ECSEL-IT 2019
Bologna, March 12th 2019

ECSEL Projects: regional engagement

Enrico Sangiorgi

ECSEL IA Projects with the contribution of the Emilia Romagna Region

Reaction – ECSEL IA 2017

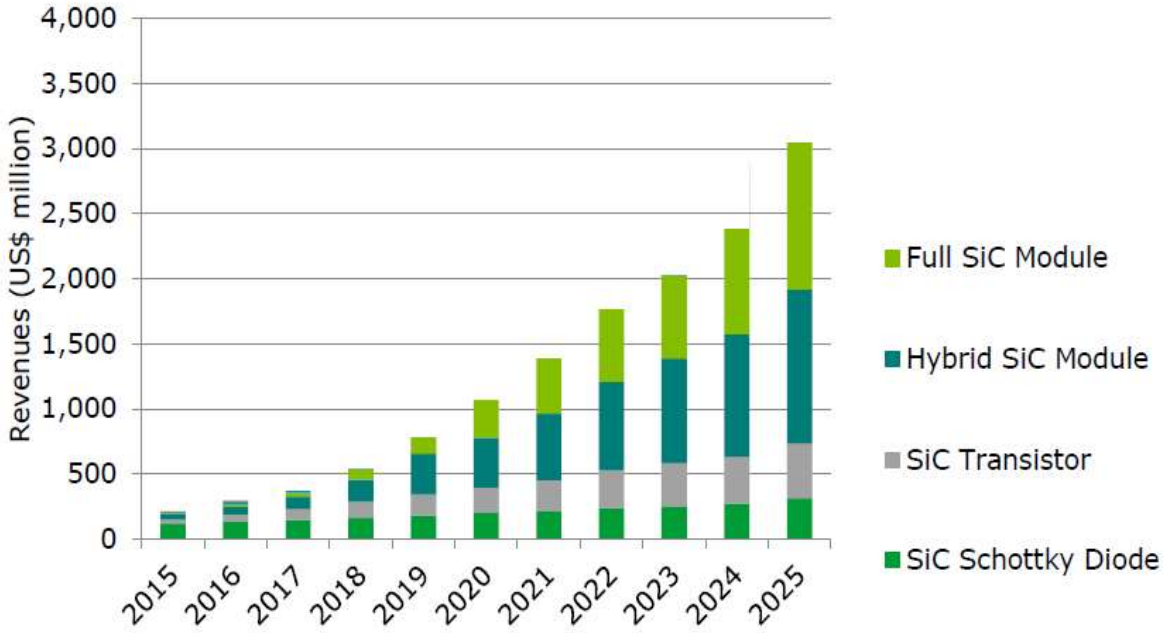
Arrowhead Tools – ECSEL IA 2018

Reaction – ECSEL IA 2017

Objective: First Worldwide 8” SiC Pilot Line Facility for Power Technology

- Start date: 1st November 2018
- Duration 42 Months
- Coordinator: ST (Angelo Alberto Messina)
- 27 Partners
- Cost: 48,7 MEUR
- Maximum EU Funding: 10.9 MEUR

SiC power semiconductors by device type



Note: SiC transistors include SiC MOSFETs, SiC JFETs and SiC Bipolar Junction

Market projection of SiC devices and modules

Partners

- 27 in total
- 6 from Italy
  - ST, LPE, CNR, UNIPA, TerniEnergia, IUNET (UNIBO,UNIPD,UNIMORE,UNICAL,UNIPI),
- 4 Germany (among which Applied Materials)
- 1 France (LAM Research)
- 3 LARGE COMPANIES (ST, AMAT, LAM
- 8 RTO and Universities (including IUNET)

- 3800+ Person-months (~100 full time staff for the whole project duration)

Detailed objectives

- First WW 200 mm SiC advanced manufacturing facility leveraging **all actors of the value chain**
- Improvement in productivity, competitiveness, affordability of next gen SiC devices and system solutions starting from 6'' substrates and moving towards 8'' substrates.

Dev. of 8'' SiC substrate	Dev. of 8'' SiC equipment	Drive the strategic decision on a 8'' full size production line for SiC power devices	Final user demonstrators in the field of Smart Energy and mobility.

