

Status Funding CBM and HADES experiment



12th CBM Resource Review Board meeting – 6th June 2023
Report CBM and HADES Resource Coordinator, Jürgen Eschke

Content:

- CBM Collaboration without Russian participation
- Consequences of the termination of all In-Kind contracts with Russian institutes (strategy for re-procurement)
- Status funding of the CBM day 1 setup and of the CBM start version
- Status Contracts for FAIR shareholder contributions
- Status Funding of HADES@SIS18 (FAIR Phase 0) and of HADES@SIS100 (FAIR Phase 1)
- HADES MoUs

March 2022

Stop of communication and cooperation with Russian Institutes in CBM Collaboration

In the context of the sanctions that have been decided, we ask you to comply with the following concrete catalog of measures, which applies with immediate effect:

- All deliveries to Russia are to be stopped.
- No new orders to be placed with Russia.
- Any know-how and technology transfer to Russia is to be stopped.
- Existing cooperation agreements are to be suspended.
- GSI's NICA project is frozen, as other GSI/FAIR bilateral projects with Russia.
- Workshops, talks, scientist exchanges, etc. with individuals from Russian institutions/companies must not be planned and must not take place.
- New visits of Russian partners must not be planned and must not take place.
- Participation of GSI/FAIR staff in advisory boards and activities of Russian institutions/companies and vice versa must be suspended.
- Any official communication with Russian institutes/companies such as BINP, JINR, etc. must be frozen.

Adjustments of the measures will be made depending on the further development of the situation.

Yours sincerely,

28. Februar 2022



Paolo Giubellino



Ulrich Breuer



Jörg Blaurock

CBM CB decision 18.05.2022

“The CBM collaboration has to follow the instructions by the FAIR/GSI management and therefore has to suspend the membership of Institutions in Russia, including JINR in the CBM Collaboration for the time being.

Following this prerequisite, the CBM Collaboration Board endorses the suspension of the membership of Institutions in Russia in the CBM Collaboration for the time being.”

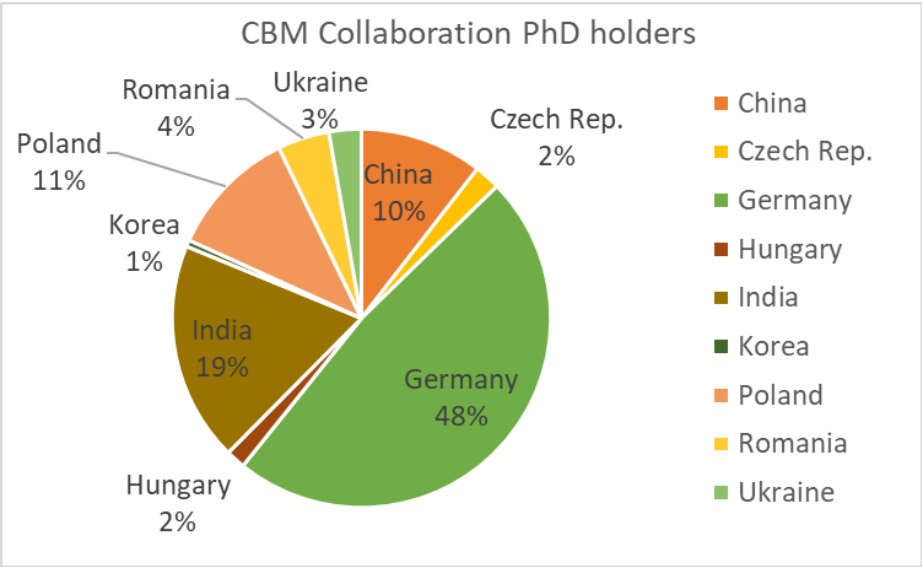
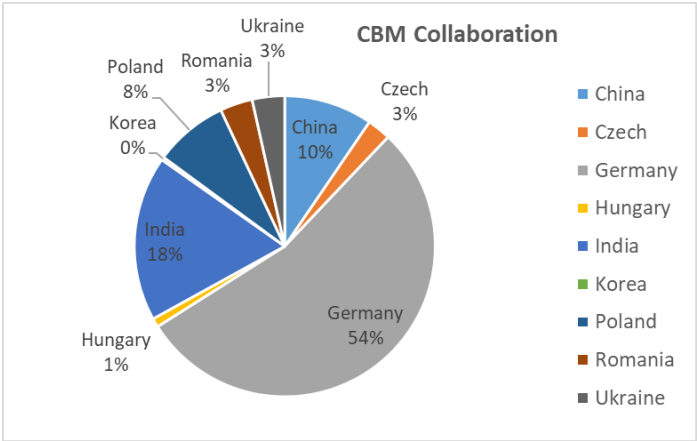
Termination (6.12.2022) of all collaboration contracts with Russian institutions by Council → executed by FAIR management

CBM CB decision 04.04.2023 (by e-voting)

CBM CB has decided to terminate the membership of institutions in Russia (this includes JINR) in the CBM collaboration.

Composition of CBM Collaboration (May 2023)

47 full member institutions
10 associated member institutions
from 10 countries
~400 full member – 22% from Russia = 315



CBM without Russia

Institute	City	Country	all	phd students	(PhD holder)
THU	Beijing	China	7	2	5
UChongqing	Chongqing	China	3	0	2
USTC	Hefei	China	8	4	3
CCNU	Wuhan	China	8	2	6
CTGU	Yichang	China	4	1	3
CTU	Prague	Czech	6	0	3
NPI-CAS	Řež	Czech	2	1	1
ZIB	Berlin	Germany	3	0	2
FAIR	Darmstadt	Germany	11	0	10
GSI	Darmstadt	Germany	58	7	40
IKP-TUD	Darmstadt	Germany	4	3	1
HZDR	Dresden	Germany	2	0	1
FIAS	Frankfurt	Germany	14	7	5
IKF-UFra	Frankfurt	Germany	16	5	8
IRI-UFra	Frankfurt	Germany	5	4	1
UGiessen	Gießen	Germany	8	4	2
PI-UHd	Heidelberg	Germany	7	2	3
ZITI-UHd	Heidelberg	Germany	1	0	1
KIT	Karlsruhe	Germany	7	1	3
UMuenster	Münster	Germany	15	5	3
UTuebingen	Tübingen	Germany	9	5	3
UWuppertal	Wuppertal	Germany	10	4	4
ELTE	Budapest	Hungary	1	0	1
WignerRCP	Budapest	Hungary	2	0	2
AMU	Aligarh	India	6	3	3
IOPB	Bhubaneswar	India	3	0	2
NISER	Bhubaneswar	India	3	0	3
UPanjab	Chandigarh	India	1	0	1
UGauhati	Guwahati	India	2	1	1
IIT-I	Indore	India	3	1	2
UJammu	Jammu	India	4	0	2
IIT-KGP	Kharagpur	India	1	0	1
Bose	Kolkata	India	8	2	6
UCalcutta	Kolkata	India	4	0	4
VECC	Kolkata	India	12	8	4
UKashmir	Srinagar	India	5	0	2
BHU	Varanasi	India	4	1	3
PNU	Pusan	Korea	1	0	1
AGH	Kraków	Poland	6	0	6
UJagiellonian	Kraków	Poland	7	0	6
IF-WUT	Warsaw	Poland	3	0	3
ISE-WUT	Warsaw	Poland	7	2	3
UWarsaw	Warsaw	Poland	2	0	2
IFIN-HH	Bucharest	Romania	6	0	4
UBucharest	Bucharest	Romania	5	1	4
KINR	Kyiv	Ukraine	6	1	1
TSNU-Kyiv	Kyiv	Ukraine	5	0	4
Sum-All			315	77	181

Termination of collaboration contracts (with Russia)

Decision of FAIR Shareholders (council) executed on 06.10.2022 by FAIR management to terminate all collaboration contracts with Russian institutions.

Many Collaboration Contracts (CC) for the accelerator In-Kind components have been terminated.

But also all Collaboration Contracts (CC) with Russian Institutions for In-Kind components for the NUSTAR, APPA, PANDA and CBM have been terminated.

For CBM four important Collaboration Contracts have been terminated (see list next slide).

The termination of the CCs is a prerequisite to procure these items from alternative vendors or receive them from other In-Kind partners.

CBM collaboration contracts (with Russia) **terminated !**

Project	Partner in Russia	Task	Costs [2005 KEURO]	Council Decision	Status contract	Contract value [€]	sum payments until 24.02.2022	amount available at FAIR GmbH	Equipment delivered	
SC dipole magnet	BINP	Design and Construction	3.758 Mio	09.07.2014	signed	4.961.650	2.409.413	2.552.237		terminated
STS	JINR	Construction of detector ladders for first 4 stations	2.115 Mio	10.12.2013	signed	2.812.332	140.617	717.729	1.953.986	not terminated yet *2 MC used for sensor and micro cable procurements by FAIR GmbH
PSD	INR Troitzk	Design and Construction	0.778 Mio	30.06.2015	signed	993.034	734.357	258.677		terminated
RICH	PNPI Gatchina	Construction of mechanical structures, gas system	1.2 Mio	09.11.2016	signed	1.615.237	636.940	978.297		terminated
MUCH	PNPI Gatchina	Construction of absorbers, mechanical structures, gas system	1.822 Mio	09.11.2016	signed	2.457.436	765.615	1.691.821		terminated
TOF	ITEP	Inner zone	0.468 Mio	09.11.2016	In preparation					not worked out anymore
						12.839.689	4.686.942	6.198.761	1.953.986	

Decision of FAIR Shareholders executed to terminate all collaboration contracts (except JINR CCs), which is the prerequisite to procure items from alternative vendors or other In-Kind partners

Decision by council on usage of unspent Russian CC money for Experiments to be done

→ should be according to original planning (this was suggested to and appreciated by IKMG)

In-Kind Monitoring Group (IKMG)

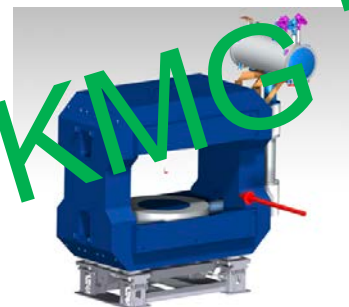
Time-Critical Item “CBM Dipole Magnet”

Function and Status

Essential for science with CBM.
Yoke manufactured, coil and cryostat pending, all components at BINP in Russia

Proposal and Cost estimate

Full re-procurement as no parts are delivered outside Russia and the new company will provide its design.



