



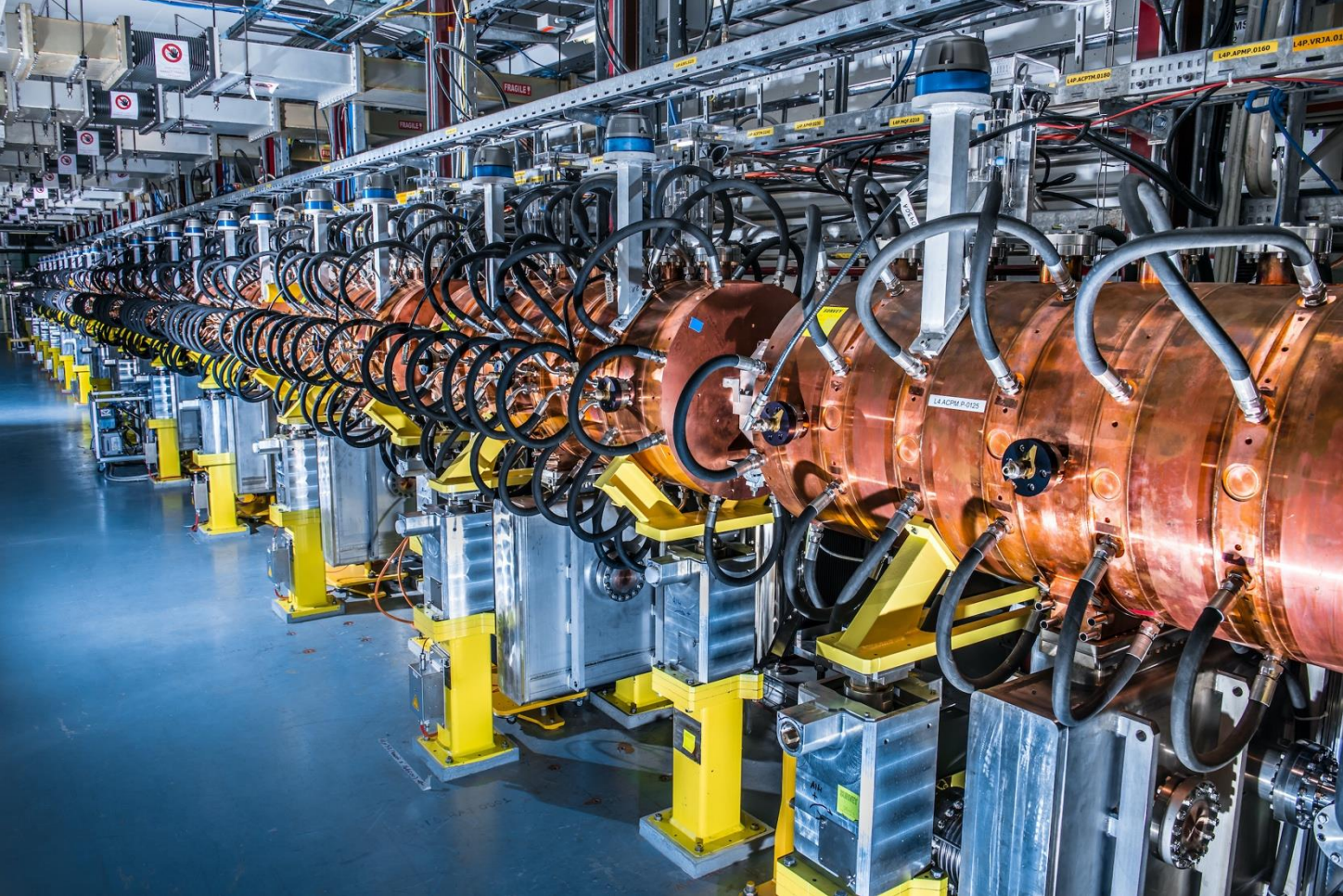
# Status of the accelerator complex

Mike Lamont

RRB, 25<sup>th</sup> April 2022

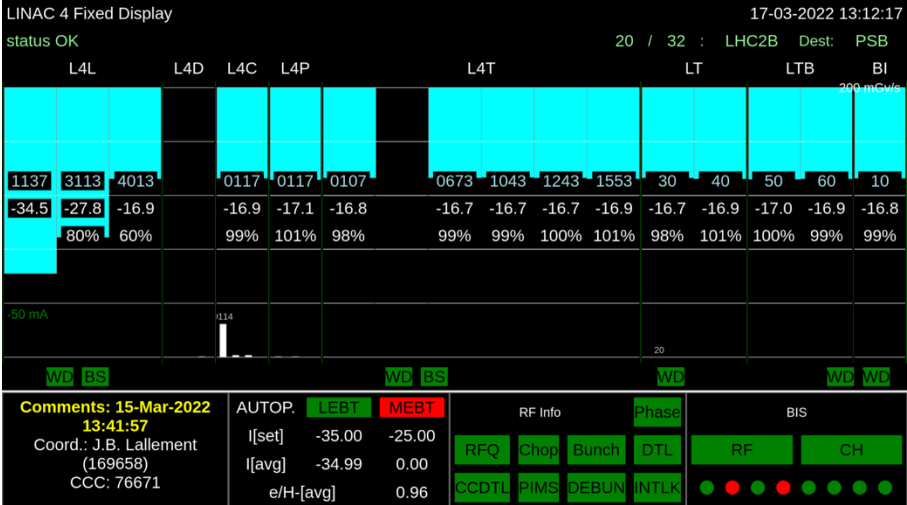
# Linac4

96% availability last week



In good shape and stable

Out of source: ~35 mA  
 After RFQ: ~ 17 mA



# Booster

96% availability last week



- **All required beams in place**

- ISOLDE, n\_TOF, East Area, AD, North Area, LHC variants

PSB Fixdisplay - W 17

25-Apr-2022 12:08:54

Comments (23-Apr-2022 07:13:49)

