Status Funding
CBM and HADES experiment

13th CBM Resource Review Board meeting – 16th May 2024

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 IKCs
- CBM construction timeline and funding strategy
- 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."

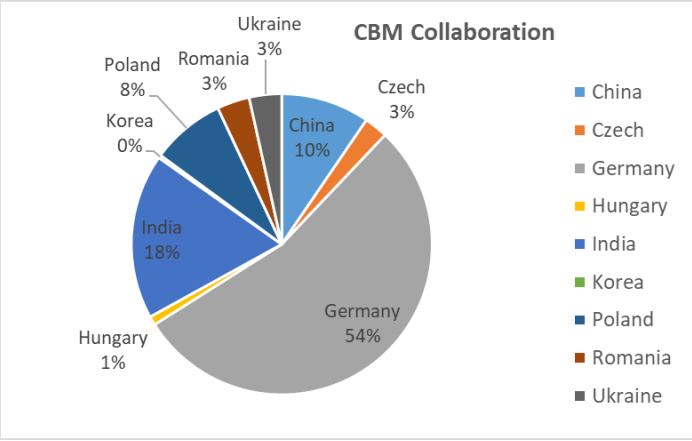
Termination (6.12.2022) of all collaboration contracts with Russian institutions by Council → executed by FAIR management

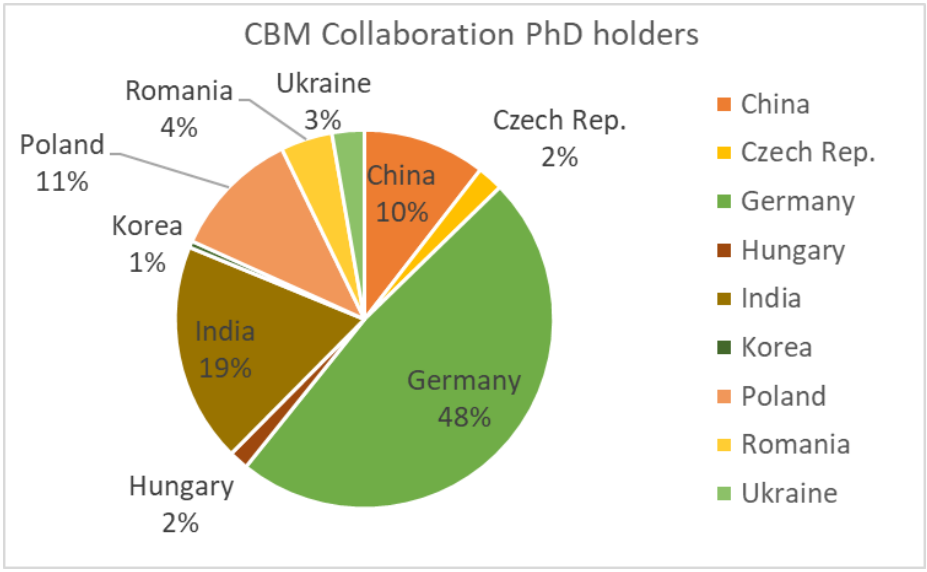
CBM CB decision 04.04.2023 (by e-voting)

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

Composition of CBM Collaboration (December 2023)

47 full member institutions
10 associated member institutions
from 10 countries
~400 full member – ~22% from Russia = 305





CBM without Russia (06.12.2023)

Institute	City	Country	all	phd students	D+P (PhD holder)
THU	Beijing	China	5	1	4
UChongqing	Chongqing	China	3	0	2
USTC	Hefei	China	6	2	2
CCNU	Wuhan	China	7	0	7
CTGU	Yichang	China	4	0	4
CTU	Prague	Czech	5	1	3
NPI-CAS	Řež	Czech	3	2	1
ZIB	Berlin	Germany	2	0	2
RUB	Bochum	Germany	8	1	7
FAIR	Darmstadt	Germany	10	0	9
GSI	Darmstadt	Germany	63	6	45
IKP-TUD	Darmstadt	Germany	4	3	1
HZDR	Dresden	Germany			
FIAS	Frankfurt	Germany	13	6	6
IKF-UFra	Frankfurt	Germany	17	9	8
IRI-UFra	Frankfurt	Germany	4	3	1
UGiessen	Gießen	Germany	7	3	2
PI-UHd	Heidelberg	Germany	6	2	3
ZITI-UHd	Heidelberg	Germany	1	0	1
KIT	Karlsruhe	Germany	8	1	4
UMuenster	Münster	Germany	13	5	3
UTuebingen	Tübingen	Germany	3	2	1
UWuppertal	Wuppertal	Germany	10	4	4
ELTE	Budapest	Hungary	1	0	1
WignerRCP	Budapest	Hungary	1	0	1
AMU	Aligarh	India	5	2	3
IOPB	Bhubaneswar	India	3	0	2
NISER	Bhubaneswar	India	3	0	3
UPanjab	Chandigarh	India	1	0	1
UGauhati	Guwahati	India	1	0	1
IIT-I	Indore	India	3	0	3
UJammu	Jammu	India	4	0	2
IIT-KGP	Kharagpur	India	1	0	1
Bose	Kolkata	India	11	3	8
UCalcutta	Kolkata	India	3	0	3
VECC	Kolkata	India	11	5	6
UKashmir	Srinagar	India	4	0	2
BHU	Varanasi	India	3	1	2
PNU	Pusan	Korea	1	0	1
AGH	Kraków	Poland	5	0	5
UJagiellonian	Kraków	Poland	8	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	5	0	4
UBucharest	Bucharest	Romania	6	2	4
KINR	Kyiv	Ukraine	7	4	1
TSNU-Kyiv	Kyiv	Ukraine	4	0	4
sum (all)			**305**	**70**	**192**

new CBM spokesperson

Prof. Norbert Herrmann
(University Heidelberg)

CBM spokesperson
(April 2017 – April 2024)

Prof. Tetyana Galatyuk
(University Darmstadt)

elected on 12th April 2024
as new CBM spokesperson

Termination of In-Kind contracts with Russia

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

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.

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

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~~

CC for CBM STS with JINR not terminated

GSI FAIR

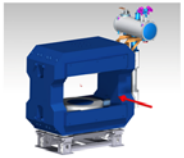
Critical for success: Council release of available project funds for experiments for the following re-procurements

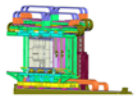
List CBM re-procurenment costs recommended by IKMG: (included in CBM cost matrix)
Included in update of Experiment Cost Book (ECB) → approved by council

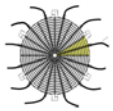
				Old ECB				New ECB
Pillar	Provider	Contract name	Main PSP	Orig. Costbook-Value [€ 2005]	Contracting Value [€]	Usable On-Site [€ 2005]	Est. Re-Procurement costs [€ 2023]	Re-Procurement [€ 2005]
CBM	PNPI	CC1.1.1.3.1.2.1 RICH	1.1.1.3.1.2.1	1.200.000	1.615.237	0	1.283.037	784.732
CBM	PNPI	CC1.1.1.3.2.3.1 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







Re-procurement CBM Magnet – experiment project funds released by council

Superconducting magnet

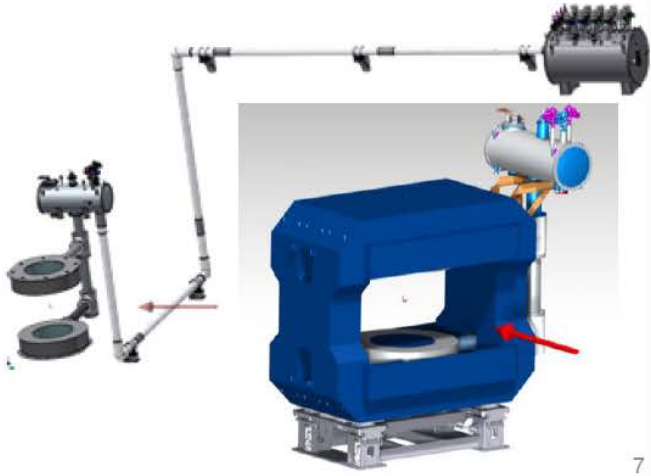
HIGHLIGHTS

- **CBM Dipole defined as an item for urgent re-procurement**
  - New Detailed Specifications defined in 2022 (P. Senger, G. Moritz, M. Kiš, P. Dahm, PG, see EDMS)
  - The aperture enlarged to 1470×3300 mm² to accommodate modular STS
  - Call for tender started in 20.01.2023; **Contract awarded in December to ~~BNG~~ BNET in December 2023**

- Expected delivery: **Q4.2026**

First magnet installations

Auftragsvergabe/Anzahlung	20.12.2023
PDR	20.03.2024
CDR	30.06.2024
FDR Magnete	20.12.2024
FAT Untergestell	30.04.2025
FAT Branchbox und Transferlines	30.04.2025
Lieferung und Installation Untergestell	30.06.2025
Lieferung und Installation BB und MTL	30.07.2025
Fertigstellung Coils	30.09.2025
FAT Joch	30.10.2025
FAT, Lieferung und Installation Magnet	30.08.2026
SAT CBM Dipol Magnet	20.12.2026
Final acceptance	20.01.2027



- Tender for the power supply and quench protection to be open in ~2024!

