



International Spectroradiometer Intercomparison 2024 - Final report

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2025

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JRC141156

EUR 40257

PDF ISBN 978-92-68-25543-8 ISSN 1831-9424 doi:10.2760/7023588 KJ-01-25-171-EN-N

Luxembourg: Publications Office of the European Union, 2025

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How to cite this report: European Commission: Joint Research Centre, Pavanello, D., Alessandrini, S. and Thiel, C., *International Spectroradiometer Intercomparison 2024 - Final report*, Publications Office of the European Union, Luxembourg, 2025, <https://data.europa.eu/doi/10.2760/7023588>, JRC141156.

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Abstract

The International Spectroradiometer Intercomparison (ISRC) is a metrological event in the field of solar radiation measurements. The ISRC is managed by the European Solar Test Installation (ESTI) laboratories of the European Commission Joint Research Centre on an annual basis. The 12th edition was held in June 2024 at the Joint Research Centre site of Ispra, Italy.

The event consisted of a week of uninterrupted measurements of the solar radiation by the instruments of different participants, with the ESTI instrumentation acting as reference for the performance evaluation of spectroradiometers, pyranometers and pyrhemometers. Spectroradiometers were assessed also using the artificial light source of Apollo, a large area steady state solar simulator of ESTI.

Starting in 2011, the first ISRC focused primarily on photovoltaic research and applications. Over the years, the range of interested participants has gradually expanded, encompassing not only laboratories in the PV field, but also space agencies, national metrological institutes (NMI), university and research groups, manufacturers of measurement equipment operating in the fields of climatology and meteorology.

The physical quantities measured during the campaign were the broadband solar irradiance (direct, diffuse and global normal) and the spectrally resolved spectral irradiance (direct and global normal).

The present report summarizes the results of the Intercomparison, divided in four main sections: in the first section the performance of the broadband irradiance sensors is presented; the second and third are dedicated to the performance indicators of the spectroradiometers in outdoor conditions using natural sunlight and indoor using the Apollo solar simulator; the fourth contains a summary of the prototype instruments present at the Intercomparison.

Prototype instruments were not comparable directly with the reference instruments; their interest in participating at the ISRC was mainly to collect data for further development of the instruments or validation of mathematical models.

Foreword by Christian Thiel

The Joint Research Centre (JRC) is a Directorate-General of the European Commission. The JRC is present in five different Member States of the EU, with six sites in Brussels and Geel (Belgium), Ispra (Italy), Petten (The Netherlands), Karlsruhe (Germany) and Seville (Spain) with more than 2000 staff.

The JRC activities are grouped in different portfolios, with different scope such as Security and Digitalization, Economy and Finance, Environment, Climate Change, Energy and Mobility, Food and Migration.

Within the energy and mobility field, the European Solar Test Installation laboratory (ESTI) is a European reference laboratory for calibration of photovoltaic (PV) devices and for the verification of energy generation. ESTI's unique set of indoor and outdoor facilities allows the measurements of all PV technologies and almost any device size.

To guarantee validity, all measurements (including PV) are required to have an unbroken traceability chain to international primary measurement standards as well as a calculation of their uncertainty. For PV devices the most important and difficult aspect is the irradiance determination, for which ESTI is accredited for three methods. The global sunlight method (1st method) and the direct sunlight method (2nd method) transfer the irradiance calibration from two cavity radiometers, which are calibrated every five years against the World Radiometric Reference at the International Pyrheliometer Comparison held in Davos, Switzerland. The solar simulator method (3rd method) makes reference to the international irradiance scale, as represented by a standard lamp.

ESTI maintains a laboratory management system compliant to the ISO/IEC 17025 and is accredited for the calibration of PV devices (LAT 225) by the Italian accreditation body Accredia.

Since 2011 ESTI manages the International Spectroradiometer Intercomparison (ISRC). Spectroradiometry has become a key discipline in order to achieve precise measurements on any PV device; for this reason, the ISRC began with the participation of actors within the PV community, from top level laboratories to industry and universities. Since the previous edition in June 2023 and also this year other scientific areas have been touched by the ISRC, in particular meteorology and climatology. I thank all JRC colleagues who have organized this year's ISRC and all participants who made it a success.

The ISRC is now a key element in the portfolio of the ESTI activities, and I wish for the upcoming years an increase in the number of participants and instruments, to give to the ISRC more and more recognition within the scientific community.

Acknowledgements

The authors would like to warmly acknowledge all the colleagues of the European Solar Test Installation for the valuable support during the intense week of the Intercomparison 2024.

We would like to thank several colleagues of other laboratories, who have contributed with their wonderful explanations during the scientific visits to their laboratories at the JRC. In particular Marco Zanni for the visit at VELA (Vehicle Emission Laboratory) and Pietro Sciuto, Barbara Bulgarelli and Jean-François Berthon for the visit at the Marine Optical Laboratory.

Thanks to everyone who dedicated time to make the Intercomparison an event of scientific relevance and a pleasant opportunity to meet new people.

Authors

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Christian Thiel

Introduction

The International Spectroradiometer Intercomparison (ISRC) has reached its 12th edition this year, hosted for the first time by the Joint Research Centre (JRC), at the European Solar Test Installation (ESTI) laboratories.

The ISRC started in 2011 at the ENEA site of Portici (NA), in Italy, with the aim to assess the comparability of different measurement chains for the solar spectral irradiance between the participating institutions [1]. As an accredited reference laboratory in the field of photovoltaics, ESTI's main interest is related to metrological aspects of the performance of different PV technologies [2]. While crystalline silicon devices, with all their different flavors available nowadays on the market, can be considered as well known technologies with respect to their dependency on spectral irradiance, this is not yet true for new materials like perovskites (single and tandem), dye-sensitized and organic [3-7]. Considering this aspect, a precise characterization of the incoming light spectrum has become a crucial metrological factor to reduce (or at least better characterize) the measurement uncertainties for these devices.

A second aspect concerns the measurement of the direct normal (DNI or beam) and global normal (GNI) incident solar radiation using so-called broadband sensors, in particular pyranometers and pyrhemometers [8-10]. A precise calibration and regular performance assessments are key factors for all the applications involving solar radiation: to have reliable outdoor performance estimations of PV systems, to improve mathematical models related to meteorology and climatology, to perform secondary calibrations of other instruments at factory level, to monitor the energy production of PV installations.

The aforementioned aspects are key elements for the successful achievement of the ambitious goals set by the European Green Deal. The EU has adopted several actions to promote climate action for the protection of the environment, achieve energy transition and create a circular economy of products. The renewable energy with the largest scope in terms of scientific development, innovation, industrial transfer and impact is solar photovoltaic energy. The ISRC acts in the framework of the JRC activities for the development of international standards, research for the metrology used to measure the photovoltaic performance and estimation, in particular for innovative technologies, providing independent reference data for EU research laboratories and industry.

The present report summarizes the results of the 12th ISRC, held from 17-21 June 2024.

Participating institutions

The following table summarizes (in alphabetical order) the list of participating institutions, their role and participation sectors, and contact websites.

Table 1: Participating Institutions.

JRC European Solar Test Installation (ESTI)		Organizer of the ISRC. Reference for spectroradiometers and broadband sensors.	JRC: https://joint-research-centre.ec.europa.eu/index_en ESTI: https://joint-research-centre.ec.europa.eu/european-solar-test-installation_en
JRC Marine Optical Laboratory		Spectroradiometers Intercomparison	JRC: https://joint-research-centre.ec.europa.eu/index_en OML: https://joint-research-centre.ec.europa.eu/laboratories-z/marine-optical-laboratory_en
Atamostec Corporation		Broadband sensors	https://www.atamostec.cl
CEA		Spectroradiometers Intercomparison	https://www.cea.fr/
ENEA (Portici)		Spectroradiometers Intercomparison Broadband sensors	https://www.portici.enea.it/
ESA ESTEC European Space Agency		Spectroradiometers Intercomparison	ESA: https://www.esa.int/
EURAC		Spectroradiometers Intercomparison Broadband sensors	https://www.eurac.edu
Officina del Sole		Broadband sensors	
Pasan SA		Spectroradiometers Intercomparison	https://www.pasan.ch/
Peak Design Ltd		Spectroradiometers Intercomparison	

PV Lab		Spectroradiometers Intercomparison	https://www.pv-lab.de
RSE – Ricerca Sistema Energetico		Spectroradiometers Intercomparison Broadband sensors	https://www.rse-web.it
SERIS		Spectroradiometers Intercomparison Broadband sensors	https://www.seris.nus.edu.sg
SUPSI		Spectroradiometers Intercomparison Broadband sensors	https://www.supsi.ch
Solar Performance Limited		Spectroradiometers Intercomparison Broadband sensors	
Universidad de Antofagasta		Broadband sensors	https://www.uantof.cl
Universidad Nacional de Colombia		Spectroradiometers Intercomparison Broadband sensors	https://www.unal.edu.co

Source: European Solar Test Installation – JRC.

Pyranometers and pyrhelimeters

This section presents the results of the data acquired by the participating pyranometers and pyrhelimeters. The pyranometers were all mounted on a large area tracker (2m x 2m size), while the pyrhelimeters were on a second smaller tracker. The reference absolute cavity radiometers (ACR) and the reference pyranometer measuring the diffuse irradiance were on a third tracker; to measure the diffuse component of the irradiance the pyranometer was always kept shaded by a shading disc. The alignment of all the trackers was checked periodically every 10-15 minutes throughout all the days¹. The acquisition timing was ruled by the ACR system.

1.1 Instruments

Table 2: list of pyranometers and pyrhelimeters.

Broadband sensors	
ESTI: <ul style="list-style-type: none"> • Kipp & Zonen CMP22 060142 • Kipp & Zonen CMP22 220889 • Kipp & Zonen CH1 930018 • Kipp & Zonen CHP1 060460 • Kipp & Zonen CHP1 110533 • PMO6 81109 • PMO6 911204 	Universidad Nacional de Colombia: <ul style="list-style-type: none"> • EKO MS80 S18003080 • Kipp & Zonen CMP10 141141
ENEA Portici: <ul style="list-style-type: none"> • Eppley PSP 25828F3 • Eppley NIP 25668E6 	EURAC Research: <ul style="list-style-type: none"> • Kipp & Zonen CMP21 140385 • Kipp & Zonen CMP21 100411 • Kipp & Zonen CHP1 110545
RSE: <ul style="list-style-type: none"> • Kipp & Zonen CMP21 100410 • Kipp & Zonen CMP21 133060 • Kipp & Zonen CHP1 120985 	Solar Performance Limited: <ul style="list-style-type: none"> • Kipp & Zonen CMP22 100214 • Kipp & Zonen CMP11 152486 • Eppley SNIP 3789E6
Corporation Atamostec / Univ. de Chile: <ul style="list-style-type: none"> • Kipp & Zonen CM22 190612 • Kipp & Zonen CHP1 210865 	PV-Lab: <ul style="list-style-type: none"> • Kipp & Zonen CMP11 114178 • Hukseflux SR20 2026
Officina del Sole: <ul style="list-style-type: none"> • Kipp & Zonen CMP10 191709 • Kipp & Zonen CMP11 070362 	SERIS Singapore: <ul style="list-style-type: none"> • Kipp & Zonen CMP11 101398 • Kipp & Zonen CMP3 139657

Source: European Solar Test Installation JRC

¹ The nominal accuracy of the trackers is <0.01°.

1.2 Data acquisition and evaluation

The signals of the absolute cavity radiometers, calibrated pyrheliometers and a shaded CM22 pyranometer were simultaneously acquired by an in-house software developed at ESTI. All the reference instruments were connected to data loggers HP 34970A. The control and data acquisition systems of the reference instruments were independent from the systems connected to the broadband instruments of the participants.

The participants' pyranometers and pyrheliometers were connected to two data loggers HP34970A, connected via GPIB cable to a unique computer, which sent the trigger signals to both the systems for a synced data acquisition.

The time sync between the different systems was performed every morning before starting the acquisitions, using a GPS signal, and setting all the clocks at GMT+1. It is worth noting that in Italy the Local Time was GMT+2 in June, but the solar time GMT+1.

The timing of the ESTI's PM06 cavities was set to cycles of 45 seconds with shutter closed alternated to 45 seconds with shutter opened. At the end of each cycle a single data point was acquired. The four calibrated pyrheliometers and diffuse pyranometer acquired a valid irradiance point every 45 seconds as well, thus including the periods where the ACR had the shutter closed. A more dense temporal resolution allowed to improve the sky stability control for the data post-processing. The instruments of the participants were acquired every 45 seconds synchronously with the cavities.

Data were filtered according to the criteria listed in 1.3 in order to consider, for the evaluation, only those points acquired in stable sky conditions.

1.3 Data filtering

Data were acquired during the entire day independently on the sky stability, which was assessed afterwards during the data post-processing. The entire raw data set of the ISRC has been given to all the participants. From the raw data set, only the points fulfilling the criteria for a suitable sky stability have been kept for data analysis, whilst all the others have been removed.

The filtering criteria are summarized as follows:

- $DNI(t) \leq 1000 \text{ W/m}^2$
- $DNI(t) \geq 700 \text{ W/m}^2$
- $GNI(t) \leq 1100 \text{ W/m}^2$
- $\text{Diffuse}(t) \leq 400 \text{ W/m}^2$
- Maximum difference between the two ESTI's reference ACRs: less than 2 W/m^2
- Maximum DNI difference in a period of 90 seconds (measured by the reference pyrheliometers): 3 W/m^2
- Maximum ratio between any reference pyrheliometer and the ACR average: $0.998 \leq R_k \leq 1.002$

A second layer of filtering is then performed individually for each instrument's data series to flag suspicious points affected by artefacts. Flagged points are then singularly evaluated and eventually manually removed from the series.

In order to give a course idea of the impact of data filtering on the total amount of acquired points, on the days used for the calculations, about 85% of the raw data have been filtered out.

1.4 The outcome: a dataset for broadband instruments

The outcome of the ISRC for broadband instruments are two datasets of all the acquired irradiance points, one preceding the filtering and another including only the filtered points. Each dataset, disseminated in form of a MS Excel® file, contains the irradiance points of the instruments (voltage) and the corresponding reference values (in W/m²) of Direct Normal, Diffuse Normal and Global Normal irradiances. The Global Normal Irradiance was given both as measured by the reference pyranometer and as the sum of the Diffuse Global and The Direct Normal as average of the two Absolute Cavity Radiometers.

Spectroradiometers

The assessment of the spectroradiometers was carried out both outdoor and indoor. During the days 17-19 June natural sunlight was acquired with the measurement protocol explained in 1.5, whereas for the indoor part the solar simulator Apollo was used [1.6].

To improve the readability of the report, the graphical and numerical results are detailed in the Annexes section (1.8 - 0) but not in the body of the report.

Anonymity: in the following sections 1.5 and 1.6 the spectroradiometers are listed with their brand, model and owner. However, the results of the exercise in the Annexes are presented anonymously. Each instrument has been associated a letter, which has been disclosed only to its owner. The dataset of the measured spectra, converted into the “.isrc” file format, has been disclosed to the participants in anonymous form as well.

1.5 Outdoor intercomparison

This section presents the results of the spectroradiometers outdoor intercomparison, while the results of the indoor measurements are presented in the next section. The instruments of the participants were all mounted on a large MEMS tracker, while the EKO Wiser system (MS701-MS710-MS712) serving as reference for Direct Normal Spectral Irradiance and the CAS140+CAS140CTS system serving as reference for Global Normal Spectral Irradiance were mounted on two different trackers. The alignment of all of them was checked periodically every 10-15 minutes throughout all the campaign.

The timing was agreed between all the participants having a data acquisition software allowing automatic acquisitions, and was set to one spectrum every minute. Participants having to do manual acquisitions acquired less spectra, but nevertheless all the clocks were synchronized with the reference clock. The spectra were acquired at the beginning of each minute (hh:mm:00). The list of the spectroradiometers is presented in the following table according to the information provided by the participants.

Table 3: List of spectroradiometers for the outdoor campaign.

Manufacturer	Model and s/n	Owner	Comment
Instrument Systems	CAS140CT + CAS140CTS	JRC – ESTI	Reference for GNI
Cimel	SeaPrism CE318-T	JRC - MarLab	
TriOS	Ramses SAM ACC VIS	JRC - MarLab	
Biospherical Industries	C-OPS Ed0	JRC - MarLab	
Avantes	Avaspec NIR512-2.5-HSC-EVO	Pasan SA	
Avantes	Avaspec NIR512-1.7 EVO	Pasan SA	
Avantes	Avaspec ULS2048CL_EVO-FCPC	Pasan SA	
Peak Design Ltd	HSR1	Peak Design Ltd	
Avantes	AvaSpec 210636902	ENEA	
Avantes	AvaSpec 2106370U2	ENEA	
Ocean Optics	RaySphere 900	ESA	
Instrument Systems	CAS140	PVLAB	
Avantes	Avaspec 3648-USB2	SERIS	
Avantes	Avaspec 2048-USB2-RM	SUPSI	
Avantes	Avaspec ULS2048CL-EVO + NIR512	SUPSI	
Avantes	Avaspec	CEA France	

EKO	MS700	Solar Perf. Ltd.	
EKO	MS701 + MS710 + MS712	JRC – ESTI	Reference for DNI
Spectrafy	SolarSIM D2	JRC – ESTI	Hybrid instrument (*)
Spectrafy	SolarSIM D2	RSE	Hybrid instrument (*)

(*): the instrument models the DNI solar spectrum based on the short circuit current measurements of six filtered photodiodes.

Source: *European Solar Test Installation - JRC*

The two reference systems are internally calibrated at ESTI on an annual basis, and additionally before and after any external measurement campaign. The spectroradiometer calibration is ISO/IEC 17025 accredited. They are traceable to both NPL and PTB via calibrated standard lamps.

Data filtering and evaluation

Each participant brings to the ISRC his own measurement method, settings and laboratory routines. A deep understanding of the instrument with its capabilities and limitations is essential for a reliable measurement. Differently from the broadband sensors that are passively acquired automatically on a continuous basis, spectroradiometers need the presence of an operator. Every instrument model has its own software, settings and output format.

For this reason, although the synced schedule was one spectrum per minute, every participant was authorized to use a custom timing if required by his own measurement protocol. For example, two instruments needed to be regularly moved from the tracker to measure the dark signal using dedicated equipment.

A participant's spectrum is taken into account for the analysis if satisfies the following conditions:

- Temporal distance from the closest reference spectrum less than 5 seconds
- Global Normal Irradiance GNI in the range 700 – 1100 W/m²
- Diffuse Normal Irradiance less than 400 W/m²

The following functions have been considered of interest for the outdoor intercomparison:

- $R_{10}(\lambda_1, \lambda_2)$: absolute spectral content in narrow spectral bands (10 nm width) within the spectral limits imposed by each instrument model
- $R_{10}^*(\lambda_1, \lambda_2)$: relative spectral content respect to the entire integral of the same spectrum with the limits of the previous point

The former contains all the elements of the traceability chain of each participant and the reference as well, while the latter is a “shape-factor” not sensitive to constant errors independent of the wavelengths.

The two following narrowband quantities are expressed by:

$$R_{10}(\lambda_1, \lambda_2) = \frac{\int_{\lambda_1}^{\lambda_2} E_i(\lambda) d\lambda}{\int_{\lambda_1}^{\lambda_2} E_{REF}(\lambda) d\lambda} \quad (\text{Eq. 1})$$

and

$$R_{10}^*(\lambda_1, \lambda_2) = \frac{\int_{\lambda_1}^{\lambda_2} E(\lambda) d\lambda}{\int_{\lambda_{min}}^{\lambda_{max}} E(\lambda) d\lambda} \frac{\int_{\lambda_{min}}^{\lambda_{max}} E_{REF}(\lambda) d\lambda}{\int_{\lambda_1}^{\lambda_2} E_{REF}(\lambda) d\lambda} \quad (\text{Eq. 2})$$

In the following section the plots show the R10 functions with error bars. Each error bar refers to the expanded standard deviation of each measured data series, obtained by multiplying the standard deviation by the coverage factor $k = 2$ (assuming a normal distribution). Each series consists of the set of participant's and reference spectra acquired during the outdoor measurements and satisfying the filtering conditions listed above. Therefore, the error bars does not refer to the complete uncertainty budget of the calculated points.

Spectra have then been linearly interpolated on an evenly spaced grid of 0.1 nm. A linear interpolation is sufficient because all the spectroradiometers have a sufficiently good wavelength resolution (although the uncertainty of the wavelength alignment is usually higher than the resolution and not constant in the entire range). It is worth considering that the interpolation process solves the issue that all the spectroradiometers have different wavelength axis, and that they are usually unevenly spaced.

Interpolated spectra have then been divided in bands with 10 nm width and the partial integrals calculated to obtain the two parameters $R_{10}(\lambda_1, \lambda_2)$ and $R_{10}^*(\lambda_1, \lambda_2)$. For each spectral band all the couples of spectra acquired in the same series have been used to calculate the average and standard deviation for each spectral band.

The intermediate file format “.isrc”

All the participants were given the possibility to submit measured spectra in their preferred file format. The raw data set was initially composed by a variety of different formats: spectra stored singularly in different files, or spectra stored in a single file, spectra stored in columns or in rows, with different delimiters, Windows or Linux end-of-line characters, but most important using different time settings.

The first step in the data analysis process was the conversion of all the different formats into a unique file type, conceived on purpose for the Intercomparison, with the extension .isrc.

The filename is structured as follows:

[ID]_[YYYY]_[MM]_[DD]_[hh]_[mm]_[ss]_[sfm].isrc

with

ID: string identifying the participant and instrument

YYYY: year (four characters)

MM: month (two characters)

DD: day (two characters)

hh: hour (two characters)

mm: minute (two characters)

ss: second (two characters)

sfm: seconds from midnight

The seconds from midnight are calculated as

$$sfm = 3600hh + 60mm + ss \quad (\text{Eq. 3})$$

and the time is referred to GMT+1. Seconds from midnight have been added in the filename to be able at a later stage to find the closest spectra without opening the files, thus reducing the computational time. The file is structured in two columns tab separated, containing the wavelength axis (in nm) and the measured spectrum (in W/(m² nm)). No data manipulation such as wavelength range cut or interpolation is done at this stage yet.

Temporal syncing

After the conversion of all the spectra to the format .isrc the temporal alignment has been checked. The synchronization of all the spectra with the reference data series is essential to build the sets by finding, for each reference spectrum, the closest one of each participant. Although the time frames considered for the analysis included only spectra acquired in clear sky conditions, the maximum allowed distance to couple two spectra was set to 5 seconds. The clocks of all the data acquisition systems were synced every morning using a dedicated GPS signal, although the precision of the operator might lead to a misalignment of a few seconds.

In order to perform the alignment, for each spectrum of each participant the integrated irradiance between 400 – 1000 nm has been calculated, being this reduced range common to all the instruments. During the day, the irradiance drops due to passing clouds have been detected and the participant's time axis have been shifted if not properly aligned.

1.6 Indoor intercomparison

The indoor assessment has been carried out using the spectrum provided by the Apollo solar simulator. Apollo is a steady-state large area system, used at ESTI for the characterization of slow-responding photovoltaic devices that cannot be precisely measured using flash simulators (Figure 1).

Figure 1: Layout of the Apollo solar simulator as seen from the center of the measurement plane, where the PV module is placed.



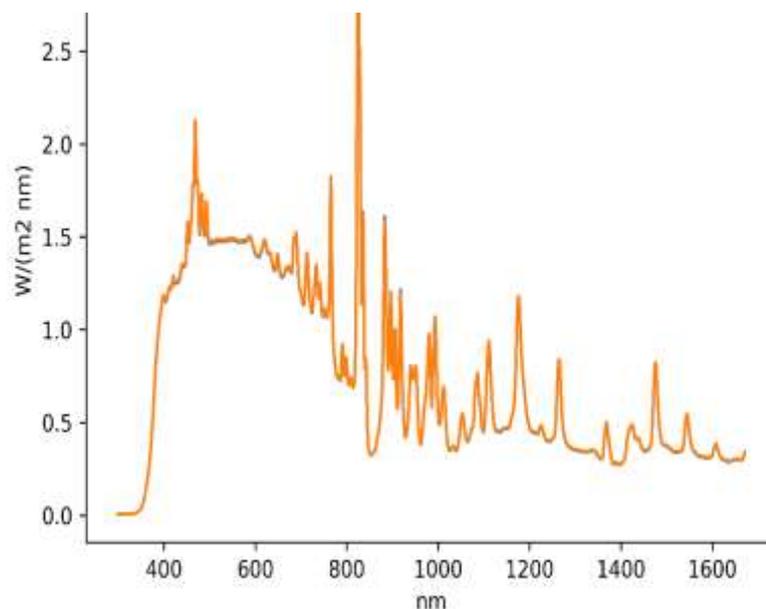
Source: European Solar Test Installation - JRC

The system is composed by 13 Xenon lamps, providing an adjustable irradiance from about 80 W/m² to 1250 W/m² on an illuminated area of 2m x 2m. According to IEC 60904-9:2020 international standard, the system is classified as class A for spectral irradiance² and A+ for temporal instability and irradiance non-uniformity. Being part of the ESTI's ISO17025 accredited system, Apollo undergoes planned maintenance interventions at least twice per year, with a dedicated verification session after each of them. The system repeatability is checked every week throughout the whole year using a set of three reference PV modules.

The indoor campaign took place on the days 20-21 June, after the outdoor measurements. At the beginning of each session, the system was stabilized for 1 hour with all the lamps on set at 1000 W/m². At the beginning of the day the reference spectra at different irradiances were taken by the JRC CAS140 spectroradiometers, positioned at 8 meters distance from the lamps (the measurement plane of the PV devices), at the centre of the illuminated area (see Figure 2). The measurements of the participating spectroradiometers were done sequentially, keeping the same distance and the same position on the plane.

The target irradiance levels were chosen basing upon the standard IEC 61853-1, with the following sequence: 1100, 1000, 800, 600, 400, 200 and 100 W/m² always in this order. The system configuration (the combination of selected lamps and their electrical power) was kept unchanged for each irradiance level for all the participants, in order to minimize the errors attributable to repeatability issues. During the acquisition phase, the stability of irradiance was monitored using a calibrated ESTI reference cell, and was always within 0.3% during the entire day. The system was switched off only at the end of the day not to compromise the validity of the reference spectrum acquired first.

Figure 2: Apollo spectra on the days 20-21 June, measured by the JRC at the beginning of the measurement day. The optical entrance of the spectroradiometer is positioned at 8 meters from the lamps, in the centre of the illuminated area. The system was set at 1000 W/m² irradiance.



Source: European Solar Test Installation - JRC

² The system is actually A+ on all the spectral bands except the band 919-1200 nm where is class A.

The set of spectroradiometers involved in the indoor assessment is different from that of the outdoor; the two hybrid spectroradiometers, due to the mathematical clear-sky model, could not measure an artificial light source, while another instrument showing data acquisition problems in the outdoor field was able to participate indoor (Table 4).

Table 4: List of spectroradiometers for the indoor campaign. *Source: European Solar Test Installation - JRC*

Manufacturer	Model and s/n	Owner	Comment
Instrument Systems	CAS140CT + CAS140CTS	JRC – ESTI	Reference
TriOS	Ramses SAM ACC VIS	JRC - MarLab	
Biospherical Industries	C-OPS Ed0	JRC - MarLab	
Avantes	Avaspec NIR512-2.5-HSC-EVO	Pasan SA	
Avantes	Avaspec NIR512-1.7 EVO	Pasan SA	
Avantes	Avaspec ULS2048CL_EVO-FCPC	Pasan SA	
ORB	Optronix	Univ. Nac. Colombia	
Peak Design Ltd	HSR1	Peak Design Ltd	
Avantes	AvaSpec 210636902	ENEA	
Avantes	AvaSpec 2106370U2	ENEA	
Ocean Optics	RaySphere 900	ESA	
Instrument Systems	CAS140	PVLAB	
Avantes	Avaspec 3648-USB2	SERIS	
Avantes	Avaspec ULS2048CL-EVO + NIR512	SUPSI	
Avantes	Avaspec	CEA France	
EKO	MS700	Solar Perf. Ltd.	

Overview of custom sensors and prototypes

1.7 RSE CPV-PV Hybrid module Functional Unit³

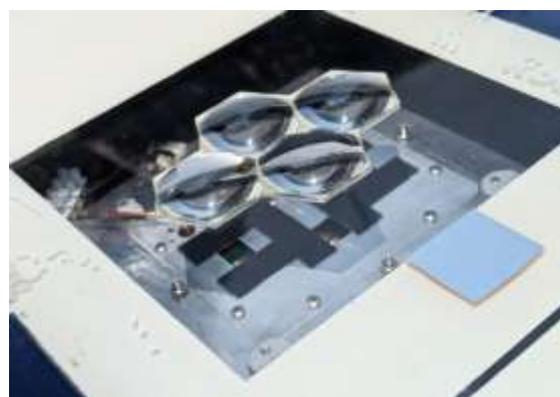
Concentrated photovoltaics (CPV), leveraging highly efficient multi-junction (MJ) cells, achieves significantly higher power output compared to traditional photovoltaic (PV) modules, while reducing semiconductor material usage and CO₂ emissions. Despite its potential, CPV adoption has been hindered by two main limitations: reliance on direct solar radiation, which excludes the diffuse component, and the requirement for high-precision dual-axis tracking systems, which increase both costs and system complexity.

To address these challenges, RSE has developed HYB Quantum, an innovative technology combining hybrid CPV/PV modules with advanced tracking systems. These hybrid modules integrate MJ cells, optimized for direct radiation, with traditional PV cells, tailored for diffuse radiation, thereby maximizing energy production under variable solar irradiance conditions. Such modules include an internal tracking system utilizing SMA (shape memory alloy) springs. These springs ensure automatic alignment of MJ cells, offering a field of view (FOV) of up to 17°, providing a cost-effective, reliable, and durable solution, even in demanding environmental conditions.

At International Spectroradiometer and Broadband Radiometer Intercomparison 2024, RSE brought an updated functional unit of the hybrid CPV/PV module, featuring three distinct arrays: a CPV array for direct radiation, an internal PV array for diffuse light, and an external PV array for global light. Compared to the previous version, this new unit integrates an enhanced internal tracking mechanism, still based on shape memory alloys, and includes innovative asymmetric optics that achieve high optical efficiency, even at wide incidence angles.

A preliminary test validation of the system was conducted during the ISRC 2024. This measurement campaign demonstrated the integrated solar tracking system's reliability under significant daily radiation variations, which could otherwise compromise the accuracy of SMA actuator control. In addition, the current-voltage (I-V) curves of the three PV arrays were recorded to evaluate their power performance, confirming the module's ability to operate efficiently in real operating conditions.

Figure 3: Front view of RSE's new hybrid CPV/PV module functional unit, featuring an integrated solar tracking system based on SMA actuators, comprising three distinct PV arrays and an innovative optic.



Source: RSE Ricerca Sistema Energetico

³ Section provided by RSE

1.8 HSR1 Global and Diffuse Spectroradiometer⁴

The HSR1 is a development of the SPN1 Global & Diffuse broadband radiometer, available commercially through Delta-T Devices Ltd. It uses an array of detector channels which sit under a specially shaped mask, such that for any position of the sun in the sky, at least one detector is fully exposed and one fully shaded from the sun – Ref 1. This scheme allows the Global and Diffuse (and hence Direct) irradiances to be calculated without requiring any polar alignment apart from horizontal levelling, at any position on Earth at any time, with no moving parts. As well as conventional fixed ground-based mountings, the system also works on moving platforms such as boats or airplanes.

In the HSR1, the detected light is transferred to a custom designed multi-channel spectrometer, sensitive between 350nm – 1050nm, where all of the irradiance spectra are measured using the same detector and optics to minimise variation between channels. The spectrometer has an optical resolution of ~3.5nm.

The HSR1 is designed for long-term network monitoring applications, and can measure at up to 1Hz. The measurement of the Direct/Diffuse partition of the primary horizontal spectral irradiances potentially enables inversions to different orientations, as well as many derivative measurements such as AOD, water content, clouds.

The ISRC2024 has been a valuable opportunity to confirm the calibration procedures used for the HSR1, and benchmark it against other research instruments.

For further information, please contact info@peakdesign.co.uk

Figure 4: The HSR1 once installed during the ISRC2024 and on a marine station.



Source: Peak Design Ltd.

Reference 1 *Solar irradiances measured using SPN1 radiometers: uncertainties and clues for development* – Badosa et al. doi:10.5194/amt-7-4267-2014.

⁴ Section provided by Peak Design Ltd

Conclusions

The International Spectroradiometer and Broadband Radiometer Intercomparison (ISRC) took place at the ESTI laboratories of the Joint Research Centre in Ispra (VA) from 17th to 21st June 2024.

The 12th edition saw the participation of the European Space Agency, National Metrological Institutes, laboratories, universities, private companies and research organizations operating in different fields, mainly in the renewable energies sector, meteorology and climatology.

During the measurement campaign several spectroradiometers of different types were compared against the ESTI reference instruments to provide an assessment of their performance in different spectral bands of interest for many applications, ranging from studies on new materials for photovoltaics and their characterization, space missions, development of measurement systems for collection of data for climatology models. Both the natural sunlight and the artificial source provided by the ESTI's Apollo steady-state large area solar simulator were used.

The broadband irradiance instruments of different participants have been compared against the ESTI set of Absolute Radiometric Cavities and the reference pyranometers in order to give to the participants an useful irradiance dataset for internal use.

The ISRC is an annual event organised by the Joint Research Centre of the European Commission, in particular by the ESTI laboratories based at the Ispra site in Italy, and having no participation fees for the participants. It is a free useful service to support research bodies and small/medium enterprises operating in the solar energy sectors, and a high level metrology assessment for top class institutes.

The performance of spectroradiometers in absolute terms suggests that improvements in the calibration procedures are needed for some participants, due to the absolute deviations respect to the reference spectra (R_{10} performance indicator). In relative terms (R_{10}^*), the agreement is much better and thus the impact on the calculation of the spectral mismatch factor for PV devices is limited. Differences in the R_{10} functions calculated using outdoor and indoor data suggest that several instruments might be more challenged by an use in outdoor conditions respect to a better controlled laboratory environment.

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List of abbreviations and definitions

JRC	Joint Research Centre
ISRC	International Spectroradiometer Intercomparison
ESTI	European Solar Test Installation
PV	Photovoltaics
ISO	International Organisation for Standardisation
DNI	Direct Normal Irradiance
GNI	Global Normal Irradiance
λ	Wavelength
ACR	Absolute Cavity Radiometer
$R_{10}(\lambda_1, \lambda_2)$	Performance indicator expressing the agreement of the absolute spectral content in the band (λ_1, λ_2)
$R_{10}^*(\lambda_1, \lambda_2)$	Performance indicator expressing the agreement of the relative spectral content in the band (λ_1, λ_2)

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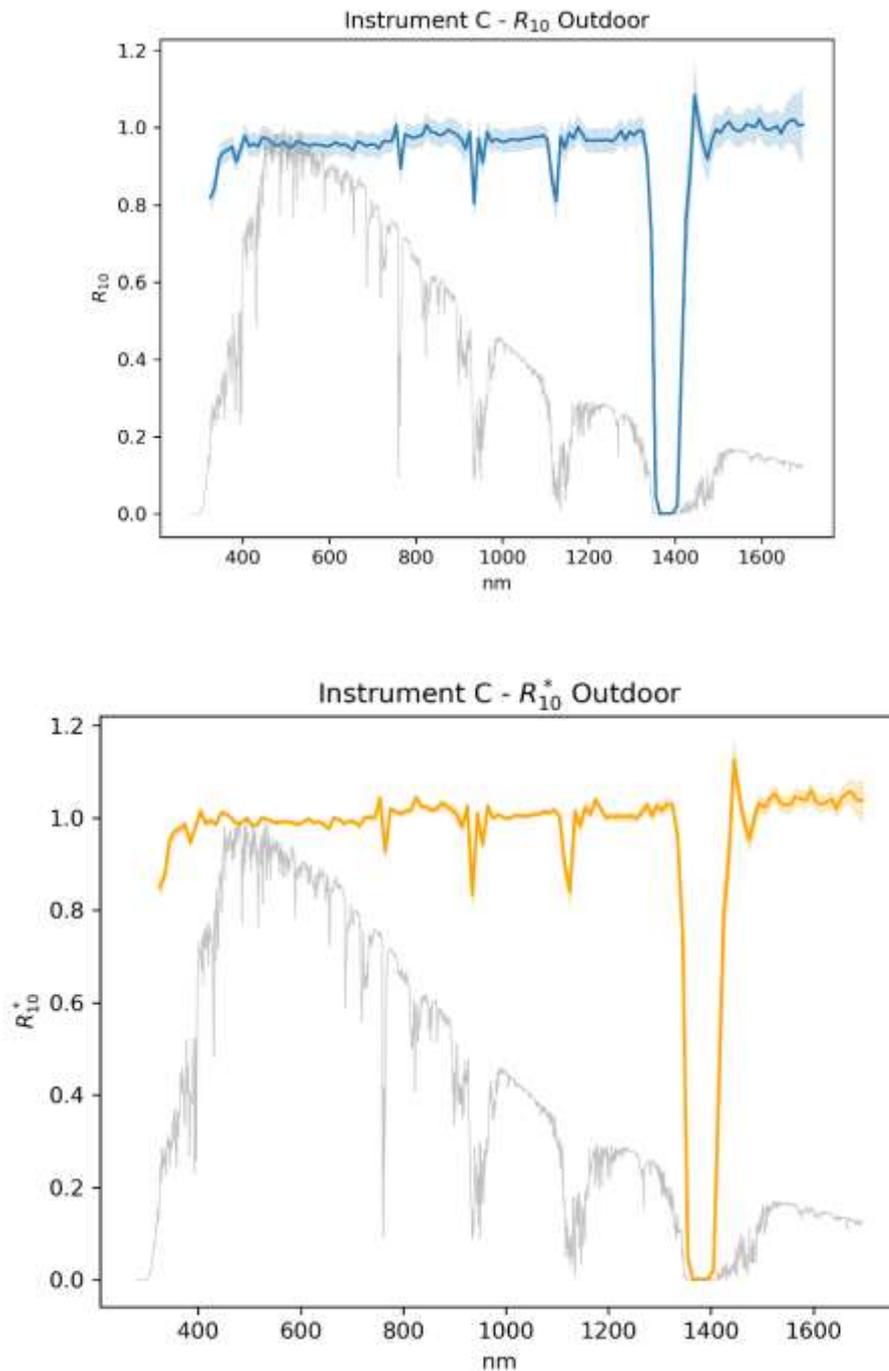
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Annex I – Outdoor Intercomparison Results

Instruments “A” and “B” are not listed in this section being two references for the outdoor campaign.

1.9 Instrument “C”

Figure 5: Instrument C - Outdoor R_{10} and R_{10}^* functions.



Source: European Solar Test Installation – JRC.

Table 5: Instrument C – Outdoor R10 and R10* functions.

320 - 330 nm	0.8189 ± 0.0375	0.8493 ± 0.0318
330 - 340 nm	0.8437 ± 0.0324	0.8753 ± 0.0260
340 - 350 nm	0.9179 ± 0.0321	0.9522 ± 0.0210
350 - 360 nm	0.9366 ± 0.0310	0.9716 ± 0.0175
360 - 370 nm	0.9418 ± 0.0302	0.9769 ± 0.0149
370 - 380 nm	0.9506 ± 0.0300	0.9861 ± 0.0134
380 - 390 nm	0.9114 ± 0.0286	0.9454 ± 0.0119
390 - 400 nm	0.9447 ± 0.0299	0.9799 ± 0.0124
400 - 410 nm	0.9787 ± 0.0310	1.0152 ± 0.0126
410 - 420 nm	0.9519 ± 0.0302	0.9874 ± 0.0119
420 - 430 nm	0.9585 ± 0.0305	0.9943 ± 0.0118
430 - 440 nm	0.9502 ± 0.0302	0.9856 ± 0.0114
440 - 450 nm	0.9744 ± 0.0307	1.0107 ± 0.0109
450 - 460 nm	0.9724 ± 0.0304	1.0087 ± 0.0098
460 - 470 nm	0.9635 ± 0.0298	0.9994 ± 0.0087
470 - 480 nm	0.9527 ± 0.0292	0.9882 ± 0.0075
480 - 490 nm	0.9542 ± 0.0290	0.9898 ± 0.0067
490 - 500 nm	0.9635 ± 0.0292	0.9994 ± 0.0063
500 - 510 nm	0.9495 ± 0.0289	0.9849 ± 0.0062
510 - 520 nm	0.9493 ± 0.0289	0.9847 ± 0.0062
520 - 530 nm	0.9649 ± 0.0295	1.0008 ± 0.0062
530 - 540 nm	0.9609 ± 0.0293	0.9967 ± 0.0070
540 - 550 nm	0.9560 ± 0.0292	0.9917 ± 0.0074
550 - 560 nm	0.9534 ± 0.0291	0.9890 ± 0.0070
560 - 570 nm	0.9568 ± 0.0292	0.9925 ± 0.0066
570 - 580 nm	0.9554 ± 0.0292	0.9910 ± 0.0062
580 - 590 nm	0.9541 ± 0.0293	0.9897 ± 0.0067
590 - 600 nm	0.9503 ± 0.0293	0.9857 ± 0.0069
600 - 610 nm	0.9551 ± 0.0290	0.9907 ± 0.0059
610 - 620 nm	0.9624 ± 0.0295	0.9982 ± 0.0064
620 - 630 nm	0.9542 ± 0.0294	0.9898 ± 0.0060
630 - 640 nm	0.9569 ± 0.0295	0.9926 ± 0.0060
640 - 650 nm	0.9510 ± 0.0295	0.9864 ± 0.0060
650 - 660 nm	0.9412 ± 0.0294	0.9763 ± 0.0060
660 - 670 nm	0.9645 ± 0.0300	1.0005 ± 0.0053
670 - 680 nm	0.9600 ± 0.0299	0.9959 ± 0.0054
680 - 690 nm	0.9520 ± 0.0305	0.9875 ± 0.0071
690 - 700 nm	0.9572 ± 0.0307	0.9930 ± 0.0078
700 - 710 nm	0.9556 ± 0.0308	0.9913 ± 0.0086
710 - 720 nm	0.9468 ± 0.0307	0.9822 ± 0.0092
720 - 730 nm	0.9644 ± 0.0319	1.0005 ± 0.0108
730 - 740 nm	0.9651 ± 0.0312	1.0012 ± 0.0098

740 - 750 nm	0.9643 ± 0.0308	1.0003 ± 0.0094
750 - 760 nm	1.0065 ± 0.0321	1.0440 ± 0.0100
760 - 770 nm	0.8929 ± 0.0385	0.9266 ± 0.0230
770 - 780 nm	0.9826 ± 0.0310	1.0192 ± 0.0093
780 - 790 nm	0.9773 ± 0.0309	1.0137 ± 0.0095
790 - 800 nm	0.9726 ± 0.0313	1.0089 ± 0.0103
800 - 810 nm	0.9784 ± 0.0313	1.0148 ± 0.0100
810 - 820 nm	0.9796 ± 0.0319	1.0161 ± 0.0116
820 - 830 nm	1.0069 ± 0.0329	1.0444 ± 0.0131
830 - 840 nm	0.9886 ± 0.0327	1.0254 ± 0.0125
840 - 850 nm	0.9867 ± 0.0325	1.0234 ± 0.0121
850 - 860 nm	0.9799 ± 0.0320	1.0164 ± 0.0127
860 - 870 nm	0.9833 ± 0.0322	1.0198 ± 0.0143
870 - 880 nm	0.9948 ± 0.0342	1.0319 ± 0.0166
880 - 890 nm	0.9881 ± 0.0355	1.0249 ± 0.0191
890 - 900 nm	0.9813 ± 0.0369	1.0177 ± 0.0225
900 - 910 nm	0.9703 ± 0.0397	1.0063 ± 0.0288
910 - 920 nm	0.9452 ± 0.0388	0.9803 ± 0.0259
920 - 930 nm	0.9883 ± 0.0374	1.0250 ± 0.0226
930 - 940 nm	0.8033 ± 0.0514	0.8329 ± 0.0462
940 - 950 nm	0.9725 ± 0.0410	1.0087 ± 0.0278
950 - 960 nm	0.9082 ± 0.0330	0.9420 ± 0.0146
960 - 970 nm	0.9893 ± 0.0317	1.0260 ± 0.0078
970 - 980 nm	0.9633 ± 0.0305	0.9991 ± 0.0064
980 - 990 nm	0.9708 ± 0.0302	1.0069 ± 0.0064
990 - 1000 nm	0.9657 ± 0.0299	1.0016 ± 0.0065
1000 - 1010 nm	0.9624 ± 0.0298	0.9982 ± 0.0064
1010 - 1020 nm	0.9678 ± 0.0300	1.0038 ± 0.0066
1020 - 1030 nm	0.9694 ± 0.0301	1.0055 ± 0.0069
1030 - 1040 nm	0.9679 ± 0.0301	1.0039 ± 0.0072
1040 - 1050 nm	0.9688 ± 0.0301	1.0048 ± 0.0075
1050 - 1060 nm	0.9719 ± 0.0303	1.0081 ± 0.0080
1060 - 1070 nm	0.9723 ± 0.0302	1.0084 ± 0.0083
1070 - 1080 nm	0.9773 ± 0.0307	1.0135 ± 0.0097
1080 - 1090 nm	0.9751 ± 0.0306	1.0114 ± 0.0090
1090 - 1100 nm	0.9808 ± 0.0309	1.0172 ± 0.0092
1100 - 1110 nm	0.9670 ± 0.0316	1.0029 ± 0.0112
1110 - 1120 nm	0.8640 ± 0.0390	0.8961 ± 0.0272
1120 - 1130 nm	0.8092 ± 0.0589	0.8399 ± 0.0510
1130 - 1140 nm	0.9773 ± 0.0411	1.0137 ± 0.0241
1140 - 1150 nm	0.9466 ± 0.0414	0.9819 ± 0.0259
1150 - 1160 nm	0.9859 ± 0.0380	1.0225 ± 0.0222
1160 - 1170 nm	0.9720 ± 0.0342	1.0082 ± 0.0177
1170 - 1180 nm	1.0019 ± 0.0327	1.0390 ± 0.0159
1180 - 1190 nm	0.9839 ± 0.0317	1.0204 ± 0.0139

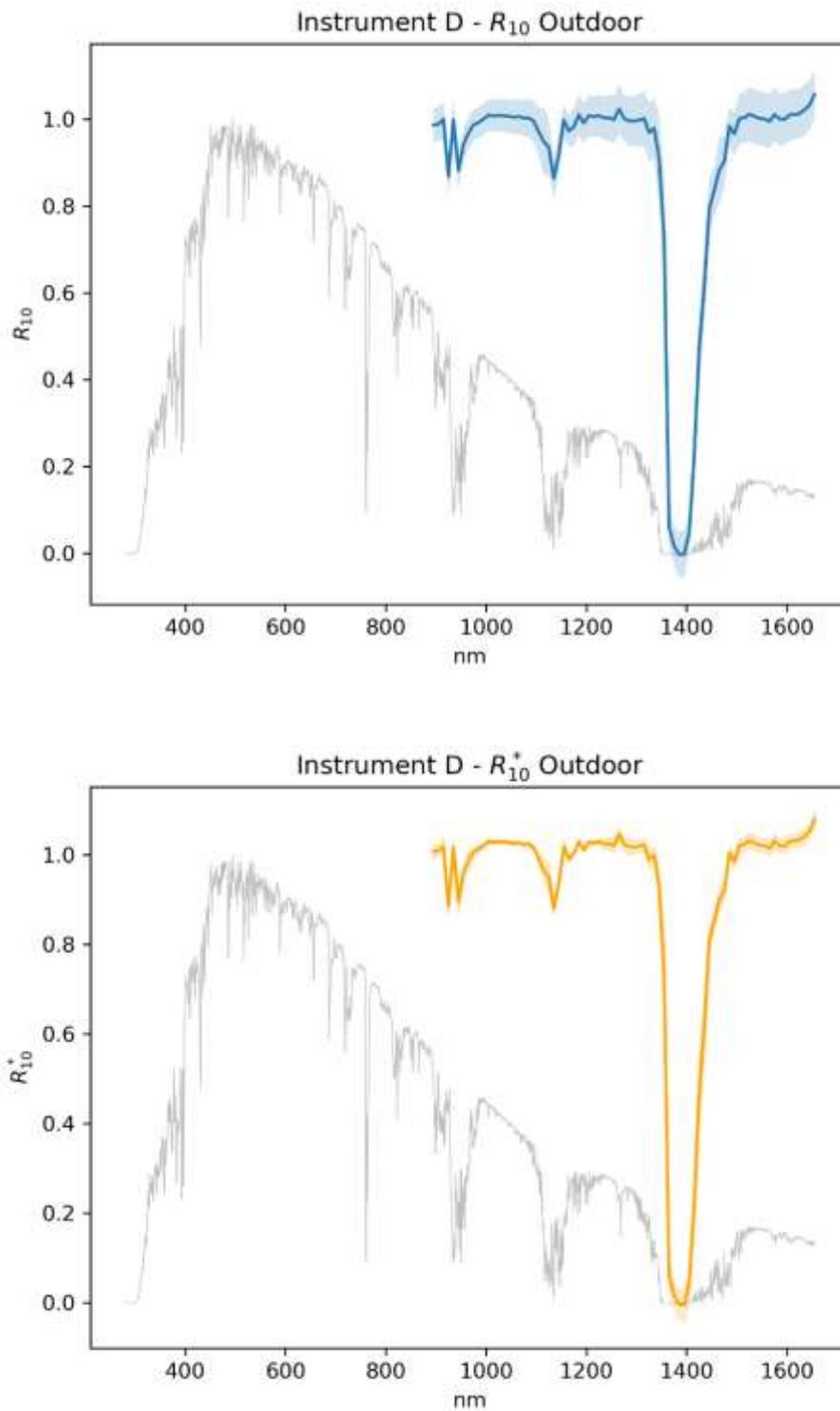
1190 - 1200 nm	0.9652 ± 0.0311	1.0010 ± 0.0139
1200 - 1210 nm	0.9672 ± 0.0316	1.0031 ± 0.0148
1210 - 1220 nm	0.9663 ± 0.0318	1.0022 ± 0.0152
1220 - 1230 nm	0.9674 ± 0.0320	1.0033 ± 0.0158
1230 - 1240 nm	0.9666 ± 0.0322	1.0025 ± 0.0166
1240 - 1250 nm	0.9681 ± 0.0323	1.0041 ± 0.0167
1250 - 1260 nm	0.9635 ± 0.0321	0.9992 ± 0.0171
1260 - 1270 nm	0.9758 ± 0.0331	1.0120 ± 0.0180
1270 - 1280 nm	0.9914 ± 0.0335	1.0283 ± 0.0188
1280 - 1290 nm	0.9684 ± 0.0333	1.0044 ± 0.0191
1290 - 1300 nm	0.9898 ± 0.0349	1.0266 ± 0.0209
1300 - 1310 nm	0.9796 ± 0.0357	1.0159 ± 0.0219
1310 - 1320 nm	0.9928 ± 0.0361	1.0297 ± 0.0223
1320 - 1330 nm	0.9910 ± 0.0365	1.0278 ± 0.0223
1330 - 1340 nm	0.9241 ± 0.0424	0.9585 ± 0.0310
1340 - 1350 nm	0.7186 ± 0.0639	0.7453 ± 0.0611
1350 - 1360 nm	0.0455 ± 0.0251	0.0472 ± 0.0261
1360 - 1370 nm	0.0000 ± 0.0000	0.0000 ± 0.0000
1370 - 1380 nm	0.0023 ± 0.0029	0.0024 ± 0.0030
1380 - 1390 nm	0.0009 ± 0.0012	0.0009 ± 0.0012
1390 - 1400 nm	0.0033 ± 0.0041	0.0034 ± 0.0042
1400 - 1410 nm	0.0213 ± 0.0199	0.0220 ± 0.0206
1410 - 1420 nm	0.3932 ± 0.1343	0.4084 ± 0.1349
1420 - 1430 nm	0.7613 ± 0.1197	0.7915 ± 0.1122
1430 - 1440 nm	0.8858 ± 0.0992	0.9189 ± 0.0918
1440 - 1450 nm	1.0848 ± 0.0849	1.1252 ± 0.0740
1450 - 1460 nm	1.0100 ± 0.0487	1.0476 ± 0.0352
1460 - 1470 nm	0.9540 ± 0.0566	0.9894 ± 0.0456
1470 - 1480 nm	0.9180 ± 0.0588	0.9521 ± 0.0495
1480 - 1490 nm	0.9674 ± 0.0514	1.0030 ± 0.0405
1490 - 1500 nm	0.9956 ± 0.0456	1.0319 ± 0.0343
1500 - 1510 nm	0.9862 ± 0.0426	1.0223 ± 0.0312
1510 - 1520 nm	1.0045 ± 0.0428	1.0413 ± 0.0313
1520 - 1530 nm	1.0151 ± 0.0433	1.0522 ± 0.0321
1530 - 1540 nm	0.9966 ± 0.0427	1.0331 ± 0.0318
1540 - 1550 nm	0.9912 ± 0.0426	1.0273 ± 0.0316
1550 - 1560 nm	0.9923 ± 0.0431	1.0285 ± 0.0321
1560 - 1570 nm	1.0089 ± 0.0438	1.0458 ± 0.0327
1570 - 1580 nm	1.0047 ± 0.0445	1.0413 ± 0.0330
1580 - 1590 nm	1.0012 ± 0.0441	1.0376 ± 0.0328
1590 - 1600 nm	1.0217 ± 0.0449	1.0589 ± 0.0337
1600 - 1610 nm	0.9990 ± 0.0448	1.0352 ± 0.0333
1610 - 1620 nm	0.9938 ± 0.0446	1.0297 ± 0.0332
1620 - 1630 nm	0.9972 ± 0.0450	1.0331 ± 0.0331
1630 - 1640 nm	1.0046 ± 0.0460	1.0406 ± 0.0340

1640 - 1650 nm	0.9848 ± 0.0468	1.0200 ± 0.0350
1650 - 1660 nm	1.0074 ± 0.0507	1.0431 ± 0.0389
1660 - 1670 nm	1.0180 ± 0.0572	1.0541 ± 0.0461
1670 - 1680 nm	1.0206 ± 0.0674	1.0555 ± 0.0554
1680 - 1690 nm	1.0056 ± 0.0822	1.0378 ± 0.0688
1690 - 1700 nm	1.0074 ± 0.1030	1.0378 ± 0.0879

Source: European Solar Test Installation – JRC

1.10 Instrument "D"

Figure 6: Instrument D - Outdoor R10 and R10* functions.



Source: European Solar Test Installation – JRC.

Table 6: Instrument D – Outdoor R10 and R10* functions.

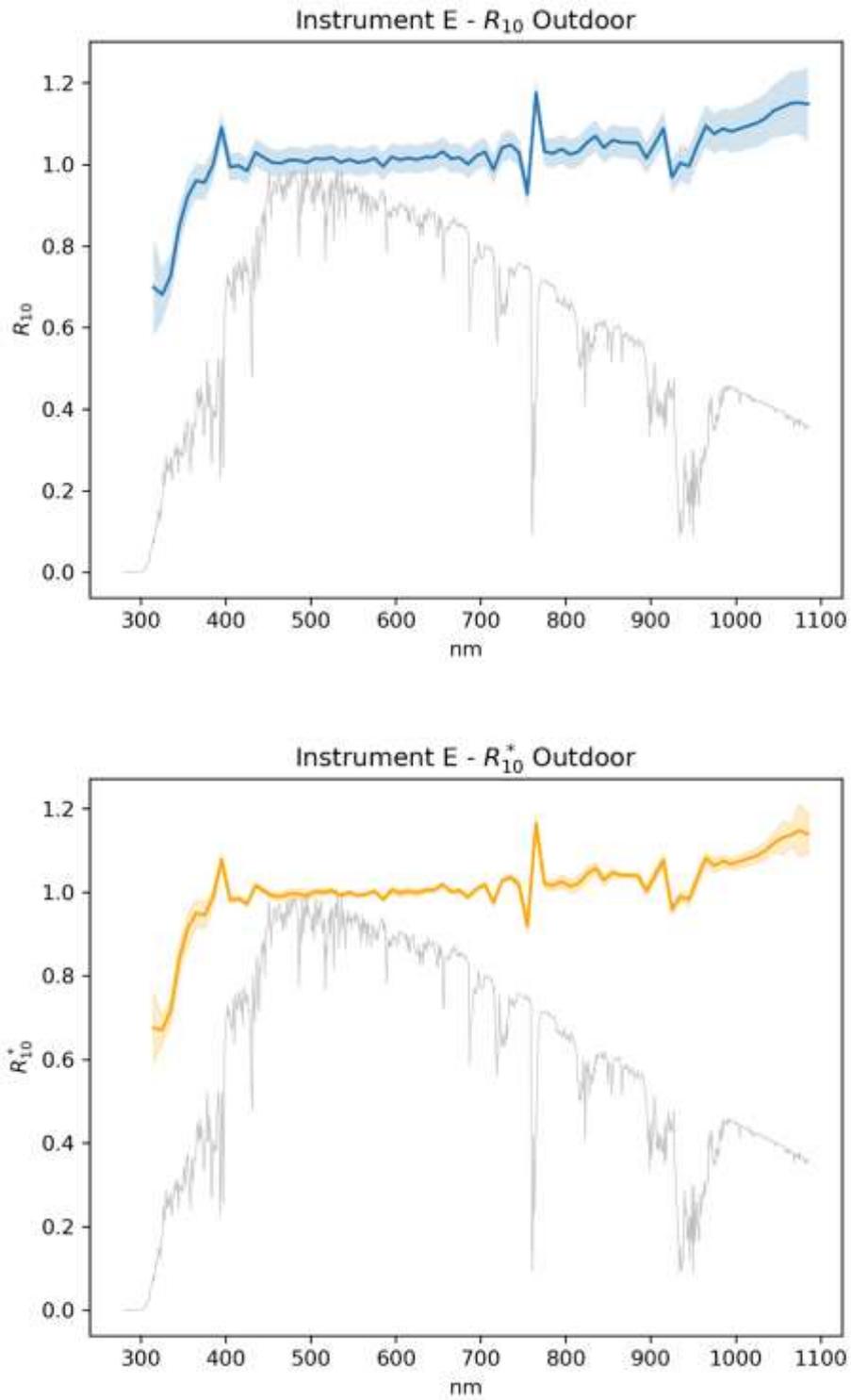
Band	R10	R10*
890 - 900 nm	0.9861 ± 0.0396	1.0081 ± 0.0320
900 - 910 nm	0.9884 ± 0.0390	1.0095 ± 0.0217
910 - 920 nm	0.9996 ± 0.0425	1.0194 ± 0.0391
920 - 930 nm	0.8676 ± 0.0456	0.8850 ± 0.0355
930 - 940 nm	0.9980 ± 0.0545	1.0182 ± 0.0269
940 - 950 nm	0.8818 ± 0.0453	0.8967 ± 0.0566
950 - 960 nm	0.9414 ± 0.0382	0.9611 ± 0.0274
960 - 970 nm	0.9682 ± 0.0385	0.9868 ± 0.0422
970 - 980 nm	0.9865 ± 0.0346	1.0069 ± 0.0204
980 - 990 nm	0.9919 ± 0.0346	1.0133 ± 0.0212
990 - 1000 nm	0.9999 ± 0.0362	1.0210 ± 0.0116
1000 - 1010 nm	1.0089 ± 0.0369	1.0303 ± 0.0123
1010 - 1020 nm	1.0070 ± 0.0371	1.0283 ± 0.0104
1020 - 1030 nm	1.0087 ± 0.0377	1.0301 ± 0.0092
1030 - 1040 nm	1.0072 ± 0.0379	1.0286 ± 0.0097
1040 - 1050 nm	1.0068 ± 0.0389	1.0283 ± 0.0089
1050 - 1060 nm	1.0037 ± 0.0392	1.0251 ± 0.0089
1060 - 1070 nm	1.0056 ± 0.0408	1.0271 ± 0.0086
1070 - 1080 nm	1.0026 ± 0.0412	1.0240 ± 0.0088
1080 - 1090 nm	1.0023 ± 0.0436	1.0240 ± 0.0135
1090 - 1100 nm	0.9951 ± 0.0475	1.0163 ± 0.0111
1100 - 1110 nm	0.9706 ± 0.0536	0.9912 ± 0.0188
1110 - 1120 nm	0.9478 ± 0.0789	0.9672 ± 0.0474
1120 - 1130 nm	0.9353 ± 0.0642	0.9505 ± 0.0618
1130 - 1140 nm	0.8634 ± 0.0457	0.8810 ± 0.0306
1140 - 1150 nm	0.9179 ± 0.0481	0.9369 ± 0.0193
1150 - 1160 nm	0.9976 ± 0.0373	1.0184 ± 0.0330
1160 - 1170 nm	0.9722 ± 0.0362	0.9922 ± 0.0176
1170 - 1180 nm	0.9820 ± 0.0439	1.0025 ± 0.0056
1180 - 1190 nm	1.0098 ± 0.0466	1.0301 ± 0.0141
1190 - 1200 nm	0.9905 ± 0.0461	1.0108 ± 0.0102
1200 - 1210 nm	1.0082 ± 0.0478	1.0289 ± 0.0106
1210 - 1220 nm	1.0051 ± 0.0467	1.0263 ± 0.0086
1220 - 1230 nm	1.0077 ± 0.0490	1.0296 ± 0.0142
1230 - 1240 nm	1.0027 ± 0.0493	1.0251 ± 0.0196
1240 - 1250 nm	1.0027 ± 0.0531	1.0256 ± 0.0307
1250 - 1260 nm	0.9980 ± 0.0540	1.0205 ± 0.0266
1260 - 1270 nm	1.0234 ± 0.0576	1.0466 ± 0.0293
1270 - 1280 nm	1.0018 ± 0.0509	1.0243 ± 0.0229
1280 - 1290 nm	0.9955 ± 0.0573	1.0182 ± 0.0369
1290 - 1300 nm	0.9955 ± 0.0574	1.0177 ± 0.0281

1300 - 1310 nm	0.9972 ± 0.0613	1.0187 ± 0.0270
1310 - 1320 nm	1.0018 ± 0.0630	1.0225 ± 0.0277
1320 - 1330 nm	0.9689 ± 0.0680	0.9892 ± 0.0335
1330 - 1340 nm	0.9790 ± 0.0696	0.9994 ± 0.0357
1340 - 1350 nm	0.9099 ± 0.1006	0.9288 ± 0.0713
1350 - 1360 nm	0.7285 ± 0.1418	0.7348 ± 0.1568
1360 - 1370 nm	0.0591 ± 0.0427	0.0578 ± 0.0596
1370 - 1380 nm	0.0172 ± 0.0423	0.0169 ± 0.0497
1380 - 1390 nm	-0.0018 ± 0.0532	-0.0035 ± 0.0613
1390 - 1400 nm	-0.0020 ± 0.0559	-0.0053 ± 0.0772
1400 - 1410 nm	0.0475 ± 0.0399	0.0451 ± 0.0590
1410 - 1420 nm	0.2255 ± 0.0821	0.2211 ± 0.1257
1420 - 1430 nm	0.4755 ± 0.0909	0.4744 ± 0.1545
1430 - 1440 nm	0.6115 ± 0.0918	0.6136 ± 0.1446
1440 - 1450 nm	0.7936 ± 0.0724	0.8096 ± 0.0611
1450 - 1460 nm	0.8363 ± 0.0540	0.8535 ± 0.0300
1460 - 1470 nm	0.8822 ± 0.0765	0.9000 ± 0.0491
1470 - 1480 nm	0.9023 ± 0.0589	0.9206 ± 0.0385
1480 - 1490 nm	0.9839 ± 0.0463	1.0043 ± 0.0261
1490 - 1500 nm	0.9654 ± 0.0503	0.9849 ± 0.0261
1500 - 1510 nm	1.0012 ± 0.0588	1.0215 ± 0.0301
1510 - 1520 nm	1.0030 ± 0.0591	1.0234 ± 0.0288
1520 - 1530 nm	1.0111 ± 0.0624	1.0318 ± 0.0313
1530 - 1540 nm	1.0060 ± 0.0628	1.0265 ± 0.0313
1540 - 1550 nm	1.0015 ± 0.0616	1.0220 ± 0.0296
1550 - 1560 nm	1.0002 ± 0.0624	1.0206 ± 0.0306
1560 - 1570 nm	0.9943 ± 0.0618	1.0147 ± 0.0302
1570 - 1580 nm	1.0106 ± 0.0613	1.0313 ± 0.0296
1580 - 1590 nm	1.0002 ± 0.0594	1.0208 ± 0.0283
1590 - 1600 nm	0.9992 ± 0.0597	1.0196 ± 0.0297
1600 - 1610 nm	1.0092 ± 0.0588	1.0300 ± 0.0265
1610 - 1620 nm	1.0106 ± 0.0580	1.0314 ± 0.0263
1620 - 1630 nm	1.0125 ± 0.0573	1.0335 ± 0.0255
1630 - 1640 nm	1.0214 ± 0.0593	1.0416 ± 0.0358
1640 - 1650 nm	1.0320 ± 0.0563	1.0533 ± 0.0283
1650 - 1660 nm	1.0568 ± 0.0577	1.0785 ± 0.0332

Source: European Solar Test Installation – JRC

1.11 Instrument "E"

Figure 7: Instrument E - Outdoor R10 and R10* functions.



