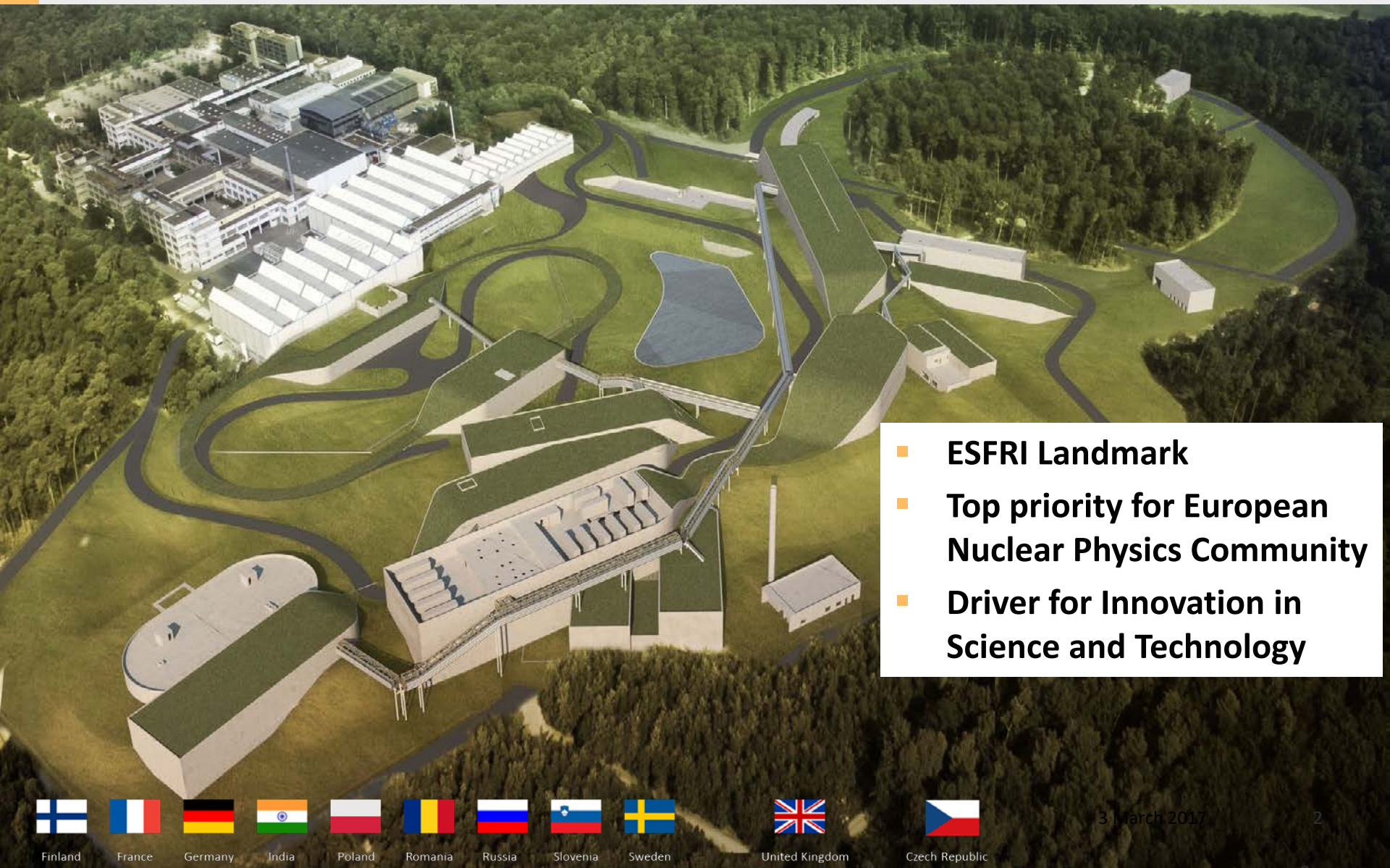
News from FAIR

Paolo Giubellino

KHUK2021, 9-10 Dec 2021

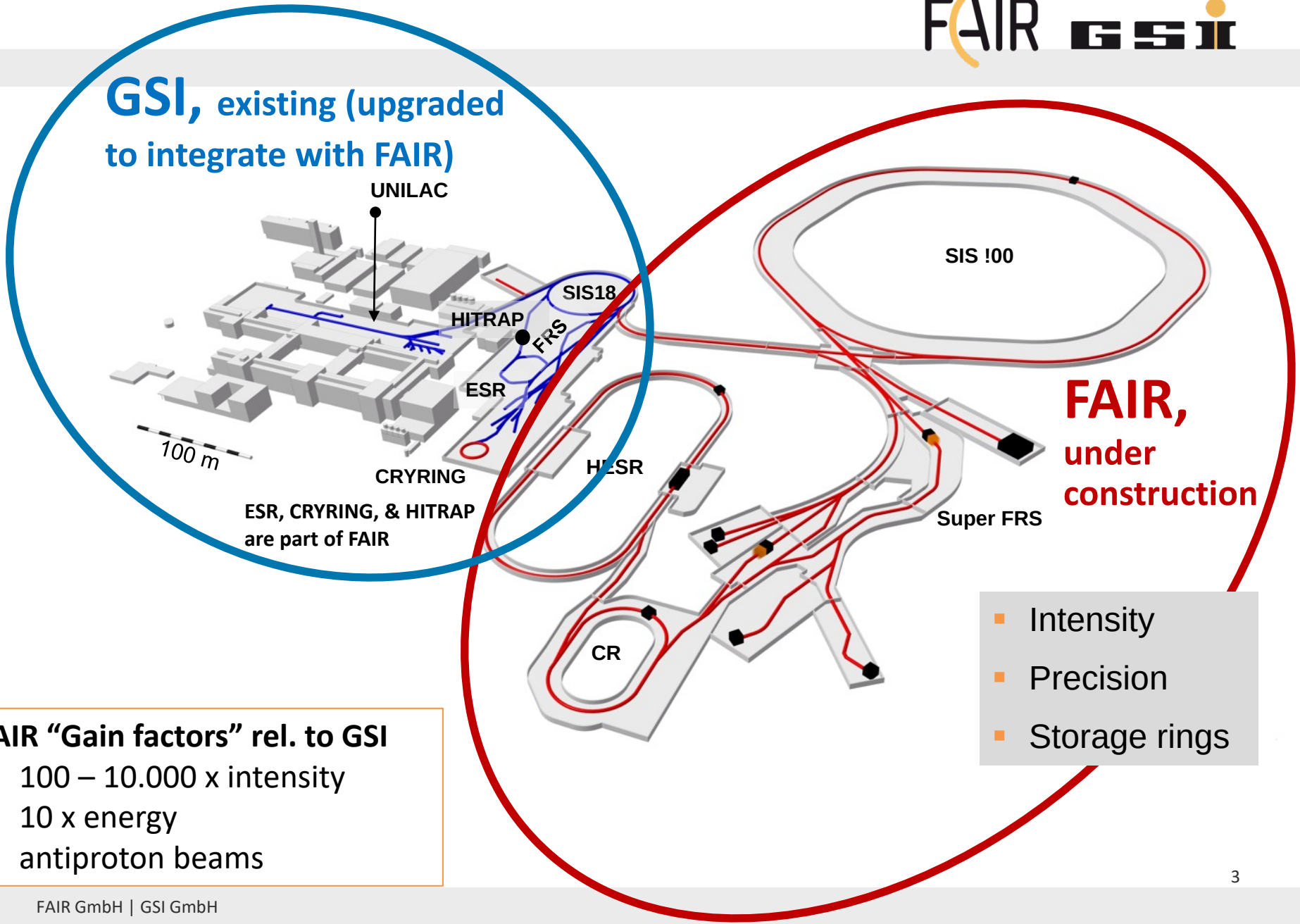
FAIR: Facility for Antiproton and Ion Research