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Additional Costs for FS+

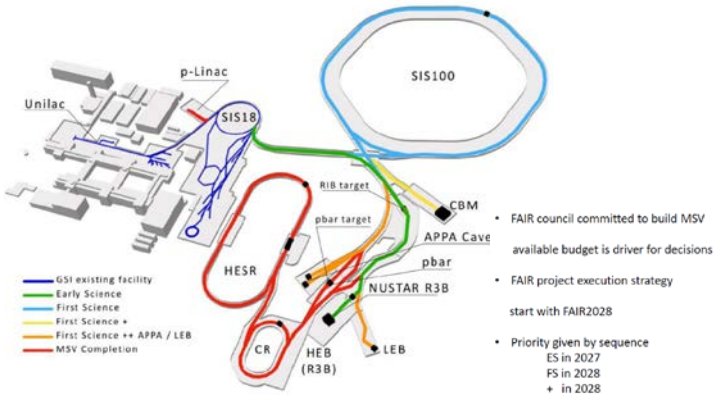
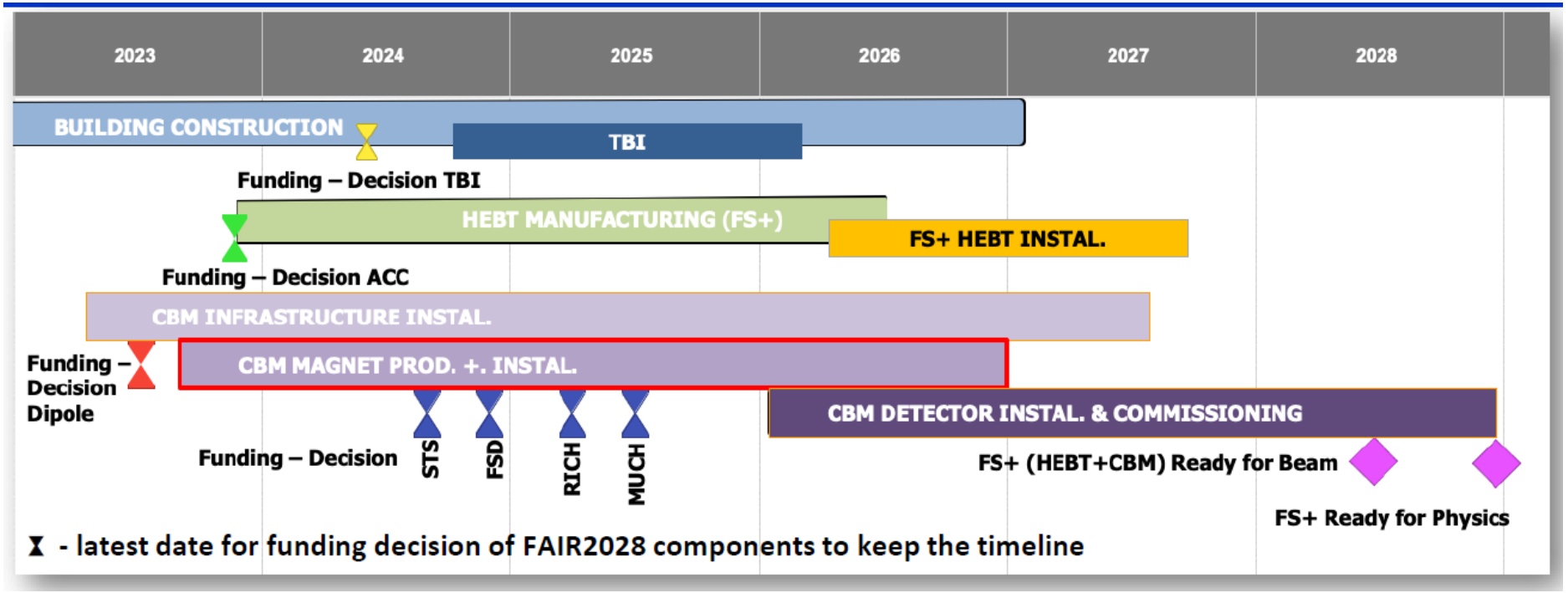


Table 1: Components/services to be procured for the completion of the CBM science programme, their estimated costs (current price level) and their latest date for procurement/expense to keep the timeline.

1	EXP	CBM SC Dipole magnet	4-5 Mio. €	July 2023
2	EXP	CBM Silicon Tracker System	0,9 Mio. €	Q3 2024
3	EXP	CBM PSD	0,5 Mio. €	Q4 2024
4	EXP	CBM RICH	1,0 Mio. €	Q2 2025
5	EXP	CBM MUCH	2,0 Mio. €	Q3 2025
6	ACC	CBM beamline magnets	4,2 Mio. €	Q4 2024
7	ACC	CBM beamline vacuum comp.	2,3 Mio. €	Q4 2024
8	S&B	TGA CBM cave	14,3 Mio. €	Q2 2024
9	S&B	TGA CBM cave risks	7 Mio. €	2024/2025
		Sum	**ca. 37 Mio. €**	



Responsibilities for re-procurement for RICH, MUCH and for building FSD

CBM RICH mechanical structures and gas system

The Wuppertal and Giessen groups have started to prepare the finalization of the engineering design of the RICH mechanical structures, which can be built by a company, if the FAIR council gives the green light for the release of FAIR project funds for experiments.

CBM MUCH mechanical structures/absorbers and gas system

VECC in India is prepared to take over the responsibility for the MUCH mechanical structures, which can be built by a company, if the FAIR council gives the green light for the release of the FAIR project funds for experiments.

new Forward Spectator Detector (FSD) (ex PSD)

CTU, Prague in the Czech Republic has taken over the preparations for the construction of the new Forward Spectator Detector (FSD). CTU is working on the concept and design and will provide additional CZ funds for the construction of the FSD. NPI, Rez is also contributing. Recently the Univ. Bochum and the GSI-FFN group joined the FSD team. However, for the construction of the FSD additional funds are required.

Country funding (in 2022 prices [M€]) CBM day 1 setup 11th RRB 23.02.2022

and CBM phase 1 setup (CBM start version)

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	3,37		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 +**			**0,15**	**2,50**
Sum in 2005 M€	37,49	2,19	7,49	3,82	0,74 + 10,1	3,83	2,00	1,98						09	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**	**0,15**	**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	0,09	1,93

85,8 % secured

Update of costs and funding matrix required without Russian In-Kind contributions (cancellation of In-Kind Contracts) and due to termination of Russian (plus JINR) membership in CBM Collaboration

Experiment funding
(in 2005 and 2024 prices [k€])

CBM day 1 setup

13th RRB

16.05.2024

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

Status CBM experiment funding (CBM day 1 & start version@SIS100)

