Important Project of Common European Interest (IPCEI) Microelectronics and Communication Technologies

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*Speaker

MOTIVATIONS FOR IPCEI ME/CT

IPCEIs strengthen important European value chains and contribute to **political priorities of the Union** (e.g. Green Deal, Digital Strategy) and its sovereignty :

- **is complementary to R&D programs** like EFECS, Eureka, Chips JU or Horizon Europe by **involving "First Industrial Deployment" (FID)** activities on top of R&D&I,
- **addresses critical "key enabling technologies"** like microelectronics/communication, battery technologies, hydrogen, low carbon industries,
- **is funded by national authorities** of the member states, but approval from the EC is needed, as it is an exception to state-aid rules.

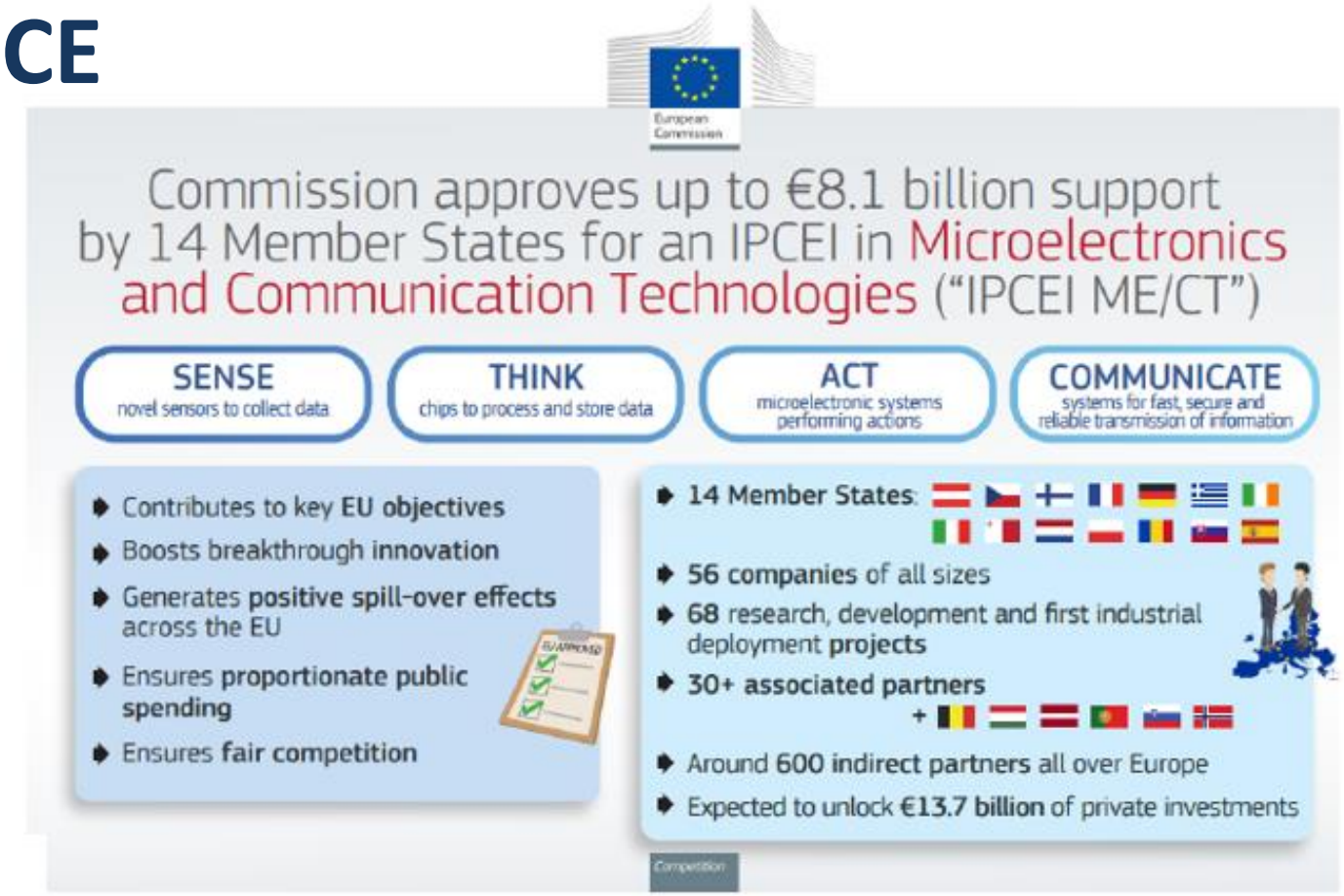
This exception is made due to **high-risk activities involving market failure mechanisms** and coordination problems, and due to the significant additional value IPCEIs bring to European industry and society by cooperation, dissemination and spill-over activities.

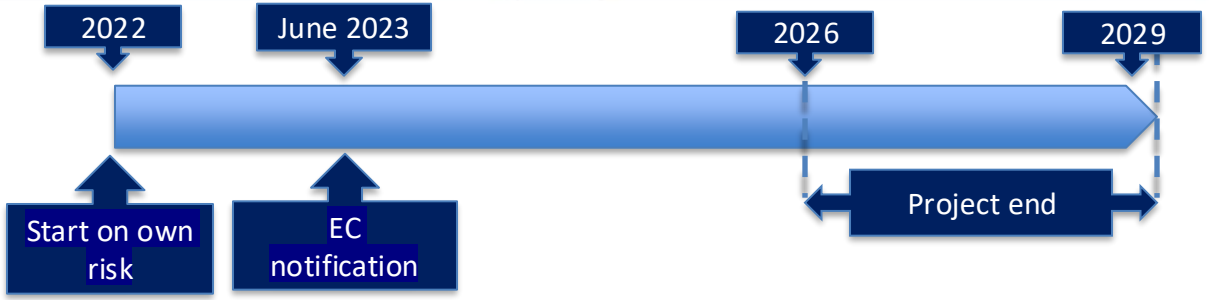
IPCEI ME/CT AT A GLANCE

Facts and Numbers:

- **€22** billion program (**biggest IPCEI ever**):
  - **€8** billion public funding
  - **€14** billion private investments

  - **14** MSs (member states) + **6** associated MSs
  - **> 56** direct participants
  - **> 30** associated partners
  - **> 600** indirect partners
  - **SPILL OVER** activities address partners beyond the conventional ecosystem across entire EC

