

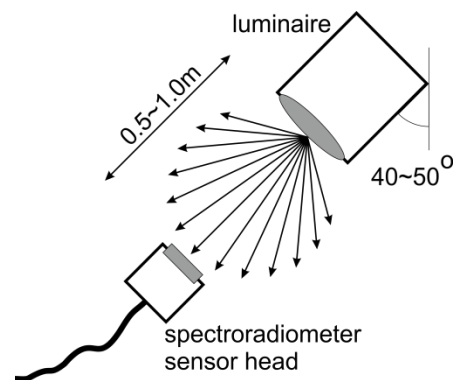
# Luminaire measurement procedures for TLCI-2012 and TLMF-2013

Alan Roberts, August 2014 version 2

In order to achieve repeatability, reliability and accuracy in spectroradiometric measurements of luminaires, some conditions must be observed. These are not onerous, but should ensure credibility for measurements and calculations. They can be summarized:

## Measurement procedures

1. **Operating temperature.** The ambient temperature for measurement should not have a great effect on a luminaire, but it might (it can change the correlated colour temperature a little). Therefore, measurements should not be made in ambient temperatures lower than 18°C.
2. **Orientation.** In television lighting, the luminaires mostly point downwards, therefore it makes sense to measure in such a condition. The lamp should be pointed downwards, at an angle between 40° and 50°. This in itself will cause heating in the lamp-holder, which should be allowed to stabilise before measurements are made.



Measurement should be made on the central axis of the beam, and with the sensing surface (usually a diffuser on the end of a fibre-optic cable) normal to this direction. The spectroradiometer sensing surface should be placed at a distance which ensures sufficient light for a good measurement to be taken while eliminating any stray light, typically 0.5m to 1.5m should be acceptable. If the polar diagram of the light source is to be measured, then the distance from the sensing surface to the source must be kept constant, and only the angle varied.

If the luminaire has discrete light sources of different colours, then the sensing surface should be placed such that it is equally light by an even mixture of those sources. This may not always be possible, in which case a separate diffusing screen will be needed.

3. **Warm-up period.** Different types of light source need different warm-up periods before it can be assumed that the output is stable. The following minimum times should be allowed for stabilisation, not only for the light source itself but for the associated electronics and mounting components.

Source type	Minutes
Incandescent filament, e.g. tungsten.	2
Discharge, e.g. plasma, HMI	10
Fluorescent	20
LED	20

The spectroradiometer should also be allowed to warm up to achieve stability. Generally, this will require about 30 minutes, but large spectroradiometers may take considerably longer, and small ones considerably less. If the manufacturer's specification does not give a warm-up time, then at least 30 minutes should be allowed.

## Reporting and recording results

The TLCl software presents results in a standard format, but it cannot convey all the information which may be relevant to the measurement.

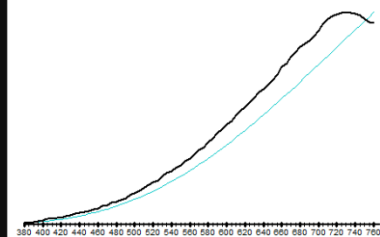
**Candle flame: CCT = P2333 (-0.1)**

**TLCl-2012 : 100 (P2333, out of range!)**



## Television Lighting Consistency Index-2012

Sector	Lightness	Chroma	Hue
R	0	0	0
R/Y	0	0	0
Y	0	0	0
Y/G	0	0	0
G	0	0	0
G/C	0	0	0
C	0	0	0
C/B	0	0	0
B	0	0	0
B/M	0	0	0
M	0	0	0
M/R	0	0	0



The light source is identified by its file name, 'Candle flame' in this case. There is space on-screen for the file name to include a little more, but not much. However, it should always be possible to include some of this information, e.g. luminaire maker and model number, and possibly the CCT setting, but extending this file name to include all the relevant information results in a messy image. Therefore, a metadata file should be generated to hold such information. The software can do that automatically, generating a spreadsheet file which also contains the measurement result values.

Some items in the table are automatically filled in by the software, those marked here with an asterisk should be provided by the operator, if they are relevant. This metadata file should be retained as evidence should there be any dispute over TLCl or TLMF measurements.

TLCI/TLMF metadata report	
Report file	Candle flame.lum.xls
Report screen image	Candle flame.lum.bmp
Date	Sat.02 Aug 2014,23:56:04
Author *	Alan Roberts
Spectroradiometer *	ASEQ Instruments LR1, Ocean Optics CC-3 diffuser
Spectroradiometer calibration *	Ocean Optics HL2000, Thu.13 Dec 2012
Test file	Candle flame.lum
Test file date	Fri.21 Jun 2013,15:08:43
Test file CCT	P2333 ( -0.1)
Luminaire manufacturer *	(enter the makers name here)
Luminaire model *	(and the model number/reference here)
Luminaire type *	(e.g. tungsten, LED, flu, spot, panel, etc)
Luminaire details *	(e.g. version number, batch number and date, anything unusual)
Luminaire supply voltage *	(if different from makers' spec.)
Luminaire CCT setting *	(if there is a CCT control)
Luminaire level setting *	(if there is a dimmer control)
Luminaire angle *	(if not between 40 and 50 degrees)
Luminaire distance *	(if not between 0.5 and 1.0m)
Test colour	Q value
Dark skin	+99.96
Light skin	+99.72
Blue sky	+99.99
Foliage	+99.99
Blue flower	+100.00
Bluish green	+99.98
Orange	+99.95
Purplish blue	+100.00
Moderate red	+99.78
Purple	+99.99
Yellow green	+100.00
Orange yellow	+99.99
Blue	+100.00
Green	+99.97
Red	+99.50
Yellow	+100.00
Magenta	+99.98
Cyan	+99.97
White 90.01%	+100.00
Neutral 8 59.1%	+100.00
Neutral 6.5 36.2%	+100.00
Neutral 5 19.77%	+100.00
Neutral 3.5 9%	+100.00
Black 3.13%	+100.00
Result Qa value	+99.879