Supervisor : C. Bracco (169331)

Operator : CCC: 76671

BP	User	Pls	Inj.	Acc.	b.Ej.E10	Ej.E10	Dest.
10	EAST_T8_2022	2	○○●○	○○●○	59.64	61.08	LATE_SE_T8_
11	ISOGPS_2022	18	●●●○	●●●○	2421	2403	BDUMP
12	TOF_2022	23	○●○○	○●○○	871	845	TOF_22
13	MTE_2022	20	●●●○	●●●○	603	617	MTE_22
14	MTE_2022	20	●●●○	●●●○	600	619	MTE_22
15	TOF_2022	23	○●○○	○●○○	871	838	TOF_22
16	---ZERO---	1	○○○○	○○○○	0.00	0.04	BDUMP
17	AD_5_Bunch_2022	24	●●●○	●●●○	1206	1218	ADO_22
18	---ZERO---	1	○○○○	○○○○	0.00	0.03	BDUMP
19	TOF_2022	23	○●○○	○●○○	875	872	TOF_22
20	ISOGPS_2022	18	●●●○	●●●○	2414	2381	BDUMP
22	EAST_T8_2022	2	●●●○	●●●○	964	950	BDUMP
	---ZERO---						BDUMP

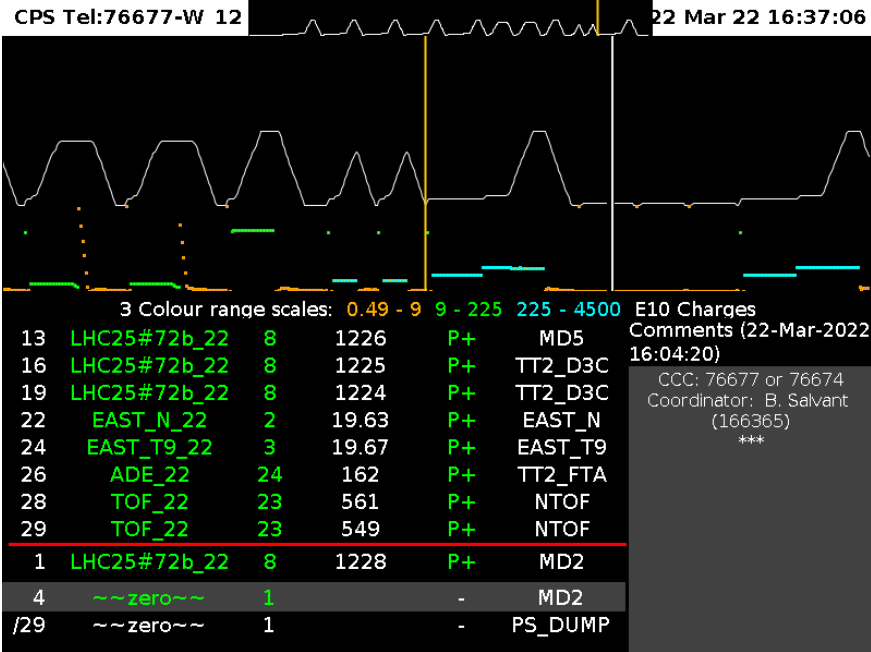
22/44 No Message

# PS – looking good at 62



First beam Thursday 24 February

Start of physics for AD, EAST and n\_TOF on 28 March



# PS: Availability last week

## Availability

82.7%

## Blocking Faults

39

## Total Faults

39

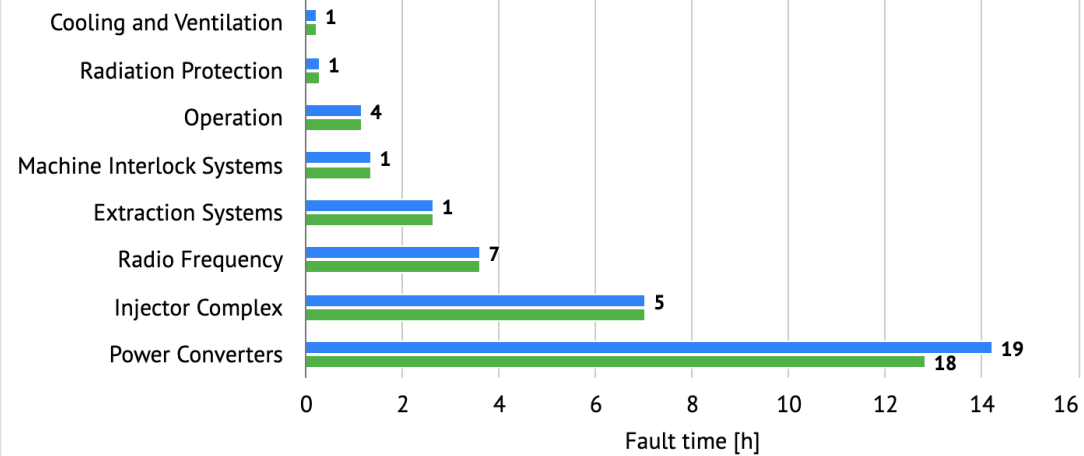
## Fault Duration (overlap excluded)

