

LINAC & BTF

Luca Foggetta
on the behalf of LINAC and BTF teams

LINAC- BTF STAFF: B. Buonomo (Head)

F. Cardelli, C. Di Giulio L. G. Foggetta, D. Di Giovenale (Oct 2020)

R. Ceccarelli, A. Cecchinelli, G. Piermarini, S. Strabioli, A. Rossi, R. Zarlenga

Technical Association (Retired): R. Clementi, M. Belli



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First off

These summary slides are the results of the hard work of brave people who face the pandemic difficulties (and the normal ones) with cooperation and reciprocal support.

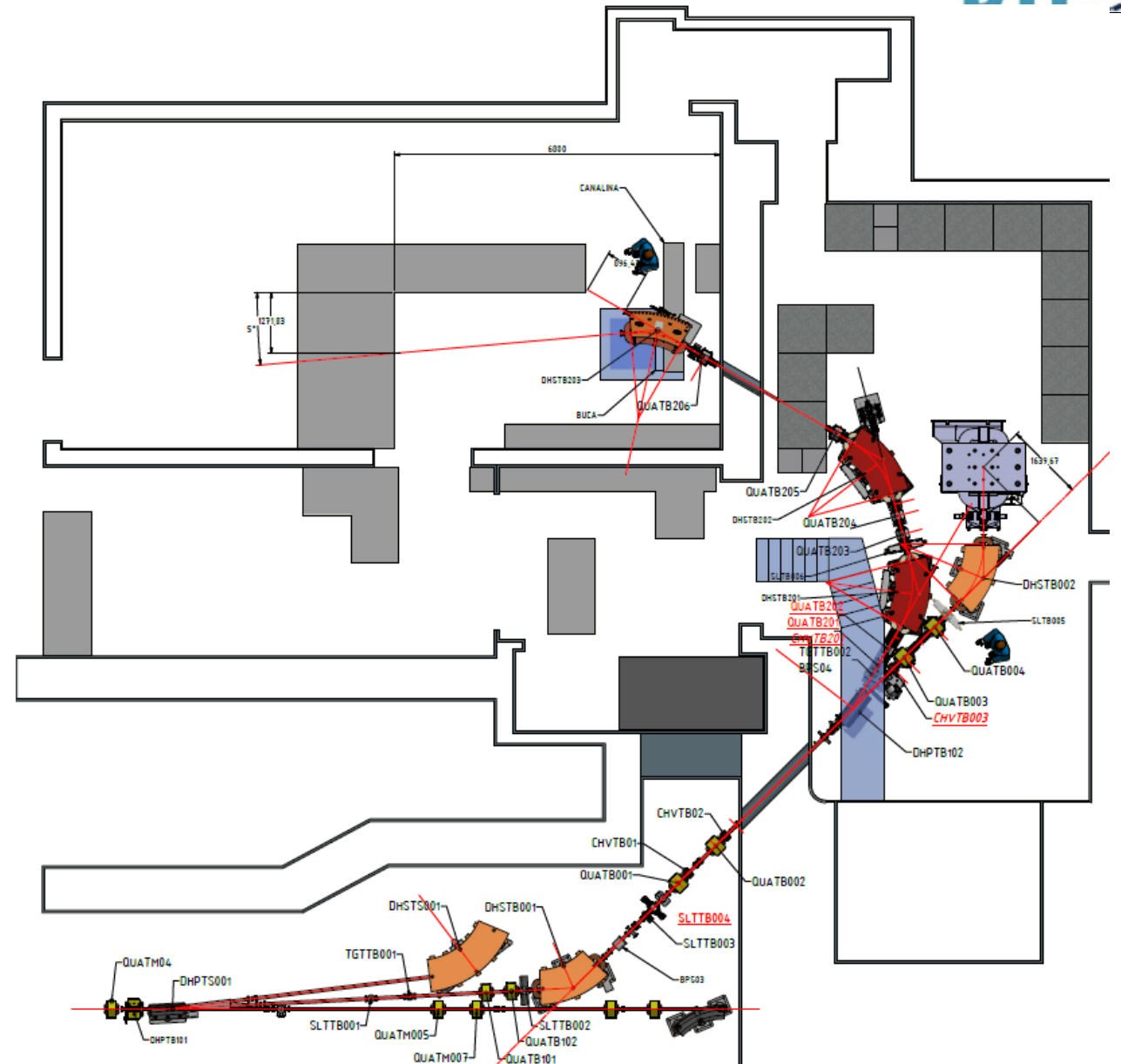
LNF tech services, DAFNE operators and LINAC-BTF-PADME staff we are moving to the final rush

Thank you

- **BTF1** for **PADME** run
- Build a **second beam-line (BTF-2)** and experimental hall
- **BTF** external commitments
- **LINAC** activities



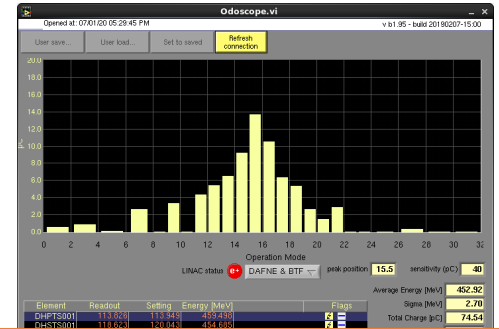
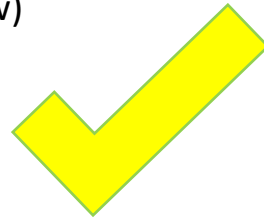
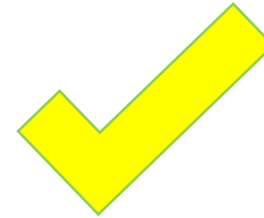
16/11/2020



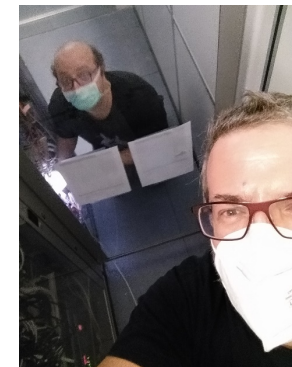
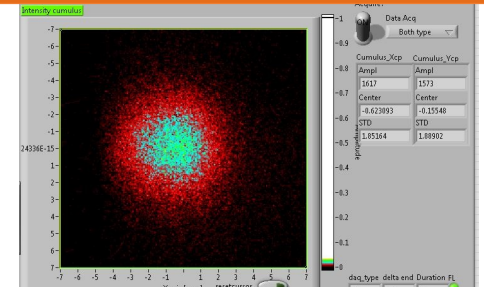
LNf SC60

We had foreseen correctly

- **PADME Tech-RUN2** with long primary positron pulses for the **PADME run**, expected in first week of July 20 (delayed from late April)
 - Planned on 3rd July – got it (Beam in BTFEH1)
 - Real start on 7th July
 - PADME needs technical daily run **till last week of July**, night steady state inj
 - LINAC slow conditioning in the middle, lower energy limit at 430MeV
 - Then Pulse up to 250ns (up to 270), 25kPoT, 430MeV
 - 0.85 uptime, 1E12 PoT delivered in steady state
- **PADME RUN2** started in September 20
 - Planned restart on 07/09 delayed to 14/09 due to LNF power plant overhauling
 - Some LINAC downtime due to Vacuum on elbow modC, WG on downstream of SLED C, thyratrons substitution for ageing, few of HVPS mod D dead
 - 0.75 uptime, 4.6E12 PoT delivered in physical run (till now)
- **Final BTF 2 installation start and commissioning**
 COVID19 and longer PADME RUNS
 - => Delayed from late September to second half of January



Re-First electron beam in BTF1 in 1° July



- **LINAC operation and main faults**
 - 96' Klystron Mod. C substituted in Feb. due to cathode exhaustion.
 - During new Klystron conditioning, suspected vacuum fault on Elbow mod. C ionic pump -> replaced pump but still vacuum problem (elbow, leak on SLED out)
 - Thyratrons substituting (ModA, ModC with a bugged one)
 - 380V mains instabilities (ModA, ModC, ModD 2xHVPS(one already repaired) out of service)
- **Consolidate the LINAC: extend lifetime of 8(10) years**
 - Implementing HVPS on 4 mod's
 - **65% full operative (Pulse transformer of ModC ready for new HVPS)**
 - Substituting mod's and subsystem old electronics with a new embedded one
 - **Prototyping on Mod. B in debug -> advance in low level programming (FPGA)**
 - Improved Maintenance and Diagnostics
 - **MemCached based live DB very good performances**
 - **Historical DB**
 - **Main software -> added a semi automatic conditioning software**
 - **Conditioning by pulse time, power, getting V_k/R_f pulse shape and vacuum**
 - **Slow control energy feedback on going (to be tested in a shutdown, obviously)**



UP to now, we foreseen before next (SIDDHARTA) run

- Huge overhauling of ModC-related vacuum 8 Ionic pumps in ModC RF waveguides, elbow, SLED
- Installation of ACC fast safety valve

12/2019: Reopen BTF experimental area, then until 02/2019

- Refurbishing for BTF1 and new vacuum safety system completed, BTF2 90% completed
- Alignment and vacuum installation and tests in BTFEH1/BTF1
- Setup preparation, mechanical and vacuum tests for Mylar window for vacuum breaking
- Fluka/ANSYS Simulation for Mylar window
- Final layout for new vacuum safety system LINAC/DR/BTF and PLC layout
- Preparation for LINAC area works for BTF line vacuum, cooling, vacuum safety system
- All of the BTF subsystems (diagnostic, detectors, network, high voltage) up and ready

30/01/2020 – LINAC Fault on Klystron Mod. C

- Trails, Substitution and Conditioning ended in one week -> restart

05/03/2020 – LINAC fault on already substituted Klystron Mod.C

12/03/2020 - Kly Conditioning suspended for COVID19

08/06/2020: Restart LINAC conditioning on KlyC

30/06/2020 – restart full LINAC operations

03/07/2020 – Secondary Beam in BTFEH1

07/07/2020 – PADME engineering Tech-RUN2 start. BTF beam on request (mostly single particle, different energies, secondary or few kPoT/bunch, conditioned primary)

29/07/2020 – BTF free to implement 250ns beam, physics graded

07/08/2020 Tech-RUN2 end

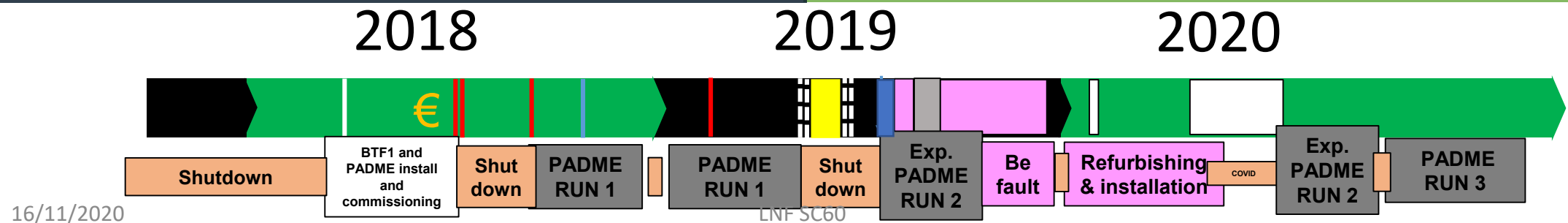
10/08/2020 -> 30/08/2020 LINAC maintenance and vacation

31/08/2020->07/09/2020 – Delayed MAINS shutdown

08/09/2020 – LINAC warmup

14/09/2020 -> Up to now – Physics beam on for RUN2

30/11/2020 – RUN2 end



BTF ACTIVITIES

- Mylar vacuum windows test, installation and the new vacuum safety system **completed in May**
- Main BTF area cooling implementation (for BTF2) lasts as reschedule **at the end of May**
- LINAC maintenance (load on sections, ion pumps, additional air cooler) and BTF safety **completed before end of May**
- BTF line final tests and setup **ended on first two week of June**
- LINAC Klystron C elbow conditioning start on June 8th , **ended on 30th**
 - not reached full power due to vacuum events and discharges in the elbow again and seems also in SLED
- Beam injections in BTFEH1 Tech-RUN2 (3rd July to 7th August) and RUN2 (15th September to 30th November)
 - PADME experimental needs intermediate steps of beam development
 - LINAC needs runtime conditioning on elbow
 - Night long run in steady state condition
- Beam energy limit due to Klystron C power limits
 - We have to lower injection energy to gain the 300ns pulse length **capabilities from 460MeV to 432 MeV**
 - PADME needs were compatible with a lower beam energy, so we move on injections

} Area ready for LINAC power up and conditioning

Very low charged primary positron beam

PADME received different beams type

- Bunch length up to 320ns
- Charge at users request (down to single particle)
- Improvements in beam stability and background

HUGE improvements in respect 2019 primary and secondary beam:

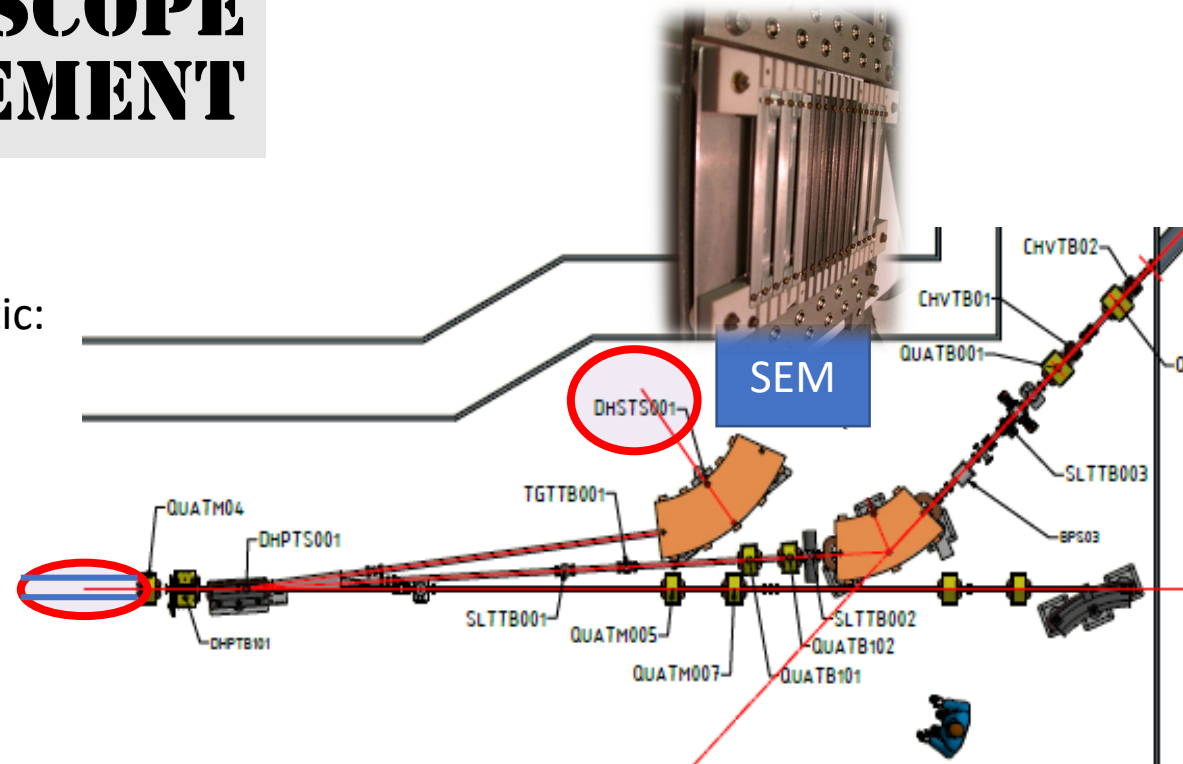
- **Lower GUN emitted current**
 - Under the dynamic range for the most LINAC diagnostic, after positron converter (BCM, BPM, ICT)
 - Setup done at higher current, then increase GUN cathode control grid voltage (linear range)
- **Very good** background in BTF1 experimental hall and PADME (now less than 230nS/h)
 - Increased stay-clear factor in BTFEH1 pipes, avoiding bottleneck (especially in previous installed DHPTB102)
 - Lower than one order of magnitude in respect to 2018-19 secondary one
 - A Factor of 5 regarding 2019 conditioned primary one
- **Low beam loading** => Final beam energy spread around 5% (before BTF line selection)
 - Different energy populations with different bunch length and charge
- **LINAC is in quasi-continuous mode** => Beam length ~90m
 - The head of the pulse already converted in shower at the experiment,
 - The tail yet to be born

