



**Windows as Renewable Energy Sources for Europe
Window Energy Data Network**

*Project supported by DG for Energy and Transport
of the European Commission*

www.windat.org

Contract NNE5-2000-122

UV/VIS/NIR SPECTROPHOTOMETRIC NEAR-NORMAL SPECULAR TRANSMITTANCE AND REFLECTANCE MEASUREMENT INTERCOMPARISON

I N S T R U C T I O N S

**Michael Hutchins
Neviana Kilbey**

Oxford Brookes University

School of Technology

Gipsy Lane Campus

Headington, Oxford, OX3 0BP

mhutchins@brookes.ac.uk; nbkilbey@brookes.ac.uk

WinDat document N2.05 - Public

February 2004

This document was produced within WinDat, with active contribution by the members of this European Thematic Network. See www.windat.org for more information.

Contact:

On this report:

Michael Hutchins, Neviana Kilbey
Oxford Brookes University, School of Technology
Gipsy Lane Campus, Headington, Oxford, OX3 0BP, United Kingdom
Email: mhutchins@brookes.ac.uk
nbkilbey@brookes.ac.uk

On Thematic Network WinDat:

WinDat coordinator: Dick van Dijk, TNO Building and Construction Research, Delft, The Netherlands
Email: H.vanDijk@bouw.tno.nl

Research funded in part by
THE EUROPEAN COMMISSION
in the framework of the Community activities
in the Field of the specific programme for RTD and demonstration on
Energy, Environment and Sustainable Development

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1 BACKGROUND

WinDat is a European RTD Thematic Network (2001-2004). It aims to make available and freely distribute a European software tool for the calculation of the thermal and solar properties of commercial and innovative window systems on the basis of known component properties and thermal and solar/optical interactions between the components. It is intended that this tool will be collectively supported and used in research, industry, standardisation, education and design throughout Europe. It will be used to compare, select and promote innovative windows and window components for the optimum use of renewable energy and maximised energy savings and indoor comfort. One of the unique elements in the software tool is the combination of glazings and shading devices. This makes the tool particularly suited to calculate the thermal and solar performance of complex windows and active facades. One of the early achievements (Spring 2002) was the agreement on a draft European procedure and format for the collation of optical properties of non-scattering glazings. It will be ensured that the European database is compatible with the existing database in USA (Optics5) with the long-term aim of creating a single international glazing library for worldwide application.

The WinDat inter-laboratory comparison forms part of the procedure to assure the quality of spectral transmittance and reflectance data in the range 2500 –300 nm held in the WIS database [2,3]. Participants include European manufacturers who submit data and other European laboratories with capability for accurate measurement of spectral optical properties. This is the first such exercise undertaken within WinDat. It is intended this activity to be repeated regularly with a frequency of no less than once in every 5 years.

Oxford Brookes University has responsibility for coordination of the WinDat inter-laboratory comparison and the responsible contact persons are Prof Michael G Hutchins and Dr Neviana Kilbey (full contact details are given in Section 5 below).

2 TEST SAMPLES

For the WinDat UV/Vis/NIR spectrophotometric near-normal specular transmittance and reflectance measurement intercomparison, 15 sets of samples have been prepared.

Each set contains 4 commercially available glass samples. The 4 glass samples are:

Planitherm Std (Single Ag based, low emissivity)

SS-108 (Stainless steel/Silicon nitride based, medium emissivity)

Ecologique (SnO₂:F, low emissivity)

SKN-165B (Double Ag based low emissivity)

The size of the samples is 100 x 100 mm. All samples were procured from St Gobain Recherche, Aubervilliers, France.

2.1 SAMPLE CODING

The samples are coded as follows (xx = Box number 01 –15 inclusive):

WD04_BOX XX_ S01: Planitherm Std (Single Ag based, low emissivity)

WD04_BOX XX_ S02: SS-108 (Stainless steel/Silicon nitride based, medium emissivity)

WD04_BOX XX_ S04: Ecologique (SnO₂:F, low emissivity)

WD04_BOX XX_ S05: SKN-165B (Double Ag based low emissivity)

Thus Sample “WD04_BOX 06_ S05” is the SKN-165B sample contained in Box No. 06.

