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present/past scientific work:
1) ongoing PhD in Physics (University of Hamburg, Germany
2) Master in Physics (University of Insubria, Como, Italy)
3) Internship (Paul Scherrer Institute, Villigen, Switzerland)
4) Bachelor in Physics (University of Insubria, Como, Italy

Summary

1) Fluences as high as 1.3-5·10^{16}/cm^2 during 5-10 years operation of HL-LHC
will strongly affect the tracking detectors' performance, e.g. resulting in more leakage current, less CCE, and different electric field. Therefore, it is of paramount importance to simulate and predict the impact of different particles in type, energy and fluence on silicon detectors for the LHC upgrade.
Currently few models exist, which address the bulk damage in silicon sensors with effective parameters representing the defects concentration, energy and cross-section. It is the scope of my PhD work to link these effective parameters to microscopic measurements of defects (such as the TSC method), in order to provide a measurement driven-model for bulk damage in highly irradiated silicon sensors.
2) Nowadays, radiotherapy treatments provide excellent conformal dose distributions, but also a non-negligible risk of secondary malignancies induction, mainly because of the neutron contamination of the primary beam. In the first part of my Master work, I simulated with MCNPX the main components of a 18 MV Varian Clinac to study the production, spatial distribution and energy of neutrons photoproduced by the medical linac. The second part of the thesis deals with the R&D of a compact neutron TOF spectrometer, which consists of BC-454 fibers and a MAPMT. The readout electonics (based on the Multi Anode ReadOut Chip - MAROC3 board) allows to perform neutron TOF measurements in real-time.
The new type of nTOF spectrometer is a suitable candidate for neutron dosimetry, aiming at a quantitative comparison with Monte Carlo methods, which currently represent the only way to calculate the contribution of neutrons to the integral dose of a radiotherapy patient.
3) During the internship at the PSI in the "Target Development Group", I worked out a method to calculate with MCNPX the proton- and neutron-induced damage to the most critical structural components of the MEGAPIE spallation target: the main flow guide tube and the lower liquid metal container, with a special focus on the entrance beam window.
Peak values of 6 dpa were found for the beam window, resulting from a four months long exposure to 575 MeV protons (for a 6.8 Ah overall charge), and spallation neutrons produced in the flowing (lead-bismuth eutectic) LBE.
The feasibility of such an approach was confirmed by the subsequent mechanical and microstructure analysis tests performed during the post-irradiation examination phase.
4) My bachelor thesis was performed within the framework of the INFN PhoNeS project, whose main goal was to develop the first hospital-based neutron source for Boron Neutron Capture Therapy (BNCT) treatments.
The underlying principle was the conversion of photons into neutrons (mainly via the GDR process), by means of a converter+moderator system placed directly in front of a standard accelerator for photon therapy.
Firstly, I performed the Neutron Activation Analysis (NAA) on ^{27}Al samples, to obtain a 2D profile of the neutron field. The maximum neutron flux was $(3.38\pm0.02)\times10^5$ n/cm^2/s^1.
Secondly, the neutron beam was exploited to develop a new type of neutron autoradiography: in fact, the

α-particles resulting from the irradiation of boronated samples with thermal neutrons were detected with a microstrip silicon detector. The system was useful for contributing to the research on new ^{10}B-carriers for BNCT treatments, and to study the ^{10}B uptake in biological samples.

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