CBM magnet yoke at BINP



Contract

	Status
Contracting value [€]	4,961,649
Paid out [€]	2,409,412
Usable/on-site	0%
Proposed	Full re-procurement

Proposed Cost Book entries [k€ 2005]

	PSP	Old	New
Original PSP	1.1.1.7	3,758.0	-
<i>Usable On-Site</i>	1.1.1.7.1	-	-
<i>Spent&Lost Payments RU</i>	1.1.1.7.2	-	1,824.9
<i>Re-Procurement</i>	1.1.1.7.3	-	3,758.0

6144 k€ (2023 prices)

CBM Magnet

Main achievements in last ~6 months

- The call for tenders has been submitted on January 20, 2023.
- Three companies have applied: ASG (Italy), Bilfinger-Noell (Germany), and ELYTT (Spain). All three of them have passed the qualification criteria, and were asked to submit detailed offers including the costs. The deadline for offers has been extended to May 31, by request of one company.
- The contract can be concluded after a FAIR council decision releasing funding (next meeting planned for July 2023).
- The power supply and the quench protection system will be procured separately, because their specifications require a preliminary design of the magnet



ASG (Italy)
SFRS sc multiplett
magnets



Bilfinger-Noell
(Germany)
SIS100 sc dipole
magnets



ELYTT (Spain)
SFRS sc dipole
magnets

status re-procurement:

- 31 May 2023: 3 offers of companies received
- Decision of FAIR council for contracting as “urgent procurement” is scheduled for July 2023 council meeting

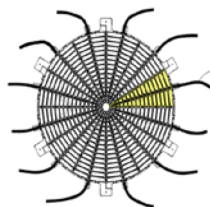
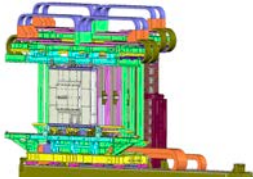
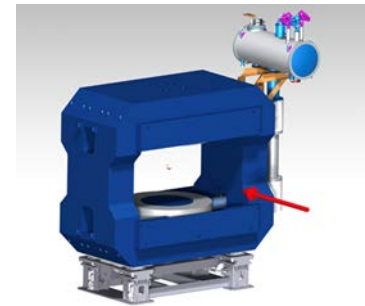
Critical for success: Council release of available project funds for experiments for the following re-procurements

List CBM re-procurement costs recommended by IKMG: (included in CBM cost matrix)

				Old ECB				New ECB
Pillar	Provider	Contract name	Main PSP	Orig. Costbook-Value [€ 2005]	Contracting Value [€]	Usable On-Site [€ 2005]	Est. Re-Procurement costs [€ 2023]	Re-Procurement [€ 2005]
CBM	PNPI	CC1.1.1.3.1.2.1 RICH	1.1.1.3.1.2.1	1.200.000	1.615.237	0	1.283.037	784.732
CBM	PNPI	CC1.1.1.3.2.3.1 MUCH	1.1.1.3.2.3.1	1.822.000	2.457.436	0	2.566.074	1.569.464
CBM	INR	CC1.1.1.6.2.1 PSD	1.1.1.6.2.1	778.000	993.034	0	718.501	439.450
CBM	BINP	CC1.1.1.7 SC dipole magnet	1.1.1.7	3.758.000	4.961.650	0	6.144.330	3.758.000

- **All missing Russian components need to be re-procured.**
 - RICH: gas box, support stand, mirror system, gas system
 - MUCH: absorbers, superstructure, rails, gas system
 - PSD: new project defined - Forward Spectrometer Detector (FSD)

In addition to the Magnet



- Components affected by EU sanctions discussed by IKMG
 - Collaboration Contracts terminated
(CC with JINR seem impossible in practice)
- CBM Re-Procurement costs are in new Cost Book (2005 prices), which has to be approved by Council.
- CBM Re-Procurements proposed (from available FAIR project funds for experiments)
- **The IKMG (meeting #9, 1 June 23) confirmed their earlier recommendation to recommend the procurement of the CBM dipole. Approval needs a Council decision, which is expected in July.**

CBM day 1 setup detector / system	Costs	Common fund	Germany		Russia	India	Poland	Romania	China	Czech Republic	Hungary		France	Korea	Ukraine	to be assigned
			GSI and FAIR project funds	University funding (VF)												
MVD	1,46			0,58									0,50	0,11		0,26
STS	15,14		7,38	0,97			2,87								0,15	0,41
TRD	4,17			1,25				1,97			0,23	0,06				0,67
RICH	5,89		1,97	1,28	0,40	1,91										0,32
TOF	9,22		1,18	0,70		0,75		1,19	4,55							0,85
Beam Monitoring System	0,19			0,11						0,08						
Online Systems (DAQ+FLES) day-1 setup	2,91		1,40	1,18			0,32									
Magnet	5,99					5,99										
MuCh	9,78				0,78	2,90	6,09									
PSD	1,50					1,24				0,26						
Infrastructure	3,49	3,49														
ECAL (not part of day 1 setup)																
Sum in 2022 M€	59,72	3,49	11,93	6,09	1,18	16,15	6,09	3,19	3,16	4,55	0,34	0,23	0,06	0,50	0,11	2,50
Sum in 2005 M€	37,49	2,19	7,49	3,82	0,74	10,14	3,83	2,00	1,98	2,86	0,21	0,14	0,04	0,31	0,07	1,57
escalation factor (1./1.593)																

This calculation uses an escalation factor of 1.593 between 2005 prices and 2022 prices

1,593

CBM phase 1																
CBM day 1 set													0,50	0,11	0,15	2,50
full bandwidth (DAQ/FLES)																0,58
plus ECAL																
Sum in 2022 M€						16,15	6,09	3,19	3,16	4,55	0,34	0,23	0,06	0,50	0,11	3,08
Sum in 2005 M€			7,49	3,82	3,55	10,14	3,83	2,00	1,98	2,86	0,21	0,14	0,04	0,31	0,07	1,93

85,8 % secured

Experiment funding
(in 2005 and 2023 prices [k€])

CBM day 1 setup
and CBM phase 1 setup (CBM start version@SIS100)

12th RRB 06.06.2023

Status CBM experiment funding (CBM day 1 & start version@SIS100)										
PSP Code	detector / system	Prices, K Euro (2005 price)				Prices, K Euro (2023 price)				components belongs to CBM day 1 setup
		total cost 2005 prices	Secured amount	Eol	To be assigned	total cost 2023 prices	Secured amount	Eol	To be assigned	
1.1.1.1	Micro Vertex Detector (MVD)	914	680	71	163	1495	1112	117	266	1
1.1.1.2	Silicon Tracking System (STS)	9504	9152	94	258	15539	14964	153	422	1
1.1.1.3.1	Ring Image Cherenkov Detector (RICH)	3032	2046	785	201	4957	3345	1283	329	1
1.1.1.3.2	Muon Detector (MUCH)	5395	3826	1569		8821	6255	2566		1
1.1.1.4	Transition Radiation Detector (TRD)	2615	2054	143	418	4276	3359	234	683	1
1.1.1.5	Time of Flight System (TOF)	5785	4787	0	999	9459	7826	0	1633	1
1.1.1.6.1	Electromagnetic Calorimeter (ECAL)	2805		2805		4587		4587		no
1.1.1.6.2	Projectile Spectator Detector (PSD), now Forward Detector	705	166	539		1153	271	882		1
1.1.1.7	Dipol MAGNET	3758	3758			6144	6144			1
1.1.1.8	Online Systems (DAQ and FLES)	2188	1825	0	363	3577	2984	0	593	(1)
1.1.1.9	Beam Monitoring System	241	120	122		395	196	199		1
1.1.1.10	Infrastructure	2192	1754		438	3584	2867		717	1
	Sum CBM Phase 1 setup	39136	30167	6129	2840	63987	49323	10020	4643	77,1%
	Sum CBM day 1 setup (without ECAL and full bandwidth DAQ/FLES)	35967	30167	3323	2477	58807	49323	5433	4050	83,9%
										percentage secured
1.635	This calculation uses an escalation factor of 1.635 between 2005 prices and 2023 prices									

revised Funding CBM day-1 setup

June 2023

Estimated re-procurement costs [2023 EUROS]

- Magnet: 6,14 M€
- Forward Detector (former PSD): 0,72 M€
- RICH mechanics, gassystem: 1,28 M€
- MUCH absorbers, mechanics: 2,56 M€

