Status and Schedule



of PANDA at BINP

L. Schmitt, GSI/FAIR

BINP-FAIR Workshop 3, **GSI**, November 26, 2019

Overview and Schedule

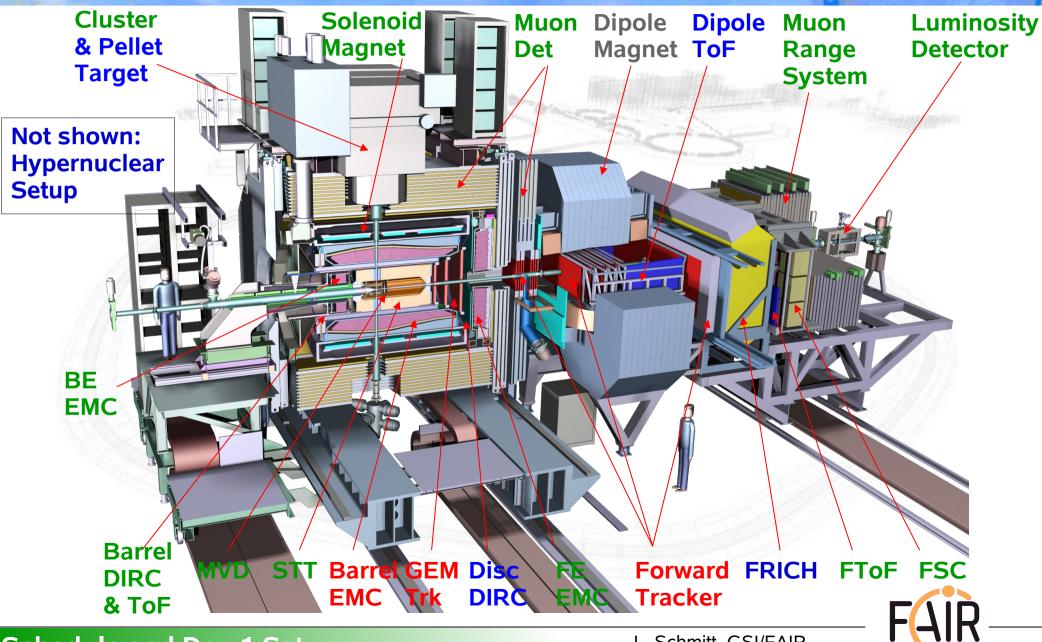
Installation Planning

BINP Systems



PANDA Day-1 / Phase 1 / Phase 2





Day-1 Scorecard Aug 2019



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PANDA		TDR /	Cost [k€ 2005]	% Funding (Sec / RUS / Eol / TBA	(A) Construction	Construction	Test/
		Specs		<u> </u>		complete	Commissioning
	Cluster Jet Target		771,00			08/2022	
	Micro Vertex Detector (MVD) - Str		2.550,00			05/2023	
	Micro Vertex Detector (MVD) - Pix		2.091,00			05/2023	
	Straw Tube Tracker (STT) (1)		2.603,00			09/2023	
	Planar GEM Tracker - 50%		555,00			03/2022	
	Barrel DIRC		2.782,00			04/2023	
	Barrel Time of Flight (TOF)		310,00			01/2023	
	Forward Tracking (w/o FT 5/6) (1)		1.145,00			07/2023	
	Forward TOF (2)		362,00			12/2021	
y-1	Barrel EMC System		8.001,00			03/2022	
Day-1	Barrel EMC Crystals - 75% (2)		8.634,00			03/2022	
	Backward Endcap EMC		1.309,00			06/2023	
	Forward Endcap EMC		5.674,00			02/2020	
	Forward Shashlyk Calorimeter (2)		1.447,00			06/2023	
	Luminosity Detector		666,00			06/2023	
	Muon Detectors (2)		2.318,00			06/2023	
	Solenoid		5.800,00			10/2021	
	Interaction Region		151,00			12/2022	
	Infrastructure		4.006,00			01/2023	
	DAQ Hardware (3)		1.350,00			12/2022	
		88% value weighted	52.525,00	67% 17% 15%	1% 31% value weighted		1% value weighted