LINAC BEAM – HODOSCOPE MEASUREMENT

Hodoscope Secondary emission strip monitor

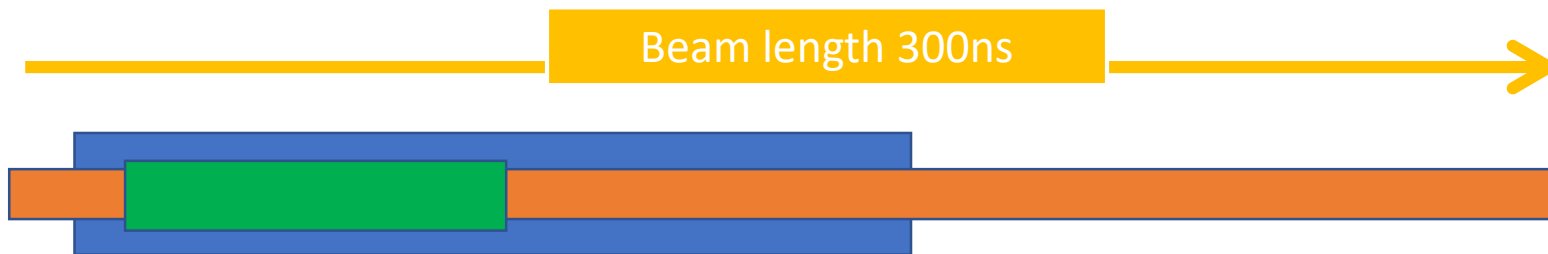
used for LINAC pulse energy spread envelope and charge diagnostic:

- Downstream of DHSTS001 60° magnet (high dispersion)
- Typically charge readout (QDC)
- Each strip senses a different beam energy bin (~2MeV/strip at 432MeV energy)
- Measurements done with high band pass scope
 - Pulse delay
 - Pulse width
 - Pulse charge



Naive model of LINAC 300ns beam pulse

Beam pipe

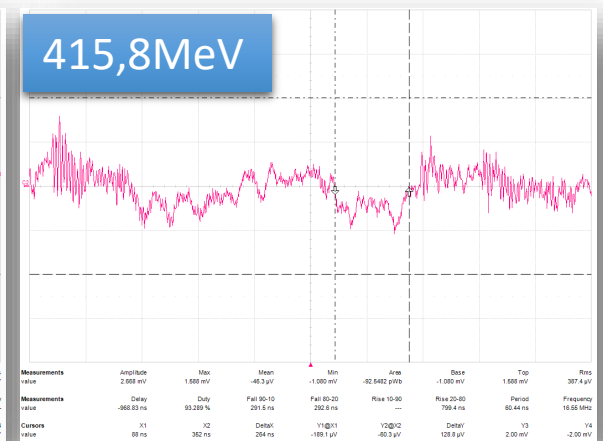
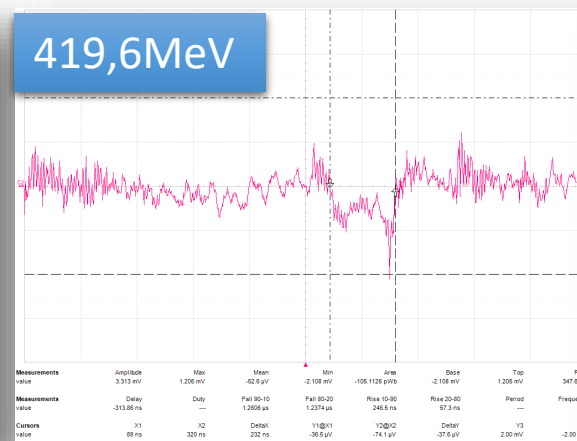
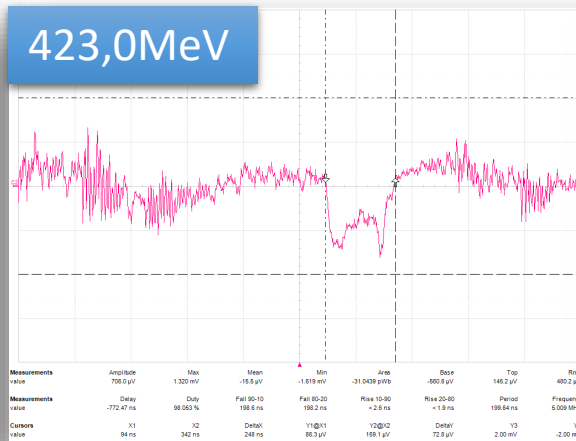
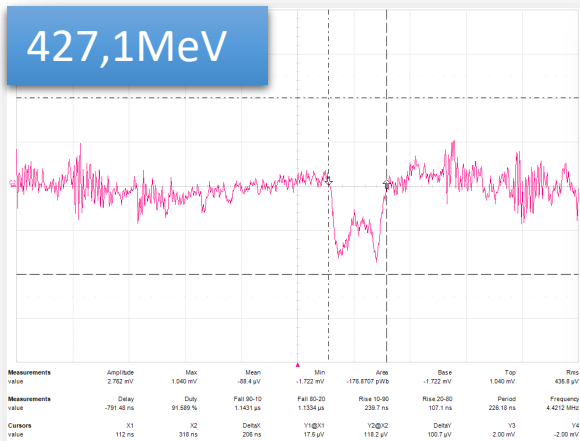
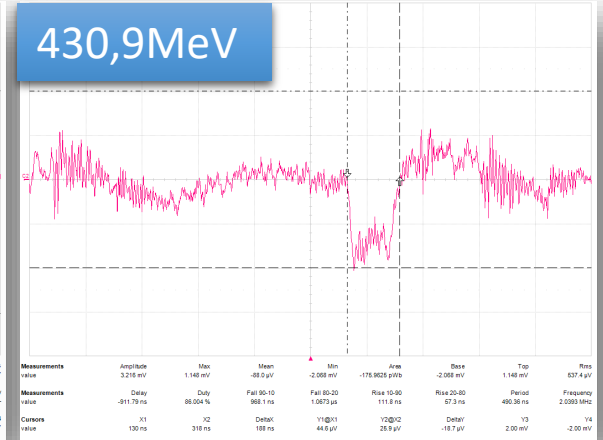
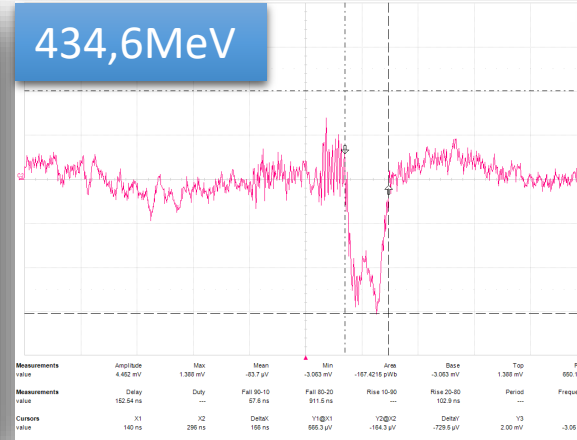
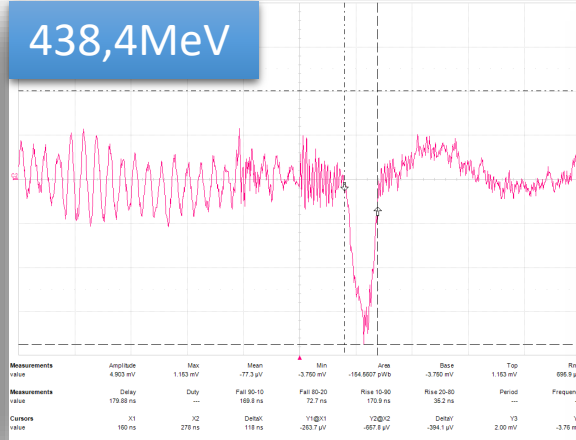
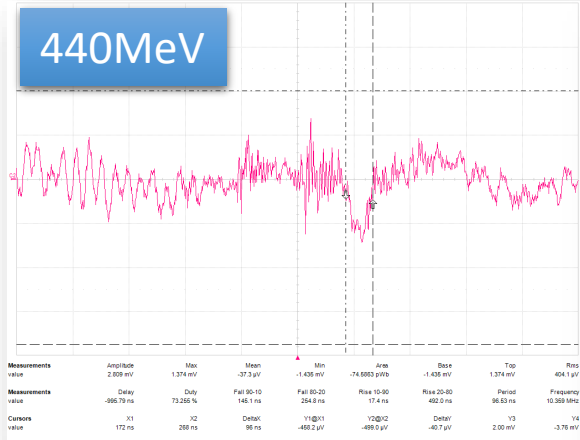


