

NCC Calibration Seminar



Title: Automated calibration of optical sensors using a low-cost kHz OPO laser system

Speaker: Juqin Zong, Sensor Science Division, National Institute of Standards and Technology (NIST)

Date & Time: Friday, June 22nd, 10:30am – 11:30am

Location: Conference Room 4102 (4th floor), ESSC Building (free parking) 5825 University Research Ct., College Park, MD 20740

Abstract:

Continuous-wave (CW) and pulsed, mode-locked tunable lasers have been successfully used for calibration of optical sensors, especially for spectral irradiance and radiance responsivity, for many years at NIST and other National Metrology Institutes to achieve smallest calibration uncertainties. These tunable lasers, however, are expensive and difficult to automate; these characteristics limit their widespread industrial use. To address these issues, a new method was developed recently at NIST for calibration of optical sensors using a low-cost, fully automated kHz pulsed tunable optical parametric oscillator (OPO) laser system. Unlike conventional methods, the new method is based on measurement of total energy of a pulsed OPO laser train using two synchronized current integrators (also called charge amplifiers) to obtain total integrated electric charges from a test

detector or standard detector and a monitor detector, respectively. Extremely high measurement repeatability (10 ppm) is achieved by using this new method even though fluctuation of the OPO laser is approximately 10 %. Absolute expanded calibration uncertainty is estimated to be 0.05 % (with a coverage factor of k = 2), which is virtually the same as that by using tunable CW lasers. The calibration method, the kHz OPO laser system, and various a



calibration method, the kHz OPO laser system, and various applications (such as stray-light correction and calibration for spectrometers) will be discussed.

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