PSP Code	detector / system	Prices, K Euro (2005 price)				Prices, K Euro (2024 price)				
		total cost 2005 prices	Secured amount	EoI	To be assigned	total cost 2023 prices	Secured amount	EoI	To be assigned	components belongs to CBM day 1 setup
1.1.1.1	Micro Vertex Detector (MVD)	**817**	582	71	163	**1369**	976	120	273	1
1.1.1.2	Silicon Tracking System (STS)	**9287**	9100	94	93	**15574**	15261	157	156	1
1.1.1.3.1	Ring Image Cherenkov Detector (RICH)	**3088**	2102	785	201	**5179**	3526	1316	338	1
1.1.1.3.2	Muon Detector (MUCH)	**5395**	3826	1569		**9048**	6416	2632		1
1.1.1.4	Transition Radiation Detector (TRD)	**2845**	2284	143	418	**4771**	3830	240	701	1
1.1.1.5	Time of Flight System (TOF)	**5940**	4941	0	999	**9961**	8286	0	1675	1
1.1.1.6.1	Electromagnetic Calorimeter (ECAL)	**2805**		2805		**4705**		4705		no
1.1.1.6.2	Projectile Spectator Detector (PSD), now Forward Detector	**705**	266	439		**1183**	446	737		1
1.1.1.7	Dipol MAGNET	**3058**	3058			**5128**	5128			1
1.1.1.8	Online Systems (DAQ and FLES)	**2061**	1698	0	363	**3457**	2848	0	609	(1)
1.1.1.9	Beam Monitoring System	**241**	120	122		**405**	201	204		1
1.1.1.10	Infrastructure	**2192**	1754		438	**3676**	2941		735	1
	Sum CBM Phase 1 setup	**38435**	**29732**	**6029**	**2675**	**64456**	**49860**	**10110**	**4486**	**77,4%**
Sum CBM day 1 setup (without ECAL and full bandwidth DAQ/FLES)		**35267**	**29732**	**3223**	**2312**	**59143**	**49860**	**5405**	**3877**	**84,3%**
										percentage secured
1,677	This calculation uses an escalation factor of 1.677 between 2005 prices and 2024 prices									

Funding CBM day-1 setup

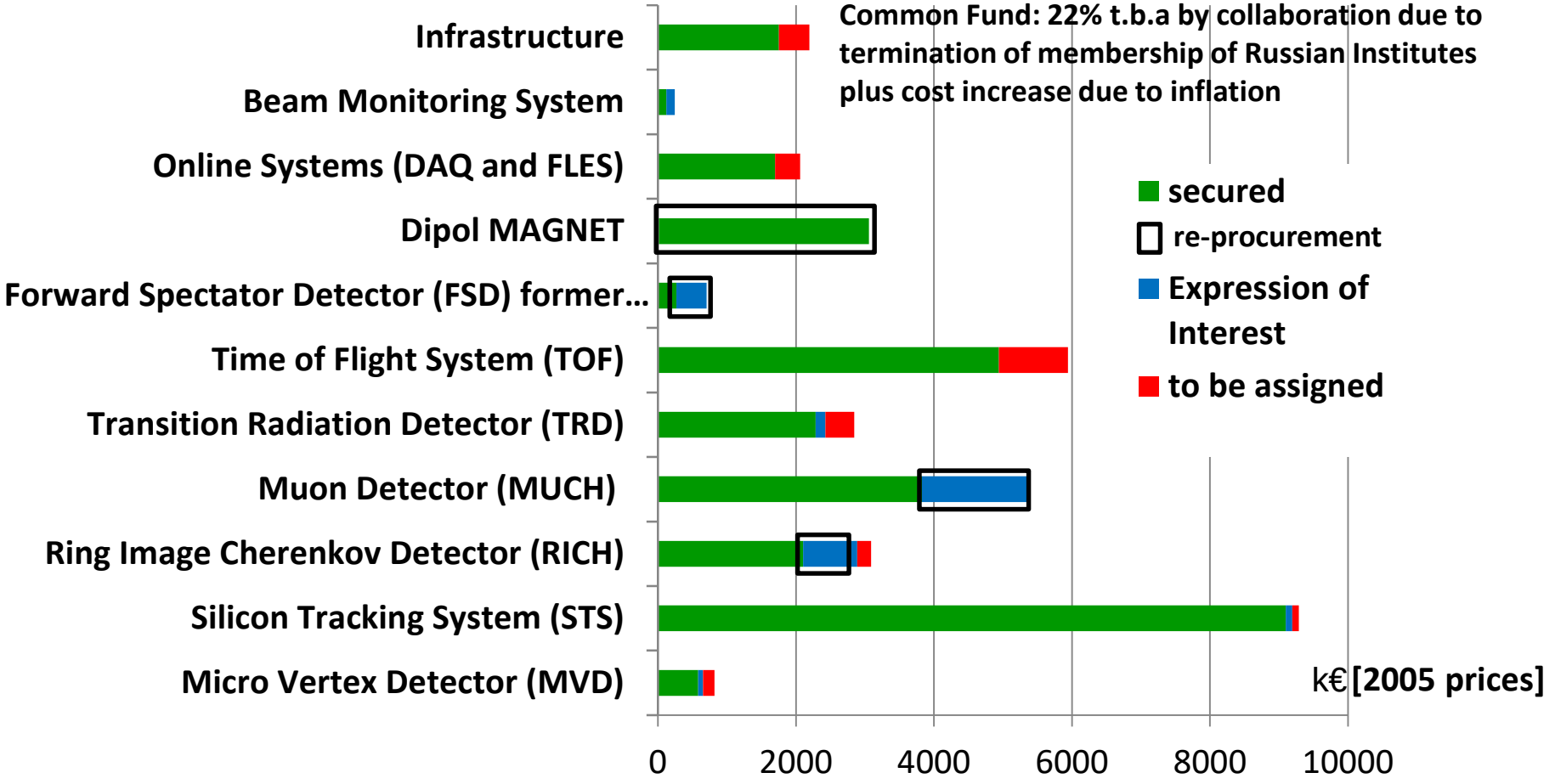
16 May 2024

Estimated re-procurement costs [2024 EUROS]

- **Magnet: 5,13 M€**
- **Forward Spectator Detector (ex PSD): 0,74 M€**
- **RICH mechanics, gassystem: 1,32 M€**
- **MUCH absorbers, mechanics: 2,63 M€**

total cost: 35,27 M€ (2005 EURO)
secured: 29,73 M€
EoI: 3,22 M€
t.b.a. 2,31 M€

84,3 % secured funding



Country funding (in 2024 prices [M€]) CBM day 1 setup 13th RRB 16.05.2024

and CBM phase 1 setup (CBM start version)

CBM day 1 setup detector / system	Costs	Common fund	Germany		FAIR (re-procurment)			India	Poland	Romania	China	Czech Republic			Hungary			France	Korea	Ukraine	to be assigned
			GSI and FAIR project funds	University funding (VF)																	
MVD	1,37			0,45														0,53	0,12		0,27
STS	15,57		8,04	0,65			3,55		3,02											0,16	0,16
TRD	4,77			1,70						2,07					0,24	+	0,06				0,70
RICH	5,18		**2,08**	1,45	1,32	+															0,34
TOF	9,96		1,24	1,00			0,00			1,25	4,79										1,67
Beam Monitoring System	0,40			0,12								0,08									0,20
Online Systems (DAQ+FLES) day-1 setup	2,85		**1,48**	1,03					0,34												
Magnet	5,13					+	5,13														
MuCh	9,05				2,63	+		6,42													
Forward Detector (former PSD)	1,18				0,74	+						0,45	+	0,00							
Infrastructure	3,68	**2,94**																			0,74
ECAL (not part of day 1 setup)																					
Sum in 2024 M€	**59,14**	**2,94**	**12,84**	**6,41**	**4,68**	**+**	**8,68**	**6,42**	**3,35**	**3,32**	**4,79**	**0,53**	**+**	**0,00**	**0,24**	**+**	**0,06**	**0,53**	**0,12**	**0,16**	**4,08**
Sum in 2005 M€	35,27	1,75	7,66	3,82	2,79	+	5,17	3,83	2,00	1,98	2,86	0,31	+	0,00	0,14	+	0,04	0,31	0,07	0,09	2,43
escalation factor (1./1.677)																					

This calculation uses an escalation factor of 1.677 between 2005 prices and 2024 prices