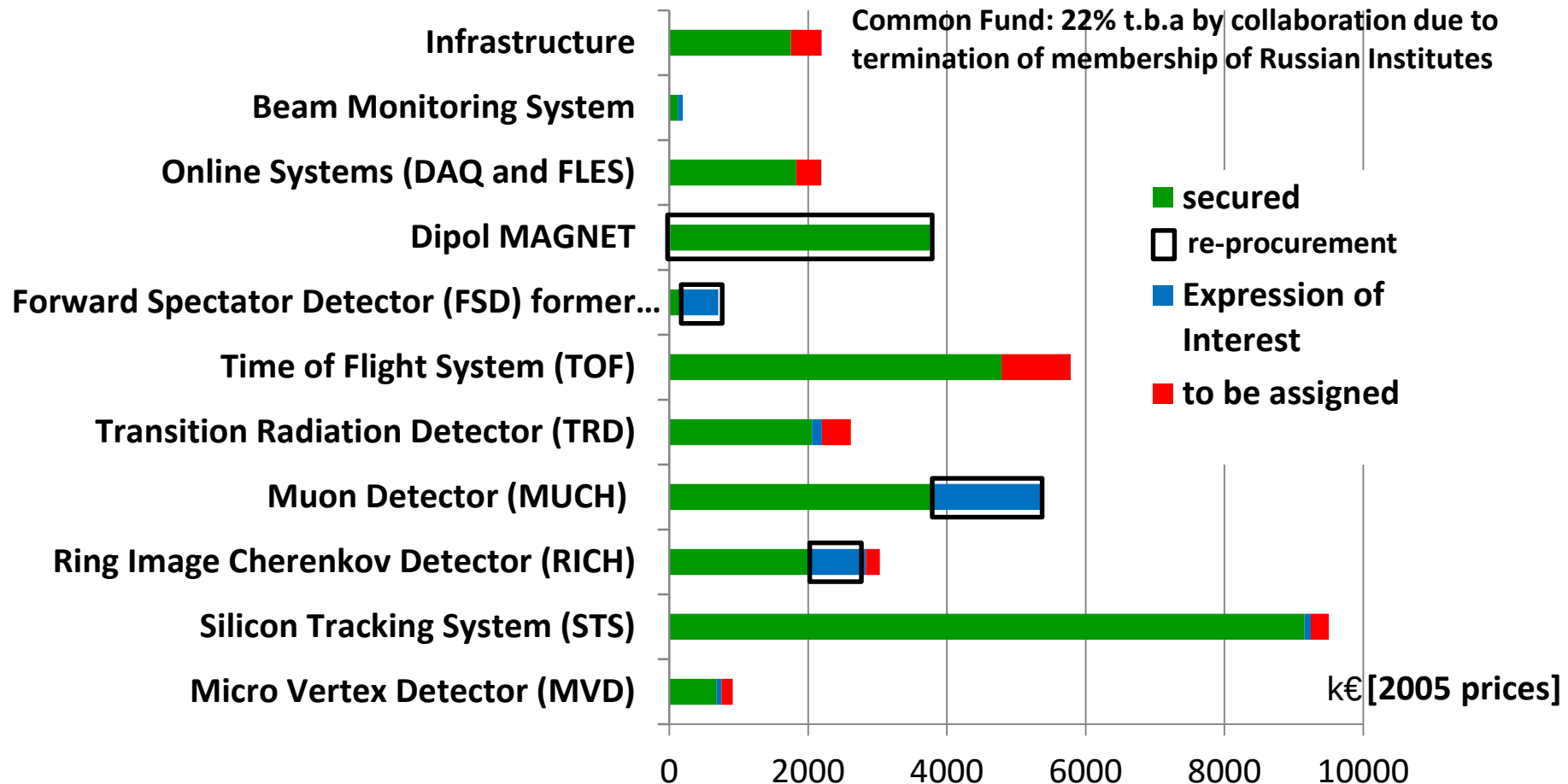
total cost: 35,97 M€ (2005 EURO)

secured: 30,17 M€

Eol: 3,32 M€

t.b.a. 2,48 M€

83,9 % secured funding



Country funding (in 2023 prices [M€])CBM day 1 setup12th RRB 06.06.2023

and CBM phase 1 setup (CBM start version)

CBM day 1 setup detector / system	Costs	Common fund	Germany		FAIR (re- procurement) * IKC for STS with JINR (will be terminated)			India	Poland	Romania	China	Czech Republic			Hungary		France	Korea	Ukraine	to be assigned	
			GSI and FAIR project funds	University funding (VF)																	
MVD	1,49			0,60												0,51	0,12		0,27		
STS	15,54		7,57	0,99		*	3,46		2,94									0,15	0,42		
TRD	4,28			1,28						2,02				0,23	+	0,06			0,68		
RICH	4,96		2,03	1,32	1,28	+													0,33		
TOF	9,46		1,21	0,72			0,00			1,22	4,67								1,63		
Beam Monitoring System	0,39			0,12								0,08							0,20		
Online Systems (DAQ+FLES) day-1 setup	2,98		1,44	1,22					0,33												
Magnet	6,14					+	6,14														
MuCh	8,82				2,57	+		6,26													
Forward Detector (former PSD)	1,15				0,72	+						0,27	+	0,16							
Infrastructure	3,58	2,87																	0,72		
ECAL (not part of day 1 setup)																					
Sum in 2023 M€	58,81	2,87	12,25	6,25	4,57	+	9,60	6,26	3,27	3,24	4,67	0,35	+	0,16	0,23	+	0,06	0,51	0,12	0,15	4,25
Sum in 2005 M€	35,97	1,75	7,49	3,82	2,79	+	5,87	3,83	2,00	1,98	2,86	0,21	+	0,10	0,14	+	0,04	0,31	0,07	0,09	2,60
escalation factor (1./1.635)																					
This calculation uses an escalation factor of 1.635 between 2005 prices and 2023 prices																					
1,635																					
amounts in green are considered as secured / 83,9 % secured																					
amounts in blue - Expression of Interest (EoI)																					
amounts in red - to be assigned																					
CBM phase 1 setup																					
CBM day 1 setup	58,81	2,87	12,25	6,25	4,57	+	9,60	6,26	3,27	3,24	4,67	0,35	+	0,16	0,23	+	0,06	0,51	0,12	0,15	4,25
full bandwidth (DAQ/FLES)	0,59																			0,59	
plus ECAL	4,59				4,59																
Sum in 2023 M€	63,99	2,87	12,25	6,25	9,15		9,60	6,26	3,27	3,24	4,67	0,35	+	0,16	0,23	+	0,06	0,51	0,12	0,15	4,84
Sum in 2005 M€	39,14	1,75	7,49	3,82	5,60	+	5,87	3,83	2,00	1,98	2,86	0,21	+	0,10	0,14	+	0,04	0,31	0,07	0,09	2,96
77,1 % secured																					

CBM day 1 setup detector / system	Costs	Common fund	Germany		FAIR (re- procurement) * IKC for STS with JINR (will be terminated)			India	Poland	Romania	China	Czech Republic			Hungary			France	Korea	Ukraine	to be assigned
			GSI and FAIR project funds	University funding (VF)																	
MVD	0,91			0,37													0,31	0,07		0,16	
STS	9,50		4,63	0,61		*	2,12		1,80										0,09	0,26	
TRD	2,62			0,78						1,23					0,14	+	0,04			0,42	
RICH	3,03		1,24	0,81	0,78	+														0,20	
TOF	5,79		0,74	0,44			0,00			0,75	2,86									1,00	
Beam Monitoring System	0,24			0,07								0,05								0,12	
Online Systems (DAQ+FLES) day-1 setup	1,83		0,88	0,74					0,20												
Magnet	3,76					+	3,76														
MuCh	5,40				1,57	+		3,83													
Forward Detector (former PSD)	0,71				0,44	+						0,17	+	0,10							
Infrastructure	2,19	1,75																		0,44	
ECAL (not part of day 1 setup)																					
Sum in 2005 M€	35,97	1,75	7,49	3,82	2,79	+	5,87	3,83	2,00	1,98	2,86	0,21	+	0,10	0,14	+	0,04	0,31	0,07	0,09	2,60
Sum in 2023 M€	58,81	2,87	12,25	6,25	4,57	+	9,60	6,26	3,27	3,24	4,67	0,35	+	0,16	0,23	+	0,06	0,51	0,12	0,15	4,25
escalation factor 1.635																					

This calculation uses an escalation factor of 1.635 between 2005 prices and 2023 prices

amounts in green are considered as secured / 83,9 % secured

amounts in blue - Expression of Interest (EoI)

amounts in red - to be assigned

CBM phase 1 setup																					
CBM day 1 setup	35,97	1,75	7,49	3,82	2,79	+	5,87	3,83	2,00	1,98	2,86	0,21	+	0,10	0,14	+	0,04	0,31	0,07	0,09	2,60
full bandwidth (DAQ/FLES)	0,36																			0,36	
plus ECAL	2,81				2,81																
Sum in 2023 M€	39,14	1,75	7,49	3,82	5,60		5,87	3,83	2,00	1,98	2,86	0,21	+	0,10	0,14	+	0,04	0,31	0,07	0,09	2,96
Sum in 2005 M€	39,14	1,75	7,49	3,82	5,60	+	5,87	3,83	2,00	1,98	2,86	0,21	+	0,10	0,14	+	0,04	0,31	0,07	0,09	2,96

CBM Cost Matrix & HADES Cost Matrix (22.05.2023)

please consult distributed cost matrix for all details!

