Report on
the CCPR Key Comparison K6

Spectral regular transmittance

LNE-INM – Sept 2008
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1. Introduction

In 1952 the Comité Consultatif de Photométrie (CCP at that time) has carried out the first and up to now sole comparison of spectral regular transmittance on coloured glass filters with the Bureau International des Poids et Mesures acting as pilot laboratory. Since that time the organisation of the worldwide metrology has changed with the implementation of the Mutual Recognition Arrangement (MRA)[1] signed in October 1999 by thirty-eight Member States of the Metre Convention and representatives of two international organisations. Now the list of signatories of the Mutual Recognition Arrangement has 45 Members States, 20 Associates of the CGPM and 2 international organisations. A particular aspect of the MRA is the organisation of international comparisons of measurements, to be known as key comparisons. They are introduced, organised and processed according to guidelines which ensure the equivalence of values assigned to transfer standards by different National Metrological Institutes (NMIs).
At the 14th CCPR-meeting in June 1997, it was decided to carry out a Key Comparison of spectral regular transmittance. For the preparation of this comparison a working group with Helsinki University of Technology (HUT, at the present time MIKES), Measurement Standards Laboratory of New Zealand (MSL), National Institute of Standards and Technology (NIST), National Physical Laboratory (NPL), Physikalisch-Technische Bundesanstalt (PTB) and Bureau National de Métrologie (BNM-INM, at present time LNE-INM) was formed, with the LNE-INM acting as the central and reporting laboratory for the measurements to be done and co-operating closely with the BIPM.

2. Participants :

The formal invitation to participate in this comparison with a short note giving the main features of the comparison was sent out to all the CCPR members and observers on 30 November 1998. Nineteen reply have been received. They are summed up in the following Table 1.
According to the paragraph 5 of the MRA guidelines for comparisons, the CCPR, at its 16th meeting, agreed that all the participants accepted before the comparison begins contribute to the data reduction whether members or observers of the CCPR.

[1] Mutual recognition of national measurement standards and of calibration and measurement certificates issued by national metrology institutes
Paris, 14 October 1999
Comité international des poids et mesures
Édité par le BIPM
Pavillon de Breteuil
F-92312 Sèvres Cedex, France
Imprimerie STEDI (Paris)
Achevé d’imprimer : septembre 1999

Table 1 – List of the participating laboratories to the CCPR-K6 comparison.[2]

Acronym	Laboratory Name	Country
BNM-INM → LNE-IMN	*Bureau National de Métrologie - Institut National de Métrologie* Laboratoire National de métrologie et d'Essais	France
CSIR	National Metrology Laboratory	South Africa
CSIRO → NMIA	*Commonwealth Scientific and Industrial Research Organisation* National Metrology Institute of Australia	Australia
HUT → MIKES	*Helsinki University Of Technology* Centre for Metrology and Accreditation	Finland
IEN → INRIM	*Instituto Elettrotecnico Nazionale Galileo Ferraris* Instituto Nazionale di Ricerca Metrologica	Italy
IFA	Instituto de Fisica Aplicada	Spain
KRISS	Korea Research Institute of Standards and Science	Republic of Korea
MSL	Measurement Standards Laboratory	New Zealand
NIST	National Institute of Standard and Technology	USA
NMi	Nederlands Meetinstituut	The Netherlands
NPL	National Physical Laboratory	UK
NRC	National Research Council of Canada	Canada
NRLM → NMIJ/AIST	*National Research Laboratory of Metrology* National Metrology Institut of Japan	Japan
OMH	Országos Mérésügyi Hivatal	Hungary
PSB → NMC-A*STAR	*Singapore Productivity and Standards Board* National Metrology Centre, Agency for Science, Technology and Research	Singapore
PTB	Physikalisch-Technische Bundesanstalt	Germany
SMU	Slovensky Metrologicky Ustav	Slovakia
UME	Ulusal Metroloji Enstitüsü	Turkey
VNIIOFI	All Russian Research Institute for Optophysical Measurements	Russia

For laboratories having changed their name, the new name will be used in this report.
In some laboratories the contact person in charge of the comparison has also changed between the beginning and the end of the comparison. In some other cases it is the address of the contact

[2] When the laboratory name or the acronym has changed during the time of the key comparison, the first line, *written in italic*, is the name of the lab at the beginning of the comparison, the actual name is written under, in regular.

person which has changed. Also the information given on that topic in the technical protocol (Annex A) has to be updated according to the information contained in the table below.

Table 2 – List updated in September 2008 of the contact persons for the participating laboratories to the CCPR-K6 comparison.

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NRC	**Dr Joanne Zwinkels** NRCC – Institute for National Measurement Standards 1200 Montreal Road, Bldg. M-36 Ottawa, Ontario Canada K1A 0R6	Phone : + 1 613 993 9363 Fax : + 1 613 952 1394 E-mail : Joanne.zwinkels@nrc-cnrc.gc.ca
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PTB	**Dr Alfred Schirmacher** PTB – AG 4.51 Speltrometrie und mikrooptische Messtechnik Bundesallee 100 D – 38116 Braunschweig Germany	Phone : + 49 531 592 4510 Fax : + 49 531 592 4272 or 9292 E-mail : alfred.schirmacher@ptb.de
SMU	**Dr Marta Obenrauchova** SMU – Chemistry centre Karloveska 63 842 55 Bratislava Slovakia	Phone : + 421 2 602 94 228 Fax : + 421 2 602 94 561 E-mail : obenrauchova@smu.gov.sk
VNIIOFI	**Dr Svetlana Morozova** VNIIOFI – GOSSTANDART Radiometric and photometric laboratory Ozernaya 46 119361 Moscow Russia	Phone : + 7 95 437 33 11 Fax : + 7 95 437 37 00 E-mail : morozova-m4@vniiofi.ru

3. Principle of the comparison

After discussion among the members of the working group it was decided to organise the comparison in the following way :

* The aim of this first key comparison in this field was restricted to check only the accuracy of the radiometric scale of the reference spectrophotometers of National Metrological Institutes.
* The comparison will be a star type comparison with the samples provided by the pilot laboratory and sent out to all the participants at the same time.
* The filters will be coloured glass filters plates 50 x 50 mm^2.
* The nominal transmittance will be approximately 92%, 56%, 10%, 1% and 0.1%.
* The wavelengths of measurement should be 380, 400, 500, 600, 700, 800, 900 and 1000 nm.
* The recommended geometry will be a parallel beam with a circular shape of 20 mm diameter or a square shape of 20 mm side.
* The angle of incidence should be normal or near normal.
* The recommended bandwidth will be 1 nm.

3.1. Preliminary works

In 1998 and 1999, in order to buy the suitable filters for the comparison, the pilot laboratory has carried out some preliminary work in connection with the French subsidiary of Schott. Two sets of six glass filters each have been specially manufactured to check the quality of the realisation of the filters and the homogeneity of the transmittance. The filters of the first set were made of BK 7 glass, 5 mm thick, with a nominal transmittance of 92% and the filters of the second one were made of NG 5 glass, 5 mm thick, with a nominal transmittance of 10%. All these filters were measured at 700 nm in 5 small areas of 2 x 2 mm^2 one at the centre and the 4 others on the summits of a square of 1 cm side centred on the filter. The homogeneity was checked by comparing transmittance of the central area to that of the other areas. For the BK 7 type filters the variation was usually of the same order of magnitude than the uncertainty of measurement (few parts in 10^4). For the NG 5 type filters the variation was usually in the range of 1 to 2 parts in 10^3, much larger than the uncertainty but never the less acceptable according to the spot size recommended for the comparison. Some extra measurements have been also carried out on one or two filters to check the homogeneity at other wavelengths, or over a much larger area than the central part of the filters (± 15 mm). The cleaning method was also checked. The results of all these tests being satisfactory, order for the sets of filters necessary for the comparison was placed.

3.2. Description of the standards

The filter set to check the photometric scale is constituted by 5 neutral coloured glass filter plates 50 mm x 50 mm with nominal transmittance, at the wavelength of 546 nm, of approximately 92%, 56%, 10%, 1% and 0.1%. Each filter is identified by a reference engraved in a corner outside the area used for measurement. This reference has two parts. One is a letter indicating the type of glass (see table below) the other is the serial number of the filter. The main characteristics of the filters are summarised in the following Table 3:

Table 3 – Filter characteristics.

Nominal transmittance @ 546 nm in %	Type of glass	Nominal thickness mm	Reference
92	BK 7	4.0	A
56	NG 11	1.5	B
10	NG 5	3.9	C
1	NG 4	3.9	D
0.1	NG 3	3.1	E

The manufacturing tolerances are for :
Size : 50 x50 (+0/-0.3) mm
Flatness : better than 5 µm over a central diameter of 30 mm
Parallelism : better than 0.02 mm except for the filter of transmittance 92% (<0.1 mm)

The delivery of 30 sets of filters arrived at the end of July 1999 and measurements started in September of the same year on 20 sets for the CCPR comparison.

3.3. Measurements before dispatching

At the pilot laboratory, measurements before dispatching the filters have been carried out on the reference spectrophotometer of the laboratory. The complete description of the experiment is detailed in the following paragraph.

3.4. LNE-INM experimental set-up

Facility

The LNE-INM reference spectrometer for transmission measurements is composed primarily of a source, a monochromator, an optical mount and a detector (Figure 1). The QTH lamp is used on the full spectral range from 380 to 1000 nm. The image of the filament is formed at the entrance slit of the monochromator with two lenses (*L*). Between the lenses, where the beam is collimated, non-fluorescent filters (*F*) are used to suppress higher orders. These filters are colored filters from the SFK filter collection, from Schott. They are band pass filters with a half width at half the maximum ranging between 25 nm to 60 nm. To reduce the “in band” straylight, the aperture (*A*) is adjusted to avoid having light outside the grating. The “out band” stray was checked using long pass, sharp cut-off, coloured glass filters at various wavelengths.
The wavelength is controlled by a high resolution Jobin Yvon single grating monochromator (THR). The focal distance of the spherical mirrors of the Czerny-Turner mount is 1500 mm and the numerical aperture is F/12. For the spectral range 380 nm to 700 nm, the grating is an holographic grating with 2000 groves per mm giving a band pass of 0.5 nm at the exit slit of the monochromator. For the spectral range 700 nm to 1000 nm, the grating is an engraved grating with 1200 groves per mm giving a band pass of 0.8 nm. The resolution obtained with the stepper motor is 0.002 nm with the holographic grating and better than 0.0035 nm between 800 and 1400 nm.
Two spherical mirrors (*M*) are used to relay the light to the detector and avoid chromatics aberrations and back reflections. Between the mirrors, the light beam is collimated and goes through the filter to be measured. The beam spot on the filters was 20 mm diameter circle as recommended in the protocol. The filter holder is mounted on a translation stage, to allow the measurement of the reference beam (100%) and the black (0%).

The detector part is composed of an integrating sphere (SI) and a detector. The detector is associated with the grating. For the holographic grating, on the visible range, a photomultiplier S20 is used. For the ruled grating, on the IR range, a silicon photodiode is used.
All the optical mounts at the exit slit of the monochromator is housed in a temperature controlled black box. For the “before” measurements, the average temperature in the box was 22 ± 1 °C; for the “after” measurements the average temperature in the box was 22.5 ± 0.6 °C.

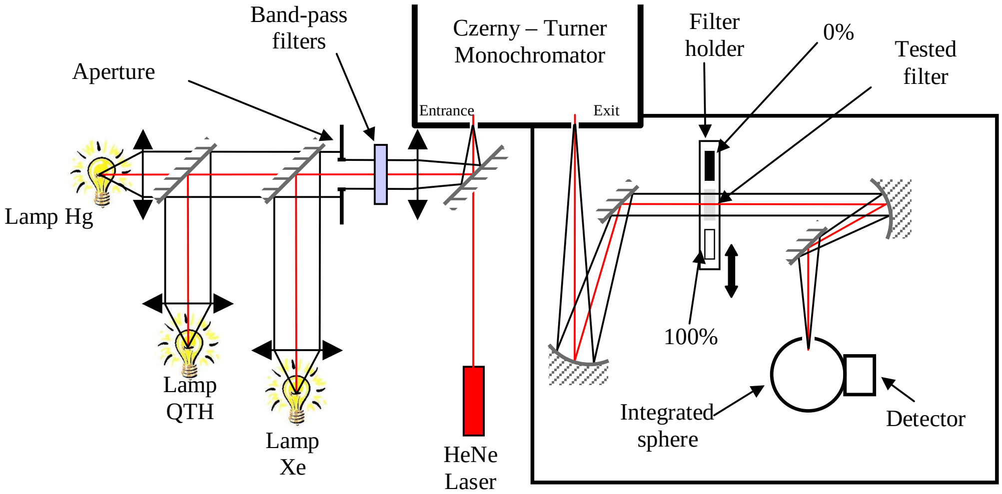

Figure 1 – Schematic drawing of the reference spectrometer.

Filter sets “D” and “E” have been measured using a step down method with an NG 5 filter in the reference beam. The transmittance of this filter was approximately 10%.
For each filter and each wavelength, a set of three successive measurements was taken and the mean value and the standard deviation were calculated. A second set of measurements identical to the first one was taken another day. If one of the standard deviations was larger than the expected value or the discrepancy between both measurements was too large, a third and eventually a fourth set of measurements was taken. The final result is the mean value of at least two sets of measurements.

Typical uncertainties

The uncertainties are absolute uncertainties

Table 4 : Type A uncertainties

λ (nm)	Filter "A"	Filter "B"	Filter "C"	Filter "D"	Filter "E"
380	6,16E-05	4,11E-04	1,52E-04	1,04E-05	6,54E-07
400	6,15E-05	6,61E-05	2,96E-05	4,13E-06	1,60E-06
500	6,15E-05	6,60E-05	2,92E-05	6,28E-06	1,67E-06
600	6,15E-05	6,68E-05	4,23E-05	9,88E-06	2,41E-06
700	6,15E-05	7,02E-05	3,48E-05	1,73E-05	4,01E-06
800	6,84E-05	1,22E-04	1,15E-04	2,21E-05	9,52E-06
900	6,83E-05	1,21E-04	8,09E-05	2,28E-05	8,33E-06
1000	6,83E-05	8,72E-05	6,24E-05	1,71E-05	7,05E-06

Table 5 : Type B uncertainties

λ (nm)	Filter "A"	Filter "B"	Filter "C"	Filter "D"	Filter "E"
380	6,20E-05	4,12E-04	1,52E-04	1,10E-05	1,00E-06
400	6,20E-05	6,70E-05	3,00E-05	5,00E-06	2,00E-06
500	6,20E-05	6,70E-05	3,00E-05	7,00E-06	2,00E-06
600	6,20E-05	6,70E-05	4,30E-05	1,00E-05	3,00E-06
700	6,20E-05	7,10E-05	3,50E-05	1,80E-05	5,00E-06
800	6,90E-05	1,23E-04	1,15E-04	2,30E-05	1,00E-05
900	6,90E-05	1,22E-04	8,10E-05	2,30E-05	9,00E-06
1000	6,90E-05	8,80E-05	6,30E-05	1,80E-05	8,00E-06

3.5. Circulation of the filters

Before the circulation of the filters, an up-to-date technical protocol was written to take into account the new rules of key comparisons procedures (Annex A, p69). The basic organisation of the comparison and the measurements to be carried out, as agreed by the working group, were not modified. The selection of filter sets to each laboratory was done at random and is summarized in Table 6.

Table 6 – Identification of the set of filters sent to the laboratories.

Laboratory acronym	Filter set identification
CSIR	Set 01
NMIA	Set 17
MIKES	Set 16
INRIM	Set 02
IFA	Set 05
KRISS	Set 07
MSL	Set 19
NIST	Set 06
NMi	Set 08
NPL	Set 04
NRC	Set 18
NMIJ/AIST	Set 09
OMH	Set 12
NMC-A*STAR	Set 10
PTB	Set 03
SMU	Set 11
UME	Set 13
VNIIOFI	Set 14

The filters were sent to the participating laboratories in May 2000 but due to some difficulties with customs, several sets of filters arrived several weeks later and even, in one case, several months later. Fifteen laboratories completed the measurements and sent back the filters before the end of the year 2000.
For various reasons, during the comparison, some laboratories encountered difficulties and withdrew their participation to the comparison. These laboratories are :

- CSIR, National Metrology Laboratory (South Africa) - The filters were sent back without results.
- INRIM, Instituto Nazionale di Ricerca Metrologica (Italy) - For practical reasons, the laboratory was unable to carry out the measurements in time. As INRIM is also a member of EUROMET, it has asked to move from the CCPR comparison to the EUROMET comparison.
- OMH, Orszàgos Mérésügyi Hivatal (Hungary) - Just after sending its results this laboratory discovered a problem in its measurements and cancelled out its participation in the CCPR key comparison. As it is also a member of EUROMET, it has asked to take part in the EUROMET comparison with a new set of filters.
- UME, Ulusal Metroloji Enstitüsü (Turkey) - This laboratory has sent back the filters with its results only in April 2001. It was not possible to include them in the return measurements. As UME is a member of EUROMET, its results has been transferred to the EUROMET comparison.

The final number of laboratories having taken part in the comparison is 15.

3.6. Measurements after return of the filters

The measurements after return of the filters have started with the available filters in January 2001. But due to some difficulties in the staff of the pilot laboratory, they were completed only in December 2001. In order to check the stability of the filters, they were carried out exactly in the same way as the measurements before dispatching and without any cleaning.

3.7. Stability of the filters

The stability of the filters during the comparison was checked by calculating the absolute deviation of the transmittance of the filter according to the equation :

$$\text{Deviation} = \text{transmittance after} - \text{transmittance before} \qquad (1)$$

The uncertainties taken into account for this study are only the uncertainties determined by type A methods of the measurements carried out by LNE-INM. Because measurements have been done in exactly the same conditions in both cases, most of the uncertainties determined by type B methods cancelled out or have a negligible effect. The results for the filters used in the comparison are given in Figure 2 to Figure 6. Numerical values are reported in Annex B.1 and Annex B.2, respectively, on p84 and 85.

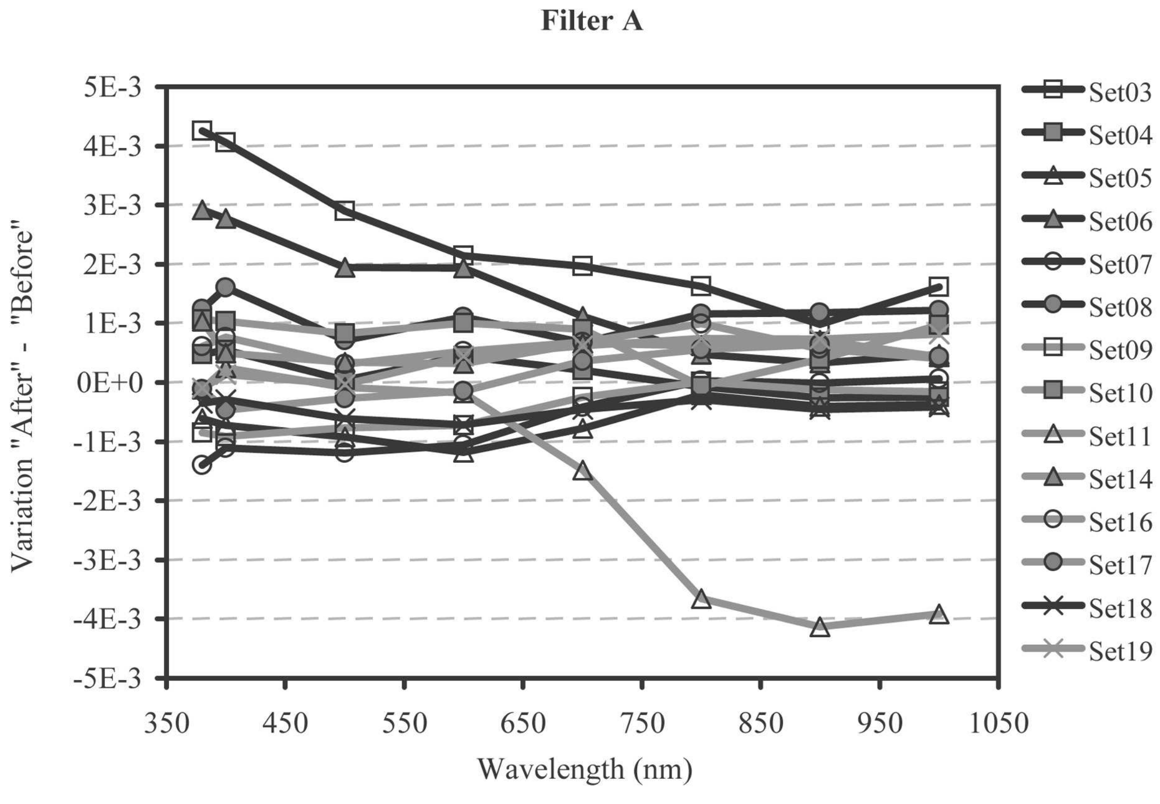

Figure 2 – Stability of type A filters during the comparison

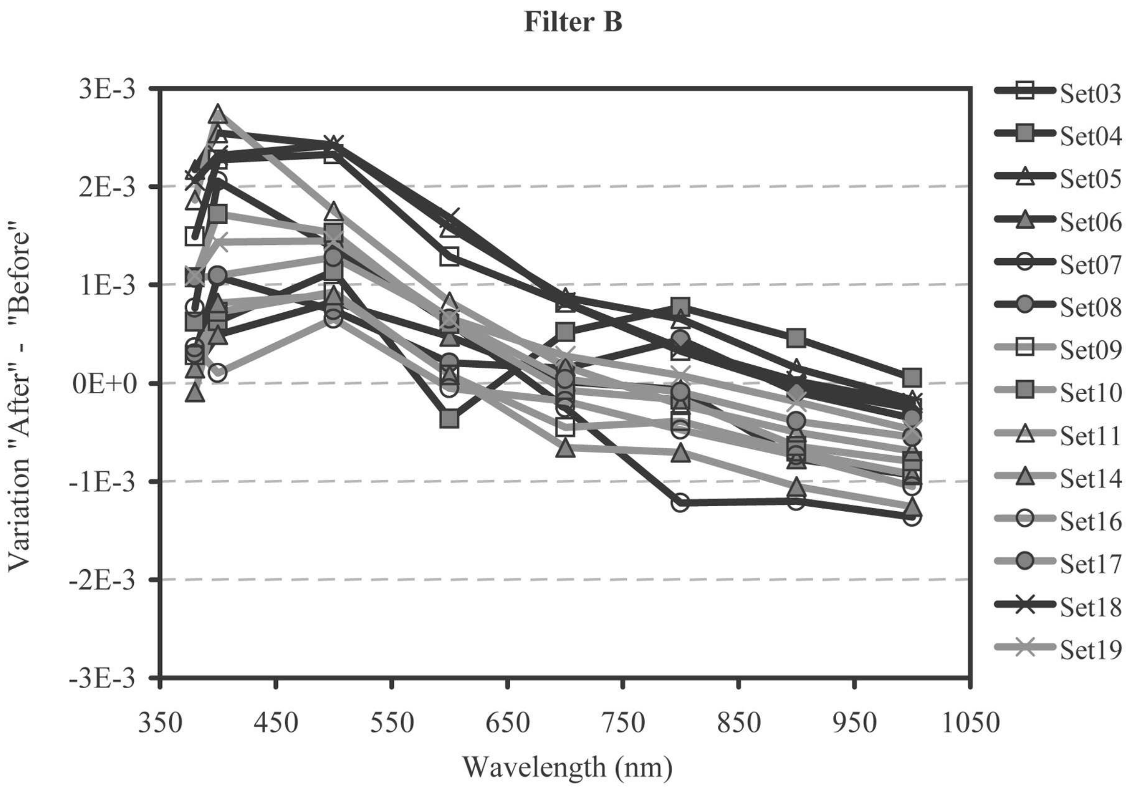

Figure 3 – Stability of type B filters during the comparison

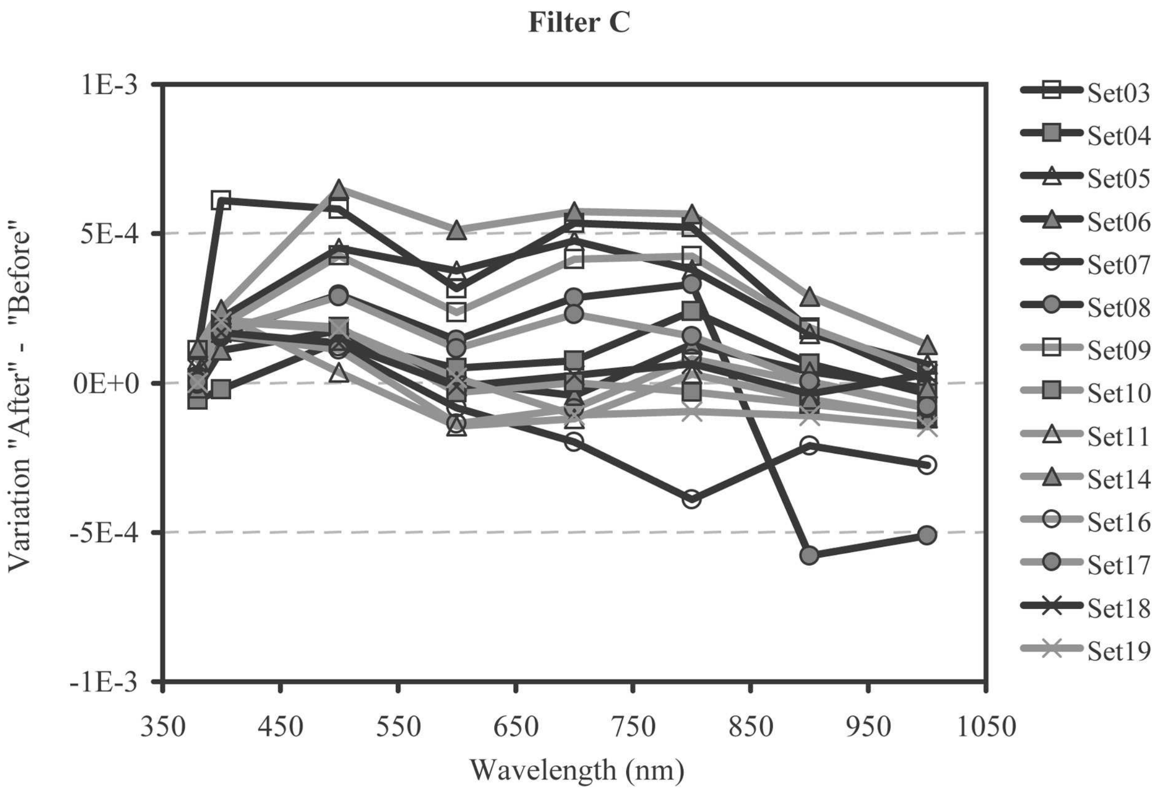

Figure 4 – Stability of type C filters during the comparison

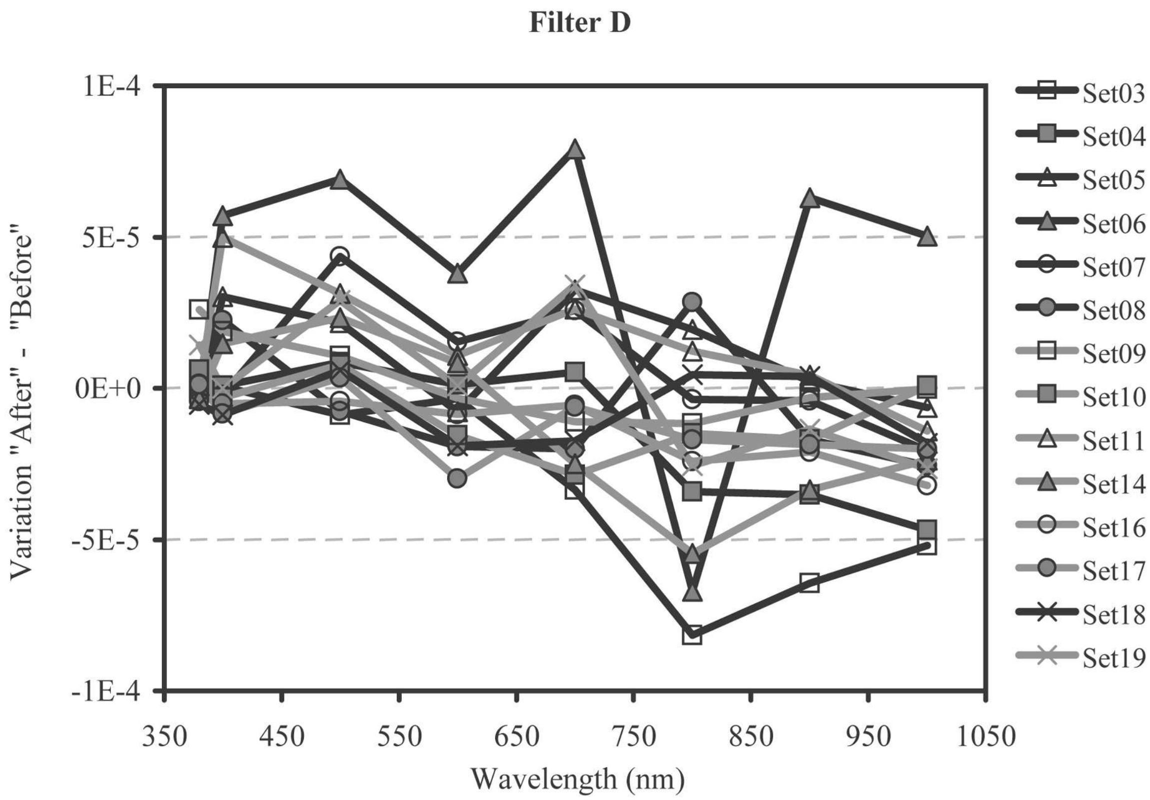

Figure 5 – Stability of type D filters during the comparison

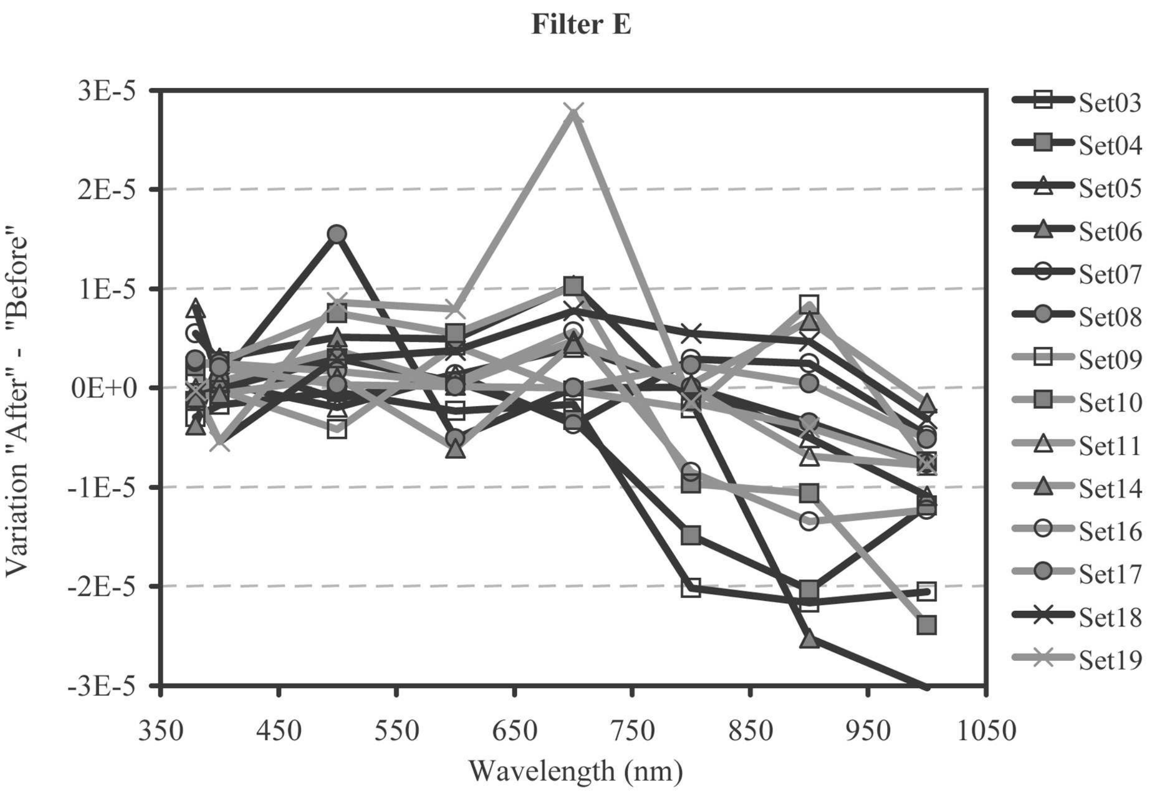

Figure 6 Stability of type E filters during the comparison

As it can be seen from the preceding graphs, the stability of the filters was rather poor. Moreover, for the coloured glass filters (filters B to E), the drift was wavelength dependent. As a consequence, for many results, the uncertainty due to the drift of the filters during the comparison is the major cause of uncertainty, much larger than the measurement uncertainty of the measurements reported by the laboratories. A few filters, which exhibited a very small drift, give results with an uncertainty much smaller than the uncertainty value for the majority of the filters leading to difficulties in the data processing.

3.8. LNE - INM transmittance value

The transmittance value adopted by the LNE-INM for the filter was the mean value of measurements before and after the circulation of the filters.

4. Facilities, measurement methods and conditions, and uncertainties from the participating laboratories

Each participating laboratory has returned its transmission measurements with a brief description of the experimental set up and a detailed uncertainties budget. These documents have been compiled together in two files, a “tables of facilities” and a “table of uncertainties”. The files have been sent to all the participants for verification and validation. In the following, a résumé of these information is reported.

For each participating lab, we report:

The make and type of the spectrophotometer:
The description of the measuring technique.
The description of calibration laboratory conditions
If applicable, comments on filters.
The Type A and Type B uncertainties for each filter and each wavelength.

4.1. IFA

Assigned set: #5

Make and Type of the spectrophotometer:

The measurements have been done in a purpose built spectrophotometer. This spectrophotometer features a single beam, single monochromator with 3 interchangeable diffraction gratings. Although this is a single grating monochromator, stray light is lower than 100 p.p.m. of the detector signal. A 1200 g/mm grating has been used for the calibration in the UV/Visible spectral range (380, 400, 500, 600, 700 and 800 nm wavelengths), while a 600 g/mm grating has been used for the calibration in the near IR spectral interval (900 and 1000 nm). Long wave pass filters have been used in both intervals to eliminate second order wavelength radiation. Filter change is automatic during monochromator slewing as well as grating changes.

A tungsten lamp has been used for the whole spectral range. Similarly only one silicon detector has been used in order to cover the wavelength range.

Description of the measuring technique

Samples were illuminated by a parallel beam impinging normally. The spot size was 23 mm diameter. Measurements have been done at a nominal bandwidth of 3.4 nm in the UV/VIS range for the filters identified as A05, B05 and C05; and 5 nm for the filters D05 and E05. In the near IR (900 and 1000 nm wavelengths), the measurements have been done at a nominal bandwidth of 3 nm for all the filters.

The spectral transmittance of the filters has been determined by comparing the detector response with and without filter in the beam. The calibration procedure consists in recording the detector response to the calibration beam without filter, at every wavelength; and then to record the detector response, for the same wavelengths, when we introduce the filter in the beam. The spectral transmittance is determined then, as the ratio of the detector responses. A detector is used to monitor the power temporal drift of the calibration beam.

Each filter has been measured in four different positions. Every position was obtained by rotating the filter by 90º about the optical axis. This procedure has been repeated three times, resulting a number of 12 independent measurements for each filter.

Description of calibration laboratory conditions

Filter temperature is supposed to be that of the calibration enclosure. This temperature was always between 23ºC and 25ºC.

Comments on filters

No cleaning of the filters has been done

Uncertainties

The uncertainties are absolute uncertainties

Table 7 : Type A uncertainties

λ (nm)	Filter “A”	Filter “B”	Filter “C”	Filter “D”	Filter “E”
380	5,40E-04	2,70E-04	1,10E-04	1,30E-05	1,60E-05
400	6,20E-05	3,10E-04	9,10E-05	1,40E-05	1,20E-05
500	4,00E-05	2,20E-04	5,50E-05	6,90E-06	5,40E-06
600	9,50E-05	2,70E-04	1,10E-05	4,60E-06	2,80E-06
700	7,20E-05	2,20E-04	1,80E-05	3,70E-06	3,60E-06
800	2,40E-05	1,70E-04	1,90E-05	9,00E-06	9,90E-06
900	6,70E-05	1,20E-04	1,60E-05	1,50E-06	1,20E-06
1000	4,10E-05	2,40E-04	2,20E-05	1,50E-06	1,90E-06

Table 8 : Type B uncertainties

λ (nm)	Filter “A”	Filter “B”	Filter “C”	Filter “D”	Filter “E”
380	2,34E-03	7,53E-04	8,66E-05	1,52E-05	4,74E-05
400	2,80E-03	1,57E-03	2,11E-04	2,65E-05	3,82E-05
500	4,98E-04	3,34E-04	2,14E-05	6,67E-06	8,42E-06
600	6,94E-04	4,21E-04	6,20E-05	7,38E-06	5,31E-06
700	2,30E-03	1,38E-03	3,19E-04	4,99E-05	9,33E-06
800	6,00E-04	3,62E-04	9,61E-05	2,33E-05	1,41E-06
900	2,10E-03	9,93E-04	1,99E-04	2,40E-05	9,93E-06
1000	2,00E-03	1,28E-03	8,11E-05	2,09E-05	1,18E-05

4.2. KRISS
Assigned set: #7

Make and Type of the spectrophotometer:

The spectrophotometer is a self-built spectrophotometer. The main characteristics of the equipment are listed below:

Beam geometry and size	: Circular parallel beam with 20 mm diameter
Type of the spectrophotometer	: Single beam spectrophotometer
Monochromator	: Double grating monochromator
Light source	: Tungsten lamp, Xe arc lamp(380 ~ 400 nm)
Detector	: Silicon photodiode

The bandwidth was 2nm for all the measurements.

The following figure describes the principle of the equipment.

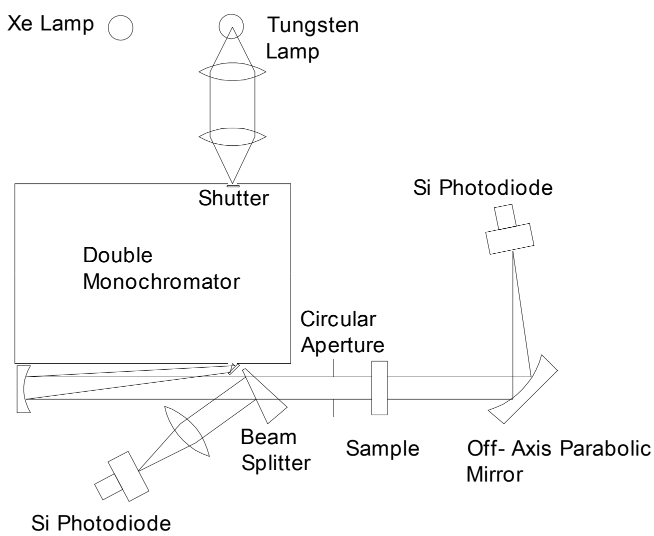

Figure 7 - The experimental arrangement for the spectral transmittance measurement.

Description of calibration laboratory conditions

Temperature : 23 ± 1°C
Humidity : 50 ± 10

Comments on filters

During measurement edges of the D07 filter was broken and A07 filter was partly contaminated.

Uncertainties

The uncertainties are absolute uncertainties.

Table 9 : Type A uncertainties

λ (nm)	Filter “A”	Filter “B”	Filter “C”	Filter “D”	Filter “E”
380	1,30E-04	1,80E-04	5,00E-05	2,00E-06	1,00E-07
400	1,20E-04	5,00E-05	1,50E-05	1,00E-06	8,00E-07
500	9,00E-05	6,00E-05	2,20E-05	2,00E-06	1,00E-06
600	8,00E-05	1,00E-04	1,80E-05	5,00E-06	1,40E-06
700	1,10E-04	1,00E-04	3,10E-05	1,00E-05	3,40E-06
800	1,20E-04	8,00E-05	3,00E-05	1,10E-05	3,50E-06
900	1,20E-04	9,00E-05	2,00E-05	1,20E-05	3,70E-06
1000	1,00E-04	6,00E-05	2,10E-05	1,00E-05	4,00E-06

Table 10 : Type B uncertainties

λ (nm)	Filter “A”	Filter “B”	Filter “C”	Filter “D”	Filter “E”
380	2,25E-04	4,88E-04	9,12E-05	2,24E-06	1,73E-07
400	1,84E-04	1,31E-04	4,56E-05	6,93E-06	7,55E-07
500	1,32E-04	9,22E-05	9,59E-06	3,46E-06	6,63E-07
600	7,55E-05	4,58E-05	1,88E-05	4,90E-06	7,75E-07
700	1,02E-04	6,63E-05	6,28E-05	1,62E-05	5,06E-06
800	9,00E-05	7,55E-05	3,08E-05	1,02E-05	6,75E-06
900	1,06E-04	6,32E-05	2,10E-05	1,06E-05	4,34E-06
1000	1,25E-04	5,29E-05	negligible	8,31E-06	3,63E-06

4.3. MIKES

Assigned set: #16

Make and Type of the spectrophotometer:

The spectrometer (Figure 8) is an automated single-beam instrument with collimated normal-incidence beam geometry. The light source is a flat-filament 150-W quartz-tungsten-halogen lamp for the measurements at visible and NIR wavelengths and a 150-W xenon-arc light source for the UV and short-wavelength visible measurements.
The monochromator is a diffraction grating apparatus with three interchangeable gratings for the UV, visible, and NIR wavelength ranges. It is a Fasti asymmetrical circuit using spherical mirror objectives of 600-mm focal length. The gratings for the UV, visible, and NIR ranges are replicas with 1200, 1200, and 600 lines/mm, respectively, and with dimensions of 100 mm × 100 mm. The working ranges are from 200 nm to 500 nm, 350 nm to 1000 nm, and 700 nm to 2000 nm for the UV, visible, and NIR replicas, respectively.
The narrow bandwidth light beam emerging from the monochromator is collimated and directed towards the detector unit by a 90-degree off-axis parabolic mirror. The beam size is 20 mm × 22 mm at the vicinity of the parabolic mirror and its final shape is defined by an iris diaphragm.
The detector unit includes a 110-mm-diameter averaging sphere with an input-port diameter of 20 mm. An interchangeable detector is mounted to the output port of the averaging sphere. A silicon photodiode is used for measurements at visible wavelengths and an InGaAs photodiode is used for measurements at NIR wavelengths. The active area of the photodiodes is 100 mm^2 and each detector includes a low-noise transimpedance amplifier. For short visible wavelengths, the averaging sphere detector was replaced with a large area silicon trap detector and a transimpedance amplifier.

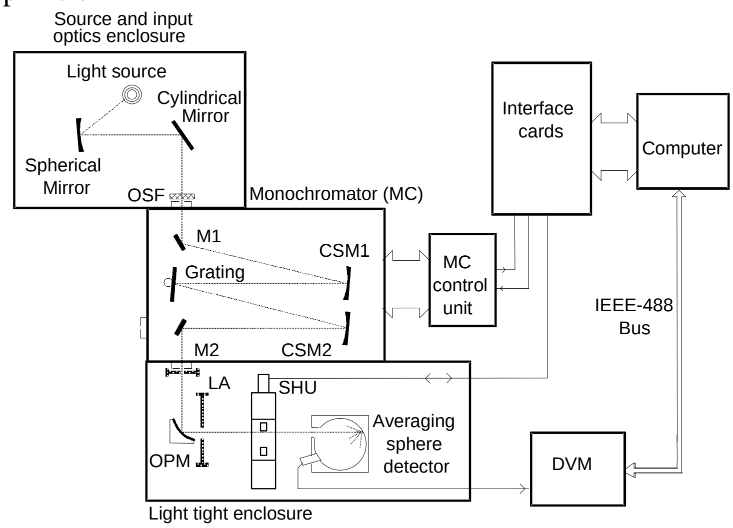

Figure 8 - Schematic of spectrometer for transmittance measurements. OSF, order-sorting filter; M1, M2, flat mirrors; CSM1, CSM2, collimating spherical mirrors; LA, limiting apertures (iris diaphragm), OPM, off-axis parabolic mirror; SHU, sample-holder unit; DVM, digital volt meter.

Description of the measuring technique

The bandpass of the instrument was set to 1.0 nm for the measurements at the visible wavelengths and to 2.0 nm at the NIR wavelengths. Four individual sets of measurements were carried out on the filters. From one set to the other, the filters are rotated clockwise by 90. For one orientation of the filters at a wavelength setting, the sequence is *m* times (I_b, I_o, I_s, I_s, I_o, I_b). Symbols I_b, I_o and I_s denote respectively the signal readings for the detector dark current, for the beam intensity through an empty space, and for signal reading for the transmitted beam through filter. The number of passes was usually chosen as $m = 5$. Two consecutive readings were taken for each individual sample so that the detector exposure times were equal for the partial and full beam intensity. The average value of the two I_{sj} readings is denoted by $\bar{I}_{sj}$ (j=1, 2). The signal-reading data were processed by taking the average values of two I_b readings and the closest I_o readings on both sides of I_{sj} readings, giving mean values $\bar{I}_b$ and $\bar{I}_{oj}$. Then the transmittance T_j was computed for each filter according to

$$T_j = \frac{\bar{I}_{sj} - \bar{I}_b}{\bar{I}_{oj} - \bar{I}_b}.$$

The transmittance values for the *m* passes were then averaged to obtain $\bar{T}_j$.

Description of calibration laboratory conditions

When received, the filters were clean except for a few minor stains and some dust particles attached to the surfaces of the filters. We used soft brush to remove the dust particles. No efforts were made to remove the dirt stains. The ambient temperature of the laboratory was 23±1 °C.

Comments on filters

When received, the filters were clean except for a few minor stains and some dust particles attached to the surfaces of the filters. We used soft brush to remove the dust particles. No effort were made to remove the dirt stains.

Uncertainties

The uncertainties are absolute uncertainties.

Table 11 : Type A uncertainties

λ (nm)	Filter “A”	Filter “B”	Filter “C”	Filter “D”	Filter “E”
380	1,00E-04	1,00E-04	2,00E-05	5,00E-07	5,00E-07
400	5,00E-05	1,00E-04	3,00E-05	5,00E-07	5,00E-07
500	1,50E-04	5,00E-05	5,00E-06	1,50E-06	2,00E-06
600	1,00E-04	1,00E-04	2,50E-05	1,50E-06	1,00E-06
700	1,00E-04	5,00E-05	2,50E-05	2,50E-06	2,50E-06
800	1,00E-04	5,00E-05	1,50E-05	2,00E-06	1,50E-06
900	5,00E-05	5,00E-05	3,00E-05	2,50E-06	2,50E-06
1000	5,00E-05	5,00E-05	3,50E-05	3,00E-06	3,00E-06

Table 12 : Type B uncertainties

λ (nm)	Filter “A”	Filter “B”	Filter “C”	Filter “D”	Filter “E”
380	6,00E-04	6,00E-04	1,30E-04	1,40E-05	4,00E-06
400	4,00E-04	4,00E-04	9,00E-05	5,00E-06	2,00E-06
500	3,00E-04	3,00E-04	7,00E-05	7,00E-06	2,00E-06
600	3,00E-04	3,00E-04	7,00E-05	9,00E-06	2,00E-06
700	3,00E-04	3,00E-04	1,20E-04	2,10E-05	5,00E-06
800	3,00E-04	3,00E-04	1,10E-04	2,50E-05	8,00E-06
900	4,00E-04	3,00E-04	9,00E-05	2,00E-05	8,00E-06
1000	4,00E-04	3,00E-04	7,00E-05	1,50E-05	7,00E-06

4.4. MSL

Assigned set: #19

Make and Type of the spectrophotometer:

The MSL Reference Spectrophotometer is a single-beam instrument based on a McPherson 2051 spectrometer consisting of a prism predisperser and a one-metre focal-length Czerny-Turner single-grating monochromator with an effective aperture of f/8.7. Entrance and exit slits of the latter are variable from 0.005–2.0 mm corresponding to bandwidths of 0.008–3.3 nm. The three gratings are of 600 lines/mm and blazed for peak efficiency at 300, 500 and 1250 nm respectively. Beam shaping is achieved with mirrors not lenses and off-axis paraboloids have been used throughout for this purpose. All optical components are mounted on a custom-made, vibration-isolated optical table. In the source room light sources available include tungsten-halogen projection lamps for high-intensity visible light, tungsten-filament ribbon lamps for a lower-noise source, a deuterium lamp for UV, and a red HeNe laser for alignment.

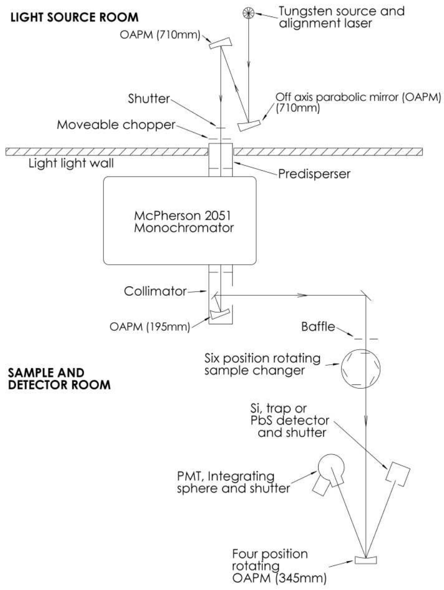

Figure 9 - Schematic diagram of the MSL Reference Spectrophotometer

Description of the measuring technique

Four sets of measurements were made on each filter in which the filter was rotated about horizontal and vertical axes.

The MSL reference spectrophotometer was set up to place a well-collimated beam of 18 mm diameter and 1 nm bandwidth on the filters at normal incidence (see Figure 9). The source used was a tungsten-filament ribbon lamp, except for the measurements on filters D and E at 380 nm for which a tungsten-halogen projection lamp was used. The sample carousel holds up to six artefacts, each up to 50 mm square, in holders which can be both translated and tilted in two axes normal to the beam, so that the artefacts under test may be centred on and set normal to the incident beam. The area of sample illuminated is defined by an iris 300 mm before the sample. The detectors are coupled to locally-made current-to-voltage converters (gain adjustable from 10^4 to 10^8 ohm) whose output is measured with a HP 3458 DVM under computer control.

At each wavelength setting the complete time-symmetric sequence of measurements of the flux transmitted by each filter and by the reference position was made before incrementing the wavelength. For each measurement of transmitted intensity the DVM is programmed to take 10 readings, each averaged over 200 PLC (power line cycles), and to return the mean and standard deviation. All such measurements are preceded by a measurement, identical in form, of the detector dark current, taken with the shutter closed. The measurement sequence used is time-symmetric and may be written as N repetitions of $\{D, I_0, D, I_1, \ldots, D, I_n, D, I_0, D, I_n, D, I_{n-1}, \ldots\ D, I_1\}$ then $\{D, I_0, D\}$where I_n is a transmitted intensity, $n = 0$ denotes the reference position and $1 \le n \le 5$ denotes filters under test, and where D is a dark current measurement. Typically N=4 repetitions are used. After dark current subtraction a linear temporal fit is made to the 8 or 9 readings for each filter using a common slope for all filters to correct for linear drift in lamp intensity and detector-chain response.

Description of calibration laboratory conditions

The spectrophotometer room was maintained at 22.6 ± 0.3ºC during the measurements. On arrival the filters were dusty and there was some evidence of a fine haze on the surface; after consulting with the pilot laboratory, they were cleaned with dry nitrogen and then with iso-propyl alcohol and lens tissue.

Comments on filters

Filters arrived last night. Package does not appear to have been opened. We opened them under clean conditions and what does concern us greatly is the amount of dust on the filters. The dust is equally spread on both surfaces of all 5 filters and includes large flecks up to 50 microns in size. It extends right to the edge of each filter (the edges of both surfaces that were in the slots in the box are equally dusty) and hence appears to have landed on them prior to despatch. There are certainly no finger prints on them nor can we see any solvent smears but there is some evidence of a fine haze on the surface in addition to the coarser dust. We will remove this dust before measuring their transmittance as we can only presume that they were dust free when measured in your laboratory. Although we will try, in our judgement it will probably not be possible to clean them adequately with dry nitrogen. We will then have to use alcohol and lens tissue; before doing so we would like comment from you as to whether we should do this.

