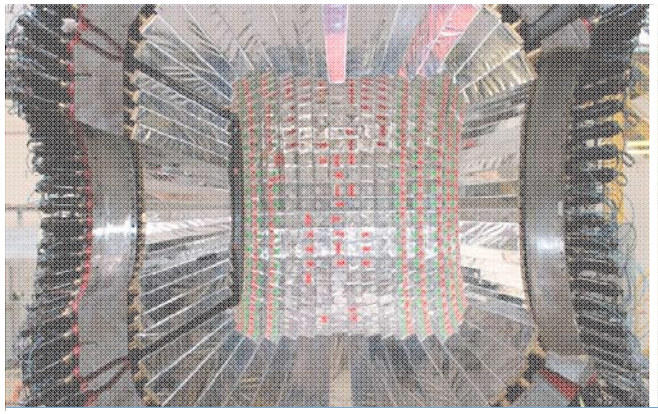
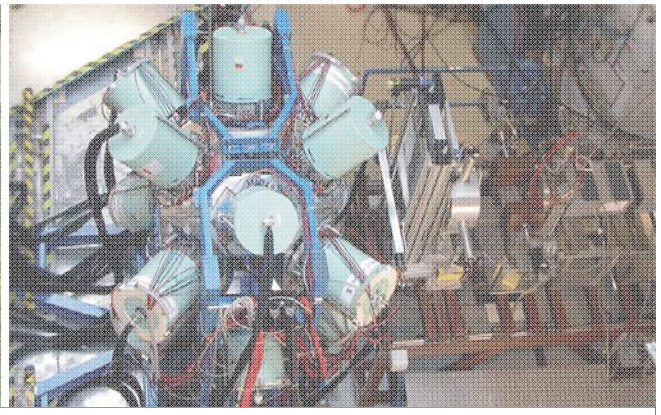




German in-kind contributions for FAIR

Hermann Kolb

GSI

HELMHOLTZ ASSOCIATION

JÜLICH FORSCHUNGSZENTRUM

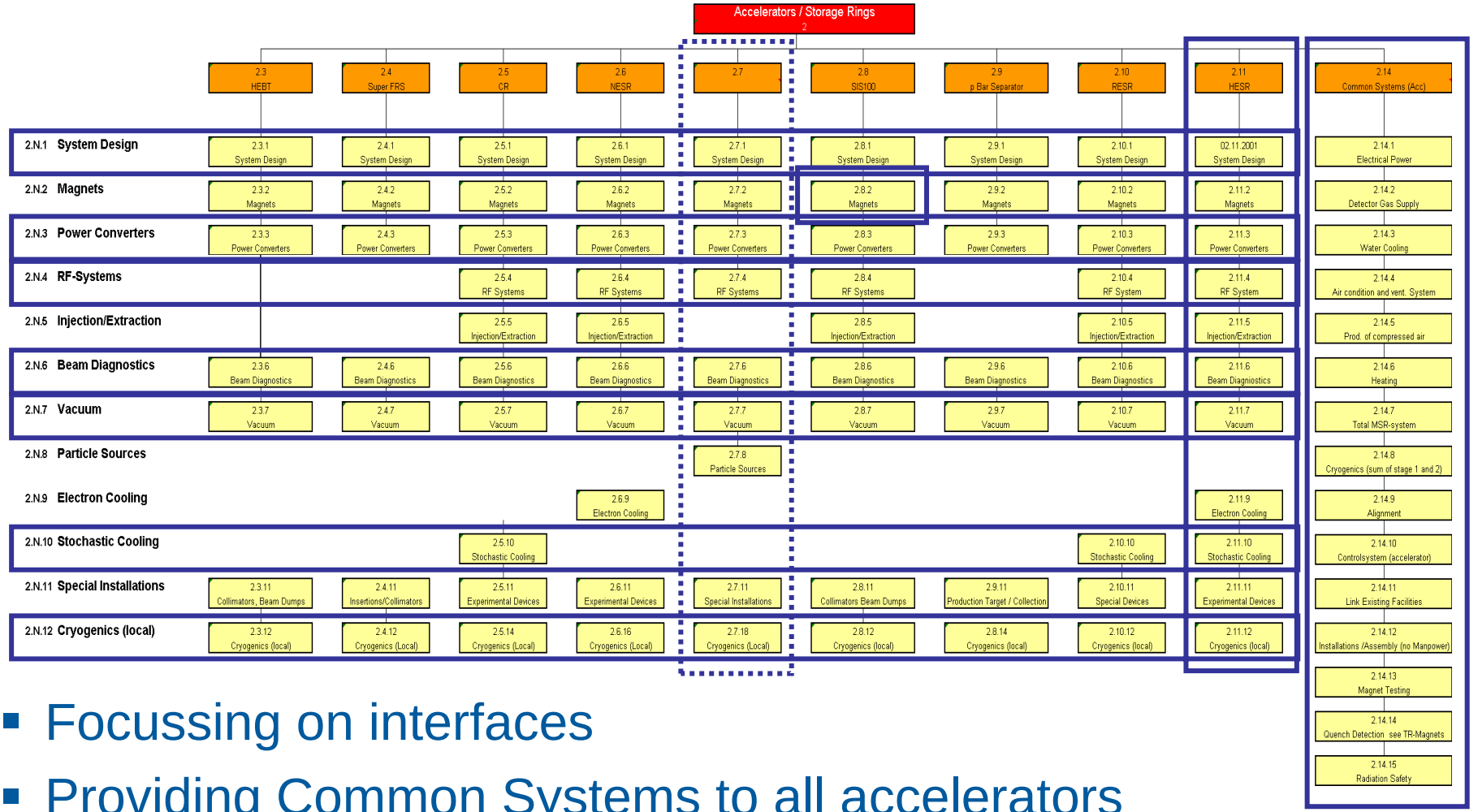
GSI

German in-kind contributions

Providing contributions to

- Experiments
- Accelerators
  - system design
  - dedicated single items
  - HESR (FZJ)
  - cross-sectional tasks and interfaces
  - "Common Systems"
  - project management
- Civil Construction
  - planning activities
  - supervising activities
  - cash contribution to civil construction

