



**Università
di Catania**



BRIT

Bio-nanotech Research and Innovation Tower

B.R.I.T. is the **University of Catania Service Center** for Research and Innovation in Bio- and Nano-technology.

We provide access to high-end scientific instrumentation and interdisciplinary expertise to support University departments and public/private partners, fostering research and technology transfer.

Bio-nanotech Research and Innovation Tower



You can find us at:

Torre biologica "Ferdinando Latteri"

University of Catania

Via S. Sofia, 89

95123 Catania

- Promote access to complex, high-cost scientific equipment through shared use among University research groups.
- Encourage the submission of competitive research proposals to secure funding.
- Strengthen collaboration between academia, industry and the innovation ecosystem.
- Support training and outreach activities in bio- and nanotechnologies.

The Center has two large laboratories (**Biotech** and **Nanotech**)
each developed across three synergistic research platforms.

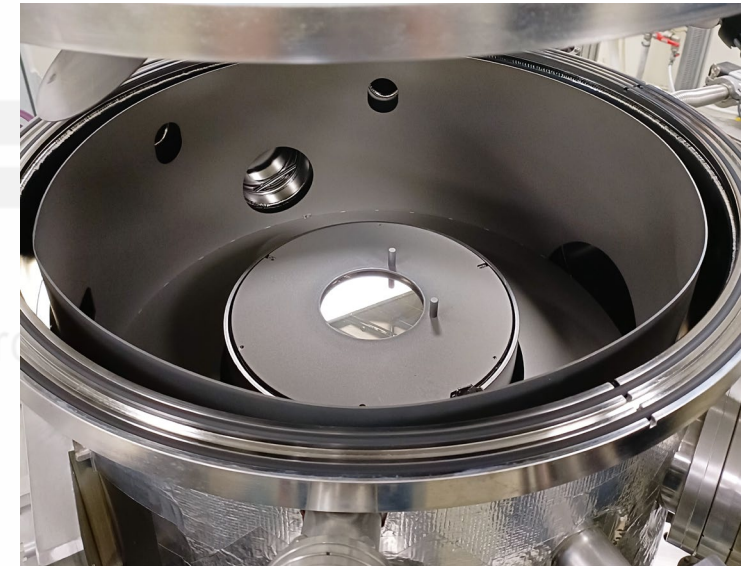
Nanotech

The **Nanotechnology Laboratory** of the BRIT Service Center provides state-of-the-art instrumentation and expertise in materials science and micro-/nano-scale device fabrication. Activities are structured into three platforms - Growth, Characterization, and Prototyping - supporting the synthesis and characterization of micro- and nanostructured materials, innovation in smart multifunctional surfaces and research for cultural heritage.

Confocal Magnetron Sputter deposition system



Growth technique for applications in many different fields on 4" wafer with automatic loadlock wafer transfer system. The UHV sputtering system is equipped with 9 confocal 3" sources operating both under DC and RF bias, quartz microbalance and the substrate can be rotated and heated up to 850°C.





PHI 5000 VersaProbe II

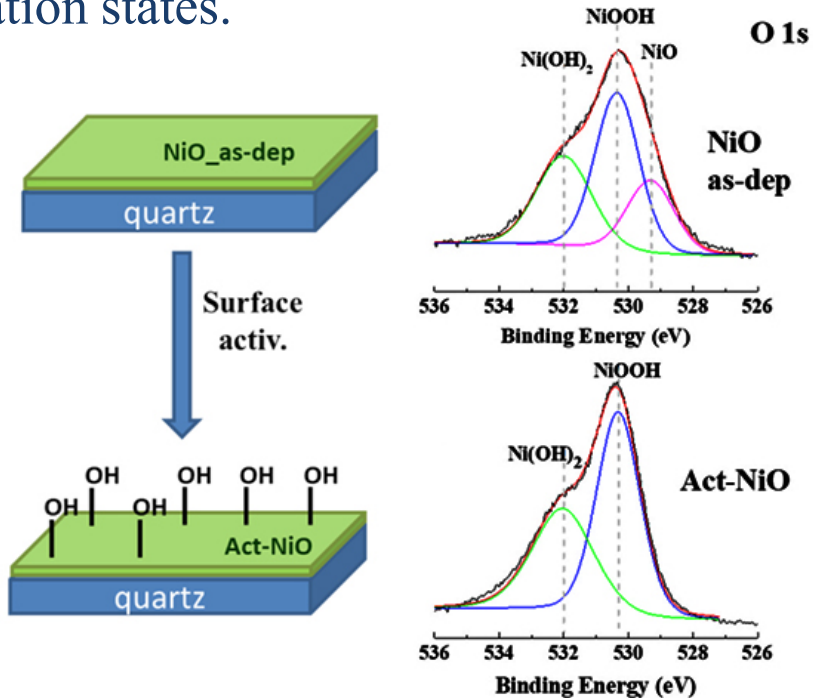
Spectroscopy, depth profiling and imaging can all be performed over the full range of X-ray beam sizes less than 10 μm .

The multi-technique includes:

- Monochromatic X-ray source
- UV He-I and He-II lamp for UPS analysis
- C60 gun, Ar ion gun, electron gun
- Spatial resolution better than 10 μm
- Cold - Hot sample stage

Surface-Engineered NiO in Solar Cells

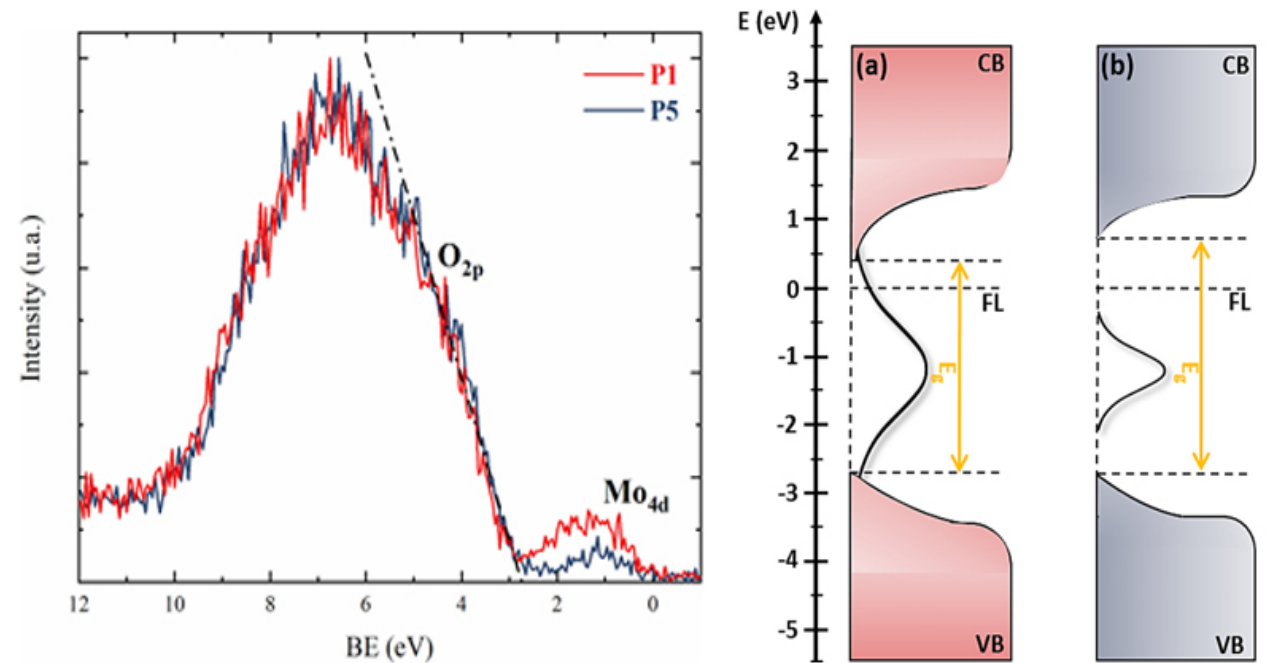
XPS reveals NiO surface activation through $-OH$ formation. Shows surface functional groups and oxidation states.



Pellegrino, A. L., Tudisco, C., Presti, F. L., Milan, E., Speghini, A., Condorelli, G. G., & Malandrino, G. (2023). Molecular layer deposition to grow a luminescent metalorganic monolayer on inorganic substrate: Breaking monopoly of solution routes to self-assembled monolayer. *Nano Energy*, 116, 108804.

