

**H**ETEROGENEOUS  
**T**ECHNOLOGY  
**A**LLIANCE

European Solutions for the Global Market

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Chairman of the Board of Directors Fraunhofer Group for Microelectronics  
Executive Director Fraunhofer IPMS



# Mikroelektronik ist systemrelevant

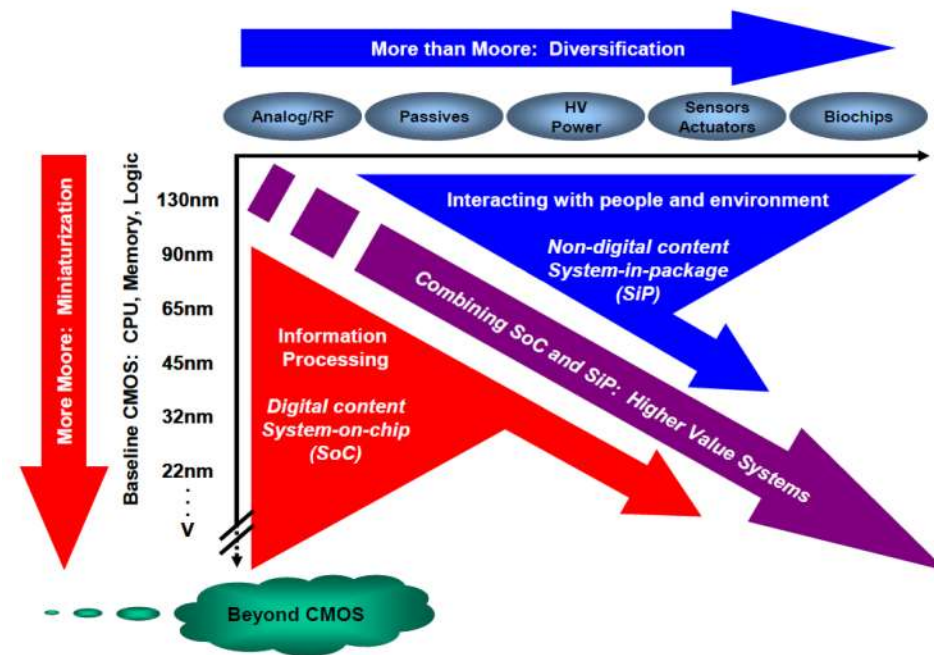
## Microelectronic is one of the most important key technologies for innovations

- Within Europe 200.000 jobs depend on microelectronics directly, manifold indirectly in other industries
- Microelectronics contribute to more than 10% of European GDP

Source: Mikroelektronik aus Deutschland – Innovationstreiber der Digitalisierung , BMBF

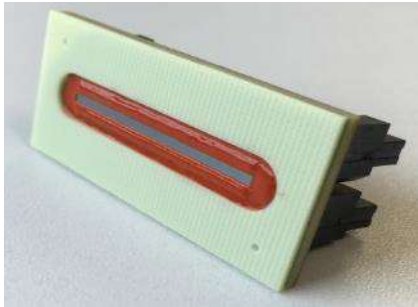
## Microelectronic development trends

- **Micro- and Nanoelectronics** are key enabling technologies for all major industrial areas in Germany and Europe
- The development cycles are decreasing rapidly in the area of leading-edge technologies («More Moore») as well as in the field of microsystems («More than Moore»)
- **New development and solutions for the Internet-of-Things** could be generated only by strong cooperation efforts between different expertises

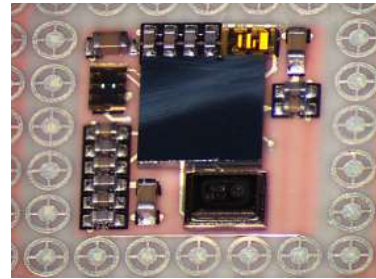
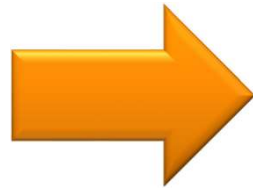