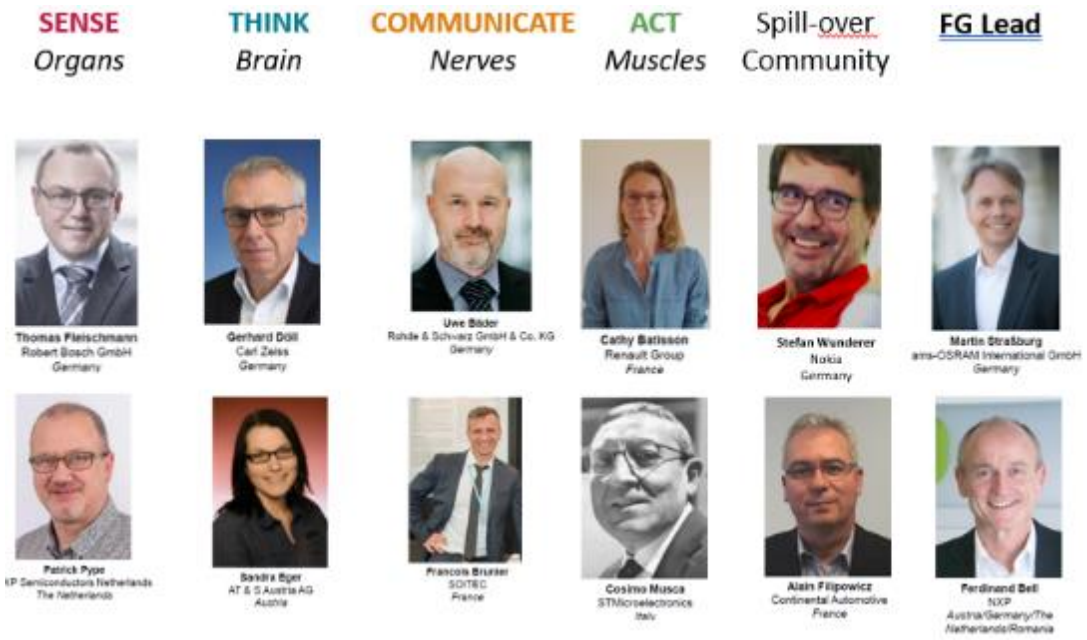




DIRECT PARTICIPANTS OF THE IPCEI ME/CT

Working teams: Facilitation and Transform Group*

*supported by service provider ABGI

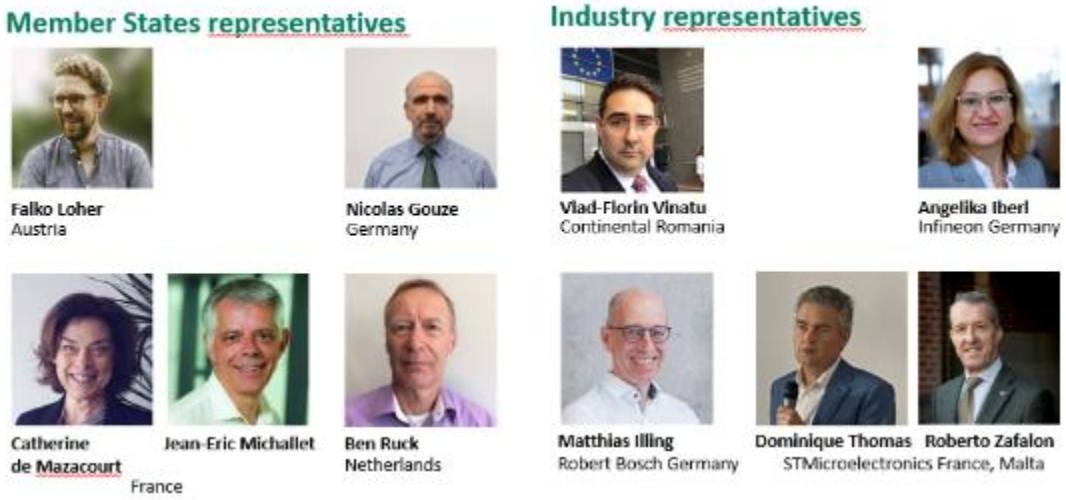


The **Facilitation Group** is the industrial interface to Public Authority Board (PAB)

- Interface to Public Authority Boards
- Reports on workstream results and spill-over activities
- Reports and presents technical project results at the General Assembly meetings

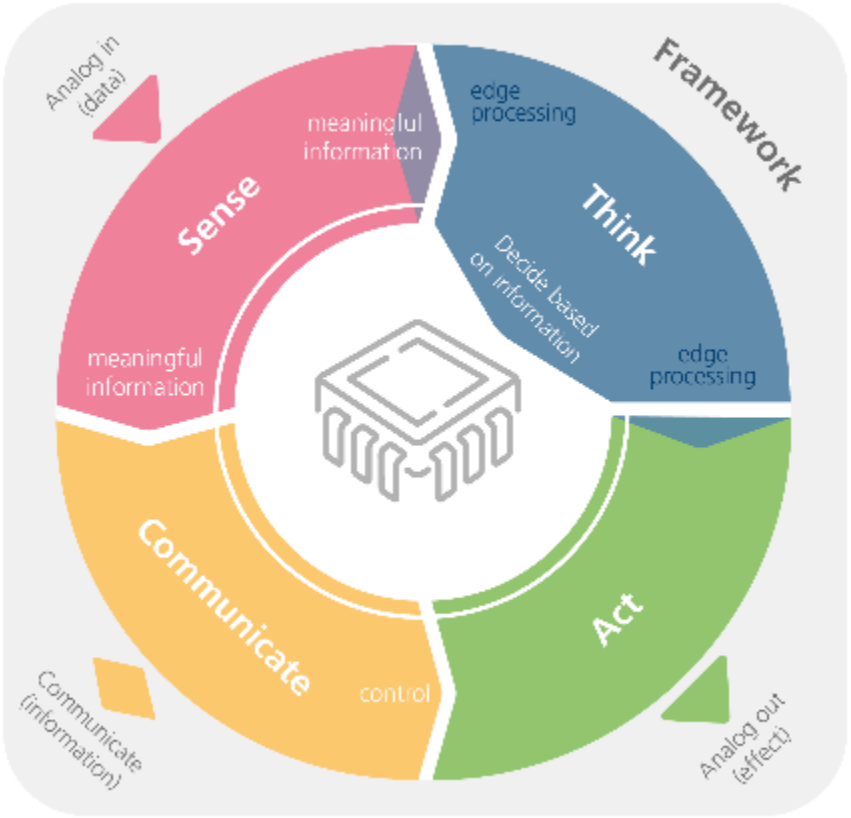
The **Transform Group** is adding an operative dimension to the project goals that go beyond the technical work and achievements in the Work Streams

