ΓΕΝΙΚΟ ΣΕΜΙΝΑΡΙΟ ΤΜΗΜΑΤΟΣ ΦΥΣΙΚΗΣ

PHYSICS COLLOQUIUM

Thursday 13 Dicember 2007
17:00-18:00

3rd Floor Seminar Room

"Electrical Spin Injection into Semiconductor Heterostructures from Magnetic Metal and Semiconductor Contacts"

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Efficient electrical injection of spin-polarized electrons from a magnetic contact into a semiconductor is an essential requirement for utilizing the spin degree of freedom in semiconductor spintronic devices. We present results using different types of contacts; paramagnetic and ferromagnetic (FMS) semiconductors and FM metal contacts. The spin-polarized light emitting diode (spin-LED) is used as the platform for demonstrating spin injection since it provides a quantitative and model independent measure of the electron spin polarization Pspin. Large values of Pspin = 85% were obtained using ZnMnSe as the contact but practical limitations imposed by low temperature and high magnetic field requirements, force us to look into FMS and FM metals as preferable source of spin polarized carriers. Using Fe and FeGa as spin injectors, we have observed electron spin polarizations up to 40% in GaAs (001) QWs. While significant progress has been realized in GaAs, little has been made in Si, despite its overwhelming dominance of the semiconductor industry. We have recently reported successful electrical injection of spin-polarized electrons from an Fe film through an Al_2O_3 tunnel barrier into Si (001). We determined a lower bound for the Si electron spin polarization of 10%, with significant polarization extending to at least 125K.