

CSPEC STAP report October 2025

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CSPEC is the cold chopper spectrometer at the ESS. CSPEC TG5¹ is currently planned in August 2027. We are considering a list of components which could be completed during the hot commissioning period, hence moving TG5 to an earlier date. We will present the list for discussion during the meeting. The science case for CSPEC is very broad and will address the needs of many different communities such as magnetism, soft matter, energy materials, life science. CSPEC has a strong focus on small samples, in situ and operando, kinetics etc. Most recent CSPEC paper: Rev Sci Instrum. 2021 Oct 1;92(10):105104. DOI: [10.1063/5.0059907](https://doi.org/10.1063/5.0059907). In this STAP report, we provide an overview of the status of the main components. More details will be given during the talk at the STAP meeting.

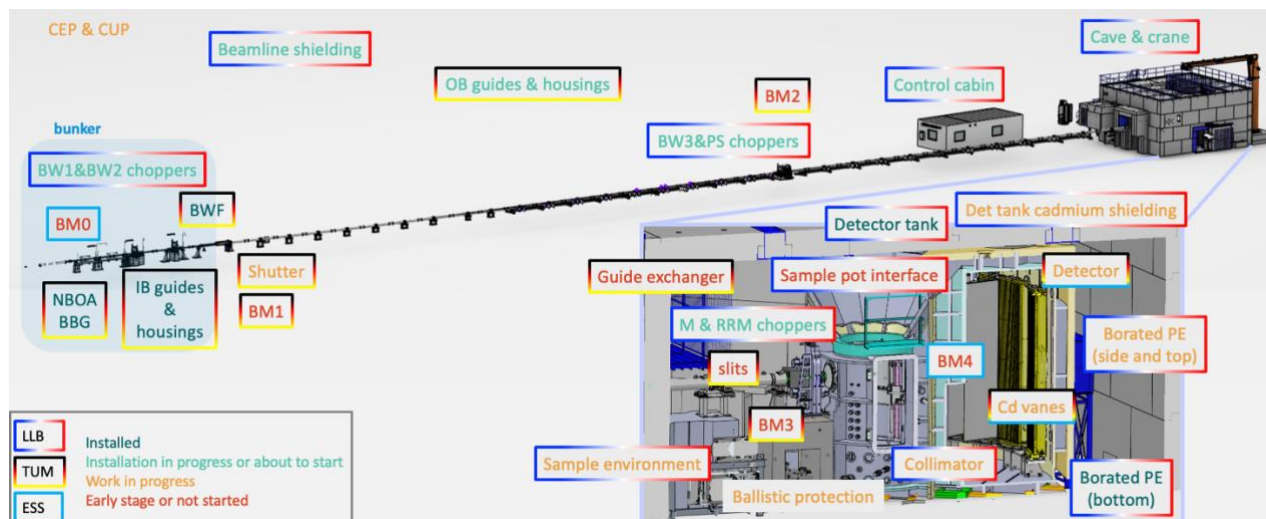


Figure 1 Model of the instrument and summary of the status of different components (see color code)

Staff

Jackson Da Silva, Instrument Operation Engineer (IOE), started on the 19th of August; Christian Beck, Instrument Data Scientist (IDS) on CSPEC and MIRACLES started on the 1st of October; Christian Balz, Instrument Scientist, is starting in January. Although Jackson is involved in some design work and some remaining design tasks have been assigned to NSS pool designers, we still have designing tasks which are missing resources.

Guides and housings

NBOA and BBG (first guide elements), BWF (bunker wall feedthroughs), and in-bunker guides are installed. Out-of-bunker installation will start in November.

