



TA2 – Transnational Access to MAMI

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 824093



Mainz Electron Accelerator Complex

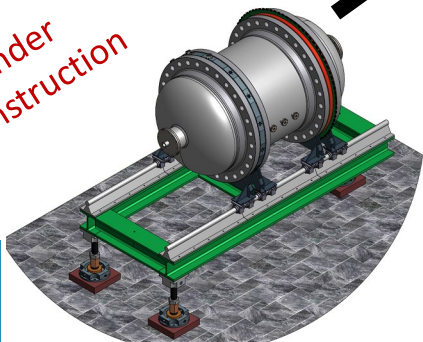
Electron Accelerator $E_{\text{max}} = 1.6 \text{ GeV}$
Operated at JGU Mainz

Hallmarks

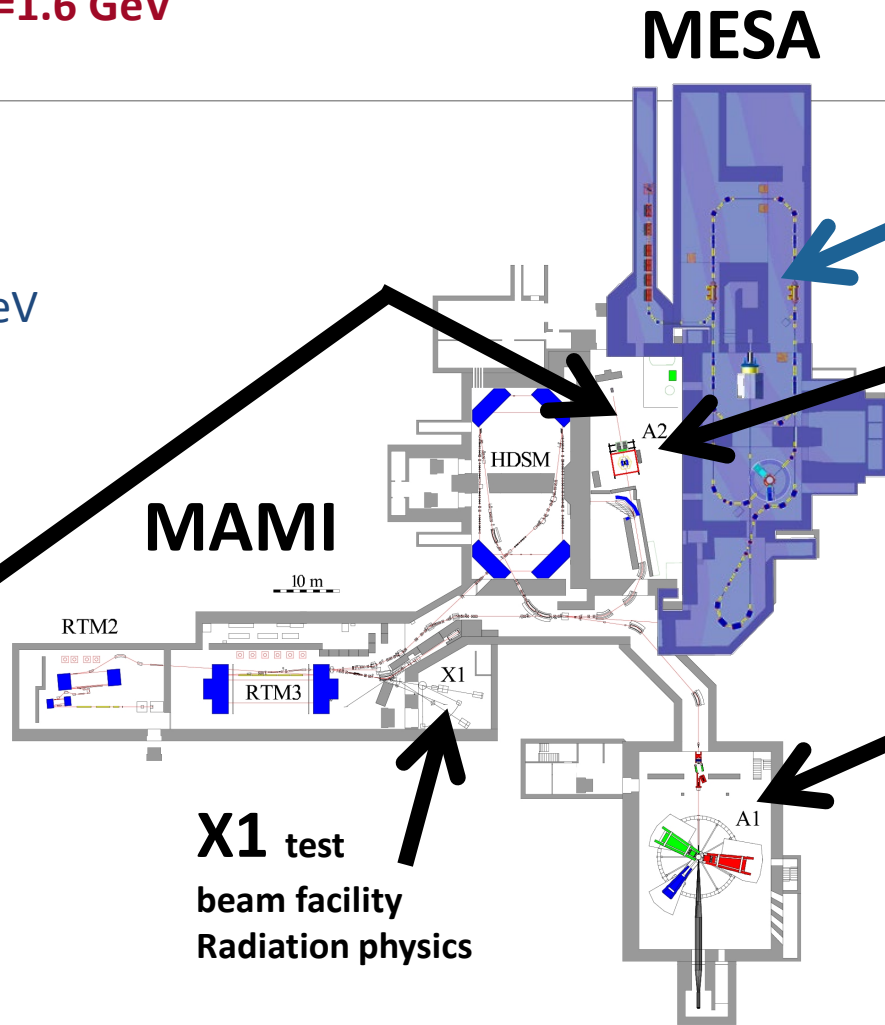
- Intensity max. 100 pA
- Resolution $\Delta E < 0.100 \text{ MeV}$
- Polarization 85%
- Reliability: 7000 h / year