+10MeV, 80ns, 10x charge

Beam energy centroid,
150ns, 2x charge

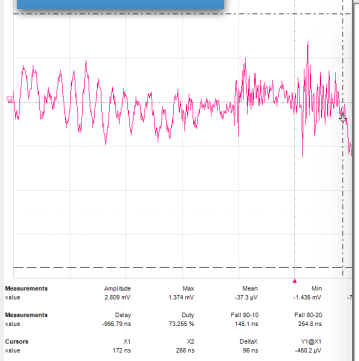
-10MeV, 300ns, 1x charge
Good for PADME

LINAC BEAM - HODOSCOPE

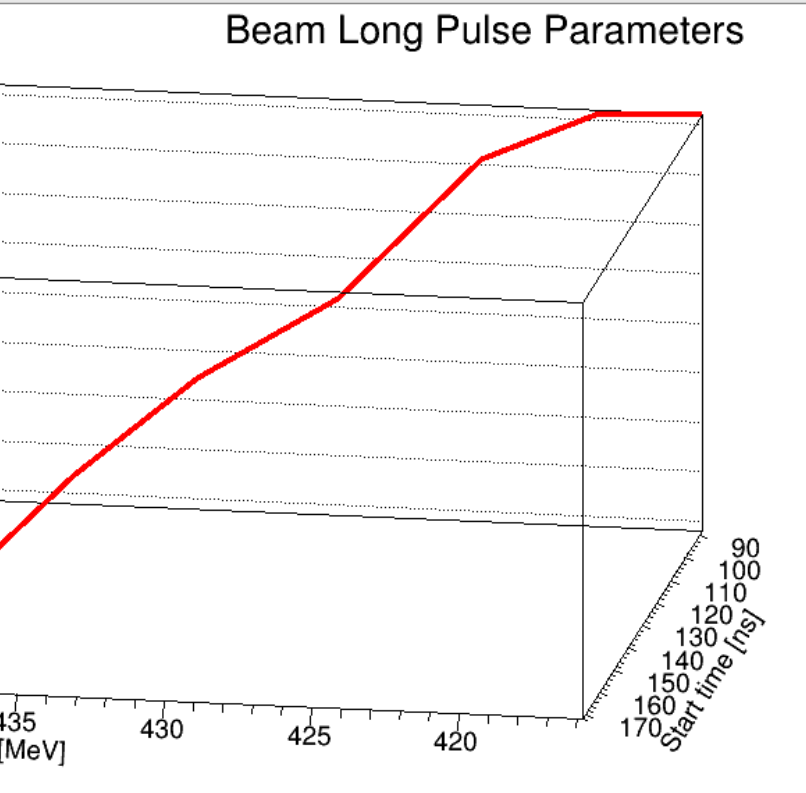


LINAC BEAM - HODOSCOPE

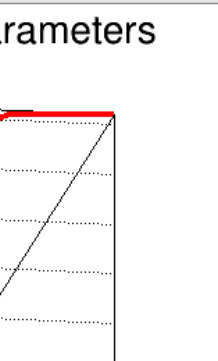
440MeV



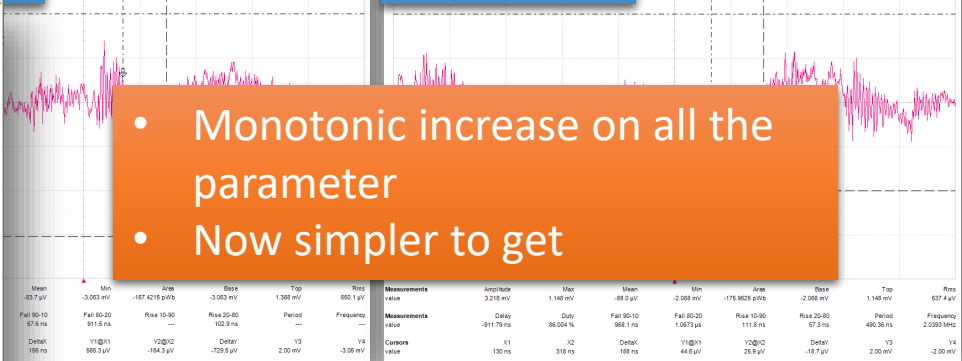
438,4MeV



434,6MeV

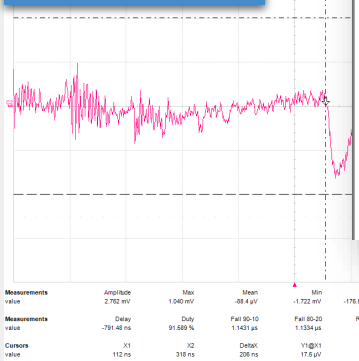


430,9MeV

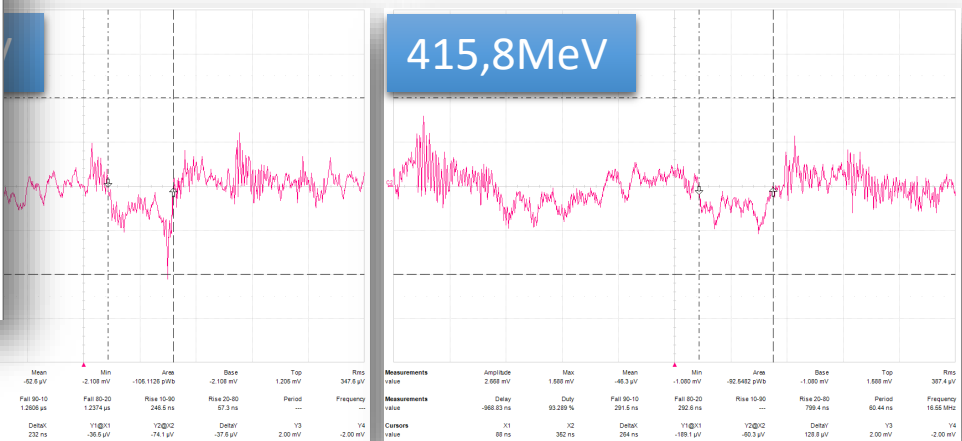


- Monotonic increase on all the parameter
- Now simpler to get

427,1MeV



415,8MeV



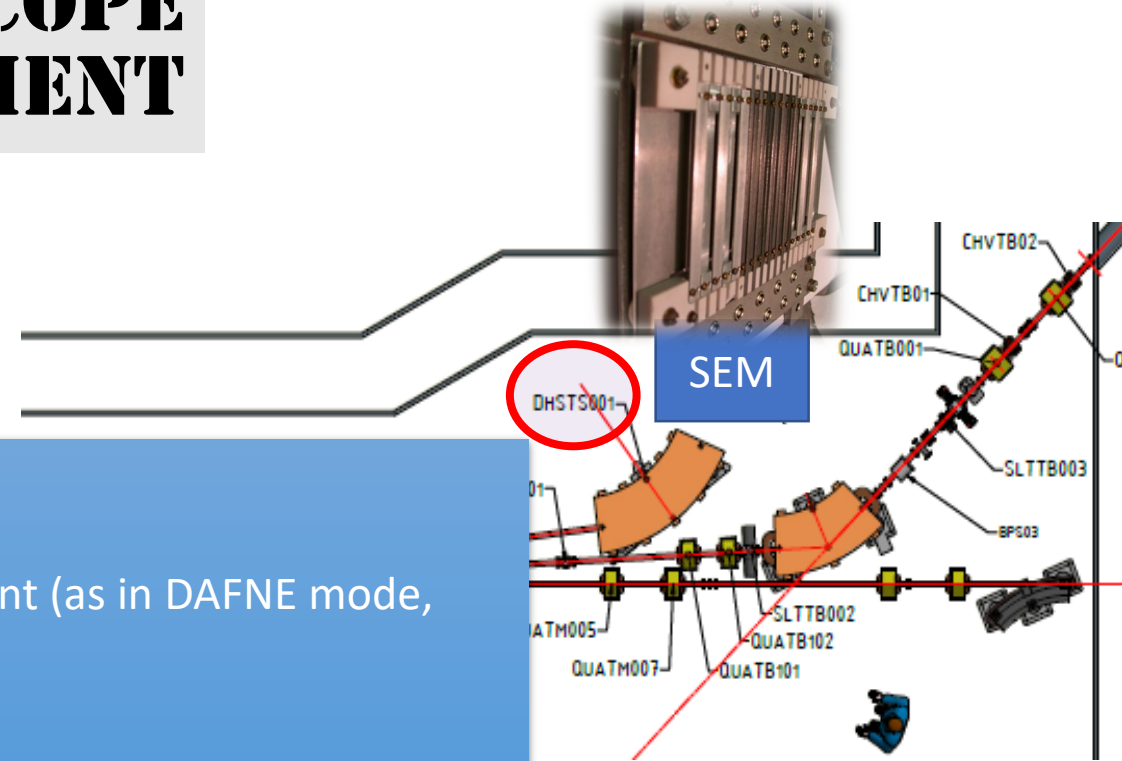
LINAC BEAM – HODOSCOPE MEASUREMENT

Hodoscope Secondary emission strip monitor, used for LINAC pulse energy spread envelope and charge diagnostic:

- Downstream of DHSTS001 high dispersion magnet
- Typically charge readout (QDC)

Beam structure strongly dependent on:

- Gun time advance in respect to the best injection point (as in DAFNE mode, 10ns as DIRAC δ , -200ns)
- GUN control grid and HV
- LINAC RF main frequency then prebuncher&buncher power/phases
- Modulator phase, obviously, for the beam energy centroid (charge and shape is matter for A&B)



+10MeV, 80ns, 10x charge

Beam energy centroid,
150ns, 2x charge

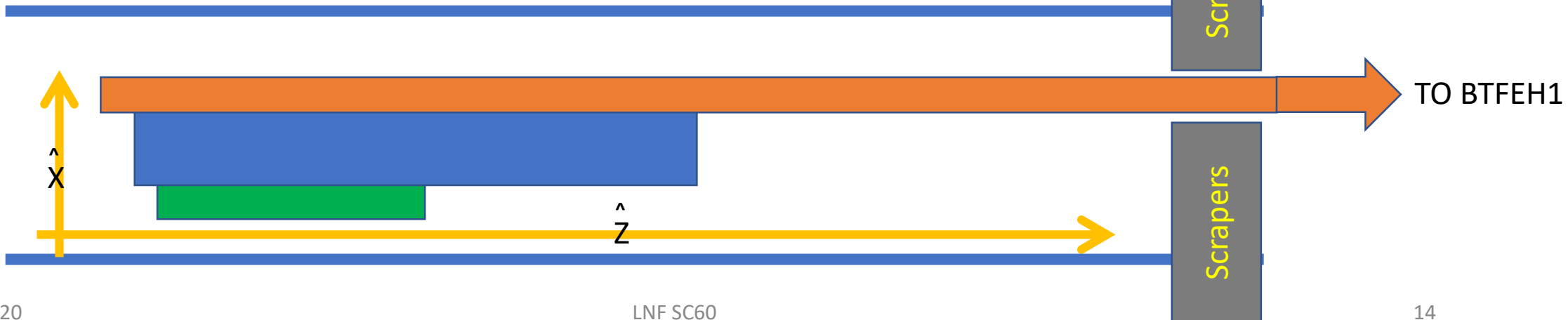
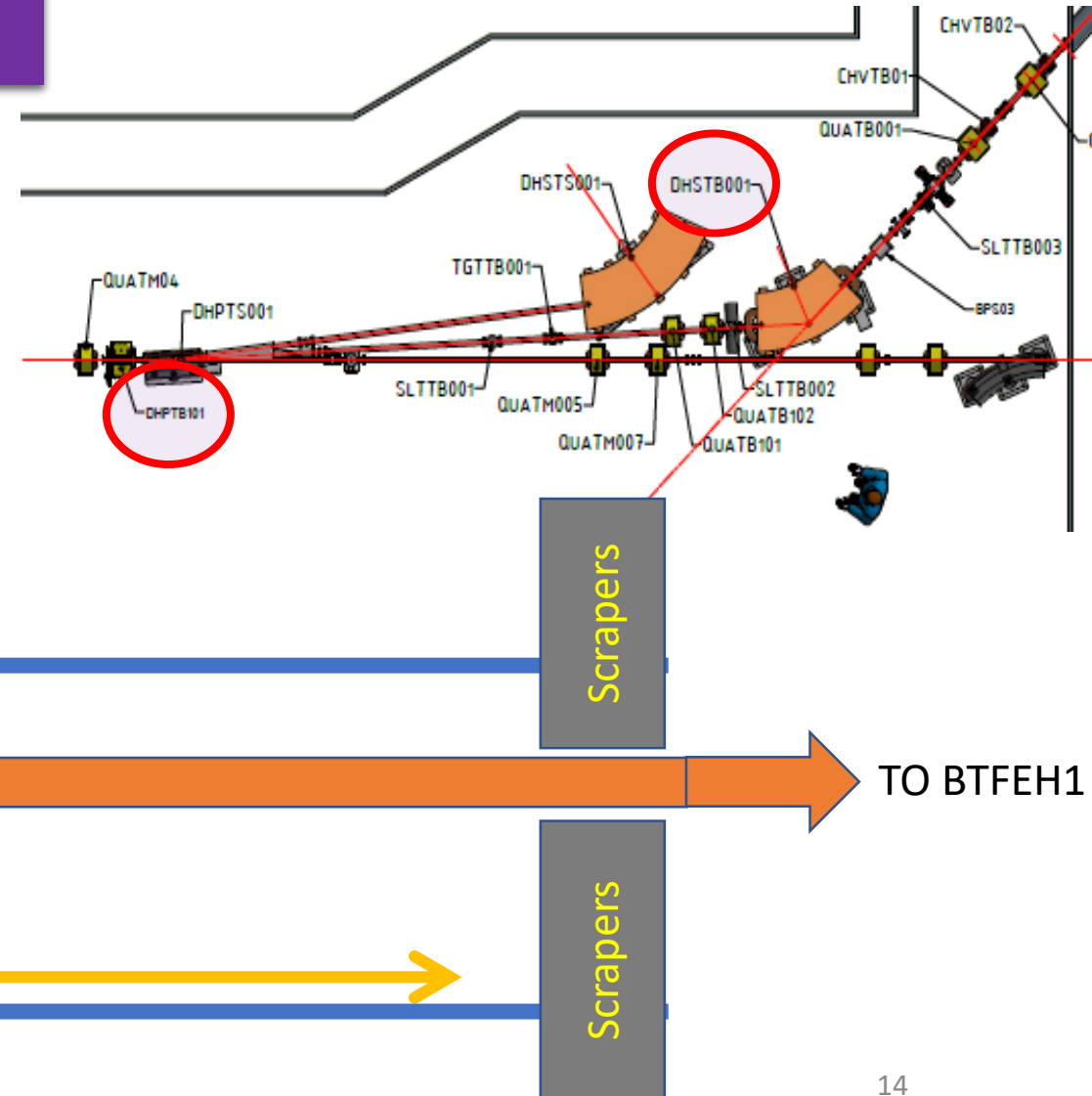
-10MeV, 300ns, 1x charge
Good for PADME

BTF BEAM - SELECTION

After DHSTB001 e DHPTB101, 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**
- LINAC dark current negligible, again no off energy particles out of time, lower background

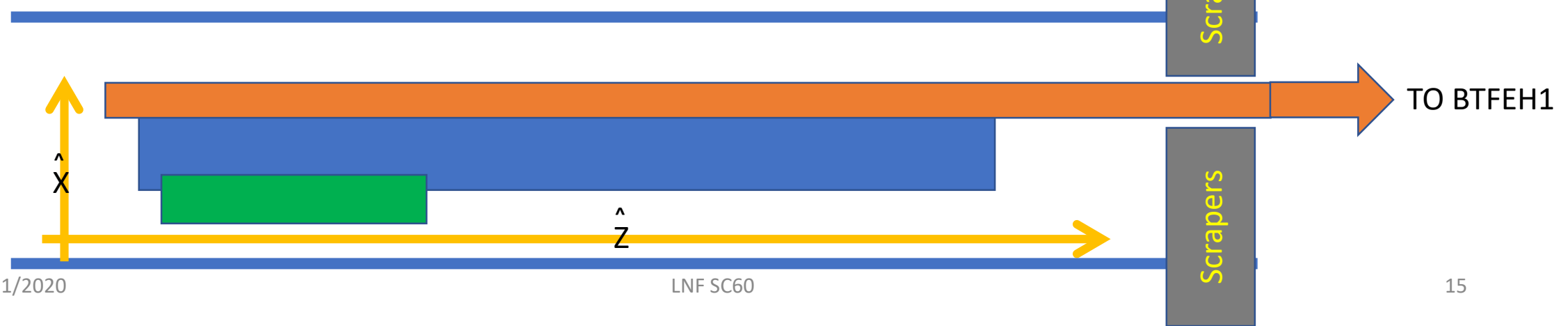
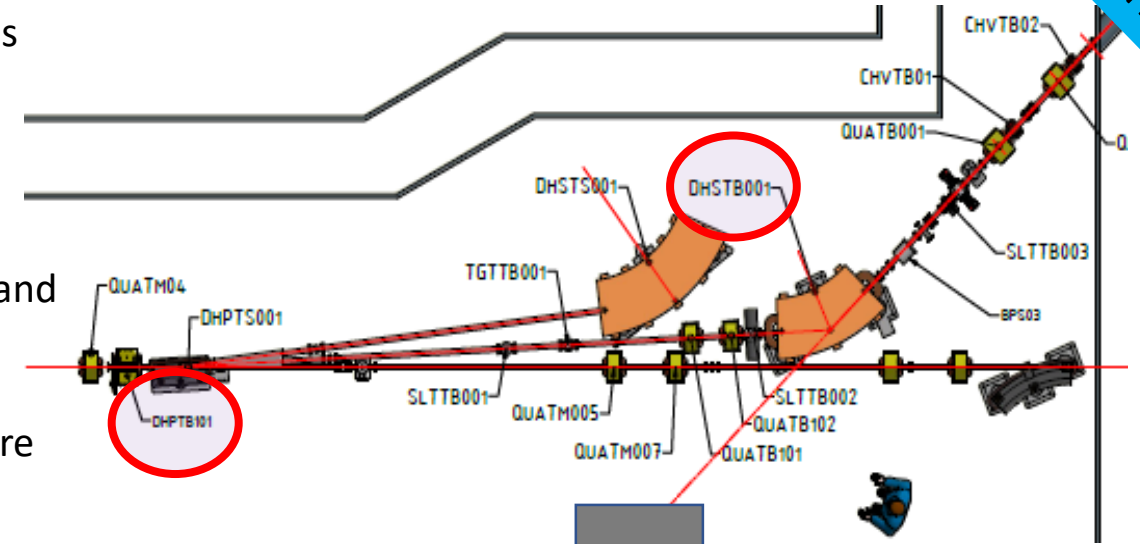


BTF BEAM - SELECTION

To BTFEH1

These way of beam structure leads to:

- DHPTB001 - DHSTB001 act as second beam pulse flattening tool (removes head-tail peaks)
- DHSTB001 sector magnet => -X sees more focusing for higher energy
 - Treat this beam as secondary beam (as BTF usually do)
- SLTB004 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



BTF BEAM – BEAM DIAGNOSTICS

Fast BTF beam diagnostics

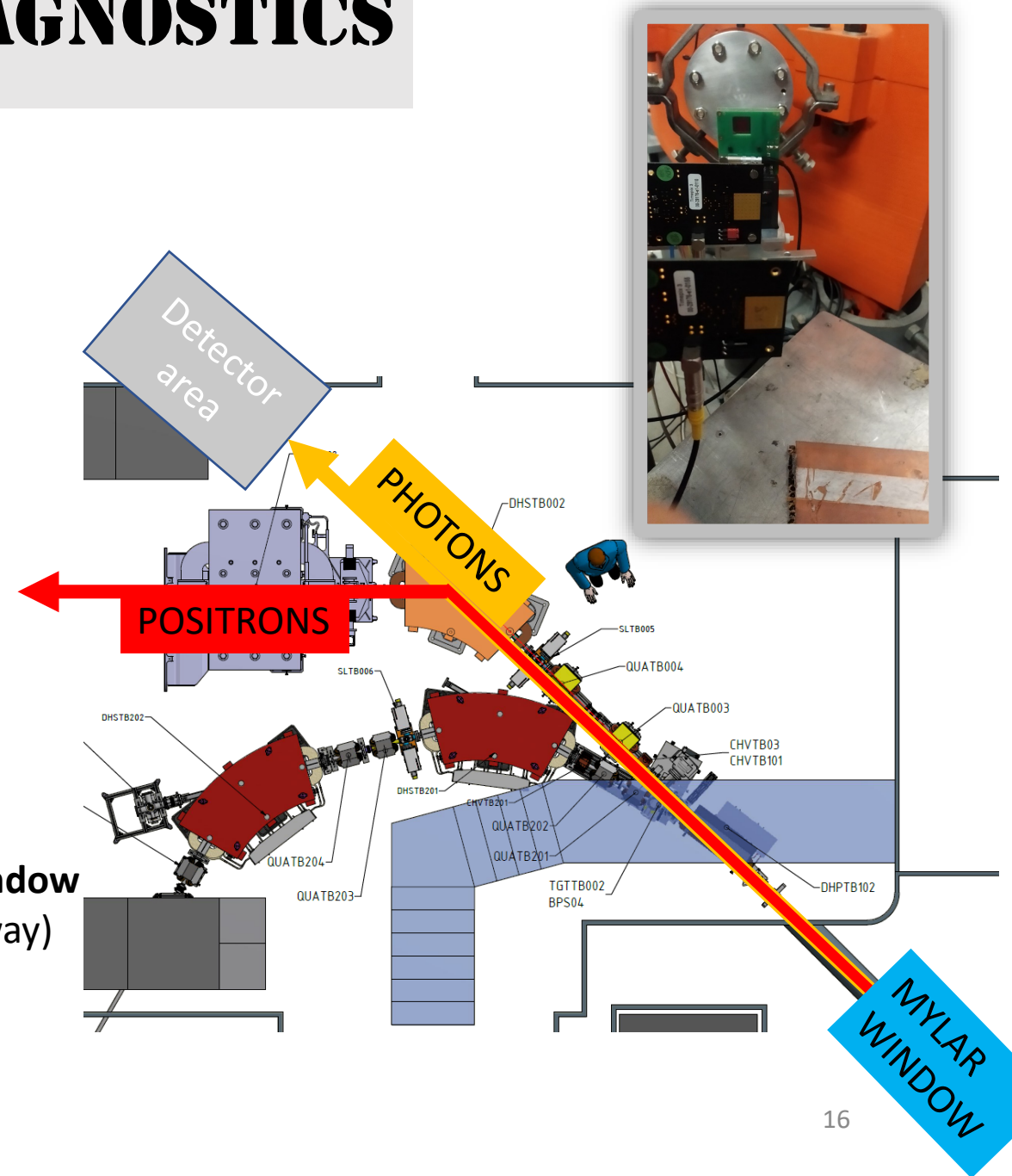
- CALOBTF1 (PbWO – NA62 like)
- Timepix detectors (65k Pixel TPX,TPX3 detector, $\sim 2\text{cm}^2$)
- Located downstream the straight pipe in the DHSTB002 dipole
- Adsorber in the middle (0.3mm Al window, 0.7 Si detectors)

