

# Calibration transfer of laser power in the visible spectral range

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## Abstract

The Laser Metrology Laboratory is offering calibration of optical power meters from visible (488 nm) to IR (10.6  $\mu\text{m}$ ) spectral range, from nm (at visible and communication wavelengths) up to 1 kW (for CO<sub>2</sub> lasers). As the Laboratory is expecting its re-accreditation as a testing laboratory according to ISO 17025 standard, procedures for the calibration of optical power meters at different wavelengths/ power levels were developed. In the present paper we report the calibration transfer at five discrete wavelengths in the visible spectral range ( $\lambda_1=632.8$  nm,  $\lambda_2=611.8$ nm,  $\lambda_3=604.6$ nm,  $\lambda_4=593.9$ nm,  $\lambda_5=543.4$ nm) at power levels from 0.4 mW to 5 mW (wavelength dependent). The calibration was done using two primary detectors: one based on a thermopile array, and the other a UV-enhanced photodiode. Both units were previously calibrated at PTB, at the He-Ne laser wavelength of  $\lambda = 632.8$  nm. The procedure was carried out using the substitution method with laser power monitoring. For the monitoring process, a Si photodiode with background subtraction was employed. Data were acquired with two instruments through either serial or USB links. The acquisition type was about 5 min. leading to a statistics over more than 400 data points. In order to evaluate the uncertainties budget, several additional investigations were performed: optical background measurement, the power and wavelength stability of the tunable He-Ne laser used, the sensitivity of the primary standards to wavelength change.