Relationship brightness $B^*_{1,T}$ and luminance L_T as function of viewing angle φ for test equal adaptation luminance L_a=1000 cd/m²

$B^*_{1,T}(L_T, L_a, \varphi) = C_T(\varphi)\frac{L_T^{\gamma}}{L_T + B_d(L_a,\varphi)} - B_d(L_a,\varphi)$ brightness $B^*_{1,T}$ [1]

$B_d(L_a,\varphi) = C_T(\varphi)[S_d(\varphi) + S_T(\varphi)\frac{L_a}{n}]^{\gamma}$ (n=0,31) [2]

$L_{1,d}(L_a,\varphi) = [S_d(\varphi) + S_T(\varphi)\frac{L_a}{n}]^{1/\gamma}$ (=black threshold) [3]

$s_d(\varphi) = C_T(\varphi)\,[S_d(\varphi) - B_d(L_a,\varphi)]$ [4] (=scaling factor)

L_T	φ	$C_T(\varphi)$	$S_d(\varphi)$	$S_T(\varphi)$	$B_d(L_a,\varphi)$	$B^*_{1,T}$	$L_{1,d}$	L_a/L_T	$s_d(\varphi)$ $B^*_{1,T}$	$s_d(\varphi)$ $B^*_{1,T}$
1000	120°	22,969	0,0718	0,2448	49,51	145,98	11,91	83,94	22,96	49,51
1000	100°	23,128	0,0747	0,2494	49,51	145,98	11,91	83,94	22,96	49,51
1000	90°	23,415	0,1086	0,2526	50,82	146,02	12,68	78,86	23,12	50,82
1000	60°	23,973	0,1313	0,2657	52,88	145,98	13,85	72,15	23,14	52,88
1000	30°	26,235	0,1797	0,3188	57,37	146,66	16,69	59,88	23,97	57,37
1000	20°	27,971	0,2013	0,3555	75,92	147,37	30,80	32,46	25,72	75,92
1000	10°	30,747	0,2730	0,3984	90,28	147,78	43,81	22,82	27,97	90,28
221,4	120°	22,969	0,0718	0,2448	49,51	70,91	11,91	83,94	22,96	49,51

Sep20-1a L_a=1000,1,300–Light-3,33, Lighter=1,45, 0° ⇔ 0° = 120°

Relationship brightness $B^*_{1,T}$ and luminance L_T as function of viewing angle φ for test equal adaptation luminance L_a=200 cd/m²

$B^*_{1,T}(L_T, L_a, \varphi) = s_d(\varphi)\frac{L_T^{\gamma} - d_d(L_a,\varphi)}{L_T + B_d(L_a,\varphi)}$ brightness $B^*_{1,T}$ [1]

$B_d(L_a,\varphi) = C_T(\varphi)[S_d(\varphi) + S_T(\varphi)\frac{L_a}{n}]^{\gamma}$ (n=0,31) [2]

$s_d(\varphi) = C_T(\varphi)\,[S_d(\varphi) - B_d(L_a,\varphi)]$ [4] (=scaling factor)

$d_d(L_a,\varphi) = B_d(L_a,\varphi)$ [4] (=scaling factor)

L_T	φ	$C_T(\varphi)$	$S_d(\varphi)$	$S_T(\varphi)$	$B_d(L_a,\varphi)$	$B^*_{1,T}$	$L_{1,d}$	L_a/L_T	$s_d(\varphi)$ $B^*_{1,T}$	$s_d(\varphi)$ $B^*_{1,T}$
1000	120°	22,969	0,0718	0,2448	49,51	145,98	22,96	49,51	22,96	49,51
1000	100°	23,128	0,0747	0,2494	49,51	145,98	22,96	49,51	22,96	49,51
1000	90°	23,415	0,1086	0,2526	50,82	146,02	23,12	50,82	23,12	50,82
1000	60°	23,973	0,1313	0,2657	52,88	145,98	23,14	52,88	23,14	52,88
1000	30°	26,235	0,1797	0,3188	57,37	146,66	23,97	57,37	23,97	57,37
1000	20°	27,971	0,2013	0,3555	75,92	147,37	26,23	75,92	25,72	75,92
1000	10°	30,747	0,2730	0,3984	90,28	147,78	27,97	90,28	27,97	90,28
9,11	120°	22,969	0,0718	0,2448	49,51	70,91	11,91	83,94	22,96	49,51

