



News from FAIR

Paolo Giubellino

- Activities at the construction site and on Campus continue as far as possible whilst keeping safety as top priority
- Safety measures are in place, and continuously monitored by a dedicated task force
- Since October, a few COVID19 positive cases have occurred on campus and at Construction site
 - Extensive contact follow-up, including testing and quarantine, has been carried out immediately after each new case became known
 - Still no transmissions of SARS-CoV-2 on the campus
- FAIR suppliers and collaborating institutions also affected, resulting in slower progress on manufacturing and delivery of accelerator and experiment components.
- In view of the 2021 beam time, procedures have been developed to assist in the participation of experimental groups



- **Presentation by HH, construction advances rapidly**
- The integrated FAIR Project Master Time Schedule was issued the first time in Dec. 2016.
- Part of the regular planning process is to review and to consolidate the Project Master Time Schedule at certain consolidation points. This REBASELINING is required after major project steps or major project developments have taken
- The 1st REBASELINING was performed end of 2018 and a new FAIR project baseline was issued in February 2019.
- The 2nd REBASELINING is in progress and will be completed end of March 2021.

- Civil Construction continues to make substantial progress.
 - SIS100 tunnel ground slab completed, CBM cave advanced construction
 - Concrete works in full swing (about 2/3 of SIS100 tunnel complete)
 - the civil works contract for the Intermediate Objective (IO) buildings in area South has been awarded to the consortium Züblin + Strabag and activity is progressing.

Drone videos available via www.gsi.de



FAIR Project Progress – Images



The NUSTAR CAVES!



South AREA18th November 2020

Accelerators

- SIS100: all 110 dipole magnets and all RF cavities manufactured, series production of quadrupole modules ongoing. 2 injection septa delivered.
- Super-FRS: Testing of magnets ongoing at CERN
- HEBT: Delivery of 36 power convertors from ECIL.
- CR: assembly of first-of-series CR dipole magnet at BINP.



- Two meetings in 2020
 - 02 Nov - 03 Nov: 10th FAIR and GSI Joint Scientific Council
 - 06 May: 9th FAIR and GSI Joint Scientific Council
- A few recommendations (for all see distributed documents)
 - The **large number of excellent proposals** submitted to the G-PAC documents the **great interest** of the community and **relevance of Phase-0**. The JSC considers **Phase-0 crucial** and **strongly recommends its continuation** until the start of FAIR.
 - The JSC is **very impressed by the projects** of the **ERC Advanced Grants** recently awarded to FAIR and GSI scientists and looks forward to exciting results. The JSC **strongly encourages** further **applications for ERC grants** by FAIR and GSI scientists and the FAIR community.

Meetings in 2020

- 18 Mar: CBM Common Fund and MoU review
- 26 May: Joint 12th ECE and 3rd ECSG meeting
- 26-30 Oct: Joint 13th ECE and 4th ECSG meeting
 - including break-out sessions for each pillar
 - Shift from focus on TDRs to manufacturing, assembly, and commissioning – extended meetings with break-out sessions
 - Findings/Comments/Recommendations: see distributed document



ECE/ECSG: TDR Status

Collaboration	Approved	Submitted	To be submitted		Total expected
			in total	out of which for Day-1	
APPA	19	1	8	5	28
SPARC	11	1	3	1	15
BIOMAT	0	0	4	4	4
HED@FAIR	8	0	1	0	9
CBM	8	0	4	3	12
NUSTAR	26	1	10	3	37
LEB Infrastructure	1	0	1	1	2
HISPEC/DESPEC	10	0	4	0	14
MATS/LASPEC	1	0	0	0	1
R3B	9	1	2	1	12
ILIMA	3	0	0	0	3
Super-FRS Exp	2	0	3	1	5
PANDA	14	2	4	1	20
Total TDRs	67	4	26	12	97

Council has now taken note of the inclusion of the Super-FRS, now handled as any other MSV experiment

Resources Review Boards (RRBs), 10th meeting



- Held on the 9th and 10th of February 2021 via video
 - 16 funding agencies from 13 countries (> 70 participants)
 - Impressed by progress of FAIR
 - ECE and ECSG work commended
 - CBM Construction MoU already signed by many parties
 - NUSTAR consolidating list for common infrastructure items
 - PANDA infrastructure report under review by ECE/ECSG
- EDMS link

