

# **FAIR/GSI Status**

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Verbundforschungsmeeting 2023

- Report by international review panel publicly available in full ([www.gsi.de](http://www.gsi.de))
  - The scientific program of all four FAIR pillars is indicated as outstanding and in many cases world leading
  - *"If resources are tightly constrained, completing SIS100 with beams into the S-FRS and HEB cave, plus setting up and commissioning the CBM experiment offers an intermediate solution for developing world-class science at FAIR."*
- October 2022
  - FAIR Council decided to follow the recommendation of the review and take this as "the basis for the further FAIR execution"
- March 2023
  - FAIR Council stated that *"the realisation of the MSV... ..remains the aim of the FAIR-Project"*.
  - Germany committed additional 518 Million Euro to build First Science.
  - The German commitment of 518 Million Euro is greatly appreciated and the German authorities are thanked particularly to allow the work to be resumed with immediate effect towards First Science. The Management is confident that contributions from the other shareholders will allow very soon to also continue the path towards CBM without delay.

# Nomenclature: Steps of FAIR



Currently running FAIR Phase-0 experiments will mostly continue to operate on the GSI/FAIR campus, while the step below are progressively implemented (see "FAIR 2028").

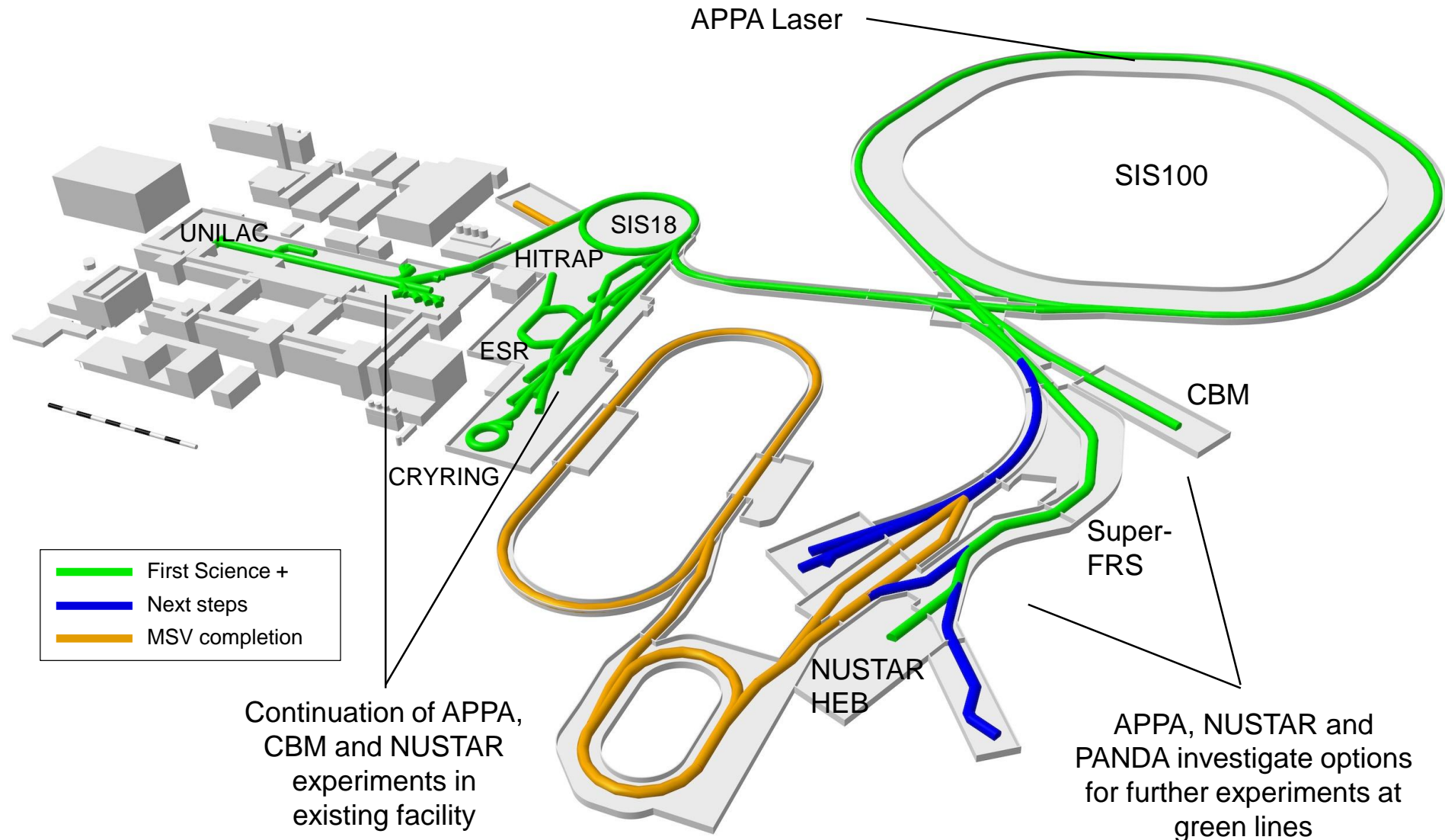
## Steps (defined by Review/Council)

