



European funding opportunities in micro and nanoelectronics Overview and perspectives

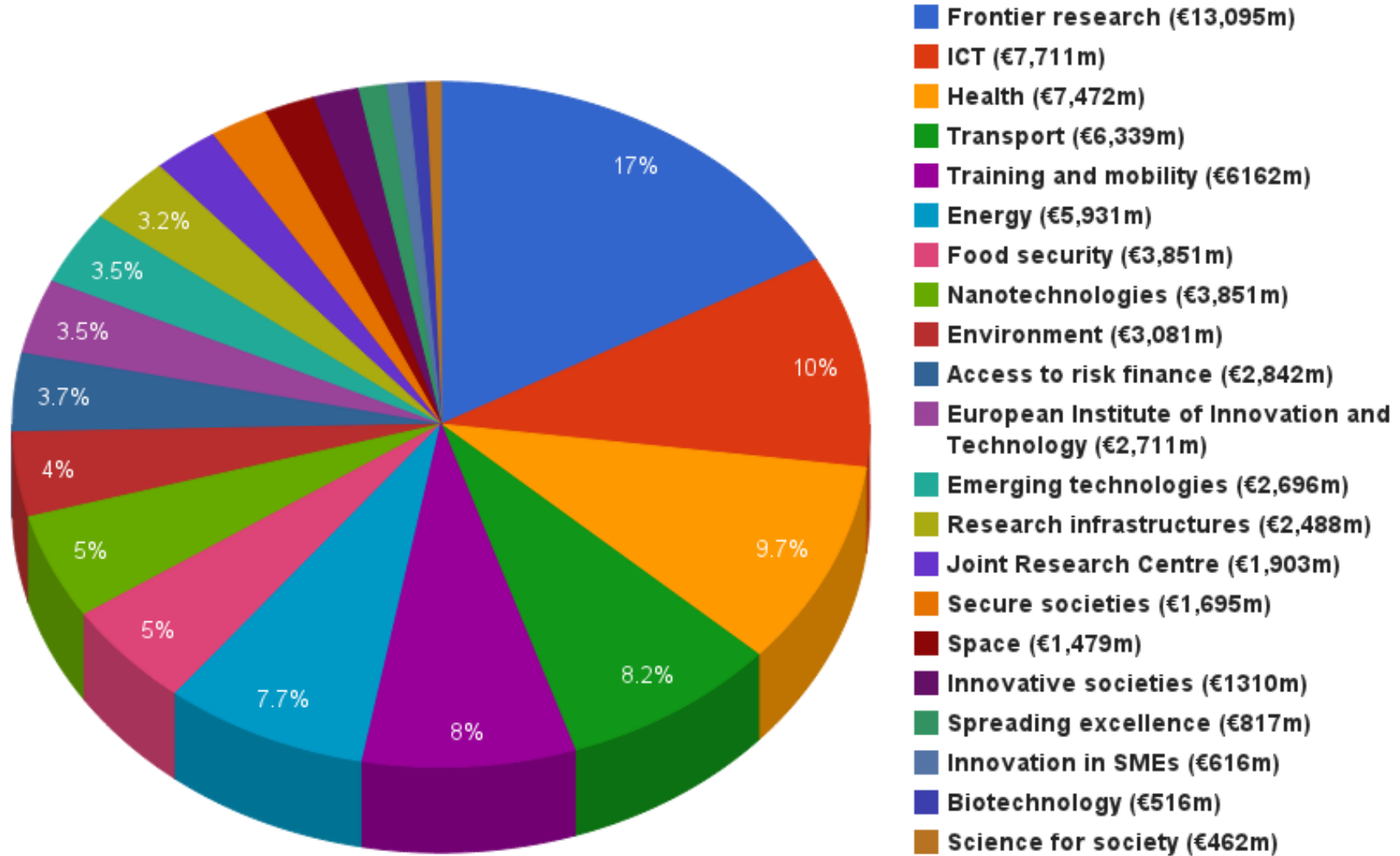
Eric Fribourg-Blanc
Competitive Electronics Industry
DG CONNECT



Competitive electronics industry

- Portfolio
 - Strategy on electronics
 - Nanoelectronics, integrated systems & TOLAE
 - ECSEL Joint Undertaking
- Role: (re)position Europe in the map of computing and integrated devices
- Project mapping across the Commission since the beginning of FP7 in multiple areas

Horizon 2020 areas





Horizon 2020 – electronic components

Excellence in Science

Leadership in Enabling and Industrial Technologies (LEIT)

Societal Challenges



European Research Council (ERC) grants

Marie Skłodowska-Curie grants

Future and Emerging Technologies collaborative projects

Electronic components

ENIAC/ECSEL Joint Undertaking

- Types of project
 - RIA – Research and Innovation Actions
 - IA – Innovation Actions
 - CSA – Coordination and Support Actions
- Flagships
 - Graphene
 - Human Brain Project
 - Quantum Technologies – in final preparation
- Joint Undertakings
 - Started under FP7
 - Currently 7 JUs → ECSEL in DG CONNECT

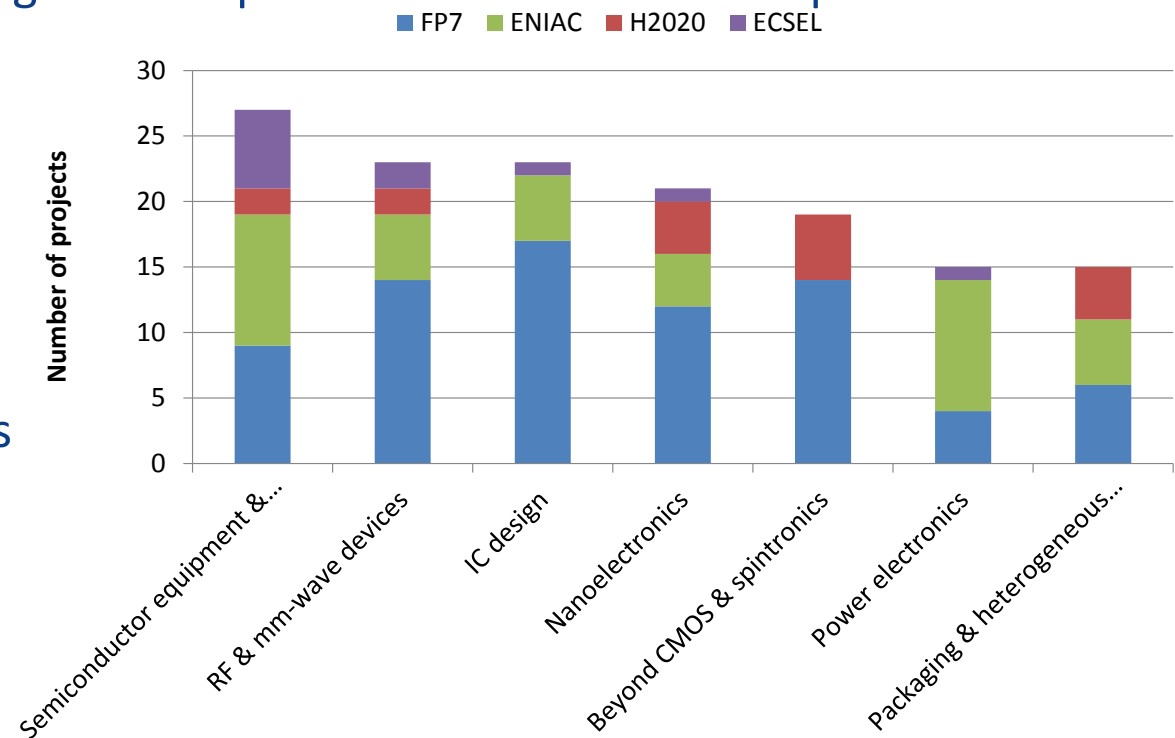


Micro-nanoelectronics

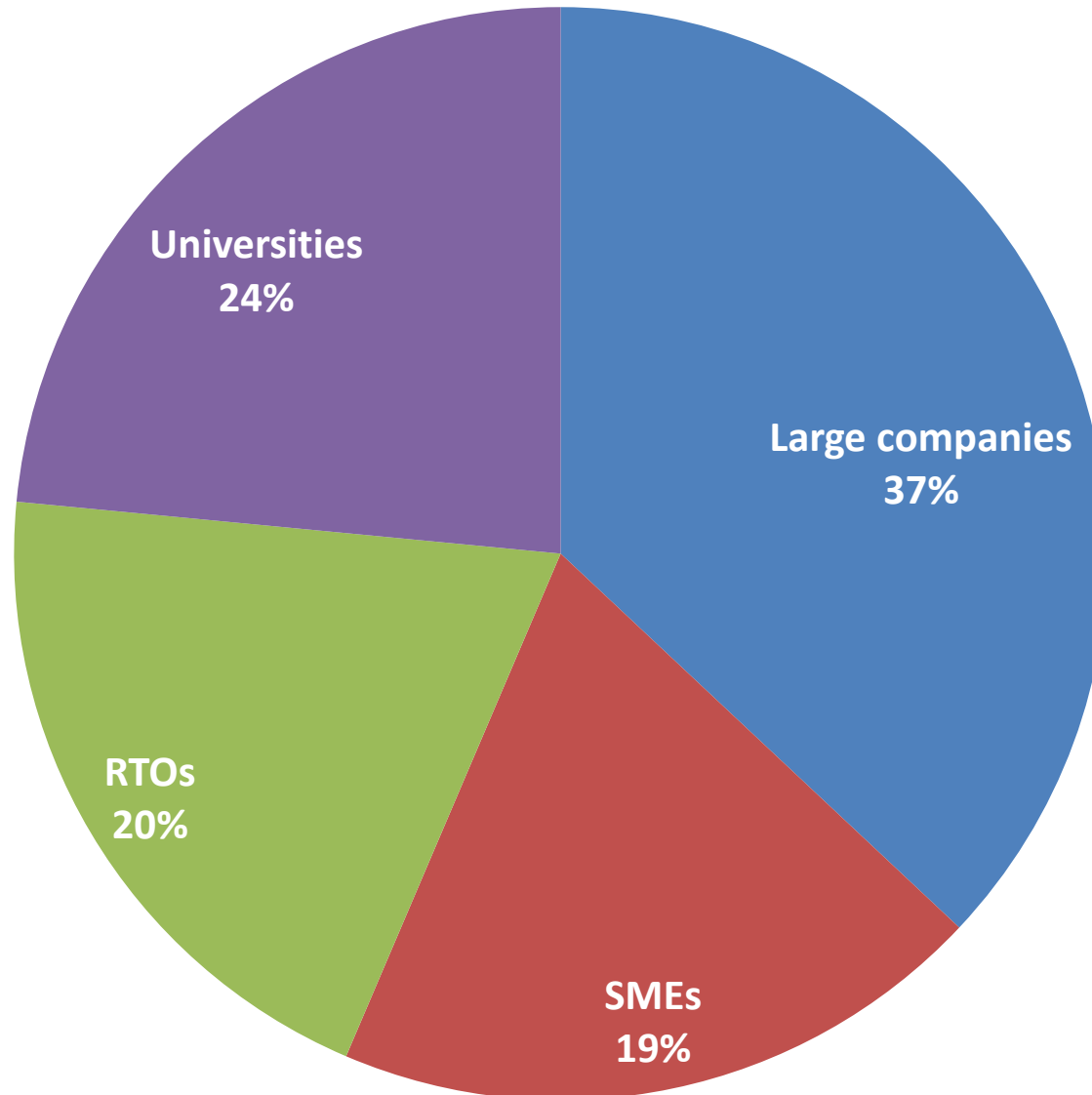
What has been funded so far – key figures

- 9 years of funding – 2007-2015
- Programmes FP7 and H2020 (2 years), including ENIAC and ECSEL Joint Undertakings
- 7 areas of funding covering the full spectrum of electronic component technologies

- 143 projects
- About 2100 participations
- Total costs: 3.6 B€
- EU contribution: 880 M€



