MAGiC progress report

October 2020 STAP meeting

This report highlights the progress and changes made on the MAGiC instrument since the last meeting in April 2020.

1. Status of tenders and procurement

LLB

The tendering process has started at CNRS since February 2020. Two paths can be used to procure equipment :

- Above 140 k€ : open tender
- Below 140 k€ : simplified procedure

At the moment :

- Neutron guide system : the offers have been received on the 12th of August. The tender was split in 4 lots based on guide substrate and location. The received offers cover 3 of the 4 lots (thermal poarizer not covered). Each offer is in budget and matching our requirements. As delivery time is 3-9 months behind schedule, a negociation phase is required to go further.
- Experimental cave : as personnel and users will enter the cave and work in it, an additional layer of administrative work is required to publish the tender. This work is in progress, but tender publication is impacted and is expected for early 2021.
- Other equipments : will go through the simplified procedure. Lead time is reduced and the tenders will be published in early 2021 for a delivery in Q4/21-Q1/22.

JCNS

Procurement is done for most of the equipments (detectors, monitors) and everything is on track for a successful installation in 2022.

PSI

No tendering/procurement required so far. The analyzer is still in its design phase.

2. Meetings

ICEB

A second ICEB was held remotely in June 2020. The focus was on project management (Tollgate process, planning, …).

Installation workshop

An installation workshop for the first 8 instruments was held in August 2020. The aim was to define the impact of a Bunker access delay on the installation plan of instruments. The main outcome of this meeting is an agreement on shifting the Bunker opening window for the West Hall from July 21 to March 22.

3. Progress on individual components

Solid State Bender

Preparing for the ICEB, a mistake was spotted in the McStas file used for the SSB optimisation. This resulted in a degraded polarization for wavelength larger than 4A (85% at 6A). A new round of optimisation with the proper parameters has been carried out resulting in a small design change. The bender is now S-like instead of C-shaped (see figure). The increased Silicon length (+10 mm) results in a small loss of transmission (~2%).

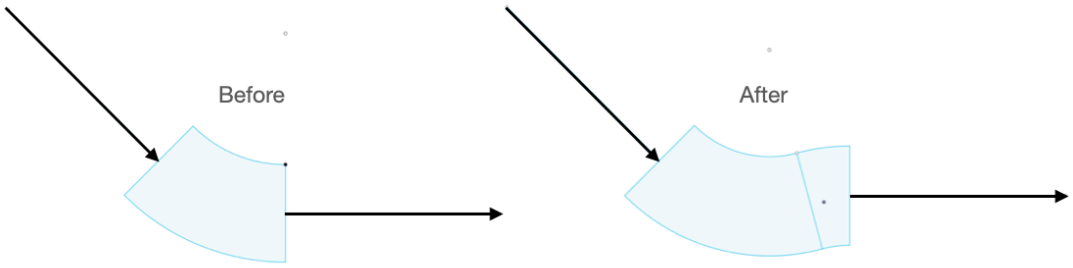

Figure 1: geometrical change of the SSB to maximize polarization at large wavelength.

Heavy Shutter

The attenuating block of the heavy shutter is now finalized. The neutronics calculations are conclusive and ensure a radiation leak outside of the bunker below the safety threshold.

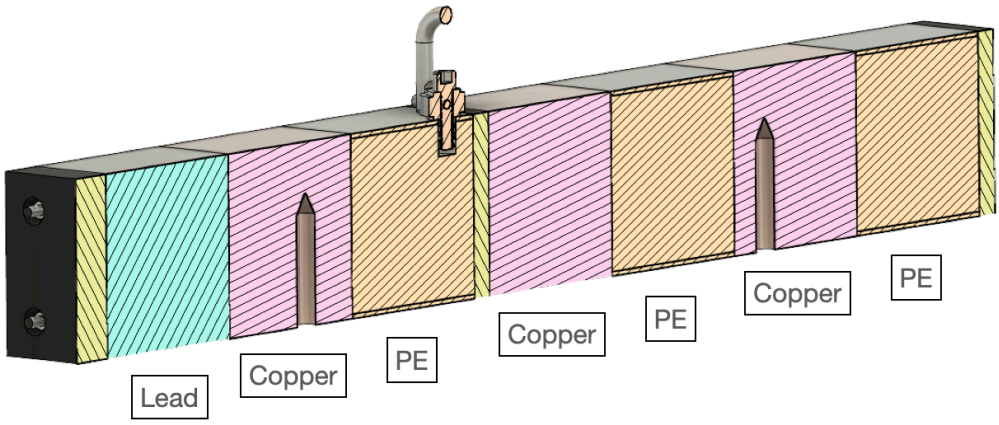

Figure 2: Heavy Shutter attenuation block sequence. The yellow part are made of B_4C.

