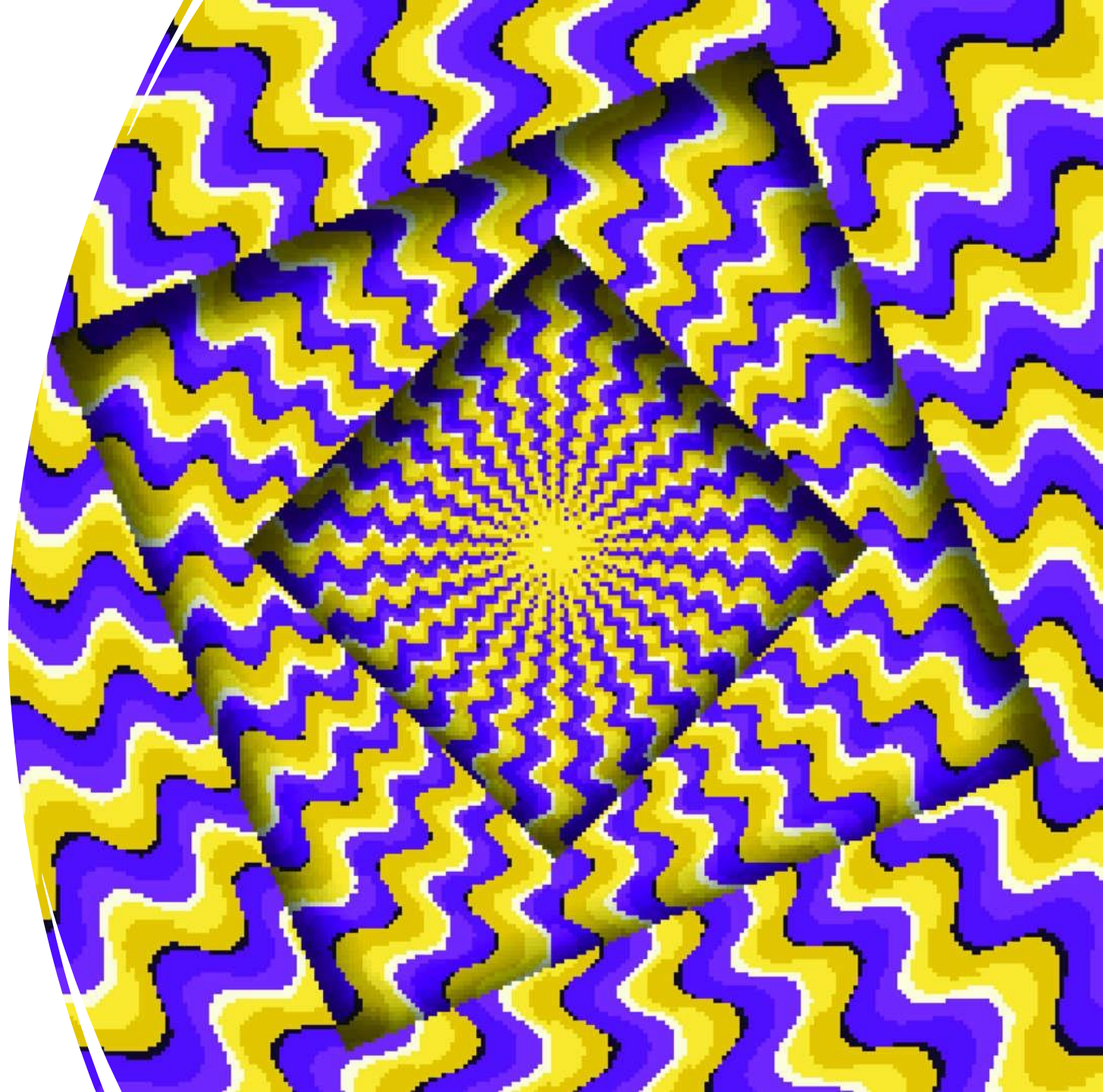


# LINAC & BTF

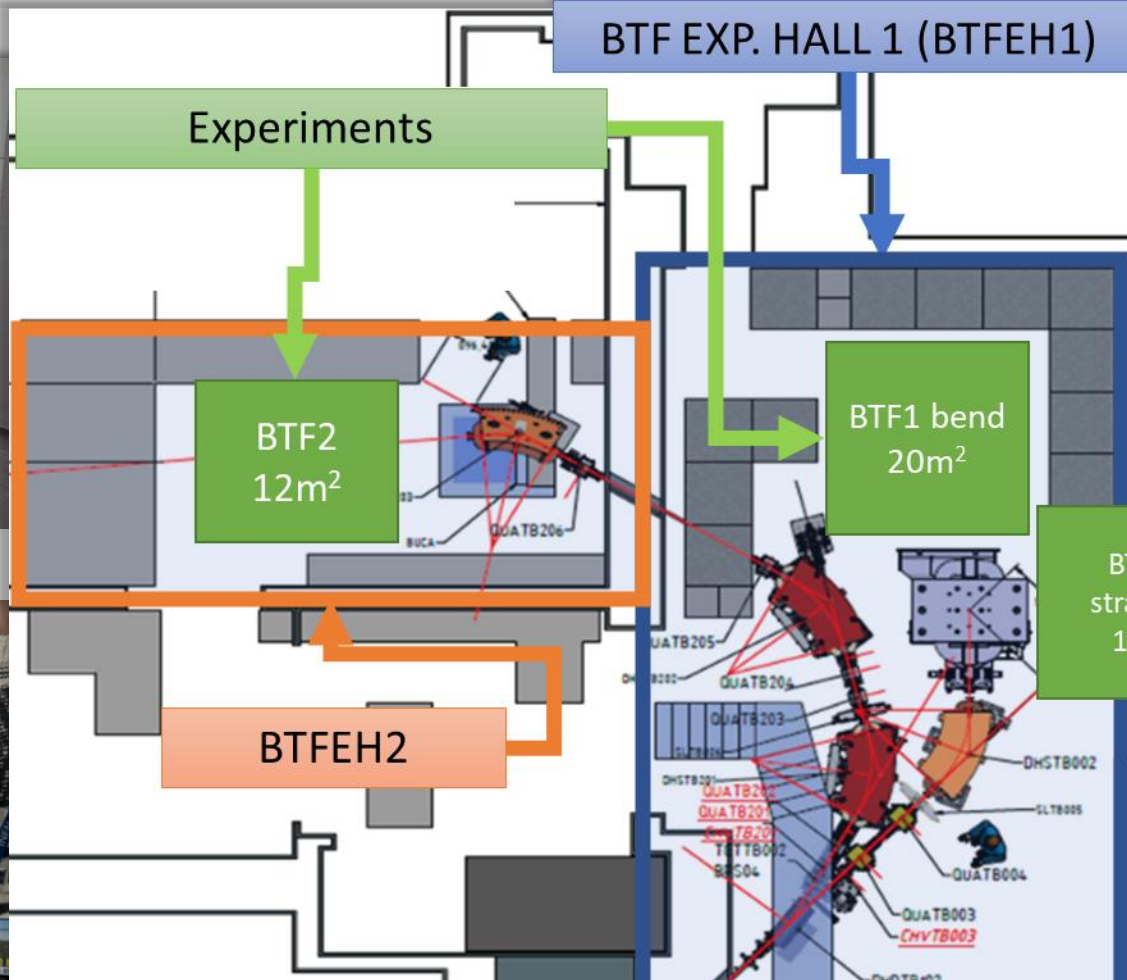
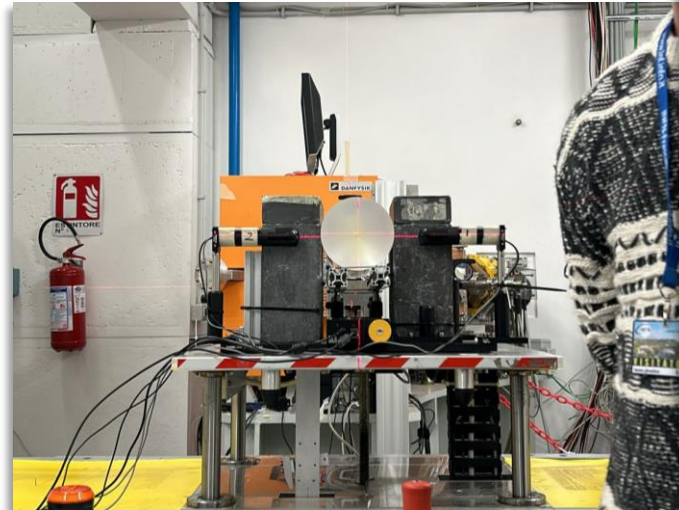
*LINAC/BTF Group*

# BTF STATUS

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# OVERVIEW - 1Y OF ACTIVITY



**GOOD NEWS:  
STILL SURVIVING over ~300 users**

## BTFEH1 – BTF1 (2 lines)

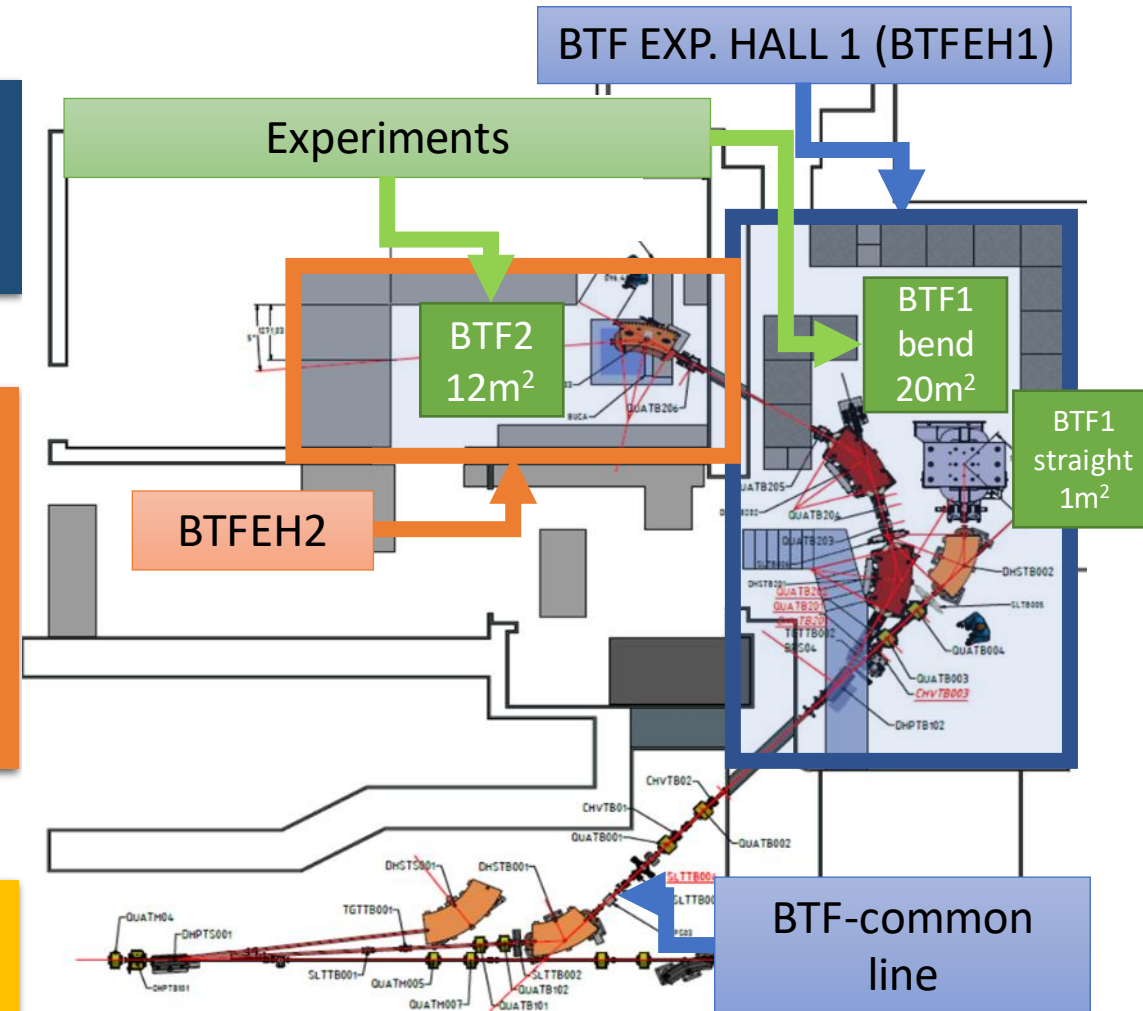
- Hall Operative but in mostly in standby
- VHEE community interests – 3 runs both in primary and secondary beam
- Still suffering experimental area limitation

## BTFEH2 – BTF2 (1 line)

- Hall operative, BTF2 line to external users
  - external users run foreseen now up to December ends
  - Foreseen PADME developing activity
- Only secondary beam
- Improved stability (transverse param., single particle cumulative average position)
- Involved in EUROLABS Project, started on Autumn 2022 – 1 week assigned

## BTFs

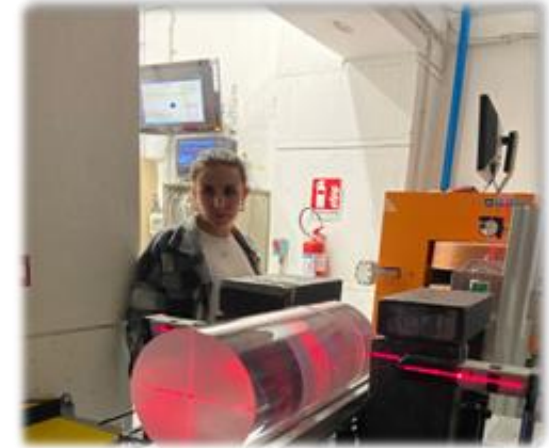
- **Software for automated call and user management operative, extended to other INFN labs**
- **New triggering scheme for users, Gas full feeding**
- **DAΦNE on, BTF run in spare pulse mode till June**



- **2023 Open and closed calls for users closed successfully**
- **2024 Q1 Q2 Q3 call**
  - Q1-Q2 open call beamtime on going, up to May end,
    - **Few last-minute withdrawals (2)**, converted in crane maintenance, gas system installation, BTF particle type masked trigger (**Thank to Diagnostic Service (P. Donato, T. De Nardis)** and internal project beam time (beamtime)
  - added 6 week for Q3 in April, up to shut down
  - **Calls fully booked**
- **2024 Q4 mixed call**
  - PADME team asked 4 weeks both for warm up and detector dev.
  - 11 weeks, 9 as beam availability, 5 for ext. user
  - **Opening next week**
- **BTFEH2 GAS implemented and used**
  - Just in time for PADME-TPC team
  - Two inert gas pipeline (N, AR plus mixture) installed
  - **Gas community could benefit the BTFEH2**
- **Failures affecting BTF availability**  
3 days:
  - 1 during maintenance week for layout problem in BTFEH2 power mains lines, scheduled layout upgrade in second half of July (needs shutdown)
  - 2 KLYB conditioning

## Recommendations LINAC-BTF previous meeting


- An analysis of the expected BTF user beam time requirements should be included.