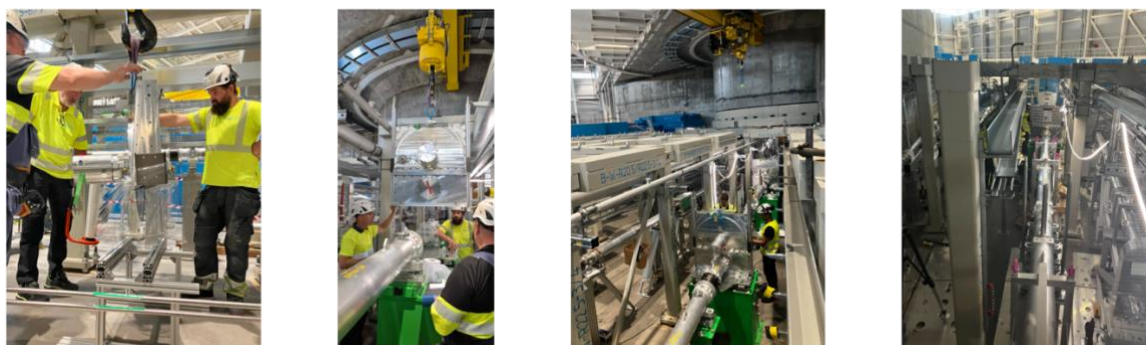


Figure 2 Installation of the in-bunker guides, housings and choppers

Shutter

A prototype was produced and tested. We are currently working on some corrections. SubTG3² is planned for end of November. A temporary plug will be installed in November, to ensure BOT³.

¹ Final ESS internal review, corresponding to the end of construction phase with relative documentation and licensing.

² Intermediate internal review, corresponding to the end of design for the whole instrument (final TG3) or components (subTG3).

³ Beam On Target

Primary spectrometer shielding

All the shielding blocks have been produced and tested for installation (planned in November).

Choppers

BW1 and BW2 choppers are installed in bunker (see Figure 2). The on-site tests will be performed at a later stage, by summer 2026, due to lack of resources from chopper group and prioritisation of T1 instruments. However, the risk is mitigated by the low operational speed (14 Hz) and the tests already done during the FAT⁴ (by the ESS chopper group, CSPEC team and Airbus). BW3, PS, M and RRM choppers will be installed from December 2025 to April 2026.

Cave and control cabin

The control cabin installation is finished (energisation excluded) and the cave installation will be completed in December/early 2026 but all the main parts (structure, moving door, roof hatch, fences and instrument crane) are finished.

