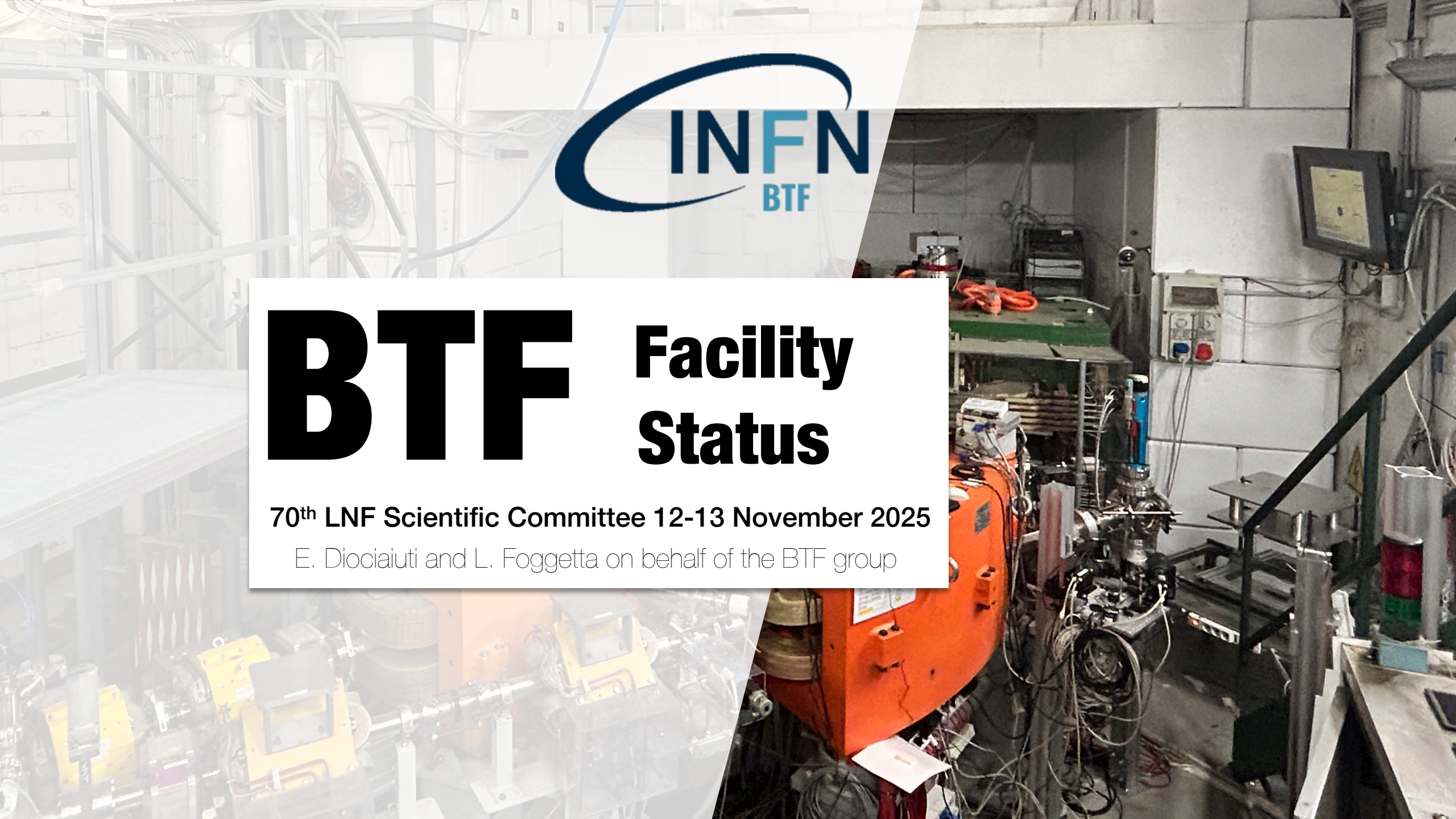


BTF Facility Status

70th LNF Scientific Committee 12-13 November 2025

E. Diociaiuti and L. Foggetta on behalf of the BTF group

INDEX

- BTF status
  - Status of the EHs
  - Calendar
  - Foreseen Call
  - Foreseen Upgrade
- BTF & PADME
  - Beam days
  - Q3 report
  - Q4 status
- Status of projects

BTF LINES STATUS

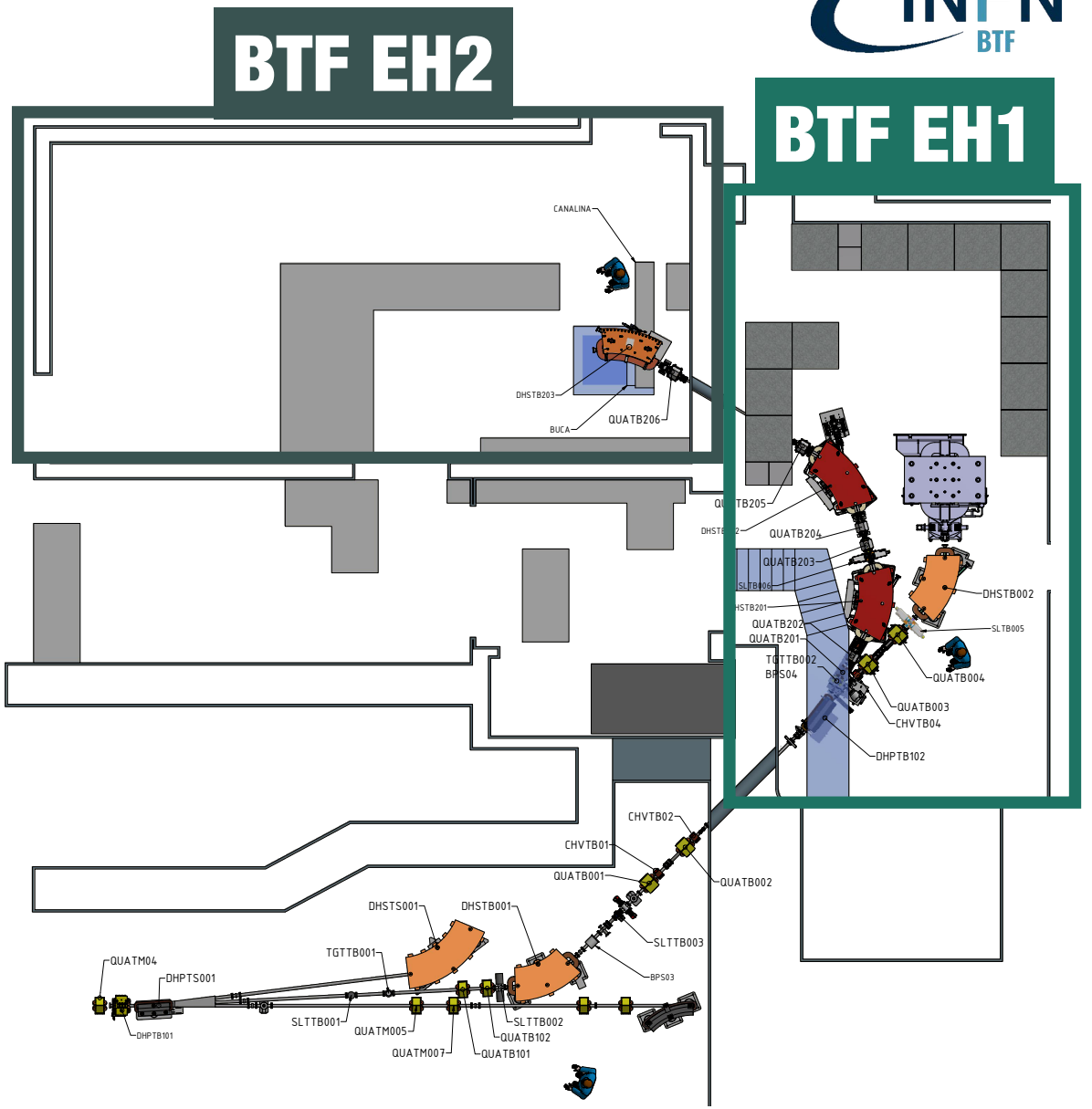
- LINAC only serving BTF @ 50 Hz
- Continuing the DCS + Logging upgrade with Epik8s and Phoebus
- Involved in ASIF-2 and EUROLABS projects