29.1h

## Faults by Root Cause

### Faults by Root Cause i

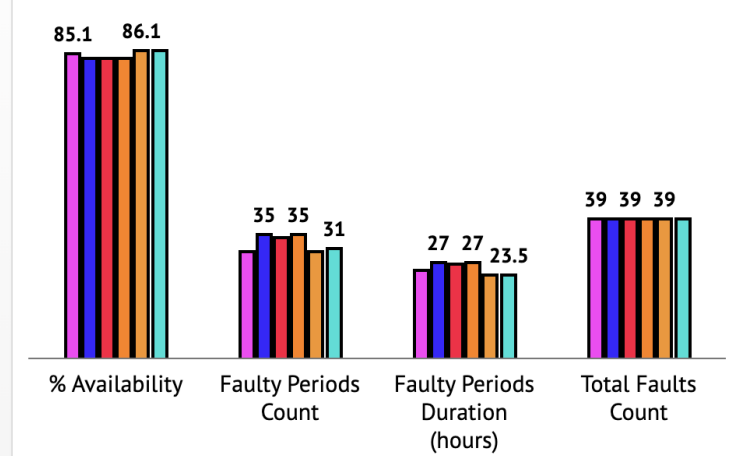
- Raw (includes faults in shadows and child faults)
- Root Cause (child faults assigned to parent systems, time in shadow removed)



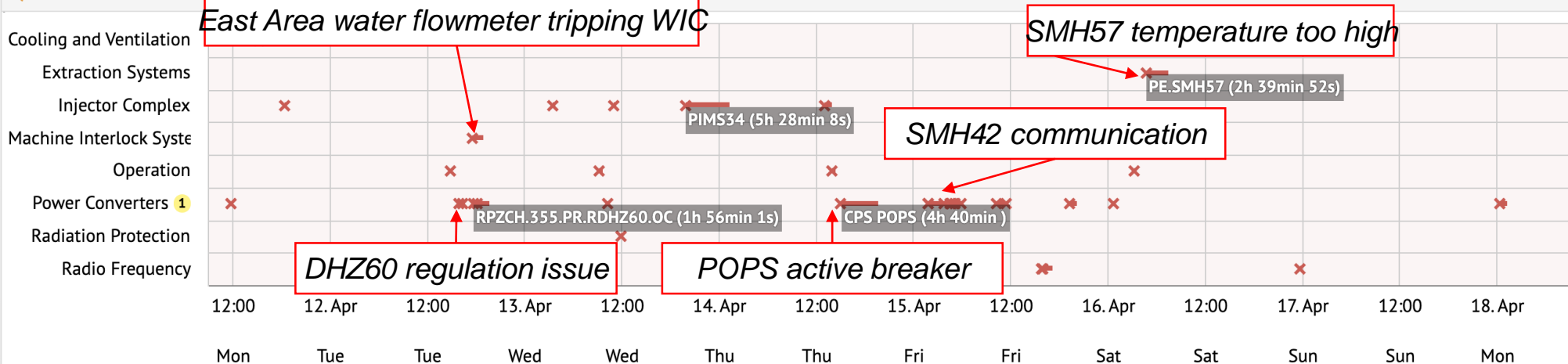
## Destination Availability

### Destination Availability i

- AD
- EAST\_N
- EAST\_T8
- EAST\_T9
- NTOF
- SPS



## Faults Timeline by System



RELATIONS

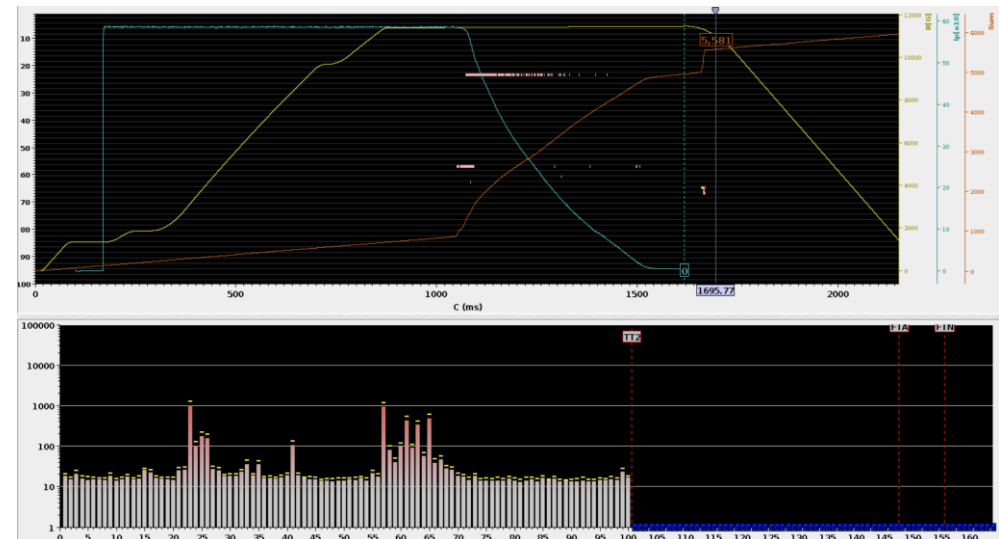
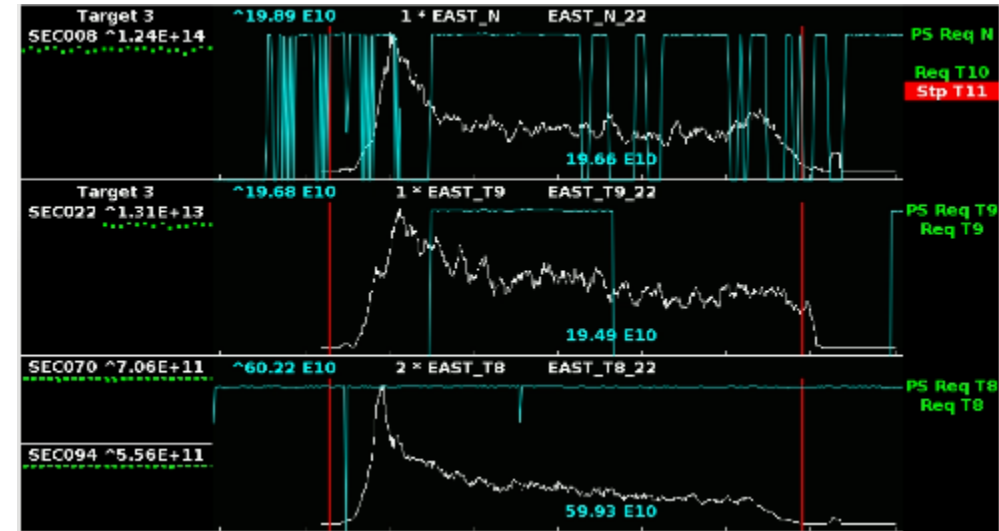
- is same as
- is similar to
- is related to
- blocks
- is parent of

