

SKADI STAP report

STAP meeting October 23rd 2023

Instrument Team

Romuald Hanslik – Lead Engineer

Sylvain Désert – Lead Engineer LLB

Teddy Koziellewski – Systems Engineer

Ralf Engels – Detector Engineer

Sebastian Jaksch – Lead Scientist

General Progress

For a range of components SKADI has now entered either the late manufacturing or early installation stage. The sample cave and in-bunker installation will be installed shortly after or during the STAP meeting.

The collimation is being manufactured with a factory acceptance test in January 2024, the detector tube will follow slightly later. The choppers are manufactured and await installation as soon as the collimation is available.

Shielding for both the collimation and the detector are being contracted now with a projected installation late 2024. The polarizer is currently being procured, with a lead time of approximately half a year.

A detector workshop has taken place in August and the programming of the firmware is now contracted with a company (IDEAS). The firmware programming does not impede the mechanical construction of the detector, which is ongoing. Detector modules for testing are being kept available throughout the construction process, so firmware adaption and hardware construction can be done in parallel.

Central facility services (common electrical and common utility project) have started their work to quote and plan for the SKADI installation. This is also coordinated with chopper installation, since there cable length and interfacing with other installations are a fundamental issue.

The SKADI team endeavors to achieve licensing together with the first licensing submission by the end of 2023. This will minimize administrative complications later on between cold and hot commissioning.

In-bunker installation

Both heavy shutter and optical components are being installed during and following the STAP meeting. All components met or exceeded specifications during their factory acceptance tests.

The optical components including the vacuum housings were manufactured by Swiss Neutronics and are $m=4$ copper substrate neutron guides.

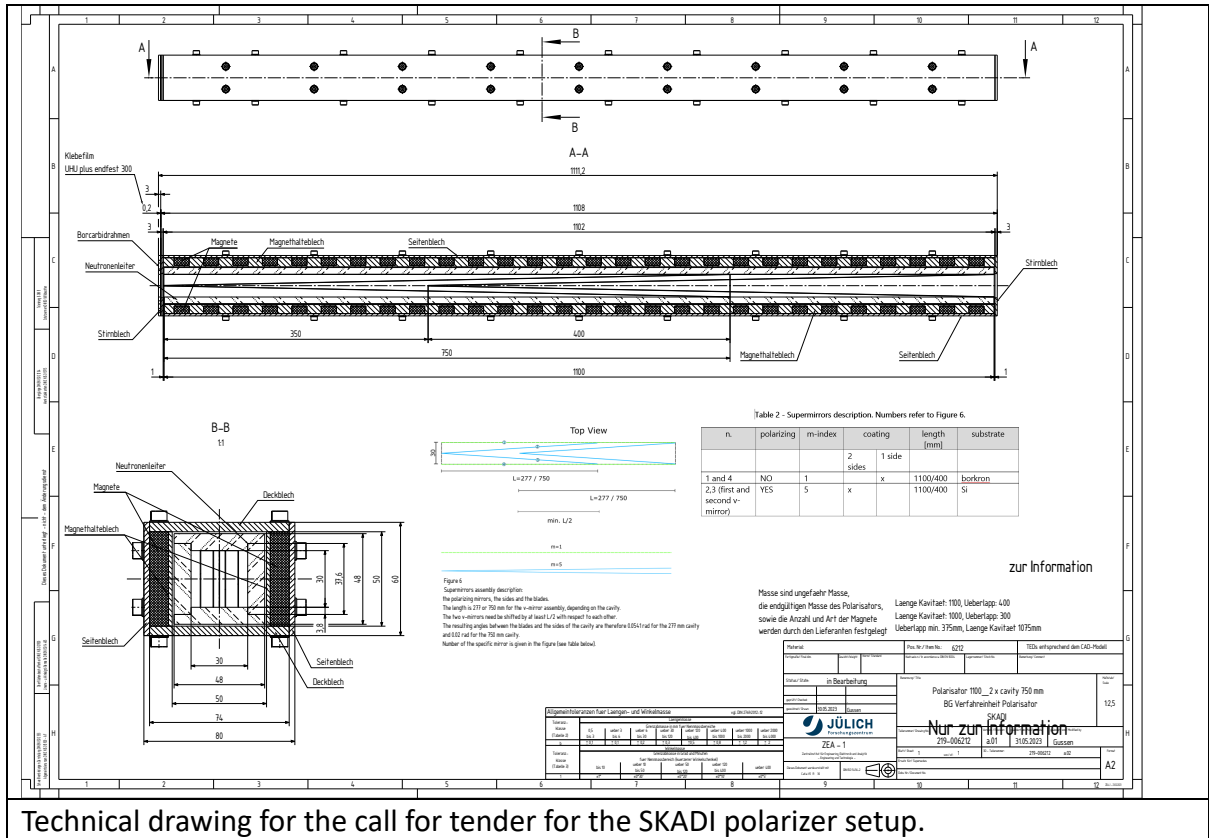
The heavy shutter is a vertical displacement of the last guide section at the exit of the bunker. In case of failure, it will close under its own weight. With the heavy shutter in place construction of SKADI can continue regardless of the status of the source.



