



Department of Physical Sciences and Technologies of Matter

www.dsftm.cnr.it

The Department of Physical Sciences and Technologies of Matter (DSFTM) of CNR coordinates 11 Institutes, spread all over the national territory in 56 branches that host 750 researchers. A comparable number of associated scientists from Universities participates in the activities.

DSFTM institutes carry out research spanning from fundamental topics, at the frontier of knowledge, to applicative ones, in response to societal challenges and in agreement with the goals of Horizon 2020 at European level: Environment, Aerospace, Agri-food, Life Sciences, Communications, Information processing and storage, Cultural Heritage conservation, Energy, Health and Wellness.

In this framework, Key Enabling Technologies such as **nanotechnology**, **micro and nanoelectronics**, **advanced materials**, **photonics**, **biotechnology**, are the common base to carry on research, representing a source of innovation pervading all fields of activity.

KEY ENABLING TECHNOLOGIES AT DSFTM



Nanotechnology

Quoting the European Commission, "Nanotechnology is an umbrella term that covers the design, characterisation, production and application of structures, devices and systems by controlling shape and size at nanometre scale".

Keywords: nanostructures, nanodevices, 2D materials, nanomedicine, nanocomposites



Micro and Nanoelectronics

Deal with semiconductor components and highly miniaturised electronic subsystems and their integration in larger products and systems.

Keywords: semiconductors, sensors, biosensors, magnetoelectronics, flexible electronics, microsystems, advanced photovoltaics



Advanced Materials

Lead both to new reduced cost substitutes to existing materials and to new higher added-value products and services.

Keywords: graphene, silicene, new superconductors, hybrid materials, organic architectures, nanostructures, highly cohercitive nanomaterials, oxides,ferroelectric crystals



Lasers and Photonics

Are the sciences and technologies of light, its generation, detection, management. **Keywords:** quantum cascade laser, coherent sources, non-linear optics, new spectral ranges, biophotonics, new laser types for energy, spectroscopy, Bose-Einstein condensates, applications in biomedicine, cultural heritage, environment



Biotechnology

Deals with biological systems and living organisms, interfacing and using them to develop useful products. Nanobiotechnology applies nanotools to medical /biological problems. **Keywords:** lab-on-chips, biosensors, nanotoxicology, drug delivery, tissue engineering, optical tweezers, microfluidics





Method for the controlled distribution of pico- or nanovolumes of a liquid WO 2010122592 A1



Multi-D super-resolution imaging in Video-Confocal Microscopy (VCM) EP0833181 B1 WO 2013144891 A2



Optical method for the automated gas pressure and concentration measurement inside sealed containers (with UNIPD, licensed to LPro) WO 2008053507 A2

Microwave surgical device: interstitial probe for ablation of solid tumors (licensed to HS Hospital Service) WO204037202 (A1) WO02061880 (A2)



In recent years, DSFTM has generated several spin-off companies. Presently, 7 of them are active and 3 are mainly involved in KETs:

> Soft Material & Technologies S.r.l. - Micro and nanotechnologies for the production of nano-structured soft materials

> ThunderNII S.r.I. - Tools for NanoImprinting Lithography with unprecedented throughputs

> Columbus Superconductors S.p.A. - Superconducting wires by magnesium diboride technology

INFRASTRUCTURES AND SERVICES FOR COMPANIES

DSFTM Institutes own and operate a remarkable number of high-technology facilities and laboratories: they form a unique multi-site network that can support industries and small companies, providing access to technology, know-how and services. The map shows the location of the major facilities (smaller ones may be also available elsewhere).

For nanotechnology, micro-nanoelectronics, advanced materials **CLEANROOMS** Cleanrooms host equipment for thin film technology, lithography, diagnostics, material growth.....Find the one closer to you! Lithography: UV, deep UV. Growth/deposition: physical and electron beam, ion beam, X-Ray, nanoImprinting, laser interference chemical deposition, MBE, atomic layer deposition, chemical IFN synthesis, nanostructured materials, nano-wires, nanoparticles ΙΜΜ IFN IMM NANO Characterization: high resolution NANO INO electron microscopy (TEM, SEM, STM), X-Ray, electrical measurements and optical spectroscopies, Raman spectroscopy, photoluminescence IFN, IMM TFN **IMM, NANOTEC** ISASI, IMM, Processes: etching, micro-nano machining, thermal treatments, wafer bonding, wet processes IMM DSFTM institutes guarantee access to international for infrastructures nanotechnology, micro-RF, ILL Elettra nanoelectronic, advanced materials and biotechnology Neutron and research, through beamlines at **Elettra** (Trieste, IT) Synchroton and ESRF (Grenoble, F) synchrotron facilities, ILL **Radiaton** probes (Grenoble, F) and ISIS (Oxford, UK) neutron sorces..... Find the one which suits you best!

Are devoted to the development of new sources and detectors, in various spectral ranges and are key facilities for the advancement of fundamental research and for applications in different fields, from communication and quantum cryptography, to new tools for medical diagnostics

Biotech Labs

Optics and

Photonics

Labs

Merge equipment and tools typical of biochemistry, biophysics and molecular biology laboratories. Nanotechnology is often needed in order to manipulate tiny living things

Advanced laser sources (midinfrared and terahertz quantum cascade lasers, high-brightness fiber lasers, femtosecond lasers); photonics detectors; sensors; nonlinear optics; quantum optics



Manufacturing of optical elements, laser micromachining and macromachining; laser lithography; optical fibers; otical measurements and testing



Lasers and photonics for food, cultural heritage, health care (mammography, ophthalmology, tissue analysis, biophotonics); lasers for ICT, quantum information





IBF Biophysics Institute (www.ibf.cnr.it) - **IFN** Institute for Photonics and Nanotechnologies (www.ifn.cnr.it) - **IMM** Institute for Microelectronics and Microsystems (www.imm.cnr.it) - **INO** National Institute of Optics (www.ino.it) - **IOM** Institute of Materials (www.iom.cnr.it) - **ISASI** Institute of Applied Sciences and Intelligent Systems (www.isasi.cnr.it) - **ISC** Institute for Complex Systems (www.isc.cnr.it) - **ISM** Institute of Structure of Matter (www.ism.cnr.it) - **NANO** Institute of Nanoscience (www.nano.cnr.it) - **NANOTEC** Institute of Nanotechnology (www.nanotec.cnr.it) - **SPIN** Institute for superconductors, oxides and other innovative materials and devices (www.spin.cnr.it)

BE A CNR PARTNER! CONTACT DSFTM

DSFTM Institutes have a long tradition of collaboration with industries and enterprises. This has resulted in a huge number of partnerships in projects funded by public organizations (Ministries, regions, etc.), European Community, consortia.... Here are some of our industrial partners. **Join them! Contact DSFTM or its Institutes!**



WHAT WE OFFER:



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