

Contributions to the APECS Pilot Line: Fraunhofer HHI

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Fraunhofer HHI is one of 14 German research institutes involved in the implementation of the APECS pilot line.

Through its application-oriented research and strong collaboration with industry partners, Fraunhofer HHI plays a key role in shaping the next generation of digital infrastructure and develops innovative solutions.

Fraunhofer HHI researches the scientific foundations and key technologies for the digital society of tomorrow. The institute combines fundamental and application-oriented research in artificial intelligence, multimedia systems, wireless and optical communication networks, photonic components, and sensor systems. Together with partners from science and industry, it turns research results into highly cited scientific publications, prototypes, contributions to international standards, and solutions.

The role of Fraunhofer HHI in the APECS pilot line

Fraunhofer HHI contributes its expertise in photonic components, optical communication systems, and hybrid integration technologies to the APECS pilot line. The institute develops advanced indium phosphide (InP)-based lasers, modulators and detectors, integrating them into photonic integrated circuits for high-speed data communications and sensing applications.

A major focus is the development of ultra-high-speed optical transmitters, including the required electrical RF connections and scalable hybrid integration concepts. These technologies enable compact, energy-efficient and high-performance photonic systems for data communications and high-performance computing.

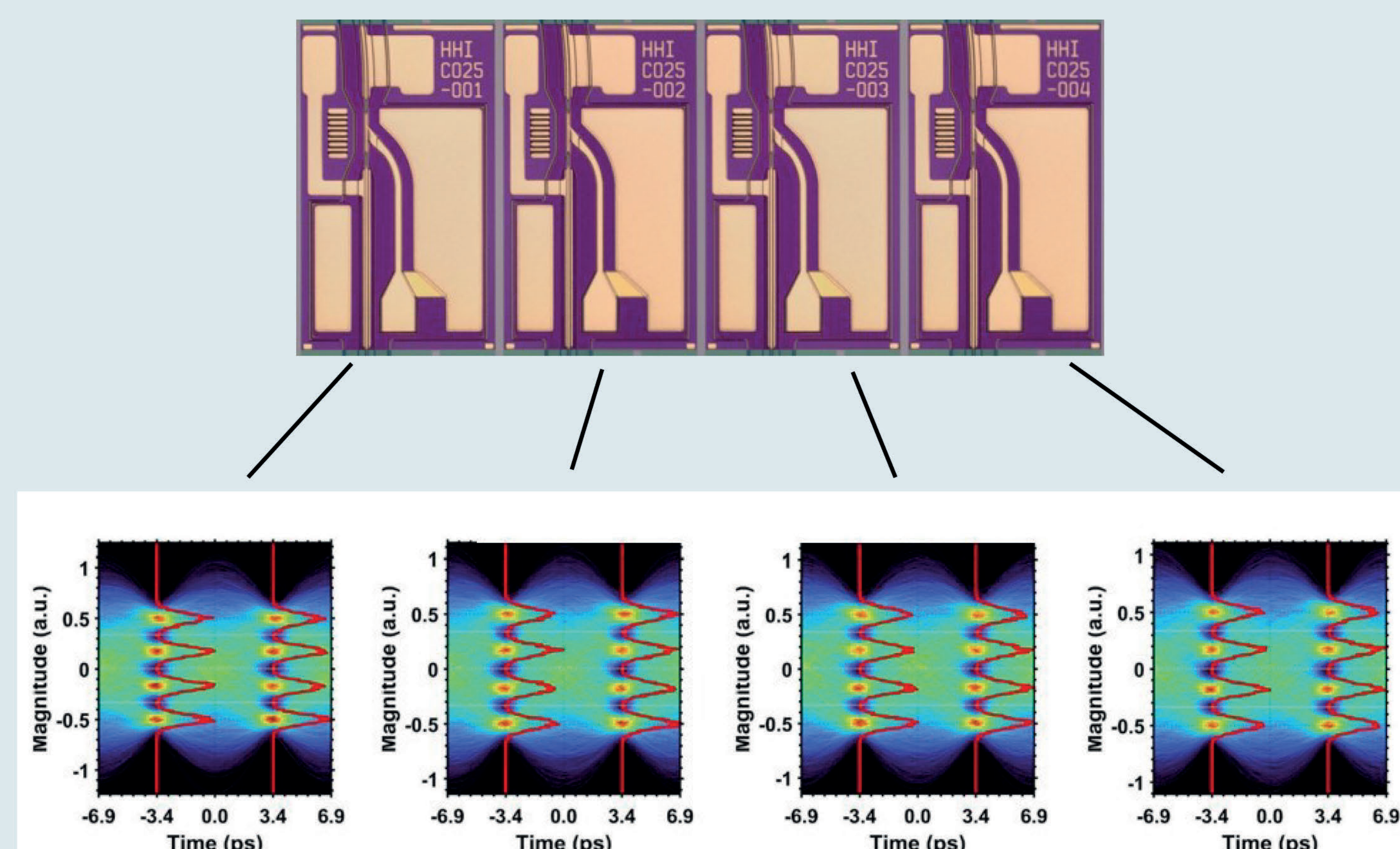
A key contribution is the Photonics Chiplet Demonstrator, which combines:

- a novel 4 × 200 Gbps InP electroabsorption-modulated laser array developed by Fraunhofer HHI;
- high-frequency RF flexlines from Fraunhofer HHI;
- dedicated InP EML driver chips developed by Leibniz FBH;
- an interposer from Fraunhofer IZM that integrates the components into a compact photonic chiplet; and
- a fiber array connected to the EML array using Fraunhofer IZM's Photonic Wire Bonding technology.

