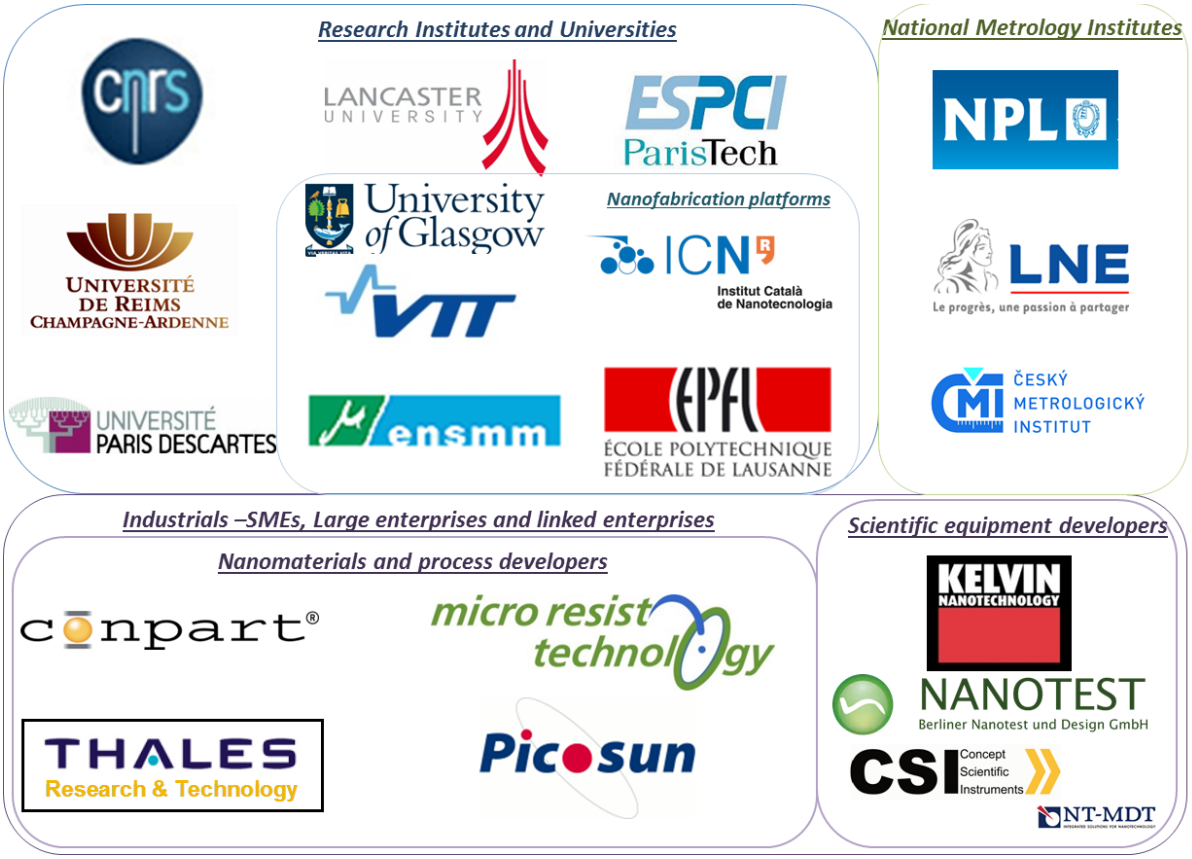
Attachment1: QUANTIHEAT consortium /list of partners