- **ESFRI Landmark**
- **Top priority for European Nuclear Physics Community**
- **Driver for Innovation in Science and Technology**

Finland France Germany India Poland Romania Russia Slovenia Sweden United Kingdom Czech Republic

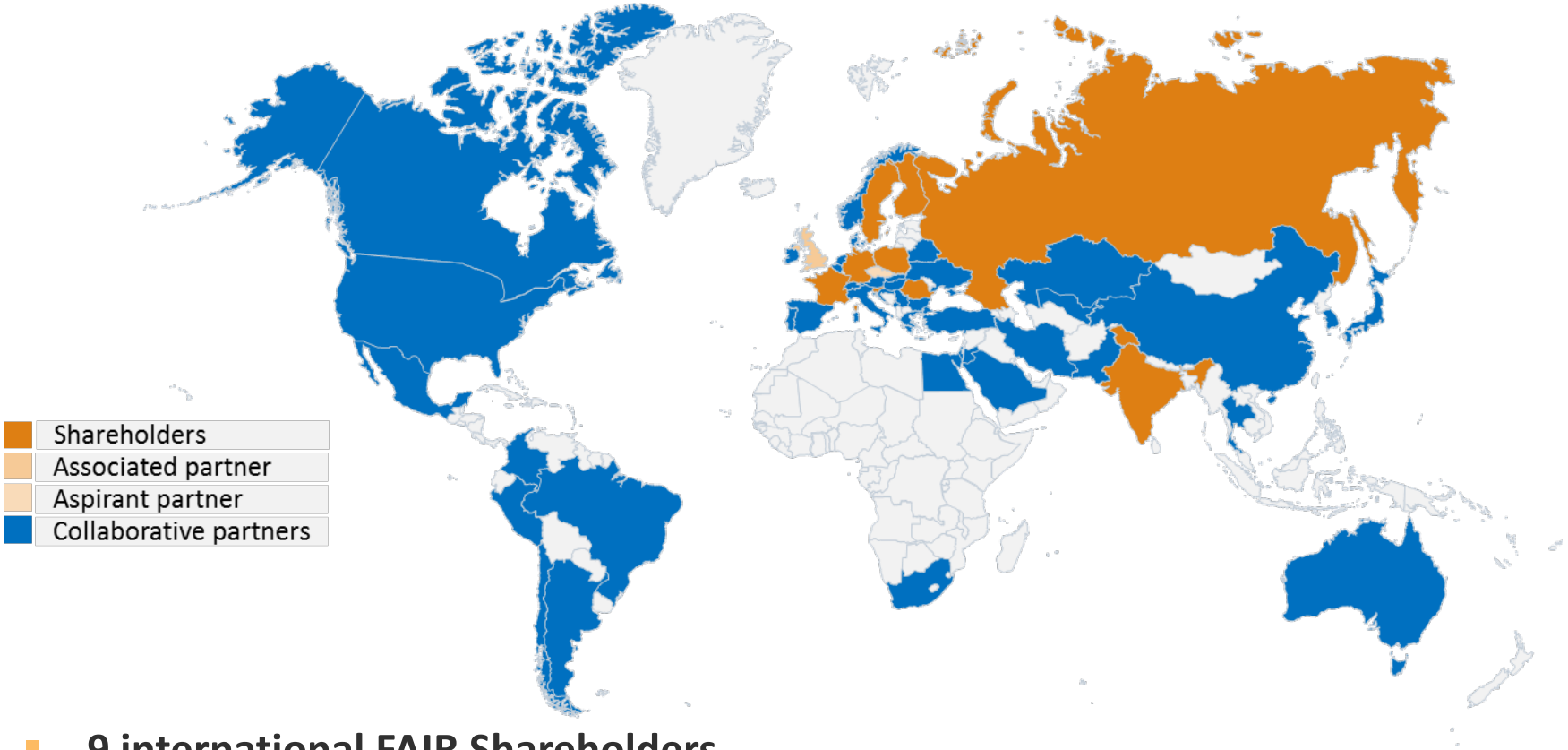
GSI and FAIR – The Facility



FAIR "Gain factors" rel. to GSI

- 100 – 10.000 x intensity
- 10 x energy
- antiproton beams

FAIR: International Cooperation



- **9 international FAIR Shareholders**
- 1 Associated Partner (United Kingdom)
- 1 Aspirant Partner Czech Republic (Since 2018)
- Participation of **3.000 scientists from all continents**

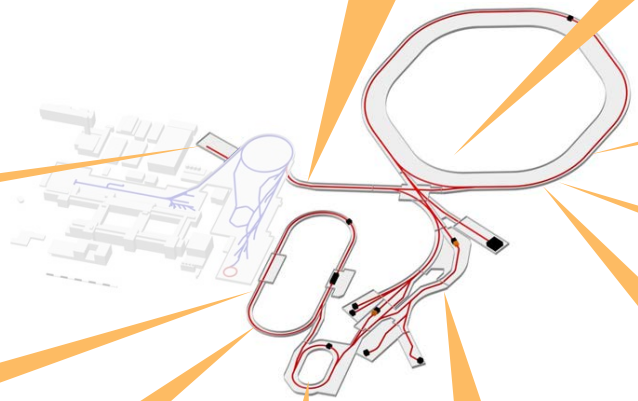
FAIR facility - worldwide production and delivery of accelerator components and

HEBT: Dipole-Magnet

Power Converters

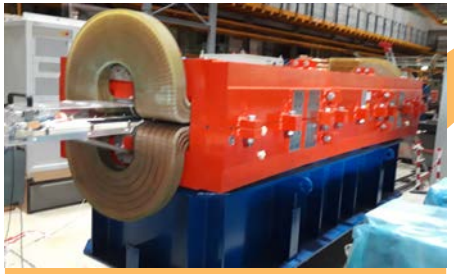
SIS100: Quadrupol-Magnet

p-Linac: RFQ- Development



SIS100: Vacuum Chambers

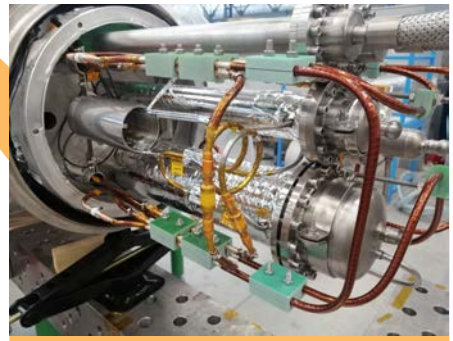
HESR: Quadrupol-Magnets



HESR: Dipole-Magnet

CR: Dipole-Magnet

facility



SIS100: Dipole-Magnet

FAIR Construction, 2021

Civil construction progressing well, concrete works of underground ringtunnel completed in May 2021.

