

ONE-STOP-SHOP FOR TECHNOLOGIES AND SYSTEMS



**Forschungsfabrik
Mikroelektronik**
Deutschland

The entire added-value chain for microelectronics and nanoelectronics from a single provider

The Research Fab Microelectronics Germany (FMD), a cross-location cooperation that was founded in April 2017, links the research and development infrastructure and the technological know-how of, at last count, eleven Fraunhofer institutes from within the Group for Microelectronics, as well as two Leibniz institutes – FBH and IHP.

For the modernization and expansion of their research facilities to keep up with technical developments, the 13 founding participants will receive around 350 million euros from Germany's Federal Ministry of Education and Research over the next few years.

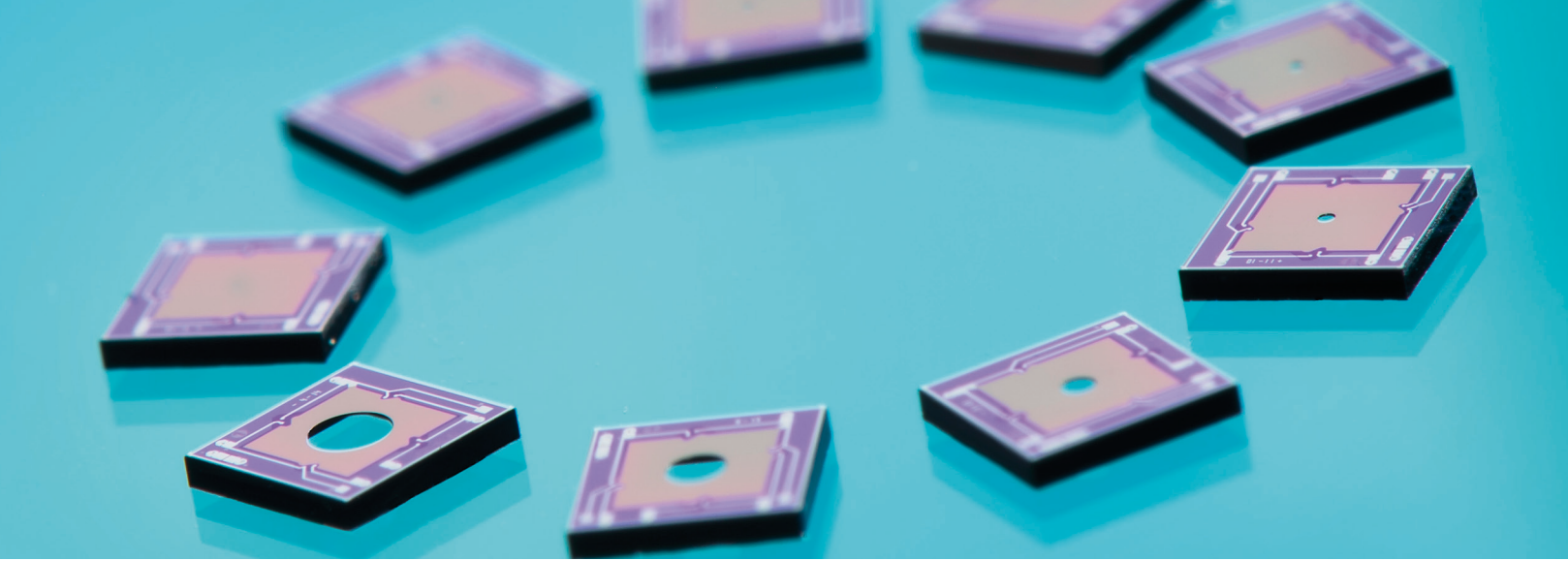
In order to advance future-relevant research topics as efficiently and quickly as possible, the FMD is organized into four technology parks – "Silicon-based Technologies," "Compound Semiconductors," "Heterointegration," and "Design, Test and Reliability."

The existing locations will be retained, while expansion and operation will be organized by a shared business office in Berlin.



