Viso LightSpion Test

Test of LightSpion made in collaboration with DTU
(Danish technical university, photonics laboratory Risø)

Date: 02-09-2013

Contents

Summery

Test date: 17-06-2013

To test the accuracy of the LightSpion portable system have DTU photonics the Danish university research center at Riso made a series of test using the LightSpion.
http://www.fotonik.dtu.dk/English.aspx

The test has been performed using integrating sphere, spectrometer, calibration bulb. This setup can perform complete luminous flux measurements in lumen using the integrated spectra including color temperature and CRI.
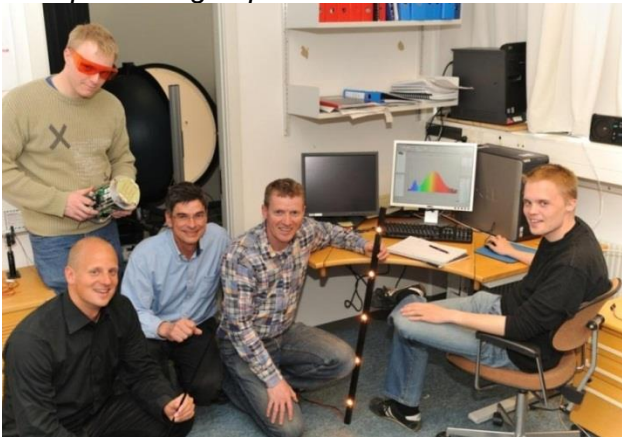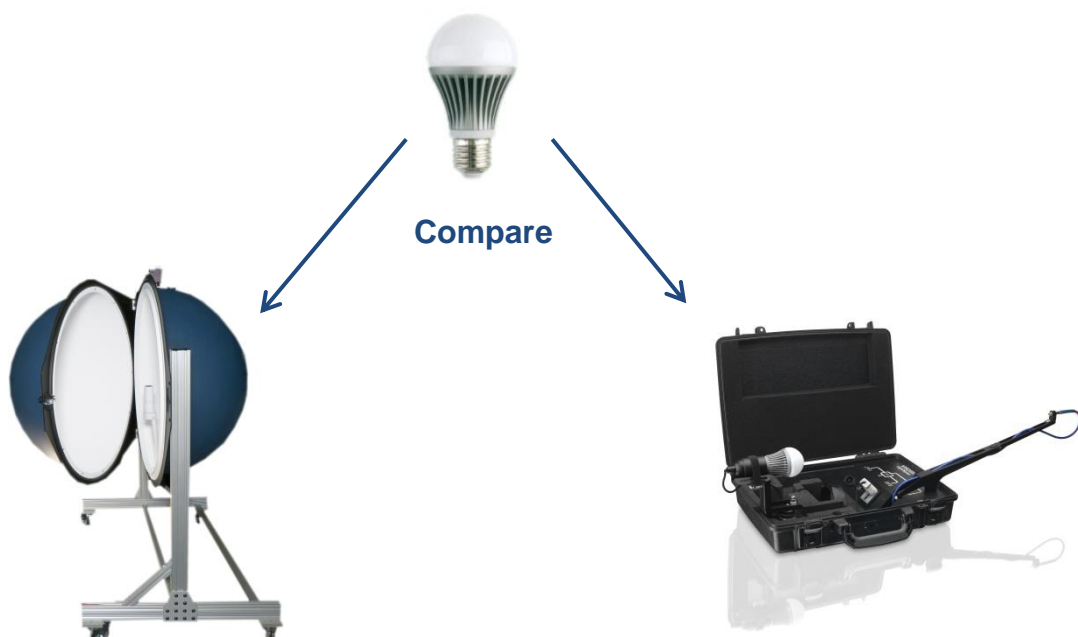
DTU photonic group   *Carsten Dam-Hansen Senior Scientist*

A series of light sources has been chosen for testing accuracy. The light sources are first measured using the integrating sphere of DTU and then measured using the LightSpion and the two results are compared.

