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Wavelength-Shifting Fiber Scintillation Neutron Detectors for POWGEN3 & VULCAN at SNS. Jason Hodges, Lowell Crow, Luke Heroux, Bruce Hannan, Spallation Neutron Source, Oak Ridge National Laboratory Oak Ridge, TN 37830, USA.

We have constructed & tested the initial production wavelength-shifting (WLS) fiber scintillation neutron detector module for the Spallation Neutron Source POWGEN3 & VULCAN diffractometers. The design is based on a successful prototype [1]. These diffractometers require neutron detector systems with large, narrow pixels (about 5mm x 50 mm), good efficiency up to 0.5 eV, and array areas of > 10 m^2. The detector uses a ^{6}LiF/ZnS:Ag scintillation screen for neutron conversion. The scintillation light is collected using a two-layer grid of 308 × 152 WLS plastic optical fibers (area is ~0.3 m^2). The vertical (V) fiber ends, encoding 5 mm wide horizontal (H) pixels, are mapped to an array of 20 photomultiplier tubes (PMTs) in a ^2C_n coincidence pattern. Each horizontal fiber, mirrored at one end, conducts light to a PMT; bundling of these fibers defines the vertical pixels. The detector operates in coded coincidence, requiring signals from 1 V & 2 H PMTs. The PMT output is converted to digital signals using fast comparators, and the neutron identification and position encoding are processed digitally. The detector module has been successfully tested at the High Flux Isotope Reactor.

[1] M. L. Crow *et al*., Nucl. Instr. Meth. A 529 (2004) 287.