

Digital Futures 2008

Implementing a method for single
shot DSC spectral sensitivity
recovery for ISO 17321 spectral
sensitivity based characterisation

D.S. Hawkins

The Royal London Hospital; London, UK

P.J. Green

London College of Communication; London, UK

Aims

- A single camera exposure to retrieve DSC spectral sensitivities.
- Spectral range from 380nm to 730nm.
- Portable.
- Easy to use.
- Accurate.

Considerations

- Filter type
 - Illuminant
 - Diffusion
 - Calibration
- } Determines overall design, accuracy & repeatability.

Filters

- 12.7mm 1/2" narrow band dichroic interference filters.
- 10nm passband at full width half height.
- No secondary passband within range to be sampled.



Illuminant (LED)

Pros

- Small (5mm).
- High luminant flux.
- Minimal heat output.
- Tailored to filter bandpass

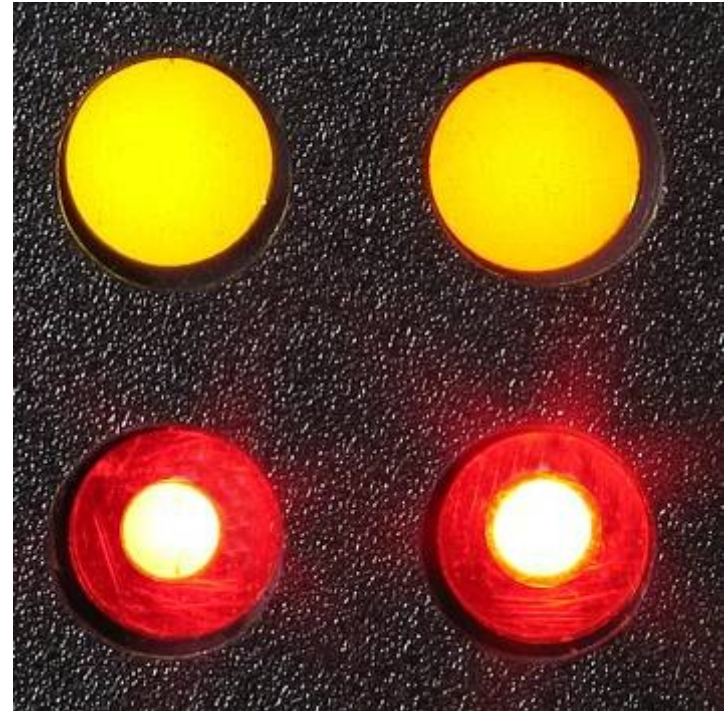
Cons

- Output varies with temperature.



