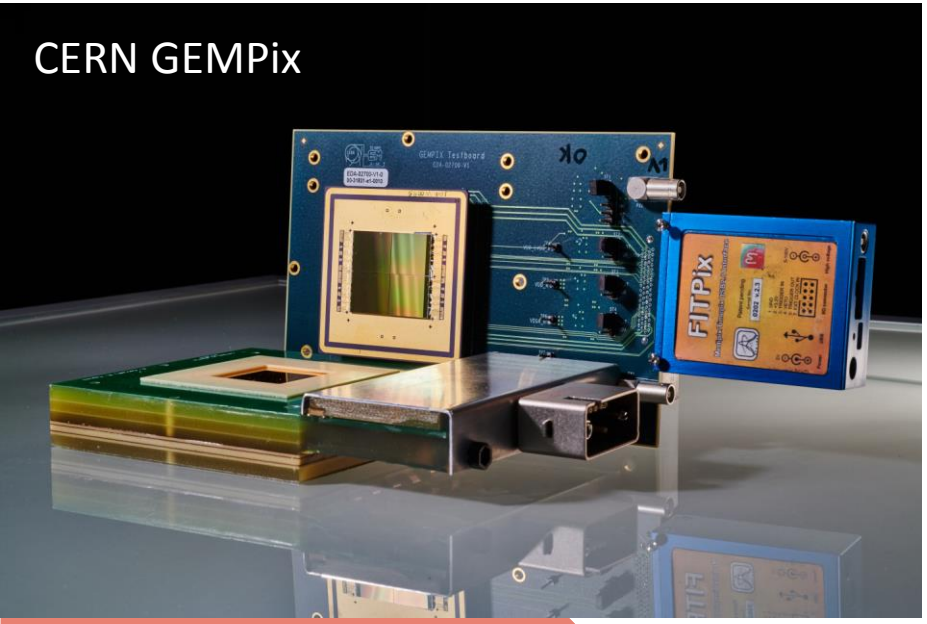
GEMTEQ - GEMPix detector for microdosimetry with tissue-equivalent gas

The Idea is to develop GEMTEQ – an innovative detector for microdosimetry based on GEMPix – crucial to understand the effects of radiation on human tissue at cellular/sub-cellular level.



It could have applications in microdosimetry, for example in understanding better the effects of a carbon ion beam for cancer treatment. For this, a larger detection area would also be beneficial (LaGEMPix project).

Our project is coordinated by CERN **and the partner is** ARTEL SRL (Italy) .

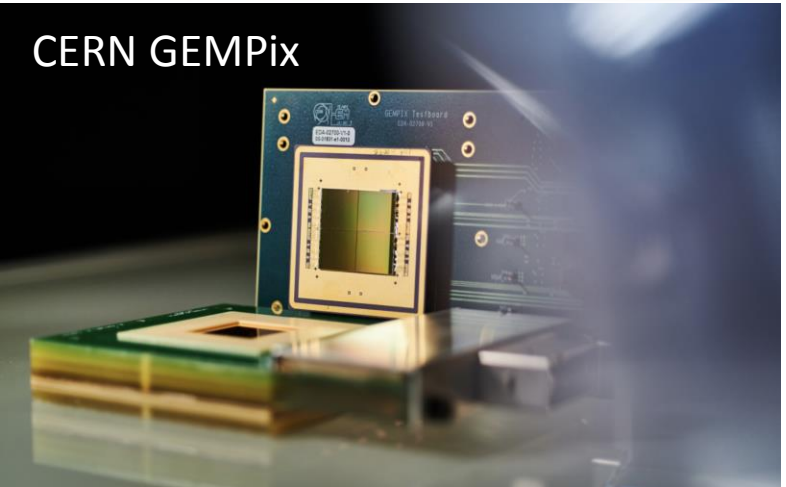
We plan to liaise with Research Infrastructure CNAO (Italy).

Contact email Marco.Silari@cern.ch

LaGEMPix

The Idea is the development of the next generation of the state-of-the-art GEMPix detector by replacing the ASIC by a large-area organic photodiode coated on an organic TFT (thin film transistor) backplane, an idea that can lead to a significant improvement in the detector performance.

ISORG Flexible TFT



It could have applications in industry, medical physics and imaging. Quality assurance (QA) procedures in hadron therapy, beam monitoring in radiotherapy, proton or X-ray radiography, non destructive tests and microdosimetry (GEMTEQ project).

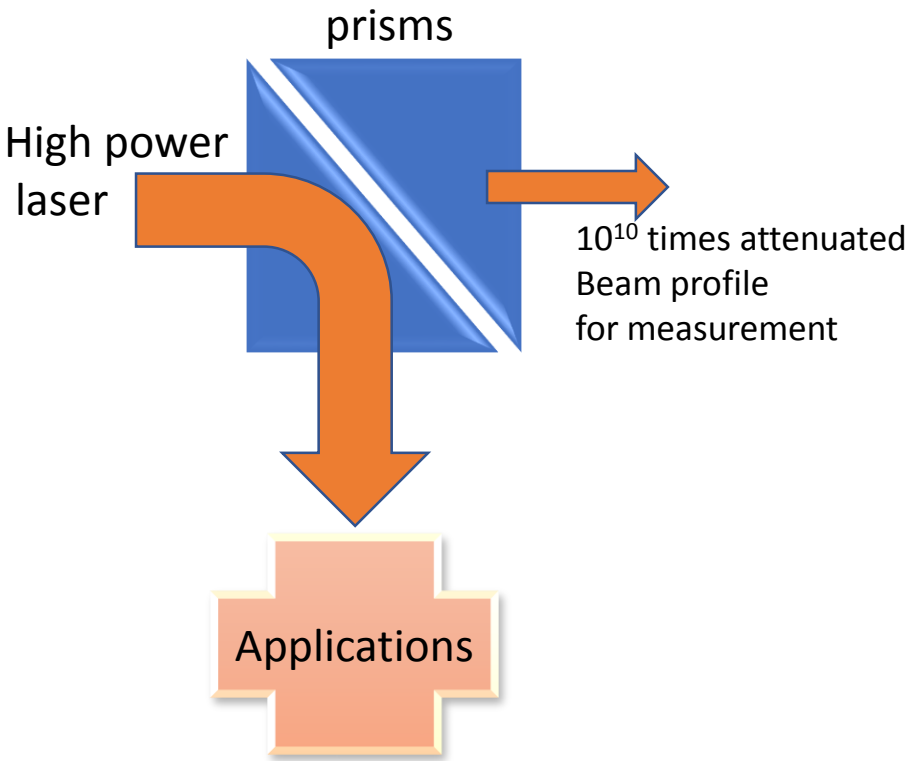
Our project is coordinated by CERN and the partner is ISORG company (Grenoble, F).

We plan to liaise with Research Infrastructures CNAO (Pavia, I) and LHEP (Bern, CH).

Contact email Marco.Silari@cern.ch

High Power Laser Beam Profile and Pointing Measurement

The Idea is to develop a device for measurement of laser beam profiles for pulsed and continuous high power lasers based on in-line beam sampling with continuous control of the laser intensity over very large dynamic range (>100dB).



It could have applications in high power laser systems, laser surgery, laser safety, materials processing with laser

Our project is coordinated by National Institute for Physics and Nuclear Engineering – Horia Hulubei and the **partner is** MGM Star Construct SRL

We plan to liaise with Research Infrastructure Extreme Light Infrastructure – Nuclear Physics, Romania

Contact email daniel.ursescu@eli-np.ro

HIGHER-HARMONIC GENERATION MICROSCOPY BEYOND THE DIFFRACTION BARRIER BASED ON RE-SCAN STRATEGIES FOR OPTICAL DATA ACQUISITION (HARMOPLUS)

The Idea is to is to demonstrate Second and Third Harmonic Generation Imaging at sub-diffraction resolution using an approach inspired from the Re-scan Confocal Microscope (RCM). HARMOPLUS will build and test a prototype system for Re-scan SHG/THG.

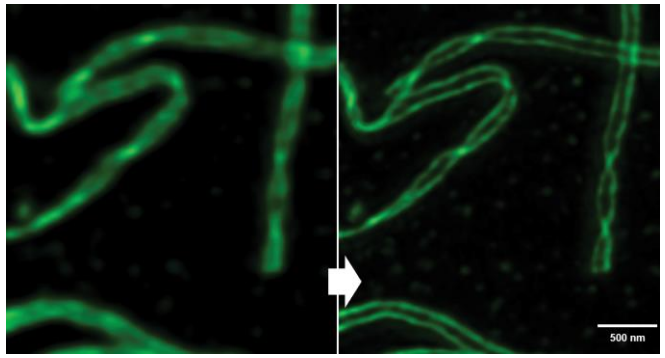


Image improvement by RCM (nuclear spread of mouse spermatocytes)

It will enable fundamental research and applications in life and material sciences that require label-free super-resolution microscopy, such as:

- in-depth understanding of the collagen architecture in tissues
- diagnostics of pathologies the involve extracellular matrix remodelling
- novel insights into new generation materials that poses tuneable second and third order nonlinear effects
- benchmarking of advanced materials by precise determination of various interest features: crystallographic orientations, ferroelectric domain distribution, strain, etc.

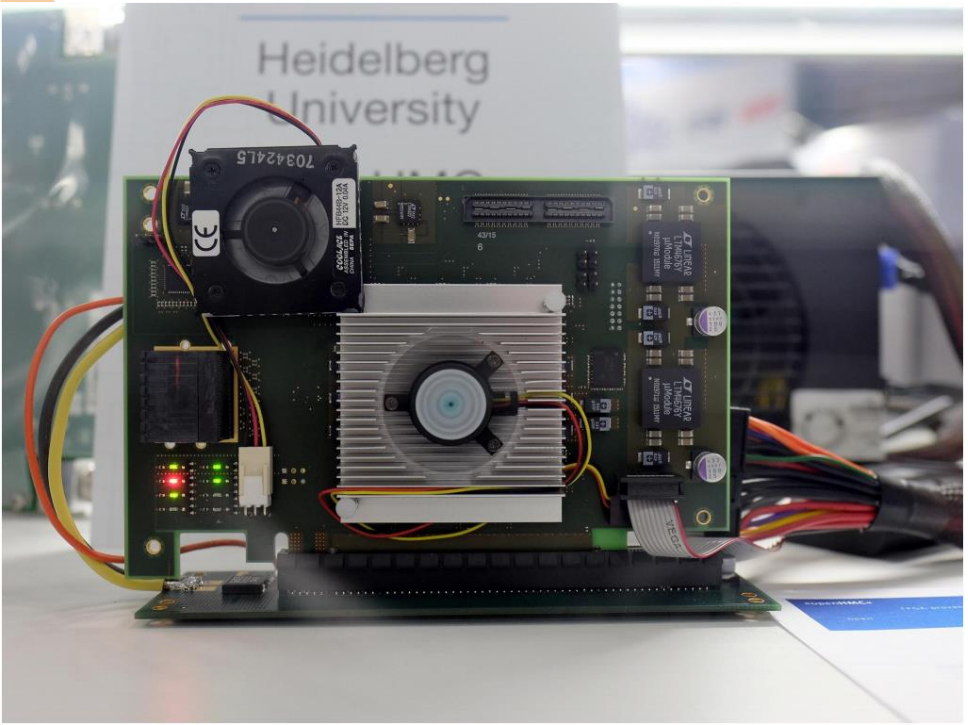
Our project is coordinated by Dr. Stefan G. Stanciu, Politehnica University of Bucharest (Romania) and the **partner is** Prof. Erik Manders, Confocal.nl B.V., The Netherlands.

Contact email:
stefan.stanciu@cmmip-upb.org

HIOS: Heterogeneous I/O for Scale

Provide a scalable solution to the problem of streaming large quantities of data from remote location by

- introducing heterogeneous I/O units on the compute clusters
- offloading aggressive caching functionality from the compute node
- providing near memory processing.



Applicable across various knowledge-based, Big Data driven, domains of business, industry and science that generate large quantities of data.

Can be integrated into existing HPC and cloud facilities.

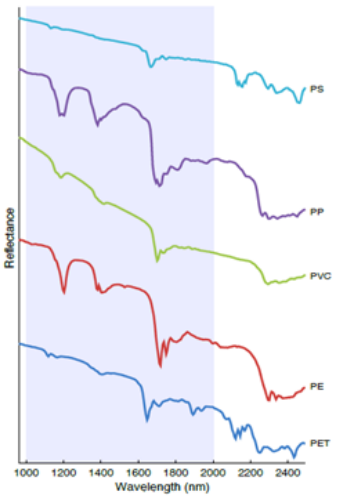
Our project is coordinated by CERN **and the partners are** Extoll and University of Heidelberg

Contact email viktor.khristenko@cern.ch

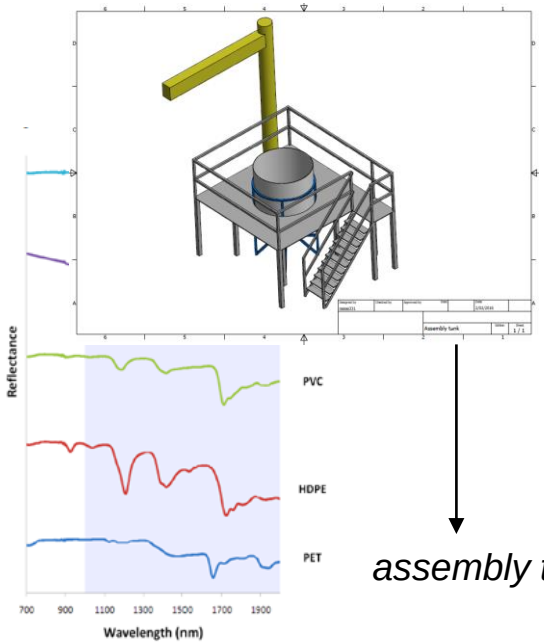
Hyperspectral remote sensing of marine plastics – HyPeR

The Idea is to test whether plastics are remotely detectable in real marine conditions

Plastic polymers possess unique optical signature



(a) Acquired spectra



(b) Spectra from literature[76]

assembly tank.

