



# WP8 : *Upgrade of the FAIR facility for shielding testing*

---

CERN, 20.01.2023

HEARTS Kick-off Meeting

<https://indico.cern.ch/event/1216205/>



Marco Durante/  
GSI & TUDa



This project has received funding from the European Union's Horizon Europe Research and Innovation programme under GA No 101082402.

# FAIR: Facility for Antiproton and Ion Research

– builds on Competence of GSI and the Community worldwide

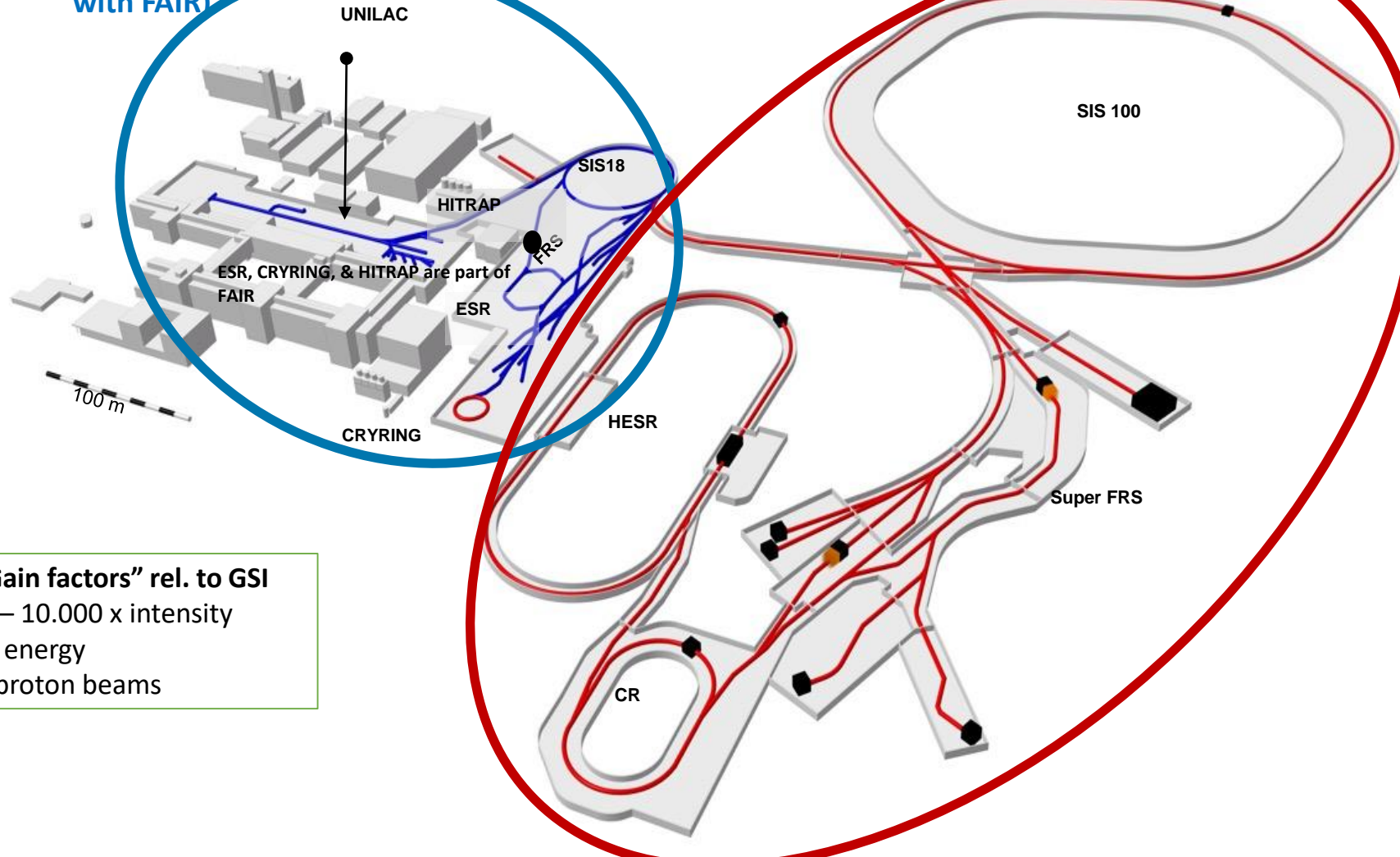


- **ESFRI Landmark**
- **Top priority for European Nuclear Physics Community**
- **Driver for Innovation in Science and Technology**

# FAIR: Facility for Antiproton and Ion Research

– builds on Competence of GSI and the Community worldwide

GSI, existing (ungraded to integrate with FAIR)