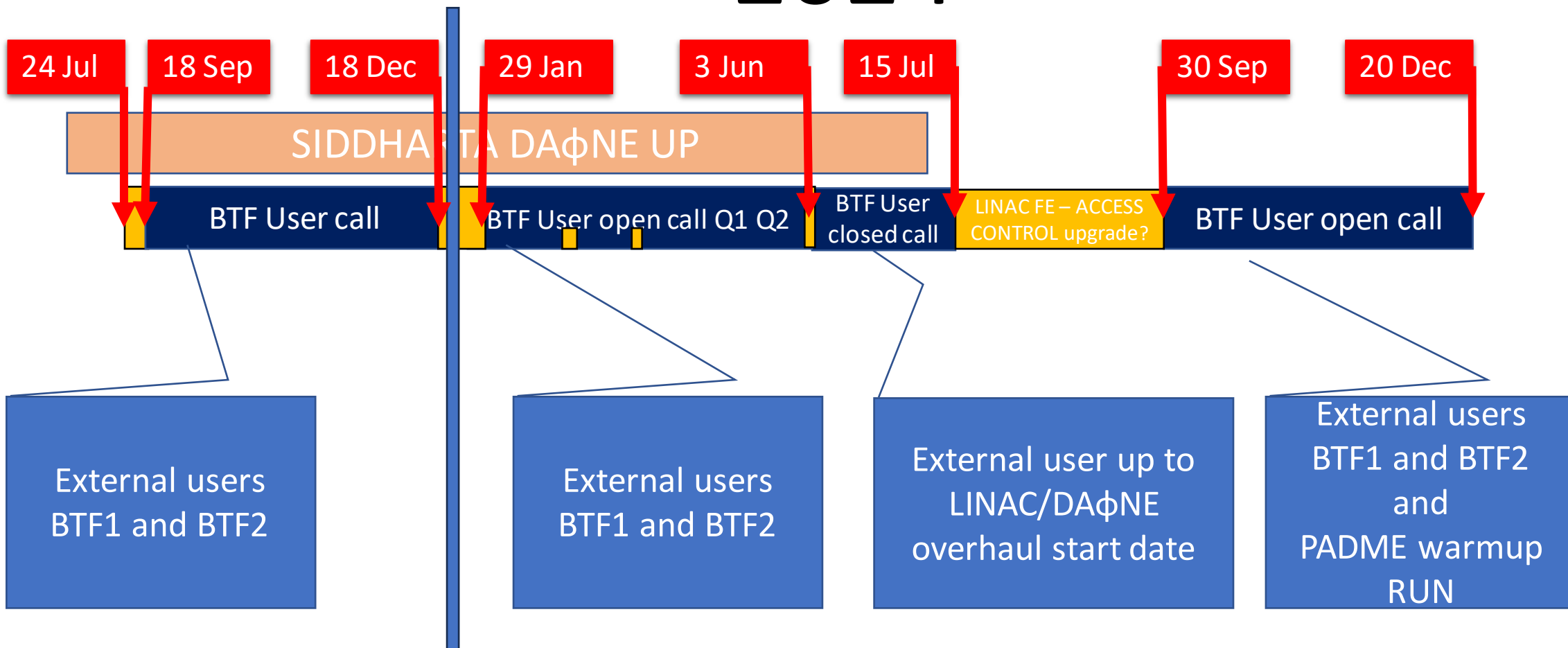


# NEXT DUMMY CALENDAR

## 2023

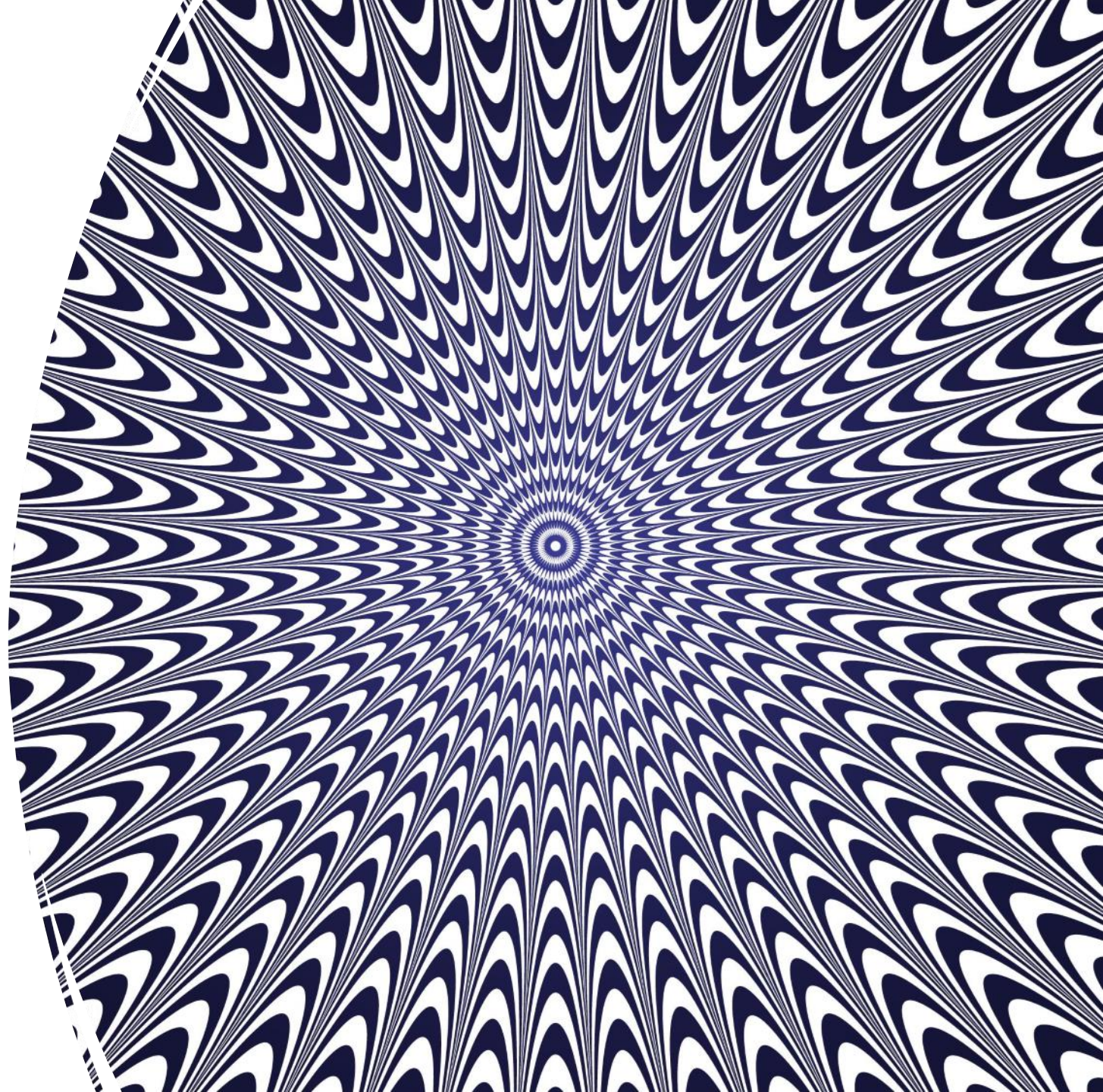
## 2024

 = shutdown



# BTF USERS

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# BTF CALL PROSPECT

BTF mostly used for:

- Space detectors test and calibration
- HEP detector developing
- FLASH-VHEE detector calibration



**Foreseen ~180 days for active call up to 15/07/2024**



**Increased number of beam time from VHEE Dosimetry/particle counting mainly**

DIAMOND for VHEE  
FLASH DC  
MORSEPET



**First or Final run of already developed single particle detector, New material developing**

NANOCAL, NOVA RD  
Mucol, CRILIN,  
MICROPEROV



**(Big) detectors in big experiment**

WC – CUPID (LNGS) collaboration  
Zirettino - ZIRÈ Satellite, NUSES mission.  
FCC  
N-TOF



**INVOLVED international coll's and national project (PRIN, PNRR...)**

CUPID, PADME, PRIN, FOOT, MICROPEROV, Zirettino, ASIF2, CALORINHO



**Argument of Grad and PHD thesis discussion and with undergrad group**

INSULAB, NANOcal, RDMucol, FLASHDC, MICROPEROV and other



**Week occupation fulfilled with 3 backup week (in scheduled maintenance for LINAC, BTF DAFNE services)**

BTFEH2 GAS installation (1 w +1w contingency **used**)  
BTF crane  
BTFEH2 gas safety upgrade



**STILL suffering technical limitation in:**

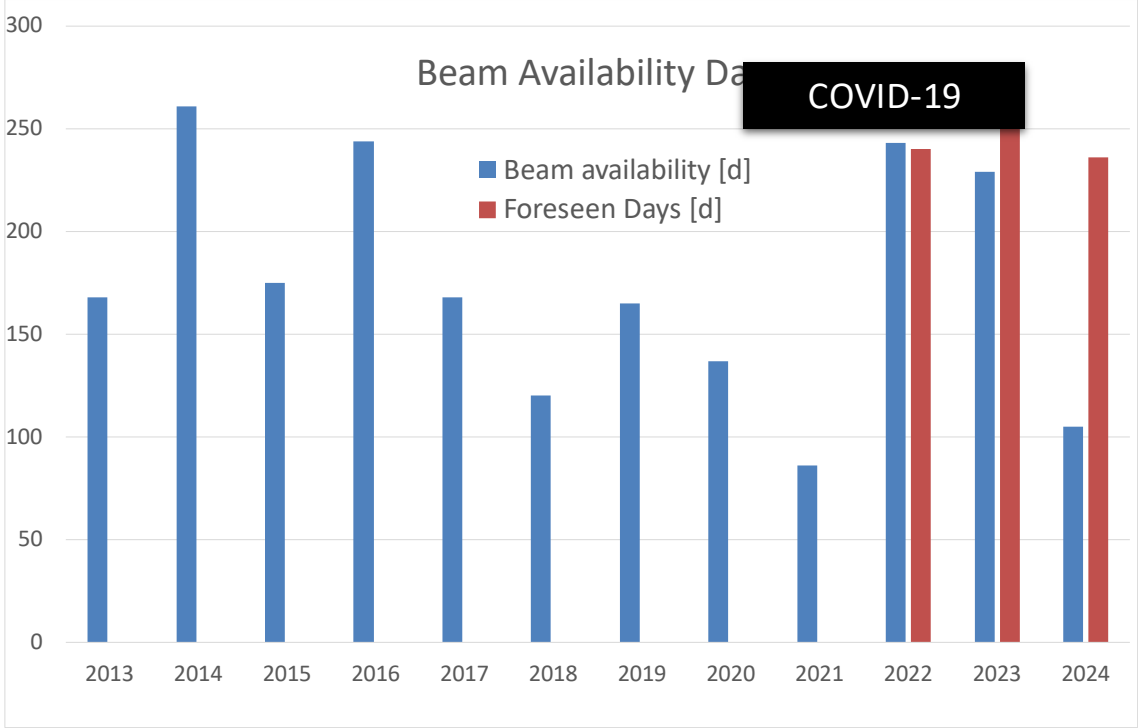
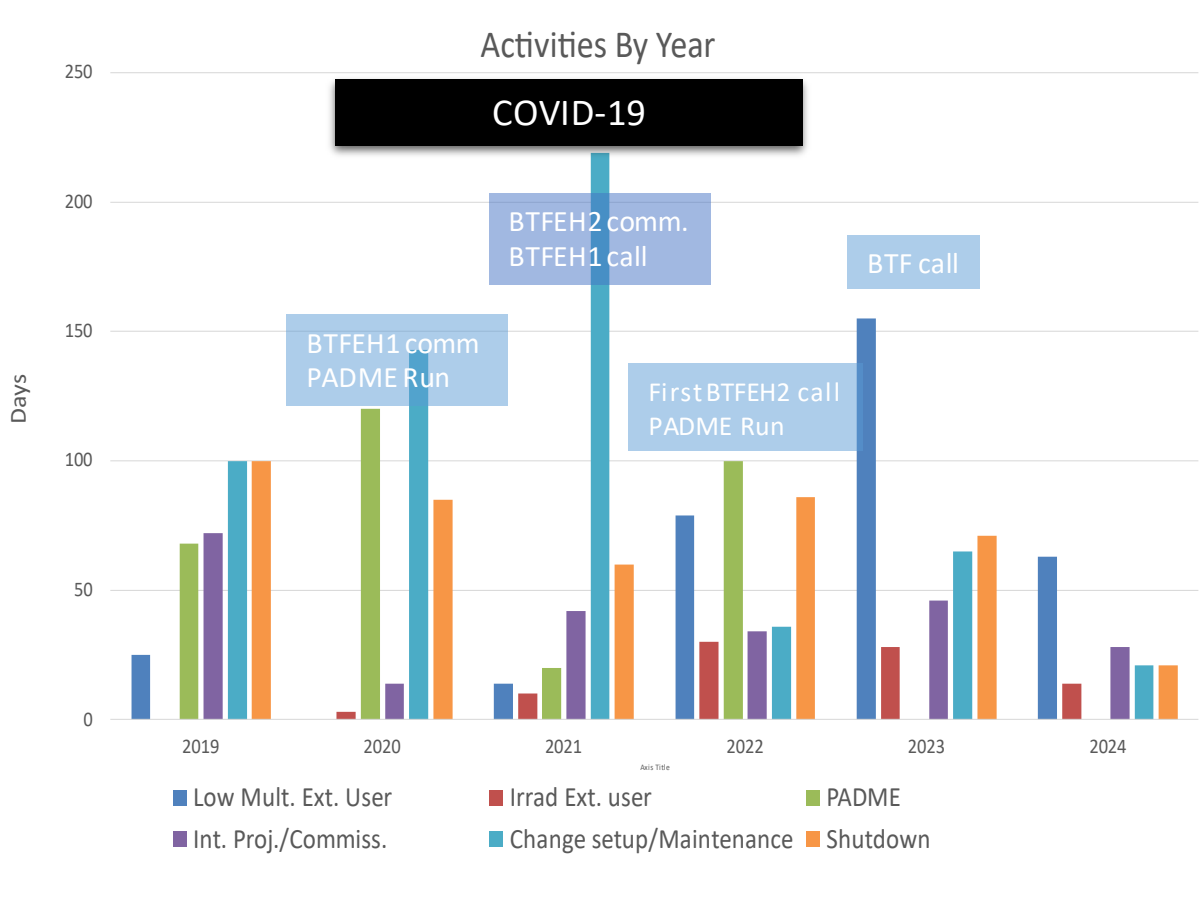
Systematic High intensity beam time: PADME installation  
Large volume experiment, BTFEH1: PADME installation

2024 Expected Beam availability days = ~240  
Shift average time = 6,5d  
Average team member number = 8



## 2019-2024 Activities

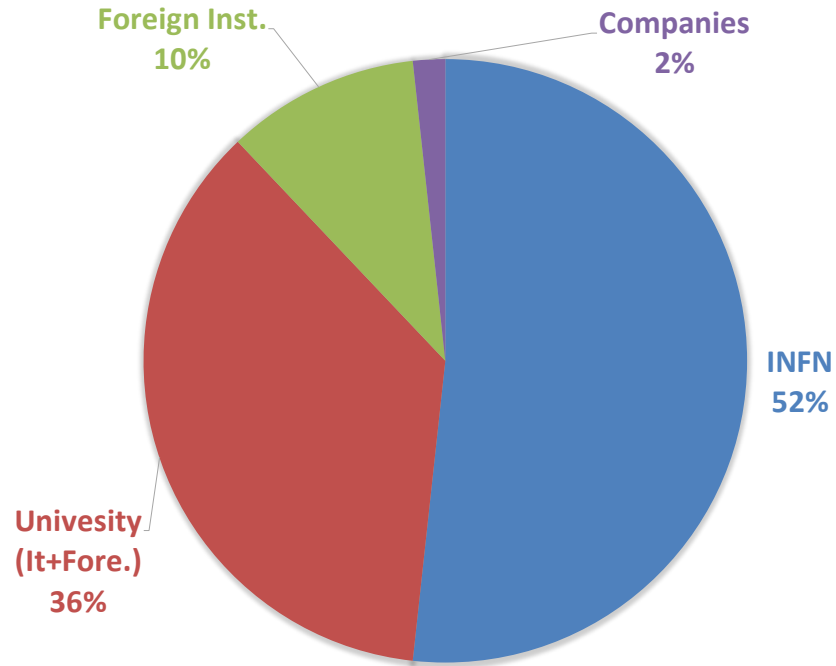
## Beam Availability Days (up to May 2024)



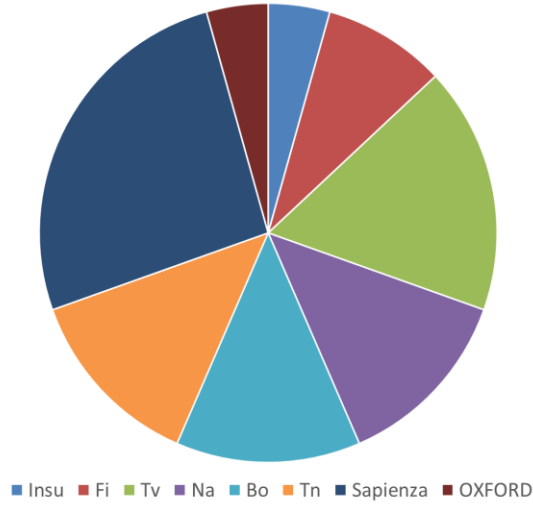
Minor fault to be reported, 2w withdrawal converted:

- in crane maintenance (stuck on 2022)
- BTFEH2 gas installation
- BTF particle type masked trigger for users
- Detector devel

