

LINAC & BTF

L. Foggetta on the behalf of

LINAC/BTF Group

Researchers (5):

*B. Buonomo, F. Cardelli,
D. Di Giovenale, C. Di Giulio,
L. G. Foggetta*

Technicians (7):

*R. Ceccarelli, A. Cecchinelli,
M. Ceccarelli, G. Piermarini,
A.L. Rossi, S. Strabioli, R. Zarlenga*
Retired: *M. Belli, R. Clementi*

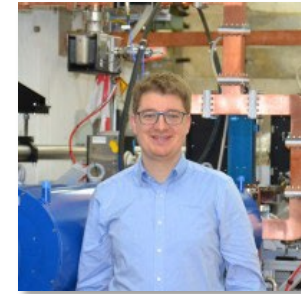
New:

- **Michela Prest** – INFN and Università degli studi dell'Insubria (Como-IT)
- **Florian Burkart** – DESY (Hamburg-DE)

Existing:

- Vincenzo Patera - INFN and Sapienza University, (Roma-IT) - BTFUC
- Bruno Buonomo – INFN-LNF - Tech. Resp. - BTFUC
- Luca Foggetta – INFN-LNF - Scient. Resp. - BTFUC

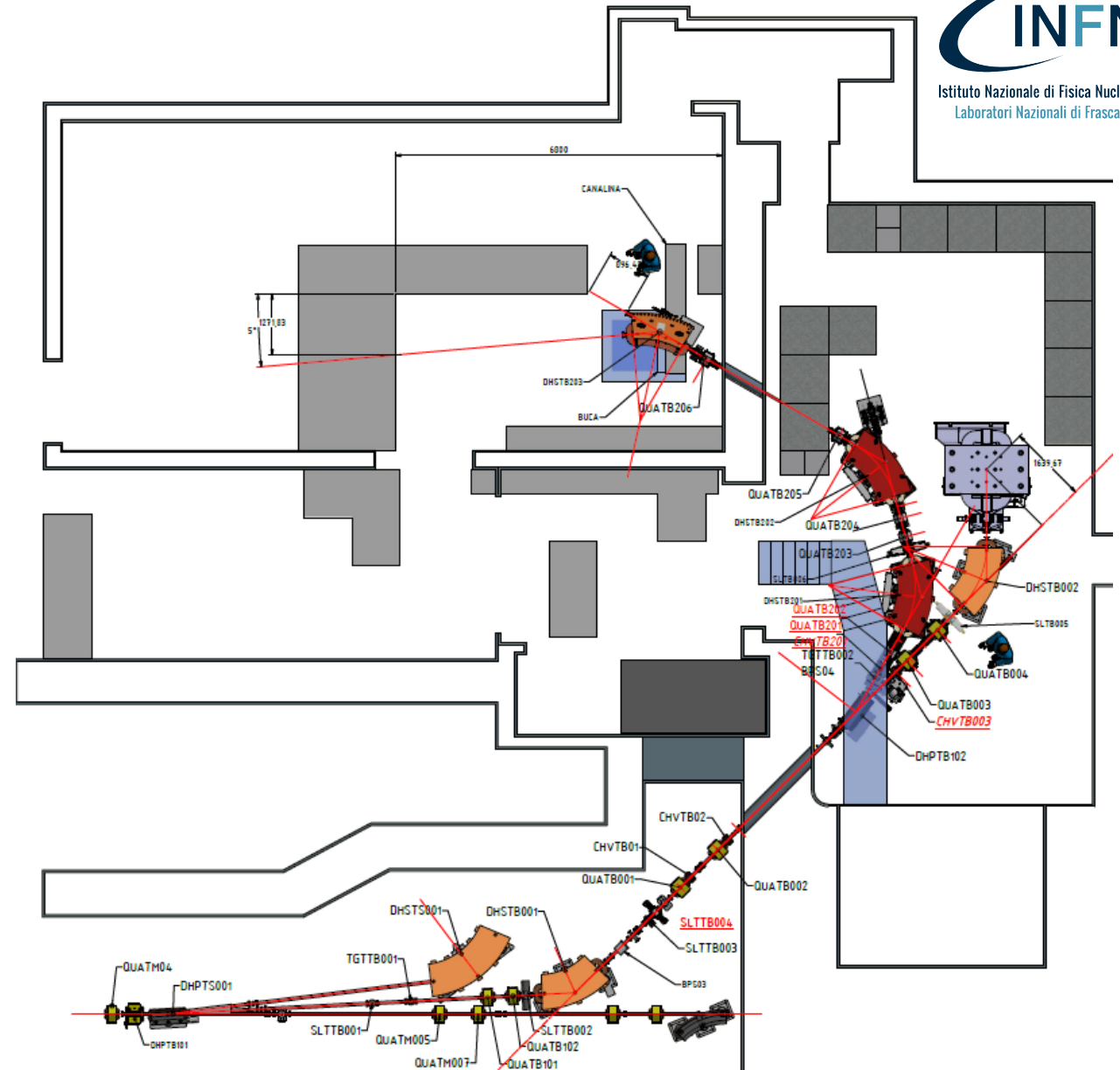
- Claudio Di Giulio – INFN-LNF
- Domenico Di Giovenale – INFN-LNF
- Fabio Cardelli – INFN-LNF



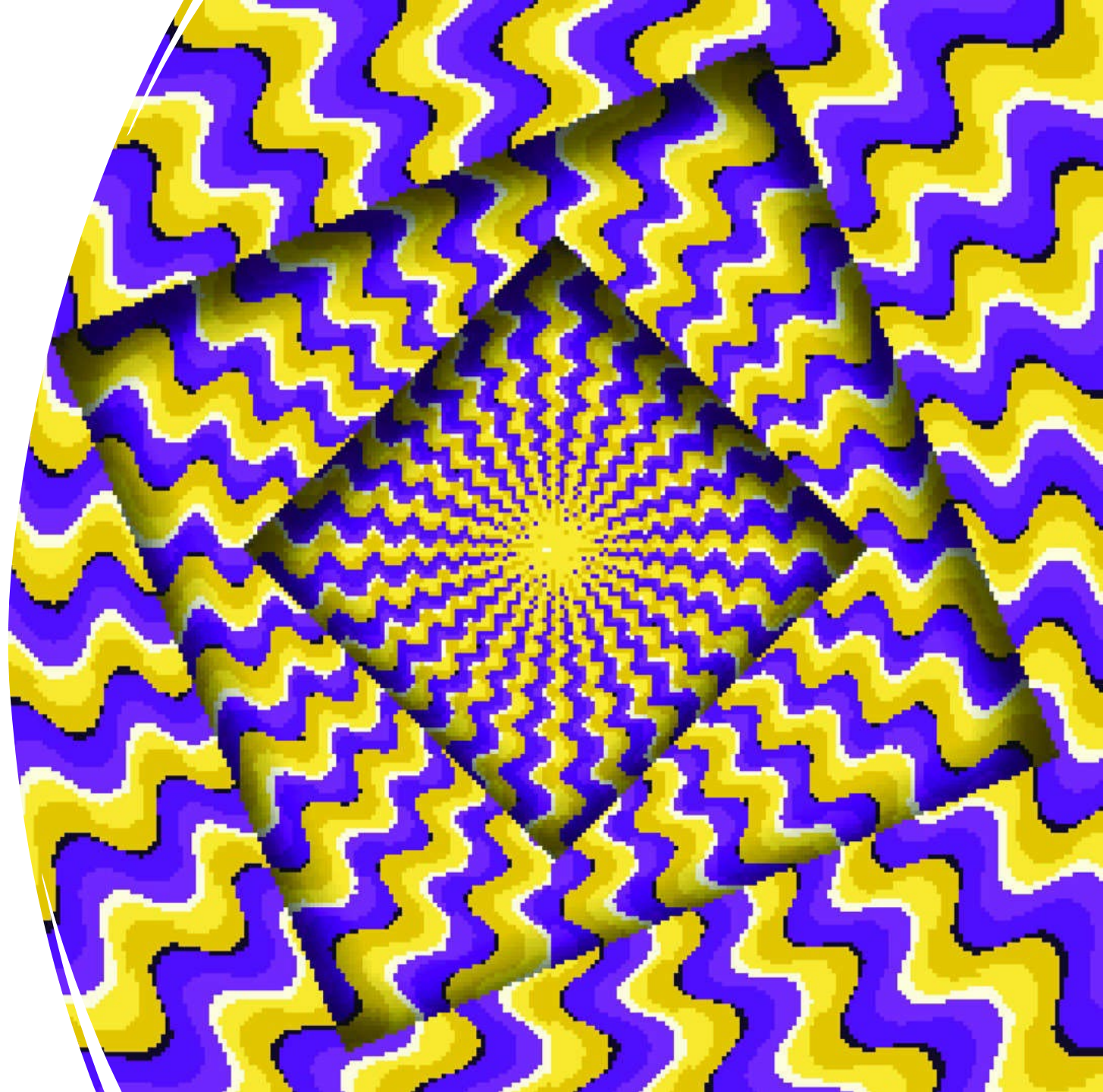
We greatly thanks BTFUC Oct.2018-June 2022
Erika De Lucia (INFN-LNF)
Barbara Liberti (INFN-Roma2)
Giovanni Ambrosi (INFN-Perugia)
for their **strong, pragmatic and extremely professional** support in such a difficult previous years

- BTF1, BTF2 for user run
- LINAC and BTF for X17 run
- LINAC and BTF projects

27/09/2022 35° year



BTF



What we got from last SciCom (Spring 2022 – Fall 2022) – Internal activities

BTFEH2 final commissioning phase	12 Apr -> 19 Apr
LINAC for SIDDHARTA Run	up to Jul
BTF user run on both BTFEH1 and BTFEH2, all of the 3 LINES	up to June end
ERAD run 3 (good ended project)	Jul 2022
PADME/X17 Trials revamp and preps	Jul 2022
During summer shutdown	
Huge maintenance on LINAC – steering replacement	
Shielding on BTF1-straight increased	
Some Difficulties in restart (burned different pieces) but no delays	
BTF1 for X17 run	28 Sep. -> up to now

BTFEH1 – BTF1 (2 lines)

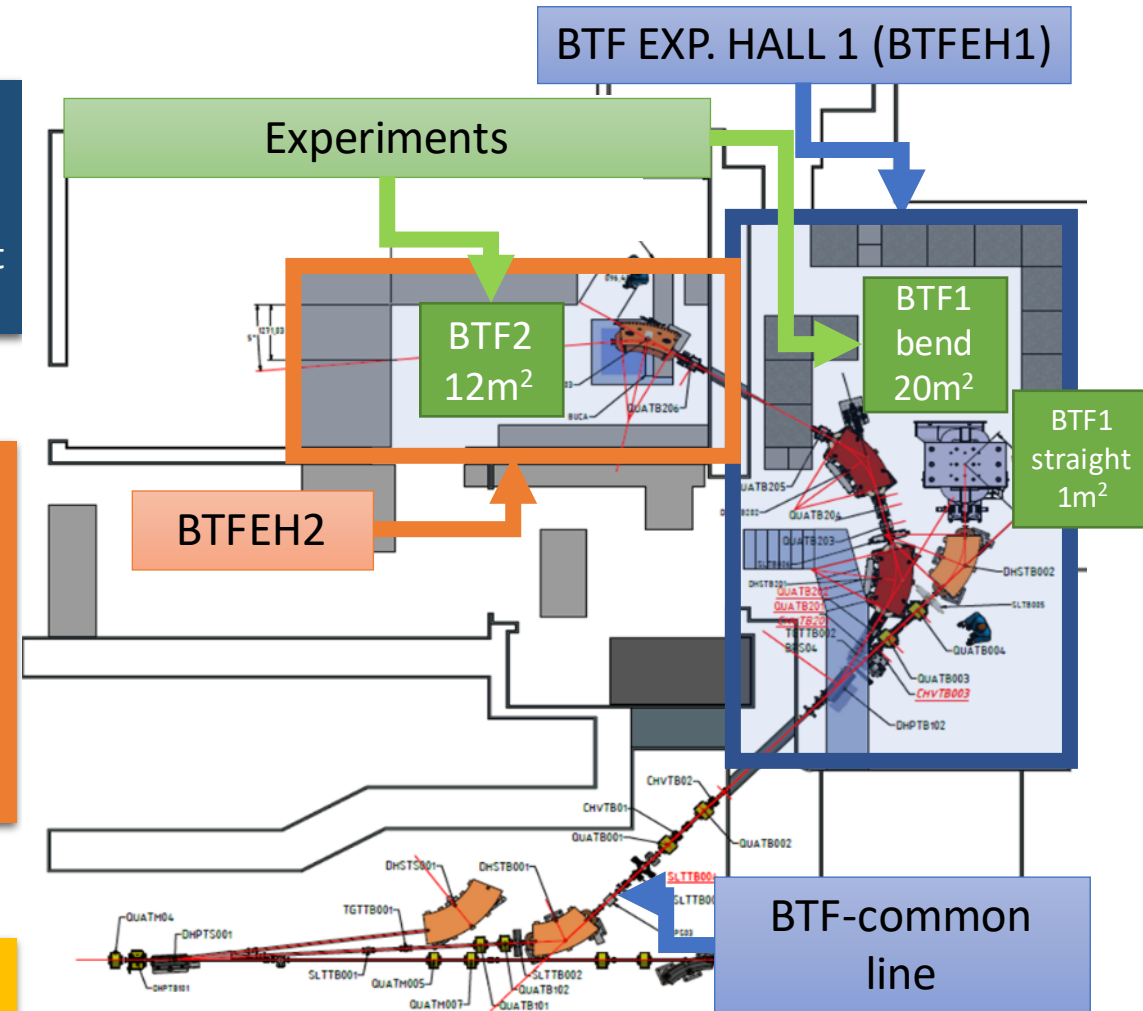
- Hall Operative devoted to ERAD project and PADME experiment, **nowadays X17**
- Involved in opportunistic INFN runs up to BTF2 commissioning phase 3 (FISMELE – SPARCULENS)
- Upgraded vacuum line BTF1 straight for OTR charge measurement and single shot emittance test with two optical lines

BTFEH2 – BTF2 (1 line)

- Hall operative, external users run period accomplished Apr->July 2022
- Only BTF2 line to external users
 - Intended for weekly based users
 - Only secondary beam
 - Limited performances respect to BTF1
 - Foreseen external users from March 2023
- Involved in EUROLABS Project, started on Autumn 2022

BTFEHs

- Software for automated call on going:
 - First release in July
 - Advanced Debugging phase



Parameters	BTF1 Time sharing		BTF1 Dedicated		BTF2 Time sharing	BTF2 Dedicated
	With Cu target	Without Cu target	With Cu target	Without Cu target	With Cu target	With Cu target
Particle	e ⁺ / e ⁻ (User)	e ⁺ / e ⁻ (DAΦNE status)	e ⁺ / e ⁻ (User)		e ⁺ / e ⁻ (User)	
Energy (MeV)	25–500	510	25–700 (e ⁻ /e ⁺)	167–700 (e ⁻) 250–550 (e ⁺)	25–500	25–700
Best Energy Resolution at the experiment	0.5% at 500 MeV	0.5%/1%	0.5%(Energy/mult dependent)		1% at 500 MeV(Energy/mult dependent)	
Repetition rate (Hz)	Variable from 1 to 49 (DAΦNE status)		1–49 (User)		Variable from 1 to 49 (DAΦNE status)	1–49 (User)
Pulse length (ns)	10		1.5–320 (User)		10	10
Intensity (particle/bunch)	1–10 ⁵ (Energy dependent)	10 ³ to 1.5x10 ¹⁰	1–10 ⁵ (Energy dependent)	1 to 3x10 ¹⁰	1–10 ⁴ (Energy dependent)	
Max int flux	3.125x10 ¹⁰ part./s				1x10 ⁶ part./s	
Beam waist size(mm)	0.5–55 X / 0.35–25 Y (vacuum window dependent)				1x1(Energy/mult dependent)	
Divergence (mrad)	Down to 0.5				Down to 0.5	

- Pulsed **electron** and **positron** beams (up to 49 pulses/second)
- Wide range: from 10¹⁰ down to single particle per bunch, continuous energy selection
- Different ranges of parameters in the **two running modes**:
 - Dedicated: only when DAΦNE collider in shutdown, exclusive BTF users
 - Time sharing:
 - DAΦNE spare pulse injections mode via DHPTB101 pulsed magnet
 - Beam top parameters defined by DAΦNE injections

Recommendations DAFNE-BTF SC63

- A risk analysis concerning the possible failure of Klystron C should be conducted and mitigation or intervention plans should be established in view of the 2023 BTF/DAΦNE run.

- 2022 beam planning expectations well accomplished
- 2023 planning performed (Oct 2022)
- Maybe DAFNE off for the most of the year (see C. Milardi pres.)
- An extension of X17 Run TBD
- Delayed restart in March 2023 for KlyC assessment
- LINAC/BTF team mainly involved in 2023 for BTF operations
- EUROLABS inclusion (1w payed)

EARLY 2022 ACTIVITIES GANTT

From May to July

SCHEDULE LINAC+BTF+DAFNE 2022

2 mag - 23 dic

Griglia Bacheca Sequenza

	Nome ▾	Durata ▾	Inizio ▾
1	<input type="radio"/> DAFNE ON - FASE GLOBALE	61 giorni	2/5/2022
2	<input type="radio"/> SIDDHARTA	46 giorni	2/5/2022
3	<input type="radio"/> SIDDHARTA Buffer	15 giorni	5/7/2022
4	<input type="radio"/> BTF extern user call	41 giorni	2/5/2022
5	<input type="radio"/> BTF-SPARC run	5 giorni	28/6/2022
6	<input type="radio"/> ERAD in spare pulse	5 giorni	5/7/2022
7	<input type="radio"/> BTF+X17 vacuum reconnection	1 giorno	12/7/2022
8	<input type="radio"/> X17 setup	10 giorni	12/7/2022
9	<input type="radio"/> Line shutdown	29 giorni	26/7/2022

From BTF project office (Jan schedule for Spring act.):

- All of the foreseen items **respected**
- Delayed days = 0
- BTF beam availability = 99,9% (just a unexpected coffee break)
- 71 slotted days
- 10 Users

Name	Gap before [gg]	Setup day	Duration [g]	Exp. hall	Beam Type
START	0	lun	09/05/2022	0	
LUXE first trial	0	lun	09/05/2022	3	BTFEH1 STRAIGHT Media Int.
FOOT-LNF	0	gio	12/05/2022	4	BTFEH2 Singola part.
PEROV	0	lun	16/05/2022	7	BTFEH2 Singola part.
FOOT-SCINTI	0	lun	23/05/2022	4	BTFEH2 Singola part.
DAFNE safety	3	ven	27/05/2022	7	BTFEH2
SHERPA	0	lun	06/06/2022	5	BTFEH2 Singola part.
LIMADOU	2	sab	11/06/2022	7	BTFEH2 Singola part.
HERD	0	lun	20/06/2022	7	BTFEH2 Media Int.
SPARC-ULENS	0	lun	27/06/2022	7	BTFEH1 STRAIGHT Alta Int.
ERAD	0	lun	04/07/2022	7	BTFEH1 STRAIGHT Alta Int.
X17 setup	1	lun	11/07/2022	13	BTFEH1 BEND Singola part.
			Total	71	

LATE 2022 ACTIVITIES GANTT

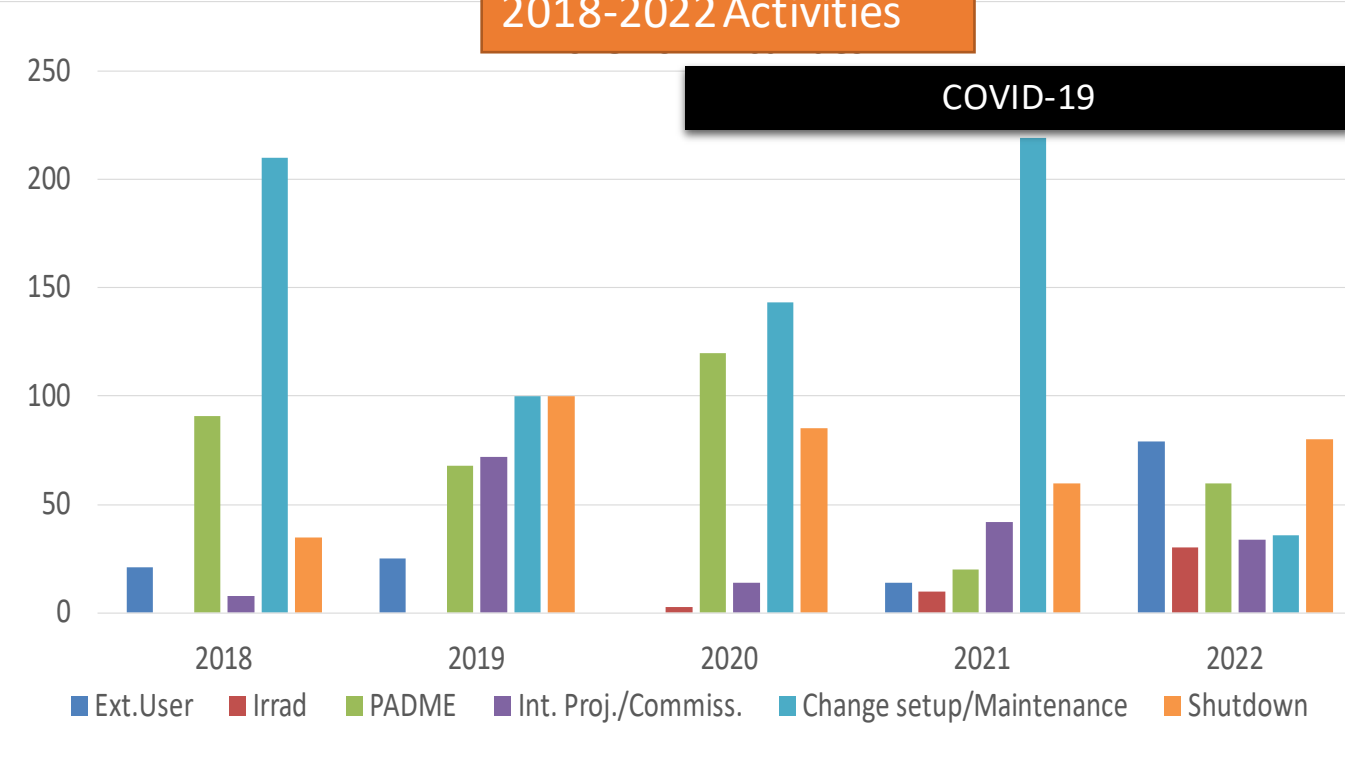
From BTF project office (April schedule for Summer/Fall act.):

- All of the foreseen items respected
- Summer time preparation
- Difficult but on time restart

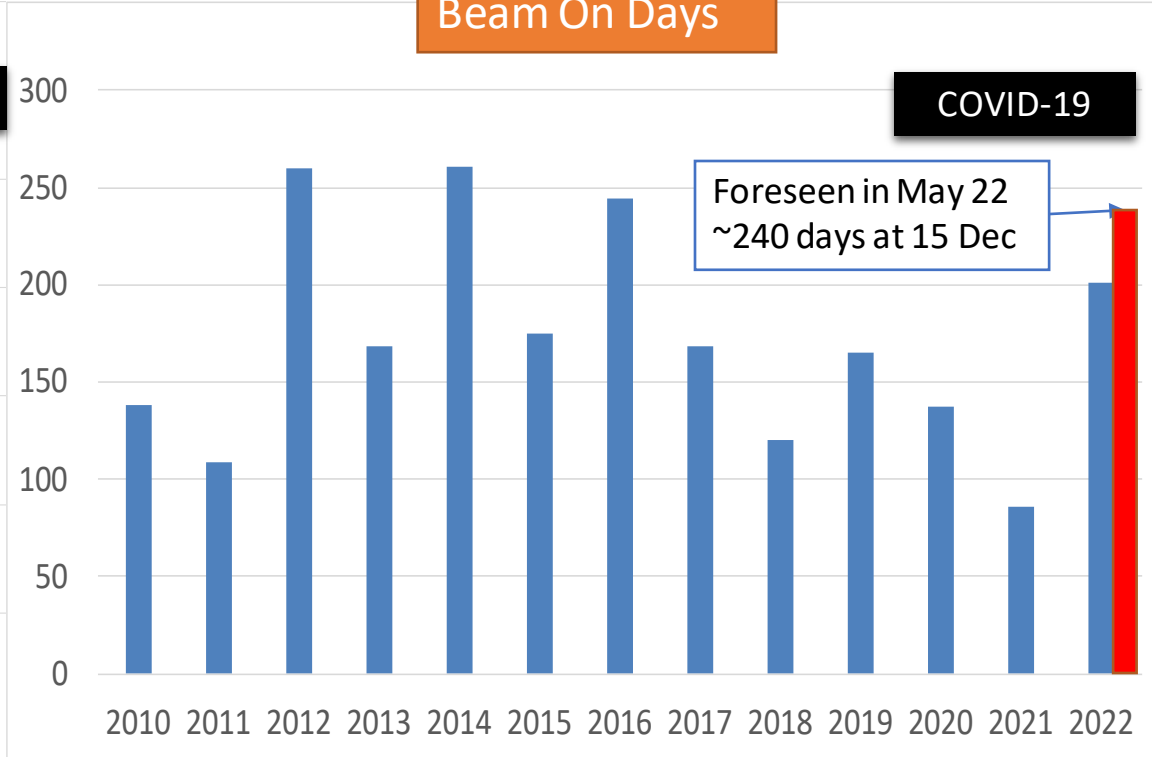
1	✓	→	Tech run X17	10 g	ven 08/07/22
2	✓	→	Shutdown LINAC-BTF	41 g	ven 22/07/22
3	✓	→	LNf closed	12 g	gio 04/08/22
4	✓	→	▾ LINAC maintenance	40 g	lun 25/07/22
5	✓	✦	LINAC Scheduled maintenance	19 g	mar 23/08/22
6	✓	✦	LINAC tower maintenance	35 g	lun 25/07/22
7	✓	✦	LINAC fluid primary and secondary pumps and circuit check	35 g	lun 25/07/22
8	✓	✦	LINAC resin maintenance	35 g	lun 25/07/22
9	✓	→	▷ Corrector installation	50 g	lun 11/07/22
16	✓	→	CHECK and maintenance electrical device and mains	1 g	ven 09/09/22
17	✓	→	Shielding BTFEH1->DR	21 g	gio 18/08/22
18	✓	→	▾ Needed DAFNE service on	1 g	lun 12/09/22
19	✓	✦	LINAC tower on	1 g	lun 12/09/22
20	✓	✦	DAFNE service HW SW ready	1 g	lun 12/09/22
21	✓	→	▾ BTF on	12 g	lun 12/09/22
22	✓	✦	BTF start up	5 g	lun 12/09/22
23	✓	→	BTF/PADME vacuum operation	7 g	lun 19/09/22
24	✓	→	▾ LINAC on	7 g	lun 19/09/22
25	✓	✦	Operators shift start	1 g	lun 19/09/22
26	✓	✦	LINAC beam setup	6 g	mar 20/09/22
27	✓	✦	Final commissioning power supply correctors	6 g	mar 20/09/22
28	📅	→	Run scientifico PADME	57 g	mer 28/09/22