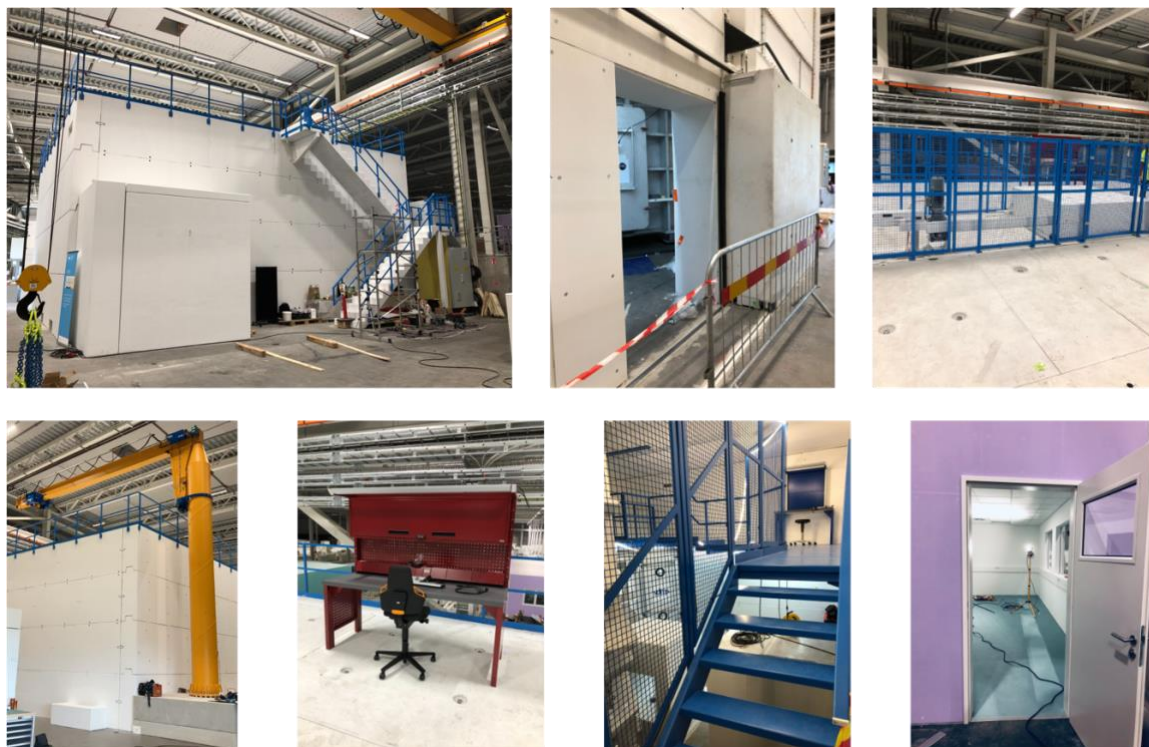


Figure 3 Top row, left to right: overview of the cave, side access automated door, roof hatch. Bottom row, left to right: the local crane, a preparation workbench on the roof, the stairs towards the sample pot from top access, the entrance of the control cabin.

Electrical installation, utilities installation, motion control (common projects)

Common Electrical Project started for CSPEC. Some delays may occur due to lack of resources and prioritisation of earlier instruments. We are waiting for an offer for Common Utility Project and Motion Control, but initial meetings were held.

Beam Monitors (common project)

An official request to join the common project was sent at the end of 2024. We are waiting for an offer, with delays due to lack of resources and prioritisation of earlier instruments. Technical solutions have been discussed and are unchanged from previous reports. We are however taking the risk of finalising interfacing components (e.g. the shutter) without a final contract in place.

Radial oscillating collimator

The collimator is at the ESS. The collimator drive is in preliminary design stage (ESS design resources have been requested to finish the preliminary design). The detailed/manufacturing design will be outsourced to an external company. The installation is planned for May 2026.

⁴ Factory Acceptance Test

Detector tank

The detector tank is installed, aligned with 0.1 mm precision, and passed vacuum and leak tests. The gate valve mechanism will need some additional work both in terms of functionality and documentation (CE marking). The installation of the cadmium is planned for next summer. Borated polyethylene was installed under the tank; design is ongoing for shielding the sides and the top. The beamstop is installed. The detector integration design is ongoing and planned to be ready for the arrival of the first module.