Micro-nanoelectronics value chain – Participations





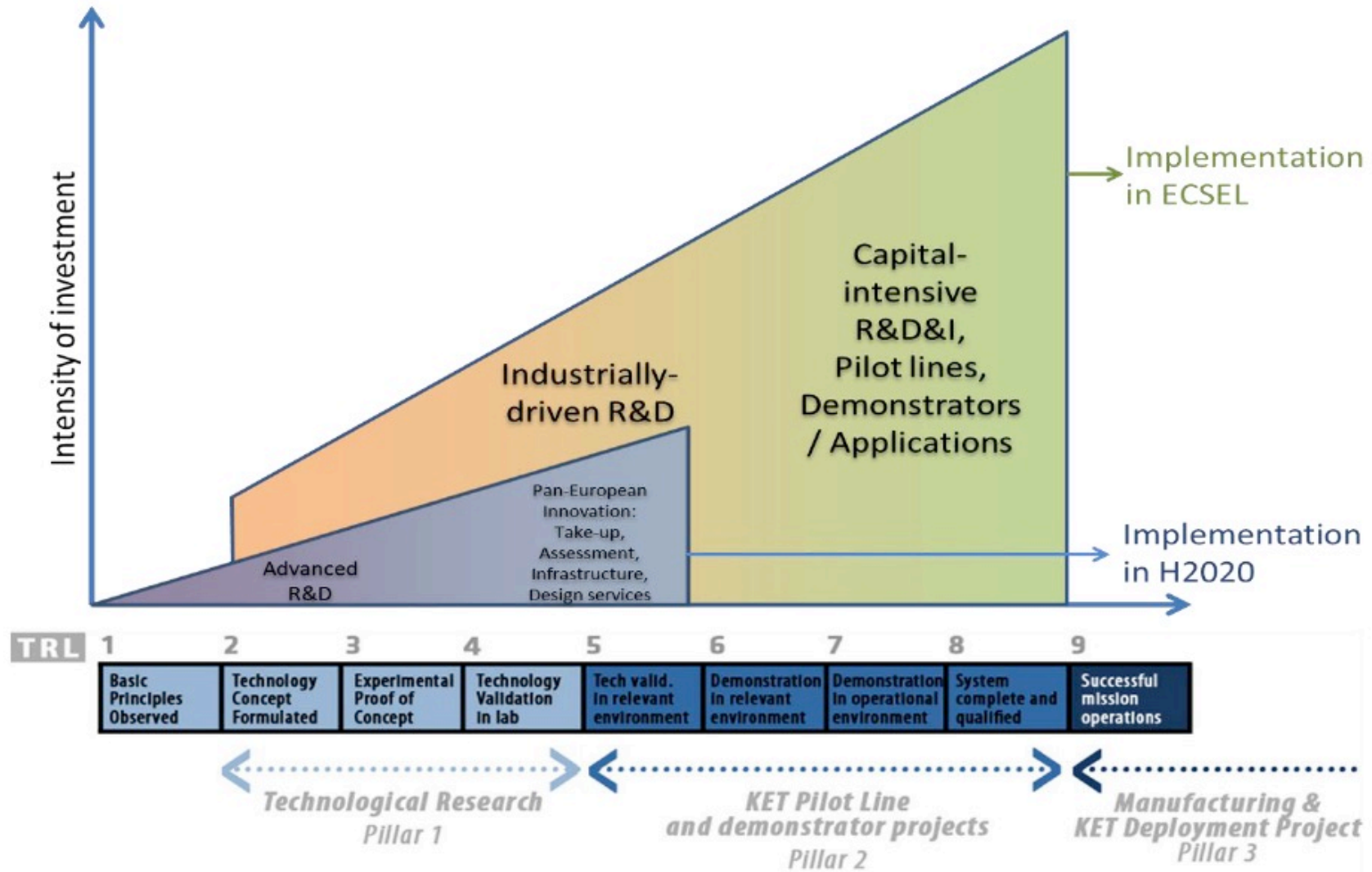
ECSEL JOINT UNDERTAKING



ECSEL Joint Undertaking – objectives

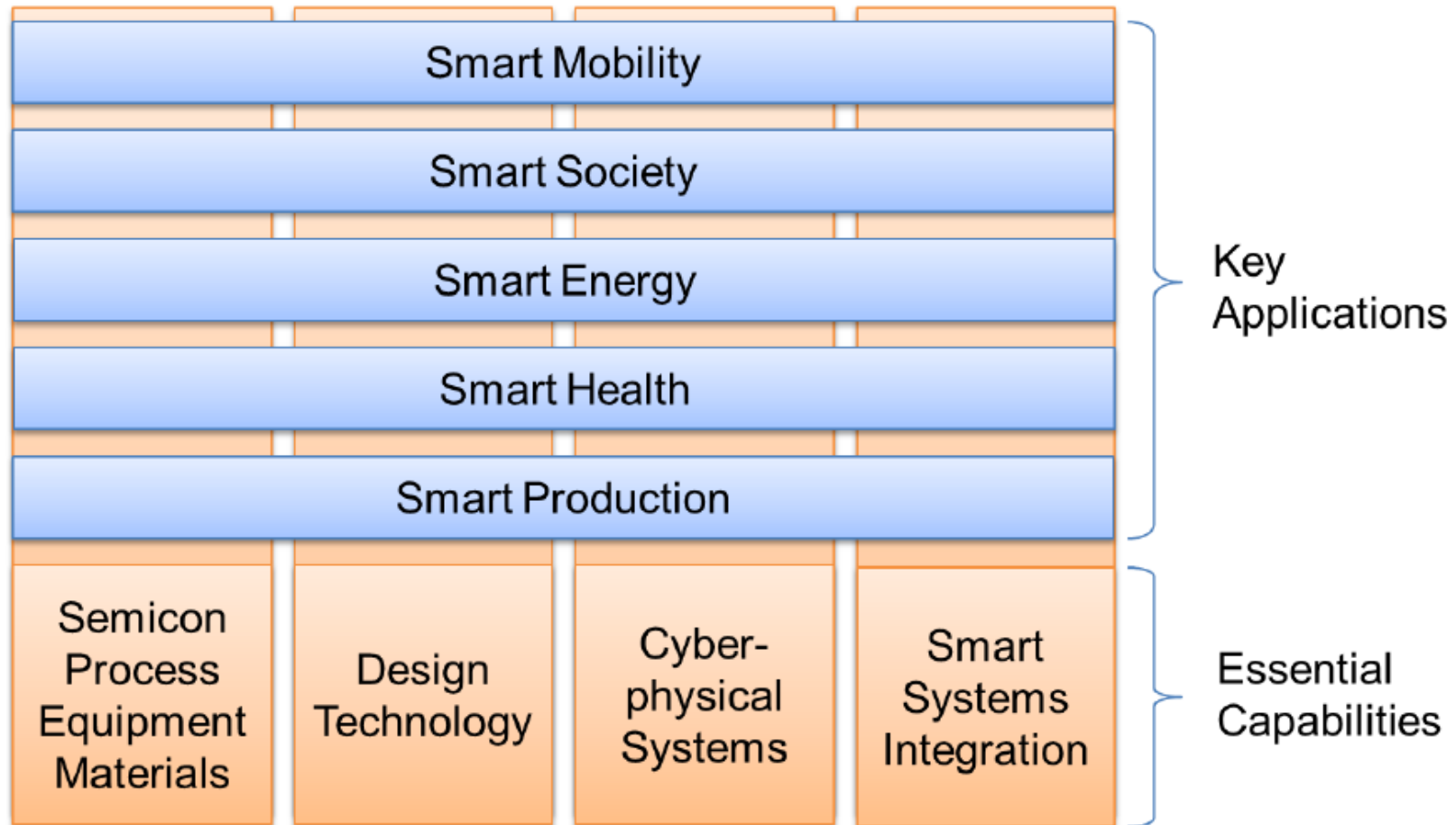
- Contribute to the development of a strong and **globally competitive electronics components and systems industry** in the Union;
- Ensure the **availability of electronic components and systems for key markets and for addressing societal challenges**, aiming at keeping Europe at the forefront of technology development, bridging the gap between research and exploitation, strengthening innovation capabilities and creating economic and employment growth in the Union;
- **Align strategies with Member States** to attract private investment and contribute to the effectiveness of public support by avoiding an unnecessary duplication and fragmentation of efforts and by facilitating the participation of actors involved in research and innovation;
- Maintain and grow **semiconductor and smart system manufacturing capability in Europe**, including leadership in manufacturing equipment and materials processing;
- Secure and strengthen a **commanding position in design and systems engineering** including embedded technologies;
- Provide access of all stakeholders to a world-class infrastructure for the design and manufacture of electronic components and embedded/cyber-physical and smart systems; and
- Build a dynamic ecosystem involving Small and Medium-Sized Enterprises (SMEs), thereby strengthening existing clusters and nurturing the creation of new clusters in promising new areas.

ECSEL Joint Undertaking





ECSEL Strategic Agenda





Projects funded

- Strong focus on Innovation Actions
- Research and Innovation Actions for maturing technologies

Evolution -> Lighthouse Initiatives

- Funding in 2016: 2 projects
 - Industry 4.E
 - Mobility 4.E
- Structuring actions for ECSEL to reinforce the strategic mid-term impact
- Currently under discussion about the projects which could be supported in 2017



ECSEL – interim evaluation

- Report well received in the Commission
- ECSEL recognised as a strategic instrument to support digital value chains in Europe in a coordinated way
- A number of recommendations were made to improve the functioning
 - Develop a stronger strategy for electronic components and systems
 - Engage more proactively to bring the systems community and actors in the strategy
 - Improve the process of measuring impact and success of the instrument
 - Harmonise Member State participation rules and reimbursement rates



H2020 LAST WORK PROGRAMME

LEIT-ICT WP2018-20

- Unconventional Nanoelectronics-
 - exploring the development of promising beyond-CMOS devices
- Large Area Electronics-
 - enhancing manufacturability, integration with conventional electronic components and take-up in applications
- Electronic Smart Systems-
 - integrating sensing, actuating, advanced processing and wireless transmission
 - new functionalities, miniaturisation and performance improvement



H2020 – Last call on nanoelectronics

ICT-08-2019: Unconventional nanoelectronics

Objective: accompany enabling technologies for the advanced CMOS and prepare the road beyond CMOS

Exploratory Research

- Differentiating factors for the Industry

RIA – *Research and Innovation (30M€ – 100% funding) (Demonstration in controlled environment at a limited scale)*

- Energy-efficient computation devices beyond the current CMOS paradigm
- Energy-efficient computation circuit architectures
- 3D and cryogenic electronics
- Design for advanced nanoelectronics technologies

- Each call is unique
 - Every word of the work programme counts but it is usually enough to hook your proposal(s) on a number of them, not all
 - Beware of resubmissions
 - ↳ Preferably restart from fresh even if keeping the same core concept(s)
- Excellent proposal – some (non-binding) considerations
 - With a score of 13.5 (4.5 on each criterion on average) and above
 - Usually the minor shortcomings from one evaluation ESR will not apply to another call (uniqueness of the calls)
 - Beware of ranking rules (RIAs)
 - Excellence
 - Impact
 - SME budget
 - Gender parity
- Fine tuning of a proposal is essential to leave no room for shortcomings

Further considerations

- Provided the idea/concept and impact reasonably fit with the call, these will not be a reason for low score
- Usual shortcomings which can be avoided
 - Insufficient/not too realistic description of impact
 - Language not sufficiently clear
 - Insufficient focus on core activities / developments
 - Unbalanced consortium
 - Insufficient attention to risks, management, dissemination