Polarizer

A call for tender was published for the polarizer and bidders can put in quotes. It will consist of 2 V-cavities for long and short wavelengths over 8 \AA and between 3 and 8 \AA . Polarization is in all cases better than 95%. The magnetic field of the polarizer is seamlessly integrated into the guide field of the collimation, maintaining polarization up until the sample.

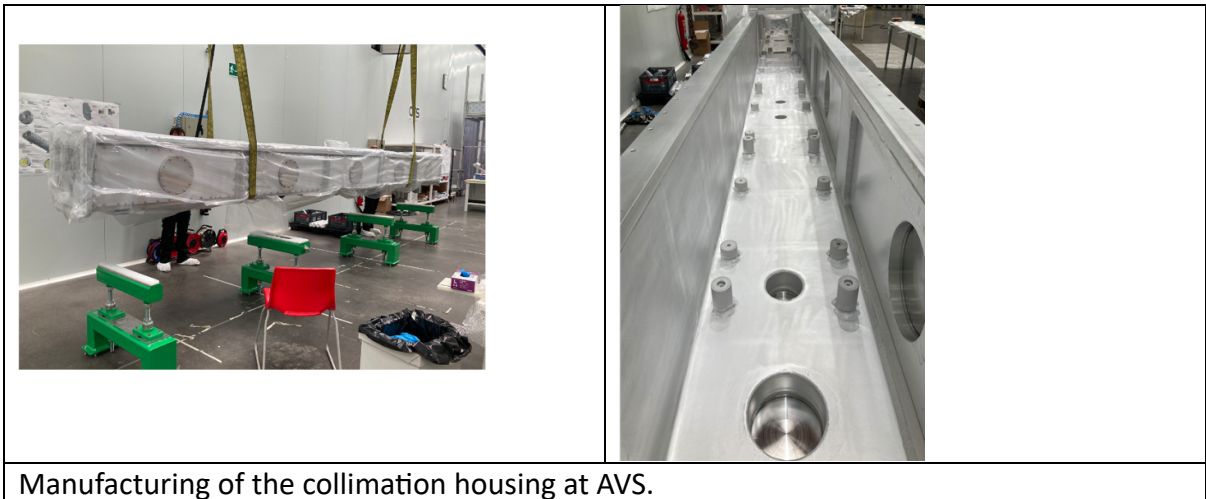
Work on the polarization analysis is being taken up by Annika Stellhorn as part of her ESS post-doc position. The current plan for PA is to be developed alongside the PA for DREAM for the ^3He analyzer. Integration of the PA together with magnets for sample environment and data analysis are also part of that project.



Technical drawing for the call for tender for the SKADI polarizer setup.