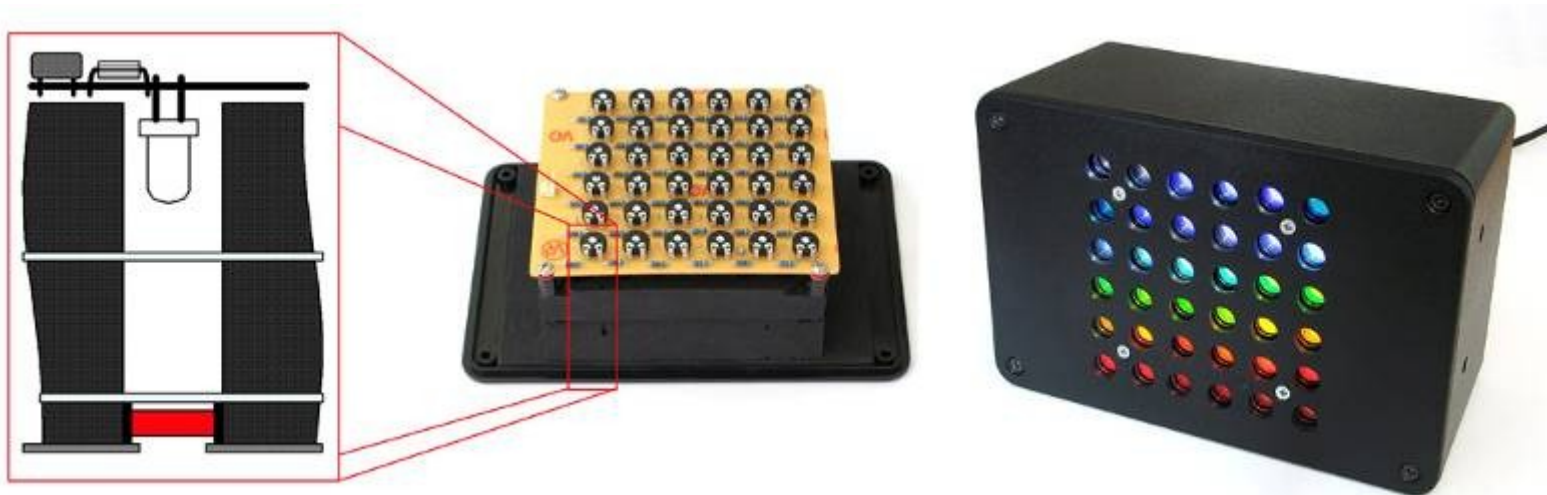
Diffusion

- Even illumination over entire filter plane.
- Must pass all wavelengths to be sampled.
- Stops diode chip being imaged.