Participants 10th RRBs

Czech Republic



Finland



France



Germany



Hungary



India



Italy



Poland



Romania



Russia



Spain



Sweden



United Kingdom



<https://edms.cern.ch/project/FAIR-000002479>

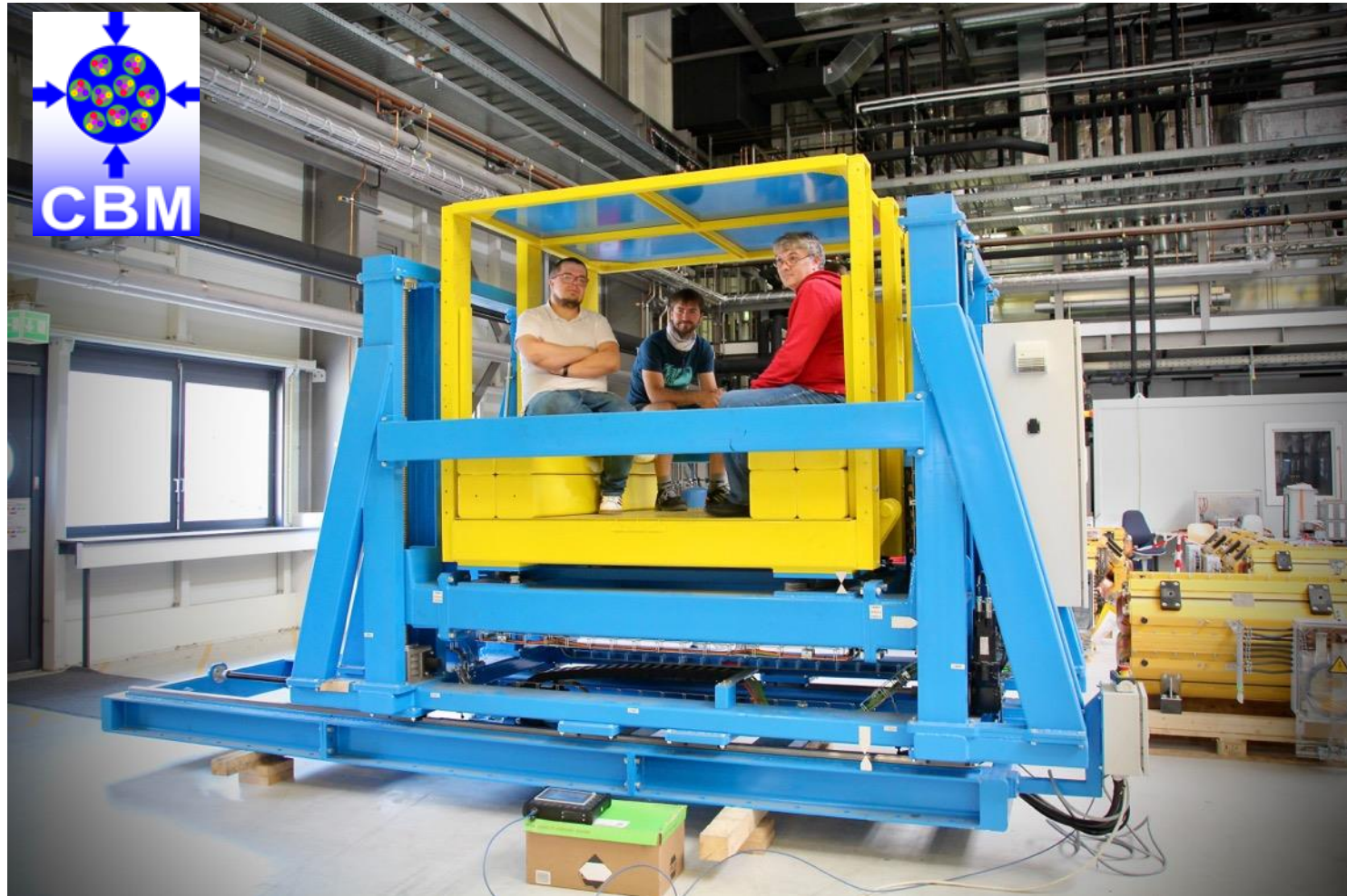
Construction Highlights: APPA

- PRIOR-II magnets for APPA HED@FAIR delivered to GSI and successfully passed the Site-Acceptance-Test (SAT)



