

Dr. Alessandro Pecora

Research Scientist

Istituto per la Microelettronica e Microsistemi-CNR

Manager of the NanoMicroFab facility



Consiglio Nazionale
delle Ricerche

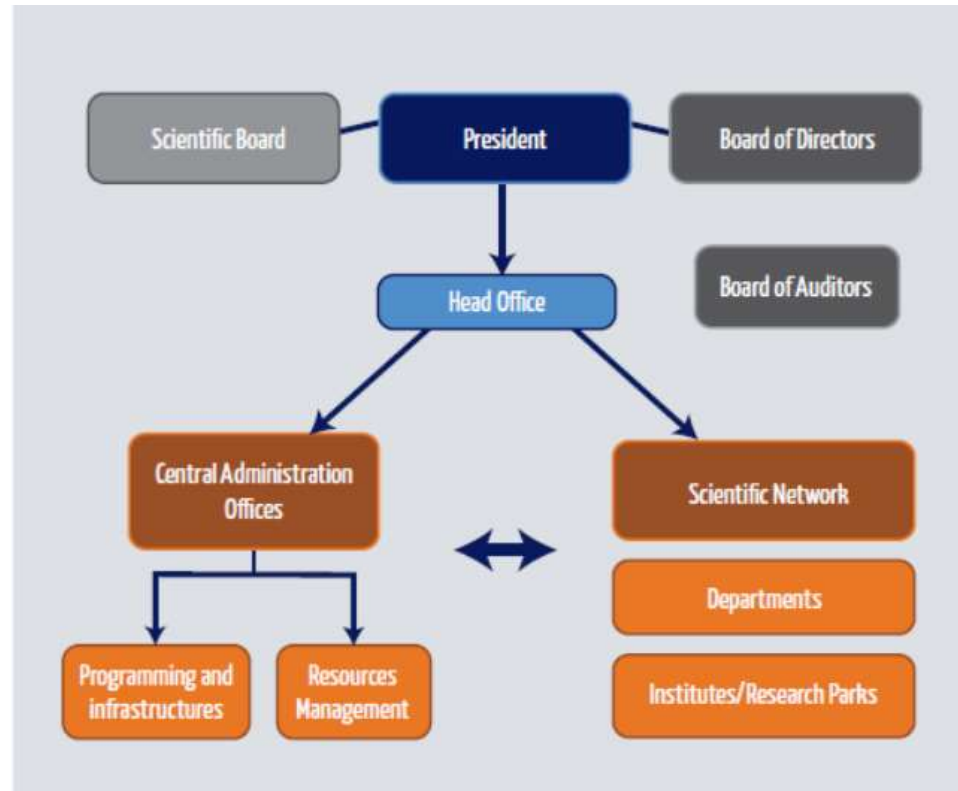
alessandro.pecora@cnr.it



Consiglio Nazionale delle Ricerche

The Italian National research Council (CNR) is the largest public research institution in Italy, the only one under the Research Ministry performing multidisciplinary activities.

The Mission is to perform research in its own Institutes, to promote innovation and competitiveness of the national industrial system, to promote the internationalization of the national research system, to provide technologies and solutions to emerging public and private needs, to advice Government and other public bodies, and to contribute to the qualification of human resources.



CNR Research Parks - Lazio

- The Nation Research Council (CNR - <http://www.cnr.it>) is the largest public Italian research institution. The CNR Scientific Network consists of more than 100 research institutes, spread across the country and coordinated by 7 Divisions on specific topic (Departments).
- Each Department has a geographical distribution of the Institutes on the whole national territory

CNR Departments

1. Physical sciences and technologies of matter
2. Earth system science and environmental technology
3. Agrifood science
4. Biomedical sciences
5. Chemical sciences and technology of materials
6. Engineering, ITC and technologies for energy and transport
7. Human and social sciences, cultural heritage



