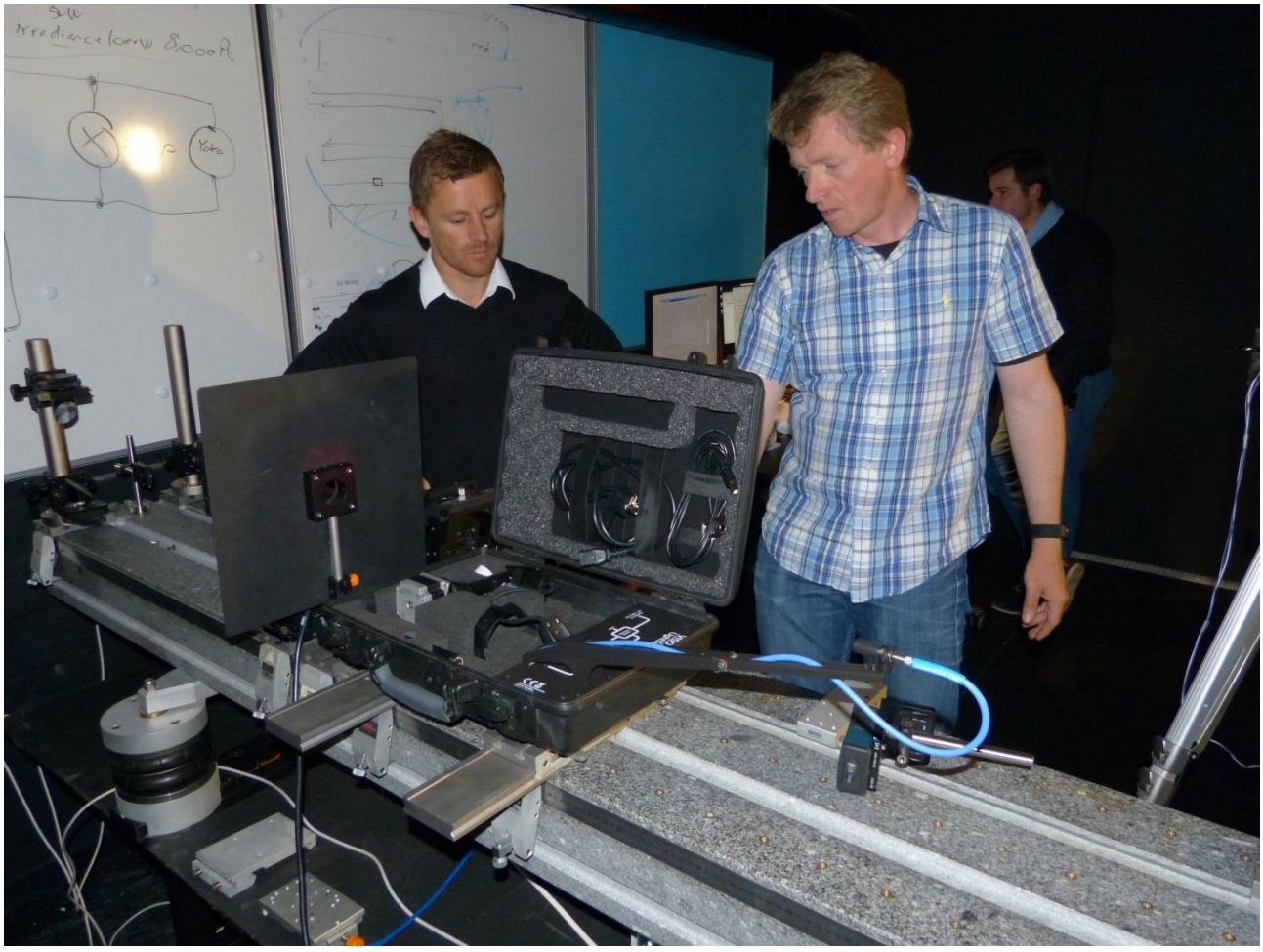
Viso LightSpion Test

Test of LightSpion made in collaboration with DTU

(Technical University of Denmark, photonics laboratory Risø)