Construction Highlights: CBM

- Support carriage for the CBM Projectile Spectator Detector PSD (25t), Czech contribution, manufactured and delivered (SAT) to Darmstadt



Construction Highlights: NUSTAR

- Pre-series electrical cooler of NUSTAR DEGAS delivered and successfully tested
- Basic Phase-0 setup of the NUSTAR R³B CALIFA array successful commissioned

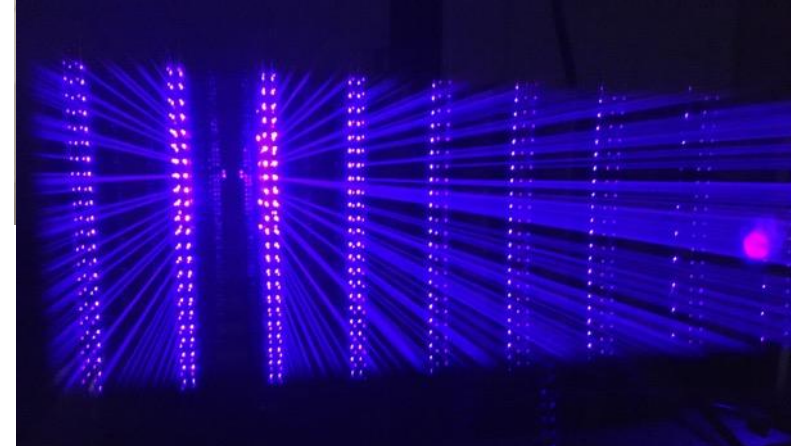


Construction Highlights: PANDA



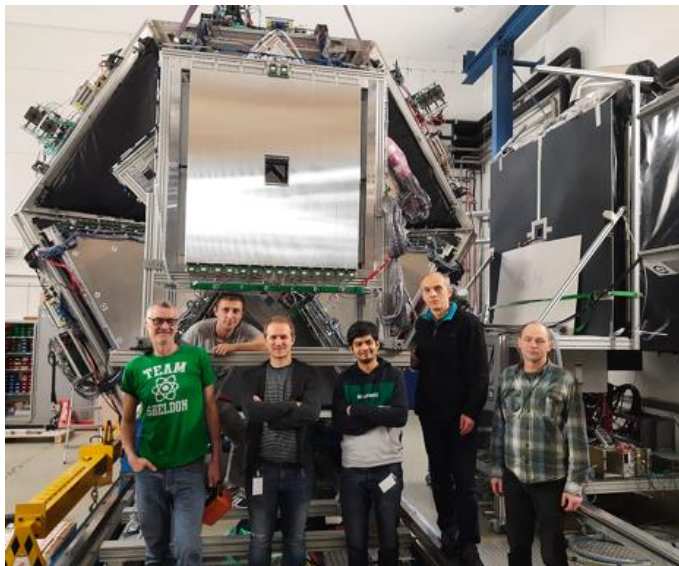
PANDA Barrel DIRC

70 (out of 98) fused silica bars delivered and being quality tested at GSI


















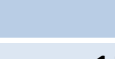
