
FRAUNHOFER IN ECSEL AND BEYOND

ECSEL VE ÖTESİNDE FRAUNHOFER

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70 YEARS OF
FRAUNHOFER
**70 YEARS
OF FUTURE**
#WHATSNEXT



Agenda

- Fraunhofer Gesellschaft

- Working with/in ECSEL and Success Stories

- #WHATSNEXT

Joseph von Fraunhofer (1787 – 1826)



© Deutsches Museum

Researcher

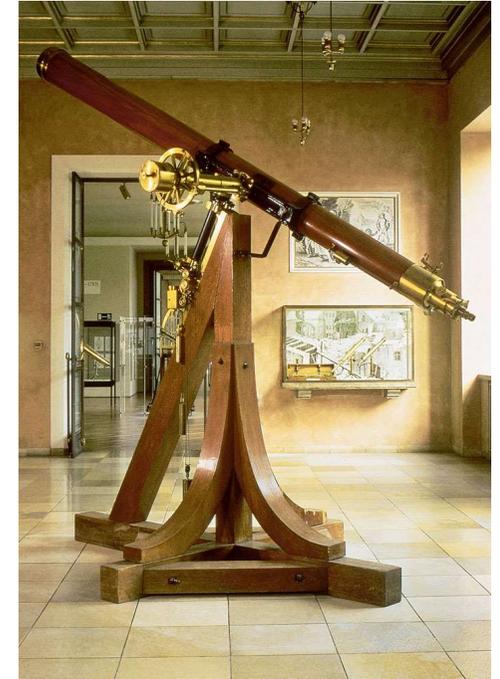
→ Discovery of the “Fraunhofer lines” in the solar spectrum

Inventor

→ New methods for processing lenses

Entrepreneur

→ Director and partner in a glassworks



© Fraunhofer-Gesellschaft



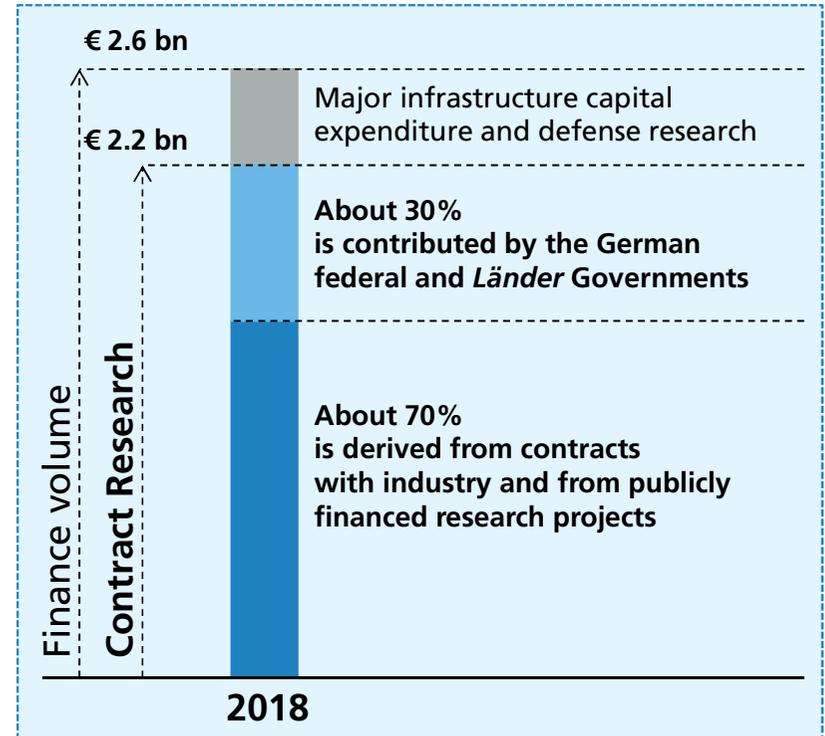
The Fraunhofer-Gesellschaft in a Nutshell



72 Fraunhofer Institutes and research institutions



26,600 staff



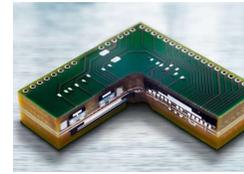
Applied research is the foundation of our organization.
We partner with companies to transform original ideas into innovations.