1,677

amounts in green are considered as secured / **84,3 % secured**

amounts in blue - Expression of Interest (EoI)

amounts in red - to be assigned

CBM phase 1 setup																					
CBM day 1 setup	59,14	2,94	12,84	6,41	4,68	+	8,68	6,42	3,35	3,32	4,79	0,53	+	0,00	0,24	+	0,06	0,53	0,12	0,16	4,08
full bandwidth (DAQ/FLES)	0,61																				0,61
plus ECAL	4,70				4,70																
Sum in 2024 M€	**64,46**	**2,94**	**12,84**	**6,41**	**9,39**		**8,68**	**6,42**	**3,35**	**3,32**	**4,79**	**0,53**	**+**	**0,00**	**0,24**	**+**	**0,06**	**0,53**	**0,12**	**0,16**	**4,69**
Sum in 2005 M€	38,44	1,75	7,66	3,82	5,60	+	5,17	3,83	2,00	1,98	2,86	0,31	+	0,00	0,14	+	0,04	0,31	0,07	0,09	2,80

77,4 % secured

Country funding (in 2005 prices [M€]) CBM day 1 setup 13th RRB 16.05.2024

and CBM phase 1 setup (CBM start version)

CBM day 1 setup detector / system	Costs	Common fund	Germany		FAIR (re-procurment)			India	Poland	Romania	China	Czech Republic			Hungary			France	Korea	Ukraine	to be assigned
			GSI and FAIR project funds	University funding (VF)																	
MVD	0,82			0,27														0,31	0,07		0,16
STS	9,29		4,80	0,39			2,12		1,80											0,09	0,09
TRD	2,84			1,01						1,23					0,14	+	0,04				0,42
RICH	3,09		**1,24**	0,86	0,78	+															0,20
TOF	5,94		0,74	0,60			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	1,70		**0,88**	0,62					0,20												
Magnet	3,06					+	3,06														
MuCh	5,40				1,57	+		3,83													
Forward Detector (former PSD)	0,71				0,44	+						0,27	+	0,00							
Infrastructure	2,19	**1,75**																			0,44
ECAL (not part of day 1 setup)																					
Sum in 2005 M€	**35,27**	**1,75**	**7,66**	**3,82**	**2,79**	**+**	**5,17**	**3,83**	**2,00**	**1,98**	**2,86**	**0,31**	**+**	**0,00**	**0,14**	**+**	**0,04**	**0,31**	**0,07**	**0,09**	**2,43**

amounts in green are considered as secured / 84,3 % secured

1 amounts in blue - Expression of Interest (EoI)

amounts in red - to be assigned

CBM phase 1 setup																					
CBM day 1 setup	35,27	1,75	7,66	3,82	2,79	+	5,17	3,83	2,00	1,98	2,86	0,31	+	0,00	0,14	+	0,04	0,31	0,07	0,09	2,43
full bandwidth (DAQ/FLES)	0,36																				0,36
plus ECAL	2,81				2,81																
Sum in 2005 M€	**38,44**	**1,75**	**7,66**	**3,82**	**5,60**		**5,17**	**3,83**	**2,00**	**1,98**	**2,86**	**0,31**	**+**	**0,00**	**0,14**	**+**	**0,04**	**0,31**	**0,07**	**0,09**	**2,80**

77,4 % secured

CBM Cost Matrix &

HADES Cost Matrix (16.05.2024)