PANDA-HADES cooperation

Straw-Tube Tracker installed in HADES for FAIR Phase-0



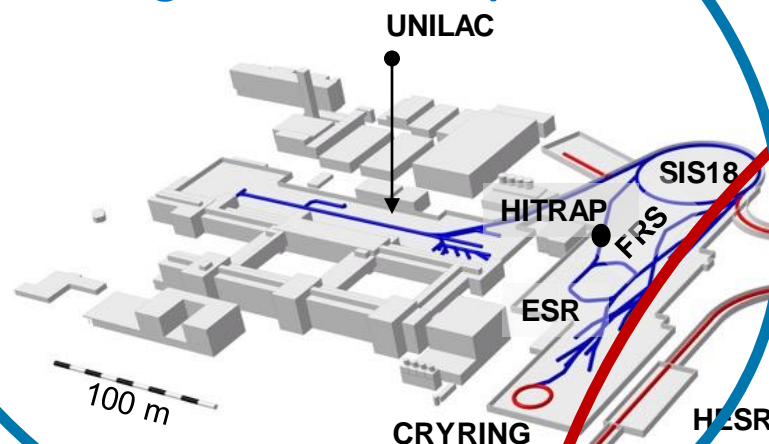
Status Overview of Experiments

Progress despite Covid-19 crisis

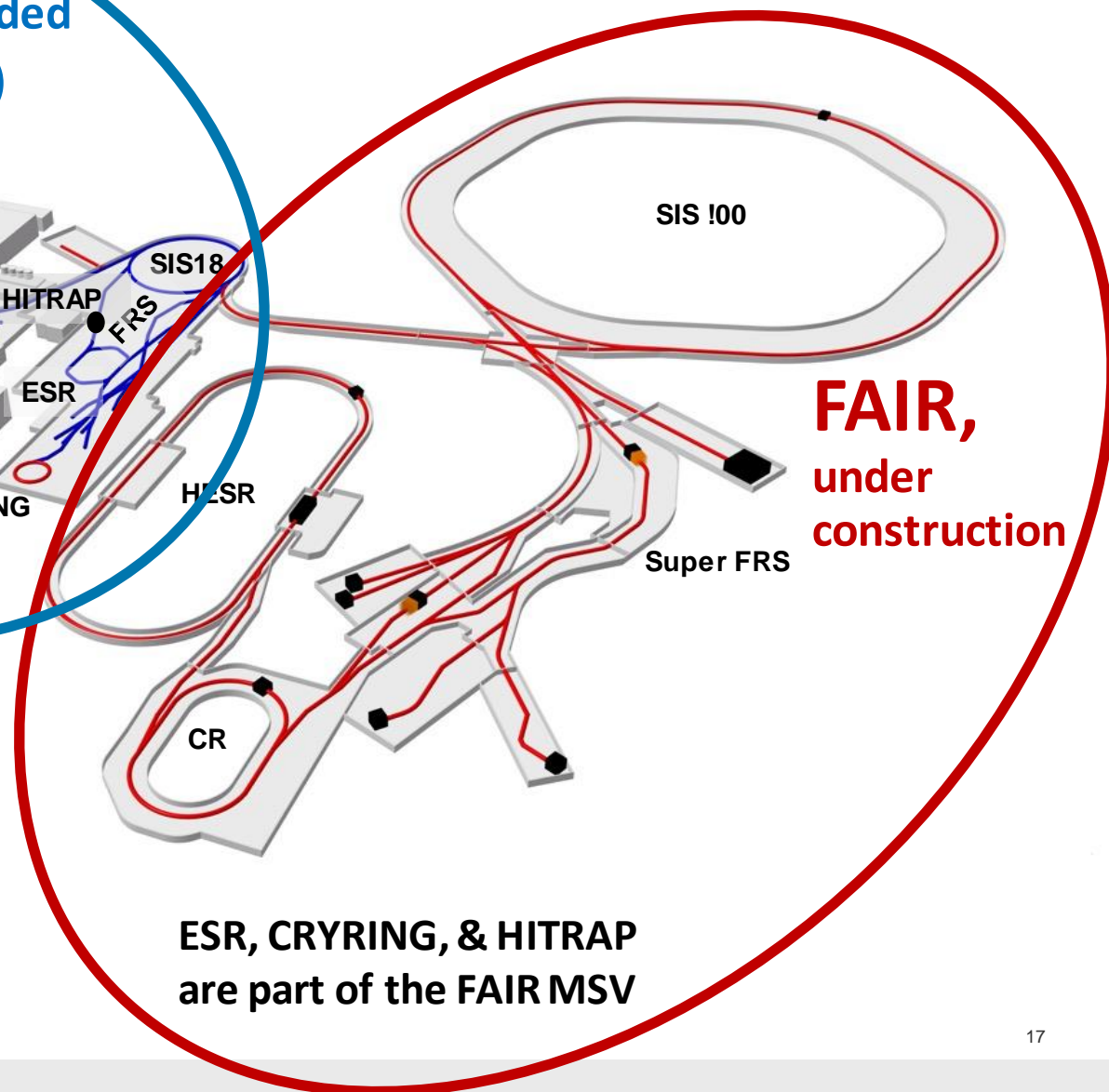
	Pillar	TDR	Cost [k€ 2005]	Funding	Construction	Construction completed	Test/ Commissioning
Day-1	APPA		18,421			07/2026	
	CBM		39,897			04/2025	
	NUSTAR		33,004			08/2024	
	PANDA		52,525			08/2024	
Status Sept 2020		89.0% <i>value weighted</i>	143,847	87.0% <i>secured</i>	38.0% <i>value weighted</i>		15.1% <i>value weighted</i>
Changes since report 2020-I		+1.0%		+0.1%	+2.2%		+0.4%

