PSD11

Contribution ID: **96** Type: **Poster**

Four-quadrant Silicon and Silicon Carbide Photodiodes for Beam Position Monitor Application: Electrical Characterization and Electron Irradiation Effects

Thursday 7 September 2017 12:40 (1h 50m)

Silicon photodiodes are very useful devices as X-ray beam monitors in synchrotron radiation beamlines. In order to be used in transmissive mode and given the absorption properties of silicon, the devices must be thinner than 10 um to achieve X-ray transmission higher than 90% for photon energies above 10 keV. On the other hand, bulk silicon segmented devices are also of interest for astronomy and space applications, such as solar tracking systems. Owing to their lower susceptibility to variable temperature and illumination conditions, there is also a special interest on silicon carbide devices for some of these applications. Moreover, radiation hardness of the involved technologies is a major concern for high-energy physics and space applications.

This work presents four-quadrant photodiodes produced on ultrathin (10 um) and bulk silicon, as well as on thick epilayer silicon carbide substrates with different design parameters along with auxiliary technology test structures (single diodes and MOS capacitors). The impact of different temperature (from -50ºC to 175ºC) and visible light conditions on the electrical characteristics of the various devices has been evaluated. An extensive electrical characterization, using current-voltage (I-V) and capacitance-voltage (C-V) techniques, has been carried out on non-irradiated and 2 MeV electron irradiated devices up to 1x1014, 1x1015 and 1x1016 e/cm2 fluences. Special attention has been devoted to the study of charge build-up in diode interquadrant isolation, as well as its impact on interquadrant resistance. The study of these electrical properties and its radiation-induced degradation should be taken into account for device applications.

Authors: Dr RAFÍ, Joan Marc (Instituto de Microelectrónica de Barcelona, IMB-CNM (CSIC)); Dr PELLEGRINI, Giulio (Instituto de Microelectrónica de Barcelona, IMB-CNM (CSIC)); Prof. GODIGNON, Philippe (Instituto de Microelectrónica de Barcelona, IMB-CNM (CSIC)); Dr QUIRION, David (Instituto de Microelectrónica de Barcelona, IMB-CNM (CSIC)); HIDALGO, Salvador (Instituto de Microelectrónica de Barcelona, IMB-CNM (CSIC)); Mr MATILLA, Oscar (ALBA Synchrotron); Mr FONTSERÈ, Abel (ALBA Synchrotron); Mr MOLAS, Bernat (ALBA Synchrotron); Dr TAKAKURA, Kenichiro (National Institute of Technology, Kumamoto College); Dr TSUNODA, Isao (National Institute of Technology, Kumamoto College); Dr YONEOKA, Masashi (National Institute of Technology, Kumamoto College); Dr POTHIN, Daniel (ESRF The European Synchrotron); Dr FAJARDO, Pablo (ESRF The European Synchrotron)

Presenter: Dr RAFÍ, Joan Marc (Instituto de Microelectrónica de Barcelona, IMB-CNM (CSIC))

Session Classification: Poster session