Micro-nanotechnologies for integrated smart systems
Opportunities in the Horizon Europe Programme

Henri RAJBENBACH

European Commission
Directorate Artificial Intelligence and Digital Industries

Unit: Microelectronics and Photonics Industry

INTERNATIONAL SEMICONDUCTOR CONFERENCE
CAS 2021 - an IEEE event

Outline

- Introduction: Commission priorities, the European Chips Act
- Integrating micro-nanotechnologies in their diversity
- Horizon Europe, Leadership in Electronics and Photonics
  - 2021 – Functional electronics for green and circular economy
  - 2022 – Advanced multi-sensing systems

European Commission

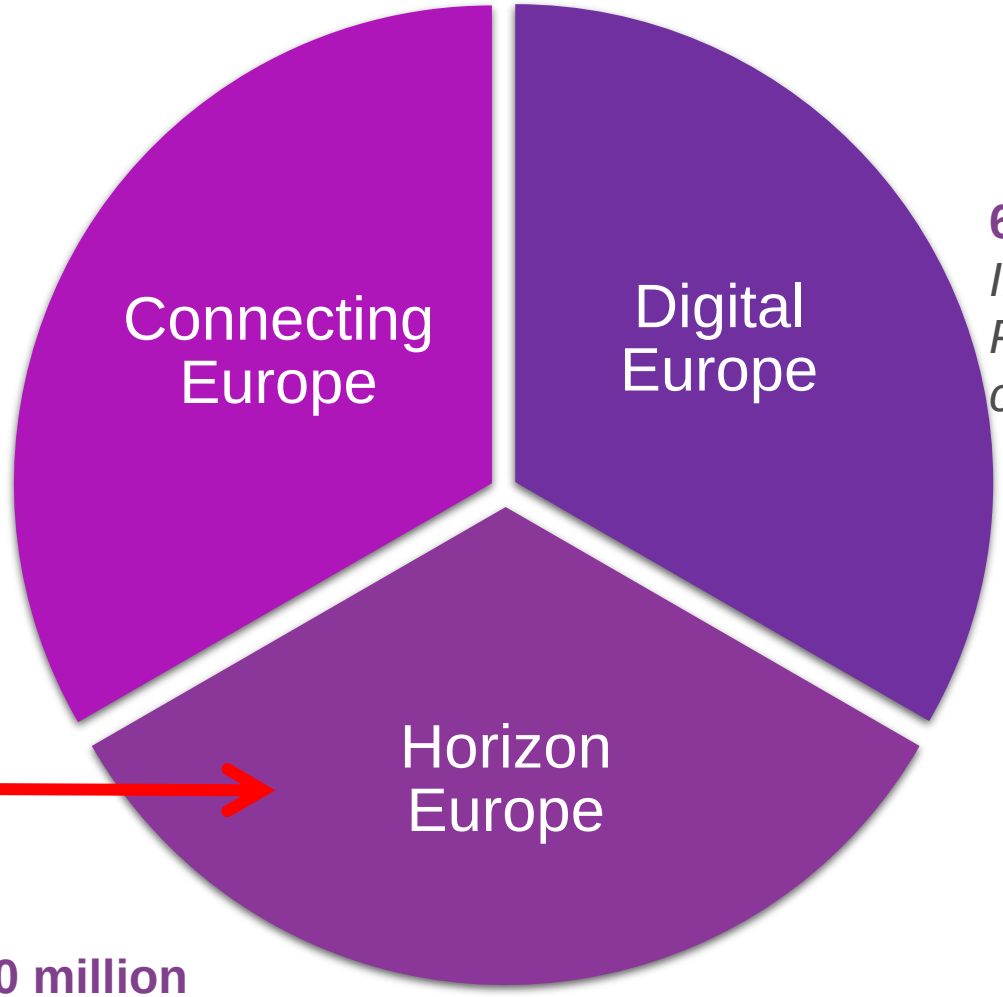
Von der Leyen Commission Priorities

- A European Green Deal
- A Europe fit for the digital age
- An economy that works for people
- Promoting the European way of life
- A stronger Europe in the world
- A new push for European democracy

Financing the EU's digital policy

Multiannual Financial Framework 2021-2027

1 832 million
Connectivity and the digital transformation



6 761 million
Investing in High Performance computing, AI, cybersecurity

75 900 million
Investing in research and innovation

"Integrated in Diversity"