PRES Electron scattering

under construction



High pressure active TPC detector

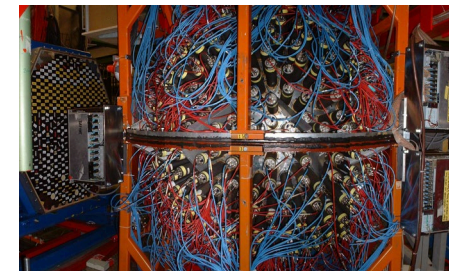


X1 test beam facility
Radiation physics

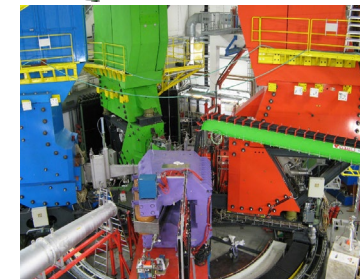
MESA



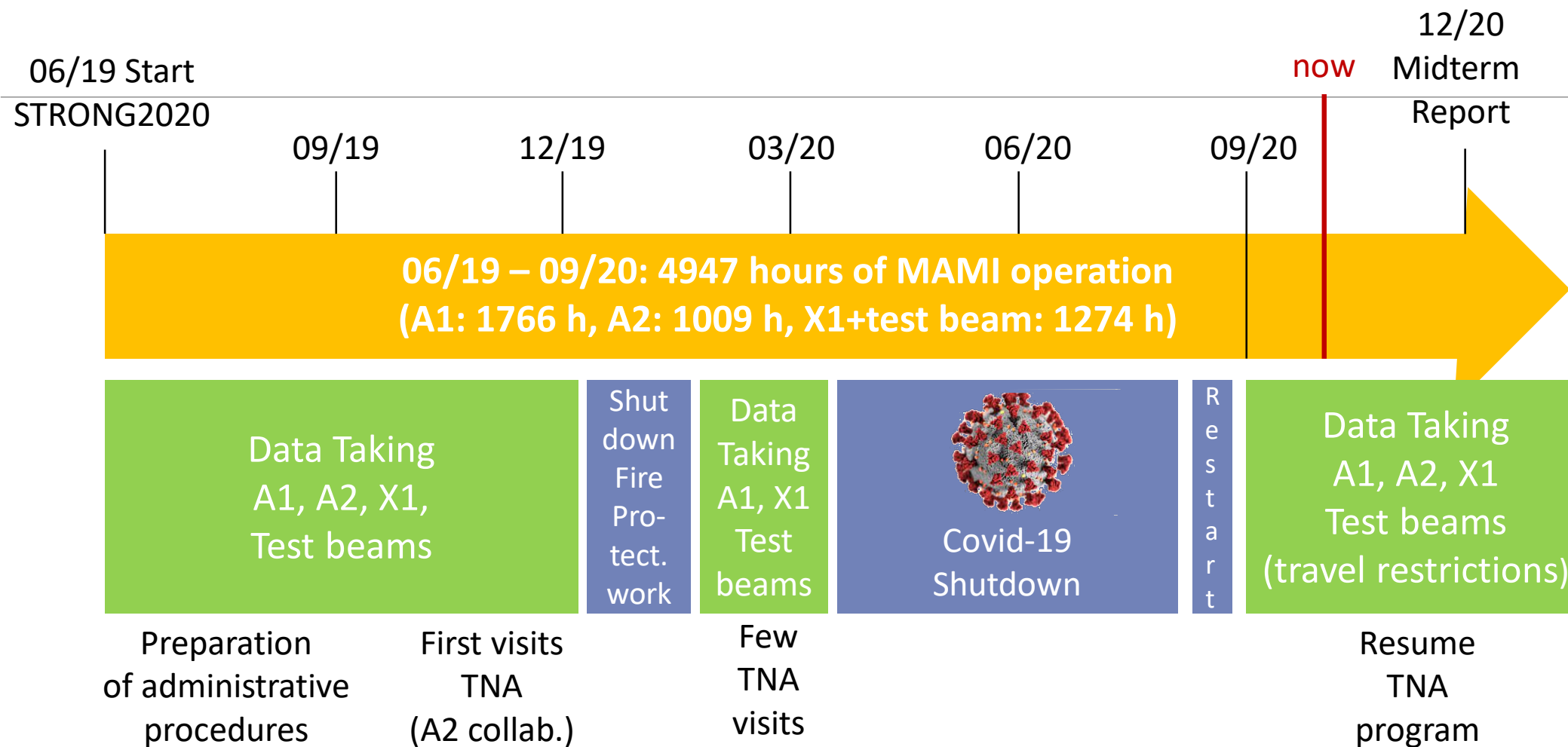
Photon scattering

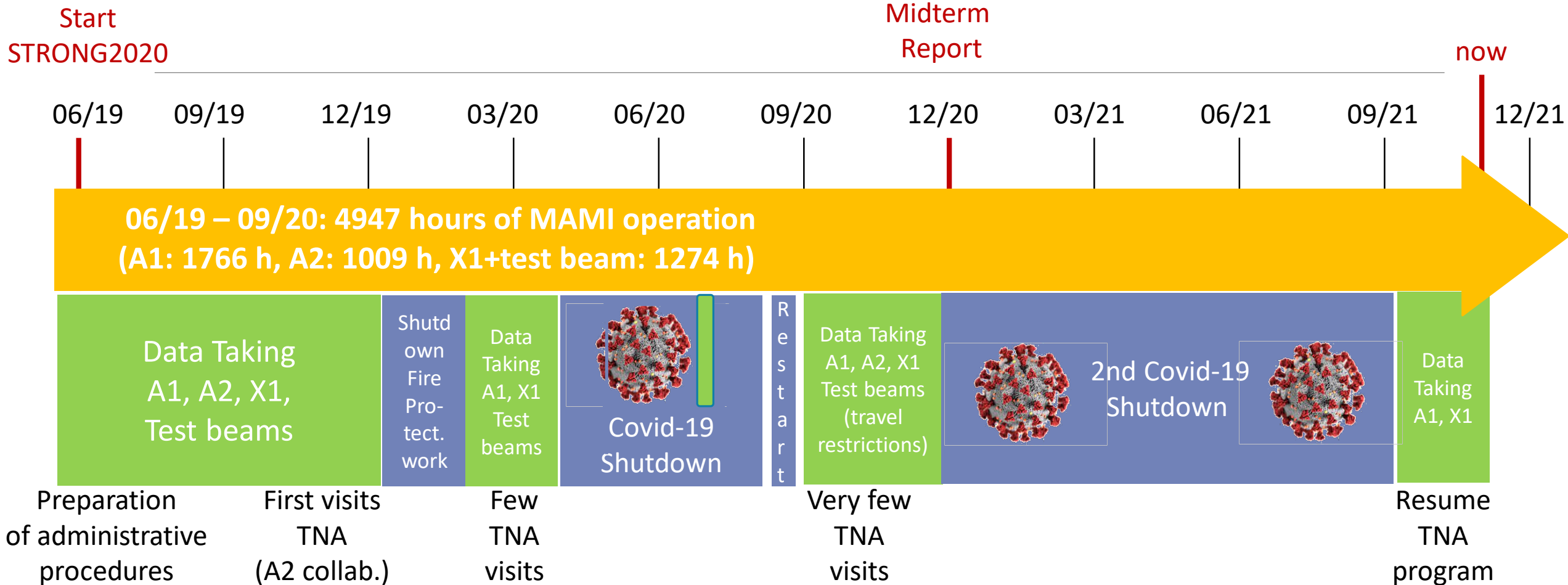


Electron scattering