The **final goal** is to have **a dedicated hyperspectral sensor for marine plastics monitoring**, that can be used on a small drone or, on the longer term, on a HAPS or a satellite platform

Our project is coordinated by VITO **and the partners are** FlandersHydraulics Research and Norsk Elektro Optikk AS

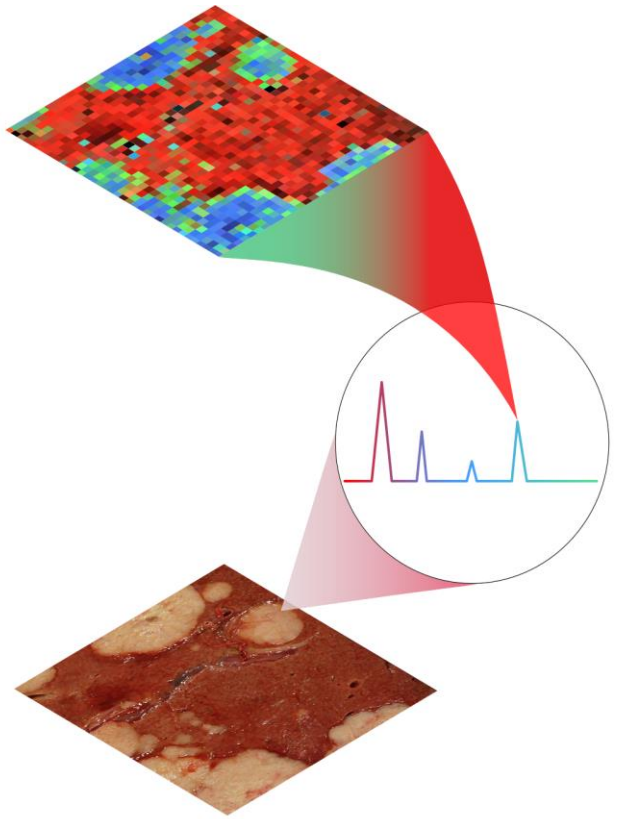
Contact email els.knaeps@vito.be

iDMS – breakthrough in molecular imaging

Molecular imaging is an emerging analysis method in several areas of biomedicine

Oncology, neurological disorders, cardiology, rheumatology, immunology, tissue pharmacokinetics

However, the use of current mass-spectrometry –based technology is limited by its price



We develop a novel, affordable method for molecular imaging

Based on ion mobility spectrometry and advanced data analytics

The goal is to pilot both, qualitative and quantitative concepts

in tissue and drug concentration mapping applications

Consortium: Tampere University and Olfactomics Ltd., Finland

In collaboration with Finnish clinical biobank infrastructure

Contact: antti.vehkaoja@tuni.fi, antti.roine@olfactomics.fi

immunoSpot Layer Imaging of Cell Excretions (iSLICE)

The Idea is to detect secreted molecules from single cells in stacked iSLICEs. In this way the number of compounds in an ELISpot/SPR-imaging assay can be doubled/tripled.

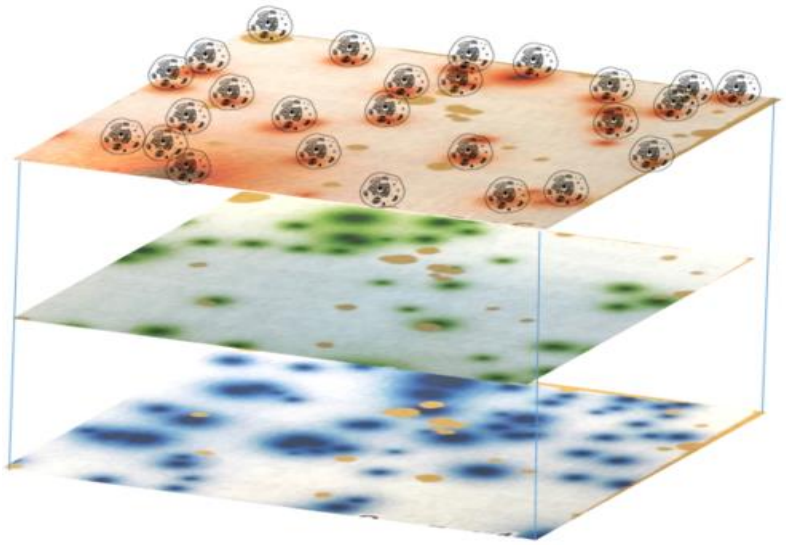


Fig. iSLICE exploded view of stacked layers for cell secretion profile imaging. On top, the cells secrete molecules that are directly locally captured by the porous ultrathin layers. The imaging system will read each layer.

It could have applications in the cancer diagnostics area to find the origin of circulating tumour cells. The fingerprint (=secretome) is characteristic for a certain cell (e.g. from liver, prostate, etc.). Additionally, PBMC samples are indicative to the response of the patient's immune system and compounds IFN-y/IL2/IL6 among others are important single cell signal molecules.

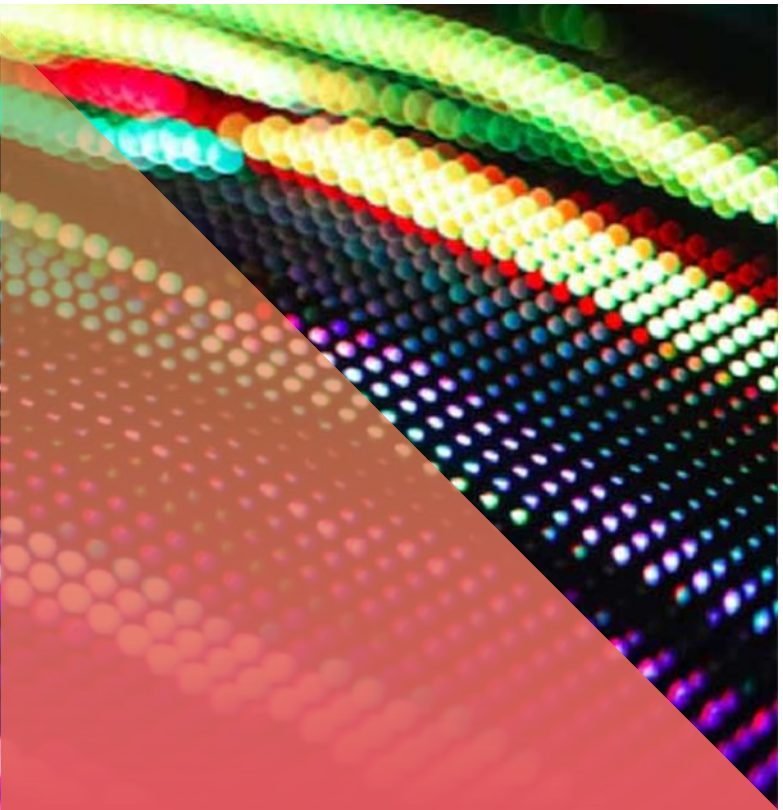
Our project is coordinated by InterFluidics BV and the **partners are** Xantec Bioanalytics GmbH and the University of Twente (The Netherlands).

Contact email r.b.m.schasfoort@utwente.nl

InterFluidics
Imaging cell secretions

InGaN FULL SPECTRUM

The Idea is to relax strained InGaN membranes through a flip-chip process using the deformation of polymer host substrate for tuning the emission wavelength of micro-LEDs.



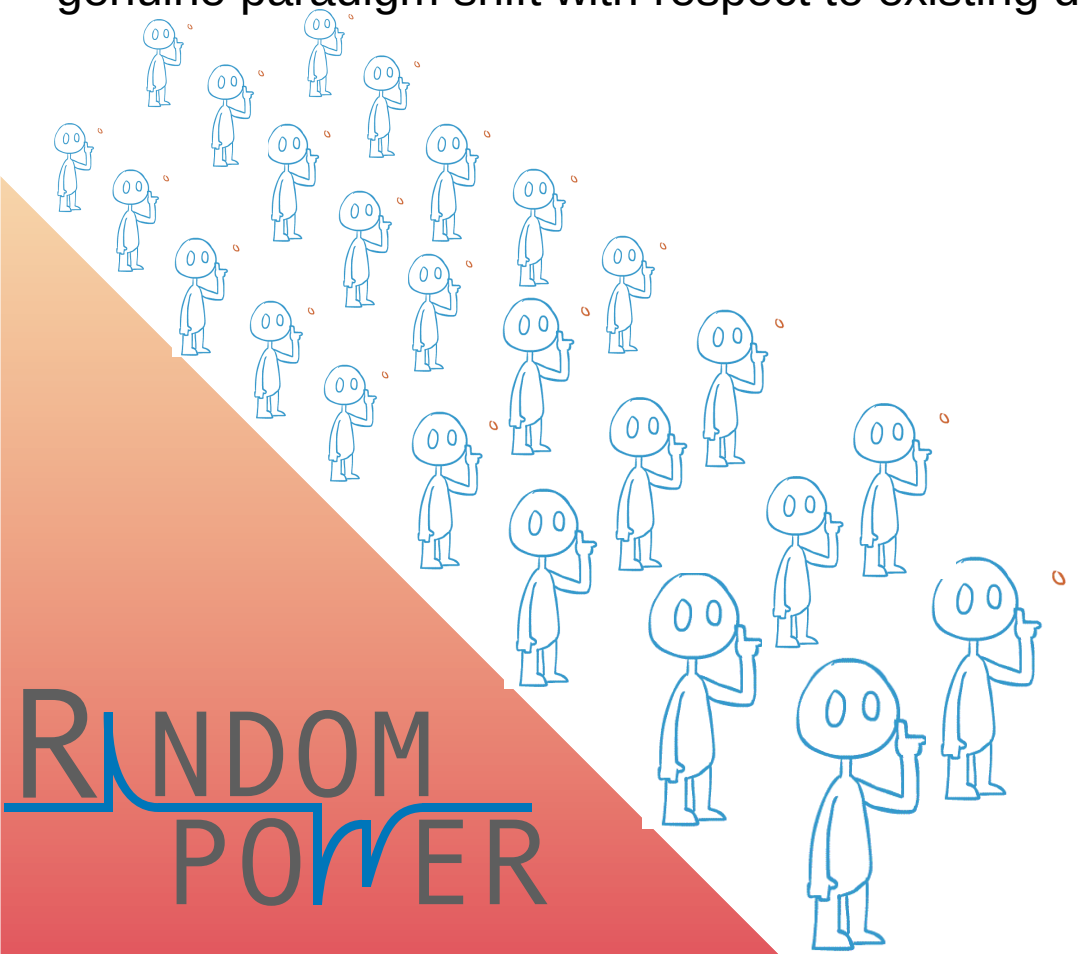
It could have applications in the fabrication of high resolution screens (used close to the high: smart watch, virtual reality, mixed reality, smart phones, etc.).

Our project is coordinated by The ESRF-The European Synchrotron **and the partners are** CEA LETI (France), Leibniz Institute for Crystal Growth (Germany), and Nelumbo Digital (France).

Contact email tobias.schulli@esrf.fr

IN-SILICO QUANTUM GENERATION OF RANDOM BIT STREAMS

The idea: implement in-Silico a way to flip a fair coin 1 000 000 time per second, to get a continuous stream of bits with unpredictable states. The source of randomness in the proposed system is endogenous and this is a genuine paradigm shift with respect to existing devices, providing simplification and robustness of the system.



RANDOM POWER

It could have applications in cybersecurity (key generation and beyond) for infrastructures, portable and mobile devices and IoT.

