

DIS2024

The NuPECC Long Range Plan 2024

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31st International Workshop on Deep Inelastic Scattering (DIS2024)
8-12 April 2024, Grenoble, France

The Nuclear Physics European Collaboration Committee
is an Expert Committee of the European Science Foundation

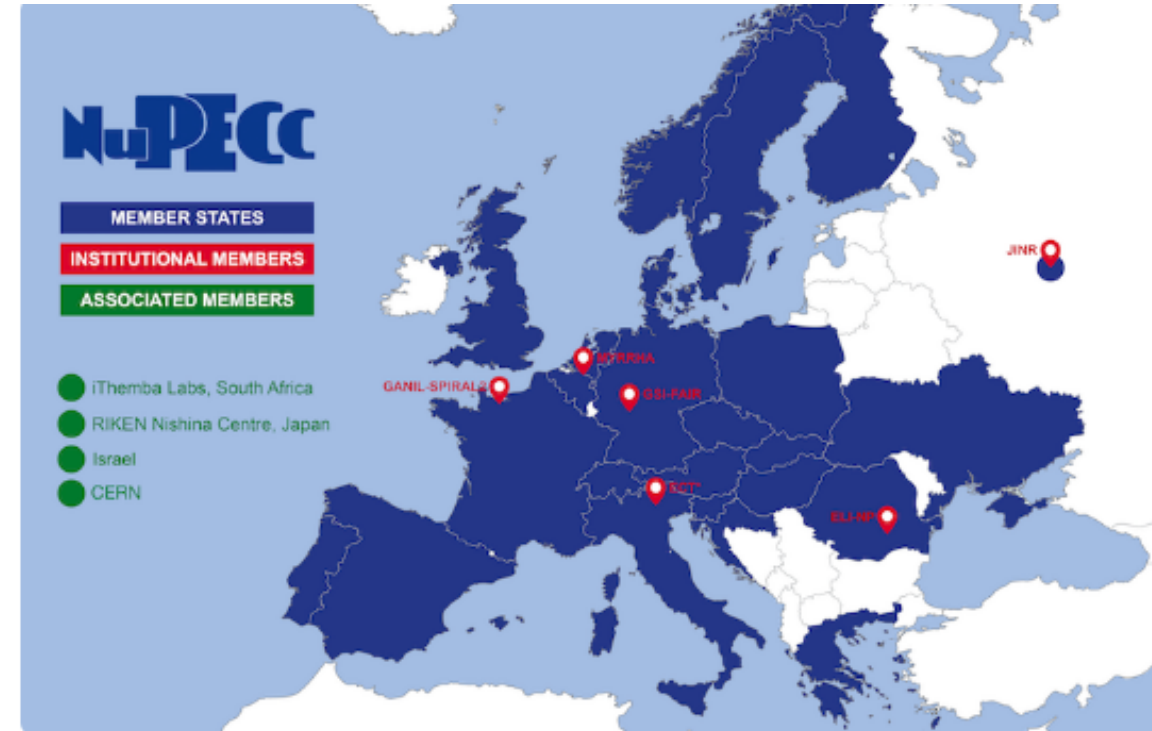
The Nuclear Physics European Collaboration Committee is an Expert Committee of the European Science Foundation.

The objective of NuPECC is to:

- develop the strategy for European Collaboration in nuclear science by supporting collaborative ventures between research groups within Europe, and
- promote nuclear physics and its trans-disciplinary use in applications for societal benefit.

In pursuing this objective the Committee shall:

- **provide advice** and make strategic recommendations to funding agencies and decision-making bodies;
- **define a network** of complementary facilities within Europe and encourage optimisation of their usage;
- **provide a forum** for the discussion of the provision of future facilities and instrumentation;
- **contribute to public** education and awareness.