MAMI Data Taking since 06/2019



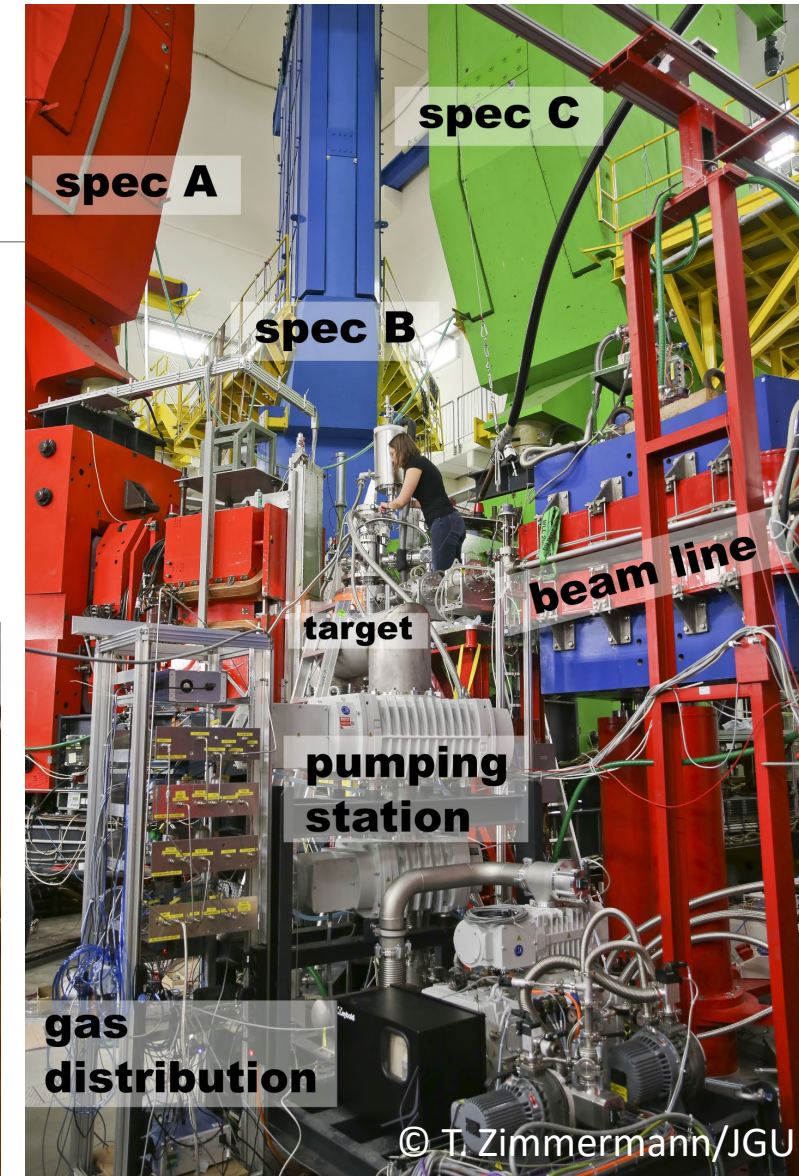
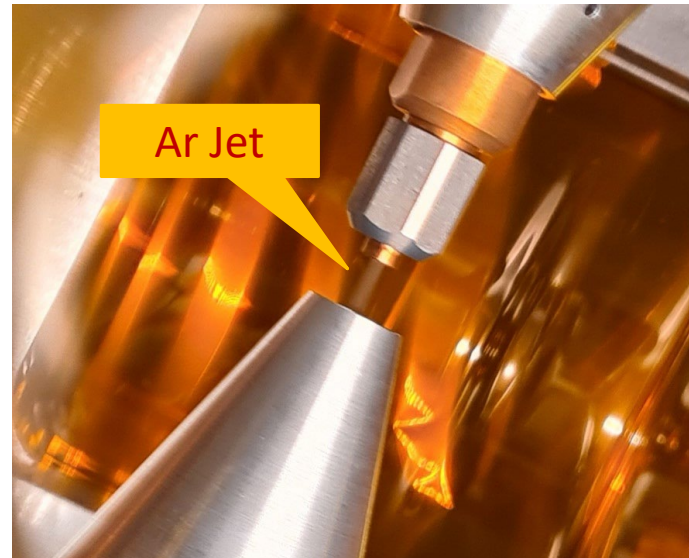
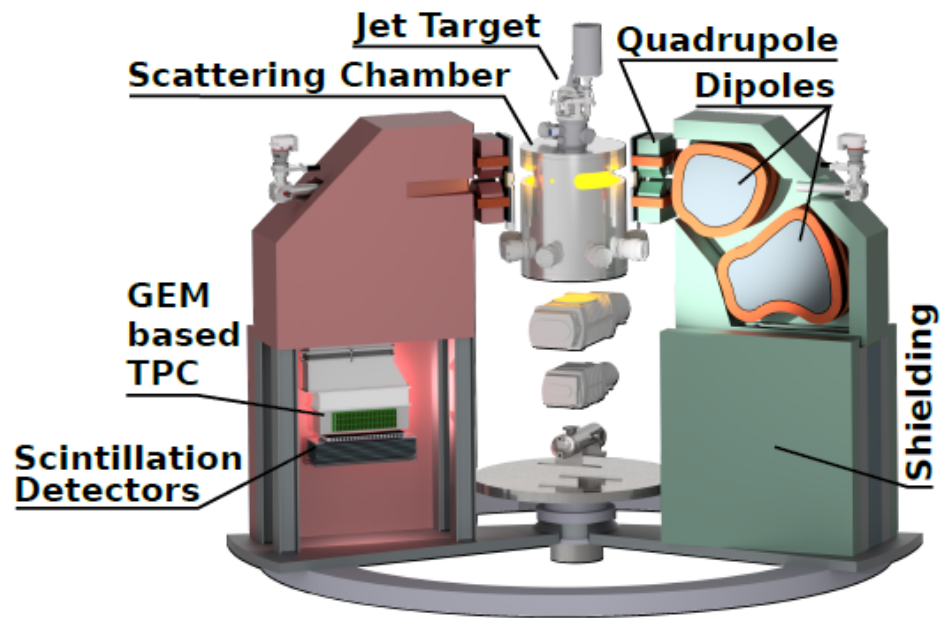