⁽¹⁾ if synergies between STT and Fw. Tracking realise

(2) if German-Russian Roadmap realised

(3) DAQ computing via operation funds



PANDA Schedule





Construction of Phase 1 systems has started

Installation periods:

- 1/2022 8/2022: solenoid, dipole, supports etc.
- 5/2023 -3/2024: all other systems
- Commissioning with protons 2025
- Start of physics with antiprotons 2026

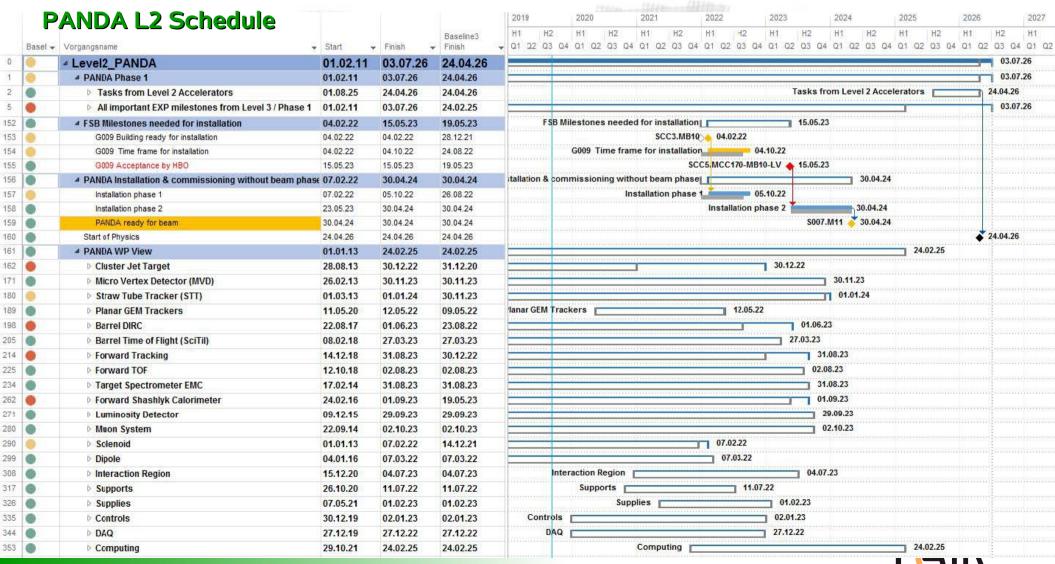


Today

Updates of Project Plans



- Update of all FAIR project plans Dec 2018 Re-baseline of all project plans
- PANDA update July 2019 Milestones, Risks, Progress status, Scorecard



