Quantum Information and Communication at Bicocca

Fri, 2016-10-07 12:06 - Stefano Sanguinetti [1] **Research Type:** Experiment
Keywords: Semiconductor quantum nanostructures, Spintronics, Single photon sources and detectors, magnetic resonance spectroscopy, Molecular Beam Epitaxy, Photoluminescence

At the University of Milano-Bicocca, Department of Materials Science, the research focuses on Inorganic Semiconductors. The UNIMIB group has cutting edge knowledge in the growth, processing, and study of the electronic and optical properties of group IV (Si, Ge) and III-V (GaAs, nitrides) semiconductors and nanostructures (quantum dots, quantum wires, quantum wells).

Key objectives are:
• **Silicon nanostructures fabrication and characterization for CMOS-compatible Quantum Computation.**
The activity relies on the fabrication and characterization of group IV semiconductor nanostructures, particularly nanowires, complex core-shell heterostructures and their deterministic doping. Charge and spin transport are investigated. In particular, spin-relaxation and coherence of donors in silicon nanostructures and their interactions with other defects are studied with the aim of utilizing donor-based qubit, hybrid-qubit. To achieve this purpose advanced magnetic resonance spectroscopy techniques are employed.
• **Quantum Nanostructures Fabrication for Quantum Communication and Quantum Computation**
The activity relies on the fabrication, by Molecular Beam Epitaxy, and morphological and optical characterization of arsenic and nitrogen based III-V semiconductor nanostructures to investigate single photon sources, high efficiency single photon detectors and quantum photonic devices integrated on silicon. Special focus is devoted to non-classical light storage for quantum optical circuits, twisted light interaction with quantum nanostructures and nano-engineering of quantum confined carrier states and spins.
• **Spin-photon interfaces based on CMOS-compatible solid-state architectures for Quantum Communication and Quantum Computation.**
The activity is related to spin-photon interfaces as a means to develop novel approaches for quantum repeaters, quantum computation and information in the solid state, paying particular attention to the compatibility with mainstream microelectronic technology.

Leader: Marco Fanciulli

Location

Universita' di Milano Bicocca Via Cozzi 55
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45° 30' 44.0172" N, 9° 12' 44.0424" E

- Quantum Communication [2]
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