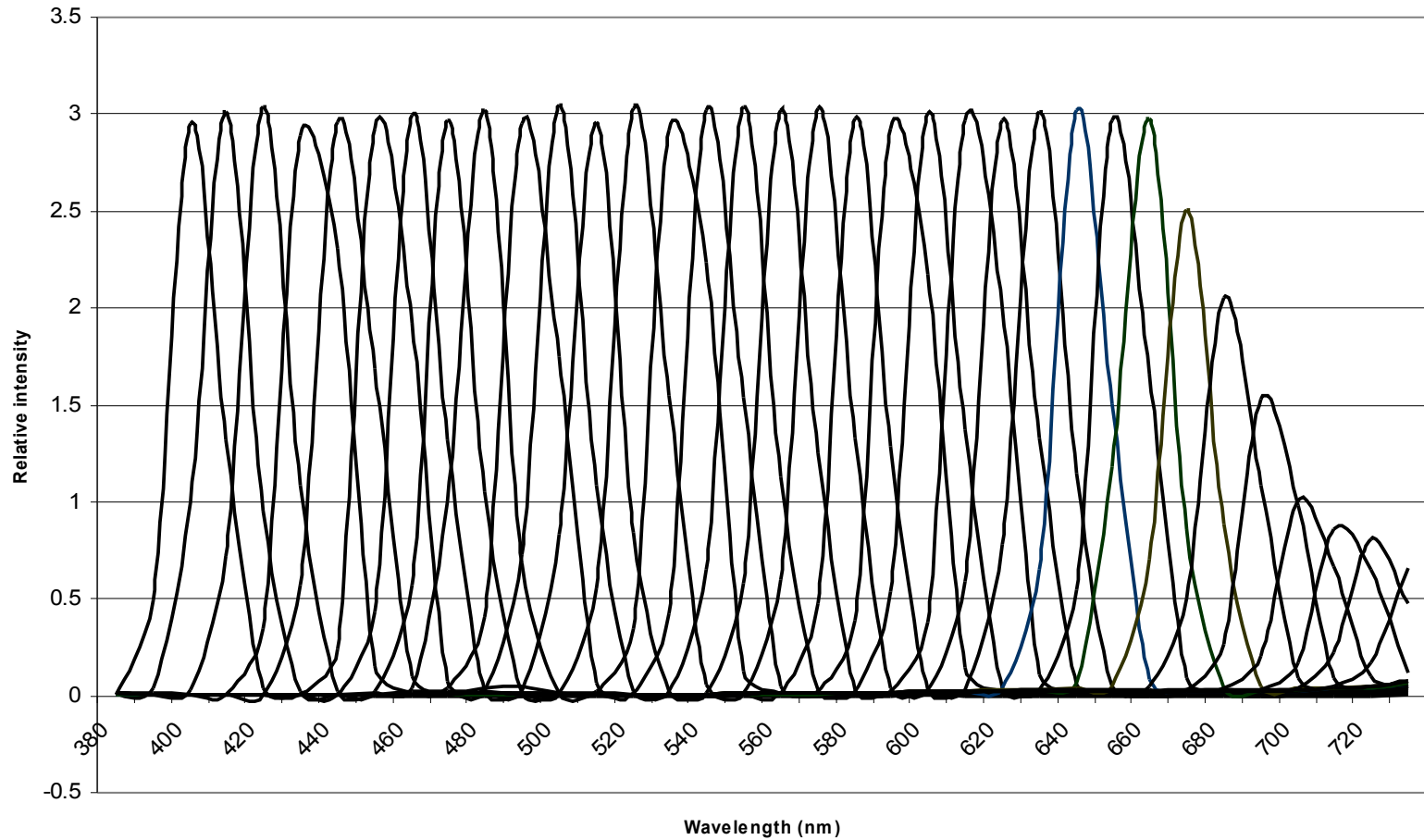


Final construction

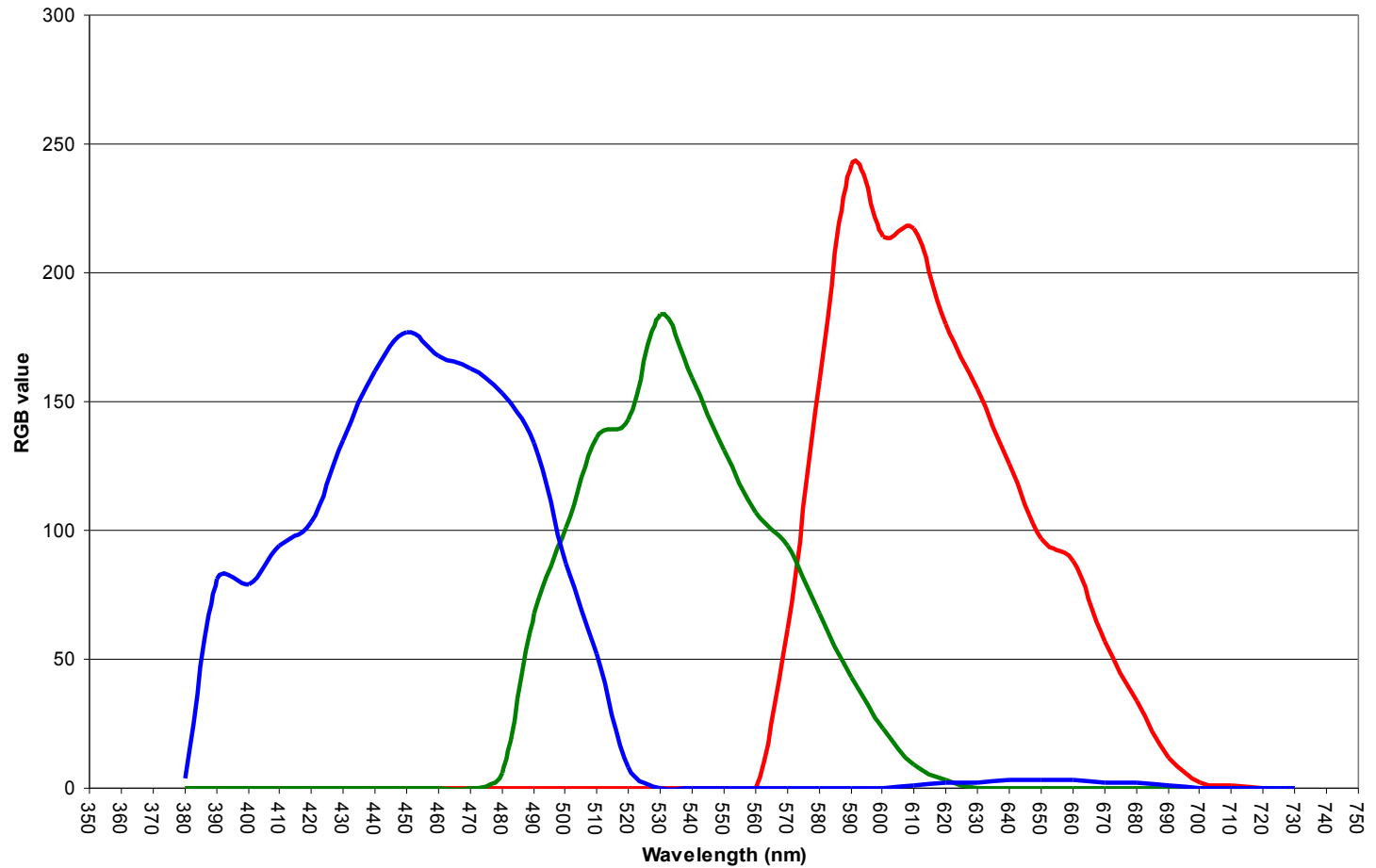
- 6 x 6 LED filter array.
- Individual chamber per LED filter combination.
- Individual attenuation by potentiometer.
- External 12v DC power supply.



