



**chist-era**



# CHIST-ERA Projects Seminar 2023

## *Nano-Opto-Electro-Mechanical Systems (NOEMS) for ICT*

***April 05, 2023***



Programme co-funded by the  
EUROPEAN UNION



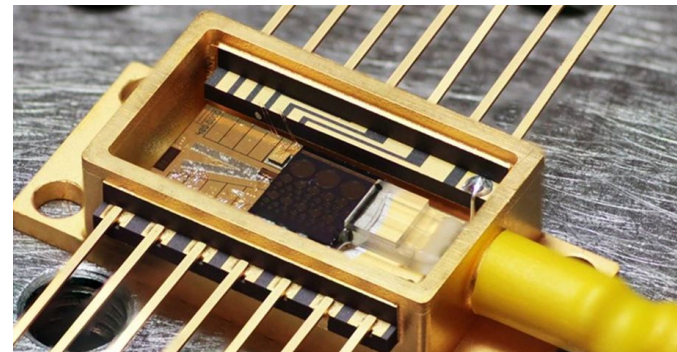
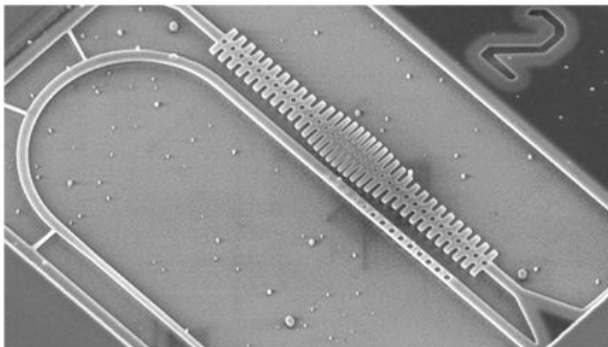
## **Nano-Opto-Electro-Mechanical Systems for ICT (NOEMS)**

- ❖ HetPIL: Heterogeneously integrated piezo-electro-mechanical lasers for LiDAR and 6G cellular networks
- ❖ META-LIFI: MEMS-metasurface Based Tunable Optical Vortex Lasers for smart free - space communication
- ❖ MUSICIAN: MULTifunctional SiliCon Integrated NOEMS for broadband Access Networks
- ❖ NOEMIA: Nano-Opto-Electro-Mechanical Integrated Oscillator Arrays for Energy-Efficient Physical Reservoir Computing
- ❖ SNOW: Wearable Nano-Opto-electro-mechanic Systems

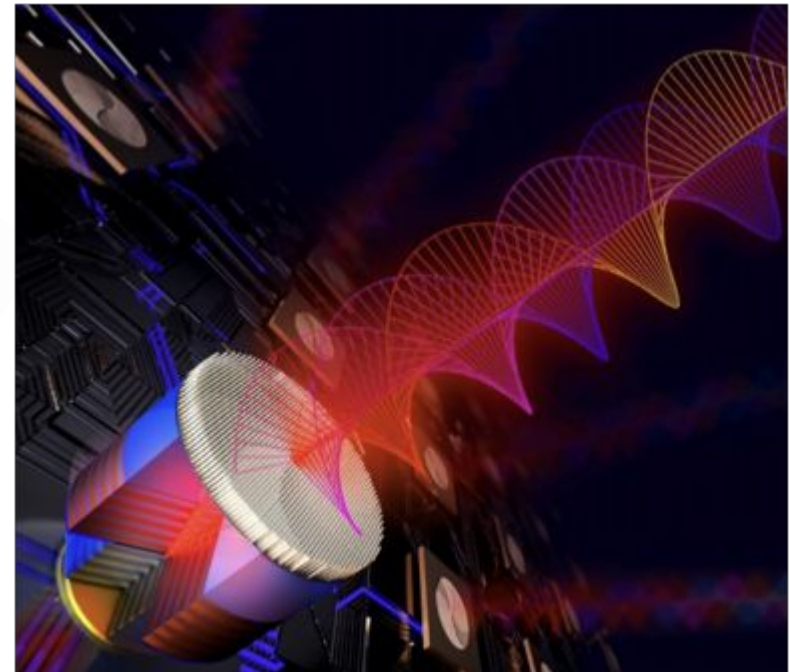
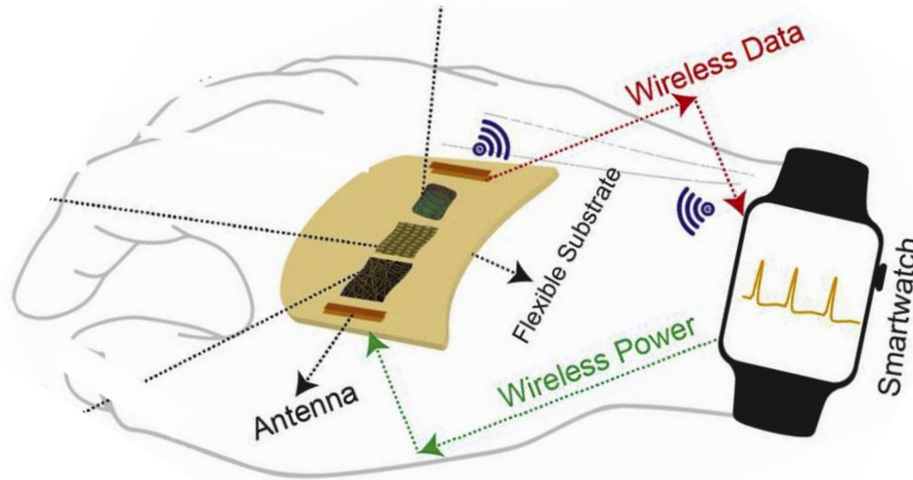


