# Forschungsfabrik Mikroelektronik

Deutschland

Fraunhofer Group for Microelectronics in Cooperation with Leibniz Institutes FBH and IHP

The Fraunhofer-Gesellschaft Dedicated to Applied Research

Forschungsfabrik Mikroelektronik Deutschland

- 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)

● main location
○ other location
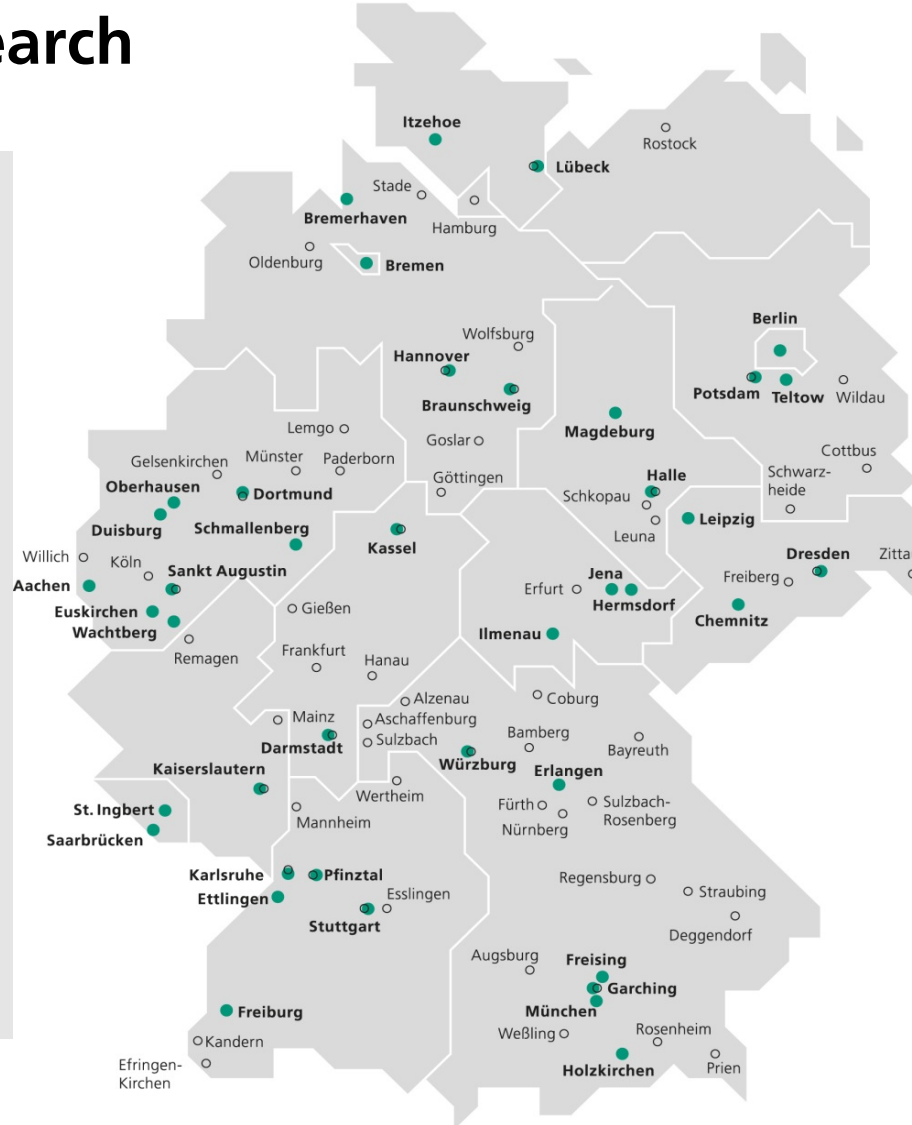
Europe's Largest Not-for-Profit Research and Technology Organisation (RTO)

Founded in 1949 (in part with US Marshall Funds)

