# **Technical Status**



# of PANDA

L. Schmitt, GSI/FAIR

## *FAIR ECE 11,* GSI, November 4, 2019

**Schedule and Day-1 Setup** 

Hall and Infrastructure

System Status



## **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



**Schedule and Day-1 Setup** 

## **Updates of Project Plans**



- Update of all FAIR project plans Dec 2018 Re-baseline of all project plans 0
- PANDA update July 2019 Milestones, Risks, Progress status, Scorecard 0

	P	ANDA L2 Schedule				2019	2020	2021	20	22	2023		2024		2025	2026	6	2027
					Baseline3	H1 H2	H1 H2	2 H1	H2 H1	12	H1	H2	H1	H2	нт н	2 H1	H2	H1
	Basel 👻	Vorgangsname 👻	Start -	Finish -	Finish	- Q1 Q2 Q3 Q4	Q1 Q2 Q3	Q4 Q1 Q2	Q3 Q4 Q1	Q2 Q3 Q	14 Q1 Q2	Q3 Q4	Q1 Q2	Q3 Q4 I	Q1 Q2 Q3	3 Q4 Q1	Q2 Q3 (	Q4 Q1 Q2
0	•	Level2_PANDA	01.02.11	03.07.26	24.04.26												<b>9 03.</b>	.07.26
1	0	A PANDA Phase 1	01.02.11	03.07.26	24.04.26												03.0	.07.26
2	•	Tasks from Level 2 Accelerators	01.08.25	24.04.26	24.04.26						T	lasks fro	om Level	2 Accele	rators		24.04.5	.26
5	•	All important EXP milestones from Level 3 / Phase 1	01.02.11	03.07.26	24.02.25										1		03.0	.07.26
52	•	FSB Milestones needed for installation	04.02.22	15.05.23	19.05.23	FSB Mi	lestones ne	eded for inst	allation		1	15.05.23	3					
53	0	G009 Building ready for installation	04.02.22	04.02.22	28.12.21			SCO	3.MB10	04.02.22							3	
54	•	G009 Time frame for installation	04.02.22	04.10.22	24.08.22		G009 Time	frame for ins	tallation		04.10.22						a guun	
55		G009 Acceptance by HBO	15.05.23	15.05.23	19.05.23				SCC5.	MCC170-ME	310-LV 🔶	15.05.23	3					
56	•	PANDA Installation & commissioning without beam phase	€ 07.02.22	30.04.24	30.04.24	tallation & com	missioning	without bean	n phase				3	0.04.24				
57	•	Installation phase 1	07.02.22	05.10.22	26.08.22			Installation	phase 🛀	(	05.10.22						ang nam	
58	•	Installation phase 2	23.05.23	30.04.24	30.04.24				Ir	stallation p	ohase 2 🏅	<i></i>	30	.04.24				
59	•	PANDA ready for beam	30.04.24	30.04.24	30.04.24							S007.	.M11 🥇 3	0.04.24			a gunn	
60		Start of Physics	24.04.26	24.04.26	24.04.26	n energy and a second										manan and	24.04.2	.26
61	•	A PANDA WP View	01.01.13	24.02.25	24.02.25										24.02.2	25	9	
62	•	Cluster Jet Target	28.08.13	30.12.22	31.12.20						30.12.	.22						
71		Micro Vertex Detector (MVD)	26.02.13	30.11.23	30.11.23								30.11.23				1	
80		Straw Tube Tracker (STT)	01.03.13	01.01.24	30.11.23						1.613.561.61.61.61.		01.01.2	4			and ann	
89	•	Planar GEM Trackers	11.05.20	12.05.22	09.05.22	lanar GEM Trac	kers 🕅			12.05.3	22						3	
98	•	Barrel DIRC	22.08.17	01.06.23	23.08.22							01.06.2	23				ang anan	
205		Barrel Time of Flight (SciTil)	08.02.18	27.03.23	27.03.23						27	7.03.23					3	
14	•	Forward Tracking	14.12.18	31.08.23	30.12.22			нындтынынын				31.	.08.23				ang man	
25		Forward TOF	12.10.18	02.08.23	02.08.23							02.0	8.23					
34	•	Target Spectrometer EMC	17.02.14	31.08.23	31.08.23							31.	.08.23					
62	•	Forward Shashlyk Calorimeter	24.02.16	01.09.23	19.05.23						1	01.	.09.23					
271	•	Luminosity Detector:	09.12.15	29.09.23	29.09.23						erg serererén	2	9.09.23				nn fann	
80	•	Muon System	22.09.14	02.10.23	02.10.23							0	2.10.23				*****	
90	•	Sclenoid	01.01.13	07.02.22	14.12.21					07.02.22								
99	•	Dipole	04.01.16	07.03.22	07.03.22		831111111111111			07.03.22							a ng na na	
808	•	> Interaction Region	15.12.20	04.07.23	04.07.23	Inter	action Regi	on				04.07	.23					
17	•	Supports	26.10.20	11.07.22	11.07.22		Supports			11.0	07.22						angana S	
26	•	Supplies	07.05.21	01.02.23	01.02.23			Supplies			01.0	2.23						
35		▷ Controls	30.12.19	02.01.23	02.01.23	Controls					02.01.	.23					angann	
44		⊳ DAQ	27.12.19	27.12.22	27.12.22	DAQ					27.12.	22					terre (errere	
53		Computing	29.10.21	24.02.25	24.02.25			Comput	ing			MERETER F	IN A A A A A	arararaka	24.02.	25	ang anao	