Installation Planning



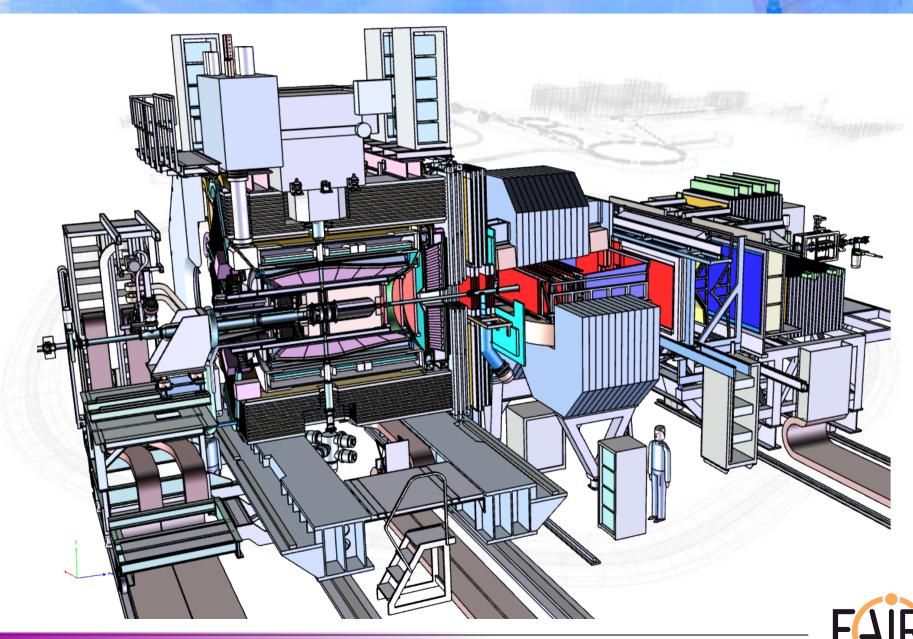
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				21 Juli	01 Januar	11 Juni	21 November	01 Mai	11 Oktober	21 März	01 September	11 Februar	21 Juli	01 Januar	11 Juni	21 Nove
Vorgangsname	▼ Dauer ¬	→ Anfang →	Ende ▼	03.06 19.0	18 04.11 20.01	06.04 22.06	07.09 23.11 08.02	26.04 12.07	7 27.09 13.12	28.02 16.05	01.08 17.10 (02.01 20.03	05.06 21.08	06.11 22.01	08.04 24.06	09.09 25.11
△ PANDA_integriert_191024_V2_mod	1223 Tage	Die 18.02.20	Don 24.10.24													24.10.24
▶ Building of PANDA hall	849 Tage	Die 18.02.20	Fre 19.05.23	Building of	PANDA hall								19.05.23			
△ Installation phase 1 / before HBO	330 Tage	Die 28.12.21	Mon 03.04.23				Installation	on phase 1 / bef	fore HBO			03.0	4.23			
▶ Installation Tunnel / Hall	150 Tage	Die 28.12.21	Mon 25.07.22				In	Installation Tun	nnel / Hall		25.07.22					
▶ Supply Platform Installation	36 Tage	Mit 02.02.22	Mit 23.03.22				Su	upply Platforn	n Installation	23.03.22						
Solenoid installation	274 Tage	Mit 02.02.22	Mon 20.02.23					Solenoic	d installation			20.02.23				
Yoke Assembly	36 Tage	Mit 02.02.22	Mit 23.03.22					You	oke Assembly 💳	23.03.22						
Muon Assembly	6,5 Monate	Don 24.03.22	Mit 21.09.22						Muon Assembly	у	21.09.22					
Cryostat & Control Dewar Installation (Solenoid Sides)	4 Monate	Don 22.09.22	Mit 11.01.23				Сгуо	ostat & Contro	ol Dewar Installatio	on (Solenoid Sid	es)	11.01.23				
Solenoid - liquid and gas connections	10 Tage	Don 12.01.23	Mit 25.01.23						Solenoi	id - liquid and ga	s connections 🛓	25.01.23				
Solenoid - electrical connections	3 Tage	Don 26.01.23	Mon 30.01.23						S	Solenoid - electri	ical connections	30.01.23				
Cryo preparation and connection	3 Wochen	Die 31.01.23	Mon 20.02.23						C	Cryo preparation	n and connection	上				
Cryogenics test	30 Tage	Die 21.02.23	Mon 03.04.23								Cryogenics tes		1.23			
■ Installation phase 2 / after HBO	224 Tage	Mon 22.05.23	Don 28.03.24							Inst	tallation phase 2 /	after HBO			28.03.24	
▶ Counting House installation	19 Tage	Mon 22.05.23	Don 15.06.23							c	Counting House in	nstallation F	15.06.23			