Each sample is labelled according to this coding. The labelled side of the samples is “Front” (Uncoated) side.

N.B. There is no sample numbered S03. This derives and is consistent with earlier labelling from an infrared interlaboratory comparison undertaken within the Thermes FP5 project where the same samples were measured.

3 MEASUREMENTS TO BE PERFORMED

3.1 GENERAL REQUIREMENTS

For each sample the following measurements are to be carried out:

Spectral transmittance 300 – 2500 nm

Spectral reflectance 300 – 2500 nm

For the WinDat intercomparison **the preferred wavelength interval is 5nm throughout the whole measured wavelength range.** The resolution must be sufficient to enable calculation of all relevant integrated luminous and solar optical properties as required by EN 410. [1].

For the purposes of this intercomparison where the samples are coated, the coated side is identified as the “Back” side. Measurements should be made for near-normal incidence only. The reflectance of both “Back “ (Coated) side and “Front”(Uncoated) sides of the samples should be measured. The labelled side of the samples is the “Front” (Uncoated) side.

All measurements should seek to include all reflected or transmitted light, i.e. all components contributing to the total transmittance or reflectance of the sample.

Participants should take extreme care in handling samples and the use of gloves is recommended. After opening the box, all samples should be stored in a clean, dry (dessicated) environment.

3.2 MEASUREMENT PROCEDURES

Each participant will use traceable reference standards of their own and the spectral data should be supplied CORRECTED for the standard used where necessary.

Each participant should also calculate and report the integrated optical properties. The calculation should be done using the standard EN410 [1].

Each participant is required to submit the spectral data and the integrated results according to the instructions given below in Section 4.

4 REPORTING DATA FORMATS

4.1 THE WINDAT UV/VIS/NIR MEASUREMENT RESULTS EXCEL WORKBOOK

All data, results and details of the measurement procedure are to be reported to Oxford Brookes University by completing the appropriate sheets of the Excel Workbook provided for this purpose. The workbook has the filename “WinDat_Measurement Intercomparison.xls”.

Please return the workbook with the filename of the form:

“WinDat_WP2_Organisation Short Name_Box Number.xls”.

Thus the measurement of the set of samples of Box 01 by the Belgian Building Research Institute (BBRI) would be entered into the Excel Workbook “WinDat_Measurement Intercomparison.xls” and given the filename:

“WinDat_WP2_BBRI-B_01.xls”

Each participant should submit only one workbook.

The workbook “WinDat_Measurement Intercomparison.xls” consist of 3 worksheets:

4.1.1 WORKSHEET “MEASUREMENT INFORMATION PAGE”

In addition to the data, which are to be returned, details of the measurement procedure(s) are required, which should be given following the format provided in this worksheet. The procedure requires details of all reference materials used and certificates of calibration.

4.1.2 WORKSHEET “SPECTRAL DATA CORRECTED”

Enter the final results after any corrections made in this worksheet. The format of the data is given in Section 4.2.

4.1.3 WORKSHEET “INTEGRATED OPTICAL PROPERTIES”

The calculated integrated optical properties of each sample should be entered into this sheet.

4.2 SPECTRAL DATA FORMAT

In the Excel workbook, sheet “Spectral Data Corrected”, the first column should be the wavelengths and the spectral data shall be given in 3 columns for each sample according to Table 1.

Table 1. Required spectral data format for the WinDat WP2 UV/Vis/NIR transmittance and reflectance intercomparison

Column Name	Content	Format
Wavelength (nm)	Wavelength	Should be in [nm]
S01_T	Measured near normal specular transmittance of the sample.	The values should be as a fraction e.g. 0.625, and NOT as a percentage.
S01_Rf	Measured near normal specular reflectance of the Front (uncoated) side of the sample, i.e. the labelled side	The values should be given in 3 significant digits. Do not use scientific notation (such as 3E-2)
S01_Rb	Measured near normal specular reflectance of the Back (coated) side of the sample.	
S02_T	Repeats for each sample as above.....	
S02_Rf	Repeats for each sample as above	
.....	