Date: 02-09-2013



Contents

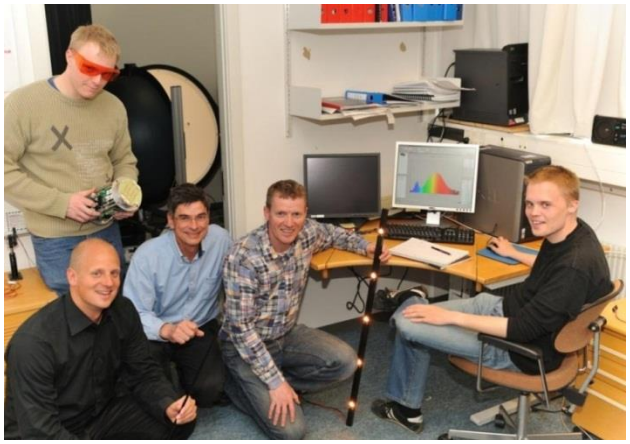
Summary

Test date: 17-06-2013

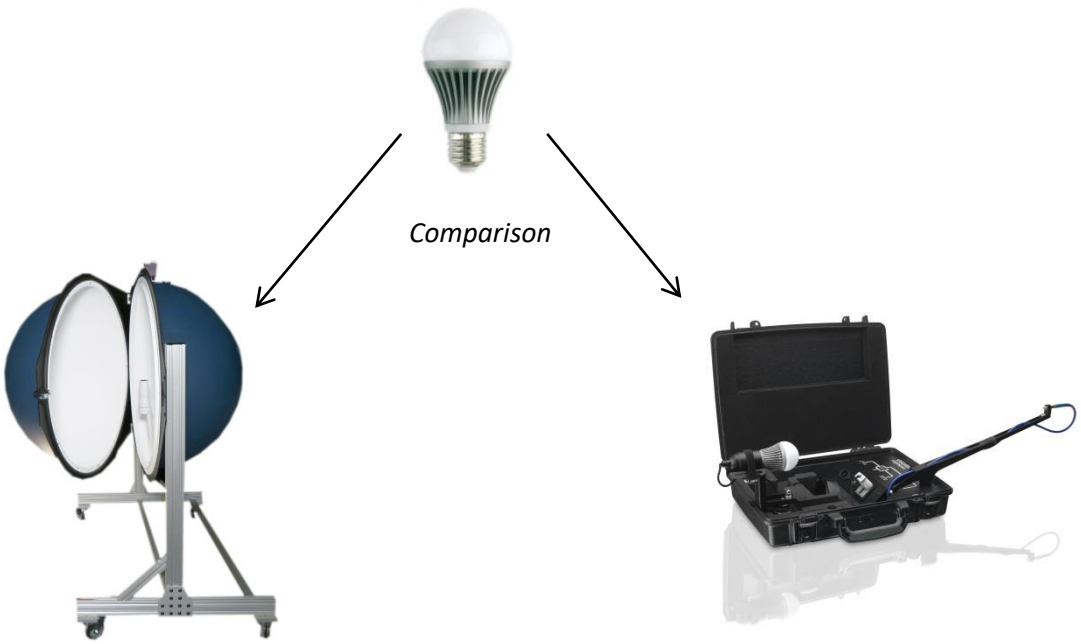
DTU Fotonik (the Danish university lighting research center at Risø) has made a series of accuracy tests of the portable Viso Systems “LightSpion”.

Tests have been performed using an integrating sphere, a spectrometer and a calibration light source. This setup can perform complete luminous flux measurements in lumen using the integrated spectrum including color temperature and CRI.

DTU Fotonik group Senior Researcher Carsten Dam-Hansen

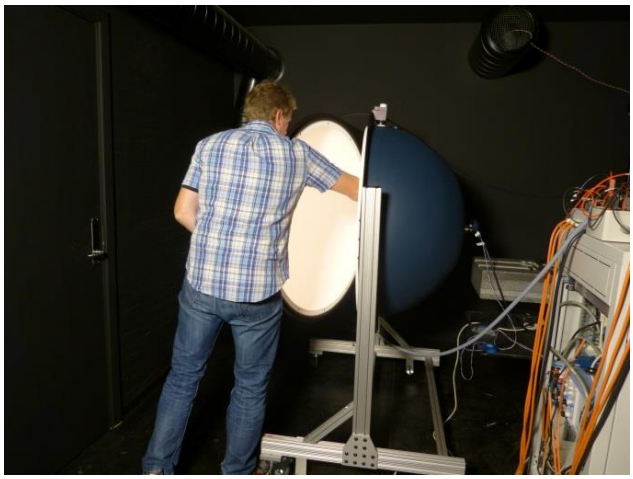


A series of light sources has been chosen for testing accuracy. Initially, the light sources are measured using the integrating sphere of DTU. Then the same light sources are measured using the LightSpion and the two results are compared.