# PS - Status of operational beams

Fixed target beams	Status	Comment
SFTPRO (core only)	Operational	Available up to $2 \cdot 10^{12}$ p/p
SFTPRO (5 turn extraction)	Setup ongoing	Pushed <b>up to <math>1.8 \cdot 10^{13}</math> p/p</b> , beam quality to be optimized for high intensity, DFA's and trajectory setup ongoing
AD	Operational	Nominal beam ( <b>5 bunches</b> )
TOF	Operational	Nominal beam ( <b>parasitic beam</b> setup ongoing)
EAST	Operational	<b>New version</b> with late extraction, no sweep, 400ms spill length
LHC-type beams	Status	Comment
LHCPILOT, LHCINDIV	Operational	
LHC25 (72b)	Operational	Operational at $2.2 \cdot 10^{11}$ p/b; few losses above this intensity
LHC25 (12b or 24b)	Operational	
LHC25 BCMS (48b)	Operational	Operational at $1.8 \cdot 10^{11}$ p/b; setting up higher intensities and improving beam quality
AWAKE	To be started	

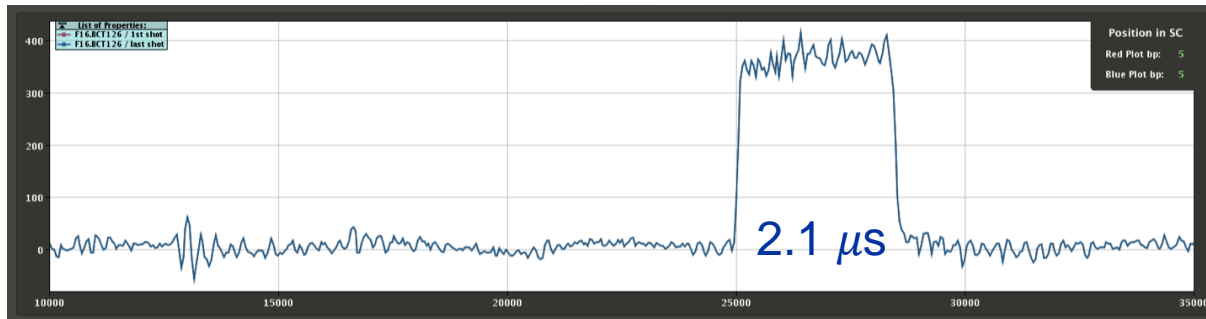
# PS Beams to the EAST area

- EAST physics started on 28 March
  - Beam delivered to *all destinations*
  - Fast and slow extractions operationally available
  - Beam intensities available between  $2 \times 10^{11}$  p<sup>+</sup> to  $6 \times 10^{11}$  p<sup>+</sup>
- *Major effort ongoing to optimise beam parameters*
  - maximize transmission, reproducibility and spill quality
- *Implementation of new tools to facilitate steering of beam position on IRRAD targets*

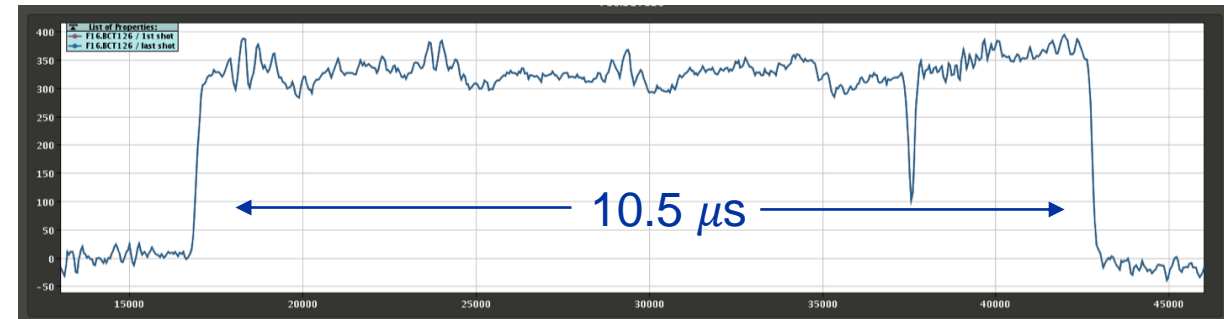


# PS Fixed Target beam to SPS

- Regularly providing **single- ( $50 \cdot 10^{10}$  p<sup>+</sup>)** and **5-turn (up to  $500 \cdot 10^{10}$  p<sup>+</sup>)** extraction to the SPS for setting up
- **Nominal 5-turn extraction prepared up to  $1800 \cdot 10^{10}$  p<sup>+</sup>**
  - *Work on further intensity increase ongoing*
  - *beam quality checks and optimization ongoing*