- **Early Science (ES):** FAIR pre-cursor programme at the Super-Fragment-Separator (S-FRS) und NUSTAR High-Energy Branch (HEB) served by beams from SIS18.
- **First Science (FS):** first science at the Super-Fragment-Separator (S-FRS) und NUSTAR High-Energy Branch (HEB) served by beams from SIS100.
- **First Science + (FS+):** in addition to FS the CBM branch served by beams from SIS100.
- **First Science ++ (FS++):** in addition to FS+:
  - the branch into the APPA cave, and
  - the NUSTAR Low-Energy Branch (LEB)
- **MSV completion (MSVc):** Completion of the Modularised Start Version.

The steps are incremental, i.e. earlier steps are completely subsumed in the later steps.

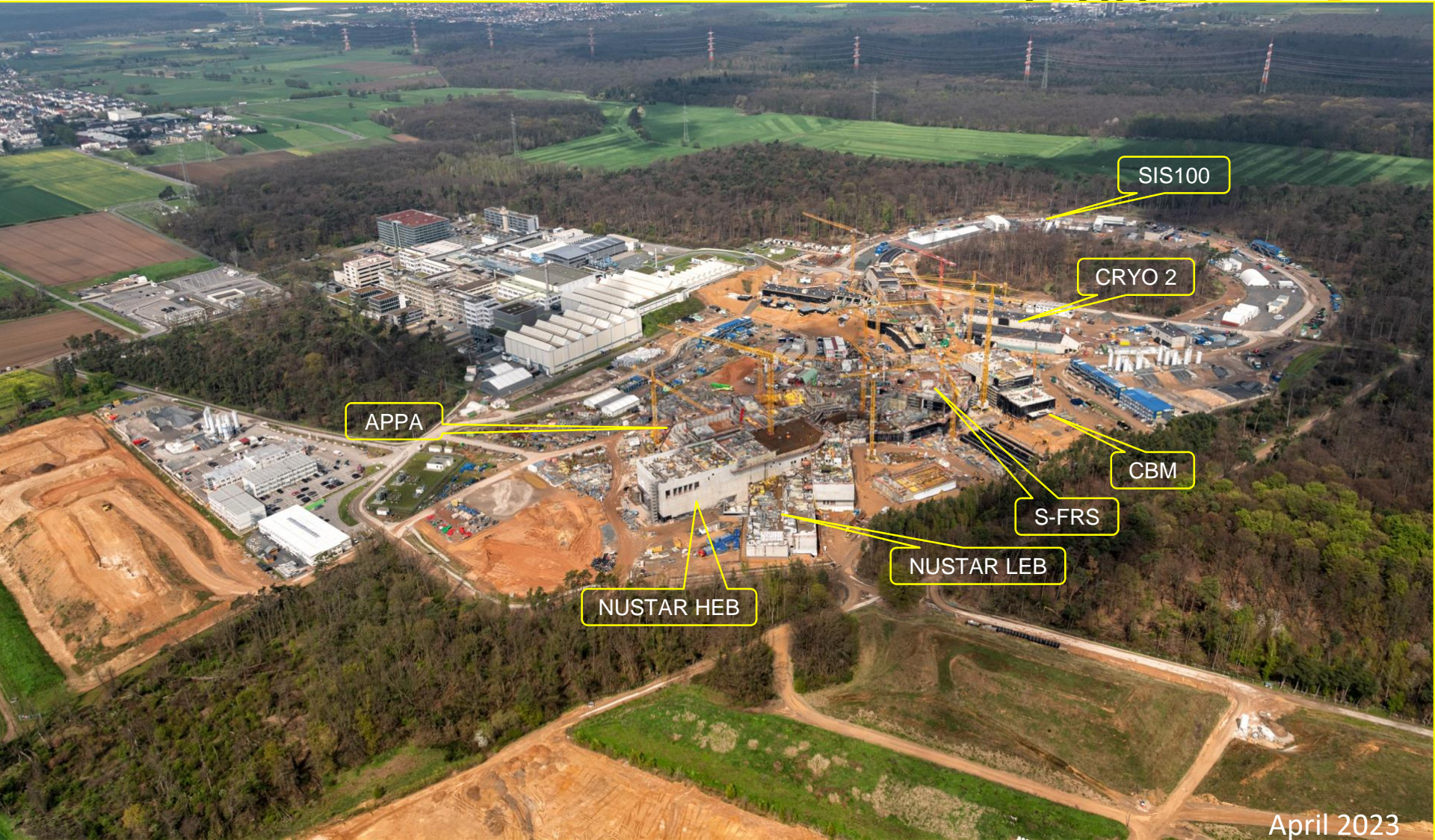
- Following the March Council
  - Work continued with the vision *FAIR 2028* and the current funding situation in mind. For the moment, only FS is guaranteed
    - Following the German commitment and Decision XXXVIII.6.1.
  - Further commitments from other shareholders are vital to make sure that FAIR 2028 can become reality.
- The project progresses, but challenges remain due to sanctions, supply chain uncertainties and cost uncertainties
  - Uncertainties with In-Kind deliveries become time critical.
  - The index for escalation is varying significantly.
- Contracts with Russian institutes terminated due to EU sanctions following Council decision. Possibility to resume production in JINR is being pursued.
  - Time-critical items need to be re-procured
  - Risk-mitigation regarding production at JINR
- Transition to “Commissioning and Early Operation” Phase coming soon
  - A first pre-budget is required in 2024

