Status of the FAIR accelerators

Udo Weinrich
GSI Helmholtzzentrum für Schwerionenforschung, Division Stored Beams

Courtesy: to O.Kester for supply of information
Outline: Upgrade and Extension

Upgrade
- Ion sources
- UNILAC
- SIS18

Extension
- P-LINAC
- HEBT
- SIS100
- Super-FRS
- pbar-separator
- CR
- HESR

Summary and Outlook
Extension of accelerator complex is challenging

- Primary Beam Intensity: x100–1000
- Secondary Beam Intensity: x 10000
- Heavy Ion Energy: x30
- Cooled pbar Beams (15 GeV)
- Intense Cooled Radioactive Beams
- Variable duty cycle

**SIS100 ion beam parameters:**

- Ion species: U^{28+} -ions (all p – U)
- N: 5x10^{11} /cycle (uranium)
- Rep. rate: 0.5 Hz
- Energy: 400 – 2715 MeV/u for heavy ions
- Pulse length: 30 – 90 ns
Matching LINAC/SIS18 will be optimised

UNILAC emittance does not fit SIS18 acceptance

Emittance limited by space charge

Manipulation between horizontal and vertical plane required

Test with beam in 2014
SIS18 ring performance increase ongoing

- upgrade of pulse power supply for faster ramping
- new NEG coated chambers for better vacuum
- new injection septum with improved loss tolerance
- new ion catcher system to avoid pressure bursts
- new residual gas monitor to enable non destructive profile measurements
- H=2 system to increase flexibility in longitudinal plane
Detailed Integration Planning for HEBT existing SIS100/300 DUMP
First SIS100 dipole delivered and tested on site

Assembly on dedicated rig:
1. Place thermal shield in cryostat
2. Pull magnet into cryostat and suspend on rods
3. Align with laser-tracker
SIS100 Dipole Test Facility under construction

- 3 — 4 Test benches for SIS100 dipoles
- 1 Test Bench for String test
- Cryo and power supply in Annex building
SIS100 Quadrupoles shared with JINR, Dubna

Integration on GSI site

quadrupole units by JINR

cryo-collimators by GSI

cryostats by GSI
CR Debuncher System in production

- SIS100 proton beam energy spread too large for direct stochastic cooling

=> Debunching of beam with a Debuncher System within 100 µs

5 units
Gap voltage 40 kV
Unit Length 1 m

SIS100 bunch after target

after bunch rotation and debunching in CR
Summary and Outlook

- Upgrade of existing accelerators progressing well
- Planning of work is detailed and well advanced
- Long lead items are in production or close to it
- Sharing of work between participating accelerator institutes and companies mostly defined

- Accelerator logistics planning will be synchronised with updated after building logistics planning
- Exploration of ESR/Cryring potential during commissioning and operation phase

FAIR Accelerator work is and will remain challenging, exiting and full of perspectives