Target devices

Diodes and P-MOSFET from 650 V to 1.7 KV with possible extension to 3.3 KV

- Critical areas:
  - Doping and dopants activation
  - Gate formation
  - Trench SiC MOSFET

Key Applications (and demonstrators)

Smart Energy: Bidirectional inverters for photovoltaic and wind energy generation

Smart Mobility: motor drives, DC-DC converters and battery charging systems for electric cars.

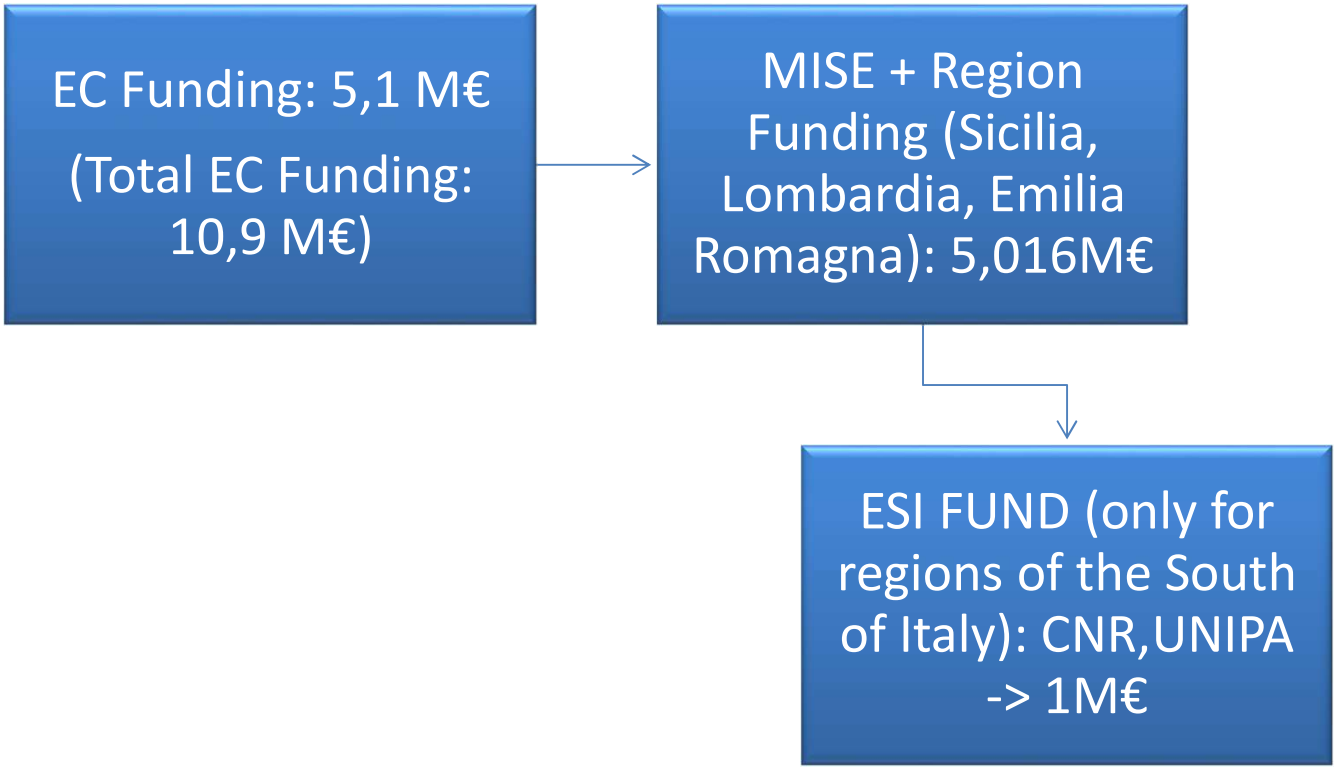
Smart Production: Automation and process control

