

NUSTAR Construction MoU

13th FAIR-NUSTAR Resources Review Board
FAIR/GSI, Darmstadt, Germany

Alexander Herlert
NUSTAR Resource Coordinator
FAIR



Finland



France



Germany



India



Poland



Romania



Russia



Slovenia



Sweden



UK

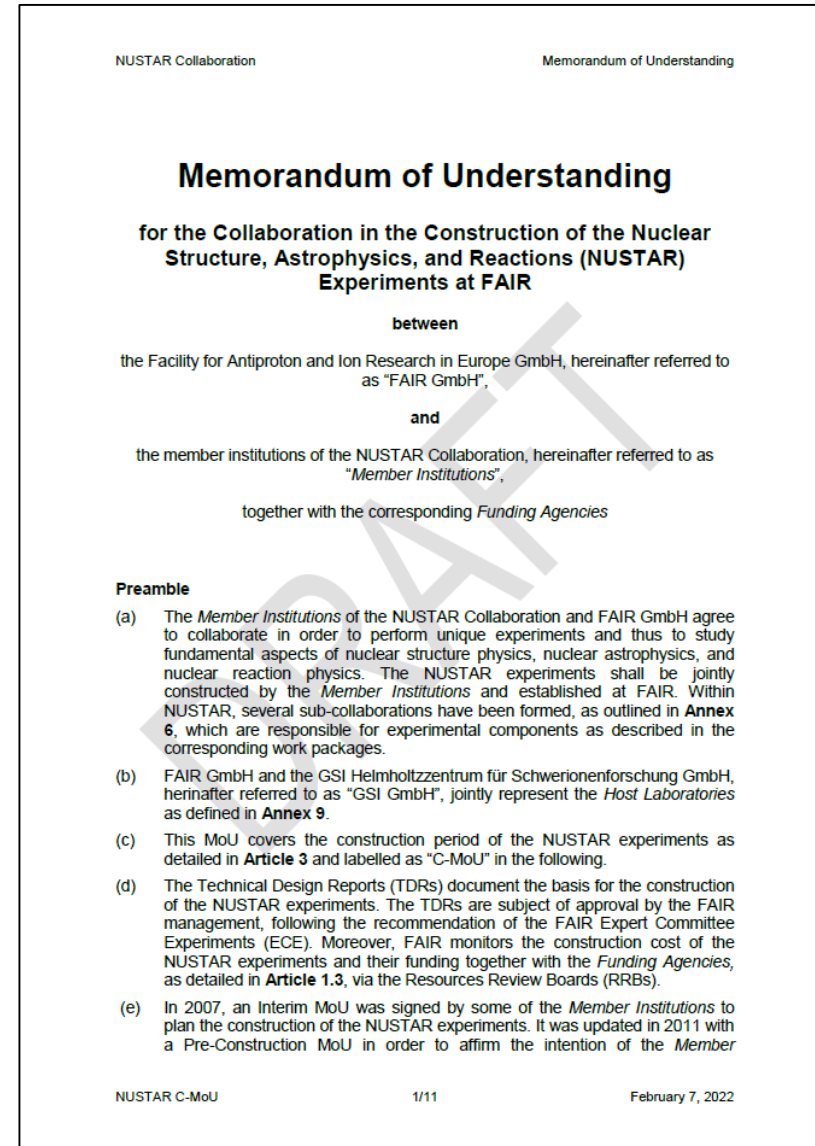


Czech Republic

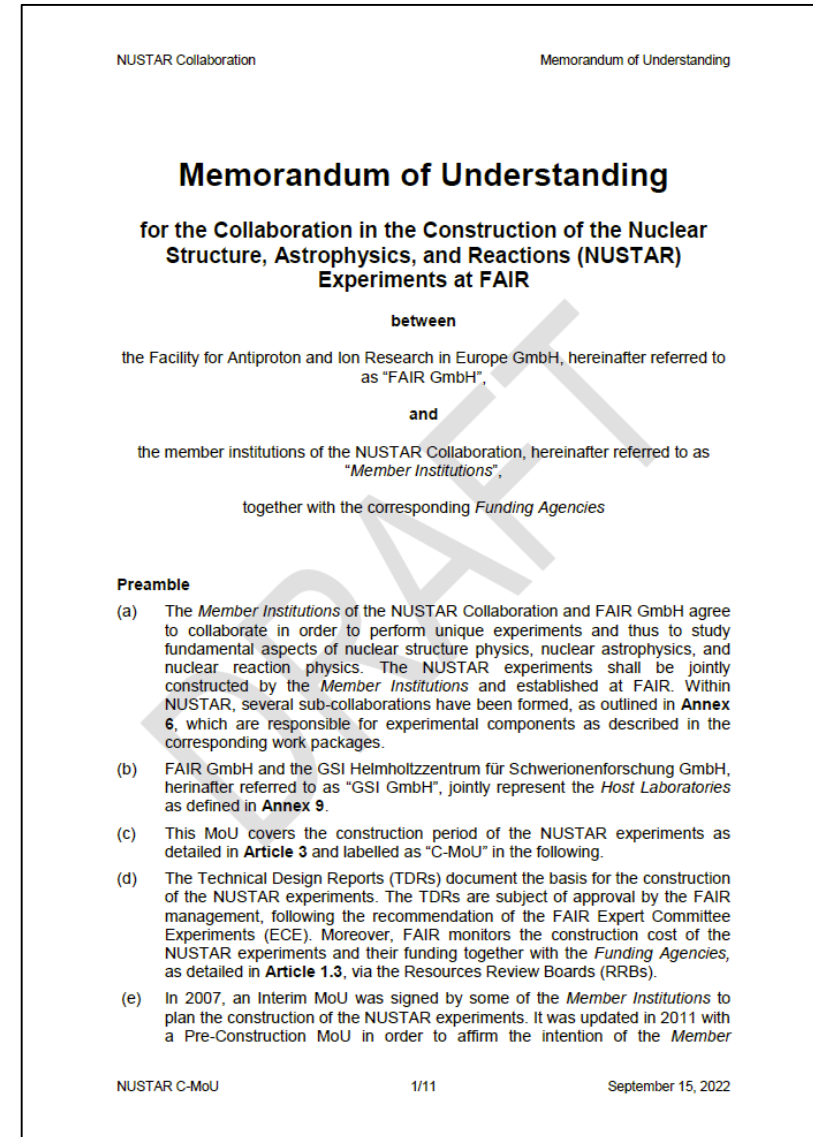


- **NUSTAR Construction MoU**
 - Final draft of Construction MoU (May 2024)
 - Short history of C-MoU
 - List of changes to December 2023 version
 - **Request for approval**