Dipole SAT	10 Tage	Mon 22.05.23	Fre 02.06.23									Dipole SAT	02.06.23			
▶ Solenoid SAT	45 Tage	Mon 22.05.23	Fre 21.07.23								Sole	enoid SAT	21.07.23			
DIS (Detector Installation Start)	0 Tage	Fre 21.07.23	Fre 21.07.23										♦ 21.07.23			
▶ Target Installation	36 Tage	Mon 24.07.23	Mon 11.09.23								Ta	arget Installati	tion 11.	.09.23		
△ Detector Installation	179 Tage	Mon 24.07.23	Don 28.03.24								Dete	ector Installati	ion		28.03.24	
▶ Solenoid Sides and Top assembly	98 Tage	Mon 24.07.23	Mit 06.12.23							S	olenoid Sides and	d Top assem	bly	06.12.23		
▶ Installation Beam	65 Tage	Mon 24.07.23	Fre 20.10.23								lt.	Installation Bea	am	20.10.23		
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▶ Service Route	64 Tage	Mon 23.10.23	Don 18.01.24									Se	ervice Route	18.01.2	٧4	
▶ Aux Platform	88 Tage	Mon 23.10.23	Mit 21.02.24									А	Aux Platform	21.0	02.24	
▶ Downstream	43 Tage	Die 30.01.24	Don 28.03.24										Downs	stream	28.03.24	
Commissioning without beam	30 Tage	Fre 29.03.24	Don 09.05.24									Co	mmissioning w	without beam	09.05.24	
△ Prepare for beam	70 Tage	Fre 10.05.24											F	Prepare for beam	1	15.08.24
Survey and alignment	2 Tage		Mon 13.05.24										Sur	vey and alignmer	nt 1,13.05.24	
First light: Cosmics / Parkposition	20 Tage		Mon 10.06.24									F		mics / Parkpositio		4
Move to measuring position	5 Tage		Mon 17.06.24										Move to	o measuring pos	ition 17.06.2	14
Survey and alignment	3 Tage		Don 20.06.24											Survey and align	📥	
Interface PANDA<->HESR	20 Tage	Fre 21.06.24	Don 18.07.24										lm	terface PANDA<	HESR 418.0	97.24
First Light: Cosmics with magnetic field / final position	20 Tage		Don 15.08.24								Fi	irst Light: Cos	smics with mag	gnetic field / final	position 📥	15.08.24
Ready for beam (M11)	0 Tage	Don 15.08.24	Don 15.08.24												\$007.M11	15.08.24
■ Commissioning with beam	50 Tage	Fre 16.08.24	Don 24.10.24										(Commissioning	with beam	24.10.24
Pretests with beam	10 Tage	Fre 16.08.24												Pretests	with beam	29.08.24
Calibration with beam	40 Tage	Fre 30.08.24													on with beam	24.10.24
Ready for operation (M12)	0 Tage	Don 24.10.24														24.10.24