Equal-radiance calibration



Camera response



Characterisation ΔE^*_{ab} errors

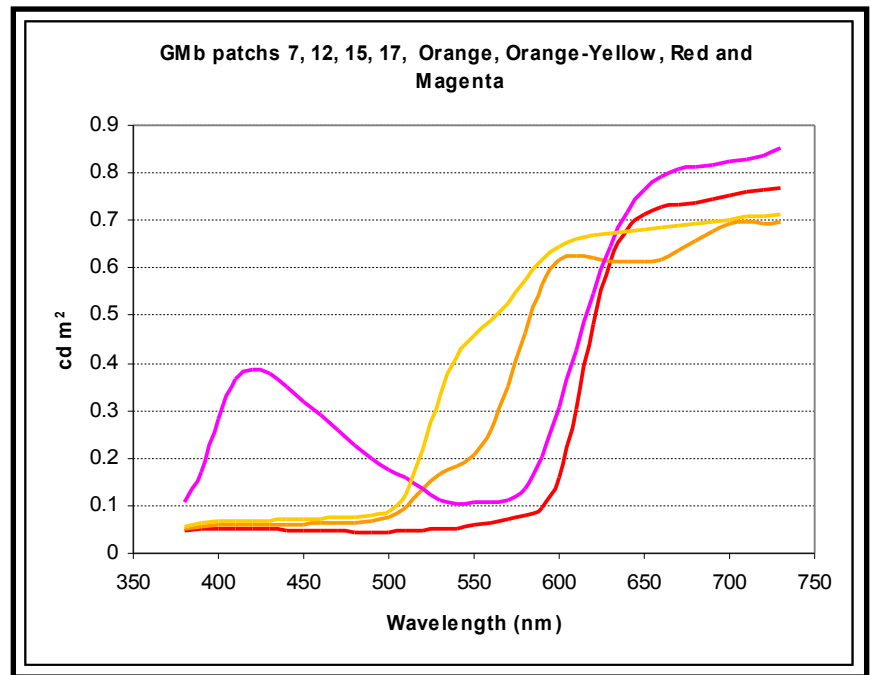
	Polynomial (1 st order)	Spectral
mean ΔE^*_{ab}	2.80	2.85
max ΔE^*_{ab}	4.37	7.79
min ΔE^*_{ab}	1.29	0.08

- Excellent initial results.

