Paper categorisation meeting
Leeds, June 15 2006

Current activities in ISO/TC6/WG3
Paper, board and pulps-optical properties

Nils Pauler, M-real

ISO/TC6/WG3

Liaison ISO/TC6/WG3 with other organisation

Convenor Dr Byron Jordan

- Liaison with CIE *Dr Joanne Zwinkel*
- Liaison with ISO/TC130 Graphic Arts *Mr Bryan Sunderland*
- Liaison with ISO/TC38-Textiles *Mr Richard Harold*
- Liaison with ICC *Mr Nils Pauler*

Activities in paper industry related to colour

- Increased focus on shade of papers
- Measurements and Simulations of L*a*b* of paper products
- A transition from black & white printing to four colour printing in office sector
- Colour management of traditional print
- Evaluation of colour reproduction of desktop printers
- ICC profiles for RGB printers
- Simulation of optical interaction between ink and paper. (Co-operation with Universities)

Optical instruments used in paper industry

- D/ 0° Spectrophotometers (L&W Elrepho, Elrepho SF450,…)
- Gloss instrument

- 45/0° Spectrophotometers (Gretag Macbeth Spectrolino)
- Scanner calibrated for L*a*b* measurements

International standards for reflectance measurements

- ISO 2469 Measurement of diffuse radiance (reflectance) factor
- ISO 2470 Measurement of diffuse blue reflectance factor (ISO brightness)
- ISO 2471 Determination of opacity (paper packing) – diffuse reflectance method
- ISO 11475 Determination of CIE whiteness, D65/10° (outdoor daylight)
- ISO 11476 Determination of CIE whiteness, C/2°(indoor lighting)
- ISO 5631 Determination of Colour (L*a*b*), C/2°
- ISO 9416 Determination of light scattering and absorption coefficient using Kubelka-Munk theory

ISO methods for reflectance measurements

new ISO numbers and new methods

- ISO 2469 Diffuse reflectance

- ISO 2470-1 ISO Brightness, (UV(C))
- ISO 2470-2 D65 Brightness, (UV(D65))

- ISO 2471 Opacity

- ISO 5631-1 Colour , L*a*b*, C/ 2°
- ISO 5631-2 Colour, L*a*b*, D65/10°
- ISO 5631-3 Colour, L*a*b*, D50/2°

- ISO 9416 Kubelka-Munk coefficients

- ISO 11475 CIE-whiteness (D65/10°
- ISO 11476 Indoor- whiteness (C/2°)

- ISO 22892 Transmittance

ISO methods paper and board
Gloss measurements

- ISO 8254-1 Gloss at 75°, Tappi
- ISO 8254-2 Gloss at 75°, DIN
- ISO 8254-3 Gloss at 20°, TAPPI

The calibration hierarchy for absolute reflectance measurements

Perfect reflecting diffuser

Standardizing Laboratories (NRC, NIST, PTB)

Authorized Laboratories (CTP, KCL, Paprican, STFI-P,TLS)

Reflectance instruments D/0° ISO 2469

All the larger Pulp and Paper companies rely on ISO calibration!