Our project is coordinated by Università dell'Insubria **and the partners are** AGH-University of Science &Technology, Nuclear Instruments, Quantum Financial Analytics

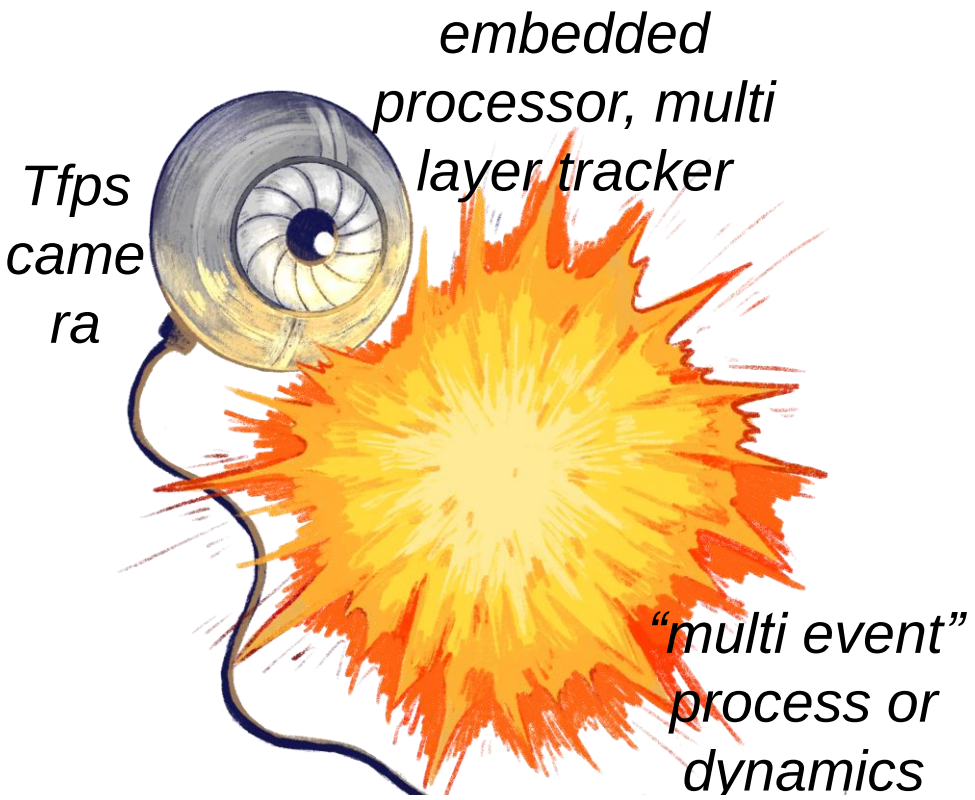
We plan to liaise with CERN (OpenLab), EiRMA & ESADE

Contact email: Massimo.Caccia@uninsubria.it

http://glee.wikia.com/wiki/File:281735_1342370254-coin-flip.gif.gif

INSTANT project (Imaging iN SpaceTime ANd Tracking)

The Idea is to develop a Tera-fps video-camera for ionizing radiation, capable of embedded stereo-scopic image reconstruction (tracking) and to sustain extremely high radiation doses and event rates.



It could have applications in study of complex process in the sub-ns scale, study in the dynamics of sub-μm complex systems, real-time monitoring in hadrotherapy, PET, ultra-fast imaging up to extremely high rates, fluences and doses

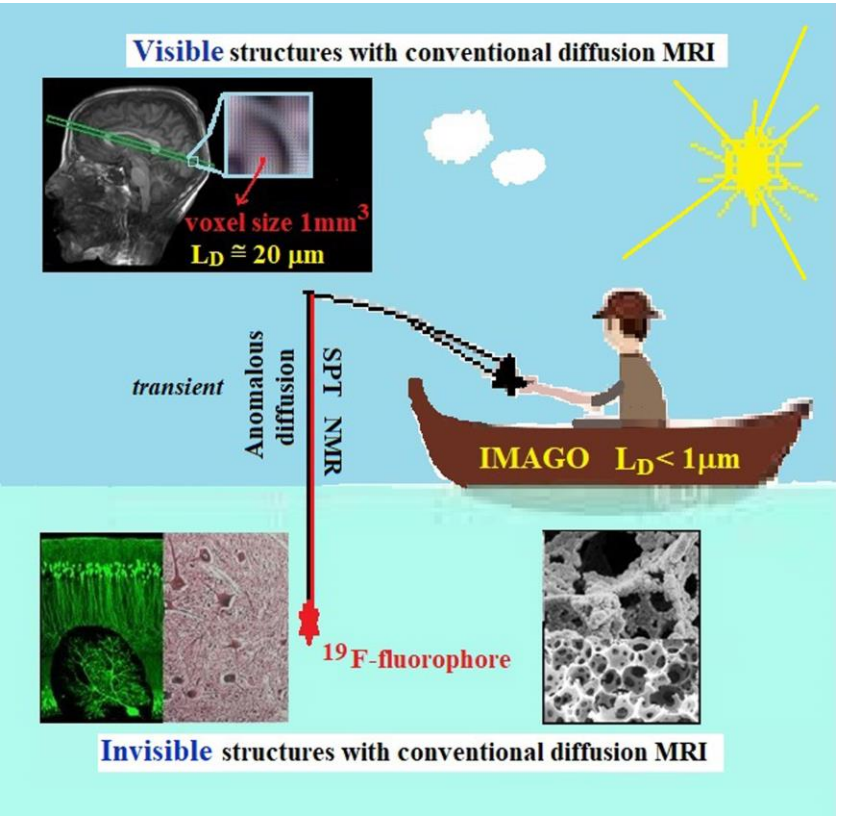
Our project is coordinated by INFN Cagliari **and the partners are** Università di Milano, Università di Trento, University of Manchester.

We plan to liaise with Research Infrastructure Fondazione Bruno Kessler (Trento) and others possibly interested

Contact email adriano.lai@ca.infn.it

Integrated Multimodal Optical and Magnetic Resonance Imaging IMAGO

The Idea is to develop Nuclear Magnetic Resonance Imaging (MRI) with resolution down to the micron scale through the integration of diffusion MRI and single-particle tracking.



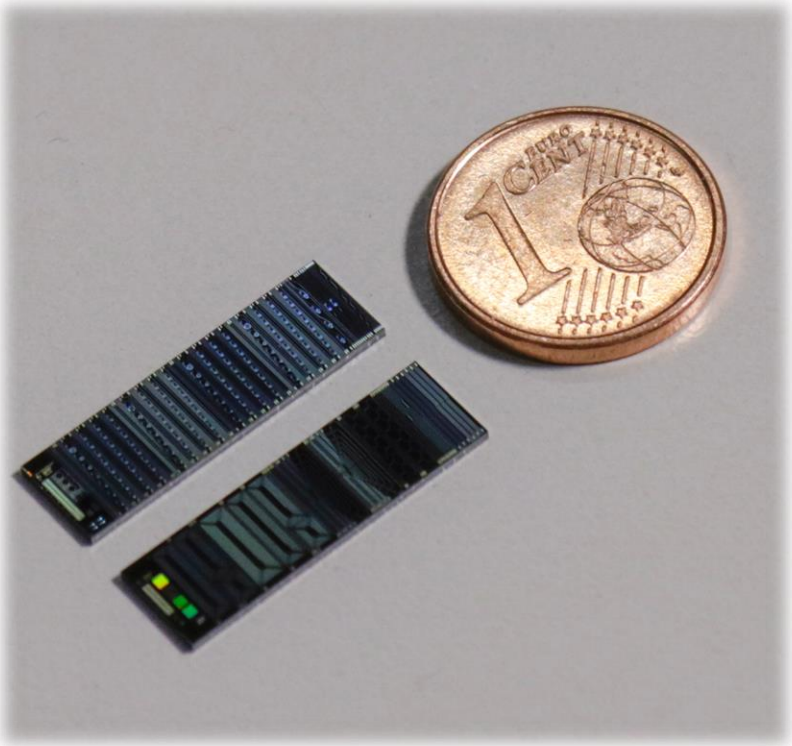
It could have applications in medical diagnostics. In a long-term vision, MRI with subcellular spatial resolution will enter in the clinical routine opening up new possibilities in terms of early diagnostic, new drugs development, therapeutic strategies and patients handling.

Our project is coordinated by CNR Institute for Complex Systems (ISC) Rome, Italy **and the partners are** Physics Department of Sapienza University Rome, Italy.

Contact email silvia.capuani@roma1.infn.it
silvia.capuani@isc.cnr.it

Integrated Photonic Electronic platform for Quantum Technologies

The Idea is to implement a robust and monolithic photonic/electronic integration between a Quantum Photonic Circuitry (QPC) and arrays of Single Photon Avalanche Detectors (SPADs). This project addresses a fundamental cornerstone in the development of Quantum Technologies.

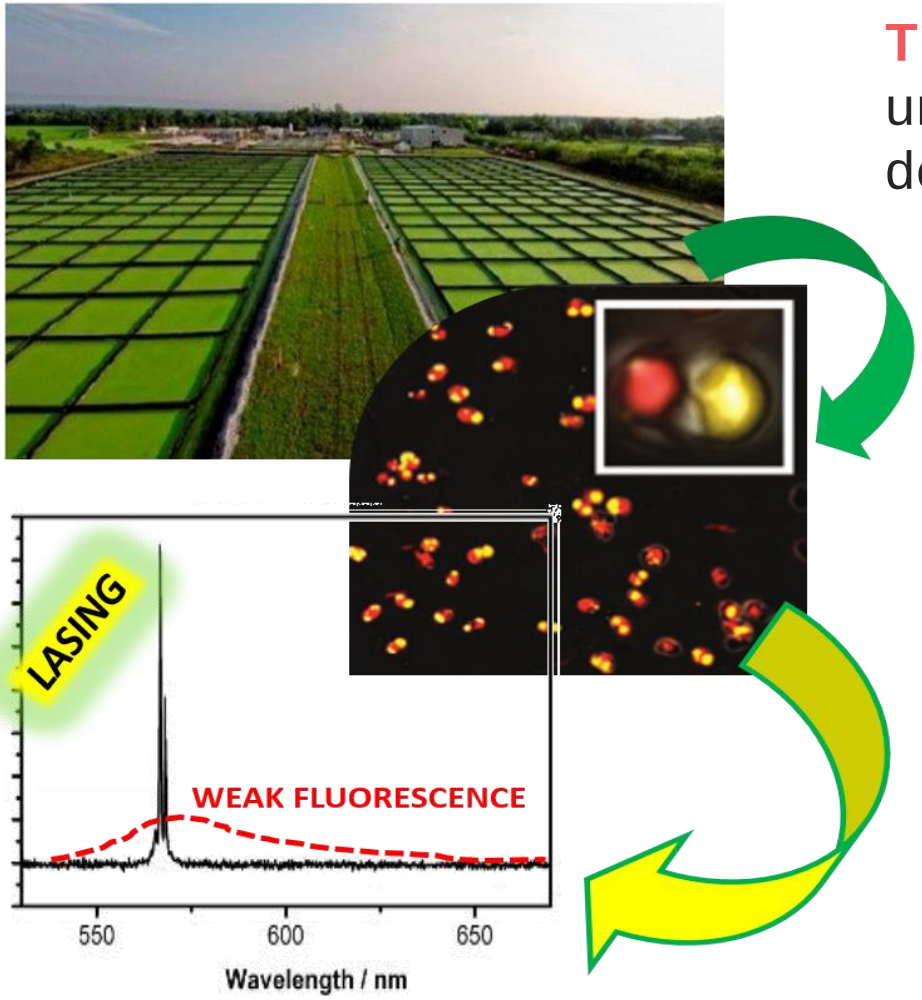


It could have applications in different areas of rapidly developing Quantum Science: compact and portable integrated photonic **quantum simulators** (QS), operating at room-temperatures, can be useful for the development of **new smart materials**, **chemical reactions** or to **predict social behaviors**.

Our project is coordinated by Fondazione Bruno Kessler (ITA) **and the partner is** ETH-Zurich (CHE).

Contact email ghulinyan@fbk.eu

INTRINSIC **LAS**ING WITH**IN** MICRO**A**LGAE TO MONITOR BIO**FUEL** PRODUCTION



The Idea is to realize **intrinsic biolaser sensors** in unicellular microalgae based on WGM microresonators, to develop a fast analysis of the status of these organisms.

It could have **applications** as a **fast and reliable tool to monitor oil production,** with the potential to boost an **enormous screening** of uncharacterized microalgae and cultivation conditions.

Our project is **coordinated by PhotoNanoLab** (**UniBologna**, Italy) and the **partners** are **UniPadova**, Italy and **TMCI S.R.L.,** Italy.

Contact email damiano.genovese2@unibo.it

LIROC – Read-Out Chip for SiPM LIDAR

The Idea is to design a novel Front-End ASIC dedicated to **SiPM read-out for LIDAR**. SiPM will disrupt Lidar by combining both high granularity (like existing APD based Lidar) and sensitivity (like existing PM based Lidar).

weeroc

It could have applications in Aerospace industry, Autonomous vehicles, Geology, Meteorologic metrology, etc…

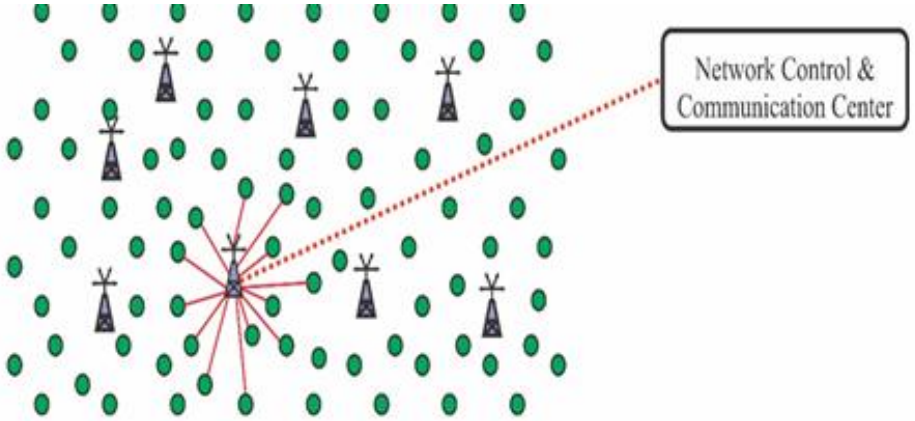
Our project is coordinated by Weeroc and the **partners are** Omega laboratory (FR) & Weeroc (FR).