#### Schedule and Day-1 Setup

## **Installation Planning**

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						ALODGI 20	015	September 2020		August 20	/21	50	11 2022		3011 2023		11012024	
				21	Juli		01 Januar 11 Ju	uni 21 Novemb	ber 01 Ma	ai 11	Oktober	21 März	01 Septemb	er 11 Februar	21 Juli	01 Jan	uar 11 Jr	uni 21 Nove
/organgsname		Anfang 👻	Ende 👻	03.06	19.08	04.11	20.01 06.04 22.	06 07.09 23.11 0	8.02 26.04	12.07 27.0	09 13.12	28.02 16.05	01.08 17.10	02.01 20.03	05.06 21.08	06.11 22.0	1 08.04 24	.06 09.09 25.11
PANDA_integriert_191024_V2_mod	1223 Tage	Die 18.02.20	Don 24.10.24	egriert_	191024	_V2_mo	bd											24.10.24
Building of PANDA hall	849 Tage	Die 18.02.20	Fre 19.05.23	Buildin	ng of P	ANDA ha	all								19.05.23			
Installation phase 1 / before HBO	330 Tage	Die 28.12.21	Mon 03.04.23					Insta	Illation phas	se 1 / before H	BO			03.0	4.23			
Installation Tunnel / Hall	150 Tage	Die 28.12.21	Mon 25.07.22						Installa	tion Tunnel / H	Hall		25.07.22					
Supply Platform Installation	36 Tage	Mit 02.02.22	Mit 23.03.22						Supply	Platform Insta	Illation	23.03.22						
Solenoid installation	274 Tage	Mit 02.02.22	Mon 20.02.23						:	Solenoid insta	Ilation			20.02.23				
Yoke Assembly	36 Tage	Mit 02.02.22	Mit 23.03.22							Yoke Ass	sembly 💻	23.03.22						
Muon Assembly	6,5 Monate	Don 24.03.22	Mit 21.09.22							Muo	on Assembly		21.09.22					
Cryostat & Control Dewar Installation (Solenoid Sides)	4 Monate	Don 22.09.22	Mit 11.01.23						Cryostat 8	Control Dewa	ar Installatio	n (Solenoid Si	des)	11.01.23				
Solenoid - liquid and gas connections	10 Tage	Don 12.01.23	Mit 25.01.23								Solenoid	d - liquid and g	as connections	s 🎽 25.01.23				
Solenoid - electrical connections	3 Tage	Don 26.01.23	Mon 30.01.23								So	olenoid - elect	rical connection	ns 30.01.23				
Cryo preparation and connection	3 Wochen	Die 31.01.23	Mon 20.02.23								C	ryo preparatio	on and connecti	on 🎽 20.02.23				
Cryogenics test	30 Tage	Die 21.02.23	Mon 03.04.23										Cryogenics	test 📥 03.04	23			
Installation phase 2 / after HBO	224 Tage	Mon 22.05.23	3 Don 28.03.24									Ins	stallation phase	2 / after HBO			28.03.24	
Counting House installation	19 Tage	Mon 22.05.23	3 Don 15.06.23										Counting Hous	e installation	15.06.23			
Dipole SAT	10 Tage	Mon 22.05.23	Fre 02.06.23											Dipole SAT 🚪	02.06.23			ר - E
