IPCEI on Microelectronics

Millimeter-Wave Technologies in the “Important Project of Common European Interest (IPCEI)”and Related Projects

MIKON-2020

MRW 2020 Microwave and Radar Week

Klaus Pressel, Infineon Technologies Regensburg, Germany

Infineon

The importance of mm-wave technologies in the IPCEI

Klaus Pressel

Klaus joined Infineon Technologies at Regensburg in 2001, where he now focuses on innovations in assembly and packaging technology. His special interests are System-in-Package solutions, mm-wave applications, and chip-package-board/system co-design. Klaus is representing Infineon in various international technical committees, e.g. SEMI Advanced Packaging Conference, ESTC, the Eureka EURIPIDES program, the ECSEL JU, and supports the Heterogenous Integration Roadmap. Klaus is author/co-author of more than 200 publications in semiconductor physics and technology, circuit design, assembly and interconnect technology and owns/co-owns 15 patents.

Maciej Wojnowski

Maciej is with Infineon Technologies AG since 2005. He is Lead Principal Engineer and Head of RF Package Simulation & Characterization in the central development department at Infineon Technologies Munich. He is the author or co-author of more than 50 papers and 30 patents in the areas of RF and millimeter-wave packaging and passive device characterization. Dr. Wojnowski is recipient of the 2018 IEEE Outstanding Young Engineer Award “For Leadership and Contributions to the Fields of Millimeter-Wave Packaging and Passive Device Characterization”. Among others he serves on the Technical Committees of the IEEE MTT-16 and the ECTC conference.

Outline

- History and motivation
- The five technology fields
- Investment in Europe
- Mm-wave technologies in the IPCEI
- Conclusions

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History of IPCEI

In 2012 the European Commission defined the Key Enabling Technologies (KETs)

Micro-/Nanoelectronics was identified as one of the key enabler

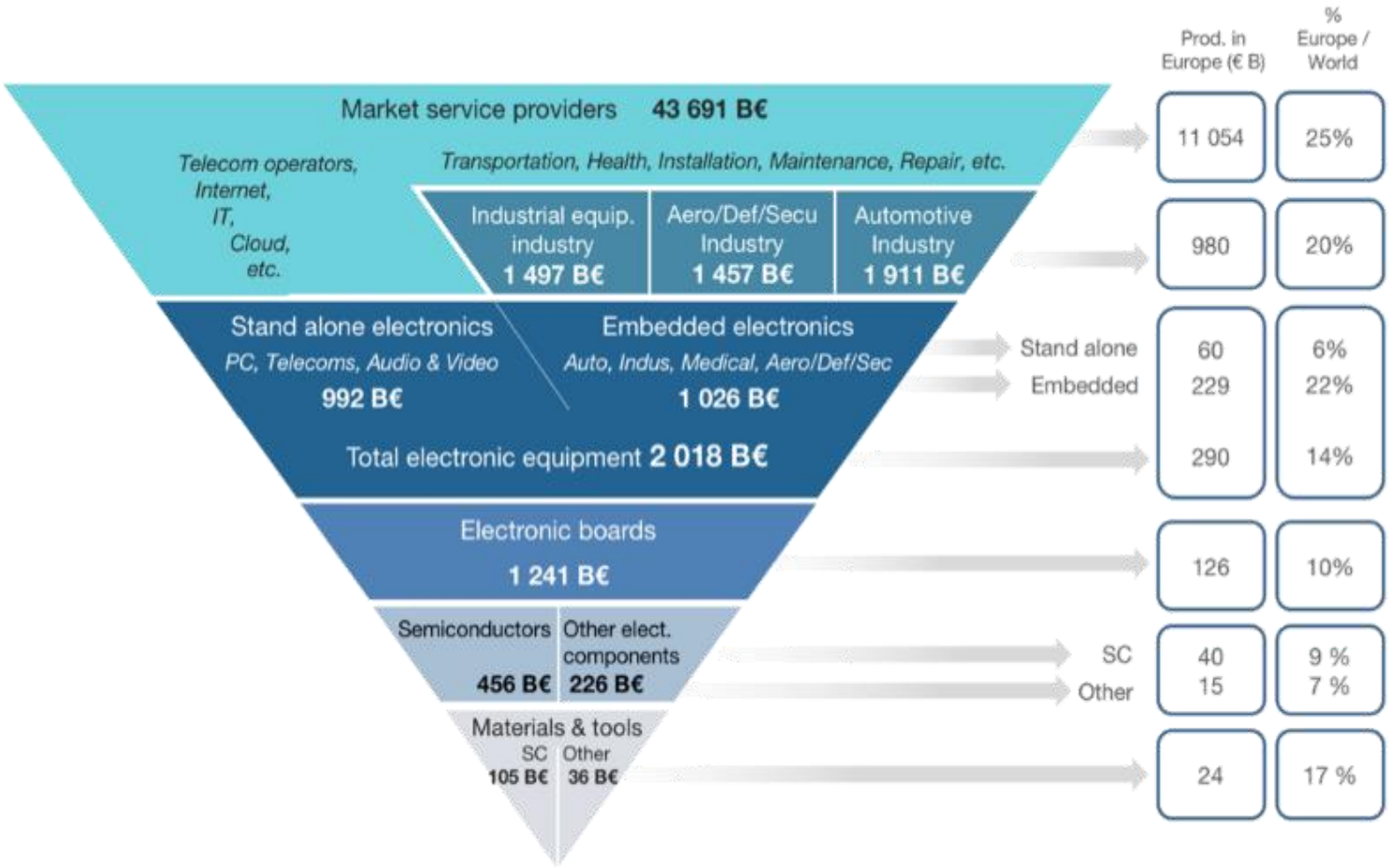
- ECSEL JU was founded - focuses on Research & Development & Innovation and on pilot lines **(access to technology),**
  but, during ramp up a lot of issues need to be addressed
  e.g. stability of processes, understanding of small effects and their impact on reliability, quality and yield