Single turn extraction from PS

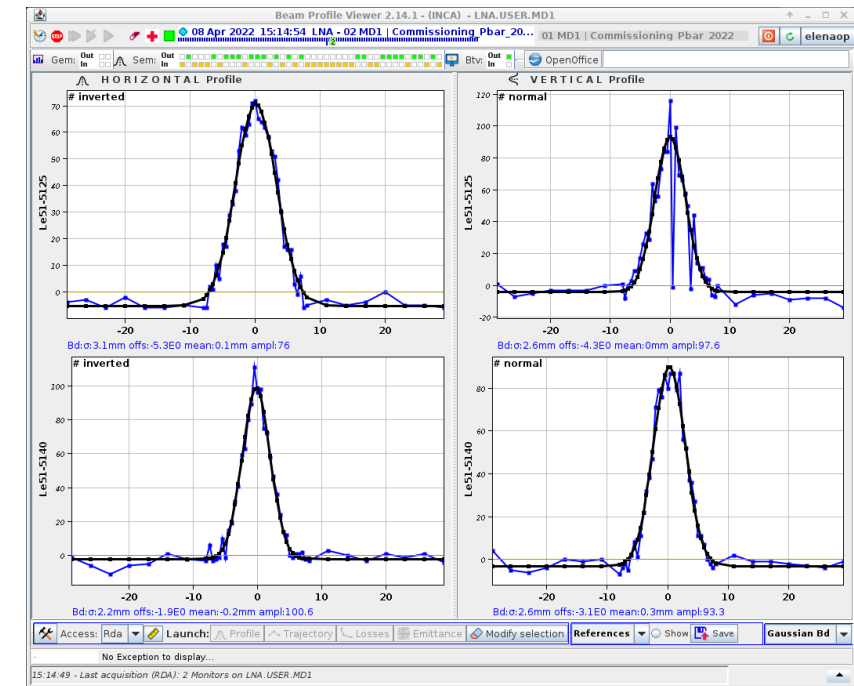
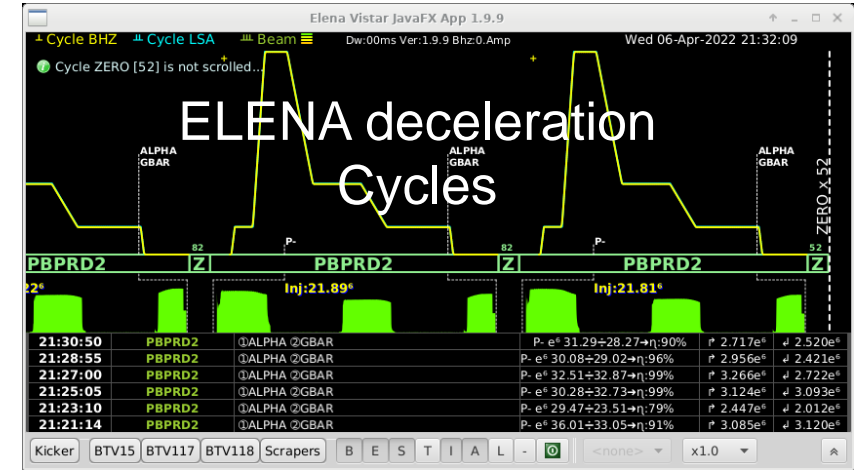
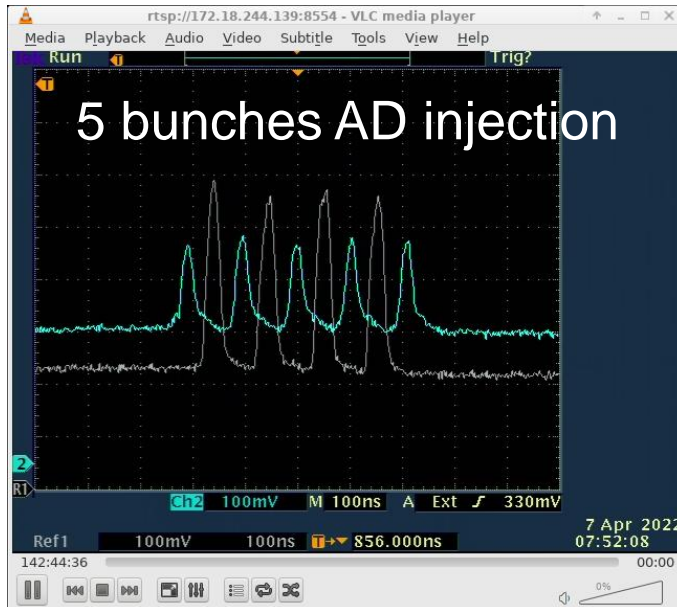
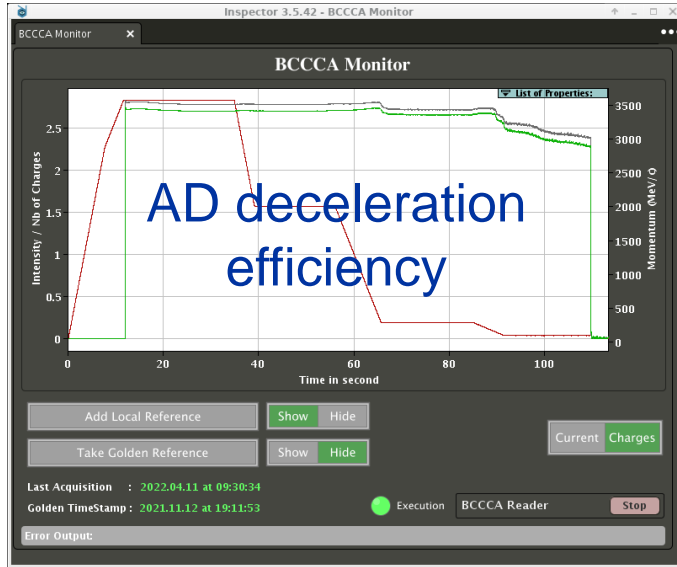