XPS Insights into HER-Active Oxygen Vacancies

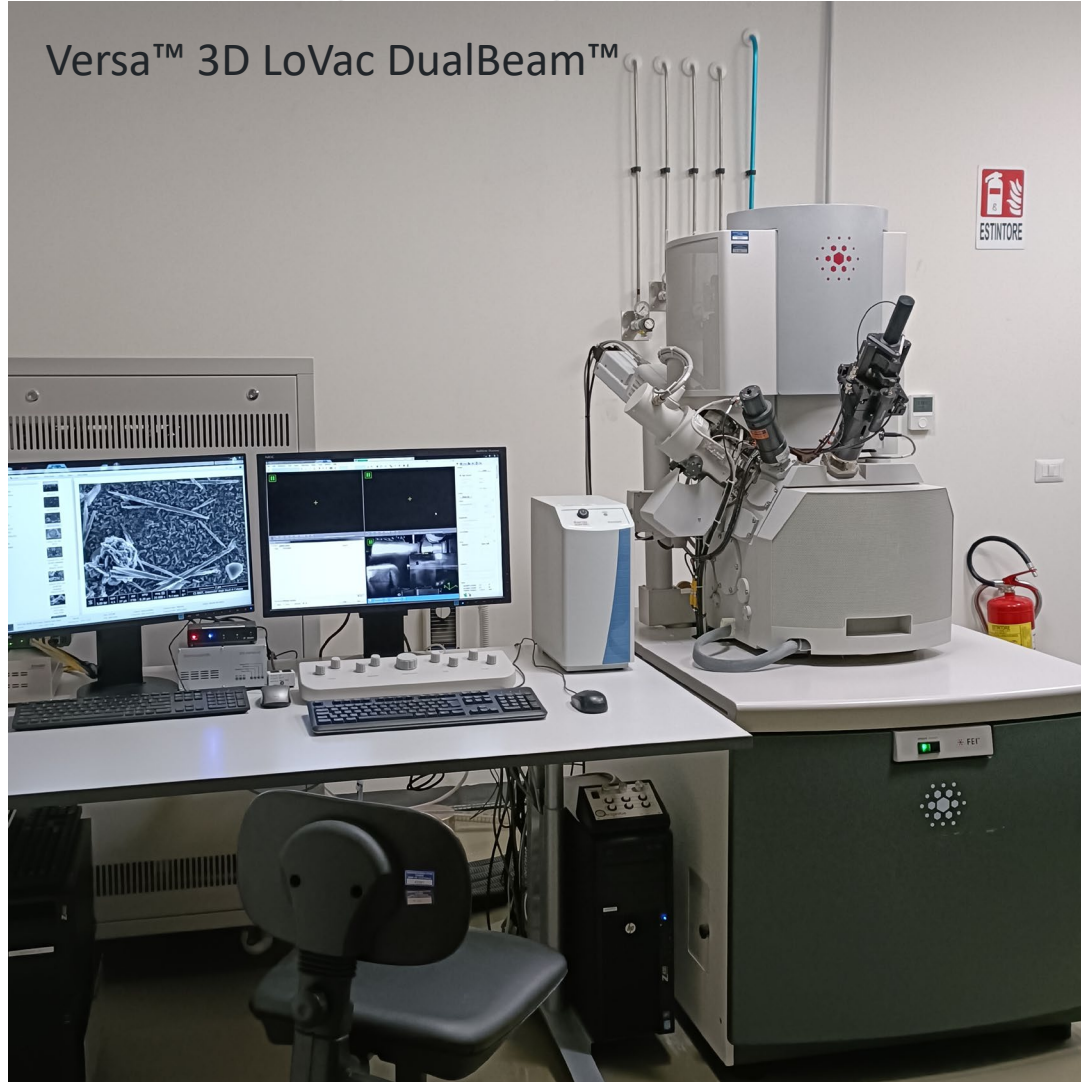
XPS identifies oxygen vacancies and Mo oxidation states. Connects defect density to electronic and photocatalytic behavior.



La Manna, S., Franzo, G., Terrasi, A., Condorelli, G. G., & Miritello, M. (2025). Stoichiometry modulation of molybdenum oxide thin films by direct sputtering for energy applications. *Surface and Coatings Technology*, 496, 131663.

Dual Beam Focused Ion Beam (SEM/FIB)

Versa™ 3D LoVac DualBeam™



The instrument is a Focused Ion Beam (FIB) combined with a Scanning Electron Microscopy (SEM). In a DualBeam, the electron and ion beams intersect at a 52° angle at a coincident point near the sample surface, allowing immediate, high resolution SEM imaging of the FIB-milled surface.

The combination of high and low vacuum modes gives the flexibility to work with a range of samples including uncoated and non-conductive samples.

Environmental SEM (ESEM) mode allows electron beam imaging of naturally hydrated samples.



Raith eLINE Plus

Raith eLINE is a fully integrated EBL system. The main features are: Schottky field-emission gun, acceleration voltage up to 30 kV, high-speed pattern generator (20 MHz), laser interferometer stage with a stitching error < 20 nm and 100 x 100 mm horizontal and 30 mm vertical travel range under full interferometric control, alignment error < 20 nm, automated laser height sensing (working distance error < 5 μm), traxx module for stitching error free continuous writing mode for elongated paths.



Oxford Instruments, Plasma Pro NGP 80

ICP RIE is a popular dry-etching technique because of its possibility for high etch rates, great selectivity and reduced ion bombardment damage.

Sample sizes: from small chips up to 4" wafers

Equipped with ICP source Cobra 80

Process Gases: CHF_3 , CF_4 , Ar, O_2 , N_2

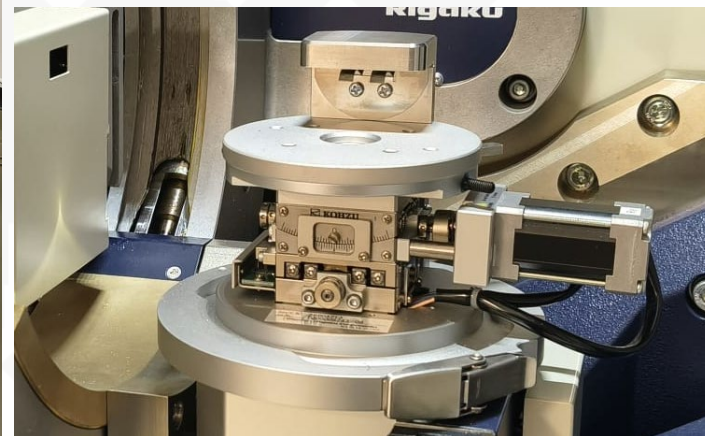
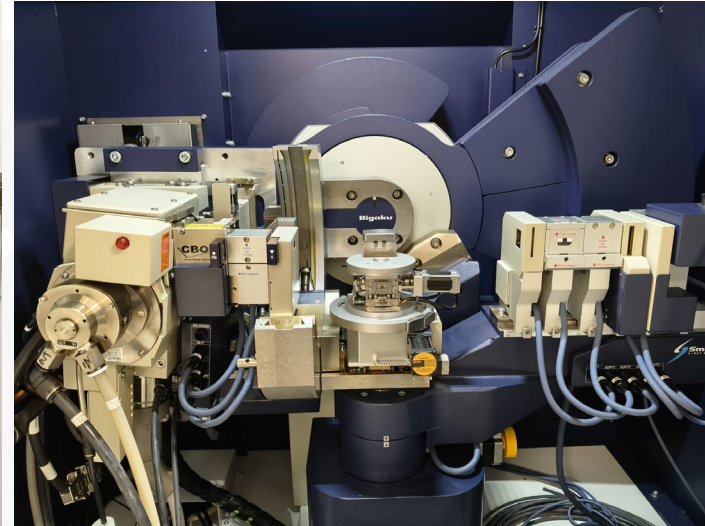
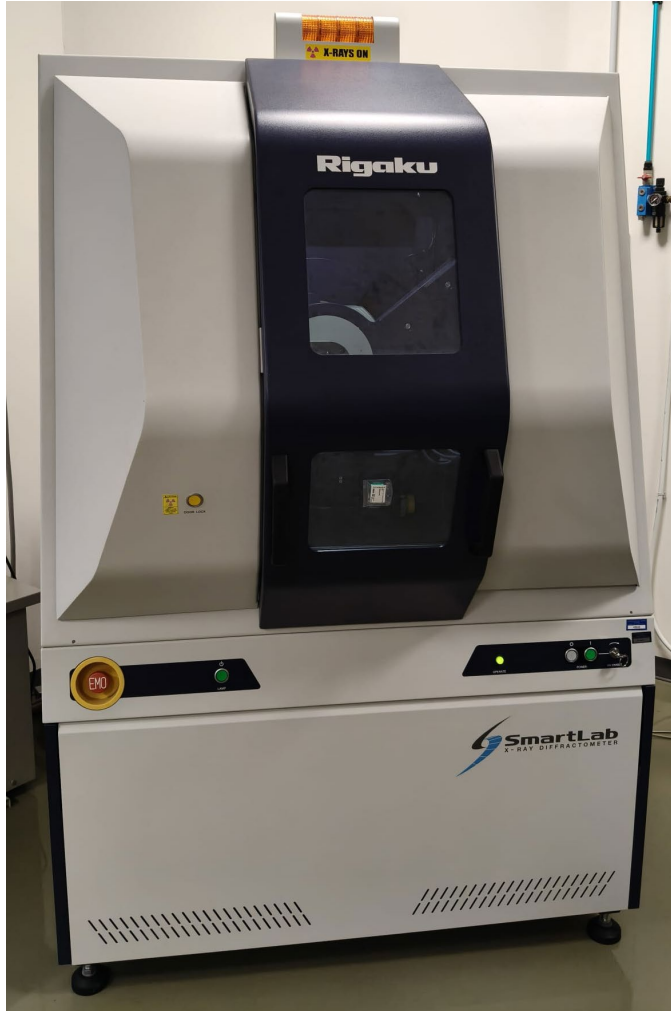
ICP Power: 600W

RIE Power: 600W



WITec ALPHA300 RS

Combines Raman, AFM, and SNOM imaging in a single instrument for the utmost flexibility and sophisticated sample characterization. By combining the imaging techniques, simultaneous Raman-AFM analysis, TERS, and nearfield-Raman (Raman-SNOM) imaging can be easily performed.