4.3 DATA ANALYSIS AND COMPARISON

From the measured spectral data we shall compare at least the following values for each set of data:

Spectral transmittance and spectral reflectance at 500 nm

Spectral transmittance and spectral reflectance at 1500 nm

Photopic (Visible) transmittance and reflectance (calculated using Table 1 of EN 410)

Solar transmittance and reflectance (calculated using Table 2 of EN 410).

We may analyse and compare other values.

5 ORGANISATIONAL DETAILS

5.1 TIMESCALE FOR COMPLETION OF MEASUREMENTS

To enable all necessary work to be completed and all data processed in time for the next WinDat meeting scheduled for 25-26 March 2004 **it is necessary for your results to be completed and returned to Oxford Brookes University no later than Wednesday 17 March 2004.**

5.2 FURTHER INFORMATION

All measurement data should be submitted directly to Dr. Neviana Kilbey, Oxford Brookes University, and copied to Prof. Mick Hutchins.

For further information or in the event of any queries please contact:

Dr Neviana Kilbey Solar Energy Materials Research Laboratory School of Technology Oxford Brookes University Headington Campus, Gipsy Lane, Oxford OX3 0BP, UK Tel: + 44 1865 483539 Fax: + 44 1865 484263 Email: nbkilbey@brookes.ac.uk	Prof Michael G Hutchins Solar Energy Materials Research Laboratory School of Technology Oxford Brookes University Headington Campus, Gipsy Lane, Oxford OX3 0BP, UK Tel: +44 1865 483604 Fax: +44 1865 484263 Email: mhutchins@brookes.ac.uk
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5.3 PARTICIPANTS

Table 2 Participants

Box No.	Organisation	Organisation Short Name	Responsible Person	Email
01	Belgian Building Research Institute (BBRI)	BBRI-B	Mr Giles Flamant	gilles.flamant@bbri.be
02	Centre Scientifiques et Techniques du Batiment	CSTB-F	Mr Francois Olive	olive@cstb.fr
03	Fraunhofer Institute for Solar Energy Systems	FH-ISE	Mr Michael Koehl	mike@ise.fhg.de
04	GLAVERBEL S.A.	GLAVERBEL-B	Mr Jean Roucour	jean.roucour@crd.gla verbel.com
05	Guardian Europe	GUARDIAN-LUX	Mr Michel Pires	mpires@guardian.co m
06	Instituto Elettrotecnico Nazionale Galileo Ferraris	IEAN	Mr G. Rossi	E-mail: rossig@ft.ien.it
07	Interpane	INTERPANE-D	Dr Helen-Rose Wilson	wilson@ise.fhg.de
08	Netherlands Organization for Applied Scientific Research (TNO TPD)	TNO-TPD	Dr Peter van Nijnatten	nijnatten@tpd.tno.nl
09	Pilkington	PILKINGTON-UK	Mr Robert Davies	robert.davies@ptc.pilk ington.co.uk
10	Saint Gobain Glass	ST-GOBAIN-D	Mr Frank Rubbert	Frank.Rubbert@saint- gobain.com
11	Schott Glas	SCHOTT	Dr Thomas Korb	korb@schott.de
12	Stazione Sperimentale del Vetro (SSV)	SSV-I	Mr Franco Geotti- Bianchini	FGeotti@spevetro.it
13	Uppsala University	UU-SW	Prof Arne Roos	Arne.Roos@angstrom .uu.se
14	Velux A/S	VELUX	Mr Karsten Duer	karsten.duer@VELUX .com
15	Fraunhofer-Institut für Bauphysik	FhG IBP	Mr Jan de Boer	jdb@ibp.fhg.de

6 REFERENCES

- [1] EN 410 Glass in building – Determination of luminous and solar characteristics of glazing, April 1998.
- [2] WIS Database. Data Submission Procedure for Glass and Coatings (non –scattering) glazing products, May 2004 (**WinDat_N2.01**).
- [3] WIS Database. Verification Procedure for Spectral Optical Properties data submission from European Glass and Glazing Manufacturers in WIS Database, May 2004 (**WinDat_N2.02**).