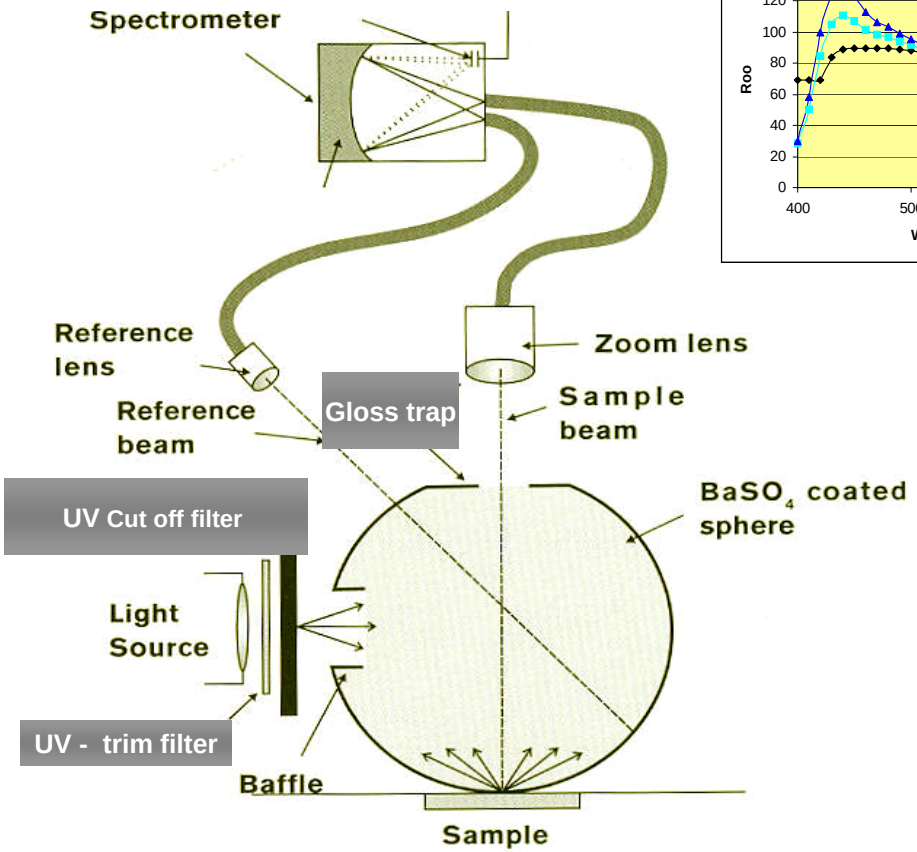
Nils Pauler, M-real

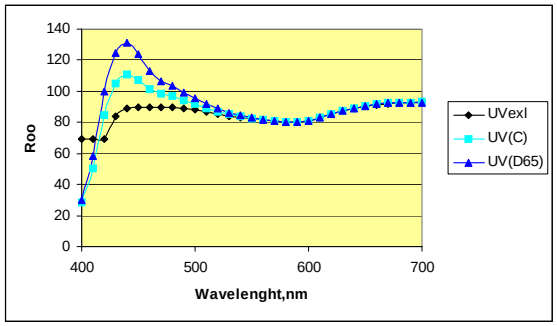
ISO/TC6/WG3

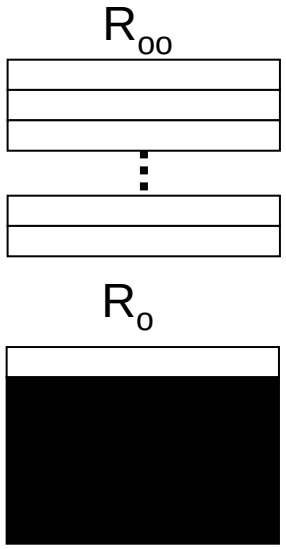
ISO 2469 - diffuse reflectance

- Optical geometry D/0°
- Optical sphere with diameter 150 mm
- Measure area with a diameter of 28 mm
- Illumination area with a diameter of 34 mm
- Gloss trap
- Variable UV filter
  - Three UV settings: UV(D65), UV(C) and UVex(420)

