

Melanopic limits of metamer spectral optimisation in multi-channel smart lighting systems

Supplementary materials

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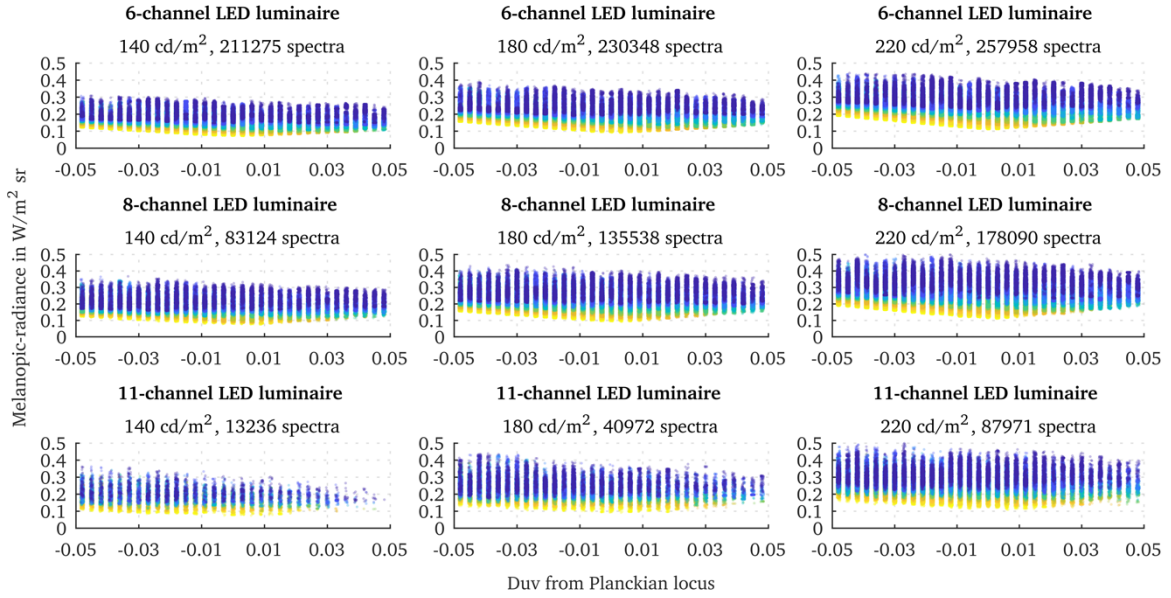


Figure S1 Scatter plot of all optimised spectra's melanopic radiance against Duv with a jitter of 0.0005 and without any colour rendition condition. A negative Duv denotes the chromaticity coordinates below the Planckian locus.

Table S1 Number of metamer spectra which were generated for the chromaticity coordinates in different conditions.

Luminaire configuration	Target luminance in cd/m ²	Solutions ¹⁾	Mean metamer count ²⁾	Total optimised spectra ³⁾
6-channel	140	474 of 561	445.73 SD ± 430.38	211275
6-channel	180	465 of 561	495.37 SD ± 267.41	230348
6-channel	220	459 of 561	562.00 SD ± 301.36	257958
8-channel	140	489 of 561	169.99 SD ± 112.07	83124
8-channel	180	476 of 561	284.74 SD ± 172.06	135538
8-channel	220	469 of 561	379.72 SD ± 155.37	178090
11-channel	140	437 of 561	30.29 SD ± 22.19	13236
11-channel	180	491 of 561	83.45 SD ± 65.17	40972
11-channel	220	499 of 561	176.29 SD ± 112.47	87971

- 1) For how many chromaticity targets a solution was found
- 2) Mean count of found metamer spectra for each chromaticity target
- 3) How many spectra were found across all chromaticity targets

Table S2 Maximum possible melanopic metamer contrast dependent on the used channel configuration and luminance.

Luminaire configuration	Target luminance in cd/m ²	Duv from Planck	CCT	Max. melanopic metamer contrast
6-channel	140	-0.009	4386 K	55.22%
6-channel	180	0.006	4717 K	56.65%
6-channel	220	-0.009	4101 K	58.28%
8-channel	140	-0.006	4717 K	55.52%
8-channel	180	0.006	3855 K	60.24%
8-channel	220	0.003	3855 K	65.85%
11-channel	140	0	3642 K	49.16%
11-channel	180	0.015	4101 K	53.60%
11-channel	220	-0.009	3292 K	62.67%