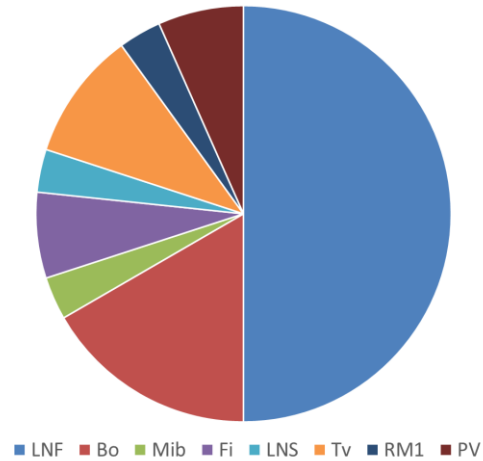
## BTF USERS - INVOLVED INSTITUTIONS



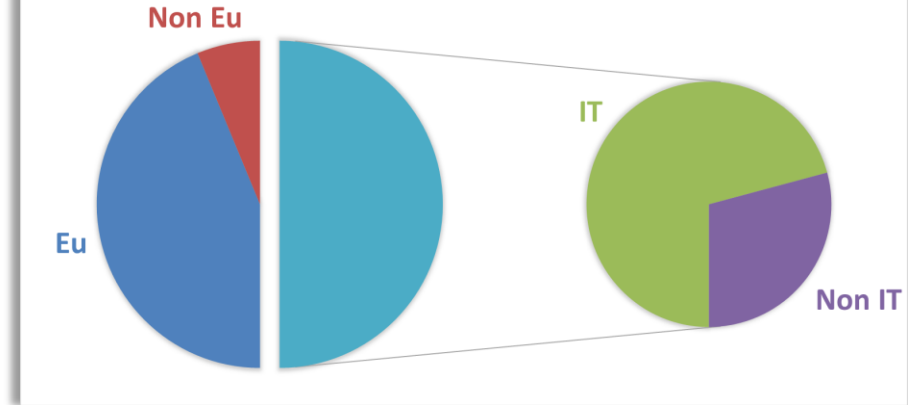
### University site - mainly involved



### INFN site - mainly involved



## REGIONAL DISTRIBUTION



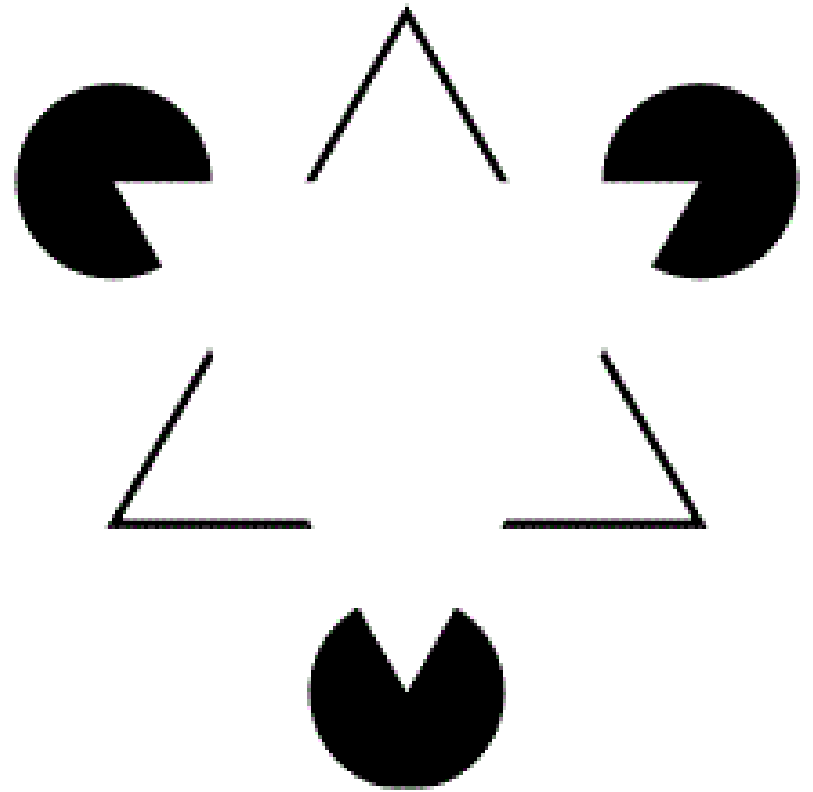


BTF Team in last six month (up to Now) has been involved as tutor, visit guide, and presenter for:

18<sup>th</sup> May 2024 LNF Open Day

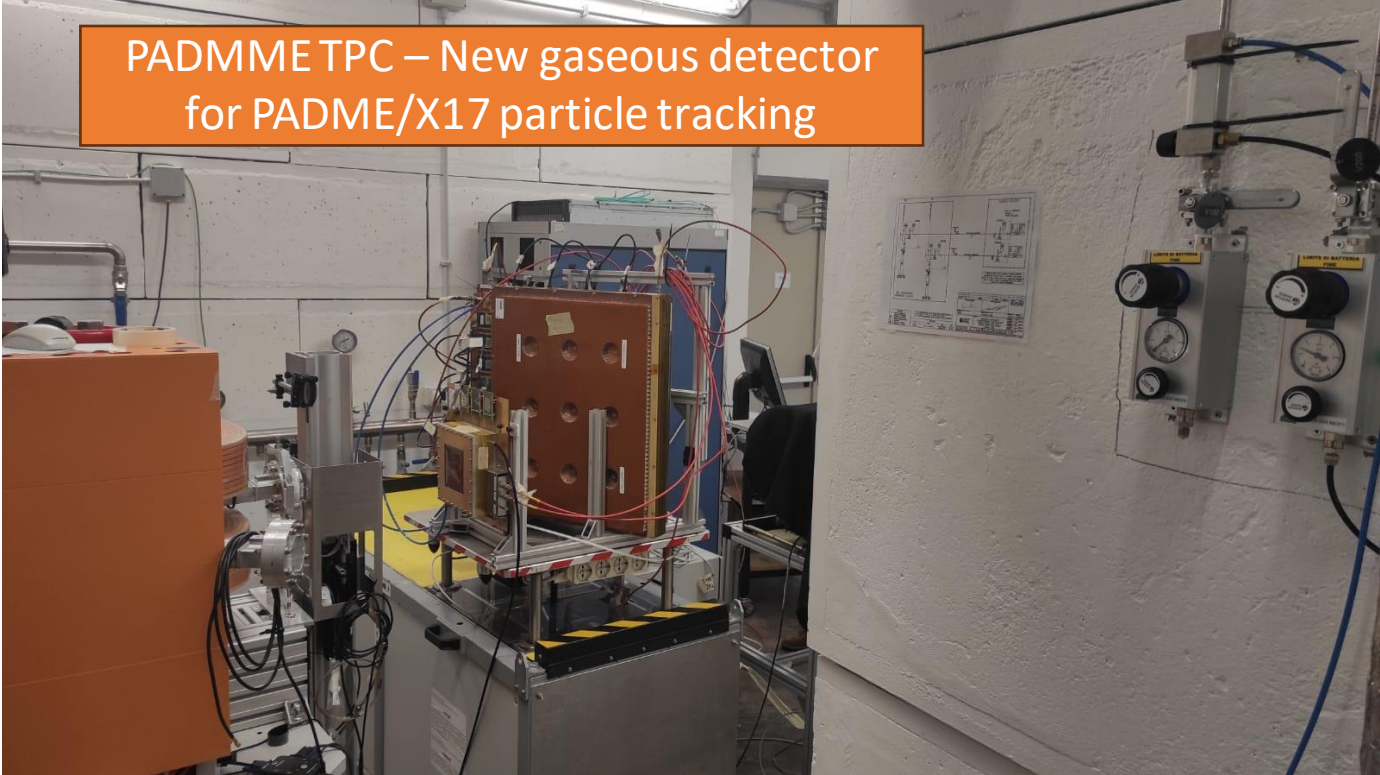
Event Type	Target	Year	Number of students/people involved
Professional tutoring	Secondary school professors	last 6 months	30
PhD tutoring	PhD Students/BTF users	last 6 months	13
Undergraduate tutoring	Post High school/University student/BTF users	last 6 months	22
LNF visit guide	University and Secondary school	last 6 months	536
PCTO (work-school join)	Upper secondary school students	last 6 months	30
Childhood/Teenager tutoring at school	Primary and Lower Secondary school students	last 6 months	267
Lab events	(INTERNATIONAL DAY OF WOMEN AND GIRLS IN SCIENCE, Open day, INSPYRE)	last 6 months	800

BTF upgrade



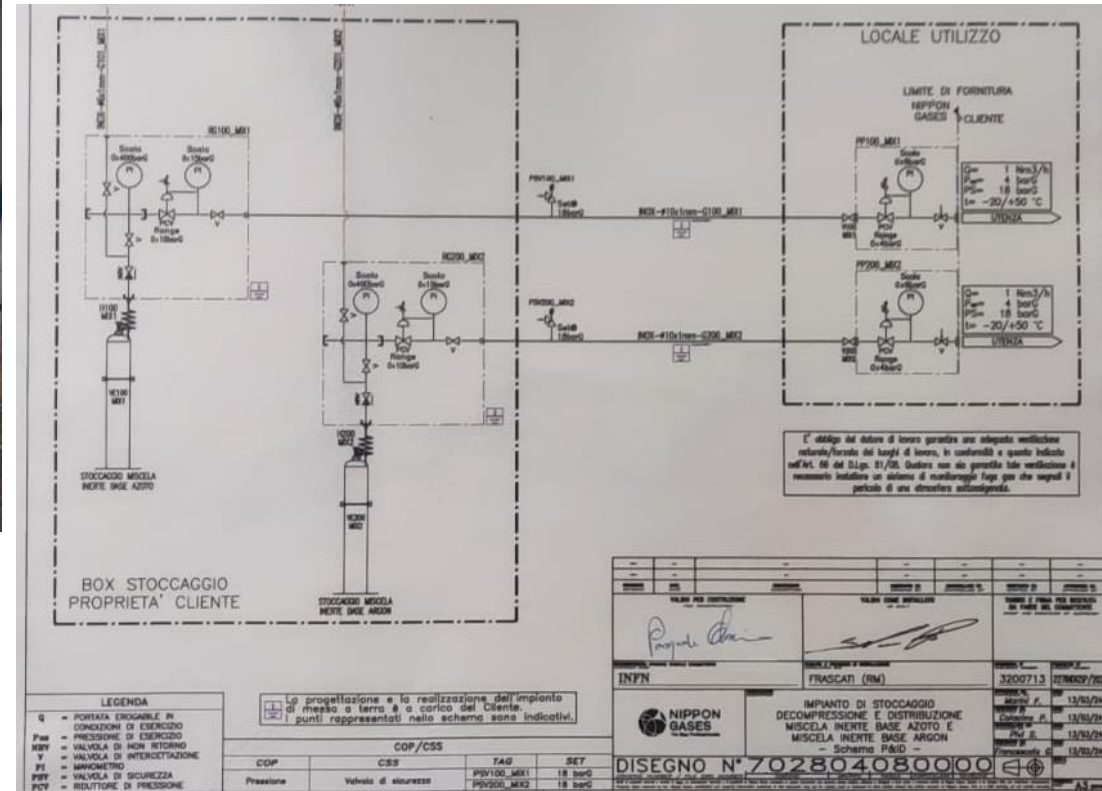
# BTFEH2 GAS FEEDING

- Installed for PADMME TPC team (M. Antonelli G. Mancini, C. Arcangeletti et al.) for developing a new TPC
- Two inert gas pipeline (N, AR, inert mixture) installed
- Installed during recovered user withdrawal



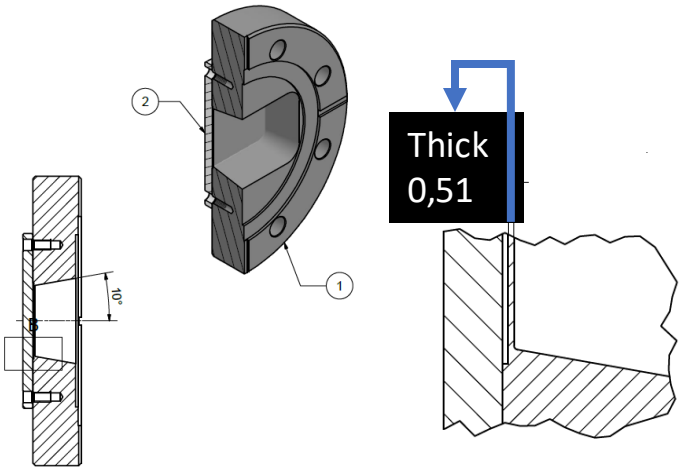
- Operative and just used
- BTFEH2 opened to gas detector community

Thanks to DR and Paola Gianotti

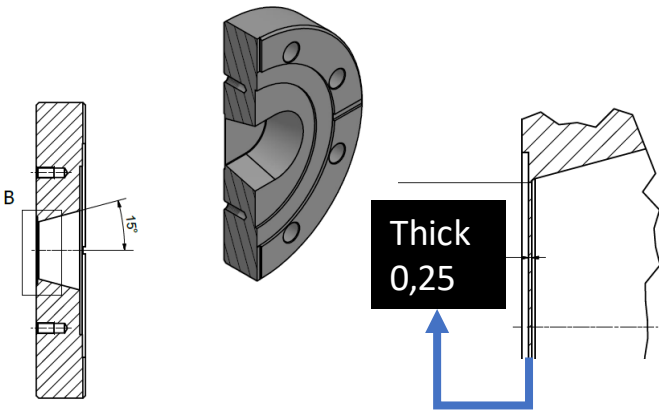


# BTF2 VACUUM WINDOWS

## DHSTB203 – BTF2 end



## DHSTB201-202



A-A (1:1)

27-28/05/2024

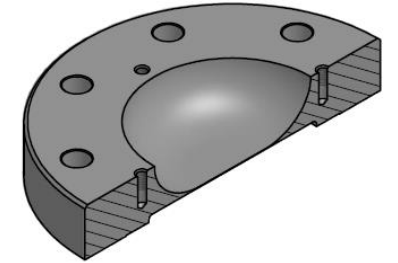
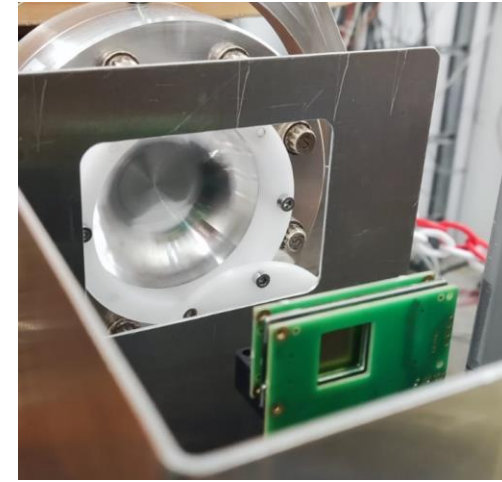
Easier beam setup operation

Developed specific tool and machining procedure to reach 100um at flat (one inch)

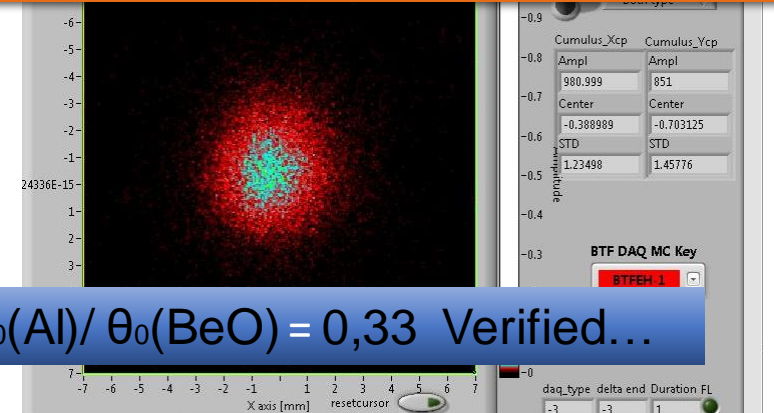
Trials with 80um -> ok but...you know

Cycle Test:  
20 cycle bar abrupt vent -> leak  $< 1.8 \times 10^{-8} \text{ mb} \cdot \text{l/s}$

	BeO	~Al
Radiation length	13,72	24.01 cm
<u>Critical energy</u>	74,86	42,7 MeV (for e <sup>-</sup> )
X/X0 in use	3,6E-3	5E-4



Low energy beam transverse improvement!  
50MeV m1, electrons ->  $\sigma_x/\sigma_y = 1,21/1,45$  [mm]

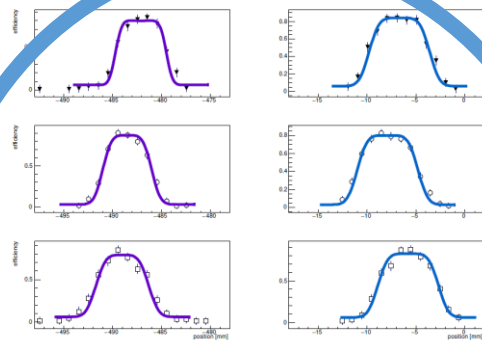
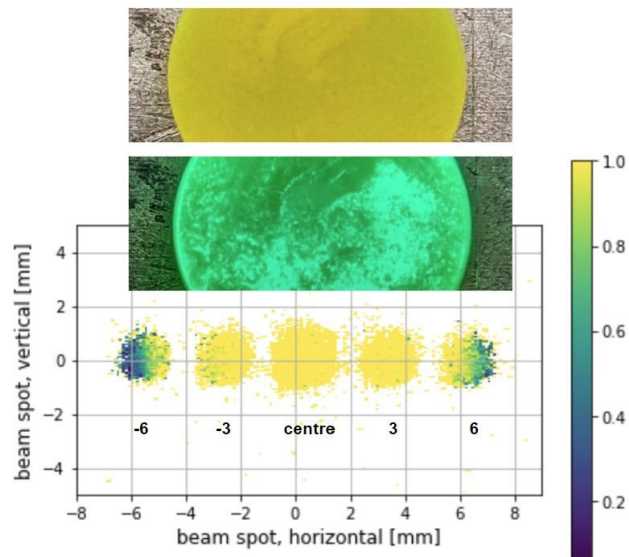


$\theta_0(\text{Al}) / \theta_0(\text{BeO}) = 0,33$  Verified...