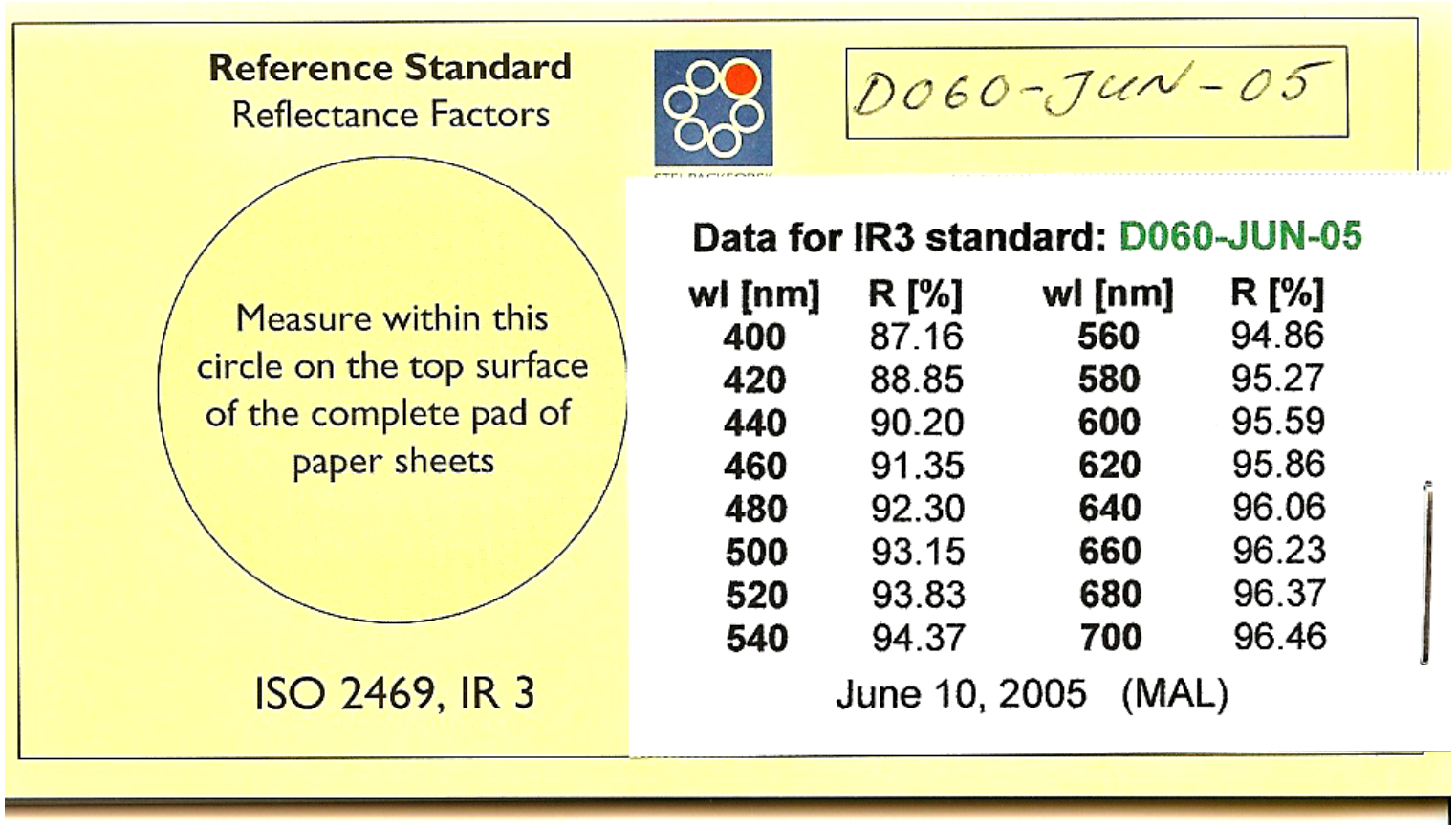
Instrument according to ISO 2469







Calibration of spectral reflectance factors



Reference Standard
Reflectance Factors

D060-JUN-05

Measure within this circle on the top surface of the complete pad of paper sheets