Fraunhofer Groups – Pooling Expertise

Autonomy of institutes

+

Simple corporate rules and strong branding



- Innovation Research
- Information and Communication Technology
- Life Sciences
- Light & Surfaces
- Microelectronics
- Production
- Defense and Security
- Materials and Components – MATERIALS

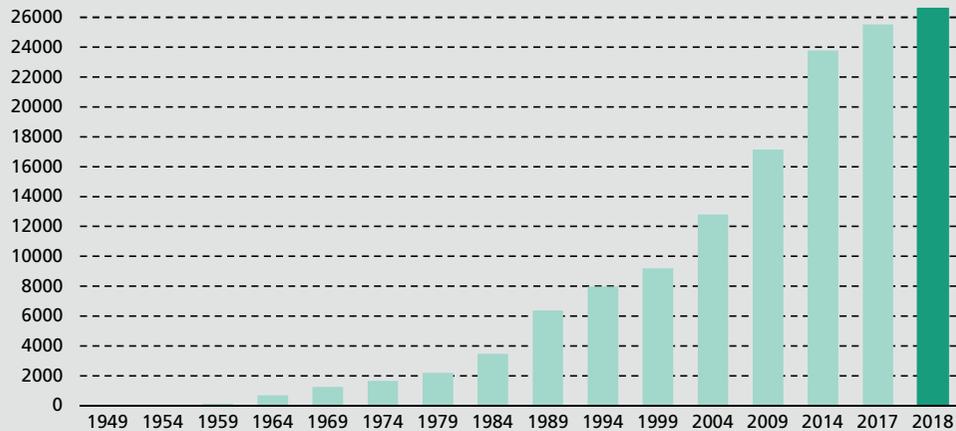
Institutes working in related subject areas cooperate in **Fraunhofer Groups** and foster a joint presence on the R&D market. They help to define the Fraunhofer-Gesellschaft's business policy and act to implement the organizational and funding principles of the Fraunhofer model.