Source: European Solar Test Installation – JRC.

Table 7: Instrument E – Outdoor R10 and R10* functions.

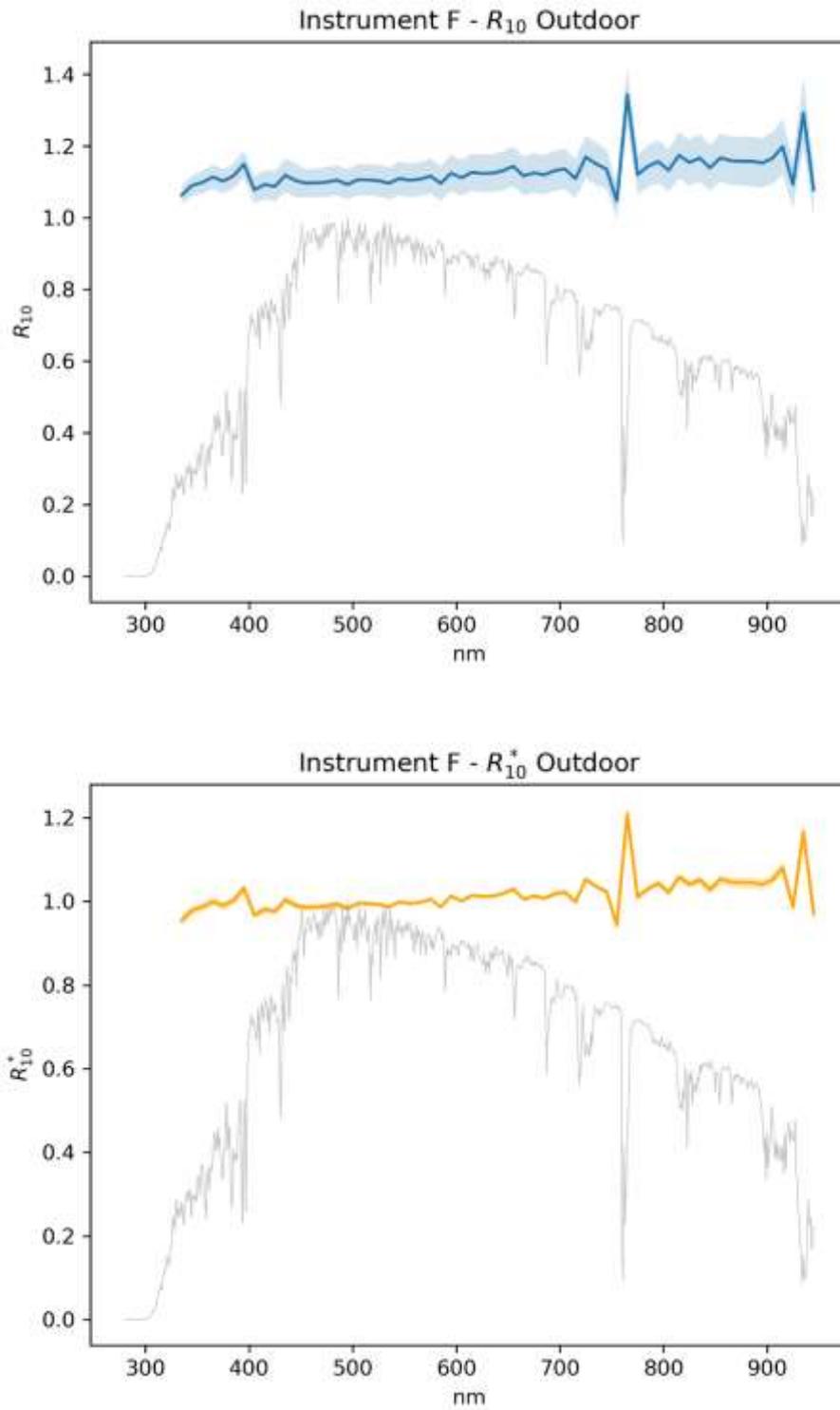
Band	R10	R10*
310 - 320 nm	0.6989 ± 0.1201	0.6755 ± 0.1618
320 - 330 nm	0.6808 ± 0.0656	0.6704 ± 0.0629
330 - 340 nm	0.7260 ± 0.0523	0.7169 ± 0.0552
340 - 350 nm	0.8473 ± 0.0507	0.8389 ± 0.0665
350 - 360 nm	0.9209 ± 0.0462	0.9126 ± 0.0693
360 - 370 nm	0.9602 ± 0.0436	0.9503 ± 0.0643
370 - 380 nm	0.9555 ± 0.0434	0.9452 ± 0.0607
380 - 390 nm	0.9996 ± 0.0407	0.9883 ± 0.0406
390 - 400 nm	1.0904 ± 0.0393	1.0786 ± 0.0297
400 - 410 nm	0.9934 ± 0.0339	0.9813 ± 0.0149
410 - 420 nm	0.9972 ± 0.0336	0.9851 ± 0.0138
420 - 430 nm	0.9845 ± 0.0333	0.9725 ± 0.0143
430 - 440 nm	1.0298 ± 0.0347	1.0168 ± 0.0130
440 - 450 nm	1.0164 ± 0.0340	1.0032 ± 0.0127
450 - 460 nm	1.0046 ± 0.0330	0.9912 ± 0.0152
460 - 470 nm	1.0030 ± 0.0328	0.9891 ± 0.0193
470 - 480 nm	1.0112 ± 0.0334	0.9969 ± 0.0233
480 - 490 nm	1.0103 ± 0.0335	0.9961 ± 0.0254
490 - 500 nm	1.0045 ± 0.0336	0.9908 ± 0.0225
500 - 510 nm	1.0148 ± 0.0342	1.0018 ± 0.0151
510 - 520 nm	1.0130 ± 0.0342	1.0000 ± 0.0150
520 - 530 nm	1.0172 ± 0.0347	1.0043 ± 0.0121
530 - 540 nm	1.0047 ± 0.0341	0.9920 ± 0.0125
540 - 550 nm	1.0126 ± 0.0343	1.0000 ± 0.0081
550 - 560 nm	1.0049 ± 0.0341	0.9924 ± 0.0080
560 - 570 nm	1.0076 ± 0.0345	0.9950 ± 0.0085
570 - 580 nm	1.0157 ± 0.0346	1.0029 ± 0.0093
580 - 590 nm	0.9951 ± 0.0345	0.9826 ± 0.0105
590 - 600 nm	1.0188 ± 0.0349	1.0056 ± 0.0165
600 - 610 nm	1.0111 ± 0.0346	0.9978 ± 0.0188
610 - 620 nm	1.0161 ± 0.0348	1.0027 ± 0.0178
620 - 630 nm	1.0117 ± 0.0347	0.9984 ± 0.0176
630 - 640 nm	1.0181 ± 0.0354	1.0051 ± 0.0125
640 - 650 nm	1.0176 ± 0.0357	1.0046 ± 0.0109
650 - 660 nm	1.0322 ± 0.0363	1.0191 ± 0.0096
660 - 670 nm	1.0139 ± 0.0355	1.0012 ± 0.0077
670 - 680 nm	1.0173 ± 0.0358	1.0043 ± 0.0116
680 - 690 nm	1.0008 ± 0.0358	0.9881 ± 0.0101
690 - 700 nm	1.0210 ± 0.0361	1.0082 ± 0.0091
700 - 710 nm	1.0311 ± 0.0364	1.0182 ± 0.0106
710 - 720 nm	0.9871 ± 0.0357	0.9746 ± 0.0143

720 - 730 nm	1.0412 ± 0.0369	1.0278 ± 0.0097
730 - 740 nm	1.0481 ± 0.0361	1.0358 ± 0.0134
740 - 750 nm	1.0296 ± 0.0354	1.0188 ± 0.0263
750 - 760 nm	0.9278 ± 0.0341	0.9188 ± 0.0305
760 - 770 nm	1.1759 ± 0.0383	1.1643 ± 0.0409
770 - 780 nm	1.0316 ± 0.0355	1.0195 ± 0.0202
780 - 790 nm	1.0272 ± 0.0357	1.0156 ± 0.0242
790 - 800 nm	1.0381 ± 0.0364	1.0266 ± 0.0266
800 - 810 nm	1.0248 ± 0.0367	1.0140 ± 0.0312
810 - 820 nm	1.0316 ± 0.0375	1.0211 ± 0.0310
820 - 830 nm	1.0536 ± 0.0383	1.0433 ± 0.0351
830 - 840 nm	1.0702 ± 0.0393	1.0582 ± 0.0272
840 - 850 nm	1.0411 ± 0.0382	1.0294 ± 0.0275
850 - 860 nm	1.0599 ± 0.0389	1.0471 ± 0.0183
860 - 870 nm	1.0543 ± 0.0392	1.0412 ± 0.0105
870 - 880 nm	1.0537 ± 0.0395	1.0406 ± 0.0108
880 - 890 nm	1.0522 ± 0.0405	1.0394 ± 0.0186
890 - 900 nm	1.0155 ± 0.0393	1.0034 ± 0.0219
900 - 910 nm	1.0509 ± 0.0415	1.0402 ± 0.0306
910 - 920 nm	1.0885 ± 0.0436	1.0768 ± 0.0279
920 - 930 nm	0.9687 ± 0.0394	0.9582 ± 0.0230
930 - 940 nm	1.0040 ± 0.0445	0.9904 ± 0.0228
940 - 950 nm	0.9958 ± 0.0467	0.9826 ± 0.0263
950 - 960 nm	1.0481 ± 0.0485	1.0342 ± 0.0307
960 - 970 nm	1.0948 ± 0.0521	1.0819 ± 0.0255
970 - 980 nm	1.0749 ± 0.0489	1.0636 ± 0.0335
980 - 990 nm	1.0880 ± 0.0506	1.0745 ± 0.0283
990 - 1000 nm	1.0809 ± 0.0527	1.0673 ± 0.0272
1000 - 1010 nm	1.0880 ± 0.0547	1.0742 ± 0.0296
1010 - 1020 nm	1.0947 ± 0.0562	1.0809 ± 0.0323
1020 - 1030 nm	1.1016 ± 0.0591	1.0877 ± 0.0352
1030 - 1040 nm	1.1135 ± 0.0616	1.0997 ± 0.0410
1040 - 1050 nm	1.1323 ± 0.0646	1.1179 ± 0.0436
1050 - 1060 nm	1.1407 ± 0.0724	1.1310 ± 0.0792
1060 - 1070 nm	1.1505 ± 0.0769	1.1369 ± 0.0556
1070 - 1080 nm	1.1516 ± 0.0774	1.1481 ± 0.1258
1080 - 1090 nm	1.1482 ± 0.0914	1.1397 ± 0.0935

Source: European Solar Test Installation – JRC

1.12 Instrument "F"

Figure 8: Instrument F - Outdoor R10 and R10* functions.



Source: European Solar Test Installation – JRC.

Table 8: Instrument F – Outdoor R10 and R10* functions.

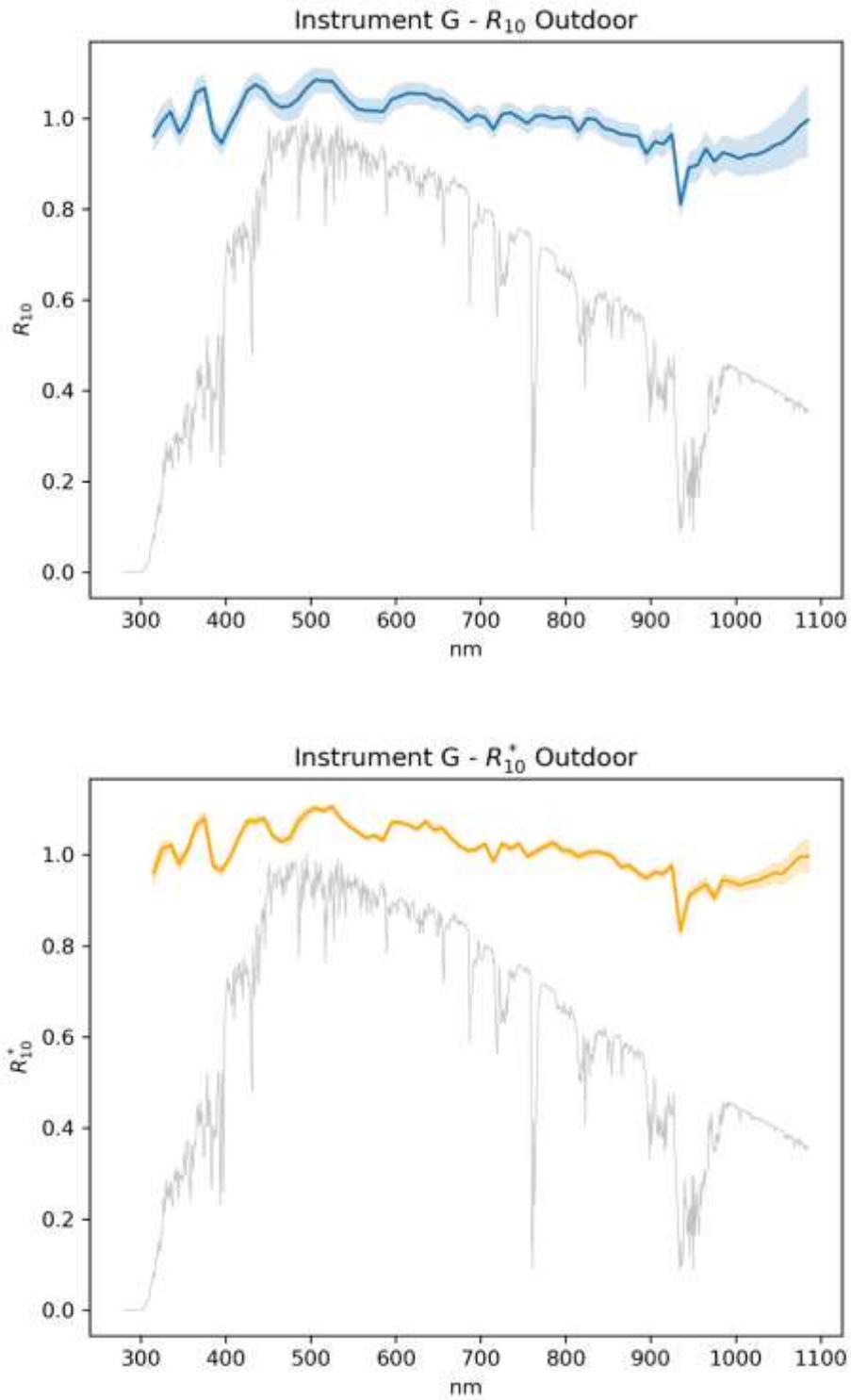
Band	R10	R10*
330 - 340 nm	1.0628 ± 0.0265	0.9550 ± 0.0201
340 - 350 nm	1.0895 ± 0.0289	0.9789 ± 0.0183
350 - 360 nm	1.0987 ± 0.0312	0.9871 ± 0.0169
360 - 370 nm	1.1134 ± 0.0333	0.9999 ± 0.0169
370 - 380 nm	1.1022 ± 0.0338	0.9899 ± 0.0156
380 - 390 nm	1.1165 ± 0.0352	1.0025 ± 0.0159
390 - 400 nm	1.1498 ± 0.0377	1.0320 ± 0.0178
400 - 410 nm	1.0776 ± 0.0377	0.9675 ± 0.0145
410 - 420 nm	1.0927 ± 0.0406	0.9811 ± 0.0143
420 - 430 nm	1.0872 ± 0.0427	0.9763 ± 0.0135
430 - 440 nm	1.1185 ± 0.0458	1.0040 ± 0.0144
440 - 450 nm	1.1034 ± 0.0473	0.9904 ± 0.0138
450 - 460 nm	1.0963 ± 0.0391	0.9856 ± 0.0128
460 - 470 nm	1.0969 ± 0.0400	0.9865 ± 0.0122
470 - 480 nm	1.0993 ± 0.0416	0.9889 ± 0.0131
480 - 490 nm	1.1046 ± 0.0417	0.9936 ± 0.0122
490 - 500 nm	1.0925 ± 0.0421	0.9831 ± 0.0100
500 - 510 nm	1.1061 ± 0.0434	0.9954 ± 0.0092
510 - 520 nm	1.1054 ± 0.0438	0.9953 ± 0.0076
520 - 530 nm	1.1030 ± 0.0445	0.9933 ± 0.0064
530 - 540 nm	1.0958 ± 0.0449	0.9870 ± 0.0057
540 - 550 nm	1.1092 ± 0.0463	0.9990 ± 0.0059
550 - 560 nm	1.1044 ± 0.0469	0.9948 ± 0.0050
560 - 570 nm	1.1075 ± 0.0475	0.9976 ± 0.0045
570 - 580 nm	1.1161 ± 0.0490	1.0054 ± 0.0040
580 - 590 nm	1.0959 ± 0.0481	0.9872 ± 0.0044
590 - 600 nm	1.1243 ± 0.0510	1.0129 ± 0.0045
600 - 610 nm	1.1111 ± 0.0498	1.0009 ± 0.0044
610 - 620 nm	1.1265 ± 0.0516	1.0147 ± 0.0049
620 - 630 nm	1.1236 ± 0.0522	1.0121 ± 0.0053
630 - 640 nm	1.1244 ± 0.0530	1.0128 ± 0.0054
640 - 650 nm	1.1308 ± 0.0541	1.0185 ± 0.0058
650 - 660 nm	1.1434 ± 0.0555	1.0299 ± 0.0062
660 - 670 nm	1.1163 ± 0.0543	1.0055 ± 0.0062
670 - 680 nm	1.1251 ± 0.0550	1.0130 ± 0.0081
680 - 690 nm	1.1196 ± 0.0547	1.0077 ± 0.0089
690 - 700 nm	1.1315 ± 0.0565	1.0184 ± 0.0101
700 - 710 nm	1.1359 ± 0.0568	1.0223 ± 0.0096
710 - 720 nm	1.1088 ± 0.0545	0.9985 ± 0.0068
720 - 730 nm	1.1694 ± 0.0603	1.0528 ± 0.0100
730 - 740 nm	1.1501 ± 0.0587	1.0359 ± 0.0084

740 - 750 nm	1.1354 ± 0.0556	1.0238 ± 0.0084
750 - 760 nm	1.0463 ± 0.0496	0.9433 ± 0.0111
760 - 770 nm	1.3433 ± 0.0762	1.2098 ± 0.0186
770 - 780 nm	1.1202 ± 0.0560	1.0104 ± 0.0121
780 - 790 nm	1.1432 ± 0.0578	1.0309 ± 0.0116
790 - 800 nm	1.1563 ± 0.0601	1.0432 ± 0.0123
800 - 810 nm	1.1323 ± 0.0590	1.0217 ± 0.0126
810 - 820 nm	1.1740 ± 0.0646	1.0588 ± 0.0135
820 - 830 nm	1.1541 ± 0.0641	1.0409 ± 0.0138
830 - 840 nm	1.1664 ± 0.0661	1.0519 ± 0.0159
840 - 850 nm	1.1391 ± 0.0637	1.0281 ± 0.0169
850 - 860 nm	1.1671 ± 0.0670	1.0534 ± 0.0186
860 - 870 nm	1.1589 ± 0.0671	1.0462 ± 0.0196
870 - 880 nm	1.1576 ± 0.0684	1.0451 ± 0.0208
880 - 890 nm	1.1575 ± 0.0693	1.0451 ± 0.0215
890 - 900 nm	1.1524 ± 0.0686	1.0405 ± 0.0207
900 - 910 nm	1.1651 ± 0.0728	1.0515 ± 0.0207
910 - 920 nm	1.1981 ± 0.0782	1.0805 ± 0.0244
920 - 930 nm	1.0929 ± 0.0672	0.9866 ± 0.0206
930 - 940 nm	1.2922 ± 0.0955	1.1657 ± 0.0307
940 - 950 nm	1.0772 ± 0.0740	0.9714 ± 0.0265

Source: European Solar Test Installation – JRC

1.13 Instrument "G"

Figure 9: Instrument G - Outdoor R10 and R10* functions.



Source: European Solar Test Installation – JRC.

Table 9: Instrument G – Outdoor R10 and R10* functions.

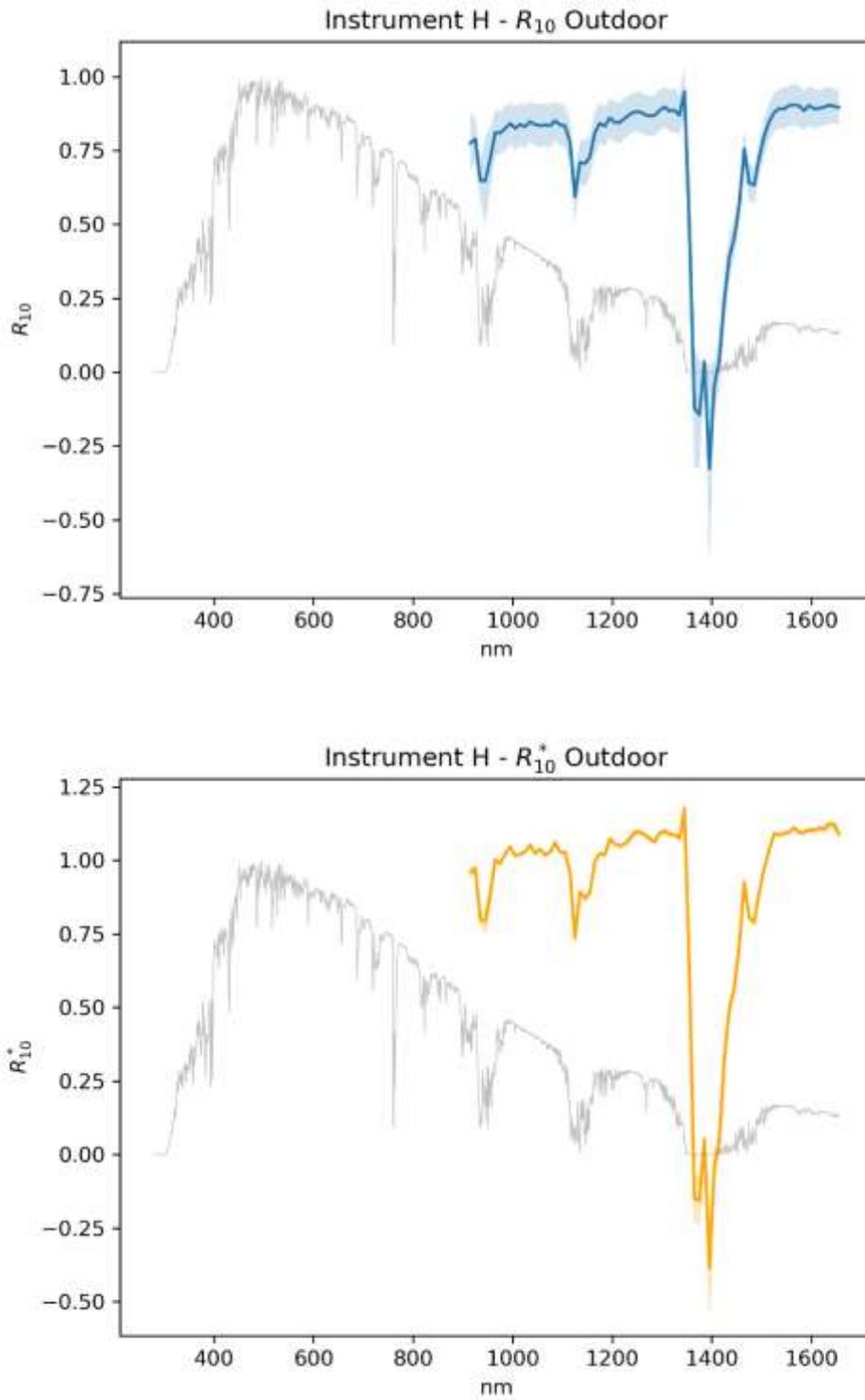
Band	R10	R10*
310 - 320 nm	0.9611 ± 0.0352	0.9784 ± 0.0533
320 - 330 nm	0.9932 ± 0.0354	1.0113 ± 0.0341
330 - 340 nm	1.0145 ± 0.0350	1.0239 ± 0.0218
340 - 350 nm	0.9678 ± 0.0319	0.9854 ± 0.0283
350 - 360 nm	0.9999 ± 0.0318	1.0113 ± 0.0203
360 - 370 nm	1.0565 ± 0.0323	1.0595 ± 0.0235
370 - 380 nm	1.0668 ± 0.0317	1.0825 ± 0.0257
380 - 390 nm	0.9710 ± 0.0282	0.9893 ± 0.0222
390 - 400 nm	0.9450 ± 0.0265	0.9572 ± 0.0202
400 - 410 nm	0.9859 ± 0.0267	0.9987 ± 0.0115
410 - 420 nm	1.0199 ± 0.0273	1.0342 ± 0.0152
420 - 430 nm	1.0605 ± 0.0281	1.0765 ± 0.0152
430 - 440 nm	1.0745 ± 0.0278	1.0964 ± 0.0182
440 - 450 nm	1.0627 ± 0.0272	1.0895 ± 0.0150
450 - 460 nm	1.0363 ± 0.0269	1.0524 ± 0.0126
460 - 470 nm	1.0244 ± 0.0278	1.0462 ± 0.0141
470 - 480 nm	1.0274 ± 0.0353	1.0302 ± 0.0231
480 - 490 nm	1.0428 ± 0.0417	1.0630 ± 0.0299
490 - 500 nm	1.0668 ± 0.0353	1.0970 ± 0.0218
500 - 510 nm	1.0846 ± 0.0290	1.0914 ± 0.0119
510 - 520 nm	1.0826 ± 0.0272	1.0985 ± 0.0105
520 - 530 nm	1.0819 ± 0.0269	1.0999 ± 0.0109
530 - 540 nm	1.0587 ± 0.0262	1.0817 ± 0.0101
540 - 550 nm	1.0375 ± 0.0258	1.0655 ± 0.0099
550 - 560 nm	1.0206 ± 0.0263	1.0439 ± 0.0093
560 - 570 nm	1.0171 ± 0.0270	1.0256 ± 0.0105
570 - 580 nm	1.0169 ± 0.0277	1.0443 ± 0.0115
580 - 590 nm	1.0147 ± 0.0284	1.0243 ± 0.0123
590 - 600 nm	1.0418 ± 0.0272	1.0665 ± 0.0095
600 - 610 nm	1.0486 ± 0.0267	1.0546 ± 0.0085
610 - 620 nm	1.0557 ± 0.0254	1.0554 ± 0.0091
620 - 630 nm	1.0541 ± 0.0248	1.0818 ± 0.0105
630 - 640 nm	1.0540 ± 0.0246	1.0806 ± 0.0123
640 - 650 nm	1.0424 ± 0.0242	1.0489 ± 0.0129
650 - 660 nm	1.0417 ± 0.0242	1.0468 ± 0.0133
660 - 670 nm	1.0282 ± 0.0240	1.0408 ± 0.0115
670 - 680 nm	1.0147 ± 0.0237	1.0363 ± 0.0106
680 - 690 nm	0.9941 ± 0.0234	1.0126 ± 0.0095
690 - 700 nm	1.0071 ± 0.0235	1.0126 ± 0.0108
700 - 710 nm	1.0019 ± 0.0236	1.0215 ± 0.0101
710 - 720 nm	0.9764 ± 0.0233	1.0011 ± 0.0101

720 - 730 nm	1.0091 ± 0.0238	1.0108 ± 0.0129
730 - 740 nm	1.0126 ± 0.0240	1.0187 ± 0.0119
740 - 750 nm	1.0016 ± 0.0239	1.0286 ± 0.0109
750 - 760 nm	0.9889 ± 0.0241	1.0009 ± 0.0095
760 - 770 nm	1.0057 ± 0.0244	1.0286 ± 0.0186
770 - 780 nm	1.0062 ± 0.0244	1.0064 ± 0.0135
780 - 790 nm	0.9996 ± 0.0245	1.0248 ± 0.0146
790 - 800 nm	1.0028 ± 0.0249	1.0086 ± 0.0165
800 - 810 nm	1.0007 ± 0.0250	1.0239 ± 0.0156
810 - 820 nm	0.9712 ± 0.0253	0.9954 ± 0.0177
820 - 830 nm	0.9997 ± 0.0259	1.0139 ± 0.0171
830 - 840 nm	0.9977 ± 0.0262	1.0221 ± 0.0163
840 - 850 nm	0.9785 ± 0.0261	1.0007 ± 0.0101
850 - 860 nm	0.9737 ± 0.0265	0.9934 ± 0.0141
860 - 870 nm	0.9649 ± 0.0266	0.9759 ± 0.0135
870 - 880 nm	0.9629 ± 0.0271	0.9856 ± 0.0128
880 - 890 nm	0.9601 ± 0.0280	0.9834 ± 0.0139
890 - 900 nm	0.9217 ± 0.0264	0.9218 ± 0.0133
900 - 910 nm	0.9491 ± 0.0285	0.9485 ± 0.0136
910 - 920 nm	0.9432 ± 0.0304	0.9571 ± 0.0145
920 - 930 nm	0.9651 ± 0.0299	0.9739 ± 0.0140
930 - 940 nm	0.8103 ± 0.0315	0.8213 ± 0.0222
940 - 950 nm	0.8917 ± 0.0354	0.9013 ± 0.0227
950 - 960 nm	0.8969 ± 0.0367	0.8991 ± 0.0238
960 - 970 nm	0.9332 ± 0.0392	0.9583 ± 0.0249
970 - 980 nm	0.9047 ± 0.0359	0.9109 ± 0.0219
980 - 990 nm	0.9246 ± 0.0388	0.9379 ± 0.0242
990 - 1000 nm	0.9191 ± 0.0387	0.9281 ± 0.0239
1000 - 1010 nm	0.9113 ± 0.0406	0.9118 ± 0.0262
1010 - 1020 nm	0.9197 ± 0.0438	0.9464 ± 0.0296
1020 - 1030 nm	0.9204 ± 0.0458	0.9327 ± 0.0317
1030 - 1040 nm	0.9277 ± 0.0494	0.9278 ± 0.0351
1040 - 1050 nm	0.9394 ± 0.0550	0.9488 ± 0.0412
1050 - 1060 nm	0.9470 ± 0.0583	0.9596 ± 0.0444
1060 - 1070 nm	0.9616 ± 0.0660	0.9848 ± 0.0535
1070 - 1080 nm	0.9820 ± 0.0707	1.0099 ± 0.0593
1080 - 1090 nm	0.9964 ± 0.0817	1.0049 ± 0.0716

Source: European Solar Test Installation – JRC

1.14 Instrument "H"

Figure 10: Instrument H - Outdoor R_{10} and R_{10}^* functions.



Source: European Solar Test Installation – JRC.

Table 10: Instrument H – Outdoor R10 and R10* functions.

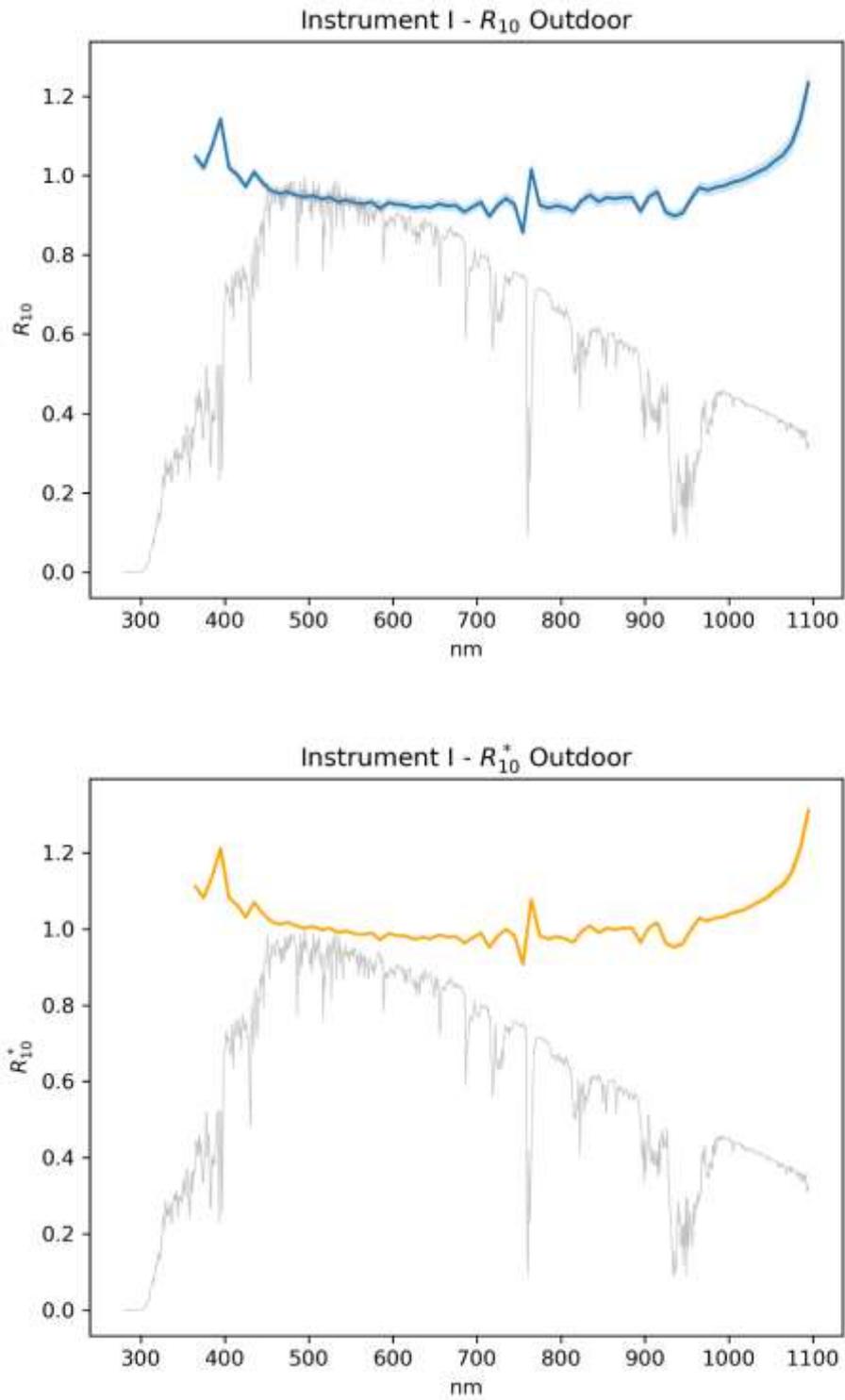
Band	R10	R10*
910 - 920 nm	0.7751 ± 0.0971	0.9505 ± 0.0371
920 - 930 nm	0.7895 ± 0.0736	0.9793 ± 0.0130
930 - 940 nm	0.6476 ± 0.0677	0.7886 ± 0.0230
940 - 950 nm	0.6480 ± 0.1499	0.8137 ± 0.0859
950 - 960 nm	0.7233 ± 0.0999	0.8831 ± 0.0454
960 - 970 nm	0.8106 ± 0.0786	1.0009 ± 0.0146
970 - 980 nm	0.8092 ± 0.0711	1.0032 ± 0.0042
980 - 990 nm	0.8247 ± 0.0763	1.0208 ± 0.0065
990 - 1000 nm	0.8416 ± 0.0680	1.0403 ± 0.0088
1000 - 1010 nm	0.8254 ± 0.0740	1.0244 ± 0.0046
1010 - 1020 nm	0.8383 ± 0.0707	1.0460 ± 0.0066
1020 - 1030 nm	0.8307 ± 0.0740	1.0111 ± 0.0046
1030 - 1040 nm	0.8478 ± 0.0672	1.0552 ± 0.0155
1040 - 1050 nm	0.8380 ± 0.0713	1.0446 ± 0.0075
1050 - 1060 nm	0.8341 ± 0.0719	1.0378 ± 0.0056
1060 - 1070 nm	0.8369 ± 0.0714	1.0254 ± 0.0079
1070 - 1080 nm	0.8330 ± 0.0750	1.0138 ± 0.0050
1080 - 1090 nm	0.8507 ± 0.0655	1.0389 ± 0.0199
1090 - 1100 nm	0.8368 ± 0.0715	1.0159 ± 0.0042
1100 - 1110 nm	0.8335 ± 0.0699	1.0182 ± 0.0060
1110 - 1120 nm	0.7795 ± 0.0743	0.9524 ± 0.0158
1120 - 1130 nm	0.5929 ± 0.0835	0.7575 ± 0.0385
1130 - 1140 nm	0.7092 ± 0.0746	0.8832 ± 0.0224
1140 - 1150 nm	0.7058 ± 0.0804	0.8704 ± 0.0236
1150 - 1160 nm	0.7279 ± 0.0691	0.8908 ± 0.0127
1160 - 1170 nm	0.8108 ± 0.0715	1.0067 ± 0.0042
1170 - 1180 nm	0.8423 ± 0.0694	1.0267 ± 0.0079
1180 - 1190 nm	0.8318 ± 0.0662	1.0158 ± 0.0151
1190 - 1200 nm	0.8606 ± 0.0662	1.0658 ± 0.0184
1200 - 1210 nm	0.8458 ± 0.0685	1.0485 ± 0.0113
1210 - 1220 nm	0.8445 ± 0.0705	1.0479 ± 0.0069
1220 - 1230 nm	0.8592 ± 0.0678	1.0612 ± 0.0156
1230 - 1240 nm	0.8725 ± 0.0670	1.0728 ± 0.0193
1240 - 1250 nm	0.8804 ± 0.0666	1.0751 ± 0.0212
1250 - 1260 nm	0.8809 ± 0.0704	1.0910 ± 0.0114
1260 - 1270 nm	0.8723 ± 0.0692	1.0832 ± 0.0136
1270 - 1280 nm	0.8667 ± 0.0678	1.0652 ± 0.0172
1280 - 1290 nm	0.8686 ± 0.0712	1.0660 ± 0.0082
1290 - 1300 nm	0.8857 ± 0.0707	1.1045 ± 0.0106
1300 - 1310 nm	0.8977 ± 0.0676	1.1080 ± 0.0197
1310 - 1320 nm	0.8835 ± 0.0697	1.0950 ± 0.0127

1320 - 1330 nm	0.8868 ± 0.0761	1.0894 ± 0.0098
1330 - 1340 nm	0.8692 ± 0.0637	1.0789 ± 0.0235
1340 - 1350 nm	0.9499 ± 0.0835	1.1714 ± 0.0307
1350 - 1360 nm	0.4810 ± 0.1932	0.5983 ± 0.1053
1360 - 1370 nm	-0.1212 ± 0.2019	-0.1364 ± 0.1607
1370 - 1380 nm	-0.1453 ± 0.1808	-0.1835 ± 0.1465
1380 - 1390 nm	0.0343 ± 0.0110	0.0508 ± 0.0138
1390 - 1400 nm	-0.3276 ± 0.3501	-0.4015 ± 0.2841
1400 - 1410 nm	-0.0436 ± 0.0801	-0.0354 ± 0.0653
1410 - 1420 nm	0.0393 ± 0.0951	0.0513 ± 0.0835
1420 - 1430 nm	0.2426 ± 0.0806	0.3284 ± 0.0572
1430 - 1440 nm	0.3896 ± 0.0796	0.5023 ± 0.0410
1440 - 1450 nm	0.4533 ± 0.0568	0.5770 ± 0.0322
1450 - 1460 nm	0.5650 ± 0.0663	0.7116 ± 0.0266
1460 - 1470 nm	0.7548 ± 0.0647	0.9436 ± 0.0149
1470 - 1480 nm	0.6404 ± 0.0634	0.8043 ± 0.0159
1480 - 1490 nm	0.6329 ± 0.0631	0.7744 ± 0.0179
1490 - 1500 nm	0.7245 ± 0.0589	0.9088 ± 0.0148
1500 - 1510 nm	0.7986 ± 0.0644	0.9803 ± 0.0114
1510 - 1520 nm	0.8474 ± 0.0643	1.0470 ± 0.0118
1520 - 1530 nm	0.8785 ± 0.0659	1.0757 ± 0.0128
1530 - 1540 nm	0.8922 ± 0.0658	1.0945 ± 0.0143
1540 - 1550 nm	0.8907 ± 0.0696	1.0906 ± 0.0094
1550 - 1560 nm	0.9019 ± 0.0677	1.0976 ± 0.0114
1560 - 1570 nm	0.9050 ± 0.0705	1.1194 ± 0.0100
1570 - 1580 nm	0.9013 ± 0.0681	1.1229 ± 0.0110
1580 - 1590 nm	0.8848 ± 0.0682	1.0909 ± 0.0125
1590 - 1600 nm	0.9026 ± 0.0661	1.1038 ± 0.0143
1600 - 1610 nm	0.8913 ± 0.0688	1.1082 ± 0.0138
1610 - 1620 nm	0.8922 ± 0.0627	1.1062 ± 0.0181
1620 - 1630 nm	0.8968 ± 0.0630	1.1192 ± 0.0201
1630 - 1640 nm	0.9033 ± 0.0634	1.1102 ± 0.0224
1640 - 1650 nm	0.9000 ± 0.0591	1.1020 ± 0.0278
1650 - 1660 nm	0.8957 ± 0.0584	1.1004 ± 0.0297

Source: European Solar Test Installation – JRC

1.15 Instrument "I"

Figure 11: Instrument I - Outdoor R10 and R10* functions.



Source: European Solar Test Installation – JRC.

Table 11: Instrument I – Outdoor R10 and R10* functions.

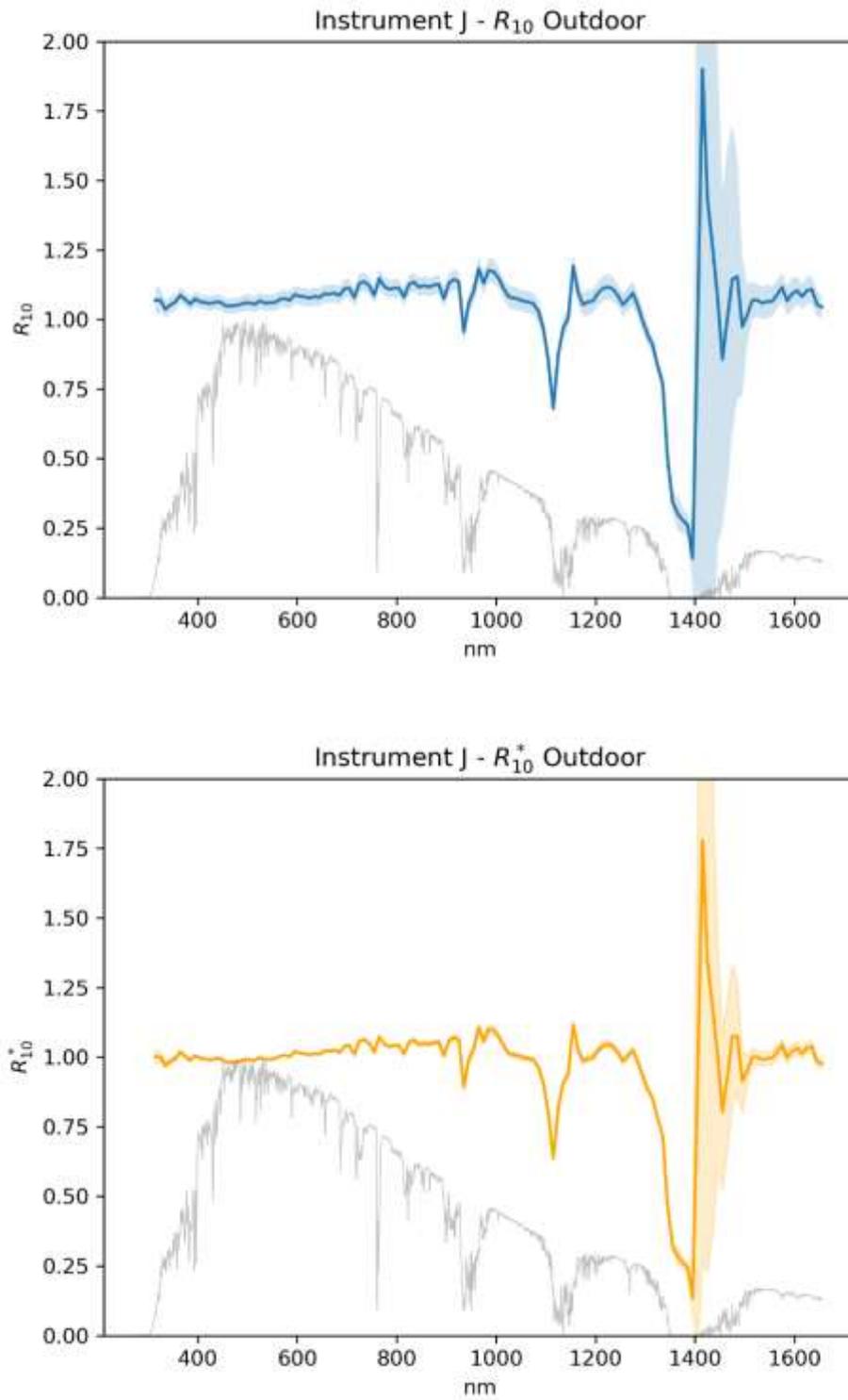
Band	R10	R10*
360 - 370 nm	1.0476 ± 0.0158	1.1107 ± 0.0083
370 - 380 nm	1.0197 ± 0.0142	1.0814 ± 0.0071
380 - 390 nm	1.0736 ± 0.0152	1.1383 ± 0.0067
390 - 400 nm	1.1423 ± 0.0144	1.2112 ± 0.0066
400 - 410 nm	1.0197 ± 0.0125	1.0811 ± 0.0049
410 - 420 nm	1.0016 ± 0.0125	1.0620 ± 0.0040
420 - 430 nm	0.9720 ± 0.0123	1.0307 ± 0.0037
430 - 440 nm	1.0089 ± 0.0125	1.0698 ± 0.0040
440 - 450 nm	0.9816 ± 0.0125	1.0408 ± 0.0034
450 - 460 nm	0.9621 ± 0.0126	1.0201 ± 0.0031
460 - 470 nm	0.9544 ± 0.0124	1.0119 ± 0.0032
470 - 480 nm	0.9591 ± 0.0126	1.0169 ± 0.0030
480 - 490 nm	0.9501 ± 0.0127	1.0074 ± 0.0028
490 - 500 nm	0.9457 ± 0.0128	1.0027 ± 0.0030
500 - 510 nm	0.9492 ± 0.0128	1.0064 ± 0.0028
510 - 520 nm	0.9407 ± 0.0131	0.9973 ± 0.0023
520 - 530 nm	0.9447 ± 0.0131	1.0016 ± 0.0024
530 - 540 nm	0.9336 ± 0.0131	0.9899 ± 0.0024
540 - 550 nm	0.9383 ± 0.0134	0.9948 ± 0.0023
550 - 560 nm	0.9308 ± 0.0136	0.9868 ± 0.0020
560 - 570 nm	0.9292 ± 0.0133	0.9852 ± 0.0019
570 - 580 nm	0.9330 ± 0.0134	0.9893 ± 0.0020
580 - 590 nm	0.9160 ± 0.0129	0.9712 ± 0.0021
590 - 600 nm	0.9319 ± 0.0144	0.9878 ± 0.0021
600 - 610 nm	0.9268 ± 0.0140	0.9825 ± 0.0019
610 - 620 nm	0.9257 ± 0.0137	0.9815 ± 0.0019
620 - 630 nm	0.9180 ± 0.0139	0.9732 ± 0.0018
630 - 640 nm	0.9223 ± 0.0145	0.9777 ± 0.0020
640 - 650 nm	0.9188 ± 0.0139	0.9742 ± 0.0018
650 - 660 nm	0.9285 ± 0.0151	0.9843 ± 0.0023
660 - 670 nm	0.9232 ± 0.0148	0.9787 ± 0.0021
670 - 680 nm	0.9245 ± 0.0150	0.9800 ± 0.0022
680 - 690 nm	0.9083 ± 0.0145	0.9630 ± 0.0021
690 - 700 nm	0.9205 ± 0.0146	0.9761 ± 0.0021
700 - 710 nm	0.9327 ± 0.0158	0.9889 ± 0.0029
710 - 720 nm	0.8969 ± 0.0133	0.9510 ± 0.0020
720 - 730 nm	0.9249 ± 0.0154	0.9806 ± 0.0028
730 - 740 nm	0.9424 ± 0.0175	0.9990 ± 0.0045
740 - 750 nm	0.9269 ± 0.0161	0.9828 ± 0.0033
750 - 760 nm	0.8555 ± 0.0132	0.9071 ± 0.0020
760 - 770 nm	1.0152 ± 0.0206	1.0766 ± 0.0072

770 - 780 nm	0.9258 ± 0.0162	0.9817 ± 0.0035
780 - 790 nm	0.9179 ± 0.0156	0.9733 ± 0.0029
790 - 800 nm	0.9238 ± 0.0165	0.9795 ± 0.0035
800 - 810 nm	0.9192 ± 0.0156	0.9746 ± 0.0030
810 - 820 nm	0.9098 ± 0.0151	0.9645 ± 0.0028
820 - 830 nm	0.9371 ± 0.0162	0.9937 ± 0.0033
830 - 840 nm	0.9508 ± 0.0177	1.0081 ± 0.0041
840 - 850 nm	0.9337 ± 0.0167	0.9899 ± 0.0038
850 - 860 nm	0.9449 ± 0.0171	1.0019 ± 0.0041
860 - 870 nm	0.9415 ± 0.0171	0.9985 ± 0.0044
870 - 880 nm	0.9448 ± 0.0170	1.0018 ± 0.0041
880 - 890 nm	0.9450 ± 0.0164	1.0021 ± 0.0037
890 - 900 nm	0.9095 ± 0.0143	0.9642 ± 0.0029
900 - 910 nm	0.9464 ± 0.0158	1.0034 ± 0.0034
910 - 920 nm	0.9587 ± 0.0167	1.0166 ± 0.0038
920 - 930 nm	0.9076 ± 0.0147	0.9623 ± 0.0042
930 - 940 nm	0.8978 ± 0.0138	0.9524 ± 0.0092
940 - 950 nm	0.9050 ± 0.0149	0.9605 ± 0.0099
950 - 960 nm	0.9405 ± 0.0154	0.9978 ± 0.0084
960 - 970 nm	0.9698 ± 0.0161	1.0284 ± 0.0051
970 - 980 nm	0.9626 ± 0.0163	1.0209 ± 0.0049
980 - 990 nm	0.9706 ± 0.0167	1.0290 ± 0.0045
990 - 1000 nm	0.9742 ± 0.0171	1.0330 ± 0.0051
1000 - 1010 nm	0.9834 ± 0.0173	1.0428 ± 0.0063
1010 - 1020 nm	0.9881 ± 0.0178	1.0478 ± 0.0067
1020 - 1030 nm	0.9977 ± 0.0186	1.0579 ± 0.0076
1030 - 1040 nm	1.0087 ± 0.0187	1.0701 ± 0.0089
1040 - 1050 nm	1.0191 ± 0.0189	1.0815 ± 0.0108
1050 - 1060 nm	1.0370 ± 0.0215	1.1002 ± 0.0139
1060 - 1070 nm	1.0524 ± 0.0231	1.1166 ± 0.0173
1070 - 1080 nm	1.0815 ± 0.0266	1.1484 ± 0.0220
1080 - 1090 nm	1.1389 ± 0.0332	1.2096 ± 0.0280
1090 - 1100 nm	1.2338 ± 0.0402	1.3095 ± 0.0353

Source: European Solar Test Installation – JRC

1.16 Instrument "J"

Figure 12: Instrument J - Outdoor R10 and R10* functions.



Source: European Solar Test Installation – JRC.

Table 12: Instrument J – Outdoor R10 and R10* functions.

Band	R10	R10*
310 - 320 nm	1.0691 ± 0.0568	1.0013 ± 0.0485
320 - 330 nm	1.0697 ± 0.0401	1.0014 ± 0.0334
330 - 340 nm	1.0368 ± 0.0318	0.9705 ± 0.0248
340 - 350 nm	1.0525 ± 0.0298	0.9853 ± 0.0222
350 - 360 nm	1.0628 ± 0.0292	0.9949 ± 0.0207
360 - 370 nm	1.0869 ± 0.0284	1.0175 ± 0.0184
370 - 380 nm	1.0724 ± 0.0270	1.0039 ± 0.0152
380 - 390 nm	1.0557 ± 0.0257	0.9882 ± 0.0112
390 - 400 nm	1.0748 ± 0.0256	1.0061 ± 0.0077
400 - 410 nm	1.0634 ± 0.0252	0.9955 ± 0.0077
410 - 420 nm	1.0610 ± 0.0258	0.9932 ± 0.0071
420 - 430 nm	1.0575 ± 0.0264	0.9899 ± 0.0068
430 - 440 nm	1.0621 ± 0.0273	0.9942 ± 0.0063
440 - 450 nm	1.0630 ± 0.0275	0.9950 ± 0.0065
450 - 460 nm	1.0501 ± 0.0272	0.9830 ± 0.0069
460 - 470 nm	1.0483 ± 0.0273	0.9812 ± 0.0067
470 - 480 nm	1.0504 ± 0.0276	0.9832 ± 0.0068
480 - 490 nm	1.0536 ± 0.0282	0.9862 ± 0.0064
490 - 500 nm	1.0599 ± 0.0289	0.9921 ± 0.0061
500 - 510 nm	1.0594 ± 0.0294	0.9917 ± 0.0056
510 - 520 nm	1.0548 ± 0.0297	0.9874 ± 0.0054
520 - 530 nm	1.0672 ± 0.0302	0.9991 ± 0.0054
530 - 540 nm	1.0594 ± 0.0301	0.9917 ± 0.0055
540 - 550 nm	1.0605 ± 0.0302	0.9928 ± 0.0053
550 - 560 nm	1.0614 ± 0.0303	0.9936 ± 0.0055
560 - 570 nm	1.0722 ± 0.0306	1.0038 ± 0.0056
570 - 580 nm	1.0759 ± 0.0309	1.0072 ± 0.0058
580 - 590 nm	1.0690 ± 0.0309	1.0007 ± 0.0056
590 - 600 nm	1.0900 ± 0.0319	1.0204 ± 0.0057
600 - 610 nm	1.0837 ± 0.0317	1.0145 ± 0.0059
610 - 620 nm	1.0817 ± 0.0319	1.0126 ± 0.0057
620 - 630 nm	1.0770 ± 0.0320	1.0082 ± 0.0057
630 - 640 nm	1.0834 ± 0.0323	1.0142 ± 0.0058
640 - 650 nm	1.0791 ± 0.0323	1.0102 ± 0.0059
650 - 660 nm	1.0927 ± 0.0326	1.0228 ± 0.0062
660 - 670 nm	1.0910 ± 0.0324	1.0213 ± 0.0064
670 - 680 nm	1.0953 ± 0.0325	1.0253 ± 0.0067
680 - 690 nm	1.0860 ± 0.0325	1.0164 ± 0.0077
690 - 700 nm	1.1107 ± 0.0332	1.0396 ± 0.0077
700 - 710 nm	1.1131 ± 0.0331	1.0418 ± 0.0080
710 - 720 nm	1.0787 ± 0.0326	1.0096 ± 0.0089

720 - 730 nm	1.1302 ± 0.0339	1.0579 ± 0.0086
730 - 740 nm	1.1366 ± 0.0332	1.0638 ± 0.0085
740 - 750 nm	1.1210 ± 0.0325	1.0492 ± 0.0089
750 - 760 nm	1.0869 ± 0.0317	1.0173 ± 0.0095
760 - 770 nm	1.1471 ± 0.0338	1.0736 ± 0.0099
770 - 780 nm	1.1185 ± 0.0325	1.0468 ± 0.0105
780 - 790 nm	1.1086 ± 0.0326	1.0376 ± 0.0113
790 - 800 nm	1.1132 ± 0.0327	1.0419 ± 0.0118
800 - 810 nm	1.1121 ± 0.0330	1.0409 ± 0.0127
810 - 820 nm	1.0809 ± 0.0333	1.0115 ± 0.0141
820 - 830 nm	1.1261 ± 0.0338	1.0539 ± 0.0143
830 - 840 nm	1.1350 ± 0.0339	1.0623 ± 0.0151
840 - 850 nm	1.1161 ± 0.0332	1.0446 ± 0.0152
850 - 860 nm	1.1223 ± 0.0336	1.0503 ± 0.0161
860 - 870 nm	1.1175 ± 0.0333	1.0458 ± 0.0164
870 - 880 nm	1.1237 ± 0.0336	1.0517 ± 0.0171
880 - 890 nm	1.1273 ± 0.0340	1.0550 ± 0.0179
890 - 900 nm	1.0745 ± 0.0335	1.0055 ± 0.0176
900 - 910 nm	1.1308 ± 0.0354	1.0582 ± 0.0199
910 - 920 nm	1.1441 ± 0.0367	1.0706 ± 0.0222
920 - 930 nm	1.1365 ± 0.0357	1.0636 ± 0.0203
930 - 940 nm	0.9547 ± 0.0378	0.8933 ± 0.0257
940 - 950 nm	1.0594 ± 0.0397	0.9913 ± 0.0276
950 - 960 nm	1.0999 ± 0.0414	1.0291 ± 0.0298
960 - 970 nm	1.1830 ± 0.0437	1.1069 ± 0.0327
970 - 980 nm	1.1302 ± 0.0410	1.0576 ± 0.0298
980 - 990 nm	1.1771 ± 0.0429	1.1014 ± 0.0324
990 - 1000 nm	1.1722 ± 0.0438	1.0968 ± 0.0340
1000 - 1010 nm	1.1489 ± 0.0372	1.0752 ± 0.0227
1010 - 1020 nm	1.1120 ± 0.0354	1.0409 ± 0.0104
1020 - 1030 nm	1.0826 ± 0.0405	1.0136 ± 0.0191
1030 - 1040 nm	1.0773 ± 0.0411	1.0087 ± 0.0205
1040 - 1050 nm	1.0733 ± 0.0396	1.0049 ± 0.0188
1050 - 1060 nm	1.0660 ± 0.0394	0.9981 ± 0.0187
1060 - 1070 nm	1.0630 ± 0.0392	0.9953 ± 0.0185
1070 - 1080 nm	1.0569 ± 0.0400	0.9896 ± 0.0193
1080 - 1090 nm	1.0298 ± 0.0412	0.9643 ± 0.0203
1090 - 1100 nm	0.9692 ± 0.0369	0.9075 ± 0.0172
1100 - 1110 nm	0.8530 ± 0.0309	0.7983 ± 0.0150
1110 - 1120 nm	0.6802 ± 0.0199	0.6362 ± 0.0097
1120 - 1130 nm	0.8753 ± 0.0291	0.8187 ± 0.0166
1130 - 1140 nm	0.9708 ± 0.0351	0.9087 ± 0.0167
1140 - 1150 nm	1.0036 ± 0.0390	0.9393 ± 0.0229
1150 - 1160 nm	1.1929 ± 0.0480	1.1165 ± 0.0295
1160 - 1170 nm	1.0953 ± 0.0459	1.0256 ± 0.0251

1170 - 1180 nm	1.0536 ± 0.0425	0.9863 ± 0.0237
1180 - 1190 nm	1.0630 ± 0.0455	0.9952 ± 0.0264
1190 - 1200 nm	1.0669 ± 0.0428	0.9987 ± 0.0242
1200 - 1210 nm	1.0956 ± 0.0446	1.0256 ± 0.0257
1210 - 1220 nm	1.1121 ± 0.0449	1.0410 ± 0.0262
1220 - 1230 nm	1.1168 ± 0.0455	1.0458 ± 0.0249
1230 - 1240 nm	1.1092 ± 0.0432	1.0383 ± 0.0247
1240 - 1250 nm	1.0860 ± 0.0407	1.0166 ± 0.0222
1250 - 1260 nm	1.0521 ± 0.0405	0.9849 ± 0.0222
1260 - 1270 nm	1.0738 ± 0.0431	1.0052 ± 0.0249
1270 - 1280 nm	1.0952 ± 0.0427	1.0251 ± 0.0248
1280 - 1290 nm	1.0504 ± 0.0420	0.9833 ± 0.0240
1290 - 1300 nm	0.9938 ± 0.0406	0.9303 ± 0.0228
1300 - 1310 nm	0.9442 ± 0.0353	0.8836 ± 0.0195
1310 - 1320 nm	0.9079 ± 0.0326	0.8498 ± 0.0172
1320 - 1330 nm	0.8320 ± 0.0265	0.7782 ± 0.0162
1330 - 1340 nm	0.7696 ± 0.0280	0.7203 ± 0.0152
1340 - 1350 nm	0.4947 ± 0.0188	0.4626 ± 0.0131
1350 - 1360 nm	0.3420 ± 0.0350	0.3205 ± 0.0296
1360 - 1370 nm	0.3025 ± 0.0640	0.2841 ± 0.0580
1370 - 1380 nm	0.2782 ± 0.0473	0.2612 ± 0.0418
1380 - 1390 nm	0.2612 ± 0.0404	0.2451 ± 0.0360
1390 - 1400 nm	0.1413 ± 0.0910	0.1327 ± 0.0854
1400 - 1410 nm	0.9599 ± 2.0081	0.8989 ± 1.8801
1410 - 1420 nm	1.9009 ± 3.2386	1.7790 ± 3.0351
1420 - 1430 nm	1.4320 ± 2.3680	1.3398 ± 2.2207
1430 - 1440 nm	1.2650 ± 1.7643	1.1848 ± 1.6524
1440 - 1450 nm	1.0852 ± 0.9004	1.0133 ± 0.8284
1450 - 1460 nm	0.8565 ± 0.6011	0.8035 ± 0.5590
1460 - 1470 nm	1.0046 ± 0.6113	0.9311 ± 0.5343
1470 - 1480 nm	1.1454 ± 0.5575	1.0739 ± 0.5131
1480 - 1490 nm	1.1545 ± 0.4351	1.0762 ± 0.4041
1490 - 1500 nm	0.9739 ± 0.2522	0.9140 ± 0.2262
1500 - 1510 nm	1.0171 ± 0.1089	0.9513 ± 0.0992
1510 - 1520 nm	1.0686 ± 0.0667	0.9996 ± 0.0590
1520 - 1530 nm	1.0701 ± 0.0590	1.0010 ± 0.0501
1530 - 1540 nm	1.0587 ± 0.0586	0.9908 ± 0.0483
1540 - 1550 nm	1.0647 ± 0.0604	0.9962 ± 0.0500
1550 - 1560 nm	1.0653 ± 0.0541	0.9966 ± 0.0468
1560 - 1570 nm	1.0888 ± 0.0523	1.0185 ± 0.0446
1570 - 1580 nm	1.1161 ± 0.0526	1.0441 ± 0.0441
1580 - 1590 nm	1.0676 ± 0.0542	0.9989 ± 0.0449
1590 - 1600 nm	1.0916 ± 0.0592	1.0212 ± 0.0498
1600 - 1610 nm	1.1044 ± 0.0498	1.0335 ± 0.0411
1610 - 1620 nm	1.0826 ± 0.0449	1.0133 ± 0.0375

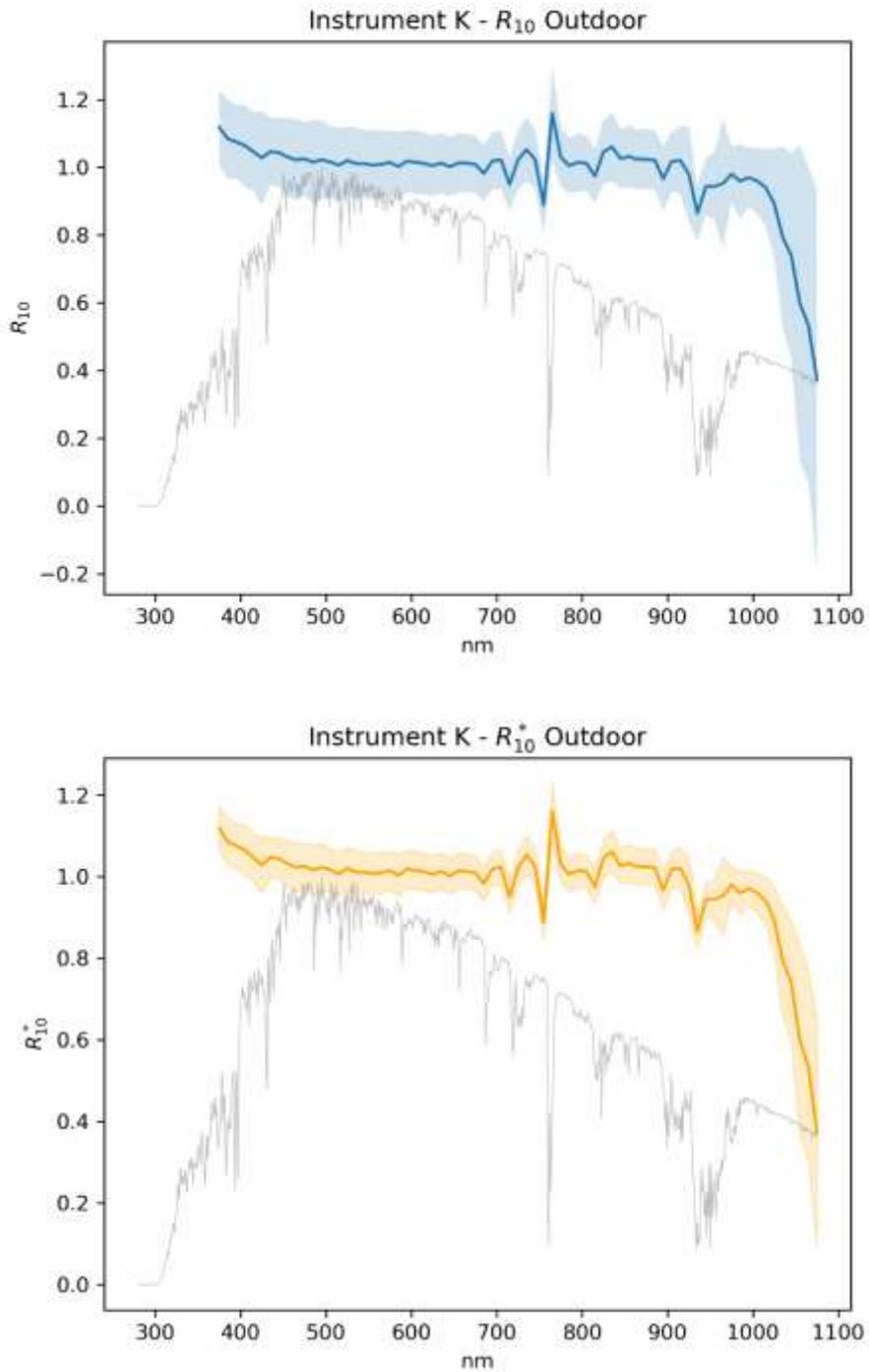
1620 - 1630 nm	1.1039 ± 0.0502	1.0330 ± 0.0418
1630 - 1640 nm	1.1088 ± 0.0484	1.0375 ± 0.0410
1640 - 1650 nm	1.0538 ± 0.0475	0.9843 ± 0.0359
1650 - 1660 nm	1.0447 ± 0.0373	0.9768 ± 0.0289

Source: European Solar Test Installation – JRC

1.17 Instrument “K”

Instrument “K” is a particular spectroradiometer to be installed horizontally, and capable to measure the Global Horizontal and Diffuse components. The results presented here refer to the Direct Normal component, calculated using the measured horizontal and diffuse.