Manufacturing of accelerator and experiment components by all partner countries ongoing worldwide.

Many accelerator and experiment components are delivered and tested ready for installation

Accelerator components (including all SIS100 dipoles and RFCavities)

Storage Warehouse Weiterstadt … filling in progress!

FAIR in construction

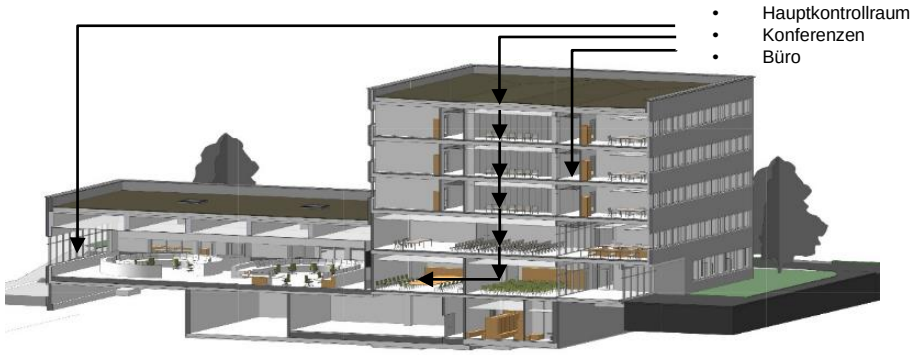
FAIR in construction

FAIR in construction

FAIR in construction

Campus Infrastructure

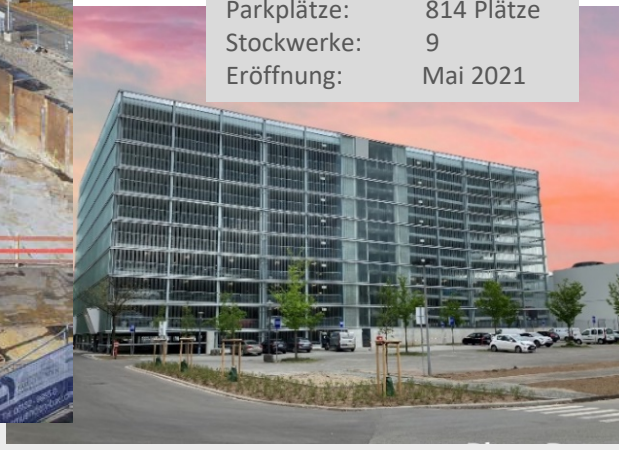
FAIR Control-Center (FCC)



Campus Masterplan

CAR park

Parkplätze:	814 Plätze
Stockwerke:	9
Eröffnung:	Mai 2021



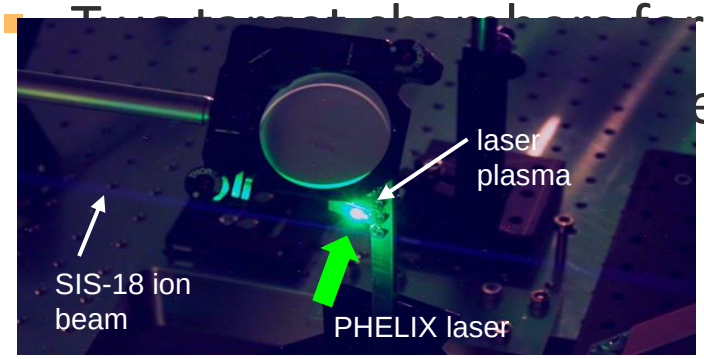
Status Overview of Experiments

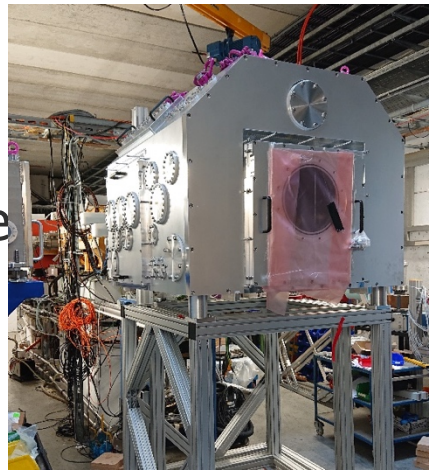
	Pillar	TDR	Cost [k€ 2005]	Funding	Construction	Construction completed	Test/ Commissioning
Day-1	APPA		19,110			07/2026	
	CBM		40,086			04/2025	
	NUSTAR		33,615			07/2025	
	PANDA		52,523			12/2025	
		90.9% *value weighted*	145,335	88.7% *secured*	42.5% *value weighted*		17.8% *value weighted*
Changes since report 2021-I		+1.3%		+0.0%	+1.7%		+1.5%

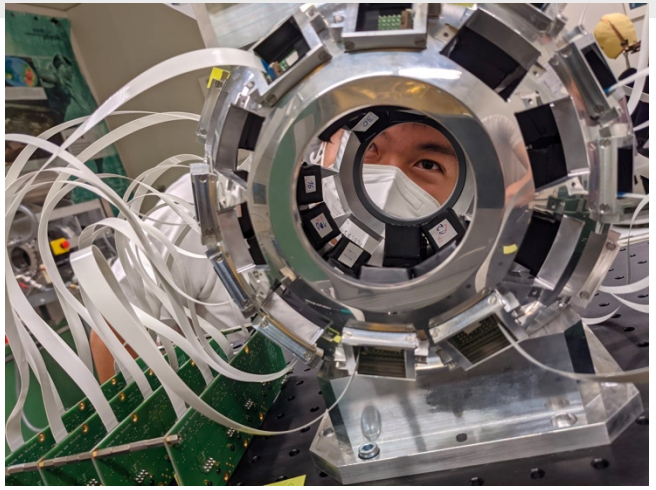
- Slow due to Covid-19 and problems with mobilising resources for PANDA due to uncertainties in civil construction schedule

