

8.3 Special Measurements

8.3.1 Ultraviolet Radiation

For the measurement of sun and sky ultraviolet radiation in the wavelength interval $0.295\text{--}0.385\ \mu\text{m}$, which is particularly important in environmental, biological, and pollution studies the Total Ultraviolet Radiometer (Model TUVR) can be used. This instrument utilizes a photoelectric cell protected by a quartz window. A specially designed teflon diffuser not only reduces the radiant flux to acceptable levels but also provides close adherence to the Lambert cosine law. An encapsulated narrow bandpass (interference) filter limits the spectral response of the photocell to the wavelength interval $0.295\text{--}0.385\ \mu\text{m}$.

8.3.2 Infrared Radiation

Net radiometers have been employed for longwave radiation beyond $3\ \mu\text{m}$ for work in thermal balance but they were criticized for the fragile nature of their thin polyethylene domes and their requirement for compressors or nitrogen bottles for purging or ventilation. This problem is overcome by the Precision Infrared Radiometer (Eppley Model PIR).

8.3.3 Spectral Radiation

Spectral Radiometers are instruments like sunphotometer (SPM), which consist of interference filters and silicon detectors to measure solar radiation in a narrow spectral band (typically $5\ \text{nm}$ FWHM). SPM's are used to determine the atmospheric turbidity (aerosol optical depth) and the concentration of trace gases such as ozone or water vapor. A SPM is calibrated in terms of its extraterrestrial signal at 1 AU (astronomical unit) distance from the sun. When calibrated in absolute units, the SPM can also be used to determine the solar spectral irradiance from stratospheric balloons, rockets or satellites.

8.4 Radiation Standards

Self calibrating cavity pyrheliometers are used to define the scale of solar radiation. This type of instrument can be constructed and characterized to yield absolute radiation values in Standard International (SI) units by employing the electrical substitution method. A selected group of these instruments is known as the World Standard Group (WSG) which is maintained at the World Radiation Center (WRC)

in Davos, Switzerland. Using this group of instruments, the World Radiation Reference (WRR) is periodically determined. All other cavity instruments are referenced to the WRR by intercomparison.

The specification, the calibration and the use of pyranometers and pyrhemometers is covered by international standards. The most common standards are:

- ISO 9060 : Specification and classification of instruments for measuring hemispherical solar and direct solar radiation. This standard covers the specification, and can serve as a guide when selecting instruments for a particular application.
- ISO TR 9901 : Field pyranometers, recommended practice for use. This standard covers selection, installation and maintenance of pyranometers.
- ISO 9847 : Calibration of field pyranometers by comparison to a reference pyranometer. This standard covers calibration, both during use in the field and indoors.