Figure 13: Instrument K - Outdoor R_{10} and R_{10}^* functions.



Source: European Solar Test Installation – JRC.

Table 13: Instrument K – Outdoor R10 and R10* functions.

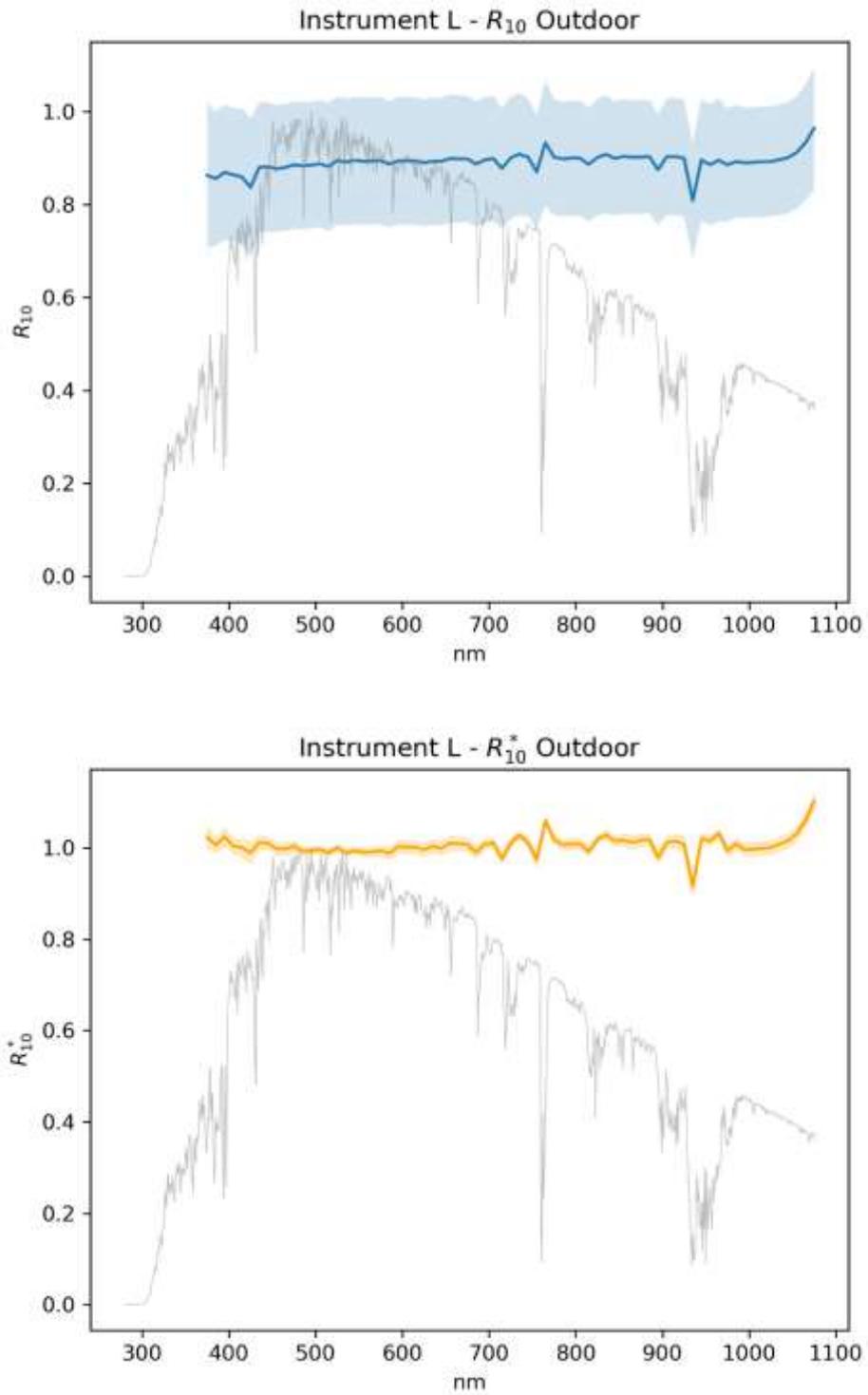
Band	R10	R10*
370 - 380 nm	1.1185 ± 0.1092	1.1185 ± 0.1092
380 - 390 nm	1.0845 ± 0.1174	1.0845 ± 0.1174
390 - 400 nm	1.0756 ± 0.1089	1.0756 ± 0.1089
400 - 410 nm	1.0648 ± 0.1208	1.0648 ± 0.1208
410 - 420 nm	1.0466 ± 0.1165	1.0466 ± 0.1165
420 - 430 nm	1.0284 ± 0.1386	1.0284 ± 0.1386
430 - 440 nm	1.0469 ± 0.0985	1.0469 ± 0.0985
440 - 450 nm	1.0441 ± 0.1031	1.0441 ± 0.1031
450 - 460 nm	1.0309 ± 0.1150	1.0309 ± 0.1150
460 - 470 nm	1.0227 ± 0.1203	1.0227 ± 0.1203
470 - 480 nm	1.0256 ± 0.1083	1.0256 ± 0.1083
480 - 490 nm	1.0155 ± 0.1245	1.0155 ± 0.1245
490 - 500 nm	1.0229 ± 0.1162	1.0229 ± 0.1162
500 - 510 nm	1.0165 ± 0.1047	1.0165 ± 0.1047
510 - 520 nm	1.0067 ± 0.1112	1.0067 ± 0.1112
520 - 530 nm	1.0205 ± 0.1001	1.0205 ± 0.1001
530 - 540 nm	1.0116 ± 0.1078	1.0116 ± 0.1078
540 - 550 nm	1.0109 ± 0.0996	1.0109 ± 0.0996
550 - 560 nm	1.0071 ± 0.1030	1.0071 ± 0.1030
560 - 570 nm	1.0093 ± 0.0992	1.0093 ± 0.0992
570 - 580 nm	1.0149 ± 0.0942	1.0149 ± 0.0942
580 - 590 nm	1.0025 ± 0.1040	1.0025 ± 0.1040
590 - 600 nm	1.0187 ± 0.0915	1.0187 ± 0.0915
600 - 610 nm	1.0153 ± 0.0938	1.0153 ± 0.0938
610 - 620 nm	1.0120 ± 0.0914	1.0120 ± 0.0914
620 - 630 nm	1.0053 ± 0.0906	1.0053 ± 0.0906
630 - 640 nm	1.0131 ± 0.0888	1.0131 ± 0.0888
640 - 650 nm	1.0019 ± 0.0877	1.0019 ± 0.0877
650 - 660 nm	1.0133 ± 0.0872	1.0133 ± 0.0872
660 - 670 nm	1.0129 ± 0.0860	1.0129 ± 0.0860
670 - 680 nm	1.0090 ± 0.0850	1.0090 ± 0.0850
680 - 690 nm	0.9823 ± 0.0839	0.9823 ± 0.0839
690 - 700 nm	1.0194 ± 0.0848	1.0194 ± 0.0848
700 - 710 nm	1.0231 ± 0.0868	1.0231 ± 0.0868
710 - 720 nm	0.9502 ± 0.0781	0.9502 ± 0.0781
720 - 730 nm	1.0226 ± 0.0875	1.0226 ± 0.0875
730 - 740 nm	1.0531 ± 0.0938	1.0531 ± 0.0938
740 - 750 nm	1.0235 ± 0.0874	1.0235 ± 0.0874
750 - 760 nm	0.8888 ± 0.0825	0.8888 ± 0.0825
760 - 770 nm	1.1603 ± 0.1374	1.1603 ± 0.1374
770 - 780 nm	1.0301 ± 0.0874	1.0301 ± 0.0874

780 - 790 nm	1.0052 ± 0.0828	1.0052 ± 0.0828
790 - 800 nm	1.0149 ± 0.0849	1.0149 ± 0.0849
800 - 810 nm	1.0124 ± 0.0823	1.0124 ± 0.0823
810 - 820 nm	0.9747 ± 0.0797	0.9747 ± 0.0797
820 - 830 nm	1.0458 ± 0.0937	1.0458 ± 0.0937
830 - 840 nm	1.0613 ± 0.1021	1.0613 ± 0.1021
840 - 850 nm	1.0263 ± 0.0876	1.0263 ± 0.0876
850 - 860 nm	1.0322 ± 0.0923	1.0322 ± 0.0923
860 - 870 nm	1.0240 ± 0.0881	1.0240 ± 0.0881
870 - 880 nm	1.0244 ± 0.0883	1.0244 ± 0.0883
880 - 890 nm	1.0218 ± 0.0870	1.0218 ± 0.0870
890 - 900 nm	0.9669 ± 0.0959	0.9669 ± 0.0959
900 - 910 nm	1.0180 ± 0.0881	1.0180 ± 0.0881
910 - 920 nm	1.0207 ± 0.0996	1.0207 ± 0.0996
920 - 930 nm	0.9805 ± 0.1416	0.9805 ± 0.1416
930 - 940 nm	0.8650 ± 0.0823	0.8650 ± 0.0823
940 - 950 nm	0.9440 ± 0.0842	0.9440 ± 0.0842
950 - 960 nm	0.9442 ± 0.1015	0.9442 ± 0.1015
960 - 970 nm	0.9526 ± 0.1923	0.9526 ± 0.1923
970 - 980 nm	0.9802 ± 0.0820	0.9802 ± 0.0820
980 - 990 nm	0.9595 ± 0.1096	0.9595 ± 0.1096
990 - 1000 nm	0.9704 ± 0.0875	0.9704 ± 0.0875
1000 - 1010 nm	0.9604 ± 0.0969	0.9604 ± 0.0969
1010 - 1020 nm	0.9408 ± 0.1143	0.9408 ± 0.1143
1020 - 1030 nm	0.8940 ± 0.1608	0.8940 ± 0.1608
1030 - 1040 nm	0.7931 ± 0.2698	0.7931 ± 0.2698
1040 - 1050 nm	0.7410 ± 0.3005	0.7410 ± 0.3005
1050 - 1060 nm	0.5986 ± 0.4672	0.5986 ± 0.4672
1060 - 1070 nm	0.5353 ± 0.4664	0.5353 ± 0.4664
1070 - 1080 nm	0.3741 ± 0.5600	0.3741 ± 0.5600

Source: European Solar Test Installation – JRC

1.18 Instrument "L"

Figure 14: Instrument L - Outdoor R_{10} and R_{10}^* functions.



Source: European Solar Test Installation – JRC.

Table 14: Instrument L – Outdoor R10 and R10* functions.

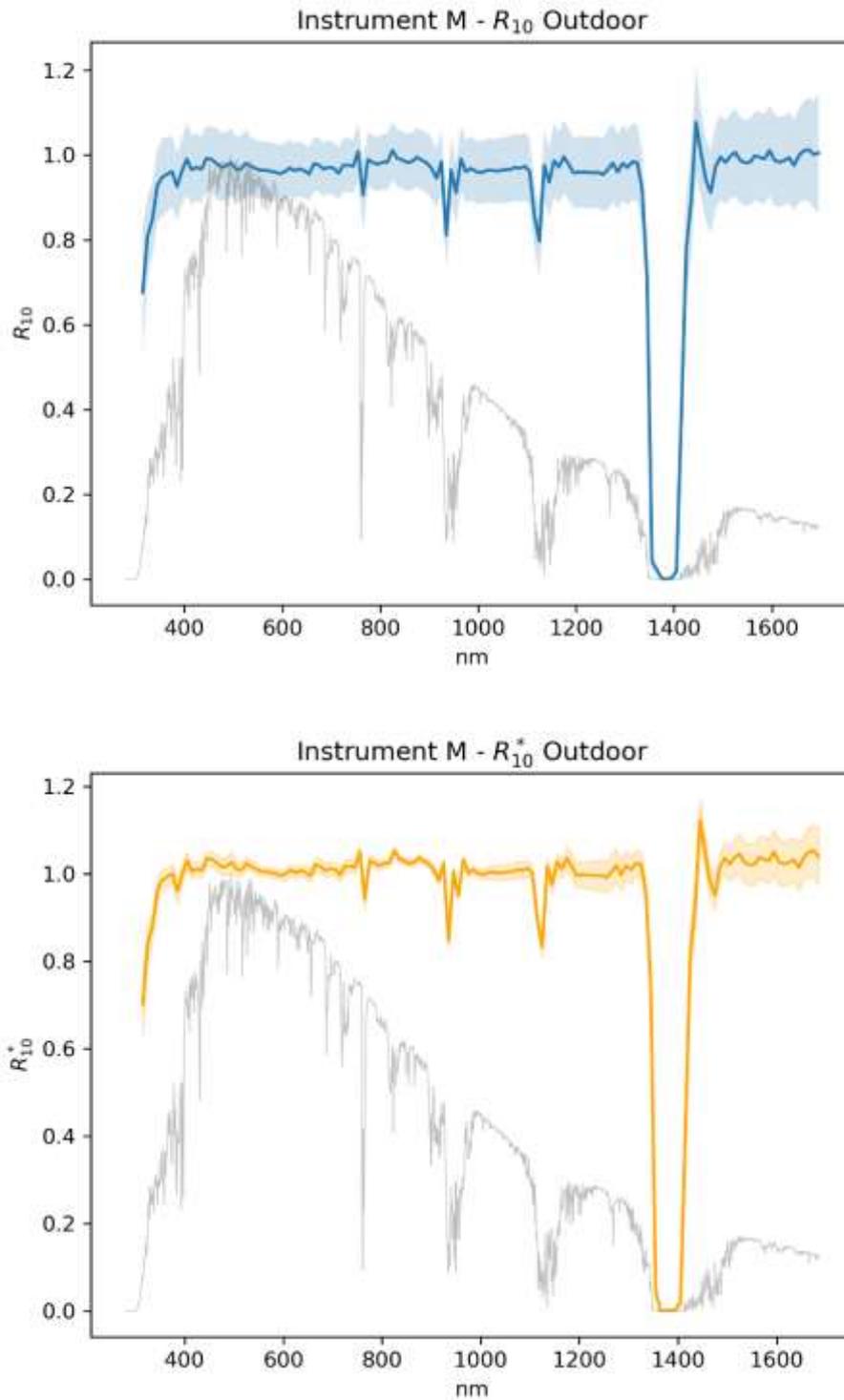
Band	R10	R10*
370 - 380 nm	0.8629 ± 0.1552	1.0234 ± 0.0208
380 - 390 nm	0.8562 ± 0.1445	1.0061 ± 0.0158
390 - 400 nm	0.8696 ± 0.1462	1.0247 ± 0.0188
400 - 410 nm	0.8643 ± 0.1430	1.0039 ± 0.0140
410 - 420 nm	0.8596 ± 0.1473	1.0009 ± 0.0189
420 - 430 nm	0.8371 ± 0.1487	0.9891 ± 0.0235
430 - 440 nm	0.8804 ± 0.1400	1.0123 ± 0.0136
440 - 450 nm	0.8816 ± 0.1385	1.0096 ± 0.0119
450 - 460 nm	0.8773 ± 0.1368	0.9985 ± 0.0130
460 - 470 nm	0.8800 ± 0.1362	0.9981 ± 0.0136
470 - 480 nm	0.8857 ± 0.1369	1.0043 ± 0.0111
480 - 490 nm	0.8834 ± 0.1370	0.9920 ± 0.0084
490 - 500 nm	0.8850 ± 0.1355	0.9943 ± 0.0081
500 - 510 nm	0.8879 ± 0.1366	0.9963 ± 0.0082
510 - 520 nm	0.8817 ± 0.1386	0.9896 ± 0.0079
520 - 530 nm	0.8952 ± 0.1373	1.0002 ± 0.0077
530 - 540 nm	0.8915 ± 0.1362	0.9896 ± 0.0069
540 - 550 nm	0.8953 ± 0.1372	0.9938 ± 0.0073
550 - 560 nm	0.8935 ± 0.1369	0.9905 ± 0.0074
560 - 570 nm	0.8941 ± 0.1369	0.9912 ± 0.0088
570 - 580 nm	0.8949 ± 0.1370	0.9938 ± 0.0111
580 - 590 nm	0.8872 ± 0.1354	0.9885 ± 0.0115
590 - 600 nm	0.8943 ± 0.1378	1.0031 ± 0.0126
600 - 610 nm	0.8946 ± 0.1371	1.0019 ± 0.0122
610 - 620 nm	0.8940 ± 0.1373	1.0016 ± 0.0128
620 - 630 nm	0.8900 ± 0.1365	0.9961 ± 0.0132
630 - 640 nm	0.8933 ± 0.1374	1.0040 ± 0.0138
640 - 650 nm	0.8933 ± 0.1373	0.9987 ± 0.0137
650 - 660 nm	0.8992 ± 0.1381	1.0106 ± 0.0146
660 - 670 nm	0.8988 ± 0.1368	1.0093 ± 0.0131
670 - 680 nm	0.8985 ± 0.1359	1.0078 ± 0.0139
680 - 690 nm	0.8873 ± 0.1343	0.9900 ± 0.0117
690 - 700 nm	0.8962 ± 0.1358	1.0082 ± 0.0106
700 - 710 nm	0.8993 ± 0.1350	1.0111 ± 0.0098
710 - 720 nm	0.8778 ± 0.1293	0.9763 ± 0.0082
720 - 730 nm	0.9006 ± 0.1318	1.0113 ± 0.0091
730 - 740 nm	0.9089 ± 0.1316	1.0280 ± 0.0081
740 - 750 nm	0.9023 ± 0.1267	1.0125 ± 0.0091
750 - 760 nm	0.8707 ± 0.1213	0.9743 ± 0.0132
760 - 770 nm	0.9332 ± 0.1350	1.0601 ± 0.0071
770 - 780 nm	0.9023 ± 0.1246	1.0181 ± 0.0096

780 - 790 nm	0.8986 ± 0.1230	1.0070 ± 0.0103
790 - 800 nm	0.9002 ± 0.1239	1.0091 ± 0.0110
800 - 810 nm	0.9001 ± 0.1237	1.0086 ± 0.0112
810 - 820 nm	0.8866 ± 0.1232	0.9924 ± 0.0086
820 - 830 nm	0.9017 ± 0.1258	1.0191 ± 0.0083
830 - 840 nm	0.9084 ± 0.1266	1.0287 ± 0.0097
840 - 850 nm	0.8992 ± 0.1230	1.0152 ± 0.0103
850 - 860 nm	0.9040 ± 0.1233	1.0171 ± 0.0119
860 - 870 nm	0.9021 ± 0.1225	1.0121 ± 0.0140
870 - 880 nm	0.9024 ± 0.1224	1.0167 ± 0.0121
880 - 890 nm	0.9036 ± 0.1223	1.0182 ± 0.0112
890 - 900 nm	0.8749 ± 0.1191	0.9787 ± 0.0108
900 - 910 nm	0.9032 ± 0.1252	1.0119 ± 0.0118
910 - 920 nm	0.9034 ± 0.1266	1.0153 ± 0.0136
920 - 930 nm	0.9002 ± 0.1259	1.0081 ± 0.0157
930 - 940 nm	0.8086 ± 0.1248	0.9148 ± 0.0153
940 - 950 nm	0.8963 ± 0.1302	1.0200 ± 0.0111
950 - 960 nm	0.8859 ± 0.1304	1.0151 ± 0.0099
960 - 970 nm	0.8957 ± 0.1324	1.0320 ± 0.0082
970 - 980 nm	0.8855 ± 0.1218	0.9941 ± 0.0132
980 - 990 nm	0.8928 ± 0.1212	1.0091 ± 0.0100
990 - 1000 nm	0.8902 ± 0.1188	0.9960 ± 0.0133
1000 - 1010 nm	0.8910 ± 0.1187	0.9971 ± 0.0138
1010 - 1020 nm	0.8924 ± 0.1188	0.9991 ± 0.0141
1020 - 1030 nm	0.8926 ± 0.1185	1.0007 ± 0.0141
1030 - 1040 nm	0.8968 ± 0.1188	1.0082 ± 0.0142
1040 - 1050 nm	0.9013 ± 0.1195	1.0161 ± 0.0138
1050 - 1060 nm	0.9126 ± 0.1208	1.0317 ± 0.0143
1060 - 1070 nm	0.9331 ± 0.1253	1.0598 ± 0.0145
1070 - 1080 nm	0.9643 ± 0.1314	1.1012 ± 0.0153

Source: European Solar Test Installation – JRC

1.19 Instrument "M"

Figure 15: Instrument M - Outdoor R10 and R10* functions.



Source: European Solar Test Installation – JRC.

Table 15: Instrument M – Outdoor R10 and R10* functions.

Band	R10	R10*
310 - 320 nm	0.6763 ± 0.1546	0.7020 ± 0.1379
320 - 330 nm	0.8084 ± 0.0945	0.8397 ± 0.0815
330 - 340 nm	0.8485 ± 0.0867	0.8820 ± 0.0613
340 - 350 nm	0.9278 ± 0.0861	0.9639 ± 0.0534
350 - 360 nm	0.9478 ± 0.0918	0.9861 ± 0.0465
360 - 370 nm	0.9543 ± 0.0873	0.9932 ± 0.0413
370 - 380 nm	0.9614 ± 0.0839	1.0003 ± 0.0428
380 - 390 nm	0.9256 ± 0.0775	0.9604 ± 0.0569
390 - 400 nm	0.9613 ± 0.0771	0.9983 ± 0.0481
400 - 410 nm	0.9906 ± 0.0868	1.0307 ± 0.0379
410 - 420 nm	0.9652 ± 0.0819	1.0051 ± 0.0355
420 - 430 nm	0.9710 ± 0.0799	1.0114 ± 0.0306
430 - 440 nm	0.9662 ± 0.0773	1.0070 ± 0.0311
440 - 450 nm	0.9918 ± 0.0775	1.0346 ± 0.0342
450 - 460 nm	0.9902 ± 0.0757	1.0331 ± 0.0349
460 - 470 nm	0.9808 ± 0.0833	1.0252 ± 0.0409
470 - 480 nm	0.9712 ± 0.0811	1.0150 ± 0.0391
480 - 490 nm	0.9735 ± 0.0801	1.0175 ± 0.0413
490 - 500 nm	0.9827 ± 0.0798	1.0267 ± 0.0467
500 - 510 nm	0.9667 ± 0.0786	1.0100 ± 0.0338
510 - 520 nm	0.9660 ± 0.0781	1.0090 ± 0.0303
520 - 530 nm	0.9801 ± 0.0795	1.0236 ± 0.0301
530 - 540 nm	0.9743 ± 0.0690	1.0164 ± 0.0238
540 - 550 nm	0.9684 ± 0.0682	1.0108 ± 0.0277
550 - 560 nm	0.9639 ± 0.0678	1.0052 ± 0.0198
560 - 570 nm	0.9645 ± 0.0686	1.0053 ± 0.0216
570 - 580 nm	0.9619 ± 0.0688	1.0020 ± 0.0215
580 - 590 nm	0.9599 ± 0.0673	0.9998 ± 0.0223
590 - 600 nm	0.9562 ± 0.0672	0.9957 ± 0.0208
600 - 610 nm	0.9602 ± 0.0677	0.9991 ± 0.0270
610 - 620 nm	0.9696 ± 0.0666	1.0091 ± 0.0264
620 - 630 nm	0.9627 ± 0.0655	1.0021 ± 0.0271
630 - 640 nm	0.9674 ± 0.0648	1.0074 ± 0.0254
640 - 650 nm	0.9630 ± 0.0638	1.0031 ± 0.0278
650 - 660 nm	0.9552 ± 0.0629	0.9950 ± 0.0299
660 - 670 nm	0.9797 ± 0.0641	1.0205 ± 0.0324
670 - 680 nm	0.9761 ± 0.0635	1.0168 ± 0.0345
680 - 690 nm	0.9665 ± 0.0637	1.0068 ± 0.0305
690 - 700 nm	0.9711 ± 0.0633	1.0118 ± 0.0320
700 - 710 nm	0.9688 ± 0.0625	1.0096 ± 0.0326
710 - 720 nm	0.9568 ± 0.0621	0.9972 ± 0.0308

720 - 730 nm	0.9761 ± 0.0641	1.0175 ± 0.0316
730 - 740 nm	0.9761 ± 0.0632	1.0171 ± 0.0294
740 - 750 nm	0.9734 ± 0.0625	1.0141 ± 0.0280
750 - 760 nm	1.0084 ± 0.0654	1.0504 ± 0.0266
760 - 770 nm	0.9053 ± 0.0824	0.9421 ± 0.0487
770 - 780 nm	0.9893 ± 0.0644	1.0306 ± 0.0226
780 - 790 nm	0.9827 ± 0.0641	1.0237 ± 0.0219
790 - 800 nm	0.9778 ± 0.0643	1.0187 ± 0.0214
800 - 810 nm	0.9830 ± 0.0654	1.0240 ± 0.0207
810 - 820 nm	0.9837 ± 0.0668	1.0244 ± 0.0205
820 - 830 nm	1.0108 ± 0.0692	1.0529 ± 0.0188
830 - 840 nm	0.9925 ± 0.0671	1.0341 ± 0.0178
840 - 850 nm	0.9884 ± 0.0675	1.0297 ± 0.0186
850 - 860 nm	0.9820 ± 0.0678	1.0230 ± 0.0180
860 - 870 nm	0.9846 ± 0.0678	1.0256 ± 0.0178
870 - 880 nm	0.9948 ± 0.0694	1.0362 ± 0.0182
880 - 890 nm	0.9877 ± 0.0703	1.0288 ± 0.0183
890 - 900 nm	0.9816 ± 0.0718	1.0224 ± 0.0207
900 - 910 nm	0.9683 ± 0.0720	1.0085 ± 0.0223
910 - 920 nm	0.9453 ± 0.0703	0.9849 ± 0.0193
920 - 930 nm	0.9837 ± 0.0740	1.0249 ± 0.0176
930 - 940 nm	0.8112 ± 0.0782	0.8465 ± 0.0364
940 - 950 nm	0.9648 ± 0.0769	1.0055 ± 0.0238
950 - 960 nm	0.9107 ± 0.0715	0.9493 ± 0.0144
960 - 970 nm	0.9913 ± 0.0766	1.0331 ± 0.0119
970 - 980 nm	0.9606 ± 0.0739	1.0008 ± 0.0150
980 - 990 nm	0.9685 ± 0.0747	1.0087 ± 0.0199
990 - 1000 nm	0.9615 ± 0.0743	1.0014 ± 0.0220
1000 - 1010 nm	0.9579 ± 0.0741	0.9977 ± 0.0230
1010 - 1020 nm	0.9627 ± 0.0750	1.0022 ± 0.0281
1020 - 1030 nm	0.9642 ± 0.0756	1.0038 ± 0.0293
1030 - 1040 nm	0.9623 ± 0.0761	1.0016 ± 0.0329
1040 - 1050 nm	0.9629 ± 0.0766	1.0019 ± 0.0365
1050 - 1060 nm	0.9656 ± 0.0777	1.0044 ± 0.0357
1060 - 1070 nm	0.9657 ± 0.0783	1.0045 ± 0.0365
1070 - 1080 nm	0.9708 ± 0.0791	1.0098 ± 0.0367
1080 - 1090 nm	0.9685 ± 0.0790	1.0075 ± 0.0360
1090 - 1100 nm	0.9733 ± 0.0797	1.0126 ± 0.0347
1100 - 1110 nm	0.9623 ± 0.0792	1.0013 ± 0.0366
1110 - 1120 nm	0.8574 ± 0.0736	0.8936 ± 0.0314
1120 - 1130 nm	0.7969 ± 0.0833	0.8319 ± 0.0505
1130 - 1140 nm	0.9757 ± 0.0848	1.0166 ± 0.0357
1140 - 1150 nm	0.9360 ± 0.0818	0.9757 ± 0.0422
1150 - 1160 nm	0.9864 ± 0.0869	1.0272 ± 0.0361
1160 - 1170 nm	0.9715 ± 0.0839	1.0106 ± 0.0439

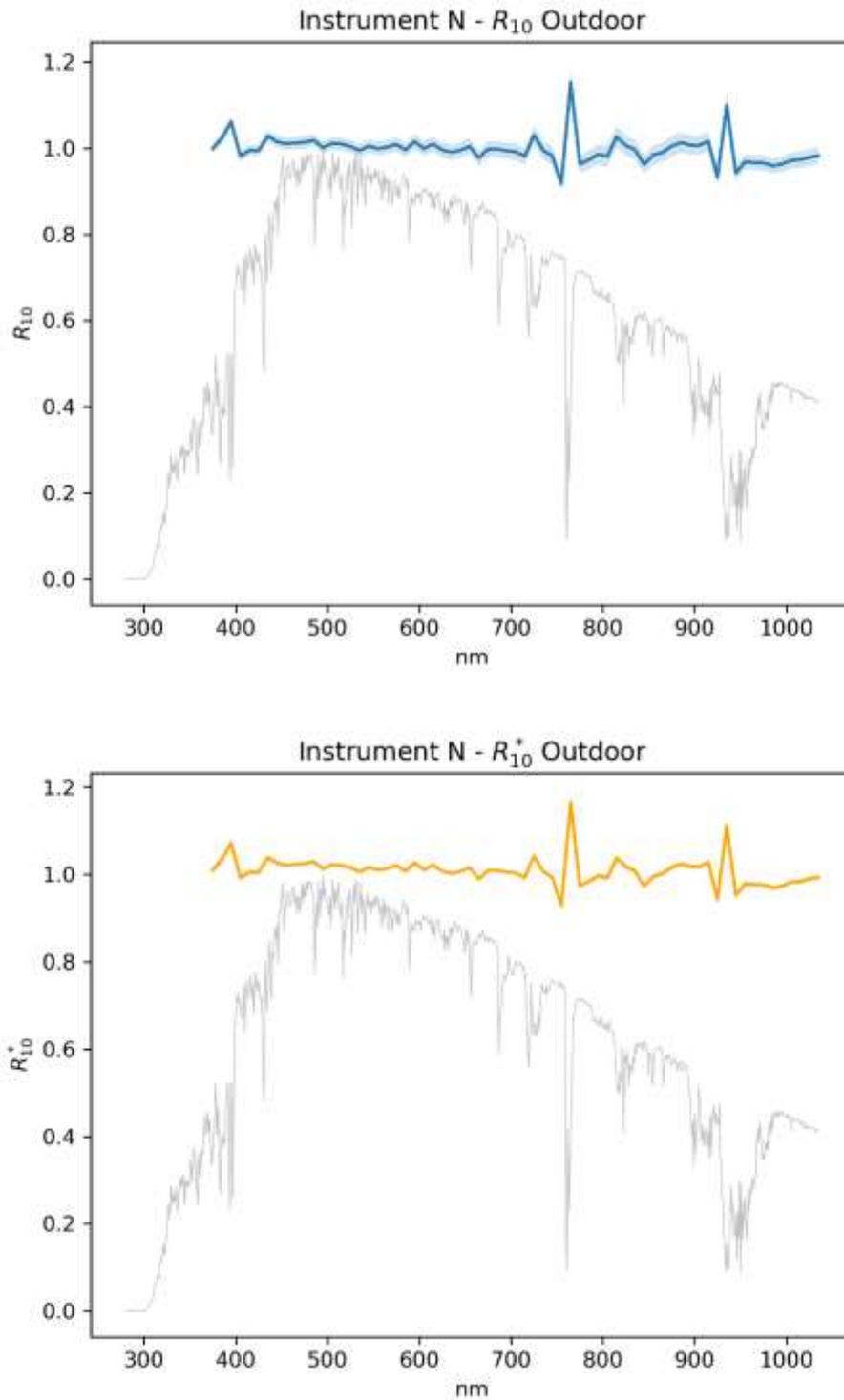
1170 - 1180 nm	0.9961 ± 0.0858	1.0353 ± 0.0547
1180 - 1190 nm	0.9780 ± 0.0842	1.0166 ± 0.0534
1190 - 1200 nm	0.9575 ± 0.0825	0.9952 ± 0.0562
1200 - 1210 nm	0.9600 ± 0.0839	0.9977 ± 0.0586
1210 - 1220 nm	0.9590 ± 0.0839	0.9966 ± 0.0603
1220 - 1230 nm	0.9593 ± 0.0843	0.9967 ± 0.0644
1230 - 1240 nm	0.9581 ± 0.0847	0.9953 ± 0.0681
1240 - 1250 nm	0.9592 ± 0.0852	0.9964 ± 0.0700
1250 - 1260 nm	0.9539 ± 0.0858	0.9908 ± 0.0707
1260 - 1270 nm	0.9657 ± 0.0946	1.0028 ± 0.0786
1270 - 1280 nm	0.9814 ± 0.0910	1.0193 ± 0.0751
1280 - 1290 nm	0.9598 ± 0.0871	0.9971 ± 0.0714
1290 - 1300 nm	0.9806 ± 0.0894	1.0189 ± 0.0700
1300 - 1310 nm	0.9706 ± 0.0891	1.0090 ± 0.0645
1310 - 1320 nm	0.9843 ± 0.0905	1.0236 ± 0.0605
1320 - 1330 nm	0.9819 ± 0.0904	1.0218 ± 0.0558
1330 - 1340 nm	0.9188 ± 0.0871	0.9579 ± 0.0565
1340 - 1350 nm	0.7120 ± 0.0828	0.7434 ± 0.0594
1350 - 1360 nm	0.0418 ± 0.0168	0.0447 ± 0.0201
1370 - 1380 nm	0.0019 ± 0.0016	0.0000 ± 0.0000
1380 - 1390 nm	0.0008 ± 0.0007	0.0022 ± 0.0033
1390 - 1400 nm	0.0027 ± 0.0024	0.0009 ± 0.0015
1400 - 1410 nm	0.0185 ± 0.0115	0.0031 ± 0.0049
1410 - 1420 nm	0.3847 ± 0.1155	0.0203 ± 0.0178
1420 - 1430 nm	0.7805 ± 0.1300	0.4052 ± 0.1232
1430 - 1440 nm	0.8900 ± 0.1283	0.8162 ± 0.1246
1440 - 1450 nm	1.0775 ± 0.1284	0.9277 ± 0.1106
1450 - 1460 nm	1.0055 ± 0.1032	1.1228 ± 0.0973
1460 - 1470 nm	0.9415 ± 0.0981	1.0490 ± 0.0751
1470 - 1480 nm	0.9115 ± 0.0982	0.9821 ± 0.0710
1480 - 1490 nm	0.9731 ± 0.1003	0.9506 ± 0.0699
1490 - 1500 nm	0.9953 ± 0.1004	1.0140 ± 0.0634
1500 - 1510 nm	0.9822 ± 0.0989	1.0359 ± 0.0715
1510 - 1520 nm	0.9970 ± 0.1010	1.0217 ± 0.0773
1520 - 1530 nm	1.0063 ± 0.1025	1.0365 ± 0.0843
1530 - 1540 nm	0.9874 ± 0.1016	1.0457 ± 0.0909
1540 - 1550 nm	0.9817 ± 0.1012	1.0260 ± 0.0931
1550 - 1560 nm	0.9827 ± 0.1019	1.0200 ± 0.0942
1560 - 1570 nm	0.9983 ± 0.1041	1.0210 ± 0.0957
1570 - 1580 nm	0.9946 ± 0.1088	1.0372 ± 0.0981
1580 - 1590 nm	0.9906 ± 0.1051	1.0332 ± 0.1021
1590 - 1600 nm	1.0106 ± 0.1065	1.0293 ± 0.0997
1600 - 1610 nm	0.9878 ± 0.1085	1.0501 ± 0.1015
1610 - 1620 nm	0.9833 ± 0.1056	1.0262 ± 0.1031
1620 - 1630 nm	0.9868 ± 0.1054	1.0217 ± 0.1012

1630 - 1640 nm	0.9936 ± 0.1071	1.0254 ± 0.1018
1640 - 1650 nm	0.9753 ± 0.1070	1.0325 ± 0.1036
1650 - 1660 nm	0.9986 ± 0.1111	1.0134 ± 0.1035
1660 - 1670 nm	1.0102 ± 0.1166	1.0376 ± 0.1076
1670 - 1680 nm	1.0128 ± 0.1225	1.0496 ± 0.1136
1680 - 1690 nm	1.0012 ± 0.1258	1.0523 ± 0.1208
1690 - 1700 nm	1.0046 ± 0.1424	1.0390 ± 0.1316

Source: European Solar Test Installation – JRC

1.20 Instrument "N"

Figure 16: Instrument N - Outdoor R10 and R10* functions.



Source: European Solar Test Installation – JRC.

Table 16: Instrument N – Outdoor R10 and R10* functions.

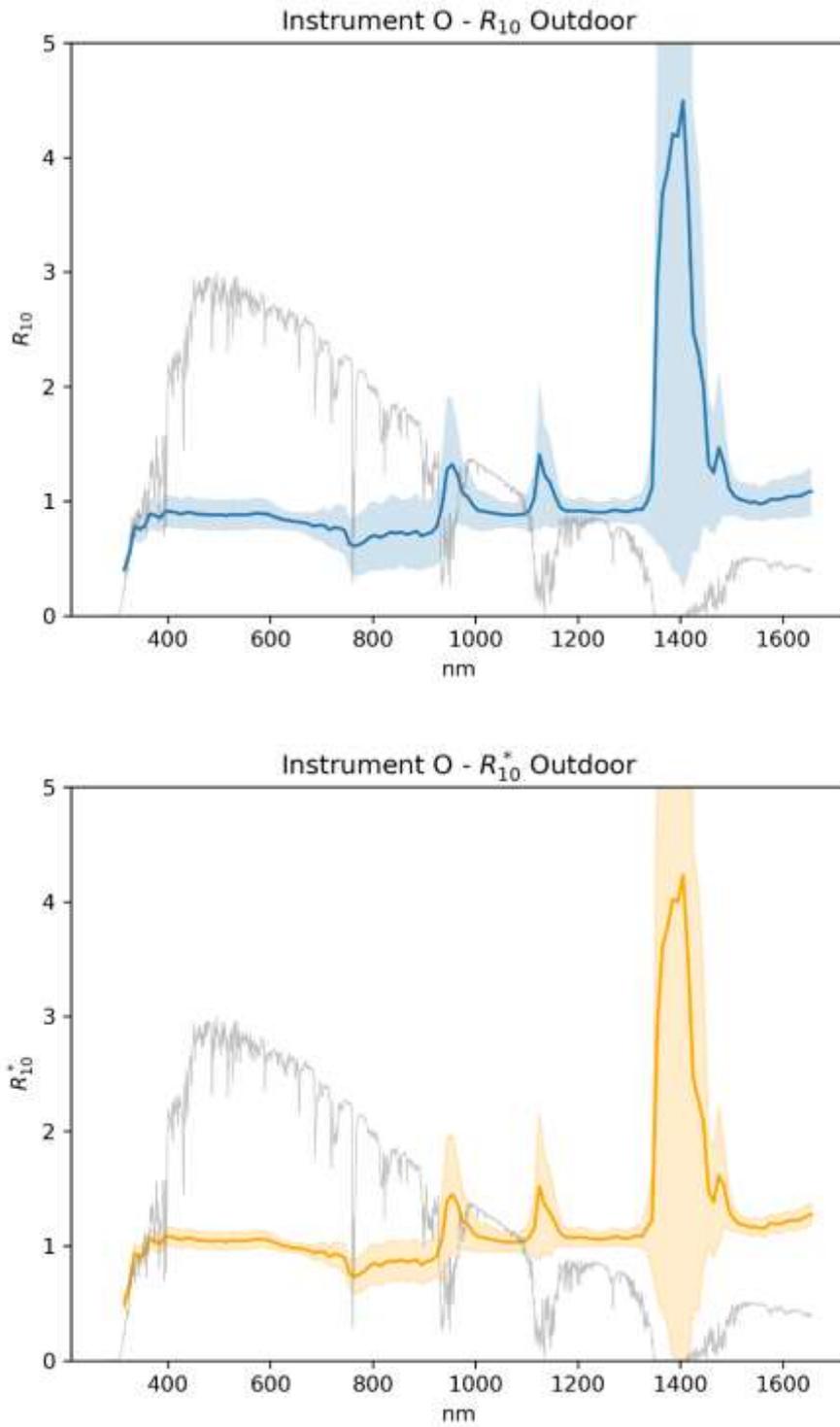
Band	R10	R10*
370 - 380 nm	0.9987 ± 0.0117	1.0099 ± 0.0089
380 - 390 nm	1.0231 ± 0.0125	1.0345 ± 0.0083
390 - 400 nm	1.0611 ± 0.0127	1.0726 ± 0.0083
400 - 410 nm	0.9811 ± 0.0123	0.9920 ± 0.0066
410 - 420 nm	0.9947 ± 0.0125	1.0058 ± 0.0064
420 - 430 nm	0.9938 ± 0.0124	1.0050 ± 0.0062
430 - 440 nm	1.0279 ± 0.0133	1.0395 ± 0.0064
440 - 450 nm	1.0146 ± 0.0139	1.0263 ± 0.0061
450 - 460 nm	1.0098 ± 0.0137	1.0214 ± 0.0056
460 - 470 nm	1.0118 ± 0.0138	1.0235 ± 0.0053
470 - 480 nm	1.0132 ± 0.0141	1.0248 ± 0.0053
480 - 490 nm	1.0179 ± 0.0142	1.0297 ± 0.0049
490 - 500 nm	1.0012 ± 0.0141	1.0130 ± 0.0044
500 - 510 nm	1.0105 ± 0.0146	1.0223 ± 0.0040
510 - 520 nm	1.0098 ± 0.0147	1.0215 ± 0.0040
520 - 530 nm	1.0039 ± 0.0150	1.0158 ± 0.0034
530 - 540 nm	0.9943 ± 0.0149	1.0060 ± 0.0031
540 - 550 nm	1.0047 ± 0.0155	1.0165 ± 0.0030
550 - 560 nm	0.9988 ± 0.0154	1.0105 ± 0.0028
560 - 570 nm	1.0021 ± 0.0155	1.0139 ± 0.0026
570 - 580 nm	1.0087 ± 0.0168	1.0207 ± 0.0020
580 - 590 nm	0.9953 ± 0.0159	1.0072 ± 0.0029
590 - 600 nm	1.0149 ± 0.0177	1.0272 ± 0.0032
600 - 610 nm	0.9989 ± 0.0167	1.0107 ± 0.0021
610 - 620 nm	1.0093 ± 0.0173	1.0213 ± 0.0016
620 - 630 nm	0.9957 ± 0.0176	1.0077 ± 0.0016
630 - 640 nm	0.9902 ± 0.0173	1.0020 ± 0.0014
640 - 650 nm	0.9953 ± 0.0178	1.0073 ± 0.0016
650 - 660 nm	1.0037 ± 0.0180	1.0159 ± 0.0026
660 - 670 nm	0.9772 ± 0.0179	0.9890 ± 0.0015
670 - 680 nm	0.9975 ± 0.0192	1.0095 ± 0.0026
680 - 690 nm	0.9976 ± 0.0189	1.0094 ± 0.0026
690 - 700 nm	0.9936 ± 0.0191	1.0055 ± 0.0030
700 - 710 nm	0.9915 ± 0.0196	1.0034 ± 0.0030
710 - 720 nm	0.9807 ± 0.0198	0.9923 ± 0.0041
720 - 730 nm	1.0302 ± 0.0212	1.0427 ± 0.0060
730 - 740 nm	0.9949 ± 0.0213	1.0071 ± 0.0049
740 - 750 nm	0.9819 ± 0.0213	0.9935 ± 0.0056
750 - 760 nm	0.9173 ± 0.0180	0.9282 ± 0.0054
760 - 770 nm	1.1524 ± 0.0340	1.1655 ± 0.0161
770 - 780 nm	0.9626 ± 0.0206	0.9740 ± 0.0050

780 - 790 nm	0.9731 ± 0.0223	0.9845 ± 0.0057
790 - 800 nm	0.9852 ± 0.0230	0.9973 ± 0.0076
800 - 810 nm	0.9809 ± 0.0248	0.9925 ± 0.0095
810 - 820 nm	1.0261 ± 0.0250	1.0380 ± 0.0092
820 - 830 nm	1.0057 ± 0.0235	1.0180 ± 0.0080
830 - 840 nm	0.9963 ± 0.0232	1.0079 ± 0.0060
840 - 850 nm	0.9621 ± 0.0211	0.9736 ± 0.0048
850 - 860 nm	0.9839 ± 0.0225	0.9956 ± 0.0057
860 - 870 nm	0.9897 ± 0.0226	1.0016 ± 0.0066
870 - 880 nm	1.0043 ± 0.0235	1.0164 ± 0.0075
880 - 890 nm	1.0126 ± 0.0234	1.0247 ± 0.0073
890 - 900 nm	1.0068 ± 0.0221	1.0185 ± 0.0077
900 - 910 nm	1.0057 ± 0.0219	1.0173 ± 0.0062
910 - 920 nm	1.0161 ± 0.0217	1.0282 ± 0.0069
920 - 930 nm	0.9322 ± 0.0201	0.9428 ± 0.0075
930 - 940 nm	1.0998 ± 0.0286	1.1123 ± 0.0171
940 - 950 nm	0.9420 ± 0.0179	0.9525 ± 0.0078
950 - 960 nm	0.9679 ± 0.0184	0.9789 ± 0.0092
960 - 970 nm	0.9661 ± 0.0167	0.9770 ± 0.0063
970 - 980 nm	0.9654 ± 0.0187	0.9765 ± 0.0055
980 - 990 nm	0.9586 ± 0.0169	0.9694 ± 0.0057
990 - 1000 nm	0.9621 ± 0.0182	0.9732 ± 0.0053
1000 - 1010 nm	0.9712 ± 0.0186	0.9827 ± 0.0059
1010 - 1020 nm	0.9728 ± 0.0193	0.9839 ± 0.0068
1020 - 1030 nm	0.9782 ± 0.0200	0.9900 ± 0.0075
1030 - 1040 nm	0.9824 ± 0.0198	0.9936 ± 0.0096

Source: European Solar Test Installation – JRC

1.21 Instrument "O"

Figure 17: Instrument O - Outdoor R10 and R10* functions.



Source: European Solar Test Installation – JRC.

Table 17: Instrument O – Outdoor R10 and R10* functions.

Band	R10	R10*
310 - 320 nm	0.4023 ± 0.0900	0.4916 ± 0.1462
320 - 330 nm	0.5407 ± 0.0991	0.6494 ± 0.1350
330 - 340 nm	0.7816 ± 0.1295	0.9353 ± 0.1697
340 - 350 nm	0.7542 ± 0.1237	0.9014 ± 0.1564
350 - 360 nm	0.7802 ± 0.1262	0.9322 ± 0.1587
360 - 370 nm	0.8907 ± 0.1380	1.0614 ± 0.1714
370 - 380 nm	0.8745 ± 0.1303	1.0431 ± 0.1639
380 - 390 nm	0.8511 ± 0.1286	1.0140 ± 0.1580
390 - 400 nm	0.9120 ± 0.1456	1.0813 ± 0.1671
400 - 410 nm	0.9076 ± 0.1391	1.0781 ± 0.1629
410 - 420 nm	0.9020 ± 0.1375	1.0716 ± 0.1601
420 - 430 nm	0.8856 ± 0.1321	1.0520 ± 0.1530
430 - 440 nm	0.8998 ± 0.1391	1.0679 ± 0.1586
440 - 450 nm	0.9022 ± 0.1402	1.0695 ± 0.1575
450 - 460 nm	0.8871 ± 0.1370	1.0514 ± 0.1535
460 - 470 nm	0.8858 ± 0.1369	1.0489 ± 0.1518
470 - 480 nm	0.8818 ± 0.1370	1.0431 ± 0.1501
480 - 490 nm	0.8811 ± 0.1353	1.0432 ± 0.1486
490 - 500 nm	0.8791 ± 0.1345	1.0419 ± 0.1480
500 - 510 nm	0.8821 ± 0.1364	1.0456 ± 0.1494
510 - 520 nm	0.8720 ± 0.1357	1.0338 ± 0.1482
520 - 530 nm	0.8846 ± 0.1367	1.0485 ± 0.1494
530 - 540 nm	0.8801 ± 0.1348	1.0431 ± 0.1475
540 - 550 nm	0.8817 ± 0.1352	1.0449 ± 0.1473
550 - 560 nm	0.8815 ± 0.1348	1.0446 ± 0.1463
560 - 570 nm	0.8889 ± 0.1354	1.0533 ± 0.1471
570 - 580 nm	0.8944 ± 0.1365	1.0598 ± 0.1478
580 - 590 nm	0.8888 ± 0.1332	1.0542 ± 0.1455
590 - 600 nm	0.8879 ± 0.1332	1.0532 ± 0.1440
600 - 610 nm	0.8683 ± 0.1147	1.0337 ± 0.1259
610 - 620 nm	0.8536 ± 0.1005	1.0180 ± 0.1088
620 - 630 nm	0.8366 ± 0.0891	0.9986 ± 0.0919
630 - 640 nm	0.8328 ± 0.0850	0.9951 ± 0.0845
640 - 650 nm	0.8216 ± 0.0832	0.9818 ± 0.0772
650 - 660 nm	0.8197 ± 0.0836	0.9814 ± 0.0816
660 - 670 nm	0.8129 ± 0.0919	0.9739 ± 0.0907
670 - 680 nm	0.8009 ± 0.1034	0.9598 ± 0.1051
680 - 690 nm	0.7810 ± 0.1177	0.9385 ± 0.1227
690 - 700 nm	0.7903 ± 0.1370	0.9502 ± 0.1451
700 - 710 nm	0.7869 ± 0.1538	0.9476 ± 0.1672
710 - 720 nm	0.7502 ± 0.1594	0.9036 ± 0.1755

720 - 730 nm	0.7708 ± 0.1903	0.9277 ± 0.2066
730 - 740 nm	0.7636 ± 0.2068	0.9198 ± 0.2279
740 - 750 nm	0.7440 ± 0.2187	0.8967 ± 0.2431
750 - 760 nm	0.6235 ± 0.2332	0.7539 ± 0.2666
760 - 770 nm	0.6078 ± 0.2604	0.7341 ± 0.2962
770 - 780 nm	0.6225 ± 0.2743	0.7523 ± 0.3127
780 - 790 nm	0.6499 ± 0.2812	0.7873 ± 0.3243
790 - 800 nm	0.6883 ± 0.3017	0.8314 ± 0.3429
800 - 810 nm	0.7004 ± 0.3021	0.8483 ± 0.3483
810 - 820 nm	0.6810 ± 0.2918	0.8253 ± 0.3382
820 - 830 nm	0.7056 ± 0.3002	0.8548 ± 0.3480
830 - 840 nm	0.7292 ± 0.3267	0.8700 ± 0.3514
840 - 850 nm	0.7198 ± 0.3223	0.8627 ± 0.3532
850 - 860 nm	0.7294 ± 0.2859	0.8795 ± 0.3220
860 - 870 nm	0.7101 ± 0.3048	0.8585 ± 0.3502
870 - 880 nm	0.7195 ± 0.3087	0.8687 ± 0.3516
880 - 890 nm	0.7382 ± 0.3365	0.8785 ± 0.3590
890 - 900 nm	0.6949 ± 0.2986	0.8349 ± 0.3326
900 - 910 nm	0.7133 ± 0.2971	0.8639 ± 0.3467
910 - 920 nm	0.7276 ± 0.3045	0.8757 ± 0.3429
920 - 930 nm	0.7820 ± 0.3377	0.9130 ± 0.3343
930 - 940 nm	0.9558 ± 0.4713	1.0614 ± 0.7530
940 - 950 nm	1.2787 ± 0.6461	1.3948 ± 1.1209
950 - 960 nm	1.3200 ± 0.5690	1.4461 ± 1.0380
960 - 970 nm	1.2280 ± 0.4201	1.3672 ± 0.7720
970 - 980 nm	1.0749 ± 0.2911	1.2189 ± 0.5149
980 - 990 nm	1.0365 ± 0.2547	1.1869 ± 0.4338
990 - 1000 nm	0.9678 ± 0.2212	1.1193 ± 0.3501
1000 - 1010 nm	0.9180 ± 0.1721	1.0812 ± 0.2354
1010 - 1020 nm	0.9129 ± 0.1814	1.0731 ± 0.2533
1020 - 1030 nm	0.9026 ± 0.1611	1.0611 ± 0.2296
1030 - 1040 nm	0.8962 ± 0.1507	1.0534 ± 0.2169
1040 - 1050 nm	0.8879 ± 0.1253	1.0439 ± 0.1809
1050 - 1060 nm	0.8810 ± 0.1166	1.0343 ± 0.1741
1060 - 1070 nm	0.8805 ± 0.1118	1.0337 ± 0.1680
1070 - 1080 nm	0.8782 ± 0.1070	1.0319 ± 0.1648
1080 - 1090 nm	0.8829 ± 0.1226	1.0376 ± 0.1790
1090 - 1100 nm	0.8866 ± 0.1322	1.0421 ± 0.1941
1100 - 1110 nm	0.9151 ± 0.1910	1.0748 ± 0.2697
1110 - 1120 nm	1.0273 ± 0.2759	1.1599 ± 0.5215
1120 - 1130 nm	1.4054 ± 0.6526	1.5161 ± 1.2867
1130 - 1140 nm	1.2279 ± 0.4419	1.3608 ± 0.8335
1140 - 1150 nm	1.1647 ± 0.3972	1.2922 ± 0.7699
1150 - 1160 nm	1.0496 ± 0.2888	1.2078 ± 0.4581
1160 - 1170 nm	0.9487 ± 0.1607	1.1152 ± 0.2285

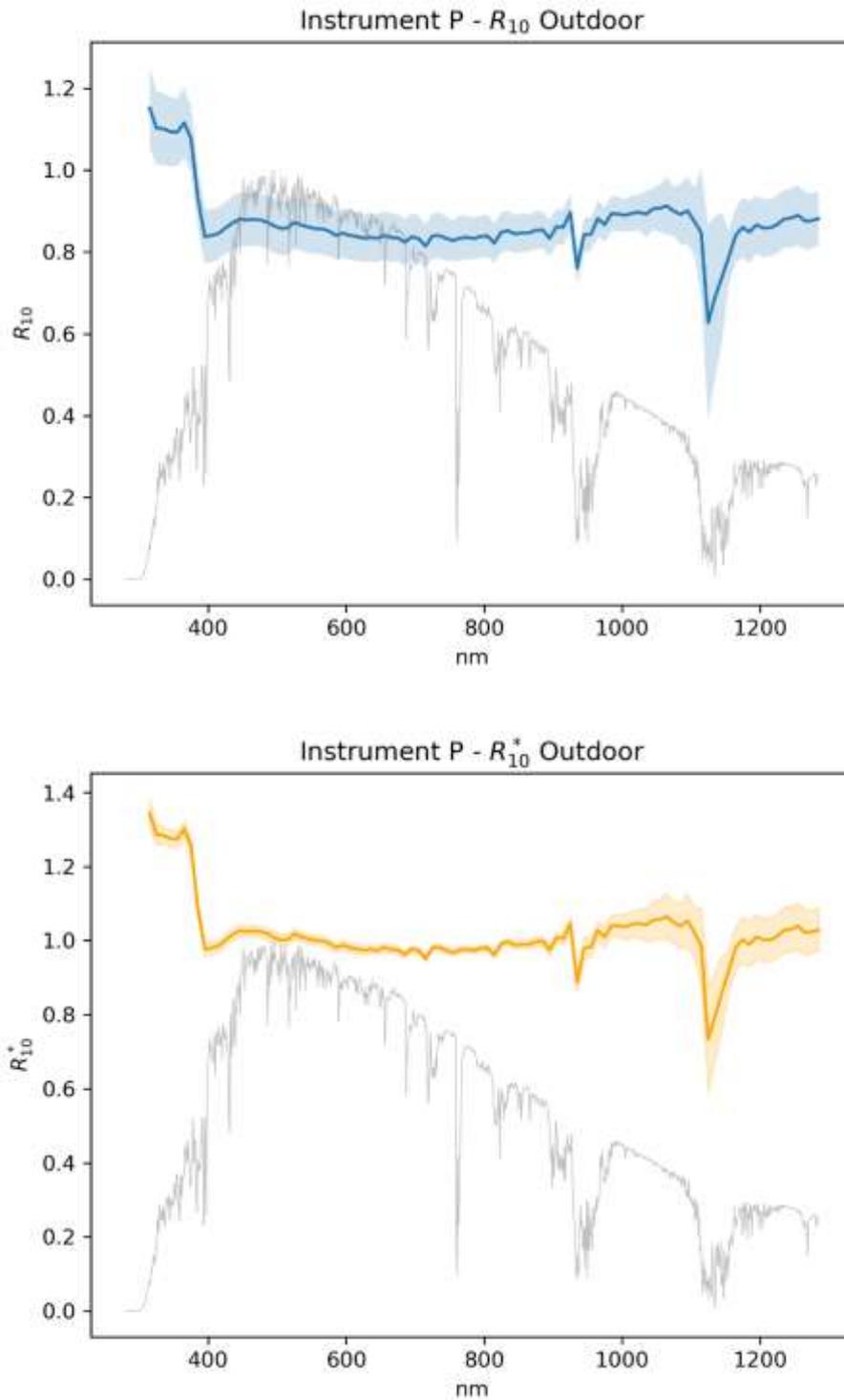
1170 - 1180 nm	0.9173 ± 0.1144	1.0768 ± 0.1665
1180 - 1190 nm	0.9149 ± 0.1085	1.0748 ± 0.1571
1190 - 1200 nm	0.9124 ± 0.1007	1.0718 ± 0.1435
1200 - 1210 nm	0.9166 ± 0.1271	1.0770 ± 0.1809
1210 - 1220 nm	0.9115 ± 0.1135	1.0709 ± 0.1596
1220 - 1230 nm	0.9064 ± 0.0982	1.0646 ± 0.1356
1230 - 1240 nm	0.9024 ± 0.0926	1.0597 ± 0.1147
1240 - 1250 nm	0.9014 ± 0.0960	1.0575 ± 0.1263
1250 - 1260 nm	0.9034 ± 0.0960	1.0609 ± 0.1231
1260 - 1270 nm	0.9166 ± 0.1115	1.0743 ± 0.1592
1270 - 1280 nm	0.9224 ± 0.1032	1.0821 ± 0.1420
1280 - 1290 nm	0.9118 ± 0.1012	1.0695 ± 0.1367
1290 - 1300 nm	0.9062 ± 0.1033	1.0629 ± 0.1366
1300 - 1310 nm	0.9156 ± 0.1205	1.0730 ± 0.1705
1310 - 1320 nm	0.9298 ± 0.1252	1.0897 ± 0.1791
1320 - 1330 nm	0.9235 ± 0.1495	1.0823 ± 0.2181
1330 - 1340 nm	0.9937 ± 0.2708	1.1571 ± 0.3954
1340 - 1350 nm	1.1235 ± 0.4431	1.2268 ± 0.8964
1350 - 1360 nm	2.9250 ± 2.3059	2.9031 ± 4.7225
1360 - 1370 nm	3.6884 ± 3.1031	3.6070 ± 6.3859
1370 - 1380 nm	3.8858 ± 3.3793	3.7779 ± 6.9198
1380 - 1390 nm	4.2024 ± 3.8142	4.0184 ± 7.9793
1390 - 1400 nm	4.1822 ± 3.8166	3.9992 ± 7.9533
1400 - 1410 nm	4.4928 ± 4.2617	4.2326 ± 9.0142
1410 - 1420 nm	3.6641 ± 3.3137	3.4897 ± 7.0454
1420 - 1430 nm	2.4750 ± 1.9206	2.4514 ± 4.0117
1430 - 1440 nm	2.2928 ± 1.7347	2.2721 ± 3.6999
1440 - 1450 nm	2.0074 ± 1.2156	2.0820 ± 2.5128
1450 - 1460 nm	1.3198 ± 0.5755	1.4762 ± 0.9662
1460 - 1470 nm	1.2483 ± 0.5340	1.3805 ± 0.9602
1470 - 1480 nm	1.4664 ± 0.6705	1.6136 ± 1.2093
1480 - 1490 nm	1.3272 ± 0.4510	1.5224 ± 0.6970
1490 - 1500 nm	1.1109 ± 0.2458	1.3042 ± 0.3416
1500 - 1510 nm	1.0475 ± 0.1637	1.2295 ± 0.2017
1510 - 1520 nm	1.0145 ± 0.1599	1.1904 ± 0.1630
1520 - 1530 nm	1.0056 ± 0.1636	1.1816 ± 0.1425
1530 - 1540 nm	0.9879 ± 0.1599	1.1629 ± 0.1392
1540 - 1550 nm	0.9943 ± 0.1622	1.1664 ± 0.1567
1550 - 1560 nm	0.9747 ± 0.1454	1.1556 ± 0.1398
1560 - 1570 nm	0.9859 ± 0.1635	1.1566 ± 0.1606
1570 - 1580 nm	1.0137 ± 0.1661	1.1955 ± 0.1448
1580 - 1590 nm	1.0159 ± 0.1740	1.1926 ± 0.1566
1590 - 1600 nm	1.0147 ± 0.1718	1.1902 ± 0.1716
1600 - 1610 nm	1.0319 ± 0.1813	1.2113 ± 0.1645
1610 - 1620 nm	1.0433 ± 0.1878	1.2244 ± 0.1632

1620 - 1630 nm	1.0408 ± 0.1896	1.2216 ± 0.1729
1630 - 1640 nm	1.0472 ± 0.1942	1.2291 ± 0.1761
1640 - 1650 nm	1.0697 ± 0.2014	1.2542 ± 0.1941
1650 - 1660 nm	1.0860 ± 0.2164	1.2768 ± 0.1965

Source: European Solar Test Installation – JRC

1.22 Instrument "P"

Figure 18: Instrument P - Outdoor R_{10} and R_{10}^* functions.