Fraunhofer-Verbund Mikroelektronik

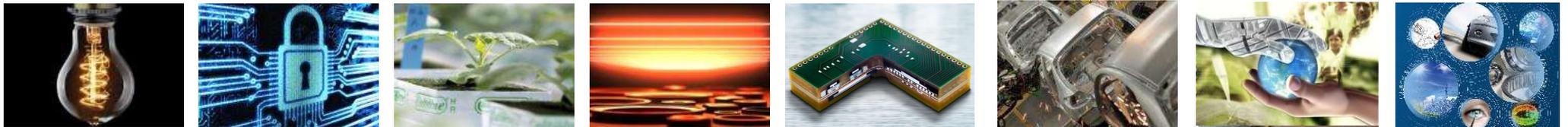
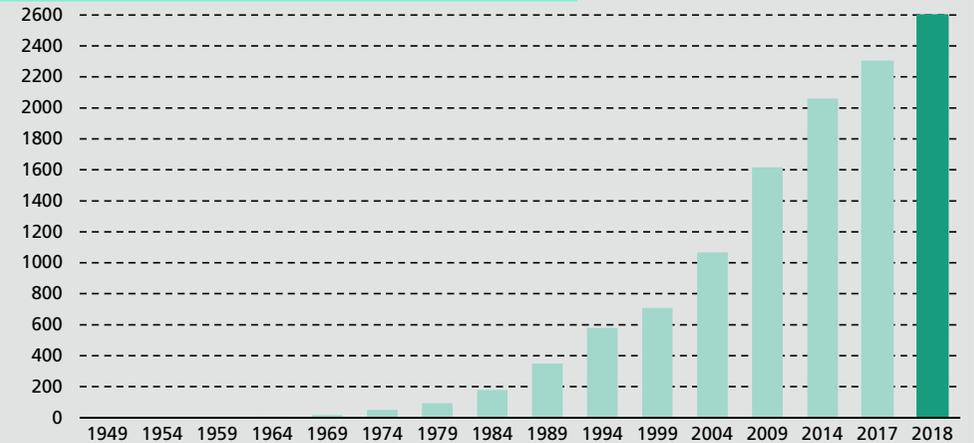
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|---|---|--|--|--|---|--|
|  <p>Fraunhofer EMFT / Bernd Müller</p> <p>Fraunhofer EMFT</p> <p>Fraunhofer-Einrichtung für Mikrosysteme und Packkörper-Technologien EMPT Hansstraße 27d 80686 München</p> <p>→ Zur Website <input type="checkbox"/></p> <p>→ Video <input type="checkbox"/></p> <p>→ 360-Grad Rundgang <input type="checkbox"/></p> |  <p>Fraunhofer ENAS</p> <p>Fraunhofer ENAS</p> <p>Fraunhofer-Institut für Elektronische Nanosysteme ENAS Technologie-Campus 3 08156 Chemnitz</p> <p>→ Zur Website <input type="checkbox"/></p> |  <p>Fraunhofer FHR</p> <p>Fraunhofer FHR</p> <p>Fraunhofer-Institut für Hochfrequenzphysik und Radartechnik FHR Fraunhoferstraße 30 53143 Wachtberg</p> <p>→ Zur Website <input type="checkbox"/></p> |  <p>Fraunhofer HHI</p> <p>Fraunhofer HHI</p> <p>Fraunhofer-Institut für Hochfrequenzschrittmotor, Heinrich-Hertz-Institut, HHI HHC Bismarckstraße 37 10587 Berlin</p> <p>→ Zur Website <input type="checkbox"/></p> |  <p>Fraunhofer IPMS / Rene Gaers</p> <p>Fraunhofer IPMS</p> <p>Fraunhofer-Institut für Photonische Mikrosysteme IPMS Marie-Richter-Strasse 2 01109 Dresden</p> <p>→ Zur Website <input type="checkbox"/></p> <p>→ Video (Link zu "Youtube") <input type="checkbox"/></p> |  <p>Fraunhofer ISIT</p> <p>Fraunhofer ISIT</p> <p>Fraunhofer-Institut für Silikon-Technologie ISIT Fraunhoferstraße 1 25324 Itzehoe</p> <p>→ Zur Website <input type="checkbox"/></p> |  <p>Fraunhofer IZM / Frank Walke</p> <p>Fraunhofer IZM</p> <p>Fraunhofer-Institut für Zerstreuung und Mikrosensoren IZM Gustav-Meyer-Allee 25 13355 Berlin</p> <p>→ Zur Website <input type="checkbox"/></p> |
|  <p>Fraunhofer IAF</p> <p>Fraunhofer IAF</p> <p>Fraunhofer-Institut für Angewandte Festkörperphysik IAF Tullnerstraße 72 79110 Freiburg i. Br.</p> <p>→ Zur Website <input type="checkbox"/></p> <p>→ Video (Link zu "Youtube") <input type="checkbox"/></p> |  <p>Fraunhofer IIS / Kurt Fuchs</p> <p>Fraunhofer IIS</p> <p>Fraunhofer-Institut für Integrierte Schaltungen IIS Am Wolfenmühl 33 91058 Erlangen</p> <p>→ Zur Website <input type="checkbox"/></p> <p>→ Video (Link zu "Youtube") <input type="checkbox"/></p> |  <p>Fraunhofer IISB / Kurt Fuchs</p> <p>Fraunhofer IISB</p> <p>Fraunhofer-Institut für Integrierte Systeme und Bauelemente-Technologie IISB Schwellenstraße 18 91058 Erlangen</p> <p>→ Zur Website <input type="checkbox"/></p> |  <p>Fraunhofer IMS</p> <p>Fraunhofer IMS</p> <p>Fraunhofer-Institut für Mikroelektronische Schaltungen und Systeme IMS Friedrichstraße 61 47057 Duisburg</p> <p>→ Zur Website <input type="checkbox"/></p> | <p>16 Member Institutes</p> <p>5 Associate Institutes</p> | | |