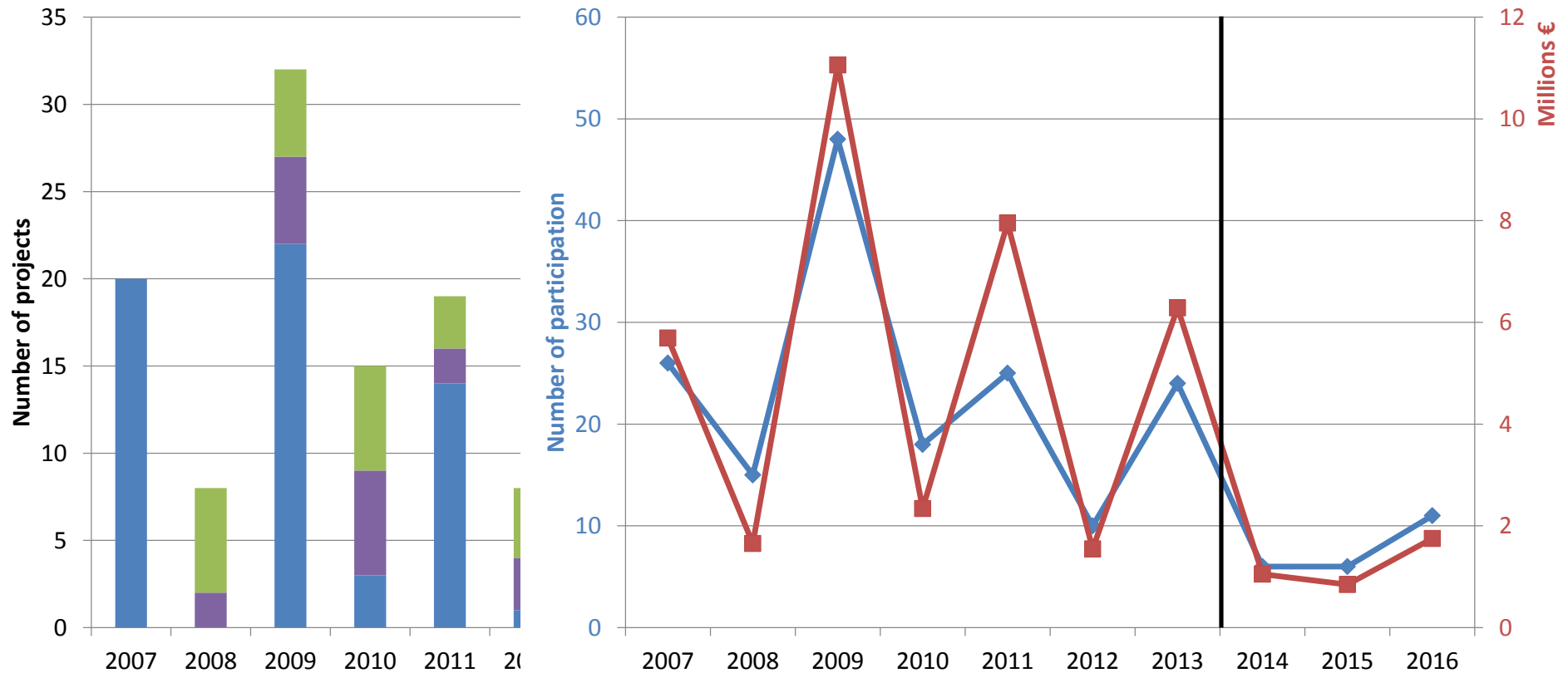


IU.NET IN FRAMEWORK PROGRAMMES

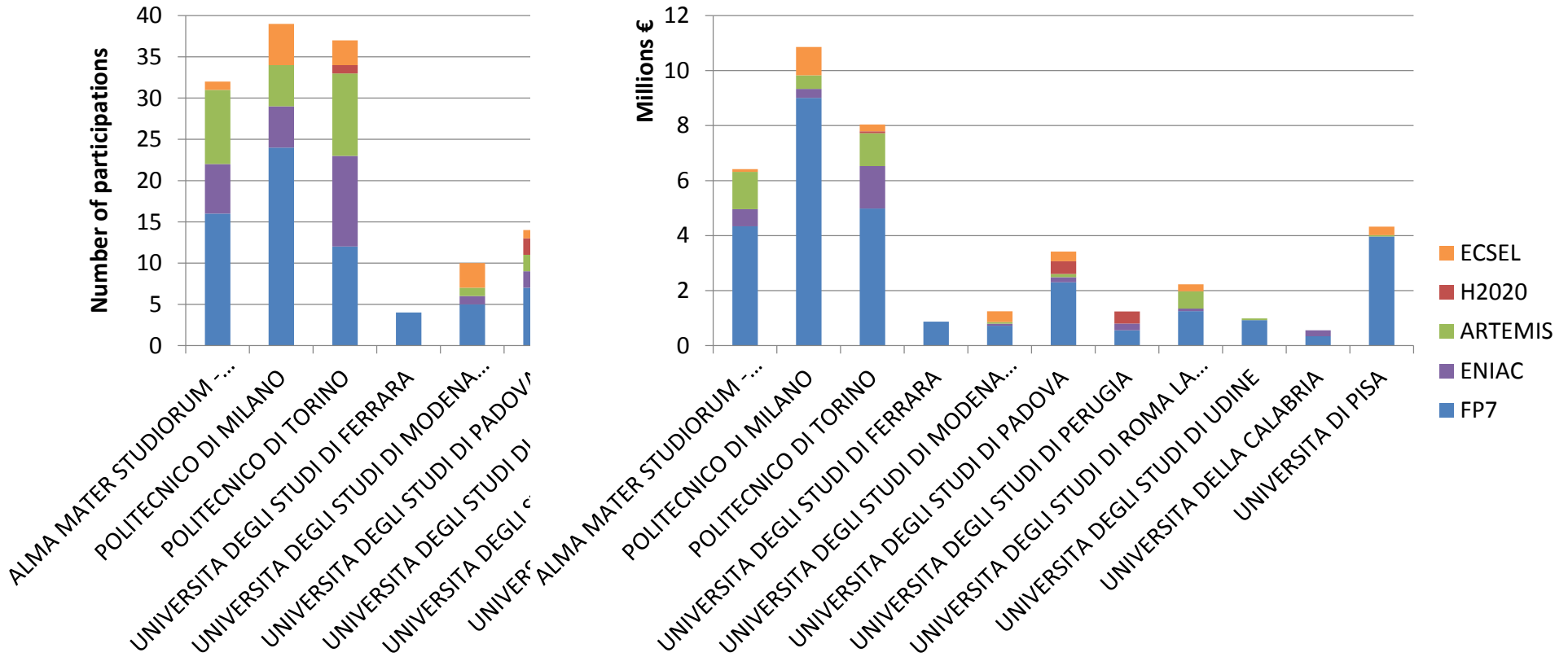


IUNET in EU programmes on electronic components and systems

- Coverage
 - Nanoelectronics and smart systems projects under FP calls
 - Joint Undertakings: ENIAC, ARTEMIS, ECSEL

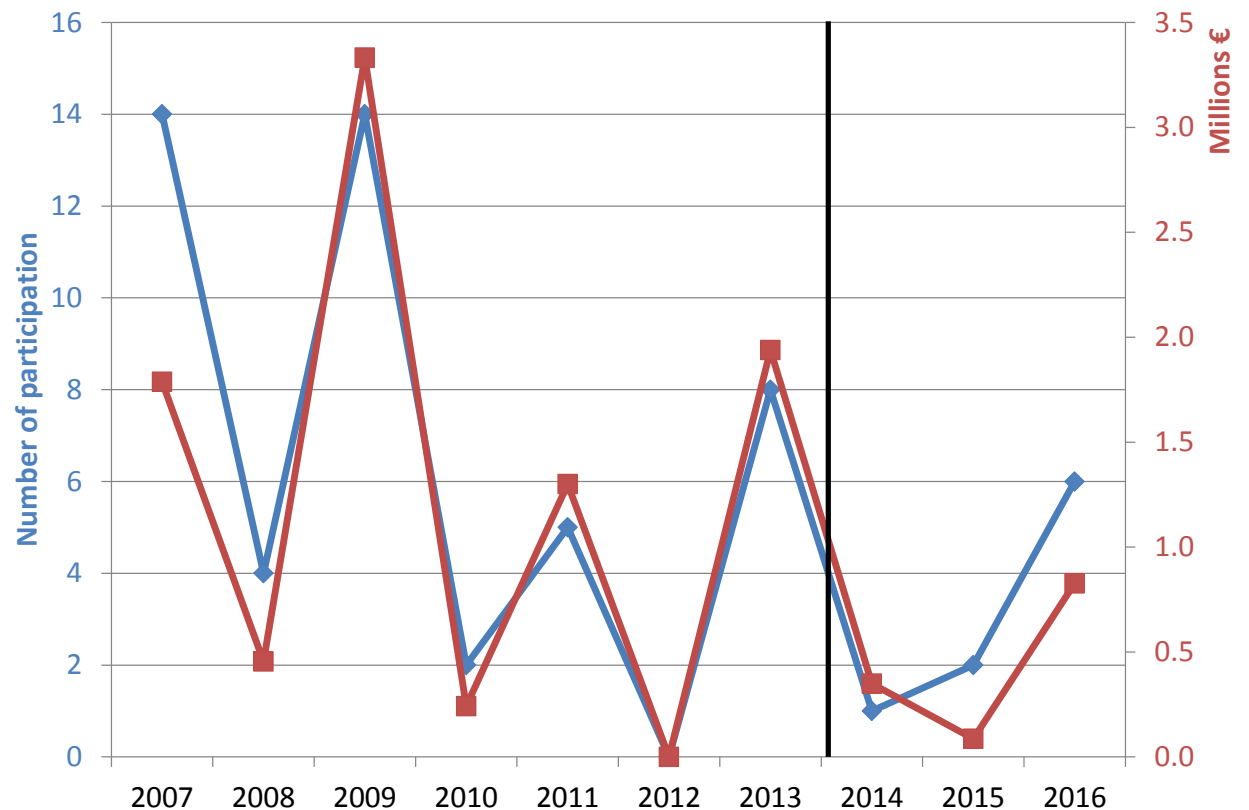
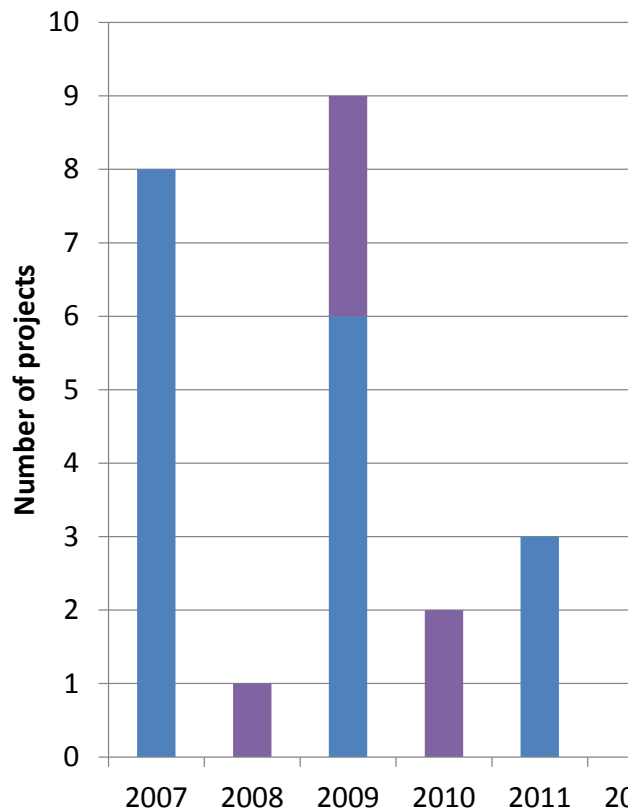


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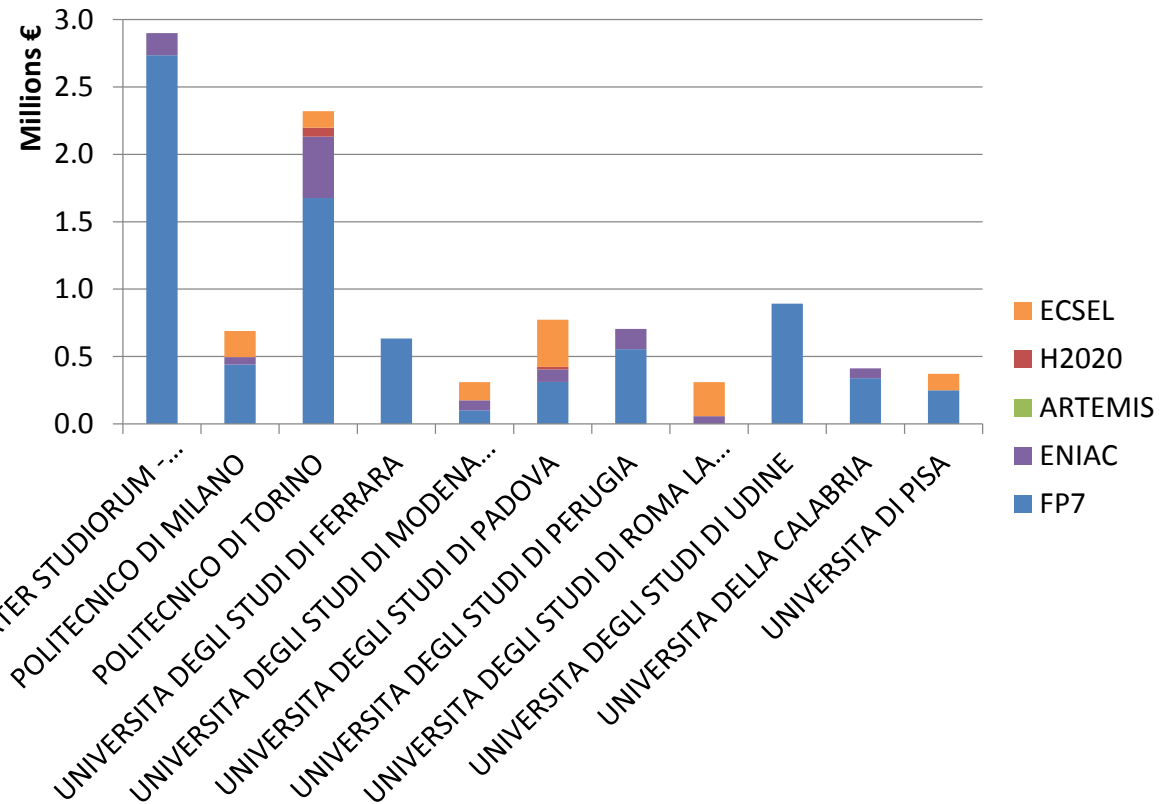
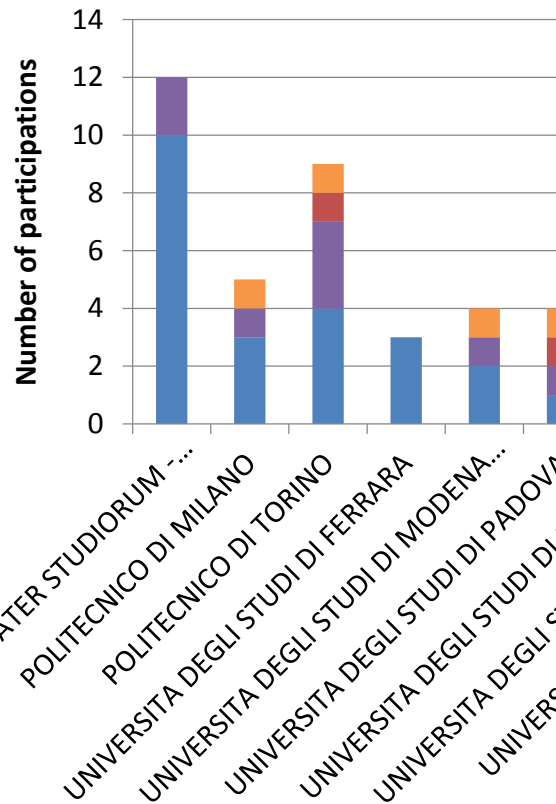
- Coverage

- IC design, Nanoelectronics, Beyond CMOS & spintronics, RF & mm-wave devices, Power electronics
- Both under FP and JU calls