Our range of services

- We can offer you a globally unique range of know-how in microelectronic technologies for the Internet of Things and Industry 4.0
- Our technological and system developments are tailor-made and from a single provider
- We offer access to our joint laboratories and shared production facilities
- We can support you with demonstrator or prototype production, specific technology services, as well as the creation of reports and analysis process
- We offer different possibilities for training and continuing education of personnel
- We observe technological trends and market developments and can carry out feasibility studies for you
- We can accompany you through R&D projects as well as technological and process development
- You can take advantage of the results of our preliminary research in the areas of microelectronics and nanoelectronics as well as microsystem and communication technologies (through licensing contracts)
- You will benefit from our wide-ranging research network and numerous cooperation arrangements with renowned international research institutes and universities



Silicon-based Technologies

Technology park 1 covers the area of silicon-based microelectronics and microsystem technology. Integrating new material systems for MEMS and NEMS sensors and actuators and combining them with CMOS processes is one of the technology park's main focuses. These technologies allow, in particular, the development and pilot manufacture of intelligent sensor nodes, cyber-physical systems, and hardware-oriented Industrial Internet-of-Things solutions.

The range of technologies is complemented with high-frequency-capable MEMS and SiGe elements. Within More-Moore technologies, the technology park offers a unique composition of machinery for 300 mm wafer diameters, including, in particular, the development of new types of devices in the Back-End-of-Line (BEoL) segment and system integration by means of 3D integration technologies.

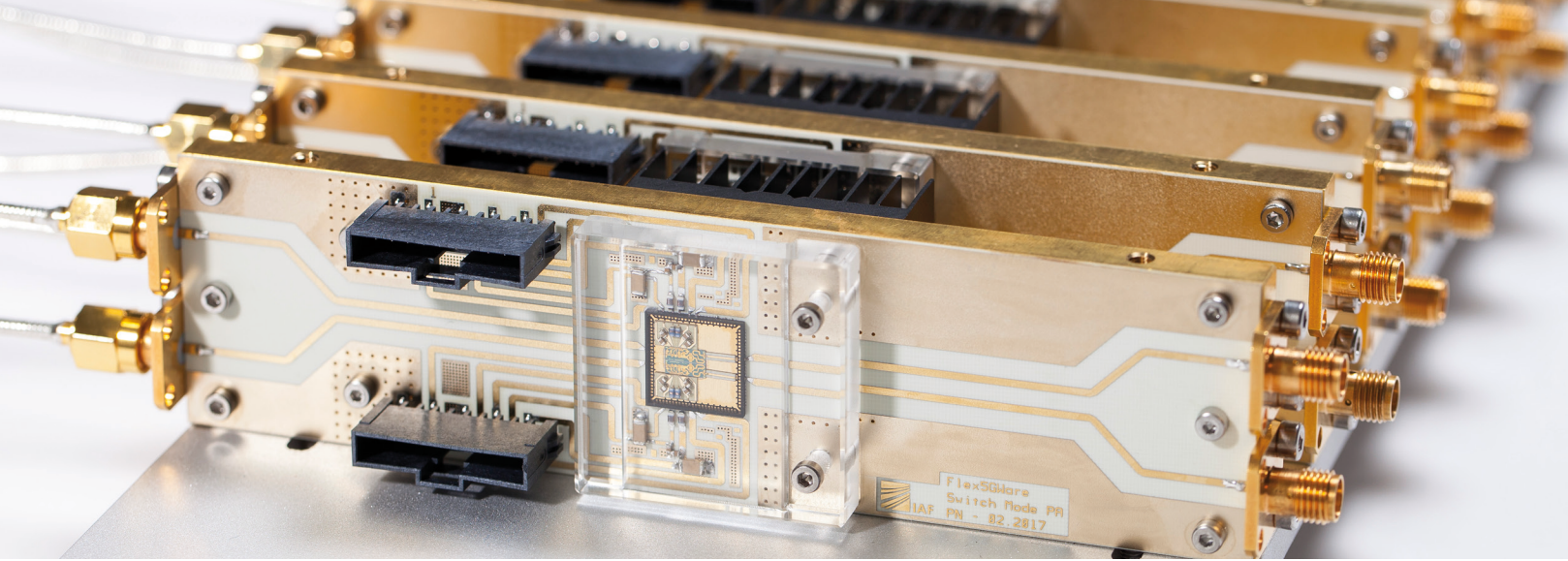
Cooperating institutes

Infrastructure and know-how in silicon-based technologies (200 / 300 mm silicon) from the Fraunhofer institutes ENAS, EMFT, ISIT, IMS, IZM, IPMS and Leibniz IHP.

For more information, contact

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Compound Semiconductors

The special properties of compound semiconductors make it possible to realize leading-edge devices and circuits for frequencies of up to 800 GHz, high-power transistors based on wide-bandgap semiconductors, as well as advanced optoelectronic devices.

