Software requirements for diffraction (DREAM, MAGIC, BEER, HEIMDAL)

# Instrument control

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|  | **DREAM** | **HEIMDAL** | **MAGIC** | **BEER** |
| M = Must, S = Should, N = Nice | M | S | N | M | S | N | M | S | N | M | S | N |
| **Data Display** |  |  |  |  |  |  |  |  |  |  |  |  |
| Full detector area: (n-dimensional (nD): 2θ, d, Q, E, Intensity  | X |  |  | X |  |  | X |  |  | X |  |  |
| 1D live histogram display: Integrated intensity over all detectors vs ToF) | X |  |  | X |  |  |  |  |  | X |  |  |
| Save detector and 1D histogram images | X |  |  |  | X |  |  |  |  |  | X |  |
| Region of interest (ROI) selection and readout of physical location of detector module | X |  |  | X |  |  | X |  |  | X |  |  |
| Remote access to live detector data for users |  |  | X |  |  | X |  | X |  |  | X |  |
| Remote access to live detector data for instrument team | X |  |  |  | X |  | X |  |  | X |  |  |
| Incident beam spectrum |  | X |  |  | X |  | X |  |  | X |  |  |
| Correction of the live detector data for distortions, efficiency, calibration,  |  | X |  |  | X |  |  |  | X |  | X |  |
| Plot of SEE parameters (field, temp) as a function of time |  | X |  | X |  |  |  | X |  | X |  |  |
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| **Under the Hood** |  |  |  |  |  |  |  |  |  |  |  |  |
| All relevant EPICS information saved in NeXuS file | X |  |  | X |  |  | X |  |  | X |  |  |
| sample, user, experiment information in NeXuS file | X |  |  | X |  |  | X |  |  | X |  |  |
| Logbook of entire experiment including instrument configuration, beam status and SEE parameters  | X |  |  |  | X |  | X |  |  | X |  |  |
| **CLI & GUI Interfaces** |  |  |  |  |  |  |  |  |  |  |  |  |
| Driving motors, setting limits, offsets | X |  |  | X |  |  | X |  |  | X |  |  |
| Changing SEE parameters | X |  |  | X |  |  | X |  |  | X |  |  |
| Reading SEE parameters | X |  |  | X |  |  | X |  |  | X |  |  |
| Ability to script counting for time, monitor counts, proton charge  | X |  |  | X |  |  | X |  |  | X |  |  |
| Continuous measurements during sweeping of field, temperature, current |  | X |  | X |  |  | X |  |  | X |  |  |
| Loops, if-then | X |  |  | X |  |  | X |  |  | X |  |  |
| Script simulation |  | X |  |  | X |  | X |  |  | X |  |  |
| Quick change of instrument setups (SEE, high/low resolutions, polarized/unpolarized neutrons) | X |  |  | X |  |  | X |  |  | X |  |  |
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| **Instrument Live feedback** |  |  |  |  |  |  |  |  |  |  |  |  |
| Choppers frequency and position  | X |  |  | X |  |  | X |  |  | X |  |  |
| Vacuum systems | X |  |  | X |  |  | X |  |  |  | X |  |
| Beam power monitor | X |  |  | X |  |  | X |  |  | X |  |  |
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# Instrument specific control

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| Item | Must | Should | Nice |
| MAGIC: XYZ polarized measurements | X |  |  |
| HEIMDAL: SANS detector position readout |  | X |  |
| HEIMDAL: Imaging detector readout |  | X |  |
| BEER: laser alignment and 3D scan to define sample coordination system | X |  |  |
| BEER: Standalone mode for SEE (reading, changing parameters) off the beam for long term experiments | X |  |  |
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Comments and questions from BEER:

“**Full detector area: (n-dimensional (nD): 2θ, d, Q, E, Intensity**”: I missed ToF as one of the axis. For the BEER instrument in modulation setup ToF vs 2θ diagrams will be needed to see the possible overlap regions.

“**1D live histogram display: Integrated intensity over all detectors vs ToF**”: If integrated over all detectors than it should be vs d not ToF. It would be good to have an option to select predefined part of the detector for live view. But it is probably the ROI option you explained next.

“**Region of interest (ROI) selection and readout of physical location of detector module**”: It will be used just for data visualization? Or it can be used as selected region for the data reduction? For BEER it can help in the case of texture to analyze for example the intensity variation as a function of detector position within the selected ROI.

“**Remote access to live detector data for users**”: It doesn’t need to be exactly live data but user should be able to see what is currently measuring and what is the collected patterns and status of the instrument.

“**Driving motors, setting limits, offsets**”: On BEER there will be hexapod and robot for positioning of the samples. It is necessary to set the position in the defined (sample based) coordinating system not as a set of positions for individual motors in the robot or hexapod piston.