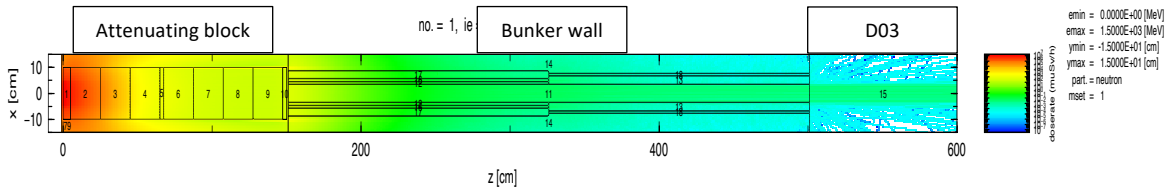

Figure 3: neutronics calculations of doserate outside of the bunker with the attenuating block in position.

Detectors

Following the kick-off meeting held in February 2020, an internal IDR meeting took place in June 2020. Details of both PA and large detectors were covered and communications with the ESS detectors group ensured that no blocking point exists.
Both detector are in inclined geometry with the detecting blade being 10° tilted with respect to the radial direction. Decision has been taken at the IDR to incline both detector in forward direction to maximize angular coverage (see figure).
The sub-TG3 are scheduled for November 2020 (PA detector) and January 2021 (large detector).

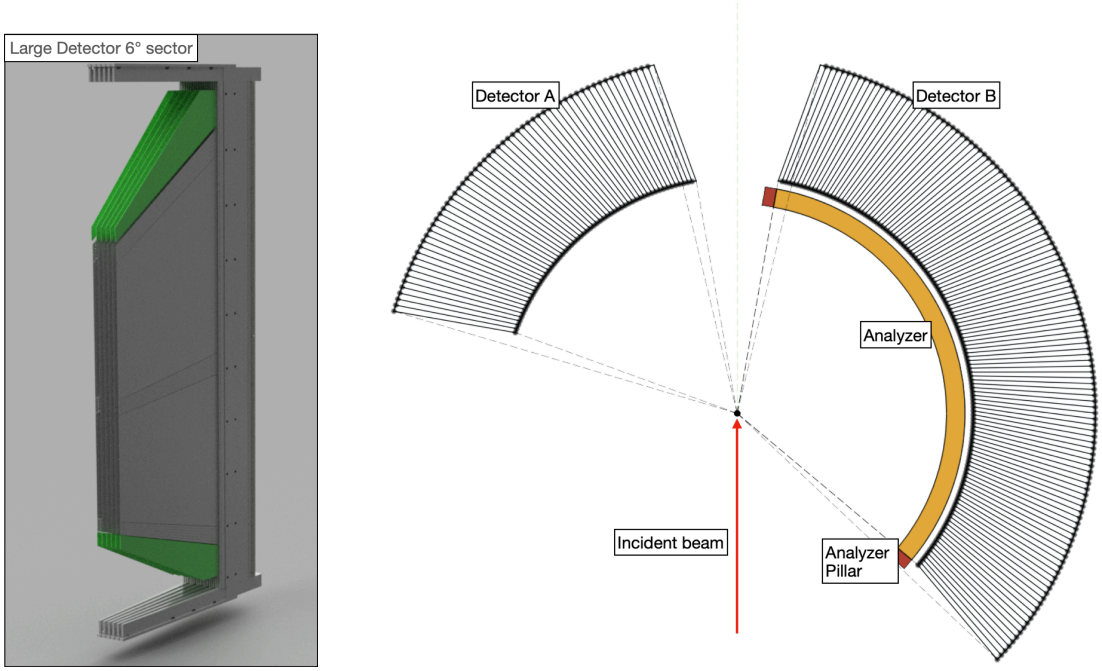

Figure 4: (left) Large detector 6° segment. (right) Top view of both detector showing the forward tilting of ^{10}B covered blades.