German In-Kind contributions



- Focussing on interfaces
- Providing Common Systems to all accelerators
- Few dedicated single items

German in-kind contributions to the accelerators

- Based on Expressions of Interest (EoI)

- Delivery of HESR as a full subsystem by FZJ
- Joint EoI with France for the p-Linac

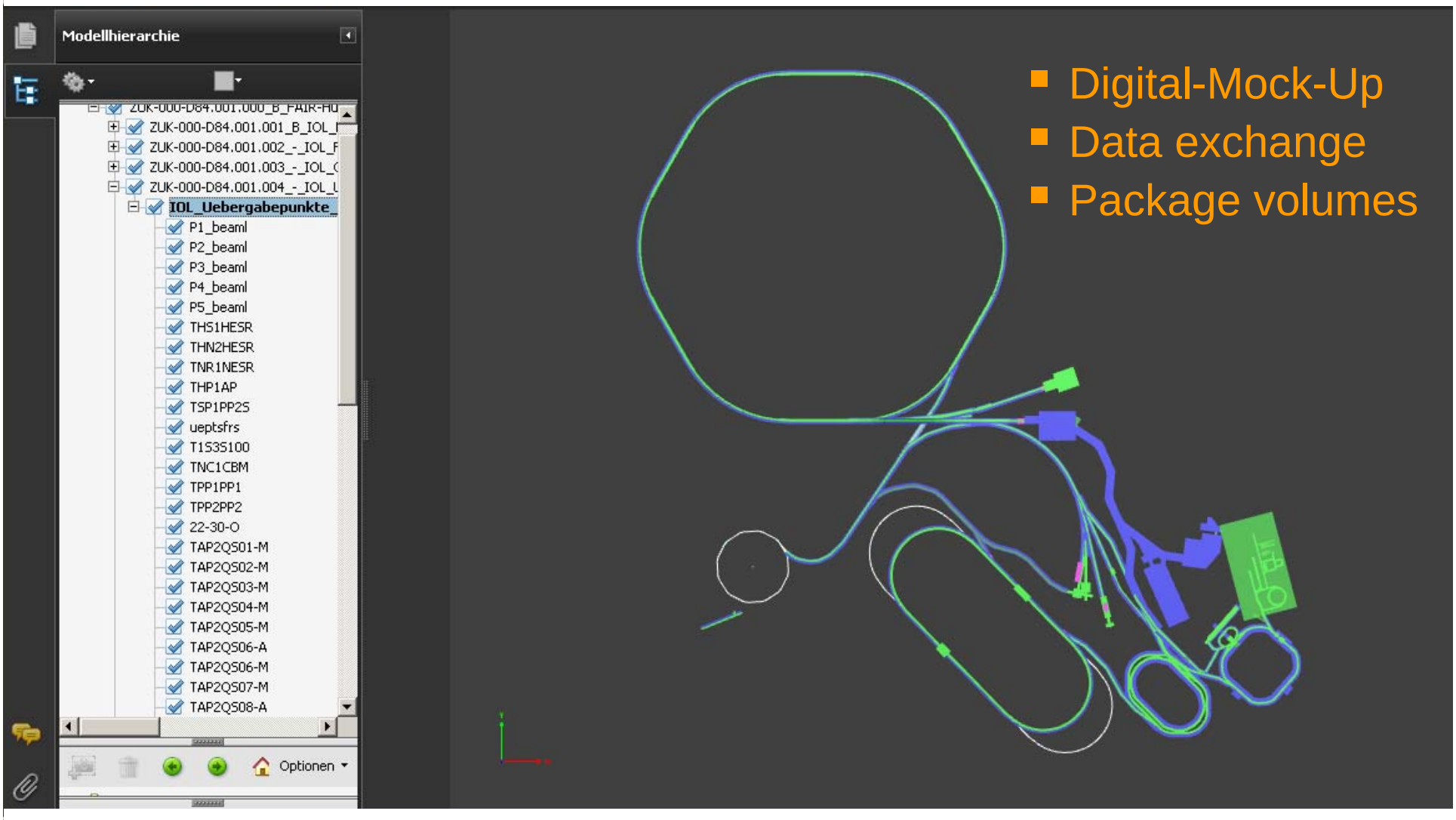
- GSI focus on items crucial for operation, reliability, maintainability and secure operation of the facility
  - low-level rf-system
  - interfaces to the beam diagnostic system
  - vacuum system (partly)
  - control system

- Management of the technical realisation of the facility

Common Systems

- Liquid Helium refrigerator and LHe distribution systems
- Electrical Power
- Technical facility equipment
- Alignment and meteorology
- Magnet testing
  - series testing of superconducting magnets
  - special normal conducting magnets
- Quench detection
- Link to existing facilities
- Supervision of installations
- Radiation safety