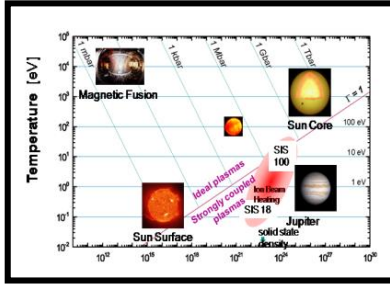
### FAIR "Gain factors" rel. to GSI

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

**FAIR,**  
under  
construction

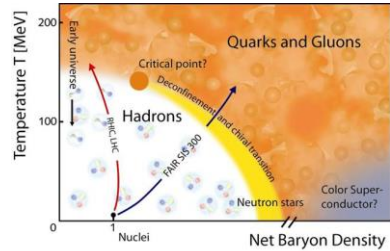


# The FAIR science: four pillars



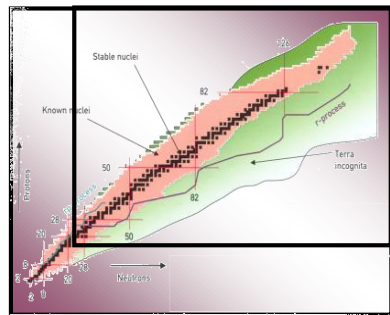
atomic physics, biophysics,  
plasma physics, material research

**APPA**



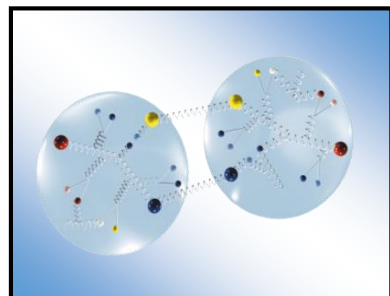
nuclear- and quark-matter  
*high-energy nucleus-nucleus  
collisions*

