

PROPOSED NEW SCHEME FOR SPIN REORGANIZATION

Project 1) Materials and mechanisms of superconductivity and power applications

(within the Program “**Innovative Materials**”)

Fe-based superconductors and other innovative superconducting materials; mechanisms of high T_c superconductivity (towards room temperature); performance improvement of practical conductors; magnet applications; other power applications.

This could include Carlo Ferdeghini and Marina Putti activity in Genova, the work by Andrei Varlamov and the Salerno group (Sandro Pace and Gaia Grimaldi) activity, as now in Activity 1.

Project 2) Advanced superconducting devices

(within the Program “**Devices and Sensors**”)

Superconducting single photon detectors; superconducting/magnetic hybrid devices; spin injection and spin imbalance in superconductors; devices based on metamaterials; other superconducting device applications.

This could include a large fraction of the activity of the ex-ICIB group in Pozzuoli and the work by the groups in Salerno by Sergio Pagano and Carmine Attanasio.

Project 3) Quantum effects in new materials and devices

(within the Program “**Quantum Technologies**”)

Josephson systems and superconducting qubits; sources of decoherence in superconducting quantum circuits; collective quantum phenomena; decoherence-free materials; quantum nano-devices; quantum-classical crossover; novel topological states of matter.; topological insulator - superconductor interfaces.

This could include the activity by Francesco Tafuri group, the new, growing activity on Topological insulators (Procolo Lucignano and others), the Activity of the Group in Rome by Matteo Cirillo, a small fraction of the ICIB group activity, and also include the activity of the Genova theoretical group presently working within Activity 5 .

Project 4) Devices based on innovative materials for electronics and energy applications

(Within the Program “**Devices and Sensors**”)

Use of innovative materials with novel ferromagnetic, ferroelectric, multiferroic, semiconducting and superconducting behaviour to create new classes of devices and sensors for electronics and energy applications.

This could include the Genova activity (Daniele Marre’) possibly the Salerno (Maritato), Rome (Balestrino) and Napoli more device-oriented oxide activity (Salluzzo).

Project 5) Advanced materials with magnetic and/or dipolar electric ordering

(within the Program “**Innovative Materials**”)

Synthesis and characterization of oxides and related complex functional materials; fundamental material properties related to exotic magnetic, charge and orbital ordering; ferroelectricity and multiferroicity; surfaces and interfaces of correlated oxides; first principles and model Hamiltonian approaches to microscopic electronic and magnetic properties.

This could include the activity of the group in Napoli (Miletto, Scotti, Amoruso, Marrucci) in Salerno (Vecchione, Cuoco, leaders of the MAMA project) and in L’Aquila-Rome (Picozzi, Calvani). This could also include the activity of the theoretical group in Napoli lead by Cataudella

Project 6) Organic compounds and other complex materials and systems for electronic devices and sensors.

(Within the Program “**Innovative Materials**” or “**Devices and Sensors**”)

Synthesis and characterization of organic (polymers and small molecules) and carbon-based compounds; composite materials, biomaterials and other complex nanostructured materials; new concepts for related devices and sensors; modeling of electronic properties; quantum effects in transport properties of nanodevices.

This could include the present activity on organics, and the theoretical component by Cantele and by the statistical mechanics groups in Napoli.