

A wireframe model of the FAIR accelerator complex, showing various rings and structures, set against a background of a colorful nebula and starry space.

# FAIR Status and News

**13<sup>th</sup> JSC meeting,  
May 16<sup>th</sup> 2024**

**Paolo Giubellino**

# GSI GmbH – Helmholtzzentrum für Schwerionenforschung FAIR GmbH – Facility for Antiproton and Ion Research



ehrenz/GSI/FAIR, Oktober 2022

- Existing facility: GSI Darmstadt (Foundation: 1969)
- Future facility: FAIR (Foundation: 2010)
- Landmark in the European research roadmap (ESFRI)
- Employees on location: approx. 1580

Where are heavy elements created?

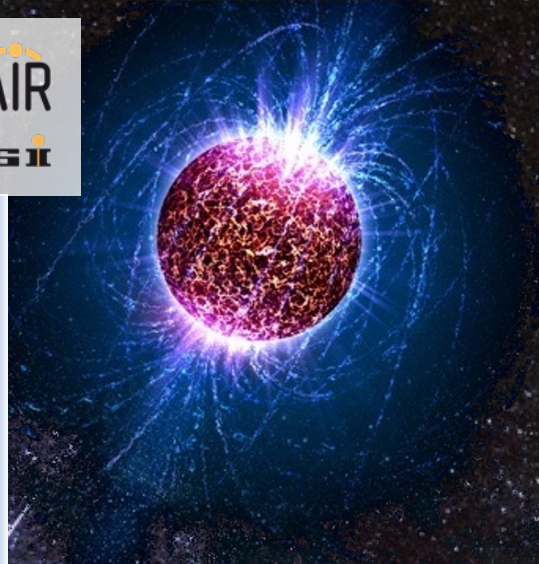


**NUSTAR**



What is in the interior of a neutron star?

**CBM**



**PANDA**

Glueballs:  
What are protons and neutrons made of?  
What is the structure of hadrons?



**APPA**

How do materials behave under high pressure?