**CBM**



nuclear structure and  
nuclear astrophysics,  
*super-FRS*

**NuSTAR**



hadron structure and dynamics  
*Antiprotons*

**PANDA**

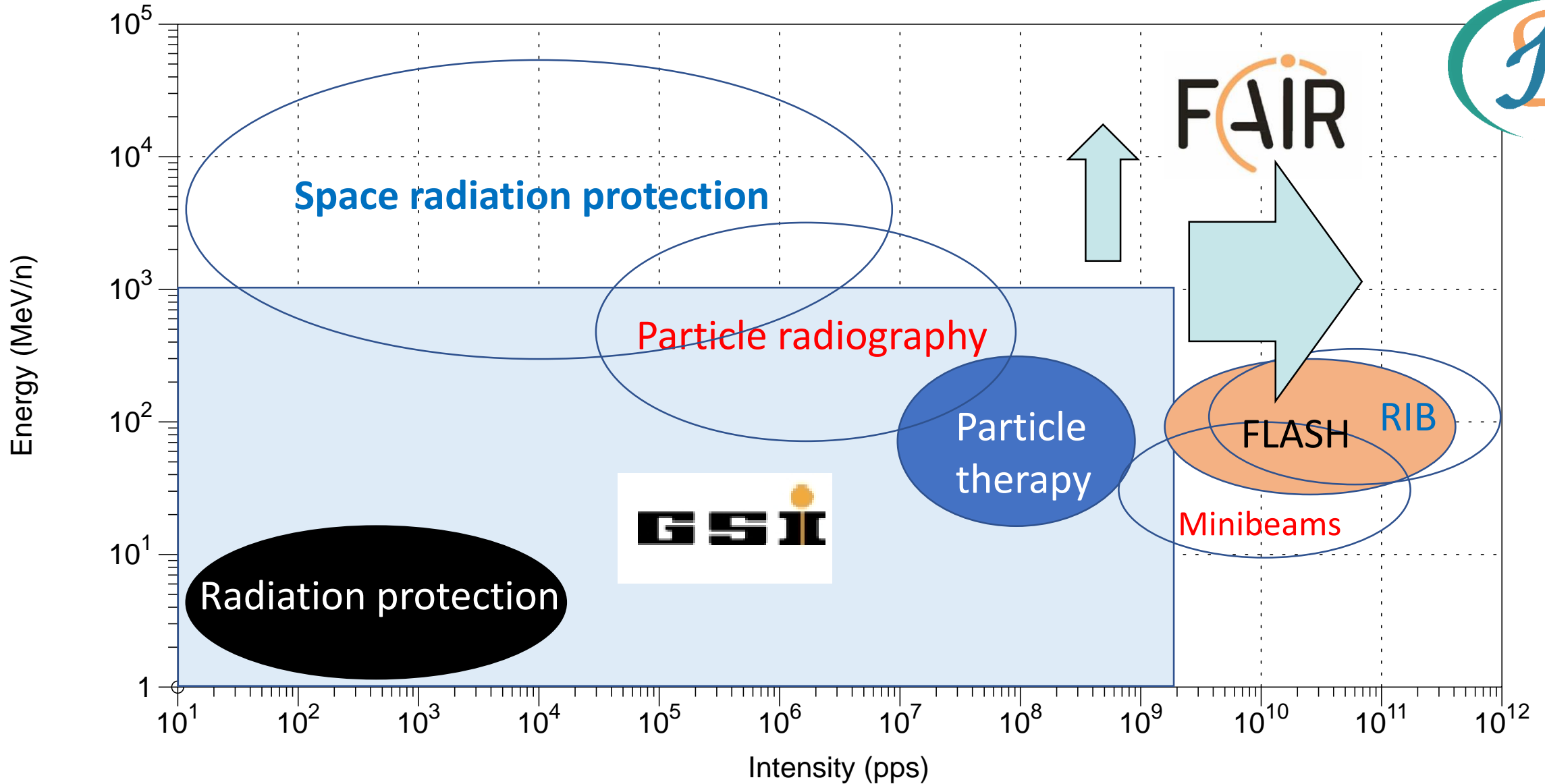


# Civil construction

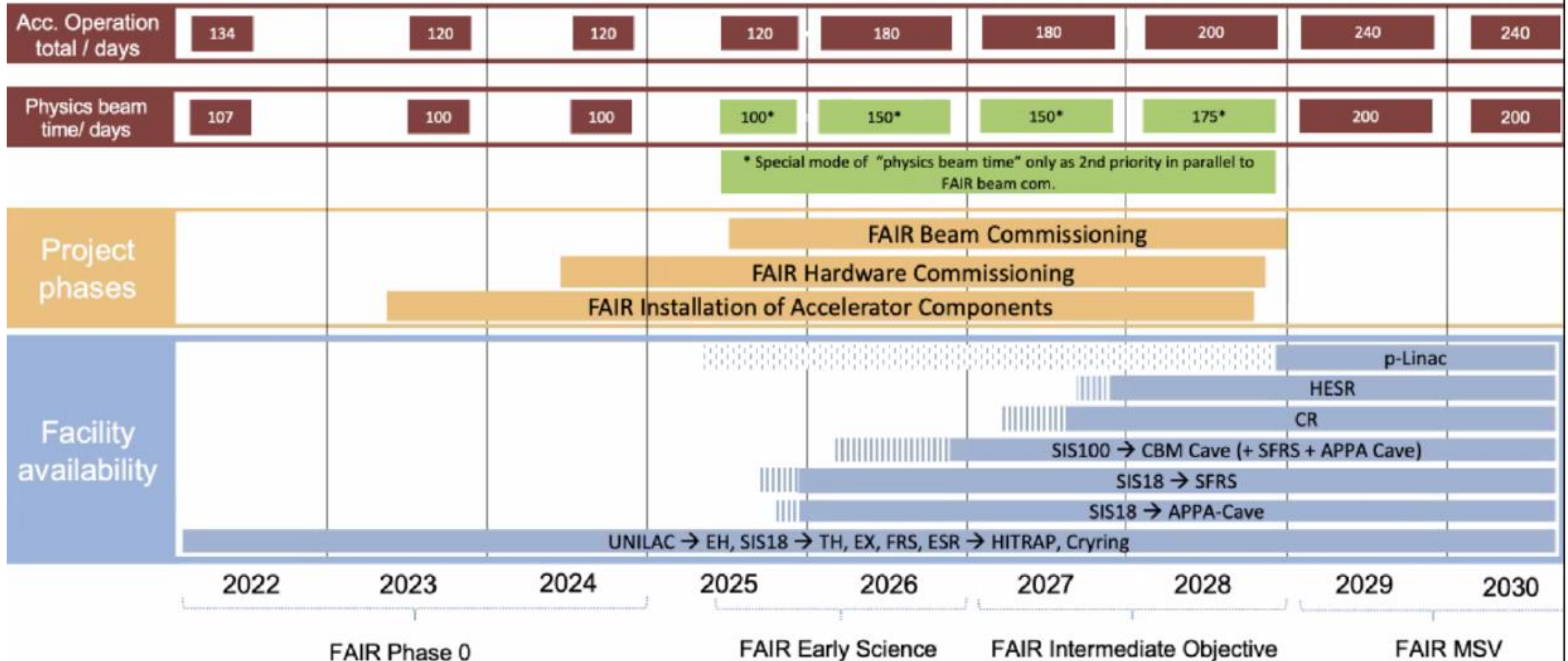
- Civil construction continues to make substantial progress
  - both civil companies (construction area North & South) are performing according to the baseline schedule





