MODEL LI-190SA/SZ QUANTUM SENSOR

MEASURE PHOTOSYNTHETICALLY ACTIVE RADIATION

During photosynthesis,plants use energy inthe region of the electromagnetic spectrum from 400-700 nm (1,2). The radiation in this range,referred to as Photosynthetically Active Radiation (PAR), can be measured in energy units (watts m^{-2}) or as Photosynthetic Photon Flux Density(PPFD),which has units of quanta (pho-tons) per unit time per unit surface area.The units most commonly used are micro-moles of quanta per second per square-meter (µmol $s^{-1}m^{-2}$). Plant scientists, horticulturists, ecologists,and other environmental scientists use the LI-190SA Quantum Sensor to accurately measurethis variable.

QUANTUM SENSORS

LI-COR Quantum Sensors are used to measure PPFD of photosynthetically active radiation (PAR). A simple integral relationship exists between the number of molecules photochemically changed and the number of photons absorbed within a particular waveband regardless of photon energy (6). The ideal quantum sensor should have an equal response to all photons within the 400-700 nm waveband. A typical response curve of a LI-COR quantum Sensor plotted against the ideal quantum response is shown in Figure 1.

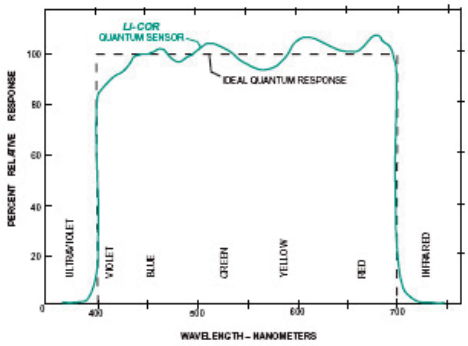

Figure 1. Typical spectral response of LI-COR Quantum Sensors vs. Wavelength and the Ideal Quantum Response (equal response to all photons in the 400-700 nm waveband).

Accurate measurements are obtained under all natural and artificial lighting conditions because of the computer tailored spectral response of the LI-190SA. Colored glass filters are used to tailor thesilicon photodiode response to the desiredquantum response (Figure 1). An interference filter provides a sharp cutoff at 700nm, which is critical for measurements under vegetation where the ratio of infrared to visible light may be high. A small response in the infrared region can causean appreciable measurement error. This sensor, developed from earlier work (3),was pioneered by LI-COR and has become the standard for PPFD measurement inmost photosynthesis related studies. The LI-190SA is also used in oceanography, limnology, and marine science as a reference sensor for comparison to underwater PAR measured by the LI-192SA Underwater Quantum Sensor.

*Units currently used are moles,einsteins,photons and quanta (2,4,5).
1 µmol $s^{-1}m^{-2}$ = 1 µE $s^{-1}m$-2 = 6.02 x 10^{17}photons $s^{-1}m^{-2}$=6.02 x 10^{17}quanta $s^{-1}m^{-2}$.

SPECIFICATIONS:

Absolute Calibration: ±5% traceable to theNational Institute of Standards andTechnology (NIST).
Sensitivity: Typical 5µA per 1000µmol $s^{-1}m^{-2}$.
Linearity: Maximum deviation of 1% up to10,000 µmol $s^{-1}m^{-2}$.
Stability: Typically < ±2% change over a 1 year period.
Response Time:10 µs.
Temperature Dependence: 0.15% per °Cmaximum.
Cosine Correction: Cosine corrected up to80°angle of incidence.
Azimuth: < ±1% error over 360°at 45°elevation.
Tilt: No error induced from orientation.
Operating Temperature: -40 to 65°C.
Relative Humidity: 0 to 100%.
Detector: High stability silicon photovoltaicdetector (blue enhanced).
Sensor Housing: Weatherproof anodizedaluminum case with acrylic diffuser andstainless steel hardware.

ORDERING INFORMATION

The LI-190SA Quantum Sensor cable terminates with a BNC connector that connects directly to the LI-250 Light Meter or LI-1400 DataLogger. The 2290 Millivolt Adapter should be ordered if the LI-190SA will be used with a strip chart recorder or datalogger that measures millivolts. The 2290 uses a 6040 hm precision resistor to convert the LI-190SA output from microamps to milli-volts. The Quantum Sensor can also be ordered with bare leads (without the connector) and is designated LI-190SZ. Both are available with 50 foot cables, LI-190SA-50 orLI-190SZ-50. The 2003S Mounting and Leveling Fixture is recommended for each sensor unless other provisions for mounting are made.

LI-190SA Quantum Sensor
LI-190SZ Quantum Sensor
LI-190SA-50 Quantum Sensor
LI-190SZ-50 Quantum Sensor2290 Millivolt Adapter
2003S Mounting and Leveling Fixture
2222SB-50 Extension Cable
2222SB-100 Extension Cable

LI-190SA Quantum Sensor