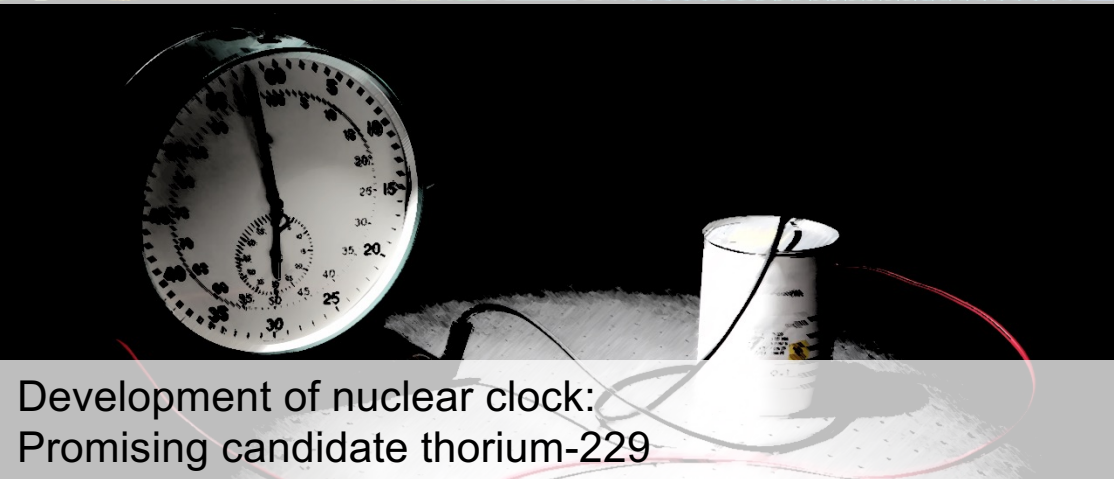
# Direct applications



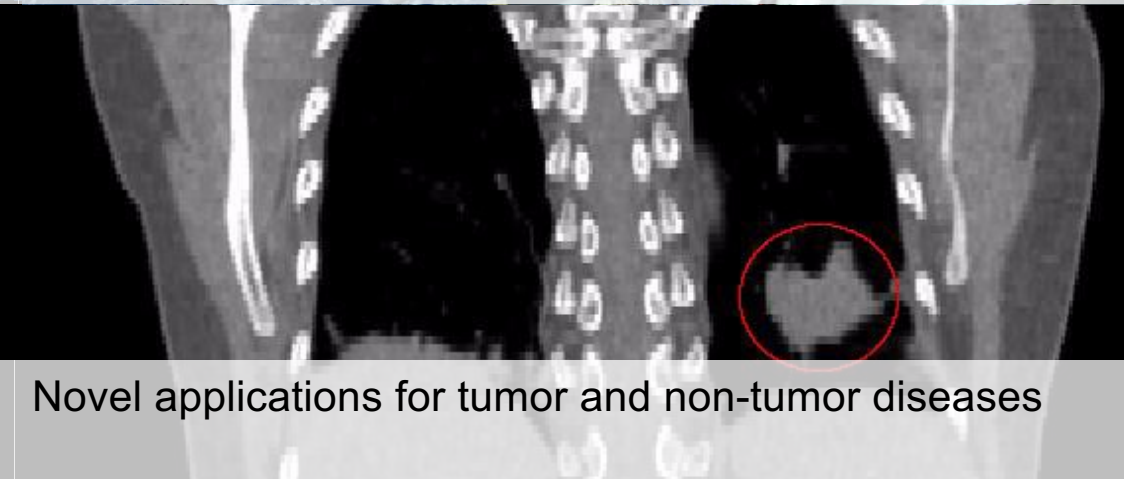
High-performance and scientific computing, big data, green IT



Space radiation protection, unique facility for simulation, collaboration with ESA



Development of nuclear clock:  
Promising candidate thorium-229



Novel applications for tumor and non-tumor diseases

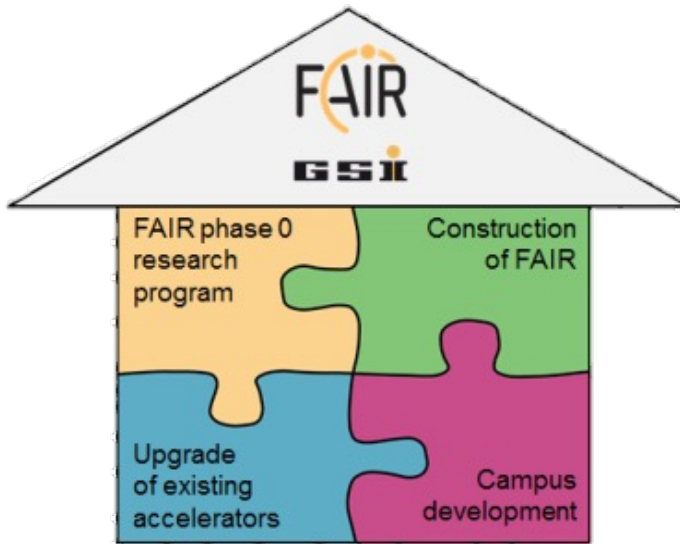
- A unique capability to attract and create talent and know-how.
- Training and education of the next generation of scientists, engineers and computing experts from all over the world:
  - Graduate Schools with currently more than 300 doctoral students from all over the world
  - International Postdoc Programs
  - Multiple training programs for students
  - Bilateral Agreements with several countries for training and education of young scientists and engineers via the GET\_INVolved Programme.
- Very intense collaboration with Universities



