Superconductors and wide-bandgap semiconductors

Thesis activities at the Solid State Physics Research group

http://www.solid.unito.it

Topic:

X-ray nanopatterning of oxide materials for novel electronics

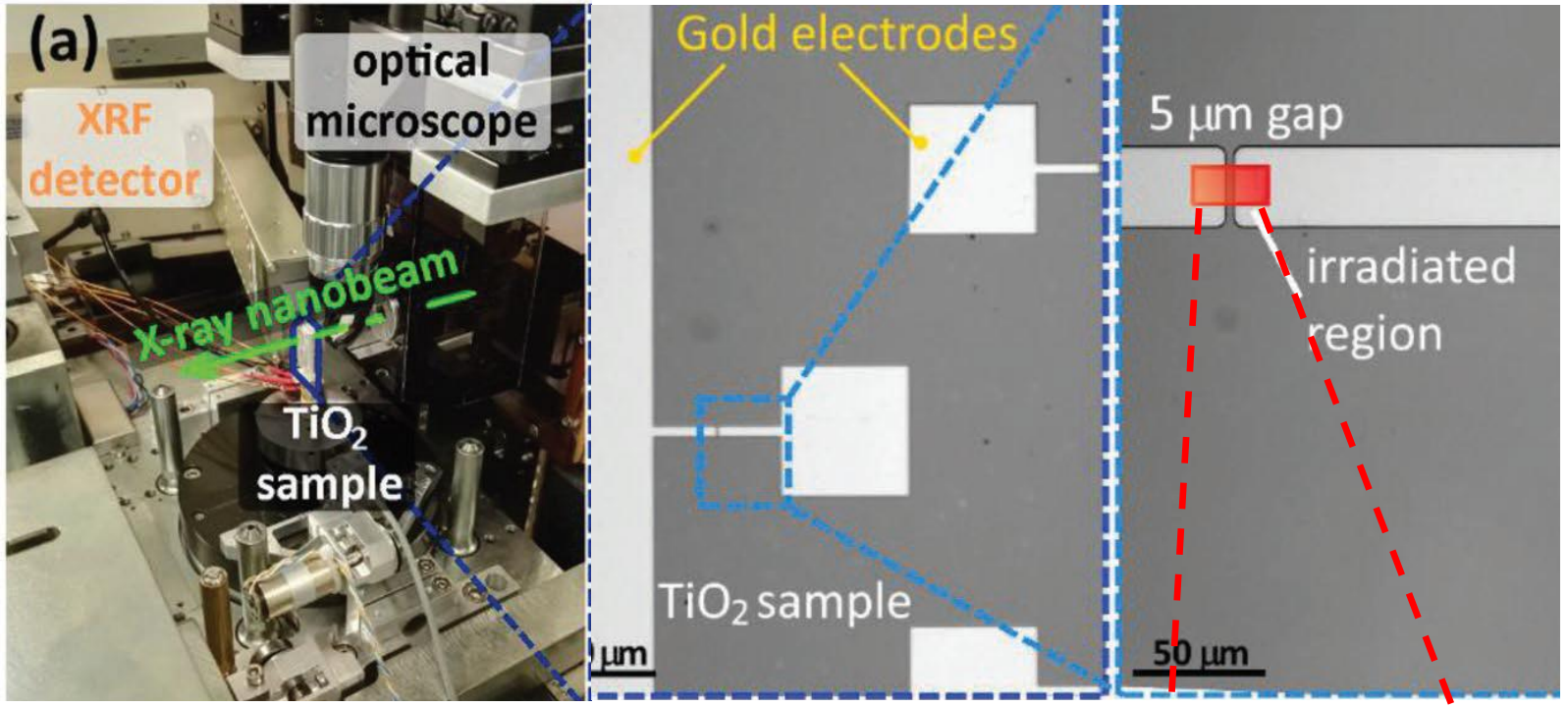
Supervisor: Marco Truccato

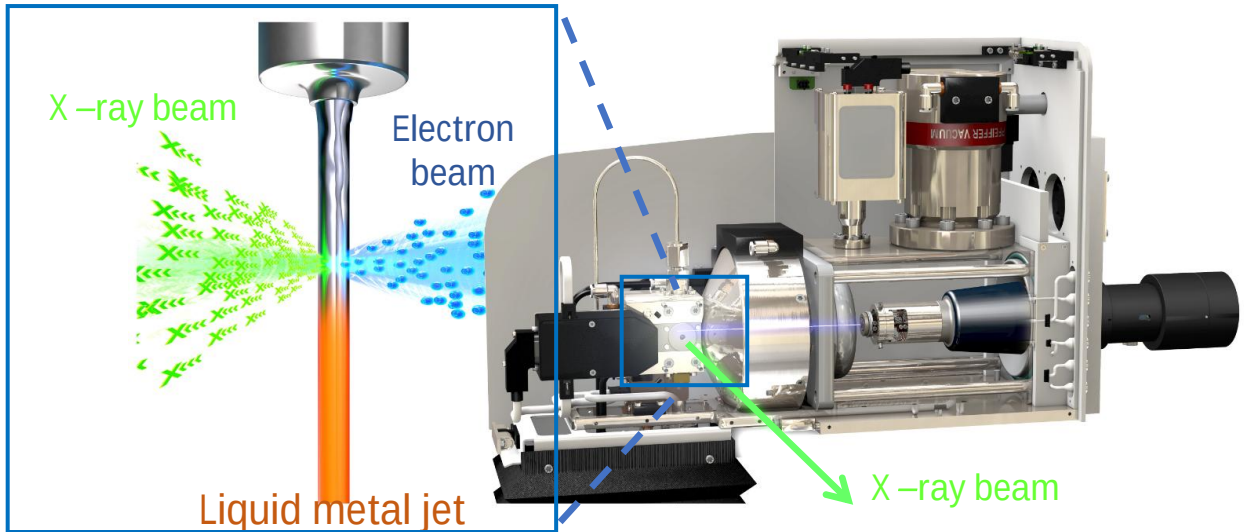
Available from: To be negotiated

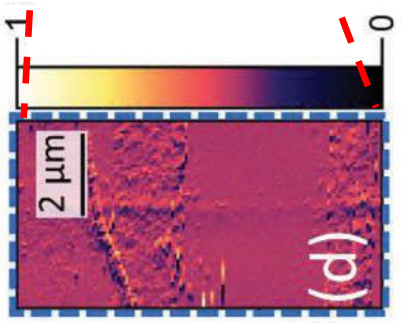
Approaches:
photolithography, Metal-Jet X-ray source, setup development, X-ray focussing, TiO_2 single crystal patterning, X-ray nanobeams, synchrotron radiation, X-ray absorption spectroscopy