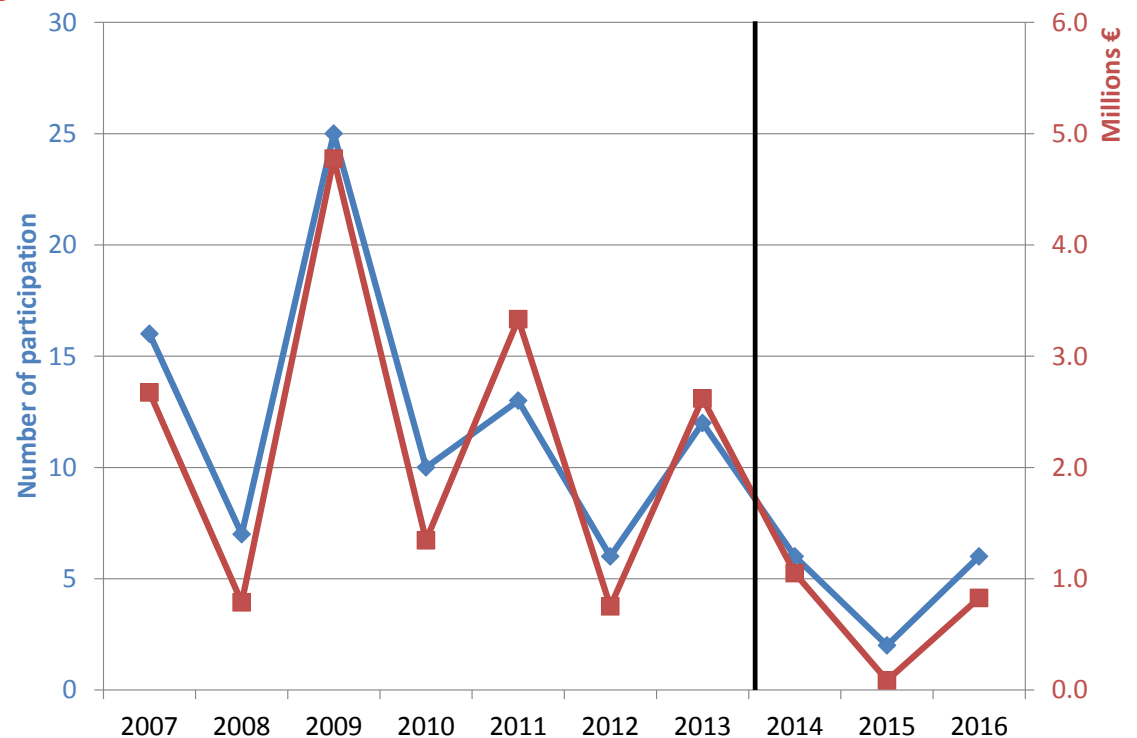
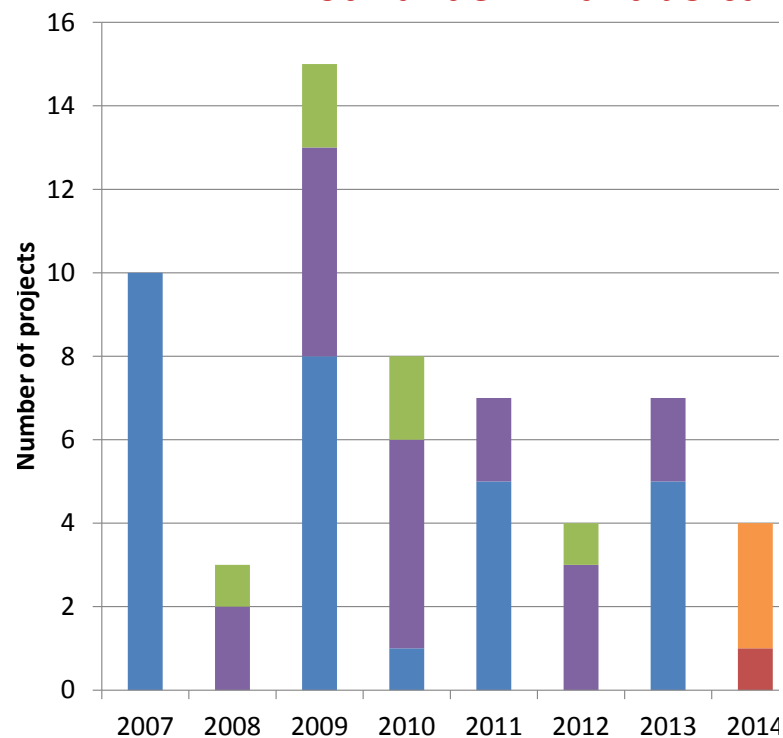
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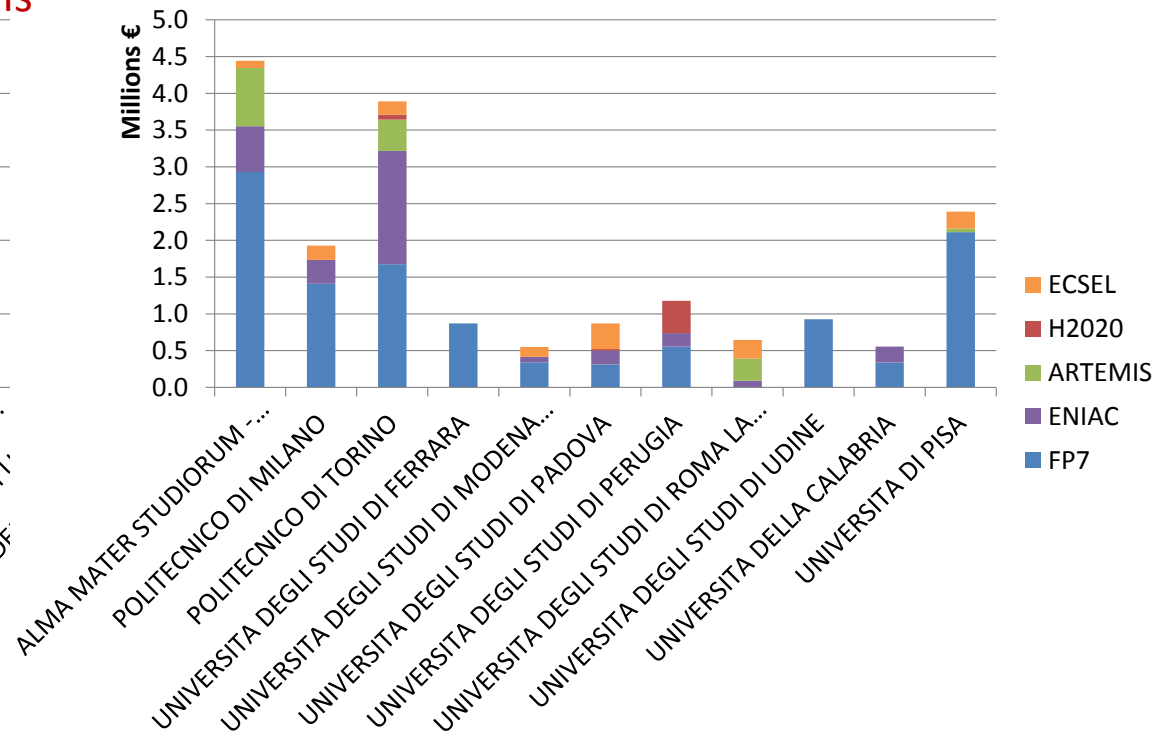
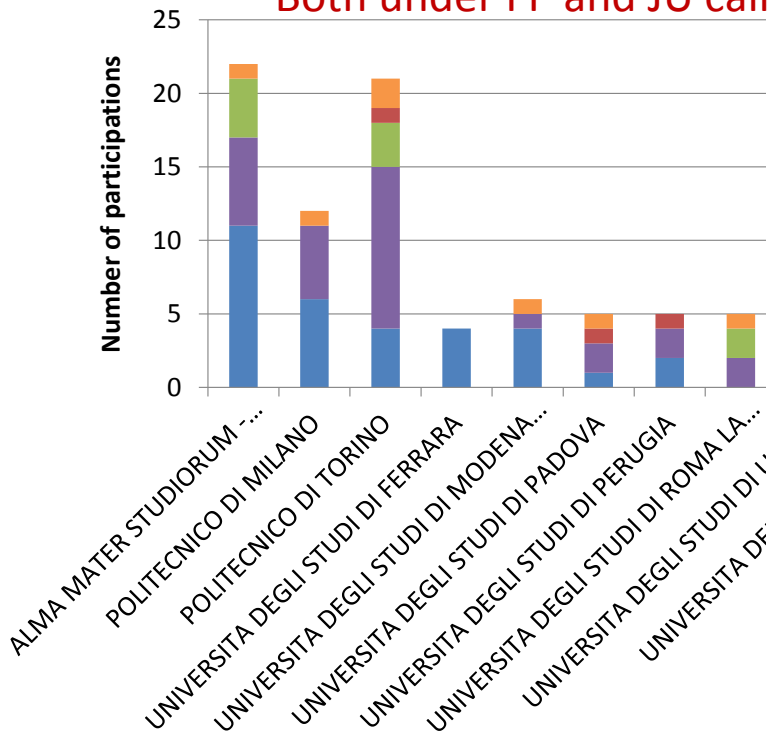
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- IC design, Nanoelectronics, Beyond CMOS & spintronics, RF & mm-wave devices, Power electronics, Semiconductor equipment & processes
- MNBS in vitro, MEMS, Packaging & heterogeneous integration, Electric vehicle, Clinical & healthcare platforms
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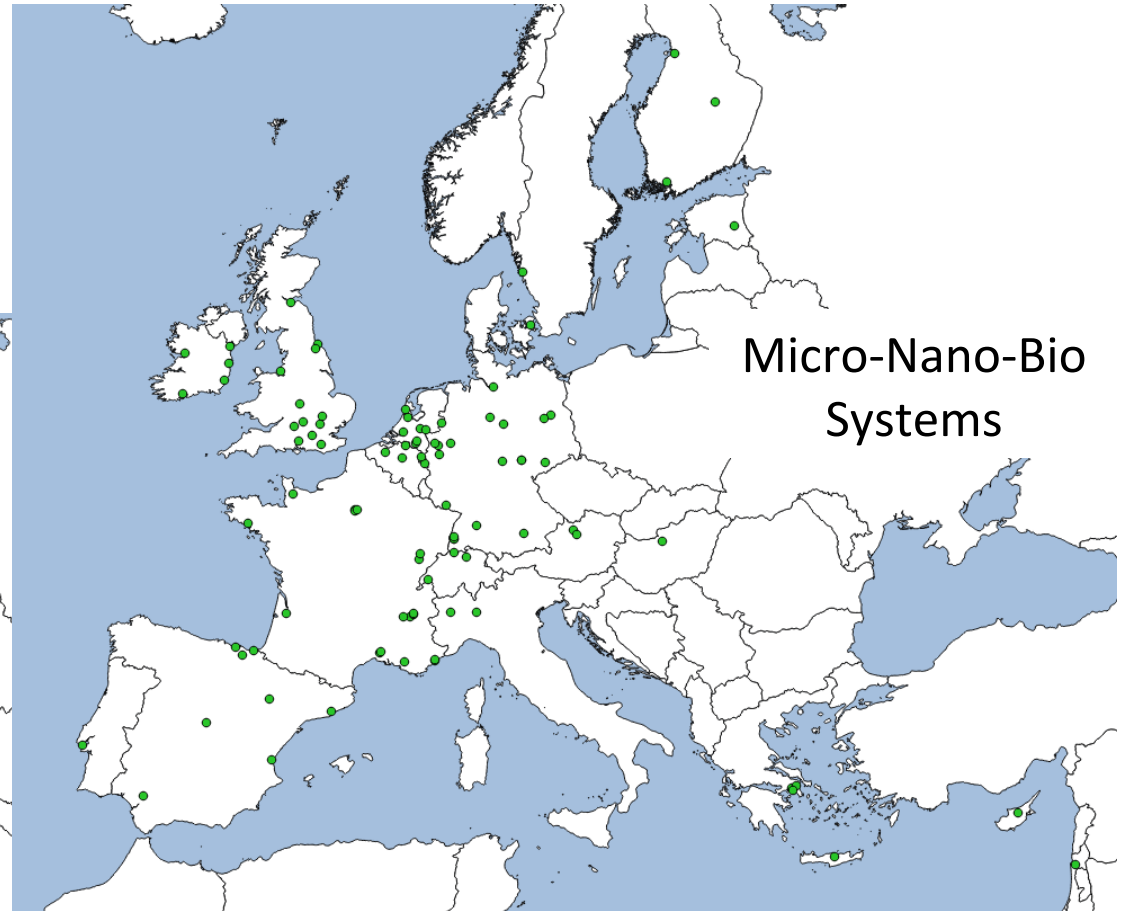


