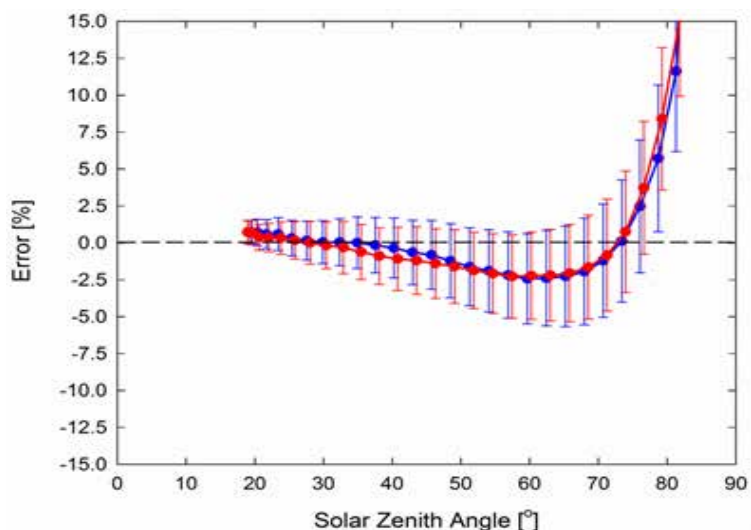
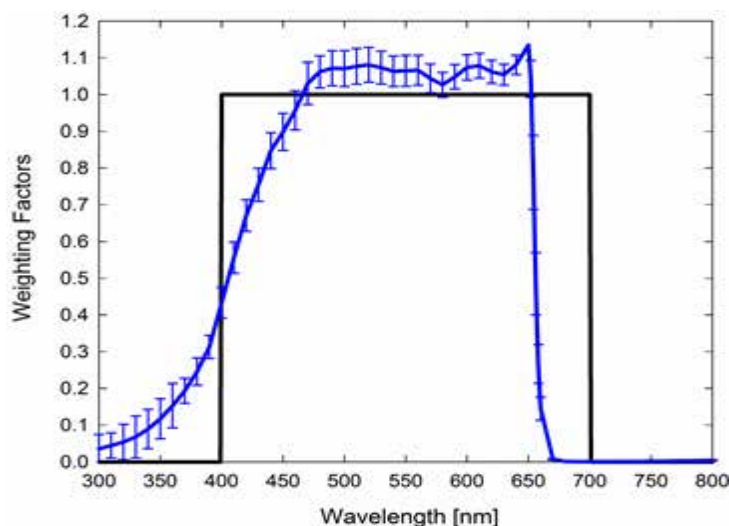




Response Graphs



Mean **cosine response** of twenty-three SQ series quantum sensors. Blue points represent the AM response and red points represent the PM response.



Mean **spectral response** of six SQ series quantum sensors (error bars represent two standard deviations above and below mean) compared to PFD weighting function.

USB quantum sensor can be connected directly to a computer for real time measurements and data logging, or act as a stand-alone datalogger when connected to most standard 5 V DC USB power sources

Product Specifications

SQ-420

Power Supply	Uses a 5 V USB power source and has a 61 mA current draw
Resolution	0.1 $\mu\text{mol m}^{-2} \text{s}^{-1}$
Calibration Factor	Custom for each sensor and stored in the firmware
Calibration Uncertainty	$\pm 5 \%$
Measurement Repeatability	Less than 0.5 %
Long-term Drift (non-stability)	Less than 2 % per year
Non-linearity	Less than 1 % (up to 4000 $\mu\text{mol m}^{-2} \text{s}^{-1}$)
Response Time	Software updates every second
Field of View	180°
Spectral Range	410 to 655 nm (wavelengths where response is greater than 50 % of maximum)
Directional (Cosine) Response	$\pm 5 \%$ at 75° zenith angle
Temperature Response	0.06 \pm 0.06 % per C
Operating Environment	-40 to 70 C; 0 to 100 % relative humidity; can be submerged in water up to depths of 30 m
Dimensions	24 mm diameter, 33 mm height
Mass	90 g (with 5 m of lead wire)
USB Cable	4.6 m (15 ft)
Warranty	4 years against defects in materials and workmanship

Features

ACCURATE, STABLE MEASUREMENTS

Cosine-corrected with directional errors less than $\pm 5\%$ at a solar zenith angle of 75° . Long-term non-stability less than 2% per year.

SPECTRAL RESPONSE

Original quantum sensors work well for broadband sources (sun, high pressure sodium, metal halide, cool white fluorescent lamps).

INTERNAL DATA STORAGE

Sensor has internal data storage capability with the ability to hold up to 10,000 measurements. This allows the sensor to collect data while connected to most stand-alone 5 V DC USB power sources.

NO DATALOGGER REQUIRED

Sensor can be connected to a desktop, laptop, or tablet computer via a USB 2.0 type A plug. The ApogeeConnect software gives the user control of data logging and calibration settings, provides real time output display and graph of PPFD measurements, and allows the data set to be saved as a csv file for further analysis.

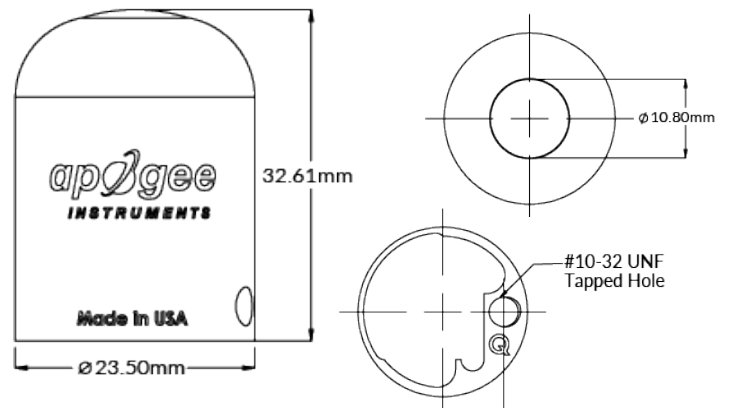
INDEPENDENT CALIBRATION

The SQ-420 is calibrated independently for sunlight and electric light to improve measurement accuracy. The light source calibration can be selected in the settings menu of the Apogee software.

CALIBRATION TRACEABILITY

Apogee SQ sensors are calibrated through side-by-side comparison to the mean of four transfer standard sensors under a reference lamp. The reference sensors are recalibrated with a quartz halogen lamp traceable to the National Institute of Standards and Technology (NIST).

Dimensions



Software Overview

The screenshot shows the Apogee Sensor Interface software. It features a real-time display of 81.9 $\mu\text{mol}/\text{m}^2 \text{ s}$, a graph of radiation levels, a setup menu with calibration type selection, and a data capture table. The data capture table is expandable and shows a list of timestamps and values. The file name and location are also displayed.

Annotations:

- Instantaneous output display
- Graphic display of radiation levels
- Setup menu with calibration type selection
- Connection status
- Data capture setup with user defined logging intervals
- Expandable data capture table
- File name and location