Lightness L^*_W for surround white W

For adjacent surface colours in the range $3{,}6<Y<90$

or the digital range $100/255=0{,}39<Y<100$ it is valid:

$L^*_W = a\,(Y/Y_W)^k$ **[1]** **a=100; Y_W=100; k=0,50=1/2,0**

$= b\,(Y/Y_u)^k$ **[2]** **b=a$(Y_u/Y_W)^k$=42; Y_u=18**

For $Y=Y_u$ it is valid: $L^*=42$.

Derivation of equation [2] gives with $1-k = 0{,}50$:

$\delta(L^*_W)/\delta Y = c\,(Y/Y_u)^{1-k}$ **[3]** $c = (b\,k)/Y_u = 21/18 = 1{,}17$

or for the treshold $\delta(L^*_W)=1$

$\delta Y = d\,(Y/Y_u)^{1-k}$ **[4]** $d = Y_u/(b\,k) = 18/21 = 0{,}86$

For the surround lightness $L^*_{Wu} = 50$ with $Y=Y_u$ the threshold is:

$\delta Y_{Wu} = 0{,}86$. This threshold is *independent* of k.