Direct measurement (positrons, PADME delivered beam):

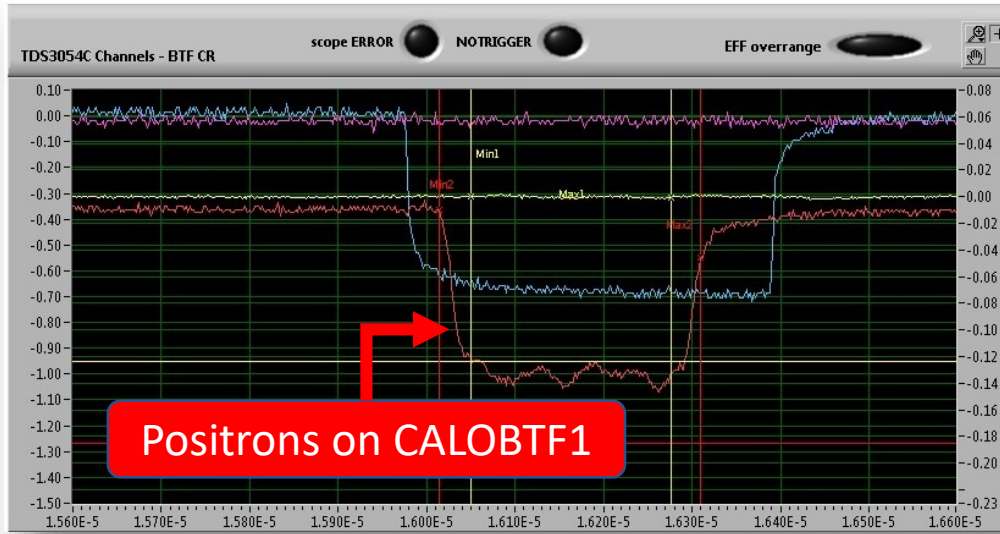
- Stop injections to PADME
- DHSTB002 switch off
- Injection in the straight DHSTB002 channel

Undirect measurement (secondary photons, run quality monitor)

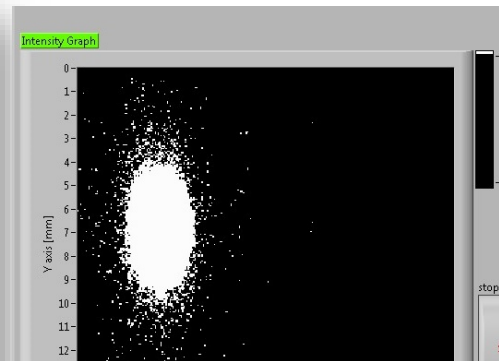
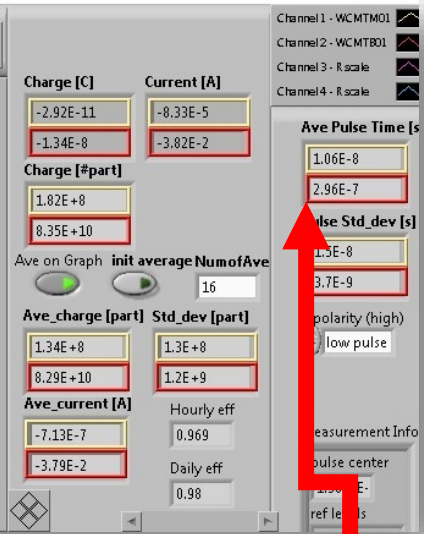
- Beam steered to PADME
- CALOBTF1 and FITPix get Bremsstrahlung photon from mylar window
- Energy collected is less 0,001 of the total steered charge (12m away)
- Used to calculate delivered PoT, beam lenght runtime
- Higher measurement errors (10%)



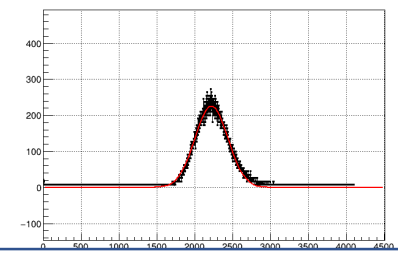
BTF BEAM – STANDARD PADME PULSE



Positrons on CALOBTF1

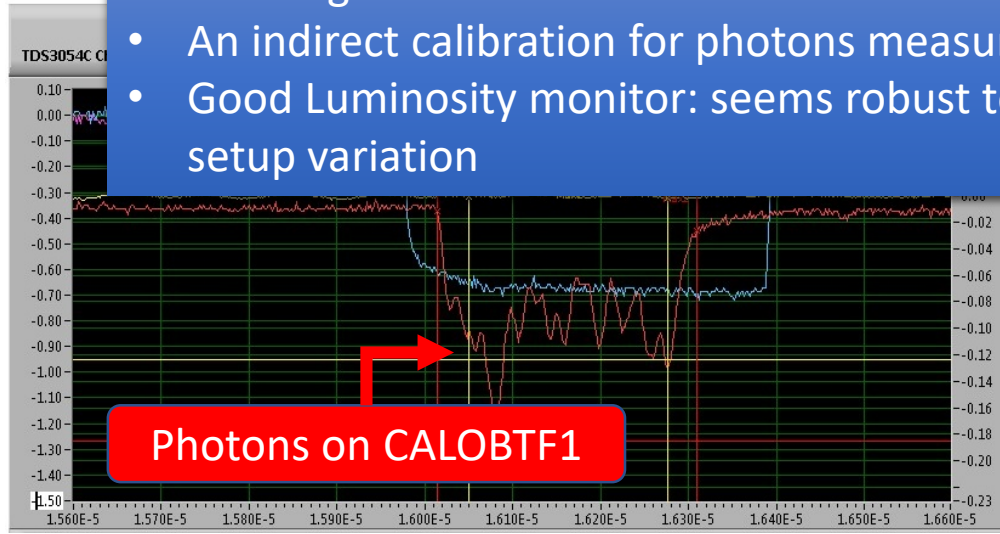


Direct positrons in FitPIX

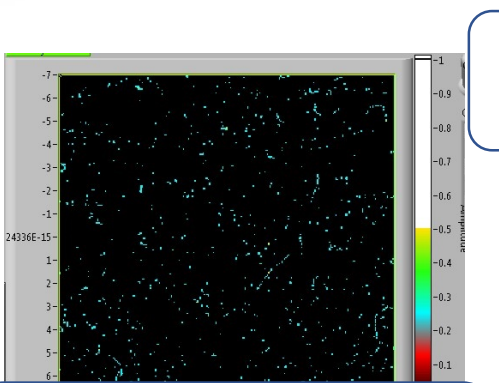
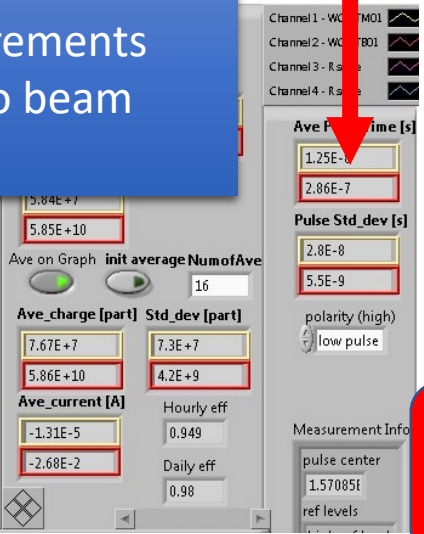


1000 bunched 30kPoT photons charge distribution
10% resolution

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

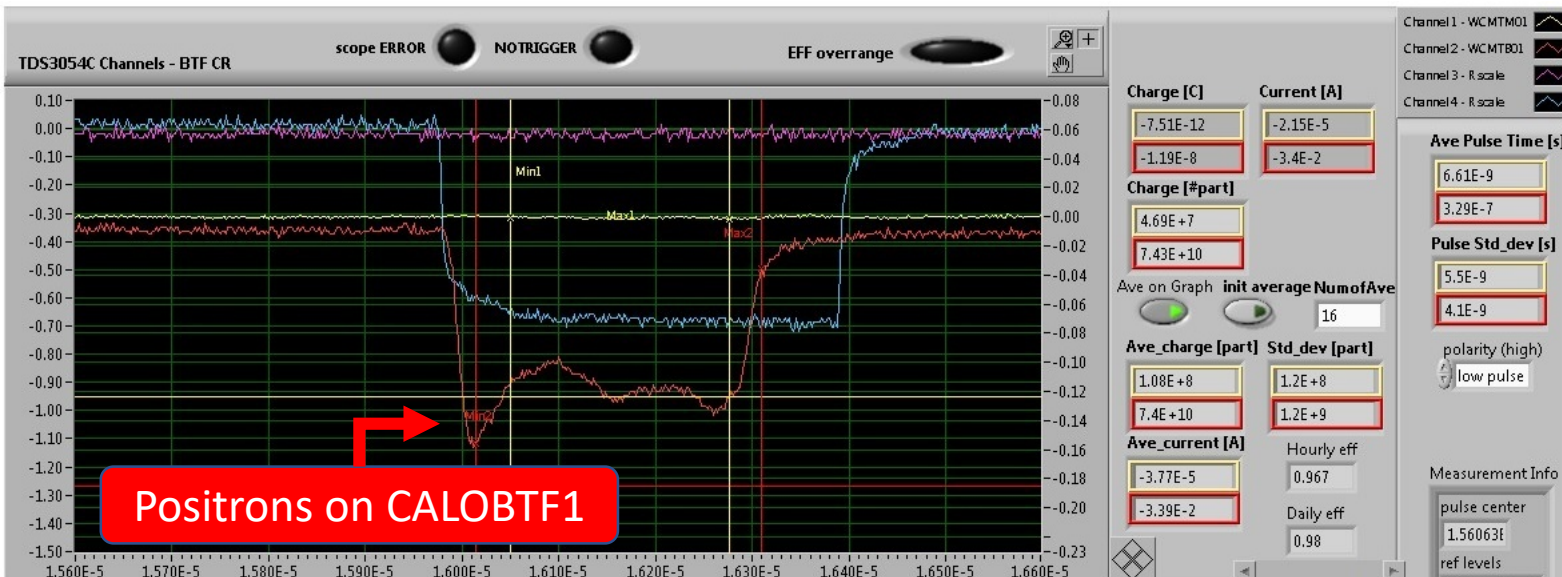


Photons on CALOBTF1



Photons conversion on adsorber, deltas... in FitPIX

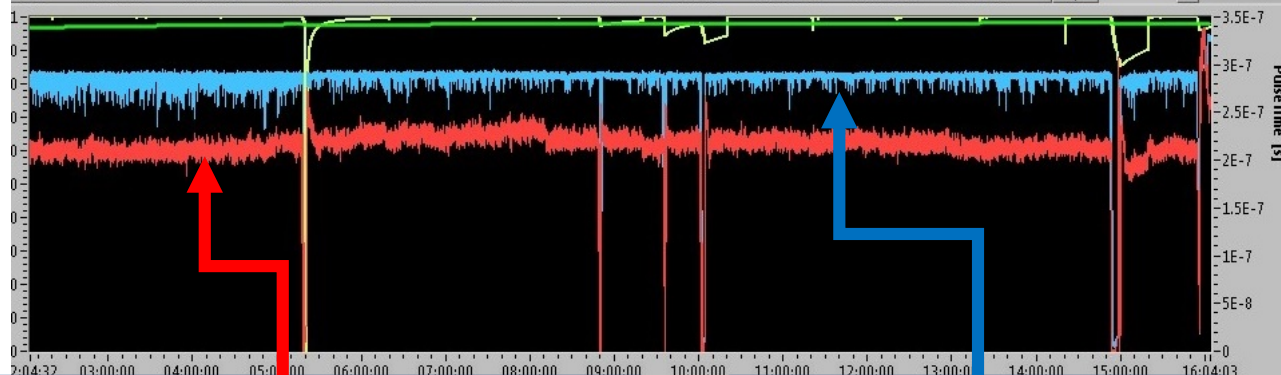
BTF BEAM - 320NS PULSE TRIALS



Positrons on CALOBTF1

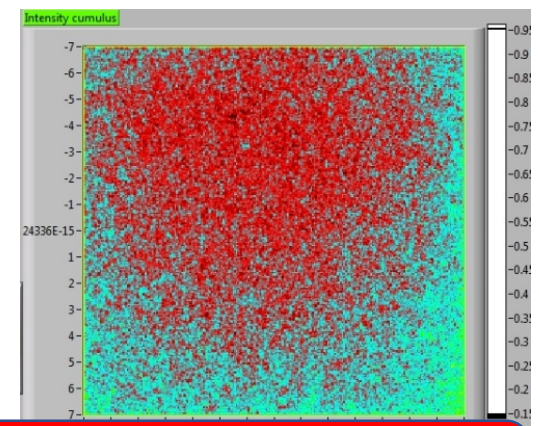
Extending longitudinal line acceptance with GUN improved timing:

- 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)