We plan to liaise with Research Infrastructure Omega, IN2P3, CNRS.

Contact email julien.fleury@weeroc.com

Live, autonomous biosensor modules for environmental monitoring (SENSEI)

The Idea is to develop a novel generic sensing methodology, integrating live sensor cells into a specially designed miniaturized hardware platform, for autonomous and networked field operation. The design and construction of such bio-hybrid sensors will combine state of the art synthetic biology with innovative integrated photonic circuits; we will focus on water quality monitoring as the technological benchmark.



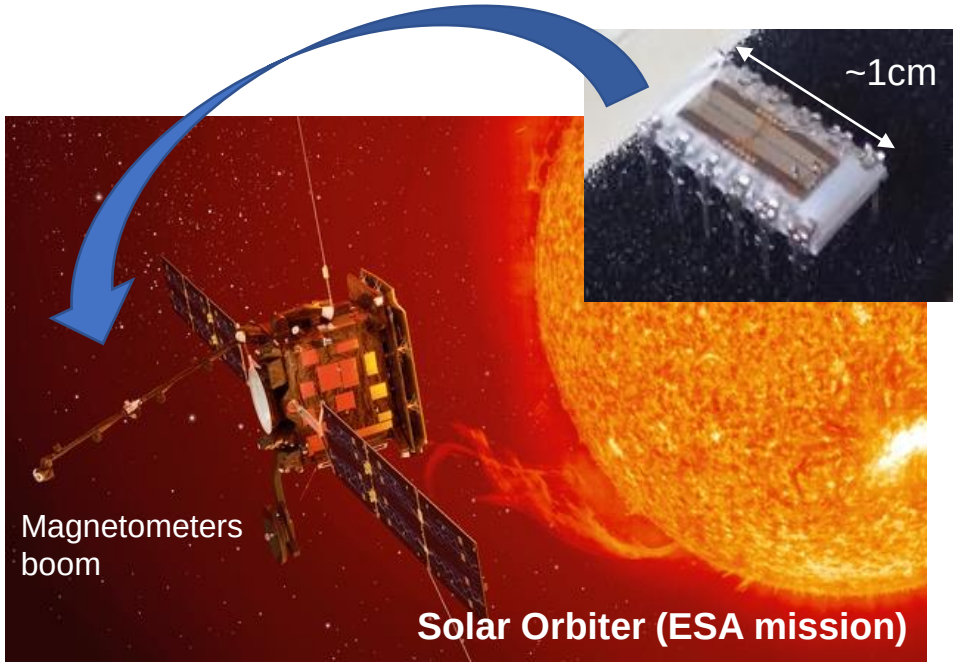
It could have applications in all fields in which remote sensing by live, whole-cell sensors is of potential importance, in particular **environmental, agricultural** and **security**

Our project is coordinated by Prof. Shimshon Belkin (Life Sciences, Hebrew University) **and the partners are** Prof. Aharon Agranat (Applied Physics, Hebrew University) and Dr. Offer Schwartsglass (Shenkar College of Engineering and Design), Israel

Contact email sb@mail.huji.ac.il

MAROT : low-noise MAgnetometeR based On Tunnel junctions

The Idea is to combine expertise in space magnetometry and nanotechnology to realize a new **miniaturized and ultra-sensitive magnetometer** based on innovative magnetic tunnel junctions.



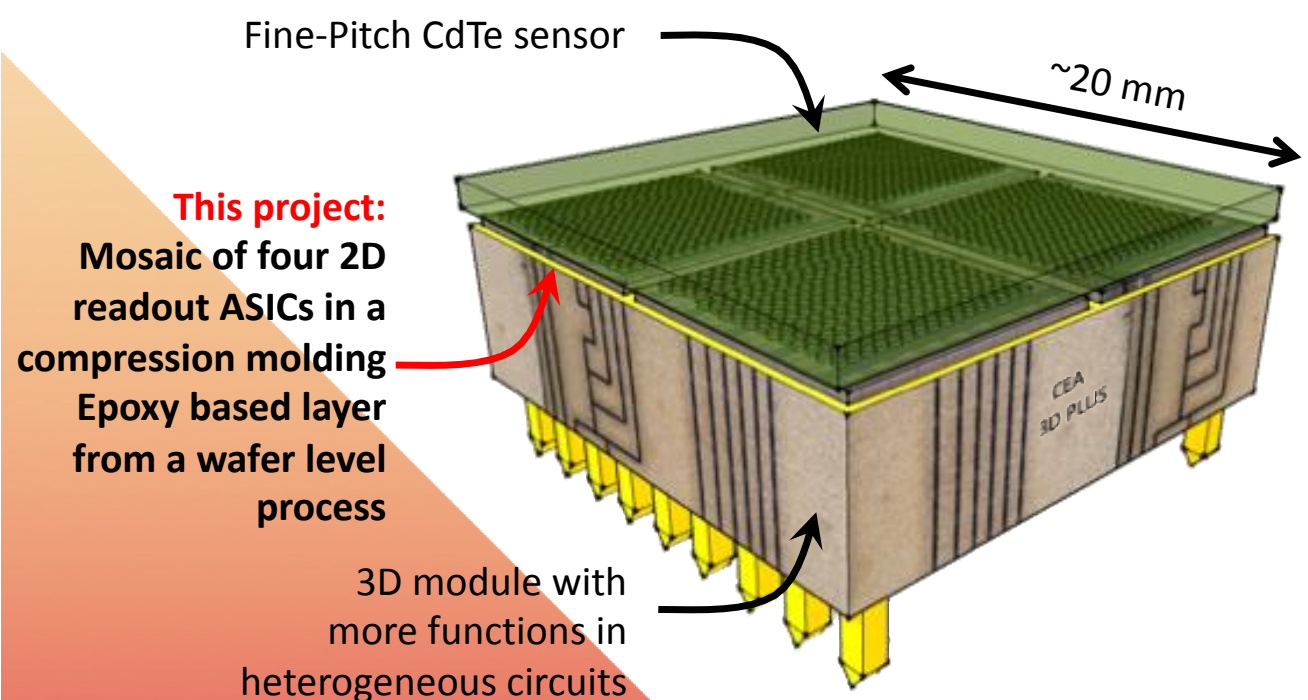
It has applications in space measurements on all kind of spacecrafts (e.g., nanosatellites), by combining the measurement capabilities of 2 magnetometers in a 10 times smaller instrument with similar performances. It might also be of interest for **medical applications.**

Our project is coordinated by CNRS-LPC2E laboratory **and the partners is** CEA-SPINTEC laboratory.

Contact email guillaume.jannet@cnrs-orleans.fr

MC2 – Mini CdTe On Chip

The Idea is to unlock a disruptive technology for high density, large scale, highly reliable manufacturing of **CdTe based hard X-ray imaging spectrometers,** on the basis of a **wafer-level epoxy based packaging process** to build a **mosaic of MPW chips**, by means of a compression molding technique to stack electronic functions in 3D.



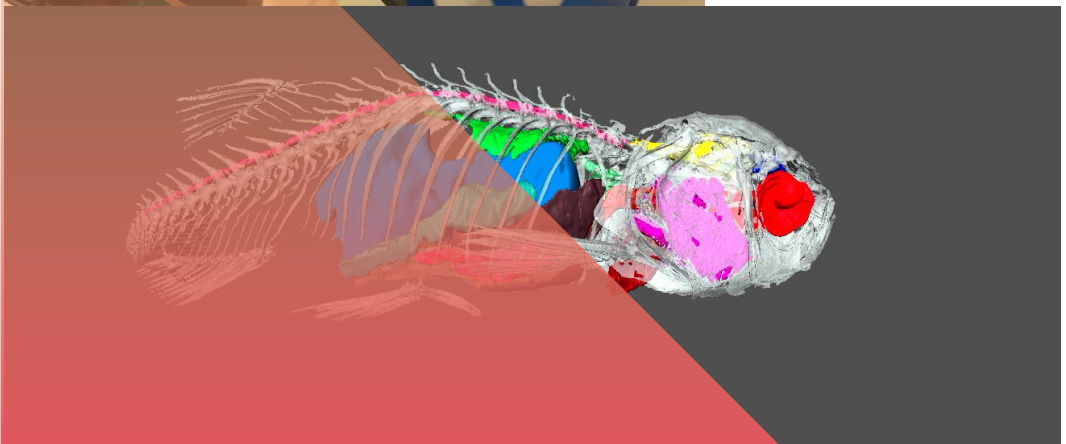
It could have applications in Space Science, Synchrotron imaging, spectrometers applied to X-ray fluorescence, Medical imaging, Additive Manufacturing monitoring, and more, where advanced assembly of sensors with heterogeneous full-custom integrated circuit packaging in 3D is needed to read out fine-pitch imaging spectrometers.

Our project is coordinated by CEA (Research and Technology organization) **and our partner is 3D PLUS** (Company)

Contact email olimousin@cea.fr

MERMAID: Multi-Emission Radioisotopes – Marine Animal Imaging Device

The Idea is to design & build the first dedicated device for *in vivo* radioisotope imaging of small aquatic animals, such as zebrafish



It could have applications in aquaculture, environmental sciences, biology & biomedical research.

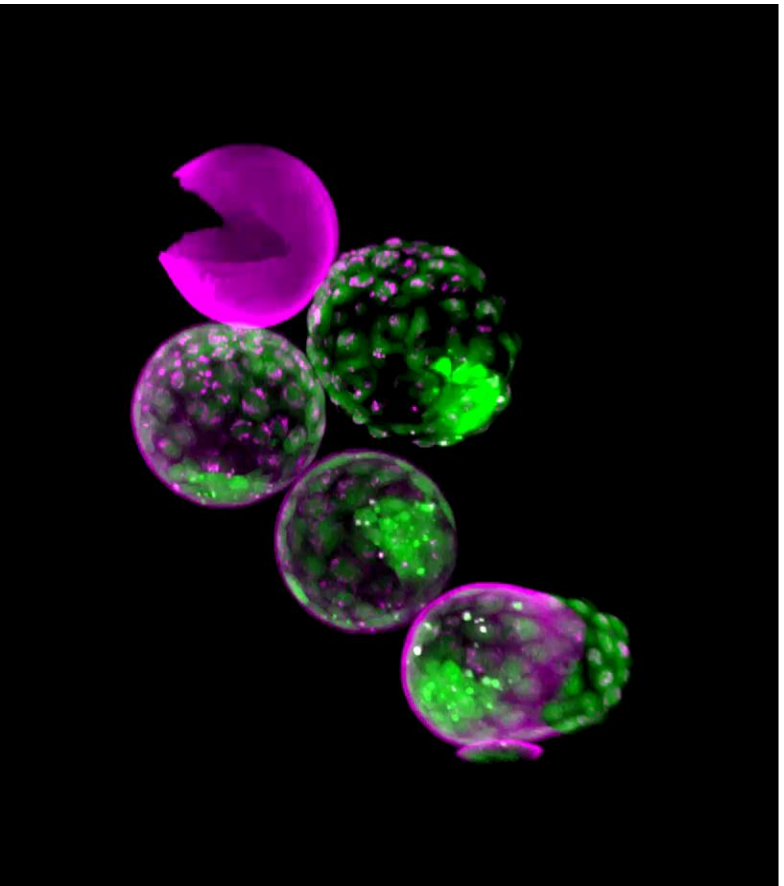
Our project is coordinated by Universität zu Lübeck and **the partner is** Fraunhofer EMB (Marine Biotechnology)

We plan to liaise with Research Infrastructure
(potentially) CERN and European Zebrafish Resource Center at KIT

Contact email {zvolsky,rafecas}@imt.uni-luebeck.de

METABOLIC PROFILING OF IN VITRO FERTILIZATION EMBRYOS USING HYSPECTRAL IMAGING (HYSPLANT)

The Idea is to develop a robust label-free imaging technology capable to measure the metabolic state of human embryos in a minimally invasive way



It could have applications in Reproductive Medicine where it will help doctors to select the best quality embryos

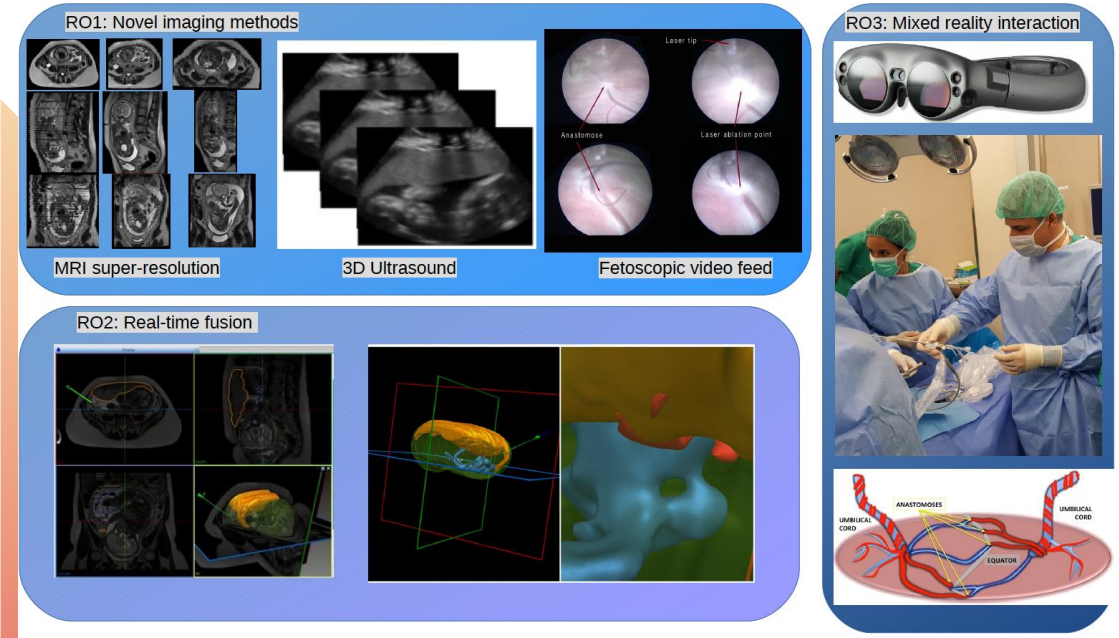
Our project is coordinated by The Bioengineering in Reproductive Health group at IBEC Barcelona **and the partner is** Dexeus Hospital

We plan to liaise with an engineering company capable to integrate lasers and optics in medical devices.

