Séminaire - Lundi 23 février 2015 – 10H30

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Spintronics with Semiconductors : From Fundamentals of Spin Injection to Laser Operation in extended cavities.

Salle du laboratoire LMS (salle 05-1026)


10H00

Since the discovery of Giant MagnetoResistance (GMR) observed at Orsay in 1988 by Albert Fert and his team on metallic magnetic multilayers, the injection and manipulation of spin currents are at the heart of spintronics and spintronic devices such as sensors, reading heads, magnetic memories and spin-transfer oscillators. Nowadays, the extension of spintronics to semiconductors represents a novel, emerging route towards new device functionalities, including rapid information transfer, optically coded via the photon angular momentum (helicity). Whereas metallic spintronics exploits the different electronic mobility in materials, thereby creating the necessary spin-current for the observation of magnetoresistive effects, a sizeable spin accumulation (imbalance of spin population) in semiconductors is needed for semiconductor technology, with such applications as the emission of circularly polarized light in Spin-Light Emitting Diodes and future spin lasers.
Starting from the physics of GMR, I shall, during my seminar, present the fundamentals and experimental highlights of electrical spin-injection in semiconductors, as well as the key material issues for the semiconductor technology. For instance, for Hybrid – III-V heterojunctions (spin-Light Emitting Diode and Spin-Lasers), this are designs for circularly polarized light emission. I will particularly emphasize on the issue of impedance mismatch that requires additive tunnel junctions for efficient spin injection. I shall present the different experimental techniques used in the laboratory to probe the efficiency of spin injection and spin accumulation in III-V junctions, from Electrical Hanle measurements to spin-resolved Electroluminescence measurements in spin-Light Emitting Diodes, for the goal of spin-laser operation.