SMES AS PARTNERS IN PROJECTS

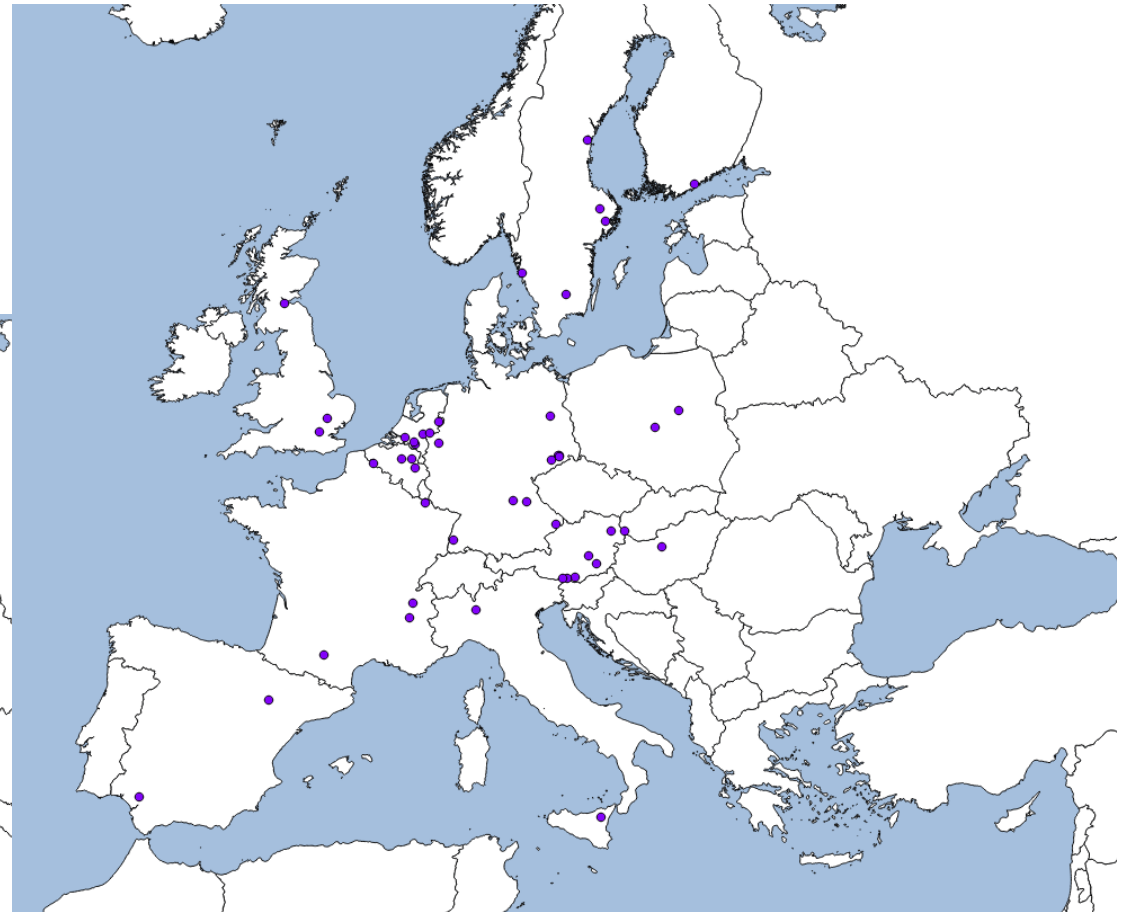
Nanoelectronics & IC design



Micro-Nano-Bio Systems



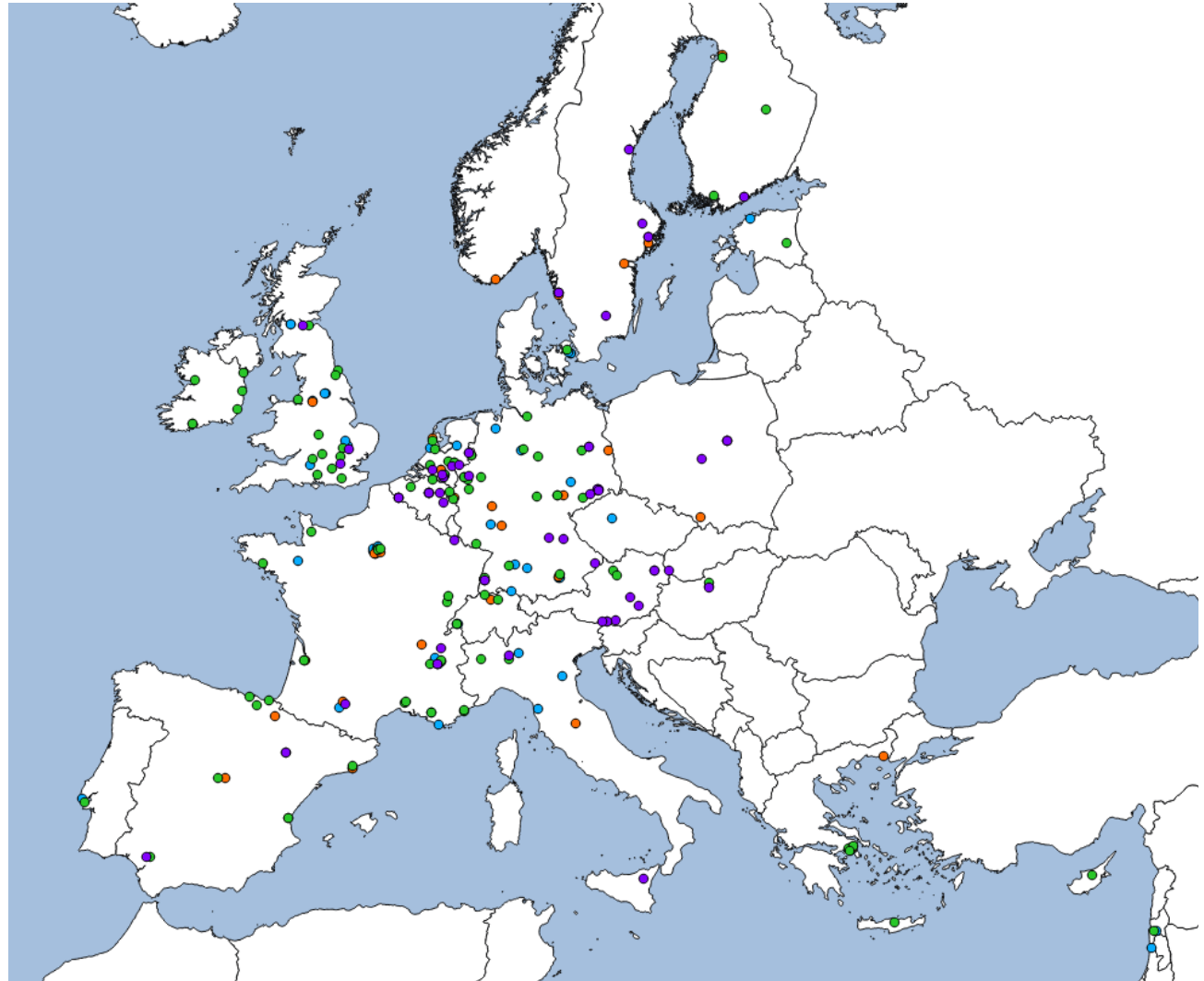
RF & mm-wave devices



Power electronics

SMEs from FP7 to now – 4 areas

- Per area
 - 60 to 135 SMEs
- Italy
 - 10 participations
 - 8 SMEs overall





SPECIFIC PORTFOLIO MAPPING

- From 2007 to 2015
- Focus on system integration
- 119 projects
 - CONNECT 2/3
 - RTD 1/4
 - JUs 8%
- 1365 participations

Patient-centred devices and imaging

- **Medical imaging**
- **On / in-body devices**
- **Wearable devices**
- **Neurological devices and imaging**

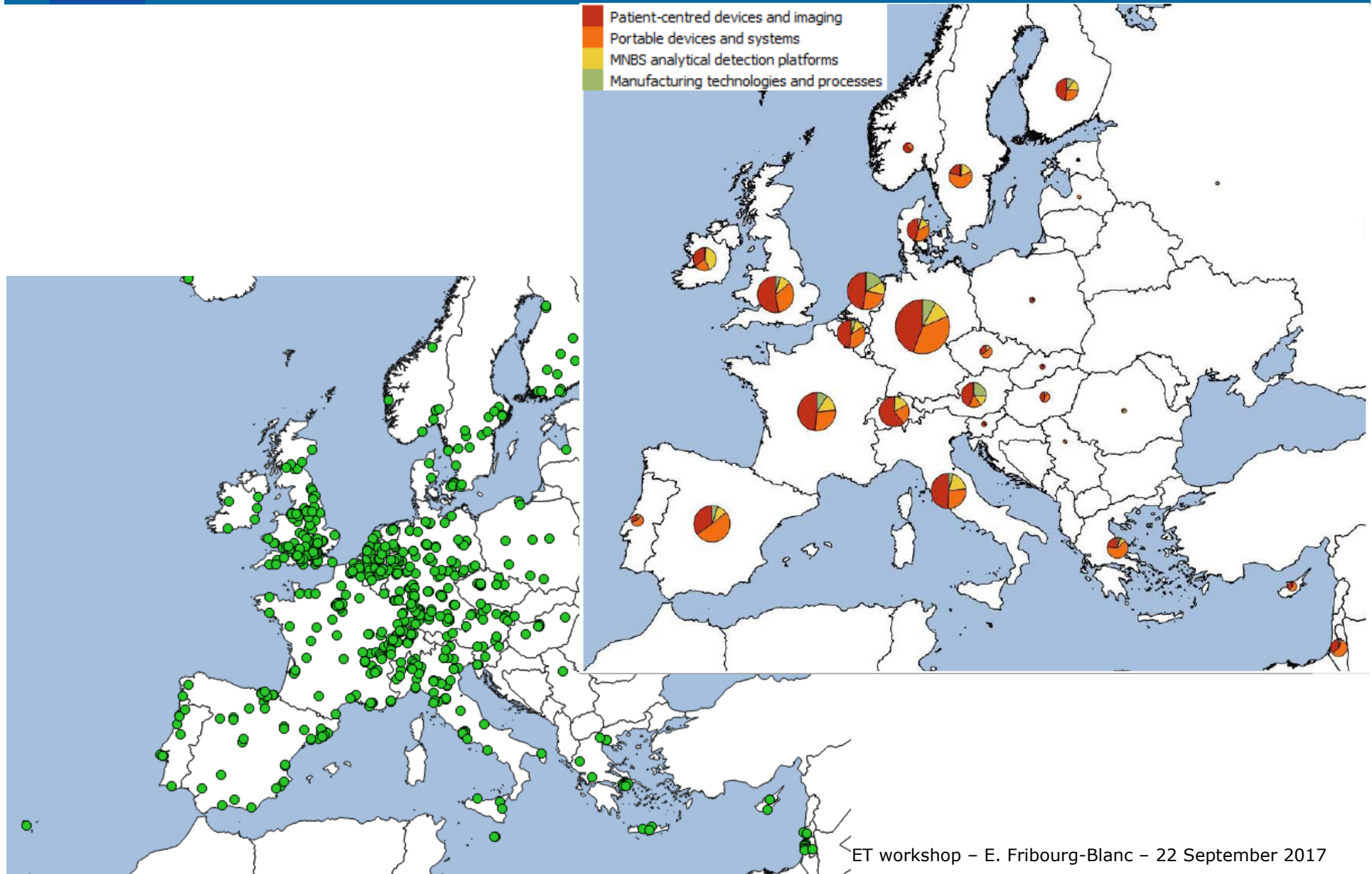
Portable devices and systems

- **Cell chips**
- **DNA detection chips**
- **Lab-on-Chip**
- **Point-of-Care systems**
- **Point-of-Need systems**

Analytical detection platforms

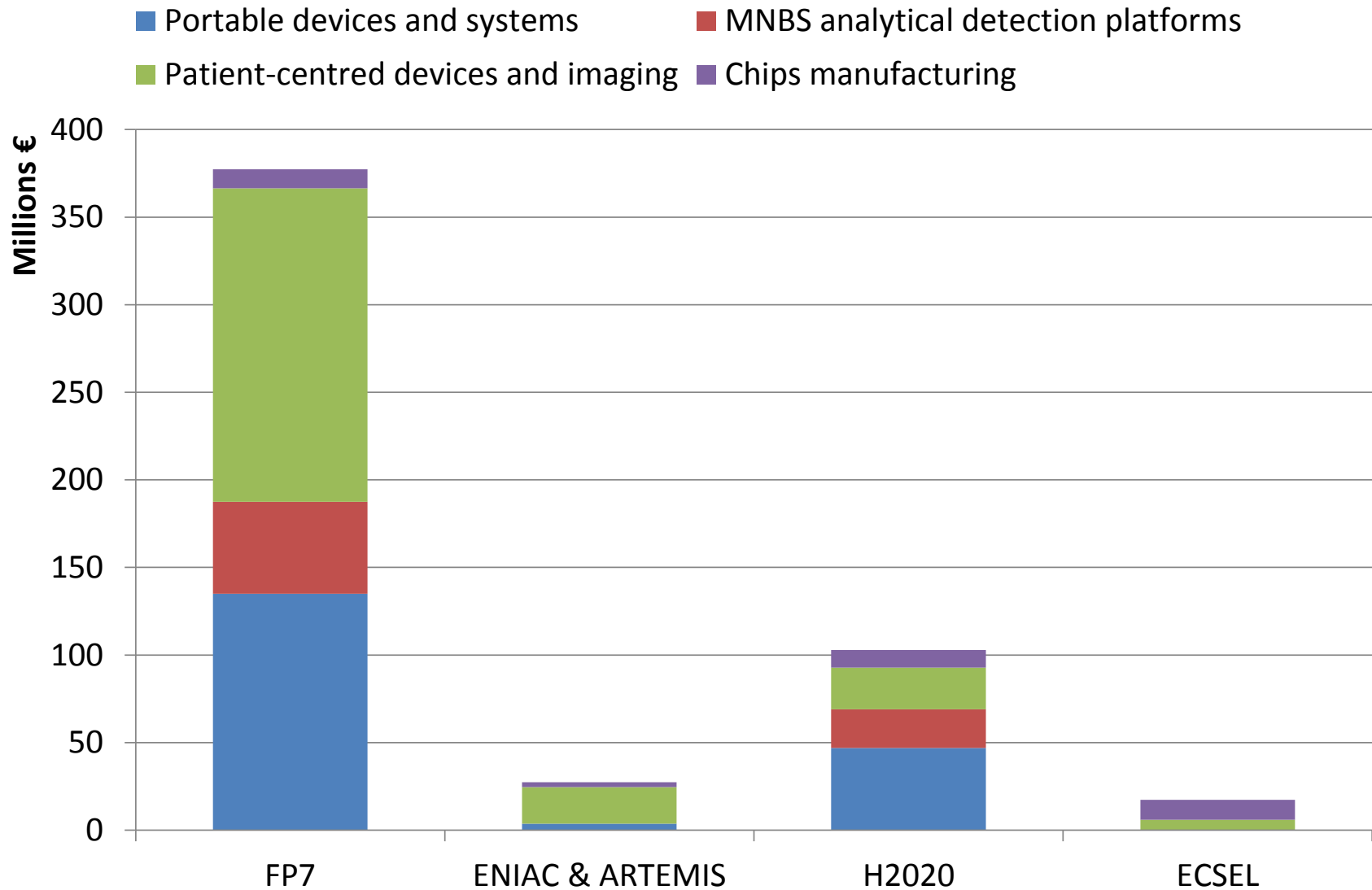
Manufacturing processes and technologies