BTF EH1- 2 Lines

- Hall operational, system upgraded for PADME (mechanics, vacuum, gas-safety and delivering, logistics, magnet services, DCS)
- Area requested from FIREBALL@LNF, EUROLABS, ASIF-2 and PADME-X17

BTF EH2

- Currently in stand-by
- 3 users call for the end of 2025 Q4 + 2 months internal call organized from Feb-Apr 2026
- **One week needed to setup for external users**



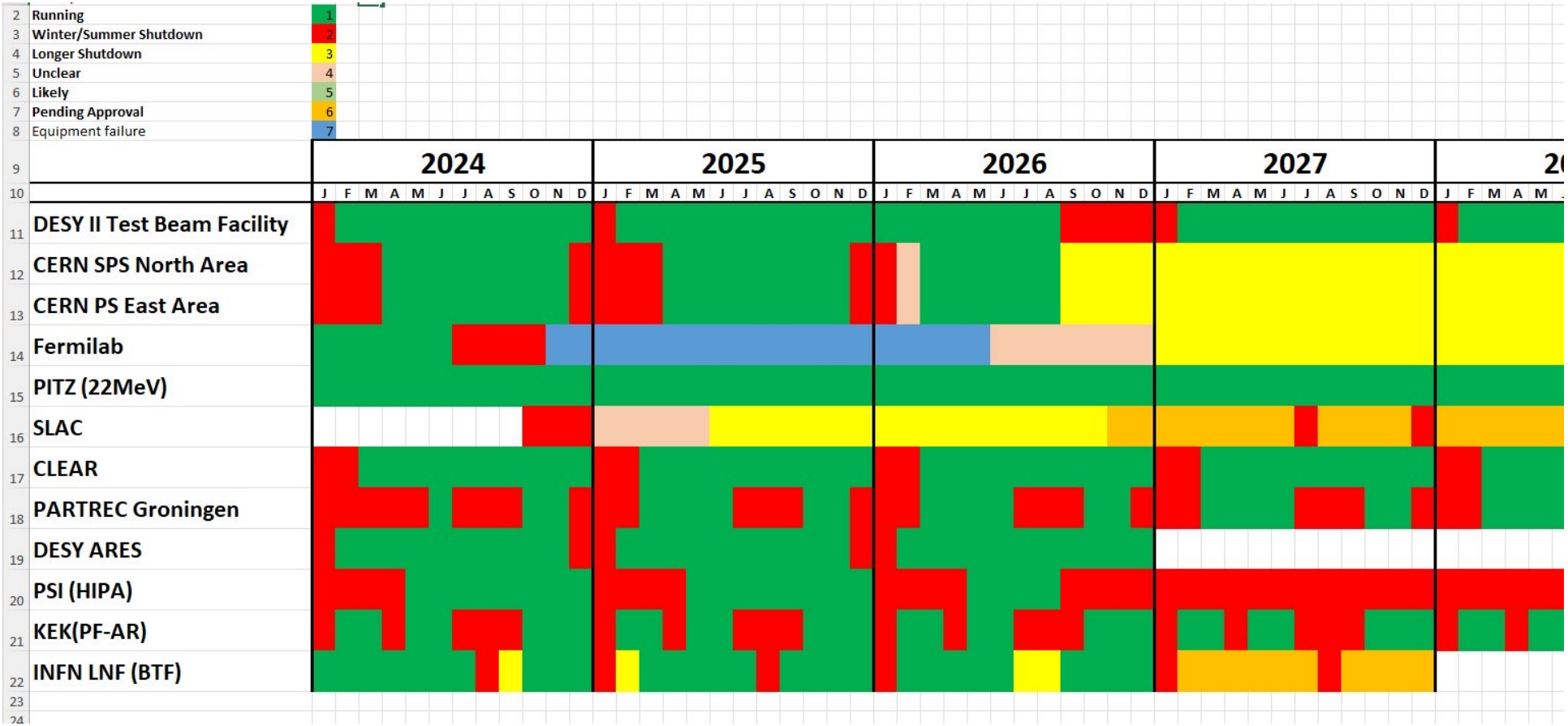
BTF SCHEDULE

Nov 10 – 17: Last Week of PADME 2025
Nov 17 – 24 : LINAC+ BTF reconversion for external user
Nov 24 – Dec 15: BTF internal call (3 weeks)
Dec 15 – 24: Maintenance
Dec 25 – Jan 4: Shut Down
Jan 4 – Feb 1: LINAC Maintenance
Feb 2 – Apr 13: BTF internal call (10 weeks)
Apr 13 – June 29: BTF User Call (11 weeks)
Q4 TBD

PADME run
Maintenance
Internal Call
User Call
Shut Down

International facility coordination

- BTF is part of international facilities group for beam time information sharing;
- Next years schedule collected during BTTB13 workshop;



FUTURE USERS

FROM 69 SCICOM

The machine studies to assess the feasibility of the beam parameters required by FIREBALL should be conducted before the end of operation in 2025.

2025 Closed Call

- **WC-CUPID**: n moderator + μ detector prototype for CUPID experiment at LNGS: water tank equipped with 6 PMTs powered by standard HV PS;
- **Pcube_diag_test-FCC Injector:** Characterization of the imaging system response of a view-screen as a function of the beam charge/energy for e^+/e^-, and of the scintillation signal response vs charge/beam energy for a 1 mm scintillating fiber;
- **BTF Development**: 1.5ns and 150 MeV primary beam feasibility;

2026 Closed Call

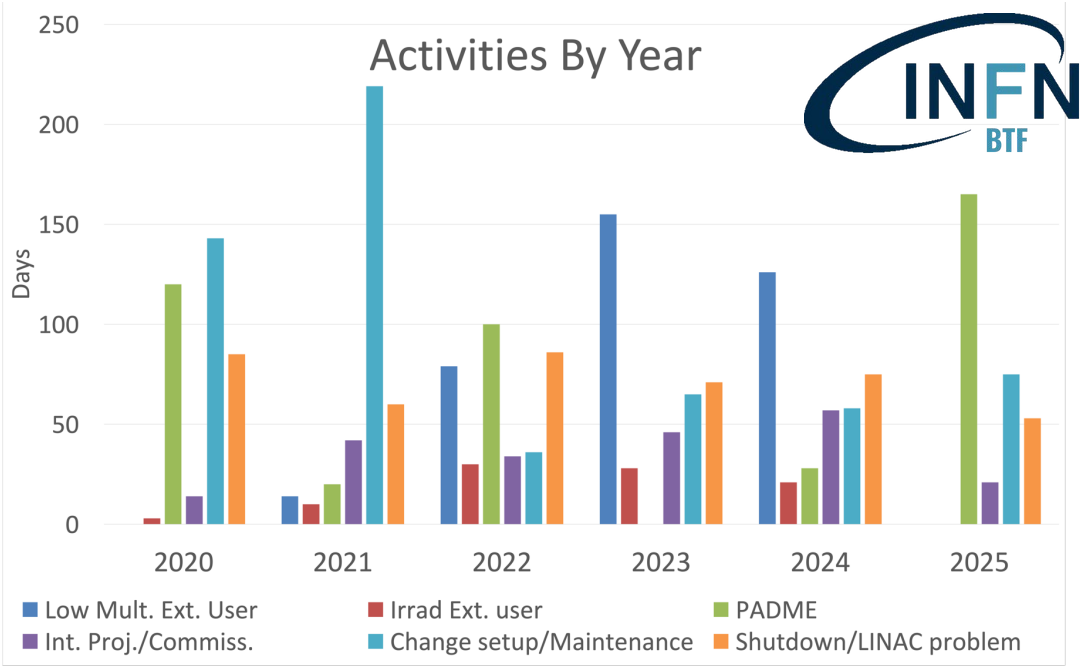
- FOOT (2 weeks);
- SIDDHARTA (2 weeks);
- Internal – TPX4;
- Reserved to BTFUC;
- DIANA – Grant Giovani INFN;
- Mu2e-II (2 weeks);