- “Bind together”
- “Increase impact
- “Draw the future”



Project description in the Chapeau document

Four Workstreams defined



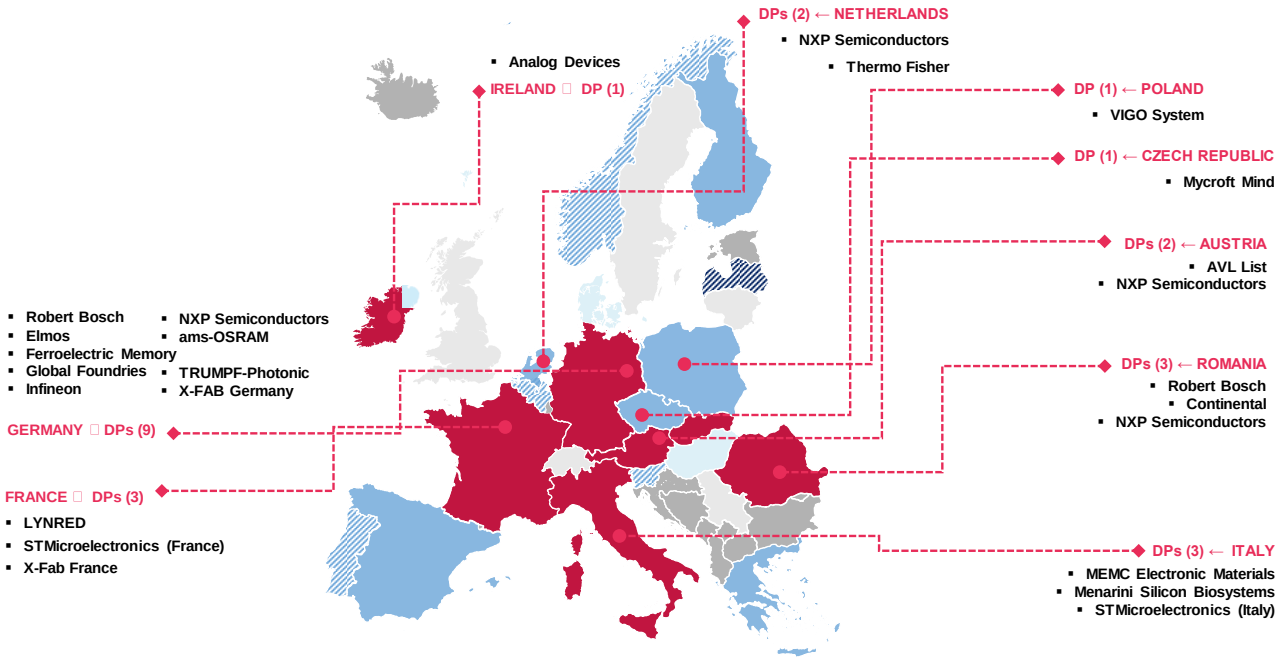
Four work-streams corresponding to the **complementary** technical objectives along the microelectronics value chain.

- **SENSE** addresses the *organs of perceptions* which generate the data to be processed.
- **THINK** addresses processors and memory as the *brain* of a computer.
- **COMMUNICATE** addresses the *strong nerve pathways* which network with the brain.
- **ACT** addresses the *body and muscles* of an electronic system.

Each workstream is further structured into four workpackages corresponding to the **(common)** microelectronic value chain .

What is SENSE?

The workstream SENSE addresses microelectronics as related mainly to **capturing information from our environment** in order to have it processed for decision making (“THINK”), communicate the decision (“COMMUNICATE”) and act upon that information (“ACT”).



SENSE Workpackage Structure

Materials Simulation tools Production equipment

- New organic, magnetic and piezoelectric materials
- New processing, packaging & measurement equipment
- Simulation tools

WACKER

LYNRED

GlobalWafers
MEMC Electronic Materials S.p.A.

Semiconductor Technologies, Smart Manufacturing, Packaging and Test

- New sensor principles
- Heterogeneous integration
- System-in-Package, WLP
- High-reliability concepts

ANALOG DEVICES
elmos
TRUMPF
BOSCH
VIGO PHOTONICS
LYNRED
infineon
xfab
Continental
NXP
life.augmented
amu
OSRAM
GlobalFoundries

Components and Modules

- High-precision sensors
- Low energy consumption
- Embedded Intelligence
- Sensor fusion

ANALOG DEVICES
xfab
elmos
AVL
mycroftmind.
member of TTC Group
life.augmented
amu
OSRAM
VIGO PHOTONICS
LYNRED
FMC
The Ferroelectric Memory Company
Continental
BOSCH
TRUMPF
NXP
infineon
MENARINI

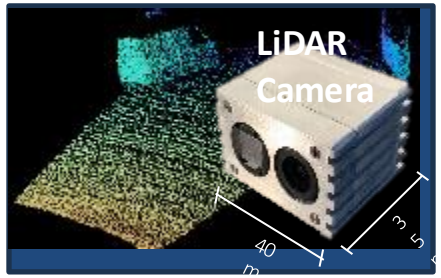
Sub-system System

- ADAS functions, LiDAR, RADAR, Video, etc.
- Medical and smart health applications

NXP
AVL
MENARINI
Continental
BOSCH
mycroftmind.
member of TTC Group
VIGO PHOTONICS
elmos

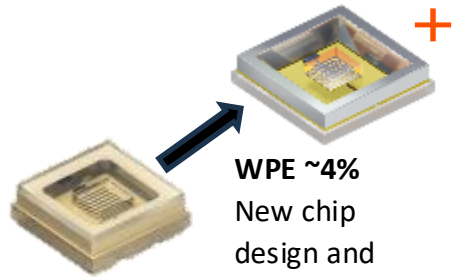
SENSE - Some Highlights of new Sensor Components & Modules

