

Light guide & Reflector-lens combination



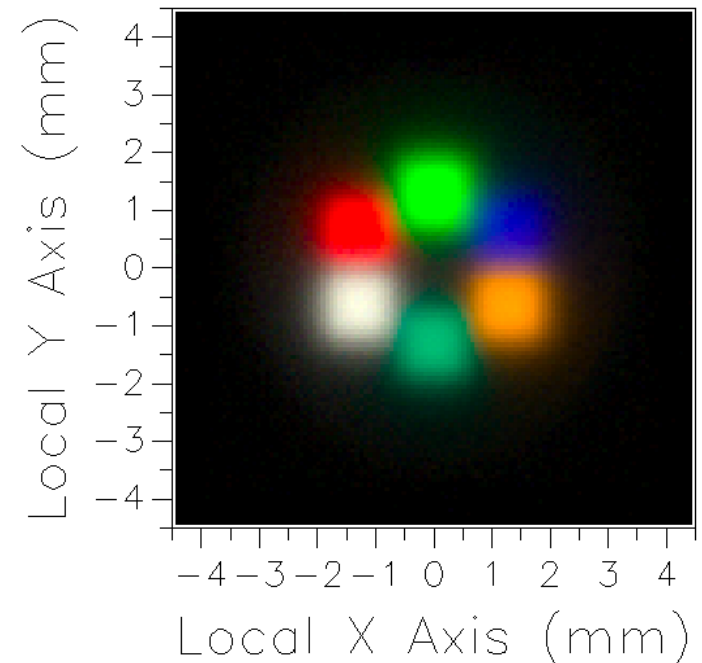
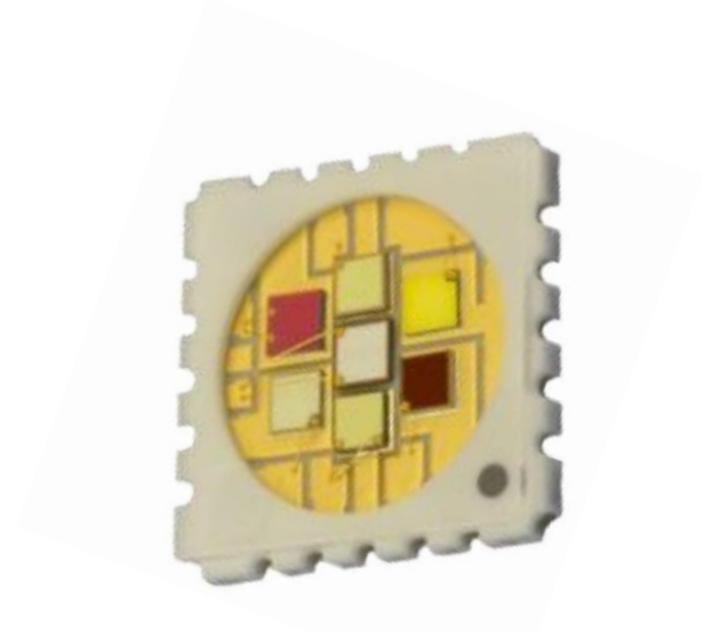
Introduction

- To mix the emission of multi-color LEDs efficiently and artifact-free light guides can be used
- These optics are typically not able to create tight spot lights.
- Within this report, an alternative method for spot creation is evaluated:
 - A light guide, and
 - a reflector-lens (“Jupiter 110”)
both available as standard optics from Auer Lighting
- The light guides were chosen to geometrically match the light emitting surface of the LED