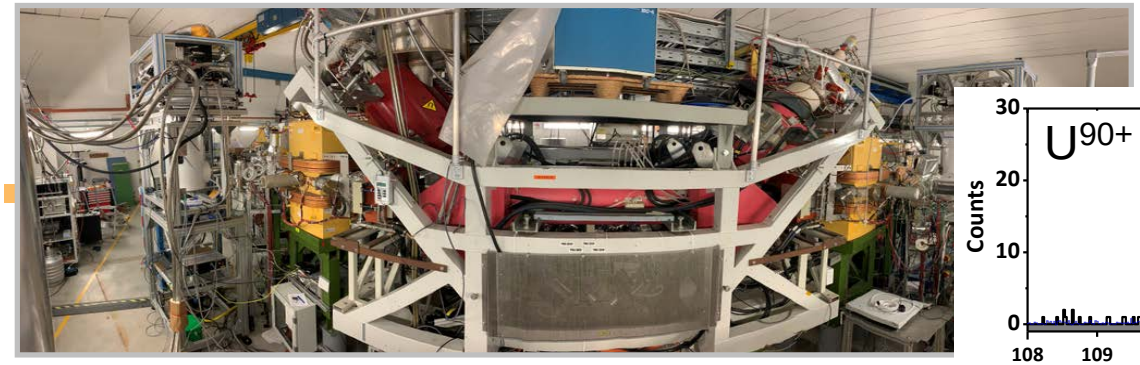
Selected Highlights: APPA

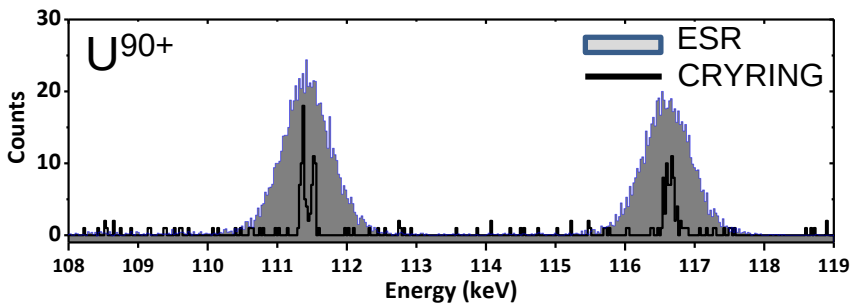
- Two experimental setups for BIOMAT have proven their performance in tests in FAIR
- Two target chambers for [illegible]e





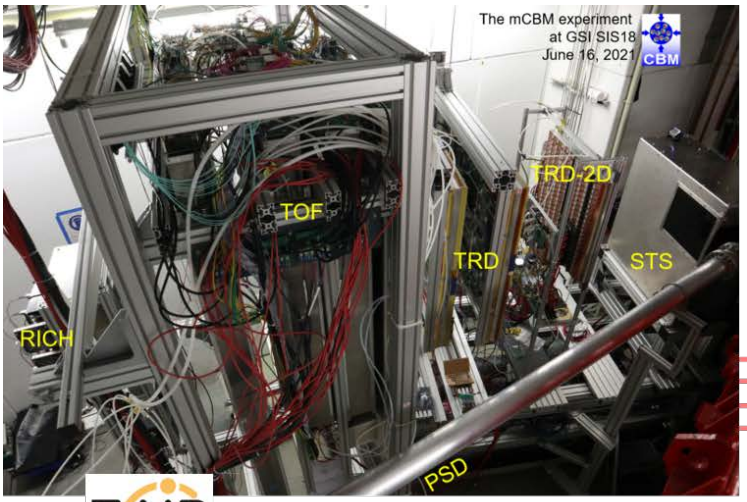


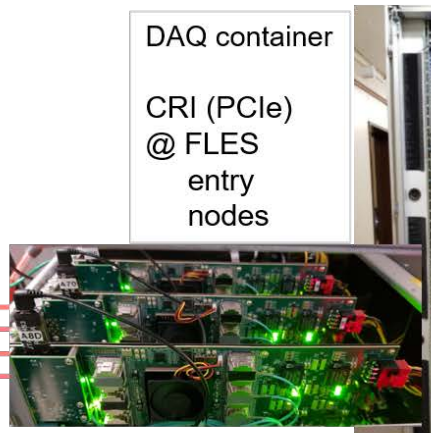


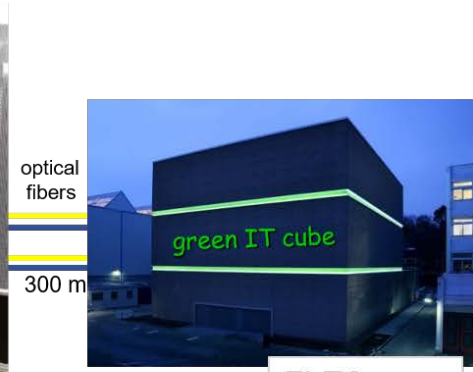


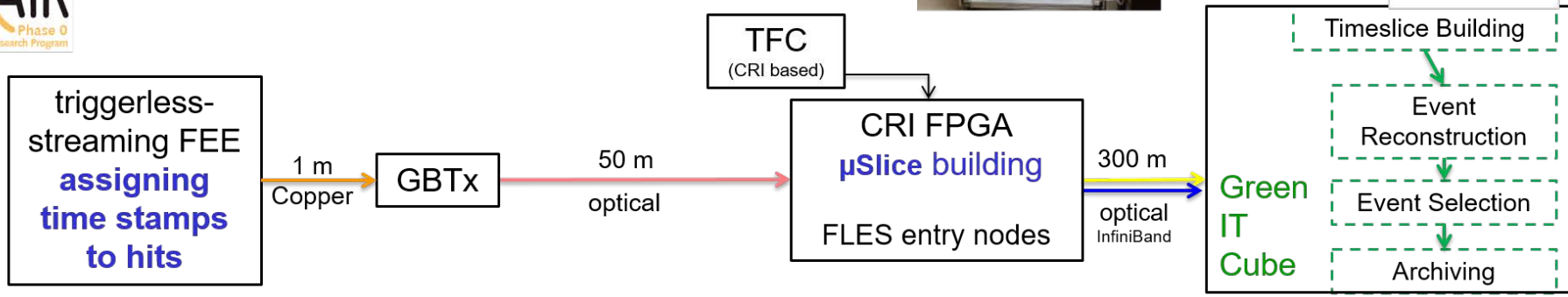
Selected Highlights: CBM

- During the last campaign, mCBM was successfully tested with the highest collision rates available in FAIR Phase-0
- Customised chain of electronics to process and transfer the data of all subsystems to the final data processing proven its capability









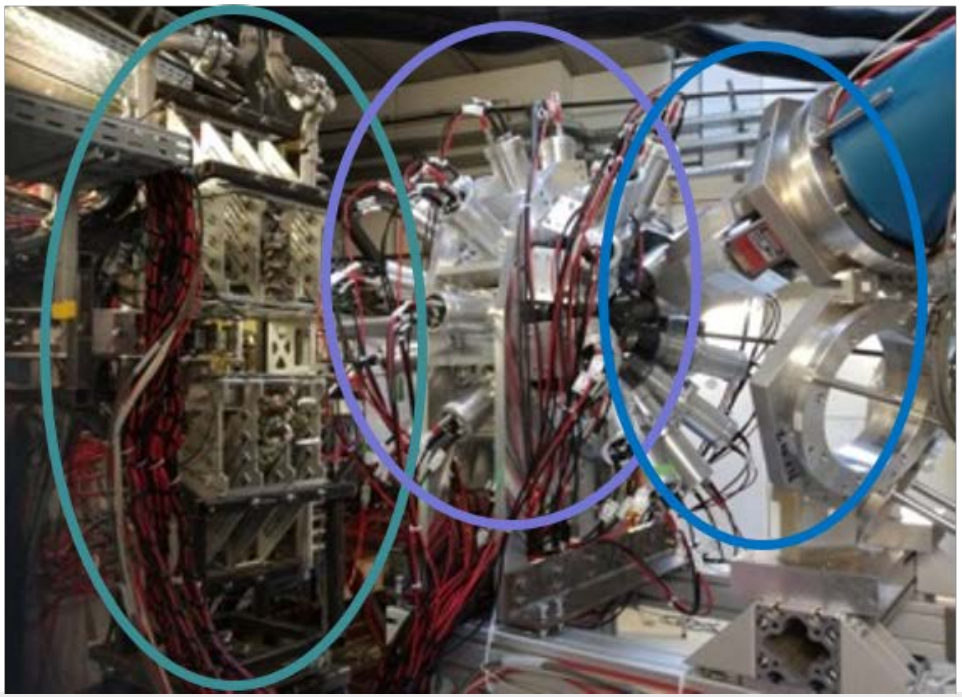
Selected Highlights: NUSTAR

- The FAIR Phase-0 campaign at GSI/FAIR with extended set-ups and further methodological developments has been successfully continued.