Micro-Nano-Bio Systems projects – maps





MNBS – EU contribution





Horizon 2020 – Alternative computing

Excellence in Science

Leadership in Enabling and Industrial Technologies (LEIT)

Societal Challenges



European Research Council (ERC) grants

Marie Skłodowska-Curie grants

Future and Emerging Technologies collaborative projects

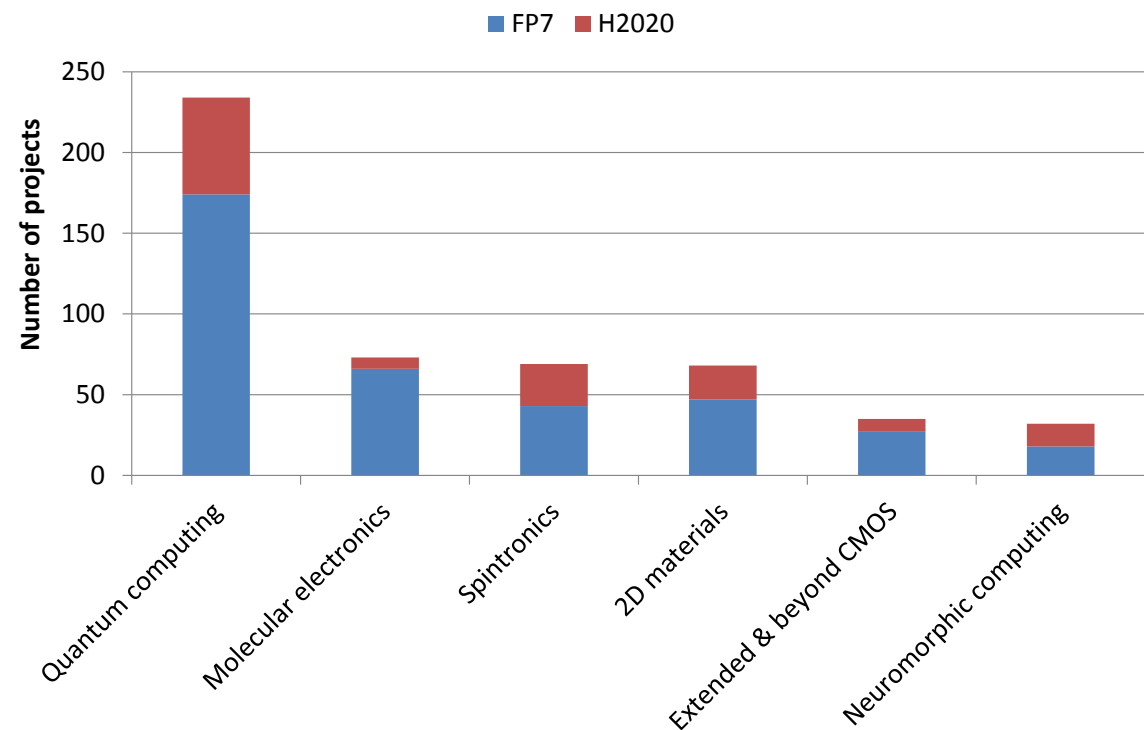
Electronic components

ENIAC/ECSEL Joint Undertaking

Computing beyond current nanoelectronics

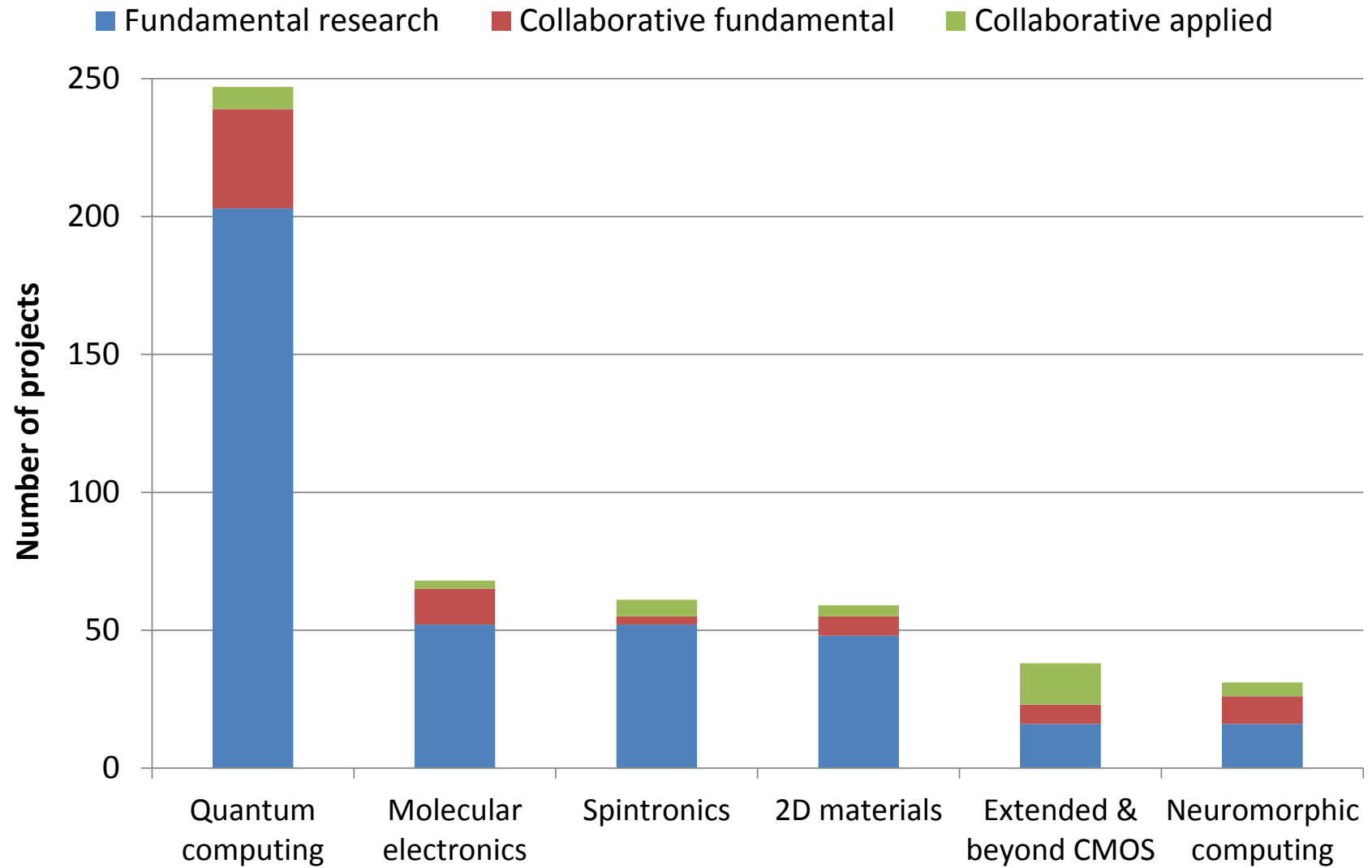
- 10 years of funding – 2007-2016
- Programmes FP7 and H2020
- 6 distinct areas emerge

- 511 projects
- About 1650 participations
- Total costs: 950 M€
- EU contribution: 800 M€



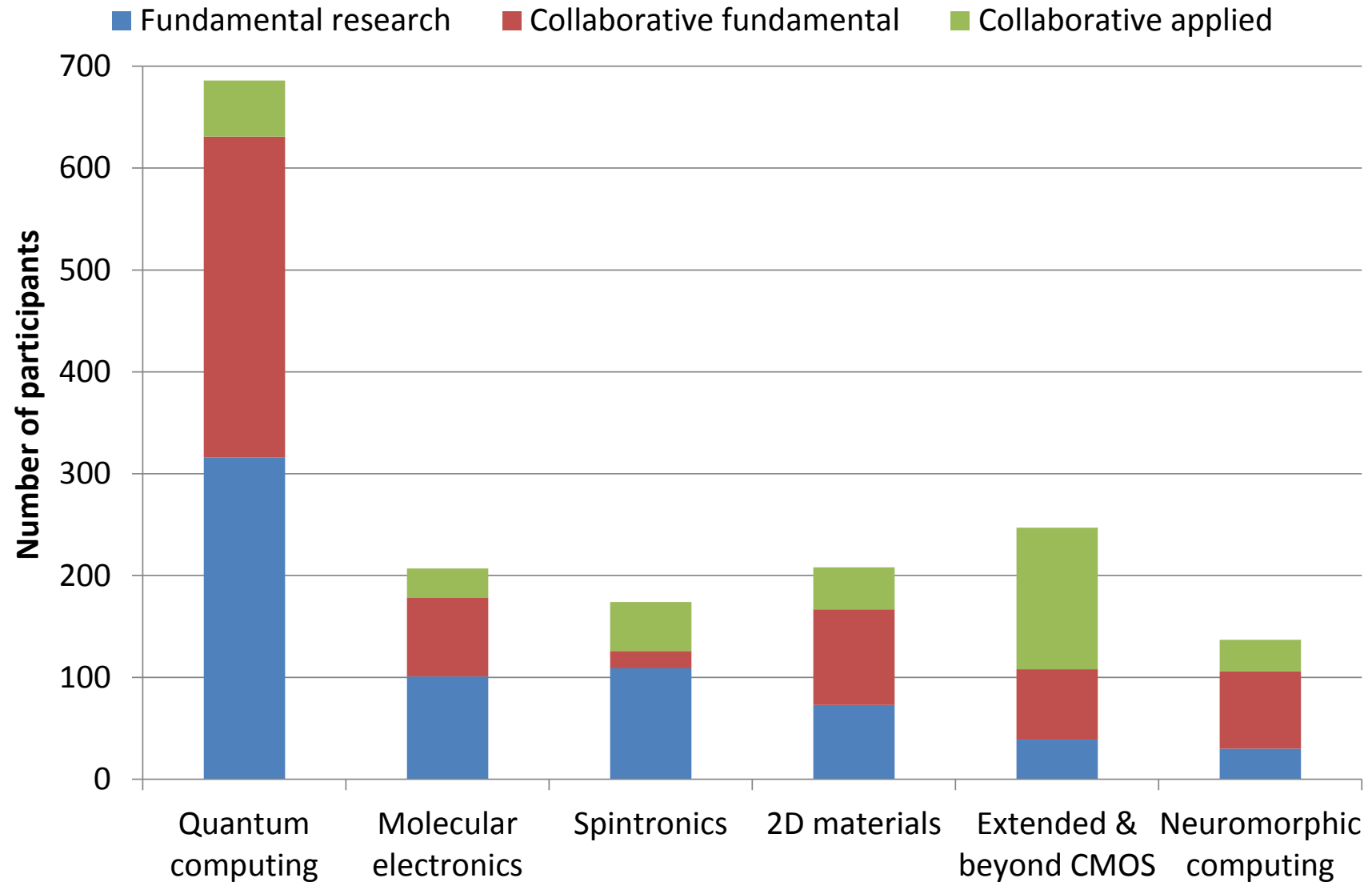
Category	Coverage
Quantum computing	Technologies to build qubits and transport information between them, including algorithmic and architecture
Molecular electronics	Solid-state information processing functions built on organic molecules including biomolecules; molecular spintronics
Spintronics	Spin-based electronics and related materials
2D materials	Carbon-based and transition metal dichalcogenides, as well as electronic and spintronic functions based on these
Extended & beyond CMOS	Non mainstream semiconductor transistors, including III-V materials, steep-slope devices, single electron transistors, etc.
Neuromorphic computing	Hardware implementation of neural networks, analogue and digital, architectures and applications