- Start of installation phase 1: Q1 2022, start of magnet installation
- Building take over (HBO): May 2023
- Start of detector installation: July 2023, after Solenoid SAT
- End of installation, start of commissioning w/o beam: Q2 2024



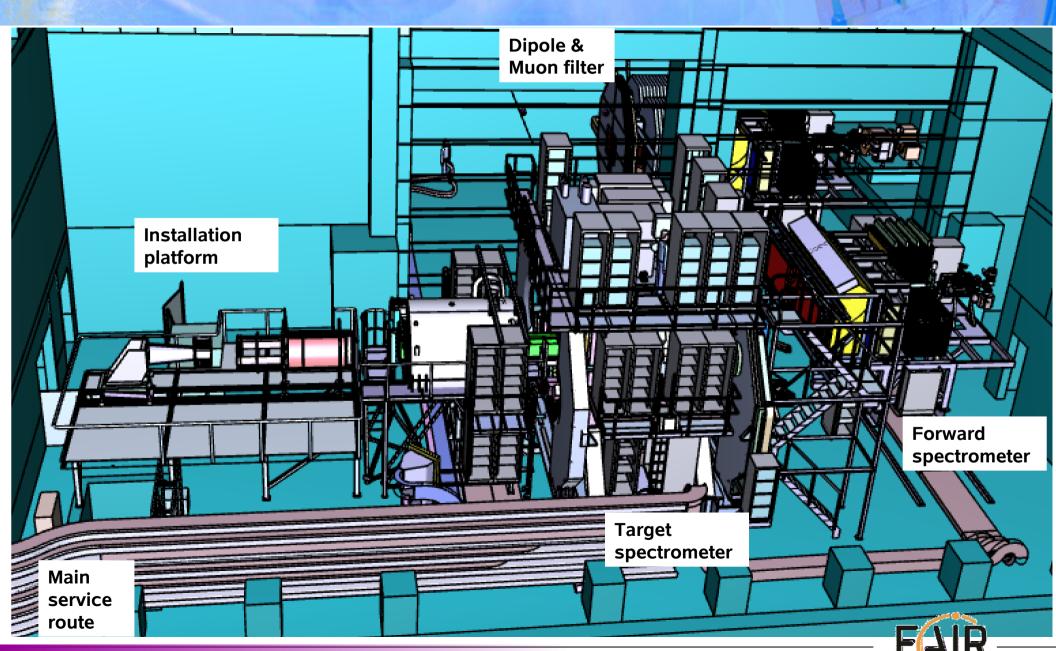
PANDA Installation





PANDA Hall Space





Target Spectrometer Installation



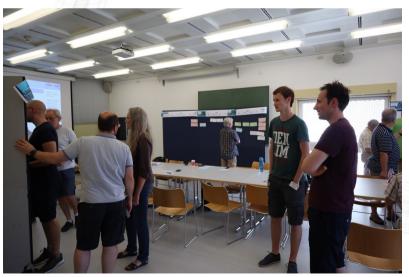
- 1) Rails for Solenoid, Solenoid installation
- 2) Muon detectors (partly interleaved in yoke assembly)
- 3) Installation platform, cable trays, racks and stairs Infrastructure: cooling plants, supply racks
- 4) Solenoid SAT
- 5) Barrel EMC (partial/complete ?)
- 6) Support beam and Barrel DIRC/ToF
- 7) Central tracker and MVD with target cross
- 8) Cluster target
- 9) Backward Endcap EMC
- 10) GEM Tracker
- 11) Forward Endcap EMC

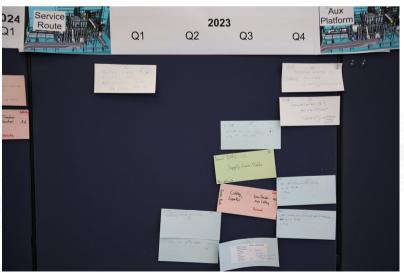


Interactive Workshop



- Installation of different systems in parallel:
 - → Manage locations and resources
- Collection of individual procedures in previous workshop
- 3rd Workshop:
 - Pin boards designate different locations
 - Cards denote activities: task, requirements, duration
 - Colors denote different systems / groups of systems
- Discussion of needs, ordering, interferences