In collaboration with:
Chemistry Department
European Synchrotron Radiation Facility

Turning an electrical insulator into a conductor







Topic:

Effects of focussed X-ray beam on high-Tc superconductors

Supervisor: Marco Truccato

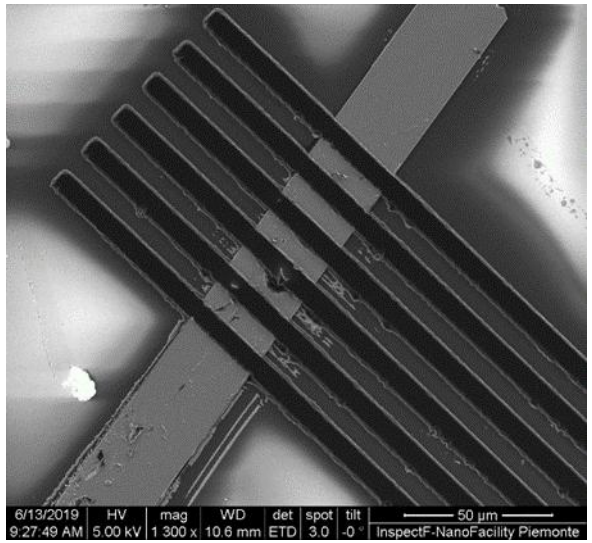
Available from: To be negotiated

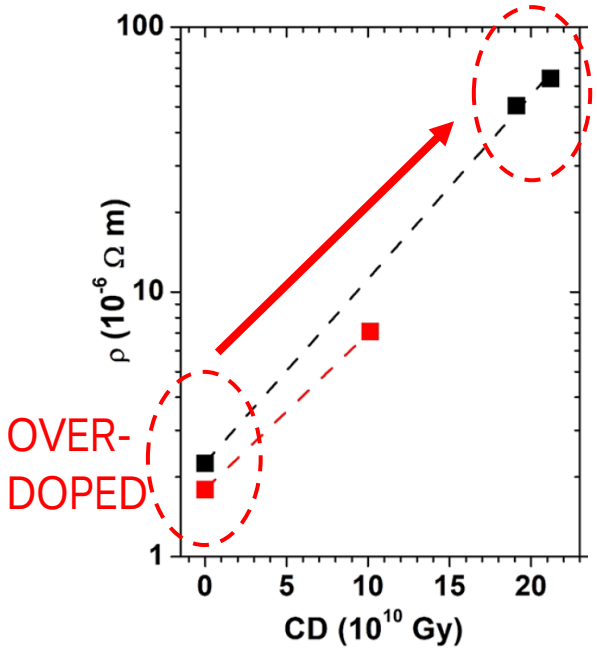
Inducing underdoping in Bi-2212via X-ray irradiation

Is it possible to reproduce synchrotron effects on the lab scale ?