Information						2005 prices								2023 prices				Comments
PSP code	System & description	TDR year approved	Country	Funding agency / source	Institution	assignment belongs to CBM (in %)	Total Cost (2005 prices)	Second amount (2005 prices)		Est. (2005 prices)	To be assigned (2005 prices)	Total Cost (2023 prices)	Second amount (2023 prices)		Est. (2023 prices)	To be assigned (2023 prices)		
								FARH Budget	Other sources				FARH Budget	Other sources				
1.1.1. CBM start version@SIS100																		
1.1.1.1	Micro Vortex Detector (MVD)	approved in 2005				1	914					1495						
1.1.1.1.1	Micro Vortex Detector (MVD)		Germany	BMBF-VF	Institut für Kernphysik, Universität Frankfurt	1	365		365			598	0	598	0	0		
1.1.1.1.2	Micro Vortex Detector (MVD)			In be assigned			163		163			266	0	0	266			
1.1.1.1.3	Micro Vortex Detector (MVD)		France	CNRS	IMAC, IM2P-CNRS et Université de Strasbourg	1	314	314				514	0	514	0	0		
1.1.1.1.4	Micro Vortex Detector (MVD)		Austria	Proton National University	Proton National University	1	71		71			117	0	0	117	0		
1.1.1.2	Optical Tracking System (OTS)	approved in 2013				1	9504					15539						
1.1.1.2.1	Optical Tracking System (OTS)		Germany	BMBF / RWTH AACHEN	GSF	1	4630	4630				7570	7570	0	0	0		
1.1.1.2.2	Optical Tracking System (OTS)		Russia	ROSCOSMOS	Joint Institute for Nuclear Research (JINR-Vladimir)	1	2115	2115				3458	3458	0	0	0		
1.1.1.2.3	Optical Tracking System (OTS)		Poland	Ministry of Science and Higher Education	AGH University of Science and Technology	1	572	572				936	936	0	0	0		
1.1.1.2.4	Optical Tracking System (OTS)		Poland	Ministry of Science and Higher Education	Warsaw School of Physics, Jagiellońska University	1	707	707				1156	1156	0	0	0		
1.1.1.2.5	Optical Tracking System (OTS)		Poland	Ministry of Science and Higher Education	Warsaw School of Physics, Jagiellońska University	1	261	261				427	427	0	0	0		
1.1.1.2.6	Optical Tracking System (OTS)		Poland	Ministry of Science and Higher Education	Institute of Electronic Systems, WUT	1	260	260				425	425	0	0	0		
1.1.1.2.7	Optical Tracking System (OTS)		Germany	BMBF-VF	Physikalisches Institut, Universität Tübingen	1	607	607				993	0	993	0	0		
1.1.1.2.8	Optical Tracking System (OTS)			In be assigned			258		258			422	0	0	422			
1.1.1.2.9	Optical Tracking System (OTS)		Japan	KEK / State Agency of Japan	High Energy Physics Department, KEK	1	94		94			153	0	0	153	0		
1.1.1.3	Long Range Cherenkov Detector (LRCH)	approved in 2004				1	3032					4997						
1.1.1.3.1	Long Range Cherenkov Detector (LRCH)		Germany	BMBF-VF	Physikalisches Institut, Universität Gießen	1	275	275				450	0	450	0	0		
1.1.1.3.1.1	Long Range Cherenkov Detector (LRCH)			In be assigned			201		201			329	0	0	329			
1.1.1.3.1.2	Long Range Cherenkov Detector (LRCH)		Germany	BMBF-VF	Fachbereich C, Universität Wuppertal	1	531	531				869	0	869	0	0		
1.1.1.3.1.3	Long Range Cherenkov Detector (LRCH) (in preparation)						785		785			1283	0	0	1283			
1.1.1.3.1.4	Long Range Cherenkov Detector (LRCH)		Germany	BMBF-VF	GSF	1	1239	1239				2026	0	2026	0	0		
1.1.1.3.2	Micro Detector (MDC)	approved in 2005				1	5395					8821						
1.1.1.3.2.1	Micro Detector (MDC)		India	DOT	Variable Energy Cyclotron Center (VCC)	1	36	36				58	0	58	0	0		
1.1.1.3.2.2	Micro Detector (MDC)		India	DOT	Variable Energy Cyclotron Center (VCC)	1	3790	3790				6197	6197	0	0	6197		
1.1.1.3.2.3	Micro Detector (MDC) (in preparation)					1	1569		1569			2566	0	0	2566			
1.1.1.4	Transition Radiation Detector (TRD)	approved in 2005				1	2615					4276						
1.1.1.4.1	Transition Radiation Detector (TRD)		Germany	BMBF-VF	Institut für Kernphysik, Universität Frankfurt	1	321	321				526	0	526	0	0		
1.1.1.4.2	Transition Radiation Detector (TRD)			In be assigned			418		418			683	0	0	683			
1.1.1.4.3	Transition Radiation Detector (TRD)		Germany	BMBF-VF	Institut für Kernphysik, Universität Frankfurt	1	142	142				232	0	232	0	0		
1.1.1.4.4	Transition Radiation Detector (TRD)				In be assigned		0		0			0	0	0	0	0		
1.1.1.4.5	Transition Radiation Detector (TRD)		Germany	BMBF-VF	Institut für Kernphysik, Universität Münster	1	321	321				524	0	524	0	0		
1.1.1.4.6	Transition Radiation Detector (TRD)				In be assigned		0		0			0	0	0	0	0		
1.1.1.4.7	Transition Radiation Detector (TRD)		Russia	MCC and Atomic Physics Institute (IAP)	ITP	1	752	752				1230	1230	0	0	0		
1.1.1.4.8	Transition Radiation Detector (TRD)		Russia	MCC and Atomic Physics Institute (IAP)	ITP	1	482	482				789	789	0	0	0		
1.1.1.4.9	Transition Radiation Detector (TRD)		Hungary	Ministry of Science and Technology Development Office	Magyar Research Center	1	179	36	143			292	0	58	234	0		
1.1.2	Time of Flight System (TOF)	approved in 2005				1	5786					9459						
1.1.2.1	Time of Flight System (TOF)		Germany	BMBF / RWTH AACHEN	GSF	1	740	740				1210	1210	0	0	0		
1.1.2.2	Time of Flight System (TOF)		China	Central China Normal University, College of Physical Science and Technology		1	1086	1086				1775	0	1775	0	0		
1.1.2.3	Time of Flight System (TOF)		China	Tsinghua University (THU)	Department of Engineering Physics, Tsinghua University	1	911	911				1489	0	1489	0	0		
1.1.2.4	Time of Flight System (TOF)		China	Technology of China (USTC)	Department of Modern Physics, University of Science & Technology of China (USTC)	1	861	861				1407	0	1407	0	0		
1.1.2.5	Time of Flight System (TOF)				In be assigned		0		0			0	0	0	0	0		
1.1.2.6	Time of Flight System (TOF)				In be assigned		0		0			0	0	0	0	0		
1.1.2.7	Time of Flight System (TOF)		Germany	BMBF-VF	Physikalisches Institut, Universität Heidelberg	1	441	441				722	0	722	0	0		
1.1.2.8	Time of Flight System (TOF)				In be assigned		0		0			0	0	0	0	0		
1.1.2.9	Time of Flight System (TOF)		Russia	IKI	ITP	1	748	748				1223	1223	0	0	1223		
1.1.2.10	Time of Flight System (TOF)			In be assigned			468		468			765	0	0	765			
1.1.2.11	Time of Flight System (TOF)			In be assigned			531		531			869	0	0	869			
1.1.3	Electromagnetic Calorimeter (ECAL)	substitution in 2005				1	2909		2909			4587						
1.1.3.1	Forward Detector - Barrel Projectile Spectator (FDS) (in preparation)		France	ROSCOSMOS	TSP	1	709					1153						
1.1.3.2	Forward Detector - Barrel Projectile Spectator (FDS) (in preparation)				In be assigned		439		439			719			719			
1.1.3.3	Forward Detector - Barrel Projectile Spectator (FDS) (in preparation)		Czech Republic	MSMT	Czech Technical University (CTU)	1	83	83				136	0	136	0	0		
1.1.3.4	Forward Detector - Barrel Projectile Spectator (FDS) (in preparation)		Czech Republic	MSMT	ITP	1	163	83	180			299	0	136	164	0		
1.1.3.5	Forward Detector - Barrel Projectile Spectator (FDS) (in preparation)				In be assigned		3758					6144						
1.1.3.6	Forward Detector - Barrel Projectile Spectator (FDS) (in preparation)				In be assigned		3758	3758				6144	6144					
1.1.4	Online Systems (DAQ and FLS)					1	2188					3577						
1.1.4.1	Data Acquisition and Controls (DAQ)		Germany	BMBF-VF	GSF	1	881	881				1441	0	1441	0	0		
1.1.4.2	Data Acquisition and Controls (DAQ)				In be assigned		0		0			0	0	0	0	0		
1.1.4.3	Data Acquisition and Controls (DAQ)		Germany	BMBF-VF	Ministry of Science and Higher Education	1	40	40				65	0	65	0	0		
1.1.4.4	Data Acquisition and Controls (DAQ)		Poland	Ministry of Science and Higher Education	Institute of Electronic Systems, WUT	1	200	200				327	327	0	0	0		
1.1.4.5	Fast Local Event Detector (FLED)		Germany	BMBF-VF	Institute of Electronic Systems, WUT	1	704	704				1150	0	1150	0	0		
1.1.4.6	Fast Local Event Detector (FLED)			In be assigned			0		0			0	0	0	0	0		
1.1.4.7	Beam Monitoring System			In be assigned			241		241			395	0	0	395			
1.1.4.8	Beam Monitoring System		Germany	BMBF-VF	ITP	1	72	72				118	118	0	0	118		
1.1.4.9	Beam Monitoring System (BMS)		Germany	BMBF-VF	ITP	1	122					199						
1.1.4.10	Beam Monitoring System (BMS)		Czech Republic	MSMT	CTU	1	48	48				78	78	0	0	78		
1.1.5	Trigger and Beam pipe & vacuum	no TDR provided				1	2182					3584						
1.1.5.1	Trigger and Beam pipe & vacuum		Common Fund	at CBM member institutions		1	229	179	45	365	292	73	73	73	73	Common		
1.1.5.2	Trigger and Beam pipe & vacuum		Common Fund	at CBM member institutions		1	349	265	64	104	164	40	40	40	40	Common		
1.1.5.3	Common data optical fibers		Common Fund	at CBM member institutions		1	368	295	73	121	196	45	45	45	45	Common		
1.1.5.4	Electronics Rack		Common Fund	at CBM member institutions		1	290	204	86	140	224	56	56	56	56	Common		
1.1.5.5	Cryogenics		Common Fund	at CBM member institutions		1	0	0	0	0	0	0	0	0	0	0		
1.1.5.6	Detector gas infrastructure		Common Fund	at CBM member institutions		1	184	145	39	63	103	25	25	25	25	Common		
1.1.5.7	General infrastructure & safety		Common Fund	at CBM member institutions		1	370	295	75	121	196	45	45	45	45	Common		
1.1.5.8	Common support infrastructure		Common Fund	at CBM member institutions		1	370	295	75	121	196	45	45	45	45	Common		
1.1.5.9	Power & standard media distribution		Common Fund	at CBM member institutions		1	79	60	19	32	51	12	12	12	12	Common		
Total amounts CBM Phase 1 setup							39136	18533	11634	6129	2840	63987	30302	19021	10020	4643		
Total amounts CBM day 1 setup (without ECAL and full bandwidth DAQ/FLS)							35967	18533	11634	3323	2477	58807	30302	19021	5433	4050	83,9% less	
This calculation uses an escalation factor of 1.435 between 2005 prices and 2023 prices							1435			438		2807		787		2010		