Source: European Solar Test Installation – JRC.

Table 18: Instrument P – Outdoor R10 and R10* functions.

Band	R10	R10*
310 - 320 nm	1.1519 ± 0.0985	1.3442 ± 0.0782
320 - 330 nm	1.1026 ± 0.0906	1.2870 ± 0.0589
330 - 340 nm	1.1011 ± 0.0877	1.2838 ± 0.0430
340 - 350 nm	1.0937 ± 0.0845	1.2757 ± 0.0469
350 - 360 nm	1.0925 ± 0.0826	1.2743 ± 0.0445
360 - 370 nm	1.1159 ± 0.0861	1.3016 ± 0.0457
370 - 380 nm	1.0771 ± 0.0803	1.2564 ± 0.0402
380 - 390 nm	0.9314 ± 0.0715	1.0864 ± 0.0369
390 - 400 nm	0.8374 ± 0.0674	0.9772 ± 0.0383
400 - 410 nm	0.8403 ± 0.0642	0.9802 ± 0.0319
410 - 420 nm	0.8451 ± 0.0638	0.9859 ± 0.0312
420 - 430 nm	0.8584 ± 0.0624	1.0015 ± 0.0279
430 - 440 nm	0.8706 ± 0.0666	1.0161 ± 0.0333
440 - 450 nm	0.8801 ± 0.0660	1.0271 ± 0.0317
450 - 460 nm	0.8785 ± 0.0649	1.0254 ± 0.0299
460 - 470 nm	0.8792 ± 0.0646	1.0262 ± 0.0296
470 - 480 nm	0.8780 ± 0.0646	1.0248 ± 0.0300
480 - 490 nm	0.8731 ± 0.0630	1.0195 ± 0.0291
490 - 500 nm	0.8639 ± 0.0660	1.0088 ± 0.0340
500 - 510 nm	0.8574 ± 0.0657	1.0011 ± 0.0333
510 - 520 nm	0.8585 ± 0.0642	1.0025 ± 0.0302
520 - 530 nm	0.8727 ± 0.0638	1.0187 ± 0.0279
530 - 540 nm	0.8654 ± 0.0629	1.0102 ± 0.0269
540 - 550 nm	0.8609 ± 0.0632	1.0049 ± 0.0280
550 - 560 nm	0.8569 ± 0.0613	1.0006 ± 0.0259
560 - 570 nm	0.8562 ± 0.0614	0.9994 ± 0.0257
570 - 580 nm	0.8513 ± 0.0612	0.9938 ± 0.0256
580 - 590 nm	0.8400 ± 0.0588	0.9810 ± 0.0235
590 - 600 nm	0.8457 ± 0.0602	0.9879 ± 0.0258
600 - 610 nm	0.8406 ± 0.0599	0.9814 ± 0.0246
610 - 620 nm	0.8376 ± 0.0599	0.9781 ± 0.0249
620 - 630 nm	0.8337 ± 0.0582	0.9740 ± 0.0232
630 - 640 nm	0.8356 ± 0.0594	0.9765 ± 0.0240
640 - 650 nm	0.8333 ± 0.0585	0.9735 ± 0.0229
650 - 660 nm	0.8402 ± 0.0589	0.9819 ± 0.0228
660 - 670 nm	0.8350 ± 0.0589	0.9758 ± 0.0229
670 - 680 nm	0.8342 ± 0.0581	0.9749 ± 0.0217
680 - 690 nm	0.8236 ± 0.0560	0.9625 ± 0.0196
690 - 700 nm	0.8368 ± 0.0576	0.9780 ± 0.0210
700 - 710 nm	0.8331 ± 0.0560	0.9740 ± 0.0199
710 - 720 nm	0.8139 ± 0.0525	0.9512 ± 0.0160

720 - 730 nm	0.8390 ± 0.0560	0.9809 ± 0.0200
730 - 740 nm	0.8400 ± 0.0557	0.9821 ± 0.0193
740 - 750 nm	0.8331 ± 0.0539	0.9740 ± 0.0174
750 - 760 nm	0.8275 ± 0.0494	0.9674 ± 0.0150
760 - 770 nm	0.8338 ± 0.0561	0.9748 ± 0.0216
770 - 780 nm	0.8355 ± 0.0528	0.9765 ± 0.0162
780 - 790 nm	0.8327 ± 0.0509	0.9736 ± 0.0160
790 - 800 nm	0.8377 ± 0.0508	0.9794 ± 0.0168
800 - 810 nm	0.8390 ± 0.0513	0.9806 ± 0.0175
810 - 820 nm	0.8214 ± 0.0476	0.9610 ± 0.0198
820 - 830 nm	0.8483 ± 0.0496	0.9922 ± 0.0193
830 - 840 nm	0.8515 ± 0.0484	0.9965 ± 0.0192
840 - 850 nm	0.8438 ± 0.0469	0.9875 ± 0.0206
850 - 860 nm	0.8462 ± 0.0471	0.9900 ± 0.0213
860 - 870 nm	0.8462 ± 0.0458	0.9897 ± 0.0225
870 - 880 nm	0.8528 ± 0.0460	0.9969 ± 0.0237
880 - 890 nm	0.8541 ± 0.0452	0.9992 ± 0.0242
890 - 900 nm	0.8328 ± 0.0445	0.9744 ± 0.0303
900 - 910 nm	0.8616 ± 0.0450	1.0082 ± 0.0272
910 - 920 nm	0.8605 ± 0.0433	1.0061 ± 0.0312
920 - 930 nm	0.8963 ± 0.0461	1.0459 ± 0.0403
930 - 940 nm	0.7601 ± 0.0386	0.8872 ± 0.0510
940 - 950 nm	0.8414 ± 0.0420	0.9800 ± 0.0651
950 - 960 nm	0.8433 ± 0.0405	0.9830 ± 0.0528
960 - 970 nm	0.8815 ± 0.0440	1.0283 ± 0.0493
970 - 980 nm	0.8666 ± 0.0425	1.0096 ± 0.0543
980 - 990 nm	0.8940 ± 0.0425	1.0412 ± 0.0602
990 - 1000 nm	0.8922 ± 0.0422	1.0401 ± 0.0622
1000 - 1010 nm	0.8895 ± 0.0388	1.0375 ± 0.0691
1010 - 1020 nm	0.8948 ± 0.0451	1.0450 ± 0.0725
1020 - 1030 nm	0.8966 ± 0.0429	1.0470 ± 0.0797
1030 - 1040 nm	0.8922 ± 0.0563	1.0425 ± 0.0896
1040 - 1050 nm	0.9051 ± 0.0516	1.0552 ± 0.1038
1050 - 1060 nm	0.9072 ± 0.0582	1.0576 ± 0.1095
1060 - 1070 nm	0.9123 ± 0.0704	1.0652 ± 0.1251
1070 - 1080 nm	0.8996 ± 0.0603	1.0489 ± 0.1113
1080 - 1090 nm	0.8919 ± 0.0740	1.0397 ± 0.1253
1090 - 1100 nm	0.9009 ± 0.0839	1.0539 ± 0.1442
1100 - 1110 nm	0.8749 ± 0.0821	1.0218 ± 0.1371
1110 - 1120 nm	0.8466 ± 0.1569	0.9844 ± 0.2080
1120 - 1130 nm	0.6272 ± 0.2389	0.7332 ± 0.2810
1130 - 1140 nm	0.6897 ± 0.1979	0.7962 ± 0.2386
1140 - 1150 nm	0.7378 ± 0.1586	0.8601 ± 0.1991
1150 - 1160 nm	0.7878 ± 0.0666	0.9199 ± 0.1081
1160 - 1170 nm	0.8406 ± 0.0654	0.9816 ± 0.1120

1170 - 1180 nm	0.8600 ± 0.0734	1.0024 ± 0.1243
1180 - 1190 nm	0.8485 ± 0.0761	0.9904 ± 0.1249
1190 - 1200 nm	0.8662 ± 0.0705	1.0103 ± 0.1204
1200 - 1210 nm	0.8583 ± 0.0713	1.0028 ± 0.1187
1210 - 1220 nm	0.8588 ± 0.0695	1.0016 ± 0.1164
1220 - 1230 nm	0.8667 ± 0.0703	1.0114 ± 0.1201
1230 - 1240 nm	0.8805 ± 0.0705	1.0284 ± 0.1231
1240 - 1250 nm	0.8824 ± 0.0727	1.0303 ± 0.1266
1250 - 1260 nm	0.8898 ± 0.0727	1.0398 ± 0.1259
1260 - 1270 nm	0.8759 ± 0.0716	1.0226 ± 0.1222
1270 - 1280 nm	0.8762 ± 0.0672	1.0234 ± 0.1171
1280 - 1290 nm	0.8815 ± 0.0652	1.0288 ± 0.1169

Source: European Solar Test Installation – JRC

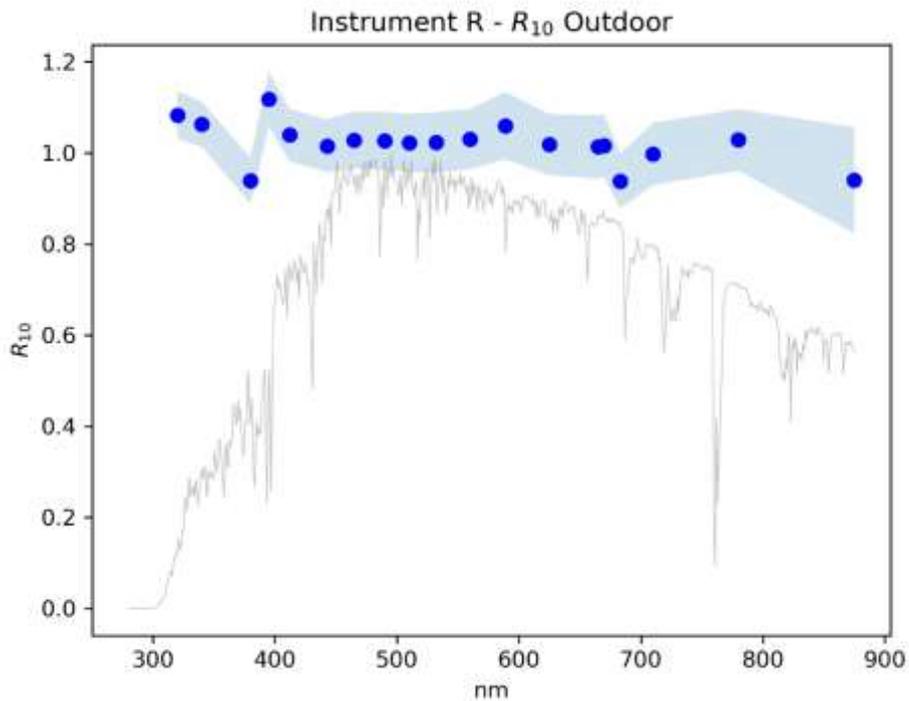
1.23 Instrument “R”

Instrument “R” is a particular multi-spectral spectroradiometer measuring only a limited number of wavelengths. It is equipped with crystalline silicon detectors and a wheel of bandpass filters. Its output is therefore applicable only to a reduced wavelengths set. Due to the fact that a numerical integration is not possible in this case, the relative function R^*_{10} is not presented.

Hereafter the absolute $R_{10}(\lambda)$ is a simplified version of the more general definition (Eq. 1), taking into account the point-by-point values of the multi-spectra spectrum and the hyper-spectral reference:

$$R_{10}(\lambda) = \frac{E_i(\lambda)}{E_{REF}(\lambda)}$$

Figure 19: Instrument R - Outdoor R10 function.



Source: European Solar Test Installation – JRC.

Table 19: Instrument R – Outdoor R10 function.

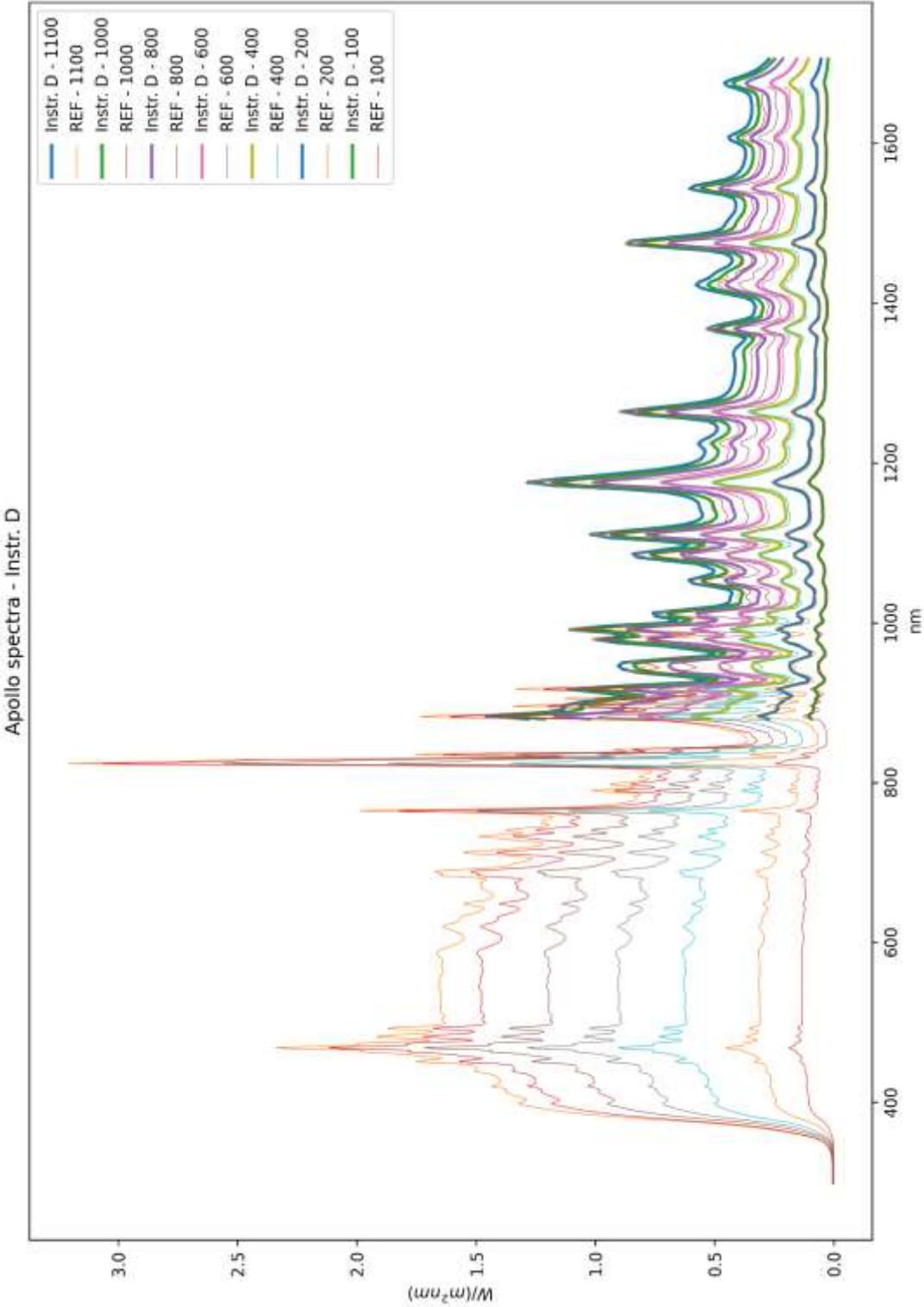
Filter	R10
320 nm	1.0831 ± 0.0516
340 nm	1.0627 ± 0.0494
380 nm	0.9387 ± 0.0508
395 nm	1.1174 ± 0.0607
412 nm	1.0388 ± 0.0579
443 nm	1.0152 ± 0.0579
465 nm	1.0281 ± 0.0622
490 nm	1.0261 ± 0.0638
510 nm	1.0218 ± 0.0638
532 nm	1.0230 ± 0.0664
560 nm	1.0304 ± 0.0662
589 nm	1.0596 ± 0.0743
625 nm	1.0179 ± 0.0671
665 nm	1.0131 ± 0.0699
670 nm	1.0161 ± 0.0686
683 nm	0.9376 ± 0.0604
710 nm	0.9976 ± 0.0685
780 nm	1.0282 ± 0.0674
875 nm	0.9397 ± 0.1163

Source: European Solar Test Installation – JRC

Annex II – Indoor Intercomparison Results

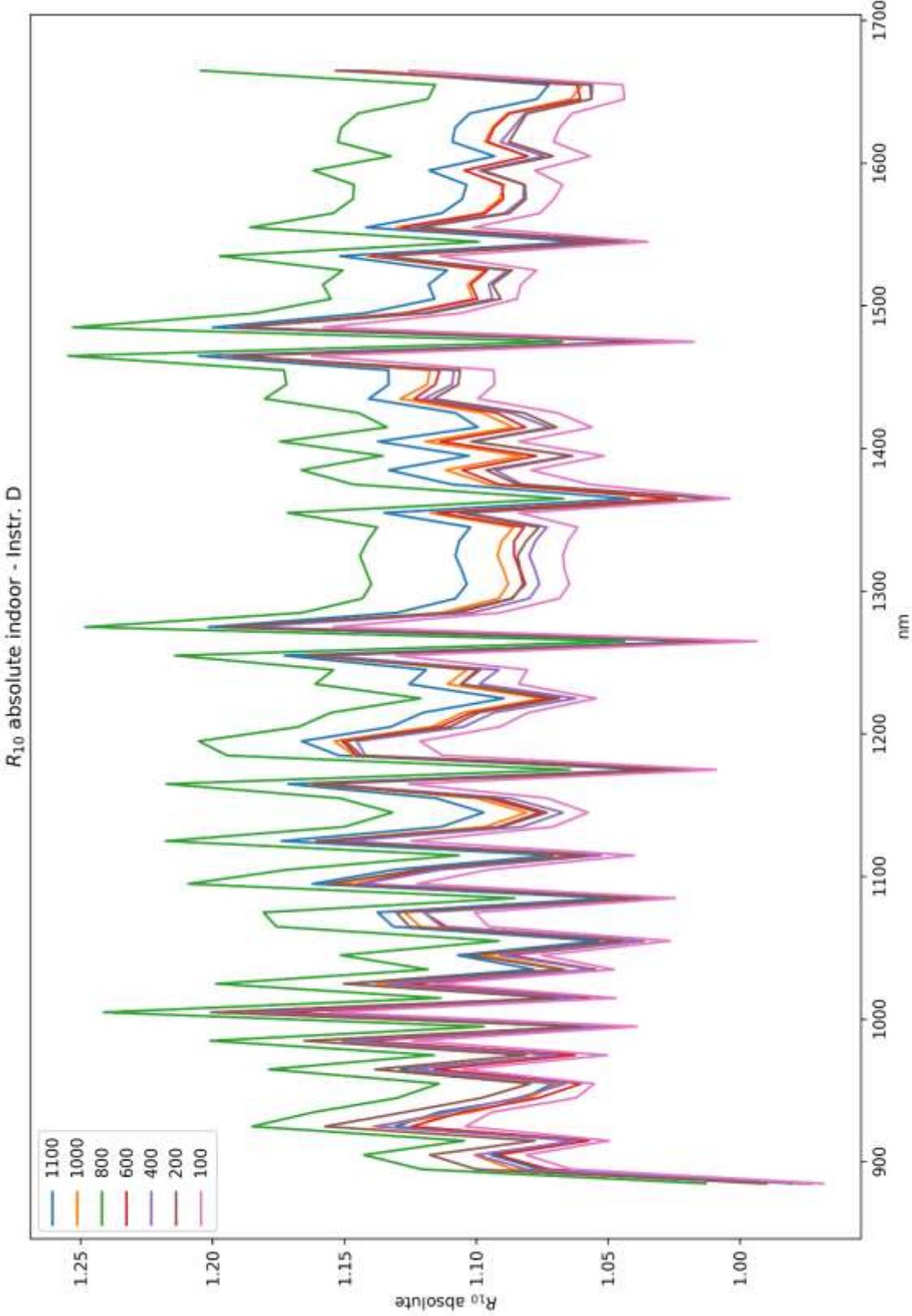
1.24 Instrument “D”

Figure 20: Instrument D - Indoor Apollo spectra at different irradiance levels.



Source: European Solar Test Installation – JRC.

Figure 21: Instrument D - Indoor R10 and R10* functions at different irradiance levels.



Source: European Solar Test Installation – JRC

Table 20: Instrument D – Indoor R10 and R10* functions at different irradiance levels.

R10 absolute at different irradiances in Apollo							
Band	1100	1000	800	600	400	200	100
880 - 890 nm	0.9801	0.9927	1.0129	0.9729	0.9762	0.9899	0.9684
890 - 900 nm	1.0755	1.0863	1.1207	1.0725	1.0807	1.1000	1.0640
900 - 910 nm	1.0943	1.1007	1.1425	1.0920	1.0999	1.1175	1.0810
910 - 920 nm	1.0634	1.0603	1.1045	1.0573	1.0616	1.0778	1.0496
920 - 930 nm	1.1305	1.1390	1.1849	1.1245	1.1377	1.1572	1.1040
930 - 940 nm	1.1141	1.1016	1.1615	1.1052	1.1100	1.1270	1.0940
940 - 950 nm	1.0818	1.0797	1.1297	1.0762	1.0841	1.0979	1.0621
950 - 960 nm	1.0710	1.0694	1.1141	1.0601	1.0660	1.0794	1.0552
960 - 970 nm	1.1285	1.1251	1.1785	1.1158	1.1240	1.1382	1.1048
970 - 980 nm	1.0681	1.0706	1.1159	1.0625	1.0693	1.0812	1.0504
980 - 990 nm	1.1467	1.1501	1.2008	1.1431	1.1506	1.1651	1.1241
990 - 1000 nm	1.0537	1.0422	1.0969	1.0490	1.0504	1.0609	1.0390
1000 - 1010 nm	1.1843	1.1842	1.2412	1.1745	1.1860	1.2005	1.1558
1010 - 1020 nm	1.0698	1.0601	1.1135	1.0568	1.0607	1.0698	1.0470
1020 - 1030 nm	1.1498	1.1376	1.1985	1.1266	1.1338	1.1501	1.1153
1030 - 1040 nm	1.0781	1.0660	1.1183	1.0545	1.0558	1.0672	1.0477
1040 - 1050 nm	1.1070	1.0973	1.1513	1.0876	1.0909	1.1026	1.0751
1050 - 1060 nm	1.0535	1.0437	1.0913	1.0365	1.0364	1.0448	1.0264
1060 - 1070 nm	1.1313	1.1210	1.1757	1.1112	1.1131	1.1252	1.0952
1070 - 1080 nm	1.1373	1.1271	1.1805	1.1200	1.1199	1.1302	1.1005
1080 - 1090 nm	1.0492	1.0396	1.0853	1.0360	1.0309	1.0378	1.0245
1090 - 1100 nm	1.1620	1.1521	1.2091	1.1448	1.1437	1.1563	1.1223
1100 - 1110 nm	1.1307	1.1217	1.1712	1.1186	1.1133	1.1215	1.0951
1110 - 1120 nm	1.0709	1.0609	1.1064	1.0587	1.0527	1.0583	1.0400
1120 - 1130 nm	1.1738	1.1605	1.2176	1.1545	1.1498	1.1606	1.1247
1130 - 1140 nm	1.1133	1.0966	1.1499	1.0914	1.0826	1.0902	1.0708
1140 - 1150 nm	1.0971	1.0809	1.1317	1.0757	1.0670	1.0731	1.0575
1150 - 1160 nm	1.1150	1.0998	1.1516	1.0957	1.0869	1.0922	1.0728
1160 - 1170 nm	1.1713	1.1633	1.2173	1.1597	1.1577	1.1617	1.1255
1170 - 1180 nm	1.0334	1.0260	1.0644	1.0267	1.0191	1.0179	1.0090
1180 - 1190 nm	1.1520	1.1461	1.1944	1.1451	1.1420	1.1434	1.1127
1190 - 1200 nm	1.1661	1.1537	1.2050	1.1508	1.1452	1.1495	1.1212
1200 - 1210 nm	1.1324	1.1169	1.1673	1.1139	1.1048	1.1100	1.0911
1210 - 1220 nm	1.1201	1.1049	1.1550	1.1016	1.0932	1.0991	1.0803
1220 - 1230 nm	1.0895	1.0745	1.1210	1.0716	1.0621	1.0683	1.0545
1230 - 1240 nm	1.1254	1.1108	1.1609	1.1057	1.0987	1.1056	1.0838
1240 - 1250 nm	1.1189	1.1034	1.1541	1.0994	1.0914	1.0984	1.0805
1250 - 1260 nm	1.1726	1.1625	1.2141	1.1588	1.1576	1.1642	1.1303
1260 - 1270 nm	1.0137	1.0045	1.0436	1.0038	0.9976	0.9998	0.9936
1270 - 1280 nm	1.2014	1.1922	1.2481	1.1866	1.1880	1.1959	1.1542
1280 - 1290 nm	1.1300	1.1131	1.1659	1.1073	1.1015	1.1094	1.0910
1290 - 1300 nm	1.1077	1.0914	1.1431	1.0861	1.0798	1.0867	1.0684

1300 - 1310 nm	1.1035	1.0878	1.1397	1.0821	1.0760	1.0812	1.0646
1310 - 1320 nm	1.1054	1.0896	1.1419	1.0835	1.0776	1.0831	1.0664
1320 - 1330 nm	1.1078	1.0919	1.1440	1.0855	1.0798	1.0843	1.0671
1330 - 1340 nm	1.1064	1.0903	1.1413	1.0856	1.0776	1.0811	1.0652
1340 - 1350 nm	1.1022	1.0857	1.1374	1.0818	1.0731	1.0761	1.0615
1350 - 1360 nm	1.1348	1.1172	1.1715	1.1144	1.1035	1.1064	1.0837
1360 - 1370 nm	1.0418	1.0248	1.0668	1.0241	1.0095	1.0084	1.0038
1370 - 1380 nm	1.1092	1.0948	1.1466	1.0915	1.0825	1.0842	1.0570
1380 - 1390 nm	1.1330	1.1115	1.1662	1.1052	1.0927	1.0962	1.0791
1390 - 1400 nm	1.1028	1.0829	1.1353	1.0771	1.0633	1.0639	1.0514
1400 - 1410 nm	1.1371	1.1192	1.1744	1.1134	1.1020	1.1012	1.0839
1410 - 1420 nm	1.0993	1.0859	1.1338	1.0812	1.0722	1.0695	1.0560
1420 - 1430 nm	1.1078	1.0974	1.1444	1.0920	1.0868	1.0817	1.0689
1430 - 1440 nm	1.1407	1.1288	1.1801	1.1234	1.1198	1.1161	1.0993
1440 - 1450 nm	1.1331	1.1185	1.1718	1.1155	1.1091	1.1067	1.0930
1450 - 1460 nm	1.1332	1.1174	1.1728	1.1137	1.1083	1.1060	1.0933
1460 - 1470 nm	1.2052	1.1959	1.2547	1.1943	1.1949	1.1920	1.1621
1470 - 1480 nm	1.0346	1.0258	1.0673	1.0300	1.0224	1.0181	1.0173
1480 - 1490 nm	1.1999	1.1932	1.2529	1.1925	1.1935	1.1913	1.1579
1490 - 1500 nm	1.1418	1.1270	1.1833	1.1264	1.1200	1.1174	1.1055
1500 - 1510 nm	1.1157	1.1011	1.1550	1.0995	1.0938	1.0906	1.0844
1510 - 1520 nm	1.1180	1.1032	1.1581	1.1020	1.0952	1.0938	1.0830
1520 - 1530 nm	1.1109	1.0966	1.1505	1.0958	1.0881	1.0863	1.0770
1530 - 1540 nm	1.1515	1.1410	1.1971	1.1396	1.1372	1.1354	1.1138
1540 - 1550 nm	1.0604	1.0519	1.0988	1.0528	1.0478	1.0431	1.0348
1550 - 1560 nm	1.1417	1.1301	1.1857	1.1281	1.1249	1.1215	1.1011
1560 - 1570 nm	1.1130	1.0979	1.1542	1.0965	1.0893	1.0875	1.0758
1570 - 1580 nm	1.1052	1.0910	1.1466	1.0896	1.0822	1.0811	1.0705
1580 - 1590 nm	1.1036	1.0892	1.1462	1.0902	1.0817	1.0815	1.0671
1590 - 1600 nm	1.1177	1.1046	1.1617	1.1043	1.0989	1.0974	1.0777
1600 - 1610 nm	1.0930	1.0804	1.1322	1.0804	1.0742	1.0708	1.0567
1610 - 1620 nm	1.1090	1.0966	1.1524	1.0955	1.0907	1.0875	1.0706
1620 - 1630 nm	1.1079	1.0939	1.1511	1.0931	1.0860	1.0842	1.0683
1630 - 1640 nm	1.1024	1.0882	1.1448	1.0873	1.0815	1.0807	1.0636
1640 - 1650 nm	1.0770	1.0641	1.1183	1.0604	1.0563	1.0563	1.0437
1650 - 1660 nm	1.0724	1.0597	1.1154	1.0617	1.0559	1.0567	1.0444
1660 - 1670 nm	1.1442	1.1412	1.2043	1.1506	1.1474	1.1531	1.1253

R10* relative at different irradiances in Apollo							
Band	1100	1000	800	600	400	200	100
880 - 890 nm	0.8879	0.9067	0.8852	0.8920	0.8972	0.9047	0.9028
890 - 900 nm	0.9743	0.9921	0.9795	0.9833	0.9933	1.0054	0.9919
900 - 910 nm	0.9914	1.0053	0.9985	1.0011	1.0109	1.0214	1.0077
910 - 920 nm	0.9633	0.9684	0.9653	0.9693	0.9757	0.9851	0.9784
920 - 930 nm	1.0241	1.0403	1.0355	1.0309	1.0457	1.0576	1.0292

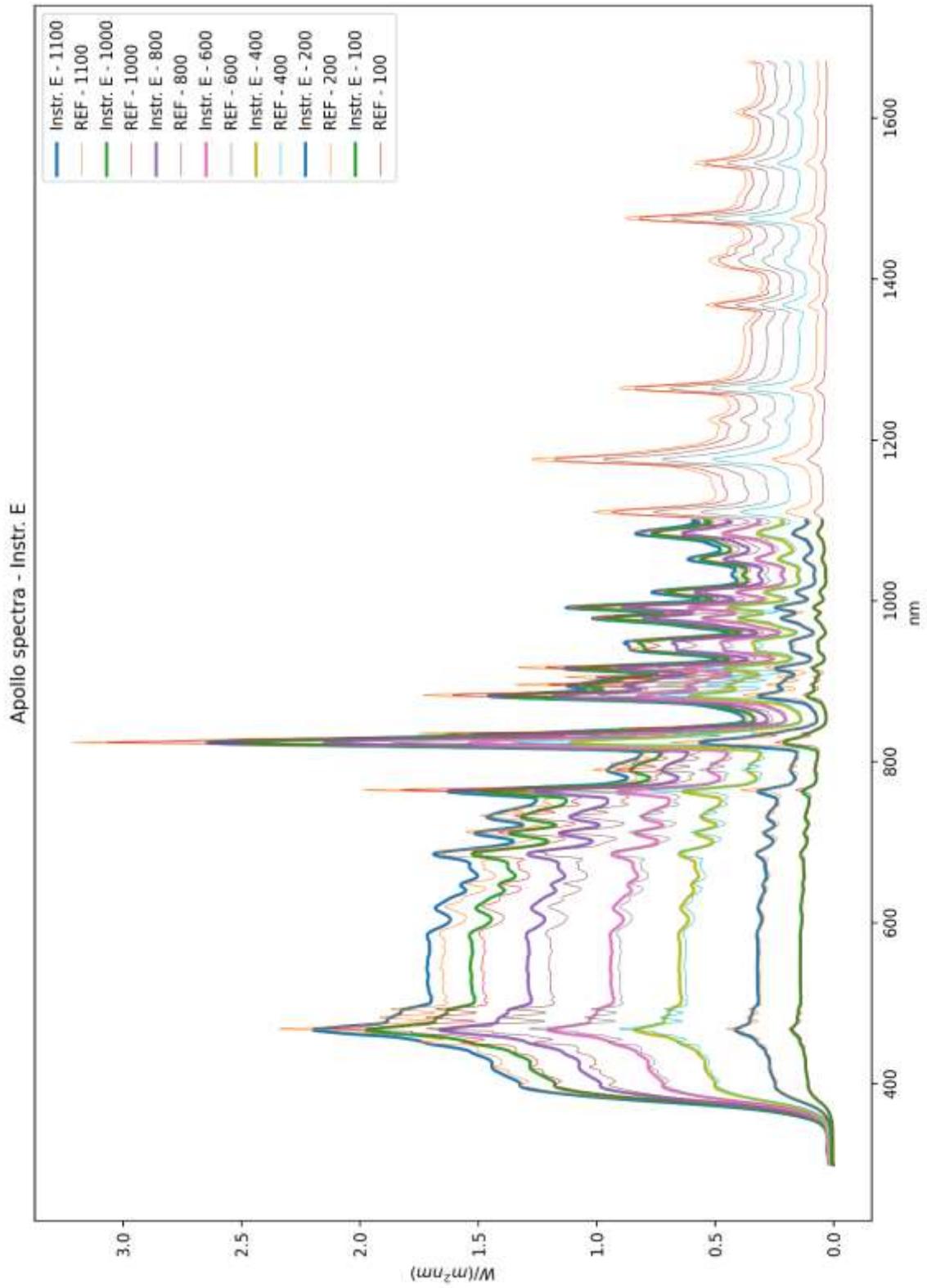
930 - 940 nm	1.0092	1.0061	1.0151	1.0133	1.0202	1.0301	1.0199
940 - 950 nm	0.9800	0.9861	0.9873	0.9867	0.9964	1.0034	0.9901
950 - 960 nm	0.9702	0.9767	0.9737	0.9720	0.9798	0.9866	0.9837
960 - 970 nm	1.0223	1.0276	1.0300	1.0230	1.0331	1.0403	1.0299
970 - 980 nm	0.9676	0.9779	0.9752	0.9741	0.9828	0.9882	0.9792
980 - 990 nm	1.0388	1.0505	1.0494	1.0480	1.0576	1.0649	1.0479
990 - 1000 nm	0.9546	0.9519	0.9587	0.9617	0.9654	0.9697	0.9686
1000 - 1010 nm	1.0728	1.0815	1.0847	1.0768	1.0901	1.0973	1.0775
1010 - 1020 nm	0.9692	0.9683	0.9731	0.9689	0.9749	0.9778	0.9761
1020 - 1030 nm	1.0416	1.0390	1.0474	1.0329	1.0421	1.0512	1.0397
1030 - 1040 nm	0.9766	0.9737	0.9773	0.9668	0.9704	0.9754	0.9766
1040 - 1050 nm	1.0028	1.0022	1.0062	0.9971	1.0027	1.0077	1.0023
1050 - 1060 nm	0.9543	0.9533	0.9538	0.9503	0.9525	0.9550	0.9569
1060 - 1070 nm	1.0249	1.0239	1.0275	1.0188	1.0230	1.0284	1.0209
1070 - 1080 nm	1.0303	1.0294	1.0317	1.0269	1.0293	1.0330	1.0259
1080 - 1090 nm	0.9505	0.9495	0.9485	0.9498	0.9475	0.9485	0.9550
1090 - 1100 nm	1.0526	1.0522	1.0566	1.0496	1.0511	1.0569	1.0462
1100 - 1110 nm	1.0243	1.0245	1.0236	1.0255	1.0233	1.0251	1.0208
1110 - 1120 nm	0.9702	0.9689	0.9669	0.9707	0.9675	0.9672	0.9695
1120 - 1130 nm	1.0633	1.0599	1.0641	1.0585	1.0568	1.0607	1.0485
1130 - 1140 nm	1.0086	1.0015	1.0050	1.0006	0.9950	0.9964	0.9983
1140 - 1150 nm	0.9939	0.9872	0.9890	0.9862	0.9807	0.9808	0.9858
1150 - 1160 nm	1.0101	1.0045	1.0064	1.0046	0.9990	0.9983	1.0001
1160 - 1170 nm	1.0611	1.0625	1.0639	1.0633	1.0640	1.0618	1.0493
1170 - 1180 nm	0.9362	0.9371	0.9302	0.9413	0.9367	0.9303	0.9406
1180 - 1190 nm	1.0436	1.0467	1.0438	1.0498	1.0496	1.0451	1.0373
1190 - 1200 nm	1.0564	1.0537	1.0531	1.0551	1.0526	1.0506	1.0452
1200 - 1210 nm	1.0259	1.0201	1.0202	1.0213	1.0154	1.0145	1.0171
1210 - 1220 nm	1.0147	1.0091	1.0094	1.0100	1.0048	1.0045	1.0070
1220 - 1230 nm	0.9870	0.9814	0.9797	0.9825	0.9762	0.9764	0.9831
1230 - 1240 nm	1.0195	1.0145	1.0146	1.0138	1.0098	1.0105	1.0103
1240 - 1250 nm	1.0136	1.0077	1.0086	1.0080	1.0031	1.0039	1.0073
1250 - 1260 nm	1.0622	1.0618	1.0610	1.0625	1.0639	1.0641	1.0537
1260 - 1270 nm	0.9183	0.9175	0.9121	0.9203	0.9169	0.9138	0.9263
1270 - 1280 nm	1.0884	1.0888	1.0908	1.0879	1.0919	1.0931	1.0760
1280 - 1290 nm	1.0237	1.0167	1.0189	1.0152	1.0124	1.0140	1.0170
1290 - 1300 nm	1.0035	0.9968	0.9990	0.9958	0.9925	0.9932	0.9959
1300 - 1310 nm	0.9997	0.9935	0.9960	0.9921	0.9889	0.9882	0.9925
1310 - 1320 nm	1.0014	0.9952	0.9979	0.9934	0.9904	0.9900	0.9941
1320 - 1330 nm	1.0036	0.9972	0.9998	0.9953	0.9925	0.9910	0.9947
1330 - 1340 nm	1.0023	0.9959	0.9974	0.9953	0.9904	0.9881	0.9930
1340 - 1350 nm	0.9985	0.9916	0.9940	0.9918	0.9863	0.9836	0.9895
1350 - 1360 nm	1.0280	1.0204	1.0238	1.0217	1.0142	1.0113	1.0103
1360 - 1370 nm	0.9438	0.9360	0.9323	0.9389	0.9278	0.9217	0.9358
1370 - 1380 nm	1.0048	0.9999	1.0021	1.0007	0.9949	0.9910	0.9854

1380 - 1390 nm	1.0264	1.0152	1.0192	1.0133	1.0043	1.0019	1.0060
1390 - 1400 nm	0.9990	0.9890	0.9922	0.9876	0.9773	0.9724	0.9802
1400 - 1410 nm	1.0302	1.0222	1.0264	1.0208	1.0129	1.0065	1.0104
1410 - 1420 nm	0.9958	0.9918	0.9908	0.9913	0.9855	0.9775	0.9844
1420 - 1430 nm	1.0035	1.0023	1.0001	1.0012	0.9988	0.9886	0.9965
1430 - 1440 nm	1.0333	1.0310	1.0314	1.0300	1.0292	1.0201	1.0248
1440 - 1450 nm	1.0265	1.0216	1.0241	1.0227	1.0194	1.0115	1.0189
1450 - 1460 nm	1.0266	1.0206	1.0250	1.0211	1.0187	1.0109	1.0192
1460 - 1470 nm	1.0918	1.0923	1.0965	1.0950	1.0982	1.0895	1.0833
1470 - 1480 nm	0.9372	0.9369	0.9328	0.9443	0.9397	0.9305	0.9484
1480 - 1490 nm	1.0870	1.0898	1.0949	1.0933	1.0970	1.0888	1.0794
1490 - 1500 nm	1.0344	1.0293	1.0342	1.0327	1.0294	1.0213	1.0306
1500 - 1510 nm	1.0107	1.0057	1.0094	1.0080	1.0053	0.9968	1.0109
1510 - 1520 nm	1.0128	1.0076	1.0121	1.0103	1.0066	0.9997	1.0096
1520 - 1530 nm	1.0064	1.0016	1.0055	1.0046	1.0000	0.9929	1.0040
1530 - 1540 nm	1.0432	1.0421	1.0462	1.0448	1.0452	1.0378	1.0383
1540 - 1550 nm	0.9606	0.9608	0.9603	0.9652	0.9630	0.9534	0.9647
1550 - 1560 nm	1.0343	1.0322	1.0362	1.0342	1.0339	1.0251	1.0264
1560 - 1570 nm	1.0083	1.0027	1.0087	1.0053	1.0011	0.9939	1.0029
1570 - 1580 nm	1.0012	0.9965	1.0021	0.9990	0.9947	0.9881	0.9979
1580 - 1590 nm	0.9998	0.9949	1.0017	0.9996	0.9942	0.9885	0.9948
1590 - 1600 nm	1.0126	1.0089	1.0153	1.0125	1.0100	1.0030	1.0047
1600 - 1610 nm	0.9902	0.9868	0.9895	0.9906	0.9873	0.9787	0.9851
1610 - 1620 nm	1.0046	1.0016	1.0072	1.0044	1.0024	0.9940	0.9981
1620 - 1630 nm	1.0037	0.9991	1.0060	1.0022	0.9981	0.9909	0.9959
1630 - 1640 nm	0.9986	0.9939	1.0005	0.9969	0.9940	0.9877	0.9915
1640 - 1650 nm	0.9756	0.9719	0.9773	0.9722	0.9708	0.9654	0.9730
1650 - 1660 nm	0.9715	0.9678	0.9748	0.9734	0.9704	0.9659	0.9736
1660 - 1670 nm	1.0365	1.0423	1.0525	1.0550	1.0546	1.0539	1.0490

Source: European Solar Test Installation – JRC

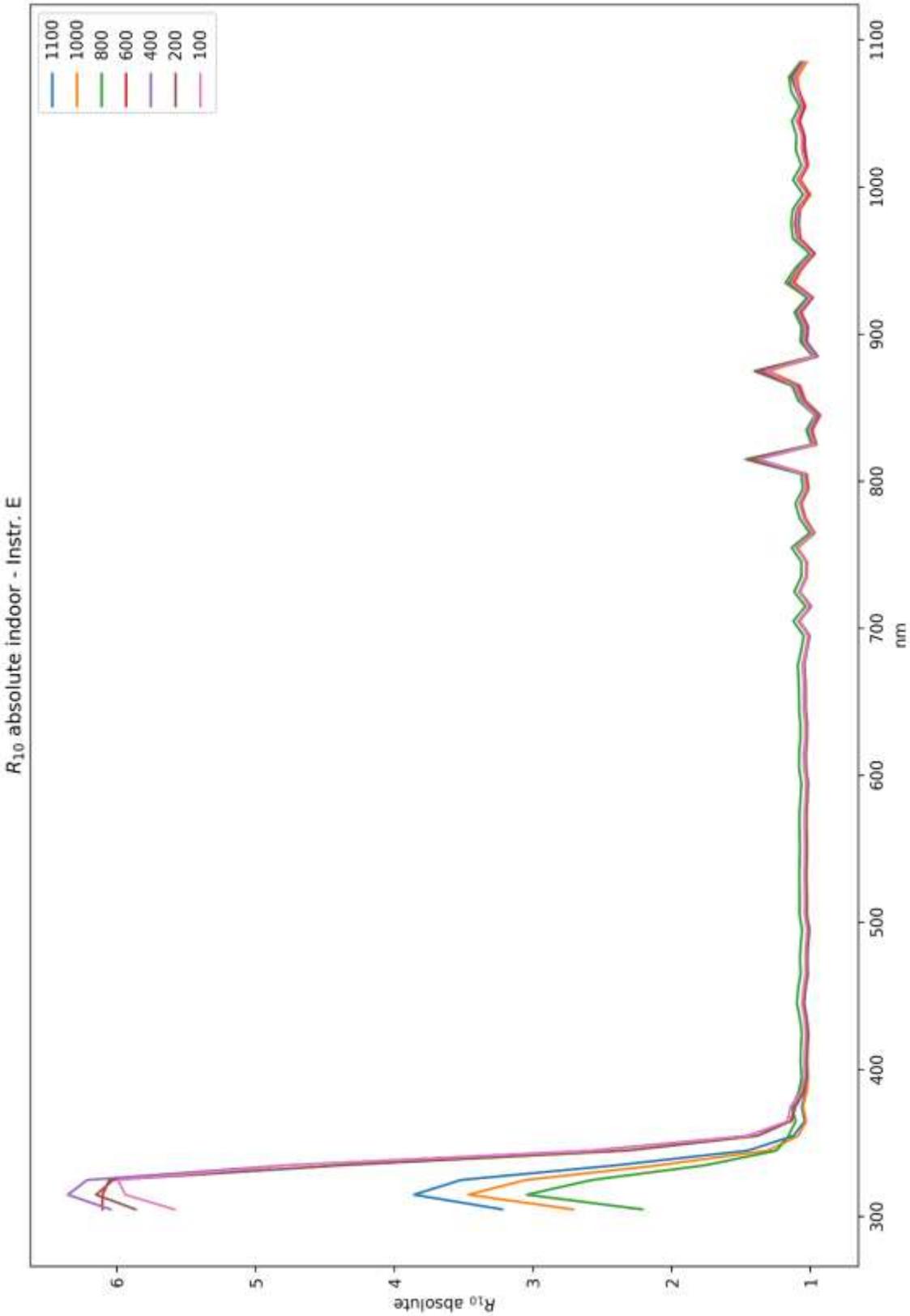
1.25 Instrument "E"

Figure 22: Instrument E - Indoor Apollo spectra at different irradiance levels.



Source: European Solar Test Installation – JRC.

Figure 23: Instrument E - Indoor R10 and R10* functions at different irradiance levels.



Source: European Solar Test Installation – JRC.

Table 21: Instrument E – Indoor R10 and R10* functions at different irradiance levels.

R10 absolute at different irradiances in Apollo							
Band	1100	1000	800	600	400	200	100
300 - 310 nm	3.2203	2.7099	2.2113	6.1031	6.0426	5.8636	5.5832
310 - 320 nm	3.8559	3.4647	3.0439	6.1015	6.3508	6.1474	5.9360
320 - 330 nm	3.5189	3.0515	2.5746	6.0515	6.2105	6.0251	5.9915
330 - 340 nm	2.4000	2.0905	1.7581	4.7579	4.7796	4.3746	4.7458
340 - 350 nm	1.4507	1.3066	1.2440	2.5789	2.5587	2.3162	2.5484
350 - 360 nm	1.1236	1.0882	1.1591	1.4570	1.4611	1.3809	1.4521
360 - 370 nm	1.0415	1.0302	1.1061	1.1365	1.1413	1.1429	1.1668
370 - 380 nm	1.0629	1.0531	1.1343	1.1073	1.1162	1.1081	1.1422
380 - 390 nm	1.0317	1.0257	1.0832	1.0489	1.0512	1.0448	1.0688
390 - 400 nm	1.0225	1.0178	1.0636	1.0311	1.0284	1.0222	1.0417
400 - 410 nm	1.0296	1.0235	1.0709	1.0354	1.0332	1.0248	1.0437
410 - 420 nm	1.0284	1.0226	1.0690	1.0322	1.0304	1.0198	1.0391
420 - 430 nm	1.0241	1.0179	1.0625	1.0263	1.0241	1.0140	1.0337
430 - 440 nm	1.0350	1.0295	1.0760	1.0382	1.0362	1.0260	1.0430
440 - 450 nm	1.0553	1.0496	1.0974	1.0576	1.0558	1.0442	1.0602
450 - 460 nm	1.0469	1.0421	1.0886	1.0499	1.0491	1.0350	1.0493
460 - 470 nm	1.0318	1.0268	1.0704	1.0344	1.0309	1.0174	1.0349
470 - 480 nm	1.0337	1.0302	1.0754	1.0362	1.0346	1.0223	1.0351
480 - 490 nm	1.0298	1.0248	1.0699	1.0306	1.0295	1.0163	1.0320
490 - 500 nm	1.0198	1.0153	1.0596	1.0223	1.0196	1.0062	1.0231
500 - 510 nm	1.0376	1.0327	1.0778	1.0395	1.0371	1.0247	1.0407
510 - 520 nm	1.0366	1.0321	1.0770	1.0384	1.0364	1.0235	1.0399
520 - 530 nm	1.0396	1.0345	1.0792	1.0419	1.0400	1.0267	1.0420
530 - 540 nm	1.0395	1.0352	1.0796	1.0420	1.0403	1.0275	1.0434
540 - 550 nm	1.0362	1.0321	1.0762	1.0397	1.0368	1.0242	1.0399
550 - 560 nm	1.0373	1.0327	1.0764	1.0396	1.0376	1.0239	1.0396
560 - 570 nm	1.0395	1.0353	1.0784	1.0417	1.0395	1.0271	1.0416
570 - 580 nm	1.0389	1.0355	1.0793	1.0419	1.0406	1.0269	1.0408
580 - 590 nm	1.0323	1.0286	1.0708	1.0345	1.0333	1.0206	1.0339
590 - 600 nm	1.0284	1.0238	1.0654	1.0300	1.0279	1.0164	1.0299
600 - 610 nm	1.0423	1.0373	1.0820	1.0441	1.0439	1.0310	1.0425
610 - 620 nm	1.0415	1.0378	1.0814	1.0468	1.0457	1.0325	1.0429
620 - 630 nm	1.0340	1.0291	1.0723	1.0375	1.0358	1.0236	1.0347
630 - 640 nm	1.0349	1.0299	1.0726	1.0372	1.0348	1.0232	1.0352
640 - 650 nm	1.0429	1.0387	1.0816	1.0465	1.0442	1.0332	1.0428
650 - 660 nm	1.0440	1.0396	1.0824	1.0469	1.0458	1.0332	1.0439
660 - 670 nm	1.0459	1.0411	1.0847	1.0485	1.0476	1.0362	1.0454
670 - 680 nm	1.0521	1.0483	1.0911	1.0560	1.0544	1.0437	1.0506
680 - 690 nm	1.0294	1.0262	1.0669	1.0332	1.0332	1.0244	1.0292
690 - 700 nm	1.0137	1.0079	1.0479	1.0156	1.0128	1.0051	1.0161
700 - 710 nm	1.0778	1.0759	1.1227	1.0828	1.0858	1.0779	1.0750
710 - 720 nm	1.0024	0.9965	1.0358	1.0033	1.0013	0.9947	1.0082

720 - 730 nm	1.0765	1.0732	1.1172	1.0803	1.0823	1.0777	1.0767
730 - 740 nm	1.0276	1.0254	1.0664	1.0322	1.0334	1.0274	1.0316
740 - 750 nm	1.0283	1.0237	1.0642	1.0296	1.0305	1.0262	1.0329
750 - 760 nm	1.0891	1.0887	1.1344	1.0957	1.0998	1.0983	1.0920
760 - 770 nm	0.9724	0.9687	1.0050	0.9752	0.9755	0.9736	0.9818
770 - 780 nm	1.0388	1.0336	1.0786	1.0397	1.0427	1.0442	1.0485
780 - 790 nm	1.0667	1.0623	1.1079	1.0701	1.0737	1.0761	1.0787
790 - 800 nm	1.0161	1.0116	1.0538	1.0179	1.0232	1.0249	1.0304
800 - 810 nm	1.0293	1.0247	1.0674	1.0318	1.0373	1.0446	1.0468
810 - 820 nm	1.3741	1.3933	1.4664	1.4044	1.4389	1.4571	1.3776
820 - 830 nm	0.9553	0.9556	0.9921	0.9638	0.9677	0.9739	0.9756
830 - 840 nm	0.9856	0.9862	1.0299	0.9929	1.0024	1.0108	1.0088
840 - 850 nm	0.9326	0.9267	0.9676	0.9317	0.9358	0.9454	0.9604
850 - 860 nm	1.0415	1.0351	1.0878	1.0424	1.0502	1.0642	1.0693
860 - 870 nm	1.0852	1.0710	1.1323	1.0828	1.0967	1.1125	1.1091
870 - 880 nm	1.3068	1.2976	1.4036	1.3330	1.3741	1.3986	1.3210
880 - 890 nm	0.9474	0.9592	0.9828	0.9488	0.9547	0.9632	0.9700
890 - 900 nm	1.0261	1.0363	1.0730	1.0321	1.0440	1.0552	1.0487
900 - 910 nm	1.0159	1.0220	1.0638	1.0227	1.0335	1.0438	1.0384
910 - 920 nm	1.0641	1.0653	1.1157	1.0734	1.0855	1.0945	1.0875
920 - 930 nm	0.9818	0.9828	1.0246	0.9808	0.9892	0.9989	1.0018
930 - 940 nm	1.1210	1.1132	1.1802	1.1283	1.1426	1.1537	1.1390
940 - 950 nm	1.0584	1.0588	1.1089	1.0655	1.0788	1.0839	1.0761
950 - 960 nm	0.9675	0.9658	1.0069	0.9701	0.9753	0.9768	0.9891
960 - 970 nm	1.0715	1.0690	1.1256	1.0756	1.0898	1.0949	1.0885
970 - 980 nm	1.0823	1.0874	1.1381	1.0907	1.1046	1.1121	1.0962
980 - 990 nm	1.0731	1.0747	1.1271	1.0800	1.0929	1.0972	1.0883
990 - 1000 nm	1.0090	0.9973	1.0537	1.0127	1.0206	1.0222	1.0261
1000 - 1010 nm	1.0747	1.0711	1.1261	1.0769	1.0868	1.0921	1.0851
1010 - 1020 nm	1.0199	1.0137	1.0652	1.0228	1.0325	1.0348	1.0345
1020 - 1030 nm	1.0480	1.0380	1.1049	1.0355	1.0571	1.0582	1.0624
1030 - 1040 nm	1.0562	1.0404	1.1008	1.0433	1.0585	1.0557	1.0620
1040 - 1050 nm	1.0875	1.0784	1.1334	1.0761	1.0985	1.0998	1.0955
1050 - 1060 nm	1.0410	1.0345	1.0791	1.0402	1.0603	1.0564	1.0600
1060 - 1070 nm	1.0791	1.0815	1.1386	1.0802	1.0980	1.0992	1.0910
1070 - 1080 nm	1.1006	1.0922	1.1548	1.1287	1.1332	1.1384	1.1151
1080 - 1090 nm	1.0312	1.0279	1.0732	1.0559	1.0628	1.0576	1.0451

R10* relative at different irradiances in Apollo							
Band	1100	1000	800	600	400	200	100
300 - 310 nm	3.0987	2.6171	2.0463	5.8404	5.7701	5.6279	5.3215
310 - 320 nm	3.7103	3.3460	2.8167	5.8388	6.0644	5.9003	5.6577
320 - 330 nm	3.3861	2.9470	2.3825	5.7910	5.9304	5.7829	5.7107
330 - 340 nm	2.3094	2.0189	1.6269	4.5531	4.5641	4.1988	4.5234
340 - 350 nm	1.3959	1.2619	1.1512	2.4679	2.4433	2.2231	2.4290