# FAIR: a World-wide project

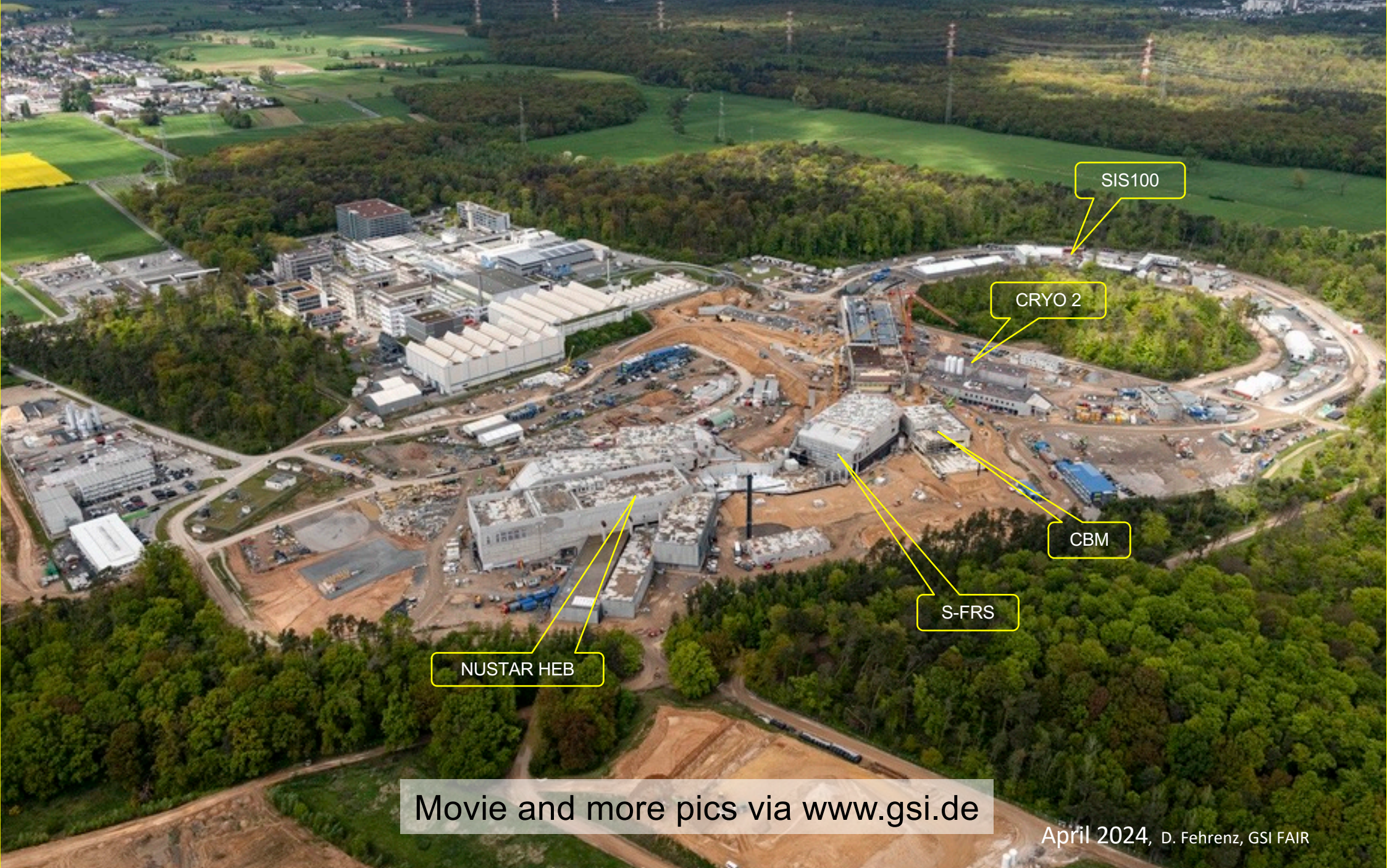


- FAIR governed by international convention
  - 9 shareholders:
  - + 1 associated partner:
  - + 1 aspirant partner:
  - About 3000 Scientists and Engineers from all over the world
- More than 200 institutions from 53 countries are involved with their scientists (orange + blue)