Compound semiconductors are – with the exceptions of silicon carbide (SiC) and gallium nitride on silicon (GaN-on-Si) – not compatible with silicon-based technologies when it comes to wafer diameter and process control. One important role of the technology park “Compound Semiconductors” will therefore be the provision of III-V wafers and chips for heterointegration with silicon electronics. This will allow customers to make practical use of the advantages offered by devices and circuits based on compound semiconductors.

Additionally, the development of special substrates such as SiC and aluminum nitride (AlN) required for next-generation power devices is driven in this technology park. Other new developments such as power electronics based on the semiconductor gallium oxide (GaO) or semiconducting diamond are being pursued well ahead of time.

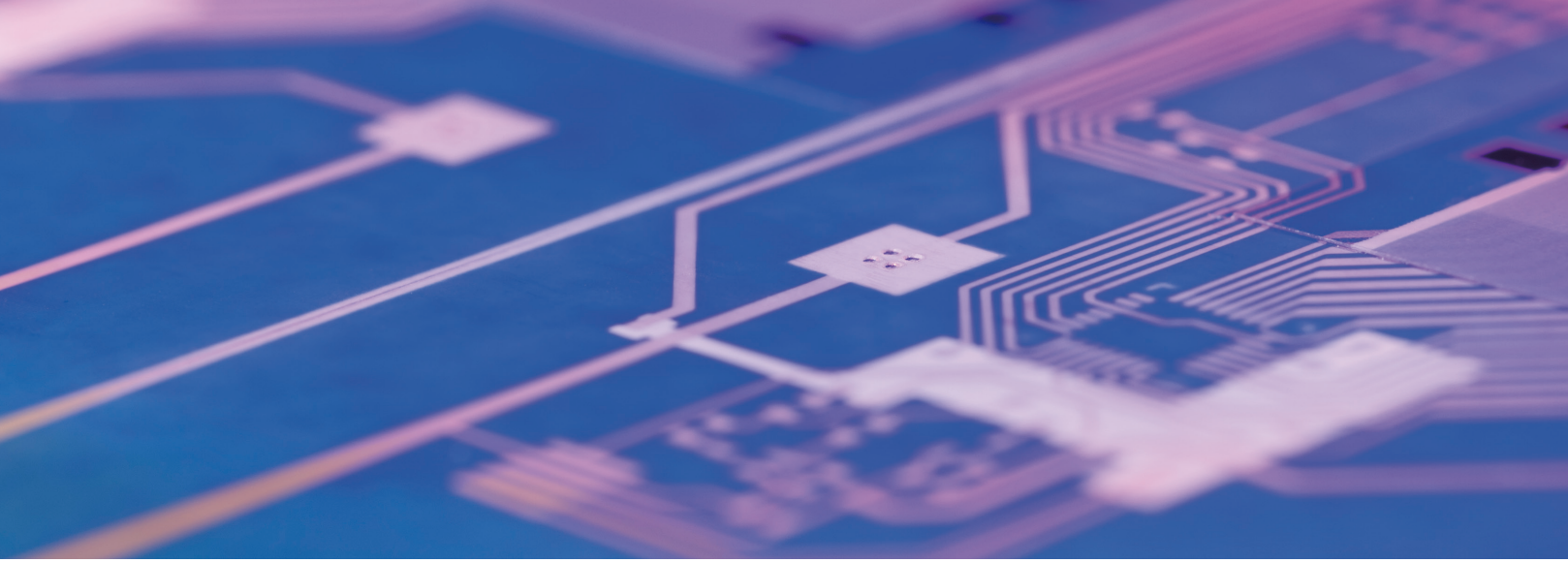
Cooperating institutes

Fraunhofer institutes HHI and IAF as well as ISIT (200 mm GaN-on-Si), Leibniz FBH and, in the field of SiC power electronics and SiC materials research, Fraunhofer IISB.

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Heterointegration

Heterointegration is the bonding of all parts and components of a system into a single functional unit - either as prototype or as finished product. When it comes to modern electronic products, this technology approach gives rise to numerous challenges: On the one hand, dissimilar technologies, feature size and materials have to be taken into account; on the other hand, handling, electrical and mechanical interconnection and protection from external influences have conflicting requirements.

We are currently experiencing a fundamental shift in the subdivision of the value chain. Interaction between parts and component manufacturers and electronic system suppliers is increasing – and with this, the complexity of technology processes.

The technology park develops and harmonizes all processing steps relevant to functional integration, which is then made available to our project partners in the form of transparent integration lines.

They can be used for anything from constructing first prototypes, to small series manufacturing, or as starting points for developing new technologies customized to one's own product range.

