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GEM-based thermal neutron beam monitors for spallation sources

The development of new neutron instrumentation and facilities is held back by the well-known problem of ^3He shortage. The research of reliable substitutes is an important task for the affordability of new neutron scattering instrumentation for future spallation sources like ESS. In the framework of the development of the European Spallation Source (ESS) the GEM (Gas Electron Multiplier) is one of the detector technologies that have been proposed as thermal neutron sensor. GEM detectors combine high rate capability, coverage of 1 m² area and resolution better than 0.5 cm and their use as thermal neutron detector requires conversion of neutrons into a charged particle. The approach considered here is the bGEM, i.e. to equip GEM detectors with a converter cathode containing ^{10}B . A first prototype of bGEM detector has been realized and successfully tested in a neutron beam campaign held at the ISIS-RAL facility. Neutron beam profile, time of flight spectrum, efficiency to thermal neutrons and gamma background suppression have been measured. This first prototype represents only the first step towards the realization of thermal neutrons detectors with an efficiency of 30-50% as alternatives to ^3He tubes.

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Authors: Mr CAZZANIGA, Carlo (Università & INFN - MIB Milano); Dr VASSALLO, Espedito (Istituto di Fisica del Plasma - CNR - Milano); MURTAS, Fabrizio (Istituto Nazionale Fisica Nucleare (IT)); CROCI, Gabriele (Istituto di Fisica del Plasma - CNR - Milano); CLAPS, Gerardo (I); Dr GROSSO, Giovanni (Istituto di Fisica del Plasma - CNR - Milano); Prof. GORINI, Giuseppe (Università di Milano Bicocca); Dr TARDOCCHI, Marco (Istituto di Fisica del Plasma - CNR - Milano); Dr CANIELLO, Roberto (Istituto di Fisica del Plasma - CNR - Milano)

Presenter: CROCI, Gabriele (Istituto di Fisica del Plasma - CNR - Milano)

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