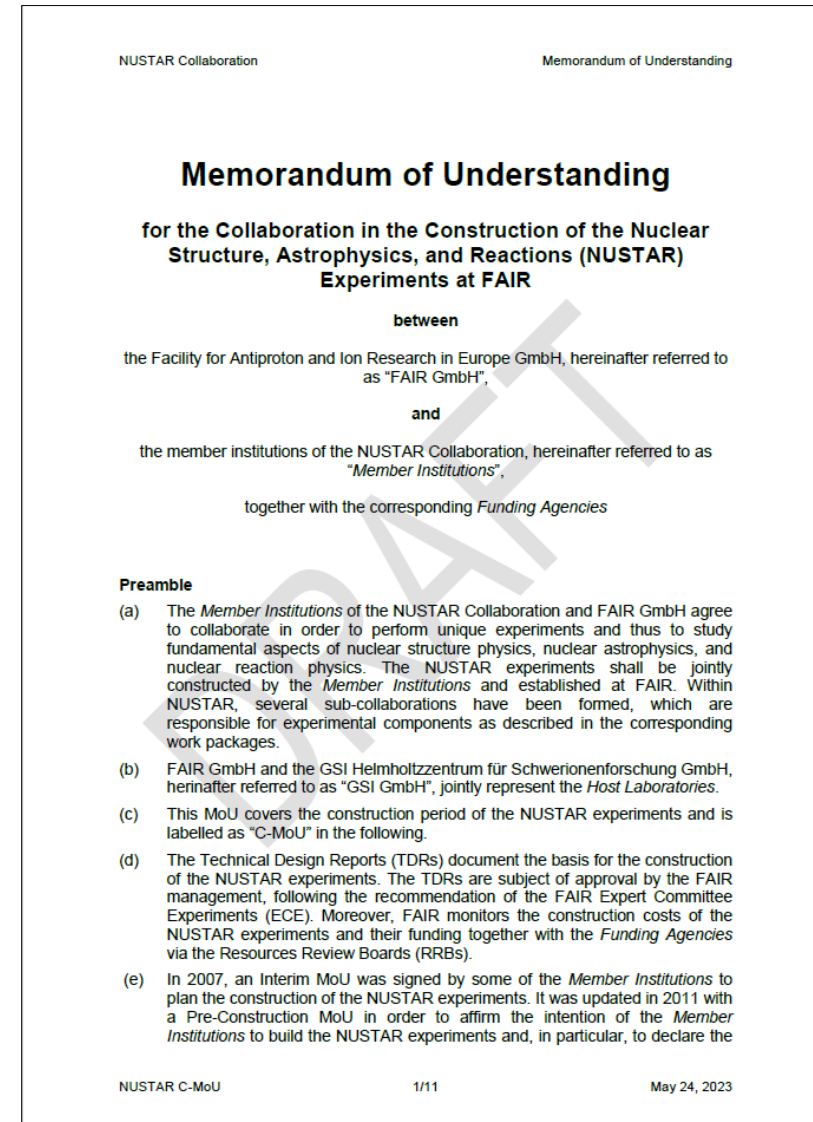
- Version from December 17, 2021
 - Based on **CBM C-MoU**
 - **endorsed** by NUSTAR Council (Collaboration Board)
 - **submitted to ECSG** and comments received and changes implemented in new version
 - **submitted to all Member Institutions** to get first feedback – minor modifications to main text and annexes for new version
- Version from February 7, 2022
 - **submitted to FAIR-RRB**
 - Discussed at **11th FAIR-RRB**
 - Request to **reduce overall length** of the document