Name						Total Cost (2005 prices)		Second amount (2005 prices)		Est. (2005 prices)		To be assigned (2005 prices)		Total Cost (2023 prices)		Second amount (2023 prices)		Est. (2023 prices)		To be assigned (2023 prices)		Comments		
PSP code	System & description	TDR / year of approval	Country	Funding agency	Institution	assignment belongs to	Total Cost (2005 prices)	FARH Budget	Other sources	FARH Budget	Other sources	Total Cost (2023 prices)	FARH Budget	Other sources	Total Cost (2023 prices)	FARH Budget	Other sources	Total Cost (2023 prices)	FARH Budget	Other sources	Total Cost (2023 prices)	FARH Budget	Other sources	Comments
1.1.2. HADES@SIS100 (FAIR Phase 1) and HADES@SIS18 (FAIR Phase 0)																								
1.1.2.1	Hadrons and interaction		Germany	BMBF-GS	GSF	FAIR Phase 1	386					631												
1.1.2.1.1			Germany	BMBF-GS	GSF	FAIR Phase 1	6				6											10		
1.1.2.1.2	Infrastructure		Czech Rep.	MSMT	CTU	FAIR Phase 1	290				290	0									457	0		
1.1.2.1.3	HADES exp. allocation into CBM core		HADES Common Fund			FAIR Phase 1	100				100	0									164	164		
1.1.2.2	Open Infrastructure		HADES Common Fund			FAIR Phase 0	69		69			113		113										
1.1.2.3	HADES Calorimeter (ECAL)	approved in 2004					1229					2009												
1.1.2.3.1	ECAL main frame		Poland	Ministry of Science and Higher Education	Warsaw School of Physics, Jagiellońska University	FAIR Phase 0	200	200				327	327								0			
1.1.2.3.2	ECAL Ref System		Germany	BMBF-GS	GSF	FAIR Phase 0	25		25			41		41										
1.1.2.3.3	ECAL Infrastructure		Czech Rep.	MSMT	CTU	FAIR Phase 0	293		293			479		479										
1.1.2.3.4	ECAL 3 inch PMTs		Germany	BMBF-VF	ITP Darmstadt	FAIR Phase 1	66		66			107		107										
1.1.2.3.5			Germany	BMBF-GS	GSF	FAIR Phase 1	159		159			260		260										
1.1.2.3.6			Germany	ITP Darmstadt	ITP Darmstadt	FAIR Phase 1	21		21			35		35										
1.1.2.3.7			Czech Rep.	MSMT	CTU	FAIR Phase 1	13		13			21		21										
1.1.2.3.8			Czech Rep.	MSMT	NPI	FAIR Phase 1	452		333	119		778		544	195									
1.1.2.4	Readout Electronics Modification						168					275												
1.1.2.5	Readout Electronics Modification				to be assigned		168			168		275		0	275									
							421					689												
1.1.2.6	MDC Phase 0				to be assigned	FAIR Phase 1	207			207		338		0	338									
1.1.2.7	MDC FEE		Germany	BMBF-VF	Institut für Kernphysik, Universität Frankfurt	FAIR Phase 0	197		197			322		322	0									
1.1.2.8	MDC FEE				to be assigned		0					0		0	0									
1.1.2.9	MDC FEE		HADES Common Fund			FAIR Phase 0	17		17			28		28	0									
1.1.3	BCR Upgrade					FAIR Phase 0	43					59												
1.1.3.1	BCR Upgrade						0					0												
							0				0													
							0				0													
							0				0													
							0				0													
1.1.3.2	BCR electronics		Germany	ITP Mainz	ITP Mainz		43		43			69		69	0									
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Status CBM collaboration contracts (Russia)

Project	Partner in Russia	Task	Costs (€ 2005)	Council Decision	Status contract
SC dipole magnet	BINP Novosibirsk	Design and Construction	3.758 Mio	9.07.2014	signed
STS	JINR Dubna	Construction of detector ladders for first 4 stations	2.115 Mio	10.12.2013	signed
PSD	INR Troitzk	Design and Construction	0.778 Mio	30.06.2015	signed
RICH	PNPI Gatchina	Construction of mechanical structures, gas system	1.2 Mio	9.11.2016	signed
MUCH	PNPI Gatchina	Construction of absorbers, mechanical structures, gas system	1.822 Mio	9.11.2016	signed
TOF	ITEP	Inner zone	0.468 Mio	9.11.2016	In preparation

collaboration contract with JINR on
STS module assembly *not terminated yet (termination in preparation)*

JINR Dubna – contract not canceled yet!

- Majority of the IKC completed → all sensors delivered plus microcables value ~2M€
- 40% of the STS modules to be assembled in JINR → needs to be accommodated at GSI and KIT



Status CBM in-kind contracts (other shareholders)

Project	Partner Institution	Task	Costs k€ 2005	Council decision	Status In-Kind contract
STS	AGH, Crakow, Poland	Design and Construction of STS-XYTER chip	572	30.06.2015	Signed
STS	JU, Crakow	Sensors and QA	707	28.06.2016	Signed
STS	JU, Crakow	Front End Boards, test procedures for STS- XYTER chip and FEE	261	28.06.2016	Signed
STS	GSI, Germany	STS system	4630	28.06.2016	Signed
HADES	JU, Crakow, Poland	HADES ECAL Mechanical frame	200	30.06.2015	Signed (frame delivered and installed in HADES cave)
STS	WUT, Warsaw, Poland	Development of DAQ Data Processing Boards (DPBs)	260	30.06.2015	In preparation
TOF	IFIN-HH, Bukarest, Romania	RPC chambers	748	30.06.2015 28.06.2016	In preparation
TOF	GSI, Germany	FEE	740	28.06.2016	In preparation
TRD	IFIN-HH, Bukarest	TRD Chambers	752	29.4.2019	In preparation
MUCH	BOSE, Kolkata VECC +12 Indian Institutes	GEM chambers and FEE	3790	10.12.2015	Signed

revised Funding CBM day-1 setup

June 2023

Estimated re-procurement costs [2023 EUROS]

total cost: 35,97 M€ (2005 EURO)

- Magnet: 6,14 M€
- Forward Spectator Detector (FSD) former. ... 2,56 M€
- RICH mechanics, grassystem: 1,38 M€
- MUCH absorbers, mechanics: 2,56 M€

secured: 30,17 M€
Eol: 3,32 M€
t.b.a. 2,48 M€

83,9 % secured funding

How to close the funding gap?

