US Government Participation in Consensus Standards Development: OMB Circular A-119

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CORM

Council For Optical Radiation Measurements

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Consensus Standards

- Common repeated use of rules, conditions, guidelines or characteristics….processes production methods
- "voluntary consensus standards" developed or adopted by voluntary bodies
  - Classification of components
  - Delineation of procedures
  - Specifications
  - Measurement of quality and quantity
  - Test methods and sampling procedures;
  - Measurements of size or strength

Consensus Standards

- Members review and vote on draft standards
- General agreement, not necessarily unanimity
  - ASTM requires resolution of ALL negatives
  - International (ISO, IEC) only require MAJORITY votes
- Process resolves objections by interested parties
- All comments fairly considered
- Objector is advised of the disposition of objection(s) with reason
- Consensus body members given opportunity to change their votes after reviewing the comments

"I'm from the government* and I'm here to help...."

* Sort of…Employee of Contractor to US Dept of Energy

What is OMB Circular A-119?

"Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities "

- Pub. L. 104-113, the "National Technology Transfer and Advancement Act of 1995," ***codified in A-119***
- Establishes policies on Federal use ***and development*** of voluntary consensus standards
- Guidance for ***agencies participating*** in voluntary consensus standards bodies
- Establish reporting requirements
- Authorizes the National Institute of Standards and Technology to coordinate conformity assessment activities of the agencies.
- **http://standards.gov/standards_gov/index.cfm?do=documents.A119#1**

Consensus Standards and the Government

Policy For Federal Use Of Standards:

All federal agencies must use voluntary consensus standards in lieu of government-unique standards in their procurement and regulatory activities, except where inconsistent with law.

Agencies report reason(s) for using government-unique standards in lieu of voluntary consensus standards to Office of Management and Budget (OMB) through the National Institute of Standards and Technology (NIST).

Consensus Standards and the Government

Policy For Federal Participation In Voluntary Consensus Standards Bodies

Agencies :

- Must consult with voluntary consensus standards bodies, both domestic and international

- Must participate in development of voluntary consensus standards when in the public interest and compatible with missions, authorities, priorities, and budget resources.

OMB A-119 Goals

- Eliminate the cost to the Government of developing its own standards

- Decrease cost of goods procured; burden of complying with agency regulation.

- Provide incentives and opportunities to establish standards that serve national needs.

- Encourage long-term growth for U.S. enterprises

- Promote efficiency and economic competition through harmonization of standards.

- Further policy of reliance upon the private sector to supply Government needs for goods and services.

Dept. of Energy, National Renewable Energy Laboratory (NREL)

NREL develops renewable energy and energy efficiency technologies and practices, advances related science and engineering, and transfers knowledge and innovations to address the nation's energy and environmental goals

Renewable Energy Systems

Materials & Performance Testing

ASTM and NREL/DOE Mission Overlap

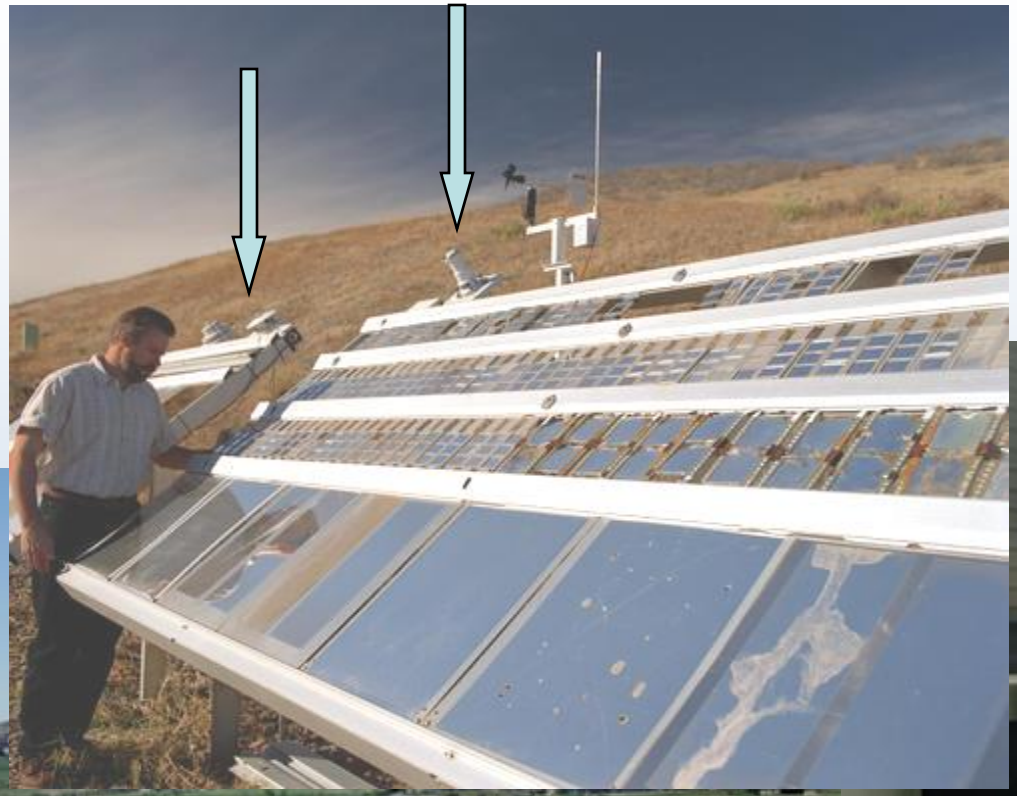
G03 on Weathering and Durability:

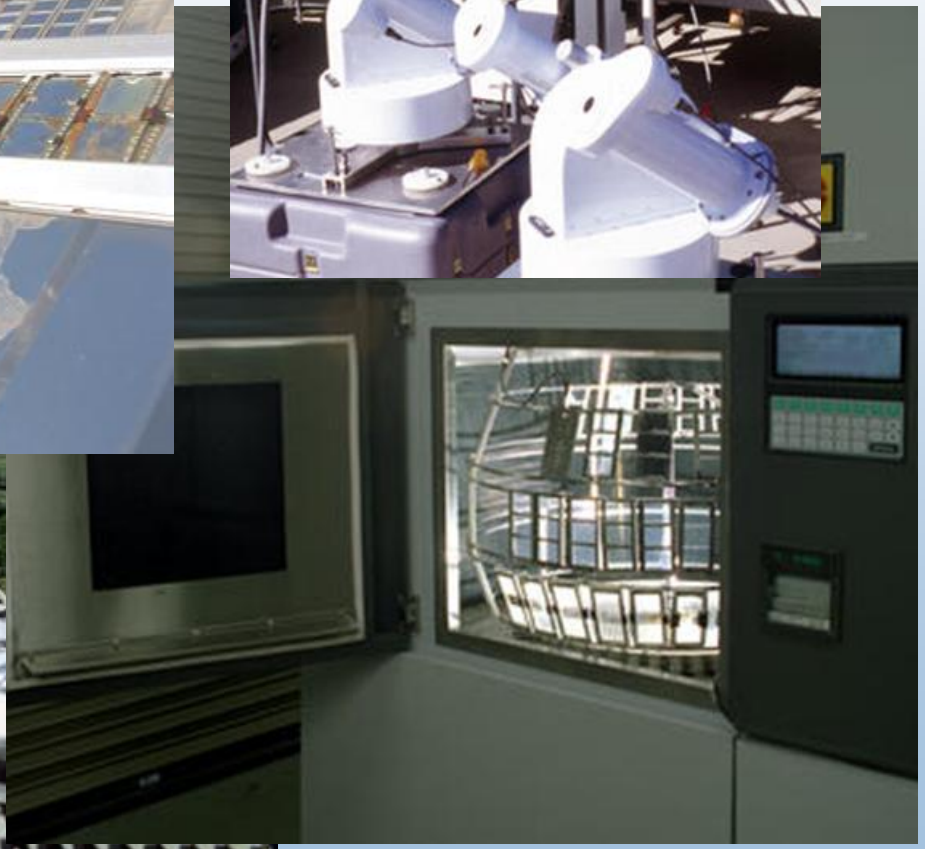
- Promote knowledge, stimulate research
- Durability and performance organic and inorganic nonmetallic materials, components and assemblies
- Nomenclature, standard conditions, methods and instrumentation, weathering exposure, accelerated and service testing

E44 on Solar, Geothermal and Alternative Energy:

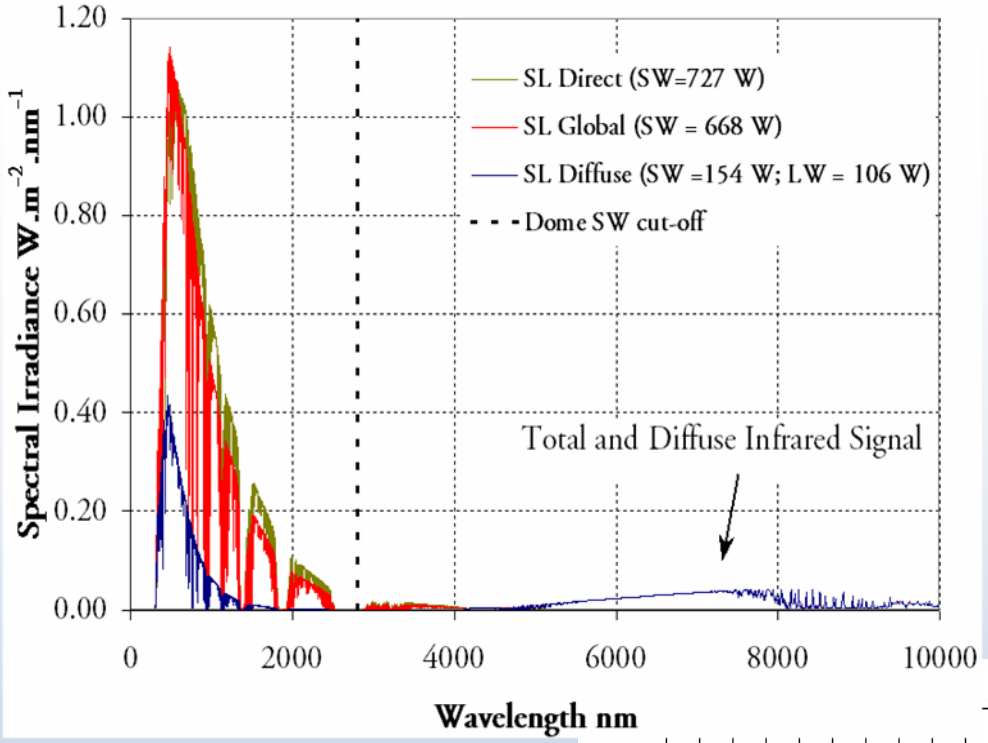
- Solar and geothermal energy conversion.
- Domestic hot water
- Active and passive space heating and cooling
- Process heat
- Thermal conversion power generation
- Photovoltaic generation of electricity
- Wind energy

NREL & Radiometry

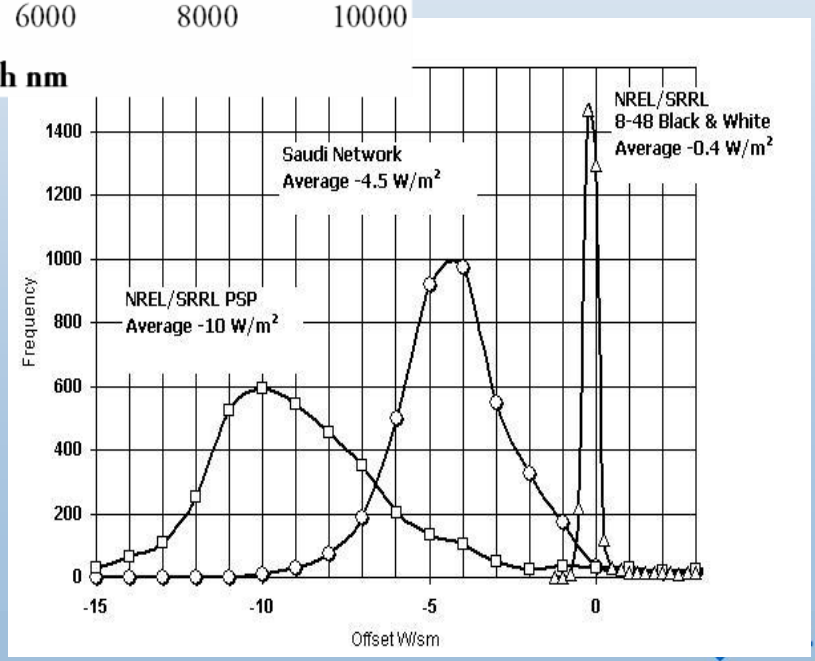




Solar Radiometer Calibration Research



Thermal Offsets



Intra/Inter-Laboratory Data (5 years)

E 816 – 05

TABLE 2 Within and Between Laboratory Precision and Bias for Pyrheliometer Calibrations at Two Laboratories