## NANOCAL – Nano Crist Scintillator developing

(M. Soldani (LNF-INFN) et al.)

NanoCal aims to develop fine-sampling, large-volume calorimeters for next-generation experiments using innovative scintillating materials made from perovskite or chalcogenide nanocrystals in a plastic matrix to create a nanocomposite scintillator



2023 KLOE2-HET (C. Bloise et al.) 100um sensitivity sampling

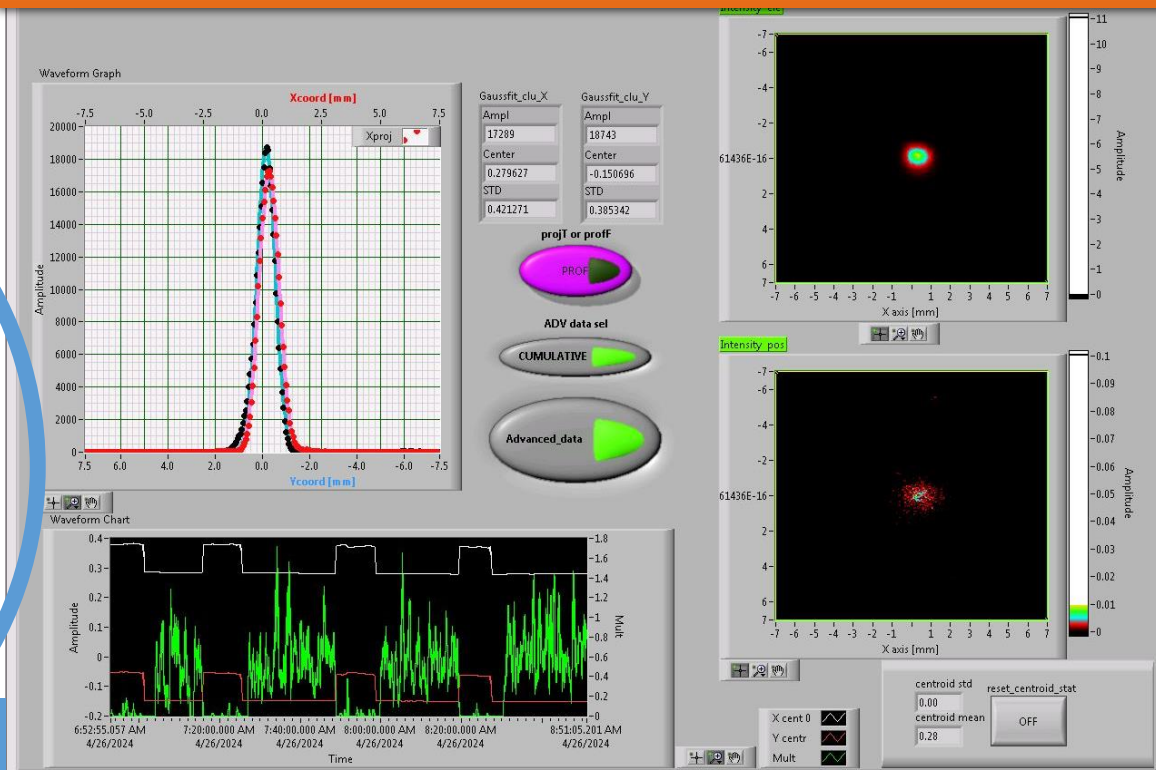
- Study charges collected by SiPM coupled with samples

BTF beam for sub mm detector spatial sensitivity reconstruction

## BTF BEAM single particle STABILITY

5 days long measure

- >600k events single particle (1 poiss=0.8)
- **3x10<sup>6</sup> TOTAL EVENTS – 15 hall entrances with full dipoles cycling**

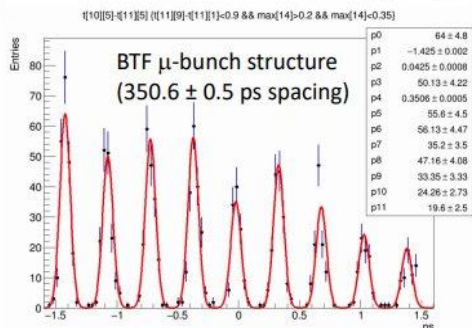
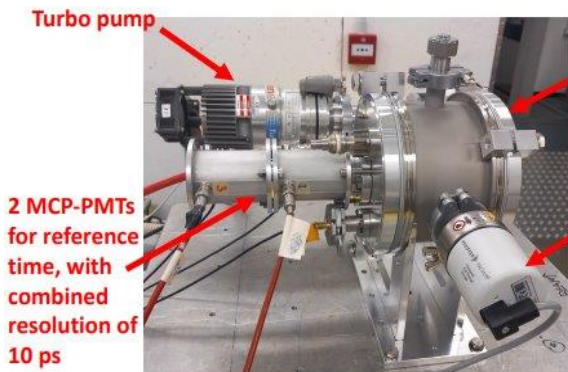
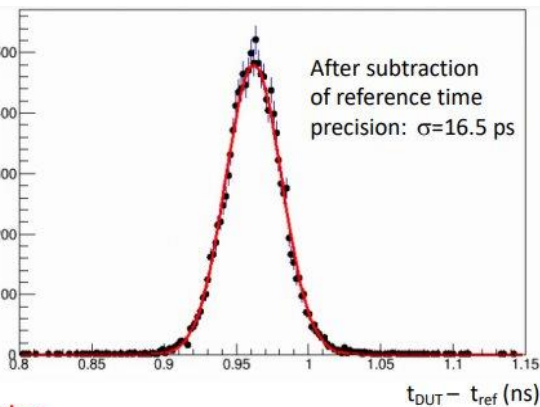
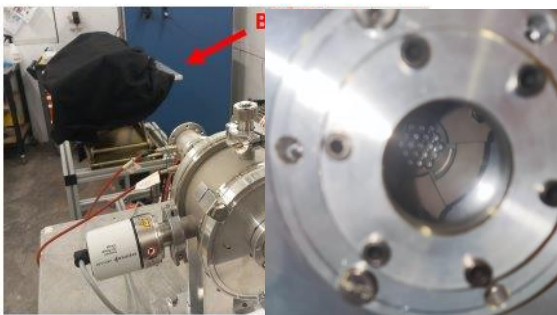


BEAM sigma is actually shot precision  
450MeV, m1, electrons

## NOVA – MPC Devel- HEP Physics

T. Spadaro (LNF-INFN), V. Vagnoni (INFN-Bo) et al.

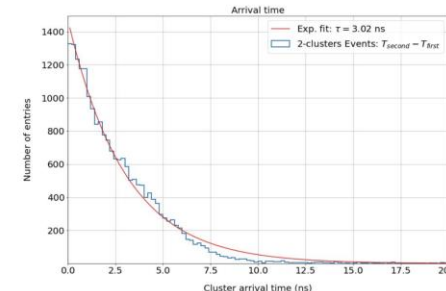
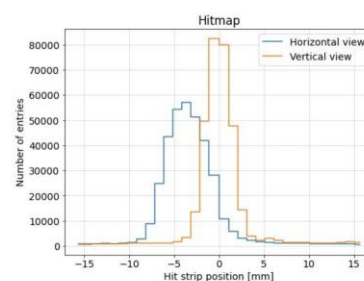
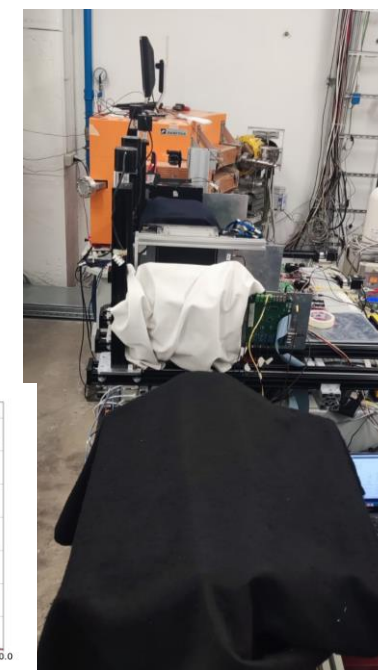
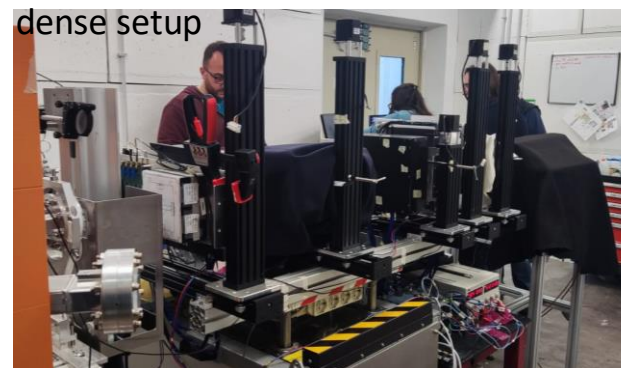
- New generation MCP detector with new anode design,
- impressive prompt  $\sigma_t \sim 16\text{ps}$



## ZIRETTINO – Fiber Tracking detect – Space and Earth Physics

N.M. Mazziotta (INFN-Ba) et al., Nuclear Instrument corp.

- Zirettino is a prototype of Ziré which is part of the **NUSES space mission** and will detect Cosmic Rays with energies from few up to hundreds of MeVs
  - Beam from 450 to 50 MeV few particles regime in a impressively dense setup



Machine measurement of LINAC bunched structure with a single particle, off energy, secondary beam (450MeV, m1, electrons)

First operative test with FTK+LYSO cubic crystals @ lower energies (different energies, m1, electrons)

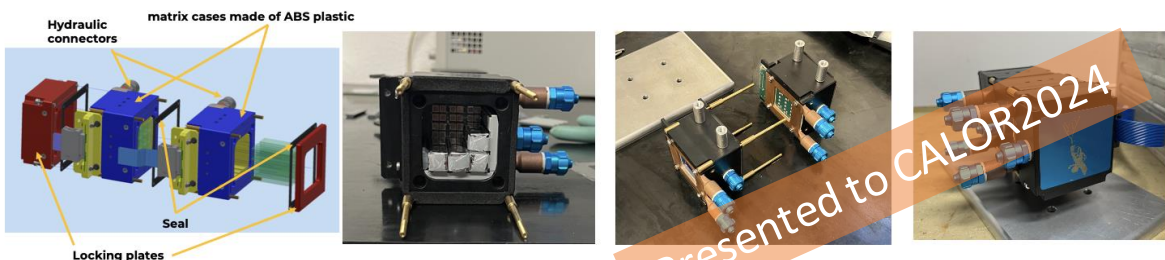


# BTF2 SINGLE PARTICLE MEASUREMENTS

## CRILIN – Muon collider detector dev - HEP Physics

I. Sarra(LNF-INFN ) et al.

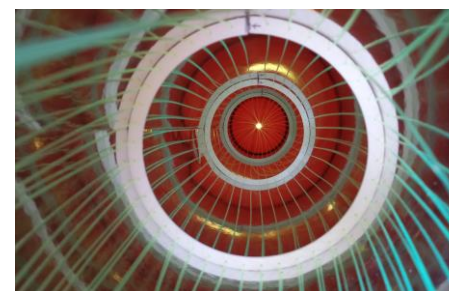
Crilin, is a **semi-homogeneous** electromagnetic calorimeter made of **Lead Fluoride Crystals (PbF<sub>2</sub>)** matrices where each crystal is readout by 2 series of 2 UV-extended surface mount **SiPMs**. It represents a valid and cheaper alternative to the W-Si Muon Collider ECAL.



## WC CUPID – CUPID (LNGS) v veto - Neutrino Physics

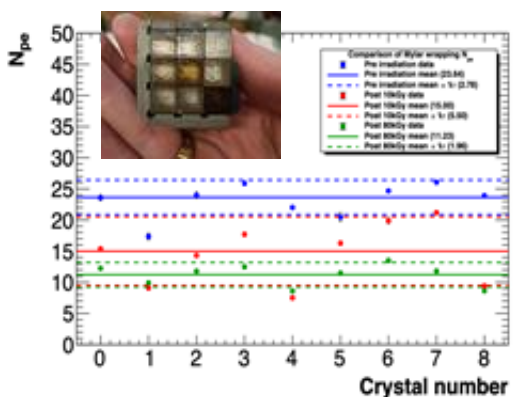
G. Mazzitelli, L. Benussi (LNF-INFN ) et al.

the idea is to construct walls using **low-cost, stacked pipes**, possibly **equipped with optical Cherenkov light sensors**, for event veto muon tagger for CUPID (LNGS).

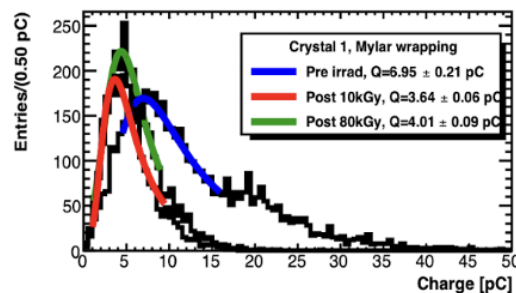


## Study of the LY loss of one layer of Proto-1 after $\gamma$ irradiation

- Beam: 450 MeV e<sup>-</sup> with multiplicity 1
- Beam centred on a different crystal at each run

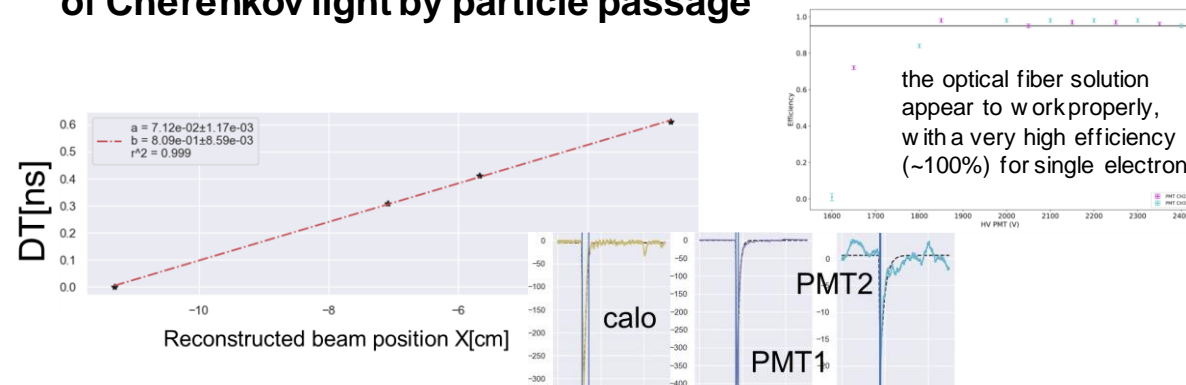


08-09/05/2023



LNF - SC 67

Water filled sewer pipes with their caps (typically 15cm in diameter) with PMTs and SIPM longitudinal fiber readout. TOF reconstruction of Cherenkov light by particle passage