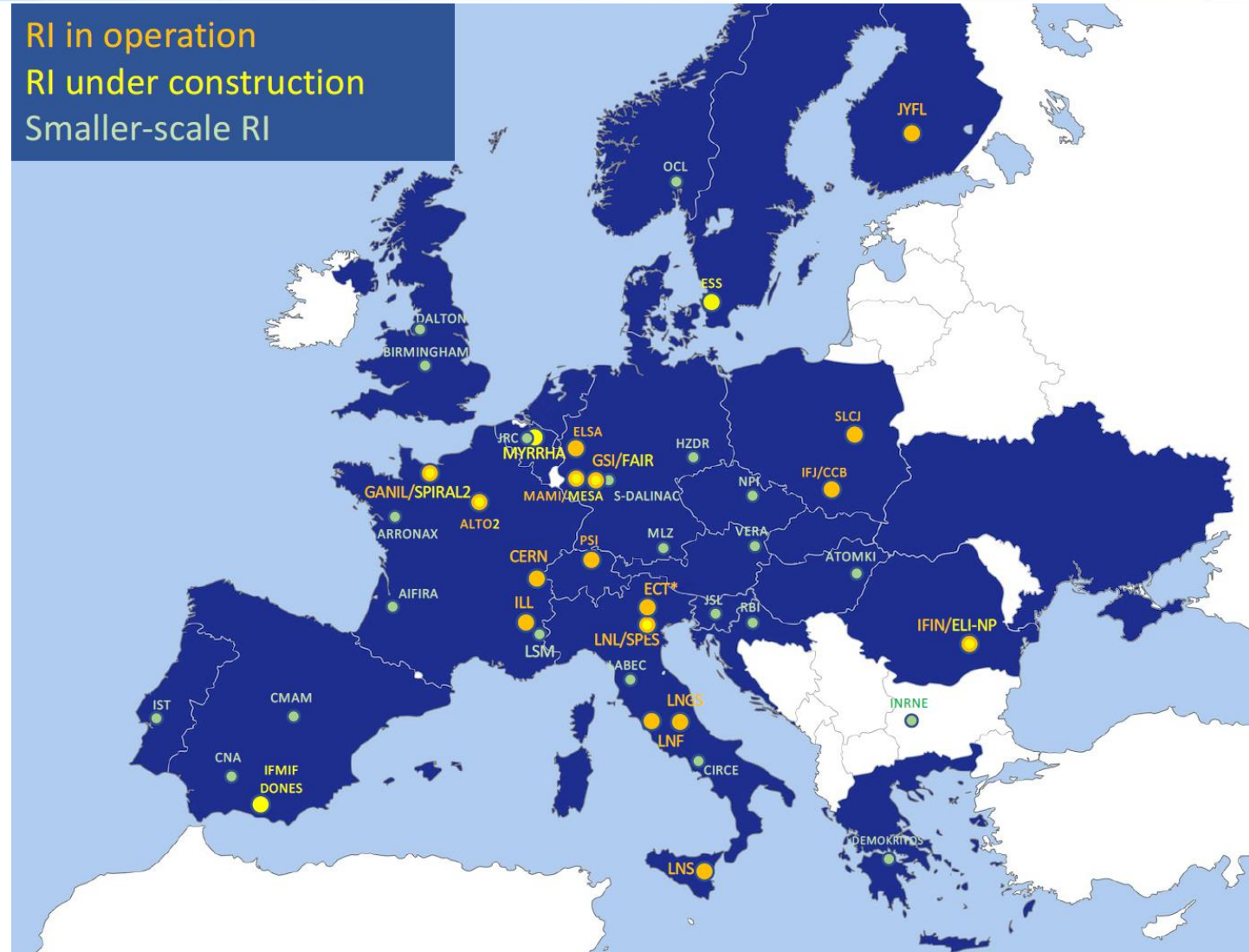


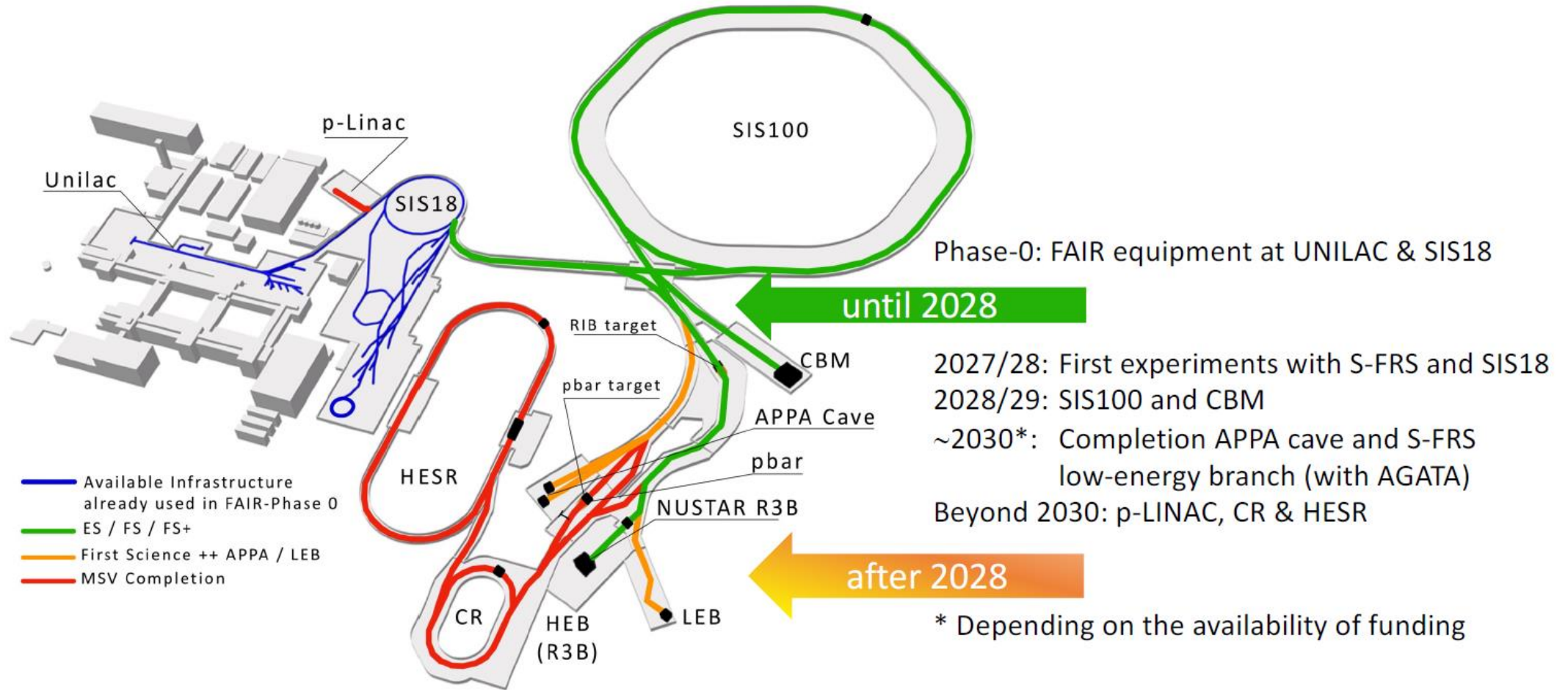
At its meeting in Madrid in May 2022, NuPECC took the decision to launch the process of creating a new Long Range Plan (LRP) for Nuclear Physics in Europe, identifying opportunities and priorities for nuclear science in Europe, with the aim of publishing the document in 2024.

- **May 30, 2022: Call for community input** (5 pages) for the NuPECC Long Range Plan 2024 – Deadline: Oct 1st, 2022
- January 2023: Formation of Thematic Working Groups (TWG) to analyze contribution received (153)
 1. **Hadron Physics**
 2. Strongly Interacting Matter under Extreme Conditions
 3. Nuclear Structure and Reaction Dynamics
 4. Nuclear Astrophysics
 5. Symmetries and Fundamental Interactions
 6. **Research Infrastructures**
 7. Applications and Societal Benefit
 8. Nuclear Physics Tools
 9. Open Science and Data
 10. Nuclear Science – People and Society
- April 3, 2024: [Draft document](#) released to the community (370 pages)
- **April 15-17, 2024: Town Meeting** (Bucharest, Romania) - <https://indico.ph.tum.de/event/7593/>
- **Final document: Fall 2024**