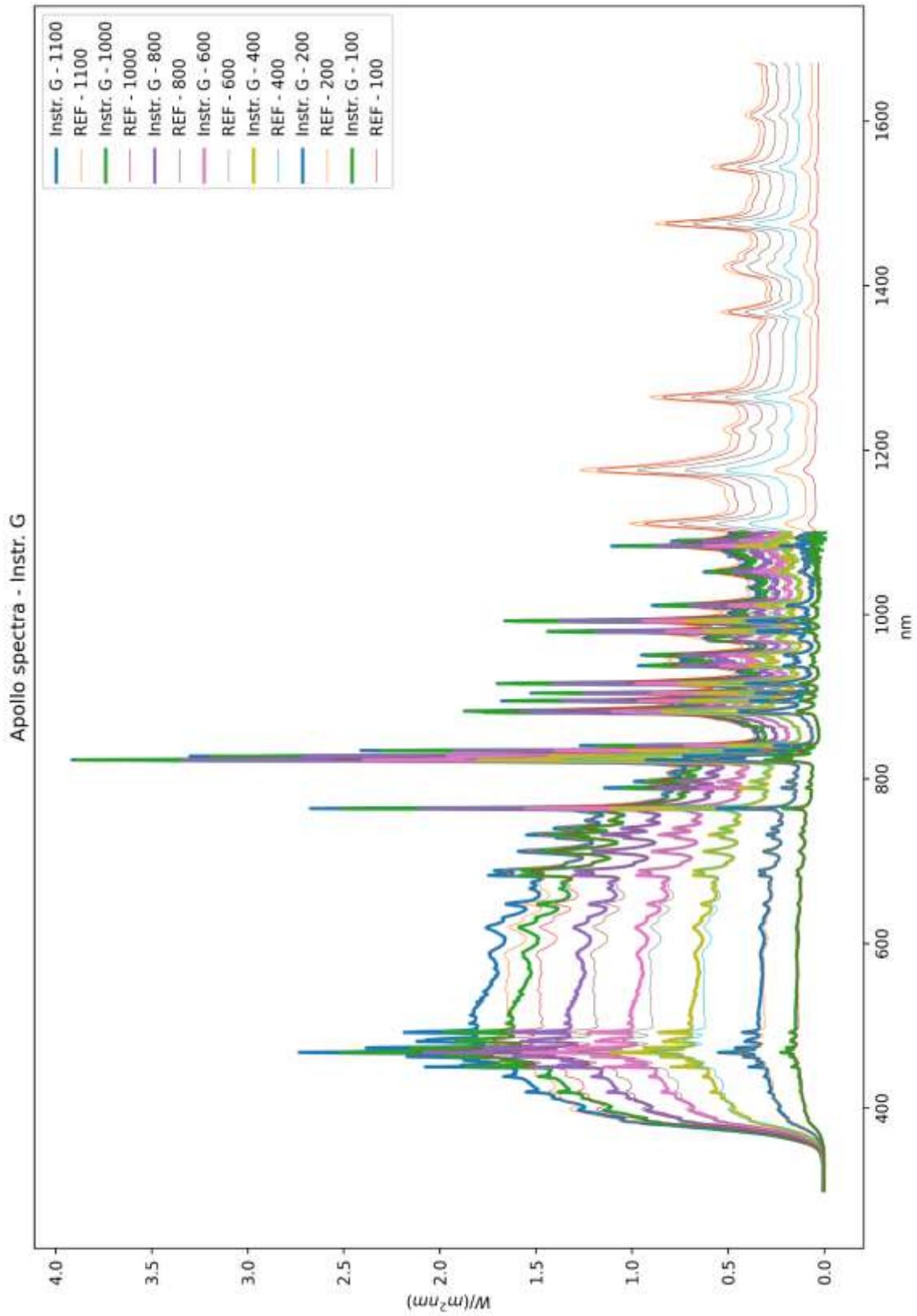
350 - 360 nm	1.0812	1.0510	1.0726	1.3942	1.3952	1.3253	1.3840
360 - 370 nm	1.0022	0.9950	1.0235	1.0876	1.0898	1.0969	1.1121
370 - 380 nm	1.0228	1.0171	1.0497	1.0596	1.0659	1.0636	1.0887
380 - 390 nm	0.9927	0.9906	1.0024	1.0038	1.0038	1.0028	1.0187
390 - 400 nm	0.9839	0.9830	0.9842	0.9867	0.9820	0.9811	0.9928
400 - 410 nm	0.9907	0.9885	0.9910	0.9908	0.9867	0.9836	0.9948
410 - 420 nm	0.9895	0.9876	0.9892	0.9878	0.9839	0.9788	0.9904
420 - 430 nm	0.9855	0.9831	0.9832	0.9821	0.9779	0.9733	0.9853
430 - 440 nm	0.9960	0.9943	0.9957	0.9935	0.9894	0.9848	0.9941
440 - 450 nm	1.0154	1.0136	1.0155	1.0121	1.0082	1.0023	1.0105
450 - 460 nm	1.0074	1.0064	1.0074	1.0047	1.0018	0.9934	1.0001
460 - 470 nm	0.9929	0.9916	0.9905	0.9899	0.9844	0.9765	0.9864
470 - 480 nm	0.9947	0.9949	0.9952	0.9916	0.9880	0.9812	0.9866
480 - 490 nm	0.9909	0.9897	0.9901	0.9863	0.9830	0.9754	0.9836
490 - 500 nm	0.9813	0.9806	0.9805	0.9783	0.9736	0.9658	0.9751
500 - 510 nm	0.9985	0.9974	0.9973	0.9948	0.9903	0.9835	0.9919
510 - 520 nm	0.9974	0.9967	0.9967	0.9937	0.9896	0.9824	0.9912
520 - 530 nm	1.0004	0.9991	0.9987	0.9970	0.9931	0.9854	0.9932
530 - 540 nm	1.0002	0.9997	0.9990	0.9971	0.9934	0.9862	0.9945
540 - 550 nm	0.9970	0.9967	0.9959	0.9949	0.9900	0.9831	0.9912
550 - 560 nm	0.9981	0.9974	0.9960	0.9948	0.9908	0.9828	0.9908
560 - 570 nm	1.0003	0.9998	0.9979	0.9969	0.9926	0.9858	0.9928
570 - 580 nm	0.9997	1.0001	0.9987	0.9971	0.9937	0.9856	0.9921
580 - 590 nm	0.9934	0.9934	0.9909	0.9900	0.9867	0.9796	0.9854
590 - 600 nm	0.9895	0.9888	0.9859	0.9857	0.9815	0.9755	0.9816
600 - 610 nm	1.0029	1.0018	1.0012	0.9991	0.9969	0.9896	0.9936
610 - 620 nm	1.0022	1.0023	1.0007	1.0017	0.9985	0.9910	0.9940
620 - 630 nm	0.9949	0.9939	0.9923	0.9929	0.9891	0.9824	0.9862
630 - 640 nm	0.9958	0.9946	0.9925	0.9926	0.9881	0.9820	0.9866
640 - 650 nm	1.0035	1.0031	1.0008	1.0015	0.9971	0.9917	0.9939
650 - 660 nm	1.0046	1.0040	1.0017	1.0018	0.9986	0.9917	0.9950
660 - 670 nm	1.0064	1.0054	1.0038	1.0034	1.0004	0.9945	0.9964
670 - 680 nm	1.0123	1.0124	1.0097	1.0105	1.0069	1.0017	1.0014
680 - 690 nm	0.9905	0.9911	0.9873	0.9887	0.9866	0.9832	0.9810
690 - 700 nm	0.9754	0.9734	0.9697	0.9719	0.9671	0.9647	0.9684
700 - 710 nm	1.0371	1.0391	1.0389	1.0362	1.0369	1.0345	1.0246
710 - 720 nm	0.9645	0.9624	0.9585	0.9602	0.9562	0.9548	0.9610
720 - 730 nm	1.0358	1.0364	1.0339	1.0338	1.0335	1.0344	1.0262
730 - 740 nm	0.9888	0.9903	0.9868	0.9878	0.9868	0.9861	0.9832
740 - 750 nm	0.9894	0.9886	0.9848	0.9853	0.9840	0.9850	0.9845
750 - 760 nm	1.0480	1.0515	1.0498	1.0486	1.0502	1.0541	1.0408
760 - 770 nm	0.9357	0.9355	0.9300	0.9333	0.9315	0.9344	0.9358
770 - 780 nm	0.9996	0.9982	0.9981	0.9949	0.9957	1.0023	0.9993
780 - 790 nm	1.0264	1.0259	1.0252	1.0241	1.0253	1.0328	1.0282
790 - 800 nm	0.9777	0.9769	0.9752	0.9741	0.9771	0.9837	0.9821

800 - 810 nm	0.9904	0.9896	0.9877	0.9874	0.9905	1.0026	0.9977
810 - 820 nm	1.3223	1.3456	1.3569	1.3440	1.3740	1.3985	1.3130
820 - 830 nm	0.9192	0.9229	0.9180	0.9223	0.9240	0.9348	0.9299
830 - 840 nm	0.9484	0.9524	0.9531	0.9502	0.9572	0.9702	0.9615
840 - 850 nm	0.8974	0.8950	0.8954	0.8915	0.8936	0.9074	0.9154
850 - 860 nm	1.0022	0.9996	1.0066	0.9975	1.0028	1.0214	1.0192
860 - 870 nm	1.0442	1.0344	1.0478	1.0362	1.0472	1.0678	1.0571
870 - 880 nm	1.2574	1.2531	1.2989	1.2756	1.3121	1.3424	1.2591
880 - 890 nm	0.9116	0.9264	0.9095	0.9080	0.9117	0.9245	0.9245
890 - 900 nm	0.9874	1.0008	0.9929	0.9877	0.9969	1.0128	0.9995
900 - 910 nm	0.9776	0.9870	0.9844	0.9787	0.9869	1.0018	0.9897
910 - 920 nm	1.0239	1.0288	1.0324	1.0272	1.0366	1.0505	1.0365
920 - 930 nm	0.9447	0.9491	0.9481	0.9386	0.9446	0.9588	0.9548
930 - 940 nm	1.0787	1.0751	1.0922	1.0797	1.0910	1.1073	1.0856
940 - 950 nm	1.0184	1.0226	1.0262	1.0197	1.0302	1.0403	1.0256
950 - 960 nm	0.9310	0.9327	0.9318	0.9283	0.9314	0.9375	0.9427
960 - 970 nm	1.0311	1.0324	1.0416	1.0293	1.0407	1.0509	1.0375
970 - 980 nm	1.0415	1.0502	1.0532	1.0437	1.0548	1.0674	1.0448
980 - 990 nm	1.0326	1.0379	1.0430	1.0335	1.0436	1.0531	1.0373
990 - 1000 nm	0.9709	0.9631	0.9750	0.9691	0.9746	0.9811	0.9780
1000 - 1010 nm	1.0341	1.0344	1.0421	1.0306	1.0378	1.0482	1.0342
1010 - 1020 nm	0.9814	0.9790	0.9857	0.9788	0.9859	0.9932	0.9860
1020 - 1030 nm	1.0085	1.0025	1.0225	0.9909	1.0094	1.0157	1.0126
1030 - 1040 nm	1.0163	1.0048	1.0186	0.9984	1.0108	1.0133	1.0122
1040 - 1050 nm	1.0464	1.0415	1.0488	1.0298	1.0489	1.0556	1.0441
1050 - 1060 nm	1.0017	0.9991	0.9986	0.9954	1.0125	1.0140	1.0103
1060 - 1070 nm	1.0384	1.0445	1.0536	1.0337	1.0485	1.0550	1.0399
1070 - 1080 nm	1.0590	1.0548	1.0686	1.0801	1.0821	1.0927	1.0629
1080 - 1090 nm	0.9922	0.9927	0.9931	1.0104	1.0149	1.0151	0.9962

Source: European Solar Test Installation – JRC

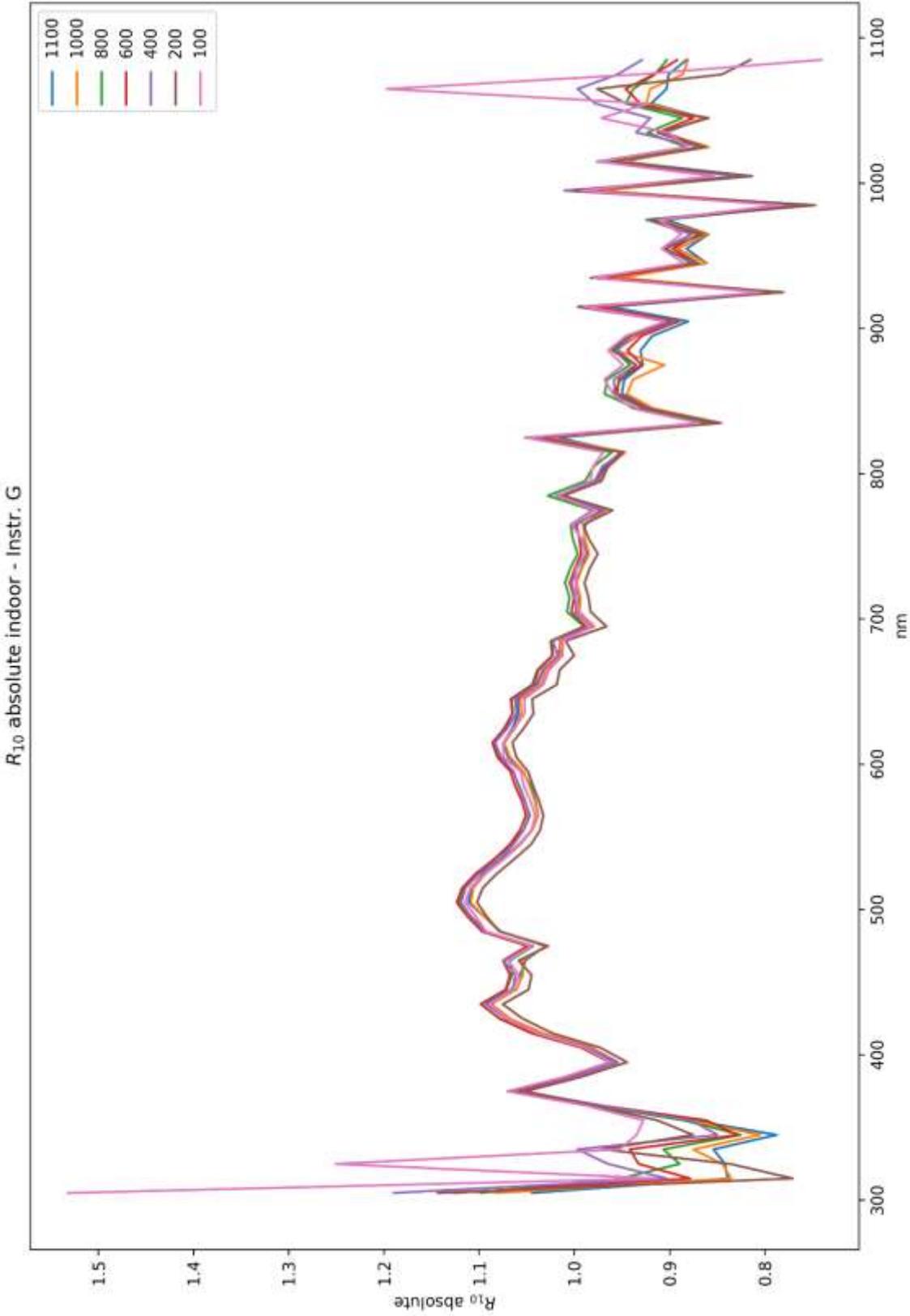
1.26 Instrument "G"

Figure 24: Instrument G - Indoor Apollo spectra at different irradiance levels.



Source: European Solar Test Installation – JRC.

Figure 25: Instrument G - Indoor R10 and R10* functions at different irradiance levels.



Source: European Solar Test Installation – JRC.

Table 22: Instrument G – Indoor R10 and R10* functions at different irradiance levels.

R10 absolute at different irradiances in Apollo							
Band	1100	1000	800	600	400	200	100
300 - 310 nm	1.0442	1.0816	1.0985	1.1262	1.1895	1.1431	1.5317
310 - 320 nm	0.8389	0.8352	0.9513	0.8782	0.9028	0.7705	0.9123
320 - 330 nm	0.8418	0.8444	0.8893	0.9324	0.9646	0.8361	1.2505
330 - 340 nm	0.8538	0.8750	0.9064	0.9418	0.9968	0.9705	0.9521
340 - 350 nm	0.7877	0.8048	0.8251	0.8284	0.8496	0.8752	0.9346
350 - 360 nm	0.8749	0.8791	0.8850	0.8612	0.8770	0.9126	0.9274
360 - 370 nm	0.9697	0.9715	0.9781	0.9691	0.9709	0.9795	0.9866
370 - 380 nm	1.0553	1.0523	1.0632	1.0571	1.0538	1.0513	1.0704
380 - 390 nm	1.0020	0.9970	1.0096	1.0054	0.9993	0.9919	1.0101
390 - 400 nm	0.9563	0.9538	0.9630	0.9623	0.9545	0.9445	0.9624
400 - 410 nm	0.9858	0.9816	0.9924	0.9918	0.9853	0.9726	0.9888
410 - 420 nm	1.0359	1.0326	1.0449	1.0448	1.0389	1.0230	1.0392
420 - 430 nm	1.0716	1.0673	1.0785	1.0779	1.0711	1.0541	1.0709
430 - 440 nm	1.0924	1.0868	1.0977	1.0983	1.0912	1.0750	1.0888
440 - 450 nm	1.0661	1.0608	1.0712	1.0720	1.0649	1.0480	1.0640
450 - 460 nm	1.0568	1.0540	1.0653	1.0674	1.0619	1.0447	1.0581
460 - 470 nm	1.0512	1.0540	1.0677	1.0748	1.0741	1.0584	1.0694
470 - 480 nm	1.0306	1.0294	1.0433	1.0493	1.0440	1.0273	1.0454
480 - 490 nm	1.0773	1.0780	1.0926	1.0967	1.0939	1.0785	1.0925
490 - 500 nm	1.0942	1.0944	1.1078	1.1117	1.1083	1.0916	1.1030
500 - 510 nm	1.1109	1.1087	1.1210	1.1234	1.1189	1.1020	1.1147
510 - 520 nm	1.1079	1.1058	1.1162	1.1177	1.1141	1.0961	1.1088
520 - 530 nm	1.0957	1.0929	1.1023	1.1032	1.0996	1.0810	1.0935
530 - 540 nm	1.0757	1.0734	1.0829	1.0838	1.0783	1.0626	1.0740
540 - 550 nm	1.0583	1.0567	1.0664	1.0675	1.0638	1.0453	1.0579
550 - 560 nm	1.0445	1.0438	1.0531	1.0567	1.0529	1.0357	1.0447
560 - 570 nm	1.0380	1.0379	1.0475	1.0507	1.0464	1.0324	1.0409
570 - 580 nm	1.0406	1.0415	1.0516	1.0550	1.0520	1.0370	1.0460
580 - 590 nm	1.0454	1.0467	1.0577	1.0619	1.0585	1.0431	1.0529
590 - 600 nm	1.0536	1.0530	1.0640	1.0669	1.0635	1.0483	1.0559
600 - 610 nm	1.0694	1.0674	1.0789	1.0807	1.0769	1.0608	1.0742
610 - 620 nm	1.0744	1.0733	1.0844	1.0860	1.0831	1.0649	1.0748
620 - 630 nm	1.0647	1.0621	1.0735	1.0729	1.0702	1.0529	1.0631
630 - 640 nm	1.0587	1.0556	1.0650	1.0645	1.0607	1.0428	1.0520
640 - 650 nm	1.0593	1.0567	1.0667	1.0658	1.0619	1.0442	1.0523
650 - 660 nm	1.0385	1.0347	1.0441	1.0423	1.0396	1.0182	1.0322
660 - 670 nm	1.0325	1.0298	1.0387	1.0376	1.0333	1.0153	1.0265
670 - 680 nm	1.0164	1.0143	1.0230	1.0225	1.0174	1.0001	1.0122
680 - 690 nm	1.0144	1.0152	1.0249	1.0233	1.0224	1.0089	1.0121
690 - 700 nm	0.9827	0.9789	0.9900	0.9879	0.9825	0.9662	0.9806
700 - 710 nm	0.9985	0.9946	1.0075	1.0029	0.9977	0.9828	0.9958

710 - 720 nm	0.9943	0.9935	1.0050	1.0002	0.9994	0.9850	0.9980
720 - 730 nm	0.9987	0.9976	1.0096	1.0046	1.0028	0.9893	0.9985
730 - 740 nm	0.9926	0.9920	1.0043	0.9992	0.9971	0.9837	0.9981
740 - 750 nm	0.9865	0.9843	0.9962	0.9925	0.9877	0.9753	0.9885
750 - 760 nm	0.9896	0.9889	1.0014	0.9946	0.9930	0.9845	0.9917
760 - 770 nm	0.9883	0.9904	1.0038	0.9976	1.0001	0.9906	1.0030
770 - 780 nm	0.9701	0.9666	0.9809	0.9718	0.9685	0.9598	0.9786
780 - 790 nm	1.0101	1.0111	1.0278	1.0166	1.0190	1.0115	1.0175
790 - 800 nm	0.9764	0.9742	0.9887	0.9791	0.9783	0.9713	0.9833
800 - 810 nm	0.9672	0.9641	0.9797	0.9691	0.9708	0.9646	0.9804
810 - 820 nm	0.9508	0.9465	0.9604	0.9510	0.9488	0.9483	0.9694
820 - 830 nm	1.0166	1.0294	1.0474	1.0366	1.0457	1.0517	1.0510
830 - 840 nm	0.8468	0.8450	0.8577	0.8505	0.8467	0.8487	0.8686
840 - 850 nm	0.9178	0.9167	0.9350	0.9216	0.9246	0.9265	0.9392
850 - 860 nm	0.9501	0.9446	0.9681	0.9547	0.9574	0.9592	0.9592
860 - 870 nm	0.9475	0.9383	0.9654	0.9533	0.9584	0.9509	0.9684
870 - 880 nm	0.9279	0.9053	0.9414	0.9292	0.9351	0.9352	0.9486
880 - 890 nm	0.9305	0.9568	0.9576	0.9442	0.9547	0.9603	0.9645
890 - 900 nm	0.9181	0.9333	0.9405	0.9292	0.9391	0.9431	0.9456
900 - 910 nm	0.8802	0.8892	0.8995	0.8906	0.8949	0.8988	0.9044
910 - 920 nm	0.9622	0.9745	0.9921	0.9769	0.9880	0.9963	0.9889
920 - 930 nm	0.7854	0.7873	0.7926	0.7892	0.7861	0.7802	0.8044
930 - 940 nm	0.9526	0.9527	0.9813	0.9684	0.9820	0.9827	0.9792
940 - 950 nm	0.8610	0.8617	0.8774	0.8694	0.8729	0.8691	0.8849
950 - 960 nm	0.8823	0.8912	0.9031	0.8966	0.9076	0.9059	0.9081
960 - 970 nm	0.8591	0.8600	0.8766	0.8695	0.8768	0.8638	0.8875
970 - 980 nm	0.9034	0.9131	0.9242	0.9149	0.9215	0.9187	0.9111
980 - 990 nm	0.7593	0.7561	0.7636	0.7612	0.7623	0.7471	0.7859
990 - 1000 nm	0.9739	0.9767	1.0019	0.9908	1.0104	1.0001	0.9924
1000 - 1010 nm	0.8148	0.8185	0.8270	0.8245	0.8257	0.8133	0.8539
1010 - 1020 nm	0.9481	0.9532	0.9760	0.9657	0.9740	0.9616	0.9750
1020 - 1030 nm	0.8642	0.8585	0.8826	0.8674	0.8672	0.8622	0.8812
1030 - 1040 nm	0.9039	0.9068	0.9232	0.9126	0.9351	0.9104	0.9021
1040 - 1050 nm	0.8641	0.8641	0.8863	0.8748	0.9200	0.8588	0.9714
1050 - 1060 nm	0.9193	0.9244	0.9459	0.9305	0.9781	0.9452	0.9221
1060 - 1070 nm	0.9031	0.9201	0.9380	0.9462	0.9965	0.9761	1.1970
1070 - 1080 nm	0.9008	0.8861	0.9154	0.9165	0.9545	0.8450	0.9331
1080 - 1090 nm	0.8823	0.8807	0.9026	0.8919	0.9288	0.8150	0.7407

R10* relative at different irradiances in Apollo							
Band	1100	1000	800	600	400	200	100
300 - 310 nm	1.0376	1.0754	1.0783	1.1078	1.1701	1.1411	1.5068
310 - 320 nm	0.8335	0.8305	0.9338	0.8638	0.8881	0.7692	0.8975
320 - 330 nm	0.8365	0.8396	0.8729	0.9171	0.9488	0.8347	1.2301

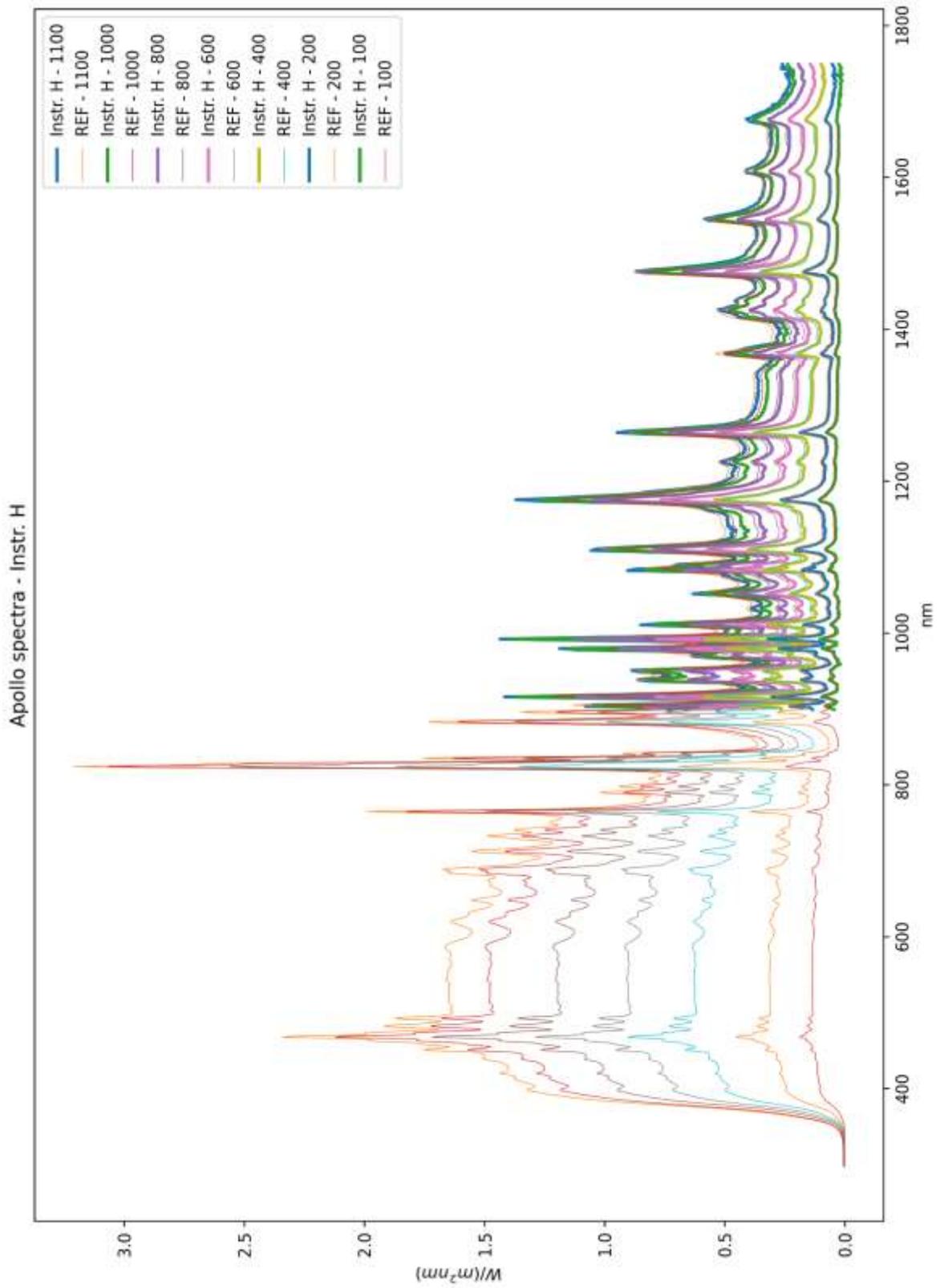
330 - 340 nm	0.8483	0.8701	0.8897	0.9264	0.9805	0.9688	0.9367
340 - 350 nm	0.7826	0.8002	0.8099	0.8149	0.8357	0.8737	0.9194
350 - 360 nm	0.8693	0.8740	0.8687	0.8472	0.8627	0.9110	0.9124
360 - 370 nm	0.9635	0.9660	0.9601	0.9533	0.9551	0.9778	0.9705
370 - 380 nm	1.0486	1.0463	1.0436	1.0398	1.0366	1.0495	1.0530
380 - 390 nm	0.9957	0.9913	0.9910	0.9890	0.9830	0.9902	0.9937
390 - 400 nm	0.9502	0.9484	0.9453	0.9466	0.9390	0.9429	0.9468
400 - 410 nm	0.9795	0.9760	0.9741	0.9756	0.9693	0.9709	0.9728
410 - 420 nm	1.0293	1.0267	1.0257	1.0277	1.0219	1.0213	1.0223
420 - 430 nm	1.0647	1.0612	1.0587	1.0602	1.0536	1.0523	1.0535
430 - 440 nm	1.0855	1.0806	1.0775	1.0804	1.0734	1.0732	1.0712
440 - 450 nm	1.0593	1.0548	1.0515	1.0545	1.0475	1.0462	1.0467
450 - 460 nm	1.0501	1.0480	1.0457	1.0500	1.0446	1.0429	1.0409
460 - 470 nm	1.0445	1.0480	1.0481	1.0572	1.0566	1.0566	1.0521
470 - 480 nm	1.0240	1.0236	1.0241	1.0321	1.0269	1.0255	1.0284
480 - 490 nm	1.0704	1.0719	1.0725	1.0788	1.0761	1.0767	1.0748
490 - 500 nm	1.0872	1.0881	1.0874	1.0935	1.0903	1.0897	1.0851
500 - 510 nm	1.1039	1.1024	1.1004	1.1050	1.1007	1.1001	1.0966
510 - 520 nm	1.1008	1.0995	1.0957	1.0995	1.0959	1.0942	1.0908
520 - 530 nm	1.0887	1.0867	1.0820	1.0852	1.0816	1.0792	1.0757
530 - 540 nm	1.0688	1.0673	1.0630	1.0661	1.0607	1.0608	1.0565
540 - 550 nm	1.0515	1.0506	1.0468	1.0501	1.0465	1.0436	1.0407
550 - 560 nm	1.0379	1.0378	1.0337	1.0394	1.0357	1.0339	1.0277
560 - 570 nm	1.0313	1.0320	1.0282	1.0335	1.0294	1.0306	1.0240
570 - 580 nm	1.0340	1.0355	1.0322	1.0378	1.0348	1.0353	1.0290
580 - 590 nm	1.0387	1.0408	1.0382	1.0445	1.0412	1.0413	1.0358
590 - 600 nm	1.0469	1.0470	1.0445	1.0494	1.0462	1.0466	1.0387
600 - 610 nm	1.0626	1.0613	1.0591	1.0630	1.0593	1.0590	1.0567
610 - 620 nm	1.0676	1.0672	1.0644	1.0682	1.0654	1.0631	1.0573
620 - 630 nm	1.0579	1.0561	1.0538	1.0554	1.0527	1.0511	1.0458
630 - 640 nm	1.0519	1.0495	1.0454	1.0471	1.0434	1.0410	1.0350
640 - 650 nm	1.0525	1.0507	1.0471	1.0483	1.0446	1.0424	1.0353
650 - 660 nm	1.0319	1.0288	1.0249	1.0253	1.0227	1.0165	1.0155
660 - 670 nm	1.0259	1.0239	1.0196	1.0207	1.0165	1.0136	1.0098
670 - 680 nm	1.0099	1.0085	1.0041	1.0058	1.0008	0.9984	0.9957
680 - 690 nm	1.0079	1.0094	1.0060	1.0065	1.0058	1.0072	0.9956
690 - 700 nm	0.9765	0.9733	0.9718	0.9718	0.9665	0.9645	0.9647
700 - 710 nm	0.9922	0.9889	0.9890	0.9865	0.9814	0.9811	0.9796
710 - 720 nm	0.9880	0.9878	0.9865	0.9839	0.9831	0.9833	0.9817
720 - 730 nm	0.9924	0.9919	0.9910	0.9882	0.9865	0.9876	0.9823
730 - 740 nm	0.9862	0.9863	0.9858	0.9829	0.9809	0.9820	0.9818
740 - 750 nm	0.9802	0.9787	0.9779	0.9763	0.9716	0.9736	0.9724
750 - 760 nm	0.9833	0.9833	0.9830	0.9783	0.9768	0.9828	0.9756
760 - 770 nm	0.9820	0.9847	0.9853	0.9813	0.9838	0.9889	0.9867
770 - 780 nm	0.9639	0.9611	0.9628	0.9559	0.9527	0.9581	0.9627

780 - 790 nm	1.0036	1.0054	1.0089	0.9999	1.0024	1.0098	1.0010
790 - 800 nm	0.9702	0.9686	0.9705	0.9631	0.9624	0.9697	0.9673
800 - 810 nm	0.9610	0.9586	0.9617	0.9532	0.9549	0.9630	0.9645
810 - 820 nm	0.9447	0.9411	0.9428	0.9355	0.9334	0.9466	0.9537
820 - 830 nm	1.0101	1.0236	1.0281	1.0197	1.0287	1.0499	1.0339
830 - 840 nm	0.8414	0.8402	0.8419	0.8366	0.8329	0.8472	0.8545
840 - 850 nm	0.9120	0.9114	0.9178	0.9065	0.9095	0.9249	0.9239
850 - 860 nm	0.9440	0.9393	0.9503	0.9391	0.9418	0.9575	0.9436
860 - 870 nm	0.9414	0.9330	0.9477	0.9377	0.9428	0.9493	0.9526
870 - 880 nm	0.9220	0.9002	0.9241	0.9140	0.9198	0.9336	0.9332
880 - 890 nm	0.9245	0.9514	0.9400	0.9287	0.9392	0.9587	0.9489
890 - 900 nm	0.9122	0.9279	0.9232	0.9140	0.9238	0.9415	0.9303
900 - 910 nm	0.8746	0.8841	0.8829	0.8760	0.8804	0.8972	0.8898
910 - 920 nm	0.9560	0.9689	0.9738	0.9609	0.9719	0.9946	0.9728
920 - 930 nm	0.7804	0.7828	0.7780	0.7763	0.7733	0.7789	0.7913
930 - 940 nm	0.9465	0.9473	0.9632	0.9526	0.9660	0.9810	0.9633
940 - 950 nm	0.8555	0.8568	0.8612	0.8552	0.8587	0.8676	0.8706
950 - 960 nm	0.8767	0.8861	0.8865	0.8819	0.8928	0.9044	0.8934
960 - 970 nm	0.8536	0.8551	0.8605	0.8553	0.8625	0.8623	0.8730
970 - 980 nm	0.8976	0.9079	0.9072	0.8999	0.9064	0.9171	0.8963
980 - 990 nm	0.7544	0.7518	0.7496	0.7487	0.7499	0.7458	0.7731
990 - 1000 nm	0.9677	0.9712	0.9834	0.9746	0.9939	0.9984	0.9762
1000 - 1010 nm	0.8096	0.8139	0.8118	0.8110	0.8123	0.8119	0.8400
1010 - 1020 nm	0.9421	0.9477	0.9580	0.9499	0.9581	0.9600	0.9591
1020 - 1030 nm	0.8587	0.8536	0.8664	0.8533	0.8530	0.8607	0.8669
1030 - 1040 nm	0.8982	0.9017	0.9062	0.8977	0.9199	0.9088	0.8874
1040 - 1050 nm	0.8585	0.8592	0.8700	0.8605	0.9050	0.8574	0.9557
1050 - 1060 nm	0.9134	0.9192	0.9285	0.9153	0.9621	0.9436	0.9072
1060 - 1070 nm	0.8973	0.9149	0.9207	0.9307	0.9803	0.9744	1.1775
1070 - 1080 nm	0.8951	0.8810	0.8985	0.9015	0.9390	0.8436	0.9179
1080 - 1090 nm	0.8767	0.8757	0.8860	0.8773	0.9137	0.8136	0.7287

Source: European Solar Test Installation – JRC

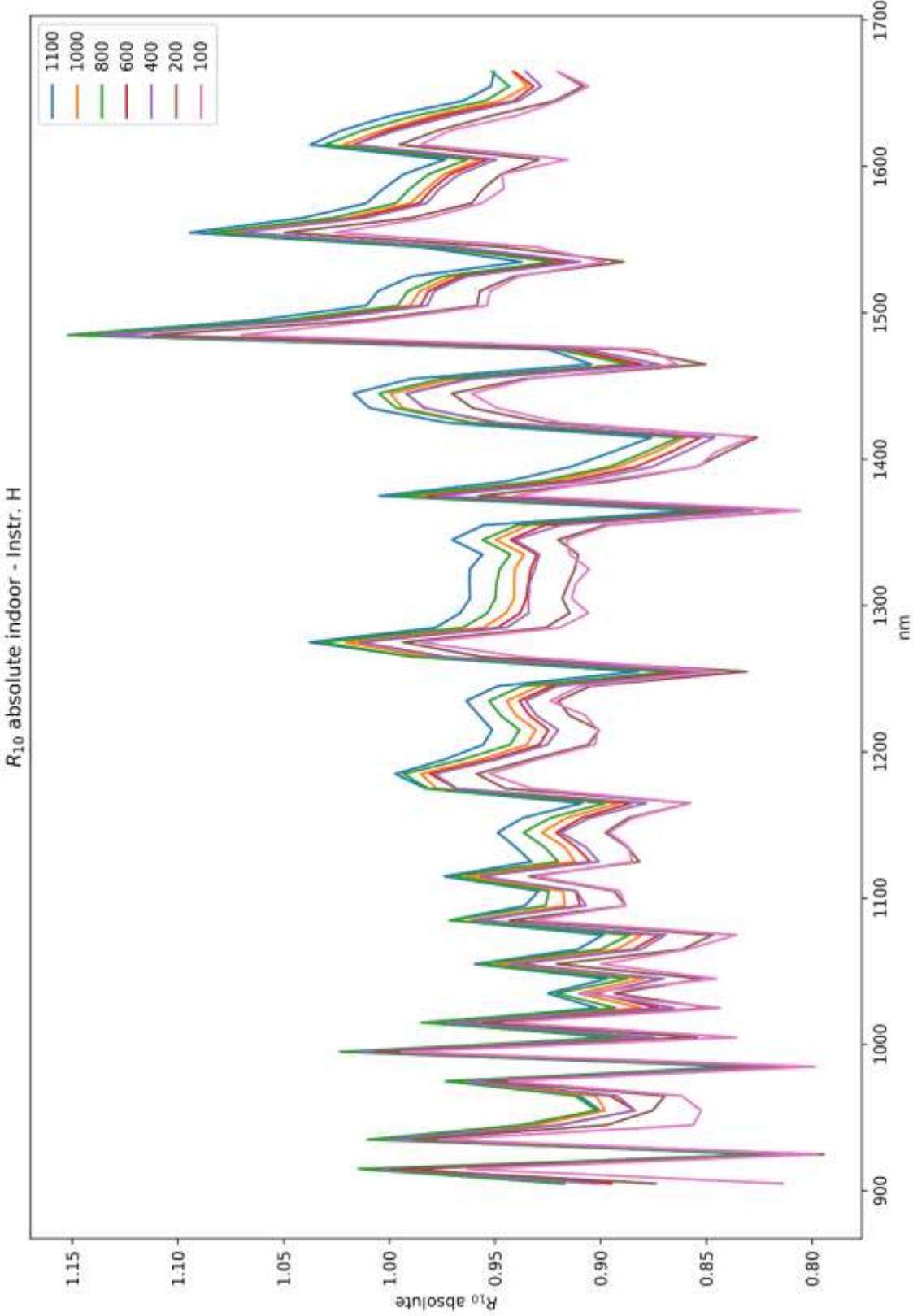
1.27 Instrument "H"

Figure 26: Instrument H - Indoor Apollo spectra at different irradiance levels.



Source: European Solar Test Installation – JRC.

Figure 27: Instrument H - Indoor R10 and R10* functions at different irradiance levels.



Source: European Solar Test Installation – JRC.

Table 23: Instrument H – Indoor R10 and R10* functions at different irradiance levels.

R10 absolute at different irradiances in Apollo							
Band	1100	1000	800	600	400	200	100
900 - 910 nm	0.9170	0.9185	0.9176	0.8948	0.9014	0.8739	0.8137
910 - 920 nm	1.0039	1.0071	1.0143	0.9908	1.0035	0.9990	0.9629
920 - 930 nm	0.8243	0.8198	0.8161	0.8016	0.8023	0.7942	0.7969
930 - 940 nm	0.9997	0.9927	1.0102	0.9899	1.0000	0.9890	0.9762
940 - 950 nm	0.9354	0.9304	0.9377	0.9197	0.9186	0.8970	0.8560
950 - 960 nm	0.9002	0.8978	0.9018	0.8836	0.8838	0.8753	0.8524
960 - 970 nm	0.9098	0.9021	0.9121	0.8954	0.8921	0.8695	0.8616
970 - 980 nm	0.9656	0.9679	0.9733	0.9566	0.9633	0.9529	0.9433
980 - 990 nm	0.8373	0.8284	0.8310	0.8206	0.8155	0.8017	0.7984
990 - 1000 nm	1.0091	1.0028	1.0234	1.0051	1.0145	1.0064	0.9941
1000 - 1010 nm	0.8961	0.8839	0.8899	0.8761	0.8747	0.8544	0.8357
1010 - 1020 nm	0.9805	0.9719	0.9848	0.9667	0.9712	0.9559	0.9452
1020 - 1030 nm	0.9018	0.8809	0.8930	0.8726	0.8654	0.8482	0.8435
1030 - 1040 nm	0.9248	0.9103	0.9207	0.9029	0.9040	0.8933	0.9100
1040 - 1050 nm	0.8970	0.8794	0.8874	0.8716	0.8701	0.8517	0.8453
1050 - 1060 nm	0.9594	0.9490	0.9569	0.9389	0.9427	0.9207	0.8997
1060 - 1070 nm	0.9108	0.8925	0.9001	0.8845	0.8809	0.8614	0.8591
1070 - 1080 nm	0.8986	0.8802	0.8862	0.8720	0.8692	0.8468	0.8357
1080 - 1090 nm	0.9713	0.9616	0.9714	0.9573	0.9594	0.9429	0.9321
1090 - 1100 nm	0.9356	0.9168	0.9260	0.9095	0.9068	0.8881	0.8880
1100 - 1110 nm	0.9293	0.9177	0.9245	0.9117	0.9114	0.8935	0.8910
1110 - 1120 nm	0.9738	0.9632	0.9702	0.9567	0.9563	0.9337	0.9303
1120 - 1130 nm	0.9327	0.9121	0.9200	0.9049	0.9007	0.8815	0.8851
1130 - 1140 nm	0.9402	0.9169	0.9265	0.9116	0.9070	0.8873	0.8866
1140 - 1150 nm	0.9486	0.9278	0.9365	0.9210	0.9189	0.8976	0.8960
1150 - 1160 nm	0.9367	0.9159	0.9236	0.9088	0.9049	0.8867	0.8847
1160 - 1170 nm	0.9089	0.8911	0.8979	0.8855	0.8784	0.8577	0.8576
1170 - 1180 nm	0.9827	0.9776	0.9815	0.9683	0.9679	0.9451	0.9325
1180 - 1190 nm	0.9971	0.9850	0.9932	0.9806	0.9785	0.9585	0.9524
1190 - 1200 nm	0.9735	0.9561	0.9649	0.9514	0.9488	0.9330	0.9296
1200 - 1210 nm	0.9555	0.9348	0.9428	0.9289	0.9253	0.9059	0.9027
1210 - 1220 nm	0.9512	0.9306	0.9384	0.9246	0.9200	0.9006	0.9012
1220 - 1230 nm	0.9575	0.9400	0.9472	0.9336	0.9304	0.9147	0.9072
1230 - 1240 nm	0.9635	0.9444	0.9527	0.9385	0.9353	0.9200	0.9238
1240 - 1250 nm	0.9485	0.9288	0.9371	0.9232	0.9204	0.9049	0.9095
1250 - 1260 nm	0.8821	0.8612	0.8666	0.8567	0.8494	0.8307	0.8442
1260 - 1270 nm	0.9877	0.9816	0.9890	0.9733	0.9749	0.9561	0.9374
1270 - 1280 nm	1.0377	1.0206	1.0322	1.0139	1.0132	0.9935	0.9851
1280 - 1290 nm	0.9780	0.9554	0.9650	0.9484	0.9443	0.9258	0.9191
1290 - 1300 nm	0.9664	0.9446	0.9534	0.9380	0.9340	0.9146	0.9057
1300 - 1310 nm	0.9617	0.9409	0.9497	0.9351	0.9341	0.9181	0.9136

1310 - 1320 nm	0.9620	0.9408	0.9492	0.9343	0.9336	0.9152	0.9118
1320 - 1330 nm	0.9618	0.9406	0.9477	0.9330	0.9312	0.9122	0.9053
1330 - 1340 nm	0.9558	0.9361	0.9426	0.9301	0.9289	0.9105	0.9144
1340 - 1350 nm	0.9702	0.9496	0.9557	0.9425	0.9406	0.9201	0.9160
1350 - 1360 nm	0.9554	0.9341	0.9394	0.9266	0.9189	0.8983	0.8963
1360 - 1370 nm	0.8547	0.8416	0.8434	0.8348	0.8280	0.8098	0.8055
1370 - 1380 nm	1.0045	0.9896	0.9972	0.9815	0.9777	0.9575	0.9408
1380 - 1390 nm	0.9441	0.9223	0.9289	0.9157	0.9092	0.8951	0.9013
1390 - 1400 nm	0.9138	0.8917	0.8955	0.8830	0.8754	0.8545	0.8536
1400 - 1410 nm	0.8947	0.8741	0.8788	0.8667	0.8602	0.8407	0.8455
1410 - 1420 nm	0.8759	0.8601	0.8627	0.8526	0.8461	0.8260	0.8284
1420 - 1430 nm	0.9729	0.9603	0.9612	0.9501	0.9482	0.9266	0.9184
1430 - 1440 nm	1.0092	0.9935	0.9966	0.9830	0.9835	0.9605	0.9488
1440 - 1450 nm	1.0171	0.9994	1.0048	0.9920	0.9917	0.9703	0.9610
1450 - 1460 nm	0.9897	0.9696	0.9755	0.9628	0.9609	0.9364	0.9335
1460 - 1470 nm	0.9043	0.8834	0.8865	0.8802	0.8721	0.8501	0.8637
1470 - 1480 nm	0.9246	0.9179	0.9202	0.9120	0.9065	0.8875	0.8762
1480 - 1490 nm	1.1520	1.1421	1.1511	1.1321	1.1357	1.1117	1.0699
1490 - 1500 nm	1.0633	1.0434	1.0502	1.0387	1.0348	1.0123	1.0046
1500 - 1510 nm	1.0108	0.9900	0.9960	0.9852	0.9821	0.9583	0.9537
1510 - 1520 nm	1.0053	0.9855	0.9912	0.9814	0.9787	0.9571	0.9522
1520 - 1530 nm	0.9893	0.9704	0.9751	0.9665	0.9634	0.9412	0.9387
1530 - 1540 nm	0.9373	0.9183	0.9223	0.9151	0.9096	0.8891	0.8981
1540 - 1550 nm	0.9843	0.9750	0.9779	0.9670	0.9663	0.9457	0.9298
1550 - 1560 nm	1.0944	1.0779	1.0845	1.0703	1.0713	1.0495	1.0258
1560 - 1570 nm	1.0409	1.0198	1.0269	1.0151	1.0115	0.9897	0.9815
1570 - 1580 nm	1.0109	0.9901	0.9968	0.9858	0.9823	0.9610	0.9562
1580 - 1590 nm	1.0027	0.9824	0.9902	0.9795	0.9762	0.9555	0.9457
1590 - 1600 nm	0.9931	0.9740	0.9813	0.9710	0.9666	0.9469	0.9465
1600 - 1610 nm	0.9734	0.9572	0.9629	0.9533	0.9492	0.9291	0.9154
1610 - 1620 nm	1.0373	1.0217	1.0305	1.0171	1.0169	0.9953	0.9852
1620 - 1630 nm	1.0221	1.0033	1.0122	0.9997	0.9962	0.9764	0.9708
1630 - 1640 nm	0.9989	0.9792	0.9873	0.9749	0.9698	0.9512	0.9393
1640 - 1650 nm	0.9651	0.9474	0.9544	0.9409	0.9386	0.9217	0.9198
1650 - 1660 nm	0.9517	0.9345	0.9430	0.9317	0.9280	0.9084	0.9057
1660 - 1670 nm	0.9502	0.9417	0.9515	0.9409	0.9355	0.9203	0.9201

R10* relative at different irradiances in Apollo							
Band	1100	1000	800	600	400	200	100
900 - 910 nm	0.9566	0.9719	0.9636	0.9537	0.9620	0.9517	0.8941
910 - 920 nm	1.0472	1.0656	1.0651	1.0560	1.0711	1.0879	1.0580
920 - 930 nm	0.8599	0.8674	0.8570	0.8544	0.8563	0.8650	0.8756
930 - 940 nm	1.0428	1.0504	1.0608	1.0552	1.0673	1.0770	1.0726
940 - 950 nm	0.9758	0.9844	0.9846	0.9803	0.9804	0.9769	0.9406

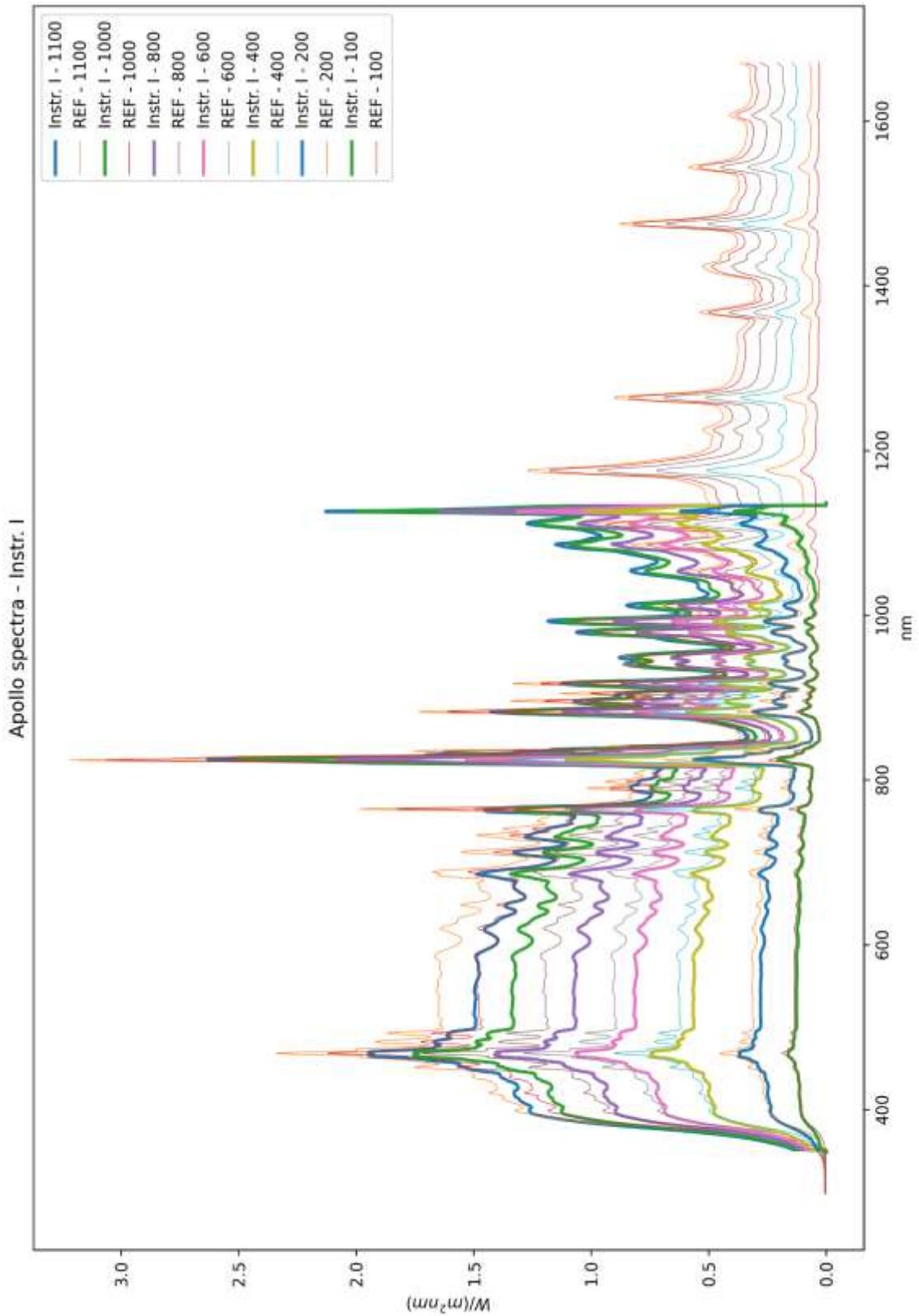
950 - 960 nm	0.9391	0.9500	0.9470	0.9419	0.9433	0.9533	0.9366
960 - 970 nm	0.9491	0.9545	0.9577	0.9544	0.9521	0.9469	0.9468
970 - 980 nm	1.0073	1.0241	1.0220	1.0196	1.0281	1.0377	1.0365
980 - 990 nm	0.8734	0.8765	0.8726	0.8747	0.8704	0.8730	0.8772
990 - 1000 nm	1.0526	1.0611	1.0746	1.0713	1.0828	1.0960	1.0923
1000 - 1010 nm	0.9348	0.9352	0.9345	0.9339	0.9335	0.9305	0.9182
1010 - 1020 nm	1.0228	1.0284	1.0342	1.0304	1.0365	1.0410	1.0386
1020 - 1030 nm	0.9407	0.9321	0.9377	0.9301	0.9236	0.9237	0.9268
1030 - 1040 nm	0.9647	0.9632	0.9668	0.9624	0.9649	0.9729	0.9999
1040 - 1050 nm	0.9358	0.9305	0.9318	0.9290	0.9287	0.9276	0.9288
1050 - 1060 nm	1.0009	1.0041	1.0049	1.0008	1.0061	1.0027	0.9886
1060 - 1070 nm	0.9501	0.9444	0.9451	0.9428	0.9402	0.9382	0.9440
1070 - 1080 nm	0.9374	0.9313	0.9305	0.9295	0.9277	0.9222	0.9182
1080 - 1090 nm	1.0132	1.0175	1.0201	1.0204	1.0239	1.0269	1.0242
1090 - 1100 nm	0.9760	0.9700	0.9723	0.9695	0.9678	0.9672	0.9758
1100 - 1110 nm	0.9694	0.9710	0.9707	0.9718	0.9727	0.9731	0.9790
1110 - 1120 nm	1.0158	1.0191	1.0188	1.0197	1.0207	1.0168	1.0222
1120 - 1130 nm	0.9729	0.9650	0.9660	0.9645	0.9614	0.9600	0.9725
1130 - 1140 nm	0.9808	0.9701	0.9729	0.9717	0.9680	0.9663	0.9742
1140 - 1150 nm	0.9896	0.9816	0.9834	0.9817	0.9808	0.9776	0.9845
1150 - 1160 nm	0.9771	0.9691	0.9699	0.9686	0.9658	0.9656	0.9721
1160 - 1170 nm	0.9481	0.9429	0.9429	0.9438	0.9375	0.9341	0.9423
1170 - 1180 nm	1.0252	1.0344	1.0306	1.0321	1.0331	1.0293	1.0247
1180 - 1190 nm	1.0401	1.0422	1.0430	1.0452	1.0443	1.0439	1.0465
1190 - 1200 nm	1.0155	1.0116	1.0133	1.0141	1.0126	1.0161	1.0214
1200 - 1210 nm	0.9967	0.9891	0.9900	0.9900	0.9876	0.9866	0.9919
1210 - 1220 nm	0.9923	0.9846	0.9853	0.9856	0.9819	0.9808	0.9902
1220 - 1230 nm	0.9988	0.9946	0.9946	0.9951	0.9930	0.9962	0.9968
1230 - 1240 nm	1.0051	0.9992	1.0004	1.0003	0.9982	1.0019	1.0151
1240 - 1250 nm	0.9895	0.9828	0.9840	0.9840	0.9824	0.9854	0.9994
1250 - 1260 nm	0.9202	0.9112	0.9100	0.9131	0.9066	0.9047	0.9276
1260 - 1270 nm	1.0304	1.0386	1.0386	1.0375	1.0405	1.0413	1.0300
1270 - 1280 nm	1.0825	1.0799	1.0839	1.0807	1.0813	1.0819	1.0824
1280 - 1290 nm	1.0202	1.0109	1.0133	1.0109	1.0079	1.0083	1.0099
1290 - 1300 nm	1.0081	0.9995	1.0012	0.9998	0.9968	0.9961	0.9952
1300 - 1310 nm	1.0032	0.9955	0.9973	0.9967	0.9969	0.9998	1.0039
1310 - 1320 nm	1.0035	0.9954	0.9968	0.9958	0.9965	0.9968	1.0018
1320 - 1330 nm	1.0033	0.9952	0.9952	0.9945	0.9938	0.9934	0.9947
1330 - 1340 nm	0.9971	0.9904	0.9898	0.9914	0.9914	0.9916	1.0047
1340 - 1350 nm	1.0120	1.0047	1.0036	1.0046	1.0039	1.0021	1.0065
1350 - 1360 nm	0.9966	0.9884	0.9864	0.9877	0.9808	0.9783	0.9848
1360 - 1370 nm	0.8916	0.8905	0.8857	0.8898	0.8838	0.8819	0.8850
1370 - 1380 nm	1.0479	1.0471	1.0472	1.0462	1.0435	1.0428	1.0337
1380 - 1390 nm	0.9849	0.9758	0.9754	0.9760	0.9704	0.9748	0.9904
1390 - 1400 nm	0.9533	0.9435	0.9403	0.9412	0.9343	0.9306	0.9379

1400 - 1410 nm	0.9333	0.9248	0.9228	0.9238	0.9181	0.9155	0.9291
1410 - 1420 nm	0.9137	0.9101	0.9059	0.9087	0.9030	0.8995	0.9103
1420 - 1430 nm	1.0149	1.0161	1.0093	1.0126	1.0120	1.0092	1.0091
1430 - 1440 nm	1.0528	1.0512	1.0465	1.0478	1.0497	1.0460	1.0425
1440 - 1450 nm	1.0610	1.0574	1.0552	1.0574	1.0585	1.0567	1.0560
1450 - 1460 nm	1.0324	1.0260	1.0243	1.0263	1.0256	1.0198	1.0257
1460 - 1470 nm	0.9433	0.9347	0.9308	0.9382	0.9308	0.9258	0.9490
1470 - 1480 nm	0.9645	0.9713	0.9663	0.9721	0.9675	0.9666	0.9628
1480 - 1490 nm	1.2017	1.2085	1.2087	1.2067	1.2122	1.2107	1.1756
1490 - 1500 nm	1.1092	1.1040	1.1028	1.1072	1.1045	1.1025	1.1039
1500 - 1510 nm	1.0545	1.0475	1.0458	1.0501	1.0482	1.0437	1.0479
1510 - 1520 nm	1.0487	1.0428	1.0409	1.0461	1.0445	1.0423	1.0463
1520 - 1530 nm	1.0320	1.0267	1.0239	1.0301	1.0283	1.0250	1.0315
1530 - 1540 nm	0.9778	0.9716	0.9685	0.9754	0.9708	0.9683	0.9869
1540 - 1550 nm	1.0268	1.0316	1.0268	1.0307	1.0313	1.0299	1.0217
1550 - 1560 nm	1.1416	1.1405	1.1389	1.1409	1.1434	1.1429	1.1271
1560 - 1570 nm	1.0858	1.0790	1.0783	1.0819	1.0796	1.0778	1.0784
1570 - 1580 nm	1.0545	1.0476	1.0468	1.0508	1.0485	1.0466	1.0507
1580 - 1590 nm	1.0459	1.0394	1.0398	1.0441	1.0418	1.0406	1.0392
1590 - 1600 nm	1.0359	1.0305	1.0304	1.0349	1.0317	1.0313	1.0400
1600 - 1610 nm	1.0154	1.0128	1.0111	1.0162	1.0131	1.0118	1.0059
1610 - 1620 nm	1.0821	1.0810	1.0821	1.0841	1.0854	1.0840	1.0825
1620 - 1630 nm	1.0662	1.0615	1.0629	1.0656	1.0632	1.0634	1.0667
1630 - 1640 nm	1.0420	1.0361	1.0368	1.0391	1.0351	1.0359	1.0320
1640 - 1650 nm	1.0067	1.0024	1.0022	1.0029	1.0018	1.0038	1.0106
1650 - 1660 nm	0.9928	0.9887	0.9903	0.9931	0.9904	0.9893	0.9952
1660 - 1670 nm	0.9913	0.9963	0.9991	1.0029	0.9984	1.0022	1.0110

Source: European Solar Test Installation – JRC

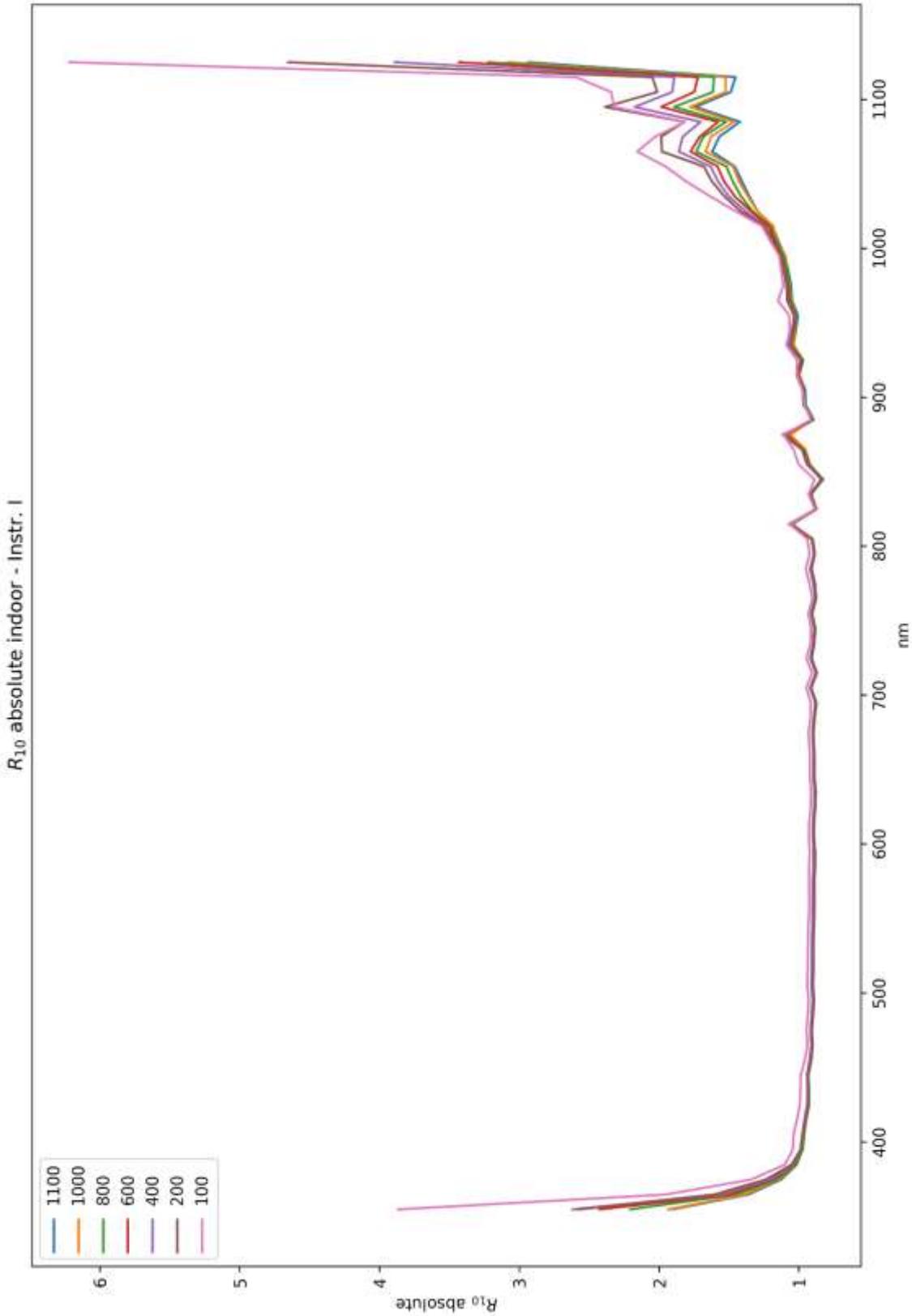
1.28 Instrument "I"

Figure 28: Instrument I - Indoor Apollo spectra at different irradiance levels.



Source: European Solar Test Installation – JRC.

Figure 29: Instrument I - Indoor R10 and R10* functions at different irradiance levels.



Source: European Solar Test Installation – JRC.

Table 24: Instrument I – Indoor R10 and R10* functions at different irradiance levels.