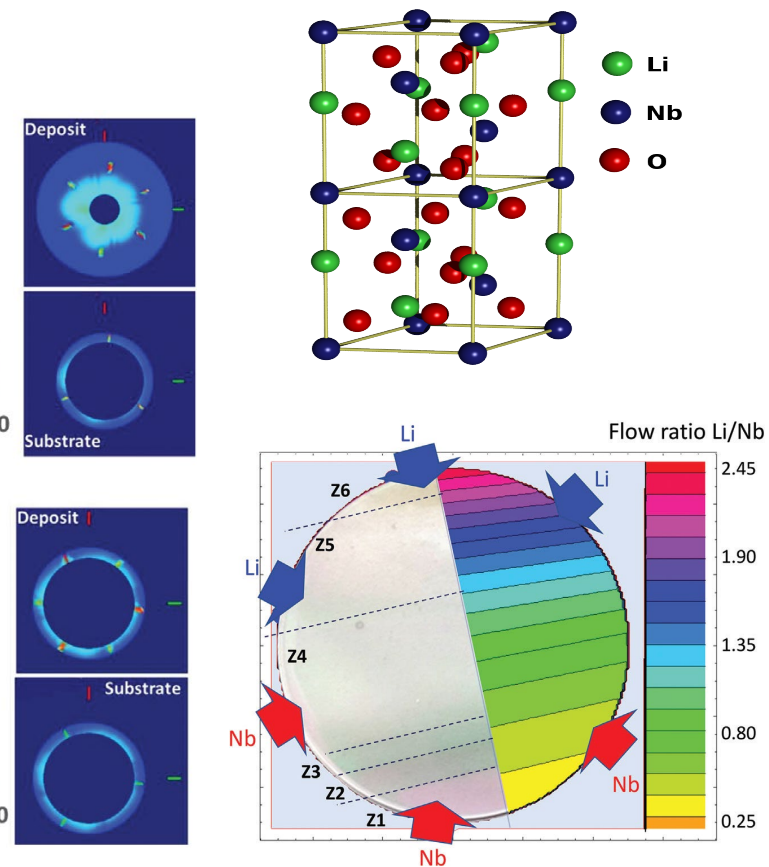
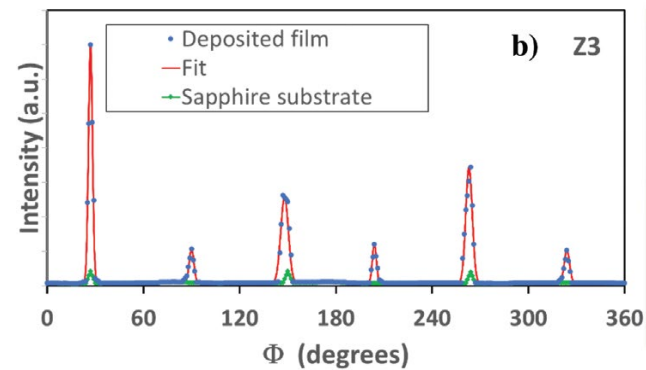
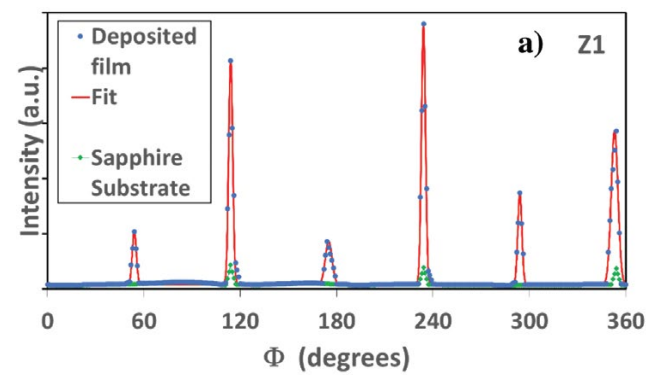
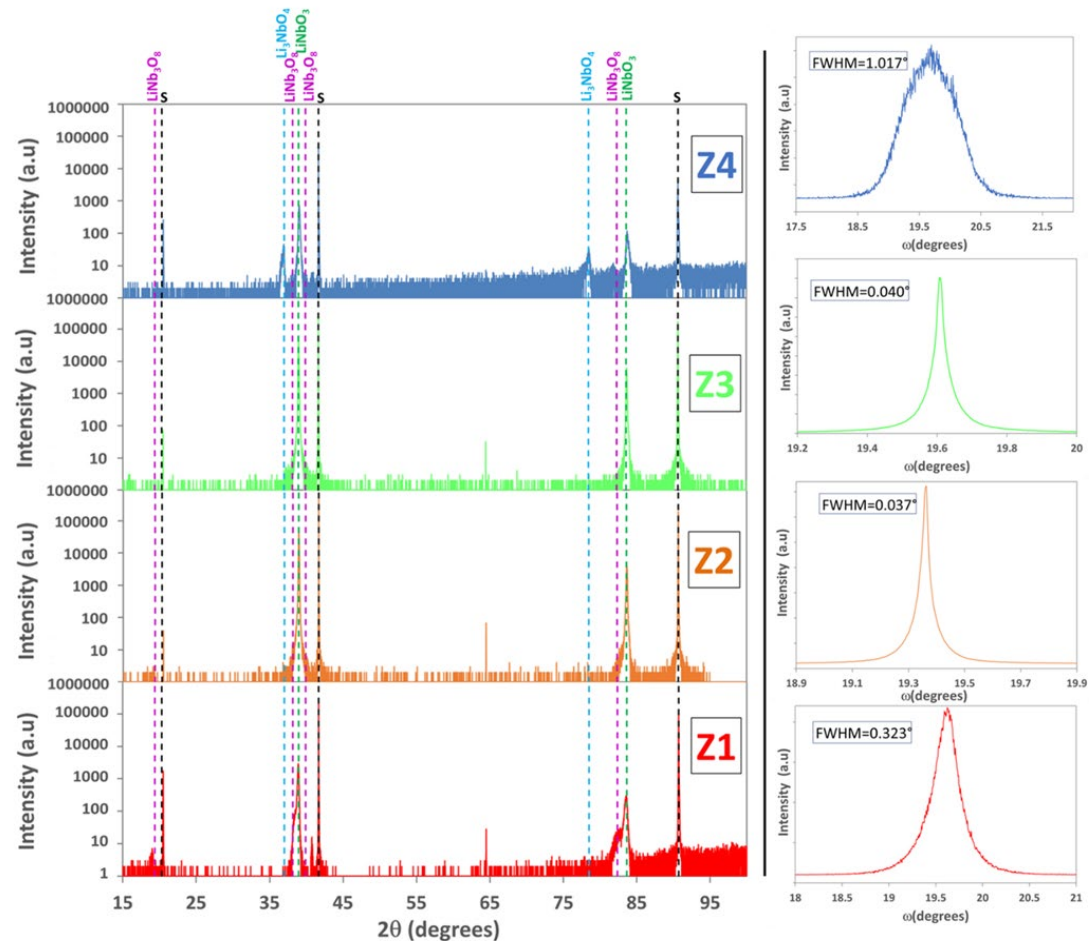


The X-ray Diffractometer Smartlab combines in a unique apparatus, the facilities of conventional θ - θ diffractometer (for phase analysis and thin films characterization) and those of an Eulerian cradle diffractometer (for pole figure and strain/stress analyses). Accurate measurements of thin film thickness, roughness and density are achievable through X-ray reflectivity (XRR) techniques. Small Angle X-ray Scattering (SAXS) will allow particle size distributions of nanoparticles suspended in solution.

Rigaku, Smartlab 9kW

Epitaxial LiNbO₃ Thin Film studies:

From HR-XRD data and the corresponding rocking curves to Pole figures and ϕ -scans measurement on different sites of the sample.





Thermo Scientific HAAKE MARS III

Modular rotational rheometer for rheology characterization of complex fluids. It allows to fully characterize the viscoelastic behavior of complex fluids like: thermoplastics, thermosets, polymer blends, adhesives, pastes and biological fluids.

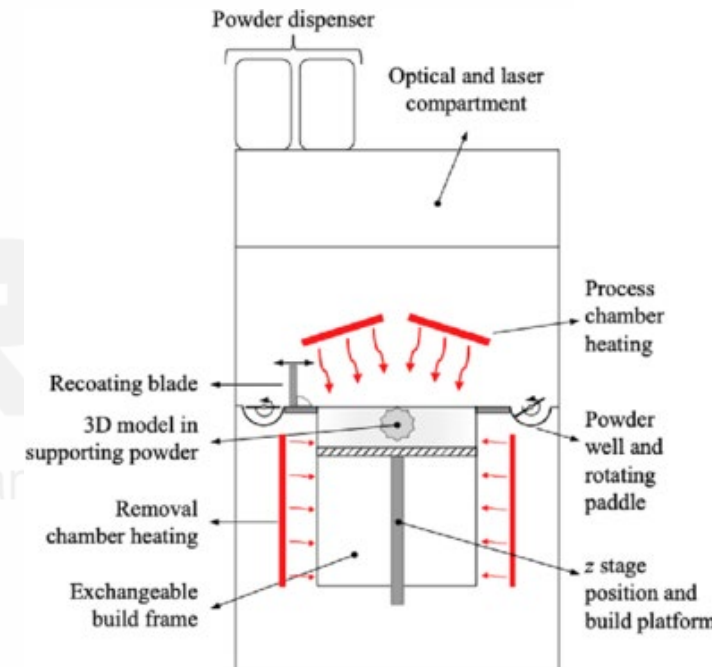
- Torque range 0,02 μ Nm to 200mNm
- Wide operating range (25°C to 600°C)
- DMTA tool for dynamic mechanical analysis
- Peltier module for fast precise temperature control
- Special tool geometry for biological samples

EOS Formiga P110 – Industrial Selective Laser Sintering (SLS) System

The **EOS Formiga P110** is an industrial additive manufacturing system based on **Selective Laser Sintering (SLS)** for polymer materials.

In this process, a laser selectively sinters thin layers of polymer powder, consolidating the material layer by layer to form a three-dimensional component. The powder bed is maintained at an elevated temperature close to the melting point, allowing the laser to locally induce sintering and partial melting of the particles.

Since the surrounding, non-sintered powder naturally supports the printed part during fabrication, **no support structures are required**, enabling the production of complex internal features and lightweight geometries. The Formiga P110 is commonly used to manufacture functional components in engineering polymers such as **PA11 and PA12**, offering good mechanical performance, geometric freedom, and high process reliability.