Solenoid SAT	45 Tage	Mon 22.05.23	3 Fre 21.07.23										5	Solenoid SAT	21.07.23			
DIS (Detector Installation Start)	0 Tage	Fre 21.07.23	Fre 21.07.23															
Target Installation	36 Tage	Mon 24.07.23	3 Mon 11.09.23											Target Installati	ion 🔽 11.	09.23		
Detector Installation	179 Tage	Mon 24.07.23	3 Don 28.03.24										D	etector Installati	ion 🛛		28.03.24	
Solenoid Sides and Top assembly	98 Tage	Mon 24.07.23	3 Mit 06.12.23										Solenoid Sides	and Top assem	bly	06.12.23	\$	
Installation Beam	65 Tage	Mon 24.07.23	3 Fre 20.10.23											Installation Bea	am 🔽	20.10.23		
Installation Platform	117 Tage	Mon 31.07.23	3 Die 09.01.24										I	nstallation Platfo	orm	09.0	1.24	
Service Route	64 Tage	Mon 23.10.23	3 Don 18.01.24											Se	ervice Route	18./	J <b>1.24</b>	
Aux Platform	88 Tage	Mon 23.10.23	3 Mit 21.02.24											A	ux Platform		21.02.24	
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	vithout beam	09.05.1	24
Prepare for beam	70 Tage	Fre 10.05.24	Don 15.08.24		••••••										F	Prepare for be	eam	15.08.24
Survey and alignment	2 Tage	Fre 10.05.24	Mon 13.05.24												Surv	vey and align	ment 513.05.2	<u>14</u>
First light: Cosmics / Parkposition	20 Tage	Die 14.05.24	Mon 10.06.24											F	irst light: Cosn	nics / Parkpor	sition 📥 10.0	)6.24
Move to measuring position	5 Tage	Die 11.06.24	Mon 17.06.24												Move to	o measuring	position 17.(	06.24
Survey and alignment	3 Tage	Die 18.06.24	Don 20.06.24													Survey and a	lignment 120.	.06.24
Interface PANDA<->HESR	20 Tage	Fre 21.06.24	Don 18.07.24												Int	terface PAND.	A<->HESR 🃥	48.07.24
First Light: Cosmics with magnetic field / final position	20 Tage	Fre 19.07.24	Don 15.08.24											First Light: Cos	mics with mag	jnetic field / fi	nal position 🛓	15.08.24
Ready for beam (M11)	0 Tage	Don 15.08.24	Don 15.08.24														\$007.M11	\$ 15.08.24
4 Commissioning with beam	50 Tage	Fre 16.08.24	Don 24.10.24													Commissioni	ng with beam	24.10.24
Pretests with beam	10 Tage	Fre 16.08.24	Don 29.08.24													Prete	sts with beam	n 🎽 29.08.24
Calibration with beam	40 Tage	Fre 30.08.24	Don 24.10.24													Calibr	ation with hea	m 24.10.24
Ready for operation (M12)	0 Tage	Don 24.10.24	Don 24.10.24														♦	4 24.10.24
					- <b>b</b>													