AIDA
implantation and decay detector

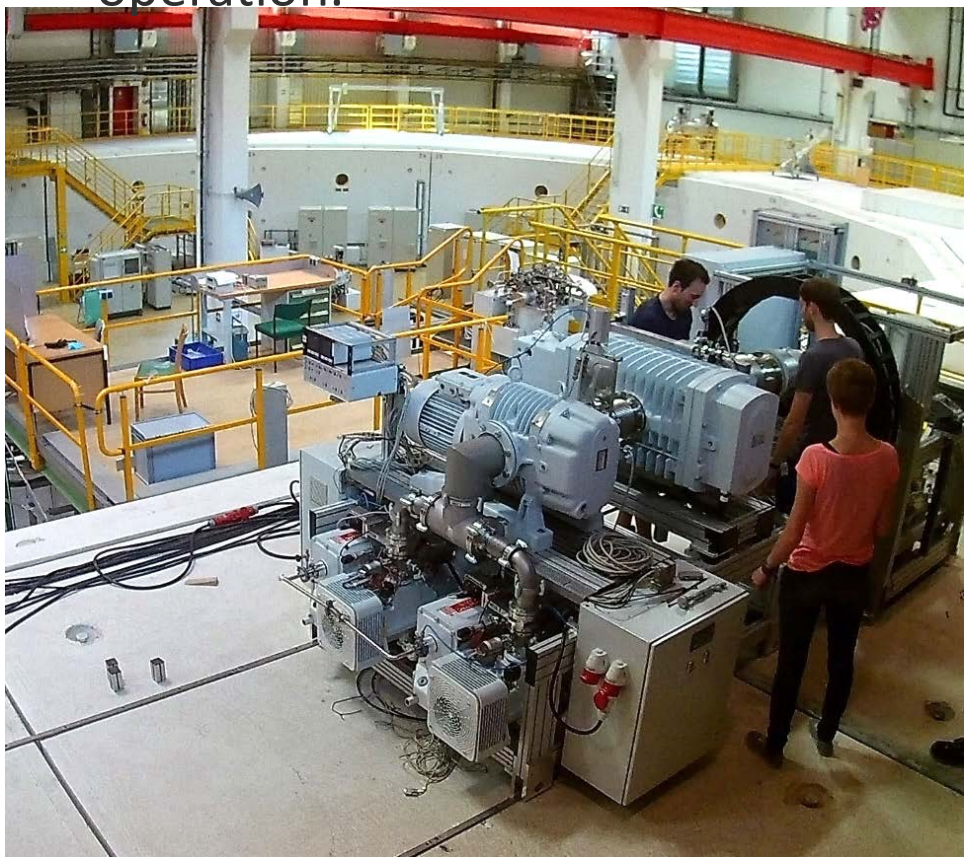
FATIMA
Fast Timing $LaBr_3$ Array

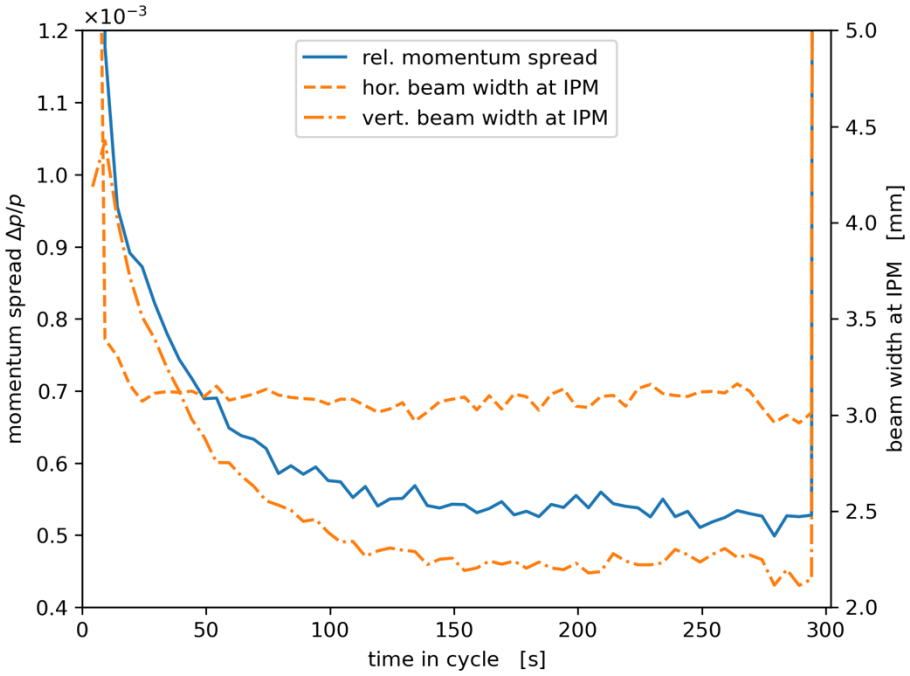
DEGAS/GTC
HPGe Array



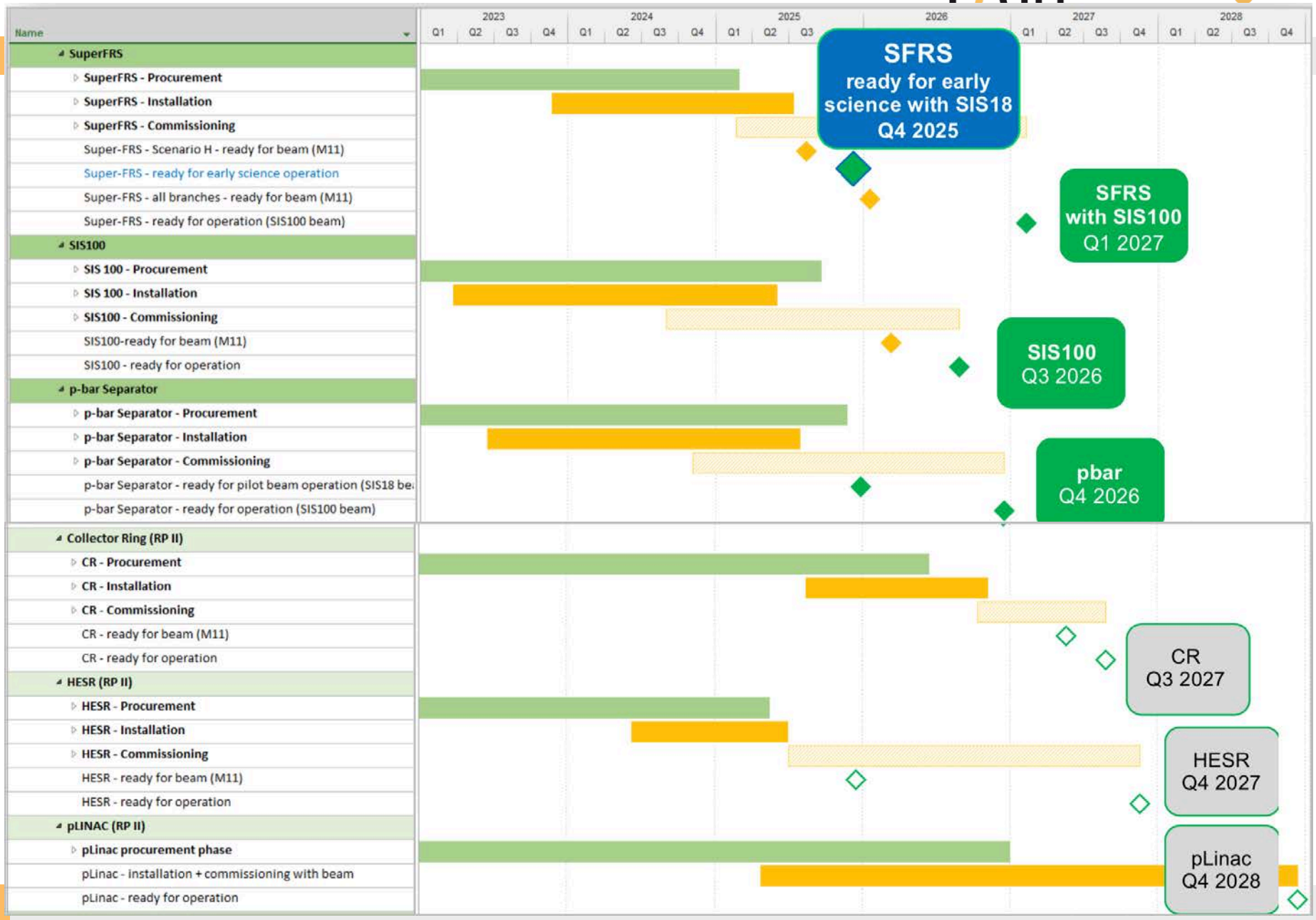
Selected Highlights: PANDA

- The cluster jet target was successfully tested at COSY with elements of stochastic cooling of HESR in operation.