- depends on council decision on FS+ and green light for re-procurement
- Agree on Addendum Construction MoU to compensate missing Common Fund contribution from Russia (next talk)

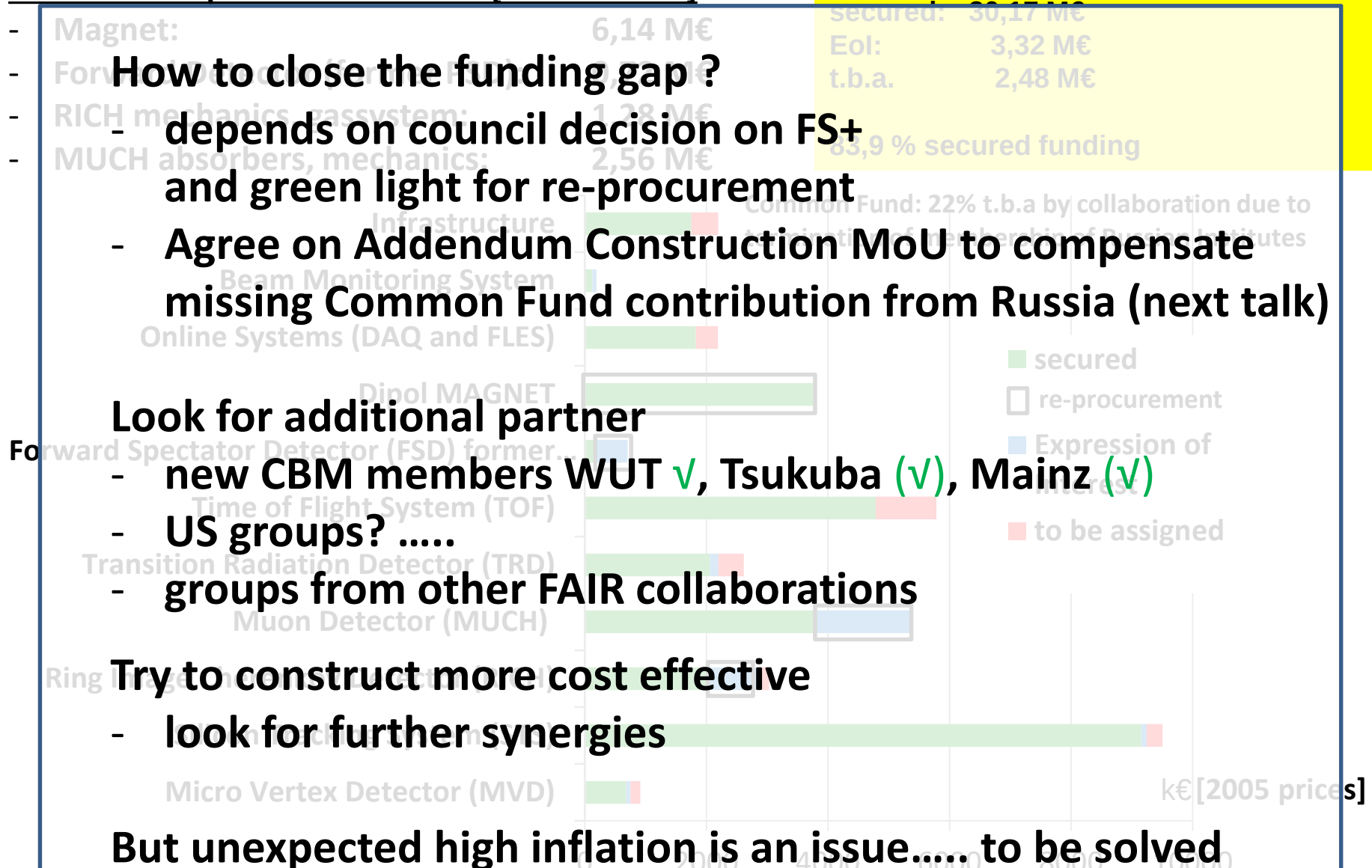
Look for additional partner

- new CBM members WUT ✓, Tsukuba (✓), Mainz (✓)
- US groups?
- groups from other FAIR collaborations

Try to construct more cost effective

- look for further synergies

But unexpected high inflation is an issue..... to be solved



Summary CBM Costs and Funding

The CBM collaboration has define the “day 1” setup, which will be operational, when the SIS100 beam will be switched on.

The total **cost of the CBM day 1 version (37,96 M€ in 2005 prices)** **slightly smaller** compared to the RRB11.

The CBM Collaboration is preparing the re-procurement of the missing Russian In-Kind contributions

The CBM collaboration has implemented a Common Fund for covering the costs of the common infrastructure of 3,58 M€ (2023 prices).

Missing contributions of Russian institutions of 22% need to be compensated (Addendum to CBM Construction MoU – next presentation)

- **The CBM day 1 setup has 83,9% secured funding**
- The CBM start version (including ECAL and the full bandwidth of the DAQ/FLES) has 77,1% secured funding

Upgrade phase, preparation for SIS18 (FAIR phase 0))

- 2022:**
- RICH UV photo-detector – ready
 - Forward detector – ready
 - ECAL 5 sectors - ready
 - MDC readout upgrade – in progress
 - T0 prototype LGAD based

- 2023:**
- ECAL last sector ready
 - improved target
 - MDC FEE Upgrade
 - T0 LGAD+ASIC based Upgrade

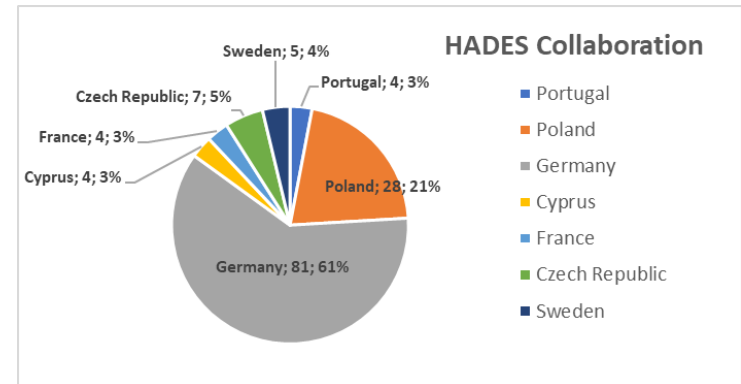
2022-2024... (experiment campaign at SIS18 - FAIR phase 0)

- we plan three long runs, e.g.:
 - - Au+Au Beam Energy Scan (200-400-600-800 MeV)
 - $\pi^+(\text{CH}_2)_n/\text{LH}_2$: baryon em transition form factors, baryonic resonances with strangeness
 - p+A/p+p: strangeness/vector mesons in medium

~2030... on (HADES at SIS100)

- Transfer spectrometer to new experimental hall
- Cold matter physics (p+A)
- Exclusive measurements (p+p)
- Ag+Ag system at 4.5 GeV beam energy

HADES collaboration has also terminated the membership of institutions in Russia (this includes JINR) in the collaboration



HADES collaboration has 133 members (May 2023)

LIP, Coimbra, Portugal	4
AGH, Cracow, Poland	6
PAN, Cracow, Poland	2
IF UJ, Cracow, Poland	11
GSI HADES	15
GSI EX Electronic	4
GSI CBM	2
GSI FFN	9
TU, Darmstadt, Germany	14
HZ Dresden, Germany	5
IKP GU, Frankfurt, Germany	13
TU Munchen, Garching, Germany	3
Justus Liebig Uni Giessen, Giessen, Germany	8
FZ Juelich, Juelich, Germany	3
Frederick Uni, Nicosia, Cyprus	4
UCNRS-IN2P3, Orsay, France	4
IUJ, Rez, Czech Republic	7
Uppsala Uni, Uppsala, Sweden	5
IFD, Uni Warsaw, Warszawa, Poland	3
WUT, Warszawa, Poland	6
Bergische Uni Wuppertal, Wuppertal, Germany	5
	133

The HADES Phase-0 activity has attracted new members with own funding

- o Polish initiative to increase participation in HADES (coordinated by Prof. Salabura)
 - Institute of Nuclear Physics, Polish Academy of Sciences, Cracow (5)
 - AGH University of Science and Technology, Cracow (6)
 - University of Warsaw - Institute of Experimental Physics (3)
 - Warsaw Technical University (8)
- o New Czech group: Department of Experimental Physics of Faculty of Science, Palacky University, Olomouc (3)
- o FZJülich (Prof. Ritmans group) – now FAIR-RW (10)
- o Swedish PANDA colleagues (through PANDA.HADES MoU, coord. Prof. Schönning)
 - Department of Physics and Astronomy, Uppsala University (5)
 - University of Stockholm
- o To come soon: cooperation with NUSTAR-R3B
 - TU Darmstadt
 - MIT

The upgraded HADES detector (five new detector systems)



Forward RPC

LIP Coimbra

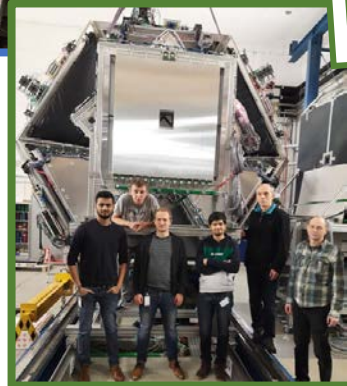
- Based on R&D for neuLAND
- TRB3 read-out

STS2

Jagiellonian Univ.

- PANDA straw technology
- PANDA PASTTREC FEE chip

- Improved physics performance through instrumentation of the very forward hemisphere using FAIR technology.
- In particular important for the Hyperon Program.