From a Small Association to the Leading Organization for Applied Research in Europe

Staff in 2018: > 26,600



Budget in 2018: € 2.6 billion



The Fraunhofer Model Consists of 3 Pillars

1/3 **Base Funding**
long term

90 % Federal
10 % Länder

1/3 **Public Projects and PPP**
between 2-4 years

National
EU
Others

1/3 **Exclusive Projects**
< 2 years

Industry



Continuity of scientific excellence

Precompetitive research (networks)

Direct innovation push

Highlights from Fraunhofer's Research

1992



mp3 Music data compression

1996



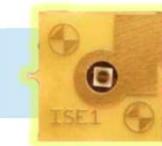
Development of the white led

2000



New video format allows live streaming

2009/2013



World record: efficiency rate of solar cell

2012



World record: - 35 % energy in automobile body construction

2013



Dandelion as a replacement for rubber in car tires

2015



Data sovereignty: Industrial Data Space

2020

Biological Transformation, Programmable Materials, Quantum Technologies, ...

Exclusive Research for ~6,350 Companies per Year

SMEs (1-250 employees)
60% of customers (≈3 900)
30% of revenues



Big companies (>251 e.)
30% of customers (≈1 900)
30% of revenues



Group comp. (>10 001 e.)
10% of customers (≈550)
40% of revenues



Fraunhofer-Gesellschaft Worldwide



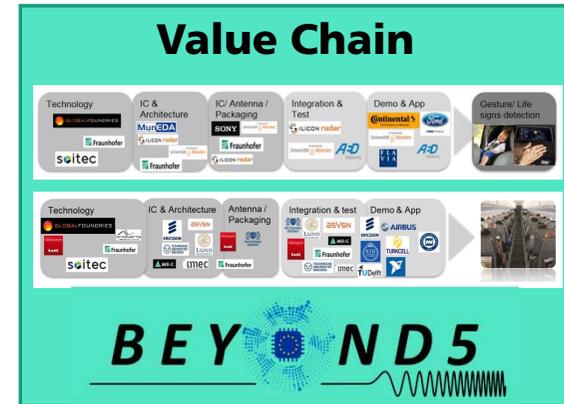
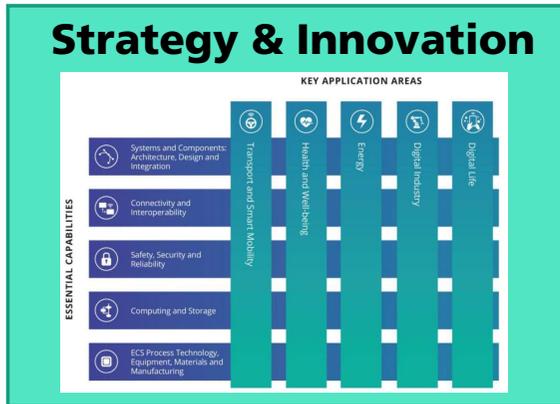
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ECSEL is about ...