New LiDAR and Ultrasonic Vision Demonstrators



Sensor systems for ADAS and new concepts for E/E architecture

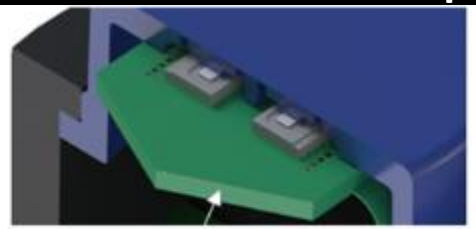
Highly Efficient UV-C LEDs



WPE ~2%
Previous chip generation and old package concept

WPE ~4%
New chip design and novel package concept

MEMS based sensor components



Sensors for automotive mobility solutions

140 GHz radar

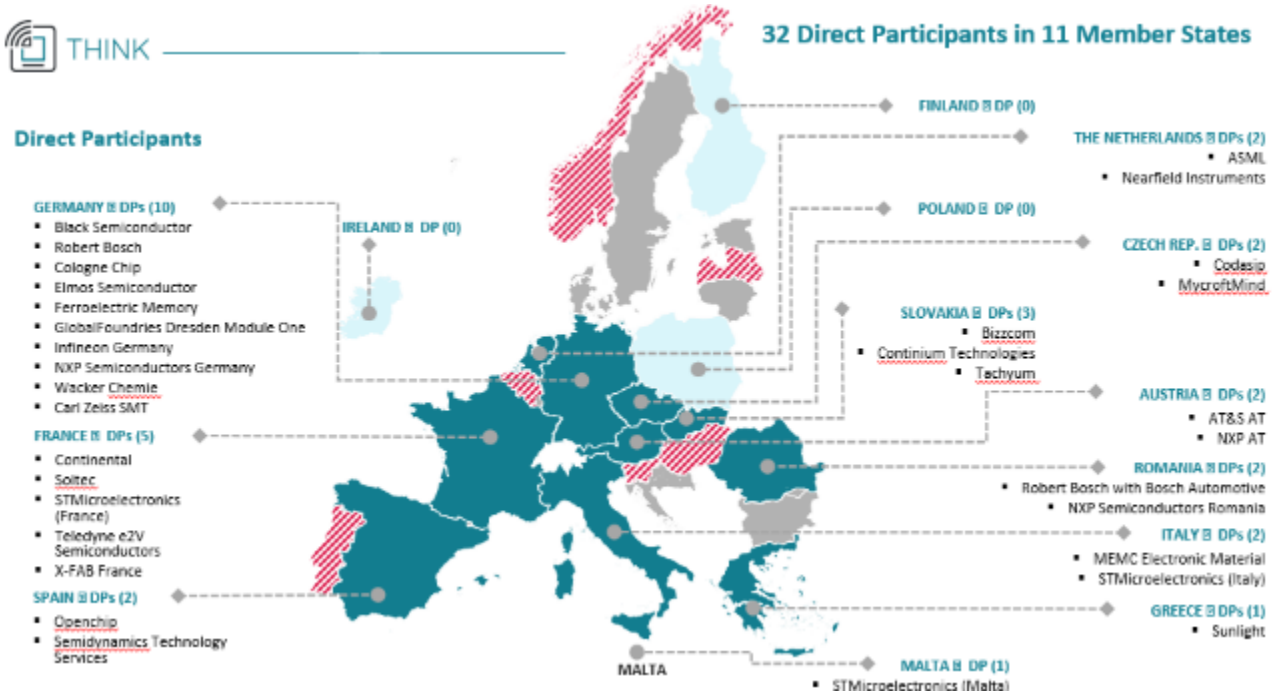
MEMS inertial sensor ASIL-D

ANALOG DEVICES · ams · OSRAM · AVL · BOSCH · Continental · elmos · FMC The Ferroelectric Memory Company · GlobalFoundries

GlobalWafers MEMC Electronic Materials S.p.A. · Infineon · LYNRED · MENARINI · mycroftmind. member of TTC Group · NXP · life.augmented · TRUMPF · VIGO PHOTONICS · WACKER · xfab

What is THINK?

THINK addresses the microelectronics value chain of **energy efficient and secure data processing and data storage** at all levels. This means in particular: materials, software tools, equipment, front-end and back-end (packaging) technology, chip design and fabrication, and of course, the applications which are enabled



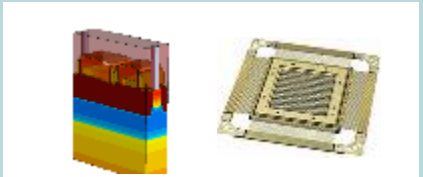
THINK Workpackage Structure

WP1
Materials, tools, equipment

- New bulk and FD-SOI substrate generation
- Poly Si ready for 2nm
- New EDA tools for 2.5 et 3D designs
- Tools for developing FPGAs
- EUV techniques for A10, A7
- Trusted supply chain for eMCP and SiP

ASML, bizzcom, black, codasip, GlobalWafers, NEARFIELD INSTRUMENTS, ThermoFisher SCIENTIFIC, soitec, ZEISS, WACKER

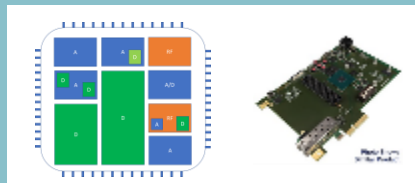
WP2
Semiconductor Technologies, manufacturing, packaging & test



- State of the art eNVM technologies enabling In Memory Computing
- Pilot Line Hi NA EUV
- AI-enabled maintenance technologies
- Highest quality-grade packaging technology for high-end microcontrollers
- Organic substrate 2D SiP for low volumes

ASML, AT&S, elmos, FMC, GlobalFoundries, infineon, TELEDYNE e2v Semiconductors, SUNLIGHT, ThermoFisher SCIENTIFIC, xfab, ST

WP3
Components, modules



- Low-power microcontrollers to high performance processors
- Embedded AI and/or HPC IPs and processors and FPGAs
- Automotive grade processor in 5nm design
- Battery-less Micro Controller Unit (MCU)
- New ferroelectric memory

bizzcom, BOSCH, Cologne Chip, codasip, openchip, FMC, NXP, semidynamics, elmos, SUNLIGHT, ST, xfab

WP4
Sub-systems, systems

- Scalable, and upgradeable Electric / Electronic Architecture for vehicle
- Secure accelerator modules for HPC, AL, ML, DL
- Software and virtualization techniques (Digital Twins)
- Adaptable AI modules for smart devices
- Demonstration with downstream industries