- Construction of FAIR
  - See next presentation
- Upgrade of existing accelerators
  - In progress: SIS18 already upgraded
- FAIR Phase-0 research program
  - Very successful
- Development on Campus to serve FAIR
  - Campus Masterplan under execution





NUSTAR HEB

S-FRS

CBM

CRYO 2

SIS100

Movie and more pics via [www.gsi.de](http://www.gsi.de)

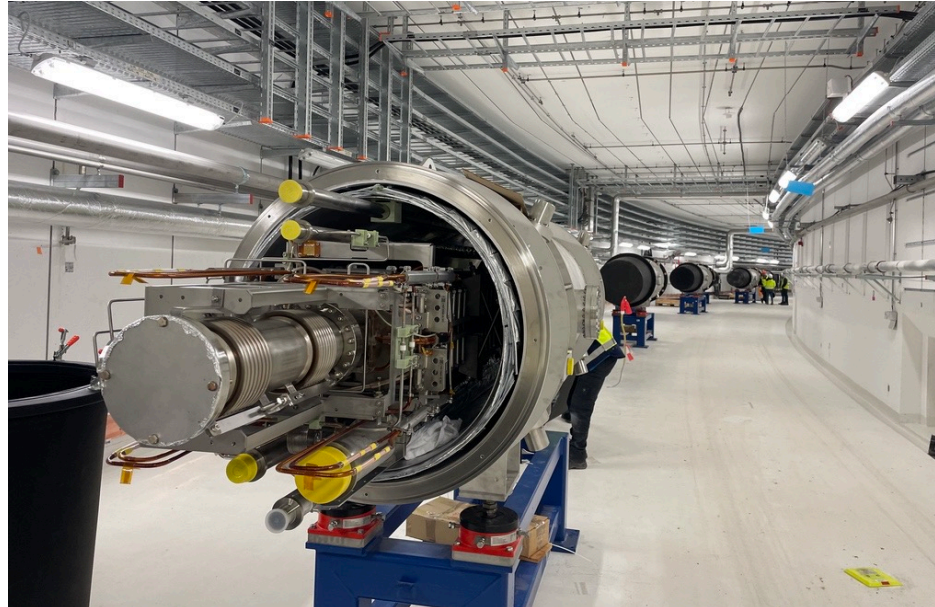
April 2024, D. Fehrenz, GSI FAIR



# FAIR Installation and Commissioning is Starting

## Installation

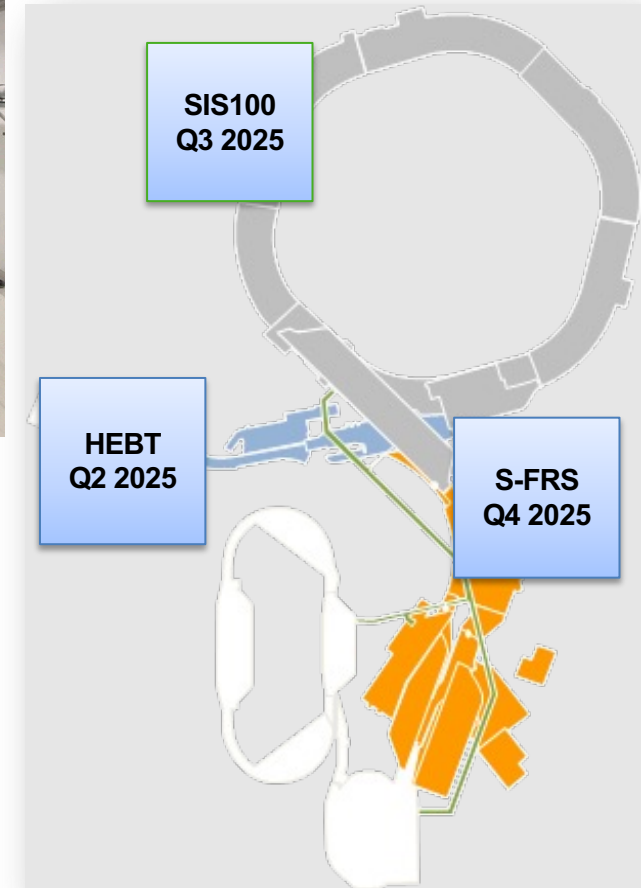
- Magnets are being installed in the tunnels