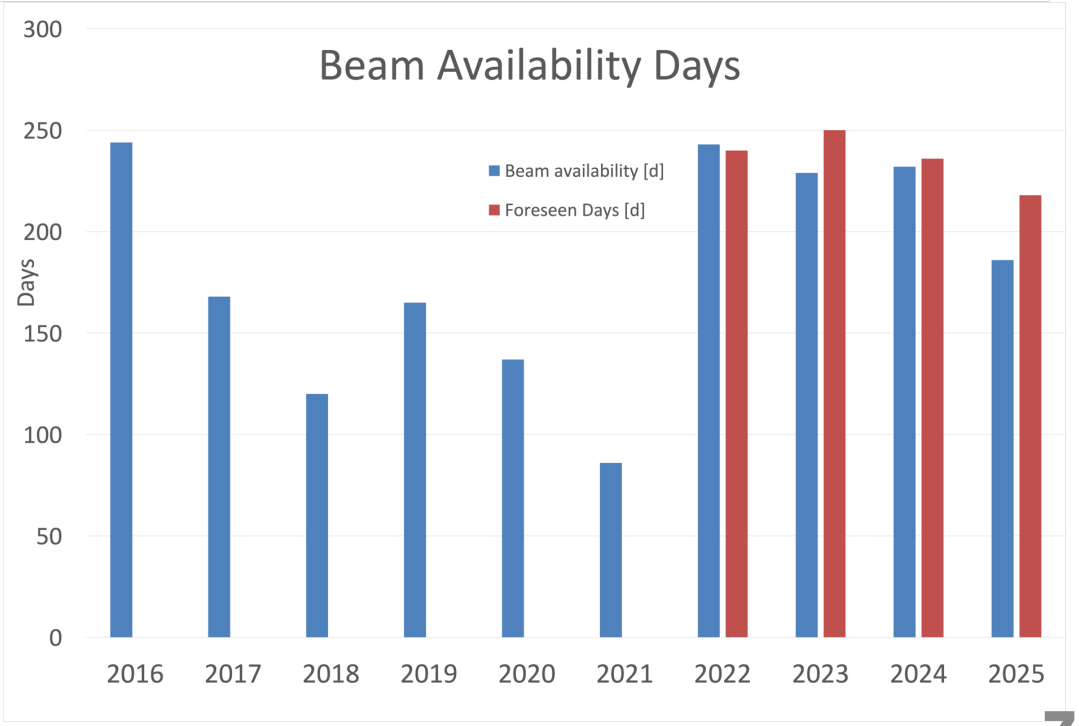
- Priority given to delayed users requiring urgent detector tests and delayed for PADME run extension
- The machine studies for **1.5ns and 150 MeV primary beam feasibility** are planned for the last weeks of December and will continue after the LINAC restart following the maintenance period ~ Q1 2026

BTF Beam Days

Profited of the forced LINAC shutdown for building improvement (around 2.5 months) to carry out maintenance on the subsystems (fluids, magnetic probes), BTF-EH1 setup for PADME and to perform upgrades of the BTF both HW and SW

Activity	Days
Shutdown/LINAC problems	53
Maintenance and upgrade	75 (during LINAC shutdown)
PADME beam test	21
PADME	165
Total (at 11/12/2025)	315





DISSEMINATION

Event type	People reached
Undergraduate + PhD tutoring*	25
LNF Visit for University	45
LNF Visit for High School	2340
LNF Visit for Middle School	778
Talk to Student	132
LNF Visit for general public	196

*Activities carried out within the projects EPOS, EuPRAXIA Doctorate Network and Roma1 PhD Accelerator program

MAINTENANCE and FORESEEN UPGRADES (1)

- **Consolidation of the gaussmeter readback** system to COM readout, in use over BTF1 main dipoles→ **DONE**
- **A 100 kW mains power line upgrade for BTFEH1.** This upgrade increases electrical capacity to support future experiments and services in the BTFEH1 area. (Elect. Plant Serv. DT, **20K€/0,5PM***) → **APPROVED**
- **Vacuum layout upgrades** at the end-of-line windows: a remotely controlled gating valve, a compact pre-vacuum pumping line, and exit windows. This configuration will simplify operations for setting up and linking users'vacuum chambers. (Vacuum serv. DA, **30K€ /0,5PM**) → **APPROVED**
- **Variation in the vacuum PLC layout** that hosts the controlled vacuum pumps status read-back, the gating valves status readouts and actions, and the vacuum gauges related safety actions. (Elect. Plant Serv. DT, **20K€ /0,5PM**) → **APPROVED**