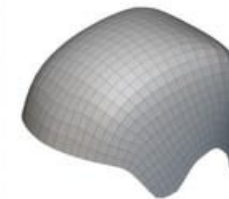
Medical / Prosthetics

- Patient-specific prosthetic and orthotic components
- Lightweight structures improving comfort and wearability
- Complex geometries tailored to individual anatomical needs
- Rapid design iteration for clinical testing and customization

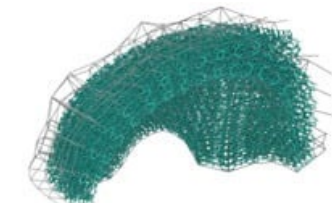


Lattice Structures

- Lightweight structures with high strength-to-weight ratio
- Energy absorption and load distribution capabilities:
 - Protective components
 - Shock and vibration damping
 - Prosthetic and wearable components
- Tuneable mechanical behaviour through lattice topology design
- Geometries not achievable with conventional manufacturing



(a)



(b)

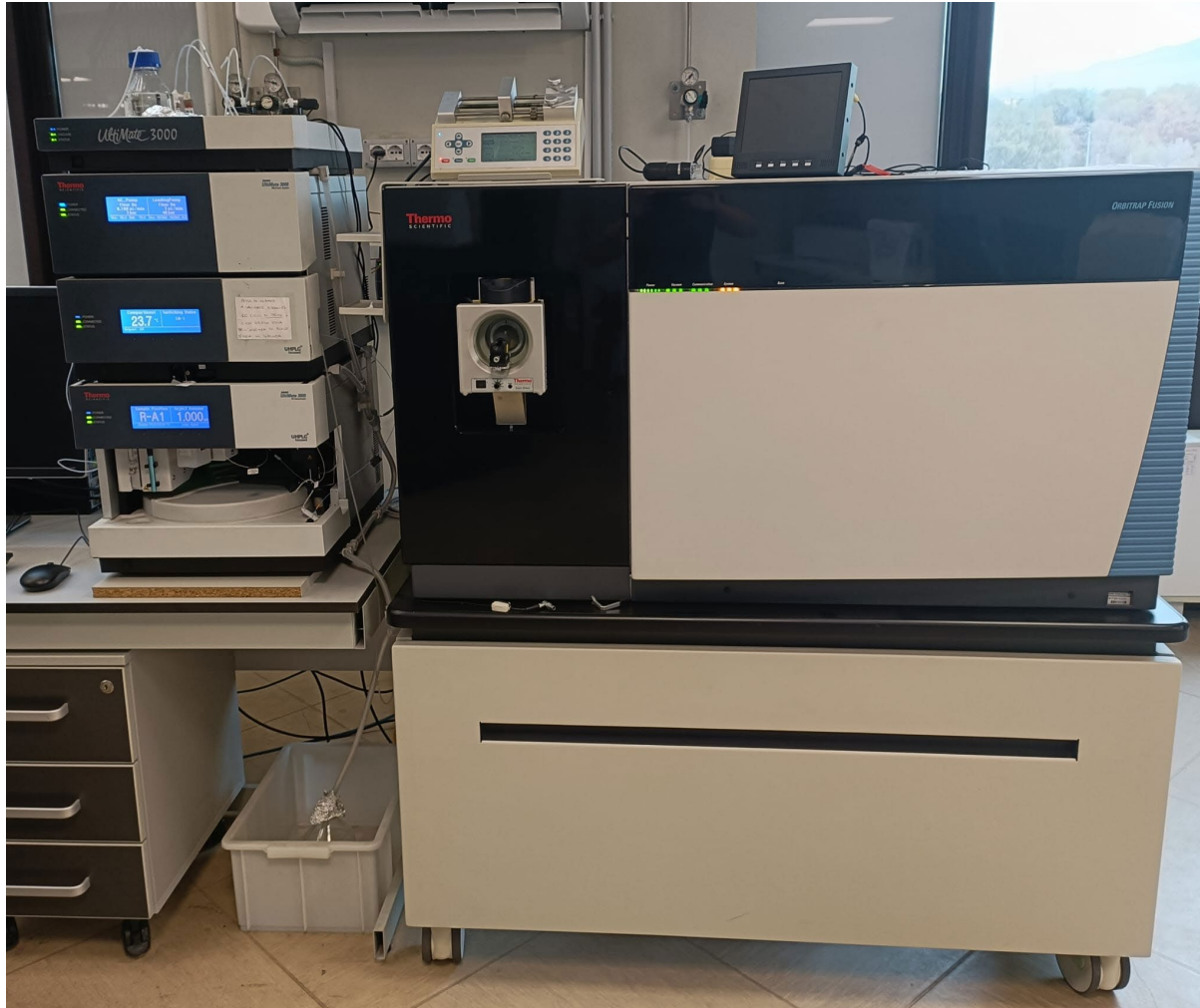


(c)

Biotech

The **Biotechnology Laboratory** of the BRIT Service Center provides the University and local scientific and industrial stakeholders with state-of-the-art instrumentation and expertise in life sciences and biomedical research. Its facilities are organized into three platforms (Genomics & Transcriptomics, Proteomics, and Signaling) and enable advanced genomic, proteomic, cellular and biomolecular analyses, including flow cytometry, imaging and confocal microscopy, as well as cell culture.

Orbitrap Fusion Tribrid LC-MS Mass Spectrometer



Thermo Scientific Orbitrap Fusion LC-MS mass spectrometer combined with UHPLC

UHPLC–ESI–MS/MS platform for advanced proteomic workflows, combining a Thermo Scientific UltiMate 3000 RSLCnano UHPLC (nano/capillary flow: 20 nL/min – 50 μ L/min) with an **Orbitrap Fusion™ Tribrid™** mass spectrometer. The Tribrid™ analyzer integrates quadrupole precursor selection, a dual-pressure linear ion trap, and an ultra-high-field Orbitrap™ analyzer, enabling flexible MS/MS with CID/HCD and parallelized acquisition. Performance includes up to 450,000 FWHM resolution (m/z 200), scan rates up to 15 Hz (Orbitrap) / 20 Hz (Ion Trap), and high mass accuracy.

Orbitrap Fusion Tribrid LC-MS Mass Spectrometer

The **UHPLC–ESI–MS/MS** platform represents a **powerful tool** in many proteomic fields such as:

- ✓ **Clinical**
- ✓ **Microbiological**
- ✓ **Food-technology**
- ✓ **Pharmaceutical**
- ✓ **Agricultural**
- ✓ **Cultural heritage**

As example,

this platform was recently used to an **in-depth exploration** of **three original documents** written by the Romanian prince **Vlad III** (or Vlad Dracula).

The **proteomic data**, although cannot be considered exhaustive alone, **might indicate that**, according to some stories, **he probably suffered**, at least in the last years of his life, from a pathological condition called **hemolacria**, that is, he could shed tears admixed with blood.



Anal. Chem. 2023, 95, 34, p. 12732

Sorvall WX Ultra 100 Ultracentrifuge

The **Sorvall WX Ultra 100 Ultracentrifuge** is a high-performance instrument for advanced sample separation and purification across biological and nanomaterial applications. By generating extremely high centrifugal forces, it enables the efficient fractionation of complex mixtures, the isolation of subcellular components, and the separation of nanoparticles, macromolecules, or viral particles according to their size and density. This process yields well-resolved sample fractions with great reproducibility.

The **Sorvall WX Ultra 100** supports a wide range of rotors and protocols, offering flexible workflow optimization for research, preparative, and analytical needs — from biomolecule purification to detailed structural studies, with reliable performance and data quality.

Multiple rotors for different workflows:



Max rpm: 100,000
Max g: 802,006



Max rpm: 30,000
Max g: 166,880

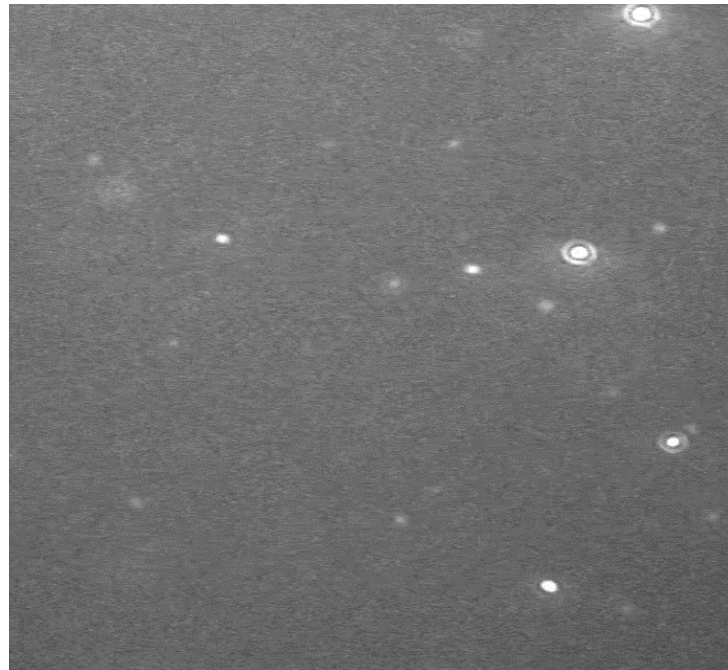
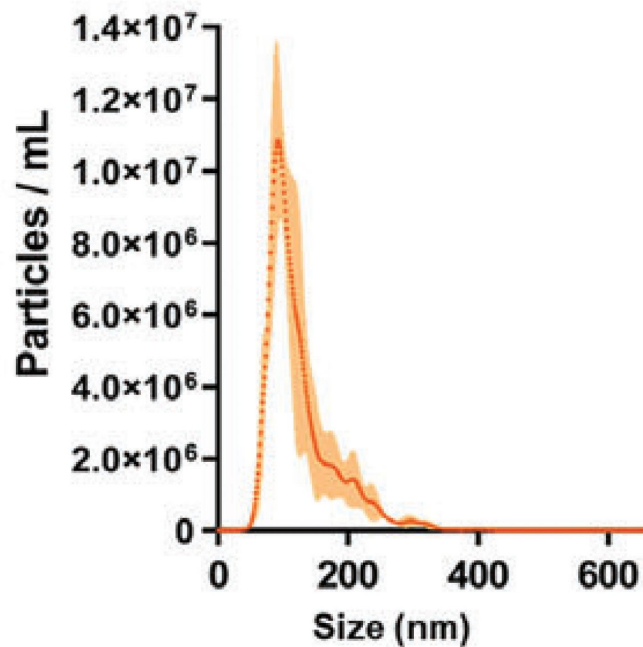


