

# Статус проекта FAIR

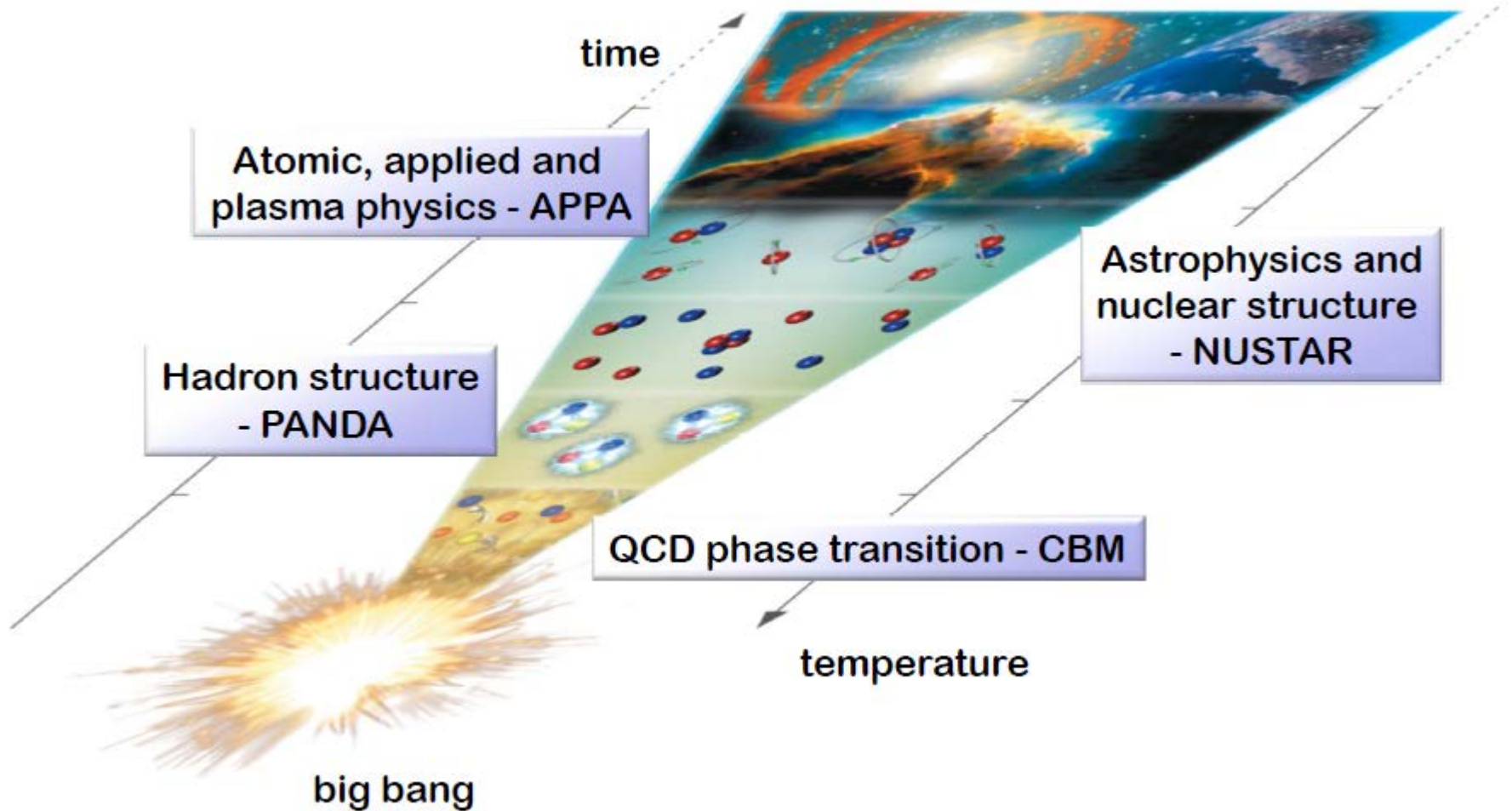
*(Facility for Antiproton and Ion Research)*