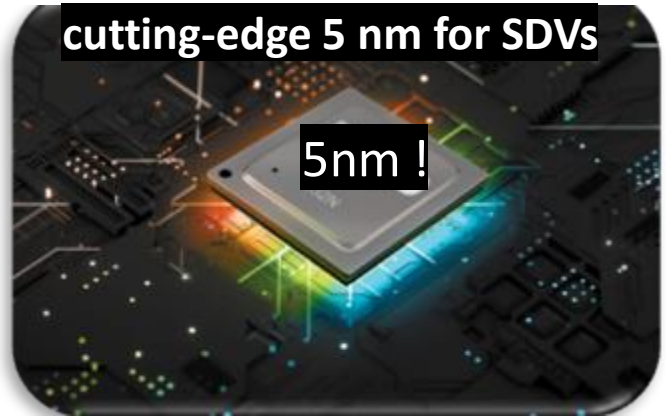
BOSCH, Continental, elmos, mycroftmind, NXP, openchip, SUNLIGHT

THINK – Workpackage Highlights

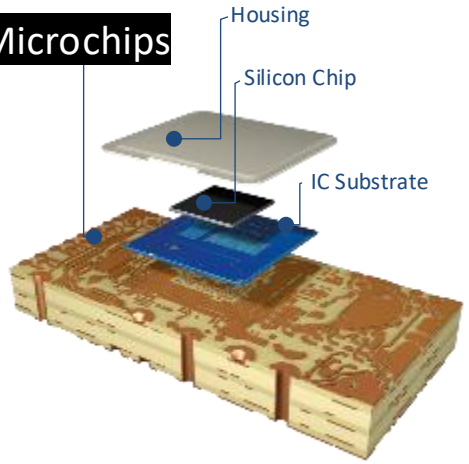
high-transmission EUV illumination system

Package Development New Product Introduction

cutting-edge 5 nm for SDVs



IC Substrates for cutting-edge Microchips



Quantum Random Number Generator

codasip · GlobalWafers · bizzcom · black · FMC · TELEDYNE e2v · GlobalFoundries · elmos · NXP · openchip · TASKING · BOSCH · Continental · ThermoFisher SCIENTIFIC · xfab · soitec · ASML · NEARFIELD INSTRUMENTS · ZEISS · infineon · WACKER · AT&S · SUNLIGHT · codasip · semidynamics · Cologne Chip · mycroftmind

What is COMMUNICATE?

COMMUNICATE addresses microelectronics as related mainly to **transmitting and receiving information from and to electronic equipment.**

COMMUNICATE

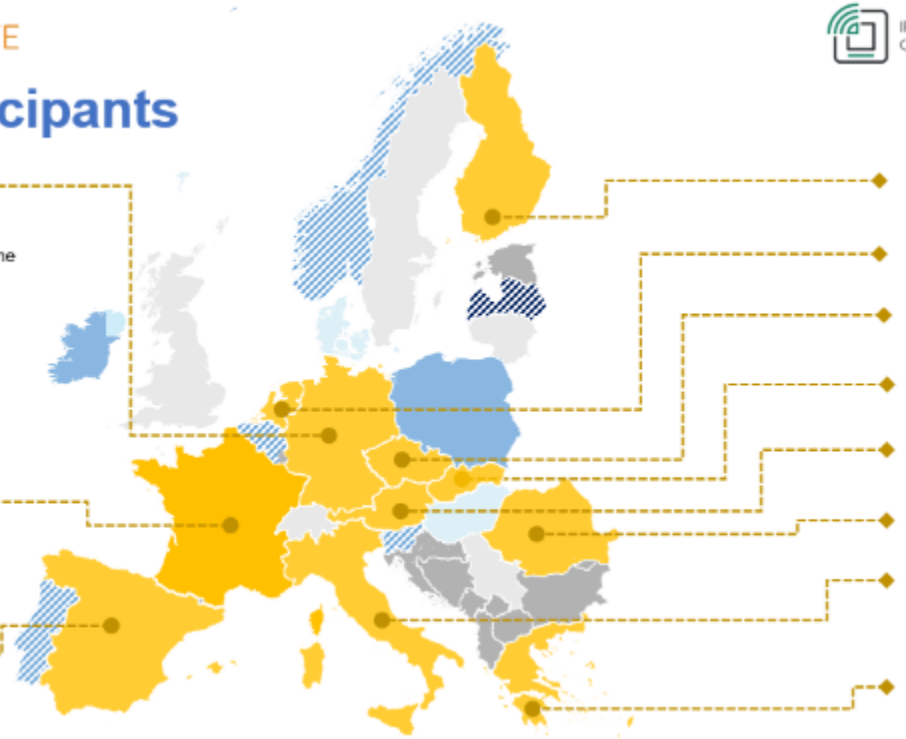
IPCEI Microelectronics and Communication Technologies

Direct Participants

GERMANY (12)
- Adtran Networks
- Freiberger Compound Materials
- GlobalFoundries Dresden Module One
- Infineon Germany
- Ericsson Antenna Technology
- Nokia Solutions and Networks
- NXP Semiconductors Gemany
- Rohde & Schwarz
- TRUMPF Photonic Components
- United Monolithic Semiconductors
- Wacker Chemie
- X-FAB Germany