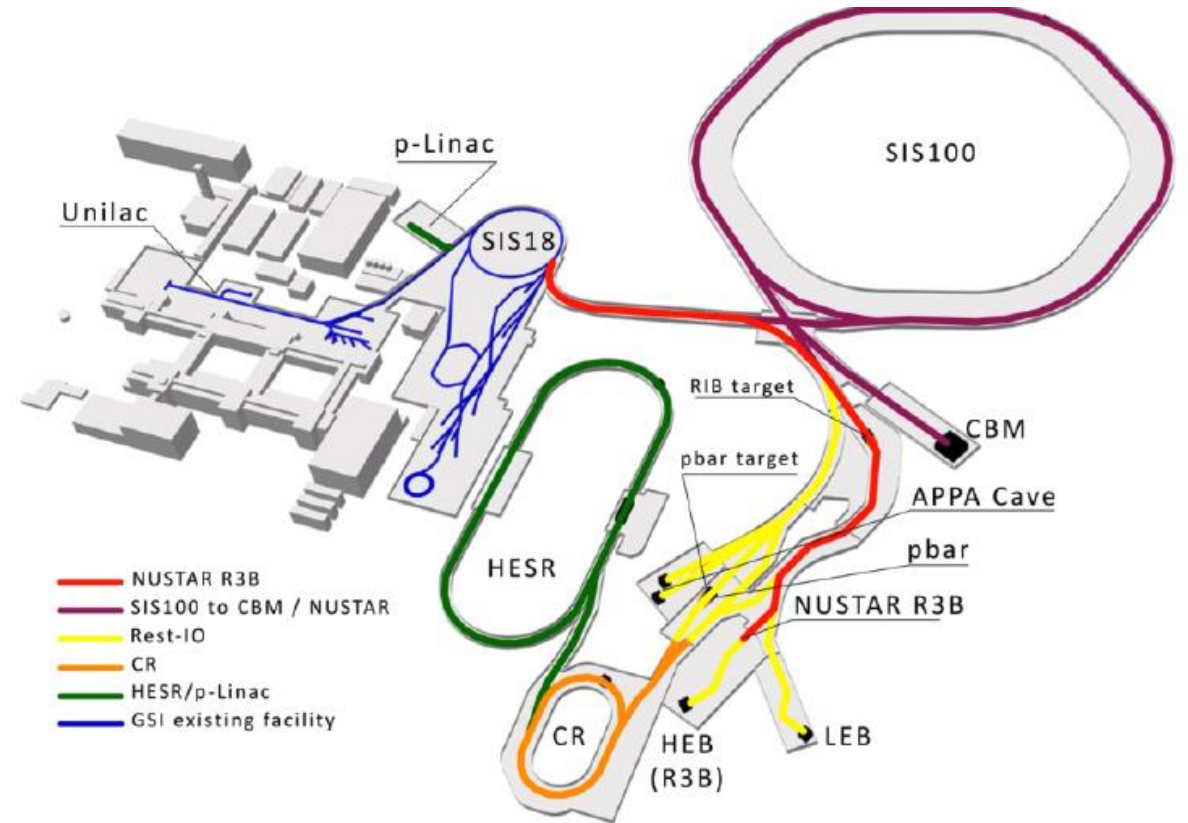


## FAIR/GSI strategic operation scenario



# FAIR review July 2022

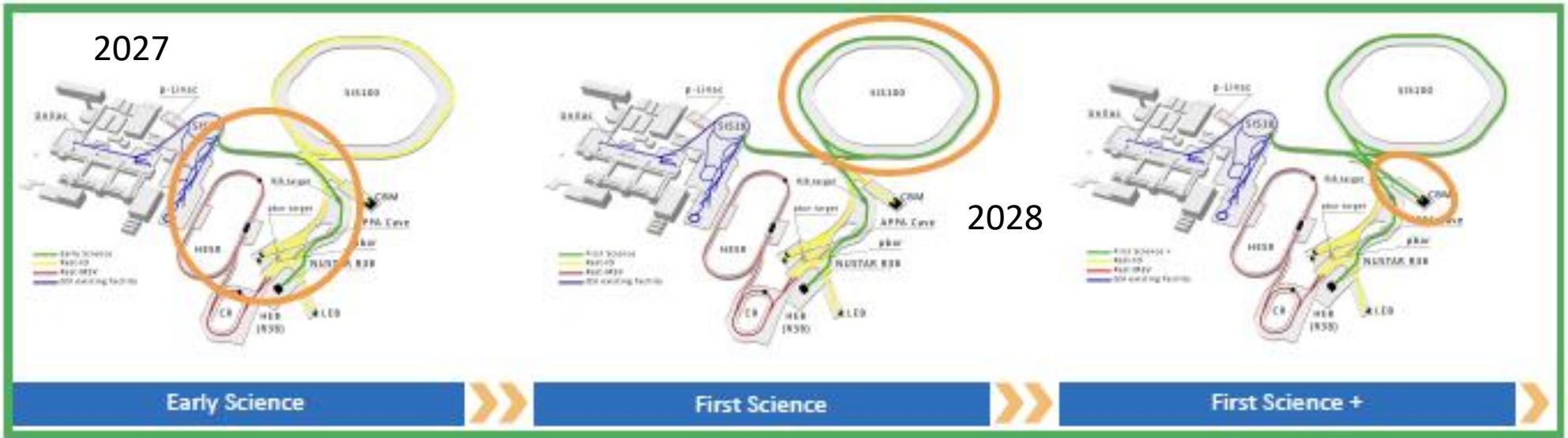
- The war in Ukraine and the energy crisis have increased the cost and consequently the FAIR council requested a new scientific review in 2022
- The international review panel has issued a report, which is publicly available on GSI website
- The scientific program of all four FAIR pillars is indicated as outstanding and in many cases world leading
