Stuttgarter Physikalisches Kolloquium

Fachbereich Physik, Universität Stuttgart
Max-Planck-Institut für Festkörperforschung
Max-Planck-Institut für Intelligente Systeme

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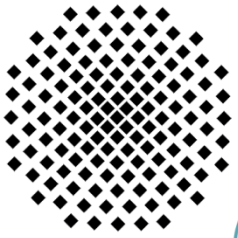

Dienstag, 13. Mai 2025	16:15 Uhr	V57.02

Universität Stuttgart, Pfaffenwaldring 57, 70569 Stuttgart-Vaihingen

Gastgeber: Prof. Dr. Martin Dressel, Universität Stuttgart, Telefon: 0711 - 685-64946

Compound Semiconductor-Based Monolithic Integrated Circuits in High-Performance Terahertz

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Abstract

The advantageous properties of group III-V compound semiconductor devices in terms of charge transport and breakdown voltage, as embodied e.g. by the Johnson figure of merit, make them attractive technology candidates in extreme high frequency electronics exploiting the high millimeter-wave and submillimeter-wave spectrum for sensing and communication applications. With InGaAs-based HEMTs, the cutoff frequency for active amplifying transistor operation can be pushed to beyond 1 THz. The presentation will highlight the challenges faced in unlocking the semiconductor devices' potential on the circuit and application level. Monolithic millimeter-wave integrated circuits realized in 35 nm InGaAs HEMT technology of Fraunhofer IAF and implementing active transmit and receive frontends are employed in state-of-the-art high-capacity wireless communication links operating at a radio frequency of 300 GHz. The low-noise amplifier stages lead to highly sensitive receivers, while power amplifiers can be used to boost the output power electronic frequency converters and of photonic mixers based e.g. on uni-traveling-carrier photodiodes. Besides the design flow and performance of the 300 GHz chip sets, a novel measurement setup combining time and frequency domain characterization for traceability of Terahertz transceiver impairments will be discussed.