Approaches:

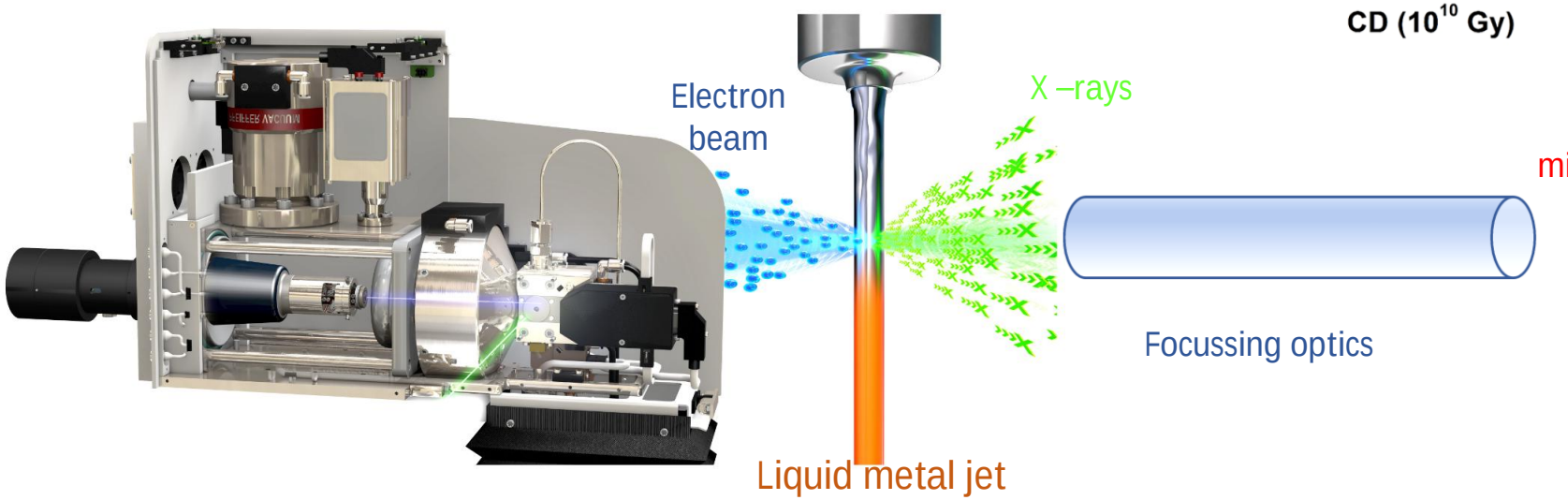
photolithography, Metal-Jet X-ray source, setup development, X-ray focussing, synchrotron radiation, numerical simulations





In collaboration with:

Chemistry Department



Topic:

MgB_2 as a novel antimicrobial material

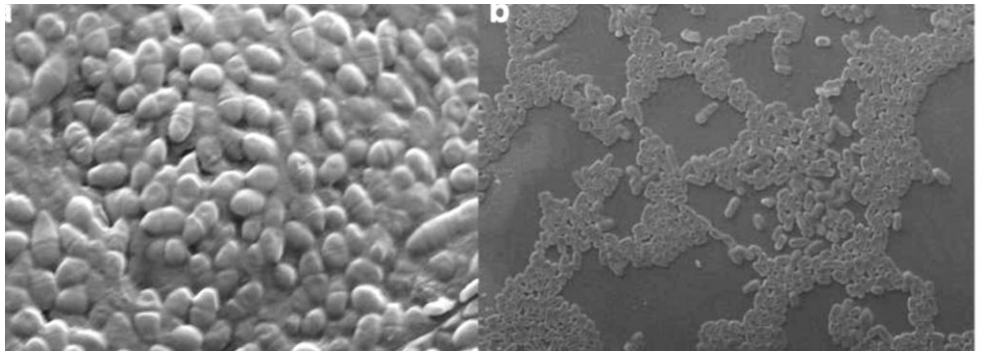
Supervisor: Marco Truccato

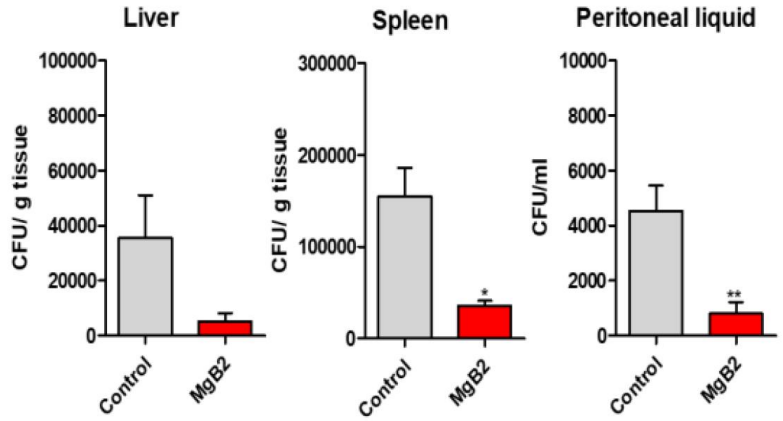
Available from: To be negotiated

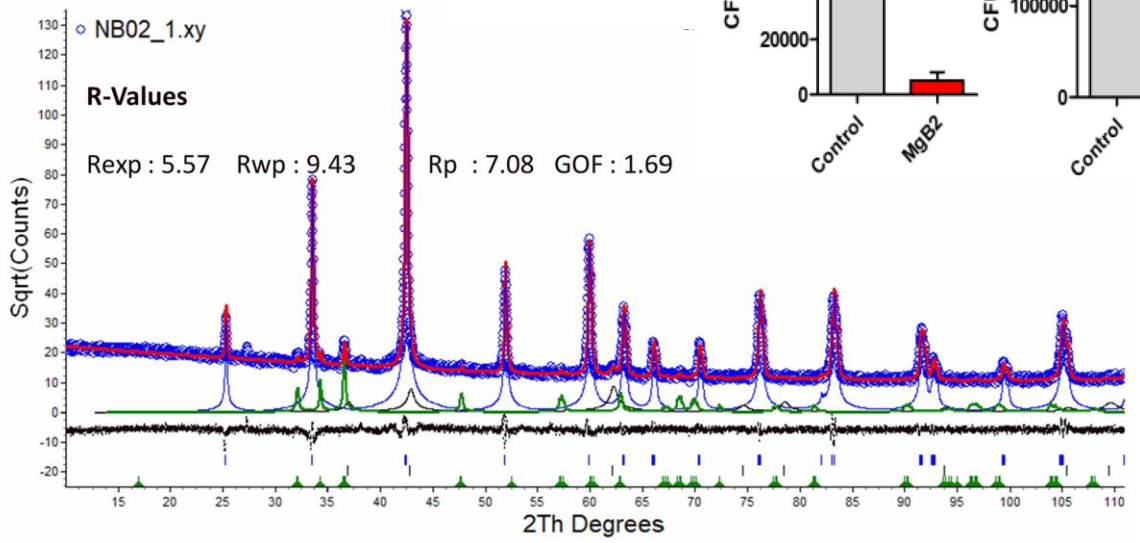
Approaches:

Material synthesis and characterization, reactive liquid infiltration, antibiofilm activity, X-ray diffraction, Rietveld refinement, medical applications

Antibiofilm activity







In collaboration with:

Chemistry Department

Romania National Institute for Physics of Materials

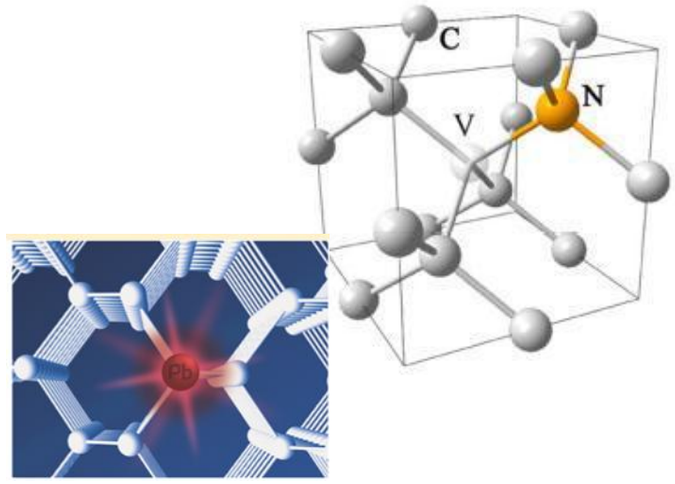
Part of a EU project: BIOMB

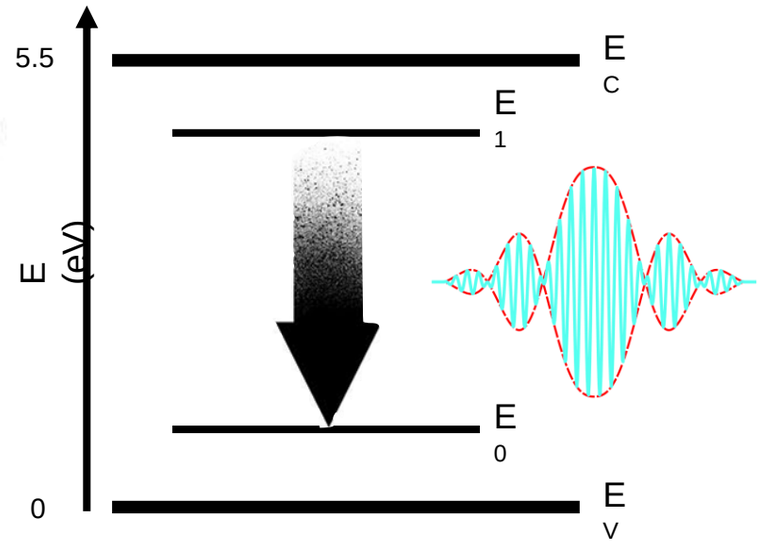
Topic:

Novel classes of diamond quantum emitters

Supervisor: Jacopo Forneris

Available from: to be negotiated





Approaches:

<u>Experimental activity</u>

Optically-active defects: single-photon emission

Limited number of defects known

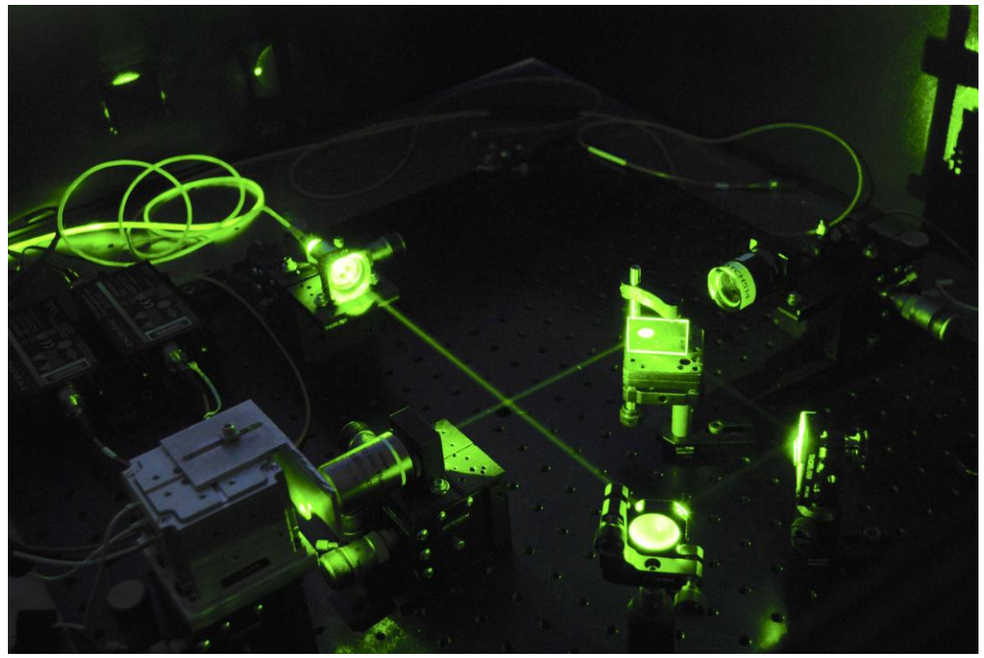
Exploration of photoluminescence properties of ion implanted diamond

Confocal microscopy apparatus: set-up (room temp., 4K) and operation

Single-photon emission assessment by interferometry

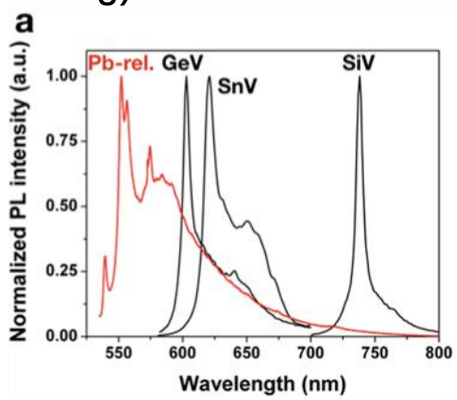
Thermal processing of diamond plates

Study of activation processes (thermal, laser annealing)



Alternative materials:

Si, SiC: IR confocal microscope, from Feb 2021



In collaboration with:

Istituto Nazionale di Fisica Nucleare (INFN)

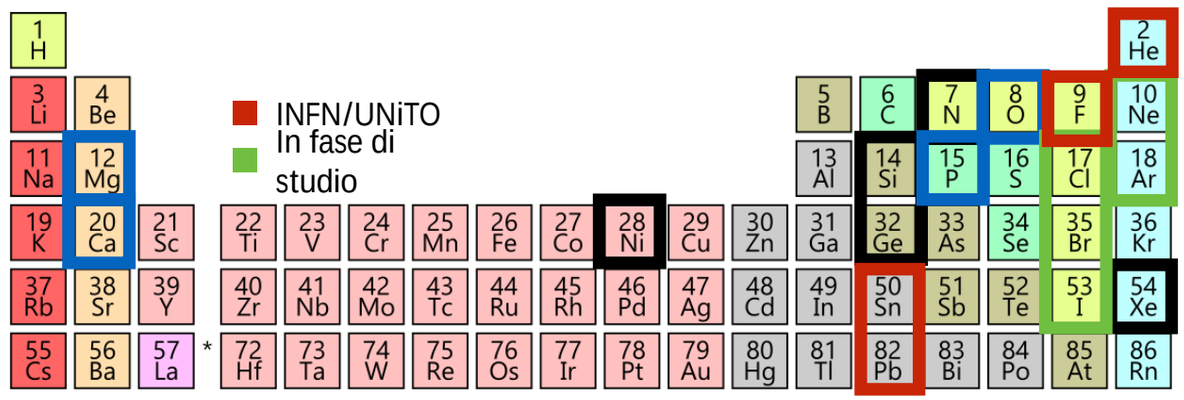
Istituto Nazionale di Ricerca Metrologica (INRiM)