Analyzer

A McStas component allowing to optimize and compare different analyzer geometries has been written by Erik Knudsen from DTU. A detailed report (see Analyzer_report.pdf) has been written highlighting the excellent performance of the solid state design compared to other existing solutions.
Focus is now on the mechanical design of the analyzer. Covering an extended wavelength range (2-6 A) is a challenge and induces tight tolerances on the radial alignement of silicon blades. A joint effort is in progress to converge before the end of the year on a viable design. Additional testing with neutrons at PSI is scheduled before the end of the year.

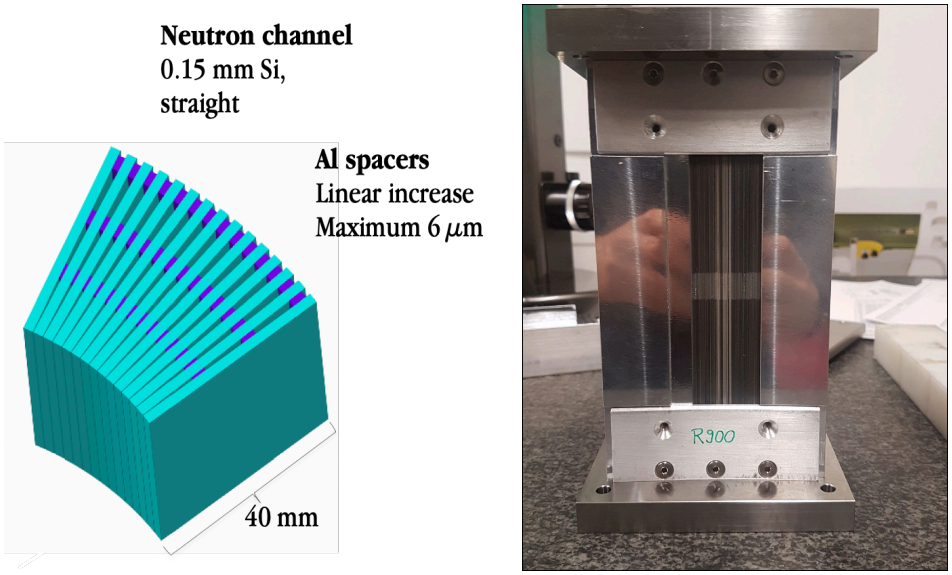

Figure 5: (left) radial alignement of Si blades. (right) Prototype tested at PSI.

4. Common projects

Choppers

The choppers project is well advanced with the CDR scheduled for the 26th of November. The magnetic guide field is now integrated into the choppers models and has been released into the CATIA PLM.

A report on fast rotating discs in magnetic field from DR H. Solftner (see Choppers_report.pdf) showed that Aluminum discs rotating at 154 Hz combined with the 60G guide field could generate excessive heat as well as torque on the motors. To avoid this situation, carbon fibre discs have been procured for the PSC. The kick-off meeting with Airbus took place in September and delivery is on track for a successful installation in-Bunker.

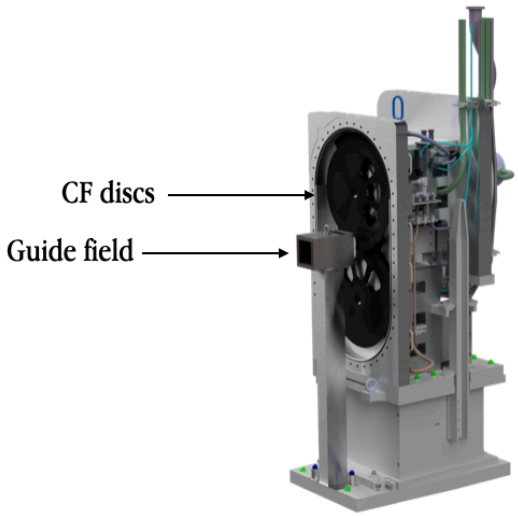

Figure 6: front end chopper set (PSC+SC) render

New projects

Two new common projects are considered for the instrument.

Electrical

Contact is well advanced with Stuart Birch to enter the Common Electrical project. This project covers the design, documentation and installation of most of the electrical wiring (main power, grounding, rack connection, …).