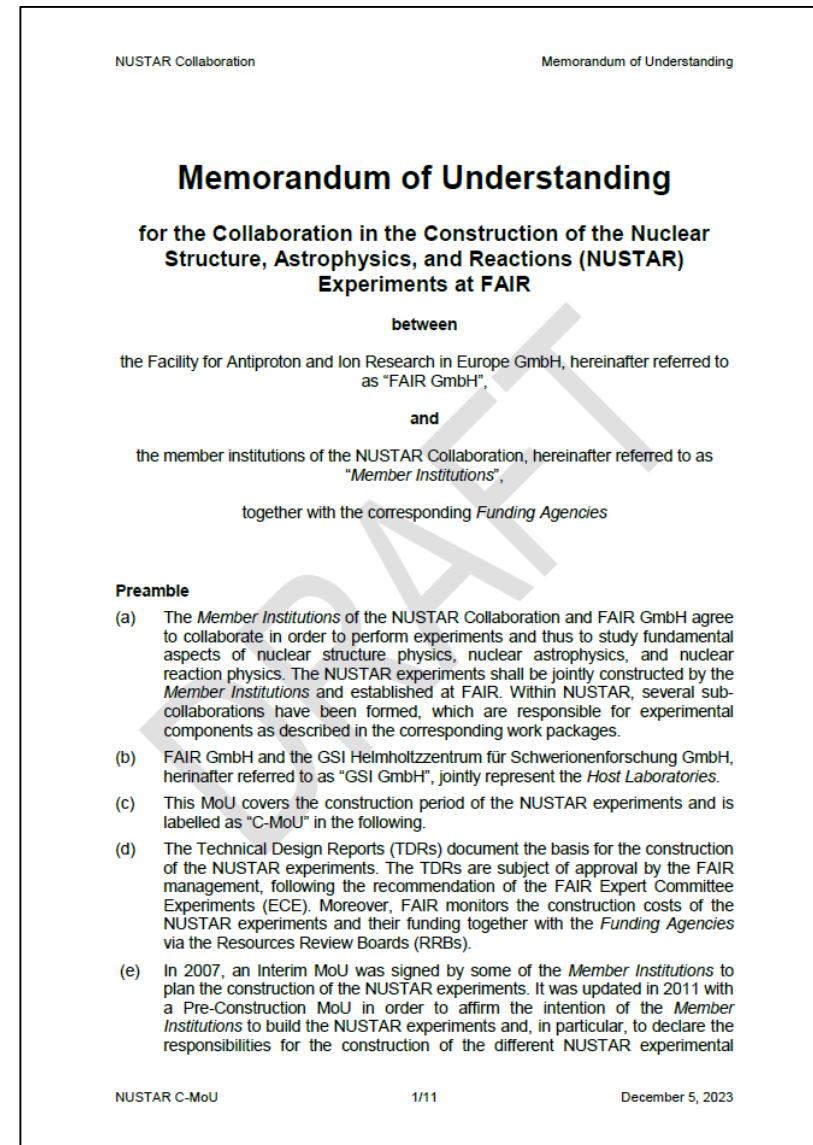
- Version from September 15, 2022
 - **Intermediate version**
 - **New “structure” of annexes**
 - *All annexes kept as external documents, which can be updated separately (with defined procedure)*
 - *First discussion with some funding agencies (INFN, PT-DESY for BMBF) with **positive feedback***
 - **Suspension of Russian institutes**
 - *Recalculation of Construction Common Fund share*
 - **FAIR Review 2022**
 - *Need to implement new FAIR staging steps*



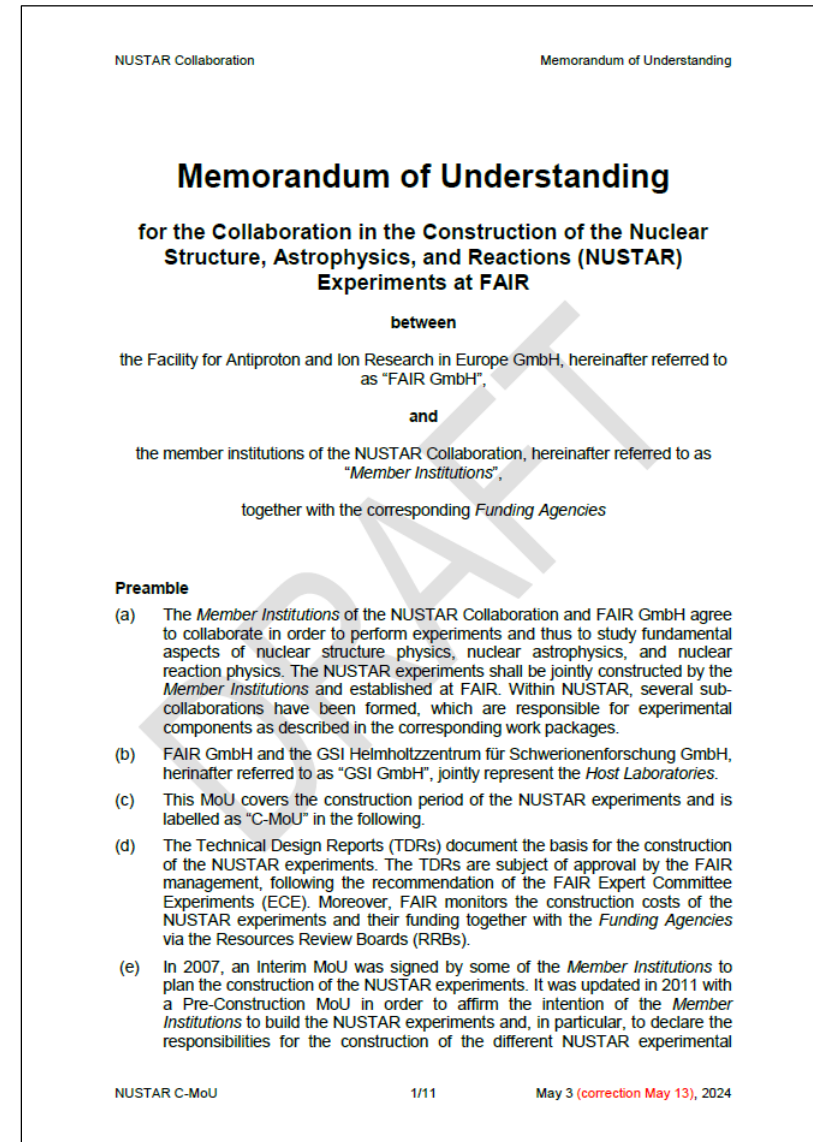
- Version from May 24, 2023
 - **Updated version for RRB**
 - *Feedback* from funding agencies taken into account
 - All C-MoU documents including all supplements to Annexes **uploaded to EDMS**
 - Staging steps **implemented**
 - **Updated Construction Common Fund** expenditure profile with respect to new project timeline and staging steps
 - **Details discussed with ECE/ECSG**
 - Support to have **separate C-MoU and Operation MoU**
 - **Discussed at 12th FAIR-RRB**
 - **Requested check of new structure and changes**
 - Aim at new draft version for **legal check**