Sep20-1a L_a=40,1,300–Light-0,13, Lighter=0,53, 0° ⇔ 0° = 120°

Relationship brightness $B^*_{1,T}$ and luminance L_T as function of viewing angle φ for test equal adaptation luminance L_a=40 cd/m²

$B^*_{1,T}(L_T, L_a, \varphi) = s_d(\varphi)\frac{L_T^{\gamma} - d_d(L_a,\varphi)}{L_T + B_d(L_a,\varphi)}$ brightness $B^*_{1,T}$ [1]

$B_d(L_a,\varphi) = C_T(\varphi)[S_d(\varphi) + S_T(\varphi)\frac{L_a}{n}]^{\gamma}$ (n=0,31) [2]

$s_d(\varphi) = C_T(\varphi)\,[S_d(\varphi) - B_d(L_a,\varphi)]$ [4] (=scaling factor)

$d_d(L_a,\varphi) = B_d(L_a,\varphi)$ [4] (=scaling factor)

L_T	φ	$C_T(\varphi)$	$S_d(\varphi)$	$S_T(\varphi)$	$B_d(L_a,\varphi)$	$B^*_{1,T}$	$L_{1,d}$	L_a/L_T	$s_d(\varphi)$ $B^*_{1,T}$	$s_d(\varphi)$ $B^*_{1,T}$
1000	120°	22,969	0,0718	0,2448	49,51	145,98	22,96	49,51	22,96	49,51
1000	100°	23,128	0,0747	0,2494	49,83	146,04	23,14	49,83	23,12	49,83
1000	90°	23,415	0,1086	0,2526	51,10	146,06	23,29	51,10	23,12	51,10
1000	60°	23,973	0,1313	0,2657	53,14	146,02	23,32	53,14	23,14	53,14
1000	30°	26,235	0,1797	0,3188	57,66	146,69	24,17	57,66	23,97	57,66
1000	20°	27,971	0,2013	0,3555	76,31	147,40	26,44	76,31	25,72	76,31
1000	10°	30,747	0,2730	0,3984	90,78	147,81	28,21	90,78	27,97	90,78
9,41	120°	22,969	0,0718	0,2448	49,51	70,91	11,91	83,94	22,96	49,51

Sep20-1a L_a=40,1,300–Light-0,13, Lighter=0,53, 0° ⇔ 0° = 120°

Relationship brightness $B^*_{1,T}$ and luminance L_T as function of viewing angle φ for test equal adaptation luminance L_a=8 cd/m²

$B^*_{1,T}(L_T, L_a, \varphi) = s_d(\varphi)\frac{L_T^{\gamma} - d_d(L_a,\varphi)}{L_T + B_d(L_a,\varphi)}$ brightness $B^*_{1,T}$ [1]

$B_d(L_a,\varphi) = C_T(\varphi)[S_d(\varphi) + S_T(\varphi)\frac{L_a}{n}]^{\gamma}$ (n=0,31) [2]

$s_d(\varphi) = C_T(\varphi)\,[S_d(\varphi) - B_d(L_a,\varphi)]$ [4] (=scaling factor)

$d_d(L_a,\varphi) = B_d(L_a,\varphi)$ [4] (=scaling factor)

L_T	φ	$C_T(\varphi)$	$S_d(\varphi)$	$S_T(\varphi)$	$B_d(L_a,\varphi)$	$B^*_{1,T}$	$L_{1,d}$	L_a/L_T	$s_d(\varphi)$ $B^*_{1,T}$	$s_d(\varphi)$ $B^*_{1,T}$
1000	120°	22,969	0,0718	0,2448	49,51	145,98	22,96	49,51	22,96	49,51
1000	100°	23,128	0,0747	0,2494	49,83	146,04	23,14	49,83	23,12	49,83
1000	90°	23,415	0,1086	0,2526	51,10	146,06	23,29	51,10	23,12	51,10
1000	60°	23,973	0,1313	0,2657	53,14	146,02	23,32	53,14	23,14	53,14
1000	30°	26,235	0,1797	0,3188	57,66	146,69	24,17	57,66	23,97	57,66
1000	20°	27,971	0,2013	0,3555	76,31	147,40	26,44	76,31	25,72	76,31
1000	10°	30,747	0,2730	0,3984	90,78	147,81	28,21	90,78	27,97	90,78
1,91	120°	22,969	0,0718	0,2448	12,36	15,69	0,13	58,98	1,91	12,36