Installation Planning



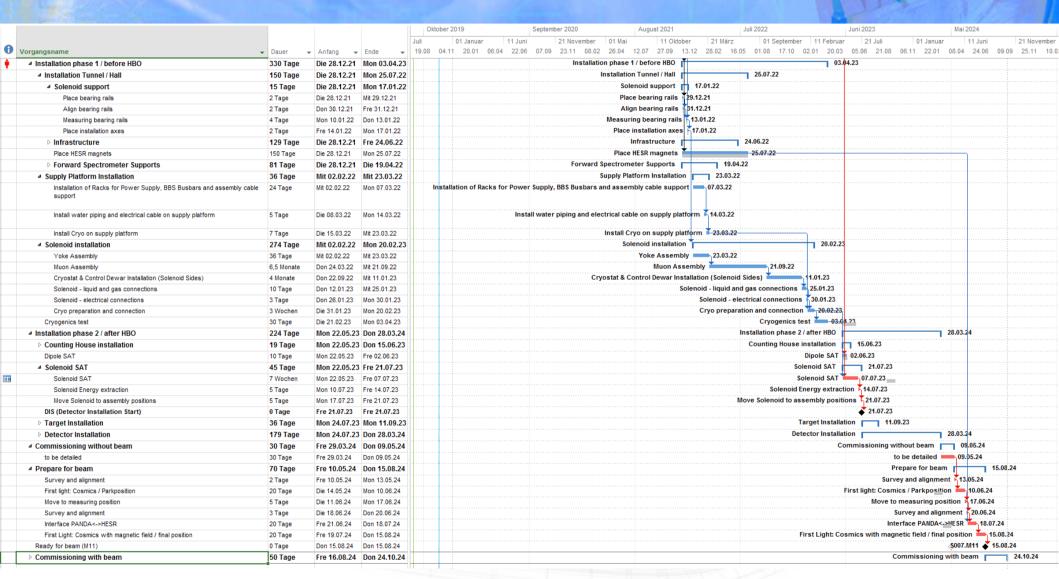
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Solenoid Installation