Reply to comments on filters

I have received your e-mail telling me the problem you have with the filters for the comparison. At present time I have no explanation for that, probably something wrong has happened during the rather long period after the end of the measurements and departure of the filters due to customs and sending difficulties. Up to now, I have received 13 over 18 receipt confirmations and fortunately only Canada and you have the same problem with dust and haziness. According to our study on the cleaning, it seems to me better for the quality of the comparison you clean the filters according to your method which is comparable to our process of cleaning. And according to the protocol you will mention in your report the cleaning of the filters.

Uncertainties

The uncertainties are absolute uncertainties.

Table 13 : Type A uncertainties

λ (nm)	Filter “A”	Filter “B”	Filter “C”	Filter “D”	Filter “E”
380	1,83E-04	8,10E-05	6,00E-06	6,00E-06	6,00E-06
400	1,83E-04	1,21E-04	1,90E-05	6,00E-06	6,00E-06
500	1,83E-04	1,23E-04	1,80E-05	6,00E-06	6,00E-06
600	1,84E-04	1,21E-04	1,50E-05	6,00E-06	6,00E-06
700	1,84E-04	1,27E-04	3,20E-05	6,00E-06	6,00E-06
800	1,84E-04	1,15E-04	3,00E-05	6,00E-06	6,00E-06
900	1,84E-04	1,00E-04	2,00E-05	6,00E-06	6,00E-06
1000	1,84E-04	9,00E-05	1,50E-05	6,00E-06	6,00E-06

Table 14 : Type B uncertainties

λ (nm)	Filter “A”	Filter “B”	Filter “C”	Filter “D”	Filter “E”
380	5,10E-05	5,43E-04	9,80E-05	6,00E-06	5,00E-06
400	5,10E-05	1,26E-04	5,00E-05	1,50E-05	5,00E-06
500	5,00E-05	1,21E-04	3,20E-05	1,90E-05	5,00E-06
600	5,00E-05	1,23E-04	2,70E-05	1,90E-05	5,00E-06
700	5,00E-05	1,18E-04	6,90E-05	4,70E-05	9,00E-06
800	5,00E-05	1,33E-04	4,30E-05	5,20E-05	1,30E-05
900	5,00E-05	1,41E-04	3,40E-05	4,00E-05	1,10E-05
1000	5,00E-05	1,43E-04	2,60E-05	3,20E-05	1,00E-05

4.5. NIST
Assigned set: #6

Make and Type of the spectrophotometer:

The instrument is custom-made using a McPherson 2051 prism-grating 1 m monochromator. Light from a 150 W quartz-tungsten-halogen incandescent lamp is focused by a spherical mirror onto the entrance slit of the monochromator. The entrance slit is 1 mm wide, while the exit aperture is a 1 mm diameter circle. The grating has 600 lines/mm and is blazed at 200 nm. The slit, aperture, and grating yield a triangular bandwidth of 1.5 nm. The light exiting the monochromator is collimated by an off-axis parabolic mirror, reduced in diameter by an iris, and is incident upon the sample carriage. Light passing through the sample carriage is focused by a spherical mirror into an averaging sphere attached to a silicon photodiode. The current from the photodiode is amplified and read by a digital voltmeter.

Description of the measuring technique

After cleaning with an air bulb, each sample was mounted in a holder on the sample carriage with the identification number facing the incident beam and upright. The sample was centered on the incident beam and aligned normal to the beam by retroreflecting a laser beam collinear with the axis of the incident beam. The maximum deviation from normal was 0.2º. The diameter of the incident beam was 20 mm.
The sample carriage consists of three incident positions for the beam: clear, sample, and light trap. At each wavelength, ten signals were measured from the clear, trap, sample, trap, and clear positions, in order. Net signals for the clear and sample positions were obtained by subtracting the signals from the light trap position. The spectral transmittance of the sample was given by the net sample signal divided by the average net clear signal. Measurements were performed at wavelengths of 380, 400, 500, 600, 700, 800, 900, and 1000 nm.
The spectral transmittance of each sample was measured three times, then the sample was rotated 90º about its normal and measured three more times. This was done to remove any effects from the slight polarization of the incident beam. The measurements were repeated on three different days for each sample over a period of 2 weeks. The average spectral transmittance for each rotation was calculated from the nine separate scans, then these were averaged to yield the final spectral transmittance for unpolarized incident light. The standard deviations listed above are the maximum from the two sample rotations.

Description of calibration laboratory conditions

The entire spectrophotometer is contained in a light-tight box with a slight overpressure of filtered air. The temperature inside the box remained at 23 ºC, while the relative humidity varied between 24 % and 58 %.

Comments on filters

Filter A06 was accidentally dropped, resulting in a chip in the lower left-hand corner. The chip was outside the 20 mm diameter area of the filter over which the spectral transmittance was measured.

Uncertainties

The uncertainties are absolute uncertainties

Table 15 : Type A uncertainties

λ (nm)	Filter “A”	Filter “B”	Filter “C”	Filter “D”	Filter “E”
380	3,00E-04	9,00E-04	7,00E-05	2,00E-05	2,00E-05
400	3,00E-04	3,00E-04	5,00E-05	2,00E-05	3,00E-05
500	2,00E-04	3,00E-04	5,00E-05	< 1,00E-05	< 1,00E-05
600	4,00E-04	3,00E-04	4,00E-05	1,00E-05	0,00E+00
700	3,00E-04	3,00E-04	9,00E-05	2,00E-05	1,00E-05
800	2,00E-04	1,00E-04	4,00E-05	1,00E-05	1,00E-05
900	3,00E-04	3,00E-04	3,00E-05	1,00E-05	1,00E-05
1000	3,00E-04	1,00E-04	3,00E-05	1,00E-05	1,00E-05

Table 16 : Type B uncertainties

λ (nm)	Filter “A”	Filter “B”	Filter “C”	Filter “D”	Filter “E”
380	< 1,00E-04	7,94E-04	1,21E-04	2,24E-05	< 1,00E-05
400	< 1,00E-04	< 1,00E-04	9,80E-05	< 1,00E-05	< 1,00E-05
500	< 1,00E-04	2,65E-04	8,66E-05	1,00E-05	< 1,00E-05
600	< 1,00E-04	2,65E-04	6,93E-05	< 1,00E-05	< 1,00E-05
700	< 1,00E-04	2,65E-04	1,44E-04	3,46E-05	< 1,00E-05
800	< 1,00E-04	2,83E-04	1,34E-04	2,83E-05	1,73E-05
900	< 1,00E-04	2,65E-04	9,54E-05	1,73E-05	< 1,00E-05
1000	< 1,00E-04	2,83E-04	7,42E-05	1,73E-05	1,73E-05

4.6. NMi
Assigned set: #8

Make and Type of the spectrophotometer:

The measurements have been performed using a double grating monochromator in additive dispersion (Type: 2035, McPherson, f = 350).
The operational details were:

Wavelength range:	380 - 1000 nm
Grating type:	ruled
F- number:	4
Lines/mm:	1200

Inverse linear dispersion:	1.0 nm/mm
Slit width:	2 mm
Bandwidth:	2 nm
Spot size at filter:	4,4 mm

For the measurements, a Tungsten Halogen lamp was used, Type Osram Xenophot HLX 250 W. Due to the low power at 380 nm combined with the low transmittance of the filter an additional Argon-Maxi-Arc source was used in the range from 380 nm to 500 nm. Both sources were imaged on the entrance slit of the monochromator using a quartz lens. A shutter and a order selection filter was placed at the entrance slit.
The monochromator was calibrated using low pressure spectral lamps, Cs and He-filled.
The exit slit is imaged by three mirrors on the filter(s). The mirrors increase the F-number from the monochromator to 8 on the filters; the image from the exit slit is increased with a factor 2,2.
The light transmitted through the filter is imaged with a flat mirror and a quartz lens on a silicon detector, Type S1337-1010BQ, Hamamatsu. The filter is positioned on a translation stage which allows horizontal and vertical displacement and rotation around the vertical axis. Part of the light from the exit slit is directed, using a beam splitter, on a monitor detector of the same type as the latter. The monitor detector is used to compensated for drift of the source.
The photocurrents of both detectors were measured using two Keithley 486 Picoampmeters, which were calibrated by the Electrical Department of NMi/VSL in September 1999 and re-calibrated in September 2000. No drift between the calibrations and the re-calibrations was observed.

Description of the measuring technique

Before a transmittance measurement the monochromator was calibrated using the Cs spectral lamp. After the measurements this calibration was checked with both the Cs and He lamps.
The filter dimensions were 50 mm by 50 mm with a thickness variation from 1,5 mm to 4,0 mm. The filter should be measured with a spot of 4,4 mm. A horizontal, vertical and rotational scan over the filter was performed to measure the inhomogeneity of the filter and the influence of the angle of incidence. These variables are taken in account as uncertainties.
The final measurements were taken in mostly 13 runs, in a period of several days. The transmittance of the filters was measured by measuring nearly monochromatic light with and without the filter in its path.

Description of calibration laboratory conditions

The ambient conditions during the measurements were: t = (25,0 ± 0,5) °C and rh = (45 ± 10) %.

Uncertainties

The uncertainties are absolute uncertainties.

Table 17 : Type A uncertainties

λ (nm)	Filter "A"	Filter "B"	Filter "C"	Filter "D"	Filter "E"
380	1,92E-04	3,67E-05	2,91E-05	3,17E-07	2,08E-08
400	1,46E-04	1,27E-04	8,21E-05	5,86E-06	2,56E-07
500	1,56E-04	6,83E-05	8,50E-05	1,32E-05	1,32E-06
600	1,19E-04	7,91E-05	3,60E-05	4,65E-06	7,90E-07
700	1,65E-04	1,21E-04	1,06E-04	3,11E-05	2,00E-06
800	9,20E-05	4,62E-05	9,25E-05	1,83E-05	1,38E-06
900	7,37E-05	6,03E-05	6,45E-05	1,32E-05	8,79E-07
1000	9,21E-05	5,45E-05	3,10E-05	4,48E-06	1,08E-06

Table 18 : Type B uncertainties

λ (nm)	Filter "A"	Filter "B"	Filter "C"	Filter "D"	Filter "E"
380	1,96E-04	1,02E-03	3,75E-04	2,37E-05	1,48E-06
400	1,10E-04	4,05E-04	1,85E-04	1,30E-05	1,28E-06
500	2,27E-04	4,29E-04	1,77E-04	2,13E-05	3,30E-06
600	1,40E-04	4,19E-04	1,76E-04	2,78E-05	5,24E-06
700	2,21E-04	4,29E-04	3,08E-04	6,41E-05	1,70E-05
800	1,59E-04	4,01E-04	2,89E-04	7,81E-05	3,21E-05
900	1,69E-04	3,46E-04	1,98E-04	5,45E-05	2,79E-05
1000	1,60E-04	3,13E-04	1,52E-04	4,13E-05	2,35E-05

4.7. NMIA

Assigned set: #17

Make and Type of the spectrophotometer:

The system used consisted of a GCA/McPherson model 285 0.5 m double-grating monochromator with a model 608M1 quartz prism predisperser. The grating blaze wavelength was 500 nm. The slits were set for a spectral bandwidth of 2 nm at all wavelengths. Two detectors were used, either an EMI 9558QB photomultiplier or a Hamamatsu model S1337-1010BQ silicon photodiode attached to the exit slit of the monochromator.
The source was a 1 kW FEL quartz halogen lamp run at about 3000 K. White light from the lamp is imaged by mirrors into a small integrating sphere. The sphere inlet aperture has a diameter of 12 mm and the filter is 120 mm from this aperture. Light from another aperture in the sphere is directed onto the monochromator entrance slit.
The filter is placed in the beam at normal incidence where it has a cross section diameter of 20 mm at the centre of the filter. The convergence of the beam is f/7. The total irradiance of the tested area of the filters was 7.5 mW/cm². However, within a typical 50 second measurement cycle the filter was in the beam about 40% of the time so the time averaged irradiance was about 3 mW/cm².

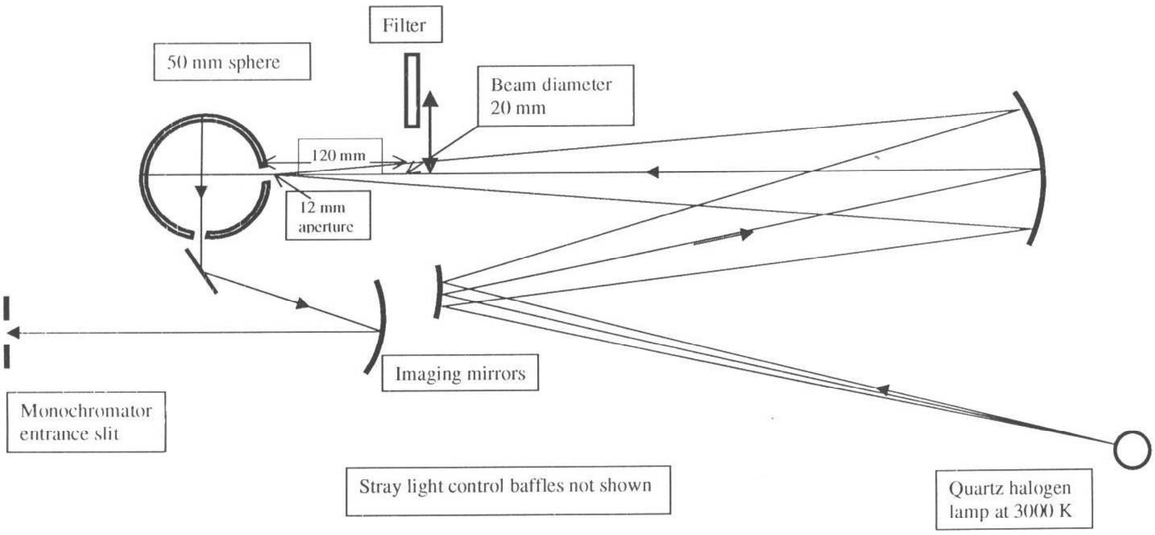

Figure 10 – Optical system for measuring the spectral transmittances of the CCPR comparison filters with the McPherson monochromator

Description of the measuring technique

As flux levels entering the monochromator were low it was necessary to integrate signals for lengthy periods, typically 5 – 15 seconds. It was therefore necessary to set a particular wavelength and then take a background (zero) reading and then a series of alternate filter-out and filter-in readings to interpolate out any lamp drift.
During each of the three series of tests the filters were placed in the holder and removed four times for measurements at different groups of wavelengths. Between each series the holder was re-positioned and the wavelength scale was re-calibrated as well. Therefore, the estimation of the measurement repeatability cannot be readily separated from the measurement reproducibility and the random uncertainties reported represent both of these.

Description of calibration laboratory conditions

During the measurements the laboratory temperature was 22 ± 0.5 °C. The relative humidity was approximately 50%.

Comments on filters

The filters were tested as they arrived without cleaning. During the tests there was some accumulation of dust and marks out side the test area from holders. At the end of the tests these were removed by wiping lightly with a lint free lens tissue. No solvents were used.

Uncertainties

The uncertainties are absolute uncertainties.

Table 19 : Type A uncertainties

λ (nm)	Filter “A”	Filter “B”	Filter “C”	Filter “D”	Filter “E”
380	1,32E-04	3,50E-05	4,50E-05	5,60E-05	2,70E-05
400	1,19E-04	4,80E-05	2,50E-05	2,10E-05	2,20E-05
500	6,30E-05	3,60E-05	1,20E-05	7,00E-06	7,00E-06
600	4,50E-05	3,00E-05	1,20E-05	7,00E-06	1,00E-05
700	5,60E-05	4,50E-05	2,70E-05	1,60E-05	1,30E-05
800	1,11E-04	8,40E-05	1,23E-04	1,23E-04	1,83E-04
900	3,80E-05	5,30E-05	8,70E-05	8,00E-05	9,60E-05
1000	2,80E-05	3,30E-05	7,20E-05	4,50E-05	4,80E-05

Table 20 : Type B uncertainties

λ (nm)	Filter “A”	Filter “B”	Filter “C”	Filter “D”	Filter “E”
380	2,83E-05	7,51E-04	1,27E-04	1,82E-05	1,73E-05
400	2,83E-05	8,00E-05	1,10E-04	3,20E-05	1,76E-05
500	2,83E-05	6,26E-05	3,20E-05	2,96E-05	1,81E-05
600	2,83E-05	6,26E-05	2,50E-05	2,96E-05	1,84E-05
700	2,83E-05	6,26E-05	3,71E-05	5,48E-05	3,08E-05
800	2,83E-05	2,06E-04	2,23E-04	8,19E-05	3,91E-05
900	2,83E-05	6,08E-05	2,83E-05	1,81E-05	1,74E-05
1000	2,83E-05	5,66E-05	2,24E-05	1,75E-05	1,74E-05

4.8. NMIJ

Assigned set: #9

Make and Type of the spectrophotometer:

Double beam: Sector mirror
Monochrometer: Prism and grating double Littrow monochrometer
Light Source: Tungsten halogen lamp
Beam splitting: Mechanical chopper
Beam size: 4.5 mm (horizontal) x 10.5 mm (vertical) at sample
Detector: Head-on type photomultiplier (Hamamatsu R375) with 150 mmϕ integrating sphere ($BaSO_4$) at 380-800 nm,
PbS photodiode with 60mmϕ integrating sphere at 900-1000 nm
Signal processing: The signal of detector is digitalized by an A/D converter.

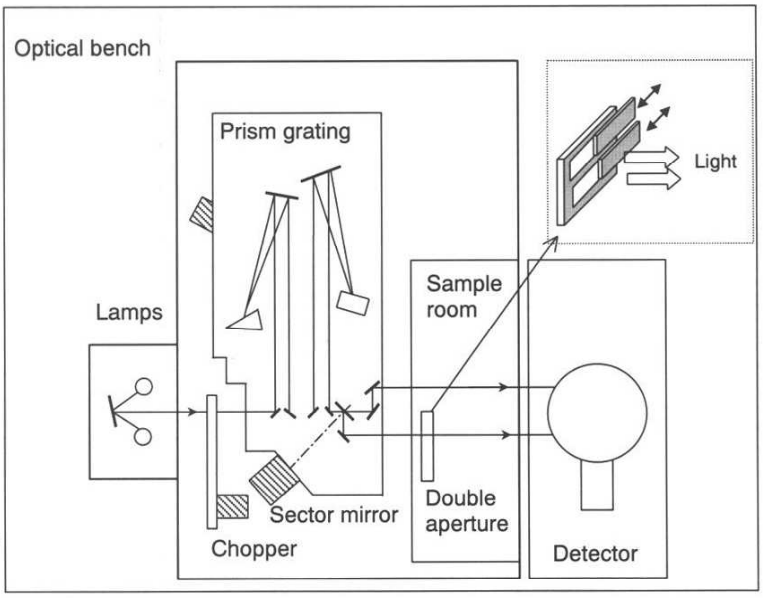

Figure 11 – Schematic diagram of the facility at NMIA

Description of the measuring technique

T: =(Sample – dark)/(Reference – dark), one-minute signal averaging
T_0: =T with blocking sample beam
T_{100}: =T with blank sample

1. Measurement: T_0, T_{100}, T, T_{100}, T, T_{100}, T, T_{100}, T_0 were measured in sequence to check the drift.
T_{100}, T_0, T, T_{100}, T_0, T, T_{100}, T_0, T, T_{100} were measured in NIR (PbS detector) region.
2. Apparent transmittance T': $T'=[\Sigma_{i=1,3}(T_i-T_{0,av})/(T_{100,av}-T_{0,av})]/3$, where $T_{0,av}$ is average of two T_0 and $T_{100,av}$ is the average of two adjacent T_{100}.
$T'=[\Sigma_{i=1,3}(T_i-T_{i,0})/(T_{100,av}-T_{i,0})]/3$ in NIR.
3. Measurement result T": $T"=T'+\Delta T$, where ΔT is the nonlinearity of detectors.
4. Number of runs: Twelve measurements at each wavelength were made

Description of calibration laboratory conditions

Temperature in sample room: 23.0±0.5°C
Humidity: 45±5%

Comments on filters

No cleaning was made.

Uncertainties

The uncertainties are absolute uncertainties.

Table 21 : Type A uncertainties

λ (nm)	Filter "A"	Filter "B"	Filter "C"	Filter "D"	Filter "E"
380	1,09E-04	2,30E-04	4,10E-05	5,00E-06	2,00E-06
400	6,80E-05	7,20E-05	3,10E-05	6,00E-06	7,00E-06
500	7,50E-05	6,00E-05	1,50E-05	5,00E-06	6,00E-06
600	6,30E-05	6,40E-05	2,00E-05	2,40E-05	8,00E-06
700	3,10E-05	6,80E-05	4,30E-05	1,20E-05	8,00E-06
800	7,70E-05	1,30E-04	3,10E-05	1,90E-05	7,00E-06
900	1,37E-04	1,01E-04	1,09E-04	3,50E-05	1,07E-04
1000	8,60E-05	8,50E-05	9,10E-05	1,22E-04	8,50E-05

Table 22 : Type B uncertainties

λ (nm)	Filter "A"	Filter "B"	Filter "C"	Filter "D"	Filter "E"
380	7,79E-05	1,18E-03	2,24E-04	3,26E-05	3,19E-05
400	8,39E-05	1,08E-04	1,31E-04	3,65E-05	3,22E-05
500	7,91E-05	6,97E-05	5,60E-05	3,26E-05	3,24E-05
600	7,89E-05	6,88E-05	4,58E-05	3,32E-05	3,20E-05
700	7,91E-05	6,92E-05	1,52E-04	4,85E-05	3,30E-05
800	7,99E-05	1,10E-04	8,02E-05	3,63E-05	3,22E-05
900	5,93E-04	5,93E-04	5,92E-04	5,88E-04	5,87E-04
1000	5,05E-04	5,06E-04	5,01E-04	5,00E-04	4,96E-04

4.9. NPL

Assigned set: #4

Make and Type of the spectrophotometer:

The facility is automated and controlled by a PC. A Heidenhain ROD800 rotary encoder is fitted to the spindle of the output grating table, and the encoder readings are used in the calibration of the wavelength scale.

The monochromator is a double grating Jobin-Yvon HRD1 monochromator, with additive dispersion from a Czerny-Turner mounting. Three pairs of gratings are used to cover the spectral regions 200 nm - 1000 nm, 500 nm - 2000 nm, 1000 – 4000 nm. The dispersions in the middle of these ranges are 1.2, 2.4 and 4.8 mm·nm^{-1} with respective blaze wavelengths of 250 nm, 1000 nm and 2000 nm.

The light emerging from the monochromator is collimated with reflective optics. A four-leafed aperture is used to define the patch size

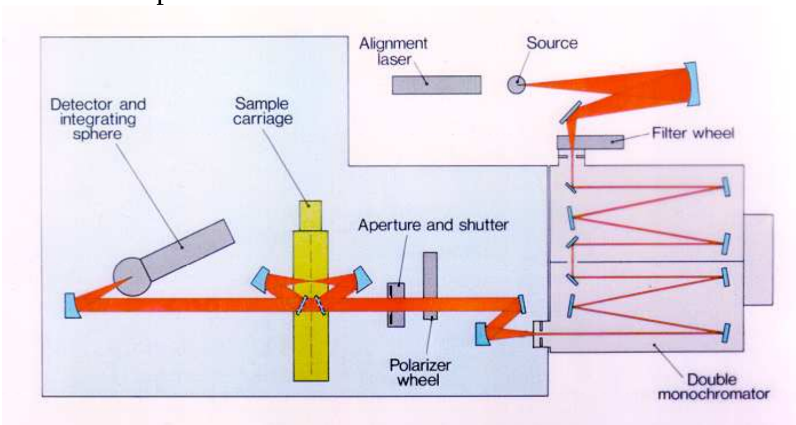

Figure 12 Schematic of facility with the PMT and sphere assembly. Ancillary optics used to produce focussed radiation at the sample are also shown.

The facility has two sources, Polaron 25G tungsten ribbon lamp, region of use 300 nm to 4000 nm and a Cathodeon R07 deuterium lamp, region of use 200 nm to 350 nm.

The facility has 4 detectors:

- a Thorn-EMI 9558QA S20 photomultiplier tube behind a baffled 100 mm diameter Spectralon integrating sphere, region of use 200 nm to 700 nm ;
- a Hamamatsu S1337 silicon photodiode, region of use 200 nm to 1000 nm;
- a Germanium Power Devices GAP5000 InGaAs detector, region of use 900 nm to 1500 nm;
- a liquid nitrogen cooled Judson J10D InSb detector with a cold filter, region of use 1000 nm to 2800 nm.

Description of the measuring technique

Measurements were carried out using time-symmetric measurement sequences. The comparison artefacts (A04, B04, C04, D04, E04) were measured relative to air. E04 was measured relative to D04 at 380 nm and 400 nm and its transmittance relative to air calculated using T(E04) = T(E04/D04) x T(D04).

The measurement sequences comprised the following individual measurement settings: S – sample in beam, R – reference (air or D04) in beam, D – dark (shutter closed). For each setting an average of 70 DVM readings was taken.

The normal sequence used was {D [(R S) x 9] R D}, but for measurements of D04 and E04/D04 at 380 nm and 400 nm, the sequence {D [(R S R D) x 9]} was used. There was no change of amplifier gain setting within a measurement sequence.
Grating pair I were used for measurements from 380 nm to 600 nm, and grating pair II for measurements from 700 nm to 1000 nm. The photomultiplier tube and integrating sphere was used for measurements at 380 nm and 400 nm, and the silicon photodiode was used for measurements at 500 nm – 1000 nm.
Measurements were carried out with the sample rotated by 2° about the vertical axis (the monochromator plane is horizontal) and the transmittance at normal incidence was calculated using the standard expressions in the literature. The spectral bandwidth used was 1 nm.

Description of calibration laboratory conditions

The temperature in the sample compartment was (24.5 ± 1)°C. The humidity was (20.5 ± 1.5) %

Comments on filters

Small mark on filter E. May need to be cleaned.

Uncertainties

The uncertainties are absolute uncertainties

Table 23 : Type A uncertainties

λ (nm)	Filter “A”	Filter “B”	Filter “C”	Filter “D”	Filter “E”
380	3,90E-05	1,05E-04	2,60E-05	3,00E-06	1,10E-07
400	4,80E-05	6,90E-05	3,20E-05	4,00E-06	4,00E-07
500	3,20E-05	5,50E-05	1,70E-05	3,00E-06	5,00E-07
600	1,60E-05	8,10E-05	2,90E-05	6,00E-06	1,10E-06
700	4,80E-05	5,40E-05	7,00E-06	6,00E-06	7,00E-07
800	1,10E-05	3,80E-05	1,20E-05	5,00E-06	3,00E-07
900	7,50E-05	9,30E-05	9,00E-06	4,00E-06	7,00E-07
1000	1,17E-04	1,25E-04	6,00E-06	3,00E-06	9,00E-07

Table 24 : Type B uncertainties

λ (nm)	Filter “A”	Filter “B”	Filter “C”	Filter “D”	Filter “E”
380	3,50E-05	1,49E-04	4,70E-05	2,00E-06	1,70E-07
400	5,00E-05	4,10E-05	2,80E-05	5,00E-06	4,00E-07
500	2,60E-05	2,60E-05	1,20E-05	5,00E-06	2,20E-06
600	2,60E-05	2,50E-05	1,10E-05	2,00E-06	8,00E-07
700	4,20E-05	3,50E-05	2,90E-05	1,40E-05	4,50E-06
800	3,30E-05	4,10E-05	2,20E-05	1,20E-05	7,30E-06
900	2,80E-05	3,10E-05	1,50E-05	7,00E-06	4,90E-06
1000	2,90E-05	2,60E-05	1,10E-05	8,00E-06	5,30E-06

4.10. NRC

Assigned set: #18

Make and Type of the spectrophotometer:

The NRC Reference spectrophotometer was used for this comparison. The instrument is shown schematically in Figure 13. It is a single-beam instrument with a highly-collimated beam design using all-reflective optics and a prism-grating monochromator in conjunction with a deuterium and tungsten-halogen source to cover the spectral range 200 nm to 2500 nm. The detectors and linear PMT and silicon photodiode detectors, respectively a Hamamatsu R6872 PMT and a large area Hamamatsu S1337 silicon diode (S6337) which were specially selected for their excellent linearity and uniformity characteristics. To minimize interreflection effects, the Hamamatsu R6872 PMT is used behind a Suprasil (50 mm diameter) diffuser and the Hamamatsu S6337 is slightly tilted. The PMTs are thermoelectrically cooled to 258 K to increase measurement sensitivity and to lower dark current noise. The linearity of all five of these detection systems has been tested over more than 3 decades using the NRC automated high-precision variable aperture

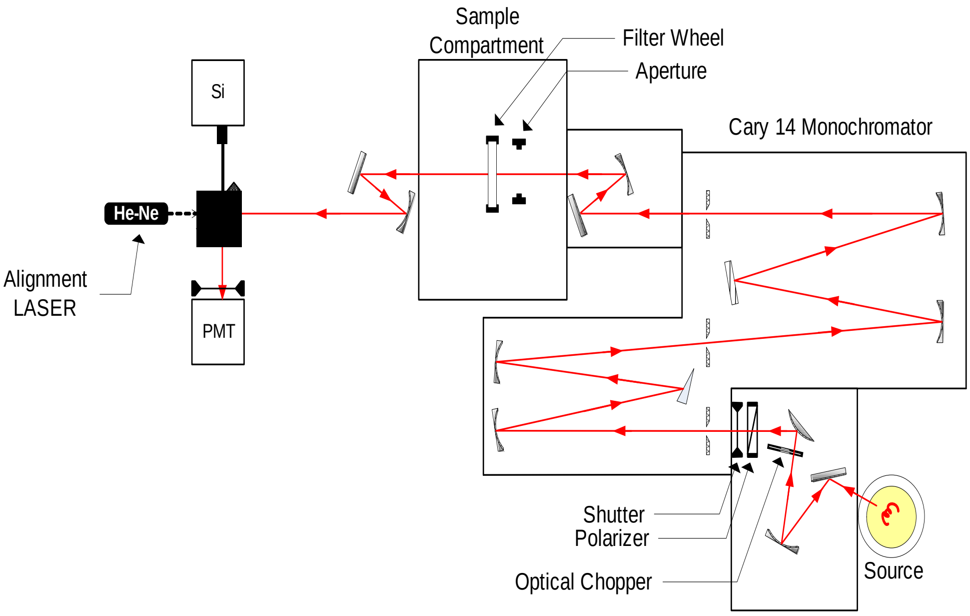

Figure 13 Schematic diagram of the NRC Reference Spectrophotometer

Description of the measuring technique

The filters were mounted in the usual NRC sample holder, an automated 6-position filter wheel. A precision aperture was fabricated for this comparison to limit the beam size to that specified in the technical protocol. In general, four filters were measured in any given measurement cycle at a given set of experimental conditions, with 2 open beam positions for the 100% reference readings. For the higher density filters, this procedure was modified; a reference beam attenuation technique was used to enhance the measurement precision and accuracy: for filter D-18 at a wavelength of 380 nm only, a calibrated optical density (OD) 1.0 filter was used in the reference beam position; for filter E-18, at the wavelengths of 380, 400, 500, 600, 700 and 800 nm, a calibrated OD 2.0 filter was used in the reference beam position.

The sample readings were always performed in a time-symmetrical sequence with respect to the open beam or calibrated filter reading to correct for linear system drift and the average result of these two readings was used for each measurement cycle. The short-term repeatability was assessed from the standard deviation of 8 repeat measurement cycles, typically recorded over a total elapsed time of 20 minutes. The long-term reproducibility and influence of sample nonuniformity were assessed from the standard deviation of 4 independent runs taken over several weeks in which the filter was repositioned and/or the detection system was changed.
All five filters were calibrated at the eight specified wavelengths from 380 nm to 1000 nm, with a bandwidth of 1.0 nm. The measurements were performed using a tungsten-halogen lamp, and a minimum of two different types of characterised photodetectors. The characterised photodetectors that were used, included three silicon photodiodes (Hamamatsu S1337, Hamamatsu S6337, EG&G UV444BQ) and two PMTs (Hamamatsu R6872 and Hamamatsu P928). Only the silicon photodiode detectors were used at wavelengths of 900 nm and 1000 nm.

Description of calibration laboratory conditions

The relative humidity during the measurements varied from a minimum of about 35% to a maximum of about 50%, with an average around 42%. The NRC Reference Spectrophotometer has an RTD element installed in the sample compartment. This temperature was monitored during the filter measurements and was 23,7°C ± 0.5 °C. The laboratory is equipped with an electronic air cleaner and a positive air flow system. Prior to each measurement run, a jet of purified nitrogen gas was used to blow the dust off the surfaces of the filters.

Comments on filters

Filter A18 – Okay.
Filter B18 – With the filter reference number in the top right hand corner, the right hand side of the filter contains many pits; one pit is in the middle of the area to be used for measurement. There is also a grease film on the top edge, but outside the measurement area.
Filter C18 – There is a film covering a large area of the filter on both side. It is located near the top edge and probably outside the measurement area.
Filter D18 – There is a film on the top edge of the incident face and a wide film on the bottom edge of the back face. The incident face also has one large pit on the top right of the measurement area.
Filter E18 – There is a faint film on the top edge of the incident face but outside the measurement area. Otherwise this filter looks okay.
No attempts were made to clean the surfaces of the filters at any time.

Uncertainties

The uncertainties are absolute uncertainties.

Table 25 : Type A uncertainties

λ (nm)	Filter “A”	Filter “B”	Filter “C”	Filter “D”	Filter “E”
380	2,39E-04	2,01E-04	2,22E-05	6,21E-07	3,94E-08
400	2,35E-04	1,25E-04	3,95E-05	5,17E-06	3,09E-07
500	1,34E-04	8,75E-05	3,01E-05	7,01E-06	6,17E-07
600	1,29E-04	1,22E-04	5,02E-05	7,02E-06	6,22E-07
700	5,39E-05	6,75E-05	6,85E-05	1,50E-05	2,58E-06
800	5,41E-05	7,23E-05	3,20E-05	1,00E-05	3,74E-06
900	4,34E-05	1,00E-04	1,02E-05	2,15E-06	3,51E-06
1000	3,45E-05	1,10E-04	8,25E-06	4,03E-06	3,50E-06

Table 26 : Type B uncertainties

λ (nm)	Filter “A”	Filter “B”	Filter “C”	Filter “D”	Filter “E”
380	2,05E-04	3,95E-04	8,07E-05	1,62E-06	5,10E-07
400	2,05E-04	1,63E-04	3,62E-05	7,55E-06	2,68E-07
500	8,12E-05	5,59E-05	2,54E-05	3,88E-06	4,29E-07
600	7,28E-05	5,59E-05	2,97E-05	6,17E-06	6,71E-07
700	6,48E-05	5,42E-05	3,76E-05	8,74E-06	2,84E-06
800	6,48E-05	5,59E-05	3,02E-05	8,52E-06	4,07E-06
900	7,21E-05	6,24E-05	2,41E-05	6,57E-06	3,55E-06
1000	7,21E-05	5,77E-05	1,79E-05	4,72E-06	3,42E-06

4.11. PTB

Assigned set: #3

Make and Type of the spectrophotometer:

A self-built reference spectrophotometer was used consisting of lamp section, single pass double monochromator (Jobin Yvon HRD1, focal length f = 0,6 m), beam forming chamber, and detection chamber (see Figure 14).

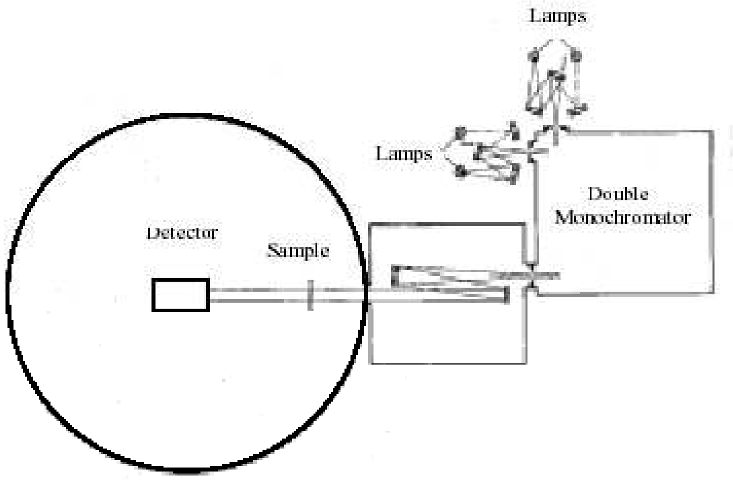

Figure 14 Sketch of the spectrophotometer set-up for the measurement of regular transmittance

In this study a tungsten halogen lamp was used for the transmittance measurements, a HeNe-Laser for alignment, and for checking of the wavelength calibration the laser and a mercury spectral lamp. From 380 nm up to 800 nm, the 1200 lines/mm grating was used, giving at spectral bandwidth of 1,0 nm. For the wavelength 900 and 1000 nm, the 600 lines/mm grating was used, corresponding to a 2,1 nm bandwidth.
The beam was formed to be parallel with a diameter of 20 mm at the sample. The residual divergence was in horizontal direction θ_h = 0,15° and for the vertical direction θ_v = 0,65°.
Normal incidence was used.
In the spectral range up to 800 nm a photomultiplier detector (EMI 9558), above 800 nm a cooled PbS detector (Hamamatsu 1908) was used.

Description of the measuring technique

The samples were fed into a computer controlled sample-holder which is able to carry five filters and has a sixth position for a reference filter or for the determination of the 100% signal, respectively. One cycle at a specific wavelength consists of the reading of the 100% value, the reading for up to five filters and the reverse process. The mean of both values for each of the six positions is calculated in order to cope for a drift of the lamp radiation. A complete measurement consists of up to 100 cycles at maximum. The number of cycles of the individual measurements is given in the row named *N* of the result tables (tables 2 to 6).
The samples were not cleaned, only dust stemming from the wooden sample box was blown off by clean and dry nitrogen gas.

Description of calibration laboratory conditions

The temperature during the measurements was controlled by the climatic system of the laboratory to be 23 °C ± 1 °C. The relative humidity also was controlled by this system and stabilised to lie below 55%.

Comments on filters

Sample A (BK7, thickness 4,0 mm) shows a distinct prismatic effects of about 0,06 cm/m stemming from a non-perfect parallelism of the surfaces. This results in a higher uncertainty with respect to the effect 'beam displacement'. Such a filter is not well suited for calibrations at a high level of precision.
The NG-type neutral density filters (especially samples C, D and E) have a steep absorption edge below 400 nm. The edge is also known to shift with temperature. Both aspects are in contrast to demand for spectral flatness and independence from environmental influences, which should be required from calibration standard. Precise calibrations at the wavelength of 380 nm cannot be expected to be performed for the NG-type filters and this particular wavelength should be excluded from the comparison.

Uncertainties

The uncertainties are absolute uncertainties

Table 27 : Type A uncertainties

λ (nm)	Filter "A"	Filter "B"	Filter "C"	Filter "D"	Filter "E"
380	5,10E-05	3,20E-05	3,30E-06	7,50E-07	2,00E-07
400	6,40E-05	6,80E-05	1,10E-05	1,70E-06	1,10E-06
500	6,10E-05	5,00E-05	7,80E-06	1,50E-06	1,20E-06
600	5,10E-05	6,10E-05	5,80E-06	1,50E-06	1,20E-06
700	5,80E-05	5,00E-05	1,30E-05	2,90E-06	1,40E-06
800	1,40E-04	1,20E-04	3,50E-05	7,70E-06	2,90E-06
900	1,10E-04	6,50E-05	2,70E-05	2,30E-05	2,20E-05
1000	5,80E-05	4,90E-05	1,40E-05	9,50E-06	9,10E-06

Table 28 : Type B uncertainties

λ (nm)	Filter “A”	Filter “B”	Filter “C”	Filter “D”	Filter “E”
380	4,93E-04	7,21E-04	9,42E-05	2,91E-06	1,51E-07
400	4,89E-04	6,13E-04	2,18E-04	1,72E-05	1,41E-06
500	4,89E-04	6,01E-04	2,11E-04	2,71E-05	2,01E-06
600	4,86E-04	6,11E-04	2,10E-04	2,71E-05	2,00E-06
700	4,86E-04	5,82E-04	3,94E-04	6,34E-05	1,60E-05
800	4,86E-04	6,43E-04	3,97E-04	1,11E-04	2,75E-05
900	1,80E-03	2,62E-04	1,35E-04	3,51E-05	1,80E-05
1000	1,80E-03	2,94E-04	1,05E-04	3,16E-05	1,06E-05

4.12. SMU

Assigned set: #11

Make and Type of the spectrophotometer:

- Double beam UV-VIS spectrophotometer CARY 4E by Varian (the spectral transmittance primary standard equipment of SMU)
- Wavelength range: (175-900) nm
- Monochromator: double out-of plane Littrow monochromator
- Grating: 70x45 mm, 1200 limes/mm, blazed at 250 nm (blaze angle 8.5°, reciprocal dispersion 0.98 nm/mm)
- High-order rejection: filter (WG320, OG530,RG780)
- Beam splitting system: chopper (30 Hz)
- Detection system: high performance R928 PMT
- Sources: tungsten halogen visible source with quartz windows deuterium arc UV source
- Diameter of the illum. area: 5.1 mm
- Collimating optics: spherical mirrors
- Beam details: Polarisation: identical reference and sample beam (beams partially polarised only)
  Vertical F number 7.2
  Horizontal F number 9
  Maximum vertical angle of incidence on sample 7.61°
  Maximum horizontal angle of incidence on sample 3.22°
  Image sizes at centre of sample compartment:
  full height slit (5 nm SBW) 13.35 mm x 5.1 mm wide

Description of the measuring technique

5 sets of measurements have been done. For each set, the 5 filters are measured, starting with the filter A and ending with the filter E. Within the set, 10 consecutive measurements are performed per filter. Each measurement consist in a measurement of the instrument zero, the reference and the filter.

Description of calibration laboratory conditions

Ambient temperature: (23 ± 2)°C
Relative humidity: (50 ± 10) %

Comments on filters

The filter reference N° A11 was cleaned with ethanol (purity UV) before measurements.
In case of accidental pollution during measurements all filters (reference N° A11, B11, C11, D11 and E11) were cleaned with a special paper for optical glass or with brush for optics.

Uncertainties

The uncertainties are absolute uncertainties.

Table 29 : Type A uncertainties

λ (nm)	Filter "A"	Filter "B"	Filter "C"	Filter "D"	Filter "E"
380	1,66E-05	5,34E-05	9,79E-06	2,21E-06	4,76E-07
400	2,88E-05	7,60E-05	1,19E-05	4,55E-06	7,91E-07
500	5,22E-05	6,95E-05	2,04E-05	3,10E-06	8,61E-07
600	4,52E-05	4,99E-05	2,83E-05	6,08E-06	1,43E-06
700	3,90E-05	4,82E-05	3,12E-05	4,08E-06	4,43E-06
800	3,89E-05	3,61E-05	2,62E-05	4,07E-06	3,74E-06
900	9,75E-05	4,92E-05	2,58E-05	1,13E-05	5,25E-06
1000	1,66E-05	5,34E-05	9,79E-06	2,21E-06	4,76E-07

Table 30 : Type B uncertainties

λ (nm)	Filter "A"	Filter "B"	Filter "C"	Filter "D"	Filter "E"
380	1,40E-04	1,43E-04	3,55E-05	3,11E-06	2,01E-06
400	1,40E-04	1,40E-04	9,21E-05	1,30E-05	2,91E-06
500	1,40E-04	1,40E-04	9,00E-05	1,90E-05	4,31E-06
600	1,40E-04	1,40E-04	8,20E-05	1,90E-05	4,50E-06
700	1,40E-04	1,40E-04	1,20E-04	4,16E-05	1,20E-05
800	1,40E-04	1,40E-04	1,20E-04	4,80E-05	1,90E-05
900	1,40E-04	1,40E-04	9,60E-05	3,70E-05	1,80E-05
1000	1,40E-04	1,43E-04	3,55E-05	3,11E-06	2,01E-06

4.13. NMC-A*STAR

Assigned set: #10

Make and Type of the spectrophotometer:

The reference spectrophotometer used for this comparison is an automated single beam spectrometer developed at NMC-A*STAR. A Czerny-Turner double monochromator with focal length 240mm and an effective aperture of f/4 is used in this system. Order-sorting filters are placed in front of the entrance slit to provide high order rejection. A tungsten ribbon lamp is used as the radiation source. Spherical mirrors are used to focus the source radiation on the entrance slit and to collimate the exit beam from the monochromator. The collimation of the beam so obtained is about 0.013 rad. The detection unit comprises an averaging sphere and a 100 mm² silicon photodiode (or a photomultiplier) with a low noise transimpedance amplifier. The photomultiplier is used only for filters D10, E10 at wavelengths 380 nm, 400 nm where the signal becomes too noisy for Si-photodiode. DC mode is used for the signal amplification and measurement. The solid angle of collection of the system subtends about 0.004 sr at the filter position. Figure 15 shows the optical configuration and set-up of the spectrometer.

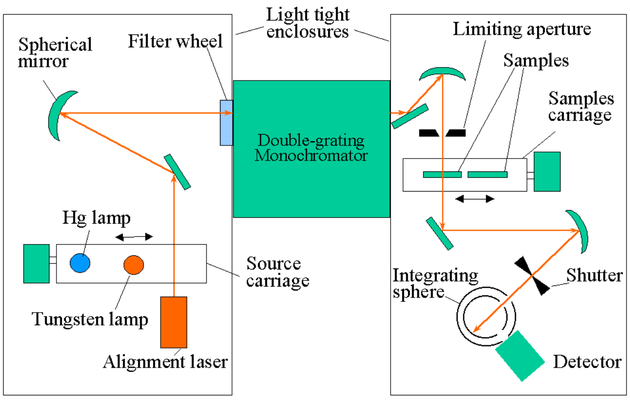

Figure 15 – The reference spectrometer at NMC-A*STAR

Description of the measuring technique

In this comparison a circular aperture with 20-mm diameter is used. The bandwidth of the monochromator used is 1 nm.

For filters of low optical densities, the transmittance against air is obtained directly by measuring the ratio of signals with and without the filter in the beam path. For filters with higher optical densities the step-down method is used to minimise uncertainty induced by detector nonlinearity. In this method, the relative transmittance of the test filter relative to a reference filter (of low optical density) is measured first. This is done by measuring the ratio of the two signals obtained with the two filters in the beam path separately. The transmittance value of the test filter against the air is then calculated by multiplying the relative transmittance value with the known (or measured) transmittance value of the reference filter. In this comparison filters A10, B10 and C10 are measured directly. D10 is measured relative to C10. Likewise, E10 is measured relative to D10.

The data acquisition is performed automatically following the sequence

$I_d\ \ I_o\ I_d\ I_i\ I_d\ \ I_o\ I_d\ I_i\ I_d\ \ I_o\ I_d\ I_i\ I_d\ \ I_o\ I_d\ I_i\ I_d\ \ I_o\ I_d$

where I_d is the dark current when shutter is closed, I_o the signal current with the test filter moved out of the beam and I_i the signal current with the test filter moved into the beam. Totally 19 current readings are obtained from one measurement. Each current reading is the average of 15 readings repeatedly taken within 10 seconds. There is a 15 seconds time interval between adjacent current readings to eliminate the fatigue effect of the detector system.

The dark currents on both sides of the signal currents are averaged and subtracted from these signal currents, yielding a sequence of 9 adjusted signal currents. The transmittance of the filter is thus

$$\tau = I_i / I_{o\text{-ave}}$$

where $I_{o\text{-ave}}$ is the average of I_o's before and after each I_i . Four τ values are obtained and the final value is the average of these four.

Description of calibration laboratory conditions

The ambient temperature in the calibration laboratory is 23 ± 2°C and the relative humidity is 60 ± 10% r.h. Filters A10 and B10 were cleaned with alcohol and lint-free lens tissue before the measurement due to accidental contamination to their surfaces. No cleaning was done on filters C10, D10 and E10. Only dry nitrogen was used to remove dust before the measurement

Comments on filters

I should highlight is that filters A10 and B10 had to be re-cleaned in our lab before measurement because they were accidentally contaminated by some oil particles sprayed from the nozzle of the nitrogen gas cylinder we used for removing dust.

Uncertainties

The uncertainties are absolute uncertainties.

Table 31 : Type A uncertainties

λ (nm)	Filter “A”	Filter “B”	Filter “C”	Filter “D”	Filter “E”
380	8,00E-05	1,40E-04	1,00E-05	1,00E-06	1,00E-07
400	1,00E-04	5,00E-05	2,00E-05	8,00E-06	1,20E-06
500	6,00E-05	5,00E-05	4,00E-05	2,00E-06	5,00E-07
600	6,00E-05	7,00E-05	2,00E-05	4,00E-06	1,30E-06
700	4,00E-05	4,00E-05	1,00E-05	1,10E-05	2,90E-06
800	2,00E-05	7,00E-05	2,00E-05	8,00E-06	4,70E-06
900	2,00E-05	3,00E-05	1,00E-05	5,00E-06	3,40E-06
1000	3,00E-05	3,00E-05	2,00E-05	3,00E-06	2,40E-06

Table 32 : Type B uncertainties

λ (nm)	Filter "A"	Filter "B"	Filter "C"	Filter "D"	Filter "E"
380	1,02E-04	1,91E-03	3,90E-04	1,50E-05	6,93E-07
400	1,12E-04	1,41E-04	1,59E-04	2,05E-05	1,72E-06
500	1,04E-04	7,48E-05	6,93E-05	1,28E-05	1,83E-06
600	1,04E-04	7,14E-05	4,58E-05	9,17E-06	1,24E-06
700	1,02E-04	8,06E-05	2,30E-04	7,52E-05	1,98E-05
800	9,80E-05	1,55E-04	8,77E-05	3,20E-05	1,20E-05
900	9,80E-05	1,16E-04	6,93E-05	2,24E-05	9,83E-06
1000	9,54E-05	7,42E-05	4,58E-05	1,16E-05	5,28E-06

4.14. VNIIOFI

Assigned set: #14

Make and Type of the spectrophotometer:

The system consists of a Jobin-Yvon model HRD1 0.6m double-grating monochromator. A 1200 g/mm grating has been used for the calibration in the UV/Visible spectral range (380, 400, 500, 600 and 700 nm wavelengths), while a 600 g/mm grating has been used for the calibration at wavelengths 800 , 900 and 1000 nm. The slits were set for a spectral bandwidth of 1 nm at all wavelengths. The foreoptic consists of a spherical concave mirror and two flat mirrors. The 150W tungsten strip lamp run at about 2850 K has been used as a source. This lamp has been used for the whole spectral range.
The narrow bandwidth light beam emerging from the monochromator is collimated and directed towards the detector unit by a off-axis parabolic mirror. The sample-holder unit includes a translation stage which is equipped with a DC motor and control unit. The beam size on the sample is defined by a diaphragm with a diameter of 20 mm. Only one silicon photodiode S1337 type (Hamamatsu company) has been used in order to cover the wavelength range.

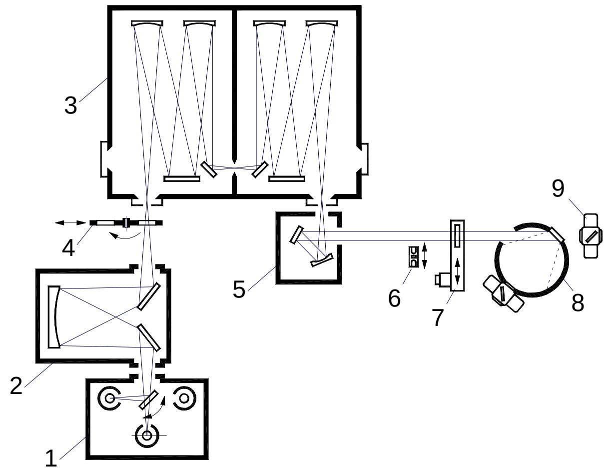

Figure 16 Schematic of facility for transmittance measurements at VNIIOFI.
1- Lamps unit, 2- foreoptic unit; 3- double grating monochromator ; 4- filter wheel; 5- collimator with off-axis parabolic mirror; 6- set of circular apertures; 7- sample-holder unit; 8- integrating sphere; 9- detector.

Description of calibration laboratory conditions

During the measurements, the conditions were:

temperature, °C ……………..23±2
humidity, %………………..80±10

Comments on filters

The filters were cleaned by very pure alcohol and special optical paper, because they were touched by officers at the customs.

Uncertainties

The uncertainties are absolute uncertainties.