- 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

#### Schedule and Day-1 Setup



## **TDR Status**



System	Submission ExpectedSubmission	M3M3 (Approval) Expected M3								
PANDA PHASE 1										
Target Spectrometer EMC 08/08/2008										
Solenoid	- Alle	21/05/2009								
Dipole	Se V	21103/2003								
Micro Vertex Detector (MVD)	Contraction of the second	26/02/2013								
Straw Tube Tracker (STT)	A State	29/01/2013								
Cluster Jet Target		28/08/2013								
Muon System		22/09/2014								
Forward Shashlyk Calorimeter		03/03/2016								
Barrel DIRC		20/08/2017								
Barrel Time of Flight (TOF)		14/02/2018								
Forward TOF		16/10/2018								
Forward Tracking		16/10/2018								
Luminosity Detector		04/04/2019								
Controls	28/08/2019	3/2020								
DAQ	2/2020	8/2020								
Planar GEM Trackers	3/2020	9/2020								
PANDA PHASE 2										
Endcap Disc DIRC	29/6/2018	6/2019								
Forward RICH	6/2020	12/2020								
Pellet Target	3/2020	9/2020								
Hypernuclear Setup	3/2020	9/2020								

Status 28/08/2019

For the items "Interaction Region", "Supports" and "Supplies" no TDRs are planned, only specification documents.

Computing TDR together with FAIR Computing TDR: FAIR Computing CDR late 2019

#### Phase 1: 12 TDRs approved

- Luminosity Detector: approved Apr 2019
- DCS TDR submitted end of Aug 2019
- DAQT TDR draft in preparation
- GEM TDR much delayed

#### Phase 2:

- Endcap Disc DIRC: submitted to FAIR, review by ECE in final stage, early deployment of First-of-Series
- Pellet Target
- Forward RICH
- Hypernuclear Setup



#### Schedule and Day-1 Setup

## **Day-1 Scorecard Aug 2019**



ΡΔΝΠΔ		TDR /	Cost the 20051	% Funding (See / RUS / Fol / TBA)	Construction	Construction	Test/
		Specs	CO3C [KE 2005]		construction	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	
Da	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% 19	6 31% value weighted		1% value weighted

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

(3) DAQ computing via operation funds

(2) if German-Russian Roadmap realised



#### **Schedule and Day-1 Setup**

## PANDA Day-1 / Phase 1 / Phase 2



Schedule and Day-1 Setup

## **PANDA Hall and Infrastructure**







#### Hall and Infrastructure

## **Infrastructure Planning**



## Infrastructure items

- Support structures
- Rails or Sliders
- Gas distribution
- Electrical power
- Cooling
- Service network
- Racks
- Infrastructure for control system

## Assignments

- Experiment
- Civil construction
  (partial)





### Hall and Infrastructure



Auxiliary platform

Hall and Infrastructure





Auxiliary platform

Hall and Infrastructure





Auxiliary platform

Hall and Infrastructure



Auxiliary platform

Hall and Infrastructure





Auxiliary & installation platforms



Hall and Infrastructure



Installation platforms

Hall and Infrastructure





Installation platforms

Hall and Infrastructure



Solenoid without supports

Hall and Infrastructure



Solenoid with rack supports and top platform

Hall and Infrastructure





Solenoid with rack supports and top platform

#### Hall and Infrastructure





**Forward platform** 

FAIR

Hall and Infrastructure



Solenoid with service drag chains and all supports and platforms

FAIR

#### Hall and Infrastructure

## **Interaction Region**



## Vacuum system, pumps, shutters

- Beam pipe, target cross, flanges
- Interfaces with detectors, target
- Support for pipe, MVD services
- Mounted on central space frame

## Status

- German in-kind of 151 k€ (2005)
- Workpackage at FZJ
- Project kick-off Jan 30, 2018:
  - ZEA-1 started development
- Prototype designs: Ti pipes
- Follow-up meetings
- Proposed Central Support to carry MVD services

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#### Hall and Infrastructure