- GANTT in working days (add 40% for 24/7 ops)
- Big work in summer time exp. for LINAC
 - 32/46 LINAC steering correctors refurbished (Control Magnet and LINAC service deeply involved)
 - Improving building in BTF/DR frontier (dismounting PS and air ducts, concrete improvements, restoring from scratch – Fluids, Electrical and Building service, Tech. Division)
- Huge number of died elements and faults in restart:
 - BTF: RACK PCs (thanks to R. Gargana), hv board,
 - Out of service of DHPTB101 PS!!!
 - Our great Magnet group switched to spare DC power supply in a week
 - Problem for BTF+DAFNE ops.
- Hurry for maintain starting date due to reduced personnel -> GOT IT

2018-2022 Activities



Beam On Days



28	📅	👉	X17 Scient Run	57 g	mer 28/09/22	gio 15/12/22	21;24	31;50	50%
29		👉	▾ Shutdown LINAC+BTF winter 2023	35 g	ven 16/12/22	ven 17/02/23		51FF;46;50II	0%
30		👉	▾ LINAC setup for THALES operation	35 g	ven 16/12/22	ven 17/02/23			0%
31		👉	prepare tank for new diagnostics and test	5 g	ven 16/12/22	gio 22/12/22	28	32	0%
32		👉	Kly C dismounting	1 g	lun 09/01/23	lun 09/01/23	31	35;33II	0%
33		👉	Kly C vacuum port soldering	1 g	lun 09/01/23	lun 09/01/23	32II		0%
34		👉	▸ New Kly C installation and pumping	8 g	mar 10/01/23	gio 19/01/23		39	0%
38		👉	▾ Kly C conditioning	21 g	ven 20/01/23	ven 17/02/23			0%
39		👉	Kly C power on	1 g	ven 20/01/23	ven 20/01/23	34	40	0%
40		👉	Mod C tuning and setup for new kly	2 g	lun 23/01/23	mar 24/01/23	39	41	0%
41		👉	power ramp up with THALES	18 g	mer 25/01/23	ven 17/02/23	40		0%
42		👉	▾ LINAC TEST and START UP	37 g	mer 11/01/23	ven 03/03/23		52;53FI+1 g	0%
43		👉	▸ Needed DAFNE service on	0 g	mer 11/01/23	n			
45		👉	▾ LINAC UP	10 g	lun 20/02/23	v			
46		👉	LINAC 4 mods conditioning	5 g	lun 20/02/23	v			
47		👉	LINAC beam on trials	5 g	lun 27/02/23	v			
48		👉	▾ BTF ON SPRING	150 g	ven 16/12/22	v			
49		👉	▾ BTF1&BTF2 on	35 g	ven 16/12/22	v			
50	📅	👉	PADME detaching vacuum and pumping	14 g	ven 16/12/22	gio 19/01/23	28;29II		0%
51		👉	BTF start up	10 g	lun 06/02/23	ven 17/02/23	29FF		0%
52		👉	beam time test call start	40 g	lun 06/03/23	ven 28/04/23	42;53IF		0%
53		👉	user call open	0 g	lun 06/03/23	lun 06/03/23	42FI+1 g	54II+3 mes;52IF	0%
54		👉	beam time user start	44 g	mar 30/05/23	ven 28/07/23	53II+3 mes		0%
55	📍		LINAC+BTF SHUTDOWN	26 g	lun 31/07/23	lun 04/09/23	48	62;57II	0%
56		👉	▾ LINAC on	36 g	lun 31/07/23	lun 18/09/23		64	0%
57		👉	Maintenance	30 g	lun 31/07/23	ven 08/09/23	55II	58	0%
58		👉	Operators shift start	1 g	lun 11/09/23	lun 11/09/23	57	59II	0%
59		👉	LINAC beam setup	6 g	lun 11/09/23	lun 18/09/23	58II		0%
60		👉	▾ BTF ON AUTUMN	137 g	mar 27/06/23	mer 03/01/24			0%
61		👉	▾ BTF1&BTF2 on	10 g	mar 05/09/23	lun 18/09/23			0%
62		👉	BTF start up	10 g	mar 05/09/23	lun 18/09/23	55		0%
63		👉	user call open	0 g	mar 27/06/23	mar 27/06/23	64II-3 mes		0%
64		👉	beam time user start	77 g	mar 19/09/23	mer 03/01/24	56;65IF	63II-3 mes	0%
65	📍		LINAC+BTF SHUTDOWN	16 g	lun 18/12/23	lun 08/01/24		64IF	0%

Recommendations DAFNE-BTF SC63

- A risk analysis concerning the possible failure of Klystron C should be conducted and mitigation or intervention plans should be established in view of the 2023 BTF/DAΦNE run.

DUMMY CALENDAR

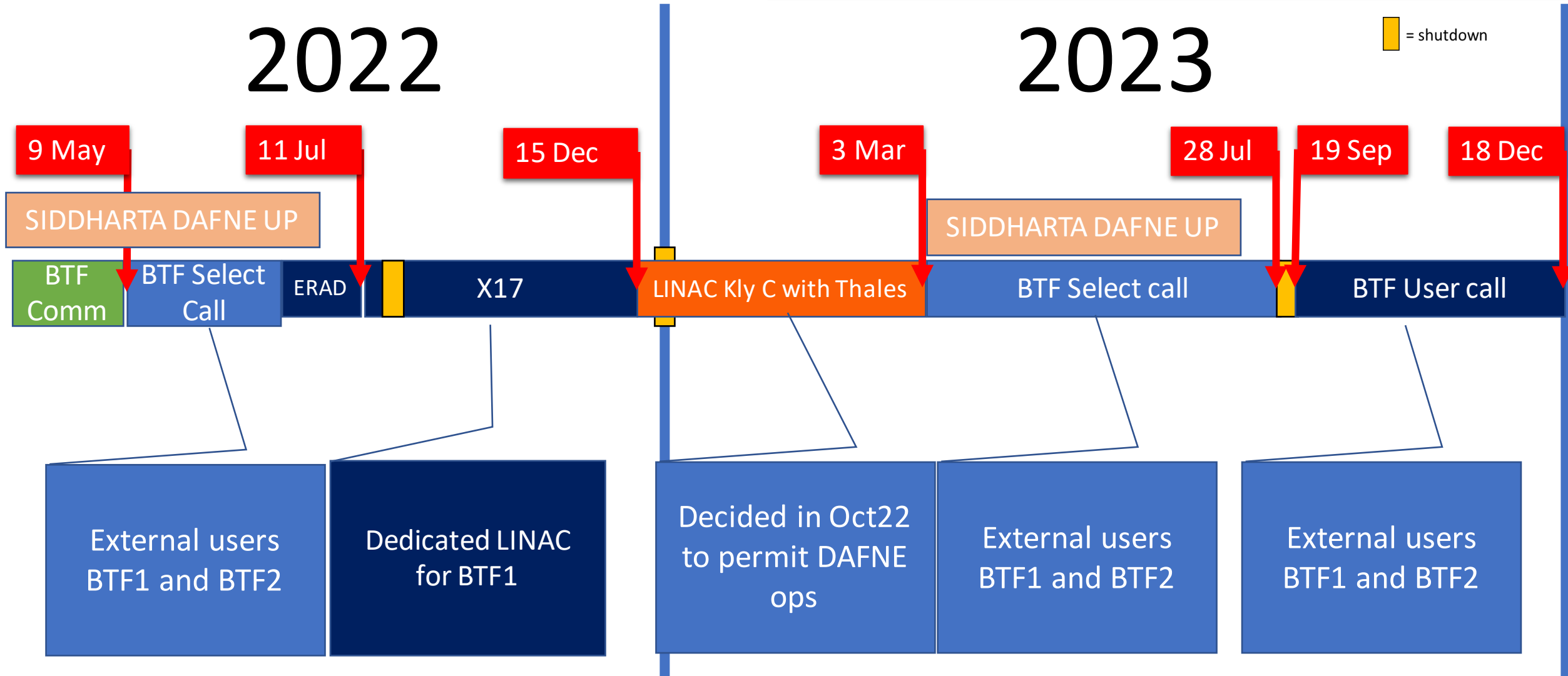
Recommendations DAFNE-BTF SC63

- A risk analysis concerning the possible failure of Klystron C should be conducted and mitigation or intervention plans should be established in view of the 2023 BTF/DAΦNE run.

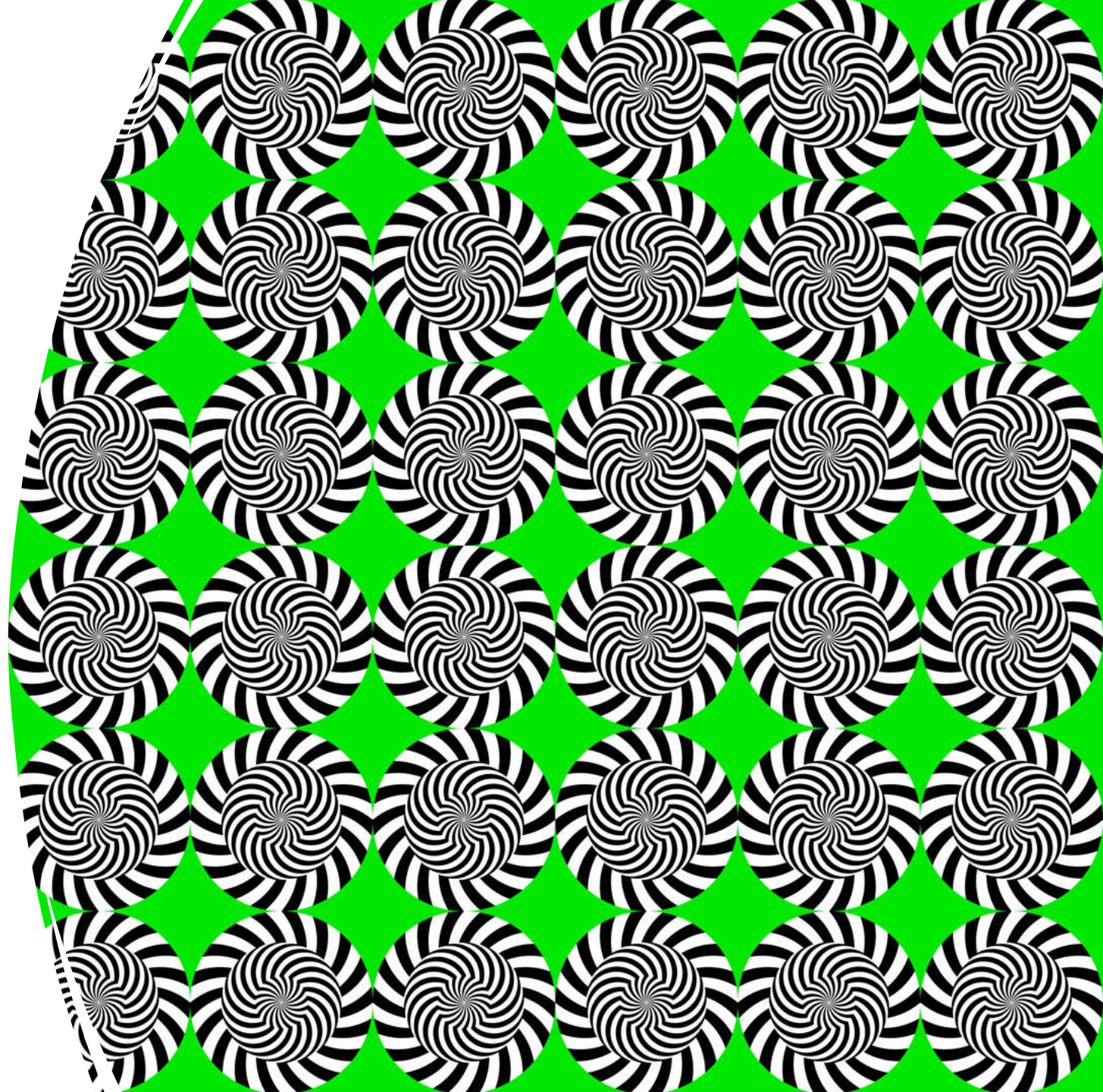
2022

2023

■ = shutdown



BTF USERS



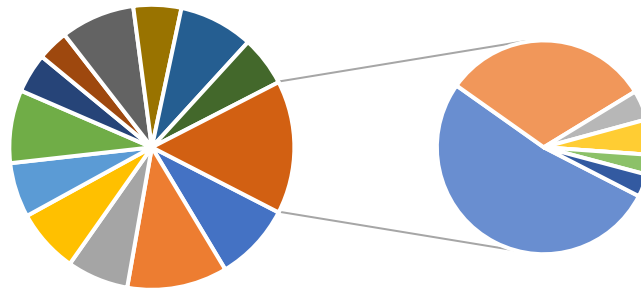
DONE (2021- Early 2022)

- SHIP
- CRILIN-KLEVER
- ERAD Run 1
- SPARC-ULENS (optics lines, change vacuum layout)
- PADME for SAC calibration (change vacuum layout)
- PADME for TPX3
- PEROV
- BTF detectors calibration (some time for us)
- ERAD Run 2
- FISMEL_TLD
- AirBPM
- LUXE Target

~~2022 Summer TO BE DONE~~

- FOOT-LNF
- PEROV
- FOOT-SCINTI
- SHERPA
- LIMADOU
- HERD
- ERAD
- FISMEL_SIM&ACTLD
- SPARC-ULENS
- PADME etagger
- PADME trials with secondary beam

**△
ONE**



More than 30 paper citing BTF in 2022, some obviously from PADME collaboration.

- 6th International Conference Frontiers in Diagnostic Technologies (ICFDT6)
- 13th International Particle Accelerator Conference (IPAC'22)

Ceravolo, Sergio, et al. "Crilin: A Semi-Homogeneous Calorimeter for a Future Muon Collider." *Instruments* 6.4 (2022): 62.

Garattini, M., et al. "Crystal slow extraction of positrons from the Frascati DA Φ NE collider." *Physical Review Accelerators and Beams* 25.3 (2022): 033501

Ceravolo, S., et al. "Crilin: A CRystal calorimeter with Longitudinal Information for a future Muon Collider." *Journal of Instrumentation* 17.09 (2022): P09033.

Bartocci, S., et al. "Deep learning based event reconstruction for the Limadou High-Energy Particle Detector." *Physical Review D* 105.2 (2022): 022004.

Backe, H., et al. "Design study for a 500 MeV positron beam at the Mainz Microtron MAMI." *arXiv preprint arXiv:2205.12613* (2022).

Patrinos, Konstantinos. "On the Hypothesis of the Absolute Reference System: Theoretical and Experimental Confirmation." *New Trends in Physical Science Research Vol. 8* (2022): 13-36.

Amaro, Fernando Domingues, et al. "The CYGNO Experiment." *Instruments* 6.1 (2022): 6.

The PADME beam line Monte Carlo simulation

F. Bossi (Frascati), P. Branchini (INFN, Rome3), B. Buonomo (Frascati), V. Capirossi (Polytech. Turin), A.P. Caricato (INFN, Lecce and Salento U.) et al.

Search for a Dark Photon with the PADME experiment

Stefania Spagnolo, A.P. Caricato, M. Martino, I. Oceano, F. Oliva et al.
Published in: PoS EPS-HEP2021 (2022), 186

Machine Learning Based Middle-Layer for Autonomous Accelerator Operation and Control

Stefano Pioli, Bruno Buonomo, Fabio Cardelli, Paolo Ciuffetti, Domenico Di Giovenale et al.
Published in: JACoW ICALEPCS 2021 (2022), THAL03

The physics program of the PADME experiment

PADME Collaboration • A.P. Caricato (INFN, Lecce and Salento U.) et al.
Published in: Phys.Scripta 97 (2022) 2, 024003

Simeonov, Radoslav. "PADME physics program." *Journal of Physics: Conference Series*. Vol. 2255. No. 1. IOP Publishing, 2022.

Sytov, A., et al. "First design of a crystal-based extraction of 6 GeV electrons for the DESY II Booster Synchrotron." *The European Physical Journal C* 82.3 (2022): 1-17.

Balla, A., et al. "Performance of scintillating tiles with direct silicon-photomultiplier (SiPM) readout for application to large area detectors." *Journal of Instrumentation* 17.01 (2022): P01038.

Atanov, Nikolay, et al. "The Mu2e Crystal Calorimeter: An Overview." *Instruments* 6.4 (2022): 60.

LIMADOU is part of a scientific program that studies natural and anthropogenic electromagnetic fields, their emissions and possible correlations with seismic events.

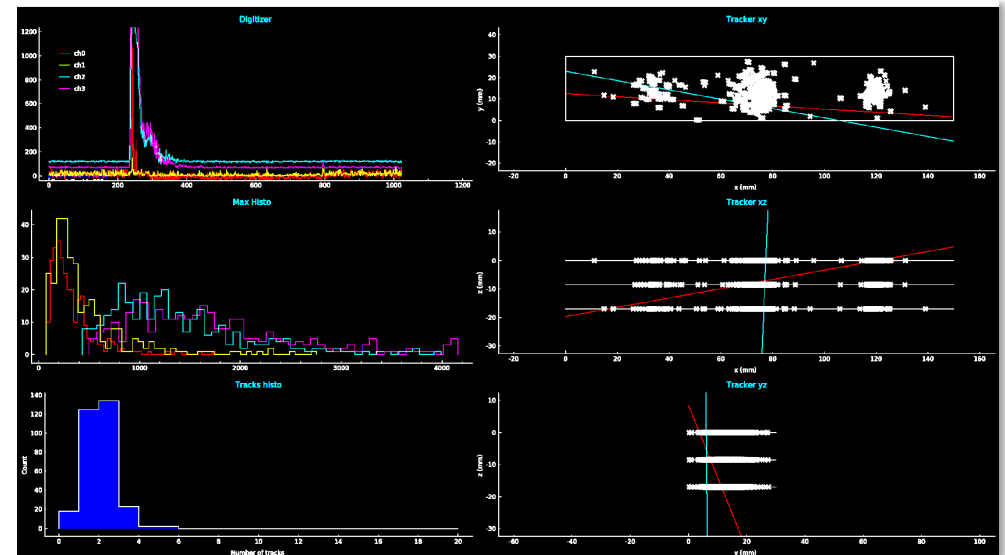
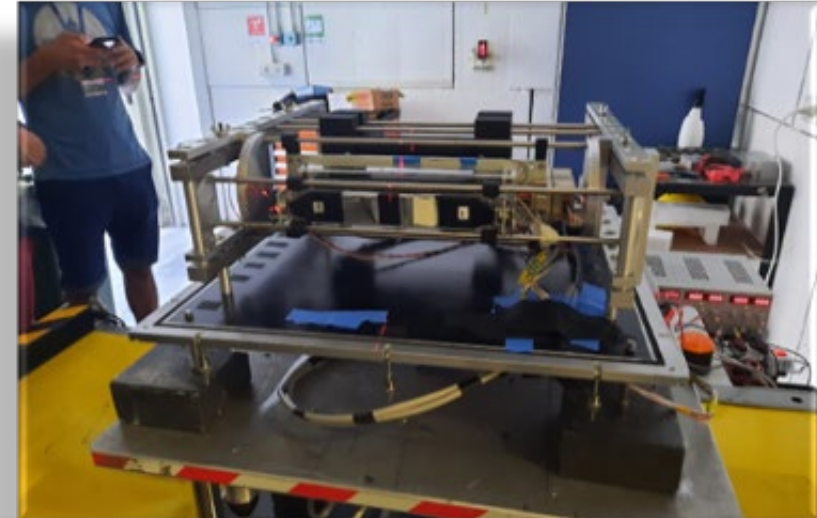
<https://w3.inf.infn.it/experiments-in-btf-orbit/?lang=en>

BTF USER run (SPACE Appl) : 11 Jun -> 20 Jun

Prototype: new tracker as part of second of the constellation (CSES-02) will mount an innovative particle tracker. CSES missions are part of a collaboration program between China National Space Administration (CNSA) and Italian Space Agency (ASI), and developed by China Earthquake Administration (CEA) and Italian National Institute for Nuclear Physics (INFN), together with several Chinese and Italian Universities and research Institutes.

Run with dedicated 30MeV- single particle beam

The main purpose of the test: check tracker efficiency in track reconstruction with single-particle electron beams at different energies (from 30 to 120MeV) were produced to characterize the response of the apparatus to natural events, similar events that will occur along the satellite's orbit

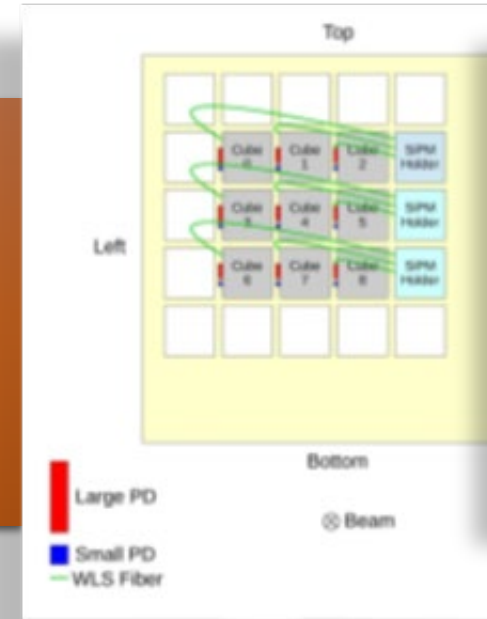


BTF USER run (SPACE Appl) : 20 Jun -> 27 Jun

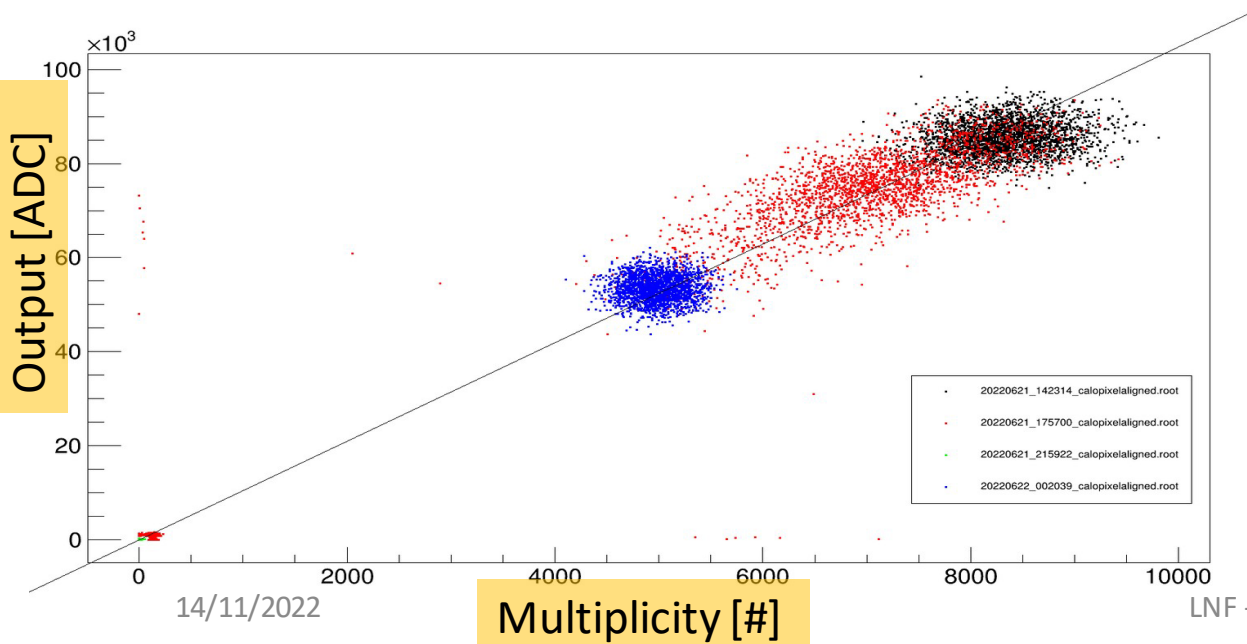
Prototype: small calorimeter made of 4 layers of 3x3 LYSO crystals. Each crystal is 3x3x3 cm³

Crystals read-out: two PDs with different active areas and a wave length shifter fiber + SiPM.