Applications:

- **Separation and purification of:**
 - **subcellular components**
 - **extracellular vesicles (EVs)**
 - **viruses and virus-like particles (VLPs)**
 - **protein complexes**
 - **nanoparticles**
 - **plasmidic DNA**

Nanoparticle Tracking Analysis (NTA) is a well-established, fast, and user-friendly technique for the single-particle characterization of biological samples and nanomaterials, enabling a deeper understanding of the “nano” world. By capturing light scattered by particles undergoing Brownian motion in solution, NTA tracks each particle individually and delivers high-resolution data on particle size and concentration. Each particle is therefore measured independently and simultaneously with others, allowing detailed insight even into highly complex samples.

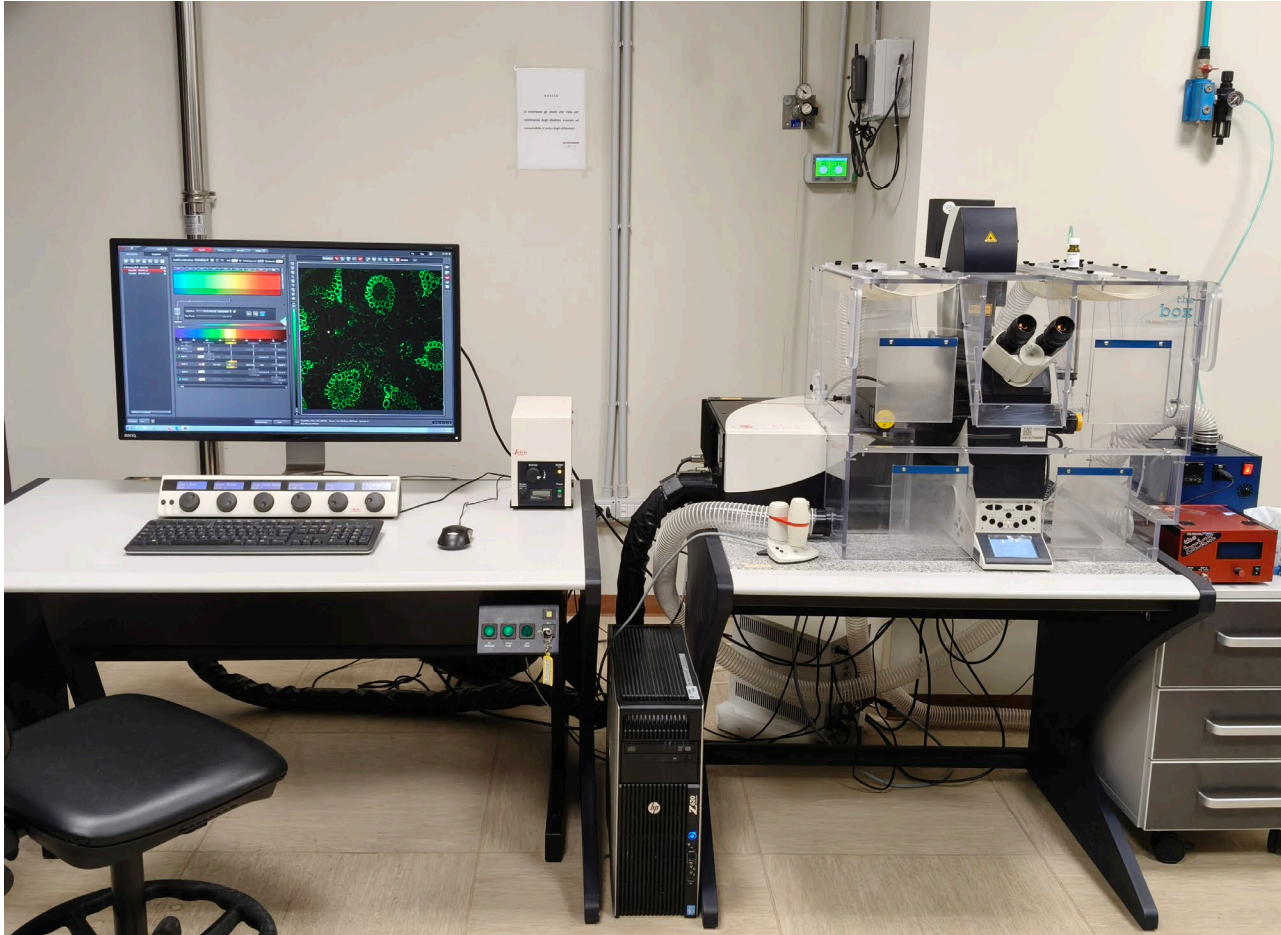
NanoSight Pro enables fully automated measurements, removes operator subjectivity, and provides the highest-quality size and concentration data for both light-scattering and fluorescence analyses.



Applications:

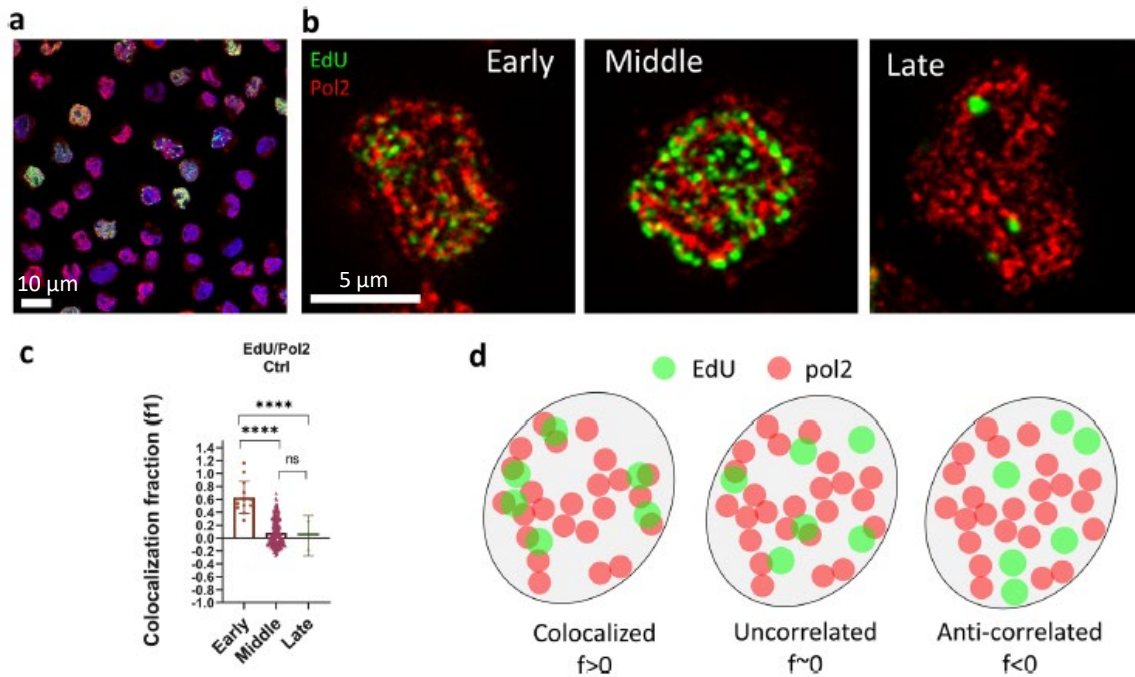
- Extracellular Vesicles (EV)
- Virus and Vaccines
- Drug Delivery & Gene Therapy
- Biotherapeutics
- Nanomaterials/colloids/toxicology
- Ultrafine bubbles

