



Wireless THz-to-optical conversion with an electro-optic plasmonic modulator

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High-speed wireless last-mile access is a promising pathway for service providers to scale up existing photonic networks without the trenching of optical fibres. A seamless connection of the wireless and the optical domains would be highly desirable. Recently, line rates of 10 Gbit/s were transmitted over wireless distances of 5 m at a carrier frequency of 60 GHz. The data became directly converted to photonic signals with a plasmonic modulator [1]. However, for supporting the envisaged data rates up to 100 Gbit/s, carrier frequencies in the terahertz range are required. Therefore, and because the frequency spectrum beyond 0.275 THz is not yet regulated, interest in wireless THz communications has tremendously increased. Optoelectronic signal processing is the preferred technology for optical-to-terahertz conversion [2]. In this talk we present a solution for a direct terahertz-to-optical conversion [3]. A 0.2885 THz carrier is modulated with QPSK data at 50 Gbit/s, received over a 16 m long wireless link, and controls the input of an electro-optic plasmonic-organic hybrid (POH) modulator ($U \cdot L = 240 \text{ V} \cdot \mu\text{m}$). The modulator has a bandwidth beyond 0.360 THz and directly transfers the received THz signal to an optical carrier with a wavelength of 1.55 μm .

SHORT BIO:

Wolfgang Freude is a Professor at the Institute of Photonics and Quantum Electronics, Karlsruhe Institute of Technology (KIT), Germany, a Distinguished Senior Fellow at KIT, and an Honorary Doctor of the Kharkov National University of Radioelectronics, Kharkov, Ukraine. His research activities are in the area of optical and wireless high-data rate transmission using high-density integrated optics with a focus on silicon photonics. He has authored and co-authored more than 300 papers, a book and 5 book chapters. Among other engagements, he serves in the Steering Committee of the “Conference on Integrated Optics (ECIO)” since 2018 and in the Technical Programme Committee “Photonic Networks and Devices” (OSA Advanced Photonics Congress) since 2013. He is an Editorial Board Member of *Light: Science & Applications* since 2016.