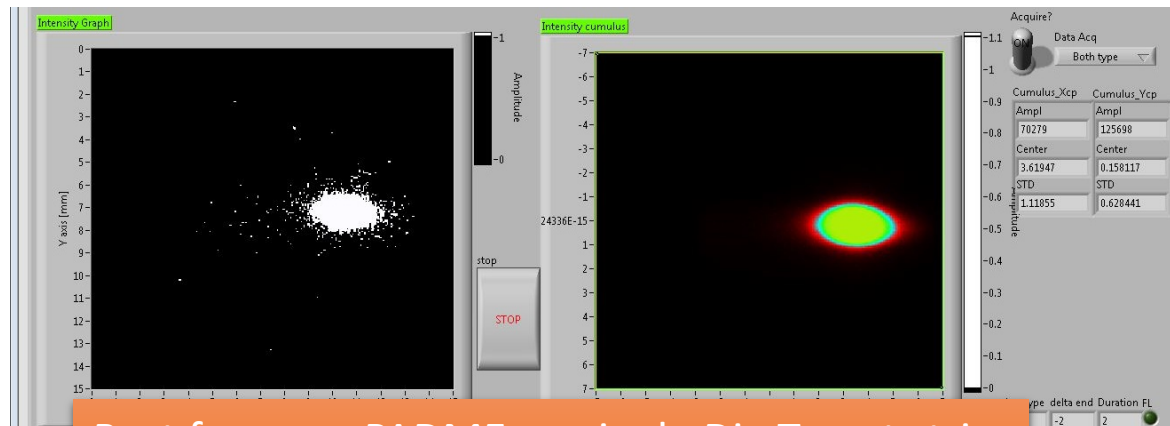
BTF BEAM – INJ TO PADME



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

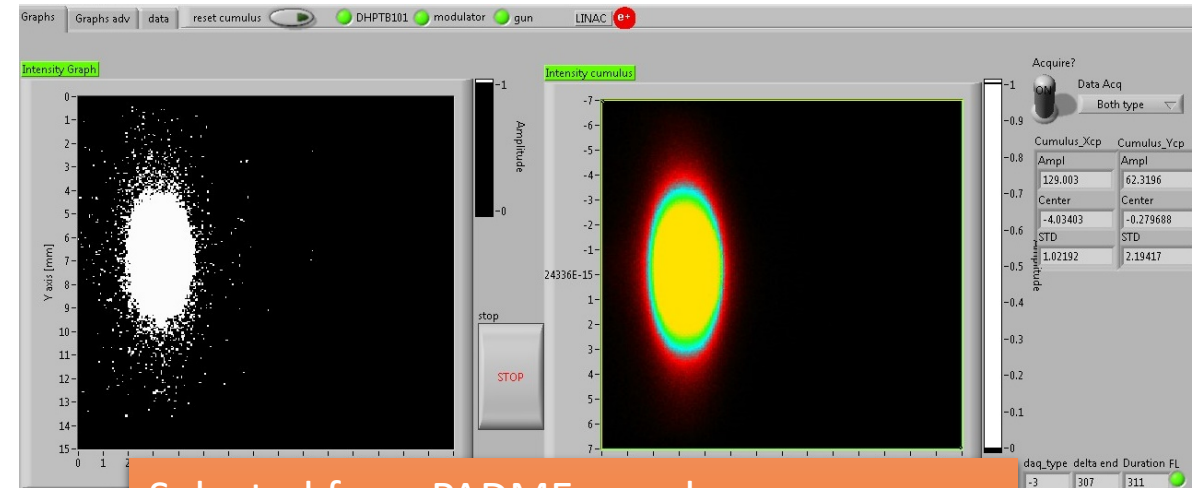
Different final focus trials maintaining:

- 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

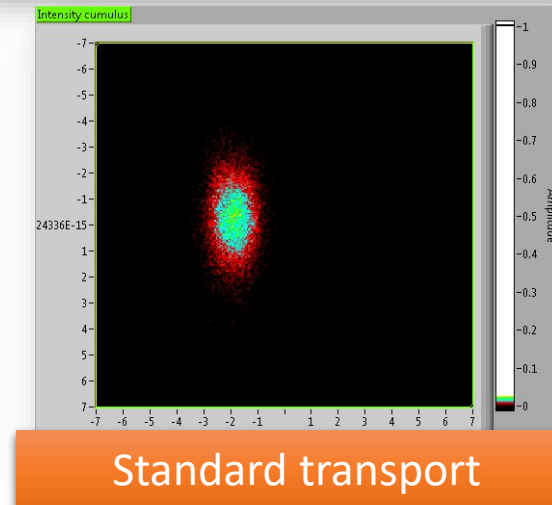
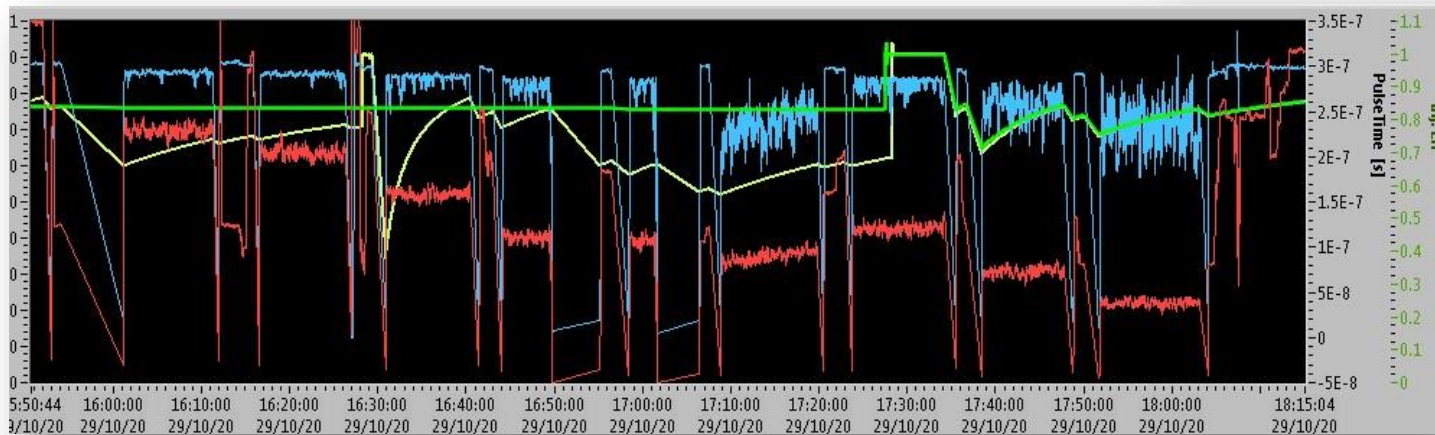
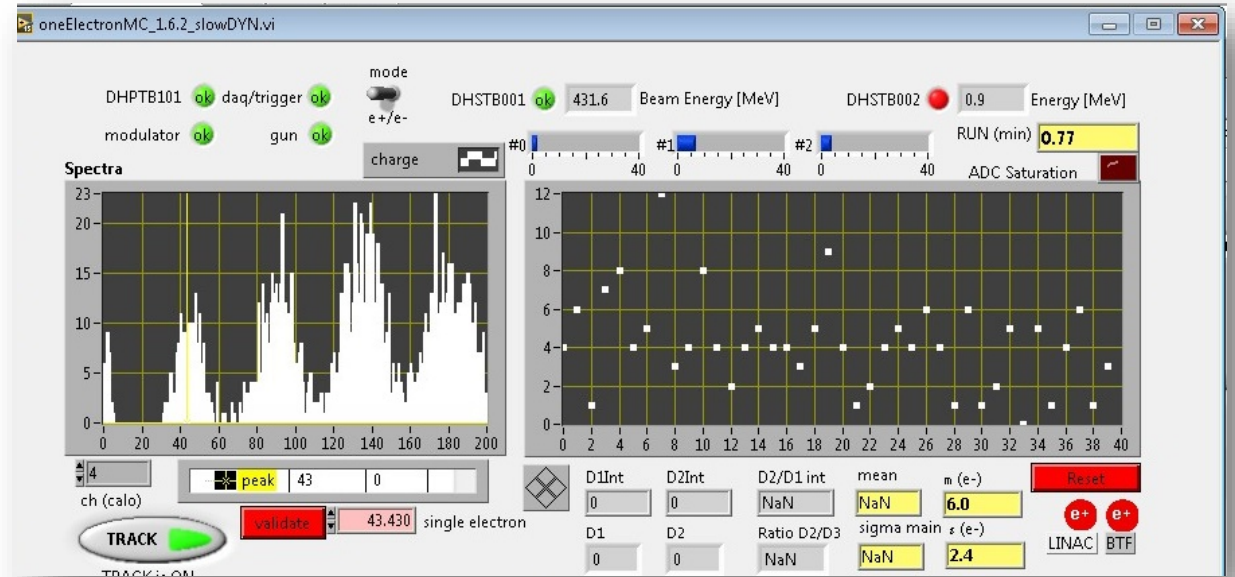
- Y-axis focus
- Better management at detector level
- $\sigma(X/Y) = (1,0/2,2)$ [mm]
- See Raggi presentation

BTF BEAM – SINGLE PARTICLE

A tough feature gained in these months is the delivery of single particle beam by only means of grid control:

- Scrapers set point not touched
- Apart gun grid, LINAC set not changed
- Beam pulse width conserved (distortion on flatness)
- Linear control
- Standard transport untouched

AGAIN another very good result for a LINAC intended for high charge, 10ns pulse!!!

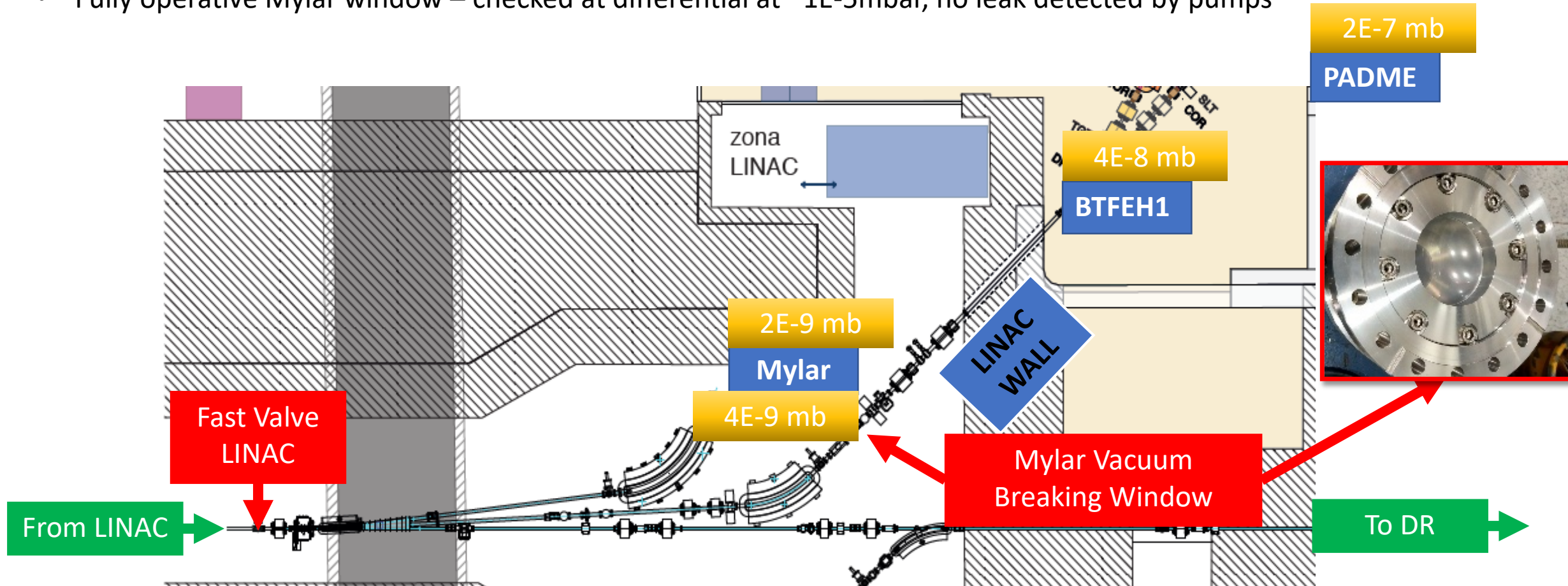


Standard transport

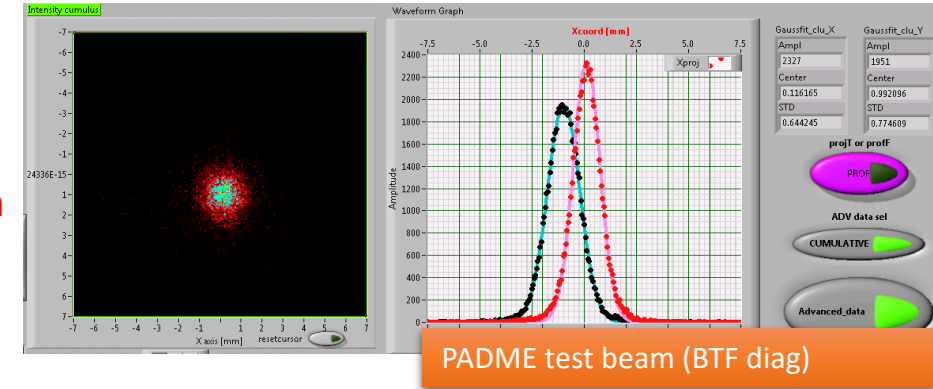
BTF VACUUM – SAFETY SYSTEM

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 $\sim 1\text{E-}5\text{mbar}$, no leak detected by pumps



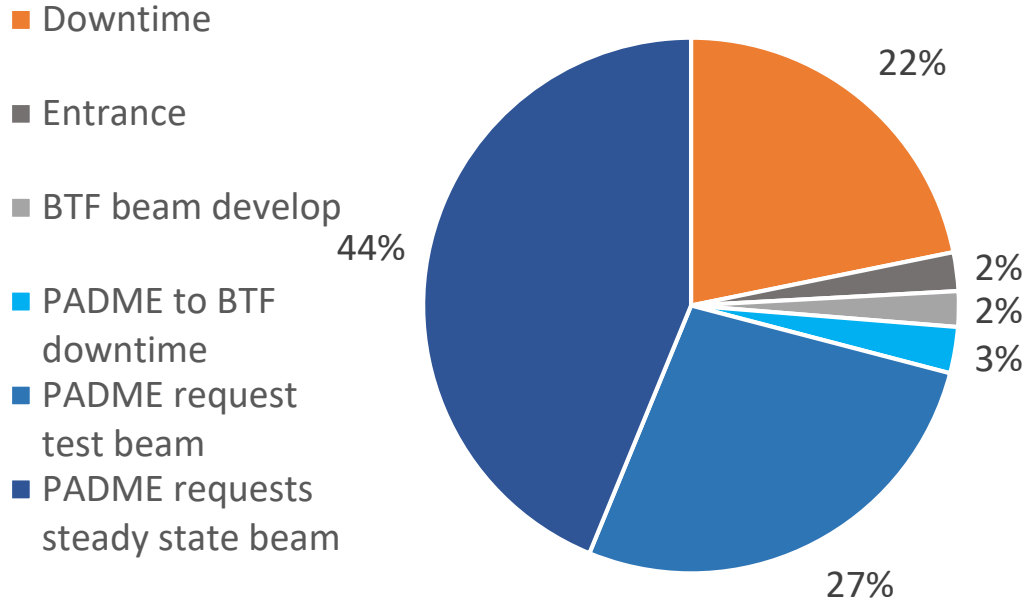
BTF RUN



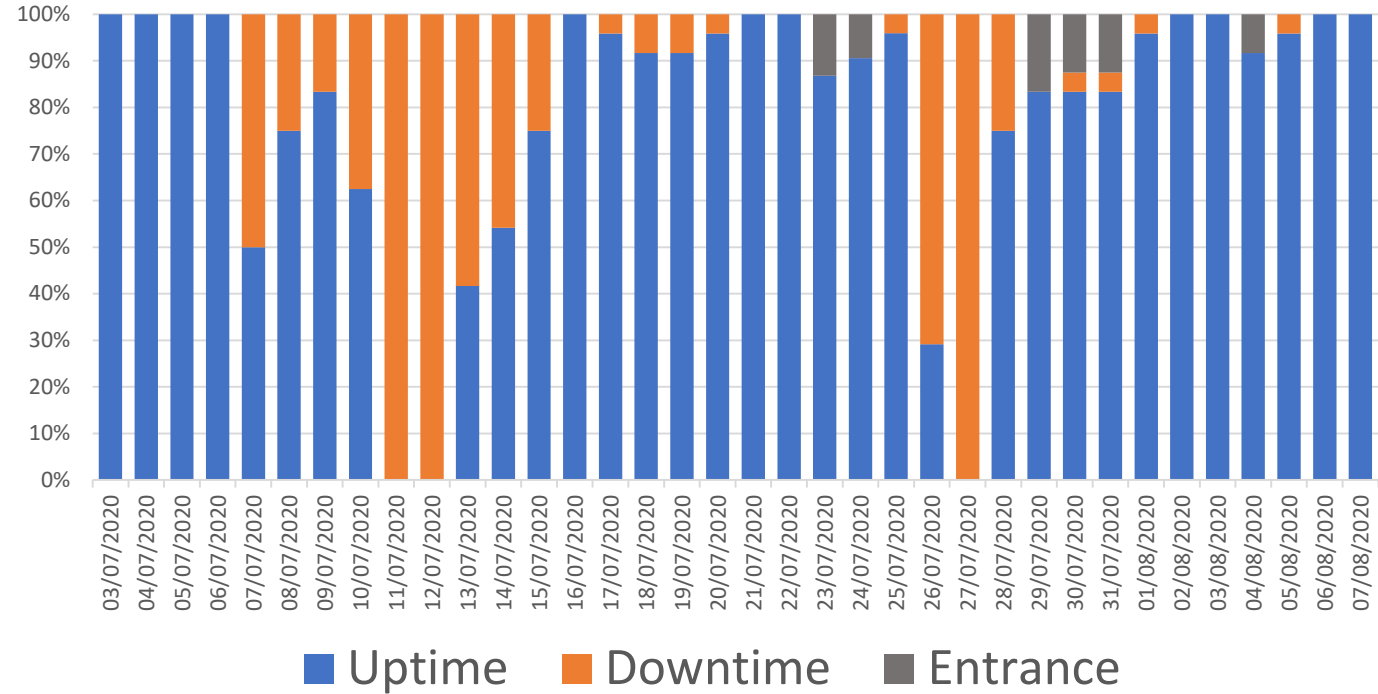
- BTF Experimental Hall 1 delayed timing due COVID19 (two months):
 - Rescheduled activities in the firsts of March 2020 taking account of restriction on area occupancy, distance between workers, and implementation of new working rules
 - External firms and third parties delays for getting needed anti-covid bureaucracy, commissioning and interventions
- *Despite the unknown COVID difficulties, thanks to a **good reading of COVID-dependant delays** the revamping project respected all the scheduled final dates (final review on mid April)*
 - PADME Tech-RUN2 beam delivered in BTFEH1 on 3rd July in time.
 - Tech-RUN2 early implementation of different beams for PADME so engineering run till the 22nd July then implemented final specs beam for data taking till 8th August (25k PoT/bunch, 280ns).
 - Successful test on mylar window and vacuum safety system reliability at the end of Tech-RUN2 (mid August 2020).
 - RUN2 starts on 14th September on schedule after the PADME upgrade and LNF electrical plant overhaul
 - **run on going**