Spill-Over

- new projects
- univ. coop.
- new applications
- new partnerships



Fraunhofer Success Story in ECSEL, 2014 to 2018

35 Projects

SMEs (33%) 221

672 Unique Partners

Partner countries 30

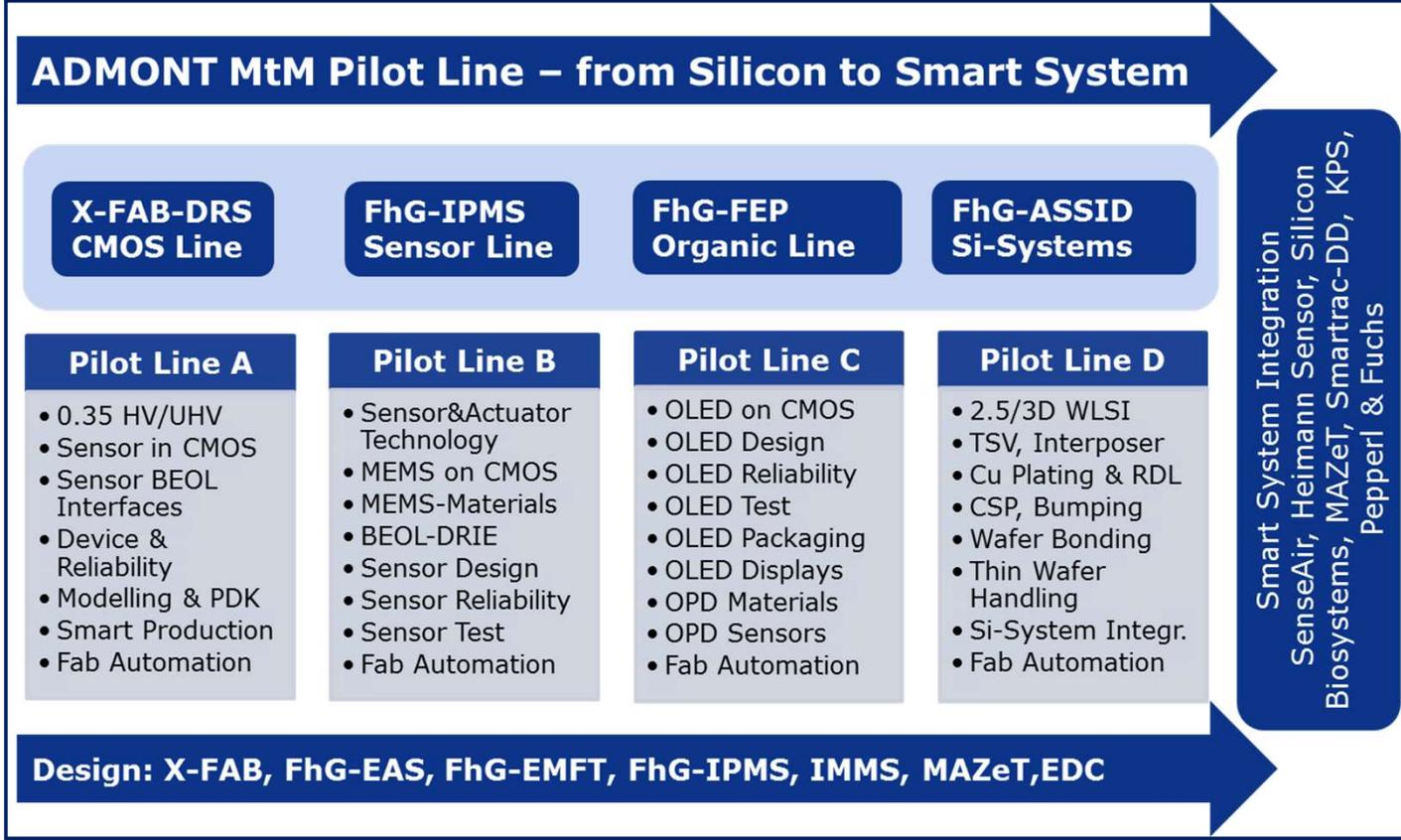
308 Large Industry (45%)

