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A Multi Grid Detector Design for the ESS CSPEC chopper spectrometer

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This contribution presents the performance and project status of the Multi Grid detector design for chopper spectrometry, in particular in the context of the state of the design for the CSPEC spectrometer at ESS. The Multi Grid detector was introduced at the ILL in 2009, and has been co-developed by ILL, Linköping University and ESS since then.

As part of the development programme, since 2010, numerous prototypes were built, to investigate both the detector design's technical and scientific performance. Of particular note is that 3 sets of scientific demonstrators were built and installed for tests on 3 leading chopper spectrometers; IN6 at ILL and CNCS and SEQUOIA at SNS. Detector and instrument simulation of the signal from the detector with the complete detector has led to a greater understanding of each of the background components; this is especially important for this application. Each of these results has led to improved understanding which has been fed back into the design.

In this contribution, the design is presented in the context of the detailed design for the CSPEC spectrometer at ESS. An overview of the performance compared to the current state of the art detectors - He-3 tubes - is given. The performance for scientific applications is broadly comparable. Great care must be taken in the design in selection of low radioactivity materials; also the design of the localised shielding inside the detector is key to optimise the extraction of the quasi-elastic signal. The design has potential significant advantages compared to He-3 tubes in terms of rate capability (both global and local instantaneous), and in terms of rejective power of beam-induced backgrounds, especially fast neutrons.

In summary, this technology is now ready for deployment on a chopper spectrometer. The current project status of the design for the CSPEC spectrometer at ESS is shown.

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