PSP code	System & description	TDR year of approval	Country	Funding agency / source	Institution	component belongs to CBM day 1 setup	2005 prices: Total Cost (2005 prices)	Secured amount (2005 price): FAIR Budget	Secured amount (2005 price): Other sources	EoI (2005 price)	To be assigned (2005 price)	2024 prices: Total Cost (2024 prices)	Secured amount (2024 price): FAIR Budget	Secured amount (2024 price): Other sources	EoI (2024 price)	To be assigned (2024 price)	Comments
1.1.1.	**CBM start version@SIS100**																
1.1.1.1	**Micro Vertex Detector (MVD)**	**approved in 2021**				1	**817**					**1369**					
1.1.1.1.1.1	Micro Vertex Detector (MVD)		Germany	BMBF-VF	Institut für Kernphysik, Universität Frankfurt	1	268		268			449	0	449	0	0	
1.1.1.1.1.2	Micro Vertex Detector (MVD)		to be assigned		to be assigned	1	163				163	273		0	0	273	
1.1.1.1.2	Micro Vertex Detector (MVD)		France	CNRS	IPHC, IN2P3-CNRS and Université de Strasbourg	1	314		314			527	0	527	0	0	
1.1.1.1.3	Micro Vertex Detector (MVD)		Korea	Pusan National University	Pusan National University	1	71			71		120	0	0	120	0	
1.1.1.2	**Silicon Tracking System (STS)**	**approved in 2013**				1	**9287**					**15574**					
1.1.1.2.1	Silicon Tracking System (STS)		Germany	BMBF / HMWK	GSI	1	4630	4630				7765	7765	0	0	0	
1.1.1.2.2	Silicon Tracking System (STS)		Russia	ROSATOM	Joint Institute for Nuclear Research (JINR-VBLHEP)	1	2115	2115				3547	3547	0	0	0	
1.1.1.2.3	Silicon Tracking System (STS)		Poland	Ministry of Science and Higher Education	AGH University of Science and Technology	1	572	572				960	960	0	0	0	
1.1.1.2.6.1	Silicon Tracking System (STS)		Poland	Ministry of Science and Higher Education	Marian Smoluchowski Institute of Physics, Jagiellonian University	1	707	707				1186	1186	0	0	0	
1.1.1.2.6.2	Silicon Tracking System (STS)		Poland	Ministry of Science and Higher Education	Marian Smoluchowski Institute of Physics, Jagiellonian University	1	261	261				438	438	0	0	0	
1.1.1.2.7	Silicon Tracking System (STS)		Poland	Ministry of Science and Higher Education	Institute of Electronic Systems, WUT	1	260	260				436	436	0	0	0	
1.1.1.2.4.1	Silicon Tracking System (STS)		Germany	BMBF-VF	Physikalisches Institut, Universität Tübingen	1	390		390			654	0	654	0	0	
1.1.1.2.4.2	Silicon Tracking System (STS)		to be assigned		to be assigned	1	93				93	156	0	0	0	156	
1.1.1.2.4.3	Silicon Tracking System (STS)		Germany	BMBF-GSI	GSI	1	165		165			277		277			
1.1.1.2.5	Silicon Tracking System (STS)		Ukraine	NASU / State Agency of Ukraine	High Energy Physics Department, KINR	1	94			94		157	0	0	157	0	
1.1.1.3	**Lepton ID Detector**																
1.1.1.3.1	**Ring Image Cherenkov Detector (RICH)**	**approved in 2014**				1	**3088**					**5179**					
1.1.1.3.1.4.1	Ring Image Cherenkov Detector (RICH)		Germany	BMBF-VF	II. Physikalisches Institut, Universität Giessen	1	294		294			493	0	493	0	0	
1.1.1.3.1.4.2	Ring Image Cherenkov Detector (RICH)		to be assigned		to be assigned	1	201				201	338	0	0	0	338	
1.1.1.3.1.5.1	Ring Image Cherenkov Detector (RICH)		Germany	BMBF-VF	Fachbereich C, Universität Wuppertal	1	569		569			954	0	954	0	0	
1.1.1.3.1.2.1.2	Ring Image Cherenkov Detector (RICH) (re-procurement)			FAIR	FAIR	1	785			785		1316	0	0	1316	0	estimated cost for re-procurement
1.1.1.3.1.1	Ring Image Cherenkov Detector (RICH)		Germany	BMBF-GSI	GSI	1	1239		1239			2078	0	2078	0	0	
1.1.1.3.2	**Muon Detector (MUCH)**	**approved in 2015**				1	**5395**					**9048**					
1.1.1.3.2.1	Muon Detector (MUCH)		India	DST	Variable Energy Cyclotron Centre (VECC)	1	36		36			60	0	60	0	0	
1.1.1.3.2.2	Muon Detector (MUCH)		India	DST	Bose Institute	1	3790	3790				6356	6356	0	0	0	
1.1.1.3.2.3.1.2	Muon Detector (MUCH) (re-procurement)			FAIR	FAIR	1	1569			1569		2632	0	0	2632	0	estimated cost for re-procurement
1.1.1.4	**Transition Radiation Detector (TRD)**	**approved in 2018**				1	**2845**					**4771**					
1.1.1.4.1.1	Transition Radiation Detector (TRD)		Germany	BMBF-VF	Institut für Kernphysik, Universität Frankfurt	1	317		317			532	0	532	0	0	
1.1.1.4.1.2	Transition Radiation Detector (TRD)		to be assigned		to be assigned	1	418				418	701	0	0	0	701	
1.1.1.4.3.1	Transition Radiation Detector (TRD)		Germany	BMBF-VF	Institut für Informatik (IRI), Universität Frankfurt	1	172		172			288	0	288	0	0	
1.1.1.4.3.2	Transition Radiation Detector (TRD)		void		void	1	0					0	0	0	0	0	
1.1.1.4.4.1	Transition Radiation Detector (TRD)		Germany	BMBF-VF	Institut für Kernphysik, Universität Münster	1	525		525			880	0	880	0	0	
1.1.1.4.4.2	Transition Radiation Detector (TRD)		void		void	1	0					0	0	0	0	0	
1.1.1.4.2.1	Transition Radiation Detector (TRD)		Romania	MEC and Atomic Physics Institute (IFA)	IFIN-HH	1	752	752				1261	1261	0	0	0	
1.1.1.4.2.2	Transition Radiation Detector (TRD)		Romania	MEC and Atomic Physics Institute (IFA)	IFIN-HH	1	482		482			809	0	809	0	0	
1.1.1.4..6	Transition Radiation Detector (TRD)		Hungary	National Research, Development and Innovation Office	Wigner Research Center	1	179		36	143		299	0	60	240	0	
1.1.1.5	**Time of Flight System (TOF)**	**approved in 2015**				1	**5940**					**9961**					
1.1.1.5.1	Time of Flight System (TOF)		Germany	BMBF / HMWK	GSI	1	740	740				1241	1241	0	0	0	
1.1.1.5.2.1	Time of Flight System (TOF)		China	Central China Normal University (CCNU)	Central China Normal University, College of Physical Science and Technology	1	1086		1086			1821	0	1821	0	0	
1.1.1.5.2.2	Time of Flight System (TOF)		China	Tsinghua University (THU)	Department of Engineering Physics, Tsinghua University	1	911		911			1528	0	1528	0	0	
1.1.1.5.2.3	Time of Flight System (TOF)		China	University of Science & Technology of China (USTC)	Department of Modern Physics, University of Science & Technology of China (USTC)	1	861		861			1443	0	1443	0	0	
1.1.1.5.5.1	Time of Flight System (TOF)		void		void	1	0		0			0	0	0	0	0	
1.1.1.5.5.2	Time of Flight System (TOF)		void		void	1	0					0	0	0	0	0	
1.1.1.5.7.1	Time of Flight System (TOF)		Germany	BMBF-VF	Physikalisches Institut, Universität Heidelberg	1	596		596			999	0	999	0	0	
1.1.1.5.7.2	Time of Flight System (TOF)		void		void	1	0					0	0	0	0	0	
1.1.1.5.3	Time of Flight System (TOF)		Romania	MCI	IFIN-HH	1	748	748				1254	1254	0	0	0	
1.1.1.5.4	Time of Flight System (TOF)		to be assigned		to be assigned	1	468				468	785	0	0	0	785	* inner TOF part by other technoligy
1.1.1.5.8	Time of Flight System (TOF)		to be assigned		to be assigned	1	531				531	890	0	0	0	890	
1.1.1.6	**Calorimeter System**																
1.1.1.6.1	**Electromagnetic Calorimeter (ECAL)**	**submission t.b.d.**	Russia	ROSATOM	ITEP	**no**	**2805**			2805		**4705**			4705		
1.1.1.6.2	**Forward Detector - former Projectile Spectator Detector (PSD)**	**approved in 2015**				1	**705**					**1183**					
1.1.1.6.2.1.2	Forward Spectator Detector (FSD) - former PSD (re-procurement)			FAIR	NPI	1	439			439		737			737		estimated cost for re-procurement
1.1.1.6.2.2	Forward Spectator Detector (FSD) - former PSD (re-procurement)		Czech Republic	MSMT	Czech Technical University (CTU)	1	183		183			307	0	307	0	0	additional CZ contribution
1.1.1.6.2.3	Forward Spectator Detector (FSD) - former PSD (re-procurement)		Czech Republic	MSMT	NPI	1	83		83			139	0	139	0	0	
1.1.1.7.2	**Dipol MAGNET (re-procurement)**	**approved in 2014**		FAIR	FAIR	1	**3058**					**5128**					
1.1.1.7.2.1	**Dipol MAGNET (re-procurement - contracted company) yoke, support, coil, cryostate, transferline, branchbox**			FAIR	FAIR	1	2788	2788				**4675**	4675				re-procurement contracted with company
1.1.1.7.2.2	**Dipol MAGNET (re-procurement) power supplies, quench protection, cables, consulting**			FAIR	FAIR	1	270	270				**453**	453				
1.1.1.8	**Online Systems (DAQ and FLES)**	approved 2023 (DAQ) & submission planned 2025 (FLES)				1	**2061**					**3457**					
1.1.1.8.1	**Data Acquisition and Controls (DAQ)**		Germany	BMBF-GSI	GSI	1	881		881			1478	0	1478	0	0	
1.1.1.8.3	void						0		0			0	0	0	0	0	
1.1.1.8.4	Data Acquisition and Controls (DAQ)		Germany	BMBF-VF	Universität Karlsruhe	1	58		58			97	0	97	0	0	
1.1.1.8.2	Data Acquisition and Controls (DAQ)		Poland	Ministry of Science and Higher Education	Institute of Electronic Systems, WUT	1	200	200				335	335	0	0	0	
1.1.1.8.6.1	First Level Event Selector (FLES)		Germany	BMBF-VF	University Frankfurt/Frankfurt Institute for Advanced Studies (FIAS)	1	559		559			937	0	937	0	0	
1.1.1.8.6.2	First Level Event Selector (FLES)		to be assigned		to be assigned	**no**	363				363	609	0	0	0	609	
1.1.1.9	**Beam Monitoring System**	* T0 start counter included in TOF TDR				1	**241**					**405**					
1.1.1.9.1	Beam Monitoring detector system (T0)		Germany	BMBF-VF	TU Darmstadt	1	72		72			121		121			
1.1.1.9.3	Beam Monitoring detector system (Halo/BAS)		Germany		TU Darmstadt	1	122			122		204			204		new PSP additional cost BMON
1.1.1.9.2	Carbon structure / infrastructure		Czech Republic	MSMT	CTU	1	48		48			80		80			
1.1.1.10	**Infrastructure**	**no TDR foreseen**	all countries involved in CBM	covered by CBM **Common Fund**	all CBM member institutes	1	**2192**					**3676**					Common
1.1.1.10.1	**Target area Beam pipe & vacuum**		all countries in CBM	Common Fund	all CBM member institutes	1	**223**		179		45	**374**		299		75	Fund
1.1.1.10.2	**Rail system**		all countries in CBM	Common Fund	all CBM member institutes	1	**337**		269		67	**565**		452		113	established
1.1.1.10.3	**Common data optical fibers**		all countries in CBM	Common Fund	all CBM member institutes	1	**368**		295		74	**618**		494		124	Funds
1.1.1.10.4	**Electronics Racks**		all countries in CBM	Common Fund	all CBM member institutes	1	**255**		204		51	**427**		341		85	partly
1.1.1.10.5	**Cryogenics**		all countries in CBM	Common Fund	all CBM member institutes	1	**0**		0		0	**0**		0		0	available
1.1.1.10.6	**Detector gas infrastructure**		all countries in CBM	Common Fund	all CBM member institutes	1	**194**		155		39	**325**		260		65	for
1.1.1.10.7	**General infrastructure & safety**		all countries in CBM	Common Fund	all CBM member institutes	1	**370**		296		74	**621**		497		124	common
1.1.1.10.8	**Common support structures**		all countries in CBM	Common Fund	all CBM member institutes	1	**370**		296		74	**620**		496		124	infrastructure
1.1.1.10.9	**Power & standard media distribution**		all countries in CBM	Common Fund	all CBM member institutes	1	**75**		60		15	**127**		101		25	
						Total amounts CBM Phase 1 setup	**38435**	**17833**	**11898**	**6029**	**2675**	**64456**	**29906**	**19953**	**10110**	**4486**	**77,4%**
			Total amounts CBM day 1 setup (without ECAL and full bandwidth DAQ/FLES)				**35267**	**17833**	**11898**	**3223**	**2312**	**59143**	**29906**	**19953**	**5405**	**3877**	**84,3%** secured
This calculation uses an escalation factor of 1,677 between 2005 prices and 2024 prices					1,677				1754		438			2941		735	

please consult distributed cost matrix for all details!

