

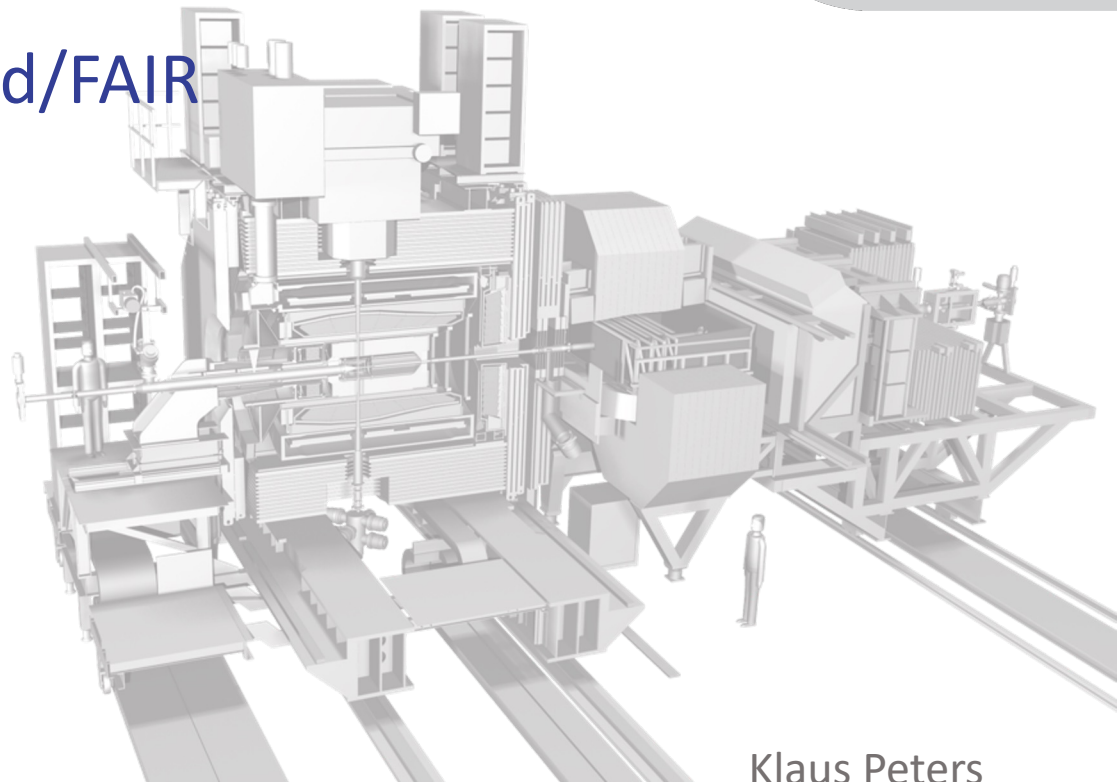
PANDA Overview

report by the Spokesperson



Resource Review Board/FAIR

GSI Darmstadt, May 16, 2024



Klaus Peters
GSI/U Frankfurt

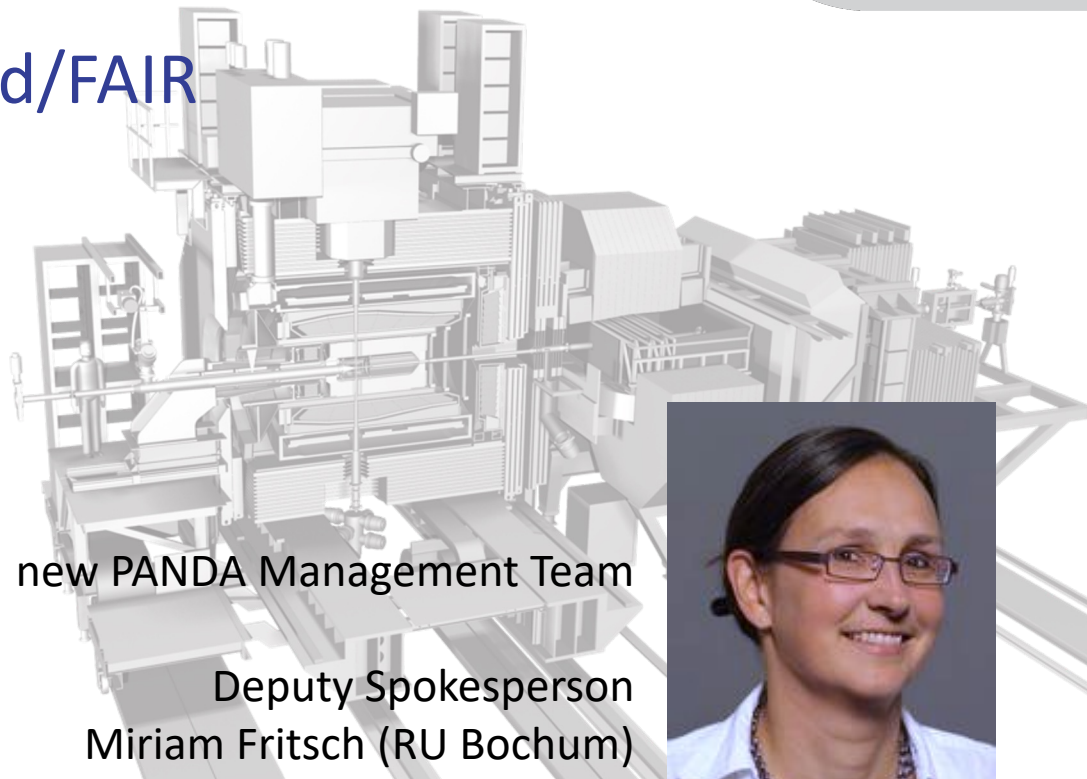
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new PANDA Management Team

Deputy Spokesperson
Miriam Fritsch (RU Bochum)



PANDA PhD Prize 2023

Anna Alicke for

“Development of fast track finding algorithms for densely packed straw tube trackers and its application to Ξ hyperon reconstruction for the PANDA experiment“



PANDA Outstanding Achievement Prizes 2023

Lars Schmitt & Tassos Belias and
Anna Alicke & Tobias Stockmanns



New PANDA Member Country



Since spring 2024 PANDA has a new member:
Osaka University with Ken Suzuki as group leader

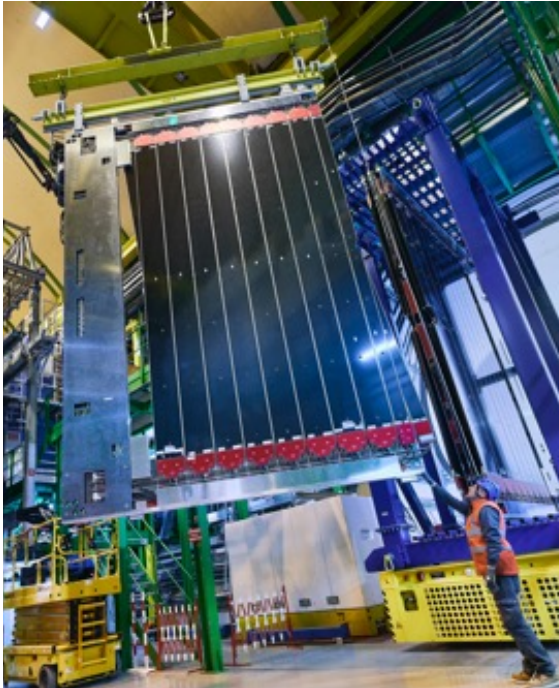
There is broader interest from Japan and personal meetings
with Japanese groups are planned

Stronger ties to JPARC groups / Synergy

PANDA receives the LHCb Outer Tracker (Aug 24, 2023)



LHCb/CERN donated the formidable Outer Tracker straw tube detector to PANDA at GSI/FAIR.



One of 12 frames, $5 \times 6 \text{ m}^2$, with 4352 straws in 18 modules. (Photo courtesy: LHCb)



Whole OT in transport frame, $7 \times 5.5 \times 3.5 \text{ m}^3$, 24t, arrival at GSI, Aug. 25, 2023. (Photo courtesy: GSI)

Outer Tracker brief specs

Straw tube

- Diameter, length: 5 mm, 2.4 m
- Anode wire: $25 \mu\text{m}$ at 1550 V
- Gas mix: Ar/CO₂/O₂

Module

- Two staggered layers of 64 straw tubes
- One module: $X/X_0 = 0.37\%$
- Independent upper and lower sides
- Front-end electronics (FEE) each side

Whole Detector

- 53,760 straw tubes, 216 modules, 432 FEE
- Area coverage: $5 \times 6 \text{ m}^2 \times 12$ planes