In Lazio region are present 42 Institutes

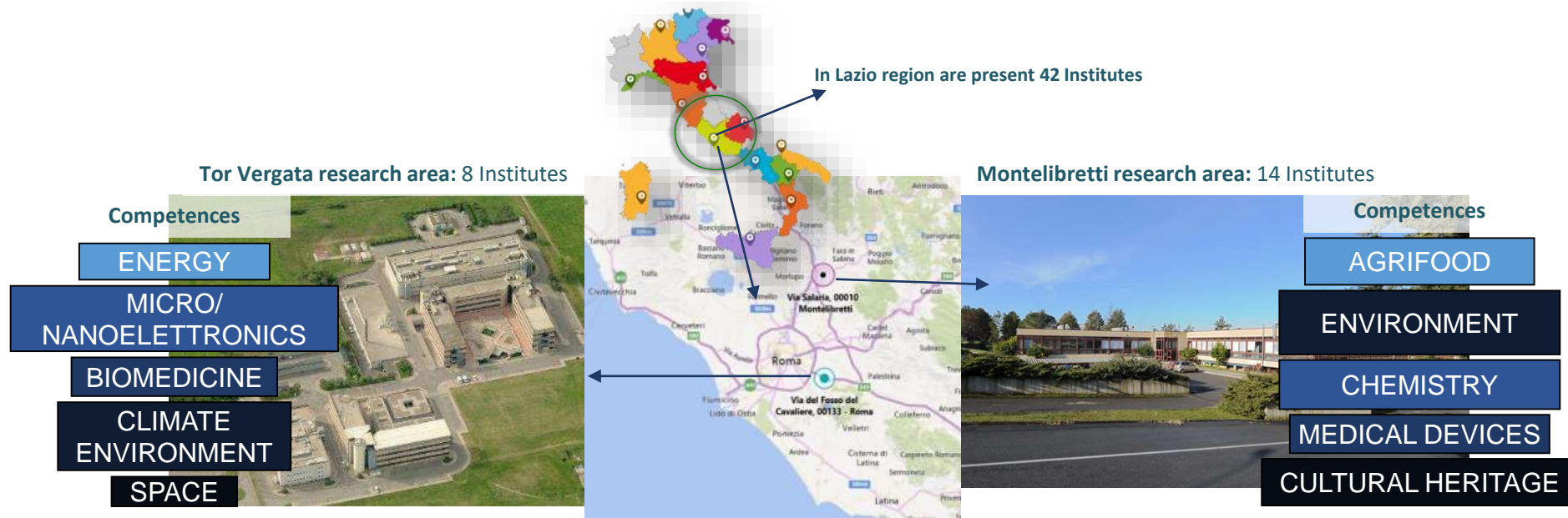
TorVergata research area: 7 Institutes



Montelibretti research area: 15 Institutes



CNR Research Parks - Lazio



CNR Departments

Institute of Structure of the Matter Institute for Microelectronics and Microsystems Institute for Photonic and Nanotechnologies Institute for Complex Systems	1. Physical sciences and technologies of matter	Institute of Structure of the Matter
Institute of Atmospheric Sciences and Climate	2. Earth system science and environmental technology	Institute of Atmospheric pollution Research Water research institute Institute of environmental geology and geoengineering
	3. Agrifood science	Institute of agricultural biology and biotechnology Institute of agro-environmental and forest biology
Institute of Translational Pharmacology	4. Biomedical sciences	Institute of biostructure and bioimaging
	5. Chemical sciences and technology of materials	Institute of nanostructured materials Methodological chemistry institute Institute of Crystallography
Institute of Acoustic and Sensors	6. Engineering, ITC and technologies for energy and transport	Construction technologies institute
	7. Human and social sciences, cultural heritage	Institute for technologies applied to cultural heritage Institute for the Study on Ancient Mediterranean Institute for the Conservation and Promotion of Cultural Heritage
Institute for Space Astrophysics and Planetology	National Institute for Astrophysics	

Open Research Infrastructure to support companies operating in the field of micro-nanoelectronics (NANOMICROFAB)