PSP code	System & description	TDR year of approval	Country	Funding agency	Institution	component belongs to FAIR Phase	2005 prices: Total Cost (2005 prices)	Secured amount (2005 price): FAIR Budget	Secured amount (2005 price): Other sources	EoI (2005 price)	To be assigned (2005 price)	2024 prices: Total Cost (2024 prices)	Secured amount (2024 price): FAIR Budget	Secured amount (2024 price): Other sources	EoI (2024 price)	To be assigned (2024 price)	Comments
1.1.2.	**HADES@SIS100 (FAIR Phase 1) and HADES@SIS18 (FAIR Phase 0)**																
1.1.2.1.	**Mechanics and Installation**					**FAIR Phase 1**	**386**					**647**					
1.1.2.1.1			Germany	BMBF-GSI	GSI	**FAIR Phase 1**	**6**			6		**10**			10		
1.1.2.1.2	**Infrastructure**		Czech Rep.	MSMT	NPI	**FAIR Phase 1**	**280**		280	0		**469**		469	0		
1.1.2.1.3	**HADES exp. relocation into CBM cave**		HADES Common Fund			**FAIR Phase 1**	**100**		100			**168**		168			
1.1.2.2	**Cryo Infrastructure**		HADES Common Fund			**FAIR Phase 1**	**69**		69			**116**		116			
1.1.2.3	**HADES Calorimeter (ECAL)**	**approved in 2014**					**1229**					**2061**					
1.1.2.3.1	**ECAL main frame**		Poland	Ministry of Science and Higher Education	Marian Smoluchowski Institute of Physics, Jagiellonian University	**FAIR Phase 0**	**200**	200				**335**	335		0		
1.1.2.3.2	**ECAL Rail System**		Germany	BMBF-GSI	GSI	**FAIR Phase 0**	**25**		25			**42**		42	0		
1.1.2.3.3	**ECAL Infrastructure**					**FAIR Phase 0**											
1.1.2.3.3.1			Czech Rep.	MSMT	NPI		**293**		293			**491**		491	0		
1.1.2.3.3.2	**void**																
1.1.2.3.3.3			Germany	BMBF-VF	TU Darmstadt		**66**		66			**110**		110	0		
1.1.2.3.4	**ECAL 3 inch PMTs**					**FAIR Phase 1**											
1.1.2.3.4.1			Germany	BMBF-GSI	GSI		**159**		159			**267**		267	0		
1.1.2.3.4.2			Germany	TU Munich	TU Munich		**21**		21			**36**		36	0		
1.1.2.3.4.3			Germany	TU Darmstadt	TU Darmstadt		**13**		13			**22**		22	0		
1.1.2.3.4.4			Czech Rep.	MSMT	NPI		**452**		452			**758**		758	0		
1.1.2.4	**Readout Electronics Modification**					**FAIR Phase 1**	**168**					**282**					
1.1.2.4.1	**Readout Electronics Modification**				to be assigned		**168**				168	**282**		0	0	282	
1.1.2.5	**MDC**						**421**					**706**					
1.1.2.5.1	**MDC Plane II**				to be assigned	**FAIR Phase 1**	**207**				207	**347**		0	0	347	
1.1.2.5.2	**MDC FEE**		Germany	BMBF-VF	Institut für Kernphysik, Universität Frankfurt	**FAIR Phase 0**	**197**		197			**331**		331	0		
1.1.2.5.4	**MDC FEE**		to be assigned		to be assigned		**0**					**0**		0	0		
1.1.2.5.3	**MDC FEE**		HADES Common Fund			**FAIR Phase 0**	**17**		17			**29**		29	0		
1.1.2.6	**RICH Upgrade***					**FAIR Phase 0**	**43**					**71**					
1.1.2.6.1	**void**						**0**					**0**		0	0		
	RICH Photon Detector(*)		Germany	BMBF-GSI	see half of the costs of CBM PSP code: 1.1.1.3.1.1		**0**					**0**		0	0		
	RICH FEE TRB (*)		Germany	BMBF-VF	Uni. Wuppertal see CBM PSP code: 1.1.1.3.1.5		**0**					**0**		0	0		
	RICH FEE HV/LV (*)		Germany	BMBF-VF	Uni. Giessen see CBM PSP code: 1.1.1.3.1.4		**0**					**0**		0	0		
1.1.2.6.2	**RICH mechanics**		Germany	TU Munich	TU Munich		**43**		43			**71**		71	0		
	activity @SIS18 included in CBM RICH project																
1.1.2.7	**Forward Detector**					**FAIR Phase 0**	**232**					**390**					
1.1.2.7.1	**Forward Detector - Straw -STS2**		Poland	Ministry of Science	Jagiellonian University		**107**		107			**180**		180	0		
1.1.2.7.3	**Forward Detector - RPC**		Portugal	LIP Coimbra	LIP Coimbra		**71**		71			**120**		120	0		
1.1.2.7.4	**Forward Detector - Straw -STS1/DAQ**		Germany	BMBF-Jülich	FZJ Institut für Kernphysik		**25**		25			**42**		42	0		
	Forward Detector - Straw -STS1/DAQ		Germany	BMBF-Jülich	FZJ Institut für Kernphysk see PANDA PSP 1.4.1.4.1												
1.1.2.7.5	**Forward Detector mechanics**		France	IPNO Orsay	IPNO Orsay		**29**		29			**49**		49	0		
1.1.2.8	**Beam Monitoring System (T0&HALO-BAS)**		Germany		TU Darmstadt		119		**24**	95		200		40	159		new PSP additional cost BMON
					SUM HADES (FAIR phase 0&1)		**2667**	**200**	**1991**	**101**	**375**	**4473**	**335**	**3338**	**170**	**629**	**82,1%**
					SUM HADES@SIS18 (FAIR phase 0)		**1168**	**200**	**873**	**95**	**0**	**1959**	**335**	**1464**	**159**	**0**	**91,9%** secured
This calculation uses an escalation factor of 1.677 between 2005 prices and 2024 prices																	

Status CBM in-kind contracts

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 & DAQ	WUT, Warsaw, Poland	DAQ Data Processing Boards (DPBs) & Data Acquisition and Controls (DAQ)	260 200	30.06.2015 06.07.2023	Joint IKC 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

Funding CBM day-1 setup

16 May 2024

Estimated re-procurement costs [2024 EUROS]

total cost: 35,27 M€ (2005 EURO)
secured: 29,73 M€
EoI: 3,22 M€
t.b.a. 2,31 M€

84,3 % secured funding

Common Fund: 22% t.b.a by collaboration due to termination of membership of Russian Institutes plus cost increase due to inflation

- Magnet: 5,13 M€
- RICH mechanics, gassystem: 1,32 M€
- MUCH absorbers, mechanics: 2,63 M€

Infrastructure
Beam Monitoring System
Online Systems (DAQ and FLES)
Dipol MAGNET
Forward Spectator Detector (FSD) former…
Time of Flight System (TOF)
Transition Radiation Detector (TRD)
Muon Detector (MUCH)
Ring Image Cherenkov Detector (RICH)
Silicon Tracking System (STS)

secured
re-procurement
Expression of Interest
to be assigned

0 2000 4000 6000 8000 10000

How to close the funding gap ?

- **depends on council decision on FS+ and green light for re-procurement for RICH, FSD and MUCH**

- **Agree on Amendment Construction MoU to compensate missing Common Fund contribution from Russia plus for cost increase due to inflation (next talk)**

- **Look for additional partner**
- **new CBM members Bochum and GSI FFN group √, Hiroshima (√) joined the CBM collaboration in September 2023**
- **US groups are interested in CBM….**

- **Try to construct more cost effective, look for further synergies**
- **Further funding applications**

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CBM system mass production

❿ STS module production

- > 100 modules assembled
- Ladder assembly ongoing (first 3 ladders ready!)
- PRR in Spring 2024

❿ RICH

- 1 of 2 photo cameras ready!
- 50% FEE produced!