- Version from December 5, 2023
 - **Legal check**
 - **Submitted to funding agencies**
 - **Deadline for comments was February 20, 2024**
 - **Extended until end of April, 2024**
 - **Details discussed with ECE/ECSG**
 - **Support to finalize and approve C-MoU at upcoming 13th FAIR-RRB**



- Version from May 3, 2024 (with **post-submission correction** from May 13)
 - **Final draft version**
 - **Minor changes** to main text and annexes
 - **Submitted to FAIR-RRB**
 - **Request approval at 13th FAIR-RRB meeting** to start signing process



Structure and update procedure of annexes



Annex	Title	supplement in print version	for information only	update	source	approval type
Annex 1	List of Member Institutions of the NUSTAR Collaboration	yes	no	FAIR-RRB	NUSTAR Collaboration	information from NUSTAR Collaboration
Annex 2	List of Funding Agencies	yes	no	FAIR-RRB	FAIR-RRB	approval by FAIR-RRB
Annex 3	Organisation rules of the NUSTAR Collaboration and management structure of the NUSTAR Collaboration	no	yes	any time	NUSTAR Collaboration	approval by NUSTAR Council
Annex 4a	Responsibilities of the Member Institutions for the construction of experimental components	no	yes	FAIR-RRB	NUSTAR Collaboration	information from NUSTAR Collaboration
Annex 4b	Summary tables on construction costs and funding of the NUSTAR experiments	yes	no	FAIR-RRB	FAIR-RRB	approval by FAIR-RRB
Annex 5	Status of Technical Design Reports	no	yes	FAIR-RRB	NUSTAR Collaboration	information from NUSTAR Collaboration
Annex 6	NUSTAR sub-collaborations	no	yes	FAIR-RRB	NUSTAR Collaboration	information from NUSTAR Collaboration
Annex 7	Construction schedule	no	yes	FAIR-RRB	NUSTAR Collaboration	information from NUSTAR Collaboration
Annex 8	Procedures for the Construction Common Fund for the Common Infrastructure	yes	no	FAIR-RRB	FAIR-RRB	approval by FAIR-RRB
Annex 9	General conditions applicable to experiments performed at FAIR	no	yes	any time	FAIR	approval by FAIR Committees
Annex 10	The Day-one configuration of NUSTAR and FAIR staging steps	no	yes	FAIR-RRB	NUSTAR Collaboration	information from NUSTAR Collaboration

Construction Common Fund – staging steps



PSP-Code	Description	data from approved TDR	cost (2005) kEUR	FAIR staging step
1.2.1.2.4	Detectors and slit system for FLF6	yes	135.7	ES
1.2.1.2.5	Beam line to MATS-LaSpec hall	yes	154.0	FS++LEB
1.2.1.7	Beam line to MATS RFQ	yes	198.4	FS++LEB
1.2.1.8	Media supplies	yes	110.5	ES
1.2.1.9	Safety	yes	25.7	ES
1.2.1.10	IT infrastructure	yes	16.1	ES
1.2.1.11	Mechanics and alignment	yes	28.4	ES
1.2.2.1.8	Scintillators at FLF2 in vacuum	yes	28.6	ES
1.2.2.3.6	Adaption of platforms for ES/FS operation	yes	10.0	ES
1.2.2.5	Safety	yes	59.2	ES
1.2.5.1.1.3.3	GLAD feedbox	yes	135.7	ES
1.2.5.1.1.3.4	GLAD warm piping	yes	6.8	ES
1.2.5.1.1.3.5	GLAD infrastructure		193.3	ES
1.2.5.1.3.4	Vacuum systems (4th share)	yes	114.9	ES
1.2.5.1.5.1	Mechanics and alignment	yes	112.0	ES
1.2.6.4.4	ToF detectors - infrastructure CR	yes	63.8	MSVC
1.2.6.6.4	DAQ - common infrastructure	yes	24.4	MSVC
1.2.10.1.1.2	DAQ infrastructure (share 2)	yes	74.3	ES
1.2.10.1.2.1.1	Pendulum valves (share 1)	yes	66.0	ES
1.2.10.1.2.3	60L dewar	yes	24.8	ES
1.2.10.1.2.4	LN2 piping	yes	5.0	ES
		Total	1587.6	