FRANCE (5)
- Airbus
- Orange
- Soitec
- STMicroelectronics
- X-FAB France

SPAIN (2)
- Innova IRV Microelectronics
- Knowledge Development POF



FINLAND (1)
- Nokia Oyj

THE NETHERLANDS (1)
- NXP Semiconductor NL

CZECH REP. (1)
- Codasip

SLOVAKIA (1)
- Continium Technologies

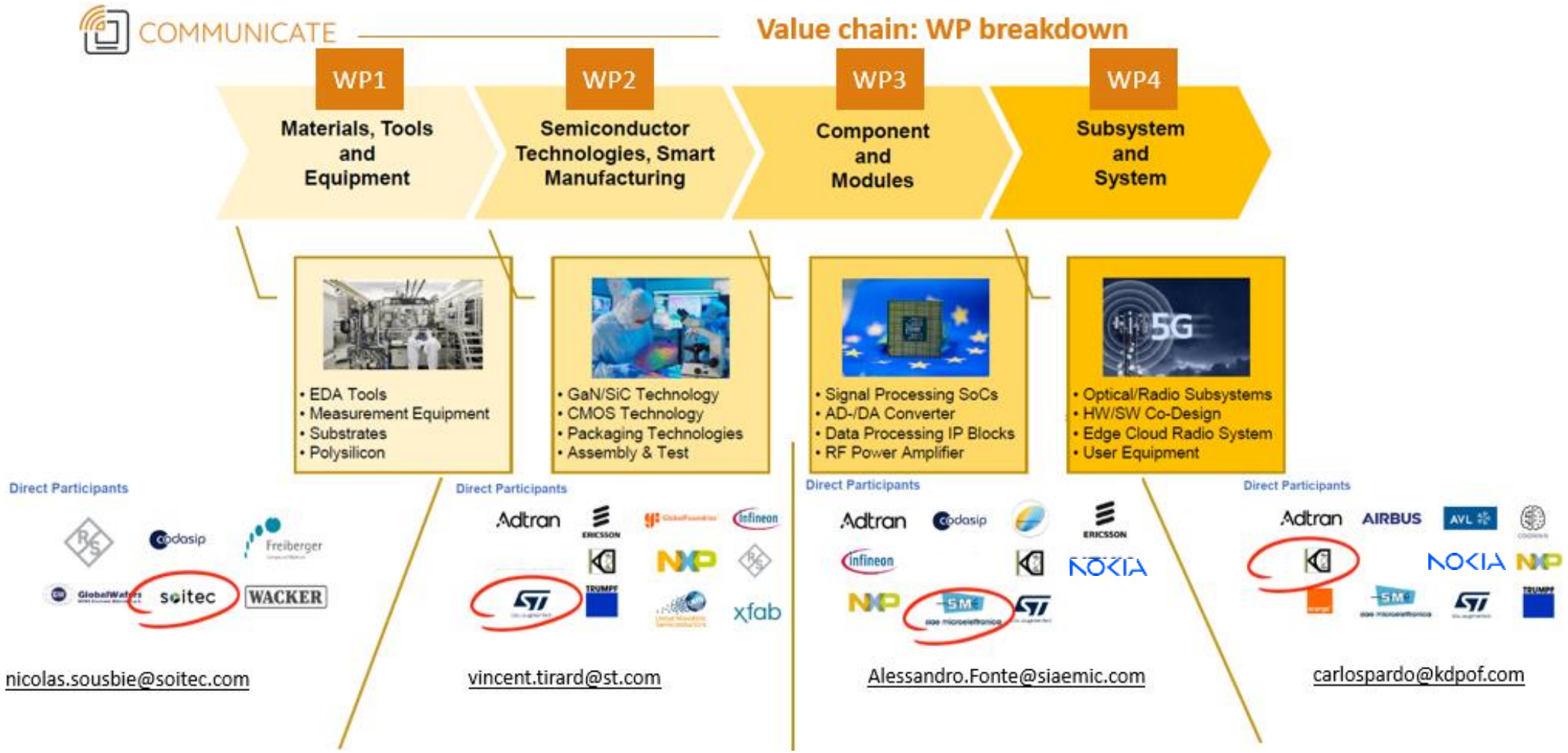
AUSTRIA (1)
- AVL List

ROMANIA (1)
- NXP Semiconductors RO

ITALY (3)
- MEMC Electronic Material
- SIAE Microelettronica
- STMicroelectronics

GREECE (1)
- Cognitive Innovations

COMMUNICATE Workpackage Structure

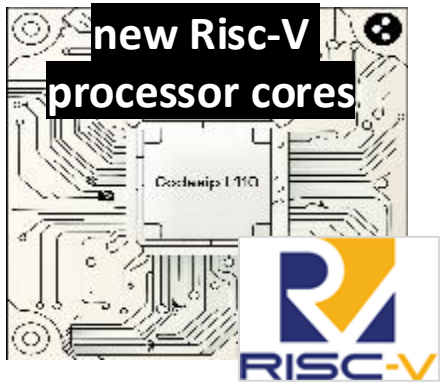


COMMUNICATE – Workpackage Highlights

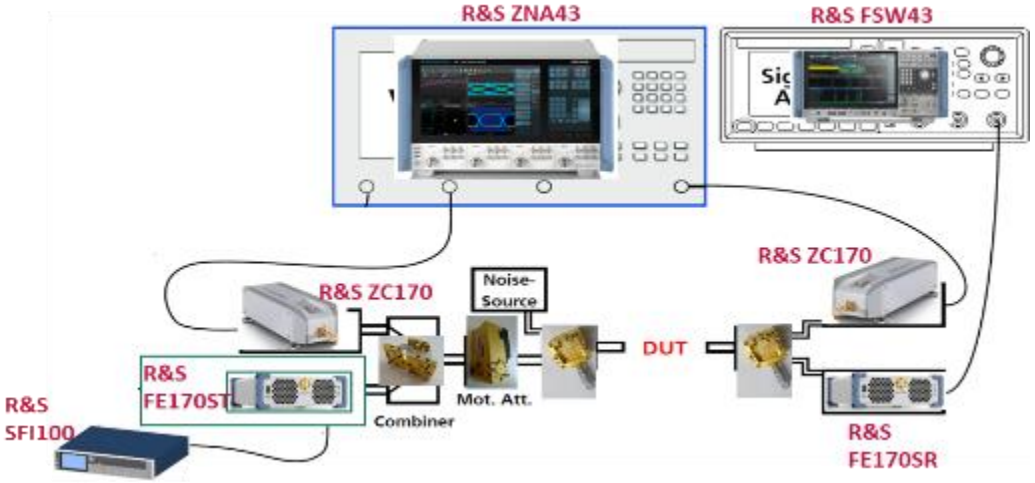
Construction the of a state-of-the-art 300mm Silicon Wafers Pilot line by MEMC

Develop ISO-TCs for hyper pure HF and innovative shipping

new Risc-V processor cores



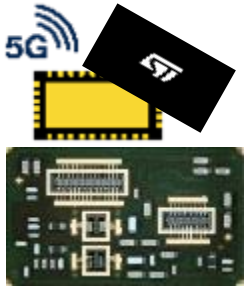
on-wafer test setup for MMIC measurement in the D-band



InP on Silicon sustainable platform

COMMUNICATE – Workpackage Highlights

GaN-based Power Amplifier Module (PAM) for O-RAN

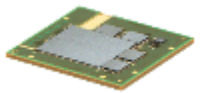


THz-Lab: expanding measurement capabilities to the sub-Terahertz frequency range

Chip Design for Optical Networks – Development of high-capacity coherent optical transponders