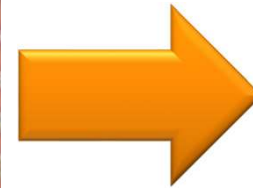
## Key parameter Integration level



Classic



System-in-Package (SiP)



System-on-Chip (SoC)

Smaller system dimensions

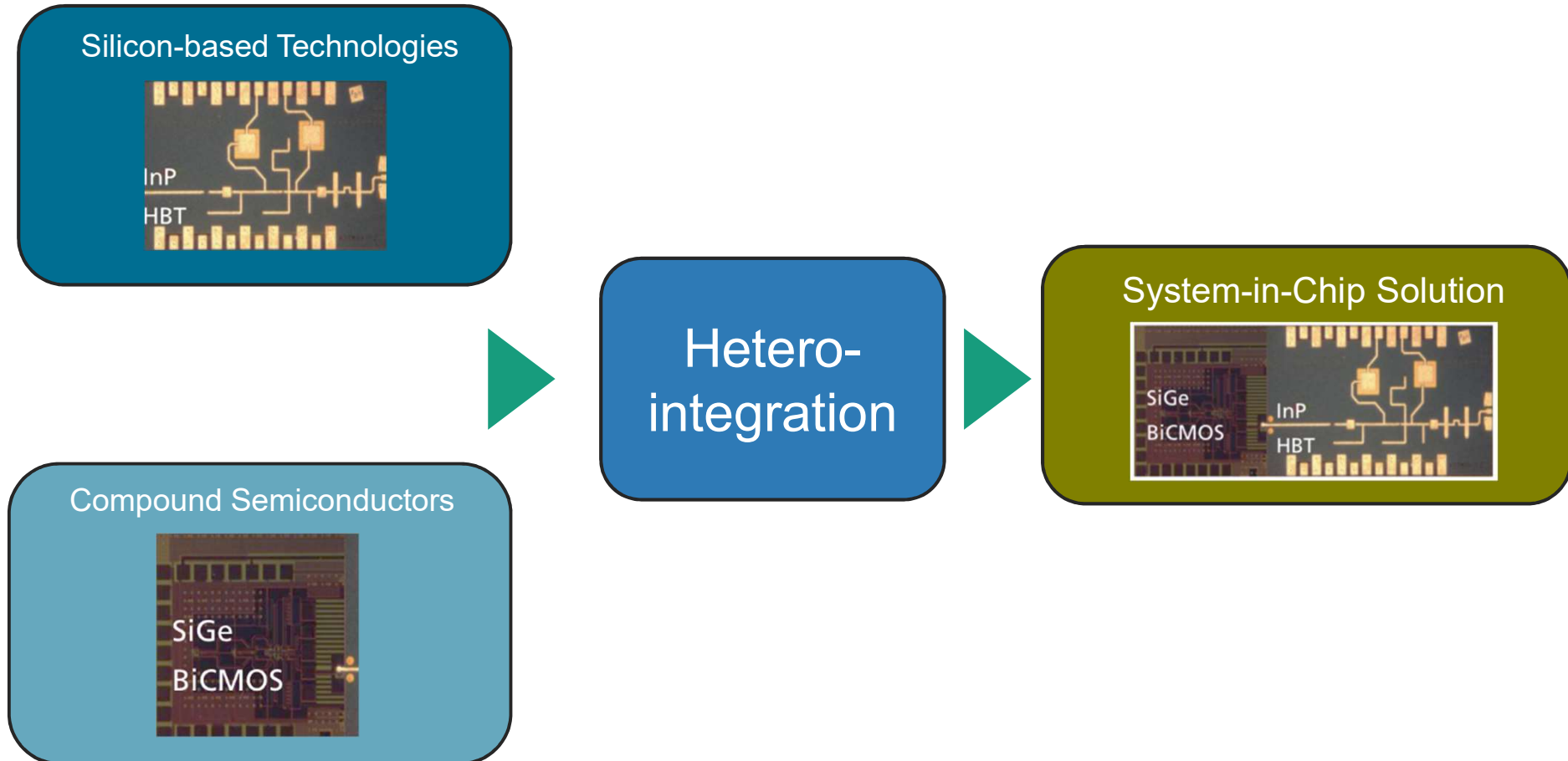
Lower power consumption

Reduced parasitic effects

Lower cost @ high volumes



# Crossborder Technology Knowledge

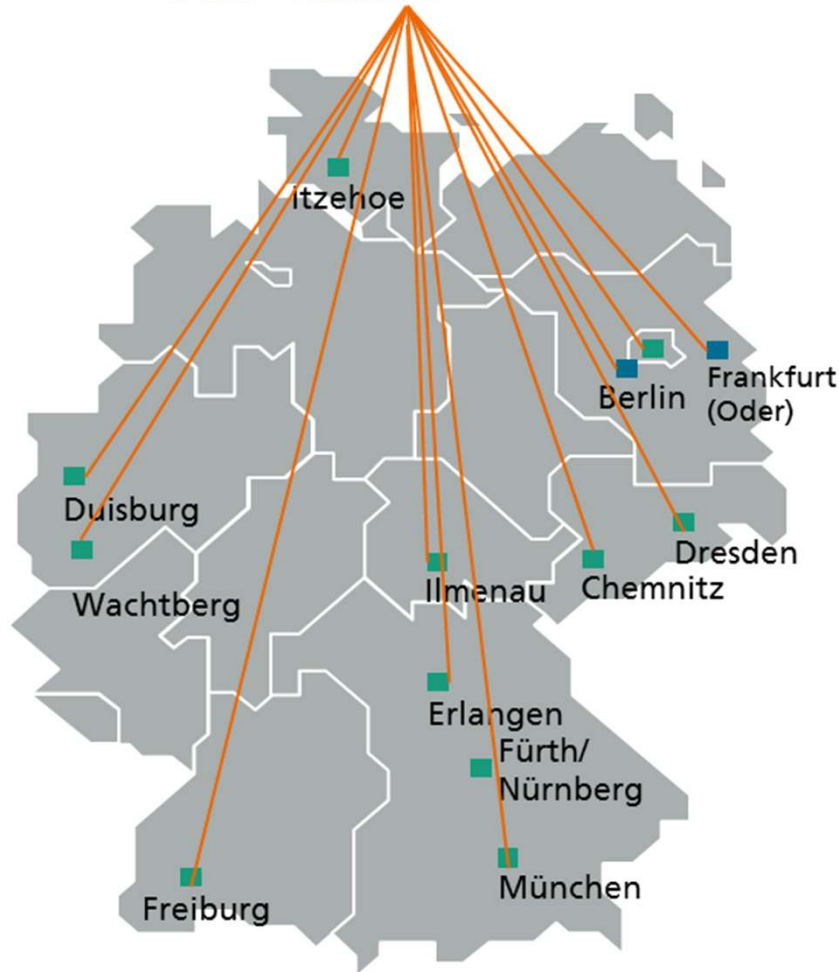


Crossborder knowledge is essential



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 **Forschungsfabrik  
Mikroelektronik**  
Deutschland



## One-Stop-Shop for developments from wafer technologies to complete systems

- The FMD combines the expertise and infrastructure of 13 Research Institutes to deliver complete developments out of one hand
- The FMD will represent a reorganization of more than 2000 scientists and the necessary equipment for technological research and development under a single, virtual roof
- To prepare the FMD for future developments additional infrastructure investment of 350 Mio. € is planned