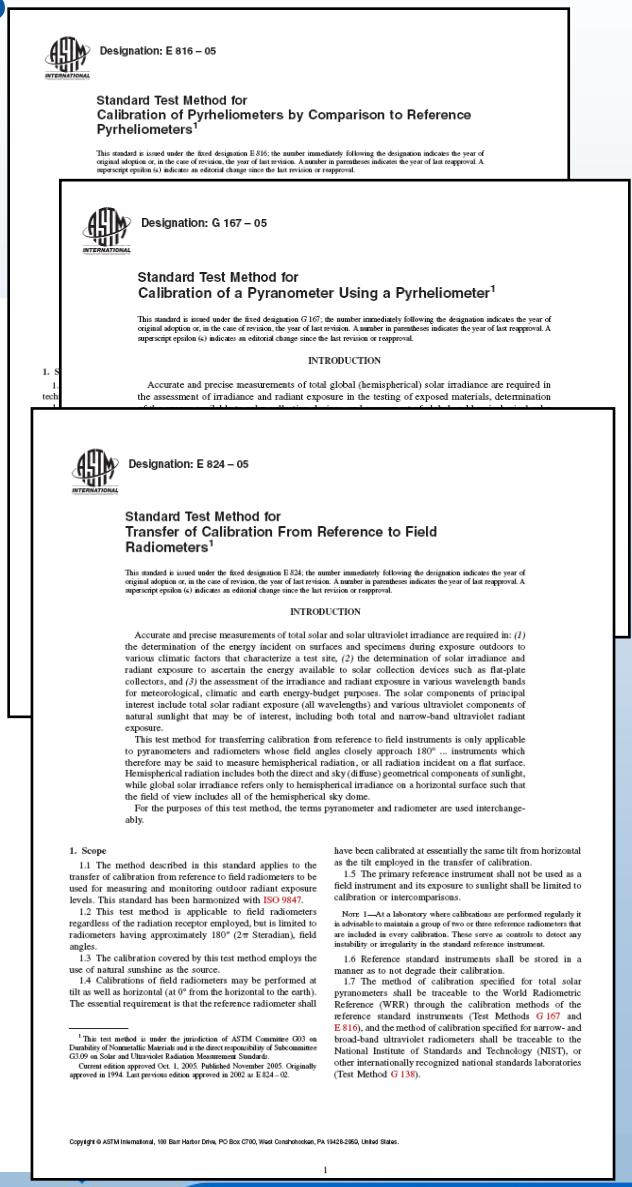
				Between	Within	Within
1	Event	2 Lab A Rs	3 Lab B Rs	4 Delta Lab A-Lab B	5 Delta Lab A	6 Delta Lab B
	1	8.896				
	2	8.942			0.52	
	3		8.922	0.22		
	4	8.929		0.08	0.15	
	5		8.878	0.57		0.49
Inst A	6	8.860		0.20	0.77	
	7		8.899	0.44		0.24
	8		8.881			0.20
	9	8.897		0.18	0.42	
	10		8.933	0.40		0.59
	11		8.851			0.92
	12	8.803		0.55	1.06	
	13		8.872	0.78		0.24
	14		8.876			0.05
	15	8.642				
	16	8.569			0.84	
	17		8.551	0.21		
	18		8.490			0.71
	19		8.509			0.22
Inst B	20	8.490		0.22	0.92	
	21		8.555	0.77		0.54
	22		8.500			0.64
	23		8.495			0.06
	24		8.477			0.21
	25		8.491			0.17
	26		8.478			0.15
	27		8.477			0.01
		Coefficient of Variation		Mean % Bias	0.67	0.34
Precision Inst A		0.57	0.34			
Precision Inst B		0.89	0.34	0.39		

Radiometer Calibrations: Weathering and Solar Applications

3 ASTM Radiometer Calibration Standards Society Ballot, July 2006.

4	.09	REVISION OF E0816-95(2002) TEST METHOD FOR Calibration of Pyrheliometers by Comparison to Reference Pyrheliometers WK6253 REVISE AS INDICATED(SEE VOLUME 14.04) (CONCURRENT WITH .0900) TECHNICAL CONTACT: DARYL R MYERS DARYL_MYERS@NREL.GOV (303) 384-6768	Affirmative Affirm with comment Negative Abstain Abstain with comment Deselect
5	.09	REVISION OF E0824-94(2002) TEST METHOD FOR Transfer of Calibration From Reference to Field Radiometers WK6252 REVISE AS INDICATED(SEE VOLUME 14.04) (CONCURRENT WITH .0900) TECHNICAL CONTACT: DARYL R MYERS DARYL_MYERS@NREL.GOV (303) 384-6768	Affirmative Affirm with comment Negative Abstain Abstain with comment Deselect
6	.09	REVISION OF G0167-00 TEST METHOD FOR Calibration of a Pyranometer Using a Pyrheliometer WK6249 REVISE AS INDICATED(SEE VOLUME 14.04) (CONCURRENT WITH .0900) TECHNICAL CONTACT: DARYL R MYERS DARYL_MYERS@NREL.GOV (303) 384-6768	Affirmative Affirm with comment Negative Abstain Abstain with comment Deselect

Submit Ballot to ASTM | Save and Return Later | Return to My Committees | Clear



Designation: E 816 – 05

Standard Test Method for Calibration of Pyrheliometers by Comparison to Reference Pyrheliometers[1]

Designation: G 167 – 05

Standard Test Method for Calibration of a Pyranometer Using a Pyrheliometer[1]

INTRODUCTION

Designation: E 824 – 05

Standard Test Method for Transfer of Calibration From Reference to Field Radiometers[1]

INTRODUCTION

Accurate and precise measurements of total solar and solar ultraviolet irradiance are required in: *(1)* the determination of the energy incident on surfaces and specimens during exposure outdoors to various climatic factors that characterize a test site, *(2)* the determination of solar irradiance and radiant exposure to ascertain the energy available to solar collection devices such as flat-plate collectors, and *(3)* the assessment of the irradiance and radiant exposure in various wavelength bands for meteorological, climatic and earth energy-budget purposes. The solar components of principal interest include total solar radiant exposure (all wavelengths) and various ultraviolet components of natural sunlight that may be of interest, including both total and narrow-band ultraviolet radiant exposure.