Chip design

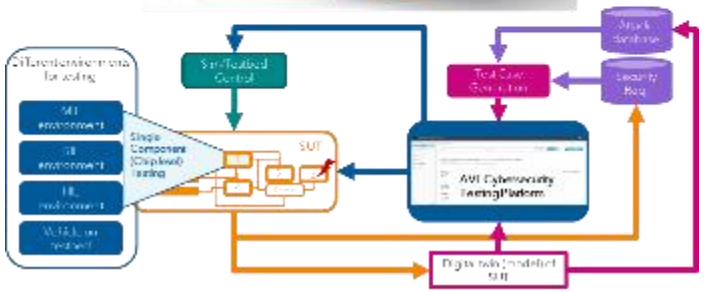
Chip Processing



Multi-Chip Assembly

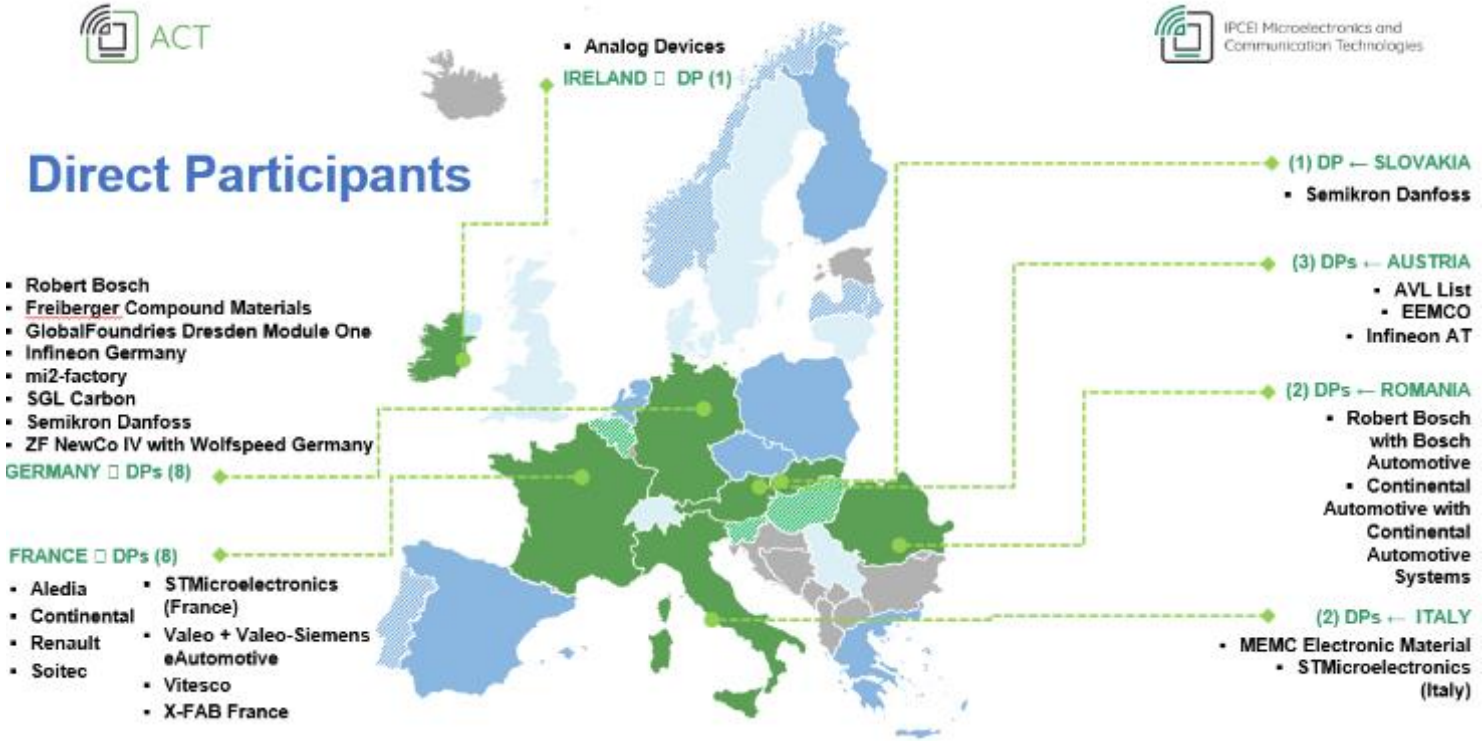
Module design & integration

Validation System for safe & secure chips and new E/E architectures in connected vehicles