Confocal laser scanning microscope Leica TCS SP8

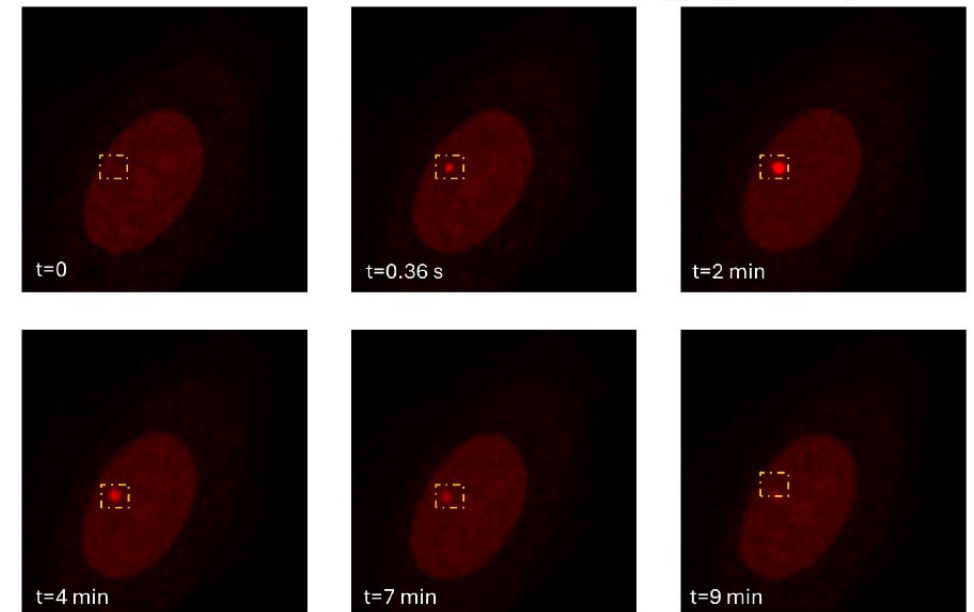


- Fully motorized inverted microscope
- Fluorescence, Brightfield, DIC
- Objectives: Planapochromat 20X, 40X oil and 63X oil, maximum spatial resolution ~200 nm
- Fixed and live samples
- Temperature and CO2 control
- Detection: AOBS + 5 Detectors
- Excitation: 405nm/DAPI – Argon (458nm / 476nm / 488nm / 496nm / 514nm) – 561nm/Rhod – 633nm/Cy5
- Software for multipoint xyz, Z stack and 3D reconstruction, time lapse) and Fluorescence Recovery after Photobleaching (FRAP)
- Resonant scanner

Application: Colocalization of molecular species



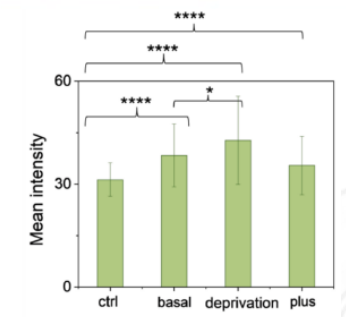
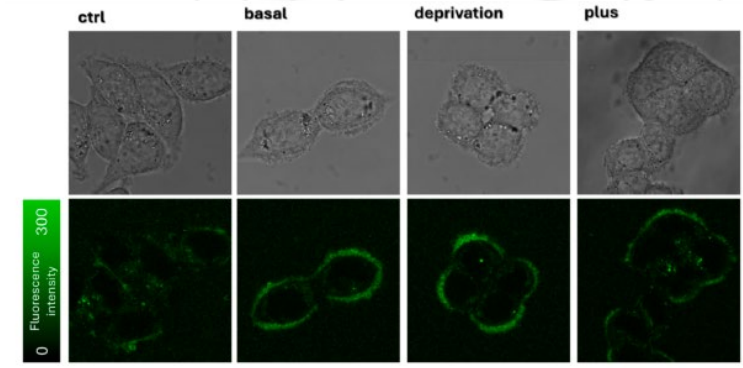
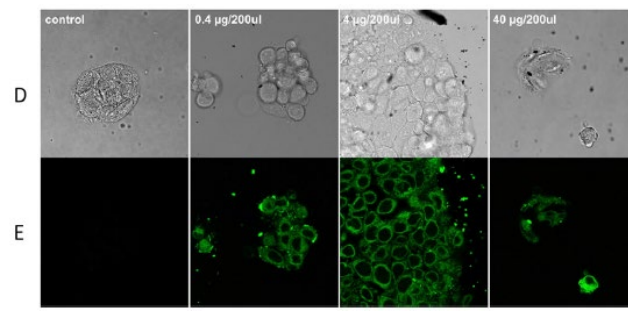
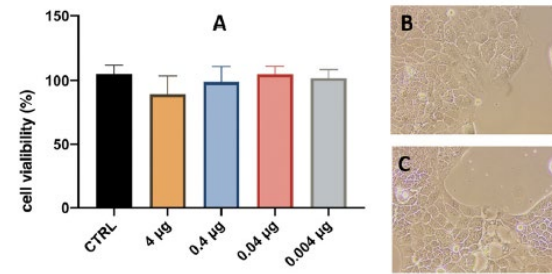
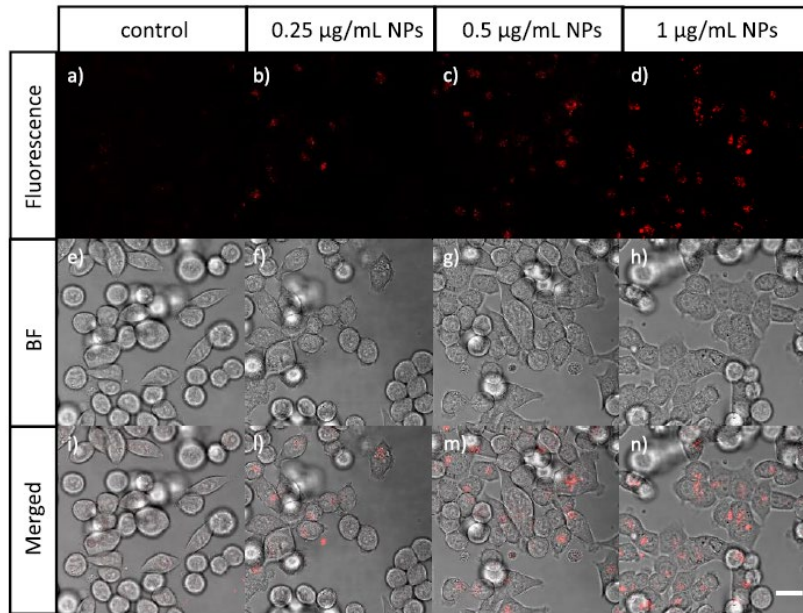
Application: time lapse imaging



Privitera, A.P., Scalisi, S., et al. Super-resolved analysis of colocalization between replication and transcription along the cell cycle in a model of oncogene activation. *Commun Biol* 7, 1260 (2024)

Elisa Longo, Greta Paternò, Alberto Diaspro, Luca Lanzanò, Measuring PARP1 mobility at DNA damage sites by segmented fluorescence correlation spectroscopy, *Biophysical Journal*, Volume 124, 20 - 2025

Application: Internalization of nanoparticles and/or molecules inside cells

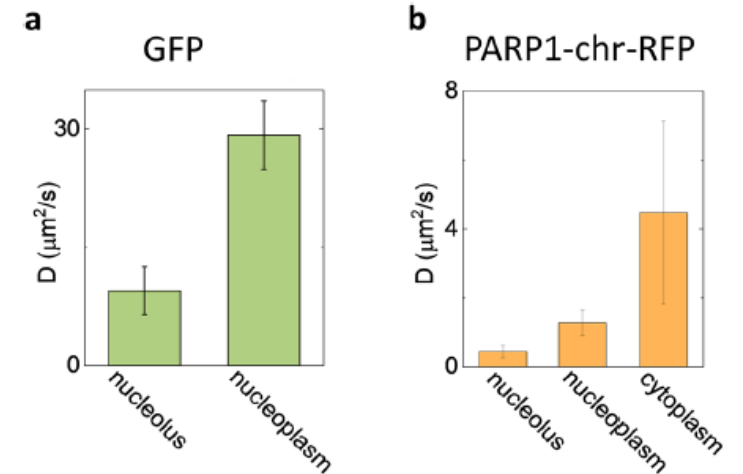
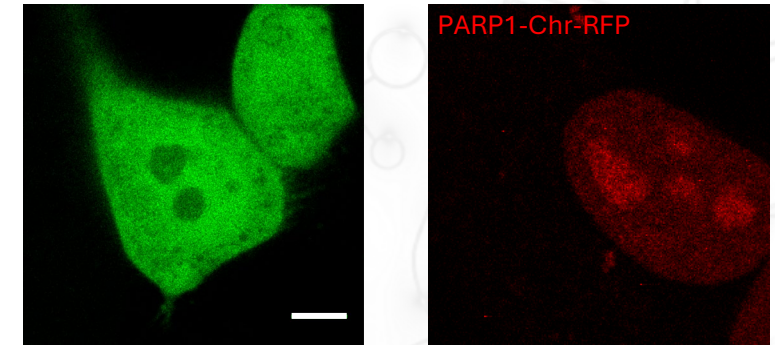
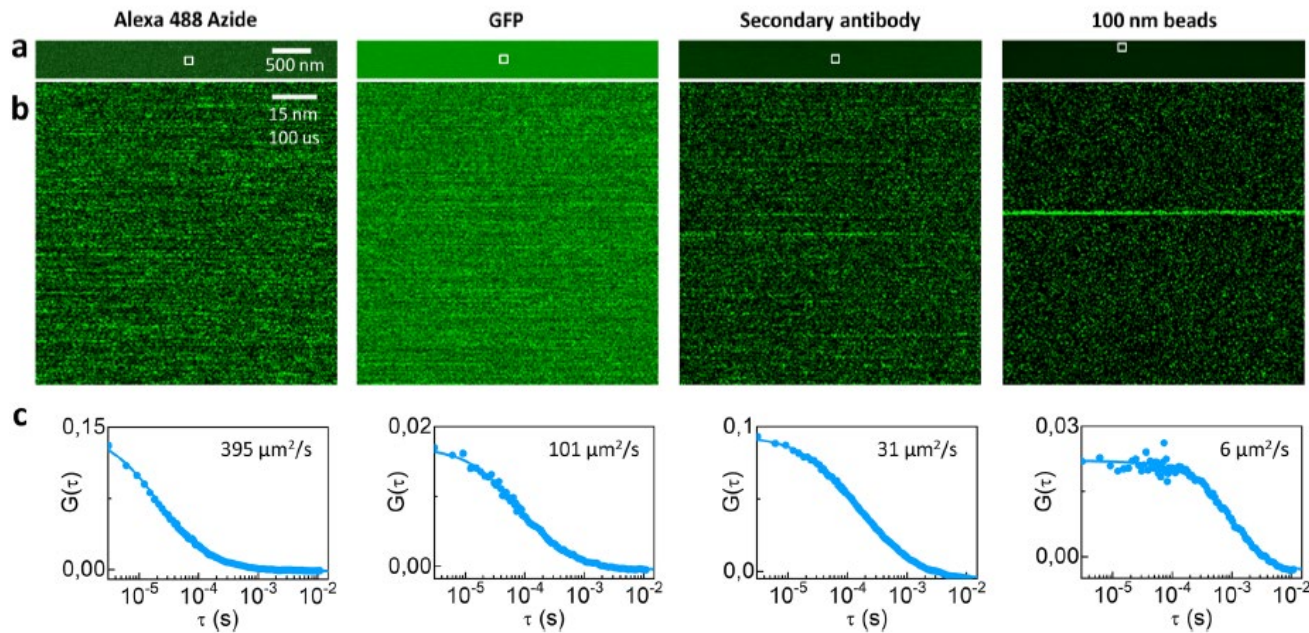