The HERD (High Energy Cosmic Radiation Detection) collaboration, on the other hand, aims to install its detector in the Chinese space station



Courtesy of Nicola Mori

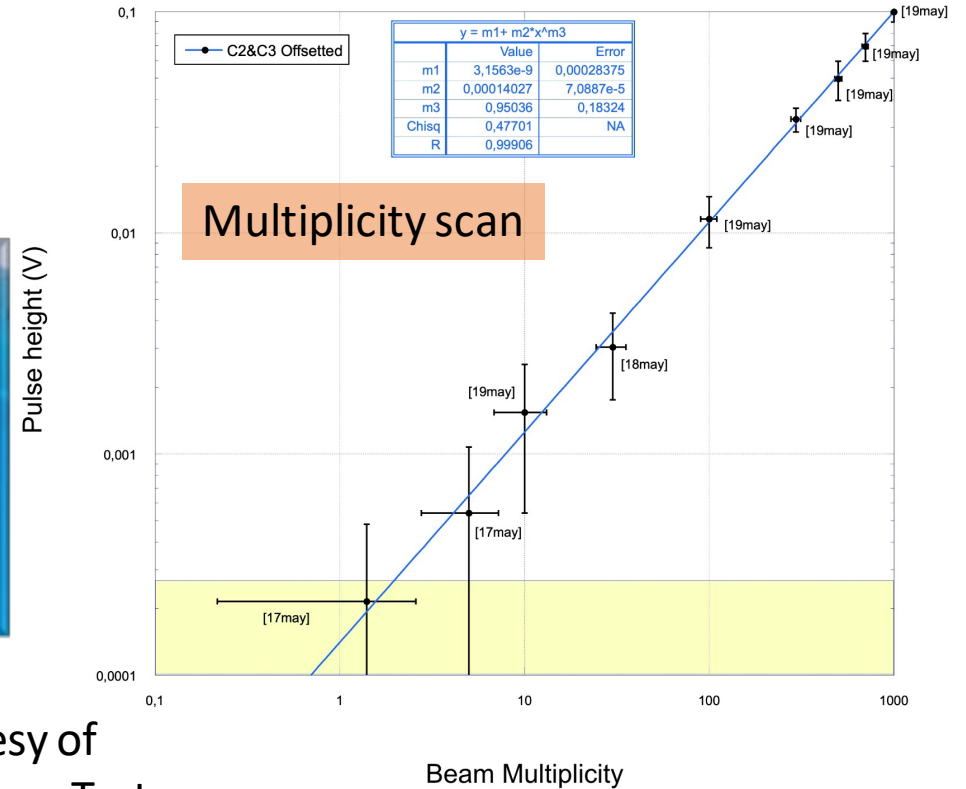
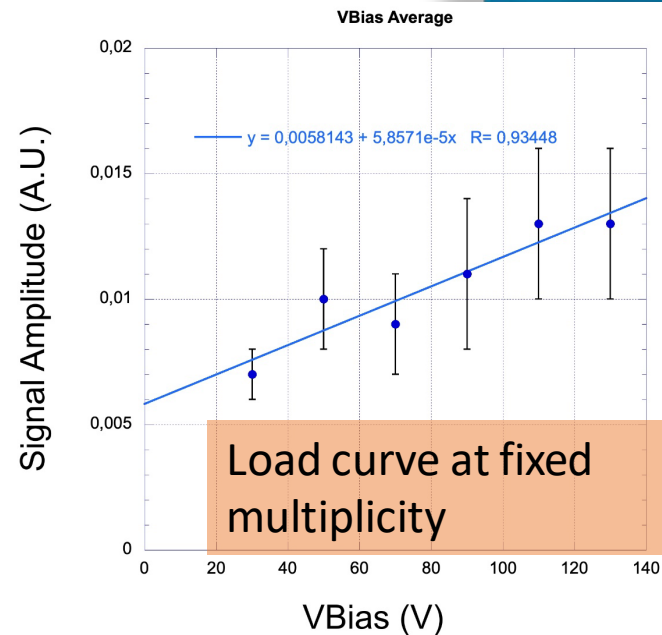
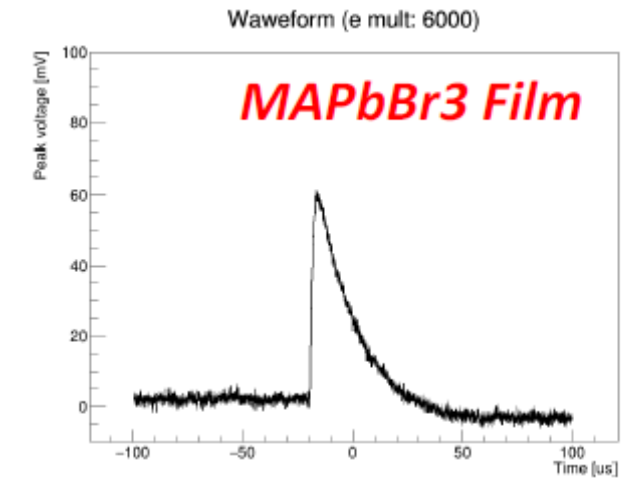


The main purpose of the test: check the linearity of the read-out system up to the saturation (very wide energy range!!!). Preliminary results show a good linearity.

Additional goals: test different hardware and firmware configurations, measure the direct ionization of PDs.

BTF USER run (New Detector dev.) :16May -> 20 May

- **Prototype:** Organo Metal-Halide Perovskites, a class of hybrid organic-inorganic semiconductor materials with a perovskite unit-cell structure
- MAPbBr3 bulk, different size and aspect ratio



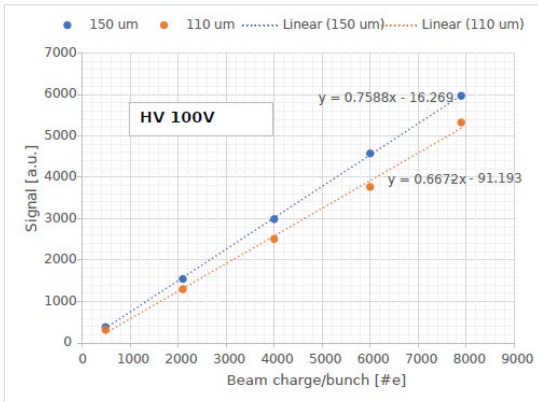
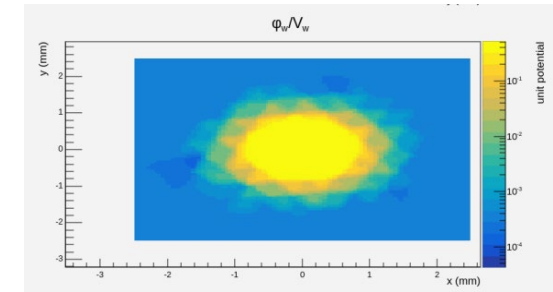
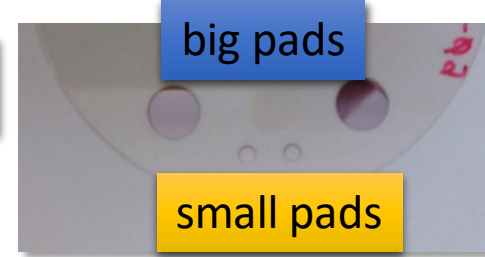
Courtesy of
Marianna Testa

- First test continuation as bulk detector
- As the first time confirmed a good linearity in wide range
- Load curve with different beam multiplicity and energy
- Tested in two different lines (BTF1-BTF2)

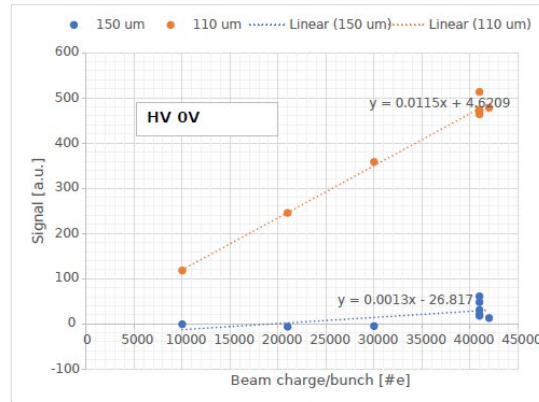
BTF USER run (New Detector dev.): 9 May -> 13 May

BTF beam 300MeV, m=10K scan, completely contained -> sim over E field fringing effects

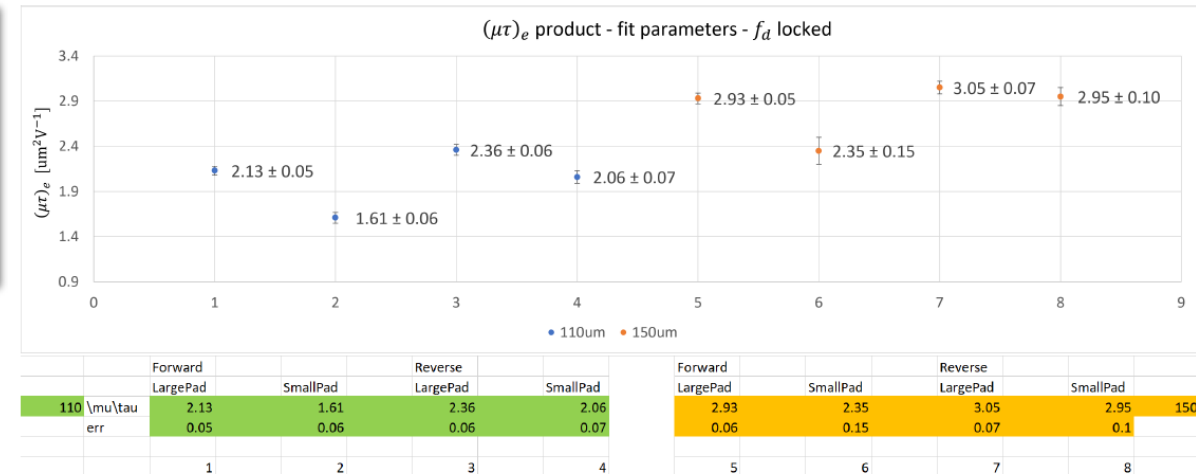
(Laser Und XFEL Experiment) is a new experiment proposed at DESY and the European XFEL to study QED in the strong-field regime where QED becomes non-perturbative
 2 x Sapphire wafer(2in) Thick d2=0.15 mm
 2 x Circular Pads R1= 0.8 mm and R2=2.75 mm



(a) $V_{\text{bias}} = 100V$



(b) $V_{\text{bias}} = 0V$



- First test as Sapphire photon current integrator for LUXE experiment
- As a preliminary response, impressive linearity in wide range in multiplicity and voltage scan
- Team reached the goal to be first in detect such Sapphire Charge Collection Efficiency

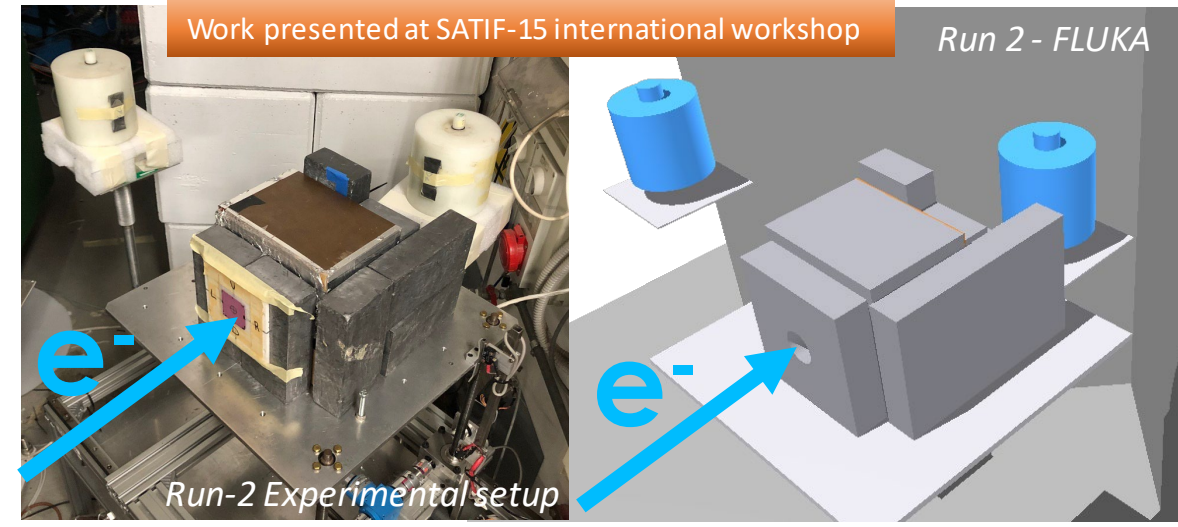
Courtesy of P. Grutta and M. Morandin

Dose evaluation from electrons impinging on a Pb target due to: i) Bremsstrahlung photon production; ii) photo-production of neutrons.
Thermoluminescent dosimeters used to measure doses at several charge intervals.

• BTF USER run: (New Rad Dosy.) June 29->30

BTF beam 503 MeV, 1 Hz, 109 e-/s, spot diameter around 1 cm
Beam on a ~ 16 cm Pb target → mixed radiation field

1° run: photon Air KERMA evaluation at 0 ° (TLD700)
2° run: photon Air KERMA and neutron ambient dose equivalent evaluation at 0 ° and 90 ° (TLD700 + TLD600)
Calibration at Cs-137 and Am-Be → Data-MC comparison needed to validate the results at higher energies and benchmark the simulation (FLUKA) itself



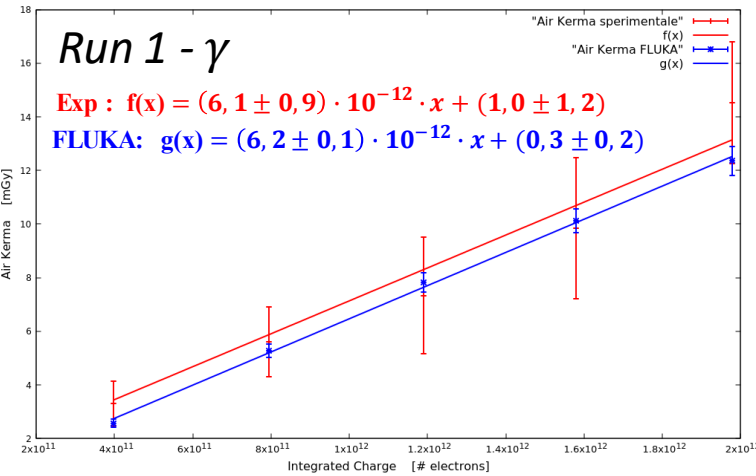
Good MC-Data agreement for the Dose-electrons conversion factor:



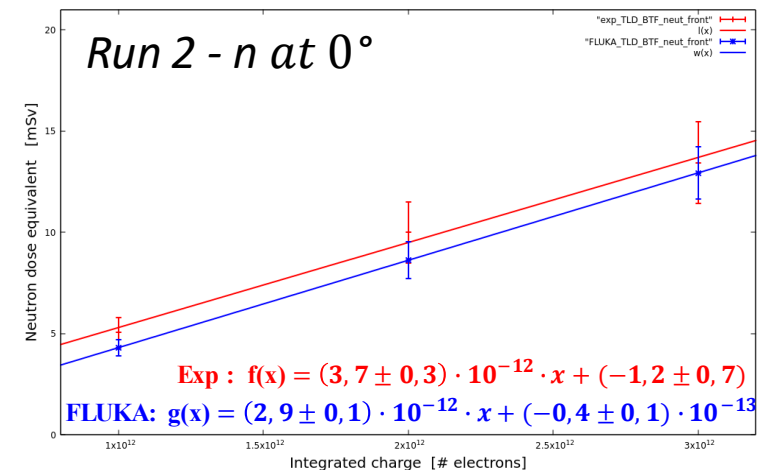
TLDs placed inside the cylinders

Courtesy of F. Chiarelli and R. Donghia on behalf of the FISMEL Group

Important results useful to estimate the mixed radiation field doses in BTF produced from HE e-beam on target



14/11/2022

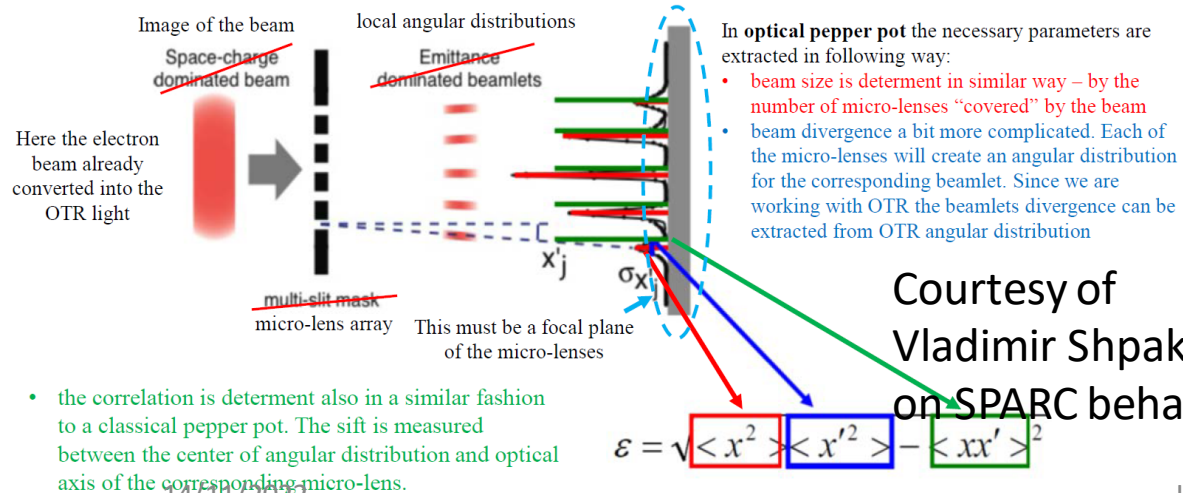
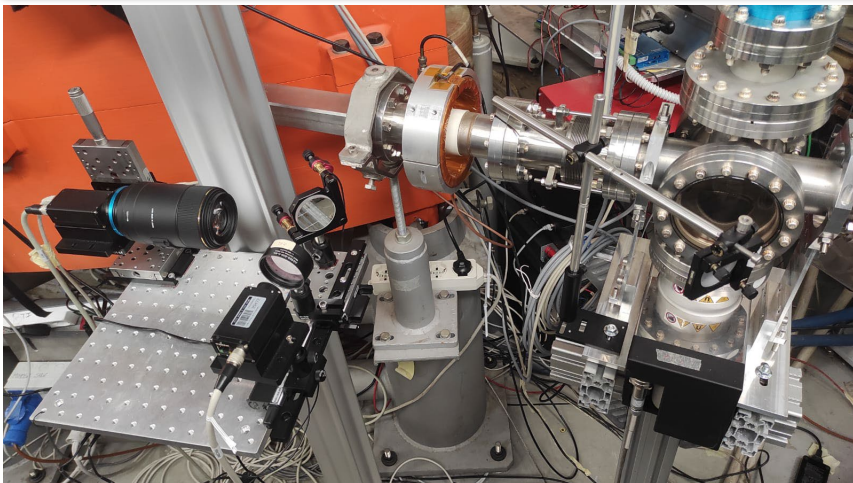


SPARC-ULENS

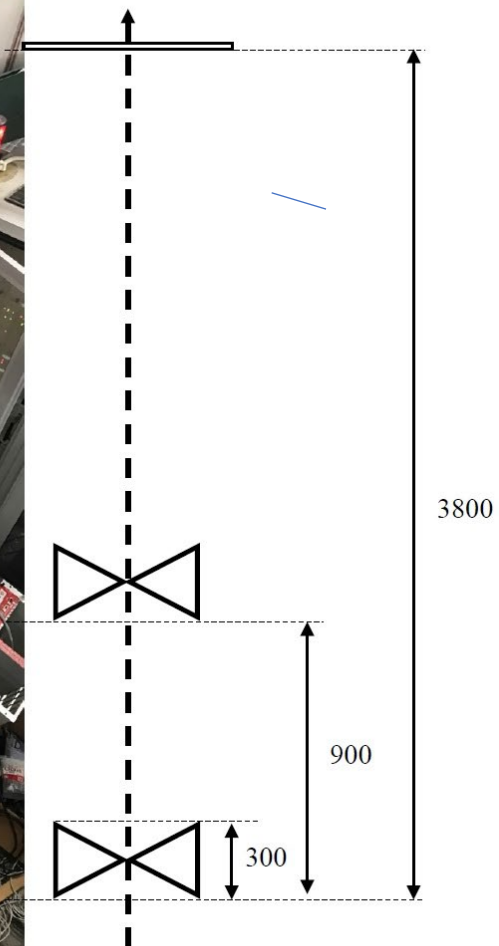
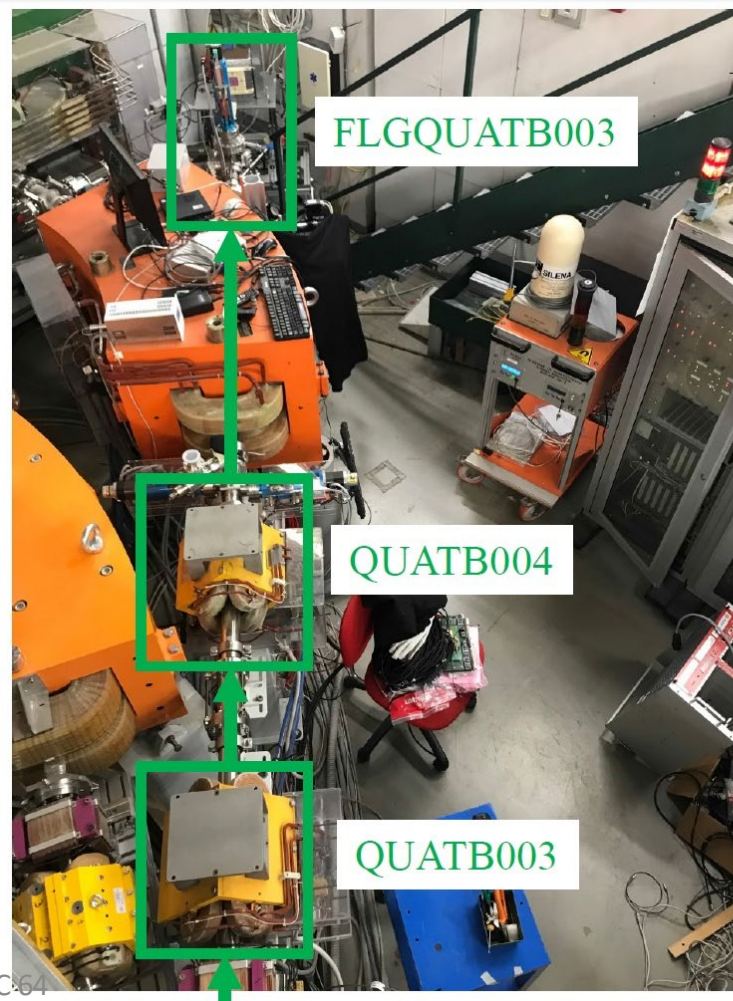
**BTF USER run (New Diagn.):
June 27->2Jul**

Synergistic emittance measurement system both for SPARC Vladimir Shpakov and BTF team.

