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Poster# PO44

Development of an Integrating Sphere Light Source of Multiple Lighting Elements for Generation of Wide Dynamic Range of Luminance

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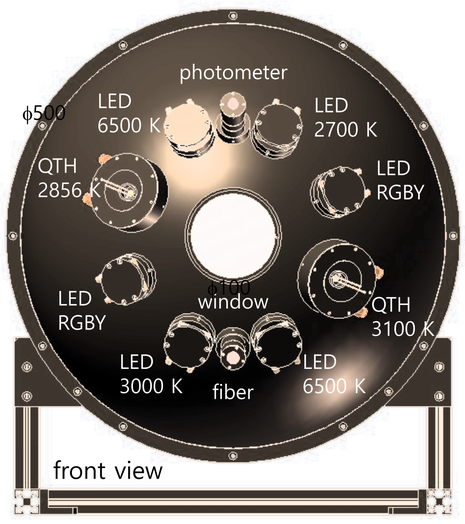
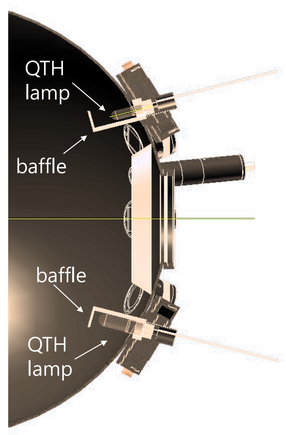
❑ Motivation

At KRISS, one of the most in-demand services in the field of photometry is of luminance meters. While we currently provide the luminance calibration service at the range of (1 ~ 3000) cd/m^2 using a QTH lamp-based sphere source, several customers have asked for extension of the calibration range down to 0.001 cd/m^2 and up to 100 000 cd/m^2. To meet this needs, we developed a new sphere source of multiple lighting elements which is capable of generating a wide dynamic range of luminance **(0.001 ~ 100 000) cd/m^2** and **a variety of spectral distributions** as well.

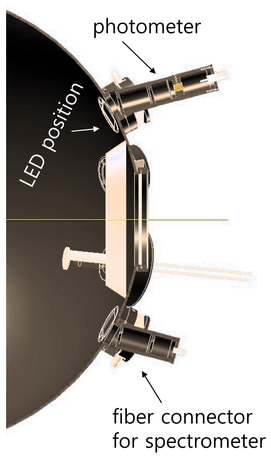
❑ Design Parameters

- integrating sphere
  - ϕ500 mm, $BaSO_4$ coated (ρ ~ 95 %), no center baffle
  - 1 window (ϕ100 mm), 8 source ports (ϕ40 mm), 2 detector ports (ϕ25 mm)
  - estimated luminance throughput ~10.4 (cd/m^2)/lm
- light sources
  - 10 W-RGBY LED for **colorimeter calibration**
    R ~270 lm × 2 EA, G ~440 lm × 2 EA., B ~100 lm × 2 EA, Y ~305 lm × 2 EA
  - 75 W-6500 K LED (~9600 lm × 2 EA) for **wide-dynamic range luminance generation and luminance meter linearity test**
  - 75 W-3000 K LED (~8500 lm × 1 EA)
  - 75 W-2700 K LED (~6430 lm × 1 EA)
  - 150 W-2860 K QTH (~800 lm × 1 EA) for **CIE illuminant A condition**
  - 150 W-3100 K QTH (~1500 lm × 1 EA) for **spectral radiance calibration**
  - all LEDs are temperature-controlled at 35 °C.
- power supply
  - voltage controlled current source (0 ~ 10 V scaled) + 16 bit DAC
  - 1 A/ 27 V 4 channels (RGBY LED)– 1 μA resolution (3 gain range)
  - 2 A/ 48 V 4 channels (W LED) – 0.2 μA resolution (4 gain range)
  - 6.25 A/ 27 V 2 channels (QTH) – 62 mA resolution (1 gain range)
- monitoring detectors
  - 1 filter-photometer of FOV ~5° (area =3.6 mm ×3.6 mm:, s_L = 66 pA/(cd/m^2), NEP = 4 fW (13 μcd/m^2) for luminance monitor and feedback control
  - 1 spectroradiometer of FOV ~5° (350 nm ~ 850 nm)