Compare

Test equipment

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

Spectrometer Instrument sys CAS 140

Power source CW1251
Constant voltage and low distortion
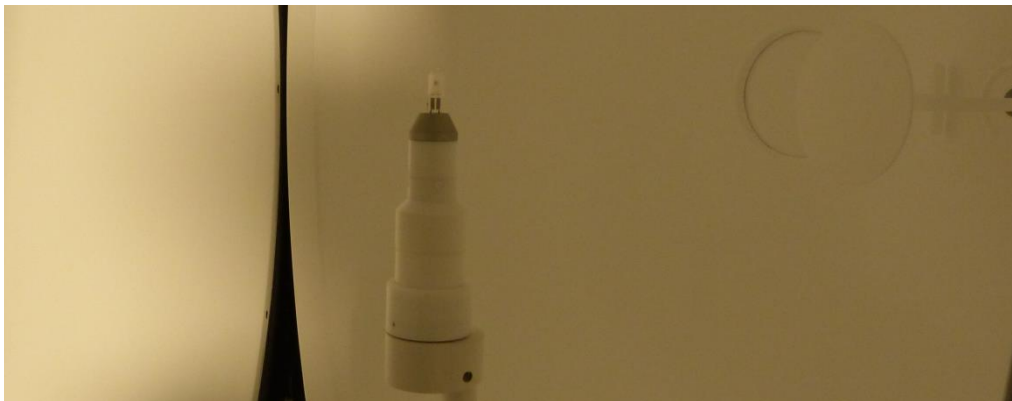

Yokogawa WT3000 power analyzer

LightSpion measurement system

Calibration

Integration sphere

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

LightSpion

The Viso LightSpion goniometer system is calibrated using a NIST directional reference light source which has a known spectra 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 intergrading sphere.

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

Test sources

The test measurement is performed using 6 different LED light sources which first are measured using the DTU integration sphere system and then afterwards using the LightSpion. The light sources used for the test is 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)
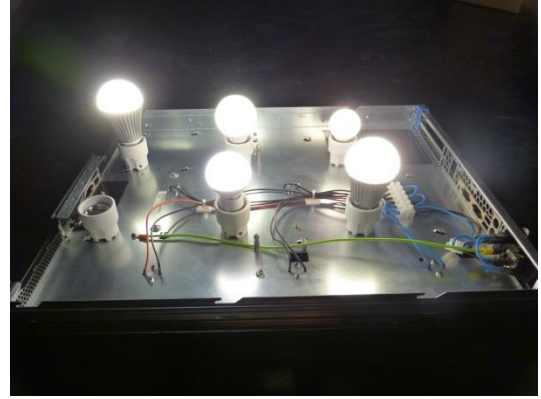Rated: 230V - 4W – 300lm