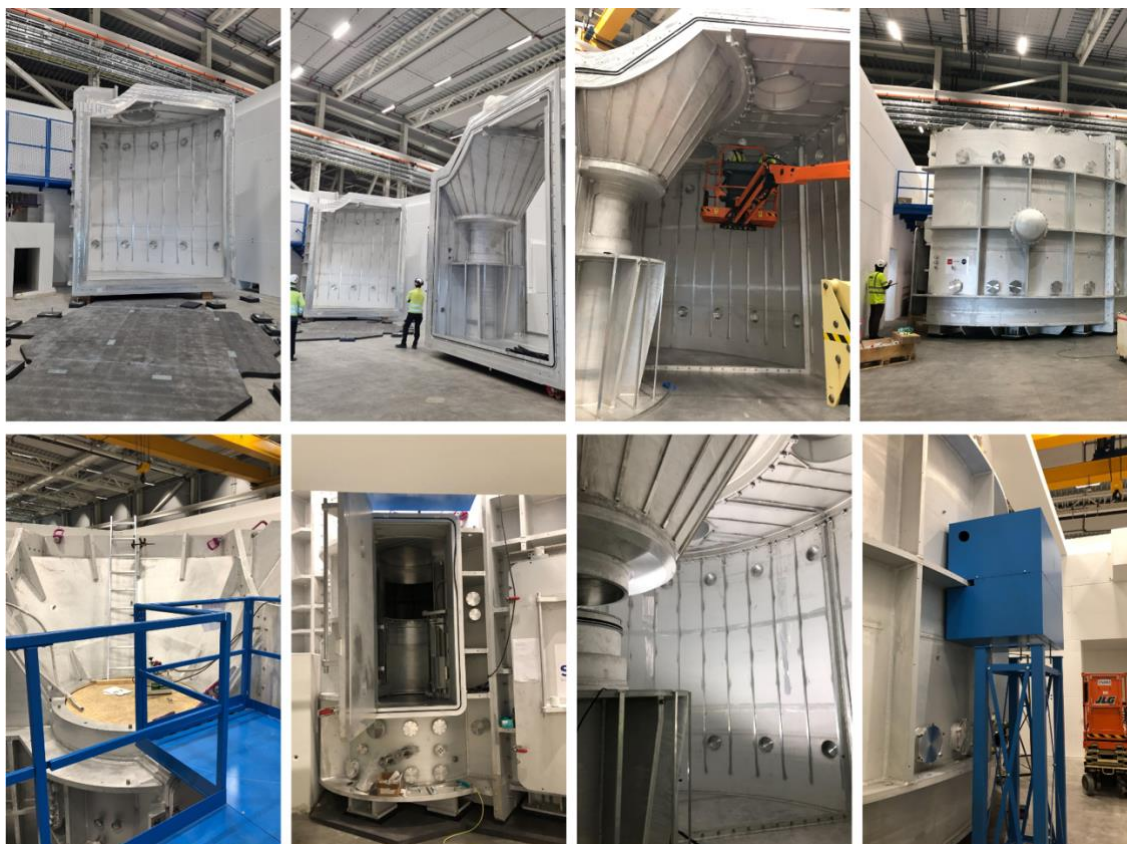


Figure 4 Installation of the detector tank

Detectors

The production of the first module was delayed because the tubes delivered by the external supplier to the ILL were not compliant with specifications. New tubes will arrive in October, and the production is expected to be completed by the end of the year. With this delay, we missed the current ILL cycle for testing, thus we will need to wait until the next reactor cycle. The first module is therefore expected to arrive at the ESS in March/April 2026. The fully automated gas handling system is under development with Siga GmbH (kick off meeting held in September). Expected delivery is in February. The CSPEC detector was re-scoped, with 5 bar of gas mixture ($^3\text{He}+\text{Ar}/\text{CO}_2$) in all the 12 modules. For the ^3He gas supply, a contract with AirLiquide was signed, with expected delivery of the gas for the first 4 modules in December, for modules 5-8 in June 2026, and for modules 9-12 in February 2027. For the back-end electronics (ESS-Detector Group), the data acquisition (DAQ) system, Readout Master Module, and high voltage are ready. Low voltage for preamplifiers (ILL) is planned to be ready with the first module in spring.

Instrument control, data acquisition, transformation and analysis

We expect to advance in data reduction and analysis in the next months, thanks to more IDS resources available for CSPEC, and partially building on the work already done for BIFROST. Contacts with the ILL computing group are in place to collaboratively work on shared problems like data analysis software.

Hot commissioning and first science

The CSPEC team will profit from the experience of the first instruments, especially BIFROST. Plans are ongoing to ensure the participation of the CSPEC scientists to the hot commissioning on BIFROST. This experience will shape future detailed plans for hot commissioning on CSPEC, with better educated guesses on the actual power and stability of the source. The support and experience of the in-kind partners during hot commissioning will also be extremely valuable. Following the experience of the T1 instruments, we will organise a CSPEC first science meeting in due time, closer to the TG5 date.