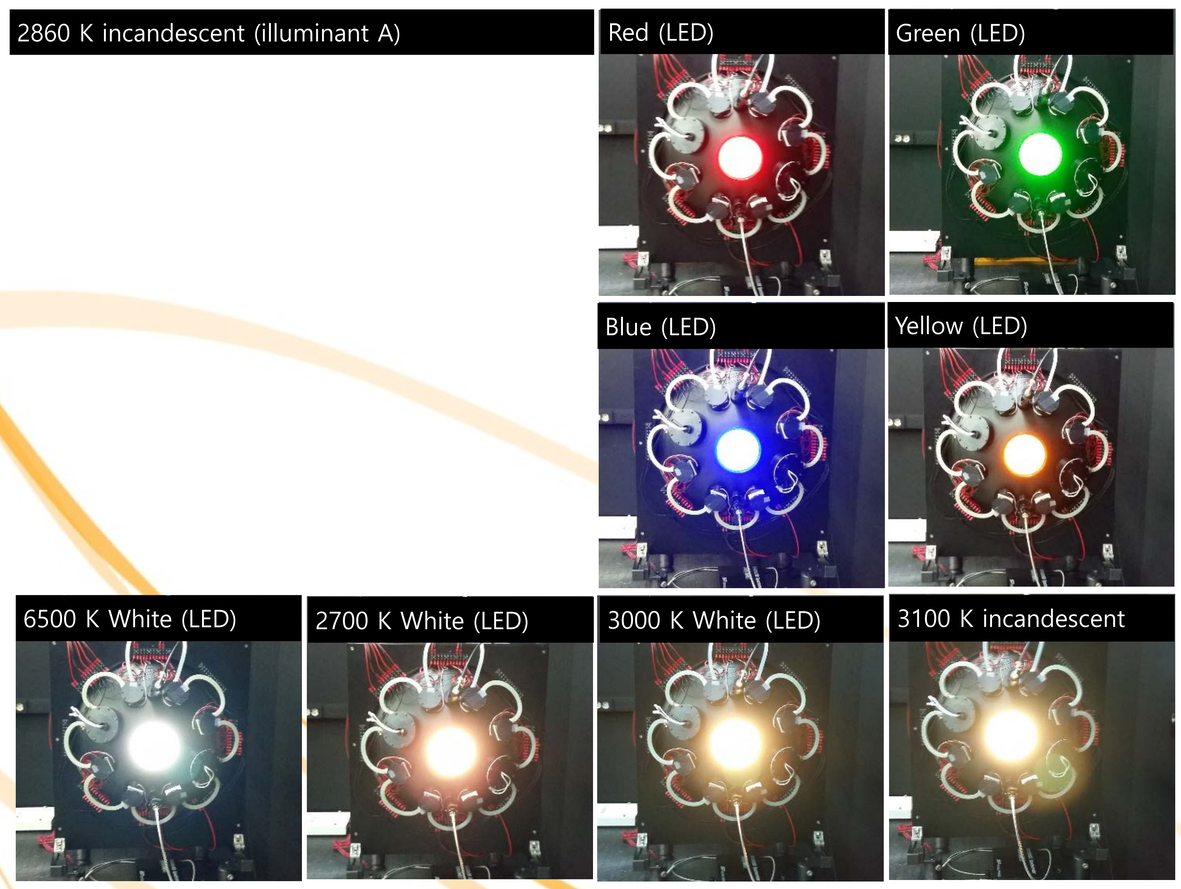




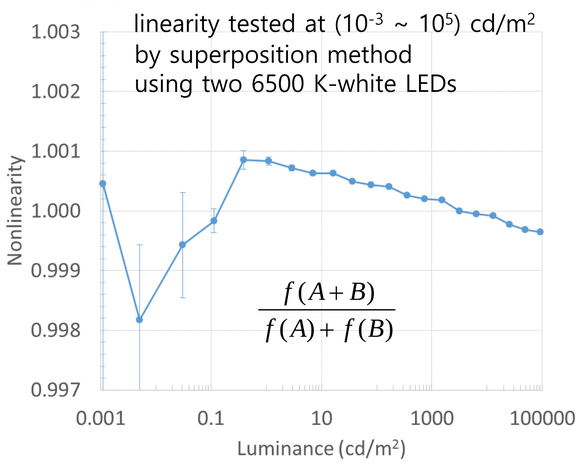
side view

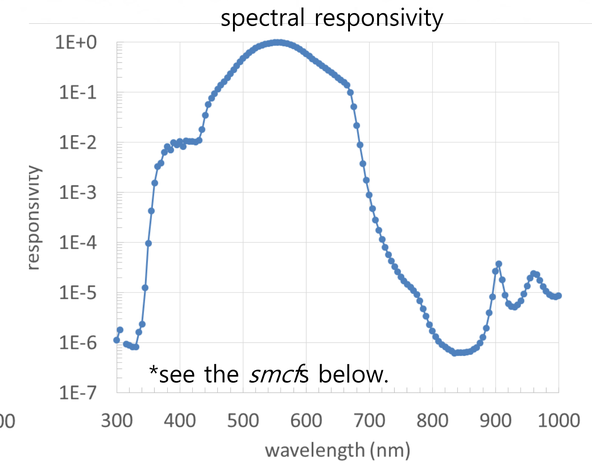


another side view



❑ Characterization of the Monitor Luminance Meter