- Thus, starting from 2014 the new funding tool **"Important Project of Common European Interest (IPCEI)"** has been introduced in Europe **(first industrial deployment, FID)**

- A first project has been launched by the European semiconductor industry in early 2017

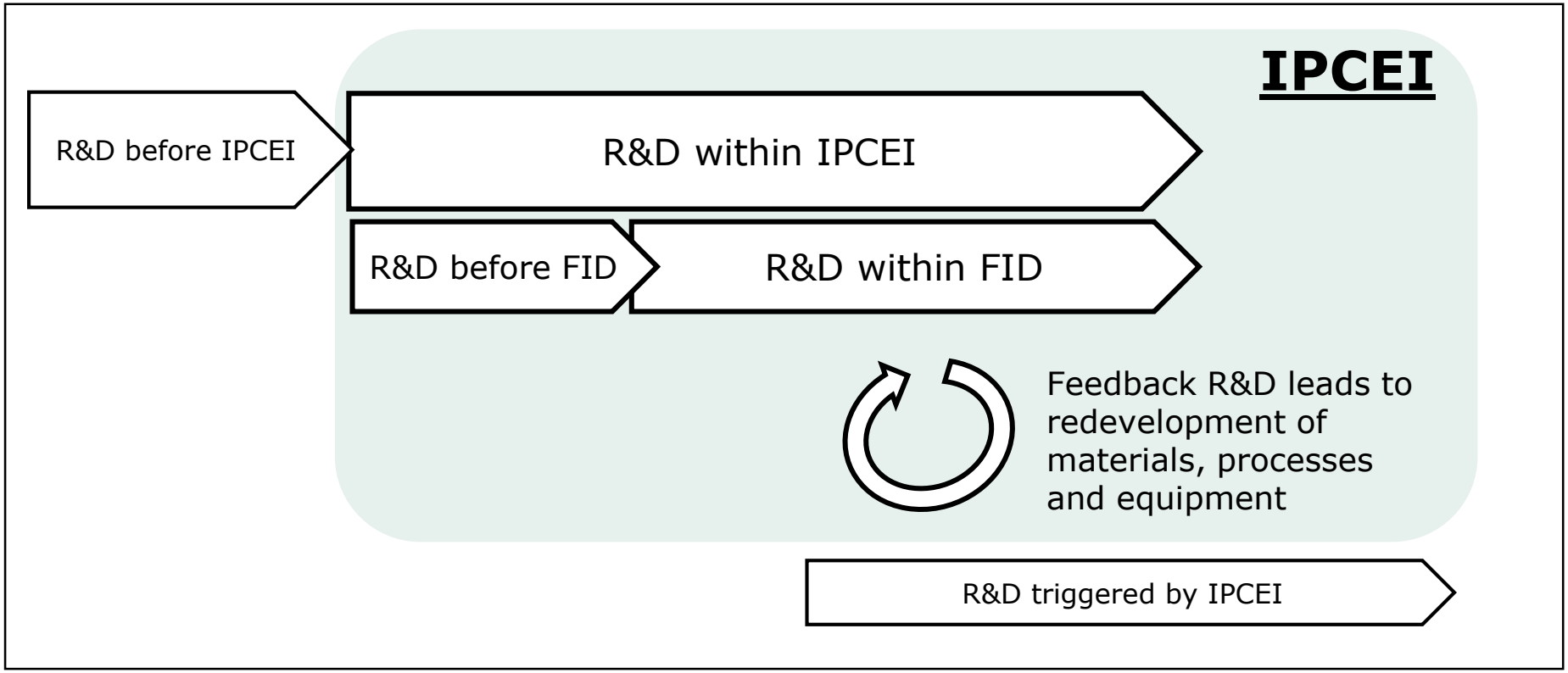
- After notification by the European Commission end of 2018 this project type is now in place and the accompanying companies push this further throughout Europe

