

# Potential response function of achromatic vision space $T^*_{POT4}$

| nonlinear color terms                                           | name and relationship with test field luminance $L$                                                                                                                                                                                                                                                                                                       | notes                                                                                                                                                                                                                                |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>threshold sum</b><br>$T^*_{POT4}$                            | $T^*_{POT4} = A_4 \cdot [(A_1 + A_3 \cdot L)^t - 1]; X = A_1 + A_3 \cdot L$ $= A_4 \cdot [X^t - 1]; dX/dL = A_3$ $= V \cdot (L_s/s)^t \cdot [(1-s + s \cdot L / L_s)^t - 1]$                                                                                                                                                                              | <i>K. Richter</i> 1988:<br>exponent: $t = -0,25$<br>or: $n = 1 - t = 1,25$<br>for presentation time:<br>$t_p = 0,4s$ ( <i>Lingelbach</i> experiments 1977)                                                                           |
| <b>CIE luminance contrast sensitivity threshold</b><br>$L / dL$ | $dT^*_{POT4} / dX = A_4 \cdot t \cdot X^{t-1}$ $dT^*_{POT4} / dL = dT^*_{POT4} / dX \cdot dX / dL$ $dT^*_{POT4} / dL = A_4 \cdot t \cdot X^{t-1} \cdot A_3$ <p>for <math>dT^*_{POT4}=1</math>, and multiplication with <math>L</math>:</p> $L / dL = A_4 \cdot L \cdot t \cdot A_3 \cdot X^{t-1}$ $= A_4 \cdot L \cdot t \cdot A_3 \cdot [A_1 + A_3 L]^t$ | threshold data $s, L_s$ :<br>$s = 1 - A_1$<br>$L_s = (1 - A_1) / A_3$<br>$V = A_4 \cdot (L_s / s)^{-t}$<br>$s = 1 / [1 + (t \cdot V \cdot L^t)^{1/(1-n)}]$<br>for large $L$ :<br>$T^*_{POT4} = V \cdot L^t$<br>for least square fit: |
| <b>CIE luminance difference threshold</b><br>$dL$               | $dL = 1 / (A_4 \cdot t \cdot A_3 \cdot X^{t-1})$ $= (A_1 + A_3 L)^n / (A_4 \cdot t \cdot A_3)$                                                                                                                                                                                                                                                            | $dX/dA1 = 1$<br>$dX/dA3 = L$<br>$dX/dL = A_3$                                                                                                                                                                                        |