Test equipment

Integration sphere: CY-03629-000
LabSphere serial 113065627 USA



Spectrometer Instrument sys CAS 140

Power source CW1251
Constant voltage and low distortion

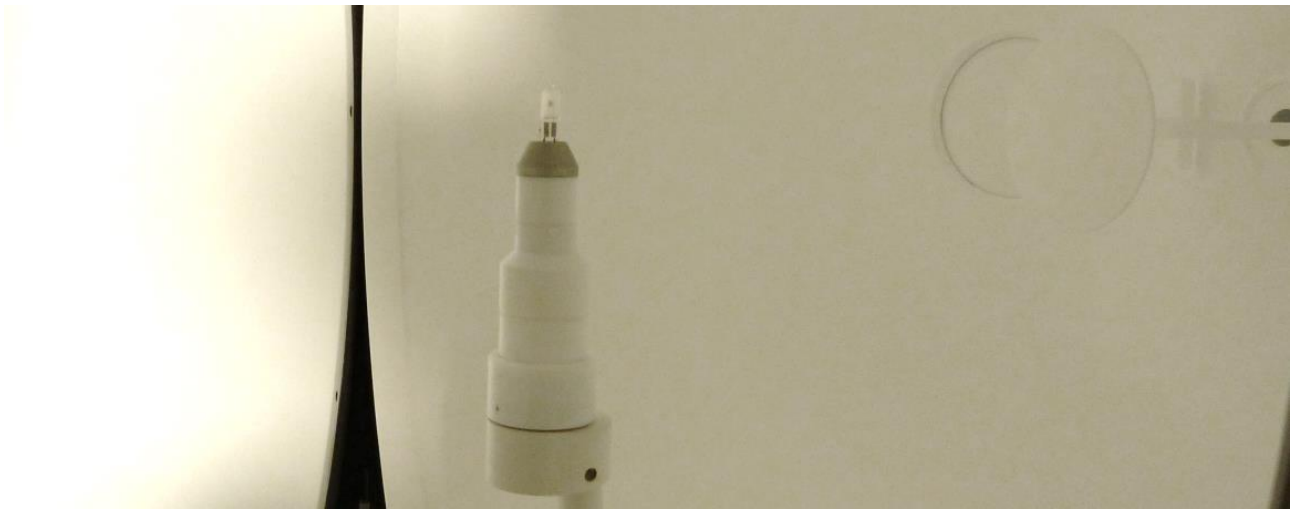
Yokogawa WT3000 power analyzer

LightSpion measurement system

Calibration

Integration sphere

The integration sphere used for the comparison is calibrated to measure total luminous flux using a NIST omni-directional calibration light source.



LightSpion

The Viso LightSpion goniometer system is calibrated using a NIST directional reference light source which has a known spectrum at a specific distance which is used to make the spectral calibration.

The lumen value is calibrated using an omnidirectional light source with a known lumen value measured by DTU in their integrating sphere.

The known light source is then measured using the LightSpion and the lumen value is corrected to match the known lumen value of the omnidirectional light source with a constant factor that corresponds to a constant distance adjustment.

