PPH/HED COLLABORATION

Requests to the Project and Accelerator divisions

General requests

- Much more “technical” beam time for optimization of beam transport and focusing before any physics run
- Transverse beam emittance measurements at/after extraction from SIS-18

1. Engineering run at the end of 2023

- High-intensity high-energy p and light ions beam shot-to-shot stability on the target — both pointing (mostly horizontal) and transverse distribution fluctuations
- Slow extraction shot-to-shot and in-shot pointing and distribution stability
- Overall intensity optimizations @fast extraction
- Reliable diagnostics for beam transmission and intensity close to the target (e.g. DTCs)
- BPM in the beam line for beam pointing stability / in-shot monitoring
- Test of the mixed beam SIS-18 operation

2. 2024 run

- Bunched heavy (U73+) ion beam, few times 10^9, SIS18 e-cooling focused on the measurement and optimization of the transverse emittance @extraction (!)
- Evaluation of the max. intensity (>10^{10}), bunching, transport and focusability on the target for U28+ (18 Tm)
- Bunch compression down to <100ns FWHM w/o large intensity losses on the target (abnormal energy spread?) and other artefacts
- One external beam time was granted at Z6 demanding Ca ions at low energy (3,6 MeV/u, 5 Hz, Z6-stripper), repair of switching magnet to Z branch
- For LIGHT experiment only a virtual machine with 5 Hz and power supply of the cavity is demanded
- Support of the specialized groups from the Commons subprojects is mandatory

3. FAIR 2028

- Plasma physics will concentrate on combined experiment with the PHELIX laser and ion beams at HHT within the HIHEX and PRIOR schemes, which requires an operation continuation of the PHELIX laser
- The crucial parameter for HIHEX experiments is the ion energy deposition in the focal spot, and connected to this mainly the ion beam intensity. With the conditions we were faced to in the last two beam times the intensity and focusability of the ion

beam was enough to melt a target, but not to heat it up to the plasma conditions of interest. Therefore, we are relying on an intensity increase and better focusability of the ion beam (small emittance behind extraction, efficient electron cooling)

- PRIOR: for setting up a community using PRIOR as experimental platform, especially when setting up the HE driver, GSI has to guarantee regularly a proton beam in each beam time block
- Performance evaluation with HE setup mockups (thick windows influence; multi-frame capture capability, etc.)
- Commissioning with light ions (e.g. He or Li) @ different configurations, even though at lower resolution
- High intensity (>1e10) optimization for lighter ions such as Ni, Xe and Kr, demonstration of previously achieved intensity levels
- Upgrade of the FFS (HIHEX) / matching (PRIOR) HHT-line quads and optics
- SiSt updates to allow higher in-shot intensities for short (<us) pulses and relatively small rep. rates (e.g., approaching the “real per second” legal limit) and faster access to non-activated setup during a run

- The LIGHT collaboration will focus on the demonstrator experiment showing the capability to inject the laser accelerated proton beam into TK and following SIS18. The design parameters are: injecting, diagnosing and post-accelerating 10^{10} protons at 10 MeV in a single laser shot. By installation of own rf supply in 2024 Z6 will become independent on the Unilac rf

- For further combined experiments at Z6 a 5 Hz signal is still requested for synchronization with the lasers

- As the ordering and production of the quadrupoles for the Final Focusing System in the APA Cave will take 4-5 years, this subproject has to restart as early as possible. Therefore, support of commons (EPS, CRY, TRI, VAC, ec.) will be needed.

- In case of a successful contract between FAIR and Focused Energy, the infrastructure for the APPA cave and the laser building have to be realized fast. Therefore, some resources of PPH and FAIR will be needed.