Single-shot beam emittance via a pepper-pot-like method:
-> microlens array beamlets from the beam OTR radiation produced by the OTR radiator. Single shot measurement of beam size (OTR beam image), beam divergence (from OTR ang. distr. image), beam correlation (from microlens)

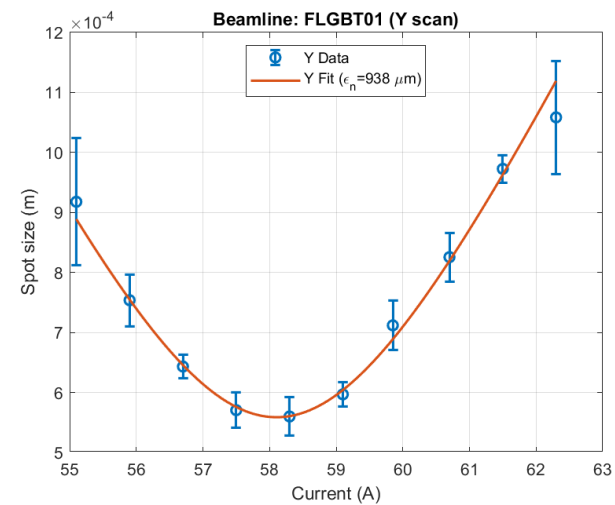
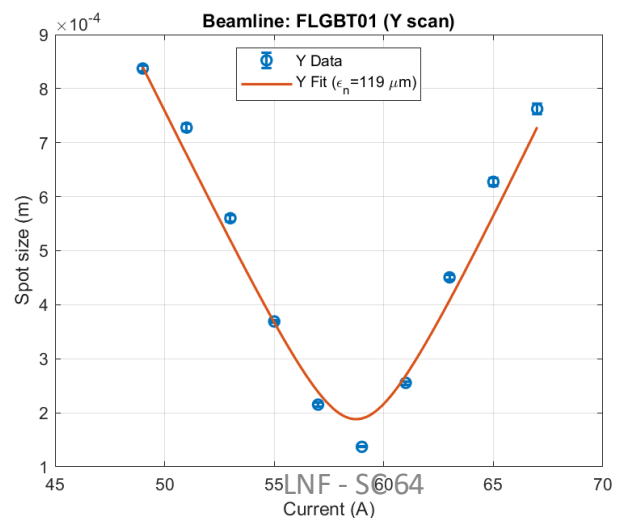
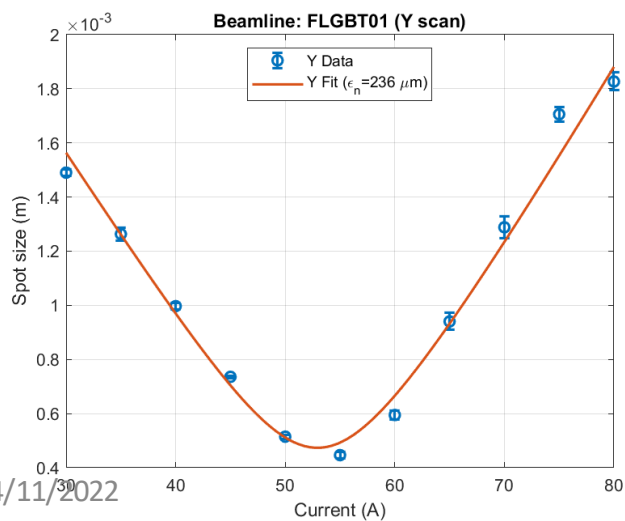
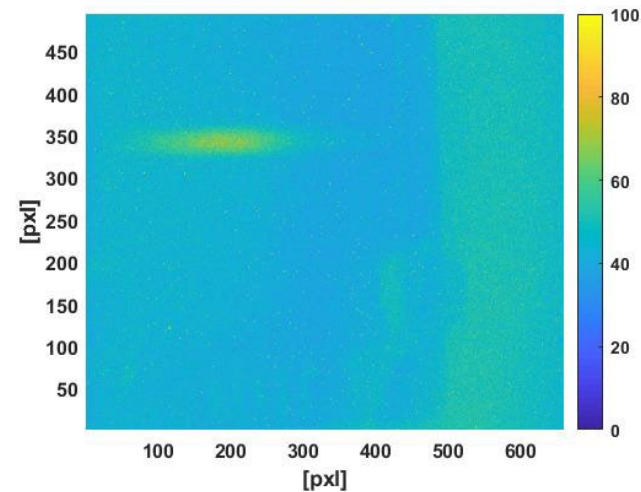
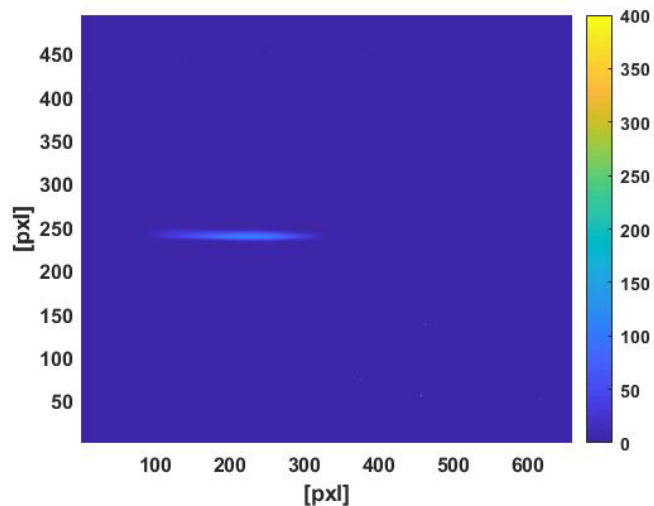
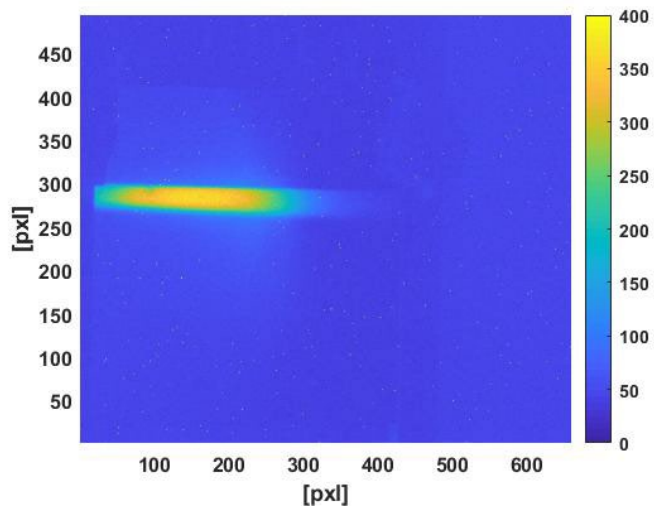


Courtesy of Vladimir Shpakov on SPARC behalf



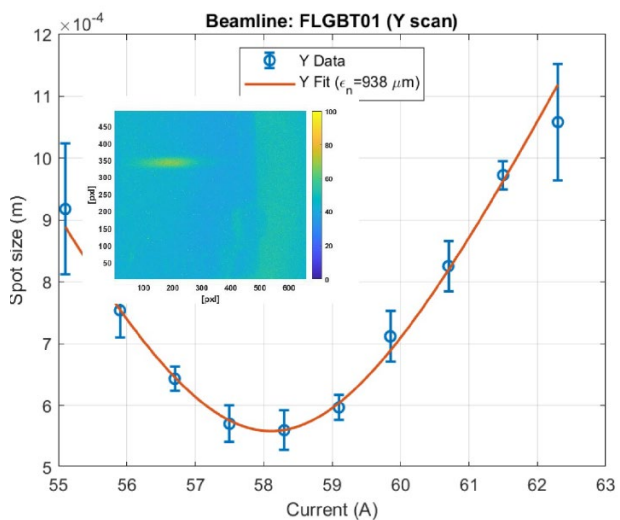
ELECTRON Beam = 503 MeV/10ns/300pC
Vertical emittance (rms) $0,2 \pm 0,05$ mm x mrad

POSITRON Beam = 497 MeV/10ns/4,7pC
Vertical emittance (rms) $1 \pm 0,32$ mm x mrad

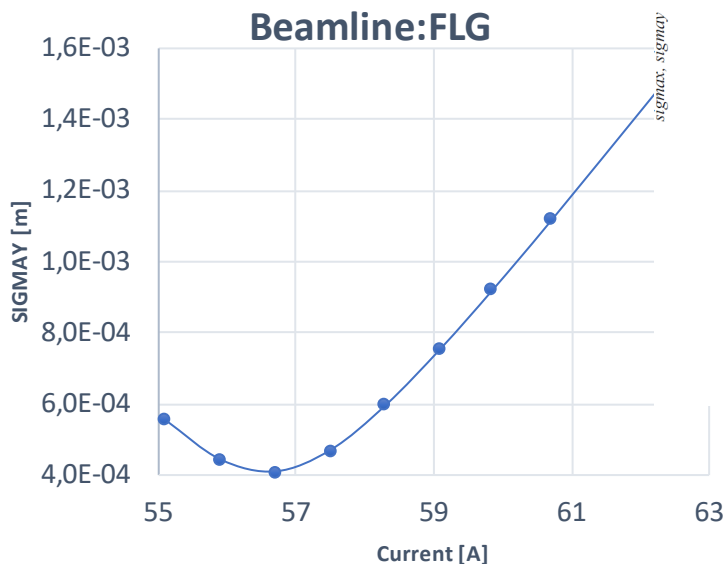


Demonstrated a fundamental possibility to make emittance measurements at FLGQUATB003, meaning we can (using OTR to image the beam, software, motors, optical set and alignment procedure...)

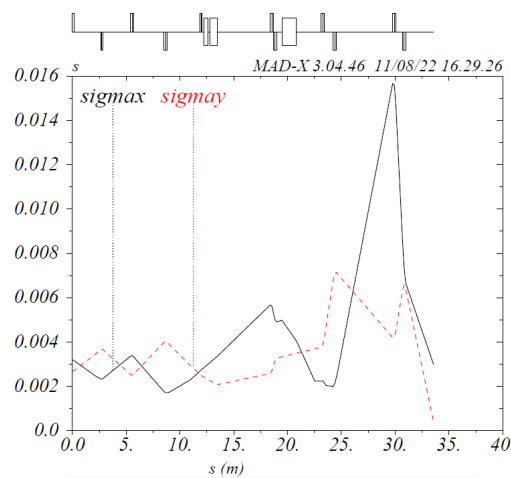
New documented measures for the BTF LINAC primary beam.



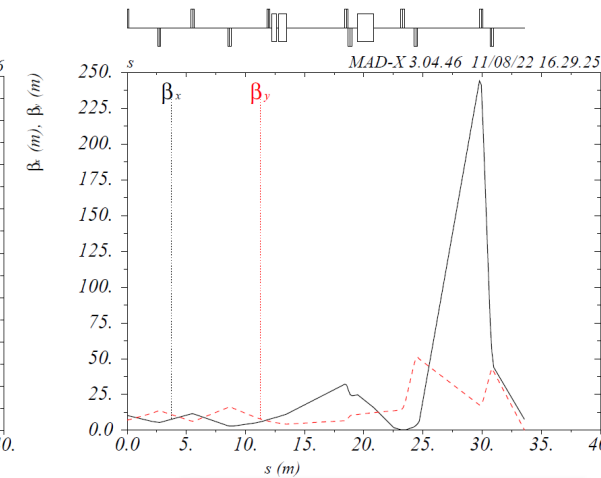
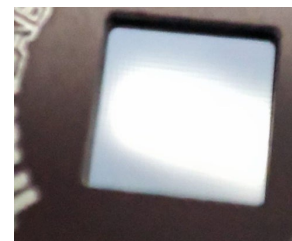
Positron Measure



MADX Sim.
C. Di Giulio



MADX Sim.



MADX Sim.



LINAC&BTF for DAFNE and X17



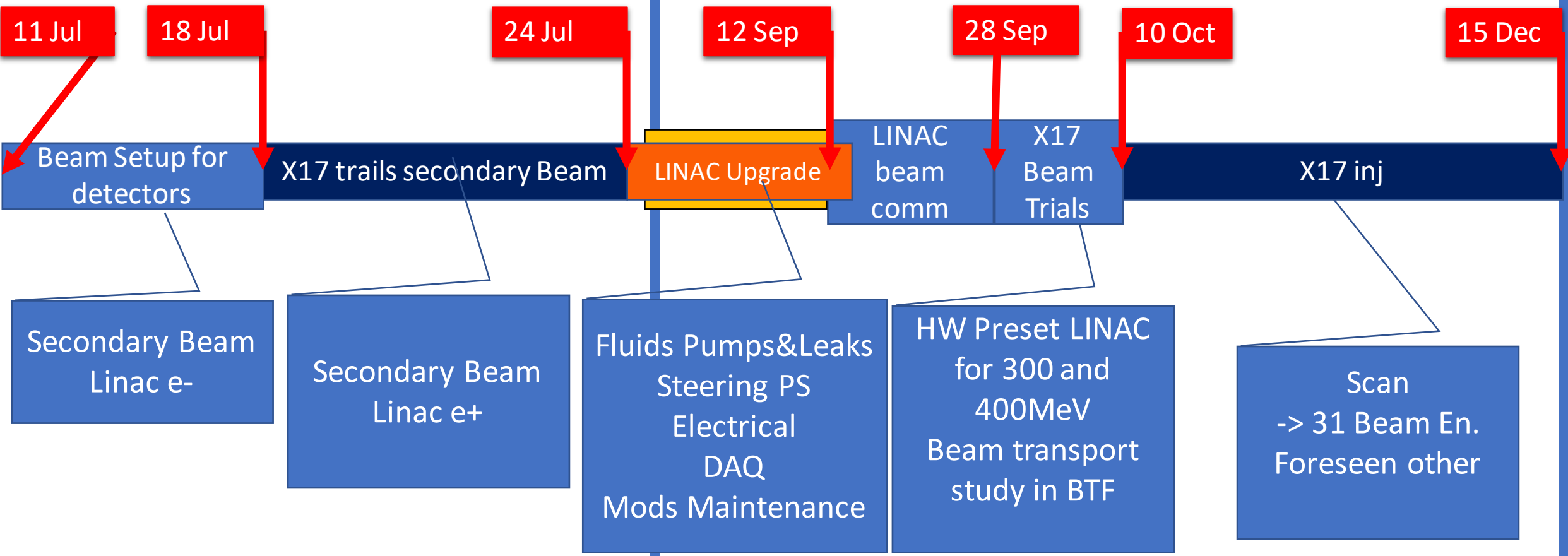
Recommendations DAFNE-BTF SC63

- The beam studies to decide on the most effective way to deliver the positron beam for the PADME run should be performed as soon as possible, compatible with the DAΦNE and the other BTF users' runs.

2022 Jul

2022 Sep->Dec

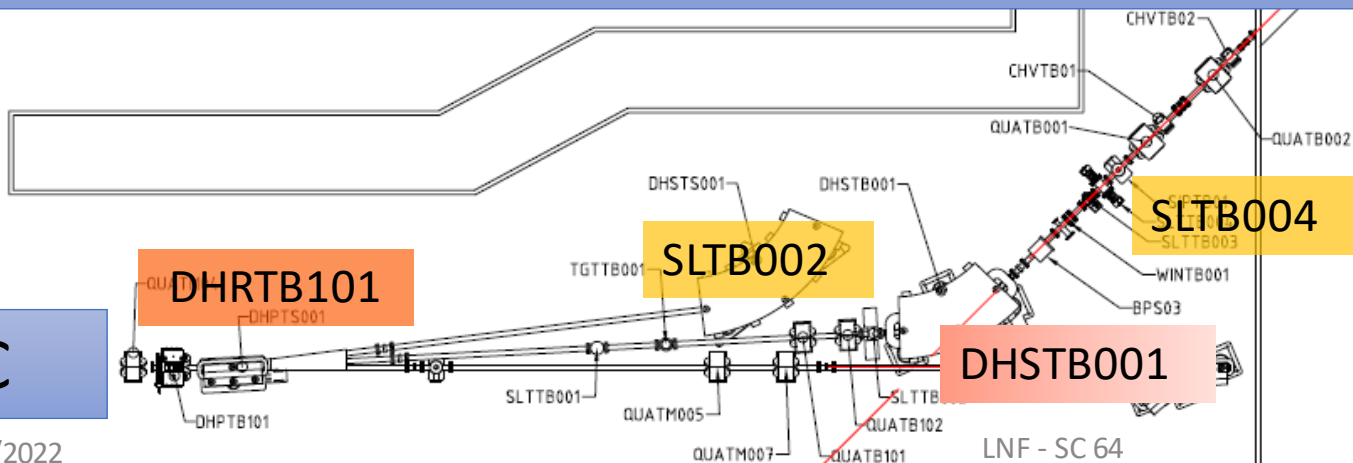
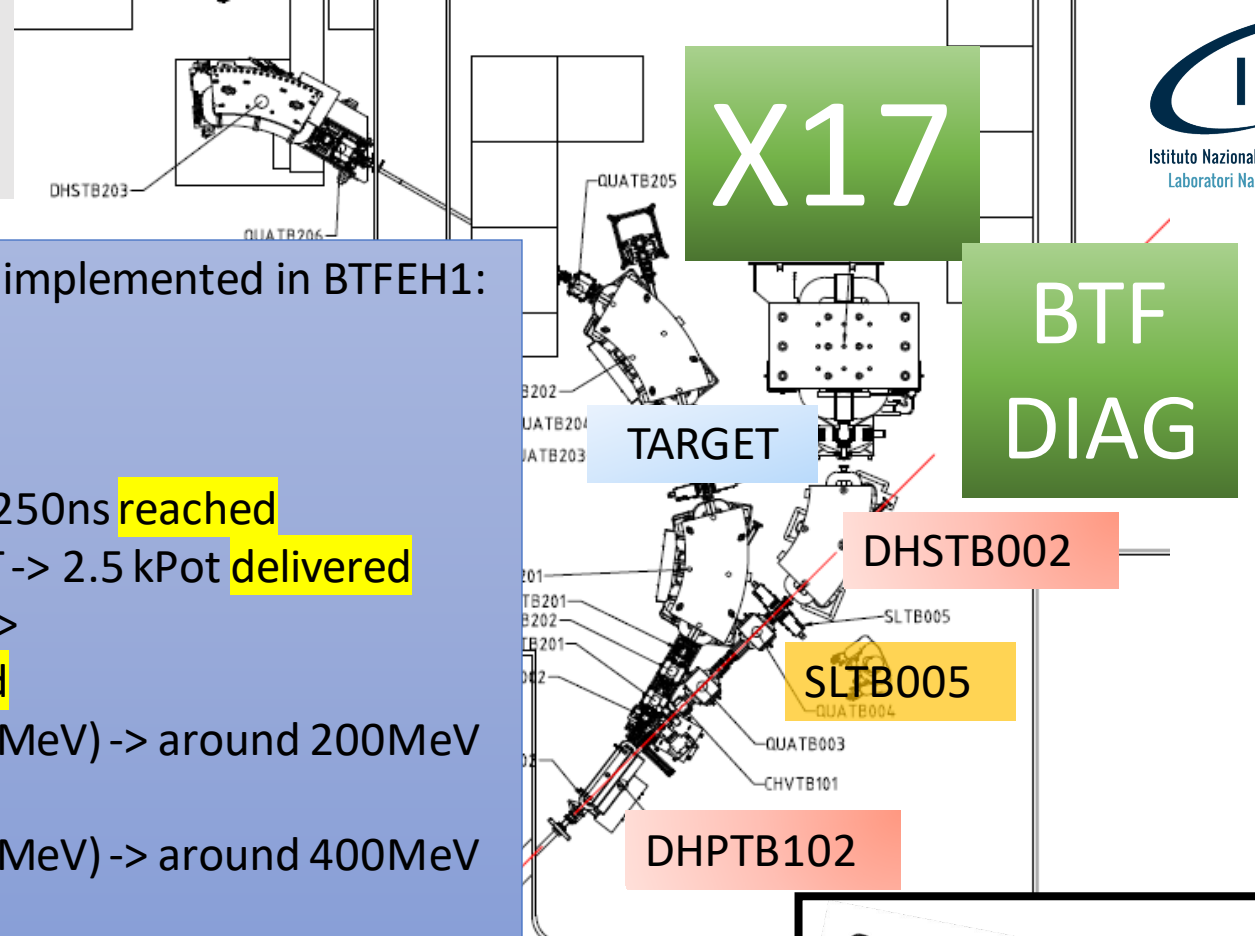
= shutdown



X17 VS PADME RUN

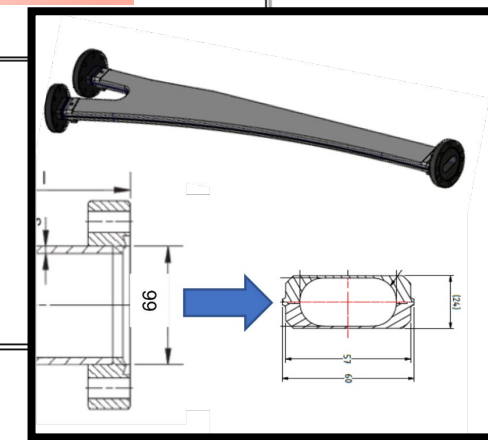
Main differences from PADME RUN2 due to BTF2 Line implemented in BTFEH1:

- DHPTB102 pipe -> check stay clear
- SLTB005 -> used to remove halo, no induced one
- Positron beam request:
 - Lower Pulse Length 320ns-> at least 100ns-> 250ns **reached**
 - Lower Pulse Charge 30kPoT-> less than 5kPoT-> 2.5 kPot **delivered**
 - Pulse selection: from fixed energy (430MeV) ->
 - Energy scan from [295-260] MeV **reached**
 - Energy scan out of resonances in U(<220MeV) -> around 200MeV **on going**
 - Energy scan out of resonances in U(>320MeV) -> around 400MeV **feasible in next weeks**



LINAC

14/11/2022



Very low charged primary positron beam
X17 received different beams type

- Bunch length up to 250ns
- Lower beam charge 2.5kPoTs
- Improvements in beam stability and background

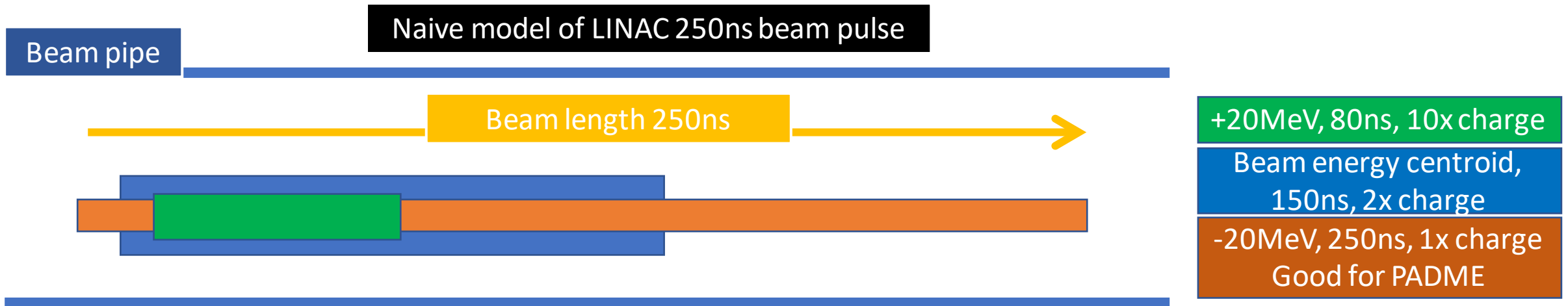
AGAIN HUGE improvements in respect PADME RUN2 2020 primary

- **Lower GUN emitted current**
 - Under the dynamic range for the most LINAC diagnostic, after positron converter (BCM, BPM, ICT)
 - Setup done at lower current without attenuator since shorter pulse requested from experiment
- **Very good** background in BTF1 experimental hall and X17 (now less than 180nS/h)
 - **Even with a reduced** stay-clear factor in BTFE1 pipes, due to BTF2 (DHPTB102) installation
 - By beam steering defined gap (2mm/3A on vertical correctors)
 - But **harder constraint** on beam passage and stability
 - X17 staff happy for this
- **Low beam loading** => Final beam energy spread around 0,5% (before BTF line selection) at 400MeV trails
 - Different energy populations with different bunch length and charge
- Beam pulse length and charge at Diamond Target with harder constraint in respect of initially asked by experiment:
 - **LINAC pulse extended from 100->200ns** => improved in respect of what experiment requested

After July trials with secondary positron beam, X17 team preferred to move vs primary positron beam, enhancing final beam spread and top current (max multiplicity was up to 3000 secondary PoT at 400MeV).

