Current collaborations between ICOS partners and Japan

Francis Balestra
GINP-CNRS & SiNANO Institute

Aim of the Workshop

This Workshop will allow to present:

- EU and International strategies

- International Roadmaps, activities and challenges dedicated to future important semiconductor technologies for many applications

- Main challenges for sustainable electronics to be taken into account in future international collaboration, IRDS roadmap and EIC challenges

- Possible supports and involvement in these areas of startups, also targeted in the Chips Act

- First analysis of the possible gaps between EU activities and most promising technologies highlighted in Roadmaps for developing international cooperation on topics of mutual interest

-Rapporteurs nominated for the main discussions and conclusions to be used in future ICOS studies

ICOS CSA

- ICOS Project started in January 2023 for three years, it is funded by the **Horizon Europe** research program.

- **Coordinator**

Technical co-Coordinator

- An ambitious project in the framework of the European strategy for semiconductors

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Context

Semiconductors & Semiconductor-based photonics are pivotal technologies for almost all existing industrial sectors, as demonstrated by the recent chips shortages.

In particular, semiconductors essential enablers for **digital and green transitions** and for SDGs.

Objectives

- **International cooperation** is key for speeding up technological innovation (e.g. ITRS/IRDS, IPSR-I/Optica)
- To build **balanced semiconductor partnerships** with like-minded countries
- To set out cooperative framework on *initiatives of mutual interest*
- To identify and support the establishment of the **most promising scientific international collaborations**
- To support the growth of the European Semiconductor industry through **focused research alliances** based on awareness of advanced research activities

Collaborations with The University of Tokyo

- **UCL/ SINANO**

- Systems Design Lab : Design of millimeter wave circuits on an FD SOI technology

- **VTT**

- Optical modulators based on semiconductor PIN structures in thick-SOI waveguides.
- Institute of Industrial Science / Laboratory for Integrated Micro-Mechatronics Systems: Phononics
- IIS : THz detectors

- **Forschungszentrum Jülich/ SINANO**

- Low power devices, Si-Ge-Sn nanoelectronics and photonics, nanowire transistors, tunnel FETs, neuromorphic devices

Collaborations with The University of Tokyo

- **University of Udine/ IUNET**

-Electronic transport in semiconductors, ferroelectric devices.

- **CNRS**

-Institute of Industrial Science : International Research Laboratory Limms (Laboratory for Integrated Micro Mechatronics Systems)

- **ICN2/ SINANO**

-Phonon engineering in precisely assembled atomically thin layers

Collaborations with Tokyo Tech

- **RWTH Aachen/ SINANO**

  - General agreement, including Mechanical Science and Robotics

- **TYNDALL**

  - Ferroelectric materials

- **TU Delft**

  - Qubit technology

Collaborations with Kobe University

- **WUT Warsaw University of Technology**

- Nanophotonics, Group-IV-semiconductor nanocomposites : From single nanoobjects to functional ensembles

- **Forschungszentrum Jülich/ SINANO**

- GeSn Nanowire devices for energy saving and harvesting

- **RWTH/ SINANO**

- GeSn Nanowire devices for energy saving and harvesting

Collaboration with Tsukuba University

- **CNRS**

- InternationalResearch Laboratory J-FAST (Japanese-French laboratory for semiconductor physics and technology)

Collaboration with Nagoya University

- **Forschungszentrum Jülich / SINANO**

- GeSn materials and devices

Collaboration with Kyushu University

- **Forschungszentrum Jülich / SINANO**

- GeSn materials and devices

Collaboration with Okayama University

- **TYNDALL**

- Microelectronics, Teraherz spectroscopy

Collaboration with Kwansei Gakuin University

- **Forschungszentrum Jülich/ SINANO**

- GeSn Nanowire devices for energy saving and harvesting

- **RWTH/ SINANO**

- GeSn Nanowire devices for energy saving and harvesting

Collaboration with Gifu University

- **TYNDALL**

- Optical spectroscopy

Collaborations with Tohoku University

- **TYNDALL**

- Magnetics

- **Fraunhofer EMFT**

- 3D IC Integration

- **Fraunhofer ENAS**

- MEMS/NEMS

Collaboration with Taiyo Yuden

- **TYNDALL**

- Magnetics

Collaboration with Kindai University

- **TYNDALL**

- Surface modified metal oxides

Collaboration with Riken

- **CEA-LETI**

- More than 60 researchers working together on AI, high performance computing …

Collaboration with Kyoto University

- **Fraunhofer IMS / ISIT**

- PCSEL CSPAD LiDAR

Collaboration with Tokyo Metropolitan University

- **Fraunhofer IISB**

- SiC devices

Collaboration with Fujitsu

- **TU Delft**

- Quantum computing chip

Collaboration with Sony :

- **TU Delft**

- Wireless communication

Collaboration with the Japan Institute of Science and Technology

- **TU Delft**

-Printed electronics

Collaboration with the International Institute of Advanced Industrial Science and Technology (AIST)

- **Fraunhofer**

- memorandum of understanding (MoU) on comprehensive research cooperation

Collaboration with the Cabinet Office of the Japanese Governement:

- **VDI/VDE via Federal Ministry of Education and Research**

- Connected and Automated Driving

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