## FMD One-Stop-Shop



### Technology Park 1

Investment  
140,6 Million Euro

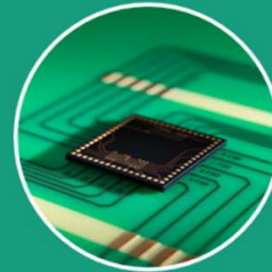
Silicon-based technologies



### Technology Park 2

Investment  
73,3 Million Euro

Compound semiconductors



### Technology Park 3

Investment  
43 Million Euro

Heterointegration



### Technology Park 4

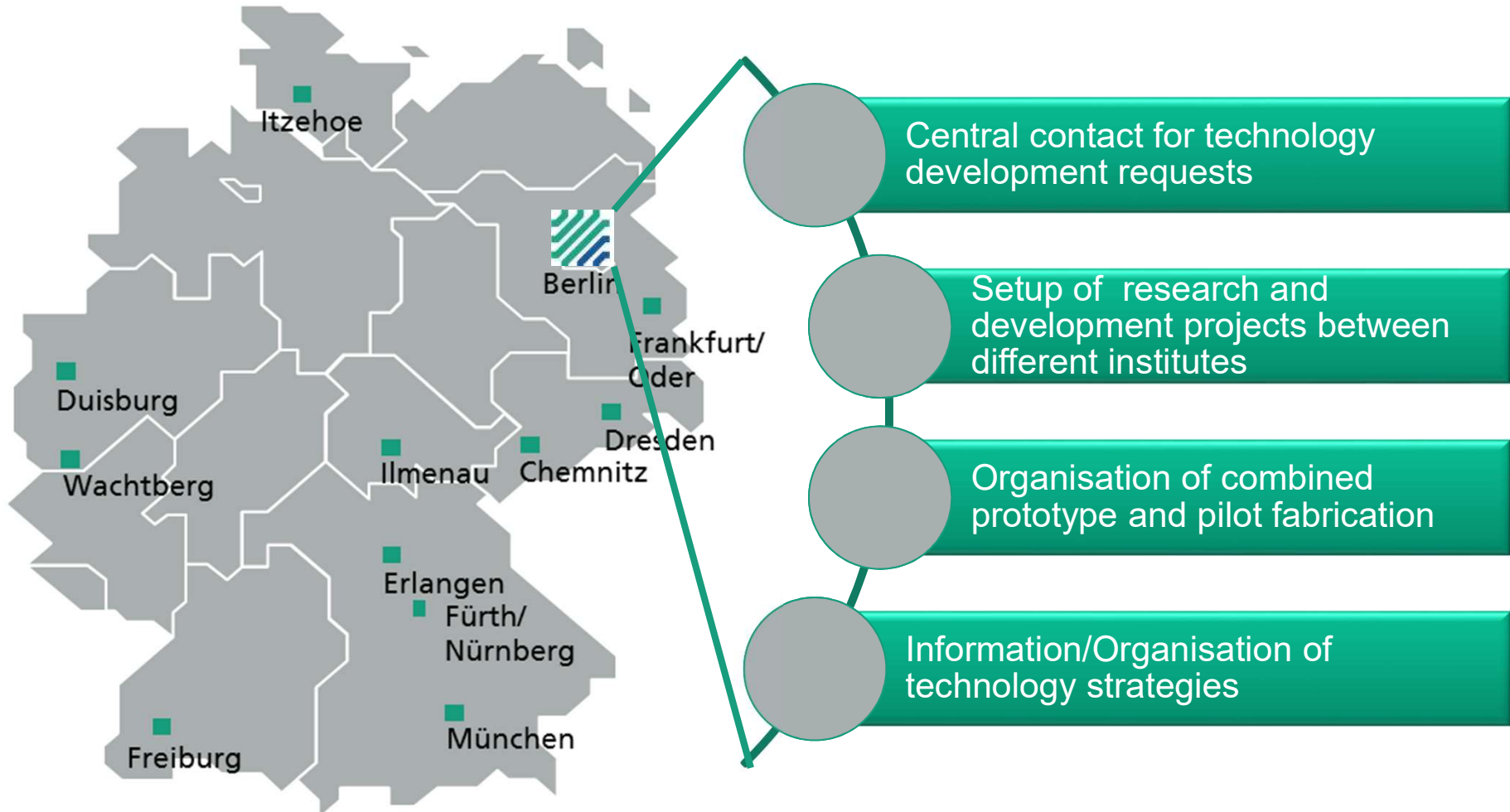
Investment  
83,8 Million Euro

Design, testing and  
reliability





## Joint R&D central access – FMD One-Stop-Shop





## Application domain *Industry 4.0*

- **Smart Sensor Systems for Applications of Industry 4.0**
- Interconnected, intelligent sensors are the key components for using modern information and communications technologies in industry. For the conditions of a production plant, however, special robust systems are required, which are equipped with components that record and communicate parameters simultaneously.
- In the »ZEPOWEL« project, methods are being developed to realize towards-zero-power smart sensors and transponders including energy harvester.