- Given the financial constraints, a start configuration including SIS 100, SFRS with the High Energy Cave and CBM is recommended



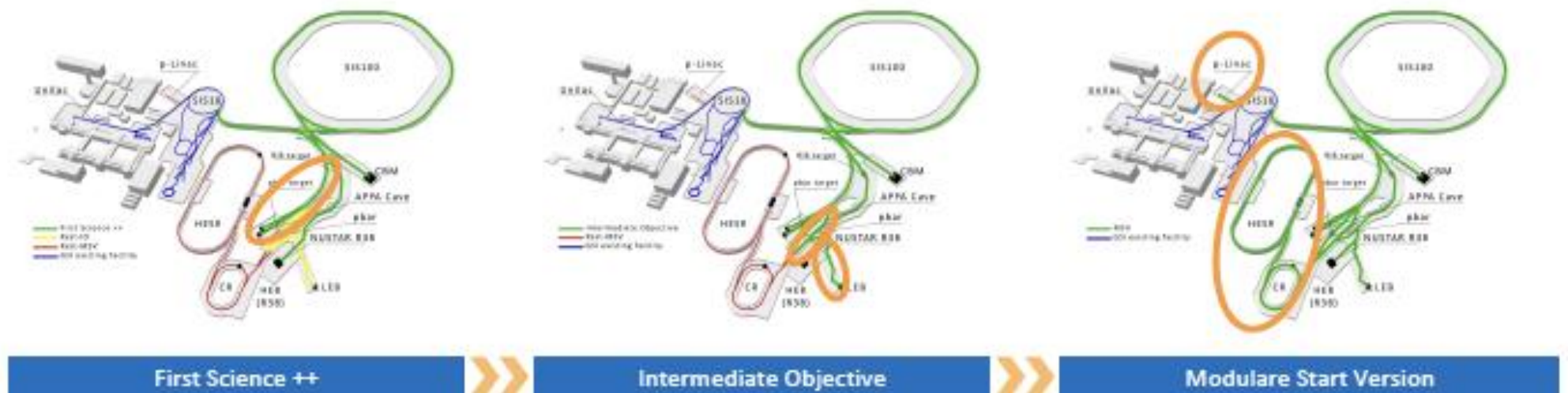
The panel considers the following steps as a possible path toward the IO:

- (1) Early Science with SIS18, NUSTAR and parts of APPA
- (2) First Science with SIS100 replacing SIS18
- (3) First Science with CBM in addition
- (4) First Science in the APPA Cave in addition