5-turn Multi Turn Extraction from PS



# AD-ELENA Status

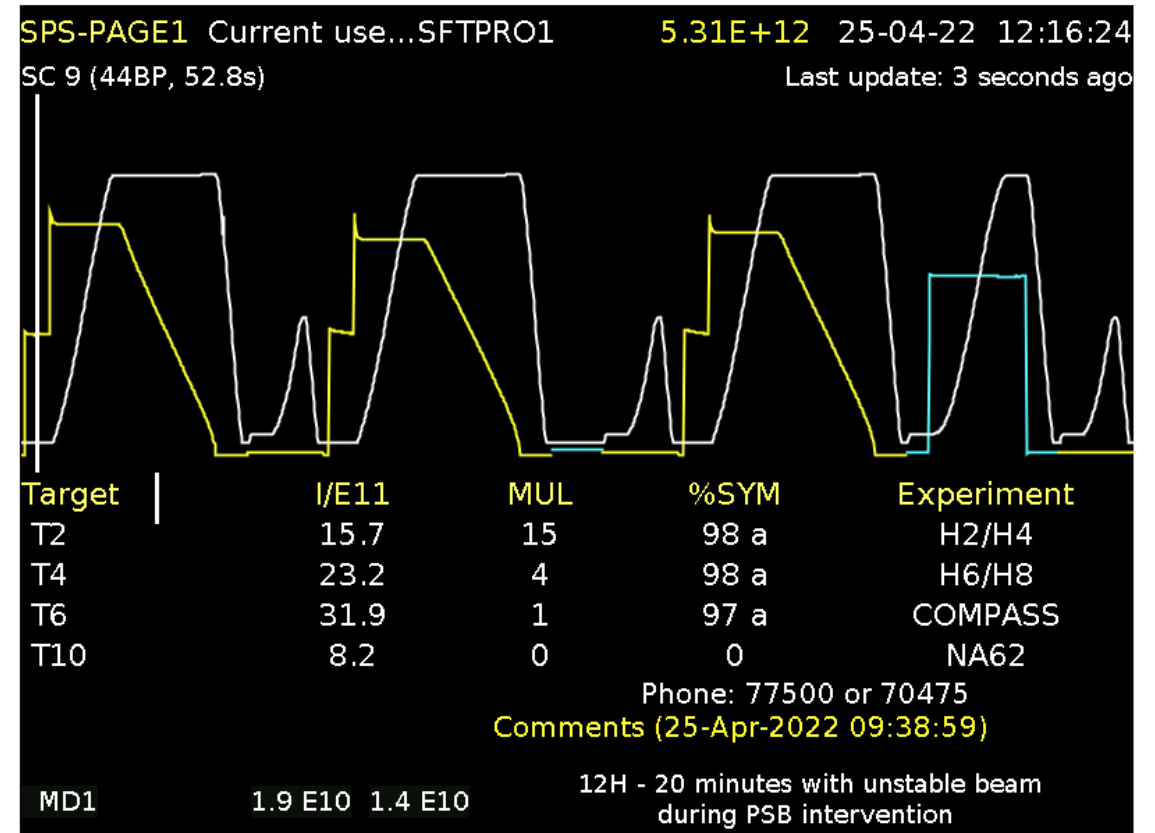
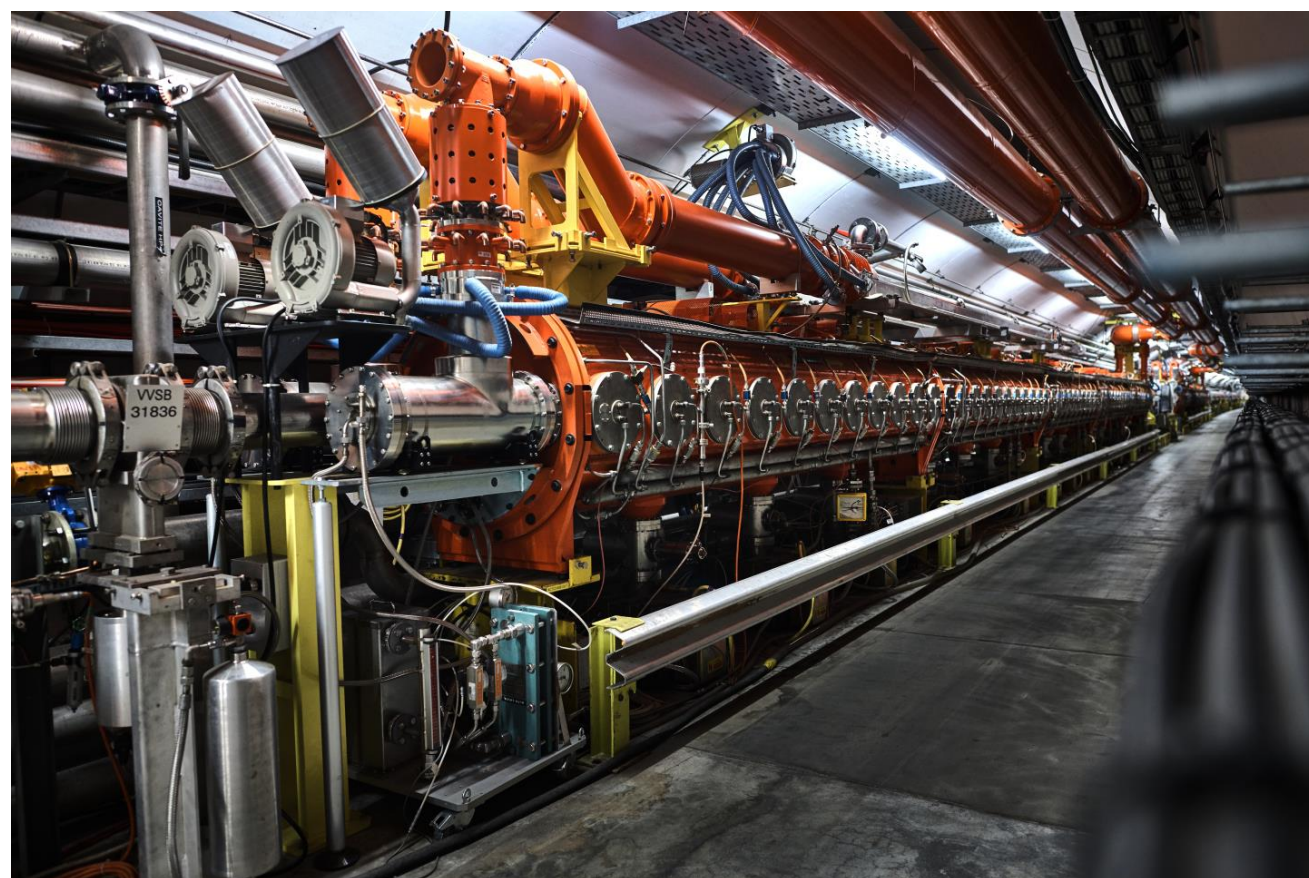
- $2 \times 10^7$  pbars injected in AD,
- $3 \times 10^6$  pbars extracted from ELENA
- 80% deceleration efficiency in AD
- 90% deceleration efficiency in ELENA



