Contribution ID: **90** Type: **Poster**

P88 - Degradation of the charge collection efficiency of an n-type Fz silicon diode subjected to MeV proton irradiation

Friday, 11 July 2014 13:00 (1 hour)

The International Atomic Energy Agency (IAEA) Coordinated Research Project entitled "Utilization of ion accelerators for studying and modelling of radiation induced defects in semiconductors and insulators"is aimed to gain a deeper understanding of how different types of radiation influences the short and long term electronic properties of materials and devices. Within this project, an experimental protocol [1] has been implemented to determine the key parameters for the characterization of radiation damage effects on semiconductors. The protocol is based on the selective damage of small regions by focused ion beams at different fluences and, subsequently, on the measurement of the charge collection efficiency (CCE) degradation by means of the IBIC technique, using probing rarefied light ions.

This report describes the application of this experimental protocol to evaluate the radiation damage on an n-type Fz silicon detector developed at the Helsinki Institute of Physics . Proton beams of 1.3, 2.0 and 3.0 MeV focused down to 2 μm, were used to irradiate (0.1x0.1) mm2 areas with fluences ranging from 1011 to 3·1013 cm-2. Therefore, the radiation induced damage was probed by evaluating the degradation of the CCE at different bias voltages, using focused 4.5 MeV Li ion beams. The IBIC experiments were carried out at the nuclear microprobe facility of the Ruder Boskovic Institute in Zagreb.

At low proton fluences, the CCE behaviour as function of the proton energy, and diode polarization state is compatible with a general linear model based on the Shockley-Read-Hall recombination mechanism, whereas, at high fluences, the degradation is strongly influenced by the variation of the effective doping profile due to (hydrogen related) defects induced by irradiation.

[1] Ž. Pastuović, E. Vittone, I. Capan, M. Jakšic, Applied Physics Letters 98 (2011) 092101.

Primary author: FORNERIS, Jacopo (Physics Department, NIS research Centre and CNISM, University of Torino, via P. Giuria 1, 10125 Torino, Italy)

Co-authors: SIMON, Aliz (International Atomic Energy Agency. Vienna International Centre, PO Box 100, 1400 Vienna, Austria; Institute of Nuclear Research of the Hungarian Academy of Sciences, (ATOMKI), P.O. Box 51, H-4001 Debrecen, Hungary); VITTONE, Ettore (Physics Department, NIS research Centre and CNISM, University of Torino, via P. Giuria 1, 10125 Torino, Italy); RAISANEN, Jyrki (Physics Department, University of Helsinki, Pietari Kalmin katu 2, 00014 Helsinki, Finland); JAKŠIĆ, Milko (Department for Experimental Physics, Ruđer Bošković Institute, P.O.Box 180, 10002 Zagreb, Croatia); SKUKAN, Natko (Department for Experimental Physics, Ruđer Bošković Institute, P.O.Box 180, 10002 Zagreb, Croatia); GRILJ, Veljko (Department for Experimental Physics, Ruđer Bošković Institute, P.O.Box 180, 10002 Zagreb, Croatia)

Presenter: FORNERIS, Jacopo (Physics Department, NIS research Centre and CNISM, University of Torino, via P. Giuria 1, 10125 Torino, Italy)

Session Classification: Poster Session with Cheese and Wine