BTF TECH-RUN2 - 07/07/20 -> 07/08/20

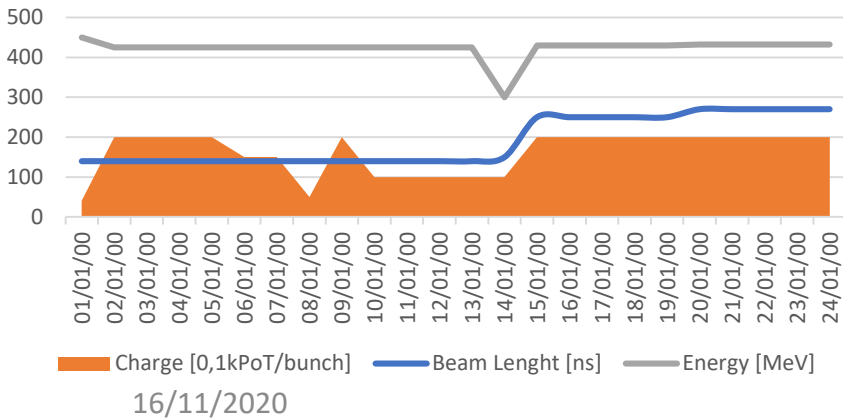
Tech-RUN2 Activities (%)



BTF time sheet

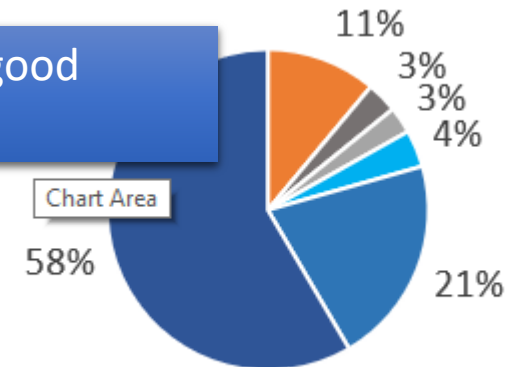


PADME steady state beam specs



Uptime Downtime Entrance

From 15/07, very good performances



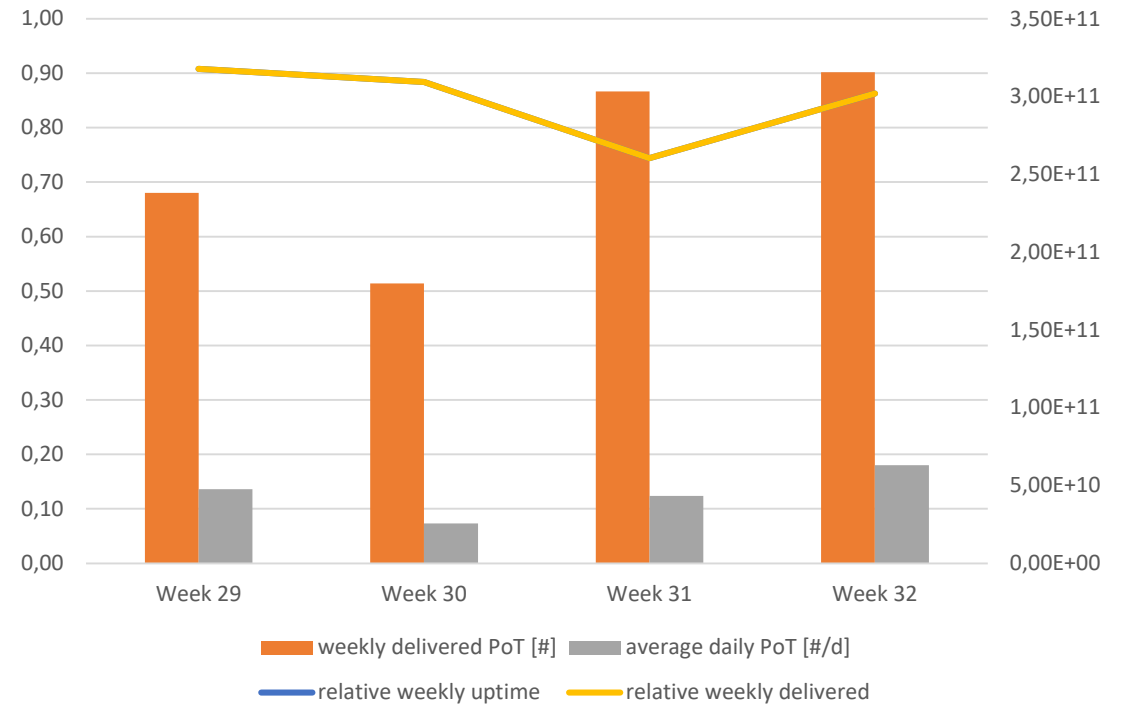
BTF TECH-RUN2 – 07/07/20 -> 07/08/20

Item	Week 27/28	Week 29	Week 30	Week 31	Week 32	Total	Total Overall
relative weekly uptime	test beam	0,91	0,88	0,74	0,86	0,85	0,75
weekly delivered PoT [#]	test beam	2,38E+11	1,80E+11	3,03E+11	3,16E+11	1,04E+12	1,04E+12
average daily PoT [# /d]	test beam	4,76E+10	2,57E+10	4,33E+10	6,32E+10	4,50E+10	
relative weekly delivered	test beam	0,91	0,88	0,74	0,86	0,85	

PADME Maximum calculated daily PoT (25kPoT/bunch, 250ns, H24)	1,0584E+11
PADME Maximum calculated weekly PoT (25kPoT/bunch, 250ns, H24)	7,4088E+11

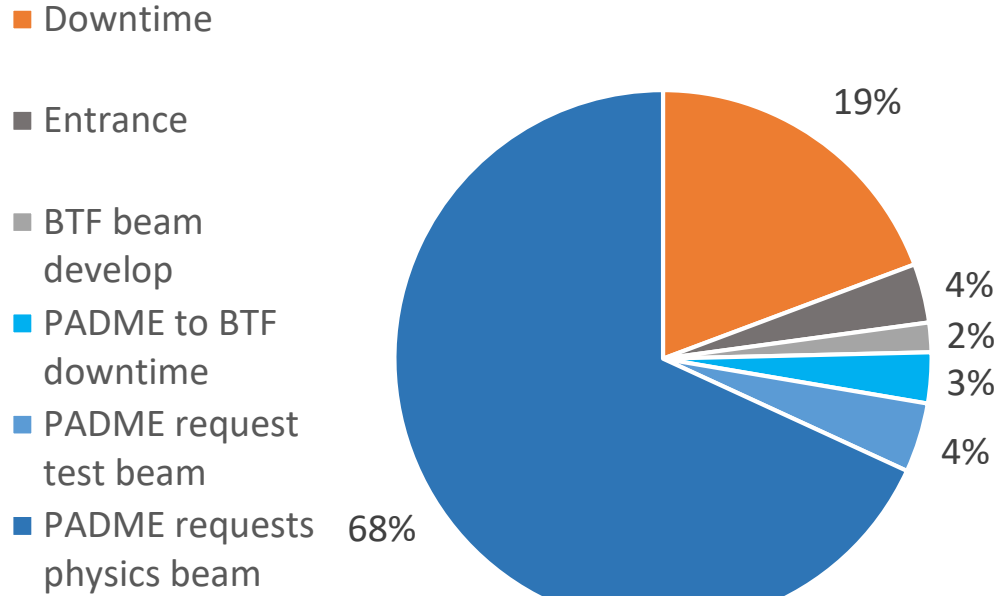
Disclaimer

- The Tech-RUN2 data are considered as tech ones, to be verified the usefulness as physics graded ones
- The delivered PoT are related only to the steady state injections
- Part of the PADME to BTF downtime is recovered with conditioning, beam setup...

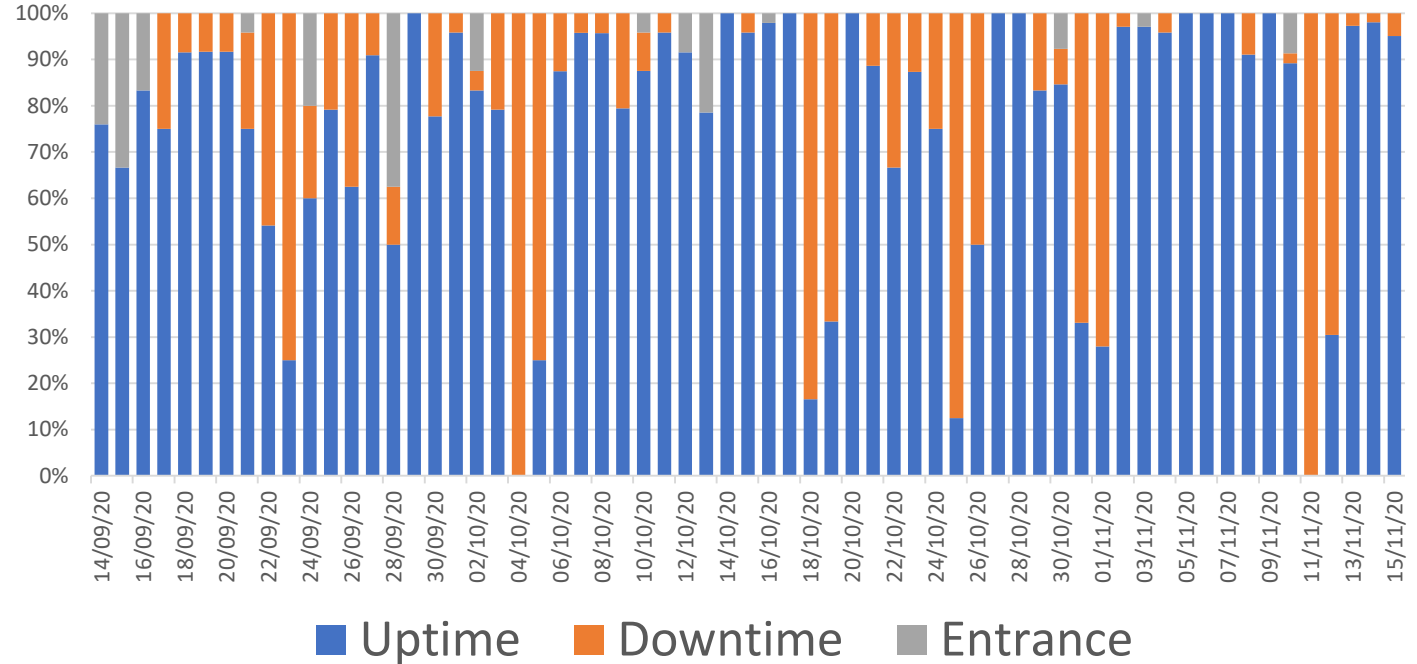


BTF RUN2 - 19/09/20 -> UP TO NOW

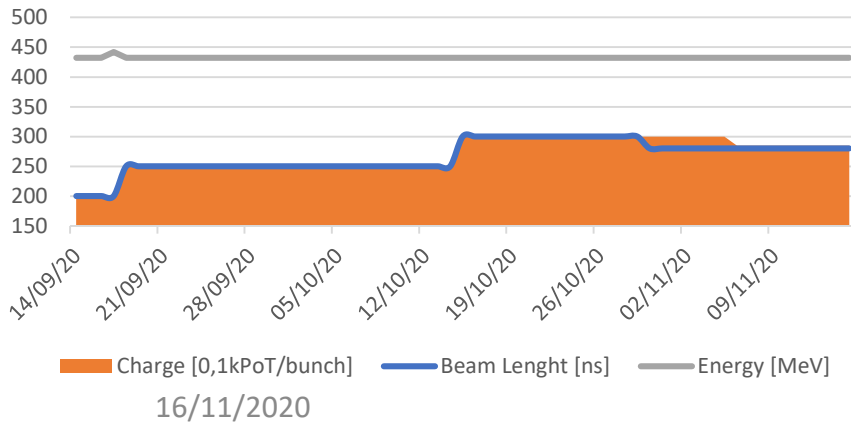
RUN2 Activities (%)