FAIR 2025

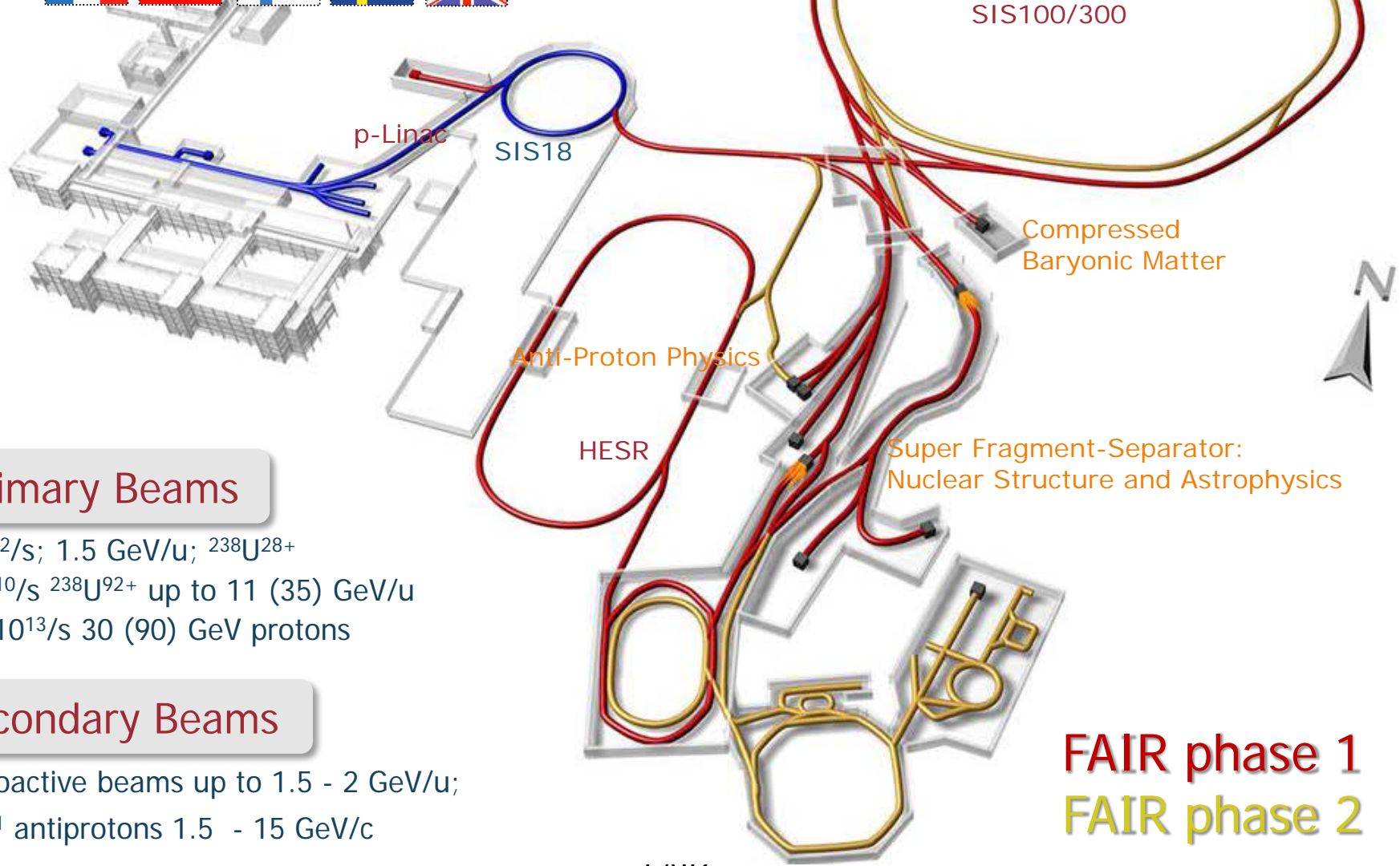


# FAIR Science Sketch





# FAIR – Conceptual View



## Primary Beams

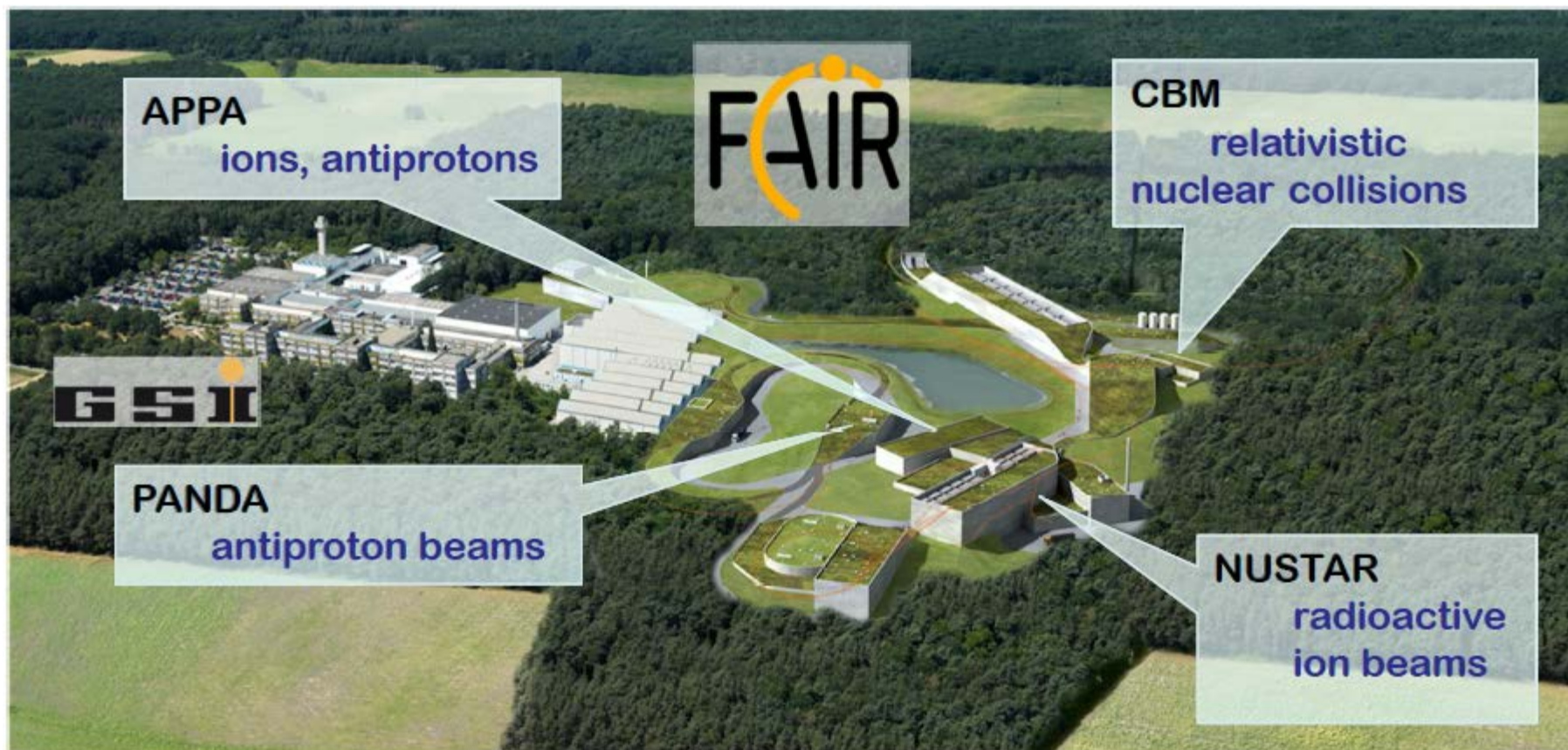
- $10^{12}/s$ ; 1.5 GeV/u;  $^{238}\text{U}^{28+}$
- $10^{10}/s$   $^{238}\text{U}^{92+}$  up to 11 (35) GeV/u
- $3 \times 10^{13}/s$  30 (90) GeV protons