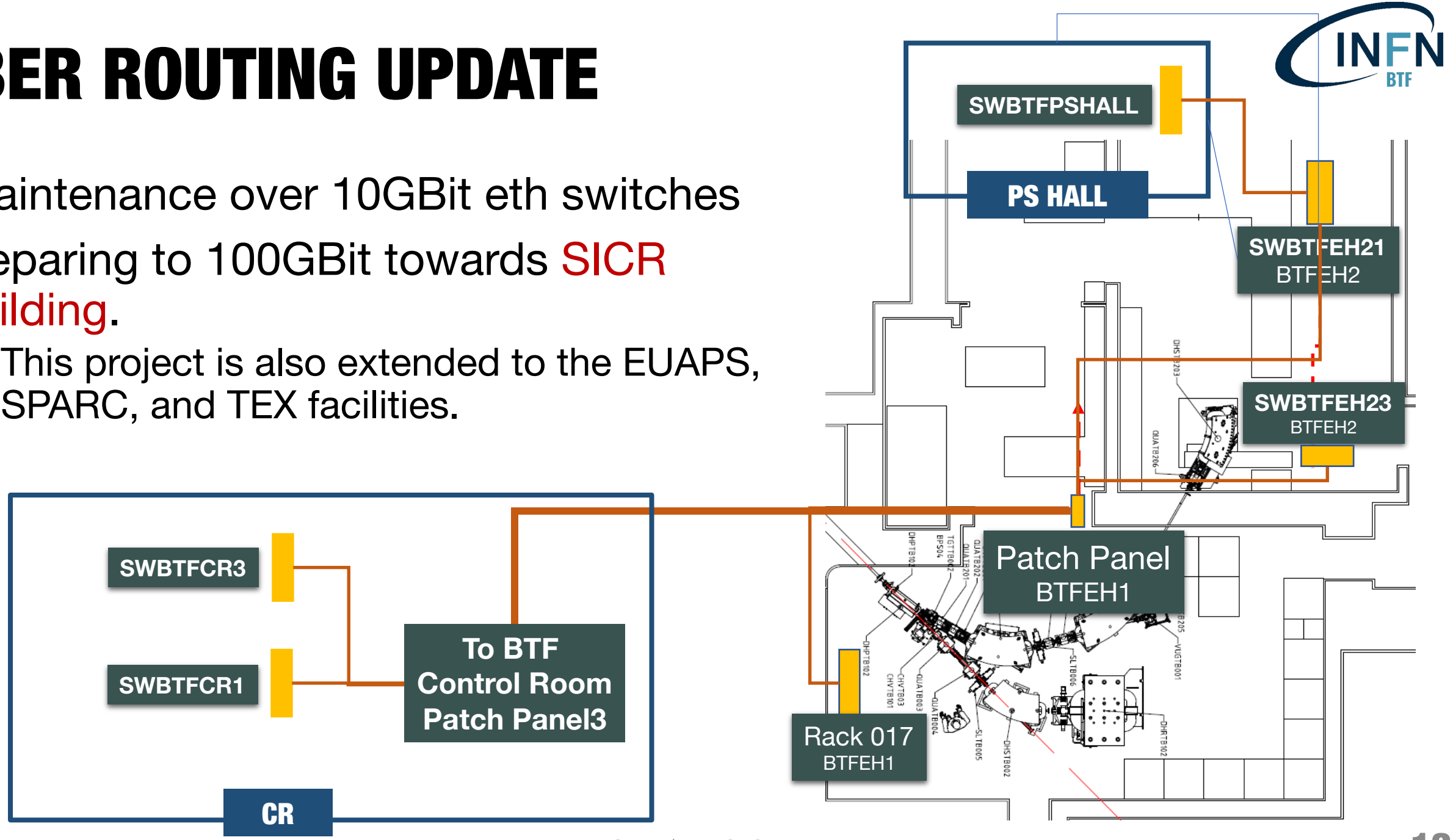
MAINTENANCE and FORESEEN UPGRADES (2)

- **Air conditioning systems** for both halls, ensuring backup units.
  → Fluids Serv. DT, **300K€/2PM/12M (DD+TD)*** **NOT YET APPROVED**
- **DOUBLE Pulsed Magnet** for upgrade **both DHPTB101/DHPTS001**
  →Magnet Serv. DA, **180K€/5PM/15M (DD+TD)*** **NOT YET APPROVED**

*DD: Design Development, TD: Task Duration

FIBER ROUTING UPDATE

- maintenance over 10GBit eth switches
- Preparing to 100GBit towards SICR Building.
  - This project is also extended to the EUAPS, SPARC, and TEX facilities.



EPIK8S STATUS

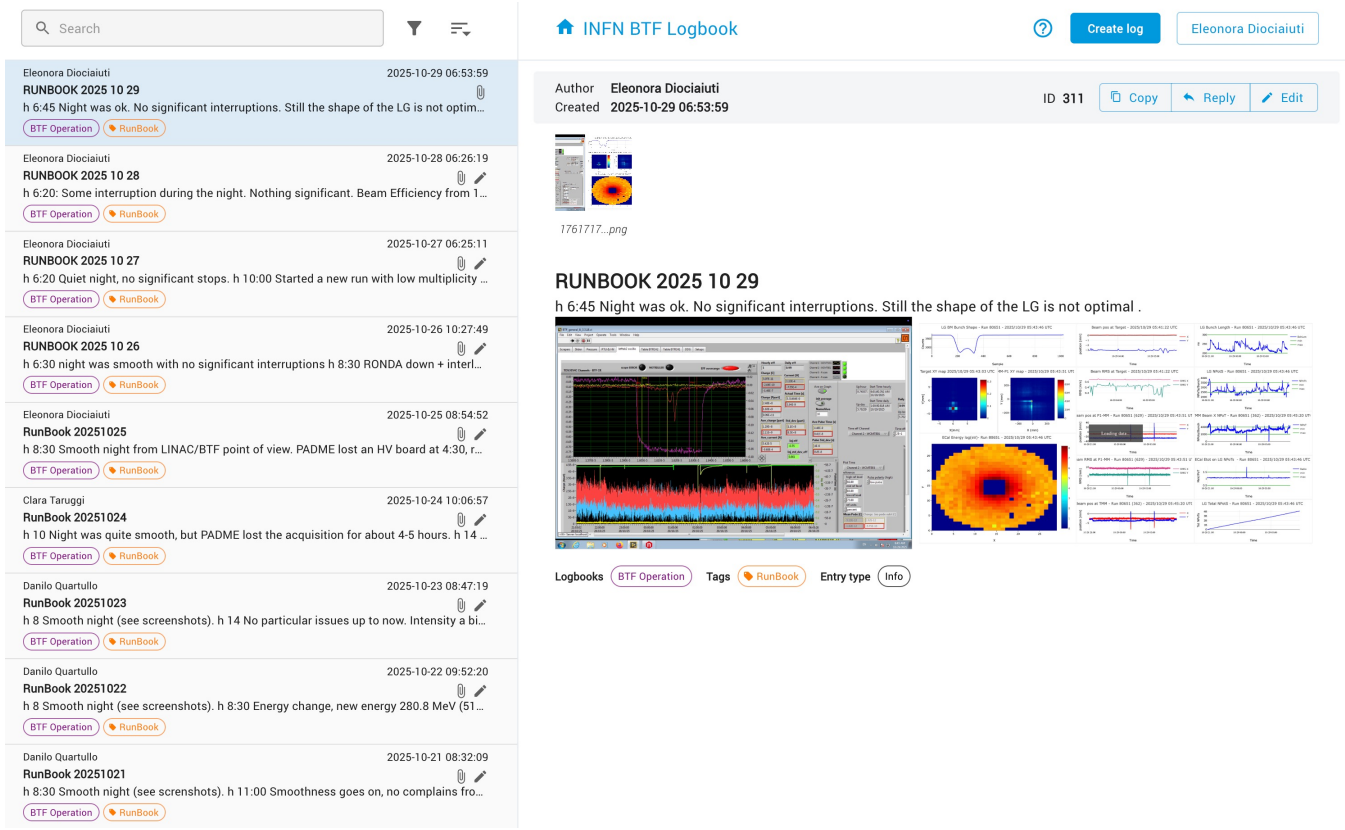
ITEM	TEST PHASE	PROD PHASE	Note
Magnet system	√	80%	**Not possible to complete the migration now for BTF activities. Some final tests will be performed during the reconversion week**
Motors – Scraper	√	In use	
Triggered Cams	√	In use	**Need to try the improved version**
HV crate control	√	30%	Final design not ready
PTH sensors in EH1-2	√	In use	**new sensor being purchased**
Vacuum monitor	√	In use	
Dipoles hall probes	√	In use	
DAQ data	√	In use	
OLOG	√	In use, 70%	**New layout, AAI authentication now working, future service for users**

- Development paused for SPARC activities now resumed, with activities also extending to the BTF DAQ
- No major faults recorded — only one due to a network outage in the entire BTF area.