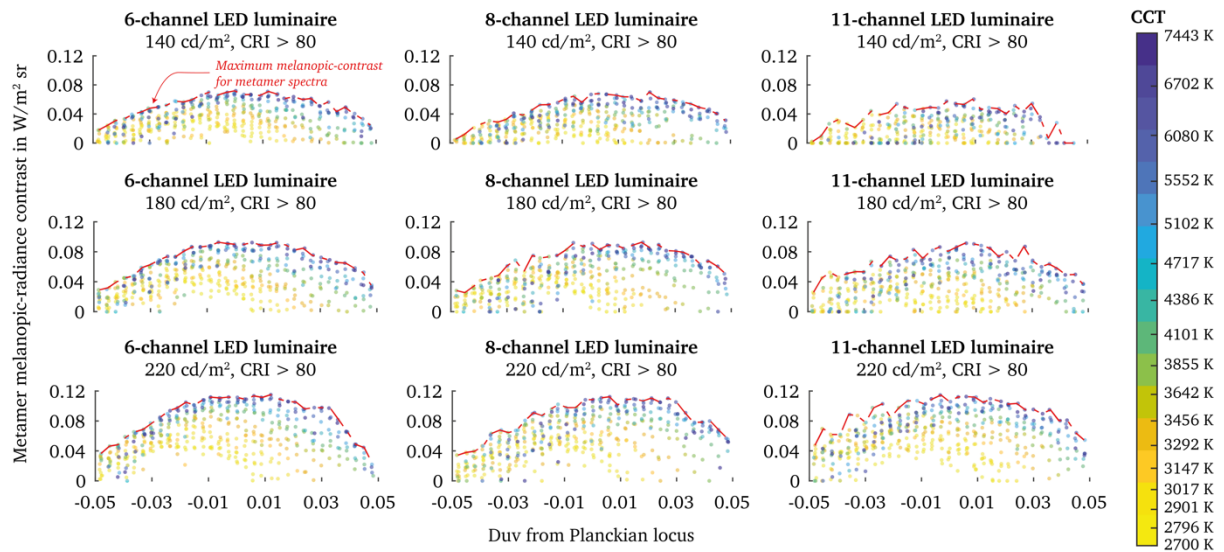


Figure S2 Maximum possible melanopic metamer contrast $\Delta\hat{L}_{Mel,max}$ for M_M in W/m²sr at a constant chromaticity coordinate within $\Delta u'v' \leq 7.05 \cdot 10^{-5}$. The highest metamer contrasts for the melanopic radiance can be achieved with chromaticity coordinates near the Planckian locus. By increasing the number of channels, a higher melanopic radiance contrast can be achieved above Planck.

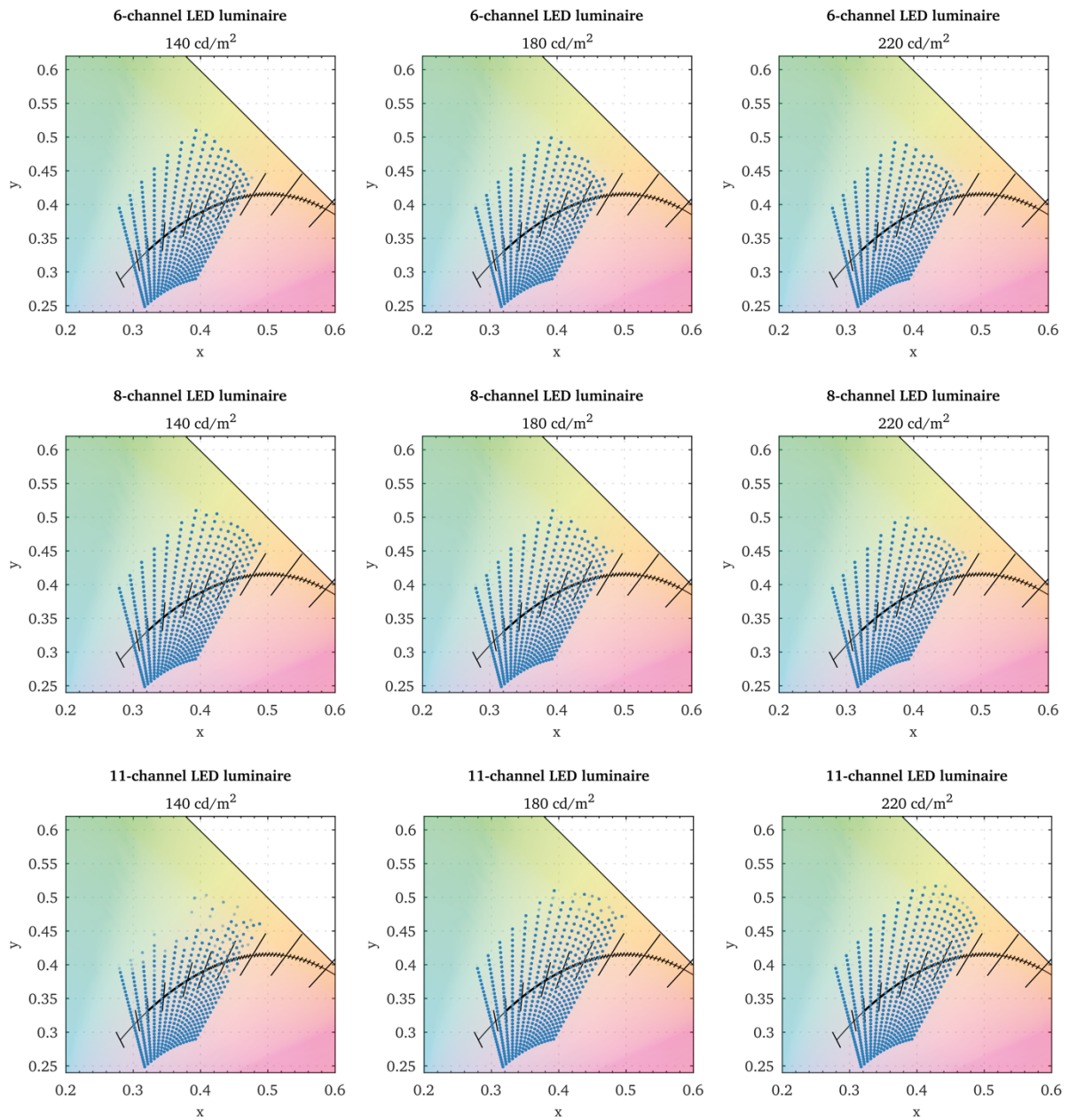


Figure S3 Illustration of the CIExy-2° chromaticity targets for which spectra were successfully optimised.