Part of a project:

EU SIQUST research project

EMPIR EURAMET

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

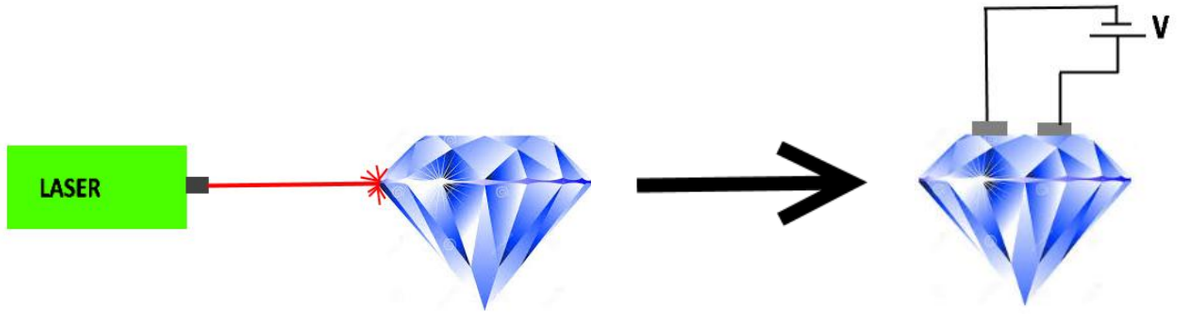


Topic:

Supervisor: Jacopo Forneris

Available from: to be negotiated

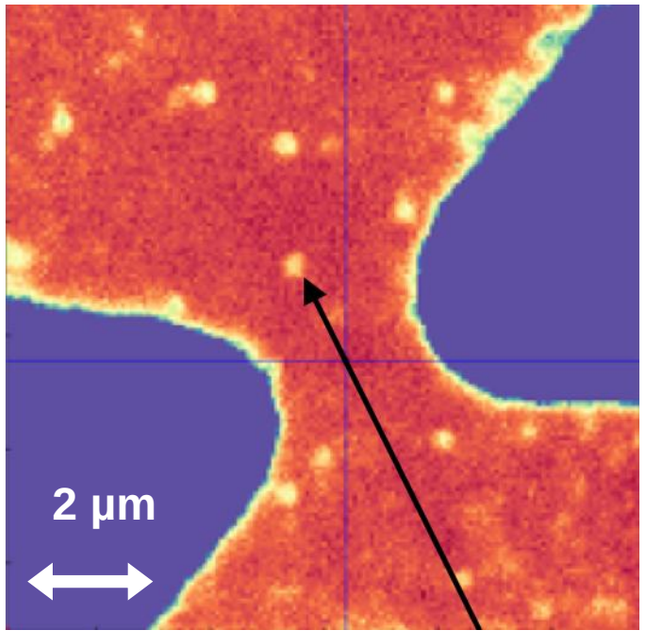
Electrical stimulation of diamond quantum emitters



Approaches:

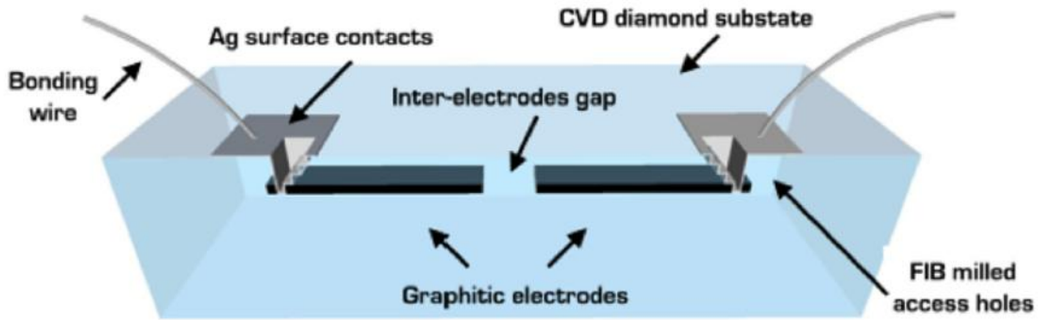
<u>Experimental activity</u>

Optically-active defects: single-photon emission
Exploration of electroluminescence properties of ion implanted diamond