Integration of Accelerator & Experiments to FCC



Civil Construction

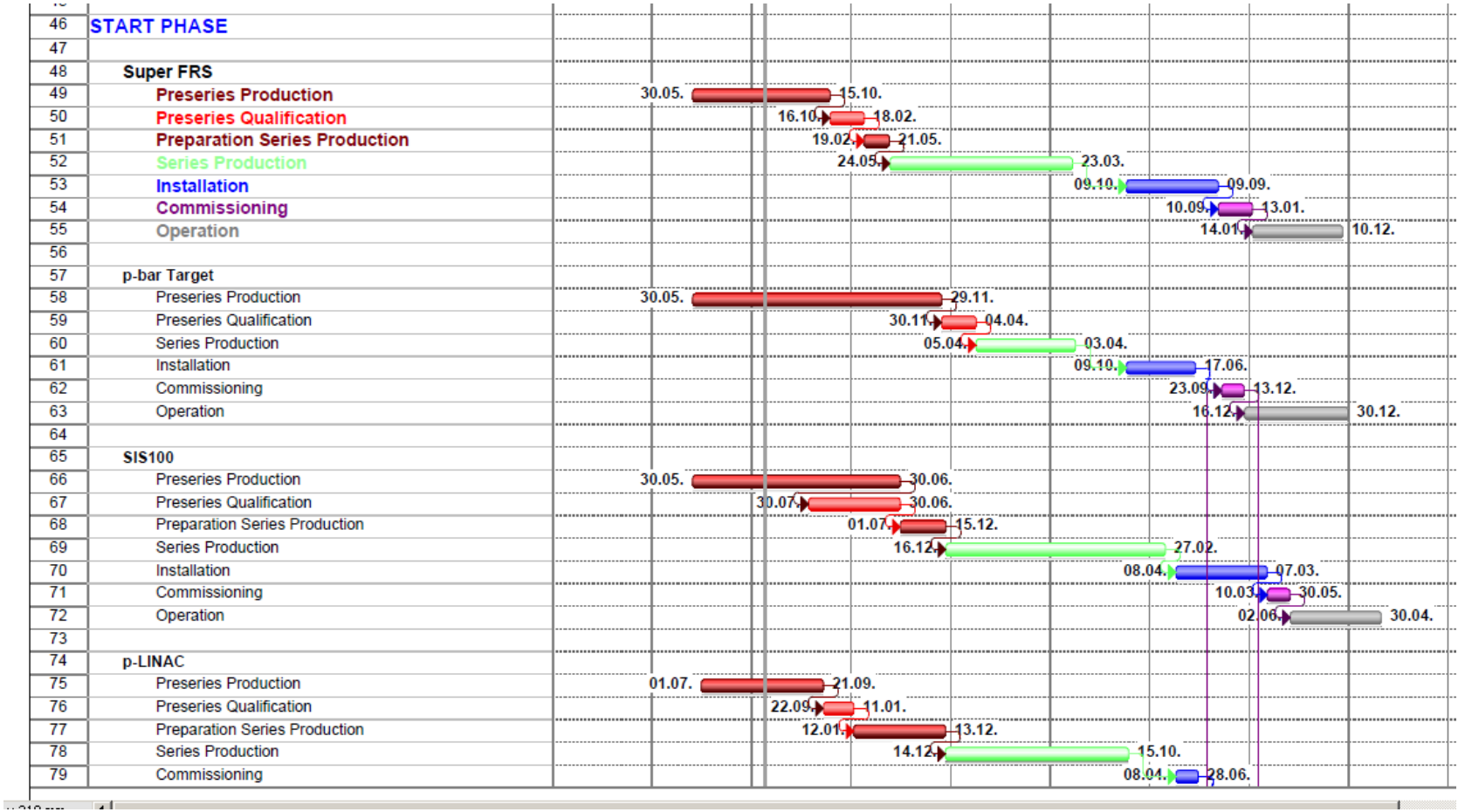
- dedicated structure build up to communicate with accelerator and experiment coordinators
- 15 planning and engineering companies
- detailed building layouts