## **PANDA Systems**









### **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



#### **System Updates**

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## **Solenoid News**

### 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 AI / SC cable end 2020

### Cold mass and coil winding:

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

### **Electrical systems:**

- Procurement of material
- Planning of power cable layout











### Status:

- Well advanced, world record density of ~4x10<sup>15</sup>cm<sup>-2</sup>
- PANDA target from U Münster, now at COSY for extended tests
- Production of new nozzles
- Gas purifier replaced

## **Current work:**

- Tests at COSY since Aug 2018
  - realistic tests of beam-target-interaction
  - commissioning successful: energy loss, beam lifetime, HF feedback
- Development of PANDA Slow Control

## **Critical:**

 Vacuum at PANDA IP, interfaces with beam-target pipe, interaction region (FZJ)





### • MVD (TDR M3 2014)

- Barrel: 2 pixel layers, 2 strip layers
- Forward: 6 disks, 2 mixed strips and pixels
- Advanced mechanical engineering
- ToPix ASIC prototype with full functionality

But slowed down in 2016/17

### First priority: strip barrel

- New 64 ch ASIC ToASt in design
- Submission late fall 2019

### Open issues:

- Pixel part from Italy not yet funded,
- Mitigation strategy pixels for Day-1
- Services of MVD within BWE EMC
- boundary conditions fixed by mock-up of services
- New Central Space Frame design reduces load on beam pipe (GSI)











#### System status

- Straw production finished
- Module assembly starting 2020
- Prototype frame installed
- Open WPs (formerly Italy):
   support frame, rails & gas system

### **Electronics Candidates:**

- PASTTREC ASIC + TRB TDC:
- Sampling ADC: time and pulse area
- Day-1 approach: ASIC/TRB for STT and Forward Tracker
- Contract ready for signature

### **Phase 0 Activities**

Straw Tracker Station for PANDA@HADES Q3/2019, 20 modules, 640 ch.,  $\rightarrow$  FT3/4

### **Critical Items**

- Mechanical support production design
- PASTTREC FEE mechanics layout







### PASTTREC card

HADES-PANDA Straw Tracker Station 1







## Technical Design:

- Straw tubes very similar to STT
- 6 stations with 4 projections each
- Modular design
- TDR approved by FAIR Oct 16 2018
- Assignment by FAIR Council
- Contract in preparation

### **Prototyping:**

Half plane of FT5 chamber (12 mod)

### **Phase 0 Activities:**

Straw Tracker for HADES based on FT5

### Reduced Day-1 setup:

- Staging of setup: FT1-4 or FT1/2/5/6
- Not all stations funded yet
  - $\rightarrow$  Replacement by LHCb OT considered

#### **System Updates**





#### **Baseline design**

- Fused silica (SiO<sub>2</sub>) radiator bars and prisms
- MCP PMT for readout
- Focusing by 3-layer spherical lenses
- Fast readout to suppress BG

#### Testbeams at CERN:

- Several campaigns with improved prototypes
- Measured results agree well with simulation
- Optimisation of readout options
- $\pi/K$  separation of 4.3  $\sigma$  reached

#### **Project status**

- Baseline design verified
- Plate radiator shows lower performance
- TDR approved in Aug 2017
- Procurement of bars awarded to Nikon
- Tender for PMTs ongoing
- Mechanics and optics production design
- Readout with DIRICH electronics tests started



#### **System Updates**



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APEEI

### **PWO Crystal Production**

**Barrel EMC** 

- Good prototypes from CRYTUR
- Funding issue for remaining crystals
- Start of first batch in 2018: complete one more slice

### **Barrel progress**

- All alveoles produced
- APD readout ASIC produced
- First slice construction complete, finalisation of cooling circuitry

## **Critical issues:**

- Timely crystal production
- APD production and screening
- Partial installation 12/16, placeholder mechanics
- Impact on inner systems of TS









## **Current status**

- Layout of alveoles done
- Full implementation in simulation
- Feature extraction algorithms
- Cooling design and simulations
- Testbeam activities at MAMI
- Tests of new HitDetection ASIC
- PRR on series production of modules