Sep21-1a L_a=8,1,300–Light-0,02, Lighter=0,32, 0° ⇔ 0° = 120°

Relationship brightness $B^*_{1,T}$ and luminance L_T as function of viewing angle φ for test equal adaptation luminance L_a=200 cd/m²

$B^*_{1,T}(L_T, L_a, \varphi) = s_d(\varphi)\frac{L_T^{\gamma} - d_d(L_a,\varphi)}{L_T + B_d(L_a,\varphi)}$ brightness $B^*_{1,T}$ [1]

$B_d(L_a,\varphi) = C_T(\varphi)[S_d(\varphi) + S_T(\varphi)\frac{L_a}{n}]^{\gamma}$ (n=0,31) [2]

$s_d(\varphi) = C_T(\varphi)\,[S_d(\varphi) - B_d(L_a,\varphi)]$ [4] (=scaling factor)

$d_d(L_a,\varphi) = B_d(L_a,\varphi)$ [4] (=scaling factor)

L_T	φ	$C_T(\varphi)$	$S_d(\varphi)$	$S_T(\varphi)$	$B_d(L_a,\varphi)$	$B^*_{1,T}$	$L_{1,d}$	L_a/L_T	$s_d(\varphi)$ $B^*_{1,T}$	$s_d(\varphi)$ $B^*_{1,T}$
200	120°	22,969	0,0718	0,2448	30,71	87,99	2,55	78,36	200	120°
200	100°	23,128	0,0747	0,2494	31,54	87,98	2,72	73,51	200	100°
200	90°	23,415	0,1086	0,2526	33,11	88,01	3,46	65,36	200	90°
200	60°	23,973	0,1313	0,2657	36,07	87,81	4,23	53,51	200	60°
200	30°	26,235	0,1797	0,3188	47,94	87,63	6,99	28,58	200	30°
200	20°	27,971	0,2013	0,3555	57,02	87,52	9,95	20,09	200	20°
200	10°	30,747	0,2730	0,3984	71,70	87,97	15,35	13,02	200	10°
44,9	120°	22,969	0,0718	0,2448	30,71	43,99	2,55	78,36	44,9	120°

Sep19-5e L_a=200,1,300–Light-0,66, Lighter=0,88, 0° ⇔ 0° = 120°

Relationship brightness $B^*_{1,T}$ and luminance L_T as function of viewing angle φ for test equal adaptation luminance L_a=200 cd/m²

$B^*_{1,T}(L_T, L_a, \varphi) = s_d(\varphi)\frac{L_T^{\gamma} - d_d(L_a,\varphi)}{L_T + B_d(L_a,\varphi)}$ brightness $B^*_{1,T}$ [1]

$B_d(L_a,\varphi) = C_T(\varphi)[S_d(\varphi) + S_T(\varphi)\frac{L_a}{n}]^{\gamma}$ (n=0,31) [2]

$s_d(\varphi) = C_T(\varphi)\,[S_d(\varphi) - B_d(L_a,\varphi)]$ [4] (=scaling factor)

$d_d(L_a,\varphi) = B_d(L_a,\varphi)$ [4] (=scaling factor)

L_T	φ	$C_T(\varphi)$	$S_d(\varphi)$	$S_T(\varphi)$	$B_d(L_a,\varphi)$	$B^*_{1,T}$	$L_{1,d}$	L_a/L_T	$s_d(\varphi)$ $B^*_{1,T}$	$s_d(\varphi)$ $B^*_{1,T}$
200	120°	22,969	0,0718	0,2448	30,71	87,99	2,55	78,36	200	120°
200	100°	23,128	0,0747	0,2494	31,76	88,08	2,73	73,32	200	100°
200	90°	23,415	0,1086	0,2526	33,11	88,07	3,46	65,36	200	90°
200	60°	23,973	0,1313	0,2657	36,07	87,81	4,23	53,51	200	60°
200	30°	26,235	0,1797	0,3188	47,94	87,63	6,99	28,58	200	30°
200	20°	27,971	0,2013	0,3555	57,02	87,52	9,95	20,09	200	20°
200	10°	30,747	0,2730	0,3984	71,70	88,07	17,41	13,02	200	10°
19,2	120°	22,969	0,0718	0,2448	30,71	50,00	2,89	78,36	10,0	120°

Sep19-5e L_a=200,1,300–Light-0,66, Lighter=0,88, 0° ⇔ 0° = 120°

Relationship brightness $B^*_{1,T}$ and luminance L_T as function of viewing angle φ for test equal adaptation luminance L_a=8 cd/m²