- Completion of the design—reflected in approved TDRs— is up by 1% over 6 months, up by 2.3% over 1 year
- Construction of experimental components, is up by 2.2% over 6 months, up by 5% over 1 year

GSI, existing (upgraded to integrate with FAIR)



**FAIR,
under
construction**

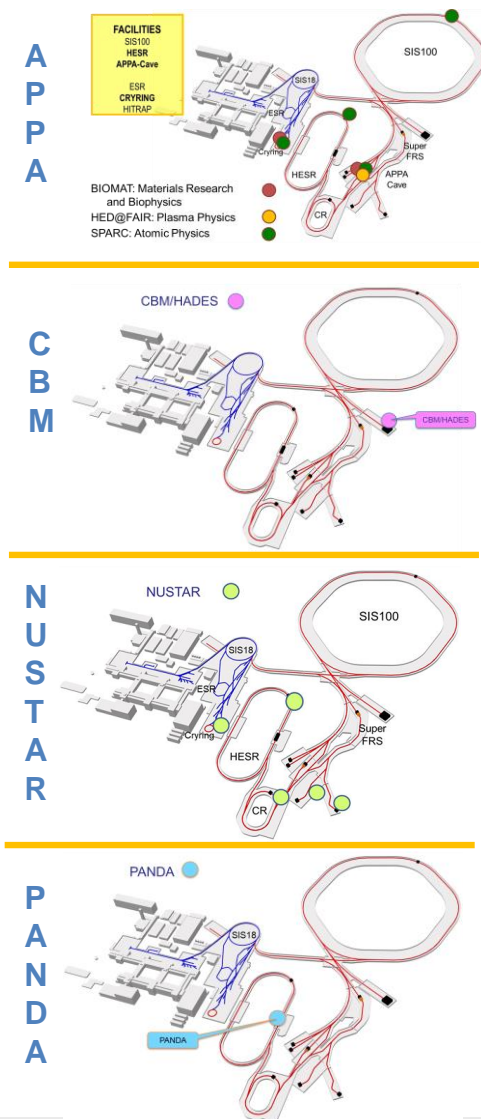


FAIR “Gain factors” rel. to GSI

- 100 – 10.000 x intensity
- 10 x energy
- antiproton beams
- Advanced instrumentation