Tools for project management

Project Management Server

- Masterplan
- detailed planning
- accessible via Web-browser

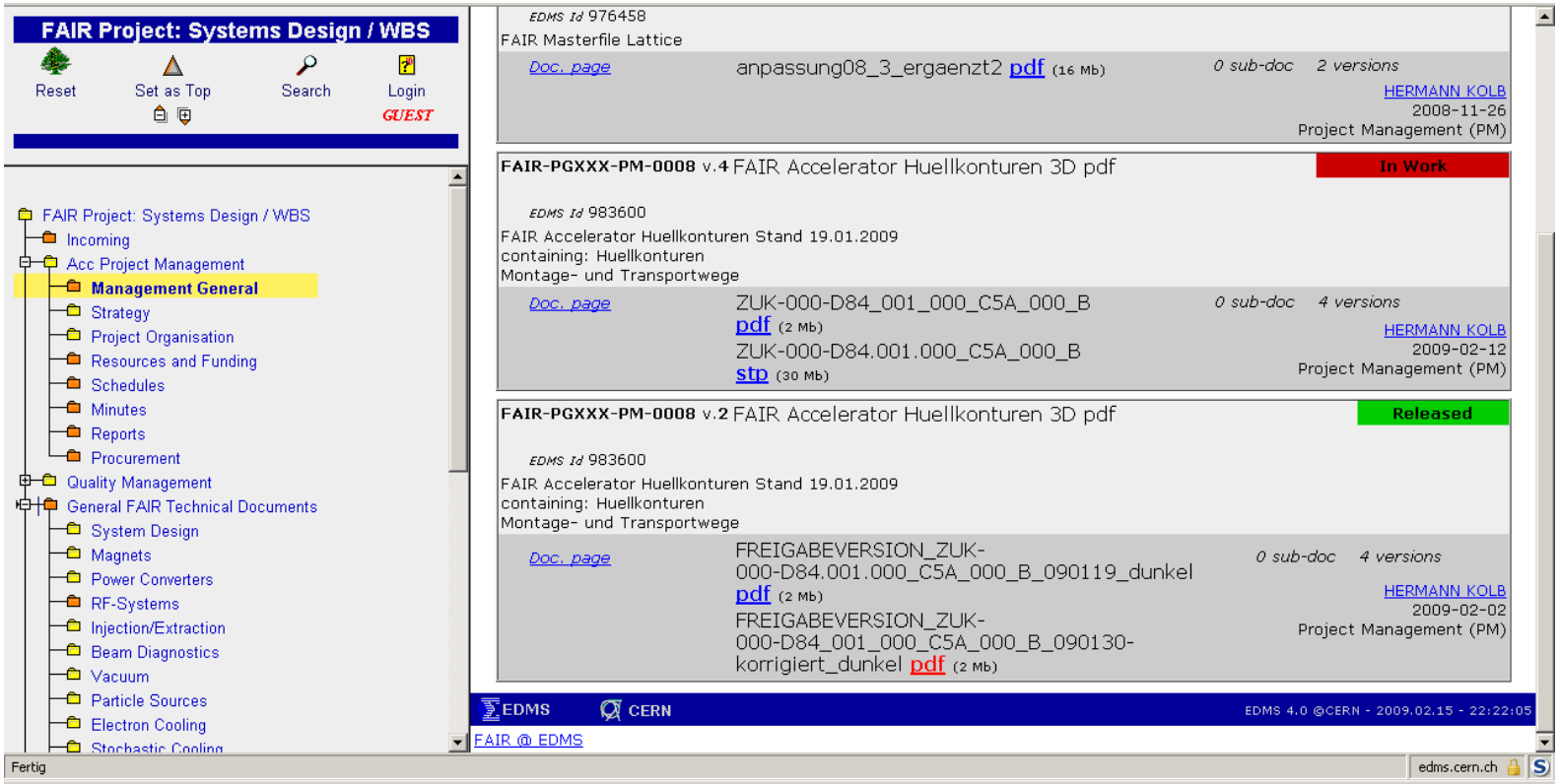
- SQL database driven
- coupling to the financial planning and controlling system



Tools for project management

EDMS

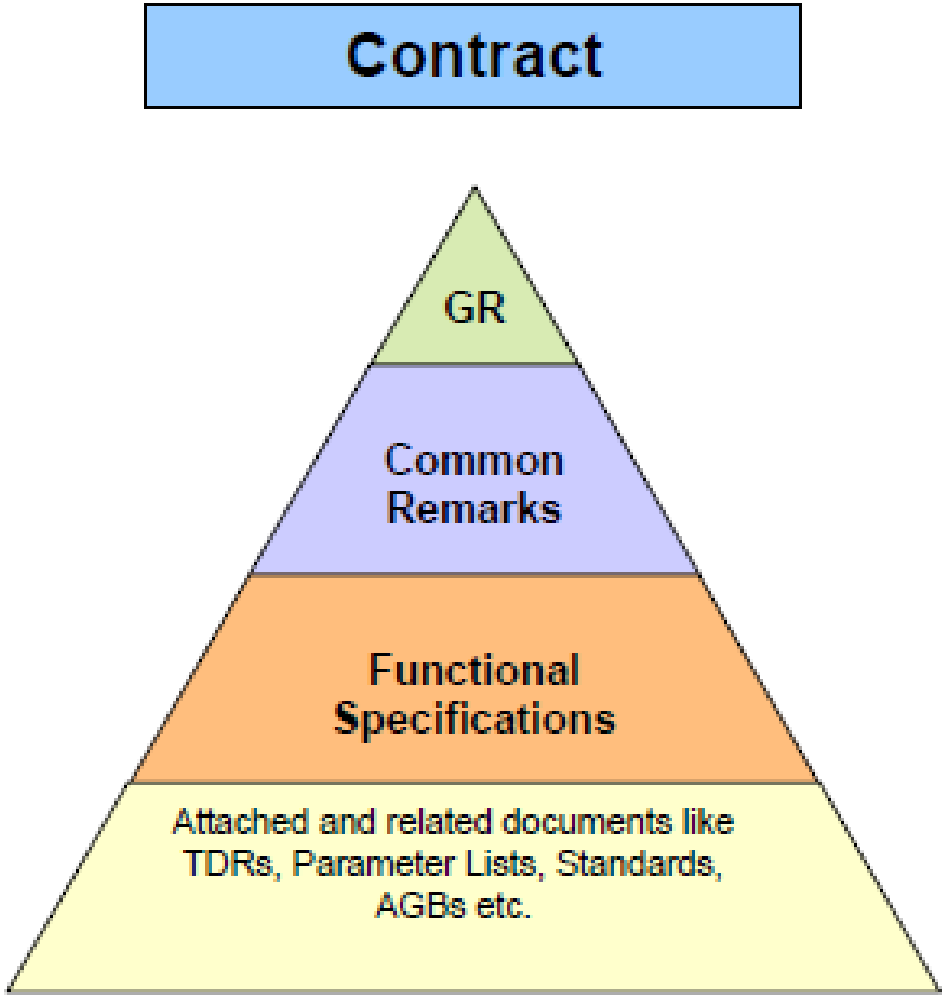
- Workflow management
- Document management
- Change management