This test method for transferring calibration from reference to field instruments is only applicable to pyranometers and radiometers whose field angles closely approach 180° ... instruments which therefore may be said to measure hemispherical radiation, or all radiation incident on a flat surface. Hemispherical radiation includes both the direct and sky (diffuse) geometrical components of sunlight, while global solar irradiance refers only to hemispherical irradiance on a horizontal surface such that the field of view includes all of the hemispherical sky dome.

For the purposes of this test method, the terms pyranometer and radiometer are used interchangeably.

1. Scope

1.1 The method described in this standard applies to the transfer of calibration from reference to field radiometers to be used for measuring and monitoring outdoor radiant exposure levels. This standard has been harmonized with ISO 9847.

1.2 This test method is applicable to field radiometers regardless of the radiation receptor employed, but is limited to radiometers having approximately 180° (2π Steradian), field angles.

1.3 The calibration covered by this test method employs the use of natural sunshine as the source.

1.4 Calibrations of field radiometers may be performed at tilt as well as horizontal (at 0° from the horizontal to the earth). The essential requirement is that the reference radiometer shall have been calibrated at essentially the same tilt from horizontal as the tilt employed in the transfer of calibration.

1.5 The primary reference instrument shall not be used as a field instrument and its exposure to sunlight shall be limited to calibration or intercomparisons.

Note 1—At a laboratory where calibrations are performed regularly it is advisable to maintain a group of two or three reference radiometers that are included in every calibration. These serve as controls to detect any instability or irregularity in the standard reference instrument.

1.6 Reference standard instruments shall be stored in a manner as to not degrade their calibration.

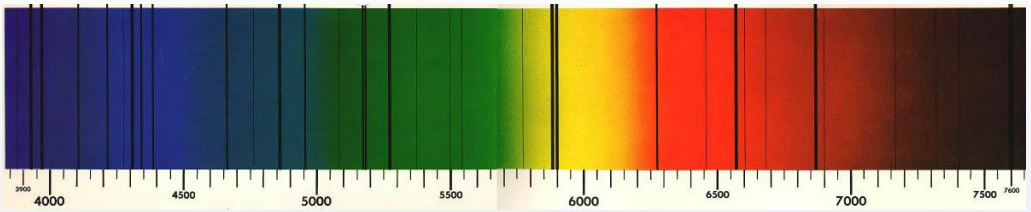
1.7 The method of calibration specified for total solar pyranometers shall be traceable to the World Radiometric Reference (WRR) through the calibration methods of the reference standard instruments (Test Methods G 167 and E 816), and the method of calibration specified for narrow- and broad-band ultraviolet radiometers shall be traceable to the National Institute of Standards and Technology (NIST), or other internationally recognized national standards laboratories (Test Method G 138).

[1] This test method is under the jurisdiction of ASTM Committee G03 on Durability of Nonmetallic Materials and is the direct responsibility of Subcommittee G03.09 on Solar and Ultraviolet Radiation Measurement Standards.

Current edition approved Oct. 1, 2005. Published November 2005. Originally approved in 1994. Last previous edition approved in 2002 as E 824 – 02.

Reference Spectral Irradiance Distributions

Tabular data developed in 1982 by ASTM with assistance from SERI…



Designation: G 159 – 98

AMERICAN SOCIETY FOR TESTING AND MATERIALS
100 Barr Harbor Dr., West Conshohocken, PA 19428
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Standard Tables for References Solar Spectral Irradiance at Air Mass 1.5: Direct Normal and Hemispherical for a 37° Tilted Surface[1]

This standard is issued under the fixed designation G 159; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

INTRODUCTION

These tables use the revised **(1)**[2] extraterrestrial spectrum of Neckel and Labs **(2)**. In addition, refinements were made to the calculation of atmospheric absorption and scattering in the computer code **(3, 4)** used to calculate the spectrum. These refinements consist of a change in the depolarization factor in the Rayleigh scattering calculation, a more accurate sampling technique for calculating scattered irradiance, and a better choice of wavelengths to perform the calculations.

1. Scope

1.1 These tables cover an air mass 1.5 solar spectral irradiance distribution for use in all terrestrial applications in which a standard reference spectral irradiance is required for the direct component of solar irradiance and hemispherical solar irradiance, consisting of both the diffuse and direct components, that is incident on a sun-facing, 37°-tilted surface.