Table 33 : Type A uncertainties

λ (nm)	Filter "A"	Filter "B"	Filter "C"	Filter "D"	Filter "E"
380	1,40E-04	1,50E-04	1,40E-04	1,50E-04	1,50E-04
400	1,00E-04	1,20E-04	1,40E-04	1,40E-04	1,40E-04
500	8,00E-05	1,00E-04	1,00E-04	1,40E-04	1,40E-04
600	8,00E-05	8,00E-05	1,20E-04	1,20E-04	1,30E-04
700	7,00E-05	8,00E-05	1,00E-04	1,10E-04	1,20E-04
800	6,00E-05	9,00E-05	9,00E-05	1,00E-04	1,20E-04
900	7,00E-05	1,30E-05	9,00E-05	1,30E-04	1,40E-04
1000	9,00E-05	1,00E-04	1,10E-04	1,20E-04	1,50E-04

Table 34 : Type B uncertainties

λ (nm)	Filter "A"	Filter "B"	Filter "C"	Filter "D"	Filter "E"
380	2,81E-04	2,89E-04	2,84E-04	2,91E-04	2,93E-04
400	2,75E-04	2,77E-04	2,75E-04	2,77E-04	2,75E-04
500	2,63E-04	2,66E-04	2,73E-04	2,65E-04	2,73E-04
600	2,67E-04	2,71E-04	2,93E-04	2,90E-04	2,90E-04
700	2,44E-04	2,52E-04	2,52E-04	2,63E-04	2,54E-04
800	2,41E-04	2,82E-04	2,75E-04	2,84E-04	2,84E-04
900	2,66E-04	2,75E-04	2,66E-04	2,75E-04	2,66E-04
1000	2,75E-04	2,58E-04	2,75E-04	2,84E-04	2,77E-04

5. Determination of the key comparison value

Method with individual drift uncertainty and outliers.

5.1. Choice of the reference value:

The choice of the way to compute the Key Comparison Reference Value (KCRV) is not trivial. Starting from 1999 until recently, the debate has been long and passionate between the different Metrological National Institutes to agree on the right method to realise the calculation.
Five different methods have been discussed:

Arithmetic mean
Classical weighted mean
Weighted mean with limited weights
Median
Median based on Monte-Carlo resampling.

After many years of work, the Consultative Committee for Photometry and Radiometry Key Comparison Working Group (CCPR KC-WG) published a guidelines to ensure that the reports of CCPR comparisons are prepared in fair and uniform manner. The last version of this document have been published in March, 2006. It specifies that the default method for calculating KCRV is the weighted mean with cut-off. When this document arrived, the Pre-draft A process was completed for the key comparison K6 and all the participating laboratories were already agreed on the same way of calculation of the KCRV, the weighted mean with cut-off.

5.2. Calculation of the weighted mean

The method we used is the weighted mean with cut-off. The cut-off value, $u_{\text{cut-off}}$ is the mean of uncertainty of the participating labs that are under the median. The detail of the calculations we used is presented here. For convenience for the reader, we tried to follow the same notations than those of the example given in the Appendix B. of the Guidelines for CCPR Comparison Report Preparation (Rv.1, March 2006). Few differences exist between our method and the one described in this document. The mains differences are:

- We use absolute uncertainties here, where they are relative in the reference document. As matter of fact, transmissions measurement are already relative measurements. For the sake of clarity, it is a tradition in this field, to express the uncertainty in absolute value, to avoid to use of relative uncertainties of relative measurements.
- The way we deal with the transfer uncertainty component (u_{add}) is slightly different than the proposition done by the CCPR Key comparison working group. Because filters are very sensitive to pollution and even if all the precaution have been taken to minimise this component, this transfer uncertainty component is high. This particularity implies a specific treatment that is detailed in the following pages.

Notations

N Number of participant NMIs, not counting the pilot lab (from p.10, we have N = 14).

$\tau_{X,i}$ Spectral transmission of the filter type X (X varies from A to E), set i.

$u(\tau_{X,i})$ Total absolute uncertainty (k=1) of $\tau_{X,i}$ reported by the NMI.

$\tau^{P}_{X,i,r}$ Spectral transmission of the filter type X (X varies from A to E), set i, measured by the Pilot.
r is the round. r = 1 to 2, where r=1 is the measurement before dispatching.
r=2 is the measurement after dispatching.

$u(\tau^{P}_{X,i,r})$ Total absolute uncertainty (k=1) of $\tau^{P}_{X,i,r}$ reported by the Pilot.
$u(\tau^{PR}_{X,i,r})$ Reproducibility (type A) of Pilot measurements for $\tau^{P}_{X,i,r}$.

Pilot Measurements

The pilot measurements of all the filters involved in the comparisons for r = 1 and 2 are reported in Annex B

Annex B.1., Pilot lab transmission measurements $\tau^{P}_{X,i,r}$ for r = 1 (p 84)
Annex B.2, Pilot lab transmission measurements $\tau^{P}_{X,i,r}$ for r = 2 (p 85)

The adopted value for the pilot lab transmission measurements is the average of round 1 and round 2

$$\tau^{P}_{X,i} = \frac{1}{2}\left(\tau^{P}_{X,i,1} + \tau^{P}_{X,i,2}\right) \tag{2}$$

All the values are in

Annex B.3, Pilot lab adopted transmission $\tau^{P}_{X,i}$ (p 86)

The uncertainties associated are in Annex B.4 and Annex B.5, where:

Annex B.4, Pilot lab total uncertainty on adopted transmission $u\ (\tau^{P}_{X,i})$ (p87)
Annex B.5, Pilot lab "type A" uncertainty on adopted transmission $u\ (\tau^{PR}_{X,i})$ (p88)

NMI Measurements

The participant laboratories measurements are reported in annex C.

Annex B.6, NMI absolute transmission measurements $\tau_{X,i}$ (p89)
Annex B.7, NMI total absolute uncertainties on transmission $u(\tau_{X,i})$ (p90)

Additional uncertainties

The additional uncertainties arise from artefacts due to transportation or different measurement conditions between Pilot and participants that affect comparison results. No problem was identified during the procedure that could suggest to incorporate an additional uncertainty.

Drift uncertainty

As it was showed in §3.7, p.11, the stability of the filters during the comparison can be accessed by the difference between transmittance measurements before and after the dispatching. We plotted this difference for all the filters (see Figure 2 to Figure 6, p.11-13). It appears that the drift is quite smooth and reasonably taken into account by the mean value of the measurement "before" and "after" at the pilot laboratory.
After discussion within the participants, it was accepted that the uncertainty $u_{\mathrm{drift},\,X,i}$, associated to possible drift of the filter X,i is estimated to be within the difference "before" – "after" with a rectangular probability distribution.

$$u_{driftX,i} = \frac{1}{2\sqrt{3}}\left|\tau^{P}_{X,i,1} - \tau^{P}_{X,i,2}\right| \tag{3}$$

For the pilot lab, the drift uncertainty is the average of all the filters.

$$u_{driftX,0} = \frac{1}{N}\sum_{i=1}^{N} u_{driftX,i} \tag{4}$$

All the results concerning u_{drift} are reported in Annex B.8 and Annex B.9, p. 91-92

Determination of the cut-off

The cut-off value is calculated by

$$u_{\text{cut-off}} = \text{average}\{u(\tau_{X,i})\} \text{ for } u(\tau_{X,i}) \le \text{median}\{u(\tau_{X,i})\};\ i = 0 \text{ to } N. \tag{5}$$

$$\text{where for the pilot lab, } u(\tau_{X,0}) = \frac{1}{N}\sum_{i=1}^{N} u(\tau_{X,i}^{\text{P}}) \tag{6}$$

When the uncertainty $u(\tau_{X,i})$ of the NMI is under the cut-off value, it is adjusted by the cut-off. After this operation, the uncertainties of the NMI become $u_{\text{adj}}(\tau_{X,i})$

In Annex B.10 (p. 93) is reported the $u_{\text{adj}}(\tau_{X,i})$. The caption of the cell is in bold when the uncertainty of the participant lab has been adjusted by the cut-off.

Determination of the weight

For each NMI i for each filter X, the difference between NMI measurement and the Pilot lab measurement (as the average of the two rounds) is given by:

$$\Delta_{X,i} = \tau_{X,i} - \tau_{X,i}^{P} \tag{7}$$

and its uncertainty, for i =1to N by

$$u(\Delta_{X,i}) = \sqrt{u^2(\tau_{X,i}) + u^2(\tau_{X,i}^{\text{PR}}) + u_{\text{drift},X,i}^2} \text{ without cut-off adjustment} \tag{8}$$

$$u_{\text{adj}}(\Delta_{X,i}) = \sqrt{u_{\text{adj}}^2(\tau_{X,i}) + u^2(\tau_{X,i}^{\text{PR}}) + u_{\text{drift},X,i}^2} \text{ with cut-off adjustment} \tag{9}$$

For the pilot lab (i =0), we have

$$\Delta_{X,0} = 0 \tag{10}$$

$$u(\Delta_{X,0}) = \sqrt{u^2(\tau_{X,0}^{\text{P}}) + u_{\text{drift},X,0}^2} \text{ without cut-off} \tag{11}$$

$$u_{\text{adj}}(\Delta_{X,0}) = \sqrt{u_{\text{adj}}^2(\tau_{X,0}^{\text{P}}) + u_{\text{drift},X,0}^2} \text{ with cut-off} \tag{12}$$

where $u_{\text{drift},X,0}^2$ comes from (4) and $u(\tau_{X,0}^{\text{P}})$ from (6).

$\Delta_{X,i}$, $u(\Delta_{X,i})$ and $u_{\text{adj}}(\Delta_{X,i})$ are reported respectively in Annex B.11, Annex B.12 and Annex B.13 (p94-96)

In the following calculations, the index X is abandoned to lighten the notations, but the reader should keep in mind that the calculations are done for each of the five filters.

The weights w_i for the NMI i is determined by:

$$w_i = \frac{u_{\text{adj}}^{-2}(\Delta_i)}{\sum_{i=0}^{N} u_{\text{adj}}^{-2}(\Delta_i)} \tag{13}$$

Results are reported in Annex B.14 (p97)

5.3. Key Comparison Reference Value (KCRV)

The KCRV is given by

$$\Delta_{\text{KCRV}} = \sum_{i=0}^{N} w_i \Delta_i \tag{14}$$

The uncertainty of the KCRV (weighted mean with cut-off) is given by

$$u\left(\varDelta_{\mathrm{KCRV}}\right)=\frac{\sqrt{\sum_{i=0}^{N}\frac{u^2\left(\varDelta_i\right)}{u_{adj}^4\left(\varDelta_i\right)}}}{\sum_{i=0}^{N}u_{adj}^{-2}\left(\varDelta_i\right)} \tag{15}$$

The results are reported in the following tables

Table 35 : Δ_{KCRV} for the five filters:

λ (nm)	Filter "A"	Filter "B"	Filter "C"	Filter "D"	Filter "E"
380	1,024E-03	1,540E-03	1,211E-04	-1,599E-06	1,049E-06
400	1,148E-03	1,093E-03	-3,117E-05	-1,185E-05	-6,444E-09
500	8,494E-04	9,756E-04	1,156E-04	8,555E-06	2,954E-06
600	7,970E-04	7,611E-04	1,777E-04	4,101E-05	8,210E-06
700	4,225E-04	3,424E-04	9,633E-05	3,374E-05	7,620E-06
800	6,383E-04	2,010E-04	1,455E-05	6,546E-06	1,543E-05
900	5,228E-04	7,263E-05	8,838E-06	-4,104E-06	-2,187E-06
1000	4,211E-04	1,051E-04	-1,840E-06	-3,835E-06	-9,511E-06

Table 36 : $u(\Delta_{\mathrm{KCRV}})$ for the five filters

λ (nm)	Filter "A"	Filter "B"	Filter "C"	Filter "D"	Filter "E"
380	1,129E-04	1,637E-04	3,114E-05	3,689E-06	2,379E-06
400	9,043E-05	1,187E-04	2,835E-05	4,792E-06	1,209E-06
500	6,858E-05	1,139E-04	2,193E-05	4,187E-06	1,125E-06
600	6,969E-05	6,358E-05	1,765E-05	4,668E-06	1,484E-06
700	6,926E-05	5,251E-05	2,987E-05	1,090E-05	4,124E-06
800	4,380E-05	5,879E-05	2,755E-05	8,918E-06	3,869E-06
900	6,047E-05	5,819E-05	1,978E-05	6,348E-06	3,015E-06
1000	6,443E-05	6,384E-05	1,555E-05	5,411E-06	2,903E-06

Uncertainties are absolute uncertainties

6. Degrees of equivalence (DoE)

Knowing the Δ_{KCRV} , the unilateral DoE of NMI *i* is given by:

$$D_i = \mathit{\Delta}_i - \mathit{\Delta}_{\mathrm{KCRV}} \qquad (16)$$

$$U_i = k\sqrt{u^2(\mathit{\Delta}_i) + u^2(\mathit{\Delta}_{\mathrm{KCRV}}) - 2\frac{\dfrac{u^2(\mathit{\Delta}_i)}{u_{\mathrm{adj}}^2(\mathit{\Delta}_i)}}{\sum_{j=0}^{N} u_{\mathrm{adj}}^{-2}(\mathit{\Delta}_j)}} \quad ;k=2 \qquad (17)$$

Results are reported in Annex B.15 and Annex B.16 (p98-99).

A graphical representation of the unilateral degrees of equivalence with k=2 is proposed in the followings pages.

Unilateral DoE of CCPR-K6 Participants
Filter “A”*

Values reported here are absolute
Uncertainties are calculated with k=2

*Nominal transmittance value : 92%

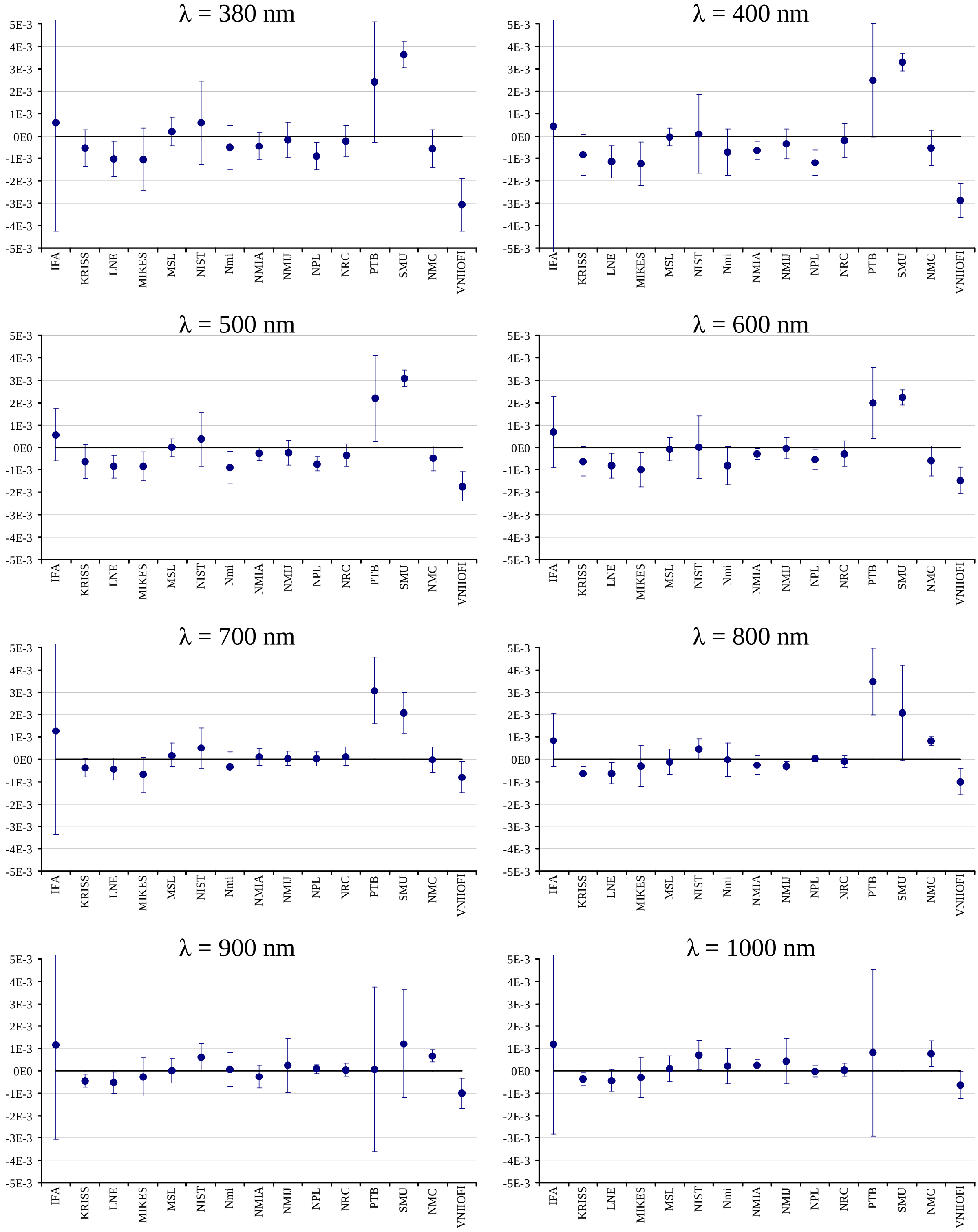

Figure 17 – DoE between laboratories and the KCRV for filter A

Unilateral DoE of CCPR-K6 Participants
Filter “B”*

Values reported here are absolute
Uncertainties are calculated with k=2

*Nominal transmittance value : 56%

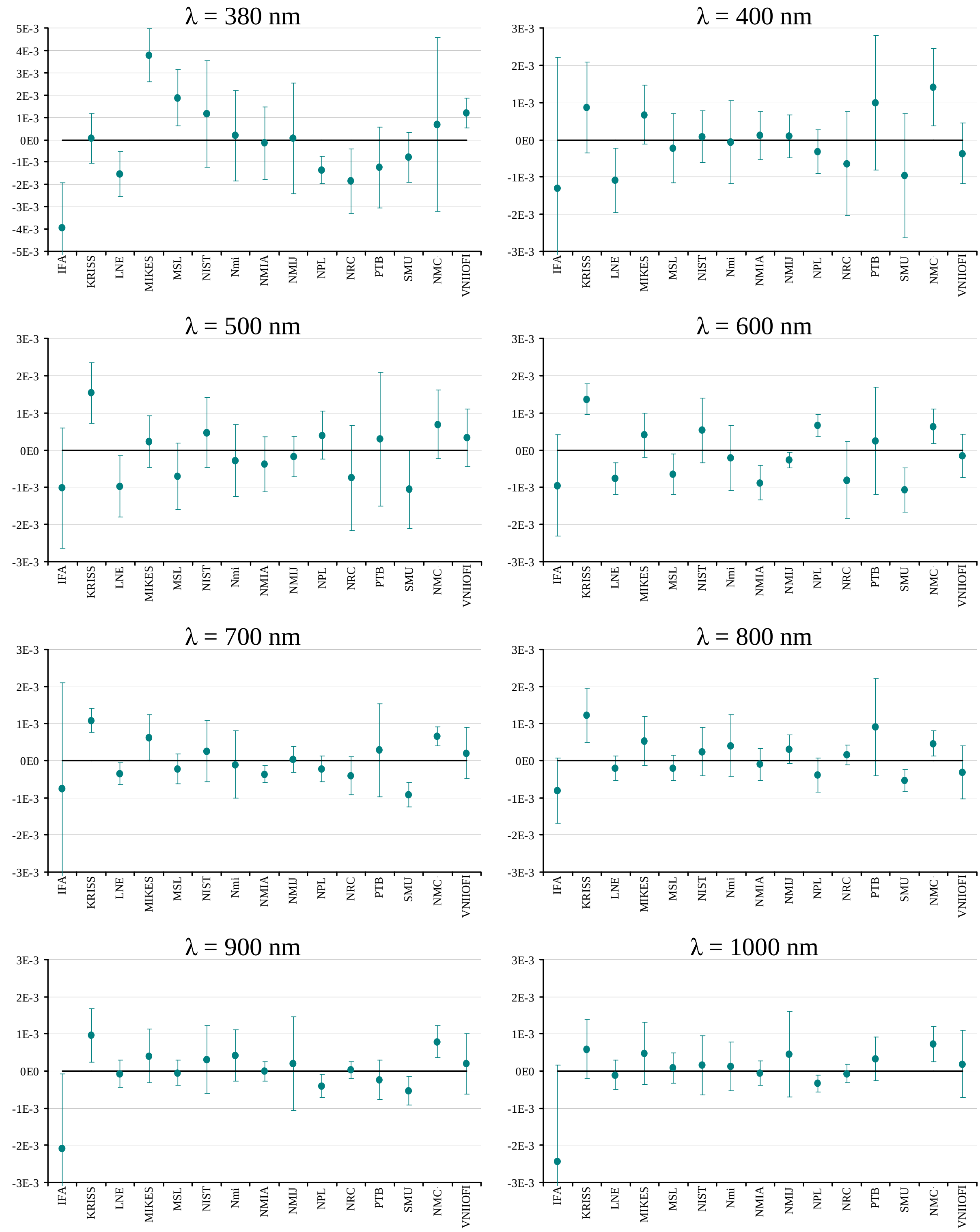

Figure 18 – DoE between laboratories and the KCRV for filter B

Unilateral DoE of CCPR-K6 Participants
Filter “C”*

Values reported here are absolute
Uncertainties are calculated with k=2

*Nominal transmittance value : 10%

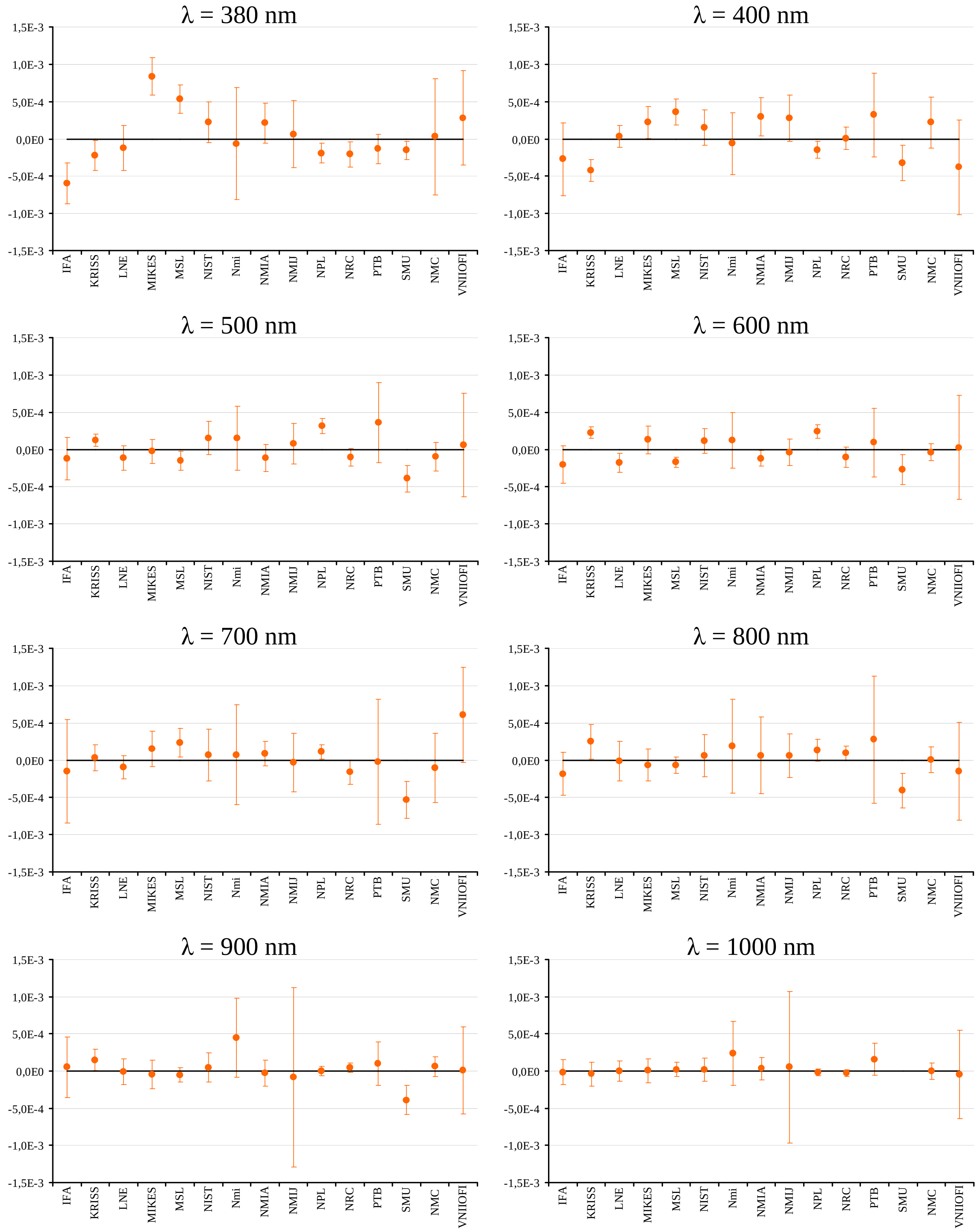

Figure 19 – DoE between laboratories and the KCRV for filter C

Unilateral DoE of CCPR-K6 Participants
Filter “D”*

Values reported here are absolute
Uncertainties are calculated with k=2

*Nominal transmittance value : 1%

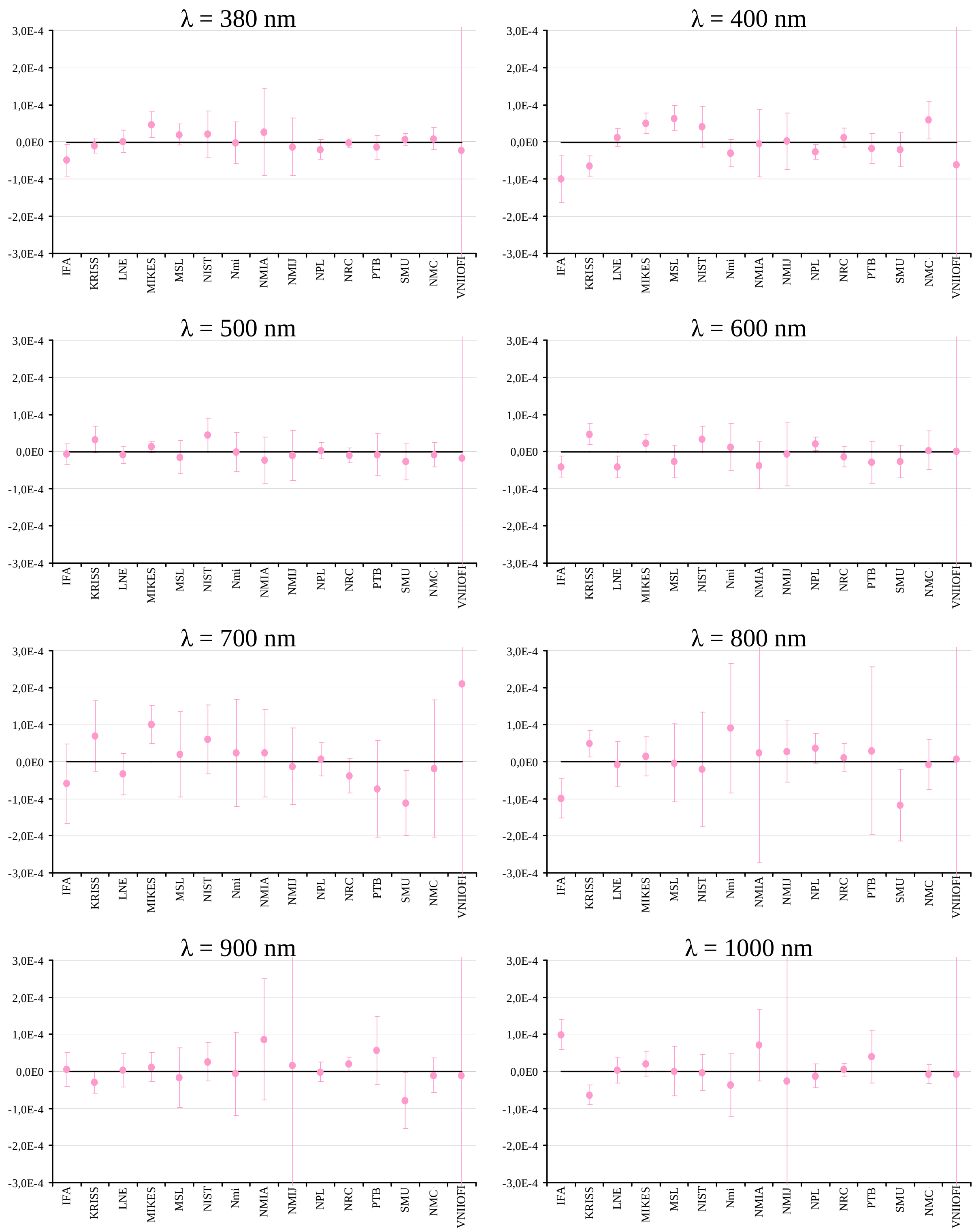

Figure 20 – DoE between laboratories and the KCRV for filter D

Unilateral DoE of CCPR-K6 Participants
Filter "E"*

Values reported here are absolute
Uncertainties are calculated with k=2

*Nominal transmittance value : 0,1%

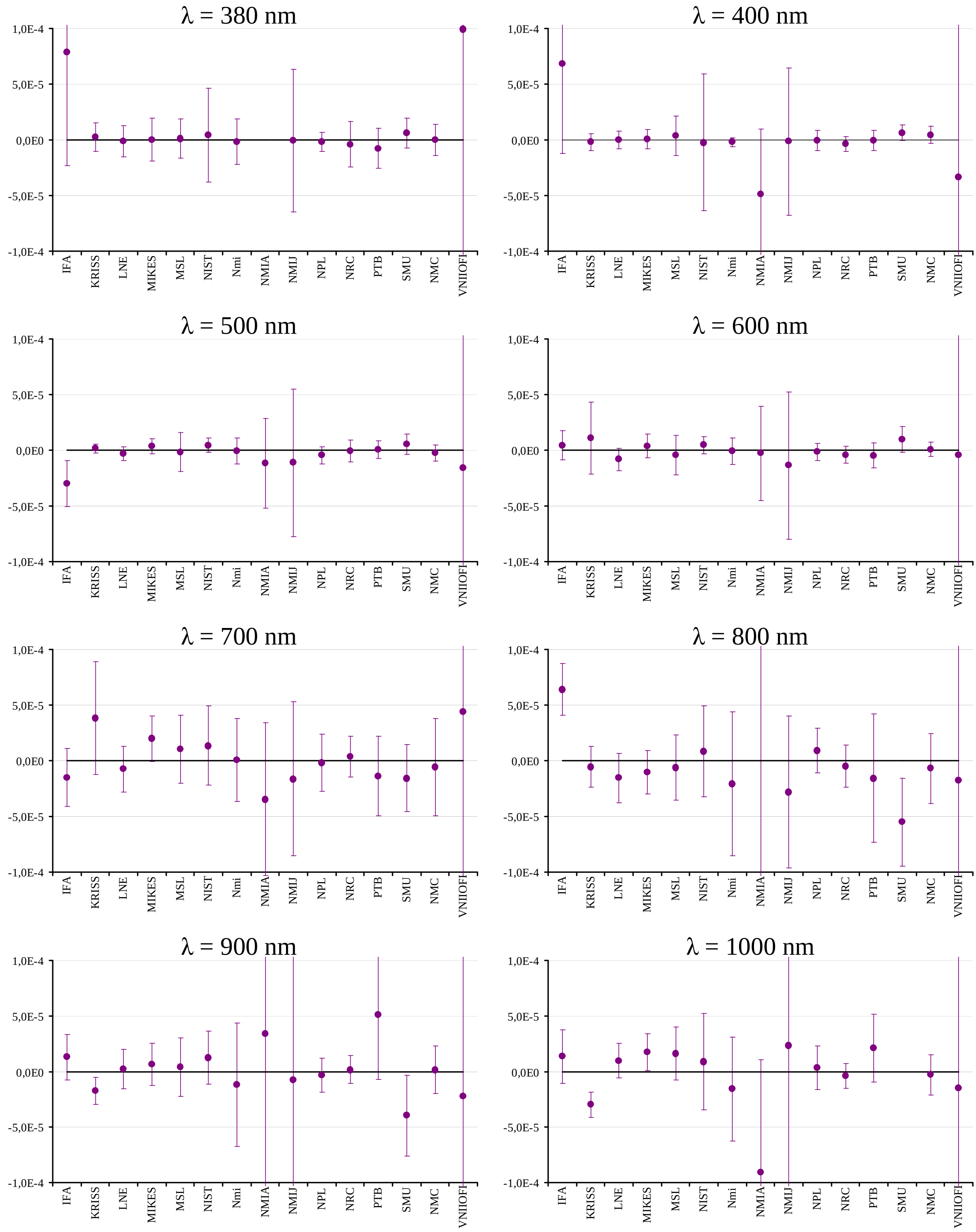

Figure 21 – DoE between laboratories and the KCRV for filter E

7. Checking of the results

7.1. Consistency check

In a first step, the consistency of the dispersion of the Degrees of Equivalence with the uncertainties was checked by means of a test derived from the chi-squared test.
The observed "test value" is

$$Q = \sum_{i=0}^{N} \frac{D_i^2}{U_i^2} \qquad (18)$$

where U_i is the expanded uncertainty with k = 2 and the summation is over all participants for a given filter type and wavelength. The consistency check is defined as failing if

$$Q > 25 \ . \qquad (19)$$

The results of the test were satisfactory for the filters "D" and "E" but not for "A", "B" and "C".
Looking in detail at each participant's contribution to Q, it appears that when the test failed the failure was usually because of only one NMI measurement.

During May 2006, the pilot, being aware of these results, invited 8 participating NMIs to check their results and associated uncertainties. 7 NMIs replied. As the corrections proposed by the NMIs were minor and had no significant effects on the KCRV or on the results of the "*Q*" test, the pilot lab decided not to integrate these modifications in the results.

After that, it has been decided to reject from the calculation of the KCRV participants who increase the Q value drastically. As a matter of fact, it appears that, for each wavelength where the test fails, the suppression of only one participant allows the test to pass for all the filters and for all the wavelengths. Ten wavelengths out of forty and four laboratories out of fifteen were affected by this rejection.

The draft A-1, presenting these proposals for the determination of the KCRV and the calculation of DoE was circulated July 20, 2006. From the answers received on this draft, it appears that the method for determining the KCRV and the DoE needs some improvements. The major difficulty in applying the consistency check was due to the drift of the filters during the measurement. As has been indicated previously, this drift was in general larger than the uncertainty reported by the laboratories for their measurements and was also strongly dependent on the individual filters. So, for the majority of the laboratories, the uncertainty of the comparison was dominated by the uncertainty due to the stability of the filters. Because the laboratories which had received very stable filters had a very low uncertainty compared to the laboratories which had received less stable filters, this led to difficulties in the use of a consistency check. The failure in the observed Q value by the data of one particular laboratory could be the result of two possible causes :

1. A deviation from the KCRV that is too large
2. A measurement uncertainty that is too small.

In the first case, it might be reasonable to exclude the results from the calculation of the KCRV as it is an "obvious outlier" and can be removed according to the CCPR guidelines. For the second case the exclusion of the results is less justifiable as there could be other factors which contribute to the small uncertainty value such as the "good" stability of the filter during the comparison.

To take into account this effect, two new methods for determining the KCRV were proposed. The first one was based on the use of the largest drift observed for one type of filter at one wavelength

assuming a rectangular distribution, applied to all laboratories. In this case, the uncertainty component related to the drift of the filters is taken to the same for all laboratories. As this uncertainty component is a very important part of the total uncertainty, all the laboratories have about the same total uncertainty using this method of analysis.
The second method was based on an "*acceptable uncertainty*" defined in a way similar to the way in which the cut-off uncertainty is determined. For the laboratory which has a ratio D_i/U_i that is responsible for the failure in the Q test, its uncertainty is to be changed to an "*acceptable uncertainty*" U'_i given by

$$U'_i = \frac{D_i}{\sqrt{\mathrm{Med}(Q)}} \tag{20}$$

where Med (Q) is the median contribution among all the participants in the Q value.

The draft A2, taking into account the corrections requested by some participants and presenting the results obtained by the two new methods proposed for identifying the outliers, was circulated March 16, 2007. The status of the CCPR-K6 key comparison was presented at the meeting of the Working Group on Key Comparisons of the CCPR (WG-KC) in June 18, 2007. From the discussion arising from these two events, it was decided that the results of the KCRV could be improved by removing some outliers, but the method for determining the outliers was not considered to be satisfactory.

7.2. Identification of outliers

After discussion with some of the interested participants it was decided to use a very simple and very conservative test for removing outliers from the calculation of the KCRV. The retained test was that the unilateral DoE, D_i should be greater than five time the uncertainty on the DoE, U_i.

$$D_i \geq 5 * U_i \tag{21}$$

Applying this criterion led to the removal from the calculation of the KCRV reference value four wavelengths for one filter and for one laboratory (Annex B.17, p100). This is schematically presented in table 36.

Table 37 : Outliers

λ (nm)	Filter "A"	Filter "B"	Filter "C"	Filter "D"	Filter "E"
380	SMU				
400	SMU				
500	SMU				
600	SMU				
700					
800					
900					
1000					

In Table 6Figure 2, page 11, showing the stability of the filters A during the comparison, it appears that the filter A of the set 11, used by SMU had a strange behaviour, indicating probably

a poor quality filter. For the wavelengths between 380 nm and 600 nm its stability is very good and it is very poor for the other wavelengths. So, the uncertainties of the comparison for this filter are very small for wavelengths between 380 nm and 600 nm and very large for the other wavelengths, since the stability of the filter is a major component of the uncertainty of the comparison.
The use of a weighted mean, even with a cut off, for determining the reference value of the comparison give a strong importance to the measurements with a low uncertainty, on this reference value. The figure "Unilateral DoE of CCPR-K6 Participants, Filter A", page 51, for wavelengths 380 nm, 400 nm, 500 nm and 600 nm, shows that 2/3 of the laboratories are below the reference value of the comparison, pointing out that this reference value is probably not the most representative of the measurements carried out by most of the laboratories. So it seems reasonable to exclude from the calculation of the reference value of the comparison some measurements of a filter which seems to be of poor quality.

8. Final value of the KCRV

The cut-off is recalculated with the remaining values. We follow the same procedure as the one described in §5.2 (p48). This second calculations is identified as version #2 in the annex. The cells are filled in pink to identify the values that have been rejected from the calculation of the KCRV.
The calculations are identical, excepted for several quantities where we have to take into account the fact that a measurement is not available anymore. These quantities are expressed below. The excluded measurement is labelled *h*.

Determination of the cut-off

The cut-off value is calculated by

$$u_{\text{cut-off}} = \text{average}\{u(\tau_{X,i})\} \text{ for } u(\tau_{X,i}) \leq \text{median}\{u(\tau_{X,i})\};\ i = 0 \text{ to } N,\ i \neq h. \quad (21)$$

$$\text{where for the pilot lab, } u\left(\tau_{X,0}\right) = \frac{1}{N}\sum_{i=1}^{N} u\left(\tau_{X,i}^{\mathrm{P}}\right) \quad (22)$$

When the uncertainty $u(\tau_{X,i})$ of the NMI is under the cut-off value, it is adjusted by the cut-off. After this operation, the uncertainties of the NMI become $u_{\text{adj}}(\tau_{X,i})$. This operation is done for the measurement *h* too if it is necessary.
In Annex B.18 (p101), we reported the $u_{\text{adj}}(\tau_{X,i})$. The caption of the cell is in bold when the uncertainty of the participant has been adjusted by the cut-off.

Determination of the weight

$\Delta_{X,i}$ (difference between NMI measurement and the Pilot lab measurement) and $u(\Delta_{X,i})$ are unchanged.
As $u_{\text{adj}}(\Delta_{X,i})$ is dependent of the cut-off, its value has changed and is updates in Annex B.19 (p102).
In the following calculations, the index X is abandoned to simplify the notations, but the reader should keep in mind that the calculations are performed for each of the five filters.
The weights wi for the NMI i are determined by:

$$\underset{i \neq h}{w_i} = \frac{u_{\text{adj}}^{-2}\left(\Delta_i\right)}{\sum_{\substack{i=0 \\ i \neq h}}^{N} u_{\text{adj}}^{-2}\left(\Delta_i\right)} \quad (23)$$

There is no weight for the case *h*. Results are reported in Annex B.20(p103).

Key Comparison Reference Value (KCRV)

The final KCRV is given by

$$\Delta_{\mathrm{KCRV}} = \sum_{\substack{i=0 \\ i\neq h}}^{N} w_i \Delta_i \tag{24}$$

The uncertainty of the KCRV (weighted mean with cut-off) is given by

$$u\left(\Delta_{\mathrm{KCRV}}\right) = \frac{\sqrt{\sum_{\substack{i=0 \\ i\neq h}}^{N} \frac{u^2\left(\Delta_i\right)}{u_{adj}^4\left(\Delta_i\right)}}}{\sum_{\substack{i=0 \\ i\neq h}}^{N} u_{adj}^{-2}\left(\Delta_i\right)} \tag{25}$$

The final KCRV is detailed in Table 38 and Table 39

Table 38 : Δ_{KCRV} for the five filters, version #2:

λ (nm)	Filter “A”	Filter “B”	Filter “C”	Filter “D”	Filter “E”
380	4,357E-04	1,540E-03	1,211E-04	-1,599E-06	1,049E-06
400	3,701E-04	1,093E-03	-3,117E-05	-1,185E-05	-6,444E-09
500	3,234E-04	9,756E-04	1,156E-04	8,555E-06	2,954E-06
600	3,075E-04	7,611E-04	1,777E-04	4,101E-05	8,210E-06
700	4,225E-04	3,424E-04	9,633E-05	3,374E-05	7,620E-06
800	6.383E-04	2,010E-04	1,455E-05	6,546E-06	1,543E-05
900	5,228E-04	7,263E-05	8,838E-06	-4,104E-06	-2,187E-06
1000	4,211E-04	1,051E-04	-1,840E-06	-3,835E-06	-9,511E-06

Table 39 : $u(\Delta_{\mathrm{KCRV}})$ for the five filters, version #2

λ (nm)	Filter “A”	Filter “B”	Filter “C”	Filter “D”	Filter “E”
380	1,058E-04	1,637E-04	3,114E-05	3,689E-06	2,379E-06
400	8,210E-05	1,187E-04	2,835E-05	4,792E-06	1,209E-06
500	6,338E-05	1,139E-04	2,193E-05	4,187E-06	1,125E-06
600	6,302E-05	6,358E-05	1,765E-05	4,668E-06	1,484E-06
700	6,926E-05	5,251E-05	2,987E-05	1,090E-05	4,124E-06
800	4,380E-05	5,879E-05	2,755E-05	8,918E-06	3,869E-06
900	6,047E-05	5,819E-05	1,978E-05	6,348E-06	3,015E-06
1000	6,443E-05	6,384E-05	1,555E-05	5,411E-06	2,903E-06

Uncertainties are absolute uncertainties

9. Final degrees of equivalence

Knowing the Δ_{KCRV} , the unilateral DoE of NMI *i* is given by equation (16) and the uncertainty by equation (17) for all the participants.

Results are reported in Annex B.21 and Annex B.22 (p104-105)
A graphical representation of the unilateral degrees of equivalence with k=2 is proposed in the followings pages.

Unilateral DoE of CCPR-K6 Participants
Filter “A”* (**Final**)

Values reported here are absolute
Uncertainties are calculated with k=2

*Nominal transmittance value : 92%

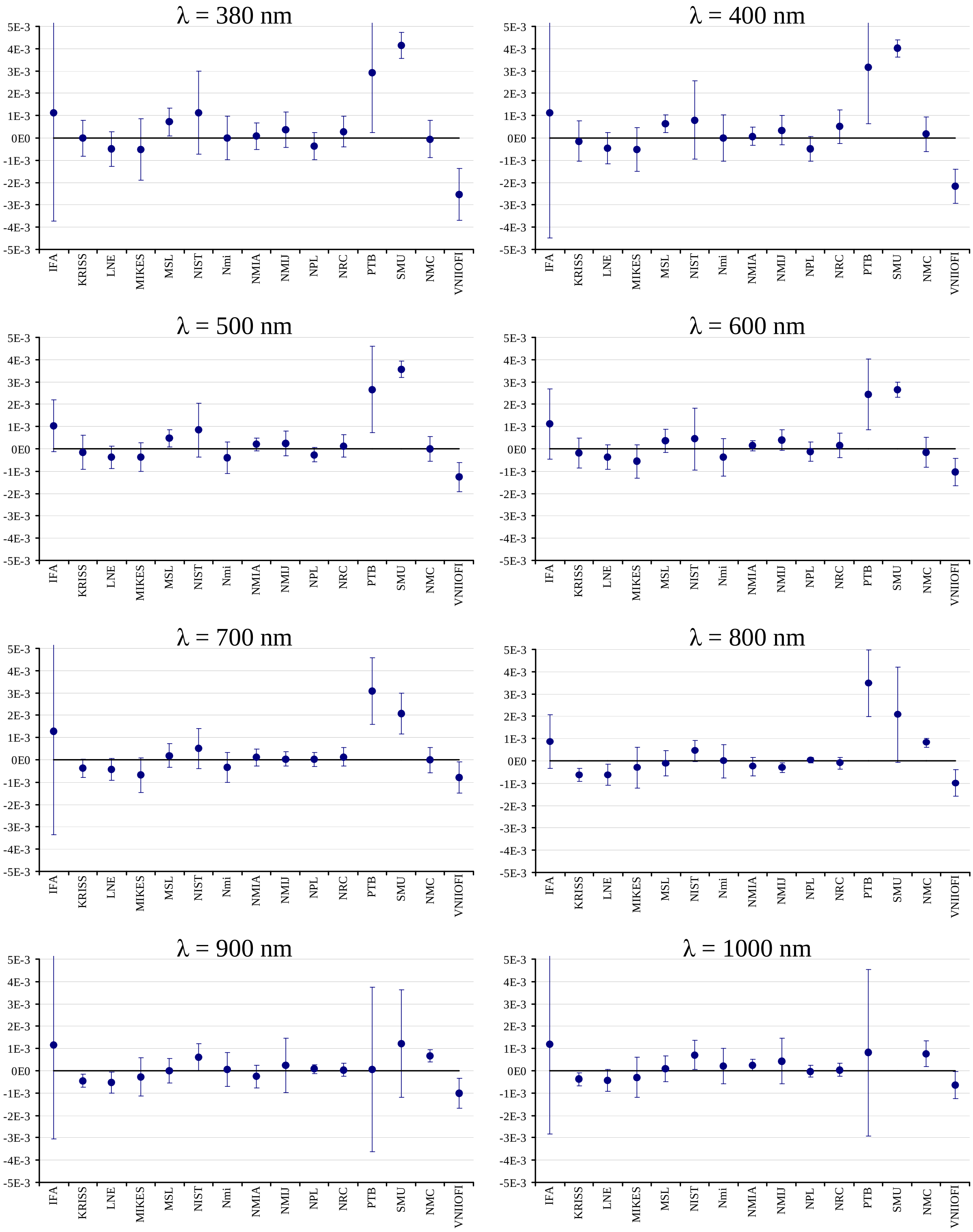

Figure 22 – DoE between laboratories and the KCRV for filter A

Unilateral DoE of CCPR-K6 Particpants
Filter "B"* (**Final**)

Values reported here are absolute
Uncertainties are calculated with k=2

*Nominal transmittance value : 56%

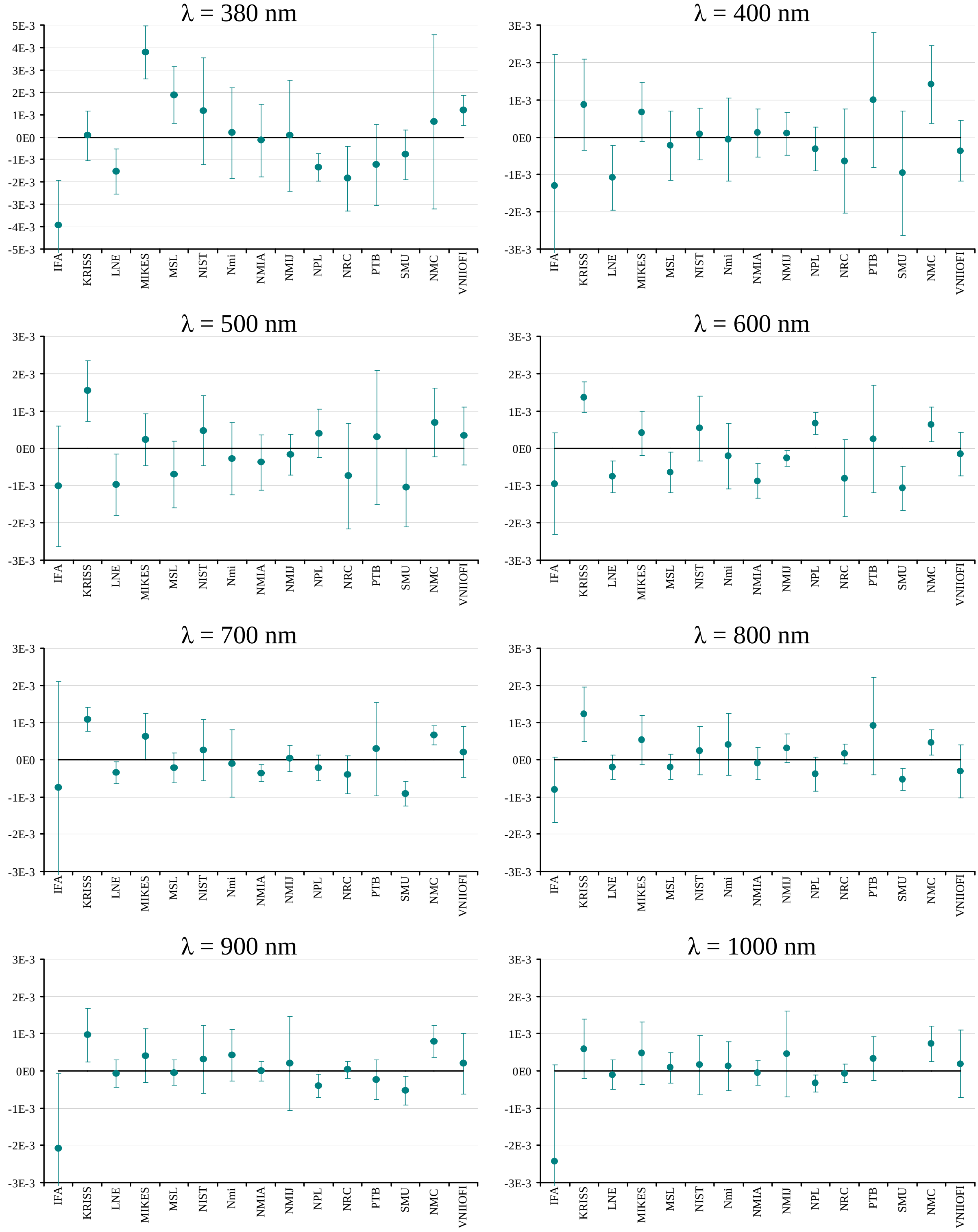

Figure 23 – DoE between laboratories and the KCRV for filter B

Unilateral DoE of CCPR-K6 Particpants
Filter “C”* (**Final**)

