



## AMERIFLUX QA/QC LAB CALIBRATION CERTIFICATE

### LAB STANDARD QUANTUM SENSOR FOR IN-HOUSE CALIBRATIONS

CALIBRATION DATE : January 10, 2020  
CALIBRATED BY : C. Hanson  
MANUFACTURER : KIPP & ZONEN  
MODEL : PAR LITE  
SERIAL NUMBER : 060831

CALIBRATION COEFFICIENT:  $131.80 \pm 0.01 \mu\text{mol m}^{-2} \text{s}^{-1} \text{ mV}$  (mean  $\pm 1$  SD)  
 $7.59 \mu\text{V}/\mu\text{mol/ m}^{-2} \text{s}^{-1}$

IMPEDANCE : 240 OHMS

SENSOR TEMP  
DURING CALIBRATION :  $28.16 \pm 0.59^\circ\text{C}$  (mean  $\pm 1$  SD)

CALIBRATION PROCEDURE: Each PAR LITE sensor output was measured against a calibrated spectral irradiance lamp (LI-1800-02 Optical Radiation Calibrator, LI-Cor Inc., Lincoln, NE) at a known distance of 20.3 cm between the lamp reference point and the surface of the PAR LITE diffuser. Previously, the Kipp and Zonen factory calibration was performed against a reference PAR-LITE sensor under a parallel beam of filtered light (NIR reducing filter) from a Xenon lamp. See Kipp and Zonen calibration certificate. This AmeriFlux calibration removes the uncertainty by Kipp and Zonen using a reference PAR LITE sensor and a Xenon in their calibration procedure.

HIERARCHY OF TRACEABILITY: This PAR LITE sensor has been calibrated against a standard of known spectral irradiance, the 200 W 1800-02I halogen lamp S/N ORL1200 supplied and calibrated by LI-Cor Inc. The standard lamp ORL1200 was calibrated against a NIST-traceable standard lamp on Nov 17, 2006.

#### CORRECTION APPLIED:

1. We examined the sensitivity of the PAR LITE to NIR with a RG780/Tiffen #87 cut-on filter and found that IR had no effect on the PAR LITE sensor using this lamp and calibration unit.
2. We applied a correction to the sensor's calibration to account for the difference in spectral irradiance between the standard lamp and clear sky conditions for wavelengths 400-700 nm. The correction is calculated by convoluting the spectral response of the PAR sensor with respect to the lamp calibration to the international standard ISO 9845-1 global air mass 1.5 spectrum (for frequencies 400 -700 nm). This correction factor was 1.0478. Note, LI-Cor does not apply this correction to any of their Li-190 sensors, so if you are comparing the response of the PAR LITE sensors to Li-190's, your initial Li-190 data will likely be lower than those of the PAR LITE sensor.

**Note:** Please return this sensor to the AmeriFlux QA/QC lab at the above address for re-calibration every year. We will maintain this sensor, so please treat it with respect. We will not pay for Kipp and Zonen factory calibration. For reference, the Kipp & Zonen calibration certificate is attached.