17

# BTF LOW ENERGY BEAMS

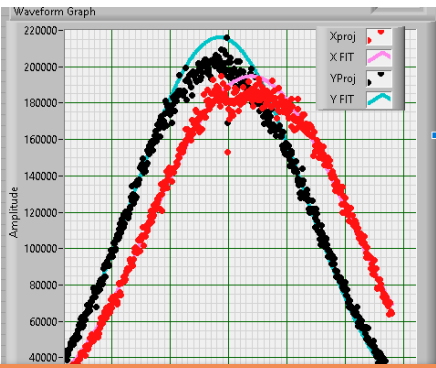
FCC – PCUBE injector (P. Craievich, G.L. Orlandi, R. Zennaro – PSI)  
N – TOF (G. Claps et al. ENEA)

PSI asking low energy beam

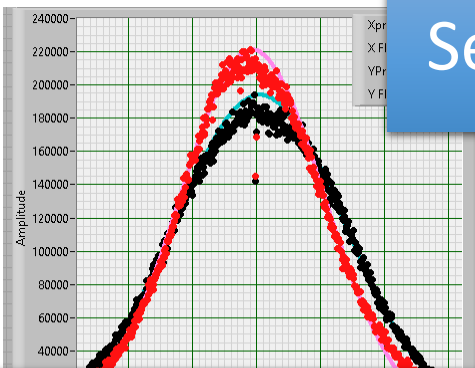
- for beam diagnostics
- MAX mult vs best transverse ( best high flux)
- Used New QUAD TPX3 Hybrid with 100um thickness w Katherine readout (developed with ENEA N-TOF group)

## Secondary e- Long focus

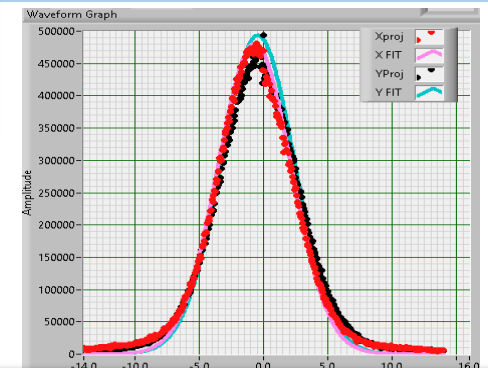
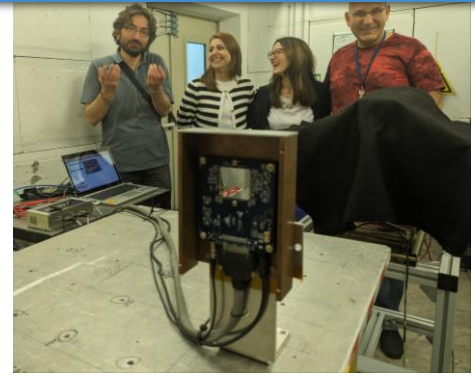
thanks to new vacuum window



25MeV – m=2,5K  
 $\sigma_x/\sigma_y=8,4/7,3$ [mm]

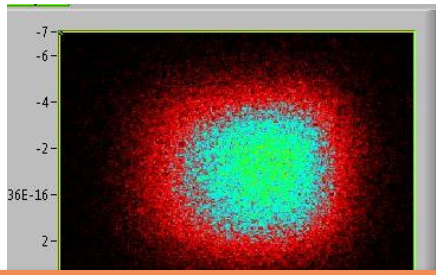


50MeV – m=5K  
 $\sigma_x/\sigma_y=5,5/6,5$ [mm]

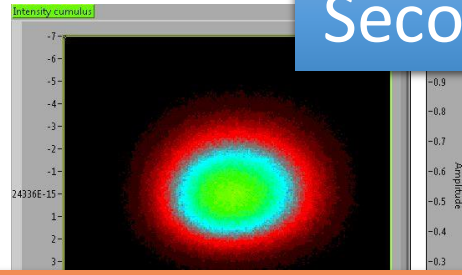


100MeV – m=6K  
 $\sigma_x/\sigma_y=2,8/2,8$ [mm]

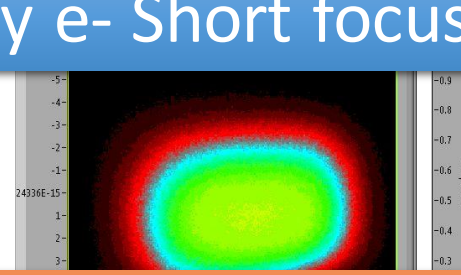
## Secondary e- Short focus



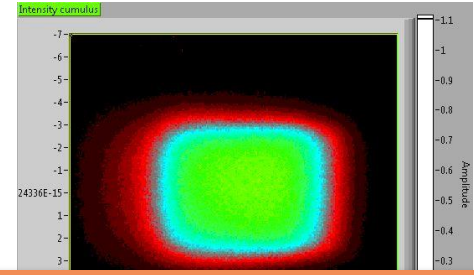
25MeV – m=1K  
 $\sigma_x/\sigma_y=2,5/2,4$ [mm]



50MeV – m=5K  
 $\sigma_x/\sigma_y=2,3/1,7$ [mm]



75MeV – m=18K  
 $\sigma_x/\sigma_y=3,2/2,3$ [mm]



100MeV – m=30K  
 $\sigma_x/\sigma_y=3,2/2,3$ [mm]

# BTF RUNS FLASH VHEE REGIME

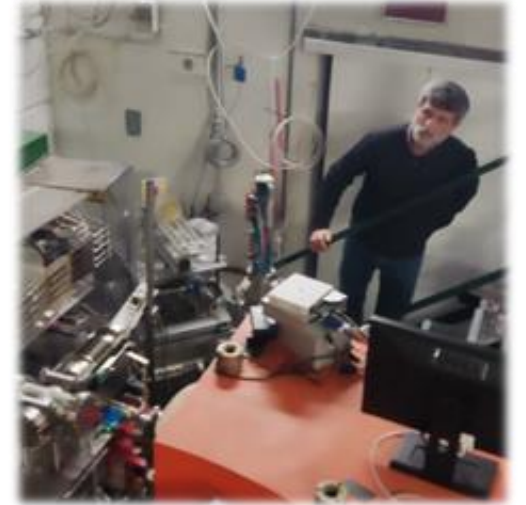
## FLASH Effect in Radiotherapy :

**Foreseen Therapeutical Advantages:** spares healthy tissues while maintaining therapeutic efficacy.

**Experimental Verification:** Mostly in-vivo with low energy (4-7 MeV) electrons, delivering doses in less than 100 ms at rates over 40 Gy/s.

**Requirements:** Further basic research and advanced technological solutions.

=> **Paradigm Shift in Radiotherapy:** evidence suggests a potential use of the FLASH effect.



Following SIR meeting in winter  
Thanks to V.Patera for the scientific liaison

## • Research Focus:

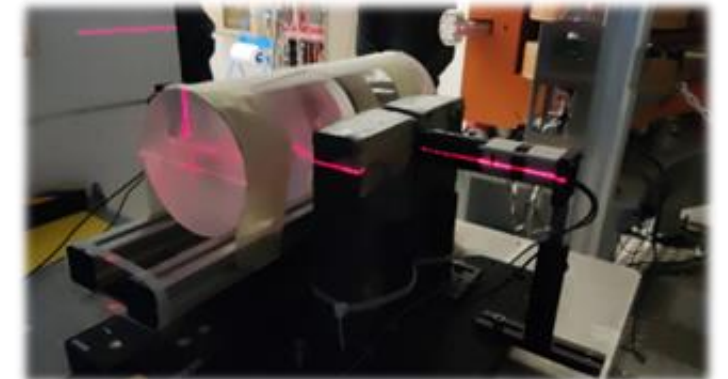
**VHEE FLASH LINAC:** Aiming to treat deep-seated tumors with Very High Energy Electrons (50-200 MeV).

## • Scientific Needs explored in BTF:

**Control Imaging Systems - MORSEPET**

**Certified dosimetry in FLASH regime – DIAMONDS for VHEE**

**New beam charge measurement in air – FLASHDC**

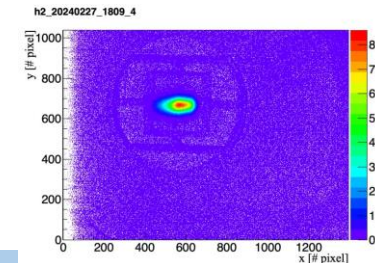
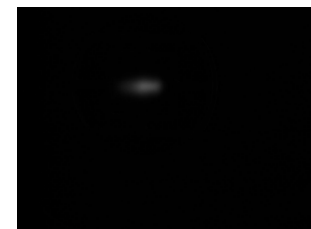


# BTF RUNS FLASH VHEE

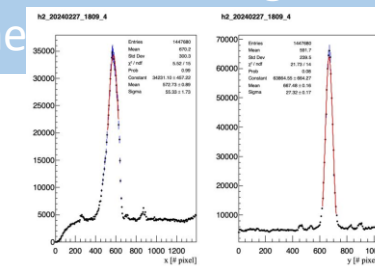
**DIAMONDS for VHEE – new dosimetry standard - Medical Physics**

M. Marinelli, G. Rinati(Uni Roma TV), L. Palumbo, L. Giuliani (Uni Sapienza)

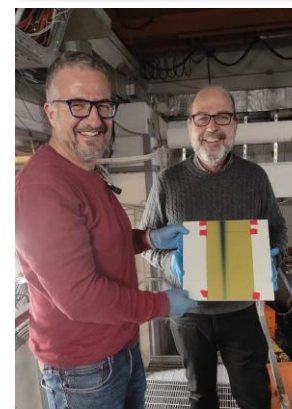
Dose measurement at high energy in FLASH regime, measure with Synthetic diamond based Schottky diodes operated at zero bias voltage



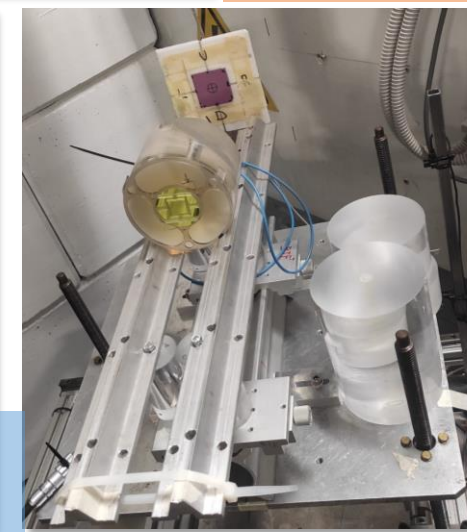
BTF triggered cams on Nd:YAG flags, in optical lock in regime



Flag holder refactoring from T. Napolitano (LNF SPCM)



Shower n.1  
510MeV, m1E9

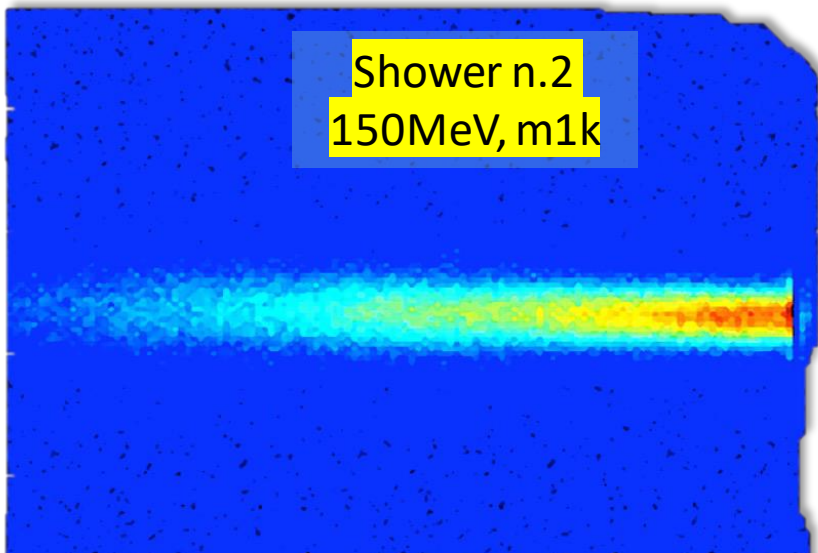


510MeV electrons primary beam, shot by shot dose measurement  
Reproducing ELMA shower dose release in PMMA in different depths  
Diamond active dose comparison with EBT3 GAFCHROMIC film  
**FIRST TRIAL ever MADE!!!**

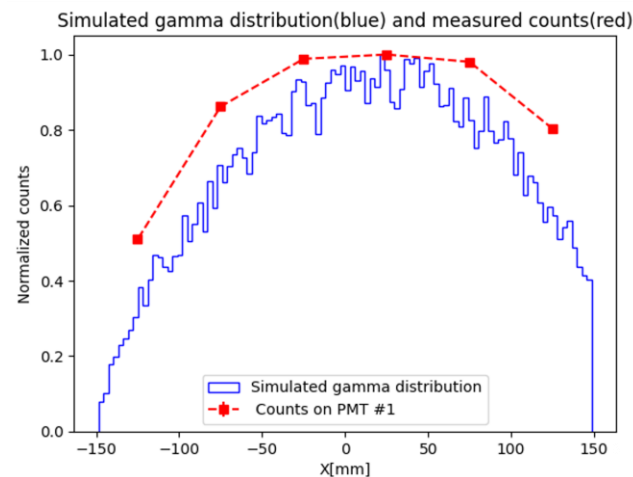
## MORSEPET – Dose monitoring in real time - Medical Physics

(M.G Bisogni et al. – Univ. Pisa)

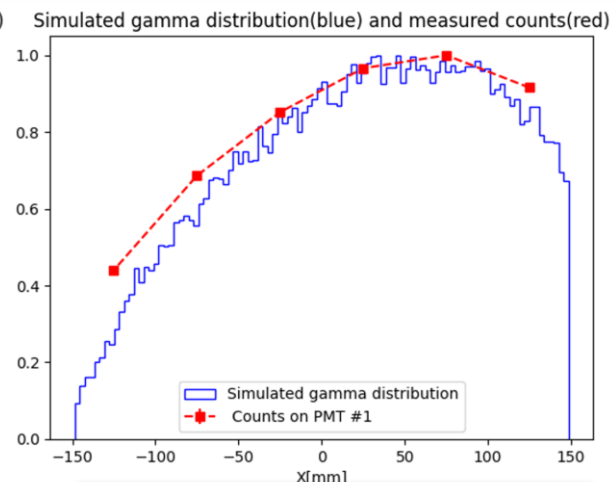
a novel method to verify the dose delivered to a tissue or a phantom by a VHEE beam based on the detection of the Breemstrahlung radiation emitted by the beam while crossing the tissue/phantom



150MeV electrons secondary beam, m=1k, **single shot**  
EJ212 plastic scintillator foil parallel to the beam direction  
Cooled CCD camera to collect emitted peaked blue light

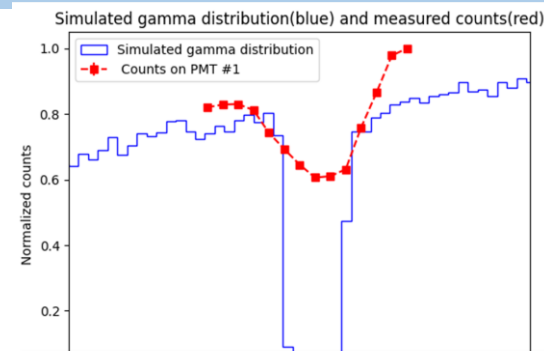


80MeV electrons secondary  
m=1k, single shot, PMMA bulk

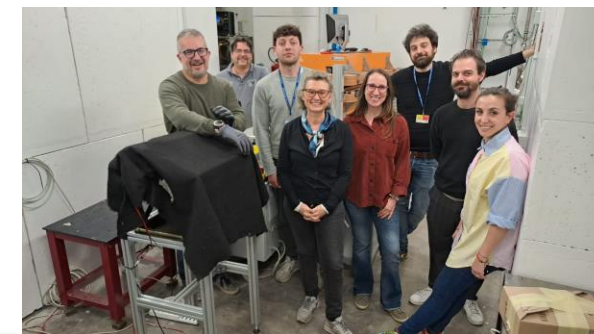


150MeV electrons secondary  
m=1k, single shot PMMA bulk

Demonstrated the feasibility of in vivo measuring the dose in a phantom irradiated with a VHEE beam with a secondary 150MeV, 80 MeV beam