First pbars in LNE51

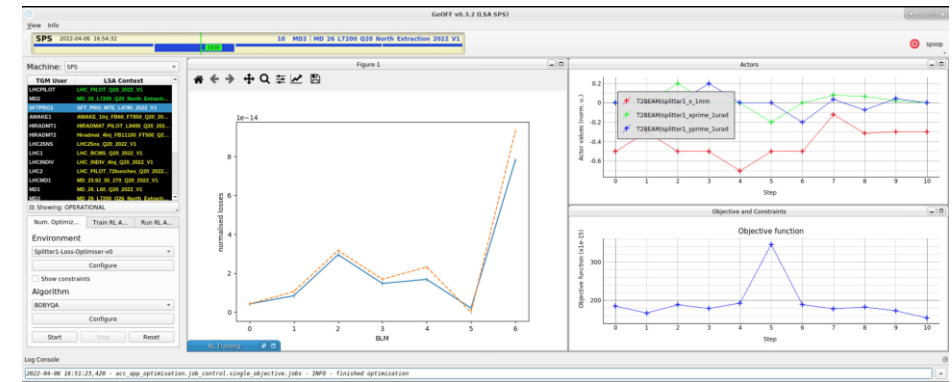
# SPS - commissioning progressing well

North Area Physics starts today – on schedule



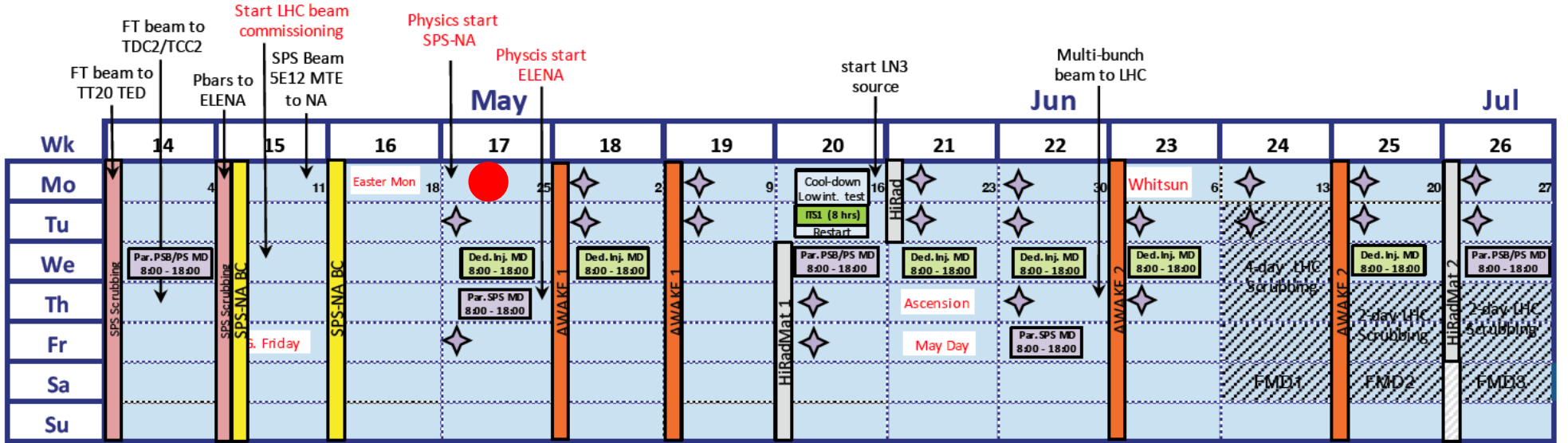
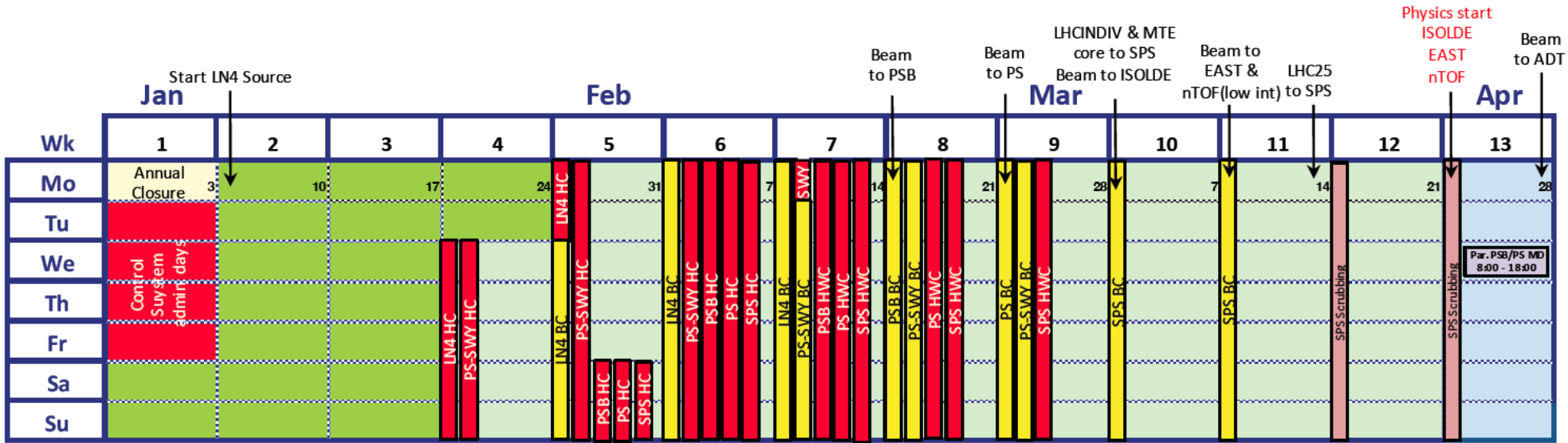
# SPS: Upcoming tests to improve spill quality