Contact email sojosnegros@ibecbarcelona.eu

MIIFI – Multimodality Integrated Imaging for Foetal Intervention

The Idea is to advance the state of foetal surgeries using Multimodal Image Fusion, Deep Learning methods and Mixed Reality visualization.



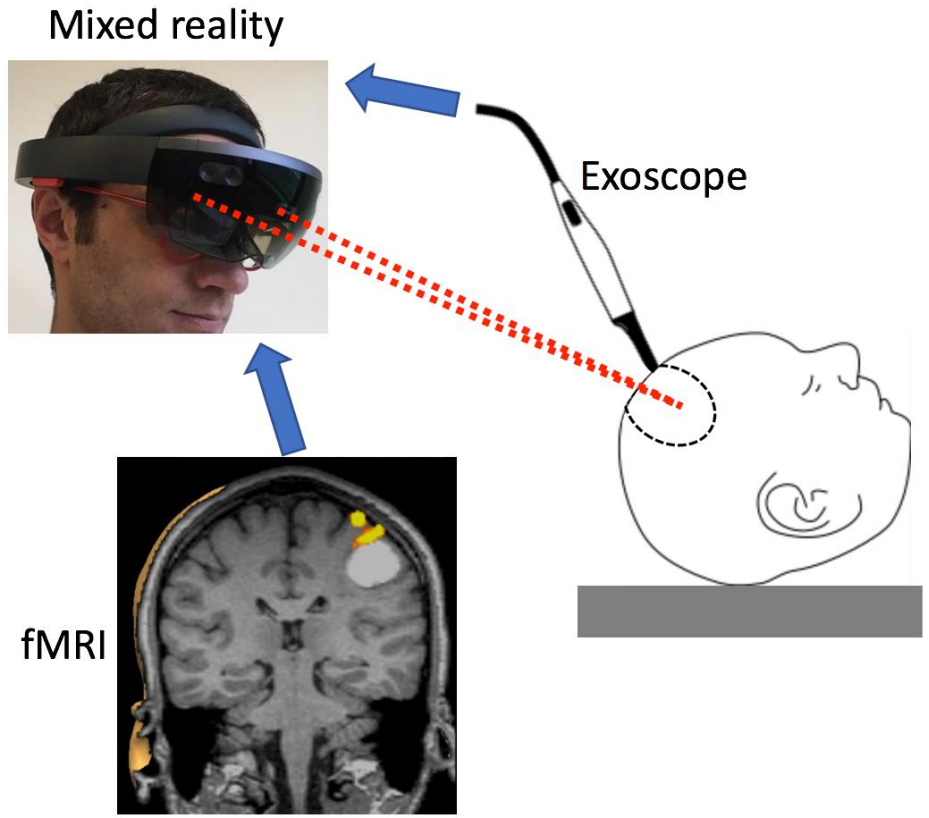
We will advance on three fronts: (1) Novel imaging algorithms to **combine** information from MRI, US and fetoscopic video feed (2) Segmentation and detection of fetal and maternal organs using **Deep Learning** to create **3D anatomical models** (3) Design a comfortable **Mixed Reality** interface for the surgeon to explore and interact with the models.

Our project is coordinated by Universitat Pompeu Fabra (Barcelona) **and the partners are** VicomTech (San Sebastian , Hospital San Juan de Deu (Barcelona).

Contact email mario.ceresa@upf.edu

Mixed reality for brain functional and structural navigation during neurosurgery

Idea: i) to implement an automatic analysis of multimodal MRI presurgical mapping in a single application; ii) 3D holograms obtained from MRI will be integrated with the physical head of the patient and the surgical exoscope view using a mixed-reality approach implemented in a wearable device.



Applications: the enhanced ergonomics of the procedure will significantly improve accuracy and safety of brain surgery, with large expected benefits for health care systems and related industrial investors.

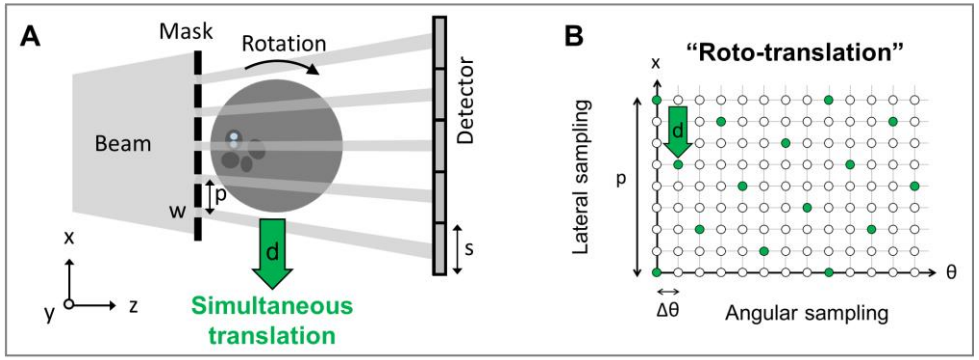
Our project is coordinated by University of Chieti-Pescara (IT) and the **partners are** University of Pavia (IT) and SerVE Srl (IT).

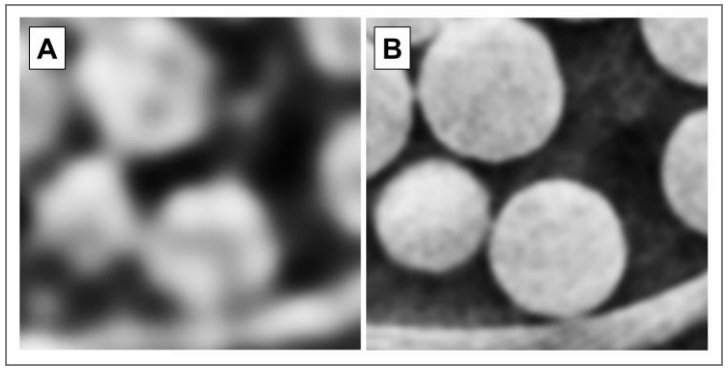
We plan to liaise with MRI and Neuronavigation systems companies.

Contact email: antonio.ferretti@unich.it

ML-CYCLO-CT: Combining cycloidal computed tomography with machine learning: a mechanism to disrupt the costly relationship between spatial resolution and radiation dose

The Idea is to develop a new micro-CT technique by combining a structured beam, tailored sampling and machine learning-based image reconstruction, with the aim of scanning at high resolution with significantly reduced radiation dose.





It could have applications in any field where high-resolution imaging at a low radiation dose is key, such as biomedical research.

Our project is coordinated by University College London and the partner is Centrum Wiskunde & Informatica (Amsterdam, NL).

Contact emails

Alessandro Olivo: a.olivo@ucl.ac.uk
Charlotte Hagen: charlotte.hagen.10@ucl.ac.uk
Daniël Pelt: daniel.pelt@cwi.nl

Monitoring tissue implants by field-cycling MRI of quadrupolar-peak contrast agents (QP-MRI)

The Idea is to develop new sensors based on ^{14}N-Quadrupolar Peaks resulting from local increases of relaxation rates ($1/T_1$) at magnetic fields where the proton NMR frequency and the ^{14}N nuclear quadrupole resonance frequency coincide thus reporting on ^{14}N probes with the proton sensitivity. These polymeric sensors are pH sensitive and completely different from the currently used contrast agents in clinical application.

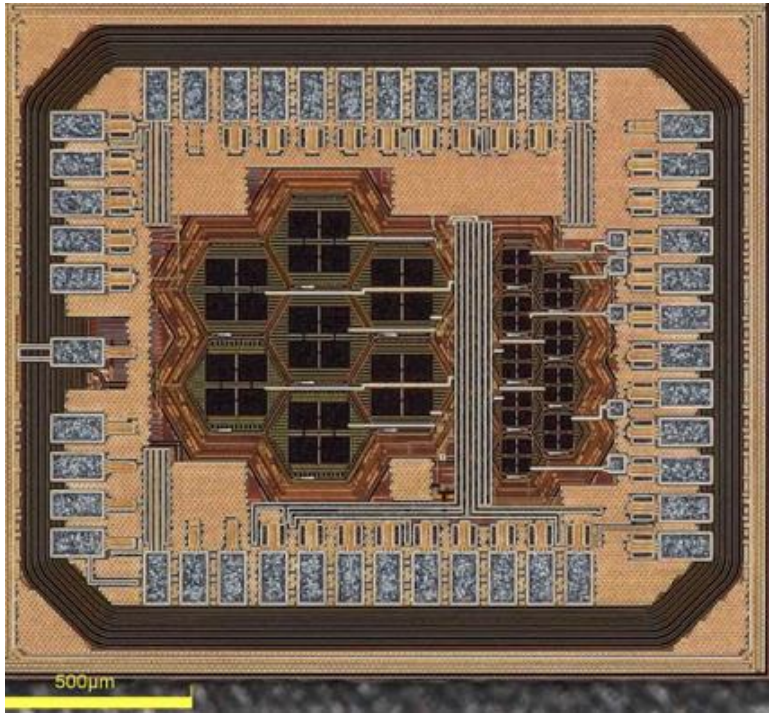
It could have applications in monitoring the status of tissue implants in vivo, at human scale. These sensors are aimed at reporting on the degradation of the scaffold and on the overall transplanted cells conditions.

Our project is coordinated by S. Geninatti Crich, University of Torino (IT) and the **partners are** D. Lurie, University of Aberdeen (UK).

Contact email simonetta.geninatti@unito.it

MonPicoAD – Monolithic Picosecond Avalanche Detector

The Idea is to produce a low-cost, low-power pixelated silicon detector that includes full electronics and is capable to measure ionizing radiation with picosecond time resolution.



It could have applications in basic science (future particle physics and space experiments) as well as Time-Of-Flight applications (PET, mass spectrometry) and photonics.

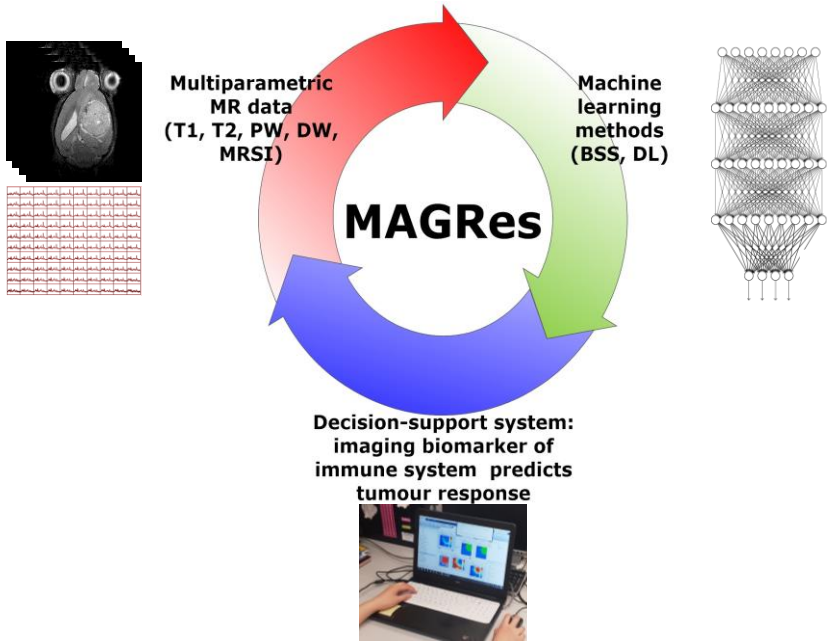
Our project is coordinated by the University of Geneva and **the partners are** EPFL Lausanne, INFN Rome Tor Vergata.

We plan to liaise with Research Infrastructure IHP Mikroelektronik.

Contact email giuseppe.iacobucci@unige.ch

Multiparametric MR approaches for non-invasive Glioblastoma therapy response follow-up (MAGRes)

The Idea is to combine information from MR imaging and spectroscopic imaging to derive a surrogate biomarker of efficient immune system participation in response to therapy in Glioblastoma with the help of machine learning techniques. Output will be integrated in a software toolbox.