STS1

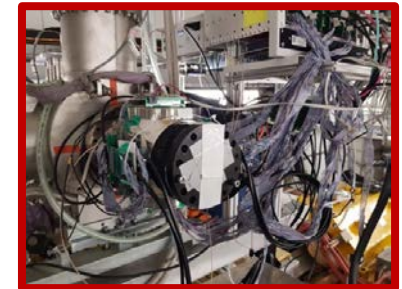
TransFAIR, Jülich

- PANDA straw technology
- PANDA PASTTREC FEE chip

iTOF

TransFAIR, Jülich

- APD read-out
- Enhances trigger purity



T0

GSI, TU Darmstadt

- LGAD technology
- In-beam detector

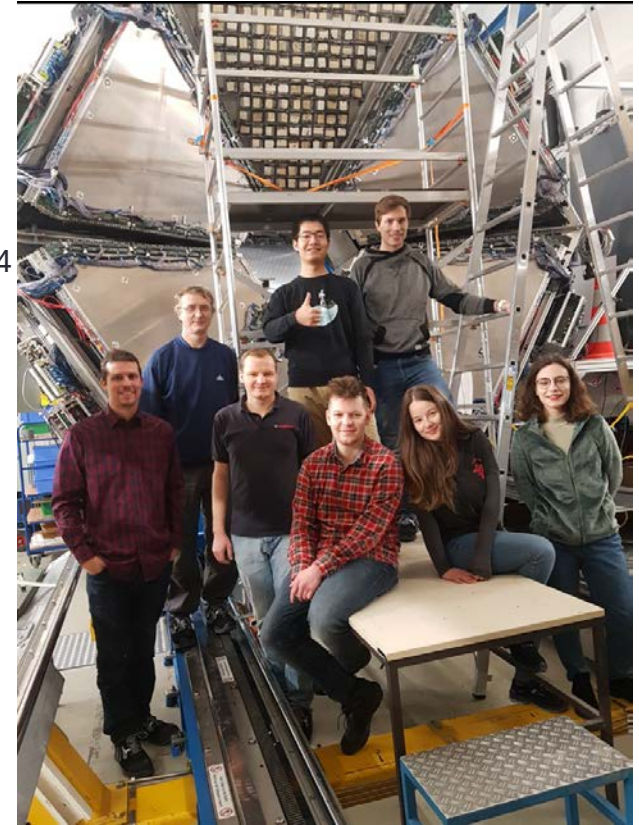
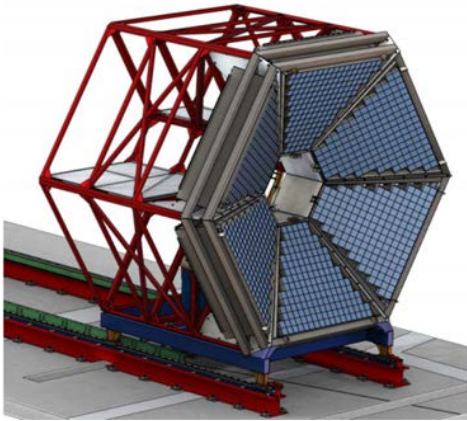
ECAL upgrade, last sector ready

Objectives:

- Precise photon measurements
- e/π separation: important for di-electron spectroscopy

Status:

- Dec. 2022/Jan.2023 last sector of the HADES ECAL installed
- DAQ Integration and system test on going
- All 6 sectors expected to be operational for Au beam (G-22-00022) in '24

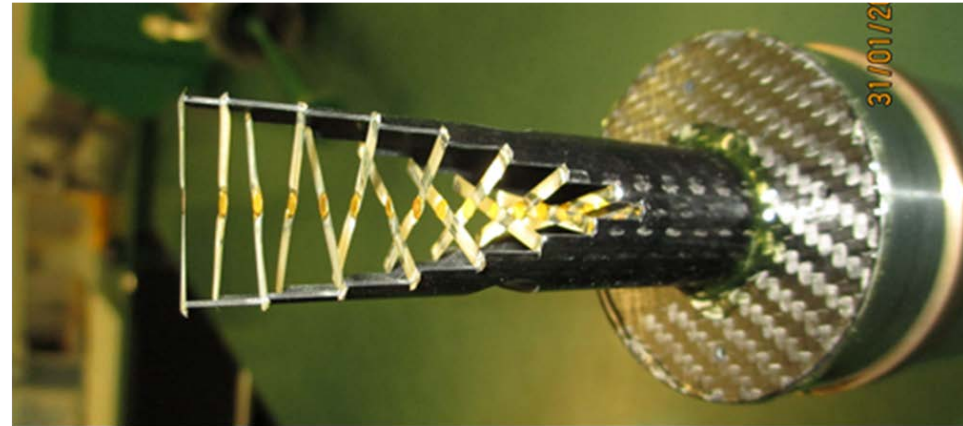


Improved Au Target Concept



Old design

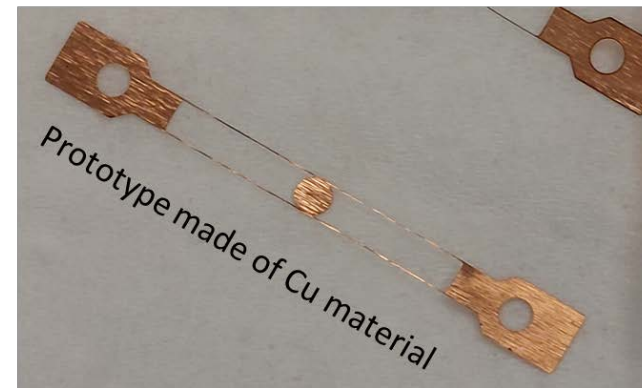
- 15 Au disks,
 - 25 μm thick each,
 - 2.2 mm diameter
 - mounted on kapton foil – 7 μm
- Contamination from Au+C reactions



New concept

- The entire target made of Au material
- Au disks fastened with Au wires

- Institut für Kernphysik
- Targetry, Laser- & Plasmaphysik
- Technische Universität Darmstadt



MDC FEE Upgrade Status

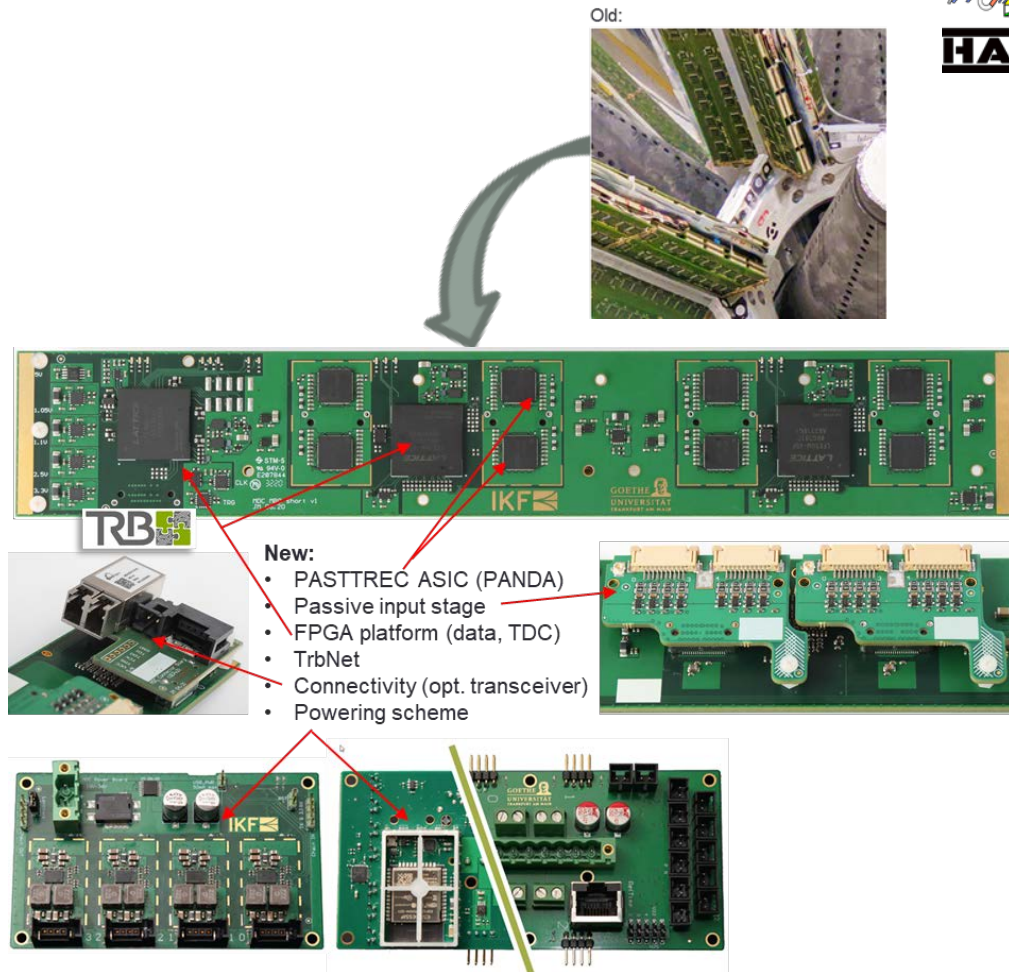


Status May'23:

- All components in-house
- Board production ongoing
- Board QA has started
- Installation scheduled

Plan:

- Installation in 2023, with a focus on 12 chambers in front of the magnet



HADES T0 detector (Low Gain Avalanche Diode (LGAD) technology)

TU Darmstadt and GSI, Germany

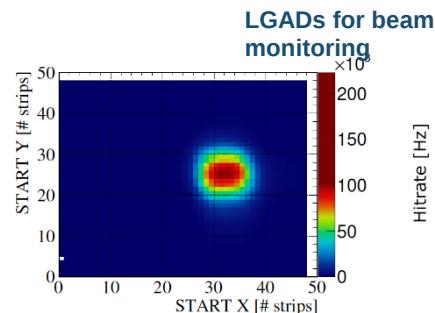
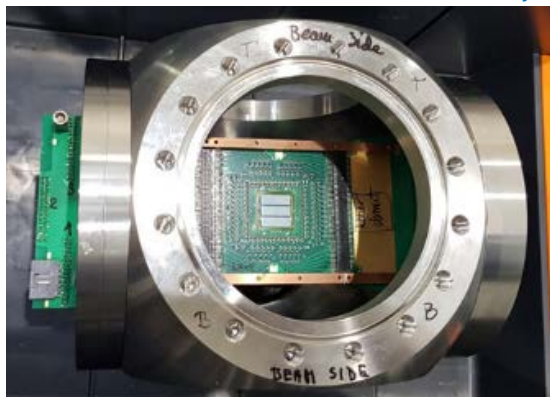