## Critical issues:

- Final boundary with MVD
- Interaction with STT FEE

## **Further steps:**

- Planning of Phase 0
- Finalization of layout











- First detector system to be fully assembled
- Cooling system available, ongoing work on controls
- Test stand for module calibration with cosmics
- All VPTT modules produced, ongoing calibration
- APD Module assembly started:
  - PRR on APD modules done
  - APD mass-screening: RUB; irradiation: JLU; QE samples: GSI
  - APD module design adapted for blue LED
- Pre-assembly prepared at FZJ
- Installation frame concept, need design & construction
- Next: Last PRR on system assembly



System Updates













#### **Detector layout:**

- Roman pot system at z=11 m
- Silicon pixels (80x80 µm<sup>2</sup>):
  4 layers of HV MAPS (50 µm thick) from Mu3e
- CVD diamond supports (200 μm)
- Retractable half planes in sec. Vacuum

### **Project status:**

- Prototypes of vessel, cooling and vacuum, production design ongoing
- CVD diamond supports available
- New MuPix prototype 1x2 cm<sup>2</sup> in test
- TDR approved Apr 4, 2019



### Forward Tracking in TS:

- Tracking in high occupancy region
- Important for large parts of physics

### Current status:

- Advanced mechanical concept
- Construction of demonstrator ongoing, first GEM foils from TECTRA received, expect delays due to fire at TECTRA
- Preparation of testbeam at GSI
- Study of different readout options
- Intensified integration planning
  Goal: TDR draft early 2020

### Ongoing issues:

- Characterisation of GEM foils
- Readout foil design
- Full size prototype design
- Lack of manpower

**System Updates** 

2D Demonstrator





Drift Electron



(Panda

Supervisory Laver

**Control Laver** 

Field Layer

Historian

Channel Access

PV Gate, Archiver,

I/O Controller(s)

Device driver(s)

WWW/W

Archiver,

- Field Layer
  - PANDA sub-systems specific
  - Interface: Detector Safety System
    "Ext." Systems
    Info. Dispatcher
- Control Layer
  - Native EPICS I/O controllers
  - Target: hybrid LabView-Epics
  - Archiving by each sub-system
- Supervisory Layer
  - Controls GUI interface
  - Interfaces: HESR, DAQ, Experiment Control System
  - Databases PV & configuration addressed
- Synergies with other FAIR experiments (CBM) ongoing
- DCS Test-bed in Mainz running, with 3 systems EMC, LMD, HYP

Interlocks bus

HESR <->

PANDA magnets ->

Experiment services <->

NTP Server

Archiver

Gb. Etherne

PV Gate

I/O Controller(s)

Device driver(s)

Monitor & Control

PV Gate,

I/O Controller(s)

Device driver(s)

TDR: reviewed, revised and submitted to FAIR ECE





A.Belias, L. Schmitt, GSI/FAIR

# Day-1: Data Acquisition

# Phase 2: Endcap Disc DIRC





## Novel concept for forward PID

- Based on DIRC principle
- Disc shaped radiator
- Photon detection on radiator rim

### **Basic components:**

- SiO<sub>2</sub> radiator disc
- Focusing element
- Optical bandpass filter
- MCP PMT for photon readout in mag field
- ToFPET ASIC for electronic readout



## Project status:

- Advanced design
- Several testbeams at CERN
- TDR submitted to FAIR ECE
- Review questions received
- Goal: quarter disc prototype

## Conclusion



### Main achievements:

- Solenoid construction in full swing test assembly delayed till January '20
- Dipole design work ongoing, construction contract in preparation
- Barrel DIRC procurement started, contract for bars signed, PMTs in preparation
- Barrel EMC first slice assembled, cooling being finalized till end 2019
- Installation planning for TS completed

## **Upcoming milestones:**

- Forward tracker and Straw FEE IKCs with Poland
- Solenoid:

Conclusion

- Yoke construction complete spring 2020
- Super-conductor production to finish by end 2020
- GEM demonstrator by end 2019
- DAQ TDR draft 12/2019
- DCS TDR submitted 8/2019
- Infrastructure cost assessment

## In summary: PANDA is on track for Day-1