It could have applications in Glioblastoma patient management. MAGRes will be able to significantly decrease the time frame needed for response/relapse detection, producing real-time reliable information

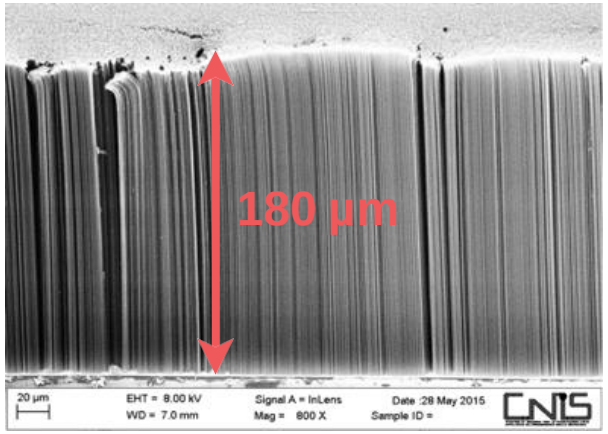
Our project is coordinated by *Centro de Investigación Biomédica en Red* (CIBER) and our **partner is** *Universitat Politècnica de Catalunya* (UPC)

We plan to liaise with Research Infrastructure NANBIOSIS, Spanish Scientific-Technical Infrastructure (www.nanbiosis.es)

Contact email AnaPaula.Candiota@uab.cat

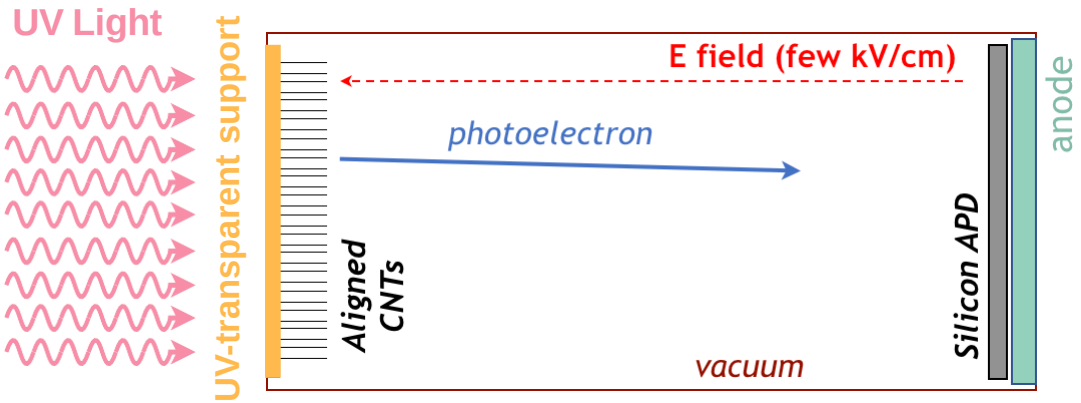
NanoUV

The Idea is to develop a high-efficiency UV-light detector based on aligned Carbon nanotubes



It could have applications in dark matter searches, space telescopes, air pollution monitoring.

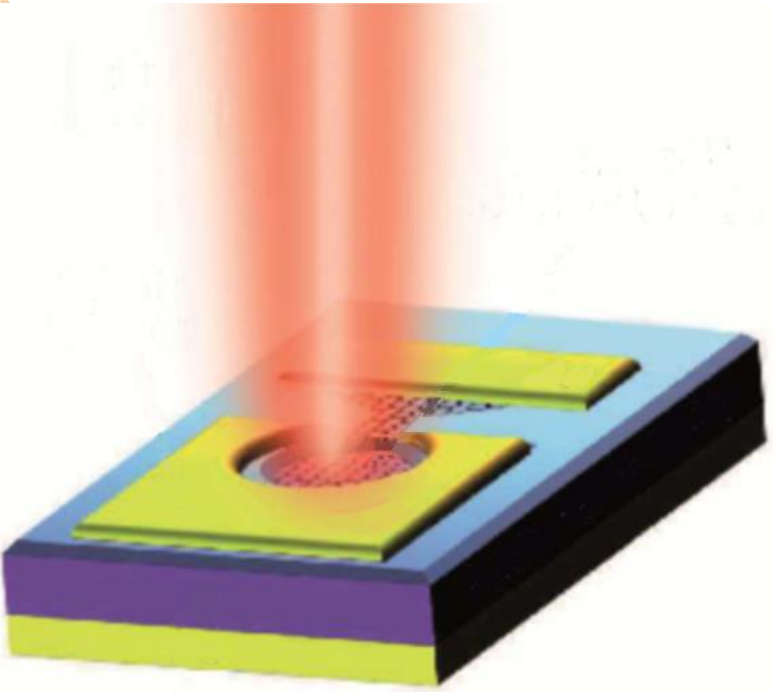
Our project is coordinated by INFN **and the partners are** 'Sapienza' University and Roma Tre University.



Contact email francesco.pandolfi@roma1.infn.it

NEAR-INFRARED RESONANT CAVITY ENHANCED GRAPHENE/SILICON PHOTODETECTORS (REVEAL)

REVEAL basic Idea is to realize high-performance Si-based photodetectors (PDs) operating at 1550 nm, taking advantage of both a **new concept of Resonant Cavity Enhanced** (RCE) PD and the integration of new 2D emerging materials like **graphene** on Si substrates.



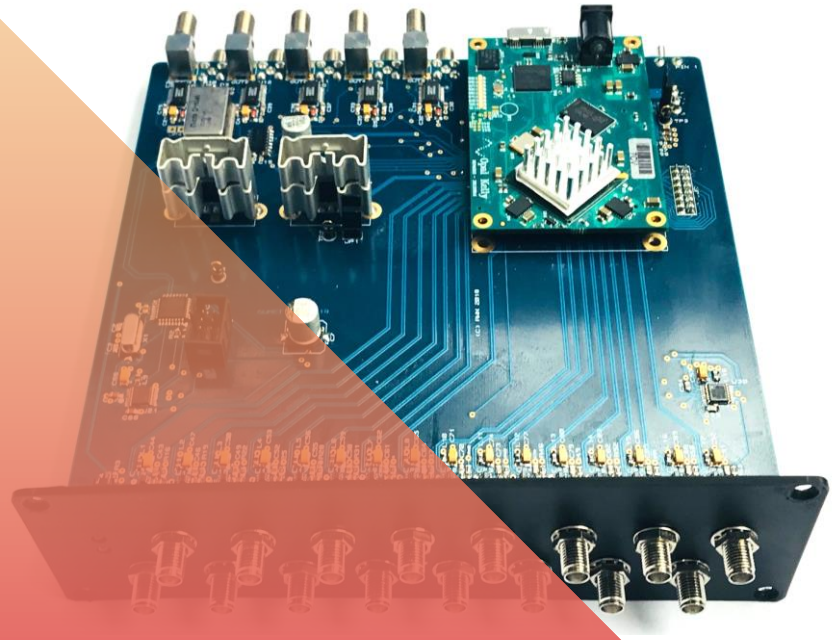
Project impact: REVEAL will strengthen RTD in the field of telecommunications, free space optical communications, optical coherence tomography, LIDAR, NIR imaging, remote sensing and environmental monitoring and surveillance.

REVEAL is coordinated by the Institute for Microelectronics and Microsystems (Napoli and Bologna sections), with Micro Photon Devices s.r.l. **as partners.**

Contact email maurizio.casalino@cnr.it

NeXt Generation of Time to Digital Converters - NXGTDC

The Idea is to create a 32 channel high-resolution and low-cost time-to-digital converter (TDC) utilising low-cost off-the-shelf field programmable gate array (FPGA) technology. This TDC will be accurate to 12ps RMS and will be capable of real-time TCSPC.



It could have applications in LiDAR, particle and quantum experiments, PET and SPECT systems, fluorescence lifetime imaging systems and more.

Our project is coordinated by Dr Richard Nock at Aston University **and the partners are** Dr Xiao Ai of QLM (Quantum Light Metrology).

Contact email r.nock@aston.ac.uk

One dimensional, Single-Chain polymers for gas sENsors through high-pressure Technology (SCENT),

The Idea is to combine high-pressure technology and zeolites featuring Å-sized pores to prepare host (zeolite) – guest (1D single-chain polymers) nanostructures to be integrated in gas-sensors.

+ Sensitivity (1D guest)
+ Selectivity (host zeolite)
+ Stability (host-guest)

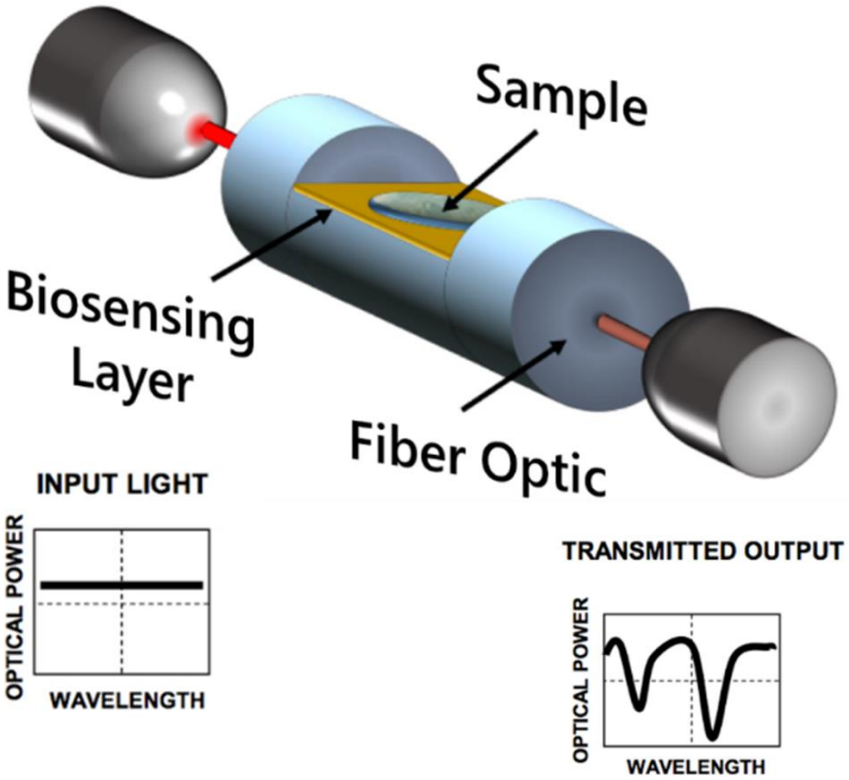
It could have applications in all fields looking for improvement in nowadays available gas sensors, including the medical, environmental, safety and security fields.

Our project is coordinated by: National Institute of Optics of CNR (Italy) **and the partners are:** University of Torino, Department of Earth Sciences (Italy) **and** CNRS, Institut Charles Gerhardt Montpellier UMR 5253 CNRS-UM-ENSCM (France) **and** European Laboratory for Non-linear Spectroscopy (Italy)

Contact email andrea.ponzoni@ino.cnr.it

Optical Biosensing Universal System - OBUS

The Idea consist of developing, testing and validating fiber optic sensors based on LMR for microRNA detection through the adequate selection of a specific biomarker panel associated to rheumatic diseases.



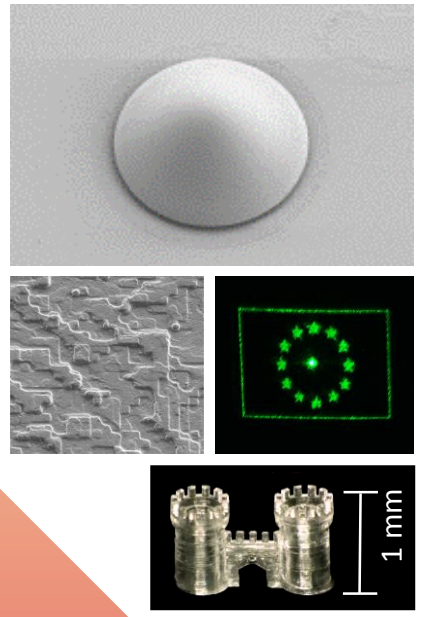
It could have applications in early diagnosis and control as well as being used for therapeutic purposes in patients suffering from Rheumatoid arthritis (RA).

Our project is coordinated by Public University of Navarra with expertise in optical fiber biosensors **and partnered by** Making Genetics S.L with knowledge in novel biomarker discovery.

Contact email carlos.ruiz@unavarra.es

OptoGlass3D

The Idea is to print high-performance optical glass via high-resolution laser direct 3D writing.



It could have applications in

- Optics for sensing and imaging
- Integrated optics
- Photonics
- Medical Imaging
- Smart Materials

Our project is coordinated by Glassomer GmbH **and the partner is** Nanoscribe GmbH.

Contact email info@glassomer.com
info@nanoscribe.com

Percussion sensor for wood disease evaluation

The Idea is to to develop a wood disease detection sensor based on a biomimetic principle: repeatedly hitting the tree and listening. The acoustic response of the tree is related to its hydration level, and therefore, with the progression of tree diseases.