Collimation

The collimation is currently being manufactured by AVS. A factory acceptance test is foreseen for late January 2024, with an installation starting in May 2024.



Also, the complete neutron guides within the collimation have been cleared for tendering. This will be published in October 2023, while the contract for delivery is foreseen to be signed in March 2024. Ordering the neutron guides now relatively late has been a deliberate choice, since they can only be installed after the collimation housing. In addition, lead times for $m=1$ guides are short, so no problems are foreseen here.

Sample Cave

Installation of the sample cave is imminent. The moving parts (door and roof hatch) have been preassembled and tested at the mshield facilities. The rest of the cave is continuously being delivered, starting in late October 2023 to be installed.



Detector tube

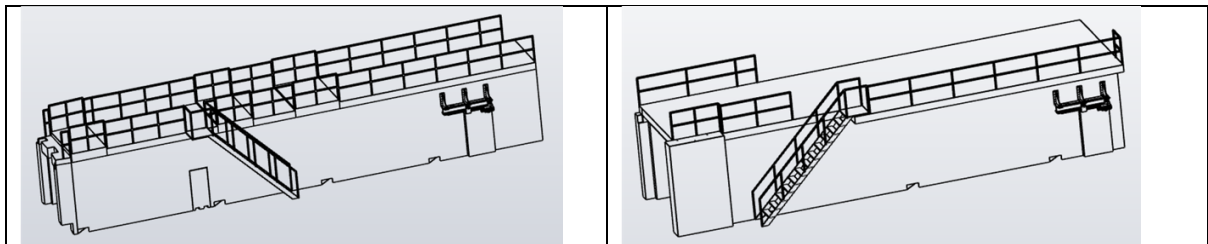
The detector tube, including the piping for the cooling system, as well as the carriage for the detectors is currently being manufactured by SDMS. Installation is foreseen for October 2024.



Manufacturing of detector tube and detector carriage at SDMS.

Shielding

Contract is now being finalized after call for tender. Negotiations are ongoing. Monte Carlo simulations show that light concrete is a suitable material choice, cutting down production times. In addition, since the shielding is designed for very extreme radiation hazards within the cave (such as a 100% gamma conversion of the neutrons at 5 MW) it will also make sure the low background requirement for SKADI is met.



Collimation and detector shielding drawing from call for tender. Shielding characteristics are now being verified via Monte Carlo simulations. All shielding is made from light concrete without additives or large steel structures other than rebar.

Detector

End of August there was a two-day workshop for the programming of the firmware. A short overview of the resulting timeline is:

- Draft for the data package should be done by 14. September. (ideas)
- Decision finalized if we use the RMM OR a switch to order by end of March, 2024
- Contract with ideas can now be prepared. (done by the time of STAP meeting) Note that after the finalization there is still a 3-6 month set up time to get personnel ready.
- Documentation needs to be updated by 14. September, 2023
- First tests with new firmware Q2/24
- Preliminary tests with the 3x3 demonstrator starting in Q2/24

- Tests at ESS EC/DC with the updated firmware starting in Q3/2024
- Clarify a test procedure which can be used by ESS with e.g. a pulse generator as event generator.

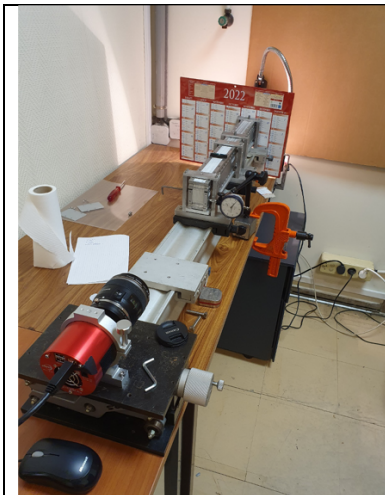
In parallel we will install a system at JCNS as well which is a copy and paste of the ESS mock up test Q3/2024

In parallel the mechanical construction of the detector will continue. This now can be integrated with the detector tube at SDMS.