Tools for project management

Specifications

- Structured approach
- 800 detailed specifications



Thanks for your Attention

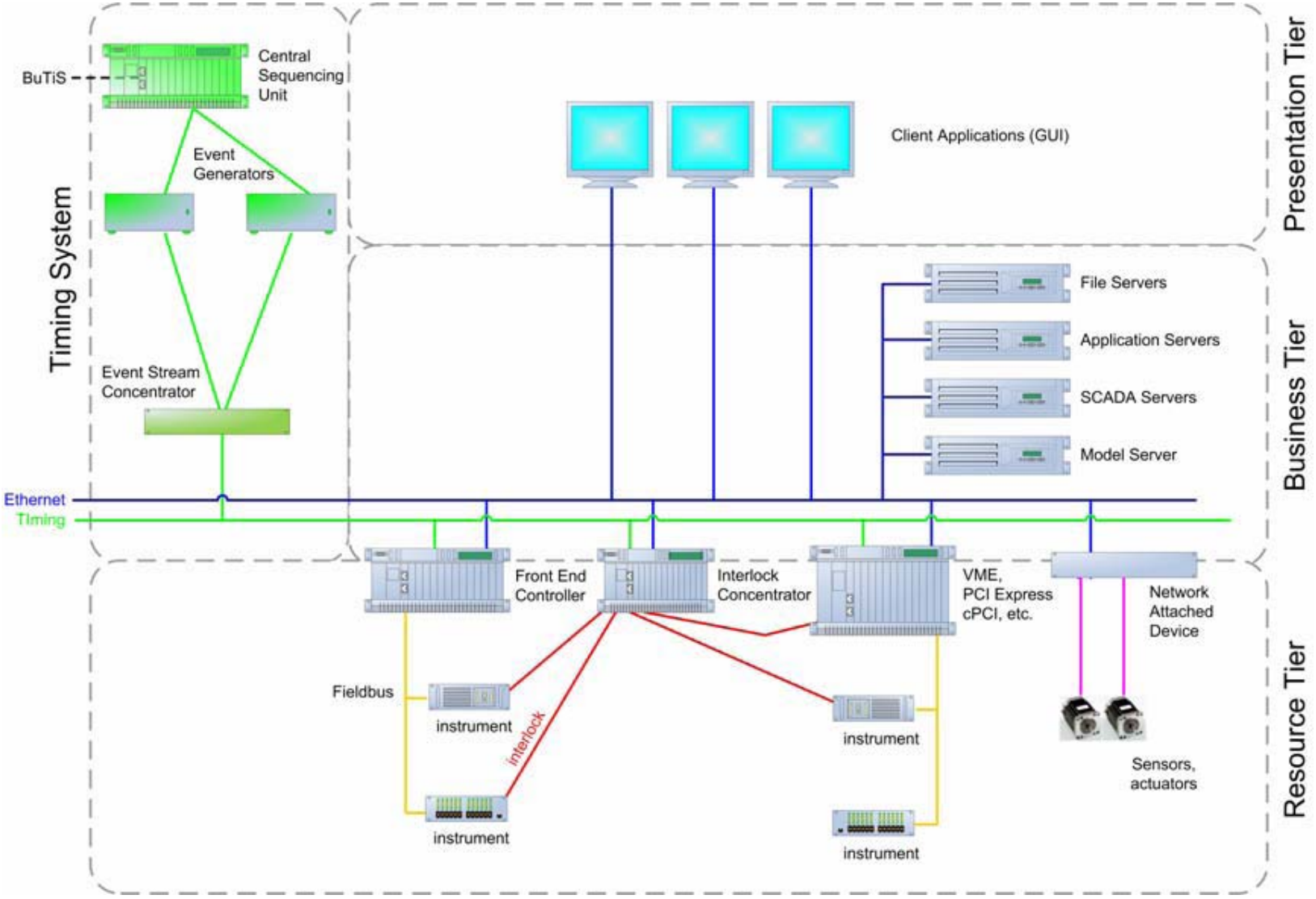
FAIR Accelerator Challenges

- Beam Intensity Frontier
  - Highest intensities for energetic heavy ion beams
  - 100-1000 times higher primary beam intensities than presently
- Beam Brightness Frontier
  - Highest phase space densities
  - Compressed and intense primary beams
  - Cooled radioactive ions and antiprotons