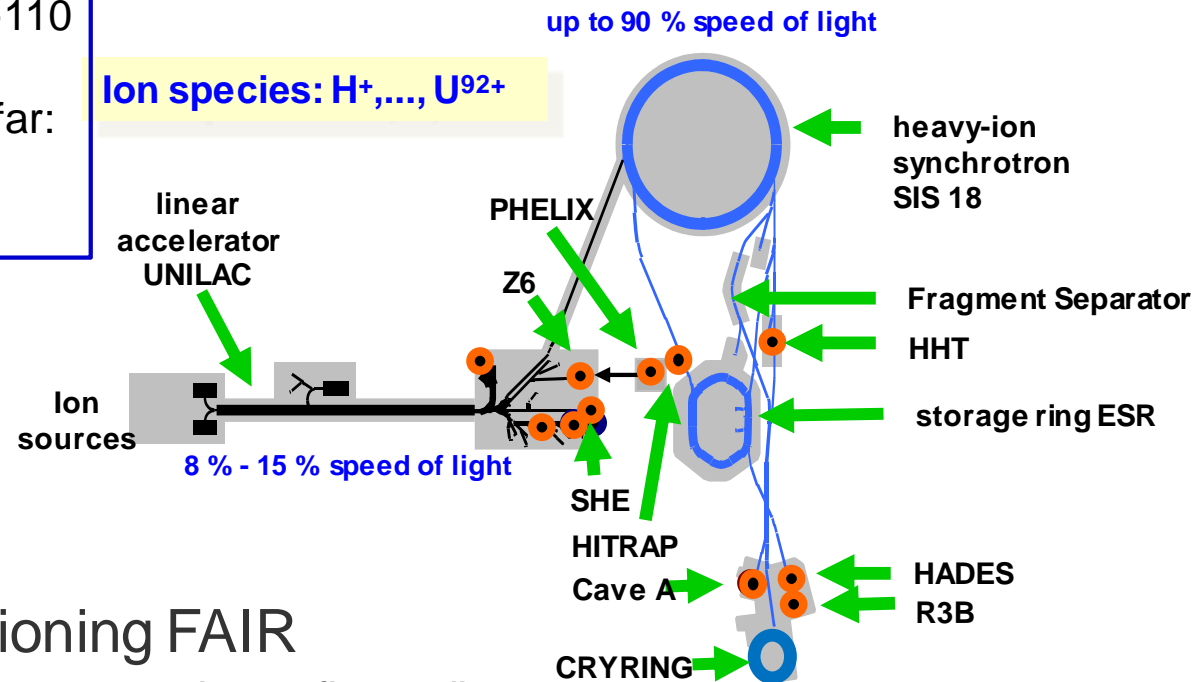
Schedule for FAIR Science

- Working towards start of FAIR
- At the same time *staged approach to FAIR science and progressive commissioning of accelerators and detectors:*
 - FAIR phase 0 : started in 2018/2019, to continue with annual runs till start of FAIR
 - Installation of experiments in the new experimental halls, starting with infrastructure items, DURING the installation of technical infrastructure, 1 or 2 years before final delivery of the completed buildings
 - FAIR day 1 configurations/ phase 1 experiments with FAIR accelerators progressively approaching design parameters (see next slide)
 - Full FAIR operation



Early science program FAIR Phase-0

- Started in 2018, annual runs of ~110 days until FAIR operation
- Supported by FAIR partners, so far: Finland, France, Germany, Romania, Sweden and the UK



- Science while commissioning FAIR
 - strong response by scientific community to first call
 - first results from 2019 run show scientific potential of future FAIR facility
 - since 2020, FRS, ESR and CRYRING@ESR are fully operational
 - 1/3 of the 2020 experiments could not be performed, mostly because of Covid-19, and will run in 2021/22
- 2nd 'Call' in 2020 for beamtime in 2021/2022
 - Demand in both calls largely exceeding the available beamtime, confirming the attractiveness of the experimental opportunities

Total of 173 proposals / 4.253 shifts:

G-PAC: 95 proposals / 3.215 shifts

Mat-PAC: 31 proposals / 425 shifts

Bio-PAC: 27 proposals / 133 shifts

PPAC: 20 proposals / 430 shifts

ERC-related: 3 proposals / 50 shifts

Beamtime-Planning for UNILAC

(for 2021-2022; distributed in 2020)



Plan: Allocation of about **420 shifts** for UNILAC experiments

'Distribution' up to:

- Heavy Elements / Nucl. Struct. (NUSTAR):
265 shifts (request 497 shifts – thereof 3 shifts re-submission) } **G-PAC (63%)**
- Materials Research*: **143 shifts** (request 288 sh.) **Mat-PAC (34%)**
- Biophysics*: **8,4 main shifts** (request 13,3 shifts) **Bio-PAC (2,0%)**
- Plasma Physics*: **4,2 main shifts** (request 9 shifts**) **PPAC (1,0%)**

* 10 parasitic shifts count as 1 main shift; values here given in main shifts.