1.2 An air mass of 1.5, a turbidity of 0.27, and a tilt of 37° (for the hemispherical spectral irradiance tables) were chosen for this standard because they are representative of average conditions in the 48 contiguous states of the United States. In real life, a large range of atmospheric conditions can be encountered, resulting in more or less important variations in atmospheric extinction. Thus, considerable departure from the present reference spectra might be observed depending on time of the day, geographical location, and other fluctuating conditions in the atmosphere.

2. Referenced Documents

2.1 *ASTM Standards:*
E 490 Solar Constant and Air Mass Zero Solar Spectral Irradiance Tables[3]
E 772 Terminology Relating to Solar Energy Conversion[4]
E 891 Tables for Terrestrial Direct Normal Solar Spectral Irradiance for Air Mass 1.5[5]
E 892 Tables for Terrestrial Solar Spectral Irradiance at Air Mass 1.5 for a 37° Tilted Surface[5]

2.2 *ISO Standard:*
ISO 9845-1:1992(E) Solar Energy - Reference Solar Spectral Irradiance at the Ground at Different Receiving Conditions - Part 1: Direct Normal and Hemispherical Solar Irradiance for Air Mass 1.5[6]

3. Terminology

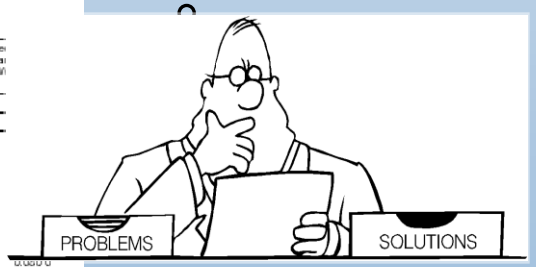
3.1 *Definitions (from Terminology E 772):*

G 159

TABLE 1 *Continued*

Wavelength	Direct Normal Solar Spectral Irradiance from 0.305 0 to 4.045 0 μm			Hemispherical Solar Spectral Irradiance Incident on a 37° Tilted Plane, Equator-Facing			Normalized Solar Spec Hemispherical Irradia (Normalized to 1 000 W	
λ_i	E_{λ_i}	$F_{0-\lambda_i}$	F_{λ_i}	E_{λ_i}	$E_{0-\lambda_i}$	F_{λ_i}	F_{λ_i}	$F_{0-\lambda_i}$
1	2	3	4	5	6	7	8	9
0.350 0	212.0	5.07	0.006 6	486.2	12.03	0.012 5	483.7	12.40
0.360 0	240.5	7.34	0.009 5	501.4	16.87	0.017 5	520.3	17.51
0.370 0	324.0	10.16	0.013 2	642.1	22.59	0.023 4	666.2	23.44
0.380 0	362.4	13.59	0.017 7	686.7	29.23	0.030 3	712.5	30.33
0.390 0	381.7	17.31	0.022 5	649.6	36.14	0.037 5	720.7	37.50
0.400 0	556.0	22.00	0.028 6	976.4	44.49	0.046 2	1 013.1	46.17
0.410 0	656.3	28.06	0.036 5	1 116.2	54.96	0.057 0	1 158.2	57.02
0.420 0	690.8	34.80	0.045 3	1 141.1	66.24	0.068 7	1 184.0	68.74
0.430 0	641.9	41.46	0.054 0	1 033.0	77.11	0.080 0	1 071.9	80.01
0.440 0	798.5	48.66	0.063 3	1 254.8	88.55	0.091 9	1 302.0	91.88
0.450 0	956.6	57.44	0.074 8	1 470.7	102.18	0.106 0	1 526.0	106.02
0.460 0	990.8	67.17	0.087 4	1 541.6	117.24	0.121 7	1 599.6	121.65
0.470 0	998.0	77.12	0.100 4	1 523.7	132.57	0.137 6	1 581.0	137.55
0.480 0	1 046.1	87.34	0.113.7	1 569.3	148.03	0.153 6	1 628.3	153.60
0.490 0	1 005.1	97.59	0.127 0	1 483.4	163.30	0.169 4	1 539.2	169.44
0.500 0	1 026.7	107.75	0.140 2	1 492.6	178.18	0.184 9	1 548.7	184.88

PV Standard Reporting Conditions?