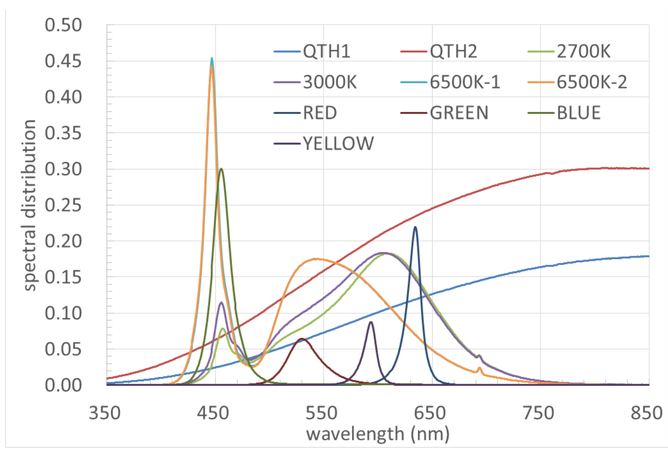


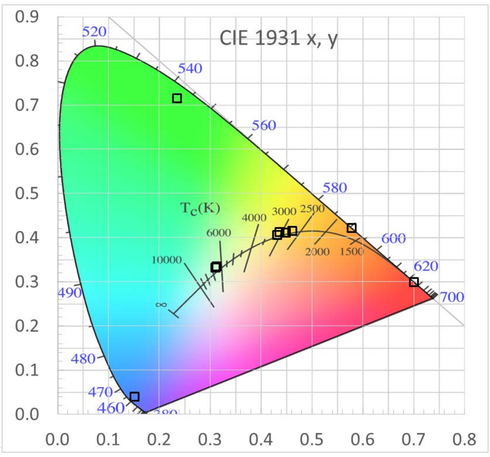


❑ Characterization of Output Luminance Field: Luminance, Chromaticity, etc.