- ESFRI (European Strategy Forum for Research Infrastructures) facilities
 - FAIR, GANIL/SPIRAL2, ELI and CERN
- Large-scale facilities
 - Hadron and Heavy Ion facilities
 - Lepton and Photon facilities
 - Neutron facilities
- Small-scale facilities
- New facilities in Europe
- Facilities outside Europe

RI in operation
 RI under construction
 Smaller-scale RI





MAMI (University of Mainz)

Plans and priorities:

- Major hadron physics program with **polarized electron beams**
- Parity violating nuclear physics program
- Upgrade of instruments
- Test bench for MESA

Electron Accelerator $E_{\max} = 1.6 \text{ GeV}$ (CW)
 operated at JGU Mainz

Hallmarks

- Intensity max. $100 \mu\text{A}$
- Resolution $\sigma_E < 0.100 \text{ MeV}$
- Polarization 85%
- Reliability: up to 7000 h / year



X1
 Test beam facility;
 Radiation physics

MAMI

RTM3

X1

HDSM

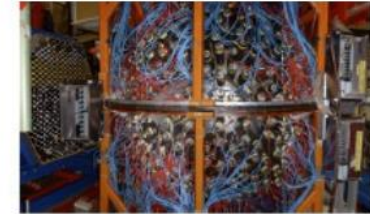
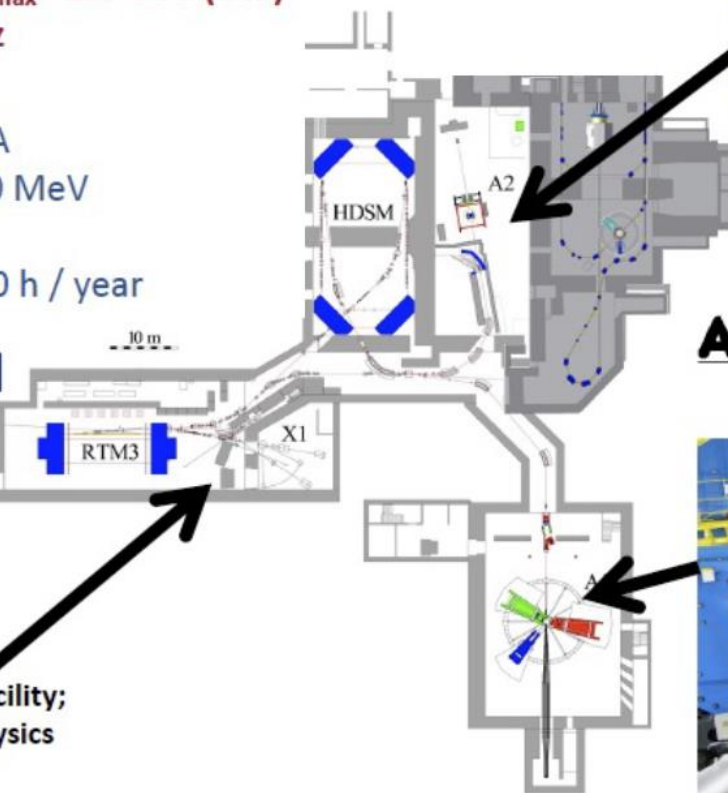
A2

A1

10 m

10 m

10 m



A2

Tagged Photon Scattering (A2 hall)
 Crystal Ball / TAPS calorimeters;
 Polarized frozen-spin target
 → currently at Univ. Bonn