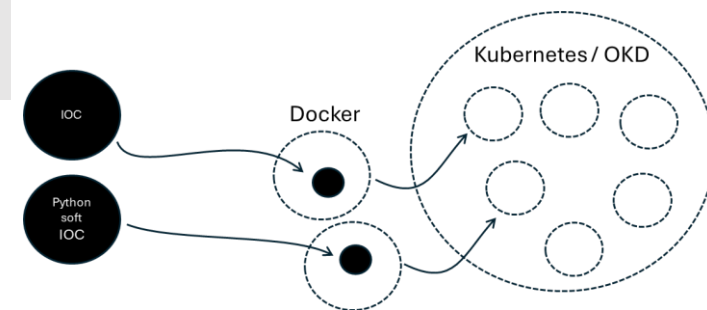


150MeV electrons secondary  
m=1k, single shot, PMMA hollow



# BTF NEW DCS DEVELOPING – EPIK8S

- BTF was fundamental for !CHAOS developing (still in use) starting from 2011
- New standard with EPIX8S standard
- For EUPRAXIA and ELI-NP DCS implementation
- EPICS based **but huge improvement in cutting-edge technologies for systems management** (dockerization and orchestration, even on the cloud) **and tools for users** derived from !CHAOS development

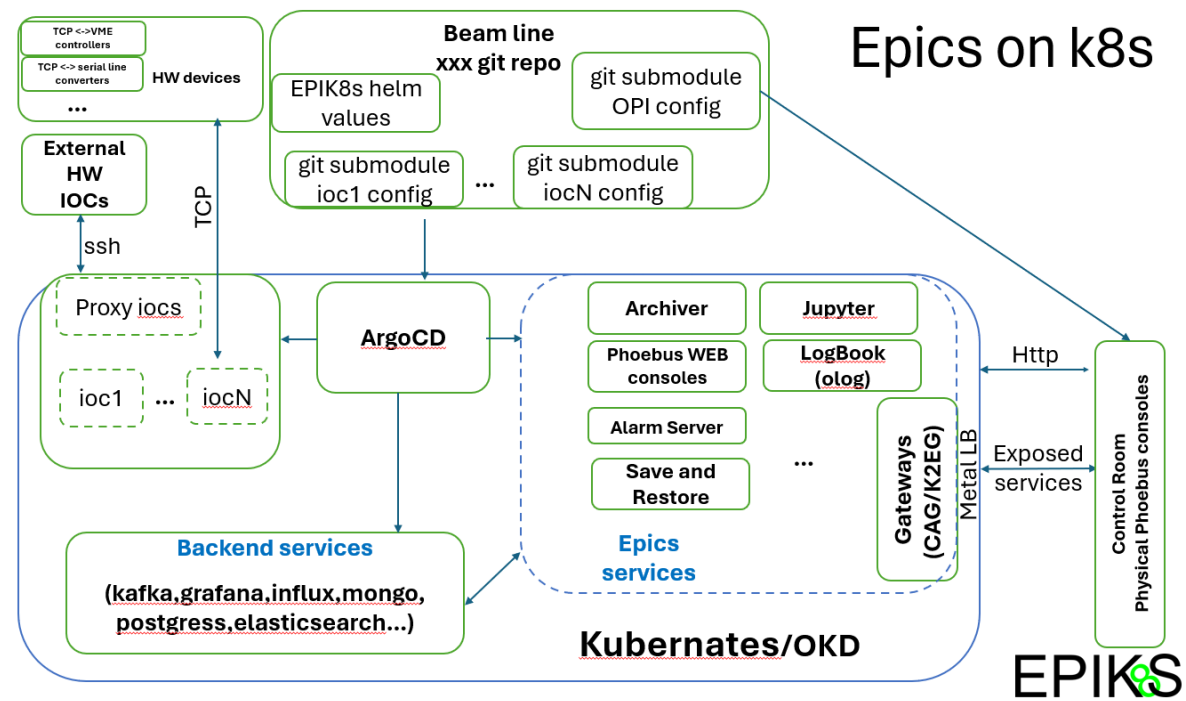


## Current tests on:

- MAGNET, ✓
- MOTOR (scrapers), DLY
- TRIGGERED CAMS (flags) ✓

## Foreseen develop for BTF needs:

- post run data sharing with users,
- ELOG with online data display,
- high level routine implementation commonly used software and IDE (PYTHON, Jupiter, LabView, ROOT...) using real time machine PV



## ELSE Ionization chamber – Dose monitoring in real time – Beam Diagnostic

(ELSE company – Busto Arsizio IT, PoLiMi)

Testing IC with more than 9 order of magnitude dynamical range

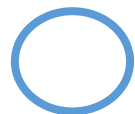
Good for overlapping BTF shot by shot charge and fluence measurements:

- “machine diagnostics” (ICTs, FC, flags optical readout reconstruction) ( $10^7$ ,  $10^{10}$ ) [p/shot]
- “scientific detectors” (CALOBTF, counting pixels...) ( $10^5 \rightarrow 10^0$ )

Extending the measurement range in BTF high intensity configuration with primary beam down to very low multiplicity

**NDA TTD\_24LNF\_041 on the run with INFN Tech Transfer service**

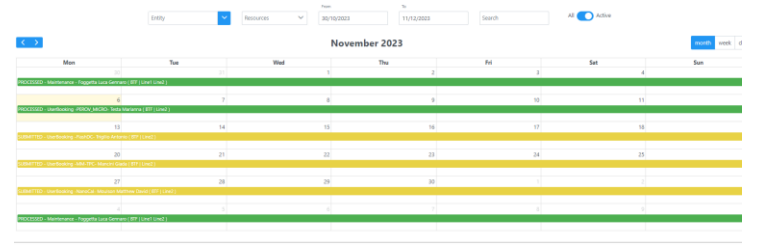
**Many thanks to M. Cestelli Guidi, I. Giammarioli and all the TT group**



Booking BTF: BTF booking management software based on an automated approval workflow software. **Call management.**

## INFN LNF developing Beam Test Facility(BTF)

- **More than one year of continuous operation**
- Few bugs in the first two months (only losing some user shifts display on UI but the automation worked well)
- Weekly, last-minute shift, renunciation or rebooking
- > 300 users in automated managed shift (weekly based) up to now



**Tech note**  
<https://www.openaccessrepository.it/record/143679>

## DAΦNE-L Facility

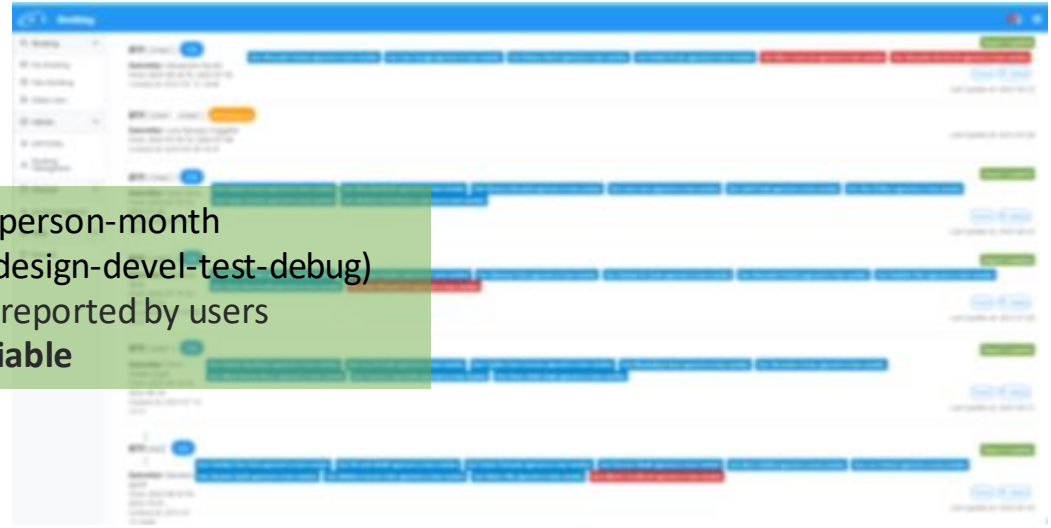
- **In final developing**, test started
- Many lines, authoritative beam line scientist and PAC approval
- Daily opportunity fast entrance and scheduled shifts

Hard to reach but could be a widely use new standard.  
~ 300 users has been managed (by this LNF app and staff)

## INFN-LABEC developing

- **Released** few month ago
- Collaboration born on INFN-A
- Similar aim (internal or users management)
- Many lines: 5 for TANDEM facility

Typical developing time ~3 person-month  
(full customization, design-devel-test-debug)  
Definitely simple to use, as reported by users  
**IT infrastructure seems reliable**



Developed G. L. Napoleoni (LNF Computing Center, main dev.), R. Orrú, M. Tota  
BTF group and LNF Secretariats (and bug-finder group):

- AD-Secretariats (M.R. Ferrazza, G. Vinicola, V. Rosicarelli)
- Personnel-Secretariats (G. Dalla Vecchia, F. Triolo, L. Occidente, A. Mininni)



# BTF Projects

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The proposal is initiated in INFN-A environment to establish an internal INFN network connecting IRRAD facilities that are dedicated to external users.

This proposal is founded on a shared request for abstraction and synergy among the numerous scientific, technological, and technical management experiences of irrad facilities across the national territory and under the management of INFN.

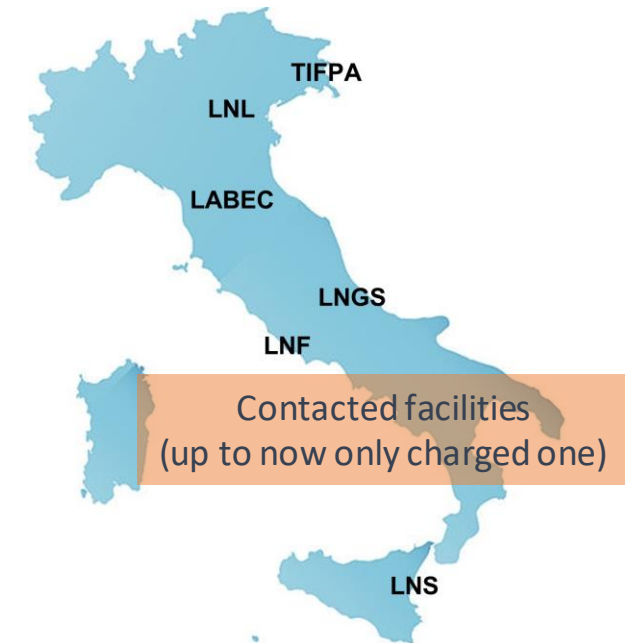
Single and independent way of working

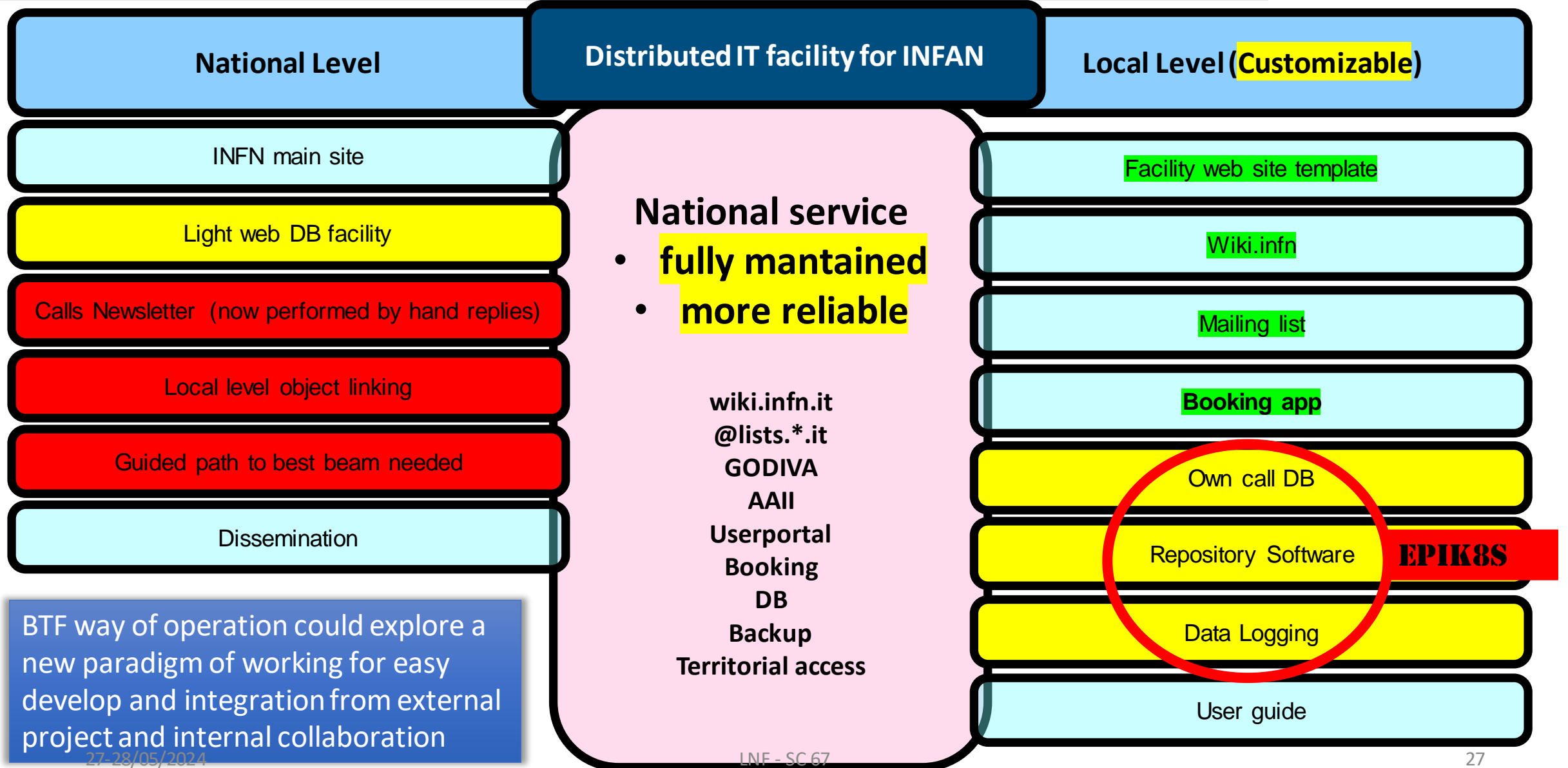
VS

Collaborative win-win approach

## AIMS

- **INTERNAL NETWORK:** Establish an internal network within INFN for scientific, technological, technical, and infrastructure exchange between irrad facilities for mutual operational benefit.
- **GENERALIZED INFRASTRUCTURE with NATIONAL SERVICES:** Utilize a generalized infrastructure based on national services that includes information, beam time calls, and access procedures to INFN irrad facilities for scientific and third-mission purposes, while respecting the usage norms and local customs of the facilities, which will integrate into an abstract IT infrastructure.
- **COMMON FUNDING:** the collection of funds to implement innovative and experimental operational solutions (e.g., detectors, hardware and software infrastructure) of shared ownership and common use, as well as to support and implement the network itself.