>2028

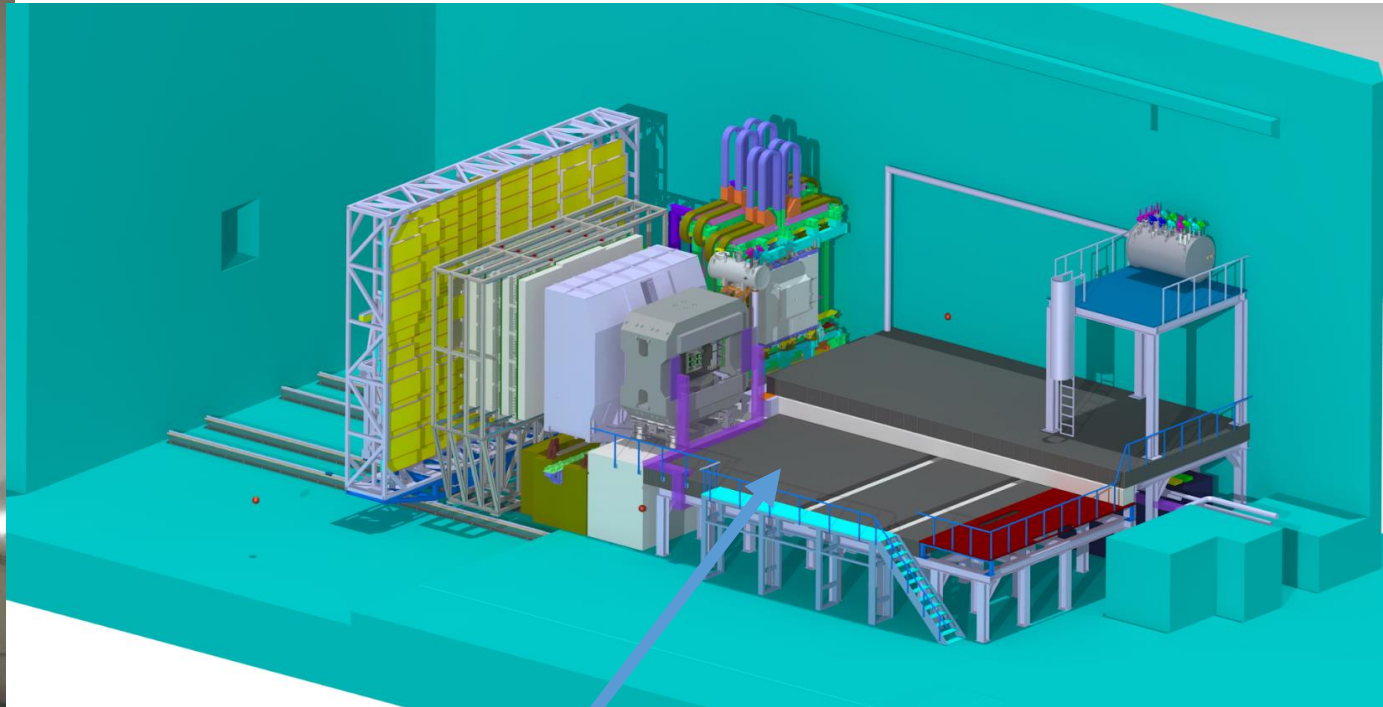


# Impact on HEARTS

---

- The impact of the war and energy crisis have substantially modified the FAIR construction plans in 2022
- The APPA cave is now postponed to >2028
- However, within the HEARTS frame we can study a setup for the GCR simulator in the CBM cave
- The physics-beam time days will raise slower than expected (100->150->200 h in 2023->2026->2029)
- Availability of beamtime in the GSI caves for our programs will remain in the order of 2 weeks per year

