

ESS Diffraction STAP Report from 24 April 2023 Meeting

STAP met online with ESS staff and instrument teams present. STAP members participating were P. Attfield (chair), T. Fennell, R. Neder, K. Page, H. Playford, G. Rousse and M. Sahlberg. M. Angst was absent.

Tom Fennell is stepping down and was thanked for his contributions to STAP over 10 years.

STAP received an update on recent ESS developments and presentations from the DREAM, MAGIC and HEIMDAL project teams.

STAP thanks all ESS staff and the instrument teams for their continuing hard work and for the high quality of reports and presentations. Recommendations in the report are indicated R and are also listed separately at the end of the report.

ESS management session and general items

- STAP notes that excellent progress is being made on the ESS project without any significant further slippage of the timetable.
- Following the previous Detectors report, STAP continues to encourage neutron testing of detector modules especially at pulsed sources. R
- STAP fully supports suggestions from ESS and the instrument teams to start discussions of First Science experiments at future STAP meetings. R
- STAP proposes to cover each of the three Diffraction instruments over the next three meetings; DREAM Oct. 2023, MAGIC April 2024, and HEIMDAL Oct. 2024. [Tentative timetable for each meeting is 3 x 20 min instrument reports then 1 hour for the specific instrument science.]
- In considering possible new instrument builds, STAP emphasises that it is important to achieve the full scope of the current instruments. R
- A future call for 7 new instruments to extend scientific coverage of ESS is also important. STAP does not recommend piecemeal funding of 1-2 instruments at a time. One or two community calls for funding of several instruments each would be more effective. R
- A High Pressure diffractometer is still a priority to complete the ESS Diffraction suite. The community could be consulted in case there are other ideas. R

Diffraction instrument suite

DREAM

DREAM is a powder diffractometer that will tackle chemistry, physics and materials problems. STAP has emphasised high resolution powder neutron diffraction as the main direction for the science programme.

- STAP noted excellent progress across all areas of the instrument build project. The completion date has slipped by 6 months due to a TG3 issue and a delay by CDT in being able to supply the detectors. However, DREAM remains on schedule to be one of the first three completed ESS instruments. Other minor issues for resolution are: check of the bispectral switch, resolution of hub failures on the band-control choppers.
- ESS should provide space for safe storage of the DREAM mantle detectors (and perhaps other large components for ESS instruments) before they are fitted onto the beamline. R
- STAP notes good progress of discussions with a potential manufacturer of the DREAM cryofurnace with 20 sample changer. It would be acceptable if this only allows cooling of samples below ambient temperature. R
- STAP supports ongoing experiments by DREAM and ESS team members at DESY and MAX-IV synchrotrons to gain practical experience of the acquisition and processing of large data sets.
- First science on DREAM should be discussed at the next STAP meeting. R
- As the build nears completion, plans for a possible upgrade such as use of the second cave should be considered. R

MAGIC

MAGIC is a single crystal instrument designed for magnetism and correlated electron materials studies using polarized cold and thermal neutrons.

- STAP noted excellent progress across the project. Work on the components is going well with no apparent roadblocks. The bender design needs to be decided upon and reported.
- Good staff progress is noted through appointing an engineer and a CAD designer. STAP encourages ESS and MAGIC team to work together to fill the full time scientist position at MAGIC. R
- Progress with provision of an elevator for the MAGIC hutch is noted favourably, but an issue with the base ramp needs to be resolved.

HEIMDAL

HEIMDAL will offer a combination of powder neutron diffraction, small angle neutron scattering (SANS) and neutron imaging to enable complex and evolving systems to be studied over multiple length scales.

- STAP notes excellent recent progress of HEIMDAL plans. The start of construction is imminent with NBOA installation planned for May 2023.
- The HEIMDAL team's aim to have in-bunker installation (including the TO chopper if possible) done before BOT (5/25), with commissioning soon afterwards, is realistic and strongly supported by STAP. R
- STAP is happy to note that the plan to include both the thermal and 116 m (around 75% of the total length) of the cold guide within the same shielding is now accepted, providing a clear path to a later upgrade that will enable the original science case of Diffraction + SANS + Imaging to be achieved.
- An additional engineering appointment is noted.
- The initial detector coverage of 1.0 sr to allow project contingency is approved by STAP, though an increase to 1.3 sr is encouraged if the budget allows. R
- The HEIMDAL cave design to allow later SANS detector installation/extension is strongly supported by STAP. R
- Polarisation upgrade of HEIMDAL is considered a lower priority by STAP. Adding imaging capabilities to enable the full Diffraction + SANS + Imaging science case to be achieved is more important. R

Summary of Diffraction STAP Recommendations

1. Following the previous Detectors report, STAP continues to encourage neutron testing of detector modules especially at pulsed sources. R
2. STAP fully supports suggestions from ESS and the instrument teams to start discussions of First Science experiments at future STAP meetings. R
3. In considering possible new instrument builds, STAP emphasises that it is important to achieve the full scope of the current instruments. R
4. A future call for 7 new instruments to extend scientific coverage of ESS is also important. STAP does not recommend piecemeal funding of 1-2 instruments at a time. One or two community calls for funding of several instruments each would be more effective. R
5. A High Pressure diffractometer is still a priority to complete the ESS Diffraction suite. The community could be consulted in case there are other ideas. R
6. ESS should provide space for safe storage of the DREAM mantle detectors (and perhaps other large components for ESS instruments) before they are fitted onto the beamline. R

7. STAP notes good progress of discussions with a potential manufacturer of the DREAM cryofurnace with 20 sample changer. It would be acceptable if this only allows cooling of samples below ambient temperature. R
8. Good staff progress is noted through appointing an engineer and a CAD designer. STAP encourages ESS and MAGIC team to work together to fill the full time scientist position at MAGIC. R
9. The HEIMDAL team's aim to have in-bunker installation (including the T0 chopper if possible) done before BOT (5/25), with commissioning soon afterwards, is realistic and strongly supported by STAP. R
10. The initial detector coverage of 1.0 sr to allow project contingency is approved by STAP, though an increase to 1.3 sr is encouraged if the budget allows. R
11. The HEIMDAL cave design to allow later SANS detector installation/extension is strongly supported by STAP. R
12. Polarisation upgrade of HEIMDAL is considered a lower priority by STAP. Adding imaging capabilities to enable the full Diffraction + SANS + Imaging science case to be achieved is more important. R