Photonics
(Sources, waveguides, detectors, Si)

Micro- Nanoelectronics
(CMOS & post-Moore)

Micromechanics
(MEMS/NEMS sensing and actuating)

Microfluidics
(pumps & channels)

Control / Processing
Software (Embedded)

Flexible & Printed
substrates

Communication
(Optical / RF/ THz)

Bio-photonics
Bio-sensing

Storage

Energy
(batteries, harvesting)

Co-Design

Miniaturisation

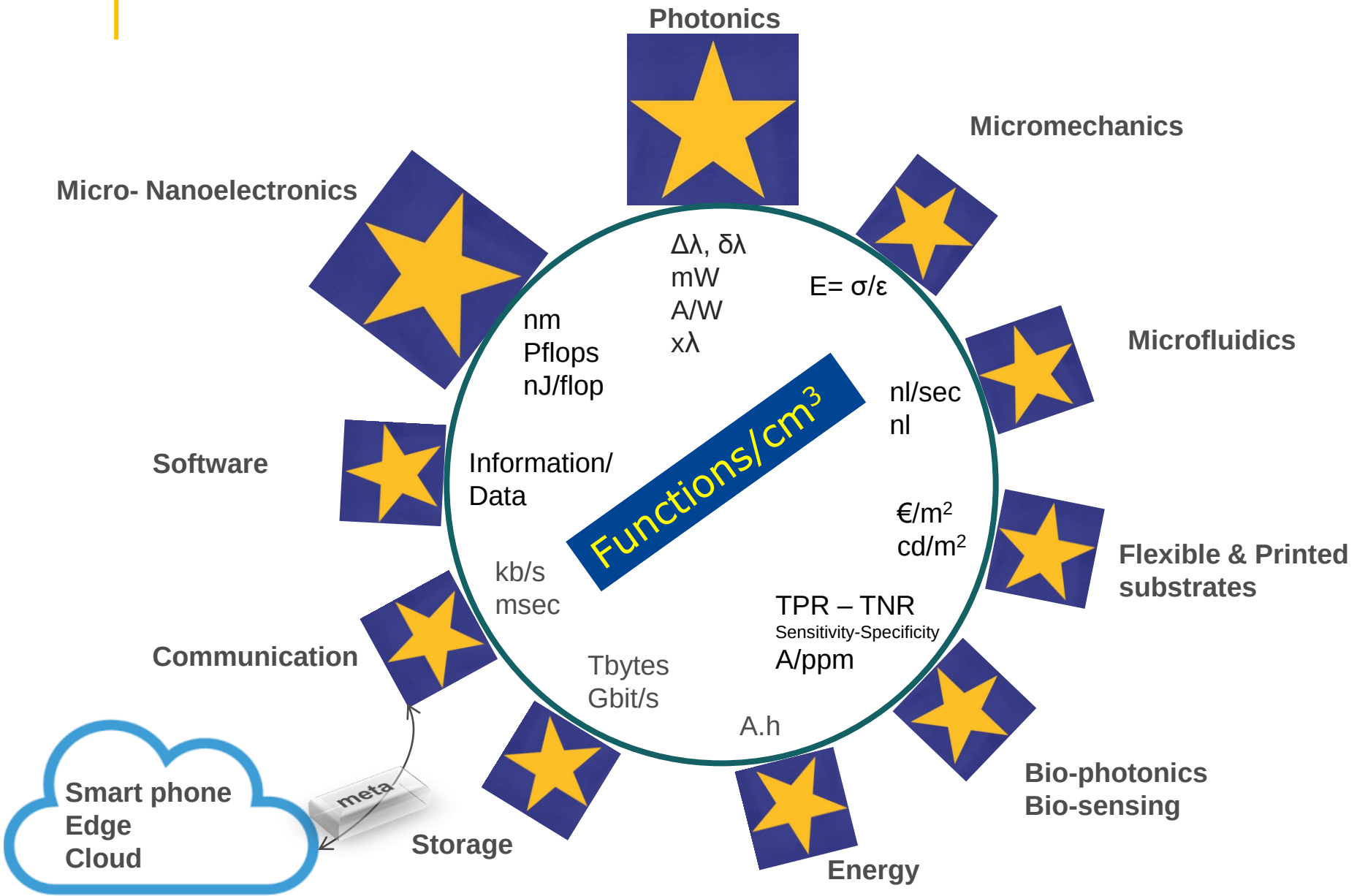
Packaging

Integrated Digital components

Smart phone
Edge
Cloud

Co-design **Eco-design**

"Specification space



Size & Cost
(order of magnitude)