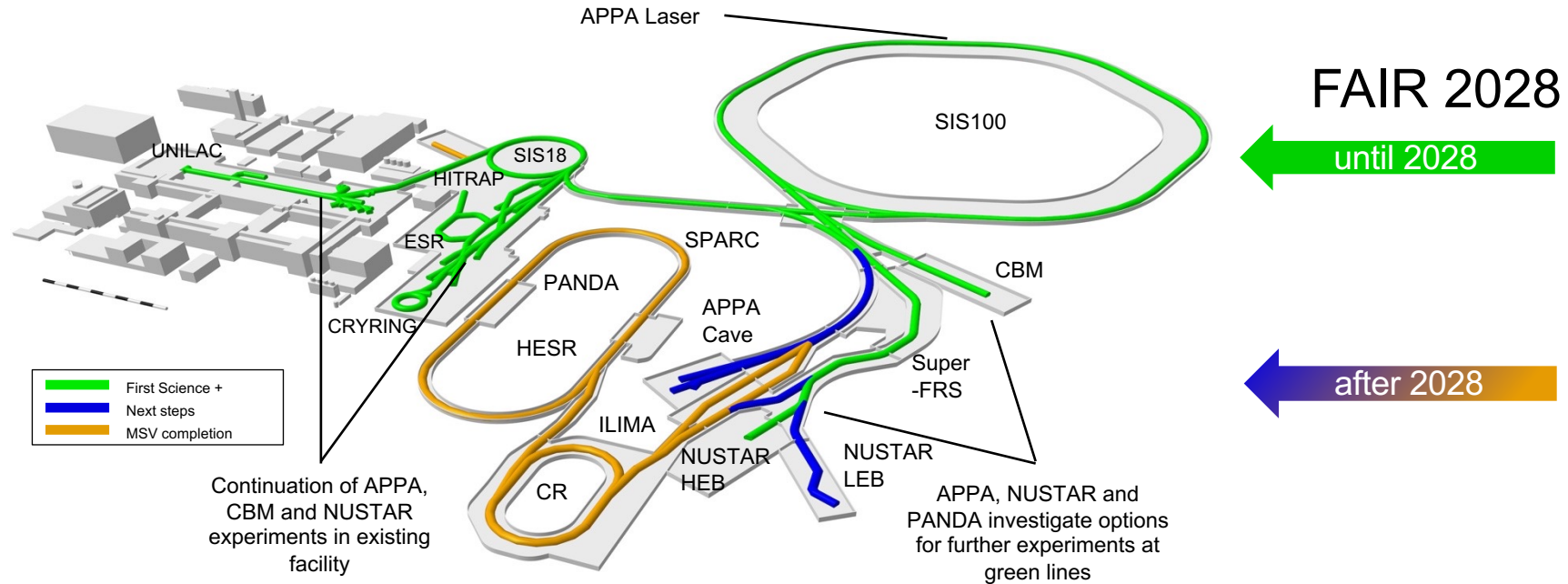
## Commissioning

- First steps are being made in 2024
  - Helium is being bought
  - Fellow and Associate program will start
- In 2025 Commissioning to start for real
- Commissioning Phase to run until 2028
- Operation Phase from 2029 onwards