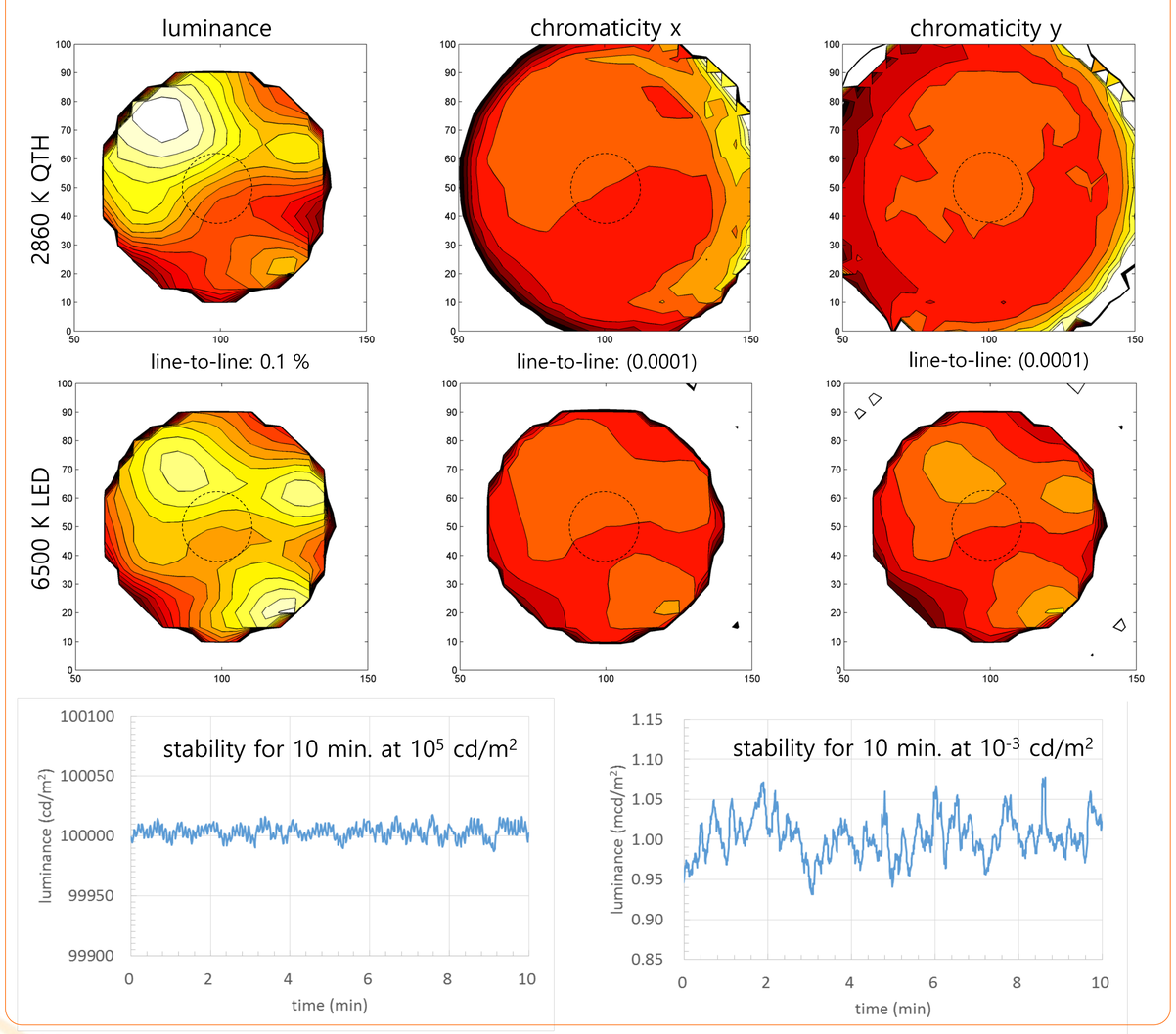
*smcf: spectral mismatch correction factor for the monitor photometer

Type	V/I-gain	V(V)	I(A)	*smcf**	L_v(cd/m^2)	*x*	*y*	CCT(K)
QTH_1	N.A.	6.984	4.717	1.000	5752	0.449	0.411	2857
QTH_2	N.A.	8.025	5.379	1.000	12228	0.431	0.405	3106
2700K	4/4	1	0.200	1.030	8324	0.462	0.415	2706
3000K	4/4	1	0.200	1.031	9302	0.437	0.412	3067
6500K-1	4/4	1	0.200	1.029	10152	0.311	0.332	6599
6500K-2	4/4	1	0.200	1.031	10153	0.312	0.335	6481
RED	3/3	1	0.100	0.923	702.8	0.701	0.299	N.A.
GREEN	3/3	1	0.100	1.043	1475	0.235	0.715	N.A.
BLUE	3/3	1	0.100	0.640	370.4	0.151	0.039	N.A.
YELLOW	3/3	1	0.100	1.125	728.8	0.578	0.422	N.A.





❑ Characterization of Output Luminance Field: Uniformity and Temporal Stability



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