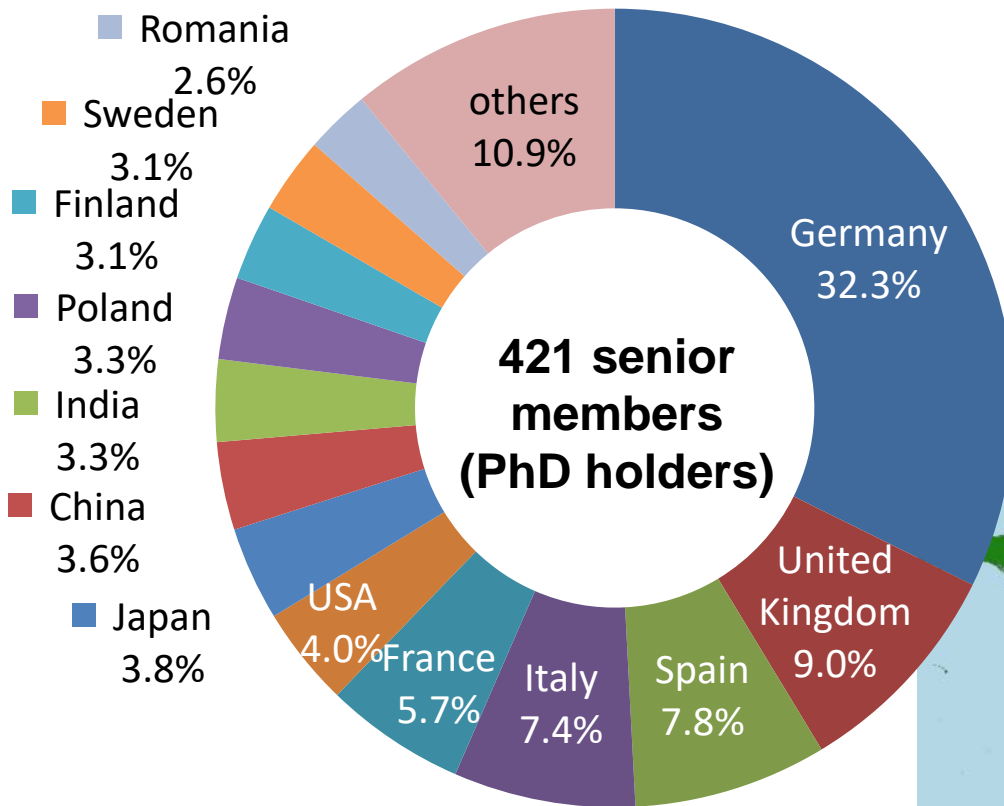
Expenditures per year (present estimate)



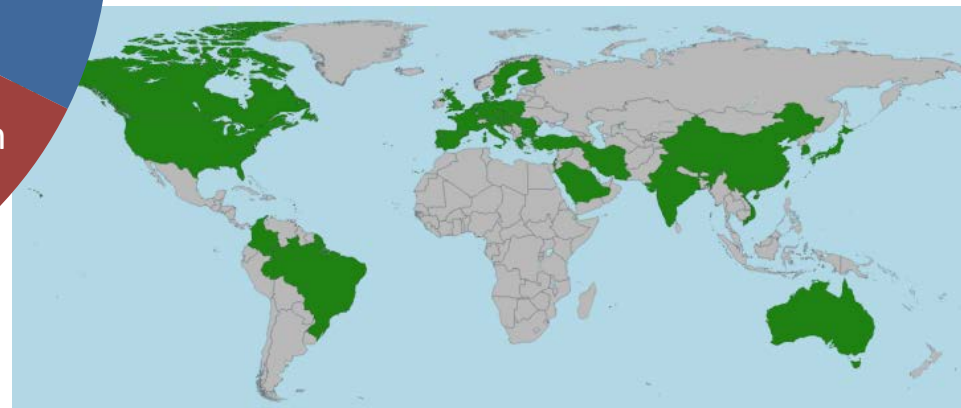
PSP-Code	Description	2023	2024	2025	2026	2027	2028	2029	2030	total
1.2.1.2.4	Detectors and slit system for FLF6				239.7					239.7
1.2.1.2.5	Beam line to MATS-LaSpec hall							294.0		294.0
1.2.1.7	Beam line to MATS RFQ							378.8		378.8
1.2.1.8	Media supplies			190.2						190.2
1.2.1.9	Safety			44.2						44.2
1.2.1.10	IT infrastructure			27.7						27.7
1.2.1.11	Mechanics and alignment			48.9						48.9
1.2.2.1.8	Scintillators at FLF2 in vacuum			49.2						49.2
1.2.2.3.6	Adaption of platforms for ES/FS operation			17.2						17.2
1.2.2.5	Safety			101.9						101.9
1.2.5.1.1.3.3	GLAD feedbox		227.6							227.6
1.2.5.1.1.3.4	GLAD warm piping		11.4							11.4
1.2.5.1.1.3.5	GLAD infrastructure	316.0								316.0
1.2.5.1.3.4	Vacuum systems (4th share)			197.8						197.8
1.2.5.1.5.1	Mechanics and alignment			192.8						192.8
1.2.6.4.4	ToF detectors - infrastructure CR								125.0	125.0
1.2.6.6.4	DAQ - common infrastructure								47.8	47.8
1.2.10.1.1.2	DAQ infrastructure (share 2)				131.3					131.3
1.2.10.1.2.1.1	Pendulum valves (share 1)				116.6					116.6
1.2.10.1.2.3	60L dewar			42.7						42.7
1.2.10.1.2.4	LN2 piping			8.6						8.6
		316.0	239.0	921.2	487.6	0.0	0.0	672.8	172.8	2809.4