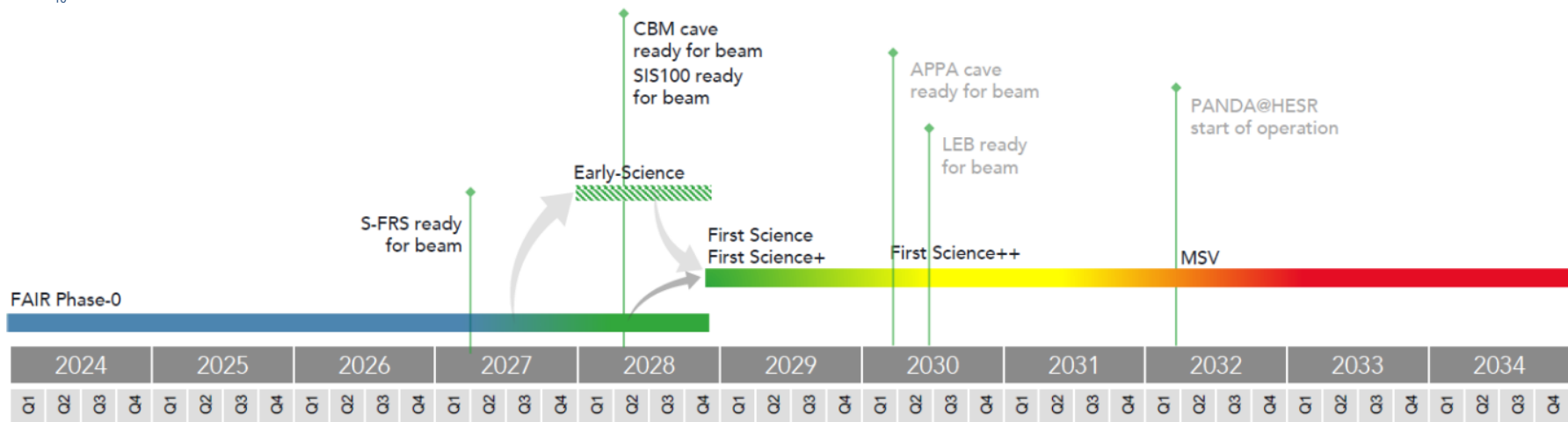
## Start of ACC Commissioning



# Current prospects and overall timeline



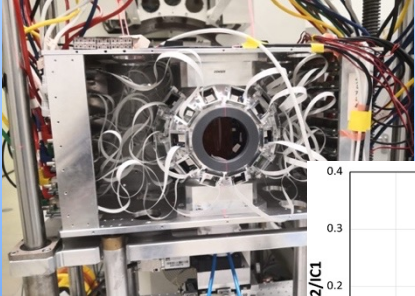
10



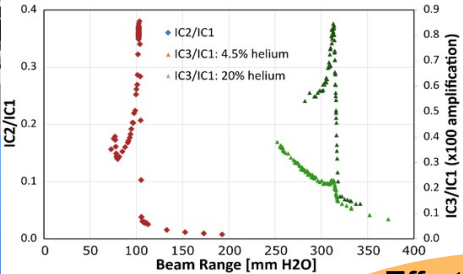
# Experimental highlights

**APPA**

**BARP PET**



Medical applications:  
Two ion species  
within one bunch




IC2/IC1

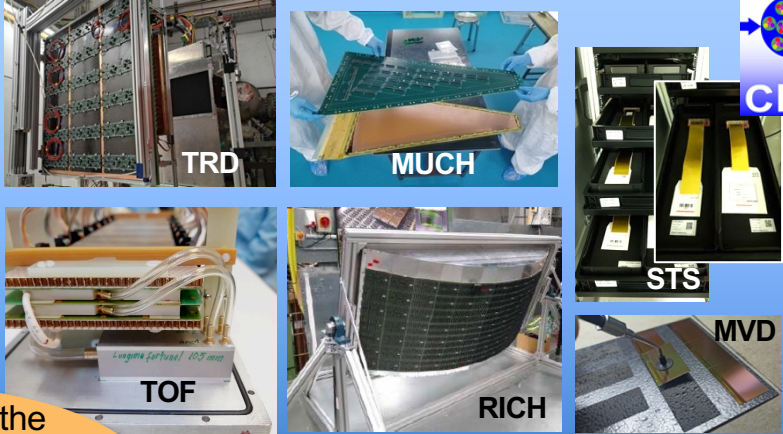
IC3/IC1 (x100 amplification)