R10 absolute at different irradiances in Apollo							
Band	1100	1000	800	600	400	200	100
350 - 360 nm	1.9059	1.9349	2.2061	2.4244	2.6179	2.5747	3.8657
360 - 370 nm	1.3615	1.3878	1.4466	1.4949	1.5558	1.6037	1.9507
370 - 380 nm	1.1260	1.1399	1.1554	1.1857	1.2092	1.2366	1.3429
380 - 390 nm	1.0145	1.0167	1.0205	1.0371	1.0441	1.0529	1.1000
390 - 400 nm	0.9770	0.9759	0.9721	0.9879	0.9864	0.9880	1.0426
400 - 410 nm	0.9688	0.9687	0.9621	0.9752	0.9696	0.9672	1.0383
410 - 420 nm	0.9544	0.9510	0.9481	0.9595	0.9545	0.9476	1.0135
420 - 430 nm	0.9347	0.9317	0.9265	0.9408	0.9390	0.9307	0.9936
430 - 440 nm	0.9341	0.9330	0.9266	0.9365	0.9387	0.9303	0.9883
440 - 450 nm	0.9394	0.9370	0.9321	0.9413	0.9382	0.9321	0.9866
450 - 460 nm	0.9220	0.9203	0.9137	0.9233	0.9210	0.9105	0.9581
460 - 470 nm	0.9095	0.9089	0.9019	0.9104	0.9090	0.9013	0.9370
470 - 480 nm	0.9161	0.9137	0.9079	0.9155	0.9165	0.9068	0.9448
480 - 490 nm	0.9093	0.9052	0.9007	0.9082	0.9087	0.8980	0.9367
490 - 500 nm	0.9005	0.8977	0.8915	0.8986	0.8977	0.8905	0.9291
500 - 510 nm	0.9106	0.9061	0.8989	0.9056	0.9089	0.8986	0.9403
510 - 520 nm	0.9082	0.9050	0.8981	0.9060	0.9061	0.8950	0.9372
520 - 530 nm	0.9070	0.9036	0.8981	0.9035	0.9057	0.8948	0.9356
530 - 540 nm	0.9056	0.9026	0.8977	0.9029	0.9040	0.8952	0.9341
540 - 550 nm	0.9034	0.9000	0.8943	0.9006	0.9006	0.8906	0.9320
550 - 560 nm	0.9013	0.8990	0.8927	0.8982	0.8989	0.8893	0.9253
560 - 570 nm	0.9005	0.8974	0.8930	0.8972	0.9000	0.8876	0.9250
570 - 580 nm	0.9008	0.8969	0.8916	0.8977	0.8992	0.8875	0.9266
580 - 590 nm	0.8961	0.8938	0.8876	0.8934	0.8941	0.8839	0.9258
590 - 600 nm	0.8935	0.8904	0.8848	0.8909	0.8903	0.8835	0.9221
600 - 610 nm	0.8997	0.8972	0.8919	0.8978	0.8983	0.8910	0.9277
610 - 620 nm	0.8983	0.8968	0.8910	0.8964	0.8986	0.8909	0.9252
620 - 630 nm	0.8901	0.8884	0.8828	0.8869	0.8896	0.8826	0.9150
630 - 640 nm	0.8871	0.8850	0.8795	0.8859	0.8848	0.8783	0.9122
640 - 650 nm	0.8969	0.8948	0.8874	0.8947	0.8970	0.8883	0.9206
650 - 660 nm	0.8947	0.8916	0.8871	0.8927	0.8929	0.8856	0.9196
660 - 670 nm	0.8975	0.8950	0.8915	0.8964	0.8972	0.8909	0.9236
670 - 680 nm	0.9020	0.8992	0.8950	0.8998	0.9025	0.8978	0.9306
680 - 690 nm	0.8909	0.8891	0.8861	0.8902	0.8933	0.8903	0.9164
690 - 700 nm	0.8818	0.8788	0.8732	0.8790	0.8810	0.8774	0.9141
700 - 710 nm	0.9142	0.9142	0.9119	0.9155	0.9199	0.9114	0.9465
710 - 720 nm	0.8786	0.8751	0.8705	0.8758	0.8785	0.8724	0.9049
720 - 730 nm	0.9120	0.9110	0.9076	0.9122	0.9183	0.9093	0.9453
730 - 740 nm	0.8921	0.8899	0.8879	0.8922	0.8971	0.8919	0.9159
740 - 750 nm	0.8893	0.8860	0.8817	0.8900	0.8910	0.8856	0.9133
750 - 760 nm	0.9062	0.9051	0.9037	0.9100	0.9110	0.9084	0.9316
760 - 770 nm	0.8801	0.8763	0.8755	0.8807	0.8833	0.8815	0.9025

770 - 780 nm	0.8939	0.8885	0.8854	0.8933	0.8959	0.8838	0.9237
780 - 790 nm	0.9128	0.9128	0.9090	0.9168	0.9202	0.9099	0.9503
790 - 800 nm	0.8887	0.8849	0.8869	0.8914	0.8917	0.8844	0.9223
800 - 810 nm	0.9047	0.8993	0.9023	0.9084	0.9084	0.9057	0.9393
810 - 820 nm	1.0450	1.0546	1.0618	1.0637	1.0729	1.0691	1.0673
820 - 830 nm	0.8727	0.8723	0.8755	0.8786	0.8812	0.8819	0.8844
830 - 840 nm	0.9121	0.9095	0.9132	0.9176	0.9221	0.9208	0.9305
840 - 850 nm	0.8406	0.8294	0.8257	0.8398	0.8376	0.8297	0.8864
850 - 860 nm	0.9275	0.9196	0.9237	0.9315	0.9382	0.9409	1.0016
860 - 870 nm	0.9597	0.9518	0.9618	0.9704	0.9753	0.9772	1.0369
870 - 880 nm	1.0718	1.0599	1.1003	1.1023	1.1166	1.1163	1.1094
880 - 890 nm	0.8951	0.9042	0.8937	0.8996	0.8987	0.9005	0.9142
890 - 900 nm	0.9495	0.9615	0.9531	0.9625	0.9630	0.9671	0.9587
900 - 910 nm	0.9545	0.9615	0.9607	0.9663	0.9713	0.9732	0.9752
910 - 920 nm	0.9953	0.9966	1.0063	1.0092	1.0159	1.0173	1.0149
920 - 930 nm	0.9696	0.9712	0.9680	0.9766	0.9859	0.9850	1.0125
930 - 940 nm	1.0376	1.0358	1.0520	1.0589	1.0712	1.0592	1.0887
940 - 950 nm	1.0208	1.0259	1.0318	1.0395	1.0503	1.0422	1.0647
950 - 960 nm	1.0064	1.0131	1.0130	1.0238	1.0287	1.0344	1.0680
960 - 970 nm	1.0474	1.0524	1.0595	1.0702	1.0803	1.0832	1.1490
970 - 980 nm	1.0554	1.0647	1.0679	1.0789	1.0894	1.0830	1.1105
980 - 990 nm	1.0748	1.0815	1.0810	1.0986	1.1050	1.1081	1.1251
990 - 1000 nm	1.0981	1.0954	1.1092	1.1252	1.1347	1.1335	1.1403
1000 - 1010 nm	1.1470	1.1557	1.1607	1.1746	1.1918	1.1885	1.2041
1010 - 1020 nm	1.1862	1.1818	1.2038	1.2162	1.2400	1.2432	1.2637
1020 - 1030 nm	1.2954	1.2976	1.3305	1.3434	1.3813	1.4159	1.4517
1030 - 1040 nm	1.3544	1.3655	1.4133	1.4580	1.5005	1.5320	1.6344
1040 - 1050 nm	1.4070	1.4281	1.4719	1.5351	1.5778	1.6215	1.8055
1050 - 1060 nm	1.4583	1.4700	1.5185	1.5809	1.6306	1.6788	1.9521
1060 - 1070 nm	1.6195	1.6669	1.7337	1.7742	1.8580	1.9787	2.1548
1070 - 1080 nm	1.5682	1.6278	1.6832	1.7082	1.8302	1.9853	2.0275
1080 - 1090 nm	1.4223	1.4645	1.5211	1.5774	1.7016	1.8182	1.8149
1090 - 1100 nm	1.7399	1.7786	1.8934	1.9846	2.1742	2.3855	2.3204
1100 - 1110 nm	1.4872	1.5224	1.6144	1.7483	1.9059	2.0122	2.3428
1110 - 1120 nm	1.4529	1.5229	1.6067	1.7212	1.8901	2.0478	2.5931
1120 - 1130 nm	2.9357	3.0783	3.2198	3.4303	3.8891	4.6512	6.2161

R10* relative at different irradiances in Apollo							
Band	1100	1000	800	600	400	200	100
350 - 360 nm	1.9507	1.9751	2.2477	2.4397	2.6037	2.5355	3.6105
360 - 370 nm	1.3936	1.4166	1.4739	1.5043	1.5474	1.5793	1.8219
370 - 380 nm	1.1525	1.1636	1.1771	1.1932	1.2027	1.2177	1.2543
380 - 390 nm	1.0384	1.0379	1.0397	1.0437	1.0385	1.0368	1.0274
390 - 400 nm	1.0000	0.9962	0.9904	0.9942	0.9810	0.9729	0.9738

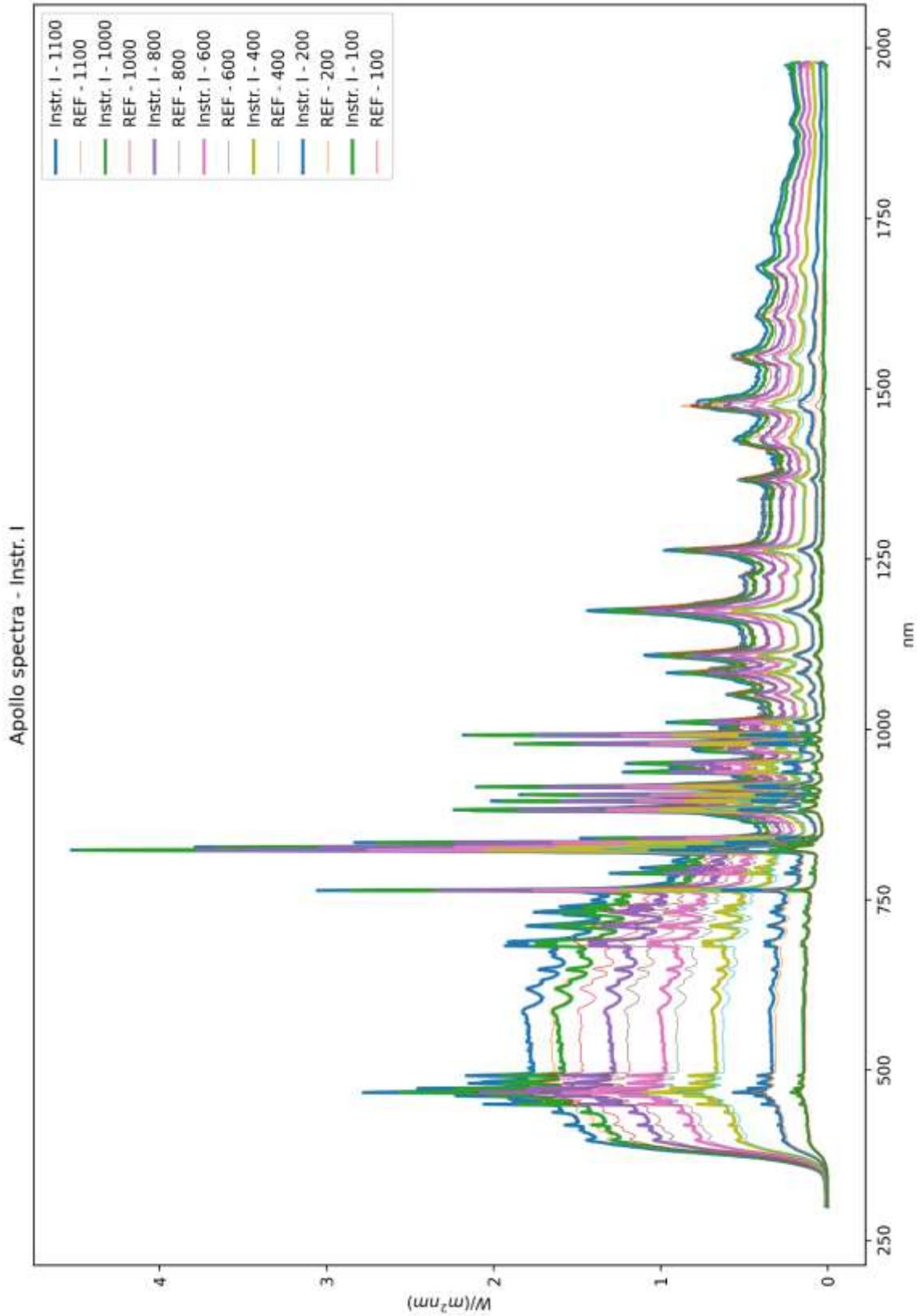
400 - 410 nm	0.9916	0.9889	0.9802	0.9813	0.9644	0.9525	0.9698
410 - 420 nm	0.9769	0.9708	0.9660	0.9655	0.9494	0.9332	0.9466
420 - 430 nm	0.9567	0.9510	0.9440	0.9468	0.9339	0.9165	0.9280
430 - 440 nm	0.9561	0.9524	0.9441	0.9424	0.9336	0.9161	0.9231
440 - 450 nm	0.9615	0.9565	0.9497	0.9473	0.9331	0.9179	0.9215
450 - 460 nm	0.9437	0.9394	0.9309	0.9291	0.9161	0.8966	0.8948
460 - 470 nm	0.9309	0.9278	0.9189	0.9162	0.9041	0.8876	0.8751
470 - 480 nm	0.9376	0.9327	0.9251	0.9213	0.9115	0.8930	0.8824
480 - 490 nm	0.9307	0.9241	0.9176	0.9139	0.9038	0.8844	0.8749
490 - 500 nm	0.9218	0.9163	0.9083	0.9043	0.8929	0.8769	0.8677
500 - 510 nm	0.9320	0.9249	0.9159	0.9113	0.9040	0.8850	0.8782
510 - 520 nm	0.9295	0.9238	0.9150	0.9117	0.9012	0.8814	0.8754
520 - 530 nm	0.9284	0.9224	0.9150	0.9092	0.9008	0.8812	0.8738
530 - 540 nm	0.9269	0.9214	0.9146	0.9086	0.8991	0.8816	0.8724
540 - 550 nm	0.9247	0.9187	0.9111	0.9063	0.8958	0.8771	0.8705
550 - 560 nm	0.9226	0.9177	0.9096	0.9039	0.8940	0.8757	0.8642
560 - 570 nm	0.9217	0.9160	0.9098	0.9028	0.8951	0.8741	0.8639
570 - 580 nm	0.9220	0.9155	0.9084	0.9033	0.8944	0.8740	0.8654
580 - 590 nm	0.9172	0.9124	0.9043	0.8990	0.8893	0.8704	0.8647
590 - 600 nm	0.9146	0.9089	0.9015	0.8965	0.8855	0.8700	0.8612
600 - 610 nm	0.9209	0.9159	0.9087	0.9035	0.8934	0.8774	0.8665
610 - 620 nm	0.9194	0.9154	0.9078	0.9021	0.8937	0.8773	0.8641
620 - 630 nm	0.9110	0.9068	0.8995	0.8925	0.8848	0.8692	0.8546
630 - 640 nm	0.9080	0.9034	0.8961	0.8915	0.8800	0.8649	0.8520
640 - 650 nm	0.9180	0.9134	0.9041	0.9004	0.8922	0.8747	0.8598
650 - 660 nm	0.9157	0.9102	0.9038	0.8984	0.8881	0.8721	0.8588
660 - 670 nm	0.9186	0.9136	0.9083	0.9021	0.8923	0.8773	0.8626
670 - 680 nm	0.9233	0.9179	0.9119	0.9055	0.8977	0.8841	0.8692
680 - 690 nm	0.9119	0.9076	0.9028	0.8958	0.8885	0.8768	0.8559
690 - 700 nm	0.9026	0.8971	0.8897	0.8846	0.8762	0.8640	0.8538
700 - 710 nm	0.9358	0.9332	0.9291	0.9213	0.9149	0.8975	0.8840
710 - 720 nm	0.8993	0.8933	0.8869	0.8814	0.8737	0.8591	0.8452
720 - 730 nm	0.9334	0.9299	0.9247	0.9180	0.9133	0.8955	0.8829
730 - 740 nm	0.9131	0.9085	0.9046	0.8979	0.8922	0.8783	0.8554
740 - 750 nm	0.9102	0.9044	0.8983	0.8956	0.8862	0.8721	0.8530
750 - 760 nm	0.9275	0.9239	0.9208	0.9158	0.9061	0.8945	0.8701
760 - 770 nm	0.9008	0.8945	0.8920	0.8862	0.8785	0.8681	0.8429
770 - 780 nm	0.9150	0.9070	0.9020	0.8990	0.8911	0.8704	0.8627
780 - 790 nm	0.9343	0.9318	0.9262	0.9226	0.9152	0.8961	0.8875
790 - 800 nm	0.9096	0.9033	0.9036	0.8970	0.8869	0.8709	0.8614
800 - 810 nm	0.9260	0.9180	0.9193	0.9141	0.9035	0.8919	0.8772
810 - 820 nm	1.0696	1.0766	1.0818	1.0704	1.0671	1.0528	0.9968
820 - 830 nm	0.8932	0.8904	0.8920	0.8842	0.8764	0.8685	0.8260
830 - 840 nm	0.9335	0.9284	0.9304	0.9235	0.9171	0.9068	0.8690
840 - 850 nm	0.8604	0.8466	0.8413	0.8451	0.8331	0.8171	0.8278

850 - 860 nm	0.9494	0.9387	0.9411	0.9374	0.9331	0.9266	0.9355
860 - 870 nm	0.9823	0.9716	0.9800	0.9765	0.9700	0.9623	0.9684
870 - 880 nm	1.0971	1.0819	1.1211	1.1093	1.1106	1.0993	1.0361
880 - 890 nm	0.9162	0.9230	0.9106	0.9053	0.8939	0.8867	0.8538
890 - 900 nm	0.9719	0.9814	0.9710	0.9685	0.9578	0.9523	0.8954
900 - 910 nm	0.9770	0.9815	0.9788	0.9724	0.9661	0.9584	0.9108
910 - 920 nm	1.0187	1.0173	1.0253	1.0155	1.0104	1.0018	0.9479
920 - 930 nm	0.9924	0.9914	0.9863	0.9827	0.9806	0.9700	0.9456
930 - 940 nm	1.0621	1.0573	1.0718	1.0656	1.0655	1.0431	1.0169
940 - 950 nm	1.0448	1.0472	1.0513	1.0461	1.0446	1.0263	0.9944
950 - 960 nm	1.0301	1.0341	1.0321	1.0303	1.0232	1.0187	0.9975
960 - 970 nm	1.0721	1.0743	1.0794	1.0770	1.0745	1.0667	1.0731
970 - 980 nm	1.0802	1.0868	1.0880	1.0858	1.0835	1.0665	1.0371
980 - 990 nm	1.1001	1.1040	1.1014	1.1055	1.0990	1.0912	1.0508
990 - 1000 nm	1.1239	1.1181	1.1301	1.1323	1.1285	1.1163	1.0650
1000 - 1010 nm	1.1740	1.1797	1.1825	1.1820	1.1853	1.1704	1.1246
1010 - 1020 nm	1.2142	1.2064	1.2265	1.2239	1.2333	1.2242	1.1803
1020 - 1030 nm	1.3259	1.3246	1.3555	1.3519	1.3738	1.3944	1.3558
1030 - 1040 nm	1.3863	1.3939	1.4399	1.4672	1.4924	1.5087	1.5265
1040 - 1050 nm	1.4402	1.4578	1.4996	1.5448	1.5692	1.5968	1.6863
1050 - 1060 nm	1.4926	1.5006	1.5471	1.5909	1.6218	1.6533	1.8232
1060 - 1070 nm	1.6576	1.7016	1.7664	1.7854	1.8480	1.9485	2.0125
1070 - 1080 nm	1.6052	1.6616	1.7150	1.7191	1.8203	1.9551	1.8937
1080 - 1090 nm	1.4558	1.4949	1.5498	1.5874	1.6924	1.7906	1.6950
1090 - 1100 nm	1.7809	1.8156	1.9291	1.9972	2.1624	2.3492	2.1672
1100 - 1110 nm	1.5223	1.5541	1.6448	1.7594	1.8956	1.9816	2.1881
1110 - 1120 nm	1.4871	1.5545	1.6370	1.7321	1.8799	2.0166	2.4219
1120 - 1130 nm	3.0048	3.1423	3.2805	3.4520	3.8681	4.5804	5.8056

Source: European Solar Test Installation – JRC

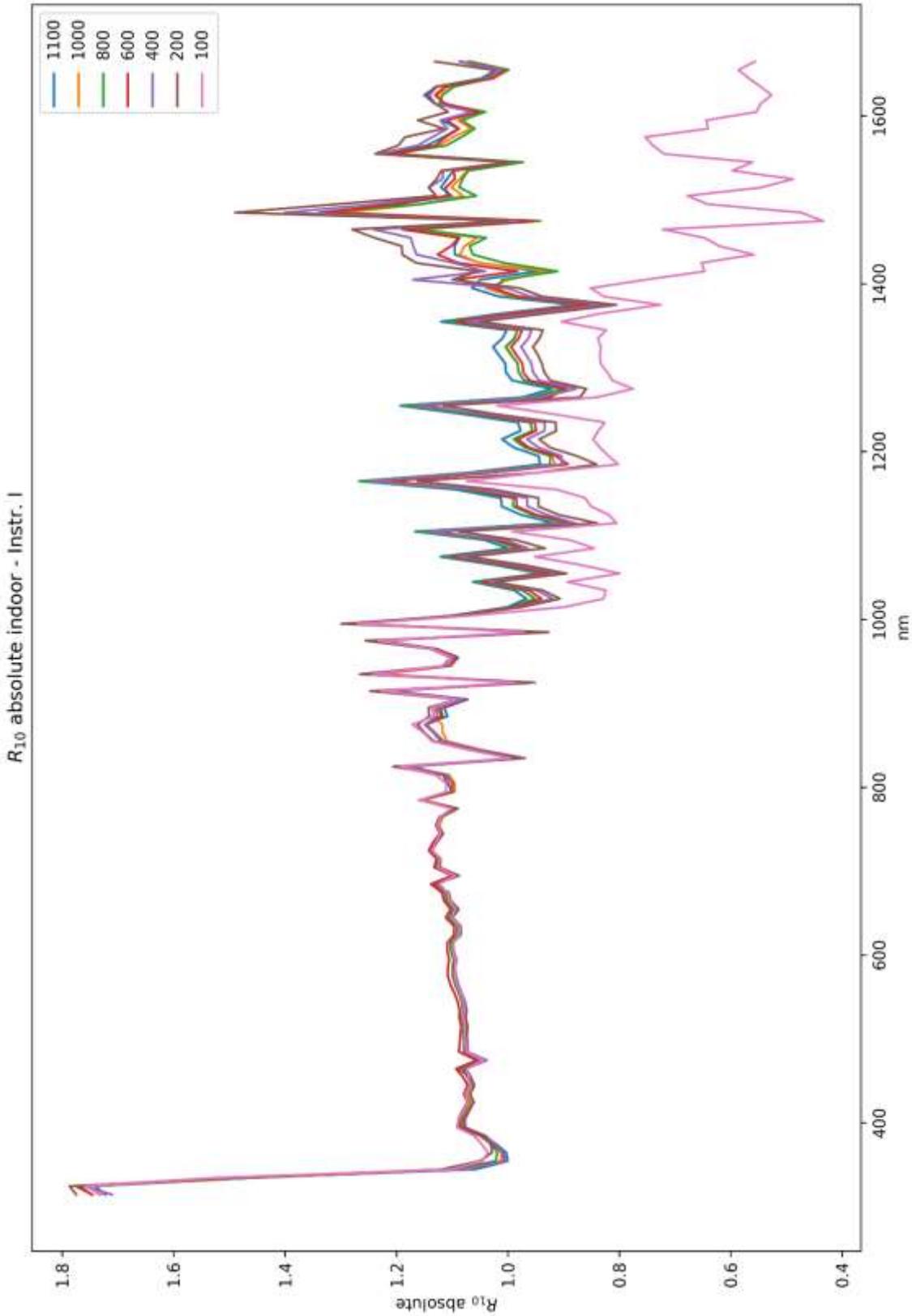
1.29 Instrument "J"

Figure 30: Instrument J - Indoor Apollo spectra at different irradiance levels.



Source: European Solar Test Installation – JRC.

Figure 31: Instrument J - Indoor R10 and R10* functions at different irradiance levels.



Source: European Solar Test Installation – JRC.

Table 25: Instrument J – Indoor R10 and R10* functions at different irradiance levels.

R10 absolute at different irradiances in Apollo							
Band	1100	1000	800	600	400	200	100
310 - 320 nm	1.7221	1.7337	1.7477	1.7458	1.7104	1.7747	1.7298
320 - 330 nm	1.7414	1.7535	1.7671	1.7754	1.7607	1.7869	1.7591
330 - 340 nm	1.4562	1.4702	1.5057	1.5166	1.5020	1.4906	1.5268
340 - 350 nm	1.0586	1.0733	1.0965	1.0840	1.0822	1.1192	1.1015
350 - 360 nm	0.9997	1.0120	1.0216	1.0046	1.0027	1.0496	1.0457
360 - 370 nm	1.0026	1.0104	1.0186	1.0107	1.0083	1.0282	1.0357
370 - 380 nm	1.0203	1.0236	1.0294	1.0249	1.0220	1.0305	1.0465
380 - 390 nm	1.0427	1.0432	1.0492	1.0475	1.0394	1.0420	1.0599
390 - 400 nm	1.0811	1.0813	1.0851	1.0872	1.0757	1.0786	1.0912
400 - 410 nm	1.0820	1.0821	1.0851	1.0888	1.0763	1.0799	1.0881
410 - 420 nm	1.0750	1.0744	1.0772	1.0809	1.0688	1.0702	1.0787
420 - 430 nm	1.0680	1.0664	1.0688	1.0720	1.0607	1.0610	1.0708
430 - 440 nm	1.0743	1.0729	1.0756	1.0789	1.0677	1.0677	1.0757
440 - 450 nm	1.0669	1.0657	1.0674	1.0720	1.0596	1.0603	1.0679
450 - 460 nm	1.0711	1.0714	1.0723	1.0800	1.0658	1.0691	1.0704
460 - 470 nm	1.0753	1.0799	1.0784	1.0930	1.0742	1.0876	1.0733
470 - 480 nm	1.0431	1.0446	1.0440	1.0554	1.0372	1.0462	1.0434
480 - 490 nm	1.0757	1.0780	1.0778	1.0875	1.0716	1.0791	1.0739
490 - 500 nm	1.0766	1.0777	1.0782	1.0861	1.0718	1.0763	1.0756
500 - 510 nm	1.0790	1.0787	1.0802	1.0854	1.0731	1.0747	1.0776
510 - 520 nm	1.0773	1.0771	1.0786	1.0835	1.0716	1.0726	1.0765
520 - 530 nm	1.0803	1.0809	1.0820	1.0868	1.0753	1.0754	1.0797
530 - 540 nm	1.0791	1.0798	1.0808	1.0864	1.0737	1.0759	1.0778
540 - 550 nm	1.0816	1.0819	1.0830	1.0900	1.0764	1.0794	1.0800
550 - 560 nm	1.0857	1.0874	1.0879	1.0956	1.0827	1.0851	1.0846
560 - 570 nm	1.0925	1.0940	1.0945	1.1028	1.0884	1.0930	1.0913
570 - 580 nm	1.0967	1.0986	1.0987	1.1073	1.0926	1.0972	1.0952
580 - 590 nm	1.0969	1.0994	1.0991	1.1075	1.0943	1.0982	1.0945
590 - 600 nm	1.0959	1.0970	1.0970	1.1052	1.0915	1.0947	1.0934
600 - 610 nm	1.1011	1.1011	1.1026	1.1085	1.0973	1.0971	1.0987
610 - 620 nm	1.1009	1.1010	1.1025	1.1084	1.0982	1.0979	1.0976
620 - 630 nm	1.0899	1.0891	1.0901	1.0959	1.0857	1.0840	1.0864
630 - 640 nm	1.0913	1.0894	1.0915	1.0966	1.0868	1.0847	1.0876
640 - 650 nm	1.1053	1.1040	1.1057	1.1113	1.1020	1.0992	1.1005
650 - 660 nm	1.0974	1.0949	1.0969	1.1024	1.0919	1.0879	1.0935
660 - 670 nm	1.1095	1.1073	1.1096	1.1145	1.1058	1.1027	1.1052
670 - 680 nm	1.1124	1.1107	1.1131	1.1182	1.1085	1.1059	1.1083
680 - 690 nm	1.1283	1.1298	1.1312	1.1380	1.1302	1.1297	1.1234
690 - 700 nm	1.0966	1.0930	1.0936	1.0997	1.0900	1.0874	1.0948
700 - 710 nm	1.1285	1.1258	1.1286	1.1321	1.1245	1.1221	1.1255
710 - 720 nm	1.1224	1.1211	1.1225	1.1277	1.1217	1.1203	1.1217

720 - 730 nm	1.1369	1.1360	1.1392	1.1418	1.1368	1.1355	1.1356
730 - 740 nm	1.1280	1.1270	1.1294	1.1337	1.1282	1.1270	1.1291
740 - 750 nm	1.1198	1.1165	1.1182	1.1217	1.1169	1.1157	1.1206
750 - 760 nm	1.1251	1.1231	1.1265	1.1288	1.1261	1.1269	1.1258
760 - 770 nm	1.1171	1.1169	1.1182	1.1230	1.1208	1.1228	1.1218
770 - 780 nm	1.0950	1.0890	1.0938	1.0933	1.0900	1.0901	1.1010
780 - 790 nm	1.1531	1.1501	1.1573	1.1559	1.1574	1.1592	1.1575
790 - 800 nm	1.0993	1.0946	1.1001	1.0994	1.0988	1.0999	1.1109
800 - 810 nm	1.0986	1.0951	1.1009	1.0995	1.1013	1.1078	1.1104
810 - 820 nm	1.1128	1.1052	1.1113	1.1096	1.1078	1.1163	1.1295
820 - 830 nm	1.1722	1.1805	1.1814	1.1843	1.1895	1.2059	1.1939
830 - 840 nm	0.9721	0.9683	0.9704	0.9703	0.9692	0.9777	0.9952
840 - 850 nm	1.0513	1.0479	1.0552	1.0517	1.0530	1.0667	1.0714
850 - 860 nm	1.1197	1.1083	1.1209	1.1148	1.1169	1.1322	1.1357
860 - 870 nm	1.1303	1.1169	1.1329	1.1303	1.1318	1.1488	1.1506
870 - 880 nm	1.1474	1.1173	1.1492	1.1461	1.1490	1.1620	1.1713
880 - 890 nm	1.1083	1.1342	1.1197	1.1168	1.1265	1.1409	1.1326
890 - 900 nm	1.1140	1.1292	1.1238	1.1207	1.1278	1.1423	1.1352
900 - 910 nm	1.0719	1.0805	1.0776	1.0755	1.0801	1.0930	1.0934
910 - 920 nm	1.2078	1.2174	1.2212	1.2187	1.2285	1.2469	1.2270
920 - 930 nm	0.9651	0.9626	0.9567	0.9584	0.9510	0.9578	0.9858
930 - 940 nm	1.2297	1.2275	1.2461	1.2390	1.2528	1.2656	1.2429
940 - 950 nm	1.1021	1.1005	1.1037	1.1046	1.1066	1.1128	1.1169
950 - 960 nm	1.0889	1.0926	1.0935	1.0920	1.0973	1.1035	1.1034
960 - 970 nm	1.1272	1.1250	1.1313	1.1276	1.1330	1.1378	1.1355
970 - 980 nm	1.2230	1.2355	1.2362	1.2330	1.2435	1.2557	1.2324
980 - 990 nm	0.9518	0.9403	0.9310	0.9410	0.9275	0.9269	0.9705
990 - 1000 nm	1.2636	1.2630	1.2750	1.2744	1.2848	1.2988	1.2699
1000 - 1010 nm	1.0986	1.0951	1.0944	1.0928	1.0908	1.0878	1.0633
1010 - 1020 nm	1.0003	0.9905	0.9918	0.9870	0.9797	0.9740	0.8982
1020 - 1030 nm	0.9661	0.9506	0.9515	0.9393	0.9195	0.9061	0.8279
1030 - 1040 nm	0.9886	0.9745	0.9726	0.9620	0.9483	0.9377	0.8237
1040 - 1050 nm	1.0624	1.0538	1.0538	1.0433	1.0333	1.0227	0.8931
1050 - 1060 nm	0.9428	0.9303	0.9258	0.9231	0.9065	0.8942	0.7988
1060 - 1070 nm	1.0211	1.0069	1.0053	0.9984	0.9837	0.9698	0.8664
1070 - 1080 nm	1.1209	1.1088	1.1081	1.0998	1.0880	1.0706	0.9515
1080 - 1090 nm	0.9991	0.9812	0.9821	0.9691	0.9636	0.9327	0.8446
1090 - 1100 nm	1.0416	1.0265	1.0271	1.0200	1.0048	0.9853	0.8890
1100 - 1110 nm	1.1662	1.1497	1.1579	1.1268	1.1428	1.0883	0.9916
1110 - 1120 nm	0.9160	0.8934	0.8947	0.8812	0.8785	0.8395	0.8044
1120 - 1130 nm	0.9764	0.9563	0.9553	0.9494	0.9295	0.9088	0.8185
1130 - 1140 nm	1.0109	0.9899	0.9902	0.9838	0.9647	0.9450	0.8503
1140 - 1150 nm	1.0120	0.9908	0.9904	0.9846	0.9652	0.9447	0.8610
1150 - 1160 nm	1.0932	1.0710	1.0749	1.0636	1.0500	1.0240	0.9121
1160 - 1170 nm	1.2668	1.2438	1.2645	1.2112	1.2466	1.1618	1.0738

1170 - 1180 nm	1.0738	1.0575	1.0650	1.0330	1.0533	0.9488	0.9494
1180 - 1190 nm	0.9420	0.9153	0.9240	0.8919	0.9036	0.8404	0.8016
1190 - 1200 nm	0.9443	0.9205	0.9239	0.9137	0.9034	0.8759	0.8188
1200 - 1210 nm	0.9889	0.9685	0.9688	0.9618	0.9447	0.9238	0.8347
1210 - 1220 nm	1.0102	0.9893	0.9896	0.9821	0.9653	0.9436	0.8468
1220 - 1230 nm	0.9768	0.9555	0.9558	0.9489	0.9342	0.9128	0.8371
1230 - 1240 nm	0.9814	0.9598	0.9590	0.9515	0.9331	0.9140	0.8259
1240 - 1250 nm	1.0811	1.0624	1.0650	1.0538	1.0436	1.0232	0.9189
1250 - 1260 nm	1.1927	1.1695	1.1823	1.1500	1.1661	1.1159	1.0191
1260 - 1270 nm	0.9727	0.9488	0.9569	0.9243	0.9410	0.8699	0.8403
1270 - 1280 nm	0.9208	0.9018	0.9015	0.8945	0.8769	0.8587	0.7750
1280 - 1290 nm	0.9921	0.9705	0.9703	0.9611	0.9437	0.9237	0.8120
1290 - 1300 nm	1.0035	0.9812	0.9807	0.9724	0.9547	0.9347	0.8213
1300 - 1310 nm	1.0041	0.9822	0.9819	0.9734	0.9573	0.9385	0.8331
1310 - 1320 nm	1.0157	0.9937	0.9928	0.9841	0.9663	0.9455	0.8343
1320 - 1330 nm	1.0263	1.0043	1.0030	0.9939	0.9758	0.9547	0.8330
1330 - 1340 nm	1.0098	0.9885	0.9873	0.9803	0.9629	0.9429	0.8380
1340 - 1350 nm	1.0017	0.9824	0.9823	0.9742	0.9572	0.9369	0.8234
1350 - 1360 nm	1.1200	1.1030	1.1035	1.0922	1.0736	1.0507	0.9037
1360 - 1370 nm	1.0085	0.9900	0.9842	0.9822	0.9546	0.9293	0.8315
1370 - 1380 nm	0.8800	0.8591	0.8561	0.8515	0.8265	0.8050	0.7257
1380 - 1390 nm	1.0155	0.9920	0.9907	0.9809	0.9593	0.9383	0.8270
1390 - 1400 nm	1.0642	1.0391	1.0200	1.0267	1.0016	0.9784	0.8513
1400 - 1410 nm	1.0493	0.9992	1.0098	1.0937	1.1699	1.0999	0.7527
1410 - 1420 nm	0.9468	0.9281	0.9105	0.9826	1.0399	1.0534	0.6467
1420 - 1430 nm	1.0494	1.0515	1.0068	1.0885	1.0971	1.1642	0.6523
1430 - 1440 nm	1.0948	1.0861	1.0628	1.1261	1.1637	1.1892	0.5580
1440 - 1450 nm	1.0955	1.0778	1.0686	1.1019	1.1697	1.1902	0.6196
1450 - 1460 nm	1.0865	1.0545	1.0387	1.0880	1.1743	1.2392	0.6474
1460 - 1470 nm	1.1740	1.1601	1.1594	1.1891	1.2410	1.2795	0.7217
1470 - 1480 nm	0.9594	0.9406	0.9438	0.9546	0.9822	1.0006	0.4336
1480 - 1490 nm	1.3392	1.2969	1.3262	1.3306	1.4006	1.4894	0.4727
1490 - 1500 nm	1.1989	1.1551	1.1572	1.2059	1.2397	1.3068	0.6412
1500 - 1510 nm	1.1005	1.0800	1.0563	1.1089	1.1283	1.1288	0.6773
1510 - 1520 nm	1.1202	1.1009	1.0872	1.1112	1.1415	1.1420	0.5448
1520 - 1530 nm	1.1089	1.0861	1.0812	1.0948	1.1170	1.1275	0.4875
1530 - 1540 nm	1.0979	1.0731	1.0708	1.0970	1.1160	1.1194	0.5969
1540 - 1550 nm	0.9882	0.9718	0.9743	0.9925	0.9960	0.9990	0.5603
1550 - 1560 nm	1.2144	1.1976	1.2032	1.2096	1.2308	1.2378	0.7194
1560 - 1570 nm	1.1453	1.1240	1.1105	1.1302	1.1617	1.1967	0.7395
1570 - 1580 nm	1.1152	1.0979	1.0831	1.1113	1.1351	1.1842	0.7531
1580 - 1590 nm	1.0886	1.0662	1.0591	1.0873	1.1080	1.1145	0.6403
1590 - 1600 nm	1.1186	1.0892	1.0829	1.1094	1.1214	1.1615	0.6437
1600 - 1610 nm	1.0625	1.0417	1.0399	1.0523	1.0640	1.1071	0.5534
1610 - 1620 nm	1.1317	1.1168	1.1223	1.1124	1.1304	1.1306	0.5456

1620 - 1630 nm	1.1500	1.1261	1.1173	1.1305	1.1410	1.1455	0.5263
1630 - 1640 nm	1.1281	1.1054	1.0962	1.1133	1.1265	1.1302	0.5459
1640 - 1650 nm	1.0474	1.0252	1.0306	1.0266	1.0416	1.0314	0.5670
1650 - 1660 nm	1.0208	0.9987	0.9980	1.0056	1.0104	1.0275	0.5860
1660 - 1670 nm	1.0869	1.0665	1.0699	1.0833	1.0863	1.1304	0.5559

R10* relative at different irradiances in Apollo							
Band	1100	1000	800	600	400	200	100
310 - 320 nm	1.5897	1.6083	1.6195	1.6131	1.5854	1.6461	1.7234
320 - 330 nm	1.6075	1.6267	1.6374	1.6405	1.6320	1.6574	1.7526
330 - 340 nm	1.3443	1.3638	1.3952	1.4013	1.3922	1.3826	1.5211
340 - 350 nm	0.9772	0.9957	1.0161	1.0016	1.0030	1.0381	1.0974
350 - 360 nm	0.9229	0.9388	0.9466	0.9282	0.9293	0.9736	1.0418
360 - 370 nm	0.9255	0.9373	0.9439	0.9339	0.9345	0.9537	1.0319
370 - 380 nm	0.9419	0.9496	0.9539	0.9471	0.9472	0.9558	1.0427
380 - 390 nm	0.9625	0.9677	0.9722	0.9679	0.9634	0.9665	1.0560
390 - 400 nm	0.9980	1.0031	1.0055	1.0046	0.9970	1.0004	1.0871
400 - 410 nm	0.9988	1.0039	1.0055	1.0061	0.9976	1.0016	1.0841
410 - 420 nm	0.9924	0.9967	0.9982	0.9987	0.9907	0.9927	1.0747
420 - 430 nm	0.9859	0.9893	0.9903	0.9906	0.9831	0.9841	1.0668
430 - 440 nm	0.9917	0.9953	0.9967	0.9969	0.9896	0.9903	1.0717
440 - 450 nm	0.9849	0.9886	0.9891	0.9906	0.9821	0.9834	1.0639
450 - 460 nm	0.9888	0.9939	0.9936	0.9980	0.9879	0.9917	1.0665
460 - 470 nm	0.9926	1.0018	0.9993	1.0099	0.9956	1.0088	1.0693
470 - 480 nm	0.9629	0.9690	0.9674	0.9752	0.9613	0.9704	1.0395
480 - 490 nm	0.9930	1.0001	0.9988	1.0049	0.9933	1.0009	1.0699
490 - 500 nm	0.9939	0.9998	0.9991	1.0035	0.9935	0.9983	1.0716
500 - 510 nm	0.9960	1.0007	1.0010	1.0029	0.9946	0.9969	1.0736
510 - 520 nm	0.9945	0.9992	0.9994	1.0011	0.9932	0.9948	1.0725
520 - 530 nm	0.9972	1.0028	1.0027	1.0042	0.9967	0.9975	1.0757
530 - 540 nm	0.9962	1.0017	1.0015	1.0039	0.9951	0.9979	1.0738
540 - 550 nm	0.9984	1.0037	1.0035	1.0072	0.9977	1.0012	1.0760
550 - 560 nm	1.0022	1.0087	1.0081	1.0123	1.0035	1.0065	1.0806
560 - 570 nm	1.0085	1.0148	1.0142	1.0190	1.0088	1.0138	1.0872
570 - 580 nm	1.0124	1.0191	1.0181	1.0232	1.0127	1.0176	1.0912
580 - 590 nm	1.0126	1.0199	1.0185	1.0234	1.0143	1.0186	1.0904
590 - 600 nm	1.0117	1.0176	1.0166	1.0213	1.0117	1.0153	1.0893
600 - 610 nm	1.0164	1.0215	1.0217	1.0243	1.0170	1.0176	1.0946
610 - 620 nm	1.0163	1.0214	1.0217	1.0242	1.0179	1.0184	1.0935
620 - 630 nm	1.0061	1.0103	1.0102	1.0127	1.0063	1.0054	1.0824
630 - 640 nm	1.0074	1.0106	1.0115	1.0132	1.0073	1.0061	1.0836
640 - 650 nm	1.0203	1.0241	1.0246	1.0268	1.0214	1.0196	1.0964
650 - 660 nm	1.0130	1.0157	1.0164	1.0186	1.0120	1.0091	1.0894
660 - 670 nm	1.0242	1.0272	1.0282	1.0298	1.0249	1.0228	1.1011
670 - 680 nm	1.0269	1.0303	1.0314	1.0332	1.0275	1.0258	1.1042

680 - 690 nm	1.0416	1.0481	1.0482	1.0516	1.0476	1.0478	1.1193
690 - 700 nm	1.0123	1.0139	1.0134	1.0161	1.0103	1.0086	1.0907
700 - 710 nm	1.0418	1.0444	1.0458	1.0461	1.0423	1.0408	1.1213
710 - 720 nm	1.0361	1.0401	1.0402	1.0420	1.0397	1.0391	1.1176
720 - 730 nm	1.0495	1.0539	1.0557	1.0551	1.0537	1.0533	1.1313
730 - 740 nm	1.0413	1.0455	1.0465	1.0475	1.0457	1.0453	1.1249
740 - 750 nm	1.0337	1.0357	1.0362	1.0365	1.0352	1.0348	1.1164
750 - 760 nm	1.0386	1.0419	1.0438	1.0430	1.0438	1.0452	1.1217
760 - 770 nm	1.0312	1.0361	1.0361	1.0377	1.0389	1.0415	1.1176
770 - 780 nm	1.0108	1.0102	1.0136	1.0102	1.0103	1.0111	1.0969
780 - 790 nm	1.0645	1.0669	1.0724	1.0681	1.0727	1.0752	1.1532
790 - 800 nm	1.0148	1.0154	1.0194	1.0159	1.0185	1.0202	1.1068
800 - 810 nm	1.0142	1.0159	1.0202	1.0159	1.0207	1.0275	1.1063
810 - 820 nm	1.0273	1.0253	1.0298	1.0252	1.0268	1.0354	1.1253
820 - 830 nm	1.0821	1.0951	1.0948	1.0943	1.1025	1.1186	1.1895
830 - 840 nm	0.8974	0.8983	0.8992	0.8965	0.8983	0.9068	0.9915
840 - 850 nm	0.9705	0.9721	0.9778	0.9718	0.9760	0.9894	1.0674
850 - 860 nm	1.0337	1.0281	1.0387	1.0301	1.0352	1.0501	1.1314
860 - 870 nm	1.0434	1.0361	1.0498	1.0444	1.0490	1.0655	1.1463
870 - 880 nm	1.0592	1.0365	1.0649	1.0590	1.0649	1.0778	1.1669
880 - 890 nm	1.0231	1.0522	1.0376	1.0319	1.0441	1.0582	1.1284
890 - 900 nm	1.0284	1.0476	1.0413	1.0355	1.0453	1.0595	1.1310
900 - 910 nm	0.9894	1.0023	0.9985	0.9938	1.0011	1.0137	1.0893
910 - 920 nm	1.1149	1.1294	1.1316	1.1261	1.1386	1.1566	1.2225
920 - 930 nm	0.8909	0.8930	0.8865	0.8856	0.8815	0.8884	0.9821
930 - 940 nm	1.1351	1.1387	1.1547	1.1449	1.1612	1.1739	1.2383
940 - 950 nm	1.0174	1.0209	1.0227	1.0206	1.0257	1.0321	1.1128
950 - 960 nm	1.0052	1.0136	1.0133	1.0090	1.0171	1.0236	1.0993
960 - 970 nm	1.0405	1.0436	1.0483	1.0419	1.0501	1.0554	1.1313
970 - 980 nm	1.1289	1.1461	1.1455	1.1393	1.1526	1.1647	1.2278
980 - 990 nm	0.8786	0.8723	0.8627	0.8695	0.8597	0.8597	0.9669
990 - 1000 nm	1.1664	1.1717	1.1814	1.1775	1.1908	1.2046	1.2652
1000 - 1010 nm	1.0141	1.0159	1.0141	1.0098	1.0110	1.0090	1.0594
1010 - 1020 nm	0.9234	0.9189	0.9191	0.9120	0.9080	0.9034	0.8949
1020 - 1030 nm	0.8919	0.8819	0.8817	0.8680	0.8523	0.8405	0.8248
1030 - 1040 nm	0.9126	0.9040	0.9013	0.8889	0.8789	0.8697	0.8207
1040 - 1050 nm	0.9807	0.9776	0.9765	0.9640	0.9577	0.9486	0.8897
1050 - 1060 nm	0.8703	0.8630	0.8579	0.8529	0.8402	0.8294	0.7958
1060 - 1070 nm	0.9426	0.9341	0.9315	0.9225	0.9118	0.8995	0.8632
1070 - 1080 nm	1.0347	1.0286	1.0268	1.0163	1.0085	0.9930	0.9479
1080 - 1090 nm	0.9223	0.9102	0.9100	0.8955	0.8931	0.8651	0.8415
1090 - 1100 nm	0.9615	0.9522	0.9517	0.9425	0.9313	0.9139	0.8857
1100 - 1110 nm	1.0765	1.0665	1.0729	1.0412	1.0593	1.0094	0.9879
1110 - 1120 nm	0.8456	0.8288	0.8290	0.8142	0.8142	0.7787	0.8014
1120 - 1130 nm	0.9013	0.8871	0.8852	0.8772	0.8615	0.8429	0.8155

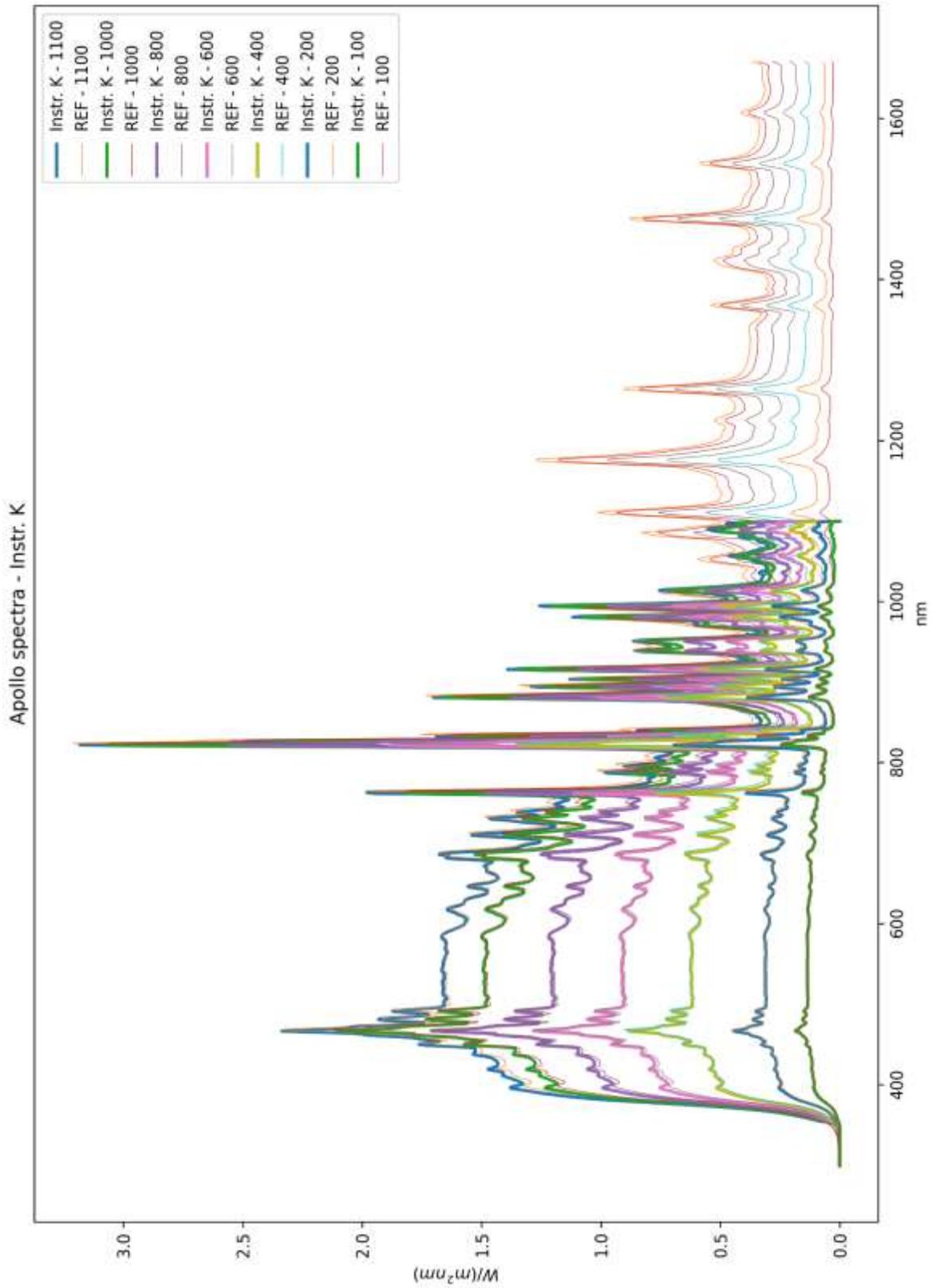
1130 - 1140 nm	0.9332	0.9183	0.9176	0.9090	0.8942	0.8765	0.8471
1140 - 1150 nm	0.9342	0.9191	0.9178	0.9098	0.8946	0.8763	0.8578
1150 - 1160 nm	1.0092	0.9935	0.9960	0.9828	0.9732	0.9498	0.9087
1160 - 1170 nm	1.1694	1.1538	1.1717	1.1192	1.1555	1.0776	1.0698
1170 - 1180 nm	0.9913	0.9810	0.9869	0.9545	0.9763	0.8800	0.9459
1180 - 1190 nm	0.8696	0.8491	0.8562	0.8241	0.8375	0.7795	0.7986
1190 - 1200 nm	0.8717	0.8539	0.8562	0.8442	0.8373	0.8125	0.8157
1200 - 1210 nm	0.9128	0.8984	0.8978	0.8887	0.8756	0.8568	0.8316
1210 - 1220 nm	0.9325	0.9178	0.9170	0.9074	0.8947	0.8752	0.8437
1220 - 1230 nm	0.9017	0.8864	0.8857	0.8768	0.8659	0.8467	0.8340
1230 - 1240 nm	0.9060	0.8904	0.8886	0.8792	0.8649	0.8477	0.8229
1240 - 1250 nm	0.9980	0.9855	0.9869	0.9737	0.9673	0.9490	0.9155
1250 - 1260 nm	1.1010	1.0849	1.0956	1.0626	1.0808	1.0351	1.0153
1260 - 1270 nm	0.8980	0.8802	0.8867	0.8541	0.8722	0.8069	0.8372
1270 - 1280 nm	0.8500	0.8365	0.8353	0.8265	0.8128	0.7965	0.7721
1280 - 1290 nm	0.9158	0.9003	0.8991	0.8880	0.8747	0.8568	0.8090
1290 - 1300 nm	0.9264	0.9102	0.9088	0.8985	0.8849	0.8670	0.8183
1300 - 1310 nm	0.9269	0.9112	0.9098	0.8995	0.8873	0.8705	0.8300
1310 - 1320 nm	0.9377	0.9219	0.9200	0.9094	0.8957	0.8769	0.8312
1320 - 1330 nm	0.9474	0.9317	0.9294	0.9184	0.9044	0.8856	0.8299
1330 - 1340 nm	0.9322	0.9170	0.9149	0.9058	0.8925	0.8746	0.8349
1340 - 1350 nm	0.9247	0.9114	0.9103	0.9002	0.8872	0.8690	0.8204
1350 - 1360 nm	1.0339	1.0232	1.0226	1.0092	0.9951	0.9745	0.9003
1360 - 1370 nm	0.9309	0.9184	0.9120	0.9075	0.8848	0.8619	0.8284
1370 - 1380 nm	0.8123	0.7970	0.7933	0.7868	0.7660	0.7467	0.7230
1380 - 1390 nm	0.9374	0.9202	0.9180	0.9064	0.8892	0.8703	0.8239
1390 - 1400 nm	0.9824	0.9639	0.9452	0.9487	0.9284	0.9075	0.8482
1400 - 1410 nm	0.9686	0.9270	0.9357	1.0106	1.0844	1.0202	0.7499
1410 - 1420 nm	0.8740	0.8610	0.8437	0.9079	0.9639	0.9771	0.6443
1420 - 1430 nm	0.9687	0.9755	0.9329	1.0058	1.0169	1.0799	0.6499
1430 - 1440 nm	1.0106	1.0075	0.9848	1.0406	1.0786	1.1030	0.5559
1440 - 1450 nm	1.0113	0.9998	0.9902	1.0182	1.0842	1.1039	0.6173
1450 - 1460 nm	1.0030	0.9783	0.9625	1.0054	1.0884	1.1494	0.6450
1460 - 1470 nm	1.0837	1.0762	1.0743	1.0988	1.1503	1.1868	0.7190
1470 - 1480 nm	0.8856	0.8726	0.8746	0.8821	0.9104	0.9281	0.4320
1480 - 1490 nm	1.2363	1.2031	1.2289	1.2295	1.2982	1.3815	0.4710
1490 - 1500 nm	1.1067	1.0716	1.0723	1.1143	1.1491	1.2121	0.6388
1500 - 1510 nm	1.0159	1.0019	0.9788	1.0246	1.0458	1.0470	0.6747
1510 - 1520 nm	1.0341	1.0213	1.0075	1.0268	1.0581	1.0593	0.5427
1520 - 1530 nm	1.0237	1.0075	1.0019	1.0116	1.0353	1.0458	0.4857
1530 - 1540 nm	1.0135	0.9955	0.9923	1.0136	1.0344	1.0383	0.5947
1540 - 1550 nm	0.9123	0.9015	0.9028	0.9171	0.9232	0.9266	0.5582
1550 - 1560 nm	1.1210	1.1110	1.1150	1.1177	1.1408	1.1481	0.7167
1560 - 1570 nm	1.0573	1.0427	1.0290	1.0443	1.0768	1.1099	0.7368
1570 - 1580 nm	1.0294	1.0185	1.0037	1.0268	1.0521	1.0984	0.7503

1580 - 1590 nm	1.0049	0.9891	0.9814	1.0047	1.0270	1.0337	0.6379
1590 - 1600 nm	1.0326	1.0104	1.0034	1.0251	1.0394	1.0773	0.6413
1600 - 1610 nm	0.9808	0.9663	0.9636	0.9724	0.9862	1.0268	0.5513
1610 - 1620 nm	1.0447	1.0360	1.0399	1.0279	1.0478	1.0486	0.5436
1620 - 1630 nm	1.0616	1.0447	1.0354	1.0446	1.0575	1.0625	0.5243
1630 - 1640 nm	1.0414	1.0255	1.0158	1.0287	1.0441	1.0483	0.5438
1640 - 1650 nm	0.9669	0.9511	0.9550	0.9486	0.9654	0.9566	0.5649
1650 - 1660 nm	0.9424	0.9265	0.9248	0.9292	0.9365	0.9531	0.5838
1660 - 1670 nm	1.0033	0.9894	0.9914	1.0010	1.0068	1.0485	0.5538

Source: European Solar Test Installation – JRC

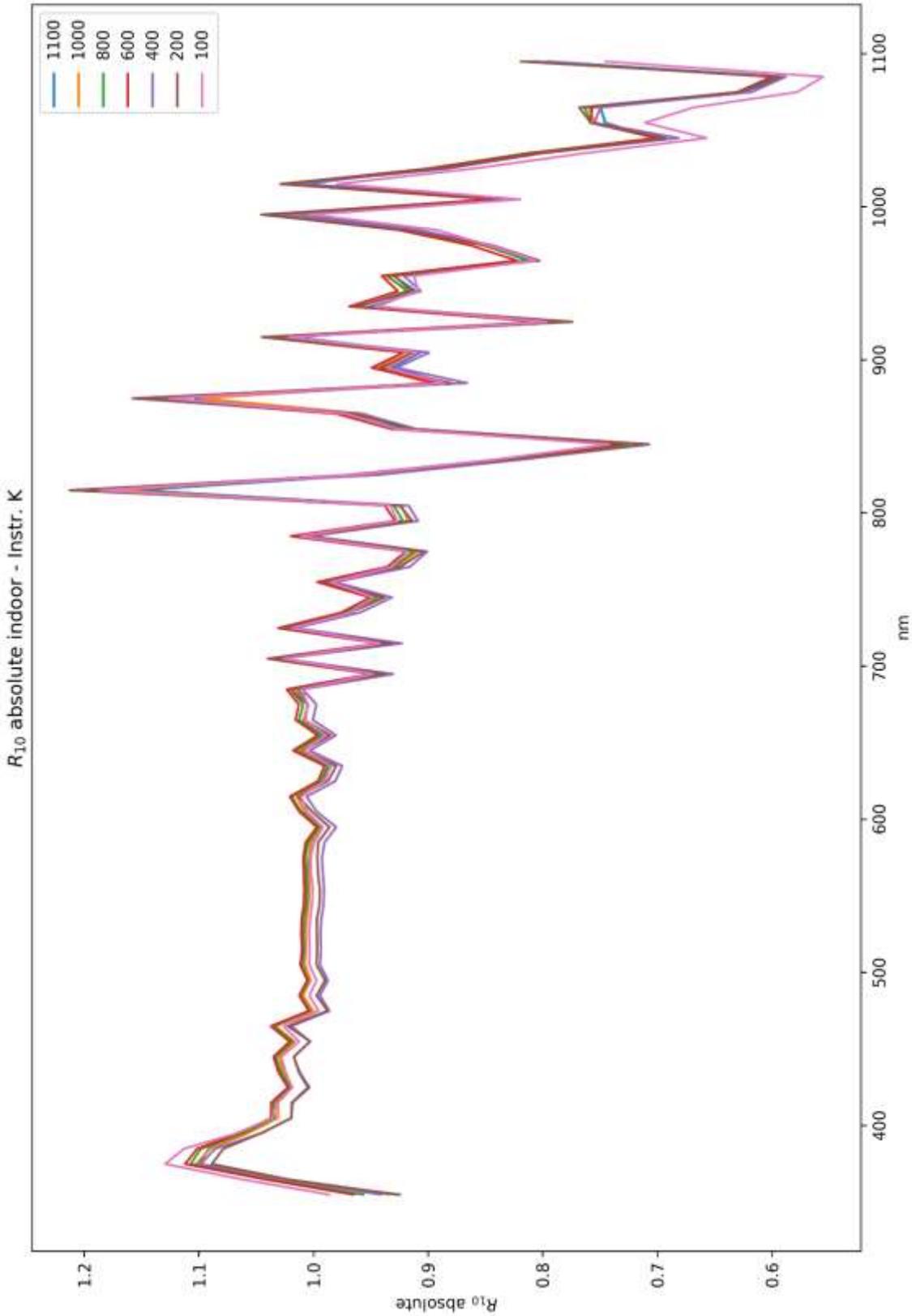
1.30 Instrument "K"

Figure 32: Instrument K - Indoor Apollo spectra at different irradiance levels.



Source: European Solar Test Installation – JRC.

Figure 33: Instrument K - Indoor R10 and R10* functions at different irradiance levels.



Source: European Solar Test Installation – JRC.

Table 26: Instrument K – Indoor R10 and R10* functions at different irradiance levels.

