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Towards the integration of THz antennas in novel communication links: the Hermes project

A. Maffucci[1], G. Fedorov[2], M. Portnoi[3], I. Kašalynas[4], C. Couteau[5], K. Konishi[6], F. Ogrin[7], A. Babusci[8], and A. Urbanovič[9]

[1]*University of Cassino and Southern Lazio - Cassino, Italy*
[2]*University of Eastern Finland - Joensuu, Finland*
[3]*University of Exeter - Exeter, United Kingdom*
[4]*FTMC - Vilnius, Lithuania*
[5]*University of Technology of Troyes - Troyes, France*
[6]*University of Tokyo - Tokyo, Japan*
[7]*MaxLLG ltd - Exeter, United Kingdom*
[8]*Monozukuri Spa - Rome, Italy*
[9]*TeraVil - Vilnius, Lithuania*
Email: maffucci@unicas.it

The HERMES project [1] addresses a key challenge for future 6G and beyond systems: the integration of terahertz (THz) devices into ultra-high-speed communication links. By exploiting graphene and other two-dimensional materials, HERMES aims to develop room-temperature THz emitters, detectors, and transceivers for short-range communications approaching 100 Gbit/s. The project combines nanomaterials, THz electronics, photonics, and system integration to overcome challenges related to efficiency, miniaturization, and infrastructure compatibility.

A key objective of the project is the integration of graphene-based THz devices into communication architectures through two complementary strategies, Fig.1. The first is an electrical integration approach, based on the co-integration of THz devices with silicon electronics and high-speed interface circuits, enabling compact and scalable solutions with reduced interconnection losses. The second is an electro-optical integration approach, where THz signals are directly converted into optical signals through graphene-enabled photonic interfaces operating in the telecom band, allowing seamless connection with existing optical communication networks. By demonstrating both integration paradigms, HERMES will contribute to establish the technological foundations for future THz communication systems.

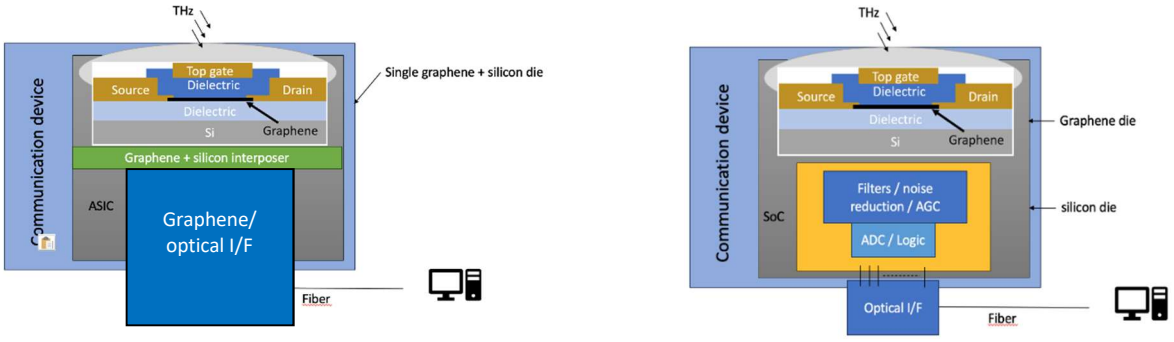

Figure 1: integration of THz devices: (left) all-optical interface; (right) electro-optical interface.

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[1] www.hermes-project.eu