Performance (LHCb operations, Run 1&2)

- $\epsilon \approx 98\%$, $\sigma \approx 170 \mu\text{m}$
- $\delta p/p \approx 0.4\%$ (2-100 GeV tracks)
- No ageing, no gain loss

PANDA successful FwEMC Test at COSY



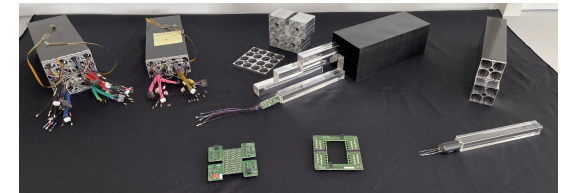
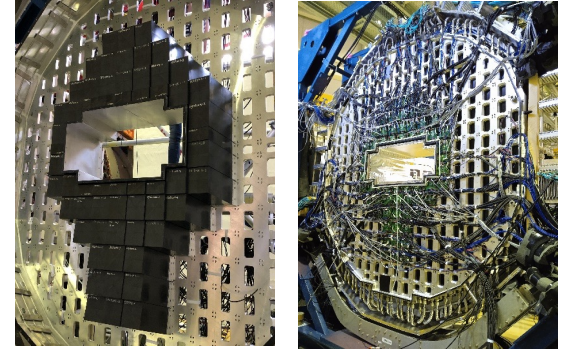
2 weeks test-beam at COSY in August/September 2023

proton beam at $p=2.7$ GeV/c

w/ 20% crystals installed

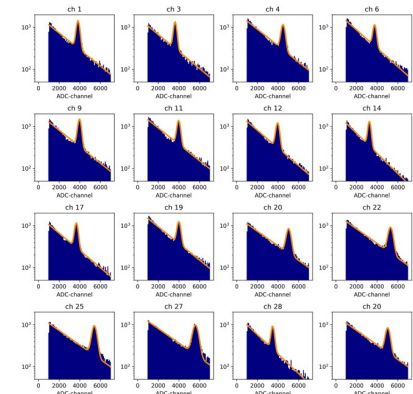
Crystal Barrel DAQ + PANDA SADCs

operation from -15°C (first week) to -25°C (design)

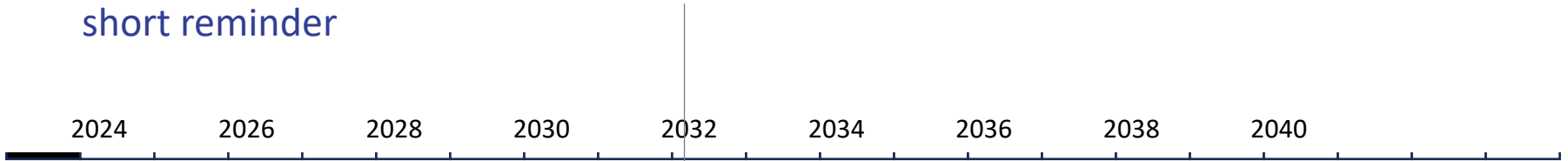


Installation at
COSY/FZ Jülich

Energy spectra
and minimum
ionizing peaks



short reminder



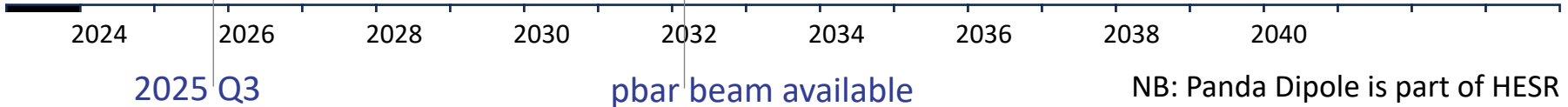
PANDA Milestones:

- Decision on the technical choice for the CR: Q4 2025
- Funding decision for Area West CC : Q4 2025
- Funding allocation: Q2 2026
- PANDA cave: Q1 2030
- Start of operation: Q2 2032

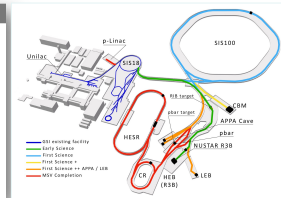
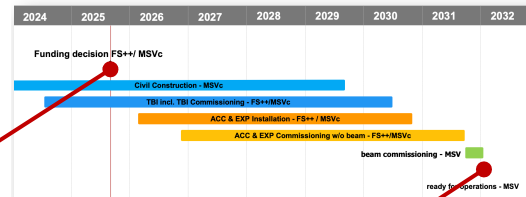
Main risk items:

- PANDA Solenoid
- Barrel EMC Crystals

MSV completion working group



Outlook: Steps beyond FS & FS+: FS++ APPA/LEB & MSVc



- Working assumption pending on decisions by the shareholders of FAIR
 - Steps beyond FS+ require additional funding, ideally to be in place by Q3 2025 so that the existing FSB Team and contractors are still in place
 - CR layout modified according to MAC recommendation
- Decision 2025
 - FS++ APPA/LEB ready for operation – 2030
 - MSVc ready for operation – 2032

FAIR project time schedule 2023 re-baselining report | 05.07.2023

Keep and develop **Community, Technology** and **Expertise**

- Science (Complementary Hadron Physics)
- Synergy (PANDA Development together with other experiments)
- Satellites (PANDA Technology being used in other experiments)

Keep and develop **Community, Technology** and **Expertise**

- Science (Complementary Hadron Physics)
 - $e^-/\gamma/p$ induced reactions @ various energies
- Synergy (PANDA Development together with other experiments)
 - DRD1,3,4 / AMBER@CERN / GlueX@JLAB / ePIC@BNL
- Satellites (PANDA Technology being used in other experiments)
 - A1@MAMI / CB@ELSA / Hades@SIS18 / Koala @ Cave-C

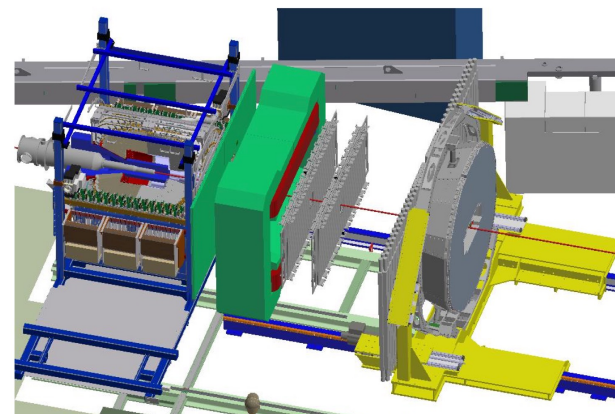
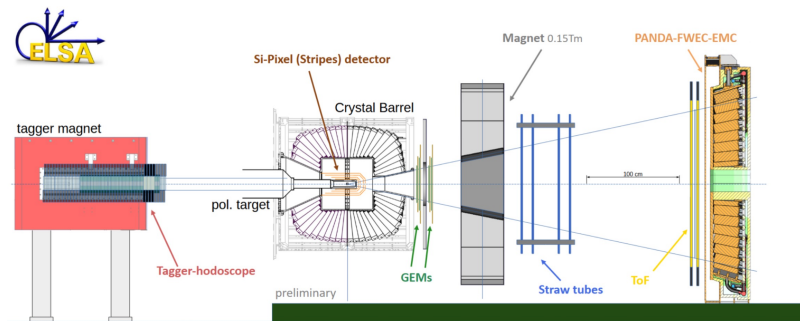
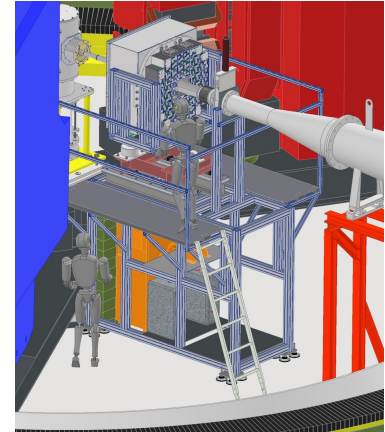
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 - A1@MAMI / CB@ELSA / Hades@SIS18 / Koala @ Cave-C
- While PANDA is doing construction and R&D wherever possible
- And accelerators are prepared for the start of new funding
 - MSVc Group chaired by the PANDA TC Lars Schmitt