Values reported here are absolute
Uncertainties are calculated with k=2

*Nominal transmittance value : 10%

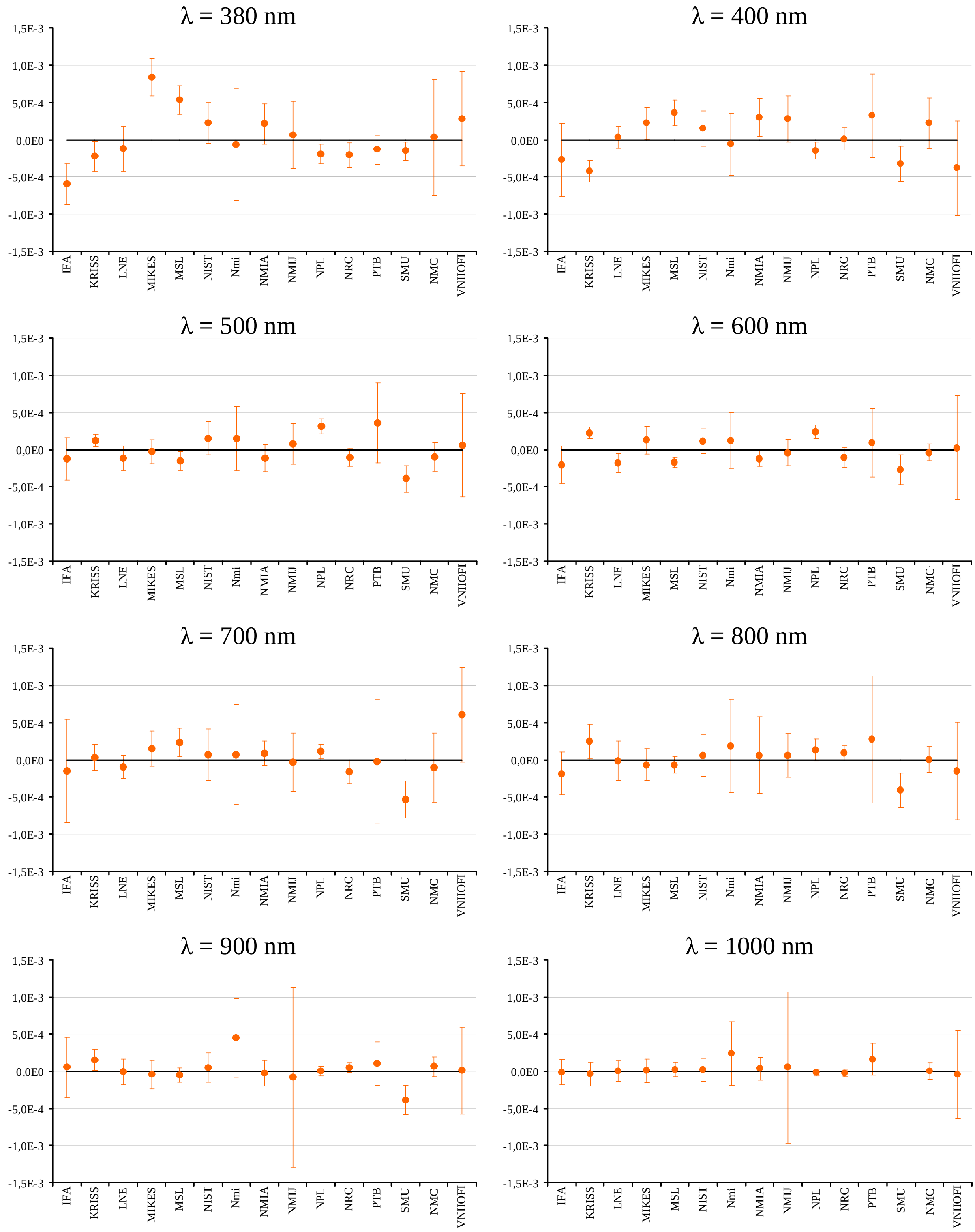

Figure 24 – DoE between laboratories and the KCRV for filter C

Unilateral DoE of CCPR-K6 Participants
Filter “D”* (**Final**)

Values reported here are absolute
Uncertainties are calculated with k=2

*Nominal transmittance value : 1%

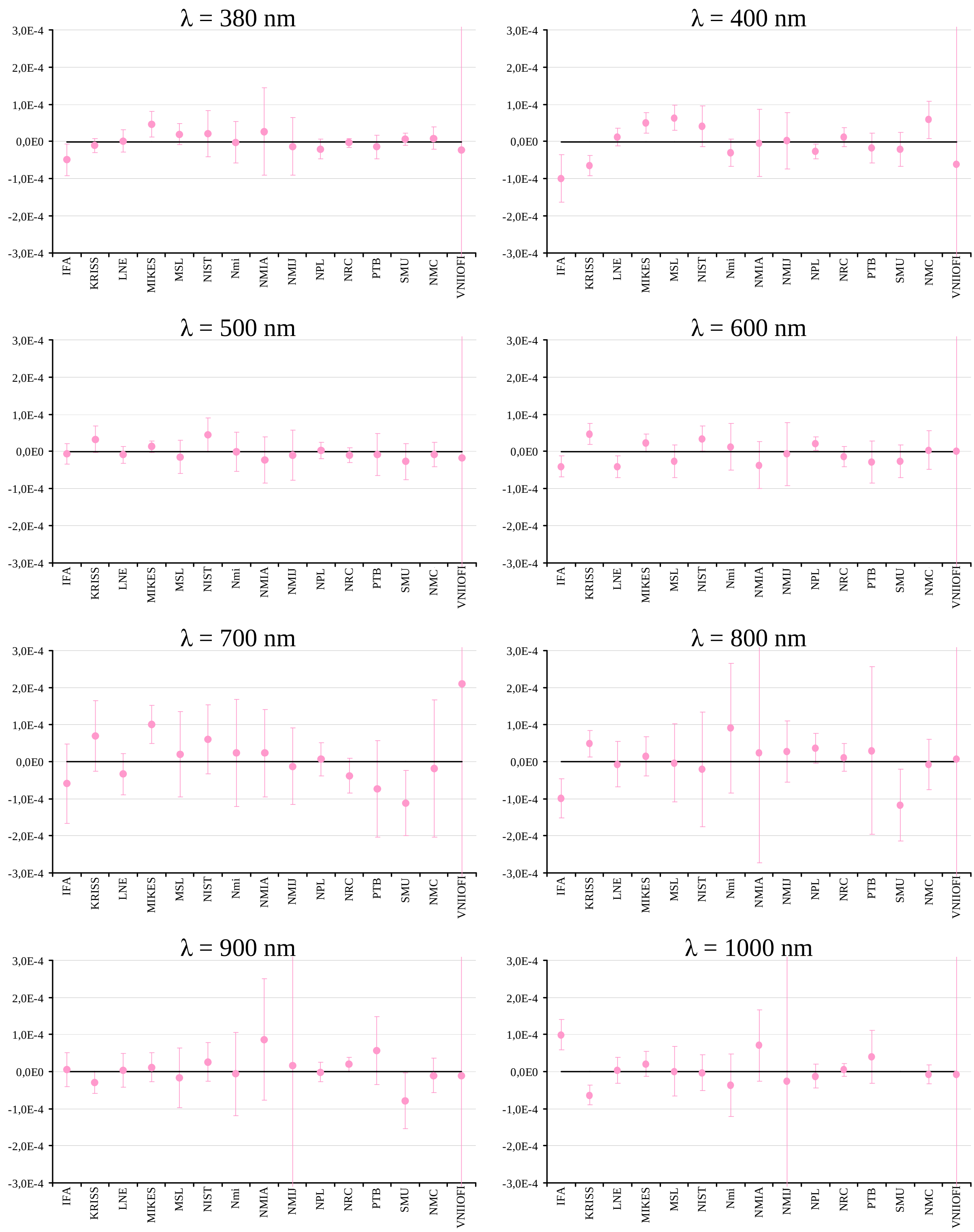

Figure 25 – DoE between laboratories and the KCRV for filter D

Unilateral DoE of CCPR-K6 Particpants
Filter “E”* (**Final**)

Values reported here are absolute
Uncertainties are calculated with k=2

*Nominal transmittance value : 0,1%

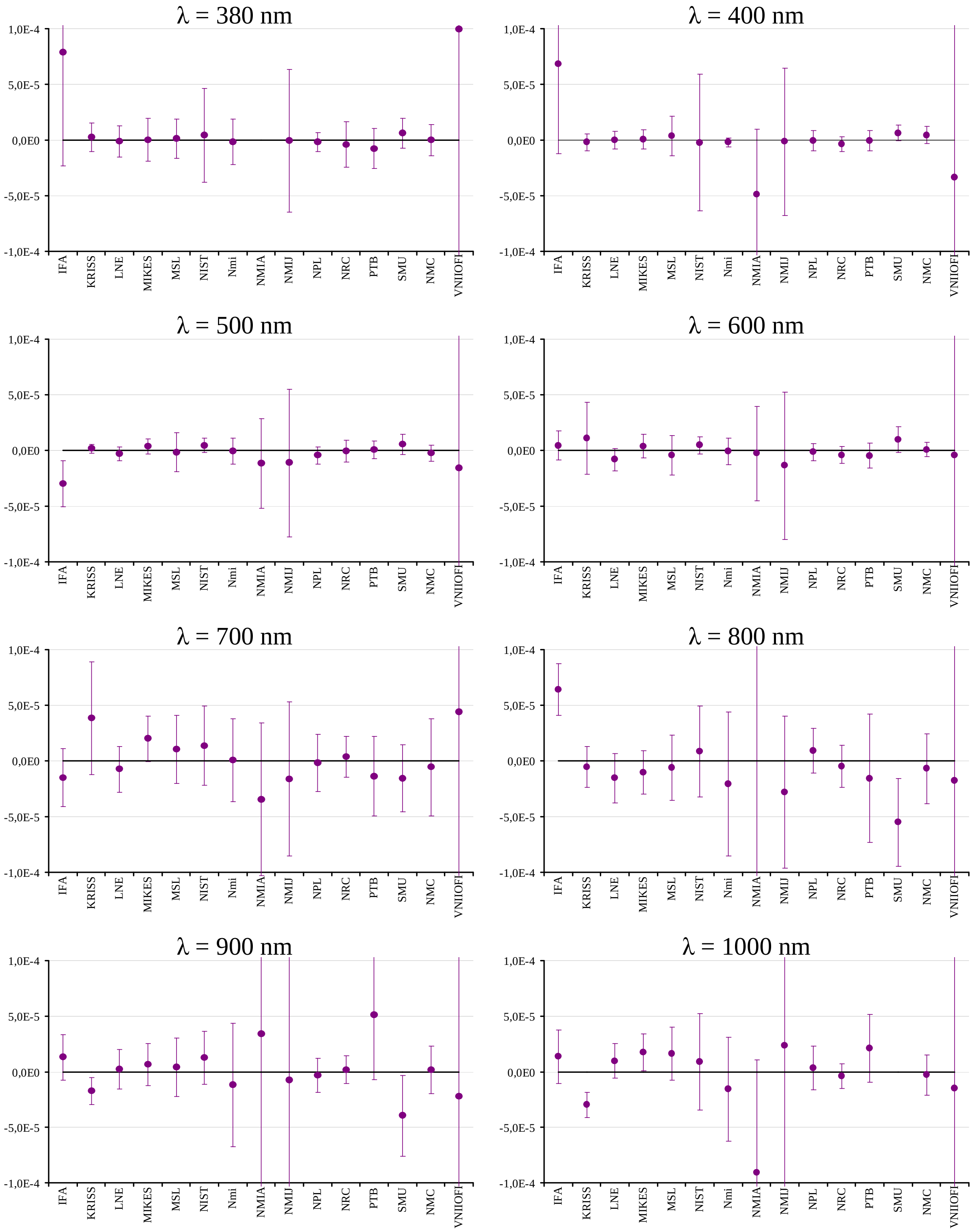

Figure 26 – DoE between laboratories and the KCRV for filter E

10. Conclusion

The present Draft-B presents the Key Comparison Reference Values (KCRV) of the comparison and the degree of equivalence of the participants based on a weighted mean with cut-off and the removal of very few values considered as outliers. This is based on a two steps calculation procedure.

The first step, already presented in the Draft A1 and Draft A2 (chapter 5 and 6), is directly derived from the “guidelines for CCPR Comparison Report Preparation”. All the data of all the participating laboratories are included in the calculation of the KCRV using the method of the weighted mean.

The second step, is basically the same as the previous one and it is also indicated as possible in the “Guidelines for CCPR Comparison Report Preparation”. In that step the outliers, determined by using a criterion based on the deviation from the KCRV and the associated uncertainty, are excluded from the KCRV calculation but the KCRV is always calculated using the weighted mean.

Following the proposals of some participants to the comparison, two new methods for determining the KCRV have been developed in the draft A2.

The comments are open on this proposal.

ANNEX A

Spectral Regular Transmittance

Technical Protocol

1. Introduction

1.1 The metrological equivalence of national measurement standards will be determined by a set of key comparisons chosen and organised by the Consultative Committees of the CIPM working closely with the Regional Metrology Organisations (RMOs).

1.2 At its meeting in March 1997, the Consultative Committee for Photometry and radiometry, CCPR, identified several key comparisons in the field of optical radiation metrology. In particular, it decided that a key comparison of spectral regular transmittance shall be carried out, with the BNM-INM (France) acting as pilot laboratory.

1.3 This technical protocol has been drawn up by a small working group comprising the Institut National de Metrologie, France (BNM-INM), the Helsinki University of Technology, Finland (MIKES), the Measurement Standard Laboratory, New Zealand (MSL), the National Institute of Standard and Technology, USA (NIST), the National Physical Laboratory, UK (NPL), and the Physikalisch-Technische Bundesanstalt, Germany (PTB).

1.4 The procedures outlined in this document cover the technical procedure to be followed during measurement of the transfer standard filters. The procedure, which followed the guidelines established by the BIPM[3], is based on current best practise in the use of standard filters and takes account of the experience gained from the previous comparisons organised in this field[4].

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[3] T.J. Quinn, « Guidelines for key comparison carried out by Consultative Committees », BIPM, Paris, 1 March 1999

[4] K.L. Eckerle, J. Bastie, J. Zwinkels, V. Sapritsky, A. Ulyanov, « Comparison of regular transmittance scales of four national standardizing laboratories », Color research and application, volume 18, number 1, February 1993.

J.F. Verrill, « Intercomparison of spectrophotometric measurements of regular transmittance », Report contract N°. MAT1-CT940021, November 1996.

Etc…….

2. Organisation

2.1 Participants

2.1.1 The list of participants was drafted by the pilot laboratory starting from the present list of CCPR member and observer laboratories, the answers to a preliminary questionnaire, and taking into account the RMOs.

2.1.2 Traditionally, only members laboratories are participants in a key comparison. Nevertheless, for practical reasons, observer laboratories have been included in the circulation of the artefacts for this comparison. Their results could be included in the comparison or considered separately according to the decision of the CCPR in this matter.

2.1.3 All participants must be able to demonstrate independent traceability to the realisation of the quantity, or make clear the route of traceability to the quantity via another named laboratory.

2.1.4 By their declared intention to participate in this key comparison, the laboratories accept the general instructions and the technical protocols written down in this document and commit themselves to follow the procedures strictly.

2.1.5 Once the protocol and list of participants has been agreed, no change to the protocol or list of participants may be made without prior agreement of all participants.

2.2 Participants’ details

2.2.1 CCPR members

BNM-INM	**Mr Jean Bastie** BNM-INM/CNAM 292 rue Saint Martin 75003 Paris France	Phone : 33 1 40 27 20 25 Fax : 33 1 42 71 37 36 E-mail : bastie@cnam.fr
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CSIRO	**Dr Jim Gardner** CSIRO - National Measurement Laboratory PO Box 218 Lindfield NSW 2070 Australia	Phone : + 612 9413 7323 Fax : + 612 9413 7474 E-mail : jlg@tip.csiro.au
HUT	**Dr Farshid Manoocheri** HUT - Metrology Research Institute Otakaari 5 A PO Box 3000 FIN-02015 HUT Finland	Phone : + 358 9 451 2337 Fax : + 358 9 451 2222 E-mail : farshid.manoocheri@hut.fi
IEN	**Dr Maria Luisa Rastello** IEN Strada delle Cacce, 91 10135 Torino Italy	Phone : + 39 11 3919 219 Fax : + 39 11 34 63 84 E-mail : rastello@ft.ien.it
IFA	**Dr Alicia Pons** CSIC - Instituto de Fisica Aplicada C/Serrano 144 28006 Madrid Spain	Phone : + 34 91 561 8806 Fax : + 34 91 411 7651 E-mail : apons@fresno.csic.es
KRISS	**Dr Young Boong Chung** KRISS Optics Lab.–Division of Quantum Metrology PO Box 102, Yusong Taejon 305-600 Republic of Korea	Phone : + 82 42 868 5200 Fax : + 82 42 868 5022 E-mail : optobit@kriss.re.kr
MSL	**Dr John Clare** MSL – Industrial Research PO Box 31 310 Lower Hutt New Zealand	Phone : + 64 4 569 0000 Fax : + 64 4 569 0003 E-mail : j.clare@irl.cri.nz

NIST	**Dr Edward A. Early** NIST – Optical Technology Division Mail Stop 8442 Gaithersburg, MD 20899-8442 USA	Phone : + 1 301 975 2343 Fax : + 1 301 840 8551 E-mail : edward.early@nist.gov
NPL	**Dr Julie Taylor** National Physical Laboratory Queens Road Teddington Middlesex TW11 0LW United Kingdom	Phone : + 44 81 943 6539 Fax : + 44 81 943 6283 E-mail : Julie.taylor@npl.co.uk
NRC	**Dr Joanne Zwinkels** NRCC – Institute for National Measurement Standards 1500 Montreal Road, Bldg. M-36 Ottawa, Ontario Canada K1A 0R6	Phone : + 1 613 993 9363 Fax : + 1 613 952 1394 E-mail : joanne.zwinkels@nrc.ca
NRLM	**Dr Akihiro Mito** NRLM – Composition Measurement Section, Thermophysical Metrology Department 1-4 Umezono, 1-Chome, Tsukuba-shi Ibaraki 305-8563 Japon	Phone : + 81 298 61 4069 Fax : + 81 298 61 4135 E-mail : mito@nrlm.go.jp
OMH	**Dr Gyula Dézsi** Notional Office of Measures, Optical section Németrölgyi ut 37 – 39 Budapest H – 1124 Hungary	Phone : + 36 1 45 85 833 Fax : + 36 1 214 3157 E-mail : gdezsi@omh.hu
PTB	**Dr Alfred Schirmacher** PTB – Laboratorium für Bildoptik und Spektrometrie 4.21S Bundesallee 100 D – 38116 Braunschweig Germany	Phone : + 49 531 592 4231 Fax : + 49 531 592 4272 or 9292 E-mail : alfred.schirmacher@ptb.de
SMU	**Dr Peter Nemecek** SMU – Laboratory for thermometry and optical radiometry Karloveska 63 842 55 Bratislava Slovakia	Phone : + 421 7 602 94 278 Fax : + 421 7 654 29 592 E-mail : nemecek@smu.savba.sk
VNIIOFI	**Dr Andrej Belousov** VNIIOFI – GOSSTANDART Radiometric and photometric laboratory Ozernaya 46 119361 Moscow Russia	Phone : + 7 95 437 33 11 Fax : + 7 95 437 37 00 E-mail : rpl@glasnet.ru

2.2.2 CCPR observers

NMi	**Dr Charles A. Schrama** NMi Van Swinden Laboratorium Temperature and radiation PO Box 654 2600 AR Delft The Netherlands	Phone : + 31 15 2961 738 Fax : + 31 15 2612 971 E-mail : cschrama@nmi.nl
PSB	**Dr Xu Gan** PSB – National Measurement Centre 1 Science Park Drive, PSB Building Singapore 118221 Singapore	Phone : + 65 77 29 663 Fax : + 65 77 83 798 E-mail : xugan@psb.gov.sg
UME	**Dr Ugur Kucuk** TUBITAK-UME PO Box 21, Gebze 41470 Kocaeli Turkey	Phone : + 90 262 646 6355 Fax : + 90 262 646 5914 E-mail : ugur@linux.ume.tubitak.gov.tr

Since the technical protocol was written before the comparison, some information related to participating laboratories and contact persons have changed. The updated information are given in the report itself in Table 2 (p 4).

2.3 Form of comparison

2.3.1 The comparison will principally be carried out through the calibration group of transfer standard filters. Each participant will use a separate set of filters to minimise the time needed for the completion of the comparison.

2.3.2 A full description of the transfer standard filters is given in section 3 of this protocol.

2.3.3 The comparison will take the form of a star comparison, carried out in one single phase. The artefacts (filters) will initially be calibrated by the pilot laboratory. They will then distributed to participants who will perform the calibration. They will be returned to the pilot laboratory to carry out a repeat calibration to check their stability.

2.3.4 BNM-INM will act as the pilot laboratory. All results are to be communicated directly to the pilot laboratory as soon as possible and certainly within 6 weeks of completion of the measurements by a laboratory.

2.3.5 Each laboratory has 3 months for calibration and transportation. With its confirmation to participate, each laboratory has confirmed that it is capable to perform the measurements in the allocated time.

2.3.6 If for some reasons, the measurement facility is not ready or customs clearance takes too much time in a country, the participant laboratory must contact the pilot laboratory immediately. It may be possible for the participant to continue to take part by sending the calibrated filters back to the pilot laboratory at an agreed later date. However, in view of the large amount of work for the pilot laboratory, this may not be possible. If this is the case, the participant and their results may have to be excluded from the final report. Exclusion may also occur if the results are not available in time to prepare the draft report.

2.3.7 Revised Timetable

Activity	**Date**
Invitation to participate	30 November 1998
Receipt of request to participate	End of March 1999
Participants filters received	Beginning of May 2000
Filters returned to BNM	End of July 2000
Draft A comparison report circulated	December 2000
Draft B comparison report submitted to CCPR	April 2000

2.4 Handling the artefacts

2.4.1 The standard filters should be examined immediately upon receipt at final destination. The condition of the filters and associated packaging should be noted and communicated to the pilot laboratory. Please use the fax form or e-mail form in appendix A4 and A5.

2.4.2 The standard filters should only be handles by authorised persons and stored in such a way as to prevent damage.

2.4.3 No cleaning of any filter should be normally done. Dust could be removed with a very soft brush or with a stream of dry nitrogen or dry CO_2. In case of accidental contamination, cleaning will be carried out with alcohol and special optical paper. Cleaning must be indicated in the measurement report and documented using the appropriate form in appendix A.2. If a filter appears damaged, a replacement will be available from the pilot laboratory.

2.4.4 After the measurements, the filters should be repackaged in their original transit cases or any other appropriate case for transportation. Ensure that the content of the package is complete before shipment. A copy of the provisional results should be included in the package.

2.5 Transport of artefacts

2.5.1 It is of outmost importance that the artefacts be transported in a manner in which they will not be lost, damaged or handled by unauthorised persons.

2.5.2 Artefacts should be marked as “fragile”.

2.5.3 The artefacts should be accompanied by a suitable customs carnet (where appropriate) or documentation identifying the items uniquely.

2.5.4 Transportation is each laboratory’s responsibility. Each participating laboratory covers the costs for its own measurements, transportation and any customs charges as well as for any damages that may have occurred within its country. The overall costs for the organisation of the comparison are covered by the pilot laboratory. The pilot laboratory is not liable for any loss or damage of the artefacts during transportation.

3. Description of the standards

3.1 The filter set to check the photometric scale is comprised of 5 neutral coloured glass filter plates 50 mm x 50 mm with nominal transmittances, at the wavelengths of 546 nm, of approximately 92%, 56%, 10%, 1% and 0.1%. The filters are contained in a wooden box specially designed for transportation.

3.2 Each filter is identified by a reference engraved in a corner outside the area used for measurement. This reference has two parts. One is a letter indicating the type of glass (see table below); the other is the serial number of the filter.

3.3 The main characteristics of the filters are summarised in the following table:

Nominal transmittance %	Type of glass	Nominal thickness mm	Reference
92	BK 7	4.0	A
56	NG 11	1.5	B
10	NG 5	3.9	C
1	NG 4	3.9	D
0.1	NG 3	3.1	E

3.4 The manufacturing tolerances are :

Size : 50 x50 (+0/-0.3) mm
Flatness : better than 5 µm over a central diameter of 30 mm
Parallelism : better than 0.02 mm except for the filter of transmittance 92% (<0.1 mm)

4. Measurement instructions

4.1 Traceability

Temperature measurements should be made using the International Temperature Scale of 1990 (ITS-90)

4.2 Measurand

4.2.1 The measurand is the spectral transmittance of the filters. The measurement should be performed in suitable laboratory accommodation maintained at a temperature of 23±2°C. The exact temperature of the laboratory during the time of the measurements should be reported.

4.2.2 The filter transmittance has to be measured independently several times. The exact number of measurements should be that normally used by the participating laboratory to obtain the reported accuracy of their specific measurement facility. The exact number of measurements used should be stated in the measurement report but only the mean or final declared value each filter of the set is required to be included.

4.3 Measurement instructions

4.3.1 Before measurement each filter should be inspected for damage or contamination. Any damage or cleaning should be documented using the appropriate form in appendix A5.

4.3.2 The spectral transmittance measurement of the filters should be performed at the following wavelengths : 380, 400, 500, 600, 700, 800, 900 and 1000 nm.

4.3.3 The beam geometry must be a parallel beam where possible. For instruments that do not use a parallel beam, the departure from parallel should be stated. The beam size will probably be different for the different instruments. 20mm diameter or 20mm square might be considered an ideal compromise between the conflicting requirements of adequate flux and good uniformity.

4.3.4 The angle of incidence on the filter should be normal or near normal and should be stated in the report.

4.3.5 The bandwidth used for the measurement should be stated in the report. 1 nm might be considered the norm for this wavelength range. However, there is no need for an agreed value of bandwidth because of the spectral neutrality of the filters.

4.3.6 Any information obtained relating to the use or any results obtained by a participant during the course of the comparison shall be sent only to the pilot laboratory who will be responsible for co-ordinating how the information should be disseminated to other participants. No communication whatsoever regarding any details of the comparison other than the general conditions described in this protocol shall occur between any of the participants or any party external to the comparison without the written consent of the pilot laboratory. The pilot laboratory will, in turn, seek permission of all the participants. This is to ensure that no bias from whatever accidental means can occur.

5. Measurement uncertainty

5.1 Measurement uncertainty shall be estimated according to the ISO Guide to the expression of uncertainty in measurement. In order to achieve optimum comparability, a list containing the principal influence parameters for calibration of spectral transmittance is given below. An example table which should be completed by participants is included as appendix A3. The participating laboratories are encouraged to follow this breakdown as closely as possible, and adapt it to their instruments and procedures. Other additional parameters may be felt appropriate to include dependent on specific measurement facilities and these should be added with an appropriate explanation and or reference. As well as the value associated with the uncertainty, participants should give an indication as to the basis of their estimate. All values should be given for a coverage factor of k=1.

5.2 Type A

5.2.1 Repeatability of measurements.

The repeatability of measurements can be determined in calculating the standard deviation of a set of measurements without realignment or repositioning of the filter. It characterises mainly the noise and the stability of the experimental set-up.

5.2.2 Reproducibility of measurements.

The reproducibility of measurements can be determined in calculating the standard deviation of a set of measurement with realignment and repositioning of the filter between each individual measurement. It characterises the whole process of the measurement. It is this value which has to be taken into account for the uncertainty evaluated according the type A method.

5.3 Type B

5.3.1 Main uncertainty components.

The 3 main components of uncertainty usually determined by type B method are :

- The non linearity of the detector over the dynamic range of the detector used for the measurements
- The uncertainty of the wavelength setting of the monochromator
- The stray light.

The uncertainties related to these effects have to be clearly stated in the uncertainty budget provided with the results of the comparison.

5.3.2 Other uncertainty components.

The other uncertainty components which can be put in the uncertainty budget if necessary are :

- The beam displacement effect and the defocusing effect due to introduction of the filter in the beam.
- The inter-reflection between the filter and the various optical and mechanical components of the experimental set-up.
- The obliquity effect due to the residual non parallelism of the beam, a non parallel beam or the imperfect alignment of the filter.
- The effect of the polarisation of the light
- The drift of the detector and/or of the sources during the measurements.
- Any other uncertainty components specific to the apparatus used for the measurements as explained in § 5.1.

6. Reporting of results

6.1 On completion of the measurements by the participating laboratory, the provisional results of these measurements should be sent to the pilot laboratory with the filters.

6.2 The Final results should be communicated to the pilot laboratory at the latest within six weeks.

6.3 In completing the description of the participants measurement facility, appendix A.2, it would be useful for a schematic diagram of the facility to be included.

6.4 The measurement report forms in appendix A.1, A.2, A.3 of this document will be sent by e-mail to all participating laboratories. It would be appreciated if the report form (in particular the results sheet) could be completed by computer and sent back electronically to the co-ordinator. **In any case, the signed report must also be sent in paper form by mail.** In of any differences, the paper forms are considered to be the definitive version.

6.5 Following receipt of all measurement reports from the participating laboratories, the pilot laboratory will analyse the results and prepare a first draft report on the comparison. This will be circulated to the participants for comments, additions and corrections. Subsequently, the procedure outlined in the BIPM Guidelines will be followed.

7. Determination of the reference value

To be completed following discussion by Key comparison working group.

A.1 Measurement results

The attached measurement summary should be completed for each filter. For clarity and consistency the following list describes what should be entered under the appropriate heading in the table.

Wavelength	The assigned centre wavelength of the measured spectral transmittance.
Spectral transmittance	The value of the spectral transmittance of the filter as measured by the participating laboratory.
Bandwidth	The spectral bandwidth of the instrument used for the measurement defined as the Full Width at Half the Maximum.
Standard Deviation	The standard deviation of the number of measurements made to obtain the assigned transmittance of the filter.
Number of runs	The number of independent measurements made to obtain the specified standard deviation.
Uncertainty	The total uncertainty of the measurement of spectral transmittance including both Type A and B for a coverage factor of k=1.

Table of measurement results

Reference of he filter : **Ambient temperature :**

Wavelength nm	Spectral transmittance	Bandwidth nm	Standard deviation	Number of runs	Uncertainty
380					
400					
500					
600					
700					
800					
900					
1000					

Laboratory :

Date : **Signature :**

A.2 Description of the measurement facility.

This form should be used as a guide. It is anticipated that many of the questions will require more information than the space allocated, please use separate sheets of paper as appropriate.

Make and type of the spectrophotometer
……………….……………………………………………………………………………………
…………………………………………………………………………………………………….
…………………………………………………………………………………………………….
…………………………………………………………………………………….
Method of characterisation of the spectrophotometer
…………………………………………………………………………………………………….
…………………………………………………………………………………………………….
…………………………………………………………………………………………………….
…………………………………………………………………………………………………….
…………………………………………………………………………………………………….
…………………………………………………………………………………………………….
…………………………………………………………………….
Description of measuring technique (please include a diagram if appropriate)
…………………………………………………………………………………………………….
…………………………………………………………………………………………………….
…………………………………………………………………………………………………….
…………………………………………………………………………………………………….
……………………………………………………………………………..
Description of calibration laboratory conditions : e.g. temperature, humidity, cleaning of the filter if it has be done due to accidental pollution etc
…………………………………………………………………………………………………….
…………………………………………………………………………………………………….
………………………………………………………………………………………

Laboratory :

Date : **Signature :**

A.3 Uncertainty of measurement

Parameter	Type A	Type B	Uncertainty in spectral transmittance
Repeatability	U_1		
Non linearity		U_2	
Wavelength setting		U_3	
Beam displacement		U_4	
Inter-reflection		U_5	
Obliquity effect		U_6	
Polarisation		U_7	
Drift		U_8	
Others		U_9	
RMS total			

The table is a suggested layout for the presentation of uncertainties for the calibration of each filter. However, it should be noted that since the uncertainties are wavelength dependent this table can only present a range for the various parameters. The summary table associated with the results (appendix A.1.) should take account of the wavelength dependent parameters.
The RMS total refers to the usual expression i.e. square root of the sum of the squares of all the individual uncertainty terms.

Laboratory :

Date : **Signature :**

A.4 Receipt confirmation

To : Jean Bastie
BNM-INM / CNAM
292 rue Saint Martin
75003 Paris
France

Fax : + 33 1 42 71 37 36
E-mail : bastie@cnam.fr

From : *(participating laboratory)*

We confirmed having received the standards of the BIPM Key comparison “regular spectral transmittance”.

Date : **Signature :**

A.5 Inspection of the transfer standards

Has the filter transportation package been opened during transit ? e.g; Customs…..Y / N

If yes please give details……………

Is there any damage to the transportation package ?…….Y / N

If yes please give details………………..

Are there any visible signs of damage to the filters ?……Y / N

If yes please give details…………………..

Laboratory:

ANNEX B

ANNEX B.1

Pilot lab transmission measurements $\tau^{P}_{X,i,r}$ for r = 1 (measurement before dispatching)

		IFA	KRISS	MIKES	MSL	NIST	Nmi	NMIA	NMIJ	NPL	NRC	PTB	SMU	NMC	VNIIOFI
Filtre A	380	9,110E-1	9,123E-1	9,122E-1	9,120E-1	9,104E-1	9,121E-1	9,108E-1	9,122E-1	9,118E-1	9,114E-1	9,086E-1	9,070E-1	9,120E-1	9,118E-1
λ (nm)	400	9,128E-1	9,142E-1	9,139E-1	9,136E-1	9,125E-1	9,137E-1	9,129E-1	9,140E-1	9,135E-1	9,130E-1	9,104E-1	9,084E-1	9,137E-1	9,137E-1
	500	9,160E-1	9,168E-1	9,168E-1	9,163E-1	9,152E-1	9,169E-1	9,156E-1	9,166E-1	9,166E-1	9,159E-1	9,142E-1	9,116E-1	9,164E-1	9,163E-1
	600	9,177E-1	9,181E-1	9,181E-1	9,176E-1	9,170E-1	9,181E-1	9,172E-1	9,179E-1	9,177E-1	9,174E-1	9,165E-1	9,137E-1	9,178E-1	9,177E-1
	700	9,184E-1	9,191E-1	9,190E-1	9,187E-1	9,182E-1	9,189E-1	9,181E-1	9,190E-1	9,186E-1	9,184E-1	9,172E-1	9,162E-1	9,187E-1	9,186E-1
	800	9,189E-1	9,196E-1	9,193E-1	9,195E-1	9,191E-1	9,192E-1	9,189E-1	9,197E-1	9,192E-1	9,191E-1	9,182E-1	9,180E-1	9,191E-1	9,194E-1
	900	9,194E-1	9,200E-1	9,201E-1	9,200E-1	9,195E-1	9,197E-1	9,193E-1	9,201E-1	9,198E-1	9,196E-1	9,189E-1	9,185E-1	9,197E-1	9,198E-1
	1000	9,198E-1	9,203E-1	9,206E-1	9,203E-1	9,197E-1	9,199E-1	9,193E-1	9,203E-1	9,203E-1	9,200E-1	9,187E-1	9,188E-1	9,199E-1	9,201E-1
Filtre B	380	4,055E-1	3,978E-1	4,040E-1	4,023E-1	4,008E-1	4,064E-1	4,040E-1	4,041E-1	4,037E-1	4,057E-1	4,040E-1	4,047E-1	4,051E-1	4,049E-1
λ (nm)	400	6,043E-1	5,981E-1	6,022E-1	6,019E-1	6,007E-1	6,048E-1	6,031E-1	6,033E-1	6,029E-1	6,046E-1	6,030E-1	6,038E-1	6,033E-1	6,034E-1
	500	6,186E-1	6,127E-1	6,168E-1	6,164E-1	6,149E-1	6,197E-1	6,175E-1	6,176E-1	6,174E-1	6,190E-1	6,174E-1	6,185E-1	6,179E-1	6,175E-1
	600	6,074E-1	6,011E-1	6,056E-1	6,050E-1	6,033E-1	6,082E-1	6,063E-1	6,063E-1	6,062E-1	6,078E-1	6,061E-1	6,074E-1	6,067E-1	6,065E-1
	700	6,361E-1	6,301E-1	6,339E-1	6,337E-1	6,321E-1	6,365E-1	6,348E-1	6,348E-1	6,348E-1	6,361E-1	6,347E-1	6,358E-1	6,353E-1	6,350E-1
	800	5,760E-1	5,692E-1	5,740E-1	5,732E-1	5,715E-1	5,761E-1	5,745E-1	5,744E-1	5,745E-1	5,758E-1	5,743E-1	5,756E-1	5,752E-1	5,749E-1
	900	5,013E-1	4,936E-1	4,995E-1	4,982E-1	4,966E-1	5,018E-1	4,996E-1	4,995E-1	4,998E-1	5,013E-1	4,994E-1	5,009E-1	5,004E-1	5,002E-1
	1000	4,533E-1	4,452E-1	4,516E-1	4,500E-1	4,484E-1	4,538E-1	4,514E-1	4,514E-1	4,516E-1	4,534E-1	4,512E-1	4,528E-1	4,523E-1	4,521E-1
Filtre C	380	2,198E-2	2,120E-2	2,077E-2	2,097E-2	2,117E-2	2,184E-2	2,150E-2	2,145E-2	2,130E-2	2,130E-2	2,103E-2	2,076E-2	2,133E-2	2,155E-2
λ (nm)	400	9,690E-2	9,471E-2	9,352E-2	9,409E-2	9,454E-2	9,657E-2	9,574E-2	9,555E-2	9,502E-2	9,496E-2	9,446E-2	9,349E-2	9,516E-2	9,619E-2
	500	9,328E-2	9,147E-2	9,021E-2	9,089E-2	9,116E-2	9,299E-2	9,199E-2	9,195E-2	9,148E-2	9,175E-2	9,086E-2	9,030E-2	9,174E-2	9,223E-2
	600	7,814E-2	7,669E-2	7,553E-2	7,622E-2	7,646E-2	7,786E-2	7,693E-2	7,694E-2	7,658E-2	7,702E-2	7,600E-2	7,562E-2	7,699E-2	7,722E-2
	700	1,631E-1	1,607E-1	1,591E-1	1,599E-1	1,604E-1	1,625E-1	1,613E-1	1,613E-1	1,607E-1	1,611E-1	1,599E-1	1,591E-1	1,612E-1	1,619E-1
	800	1,519E-1	1,496E-1	1,481E-1	1,488E-1	1,494E-1	1,513E-1	1,501E-1	1,501E-1	1,496E-1	1,499E-1	1,488E-1	1,480E-1	1,501E-1	1,506E-1
	900	1,044E-1	1,024E-1	1,013E-1	1,019E-1	1,023E-1	1,039E-1	1,029E-1	1,029E-1	1,025E-1	1,028E-1	1,018E-1	1,013E-1	1,029E-1	1,033E-1
	1000	7,789E-2	7,639E-2	7,533E-2	7,584E-2	7,622E-2	7,752E-2	7,671E-2	7,668E-2	7,636E-2	7,663E-2	7,576E-2	7,537E-2	7,672E-2	7,701E-2
Filtre D	380	3,520E-4	3,860E-4	3,579E-4	3,320E-4	3,930E-4	3,617E-4	3,509E-4	3,768E-4	3,936E-4	3,941E-4	3,849E-4	3,558E-4	3,826E-4	3,933E-4
λ (nm)	400	5,096E-3	5,416E-3	5,122E-3	5,074E-3	5,443E-3	5,125E-3	5,142E-3	5,345E-3	5,321E-3	5,477E-3	5,360E-3	5,126E-3	5,468E-3	5,470E-3
	500	8,288E-3	8,740E-3	8,347E-3	8,282E-3	8,813E-3	8,359E-3	8,361E-3	8,672E-3	8,627E-3	8,852E-3	8,682E-3	8,352E-3	8,861E-3	8,857E-3
	600	8,203E-3	8,654E-3	8,245E-3	8,191E-3	8,725E-3	8,252E-3	8,278E-3	8,561E-3	8,509E-3	8,759E-3	8,567E-3	8,255E-3	8,761E-3	8,758E-3
	700	2,621E-2	2,730E-2	2,629E-2	2,618E-2	2,749E-2	2,634E-2	2,635E-2	2,708E-2	2,697E-2	2,754E-2	2,708E-2	2,635E-2	2,754E-2	2,750E-2
	800	3,188E-2	3,319E-2	3,201E-2	3,190E-2	3,352E-2	3,198E-2	3,209E-2	3,289E-2	3,275E-2	3,343E-2	3,292E-2	3,206E-2	3,339E-2	3,338E-2
	900	2,230E-2	2,333E-2	2,239E-2	2,231E-2	2,345E-2	2,246E-2	2,246E-2	2,306E-2	2,296E-2	2,349E-2	2,310E-2	2,243E-2	2,346E-2	2,344E-2
	1000	1,651E-2	1,735E-2	1,659E-2	1,653E-2	1,743E-2	1,665E-2	1,664E-2	1,713E-2	1,705E-2	1,748E-2	1,715E-2	1,662E-2	1,742E-2	1,743E-2
Filtre E	380	1,650E-5	5,207E-6	1,542E-5	9,832E-6	1,648E-5	1,238E-5	1,481E-5	1,089E-5	1,189E-5	1,650E-5	1,955E-5	1,138E-5	1,014E-5	1,430E-5
λ (nm)	400	3,317E-4	3,190E-4	3,451E-4	3,088E-4	3,508E-4	3,059E-4	3,247E-4	3,276E-4	2,928E-4	3,477E-4	3,207E-4	2,877E-4	3,273E-4	3,353E-4
	500	9,279E-4	9,055E-4	9,495E-4	8,504E-4	9,800E-4	8,566E-4	9,193E-4	9,201E-4	8,301E-4	9,442E-4	8,962E-4	8,145E-4	9,158E-4	9,319E-4
	600	9,866E-4	9,611E-4	1,014E-3	9,082E-4	1,045E-3	9,243E-4	9,794E-4	9,752E-4	8,879E-4	1,009E-3	9,581E-4	8,707E-4	9,757E-4	9,933E-4
	700	5,005E-3	4,907E-3	5,111E-3	4,698E-3	5,224E-3	4,749E-3	4,977E-3	4,968E-3	4,631E-3	5,079E-3	4,866E-3	4,554E-3	4,966E-3	5,021E-3
	800	9,621E-3	9,460E-3	9,803E-3	9,124E-3	9,987E-3	9,193E-3	9,569E-3	9,551E-3	8,966E-3	9,757E-3	9,402E-3	8,862E-3	9,558E-3	9,634E-3
	900	8,392E-3	8,245E-3	8,554E-3	7,945E-3	8,732E-3	8,005E-3	8,344E-3	8,330E-3	7,809E-3	8,516E-3	8,194E-3	7,713E-3	8,332E-3	8,409E-3
	1000	7,101E-3	6,968E-3	7,234E-3	6,705E-3	7,396E-3	6,755E-3	7,055E-3	7,048E-3	6,573E-3	7,211E-3	6,922E-3	6,496E-3	7,051E-3	7,110E-3

ANNEX B.2

Pilot lab pilot transmission measurements $\tau^{P}_{x,i,r}$ for $r = 2$ (measurement after dispatching)

		IFA	KRISS	MIKES	MSL	NIST	Nmi	NMIA	NMIJ	NPL	NRC	PTB	SMU	NMC	VNIIOFI
Filtre A	380	9,104E-1	9,111E-1	9,128E-1	9,119E-1	9,133E-1	9,133E-1	9,107E-1	9,113E-1	9,122E-1	9,111E-1	9,129E-1	9,069E-1	9,131E-1	9,128E-1
λ (nm)	400	9,121E-1	9,131E-1	9,147E-1	9,137E-1	9,152E-1	9,153E-1	9,124E-1	9,131E-1	9,140E-1	9,127E-1	9,145E-1	9,087E-1	9,147E-1	9,142E-1
	500	9,150E-1	9,156E-1	9,172E-1	9,163E-1	9,172E-1	9,176E-1	9,154E-1	9,159E-1	9,166E-1	9,152E-1	9,171E-1	9,116E-1	9,172E-1	9,166E-1
	600	9,165E-1	9,171E-1	9,187E-1	9,181E-1	9,190E-1	9,192E-1	9,171E-1	9,171E-1	9,181E-1	9,167E-1	9,187E-1	9,135E-1	9,188E-1	9,180E-1
	700	9,176E-1	9,186E-1	9,197E-1	9,193E-1	9,193E-1	9,196E-1	9,184E-1	9,187E-1	9,188E-1	9,179E-1	9,192E-1	9,147E-1	9,196E-1	9,192E-1
	800	9,187E-1	9,196E-1	9,203E-1	9,203E-1	9,196E-1	9,204E-1	9,195E-1	9,197E-1	9,191E-1	9,188E-1	9,198E-1	9,143E-1	9,191E-1	9,200E-1
	900	9,190E-1	9,200E-1	9,206E-1	9,207E-1	9,198E-1	9,208E-1	9,199E-1	9,200E-1	9,195E-1	9,192E-1	9,199E-1	9,144E-1	9,201E-1	9,205E-1
	1000	9,194E-1	9,204E-1	9,210E-1	9,211E-1	9,202E-1	9,211E-1	9,198E-1	9,202E-1	9,200E-1	9,195E-1	9,203E-1	9,149E-1	9,208E-1	9,206E-1
Filtre B	380	4,077E-1	3,985E-1	4,044E-1	4,034E-1	4,010E-1	4,067E-1	4,051E-1	4,044E-1	4,044E-1	4,078E-1	4,054E-1	4,066E-1	4,061E-1	4,048E-1
λ (nm)	400	6,069E-1	6,002E-1	6,023E-1	6,033E-1	6,012E-1	6,059E-1	6,042E-1	6,040E-1	6,035E-1	6,069E-1	6,053E-1	6,065E-1	6,050E-1	6,042E-1
	500	6,211E-1	6,140E-1	6,174E-1	6,178E-1	6,158E-1	6,204E-1	6,188E-1	6,185E-1	6,186E-1	6,214E-1	6,197E-1	6,203E-1	6,194E-1	6,184E-1
	600	6,090E-1	6,017E-1	6,055E-1	6,057E-1	6,037E-1	6,084E-1	6,070E-1	6,064E-1	6,058E-1	6,094E-1	6,073E-1	6,083E-1	6,073E-1	6,066E-1
	700	6,369E-1	6,298E-1	6,337E-1	6,340E-1	6,321E-1	6,367E-1	6,349E-1	6,343E-1	6,353E-1	6,369E-1	6,355E-1	6,360E-1	6,352E-1	6,343E-1
	800	5,766E-1	5,680E-1	5,735E-1	5,733E-1	5,714E-1	5,765E-1	5,744E-1	5,740E-1	5,753E-1	5,762E-1	5,747E-1	5,754E-1	5,751E-1	5,742E-1
	900	5,015E-1	4,924E-1	4,988E-1	4,980E-1	4,958E-1	5,017E-1	4,992E-1	4,988E-1	5,002E-1	5,014E-1	4,993E-1	5,004E-1	4,998E-1	4,991E-1
	1000	4,532E-1	4,438E-1	4,505E-1	4,495E-1	4,475E-1	4,535E-1	4,509E-1	4,505E-1	4,517E-1	4,532E-1	4,509E-1	4,521E-1	4,515E-1	4,508E-1
Filtre C	380	2,198E-2	2,121E-2	2,079E-2	2,097E-2	2,115E-2	2,183E-2	2,150E-2	2,146E-2	2,124E-2	2,134E-2	2,114E-2	2,083E-2	2,134E-2	2,167E-2
λ (nm)	400	9,711E-2	9,487E-2	9,368E-2	9,429E-2	9,464E-2	9,674E-2	9,591E-2	9,574E-2	9,500E-2	9,513E-2	9,507E-2	9,372E-2	9,536E-2	9,643E-2
	500	9,373E-2	9,159E-2	9,032E-2	9,107E-2	9,133E-2	9,328E-2	9,228E-2	9,238E-2	9,162E-2	9,188E-2	9,144E-2	9,034E-2	9,193E-2	9,288E-2
	600	7,851E-2	7,660E-2	7,539E-2	7,623E-2	7,646E-2	7,800E-2	7,704E-2	7,718E-2	7,663E-2	7,701E-2	7,632E-2	7,548E-2	7,695E-2	7,773E-2
	700	1,636E-1	1,605E-1	1,590E-1	1,598E-1	1,604E-1	1,628E-1	1,615E-1	1,617E-1	1,608E-1	1,611E-1	1,604E-1	1,590E-1	1,612E-1	1,625E-1
	800	1,523E-1	1,492E-1	1,482E-1	1,487E-1	1,495E-1	1,516E-1	1,503E-1	1,506E-1	1,498E-1	1,500E-1	1,493E-1	1,481E-1	1,500E-1	1,511E-1
	900	1,045E-1	1,022E-1	1,013E-1	1,018E-1	1,024E-1	1,033E-1	1,029E-1	1,031E-1	1,026E-1	1,028E-1	1,020E-1	1,012E-1	1,028E-1	1,036E-1
	1000	7,795E-2	7,611E-2	7,524E-2	7,569E-2	7,620E-2	7,701E-2	7,663E-2	7,671E-2	7,632E-2	7,666E-2	7,577E-2	7,525E-2	7,661E-2	7,714E-2
Filtre D	380	3,489E-4	3,910E-4	3,593E-4	3,464E-4	3,895E-4	3,575E-4	3,521E-4	4,028E-4	3,927E-4	3,887E-4	3,874E-4	3,567E-4	3,887E-4	3,898E-4
λ (nm)	400	5,126E-3	5,414E-3	5,117E-3	5,074E-3	5,500E-3	5,148E-3	5,133E-3	5,364E-3	5,322E-3	5,468E-3	5,361E-3	5,176E-3	5,465E-3	5,485E-3
	500	8,309E-3	8,783E-3	8,342E-3	8,311E-3	8,882E-3	8,352E-3	8,364E-3	8,682E-3	8,635E-3	8,858E-3	8,673E-3	8,383E-3	8,869E-3	8,881E-3
	600	8,195E-3	8,669E-3	8,237E-3	8,192E-3	8,763E-3	8,233E-3	8,248E-3	8,557E-3	8,510E-3	8,740E-3	8,564E-3	8,265E-3	8,746E-3	8,767E-3
	700	2,624E-2	2,732E-2	2,629E-2	2,622E-2	2,757E-2	2,632E-2	2,634E-2	2,707E-2	2,697E-2	2,753E-2	2,704E-2	2,637E-2	2,751E-2	2,747E-2
	800	3,190E-2	3,319E-2	3,199E-2	3,187E-2	3,345E-2	3,201E-2	3,207E-2	3,287E-2	3,272E-2	3,343E-2	3,284E-2	3,207E-2	3,338E-2	3,333E-2
	900	2,230E-2	2,332E-2	2,237E-2	2,230E-2	2,351E-2	2,244E-2	2,245E-2	2,306E-2	2,293E-2	2,350E-2	2,304E-2	2,244E-2	2,345E-2	2,341E-2
	1000	1,650E-2	1,733E-2	1,656E-2	1,650E-2	1,748E-2	1,663E-2	1,662E-2	1,713E-2	1,700E-2	1,746E-2	1,710E-2	1,661E-2	1,742E-2	1,741E-2
Filtre E	380	2,461E-5	1,070E-5	1,801E-5	9,559E-6	1,276E-5	1,118E-5	1,768E-5	1,217E-5	1,056E-5	1,596E-5	1,663E-5	1,137E-5	1,235E-5	1,333E-5
λ (nm)	400	3,322E-4	3,216E-4	3,476E-4	3,034E-4	3,538E-4	3,067E-4	3,267E-4	3,273E-4	2,928E-4	3,423E-4	3,190E-4	2,884E-4	3,300E-4	3,347E-4
	500	9,259E-4	9,044E-4	9,512E-4	8,591E-4	9,851E-4	8,721E-4	9,197E-4	9,160E-4	8,331E-4	9,471E-4	8,959E-4	8,184E-4	9,234E-4	9,330E-4
	600	9,879E-4	9,625E-4	1,014E-3	9,161E-4	1,050E-3	9,192E-4	9,796E-4	9,795E-4	8,886E-4	1,013E-3	9,557E-4	8,709E-4	9,812E-4	9,872E-4
	700	5,009E-3	4,903E-3	5,116E-3	4,726E-3	5,234E-3	4,749E-3	4,977E-3	4,967E-3	4,628E-3	5,087E-3	4,864E-3	4,559E-3	4,976E-3	5,025E-3
	800	9,621E-3	9,463E-3	9,795E-3	9,122E-3	9,985E-3	9,193E-3	9,571E-3	9,549E-3	8,951E-3	9,762E-3	9,382E-3	8,862E-3	9,548E-3	9,634E-3
	900	8,387E-3	8,248E-3	8,541E-3	7,941E-3	8,707E-3	8,002E-3	8,345E-3	8,338E-3	7,788E-3	8,521E-3	8,172E-3	7,706E-3	8,322E-3	8,416E-3
	1000	7,090E-3	6,963E-3	7,222E-3	6,697E-3	7,366E-3	6,747E-3	7,050E-3	7,040E-3	6,561E-3	7,208E-3	6,901E-3	6,489E-3	7,027E-3	7,109E-3

ANNEX B.3

Pilot lab adopted transmission $\tau^{P}_{x,i}$ (average round 1 er 2)