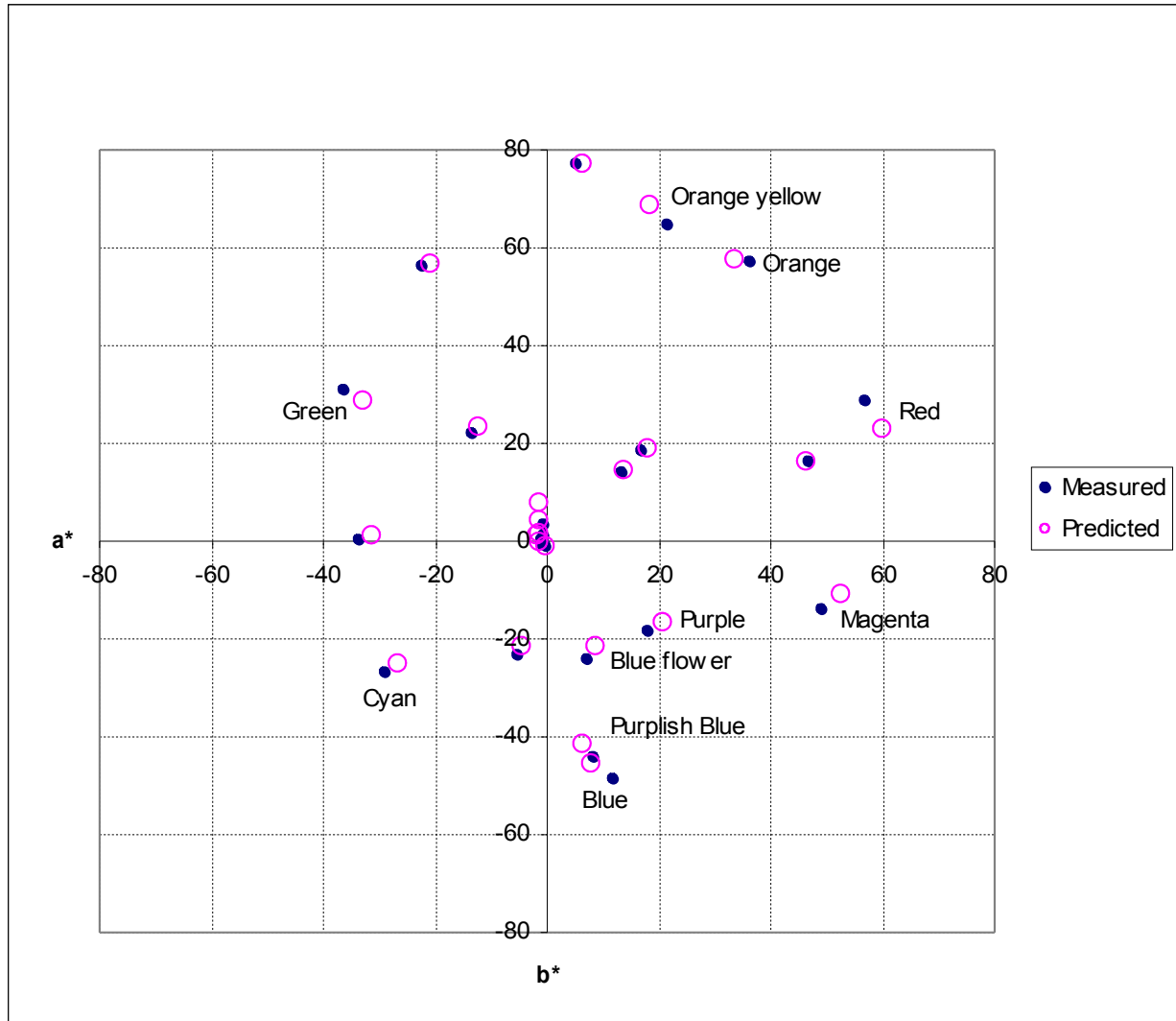
Characterisation ΔE^*_{ab} errors

- High max ΔE^*_{ab} relates to poor red calibration above 670nm?

Red	7.79
Magenta	6.10
Orange Yellow	5.12
Orange	3.39



Characterisation a^* b^* errors



Improvements & refinements

- LED's from 670nm to 730nm replaced.
- Precise peak $d\lambda$ measurement.
- Accurate equal-radiance calibration.
- Precise CIE cmf allocated to $d\lambda$.
- Possible extension through to 830nm.

Summary

- Possibility of a simple method to recover device spectral sensitivities.
- Future enhancements will allow full interface and auto tuning and calibration of device via a host computer.

Thank You