亮点报道：太赫兹成像技术——多模态演进与应用前沿

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随着相干探测与计算成像等技术的突破，太赫兹成像发展出多种模态，成像尺度也从宏观拓展至纳米级的近场探测。不同成像机制在分辨率、速度与信息量之间各有侧重，如何在权衡中寻求突破，正是当前研究不断创新的核心所在。

首都师范大学团队联合北京工业大学团队、俄罗斯 ITMO 大学团队、中国工程物理研究院团队，以及电子科技大学团队系统总结了太赫兹成像技术的主要模态及关键进展，重点阐述了连续波数字全息、叠层成像、计算层析成像、脉冲时域全息、焦平面阵列成像与单像素成像等不同技术路径的工作原理与适用场景，并探讨了从宏观尺度到纳米级近场探测的成像能力演进。结合实际应用，论文重点介绍了太赫兹成像在安全检测、生物医学、无损探伤及材料表征等领域的最新进展。

凭借其非电离、高灵敏与指纹谱特性，太赫兹成像已在安全检测、生物医学与工业探伤等领域展现出独特价值。当前技术在分辨率、速度与系统集成方面仍面临挑战，算法融合深度学习、硬件革新与多模态融合将推动太赫兹成像向实时、高精度与便携化方向持续迈进。

Highlights: Terahertz imaging technology——Progress and applications

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Against the background of rapid advances in security screening, biomedical diagnosis and non-destructive testing, the development of imaging techniques that combine safety with high resolution has become a key area of research.

The team of Capital Normal University collaborated with multiple teams to systematically summarize the main modes and key advances in terahertz imaging technology, with an emphasis on the working principles and application scenarios of different technical approaches, including continuous-wave digital holography, ptychography, computed tomography, pulse-time-domain holography, focal-plane imaging and single-pixel imaging. It also explores the evolution of imaging capabilities from macroscopic scales to nanoscale near-field detection. In the context of practical applications, the paper highlights recent progress in terahertz imaging for security screening, biomedical diagnosis, non-destructive testing and material characterization.

Terahertz imaging has demonstrated unique value in fields such as security screening, biomedical diagnosis, and industrial non-destructive testing. Current technologies still face challenges in resolution, speed, and system integration. Through the integration of deep learning algorithms, hardware innovation, and multimodal approaches, terahertz imaging is expected to continue advancing toward real-time, high-precision, and portable applications.

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