		IFA	KRISS	MIKES	MSL	NIST	Nmi	NMIA	NMIJ	NPL	NRC	PTB	SMU	NMC	VNIIOFI
Filtre A	380	9,107E-1	9,117E-1	9,125E-1	9,120E-1	9,119E-1	9,127E-1	9,108E-1	9,118E-1	9,120E-1	9,112E-1	9,108E-1	9,070E-1	9,126E-1	9,123E-1
λ (nm)	400	9,124E-1	9,136E-1	9,143E-1	9,136E-1	9,139E-1	9,145E-1	9,126E-1	9,136E-1	9,137E-1	9,129E-1	9,125E-1	9,086E-1	9,142E-1	9,139E-1
	500	9,155E-1	9,162E-1	9,170E-1	9,163E-1	9,162E-1	9,173E-1	9,155E-1	9,162E-1	9,166E-1	9,156E-1	9,157E-1	9,116E-1	9,168E-1	9,165E-1
	600	9,171E-1	9,176E-1	9,184E-1	9,179E-1	9,180E-1	9,187E-1	9,171E-1	9,175E-1	9,179E-1	9,170E-1	9,176E-1	9,136E-1	9,183E-1	9,179E-1
	700	9,180E-1	9,188E-1	9,194E-1	9,190E-1	9,188E-1	9,192E-1	9,183E-1	9,188E-1	9,187E-1	9,182E-1	9,182E-1	9,155E-1	9,192E-1	9,189E-1
	800	9,188E-1	9,196E-1	9,198E-1	9,199E-1	9,193E-1	9,198E-1	9,192E-1	9,197E-1	9,192E-1	9,190E-1	9,190E-1	9,161E-1	9,191E-1	9,197E-1
	900	9,192E-1	9,200E-1	9,203E-1	9,203E-1	9,197E-1	9,202E-1	9,196E-1	9,200E-1	9,196E-1	9,194E-1	9,194E-1	9,164E-1	9,199E-1	9,202E-1
	1000	9,196E-1	9,203E-1	9,208E-1	9,207E-1	9,200E-1	9,205E-1	9,195E-1	9,203E-1	9,201E-1	9,197E-1	9,195E-1	9,169E-1	9,204E-1	9,204E-1
Filtre B	380	4,066E-1	3,981E-1	4,042E-1	4,028E-1	4,009E-1	4,065E-1	4,046E-1	4,043E-1	4,040E-1	4,067E-1	4,047E-1	4,056E-1	4,056E-1	4,049E-1
λ (nm)	400	6,056E-1	5,991E-1	6,022E-1	6,026E-1	6,009E-1	6,054E-1	6,036E-1	6,036E-1	6,032E-1	6,057E-1	6,041E-1	6,051E-1	6,041E-1	6,038E-1
	500	6,198E-1	6,134E-1	6,171E-1	6,171E-1	6,154E-1	6,200E-1	6,181E-1	6,180E-1	6,180E-1	6,202E-1	6,185E-1	6,194E-1	6,187E-1	6,180E-1
	600	6,082E-1	6,014E-1	6,055E-1	6,054E-1	6,035E-1	6,083E-1	6,067E-1	6,064E-1	6,060E-1	6,086E-1	6,067E-1	6,078E-1	6,070E-1	6,065E-1
	700	6,365E-1	6,300E-1	6,338E-1	6,338E-1	6,321E-1	6,366E-1	6,348E-1	6,346E-1	6,351E-1	6,365E-1	6,351E-1	6,359E-1	6,352E-1	6,347E-1
	800	5,763E-1	5,686E-1	5,738E-1	5,733E-1	5,715E-1	5,763E-1	5,744E-1	5,742E-1	5,749E-1	5,760E-1	5,745E-1	5,755E-1	5,752E-1	5,746E-1
	900	5,014E-1	4,930E-1	4,991E-1	4,981E-1	4,962E-1	5,017E-1	4,994E-1	4,992E-1	5,000E-1	5,013E-1	4,994E-1	5,006E-1	5,001E-1	4,997E-1
	1000	4,532E-1	4,445E-1	4,510E-1	4,498E-1	4,479E-1	4,537E-1	4,512E-1	4,509E-1	4,517E-1	4,533E-1	4,511E-1	4,525E-1	4,519E-1	4,515E-1
Filtre C	380	2,198E-2	2,121E-2	2,078E-2	2,097E-2	2,116E-2	2,183E-2	2,150E-2	2,145E-2	2,127E-2	2,132E-2	2,108E-2	2,079E-2	2,133E-2	2,161E-2
λ (nm)	400	9,700E-2	9,479E-2	9,360E-2	9,419E-2	9,459E-2	9,665E-2	9,582E-2	9,565E-2	9,501E-2	9,504E-2	9,476E-2	9,360E-2	9,526E-2	9,631E-2
	500	9,351E-2	9,153E-2	9,026E-2	9,098E-2	9,124E-2	9,313E-2	9,214E-2	9,216E-2	9,155E-2	9,181E-2	9,115E-2	9,032E-2	9,183E-2	9,255E-2
	600	7,832E-2	7,664E-2	7,546E-2	7,622E-2	7,646E-2	7,793E-2	7,698E-2	7,706E-2	7,660E-2	7,702E-2	7,616E-2	7,555E-2	7,697E-2	7,747E-2
	700	1,634E-1	1,606E-1	1,591E-1	1,599E-1	1,604E-1	1,627E-1	1,614E-1	1,615E-1	1,608E-1	1,611E-1	1,601E-1	1,591E-1	1,612E-1	1,622E-1
	800	1,521E-1	1,494E-1	1,481E-1	1,488E-1	1,494E-1	1,514E-1	1,502E-1	1,503E-1	1,497E-1	1,499E-1	1,490E-1	1,481E-1	1,501E-1	1,509E-1
	900	1,044E-1	1,023E-1	1,013E-1	1,018E-1	1,024E-1	1,036E-1	1,029E-1	1,030E-1	1,025E-1	1,028E-1	1,019E-1	1,012E-1	1,029E-1	1,034E-1
	1000	7,792E-2	7,625E-2	7,529E-2	7,576E-2	7,621E-2	7,726E-2	7,667E-2	7,669E-2	7,634E-2	7,664E-2	7,576E-2	7,531E-2	7,666E-2	7,707E-2
Filtre D	380	3,505E-4	3,885E-4	3,586E-4	3,392E-4	3,912E-4	3,596E-4	3,515E-4	3,898E-4	3,932E-4	3,914E-4	3,862E-4	3,562E-4	3,857E-4	3,915E-4
λ (nm)	400	5,111E-3	5,415E-3	5,119E-3	5,074E-3	5,471E-3	5,137E-3	5,138E-3	5,354E-3	5,322E-3	5,473E-3	5,360E-3	5,151E-3	5,466E-3	5,477E-3
	500	8,298E-3	8,762E-3	8,345E-3	8,296E-3	8,847E-3	8,356E-3	8,362E-3	8,677E-3	8,631E-3	8,855E-3	8,678E-3	8,367E-3	8,865E-3	8,869E-3
	600	8,199E-3	8,662E-3	8,241E-3	8,192E-3	8,744E-3	8,242E-3	8,263E-3	8,559E-3	8,509E-3	8,749E-3	8,566E-3	8,260E-3	8,754E-3	8,763E-3
	700	2,623E-2	2,731E-2	2,629E-2	2,620E-2	2,753E-2	2,633E-2	2,634E-2	2,708E-2	2,697E-2	2,753E-2	2,706E-2	2,636E-2	2,752E-2	2,749E-2
	800	3,189E-2	3,319E-2	3,200E-2	3,188E-2	3,348E-2	3,200E-2	3,208E-2	3,288E-2	3,274E-2	3,343E-2	3,288E-2	3,207E-2	3,338E-2	3,336E-2
	900	2,230E-2	2,332E-2	2,238E-2	2,231E-2	2,348E-2	2,245E-2	2,245E-2	2,306E-2	2,295E-2	2,349E-2	2,307E-2	2,243E-2	2,346E-2	2,342E-2
	1000	1,650E-2	1,734E-2	1,657E-2	1,652E-2	1,746E-2	1,664E-2	1,663E-2	1,713E-2	1,703E-2	1,747E-2	1,712E-2	1,661E-2	1,742E-2	1,742E-2
Filtre E	380	2,055E-5	7,953E-6	1,672E-5	9,695E-6	1,462E-5	1,178E-5	1,624E-5	1,153E-5	1,122E-5	1,623E-5	1,809E-5	1,137E-5	1,124E-5	1,382E-5
λ (nm)	400	3,319E-4	3,203E-4	3,463E-4	3,061E-4	3,523E-4	3,063E-4	3,257E-4	3,275E-4	2,928E-4	3,450E-4	3,199E-4	2,880E-4	3,287E-4	3,350E-4
	500	9,269E-4	9,049E-4	9,503E-4	8,548E-4	9,826E-4	8,643E-4	9,195E-4	9,181E-4	8,316E-4	9,456E-4	8,961E-4	8,164E-4	9,196E-4	9,325E-4
	600	9,872E-4	9,618E-4	1,014E-3	9,121E-4	1,047E-3	9,218E-4	9,795E-4	9,773E-4	8,882E-4	1,011E-3	9,569E-4	8,708E-4	9,785E-4	9,903E-4
	700	5,007E-3	4,905E-3	5,113E-3	4,712E-3	5,229E-3	4,749E-3	4,977E-3	4,968E-3	4,629E-3	5,083E-3	4,865E-3	4,556E-3	4,971E-3	5,023E-3
	800	9,621E-3	9,461E-3	9,799E-3	9,123E-3	9,986E-3	9,193E-3	9,570E-3	9,550E-3	8,958E-3	9,760E-3	9,392E-3	8,862E-3	9,553E-3	9,634E-3
	900	8,389E-3	8,247E-3	8,548E-3	7,943E-3	8,719E-3	8,003E-3	8,344E-3	8,334E-3	7,798E-3	8,518E-3	8,183E-3	7,710E-3	8,327E-3	8,413E-3
	1000	7,096E-3	6,965E-3	7,228E-3	6,701E-3	7,381E-3	6,751E-3	7,053E-3	7,044E-3	6,567E-3	7,209E-3	6,911E-3	6,492E-3	7,039E-3	7,110E-3

ANNEX B.4

Pilot lab total uncertainty on adopted transmission $u(\tau^{P}_{x,i})$

		IFA	KRISS	MIKES	MSL	NIST	Nmi	NMIA	NMIJ	NPL	NRC	PTB	SMU	NMC	VNIIOFI
Filtre A	380	2,890E-4	1,191E-4	3,141E-4	2,806E-4	2,737E-4	2,366E-4	2,958E-4	3,170E-4	2,922E-4	1,745E-4	2,836E-4	2,842E-4	2,931E-4	4,069E-4
λ (nm)	400	1,399E-4	2,631E-4	1,973E-4	1,284E-4	2,278E-4	1,801E-4	1,425E-4	2,036E-4	2,439E-4	2,320E-4	1,218E-4	1,627E-4	2,313E-4	2,325E-4
	500	1,604E-4	1,029E-4	1,221E-4	1,022E-4	1,237E-4	1,302E-4	1,358E-4	1,510E-4	1,720E-4	1,181E-4	1,059E-4	1,378E-4	1,334E-4	1,832E-4
	600	1,549E-4	1,273E-4	1,969E-4	1,573E-4	1,397E-4	2,226E-4	1,212E-4	1,052E-4	1,950E-4	1,444E-4	1,180E-4	1,095E-4	1,568E-4	1,152E-4
	700	1,084E-4	1,231E-4	1,819E-4	1,118E-4	1,067E-4	8,899E-5	1,742E-4	1,433E-4	1,551E-4	1,592E-4	1,099E-4	1,176E-4	1,147E-4	1,949E-4
	800	7,831E-5	7,628E-5	2,152E-4	7,183E-5	7,050E-5	7,418E-5	1,119E-4	7,868E-5	7,215E-5	7,978E-5	2,969E-4	1,090E-4	7,338E-5	7,445E-5
	900	7,226E-5	6,931E-5	7,080E-5	7,345E-5	7,229E-5	7,502E-5	2,019E-4	7,598E-5	7,421E-5	7,152E-5	2,788E-4	9,129E-5	7,186E-5	6,984E-5
	1000	7,236E-5	7,175E-5	2,089E-4	7,166E-5	7,260E-5	8,271E-5	8,050E-5	8,415E-5	7,893E-5	8,571E-5	1,919E-4	8,365E-5	7,165E-5	7,847E-5
Filtre B	380	4,265E-4	4,437E-4	4,295E-4	4,491E-4	4,301E-4	4,165E-4	4,508E-4	5,605E-4	4,403E-4	4,308E-4	5,833E-4	4,207E-4	4,662E-4	4,344E-4
λ (nm)	400	1,160E-4	1,568E-4	1,223E-4	1,812E-4	1,759E-4	2,363E-4	1,207E-4	2,080E-4	2,438E-4	1,136E-4	1,594E-4	2,566E-4	1,434E-4	1,932E-4
	500	1,316E-4	1,186E-4	1,199E-4	1,147E-4	1,352E-4	1,209E-4	1,136E-4	1,030E-4	9,197E-5	1,096E-4	1,063E-4	8,805E-5	1,677E-4	1,423E-4
	600	1,153E-4	8,209E-5	8,153E-5	1,339E-4	1,267E-4	1,299E-4	1,502E-4	9,804E-5	1,029E-4	1,439E-4	1,309E-4	1,303E-4	1,548E-4	1,127E-4
	700	1,320E-4	1,162E-4	9,615E-5	1,118E-4	1,180E-4	1,067E-4	1,150E-4	1,095E-4	9,606E-5	9,306E-5	8,797E-5	1,020E-4	1,247E-4	1,321E-4
	800	1,239E-4	1,233E-4	1,428E-4	1,234E-4	1,999E-4	1,248E-4	1,233E-4	1,230E-4	1,239E-4	1,249E-4	1,248E-4	1,257E-4	1,234E-4	1,244E-4
	900	1,217E-4	1,241E-4	1,225E-4	1,224E-4	1,236E-4	1,303E-4	1,218E-4	1,215E-4	1,224E-4	1,231E-4	1,220E-4	1,283E-4	1,242E-4	1,243E-4
	1000	9,544E-5	9,035E-5	8,759E-5	8,836E-5	8,846E-5	9,021E-5	8,842E-5	8,851E-5	8,922E-5	8,954E-5	8,856E-5	8,820E-5	9,017E-5	8,867E-5
Filtre C	380	1,549E-4	1,532E-4	1,529E-4	1,544E-4	1,533E-4	1,534E-4	1,563E-4	1,538E-4	1,545E-4	1,530E-4	1,564E-4	1,566E-4	1,535E-4	1,557E-4
λ (nm)	400	6,995E-5	5,191E-5	5,920E-5	5,616E-5	5,185E-5	4,475E-5	5,657E-5	6,485E-5	4,471E-5	4,064E-5	4,264E-5	5,321E-5	4,629E-5	4,799E-5
	500	3,644E-5	3,289E-5	4,207E-5	3,364E-5	3,601E-5	4,174E-5	3,546E-5	3,692E-5	3,608E-5	4,536E-5	3,721E-5	3,370E-5	3,627E-5	3,530E-5
	600	4,902E-5	4,674E-5	5,462E-5	4,766E-5	4,889E-5	5,430E-5	5,361E-5	5,248E-5	4,847E-5	5,913E-5	4,841E-5	5,168E-5	5,601E-5	5,454E-5
	700	4,662E-5	3,992E-5	4,289E-5	6,839E-5	6,124E-5	5,197E-5	4,383E-5	4,319E-5	4,539E-5	5,153E-5	4,262E-5	4,418E-5	5,834E-5	4,727E-5
	800	1,149E-4	1,150E-4	1,151E-4	1,152E-4	1,152E-4	1,150E-4	1,151E-4	1,151E-4	1,152E-4	1,152E-4	1,151E-4	1,158E-4	1,167E-4	1,153E-4
	900	8,093E-5	9,119E-5	8,113E-5	8,104E-5	8,102E-5	8,109E-5	8,095E-5	8,104E-5	8,121E-5	8,102E-5	8,102E-5	8,113E-5	8,092E-5	8,102E-5
	1000	6,251E-5	6,271E-5	6,250E-5	6,257E-5	6,262E-5	6,259E-5	6,260E-5	6,248E-5	6,253E-5	6,257E-5	6,253E-5	6,246E-5	6,252E-5	6,259E-5
Filtre D	380	1,473E-5	1,444E-5	1,524E-5	1,615E-5	1,478E-5	1,919E-5	1,170E-5	2,291E-5	1,705E-5	1,222E-5	1,944E-5	1,336E-5	1,207E-5	1,163E-5
λ (nm)	400	8,529E-6	1,339E-5	1,371E-5	8,880E-6	1,135E-5	1,120E-5	2,511E-5	9,002E-6	9,765E-6	1,078E-5	1,209E-5	1,301E-5	1,366E-5	1,007E-5
	500	1,078E-5	1,411E-5	7,887E-6	9,199E-6	8,769E-6	1,080E-5	1,127E-5	9,654E-6	1,141E-5	9,264E-6	1,054E-5	1,446E-5	1,250E-5	1,026E-5
	600	1,517E-5	1,584E-5	1,336E-5	1,475E-5	1,396E-5	1,723E-5	1,170E-5	1,520E-5	1,206E-5	1,411E-5	1,352E-5	1,404E-5	2,676E-5	1,202E-5
	700	2,726E-5	4,858E-5	2,408E-5	3,730E-5	2,306E-5	2,499E-5	2,718E-5	2,470E-5	2,358E-5	2,421E-5	2,491E-5	2,480E-5	5,689E-5	2,541E-5
	800	2,616E-5	2,589E-5	2,615E-5	2,560E-5	7,934E-5	4,534E-5	2,570E-5	2,594E-5	2,643E-5	2,671E-5	2,610E-5	2,608E-5	2,621E-5	2,613E-5
	900	2,301E-5	2,310E-5	2,305E-5	2,302E-5	2,312E-5	2,320E-5	2,348E-5	2,307E-5	2,299E-5	2,328E-5	2,310E-5	2,294E-5	2,435E-5	2,294E-5
	1000	1,734E-5	1,732E-5	1,728E-5	1,731E-5	1,737E-5	1,755E-5	1,728E-5	1,741E-5	1,729E-5	1,736E-5	1,728E-5	1,731E-5	1,955E-5	1,738E-5
Filtre E	380	9,114E-6	6,563E-6	8,969E-6	4,584E-6	6,862E-6	1,033E-5	4,796E-6	3,071E-6	5,059E-6	1,046E-5	9,357E-6	6,798E-6	7,567E-6	1,001E-5
λ (nm)	400	5,154E-6	4,234E-6	4,225E-6	4,269E-6	6,621E-6	2,443E-6	3,347E-6	2,575E-6	4,881E-6	3,618E-6	4,837E-6	2,800E-6	3,767E-6	5,679E-6
	500	3,484E-6	2,265E-6	2,541E-6	3,209E-6	3,338E-6	2,479E-6	2,630E-6	2,966E-6	3,137E-6	5,175E-6	3,944E-6	2,301E-6	3,095E-6	3,057E-6
	600	3,678E-6	1,662E-5	5,727E-6	4,355E-6	4,524E-6	3,842E-6	3,705E-6	3,661E-6	4,341E-6	4,458E-6	5,761E-6	4,474E-6	3,521E-6	3,810E-6
	700	1,027E-5	2,541E-5	9,834E-6	9,044E-6	1,577E-5	9,451E-6	7,327E-6	8,320E-6	1,296E-5	9,349E-6	9,919E-6	9,803E-6	1,032E-5	7,835E-6
	800	1,239E-5	1,133E-5	1,191E-5	1,174E-5	1,187E-5	1,093E-5	1,161E-5	1,398E-5	1,107E-5	1,299E-5	1,079E-5	1,156E-5	1,392E-5	1,091E-5
	900	9,350E-6	8,800E-6	8,770E-6	9,649E-6	8,508E-6	8,527E-6	9,271E-6	9,559E-6	8,714E-6	9,085E-6	9,855E-6	9,336E-6	9,166E-6	8,618E-6
	1000	7,463E-6	7,390E-6	7,575E-6	7,649E-6	7,733E-6	7,388E-6	7,468E-6	7,532E-6	1,184E-5	7,431E-6	8,494E-6	7,462E-6	7,678E-6	7,428E-6

ANNEX B.5

Pilot lab “type A” uncertainty on adopted transmission $u(\tau^{PR}_{X,i})$

		IFA	KRISS	MIKES	MSL	NIST	Nmi	NMIA	NMIJ	NPL	NRC	PTB	SMU	NMC	VNIIOFI
Filter A	380	2,822E-4	1,019E-4	3,080E-4	2,737E-4	2,667E-4	2,282E-4	2,892E-4	3,099E-4	2,855E-4	1,558E-4	2,768E-4	2,774E-4	2,852E-4	4,022E-4
λ (nm)	400	1,242E-4	2,558E-4	1,874E-4	1,092E-4	2,193E-4	1,692E-4	1,250E-4	1,941E-4	2,353E-4	2,236E-4	1,048E-4	1,507E-4	2,227E-4	2,242E-4
	500	1,479E-4	8,199E-5	1,041E-4	8,019E-5	1,069E-4	1,103E-4	1,195E-4	1,379E-4	1,604E-4	1,000E-4	8,587E-5	1,233E-4	1,116E-4	1,725E-4
	600	1,399E-4	1,087E-4	1,864E-4	1,446E-4	1,246E-4	2,136E-4	1,034E-4	8,532E-5	1,836E-4	1,268E-4	1,007E-4	9,053E-5	1,428E-4	9,547E-5
	700	8,795E-5	1,046E-4	1,710E-4	9,338E-5	8,527E-5	6,420E-5	1,622E-4	1,288E-4	1,416E-4	1,443E-4	9,083E-5	9,905E-5	9,661E-5	1,791E-4
	800	3,221E-5	2,954E-5	1,885E-4	2,083E-5	1,645E-5	2,856E-5	7,665E-5	3,771E-5	2,164E-5	4,109E-5	2,749E-4	7,940E-5	2,607E-5	2,937E-5
	900	2,314E-5	1,175E-5	1,795E-5	2,631E-5	2,161E-5	3,024E-5	1,694E-4	3,328E-5	2,811E-5	2,117E-5	2,575E-4	5,221E-5	2,226E-5	1,449E-5
	1000	2,026E-5	2,149E-5	1,826E-4	2,142E-5	2,013E-5	3,965E-5	3,890E-5	4,735E-5	3,727E-5	5,098E-5	1,699E-4	4,789E-5	1,982E-5	3,500E-5
Filter B	380	1,097E-4	1,613E-4	1,230E-4	1,774E-4	1,229E-4	5,307E-5	1,841E-4	3,375E-4	1,557E-4	1,208E-4	3,803E-4	8,739E-5	2,067E-4	1,383E-4
λ (nm)	400	8,714E-5	1,418E-4	1,028E-4	1,684E-4	1,628E-4	2,267E-4	1,010E-4	1,962E-4	2,335E-4	9,227E-5	1,450E-4	2,475E-4	1,221E-4	1,806E-4
	500	1,124E-4	9,781E-5	1,001E-4	9,350E-5	1,157E-4	9,892E-5	9,227E-5	7,650E-5	6,273E-5	8,702E-5	8,153E-5	5,821E-5	1,530E-4	1,255E-4
	600	9,294E-5	4,191E-5	4,632E-5	1,138E-4	1,071E-4	1,107E-4	1,336E-4	7,140E-5	7,818E-5	1,263E-4	1,120E-4	1,117E-4	1,322E-4	9,037E-5
	700	1,112E-4	9,210E-5	6,497E-5	8,609E-5	9,474E-5	8,005E-5	8,893E-5	8,321E-5	6,540E-5	6,094E-5	5,302E-5	7,334E-5	1,030E-4	1,119E-4
	800	1,902E-5	1,421E-5	6,571E-5	1,458E-5	1,363E-4	2,252E-5	1,453E-5	1,216E-5	1,570E-5	2,433E-5	2,203E-5	2,856E-5	1,551E-5	2,110E-5
	900	1,116E-5	2,440E-5	1,720E-5	1,650E-5	2,145E-5	4,459E-5	1,006E-5	7,316E-6	1,367E-5	1,833E-5	1,301E-5	4,155E-5	2,361E-5	2,622E-5
	1000	3,354E-5	2,059E-5	8,389E-6	1,318E-5	1,407E-5	1,878E-5	1,353E-5	1,414E-5	1,894E-5	1,809E-5	1,389E-5	1,320E-5	2,278E-5	1,614E-5
Filter C	380	2,912E-5	1,836E-5	1,683E-5	2,692E-5	2,006E-5	2,009E-5	3,632E-5	2,302E-5	2,788E-5	1,481E-5	3,550E-5	3,758E-5	2,096E-5	3,345E-5
λ (nm)	400	6,011E-5	4,235E-5	5,118E-5	4,756E-5	4,255E-5	3,336E-5	4,815E-5	5,769E-5	3,277E-5	2,662E-5	2,932E-5	4,423E-5	3,558E-5	3,771E-5
	500	2,163E-5	1,439E-5	2,993E-5	1,660E-5	2,051E-5	2,886E-5	1,995E-5	2,227E-5	2,113E-5	3,466E-5	2,301E-5	1,633E-5	2,123E-5	1,925E-5
	600	2,485E-5	1,931E-5	3,453E-5	2,134E-5	2,298E-5	3,409E-5	3,289E-5	3,111E-5	2,233E-5	4,131E-5	2,190E-5	2,950E-5	3,541E-5	3,407E-5
	700	2,952E-5	1,761E-5	2,500E-5	5,781E-5	4,803E-5	3,825E-5	2,657E-5	2,459E-5	2,835E-5	3,692E-5	2,379E-5	2,689E-5	4,678E-5	3,070E-5
	800	3,522E-6	5,469E-6	6,714E-6	8,418E-6	9,224E-6	5,859E-6	6,903E-6	7,347E-6	8,558E-6	9,354E-6	7,165E-6	1,383E-5	1,704E-5	1,046E-5
	900	2,065E-6	3,295E-5	5,722E-6	4,824E-6	4,112E-6	4,796E-6	2,745E-6	4,756E-6	6,345E-6	4,264E-6	3,512E-6	6,025E-6	1,592E-6	4,399E-6
	1000	2,656E-6	5,563E-6	2,473E-6	3,891E-6	4,594E-6	4,211E-6	3,887E-6	2,032E-6	3,279E-6	3,438E-6	3,235E-6	1,647E-6	3,082E-6	4,249E-6
Filter D	380	8,392E-6	9,939E-6	1,089E-5	1,175E-5	8,860E-6	1,570E-5	4,344E-6	1,934E-5	1,327E-5	5,545E-6	1,629E-5	8,003E-6	4,887E-6	4,181E-6
λ (nm)	400	7,458E-6	1,261E-5	1,306E-5	7,813E-6	1,046E-5	1,040E-5	2,449E-5	7,996E-6	8,764E-6	9,927E-6	1,135E-5	1,229E-5	1,302E-5	9,169E-6
	500	8,764E-6	1,263E-5	4,688E-6	6,725E-6	6,121E-6	8,773E-6	9,072E-6	7,310E-6	9,507E-6	6,812E-6	8,469E-6	1,302E-5	1,067E-5	8,062E-6
	600	1,151E-5	1,215E-5	8,985E-6	1,085E-5	9,831E-6	1,387E-5	6,066E-6	1,114E-5	6,912E-6	9,776E-6	9,167E-6	9,853E-6	2,398E-5	6,715E-6
	700	2,102E-5	4,418E-5	1,660E-5	3,261E-5	1,519E-5	1,787E-5	2,059E-5	1,760E-5	1,581E-5	1,570E-5	1,766E-5	1,763E-5	5,288E-5	1,826E-5
	800	1,233E-5	1,098E-5	1,237E-5	1,061E-5	6,898E-5	3,483E-5	1,067E-5	1,090E-5	1,233E-5	1,405E-5	1,247E-5	1,212E-5	1,204E-5	1,229E-5
	900	3,321E-6	3,344E-6	3,333E-6	3,186E-6	3,699E-6	3,830E-6	5,201E-6	3,342E-6	2,909E-6	4,403E-6	3,960E-6	2,557E-6	6,807E-6	2,705E-6
	1000	2,603E-6	2,401E-6	2,358E-6	2,484E-6	2,919E-6	3,326E-6	2,337E-6	3,061E-6	2,366E-6	2,658E-6	2,255E-6	2,337E-6	7,407E-6	2,999E-6
Filter E	380	9,087E-6	6,526E-6	8,943E-6	4,444E-6	6,831E-6	1,031E-5	4,742E-6	2,782E-6	4,817E-6	1,043E-5	9,332E-6	6,763E-6	7,388E-6	9,990E-6
λ (nm)	400	4,899E-6	3,820E-6	3,880E-6	3,672E-6	6,383E-6	1,774E-6	2,898E-6	1,822E-6	4,611E-6	3,226E-6	4,360E-6	2,185E-6	3,408E-6	5,376E-6
	500	3,058E-6	1,533E-6	1,893E-6	2,742E-6	2,877E-6	1,816E-6	1,947E-6	2,447E-6	2,574E-6	4,889E-6	3,573E-6	1,537E-6	2,602E-6	2,432E-6
	600	2,774E-6	1,627E-5	5,194E-6	3,626E-6	3,741E-6	2,989E-6	2,809E-6	2,719E-6	3,569E-6	3,749E-6	5,220E-6	3,735E-6	2,561E-6	2,943E-6
	700	9,402E-6	2,498E-5	8,958E-6	8,105E-6	1,510E-5	8,529E-6	6,076E-6	7,284E-6	1,226E-5	8,443E-6	9,003E-6	8,908E-6	9,439E-6	6,726E-6
	800	7,294E-6	5,853E-6	6,078E-6	6,320E-6	6,303E-6	4,669E-6	6,283E-6	1,010E-5	5,409E-6	7,753E-6	4,876E-6	6,551E-6	9,467E-6	4,429E-6
	900	3,766E-6	2,727E-6	2,239E-6	3,903E-6	1,571E-6	1,700E-6	3,501E-6	4,532E-6	2,155E-6	3,223E-6	5,257E-6	4,197E-6	3,238E-6	2,082E-6
	1000	2,130E-6	2,141E-6	2,180E-6	2,395E-6	2,807E-6	2,035E-6	2,282E-6	2,651E-6	7,716E-6	2,312E-6	3,944E-6	2,436E-6	2,738E-6	2,284E-6

ANNEX B.6

NMI absolute transmission measurements $\tau_{X,i}$

		IFA	KRISS	MIKES	MSL	NIST	Nmi	NMIA	NMIJ	NPL	NRC	PTB	SMU	NMC	VNIIOFI
Filter A	380	9,123E-1	9,122E-1	9,125E-1	9,132E-1	9,135E-1	0,91323	9,113E-1	9,126E-1	9,121E-1	9,120E-1	9,142E-1	9,116E-1	9,130E-1	9,103E-1
λ (nm)	400	9,140E-1	9,139E-1	9,142E-1	9,147E-1	9,151E-1	0,91495	9,131E-1	9,144E-1	9,137E-1	9,138E-1	9,161E-1	9,130E-1	9,148E-1	9,122E-1
	500	9,169E-1	9,164E-1	9,170E-1	9,172E-1	9,174E-1	0,91723	9,161E-1	9,169E-1	9,167E-1	9,161E-1	9,187E-1	9,155E-1	9,172E-1	9,156E-1
	600	9,186E-1	9,178E-1	9,182E-1	9,186E-1	9,188E-1	0,91865	9,176E-1	9,182E-1	9,181E-1	9,176E-1	9,204E-1	9,166E-1	9,185E-1	9,172E-1
	700	9,197E-1	9,189E-1	9,191E-1	9,197E-1	9,197E-1	0,91932	9,188E-1	9,193E-1	9,191E-1	9,187E-1	9,217E-1	9,179E-1	9,196E-1	9,185E-1
	800	9,203E-1	9,196E-1	9,201E-1	9,204E-1	9,204E-1	0,92042	9,196E-1	9,201E-1	9,198E-1	9,195E-1	9,231E-1	9,189E-1	9,205E-1	9,193E-1
	900	9,209E-1	9,201E-1	9,206E-1	9,208E-1	9,208E-1	0,92083	9,199E-1	9,208E-1	9,202E-1	9,200E-1	9,200E-1	9,182E-1	9,211E-1	9,197E-1
	1000	9,212E-1	9,204E-1	9,209E-1	9,212E-1	9,211E-1	0,92116	9,202E-1	9,211E-1	9,205E-1	9,202E-1	9,207E-1	xxxx	9,215E-1	9,201E-1
Filter B	380	4,042E-1	3,997E-1	4,095E-1	4,062E-1	4,036E-1	0,40826	4,060E-1	4,059E-1	4,042E-1	4,064E-1	4,050E-1	4,064E-1	4,078E-1	4,076E-1
λ (nm)	400	6,054E-1	6,011E-1	6,040E-1	6,035E-1	6,021E-1	0,60638	6,048E-1	6,048E-1	6,040E-1	6,062E-1	6,062E-1	6,053E-1	6,066E-1	6,046E-1
	500	6,198E-1	6,159E-1	6,183E-1	6,174E-1	6,168E-1	0,62073	6,187E-1	6,188E-1	6,194E-1	6,205E-1	6,198E-1	6,193E-1	6,203E-1	6,193E-1
	600	6,080E-1	6,035E-1	6,067E-1	6,055E-1	6,048E-1	0,60880	6,065E-1	6,069E-1	6,075E-1	6,086E-1	6,077E-1	6,075E-1	6,084E-1	6,071E-1
	700	6,361E-1	6,314E-1	6,348E-1	6,340E-1	6,327E-1	0,63682	6,348E-1	6,350E-1	6,352E-1	6,365E-1	6,357E-1	6,353E-1	6,362E-1	6,352E-1
	800	5,757E-1	5,700E-1	5,745E-1	5,733E-1	5,719E-1	0,57689	5,745E-1	5,747E-1	5,747E-1	5,764E-1	5,756E-1	5,752E-1	5,758E-1	5,745E-1
	900	4,994E-1	4,940E-1	4,996E-1	4,981E-1	4,966E-1	0,50224	4,995E-1	4,994E-1	4,997E-1	5,014E-1	4,992E-1	5,002E-1	5,010E-1	4,999E-1
	1000	4,509E-1	4,452E-1	4,516E-1	4,499E-1	4,482E-1	0,45388	4,512E-1	4,515E-1	4,514E-1	4,533E-1	4,515E-1	xxxx	4,527E-1	4,518E-1
Filter C	380	2,150E-2	2,110E-2	2,174E-2	2,162E-2	2,151E-2	0,02189	2,183E-2	2,164E-2	2,120E-2	2,123E-2	2,107E-2	2,076E-2	2,148E-2	2,201E-2
λ (nm)	400	9,670E-2	9,433E-2	9,379E-2	9,452E-2	9,471E-2	0,09656	9,609E-2	9,589E-2	9,483E-2	9,502E-2	9,505E-2	9,325E-2	9,545E-2	9,590E-2
	500	9,350E-2	9,176E-2	9,035E-2	9,094E-2	9,151E-2	0,09340	9,214E-2	9,236E-2	9,198E-2	9,182E-2	9,162E-2	9,004E-2	9,185E-2	9,273E-2
	600	7,830E-2	7,705E-2	7,577E-2	7,623E-2	7,675E-2	0,07823	7,704E-2	7,720E-2	7,702E-2	7,709E-2	7,643E-2	7,546E-2	7,711E-2	7,768E-2
	700	1,633E-1	1,607E-1	1,593E-1	1,602E-1	1,606E-1	0,16284	1,616E-1	1,615E-1	1,610E-1	1,610E-1	1,602E-1	1,586E-1	1,612E-1	1,629E-1
	800	1,519E-1	1,497E-1	1,481E-1	1,487E-1	1,495E-1	0,15163	1,503E-1	1,504E-1	1,498E-1	1,501E-1	1,493E-1	1,477E-1	1,501E-1	1,507E-1
	900	1,045E-1	1,025E-1	1,012E-1	1,018E-1	1,024E-1	0,10404	1,029E-1	1,029E-1	1,025E-1	1,029E-1	1,020E-1	1,009E-1	1,030E-1	1,035E-1
	1000	7,790E-2	7,621E-2	7,529E-2	7,578E-2	7,623E-2	0,07750	7,670E-2	7,674E-2	7,632E-2	7,661E-2	7,592E-2	xxxx	7,666E-2	7,703E-2
Filter D	380	3,000E-4	3,760E-4	4,040E-4	3,570E-4	4,100E-4	0,0003560	3,770E-4	3,750E-4	3,710E-4	3,866E-4	3,702E-4	3,616E-4	3,930E-4	3,670E-4
λ (nm)	400	5,000E-3	5,338E-3	5,158E-3	5,125E-3	5,500E-3	0,0050946	5,122E-3	5,345E-3	5,284E-3	5,473E-3	5,331E-3	5,118E-3	5,513E-3	5,404E-3
	500	8,300E-3	8,803E-3	8,366E-3	8,290E-3	8,900E-3	0,0083634	8,348E-3	8,676E-3	8,642E-3	8,854E-3	8,678E-3	8,349E-3	8,866E-3	8,861E-3
	600	8,200E-3	8,750E-3	8,305E-3	8,206E-3	8,820E-3	0,0082954	8,267E-3	8,593E-3	8,571E-3	8,777E-3	8,578E-3	8,275E-3	8,798E-3	8,804E-3
	700	2,620E-2	2,741E-2	2,643E-2	2,626E-2	2,762E-2	0,0263833	2,640E-2	2,710E-2	2,701E-2	2,753E-2	2,702E-2	2,628E-2	2,754E-2	2,773E-2
	800	3,180E-2	3,324E-2	3,202E-2	3,189E-2	3,347E-2	0,0320936	3,211E-2	3,291E-2	3,278E-2	3,345E-2	3,292E-2	3,196E-2	3,338E-2	3,337E-2
	900	2,230E-2	2,329E-2	2,239E-2	2,229E-2	2,350E-2	0,0224419	2,254E-2	2,307E-2	2,294E-2	2,351E-2	2,312E-2	2,235E-2	2,344E-2	2,341E-2
	1000	1,660E-2	1,727E-2	1,659E-2	1,651E-2	1,745E-2	0,0165983	1,670E-2	1,710E-2	1,701E-2	1,747E-2	1,716E-2	xxxx	1,741E-2	1,741E-2
Filter E	380	1,000E-4	1,150E-5	1,800E-5	1,200E-5	2,000E-5	0,0000112	xxxx	1,200E-5	1,035E-5	1,322E-5	1,150E-5	1,870E-5	1,230E-5	1,140E-4
λ (nm)	400	4,000E-4	3,183E-4	3,470E-4	3,100E-4	3,500E-4	0,0003042	2,770E-4	3,260E-4	2,920E-4	3,412E-4	3,191E-4	2,943E-4	3,331E-4	3,016E-4
	500	9,000E-4	9,094E-4	9,570E-4	8,560E-4	9,900E-4	0,0008666	9,110E-4	9,100E-4	8,300E-4	9,482E-4	8,995E-4	8,250E-4	9,199E-4	9,195E-4
	600	1,000E-3	9,809E-4	1,026E-3	9,160E-4	1,060E-3	0,0009291	9,850E-4	9,720E-4	8,950E-4	1,015E-3	9,604E-4	8,888E-4	9,875E-4	9,944E-4
	700	5,000E-3	4,951E-3	5,141E-3	4,730E-3	5,250E-3	0,0047569	4,950E-3	4,959E-3	4,635E-3	5,094E-3	4,859E-3	4,548E-3	4,973E-3	5,074E-3
	800	9,700E-3	9,471E-3	9,804E-3	9,132E-3	1,001E-2	0,0091875	9,853E-3	9,537E-3	8,983E-3	9,770E-3	9,392E-3	8,823E-3	9,561E-3	9,632E-3
	900	8,400E-3	8,227E-3	8,552E-3	7,945E-3	8,730E-3	0,0079895	8,376E-3	8,324E-3	7,793E-3	8,518E-3	8,232E-3	7,668E-3	8,326E-3	8,388E-3
	1000	7,100E-3	6,926E-3	7,236E-3	6,708E-3	7,380E-3	0,0067259	6,952E-3	7,058E-3	6,561E-3	7,196E-3	6,923E-3	xxxx	7,026E-3	7,085E-3

ANNEX B.7

NMI total absolute uncertainties on transmission measurements $u\,(\tau_{X,i})$

		IFA	KRISS	MIKES	MSL	NIST	Nmi	NMIA	NMIJ	NPL	NRC	PTB	SMU	NMC	VNIIOFI
Filter A	380	2,400E-3	2,600E-4	6,000E-4	1,900E-4	3,000E-4	2,740E-4	1,350E-4	1,340E-4	6,000E-5	3,200E-4	4,900E-4	1,400E-4	1,300E-4	3,140E-4
λ (nm)	400	2,800E-3	2,200E-4	4,000E-4	1,900E-4	3,000E-4	1,830E-4	1,230E-4	1,080E-4	7,000E-5	3,100E-4	4,900E-4	1,400E-4	1,500E-4	2,930E-4
	500	5,000E-4	1,600E-4	3,000E-4	1,900E-4	2,000E-4	2,752E-4	6,900E-5	1,090E-4	5,000E-5	1,600E-4	4,900E-4	1,500E-4	1,200E-4	2,750E-4
	600	7,000E-4	1,100E-4	3,000E-4	1,900E-4	4,000E-4	1,837E-4	5,300E-5	1,010E-4	4,000E-5	1,600E-4	4,900E-4	1,500E-4	1,200E-4	2,790E-4
	700	2,300E-3	1,500E-4	3,000E-4	1,900E-4	3,000E-4	2,758E-4	6,300E-5	8,500E-5	7,000E-5	9,000E-5	4,900E-4	1,500E-4	1,100E-4	2,540E-4
	800	6,000E-4	1,500E-4	3,000E-4	1,900E-4	2,000E-4	1,841E-4	1,150E-4	1,110E-4	4,000E-5	9,000E-5	5,100E-4	1,500E-4	1,000E-4	2,480E-4
	900	2,100E-3	1,600E-4	4,000E-4	1,900E-4	3,000E-4	1,842E-4	4,800E-5	6,090E-4	8,000E-5	8,000E-5	1,800E-3	1,600E-4	1,000E-4	2,750E-4
	1000	2,000E-3	1,600E-4	4,000E-4	1,900E-4	3,000E-4	1,842E-4	4,000E-5	5,120E-4	1,300E-4	8,000E-5	1,800E-3	xxxx	1,000E-4	2,890E-4
Filter B	380	8,000E-4	5,200E-4	6,000E-4	5,500E-4	1,200E-3	1,021E-3	7,520E-4	1,200E-3	1,900E-4	4,400E-4	7,200E-4	1,500E-4	1,920E-3	3,260E-4
λ (nm)	400	1,600E-3	1,400E-4	4,000E-4	1,700E-4	3,000E-4	4,245E-4	9,400E-5	1,300E-4	9,000E-5	2,100E-4	6,100E-4	1,600E-4	1,500E-4	3,020E-4
	500	4,000E-4	1,100E-4	3,000E-4	1,700E-4	4,000E-4	4,345E-4	7,200E-5	9,200E-5	7,000E-5	1,300E-4	6,000E-4	1,600E-4	9,000E-5	2,850E-4
	600	5,000E-4	1,100E-4	3,000E-4	1,700E-4	4,000E-4	4,262E-4	6,900E-5	9,400E-5	9,000E-5	1,300E-4	6,100E-4	1,500E-4	1,000E-4	2,840E-4
	700	1,400E-3	1,200E-4	3,000E-4	1,700E-4	4,000E-4	4,458E-4	7,700E-5	9,700E-5	7,000E-5	9,000E-5	5,800E-4	1,500E-4	9,000E-5	2,650E-4
	800	4,000E-4	1,100E-4	3,000E-4	1,800E-4	3,000E-4	4,038E-4	2,220E-4	1,700E-4	6,000E-5	9,000E-5	6,500E-4	1,400E-4	1,700E-4	2,960E-4
	900	1,000E-3	1,100E-4	3,000E-4	1,700E-4	4,000E-4	3,516E-4	8,000E-5	6,020E-4	1,000E-4	1,300E-4	2,700E-4	1,400E-4	1,200E-4	2,750E-4
	1000	1,300E-3	8,000E-5	3,000E-4	1,700E-4	3,000E-4	3,177E-4	6,500E-5	5,130E-4	1,300E-4	1,300E-4	2,900E-4	xxxx	8,000E-5	2,760E-4
Filter C	380	1,400E-4	1,040E-4	1,300E-4	1,000E-4	1,400E-4	3,765E-4	1,350E-4	2,280E-4	6,000E-5	8,600E-5	9,400E-5	3,700E-5	3,900E-4	3,160E-4
λ (nm)	400	2,300E-4	4,800E-5	9,000E-5	5,000E-5	1,100E-4	2,028E-4	1,120E-4	1,350E-4	5,000E-5	5,700E-5	2,200E-4	9,300E-5	1,600E-4	3,090E-4
	500	5,900E-5	2,400E-5	7,000E-5	4,000E-5	1,000E-4	1,961E-4	3,400E-5	5,800E-5	3,000E-5	3,700E-5	2,100E-4	9,200E-5	8,000E-5	2,910E-4
	600	6,300E-5	2,600E-5	8,000E-5	3,000E-5	8,000E-5	1,799E-4	2,800E-5	5,000E-5	4,000E-5	5,900E-5	2,100E-4	8,700E-5	5,000E-5	3,160E-4
	700	3,200E-4	7,000E-5	1,200E-4	8,000E-5	1,700E-4	3,257E-4	4,600E-5	1,580E-4	3,000E-5	7,900E-5	3,900E-4	1,200E-4	2,300E-4	2,720E-4
	800	9,800E-5	4,300E-5	1,100E-4	5,000E-5	1,400E-4	3,033E-4	2,540E-4	8,600E-5	3,000E-5	4,500E-5	4,000E-4	1,200E-4	9,000E-5	2,890E-4
	900	2,000E-4	2,900E-5	1,000E-4	4,000E-5	1,000E-4	2,081E-4	9,100E-5	6,020E-4	2,000E-5	2,800E-5	1,400E-4	1,000E-4	7,000E-5	2,810E-4
	1000	8,400E-5	2,100E-5	8,000E-5	3,000E-5	8,000E-5	1,550E-4	7,600E-5	5,090E-4	2,000E-5	2,000E-5	1,100E-4	xxxx	5,000E-5	2,960E-4
Filter D	380	2,000E-5	3,000E-6	1,400E-5	8,000E-6	3,000E-5	2,367E-5	5,900E-5	3,300E-5	4,000E-6	1,700E-6	3,000E-6	3,800E-6	1,500E-5	3,270E-4
λ (nm)	400	3,000E-5	7,000E-6	5,000E-6	1,600E-5	2,000E-5	1,426E-5	3,800E-5	3,700E-5	6,000E-6	9,100E-6	1,700E-5	1,400E-5	2,200E-5	3,310E-4
	500	9,600E-6	4,000E-6	7,000E-6	2,000E-5	1,000E-5	2,509E-5	3,000E-5	3,300E-5	6,000E-6	8,200E-6	2,700E-5	1,900E-5	1,300E-5	2,990E-4
	600	8,700E-6	7,000E-6	9,000E-6	2,000E-5	1,000E-5	2,820E-5	3,000E-5	4,100E-5	7,000E-6	9,500E-6	2,700E-5	2,000E-5	1,000E-5	3,140E-4
	700	5,000E-5	1,900E-5	2,100E-5	4,800E-5	4,000E-5	7,123E-5	5,700E-5	5,000E-5	1,600E-5	1,700E-5	6,300E-5	4,200E-5	7,600E-5	2,850E-4
	800	2,500E-5	1,500E-5	2,500E-5	5,200E-5	3,000E-5	8,023E-5	1,480E-4	4,100E-5	1,300E-5	1,300E-5	1,100E-4	4,800E-5	3,300E-5	3,010E-4
	900	2,400E-5	1,600E-5	2,000E-5	4,100E-5	2,000E-5	5,610E-5	8,200E-5	5,890E-4	8,000E-6	7,200E-6	4,200E-5	3,800E-5	2,300E-5	3,040E-4
	1000	2,100E-5	1,300E-5	1,500E-5	3,300E-5	2,000E-5	4,150E-5	4,800E-5	5,150E-4	9,000E-6	6,500E-6	3,300E-5	xxxx	1,200E-5	3,080E-4
Filter E	380	5,000E-5	2,000E-7	4,000E-6	8,000E-6	2,000E-5	1,485E-6	xxxx	3,200E-5	2,000E-7	5,100E-7	2,500E-7	2,100E-6	7,000E-7	3,290E-4
λ (nm)	400	4,000E-5	1,100E-6	2,000E-6	8,000E-6	3,000E-5	1,308E-6	2,900E-5	3,300E-5	1,000E-6	4,100E-7	1,800E-6	3,000E-6	2,100E-6	3,090E-4
	500	1,000E-5	1,200E-6	3,000E-6	8,000E-6	0,000E+0	3,553E-6	2,000E-5	3,300E-5	3,000E-6	7,500E-7	2,300E-6	4,400E-6	1,900E-6	3,070E-4
	600	6,000E-6	1,600E-6	2,000E-6	8,000E-6	0,000E+0	5,296E-6	2,100E-5	3,300E-5	2,000E-6	9,200E-7	2,400E-6	4,700E-6	1,800E-6	3,180E-4
	700	1,000E-5	6,100E-6	6,000E-6	1,100E-5	1,000E-5	1,712E-5	3,400E-5	3,400E-5	5,000E-6	3,800E-6	1,600E-5	1,300E-5	2,000E-5	2,810E-4
	800	1,000E-5	7,600E-6	8,000E-6	1,400E-5	2,000E-5	3,216E-5	1,870E-4	3,300E-5	8,000E-6	5,500E-6	2,800E-5	1,900E-5	1,290E-5	3,080E-4
	900	1,000E-5	5,700E-6	9,000E-6	1,300E-5	1,000E-5	2,796E-5	9,800E-5	5,970E-4	5,000E-6	5,400E-6	2,800E-5	1,800E-5	1,040E-5	3,010E-4
	1000	1,200E-5	5,400E-6	8,000E-6	1,200E-5	2,000E-5	2,354E-5	5,100E-5	5,030E-4	6,000E-6	5,300E-6	1,400E-5	xxxx	5,800E-6	3,150E-4