** PPAC15 Meeting scheduled for October 5-6, 2020 (UNILAC and PHELIX proposals).

(for 2021-2022; distributed in 2020)

Plan: Allocation of about **470 shifts** for SIS18/FRS experiments

'Distribution' up to:

- HADES / CBM / NUSTAR:
341 shifts (request 1.723 shifts – thereof 112 shifts re-submission) } **G-PAC (78,2%)**
New addition: 80 more SIS18 shifts for G-PAC, to a total of 421 shifts
- Materials Research*: **31 shifts** (request: 77 sh.) **Mat-PAC (7,1%)**
- Biophysics*: **42 shifts** (request: 120 sh.) **Bio-PAC (9,6%)**
- Plasmaphysics**: **22 shifts** (request: 22,5 shifts**) **PPAC (5,1%)**
- ERC-related requests: 34 shifts

* 10 parasitic shifts count as 1 main shift; values here given in main shifts.

** In this year, PP proposals for SIS beam have been submitted via G-PAC44.

Plan: Allocation of **410 shifts** for ESR, CRYRING and HITRAP experiments

'Distribution' up to:

- Atomic Physics / Nucl. Astrophysics (APPA/NUSTAR):
369 shifts (request: 995 shifts – thereof 153 shifts re-submission) } **G-PAC (94%)**
- Mat. Research: **25 shifts** (request: 361 sh. CRYR.) **Mat-PAC (6%)**
- ERC-related requests: **16 shifts** (request: 16 shifts)

Requests to G-PAC 44 by machine

Machine	Shifts requested to G-PAC Total= main+(sec+para)/10	Shifts available to G-PAC	Overbooking factor	overbooking of G- PAC44 if rank A re- subs are re-granted first
UNILAC	497.3 (3)	265	1.9	1.9
SIS18 / FRS	1723 (111)	421	4.1	5.25
ESR / CRYRING / HITRAP	976 (153)	369	2.65	3.8
Σ	3215.3 (266)	1055	3	3.7

Numbers in parentheses are shifts granted by G-PAC43 to the unchanged **rank A** re-submissions.
 Secondary and parasitic shifts count 1/10 of main shifts
 Numbers without ERC-grant-related proposals

Quota and recommendations by machine



Machine	Quota	Recommendations	
		A	A-
UNILAC	265	268	57
SIS18 / FRS	421	511	151
ESR / CRY / HITRAP	369	321	80
CRYRING ALONE		117	30
Σ	1055	1217	318

Overall rankings:

A	42
A-	13
B	29
C	10

all resubmitted proposals ranked A by G-PAC43 have again been ranked A

Numbers without ERC-grant-related proposals

Requests and recommendations by collaboration

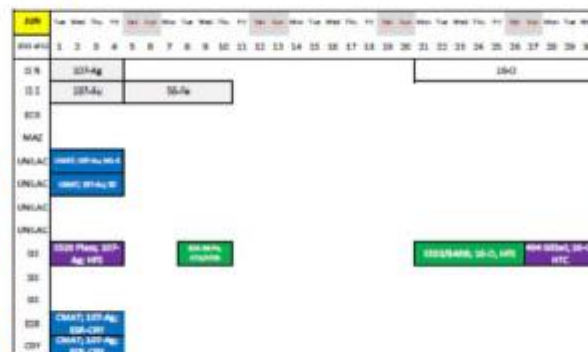
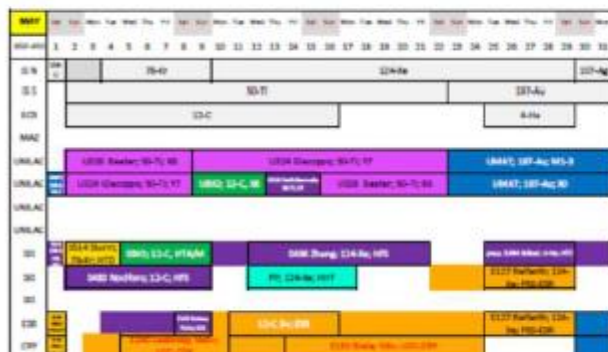
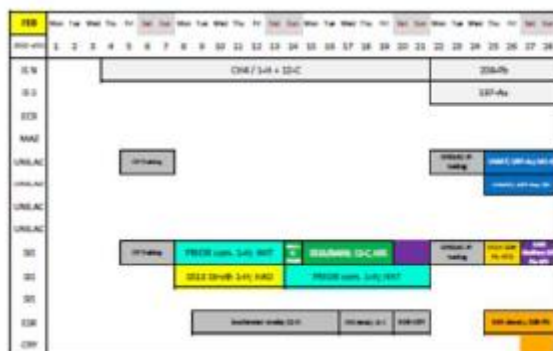