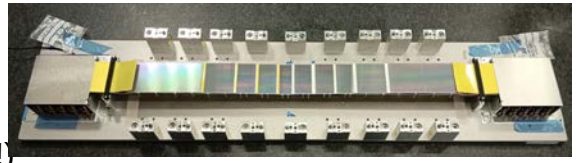
❿ TOF

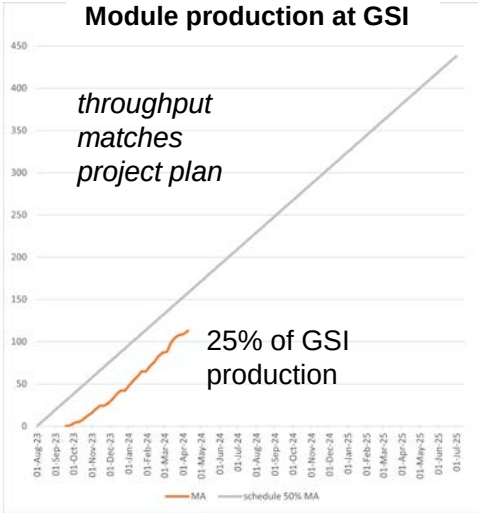
- Counter pre-production concluded. PRR in May/June
- Module pre-production ongoing

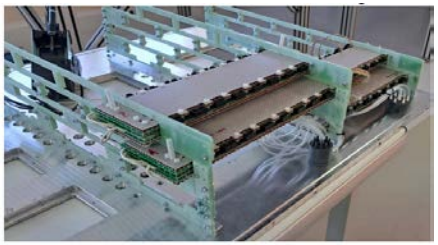
❿ TRD

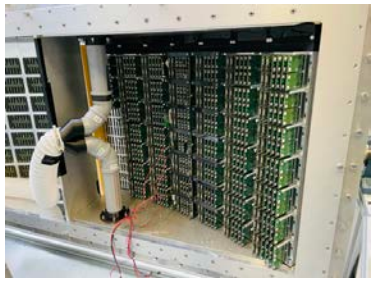
- First pre-production modules of 1D and 2D options ready!

STS module production, Ladder pre-production

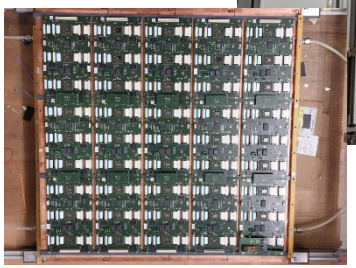








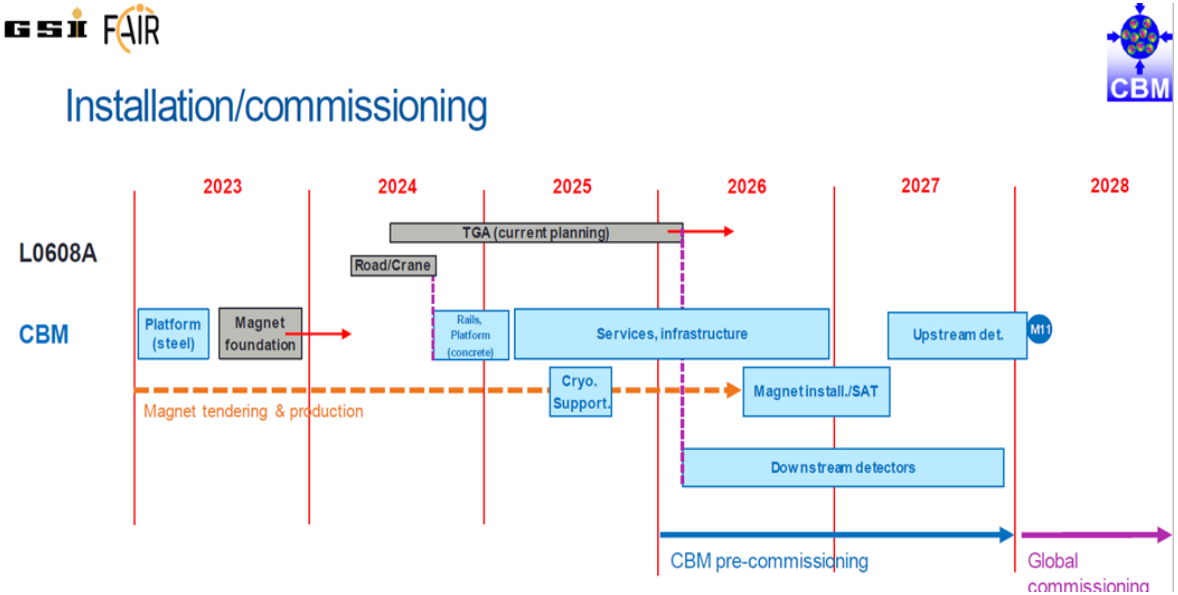
50% of RICH FEE and CAMERAs ready!

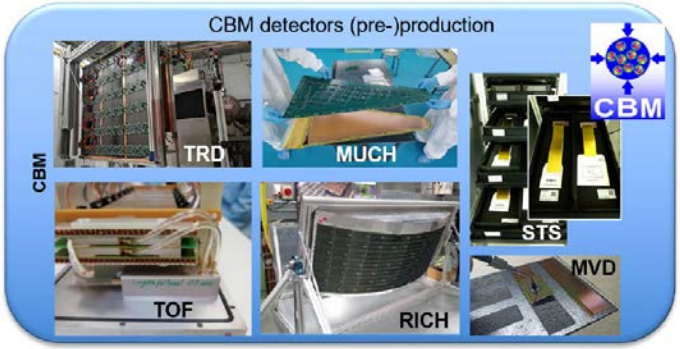


TRD pre-production modules

TOF modules pre-production

CBM construction timeline and progress





CBM has started the mass production of detectors

→ to be completed until end of 2027

	Component/ Sub-System	TDR	Cost [k€ 2005]	Funding	Construction	Construction completed	Test/ Commissioning
Day-1	Micro Vertex Detector (MVD)		914			05/2027	
	Silicon Tracking System (STS)		9504			01/2027	
	Ring Image Cherenkov Detector (RICH)		3031			06/2027	
	Muon Detector (MUCH)		5395			07/2027	
	Transition Radiation Detector (TRD)		2615			11/2027	
	Time of Flight System (TOF)		5786			07/2027	
	Forward Spectator Detector (FSD)		705			01/2027	
	Dipol Magnet		3758			01/2027	
	Online Systems (DAQ and FLES)		1825			01/2027	
	Beam Monitoring System		242			05/2027	
	Infrastructure		2192			01/2028	
March 2024		98% value weighted		85% secured	30,0% value weighted		4% value weighted

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 (35,27 M€ in 2005 prices)

(-0,7M€) compared to the RRB12.

- Czech Technical University received additional funding (164 T€ - 2024 prices) for the construction of the new Forward Spectator Detector (PSP 1.1.1.6.2.3).

- 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 3,68 M€ (2024 prices).
Missing contributions of Russian institutions of 22% need to be compensated plus cost increase due to inflation.
(Amendment to CBM Construction MoU – next presentation)

- **The CBM day 1 setup has 84,3% secured funding**
  (secured funding will increase after expected council decisions)
- The CBM start version (including ECAL and the full bandwidth of the DAQ/FLES) has 77,4% secured funding

HADES Timeline

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

2024: - setup for Carbon beam run,
time-zero detector with segmented diamond counter
all 6 sectors of ECAL in operation

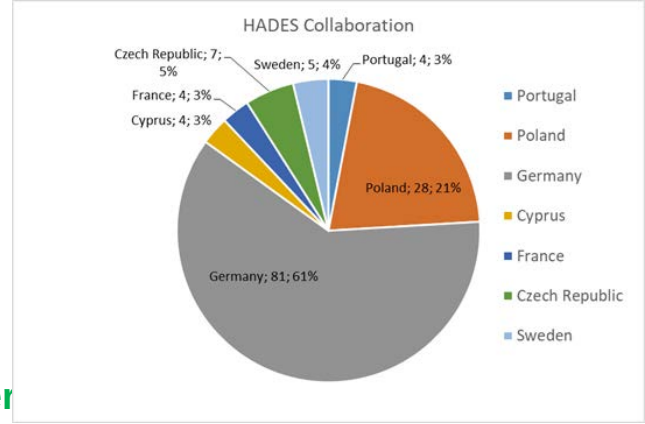
2022-2028?… (experiment campaign at SIS18 - FAIR phase 0)