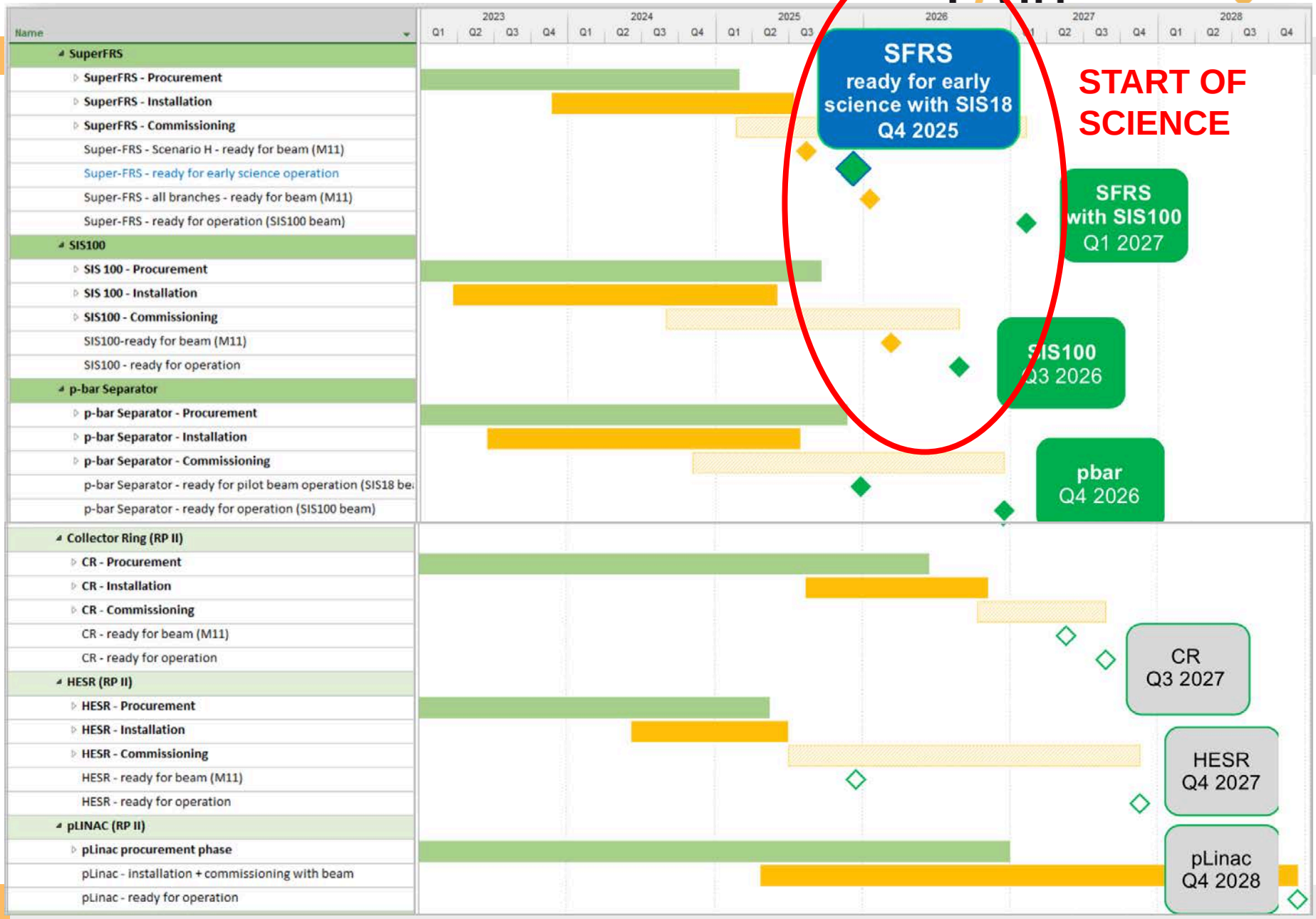




Construction plan



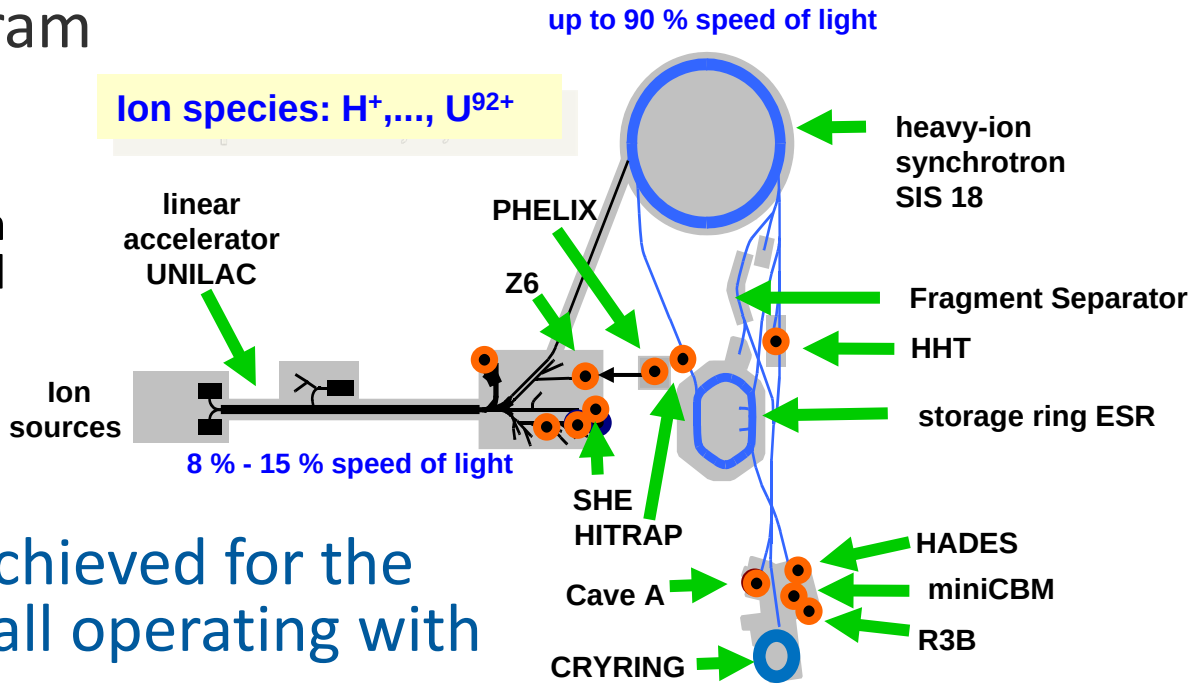
Construction Plan



FAIR Phase-0

- FAIR Phase-0 2021 Program completed as planned.

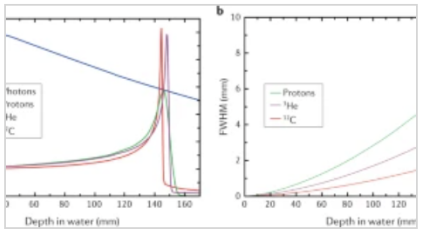
Thanks to excellent preparation of experiments by international collaborations, strong engagement of local people and from the external institutions



- Impressive progress achieved for the accelerator complex (all operating with FAIR control system)
- Until 2024 a block of 3 months beamtime per year.
- The scheme for 2025/2026 is being developed to ensure that the activities will be compatible, giving priority to the commissioning effort

FAIR Phase 0 Research Program

FAIR Phase-0 science impact
(real results tomorrow in Y.Leifel´s talk)

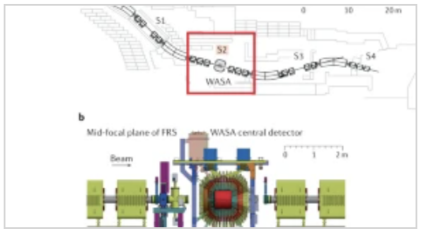


Physics and biomedical challenges of cancer therapy with accelerated heavy ions

Radiotherapy with accelerated heavy ions is a potential breakthrough in cancer therapy. This Review discusses the challenges in physics and radiobiology to make this therapy affordable and to fully exploit the clinical benefits.

Marco Durante, Jürgen Debus & Jay S. Loeffler

Review Article | 17 Sept 2021



New directions in hypernuclear physics

The study of hypernuclei contributes to the understanding of the fundamental baryonic interactions and the physics of neutron stars. This Perspective discusses different experimental approaches to answer open questions regarding hypernuclei.

