The future of themometry

Photonics and Quantum Optomechanics are two disruptive technologies which are experiencing an unstoppable progress that could help face up to present metrology challenges.

Coordinated by:

le cnam

Partners:

LNE

VSL

Laboratoire Kastler Brossel
Physique quantique et applications

UPMC
SORBONNE UNIVERSITÉS

TU Delft

Centre de Nanosciences et de Nanotechnologies
C2N

VTT
MIKES METROLOGY

PTB

Technische Universität Braunschweig

IMN
micro nano

ihp
innovations for high performance microelectronics

CEM CENTRO ESPAÑOL DE METROLOGÍA

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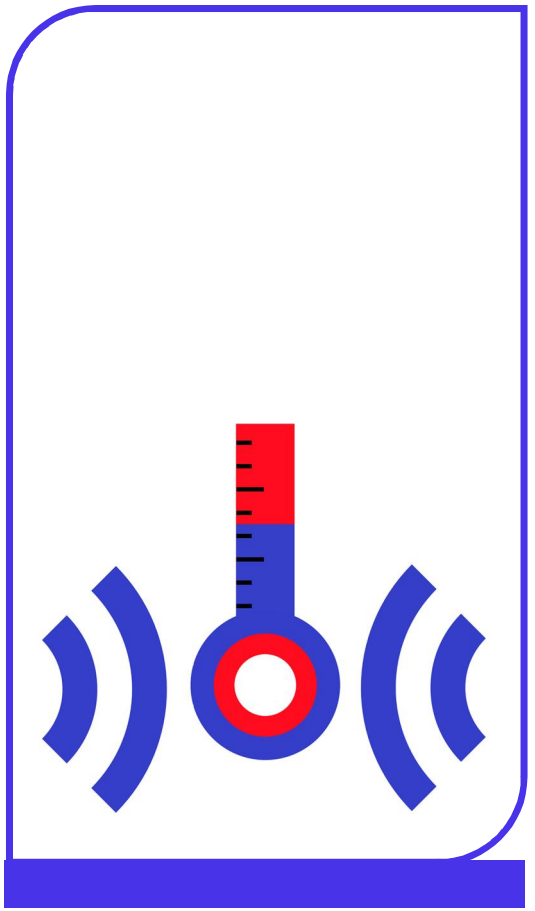
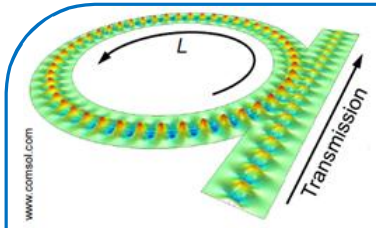
EMPIR EURAMET

The EMPIR initiative is co-funded by the European Union's Horizon 2020 research and innovation programme and the EMPIR Participating States

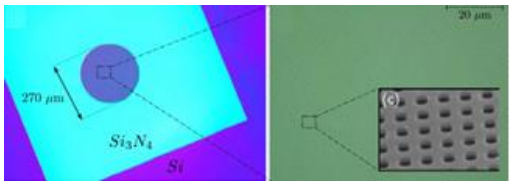
PhotOQuant

Photonic and Optomechanical Sensors for Nanoscaled and Quantum Thermometry





Ring Resonator



2D Photonic Crystal

This collaborative research project is the first European attempt to develop a quantum standard for temperature metrology

Objective

Photonic sensors use the light-matter interaction to measure temperature and other physical quantities via temperature-dependent material properties.

A particularly exciting new development is the possibility of using nano-photonic devices in combination with nano-mechanical systems (optomechanical sensors) to produce quantum primary standards that use the scale of quantum energies determined by Planck's constant to measure the size level of thermal motion. PhotOQuanT aims at developing photonic and optomechanical sensors for nanoscale and quantum metrology.

Need

Temperature is probably the most important physical variable of state, influencing almost every physical, chemical, and biological process.

Surprisingly, the world's most accurate temperature sensors, standard platinum resistance thermometers (SPRTs), rely on antiquated technologies that do not lend themselves to miniaturisation, portability, or wide dissemination

Beyond the state-of-the-art

PhotoQuant is intended not only to design and construct photonic and optomechanical sensors but to study their temperature systematic effects and the quantum regime itself.

Furthermore, a full uncertainty budget of these high-performance temperature sensors will be provided, that has not been reported yet for optomechanical resonators.

Impact

PhotoQuant will contribute to solve the problem of drift of embedded sensors. Our mesoscopic sensors will enhance the reliability of temperature measurement for applications in fields such as transportation industry, space instrumentation, engine monitoring, power plant safety and consumer electronics.

PhotOQuanT also pave the way to high accuracy temperature measurement on a mesoscopic scale. With an improved robustness and sensitivity, photonic sensors could replace standard platinum resistance thermometers.

Contact Us

PhotOQuant project coordinator

Stéphan Brideau
stephan.briaudeau@lecnam.net

Website:
https://www.vtt.fi/sites/photoquant/