Light Source

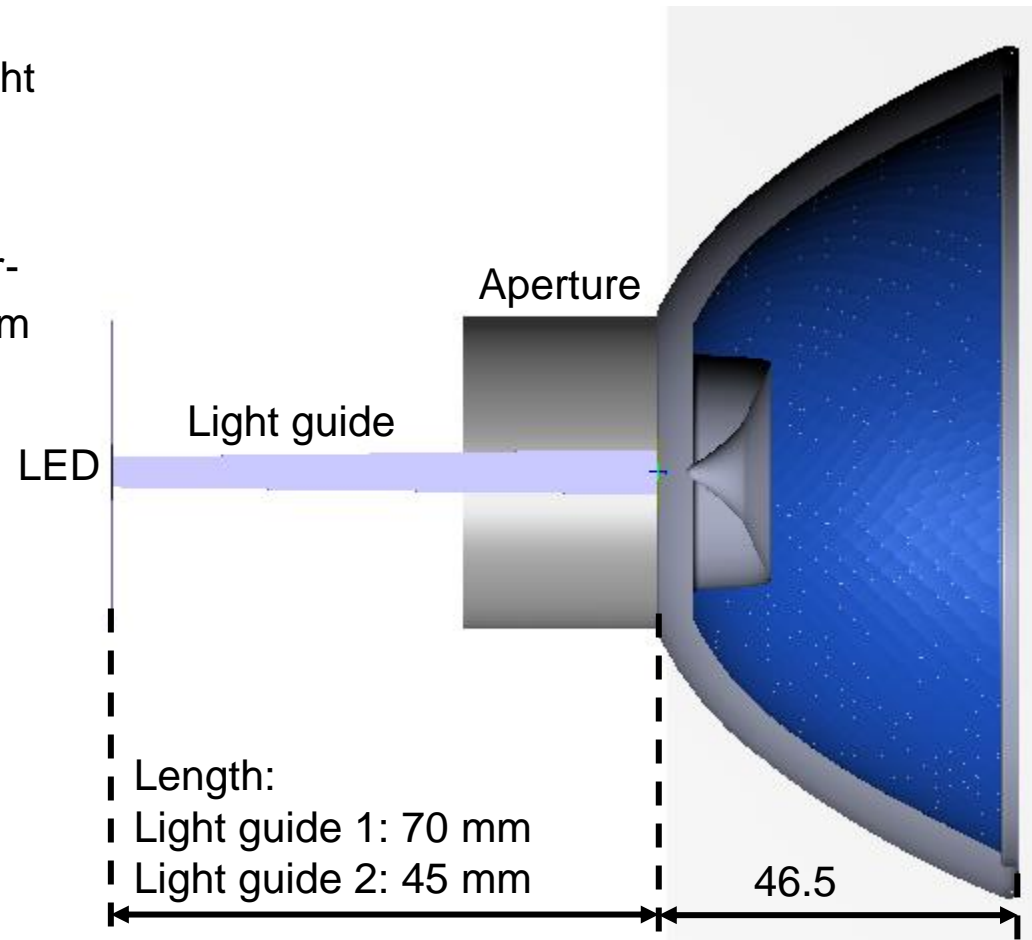
- Usage of LED Engin LZ7

Chip	Luminous flux [lm]	Ray data	No. of rays [x10 ⁶]
Green	220	dieA-Green-2m.fcr	1
Red	160	dieB-Red-2m.fcr	1
Blue	60	dieC-Blue-2m.fcr	1
Violet	1100 mW	dieD-Violet-2m.fcr	1
Cold white	350	dieE-CoolWhite-2m.fcr	1
Amber	130	dieF-Amber-2m.fcr	1
Cyan	120	dieG-Cyan-2m.fcr	1
LZ7 Total	1042.22		7



Simulation Setup

- The distance between LED and light guides entrance is 0.1 mm
- The distance between the reflector-lens and the light guides is 0.01 mm (“in contact”)
- The distance between reflector flange and detector is 3.16 m



Simulation Setup

Properties	
Light Source	
Model	LEDEngin LZ7
Ray data	see Page 3
No. of LED chips	7
No. of rays	7,000,000 (1,000,000 per chip)
LES	3.8 mm
Total luminous flux	1042 lm
Jupiter 110	
SAP / Drawing	1500188 / 71343_000_002_323
Geometry	109.4 mm (diameter) x 46.5 mm (height)
Coating	R = 95%
Light guide 1	
SAP / Drawing	1500723 / 71906_000_003_303
Entrance edge length	3.9 mm
Exit edge length	5.8 mm
Total length	70 mm
Flange	yes
Light guide 2	
SAP / Drawing	1501765 / 71916_000_000_313
Entrance edge length	4.3 mm
Exit edge length	10.8 mm
Total length	45 mm
Flange	no

Further information on the Jupiter 110 can be found here:

<https://shop.auer-lighting.com/nc/products/p/show/Product/124/27.html>



Further information on Light guide 1 can be found here:

<https://shop.auer-lighting.com/nc/products/p/show/Product/145/48.html>



Light guide 2 is available soon.