Test sources

The test measurement is performed using 6 different LED light sources which are first measured using the DTU integration sphere system and then afterwards using the LightSpion. The light sources used for the test are as follows:

Source A (DTU reference L30467)
Rated: 230V - 4W - 300lm

Source B (DTU reference L30468)
Rated: 230V – 4,5W - 300lm

Source C (DTU reference L30469)
Rated: 230V - 9W - 450lm

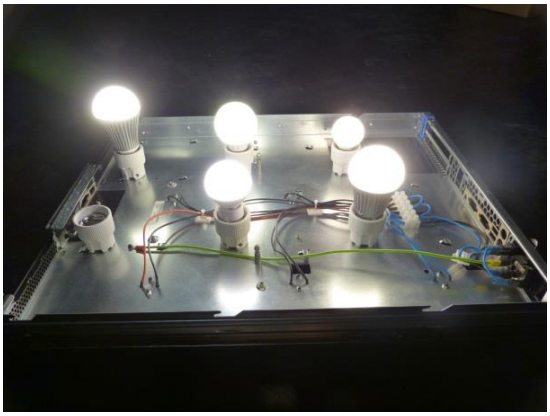
Source D (DTU reference L30470)
Rated: 230V - 12W – 850lm

Source E (DTU reference L30471)
Rated: 230V - 4W – 300lm

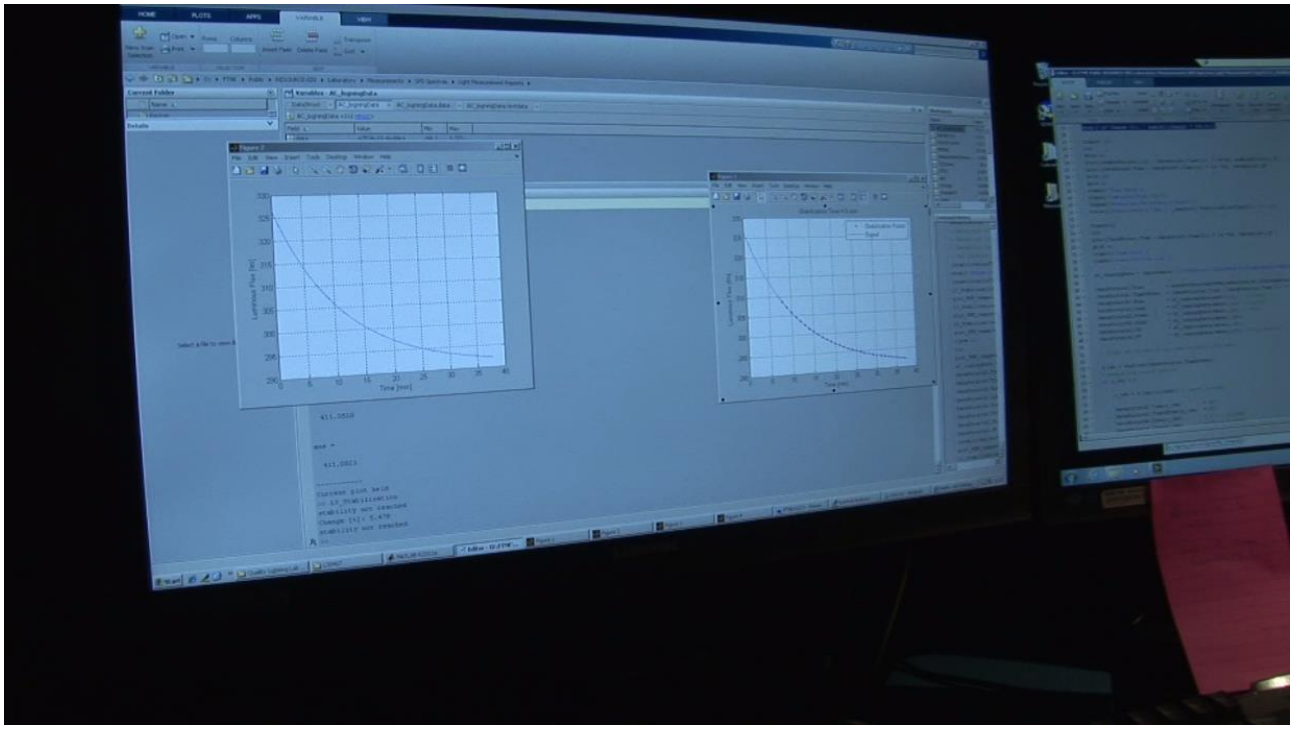
Source F (DTU reference L30472)
Rated: 230V - 2W – 150lm

Pre-test

Before the test is performed, all the test sources are powered on for one hour to ensure stable light output.
Sources are placed in pre-heat rack for one hour



Light sources are monitored for stable light output before the measurement is made.