NUSTAR collaboration **senior members** (PhD holders without Russia) for Construction Common Fund from:

- **HISPEC/DESPEC, MATS, LaSpec, R³B, ILIMA, Super-FRS EC**



- > 1000 listed “interested” scientists
- > 630 registered members (incl. students, etc.)
- ~ 420 senior members (PhD holder w/o Russia)
- > 150 institutes from 36 countries



Status: November 30, 2023

- Total expected cost (cash)
 - **No change** to overall cost estimate: **2809.4 kEUR**
- Number of senior members
 - **No significant change to December 2023 numbers**
 - **421 senior members** (PhD holders)
 - Not taking into account „emeritus“ members and theoreticians with PhD
- Contribution per senior member
 - One-time payment (sum as given in the C-MoU)
 - Possibility to pay in several rates
 - Possibility to provide components instead of cash
 - **contribution per senior member: ~6.7 kEUR**
- C-MoU Annex 8 cost-sharing table
 - Some institutes **grouped by Funding Agency** (if requested)

Status of feedback (until end of April 2024)



country	share (senior members)	comment / status	
Germany	32.3%	BMBF: in principle ok (some minor issues – see list)	GSI: No changes requested
United Kingdom	9.0%	No changes requested	
Spain	7.8%	most likely no changes	
Italy	7.4%	only typos	
France	5.7%	CNRS no changes requested	CEA (some issues addressed)
USA	4.0%	special case	
Japan	3.8%	no reply - institute will sign/pay separately	
China	3.6%	no reply - institute will sign/pay separately	
India	3.3%	no reply	
Poland	3.3%	No changes requested	
Finland	3.1%	No changes requested	
Sweden	3.1%	VR: in principle ok – institutes will pay separately (some minor changes suggested - see list)	
Romania	2.6%	No changes requested	