For X17 run:

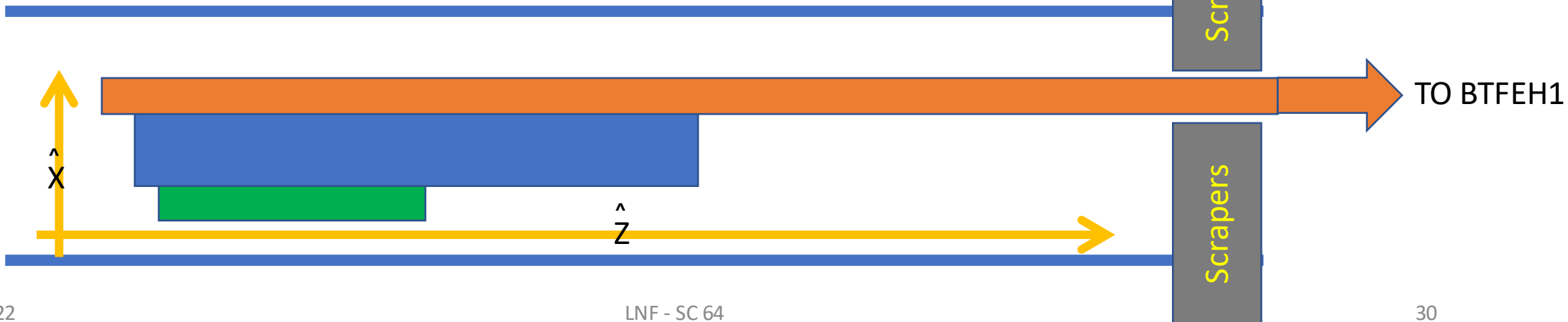
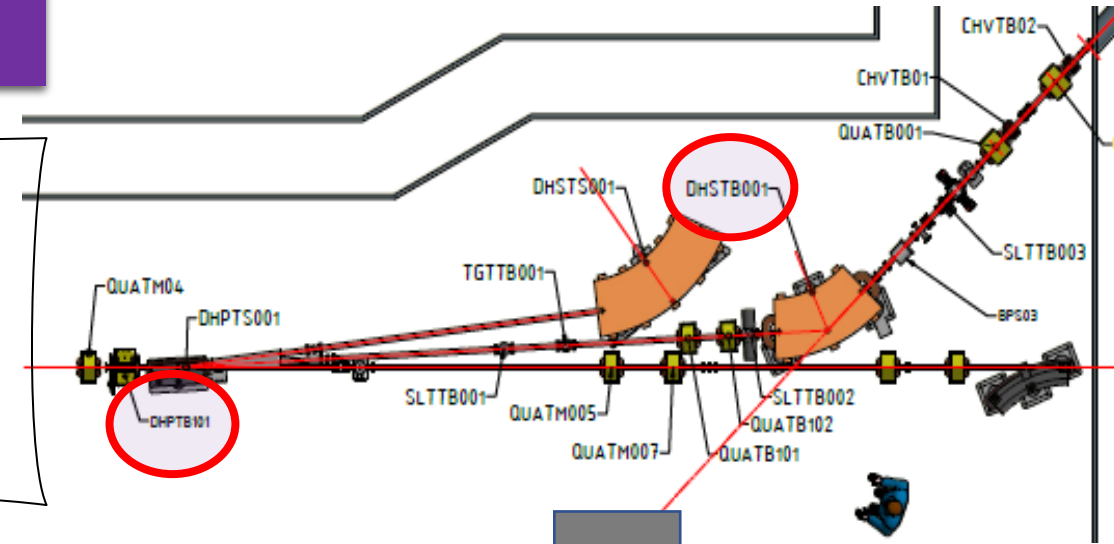
- LINAC pulses 50 shots/s
- Primary positrons
- 250ns pulse for all the energy involved (400MeV and continuously 300MeV down to 200MeV)
- Lower current on target



After DHSTB001 e DHRTB101, TB2 scraping

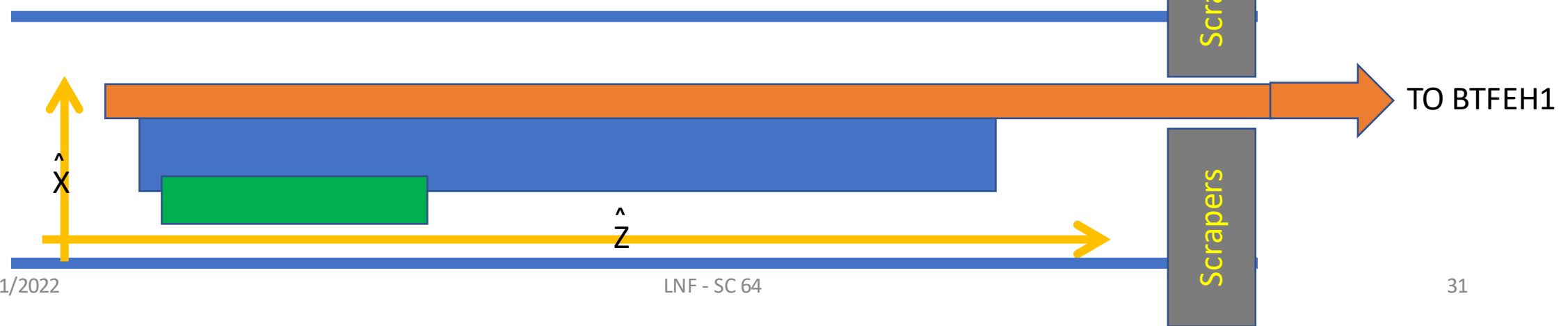
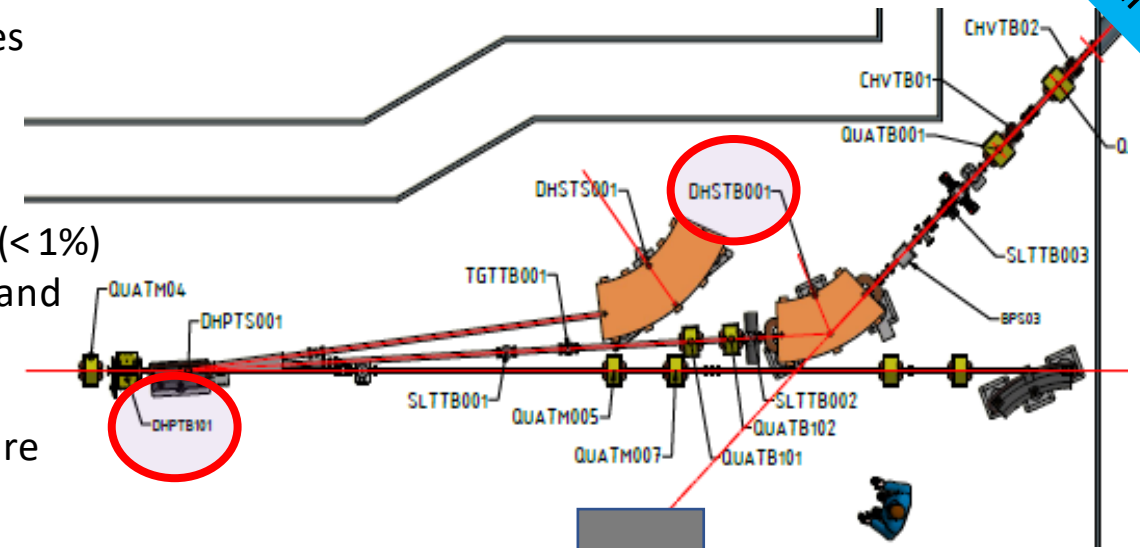
The structured beam spread is used for time/charge selection via:

- Injection angle in BTF channel
- **Horizontal scraping**, get final energy spread at SLTB002 level
- Refining as secondary beam the SLTB004
- **Charge control via LINAC current is great (down to single particle multiplicity !!!!) -> no needs of target**



These way of beam structure leads to:

- DHRTB101 - DHSTB001 act as second beam pulse flattening tool (removes head-tail peaks)
- DHSTB001 sector magnet => -X sees more focusing, higher energy
 - Treat this beam as secondary beam (as BTF usually do)
- SLTB004 – SLTB005 scraping downstream enhances final beam spread (< 1%)
 - Limited use of downstream scrapers => lower BTFEH1 background and beam side effects
- More degree of freedom to get desired beam parameters
- **Reduced coupling of final focus from injected beam** (transverse shape are huge compared to SLTB003-004 scraper pin hole)
- Mylar window is a good Bremsstrahlung radiator for an online monitor



Fast BTF beam diagnostics

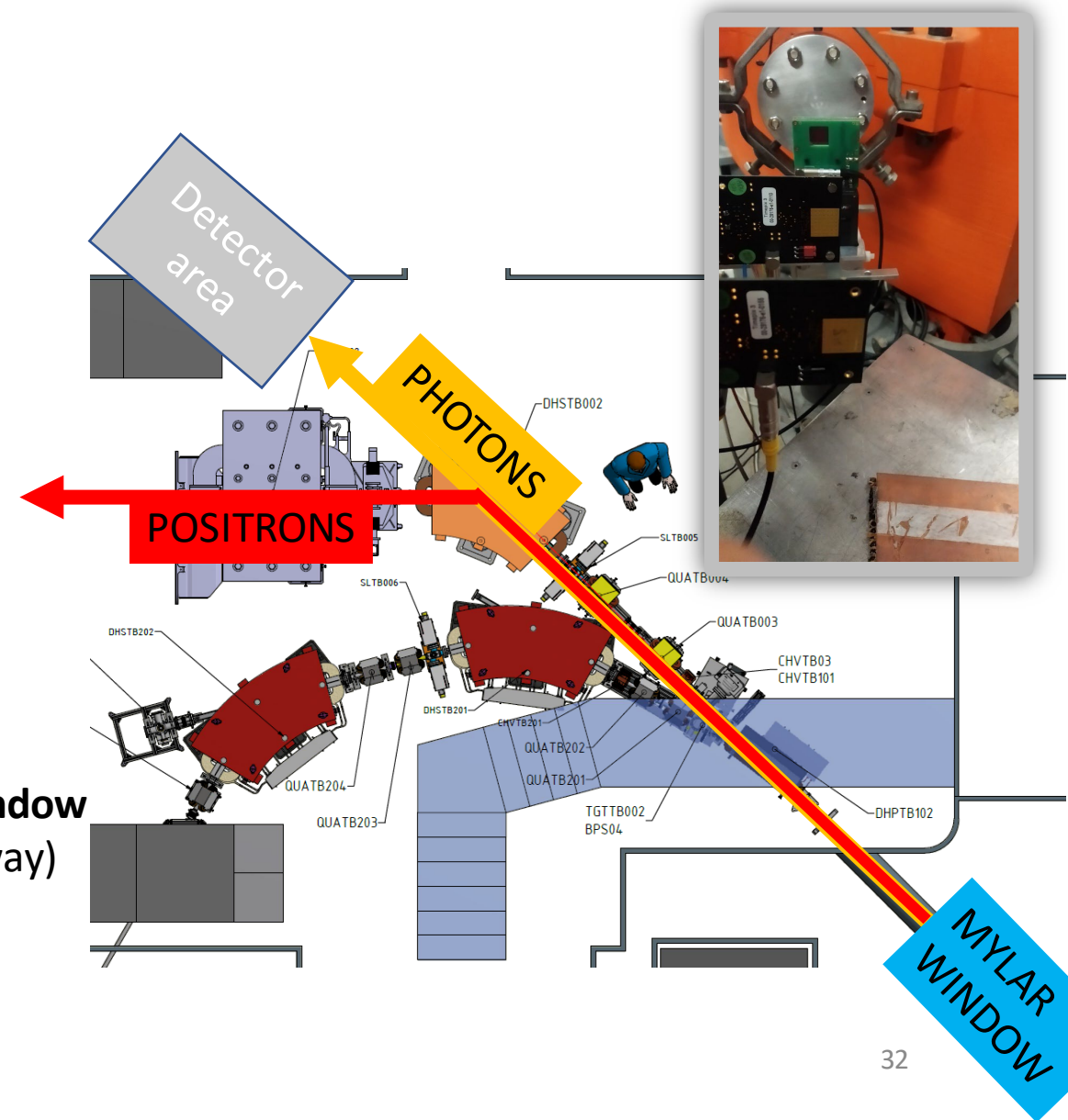
- CALOBTF1 (PbWO – NA62 like)
- Timepix detectors (65k Pixel TPX, TPX3 detector, $\sim 2\text{cm}^2$)
- Located downstream the straight pipe in the DHSTB002 dipole
- Adsorber in the middle (0.05mm Ti window, 0.7 Si detectors)

Direct measurement (positrons, X17 delivered beam):

- Stop injections to X17
- DHSTB002 switch off
- Injection in the straight DHSTB002 channel

Undirect measurement (secondary photons, run quality monitor)

- Beam steered to X17
- CALOBTF1 and FITPix get Bremsstrahlung photon from mylar window
- Energy collected is less 0,001 of the total steered charge (12m away)
- Used to monitor delivered PoT and beam length runtime
- Higher measurement errors in respect to PADME RUN(20%)



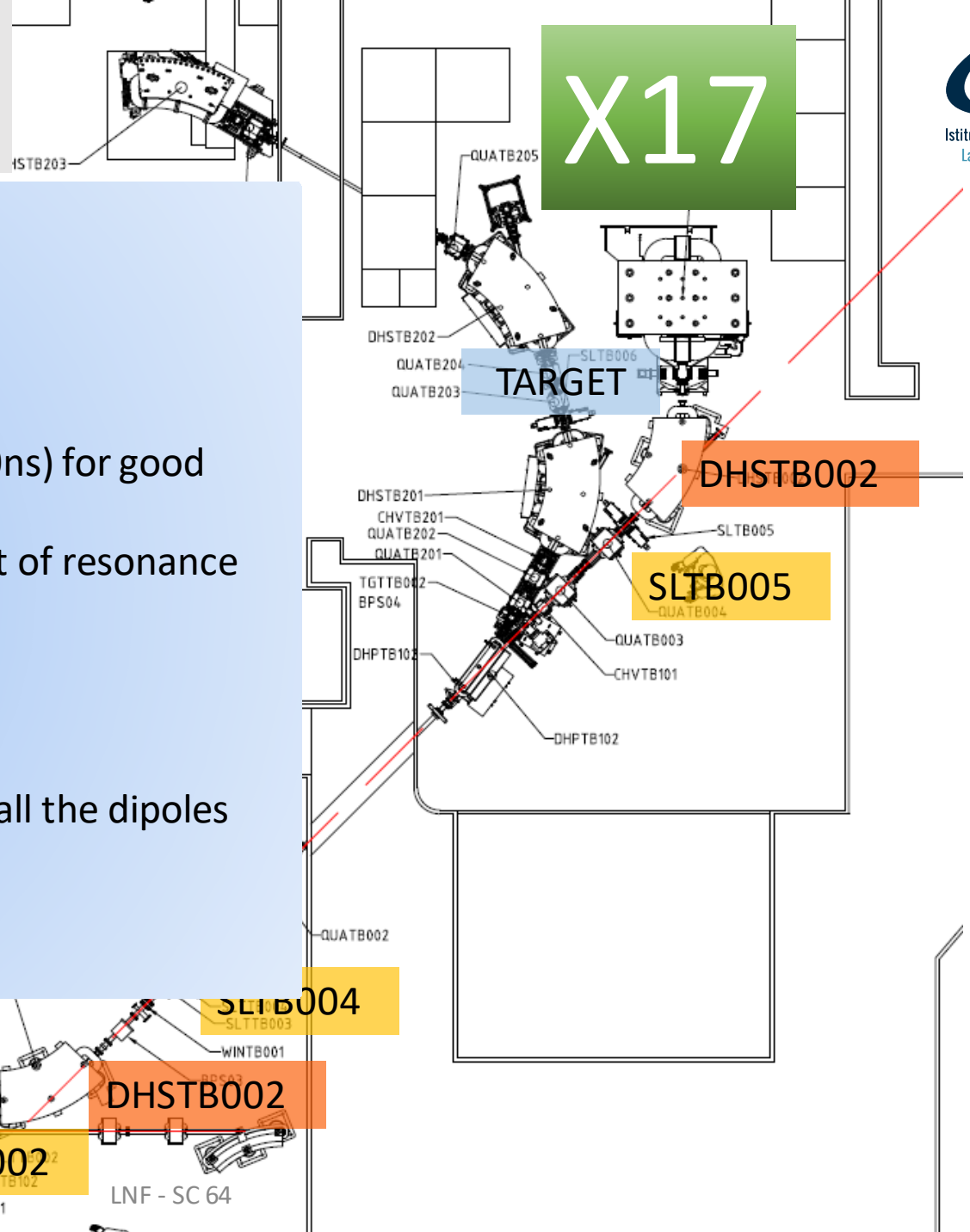
BTF ENERGY SCAN

Measure setup (X17 decisions) and its progression:
 Rules for reproducible measurements and simulations:

- **Maximum current limit** due to experiment constraint
- Minimum current obvious (Data taking)
- **Hit point stability** on diamond target
- Flat Pulse shape (ideal double step pulse in time, >100ns) for good current inj
- **Fixed quadrupoles** current (different setup only for out of resonance trials)
- Energy spread containment

DHSTB001 as energy selector

- Energy scan on hysteresis loop descending branch for all the dipoles
- Multiplicity correction only via scrapers
- Scrapers maximum gap in tuning (+-0.1 μ m)
- Pulse envelope shape correction only via ModA phase



ACTIVITIES FOR X17

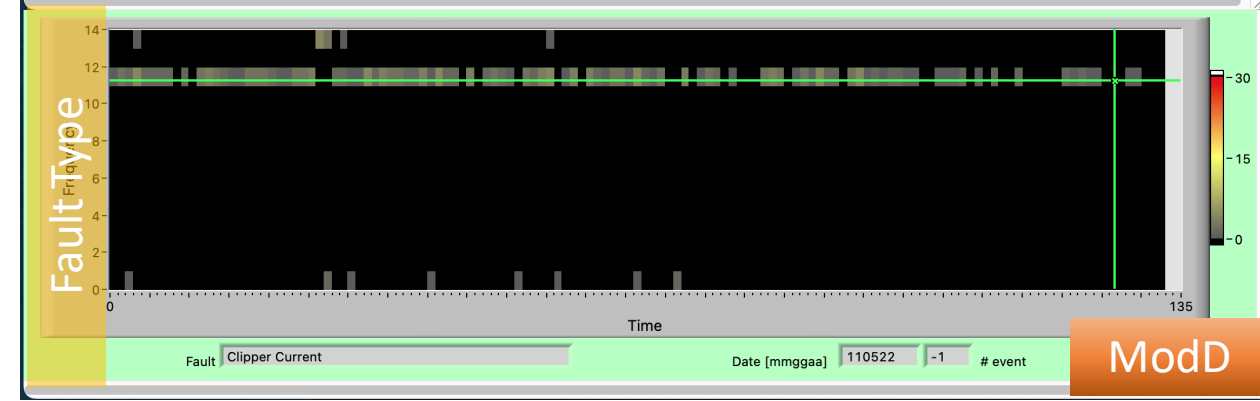
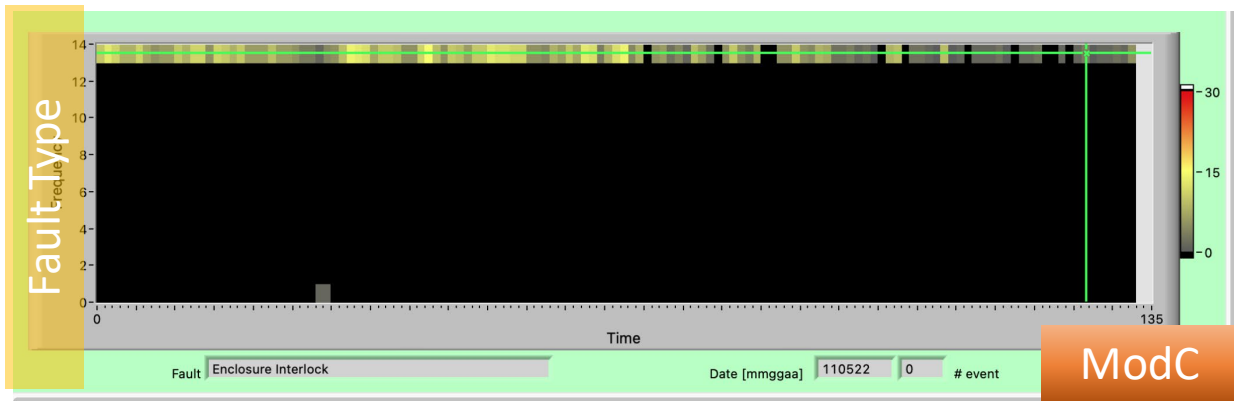
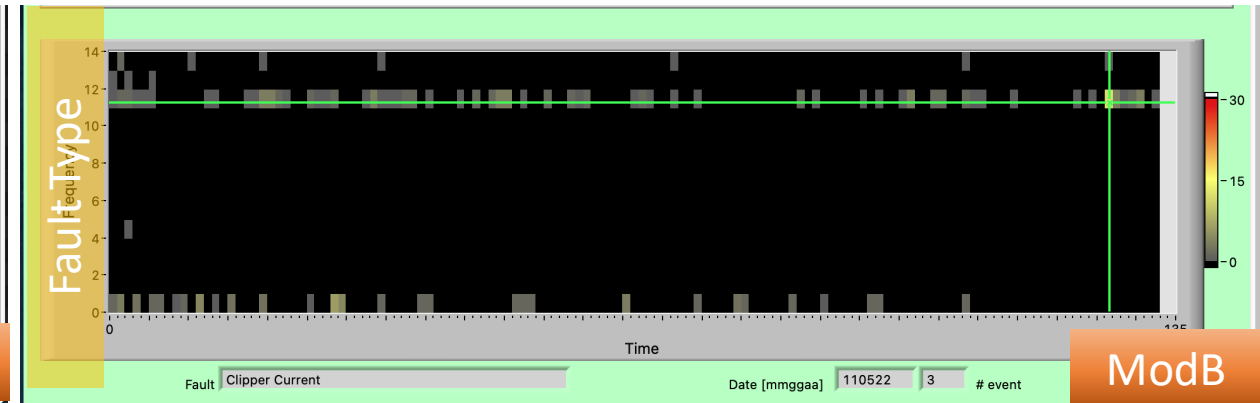
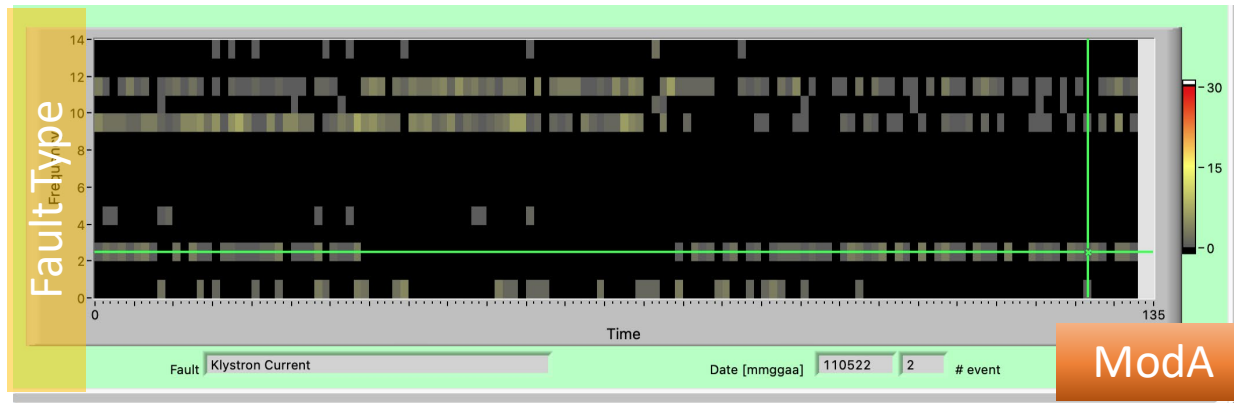
- Mylar vacuum windows test-> maintain effectiveness
- BTF1 line attached to PADME vessel but higher vacuum limit (~1E7mb)
- LINAC maintenance and consolidation:

- HV Pulser GUN installation for PADME (40ns-1us)
- (32/46) PS correctors upgraded and Commissioned Sept. 2022
- Next 16 in the next future
- QW8-10 Power supply substitution
- Secondary Water pump substitution
- DAQ (CAMAC) maintenance
- Modulator Maintenance



Kly	A	B	C	D
Vk [%]	95	92	85	89
RF [%]	51	97	91	56
Fault [hours]	~6	~45	~5	~9

- X17 300MeV positron beam requires not so much high power
- LINAC Kly B(2001) suffers fast trips (3#/day) for klystron pulse current that produce clipper current fault too.
- Beam injections in X17
 - Beam and detector study in July (22different beams, different phase)
 - One energy pre-set per day -> 24H of continuous data taking -> Integrated day lumi 1E10 PoT
 - Steady state condition



