J Astrophys Aerospace Technol 2017, 5:2 (Suppl)
DOI: 10.4172/2329-6542-C1-009

An ADS irradiation facility for fast and slow neutrons

F Panza[1], W Borreani[1], G Firpo[2], G Lomonaco[1], M Osipenko[1], G Ricco[1], M Ripani[1] and **C M Viberti[2]**
[1]Istituto Nazionale di Fisica Nucleare, Italy
[2]Ansaldo Nucleare, Italy

A conceptual design of a flexible Accelerator Driven System (ADS) based irradiation facility with fast neutrons inside the core and slow neutrons were performed, starting from the pubblication "Influence of reflector materials and core coolant on the characteristics of accelerator driven systems" in which we studied the physical principles of the light materials insertion in a fast reactor. By using the MCNP-6 code, a fast reactor core was studied, driven by a 1-mA beam of 70-MeV protons impinging on a beryllium (Be) target (producing about $8x10^{14}$ n/s), fueled by MOX (0.29 wt% Am, 21.71 wt% Pu, 78 wt% DU), embedded in a solid lead matrix together with water pipes for cooling. A mixed reflector composed by three concentric cylindrical layers of diffusing and moderating materials (lead + graphite + lead) surrounds the core. In the ADS layout three irradiation channels were included, with different neutron spectra to perform measurements out of the reactor. Finally the effect of a simple reactor shielding was considered and a preliminary thermal-hydraulics analysis of the system was performed. As possible applications, a few specific gamma spectroscopy measurements on Long Lived Fission Products (LLFP) and Actinides in various ADS positions (in-core, out-of-core and using the irradiation channels) were simulated, corresponding to different neutron spectra, as well as a few in-core irradiations with different kinds of test fuel pins. The production rates for some radioisotopes used in nuclear medicine were also evaluated.

fabio.panza@ge.infn.it