OLOG

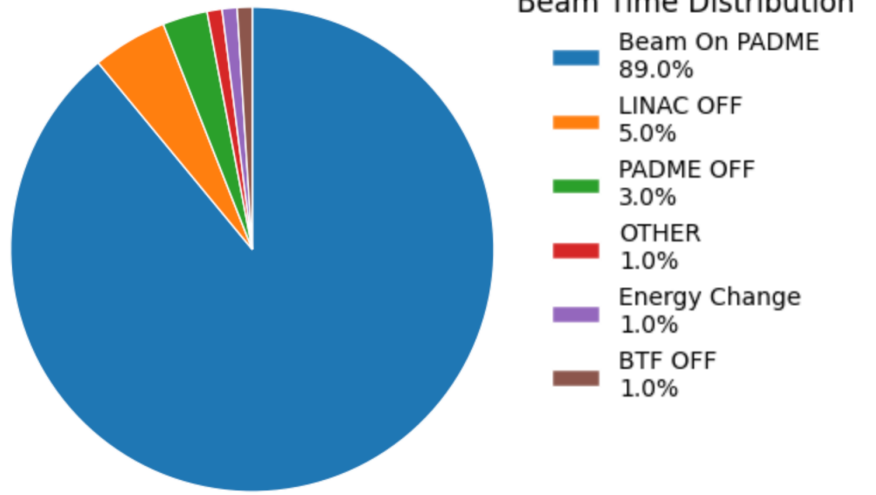
Not in operation at the moment: some repositories previously used to download the software images have been converted to paid-license access

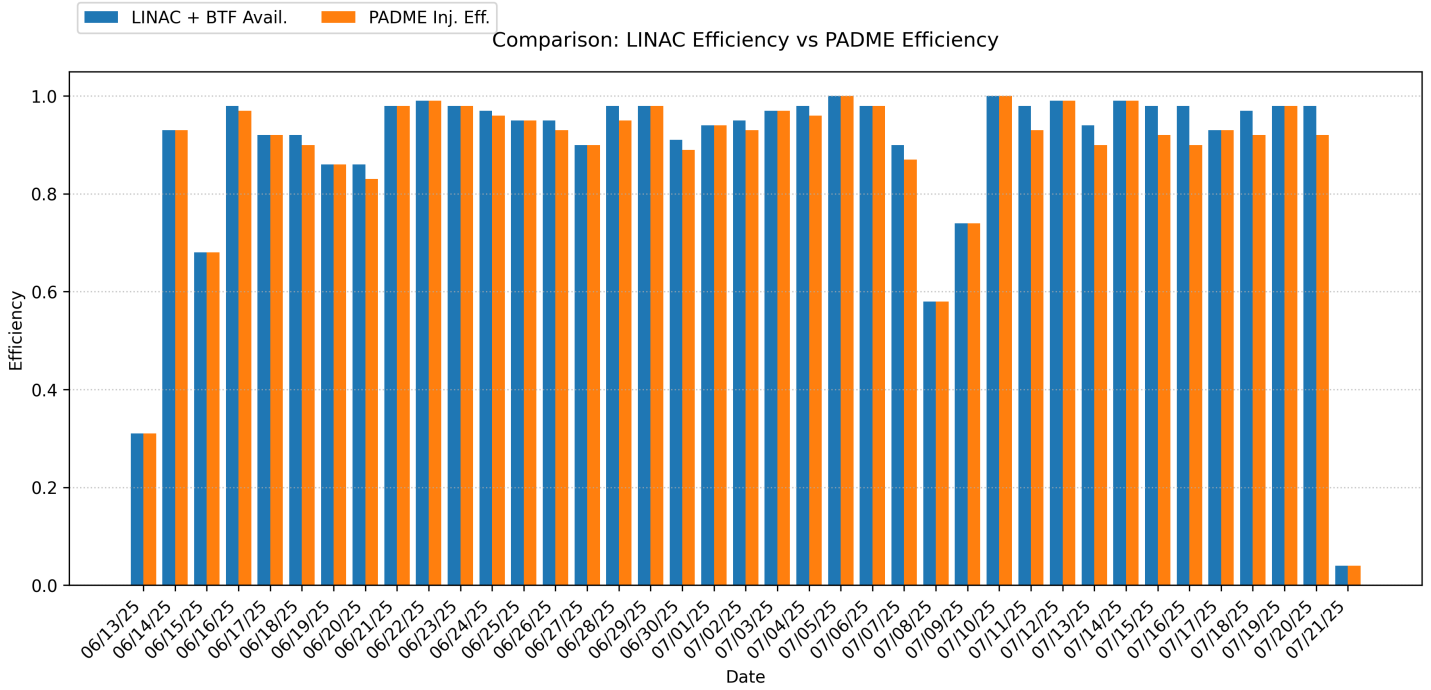
- Implemented **OAuth2 and OpenID Connect** frameworks — the standard protocols for user authentication and authorization in modern software applications;
  - **Improved security and user experience:** users authenticate with their institutional credentials, without sharing password data with different services (token-based access control);
  - **Single Sign-On (SSO):** seamless access to multiple INFN and federated services without repeated logins using a single identity provider (IdP);
  - **Simplified management:** automatic handling of user authorization, attributes and roles reduces administrative workload;

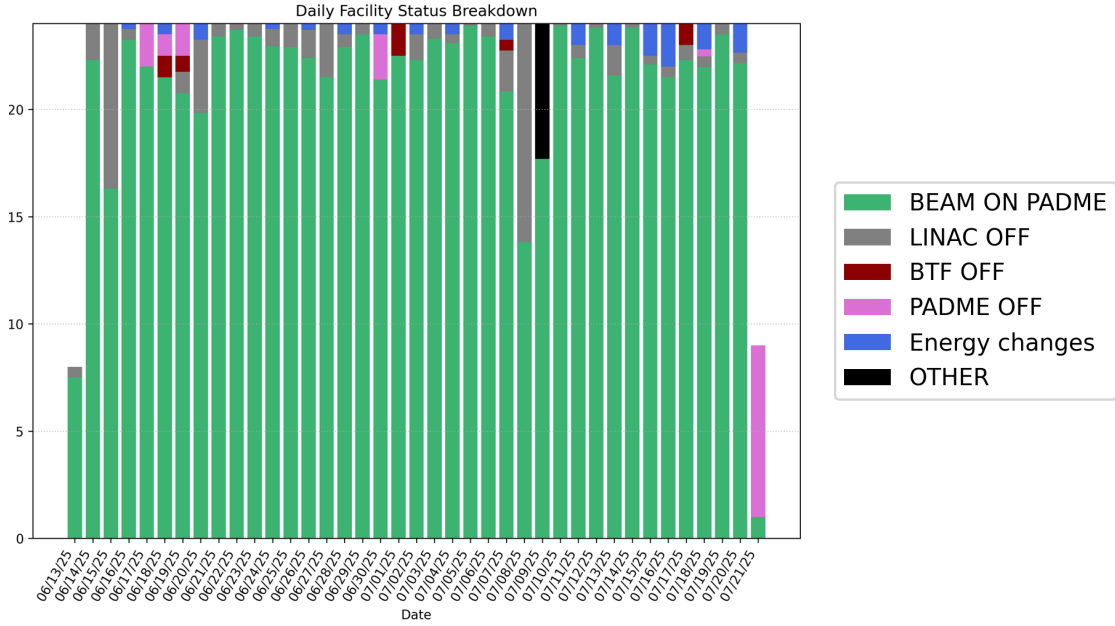


PADME RUN: JUNE-JULY 2025 RECAP

BEAM on PADME [h]	PADME OFF [h]	LINAC OFF [h]	BTF OFF [h]	Energy change[h]	Other [h]
822	15	44	5	13	6