Figure: beam spot measurement

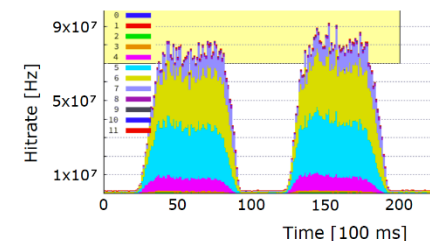


Figure: macro spill structure of p beam

Successful operation in 4 weeks p+p 4.5 GeV beam time in 2022

- LGAD strip sensor (production at FBK, Italy): 200 μ m thick with 50 μ m active sensor thickness, 20x20mm² active area, pitch of 387 μ m, fill factor of 94%
- Readout system based on leading-edge discriminators and FPGA based TDC (trb.gsi.de)
- Capable of handling particle fluences of $\sim 10^8$ p/s/cm²

[Krueger et al., NIM A 1039 \(2022\) 167046](#)

[Kedych et al., IBIC2022 proceedings \(2022\)](#)

[Ulrich-Pur et al., PMB 67 \(2022\) 9](#)

LGADs for particle identification

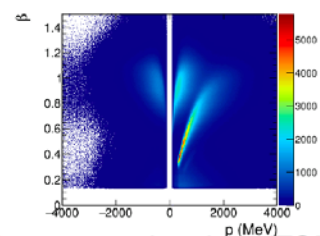


Figure: start time from iTOF

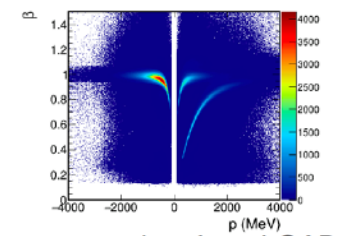


Figure: start time from LGADs

HADES upgrade costs

	Status HADES experiment funding (FAIR phase 0 (@SIS18) & FAIR phase 1 (@SIS100))									
PSP Code	detector / system	Prices, K Euro								
		2005 prices				2023 prices				
		total cost 2005 prices	Secured amount	Eol	To be assigned	total cost 2023 prices	Secured amount	Eol	To be assigned	funded in FAIR Phase
1.1.2.1	Mechanics and Installation	386	380	6		631	620	10		Phase 1
1.1.2.2	Cryo Infrastructure	69	69			113	113			Phase 1
1.1.2.3.1-3	HADES Calorimeter	584	584	0		954	954	0		Phase 0
1.1.2.3.4	HADES Calorimeter (3" PMTs)	645	526	119	0	1055	860	195	0	Phase 1
1.1.2.4	Readout Electronics Modification	168			168	275			275	Phase 1
1.1.2.5.1	MDC Plane II	207			207	338			338	Phase 1
1.1.2.5.2-3	MDC FEE	214	214	0		350	350	0		Phase 0
1.1.2.6	RICH Upgrade	43	43			69	69			Phase 0
1.1.2.7	Forward Detector	232	232	0		380	380	0		Phase 0
1.1.2.8	Beam Monitoring System (T0&HALO-BAS)	122		122		200		200		Phase 0
	SUM HADES (FAIR phase 0&1)	2671	2048	248	375	4366	3348	405	614	76,7%
	SUM HADES@SIS18 (FAIR phase 0)	1195	1073	122	0	1954	1754	200	0	89,8%
										percentage secured
	This calculation uses an escalation factor of 1.635 between 2005 prices and 2023 prices.									

- The HADES upgrade for SIS18 (total costs in 2005 prices is 1,195 M€) has 89,8% secured funding.

The costs of the HADES experiment at SIS100 (FAIR phase 1) amounts to 2,67 M€ (2005 prices). The full HADES upgrade costs including the moving to the CBM cave at SIS100 has 76,7% secured funding.

HADES upgrade for

FAIR Phase 0 (SIS18) & FAIR Phase 1 (SIS100)



HADES@SIS100 (FAIR Phase 1) and HADES@SIS18 (FAIR Phase 0)	Costs	Germany		Czech Republic		Poland		Portugal	France		Russia	HADES Common Fund	to be assigned
		FSI FZJ / TUM / TUD	University funding (VF)			FAIR project funds							
Mechanics and Installation	631	10		457	0							164	
Cryo Infrastructure	113	0										113	
HADES Calorimeter	954	41	107	479	0	327					0		
HADES Calorimeter (3" PMTs)	1055	295	21	544	195								0
Readout Electronics Modification	275												275
MDC Plane II	338												338
MDC FEE	350	0	350										
RICH Upgrade	69	69											
Forward Detector	380	41				175	117	47	0	0			
Beam Monitoring System (T0&HALO-BAS)	200	200											
	4366												
Sum in 2023 k€	4366	446	210	479	1480	195	327	175	117	47	0	276	614
Sum in 2005 k€	2671	273	129	293	906	119	200	107	71	29	0	169	375
escalation factor (1./1.635)													

This calculation uses an escalation factor of 1.635 between 2005 prices and 2023 prices

1,635

amounts in green are considered as secured

amounts in blue - Expression of Interest (EoI)

amounts in red - to be assigned

changes since 11th RRB: no contributions of Russian institutions (minus 45k€ (2005 prices))
tasks taken over by other groups
Total costs almost unchanged

HADES MoUs

Addendum 1 of the “Update HADES Memorandum Of Understanding for the execution of the HADES experiment during FAIR Phase-0”

FAIR GmbH and GSI Helmholtzzentrum GmbH jointly representing the Host Laboratories of the FAIR project certify by signing Addendum 1 to the present MoU for the HADES experiment the following:

1. The upgraded HADES detector is a FAIR experiment at SIS18 and at SIS100.
2. The HADES collaboration operating the HADES experiment is part of the C.B.M. research pillar of the FAIR science programme.
3. The financial resources for the upgrade of the HADES experiment, including the contributions of the FAIR shareholders and from other countries, are monitored by the FAIR Resource Review Board.
4. FAIR GmbH and GSI are appreciating the efforts of the HADES collaboration to produce physics data from the data taking at SIS18 and later at SIS100.
5. A separate Construction MoU like for other FAIR collaboration is not required, since the upgrade of the HADES experiment is almost completed.
6. For the operation phase of FAIR the present MoU will be superseded by a Maintenance & Operation MoU for the HADES experiment.

The Facility for Antiproton and Ion Research in Europe GmbH (Darmstadt, Germany),

GSI Helmholtzzentrum für Schwerionenforschung GmbH (Darmstadt, Germany)

and
the HADES collaboration

declare that they agree with Addendum 1
to the Memorandum of Understanding for the HADES experiment.

Done in Darmstadt

Done in Darmstadt

02.02.2022

For FAIR GmbH

For the HADES Collaboration


J. Eschke


J. Eschke

For GSI GmbH


J. Eschke

Update of the
HADES Memorandum Of Understanding
for the execution of the HADES experiment during FAIR Phase-0

between
GSI Helmholtzzentrum für Schwerionenforschung GmbH (GSI) Darmstadt, GERMANY

hereafter referred to as the “Parties”
on the one hand,
and

• Laboratório Nacional de Energia e Físicas (LNEG), Coimbra, PORTUGAL
• Centre for Nuclear Physics (CNP), Warsaw (CN), POLAND
• Gesellschaft für Schwerionenforschung GmbH (GSI) Darmstadt, GERMANY
• Institut für Experimentelle Teilchenphysik (IETP), Dresden, GERMANY
• Helmholtz-Zentrum Dresden-Rossendorf (HZDR) für die Beschleuniger, Dresden, GERMANY
• Joint Institute of Nuclear Research (JINR), Dubna, RUSSIA
• Johann Wolfgang Goethe Universität, Institut für Kernphysik, Frankfurt, GERMANY
• Technische Universität München, Experimenteller Cluster Science, Garching, GERMANY
• Jussieu-Laboratoire, Jussieu, Paris, France, GERMANY
• Forschungszentrum Jülich (FZJ), Jülich, GERMANY
• Institute of Theoretical and Experimental Physics (ITEP), Moscow, RUSSIA
• Institute for Nuclear Research (INR), Russian Academy of Sciences, Moscow, RUSSIA
• Moscow Engineering Physics Institute (MEPhI), Moscow, RUSSIA
• University of Cyprus, Department of Physics, Nicosia, CYPRUS
• Institut National de Physique Nucléaire et de Physique des Particules du Centre National de la Recherche Scientifique (IN2P3-CNRS) using the name on behalf of Institut de Physique Nucléaire d'Orsay (IPN) Orsay FRANCE
• Nuclear Physics Institute (NPI), Czech Academy of Sciences, Brno, CZECH REPUBLIC
• Universidad de Santiago de Compostela, Dep. de Física de Partículas, Santiago de Compostela, SPAIN
• Department of Physics, Bergische Universität Wuppertal (BUW), Wuppertal, GERMANY

on the other hand,

hereafter individually and collectively referred to as the “Party” or the “Parties” respectively, including the “They”.

MoU 2009
1999 2012

update MoU
2018

Addendum 1
2022

Addendum 2
extension until 2026

HADES M&O MoU
2030

12th CBM RRB
Jürgen Eschke, CBM RC