



## Seminar

### ***Air-Plasma-Based Ultrabroadband Terahertz Generation, Detection, and Spectroscopy Applications***



**Prof. Binbin Zhou**

Technical University of Denmark

**Time: 10: 30 Am, July. 31, 2025 (Thursday)**

**时间: 2025年7月31日 (周四) 上午10: 30**

**Venue: Room w563, Physics building, Peking University**

**地点: 北京大学物理楼, 西563会议室**

#### Abstract

The terahertz (THz) region of the electromagnetic spectrum hosts a wealth of intriguing light-matter interactions that are vital for understanding fundamental material properties. THz time-domain spectroscopy (THz-TDS) has emerged as a powerful technique to probe these dynamics. Among various ultrafast THz platforms, femtosecond (fs) laser-induced two-color air-plasma generation stands out for its ability to produce ultrashort pulses (tens of fs) with a continuous, gapless spectrum spanning the entire THz range (1 – 30 THz).

In this talk, I will present our recent advances in air-plasma-based THz technology. We will begin by exploring efficient THz generation strategies, including the use of long-wavelength driving lasers and third-harmonic mixing. The second part of the talk will focus on ultra-broadband coherent detection. High dynamic range (DR) and signal-to-noise ratio (SNR), crucial for spectroscopy applications, can be achieved with an air-plasma-based THz spectrometer. Innovative detection schemes, such as solid-state biased coherent detection (SSBCD) and single-shot detection, will be discussed. Finally, I will showcase key spectroscopy applications that leverage the platform's unique advantages, demonstrating its promise across diverse research domains.

#### About the speaker

Prof. Binbin Zhou is an Associate Professor at the Technical University of Denmark (DTU), where he leads a research team specializing in ultrafast THz air photonics. He received his Ph.D. in Optical Physics from the Institute of Physics, Chinese Academy of Sciences, in 2009. Since moving to Denmark in 2009, he has advanced through the roles of postdoctoral Researcher, Researcher, and Senior Researcher, and was appointed Associate Professor at DTU in 2021.

Prof. Zhou's research focuses on ultrafast terahertz spectroscopy, with emphasis on developing ultra-broadband THz generation and detection techniques, and applying them to study emerging material systems, such as low-dimensional semiconductors, quantum materials, and strongly correlated systems. He has authored over 60 peer-reviewed publications in leading journals, including Physical Review Letters, Nature Photonics, Optica, and Advanced Materials. His research has been supported by the Independent Research Fund Denmark, as well as other major Danish funding agencies, including the Novo Nordisk Foundation and the Villum Foundation..