Fraunhofer Group for Microelectronics in Cooperation with Leibniz Institutes FBH and IHP
The Fraunhofer-Gesellschaft
Dedicated to Applied Research

- Fraunhofer Model for Applied Research (benchmark: Industry)
- 72 institutes and research units
- over 26,600 staff (2018)
- 2.6 billion € annual budget (2018)
  - 2.2 billion € contract research
  - 70% (industrial and public calls)

Europe’s Largest Not-for-Profit Research and Technology Organisation (RTO)

Founded in 1949 (in part with US Marshall Funds)

Celebrating 70 years of Applied Research in 2019
Fraunhofer Microelectronics Group: 11 institutes + 5 guest institutes

- 1 of 8 Fraunhofer Groups
- 11 member institutes: EMFT, ENAS, FHR, HHI, IAF, IIS, IISB, IMS, IPMS, ISIT, IZM
- 5 associated members from other Fraunhofer Groups
  - ICT: AISEC, ESK, FOKUS,
  - MATERIALS: IMWS, IZFP
- Founded in 1996
- Chairman: Hubert Lakner
- Vice Chairman: Anton Grabmaier
- Managing Director: Patrick Bressler
- Business office: Berlin

- Budget: 481.7 Mio € (2019)
- Industrial contract share: 47.7%
- Staff: over 3,000 employees
- Cleanrooms at 9 institutes

Internationally networked research in:
- micro-/nanoelectronics,
- microsystem and communication technology
- Team building with CEA-Leti and imec
11 institutes of Fraunhofer Microelectronics and 2 institutes of Leibniz-Association (FBH, IHP) pool their R&D&I services for industry.

Research activities are coordinated under the umbrella of FMD.

Joint business office in Berlin responsible for organizing the cooperation and acts as a one-stop-shop portal for customers.
Fraunhofer Group for Microelectronics in Cooperation with Leibniz Institutes FBH and IHP
Next Generation Computing: A Competitive Alliance for Global Industry

Patrick Bressler, Fraunhofer Group for Microelectronics
European Cooperation for Next Generation Computing (NGC alliance)
Emerging Technologies and New Markets: New Opportunities for a Global Industry

Markets for microelectronic are in transition
New demands:
• New applications (Ind. 4.0, IoT, etc.), more complexity
• New higher security (trusted hardware and software)
• Increase in parallel data processing and transfer

Trends beyond „Moore‘s law“ (size reduction) are
• Reduction in energy consumption
• Reduction in necessary data transfer
• Reduction in latency (increase communication speeds)
Emerging Technologies and New Markets: New Opportunities for a Global Industry

• **New computer architectures** (non-von-Neumann) based on neural networks for Artificial Intelligence (AI): **neuromorphic computers**

• **Quantum technologies** for secure communication, **quantum computers**, powerful quantum algorithms

• **Advanced wireless networks** (photonic communication)

• Trusted and safe **complex integration technologies**
NGC Initiative - Application Domains

Cloud HPC
- Server Clusters
- Exascale Computing

Exa Flop range
Highest Performance
High Power

Edge HPC
- Distributed AI
- Mobile applications
- IoT applications

Peta/ Tera Flop range
High Performance
Low Power

In-Situ
Smart Sensors
- Data Fusion
- Preprocessing
- Data compression / reduction

Giga Flop range or below
Ultra Low Power
Emerging Technologies and New Markets: New Opportunities for a Global Industry

- Automated cars
- Aircraft & drones
- Trains & Railways
- Smart grids
- Health

Chips for AI, HPC, Distributed Intelligence, connectivity beyond 5G, Cyber security

- Defense & Security
- HPC
- Industry 4.0

In distributed (embedded) intelligence

In the field of trustworthy chip/server fabrication
Next Framework Programme: Request for a European Technology Infrastructure for Next Generation Computing

- NGC Alliance: European Chips for Embedded AI, Neuromorphic Computers and Quantum Computers
  - **Joint distributed pilot lines** (research fabs) covering the entire technology value chain
    - Develop the technologies needed to achieve **technological sovereignty**
    - Grant access to **tomorrow’s technologies** to Europe’s SMEs and its big systems houses
    - Enable **pilot production**: Demonstrators, Prototyping and Small volume manufacturing
  - Cooperate with **systems houses** to enable new applications and to address the needs of industry
  - Cooperate with **IDMs and Foundries** to make processes available for **mass production**