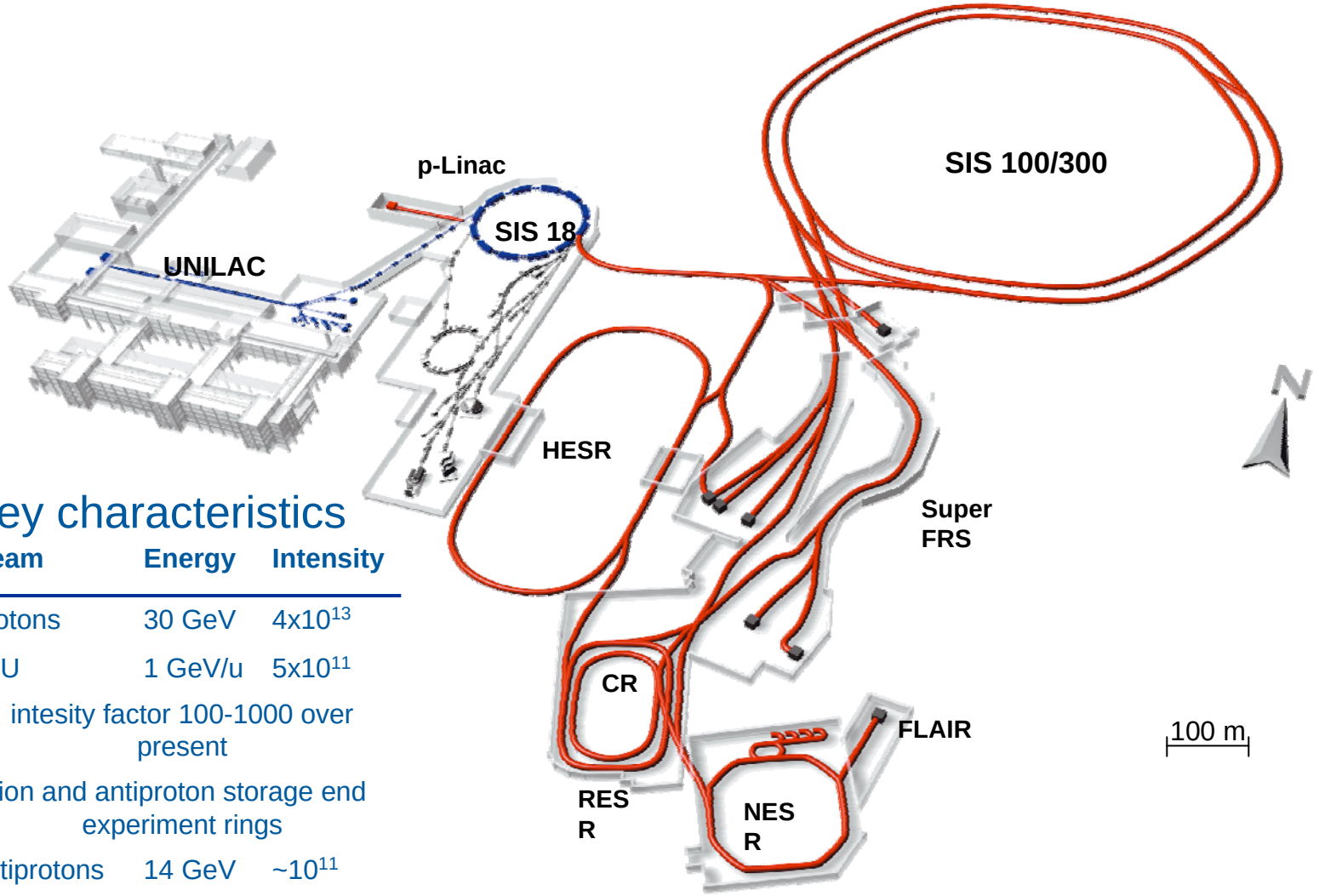
Related Technical Challenges

- control of intense, medium charge state heavy ion beams
  dynamic vacuum, space charge effects, collective instabilities
- beam cooling at high energies: electron and stochastic cooling
- fast ramping superconducting magnets
- compact rf cavities

Control System



FAIR – Facility for Antiproton and Ion Research

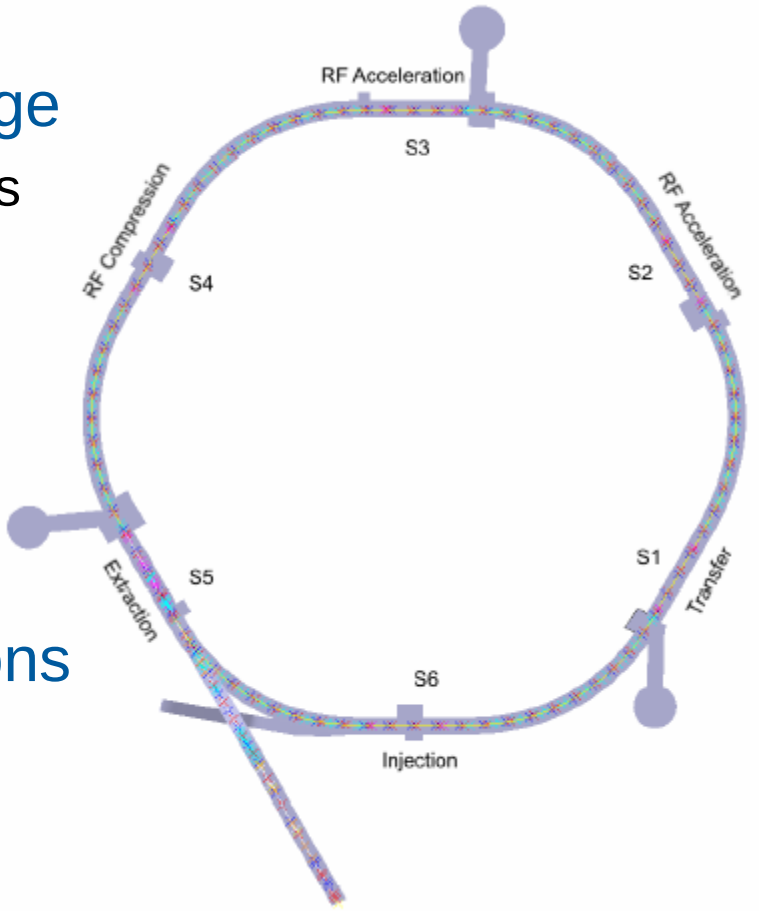


Accelerator key characteristics

Ring/Device	Beam	Energy	Intensity
SIS100	protons	30 GeV	$4x10^{13}$
(100 Tm)	^{238}U	1 GeV/u	$5x10^{11}$
	intesity factor 100-1000 over present		
CR/RESR/NESR	ion and antiproton storage end experiment rings		
HESR	antiprotons	14 GeV	~10^{11}
Super-FRS	rare-isotope beams	1 GeV/u	<10^{9}