## Secondary Beams

- radioactive beams up to 1.5 - 2 GeV/u;
- $10^{11}$  antiprotons 1.5 - 15 GeV/c

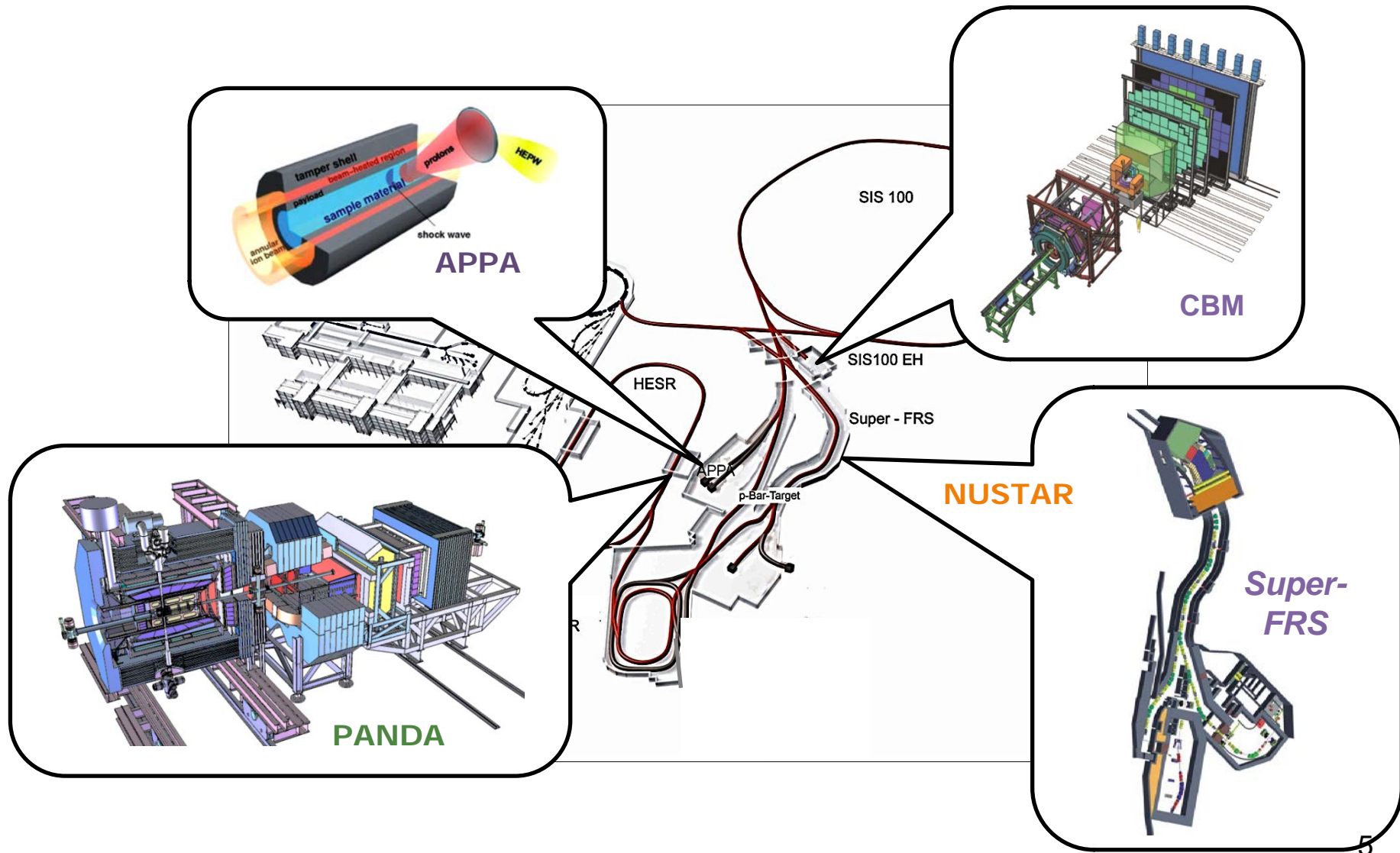
**FAIR phase 1**  
**FAIR phase 2**

# The FAIR Project





# FAIR – four research pillars

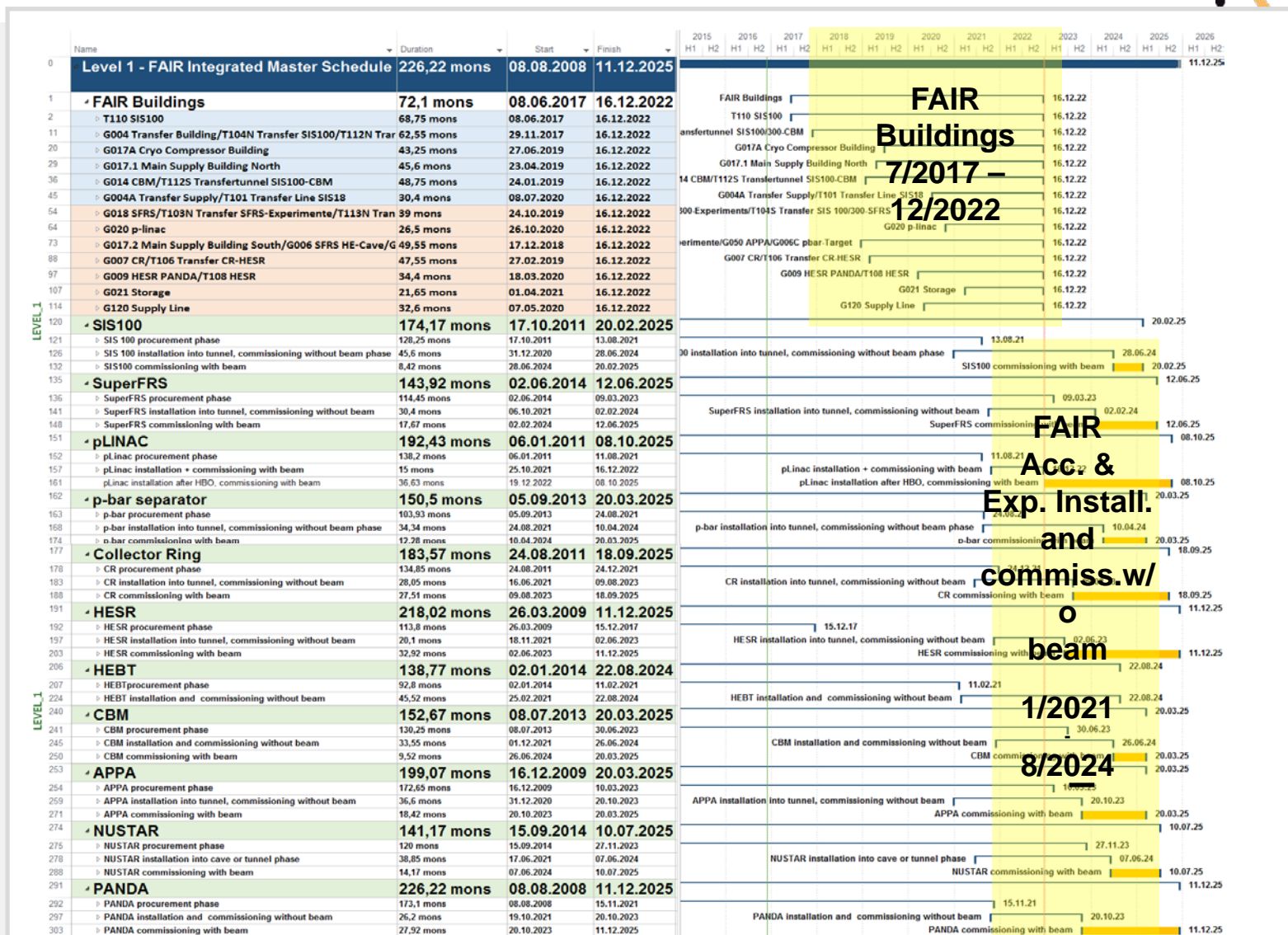


# International Participation in FAIR



- FAIR governed by international convention
  - 9 shareholders + 1 assoc. partner (orange)
- Scientists from all over the world are engaged
  - More than **200** institutions from **53** countries are involved with their scientists (orange + blue) → FAIR community growing

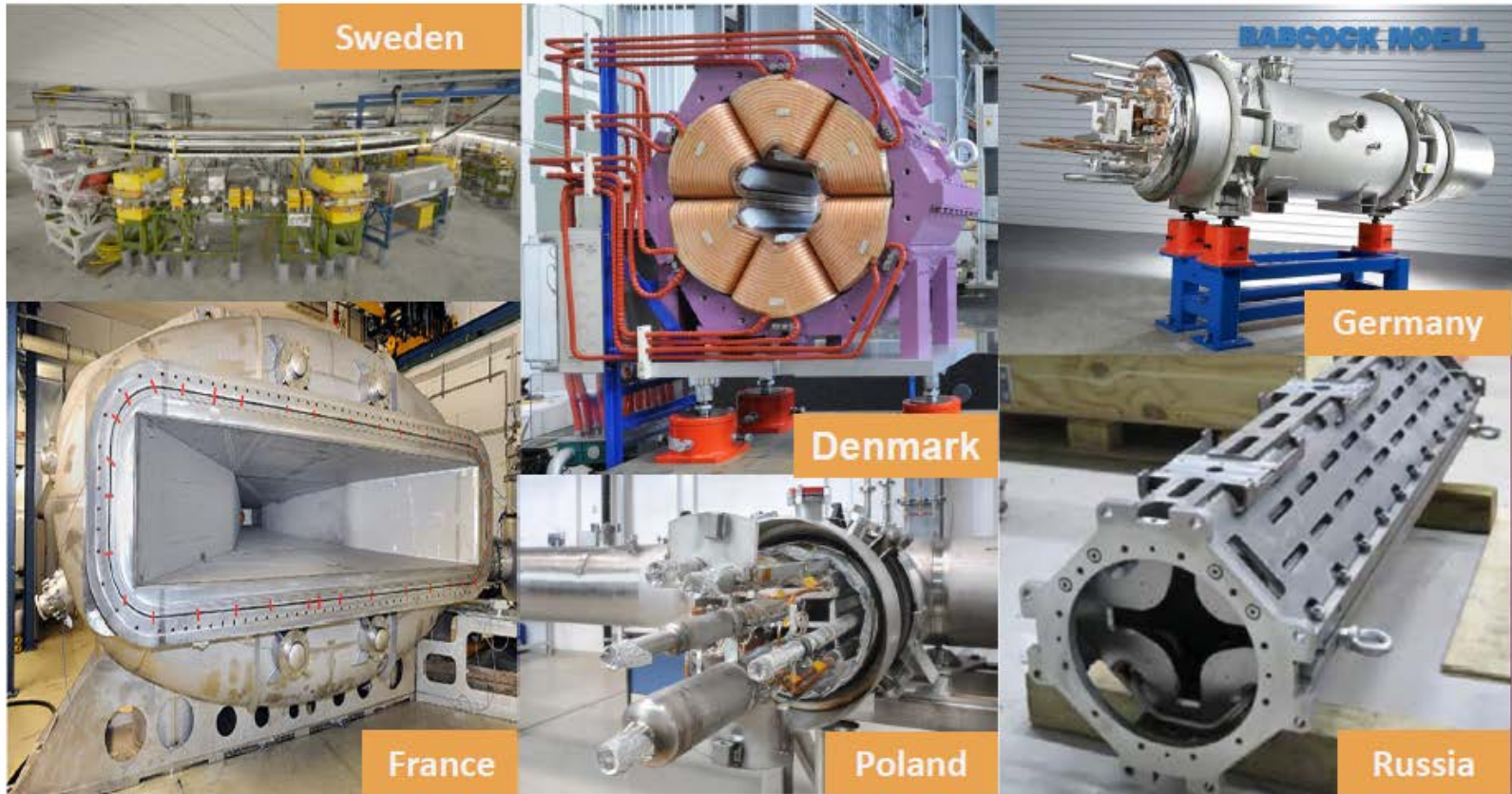
# Integrated Project Time Schedule – Level 1: FAIR Buildings, Accelerators & Experiments



# **Progress achieved in the FAIR Accelerator and Experimental Projects**



# Procurement of FAIR components is in full swing ...



- Accelerator and detector contributions from many different partner institutions



S.c. dipole magnet: Release of series production in July 2016 (Germany)



First SIS100 s.c quadrupole yoke and s.c. coil at JINR (Russia/Germany)



FoS bunch compressor for SIS100

First SIS100 bunch compressor cavity: SAT (on-site acceptance test) successful (Germany)



First cryogenic bypass line delivered and under cold testing at GSI (Poland)



FOS (first of series) sextupole magnet delivered. SAT successful, Series released (Denmark).