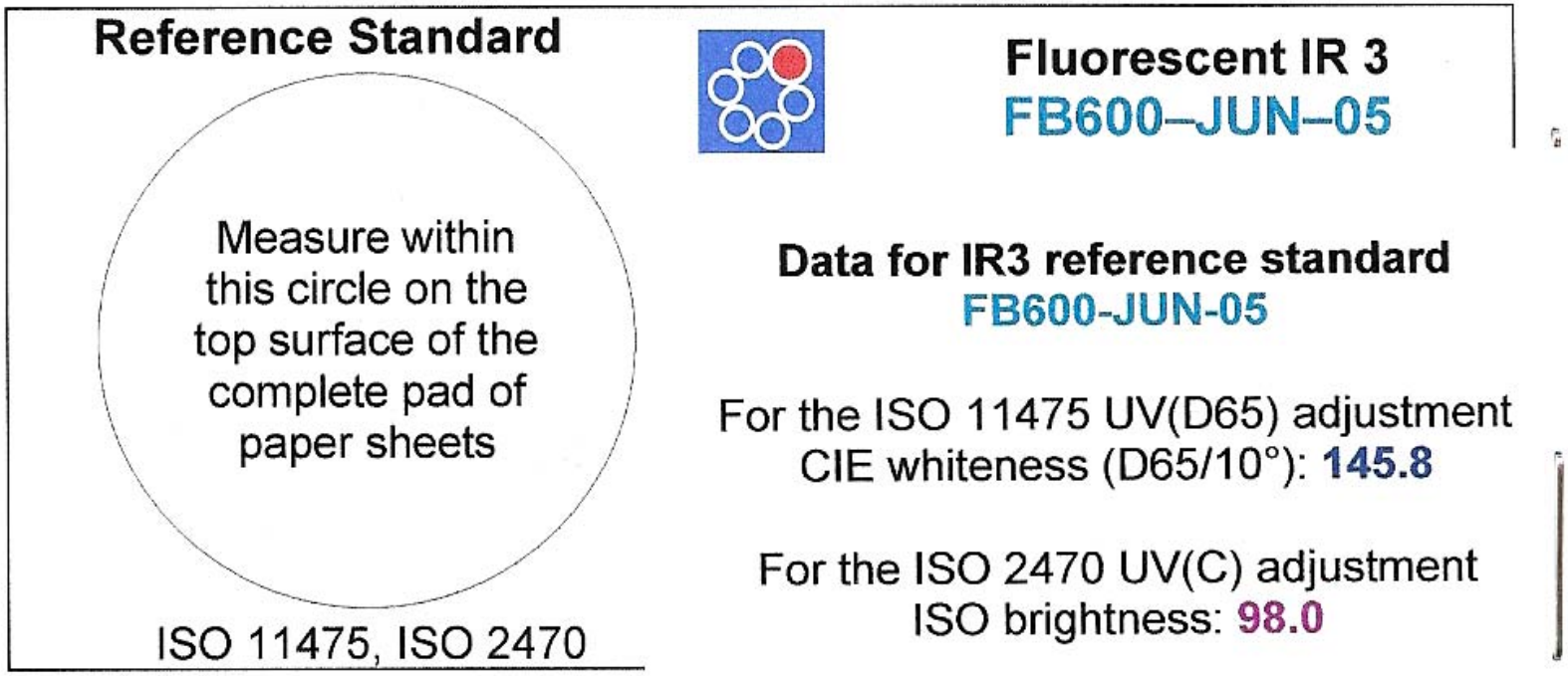
ISO 2469, IR 3

Data for IR3 standard: D060-JUN-05

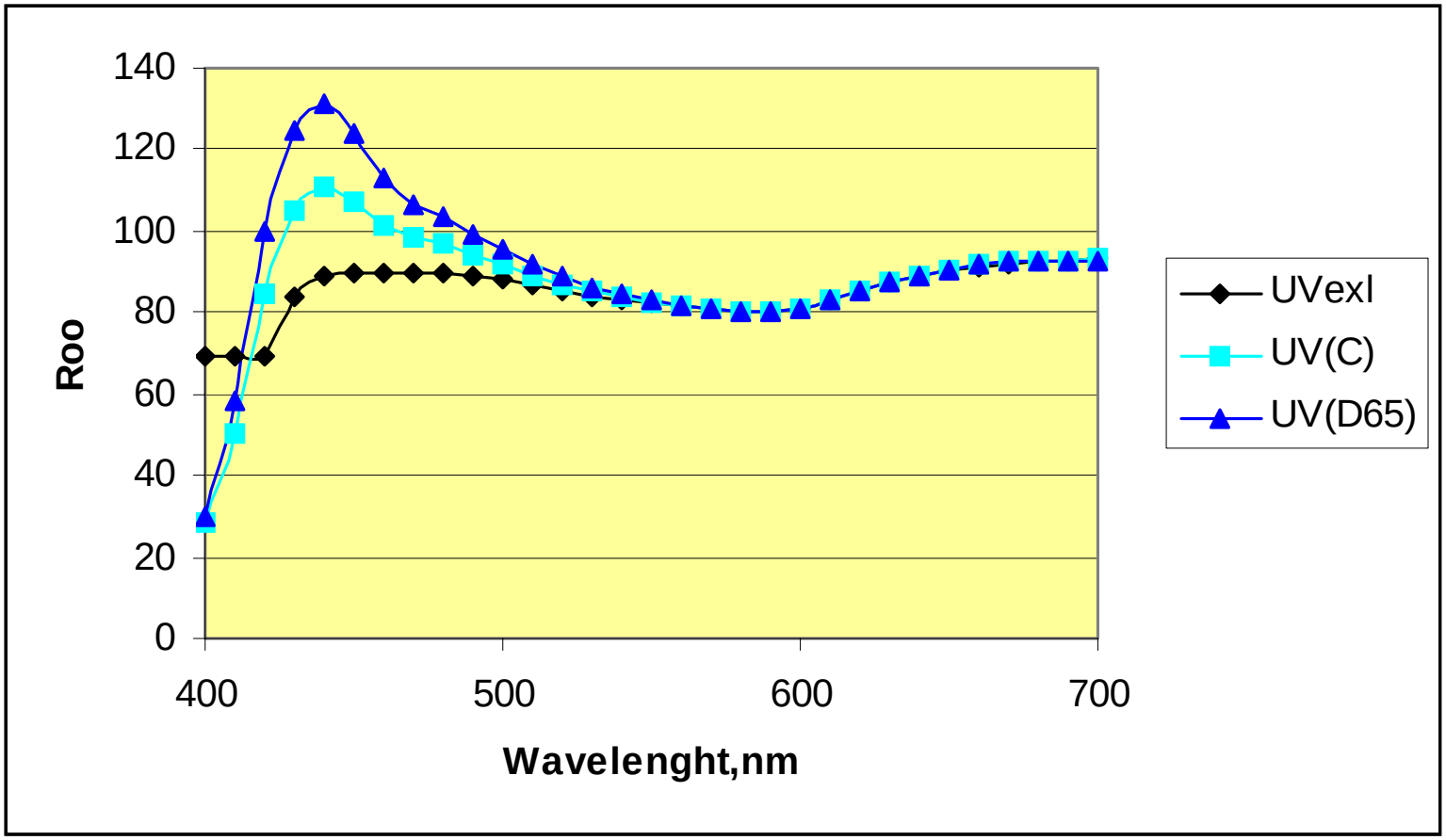
wl [nm]	R [%]	wl [nm]	R [%]
400	87.16	560	94.86
420	88.85	580	95.27
440	90.20	600	95.59
460	91.35	620	95.86
480	92.30	640	96.06
500	93.15	660	96.23
520	93.83	680	96.37
540	94.37	700	96.46

June 10, 2005 (MAL)

Calibration of the UV content in the illumination; UV(D65) and UV(C)



Radiance factor of a calibrated copy paper



Differences between instruments 0,2-0,5% !

The new Colour measurement method
ISO CD 56131-3 Colour, L*a*b*, D50/2°
(Draft)

- Instrument: ISO 2469
- Light source: Fluorescence as standard illumination C
- Calculation: L*a*b*, D50/2°

L&W Elrepho vs. Spectrolino

Instrument	L&W Elrepho	Spectrolino
Optical geometry	D/0° with	45°/0°
Illumination	Xenon lamp	Tungsten lamp A light
UV adjustment	UV(C), UV(D65), UVexcl	~UV(C), ~UV(D65), UVexcl
Measuring area	Diameter: 28 mm	4 mm
Illumination area	Diameter: 34 mm	? mm
Gloss trap	Black annulus around the receptor aperture	45°/0° 45°/0° + pol. filter
	Opaque pad	R over black or white background

Summary

- **Is there a need for common optical measurement methods?**
  - Will colour properties of paper be used in colour management?
  - Should absolute calibration be a common goal?
  - Is this a way to involve paper industry in future media standards?
  - Will it improve the communication between paper and graphical industry ?

- **Can we use the instruments of today?**
  - Is the new L*a*b* D50/2°, UV(C) comparable to methods used in graphical arts?
  - Can we use L*a*b* D65, UV(D65) for office papers?
  - Is the gloss trap of ISO 2469 D/0 comparable to 45°/0°instruments?

- **Will new Spectral Scanners and/or Digital Cameras be the future?**

A workshop is planned in Sweden autumn 2006