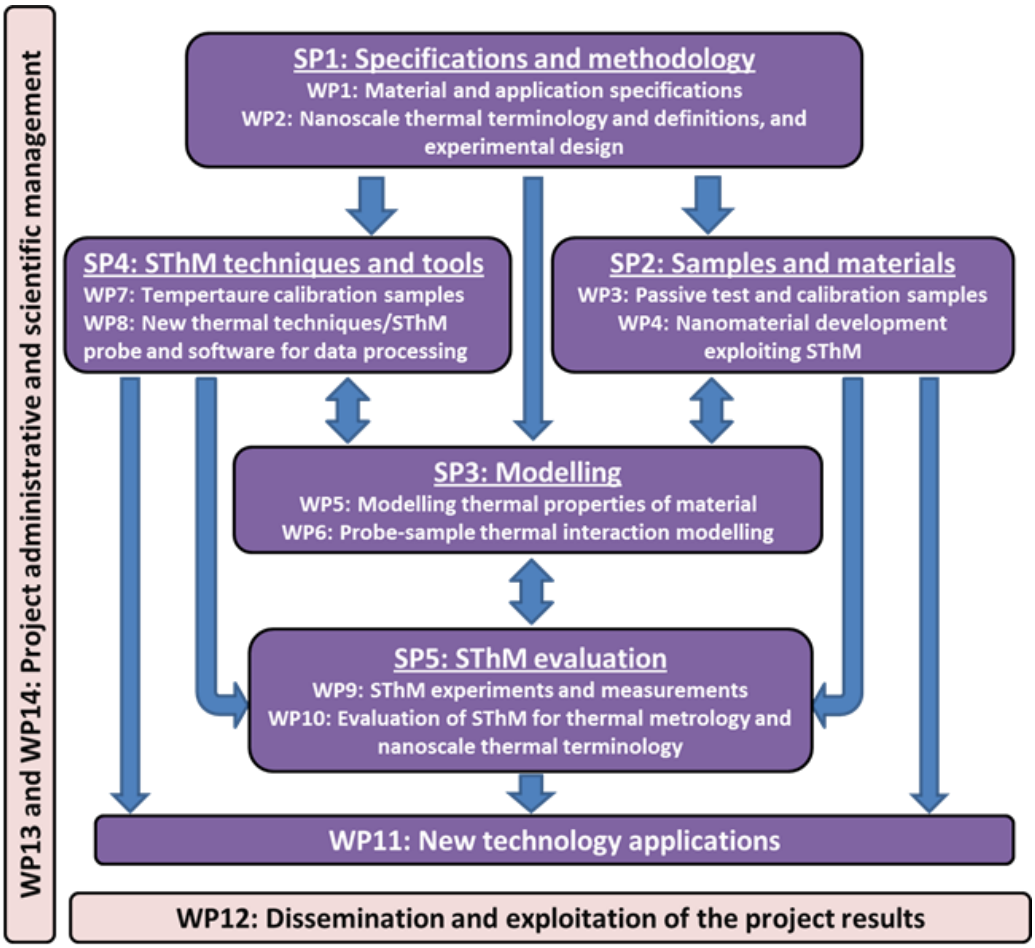


List of partners:

- Centre National de la Recherche Scientifique (CNRS),
- University of Lancaster (ULANC),
- Kelvin NanoTechnology (KNT),
- Laboratoire National de Métrologie et d'Essais (LNE),
- University of Glasgow (GU),
- VTT Technical Research Centre of Finland (VTT),
- National Physical Laboratory (NPL),
- Thales Research and Technology (THALES),
- Czech Metrology Institute (CMI),
- PICOSUN Oy (PICOSUN),
- Ecole Polytechnique Fédérale de Lausanne (EPFL),
- Catalan Institute of Nanotechnology (ICN),
- Université de Reims Champagne-Ardenne (URCA),
- Ecole Supérieure de Physique et de Chimie Industrielles de la ville de Paris (ESPCI),
- Micro Resist Technology Gesellschaft für Chemische Materialien spezieller Photoresistsysteme mbH (MRT),
- Ecole Nationale Supérieure de Mécanique et des Microtechniques (FEMTO-ST),
- Berliner NANOTEST und Design GmbH (NANOTEST),
- CONPART As (CONPART),
- NT-MDT Europe B.V. (NT-MDT) => *termination required in the amendment2 request in June 2016 and replaced by CSI.*
- Concept Scientifique Instruments (CSI) => *new entry required in the amendment2 request in June 2016 to replace NT-MDT.*
- University Paris Descartes (PARIS5).

Attachment2: Work packages (in Subproject / SP) overall strategy

The sub-project **Specifications and methodology** (SP1) provides common requirements for the end users of the metrology tools and of the design rules for heat transfer management in nanomaterials and, common nanoscale thermal terminology and design of experiments.
The output of SP1 is fed into sub-projects **Samples and materials** (SP2) and **Advanced SThM techniques and tools** (SP4); the former being responsible for reference sample/material development work for test and calibration purposes and also for material development of new nanomaterials, which benefits from the QUANTIHEAT characterization techniques. The latter (SP4) is responsible for active temperature reference devices and SThM tools such as probes and software. Sub-project **Modeling** (SP3) gives the thermophysical and SThM modeling contribution and SThM techniques are experimentally evaluated and verified in sub-project **SThM evaluation** (SP5).
The sub-projects support the full project applications on SThM tool improvement and nanomaterials to be realized in the **New technology applications** work package.
Each sub-project is divided into two goal oriented work packages, which are divided into different tasks.



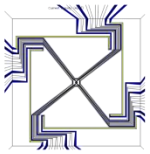
Attachment3: QUANTIHEAT project philisophy

Project Philosophy

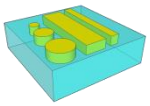
Passive & actives calibration and test samples

- **14** bulk samples selected to identify SThM calibration samples for thermal property measurement
- **9** polymeric samples selected and to be fully characterized for measuring phase transition temperature and thermo-mechanical property
- **7** heating samples designed.

Schematic of active device A ©GU

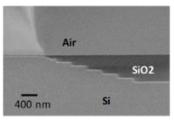


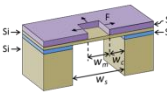
Test samples



Topography free sample ©GU

SEM cross-section of buried steps test sample © VTT





Si membranes ©VTT

Structure and morphology, physical property characterization by means of SEM, AFM, TEM, XPS, Ellipsometry, Nanoindentation, …

Benchmark of thermal techniques with reference methods (NMIs : LNE, CMI, NPL)

Thermophysical characterization *(thermal conductance / temperature)* by means of
- Photothermal methods: Laser flash, Short-time photoreflectance, thermoreflectance, …
- Electrical techniques: 3
- DSC

When involved length scales enable it

Full experimental characterization of project samples

Input data for comparison

Reference data for calibration and SThM measurement characterization

Data for comparison at nanoscale

Project sample modeling

Data for comparison at nanoscale

Measurements by means of SThM Techniques with various micro and nanoprobes

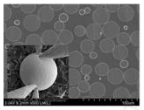
New knowledge, nanometrology, design laws, new instruments & new scientific questions

Industrial micro & nanostructured samples

micro resist technology

- Thin flat films
- **NIL** Patterns

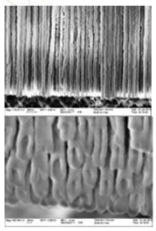
conpart®



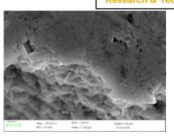
- Single particles
- Bulk **TIM materials**

Picosun **ALD**

- Nanolaminates
- Corrugated structures
- High-aspect ratio structures
- Nanowires / dots



THALES Research & Technology



- **TIM materials**
- **TE materials**

New probes & instruments to perform SThM in combination with other techniques & software

Attachment4: QUANTIHEAT Key exploitable results and other main impacts