Motivation



Source : DECISION for the study: Emerging Technologies in Electronic Components and Systems - Opportunities Ahead (DG CONNECT, 2019)

The need for ever more R & D & I in First Industrial Deployment



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The five technology fields

The 5 “Technology Fields” of the IPCEI for Microelectronics

1. Energy efficient chips (e.g. ultra-low power FDSOI and embedded digital technologies)

2. Power Semiconductors (e.g. innovative silicon as well as new materials (GaN, SiC), assembly & packaging)

3. Smart Sensors (e.g. mm-wave sensors for autonomous driving and sensors for IoT applications)

4. Advanced Optical Equipment (e.g. leading edge optics for More Moore devices)

5. Compound materials (e.g. next generation lighting systems applying LEDs)

The five technology fields

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 Micro-electronics	MURATA	Robert Bosch*		SPTS Technologies
X-FAB	Robert Bosch	ST Micro-electronics		OSRAM
	SEMIKRON	TDK-Micronas		Sofradir
	ST Micro-electronics	ULIS		Soitec
	X-FAB	X-FAB		ST Micro-electronics

* Coordinator
Name in "*italic*" = SME

Dissemination and communication

+ 4 EU countries
+ 27 project partners
+ Focus on 3 Technology Fields
+ Projects costs >/= 6bn€
+ Total funding about 1.75bn€
+ Funding per national government only

