PHYSICS DEPARTMENT COLLOQUIUM

" High Energy Observations of Gamma-Ray Bursts"

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Gamma-ray bursts are one of the most energetic phenomena known in the Universe. They are bright flashes of gamma-rays with durations of fractions to several thousands of seconds. They originate from near the visible edges of the Universe, and are therefore by far the most luminous astrophysical objects known. Observations at GeV/TeV energies are of particular interest for several reasons: Firstly the requirement that such high energy photons are created and the observation that the photon flux is variable, provides a wealth of information on the physical conditions of the γ-ray emission regions. More speculatively, we can also use these high energy photons as a probe of intergalactic background radiation fields – providing information about the star formation history and to investigate predictions of some quantum gravity models. I will describe some current detectors and future prospects for making GeV/TeV observations of gamma-ray bursts and discuss the scientific questions we are addressing with these observations. Dot sizes even down to dots containing a single electron.

Expanding beyond spin states in isolated devices, we have adapted the transverse electron focusing geometry to allow the preparation and detection of spin currents in more complicated mesoscopic structures. We use this to measure the spin polarization of transport current from open and Coulomb-blockaded quantum dots. While some aspects of the data are in agreement with current theoretical understanding, others remain to be explained. This experiment opens the door to a wide range of spin measurements, from probing transport polarization due to a spin-orbit interaction, to exploring many-particle entangled spin states."

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