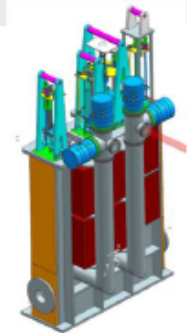
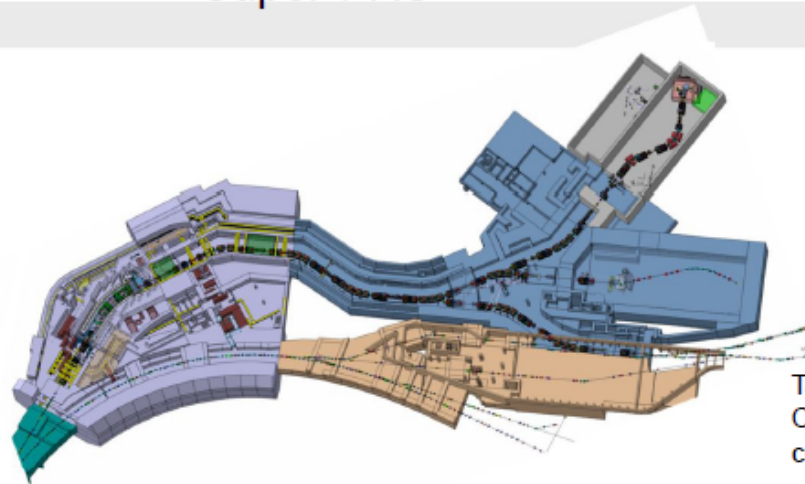
Parts for FOS acceleration cavity produced. Assembly started. FAT (factory acceptance test) in Dec. 2016 (Germany)



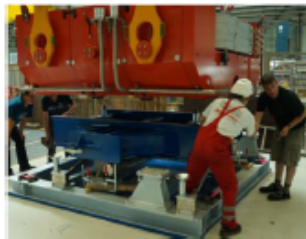


~70 ton

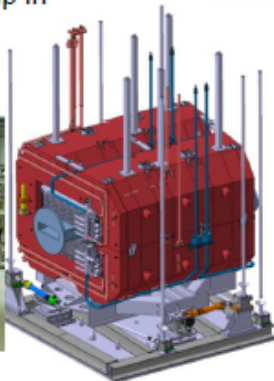
FOS s.c multiplett: PDR approved in July. Steel and wire orderd. Coil mock-up in production (Italy).



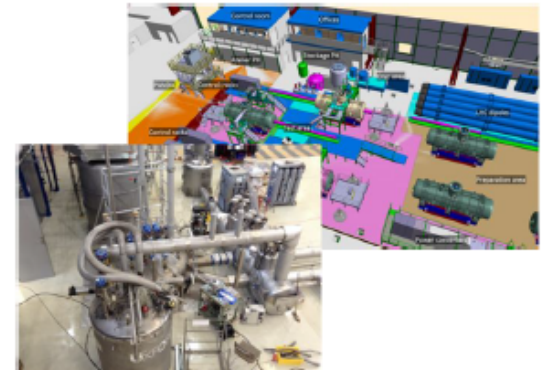
Target chamber with plug ins. Collaboration and R&D contracts with KVI-CART (NL)



Radiation hard dipole. Prototype testing almost completed. Tendering on short term (Russia)



Collaboration agreement signed with CEA, including design and technical follow-up (France)

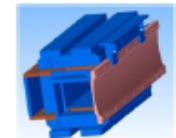


Set-up of test facility started at CERN, Commissioning of cryogenics system in 2016. First magnet end of 2017.

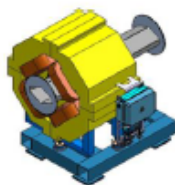
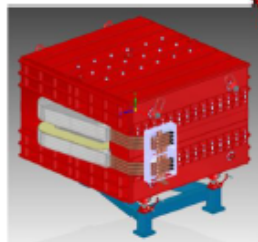




FOS debuncher cavity  
SAT ongoing.



Prototype stochastic cooling tank at GSI



- The update of TDR (Annex) is ready and approved. Several spec. completed
- The full 3D model of CR system is ready (DMU model)
- MA debuncher cavity in SAT at GSI.
- Prototype of Stochastic cooling Pick-up under development.

December 2016: Collaboration contract signed for the dipole magnets (production until 2021) and potentially for all other components with BINP, Novosibirsk (Russia)



# Novel detectors developed for NUSTAR



O-TPC: discovered  $\beta$ -delayed 3p-emission of  $^{31}\text{Ar}$



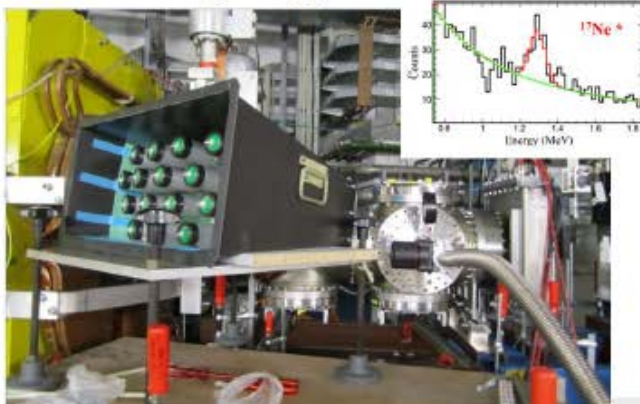
Backward-angle neutron detector for tensor-force experiments