Regina Maria Chiechio ... Annalinda Contino - Internalization of Pegylated Er:Y2O3 Nanoparticles inside HCT-116 Cancer Cells: Implications for Imaging and Drug Delivery, ACS Applied Nano Materials 2023 6 (20), 19126-19135

G Consoli ... S Petralia, Red light-triggerable nano hybrids of graphene oxide, gold nanoparticles and thermo-responsive polymers for combined phototherapy and drug release effects - Journal of Materials Chemistry B 2023

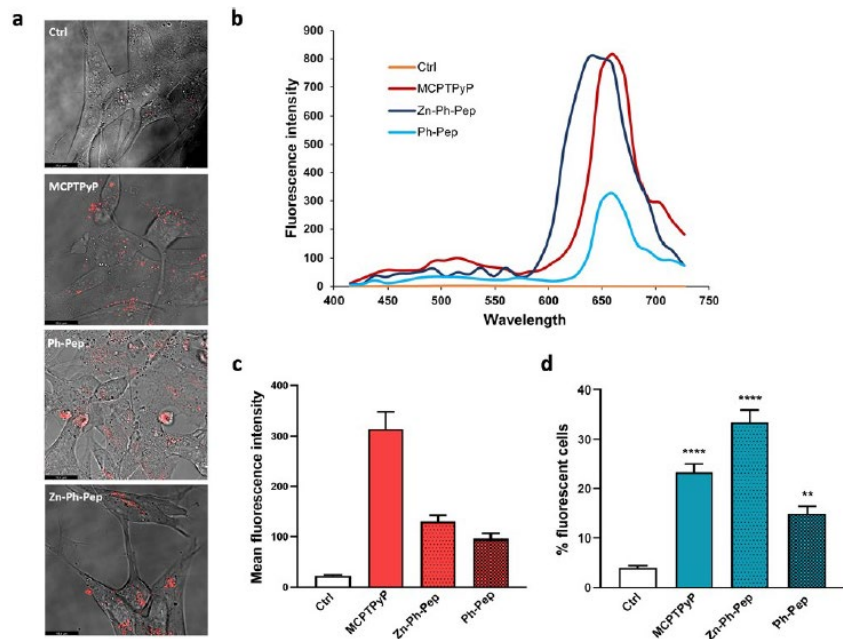
Nicolo Musso, ..., Salvatore Petralia, Biofriendly glucose-derived carbon nanodots: GLUT2-mediated cell internalization for an efficient targeted drug delivery and light-triggered cancer cell damage, Journal of Colloid and Interface Science, 2025, 137873

Application: measurement of mobility of molecules in solutions and inside cells by Fluorescence Correlation Spectroscopy (FCS)

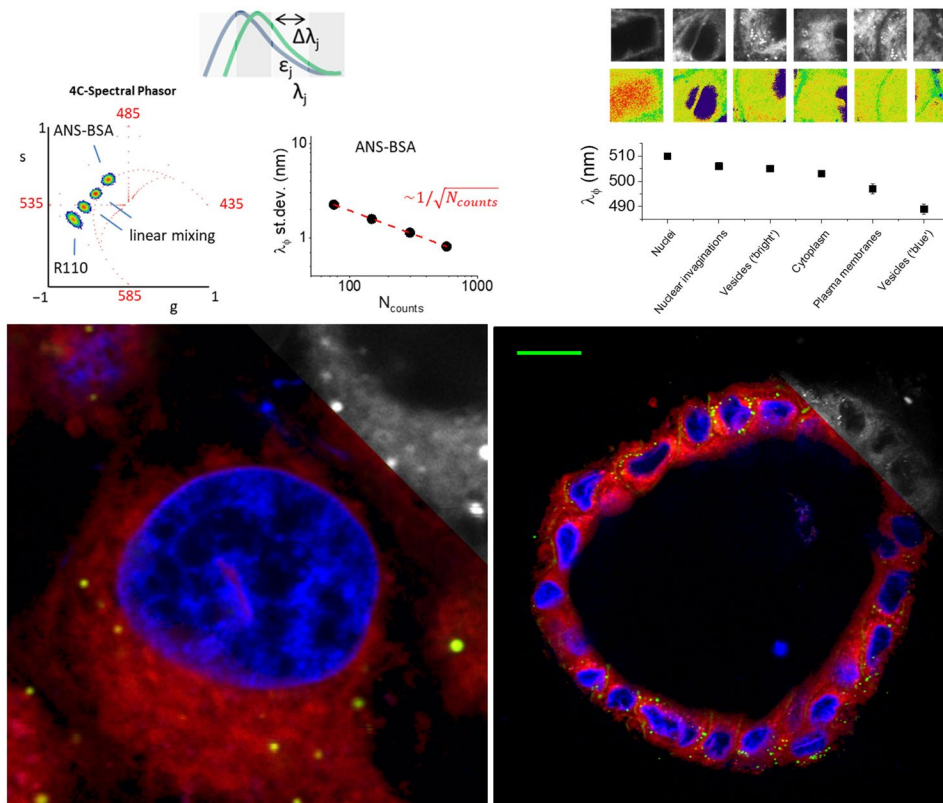


Longo, E., Scalisi, S. & Lanzaò, L. Segmented fluorescence correlation spectroscopy (FCS) on a commercial laser scanning microscope. *Sci Rep* 14, 17555 (2024)

Application: spectral imaging



Tosto et al, *A Spectroscopic Study on the Amyloid- β Interaction with Clicked Peptide-Porphyrin Conjugates: a Vision Toward the Detection of A β Peptides in Aqueous Solution* - *Chem Bio Chem* 2024



Longo, E., Costantino, A., Andreoni, A. et al. *Spectral phasor imaging on a commercial confocal microscope without a spectral detector.* *Sci Rep* 15, 31431 (2025).

Next Generation Sequencing Platform

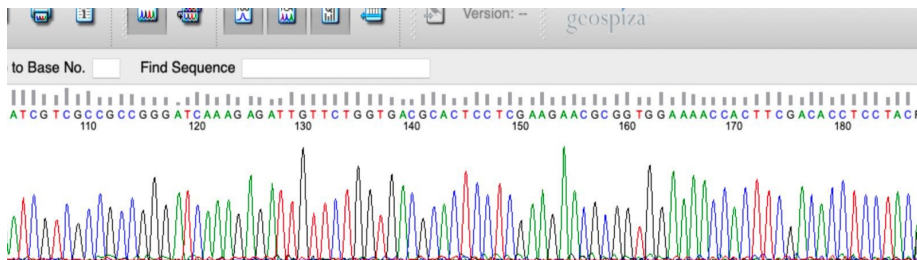


Illumina MiSeq Sequencer

A benchtop end-to-end sequencing solution integrating clustering generation, amplification, sequencing and data analysis for up to 64 different samples in parallel in a single run for:

- Targeted resequencing
- Metagenomics
- Small-genome sequencing
- Amplicon sequencing

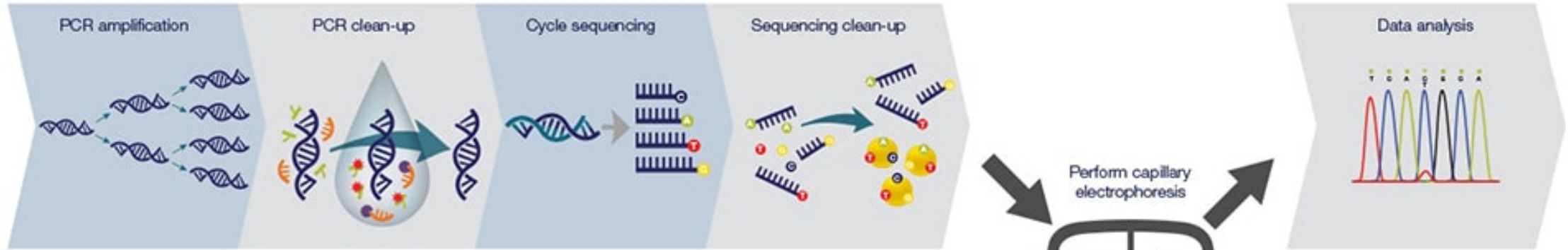
The currently available expertise enables global genomic analyzes and proteomic characterization, parallel quantitative analyzes of transcripts and proteins, analysis of neurotransmitters and metabolites, cellular and biomolecular analysis using flow cytometry and contemporary imaging, biochemical assays using spectrophotometry and spectrofluor.