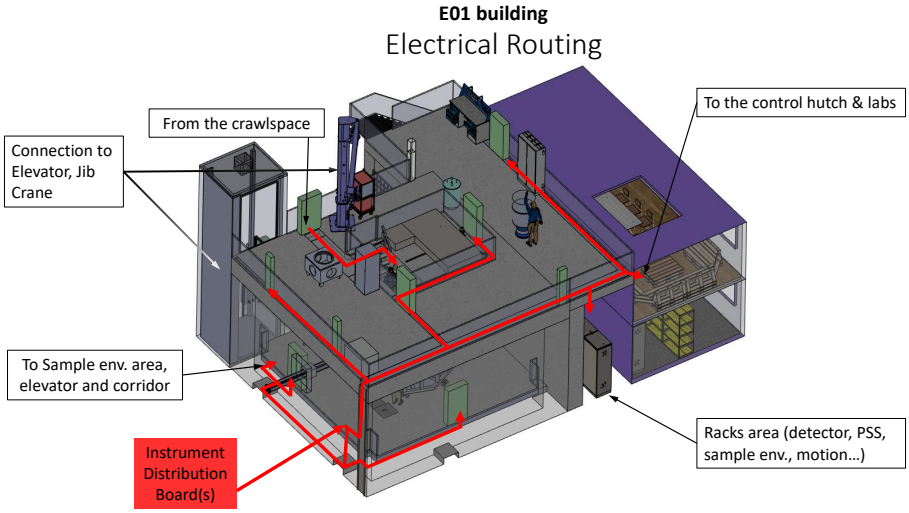

Figure 7: simplified layout of experimental cave electrical routing.

Utilities

A common project for utilities distribution is in gestation. It will be presented at the ICEB on the 15th of October and will start if support by the IK members is shown.
We have initiated contact with the project leader to start the work on cost estimate asap. A complete list of the experimental cave utility panels and their location has been transmitted.

UTILITIES FOR MAGIC

15/07/2020

SES Supply For each subset	Main characteristic	No's	ESS Main Connection	Connector type	Valve/ regulator/ IP class	Meter, control NEUS-PLC*	General	Panel 1	Panel 2	Panel 3	Panel 4	Panel 5	Panel 6	Panel 7	Panel 8	Panel 9	Panel 10	Panel 11	Panel 12	Panel 13 Specific	Panel 14	Elevator	Hutch & Lab	Racks Area
Cooling water	5°C	0					Main cooling loop															Specific electrical board (provided by supplier)	Specific electrical board (provided by supplier)	Specific electrical board (to be defined)
	14°C TBD	3	D40	Defined	Y/N	Yes	Secondary loop Capacity 20kW	YES	YES			YES	YES					YES						
Pwr. Conn. Sum	230V / 400V (16A;32A)	8/2/2	Wires	CEE	IP44[b]		Slow fuses			YES		YES			YES			YES			YES			
Box #1 Mennekes 950004	230V / 400V (16A;32A)/RJ45	2/1/1/4	Wires 5x25mm²	CEE	IP44[b]		Slow fuses	YES	YES	YES	YES	YES		YES	YES		YES	YES	YES		YES			
Box #2 Mennekes 940018	230V / 400V (16A;32A)	6/1/1	Wires 5x25mm²	CEE	IP44[b]		Slow fuses	YES		YES	YES	YES	YES, 2		YES	YES		YES	YES	2 sockets 230V	YES			
Box #3 Mennekes 920003	230V / 3x10A/15min	3	Wires 5x10mm²	CEE	IP44[b]		UPS			YES		YES			YES			YES			YES			
Gases	CO2 / Argon Mix for detector	2	Cylinder		Y/Y	Yes	ESS supply, independent extraction points			YES	YES	YES												
	Nitrogen 4.6	2	D25 <=8bar		Y/Y	Yes	ESS supply, independent extraction points																	
	Helium 4.6	2	Cylinder		Y/Y	Yes	ESS supply, independent extraction points	YES		YES		YES	YES		YES			YES		1 connector				
	Compressed air	3	D25 <=8bar		Y/Y	Yes	ESS supply, independent extraction points	YES		YES	YES	YES	YES		YES			YES	YES		YES			
	Exhaust	2	D100 ?		Y/N		Needs special consideration see ref [5]				YES ?	YES ?												
	He Recovery	3	KF DN 25	KF DN 25	Y/N		Ref. TEFI	YES					YES		YES			YES						
Communication/patch panel[1]	RS232, sensors plugs, etc.	1		Dsub 9	-	-	Serial communication																	
	General comm.	5		Dsub 25			Contact and serial communication																	
	Ethernet conn Data, USB	15		Cat6, RJ45			Network compatible connectors					YES	YES							1 connector	YES			
	4 Pin connector Temp, Heater	20		Lemo / Fischer			Thermometer, SE Process signal																	
	General signal	10		BNC			Contact and small low power, low voltage signals																	
	General signal	5 pair		4 mm "Banana"			Contact and small low power, low voltage signals																	
Power Câble Length (m)								17.6	23	21.4	12.4	11.4	25	15	12.6	16.3	20	16	18.7	21.4	22	15	16	19