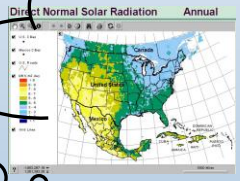
Unchanged since 1982, Issues with the "Spectral Irradiance Standard" began to emerge…

These spectra have been "renormalized" (I.e, fudged!) to give 1000 W/m^2

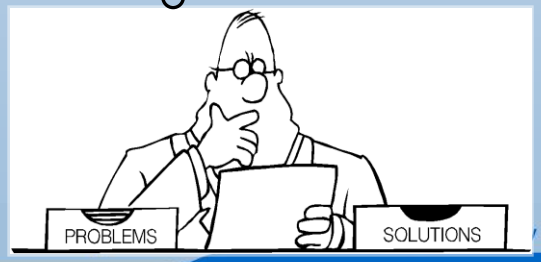
Not enough information for UV degradation estimates…

I can't reproduce the reference spectra data tables!!!

irregular, sparsely spaced data…

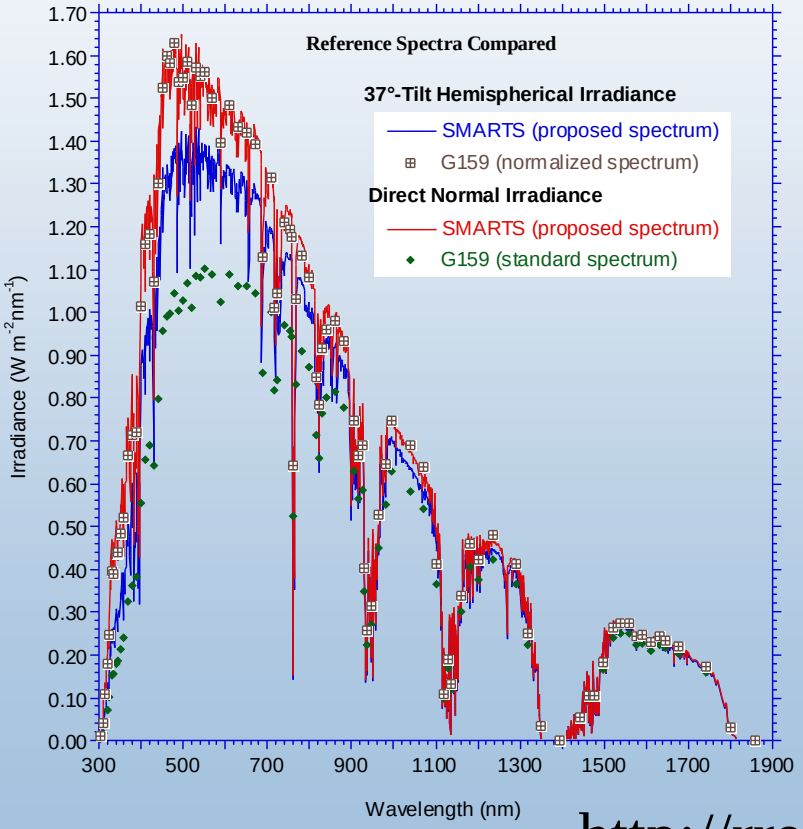


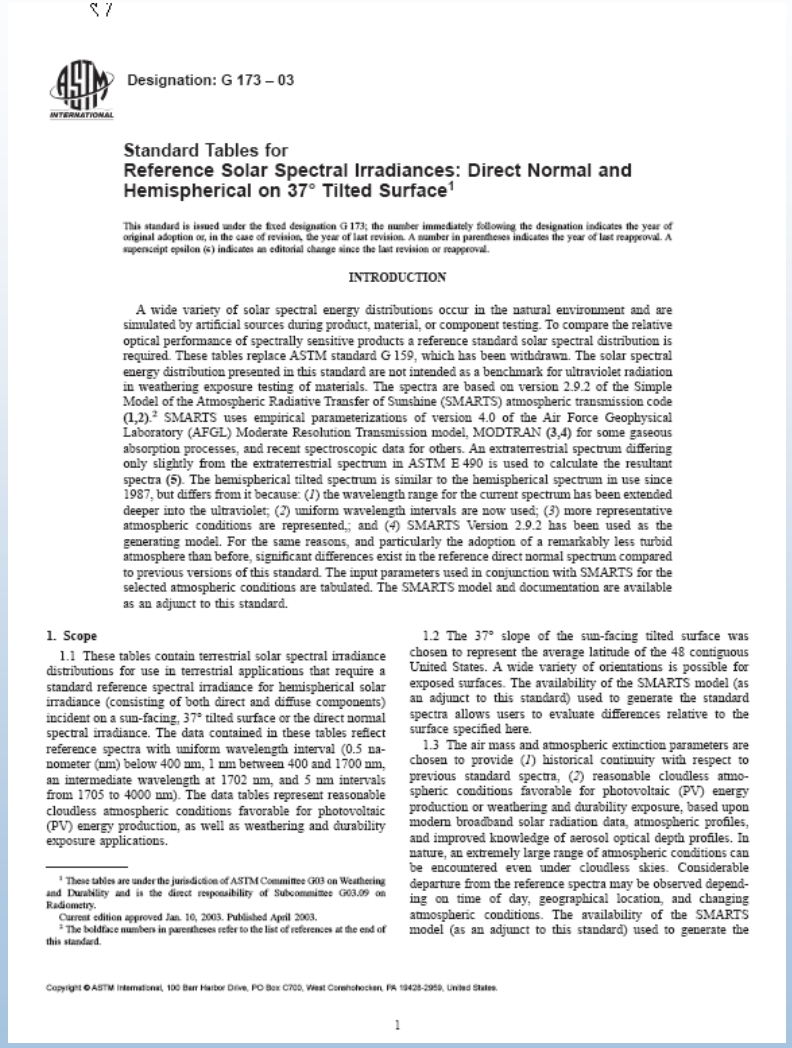
Representative of locations where PV might be deployed?