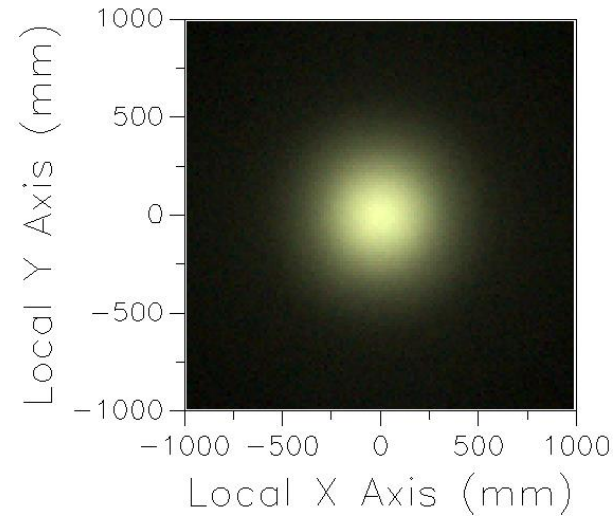
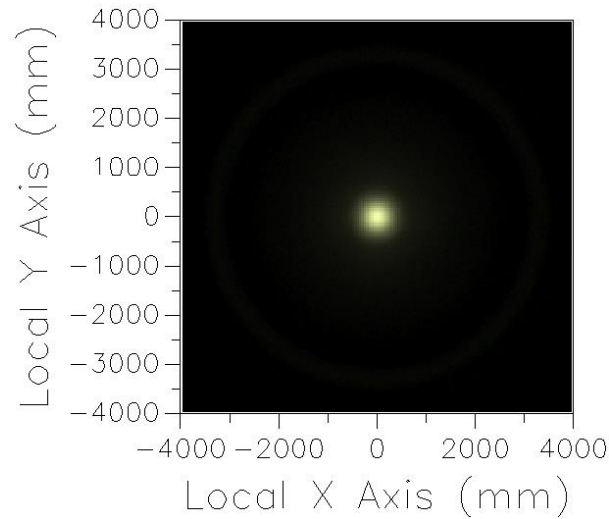
Results

- Luminous intensity distributions, illuminance distributions as well as RGB color images were evaluated on a screen in 3.16 m distance
- Beam angle and field angle and the respective luminous flux within each angular range were calculated

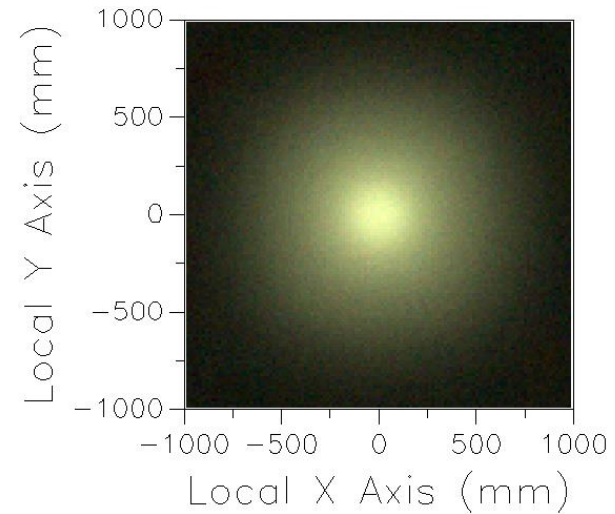
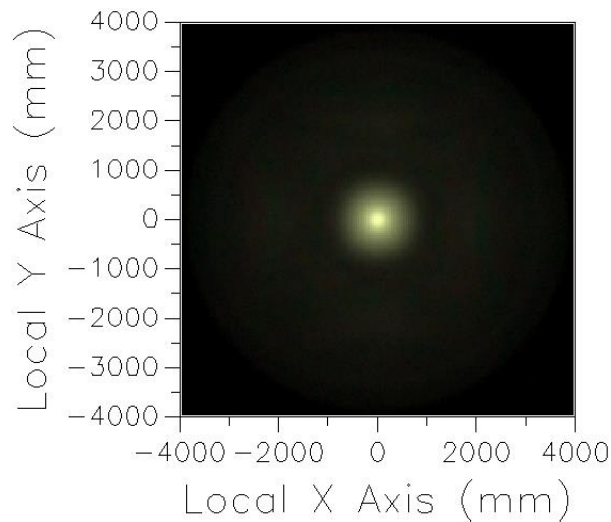
	System 1: Light guide 3.9 – 5.8 – 70	System 2: Light guide 4.3 – 10.8 – 45
Beam angle [°]	7.7	8.4
Rel. luminous flux in beam angle [%]	36	25
Field angle [°]	14.1	20.7
Rel. luminous flux in field angle [%]	61	50
Scattered light fraction outside the field angle [%]	11	28
Efficiency [%]	72	78
CBCP [cd/lm]	38.3	18.4