R10 absolute at different irradiances in Apollo							
Band	1100	1000	800	600	400	200	100
350 - 360 nm	0.9246	0.9332	0.9565	0.9650	0.9415	0.9270	0.9860
360 - 370 nm	1.0319	1.0376	1.0398	1.0424	1.0251	1.0224	1.0624
370 - 380 nm	1.0994	1.1024	1.1071	1.1118	1.0984	1.0886	1.1292
380 - 390 nm	1.0912	1.0899	1.0980	1.1013	1.0855	1.0783	1.1127
390 - 400 nm	1.0583	1.0569	1.0614	1.0651	1.0454	1.0459	1.0670
400 - 410 nm	1.0338	1.0310	1.0345	1.0370	1.0192	1.0191	1.0359
410 - 420 nm	1.0346	1.0310	1.0346	1.0367	1.0189	1.0183	1.0320
420 - 430 nm	1.0216	1.0183	1.0206	1.0223	1.0048	1.0035	1.0184
430 - 440 nm	1.0292	1.0261	1.0283	1.0304	1.0128	1.0121	1.0241
440 - 450 nm	1.0327	1.0297	1.0326	1.0348	1.0170	1.0171	1.0278
450 - 460 nm	1.0192	1.0164	1.0185	1.0207	1.0028	1.0029	1.0124
460 - 470 nm	1.0343	1.0329	1.0347	1.0371	1.0191	1.0221	1.0260
470 - 480 nm	1.0029	1.0004	1.0029	1.0040	0.9860	0.9875	0.9956
480 - 490 nm	1.0114	1.0090	1.0111	1.0123	0.9943	0.9972	1.0034
490 - 500 nm	1.0046	1.0024	1.0042	1.0052	0.9873	0.9898	0.9971
500 - 510 nm	1.0098	1.0073	1.0105	1.0113	0.9943	0.9972	1.0034
510 - 520 nm	1.0082	1.0064	1.0096	1.0098	0.9933	0.9966	1.0031
520 - 530 nm	1.0081	1.0069	1.0096	1.0105	0.9938	0.9969	1.0038
530 - 540 nm	1.0061	1.0057	1.0086	1.0102	0.9931	0.9969	1.0026
540 - 550 nm	1.0048	1.0039	1.0065	1.0082	0.9910	0.9945	1.0011
550 - 560 nm	1.0037	1.0034	1.0058	1.0078	0.9907	0.9944	1.0005
560 - 570 nm	1.0045	1.0038	1.0066	1.0084	0.9918	0.9960	1.0020
570 - 580 nm	1.0041	1.0039	1.0070	1.0088	0.9924	0.9965	1.0022
580 - 590 nm	1.0019	1.0023	1.0046	1.0068	0.9903	0.9959	0.9992
590 - 600 nm	0.9937	0.9927	0.9947	0.9970	0.9801	0.9859	0.9917
600 - 610 nm	1.0074	1.0069	1.0105	1.0121	0.9968	1.0009	1.0052
610 - 620 nm	1.0142	1.0150	1.0190	1.0205	1.0060	1.0129	1.0106
620 - 630 nm	0.9922	0.9911	0.9937	0.9961	0.9809	0.9873	0.9899
630 - 640 nm	0.9863	0.9842	0.9874	0.9902	0.9748	0.9800	0.9850
640 - 650 nm	1.0110	1.0109	1.0152	1.0178	1.0032	1.0090	1.0078
650 - 660 nm	0.9905	0.9888	0.9927	0.9962	0.9802	0.9851	0.9893
660 - 670 nm	1.0084	1.0084	1.0124	1.0155	1.0005	1.0076	1.0069
670 - 680 nm	1.0044	1.0049	1.0088	1.0126	0.9973	1.0045	1.0050
680 - 690 nm	1.0136	1.0159	1.0201	1.0232	1.0092	1.0201	1.0097
690 - 700 nm	0.9458	0.9422	0.9439	0.9492	0.9303	0.9374	0.9480
700 - 710 nm	1.0264	1.0310	1.0379	1.0396	1.0268	1.0378	1.0257
710 - 720 nm	0.9409	0.9373	0.9375	0.9425	0.9228	0.9321	0.9420
720 - 730 nm	1.0175	1.0219	1.0267	1.0306	1.0157	1.0270	1.0181
730 - 740 nm	0.9677	0.9686	0.9717	0.9761	0.9598	0.9681	0.9680
740 - 750 nm	0.9441	0.9425	0.9448	0.9504	0.9314	0.9377	0.9478

750 - 760 nm	0.9805	0.9851	0.9909	0.9965	0.9811	0.9909	0.9847
760 - 770 nm	0.9294	0.9281	0.9290	0.9354	0.9158	0.9242	0.9311
770 - 780 nm	0.9105	0.9088	0.9132	0.9193	0.9007	0.9035	0.9179
780 - 790 nm	1.0034	1.0063	1.0133	1.0195	1.0016	1.0073	1.0108
790 - 800 nm	0.9172	0.9168	0.9220	0.9287	0.9088	0.9135	0.9268
800 - 810 nm	0.9229	0.9232	0.9296	0.9376	0.9169	0.9249	0.9328
810 - 820 nm	1.1532	1.1745	1.1947	1.2033	1.1948	1.2127	1.1864
820 - 830 nm	0.9548	0.9579	0.9589	0.9685	0.9437	0.9618	0.9634
830 - 840 nm	0.8306	0.8312	0.8336	0.8416	0.8190	0.8293	0.8417
840 - 850 nm	0.7341	0.7251	0.7251	0.7327	0.7072	0.7073	0.7419
850 - 860 nm	0.9182	0.9153	0.9249	0.9317	0.9101	0.9132	0.9267
860 - 870 nm	0.9612	0.9563	0.9712	0.9800	0.9584	0.9647	0.9719
870 - 880 nm	1.1032	1.0985	1.1405	1.1486	1.1380	1.1576	1.1258
880 - 890 nm	0.8837	0.8985	0.8828	0.8923	0.8659	0.8798	0.8859
890 - 900 nm	0.9320	0.9460	0.9398	0.9492	0.9273	0.9414	0.9358
900 - 910 nm	0.9062	0.9149	0.9121	0.9214	0.8990	0.9102	0.9093
910 - 920 nm	1.0163	1.0278	1.0328	1.0446	1.0252	1.0448	1.0213
920 - 930 nm	0.8031	0.8017	0.7931	0.8014	0.7747	0.7741	0.7961
930 - 940 nm	0.9442	0.9464	0.9606	0.9686	0.9516	0.9623	0.9461
940 - 950 nm	0.9106	0.9155	0.9182	0.9263	0.9063	0.9136	0.9086
950 - 960 nm	0.9300	0.9373	0.9351	0.9404	0.9211	0.9294	0.9123
960 - 970 nm	0.8095	0.8116	0.8132	0.8223	0.8028	0.8029	0.8059
970 - 980 nm	0.8446	0.8526	0.8502	0.8632	0.8435	0.8498	0.8470
980 - 990 nm	0.9095	0.9190	0.9168	0.9259	0.9086	0.9196	0.8925
990 - 1000 nm	1.0168	1.0215	1.0327	1.0438	1.0294	1.0454	1.0015
1000 - 1010 nm	0.8382	0.8378	0.8364	0.8436	0.8250	0.8241	0.8196
1010 - 1020 nm	1.0072	1.0168	1.0245	1.0285	1.0189	1.0289	0.9798
1020 - 1030 nm	0.9005	0.8985	0.9013	0.8994	0.8832	0.8897	0.8610
1030 - 1040 nm	0.8122	0.8128	0.8145	0.8109	0.8018	0.8017	0.7646
1040 - 1050 nm	0.7015	0.7026	0.6983	0.6996	0.6814	0.6929	0.6570
1050 - 1060 nm	0.7454	0.7547	0.7575	0.7584	0.7549	0.7579	0.7108
1060 - 1070 nm	0.7497	0.7598	0.7635	0.7570	0.7497	0.7682	0.6687
1070 - 1080 nm	0.6255	0.6308	0.6279	0.6306	0.6179	0.6287	0.5783
1080 - 1090 nm	0.5891	0.5938	0.5950	0.6001	0.5882	0.5931	0.5554
1090 - 1100 nm	0.7960	0.8047	0.8126	0.8074	0.8064	0.8187	0.7451

R10* relative at different irradiances in Apollo							
Band	1100	1000	800	600	400	200	100
350 - 360 nm	0.9502	0.9587	0.9793	0.9836	0.9770	0.9569	1.0152
360 - 370 nm	1.0605	1.0660	1.0647	1.0626	1.0637	1.0555	1.0939
370 - 380 nm	1.1299	1.1325	1.1336	1.1333	1.1398	1.1238	1.1627
380 - 390 nm	1.1215	1.1197	1.1243	1.1226	1.1264	1.1132	1.1457
390 - 400 nm	1.0877	1.0858	1.0868	1.0857	1.0848	1.0798	1.0987
400 - 410 nm	1.0624	1.0592	1.0592	1.0571	1.0575	1.0521	1.0666
410 - 420 nm	1.0633	1.0591	1.0594	1.0568	1.0573	1.0512	1.0626

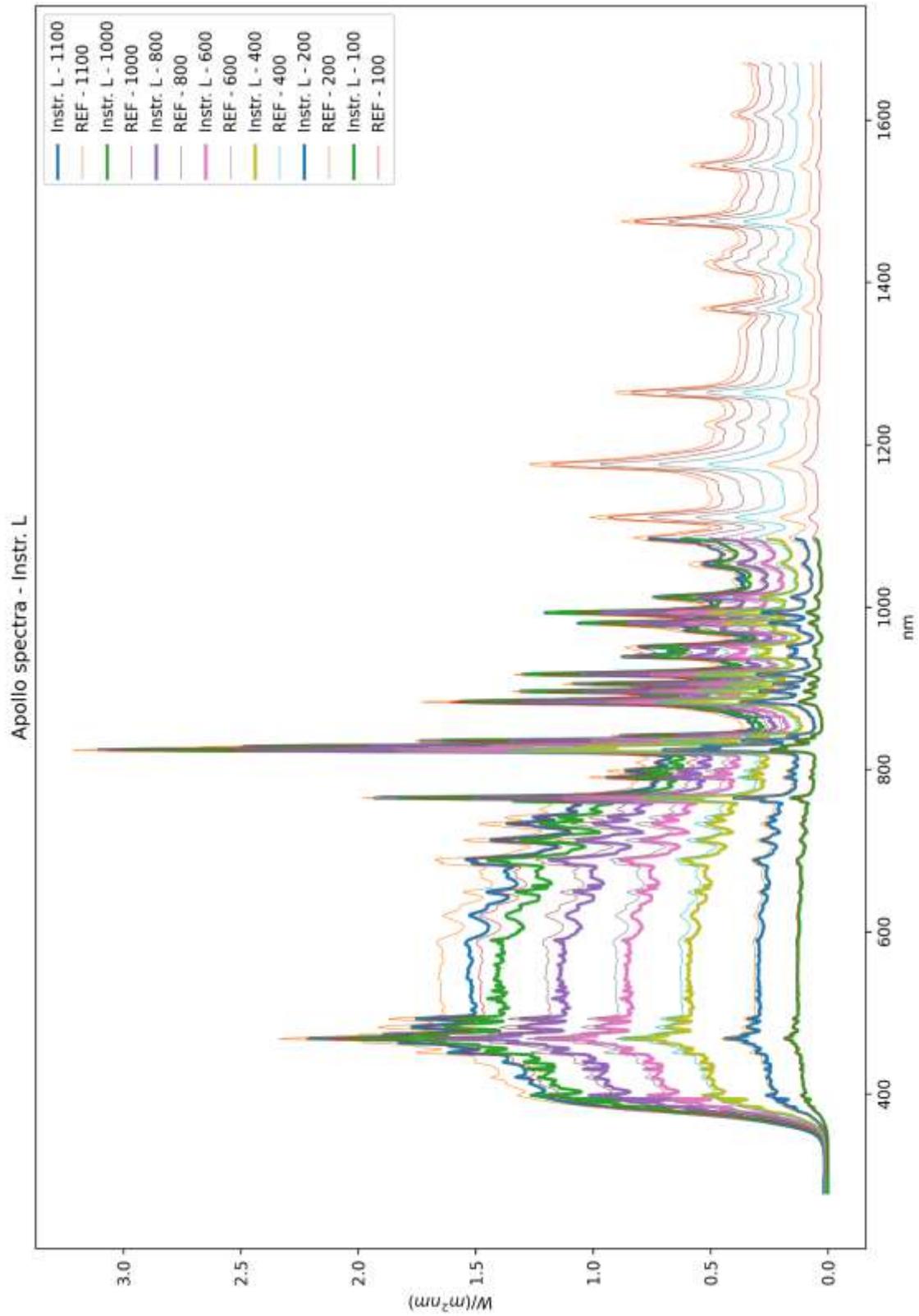
420 - 430 nm	1.0500	1.0461	1.0450	1.0421	1.0427	1.0359	1.0486
430 - 440 nm	1.0577	1.0541	1.0529	1.0504	1.0510	1.0448	1.0545
440 - 450 nm	1.0613	1.0578	1.0573	1.0548	1.0553	1.0499	1.0583
450 - 460 nm	1.0475	1.0442	1.0429	1.0404	1.0405	1.0353	1.0424
460 - 470 nm	1.0629	1.0612	1.0595	1.0571	1.0575	1.0551	1.0564
470 - 480 nm	1.0307	1.0277	1.0269	1.0234	1.0231	1.0195	1.0251
480 - 490 nm	1.0394	1.0366	1.0353	1.0319	1.0317	1.0294	1.0332
490 - 500 nm	1.0324	1.0298	1.0282	1.0247	1.0245	1.0218	1.0267
500 - 510 nm	1.0378	1.0348	1.0347	1.0309	1.0317	1.0294	1.0332
510 - 520 nm	1.0362	1.0339	1.0337	1.0294	1.0307	1.0289	1.0329
520 - 530 nm	1.0360	1.0344	1.0337	1.0301	1.0312	1.0292	1.0336
530 - 540 nm	1.0340	1.0331	1.0327	1.0298	1.0305	1.0292	1.0324
540 - 550 nm	1.0327	1.0314	1.0306	1.0277	1.0283	1.0266	1.0307
550 - 560 nm	1.0315	1.0308	1.0299	1.0274	1.0280	1.0266	1.0301
560 - 570 nm	1.0324	1.0312	1.0307	1.0279	1.0291	1.0282	1.0317
570 - 580 nm	1.0320	1.0313	1.0311	1.0283	1.0298	1.0287	1.0319
580 - 590 nm	1.0296	1.0297	1.0287	1.0263	1.0276	1.0281	1.0289
590 - 600 nm	1.0212	1.0198	1.0185	1.0163	1.0170	1.0178	1.0211
600 - 610 nm	1.0354	1.0344	1.0347	1.0317	1.0344	1.0333	1.0351
610 - 620 nm	1.0424	1.0427	1.0434	1.0403	1.0439	1.0457	1.0406
620 - 630 nm	1.0197	1.0182	1.0175	1.0154	1.0178	1.0192	1.0193
630 - 640 nm	1.0136	1.0111	1.0110	1.0094	1.0115	1.0117	1.0142
640 - 650 nm	1.0390	1.0385	1.0395	1.0375	1.0410	1.0416	1.0377
650 - 660 nm	1.0179	1.0158	1.0164	1.0155	1.0172	1.0170	1.0186
660 - 670 nm	1.0364	1.0360	1.0367	1.0351	1.0382	1.0402	1.0367
670 - 680 nm	1.0323	1.0324	1.0330	1.0322	1.0349	1.0370	1.0348
680 - 690 nm	1.0417	1.0437	1.0445	1.0431	1.0472	1.0531	1.0396
690 - 700 nm	0.9721	0.9679	0.9665	0.9675	0.9654	0.9677	0.9761
700 - 710 nm	1.0548	1.0592	1.0627	1.0597	1.0655	1.0714	1.0562
710 - 720 nm	0.9670	0.9629	0.9599	0.9608	0.9575	0.9623	0.9699
720 - 730 nm	1.0457	1.0498	1.0513	1.0505	1.0540	1.0602	1.0483
730 - 740 nm	0.9945	0.9951	0.9949	0.9950	0.9960	0.9995	0.9967
740 - 750 nm	0.9703	0.9682	0.9674	0.9688	0.9664	0.9680	0.9759
750 - 760 nm	1.0077	1.0120	1.0146	1.0158	1.0181	1.0229	1.0139
760 - 770 nm	0.9552	0.9534	0.9512	0.9535	0.9503	0.9541	0.9587
770 - 780 nm	0.9357	0.9336	0.9350	0.9371	0.9347	0.9328	0.9451
780 - 790 nm	1.0312	1.0337	1.0376	1.0393	1.0393	1.0399	1.0408
790 - 800 nm	0.9426	0.9419	0.9441	0.9467	0.9430	0.9431	0.9543
800 - 810 nm	0.9485	0.9484	0.9519	0.9557	0.9515	0.9548	0.9604
810 - 820 nm	1.1852	1.2066	1.2233	1.2266	1.2398	1.2519	1.2216
820 - 830 nm	0.9813	0.9841	0.9819	0.9873	0.9793	0.9929	0.9920
830 - 840 nm	0.8537	0.8540	0.8535	0.8579	0.8498	0.8561	0.8667
840 - 850 nm	0.7545	0.7449	0.7424	0.7469	0.7338	0.7302	0.7639
850 - 860 nm	0.9436	0.9403	0.9471	0.9498	0.9444	0.9427	0.9542
860 - 870 nm	0.9879	0.9824	0.9944	0.9989	0.9945	0.9959	1.0007

870 - 880 nm	1.1338	1.1285	1.1678	1.1709	1.1808	1.1951	1.1592
880 - 890 nm	0.9082	0.9231	0.9039	0.9096	0.8986	0.9082	0.9122
890 - 900 nm	0.9578	0.9718	0.9623	0.9675	0.9622	0.9718	0.9635
900 - 910 nm	0.9313	0.9399	0.9340	0.9393	0.9329	0.9397	0.9363
910 - 920 nm	1.0444	1.0558	1.0575	1.0648	1.0638	1.0786	1.0516
920 - 930 nm	0.8254	0.8236	0.8121	0.8169	0.8039	0.7991	0.8197
930 - 940 nm	0.9704	0.9723	0.9836	0.9874	0.9874	0.9934	0.9741
940 - 950 nm	0.9358	0.9405	0.9402	0.9442	0.9404	0.9432	0.9355
950 - 960 nm	0.9558	0.9629	0.9575	0.9585	0.9558	0.9594	0.9393
960 - 970 nm	0.8319	0.8337	0.8326	0.8382	0.8330	0.8289	0.8298
970 - 980 nm	0.8680	0.8759	0.8705	0.8799	0.8753	0.8773	0.8721
980 - 990 nm	0.9347	0.9441	0.9388	0.9439	0.9428	0.9494	0.9189
990 - 1000 nm	1.0449	1.0494	1.0574	1.0640	1.0682	1.0792	1.0312
1000 - 1010 nm	0.8615	0.8607	0.8565	0.8599	0.8561	0.8508	0.8439
1010 - 1020 nm	1.0351	1.0446	1.0490	1.0484	1.0573	1.0621	1.0088
1020 - 1030 nm	0.9255	0.9231	0.9228	0.9168	0.9165	0.9185	0.8865
1030 - 1040 nm	0.8347	0.8350	0.8340	0.8266	0.8320	0.8276	0.7873
1040 - 1050 nm	0.7209	0.7218	0.7151	0.7132	0.7071	0.7153	0.6765
1050 - 1060 nm	0.7661	0.7753	0.7756	0.7731	0.7834	0.7824	0.7319
1060 - 1070 nm	0.7704	0.7806	0.7818	0.7716	0.7780	0.7930	0.6885
1070 - 1080 nm	0.6428	0.6481	0.6429	0.6428	0.6411	0.6490	0.5954
1080 - 1090 nm	0.6055	0.6100	0.6092	0.6117	0.6103	0.6123	0.5719
1090 - 1100 nm	0.8181	0.8267	0.8320	0.8231	0.8367	0.8452	0.7672

Source: European Solar Test Installation – JRC

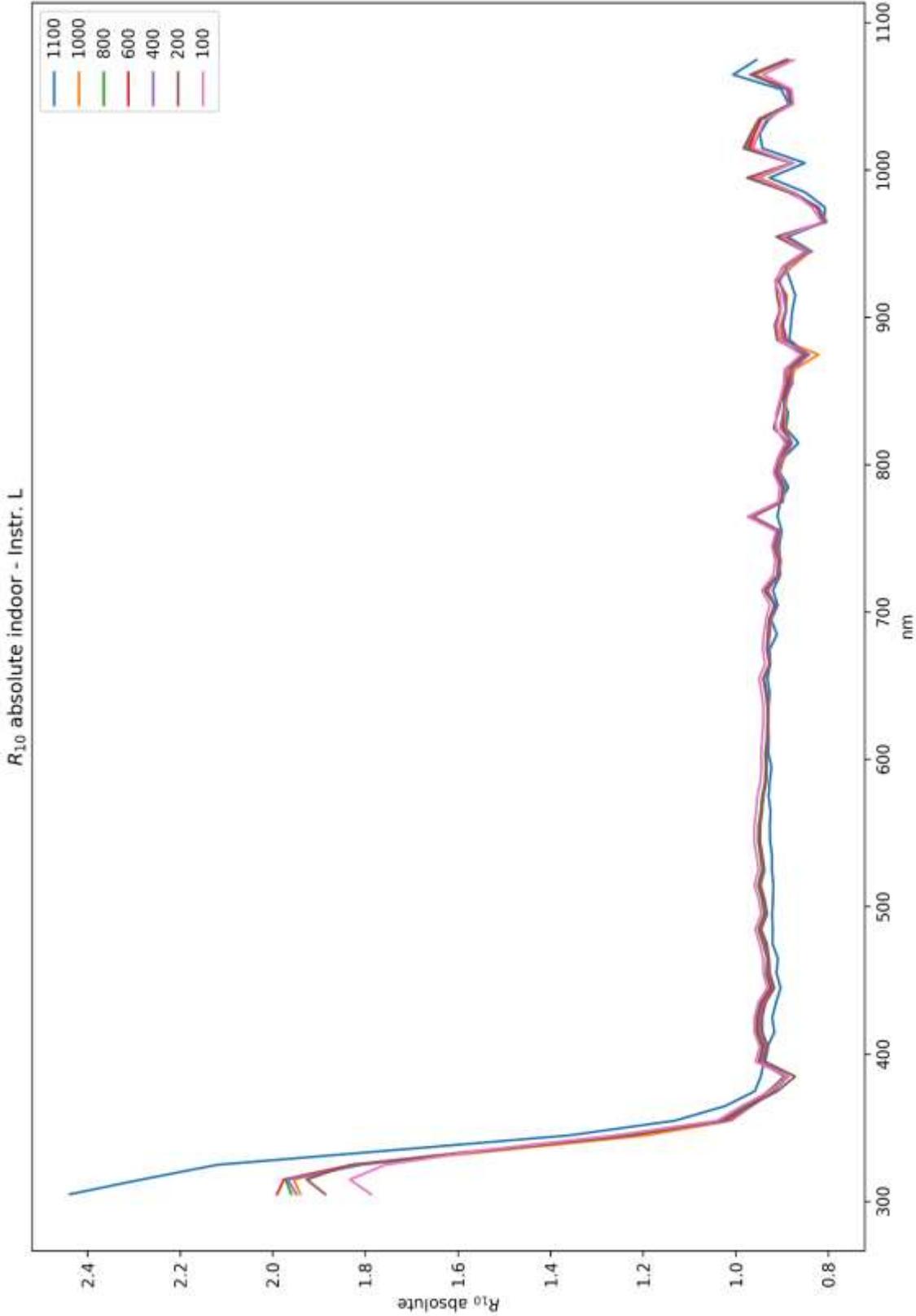
1.31 Instrument "L"

Figure 34: Instrument L - Indoor Apollo spectra at different irradiance levels.



Source: European Solar Test Installation – JRC.

Figure 35: Instrument L - Indoor R10 and R10* functions at different irradiance levels.



Source: European Solar Test Installation – JRC.

Table 27: Instrument L – Indoor R10 and R10* functions at different irradiance levels.

R10 absolute at different irradiances in Apollo							
Band	1100	1000	800	600	400	200	100
300 - 310 nm	2.4378	1.9399	1.9595	1.9903	1.9487	1.8864	1.7873
310 - 320 nm	2.2827	1.9543	1.9718	1.9756	1.9674	1.9263	1.8328
320 - 330 nm	2.1193	1.8144	1.8273	1.8280	1.8066	1.8323	1.7563
330 - 340 nm	1.7362	1.5023	1.5334	1.5426	1.5242	1.5271	1.5421
340 - 350 nm	1.3587	1.1929	1.2401	1.2549	1.2343	1.2242	1.2599
350 - 360 nm	1.1306	1.0093	1.0290	1.0247	1.0154	1.0338	1.0398
360 - 370 nm	1.0219	0.9660	0.9769	0.9715	0.9647	0.9704	0.9865
370 - 380 nm	0.9585	0.9272	0.9299	0.9270	0.9184	0.9101	0.9263
380 - 390 nm	0.9458	0.8930	0.8948	0.8921	0.8865	0.8718	0.8892
390 - 400 nm	0.9391	0.9479	0.9503	0.9488	0.9443	0.9365	0.9572
400 - 410 nm	0.9318	0.9395	0.9421	0.9393	0.9358	0.9302	0.9479
410 - 420 nm	0.9165	0.9522	0.9550	0.9513	0.9482	0.9425	0.9597
420 - 430 nm	0.9213	0.9524	0.9547	0.9514	0.9482	0.9430	0.9593
430 - 440 nm	0.9130	0.9438	0.9457	0.9438	0.9397	0.9357	0.9514
440 - 450 nm	0.9030	0.9234	0.9253	0.9234	0.9191	0.9165	0.9319
450 - 460 nm	0.9119	0.9324	0.9342	0.9324	0.9304	0.9264	0.9401
460 - 470 nm	0.9088	0.9309	0.9321	0.9307	0.9297	0.9281	0.9409
470 - 480 nm	0.9206	0.9395	0.9408	0.9386	0.9365	0.9327	0.9482
480 - 490 nm	0.9201	0.9496	0.9509	0.9486	0.9471	0.9454	0.9580
490 - 500 nm	0.9213	0.9368	0.9383	0.9359	0.9343	0.9322	0.9451
500 - 510 nm	0.9196	0.9413	0.9432	0.9406	0.9387	0.9374	0.9500
510 - 520 nm	0.9187	0.9502	0.9518	0.9492	0.9475	0.9467	0.9598
520 - 530 nm	0.9216	0.9418	0.9432	0.9405	0.9396	0.9380	0.9506
530 - 540 nm	0.9215	0.9458	0.9468	0.9446	0.9431	0.9423	0.9550
540 - 550 nm	0.9259	0.9504	0.9516	0.9492	0.9478	0.9477	0.9605
550 - 560 nm	0.9262	0.9492	0.9506	0.9487	0.9475	0.9470	0.9595
560 - 570 nm	0.9248	0.9447	0.9460	0.9441	0.9433	0.9430	0.9559
570 - 580 nm	0.9289	0.9421	0.9433	0.9411	0.9404	0.9408	0.9533
580 - 590 nm	0.9265	0.9355	0.9365	0.9348	0.9337	0.9352	0.9466
590 - 600 nm	0.9228	0.9347	0.9358	0.9339	0.9332	0.9347	0.9447
600 - 610 nm	0.9299	0.9343	0.9362	0.9339	0.9334	0.9339	0.9450
610 - 620 nm	0.9286	0.9307	0.9325	0.9306	0.9303	0.9322	0.9429
620 - 630 nm	0.9303	0.9297	0.9315	0.9296	0.9302	0.9318	0.9406
630 - 640 nm	0.9289	0.9289	0.9312	0.9295	0.9295	0.9311	0.9400
640 - 650 nm	0.9268	0.9328	0.9350	0.9341	0.9326	0.9344	0.9440
650 - 660 nm	0.9315	0.9389	0.9409	0.9399	0.9387	0.9403	0.9496
660 - 670 nm	0.9254	0.9249	0.9270	0.9261	0.9246	0.9270	0.9366
670 - 680 nm	0.9267	0.9308	0.9329	0.9320	0.9307	0.9328	0.9420
680 - 690 nm	0.9110	0.9259	0.9278	0.9280	0.9270	0.9307	0.9392
690 - 700 nm	0.9231	0.9236	0.9258	0.9248	0.9247	0.9280	0.9346
700 - 710 nm	0.9092	0.9145	0.9169	0.9148	0.9138	0.9155	0.9262

710 - 720 nm	0.9197	0.9307	0.9332	0.9320	0.9335	0.9378	0.9432
720 - 730 nm	0.9041	0.9073	0.9095	0.9076	0.9073	0.9105	0.9191
730 - 740 nm	0.9038	0.9018	0.9044	0.9037	0.9042	0.9074	0.9144
740 - 750 nm	0.9063	0.9110	0.9135	0.9122	0.9132	0.9173	0.9218
750 - 760 nm	0.9003	0.9016	0.9030	0.9030	0.9024	0.9077	0.9128
760 - 770 nm	0.9099	0.9615	0.9637	0.9640	0.9669	0.9735	0.9746
770 - 780 nm	0.9041	0.8980	0.9013	0.9002	0.8985	0.9019	0.9085
780 - 790 nm	0.8861	0.8931	0.8970	0.8959	0.8938	0.8987	0.9049
790 - 800 nm	0.9045	0.9055	0.9099	0.9087	0.9083	0.9141	0.9187
800 - 810 nm	0.8959	0.8946	0.8985	0.8985	0.8977	0.9058	0.9090
810 - 820 nm	0.8644	0.8777	0.8803	0.8808	0.8780	0.8857	0.8932
820 - 830 nm	0.8913	0.8928	0.8964	0.8977	0.9039	0.9182	0.9133
830 - 840 nm	0.8866	0.8935	0.8974	0.8982	0.8983	0.9093	0.9128
840 - 850 nm	0.8966	0.8900	0.8945	0.8932	0.8912	0.9003	0.9038
850 - 860 nm	0.8782	0.8802	0.8861	0.8851	0.8799	0.8901	0.8962
860 - 870 nm	0.8750	0.8729	0.8830	0.8825	0.8798	0.8916	0.8941
870 - 880 nm	0.8430	0.8212	0.8441	0.8443	0.8411	0.8513	0.8589
880 - 890 nm	0.8841	0.9009	0.8905	0.8905	0.8959	0.9107	0.9063
890 - 900 nm	0.8808	0.9026	0.8983	0.8985	0.9013	0.9157	0.9102
900 - 910 nm	0.8780	0.8928	0.8912	0.8914	0.8922	0.9046	0.9027
910 - 920 nm	0.8712	0.8890	0.8927	0.8934	0.8963	0.9109	0.9036
920 - 930 nm	0.8819	0.9097	0.9061	0.9062	0.9049	0.9137	0.9153
930 - 940 nm	0.8935	0.8769	0.8878	0.8876	0.8873	0.8975	0.8954
940 - 950 nm	0.8353	0.8384	0.8418	0.8439	0.8425	0.8512	0.8516
950 - 960 nm	0.8880	0.8971	0.8989	0.8974	0.9025	0.9118	0.8990
960 - 970 nm	0.8081	0.8067	0.8087	0.8088	0.8033	0.8101	0.8140
970 - 980 nm	0.8074	0.8261	0.8219	0.8256	0.8203	0.8253	0.8354
980 - 990 nm	0.8491	0.8754	0.8746	0.8751	0.8774	0.8845	0.8771
990 - 1000 nm	0.9270	0.9495	0.9596	0.9596	0.9661	0.9753	0.9576
1000 - 1010 nm	0.8507	0.8765	0.8774	0.8764	0.8756	0.8799	0.8796
1010 - 1020 nm	0.9423	0.9665	0.9751	0.9710	0.9766	0.9832	0.9617
1020 - 1030 nm	0.9481	0.9590	0.9669	0.9601	0.9677	0.9672	0.9508
1030 - 1040 nm	0.9283	0.9448	0.9498	0.9443	0.9492	0.9491	0.9346
1040 - 1050 nm	0.8853	0.8795	0.8822	0.8832	0.8827	0.8801	0.8758
1050 - 1060 nm	0.9019	0.8846	0.8876	0.8868	0.8903	0.8853	0.8790
1060 - 1070 nm	1.0057	0.9594	0.9644	0.9636	0.9694	0.9641	0.9411
1070 - 1080 nm	0.9554	0.8852	0.8916	0.8886	0.8929	0.8873	0.8742

R10* relative at different irradiances in Apollo							
Band	1100	1000	800	600	400	200	100
300 - 310 nm	2.6730	2.1032	2.1194	2.1553	2.1118	2.0396	1.9157
310 - 320 nm	2.5029	2.1188	2.1326	2.1394	2.1320	2.0828	1.9645
320 - 330 nm	2.3238	1.9672	1.9763	1.9796	1.9578	1.9812	1.8824
330 - 340 nm	1.9037	1.6288	1.6585	1.6705	1.6517	1.6512	1.6528

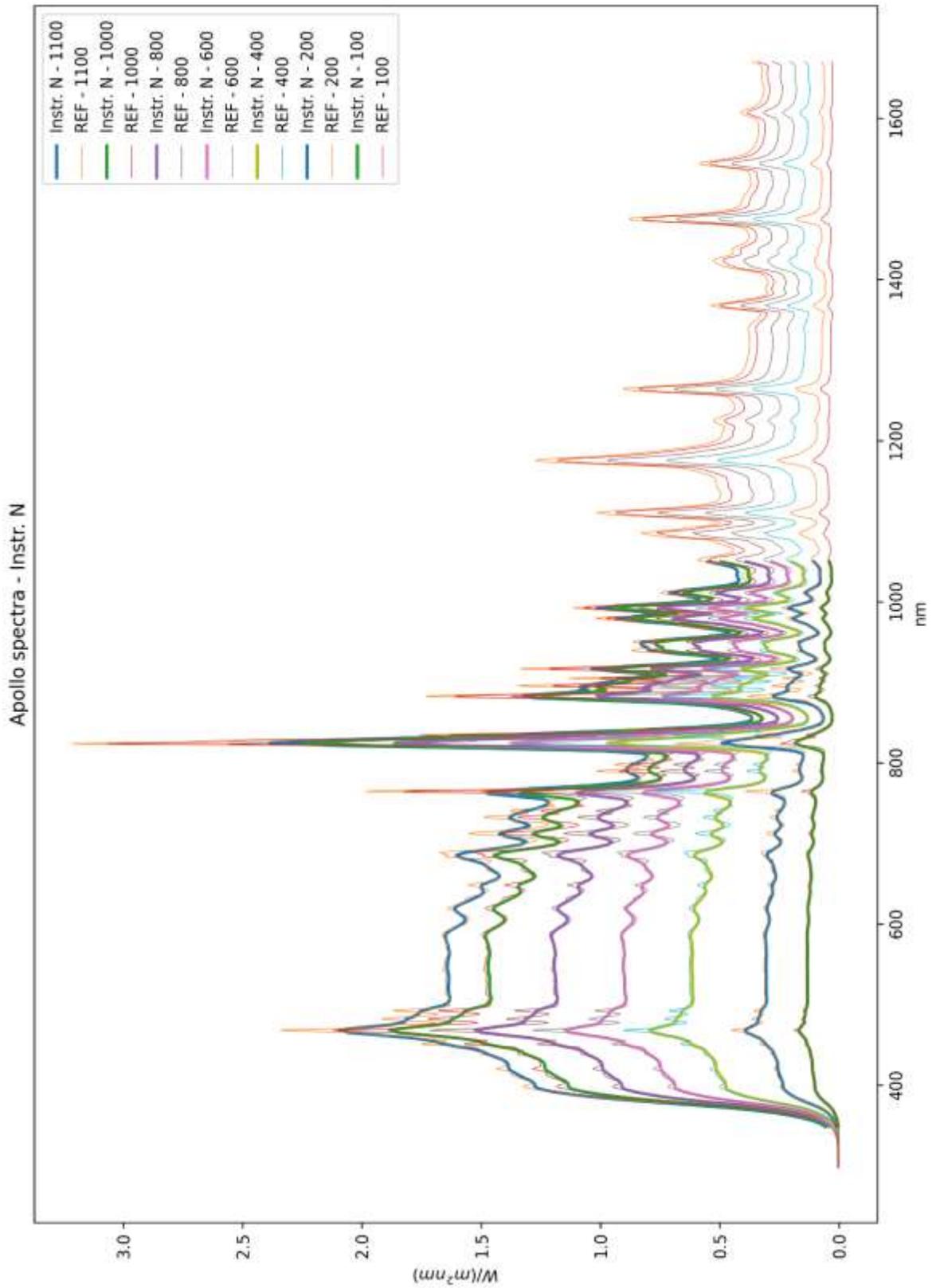
340 - 350 nm	1.4898	1.2933	1.3413	1.3589	1.3376	1.3237	1.3504
350 - 360 nm	1.2397	1.0943	1.1129	1.1096	1.1003	1.1178	1.1145
360 - 370 nm	1.1205	1.0473	1.0566	1.0520	1.0454	1.0492	1.0574
370 - 380 nm	1.0510	1.0053	1.0057	1.0039	0.9953	0.9840	0.9928
380 - 390 nm	1.0371	0.9682	0.9678	0.9661	0.9607	0.9426	0.9530
390 - 400 nm	1.0298	1.0277	1.0278	1.0275	1.0233	1.0126	1.0260
400 - 410 nm	1.0218	1.0186	1.0189	1.0172	1.0141	1.0058	1.0159
410 - 420 nm	1.0049	1.0324	1.0329	1.0302	1.0275	1.0190	1.0287
420 - 430 nm	1.0102	1.0326	1.0326	1.0303	1.0275	1.0196	1.0282
430 - 440 nm	1.0011	1.0233	1.0228	1.0221	1.0183	1.0118	1.0198
440 - 450 nm	0.9901	1.0011	1.0008	1.0000	0.9960	0.9910	0.9989
450 - 460 nm	0.9999	1.0109	1.0104	1.0098	1.0082	1.0017	1.0077
460 - 470 nm	0.9965	1.0092	1.0081	1.0079	1.0075	1.0035	1.0085
470 - 480 nm	1.0094	1.0185	1.0175	1.0164	1.0148	1.0085	1.0163
480 - 490 nm	1.0089	1.0296	1.0285	1.0273	1.0264	1.0222	1.0268
490 - 500 nm	1.0102	1.0157	1.0148	1.0135	1.0125	1.0079	1.0129
500 - 510 nm	1.0083	1.0205	1.0201	1.0186	1.0173	1.0136	1.0183
510 - 520 nm	1.0074	1.0302	1.0294	1.0279	1.0268	1.0236	1.0287
520 - 530 nm	1.0106	1.0210	1.0201	1.0185	1.0182	1.0142	1.0188
530 - 540 nm	1.0105	1.0254	1.0240	1.0229	1.0220	1.0189	1.0236
540 - 550 nm	1.0152	1.0304	1.0292	1.0279	1.0271	1.0247	1.0295
550 - 560 nm	1.0156	1.0291	1.0282	1.0274	1.0268	1.0240	1.0284
560 - 570 nm	1.0140	1.0242	1.0231	1.0224	1.0222	1.0196	1.0245
570 - 580 nm	1.0186	1.0214	1.0202	1.0191	1.0190	1.0172	1.0218
580 - 590 nm	1.0159	1.0143	1.0129	1.0123	1.0118	1.0112	1.0146
590 - 600 nm	1.0118	1.0134	1.0121	1.0113	1.0113	1.0106	1.0125
600 - 610 nm	1.0196	1.0130	1.0126	1.0113	1.0115	1.0098	1.0129
610 - 620 nm	1.0182	1.0090	1.0085	1.0078	1.0082	1.0080	1.0106
620 - 630 nm	1.0200	1.0080	1.0075	1.0066	1.0081	1.0075	1.0081
630 - 640 nm	1.0185	1.0071	1.0071	1.0065	1.0073	1.0068	1.0075
640 - 650 nm	1.0162	1.0113	1.0113	1.0116	1.0107	1.0103	1.0118
650 - 660 nm	1.0214	1.0180	1.0176	1.0178	1.0172	1.0167	1.0178
660 - 670 nm	1.0147	1.0028	1.0026	1.0029	1.0020	1.0024	1.0039
670 - 680 nm	1.0161	1.0091	1.0090	1.0092	1.0085	1.0086	1.0096
680 - 690 nm	0.9989	1.0038	1.0034	1.0050	1.0046	1.0063	1.0067
690 - 700 nm	1.0122	1.0014	1.0013	1.0015	1.0020	1.0035	1.0017
700 - 710 nm	0.9969	0.9915	0.9916	0.9906	0.9903	0.9899	0.9928
710 - 720 nm	1.0084	1.0091	1.0093	1.0093	1.0116	1.0140	1.0109
720 - 730 nm	0.9913	0.9837	0.9837	0.9829	0.9832	0.9844	0.9852
730 - 740 nm	0.9910	0.9777	0.9781	0.9786	0.9798	0.9812	0.9801
740 - 750 nm	0.9937	0.9877	0.9880	0.9879	0.9896	0.9918	0.9880
750 - 760 nm	0.9872	0.9775	0.9767	0.9779	0.9779	0.9814	0.9784
760 - 770 nm	0.9977	1.0424	1.0423	1.0439	1.0478	1.0526	1.0446
770 - 780 nm	0.9914	0.9737	0.9748	0.9749	0.9737	0.9752	0.9738
780 - 790 nm	0.9716	0.9682	0.9702	0.9702	0.9686	0.9717	0.9699

790 - 800 nm	0.9918	0.9818	0.9841	0.9840	0.9843	0.9884	0.9847
800 - 810 nm	0.9824	0.9700	0.9718	0.9730	0.9728	0.9794	0.9743
810 - 820 nm	0.9478	0.9516	0.9521	0.9539	0.9514	0.9577	0.9574
820 - 830 nm	0.9773	0.9680	0.9695	0.9722	0.9795	0.9928	0.9789
830 - 840 nm	0.9722	0.9687	0.9706	0.9727	0.9734	0.9831	0.9784
840 - 850 nm	0.9831	0.9649	0.9674	0.9673	0.9658	0.9734	0.9687
850 - 860 nm	0.9629	0.9543	0.9583	0.9585	0.9536	0.9624	0.9605
860 - 870 nm	0.9595	0.9464	0.9551	0.9557	0.9534	0.9640	0.9583
870 - 880 nm	0.9243	0.8903	0.9130	0.9143	0.9115	0.9205	0.9206
880 - 890 nm	0.9694	0.9767	0.9631	0.9643	0.9709	0.9847	0.9713
890 - 900 nm	0.9657	0.9786	0.9715	0.9730	0.9768	0.9901	0.9755
900 - 910 nm	0.9627	0.9680	0.9639	0.9653	0.9668	0.9781	0.9676
910 - 920 nm	0.9553	0.9639	0.9655	0.9675	0.9713	0.9849	0.9685
920 - 930 nm	0.9670	0.9863	0.9800	0.9814	0.9806	0.9879	0.9811
930 - 940 nm	0.9797	0.9508	0.9602	0.9612	0.9615	0.9704	0.9598
940 - 950 nm	0.9159	0.9090	0.9105	0.9138	0.9130	0.9203	0.9128
950 - 960 nm	0.9737	0.9726	0.9722	0.9718	0.9780	0.9859	0.9635
960 - 970 nm	0.8861	0.8747	0.8747	0.8759	0.8706	0.8759	0.8725
970 - 980 nm	0.8853	0.8957	0.8889	0.8941	0.8889	0.8923	0.8954
980 - 990 nm	0.9310	0.9491	0.9459	0.9477	0.9508	0.9564	0.9401
990 - 1000 nm	1.0164	1.0294	1.0378	1.0392	1.0469	1.0546	1.0264
1000 - 1010 nm	0.9328	0.9503	0.9489	0.9490	0.9489	0.9513	0.9428
1010 - 1020 nm	1.0332	1.0479	1.0547	1.0516	1.0584	1.0631	1.0308
1020 - 1030 nm	1.0396	1.0398	1.0457	1.0397	1.0487	1.0458	1.0191
1030 - 1040 nm	1.0178	1.0244	1.0273	1.0226	1.0287	1.0262	1.0017
1040 - 1050 nm	0.9707	0.9536	0.9542	0.9564	0.9566	0.9516	0.9387
1050 - 1060 nm	0.9889	0.9591	0.9599	0.9603	0.9648	0.9572	0.9422
1060 - 1070 nm	1.1028	1.0402	1.0430	1.0435	1.0505	1.0424	1.0087
1070 - 1080 nm	1.0476	0.9598	0.9643	0.9623	0.9677	0.9594	0.9370

Source: European Solar Test Installation – JRC

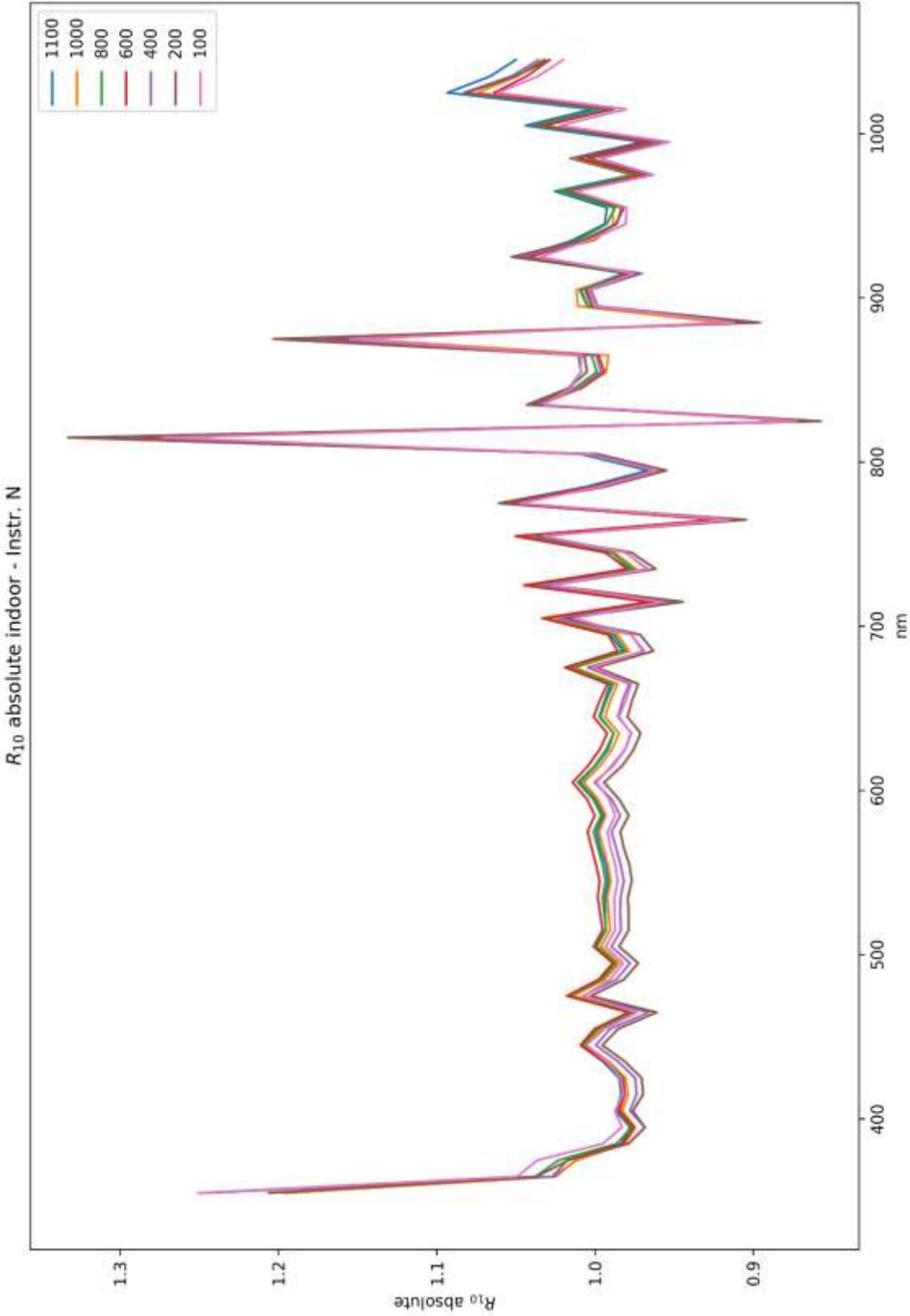
1.32 Instrument "N"

Figure 36: Instrument N - Indoor Apollo spectra at different irradiance levels.



Source: European Solar Test Installation – JRC.

Figure 37: Instrument N - Indoor R10 and R10* functions at different irradiance levels.



Source: European Solar Test Installation – JRC.

Table 28: Instrument N – Indoor R10 and R10* functions at different irradiance levels.

R10 absolute at different irradiances in Apollo							
Band	1100	1000	800	600	400	200	100
350 - 360 nm	1.1946	1.1968	1.2445	1.2488	1.2473	1.2060	1.2506
360 - 370 nm	1.0250	1.0264	1.0373	1.0265	1.0269	1.0367	1.0491
370 - 380 nm	1.0119	1.0112	1.0229	1.0173	1.0172	1.0167	1.0361
380 - 390 nm	0.9833	0.9809	0.9861	0.9823	0.9788	0.9786	0.9950
390 - 400 nm	0.9778	0.9745	0.9767	0.9754	0.9683	0.9684	0.9828
400 - 410 nm	0.9866	0.9826	0.9852	0.9844	0.9778	0.9760	0.9873
410 - 420 nm	0.9833	0.9791	0.9811	0.9813	0.9736	0.9695	0.9821
420 - 430 nm	0.9845	0.9805	0.9820	0.9824	0.9744	0.9704	0.9835
430 - 440 nm	0.9948	0.9910	0.9927	0.9938	0.9852	0.9810	0.9924
440 - 450 nm	1.0091	1.0056	1.0076	1.0090	0.9993	0.9952	1.0053
450 - 460 nm	0.9994	0.9962	0.9981	1.0001	0.9902	0.9851	0.9940
460 - 470 nm	0.9775	0.9743	0.9755	0.9787	0.9660	0.9609	0.9733
470 - 480 nm	1.0148	1.0137	1.0165	1.0177	1.0077	1.0025	1.0069
480 - 490 nm	0.9964	0.9937	0.9956	0.9977	0.9863	0.9816	0.9904
490 - 500 nm	0.9875	0.9847	0.9866	0.9886	0.9777	0.9726	0.9820
500 - 510 nm	0.9995	0.9962	0.9988	1.0008	0.9896	0.9847	0.9932
510 - 520 nm	0.9932	0.9904	0.9930	0.9951	0.9834	0.9786	0.9872
520 - 530 nm	0.9934	0.9912	0.9940	0.9966	0.9840	0.9786	0.9874
530 - 540 nm	0.9935	0.9921	0.9951	0.9982	0.9838	0.9791	0.9876
540 - 550 nm	0.9915	0.9899	0.9932	0.9969	0.9816	0.9766	0.9856
550 - 560 nm	0.9932	0.9917	0.9951	0.9992	0.9837	0.9782	0.9870
560 - 570 nm	0.9965	0.9946	0.9979	1.0020	0.9865	0.9817	0.9901
570 - 580 nm	0.9989	0.9973	1.0009	1.0046	0.9894	0.9839	0.9920
580 - 590 nm	0.9944	0.9930	0.9959	1.0000	0.9839	0.9786	0.9872
590 - 600 nm	1.0000	0.9982	1.0012	1.0051	0.9895	0.9848	0.9912
600 - 610 nm	1.0093	1.0070	1.0107	1.0140	1.0002	0.9942	0.9990
610 - 620 nm	0.9996	0.9968	1.0002	1.0043	0.9887	0.9828	0.9898
620 - 630 nm	0.9917	0.9892	0.9928	0.9970	0.9808	0.9755	0.9810
630 - 640 nm	0.9880	0.9847	0.9881	0.9921	0.9769	0.9711	0.9771
640 - 650 nm	0.9972	0.9936	0.9965	1.0007	0.9853	0.9794	0.9847
650 - 660 nm	0.9937	0.9902	0.9928	0.9968	0.9825	0.9764	0.9803
660 - 670 nm	0.9902	0.9857	0.9883	0.9920	0.9782	0.9726	0.9770
670 - 680 nm	1.0157	1.0124	1.0151	1.0188	1.0046	0.9986	1.0009
680 - 690 nm	0.9824	0.9782	0.9804	0.9856	0.9689	0.9629	0.9700
690 - 700 nm	0.9902	0.9857	0.9879	0.9916	0.9771	0.9714	0.9766
700 - 710 nm	1.0304	1.0283	1.0325	1.0332	1.0229	1.0181	1.0134
710 - 720 nm	0.9661	0.9598	0.9607	0.9651	0.9499	0.9443	0.9566
720 - 730 nm	1.0432	1.0396	1.0424	1.0448	1.0331	1.0280	1.0276
730 - 740 nm	0.9783	0.9739	0.9761	0.9798	0.9668	0.9615	0.9661
740 - 750 nm	0.9936	0.9877	0.9895	0.9931	0.9805	0.9768	0.9806
750 - 760 nm	1.0474	1.0444	1.0481	1.0502	1.0394	1.0367	1.0322

760 - 770 nm	0.9223	0.9164	0.9179	0.9220	0.9082	0.9044	0.9146
770 - 780 nm	1.0608	1.0557	1.0600	1.0584	1.0531	1.0527	1.0471
780 - 790 nm	1.0057	0.9982	1.0005	1.0007	0.9943	0.9937	0.9973
790 - 800 nm	0.9662	0.9588	0.9612	0.9611	0.9551	0.9546	0.9604
800 - 810 nm	1.0092	1.0006	1.0037	1.0038	0.9981	1.0005	1.0046
810 - 820 nm	1.2926	1.3044	1.3202	1.3076	1.3228	1.3329	1.2729
820 - 830 nm	0.8692	0.8649	0.8668	0.8712	0.8570	0.8585	0.8728
830 - 840 nm	1.0348	1.0349	1.0421	1.0390	1.0372	1.0429	1.0324
840 - 850 nm	1.0162	1.0083	1.0129	1.0088	1.0101	1.0168	1.0150
850 - 860 nm	1.0087	0.9928	0.9987	0.9940	0.9962	1.0049	1.0089
860 - 870 nm	1.0102	0.9914	1.0020	0.9976	0.9990	1.0066	1.0086
870 - 880 nm	1.1666	1.1488	1.1884	1.1744	1.1905	1.2031	1.1547
880 - 890 nm	0.9110	0.9192	0.9042	0.9050	0.8951	0.8978	0.9121
890 - 900 nm	1.0045	1.0106	1.0042	1.0019	0.9980	1.0020	0.9999
900 - 910 nm	1.0096	1.0116	1.0088	1.0052	1.0026	1.0062	1.0038
910 - 920 nm	0.9814	0.9767	0.9781	0.9776	0.9702	0.9729	0.9751
920 - 930 nm	1.0463	1.0523	1.0515	1.0419	1.0474	1.0525	1.0348
930 - 940 nm	1.0146	1.0001	1.0111	1.0054	1.0052	1.0078	1.0037
940 - 950 nm	0.9938	0.9885	0.9926	0.9861	0.9864	0.9869	0.9805
950 - 960 nm	0.9923	0.9885	0.9872	0.9830	0.9819	0.9816	0.9799
960 - 970 nm	1.0252	1.0185	1.0225	1.0148	1.0162	1.0181	1.0122
970 - 980 nm	0.9764	0.9748	0.9726	0.9708	0.9666	0.9659	0.9628
980 - 990 nm	1.0153	1.0134	1.0113	1.0102	1.0044	1.0037	0.9967
990 - 1000 nm	0.9699	0.9572	0.9640	0.9657	0.9573	0.9546	0.9527
1000 - 1010 nm	1.0437	1.0378	1.0385	1.0321	1.0365	1.0367	1.0222
1010 - 1020 nm	1.0017	0.9923	0.9965	0.9880	0.9923	0.9883	0.9801
1020 - 1030 nm	1.0931	1.0742	1.0819	1.0636	1.0829	1.0815	1.0614
1030 - 1040 nm	1.0661	1.0493	1.0502	1.0431	1.0529	1.0494	1.0360
1040 - 1050 nm	1.0500	1.0325	1.0286	1.0284	1.0357	1.0316	1.0200

R10* relative at different irradiances in Apollo							
Band	1100	1000	800	600	400	200	100
350 - 360 nm	1.1973	1.2038	1.2486	1.2514	1.2625	1.2242	1.2630
360 - 370 nm	1.0273	1.0325	1.0408	1.0286	1.0395	1.0523	1.0595
370 - 380 nm	1.0141	1.0172	1.0263	1.0194	1.0296	1.0320	1.0464
380 - 390 nm	0.9855	0.9867	0.9894	0.9844	0.9907	0.9934	1.0049
390 - 400 nm	0.9799	0.9803	0.9799	0.9774	0.9801	0.9830	0.9926
400 - 410 nm	0.9887	0.9884	0.9884	0.9864	0.9898	0.9907	0.9972
410 - 420 nm	0.9855	0.9848	0.9843	0.9833	0.9855	0.9841	0.9919
420 - 430 nm	0.9867	0.9863	0.9853	0.9844	0.9864	0.9850	0.9933
430 - 440 nm	0.9970	0.9968	0.9960	0.9959	0.9972	0.9957	1.0023
440 - 450 nm	1.0113	1.0116	1.0109	1.0111	1.0115	1.0102	1.0153
450 - 460 nm	1.0016	1.0021	1.0014	1.0022	1.0023	1.0000	1.0039
460 - 470 nm	0.9797	0.9801	0.9788	0.9807	0.9778	0.9754	0.9830

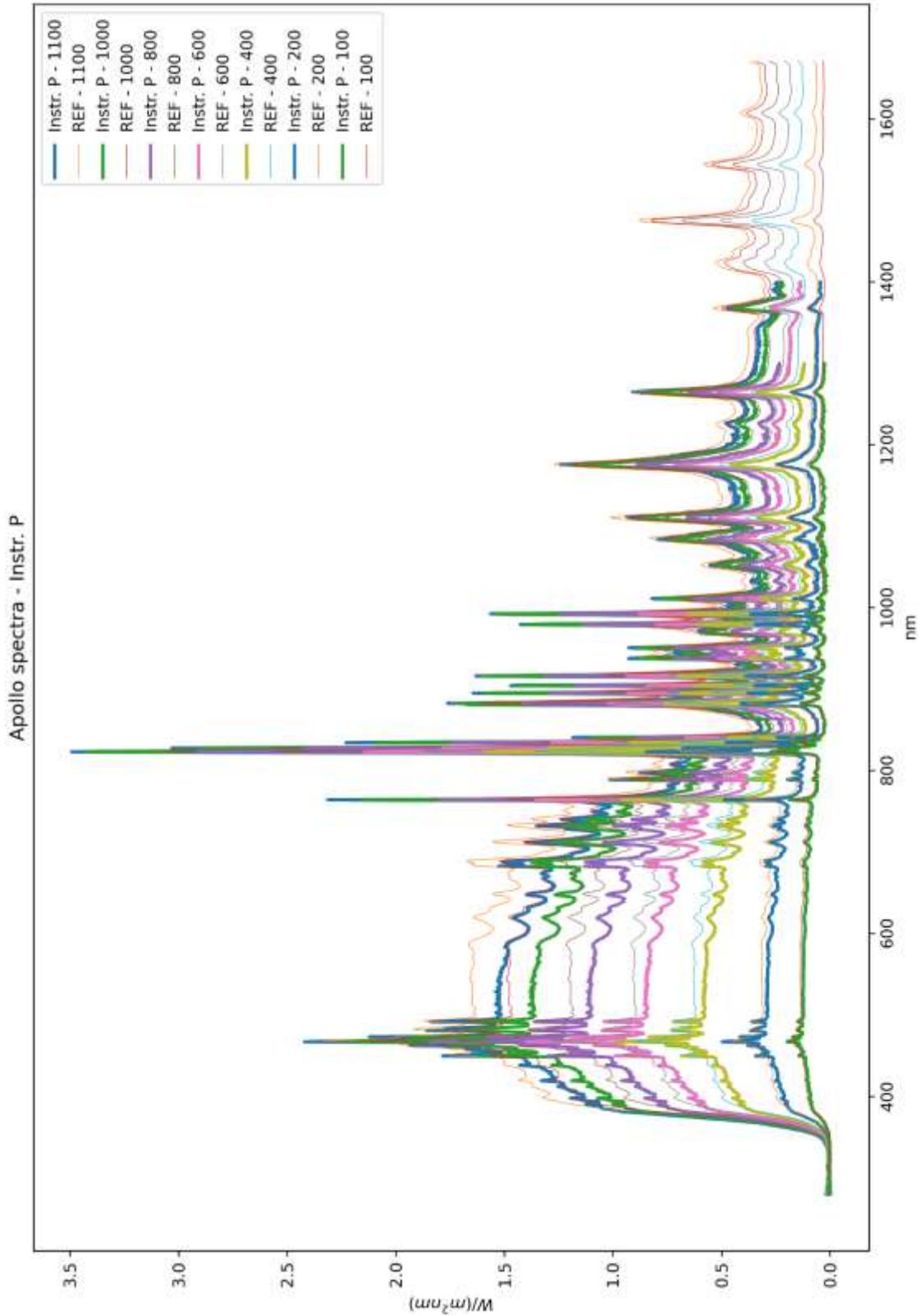
470 - 480 nm	1.0171	1.0197	1.0199	1.0198	1.0200	1.0176	1.0170
480 - 490 nm	0.9986	0.9995	0.9989	0.9997	0.9984	0.9964	1.0002
490 - 500 nm	0.9897	0.9904	0.9899	0.9907	0.9897	0.9872	0.9918
500 - 510 nm	1.0017	1.0021	1.0021	1.0029	1.0017	0.9996	1.0031
510 - 520 nm	0.9954	0.9962	0.9963	0.9972	0.9954	0.9934	0.9971
520 - 530 nm	0.9956	0.9971	0.9974	0.9986	0.9960	0.9934	0.9972
530 - 540 nm	0.9957	0.9979	0.9984	1.0002	0.9958	0.9939	0.9974
540 - 550 nm	0.9937	0.9957	0.9965	0.9990	0.9936	0.9913	0.9954
550 - 560 nm	0.9954	0.9976	0.9984	1.0013	0.9958	0.9929	0.9969
560 - 570 nm	0.9987	1.0004	1.0013	1.0040	0.9986	0.9965	1.0000
570 - 580 nm	1.0011	1.0032	1.0042	1.0067	1.0015	0.9987	1.0019
580 - 590 nm	0.9966	0.9988	0.9992	1.0020	0.9960	0.9933	0.9970
590 - 600 nm	1.0022	1.0041	1.0045	1.0072	1.0016	0.9997	1.0011
600 - 610 nm	1.0116	1.0129	1.0141	1.0161	1.0124	1.0092	1.0089
610 - 620 nm	1.0018	1.0027	1.0035	1.0064	1.0008	0.9976	0.9996
620 - 630 nm	0.9939	0.9950	0.9961	0.9990	0.9928	0.9902	0.9908
630 - 640 nm	0.9902	0.9905	0.9914	0.9942	0.9888	0.9857	0.9869
640 - 650 nm	0.9994	0.9994	0.9998	1.0028	0.9974	0.9942	0.9945
650 - 660 nm	0.9959	0.9960	0.9961	0.9989	0.9945	0.9911	0.9901
660 - 670 nm	0.9924	0.9915	0.9916	0.9941	0.9902	0.9873	0.9868
670 - 680 nm	1.0179	1.0184	1.0185	1.0209	1.0169	1.0137	1.0109
680 - 690 nm	0.9846	0.9840	0.9836	0.9876	0.9808	0.9775	0.9796
690 - 700 nm	0.9924	0.9915	0.9911	0.9937	0.9890	0.9861	0.9863
700 - 710 nm	1.0327	1.0344	1.0359	1.0354	1.0355	1.0334	1.0235
710 - 720 nm	0.9683	0.9655	0.9639	0.9671	0.9615	0.9586	0.9662
720 - 730 nm	1.0455	1.0457	1.0458	1.0469	1.0457	1.0435	1.0378
730 - 740 nm	0.9805	0.9796	0.9793	0.9818	0.9787	0.9760	0.9758
740 - 750 nm	0.9958	0.9935	0.9928	0.9951	0.9925	0.9915	0.9904
750 - 760 nm	1.0497	1.0506	1.0516	1.0524	1.0522	1.0524	1.0425
760 - 770 nm	0.9244	0.9218	0.9210	0.9239	0.9193	0.9180	0.9237
770 - 780 nm	1.0631	1.0619	1.0635	1.0606	1.0660	1.0685	1.0576
780 - 790 nm	1.0079	1.0041	1.0039	1.0027	1.0065	1.0087	1.0073
790 - 800 nm	0.9684	0.9644	0.9644	0.9630	0.9668	0.9690	0.9700
800 - 810 nm	1.0114	1.0065	1.0070	1.0059	1.0103	1.0156	1.0146
810 - 820 nm	1.2954	1.3121	1.3245	1.3103	1.3390	1.3530	1.2856
820 - 830 nm	0.8711	0.8700	0.8697	0.8730	0.8674	0.8714	0.8815
830 - 840 nm	1.0371	1.0410	1.0455	1.0412	1.0499	1.0586	1.0426
840 - 850 nm	1.0184	1.0143	1.0162	1.0109	1.0225	1.0321	1.0251
850 - 860 nm	1.0110	0.9987	1.0020	0.9961	1.0083	1.0201	1.0190
860 - 870 nm	1.0124	0.9973	1.0053	0.9997	1.0113	1.0218	1.0186
870 - 880 nm	1.1692	1.1556	1.1924	1.1768	1.2051	1.2212	1.1662
880 - 890 nm	0.9130	0.9246	0.9072	0.9069	0.9061	0.9113	0.9212
890 - 900 nm	1.0068	1.0166	1.0075	1.0039	1.0102	1.0171	1.0099
900 - 910 nm	1.0119	1.0176	1.0122	1.0072	1.0148	1.0214	1.0138
910 - 920 nm	0.9836	0.9824	0.9814	0.9796	0.9821	0.9875	0.9849

920 - 930 nm	1.0486	1.0585	1.0550	1.0441	1.0602	1.0684	1.0451
930 - 940 nm	1.0168	1.0060	1.0144	1.0075	1.0175	1.0230	1.0137
940 - 950 nm	0.9960	0.9943	0.9959	0.9881	0.9985	1.0018	0.9903
950 - 960 nm	0.9945	0.9943	0.9905	0.9850	0.9939	0.9964	0.9897
960 - 970 nm	1.0275	1.0245	1.0259	1.0169	1.0287	1.0334	1.0222
970 - 980 nm	0.9786	0.9805	0.9759	0.9728	0.9784	0.9805	0.9724
980 - 990 nm	1.0175	1.0194	1.0146	1.0123	1.0167	1.0188	1.0066
990 - 1000 nm	0.9721	0.9628	0.9672	0.9677	0.9691	0.9690	0.9622
1000 - 1010 nm	1.0460	1.0439	1.0420	1.0342	1.0492	1.0524	1.0324
1010 - 1020 nm	1.0040	0.9981	0.9998	0.9900	1.0045	1.0032	0.9899
1020 - 1030 nm	1.0955	1.0806	1.0855	1.0658	1.0961	1.0978	1.0720
1030 - 1040 nm	1.0685	1.0555	1.0537	1.0452	1.0657	1.0652	1.0463
1040 - 1050 nm	1.0523	1.0386	1.0320	1.0305	1.0483	1.0471	1.0302

Source: European Solar Test Installation – JRC

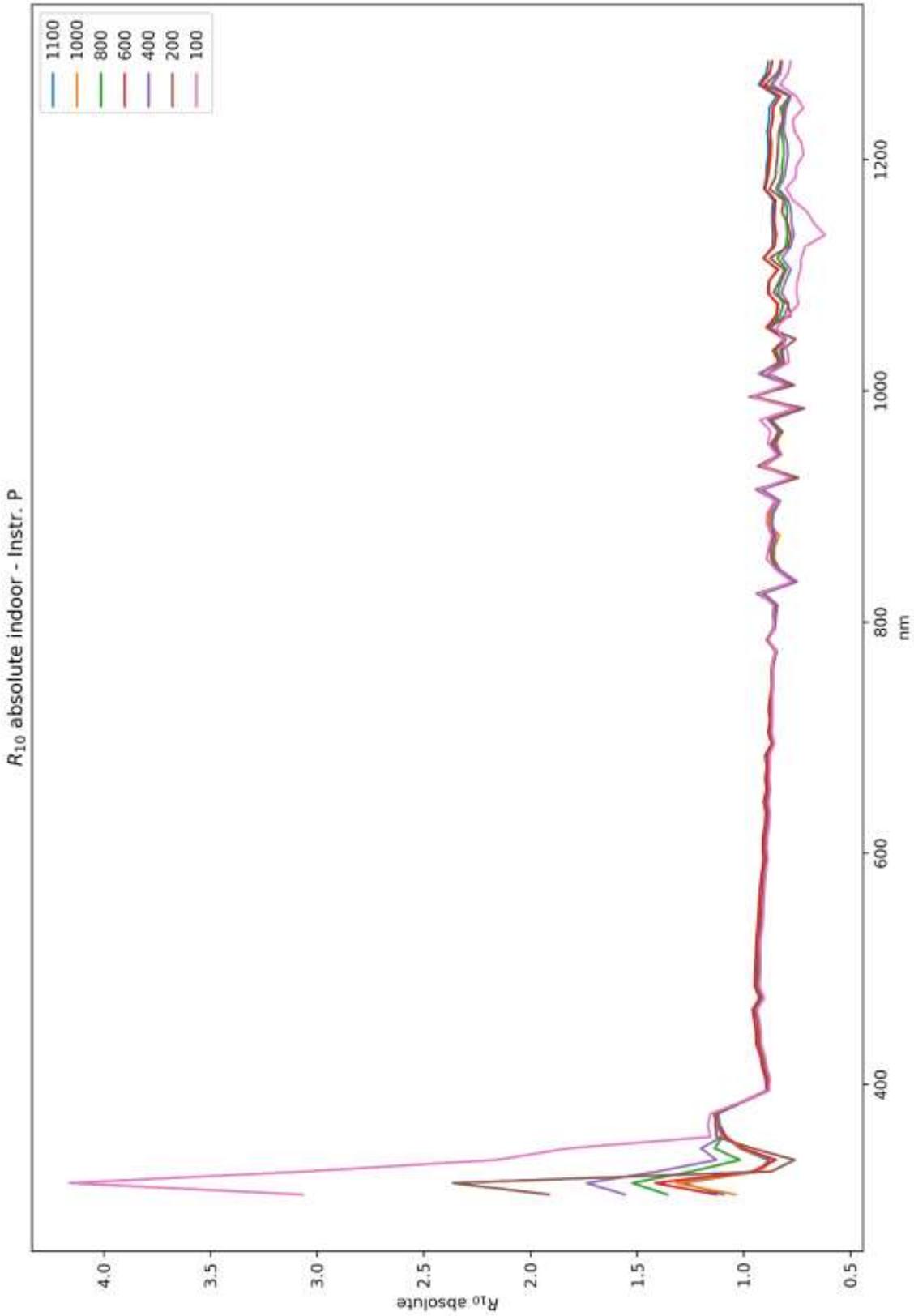
1.33 Instrument "P"

Figure 38: Instrument P - Indoor Apollo spectra at different irradiance levels.