Electronics and Photonics sections

2021

DIGITAL-EMERGING-01-01 — **Ultra-low-power, secure processors for edge computing (RIA)**

DIGITAL-EMERGING-01-05 — **Open Source Hardware for ultra-low-power, secure processors (CSA)**

DIGITAL-EMERGING-01-31 — **Functional electronics for green and circular economy (RIA)**

DIGITAL-EMERGING-01-06 — **Advanced optical communication components (IA)**

DIGITAL-EMERGING-01-07 — **Advanced Photonic Integrated Circuits (RIA)**

2022

DIGITAL-EMERGING-01-03 — **Advanced multi-sensing systems (RIA)**

European Commission

01-31 Functional electronics for green and circular economy (1/2)

35 M€	3-5 M€/project	RIA	TRL: from 2-3 to 4-5	2021

Expected Outcomes:

- European leadership in the area of **flexible, printed and organic electronics**
- New concepts, designs and technologies in electronics for **circular economy and sustainability**.
- Next generation components and systems that will deliver **climate-neutral digital solutions**

Scope:

- **Technological breakthroughs** in functional electronics technologies green and digital transformation.
- **Eco-design principles**
  - reduction of energy and resource consumption.
  - low-cost / light- weight / less energy intensive approach

21 Oct. 2021

European Commission

01-31 Functional electronics for green and circular economy (2/2)

Focus:

- Use of different types of substrates e.g. **flexible, stretchable and conformable**
- **Integration** in textiles, plastics, glass, paper and metal.
- Improvement of system characteristics - **performance, robustness, reliability**
- High throughput and low-cost **manufacturing processes**

- Application domains:
  wearables, mobility, health/well-being, agriculture and environment, energy and smart logistics

- **Eco-design principles**:
  Recovery and recycling solutions
  Optimisation of the use of resources
  e.g. energy efficiency at system and manufacturing level, material consumption

21 Oct. 2021

European Commission

01-03 Advanced multi-sensing systems (1/2)

48 M€ | 3-5 M€/project | RIA | TRL: from 2 to 5 | 2022

Expected Outcomes

- Next generation multi-sensing **photonic and electronic** systems →
  - increased integration of new functionalities, decreased size
  - cost-effective manufacturing.
- Support of a European **strategic autonomy** →
  - Key integration and packaging technologies
  - Manufacturing value chains.
- Contribution to the **green deal** objectives →
  - High levels of reuse/repair/repurpose
  - Recovery and recycling of waste and materials
  - Reduction of overall power consumption by at least a factor of 2.

- Application sectors **(broad)** →
  - healthcare and well-being
  - environmental monitoring and protection
  - transport and automated driving
  - Manufacturing
  - Aerospace and security

2022

Implementing the Photonic partnership

European Commission

01-03

Advanced multi-sensing systems (2/2)

Scope

- **Breakthroughs** in sensor systems:

  Combining: Component development + System integration + Packaging + cost-effective manufacturing
  Acquisition + Processing + Interpreting of vast amounts of sensory input data

- Reduction of overall **energy consumption**
- Modular approach with interchangeable components operating in a platform environment
- The sensing functionality should build on technologies related to light

Integration with:

- **microelectronics**
- **micro-nano-mechanical,**
- **micro-fluidic**
- **Magnetic**
- **radio frequency**
- **bio-chemical technologies.**

2022

KDT-JU

“Priority topics” to be considered for part (?) of the budget (WP2021)

Processor design for Artificial Intelligence at the edge (IA)

Open-source hardware base infrastructure (RIA or IA)

Eco-designed electronic smart systems supporting the Green Deal objectives (RIA or IA)

A Pan-European chip infrastructure for design innovation (IA)

TRL (?)

European Commission

#HorizonEU

http://ec.europa.eu/horizon-europe

Thank you

Integrated in Diversity

© European Union 2021

Unless otherwise noted the reuse of this presentation is authorised under the CC BY 4.0 license. For any use or reproduction of elements that are not owned by the EU, permission may need to be sought directly from the respective right holders.

European Commission