RGB Color Impression in 3.16 m distance

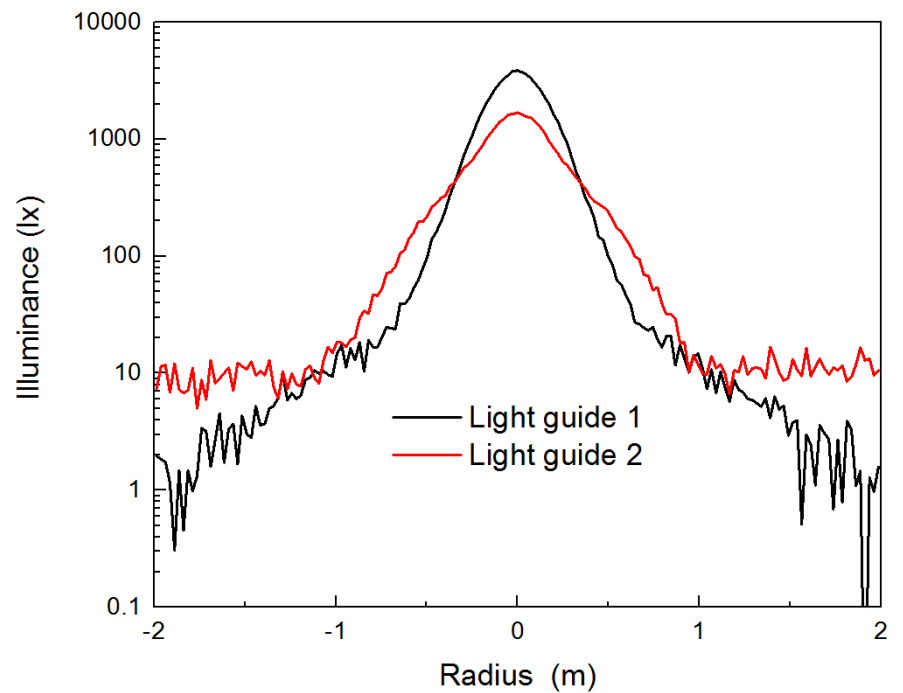
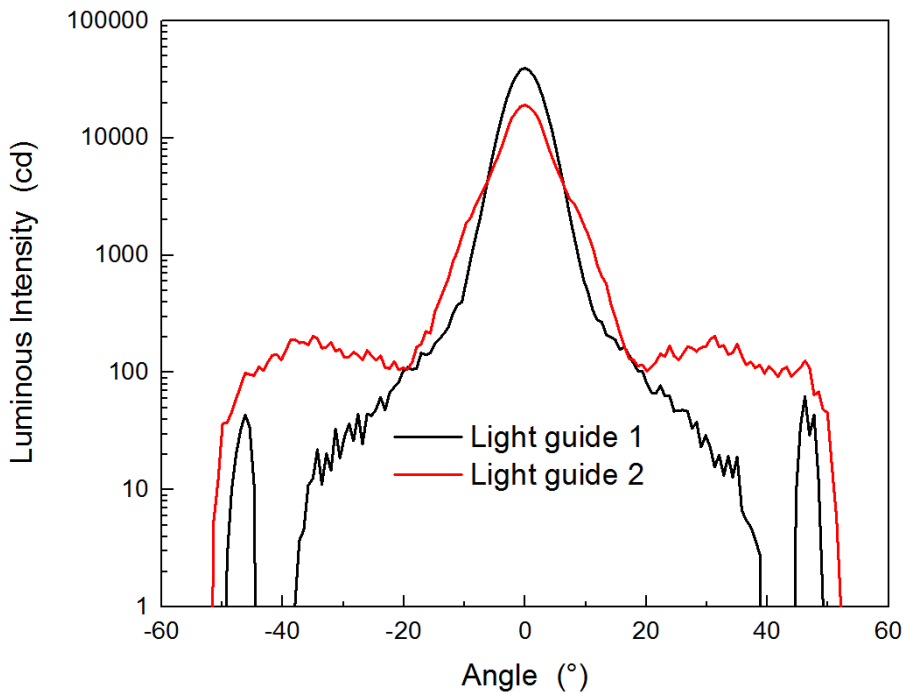
System 1



System 2



Cross sections of the distributions



Summary

- Two light guide + reflector-lens combinations were evaluated for their optical performance using a LEDEngin LZ7 multi-color LED
- Light guides and reflector-lens are standard products of Auer Lighting
- For both cases, a good color mixing was obtained
- Optical efficiencies above 72% (78% for light guide 2) could be reached
- Light guide 2 shows a higher scatter fraction
- Light guide 1 shows a significant better collimation with an almost 2 times higher maximum luminous intensity
- Using further optimized optics would lead to even better results