ANNEX B.8

$u\,(\tau^{P}_{X,i,1} - \tau^{P}_{X,i,2})$

		IFA	KRISS	MIKES	MSL	NIST	Nmi	NMIA	NMIJ	NPL	NRC	PTB	SMU	NMC	VNIIOFI
Filter A	380	6,133E-4	1,120E-3	-6,100E-4	9,500E-5	-2,922E-3	-1,240E-3	1,180E-4	8,500E-4	-4,750E-4	3,500E-4	-4,250E-3	1,150E-4	-1,065E-3	-1,038E-3
λ (nm)	400	7,263E-4	1,110E-3	-7,650E-4	-1,350E-4	-2,770E-3	-1,600E-3	4,700E-4	9,100E-4	-5,450E-4	2,850E-4	-4,055E-3	-2,483E-4	-1,040E-3	-5,000E-4
	500	9,233E-4	1,195E-3	-3,150E-4	3,500E-5	-1,950E-3	-7,150E-4	2,690E-4	7,650E-4	-4,500E-5	6,150E-4	-2,900E-3	8,167E-5	-8,300E-4	-3,400E-4
	600	1,183E-3	1,055E-3	-5,300E-4	-4,450E-4	-1,935E-3	-1,105E-3	1,450E-4	7,250E-4	-4,500E-4	7,150E-4	-2,145E-3	1,717E-4	-1,000E-3	-3,250E-4
	700	7,800E-4	4,175E-4	-6,875E-4	-6,170E-4	-1,122E-3	-6,775E-4	-3,641E-4	2,442E-4	-2,075E-4	4,542E-4	-1,962E-3	1,476E-3	-8,975E-4	-6,675E-4
	800	2,050E-4	-3,500E-5	-9,950E-4	-7,500E-4	-4,750E-4	-1,155E-3	-5,550E-4	-1,500E-5	7,500E-5	2,950E-4	-1,625E-3	3,659E-3	6,000E-5	-6,250E-4
	900	4,050E-4	1,000E-5	-5,650E-4	-7,350E-4	-3,350E-4	-1,185E-3	-6,420E-4	1,200E-4	2,550E-4	4,550E-4	-9,850E-4	4,135E-3	-3,950E-4	-7,150E-4
	1000	3,750E-4	-6,500E-5	-4,000E-4	-8,200E-4	-4,750E-4	-1,220E-3	-4,350E-4	1,530E-4	2,500E-4	4,150E-4	-1,610E-3	3,910E-3	-9,717E-4	-4,300E-4
Filter B	380	-2,175E-3	-7,650E-4	-3,650E-4	-1,095E-3	-1,500E-4	-3,000E-4	-1,070E-3	-2,850E-4	-6,250E-4	-2,065E-3	-1,490E-3	-1,865E-3	-1,075E-3	8,950E-5
λ (nm)	400	-2,545E-3	-2,055E-3	-1,030E-4	-1,435E-3	-4,950E-4	-1,080E-3	-1,095E-3	-7,200E-4	-6,300E-4	-2,320E-3	-2,271E-3	-2,745E-3	-1,720E-3	-8,150E-4
	500	-2,425E-3	-1,372E-3	-6,550E-4	-1,450E-3	-8,270E-4	-7,400E-4	-1,280E-3	-9,300E-4	-1,140E-3	-2,420E-3	-2,330E-3	-1,755E-3	-1,530E-3	-8,950E-4
	600	-1,585E-3	-6,150E-4	5,000E-5	-6,600E-4	-4,750E-4	-2,050E-4	-6,550E-4	-8,500E-5	3,600E-4	-1,685E-3	-1,285E-3	-8,300E-4	-6,000E-4	-8,500E-5
	700	-8,742E-4	2,500E-4	1,800E-4	-2,775E-4	-1,300E-5	-1,508E-4	-3,750E-5	4,525E-4	-5,208E-4	-8,250E-4	-8,155E-4	-1,700E-4	7,250E-5	6,575E-4
	800	-6,550E-4	1,220E-3	4,750E-4	-7,500E-5	6,333E-5	-4,450E-4	9,000E-5	3,850E-4	-7,750E-4	-3,550E-4	-3,250E-4	2,200E-4	1,700E-4	7,050E-4
	900	-1,500E-4	1,200E-3	7,350E-4	1,900E-4	7,747E-4	8,800E-5	3,900E-4	7,000E-4	-4,550E-4	-2,150E-5	4,500E-5	5,000E-4	6,450E-4	1,050E-3
	1000	1,700E-4	1,365E-3	1,050E-3	4,735E-4	9,333E-4	3,550E-4	5,500E-4	9,300E-4	-5,500E-5	2,000E-4	2,550E-4	6,900E-4	8,000E-4	1,255E-3
Filter C	380	5,000E-6	-1,200E-5	-2,367E-5	-1,000E-6	1,650E-5	3,500E-6	-2,667E-6	-1,633E-5	5,650E-5	-4,600E-5	-1,095E-4	-7,700E-5	-1,200E-5	-1,170E-4
λ (nm)	400	-2,175E-4	-1,550E-4	-1,625E-4	-2,050E-4	-1,093E-4	-1,650E-4	-1,730E-4	-1,915E-4	2,250E-5	-1,685E-4	-6,115E-4	-2,280E-4	-2,095E-4	-2,460E-4
	500	-4,510E-4	-1,210E-4	-1,110E-4	-1,810E-4	-1,745E-4	-2,965E-4	-2,900E-4	-4,270E-4	-1,410E-4	-1,345E-4	-5,820E-4	-3,650E-5	-1,870E-4	-6,490E-4
	600	-3,760E-4	8,300E-5	1,365E-4	-1,800E-5	-5,667E-6	-1,445E-4	-1,154E-4	-2,365E-4	-5,100E-5	1,150E-5	-3,170E-4	1,445E-4	3,200E-5	-5,130E-4
	700	-4,750E-4	1,975E-4	8,500E-5	1,075E-4	4,250E-5	-2,850E-4	-2,300E-4	-4,150E-4	-7,380E-5	-2,625E-5	-5,358E-4	1,200E-4	-1,500E-6	-5,747E-4
	800	-3,800E-4	3,900E-4	-8,000E-5	9,500E-5	-1,300E-4	-3,310E-4	-1,575E-4	-4,250E-4	-2,400E-4	-6,500E-5	-5,200E-4	-3,000E-5	3,000E-5	-5,650E-4
	900	-1,650E-4	2,100E-4	-1,000E-6	1,100E-4	-3,700E-5	5,780E-4	-5,000E-6	-1,850E-4	-6,500E-5	3,500E-5	-1,800E-4	5,500E-5	7,000E-5	-2,900E-4
	1000	-6,300E-5	2,745E-4	8,450E-5	1,470E-4	1,800E-5	5,105E-4	7,800E-5	-3,900E-5	3,500E-5	-3,050E-5	-7,300E-6	1,185E-4	1,130E-4	-1,280E-4
Filter D	380	3,137E-6	-4,933E-6	-1,401E-6	-1,436E-5	3,494E-6	4,215E-6	-1,170E-6	-2,600E-5	9,563E-7	5,381E-6	-2,520E-6	-8,779E-7	-6,060E-6	3,469E-6
λ (nm)	400	-3,029E-5	2,243E-6	5,148E-6	2,183E-8	-5,710E-5	-2,247E-5	8,331E-6	-1,875E-5	-7,354E-7	8,878E-6	-5,783E-7	-4,995E-5	2,998E-6	-1,476E-5
	500	-2,168E-5	-4,351E-5	4,331E-6	-2,901E-5	-6,903E-5	7,570E-6	-3,459E-6	-1,068E-5	-8,543E-6	-5,940E-6	8,814E-6	-3,121E-5	-7,838E-6	-2,335E-5
	600	7,773E-6	-1,536E-5	8,585E-6	-8,479E-7	-3,794E-5	1,932E-5	2,979E-5	3,255E-6	-1,146E-6	1,900E-5	3,491E-6	-1,076E-5	1,561E-5	-8,442E-6
	700	-3,249E-5	-2,568E-5	5,605E-6	-3,422E-5	-7,905E-5	1,996E-5	6,093E-6	1,112E-5	-5,293E-6	1,730E-5	3,344E-5	-2,610E-5	2,863E-5	2,496E-5
	800	-1,945E-5	3,764E-6	2,412E-5	2,563E-5	6,716E-5	-2,852E-5	1,690E-5	1,166E-5	3,422E-5	-4,521E-6	8,159E-5	-1,221E-5	1,485E-5	5,450E-5
	900	-2,215E-6	4,154E-6	2,101E-5	1,360E-5	-6,296E-5	1,703E-5	1,861E-5	3,040E-6	3,515E-5	-3,883E-6	6,448E-5	-4,211E-6	1,702E-5	3,359E-5
	1000	6,430E-6	2,059E-5	3,204E-5	2,664E-5	-5,022E-5	2,561E-5	1,998E-5	2,354E-7	4,693E-5	1,817E-5	5,200E-5	1,412E-5	-9,009E-7	2,374E-5
Filter E	380	-8,115E-6	-5,492E-6	-2,585E-6	2,730E-7	3,727E-6	1,204E-6	-2,866E-6	-1,285E-6	1,334E-6	5,340E-7	2,920E-6	5,702E-9	-2,201E-6	9,738E-7
λ (nm)	400	-4,957E-7	-2,630E-6	-2,478E-6	5,383E-6	-3,042E-6	-7,719E-7	-2,075E-6	2,367E-7	3,721E-8	5,395E-6	1,717E-6	-6,339E-7	-2,679E-6	5,713E-7
	500	1,941E-6	1,093E-6	-1,700E-6	-8,628E-6	-5,117E-6	-1,550E-5	-3,675E-7	4,123E-6	-2,987E-6	-2,955E-6	3,780E-7	-3,810E-6	-7,548E-6	-1,090E-6
	600	-1,342E-6	-1,401E-6	-6,104E-7	-7,943E-6	-4,962E-6	5,068E-6	-1,244E-7	-4,288E-6	-6,443E-7	-3,759E-6	2,327E-6	-2,694E-7	-5,530E-6	6,086E-6
	700	-4,077E-6	3,645E-6	-5,680E-6	-2,780E-5	-1,037E-5	-8,291E-9	-6,986E-9	2,738E-7	3,253E-6	-7,804E-6	1,660E-6	-4,750E-6	-1,025E-5	-4,490E-6
	800	-2,258E-7	-2,910E-6	8,465E-6	1,455E-6	1,277E-6	-8,929E-8	-2,293E-6	2,040E-6	1,487E-5	-5,526E-6	2,015E-5	-6,068E-8	9,647E-6	-3,815E-7
	900	5,003E-6	-2,484E-6	1,347E-5	3,994E-6	2,519E-5	3,460E-6	-4,534E-7	-8,408E-6	2,033E-5	-4,700E-6	2,162E-5	6,871E-6	1,061E-5	-6,823E-6
	1000	1,088E-5	4,781E-6	1,230E-5	7,695E-6	3,017E-5	7,611E-6	5,165E-6	7,395E-6	1,186E-5	3,099E-6	2,052E-5	7,771E-6	2,388E-5	1,518E-6

ANNEX B.9

$u_{\text{drift}, X,i}$

		IFA	KRISS	LNE	MIKES	MSL	NIST	Nmi	NMIA	NMIJ	NPL	NRC	PTB	SMU	NMC	VNIIOFI
Filter A	380	1,771E-4	3,233E-4	3,064E-4	1,761E-4	2,742E-5	8,434E-4	3,580E-4	3,406E-5	2,454E-4	1,371E-4	1,010E-4	1,227E-3	3,320E-5	3,074E-4	2,997E-4
λ (nm)	400	2,097E-4	3,204E-4	3,126E-4	2,208E-4	3,897E-5	7,996E-4	4,619E-4	1,357E-4	2,627E-4	1,573E-4	8,227E-5	1,171E-3	7,169E-5	3,002E-4	1,443E-4
	500	2,665E-4	3,450E-4	2,264E-4	9,093E-5	1,010E-5	5,629E-4	2,064E-4	7,765E-5	2,208E-4	1,299E-5	1,775E-4	8,372E-4	2,358E-5	2,396E-4	9,815E-5
	600	3,416E-4	3,046E-4	2,460E-4	1,530E-4	1,285E-4	5,586E-4	3,190E-4	4,186E-5	2,093E-4	1,299E-4	2,064E-4	6,192E-4	4,956E-5	2,887E-4	9,382E-5
	700	2,252E-4	1,205E-4	2,180E-4	1,985E-4	1,781E-4	3,238E-4	1,956E-4	1,051E-4	7,048E-5	5,990E-5	1,311E-4	5,665E-4	4,261E-4	2,591E-4	1,927E-4
	800	5,918E-5	1,010E-5	2,170E-4	2,872E-4	2,165E-4	1,371E-4	3,334E-4	1,602E-4	4,330E-6	2,165E-5	8,516E-5	4,691E-4	1,056E-3	1,732E-5	1,804E-4
	900	1,169E-4	2,887E-6	2,255E-4	1,631E-4	2,122E-4	9,671E-5	3,421E-4	1,853E-4	3,464E-5	7,361E-5	1,313E-4	2,843E-4	1,194E-3	1,140E-4	2,064E-4
	1000	1,083E-4	1,876E-5	2,377E-4	1,155E-4	2,367E-4	1,371E-4	3,522E-4	1,256E-4	4,417E-5	7,217E-5	1,198E-4	4,648E-4	1,129E-3	2,805E-4	1,241E-4
Filter B	380	6,279E-4	2,208E-4	2,766E-4	1,054E-4	3,161E-4	4,330E-5	8,660E-5	3,089E-4	8,227E-5	1,804E-4	5,961E-4	4,301E-4	5,384E-4	3,103E-4	2,584E-5
λ (nm)	400	7,347E-4	5,932E-4	4,130E-4	2,973E-5	4,142E-4	1,429E-4	3,118E-4	3,161E-4	2,078E-4	1,819E-4	6,697E-4	6,557E-4	7,924E-4	4,965E-4	2,353E-4
	500	7,000E-4	3,960E-4	4,072E-4	1,891E-4	4,186E-4	2,387E-4	2,136E-4	3,695E-4	2,685E-4	3,291E-4	6,986E-4	6,726E-4	5,066E-4	4,417E-4	2,584E-4
	600	4,576E-4	1,775E-4	1,892E-4	1,443E-5	1,905E-4	1,371E-4	5,918E-5	1,891E-4	2,454E-5	1,039E-4	4,864E-4	3,709E-4	2,396E-4	1,732E-4	2,454E-5
	700	2,524E-4	7,217E-5	1,092E-4	5,196E-5	8,011E-5	3,753E-6	4,354E-5	1,083E-5	1,306E-4	1,504E-4	2,382E-4	2,354E-4	4,907E-5	2,093E-5	1,898E-4
	800	1,891E-4	3,522E-4	1,229E-4	1,371E-4	2,165E-5	1,828E-5	1,285E-4	2,598E-5	1,111E-4	2,237E-4	1,025E-4	9,382E-5	6,351E-5	4,907E-5	2,035E-4
	900	4,330E-5	3,464E-4	1,432E-4	2,122E-4	5,485E-5	2,236E-4	2,540E-5	1,126E-4	2,021E-4	1,313E-4	6,207E-6	1,299E-5	1,443E-4	1,862E-4	3,031E-4
	1000	4,907E-5	3,940E-4	1,873E-4	3,031E-4	1,367E-4	2,694E-4	1,025E-4	1,588E-4	2,685E-4	1,588E-5	5,774E-5	7,361E-5	1,992E-4	2,309E-4	3,623E-4
Filter C	380	1,443E-6	3,464E-6	1,028E-5	6,832E-6	2,887E-7	4,763E-6	1,010E-6	7,698E-7	4,715E-6	1,631E-5	1,328E-5	3,161E-5	2,223E-5	3,464E-6	3,377E-5
λ (nm)	400	6,279E-5	4,474E-5	5,907E-5	4,691E-5	5,918E-5	3,156E-5	4,763E-5	4,994E-5	5,528E-5	6,495E-6	4,864E-5	1,765E-4	6,582E-5	6,048E-5	7,101E-5
	500	1,302E-4	3,493E-5	7,798E-5	3,204E-5	5,225E-5	5,037E-5	8,559E-5	8,372E-5	1,233E-4	4,070E-5	3,883E-5	1,680E-4	1,054E-5	5,398E-5	1,874E-4
	600	1,085E-4	2,396E-5	4,505E-5	3,940E-5	5,196E-6	1,636E-6	4,171E-5	3,331E-5	6,827E-5	1,472E-5	3,320E-6	9,151E-5	4,171E-5	9,238E-6	1,481E-4
	700	1,371E-4	5,701E-5	6,535E-5	2,454E-5	3,103E-5	1,227E-5	8,227E-5	6,640E-5	1,198E-4	2,130E-5	7,578E-6	1,547E-4	3,464E-5	4,330E-7	1,659E-4
	800	1,097E-4	1,126E-4	7,090E-5	2,309E-5	2,742E-5	3,753E-5	9,555E-5	4,547E-5	1,227E-4	6,928E-5	1,876E-5	1,501E-4	8,660E-6	8,660E-6	1,631E-4
	900	4,763E-5	6,062E-5	4,095E-5	2,887E-7	3,175E-5	1,068E-5	1,669E-4	1,443E-6	5,340E-5	1,876E-5	1,010E-5	5,196E-5	1,588E-5	2,021E-5	8,372E-5
	1000	1,819E-5	7,924E-5	3,396E-5	2,439E-5	4,244E-5	5,196E-6	1,474E-4	2,252E-5	1,126E-5	1,010E-5	8,805E-6	2,107E-6	3,421E-5	3,262E-5	3,695E-5
Filter D	380	9,057E-7	1,424E-6	1,608E-6	4,046E-7	4,147E-6	1,009E-6	1,217E-6	3,379E-7	7,504E-6	2,761E-7	1,553E-6	7,273E-7	2,534E-7	1,749E-6	1,001E-6
λ (nm)	400	8,743E-6	6,476E-7	4,583E-6	1,486E-6	6,301E-9	1,648E-5	6,488E-6	2,405E-6	5,412E-6	2,123E-7	2,563E-6	1,669E-7	1,442E-5	8,655E-7	4,261E-6
	500	6,257E-6	1,256E-5	5,670E-6	1,250E-6	8,376E-6	1,993E-5	2,185E-6	9,986E-7	3,084E-6	2,466E-6	1,715E-6	2,544E-6	9,010E-6	2,263E-6	6,740E-6
	600	2,244E-6	4,435E-6	3,739E-6	2,478E-6	2,448E-7	1,095E-5	5,578E-6	8,601E-6	9,396E-7	3,309E-7	5,484E-6	1,008E-6	3,105E-6	4,506E-6	2,437E-6
	700	9,379E-6	7,414E-6	7,216E-6	1,618E-6	9,879E-6	2,282E-5	5,763E-6	1,759E-6	3,210E-6	1,528E-6	4,993E-6	9,652E-6	7,535E-6	8,264E-6	7,206E-6
	800	5,616E-6	1,087E-6	8,229E-6	6,963E-6	7,399E-6	1,939E-5	8,233E-6	4,879E-6	3,365E-6	9,879E-6	1,305E-6	2,355E-5	3,525E-6	4,288E-6	1,573E-5
	900	6,395E-7	1,199E-6	6,205E-6	6,065E-6	3,925E-6	1,818E-5	4,915E-6	5,373E-6	8,776E-7	1,015E-5	1,121E-6	1,861E-5	1,216E-6	4,913E-6	9,696E-6
	1000	1,856E-6	5,944E-6	6,961E-6	9,248E-6	7,689E-6	1,450E-5	7,393E-6	5,767E-6	6,794E-8	1,355E-5	5,246E-6	1,501E-5	4,076E-6	2,601E-7	6,854E-6
Filter E	380	2,343E-6	1,586E-6	6,911E-7	7,463E-7	7,882E-8	1,076E-6	3,476E-7	8,274E-7	3,710E-7	3,851E-7	1,542E-7	8,428E-7	1,646E-9	6,355E-7	2,811E-7
λ (nm)	400	1,431E-7	7,591E-7	5,804E-7	7,154E-7	1,554E-6	8,782E-7	2,228E-7	5,991E-7	6,833E-8	1,074E-8	1,558E-6	4,956E-7	1,830E-7	7,734E-7	1,649E-7
	500	5,604E-7	3,154E-7	1,180E-6	4,909E-7	2,491E-6	1,477E-6	4,475E-6	1,061E-7	1,190E-6	8,623E-7	8,530E-7	1,091E-7	1,100E-6	2,179E-6	3,146E-7
	600	3,875E-7	4,045E-7	9,146E-7	1,762E-7	2,293E-6	1,432E-6	1,463E-6	3,591E-8	1,238E-6	1,860E-7	1,085E-6	6,717E-7	7,776E-8	1,596E-6	1,757E-6
	700	1,177E-6	1,052E-6	1,734E-6	1,640E-6	8,025E-6	2,995E-6	2,393E-9	2,017E-9	7,905E-8	9,390E-7	2,253E-6	4,791E-7	1,371E-6	2,959E-6	1,296E-6
	800	6,518E-8	8,401E-7	1,431E-6	2,444E-6	4,200E-7	3,685E-7	2,578E-8	6,620E-7	5,889E-7	4,294E-6	1,595E-6	5,816E-6	1,752E-8	2,785E-6	1,101E-7
	900	1,444E-6	7,170E-7	2,751E-6	3,888E-6	1,153E-6	7,272E-6	9,987E-7	1,309E-7	2,427E-6	5,868E-6	1,357E-6	6,242E-6	1,984E-6	3,064E-6	1,970E-6
	1000	3,140E-6	1,380E-6	3,189E-6	3,552E-6	2,221E-6	8,709E-6	2,197E-6	1,491E-6	2,135E-6	3,425E-6	8,945E-7	5,925E-6	2,243E-6	6,893E-6	4,382E-7

ANNEX B.10

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		IFA	KRISS	LNE	MIKES	MSL	NIST	Nmi	NMIA	NMIJ	NPL	NRC	PTB	SMU	NMC	VNIIOFI
Filter A	380	2,400E-3	2,600E-4	2,757E-4	6,000E-4	1,900E-4	3,000E-4	2,740E-4	**1,654E-4**	**1,654E-4**	**1,654E-4**	3,200E-4	4,900E-4	**1,654E-4**	**1,654E-4**	3,140E-4
λ (nm)	400	2,800E-3	2,200E-4	1,934E-4	4,000E-4	1,900E-4	3,000E-4	1,830E-4	**1,447E-4**	**1,447E-4**	**1,447E-4**	3,100E-4	4,900E-4	**1,447E-4**	1,500E-4	2,930E-4
	500	5,000E-4	1,600E-4	1,342E-4	3,000E-4	1,900E-4	2,000E-4	2,752E-4	**1,190E-4**	**1,190E-4**	**1,190E-4**	1,600E-4	4,900E-4	1,500E-4	1,200E-4	2,750E-4
	600	7,000E-4	**1,102E-4**	1,474E-4	3,000E-4	1,900E-4	4,000E-4	1,837E-4	**1,102E-4**	**1,102E-4**	**1,102E-4**	1,600E-4	4,900E-4	1,500E-4	1,200E-4	2,790E-4
	700	2,300E-3	1,500E-4	1,350E-4	3,000E-4	1,900E-4	3,000E-4	2,758E-4	**1,066E-4**	**1,066E-4**	**1,066E-4**	**1,066E-4**	4,900E-4	1,500E-4	1,100E-4	2,540E-4
	800	6,000E-4	1,500E-4	**1,077E-4**	3,000E-4	1,900E-4	2,000E-4	1,841E-4	1,150E-4	1,110E-4	**1,077E-4**	**1,077E-4**	5,100E-4	1,500E-4	**1,077E-4**	2,480E-4
	900	2,100E-3	1,600E-4	**1,137E-4**	4,000E-4	1,900E-4	3,000E-4	1,842E-4	**1,137E-4**	6,090E-4	**1,137E-4**	**1,137E-4**	1,800E-3	1,600E-4	**1,137E-4**	2,750E-4
	1000	2,000E-3	1,600E-4	**1,128E-4**	4,000E-4	1,900E-4	3,000E-4	1,842E-4	**1,128E-4**	5,120E-4	1,300E-4	**1,128E-4**	1,800E-3	xxxx	**1,128E-4**	2,890E-4
Filter B	380	8,000E-4	5,200E-4	4,559E-4	6,000E-4	5,500E-4	1,200E-3	1,021E-3	7,520E-4	1,200E-3	**4,040E-4**	4,400E-4	7,200E-4	**4,040E-4**	1,920E-3	**4,040E-4**
λ (nm)	400	1,600E-3	1,400E-4	1,734E-4	4,000E-4	1,700E-4	3,000E-4	4,245E-4	**1,384E-4**	**1,384E-4**	**1,384E-4**	2,100E-4	6,100E-4	1,600E-4	1,500E-4	3,020E-4
	500	4,000E-4	1,100E-4	1,188E-4	3,000E-4	1,700E-4	4,000E-4	4,345E-4	**1,054E-4**	**1,054E-4**	**1,054E-4**	1,300E-4	6,000E-4	1,600E-4	**1,054E-4**	2,850E-4
	600	5,000E-4	1,100E-4	1,209E-4	3,000E-4	1,700E-4	4,000E-4	4,262E-4	**1,080E-4**	**1,080E-4**	**1,080E-4**	1,300E-4	6,100E-4	1,500E-4	**1,080E-4**	2,840E-4
	700	1,400E-3	1,200E-4	1,101E-4	3,000E-4	1,700E-4	4,000E-4	4,458E-4	**1,005E-4**	**1,005E-4**	**1,005E-4**	**1,005E-4**	5,800E-4	1,500E-4	**1,005E-4**	2,650E-4
	800	4,000E-4	**1,314E-4**	**1,314E-4**	3,000E-4	1,800E-4	3,000E-4	4,038E-4	2,220E-4	1,700E-4	**1,314E-4**	**1,314E-4**	6,500E-4	1,400E-4	1,700E-4	2,960E-4
	900	1,000E-3	**1,217E-4**	1,237E-4	3,000E-4	1,700E-4	4,000E-4	3,516E-4	**1,217E-4**	6,020E-4	**1,217E-4**	1,300E-4	2,700E-4	1,400E-4	**1,217E-4**	2,750E-4
	1000	1,300E-3	**1,063E-4**	**1,063E-4**	3,000E-4	1,700E-4	3,000E-4	3,177E-4	**1,063E-4**	5,130E-4	1,300E-4	1,300E-4	2,900E-4	xxxx	**1,063E-4**	2,760E-4
Filter C	380	1,400E-4	1,040E-4	1,544E-4	1,300E-4	1,000E-4	1,400E-4	3,765E-4	1,350E-4	2,280E-4	**9,325E-5**	**9,325E-5**	9,400E-5	**9,325E-5**	3,900E-4	3,160E-4
λ (nm)	400	2,300E-4	**6,877E-5**	**6,877E-5**	9,000E-5	**6,877E-5**	1,100E-4	2,028E-4	1,120E-4	1,350E-4	**6,877E-5**	**6,877E-5**	2,200E-4	9,300E-5	1,600E-4	3,090E-4
	500	5,900E-5	**3,988E-5**	**3,988E-5**	7,000E-5	4,000E-5	1,000E-4	1,961E-4	**3,988E-5**	5,800E-5	**3,988E-5**	**3,988E-5**	2,100E-4	9,200E-5	8,000E-5	2,910E-4
	600	6,300E-5	**4,185E-5**	5,182E-5	8,000E-5	**4,185E-5**	8,000E-5	1,799E-4	**4,185E-5**	5,000E-5	**4,185E-5**	5,900E-5	2,100E-4	8,700E-5	5,000E-5	3,160E-4
	700	3,200E-4	**7,426E-5**	**7,426E-5**	1,200E-4	8,000E-5	1,700E-4	3,257E-4	**7,426E-5**	1,580E-4	**7,426E-5**	7,900E-5	3,900E-4	1,200E-4	2,300E-4	2,720E-4
	800	9,800E-5	**6,900E-5**	1,153E-4	1,100E-4	**6,900E-5**	1,400E-4	3,033E-4	2,540E-4	8,600E-5	**6,900E-5**	**6,900E-5**	4,000E-4	1,200E-4	9,000E-5	2,890E-4
	900	2,000E-4	**5,747E-5**	8,176E-5	1,000E-4	**5,747E-5**	1,000E-4	2,081E-4	9,100E-5	6,020E-4	**5,747E-5**	**5,747E-5**	1,400E-4	1,000E-4	7,000E-5	2,810E-4
	1000	8,400E-5	**3,994E-5**	6,256E-5	8,000E-5	**3,994E-5**	8,000E-5	1,550E-4	7,600E-5	5,090E-4	**3,994E-5**	**3,994E-5**	1,100E-4	xxxx	5,000E-5	2,960E-4
Filter D	380	2,000E-5	**6,563E-6**	1,535E-5	1,400E-5	8,000E-6	3,000E-5	2,367E-5	5,900E-5	3,300E-5	**6,563E-6**	**6,563E-6**	**6,563E-6**	**6,563E-6**	1,500E-5	3,270E-4
λ (nm)	400	3,000E-5	**1,044E-5**	1,218E-5	**1,044E-5**	1,600E-5	2,000E-5	1,426E-5	3,800E-5	3,700E-5	**1,044E-5**	**1,044E-5**	1,700E-5	1,400E-5	2,200E-5	3,310E-4
	500	9,600E-6	**8,572E-6**	1,078E-5	**8,572E-6**	2,000E-5	1,000E-5	2,509E-5	3,000E-5	3,300E-5	**8,572E-6**	**8,572E-6**	2,700E-5	1,900E-5	1,300E-5	2,990E-4
	600	**9,522E-6**	**9,522E-6**	1,498E-5	**9,522E-6**	2,000E-5	1,000E-5	2,820E-5	3,000E-5	4,100E-5	**9,522E-6**	**9,522E-6**	2,700E-5	2,000E-5	1,000E-5	3,140E-4
	700	5,000E-5	**2,910E-5**	2,978E-5	**2,910E-5**	4,800E-5	4,000E-5	7,123E-5	5,700E-5	5,000E-5	**2,910E-5**	**2,910E-5**	6,300E-5	4,200E-5	7,600E-5	2,850E-4
	800	2,500E-5	**2,316E-5**	3,127E-5	2,500E-5	5,200E-5	3,000E-5	8,023E-5	1,480E-4	4,100E-5	**2,316E-5**	**2,316E-5**	1,100E-4	4,800E-5	3,300E-5	3,010E-4
	900	2,400E-5	**1,767E-5**	2,319E-5	2,000E-5	4,100E-5	2,000E-5	5,610E-5	8,200E-5	5,890E-4	**1,767E-5**	**1,767E-5**	4,200E-5	3,800E-5	2,300E-5	3,040E-4
	1000	2,100E-5	**1,329E-5**	1,750E-5	1,500E-5	3,300E-5	2,000E-5	4,150E-5	4,800E-5	5,150E-4	**1,329E-5**	**1,329E-5**	3,300E-5	xxxx	**1,329E-5**	3,080E-4
Filter E	380	5,000E-5	**7,779E-7**	7,395E-6	4,000E-6	8,000E-6	2,000E-5	1,485E-6	xxxx	3,200E-5	**7,779E-7**	**7,779E-7**	**7,779E-7**	2,100E-6	**7,779E-7**	3,290E-4
λ (nm)	400	4,000E-5	**1,590E-6**	4,175E-6	2,000E-6	8,000E-6	3,000E-5	**1,590E-6**	2,900E-5	3,300E-5	**1,590E-6**	**1,590E-6**	1,800E-6	3,000E-6	2,100E-6	3,090E-4
	500	1,000E-5	**2,181E-6**	3,116E-6	3,000E-6	8,000E-6	**2,181E-6**	3,553E-6	2,000E-5	3,300E-5	3,000E-6	**2,181E-6**	2,300E-6	4,400E-6	**2,181E-6**	3,070E-4
	600	6,000E-6	**2,203E-6**	5,177E-6	**2,203E-6**	8,000E-6	**2,203E-6**	5,296E-6	2,100E-5	3,300E-5	**2,203E-6**	**2,203E-6**	2,400E-6	4,700E-6	**2,203E-6**	3,180E-4
	700	1,000E-5	**7,877E-6**	1,112E-5	**7,877E-6**	1,100E-5	1,000E-5	1,712E-5	3,400E-5	3,400E-5	**7,877E-6**	**7,877E-6**	1,600E-5	1,300E-5	2,000E-5	2,810E-4
	800	1,000E-5	**9,741E-6**	1,193E-5	**9,741E-6**	1,400E-5	2,000E-5	3,216E-5	1,870E-4	3,300E-5	**9,741E-6**	**9,741E-6**	2,800E-5	1,900E-5	1,290E-5	3,080E-4
	900	1,000E-5	**8,073E-6**	9,086E-6	9,000E-6	1,300E-5	1,000E-5	2,796E-5	9,800E-5	5,970E-4	**8,073E-6**	**8,073E-6**	2,800E-5	1,800E-5	1,040E-5	3,010E-4
	1000	1,200E-5	**7,199E-6**	7,895E-6	8,000E-6	1,200E-5	2,000E-5	2,354E-5	5,100E-5	5,030E-4	**7,199E-6**	**7,199E-6**	1,400E-5	xxxx	**7,199E-6**	3,150E-4

ANNEX B.11

$\Delta_{x,i}$

		IFA	KRISS	LNE	MIKES	MSL	NIST	Nmi	NMIA	NMIJ	NPL	NRC	PTB	SMU	NMC	VNIIOFI
Filter A	380	1,623E-3	4,850E-4	0,000E+0	-1,000E-5	1,223E-3	1,624E-3	5,100E-4	5,800E-4	8,570E-4	1,325E-4	7,850E-4	3,430E-3	4,652E-3	4,525E-4	-2,042E-3
λ (nm)	400	1,587E-3	3,050E-4	0,000E+0	-7,250E-5	1,103E-3	1,245E-3	4,450E-4	5,200E-4	7,940E-4	-3,250E-5	9,575E-4	3,628E-3	4,458E-3	6,200E-4	-1,728E-3
	500	1,405E-3	2,175E-4	0,000E+0	7,500E-6	8,525E-4	1,225E-3	-3,250E-5	5,775E-4	6,185E-4	1,075E-4	5,075E-4	3,040E-3	3,945E-3	3,750E-4	-8,850E-4
	600	1,485E-3	1,875E-4	0,000E+0	-1,900E-4	7,325E-4	8,125E-4	-7,500E-6	5,075E-4	7,615E-4	2,500E-4	5,225E-4	2,793E-3	3,023E-3	2,150E-4	-6,695E-4
	700	1,690E-3	5,375E-5	0,000E+0	-2,588E-4	6,165E-4	9,258E-4	9,375E-5	5,307E-4	4,646E-4	4,462E-4	5,596E-4	3,506E-3	2,484E-3	4,088E-4	-3,703E-4
	800	1,498E-3	2,500E-6	0,000E+0	3,275E-4	5,250E-4	1,082E-3	6,275E-4	3,895E-4	3,365E-4	6,575E-4	5,325E-4	4,118E-3	2,720E-3	1,450E-3	-3,545E-4
	900	1,673E-3	7,500E-5	0,000E+0	2,525E-4	5,175E-4	1,132E-3	5,875E-4	2,710E-4	7,740E-4	6,025E-4	5,625E-4	5,875E-4	1,750E-3	1,188E-3	-4,875E-4
	1000	1,603E-3	4,250E-5	0,000E+0	1,250E-4	5,100E-4	1,132E-3	6,350E-4	6,725E-4	8,525E-4	4,050E-4	4,625E-4	1,230E-3	xxxx	1,179E-3	-2,270E-4
Filter B	380	-2,387E-3	1,603E-3	0,000E+0	5,318E-3	3,418E-3	2,705E-3	1,730E-3	1,391E-3	1,607E-3	1,825E-4	-3,125E-4	3,000E-4	7,498E-4	2,233E-3	2,734E-3
λ (nm)	400	-2,075E-4	1,963E-3	0,000E+0	1,764E-3	8,675E-4	1,172E-3	1,030E-3	1,205E-3	1,187E-3	7,750E-4	4,550E-4	2,086E-3	1,293E-4	2,510E-3	7,285E-4
	500	-4,250E-5	2,509E-3	0,000E+0	1,202E-3	2,800E-4	1,448E-3	6,900E-4	5,960E-4	8,040E-4	1,370E-3	2,350E-4	1,270E-3	-8,130E-5	1,665E-3	1,306E-3
	600	-1,875E-4	2,128E-3	0,000E+0	1,165E-3	1,150E-4	1,293E-3	5,475E-4	-1,205E-4	4,905E-4	1,430E-3	-4,750E-5	1,008E-3	-3,099E-4	1,395E-3	6,065E-4
	700	-4,104E-4	1,428E-3	0,000E+0	9,725E-4	1,212E-4	5,985E-4	2,379E-4	-1,475E-5	3,863E-4	1,271E-4	-5,500E-5	6,303E-4	-5,657E-4	9,988E-4	5,507E-4
	800	-5,975E-4	1,430E-3	0,000E+0	7,375E-4	7,500E-6	4,417E-4	6,125E-4	1,020E-4	5,125E-4	-1,775E-4	3,575E-4	1,112E-3	-3,295E-4	6,650E-4	-1,075E-4
	900	-2,005E-3	1,035E-3	0,000E+0	4,825E-4	2,500E-5	3,823E-4	4,910E-4	7,100E-5	2,710E-4	-3,325E-4	1,007E-4	-1,625E-4	-4,570E-4	8,625E-4	2,660E-4
	1000	-2,335E-3	6,925E-4	0,000E+0	5,750E-4	1,883E-4	2,667E-4	2,275E-4	5,600E-5	5,690E-4	-2,275E-4	4,000E-5	4,375E-4	xxxx	8,400E-4	2,935E-4
Filter C	380	-4,775E-4	-1,040E-4	0,000E+0	9,582E-4	6,545E-4	3,478E-4	5,675E-5	3,317E-4	1,838E-4	-7,175E-5	-8,800E-5	-1,475E-5	-3,360E-5	1,490E-4	4,035E-4
λ (nm)	400	-3,038E-4	-4,535E-4	0,000E+0	1,888E-4	3,325E-4	1,203E-4	-9,250E-5	2,655E-4	2,472E-4	-1,788E-4	-2,425E-5	2,892E-4	-3,563E-4	1,902E-4	-4,120E-4
	500	-5,500E-6	2,365E-4	0,000E+0	8,950E-5	-3,550E-5	2,677E-4	2,667E-4	3,000E-6	1,935E-4	4,295E-4	7,750E-6	4,740E-4	-2,760E-4	1,650E-5	1,755E-4
	600	-2,300E-5	4,055E-4	0,000E+0	3,083E-4	6,000E-6	2,922E-4	3,027E-4	5,630E-5	1,397E-4	4,195E-4	7,175E-5	2,690E-4	-9,215E-5	1,410E-4	2,035E-4
	700	-5,250E-5	1,278E-4	0,000E+0	2,450E-4	3,287E-4	1,647E-4	1,675E-4	1,825E-4	6,500E-5	2,081E-4	-6,687E-5	7,538E-5	-4,403E-4	-6,750E-6	7,017E-4
	800	-1,700E-4	2,620E-4	0,000E+0	-5,000E-5	-5,250E-5	7,000E-5	2,005E-4	7,775E-5	6,950E-5	1,450E-4	1,075E-4	2,900E-4	-3,932E-4	2,000E-5	-1,365E-4
	900	6,250E-5	1,590E-4	0,000E+0	-3,950E-5	-4,500E-5	5,850E-5	4,560E-4	-1,750E-5	-7,650E-5	7,500E-6	5,250E-5	1,100E-4	-3,812E-4	7,000E-5	1,700E-5
	1000	-1,650E-5	-4,275E-5	0,000E+0	4,750E-6	1,850E-5	1,900E-5	2,362E-4	3,100E-5	4,850E-5	-1,750E-5	-3,025E-5	1,564E-4	xxxx	-3,500E-6	-4,700E-5
Filter D	380	-5,046E-5	-1,251E-5	0,000E+0	4,537E-5	1,779E-5	1,878E-5	-3,628E-6	2,550E-5	-1,479E-5	-2,217E-5	-4,813E-6	-1,598E-5	5,380E-6	7,333E-6	-2,454E-5
λ (nm)	400	-1,110E-4	-7,719E-5	0,000E+0	3,853E-5	5,128E-5	2,868E-5	-4,196E-5	-1,550E-5	-9,484E-6	-3,786E-5	9,051E-8	-2,929E-5	-3,276E-5	4,660E-5	-7,346E-5
	500	1,520E-6	4,128E-5	0,000E+0	2,144E-5	-6,444E-6	5,262E-5	7,823E-6	-1,431E-5	-8,453E-7	1,105E-5	-1,238E-6	3,088E-7	-1,872E-5	1,092E-6	-7,996E-6
	600	7,440E-7	8,828E-5	0,000E+0	6,399E-5	1,444E-5	7,559E-5	5,315E-5	4,105E-6	3,399E-5	6,156E-5	2,780E-5	1,236E-5	1,529E-5	4,448E-5	4,146E-5
	700	-2,517E-5	1,031E-4	0,000E+0	1,344E-4	5,410E-5	9,332E-5	5,798E-5	5,674E-5	2,174E-5	4,051E-5	-4,086E-6	-3,919E-5	-7,762E-5	1,562E-5	2,449E-4
	800	-9,205E-5	5,554E-5	0,000E+0	2,119E-5	3,514E-6	-1,440E-5	9,731E-5	3,024E-5	3,447E-5	4,330E-5	1,818E-5	3,645E-5	-1,098E-4	-3,041E-7	1,432E-5
	900	1,625E-6	-3,321E-5	0,000E+0	7,343E-6	-2,055E-5	2,186E-5	-1,045E-5	8,233E-5	1,254E-5	-5,465E-6	1,552E-5	5,255E-5	-8,290E-5	-1,423E-5	-1,503E-5
	1000	9,559E-5	-6,753E-5	0,000E+0	1,718E-5	-3,631E-6	-7,027E-6	-4,029E-5	6,735E-5	-2,921E-5	-1,576E-5	7,601E-7	3,662E-5		-1,068E-5	-1,028E-5
Filter E	380	7,945E-5	3,547E-6	0,000E+0	1,282E-6	2,305E-6	5,380E-6	-5,818E-7	xxxx	4,703E-7	-8,722E-7	-3,010E-6	-6,594E-6	7,328E-6	1,055E-6	1,002E-4
λ (nm)	400	6,807E-5	-1,985E-6	0,000E+0	6,701E-7	3,930E-6	-2,316E-6	-2,078E-6	-4,871E-5	-1,462E-6	-7,945E-7	-3,772E-6	-7,554E-7	6,256E-6	4,435E-6	-3,343E-5
	500	-2,690E-5	4,491E-6	0,000E+0	6,685E-6	1,243E-6	7,415E-6	2,293E-6	-8,493E-6	-8,063E-6	-1,562E-6	2,556E-6	3,444E-6	8,552E-6	3,209E-7	-1,299E-5
	600	1,276E-5	1,914E-5	0,000E+0	1,212E-5	3,861E-6	1,285E-5	7,336E-6	5,497E-6	-5,346E-6	6,767E-6	4,046E-6	3,505E-6	1,801E-5	9,046E-6	4,123E-6
	700	-7,432E-6	4,598E-5	0,000E+0	2,761E-5	1,810E-5	2,120E-5	8,276E-6	-2,700E-5	-8,545E-6	5,778E-6	1,138E-5	-6,115E-6	-8,003E-6	1,901E-6	5,141E-5
	800	7,932E-5	9,822E-6	0,000E+0	4,905E-6	9,224E-6	2,397E-5	-5,311E-6	2,831E-4	-1,270E-5	2,467E-5	1,047E-5	-1,175E-7	-3,960E-5	8,517E-6	-2,244E-6
	900	1,077E-5	-1,971E-5	0,000E+0	4,293E-6	1,771E-6	1,051E-5	-1,397E-5	3,162E-5	-9,937E-6	-5,416E-6	-4,537E-7	4,897E-5	-4,187E-5	-6,842E-7	-2,454E-5
	1000	4,088E-6	-3,925E-5	0,000E+0	8,009E-6	6,678E-6	-6,576E-7	-2,540E-5	-1,006E-4	1,412E-5	-6,093E-6	-1,346E-5	1,162E-5	xxxx	-1,245E-5	-2,425E-5

ANNEX B.12

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		IFA	KRISS	LNE	MIKES	MSL	NIST	Nmi	NMIA	NMIJ	NPL	NRC	PTB	SMU	NMC	VNIIOFI
Filter A	380	2,423E-3	4,272E-4	4,122E-4	6,970E-4	3,343E-4	9,341E-4	5,052E-4	3,209E-4	4,174E-4	3,223E-4	3,700E-4	1,350E-3	3,125E-4	4,391E-4	5,918E-4
λ (nm)	400	2,811E-3	4,653E-4	3,676E-4	4,939E-4	2,226E-4	8,818E-4	5,248E-4	2,217E-4	3,440E-4	2,916E-4	3,910E-4	1,273E-3	2,178E-4	4,028E-4	3,962E-4
	500	5,856E-4	3,890E-4	2,632E-4	3,303E-4	2,065E-4	6,069E-4	3,612E-4	1,583E-4	2,823E-4	1,685E-4	2,591E-4	9,738E-4	1,956E-4	2,903E-4	3,391E-4
	600	7,914E-4	3,416E-4	2,868E-4	3,849E-4	2,711E-4	6,983E-4	4,256E-4	1,235E-4	2,476E-4	2,284E-4	2,903E-4	7,960E-4	1,821E-4	3,437E-4	3,094E-4
	700	2,313E-3	2,190E-4	2,564E-4	3,983E-4	2,767E-4	4,496E-4	3,441E-4	2,033E-4	1,696E-4	1,690E-4	2,148E-4	7,545E-4	4,624E-4	2,976E-4	3,657E-4
	800	6,038E-4	1,532E-4	2,415E-4	4,561E-4	2,888E-4	2,430E-4	3,819E-4	2,116E-4	1,173E-4	5,037E-5	1,305E-4	7,455E-4	1,070E-3	1,048E-4	3,081E-4
	900	2,103E-3	1,605E-4	2,458E-4	4,323E-4	2,860E-4	3,159E-4	3,897E-4	2,556E-4	6,109E-4	1,123E-4	1,552E-4	1,840E-3	1,205E-3	1,533E-4	3,441E-4
	1000	2,003E-3	1,625E-4	2,561E-4	4,546E-4	3,043E-4	3,305E-4	3,994E-4	1,374E-4	5,161E-4	1,533E-4	1,528E-4	1,867E-3	xxxx	2,984E-4	3,165E-4
Filter B	380	1,023E-3	5,875E-4	5,332E-4	6,215E-4	6,587E-4	1,207E-3	1,026E-3	8,336E-4	1,249E-3	3,048E-4	7,507E-4	9,209E-4	5,657E-4	1,956E-3	3,550E-4
λ (nm)	400	1,763E-3	6,258E-4	4,479E-4	4,141E-4	4,784E-4	3,701E-4	5,734E-4	3,449E-4	3,140E-4	3,093E-4	7,079E-4	9,072E-4	8,454E-4	5,329E-4	4,233E-4
	500	8,141E-4	4,224E-4	4,242E-4	3,685E-4	4,614E-4	4,800E-4	4,942E-4	3,876E-4	2,939E-4	3,422E-4	7,159E-4	9,050E-4	5,345E-4	4,760E-4	4,046E-4
	600	6,841E-4	2,130E-4	2,245E-4	3,039E-4	2,795E-4	4,362E-4	4,443E-4	2,416E-4	1,206E-4	1,582E-4	5,191E-4	7,227E-4	3,039E-4	2,397E-4	2,990E-4
	700	1,427E-3	1,676E-4	1,551E-4	3,113E-4	2,067E-4	4,111E-4	4,550E-4	1,181E-4	1,827E-4	1,783E-4	2,618E-4	6,282E-4	1,740E-4	1,384E-4	3,446E-4
	800	4,428E-4	3,692E-4	1,795E-4	3,363E-4	1,819E-4	3,300E-4	4,244E-4	2,240E-4	2,035E-4	2,322E-4	1,385E-4	6,571E-4	1,564E-4	1,776E-4	3,598E-4
	900	1,001E-3	3,643E-4	1,892E-4	3,679E-4	1,794E-4	4,588E-4	3,553E-4	1,385E-4	6,351E-4	1,656E-4	1,314E-4	2,706E-4	2,053E-4	2,228E-4	4,101E-4
	1000	1,301E-3	4,026E-4	2,075E-4	4,266E-4	2,185E-4	4,035E-4	3,344E-4	1,721E-4	5,792E-4	1,323E-4	1,434E-4	2,995E-4	xxxx	2,455E-4	4,557E-4
Filter C	380	1,430E-4	1,057E-4	1,548E-4	1,313E-4	1,036E-4	1,415E-4	3,770E-4	1,398E-4	2,292E-4	6,814E-5	8,827E-5	1,053E-4	5,723E-5	3,906E-4	3,196E-4
λ (nm)	400	2,459E-4	7,810E-5	7,883E-5	1,137E-4	9,091E-5	1,221E-4	2,109E-4	1,317E-4	1,569E-4	6,014E-5	7,952E-5	2,836E-4	1,222E-4	1,747E-4	3,193E-4
	500	1,446E-4	4,476E-5	8,635E-5	8,260E-5	6,787E-5	1,138E-4	2,159E-4	9,253E-5	1,380E-4	5,480E-5	6,386E-5	2,699E-4	9,403E-5	9,882E-5	3,466E-4
	600	1,279E-4	4,028E-5	6,866E-5	9,563E-5	3,718E-5	8,325E-5	1,878E-4	5,455E-5	9,016E-5	4,812E-5	7,210E-5	2,301E-4	1,009E-4	6,196E-5	3,506E-4
	700	3,494E-4	9,198E-5	8,174E-5	1,250E-4	1,035E-4	1,771E-4	3,381E-4	8,503E-5	1,998E-4	4,645E-5	8,753E-5	4,202E-4	1,278E-4	2,347E-4	3,201E-4
	800	1,471E-4	1,206E-4	1,353E-4	1,126E-4	5,764E-5	1,452E-4	3,180E-4	2,581E-4	1,500E-4	7,598E-5	4,964E-5	4,273E-4	1,211E-4	9,201E-5	3,320E-4
	900	2,056E-4	7,484E-5	9,145E-5	1,002E-4	5,130E-5	1,007E-4	2,668E-4	9,105E-5	6,044E-4	2,815E-5	3,007E-5	1,494E-4	1,014E-4	7,288E-5	2,932E-4
	1000	8,599E-5	8,217E-5	7,118E-5	8,367E-5	5,211E-5	8,030E-5	2,139E-4	7,936E-5	5,091E-4	2,265E-5	2,212E-5	1,101E-4	xxxx	5,978E-5	2,983E-4
Filter D	380	2,171E-5	1,048E-5	1,543E-5	1,774E-5	1,480E-5	3,130E-5	2,843E-5	5,916E-5	3,898E-5	1,386E-5	6,004E-6	1,658E-5	8,863E-6	1,587E-5	3,270E-4
λ (nm)	400	3,213E-5	1,444E-5	1,302E-5	1,407E-5	1,781E-5	2,795E-5	1,881E-5	4,527E-5	3,824E-5	1,062E-5	1,371E-5	2,044E-5	2,356E-5	2,558E-5	3,312E-4
	500	1,443E-5	1,825E-5	1,218E-5	8,517E-6	2,270E-5	2,312E-5	2,667E-5	3,136E-5	3,394E-5	1,151E-5	1,080E-5	2,841E-5	2,473E-5	1,697E-5	2,992E-4
	600	1,460E-5	1,470E-5	1,544E-5	1,296E-5	2,275E-5	1,779E-5	3,192E-5	3,179E-5	4,250E-5	9,843E-6	1,469E-5	2,853E-5	2,251E-5	2,637E-5	3,141E-4
	700	5,504E-5	4,866E-5	3,064E-5	2,682E-5	5,886E-5	4,849E-5	7,367E-5	6,063E-5	5,311E-5	2,254E-5	2,367E-5	6,614E-5	4,617E-5	9,295E-5	2,857E-4
	800	2,844E-5	1,862E-5	3,233E-5	2,875E-5	5,359E-5	7,768E-5	8,785E-5	1,485E-4	4,256E-5	2,046E-5	1,919E-5	1,132E-4	4,963E-5	3,539E-5	3,017E-4
	900	2,424E-5	1,639E-5	2,401E-5	2,116E-5	4,131E-5	2,728E-5	5,645E-5	8,234E-5	5,890E-4	1,324E-5	8,514E-6	4,611E-5	3,811E-5	2,448E-5	3,042E-4
	1000	2,124E-5	1,449E-5	1,883E-5	1,778E-5	3,397E-5	2,487E-5	4,228E-5	4,840E-5	5,150E-4	1,643E-5	8,766E-6	3,632E-5	xxxx	1,410E-5	3,081E-4
Filter E	380	5,087E-5	6,718E-6	7,428E-6	9,825E-6	9,152E-6	2,116E-5	1,042E-5	xxxx	3,212E-5	4,836E-6	1,045E-5	9,374E-6	7,082E-6	7,448E-6	3,292E-4
λ (nm)	400	4,030E-5	4,047E-6	4,215E-6	4,423E-6	8,938E-6	3,068E-5	2,215E-6	2,915E-5	3,305E-5	4,718E-6	3,606E-6	4,743E-6	3,716E-6	4,077E-6	3,090E-4
	500	1,047E-5	1,972E-6	3,332E-6	3,581E-6	8,816E-6	3,234E-6	5,996E-6	2,009E-5	3,311E-5	4,046E-6	5,019E-6	4,251E-6	4,789E-6	3,890E-6	3,070E-4
	600	6,622E-6	1,635E-5	5,257E-6	5,568E-6	9,078E-6	4,005E-6	6,255E-6	2,119E-5	3,313E-5	4,096E-6	4,010E-6	5,785E-6	6,004E-6	3,514E-6	3,180E-4
	700	1,378E-5	2,574E-5	1,125E-5	1,091E-5	1,585E-5	1,836E-5	1,913E-5	3,454E-5	3,477E-5	1,328E-5	9,529E-6	1,837E-5	1,582E-5	2,231E-5	2,811E-4
	800	1,238E-5	9,630E-6	1,201E-5	1,034E-5	1,537E-5	2,097E-5	3,249E-5	1,871E-4	3,451E-5	1,057E-5	9,638E-6	2,901E-5	2,010E-5	1,624E-5	3,080E-4
	900	1,078E-5	6,359E-6	9,494E-6	1,006E-5	1,362E-5	1,246E-5	2,803E-5	9,806E-5	5,970E-4	8,005E-6	6,433E-6	2,916E-5	1,859E-5	1,131E-5	3,010E-4
	1000	1,259E-5	5,971E-6	8,515E-6	9,020E-6	1,244E-5	2,199E-5	2,373E-5	5,107E-5	5,030E-4	1,036E-5	5,851E-6	1,571E-5	xxxx	9,416E-6	3,150E-4