BTF way of operation could explore a new paradigm of working for easy develop and integration from external project and internal collaboration

27-28/05/2024

- **PNRR - Rome Technopole**
  - funding LINACSERVICE **1.2 FTE** (Buonomo, Cardelli, Di Giulio)
- **ASIF 2 – just discussed, ready to take off**
  - **0.6 FTE** involved Buonomo Foggetta Strabioli)
  - ~100K/2 years for BTF irradiation equipment and procedure developing
- **EUROLABS**
  - 86k, up to 2026
  - Needs thrust

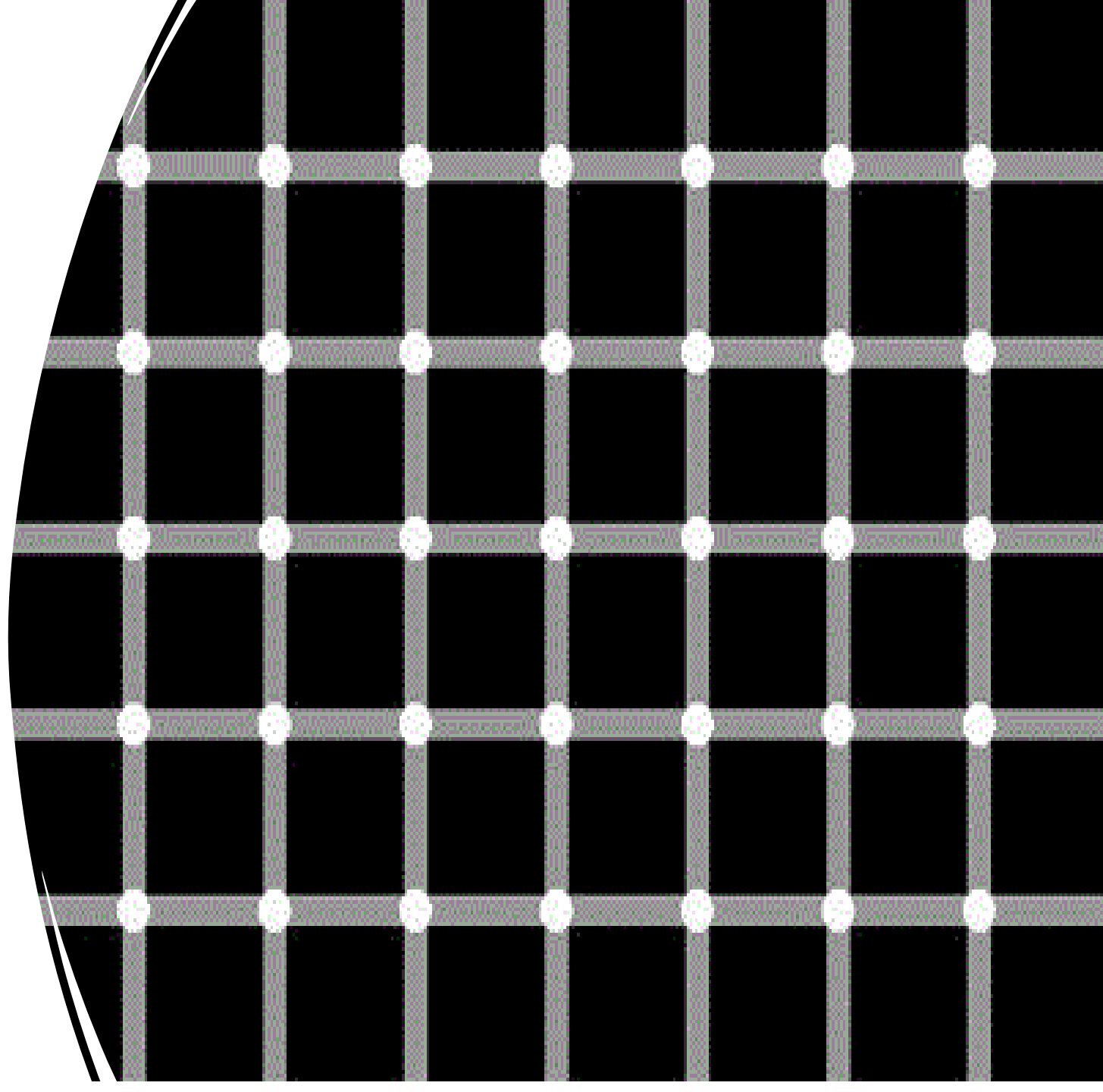


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## Project/users want to involve LINAC/BTF for long term collaboration

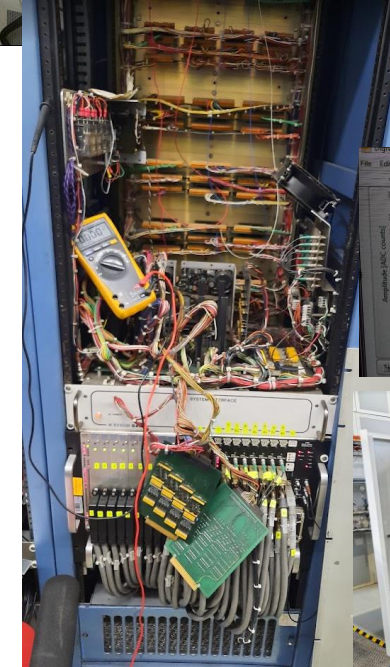
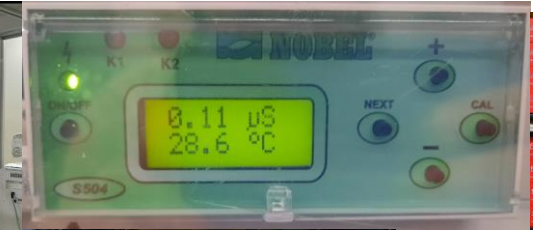
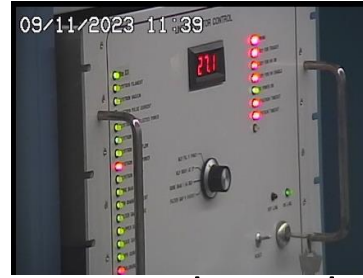
- Long term plan could help
- Funding
- People

LINAC

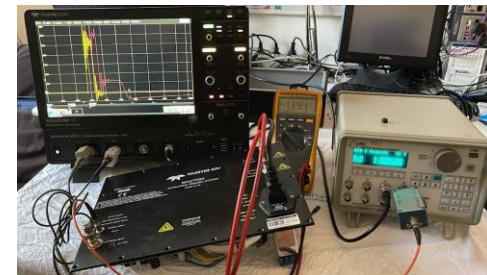


# Fault and activities 2023/2024

- 09/11/2023 fault on solenoids power supply on mod A. 1 day stop
- **Safety installation** at STAR Nov 2023:
- Conductibility measurements system upgrade Dic 2023 on DAFNE LINAC with **Fluids Services**.
- New BTF Steering power supply 22 Dic 2023 -> **Magnet Service**
- Installation of BTF e-/e+ signal Jan 2024 Thanks to
- Commissioning of new LINAC signal digitizer. **Jan 2024**
- **Upgrade of TEX IGBTs** Jan 2024
- Fault on mod A Fuses and Thyatron trigger **Febr 2024**
- **Changing tuning system** in k400 TEX modulator.
- Fault on Secondary Water system **4-6 March 2024**
- Fault on Kly A LLRF **April 2024**
- FAT @ Scandinova for X band and C band RF 400 Hz sources May 2024.
- KlyB conditioning for internal discharge May 2024



Thanks to C. Di Giulio

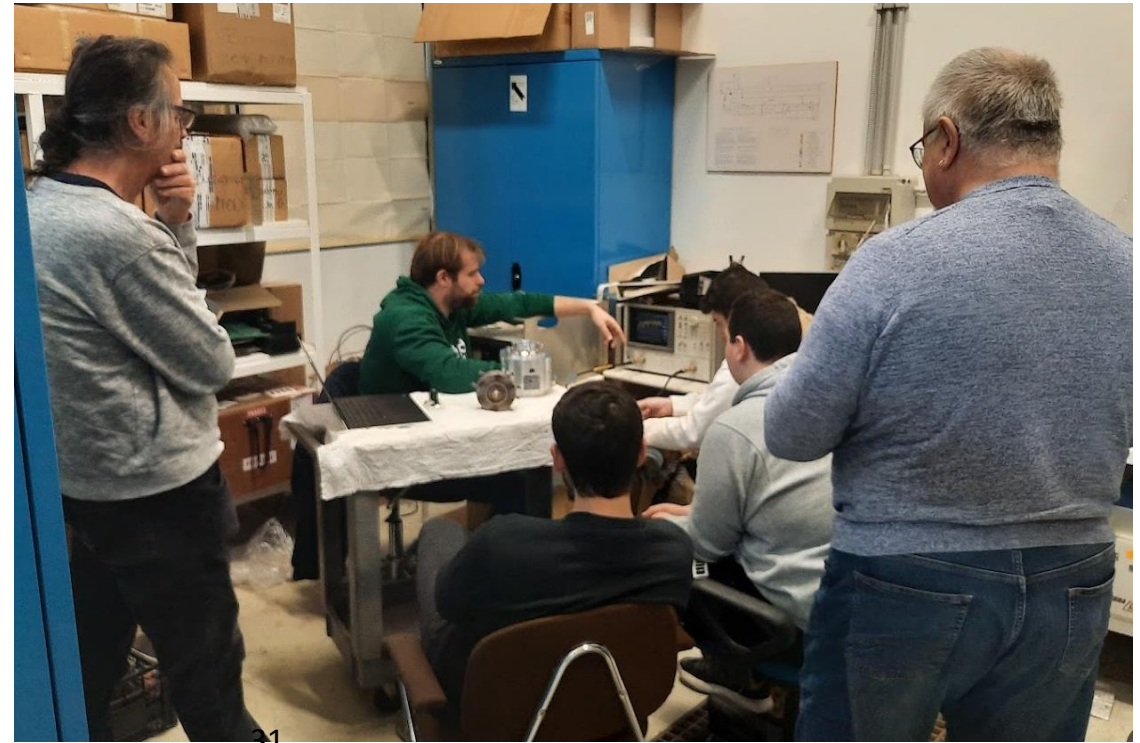
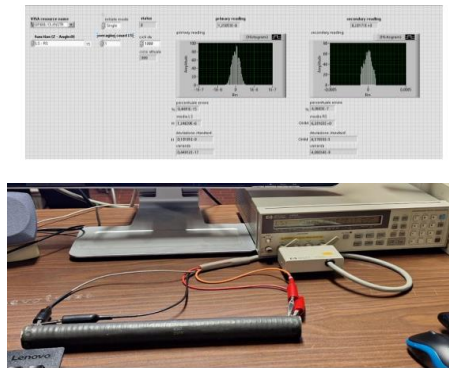
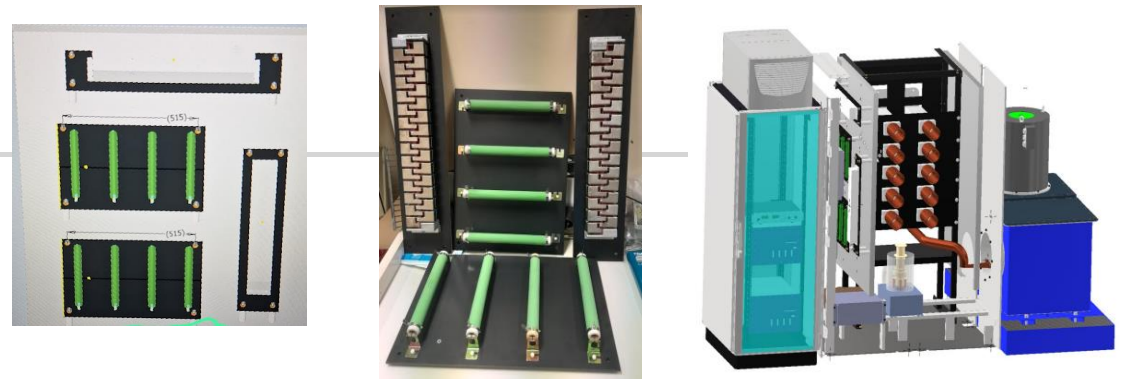


# Training activities:

RF Network Analyzer LabView interface and Calibration

LCR Meter LabView Interface and components tests (L,C,R)

CAD 3D model of building modulator.



27-28/05/2024

LNF - SC 67

# Summary on next upgrades and schedule

- LINAC fire protection upgrade (15<sup>th</sup> July-> September 2024, 2w+1)
- Access control upgrade ( 15<sup>th</sup> July-> September 2024, 2w+1)
- Measurement of LINAC element positions for LINAC simulation (15<sup>th</sup> July -> 9<sup>th</sup> September, 2w+1)
  - DA people involved for long pulse simulation

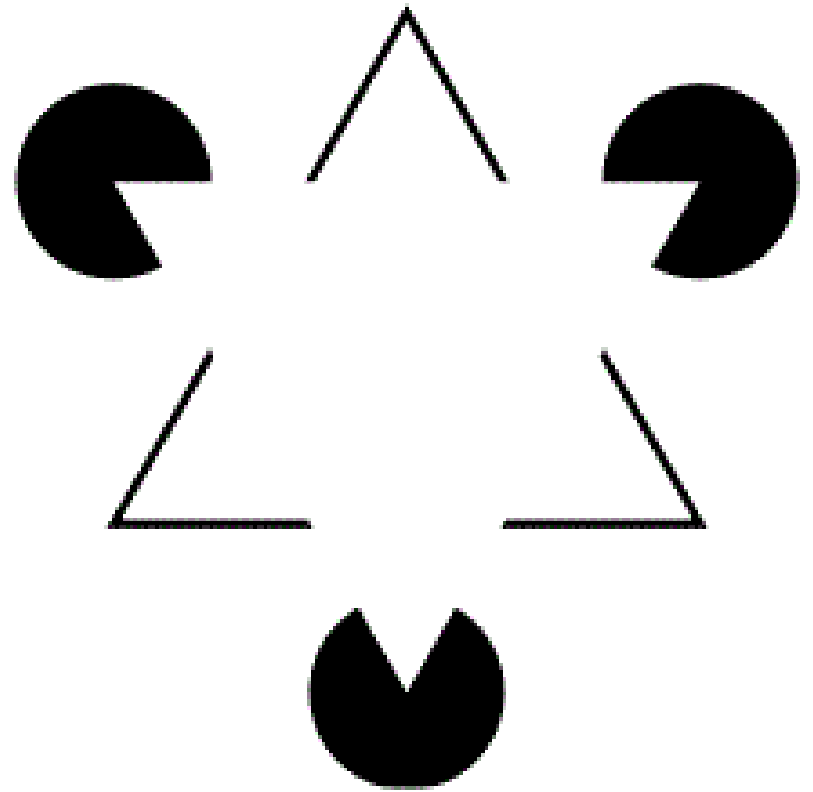
**Expected LINAC start up (16-23) September 2024**

**→ Safety check after (2 days)**

**Then BTF beam trials and calibrations (1w) (up to 30 Sep)**



Discussion



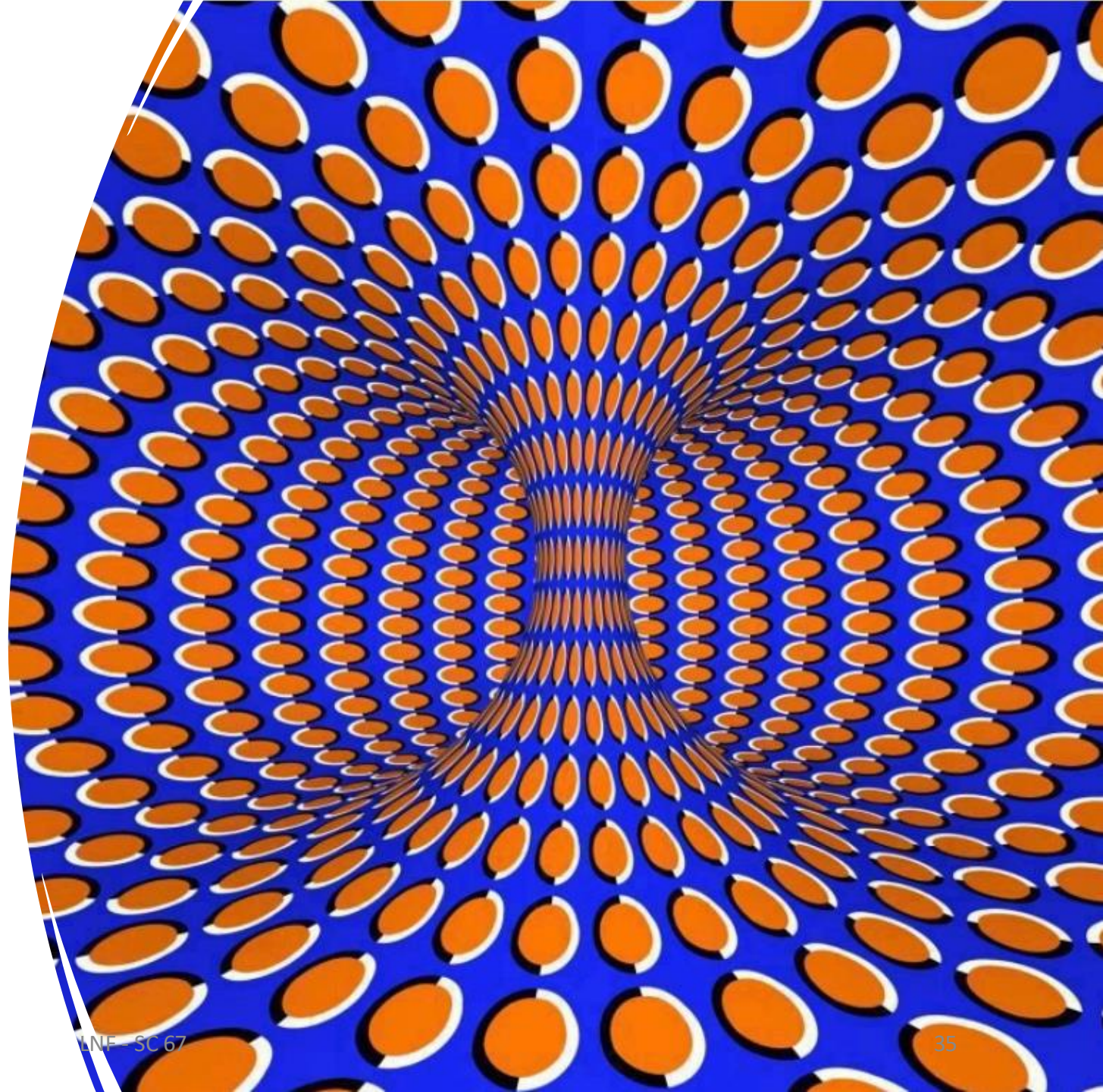
- BTF calls for beam time **closed successfully**
  - Beamtime smoothly runs for 2024 H1 up to 15<sup>th</sup> July
  - Soon opening mixed call for 2024 Q4
- **Wide scientific area** covered from external users
  - VHEE FLASH community interest born, medical physics
  - HEP the higher
  - Space related project
- LINAC/BTF team mainly involved in 2023 for DAΦNE and BTF operations, TEX, SPARCLAB, Rome Technopole
- New project born, in discussion or raising attention
  - **FIREBALL**, (B. Bingham RAL, G. Gregori Oxford Univ.) **next talk**
  - FLASHMOB seems in a good shape, ready to submission
  - ASIF-2
  - EUROLABS