Takehiko R. Saito, Wenbou Dou ... Xiaohong Zhou

Perspective | 14 Sept 2021

nature reviews physics

September 2021 webpage

APPA

NUSTAR

Goals TransFAIR:

In-line with the medium- and longterm Strategies of FZ Jülich and of GSI:

- Transfer over a period of 7 years (PoF-4) period the IKP institutes (except for
  IKP-3, “Theory”) to GSI/FAIR, thereby:
- Maintain the nuclear physics scientific competence of the IKP for the German and NRW science communities,
- Anchor these competences (without those of the IKP-3) at GSI and thereby also to strengthen the FAIR project by competences and personnel resources of the IKP.

At the end of the TransFAIR process the personnel currently working at the IKP shall carry out R&D either at GSI or within the framework of a cooperation between GSI and universities, preferentially in North Rhine-Westphalia

COSY will stop the user program by the end of 2024.

TransFAIR: Transfer of IKP to GSI/FAIR

JÜLICH Forschungszentrum

IKP-1	IKP-2	IKP-TA	IKP-4
Experimental Hadron Structure **W3 Prof. J. Ritman, PhD**	Experimental Hadron Dynamics/ EDM / Neutrinos **W3 Prof. Dr. Dr. h.c. H. Ströher** **W2 Prof. Jörg Pretz** **W2 Prof. L. Ludhova**	Technical and Administrative Infrastructure	Large-Scale Nucl. Phys. Equipment **W2 Prof. Dr. Ralf Gebel** **W2 Prof. Andreas Lehrrach**

