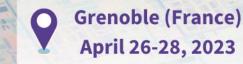


WORKSHOP – Sustainable Electronics & International Cooperation On Semiconductors



Current collaborations between ICOS partners and Japan

Francis Balestra GINP-CNRS & SiNANO Institute



WORKSHOP - Sustainable Electronics & International Cooperation On Semiconductors Francis Balestra - ICOS Coordinator



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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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.





- 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



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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



THANK YOU







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