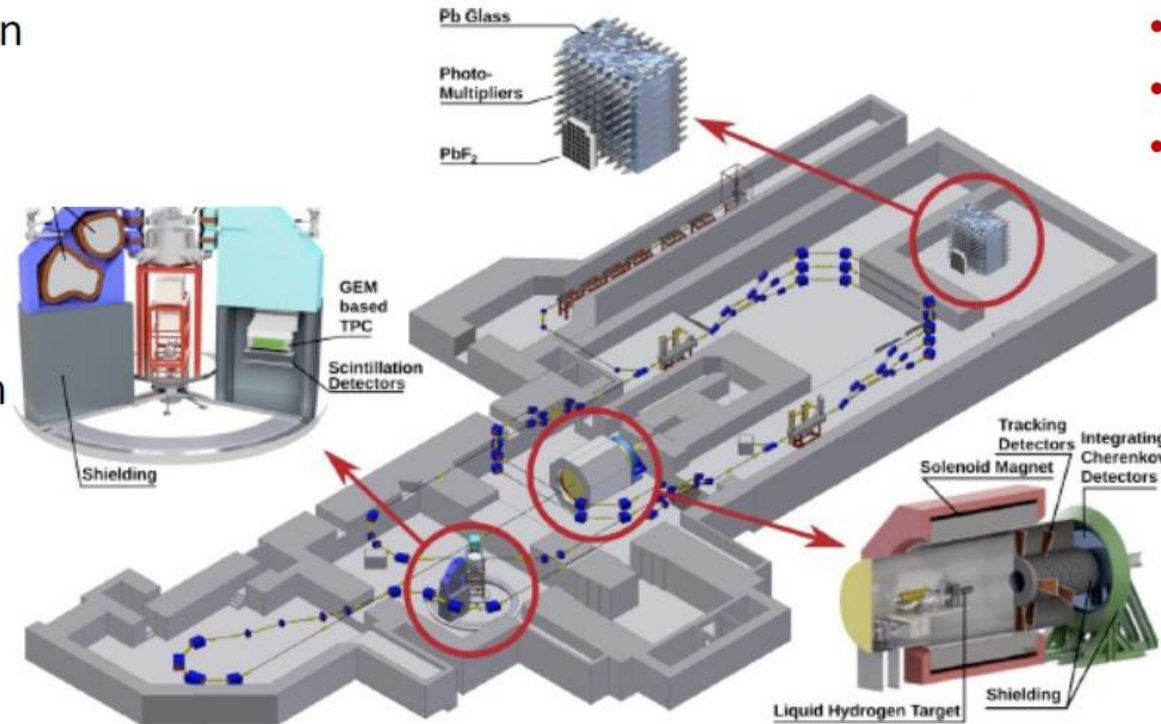
Electron scattering (A1 hall)
 High resolution
 Magnetic spectrometers



MESA: Mainz Energy-recovering Superconducting Accelerator

Plans and priorities:

- New accelerator installation
- First and only ERL operation for physics experiments
- Start of operation in 2025
- Major physics program in hadron- nuclear, particle-, and Astro-physics
- Upgrade to 10 mA electron current



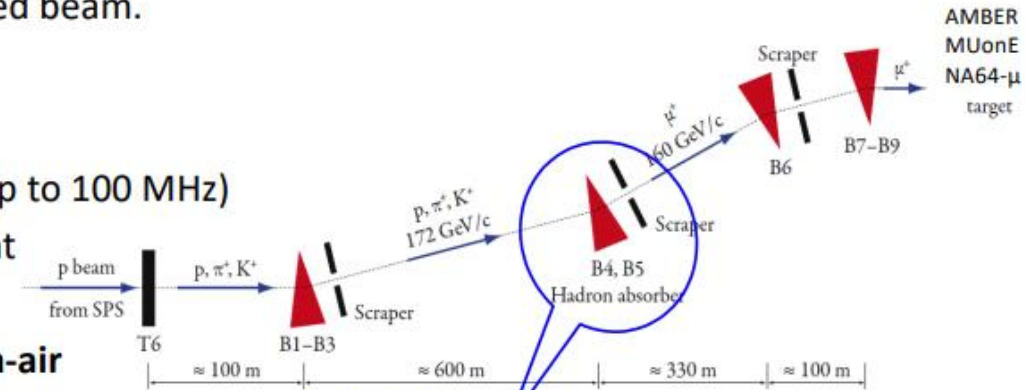
Planned experiments:

- **MAGIX** (ERL mode)
- **Dark MESA** (beam dump)
- **P2** (extracted beam mode)