Celebrating 70 years of Applied Research in 2019

Itzehoe · Rostock · Stade · Lübeck · Bremerhaven · Hamburg · Oldenburg · Bremen · Berlin · Wolfsburg · Hannover · Braunschweig · Potsdam · Teltow · Wildau · Magdeburg · Lemgo · Goslar · Cottbus · Gelsenkirchen · Münster · Paderborn · Göttingen · Halle · Schwarz-heide · Oberhausen · Dortmund · Schkopau · Leipzig · Duisburg · Schmallenberg · Kassel · Leuna · Dresden · Zittau · Willich · Köln · Sankt Augustin · Jena · Freiberg · Aachen · Erfurt · Hermsdorf · Chemnitz · Euskirchen · Gießen · Wachtberg · Ilmenau · Remagen · Frankfurt · Hanau · Alzenau · Coburg · Mainz · Aschaffenburg · Bamberg · Darmstadt · Sulzbach · Bayreuth · Kaiserslautern · Würzburg · Erlangen · Wertheim · Fürth · Sulzbach-Rosenberg · St. Ingbert · Mannheim · Nürnberg · Saarbrücken · Karlsruhe · Pfinztal · Esslingen · Regensburg · Straubing · Ettlingen · Stuttgart · Deggendorf · Augsburg · Freising · Freiburg · Garching · München · Rosenheim · Kandern · Weßling · Prien · Efringen-Kirchen · Holzkirchen

A cooperation of

Fraunhofer MIKROELEKTRONIK · FBH Ferdinand Braun Institut · ihp

Fraunhofer Microelectronics Group:
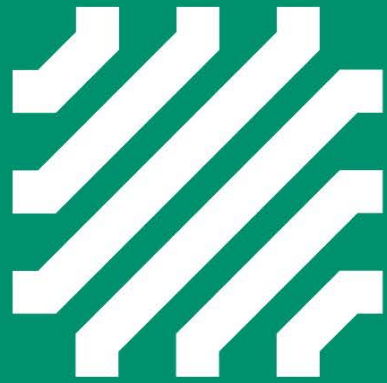# 11institutes + 5 guest institutes

- 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

A cooperation of
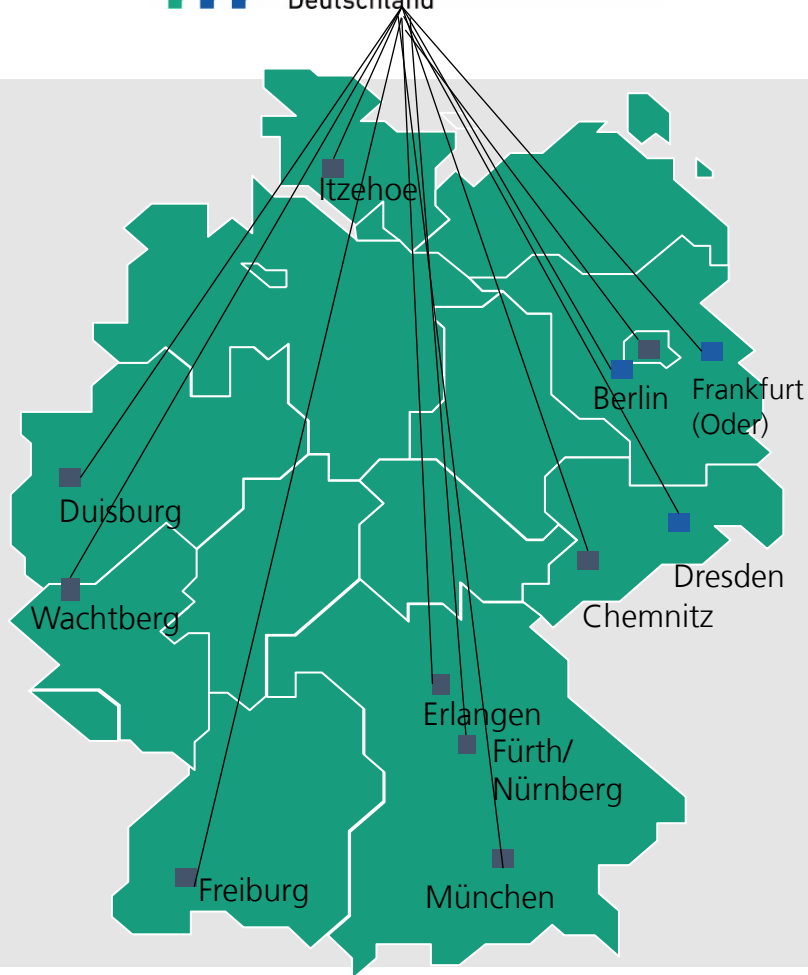
Fraunhofer Forschungsfabrik Mikroelektronik Deutschland (FMD)

- 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.