<p>ITEM 1</p> <p>Article 3.1 and 3.2</p>	<p>Dates have been partly shifted, the start date set:</p> <ul style="list-style-type: none">• Start date set to the next month following the RRB#13.• actual termination date to be set latest end of 2027 (instead of 2026) since Early Science will start in 2028.• set of start date of operation phase (with Operation MoU in a final state) until latest end of 2026 (instead of 2025). <p>New draft version reads as follows (changes in red):</p> <p>3.1 This C-MoU is valid for the construction period of the NUSTAR experiments, from 1st June 2024 to a date not earlier than 31st December 2027. The actual termination date will be set by the NUSTAR RRB no later than 31st December 2027. The construction phase ends after all construction work-packages are completed and the equipment is installed in the NUSTAR caves.</p> <p>3.2 The responsibilities for the maintenance and operation of the NUSTAR experiments is planned to be laid down in a separate Maintenance and Operation (M&O) MoU, which will come into force in the operation phase of the NUSTAR experiments. The actual start date of the operation phase will be set by the NUSTAR RRB no later than 31st December 2026. The M&O-MoU will be prepared by the NUSTAR Collaboration together with FAIR GmbH, in consultation with the NUSTAR RRB, and will be signed by all the parties participating in the operation phase of NUSTAR.</p>
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<p>ITEM 2</p> <p>Article 3.3</p>	<p>Comment from VR Sweden – phrasing not acceptable. Suggested change: Remove the last sentence</p> <p>December 2023 version</p> <p>3.3 Any Funding Agency may withdraw its support from the NUSTAR Collaboration by giving notice not less than twelve months prior to the date of withdrawal in writing to the NUSTAR RRB, the NUSTAR Collaboration and to the FAIR Scientific Managing Director. In such an event, reasonable compensation to the Collaboration shall be negotiated through FAIR GmbH and confirmed by the NUSTAR RRB.</p> <p>May 2024 version</p> <p>3.3 Any Funding Agency may withdraw its support from the NUSTAR Collaboration by giving notice not less than twelve months prior to the date of withdrawal in writing to the NUSTAR RRB, the NUSTAR Collaboration and to the FAIR Scientific Managing Director. In such an event, reasonable compensation to the Collaboration shall be negotiated through FAIR GmbH and confirmed by the NUSTAR RRB.</p>
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<p>ITEM 3</p> <p>Article 5.3</p>	<p>Comment from VR Sweden – final acceptance procedures not required in this context. Suggested change: Remove the last sentence</p> <p>December 2023 version</p> <p>5.3 The monitoring of the construction progress of the in-kind contributions is performed by the FAIR Project Leader. This monitoring comprises also the Risk Assessment and the Quality Assurance (QA). The final acceptance of an in-kind contribution is determined according to the procedures established at FAIR.</p> <p>May 2024 version</p> <p>5.3 The monitoring of the construction progress of the in-kind contributions is performed by the FAIR Project Leader. This monitoring comprises also the Risk Assessment and the Quality Assurance (QA). The final acceptance of an in-kind contribution is determined according to the procedures established at FAIR.</p>
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<p>ITEM 4</p> <p>Article 5.6</p>	<p>Comment from VR Sweden – phrasing not clear. Suggested change: Remove “FA support part” in paragraph</p> <p>December 2023 version</p> <p>5.6 The Member Institutions, supported by their Funding Agencies, will make their best efforts to design, produce final prototypes, construct, calibrate, transport, assemble, install, and commission all the deliverables listed in Annex 4a within the limits of their funding. In the event of cost overruns, these will first be brought, by the Member Institution(s) concerned, to the attention of the NUSTAR Collaboration and then to the NUSTAR RRB if solutions have not been found. The NUSTAR Collaboration will propose ways of accommodating such overruns including de-scoping or staging if other ways cannot be found, and seek the endorsement of the NUSTAR RRB.</p> <p>May 2024 version</p> <p>5.6 The Member Institutions, supported by their Funding Agencies, will make their best efforts to design, produce final prototypes, construct, calibrate, transport, assemble, install, and commission all the deliverables listed in Annex 4a within the limits of their funding. In the event of cost overruns, these will first be brought, by the Member Institution(s) concerned, to the attention of the NUSTAR Collaboration and then to the NUSTAR RRB if solutions have not been found. The NUSTAR Collaboration will propose ways of accommodating such overruns including de-scoping or staging if other ways cannot be found, and seek the endorsement of the NUSTAR RRB.</p>
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<p>ITEM 5</p> <p>Article 5.5</p>	<p>Comment from VR Sweden – similar as Article 5.6 case: phrasing not clear. Suggested change: Remove “FA support part” in paragraph</p> <p>December 2023 version</p> <p>5.5 The following definition regarding the in-kind contributions (not applicable to cash contributions) of the Member Institutions of the NUSTAR Collaboration to the NUSTAR experiments were made by the FAIR Cost Review Committee for Experiments (CORE-E) and is valid for this C-MoU: The human and financial resources needed for the construction of the NUSTAR experiments are grouped into three headings:</p> <ul style="list-style-type: none"> 5.5.1 R&D work on the various detector elements; 5.5.2 Costs for infrastructure at the Member Institutions, and costs for personnel, travel, etc. of the Member Institutions as arising from their participation in the NUSTAR Collaboration; 5.5.3 Engineering design, final prototyping, construction, calibration, transportation, assembly, installation, and commissioning costs for the experimental components. <p>The resources needed for work under the headings 5.5.1 and 5.5.2 are the responsibility of the Member Institutions supported by their respective Funding Agencies. These resources are neither accounted for in construction costs, nor monitored centrally by the NUSTAR Collaboration.</p>	<p>May 2024 version</p> <p>5.5 The following definition regarding the in-kind contributions (not applicable to cash contributions) of the Member Institutions of the NUSTAR Collaboration to the NUSTAR experiments were made by the FAIR Cost Review Committee for Experiments (CORE-E) and is valid for this C-MoU: The human and financial resources needed for the construction of the NUSTAR experiments are grouped into three headings:</p> <ul style="list-style-type: none"> 5.5.1 R&D work on the various detector elements; 5.5.2 Costs for infrastructure at the Member Institutions, and costs for personnel, travel, etc. of the Member Institutions as arising from their participation in the NUSTAR Collaboration; 5.5.3 Engineering design, final prototyping, construction, calibration, transportation, assembly, installation, and commissioning costs for the experimental components. <p>The resources needed for work under the headings 5.5.1 and 5.5.2 are the responsibility of the Member Institutions supported by their respective Funding Agencies. These resources are neither accounted for in construction costs, nor monitored centrally by the NUSTAR Collaboration.</p>
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<p>ITEM 6</p> <p>Article 7.5</p>	<p>Comment from VR Sweden – risk of unacceptable warranty commitment. Suggested change: Remove “FA part” in paragraph</p> <p>December 2023 version</p> <p>7.5 If a Member Institution withdraws from the membership in the NUSTAR Collaboration during the construction phase, the NUSTAR Board of Representatives shall make a recommendation to the NUSTAR Council how to cope with the unfinished obligations, which were taken over by this institute. A solution for these obligations should be found and agreed on between the Member Institutions, the corresponding Funding Agencies, and the NUSTAR Collaboration.</p> <p>Already delivered hardware and software remains part of the NUSTAR experiments and cannot be removed without the consent of the NUSTAR Collaboration and the Host Laboratories.</p> <p>May 2024 version</p> <p>7.5 If a Member Institution withdraws from the membership in the NUSTAR Collaboration during the construction phase, the NUSTAR Board of Representatives shall make a recommendation to the NUSTAR Council how to cope with the unfinished obligations, which were taken over by this institute. A solution for these obligations should be found and agreed on between the Member Institutions, the corresponding Funding Agencies, and the NUSTAR Collaboration.</p> <p>Already delivered hardware and software remains part of the NUSTAR experiments and cannot be removed without the consent of the NUSTAR Collaboration and the Host Laboratories.</p>
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<p>ITEM 7</p> <p>Preamble</p>	<p>Comment from BMBF, Germany: Adjust phrasing to better reflect link to FAIR Council and its decisions.</p> <p>December 2023 version</p> <p>(f) This C-MoU relates to the configuration of NUSTAR, which is to be realized within the FAIR Modularised Start Version (MSV) as defined in the FAIR Convention. The Day-one configuration of NUSTAR is a largely funded subset of the MSV configuration (see Annex 10). The <i>Member Institutions</i> confirm their planned contribution to the construction/realization of the NUSTAR experiments either by providing components in-kind or by providing appropriate human resources. In addition, the <i>Member Institutions</i> or their respective <i>Funding Agencies</i> express their intent to contribute to the Common Fund for the construction of the NUSTAR Common Infrastructure.</p> <p>corrected May 2024 version</p> <p>(f) This C-MoU relates to the configuration of NUSTAR, which is to be realized within the FAIR Modularised Start Version (MSV) in staging steps according to FAIR Council decisions as defined in the FAIR Convention. The Day-one configuration of NUSTAR is a largely funded subset of the MSV FAIR Modularised Start Version (MSV) configuration (see Annex 10). The <i>Member Institutions</i> confirm their planned contribution to the construction/realization of the NUSTAR experiments either by providing components in-kind or by providing appropriate human resources. In addition, the <i>Member Institutions</i> or their respective <i>Funding Agencies</i> express their intent to contribute to the Common Fund for the construction of the NUSTAR Common Infrastructure.</p>
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Changes to December 5, 2023 version



