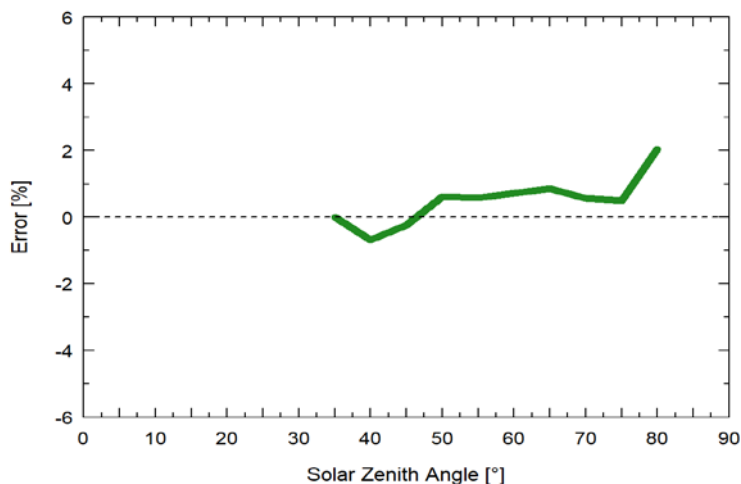
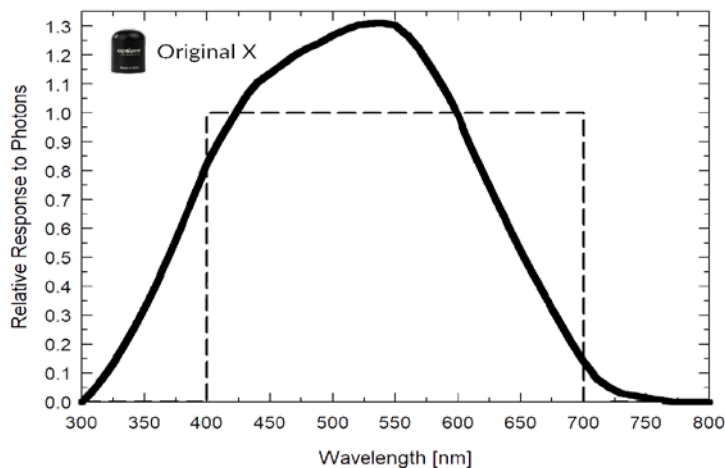




### Response Graphs



Mean **cosine response** of twenty-three SQ X series quantum sensors.



Mean **spectral response** of six SQ X series quantum sensors compared to defined PAR 400-700 nm (dotted line).

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-420X

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	370 to 650 nm (wavelengths where response is greater than 50 % of maximum)
Directional (Cosine) Response	$\pm 5\%$ at 75° zenith angle
Temperature Response	-0.04 % per C
Operating Environment	10 to 60 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  $75^\circ$ . Long-term non-stability less than  $2\%$  per year.

## SPECTRAL RESPONSE

Original X 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.

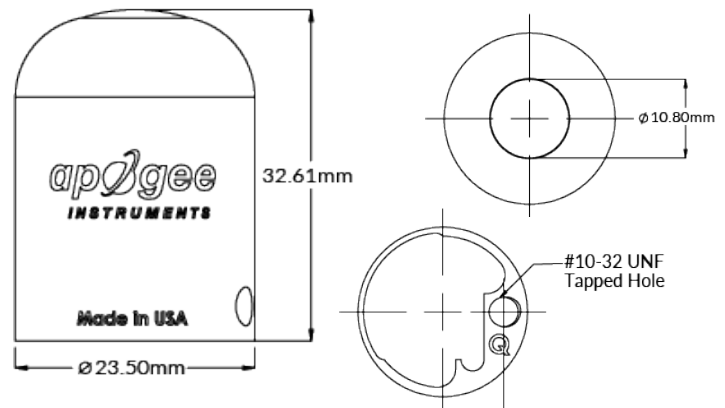
## INDEPENDENT CALIBRATION

The SQ-420X 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 X 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. Key features are highlighted with green arrows and labels:

- Instantaneous output display:** Shows a large digital readout of 81.9  $\mu\text{mol}/\text{m}^2 \text{ s}$ .
- Graphic display of radiation levels:** Shows a line graph of radiation levels over time.
- Setup menu with calibration type selection:** A dropdown menu is open, showing options for 'Light source' (Electric, Sunlight) and 'Calibration'.
- Connection status:** A status bar at the bottom indicates 'Device Connected'.
- Data capture setup with user defined logging intervals:** A 'Setup' button is visible at the top right.
- Expandable data capture table:** A table of data points is shown, with columns for 'Timestamp' and 'Value'. The table is scrollable.
- File name and location:** A 'File Location' field at the bottom shows the file path 'sq-420.csv'.