GSI Helmholtzzentrum für Schwerionenforschung GmbH

FAIR

Research

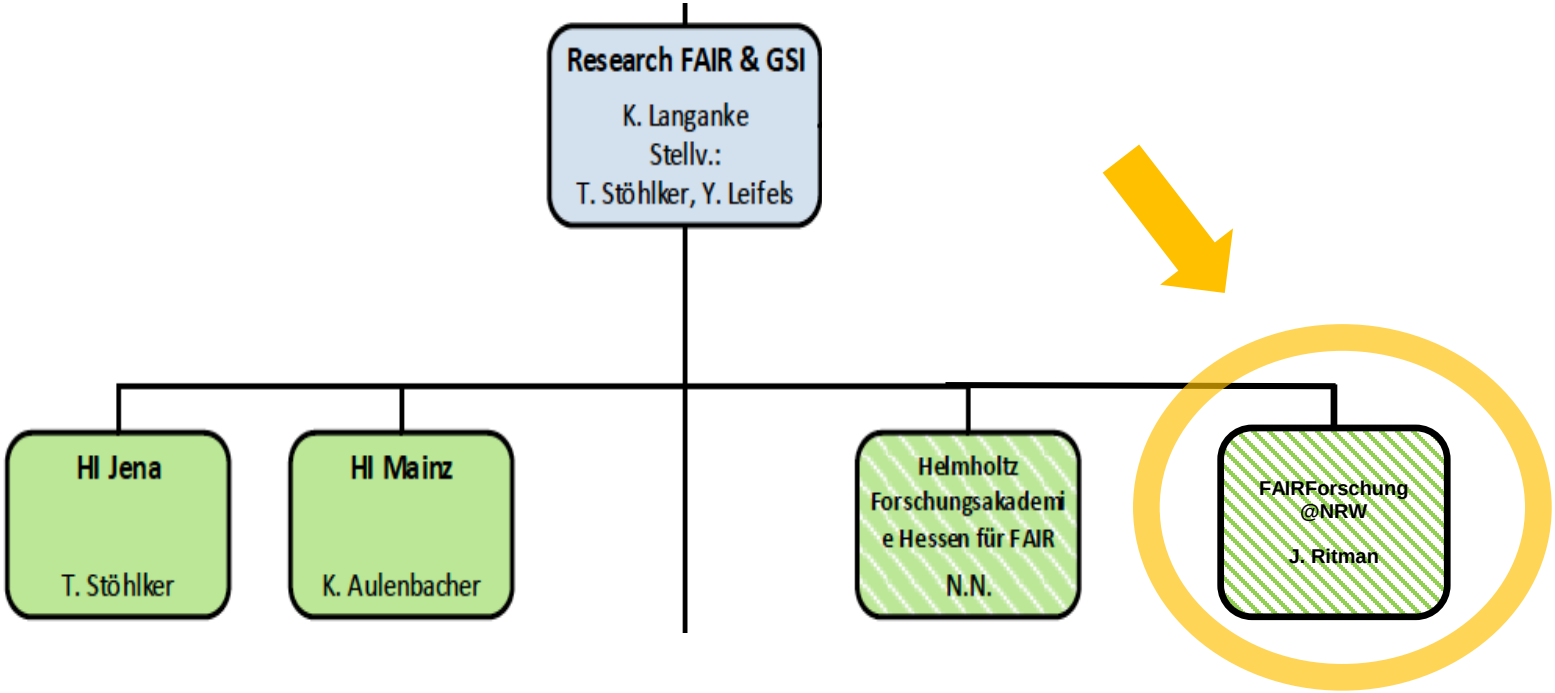
new GSI Research Division
„FAIR Forschung@NRW“
(FFN)
GSI RES Department Head:
J. Ritman

Accelerator

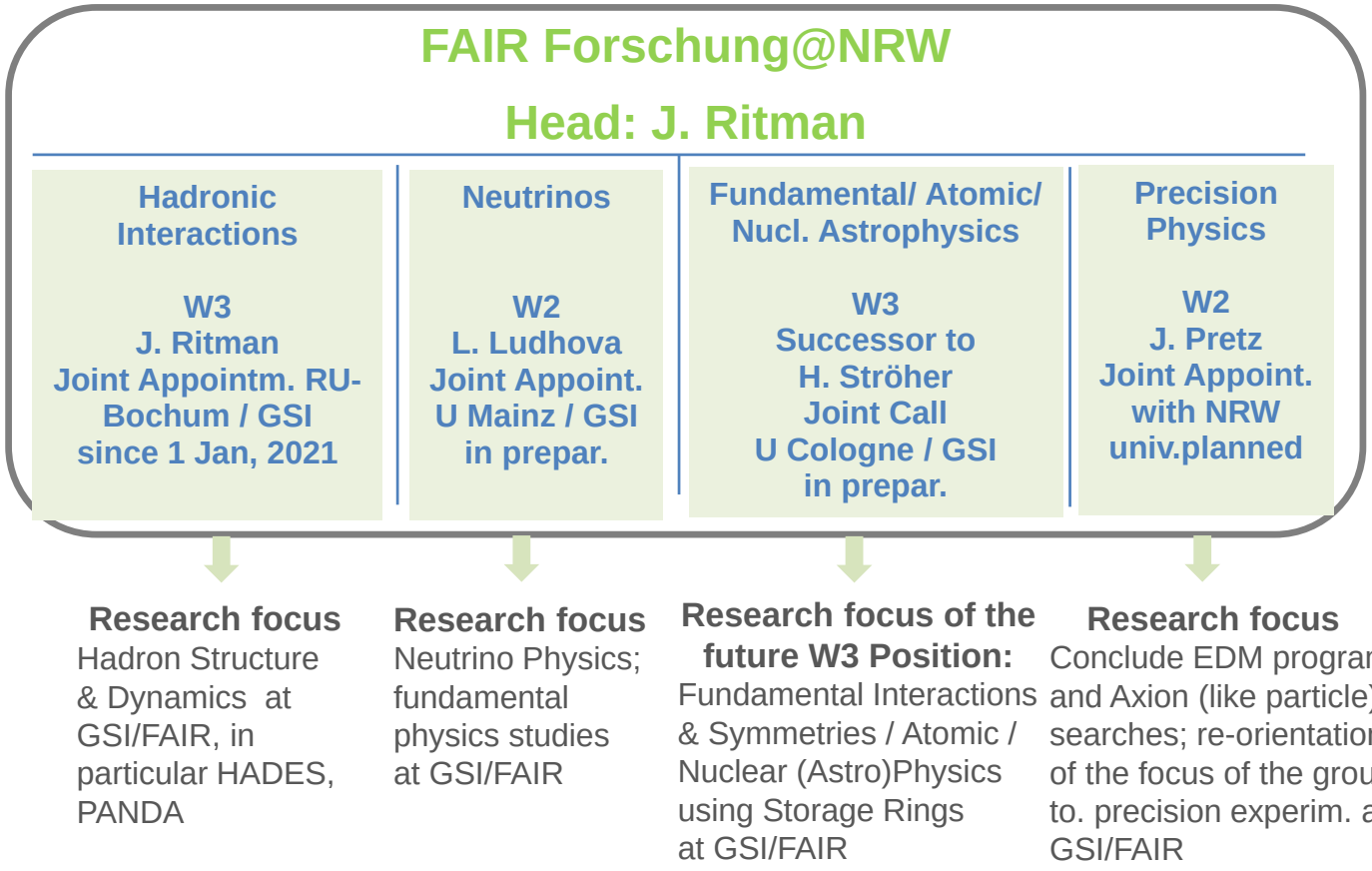
GSI ACC department or
FAIR Project group
(e.g. HESR Leader: R. Gebel)

New Organisational Unit: *FAIR Forschung@NRW*

FAIR/GSI Organizational chart : **FFN** implemented since March 2021



FAIR Forschung@NRW, research topics under discussion



Network Proposal NRW-FAIR

TransFAIR:

IKP Research (FFN) will mostly be located on several university campuses in NRW

Netzwerk-NRW:

- Goals:
  1) connect theory and expt. activities for FAIR in NRW, and
  2) establish basis for long term placement of FFN in NRW
- Bochum (Host), Bonn, Jülich (theory), Münster, Wuppertal (later Köln, …)
- Third party funding program from NRW, circa 5 MEuro/a for 4 years
- Results of first round of review in Dec. 2021
- Final decision in June 2022
- Begin in WS22/23

FAIR: Unique Opportunities!