Map labels: Itzehoe, Berlin, Frankfurt (Oder), Duisburg, Wachtberg, Dresden, Chemnitz, Erlangen Fürth/ Nürnberg, Freiburg, München

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Forschungsfabrik Mikroelektronik
Deutschland

Fraunhofer Group for Microelectronics in Cooperation with Leibniz
Institutes FBH and IHP

European Cooperation
for **N**ext **G**eneration **C**omputing
(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
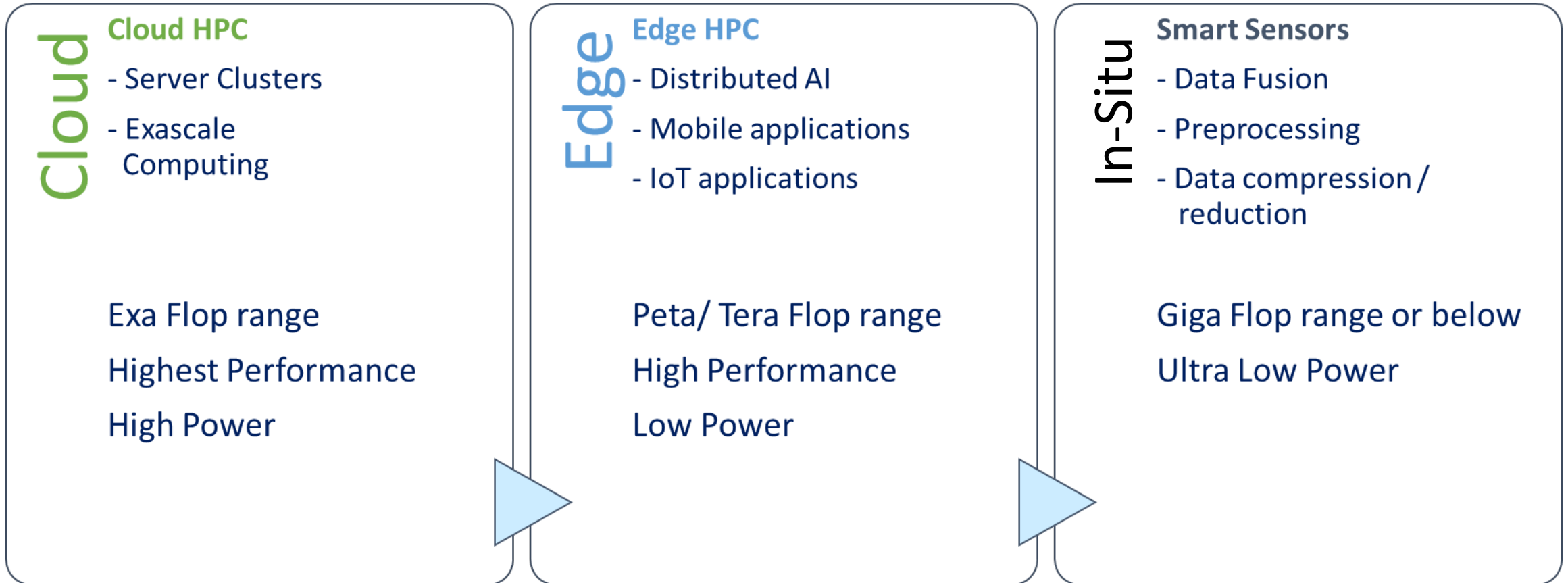- Reduction in latency (increase communication speeds)

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

Cloud HPC

- Server Clusters

- Exascale
  Computing

Exa Flop range

Highest Performance

High Power

Edge

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

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**