BTF time sheet



PADME physics beam specs



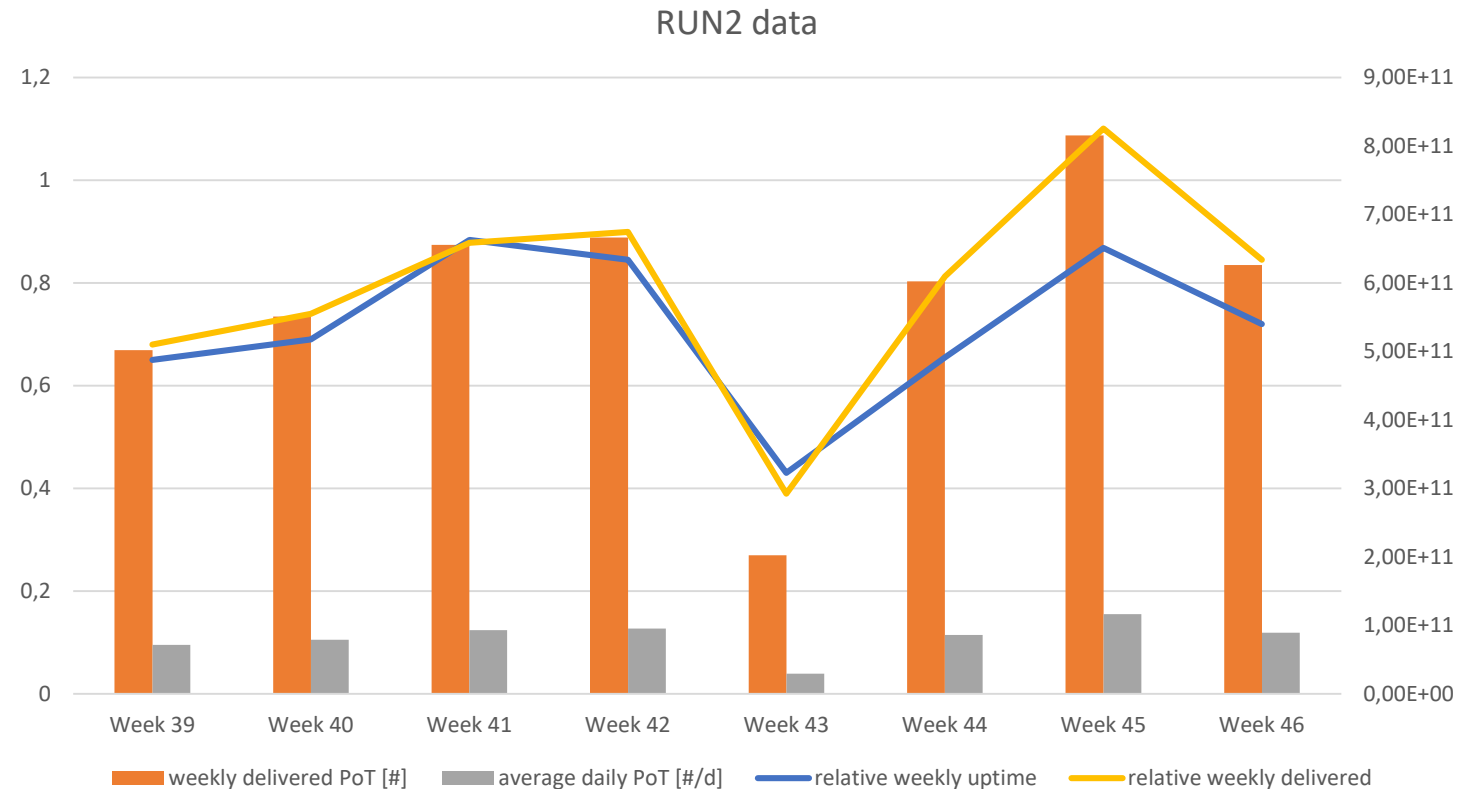
- Main faults (thanks to the poissonian factor) occurring mostly in the weekend, take more time to be solved, complying the actual ANTICOVID shifting rules
- The hard work of our LINAC-BTF personnel have balance such delays
- The more RUN going, the less faults appearing

BTF RUN2

Item	Week 38	Week 39	Week 40	Week 41	Week 42	Week 43	Week 44	Week 45	Week 46	Total	Total Estimated
relative weekly uptime	0,82	0,65	0,69	0,88	0,85	0,43	0,65	0,87	0,72	0,73	0,77
weekly delivered PoT [#]	0	5,02E+11	5,51E+11	6,56E+11	6,66E+11	2,02E+11	6,02E+11	8,16E+11	6,26E+11	4,62E+12	4,98E+12
average daily PoT [# /d]	0	7,17E+10	7,87E+10	9,30E+10	9,52E+10	2,92E+10	8,60E+10	1,17E+11	8,94E+10	8,25E+10	
relative weekly delivered	0	0,68	0,74	0,88	0,90	0,39	0,81	1,10	0,84	0,79	

PADME Maximum calculated daily PoT (25kPoT/bunch, 250ns, H24)	1,0584E+11
PADME Maximum calculated weekly PoT (25kPoT/bunch, 250ns, H24)	7,4088E+11

- Efficiency in delivered PoT is higher than uptime due to pulse width increase
- Week 43 = Three days of max power test + faults (test LINAC status suitable for DAFNE INJ)

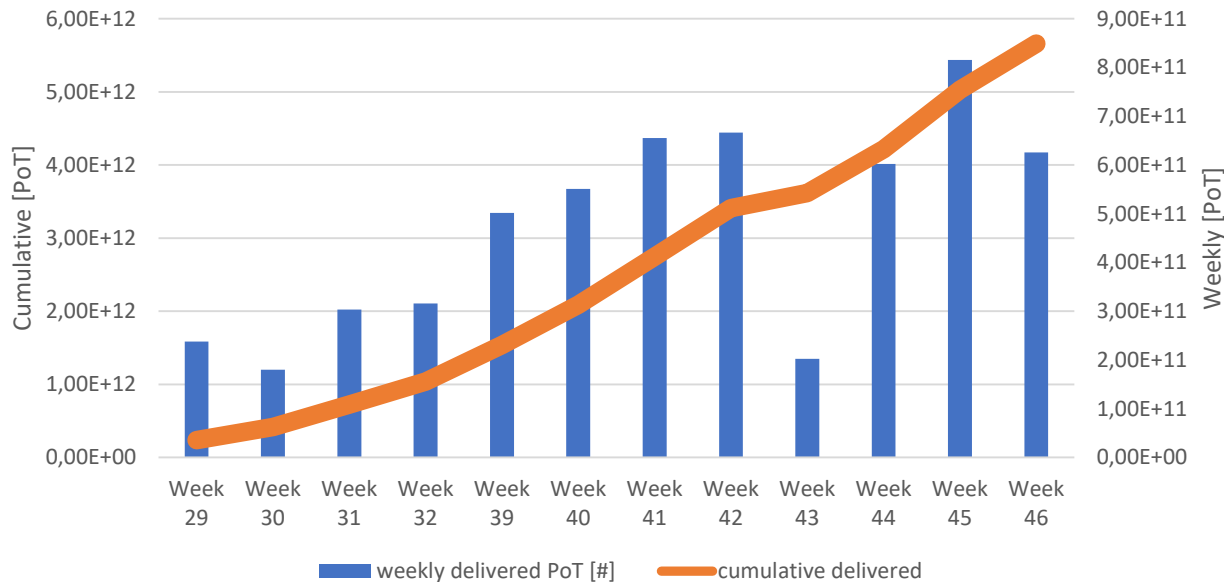


BTF RUNS - OVERALL

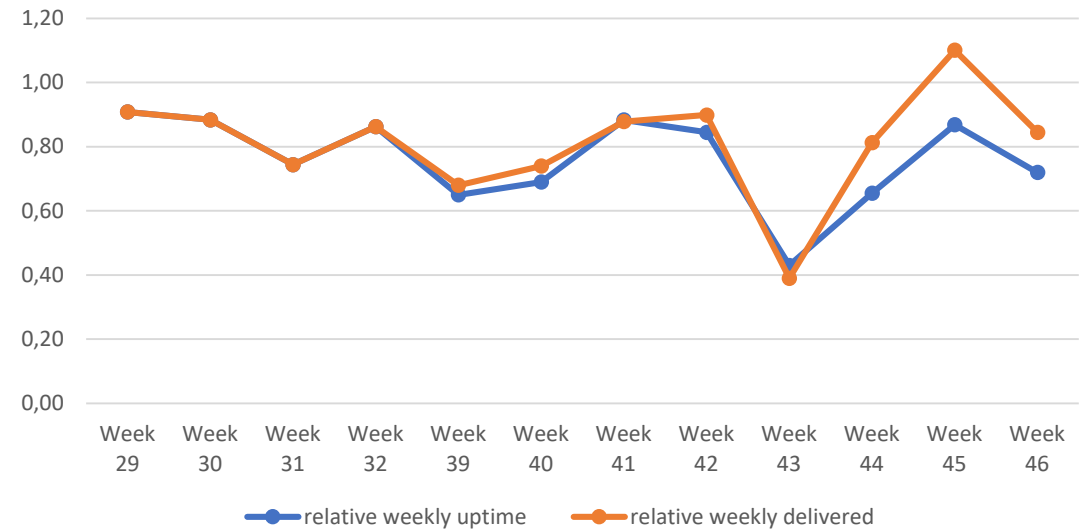
- The delivered PoT are related only to the steady state injections

Item	Week 29	Week 30	Week 31	Week 32	Week 39	Week 40	Week 41	Week 42	Week 43	Week 44	Week 45	Week 46	Total
relative weekly uptime	0,91	0,88	0,74	0,86	0,65	0,69	0,88	0,85	0,43	0,65	0,87	0,72	0,76
weekly delivered PoT [#]	2,38E+11	1,80E+11	3,03E+11	3,16E+11	5,02E+11	5,51E+11	6,56E+11	6,66E+11	2,02E+11	6,02E+11	8,16E+11	6,26E+11	5,66E+12 (RUN2 4,62E+12)
average daily PoT [# /d]	4,76E+10	2,57E+10	4,33E+10	6,32E+10	7,17E+10	7,87E+10	9,30E+10	9,52E+10	2,92E+10	8,60E+10	1,17E+11	8,94E+10	7,00E+10
relative weekly delivered	0,91	0,88	0,74	0,86	0,68	0,74	0,88	0,90	0,39	0,81	1,10	0,84	0,81
cumulative delivered	2,38E+11	4,18E+11	7,21E+11	1,04E+12	1,54E+12	2,09E+12	2,75E+12	3,41E+12	3,61E+12	4,22E+12	5,03E+12	5,66E+12	
note	Beam not in final configuration					Beam in final configuration							

Tech-RUN2 + RUN2 delivered data



Tech-RUN2 + RUN2 efficiency data



LINAC STATUS

- New Klystron on Mod C has vacuum problem in the first section of output waveguide: lower output energy (0.5 the maximum) to overcome frequent faults due to power related discharges.
 - So, lower maximum positron beam energy:
 - > approx 500MeV(10ns, tested on Week 43)
 - > 466MeV(250ns, full energy spectrum not suitable for PADME)
 - > 430MeV(320ns, PADME delivering on 15th October)



we can increase some %energy

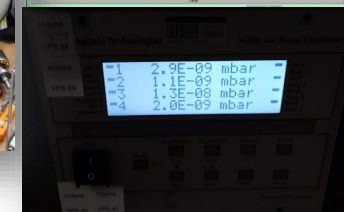
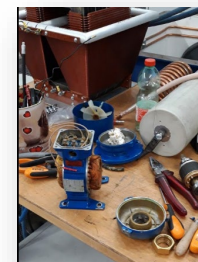
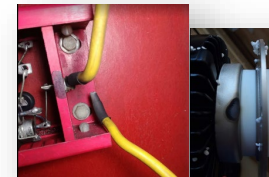
During October **conditioning of ModC elbow seems reached**

- **Power limit discovered week 43 comes from SLED section** -> found aged pumps and leaks in WG - **balancing**
- Max power test on week 43 lead us decide to forward injection to PADME (but needs overhaul ModC vacuum radically) - **balancing**
- Some problems on the two ModD PFN-HVPS (Fabrication defect in control loop for one, fail on power section the other) - **substituted**
- Minor Problems on ModA; aged Positron Modulator thyratrons, to be recovered at the end of PADME run - **solved**
- Vacuum Problem on KlyB elbow pumping. KlyB recovered from Barium deposit discharge.] – **solved**
- 3x Thyratrons (one bugged) - **substituted**
- **LINAC operation H24/7, 50Hz emission, no stop (fault apart)**
 - Duty-cycle of components in high power mode (positron inj's) **moves from 0.45 (DAFNE high inj's rate, with bad inj) to 1**
 - *more faults due to stressed setup configurations to reach the PADME final specs beam*
 - **Gun Cathode emits 15 times more than 10ns DAFNE standard operations** (37x pulse, 10x lower current but 4x overall duty cycle)
 - *LINAC KlyC significant faults are 0.5 the overall ones until Week 41*
- **PADME has to take good data** -> Opportunistic maintenance for releasing more injections -> increase beam pulse as compensation of the downtime seems the right way



LINAC MAINTENANCE

- Activities from last SC(07-05-2020)
 - 07/05/2020 New Vacuum pump on ELBOW ModC waveguide
 - 12/05/2020 Vacuum alert sections on VPS6 o (E3in) VPS13(CS) and VPS14(P1Out)
 - 08/06/2020 Start Kly C conditioning (Stopped in MARCH for COVID19)
 - 16/06/2020 mod C: fault on Capacitor Thyatron circuit
 - 01/07/2020 First Positron BEAM (10ns)
 - 03/07/2020 mod A: fault on discharging resistor
 - 15/07/2020 Installed new GUN PULSER for long bunch and attenuator for the PADME/BTF RUN
 - 31/07/2020 Mod A: PFN Charging cable fault and thyatron damage after 5500h.
 - 07/08/2020 End of PADME RUN
 - 02/09/2020 AIR FLOW SWITCH **NIGHTMARE** on mod B
 - 10/09/2020 Problem on DAFNE TIMING power supply and problem in the water primary circuit
 - 16/09/2020 SPARC C band water pump issue fixed by linac service

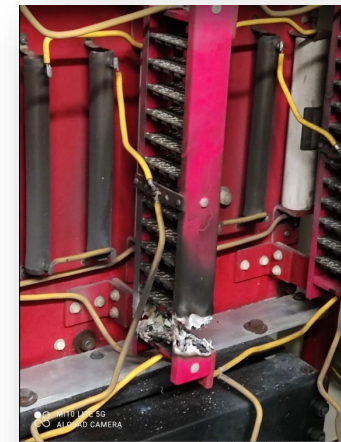


Mod C Faults in 07-08/2020 during PADME run

SLED C vacuum anomaly

LINAC MAINTENANCE

- 28/09/2020 mod D: HVPS FAULT (FUSE on AC power line) X2
- 30/09/2020 FAULT on THYRATRONS in POSITRON CONVERTER MODULATOR
- 03/10/2020 mod C: FIRE in diode half bridge resonant charging circuit
- 21/10/2020 mod C: Vacuum leak in SLED out waveguide fixed by VACUUM SERVICE
- 22/10/2020 mod C: new Thyatron installed (after 5900h HV)
- 24/10/2020 mod C: FAULT on new Thyatron grid (60h HV) and fault in thy pulser: installed old Thy to check system (work for other 400h HV)
- 31/10/2020 mod B: kly B arcing, hard conditioning
- 02/11/2020 SPARC: triaxial cable fault (fixed with spare part)
- 11/11/2020 Mod C: Thyatron fault (5900h on B and 400 on C)



Mod C Faults in Thyatron box: filament transformer broken. Installed new elements



Linac last uptime

- Conditioning and beam setup from 08 June – 07 July
- For PADME from 07 July - 07 August
- For PADME from 07 Sept - up to now

Linac Maintenance:

- Check modulators, cooling mechanics and electrics and electronics and RF
- Software online monitoring and DB of the LINAC status (Vacuum, RF, HV, Magnets, GUN) G. Piermarini.

Linac Consolidation

- New Vacuum pump on ELBOW C
- New Thyatron ModC Box elements
- Huge overhauling of ModC-related vacuum 8 Ionic pumps in ModC RF waveguides, elbow, SLED, at the end of PADME run
- Installation of ACC fast safety valve, at the end of PADME run

Linac Upgrade

- STOPPED DUE TO COVID WORKING PROCEDURE

SPARC-Lab:

More support on modulator (water issue) and klystron&safety system.

