

Updates for DREAM instrument

The following report describes major activities of the instrument project since the last STAP meeting in April, 2020.

ICEB meeting

The second instrument consortium executive board (ICEB) meeting for DREAM took place on June 2020, by digital means. During the meeting, schedule, progress and issues were discussed between FZJ, LLB and ESS. The following work package exchange was officially formalized: LLB will manufacture entire elevated floor, not only inside the cave, while in return FZJ will take responsibility of constructing the sample preparation laboratory.

Memorandum of Understanding (MoU)

MoU outlines official ways of communication and decision making between LLB, FZJ and ESS. The document was approved by all three parties and official signing is currently ongoing.

Schedule update

Since the last STAP meeting, neutron guides and detectors were procured. New dates for SubTG3 were agreed with the manufacturers. Access to the bunker area of DREAM was moved from August 2021 to October 2021 by ESS. We took all of these dates into account and made a new schedule for SubTG3 reviews (see Table 1). The bottom line is that the new SubTG3 schedule has no effect on a starting date of hot commissioning of DREAM.

Oct '20	Dec'20	Jan'21	Feb'21	Mar'21	April' 21	May' 21	Aug' 21
Sub-TG3.2	Sub-TG3.3	Sub-TG3.4	IDR	Sub-	Sub-TG3.6	Sub-TG3.7	Final TG3
Beam monitors	BC Chopper	Common shielding (ESS)	Cave	TG3.5 BWI	Cave	Neutron guides (in- bunker)	Neutron guides (out-of-bunker)
PSC + OC choppers	BBG				Beam stop		Drawing package of complete system
Heavy Shutter (ESS)					Sample environment	Hutch + Sample preparation lab	Instrument control systems (EPICS)
					Relevant MCA		PSS
					Vacuum systems (ESS solution)	Facility infrastructure connections and utilities	
					Interface of the ESS vacuum system	T0 Chopper (ESS)	

Table 1. TG3 review schedule for DREAM

In-bunker optics: NBOA and BBG

The manufacturing of NBOA is in progress at SwissNeutronics. The fabrication of neutron guides suffered from the lack of neutrons (worldwide) for the quality tests of the supermirrors. The new delivery date to ESS site is December 2020. It is still in time for the installation. Kick-off meeting about design of BBG will take place in a few weeks.

Bi-spectral switch

The order to Nob Nano Optics Berlin GmbH was placed for 200 Si wafers with dimensions of 11.8 mm x 44 mm x 0.13 mm, with NiTi-supermirror coating of $m=3$. The quality of the first wafers by the neutron reflectivity measurements are ongoing at Budapest Research Reactor. We are expecting wafers to be delivered to FZJ in Q4 2020 for the final assembly of the bi-spectral switch.

Neutron guides

The neutron guides inside and outside of the bunker have been procured as one package. The contract was awarded to SwissNeutronics. The manufacturing and installation of the in-bunker guides were prioritized in order to meet the bunker access dates. The installation of inside bunker guides will be coordinated with the installation of other components inside the bunker, i.e. choppers, heavy shutter and so on. The installation of the outside bunker guides will be synchronized with installation of the guide shielding in the experimental hall.

Status of neutron guide shielding

DREAM team has accepted the offer resulting from the ESS Common Shielding project. The design of the guide shielding for DREAM is being finalized. SubTG3 review for the neutron guide shielding is scheduled for January 2021.

Chopper system

The order for designing and manufacturing pulse shaping choppers (PSC) and band control (BC) chopper was placed to Jülich Chopper group. The disks are being manufactured by Airbus. The design of PSC was reviewed by ESS in June 2020 during Intermediate Design Review. SubTG3 review will take place by the end of October 2020 for PSC and in December 2020 for BC chopper. The issue of later access dates needed for chopper installation is still relevant and it was discussed in details in the last STAP report.

DREAM will be using a solution for T0 chopper, which was developed and manufactured by ESS chopper group using DREAM specifications. However, this project has suffered a significant delay due to COVID-19 situation, mainly due to delays of the procurement of Tungsten from China in February 2020. As a result, the fabrication of the rotor was delayed by 5 months. The expected manufacturing time of T0 chopper is about 9 months, thus we will be starting a procurement in a few weeks. This will allow manufacturing and installation of T0 chopper within the bunker access dates.

Detectors

The procurement of mass production of DREAM detectors is completed, excluding a dedicated high-resolution backscattering detector. The specifications of this detector are being finalized and the first quote from CDT is expected next month.

Detector support structure

The detector support structure is ongoing the last stages of installation in Jülich (see Fig. 1). Aluminum profiles are installed and installation of the mounting plates for the endcap detectors is ongoing. The installation steps are carefully protocolled for the future installation at ESS site.



Fig.1. Detector support structure installed in FZJ

Experimental cave

The call for tender for the experimental cave has been officially closed on October 5th, 2020. Companies were asked to provide bids including solutions for manufacturing and installation of a main experimental cave and optional second cave. The submitted bids are being evaluated.

Development of personnel safety system (PSS)

We note a good progress with ESS developments of PSS for DREAM. The last meeting between PSS and DREAM teams took place on September 30th, 2020. During this meeting the following steps to go forward were indicated: (i) PSS Concept of Operation will be written by PSS team based on DREAM team input; (ii) PSS team will review DREAM risk assessment document; (iii) both documents, together with Radiation Hazard analysis document, will be used to apply to for the instrument installation permit at Swedish Radiation Safety Authority in December 2020.

Sample vessel

The sample vessel pre-milling manufacturing is complete (see Fig. 2). The dimensions of the pre-milled vessel were verified by ZEISS company. The preparations for the wax filling of the vessel are ongoing, including the tests of different wax mixtures.



Fig. 2. Pre-milled sample vessel inside FZJ workshop.

The milling of the sample vessel is delayed by three months, in order to make the milling machine available for manufacturing of ESS cold moderator, which is also delivered to ESS by FZJ. The delay has no effect on installation date of the vessel. After the final manufacturing of the sample vessel, it will be installed together with the sample vessel support inside the detector support structure depicted in Fig.1.

DREAM-specific cryofurnace with sample changer

The official call for tender was closed on October 5th. It was deemed unsuccessful, because none of the companies applied. In order to attract more bidders the requirement for the sample-exchanger to be pre-cooled at 90K was replaced with a requirement for cooling time to the base temperature not exceeding one hour. A solution with a sample-exchanger at room temperature is more feasible. This change of requirements was agreed with ESS and new tender was posted on October 7th.

Neutron beam monitors

DREAM instrument is not a part of Common Beam Monitor project at ESS. Two beam monitors based on ionization chamber technology were procured from CDT GmbH company, which is also responsible for delivering neutron detectors for DREAM. The interfaces with two monitors are being finalized and SubTG3 review is scheduled in October 2020.

Development of polarizer setup

We continue working on the implementation of the cold polarizer (³He cell) into the last section of neutron guide. The design of guiding fields is complete and verified by the simulations. We are developing the motorized stage with three positions for neutron guide, cold polarizer and thermal polarizer. The latter is envisioned as an update option. The detailed design of the magic box setup will begin soon.