Test procedure

The tests of the 6 LED light sources are all performed at 230 VAC.

Integration sphere

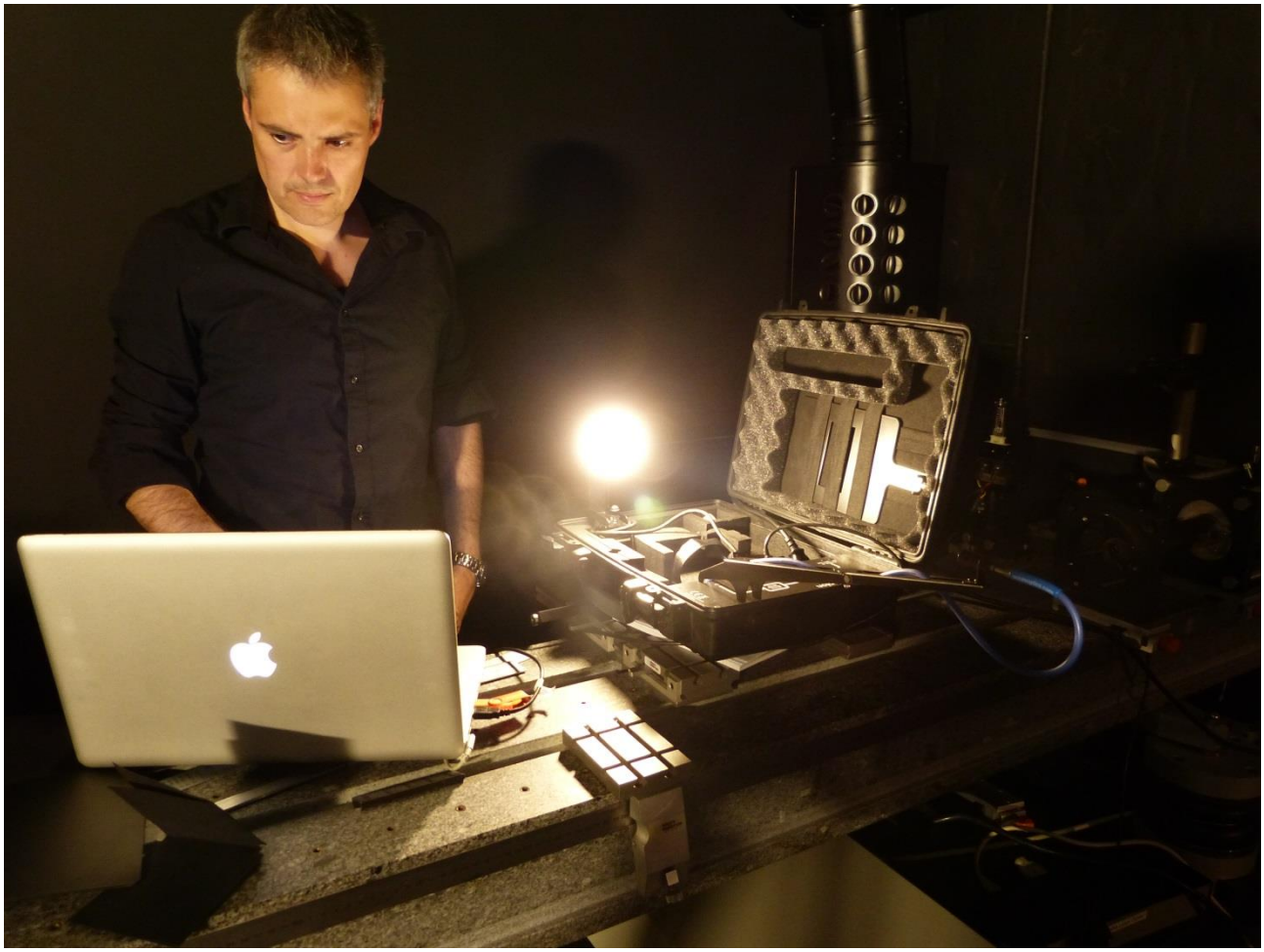
Pre heated light sources are moved quickly to the integration sphere

After the light source has been on for 5 min in the integrating sphere the total luminous flux in lumen, color temperature and power are measured.