Consiglio Nazionale
delle Ricerche



Partner

- CNR – Department of Physical sciences and technologies of matter
 - Institute for Microelectronics and Microsystems (IMM)
 - Institute for Photonic and Nanotechnologies (IFN)
 - Institute of Structure of the Matter (ISM)

Associate Partners:

- Leonardo-Finmeccanica
- Università di Tor Vergata, Dipartimento Ingegneria Elettronica
- The NanoMicroFab project has been approved by the Regione Lazio for a total cost of 4 M€ (2,6 M€ funded by Regione Lazio and 1,4 M€ provided by the partners).

Objectives of the NanoMicroFab project

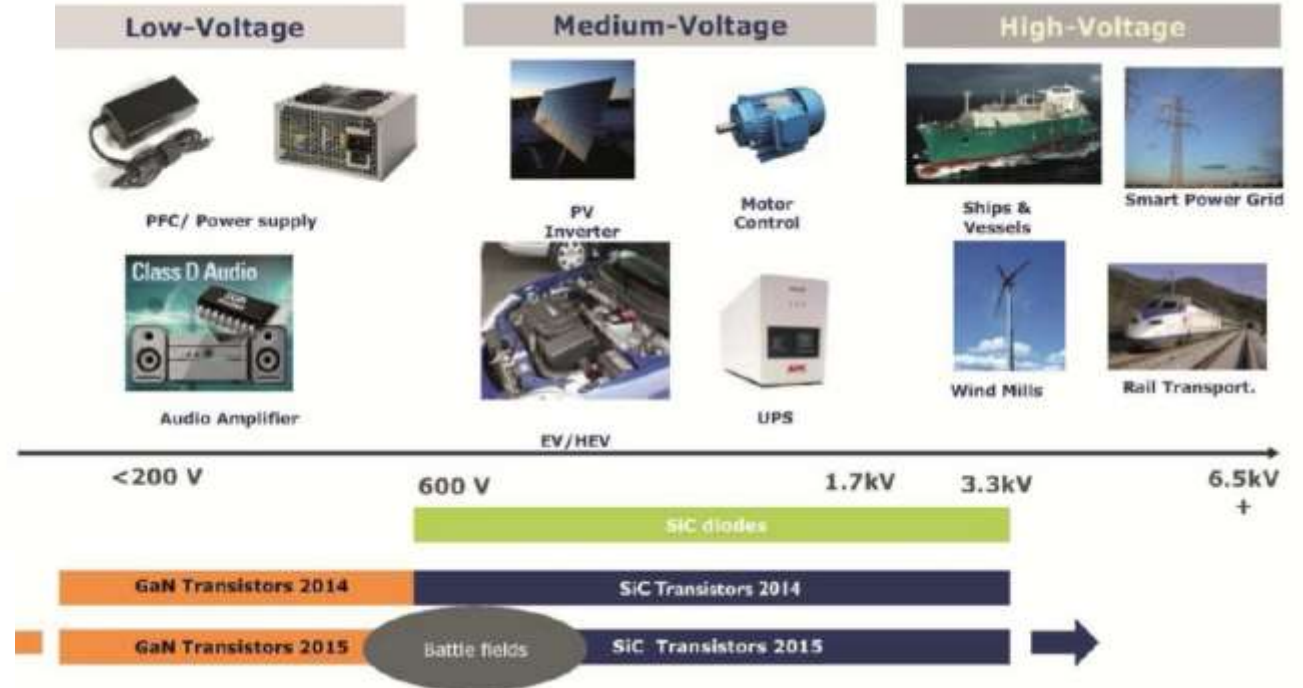
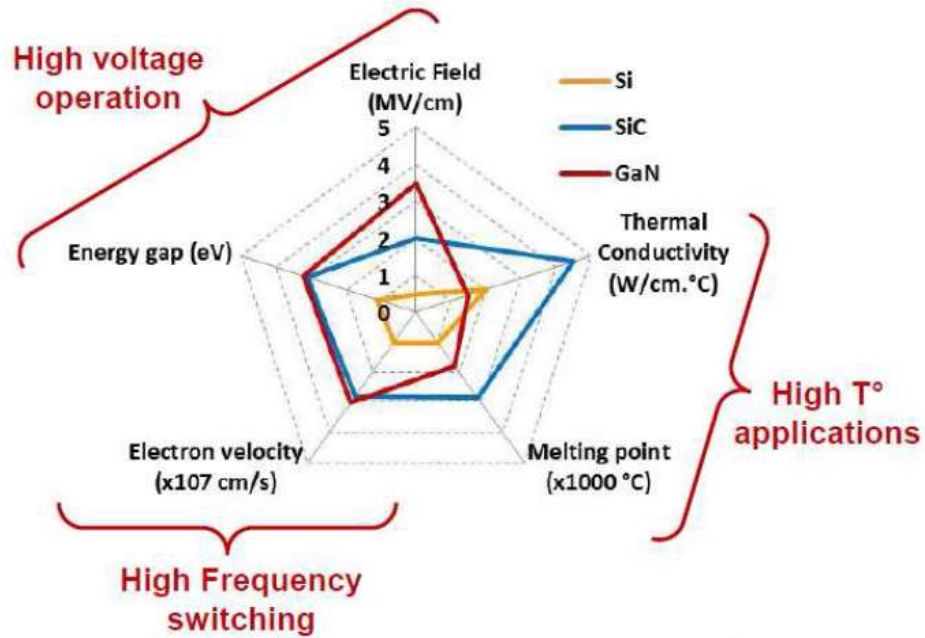
- To set-up a facility allowing to support companies operating in the field of micro-nanoelectronics by providing several services: supply new materials; development of processes and devices; design and characterization of materials and devices
 - Integrate several CNR existing infrastructures with those of the Univ. of Tor Vergata;
 - Upgrade the existing infrastructures through the acquisition of new equipment
- Application Areas
 - GaN-based electronics
 - Flexible and printed electronics
 - Sensors, microsystems and IoT