The demonstrator highlights how modular chiplet integration can combine specialized technologies from different partners. Fraunhofer HHI thereby supports the transition from innovative photonic components to scalable solutions for next-generation high-bandwidth systems.

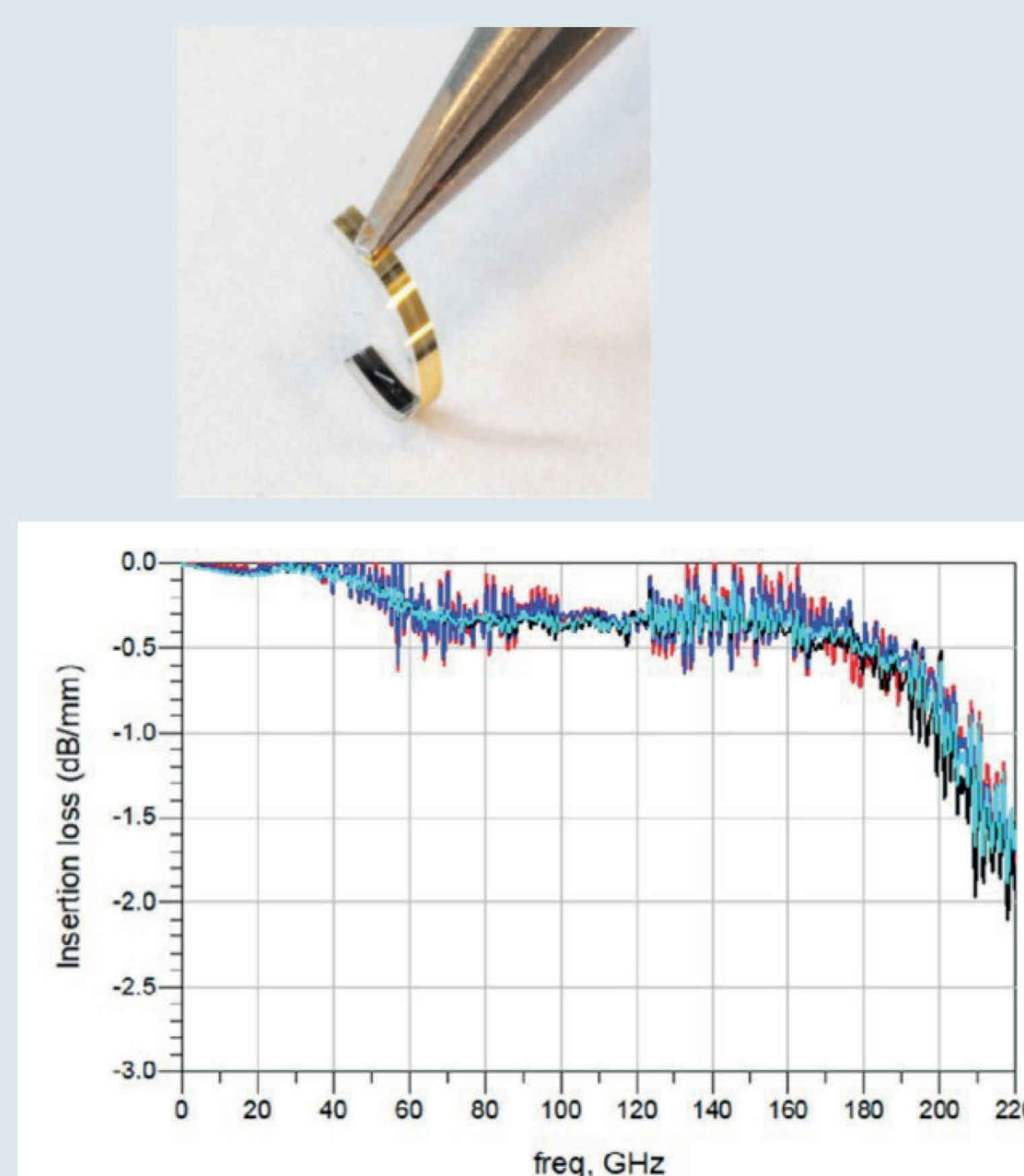
4 x 290 Gbps o-band InP EML array chip and measured optical eyes

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200GHz RF flexline and frequency response

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What is APECS?

APECS (Advanced Packaging and Heterogeneous Integration for Electronic Components and Systems) is one of 5 European pilot lines established under the EU Chips Act. APECS is the foundation for Europe's competitive position in heterogeneous system integration and advanced packaging. It plays a vital role in enhancing Europe's strategic autonomy by reducing dependence on foreign suppliers and strengthening Europe's capabilities in critical technology areas.

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Additional information

The work presented was carried out in the framework of the APECS Pilot Line of the Chips Joint Undertaking, funded by Horizon Europe and Digital Europe Programmes and national funding authorities of Austria, Belgium, Finland, France, Germany, Greece, Portugal, Spain.

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