- IC2/IC1
- IC3/IC1: 4.5% helium
- IC3/IC1: 20% helium

Beam Range [mm H2O]



**CBM detectors (pre-)production**



TRD


MUCH

STS

MVD


TOF

RICH

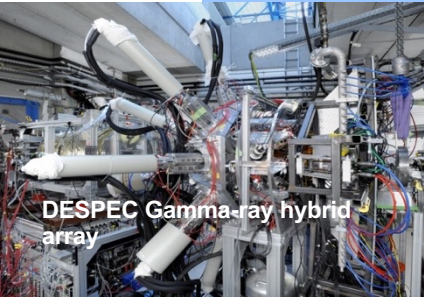


Effort to best use the part of FAIR which will be available by 2028


**NUSTAR**




**DESPEC Gamma-ray hybrid array**



**HYDRA TPC inside GLAD**



**R3B Target area Recoil tracking Stage 1**



**PANDA**



**EMC tests in Jülich**



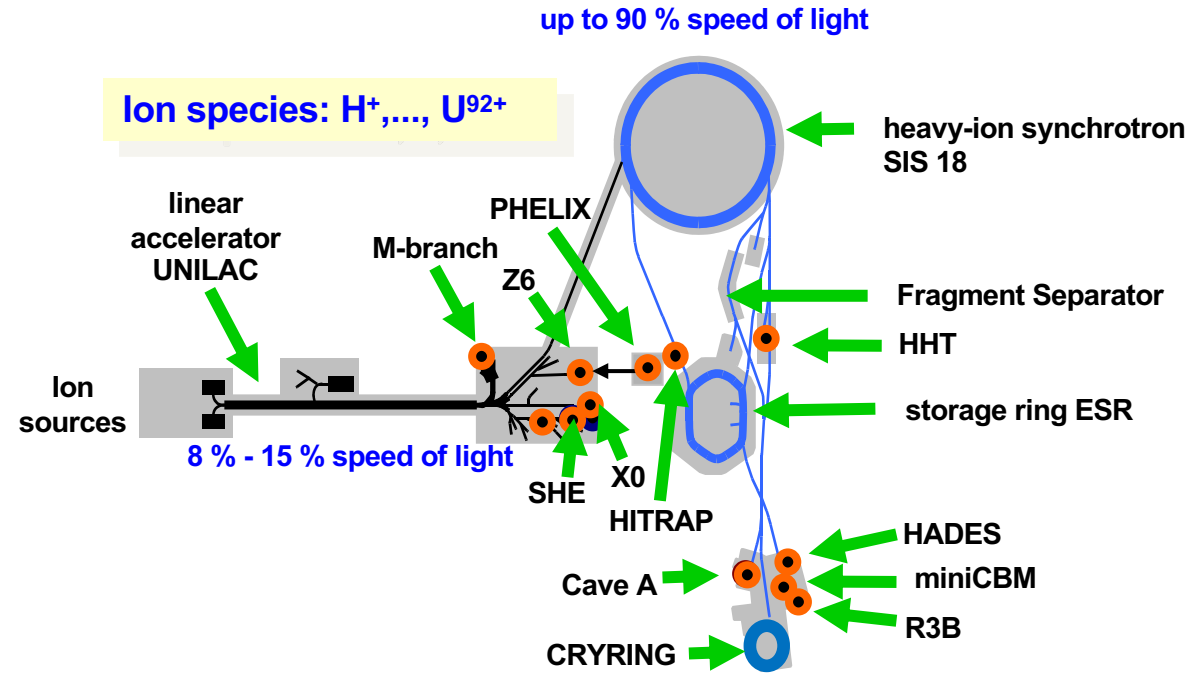
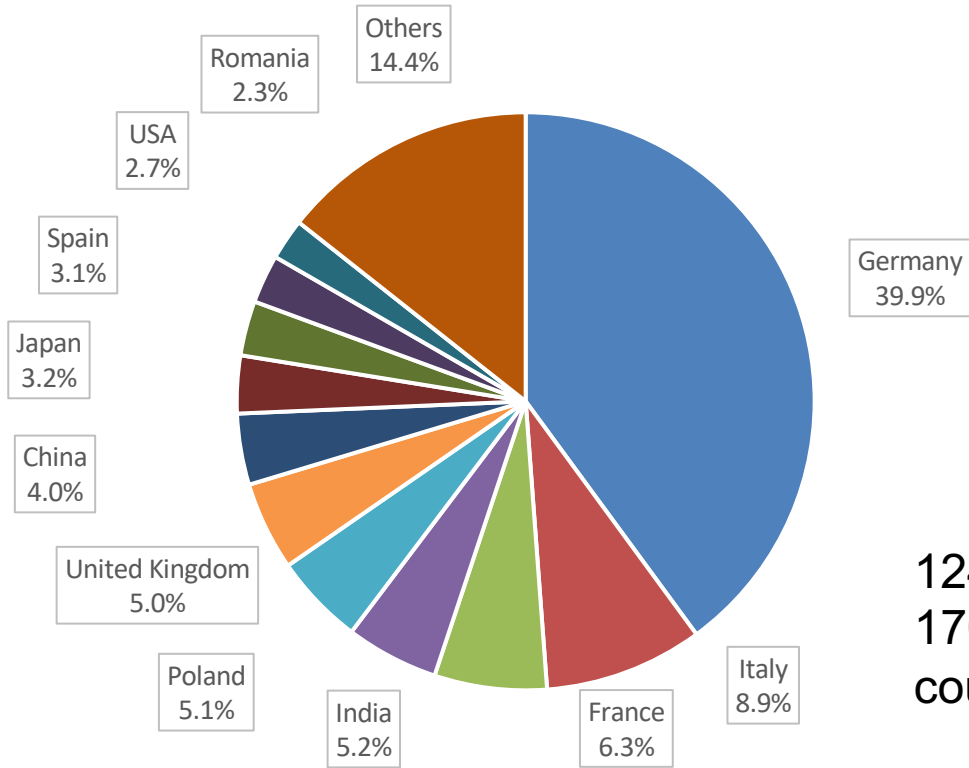
**Autom. teststand for tracker in Krakow**