The micro-nanofabrication facility

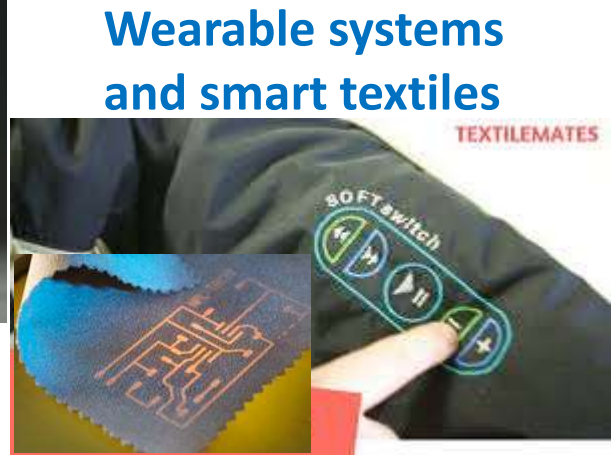
- Distributed facility over three main sites
 - CNR clean-rooms located in the Area Tor Vergata
 - Labs located inside Leonardo plant where CNR will establish a lab to grow epitaxial layers of GaN by MOCVD
 - Labs located at the Electronic Engineering Dept. Univ. Tor Vergata
- Rationalize the CNR clean-room facility in the Roman area
 - Integrate existing clean room facility at IFN and IMM
 - Upgrade of IMM clean room located in Area Tor Vergata to host both new equipment as well as IFN-Roma equipments