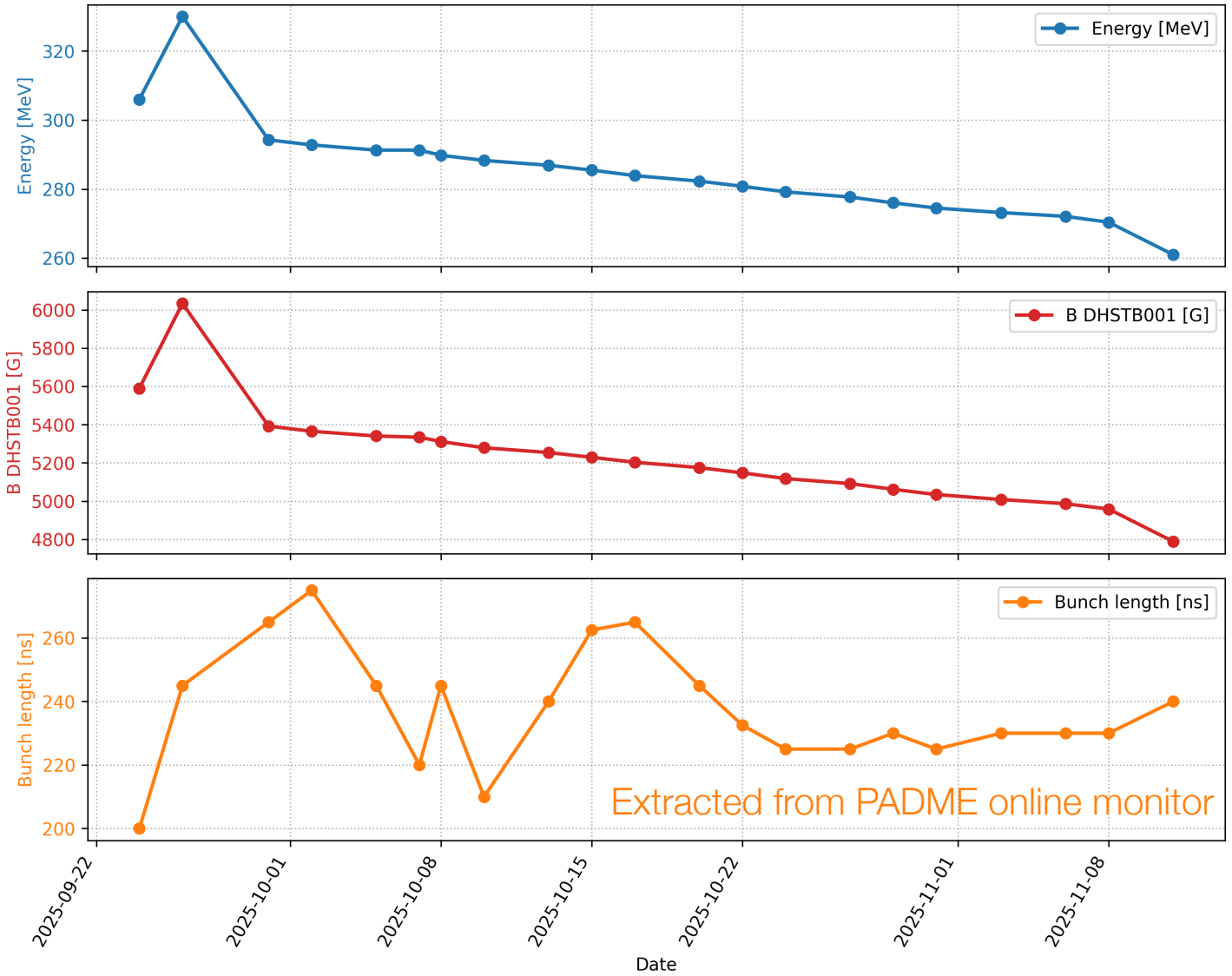






PADME RUN Q4 – current status

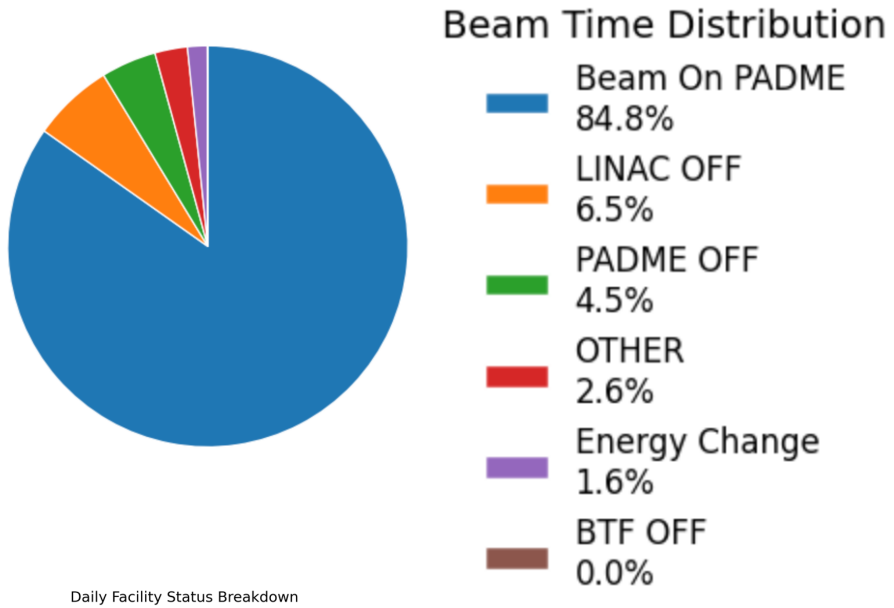
- Our calorimeter is calibrated for **energy variations**, while **PADME's calibration** is fixed at **294 MeV** → discrepancies observed between our **particle count** and the one measured by **PADME's Lead Glass (LG)**.
- **High chamber occupancy** → Recently we were asked to operate in the **lower part of the "good beam" region**.
- Ecal Energy vs LG POT shows strict dependency on energy (0.8 @ 330 MeV - ~1 @270 MeV)
- **Fixed quadrupole focus** (set values @ ~295 MeV)during the whole data-taking variation