NREL R&D, Input=> Reproducible Reference Spectrum Standard

NREL research developed new spectra & standard to meet specified needs-> ASTM G173-03





Designation: G 173 – 03

Standard Tables for
Reference Solar Spectral Irradiances: Direct Normal and Hemispherical on 37° Tilted Surface[1]

This standard is issued under the fixed designation G 173; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

INTRODUCTION

A wide variety of solar spectral energy distributions occur in the natural environment and are simulated by artificial sources during product, material, or component testing. To compare the relative optical performance of spectrally sensitive products a reference standard solar spectral distribution is required. These tables replace ASTM standard G 159, which has been withdrawn. The solar spectral energy distribution presented in this standard are not intended as a benchmark for ultraviolet radiation in weathering exposure testing of materials. The spectra are based on version 2.9.2 of the Simple Model of the Atmospheric Radiative Transfer of Sunshine (SMARTS) atmospheric transmission code (**1**,**2**).[2] SMARTS uses empirical parameterizations of version 4.0 of the Air Force Geophysical Laboratory (AFGL) Moderate Resolution Transmission model, MODTRAN (**3**,**4**) for some gaseous absorption processes, and recent spectroscopic data for others. An extraterrestrial spectrum differing only slightly from the extraterrestrial spectrum in ASTM E 490 is used to calculate the resultant spectra (**5**). The hemispherical tilted spectrum is similar to the hemispherical spectrum in use since 1987, but differs from it because: (*1*) the wavelength range for the current spectrum has been extended deeper into the ultraviolet; (*2*) uniform wavelength intervals are now used; (*3*) more representative atmospheric conditions are represented,; and (*4*) SMARTS Version 2.9.2 has been used as the generating model. For the same reasons, and particularly the adoption of a remarkably less turbid atmosphere than before, significant differences exist in the reference direct normal spectrum compared to previous versions of this standard. The input parameters used in conjunction with SMARTS for the selected atmospheric conditions are tabulated. The SMARTS model and documentation are available as an adjunct to this standard.

1. Scope

1.1 These tables contain terrestrial solar spectral irradiance distributions for use in terrestrial applications that require a standard reference spectral irradiance for hemispherical solar irradiance (consisting of both direct and diffuse components) incident on a sun-facing, 37° tilted surface or the direct normal spectral irradiance. The data contained in these tables reflect reference spectra with uniform wavelength interval (0.5 nanometer (nm) below 400 nm, 1 nm between 400 and 1700 nm, an intermediate wavelength at 1702 nm, and 5 nm intervals from 1705 to 4000 nm). The data tables represent reasonable cloudless atmospheric conditions favorable for photovoltaic (PV) energy production, as well as weathering and durability exposure applications.

1.2 The 37° slope of the sun-facing tilted surface was chosen to represent the average latitude of the 48 contiguous United States. A wide variety of orientations is possible for exposed surfaces. The availability of the SMARTS model (as an adjunct to this standard) used to generate the standard spectra allows users to evaluate differences relative to the surface specified here.

1.3 The air mass and atmospheric extinction parameters are chosen to provide (*1*) historical continuity with respect to previous standard spectra, (*2*) reasonable cloudless atmospheric conditions favorable for photovoltaic (PV) energy production or weathering and durability exposure, based upon modern broadband solar radiation data, atmospheric profiles, and improved knowledge of aerosol optical depth profiles. In nature, an extremely large range of atmospheric conditions can be encountered even under cloudless skies. Considerable departure from the reference spectra may be observed depending on time of day, geographical location, and changing atmospheric conditions. The availability of the SMARTS model (as an adjunct to this standard) used to generate the

[1] These tables are under the jurisdiction of ASTM Committee G03 on Weathering and Durability and is the direct responsibility of Subcommittee G03.09 on Radiometry.
Current edition approved Jan. 10, 2003. Published April 2003.
[2] The boldface numbers in parentheses refer to the list of references at the end of this standard.

http://rredc.nrel.gov/solar/models/SMARTS/

SUMMARY

- Government Research DOES support consensus standard activities
- Government DOES need and use consensus standards
- Taxpayers, Industry, Government, Standards Organizations and Consumers all benefit