Ion Catcher  $\rightarrow$  LEB-MATS/LASPEC



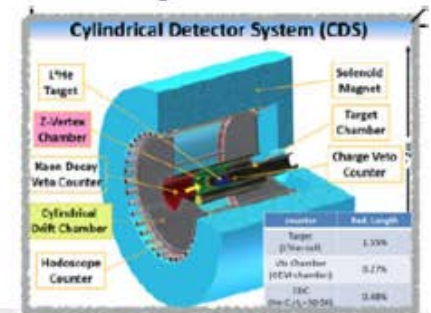
GADAST prototype measurements at S2



Full integrated S2 fiber tracker



Simulations for a pion detector integrated at S2





# New detectors and DAQ for HADES, CBM and PANDA

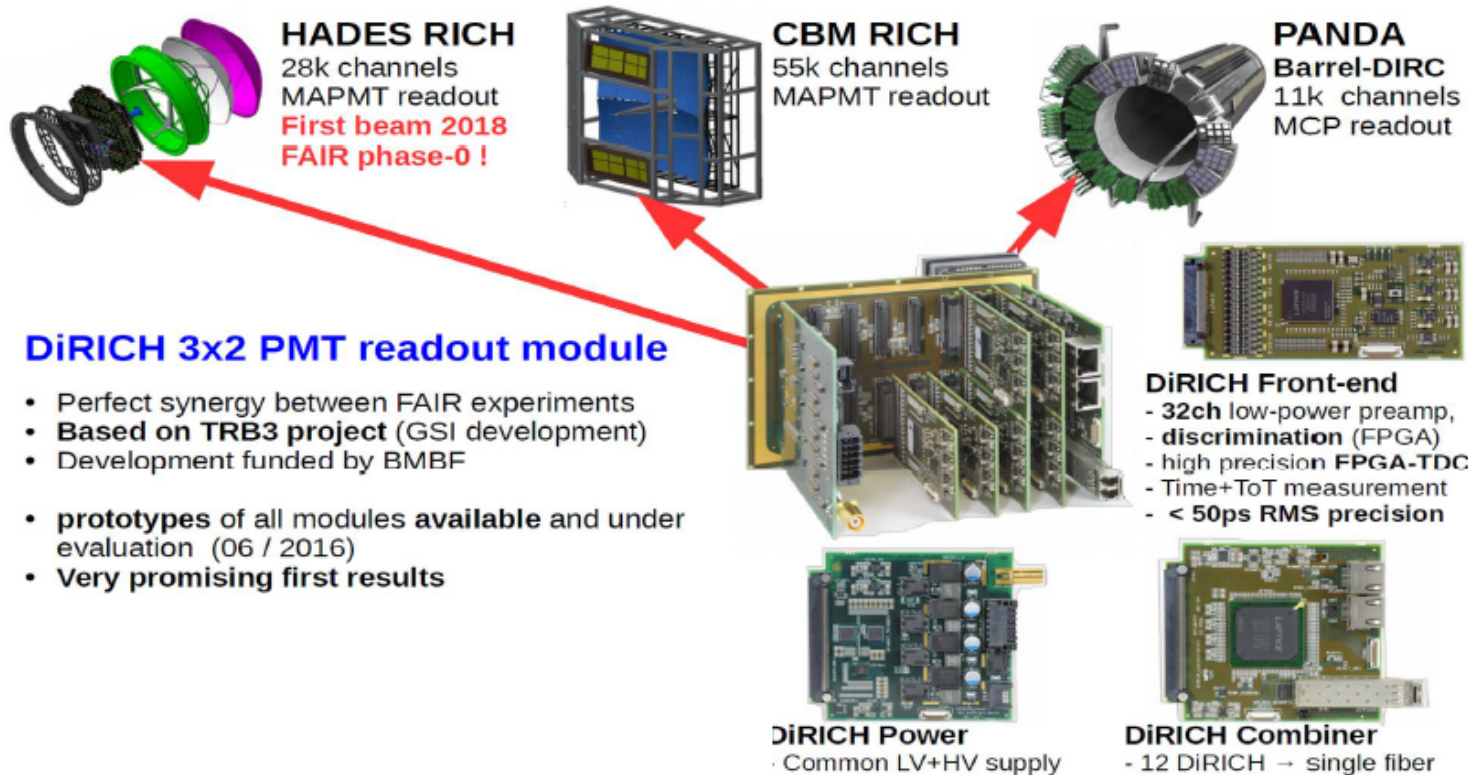




# New detectors and DAQ for HADES, CBM and PANDA



## DiRICH MAPMT/MCP readout chain common development for **HADES**, **CBM** and **PANDA**



# FAIR Project Progress - ACC

## Highlights



### Transformers North & South delivered





# FAIR Project Progress – Civil Construction



SIS 18 in direction of pLinac : Preparation of western transfer channel (WTK)



Status: 30.10.2017



# FAIR Project Progress – Civil Construction



SIS 100:  
trench sheeting  
(first 8 meters  
sheet piling)



Status: 30.10.2017



Russia



Status of this sheet:

after 23<sup>rd</sup> Council meeting, 06 Dec. 2017

<b><u>Commitment (all figures Jan. 2005 prices):</u></b> (Convention, signed)	<b>178.050 M€</b>
Cash, including:	178.050 M€
Cash (beyond contributions to ACC. & EXP.:	44.500 M€
Accountable contribution to accelerators:	65.760 M€
Of which assigned: 58.002 M€	
Accountable contribution to experiments:	24.270 M€
(of which assigned: 24.270 M€ + Priority 2 components = 30.975 M€)	
Planned additional contribution to experiments acc. to Russian Eols:	29.290 M€
Planned but not specified cash contribution to accelerators:	14.230 M€
<b><u>Required additional commitment in cash (XVII.6.3):</u></b>	<b>43.100 M€</b>
By June 2016	27.500 M€
Status of Commitment: Waiting for an official information	
By 2019	15.600 M€
Status of Commitment: Waiting for an official information	