# Ongoing precursor science program: FAIR Phase-0



- Started in 2019, annual runs of ~110 days until FAIR operation in 2027



124 proposals with more than 1700 participants from 45 countries received in 2022



Beam time started, very successful to date. Important learning curves towards FAIR

- A new Admin. Man. Dir. is expected to start in few weeks
- The search for a new Sc. Man. Dir. has started
- The FAIR Council chair is Catarina Sahlberg (UU/Big Science Sweden) and GSI AR-chair is Volkmar Dietz (BMBF Germany)
- Efforts to secure contributions from all FAIR Partners continues
- The commissioning of FAIR is under way, starting with technical infrastructures, cryo-plants and so on
- The Dec 2024 Council meeting will take place in India
- Difficult task for the management: integrate beamtime operation, installation and commissioning of the new facilities and essential interventions on the buildings (radiation shielding, fire protection...)

## Agenda and Topics at the 13<sup>th</sup> RRBs

### Today – Thursday

- Plenary session with introductions and report from ECE and ECSG
- CBM RRB
- PANDA RRB
- Dinner at "Weisser Schwan"

### Tomorrow – Friday

- APPA RRB
- NUSTAR RRB
- Concluding session
- Site visit (optional)

### Topic 1: ECSG Members (Gines Martinez stepped back)

- Nomination by Finland of Prof. Filip Tuomisto from Helsinki University

### Topic 2: MoUs:

- CBM Amendment to C-MoU
- NUSTAR Construction MoU

Signing should start unless serious objections are raised now



**Thank you very much!**