StructuredDetector Representation of BAND-GEM Detectors in Mantid

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The LOKI instrument is currently under development as part of the in-kind collaboration between ISIS and the ESS. This instrument will be using Band-Gem (Boron-Ary Neutron Detectors, Gas Emission M) detectors in a large irregular grid pattern shaped like an inverted umbrella with a large concentration of detectors in the centre compared to the outer sectors. This design has been identified as the optimal solution for small angle scattering experiments of this type. Each detector panel will be separated into 8 "fan" sectors each of which contain between 500-1000 individual (uniquely shaped) detectors. There will be three panels in total which translates to circa 2700 detectors.

Presently, the LOKI instrument is in its concept stage with many development iterations of a proposed implementation of the physical BAND-GEM detector network and associated hardware. There have also been efforts on the part of the detector group at the ESS in prototyping instrument behaviour using McStas simulations. The outputs of these simulations have provided a basis for development work on prototyping the data reduction workflow for this instrument. This allows the DMSC (Data Management and Software Centre), along with in-kind contributors to develop and test the data reduction process in the absence of a physical instrument.

The Mantid framework has been chosen by the ESS to be the main data reduction service. This is currently in use at ISIS, SNS and ILL. There has also been considerable effort in the past to ensure interoperability between McStas and Mantid, with existing capability allowing the export of McStas data and instruments to Mantid-readable formats.

One of the major drawbacks towards the design of the data reduction workflow was LOKI's irregular topology for which there was no sensible compatibility within the Mantid framework. Since Mantid has been chosen as the main data reduction service for LOKI and all other instruments at the ESS, it was important to address this issue early. McStas output produced Mantid instrument definition files (IDFs) which were impractical to use taking, on average, 12 minutes to load with very slow navigation in the instrument view tool. This was due, not only to the large number of detectors within the file itself, but also the uniqueness of each of the individual detector units. A new design pattern for IDFs called the StructuredDetector was created which enabled faster, more efficient loading and navigation of LOKI IDFs. There were also other design improvements and additions to the Mantid framework in general which facilitated faster loading of IDFs across the board.

This poster will highlight the changes to the Mantid Framework which enabled the inclusion of the StructuredDetector, the success of loading the full proposed LOKI geometry quickly and efficiently, and finally how the new IDF schema has been used by the detector group at ESS in their simulations.

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Preference: Poster