LightSpion

The LightSpion is connected to same 230V power supply as used for the integration sphere measurements to ensure equal supply of power.

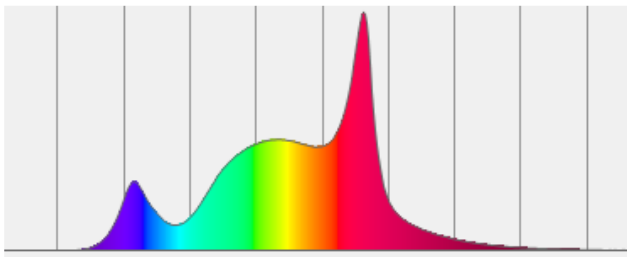
The LightSpion is set to measure using low quality resolution, which result in a worst-case measurement scenario. Again, the pre heated light sources are moved quickly to the LightSpion and after the light source has been on for 5 min in the LightSpion the total luminous flux in lumen, color temperature and power are measured.



Test results

Testing source A (DTU ref L30467)

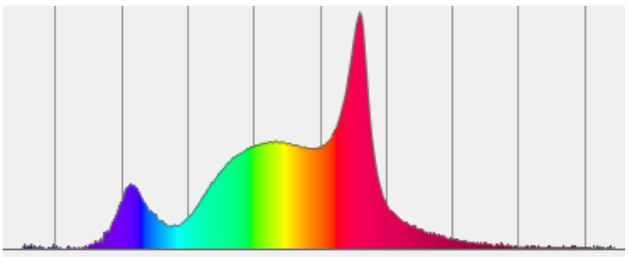
Integration sphere measurement



Lumen:	290 lm
Color temperature:	3115 K
CRI:	90,0

Measured power: 3,8 W @ 230,0 V 0.40 PF (CW 1251)

LightSpion measurement (low resolution mode)



Lumen:	292 lm
Color temperature:	3084 K
CRI:	89,6

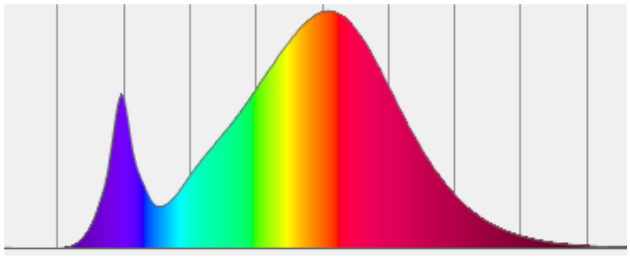
Measured power: 3,8 W @ 229,6 V 0.41 PF (LightSpion)

Measurement difference:

LumenΔ:	+0,69%
Color temperatureΔ:	-31K
CRIΔ:	-0,4

Testing source B (DTU ref L30468)

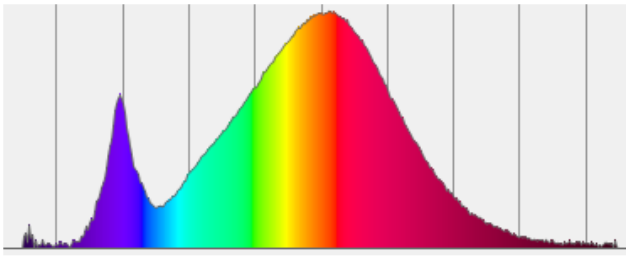
Integration sphere measurement



Lumen:	314 lm
Color temperature:	3026 K
CRI:	82,6

Measured power: 4,7 W @ 230,0 V 0.80 PF (CW 1251)

LightSpion measurement (low resolution mode)