- we plan three long runs, e.g.:
  - - Au+Au Beam Energy Scan (200-400-600-800 MeV)
  - π+$(CH_2)_n$/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 134 members (May 2024)

Institute, Town, Country	number of scientists
LIP, Coimbra, Portugal	4
AGH, Cracow, Poland	6
PAN, Cracow, Poland	2
IF UJ, Cracow, Poland	10
GSI, Darmstadt, Germany	27
TU, Darmstadt, Germany	17
HZ Dresden, Germany	3
IKP GU, Frankfurt, Germany	13
TU Munchen, Garching, Germany	3
Justus Liebig Uni Giessen, Giessen, Germany	9
FZ Juelich, Juelich, Germany	1
Frederick Uni, Nicosia, Cyprus	4
UCNRS-IN2P3, Orsay, France	5
IUJ, Rez, Czech Republic	7
Uppsala Uni, Uppsala, Sweden	5
IFD, Uni Warsaw, Warszawa, Poland	4
WUT, Warszawa, Poland	8
Bergische Uni Wuppertal, Wuppertal, Germany	6
Sum:	**134**

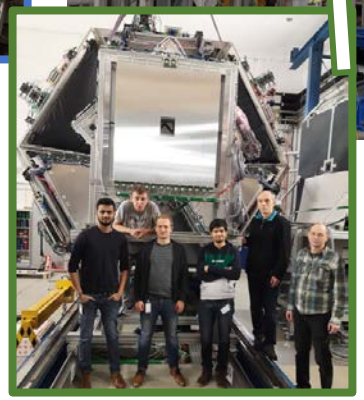
The upgraded HADES detector (five new detector systems)

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

Forward RPC

LIP Coimbra

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



STS2

Jagiellonian Univ.

- PANDA straw technology
- PANDA PASTTREC FEE chip

STS1

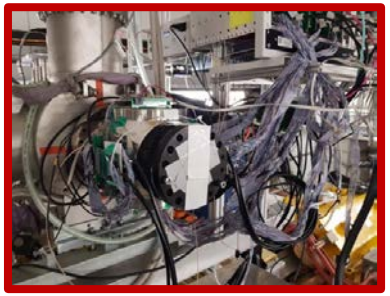
TransFAIR, Jülich

- 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

HADES members

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

- 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 Techical University (8)
- New Czech group: Department of Experimental Physics of Faculty of Science, Palacky University, Olomouc (3)
- FZJülich/Bochum (Prof. Ritmans groups) – now GSI FFN (10)
- Swedish PANDA colleagues (through PANDA.HADES MoU, coord. Prof Schönning)
  - Department of Physics and Astronomy, Uppsala University (5)
  - University of Stockholm

The HADES spokesperson Prof. Joachim Stroth (Goethe University Frankfurt) and Pavel Tlusty (deputy) have been re-elected for another period of three years in April 2024 during the collaboration meeting HADES-XLVI.

HADES upgrade costs

	Status HADES experiment funding (FAIR phase 0 (@SIS18) & FAIR phase 1 (@SIS100)									
PSP Code	detector / system	Prices, K Euro								
		2005 prices				2024 prices				
		total cost 2005 prices	Secured amount	EoI	To be assigned	total cost 2024 prices	Secured amount	EoI	To be assigned	funded in FAIR Phase
1.1.2.1	Mechanics and Installation	**386**	380	6		**647**	636	10		Phase 1
1.1.2.2	Cryo Infrastructure	**69**	69			**116**	116			Phase 1
1.1.2.3.1-3	HADES Calorimeter	**584**	584	0		**979**	979	0		Phase 0
1.1.2.3.4	HADES Calorimeter (3" PMTs)	**645**	645	0	0	**1082**	1082	0	0	Phase 1
1.1.2.4	Readout Electronics Modification	**168**			168	**282**			282	Phase 1
1.1.2.5.1	MDC Plane II	**207**			207	**347**			347	Phase 1
1.1.2.5.2-3	MDC FEE	**214**	214	0		**359**	359	0		Phase 0
1.1.2.6	RICH Upgrade	**43**	43			**71**	71			Phase 0
1.1.2.7	Forward Detector	**232**	232	0		**390**	390	0		Phase 0
1.1.2.8	Beam Monitoring System (T0&HALO-BAS)	**119**	24	95		**200**	40	159		Phase 0
	SUM HADES (FAIR phase 0&1)	**2667**	**2191**	**101**	**375**	**4473**	**3674**	**170**	**629**	**82,1%**
	SUM HADES@SIS18 (FAIR phase 0)	**1168**	**1073**	**95**	**0**	**1959**	**1799**	**159**	**0**	**91,9%**
										percentage secured
	This calculation uses an escalation factor of 1.677 between 2005 prices and 2024 prices.									

The costs of the HADES experiment at SIS18 (FAIR phase 0) amount to 1,17 M€ (2005 prices). The funding is almost assured (91,9% secured funding).

The costs of the HADES experiment at SIS100 (FAIR phase 1) amount to 2,67 M€ (2005 prices). The level of secured funding amounts to 82,1 % at this time.

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
		GSI / TUM / TUD	FZJ	University funding (VF)			FAIR project funds							
Mechanics and Installation	647		10		469	0							168	
Cryo Infrastructure	116		0										116	
HADES Calorimeter	979	42		110	491	0	335					0		
HADES Calorimeter (3" PMTs)	1082	303		22	758	0								0
Readout Electronics Modification	282													282
MDC Plane II	347													347
MDC FEE	359		0	359										
RICH Upgrade	71	71												
Forward Detector	390	42						180	120	49	0	0		
Beam Monitoring System (T0&HALO-BAS)	200	40	159											
	4473													
Sum in 2024 k€	**4473**	**498**	**170**	**491**	**1718**	**0**	**335**	**180**	**120**	**49**	**0**	**0**	**283**	**629**
Sum in 2005 k€	2667	297	101	293	1025	0	200	107	71	29	0	0	169	375
escalation factor (1./1.677)														

This calculation uses an escalation factor of 1.677 between 2005 prices and 2024 prices

1,677

amounts in green are considered as secured

amounts in blue - Expression of Interest (EoI)

amounts in red - to be assigned

There are additionally secured contribution by NPI, Czech Republic of 195T€ (2024 prices) for the PMTs for the HADES ECAL and 40,5T€ (2024 prices) from TU Darmstadt for the HADES beam monitoring system.

HADES MoUs


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

For GSI GmbH

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.**


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 "Party"

on the one hand,

and

- Laboratório de Instrumentação e Física Experimental de Partículas (LIP), Coimbra, PORTUGAL,
- Uniwersytet Jagiellonski, Collegium Maius, Faculty of Physics, Astronomy and Applied Computer Science of Jagiellonian University (JU), Institute of Nuclear Physics (IFJ PAN), Cracow, POLAND
- GSI Helmholtzzentrum für Schwerionenforschung GmbH (GSI) Darmstadt, GERMANY
- Institut für Kernphysik, Technische Universität Darmstadt, Darmstadt, GERMANY
- Helmholtz-Zentrum Dresden-Rossendorf (HZDR), Inst. für Strahlenphysik, Dresden, GERMANY
- Joint Institute of Nuclear Research (JINR), LHEP, Dubna, RUSSIA
- Johann-Wolfgang Goethe Universität, Institut für Kernphysik, Frankfurt, GERMANY
- Technische Universität München, Excellence Cluster Universe, Garching, GERMANY
- Justus-Liebig Universität, II Phys. Inst., Giessen, GERMANY
- Forschungszentrum Jülich (FZJ), Jülich, GERMANY
- Institute of Theoretical and Experimental Physics (ITEP), Moscow, RUSSIA
- Institute for Nuclear Research (INR), Russian Academy of Science, 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) acting for and on behalf of Institut de Physique Nucléaire d'Orsay (IPNO), Orsay, FRANCE
- Nuclear Physics Institute (NPI), Czech Academy of Sciences, Rez, CZECH REPUBLIC
- Universidade 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 "Host".

MoU 1999	2009 2012	update MoU 2018	Addendum 1 2022	Addendum 2 extension until 2030 (in preparation)	HADES M&O MoU 2030

Thank you for your attention !