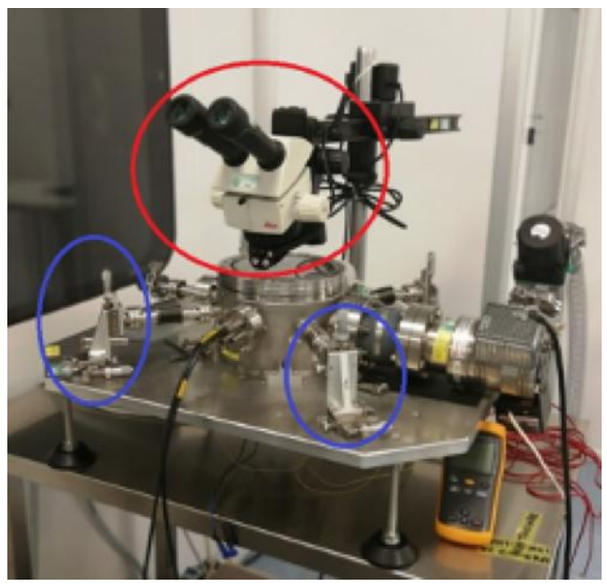


Single-photon confocal microscopy
Sample processing in cleanroom environment

Lithography techniques for electrodes fabrication
- ion implantation
- deep ion beam lithography
- focused ion beam (FIB)
- photolithography



Characterization of electrical structures



In collaboration with:
Istituto Nazionale di Fisica Nucleare (INFN)
Istituto Nazionale di Ricerca Metrologica (INRiM)

Part of a project:
EU SIQUST research project

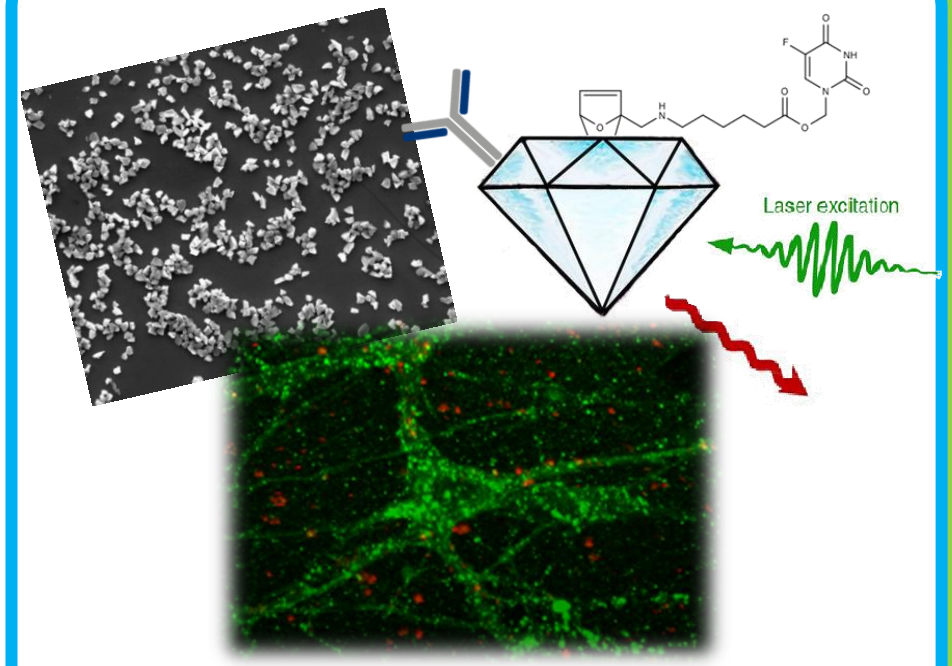
EMPIR EURAMET
The EMPIR initiative is co-funded by the European Union's Horizon 2020 research and innovation programme and the EMPIR Participating States

Topic: diamond, biosening, nanoparticle, surface properties, drug delivery, radiobiology