Types of projects



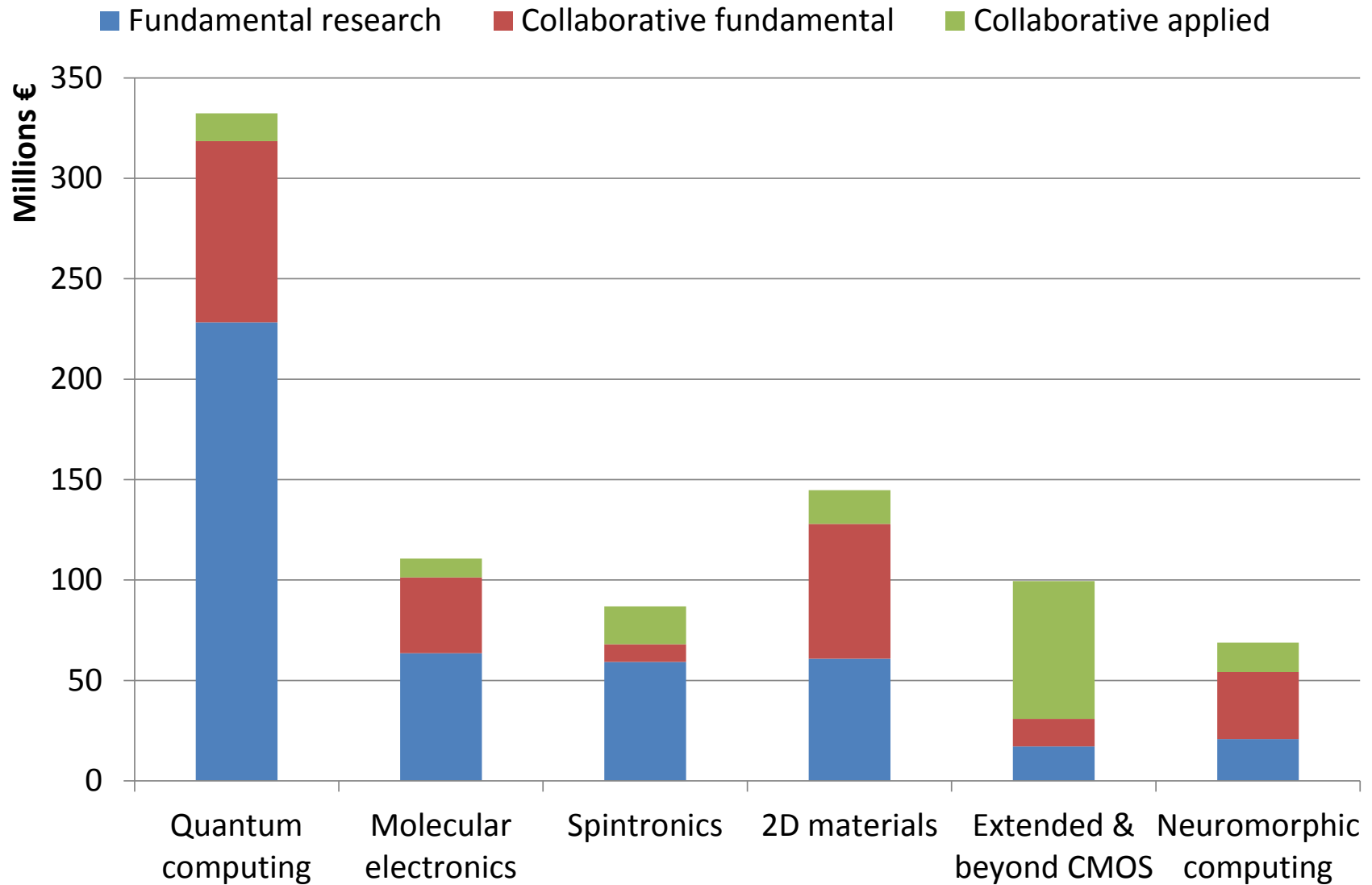


Participants

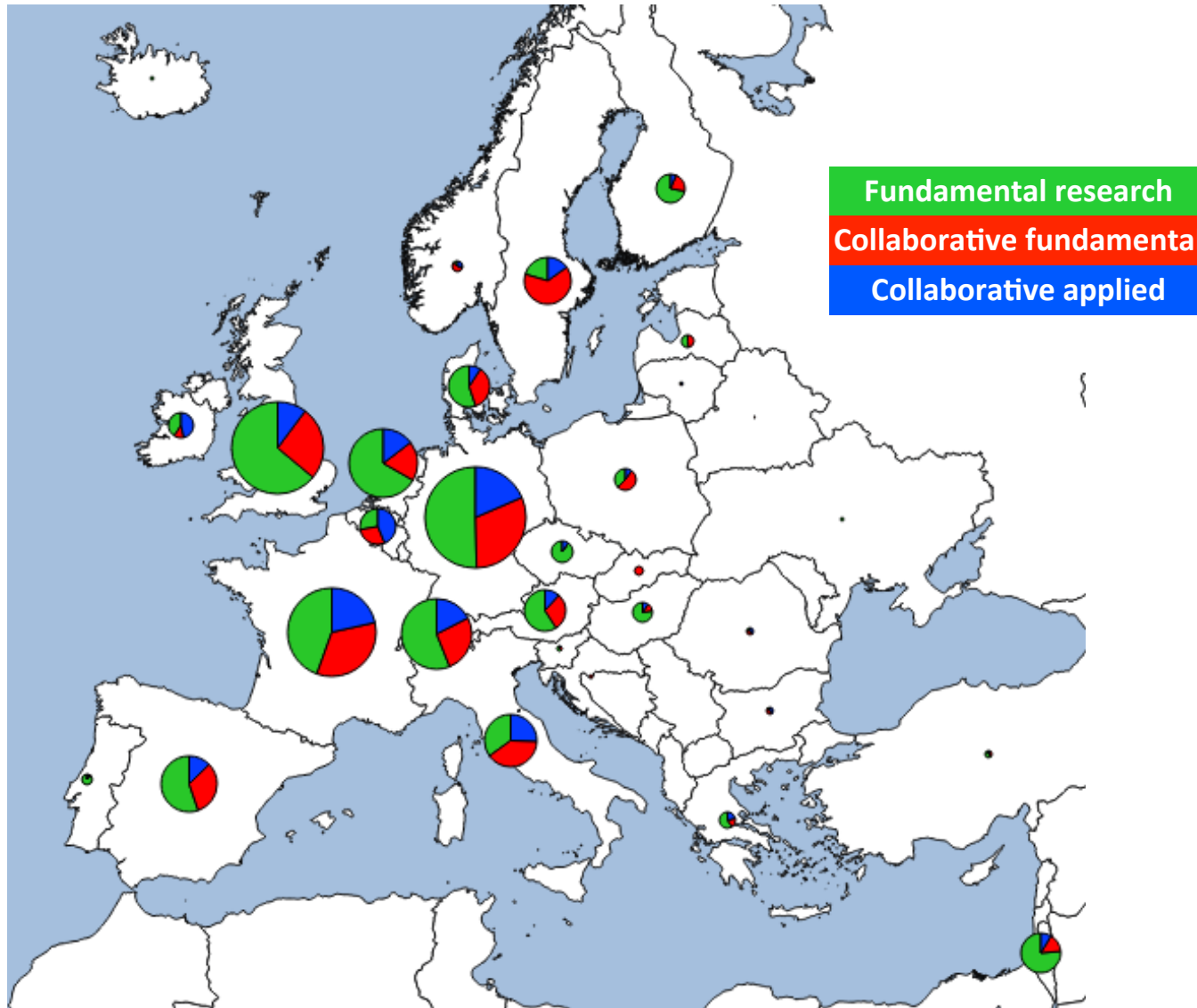




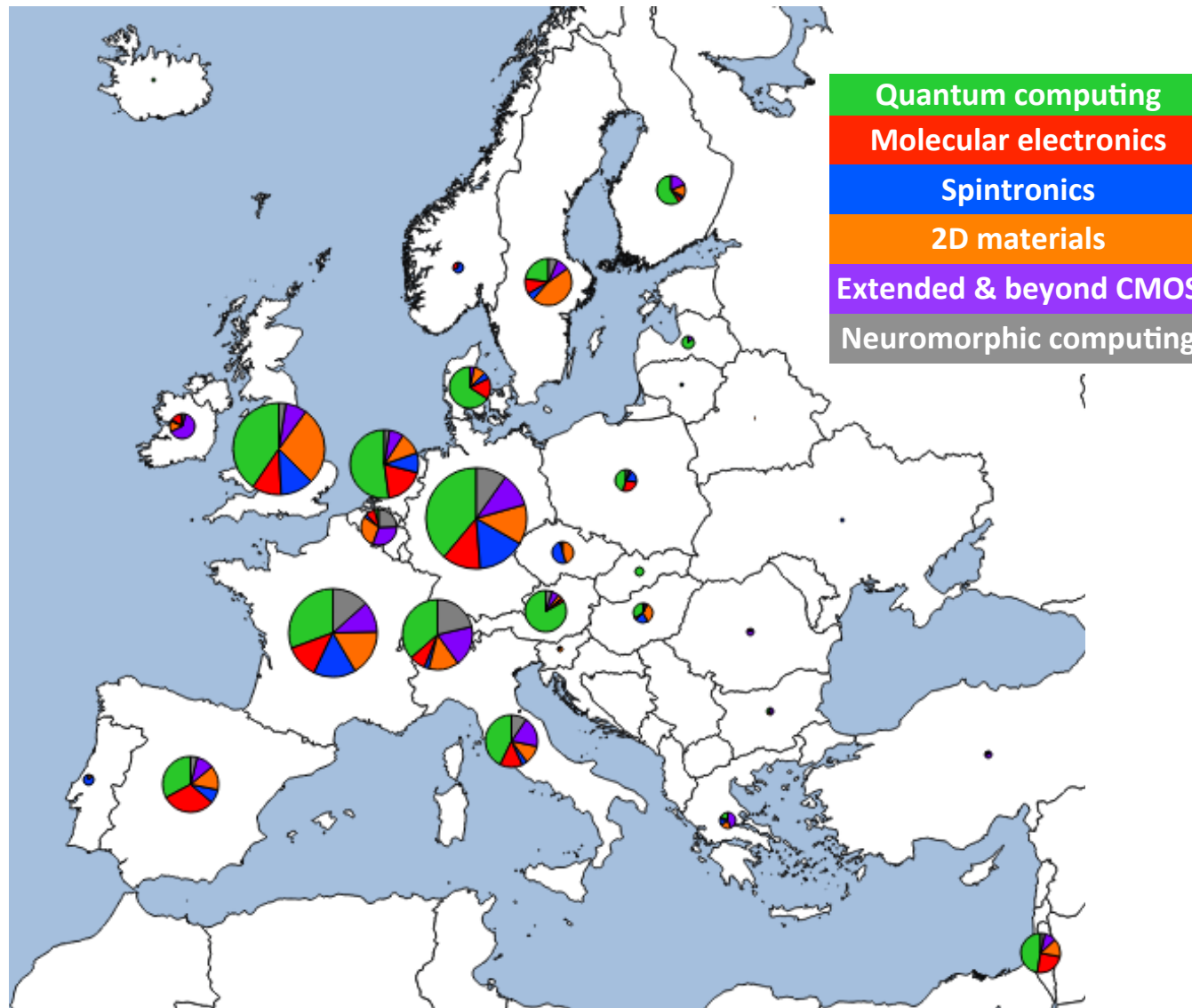
Funding



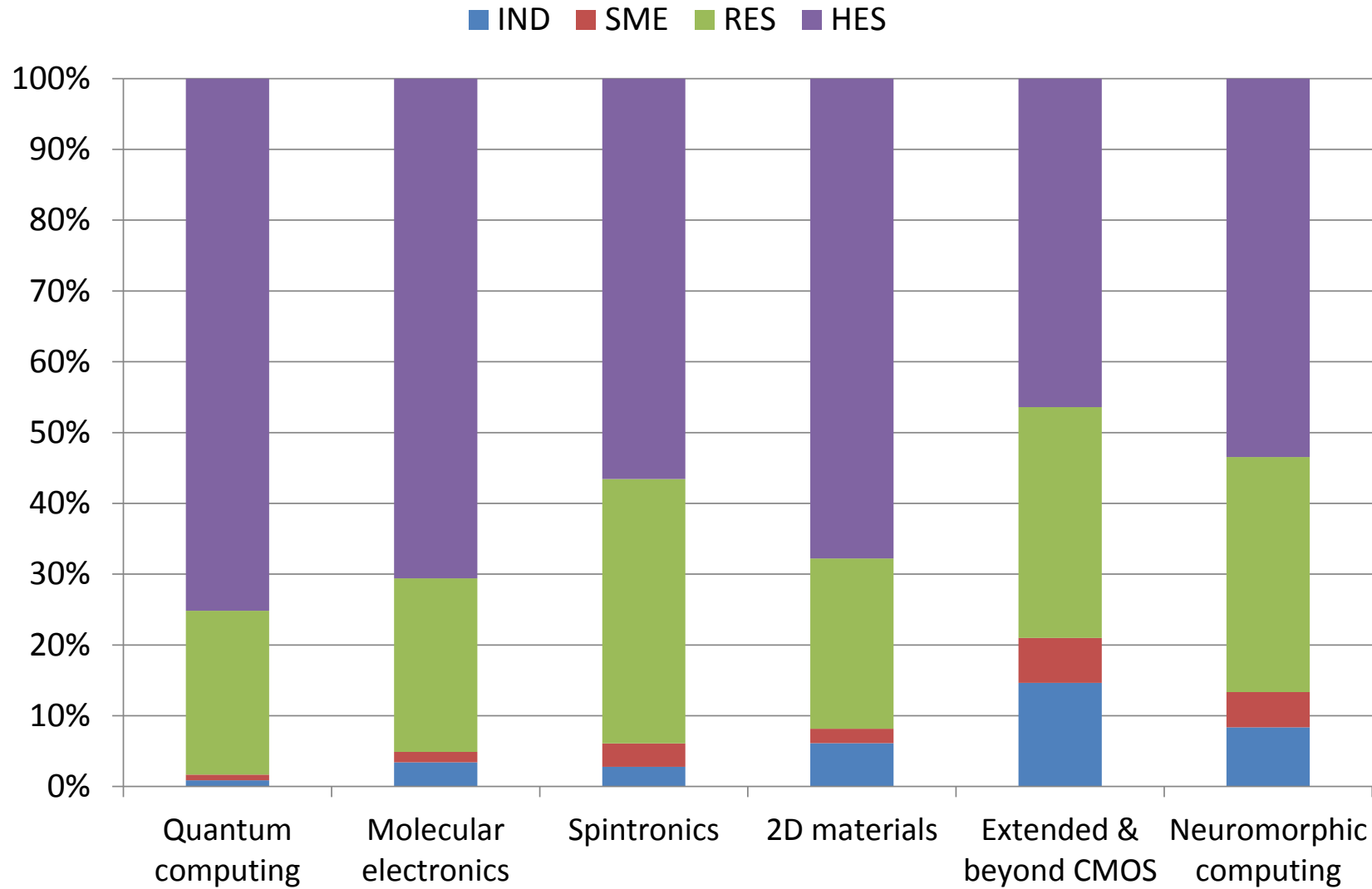
Where in Europe?