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The five technology fields

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The five technology fields

* Now Lynred

7 IPCEI presentations in this MIKON Focus Session 4 on Mm-wave technologies with four IPCEI partners involved

Introduction to importance of Mm-wave technologies

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Investment in Europe

Fab extension at Soitec Crolles

ST at Crolles

ST at Agrate

Fab extension at Zeiss Oberkochem

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New Bosch fab at Dresden

Infineon at Warstein

Fab extension Infineon at Regensburg

Globalfoundries at Dresden

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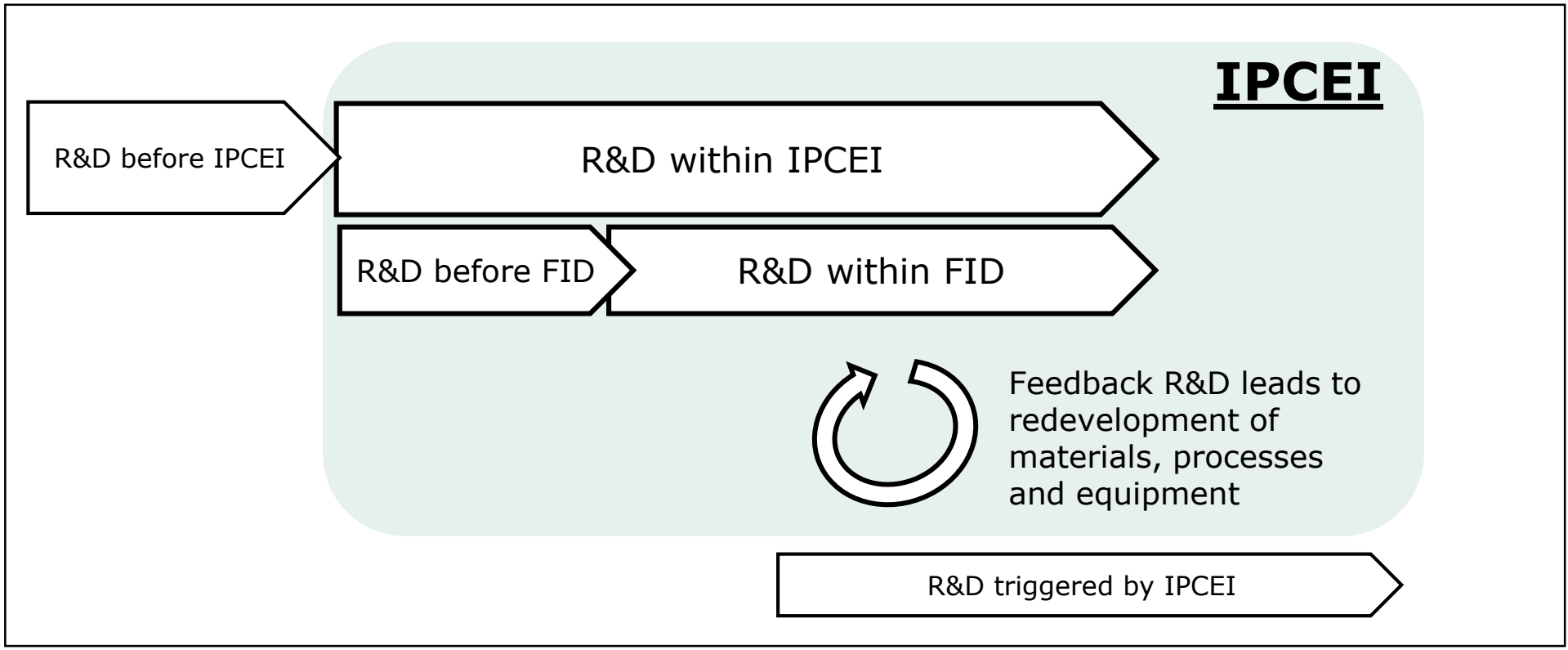
The need for ever more R & D & I in First Industrial Deployment



6 technical presentations on mm-wave technologies

1 overview presentation

6 techncial presentations

MIKON session with 4 partners involved

Target of this session

Introduction to importance of mm-wave technologies in IPCEI and in Europe

* Now Lynred

6 examples of mm-wave activities in IPCEI - Chip and package technology, design and applications

<u>Part 1</u>

1. **Klaus Pressel, Infineon Technologies AG, Regensburg, Germany, "*Introduction to Important Project of Common European Interest (IPCEI)*" (10 min.)**

2. Robert Gruenberger, Infineon Technologies AG, Regensburg, Germany, *"SiGe technologies with cut off frequencies towards 600 GHz for future mm-wave sensing in automotive and industrial applications"* (30 min.)

3. Nan Wu, GlobalFoundries Fab One, Dresden, Germany, "*22FDX Technology for Fully-Integrated mm-Wave Radar Applications*" (30 min.)

4. Maciej Wojnowski, Infineon Technologies AG, Munich, Germany, "*Packaging Trends for mm-Wave Radar and Communication Systems" (30 min.)*

6 examples of mm-wave activities in IPCEI - Chip and package technology, design and applications

Part 2

5. Thomas Brandtner, Infineon Technologies AG, Villach, Austria, "*Chip-Package-Board-System Co-Design*" (30 min.)

6. Jean-Christophe Houdbert, Laurent Dugoujon, STMicroelectronics, Grenoble France, "*ST Technologies for mmW and Perspectives, MPW Access within IPCEI on Microelectronics Frame or Collaborative Projects*" (30 Min)

7. Jürgen Hasch, Robert Bosch GmbH, Renningen, Germany, "*The Rising Wave of Millimeter-Wave Sensing*" (30 min.)

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Conclusions

- IPCEI on Microelectronics is a great success for the European Semiconductor Industry !
  - Stimulating substantial investment
  - Jobs and Know-How in Europe
- International challenges remain, have even increased
- Europe has strong opportunities in emerging microelectronics technologies needed to serve megatrends and achieve societal goals
- IPCEI Microelectronic served as a blueprint for follow-up IPCEIs: European Battery Alliance and Clean Hydrogen Alliance

IPCEI is an important tool to bring technology to the level of First Industrial Deployment and should be pushed and further developed.

Thank you

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MRW 2020 Microwave and Radar Week

Diese Maßnahme wird mitfinanziert durch Steuermittel auf Grundlage des von den Abgeordneten des Sächsischen Landtags beschlossenen Haushaltes.

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And now enjoy the 6 presentations on mm-wave technologies
from the IPCEI technology field TF3