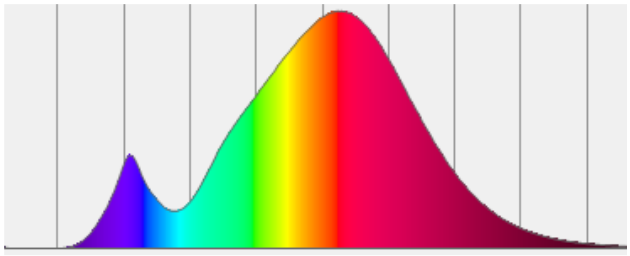
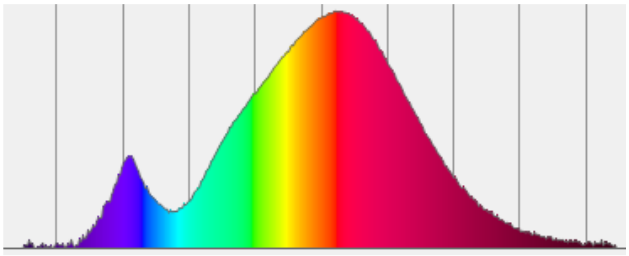
Lumen:	311 lm
Color temperature:	3057 K
CRI:	82,2

Measured power: 4,6 W @ 229,5 V 0.81 PF (LightSpion)

Measurement difference:

LumenΔ:	-0,96%
Color temperatureΔ:	31K
CRIΔ:	-0,4

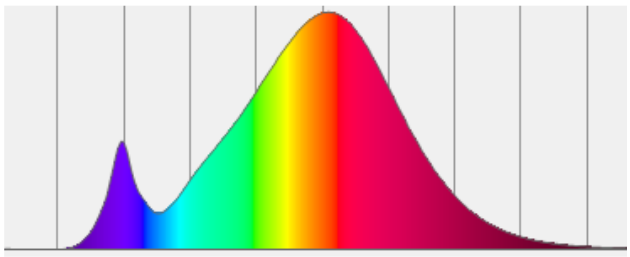
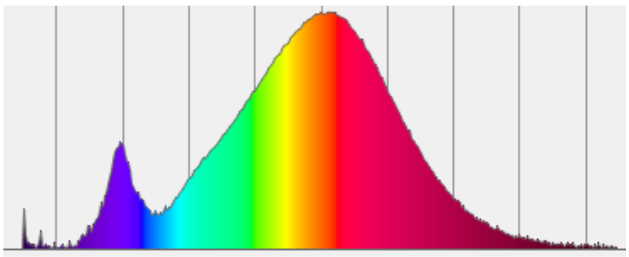
Testing source C (DTU ref L30469)

Integration sphere measurement	LightSpion measurement (low resolution mode)
	
Lumen: 435 lm	Lumen: 429 lm
Color temperature: 2744 K	Color temperature: 2769 K
CRI: 83,1	CRI: 82,6
Measured power: 8,5 W @ 230,0 V 0.93 PF (CW 1251)	Measured power: 8,4 W @ 229,6 V 0.93 PF (LightSpion)

Measurement difference:

LumenΔ:	-1,38%
Color temperatureΔ:	25K
CRIΔ:	-0,5

Testing source D (DTU ref L30470)

Integration sphere measurement	LightSpion measurement (low resolution mode)
	
Lumen: 826 lm	Lumen: 808 lm
Color temperature: 2910 K	Color temperature: 2931 K
CRI: 81,0	CRI: 80,6
Measured power: 11,2 W @ 230,0 V 0.96 PF (CW 1251)	Measured power: 11,0 W @ 229,4 V 0.97 PF (LightSpion)

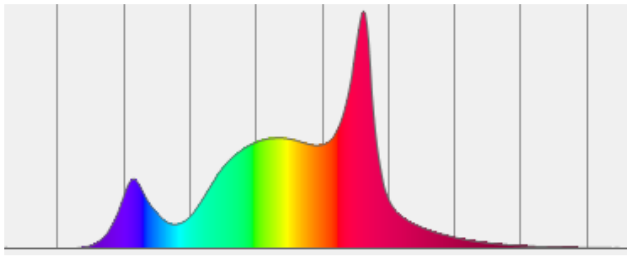
Measurement difference:

LumenΔ:	-2,18%
Color temperatureΔ:	21K
CRIΔ:	-0,4

.