Collaboration	Shifts requested	Recommendations	
		A	A-
	total <small>main+(sec+para)/10</small>		
APPA / SPARC	927 (153)	420	136
HADES / CBM	574.7 (0)	119	49
NUSTAR: R3B	300.8 (23)	164	28
NUSTAR: S-FRS	394 (29)	104	26
NUSTAR: DESPEC	503.2 (59)	145	22
NUSTAR: SHE	447.6 (0)	247	57
NUSTAR: ILIMA	68 (0)	18	0
Σ	3215.3(266)	1217	318

Numbers in parentheses are shifts granted by G-PAC43 to the unchanged **rank A** re-submissions.
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now...

Beam time schedule 2021 v012



Source: GSI, GSI-FAIR
2021-01-12

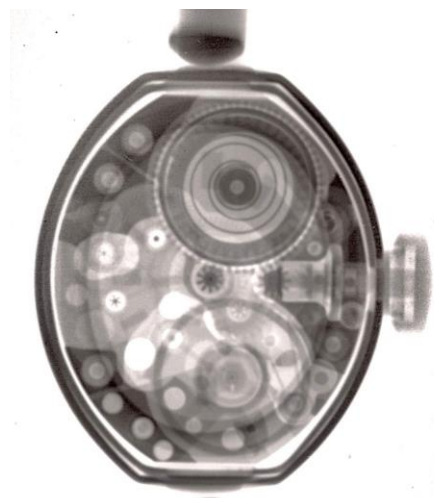
- Successful start of the physics beamtime block 2021
 - Parallel high intensity operation of carbon/proton beams (CH4 source)
 - carbon with 1.2×10^{10} ions/spill and protons with 8×10^{10} ions/spill
- Experimental program
 - ✓ PRIOR commissioning and first experiments
 - ✓ S518 Hades detector tests
 - ✓ SBIO Biophysics program with proton beam
 - ✓ S533/ERC-BARB Radioactive carbon beams for Therapy (first direct PET imaging)
- Further commissioning of ESR and ESR-CRY transport
 - ✓ ESR Isochronous mode finally tested
 - ✓ ESR-CRY transport efficiency optimized
- ✓ A NUSTAR Beam Team at the FRS has been established, with members from different GSI Departments and the Collaborations

PRIOR

Proton Microscope for FAIR



PRIOR-I Jul 2014



PRIOR-II Feb 2021

Dmitry Varentsov
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The Campus develops

FAIR control center

- hosting main control room
- 200 working places
- operational 2024



Parking garage

- providing space for 800 cars
- completed in Q1 2021



The Welcome office continues to develop to offer essential Host Lab functions. Reference for guests, especially during pandemic

- The shareholders support the project, aiming at the completion of the MSV
 - Funding decisions for civil works of the buildings CR, HESR, pLinac are expected by the end of 2021
- Substantial progress has been made in all areas, despite the impacts of the COVID-19 pandemic
- In particular, the preparations for the experiments progress well
- The FAIR Phase-0 offers an attractive program until FAIR start.
- The agreement on a Construction MoU for CBM and the establishment of a Common Fund is a major step to ensure viable experimental setups at Day-1. The other collaborations now proceed with the preparations of Construction Memoranda of Understanding

- The progress of the construction is very promising, especially for NUSTAR
- The construction of the experiments advances well but is still too slow.
- There is a very rich Phase-0 program ongoing, which will continue until the start of FAIR
- We count on NUSTAR to produce exciting Physics!



Thank you!

Photo: C. Betz