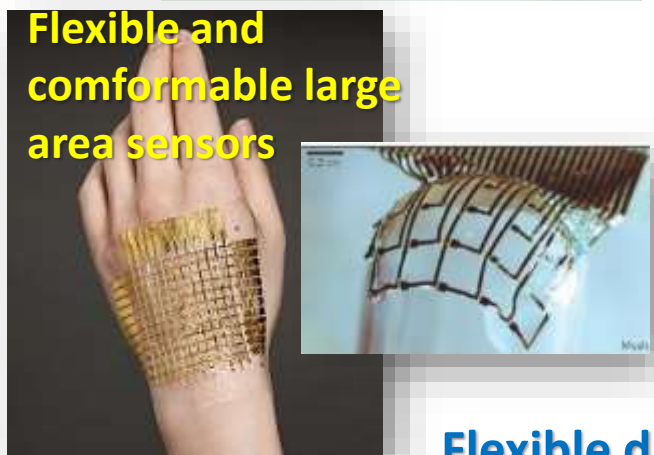
GaN-based electronics



- GaN properties are particularly suitable for applications in power electronics (voltages < 600V) and high frequencies

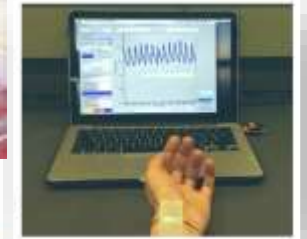
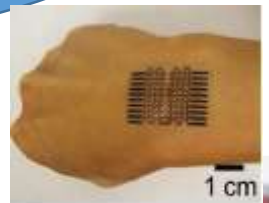


Flexible and printed electronics applications

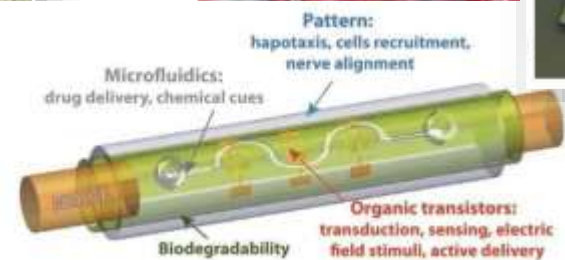


Biomedical applications

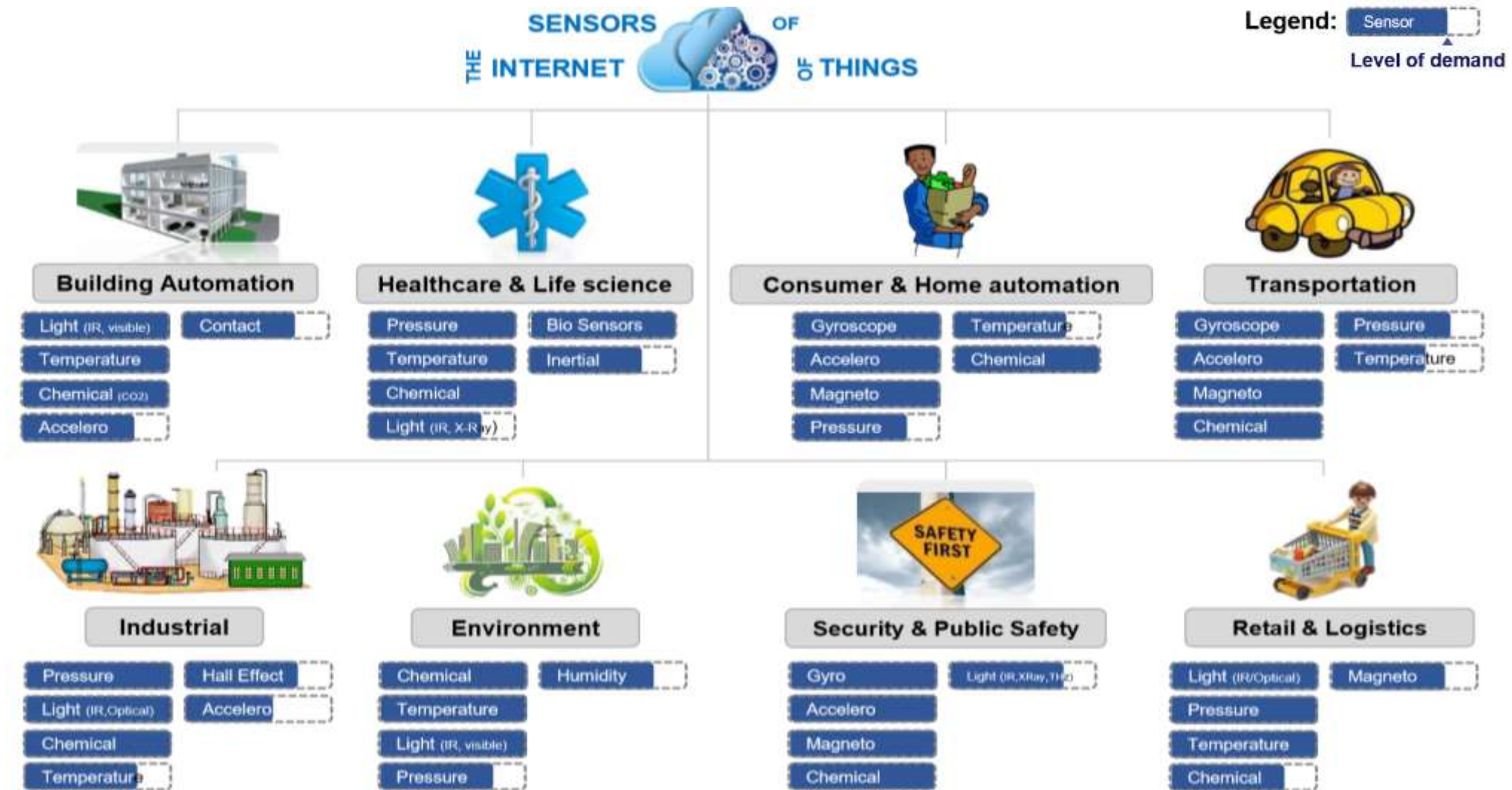
- Smart skin patches
- Electronics Wristbands
- Disposable devices
- Implantable electrodes and devices



