The LENOS Project at Laboratori Nazionali di Legnaro of INFN-LNL: a thermal to 70 MeV neutron beam facility

Pierfrancesco Mastinu

[a] *INFN, Laboratori Nazionali di Legnaro, Italy*

LENOS (Legnaro NeutrOn Source) project at the Laboratori Nazionali di Legnaro of INFN (Italy) is a neutron irradiation facility for nuclear astrophysics studies and data validation for energy and non-energy applications. It is based on a high current low energy RFQ. The facility, will use the 5 MeV, 50 mA proton beam of RFQ under test at LNL to produce an unprecedent neutron flux, precisely shaped to a Maxwell- Boltzmann energy distribution. A new method has been proposed to obtain the desired neutron spectra at different stellar energies and a dedicated target, able to sustain a very high specific power , has been developed and tested. We will present the facility, the method used to shape the neutron beam, the preliminary results of the high power test of the microchannel water cooled target and the preliminary results of a measurement dedicated to the validation of the proposed method.

Beside the neutron facility based on RFQ, we are currently preparing a TDR which include also an higher neutron energy facility based on the new Cyclotron of 35-70MeV tuneable energy and up to 750 uA current. The high energy facility is called NEPHIR and at the moment, is dedicated to the study of Single Event Effect (SEE) on electronic devices. The 70 MeV proton beam will produce an atmospheric like neutron spectra up to 70 MeV using a novel technique and novel target: the neutron spectra is constructed by a weighted convolution of neutron spectra coming from different reactions. The target able to use two different materials and thus two different reactions, is a rotating target. The moch-up has been already designed and constructed and we are going to test it from thermo-mechanical point of view.

The opportunity to have the tenable energy between 35 and 70 MeV will offer also the opportunity to produce quasi-monochromatic neutron beam, whose applications span from fundamental physics to applied one (within the framework of SEE studies allow the search for threshold effects for instance). Finally, in the long term a pulsing system with about 2 ns time width is planned to allow a neutron Time of Flight facility . In this presentation, the novel method to produce atmospheric neutron spectra, the target design, the calculations for the production of quasi mono-energetic neutron beam with p,Li and p,Be reactions will be presented.