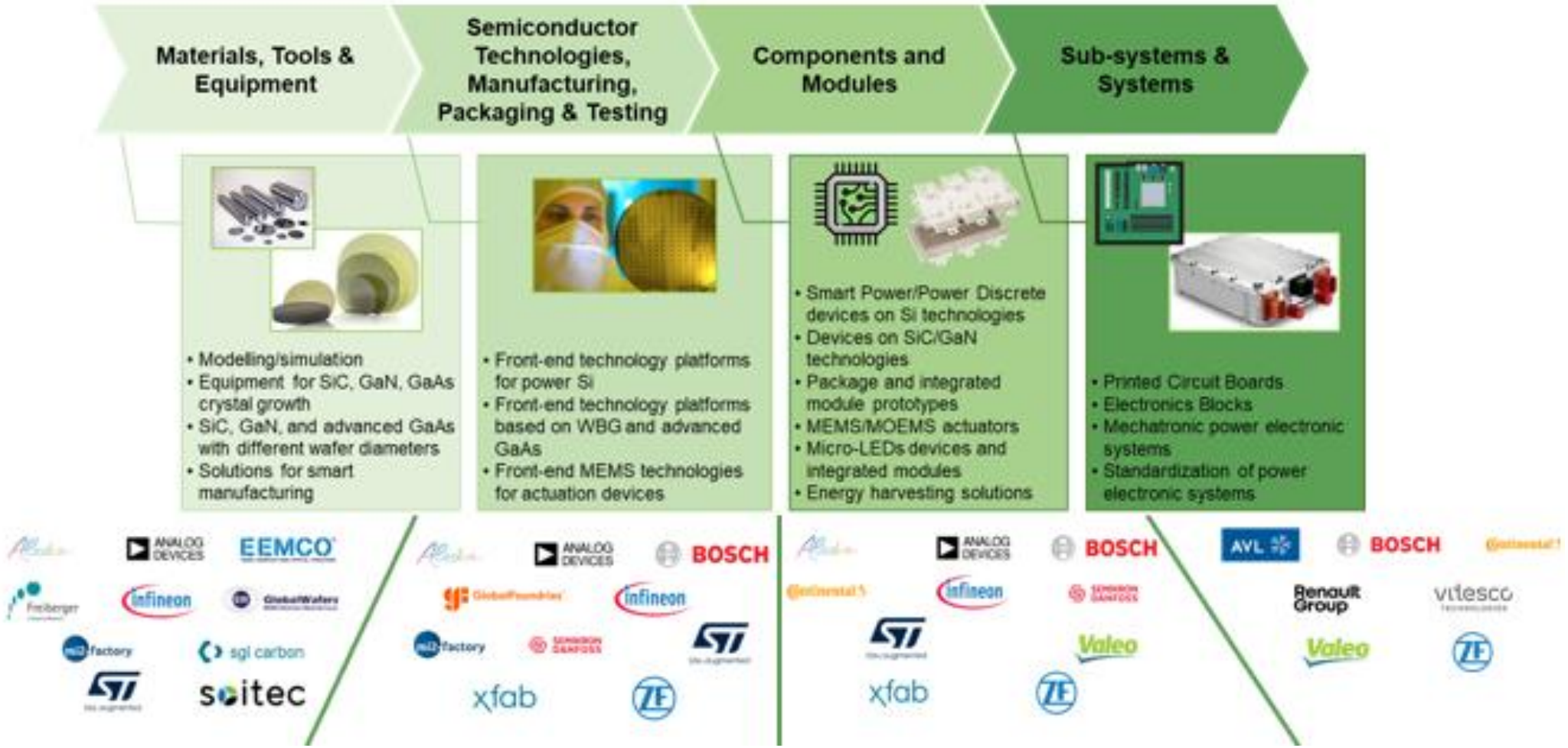


What is ACT?

The workstream “ACT” deals mainly with “**power and actuation**”. It aims at “doing” something with analogue or digital information and have an “effect”. It might be managing energy flow, displaying, moving or adjusting something, driving an electric motor, …etc.

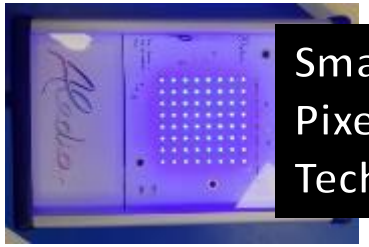


ACT Workpackage Structure



ACT – Workpackage Highlights

New Soitec Clean Room



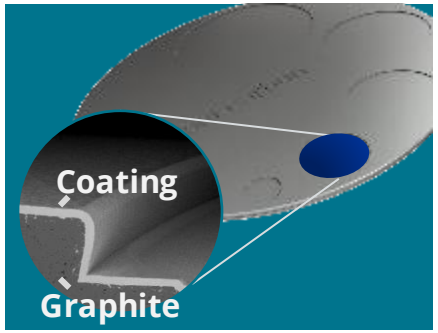
Smart Pixel Tech.

8“ GaAs wafers

GaN HVPE Tool

Si based IGBTs

SiC power modules design



ACT – Workpackage Highlights

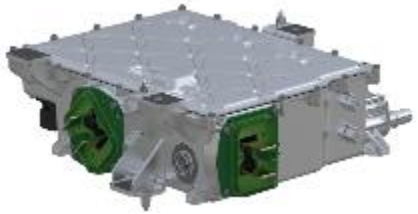
GaN Technology

Ultrasound for gesture recognition in air

The world's thinnest silicon power wafer!

Reversible OBC prototype

800V Powertrain System for electric vehicles



On board Charger converter at test bench

Aledia · GlobalWafers MEMC Electronic Materials S.p.A. · sgl carbon · SEMIKRON DANFOSS · xfab · ZF · GlobalFoundries · AVL · Continental

ANALOG DEVICES · Freiberger · soitec · miz factory · EEMCO EBNER EUROPEAN MONO CRYSTAL OPERATIONS · infineon · ST · Renault Group · vitesco TECHNOLOGIES · BOSCH · Valeo

High Focus on Spill-over Activities

IPCEI Communication defined the following:

[…]

2. IPCEIs can make a very **important contribution** to sustainable **economic growth, jobs, competitiveness and resilience** for industry and the economy […] and with **positive spill-over effects** on the internal market and the **society as a whole**.

[…]

18. The benefits of the project must **not be limited to the undertakings** or **to the sector concerned** but must be of **wider relevance and application** to the economy or society in the Union through **positive spill-over effects** […] which are clearly defined in a concrete and identifiable manner.

[…]

Joint SPILLOVER in 2024 : the Semiconductor rendez-vous

Prague, October 8th to 10th 2024

Need to continue working together in Europe in the face of global competition

Educational conferences

Technical conferences

IPCEI presentation

Porject's results

Long term perspectives

10 partner's stands

25+ conferences and pannel discussions

30+ speakers

6+ countries represented

150+ participants

With the participation of

- Czech Ministry of Industry and trade
- French and Czech Embassies
- EU DG-Connect
- VDI-VDE
- IPCEI ME/CT Facilitation Group
- Czech technical University in Prague

Highlights spill-over events

Maker Faire Rome 2023: opportunity to present demos and workshop also in the framework of IPCEI ME/CT.

Common presentation and booth at EUROSIME 2024 in Catania organized by ST-I, Infineon, Bosch and AT&S

AT&S : Groundbreaking Event of advanced IC substrate facility and R&D line

Chips JU R&I programme; Brussels Dec 2023; Panel session: Ferdinand Bell as speaker of the industrial IPCEI consortium

WWRF Huddle 2024: Uwe Bäder to share information about the European Project IPCEI ME/CT to enable sub-THz / D-band communication.

EEMCO at ICSCRM Conference

Summary

Status as of December 2024 - all project KPI's overachieved

- **Project** results: **on track** with few change requests
- Close to 1000 **patent** applications
- **Hiring**: ongoing with high 4 digit number as of today
- More than **200 PhD and master students**; ~130 internships
- **Tightly meshed network** successfully established with many spill over events (~200 open events)

- A follow up of IPCEI ME/CT?

Team Sport

IPCEIs strengthen important European value chains and contribute to political priorities of the Union (e.g. Green Deal, Digital Strategy) and its sovereignty :

- **European Commission**
- **Member States**
- **Coordinator: BMWK & VDI/VDE Innovation + Technik GmbH**
- **ABGI service provider**
- **>700 direct, indirect and associated partners**
- **Transformers Group**
- **Facilitation Group**

IPCEI Microelectronics and Communication Technologies