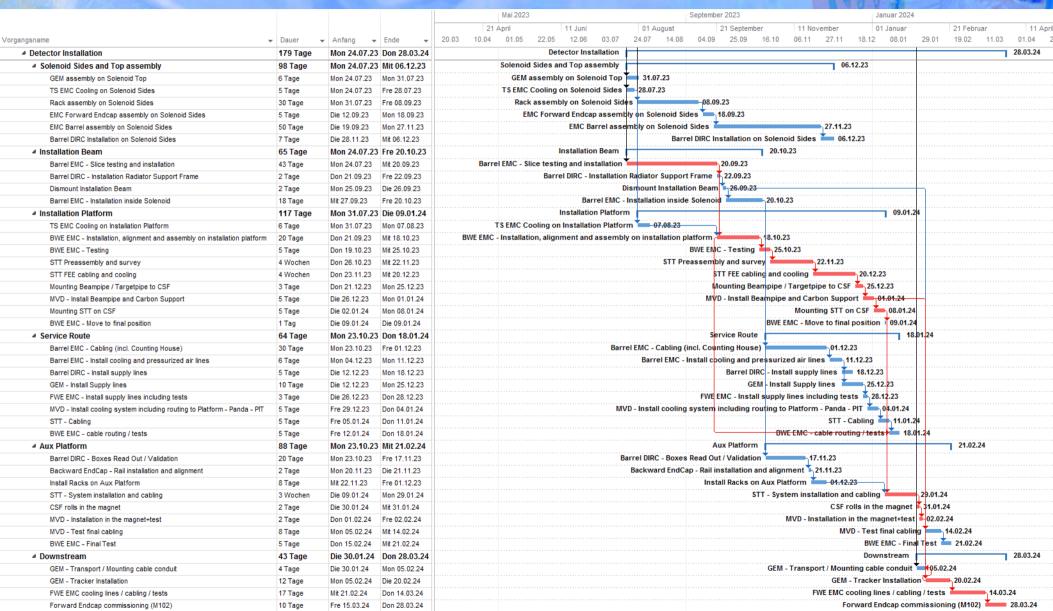






Detector Installation

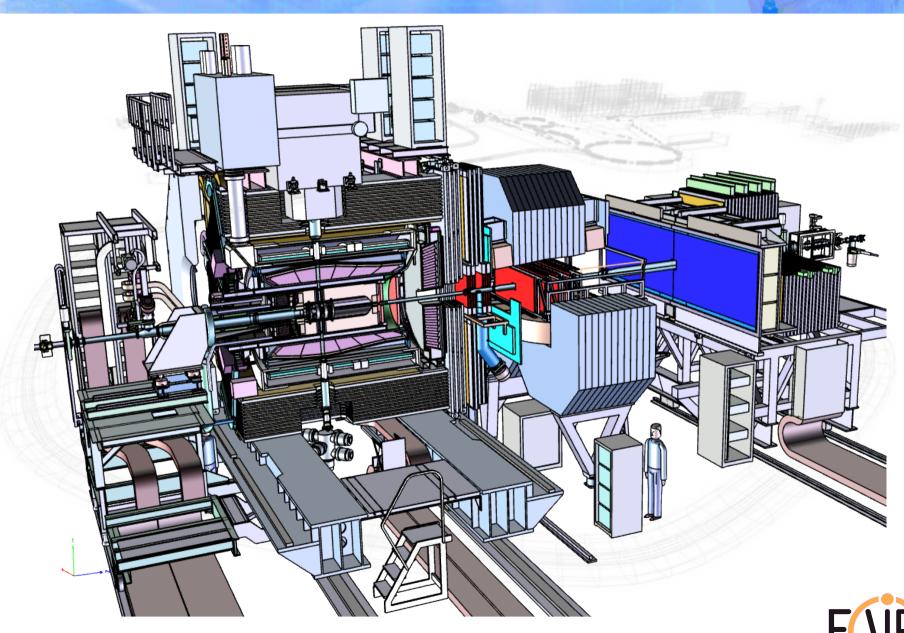






PANDA Systems





Solenoid Magnet

WPL E. Pyata, BINP



Project Status:

New design with optimized conductor, sub-coils and outer winding (CERN)

Scope: field mapping in separate contract

Main contract signed in March 2017

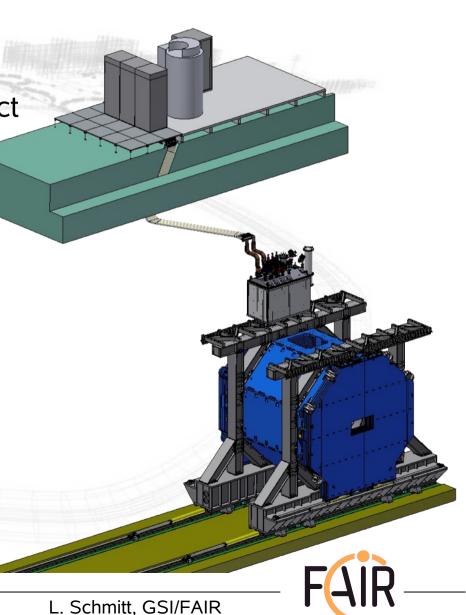
CERN team for technical follow-up

All octants produced

Cryostat, PS & Energy Extraction FDR

Critical Items:

- Superconductor procurement
- Schedule:
 - Installation at FAIR planned for Q1 2022
 - Field-mapping to be done before at BINP
 - Insertion of muon detectors



Solenoid Yoke Status





- All octants manufactured
- Door plates in preparation
- Components of platform ready
- Yoke test assembly in preparation:
 - adjustment shims for octants
 - flat area for assemble to be prepared
- Completion in Q1 2020



Solenoid News

pan da

Superconductor:

- Furukawa currently cannot deliver,
 but is interested to provide parts
- Russian joint venture in R&D phase, BINP & Russian Institutes
- Several prototype runs of extrusion
- Final pure Al / SC cable end 2020

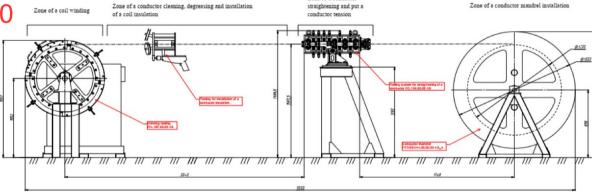
Cold mass and coil winding:

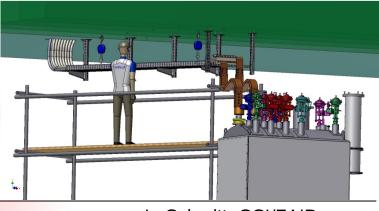
- Procedure defined
- Tooling in production
- Next step: dummy coil
- Local cryogenics: 1st design review