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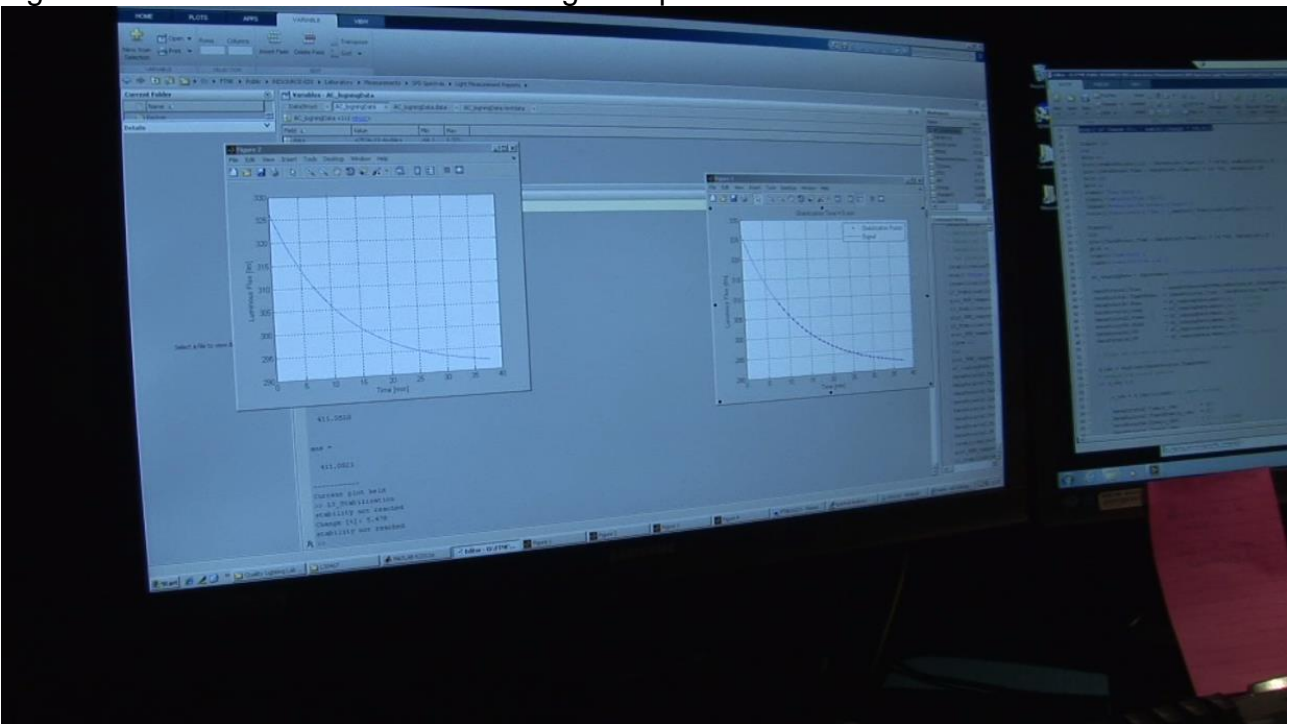Rated: 230V - 2W – 150lm

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.
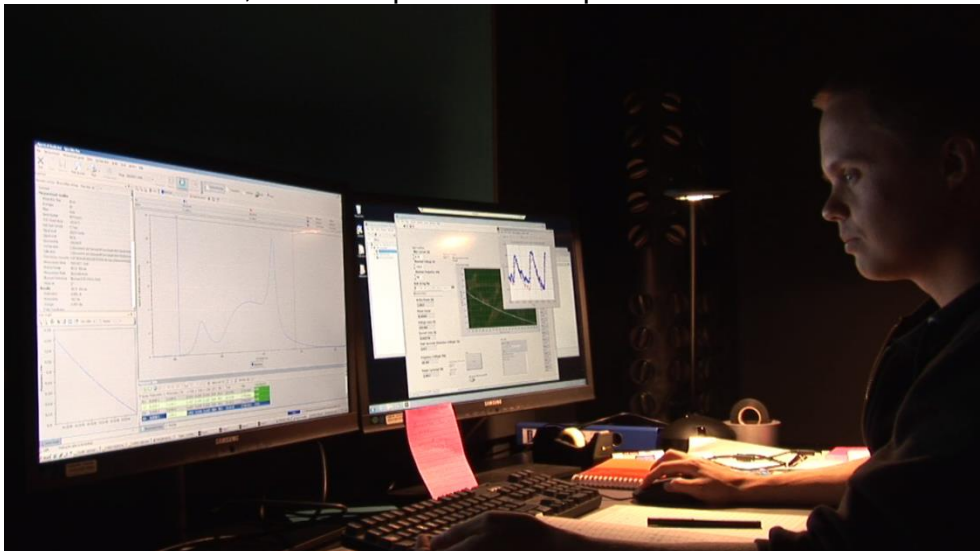
Test procedure