Deliverable No	Unit of Access	Unit cost (EUR)	Min. quantity of access	Number of users	Number of days	Number of projects
D-Tax.1	Beam hours	112,32	650	40	540	5
10/2020			178	5	52	6
D-Tax.2	Beam hours	112,32	650	42	560	6
11/2021			12	0	0	2
D-Tax.3	Beam hours	112,32	1750	110	1538	16

- In case that travel restrictions will come to an end, we will try to catch up with estimated number of visits

Gas Jet Target

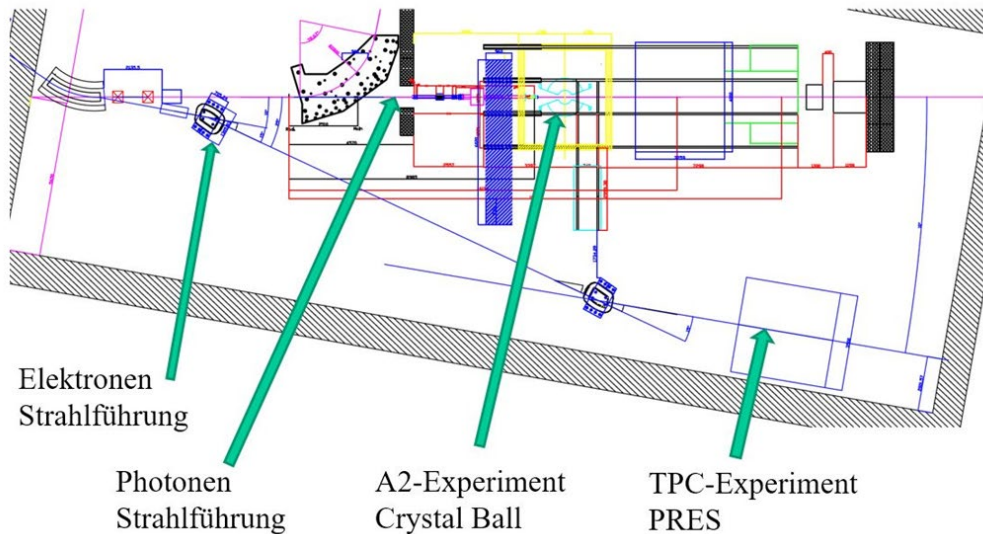
- Cryogenic supersonic gas jet target for MAGIX@MESA
- hydrogen, deuterium, helium,..., xenon
- During October 2022 first physics run with argon at A1 (QE x-sections)



