The large area scintillator neutron detectors in Chinese Spallation Neutron Source (CSNS)

Analyzing neutron scattering and diffraction is currently the best way to probe the microstructure and dynamic properties of materials. The China Spallation Neutron Source (CSNS) is a large scientific facility whose main aim is to support multidisciplinary research on material characterization using neutron scattering. It has been running steadily with four neutron instruments from March,2018. Twenty neutron instruments will be built as multidisciplinary platforms for scientific research by national institutions, universities, and industry. Several versions of large area scintillator neutron detector for the replacement of the 3He tubes have been developed to fulfill the requirements of different neutron Diffractometer. The first version detector which consists of 6LiF/ZnS (Ag) scintillators, crossed wavelength-shifting fiber (WLSF) arrays, and multi-anode photo multiplier tubes (MA-PMT) has been used in General Purpose Powder Diffractometer (GPPD) since 2018. It has 4×4 mm2 pixel size. The second version of the scintillator detector is designed with oblique ZnS(Ag):6LiF scintillators and Silicon Photomultipliers (SiPMs) readouts. It has applied in Engineering Materials Diffractometer (EMD) and Energy Resolution Neutron Imaging instrument (ERNI) with more than 6m2covera area. The pixel size is 3mm×50mm and 3mm×100mm respectively. And the neutron detect efficiency is improved from 38% to 62% for the 1.4 Å neutron. There are third version of the scintillator detector being developed for the high position resolution of 1mm. It will used in the single crystal neutron diffraction measurement.

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