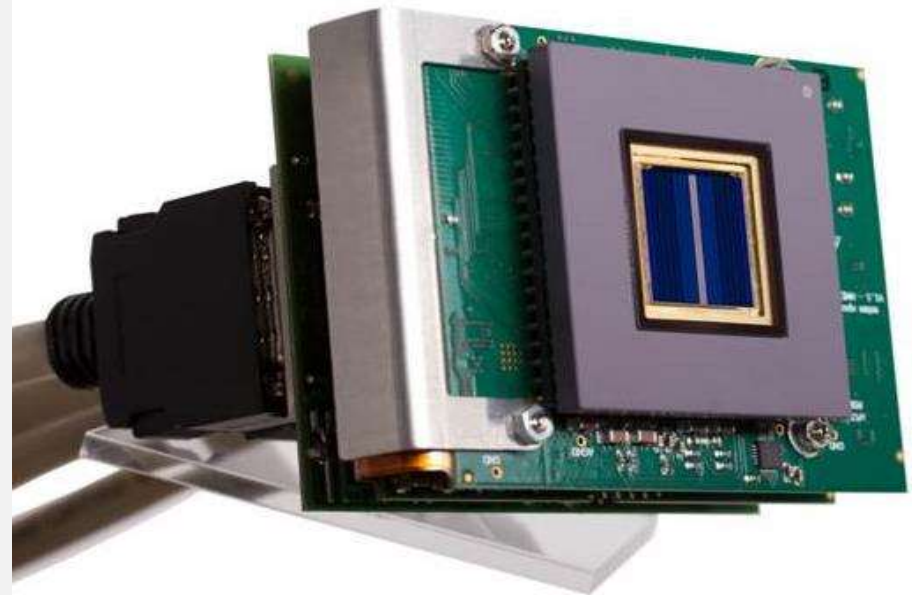


© Fraunhofer IIS/EAS, photo: Oliver Killig

## Application domain *Industry 4.0*

### "xposure"

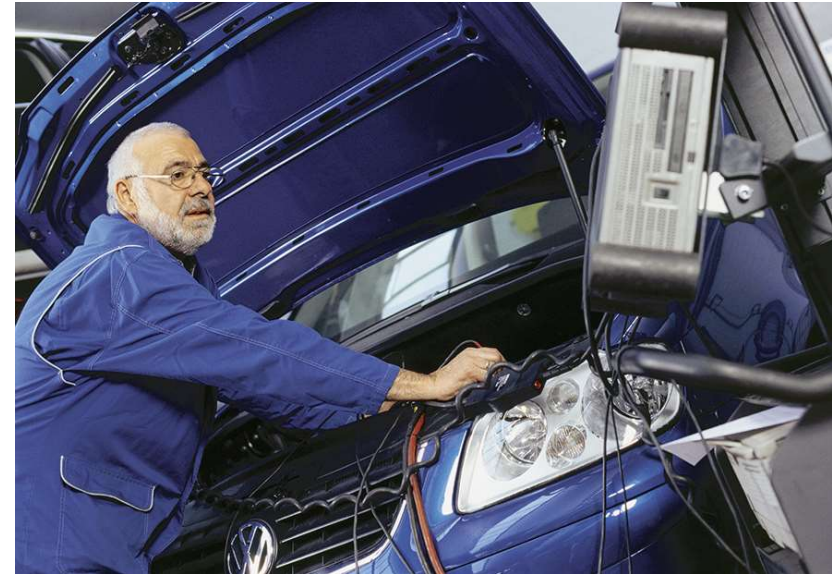
- Together with the AIT Austrian Institute of Technology, the fastest line-scan sensor for highly sensitive inspection tasks has been developed. The multiple-line-sensor enables colored imaging with a resolution of 0.05 mm at a transport-speed of 36 km/h.
- Thus, the fast sensor can detect even smallest defects on surfaces and can be ideally used for the surface-control of valuable printed material.