Satellite Activities



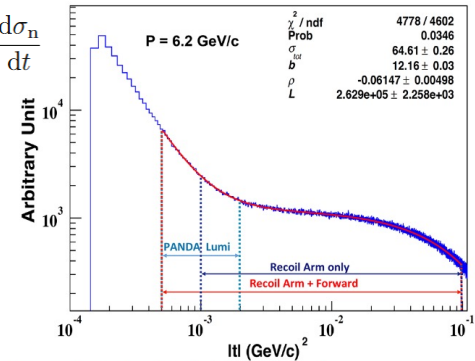
- PANDA@HADES is a success story
First results are already available
and there is more to come
- PANDA@MAMI will see the first beam soon
 - installation August 2024
 - commissioning run Oct 2024
- PANDA@ELSA is progressing as well



Koala@Cave-C

- Koala will be an HESR experiment
- Goal is to improve Luminosity determination at PANDA by better measuring the differential ppbar elastic scattering cross section

$$\frac{d\sigma}{dt} = \frac{\pi}{k^2} |f_c e^{i\delta} + f_n|^2 = \frac{d\sigma_c}{dt} + \frac{d\sigma_{\text{int}}}{dt} + \frac{d\sigma_n}{dt}$$

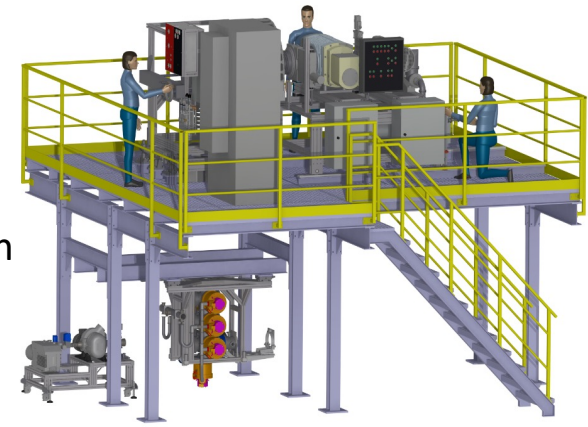


Luminosity Challenge

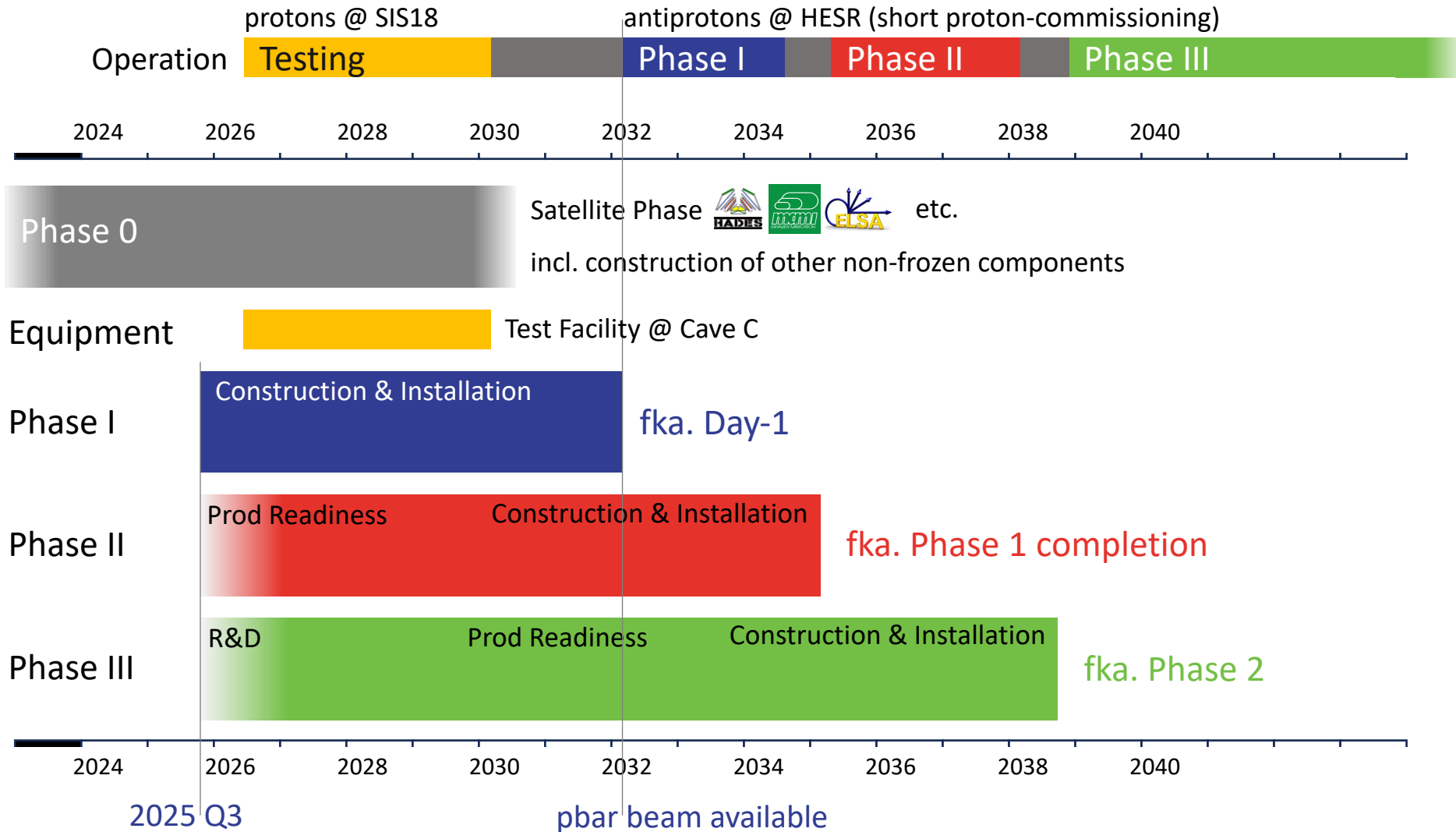
- Interference between Coulomb and hadronic amplitudes
- Poorly known hadronic amplitudes have to be known with sufficient accuracy → Koala

