red-green *Modified Minimal Apparent Motion (MMAM)* brightness-perception matching method can be applied for:  
**a./** the determination of color deficiency,

**b./** for the discrimination of protans and deutans where the gradient of the equibrightness-perception lines at protans is larger and at deutans is smaller than the gradient of the line at normal color vision.

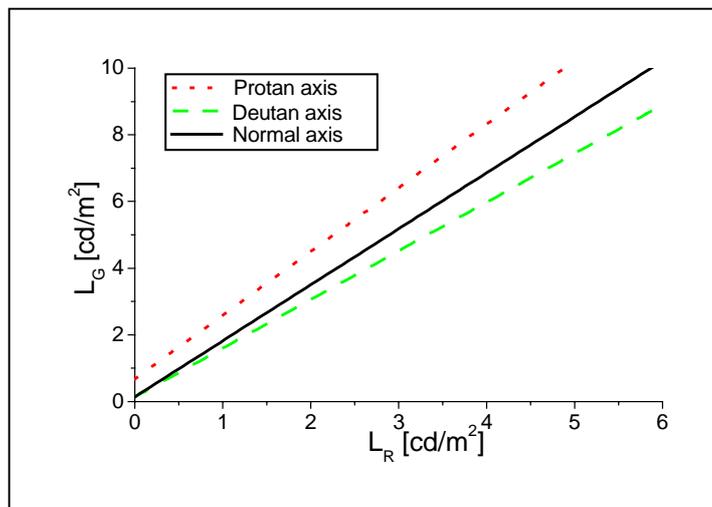


Fig. T5.

**T6** Modifying the color temperature of the adaptative field at the *Modified Minimal Apparent Motion (MMAM)* tests on CRT displays doesn't have significant influence on the mean value of the parameters ( $a_{RG}$ ,  $b_{RG}$ ) in the red-green equibrightness-perception equation of normal color vision.

**T7** The complex and P15 type pseudo-isochromatic tests:

**a./** require brightness-perception compensation

**b./** are capable to significantly discriminate protans and deutans after brightness-perception compensation.