- FAIR in 2028 will feature the most valuable science program which can be hosted in the FS+ infrastructure.
- The „**FAIR 2028**“ science program will include:
  - **APPA** experiments *at the low-energy rings, at SIS100*, at the *caves at SIS18 and UNILAC* with and at *PHELIX* and a limited set of experiments which could be hosted at all the *caves served by SIS100*
  - **NUSTAR** at the *Super FRS with SIS100 beams*, plus *SHE and MATS experiments at UNILAC* and *ILIMA at the low-energy rings*
  - **CBM** at the *new cave with SIS100 beams*, and *HADES at SIS18*
  - **PANDA** is developing a hadron physics program to be carried as bridge towards the program with antiprotons, when possible *using the caves and beams available at GSI/FAIR* and synergies with other experiments.
- Given the limits of financial and human resources, other activities will be downscaled, delayed or even discontinued.



- Up to 2025 we continue with FAIR the annual block of continuous beamtime for Phase-0, from 2026 onwards we enter the mixed-mode of Phase-0 with the commissioning of the new beamlines.
- Annual beamtime for science will increase progressively, to reach full year operation from 2028 onwards.
- Some experiments at the Super-FRS will start already in 2027 using SIS18 beams („Early Science“)
- We will try to keep a broad research programme on campus, which will also serve the long-term goals of FAIR.

# Civil Construction



April 2023

Movie on [https://edms.cern.ch/file/2796608/LATEST/FAIR\\*720p\\*.mp4](https://edms.cern.ch/file/2796608/LATEST/FAIR*720p*.mp4)  
or via [www.fair-center.eu](http://www.fair-center.eu)



# Experiment Construction

Phase-0 at CRYRING

SPARC

MAT

APPA

CBM

Yield

60

40

20

0

1.1 1.15 1.2 1.25

$M_{inv}$  [GeV]

Same event
Mixed event
Same - Mixed
Mean: 1.1199 GeV
Width: 7.2811 MeV
Signal: 513
S/B: 6.965
Sgnf: 21.10
Prob: 1.01e-06