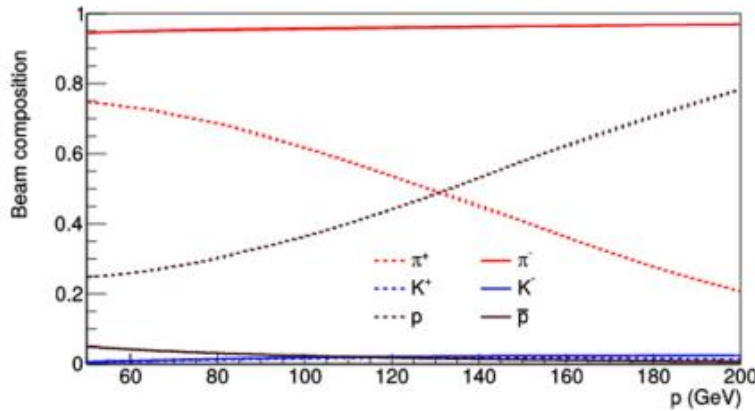


Located in the CERN North Area, it has **secondary (hadron)** and **tertiary (muon)** beams obtained from the protons@400 GeV SPS extracted beam.

- Unique **high-energy muon beam**
- Hadron beams in the range 50 – 280 GeV
- Both beam charges, and high intensity (100 kHz up to 100 MHz)
- Hadron beam composition momentum dependent
- Planned upgrades :
reduce beam divergence and beam scattering-on-air



Hadron beams by removing hadron absorber

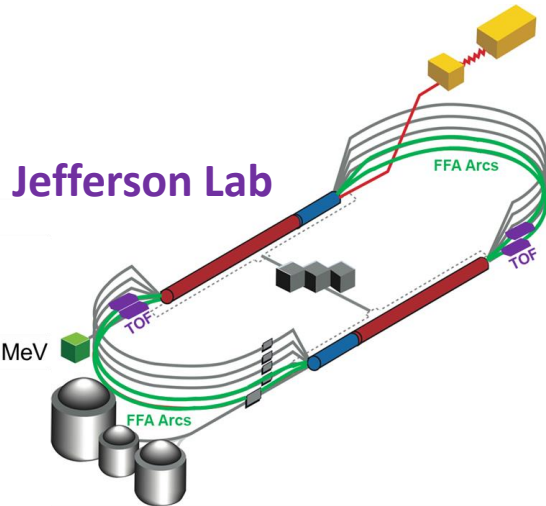


AMBER, MUonE and NA64-μ are operating at the M2 beamline:

- AMBER focusses on **hadron structure & spectroscopy**
- MUonE hadronic contribution to **muon anomalous magnetic moment**
- NA64-μ search for **Light Dark Matter** candidates

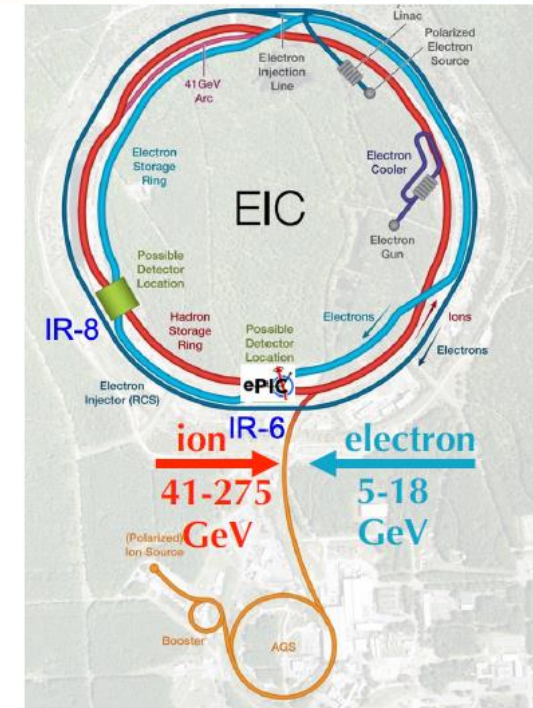
Criteria for inclusion:

- Complementarity with facilities in Europe or additional capabilities
- Strong interest and contributions to experiments from European research groups (or contribution to LRP call)
- **CEBAF@TJNAF**, **EIC@BNL**, FRIB@MSU, ISAC@TRIUMF, RIBF@RIKEN



Priorities of the European community:

1. Exploitation of the **existing** (recent) upgraded facility JLab12
 - Many recent and future detector contributions to the program
 - Strong involvement in data analysis & upcoming experiments for >10-15 years
2. Unique **future** program with polarized positrons
 - Physics case is compelling and timely
 - Possible detector contributions for new experiments
3. Explore the physics opportunities of a 22 GeV **upgrade**
 - Support in various ways connections between the EIC, NuPECC and EU high-energy communities (both exp. and th.) to maximize synergies
 - A proper design of WPs of pertinent EU projects to favor such exchanges
 - Support training of a new generation of students / early career researchers expert in Hadron Physics with special programs
 - Favor ePIC to become a recognized experiment at main EU Nuclear facilities



- The first phase of the international **FAIR** facility is expected to be operational by 2028... The completion of the full facility including the program of APPA, CBM, NUSTAR and PANDA should be vigorously pursued
- Timely completion and full exploitation of [] **GANIL/SPIRAL2** projects should be vigorously pursued.
- Nuclear physics opportunities at **CERN** (ALICE 3, scientific exploitation of ISOLDE and AD/ELENA).
- **ELI-NP** (Extreme Light Infrastructure) – nuclear photonics
- **ISOL facilities** in Europe (ALTO, IGISOL, ISOLDE, SPES, and SPIRAL) and future upgrades (ISOL@MYRRHA, TATTOOS@PSI, and RIB@IFIN)
- **Exploitation of large-scale stable beam facilities** (FAIR/GSI, GANIL/SPIRAL2, IFIN, JYFL, LNL, LNS, NLC), and smaller ones...
- **Exploitation and optimisation of the European lepton beam facilities**, including ELSA, MAMI, and S-DALINAC. Completion of the MESA facility and the High-Intensity Muon Beams project at PSI as well as the optimisation of the M2 Muon Beam Facility at CERN, are recommended.
- **Neutron facilities** like ILL, and n_ToF at CERN...
- **Theory centres** and groups should be strongly supported throughout Europe, in particular the European Centre for Theoretical Studies (ECT*, Trento, Italy).
- Collaboration with **non-European infrastructures** should be fostered. In particular, European participation in the construction of the ePIC experiment at the future [...] EIC is recommended.

Existing facilities: We recommend the continuing support of the successful hadron physics programs in Europe and the participation of European groups at global facilities. Particularly important hadron physics facilities are:

- **AMBER** at CERN
- **ELSA** in Bonn, **HADES** at GSI, **MAMI** and **MESA** in Mainz, all Germany
- **Jefferson Laboratory** in Newport News, USA

Furthermore, we recommend the support of ongoing hadron physics activities at the multipurpose facilities **Belle II**, **BESIII** and the **LHC**.

Future flagships: We recommend the expedited realisation of the antiproton experiment **PANDA**, and the support of European groups to contribute to the electron-ion experiment **ePIC**.

Theory / Computing

AGENDA:

- 30'+20' presentations/discussion for each of the 10 TWG
- Special presentations by APPEC (Astroparticle/cosmology) & ECFA (particle physics)
- Special presentations by NSAC (US) & ANPhA (Asia)
- Panel discussion (30'+60')
- Conclusion (10')

NuPECC LRP 2024 - Town Meeting

15-17 avr. 2024
Marriott Hotel Bucharest
Fuseau horaire Europe/Bucharest

Entrer le texte à rechercher

Accueil

Ordre du jour

Timetable Compact

Full draft of the LRP2024

Chapters Separately

Inscription

Liste des participants

Venue

Recommended Hotels

Transportation



Commence le 15 avr. 2024 à 11:00
Finit le 17 avr. 2024 à 14:00
Europe/Bucharest



Marriott Hotel Bucharest



LRP_2024_TM_Announcement.pdf

<https://indico.ph.tum.de/event/7593/>