Contribution ID: **46** Type: **Poster**

Characterization of multilayer Thick-GEM geometries as 10B converters aiming thermal neutron detection

Tuesday, 13 October 2015 16:40 (0 minutes)

One of the most relevant issues in neutron detection is the search for alternatives to Helium-3 as neutron converter. Its high absorption cross section for thermal neutrons used to make it the preferred absorber to build large area thermal neutron detectors. Its current unavailability triggered an intense research to find for alternatives, turning the attention of gaseous detectors developers back to Boron-10. Boron is in the solid state at NPT conditions presenting an additional challenge in its deposition on surfaces, with reasonable thickness. This creates some limitations such as the loss of at least half of the solid angle and the problem of self-absorption of the products of the nuclear reaction when the films are too thick. All these limitations are reducing the detection efficiency of the final detector.

The use of many layers is an interesting solution to overcome these issues. This has been tried in several geometries, such as Multi-grid [1], Inclined detector [2], Jalousie[3] and Cascade [4]. In this work, a solution based in the Cascade concept for the use of many thin boron layers is exploited, using cost effective Thick-GEMs as neutron converters and electron transporters, together with a standard GEM-based charge amplification stage.

Some preliminary results of the characterization of the Thick-GEMs and of boron film depositions through Ion Beam Assisted Deposition using Nuclear Reaction Analysis and Rutherford and Elastic Backscattering Spectroscopy will be presented. Some ideas for the fabrication of simple elements of a scalable detector system will also be discussed.

References:

[1] J. C. Buffet, J. Correa, P. Van Esch, B. Guerard, A. Khaplanov, and F. Piscitelli, "Study of a B-10-based Multi-Blade detector for Neutron Scattering Science,", IEEE Nuclear Science Symposium 15 Conference Record, pp. 171–175, IEEE; IEEE Nucl & Plasma Sci Soc, 2012.

[2] J. Buffet, J. Clergeau, R. Cooper, J. Darpentigny, A. D. Laulany, C. Fermon, S. Fetal, F. Fraga, B. Guérard, R. Kampmann, A. Kastenmueller, G. M. Intyre, G. Manzin, F. Meilleur, F. Millier, N. Rhodes, L. Rosta, E. Schoonevеld, G. Smith, H. Takahashi, P. V. Esch, T. V. Vuure, and K. Zeitelhack, "Advances in detectors for single crystal neutron diffraction,"Nucl. Instr. Meth. A, vol. 554, no. 1–3, pp. 392 –405, 2005.

[3] "10B –Jalousie Detector."http://www.n-cdt.com/assets/Jalousie.pdf.

[4] M. Klein and C. J. Schmidt, "CASCADE, neutron detectors for highest count rates in combination with ASIC/FPGA based readout electronics,"Nucl. Instr. Meth. A, vol. 628, no. 1, pp. 9 –18, 2011.

Primary author: NATAL DA LUZ, Hugo (Instituto de Fìsica, Universidade de São Paulo, Brasil)

Co-authors: SUAIDE, A. A. P. (Instituto de Física, Universidade de São Paulo, Brasil); RODRIGUES, C. L. (Instituto de Física, Universidade de São Paulo, Brasil); SOUZA, F. A. (Instituto de Pesquisas Energéticas e Nucleares, IPEN-CNEN/SP, São Paulo, Brasil); CHUBACI, J. F. D. (Instituto de Física, Universidade de São Paulo, Brasil); BREGANT, M. (Instituto de Física, Universidade de São Paulo, Brasil); MUNHOZ, M. G. (Instituto de Física, Universidade de São Paulo, Brasil); MATSUOKA, M. (Instituto de Física, Universidade de São Paulo, Brasil); MORALLES, M. (Instituto de Pesquisas Energéticas e Nucleares, IPEN-CNEN/SP, São Paulo, Brasil); MORO, M. V. (Instituto de Física, Universidade de São Paulo, Brasil); CARLIN, N. (Instituto de Física, Universidade de São Paulo, Brasil); NEGRÃO, R. (Instituto de Física, Universidade de São Paulo, Brasil); SILVA, T. F. (Instituto de Física, Universidade de São Paulo, Brasil)

Presenter: NATAL DA LUZ, Hugo (Instituto de Fìsica, Universidade de São Paulo, Brasil)

Session Classification: Poster session & coffee break

Track Classification: Applications