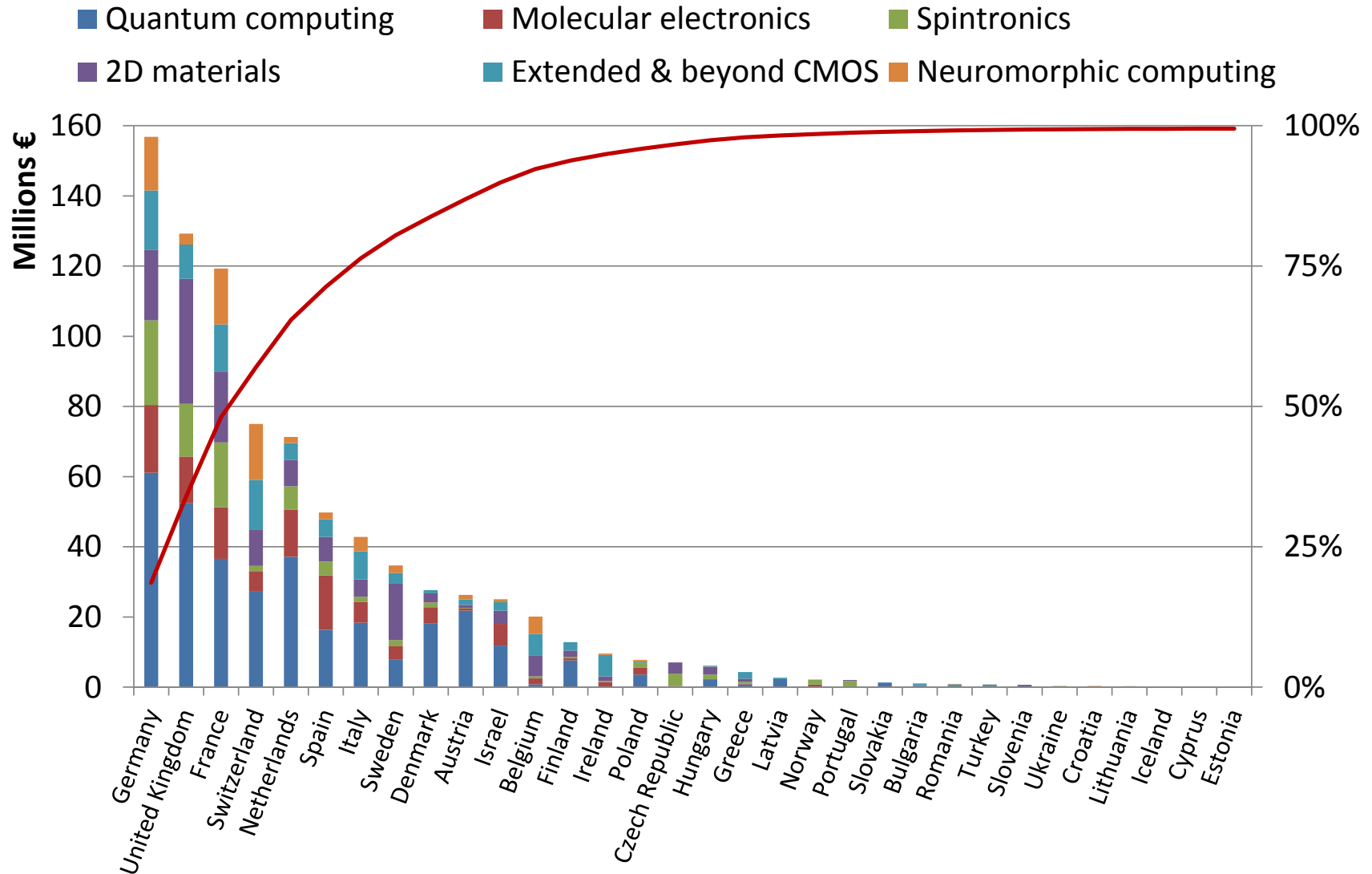
Where in Europe?



Types of participants



Country coverage



- Neuromorphic computing is probably the most mature contender to the current nanoelectronics as it relies mostly on
 - the existing CMOS technology
 - + an analogue synapse which still needs to be fully integrated
- Europe cannot afford to be late on the industrialisation of neuromorphic computing
- Coordination is needed to
 - Make sure the hardware technology roadblocks are tackled quickly
 - Stabilise and reach a consensus on an architecture efficient enough for real life challenges, in particular in IoT
 - And arrive at design kits for the industry and fabless communities

- Extended & beyond CMOS
 - Still limited interest in European industry
 - What are the prospects?
- Neuromorphic
 - Industrialisation has begun and first developments develop fast
 - Growing number of funded projects but still comparatively limited input from Human Brain Flagship, especially on hardware and concrete models for real world applications
 - Where is industry in Europe betting in this area?
- Quantum computing
 - Need focus (especially on integrated/solid-state approach)
 - A clearer roadmap to ensure the Flagship will deliver output for LEIT

- 2D materials
 - Still rather fundamental field
 - A number of experiments on 2D materials for electronics but a lot of technological hurdles
- Spintronics
 - No visibility on applications beyond MRAM
 - What are the hurdles? Materials? Foundry services? Design tools?
- Molecular electronics
 - What are the issues? Why are they blocking?
 - DNA-based computing is almost absent from EU-funded projects

TOWARDS FP9

EFFICIENCY

- ON TRACK TO BE MORE EFFICIENT THAN FP7



- Administrative expenditure below the 5% legal target
- Time-to-grant 110 days faster than FP7

- NETWORKS A WIDE RANGE OF STAKEHOLDERS



- Participants from over 130 countries
- 52% of participants are newcomers; more of them come from EU-13 (31.2%) than EU-15 (19.7%)

- LARGE-SCALE OVERSUBSCRIPTION



- Success rate only 11.6% (vs. 18.4% in FP7)
- ~EUR 1.7 billion spent to write unsuccessful proposals

TOWARDS FP9:

Key findings from the H2020 INTERIM EVALUATION

EFFECTIVENESS - ECONOMIC IMPACT

- PRODUCING INNOVATIONS & COMPETITIVENESS



- More **private sector participations** (33.2%) than FP7
- Funded projects ~40% more likely to be granted patents; patents are of **higher commercial value** than other peers
- 70% of SMEs aim at **new-to-market innovations**

- GENERATING JOBS, GROWTH & INVESTMENTS



- **Every euro invested** under Horizon 2020 brings an estimated GDP increase of **6 to 8.5 euros** (EUR 400 to EUR 600 billion by 2030)

- SUPPORTING & NETWORKING BUSINESS & SMEs



- 5,700 organisations funded under Access to Risk Finance
- EUR 13 billion **private funds leveraged**

Towards FP9 – Indicative timetable

2017	
Jan	Public stakeholder consultation for the interim evaluation (with some forward looking questions) closed on 15 January
May	Publication of the Staff Working Document on the Interim Evaluation (evaluation results based on legal base requirements & 5 mandatory evaluation criteria)
June	<ul style="list-style-type: none"> Assessment of Horizon 2020 implementation in view of its interim evaluation and the Framework Programme 9 proposal by the European Parliament (EP); ERAC Opinion on the interim evaluation of H2020 and in view of the preparations of the next FP
July	<ul style="list-style-type: none"> Publication of High Level Group report and stakeholder conference on Horizon 2020 Interim Evaluation (3 July) Informal Competitiveness Council, Tallinn
Q4	<ul style="list-style-type: none"> H2020 Work Programme 2018-2020 integrating main findings from the Interim Evaluation Publication of Commission Communication: <ul style="list-style-type: none"> Overall conclusions on the evaluation results; State of implementation of the FP7 ex-post HLEG recommendations; Response to High Level Group recommendations; Messages on Art. 185 and Art. 187 initiatives
2018	
Mid	<u>Next MFF Commission proposal</u>
	Commission proposal tabled for the next Framework Programme & accompanying Impact Assessment
2019	
	European Parliament elections, appointment of the new Commission
2021	
	Launch of the 9 th Framework Programme

PREPARING FOR THE FUTURE OF ELECTRONIC COMPONENTS AND SYSTEMS



Strategy on electronics – Preparing for the future

- Workshop on 27 April 2017
- 26 participants from industry and research community
- Objectives
 1. facilitating the update of the European Strategy for the Electronics industry and of ECSEL,
 2. widening the involvement and commitment in strategic partnerships with actors along the value chain with the overarching goal of arriving at a safe supply of secure and energy efficient electronic components and systems in Europe.
- Main messages
 - The international context has changed very fast in the past few years
 - There is a need to renew a dialogue with the industry in a form similar to the ELG
 - To address sovereignty issues, the mechanism of certification could be used
 - The investments made by the RTOs is necessary to keep the innovation ecosystem sustainable
 - Essential technologies: Europe needs to ensure the strategic developments of technologies and this goes beyond the support through existing instruments but should also be addressed under ECSEL
 - Digital Innovation Hubs are actions to continue for supporting access to digital technologies for SMEs



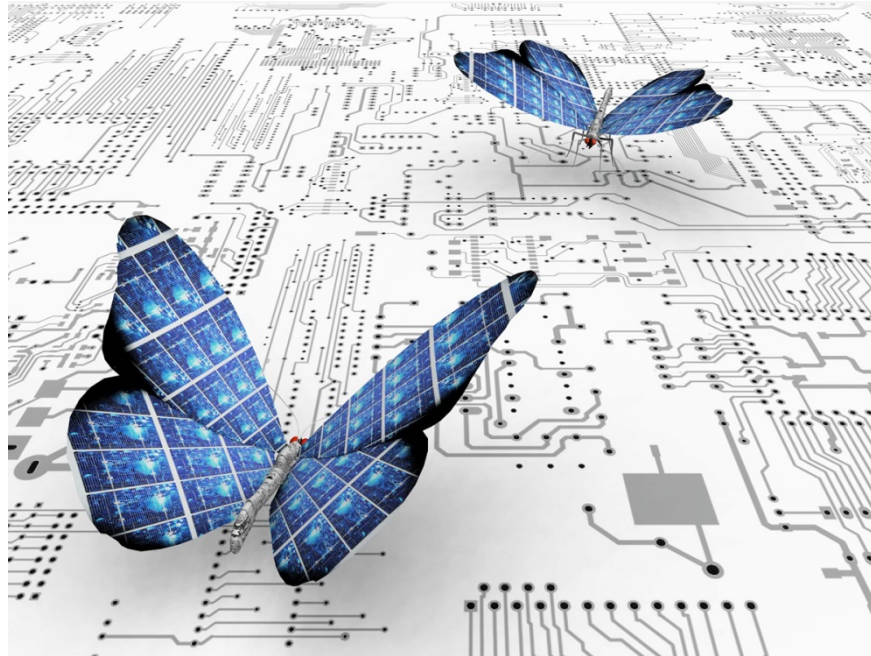
European Forum for Electronic Components and Systems



- Co-organised event to bring high added-value and raise it to encompass the relevant value chains
- Dates: 5-7 December 2017
- Location: Brussels
- The Commission will take this opportunity to propose an event with Commissioner Gabriel (invitation based) to
 - Ensure awareness on the strategic value of the sector
 - Discuss the possible follow-up on the IPCEI
 - Launch the next steps of the strategy on electronics

- ECSEL well positioned in the Lamy report
 - Open, transparent
 - Focused (non-redundant instrument)
- General objectives for the follow-up ECSEL
 - Keep its tripartite structure with an objective to improve it through
 - Harmonisation of the funding rates and of the eligibility criteria;
 - Improved transparency in funding and unified reporting mechanisms;
 - Multiannual financial commitments by the Participating States;
 - Operationalising Article 17.1 (entrusting the JU directly with the payment of the national contributions)
 - Better focus on the strategic ambitions of the JU to become a central instrument supporting the European policies on electronics, HPC, cybersecurity, AI, etc.
- Consultations with Member States and Industry Associations involved in ECSEL will start quickly

Thank You



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DG CONNECT (Communications Networks, Content and Technology):

http://ec.europa.eu/dgs/connect/index_en.htm

Horizon 2020 on the web:

http://ec.europa.eu/research/horizon2020/index_en.cfm