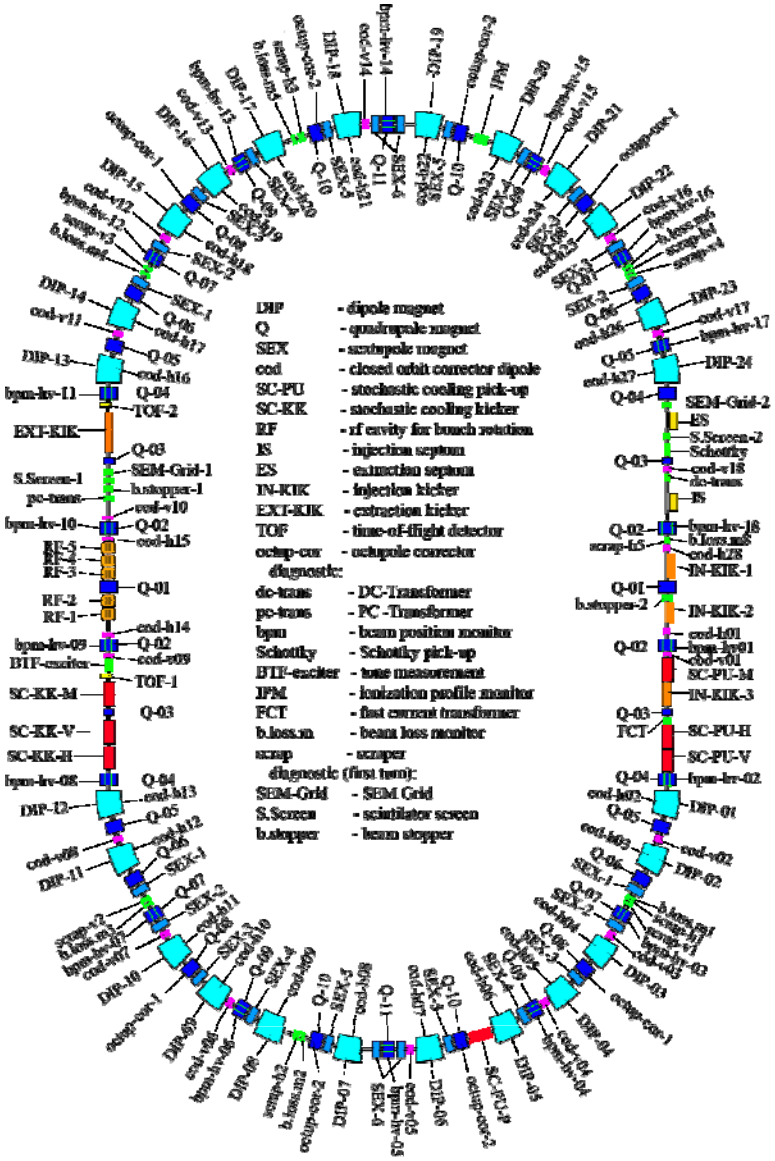
System design - SIS100

- High-intensity and compressor stage
  - fast ramped superconducting magnets
  - strong bunch compression system
- Matching of SIS100 and SIS300 lattice designs
- Cold arcs and warm straight sections
- Dynamic vacuum issues