Currently biweekly meetings between IDEAS, ECDC, ESS detector group and the SKADI instrument team check the progress of the project.

VSANS

There is now an optical alignment procedure for the VSANS modules available, two of which have been aligned at LLB, the other six will be aligned directly at ESS. Their installation is foreseen directly after installation of the collimation housing.



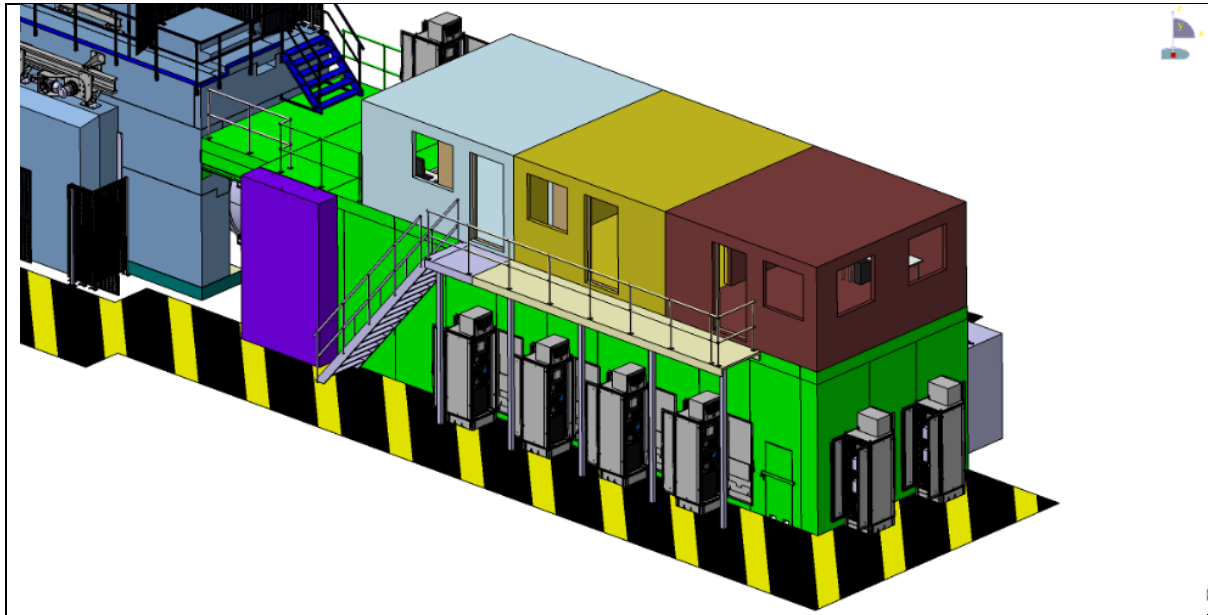
Optical alignment procedure for the single VSANS modules.

Experimental Hutch

ESS facility management has been tasked with producing the hutch for SKADI. This is to streamline the integration process with ESS/Swedish building code. A quote will be arriving within a few weeks, installation can only happen after the detector shielding has been installed.

The hutches will allow for sample preparation and the presence of two experimental teams simultaneously. The three compartments of the hutch have approximately 4x4 m² each, allowing for the installation of equipment (computers, fridges in the sample preparation area) and the presence of team of 3-4 people.

Sound insulation as well as ventilation has been taken into account to allow for extended presence at the instrument during experiments.



Concept drawing of the SKADI experimental hutches for quotation by ESS facility management. Forward is a sample preparation hutch (blue), center and back (yellow and red) are two control hutches for different experimental teams.

Licensing

The SKADI team supplied the documentation for the heavy shutter system, performed the Instrument Hazard Analysis workshop and delivered all MCNP simulations for the shielding, which were the necessary documents for the licensing.

It is the intend of the instrument team to continue with the licensing in the first batch of instruments, in order to avoid additional licensing issues later on between cold and hot commissioning.