The test of the 6 LED light sources is 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 lumens, 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.
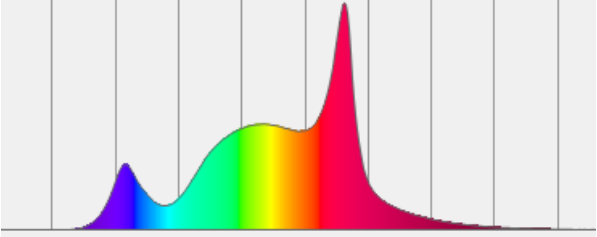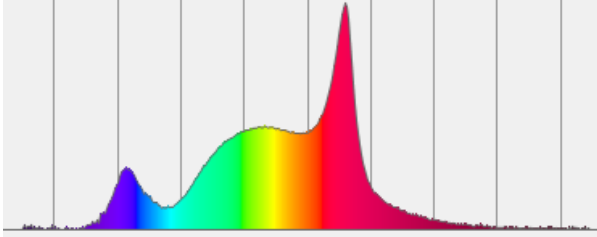
The LightSpion is set to measure using low quality resolution which result in a worst case measurement scenario.

The pre heated light sources are again moved quickly to the LightSpion and after the light source has been on for 5 min in the LightSpion total luminous flux in lumens, color temperature and power are measured.
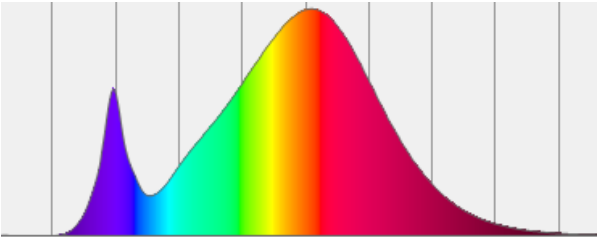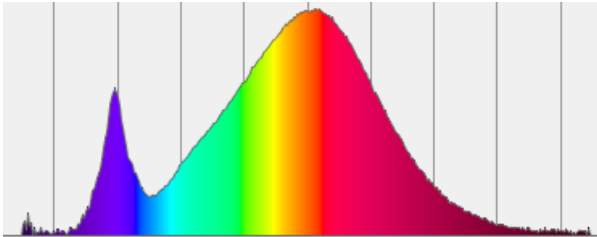
Test results

Testing source A (DTU ref L30467)

Integration sphere measurement	LightSpion measurement (low resolution mode)
Lumen: 290 lm Colour temperature: 3115 K CRI: 90,0	Lumen: 292 lm Colour temperature: 3084 K CRI: 89,6
Measured power: 3,8 W @ 230,0 V 0.40 PF (CW 1251)	Measured power: 3,8 W @ 229,6 V 0.41 PF (LightSpion)

Measurement difference:

Lumen∆:	+0,69%
Color temperature∆:	-31K
CRI∆:	-0,4

Testing source B (DTU ref L30468)

Integration sphere measurement	LightSpion measurement (low resolution mode)
Lumen: 314 lm Colour temperature: 3026 K CRI: 82,6	Lumen: 311 lm Colour temperature: 3057 K CRI: 82,2
Measured power: 4,7 W @ 230,0 V 0.80 PF (CW 1251)	Measured power: 4,6 W @ 229,5 V 0.81 PF (LightSpion)

Measurement difference:

Lumen∆:	-0,96%
Color temperature∆:	31K
CRI∆:	-0,4
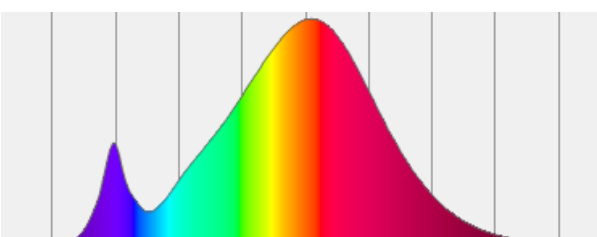
Testing source C (DTU ref L30469)

Integration sphere measurement	LightSpion measurement (low resolution mode)
Lumen: 435 lm Colour temperature: 2744 K CRI: 83,1	Lumen: 429 lm Colour temperature: 2769 K 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:

Lumen∆:	-1,38%
Color temperature∆:	25K
CRI∆:	-0,5
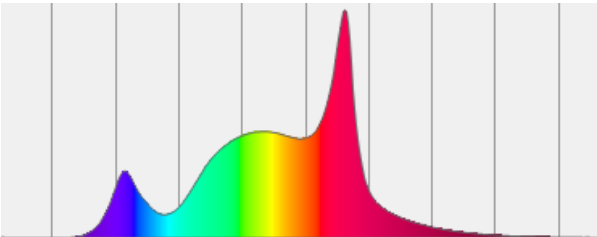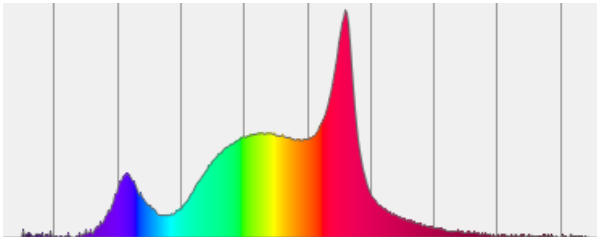
Testing source D (DTU ref L30470)

Integration sphere measurement	LightSpion measurement (low resolution mode)
Lumen: 826 lm Colour temperature: 2910 K CRI: 81,0	Lumen: 808 lm Colour temperature: 2931 K 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:

Lumen∆:	-2,18%
Color temperature∆:	21K
CRI∆:	-0,4

.
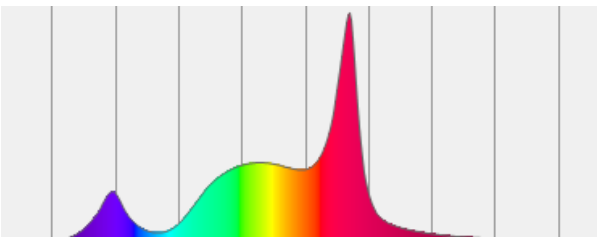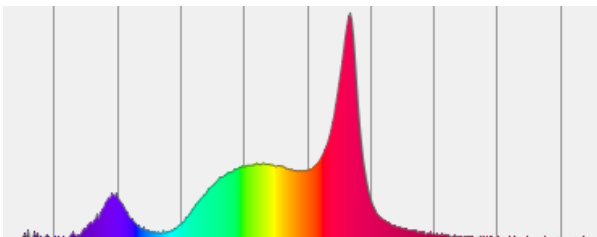
Testing source E (DTU ref L30471)

Integration sphere measurement	LightSpion measurement (low resolution mode)
Lumen: 294 lm Colour temperature: 3114 K CRI: 89,7	Lumen: 295 lm Colour temperature: 3101 K CRI: 89,2
Measured power: 3,7 W @ 230,0 V 0.40 PF (CW 1251)	Measured power: 3,7 W @ 229,6 V 0.41 PF (LightSpion)

Measurement difference:

Lumen∆:	0,34%
Color temperature∆:	-13K
CRI∆:	-0,5

Testing source F (DTU ref L30472)

Integration sphere measurement	LightSpion measurement (low resolution mode)
Lumen: 144 lm Colour temperature: 2774 K CRI: 89,1	Lumen: 144 lm Colour temperature: 2751 K CRI: 89,3
Measured power: 2,0 W @ 230,0 V 0.21 PF (CW 1251)	Measured power: 2,0 W @ 229,8 V 0.21 PF (LightSpion)

Measurement difference:

Lumen∆:	0,0%
Color temperature∆:	-23K
CRI∆:	0,2

Result summery

		Sphere	LightSpion	error
Source A				
	Lumen	290	292	0,69%
	Kelvin	3115 K	3084 K	
	CRI	90	89,6	
Source B				
	Lumen	314	311	-0,96%
	Kelvin	3026 K	3057 K	
	CRI	82,6	82,2	
Source C				
	Lumen	435	429	-1,38%
	Kelvin	2744 K	2769 K	
	CRI	83,1	82,6	
Source D				
	Lumen	826	808	-2,18%
	Kelvin	2910 K	2931 K	
	CRI	81	80,6	
Source E				
	Lumen	294	295	0,34%
	Kelvin	3114 K	3101 K	
	CRI	89,7	89,2	
Source F				
	Lumen	144	144	0,00%
	Kelvin	2774 K	2751 K	
	CRI	89,1	89,3	

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 test performed at DTU photonics 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 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.