The aye-aye taps on trees to find grubs

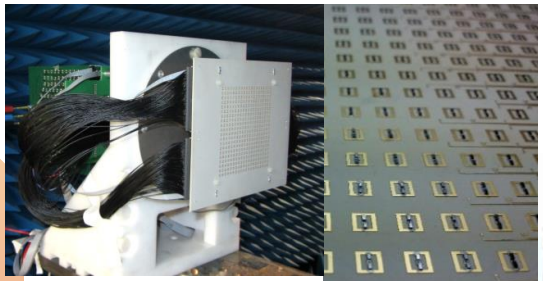
It could have applications in the care of forests affected by fungi and wood parasites

Our project is coordinated by IK4-Tekniker and the **partners are** Basoekin (member of Association of Basque Foresters)

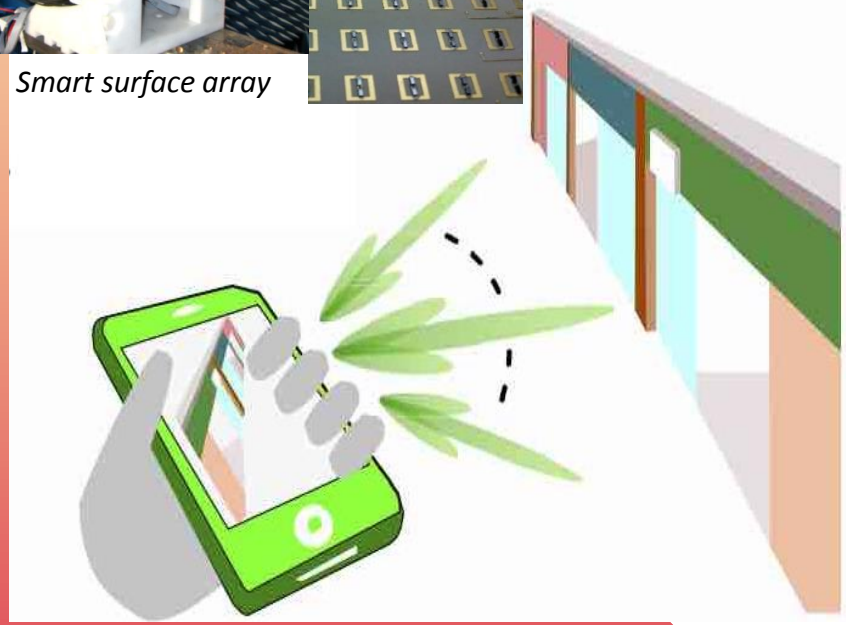
Contact email jonander.sarasua@tekniker.es

Personal Radars for Radio Imaging and Infrastructure-less Localization (PRIMELOC)

The Idea is to turn future personal devices into a **personal radar** as a milestone step towards automatically generated maps and infrastructure-less localization inside buildings using massive antenna array technology at millimeter-wave.



Smart surface array



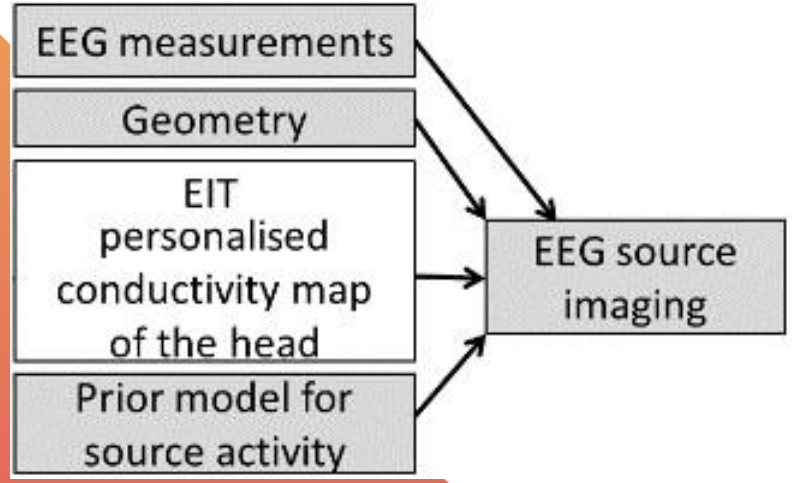
It could have applications in Industry (autonomous navigation of vehicles); **Safety** (guidance in unknown and dangerous environments, e.g., firemen); **Wellbeing** (visually impaired people guidance); **Personalized guidance** (retail, virtual/augmented reality, and cultural heritage discovery).

Our project is coordinated by the University of Bologna and the **partner is** Commissariat à l'énergie atomique et aux énergies alternatives **CEA-LETI** (Research Infrastructure).

Contact email davide.dardari@unibo.it

PERSONALISED BRAIN IMAGING

The Idea is to develop algorithms that allow simultaneous electrical impedance tomography (EIT) and electroencephalography (EEG) imaging of the human head and brain. This is important because EEG results are very sensitive to the conductivity modelling of the head, and EIT can be used to solve these individually varying conductivities and thus improve the accuracy of the EEG results.



It could have applications in the field of neuroimaging and personalised healthcare. This is well in-line with the needs of the European population for accurate and fast neurological diagnostics and targeted treatment.

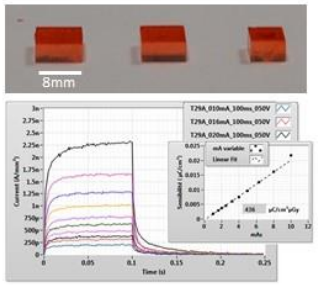
Our project is coordinated by Dr. Alexandra Koulouri (Tampere University, Finland), and the project will conducted in collaboration with Dr. Ville Rimpilainen (University of Bath, UK)

Contact email: Alexandra.Koulouri@tuni.fi
V.J.T.Rimpilainen@bath.ac.uk

PerXI (**Per**ovskite for spectrometric **X**-ray **I**maging)

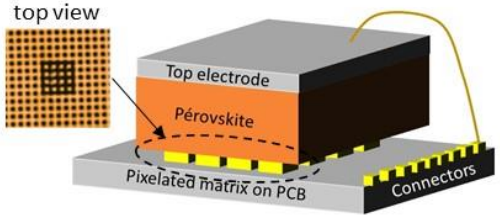
The Idea is to demonstrate **pixelated X-ray colour imaging** by the use a **new solution-processed perovskite semiconductor** further compatible with **large area** integration.

Starting point



- Know-how on perovskite single crystals growth from solution,
- X-ray detection in integration mode.

PerXI project



- Integration of thick layer of perovskite semiconductor on pixelated PCB,
- 16 pixels, 200µm pitch.

- Reading circuit upgraded for perovskite specificities,
- Evaluation of gamma and X-ray spectrometric performances.

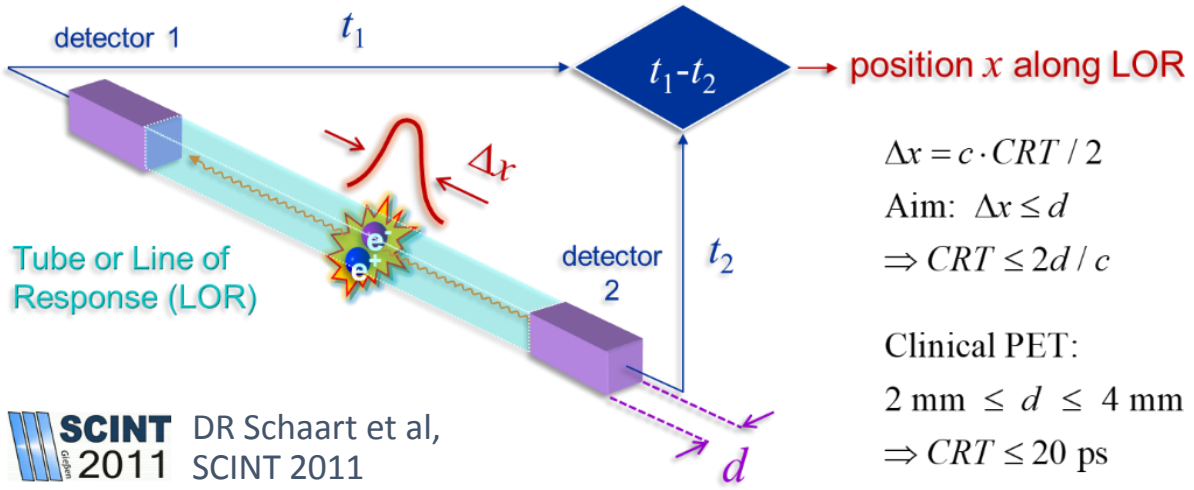
It could have applications in the fields of X-rays, gamma-rays or particles detection for **medical imaging** (radiography), security (explosive or hazardous material detection), non-destructive testing, nuclear, science (large facilities or space activities).

Our project is coordinated by CEA **and the partners are** French National Research Center (CNRS) and Trixell company.

Contact email verilhacjm@cea.fr

Picosecond Scintillator Timing with Superconducting Nanowire Single-Photon Detectors (PIZZICATO)

The Idea is to develop a radically new detector technology for positron emission tomography (PET) based on large-area superconducting nanowire single-photon detectors (SNSPDs) coupled to ultrafast cryogenic scintillators and to demonstrate that such detectors have the potential to enable ~10 picosecond PET



SCINT 2011 DR Schaart et al, SCINT 2011

The holy grail of PET is "10-picosecond PET." This will make statistical image reconstruction obsolete and allow real-time image formation. SNSPDs have demonstrated outstanding time resolution and photodetection efficiency. Large-area SNSPDs for PET will be developed in the Pizzicato project.

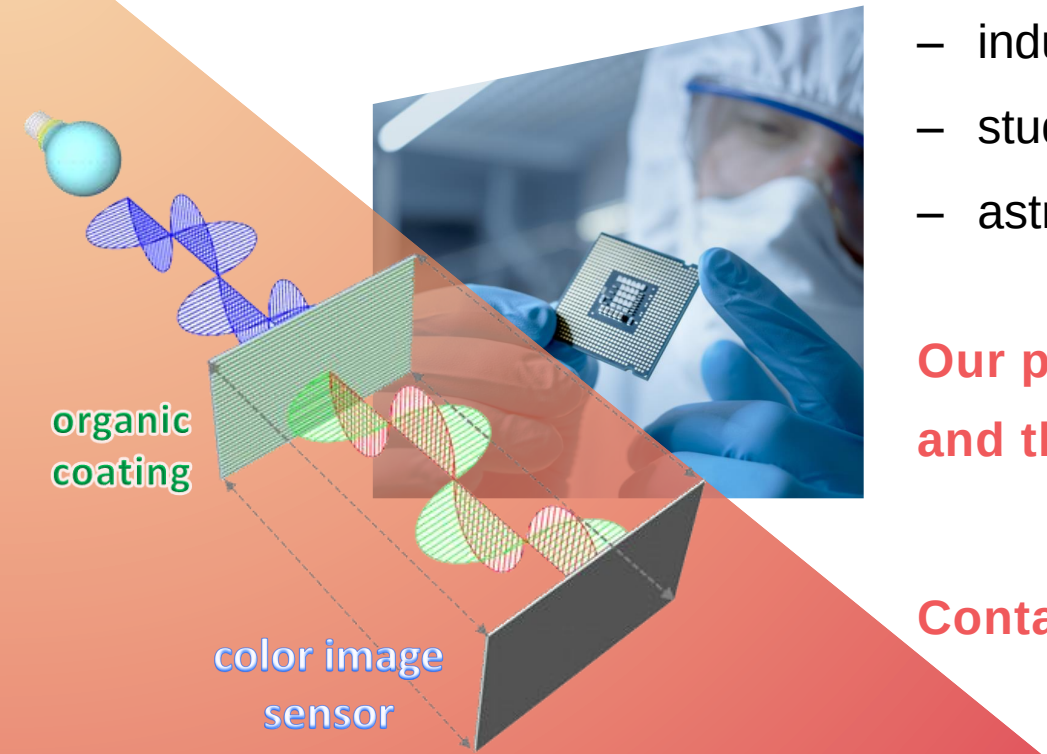
This could unleash the full potential of PET as a tool for personalized medicine, offering new possibilities in the management of cancer as well as cardiovascular and neurodegenerative diseases

Our project is coordinated by Delft University of Technology (TU Delft) **and our partner SME is** Single Quantum

Contact email
d.r.schaart@tudelft.nl

POlarization-SEnsitive Imaging Detectors with Organic Nanostructured coatings (POSEIDON)

The Idea is to add polarimetric capability to color imaging cameras with organic coatings based on anisotropic nanostructured emissive materials able to convert polarization information into different colors



Compact on-chip imaging polarimetric systems **could have applications in many fields:**

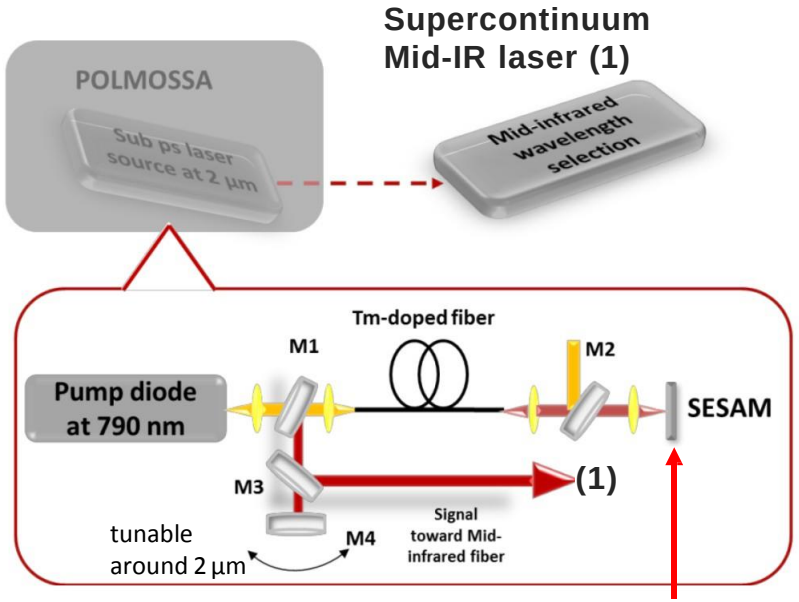
- industry (detection of surface defects and structural damages or stress)
- study of atmospheric aerosols
- astronomy (exoplanets, magnetic fields) and solar physics

Our project is coordinated by ISMAC-CNR **and the partner is** IASF-INAF.