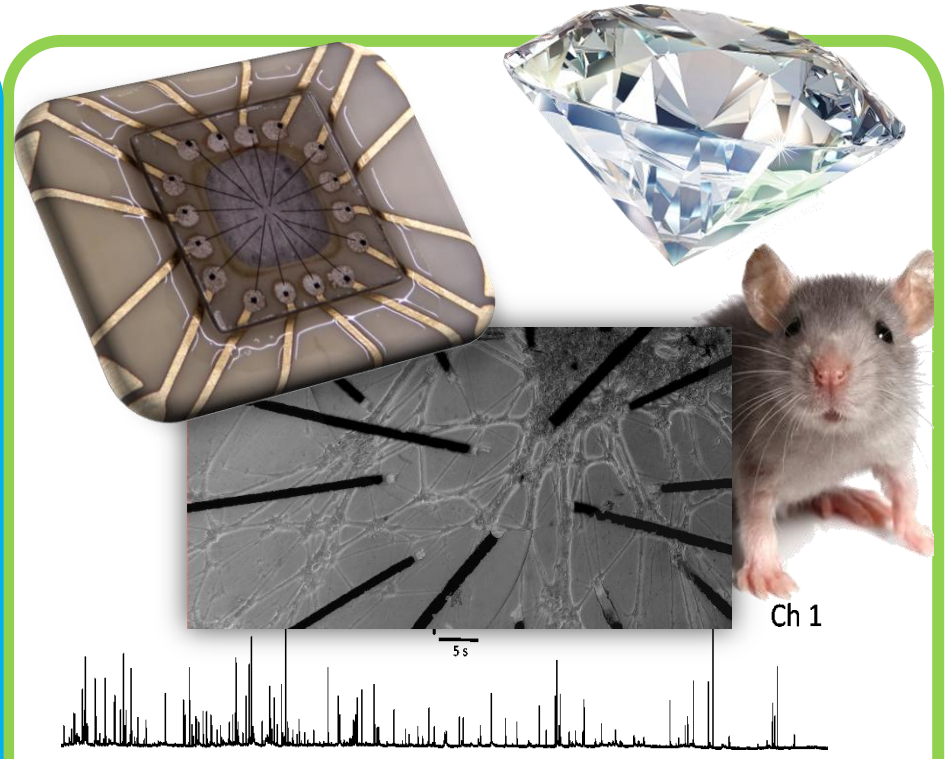
Supervisor: Federico Picollo
federico.picollo@unito.it

Available from: to be negotiated

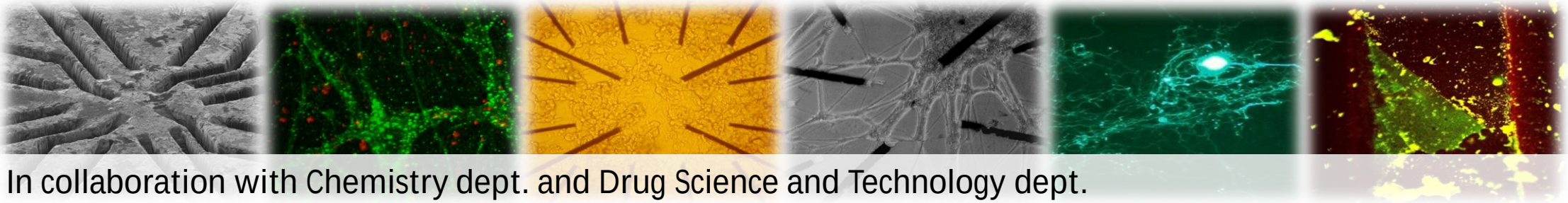
Approaches:
ion beam lithography, sensors and set-up development, amperometry, IR spectroscopy, material processing (thermal treatment), experiment with cells, X-ray irradiation, Raman and photoluminescence spectroscopy



Multifunctional nanodiamond for drug-delivery



Multi electrodes cellular bionsensor



In collaboration with Chemistry dept. and Drug Science and Technology dept.

Topics:

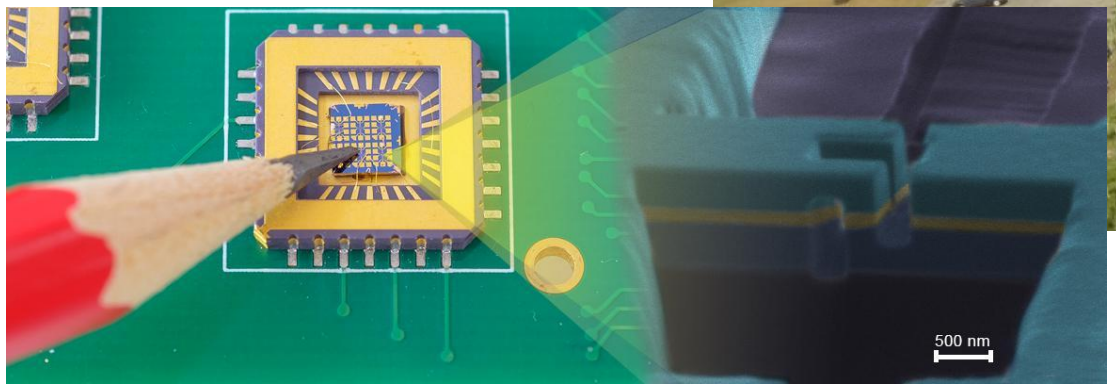
- Physical Metrology
- Nanosciences and Materials
- Metrology for Life Quality

Approaches: laser interferometry, mass spectrometry, magneto-fluxometry, micro- and nano-fabrication, materials modelling based on finite-elements and machine-learning methods, etc.

Supervisors: please contact
Paolo Olivero

https://www.inrim.it/

http://www.solid.unito.it/



Thesis activities at the National Institute of Metrologic Research (INRiM)

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