Contribution ID: **119** Type: **Poster**

Study of gamma-ray emission by proton beam interaction with injected Boron atoms for future medical imaging applications

Wednesday, 7 September 2016 10:45 (20 minutes)

Recently, a method based on the possibility to inducing an enhancement of the biological efficacy of proton therapy by using of Boron atoms localized inside a tumor mass, has been proposed [1, 2].
Specifically, the aim of this approach is exploit the well-known 11B(p,a)2a nuclear reaction channel where three alpha particles, with an average energy around 3.5 MeV, are emitted [3]. These alphas show a sufficient range (around 20 um in water) so that they can release most of their energy in the cell nucleus and high-LET values, able to strongly damage the DNA, producing an enhancement of the biological efficacy of the proton beam. In addition, various proton-boron nuclear reactions induce the emission of several prompt gamma-rays with different energies [2]. The measurement of the produced gammas, if sufficiently intense as respect the background produced from the proton-nuclear reactions with the biological tissue [4], can potentially represent a powerful on-line proton beam imaging technique. The Boron therapeutic role as well as this new imaging technique could have potentially applications with treatment based on the using of conventional proton beam and laser driven proton beam.
In this work a theoretical and experimental study of the gamma prompt emissions from the proton boron nuclear reaction has been carried out with the main aim to understand and quantify the most probable gamma prompt emitted in the proton-Boron reactions with respect to the background.

References
1. D.-K. Yoon et al, "Application of proton boron fusion reaction to radiation therapy: A Monte Carlo simulation study", Applied Physics Letters 105, 223507 (2014); doi: 10.1063/1.4903345
2. L. Giuffrida, D. Margarone, G.A.P. Cirrone, A. Picciotto, AIP Advances 2016 (submitted)
3. H.W. Becker et al, "Low-Energy Cross Sections for 11B(p, 3a)*", Z. Phys. A - Atomic Nuclei 327, 341-355 (1987)
4. J. M. Verburg et al,"Simulation of prompt gamma-ray emission during proton radiotherapy", Phys. Med. Biol. 57 (2012) 5459–5472 doi:10.1088/0031-9155/57/17/5459

Primary author: Dr PETRINGA, Giada (LNS-INFN)

Presenter: Dr PETRINGA, Giada (LNS-INFN)

Session Classification: Poster Session