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Large area CNT-Si heterojunction for photodetection

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Multiwall carbon nanotubes (MWCNTs) consist of multiple layers of graphite sheets arranged in concentric cylinders, from two to many tens. These systems are closely related to graphite layers but in some features MWCNTs behave quite differently from graphite. In particular, their ability to generate a photocurrent in a wide wavelength range has been demonstrated either without or with the application of a draining voltage. In addition, the photocurrent signal has been reported to reproduce the optical absorbance of MWCNTs, showing a maximum in the near UV region.
In this talk we will present main characteristics of a novel large area photodetector featuring low noise, high efficiency and great surface uniformity. This detector has been obtained by coupling the optoelectronic characteristics of MWCNTs with the well-known properties of silicon. MWCNTs are growth on n-doped silicon layer by Chemical Vapour Deposition creating a p-n heterojunction with high sensitivity to the radiation from UV to IR. An additional MIS junction is obtained with a metallic conductive layer deposited on the back of silicon substrate. The heterojunction is characterized by a 2.5 V threshold and a well-defined tunnel effect proportional to the radiation intensity.
In this framework, we will report accurate measurements of the detector responsivity, linearity, quantum efficiency and photocathode uniformity. In addition we will discuss about the heterojunction threshold and the tunnel effect below it.

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