FAIR - The Universe in the Lab

- Facility for Anti-proton and Ion Research
- Currently being built at GSI Helmholtz Centre in Darmstadt / Germany
- Civil construction work began in the summer of 2017
- Investments of > € 3 billion
- International shareholders from Germany, Finland, France, India, Poland, Romania, Russia, Slovenia, Sweden, associated: United Kingdom, aspirant: Czech Republic
- New ring accelerator underground with a number of storage rings and experimental stations
- Hundreds of innovative superconducting and normal conducting magnets of different types from 0.5 to 6 m length and 100 kg to 100 t weight
- Existing GSI accelerator will be part of the FAIR accelerator facility and serve as first acceleration step
- Unlike any other facility in the world, FAIR will provide highest intensity beams of all chemical elements: from light particles, such as hydrogen (protons), to heavy atomic nuclei, such as uranium
- Production of antiprotons and rare isotopes
- Parallel operation of numerous large experiments and storage rings at the same time possible
- Wide range of research programs for plasma physics as well as for applications in materials research, space physics and radiation medicine with four experiment pillars:
  - NUSTAR – “Stars and Nuclei”
  - CBM – “Inside a Neutron Star”
  - PANDA – “Antimatter Research”
  - APPA – “From Atoms and Planets to Cancer Therapy”

Key events

Civil construction
- Shell of connecting tunnel of GSI and FAIR beamline and of the ring tunnel for synchrotron SIS100 with circumference of 1.1 km in a depth of -18 m finalized in 2021
- Tunnel for SIS100 accelerator and technical supplies are currently being equipped with the technical building equipment like electrical supply, air conditioning, safety engineering
- Shell of Super-FRS tunnel, CBM experimental cave and tunnel for connecting beamlines HEBT along with various utility buildings like cryogenic supplies almost terminated

Accelerator
- 50% of SIS100 components, including all 110 superconducting dipole modules and numerous cryogenic system components, are delivered, tested@4K and wait for installation
- First 2 of 32 Super-FRS superconducting multiplets arrived at GSI site after comprehensive testing at dedicated test facility at CERN, 2 others expected until end of Nov. 2022
- 50% of magnets for the High Energy Beam Transport System HEBT are delivered to GSI
- 90% of normal conducting magnets for High Energy Storage Ring HESR are in storage warehouses
- Successful upgrade steps of the existing GSI synchrotron SIS18, which will be used as an injector for FAIR
- Construction work for the FAIR Control Center (FCC) as the crucial hub of the entire infrastructure on the GSI/FAIR campus has begun in spring 2022
- Scientific program partly starting in 2025 while work on FAIR will continue