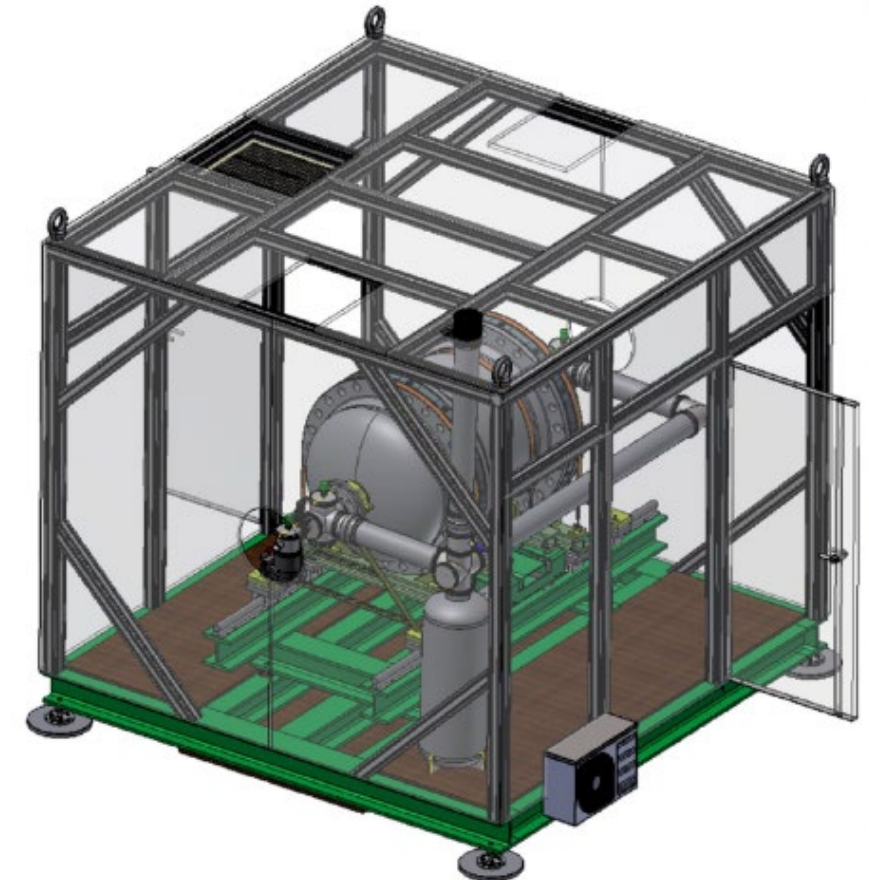
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PRES

- Electron scattering on proton
- The new electron beamline in the A2 taggerhall is under construction
- Final test of the TPC in the first half of 2022 in St. Petersburg
- transport to Mainz in the 2nd half of 2022