**Experiments:**

**Contracted:**

	<b>22.832 M€</b>
IHEP: PANDA PWO crystals (1981 pcs.), (II.19.1):	1.000 M€
IHEP: PANDA Barrel base materials, 1.4.1.10.1.8.1 (XX.13.24):	0.680 M€
IHEP: PANDA mechanical structure of EM calorimeter, (VI.11.2):	2.844 M€
IHEP: HEDgeHOB for high-gradient quadrupoles, (XI.19.3):	2.800 M€
Budker: PANDA - yoke for SC solenoid, (VI.11.3):	1.000 M€
Budker: PANDA SC. solenoid (besides yoke), (XI.19.4):	4.420 M€
Budker: CBM- SC. dipole, contract negotiations, (XI.19.5):	3.758 M€
JINR: CBM -Ladders for STS tracking system, (IX.18.4):	2.115 M€
PNPI NUSTAR HV distribution system NeuLAND, (VIII.19.5):	0.415 M€
PNPI: Mech. structure of CBM RICH detector, (XI.19.6): (0.250 M€ more in Priority 2, total price: 1.450 M€)	1.200 M€
PNPI: Components for CBM-MUCH, (XVI.12.4): (1.200 M€ more in Priority 2, total price: 3.022 M€)	1.822 M€
INR- Modules for CBM – PSD, (XVI.12.3):	0.778 M€

**Assignments: (this also includes the Priority 2 components)**

		<b>8.137 M€</b>
IHEP: PANDA Forward Shashlyk Calorimeter, 1.4.1.11.1 (XXI.6.10)	(Priority 2)	1.352 M€
JINR: PANDA – Muon System, 1.4.1.13.5 (XXI.6.11):		2.318 M€
JINR: NUSTAR – R <sub>3</sub> B, 1.2.5.1.2.3.2.2 (XXII.13.4)		0.300 M€
PNPI: NUSTAR – Sci. bars & Read-out Elec. NeuLAND, (VIII.19.4):	(Priority 2)	0.585 M€
PNPI: Components for CBM-RICH, 1.1.1.3.1.2.2 (XI.19.6)	(Priority 2 part)	0.250 M€
PNPI: Components for CBM – MUCH, 1.1.1.3.2.3.2 (XVI.12.4):	(Priority 2 part)	1.200 M€
PNPI: NUSTAR – Tracking Detectors, 1.2.5.1.2.1.4 (XXI.6.9):		0.489 M€
PNPI NUSTAR ACTAF-2 small chamber work packageCo1, (XXIII.12.8)		0.175 M€
ITEP: TOF detector for CBM, 1.1.1.5.4 (XXI.6.8)	(Priority 2)	0.468 M€
ITEP: APPA Wobbler, 1.3.2.1.4.1 (XXI.6.12):	(Priority 2)	1.000 M€

## **Decision XXIII.12.8**

The Council agrees to the collaboration between FAIR GmbH and the Petersburg Nuclear Physics Institute, Kurchatov Institute (PNPI) regarding the production of the following components of the detector of the R<sup>3</sup>B experiment of the NUSTAR collaboration:

- **Contribution to ACTAF 2 (small ACTAF chamber),**  
work package C01 (PSP 1.2.5.2.3.2.1),

This agreement is valid under the assumption that those components will be provided for the 2005-price including an inflation correction similar to that for cash contributions, according to FAIR Council Resolution V.10.1, and according to the technical specifications in the approved “Technical Design Report for the Active Target for FAIR (ACTAF)”. The 2005-price for those components shall be considered as Russian contribution to experiments.

One (or several if appropriate) collaboration contract(s) including all annexes and technical specifications, according to FAIR Council Resolution III.10.1, is/are to be concluded.

*For information: That component is classified as Priority 1 item by the shareholder and should be contracted as soon as the respective contract negotiations have been concluded. The total cost-book value of that item amounts to 174,700.00 €. The corresponding In-Kind Contract(s) is/are planned to be ready for signing during the second quarter of 2018.*

In favour:	DE, FI+SE, FR, IN, PL, RO, RU, SI
Against:	none
Abstention:	none
Not present:	none



The list of the contracted and intended contributions of the Russian Federation to the construction of the FAIR experiments

04.06.2015 , Revised on 07/07/2015

#	FAIR experiments	Russian Institutes, Contributions and Coordinators.	Contribution status.	Cost-book (in 2005 prices), in M Euro.
1	PANDA	IHEP-Protvino,1981 PWO crystals for the barrel calorimeter,A. Vasiliev.	The contract has been implemented.	1, 000
2	PANDA	IHEP-Protvino,The mechanical structure of the barrel calorimeter,A.Vasiliev.	The Collaboration contract between IHEP-Protvino and FAIR was signed on 26.11.2013.	2, 844
3	CBM	Consortium of Institutes:JINR-Dubna, ITEP-Moscow,SINP-Moscow, IHEP-Protvino, Sankt-Petersburg State University,Part of the Silicon Tracker System (STS),Yuri Murin (JINR-Dubna).	The Collaboration contract between JINR-Dubna and FAIR was signed on 27.06.2014.	2, 115
4	NuSTAR	PNPI-Gatchina,High voltage system for NeuLAND (R3B),V. Golovtsov.	The Collaboration contract between PNPI-Gatchina and FAIR was signed on 08.07.2014.	0, 415
5	NuSTAR	PNPI-Gatchina,Scintillator plates and read-out electronics for NeuLAND (R3B),V.Kuznetsov.	Assigned by the FAIR Council on 09.07.2013. 0, 335 M Euro – scintillator plates, 0, 250 M Euro – read-out electronics	0, 585
6	PANDA	JINR-Dubna,The whole superconducting solenoid,A. Vodopyanov.	Assigned by the FAIR Council on 27.06.2012 for the yoke and on 09.07.2014 for the rest, including coils, cryostat etc.	5, 420
7	CBM	JINR-Dubna,The dipole magnet,A. Malakhov.	Assigned by the FAIR Council on 09.07.2014.	3, 758
8	HEDgeHOB	IHEP-Protvino,Four strong-focusing quadrupoles,S. Kozub	Assigned by the FAIR Council on 09.07.2014.	2, 800
9	CBM	PNPI-Gatchina,The mechanical structure of the RICH detector,V. Samsonov.	Assigned by the FAIR Council on 09.07.2014.	3, 450
10	PANDA	JINR-Dubna,The muon system,Gennady Alexeev.	TDR was approved by FAIR ECE on 14.09.2014.	2, 318
11	PANDA	IHEP-Protvino,The remaining 8,358 PWO crystals for the barrel calorimeter, Alexander Vasiliev	TDR was approved by FAIR in 2008.	5, 705
12	PANDA	The Budker INP -Novosibirsk,The dipole magnet,Yuri Tikhonov.	TDR was approved by FAIR in 2009.	2, 052
13	NuSTAR	PNPI-Gatchina,The mass calibrator and thin silicon detectors for MATS, Yuri Novikov.	TDR was approved by FAIR on 07.05.2010.	0, 191
14	NuSTAR	PNPI-Gatchina,The remaining part of the NeuLAND detector in R3B, V. Kuznetsov.	TDR was approved by FAIR ECE in January 2013.	0, 250
15	CBM	PNPI-Gatchina,The muon system MUCH,V.Samsonov.	Assigned by the FAIR Council on 01.07.2015.	3, 022