Aligned with **Industry 4.0 policies** in Italy and in major European countries

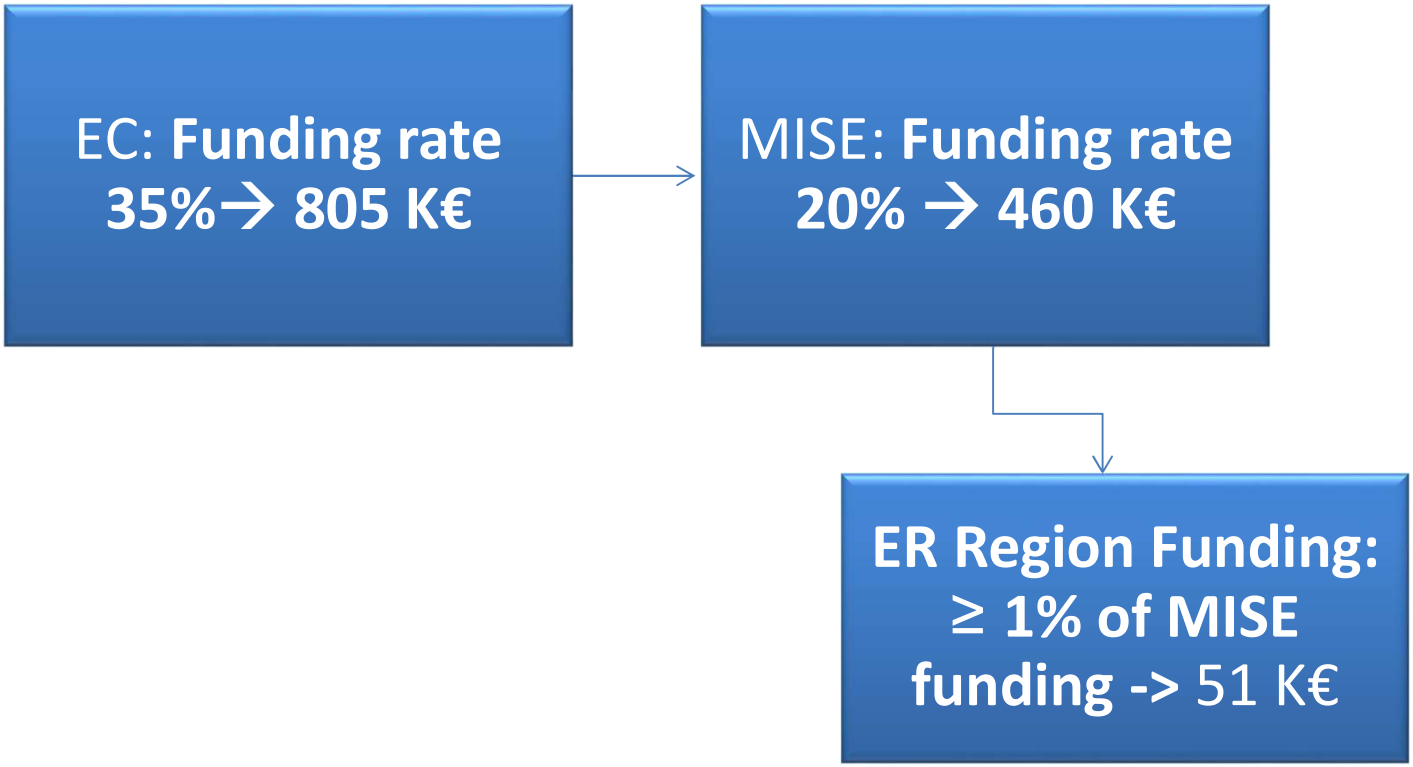
Roles of Italian Partners

- ST: Coordinator and Main Actor
- LPE: Epitaxy reactor development
- TerniEnergia: End user for Smart Energy applications
- IUNET [UNIPD,UNIBO,UNIMORE,UNICAL,UNIPI]
  - Characterization of available devices (DC, pulsed I-V, noise)
  - Reliability modeling, materials and defects modeling
  - Design of functional blocks with SiC devices (for benchmarking with Si, GaN)
- UNIPA: Characterization and modeling of EMI and partial discharge (devices/modules)
- CNR:Morphology characterization with AFM, stress characterization