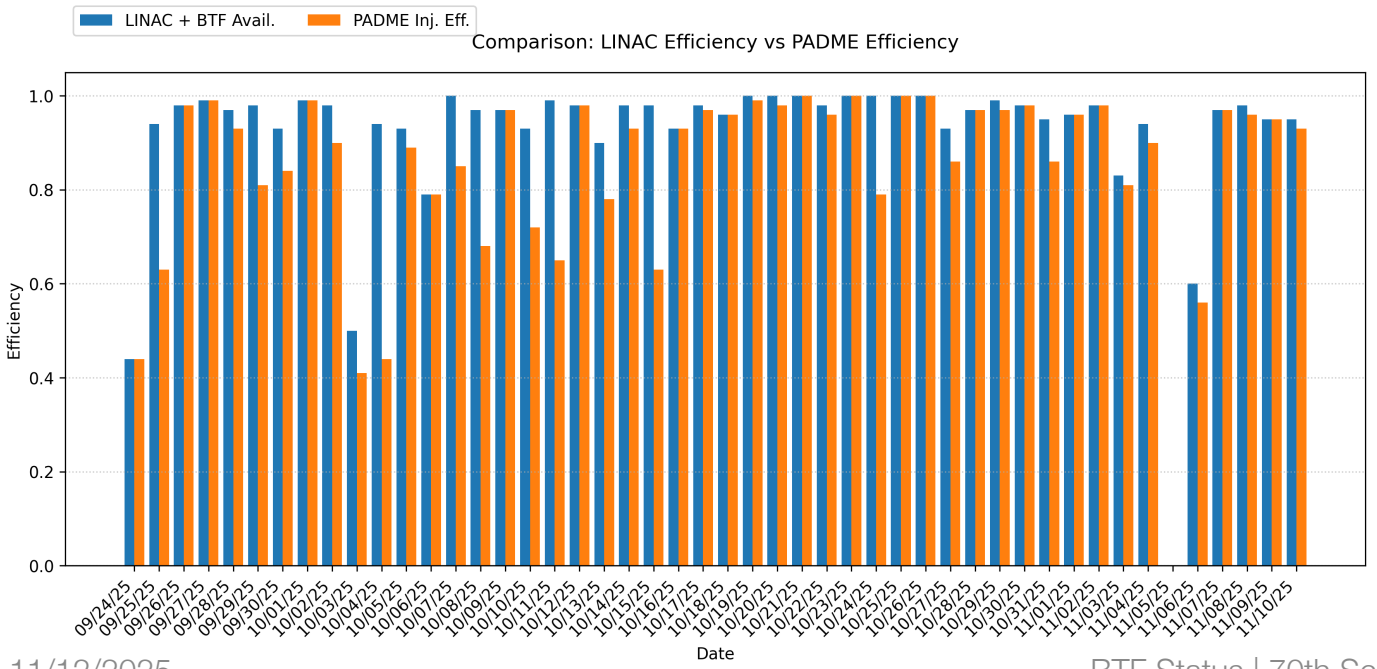


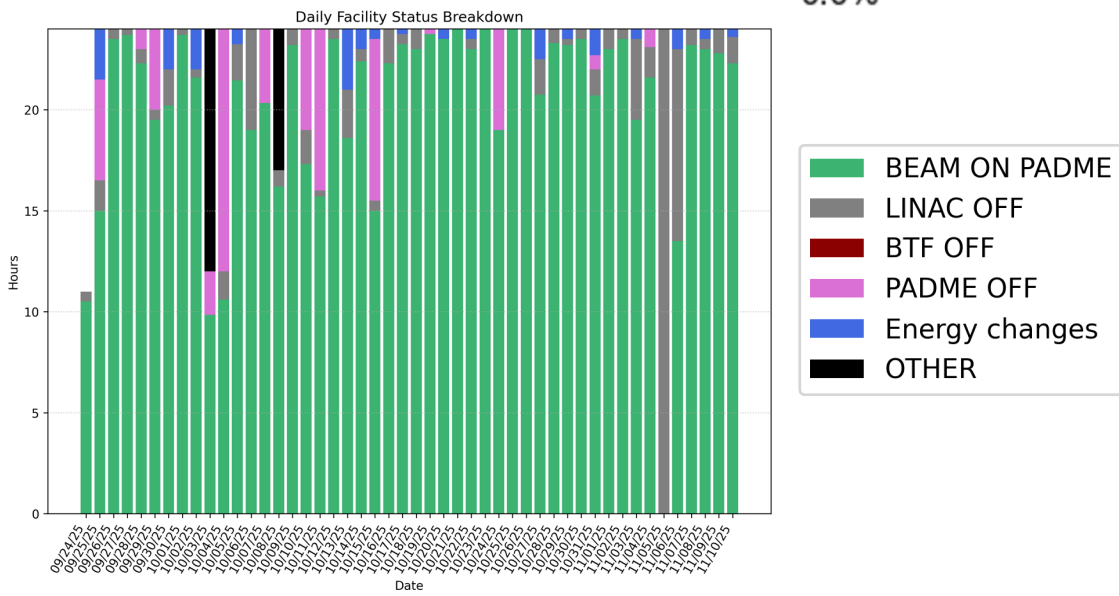
PADME RUN Q4 – Beam availability*

* Up to 11/10/2025

BEAM on PADME [h]	PADME OFF [h]	LINAC OFF [h]	BTF OFF [h]	Energy change[h]	Other [h]
971	56	75	0.5	19	29