$B^*_{1,T}(L_T, L_a, \varphi) = s_d(\varphi)\frac{L_T^{\gamma} - d_d(L_a,\varphi)}{L_T + B_d(L_a,\varphi)}$ brightness $B^*_{1,T}$ [1]

$B_d(L_a,\varphi) = C_T(\varphi)[S_d(\varphi) + S_T(\varphi)\frac{L_a}{n}]^{\gamma}$ (n=0,31) [2]

$s_d(\varphi) = C_T(\varphi)\,[S_d(\varphi) - B_d(L_a,\varphi)]$ [4] (=scaling factor)

$d_d(L_a,\varphi) = B_d(L_a,\varphi)$ [4] (=scaling factor)

L_T	φ	$C_T(\varphi)$	$S_d(\varphi)$	$S_T(\varphi)$	$B_d(L_a,\varphi)$	$B^*_{1,T}$	$L_{1,d}$	L_a/L_T	$s_d(\varphi)$ $B^*_{1,T}$	$s_d(\varphi)$ $B^*_{1,T}$
8	120°	22,969	0,0718	0,2448	12,36	31,39	0,13	58,98	8	120°
8	100°	23,128	0,0747	0,2494	12,71	31,34	0,14	55,04	8	100°
8	90°	23,415	0,1086	0,2526	13,24	31,34	0,14	43,86	8	90°
8	60°	23,973	0,1313	0,2657	15,28	30,38	0,23	34,14	8	60°
8	30°	26,235	0,1797	0,3188	20,65	29,32	0,46	17,30	8	30°
8	20°	27,971	0,2013	0,3555	24,58	28,71	0,65	12,13	8	20°
8	10°	30,747	0,2730	0,3984	31,73	28,64	1,16	7,22	8	10°
1,91	120°	22,969	0,0718	0,2448	12,36	15,69	0,13	58,98	1,91	120°

Sep21-5a L_a=8,1,300–Light-0,02, Lighter=0,32, 0° ⇔ 0° = 120°

Relationship brightness $B^*_{1,T}$ and luminance L_T as function of viewing angle φ for test equal adaptation luminance L_a=8 cd/m²

$B^*_{1,T}(L_T, L_a, \varphi) = s_d(\varphi)\frac{L_T^{\gamma} - d_d(L_a,\varphi)}{L_T + B_d(L_a,\varphi)}$ brightness $B^*_{1,T}$ [1]

$B_d(L_a,\varphi) = C_T(\varphi)[S_d(\varphi) + S_T(\varphi)\frac{L_a}{n}]^{\gamma}$ (n=0,31) [2]

$s_d(\varphi) = C_T(\varphi)\,[S_d(\varphi) - B_d(L_a,\varphi)]$ [4] (=scaling factor)

$d_d(L_a,\varphi) = B_d(L_a,\varphi)$ [4] (=scaling factor)

L_T	φ	$C_T(\varphi)$	$S_d(\varphi)$	$S_T(\varphi)$	$B_d(L_a,\varphi)$	$B^*_{1,T}$	$L_{1,d}$	L_a/L_T	$s_d(\varphi)$ $B^*_{1,T}$	$s_d(\varphi)$ $B^*_{1,T}$
8	120°	22,969	0,0718	0,2448	12,36	96,57	0,41	58,98	8	120°
8	100°	23,128	0,0747	0,2494	12,71	96,45	0,44	55,04	8	100°
8	90°	23,415	0,1086	0,2526	13,81	94,72	0,56	43,86	8	90°
8	60°	23,973	0,1313	0,2657	15,28	93,46	0,72	34,14	8	60°
8	30°	26,235	0,1797	0,3188	20,65	90,21	1,42	17,30	8	30°
8	20°	27,971	0,2013	0,3555	24,58	88,31	2,02	12,13	8	20°
8	10°	30,747	0,2730	0,3984	31,73	82,56	3,40	7,22	8	10°
5,5	120°	22,969	0,0718	0,2448	12,36	50,00	0,41	58,98	2,0	120°

Sep21-5a L_a=8,1,300–Light-0,02, Lighter=0,32, 0° ⇔ 0° = 120°

TUB-test chart hep5; HAULAB, scaling of achromatic colours in white surround of 180 degree, *Haubner* (1980), Adaptations L_a=1000, 200, 40 & 8cd/m²; 7 viewing angles 120° to 10°