CSPEC: Brief Overview to STAP, April 2020

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1 Optics

1.1 Bunker optics

The CSPEC in-monolith neutron beam optical assembly (NBOA) tender has been awarded. The CSPEC bridge beam guide and bunker feedthrough guide, both elements with a Cu substrate, has been awarded. Production for all Cu based guide pieces cannot be continued due to a lack of neutron reflectivity capabilities to check the Cu substrates.

1.2 In bunker optics

Guide housing design is now focussed on the in-bunker guide.

1.3 Out of bunker optics

Manufacturing of the out of bunker optics is progressing at FRM2. The optics team at FRM2 are manufacturing of guide components w03-07-03 : w03-07-24, approximately 64 m of guide. Manufacturing at FRM2 has ceased due to covid-19 precautionary measures.

2 Vacuum housing and integration

Tender awarded for out of bunker vacuum housing and integration. Finalised detailed design and collaboration meetings are continuing.

3 Monitors

It has become clear that the target rastering by the proton beam and the novel moderator design will not provide a uniform flux distribution across the instrument suite. Previously the CSPEC team considered that knowledge from the test beamline would be sufficient to understand the basic timing and flux profile of the neutron beam profile and as such it was decided not to place a monitor close to the moderator. We have revised this decision and will now place a monitor at 6 m. The detector group are still working towards a monitor solution which we look forward to receiving. CSPEC considers that a NitroGem monitor (ISIS) with minimised Al windows is a good solution for all monitors on CSPEC. Vanadium monitors are not of interest to us. Detector group will present an updated report.

4 Choppers

Chopper specifications approved by ESS. Chopper tender will be published shortly via LLB.

5 Detector Tank

Call for tender verification / specification documentation submitted to ESS for review - tender expected to be published shortly via LLB.

5.1 Further considerations

The following items remain in the detailed design phase and we continue to consider the best way to manufacture various components:

- Guide exchanger and slit system.
- Detailed integration of detector vessels (Aluminium vessels housing the detectors). (points of contact provided in detector tank).
- Integration of absorbing vanes within detector tank (points of contact provided in the detector tank).
- The radial collimator specification document and thus tender is intended to be submitted shortly. Integration into detector tank has been considered.

6 Shielding

- Primary spectrometer shielding: Detailed design complete: premanufacturing of lower blocks. Installation of CSPEC primary spectrometer blocks on-going in E02.
- Shielding of secondary spectrometer. Detailed shielding calculations are on-going. Cave design depends on this.

7 CSPEC Detectors

- Multigrid Boron detector tests are foreseen on LET as a pilot for the CSPEC MG detectors. The test will be performed on a detector with both pure Al and radial coating of the Boron blades - thus representing a nominal CSPEC detector. A slight variation is that the pilot detector is 20 voxels deep, as opposed to 16 on CSPEC, with a Boron coating thickness optimised for TREX and is 1 m high instead of 3.5 m high as required for CSPEC. However, the background scattering profiles that CSPEC are interested in will not be significantly affected and can be accounted for. Mechanical details of the 3.5 m high detector have been tested elsewhere.
- Tests of the electronic noise levels are being performed in Utgard, the ESS technical laboratory.
- A contract between the ESS and CSPEC is forthcoming and this will path the way for detailed design (TG3) and full scale manufacturing. Detector group will present an updated report.

8 Sample Environment

The sample environment area in the detector tank has been optimised for both hard condensed matter and for soft matter experiments. Special consideration has been given to side access, a gate valve and a number of side flanges (D63 x 4) for sample environment requirements (e.g. external gasses). First day sample environment as defined in the scope setting meeting is as follows. No recent changes have been made:

- Cryofurnace (3-600 K, ΔT= 0.1 K) (CSPEC - remains in scope).
- Multiple sample changer (up to 8 samples), possible collaboration between ESS and TUM (CSPEC, remains in scope). This will require significant further consideration. Must start Q2 2019 - delayed.
- Sample rotation stage and goniometer (CSPEC, remains in scope).
- Dilution insert (remains in-scope).
- Access to a 12 T magnet (ESS Pool, not in CSPEC scope). Has been removed from the ESS pool scope for day 1 by ESS management. A 6 T secondhand magnet has been procured from HZB, the tails will be optimised for spectroscopy.

- In-situ capabilities (in-kind, not in scope).

Collaboration with Dorthe Posselt, Roskilde University, has resulted in a recent proposal to the Danish Ministry of science with aims to develop sample environment (& corresponding data analysis) for soft matter and QENS. This group have recently developed (not particularly for CSPEC but will be off help and shows possibilities):

- Peltier Based Temperature Controlled Sample Platforms for Neutron Scattering, RUC/ESS collaborative project in which two specialized sample environments were designed and constructed built. 1) A sub-cryostat insert, providing ultrafast and stable temperature control for general neutron scattering sample cells. 2) A multitemperature SANS cuvette holder system, providing separate temperature control for 5 samples.

- Sample environment for simultaneous dielectric spectroscopy and inelastic neutron scattering under high pressure, a RUC/ILL collaboration.

Discussion with the sample environment groups have been on going. The detailed requirements for laboratory and technical space is under consideration but not complete. On going: Close links with Lund University, Copenhagen University and MAXIV will help support day 1 requirements for hard condensed matter with access to furnaces (including an image furnace), single crystal alignment with XRD, and bulk characterisation with NMR and magnetic susceptibility.

9 Further information

- Second instrument scientist Daria Noferini will join us May 2020 (Still expected).

- Radiation and safety hazard analysis has been and will continue to be a strong focus for the following months. Personal safety system (PSS) needs to be carefully considered.

- Electrical engineering. We have joined the electrical engineering resources made available at the ESS with S. Birch.

- Control cabin. Details to be discussed with Skanska.

- Polarisation analysis. A polarising guide prior to the M chopper will polarise the incident beam and a He3 analyser will analyse the scattered beam. The vacuum guide around the incident beam polarisation has been altered to easily enable the introduction of a polarising guide. The guide pieces after the M chopper will be non-magnetic to ensure continuous polarisation of the incident beam. We are collaborating with Wai Tung (Hal) Lee to evaluate the magnetic field profiles on the instrument and determine the optimum configuration. This remains an upgrade path but future proofing the instrument will enable the introduction of polarisation analysis as soon as it is available.