Flexible displays



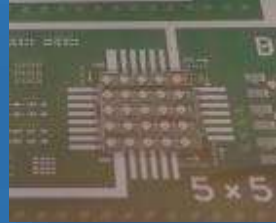
Sensors, Microsystem and IoT



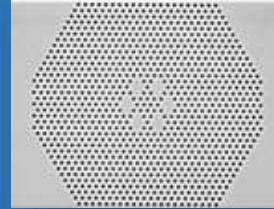
Sensors, Microsystem and IoT- examples of devices and sensor



Ultra-flexible microelectrode arrays for in vivo measurements



Array of capacitive pressure sensors



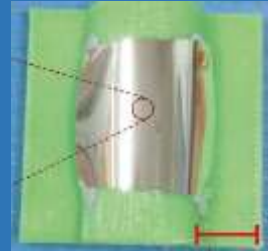
Photonic Crystal Nanocavities for gas and strain sensing



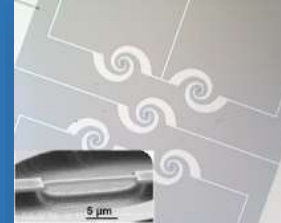
Surface acoustic wave sensors



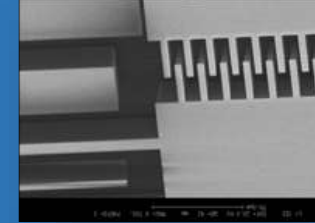
Gas sensors for environmental monitoring