Update of Annexes	
Annex 1	<p>There was no change to the list of <i>Member Institutions</i>. A footnote was added for JINR Dubna, pointing out that it is an international organization. JINR remains suspended based on a NUSTAR Collaboration decision.</p> <p>Correction May 13: JLU Giessen corrected (match English writing)</p>
Annex 2	The list of <i>Funding Agencies</i> has been updated based on feedback provided to the December 2023 version.
Annex 3 (on-line)	There was no change to the NUSTAR organizational rules.
Annex 4a (on-line)	The list of components was updated based on the latest information.
Annex 4b	<p>The cost matrix has been updated based on the data to be presented at the upcoming FAIR RRB meeting (#13).</p> <p>Correction May 13: In supplement 1, with respect to funding sources used in the cost-matrix, <i>Member Institutions</i> are added in addition to <i>Funding Agencies</i>.</p>
Annex 5 (on-line)	The TDR status has been updated .
Annex 6 (on-line)	There was no change to the NUSTAR sub-collaboration overview.
Annex 7 (on-line)	There was no change to the overall schedule.
Annex 8	<p>There was no change to the distribution of senior members.</p> <p>In a few cases, contributions have been grouped for <i>Funding Agencies</i> as a central payment is expected.</p>
Annex 9 (on-line)	There was no change .
Annex 10 (on-line)	There was no change .

NUSTAR Collaboration

Supplement 1 to Annex 4b of NUSTAR Construction MoU

NUSTAR funding sources (as used in cost-matrix)

The table below gives an overview on the funding sources¹ from which *Member Institutions* of the NUSTAR Collaboration received funding or want to ask for funding to cover the construction costs of the NUSTAR experimental equipment.

The acronyms/initialisms are used in the NUSTAR cost-matrix which gives further details on the cost-sharing for the various NUSTAR work packages.

(Data from May 3, 2024, corrected May 13, 2024)

country	acronym / initialism	corresponding Funding Agency (see Annex 2) or Member Institution (see Annex 1)	name
Canada	NSERC	NSERC	Natural Sciences and Engineering Research Council
Czech Republic	MSMT	MSMT	Ministry of Education, Youth and Sports
FAIR	Common Fund		Common Fund for infrastructure

- **NUSTAR Construction MoU**
 - The NUSTAR Collaboration **thanks the Funding Agencies** for their feedback and fruitful comments to improve the MoU text and to come to a **final draft version**.
 - The NUSTAR Collaboration asks the RRB members for the **approval of the C-MoU** in order to start the signing process.
 - *Of course, minor corrections (especially typos) can be taken into account for the released print version. This also includes an **updated (released) cost-matrix**.*
- **Next steps**
 - **Final “print” version** (released version of C-MoU) will be prepared until latest May 31, 2024.
 - *To be uploaded on EDMS*
 - **Signing** of C-MoU
 - *Printed version to be sent (from June 2024) with the request for signatures*
 - **Call for Funds** (Construction Common Fund share)
 - *All Funding Agencies and Member Institutions will be asked to pay their share (taking into account **regional or special modalities**).*