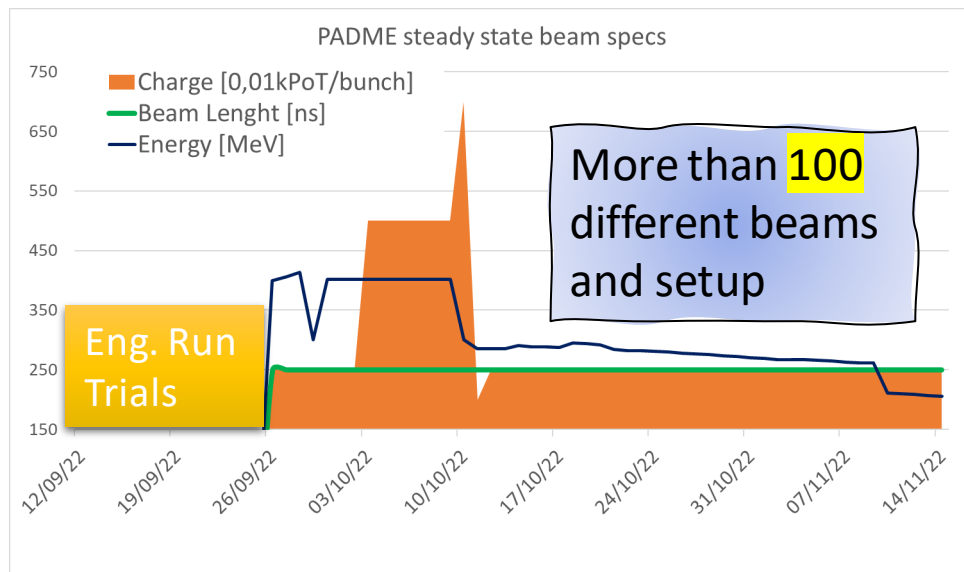
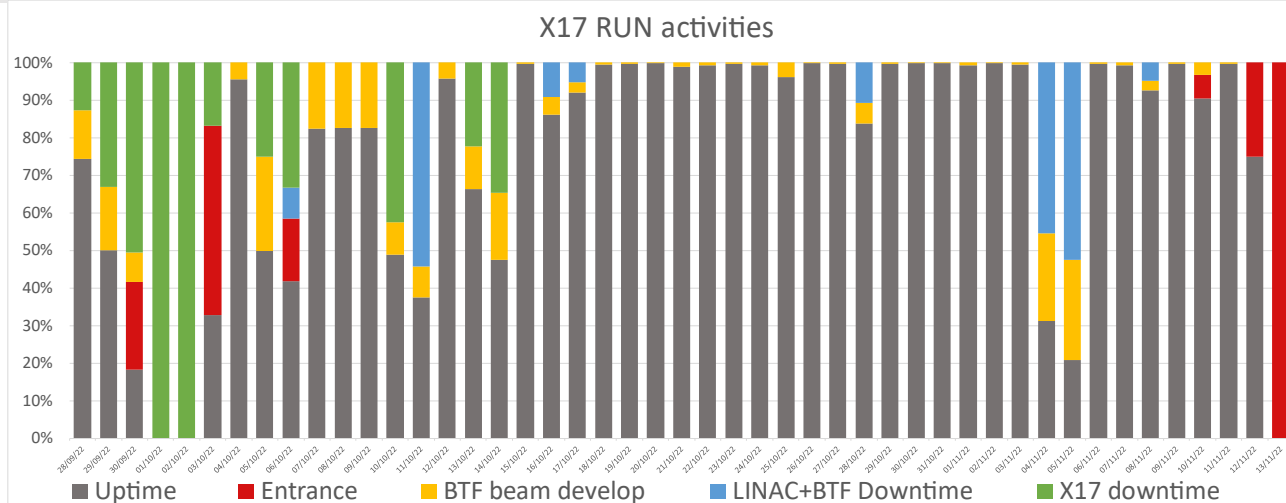
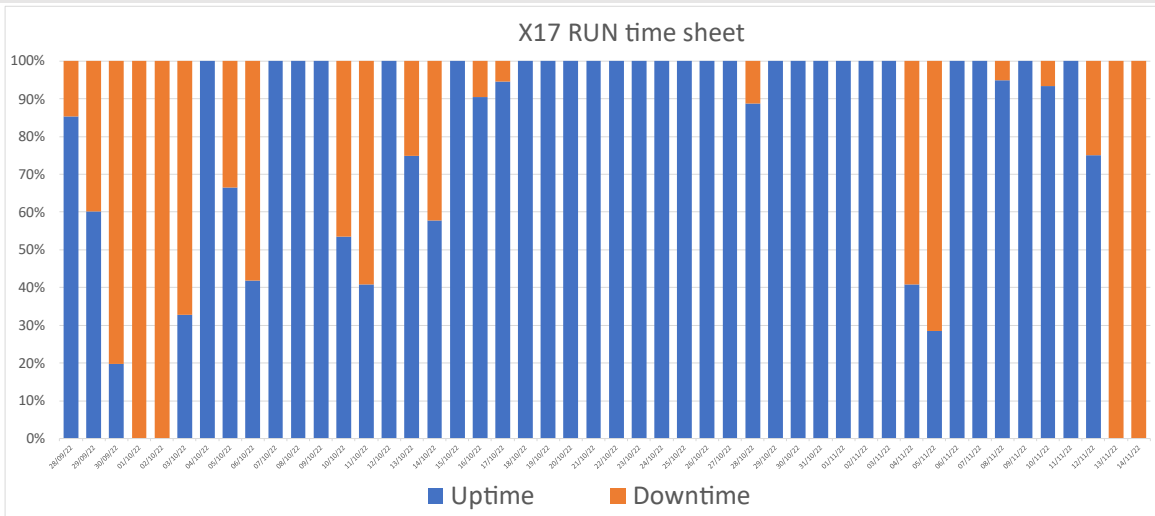
LINAC FAULTS STATS 01/05/2022 - 10/11/2022 (G. Piermarini)

KLY B clipper current

Kly A PFN Charge current/ Pulse current

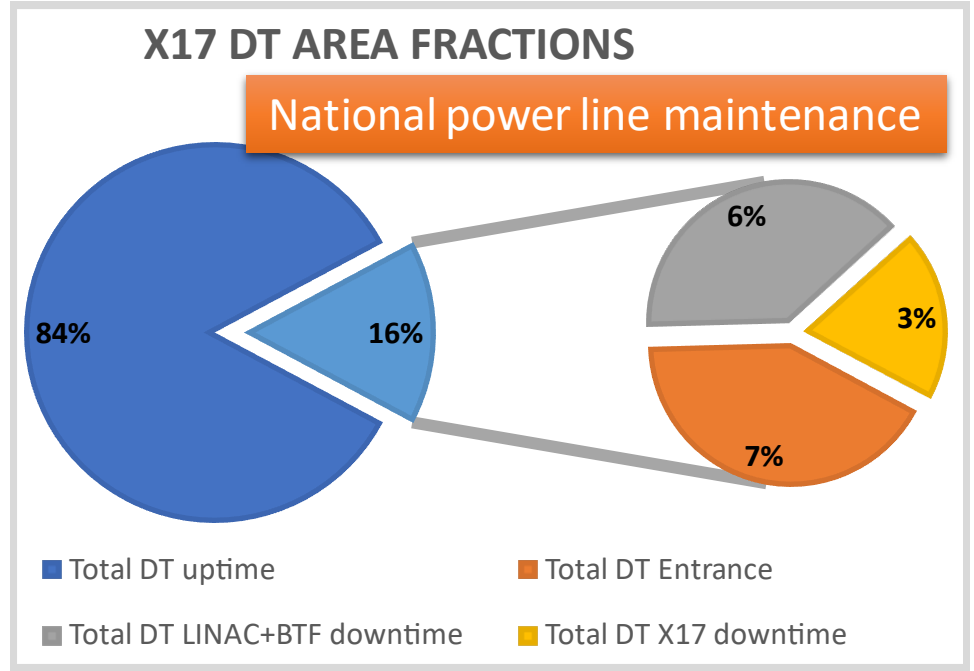
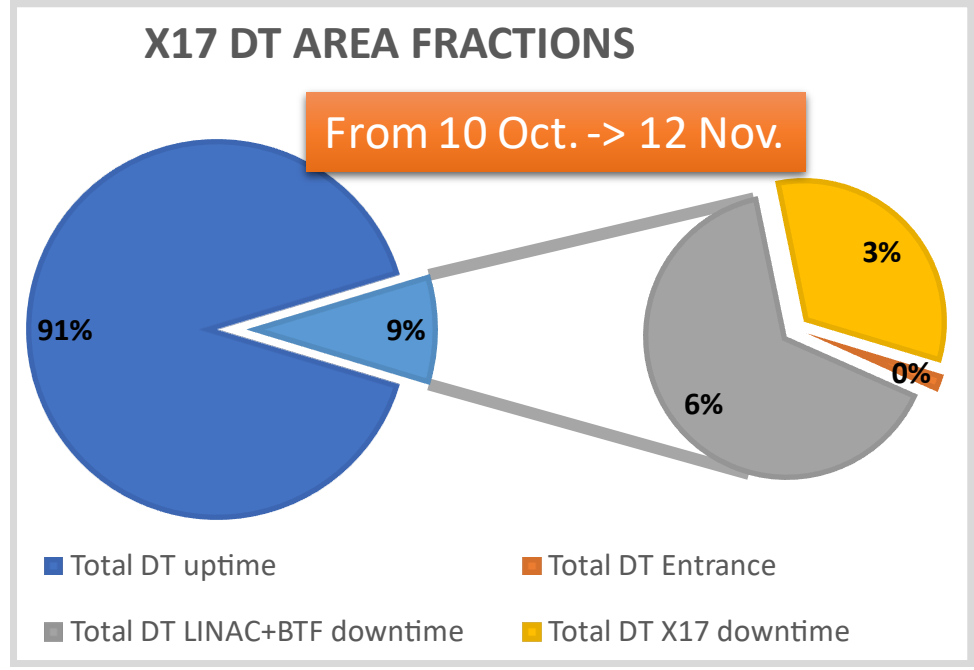
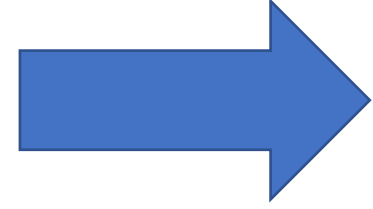
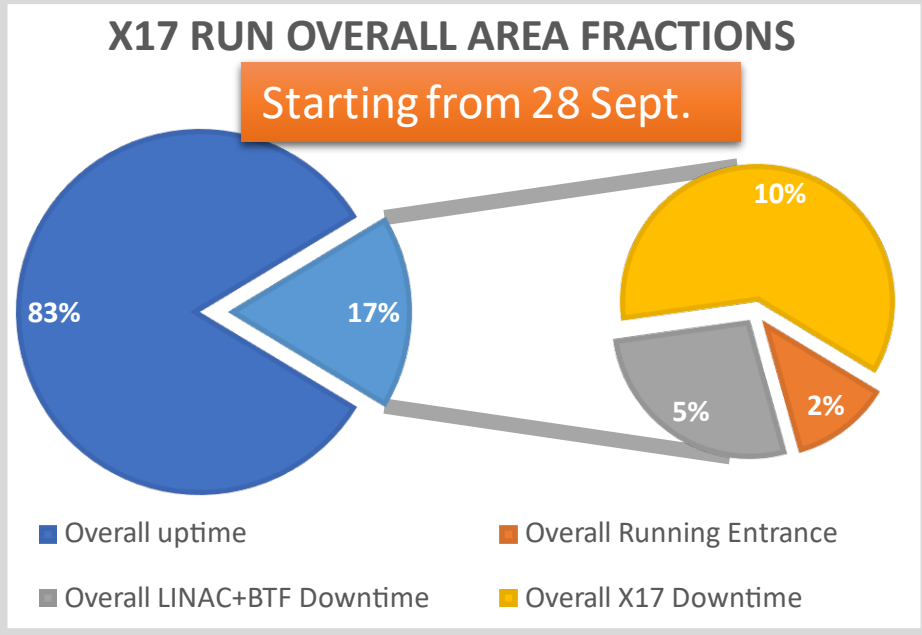
Most of the fault with rapid recover (few minutes)

BTF X17 RUN STATISTICS



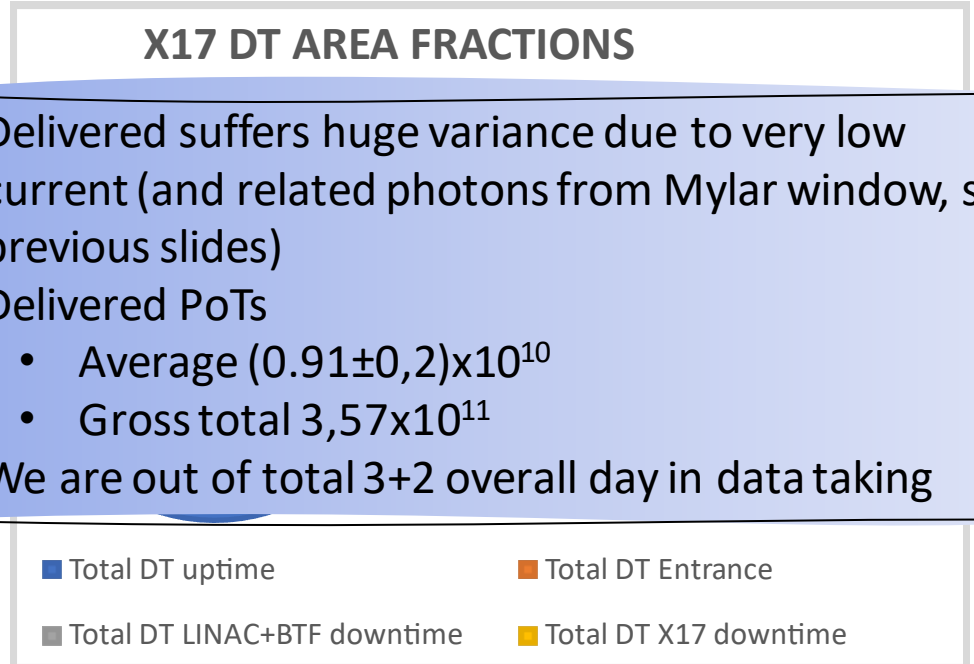
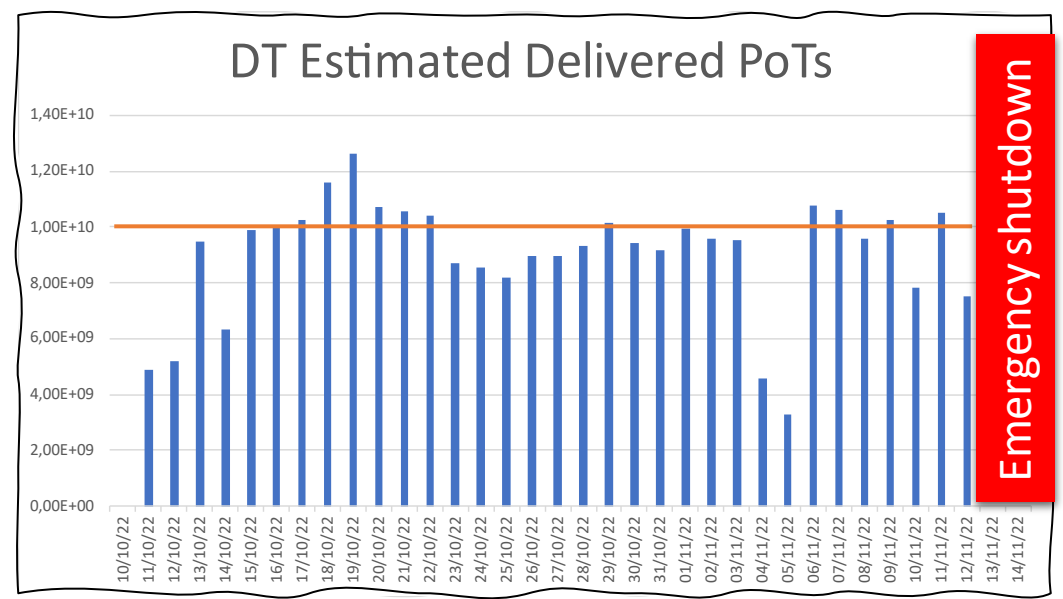
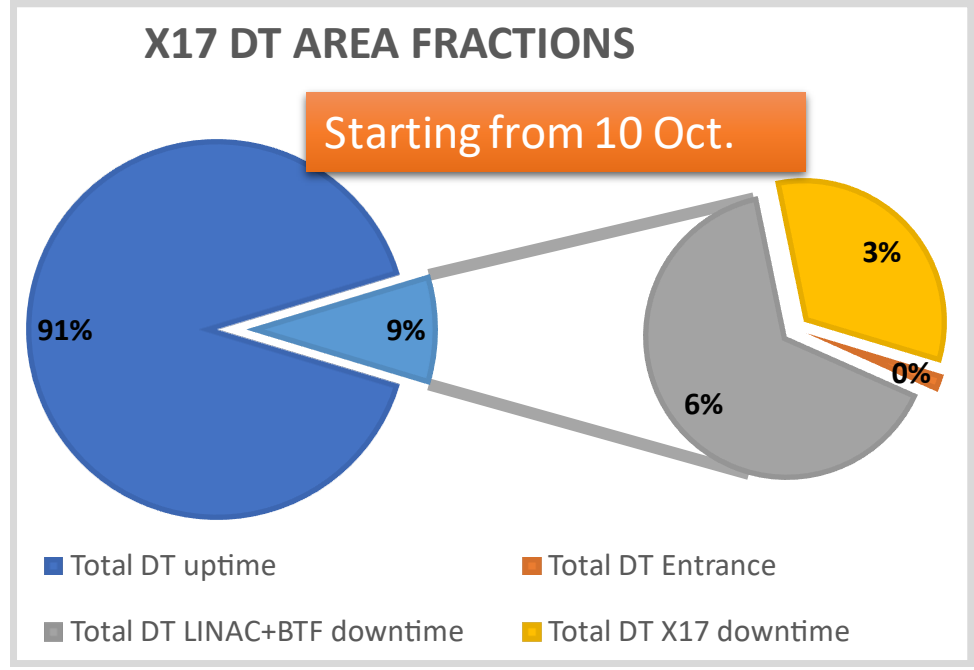
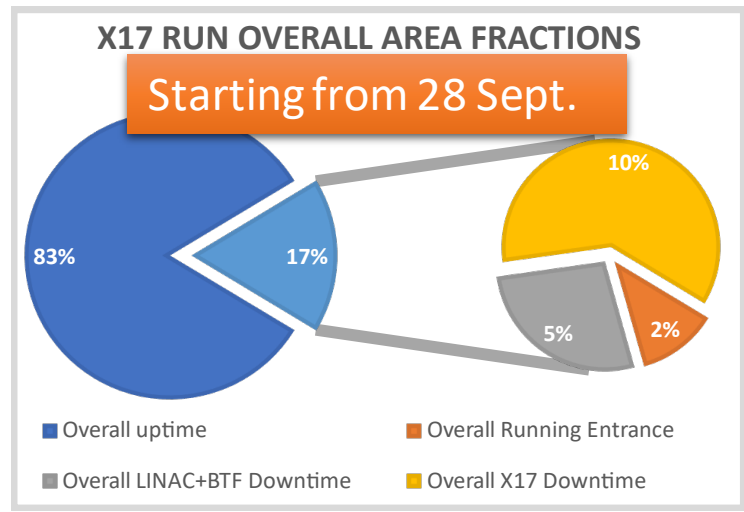
- Again, significant faults (thanks to the poissonian factor) occurring mostly in the weekend, also in this run.
- The hard work of our personnel have balanced such delays
- Again, the more RUN going on, the less faults appearing
- In respect to PADME RUN2, the injection efficiency moves from 0.77 to 0.91 average
- On the 12° Nov. evening, TERNA communicate only 1 hour to fully shutdown DAFNE complex due to emergency maintenance on this National Main Power Line branch
- Now in rebooting phase, BTF up and running

X17 RUN STATISTICS



- In respect to PADME RUN2, the injection efficiency moves from 0.77 to 0.91
- Significant impact of TERNA emergency stop, uptime 91%->84% (actual)
- At now, we can dilute the stop with our foreseen contingency-> end on 15° Dec.

X17 RUN STATISTICS



BTF Projects



ERAD PROJECT

**REGIONAL FUND ~ 690k€
(FTE+Consumables)**

AIMS:

The general aim of the project is the use of electron sources, available at the INFN-LNF to measure the behavior and resistance of electronic components intended to be subjected to radiation in the aerospace environment.

The values and results acquired with these measurements will be compared with homologous measurements performed with photons in order to define comparative resistance thresholds and related indicators.



**Last Test Beam in July 2022
Project ended with great success!**

ERAD @ BTF

INFN TEAM:

Project leader: B. Buonomo

Project TEAM: LINAC BTF Staff and LNF Services



**eRAD
Test di resistenza alle radiazioni per componenti
aerospaziali**

eRAD Protocol N. 001/2022



Electron beam irradiation protocol proposal for electronic components in the aerospace environment

Bando Regione Lazio n: POR FESR LAZIO 2014-2020 "Progetti Strategici"

eRAD

Test di resistenza alle radiazioni per componenti aerospaziali

DELIVERABLE REPORT

**MANUALE DEI REQUISITI OPERATIVI
D1.1**

Documento N.: ERAD-2020-D1.1
Data di consegna: Da Mese 5 (Nov 2020) a Mese 8 (Feb, 2021)
Data: 12/01/2021
Work package: WP1: Studio requisiti di prova e definizione protocolli
Lead beneficiary: eRAD Teams
Document status: 14/11/2022

Bando Regione Lazio n: POR FESR LAZIO 2014-2020 "Progetti Strategici"

eRAD

Test di resistenza alle radiazioni per componenti aerospaziali

DELIVERABLE REPORT

**RAPPORTO DI PROVA :
HIGH ENERGY ELECTRONS RADIATION TESTS IN COMPARISON WITH TID TESTS
D2.1**

Documento N.: ERAD-D2.1
Data di consegna: (Agosto, 2022)
Data: 12/08/2022
Work package: WP2: Rapporto di prova
Lead beneficiary: eRAD Teams
Document status: 11/02/2022



Bando Regione Lazio n: POR FESR LAZIO 2014-2020 "Progetti Strategici"

eRAD

Test di resistenza alle radiazioni per componenti aerospaziali

DELIVERABLE REPORT

**RAPPORTO DI PROVA
D3.1**

Documento N.: ERAD-D3.1
Data di consegna: (Feb, 2022)
Data: 12/08/2022
Work package: WP3: Rapporto di prova
Lead beneficiary: eRAD Teams
Document status: 11/01/2022



Bando Regione Lazio n: POR FESR LAZIO 2014-2020 "Progetti Strategici"

eRAD

Test di resistenza alle radiazioni per componenti aerospaziali

DELIVERABLE REPORT

**RAPPORTO DI PROVA LINAC-BTF
D4.1**

Documento N.: ERAD-2020-D4.1
Data di consegna: A Mese 8 (Feb, 2021)
Data: 26/02/2021
Work package: WP1: Rapporto di prova LINAC-BTF
Lead beneficiary: eRAD Teams
Document status: 12/01/2021



This document is a proposal for a irradiation protocol for electronic components in the Space environment. It is the result of the eRAD project where the difference competencies by the Italian Space Agency (ASI), the National Institute of Nuclear Physics (INFN) and IMT & c., in the context of the LAEROSPAZIO main project coordinated by the ENEA synergic propose this protocol.

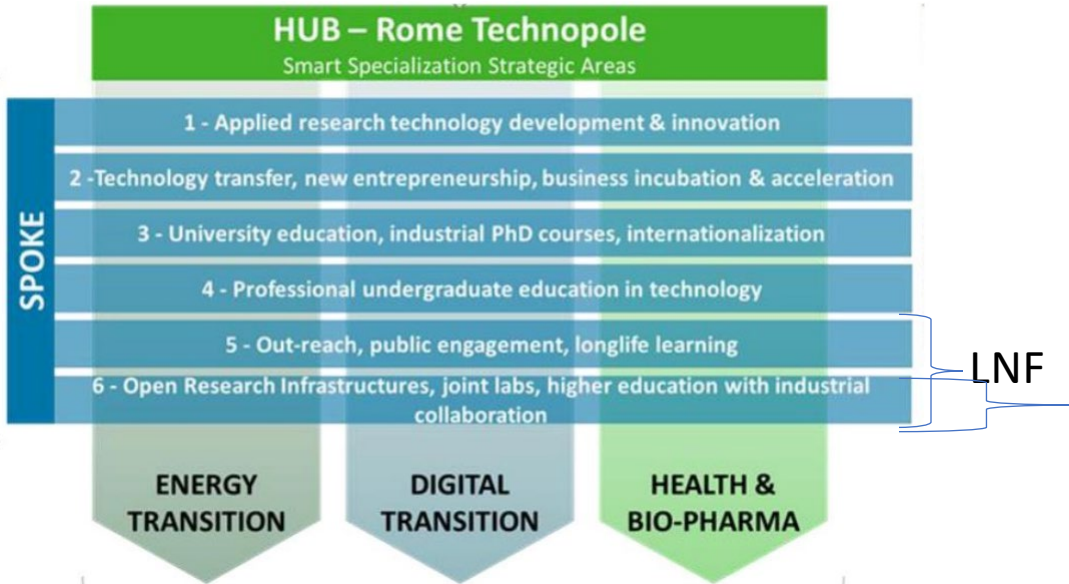
**Avviso pubblico: Proposte per la creazione e il rafforzamento di "Ecosistemi dell'Innovazione»
PNRR, Missione 4 Istruzione e ricerca
Componente 2 Dalla ricerca all'impresa, Investimento 1.5**



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.