THz flexible filter as sensor of bending radii



Waveguide Single Photon Detectors



MEMS



Wearable sensors



Disposable biomedical devices



LabOnChip

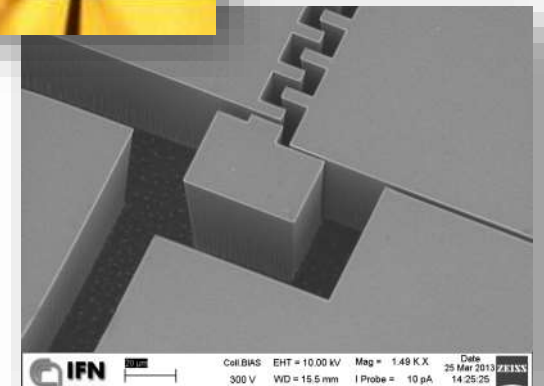
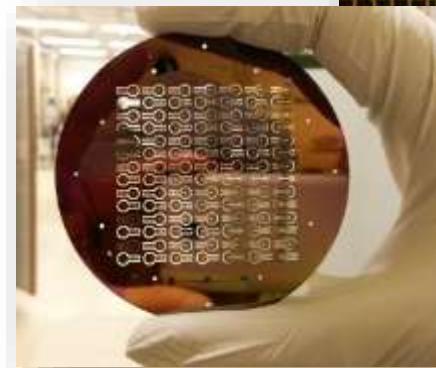
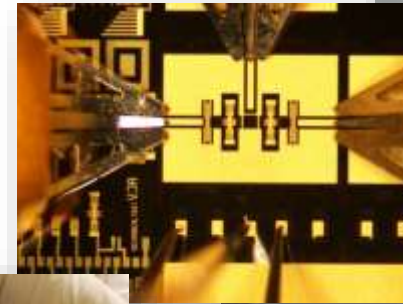


Sensors for ionising radiation detection

Sensors, Microsystem and IoT

NanoMicroFab will exploit the expertise as well as the equipment available and those to be acquired to offer services and products in the area of sensors and microsystems, including:

- Processes to deposit functional materials and fabricate solid state sensors for chemical and physical sensing (gas sensors, tactile sensors, biosensors, strain gauge, ...)
- MEMS (accelerometers, gyroscopes, ...)
- Microsystems (microbolometers, metamaterials)
- Lab on chip (microfluidic,...)
- Functional characterization of sensors



Services

Chemical-Physical Characterization

- *SNOM, STM, AFM*
- *Raman & IR spectroscopy*
- *Spectral Photometry*
- *Scanning Electron Microscopy*
- *Energy Dispersive Spectrometry*



Materials Production

- *Hot Filament CVD*
- *Pulsed laser Ablation*
- *RF&MW-PECVD*
- *RF & DC Sputtering*
- *E-beam thermal deposition*



Optical and Electrical characterizations

- *Analytical Micro-Probe Systems for DC and HF*
- *Source measure units*
- *Fiber optics spectrophotometers for UV-VIS*
- *Vector Network Analyzer for S-parameter*
- *Anechoic Chamber for millimeter wave antenna*



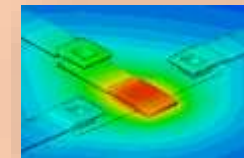
Processes for Device Fabrication

- *Femtosecond and Excimer Laser Treatments*
- *Reactive Ion Etching*
- *Optical and Electron beam lithography*
- *Rapid Thermal Annealing*
- *Printing systems*
- *Optical and electronic microscopes*
- *Nanoimprinting*



Theoretical Modelling

- *Device Physics: 2D & 3D physical simulations*
- *Compact Modeling: development of numerical models for new devices*
- *Tunable photonic microsystems*
- *High Frequency Microsystems*
- *Microwave Microscopy Techniques*
- *Synopsys® Technology CAD (semiconductor device simulation)*
- *CADENCE® Virtuoso (IC circuit design and simulation)*
- *COMSOL® Multiphysics*



Dr. Alessandro Pecora

Research Scientist

Researcher of Istituto per la Microelettronica e Microsistemi-CNR

Manager of the NanoMicroFab facility

via del Fosso del Cavaliere, 100 - 00133 Roma (ITALY)

email : alessandro.pecora@cnr.it

phone : +39 06 49934064

mob.ph. : +39 366 8328075

skype : alex.pecora



Consiglio Nazionale
delle Ricerche