Safety system:

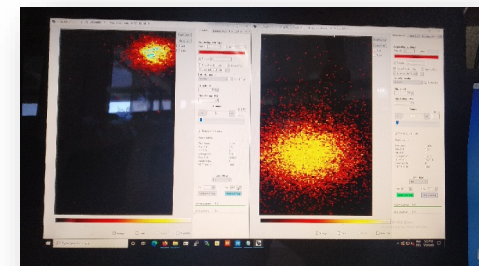
DAFNE Linac Access control: new access list implementation
LATINO (TEX-X band) Safety System (S. Pioli)
SINGULARITY project (S. Pioli) to be tested in BTF2

Milestones

- PADME installation will be maintained in the next years
- BTF2 will be installed with some logistics changes for the actual PADME installation
- All items in our Lab apart few minor ones (delay in shipping)

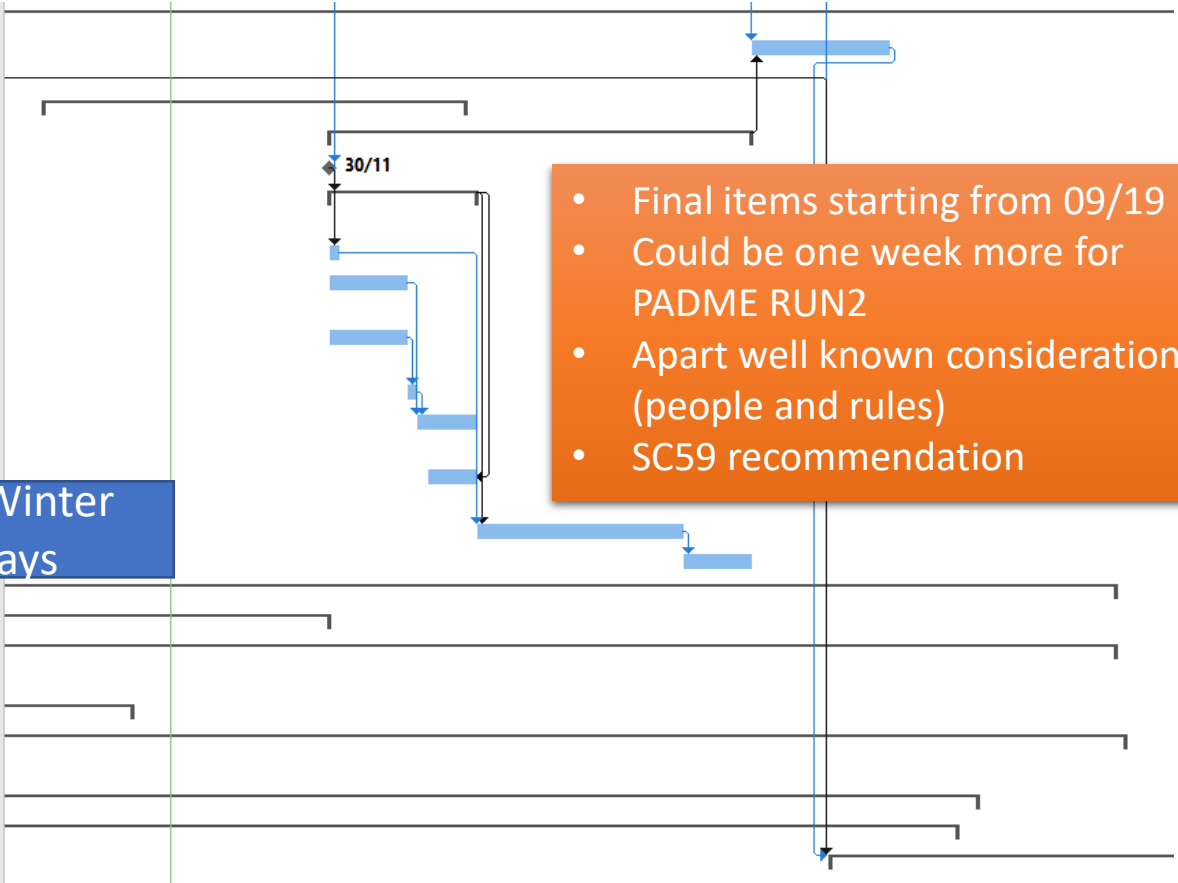
Strongly in dependence of this month, but up to now:

- BTF2 installation will start at the end of PADME run and after the SIDDHARTINO re-start (mostly for people involved) -> **Second part of January**
- After BTF2 installation, will start the commissioning and it could be very long (maybe two/three months) -> BTF2 beam **not before end of April**(COVID?)
- After BTF2 commissioning will start the **users campaign** and the external activities for E-RAD (irradiation procedure tests) and UA9 (pixel detector develop)



105	☑	▶ PHASE 6 - BTF2 commissioning	388 days?	Wed 02/10/19	Fri 26/03/21		86%
106	☑	SIDDHARTINO run startup	2 wks	Wed 13/01/21	Tue 26/01/21	104;111	0%
107	☑	BTF2 final design	149 days	Wed 02/10/19	Mon 27/04/20	131;142	100%
108	☑	▶ LOGISTICS	31 days?	Mon 02/11/20	Mon 14/12/20		9%
111	☑	▶ LINAC	31 days?	Mon 30/11/20	Tue 12/01/21		0%
112	☑	LINAC OFF	0 days	Mon 30/11/20	Mon 30/11/20	104	0%
113	☑	▶ LINAC Vacuum pump revamping	11 days?	Tue 01/12/20	Tue 15/12/20	104;112	0%
114	☑	Cabina 13 test	1 day?	Tue 01/12/20	Tue 01/12/20	104;112	0%
115	☑	2xIPump on Sled out and repair leak	6 days	Tue 01/12/20	Tue 08/12/20		0%
116	☑	6x IPump in linac tunnel for ModC sections	6 days	Tue 01/12/20	Tue 08/12/20		0%
117	☑	ACC fast valve	1 day?	Wed 09/12/20	Wed 09/12/20	116	0%
118	☑	Vacuum leak test and pumping	4 days	Thu 10/12/20	Tue 15/12/20	115;117	0%
119	☑	ACC valve for vacuum safety system	3 days	Fri 11/12/20	Tue 15/12/20	113F	0%
120	☑	LINAC overhauling	3 wks	Wed 16/12/20	Tue 05/01/21		
121	☑	LINAC restart and set	5 days	Wed 06/01/21	Tue 12/01/21	115	
122	☑	▶ Cooling	206 days?	Thu 07/05/20	Thu 18/02/21		77%
129	☑	▶ Vacuum	270 days?	Tue 19/11/19	Mon 30/11/20		94%
135	☑	▶ Magnets	291 days?	Thu 09/01/20	Thu 18/02/21		89%
149	☑	▶ Mechanics	142 days?	Fri 10/01/20	Mon 27/07/20		91%
155	☑	▶ Shipping	105 days?	Wed 17/06/20	Tue 10/11/20		91%
164	☑	▶ PLC for BTFE2 and PS hall	190 days?	Mon 01/06/20	Fri 19/02/21		73%
170	☑	▶ Civil Work	148 days	Mon 07/10/19	Wed 29/04/20		100%
173	☑	▶ SAFETY	349 days?	Mon 07/10/19	Thu 04/02/21		89%
184	☑	▶ Controls	275 days?	Wed 15/01/20	Tue 02/02/21		76%
190	☑	▶ BTF2 installation & commissioning	47 days?	Thu 21/01/21	Fri 26/03/21	34;107;30	0%

← During Winter Holidays



- Final items starting from 09/19
- Could be one week more for PADME RUN2
- Apart well known considerations (people and rules)
- SC59 recommendation

ERAD @ BTF

Lucia Sabbatini, Bruno Buonomo

INFN TEAM : Bruno Buonomo, Luca Foggetta, Claudio Di Giulio,
Domenico Di Giovenale, Fabio Cardelli



eRAD

Test di resistenza alle radiazioni per componenti
aerospaziali



REGIONAL FUND

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.

Started 11/06/2020 Duration 2 years

Beam time request ~ 3 months high intensity beam @ BTF

LINAC Measurements time request ~1 month

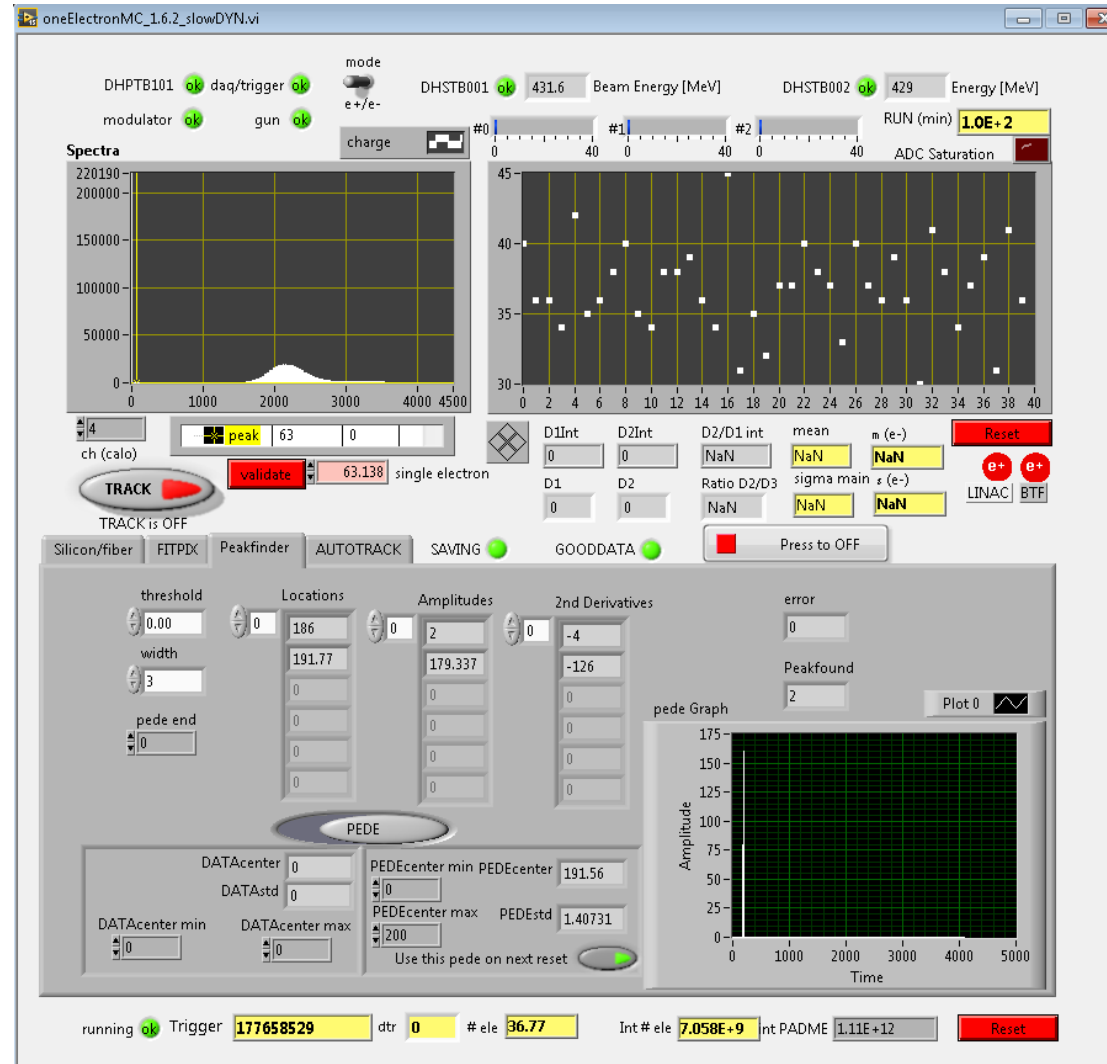
CONCLUSIONS

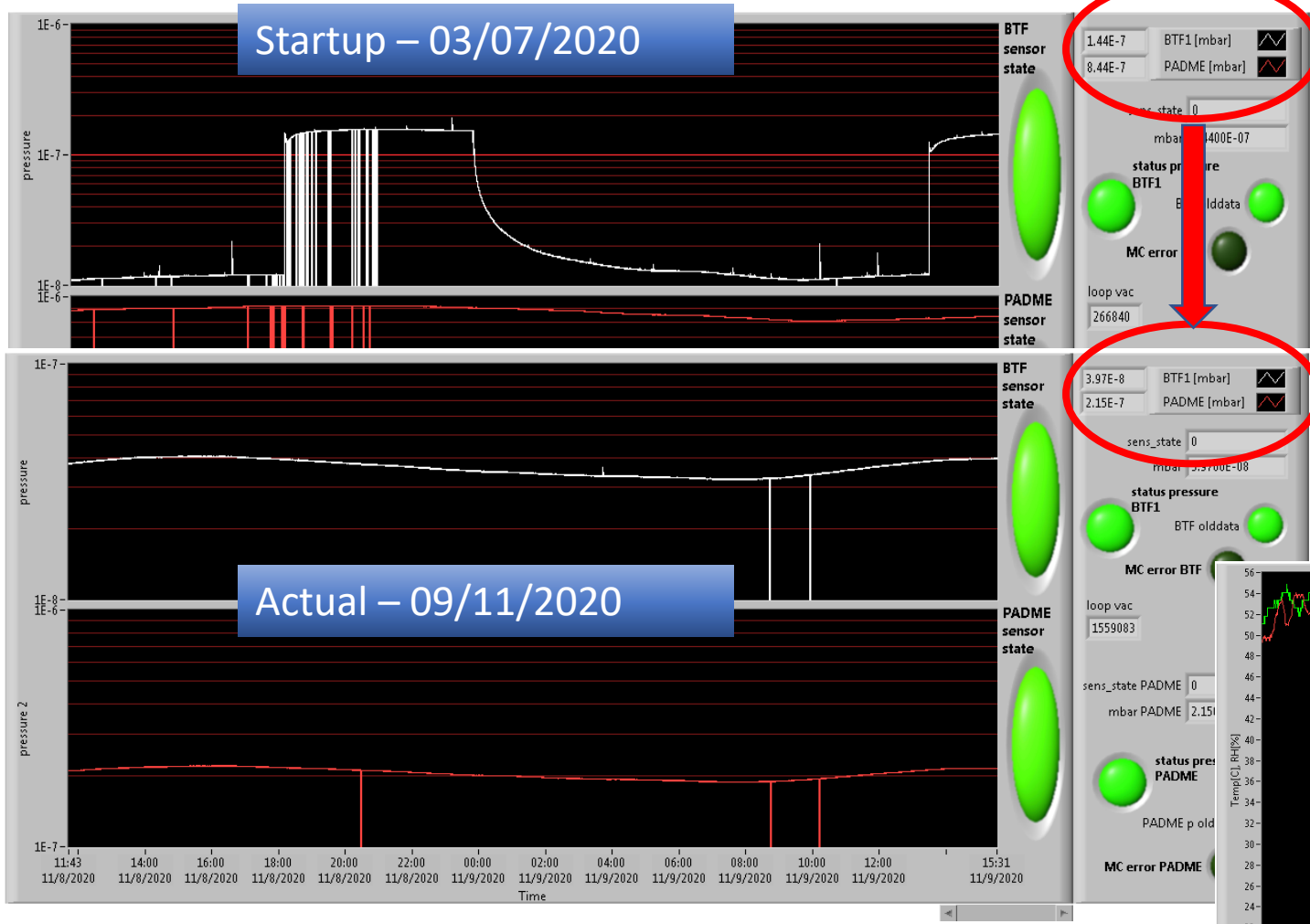
- PADME Tech-RUN2 accomplished
- PADME RUN2 on going
- Till now we got $5,66E+12$ PoT in steady state,
 - RUN2 physics graded ones are $4,62E+12$ PoT
- LINAC has problem on KlyC vacuum still to be repaired but, in spite of everything, we are up with a 0,76 uptime over 24/7 operations in approx five months
- BTF2 is ready to be installed, the end of PADME run is the milestone for fix the day 0 also for SIDDHARTA restart on the next year
- BTF accomplished all of its past duty during 2020, for the 2021 we want to be ready for users and the other external activities



Thanks to all who face this difficult year,
Looking directly in the eyes of the beast but
Staying at their desks (at work, in Lab, in CR, at home)
or with a tool in their hand, helping each other

SPARE SLIDE





Dynamic vacuums of different type:

- TMP on PADME
 - Ionic Pump on BTF1
- coexist without problem (~aging on IP)