# CBM cave and HADES detector



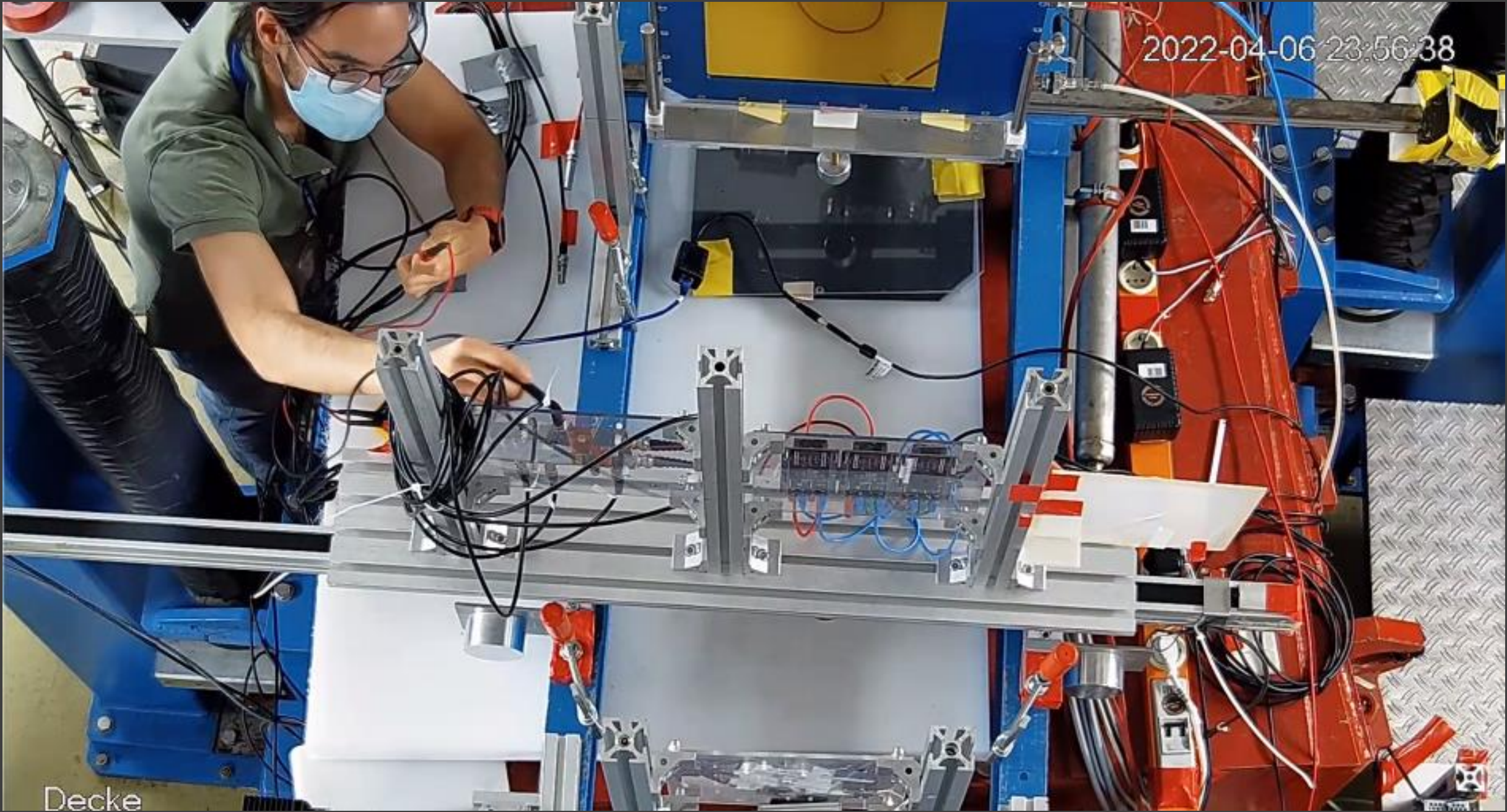
HADES  
detector



## Task 8.1/D8.1 M1-48

# ***Established framework for user access to the GCR/SPE simulator***

- Streamlined access procedure for VHE irradiation testing will be prepared in close collaboration to CERN (Task 7.3)
- At the moment GSI (FAIR-phase-0) is dedicating approx. 4 shifts/year to users supported by RADNEXT and ESA-IRES program (1 shift=8 h)
- The availability of beamtime at GSI/FAIR will remain very limited until the 30s but a limited access for testing components that need VHE should be guaranteed
- The HEARTS webpage should become a permanent point of access to VHE facilities (both CERN and GSI)