ADMONT Pilot Line Dresden

X-FAB HV-CMOS **FhG-IPMS Sensor**

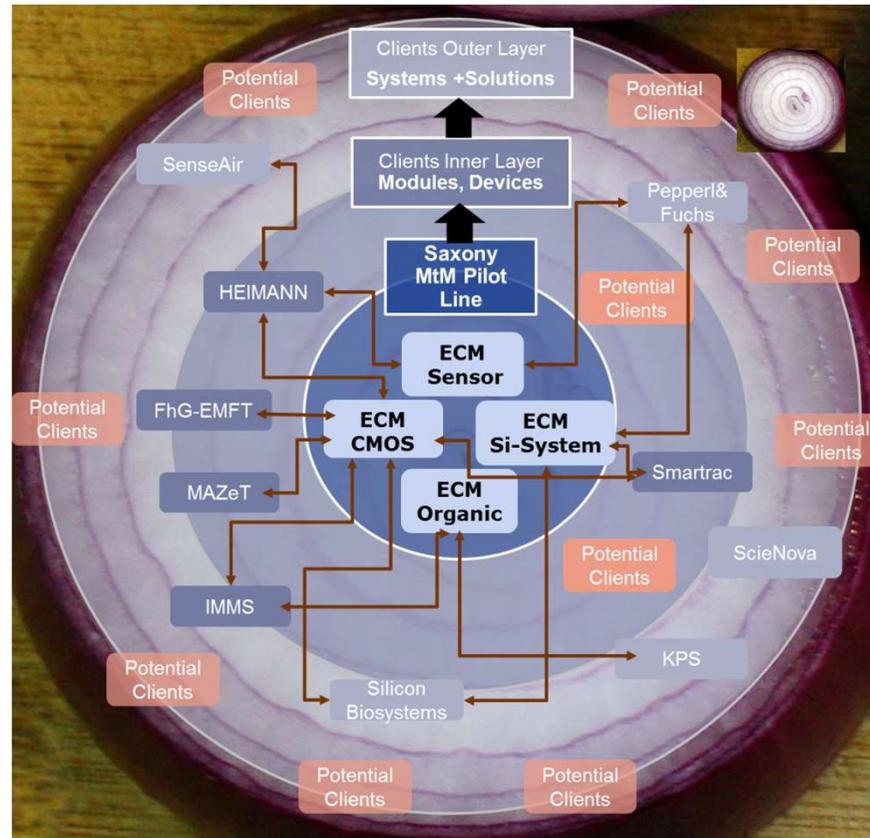
FhG-FEP OLED **FhG-IZM Si-System**

Key Application for Europe



<https://admont-project.eu/>

Creation of Ecosystems, example



© Admont / Onion Layer Model

Continuous Development



2013-2014

2014-2015

2015-2016

2017-2018

2018-2019

2019-2020

BEYOND5

CEAN12

5G MIMO SOC @ 39 GHz
120 GHz Sensor

Radar SoC @ 77 GHz

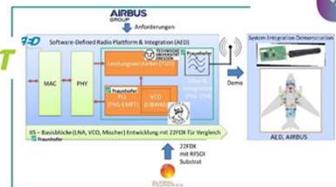
22FDX Technology Platform



WAIC Transceiver ohne FE
4.2-4.4 GHz



Radar OSC + TL
70 GHz mmW SiP



WAIC Front-End
4.2-4.4 GHz

Alignment of Investments



Fraunhofer-Verbund Mikroelektronik in Kooperation mit den Leibniz-Instituten FBH und IHP



Important Project of Common European Interest

Our Range of Technologies

Learn more about our broad technology knowledge:

© Fraunhofer EMFT / Bernd Müller
Sensor Systems
Sensor design, fabrication, integration, characterization, and testing within systems.

[MORE INFO](#)

© Fraunhofer IPMS
Extended CMOS
Design, fabrication and system integration of CMOS circuits.

[MORE INFO](#)

© IHP / Patrick Pleul
Microwave & Terahertz
Cutting-edge devices and circuits for frequencies up to and including the THz range.