Contact emails chiara.botta@ismac.cnr.it;
michela.uslenghi@inaf.it

POLMOSSA (2 µm High-Power/Short-Pulse Laser Based on Monolithic Semiconductor Saturable Absorber)

The idea is to develop and deploy a novel (since based on lattice-matched layers and monolithically integrated with a crystalline heat-sink substrate) semiconductor saturable absorber mirror (SESAM) to realize a high peak power, sub-ns pulsed laser tunable between at least 1.95 and 2.05 µm. Extensive simulation will be performed on the optimization of tunable mirrors using crystalline coating technology.



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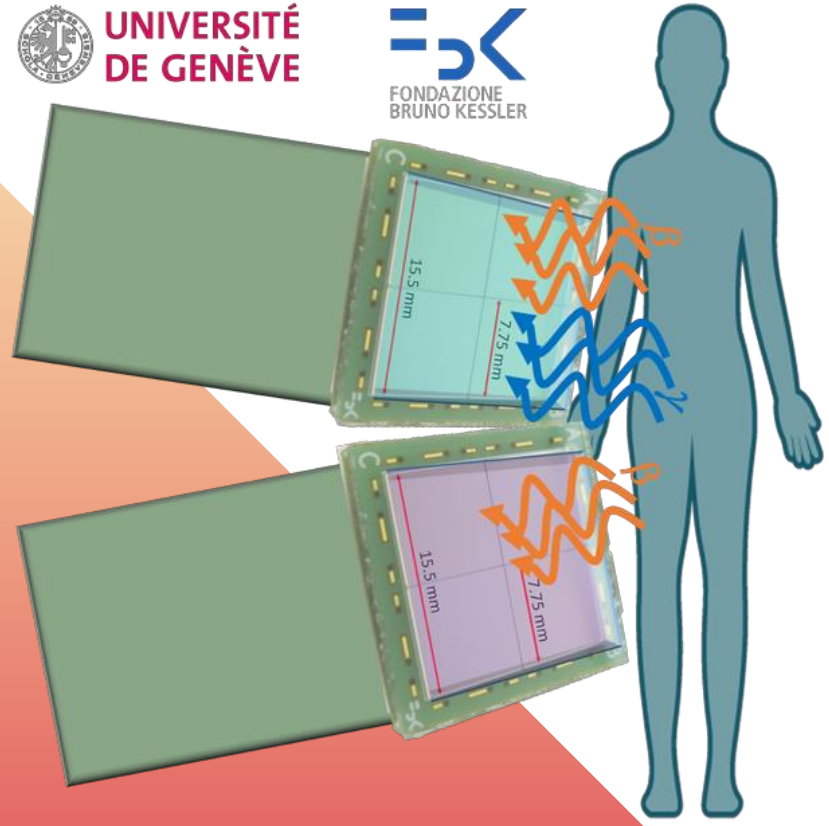
Potential applications: The resulting ~2 µm high power/short-pulse laser could be used as a laser source in its own right for surgery (e.g. of cornea and prostate) or remote spatial sensing (e.g. LIDAR). However, it would mainly be deployed as pump stage of a supercontinuum mid-infrared laser emitting from 2 to 12 µm and therefore, thanks to vibration resonance peaks of numerous molecules in this wavelength range, suitable for highly effective medical imaging or chemical sensing.

Our project is coordinated by Crystalline Mirror Solutions (Vienna, Austria) **and the partners are** Lebanese University (Beirut, Lebanon) and Reflekron (Tampere, Finland).

Contact email: j.nowack@crystallinemirrors.com.

POSiCS: POsition-sensitive SiPMs Compact & Scalable beta-camera

The Idea is to prove a new way to detect efficiently tumours, not to deep, by means of beta-probe with novel active background rejection technique, featuring new position sensitive SiPM



It could have applications in radio-guided surgery (RGS) and potentially for many other applications as it is based on the use of standard radiotracer used in PET.

Our project is coordinated by University of Geneva (D. della Volpe) **and the partners are** FBK – Foundation Bruno Kessler.

We plan to liaise with Research Infrastructure
CERN-IdeaSquare

Contact email Domenico.dellavolpe@unige.ch

Positronium surface-scanning microscopy

The Idea is to build the first laser-cooling beam optics for a source of positronium atoms, towards the first low-divergence beam of neutral antimatter atoms.

It could have applications in material science studies of nanostructured surfaces, antimatter manipulation and fundamental physics

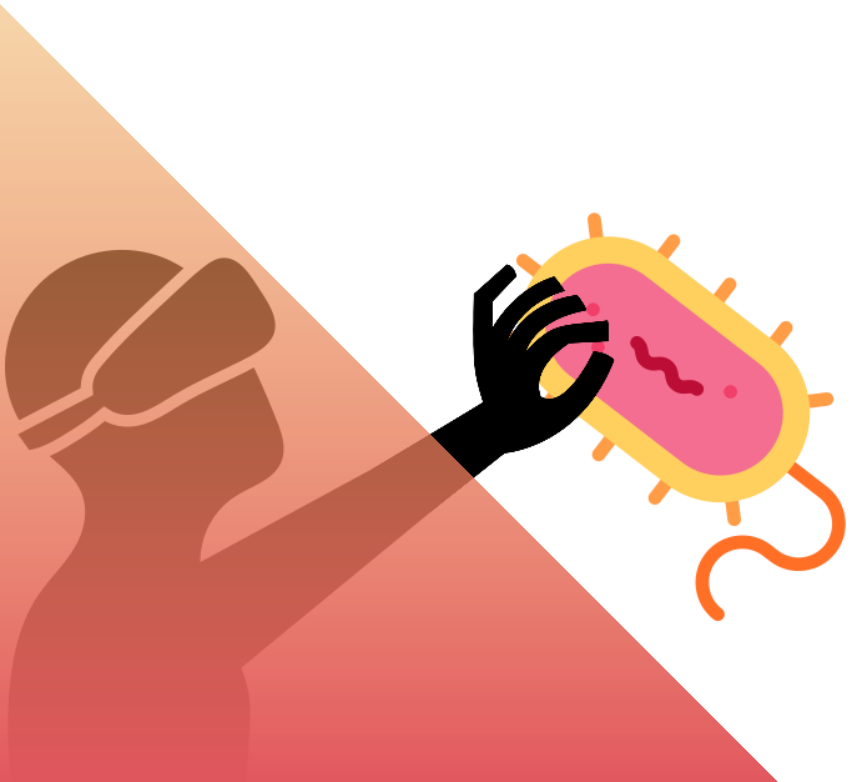
Our project is coordinated by CERN **and the partner is** Laboratoire Aimé-Cotton, Paris (FR)

We plan to liaise with Research Infrastructure TIFPA, Trento (IT) and Laboratoire Aimé-Cotton, Paris (FR)

Contact email ruggero.caravita@cern.ch michael.doser@cern.ch

PROTEUS

The Idea is to combine holographic techniques for imaging and micromanipulation in a virtual reality environment in which we can use our hands to grab, manipulate and interact with real cells that are simultaneously present under the microscope.



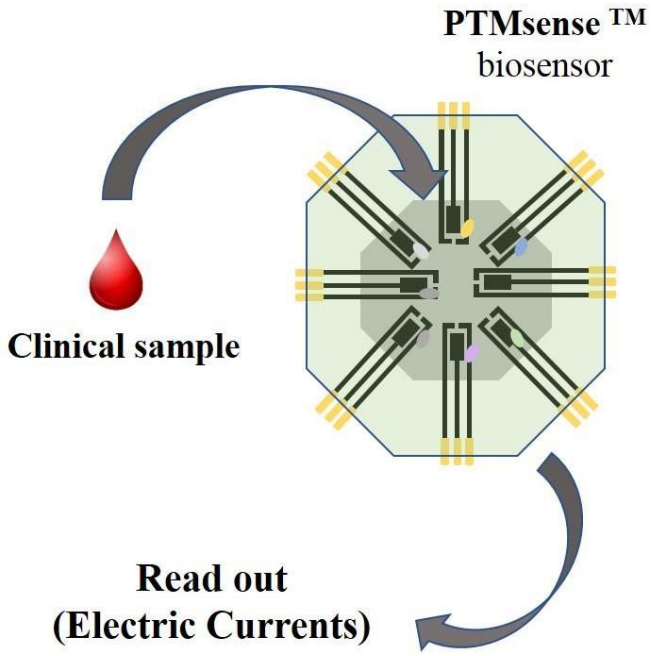
It could have applications in the design and fabrication of microsystems, interactive analysis of single cells for diagnostic purposes, teaching the “strange” physics of the “micro-world” by direct experiments .

Our project is coordinated by Sapienza University of Rome and the **partner is** the National Research Council.

Contact email roberto.dileonardo@uniroma1.it

PTMsense™ - biosensor for an electrochemically-based point-of-care diagnostics

The Idea is to develop a novel microscale electrochemical biosensor for highly sensitive detection of ubiquitination patterns of target proteins



It could have applications in Precision Medicine as companion diagnostic and prognostic kits allowing fast and cost effective prediction of response to drugs and disease prognosis in a point-of-care settings

Our project is coordinated by PTM Biosciences and the partner is the Ben-Gurion University, Israel

Contact email: htsubery@ptmbiosciences.com

Quantum Imaging for Tomography (QuIT)

The Idea is to use the reconstruction techniques used in quantum tomography for medical (and other) tomographic imaging reconstructions.

The use of quantum effects will also be explored.

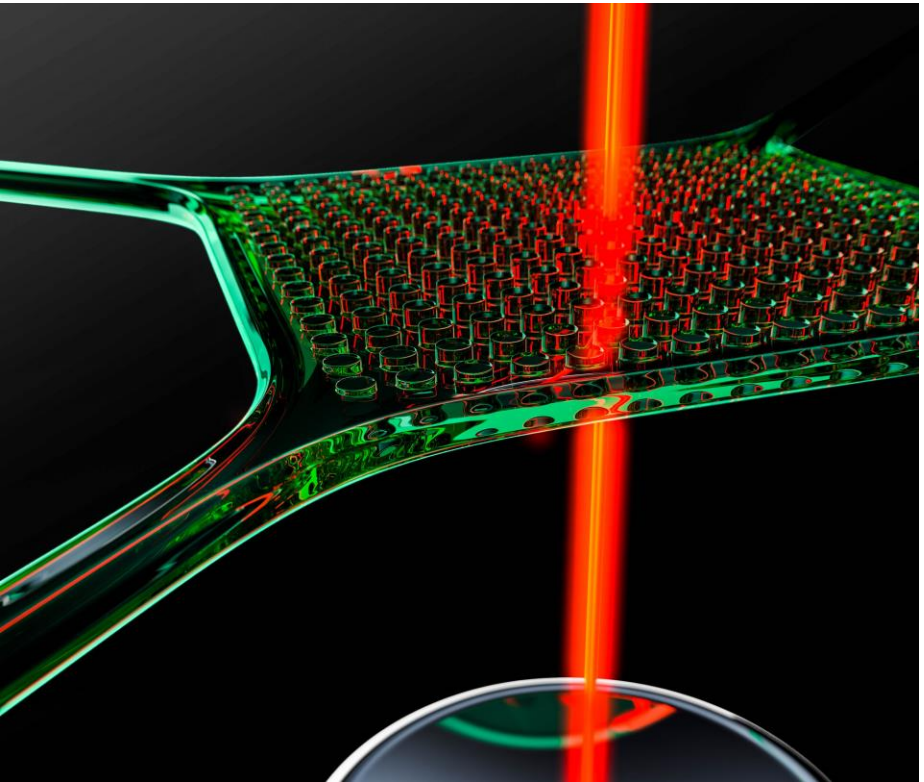
CT-scans require a large radiation dose. Our method may reduce them, opening a plethora of applications, (e.g. the use of CT for prevention).

Our project is coordinated by Lorenzo Maccone at Pavia University **and the partners are** Giampaolo Stopazzolo at AUSSL 8 Vicenza.

Contact email maccone@unipv.it

Quantum Membrane Accelerometer Microchip

The Idea is to use photonic crystal membranes to make optomechanical accelerometers that operate at the quantum-limit.



It will have applications in high-precision inertial navigation insensitive to electromagnetic jamming.

Our project is coordinated by Richard Norte & Simon Groeblacher

We plan to liaise with TU Delft, University of Vienna & Kavli Nanolabs.

Contact email: r.a.norte@tudelft.nl