# Major Achievements and Outputs

- ❖ Bring electronical tunability and new functionalities by coupling optical, and mechanical systems at nano scale.
- ❖ Devices to be fabricated at the end : Tunable lasers [wavelength and modes], wearable flexible OM sensors, nonlinear coupled oscillators, microwave-to-optics transducers



- ❖ Targeted applications : LIDAR , distributed acoustic sensors for monitoring, LIFI, neuromorphic hardware processor on-chip, wireless access networks



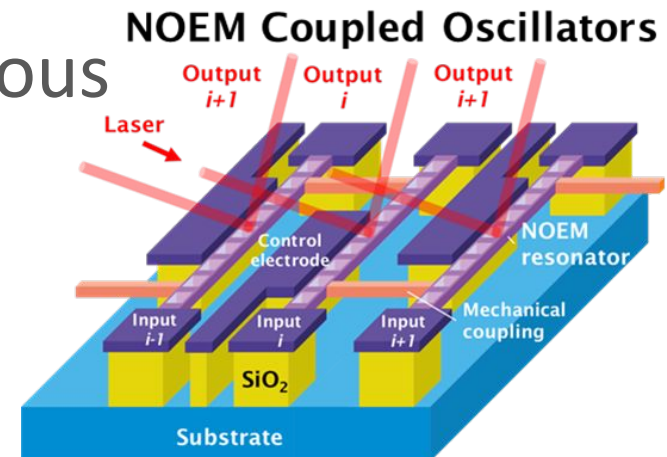


## Challenges and Needs :

- ❖ Energy efficient devices (computing, sensing) towards energy neutrality
- ❖ Reuseability of scarce materials
- ❖ Mass production for cost effectiveness, scalable, and reliable technology
- ❖ Small footprint brings ease of integration

## Solutions brought by the projects :

Heterogeneous integration of various multi-physics elements (optics, electronics, mechanics on the same chip)





# Possible Roadmap

- ❖ Proof-of-concept demonstrators (CHIST-ERA funding)
- ❖ IPR protection (eventually)
- ❖ Transfer to or creation of spin-off companies
- ❖ EIC Transition programme to scale up in TRL
- ❖ Potential users : Citizens (ultimate users), telecom operators, Medtech, chip producers



- ❖ Networking with other funded projects leveraging potential new collaborations
- ❖ Money can be adjusted depending on the topic (clean rooms are expensive !)



- ❖ Work on “incremental” technologies with low TRL as opposed to Pathfinder.
- ❖ Complementary to Horizon Europe because access to other countries not funded in the calls





- ❖ NOEMS will foster inclusiveness and share the results as open as possible.
- ❖ The projects can trigger science education especially bachelor and master level for example education in photonic integration



- ❖ Common European OS repository for sharing documents from the proposal phase to the management of the project (not Google Doc, not Dropbox)



- ❖ Patenting, licensing, creating of spin-offs
- ❖ Use the support of the ecosystems such as incubators, TTOs
- ❖ Long process time for patent which limits the high impact publications, thesis, PhD graduations etc. vs the USA.



# Questions ?