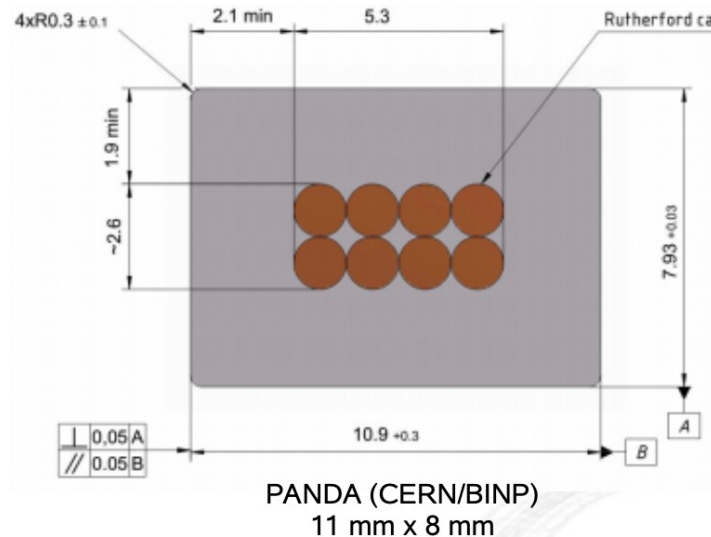
Move Koala from COSY to GSI Cave-C

- LMD prototype, cluster jet target and recoil detector
- determine real residual gas distribution on a long beam-pipe and proper handling of Lumi determination
- Nucleus for a mini-PANDA starting ~2026 using a platform which will be reused later in the PANDA Hall
- NB: R&D for a pellet-mode



PANDA @ FAIR





Wuxi Toly 15 mm x 4.7 mm

Superconductor from Wuxi Toly

Al stabilized conductor, 16 strands

Core for CEPC solenoid conductor

Samples donated to GSI from IHEP Beijing

Planned Tests

Microscopy study of cross section, strand and bonding

Extract strand and check for shape and broken filaments

Critical current vs. B in the range 3-5 T

Residual Resistance ratio

Main Question stability and margin

European Test Facilities for Superconductors

SuperACT foundation at U Twente (NL)

CEA LEAS, Saclay (F)

SULTAN Facility, EPFL/PSI (CH)

- Scientific Community is fully behind PANDA and its objectives
- **Construction of detectors** already started is being continued
- **R&D for PANDA** is going on
- Anyhow, for the time being, funding requires a certain **adjustment of priorities** for a couple of groups
- **PANDA Satellite activities** are progressing well
- Cave-C @ GSI will be used by PANDA for test purposes
- **Co-operation agreements** with other experiments/labs for synergy effects are being discussed and implemented
- Optimizations to realize a more **cost-effective setup** are under investigation



panda.gsi.de

FAIR

Thank you