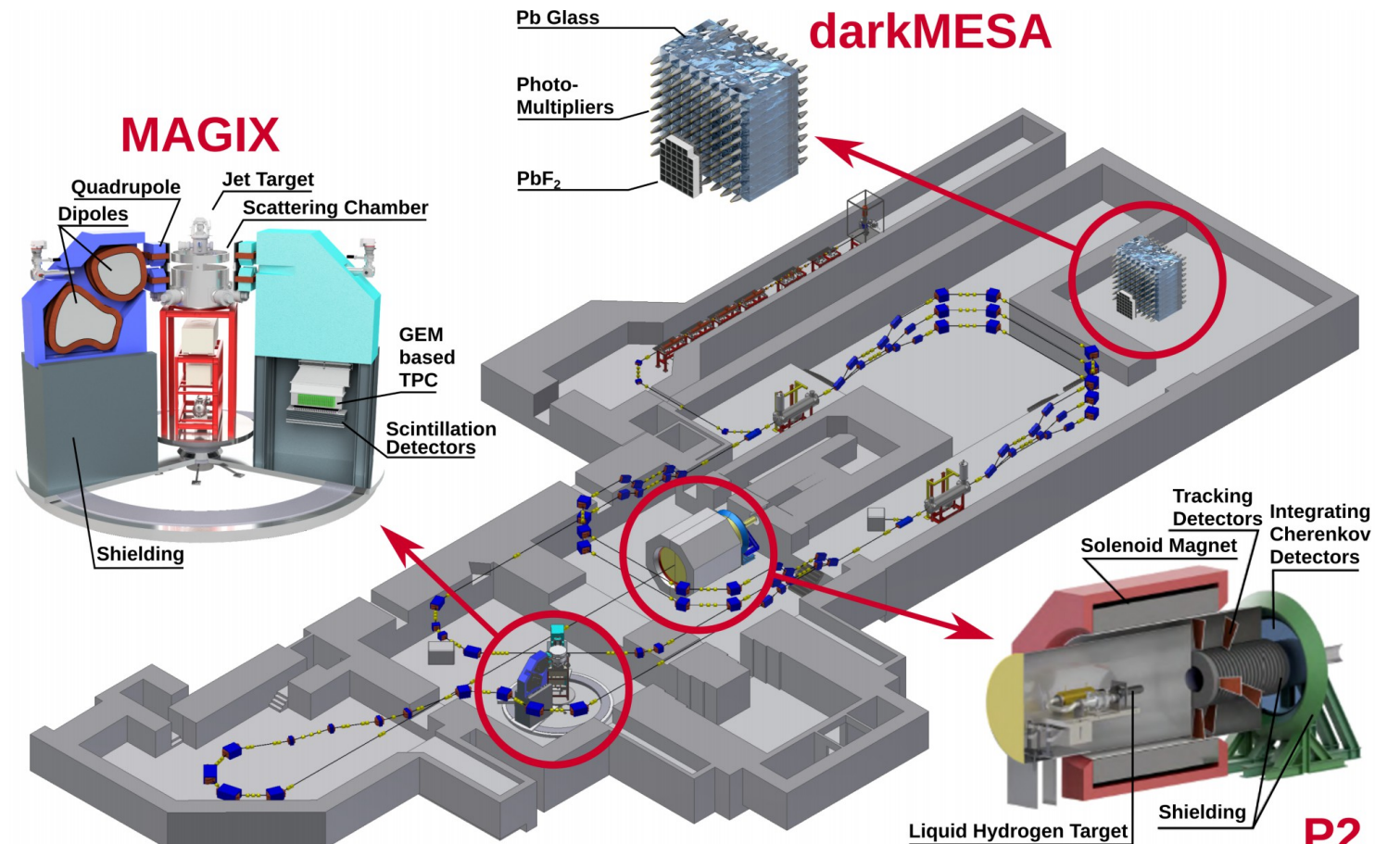
PRES



The future MESA accelerator

Key parameters electron accelerator MESA (Mainz Energy-Recovering Superconducting Accelerator)

- Max. beam energy 155 MeV
- Energy-Recovering Accelerator
- Beam current >1 mA



Status of MESA

- Cryomodules fully tested — perform according to specifications
- Main accelerator installation to start in Nov 2022 — delay in civil construction
- Cryogenic plant specified and tendered: cryomodules and superconducting solenoid (P2 experiment)
- Orders placed for off-the-shelf components (magnets, beamline)
- Start of experiments postponed to Nov 2024 due to delay in civil construction

Research Buildings



MESA Experimental Hall

Completion expected Nov 2022



Office and Laboratory Building

Completion expected Nov 2023

selected Publications in Nov. 2020- Oct.2021

Operation and characterization of a windowless gas jet target in high-intensity electron beams

A1 Collaboration, NIM 1013, 165668 (2021)

Measurements of the induced polarization in the quasi-elastic $A(e,e'p)$ process in non-coplanar kinematics

A1 Collaboration, S.J. Paul et al, Phys, Lett. B 811, 135984 (2020)

Beam-normal single spin asymmetry in elastic electron scattering off ^{28}Si and ^{90}Zr

A1 Collaboration, Phys. Lett. B 808, 135667 (2020)

Measurement of Compton scattering at MAMI for the extraction of the electric and magnetic polarizabilities of the proton

A2 Collaboration, E. Mornacchi *et al.* (Oct 29, 2021), e-Print: 2110.15691 [nucl-ex]

Single π^0 production off neutrons bound in deuteron with linearly polarized photons

A2 at MAMI Collaboration, C. Mullen(Glasgow U.) et al., Eur. Phys.J.A 57 (2021) 6, 205

Conclusion

- Excellent running conditions of MAMI up to of Covid-19 pandemics
- Many visits of EU researchers to beam times of A1, A2, and X1, beam tests
- Between October 2020 and beginning of 2021 several scheduled visits but...
- Lockdown of Institute (up to September 2021) drastically limited progress of TNA
- We hope for usual running conditions from October 2021
- Mid-term future: new proton radius experiment. prepared for MAMI (PRES collaboration)
- Long-term future: MESA accelerator will allow to explore the intensity frontier of the SM