ANNEX B.13

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		IFA	KRISS	LNE	MIKES	MSL	NIST	Nmi	NMIA	NMIJ	NPL	NRC	PTB	SMU	NMC	VNIIOFI
Filter A	380	2,423E-3	4,272E-4	4,122E-4	6,970E-4	3,343E-4	9,341E-4	5,052E-4	3,348E-4	4,285E-4	3,573E-4	3,700E-4	1,350E-3	3,246E-4	4,508E-4	5,918E-4
λ (nm)	400	2,811E-3	4,653E-4	3,676E-4	4,939E-4	2,226E-4	8,818E-4	5,248E-4	2,344E-4	3,572E-4	3,179E-4	3,910E-4	1,273E-3	2,208E-4	4,028E-4	3,962E-4
	500	5,856E-4	3,890E-4	2,632E-4	3,303E-4	2,065E-4	6,069E-4	3,612E-4	1,857E-4	2,863E-4	2,002E-4	2,591E-4	9,738E-4	1,956E-4	2,903E-4	3,391E-4
	600	7,914E-4	3,416E-4	2,868E-4	3,849E-4	2,711E-4	6,983E-4	4,256E-4	1,568E-4	2,514E-4	2,505E-4	2,903E-4	7,960E-4	1,821E-4	3,437E-4	3,094E-4
	700	2,313E-3	2,190E-4	2,564E-4	3,983E-4	2,767E-4	4,496E-4	3,441E-4	2,207E-4	1,814E-4	1,871E-4	2,222E-4	7,545E-4	4,624E-4	2,976E-4	3,657E-4
	800	6,038E-4	1,532E-4	2,423E-4	4,561E-4	2,888E-4	2,430E-4	3,819E-4	2,116E-4	1,173E-4	1,120E-4	1,433E-4	7,455E-4	1,070E-3	1,122E-4	3,081E-4
	900	2,103E-3	1,605E-4	2,526E-4	4,323E-4	2,860E-4	3,159E-4	3,897E-4	2,756E-4	6,109E-4	1,384E-4	1,750E-4	1,840E-3	1,205E-3	1,626E-4	3,441E-4
	1000	2,003E-3	1,625E-4	2,631E-4	4,546E-4	3,043E-4	3,305E-4	3,994E-4	1,732E-4	5,161E-4	1,533E-4	1,723E-4	1,867E-3	xxxx	3,030E-4	3,165E-4
Filter B	380	1,023E-3	5,875E-4	5,332E-4	6,215E-4	6,587E-4	1,207E-3	1,026E-3	8,336E-4	1,249E-3	4,691E-4	7,507E-4	9,209E-4	6,787E-4	1,956E-3	4,278E-4
λ (nm)	400	1,763E-3	6,258E-4	4,479E-4	4,141E-4	4,784E-4	3,701E-4	5,734E-4	3,595E-4	3,176E-4	3,267E-4	7,079E-4	9,072E-4	8,454E-4	5,329E-4	4,233E-4
	500	8,141E-4	4,224E-4	4,242E-4	3,685E-4	4,614E-4	4,800E-4	4,942E-4	3,952E-4	2,984E-4	3,512E-4	7,159E-4	9,050E-4	5,345E-4	4,792E-4	4,046E-4
	600	6,841E-4	2,130E-4	2,245E-4	3,039E-4	2,795E-4	4,362E-4	4,443E-4	2,555E-4	1,318E-4	1,690E-4	5,191E-4	7,227E-4	3,039E-4	2,432E-4	2,990E-4
	700	1,427E-3	1,676E-4	1,551E-4	3,113E-4	2,067E-4	4,111E-4	4,550E-4	1,346E-4	1,846E-4	1,923E-4	2,656E-4	6,282E-4	1,740E-4	1,454E-4	3,446E-4
	800	4,428E-4	3,762E-4	1,799E-4	3,363E-4	1,819E-4	3,300E-4	4,244E-4	2,240E-4	2,035E-4	2,599E-4	1,684E-4	6,571E-4	1,564E-4	1,776E-4	3,598E-4
	900	1,001E-3	3,680E-4	1,892E-4	3,679E-4	1,794E-4	4,588E-4	3,553E-4	1,661E-4	6,351E-4	1,796E-4	1,314E-4	2,706E-4	2,053E-4	2,237E-4	4,101E-4
	1000	1,301E-3	4,087E-4	2,154E-4	4,266E-4	2,185E-4	4,035E-4	3,344E-4	1,916E-4	5,792E-4	1,323E-4	1,434E-4	2,995E-4	xxxx	2,553E-4	4,557E-4
Filter C	380	1,430E-4	1,057E-4	1,548E-4	1,313E-4	1,036E-4	1,415E-4	3,770E-4	1,398E-4	2,292E-4	9,869E-5	9,535E-5	1,053E-4	1,030E-4	3,906E-4	3,196E-4
λ (nm)	400	2,459E-4	9,233E-5	9,066E-5	1,137E-4	1,024E-4	1,221E-4	2,109E-4	1,317E-4	1,569E-4	7,646E-5	8,834E-5	2,836E-4	1,222E-4	1,747E-4	3,193E-4
	500	1,446E-4	5,494E-5	8,759E-5	8,260E-5	6,787E-5	1,138E-4	2,159E-4	9,485E-5	1,380E-4	6,078E-5	6,557E-5	2,699E-4	9,403E-5	9,882E-5	3,466E-4
	600	1,279E-4	5,195E-5	6,866E-5	9,563E-5	4,727E-5	8,325E-5	1,878E-4	6,279E-5	9,016E-5	4,967E-5	7,210E-5	2,301E-4	1,009E-4	6,196E-5	3,506E-4
	700	3,494E-4	9,527E-5	9,892E-5	1,250E-4	1,035E-4	1,771E-4	3,381E-4	1,031E-4	1,998E-4	8,230E-5	8,753E-5	4,202E-4	1,278E-4	2,347E-4	3,201E-4
	800	1,471E-4	1,322E-4	1,353E-4	1,126E-4	7,473E-5	1,452E-4	3,180E-4	2,581E-4	1,500E-4	9,815E-5	7,212E-5	4,273E-4	1,211E-4	9,201E-5	3,320E-4
	900	2,056E-4	8,980E-5	9,145E-5	1,002E-4	6,584E-5	1,007E-4	2,668E-4	9,105E-5	6,044E-4	6,079E-5	5,851E-5	1,494E-4	1,014E-4	7,288E-5	2,932E-4
	1000	8,599E-5	8,891E-5	7,118E-5	8,367E-5	5,840E-5	8,030E-5	2,139E-4	7,936E-5	5,091E-4	4,133E-5	4,104E-5	1,101E-4	xxxx	5,978E-5	2,983E-4
Filter D	380	2,171E-5	1,199E-5	1,543E-5	1,774E-5	1,480E-5	3,130E-5	2,843E-5	5,916E-5	3,898E-5	1,480E-5	8,731E-6	1,758E-5	1,035E-5	1,587E-5	3,270E-4
λ (nm)	400	3,213E-5	1,639E-5	1,302E-5	1,679E-5	1,781E-5	2,795E-5	1,881E-5	4,527E-5	3,824E-5	1,363E-5	1,463E-5	2,044E-5	2,356E-5	2,558E-5	3,312E-4
	500	1,443E-5	1,977E-5	1,218E-5	9,850E-6	2,270E-5	2,312E-5	2,667E-5	3,136E-5	3,394E-5	1,304E-5	1,108E-5	2,841E-5	2,473E-5	1,697E-5	2,992E-4
	600	1,510E-5	1,606E-5	1,544E-5	1,332E-5	2,275E-5	1,779E-5	3,192E-5	3,179E-5	4,250E-5	1,177E-5	1,471E-5	2,853E-5	2,251E-5	2,637E-5	3,141E-4
	700	5,504E-5	5,342E-5	3,064E-5	3,354E-5	5,886E-5	4,849E-5	7,367E-5	6,063E-5	5,311E-5	3,315E-5	3,344E-5	6,614E-5	4,617E-5	9,295E-5	2,857E-4
	800	2,844E-5	2,565E-5	3,233E-5	2,875E-5	5,359E-5	7,768E-5	8,785E-5	1,485E-4	4,256E-5	2,803E-5	2,712E-5	1,132E-4	4,963E-5	3,539E-5	3,017E-4
	900	2,424E-5	1,803E-5	2,401E-5	2,116E-5	4,131E-5	2,728E-5	5,645E-5	8,234E-5	5,890E-4	2,059E-5	1,825E-5	4,611E-5	3,811E-5	2,448E-5	3,042E-4
	1000	2,124E-5	1,475E-5	1,883E-5	1,778E-5	3,397E-5	2,487E-5	4,228E-5	4,840E-5	5,150E-4	1,912E-5	1,453E-5	3,632E-5	xxxx	1,521E-5	3,081E-4
Filter E	380	5,087E-5	6,760E-6	7,428E-6	9,825E-6	9,152E-6	2,116E-5	1,042E-5	xxxx	3,212E-5	4,894E-6	1,046E-5	9,402E-6	7,082E-6	7,456E-6	3,292E-4
λ (nm)	400	4,030E-5	4,207E-6	4,215E-6	4,423E-6	8,938E-6	3,068E-5	2,392E-6	2,915E-5	3,305E-5	4,877E-6	3,919E-6	4,743E-6	3,716E-6	4,077E-6	3,090E-4
	500	1,047E-5	2,684E-6	3,332E-6	3,581E-6	8,816E-6	3,901E-6	5,996E-6	2,009E-5	3,311E-5	4,046E-6	5,421E-6	4,251E-6	4,789E-6	4,034E-6	3,070E-4
	600	6,622E-6	1,642E-5	5,257E-6	5,644E-6	9,078E-6	4,571E-6	6,255E-6	2,119E-5	3,313E-5	4,198E-6	4,481E-6	5,785E-6	6,004E-6	3,736E-6	3,180E-4
	700	1,378E-5	2,622E-5	1,125E-5	1,204E-5	1,585E-5	1,836E-5	1,913E-5	3,454E-5	3,477E-5	1,460E-5	1,176E-5	1,837E-5	1,582E-5	2,231E-5	2,811E-4
	800	1,238E-5	1,140E-5	1,201E-5	1,174E-5	1,537E-5	2,097E-5	3,249E-5	1,871E-4	3,451E-5	1,194E-5	1,255E-5	2,901E-5	2,010E-5	1,624E-5	3,080E-4
	900	1,078E-5	8,551E-6	9,494E-6	1,006E-5	1,362E-5	1,246E-5	2,803E-5	9,806E-5	5,970E-4	1,021E-5	8,798E-6	2,916E-5	1,859E-5	1,131E-5	3,010E-4
	1000	1,259E-5	7,637E-6	8,515E-6	9,020E-6	1,244E-5	2,199E-5	2,373E-5	5,107E-5	5,030E-4	1,109E-5	7,614E-6	1,571E-5	xxxx	1,034E-5	3,150E-4

ANNEX B.14

w_i

		IFA	KRISS	LNE	MIKES	MSL	NIST	Nmi	NMIA	NMIJ	NPL	NRC	PTB	SMU	NMC	VNIIOFI
Filter A	380	2,273E-3	7,313E-2	7,854E-2	2,747E-2	1,194E-1	1,530E-2	5,229E-2	1,190E-1	7,269E-2	1,046E-1	9,751E-2	7,326E-3	1,266E-1	6,568E-2	3,811E-2
λ (nm)	400	1,078E-3	3,932E-2	6,301E-2	3,490E-2	1,718E-1	1,095E-2	3,091E-2	1,549E-1	6,670E-2	8,424E-2	5,568E-2	5,251E-3	1,745E-1	5,247E-2	5,424E-2
	500	1,489E-2	3,375E-2	7,375E-2	4,682E-2	1,198E-1	1,387E-2	3,914E-2	1,482E-1	6,232E-2	1,275E-1	7,609E-2	5,386E-3	1,335E-1	6,062E-2	4,441E-2
	600	8,622E-3	4,627E-2	6,565E-2	3,645E-2	7,346E-2	1,107E-2	2,981E-2	2,196E-1	8,541E-2	8,608E-2	6,406E-2	8,521E-3	1,629E-1	4,571E-2	5,639E-2
	700	9,642E-4	1,075E-1	7,842E-2	3,251E-2	6,737E-2	2,552E-2	4,354E-2	1,058E-1	1,566E-1	1,473E-1	1,044E-1	9,059E-3	2,411E-2	5,823E-2	3,857E-2
	800	6,547E-3	1,017E-1	4,066E-2	1,147E-2	2,861E-2	4,040E-2	1,636E-2	5,331E-2	1,734E-1	1,903E-1	1,162E-1	4,295E-3	2,085E-3	1,896E-1	2,514E-2
	900	9,542E-4	1,640E-1	6,617E-2	2,258E-2	5,160E-2	4,229E-2	2,780E-2	5,557E-2	1,131E-2	2,205E-1	1,378E-1	1,246E-3	2,905E-3	1,597E-1	3,564E-2
	1000	1,143E-3	1,736E-1	6,621E-2	2,218E-2	4,951E-2	4,198E-2	2,874E-2	1,528E-1	1,721E-2	1,951E-1	1,545E-1	1,316E-3	xxxx	4,994E-2	4,578E-2
Filter B	380	3,046E-2	9,233E-2	1,121E-1	8,252E-2	7,346E-2	2,188E-2	3,029E-2	4,587E-2	2,042E-2	1,449E-1	5,656E-2	3,758E-2	6,918E-2	8,331E-3	1,742E-1
λ (nm)	400	4,655E-3	3,693E-2	7,209E-2	8,436E-2	6,320E-2	1,056E-1	4,399E-2	1,119E-1	1,434E-1	1,355E-1	2,886E-2	1,757E-2	2,024E-2	5,094E-2	8,073E-2
	500	1,984E-2	7,368E-2	7,308E-2	9,684E-2	6,178E-2	5,708E-2	5,384E-2	8,421E-2	1,477E-1	1,066E-1	2,566E-2	1,605E-2	4,603E-2	5,727E-2	8,032E-2
	600	9,274E-3	9,565E-2	8,608E-2	4,699E-2	5,554E-2	2,281E-2	2,199E-2	6,649E-2	2,500E-1	1,519E-1	1,611E-2	8,311E-3	4,698E-2	7,339E-2	4,853E-2
	700	1,448E-3	1,050E-1	1,226E-1	3,043E-2	6,902E-2	1,745E-2	1,424E-2	1,627E-1	8,651E-2	7,973E-2	4,181E-2	7,473E-3	9,737E-2	1,394E-1	2,483E-2
	800	1,863E-2	2,582E-2	1,130E-1	3,230E-2	1,104E-1	3,355E-2	2,029E-2	7,283E-2	8,826E-2	5,409E-2	1,289E-1	8,462E-3	1,494E-1	1,158E-1	2,822E-2
	900	3,585E-3	2,653E-2	1,003E-1	2,655E-2	1,116E-1	1,707E-2	2,846E-2	1,302E-1	8,908E-3	1,114E-1	2,080E-1	4,905E-2	8,521E-2	7,179E-2	2,136E-2
	1000	2,492E-3	2,527E-2	9,100E-2	2,320E-2	8,837E-2	2,593E-2	3,775E-2	1,150E-1	1,258E-2	2,410E-1	2,053E-1	4,704E-2	xxxx	6,477E-2	2,032E-2
Filter C	380	5,607E-2	1,027E-1	4,787E-2	6,655E-2	1,069E-1	5,726E-2	8,065E-3	5,866E-2	2,183E-2	1,177E-1	1,261E-1	1,033E-1	1,082E-1	7,516E-3	1,123E-2
λ (nm)	400	1,595E-2	1,131E-1	1,173E-1	7,463E-2	9,188E-2	6,468E-2	2,167E-2	5,555E-2	3,918E-2	1,649E-1	1,235E-1	1,199E-2	6,455E-2	3,159E-2	9,458E-3
	500	2,550E-2	1,766E-1	6,947E-2	7,812E-2	1,157E-1	4,113E-2	1,143E-2	5,924E-2	2,797E-2	1,443E-1	1,240E-1	7,315E-3	6,028E-2	5,458E-2	4,436E-3
	600	2,235E-2	1,356E-1	7,760E-2	4,001E-2	1,637E-1	5,279E-2	1,037E-2	9,278E-2	4,501E-2	1,483E-1	7,038E-2	6,909E-3	3,594E-2	9,529E-2	2,976E-3
	700	8,994E-3	1,210E-1	1,122E-1	7,026E-2	1,026E-1	3,501E-2	9,606E-3	1,033E-1	2,750E-2	1,621E-1	1,433E-1	6,218E-3	6,727E-2	1,993E-2	1,072E-2
	800	4,486E-2	5,560E-2	5,303E-2	7,660E-2	1,739E-1	4,604E-2	9,603E-3	1,458E-2	4,316E-2	1,008E-1	1,867E-1	5,319E-3	6,622E-2	1,147E-1	8,810E-3
	900	1,361E-2	7,134E-2	6,879E-2	5,733E-2	1,327E-1	5,678E-2	8,083E-3	6,938E-2	1,575E-3	1,557E-1	1,680E-1	2,578E-2	5,591E-2	1,083E-1	6,690E-3
	1000	4,852E-2	4,538E-2	7,081E-2	5,124E-2	1,052E-1	5,563E-2	7,839E-3	5,696E-2	1,384E-3	2,101E-1	2,130E-1	2,961E-2	xxxx	1,004E-1	4,031E-3
Filter D	380	3,631E-2	1,189E-1	7,183E-2	5,438E-2	7,808E-2	1,747E-2	2,116E-2	4,889E-3	1,126E-2	7,809E-2	2,245E-1	5,538E-2	1,597E-1	6,792E-2	1,600E-4
λ (nm)	400	2,526E-2	9,707E-2	1,539E-1	9,248E-2	8,223E-2	3,338E-2	7,372E-2	1,272E-2	1,783E-2	1,402E-1	1,217E-1	6,241E-2	4,698E-2	3,985E-2	2,377E-4
	500	9,258E-2	4,932E-2	1,299E-1	1,986E-1	3,739E-2	3,605E-2	2,709E-2	1,960E-2	1,673E-2	1,134E-1	1,569E-1	2,387E-2	3,150E-2	6,691E-2	2,153E-4
	600	1,039E-1	9,190E-2	9,944E-2	1,335E-1	4,578E-2	7,486E-2	2,326E-2	2,345E-2	1,312E-2	1,710E-1	1,096E-1	2,911E-2	4,677E-2	3,408E-2	2,403E-4
	700	4,861E-2	5,162E-2	1,568E-1	1,309E-1	4,251E-2	6,263E-2	2,714E-2	4,007E-2	5,223E-2	1,340E-1	1,317E-1	3,367E-2	6,910E-2	1,705E-2	1,805E-3
	800	1,226E-1	1,506E-1	9,480E-2	1,199E-1	3,452E-2	1,643E-2	1,284E-2	4,497E-3	5,472E-2	1,261E-1	1,348E-1	7,737E-3	4,023E-2	7,913E-2	1,089E-3
	900	8,801E-2	1,591E-1	8,972E-2	1,154E-1	3,029E-2	6,949E-2	1,622E-2	7,625E-3	1,490E-4	1,220E-1	1,553E-1	2,432E-2	3,561E-2	8,624E-2	5,588E-4
	1000	7,688E-2	1,594E-1	9,778E-2	1,097E-1	3,005E-2	5,606E-2	1,940E-2	1,481E-2	1,308E-4	9,487E-2	1,643E-1	2,629E-2	xxxx	1,499E-1	3,654E-4
Filter E	380	2,205E-3	1,249E-1	1,034E-1	5,911E-2	6,813E-2	1,274E-2	5,257E-2	xxxx	5,530E-3	2,382E-1	5,211E-2	6,455E-2	1,138E-1	1,027E-1	5,267E-5
λ (nm)	400	9,634E-4	8,842E-2	8,807E-2	7,996E-2	1,958E-2	1,662E-3	2,734E-1	1,841E-3	1,432E-3	6,578E-2	1,019E-1	6,957E-2	1,133E-1	9,413E-2	1,638E-5
	500	1,338E-2	2,037E-1	1,322E-1	1,144E-1	1,889E-2	9,648E-2	4,083E-2	3,635E-3	1,339E-3	8,967E-2	4,995E-2	8,122E-2	6,401E-2	9,019E-2	1,557E-5
	600	5,449E-2	8,856E-3	8,644E-2	7,499E-2	2,899E-2	1,143E-1	6,107E-2	5,322E-3	2,176E-3	1,355E-1	1,190E-1	7,140E-2	6,628E-2	1,711E-1	2,362E-5
	700	9,800E-2	2,706E-2	1,470E-1	1,283E-1	7,407E-2	5,520E-2	5,081E-2	1,559E-2	1,538E-2	8,720E-2	1,344E-1	5,514E-2	7,432E-2	3,736E-2	2,354E-4
	800	1,134E-1	1,338E-1	1,204E-1	1,261E-1	7,357E-2	3,949E-2	1,645E-2	4,962E-4	1,458E-2	1,218E-1	1,103E-1	2,064E-2	4,301E-2	6,585E-2	1,831E-4
	900	9,465E-2	1,505E-1	1,221E-1	1,088E-1	5,931E-2	7,084E-2	1,400E-2	1,144E-3	3,088E-5	1,056E-1	1,422E-1	1,294E-2	3,185E-2	8,596E-2	1,215E-4
	1000	6,375E-2	1,731E-1	1,393E-1	1,241E-1	6,528E-2	2,087E-2	1,793E-2	3,871E-3	3,991E-5	8,203E-2	1,742E-1	4,094E-2	xxxx	9,451E-2	1,018E-4

ANNEX B.15

Unilateral Degrees of Equivalence of participating NMI

		IFA	KRISS	LNE	MIKES	MSL	NIST	Nmi	NMIA	NMIJ	NPL	NRC	PTB	SMU	NMC	VNIIOFI
Filter A	380	5,990E-4	-5,393E-4	-1,024E-3	-1,034E-3	1,982E-4	5,999E-4	-5,143E-4	-4,443E-4	-1,673E-4	-8,918E-4	-2,393E-4	2,406E-3	3,628E-3	-5,718E-4	-3,066E-3
λ (nm)	400	4,387E-4	-8,431E-4	-1,148E-3	-1,221E-3	-4,559E-5	9,691E-5	-7,031E-4	-6,281E-4	-3,541E-4	-1,181E-3	-1,906E-4	2,479E-3	3,310E-3	-5,281E-4	-2,876E-3
	500	5,556E-4	-6,319E-4	-8,494E-4	-8,419E-4	3,119E-6	3,756E-4	-8,819E-4	-2,719E-4	-2,309E-4	-7,419E-4	-3,419E-4	2,191E-3	3,096E-3	-4,744E-4	-1,734E-3
	600	6,880E-4	-6,095E-4	-7,970E-4	-9,870E-4	-6,445E-5	1,555E-5	-8,045E-4	-2,895E-4	-3,545E-5	-5,470E-4	-2,745E-4	1,996E-3	2,226E-3	-5,820E-4	-1,466E-3
	700	1,267E-3	-3,688E-4	-4,225E-4	-6,813E-4	1,940E-4	5,033E-4	-3,288E-4	1,082E-4	4,206E-5	2,372E-5	1,371E-4	3,084E-3	2,061E-3	-1,378E-5	-7,928E-4
	800	8,592E-4	-6,358E-4	-6,383E-4	-3,108E-4	-1,133E-4	4,442E-4	-1,078E-5	-2,488E-4	-3,018E-4	1,922E-5	-1,058E-4	3,479E-3	2,082E-3	8,117E-4	-9,928E-4
	900	1,150E-3	-4,478E-4	-5,228E-4	-2,703E-4	-5,263E-6	6,097E-4	6,474E-5	-2,518E-4	2,512E-4	7,974E-5	3,974E-5	6,474E-5	1,228E-3	6,647E-4	-1,010E-3
	1000	1,181E-3	-3,786E-4	-4,211E-4	-2,961E-4	8,895E-5	7,114E-4	2,139E-4	2,514E-4	4,314E-4	-1,605E-5	4,145E-5	8,089E-4	xxxx	7,581E-4	-6,481E-4
Filter B	380	-3,928E-3	6,248E-5	-1,540E-3	3,777E-3	1,877E-3	1,165E-3	1,900E-4	-1,490E-4	6,748E-5	-1,358E-3	-1,853E-3	-1,240E-3	-7,902E-4	6,925E-4	1,194E-3
λ (nm)	400	-1,301E-3	8,690E-4	-1,093E-3	6,700E-4	-2,260E-4	7,904E-5	-6,346E-5	1,120E-4	9,354E-5	-3,185E-4	-6,385E-4	9,923E-4	-9,642E-4	1,417E-3	-3,650E-4
	500	-1,018E-3	1,534E-3	-9,756E-4	2,269E-4	-6,956E-4	4,729E-4	-2,856E-4	-3,796E-4	-1,716E-4	3,944E-4	-7,406E-4	2,944E-4	-1,057E-3	6,894E-4	3,309E-4
	600	-9,486E-4	1,366E-3	-7,611E-4	4,039E-4	-6,461E-4	5,314E-4	-2,136E-4	-8,816E-4	-2,706E-4	6,689E-4	-8,086E-4	2,464E-4	-1,071E-3	6,339E-4	-1,546E-4
	700	-7,529E-4	1,085E-3	-3,424E-4	6,301E-4	-2,212E-4	2,561E-4	-1,045E-4	-3,572E-4	4,381E-5	-2,154E-4	-3,974E-4	2,878E-4	-9,081E-4	6,563E-4	2,083E-4
	800	-7,985E-4	1,229E-3	-2,010E-4	5,365E-4	-1,935E-4	2,407E-4	4,115E-4	-9,898E-5	3,115E-4	-3,785E-4	1,565E-4	9,115E-4	-5,305E-4	4,640E-4	-3,085E-4
	900	-2,078E-3	9,624E-4	-7,263E-5	4,099E-4	-4,763E-5	3,097E-4	4,184E-4	-1,634E-6	1,984E-4	-4,051E-4	2,812E-5	-2,351E-4	-5,296E-4	7,899E-4	1,934E-4
	1000	-2,440E-3	5,874E-4	-1,051E-4	4,699E-4	8,316E-5	1,616E-4	1,224E-4	-4,909E-5	4,639E-4	-3,326E-4	-6,509E-5	3,324E-4	xxxx	7,349E-4	1,884E-4
Filter C	380	-5,986E-4	-2,251E-4	-1,211E-4	8,371E-4	5,334E-4	2,267E-4	-6,432E-5	2,106E-4	6,276E-5	-1,928E-4	-2,091E-4	-1,358E-4	-1,547E-4	2,793E-5	2,824E-4
λ (nm)	400	-2,726E-4	-4,223E-4	3,117E-5	2,199E-4	3,637E-4	1,515E-4	-6,133E-5	2,967E-4	2,784E-4	-1,476E-4	6,923E-6	3,204E-4	-3,251E-4	2,214E-4	-3,808E-4
	500	-1,211E-4	1,209E-4	-1,156E-4	-2,609E-5	-1,511E-4	1,522E-4	1,512E-4	-1,126E-4	7,791E-5	3,139E-4	-1,078E-4	3,584E-4	-3,916E-4	-9,909E-5	5,991E-5
	600	-2,007E-4	2,278E-4	-1,777E-4	1,306E-4	-1,717E-4	1,145E-4	1,251E-4	-1,214E-4	-3,794E-5	2,418E-4	-1,059E-4	9,131E-5	-2,698E-4	-3,669E-5	2,581E-5
	700	-1,488E-4	3,142E-5	-9,633E-5	1,487E-4	2,324E-4	6,842E-5	7,117E-5	8,617E-5	-3,133E-5	1,118E-4	-1,632E-4	-2,095E-5	-5,366E-4	-1,031E-4	6,053E-4
	800	-1,846E-4	2,474E-4	-1,455E-5	-6,455E-5	-6,705E-5	5,545E-5	1,859E-4	6,320E-5	5,495E-5	1,304E-4	9,295E-5	2,754E-4	-4,078E-4	5,449E-6	-1,511E-4
	900	5,366E-5	1,502E-4	-8,838E-6	-4,834E-5	-5,384E-5	4,966E-5	4,472E-4	-2,634E-5	-8,534E-5	-1,338E-6	4,366E-5	1,012E-4	-3,900E-4	6,116E-5	8,162E-6
	1000	-1,466E-5	-4,091E-5	1,840E-6	6,590E-6	2,034E-5	2,084E-5	2,381E-4	3,284E-5	5,034E-5	-1,566E-5	-2,841E-5	1,582E-4	xxxx	-1,660E-6	-4,516E-5
Filter D	380	-4,886E-5	-1,091E-5	1,599E-6	4,697E-5	1,939E-5	2,038E-5	-2,030E-6	2,710E-5	-1,319E-5	-2,057E-5	-3,214E-6	-1,438E-5	6,978E-6	8,932E-6	-2,294E-5
λ (nm)	400	-9,919E-5	-6,535E-5	1,185E-5	5,037E-5	6,313E-5	4,052E-5	-3,011E-5	-3,655E-6	2,362E-6	-2,602E-5	1,194E-5	-1,745E-5	-2,091E-5	5,844E-5	-6,162E-5
	500	-7,035E-6	3,273E-5	-8,555E-6	1,288E-5	-1,500E-5	4,406E-5	-7,313E-7	-2,287E-5	-9,400E-6	2,495E-6	-9,793E-6	-8,246E-6	-2,728E-5	-7,462E-6	-1,655E-5
	600	-4,026E-5	4,727E-5	-4,101E-5	2,298E-5	-2,657E-5	3,458E-5	1,215E-5	-3,690E-5	-7,012E-6	2,055E-5	-1,320E-5	-2,865E-5	-2,572E-5	3,476E-6	4,505E-7
	700	-5,891E-5	6,940E-5	-3,374E-5	1,007E-4	2,035E-5	5,957E-5	2,424E-5	2,300E-5	-1,200E-5	6,769E-6	-3,783E-5	-7,294E-5	-1,114E-4	-1,813E-5	2,112E-4
	800	-9,859E-5	4,899E-5	-6,546E-6	1,464E-5	-3,032E-6	-2,094E-5	9,077E-5	2,369E-5	2,793E-5	3,675E-5	1,163E-5	2,990E-5	-1,164E-4	-6,850E-6	7,777E-6
	900	5,728E-6	-2,911E-5	4,104E-6	1,145E-5	-1,645E-5	2,597E-5	-6,347E-6	8,644E-5	1,664E-5	-1,361E-6	1,962E-5	5,666E-5	-7,880E-5	-1,012E-5	-1,093E-5
	1000	9,942E-5	-6,370E-5	3,835E-6	2,101E-5	2,035E-7	-3,192E-6	-3,646E-5	7,118E-5	-2,537E-5	-1,192E-5	4,595E-6	4,045E-5	xxxx	-6,843E-6	-6,447E-6
Filter E	380	7,840E-5	2,498E-6	-1,049E-6	2,338E-7	1,256E-6	4,332E-6	-1,630E-6	xxxx	-5,783E-7	-1,921E-6	-4,058E-6	-7,642E-6	6,279E-6	6,442E-9	9,914E-5
λ (nm)	400	6,807E-5	-1,978E-6	6,444E-9	6,766E-7	3,936E-6	-2,309E-6	-2,071E-6	-4,870E-5	-1,455E-6	-7,880E-7	-3,766E-6	-7,490E-7	6,262E-6	4,441E-6	-3,343E-5
	500	-2,985E-5	1,537E-6	-2,954E-6	3,731E-6	-1,711E-6	4,460E-6	-6,609E-7	-1,145E-5	-1,102E-5	-4,516E-6	-3,987E-7	4,892E-7	5,598E-6	-2,633E-6	-1,594E-5
	600	4,551E-6	1,093E-5	-8,210E-6	3,908E-6	-4,349E-6	4,635E-6	-8,743E-7	-2,713E-6	-1,356E-5	-1,443E-6	-4,165E-6	-4,705E-6	9,800E-6	8,356E-7	-4,087E-6
	700	-1,505E-5	3,836E-5	-7,620E-6	1,999E-5	1,048E-5	1,358E-5	6,554E-7	-3,462E-5	-1,616E-5	-1,843E-6	3,757E-6	-1,373E-5	-1,562E-5	-5,719E-6	4,379E-5
	800	6,389E-5	-5,613E-6	-1,543E-5	-1,053E-5	-6,210E-6	8,533E-6	-2,075E-5	2,677E-4	-2,814E-5	9,232E-6	-4,962E-6	-1,555E-5	-5,503E-5	-6,917E-6	-1,768E-5
	900	1,296E-5	-1,752E-5	2,187E-6	6,480E-6	3,958E-6	1,270E-5	-1,178E-5	3,380E-5	-7,750E-6	-3,229E-6	1,733E-6	5,115E-5	-3,968E-5	1,503E-6	-2,235E-5
	1000	1,360E-5	-2,973E-5	9,511E-6	1,752E-5	1,619E-5	8,853E-6	-1,589E-5	-9,105E-5	2,363E-5	3,417E-6	-3,953E-6	2,113E-5	xxxx	-2,943E-6	-1,473E-5

ANNEX B.16

Unc (DoE$_i$) ; k=2

		IFA	KRISS	LNE	MIKES	MSL	NIST	Nmi	NMIA	NMIJ	NPL	NRC	PTB	SMU	NMC	VNIIOFI
Filter A	380	4,840E-3	8,211E-4	7,899E-4	1,374E-3	6,255E-4	1,853E-3	9,824E-4	6,040E-4	8,041E-4	6,161E-4	7,012E-4	2,689E-3	5,853E-4	8,490E-4	1,160E-3
λ (nm)	400	5,618E-3	9,114E-4	7,106E-4	9,696E-4	4,035E-4	1,753E-3	1,033E-3	4,104E-4	6,656E-4	5,617E-4	7,591E-4	2,540E-3	3,953E-4	7,833E-4	7,697E-4
	500	1,162E-3	7,637E-4	5,050E-4	6,437E-4	3,853E-4	1,205E-3	7,070E-4	2,989E-4	5,457E-4	3,216E-4	4,964E-4	1,942E-3	3,619E-4	5,612E-4	6,618E-4
	600	1,575E-3	6,655E-4	5,525E-4	7,542E-4	5,199E-4	1,388E-3	8,371E-4	2,316E-4	4,719E-4	4,384E-4	5,598E-4	1,585E-3	3,299E-4	6,699E-4	5,994E-4
	700	4,623E-3	4,121E-4	4,909E-4	7,826E-4	5,330E-4	8,868E-4	6,721E-4	3,866E-4	3,134E-4	3,158E-4	4,064E-4	1,502E-3	9,129E-4	5,763E-4	7,161E-4
	800	1,203E-3	2,872E-4	4,711E-4	9,060E-4	5,676E-4	4,742E-4	7,564E-4	4,095E-4	2,089E-4	1,182E-4	2,450E-4	1,487E-3	2,137E-3	1,869E-4	6,068E-4
	900	4,204E-3	2,896E-4	4,736E-4	8,536E-4	5,551E-4	6,165E-4	7,670E-4	4,969E-4	1,214E-3	2,069E-4	2,906E-4	3,678E-3	2,407E-3	2,804E-4	6,742E-4
	1000	4,004E-3	2,925E-4	4,943E-4	8,982E-4	5,919E-4	6,456E-4	7,862E-4	2,628E-4	1,022E-3	2,719E-4	2,849E-4	3,731E-3	xxxx	5,808E-4	6,169E-4
Filter B	380	2,009E-3	1,110E-3	9,948E-4	1,182E-3	1,260E-3	2,383E-3	2,015E-3	1,622E-3	2,469E-3	6,092E-4	1,451E-3	1,801E-3	1,100E-3	3,893E-3	6,602E-4
λ (nm)	400	3,517E-3	1,228E-3	8,621E-4	7,915E-4	9,252E-4	6,988E-4	1,121E-3	6,524E-4	5,810E-4	5,791E-4	1,395E-3	1,798E-3	1,673E-3	1,038E-3	8,107E-4
	500	1,612E-3	8,127E-4	8,164E-4	6,999E-4	8,934E-4	9,318E-4	9,610E-4	7,427E-4	5,435E-4	6,485E-4	1,413E-3	1,795E-3	1,044E-3	9,243E-4	7,756E-4
	600	1,361E-3	4,037E-4	4,279E-4	5,923E-4	5,422E-4	8,617E-4	8,780E-4	4,675E-4	2,127E-4	2,930E-4	1,029E-3	1,439E-3	5,924E-4	4,608E-4	5,824E-4
	700	2,852E-3	3,159E-4	2,892E-4	6,125E-4	3,979E-4	8,145E-4	9,031E-4	2,207E-4	3,486E-4	3,433E-4	5,121E-4	1,251E-3	3,295E-4	2,574E-4	6,801E-4
	800	8,770E-4	7,287E-4	3,370E-4	6,611E-4	3,419E-4	6,483E-4	8,396E-4	4,304E-4	3,876E-4	4,540E-4	2,661E-4	1,308E-3	2,870E-4	3,329E-4	7,089E-4
	900	1,998E-3	7,184E-4	3,578E-4	7,253E-4	3,369E-4	9,092E-4	6,998E-4	2,651E-4	1,264E-3	3,144E-4	2,322E-4	5,270E-4	3,917E-4	4,284E-4	8,109E-4
	1000	2,599E-3	7,949E-4	3,965E-4	8,428E-4	4,166E-4	7,961E-4	6,555E-4	3,279E-4	1,151E-3	2,293E-4	2,545E-4	5,843E-4	xxxx	4,755E-4	9,018E-4
Filter C	380	2,766E-4	1,984E-4	3,009E-4	2,522E-4	1,939E-4	2,735E-4	7,506E-4	2,700E-4	4,526E-4	1,345E-4	1,649E-4	1,977E-4	1,189E-4	7,778E-4	6,350E-4
λ (nm)	400	4,872E-4	1,486E-4	1,491E-4	2,172E-4	1,738E-4	2,348E-4	4,165E-4	2,548E-4	3,065E-4	1,136E-4	1,492E-4	5,632E-4	2,351E-4	3,429E-4	6,350E-4
	500	2,851E-4	8,430E-5	1,661E-4	1,580E-4	1,268E-4	2,225E-4	4,292E-4	1,792E-4	2,718E-4	1,023E-4	1,191E-4	5,377E-4	1,817E-4	1,916E-4	6,916E-4
	600	2,526E-4	7,732E-5	1,311E-4	1,868E-4	7,047E-5	1,614E-4	3,734E-4	1,046E-4	1,756E-4	8,810E-5	1,382E-4	4,584E-4	1,976E-4	1,169E-4	7,001E-4
	700	6,950E-4	1,709E-4	1,559E-4	2,394E-4	1,939E-4	3,467E-4	6,723E-4	1,628E-4	3,930E-4	9,696E-5	1,595E-4	8,373E-4	2,451E-4	4,638E-4	6,361E-4
	800	2,861E-4	2,340E-4	2,618E-4	2,144E-4	1,082E-4	2,822E-4	6,323E-4	5,117E-4	2,920E-4	1,465E-4	9,598E-5	8,518E-4	2,322E-4	1,707E-4	6,605E-4
	900	4,075E-4	1,441E-4	1,744E-4	1,926E-4	9,642E-5	1,936E-4	5,307E-4	1,736E-4	1,208E-3	6,122E-5	6,298E-5	2,936E-4	1,952E-4	1,349E-4	5,839E-4
	1000	1,664E-4	1,598E-4	1,355E-4	1,616E-4	9,770E-5	1,546E-4	4,256E-4	1,526E-4	1,017E-3	4,644E-5	4,572E-5	2,158E-4	xxxx	1,113E-4	5,951E-4
Filter D	380	4,246E-5	1,973E-5	2,950E-5	3,430E-5	2,818E-5	6,193E-5	5,614E-5	1,180E-4	7,743E-5	2,651E-5	1,157E-5	3,213E-5	1,638E-5	3,042E-5	6,540E-4
λ (nm)	400	6,334E-5	2,764E-5	2,368E-5	2,714E-5	3,393E-5	5,484E-5	3,603E-5	8,989E-5	7,571E-5	2,041E-5	2,570E-5	3,942E-5	4,586E-5	5,000E-5	6,622E-4
	500	2,736E-5	3,566E-5	2,257E-5	1,565E-5	4,447E-5	4,532E-5	5,254E-5	6,204E-5	6,726E-5	2,190E-5	1,975E-5	5,608E-5	4,861E-5	3,268E-5	5,983E-4
	600	2,762E-5	2,816E-5	2,917E-5	2,407E-5	4,437E-5	3,412E-5	6,303E-5	6,277E-5	8,439E-5	1,850E-5	2,760E-5	5,616E-5	4,387E-5	5,176E-5	6,281E-4
	700	1,068E-4	9,470E-5	5,525E-5	5,097E-5	1,147E-4	9,329E-5	1,449E-4	1,183E-4	1,028E-4	4,430E-5	4,611E-5	1,296E-4	8,845E-5	1,840E-4	5,707E-4
	800	5,253E-5	3,588E-5	6,089E-5	5,321E-5	1,049E-4	1,538E-4	1,743E-4	2,961E-4	8,228E-5	3,963E-5	3,733E-5	2,253E-4	9,684E-5	6,734E-5	6,029E-4
	900	4,580E-5	2,990E-5	4,531E-5	3,923E-5	8,108E-5	5,219E-5	1,118E-4	1,639E-4	1,178E-3	2,630E-5	1,900E-5	9,084E-5	7,454E-5	4,632E-5	6,081E-4
	1000	4,055E-5	2,626E-5	3,548E-5	3,323E-5	6,676E-5	4,811E-5	8,361E-5	9,597E-5	1,030E-3	3,150E-5	1,799E-5	7,154E-5	xxxx	2,597E-5	6,161E-4
Filter E	380	1,016E-4	1,257E-5	1,406E-5	1,906E-5	1,766E-5	4,205E-5	2,028E-5	xxxx	6,407E-5	8,463E-6	2,034E-5	1,813E-5	1,333E-5	1,411E-5	6,583E-4
λ (nm)	400	8,056E-5	7,732E-6	8,025E-6	8,462E-6	1,769E-5	6,131E-5	3,839E-6	5,824E-5	6,605E-5	9,120E-6	6,875E-6	9,127E-6	6,969E-6	7,735E-6	6,181E-4
	500	2,078E-5	3,779E-6	6,142E-6	6,680E-6	1,744E-5	6,231E-6	1,171E-5	4,011E-5	6,617E-5	7,668E-6	9,786E-6	8,100E-6	9,222E-6	7,393E-6	6,140E-4
	600	1,285E-5	3,255E-5	1,001E-5	1,069E-5	1,787E-5	7,636E-6	1,209E-5	4,225E-5	6,619E-5	7,597E-6	7,603E-6	1,111E-5	1,157E-5	6,426E-6	6,360E-4
	700	2,605E-5	5,074E-5	2,063E-5	2,054E-5	3,039E-5	3,559E-5	3,719E-5	6,849E-5	6,896E-5	2,550E-5	1,827E-5	3,561E-5	3,033E-5	4,371E-5	5,621E-4
	800	2,310E-5	1,821E-5	2,232E-5	1,949E-5	2,942E-5	4,099E-5	6,438E-5	3,741E-4	6,845E-5	1,994E-5	1,870E-5	5,734E-5	3,920E-5	3,124E-5	6,160E-4
	900	2,033E-5	1,222E-5	1,757E-5	1,878E-5	2,628E-5	2,387E-5	5,560E-5	1,960E-4	1,194E-3	1,545E-5	1,244E-5	5,789E-5	3,648E-5	2,146E-5	6,020E-4
	1000	2,422E-5	1,127E-5	1,559E-5	1,669E-5	2,391E-5	4,345E-5	4,696E-5	1,019E-4	1,006E-3	1,981E-5	1,109E-5	3,065E-5	xxxx	1,793E-5	6,300E-4

ANNEX B.17

D_i on U_i ratio

NMI		IFA	KRISS	LNE	MIKES	MSL	NIST	Nmi	NMIA	NMIJ	NPL	NRC	PTB	SMU	NMC	VNIIOFI
Filter A	380	0,12	0,66	1,30	0,75	0,32	0,32	0,52	0,74	0,21	1,45	0,34	0,89	6,20	0,67	2,64
λ (nm)	400	0,08	0,93	1,62	1,26	0,11	0,06	0,68	1,53	0,53	2,10	0,25	0,98	8,37	0,67	3,74
	500	0,48	0,83	1,68	1,31	0,01	0,31	1,25	0,91	0,42	2,31	0,69	1,13	8,55	0,85	2,62
	600	0,44	0,92	1,44	1,31	0,12	0,01	0,96	1,25	0,08	1,25	0,49	1,26	6,75	0,87	2,45
	700	0,27	0,89	0,86	0,87	0,36	0,57	0,49	0,28	0,13	0,08	0,34	2,05	2,26	0,02	1,11
	800	0,71	2,21	1,35	0,34	0,20	0,94	0,01	0,61	1,44	0,16	0,43	2,34	0,97	4,34	1,64
	900	0,27	1,55	1,10	0,32	0,01	0,99	0,08	0,51	0,21	0,39	0,14	0,02	0,51	2,37	1,50
	1000	0,30	1,29	0,85	0,33	0,15	1,10	0,27	0,96	0,42	0,06	0,15	0,22	xxxx	1,31	1,05
Filter B	380	1,95	0,06	1,55	3,20	1,49	0,49	0,09	0,09	0,03	2,23	1,28	0,69	0,72	0,18	1,81
λ (nm)	400	0,37	0,71	1,27	0,85	0,24	0,11	0,06	0,17	0,16	0,55	0,46	0,55	0,58	1,37	0,45
	500	0,63	1,89	1,20	0,32	0,78	0,51	0,30	0,51	0,32	0,61	0,52	0,16	1,01	0,75	0,43
	600	0,70	3,39	1,78	0,68	1,19	0,62	0,24	1,89	1,27	2,28	0,79	0,17	1,81	1,38	0,27
	700	0,26	3,43	1,18	1,03	0,56	0,31	0,12	1,62	0,13	0,63	0,78	0,23	2,76	2,55	0,31
	800	0,91	1,69	0,60	0,81	0,57	0,37	0,49	0,23	0,80	0,83	0,59	0,70	1,85	1,39	0,44
	900	1,04	1,34	0,20	0,57	0,14	0,34	0,60	0,01	0,16	1,29	0,12	0,45	1,35	1,84	0,24
	1000	0,94	0,74	0,27	0,56	0,20	0,20	0,19	0,15	0,40	1,45	0,26	0,57	xxxx	1,55	0,21
Filter C	380	2,16	1,13	0,40	3,32	2,75	0,83	0,09	0,78	0,14	1,43	1,27	0,69	1,30	0,04	0,44
λ (nm)	400	0,56	2,84	0,21	1,01	2,09	0,65	0,15	1,16	0,91	1,30	0,05	0,57	1,38	0,65	0,60
	500	0,42	1,43	0,70	0,17	1,19	0,68	0,35	0,63	0,29	3,07	0,91	0,67	2,16	0,52	0,09
	600	0,79	2,95	1,36	0,70	2,44	0,71	0,33	1,16	0,22	2,74	0,77	0,20	1,37	0,31	0,04
	700	0,21	0,18	0,62	0,62	1,20	0,20	0,11	0,53	0,08	1,15	1,02	0,03	2,19	0,22	0,95
	800	0,65	1,06	0,06	0,30	0,62	0,20	0,29	0,12	0,19	0,89	0,97	0,32	1,76	0,03	0,23
	900	0,13	1,04	0,05	0,25	0,56	0,26	0,84	0,15	0,07	0,02	0,69	0,34	2,00	0,45	0,01
	1000	0,09	0,26	0,01	0,04	0,21	0,13	0,56	0,22	0,05	0,34	0,62	0,73	xxxx	0,01	0,08
Filter D	380	1,15	0,55	0,05	1,37	0,69	0,33	0,04	0,23	0,17	0,78	0,28	0,45	0,43	0,29	0,04
λ (nm)	400	1,57	2,36	0,50	1,86	1,86	0,74	0,84	0,04	0,03	1,27	0,46	0,44	0,46	1,17	0,09
	500	0,26	0,92	0,38	0,82	0,34	0,97	0,01	0,37	0,14	0,11	0,50	0,15	0,56	0,23	0,03
	600	1,46	1,68	1,41	0,95	0,60	1,01	0,19	0,59	0,08	1,11	0,48	0,51	0,59	0,07	0,00
	700	0,55	0,73	0,61	1,97	0,18	0,64	0,17	0,19	0,12	0,15	0,82	0,56	1,26	0,10	0,37
	800	1,88	1,37	0,11	0,28	0,03	0,14	0,52	0,08	0,34	0,93	0,31	0,13	1,20	0,10	0,01
	900	0,13	0,97	0,09	0,29	0,20	0,50	0,06	0,53	0,01	0,05	1,03	0,62	1,06	0,22	0,02
	1000	2,45	2,43	0,11	0,63	0,00	0,07	0,44	0,74	0,02	0,38	0,26	0,57	xxxx	0,26	0,01
Filter E	380	0,77	0,20	0,07	0,01	0,07	0,10	0,08	xxxx	0,01	0,23	0,20	0,42	0,47	0,00	0,15
λ (nm)	400	0,85	0,26	0,00	0,08	0,22	0,04	0,54	0,84	0,02	0,09	0,55	0,08	0,90	0,57	0,05
	500	1,44	0,41	0,48	0,56	0,10	0,72	0,06	0,29	0,17	0,59	0,04	0,06	0,61	0,36	0,03
	600	0,35	0,34	0,82	0,37	0,24	0,61	0,07	0,06	0,20	0,19	0,55	0,42	0,85	0,13	0,01
	700	0,58	0,76	0,37	0,97	0,34	0,38	0,02	0,51	0,23	0,07	0,21	0,39	0,52	0,13	0,08
	800	2,77	0,31	0,69	0,54	0,21	0,21	0,32	0,72	0,41	0,46	0,27	0,27	1,40	0,22	0,03
	900	0,64	1,43	0,12	0,35	0,15	0,53	0,21	0,17	0,01	0,21	0,14	0,88	1,09	0,07	0,04
	1000	0,56	2,64	0,61	1,05	0,68	0,20	0,34	0,89	0,02	0,17	0,36	0,69	xxxx	0,16	0,02