Figure 8: list of all utility panels and the associated outlets/plugs

5. Updated timeline

The instrument timeline has been strongly impacted by :

- Delay in Bunker access to March 2022
- Delay in guide elements delivery up to August 2023
- Delay in Experimental Cave procurement

As such, TG5 is now expected in January 2024 corresponding to a one year delay. In the meantime, BoT has been shifted from July 2022 to at least March 2023 (9 months delay). The instrument will be in the user program at the end of 2024 allowing for a proper hot commissioning phase of 1 year.
To achieve this, cold commissioning will be performed in parallel with installation to benefit from any downtime in handling activities.

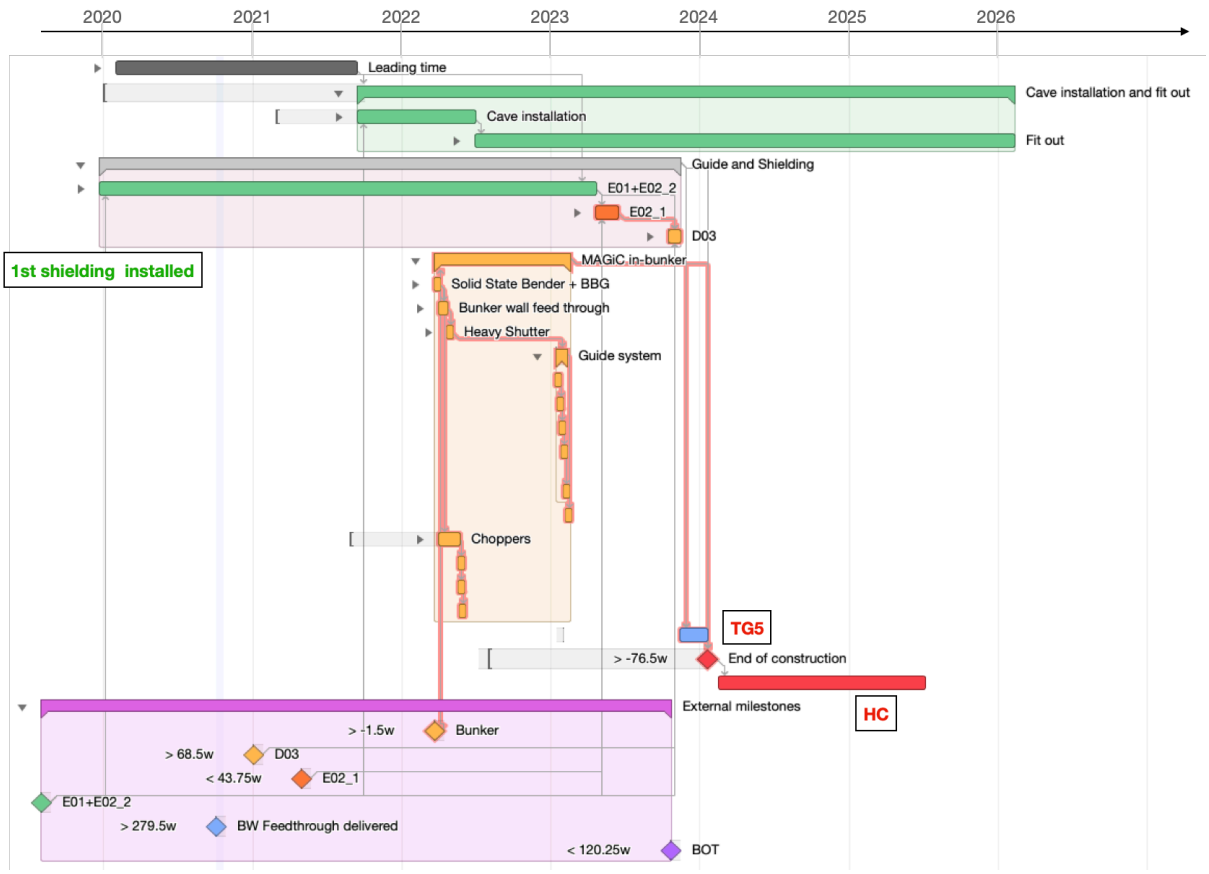

Figure 9: updated MAGiC's installation plan