CBM

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

HISPEC/DESPEC

Super-FRS EC

R<sup>3</sup>B

HISPEC/DESPEC

HISPEC/DESPEC

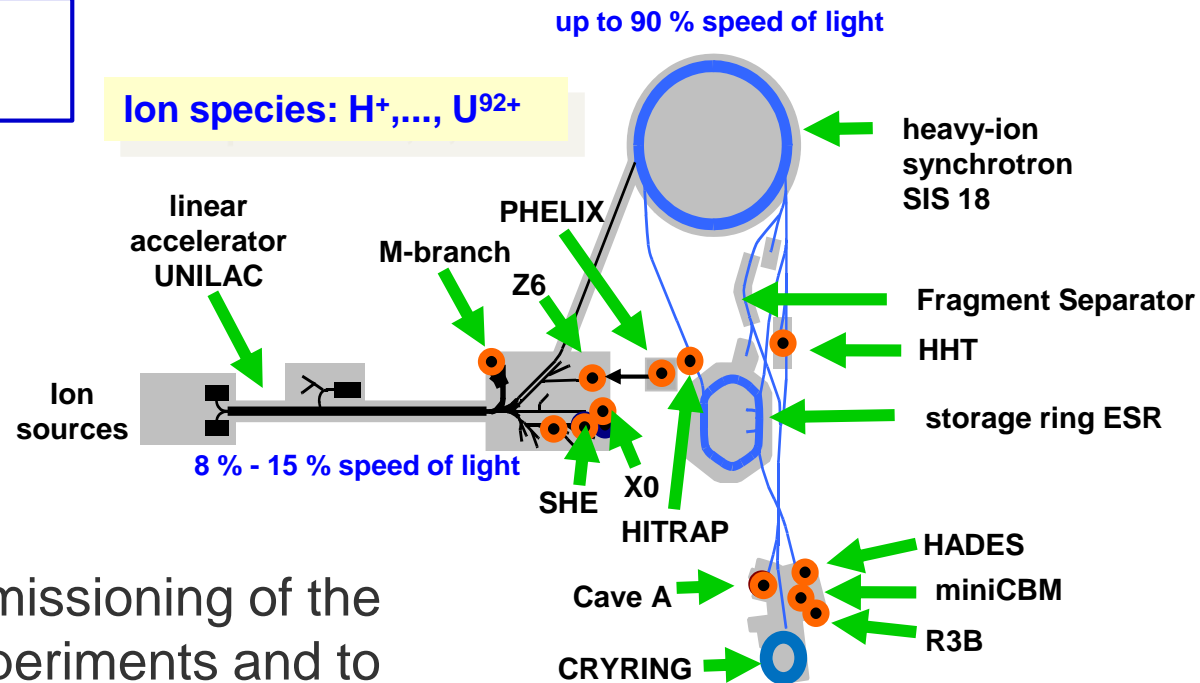
PANDA

pan da

# Early science program FAIR Phase-0



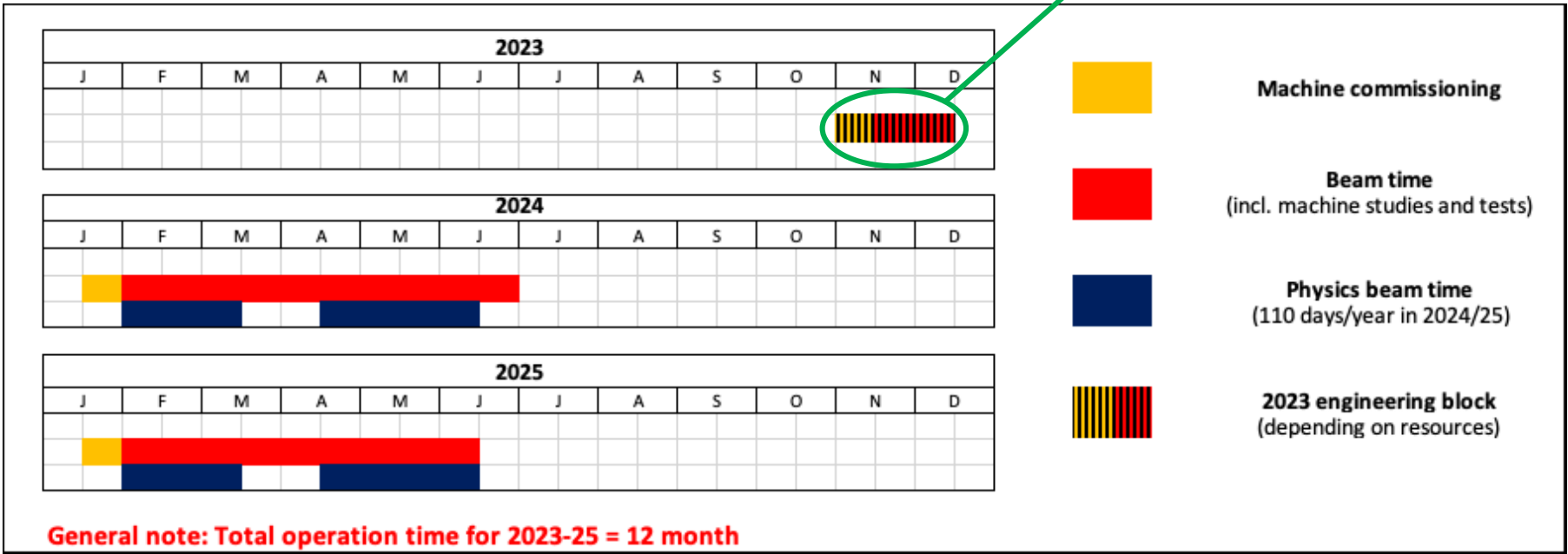
- Started in 2019, annual runs of ~110 days until FAIR operation



- Indispensable for the commissioning of the accelerators and of the experiments and to develop the know-how for their operation
- Science while commissioning FAIR
  - 2021 and 2022 runs completed as planned
  - Following the call for the next runs, the PACs, composed of international experts, evaluated the proposals in Sept 2022

# Beam time 2023/2024/2025

In 2023 just an engineering run



- This plan allows to honour all the beamtime offered in the current call
- The plan for 2026, 2027 and 2028 will be defined in the coming year



**Thank You!**