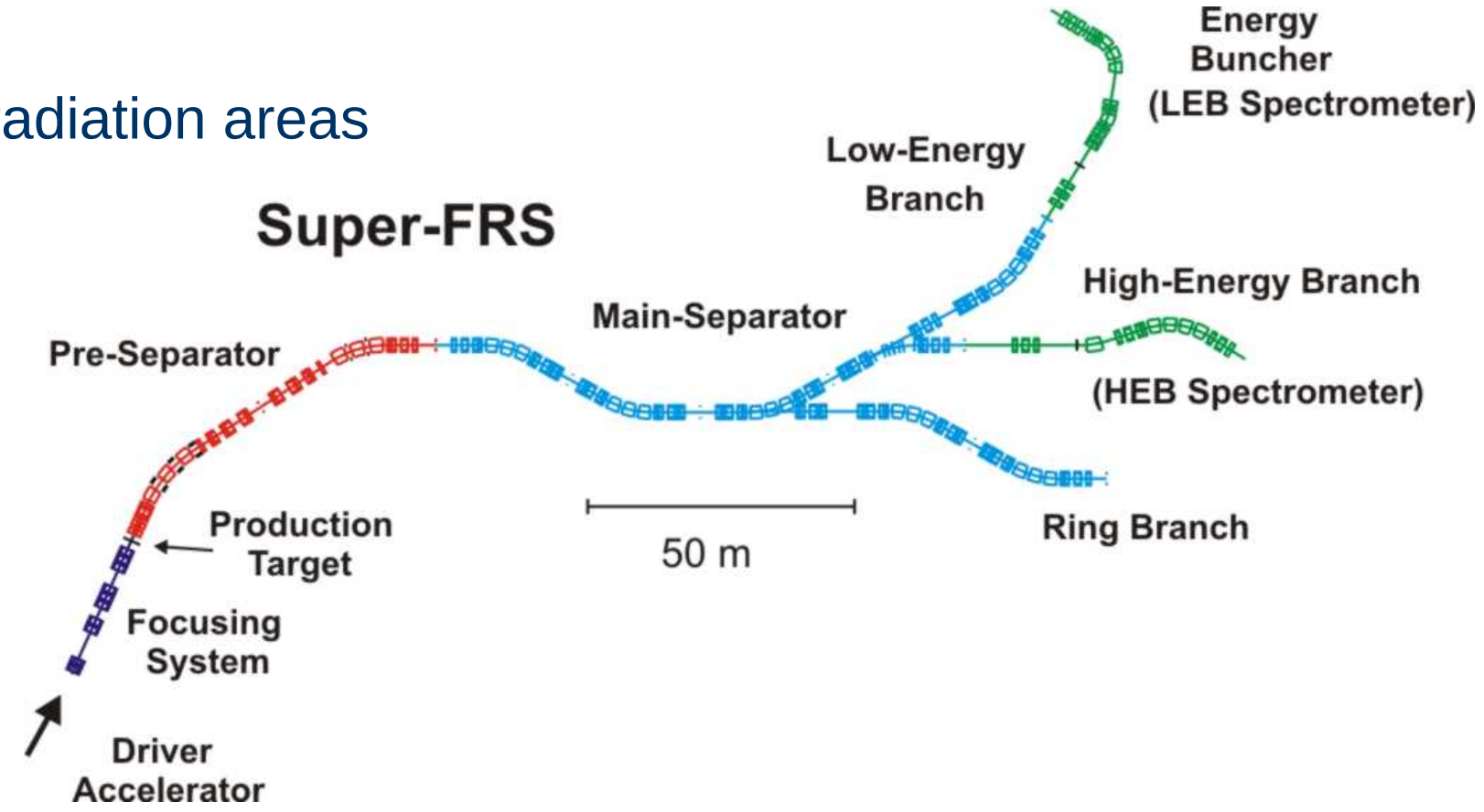
System design – Storage Rings

- Storage and accumulation rings
- Deceleration and acceleration of stable and rare isotopes or antiprotons
- High precision beams:
  - stochastic and electron cooling

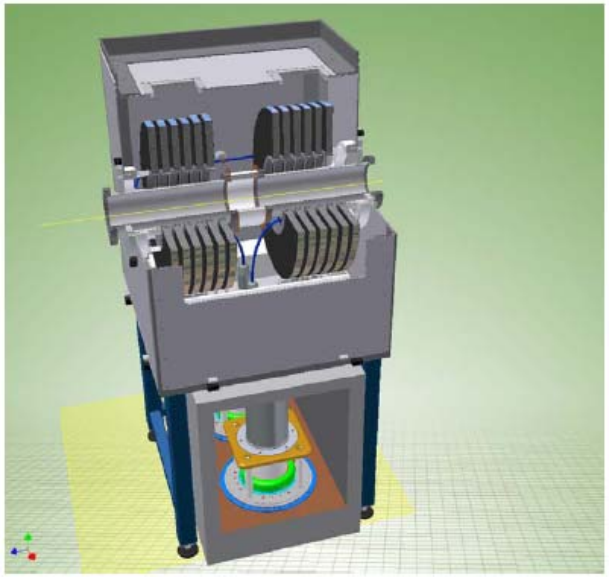


System design – Super-FRS

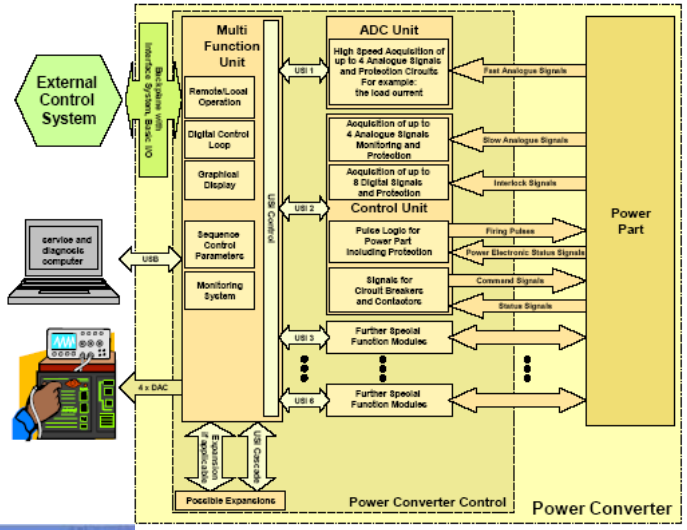
- 2 stage achromatic separation stages
- Large acceptance magnets
- High-radiation areas



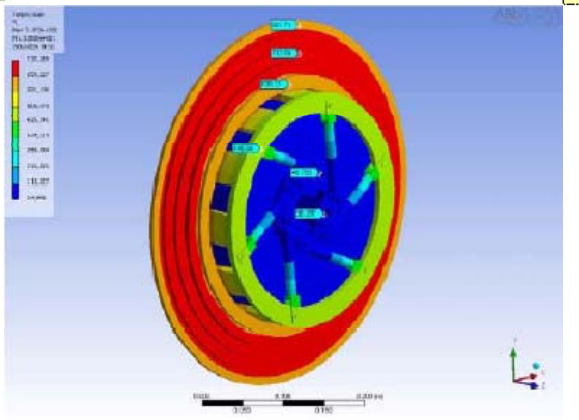
Selected German in-kind components



CR Debuncher Cavity



Power Converter Control Unit



Target wheel for Super-FRS

Artists View