Traceable power detection for terahertz radiation

Benjamin Röben

Radiation in the extended terahertz (THz) spectral range—spanning frequencies from 100 GHz to 30 THz—is non-ionizing and can penetrate through non-conductive and dry materials. These properties enable diverse applications in fields such as security imaging, biomedical diagnostics, and high-speed wireless communication. For both industrial and scientific use cases, determining the radiant power of terahertz sources is essential. To ensure reliability and comparability in radiant-power measurements, the employed detectors must be calibrated with metrological traceability to primary national standards. At the Physikalisch-Technische Bundesanstalt (PTB)—the National Metrology Institute of Germany—significant progress in detector calibrations with metrological traceability for the extended terahertz range was achieved. Today, PTB offers unique services for the calibration of terahertz detectors.

This talk will begin with an introduction to detector radiometry and the principles of metrological traceability. I will then present the key developments that have shaped the current state of the art for detector calibrations in the terahertz range. Finally, I will provide an outlook on future developments aimed at further advancing PTB's calibration capabilities in the terahertz range.

CV

Benjamin Röben studied physics with the Technische Universität Berlin, Germany, and with Université Joseph Fourier in Grenoble, France. He received the M.Sc. and doctoral degrees from the Technische Universität Berlin, in 2014 and 2018, respectively.

From 2014 until 2021, he was with the Paul-Drude-Institut for Solid State Electronics in Berlin, Germany, working on terahertz quantum-cascade lasers. He then joined the Physikalisch-Technische Bundesanstalt to work on the development of a novel type of terahertz detector. Meanwhile, he is involved in a number of topics related to the terahertz and the visible spectral range.