[MORE INFO](#)

© Fraunhofer IAF
Power Electronics
Design and fabrication of power electronic devices, including integration in modules and systems.

[MORE INFO](#)

© Fraunhofer IPMS
MEMS Actuators
Design and fabrication, as well as characterization, testing and system integration of MEMS actuators.

[MORE INFO](#)

© Fraunhofer HHM
Optoelectronic Systems
Fully integrated optoelectronic systems for image acquisition and processing, and communication up to Tbit/s speed.

[MORE INFO](#)

Project management

| 1 Energy efficient chips | 2 Power semiconductors | 3 Sensors | 4 Advanced optical equipment | 5 Compound materials |
|--------------------------|------------------------|--------------------------|------------------------------|------------------------------------|
| CEA-Leti | 3-D Micromac | CEA-Leti | AMTC | AZUR Space Solar Power |
| Cologne Chip | AP&S International | CorTec | Carl Zeiss | CEA-Leti |
| Globalfoundries | CEA-Leti | Elmos Semiconductors | | Integrated Compound Semiconductors |
| RacyICs | Elmos Semiconductors | Fondazione Bruno Kessler | | IQE |
| Soitec | Infineon | Infineon | | Newport Wafer Fab |
| ST Microelectronics | MURATA | Robert Bosch | | SPTS Technologies |
| X-FAB | Robert Bosch | ST Microelectronics | | OSRAM |
| | SEMIKRON | TDK-Micronas | | Sofradir |
| | ST Microelectronics | ULIS | | Soitec |
| | X-FAB | X-FAB | | ST Microelectronics |

Name in *italics* = SME

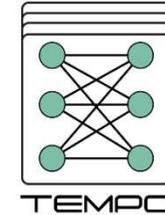
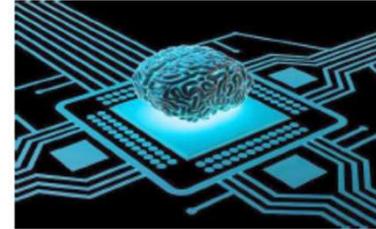
Nationwide coordinated technology expertise from a single source

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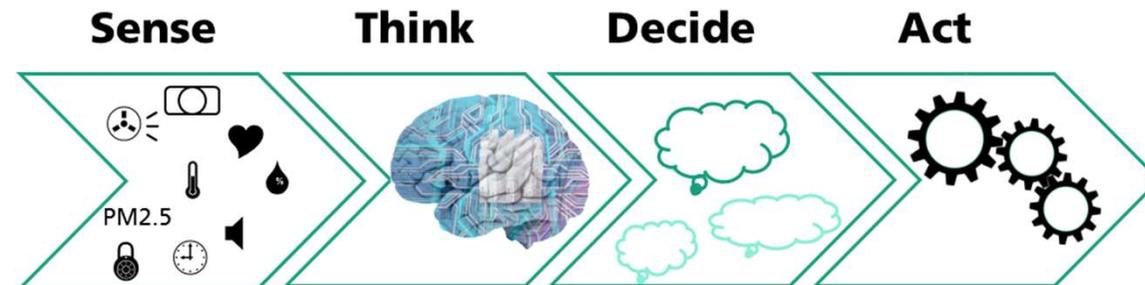
#WHATSNEXT

- Technology vision: **Neuromorphic Computing for Edge**



ANDANTE

- Technology vision: **Sensors as source for AI: Sustainable, Intelligent, Safe and Secure**



- Technology vision: **Clean Tech**

Teşekkürler

„Dijital ve temiz geleceği hep birlikte yaratalım!“



Bundesministerium
für Bildung
und Forschung



ECSEL Joint Undertaking

Electronic Components and Systems for European Leadership

VDI | VDE | IT



Freistaat
SACHSEN

Bayerisches Staatsministerium für
Wirtschaft und Medien, Energie und Technologie



#WHATSNEXT

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