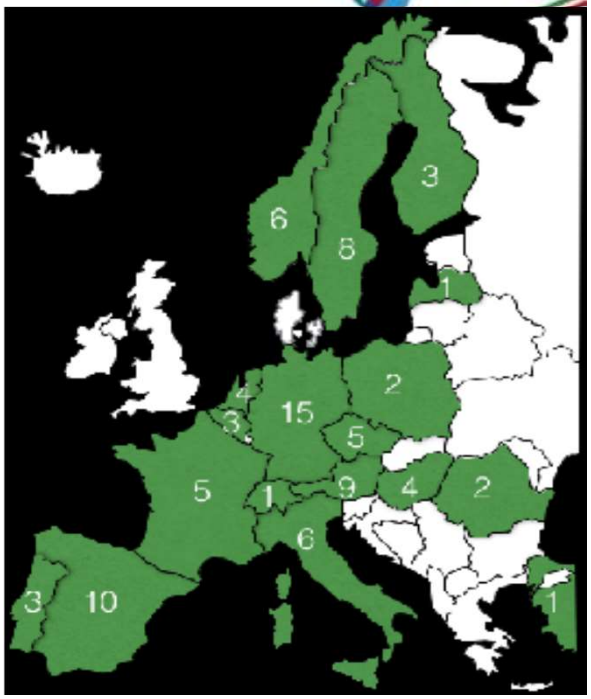
Budget and Resources: Italian Partners



Budget and Resources: IUNET



Arrowhead Tools



ECSEL INNOVATION ACTION 2018 CALL

Automation and Digitalisation Engineering project

Largest in Europe

18 countries

82 partners + 7 linked third parties

97 M€ budget

Duration 2019-2022 (kick off: May 14-16 Goteborg)

Coordinator: Prof. Jerker Delsing,

Lulea University of Technology

.Partners

Main partners (European Consortium):

- Philips, Volvo, ABB, Bosch, ST-Italia, ST-France, Infineon, Infineon Austria, SINTEF, VTT, LTU, TU/E

Partners of the Italian Consortium:

- ST-I, EUROTECH, REPLY, POLITO, **IUNET**
  - **IUNET** linked third parties:
    - UNIMORE (Regione Emilia Romagna)
    - UNIBO (Regione Emilia Romagna)
    - Politecnico di Milano
    - Università di Pisa

Target of this Innovation Action (Focus)

- Cutting the engineering effort and increase the performance level of IoT based applications
- Approach:
  - Integrating new technologies within the Tool Chain of the *Arrowhead Tools* Interoperability Framework.
- Italian Partnership contribution:
  - **Requirements, KPIs, Tools**
  - **Demonstrators in the following domains:**
    - **Energy**
    - **Smart City**

.Italian partnership main focus

Use Case:

- SoS engineering of IoT edge devices

Specific Topics:

- Design of piezoelectric MEMS (sensors/actuators/resonators)
- Extending RISC-V architecture with vector processing capabilities
- Unobtrusive load signature analysis from single energy consumption trace
- Energy harvesting, sensor integration, data fusion and distributed reasoning in Arrowhead Tools based energy optimization applications
- Integration of the Arrowhead Framework with W3C Web of Things
- Deep learning based tracking (people in smart ity applications)
- Vibrations monitoring and anomaly detection in structures (e.g. bridges)

.Sources for the italian partne

ITA:
Funding Rate:
(RI 50% - SS 25%)
→ 7 Millions

EC:
Funding Rate:
LE 20% - RTO 35%
→ 5 Millions €

Regions
(Emilia Romagna, Lombardia, Piemonte, Regioni Autonome Friuli Venezia Giulia e Sicilia)
Up to 10% of MISE funding

MISE
→ 5 Millions €

ESI FUNDING
(only for South of Italy):
ST-I **-> based on 1.7 M€ cost**

.Sources for IUNET

ITA:
Funding Rate:
(RI 50% - SS 25%)
Up to 1 Million €

EC:
Funding Rate:
35%
Up to 1 Million €

MISE
→ 0,9 Millions €

Emilia Romagna Region
Up to 10% of MISE funding

.TIMELINE

- 25/04/2019: deadline for the signature of the grant agreement by the consortium
- 23/05/2019: latest possible date for having the contract fully signed
- Prefinancing by the JU: 53,33% less 5% of guarantee fund
- National Contract and national prefinancing follows