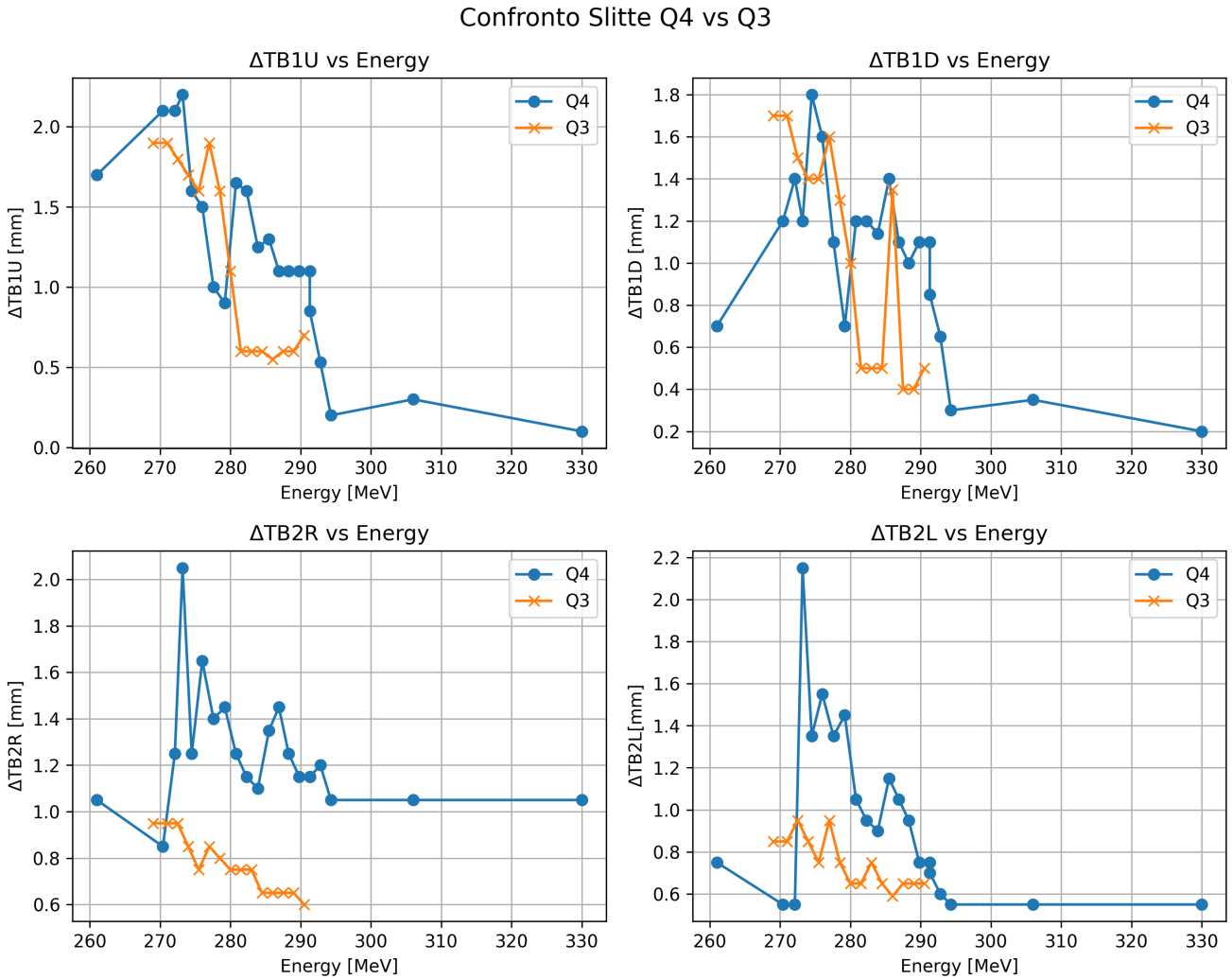






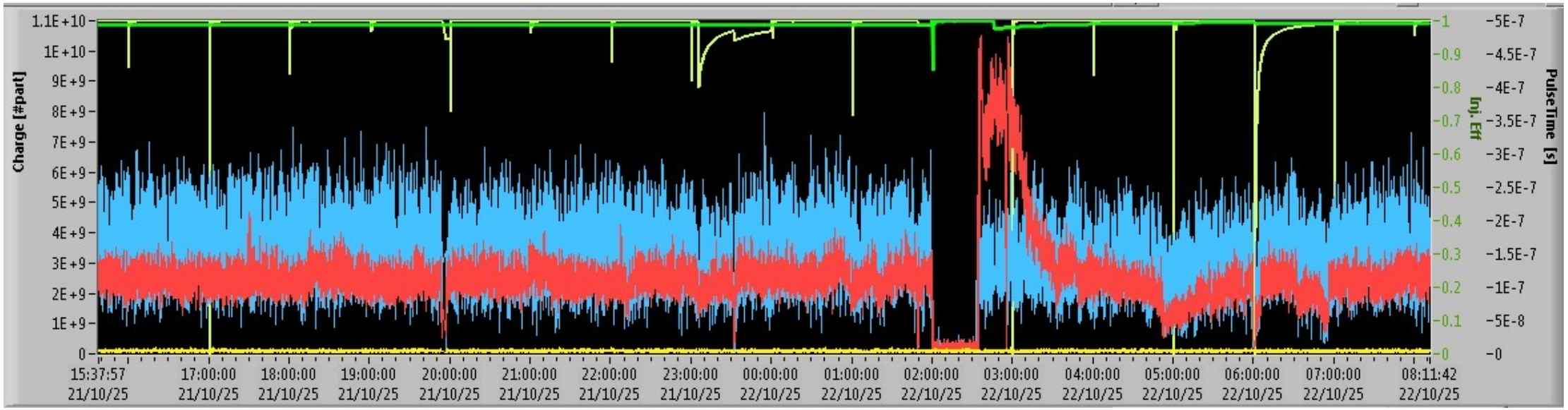
PADME Run:Beam/machine issues (1)

- Networking problems;
- Problems with QUATB003/QUATB004 (Q3) and QUATM002/QUATM003(Q4) control boards;
- UFS leaking water;
- Intervention on Positron Converter;
- LINAC charge seems to be reduced w.r.t. the previous data-taking (Q3)→ necessary to open the scrapers to obtain the required multiplicity;



PADME Run:Beam/machine issues (2)

- Some sudden charge instabilities not yet fully understood
- BCM1 charge - close to gun- shows:
  - **Variation of emission over time:** right after startup, it produces a strong spike, then decreases and stabilizes after about half an hour.
  - It may not handle the longer pulse width
  - Continuing investigating at the end of this run



2025 Article citing BTF

- Urso, F., et al. "Online Dose Verification in VHEE Radiotherapy Using Bremsstrahlung Radiation." arXiv preprint arXiv:2509.13056 (2025).
- Arias-Aragón,F., et al. "Atoms as electron accelerators for new physics searches." Journal of High Energy Physics 2025.6 (2025): 1-16.
- Garattini, M., et al. "Steering of sub-GeV positrons by ultrathin bent silicon crystal for ultraslow extraction applications." Physical Review Accelerators and Beams 28.2 (2025): 023501.
- Arias-Aragón, F., et al. "Combined Evidence for the X_{17} Boson After PADME Results on Resonant Production in Positron Annihilation." arXiv preprint arXiv:2504.11439 (2025).
- Cantone C., et al. "Advancements in Muon Collider Calorimetry: Design, Testing, and Radiation Resistance of the Crilin Calorimeter Prototype." EPJ Web of Conferences. Vol. 320. EDP Sciences, 2025.
- Cemmi, A., et al. "Radiation resistance of the Muon Collider CRILIN calorimeter prototype equipped with Cherenkov lead fluoride crystals." IEEE Transactions on Nuclear Science (2025).
- Bertelli, S., et al. "Blind unblinding procedure for the PADME X17 data sample." Journal of High Energy Physics 2025.6 (2025): 1-16.

Attended conferences

- BTTB25 “The current status of the Beam Test Facility (BTF) at LNF-INFN”
- PPPS2025 “Design and Construction of a Test Modulator at LNF”
- AE2025 “Developing EPICS at the Frascati Beam Test Facility”
- IBIC2025 “The Beam Test Facility of the National Laboratories of Frascati”

PROJECTS (1)

EUROLABS

- 86k up to 2026
- Task mainly completed: 7/7 week slotted, foreseen 1w in Q4 picking from EUROLABS-SPARC assignment
- Presented poster (and “Best Poster” prize) for 3 runs at Fourth Annual MEeting (FAME) of EURO-LABS at Ljubljana 29th Sept – 1th Oct 2025
- **Three EUROLABS contributions** acknowledged at **BTTB13**, **AE2025**, and **IBIC2025**

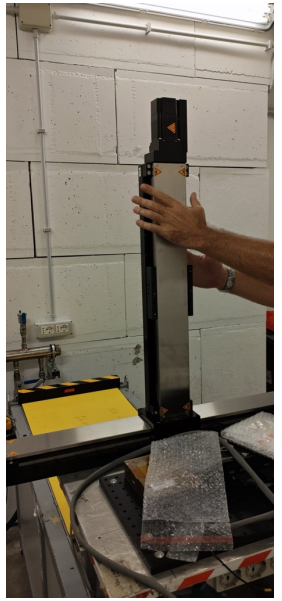
TPX4 DEVELOPMENT AGREEMENT

- With ENEA collaborators, GEMPIX side-on board designed, printed and tested from G. Claps(ENEA), P. Burian(IEAP)
- BTF was assigned 5 bare GEMPIX chips and 3 TPX4+Si assemblies, provided through the INFN–TPX4 Collaboration (M. Fiorini).
- TPX4 mounting on KATHERINE side-on/head-on board with Katherine Gen3 readout ready and available for testing once the TPX4 units arrive (thanks to P. Burian CERN/IEAP)

PROJECTS(2)

ASIF-2

- **RA1 milestone** achieved (**Deliverables 1 & 2**)
- **Booking software** approved for future use in other **INFN–ASIF** facilities
- **Couple of PI High Load, EPIK8S**: remotely controllable system (development ongoing), tested at **BTF**; enables easy implementation of additional remotely controllable axes for users
- **Three ASIF-2 contributions** acknowledged at **BTTB13**, **AE2025**, and **IBIC2025**
- **Next steps:**
  - 150 MeV high-intensity beam test
  - Evaluation of backscattered dose contribution (based on previous **FISMEL** experiment and new **FLUKA** simulation setup – *F. Chiarelli*)
  - **TPX4** tests on **Katherine GEN3** detectors



FIREBALL

- **The new PADME run depends on the currently acquired data**. The collaboration has requested to wait for their analysis before deciding on a possible run in **2026 Q4;**
  - **BTFEH1** remains assigned to **PADME** in **2026**.
- The **FIREBALL** experiment has been **postponed** due to increased facility demands. A detailed discussion on the revised timeline is foreseen.

CONCLUSIONS

- **Facility schedule defined until June 2026**
  - Closed call to selected users (2 months)
  - User call for external users (2 months)
  - Q4 activities TDB
- Completion of PADME beam operations this week
- Ready for reconversion to user operations until the end of the year

Results should be shared with all LNF colleagues involved: DT and DA services, secretariats, and administrative staff and a special thanks to DAΦNE operators