© AIT Austrian Institute of Technology

## Application domain Mobility and Transport

- Secure and Reliable Nano-electronics for Vehicle Systems
- Fraunhofer IIS/ EAS is working with partners in the project RESIST to make optimal use of this technology as a key to further advances.
- Design processes for microchips and future systems that will permit even better fulfillment of the high quality and reliability requirements.
- Powerful and robust components that contribute to reducing fuel consumption and CO2 emissions.

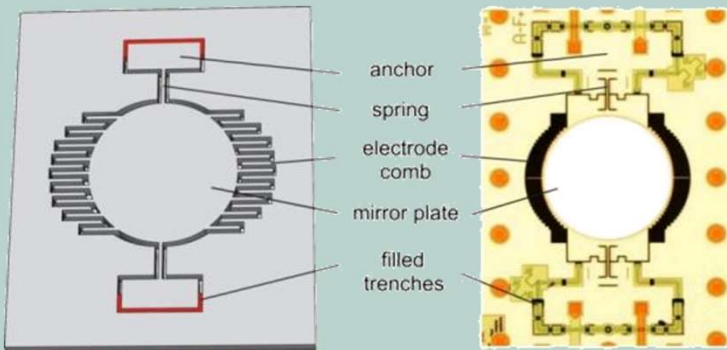


»RESIST« develops among other results an » early warning system«, that will report any electronic degradation to the maintenance service. © MEV-Verlag