ERAD funding

Started selection for BTF – fixed-term contract 2-years (**adding 1 FTE in BTF**)

- BTF people too old, looking forward also for student

PNRR - Rome Technopole funding

Expected Two young researcher – fixed-term contract 1-year (**adding 2 FTE in LINAC SERVICE**)

- In the next years other retirements will occur and needs overlapping actions
- **BTF is the right place for young people and ideas**
- **We have to balance working hours with LINAC/BTF group personnel**

Once the call for BTF is open, team leader can submit new booking request choosing the available dates on calendar.

Dates

Select date of request booking

< >

December 2022

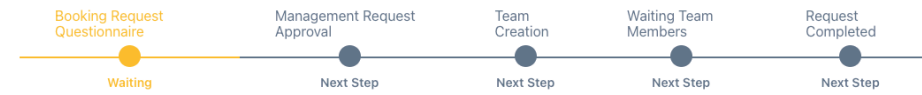
today

Mon	Tue	Wed	Thu	Fri	Sat	Sun
28	29	30	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
1a UserBooking						
19	20	21	22	23	24	25
Temporary						
26	27	28	29	30	31	1
2	3	4	5	6	7	8

Bookable
Not Bookable
No configuration

From To

✓ This period is bookable



Selected State

BTF

EXPERIMENT Proposal name *

Involved Institutions/Industries/Countries *

Experiment motivation related to requested beam time, scientific discipline, research area and purposes *

Proposal category (mark the right one): *

New - If you are submitting this experiment plan for the first time

Team Leader Telephone Number * *

Device under test description (please describe possible hazards) *

Owned setup to be put in experimental hall, brief description (please describe possible hazards related to)

Owned setup to be put in control room, brief description (please describe possible hazards) *

BTF needed setup, hardware, software and LNF facilities (after handshake with BTF staff) *

Time needed for experiment [contiguous days] *

Time needed for experiment roll in [hour] *

Time needed for experiment roll out [hour] *

- Team leader must fill the BTF questionnaire in order to proceed with request.
- The facility management and facility user committee will approve or deny via tech. and scient. reasons the submitted questionnaire.

After facility management approval, the team leader can create the team by adding INFN identities hosted in INFN identity management system.

Period: 2023-02-13 / 2023-02-19 Info
 Submitter: Giovanni Lorenzo Napoleoni
 BTF (Line2)

Selected State

Cancel Save Draft Complete

Add new team member

Selected user

Luca Gennaro Foggetta ✕ Ramon Orrù ✕ Michele Antonio Tota ✕

Create your team

Q Tota +

Name	Surname	UUID
Leonardo	Mastrototaro	7b37f3c9-2af6-485b-bd5f-231e1ec48747
Michele Antonio	Tota	017579c1-6567-4dbb-a2fc-6ef092c48d1e
Michele	Tota	26c0c003-107f-4048-92c2-145aa397c405
Dante	Totani	0e3b888f-5a5c-4623-afa5-...

Period: 2023-02-13 / 2023-02-19 Info
 Submitter: Giovanni Lorenzo Napoleoni
 BTF (Line2)

Selected State

List of selected identities

Name	Submitted Questionnaire	Secretariat Approval	Personnel Approval
Luca Gennaro Foggetta	✕	✕	✕
Ramon Orrù	✕	✕	✕
Michele Antonio Tota	✓	⊖	⊖
Giovanni Lorenzo Napoleoni	✓	✓	✓

- Each team member must fill a web personal form.
- Via this document workflow approval by secretariat and personnel.
- Team leader can view the approval team workflow in each moment.
- Once all approvals step the request is complete and team is authorized to enter the configured facility
- This software manage call period, documentation and the territorial QR-code access tool.

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 RI's 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
BTF	1176 (7 weeks)	180.75 €/h	≈ 213 k€	60 %	≈ 86 k€
SPARC	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

ERAD project closed successfully (IMT extremely happy to use electrons)

Successful Ext. User call, X17 experiment on going

- From the long stop at the end of 2019, a great deal of development has been made
- Now BTF closed for 2022 -> PADME-X17 till the end of the year
- X17 requirement had been just reached, now data taking
- Great effort from Acc. and Tech. Divisions (exp. Building and Fluids) for magnets, shielding and LINAC fluids)
- LINAC personnel and DAFNE operators fully involved in.

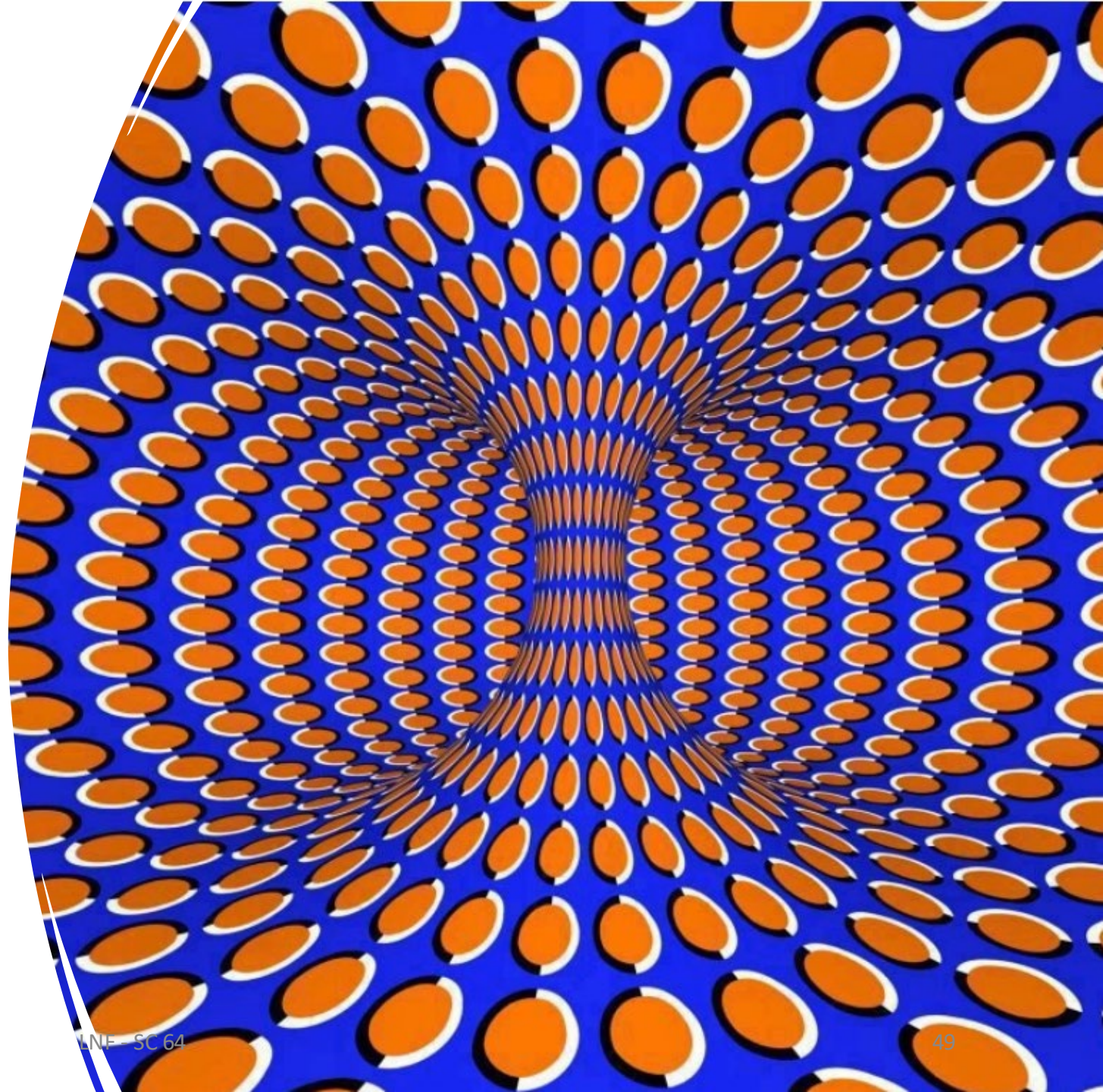
Long queue of people that need BTF1-BTF2
















- Ex. LIMADOU satellite – exp. Launch on 2023
- > 20 Groups waiting (up to now)










Young researchers needed

- PNRR and ERAD funding will cover
- BTF People too old, looking forward also for student

SPARE SLIDE



		Modal attività ▾	Nome attività ▾	Durata ▾	Inizio ▾	Fine ▾	Prede
1			▷ FISMEL_calendar_2023	320 g	lun 19/09/22	ven 08/12/23	
2			▷ BTF_calendar_2023	380,13 g	ven 08/07/22	lun 08/01/24	
3			▷ DA_calendar_2023	0 g?	gio 15/09/22	gio 15/09/22	
4			▷ SPP_calendar_2023	0 g?	lun 19/09/22	lun 19/09/22	
5			▷ DT0_calendar_2023	302 g?	lun 24/10/22	mar 19/12/23	
6			▷ Fest_calendar_2023	262 g	mer 28/09/22	gio 28/09/23	
7			▷ DR_calendar_2023	0 g?	mar 04/10/22	mar 04/10/22	

5			◀ DT0_calendar_2023	302 g?	lun 24/10/22	mar 19/12/23	
1			▷ Crane Maintenances	299 g?	gio 27/10/22	mar 19/12/23	
8			▷ Shilding Doors Maintenance	264 g	lun 24/10/22	gio 26/10/23	
12			▷ LINAC mowing	196 g	lun 31/10/22	lun 31/07/23	
18			▷ CR Deep cleanings	261 g	lun 19/12/22	lun 18/12/23	
24			▷ FLUIDS Maintenance	20 g	lun 23/01/23	ven 17/02/23	
29			▷ Pest control	101 g	ven 28/04/23	ven 15/09/23	
34			▷ Special DAFNE Building Maintenance	43 g	gio 01/06/23	lun 31/07/23	

		Modal attività	Nome attività	Durata	Inizio	Fine	Predecessori	N
1			▲ FISMEL_calendar_2023	320 g	lun 19/09/22	ven 08/12/23		
1			▲ Controllo periodico Sicurezze Radioprotezione	152 g	ven 02/12/22	lun 03/07/23		
2			Check FISMEL LINAC+BTF	3 g	lun 09/01/23	mer 11/01/23		
3			Check Globale+DAFNE-L	3 g	ven 02/12/22	<u>mar 06/12/22</u>	2	
4			Check FISMEL LINAC+BTF	3 g	gio 29/06/23	lun 03/07/23	2FI+6 mes	
5			Check Globale+DAFNE-L	3 g	ven 02/12/22	<u>mar 06/12/22</u>	4	
6			▲ Controllo Buon Funzionamento Sistema radiometrico	320 g	lun 19/09/22	ven 08/12/23		
7			Controllo Buon Funzionamento Sistema radiometrico	2 g	lun 19/09/22	mar 20/09/22		
8			Controllo Buon Funzionamento Sistema radiometrico	2 g	mar 20/06/23	mer 21/06/23	7FI+6 mes;11FI+6 mes	
9			Controllo Buon Funzionamento Sistema radiometrico	2 g	gio 07/12/23	ven 08/12/23	8FI+6 mes	
10			▲ Manutenzione Sistema radiometrico	1 g	lun 02/01/23	lun 02/01/23		
11			Manutenzione Sistema radiometrico	1 g	lun 02/01/23	lun 02/01/23		
12			▲ Monitoraggio attivazione residua aree	153 g	lun 02/01/23	mer 02/08/23		
13			Monitoraggio attivazione residua aree	2 g	lun 02/01/23	mar 03/01/23		
14			Monitoraggio attivazione residua aree	2 g	mar 01/08/23	mer 02/08/23		

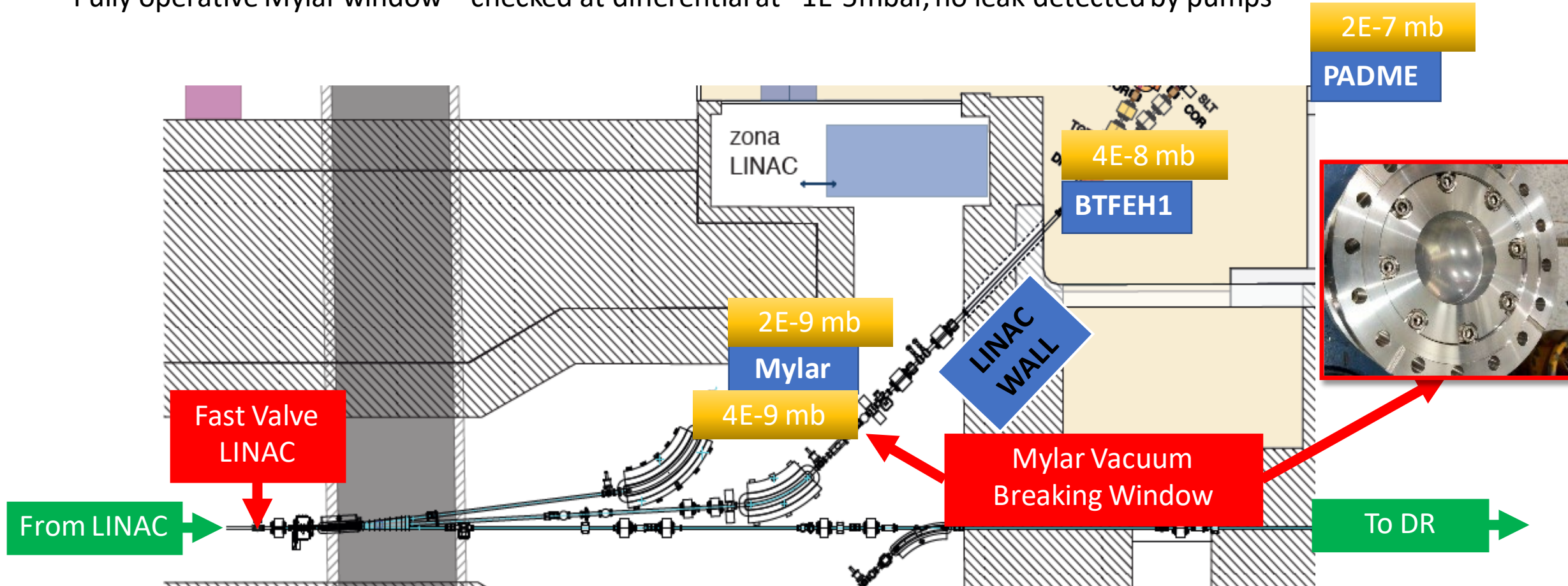
Minimize impact on inline check and maintenance operations

Repetitive scheduled events

BTF VACUUM – SAFETY SYSTEM

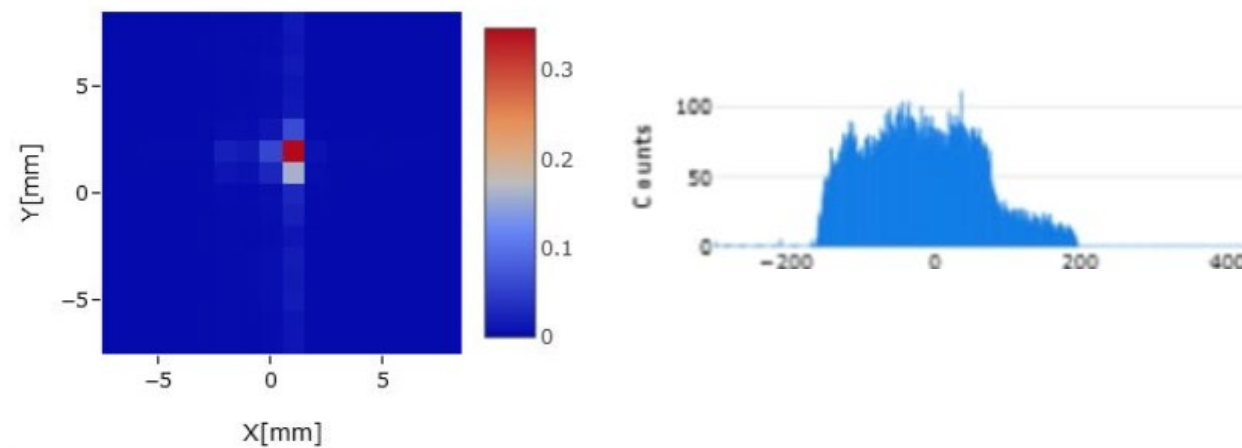
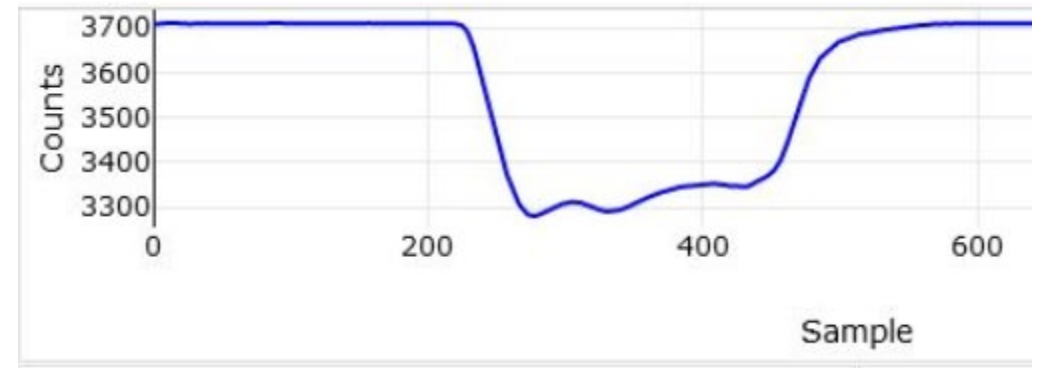
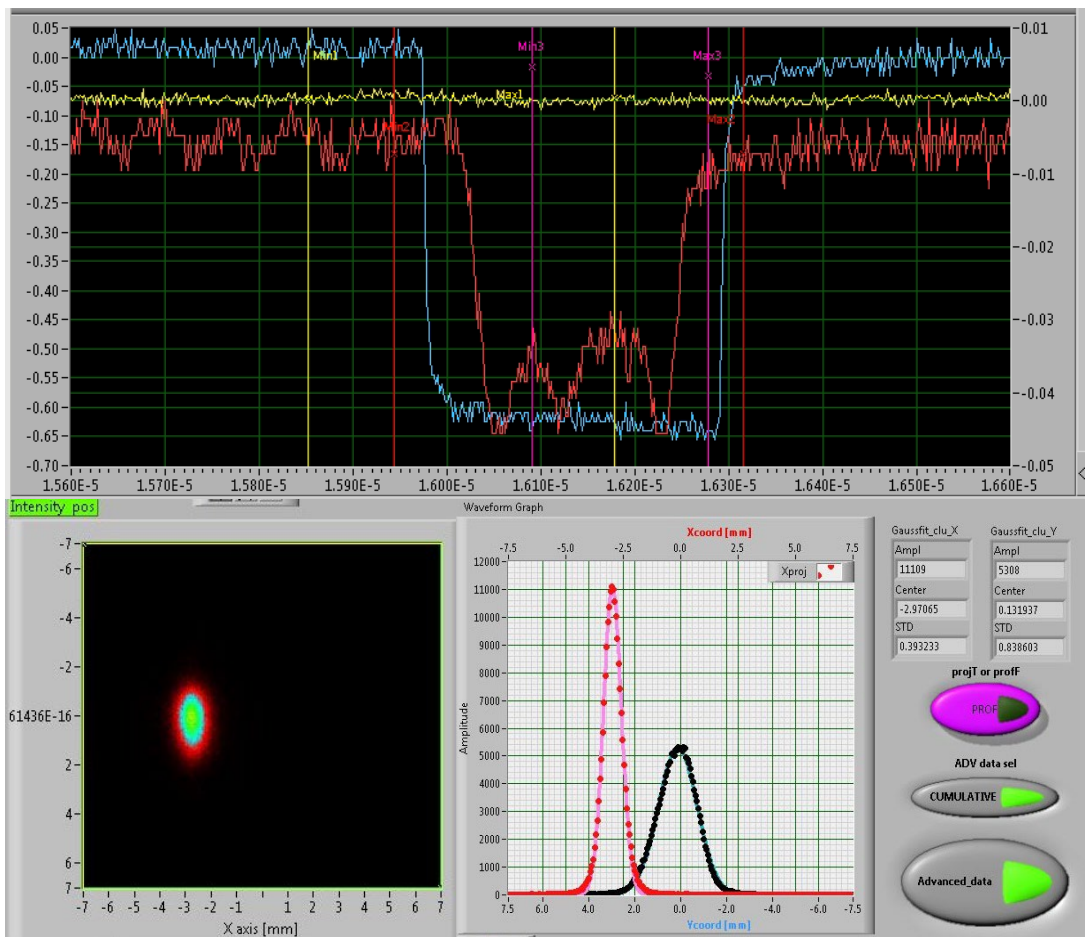
Both checked at the end of Tech-RUN2 and at the RUN2 start

- Fully operative Fast Valve safety system – at the vacuum vents
- Fully operative Mylar window – checked at differential at $\sim 1E-5$ mbar, no leak detected by pumps



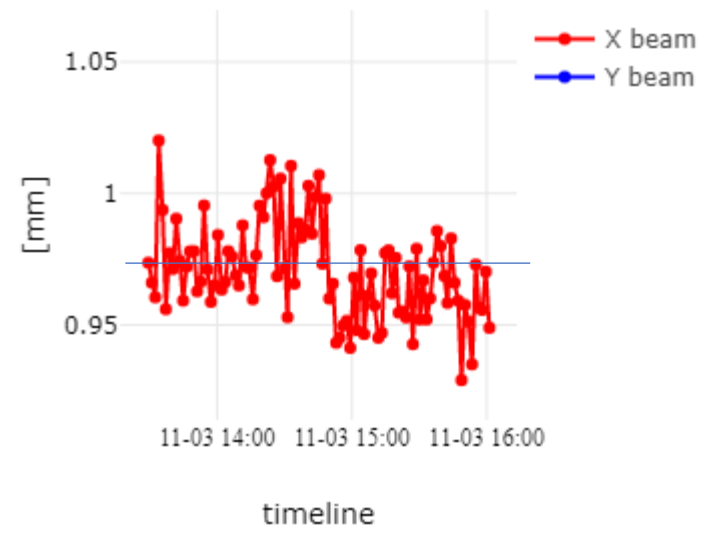
INFN BTF BEAM ON X17 DIAG

Istituto Nazionale di Fisica Nucleare
Laboratori Nazionali di Frascati

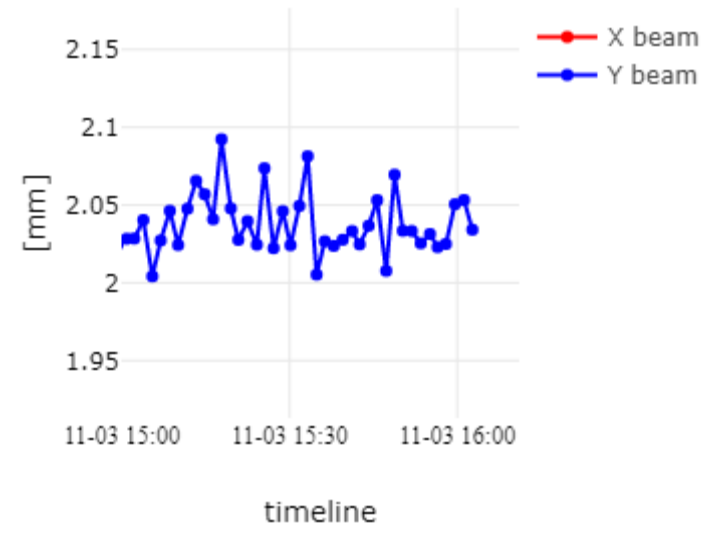


BEAM PERFORMANCES

m X and Y average 2022/11/03 16:04:31 I



m X and Y average 2022/11/03 16:06:12 I



Setup O (low stat in restart):

DHSTB001: 175.925 A (276.3MeV) (5061,20g)
DHSTB002: 186.300 A (275.4MeV)
DHRTB101: 165.3 A

Setup A

Line PLC fault, Magnet switch off

Magnets involved: QUATMXXX, QUATB10X, QUATB001, QUATB002, DHSTB001

DHSTB001: 175.925 A (276.3MeV) (5061,20g)
DHSTB002: 186.240 A (275.3MeV)
DHRTB101: 165.3 A

Setup B (tune DH)

DHSTB001: 176.225 A (276.8MeV) (5070.4g)
DHSTB002: 186.240 A (274.3MeV)
DHRTB101: 165.300 A

Setup C (tune DH)

DHSTB001: 175.925 A (276.3MeV) (5061,20g)
DHSTB002: 186.240 A (274.3MeV)
DHRTB101: 166.900 A

Setup D (tune DH)

DHSTB001: 175.925 A (276.3MeV) (5061,20g)
DHSTB002: 186.240 A (274.3MeV)
DHRTB101: 165.300 A

Setup E (tune DH)