ANNEX B.18

$u_{adj}(\tau_{X,i})$ – Version #2

NMI		IFA	KRISS	LNE	MIKES	MSL	NIST	Nmi	NMIA	NMIJ	NPL	NRC	PTB	SMU	NMC	VNIIOFI
Filter A	380	2,400E-3	2,600E-4	2,757E-4	6,000E-4	1,900E-4	3,000E-4	2,740E-4	**1,690E-4**	**1,690E-4**	**1,690E-4**	3,200E-4	4,900E-4	**1,690E-4**	**1,690E-4**	3,140E-4
λ (nm)	400	2,800E-3	2,200E-4	1,934E-4	4,000E-4	1,900E-4	3,000E-4	1,830E-4	**1,453E-4**	**1,453E-4**	**1,453E-4**	3,100E-4	4,900E-4	**1,453E-4**	1,500E-4	2,930E-4
	500	5,000E-4	1,600E-4	1,342E-4	3,000E-4	1,900E-4	2,000E-4	2,752E-4	**1,146E-4**	**1,146E-4**	**1,146E-4**	1,600E-4	4,900E-4	1,500E-4	1,200E-4	2,750E-4
	600	7,000E-4	1,100E-4	1,474E-4	3,000E-4	1,900E-4	4,000E-4	1,837E-4	**1,045E-4**	**1,045E-4**	**1,045E-4**	1,600E-4	4,900E-4	1,500E-4	1,200E-4	2,790E-4
	700	2,300E-3	1,500E-4	1,350E-4	3,000E-4	1,900E-4	3,000E-4	2,758E-4	**1,066E-4**	**1,066E-4**	**1,066E-4**	**1,066E-4**	4,900E-4	1,500E-4	1,100E-4	2,540E-4
	800	6,000E-4	1,500E-4	**1,077E-4**	3,000E-4	1,900E-4	2,000E-4	1,841E-4	1,150E-4	1,110E-4	**1,077E-4**	**1,077E-4**	5,100E-4	1,500E-4	**1,077E-4**	2,480E-4
	900	2,100E-3	1,600E-4	**1,137E-4**	4,000E-4	1,900E-4	3,000E-4	1,842E-4	**1,137E-4**	6,090E-4	**1,137E-4**	**1,137E-4**	1,800E-3	1,600E-4	**1,137E-4**	2,750E-4
	1000	2,000E-3	1,600E-4	**1,128E-4**	4,000E-4	1,900E-4	3,000E-4	1,842E-4	**1,128E-4**	5,120E-4	1,300E-4	**1,128E-4**	1,800E-3	xxxx	**1,128E-4**	2,890E-4
Filter B	380	8,000E-4	5,200E-4	4,559E-4	6,000E-4	5,500E-4	1,200E-3	1,021E-3	7,520E-4	1,200E-3	**4,040E-4**	4,400E-4	7,200E-4	**4,040E-4**	1,920E-3	**4,040E-4**
λ (nm)	400	1,600E-3	1,400E-4	1,734E-4	4,000E-4	1,700E-4	3,000E-4	4,245E-4	**1,384E-4**	**1,384E-4**	**1,384E-4**	2,100E-4	6,100E-4	1,600E-4	1,500E-4	3,020E-4
	500	4,000E-4	1,100E-4	1,188E-4	3,000E-4	1,700E-4	4,000E-4	4,345E-4	**1,054E-4**	**1,054E-4**	**1,054E-4**	1,300E-4	6,000E-4	1,600E-4	**1,054E-4**	2,850E-4
	600	5,000E-4	1,100E-4	1,209E-4	3,000E-4	1,700E-4	4,000E-4	4,262E-4	**1,080E-4**	**1,080E-4**	**1,080E-4**	1,300E-4	6,100E-4	1,500E-4	**1,080E-4**	2,840E-4
	700	1,400E-3	1,200E-4	1,101E-4	3,000E-4	1,700E-4	4,000E-4	4,458E-4	**1,005E-4**	**1,005E-4**	**1,005E-4**	**1,005E-4**	5,800E-4	1,500E-4	**1,005E-4**	2,650E-4
	800	4,000E-4	**1,314E-4**	**1,314E-4**	3,000E-4	1,800E-4	3,000E-4	4,038E-4	2,220E-4	1,700E-4	**1,314E-4**	**1,314E-4**	6,500E-4	1,400E-4	1,700E-4	2,960E-4
	900	1,000E-3	**1,217E-4**	1,237E-4	3,000E-4	1,700E-4	4,000E-4	3,516E-4	**1,217E-4**	6,020E-4	**1,217E-4**	1,300E-4	2,700E-4	1,400E-4	**1,217E-4**	2,750E-4
	1000	1,300E-3	**1,063E-4**	**1,063E-4**	3,000E-4	1,700E-4	3,000E-4	3,177E-4	**1,063E-4**	5,130E-4	1,300E-4	1,300E-4	2,900E-4	xxxx	**1,063E-4**	2,760E-4
Filter C	380	1,400E-4	1,040E-4	1,544E-4	1,300E-4	1,000E-4	1,400E-4	3,765E-4	1,350E-4	2,280E-4	**9,325E-5**	**9,325E-5**	9,400E-5	**9,325E-5**	3,900E-4	3,160E-4
λ (nm)	400	2,300E-4	**6,877E-5**	**6,877E-5**	9,000E-5	**6,877E-5**	1,100E-4	2,028E-4	1,120E-4	1,350E-4	**6,877E-5**	**6,877E-5**	2,200E-4	9,300E-5	1,600E-4	3,090E-4
	500	5,900E-5	**3,988E-5**	**3,988E-5**	7,000E-5	4,000E-5	1,000E-4	1,961E-4	**3,988E-5**	5,800E-5	**3,988E-5**	**3,988E-5**	2,100E-4	9,200E-5	8,000E-5	2,910E-4
	600	6,300E-5	**4,185E-5**	5,182E-5	8,000E-5	**4,185E-5**	8,000E-5	1,799E-4	**4,185E-5**	5,000E-5	**4,185E-5**	5,900E-5	2,100E-4	8,700E-5	5,000E-5	3,160E-4
	700	3,200E-4	**7,426E-5**	**7,426E-5**	1,200E-4	8,000E-5	1,700E-4	3,257E-4	**7,426E-5**	1,580E-4	**7,426E-5**	7,900E-5	3,900E-4	1,200E-4	2,300E-4	2,720E-4
	800	9,800E-5	**6,900E-5**	1,153E-4	1,100E-4	**6,900E-5**	1,400E-4	3,033E-4	2,540E-4	8,600E-5	**6,900E-5**	**6,900E-5**	4,000E-4	1,200E-4	9,000E-5	2,890E-4
	900	2,000E-4	**5,747E-5**	8,176E-5	1,000E-4	**5,747E-5**	1,000E-4	2,081E-4	9,100E-5	6,020E-4	**5,747E-5**	**5,747E-5**	1,400E-4	1,000E-4	7,000E-5	2,810E-4
	1000	8,400E-5	**3,994E-5**	6,256E-5	8,000E-5	**3,994E-5**	8,000E-5	1,550E-4	7,600E-5	5,090E-4	**3,994E-5**	**3,994E-5**	1,100E-4	xxxx	5,000E-5	2,960E-4
Filter D	380	2,000E-5	**6,563E-6**	1,535E-5	1,400E-5	8,000E-6	3,000E-5	2,367E-5	5,900E-5	3,300E-5	**6,563E-6**	**6,563E-6**	**6,563E-6**	**6,563E-6**	1,500E-5	3,270E-4
λ (nm)	400	3,000E-5	**1,044E-5**	1,218E-5	**1,044E-5**	1,600E-5	2,000E-5	1,426E-5	3,800E-5	3,700E-5	**1,044E-5**	**1,044E-5**	1,700E-5	1,400E-5	2,200E-5	3,310E-4
	500	9,600E-6	**8,572E-6**	1,078E-5	**8,572E-6**	2,000E-5	1,000E-5	2,509E-5	3,000E-5	3,300E-5	**8,572E-6**	**8,572E-6**	2,700E-5	1,900E-5	1,300E-5	2,990E-4
	600	**9,522E-6**	**9,522E-6**	1,498E-5	**9,522E-6**	2,000E-5	1,000E-5	2,820E-5	3,000E-5	4,100E-5	**9,522E-6**	**9,522E-6**	2,700E-5	2,000E-5	1,000E-5	3,140E-4
	700	5,000E-5	**2,910E-5**	2,978E-5	**2,910E-5**	4,800E-5	4,000E-5	7,123E-5	5,700E-5	5,000E-5	**2,910E-5**	**2,910E-5**	6,300E-5	4,200E-5	7,600E-5	2,850E-4
	800	2,500E-5	**2,316E-5**	3,127E-5	2,500E-5	5,200E-5	3,000E-5	8,023E-5	1,480E-4	4,100E-5	**2,316E-5**	**2,316E-5**	1,100E-4	4,800E-5	3,300E-5	3,010E-4
	900	2,400E-5	**1,767E-5**	2,319E-5	2,000E-5	4,100E-5	2,000E-5	5,610E-5	8,200E-5	5,890E-4	**1,767E-5**	**1,767E-5**	4,200E-5	3,800E-5	2,300E-5	3,040E-4
	1000	2,100E-5	**1,329E-5**	1,750E-5	1,500E-5	3,300E-5	2,000E-5	4,150E-5	4,800E-5	5,150E-4	**1,329E-5**	**1,329E-5**	3,300E-5	xxxx	1,329E-5	3,080E-4
Filter E	380	5,000E-5	**7,779E-7**	7,395E-6	4,000E-6	8,000E-6	2,000E-5	1,485E-6	xxxx	3,200E-5	**7,779E-7**	**7,779E-7**	**7,779E-7**	2,100E-6	**7,779E-7**	3,290E-4
λ (nm)	400	4,000E-5	**1,590E-6**	4,175E-6	2,000E-6	8,000E-6	3,000E-5	**1,590E-6**	2,900E-5	3,300E-5	**1,590E-6**	**1,590E-6**	1,800E-6	3,000E-6	2,100E-6	3,090E-4
	500	1,000E-5	**2,181E-6**	3,116E-6	3,000E-6	8,000E-6	**2,181E-6**	3,553E-6	2,000E-5	3,300E-5	3,000E-6	**2,181E-6**	2,300E-6	4,400E-6	**2,181E-6**	3,070E-4
	600	6,000E-6	**2,203E-6**	5,177E-6	**2,203E-6**	8,000E-6	**2,203E-6**	5,296E-6	2,100E-5	3,300E-5	**2,203E-6**	**2,203E-6**	2,400E-6	4,700E-6	**2,203E-6**	3,180E-4
	700	1,000E-5	**7,877E-6**	1,112E-5	**7,877E-6**	1,100E-5	1,000E-5	1,712E-5	3,400E-5	3,400E-5	**7,877E-6**	**7,877E-6**	1,600E-5	1,300E-5	2,000E-5	2,810E-4
	800	1,000E-5	**9,741E-6**	1,193E-5	**9,741E-6**	1,400E-5	2,000E-5	3,216E-5	1,870E-4	3,300E-5	**9,741E-6**	**9,741E-6**	2,800E-5	1,900E-5	1,290E-5	3,080E-4
	900	1,000E-5	**8,073E-6**	9,086E-6	9,000E-6	1,300E-5	1,000E-5	2,796E-5	9,800E-5	5,970E-4	**8,073E-6**	**8,073E-6**	2,800E-5	1,800E-5	1,040E-5	3,010E-4
	1000	1,200E-5	**7,199E-6**	7,895E-6	8,000E-6	1,200E-5	2,000E-5	2,354E-5	5,100E-5	5,030E-4	**7,199E-6**	**7,199E-6**	1,400E-5	xxxx	**7,199E-6**	3,150E-4

ANNEX B.19

$u_{adj}(\Delta_{X,i})$ – Version #2

NMI		IFA	KRISS	LNE	MIKES	MSL	NIST	Nmi	NMIA	NMIJ	NPL	NRC	PTB	SMU	NMC	VNIIOFI
Filter A	380	2,423E-3	4,272E-4	4,122E-4	6,970E-4	3,343E-4	9,341E-4	5,052E-4	3,367E-4	4,299E-4	3,590E-4	3,700E-4	1,350E-3	3,265E-4	4,522E-4	5,918E-4
λ (nm)	400	2,811E-3	4,653E-4	3,676E-4	4,939E-4	2,226E-4	8,818E-4	5,248E-4	2,349E-4	3,575E-4	3,182E-4	3,910E-4	1,273E-3	2,213E-4	4,028E-4	3,962E-4
	500	5,856E-4	3,890E-4	2,632E-4	3,303E-4	2,065E-4	6,069E-4	3,612E-4	1,829E-4	2,845E-4	1,976E-4	2,591E-4	9,738E-4	1,956E-4	2,903E-4	3,391E-4
	600	7,914E-4	3,416E-4	2,868E-4	3,849E-4	2,711E-4	6,983E-4	4,256E-4	1,529E-4	2,490E-4	2,480E-4	2,903E-4	7,960E-4	1,821E-4	3,437E-4	3,094E-4
	700	2,313E-3	2,190E-4	2,564E-4	3,983E-4	2,767E-4	4,496E-4	3,441E-4	2,207E-4	1,814E-4	1,871E-4	2,222E-4	7,545E-4	4,624E-4	2,976E-4	3,657E-4
	800	6,038E-4	1,532E-4	2,423E-4	4,561E-4	2,888E-4	2,430E-4	3,819E-4	2,116E-4	1,173E-4	1,120E-4	1,433E-4	7,455E-4	1,070E-3	1,122E-4	3,081E-4
	900	2,103E-3	1,605E-4	2,526E-4	4,323E-4	2,860E-4	3,159E-4	3,897E-4	2,756E-4	6,109E-4	1,384E-4	1,750E-4	1,840E-3	1,205E-3	1,626E-4	3,441E-4
	1000	2,003E-3	1,625E-4	2,631E-4	4,546E-4	3,043E-4	3,305E-4	3,994E-4	1,732E-4	5,161E-4	1,533E-4	1,723E-4	1,867E-3	xxxx	3,030E-4	3,165E-4
Filter B	380	1,023E-3	5,875E-4	5,332E-4	6,215E-4	6,587E-4	1,207E-3	1,026E-3	8,336E-4	1,249E-3	4,691E-4	7,507E-4	9,209E-4	6,787E-4	1,956E-3	4,278E-4
λ (nm)	400	1,763E-3	6,258E-4	4,479E-4	4,141E-4	4,784E-4	3,701E-4	5,734E-4	3,595E-4	3,176E-4	3,267E-4	7,079E-4	9,072E-4	8,454E-4	5,329E-4	4,233E-4
	500	8,141E-4	4,224E-4	4,242E-4	3,685E-4	4,614E-4	4,800E-4	4,942E-4	3,952E-4	2,984E-4	3,512E-4	7,159E-4	9,050E-4	5,345E-4	4,792E-4	4,046E-4
	600	6,841E-4	2,130E-4	2,245E-4	3,039E-4	2,795E-4	4,362E-4	4,443E-4	2,555E-4	1,318E-4	1,690E-4	5,191E-4	7,227E-4	3,039E-4	2,432E-4	2,990E-4
	700	1,427E-3	1,676E-4	1,551E-4	3,113E-4	2,067E-4	4,111E-4	4,550E-4	1,346E-4	1,846E-4	1,923E-4	2,656E-4	6,282E-4	1,740E-4	1,454E-4	3,446E-4
	800	4,428E-4	3,762E-4	1,799E-4	3,363E-4	1,819E-4	3,300E-4	4,244E-4	2,240E-4	2,035E-4	2,599E-4	1,684E-4	6,571E-4	1,564E-4	1,776E-4	3,598E-4
	900	1,001E-3	3,680E-4	1,892E-4	3,679E-4	1,794E-4	4,588E-4	3,553E-4	1,661E-4	6,351E-4	1,796E-4	1,314E-4	2,706E-4	2,053E-4	2,237E-4	4,101E-4
	1000	1,301E-3	4,087E-4	2,154E-4	4,266E-4	2,185E-4	4,035E-4	3,344E-4	1,916E-4	5,792E-4	1,323E-4	1,434E-4	2,995E-4	xxxx	2,553E-4	4,557E-4
Filter C	380	1,430E-4	1,057E-4	1,548E-4	1,313E-4	1,036E-4	1,415E-4	3,770E-4	1,398E-4	2,292E-4	9,869E-5	9,535E-5	1,053E-4	1,030E-4	3,906E-4	3,196E-4
λ (nm)	400	2,459E-4	9,233E-5	9,066E-5	1,137E-4	1,024E-4	1,221E-4	2,109E-4	1,317E-4	1,569E-4	7,646E-5	8,834E-5	2,836E-4	1,222E-4	1,747E-4	3,193E-4
	500	1,446E-4	5,494E-5	8,759E-5	8,260E-5	6,787E-5	1,138E-4	2,159E-4	9,485E-5	1,380E-4	6,078E-5	6,557E-5	2,699E-4	9,403E-5	9,882E-5	3,466E-4
	600	1,279E-4	5,195E-5	6,866E-5	9,563E-5	4,727E-5	8,325E-5	1,878E-4	6,279E-5	9,016E-5	4,967E-5	7,210E-5	2,301E-4	1,009E-4	6,196E-5	3,506E-4
	700	3,494E-4	9,527E-5	9,892E-5	1,250E-4	1,035E-4	1,771E-4	3,381E-4	1,031E-4	1,998E-4	8,230E-5	8,753E-5	4,202E-4	1,278E-4	2,347E-4	3,201E-4
	800	1,471E-4	1,322E-4	1,353E-4	1,126E-4	7,473E-5	1,452E-4	3,180E-4	2,581E-4	1,500E-4	9,815E-5	7,212E-5	4,273E-4	1,211E-4	9,201E-5	3,320E-4
	900	2,056E-4	8,980E-5	9,145E-5	1,002E-4	6,584E-5	1,007E-4	2,668E-4	9,105E-5	6,044E-4	6,079E-5	5,851E-5	1,494E-4	1,014E-4	7,288E-5	2,932E-4
	1000	8,599E-5	8,891E-5	7,118E-5	8,367E-5	5,840E-5	8,030E-5	2,139E-4	7,936E-5	5,091E-4	4,133E-5	4,104E-5	1,101E-4	xxxx	5,978E-5	2,983E-4
Filter D	380	2,171E-5	1,199E-5	1,543E-5	1,774E-5	1,480E-5	3,130E-5	2,843E-5	5,916E-5	3,898E-5	1,480E-5	8,731E-6	1,758E-5	1,035E-5	1,587E-5	3,270E-4
λ (nm)	400	3,213E-5	1,639E-5	1,302E-5	1,679E-5	1,781E-5	2,795E-5	1,881E-5	4,527E-5	3,824E-5	1,363E-5	1,463E-5	2,044E-5	2,356E-5	2,558E-5	3,312E-4
	500	1,443E-5	1,977E-5	1,218E-5	9,850E-6	2,270E-5	2,312E-5	2,667E-5	3,136E-5	3,394E-5	1,304E-5	1,108E-5	2,841E-5	2,473E-5	1,697E-5	2,992E-4
	600	1,510E-5	1,606E-5	1,544E-5	1,332E-5	2,275E-5	1,779E-5	3,192E-5	3,179E-5	4,250E-5	1,177E-5	1,471E-5	2,853E-5	2,251E-5	2,637E-5	3,141E-4
	700	5,504E-5	5,342E-5	3,064E-5	3,354E-5	5,886E-5	4,849E-5	7,367E-5	6,063E-5	5,311E-5	3,315E-5	3,344E-5	6,614E-5	4,617E-5	9,295E-5	2,857E-4
	800	2,844E-5	2,565E-5	3,233E-5	2,875E-5	5,359E-5	7,768E-5	8,785E-5	1,485E-4	4,256E-5	2,803E-5	2,712E-5	1,132E-4	4,963E-5	3,539E-5	3,017E-4
	900	2,424E-5	1,803E-5	2,401E-5	2,116E-5	4,131E-5	2,728E-5	5,645E-5	8,234E-5	5,890E-4	2,059E-5	1,825E-5	4,611E-5	3,811E-5	2,448E-5	3,042E-4
	1000	2,124E-5	1,475E-5	1,883E-5	1,778E-5	3,397E-5	2,487E-5	4,228E-5	4,840E-5	5,150E-4	1,912E-5	1,453E-5	3,632E-5	xxxx	1,521E-5	3,081E-4
Filter E	380	5,087E-5	6,760E-6	7,428E-6	9,825E-6	9,152E-6	2,116E-5	1,042E-5	xxxx	3,212E-5	4,894E-6	1,046E-5	9,402E-6	7,082E-6	7,456E-6	3,292E-4
λ (nm)	400	4,030E-5	4,207E-6	4,215E-6	4,423E-6	8,938E-6	3,068E-5	2,392E-6	2,915E-5	3,305E-5	4,877E-6	3,919E-6	4,743E-6	3,716E-6	4,077E-6	3,090E-4
	500	1,047E-5	2,684E-6	3,332E-6	3,581E-6	8,816E-6	3,901E-6	5,996E-6	2,009E-5	3,311E-5	4,046E-6	5,421E-6	4,251E-6	4,789E-6	4,034E-6	3,070E-4
	600	6,622E-6	1,642E-5	5,257E-6	5,644E-6	9,078E-6	4,571E-6	6,255E-6	2,119E-5	3,313E-5	4,198E-6	4,481E-6	5,785E-6	6,004E-6	3,736E-6	3,180E-4
	700	1,378E-5	2,622E-5	1,125E-5	1,204E-5	1,585E-5	1,836E-5	1,913E-5	3,454E-5	3,477E-5	1,460E-5	1,176E-5	1,837E-5	1,582E-5	2,231E-5	2,811E-4
	800	1,238E-5	1,140E-5	1,201E-5	1,174E-5	1,537E-5	2,097E-5	3,249E-5	1,871E-4	3,451E-5	1,194E-5	1,255E-5	2,901E-5	2,010E-5	1,624E-5	3,080E-4
	900	1,078E-5	8,551E-6	9,494E-6	1,006E-5	1,362E-5	1,246E-5	2,803E-5	9,806E-5	5,970E-4	1,021E-5	8,798E-6	2,916E-5	1,859E-5	1,131E-5	3,010E-4
	1000	1,259E-5	7,637E-6	8,515E-6	9,020E-6	1,244E-5	2,199E-5	2,373E-5	5,107E-5	5,030E-4	1,109E-5	7,614E-6	1,571E-5	xxxx	1,034E-5	3,150E-4

ANNEX B.20

w_i – Version #2

NMI		IFA	KRISS	LNE	MIKES	MSL	NIST	Nmi	NMIA	NMIJ	NPL	NRC	PTB	SMU	NMC	VNIIOFI
Filter A	380	2,284E-3	7,347E-2	7,890E-2	2,760E-2	1,200E-1	1,537E-2	5,253E-2	1,183E-1	7,254E-2	1,041E-1	9,796E-2	7,360E-3	xxxx	6,559E-2	3,829E-2
λ (nm)	400	1,079E-3	3,938E-2	6,311E-2	3,496E-2	1,721E-1	1,097E-2	3,095E-2	1,546E-1	6,670E-2	8,421E-2	5,576E-2	5,258E-3	xxxx	5,255E-2	5,432E-2
	500	1,477E-2	3,346E-2	7,311E-2	4,641E-2	1,188E-1	1,375E-2	3,880E-2	1,514E-1	6,257E-2	1,297E-1	7,543E-2	5,339E-3	xxxx	6,009E-2	4,402E-2
	600	8,496E-3	4,560E-2	6,469E-2	3,591E-2	7,238E-2	1,091E-2	2,937E-2	2,277E-1	8,581E-2	8,651E-2	6,312E-2	8,396E-3	xxxx	4,504E-2	5,556E-2
	700	9,642E-4	1,075E-1	7,842E-2	3,251E-2	6,737E-2	2,552E-2	4,354E-2	1,058E-1	1,566E-1	1,473E-1	1,044E-1	9,059E-3	2,411E-2	5,823E-2	3,857E-2
	800	6,547E-3	1,017E-1	4,066E-2	1,147E-2	2,861E-2	4,040E-2	1,636E-2	5,331E-2	1,734E-1	1,903E-1	1,162E-1	4,295E-3	2,085E-3	1,896E-1	2,514E-2
	900	9,542E-4	1,640E-1	6,617E-2	2,258E-2	5,160E-2	4,229E-2	2,780E-2	5,557E-2	1,131E-2	2,205E-1	1,378E-1	1,246E-3	2,905E-3	1,597E-1	3,564E-2
	1000	1,143E-3	1,736E-1	6,621E-2	2,218E-2	4,951E-2	4,198E-2	2,874E-2	1,528E-1	1,721E-2	1,951E-1	1,545E-1	1,316E-3	xxxx	4,994E-2	4,578E-2
Filter B	380	3,046E-2	9,233E-2	1,121E-1	8,252E-2	7,346E-2	2,188E-2	3,029E-2	4,587E-2	2,042E-2	1,449E-1	5,656E-2	3,758E-2	6,918E-2	8,331E-3	1,742E-1
λ (nm)	400	4,655E-3	3,693E-2	7,209E-2	8,436E-2	6,320E-2	1,056E-1	4,399E-2	1,119E-1	1,434E-1	1,355E-1	2,886E-2	1,757E-2	2,024E-2	5,094E-2	8,073E-2
	500	1,984E-2	7,368E-2	7,308E-2	9,684E-2	6,178E-2	5,708E-2	5,384E-2	8,421E-2	1,477E-1	1,066E-1	2,566E-2	1,605E-2	4,603E-2	5,727E-2	8,032E-2
	600	9,274E-3	9,565E-2	8,608E-2	4,699E-2	5,554E-2	2,281E-2	2,199E-2	6,649E-2	2,500E-1	1,519E-1	1,611E-2	8,311E-3	4,698E-2	7,339E-2	4,853E-2
	700	1,448E-3	1,050E-1	1,226E-1	3,043E-2	6,902E-2	1,745E-2	1,424E-2	1,627E-1	8,651E-2	7,973E-2	4,181E-2	7,473E-3	9,737E-2	1,394E-1	2,483E-2
	800	1,863E-2	2,582E-2	1,130E-1	3,230E-2	1,104E-1	3,355E-2	2,029E-2	7,283E-2	8,826E-2	5,409E-2	1,289E-1	8,462E-3	1,494E-1	1,158E-1	2,822E-2
	900	3,585E-3	2,653E-2	1,003E-1	2,655E-2	1,116E-1	1,707E-2	2,846E-2	1,302E-1	8,908E-3	1,114E-1	2,080E-1	4,905E-2	8,521E-2	7,179E-2	2,136E-2
	1000	2,492E-3	2,527E-2	9,100E-2	2,320E-2	8,837E-2	2,593E-2	3,775E-2	1,150E-1	1,258E-2	2,410E-1	2,053E-1	4,704E-2	xxxx	6,477E-2	2,032E-2
Filter C	380	5,607E-2	1,027E-1	4,787E-2	6,655E-2	1,069E-1	5,726E-2	8,065E-3	5,866E-2	2,183E-2	1,177E-1	1,261E-1	1,033E-1	1,082E-1	7,516E-3	1,123E-2
λ (nm)	400	1,595E-2	1,131E-1	1,173E-1	7,463E-2	9,188E-2	6,468E-2	2,167E-2	5,555E-2	3,918E-2	1,649E-1	1,235E-1	1,199E-2	6,455E-2	3,159E-2	9,458E-3
	500	2,550E-2	1,766E-1	6,947E-2	7,812E-2	1,157E-1	4,113E-2	1,143E-2	5,924E-2	2,797E-2	1,443E-1	1,240E-1	7,315E-3	6,028E-2	5,458E-2	4,436E-3
	600	2,235E-2	1,356E-1	7,760E-2	4,001E-2	1,637E-1	5,279E-2	1,037E-2	9,278E-2	4,501E-2	1,483E-1	7,038E-2	6,909E-3	3,594E-2	9,529E-2	2,976E-3
	700	8,994E-3	1,210E-1	1,122E-1	7,026E-2	1,026E-1	3,501E-2	9,606E-3	1,033E-1	2,750E-2	1,621E-1	1,433E-1	6,218E-3	6,727E-2	1,993E-2	1,072E-2
	800	4,486E-2	5,560E-2	5,303E-2	7,660E-2	1,739E-1	4,604E-2	9,603E-3	1,458E-2	4,316E-2	1,008E-1	1,867E-1	5,319E-3	6,622E-2	1,147E-1	8,810E-3
	900	1,361E-2	7,134E-2	6,879E-2	5,733E-2	1,327E-1	5,678E-2	8,083E-3	6,938E-2	1,575E-3	1,557E-1	1,680E-1	2,578E-2	5,591E-2	1,083E-1	6,690E-3
	1000	4,852E-2	4,538E-2	7,081E-2	5,124E-2	1,052E-1	5,563E-2	7,839E-3	5,696E-2	1,384E-3	2,101E-1	2,130E-1	2,961E-2	xxxx	1,004E-1	4,031E-3
Filter D	380	3,631E-2	1,189E-1	7,183E-2	5,438E-2	7,808E-2	1,747E-2	2,116E-2	4,889E-3	1,126E-2	7,809E-2	2,245E-1	5,538E-2	1,597E-1	6,792E-2	1,600E-4
λ (nm)	400	2,526E-2	9,707E-2	1,539E-1	9,248E-2	8,223E-2	3,338E-2	7,372E-2	1,272E-2	1,783E-2	1,402E-1	1,217E-1	6,241E-2	4,698E-2	3,985E-2	2,377E-4
	500	9,258E-2	4,932E-2	1,299E-1	1,986E-1	3,739E-2	3,605E-2	2,709E-2	1,960E-2	1,673E-2	1,134E-1	1,569E-1	2,387E-2	3,150E-2	6,691E-2	2,153E-4
	600	1,039E-1	9,190E-2	9,944E-2	1,335E-1	4,578E-2	7,486E-2	2,326E-2	2,345E-2	1,312E-2	1,710E-1	1,096E-1	2,911E-2	4,677E-2	3,408E-2	2,403E-4
	700	4,861E-2	5,162E-2	1,568E-1	1,309E-1	4,251E-2	6,263E-2	2,714E-2	4,007E-2	5,223E-2	1,340E-1	1,317E-1	3,367E-2	6,910E-2	1,705E-2	1,805E-3
	800	1,226E-1	1,506E-1	9,480E-2	1,199E-1	3,452E-2	1,643E-2	1,284E-2	4,497E-3	5,472E-2	1,261E-1	1,348E-1	7,737E-3	4,023E-2	7,913E-2	1,089E-3
	900	8,801E-2	1,591E-1	8,972E-2	1,154E-1	3,029E-2	6,949E-2	1,622E-2	7,625E-3	1,490E-4	1,220E-1	1,553E-1	2,432E-2	3,561E-2	8,624E-2	5,588E-4
	1000	7,688E-2	1,594E-1	9,778E-2	1,097E-1	3,005E-2	5,606E-2	1,940E-2	1,481E-2	1,308E-4	9,487E-2	1,643E-1	2,629E-2	xxxx	1,499E-1	3,654E-4
Filter E	380	2,205E-3	1,249E-1	1,034E-1	5,911E-2	6,813E-2	1,274E-2	5,257E-2	xxxx	5,530E-3	2,382E-1	5,211E-2	6,455E-2	1,138E-1	1,027E-1	5,267E-5
λ (nm)	400	9,634E-4	8,842E-2	8,807E-2	7,996E-2	1,958E-2	1,662E-3	2,734E-1	1,841E-3	1,432E-3	6,578E-2	1,019E-1	6,957E-2	1,133E-1	9,413E-2	1,638E-5
	500	1,338E-2	2,037E-1	1,322E-1	1,144E-1	1,889E-2	9,648E-2	4,083E-2	3,635E-3	1,339E-3	8,967E-2	4,995E-2	8,122E-2	6,401E-2	9,019E-2	1,557E-5
	600	5,449E-2	8,856E-3	8,644E-2	7,499E-2	2,899E-2	1,143E-1	6,107E-2	5,322E-3	2,176E-3	1,355E-1	1,190E-1	7,140E-2	6,628E-2	1,711E-1	2,362E-5
	700	9,800E-2	2,706E-2	1,470E-1	1,283E-1	7,407E-2	5,520E-2	5,081E-2	1,559E-2	1,538E-2	8,720E-2	1,344E-1	5,514E-2	7,432E-2	3,736E-2	2,354E-4
	800	1,134E-1	1,338E-1	1,204E-1	1,261E-1	7,357E-2	3,949E-2	1,645E-2	4,962E-4	1,458E-2	1,218E-1	1,103E-1	2,064E-2	4,301E-2	6,585E-2	1,831E-4
	900	9,465E-2	1,505E-1	1,221E-1	1,088E-1	5,931E-2	7,084E-2	1,400E-2	1,144E-3	3,088E-5	1,056E-1	1,422E-1	1,294E-2	3,185E-2	8,596E-2	1,215E-4
	1000	6,375E-2	1,731E-1	1,393E-1	1,241E-1	6,528E-2	2,087E-2	1,793E-2	3,871E-3	3,991E-5	8,203E-2	1,742E-1	4,094E-2	xxxx	9,451E-2	1,018E-4

ANNEX B.21

Unilateral Degrees of Equivalence of participating NMI – **Version #2**

NMI		IFA	KRISS	LNE	MIKES	MSL	NIST	Nmi	NMIA	NMIJ	NPL	NRC	PTB	SMU	NMC	VNIIOFI
Filter A	380	1,188E-3	4,932E-5	-4,357E-4	-4,457E-4	7,868E-4	1,188E-3	7,432E-5	1,443E-4	4,213E-4	-3,032E-4	3,493E-4	2,994E-3	4,217E-3	1,682E-5	-2,478E-3
λ (nm)	400	1,217E-3	-6,512E-5	-3,701E-4	-4,426E-4	7,324E-4	8,749E-4	7,488E-5	1,499E-4	4,239E-4	-4,026E-4	5,874E-4	3,257E-3	4,088E-3	2,499E-4	-2,098E-3
	500	1,082E-3	-1,059E-4	-3,234E-4	-3,159E-4	5,291E-4	9,016E-4	-3,559E-4	2,541E-4	2,951E-4	-2,159E-4	1,841E-4	2,717E-3	3,622E-3	5,162E-5	-1,208E-3
	600	1,178E-3	-1,200E-4	-3,075E-4	-4,975E-4	4,250E-4	5,050E-4	-3,150E-4	2,000E-4	4,540E-4	-5,746E-5	2,150E-4	2,485E-3	2,716E-3	-9,246E-5	-9,770E-4
	700	1,267E-3	-3,688E-4	-4,225E-4	-6,813E-4	1,940E-4	5,033E-4	-3,288E-4	1,082E-4	4,206E-5	2,372E-5	1,371E-4	3,084E-3	2,061E-3	-1,378E-5	-7,928E-4
	800	8,592E-4	-6,358E-4	-6,383E-4	-3,108E-4	-1,133E-4	4,442E-4	-1,078E-5	-2,488E-4	-3,018E-4	1,922E-5	-1,058E-4	3,479E-3	2,082E-3	8,117E-4	-9,928E-4
	900	1,150E-3	-4,478E-4	-5,228E-4	-2,703E-4	-5,263E-6	6,097E-4	6,474E-5	-2,518E-4	2,512E-4	7,974E-5	3,974E-5	6,474E-5	1,228E-3	6,647E-4	-1,010E-3
	1000	1,181E-3	-3,786E-4	-4,211E-4	-2,961E-4	8,895E-5	7,114E-4	2,139E-4	2,514E-4	4,314E-4	-1,605E-5	4,145E-5	8,089E-4	xxxx	7,581E-4	-6,481E-4
Filter B	380	-3,928E-3	6,248E-5	-1,540E-3	3,777E-3	1,877E-3	1,165E-3	1,900E-4	-1,490E-4	6,748E-5	-1,358E-3	-1,853E-3	-1,240E-3	-7,902E-4	6,925E-4	1,194E-3
λ (nm)	400	-1,301E-3	8,690E-4	-1,093E-3	6,700E-4	-2,260E-4	7,904E-5	-6,346E-5	1,120E-4	9,354E-5	-3,185E-4	-6,385E-4	9,923E-4	-9,642E-4	1,417E-3	-3,650E-4
	500	-1,018E-3	1,534E-3	-9,756E-4	2,269E-4	-6,956E-4	4,729E-4	-2,856E-4	-3,796E-4	-1,716E-4	3,944E-4	-7,406E-4	2,944E-4	-1,057E-3	6,894E-4	3,309E-4
	600	-9,486E-4	1,366E-3	-7,611E-4	4,039E-4	-6,461E-4	5,314E-4	-2,136E-4	-8,816E-4	-2,706E-4	6,689E-4	-8,086E-4	2,464E-4	-1,071E-3	6,339E-4	-1,546E-4
	700	-7,529E-4	1,085E-3	-3,424E-4	6,301E-4	-2,212E-4	2,561E-4	-1,045E-4	-3,572E-4	4,381E-5	-2,154E-4	-3,974E-4	2,878E-4	-9,081E-4	6,563E-4	2,083E-4
	800	-7,985E-4	1,229E-3	-2,010E-4	5,365E-4	-1,935E-4	2,407E-4	4,115E-4	-9,898E-5	3,115E-4	-3,785E-4	1,565E-4	9,115E-4	-5,305E-4	4,640E-4	-3,085E-4
	900	-2,078E-3	9,624E-4	-7,263E-5	4,099E-4	-4,763E-5	3,097E-4	4,184E-4	-1,634E-6	1,984E-4	-4,051E-4	2,812E-5	-2,351E-4	-5,296E-4	7,899E-4	1,934E-4
	1000	-2,440E-3	5,874E-4	-1,051E-4	4,699E-4	8,316E-5	1,616E-4	1,224E-4	-4,909E-5	4,639E-4	-3,326E-4	-6,509E-5	3,324E-4	xxxx	7,349E-4	1,884E-4
Filter C	380	-5,986E-4	-2,251E-4	-1,211E-4	8,371E-4	5,334E-4	2,267E-4	-6,432E-5	2,106E-4	6,276E-5	-1,928E-4	-2,091E-4	-1,358E-4	-1,547E-4	2,793E-5	2,824E-4
λ (nm)	400	-2,726E-4	-4,223E-4	3,117E-5	2,199E-4	3,637E-4	1,515E-4	-6,133E-5	2,967E-4	2,784E-4	-1,476E-4	6,923E-6	3,204E-4	-3,251E-4	2,214E-4	-3,808E-4
	500	-1,211E-4	1,209E-4	-1,156E-4	-2,609E-5	-1,511E-4	1,522E-4	1,512E-4	-1,126E-4	7,791E-5	3,139E-4	-1,078E-4	3,584E-4	-3,916E-4	-9,909E-5	5,991E-5
	600	-2,007E-4	2,278E-4	-1,777E-4	1,306E-4	-1,717E-4	1,145E-4	1,251E-4	-1,214E-4	-3,794E-5	2,418E-4	-1,059E-4	9,131E-5	-2,698E-4	-3,669E-5	2,581E-5
	700	-1,488E-4	3,142E-5	-9,633E-5	1,487E-4	2,324E-4	6,842E-5	7,117E-5	8,617E-5	-3,133E-5	1,118E-4	-1,632E-4	-2,095E-5	-5,366E-4	-1,031E-4	6,053E-4
	800	-1,846E-4	2,474E-4	-1,455E-5	-6,455E-5	-6,705E-5	5,545E-5	1,859E-4	6,320E-5	5,495E-5	1,304E-4	9,295E-5	2,754E-4	-4,078E-4	5,449E-6	-1,511E-4
	900	5,366E-5	1,502E-4	-8,838E-6	-4,834E-5	-5,384E-5	4,966E-5	4,472E-4	-2,634E-5	-8,534E-5	-1,338E-6	4,366E-5	1,012E-4	-3,900E-4	6,116E-5	8,162E-6
	1000	-1,466E-5	-4,091E-5	1,840E-6	6,590E-6	2,034E-5	2,084E-5	2,381E-4	3,284E-5	5,034E-5	-1,566E-5	-2,841E-5	1,582E-4	xxxx	-1,660E-6	-4,516E-5
Filter D	380	-4,886E-5	-1,091E-5	1,599E-6	4,697E-5	1,939E-5	2,038E-5	-2,030E-6	2,710E-5	-1,319E-5	-2,057E-5	-3,214E-6	-1,438E-5	6,978E-6	8,932E-6	-2,294E-5
λ (nm)	400	-9,919E-5	-6,535E-5	1,185E-5	5,037E-5	6,313E-5	4,052E-5	-3,011E-5	-3,655E-6	2,362E-6	-2,602E-5	1,194E-5	-1,745E-5	-2,091E-5	5,844E-5	-6,162E-5
	500	-7,035E-6	3,273E-5	-8,555E-6	1,288E-5	-1,500E-5	4,406E-5	-7,313E-7	-2,287E-5	-9,400E-6	2,495E-6	-9,793E-6	-8,246E-6	-2,728E-5	-7,462E-6	-1,655E-5
	600	-4,026E-5	4,727E-5	-4,101E-5	2,298E-5	-2,657E-5	3,458E-5	1,215E-5	-3,690E-5	-7,012E-6	2,055E-5	-1,320E-5	-2,865E-5	-2,572E-5	3,476E-6	4,505E-7
	700	-5,891E-5	6,940E-5	-3,374E-5	1,007E-4	2,035E-5	5,957E-5	2,424E-5	2,300E-5	-1,200E-5	6,769E-6	-3,783E-5	-7,294E-5	-1,114E-4	-1,813E-5	2,112E-4
	800	-9,859E-5	4,899E-5	-6,546E-6	1,464E-5	-3,032E-6	-2,094E-5	9,077E-5	2,369E-5	2,793E-5	3,675E-5	1,163E-5	2,990E-5	-1,164E-4	-6,850E-6	7,777E-6
	900	5,728E-6	-2,911E-5	4,104E-6	1,145E-5	-1,645E-5	2,597E-5	-6,347E-6	8,644E-5	1,664E-5	-1,361E-6	1,962E-5	5,666E-5	-7,880E-5	-1,012E-5	-1,093E-5
	1000	9,942E-5	-6,370E-5	3,835E-6	2,101E-5	2,035E-7	-3,192E-6	-3,646E-5	7,118E-5	-2,537E-5	-1,192E-5	4,595E-6	4,045E-5	xxxx	-6,843E-6	-6,447E-6
Filter E	380	7,840E-5	2,498E-6	-1,049E-6	2,338E-7	1,256E-6	4,332E-6	-1,630E-6	xxxx	-5,783E-7	-1,921E-6	-4,058E-6	-7,642E-6	6,279E-6	6,442E-9	9,914E-5
λ (nm)	400	6,807E-5	-1,978E-6	6,444E-9	6,766E-7	3,936E-6	-2,309E-6	-2,071E-6	-4,870E-5	-1,455E-6	-7,880E-7	-3,766E-6	-7,490E-7	6,262E-6	4,441E-6	-3,343E-5
	500	-2,985E-5	1,537E-6	-2,954E-6	3,731E-6	-1,711E-6	4,460E-6	-6,609E-7	-1,145E-5	-1,102E-5	-4,516E-6	-3,987E-7	4,892E-7	5,598E-6	-2,633E-6	-1,594E-5
	600	4,551E-6	1,093E-5	-8,210E-6	3,908E-6	-4,349E-6	4,635E-6	-8,743E-7	-2,713E-6	-1,356E-5	-1,443E-6	-4,165E-6	-4,705E-6	9,800E-6	8,356E-7	-4,087E-6
	700	-1,505E-5	3,836E-5	-7,620E-6	1,999E-5	1,048E-5	1,358E-5	6,554E-7	-3,462E-5	-1,616E-5	-1,843E-6	3,757E-6	-1,373E-5	-1,562E-5	-5,719E-6	4,379E-5
	800	6,389E-5	-5,613E-6	-1,543E-5	-1,053E-5	-6,210E-6	8,533E-6	-2,075E-5	2,677E-4	-2,814E-5	9,232E-6	-4,962E-6	-1,555E-5	-5,503E-5	-6,917E-6	-1,768E-5
	900	1,296E-5	-1,752E-5	2,187E-6	6,480E-6	3,958E-6	1,270E-5	-1,178E-5	3,380E-5	-7,750E-6	-3,229E-6	1,733E-6	5,115E-5	-3,968E-5	1,503E-6	-2,235E-5
	1000	1,360E-5	-2,973E-5	9,511E-6	1,752E-5	1,619E-5	8,853E-6	-1,589E-5	-9,105E-5	2,363E-5	3,417E-6	-3,953E-6	2,113E-5	xxxx	-2,943E-6	-1,473E-5

ANNEX B.22

Unc (DoE$_i$) ; k=2 - **Version #2**

NMI		IFA	KRISS	LNE	MIKES	MSL	NIST	Nmi	NMIA	NMIJ	NPL	NRC	PTB	SMU	NMC	VNIIOFI
Filter A	380	4,840E-3	8,171E-4	7,857E-4	1,371E-3	6,202E-4	1,851E-3	9,790E-4	5,994E-4	8,004E-4	6,115E-4	6,965E-4	2,688E-3	5,806E-4	8,454E-4	1,157E-3
λ (nm)	400	5,618E-3	9,082E-4	7,065E-4	9,666E-4	3,961E-4	1,752E-3	1,030E-3	4,035E-4	6,612E-4	5,566E-4	7,552E-4	2,539E-3	3,881E-4	7,795E-4	7,658E-4
	500	1,161E-3	7,621E-4	5,026E-4	6,418E-4	3,822E-4	1,204E-3	7,054E-4	2,932E-4	5,430E-4	3,165E-4	4,940E-4	1,941E-3	3,586E-4	5,591E-4	6,600E-4
	600	1,574E-3	6,633E-4	5,498E-4	7,523E-4	5,171E-4	1,387E-3	8,354E-4	2,216E-4	4,679E-4	4,342E-4	5,572E-4	1,584E-3	3,255E-4	6,677E-4	5,970E-4
	700	4,623E-3	4,121E-4	4,909E-4	7,826E-4	5,330E-4	8,868E-4	6,721E-4	3,866E-4	3,134E-4	3,158E-4	4,064E-4	1,502E-3	9,129E-4	5,763E-4	7,161E-4
	800	1,203E-3	2,872E-4	4,711E-4	9,060E-4	5,676E-4	4,742E-4	7,564E-4	4,095E-4	2,089E-4	1,182E-4	2,450E-4	1,487E-3	2,137E-3	1,869E-4	6,068E-4
	900	4,204E-3	2,896E-4	4,736E-4	8,536E-4	5,551E-4	6,165E-4	7,670E-4	4,969E-4	1,214E-3	2,069E-4	2,906E-4	3,678E-3	2,407E-3	2,804E-4	6,742E-4
	1000	4,004E-3	2,925E-4	4,943E-4	8,982E-4	5,919E-4	6,456E-4	7,862E-4	2,628E-4	1,022E-3	2,719E-4	2,849E-4	3,731E-3	xxxx	5,808E-4	6,169E-4
Filter B	380	2,009E-3	1,110E-3	9,948E-4	1,182E-3	1,260E-3	2,383E-3	2,015E-3	1,622E-3	2,469E-3	6,092E-4	1,451E-3	1,801E-3	1,100E-3	3,893E-3	6,602E-4
λ (nm)	400	3,517E-3	1,228E-3	8,621E-4	7,915E-4	9,252E-4	6,988E-4	1,121E-3	6,524E-4	5,810E-4	5,791E-4	1,395E-3	1,798E-3	1,673E-3	1,038E-3	8,107E-4
	500	1,612E-3	8,127E-4	8,164E-4	6,999E-4	8,934E-4	9,318E-4	9,610E-4	7,427E-4	5,435E-4	6,485E-4	1,413E-3	1,795E-3	1,044E-3	9,243E-4	7,756E-4
	600	1,361E-3	4,037E-4	4,279E-4	5,923E-4	5,422E-4	8,617E-4	8,780E-4	4,675E-4	2,127E-4	2,930E-4	1,029E-3	1,439E-3	5,924E-4	4,608E-4	5,824E-4
	700	2,852E-3	3,159E-4	2,892E-4	6,125E-4	3,979E-4	8,145E-4	9,031E-4	2,207E-4	3,486E-4	3,433E-4	5,121E-4	1,251E-3	3,295E-4	2,574E-4	6,801E-4
	800	8,770E-4	7,287E-4	3,370E-4	6,611E-4	3,419E-4	6,483E-4	8,396E-4	4,304E-4	3,876E-4	4,540E-4	2,661E-4	1,308E-3	2,870E-4	3,329E-4	7,089E-4
	900	1,998E-3	7,184E-4	3,578E-4	7,253E-4	3,369E-4	9,092E-4	6,998E-4	2,651E-4	1,264E-3	3,144E-4	2,322E-4	5,270E-4	3,917E-4	4,284E-4	8,109E-4
	1000	2,599E-3	7,949E-4	3,965E-4	8,428E-4	4,166E-4	7,961E-4	6,555E-4	3,279E-4	1,151E-3	2,293E-4	2,545E-4	5,843E-4	xxxx	4,755E-4	9,018E-4
Filter C	380	2,766E-4	1,984E-4	3,009E-4	2,522E-4	1,939E-4	2,735E-4	7,506E-4	2,700E-4	4,526E-4	1,345E-4	1,649E-4	1,977E-4	1,189E-4	7,778E-4	6,350E-4
λ (nm)	400	4,872E-4	1,486E-4	1,491E-4	2,172E-4	1,738E-4	2,348E-4	4,165E-4	2,548E-4	3,065E-4	1,136E-4	1,492E-4	5,632E-4	2,351E-4	3,429E-4	6,350E-4
	500	2,851E-4	8,430E-5	1,661E-4	1,580E-4	1,268E-4	2,225E-4	4,292E-4	1,792E-4	2,718E-4	1,023E-4	1,191E-4	5,377E-4	1,817E-4	1,916E-4	6,916E-4
	600	2,526E-4	7,732E-5	1,311E-4	1,868E-4	7,047E-5	1,614E-4	3,734E-4	1,046E-4	1,756E-4	8,810E-5	1,382E-4	4,584E-4	1,976E-4	1,169E-4	7,001E-4
	700	6,950E-4	1,709E-4	1,559E-4	2,394E-4	1,939E-4	3,467E-4	6,723E-4	1,628E-4	3,930E-4	9,696E-5	1,595E-4	8,373E-4	2,451E-4	4,638E-4	6,361E-4
	800	2,861E-4	2,340E-4	2,618E-4	2,144E-4	1,082E-4	2,822E-4	6,323E-4	5,117E-4	2,920E-4	1,465E-4	9,598E-5	8,518E-4	2,322E-4	1,707E-4	6,605E-4
	900	4,075E-4	1,441E-4	1,744E-4	1,926E-4	9,642E-5	1,936E-4	5,307E-4	1,736E-4	1,208E-3	6,122E-5	6,298E-5	2,936E-4	1,952E-4	1,349E-4	5,839E-4
	1000	1,664E-4	1,598E-4	1,355E-4	1,616E-4	9,770E-5	1,546E-4	4,256E-4	1,526E-4	1,017E-3	4,644E-5	4,572E-5	2,158E-4	xxxx	1,113E-4	5,951E-4
Filter D	380	4,246E-5	1,973E-5	2,950E-5	3,430E-5	2,818E-5	6,193E-5	5,614E-5	1,180E-4	7,743E-5	2,651E-5	1,157E-5	3,213E-5	1,638E-5	3,042E-5	6,540E-4
λ (nm)	400	6,334E-5	2,764E-5	2,368E-5	2,714E-5	3,393E-5	5,484E-5	3,603E-5	8,989E-5	7,571E-5	2,041E-5	2,570E-5	3,942E-5	4,586E-5	5,000E-5	6,622E-4
	500	2,736E-5	3,566E-5	2,257E-5	1,565E-5	4,447E-5	4,532E-5	5,254E-5	6,204E-5	6,726E-5	2,190E-5	1,975E-5	5,608E-5	4,861E-5	3,268E-5	5,983E-4
	600	2,762E-5	2,816E-5	2,917E-5	2,407E-5	4,437E-5	3,412E-5	6,303E-5	6,277E-5	8,439E-5	1,850E-5	2,760E-5	5,616E-5	4,387E-5	5,176E-5	6,281E-4
	700	1,068E-4	9,470E-5	5,525E-5	5,097E-5	1,147E-4	9,329E-5	1,449E-4	1,183E-4	1,028E-4	4,430E-5	4,611E-5	1,296E-4	8,845E-5	1,840E-4	5,707E-4
	800	5,253E-5	3,588E-5	6,089E-5	5,321E-5	1,049E-4	1,538E-4	1,743E-4	2,961E-4	8,228E-5	3,963E-5	3,733E-5	2,253E-4	9,684E-5	6,734E-5	6,029E-4
	900	4,580E-5	2,990E-5	4,531E-5	3,923E-5	8,108E-5	5,219E-5	1,118E-4	1,639E-4	1,178E-3	2,630E-5	1,900E-5	9,084E-5	7,454E-5	4,632E-5	6,081E-4
	1000	4,055E-5	2,626E-5	3,548E-5	3,323E-5	6,676E-5	4,811E-5	8,361E-5	9,597E-5	1,030E-3	3,150E-5	1,799E-5	7,154E-5	xxxx	2,597E-5	6,161E-4
Filter E	380	1,016E-4	1,257E-5	1,406E-5	1,906E-5	1,766E-5	4,205E-5	2,028E-5	xxxx	6,407E-5	8,463E-6	2,034E-5	1,813E-5	1,333E-5	1,411E-5	6,583E-4
λ (nm)	400	8,056E-5	7,732E-6	8,025E-6	8,462E-6	1,769E-5	6,131E-5	3,839E-6	5,824E-5	6,605E-5	9,120E-6	6,875E-6	9,127E-6	6,969E-6	7,735E-6	6,181E-4
	500	2,078E-5	3,779E-6	6,142E-6	6,680E-6	1,744E-5	6,231E-6	1,171E-5	4,011E-5	6,617E-5	7,668E-6	9,786E-6	8,100E-6	9,222E-6	7,393E-6	6,140E-4
	600	1,285E-5	3,255E-5	1,001E-5	1,069E-5	1,787E-5	7,636E-6	1,209E-5	4,225E-5	6,619E-5	7,597E-6	7,603E-6	1,111E-5	1,157E-5	6,426E-6	6,360E-4
	700	2,605E-5	5,074E-5	2,063E-5	2,054E-5	3,039E-5	3,559E-5	3,719E-5	6,849E-5	6,896E-5	2,550E-5	1,827E-5	3,561E-5	3,033E-5	4,371E-5	5,621E-4
	800	2,310E-5	1,821E-5	2,232E-5	1,949E-5	2,942E-5	4,099E-5	6,438E-5	3,741E-4	6,845E-5	1,994E-5	1,870E-5	5,734E-5	3,920E-5	3,124E-5	6,160E-4
	900	2,033E-5	1,222E-5	1,757E-5	1,878E-5	2,628E-5	2,387E-5	5,560E-5	1,960E-4	1,194E-3	1,545E-5	1,244E-5	5,789E-5	3,648E-5	2,146E-5	6,020E-4
	1000	2,422E-5	1,127E-5	1,559E-5	1,669E-5	2,391E-5	4,345E-5	4,696E-5	1,019E-4	1,006E-3	1,981E-5	1,109E-5	3,065E-5	xxxx	1,793E-5	6,300E-4

For most of the laboratories, the uncertainty in the table is dominated by the uncertainty due to the stability of the artefact.

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