LINAC/BTF results have to be shared with **all the LNF people involved**

- DT and DA services, secretariats and administrations
- Especially the DAΦNE operators

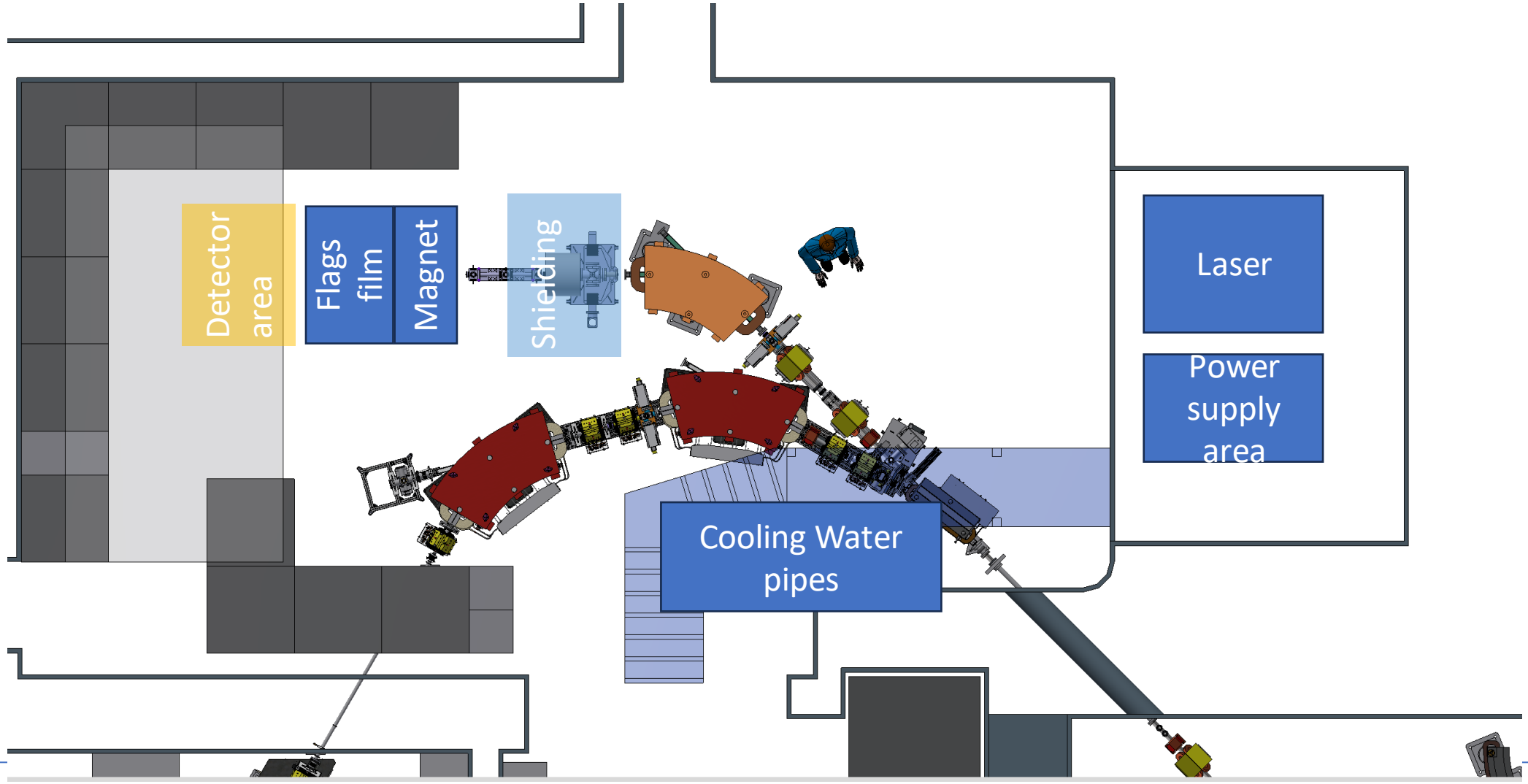
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# SPARE SLIDE

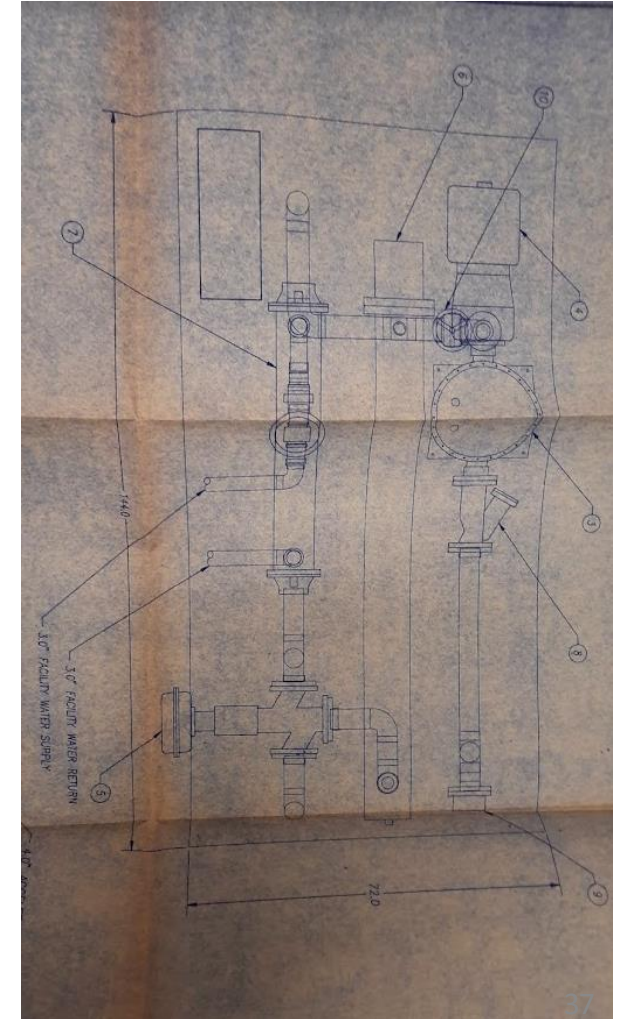


# FIREBALL@BTF

- Modular implementation in 3 phases
  - Few months/ year for data taking and setup
  - Compatible with external users' high intensity operation, fixed installation
- Needs design, procurement and technician time also from LNF



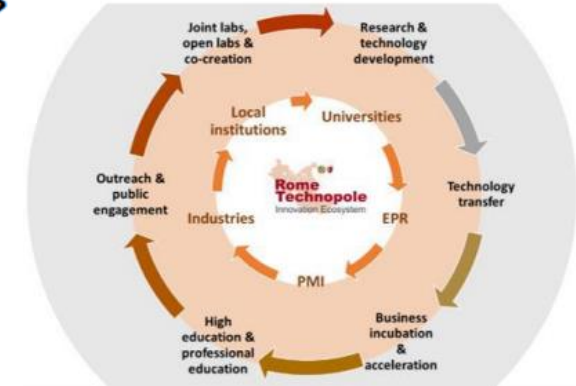
# Secondary Water system fault: 04 March 2024 -> 2 days stop



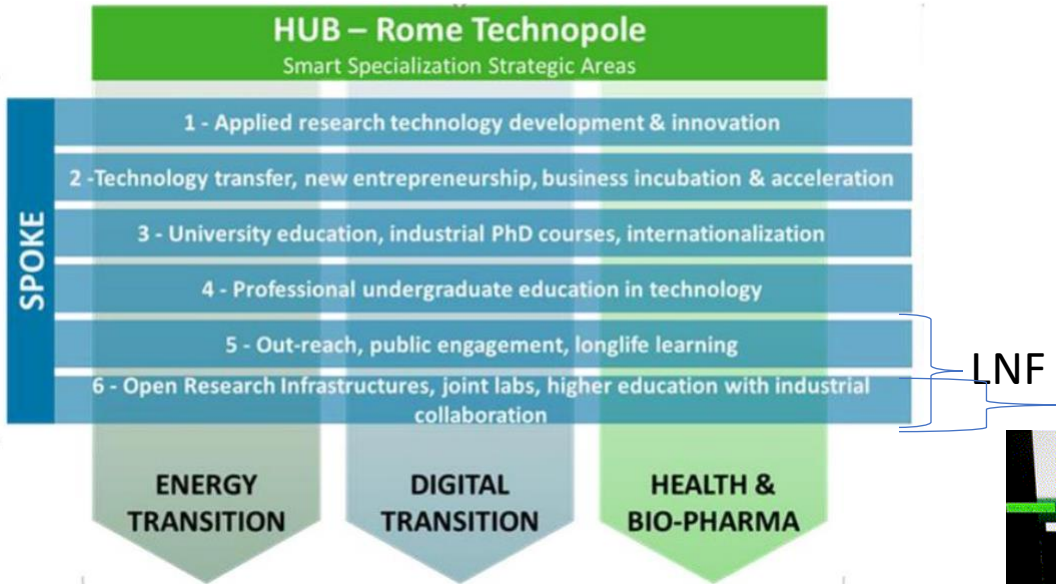
**Avviso pubblico: Proposte per la creazione e il rafforzamento di "Ecosistemi dell'Innovazione»  
PNRR, Missione 4 Istruzione e ricerca  
Componente 2 Dalla ricerca all'impresa, Investimento 1.5**



**AIM:**  
Equip the region with an open research infrastructure to provide support for competitive innovation and growth for companies and stakeholders.

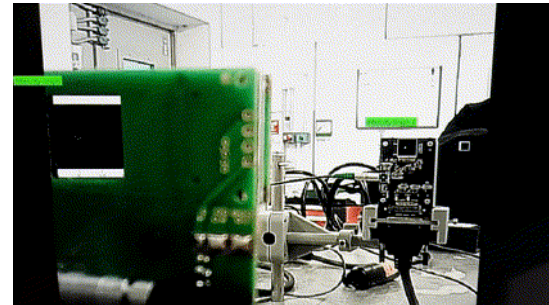


**Flagship projects**



**LINAC SERVICE  
involved with total  
1.2 FTE/YEAR**

(B. Buonomo, F. Cardelli, C. Di Giulio)



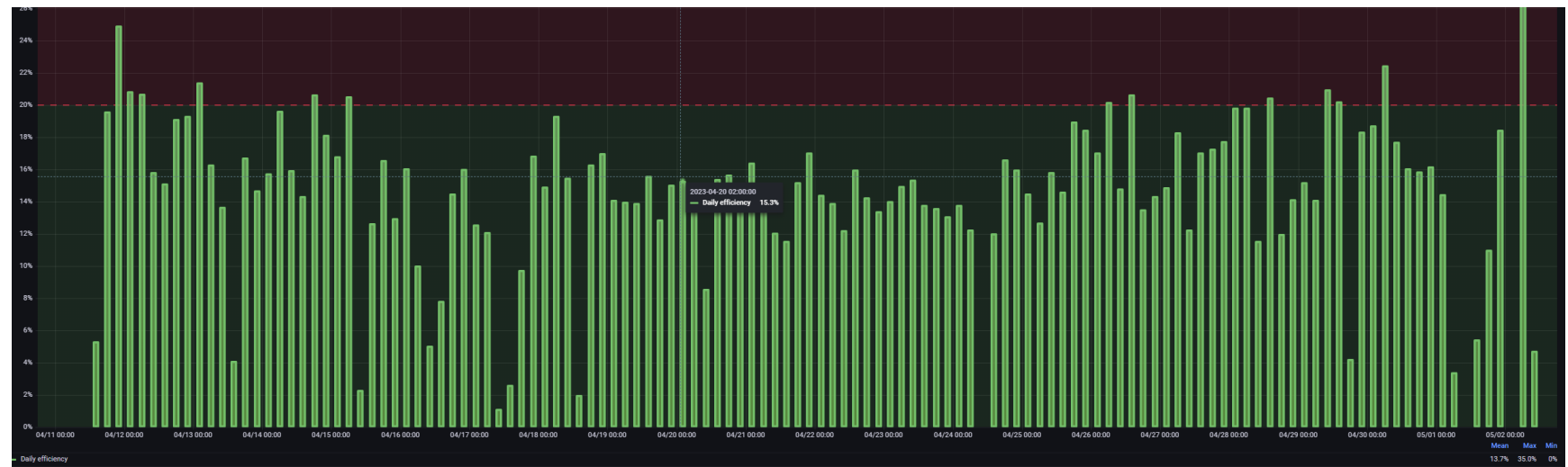
Joint Open Labs:  
 o FP4 (Health & Bio-Pharma) – **F. Cardelli** (Resp. BvTech) – Measurements and RF conditioning of acc. structures for medical application  
 o FP6 (Digital Transition) – **C. Di Giulio** (Resp. Thales) – Development of algorithms based on Machine learning for big-data analytics, Virtual and **augmented reality** and Digital Twin.

25Hz BEST ops (current ops)	e- inj	e+ inj	switch phase	coasting
Time [min]	3,5	4,3	5	12
BTF [pulse/s]	20	5	0	25
Pulses/sect	70	21,5	0	300
BTF D/sect	0,11	0,03	0,00	0,48
BTF D				0,63
BTF Average rate				15,79
Time between cycle	24,8			

50Hz BEST ops (my opinion)	e- inj	e+ inj	switch phase	coasting
Time [m]	2	3	5	12
BTF pulse/s	40	10	0	50
Pulses/sect	80	30	0	600
BTF D/sect	0,07	0,03	0,00	0,55
BTF D				0,65
BTF Average rate				32,27
Time between cycle	22			

Injection efficiency = time spent during injection  
 LINAC switch time = ~2min  
 TL switch time = ~2min  
 50Hz ops -> take in account:

- Double rate of faults
- Less efficient for TL, DR inj (stability)
- Duty cycle for BTF now is around 50% (this month)
- Not even in BEST ops



<https://dashboard.lnf.infn.it/prod/grafana/d/WeAkaME4k/long-term-trends?orgId=1&refresh=1h>

# EURO LABS

- <https://web.infn.it/EURO-LABS/>

## Access

To provide efficient access to the available resources at a major fraction of **EUROpean Laboratories for Accelerator Based Sciences (EURO-LABS)**.

## RIs

Provide broad and focused joint training activities with hands-on experience at the RIs to develop diverse skills of the next generation researchers, for the optimal use of the large number of RIs potential for scientific and technological discoveries.

## Infrastructure

Large and diverse community of users to choose the most appropriate state-of-the-art Research Infrastructures RI(s).  
For conducting high impact research, fostering the sharing of knowledge and technologies across scientific fields.

## Community

Build a super community of sub-atomic researchers and the associated technical staff.

## Data Management & Service Improvements

Implementation of good practices for data management and activities relating to targeted service improvement to enhance capabilities and performance of the RIs.

## Physics

This proposal brings together for the first time in Europe the three communities engaged in Nuclear Physics and Accelerator/ Detector technology for High Energy Physics.



# Operational Budget

	Number of hours over the 4 years	Actual cost (*)	Total value	INFN in kind contribution	Project contribution
<b>BTF</b>	1176 (7 weeks)	180.75 €/h	≈ 213 k€	60 %	≈ 86 k€
<b>SPARC</b>	1680 (10 weeks)	126.75 €/h	≈ 213 k€	60 %	≈ 86 k€

*(\*) includes:*

*electric power, personnel (2 technicians h 24, 1 staff researcher h 8), user initial training*

*Other budget items:*

*user travel support, INFN staff travels, TA management*