Our services cater to both companies and higher education institutions. We work closely with the processes of our project partners to advance product ideas, implement production chains and, where necessary, facilitate cooperation with the other technology parks.

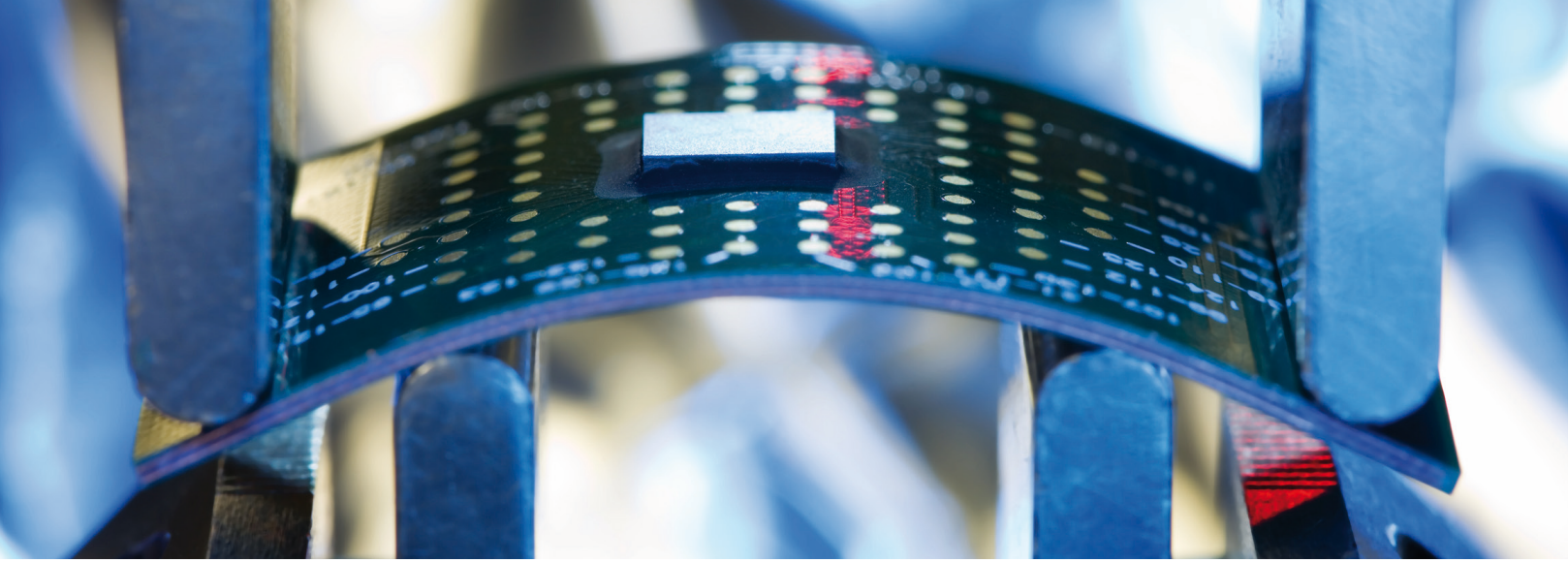
Cooperating institutes

Infrastructure, skills and know-how of the Fraunhofer institutes EMFT, ENAS, FHR, IAF, IISB, IPMS, ISIT, IZM and the Leibniz institutes FBH and IHP.

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Design, Test and Reliability

The ever-increasing complexity of microelectronic systems poses an enormous challenge for the design and the manufacturing of those systems. Novel requirements regarding energy efficiency, performance, size, and – most notably – reliability must be taken into account from the very beginning.

In the “Design, Test and Reliability” technology park, novel scientific approaches will be developed within the following focal topics in close cooperation with the other three technology parks:

- consistent expansion of design capability at system and component level and adaptation to the new requirements from the application point of view
- powerful methods for metrological characterization of new materials and devices, performance analysis in conjunction with development, testing and verification of circuits and systems, as well as comprehensive testing of innovative solutions within the context of the system,
- evaluation of reliability and service life based on the physical aging and fault mechanisms and the properties of the technology used as well as considering the requirements from the application point of view.

The exceptional multi-disciplinary cooperation within this technology park enables us to develop innovative, adaptable and reliable system solutions together with our customers.

Cooperating institutes

System know-how, design capabilities, and technological expertise from all participating Fraunhofer and Leibniz institutes.

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Fraunhofer Group for Microelectronics in cooperation
with Leibniz institutes FBH and IHP



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