Source: European Solar Test Installation – JRC.

Figure 39: Instrument P - Indoor R10 and R10* functions at different irradiance levels.



Source: European Solar Test Installation – JRC.

Table 29: Instrument P – Indoor R10 and R10* functions at different irradiance levels.

R10 absolute at different irradiances in Apollo							
Band	1100	1000	800	600	400	200	100
300 - 310 nm	1.0961	1.0397	1.3583	1.1282	1.5568	1.9133	3.0684
310 - 320 nm	1.2862	1.3174	1.5207	1.4131	1.7345	2.3624	4.1596
320 - 330 nm	0.9290	0.9306	1.2455	0.9605	1.4046	0.8717	3.0554
330 - 340 nm	0.8823	0.8570	1.0174	0.8488	1.1275	0.7612	2.1588
340 - 350 nm	1.0203	1.0147	1.1362	1.0033	1.2008	0.9590	1.8216
350 - 360 nm	1.0822	1.0941	1.1004	1.0831	1.1007	1.1277	1.1554
360 - 370 nm	1.1116	1.1149	1.1264	1.1199	1.1239	1.1327	1.1686
370 - 380 nm	1.1212	1.1304	1.1391	1.1322	1.1384	1.1360	1.1554
380 - 390 nm	1.0036	1.0063	1.0064	1.0139	1.0030	1.0053	1.0128
390 - 400 nm	0.8902	0.8889	0.8845	0.8945	0.8803	0.8847	0.8846
400 - 410 nm	0.8923	0.8914	0.8862	0.8969	0.8834	0.8857	0.8769
410 - 420 nm	0.9043	0.9033	0.9026	0.9134	0.9015	0.8989	0.8925
420 - 430 nm	0.9099	0.9115	0.9090	0.9218	0.9082	0.9083	0.9009
430 - 440 nm	0.9293	0.9298	0.9270	0.9417	0.9260	0.9273	0.9172
440 - 450 nm	0.9333	0.9338	0.9307	0.9430	0.9301	0.9296	0.9188
450 - 460 nm	0.9366	0.9379	0.9352	0.9502	0.9355	0.9351	0.9258
460 - 470 nm	0.9364	0.9421	0.9445	0.9595	0.9490	0.9516	0.9383
470 - 480 nm	0.9069	0.9098	0.9109	0.9256	0.9134	0.9145	0.9038
480 - 490 nm	0.9258	0.9307	0.9336	0.9491	0.9376	0.9398	0.9281
490 - 500 nm	0.9253	0.9286	0.9310	0.9473	0.9358	0.9351	0.9214
500 - 510 nm	0.9307	0.9325	0.9323	0.9462	0.9350	0.9334	0.9208
510 - 520 nm	0.9276	0.9291	0.9290	0.9428	0.9310	0.9315	0.9224
520 - 530 nm	0.9265	0.9290	0.9285	0.9413	0.9301	0.9287	0.9223
530 - 540 nm	0.9242	0.9250	0.9234	0.9361	0.9215	0.9245	0.9132
540 - 550 nm	0.9197	0.9209	0.9199	0.9326	0.9191	0.9212	0.9084
550 - 560 nm	0.9162	0.9169	0.9162	0.9285	0.9153	0.9153	0.9072
560 - 570 nm	0.9108	0.9130	0.9110	0.9254	0.9117	0.9122	0.9039
570 - 580 nm	0.9045	0.9072	0.9070	0.9208	0.9092	0.9100	0.9007
580 - 590 nm	0.8960	0.8993	0.9000	0.9141	0.9038	0.9034	0.8971
590 - 600 nm	0.8890	0.8925	0.8927	0.9074	0.8957	0.8983	0.8870
600 - 610 nm	0.8937	0.8963	0.8972	0.9108	0.9017	0.9012	0.8928
610 - 620 nm	0.8920	0.8941	0.8954	0.9103	0.9016	0.9007	0.8892
620 - 630 nm	0.8832	0.8852	0.8855	0.9000	0.8882	0.8885	0.8813
630 - 640 nm	0.8847	0.8854	0.8846	0.8964	0.8858	0.8855	0.8771
640 - 650 nm	0.8944	0.8954	0.8946	0.9064	0.8945	0.8936	0.8845
650 - 660 nm	0.8855	0.8857	0.8831	0.8941	0.8817	0.8821	0.8751
660 - 670 nm	0.8911	0.8900	0.8878	0.8994	0.8866	0.8887	0.8809
670 - 680 nm	0.8846	0.8847	0.8827	0.8919	0.8805	0.8786	0.8782
680 - 690 nm	0.8889	0.8903	0.8892	0.9003	0.8880	0.8919	0.8790
690 - 700 nm	0.8641	0.8608	0.8589	0.8695	0.8557	0.8579	0.8565
700 - 710 nm	0.8821	0.8791	0.8779	0.8863	0.8758	0.8756	0.8686

710 - 720 nm	0.8729	0.8729	0.8711	0.8773	0.8691	0.8697	0.8656
720 - 730 nm	0.8798	0.8781	0.8769	0.8844	0.8746	0.8745	0.8652
730 - 740 nm	0.8704	0.8699	0.8682	0.8767	0.8681	0.8679	0.8654
740 - 750 nm	0.8645	0.8617	0.8614	0.8681	0.8606	0.8613	0.8625
750 - 760 nm	0.8662	0.8657	0.8652	0.8717	0.8640	0.8687	0.8616
760 - 770 nm	0.8578	0.8577	0.8585	0.8672	0.8627	0.8662	0.8662
770 - 780 nm	0.8516	0.8461	0.8447	0.8505	0.8441	0.8450	0.8487
780 - 790 nm	0.8925	0.8885	0.8876	0.8925	0.8886	0.8927	0.8849
790 - 800 nm	0.8601	0.8540	0.8516	0.8586	0.8513	0.8566	0.8566
800 - 810 nm	0.8594	0.8523	0.8490	0.8600	0.8520	0.8608	0.8642
810 - 820 nm	0.8561	0.8443	0.8416	0.8478	0.8421	0.8496	0.8610
820 - 830 nm	0.9075	0.9065	0.9067	0.9177	0.9149	0.9386	0.9278
830 - 840 nm	0.7644	0.7550	0.7495	0.7579	0.7499	0.7651	0.7732
840 - 850 nm	0.8367	0.8281	0.8277	0.8323	0.8279	0.8432	0.8463
850 - 860 nm	0.8716	0.8573	0.8613	0.8667	0.8683	0.8714	0.8935
860 - 870 nm	0.8719	0.8566	0.8604	0.8669	0.8674	0.8760	0.8830
870 - 880 nm	0.8628	0.8323	0.8488	0.8573	0.8497	0.8678	0.8690
880 - 890 nm	0.8701	0.8814	0.8661	0.8685	0.8691	0.8915	0.8924
890 - 900 nm	0.8632	0.8685	0.8599	0.8638	0.8629	0.8823	0.8888
900 - 910 nm	0.8324	0.8313	0.8287	0.8320	0.8308	0.8497	0.8533
910 - 920 nm	0.9140	0.9147	0.9158	0.9169	0.9194	0.9428	0.9297
920 - 930 nm	0.7482	0.7465	0.7457	0.7478	0.7451	0.7442	0.7793
930 - 940 nm	0.9075	0.9060	0.9208	0.9167	0.9230	0.9333	0.9149
940 - 950 nm	0.8250	0.8226	0.8284	0.8290	0.8251	0.8381	0.8438
950 - 960 nm	0.8483	0.8530	0.8635	0.8555	0.8611	0.8726	0.8890
960 - 970 nm	0.8206	0.8187	0.8386	0.8247	0.8353	0.8212	0.8728
970 - 980 nm	0.8694	0.8758	0.8803	0.8788	0.8854	0.8782	0.9235
980 - 990 nm	0.7276	0.7279	0.7255	0.7263	0.7245	0.7155	0.7601
990 - 1000 nm	0.9464	0.9487	0.9597	0.9656	0.9674	0.9736	0.9625
1000 - 1010 nm	0.7899	0.7912	0.7906	0.7870	0.7851	0.7635	0.8105
1010 - 1020 nm	0.9231	0.9295	0.9300	0.9185	0.9279	0.8855	0.8788
1020 - 1030 nm	0.8336	0.8339	0.8231	0.8347	0.8168	0.8102	0.7879
1030 - 1040 nm	0.8555	0.8578	0.8486	0.8629	0.8279	0.8205	0.7962
1040 - 1050 nm	0.8117	0.8104	0.8091	0.8073	0.8022	0.7573	0.8181
1050 - 1060 nm	0.8875	0.8930	0.8766	0.8950	0.8742	0.8923	0.8451
1060 - 1070 nm	0.8476	0.8499	0.8314	0.8464	0.8086	0.7798	0.7923
1070 - 1080 nm	0.8433	0.8415	0.8138	0.8374	0.7887	0.7931	0.7443
1080 - 1090 nm	0.8846	0.8888	0.8391	0.8875	0.8228	0.8603	0.7525
1090 - 1100 nm	0.8793	0.8829	0.8252	0.8833	0.8036	0.8331	0.7501
1100 - 1110 nm	0.8436	0.8412	0.7994	0.8377	0.7796	0.8088	0.7339
1110 - 1120 nm	0.9067	0.9074	0.8424	0.9081	0.8200	0.8774	0.7309
1120 - 1130 nm	0.8645	0.8591	0.8028	0.8556	0.7798	0.7916	0.7121
1130 - 1140 nm	0.8619	0.8519	0.7960	0.8470	0.7651	0.7806	0.6185
1140 - 1150 nm	0.8662	0.8572	0.7995	0.8551	0.7754	0.7949	0.6706
1150 - 1160 nm	0.8665	0.8537	0.7960	0.8561	0.7771	0.8214	0.7030

1160 - 1170 nm	0.8603	0.8508	0.8032	0.8500	0.7907	0.8122	0.7684
1170 - 1180 nm	0.9047	0.9006	0.8472	0.9022	0.8373	0.8786	0.8017
1180 - 1190 nm	0.8942	0.8863	0.8234	0.8882	0.8095	0.8507	0.7572
1190 - 1200 nm	0.8921	0.8777	0.8197	0.8823	0.8005	0.8472	0.7517
1200 - 1210 nm	0.8850	0.8704	0.8120	0.8761	0.7928	0.8407	0.7198
1210 - 1220 nm	0.8854	0.8704	0.8144	0.8729	0.7971	0.8376	0.7298
1220 - 1230 nm	0.8897	0.8762	0.8251	0.8754	0.8128	0.8349	0.7632
1230 - 1240 nm	0.8809	0.8630	0.8153	0.8638	0.8077	0.8156	0.7689
1240 - 1250 nm	0.8800	0.8622	0.8122	0.8625	0.8009	0.8261	0.7207
1250 - 1260 nm	0.8440	0.8285	0.7860	0.8284	0.7797	0.7834	0.7551
1260 - 1270 nm	0.9290	0.9221	0.8713	0.9220	0.8669	0.9013	0.8290
1270 - 1280 nm	0.8936	0.8775	0.8305	0.8783	0.8270	0.8413	0.7924
1280 - 1290 nm	0.8843	0.8658	0.8253	0.8670	0.8236	0.8214	0.7785

R10* relative at different irradiances in Apollo							
Band	1100	1000	800	600	400	200	100
300 - 310 nm	1.2307	1.1687	1.5404	1.2571	1.7680	2.1582	3.5227
310 - 320 nm	1.4441	1.4809	1.7246	1.5745	1.9698	2.6648	4.7754
320 - 330 nm	1.0431	1.0461	1.4125	1.0702	1.5952	0.9833	3.5078
330 - 340 nm	0.9906	0.9633	1.1538	0.9458	1.2805	0.8586	2.4784
340 - 350 nm	1.1456	1.1406	1.2885	1.1180	1.3637	1.0818	2.0913
350 - 360 nm	1.2151	1.2299	1.2479	1.2068	1.2500	1.2721	1.3264
360 - 370 nm	1.2480	1.2533	1.2774	1.2479	1.2764	1.2777	1.3416
370 - 380 nm	1.2589	1.2707	1.2918	1.2616	1.2928	1.2815	1.3265
380 - 390 nm	1.1268	1.1312	1.1414	1.1297	1.1391	1.1340	1.1628
390 - 400 nm	0.9995	0.9992	1.0031	0.9967	0.9997	0.9979	1.0155
400 - 410 nm	1.0019	1.0020	1.0050	0.9994	1.0032	0.9991	1.0068
410 - 420 nm	1.0153	1.0154	1.0236	1.0178	1.0238	1.0140	1.0246
420 - 430 nm	1.0216	1.0246	1.0308	1.0272	1.0314	1.0246	1.0343
430 - 440 nm	1.0434	1.0451	1.0513	1.0493	1.0516	1.0461	1.0530
440 - 450 nm	1.0479	1.0497	1.0555	1.0507	1.0563	1.0486	1.0548
450 - 460 nm	1.0516	1.0543	1.0606	1.0587	1.0624	1.0548	1.0629
460 - 470 nm	1.0514	1.0590	1.0711	1.0691	1.0777	1.0734	1.0772
470 - 480 nm	1.0182	1.0227	1.0330	1.0314	1.0373	1.0316	1.0376
480 - 490 nm	1.0395	1.0462	1.0588	1.0575	1.0648	1.0600	1.0655
490 - 500 nm	1.0389	1.0439	1.0559	1.0556	1.0627	1.0548	1.0578
500 - 510 nm	1.0450	1.0483	1.0573	1.0543	1.0618	1.0528	1.0571
510 - 520 nm	1.0415	1.0444	1.0536	1.0505	1.0573	1.0507	1.0590
520 - 530 nm	1.0402	1.0443	1.0530	1.0489	1.0563	1.0475	1.0589
530 - 540 nm	1.0377	1.0398	1.0472	1.0431	1.0465	1.0428	1.0484
540 - 550 nm	1.0327	1.0352	1.0432	1.0392	1.0438	1.0391	1.0429
550 - 560 nm	1.0287	1.0307	1.0391	1.0346	1.0395	1.0324	1.0415
560 - 570 nm	1.0226	1.0264	1.0332	1.0311	1.0354	1.0290	1.0377
570 - 580 nm	1.0155	1.0198	1.0287	1.0259	1.0325	1.0265	1.0341
580 - 590 nm	1.0060	1.0109	1.0206	1.0186	1.0264	1.0190	1.0299

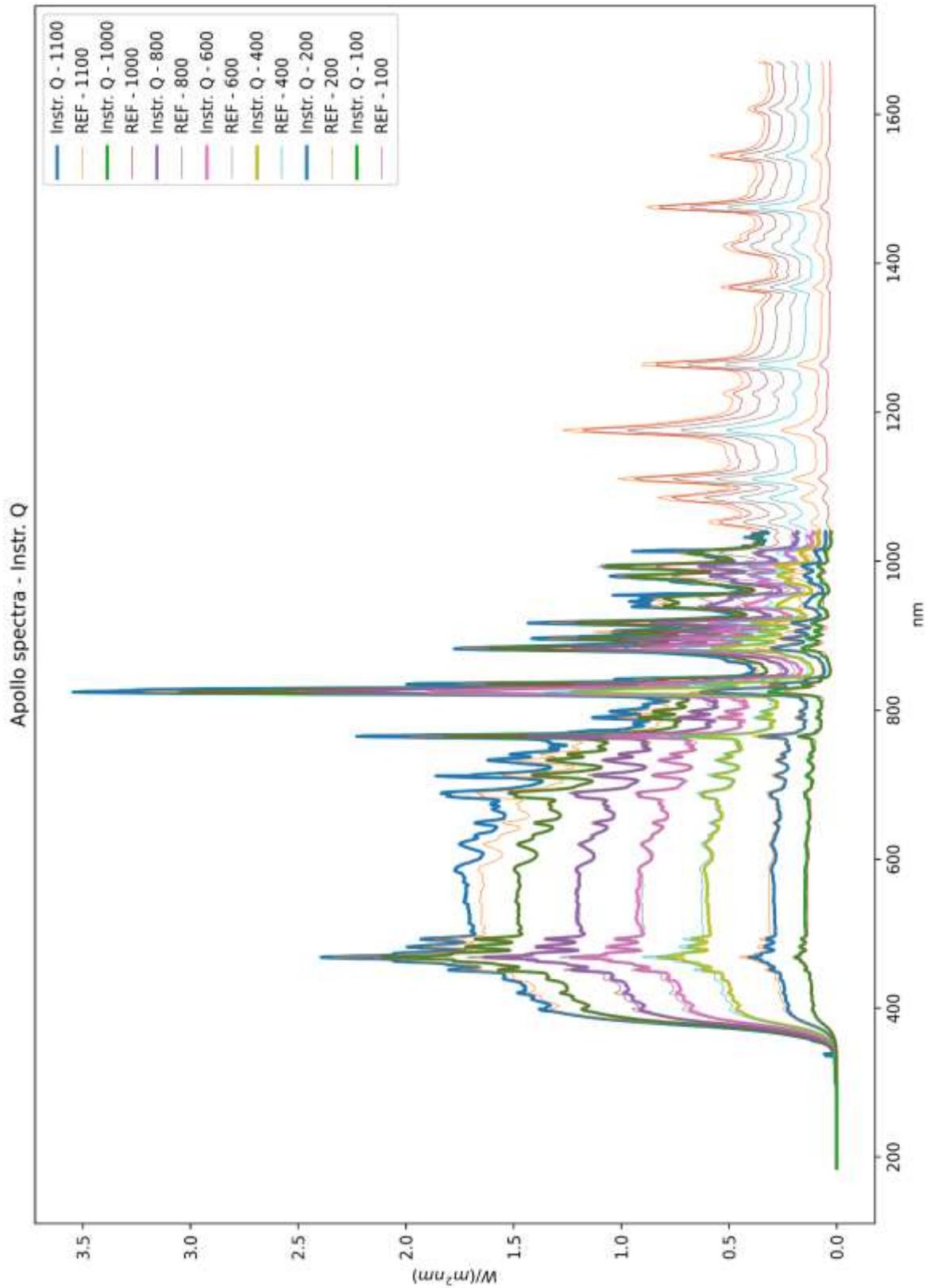
590 - 600 nm	0.9981	1.0033	1.0124	1.0110	1.0172	1.0133	1.0184
600 - 610 nm	1.0034	1.0076	1.0175	1.0148	1.0240	1.0165	1.0250
610 - 620 nm	1.0015	1.0050	1.0155	1.0143	1.0239	1.0160	1.0208
620 - 630 nm	0.9917	0.9950	1.0043	1.0028	1.0087	1.0023	1.0118
630 - 640 nm	0.9933	0.9952	1.0032	0.9988	1.0059	0.9988	1.0069
640 - 650 nm	1.0043	1.0066	1.0145	1.0100	1.0159	1.0080	1.0154
650 - 660 nm	0.9943	0.9957	1.0015	0.9963	1.0013	0.9950	1.0047
660 - 670 nm	1.0005	1.0005	1.0069	1.0021	1.0068	1.0025	1.0113
670 - 680 nm	0.9932	0.9945	1.0010	0.9938	1.0000	0.9911	1.0083
680 - 690 nm	0.9980	1.0008	1.0084	1.0031	1.0084	1.0060	1.0091
690 - 700 nm	0.9702	0.9677	0.9741	0.9688	0.9718	0.9677	0.9834
700 - 710 nm	0.9904	0.9882	0.9956	0.9876	0.9946	0.9877	0.9973
710 - 720 nm	0.9801	0.9812	0.9879	0.9775	0.9870	0.9810	0.9937
720 - 730 nm	0.9878	0.9871	0.9944	0.9854	0.9932	0.9864	0.9933
730 - 740 nm	0.9772	0.9779	0.9846	0.9769	0.9858	0.9790	0.9935
740 - 750 nm	0.9706	0.9686	0.9769	0.9673	0.9774	0.9715	0.9902
750 - 760 nm	0.9726	0.9732	0.9812	0.9712	0.9812	0.9799	0.9892
760 - 770 nm	0.9632	0.9642	0.9736	0.9663	0.9797	0.9771	0.9944
770 - 780 nm	0.9561	0.9512	0.9580	0.9477	0.9586	0.9532	0.9743
780 - 790 nm	1.0020	0.9988	1.0066	0.9945	1.0091	1.0070	1.0159
790 - 800 nm	0.9657	0.9600	0.9658	0.9566	0.9667	0.9662	0.9835
800 - 810 nm	0.9649	0.9581	0.9628	0.9582	0.9676	0.9710	0.9921
810 - 820 nm	0.9613	0.9491	0.9545	0.9446	0.9563	0.9584	0.9884
820 - 830 nm	1.0189	1.0191	1.0283	1.0225	1.0390	1.0588	1.0652
830 - 840 nm	0.8583	0.8487	0.8499	0.8445	0.8516	0.8630	0.8877
840 - 850 nm	0.9394	0.9309	0.9387	0.9274	0.9402	0.9511	0.9715
850 - 860 nm	0.9786	0.9637	0.9767	0.9657	0.9860	0.9829	1.0257
860 - 870 nm	0.9789	0.9629	0.9758	0.9659	0.9851	0.9882	1.0138
870 - 880 nm	0.9687	0.9356	0.9626	0.9552	0.9650	0.9788	0.9976
880 - 890 nm	0.9769	0.9908	0.9822	0.9677	0.9869	1.0056	1.0245
890 - 900 nm	0.9691	0.9763	0.9752	0.9625	0.9800	0.9953	1.0204
900 - 910 nm	0.9346	0.9345	0.9398	0.9271	0.9434	0.9584	0.9796
910 - 920 nm	1.0263	1.0283	1.0386	1.0217	1.0441	1.0634	1.0674
920 - 930 nm	0.8401	0.8391	0.8457	0.8332	0.8461	0.8395	0.8946
930 - 940 nm	1.0190	1.0184	1.0442	1.0214	1.0482	1.0528	1.0503
940 - 950 nm	0.9263	0.9247	0.9395	0.9237	0.9370	0.9454	0.9687
950 - 960 nm	0.9524	0.9589	0.9792	0.9532	0.9778	0.9843	1.0206
960 - 970 nm	0.9214	0.9204	0.9510	0.9189	0.9487	0.9263	1.0021
970 - 980 nm	0.9762	0.9845	0.9983	0.9791	1.0055	0.9906	1.0602
980 - 990 nm	0.8169	0.8182	0.8227	0.8092	0.8228	0.8071	0.8726
990 - 1000 nm	1.0626	1.0665	1.0884	1.0759	1.0986	1.0982	1.1050
1000 - 1010 nm	0.8869	0.8894	0.8966	0.8769	0.8916	0.8612	0.9305
1010 - 1020 nm	1.0364	1.0449	1.0547	1.0234	1.0537	0.9989	1.0090
1020 - 1030 nm	0.9359	0.9374	0.9334	0.9300	0.9275	0.9139	0.9045
1030 - 1040 nm	0.9606	0.9642	0.9624	0.9615	0.9402	0.9256	0.9141

1040 - 1050 nm	0.9113	0.9109	0.9176	0.8995	0.9111	0.8543	0.9392
1050 - 1060 nm	0.9965	1.0039	0.9942	0.9972	0.9928	1.0065	0.9703
1060 - 1070 nm	0.9517	0.9553	0.9429	0.9431	0.9182	0.8796	0.9096
1070 - 1080 nm	0.9469	0.9460	0.9229	0.9331	0.8957	0.8946	0.8544
1080 - 1090 nm	0.9933	0.9991	0.9516	0.9889	0.9344	0.9704	0.8639
1090 - 1100 nm	0.9872	0.9925	0.9358	0.9842	0.9126	0.9397	0.8611
1100 - 1110 nm	0.9472	0.9456	0.9066	0.9334	0.8853	0.9123	0.8426
1110 - 1120 nm	1.0181	1.0200	0.9554	1.0119	0.9312	0.9897	0.8391
1120 - 1130 nm	0.9707	0.9657	0.9105	0.9533	0.8856	0.8929	0.8175
1130 - 1140 nm	0.9677	0.9576	0.9027	0.9438	0.8689	0.8805	0.7101
1140 - 1150 nm	0.9725	0.9636	0.9067	0.9527	0.8806	0.8967	0.7698
1150 - 1160 nm	0.9729	0.9596	0.9027	0.9539	0.8825	0.9265	0.8071
1160 - 1170 nm	0.9659	0.9565	0.9109	0.9471	0.8979	0.9162	0.8822
1170 - 1180 nm	1.0158	1.0124	0.9607	1.0053	0.9508	0.9911	0.9204
1180 - 1190 nm	1.0040	0.9963	0.9338	0.9897	0.9193	0.9596	0.8693
1190 - 1200 nm	1.0016	0.9866	0.9296	0.9831	0.9091	0.9556	0.8630
1200 - 1210 nm	0.9937	0.9784	0.9209	0.9762	0.9004	0.9484	0.8264
1210 - 1220 nm	0.9941	0.9785	0.9235	0.9726	0.9052	0.9448	0.8379
1220 - 1230 nm	0.9990	0.9849	0.9358	0.9754	0.9231	0.9417	0.8762
1230 - 1240 nm	0.9891	0.9701	0.9246	0.9625	0.9173	0.9201	0.8827
1240 - 1250 nm	0.9881	0.9693	0.9211	0.9610	0.9096	0.9318	0.8274
1250 - 1260 nm	0.9476	0.9314	0.8914	0.9230	0.8855	0.8837	0.8669
1260 - 1270 nm	1.0430	1.0365	0.9882	1.0274	0.9845	1.0167	0.9517
1270 - 1280 nm	1.0033	0.9864	0.9418	0.9786	0.9392	0.9490	0.9097
1280 - 1290 nm	0.9929	0.9733	0.9360	0.9660	0.9353	0.9266	0.8938

Source: European Solar Test Installation – JRC

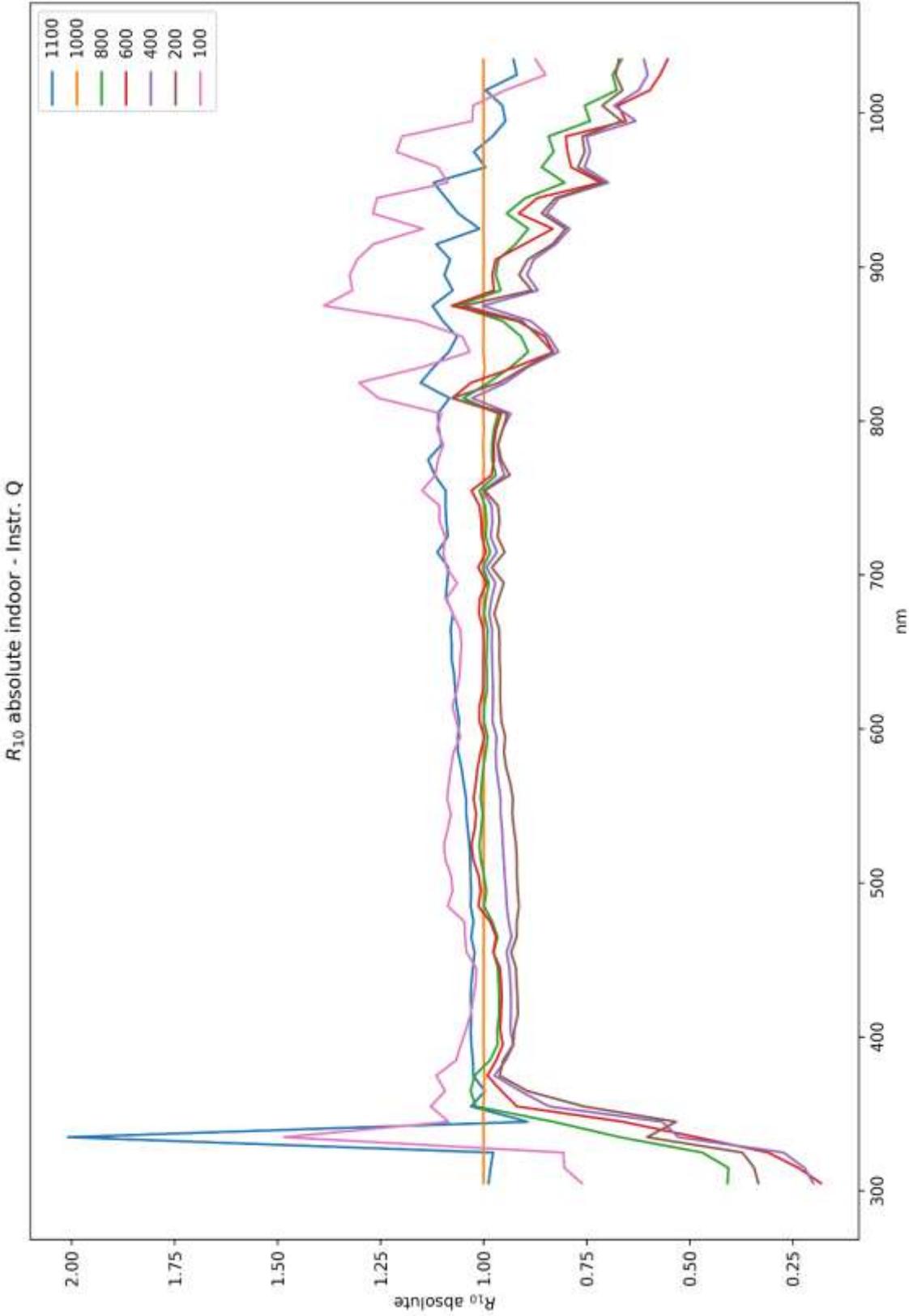
1.34 Instrument "Q"

Figure 40: Instrument Q - Indoor Apollo spectra at different irradiance levels.



Source: European Solar Test Installation – JRC.

Figure 41: Instrument Q - Indoor R10 and R10* functions at different irradiance levels.



Source: European Solar Test Installation – JRC.

Table 30: Instrument Q – Indoor R10 and R10* functions at different irradiance levels.

R10 absolute at different irradiances in Apollo							
Band	1100	1000	800	600	400	200	100
300 - 310 nm	0.9879	0.9998	0.4083	0.1814	0.2002	0.3336	0.7612
310 - 320 nm	0.9830	0.9999	0.4061	0.2360	0.2214	0.3433	0.8039
320 - 330 nm	0.9768	0.9998	0.4692	0.3099	0.2720	0.3722	0.8061
330 - 340 nm	2.0085	0.9997	0.6696	0.4832	0.5278	0.6037	1.4841
340 - 350 nm	0.8931	1.0004	0.8303	0.6624	0.5666	0.5329	1.0847
350 - 360 nm	1.0304	1.0003	1.0188	0.9194	0.8415	0.7573	1.1283
360 - 370 nm	0.9966	0.9991	1.0314	0.9565	0.9111	0.8938	1.0932
370 - 380 nm	1.0251	0.9984	1.0219	0.9906	0.9738	0.9609	1.1149
380 - 390 nm	1.0259	0.9994	0.9843	0.9691	0.9458	0.9522	1.0666
390 - 400 nm	1.0298	0.9999	0.9661	0.9533	0.9277	0.9282	1.0552
400 - 410 nm	1.0312	0.9998	0.9668	0.9596	0.9351	0.9253	1.0424
410 - 420 nm	1.0295	0.9998	0.9623	0.9578	0.9338	0.9164	1.0313
420 - 430 nm	1.0314	0.9998	0.9625	0.9557	0.9337	0.9177	1.0249
430 - 440 nm	1.0297	0.9998	0.9635	0.9573	0.9351	0.9198	1.0188
440 - 450 nm	1.0258	0.9998	0.9655	0.9603	0.9374	0.9216	1.0179
450 - 460 nm	1.0218	0.9999	0.9757	0.9767	0.9443	0.9333	1.0414
460 - 470 nm	1.0300	0.9995	0.9660	0.9695	0.9321	0.9196	1.0449
470 - 480 nm	1.0244	0.9999	0.9791	0.9839	0.9390	0.9194	1.0465
480 - 490 nm	1.0314	1.0000	0.9989	1.0127	0.9437	0.9142	1.0872
490 - 500 nm	1.0304	0.9999	0.9931	1.0070	0.9456	0.9172	1.0751
500 - 510 nm	1.0315	0.9998	0.9992	1.0120	0.9490	0.9192	1.0790
510 - 520 nm	1.0324	0.9998	1.0065	1.0248	0.9509	0.9193	1.0926
520 - 530 nm	1.0344	0.9998	1.0101	1.0294	0.9535	0.9212	1.0962
530 - 540 nm	1.0384	0.9998	1.0058	1.0217	0.9549	0.9263	1.0870
540 - 550 nm	1.0421	0.9998	1.0021	1.0180	0.9590	0.9305	1.0793
550 - 560 nm	1.0423	0.9998	1.0071	1.0243	0.9587	0.9287	1.0885
560 - 570 nm	1.0484	0.9998	1.0045	1.0187	0.9641	0.9353	1.0843
570 - 580 nm	1.0536	0.9998	1.0007	1.0145	0.9692	0.9452	1.0790
580 - 590 nm	1.0621	0.9999	0.9947	1.0072	0.9702	0.9507	1.0732
590 - 600 nm	1.0625	0.9998	0.9903	0.9977	0.9683	0.9474	1.0564
600 - 610 nm	1.0589	0.9998	0.9988	1.0102	0.9784	0.9566	1.0660
610 - 620 nm	1.0652	0.9999	0.9984	1.0100	0.9777	0.9590	1.0757
620 - 630 nm	1.0691	0.9998	0.9919	1.0016	0.9769	0.9597	1.0651
630 - 640 nm	1.0711	0.9998	0.9922	1.0005	0.9783	0.9592	1.0578
640 - 650 nm	1.0773	0.9999	0.9934	1.0008	0.9790	0.9616	1.0565
650 - 660 nm	1.0775	0.9998	0.9914	0.9999	0.9800	0.9612	1.0536
660 - 670 nm	1.0796	0.9998	0.9906	1.0008	0.9794	0.9624	1.0570
670 - 680 nm	1.0742	0.9999	0.9985	1.0113	0.9865	0.9741	1.0748
680 - 690 nm	1.0917	0.9999	0.9943	1.0092	0.9805	0.9633	1.0897
690 - 700 nm	1.0884	0.9999	0.9870	0.9927	0.9711	0.9508	1.0639
700 - 710 nm	1.0854	0.9999	1.0018	1.0130	0.9933	0.9800	1.0904

710 - 720 nm	1.1124	0.9999	0.9839	0.9942	0.9676	0.9488	1.0977
720 - 730 nm	1.0869	0.9998	0.9949	1.0041	0.9828	0.9664	1.0928
730 - 740 nm	1.0903	0.9998	0.9927	1.0054	0.9785	0.9614	1.1072
740 - 750 nm	1.0923	0.9999	0.9964	1.0100	0.9806	0.9648	1.1067
750 - 760 nm	1.0922	1.0000	1.0101	1.0294	1.0008	0.9971	1.1489
760 - 770 nm	1.1184	1.0002	0.9699	0.9809	0.9492	0.9364	1.1174
770 - 780 nm	1.1345	0.9996	0.9791	0.9746	0.9626	0.9572	1.1104
780 - 790 nm	1.1015	1.0012	0.9795	0.9749	0.9660	0.9646	1.0977
790 - 800 nm	1.1088	0.9991	0.9747	0.9693	0.9537	0.9531	1.1131
800 - 810 nm	1.1111	1.0003	0.9647	0.9573	0.9343	0.9427	1.1024
810 - 820 nm	1.0828	0.9989	1.0485	1.0763	1.0278	1.0762	1.2543
820 - 830 nm	1.1531	1.0019	0.9886	1.0303	0.9468	0.9625	1.3023
830 - 840 nm	1.1209	0.9972	0.9350	0.9250	0.8939	0.8987	1.1509
840 - 850 nm	1.0848	1.0008	0.8916	0.8305	0.8185	0.8316	1.0333
850 - 860 nm	1.0643	0.9997	0.9090	0.8511	0.8412	0.8667	1.0517
860 - 870 nm	1.0983	0.9998	0.9532	0.9168	0.8849	0.9067	1.1580
870 - 880 nm	1.1238	0.9998	1.0647	1.0774	1.0026	1.0484	1.3878
880 - 890 nm	1.0745	0.9999	0.9583	0.9746	0.8686	0.8830	1.3183
890 - 900 nm	1.0950	1.0000	0.9707	0.9790	0.8945	0.9137	1.3247
900 - 910 nm	1.0811	0.9999	0.9641	0.9709	0.8787	0.8930	1.3066
910 - 920 nm	1.1150	0.9996	0.9229	0.9012	0.8249	0.8326	1.2680
920 - 930 nm	1.0100	1.0003	0.8915	0.8320	0.7909	0.8010	1.1470
930 - 940 nm	1.0615	0.9999	0.9443	0.9147	0.8465	0.8589	1.2684
940 - 950 nm	1.0912	0.9999	0.8983	0.8692	0.8167	0.8257	1.2583
950 - 960 nm	1.1216	1.0000	0.8030	0.7156	0.6976	0.7081	1.0866
960 - 970 nm	0.9952	0.9998	0.8591	0.7876	0.7552	0.7708	1.1108
970 - 980 nm	1.0236	1.0000	0.8299	0.7963	0.7415	0.7548	1.2112
980 - 990 nm	0.9783	1.0000	0.8426	0.8007	0.7503	0.7602	1.1978
990 - 1000 nm	0.9469	0.9995	0.7418	0.6547	0.6307	0.6654	1.0270
1000 - 1010 nm	0.9542	0.9999	0.7548	0.6740	0.6836	0.7124	1.0259
1010 - 1020 nm	0.9950	1.0001	0.6766	0.5965	0.6237	0.6628	0.9472
1020 - 1030 nm	0.9192	0.9999	0.6873	0.5716	0.6020	0.6795	0.8498
1030 - 1040 nm	0.9274	0.9998	0.6648	0.5535	0.6110	0.6717	0.8738

R10* relative at different irradiances in Apollo							
Band	1100	1000	800	600	400	200	100
300 - 310 nm	0.9316	1.0000	0.4213	0.1870	0.2152	0.3627	0.6924
310 - 320 nm	0.9269	1.0000	0.4189	0.2432	0.2380	0.3734	0.7312
320 - 330 nm	0.9211	0.9999	0.4840	0.3195	0.2924	0.4048	0.7332
330 - 340 nm	1.8940	0.9998	0.6909	0.4981	0.5674	0.6565	1.3499
340 - 350 nm	0.8421	1.0005	0.8566	0.6828	0.6091	0.5795	0.9866
350 - 360 nm	0.9716	1.0004	1.0511	0.9478	0.9047	0.8236	1.0263
360 - 370 nm	0.9398	0.9993	1.0641	0.9861	0.9795	0.9720	0.9943
370 - 380 nm	0.9667	0.9985	1.0543	1.0212	1.0469	1.0449	1.0140

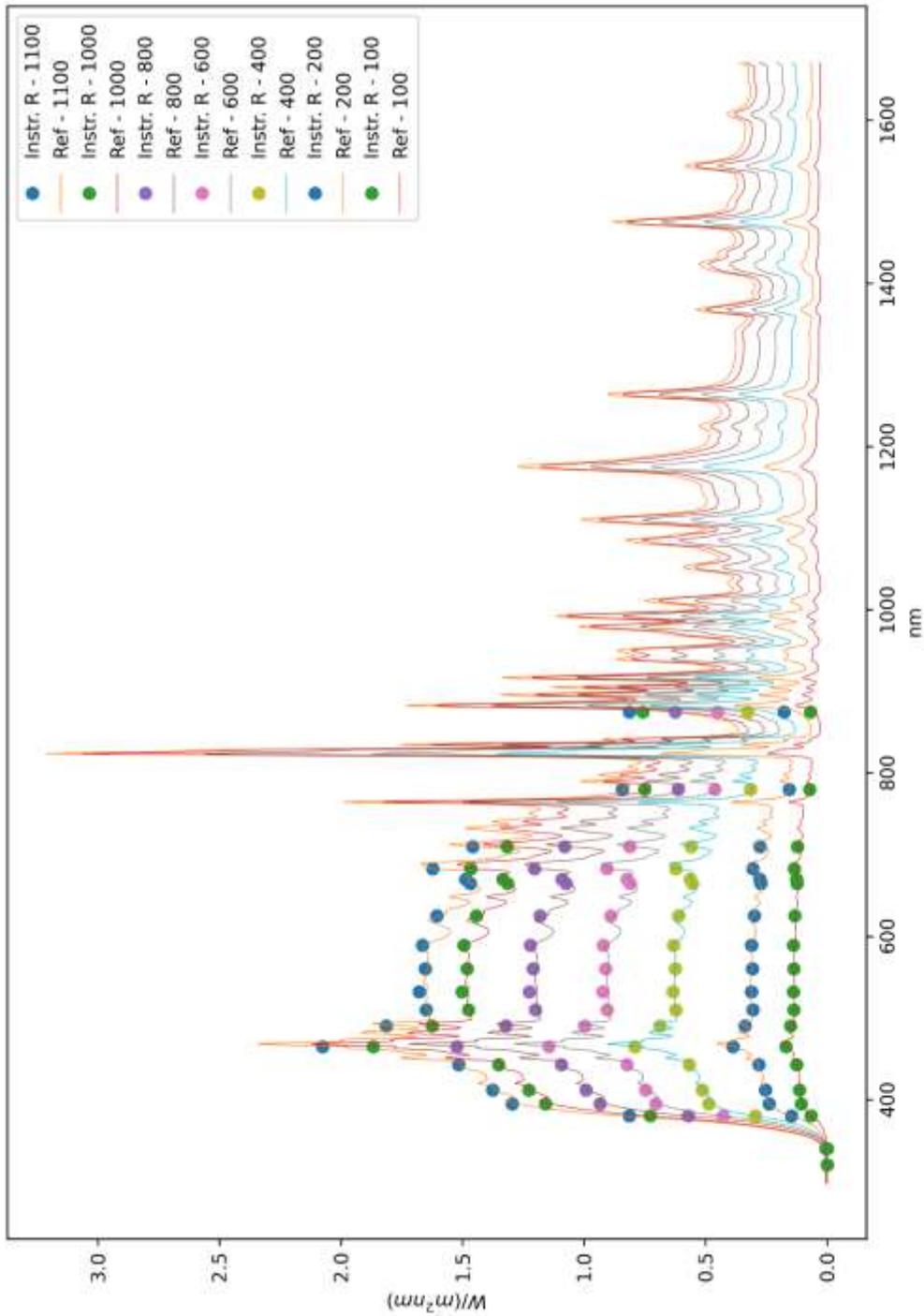
380 - 390 nm	0.9674	0.9996	1.0155	0.9990	1.0168	1.0355	0.9701
390 - 400 nm	0.9711	1.0000	0.9967	0.9828	0.9974	1.0094	0.9598
400 - 410 nm	0.9724	0.9999	0.9974	0.9892	1.0054	1.0062	0.9481
410 - 420 nm	0.9708	0.9999	0.9928	0.9873	1.0039	0.9966	0.9380
420 - 430 nm	0.9726	1.0000	0.9930	0.9852	1.0038	0.9980	0.9322
430 - 440 nm	0.9710	1.0000	0.9940	0.9869	1.0053	1.0003	0.9267
440 - 450 nm	0.9673	0.9999	0.9961	0.9900	1.0078	1.0022	0.9259
450 - 460 nm	0.9636	1.0000	1.0066	1.0068	1.0151	1.0149	0.9473
460 - 470 nm	0.9713	0.9996	0.9966	0.9994	1.0021	1.0000	0.9504
470 - 480 nm	0.9660	1.0000	1.0100	1.0142	1.0095	0.9998	0.9519
480 - 490 nm	0.9726	1.0001	1.0305	1.0440	1.0146	0.9941	0.9889
490 - 500 nm	0.9716	1.0001	1.0246	1.0381	1.0166	0.9974	0.9779
500 - 510 nm	0.9727	1.0000	1.0308	1.0433	1.0202	0.9996	0.9814
510 - 520 nm	0.9735	1.0000	1.0384	1.0565	1.0223	0.9997	0.9938
520 - 530 nm	0.9754	1.0000	1.0421	1.0612	1.0251	1.0017	0.9971
530 - 540 nm	0.9792	1.0000	1.0376	1.0532	1.0266	1.0074	0.9887
540 - 550 nm	0.9827	1.0000	1.0339	1.0494	1.0310	1.0119	0.9817
550 - 560 nm	0.9829	1.0000	1.0390	1.0559	1.0307	1.0099	0.9901
560 - 570 nm	0.9886	1.0000	1.0363	1.0502	1.0365	1.0172	0.9863
570 - 580 nm	0.9935	1.0000	1.0324	1.0459	1.0420	1.0278	0.9815
580 - 590 nm	1.0015	1.0000	1.0262	1.0383	1.0431	1.0338	0.9761
590 - 600 nm	1.0019	1.0000	1.0216	1.0285	1.0410	1.0302	0.9609
600 - 610 nm	0.9985	1.0000	1.0304	1.0414	1.0519	1.0403	0.9696
610 - 620 nm	1.0044	1.0000	1.0300	1.0412	1.0511	1.0429	0.9784
620 - 630 nm	1.0082	1.0000	1.0233	1.0325	1.0502	1.0436	0.9688
630 - 640 nm	1.0100	1.0000	1.0236	1.0314	1.0518	1.0431	0.9621
640 - 650 nm	1.0159	1.0000	1.0248	1.0317	1.0525	1.0457	0.9610
650 - 660 nm	1.0161	1.0000	1.0228	1.0307	1.0536	1.0452	0.9583
660 - 670 nm	1.0180	1.0000	1.0220	1.0317	1.0529	1.0466	0.9614
670 - 680 nm	1.0130	1.0000	1.0301	1.0425	1.0606	1.0593	0.9776
680 - 690 nm	1.0294	1.0001	1.0258	1.0403	1.0541	1.0476	0.9912
690 - 700 nm	1.0264	1.0000	1.0182	1.0234	1.0440	1.0339	0.9677
700 - 710 nm	1.0235	1.0000	1.0336	1.0442	1.0679	1.0658	0.9918
710 - 720 nm	1.0490	1.0000	1.0150	1.0249	1.0402	1.0318	0.9984
720 - 730 nm	1.0249	0.9999	1.0264	1.0351	1.0566	1.0509	0.9940
730 - 740 nm	1.0282	0.9999	1.0241	1.0364	1.0519	1.0455	1.0071
740 - 750 nm	1.0300	1.0000	1.0279	1.0412	1.0542	1.0492	1.0066
750 - 760 nm	1.0299	1.0001	1.0421	1.0612	1.0760	1.0844	1.0450
760 - 770 nm	1.0546	1.0003	1.0007	1.0111	1.0205	1.0183	1.0164
770 - 780 nm	1.0698	0.9997	1.0101	1.0047	1.0349	1.0409	1.0099
780 - 790 nm	1.0387	1.0013	1.0105	1.0050	1.0385	1.0490	0.9984
790 - 800 nm	1.0456	0.9993	1.0055	0.9992	1.0254	1.0365	1.0124
800 - 810 nm	1.0477	1.0005	0.9953	0.9869	1.0044	1.0252	1.0027
810 - 820 nm	1.0211	0.9990	1.0817	1.1095	1.1049	1.1703	1.1409
820 - 830 nm	1.0874	1.0021	1.0199	1.0621	1.0178	1.0467	1.1845

830 - 840 nm	1.0570	0.9973	0.9646	0.9535	0.9610	0.9773	1.0468
840 - 850 nm	1.0229	1.0010	0.9198	0.8561	0.8799	0.9044	0.9398
850 - 860 nm	1.0036	0.9999	0.9378	0.8774	0.9043	0.9425	0.9566
860 - 870 nm	1.0357	0.9999	0.9834	0.9451	0.9514	0.9860	1.0533
870 - 880 nm	1.0598	1.0000	1.0984	1.1107	1.0778	1.1401	1.2623
880 - 890 nm	1.0132	1.0000	0.9886	1.0047	0.9338	0.9603	1.1991
890 - 900 nm	1.0326	1.0001	1.0014	1.0092	0.9617	0.9937	1.2049
900 - 910 nm	1.0195	1.0000	0.9946	1.0009	0.9447	0.9711	1.1885
910 - 920 nm	1.0515	0.9998	0.9521	0.9291	0.8869	0.9054	1.1534
920 - 930 nm	0.9524	1.0004	0.9197	0.8577	0.8503	0.8711	1.0433
930 - 940 nm	1.0010	1.0001	0.9742	0.9429	0.9101	0.9340	1.1537
940 - 950 nm	1.0289	1.0000	0.9267	0.8961	0.8781	0.8979	1.1446
950 - 960 nm	1.0576	1.0002	0.8284	0.7377	0.7500	0.7701	0.9883
960 - 970 nm	0.9385	0.9999	0.8863	0.8119	0.8119	0.8383	1.0103
970 - 980 nm	0.9653	1.0001	0.8562	0.8209	0.7971	0.8208	1.1017
980 - 990 nm	0.9225	1.0001	0.8693	0.8254	0.8066	0.8267	1.0895
990 - 1000 nm	0.8929	0.9996	0.7653	0.6749	0.6781	0.7236	0.9341
1000 - 1010 nm	0.8998	1.0000	0.7787	0.6948	0.7349	0.7747	0.9332
1010 - 1020 nm	0.9383	1.0002	0.6980	0.6149	0.6706	0.7207	0.8615
1020 - 1030 nm	0.8668	1.0001	0.7091	0.5893	0.6472	0.7389	0.7729
1030 - 1040 nm	0.8745	1.0000	0.6858	0.5706	0.6569	0.7305	0.7948

Source: European Solar Test Installation – JRC

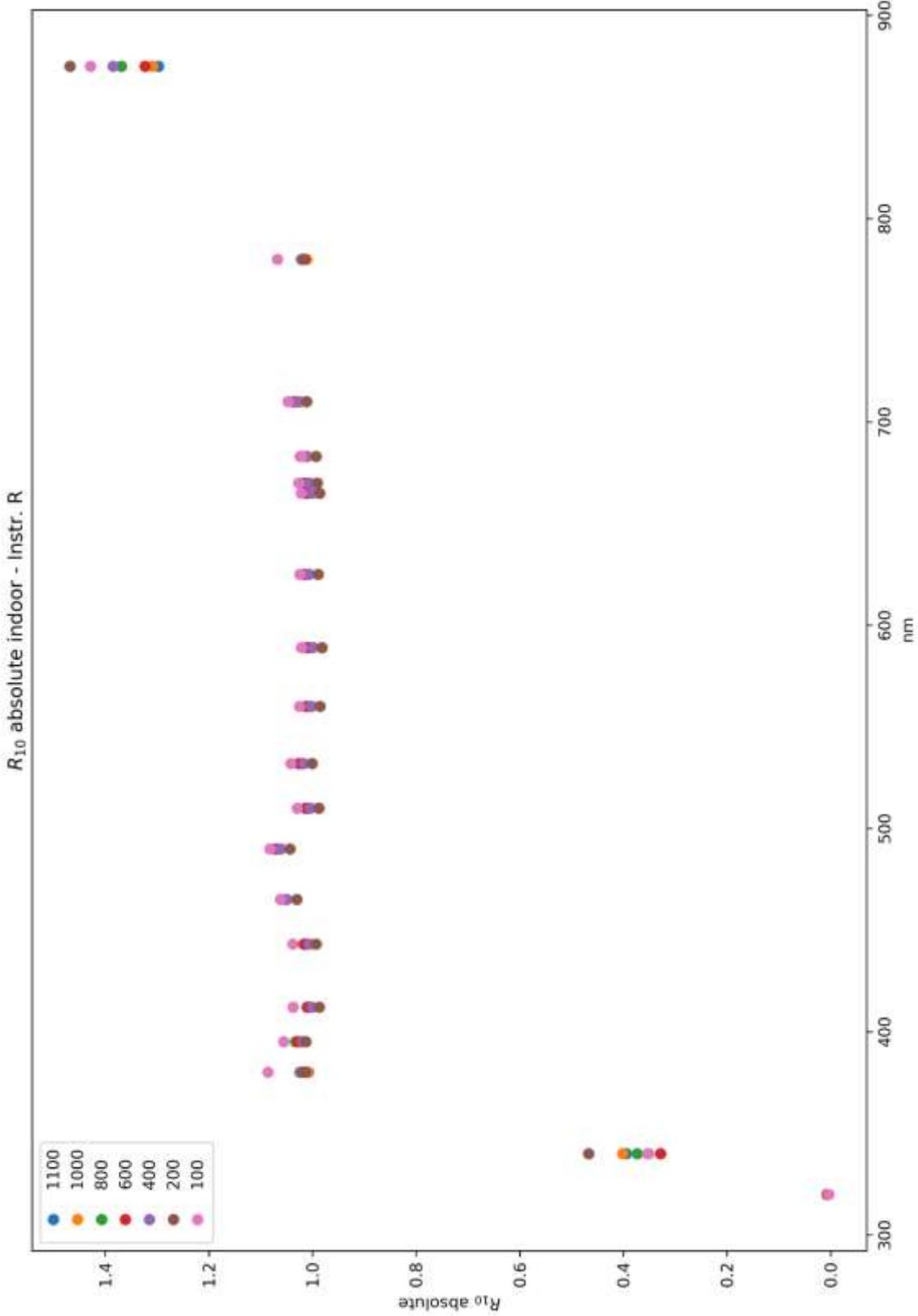
1.35 Instrument "R"

Figure 42: Instrument R - Indoor Apollo spectra at different irradiance levels.



Source: European Solar Test Installation – JRC.

Figure 43: Instrument R - Indoor R10 functions at different irradiance levels.



Source: European Solar Test Installation – JRC.

Table 31: Instrument R – Indoor R10 functions at different irradiance levels.

R10 absolute at different irradiances in Apollo							
Band	1100	1000	800	600	400	200	100
315 - 325 nm	0.0071	0.0071	0.0060	0.0057	0.0057	0.0059	0.0035
335 - 345 nm	0.3947	0.4019	0.3733	0.3284	0.3519	0.4673	0.3532
375 - 385 nm	1.0087	1.0096	1.0243	1.0144	1.0232	1.0181	1.0861
390 - 400 nm	1.0246	1.0237	1.0329	1.0284	1.0192	1.0132	1.0558
407 - 417 nm	1.0052	1.0027	1.0106	1.0093	1.0005	0.9870	1.0373
438 - 448 nm	1.0124	1.0093	1.0167	1.0158	1.0069	0.9928	1.0380
460 - 470 nm	1.0506	1.0517	1.0612	1.0619	1.0508	1.0305	1.0614
485 - 495 nm	1.0623	1.0617	1.0710	1.0704	1.0623	1.0433	1.0825
505 - 515 nm	1.0083	1.0055	1.0137	1.0132	1.0043	0.9878	1.0297
527 - 537 nm	1.0198	1.0182	1.0260	1.0263	1.0167	1.0007	1.0417
555 - 565 nm	1.0062	1.0042	1.0121	1.0124	1.0025	0.9856	1.0253
584 - 594 nm	1.0026	1.0011	1.0089	1.0104	0.9994	0.9818	1.0216
620 - 630 nm	1.0088	1.0071	1.0161	1.0173	1.0071	0.9890	1.0243
660 - 670 nm	1.0074	1.0033	1.0116	1.0124	1.0015	0.9862	1.0218
665 - 675 nm	1.0091	1.0062	1.0152	1.0168	1.0066	0.9909	1.0266
678 - 688 nm	1.0107	1.0106	1.0209	1.0230	1.0133	0.9932	1.0213
705 - 715 nm	1.0255	1.0243	1.0346	1.0360	1.0301	1.0115	1.0472
775 - 785 nm	1.0167	1.0111	1.0210	1.0153	1.0204	1.0177	1.0678
870 - 880 nm	1.2973	1.3084	1.3687	1.3231	1.3852	1.4680	1.4283

Source: European Solar Test Installation – JRC

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