2022-04-06 23:56:38

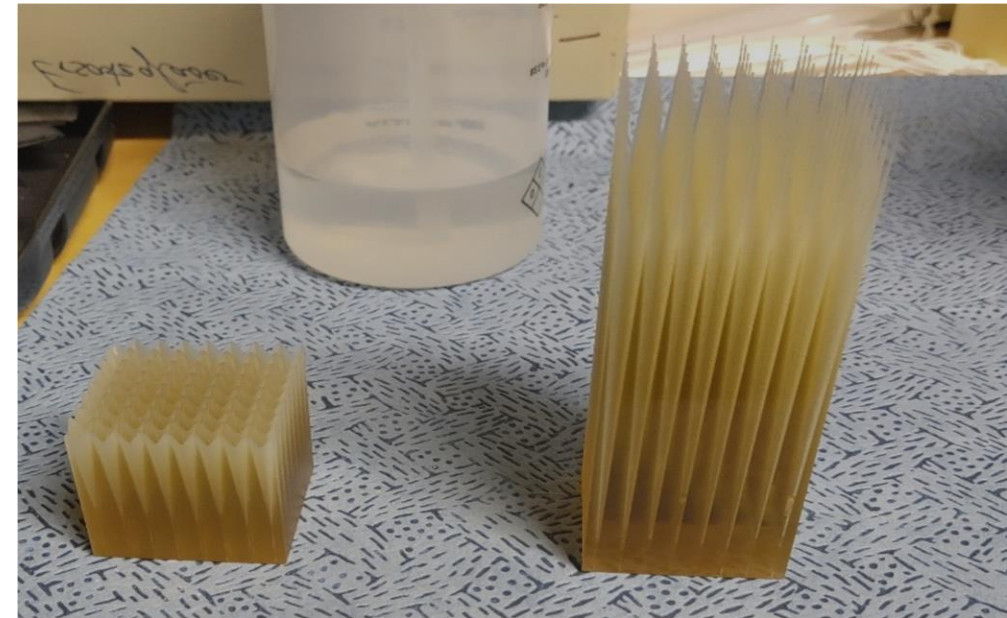
Decke

HEARTS Kick-off meeting, CERN, 20.01.2023



## ***GCR/SPE simulator installation in AFPA cave***

- New plan for installation of the GCR simulator (see WP6) in the CBM vault
- Construction of very thick ridge filters to modulate ultra-high energy beams
- Adapting the range modulator to a broad beam rather than raster scanning configuration
- Monte Carlo simulation (see WP3) of the HEARTS-beamline in CBM cave

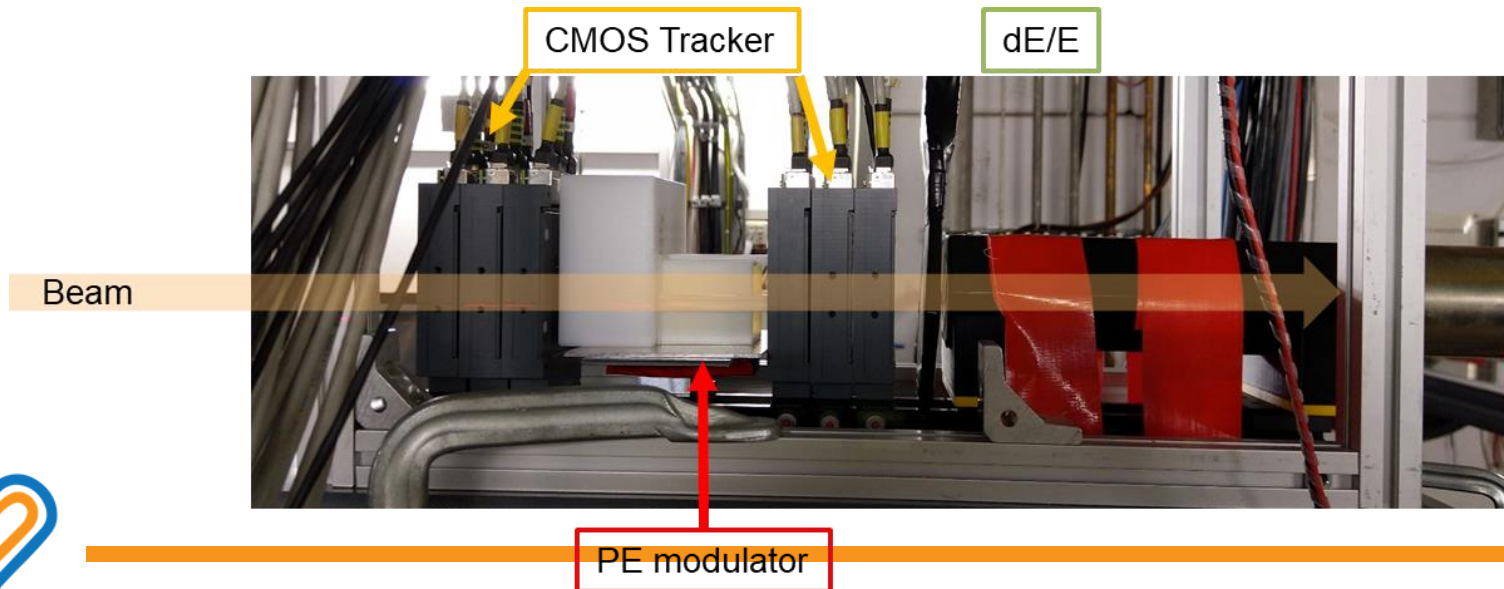




## Task 8.3/D8.3 M47-48

### ***Test of the GCR/SPE simulator***

- Test with 10 GeV/n Fe-ions in CBM cave may be difficult within the HEARTS time-frame (perhaps with a small 0-cost time extension)
- Tests with higher energy particles are however also possible at SIS-18 (e.g. 4 GeV protons, 1.5 GeV/n Fe-ions).



# WP8 – personnel allocation

Name	Task	% of the time in HEARTS
Marco Durante	8.1	60%
Christoph Schuy	8.2	20%
	8.3	10%
Uli Weber	8.3	10%
HEARTS physics postdoc	8.1	10%
	8.2	30%
	8.3	10%
HEARTS engineer	8.2	10%
	8.3	10%



**HEARTS**



This project has received funding from the European Union's Horizon Europe Research and Innovation programme under GA No 101082402.