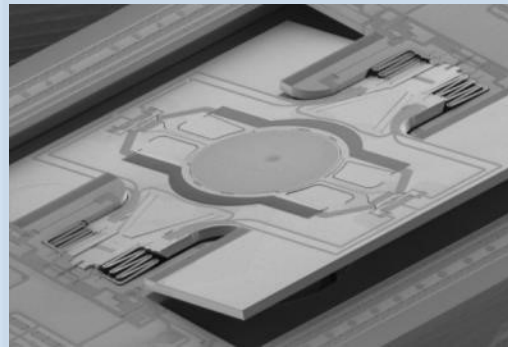


# Application domain Mobility and Transport: Micro Scanning Mirrors for LIDAR

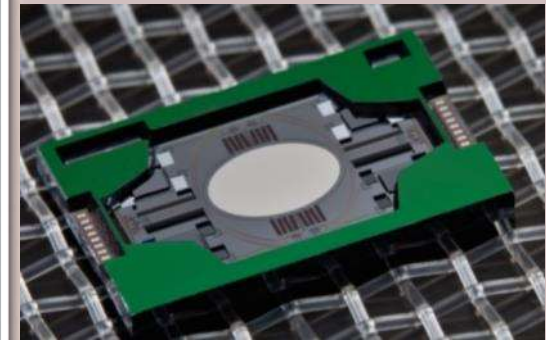
## resonant 1D



## resonant 2D

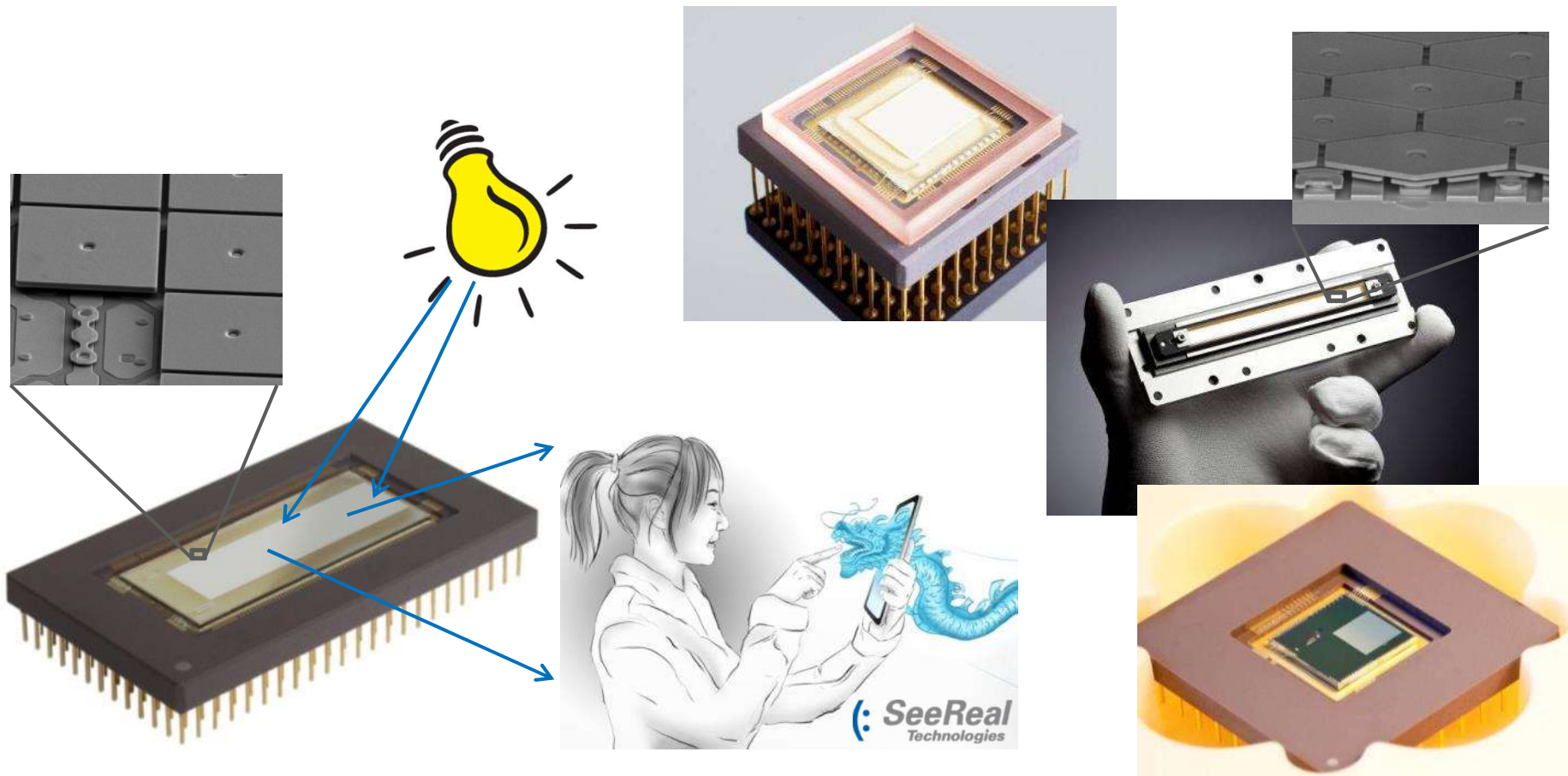


## quasi-static/ resonant 2D



# Digitale Transformation – Virtual Reality

## Computer Generated Holograms by MEMS Spatial Light Modulators



Copyright: SeeReal Technologies, Fraunhofer IPMS



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# Access for SMEs to State-of-the-Art Microelectronics

## Universal Sensor Platform for Internet-of-Things Applications



© Fraunhofer IIS/EAS, Photo: Katharina Knaut





## Benefits for SME customers

- Individualised Products due to modular system architecture and standard components
- Drastically reduced product cost
- Reduction of development cost by factor greater than 40
- Reduction of development time by factor greater than 10
- Digital sovereignty „Made in Europe“
- Access to „Leading-Edge“ technologies below 28 nm
- One-stop-shop eliminating necessity to deal with very complex supply chain





## Summary

- MEMS, sensors and microelectronics enable emerging applications like
  - Holography
  - Autonomous driving
  - Point-of-care diagnostics
  - Advanced medical imaging
  - Portable food quality control
  - Plus other applications like IoT, Industrie 4.0, ...
- R&D for the direct benefit of every citizen, tackling grand societal challenges
- Joint forces in Germany via Research Fab Microelectronics Germany (FMD)





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# THANK YOU !



## HTA alliance, your partners for a stronger Europe



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