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Status of THGEM based neutron detector in CSNS

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With the international development of the new generation neutron source, the traditional neutron detector can't satisfy the demand of the application of the high flux especially. And facing the global crisis of He-3 supply, the research on the new style of the neutron detector becomes extremely urgent. Considered with the development demand of the domestic neutron scattering facility CSNS (China Spallation Neutron Source), this research proposes to develop the new style of neutron detector based on the boron convertor and the domestic THGEM with high flux capacity and two-dimensional position sensitivity. A prototype has been constructed. A thin boron coating on the cathode is used as the neutron convertor and a single THGEM (active area: 50mm*50mm, thickness: 200 μ m, pin: 200 μ m, pitch: 500 μ m) is employed for the gas multiplication. 64 channels x-y crossed strips (x: 32 channels, y: 32 channels, strip period 1.56mm) are arranged for 2-D signal readout. The electronics integrates a 64 channel ASIC based readout with FPGA by using x-y coincidence. The latest test results using the radiation source and X-ray machine are present, including the spectrum, counting rate, spatial resolution and the 2-D image. One of the key technologies is how to coat a thin boron film onto the electrode. Last year, boron coating has been successfully deposited onto the copper by using magnetron sputtering. The measurement results show the coating has high quality with firm adhesion, high purity and high speed of deposition.

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