Electrical systems:

- Procurement of material
- Planning of power cable layout









HESR-PANDA Dipole Magnet

WPL E. Antokhin, BINP

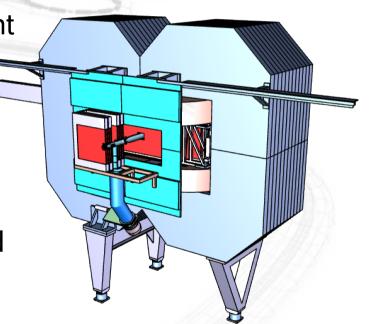


Project Status

- Magnet is part of HESR IOL, used also by SPARC and NUSTAR
- Dipole considered as HESR component
- EoI by BINP
- Design contract FAIR-BINP ongoing
- Production contract in 2020

Technical Progress

- Specs for design circulated & accepted
- Design work started at BINP:
 - Design of yoke, coils, support structure
 - Dynamic field calculations
 - Seismic stress calculations
- Candidate companies for yoke

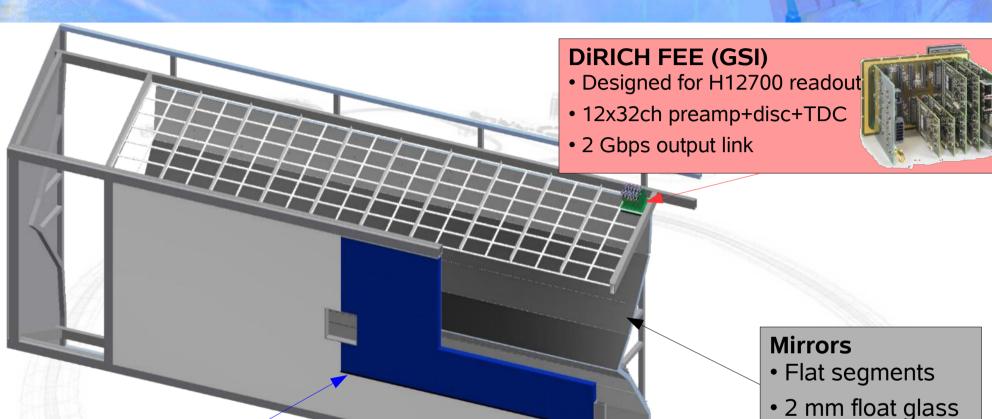




Forward Aerogel RICH

WPL S. Kononov, BINP





Aerogel radiator

- Focusing 2-or 3-layer aerogel
- n≈1.05
- 3 x 1 m² area
- 40 mm thickness

Photon Detector

H12700 MaPMTs(Hamamatsu), 1400 pcs

- flat panel
- 87% active/total area ratio
- 8x8 anode pixels of 6mm size



• Al+SiO₂ coating

Forward Aerogel RICH

WPL S. Kononov, BINP



- PANDA Forward RICH design is described.
- Different mirror samples were studied. Tomsk mirrors are chosen.
- Preliminary measurement of the absolute QE for H12700 shown.
 To be studied in more detail and negotiated with the producer.
- Study of light forward scattering in aerogel: negligible for PANDA F-RICH
- Results of the test beam in 2019:
 - Single photon radius resolution agrees quite well with the calculation.
 - Discrepancy in the photoelectrons is observed (probably due to low DQE).
- TDR will be drafted in 2020, installation in 2026



Conclusion



Main achievements:

- Solenoid construction in full swing test assembly delayed till January '20
- Dipole design work ongoing, construction contract in preparation
- Installation planning for TS completed

Upcoming milestones:

PANDA Solenoid:

- Yoke construction complete spring 2020
- Super-conductor production to finish by end 2020

HESR-PANDA Dipole:

- Intermediate report by end 2019
- Final report draft March 2020
- Contract spring 2020

PANDA Forward RICH:

TDR draft June 2020

In summary: PANDA is on track at BINP

