

Material Science:

Requests to the Project and Accelerator divisions

1. Engineering run at the end of 2023

Access to beams in 2023 would be extremely helpful, the experiments are ready to start upon short-term notice (~ 2 weeks)

SIS-18, Cave A:

Irradiations at high pressure platform

- ion species: any high-Z ions (Xe – U),
- 200 – 500 MeV/u
- Intensity 10^8 - 10^9 ions/pulse

Critical aspects of machine performance:

During the engineering run, the HTA performance should be tested and optimized for high-Z beams with respect to

(i) highest transmission

(ii) minimized beam focus in combination with highest intensity and stable beam position.

This will help us to find the limitations regarding radiation safety alarms when using our new beam collimation system.

Cryring via SIS-18 and ESR-

Irradiations at MAT beamline

- any ion species, but preferably high-Z ions (Xe – U)
- 1 – 10 MeV/u
- Intensity as high as possible

Critical aspects of machine performance

So far the intensity of the beam extracted to the MAT beamline suffered from low beam intensity. Optimization would greatly improve the experiments.

UNILAC, M-branch and X0 beamline:

Sample irradiations for internal and external user groups

- ion species: any ions between ~Ca and U
- 3.6 – 11.4 MeV/u
- long pulses (1-4 ms) preferred
- duty cycle (5 – 50 Hz)

2. 2024/2025 run

Beam requests are identical as listed under (1)

According to the recommendation of the MAT-PAC Materials Research plans a large number of A-rated experiments (see table). The experiments are more or less short and can typically be grouped within blocks with a fixed ion species.

UNILAC experiments with secondary beams are usually achieved by sharing the beam between M-branch and X0 (or with other UNILAC users).

	A		A-	
	main	secon	main	secon
UNILAC	105	169	56	82
SIS18	24	13	17	0
ESR/Cryring/HITRAP	12	0	27	0

The A-rated shifts at SIS-18 (Cave A) are extremely important for the future FAIR program with focus on experiments at the high-pressure platform in order to further develop instrumentation and on-line analysis techniques. Beam time for systematic scanning of irradiation and pressure parameters is an essential requirement for revealing access and stabilization of high pressure phases.

There is no need for special support from Commons.

3. FAIR 2028

Materials research is presently checking if the CBM caves or a location behind the S-FRS (ring branch) are suitable for MAT experiments.

The specific requirements include:

- Adjustable beam focus down to <5 mm
 - high enough intensities (1×10^9 - 5×10^9 ions/pulse)
 - high-Z ions (Au-U)
 - energy range between 180 and 500 MeV/u.
- CBM cave: Simulations are being performed to clarify if the MAT beam conditions could harm the CMB detector
 - The area downstream of the SFR at the so-call Ring Branch could be an area of interest because SIS-18 beams in combination with high intensities are available. Local radiation protection and experimental installations have to be discussed.
 - Installation of a MAT experimental station in one of the available locations will require extra budget and support for extra equipment/beamline/beam diagnosis.