	Assigned by the FAIR Council on 01.07.2015.	0, 778
	Assigned by the FAIR Council on 01.07.2015.	0, 490
	TDR is prepared and is being considered within the Collaboration.	1, 000
and	TDR is prepared and is being considered within the Collaboration.	1, 770
type,	TDR was approved by the Collaboration and submitted to FAIR ECE on June 17, 2015	1, 352
21	TDR for the barrel part was approved by FAIR in November 2012, TDR for the forward part is expected to be ready in 2015.	0, 960
22	TDR is expected to be ready in 2015.	0, 362
23	TDR is expected to be ready in 2015.	2, 805
24	TDR is expected to be ready in 2015.	0, 468
25	TDR is expected to be ready in 2015.	0, 955
26	TDR is expected to be ready in 2015.	1, 471
27	TDR is expected to be ready in 2015.	0, 700
28	TDR is expected to be ready in 2015.	0, 420
29	TDR is expected to be ready in 2015.	0, 350
30	TDR is expected to be ready in 2015.	2, 500
31	TDR is expected to be ready in 2015.	0, 480
32	TDR is expected to be ready in 2017.	2, 900
	<b>TOTAL COST OF ALL CONTRIBUTIONS</b>	<b>53,69 7,71</b>

#	FAIR experiments	Russian Institutes, Contributions and Coordinators.	Contribution status.	Cost-book (in 2005 prices), in M Euro.
21	NuSTAR	JINR-Dubna,Part of the CALIFA gamma-spectrometer,Andrey Fomichev.	TDR for the barrel part was approved by FAIR in November 2012, TDR for the forward part is expected to be ready in 2015.	0, 960
22	PANDA	PNPI-Gatchina,The forward TOF detector,Stanislav Belostotski.	TDR is expected to be ready in 2015.	0, 362
23	CBM	ITEP-Moscow,The first part of the electromagnetic calorimeter of the "shashlyk" type,Yuri Zaitsev.	TDR is expected to be ready in 2015.	2, 805
24	CBM	ITEP-Moscow,TOF detector,Alexander Akindinov.	TDR is expected to be ready in 2015.	0, 468
25	NuSTAR	PNPI-Gatchina,Active hydrogen target ACTAR,Evgeny Maev.	TDR is expected to be ready in 2015.	0, 955
26	PANDA	The Budker INP -Novosibirsk,50% of the forward DISC DIRC,Yu. Tikhonov.	TDR is expected to be ready in 2015.	1, 471
27	PANDA	ITEP-Moscow,Pellet target,Alexander Gerasimov.	TDR is expected to be ready in 2015.	0, 700
28	HEDgeHOB	ITEP-Moscow,The ion-proton radiography system,Alexander Golubev.	TDR is expected to be ready in 2015.	0, 420
29	HEDgeHOB	The Lebedev Physical Institute RAS, Moscow,Cryogenic target,E. Koresheva.	TDR is expected to be ready in 2015.	0, 350
30	NuSTAR	Consortium of institutes:JINR-Dubna, SIC Kurchatov Institute - Moscow, the Ioffe PTI – Sankt-Petersburg, SINP-Moscow.The EXPERT project for the "first day" experiments at Super-FRS,I. Mukha (SIC Kurchatov Institute – Moscow) andA. Fomichev (JINR-Dubna).	TDR is expected to be ready in 2015.	2, 500
31	NuSTAR	PNPI-Gatchina, the tracking detectors for R3B,A. Krivchitch.	TDR is expected to be ready in 2015.	0, 480
32	PANDA	The Budker INP -Novosibirsk,Forward RICH,Yuri Tikhonov.	TDR is expected to be ready in 2017.	2, 900
			<b>TOTAL COST OF ALL CONTRIBUTIONS</b>	<b>53,69 7,71</b>

**Comment:** all the items are approved by the managements of the four FAIR experimental pillars.

Тема Re: Статус FAIR

От Alexander Vasiliev <Alexander.Vasiliev@ihep.ru>

Кому samsonov\_vm <samsonov\_vm@pnpi.nrcki.ru>

Дата 2017-11-23 12:14

ФАИР завис в десятилетней дорожной карте Германия-Россия, которая в свою очередь, зависла из-за парламентского кризиса в Германии и предстоящих в марте выборов в РФ. Поэтому на сегодня, выплатив в ФАИР 100 млн. евро реальных денег из ~220 млн. и прекратив платежи, Россия не утвердила свою позицию о дальнейшем участии в ФАИР. Ее позитивная позиция в дорожной карте сформулирована, но при позитивной позиции немцев исследованиям в РФ: НИКА, ПИК и др.





**С НАСТУПАЮЩИМ  
2018-М ГОДОМ!**