亮点报道：宽带改进型单行载流子光电混频器实现光子辅助太赫兹无线通信

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随着移动互联网、人工智能计算、高清视频、虚拟现实/增强现实 (VR/AR) 等应用推动高比特率无线业务的快速发展，无线数据速率的需求在过去几十年中呈爆炸式增长。为了支持这种数十 Gbit/s 的数据速率，需要将 6G 载波频率推向太赫兹 (0.1~10 THz) 域，以适应无线业务的宽带需求。

针对未来通信中混频器件对探测器芯片大带宽和高饱和功率性能的需求，清华大学超宽带光电探测器课题组联合复旦大学智能光子通信课题组研究了高性能探测器芯片、低损耗太赫兹薄膜电路和高速光电混频模块，打通了超高速光电探测器从设计、制作到测试、封装的全链条流程，解决了应用上的迫切需求。研制了应用于光电混频器模块封装的直流—交流分配薄膜电路、低损耗微带-波导转换探针等关键电路，并分别进行加工测试验证。

团队将封装的 PD 模块成功地用于光子辅助太赫兹无线通信，其在 G 波段超过 80 GHz 的带宽保证了其宽带应用，高饱和输出功率具有实现高性能 6G 太赫兹无线通信的潜力。该太赫兹光电集成器件的研究，面向下一代移动通信技术 (6G) 核心器件的需求，具有重要的科学意义和广泛的应用前景。

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Highlights: Photonics-assisted THz wireless communication enabled by wide-bandwidth packaged back-illuminated modified uni-traveling-carrier photodiode

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With the rapid development of high bit-rate wireless services driven by mobile internet, AI computing, high-definition videos, virtual reality/augmented reality (VAR) applications, and so on, the demand for wireless data rates has grown explosively in the past decades.

The integrated optoelectronics laboratory of the Tsinghua University research team and the intelligent photonic communication research group of Fudan university present a wide-bandwidth back-illuminated modified uni-traveling-carrier photodiode (MUTC-PD) packaged with standard WR-5 rectangular waveguide for high-speed wireless communications. The over 80 GHz bandwidth of the PD module at G-band promises other broadband applications, such as THz spectroscopy and imaging. Furthermore, with the high saturated output power, the PD module has the potential to achieve high-performance 6G THz wireless communication.

The packaged PD module has been successfully employed for photonics-assisted THz wireless communication. The over 80 GHz bandwidth of the PD module at G-band promises other broadband applications, such as THz spectroscopy and imaging. Furthermore, with the high saturated output power, the PD module has the potential to achieve high-performance 6G THz wireless communication. The research of the THz photoelectric integrated device is of great scientific significance and wide application prospect for the next generation mobile communication technology (6G).

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