DHSTB001: 176.225 A (276.8MeV) (5070.4g)
DHSTB002: 186.240 A (274.3MeV)
DHRTB101: 165.300 A

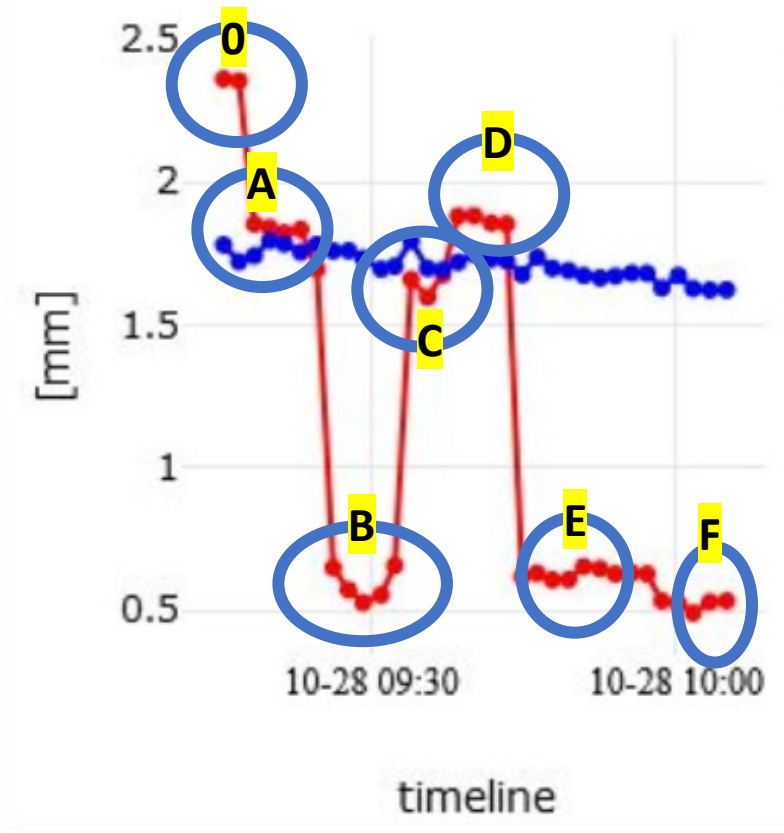
Setup F (tune DH)

DHSTB001: 176.225 A (276.8MeV) (5070.4g)
DHSTB002: 186.240 A (274.3MeV)
DHRTB101: 166.300 A

14/11/2022

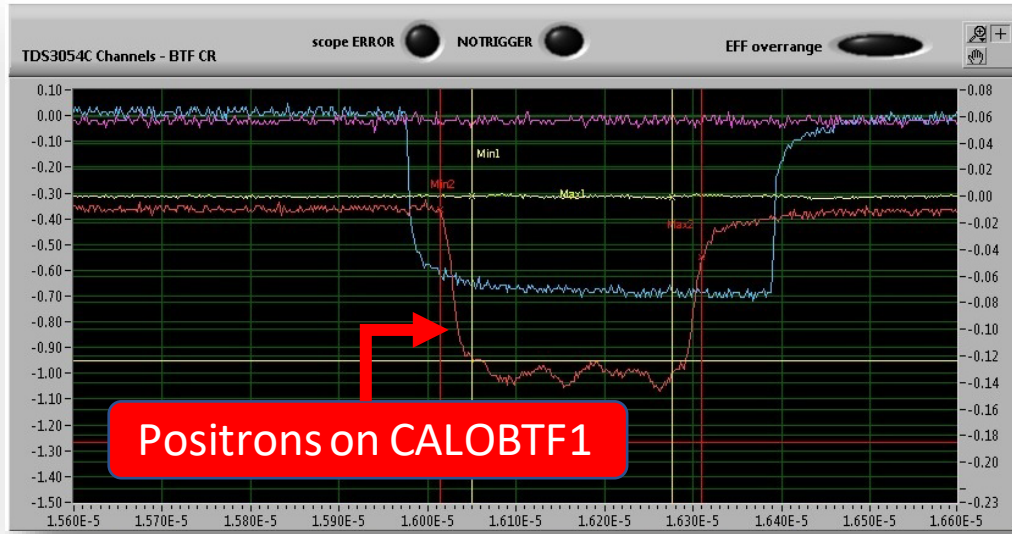
Original setup:

DHSTB001: 175.925 A (276.3MeV) 5071,20 G
DHSTB002: 186.240 A (275.3MeV)
DHRTB101 166.9 A

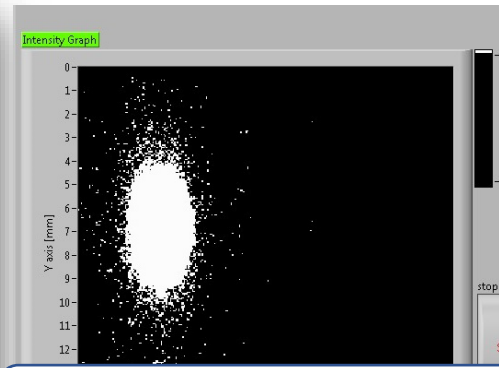
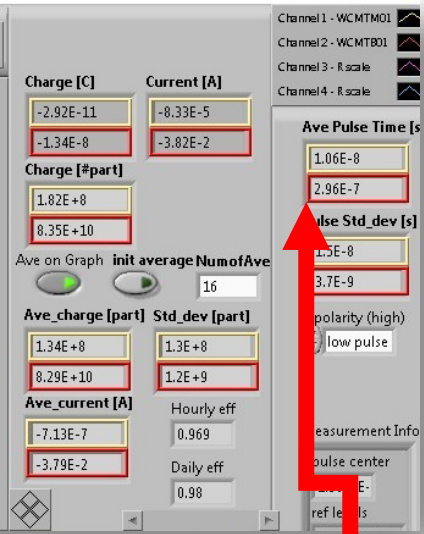


Energia e ⁺		DHSTB001				DHSTB002			DHRTB101		DATE	Hour	NOTE
E(MeV)	dE	Corrente (A)	dA	Campo (G)	dG	E(MeV)	Corrente (A)	dA	Corrente (A)	dA			
211,5	-50,30	134,66	-31,67	3894	-898,6	210,3	142,806	-33,26	125	-30,900	10/11/2022	12:51	
261,8	-1,00	166,325	-1,00	4792,6	-27,6	259,3	176,07	-1,00	155,900	-1,000	08/11/2022	22:00	
262,8	-1,60	167,325	-1,00	4820,2	-27,8	260,8	177,07	-1,13	156,900	-1,000	07/11/2022	18:30	
264,4	-1,60	168,325	-1,00	4848	-27,5	262,5	178,2	-1,17	157,900	-1,000	06/11/2022	18:03	
266	-1,50	169,325	-1,00	4875,5	-27,5		179,37	-0,63	158,900	-1,000	05/11/2022	18:45	
267,5	0,10	170,325	0,10	4903	-1,2		180	0,00	159,900	0,000	04/11/2022		restore di 267.4
267,4	-1,50	170,225	-1,00	4904,2	-27,4		180	-1,00	159,900	-1,000	02/11/2022	18:30	
268,9	-1,60	171,225	-1,00	4931,6	-27,8		181	-1,07	160,900	-1,000	01/11/2022	19:00	
270,5	-1,60	172,225	-1,00	4959,4	-27,8		182,07	-1,03	161,900	-1,000	31/10/2022	19:00	
272,1	-1,40	173,225	-1,00	4987,2	-27,6		183,1	-1,14	162,900	-1,000	30/10/2022	18:00	
273,5	-1,70	174,225	-1,00	5014,8	-55,6		184,24	-1,00	163,900	-1,400	29/10/2022	19:48	
275,2	-1,60	175,225	-1,00	5070,4	0	272,8	185,24	-1,00	165,300	-1,000	28/10/2022	19:31	
276,8	-1,10	176,225	-0,70	5070,4	-29	274,3	186,24	-1,06	166,300	-0,600	27/10/2022	16:20	276.3MeV
277,9	-1,60	176,925	-1,00	5099,4	-28	275,3	187,3	-1,00	166,900	0,000	26/10/2022	14:40	
279,5	-1,50	177,925	-1,00	5127,4	-24,2	277,3	188,3	-1,42	166,900	-2,300	25/10/2022	10:30	
281	-1,60	178,925	-1,00	5151,6	-27,6	279,5	189,722	-0,99	169,200	169,200	24/10/2022		
282,6	-1,60	179,925	-1,00	5179,2	-28	281	190,715	-1,09		-169,400	22/10/2022		20/10/2022
284,2	-1,50	180,925	-1,00	5207,2	-27	282,5	191,8	-1,00	169,400	169,400	21/10/2022	17:00	
285,7	-1,70	181,925	-1,00	5234,2	-25,8	284	192,8	-0,90		-169,400	11/10/2022		RUN11/10-13/10
287,4	-1,50	182,925	-1,00	5260	-28,4	285,4	193,7	-1,10	169,400	0,000	17/10/2022		RUN 17/10-18/10
288,9	-1,60	183,925	-1,00	5288,4	-28,4	286,9	194,8	-1,00	169,400	0,000	15/10/2022		RUN 15/10-17/10
290,5	-1,50	184,925	-1,00	5316,8	-27,2	288,4	195,8	-0,20	169,400	-6,100	14/10/2022		RUN 14/10-15/10
292	-1,60	185,925	-1,00	5344	-28,2	289,8	196	-1,80	175,500	0,000	20/10/2022		
293,6	-1,60	186,925	16,60	5372,2	-28,8	291,3	197,8	-1,00	175,500	0,000	19/10/2022		
295,2	0,00	170,325	0,00	5401	0	292,8	198,8	0,00	175,500	175,500	18/10/2022		

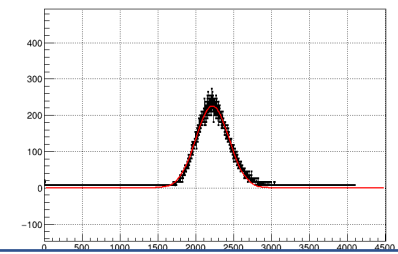
BTF BEAM – STANDARD PADME PULSE



Positrons on CALOBTF1

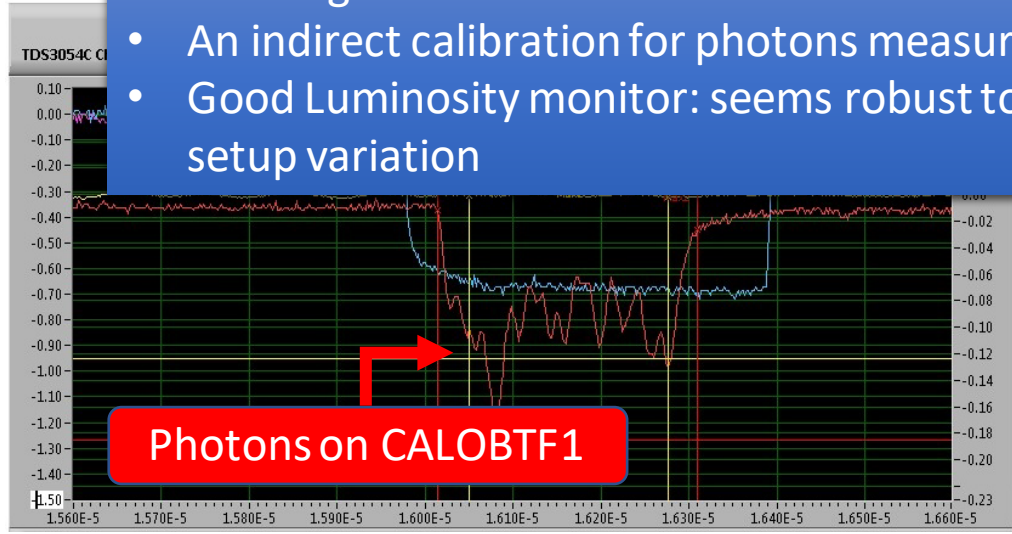


Direct positrons in FitPIX

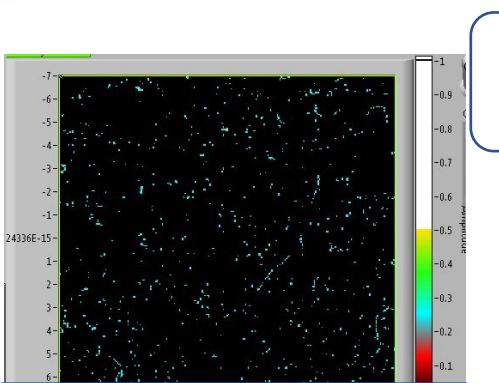
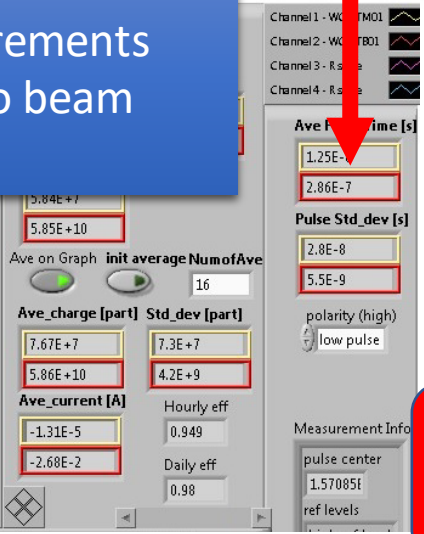


1000 bunched 30kPoT photons charge distribution
10% resolution

- Good agreement in time evaluation
- An indirect calibration for photons measurements
- Good Luminosity monitor: seems robust to beam setup variation

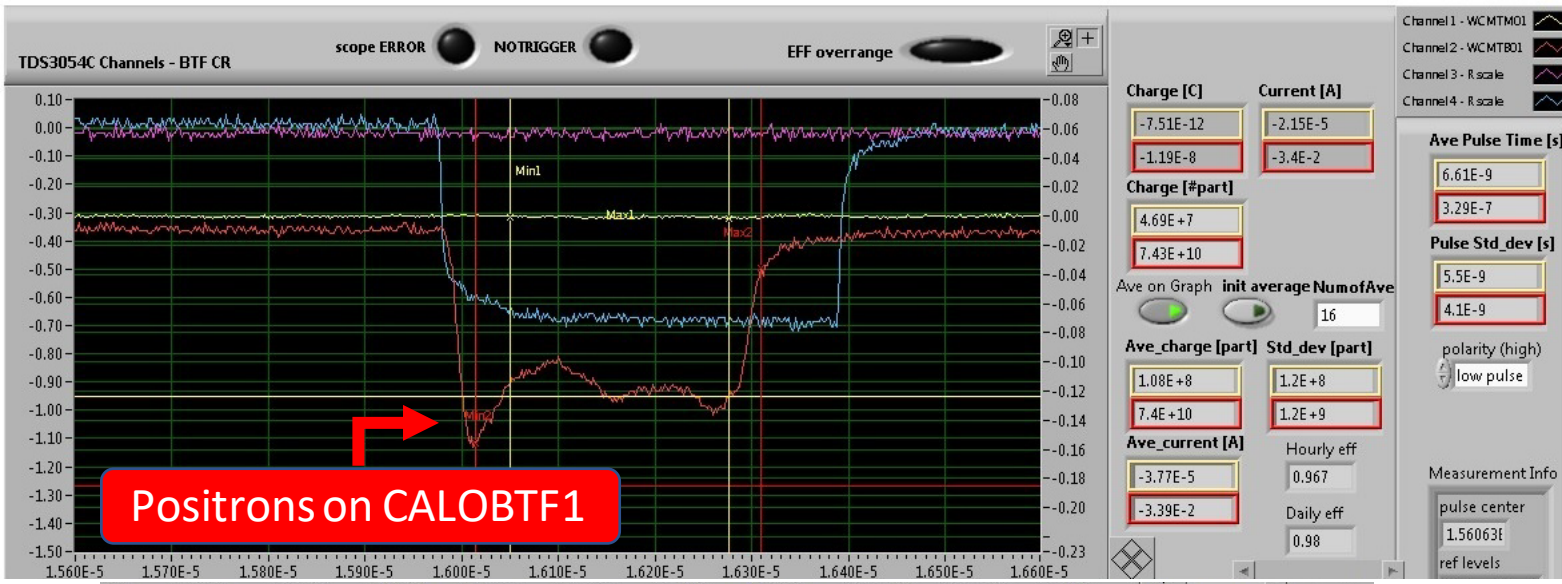


Photons on CALOBTF1



Photons conversion on adsorber, deltas... in FitPIX

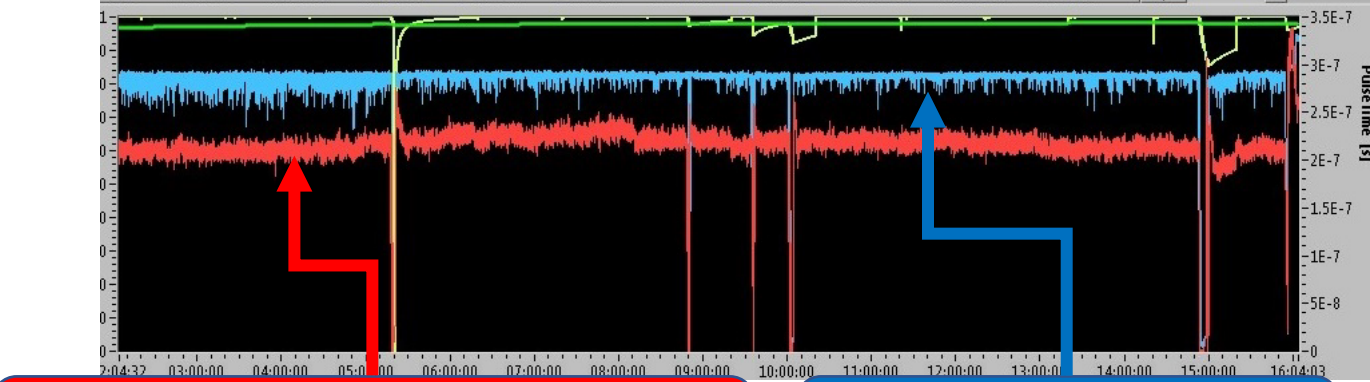
BTF BEAM - 320NS PULSE TRIALS



Positrons on CALOBTF1

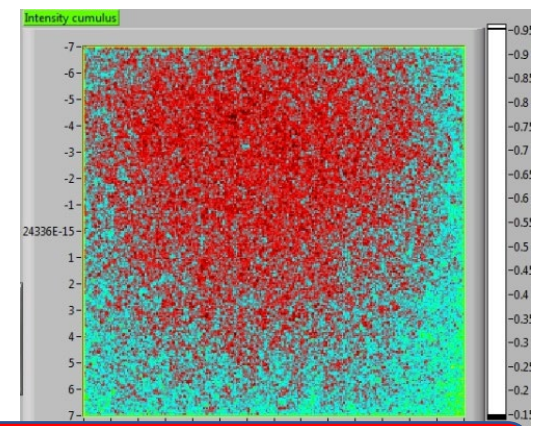
Extending longitudinal line acceptance with GUN improved timing:

- 15/10/20 trials on 320ns, 32kPoT/bunch
- Measure on BTFDAQ in direct and Bremss photons
- Coherent measure with PADME SAC DAQ
- Flatness to be improved (no much time on it)
- Very good result for a LINAC intended for 10ns pulse!!!



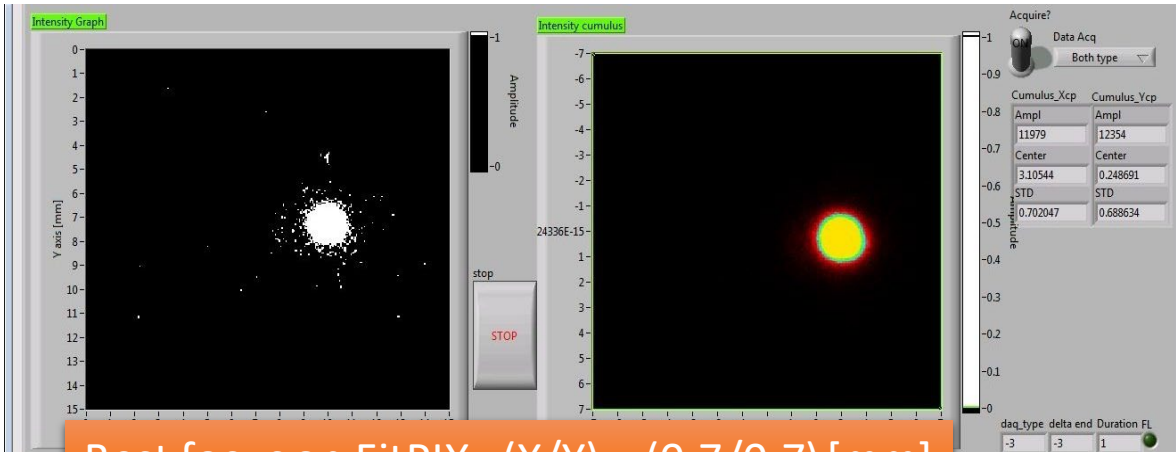
Daily trends photons stripchart on CALOBTF1

Daily trends pulse width



Cumulative plot of photons conversion at FitPIX (red < cyan, Mylar image)

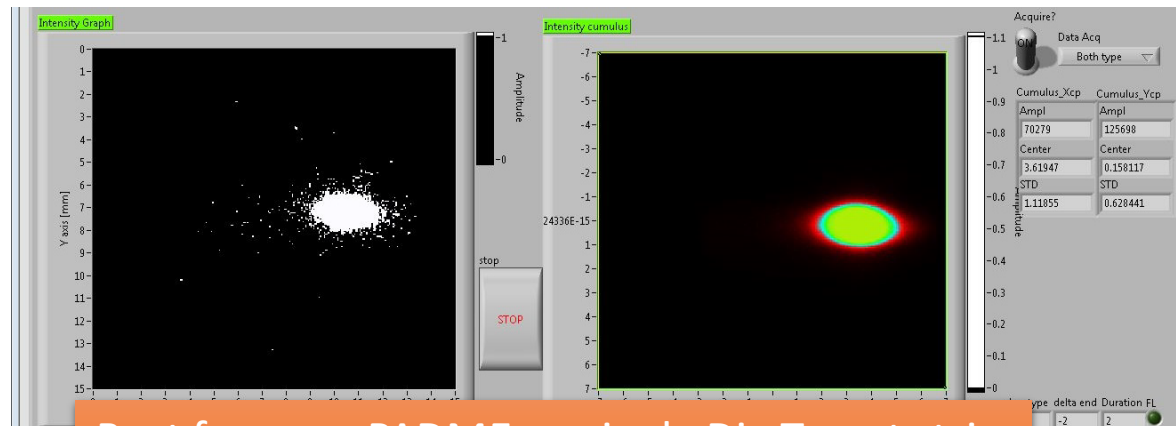
BTF BEAM – INJ TO PADME



Best focus on FitPIX $\sigma(X/Y) = (0,7/0,7)$ [mm]

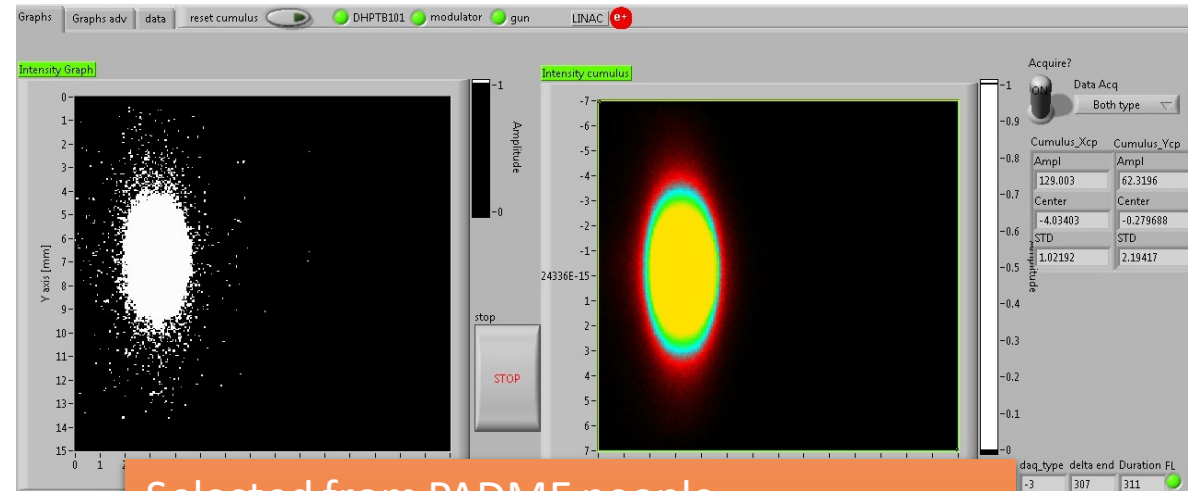
Different final focus trials maintaining:

- Background level
- Lower use of scrapers
- Low sensibility on LINAC fluctuations



Best focus on PADME on single Dia Target strip

- High divergence and flux
- $\sigma(X/Y) = (1,1/0,6)$ [mm]



Selected from PADME people

- Y-axis focus
- Better management at detector level
- $\sigma(X/Y) = (1,0/2,2)$ [mm]
- See Raggi presentation