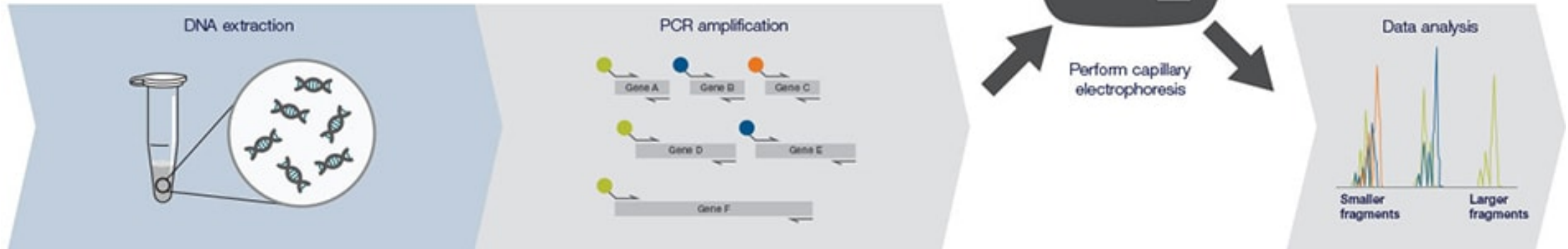
Highlights of several powerful Sanger sequencing and fragment analysis applications:

- CRISPR-Cas9 genome editing confirmation
- DNA methylation analysis
- Human cell line authentication
- Low-level somatic variant detection and analysis
- Microbial species identification
- Microsatellite instability analysis
- Multiplex ligation–dependent probe amplification (MLPA) analysis of human copy number variation (CNV)
- Plasmid sequencing
- Repeat DNA expansion
- SARS-CoV-2 identification
- Single-nucleotide polymorphisms (SNP) genotyping Human Identification

Sanger sequencing workflow



Fragment analysis workflow



The SeqStudio Genetic Analyzer features simplify capillary electrophoresis (CE) experiments with minimal intervention time thanks to an all-in-one cartridge, facilitate collaboration through sharing and Thermo Fisher Cloud-based applications, and introduce new opportunities for running sequencing samples and fragment analysis simultaneously.

Up to 4 different gene targets can be amplified simultaneously with the same fluorophore, for 4 different fluorophores, this allows for the simultaneous analysis of 16 different targets.



Article

Discriminatory Weight of SNPs in Spike SARS-CoV-2 Variants: A Technically Rapid, Unambiguous, and Bioinformatically Validated Laboratory Approach

Nicolò Musso ^{1,†}, Paolo Giuseppe Bonacci ^{1,†}, Dafne Bongiorno ¹, Stefano Stracquadanio ¹, Dalida Angela Bivona ¹, Concetta Ilenia Palermo ², Guido Scalia ², Marco Eichera ^{3,4} and Stefania Stefani ^{1,*}

Article

Low Represented Mutation Clustering in SARS-CoV-2 B.1.1.7 Sublineage Group with Synonymous Mutations in the E Gene

Paolo Giuseppe Bonacci ^{1,†}, Dalida Angela Bivona ^{1,†}, Dafne Bongiorno ^{1,*}, Stefano Stracquadanio ¹, Mariacristina Massimino ¹, Carmelo Bonomo ¹, Alessia Stracuzzi ², Paolo Pennisi ^{2,3}, Nicolò Musso ^{1,*} and Stefania Stefani ^{1,*}



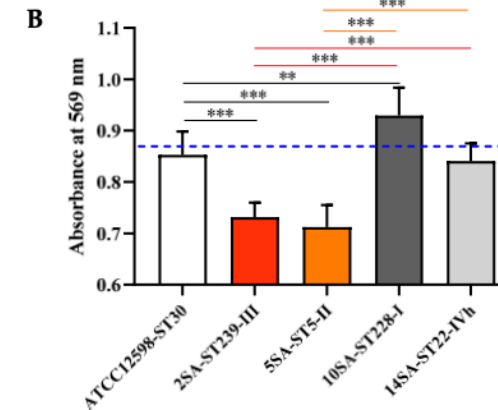
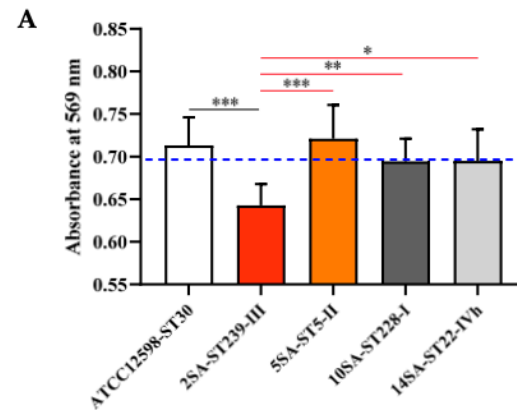
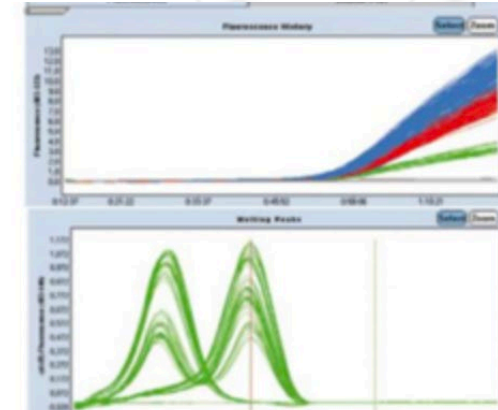
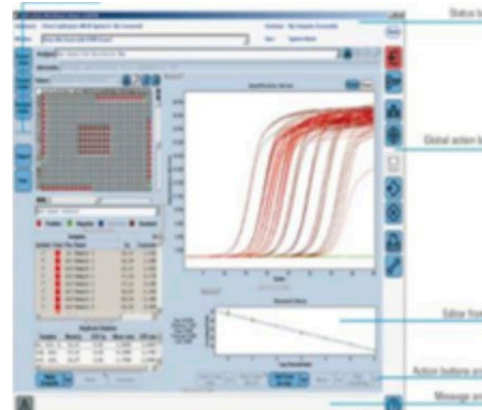
Article

Post-Mortem Detection of SARS-CoV-2 RNA in Long-Buried Lung Samples

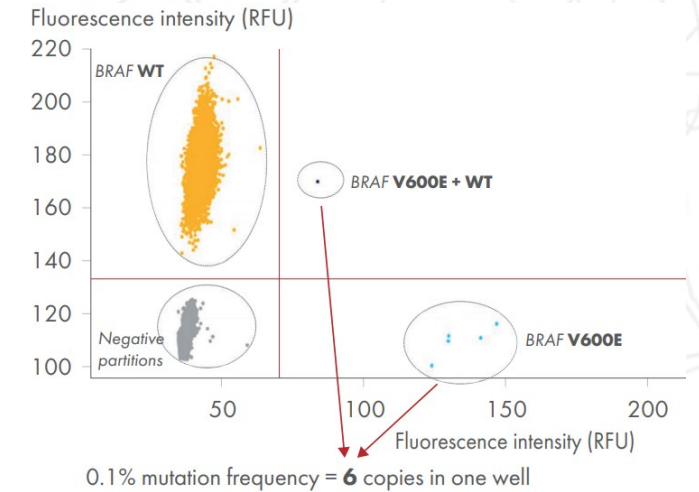
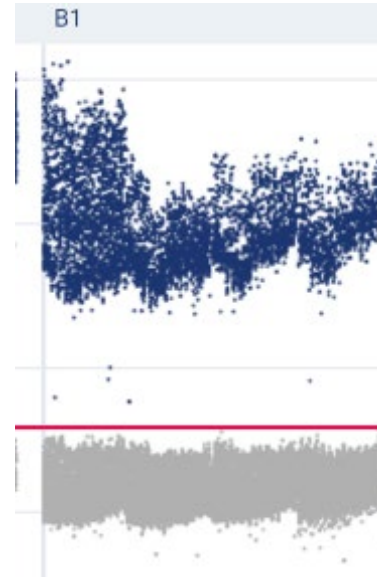
Nicolò Musso ^{1,†}, Luca Falzone ^{2,†}, Stefano Stracquadanio ¹, Dafne Bongiorno ¹, Monica Salerno ³, Massimiliano Esposito ³, Francesco Sessa ⁴, Massimo Libra ², Stefania Stefani ^{1,*} and Cristoforo Pomara ³



Roche Applied Science LightCycler[®] 480

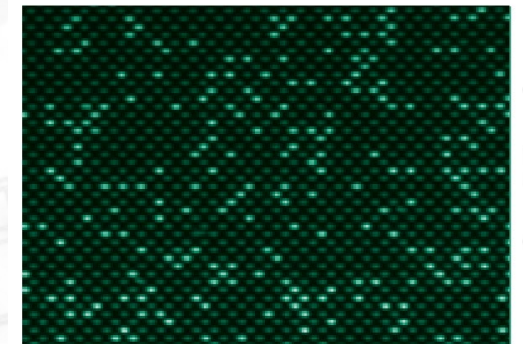


Musso N et al. 2021 doi: 10.3390/biom11010072.



dPCR applications

- Quantification of pathogen load - especially targets with no available reference material
- Accurate quantification of targets with high sequence variability
- Accurate quantification of samples with inhibitors
- Precise quantification for monitoring low pathogen loads
- Detection of rare mutations and alleles



Absolute quantification: Copies/ μ l



CytoFLEX SRT V0-B2-Y0-R3 (5 Detectors, 2 Lasers)

CytoFLEX SRT Cell Sorter is a **benchtop sorter capable** of meeting a wide range of sorting needs, **able to isolate and collect cells.**

It is **designed for complex sorting tasks**, allowing for different sorting settings on each of the 4 channels, including the ability to detect sorting errors on one of the other channels.

Mixed Mode sorting, and the ability to detect errors to prevent sample cell loss.

Simplified setup uses automatic systems to establish and maintain sorting flow.

President: Prof. Ing. Salvatore Baglio

Director: Dott.ssa Alessandra Renna

Website: www.brit.unict.it

Mail: cs.brit@unict.it