Testing source E (DTU ref L30471)

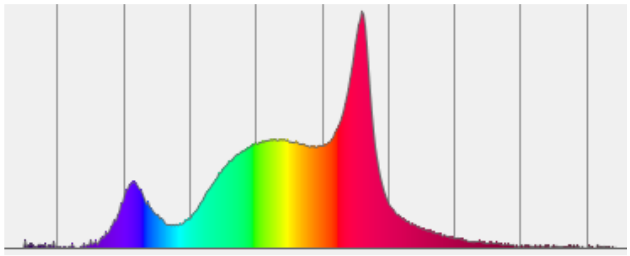
Integration sphere measurement



Lumen:	294 lm
Color temperature:	3114 K
CRI:	89,7

Measured power: 3,7 W @ 230,0 V 0.40 PF (CW 1251)

LightSpion measurement (low resolution mode)



Lumen:	295 lm
Color temperature:	3101 K
CRI:	89,2

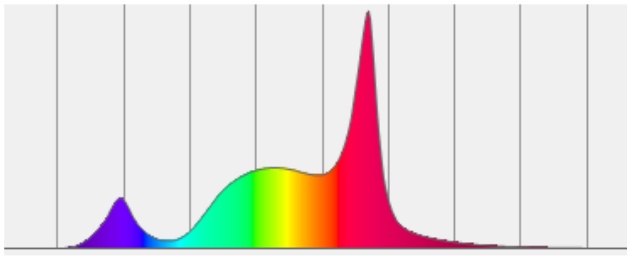
Measured power: 3,7 W @ 229,6 V 0.41 PF (LightSpion)

Measurement difference:

LumenΔ:	0,34%
Color temperatureΔ:	-13K
CRIΔ:	-0,5

Testing source F (DTU ref L30472)

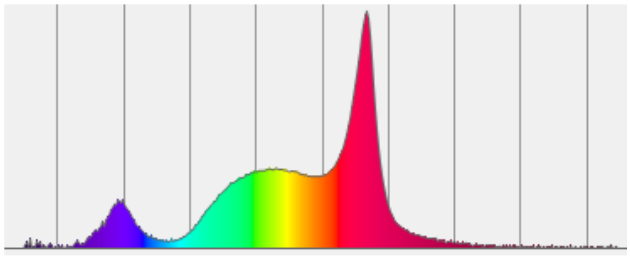
Integration sphere measurement



Lumen:	144 lm
Color temperature:	2774 K
CRI:	89,1

Measured power: 2,0 W @ 230,0 V 0.21 PF (CW 1251)

LightSpion measurement (low resolution mode)



Lumen:	144 lm
Color temperature:	2751 K
CRI:	89,3

Measured power: 2,0 W @ 229,8 V 0.21 PF (LightSpion)

Measurement difference:

LumenΔ:	0,0%
Color temperatureΔ:	-23K
CRIΔ:	0,2

Result summary

		Integrating Sphere DTU Fotonik	LightSpion Viso Systems*	Difference
Source A	Lumen	290	292	0,69%
	Kelvin	3115	3084	-31
	CRI	90	89,6	-0,4
Source B	Lumen	314	311	-0,96%
	Kelvin	3026	3057	31
	CRI	82,6	82,2	-0,4
Source C	Lumen	435	429	-1,38%
	Kelvin	2744	2769	25
	CRI	83,1	82,6	-0,5
Source D	Lumen	826	808	-2,18%
	Kelvin	2910	2931	21
	CRI	81	80,6	-0,4
Source E	Lumen	294	295	0,34%
	Kelvin	3114	3101	-13
	CRI	89,7	89,2	-0,5
Source F	Lumen	144	144	0,00%
	Kelvin	2774	2751	-23
	CRI	89,1	89,3	0,2

* Low quality resolution, 2 c-plane, “worst-case” measurement scenario

All test data can be downloaded by using this link http://www.visosystems.com/media/LightSpion-DTU-test-data-02-09-2013.zip

Conclusion

The comparison performed at DTU Fotonik has shown that a goniometer system that only measures the light source in one plane, like the LightSpion, is indeed a capable device of making quality luminous flux measurements.

The accuracy of measurement depends on that the opposite rotational field of the light source is as equal to the plane measured as possible, so homogeneous light sources such as LED and fluorescent light will give the most accurate results.

It is desired in the future to make more measurement with other type of light sources such as CFL and incandescent types to evaluate how the LightSpion performs with other types of light sources.