- Optics checks in TT20
- Investigation of **de-bunching** times:
  - *RF off vs RF @ 0 V :*
  - *more instrumentation (diamond BLMs, NA62...)*
  - *Delay start of SX and check effect with NA62*
- **100 Hz ripple hunt**
- Numerical optimization for **splitter loss reduction** – first tests successful
- **RF channeling** for noise reduction
- Continuous **auto-pilot** for target steering stability



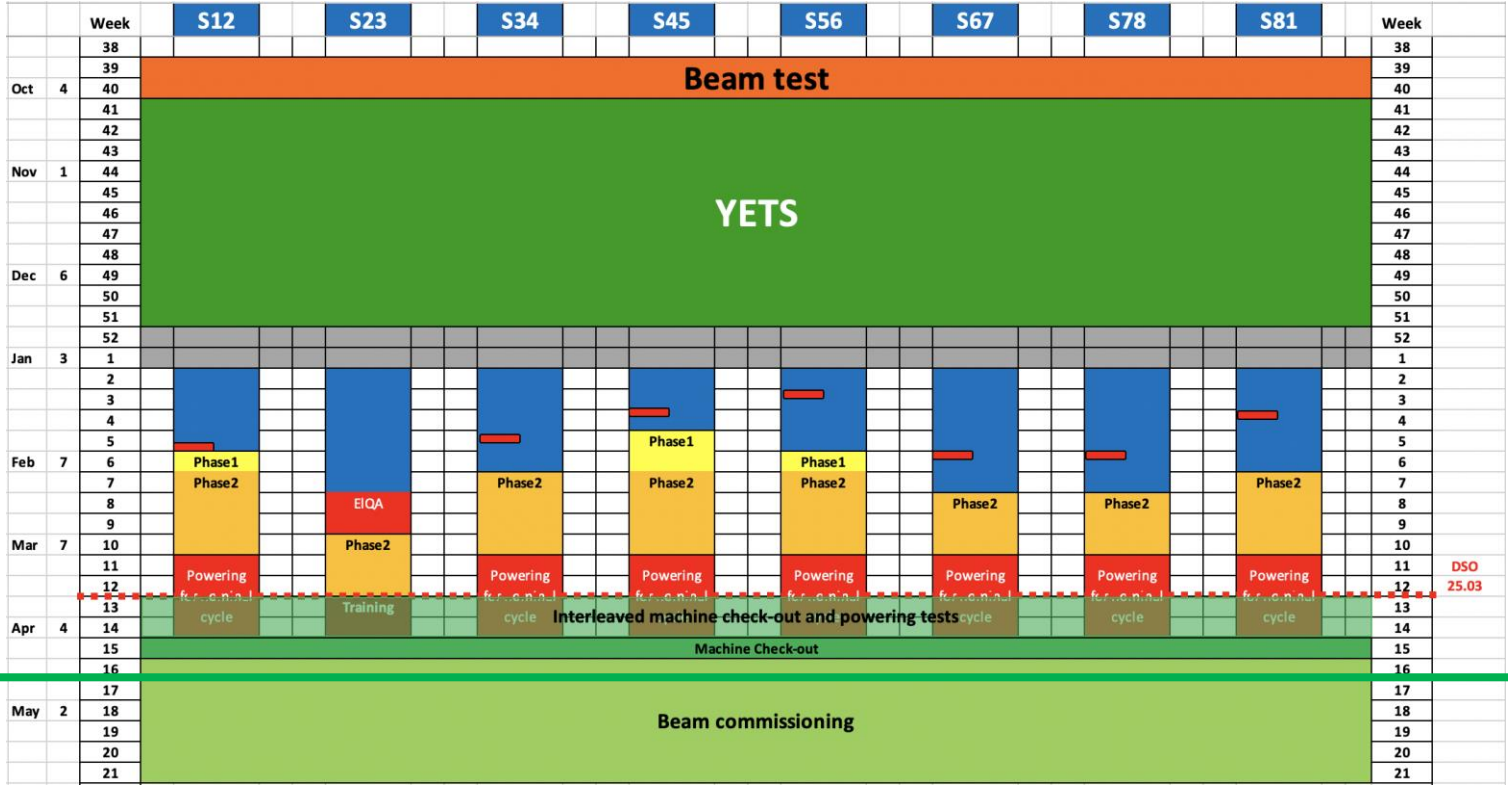
Optimizer for splitter 1 losses

# Injector Schedule Q1/Q2



# LHC near-term planning - overview

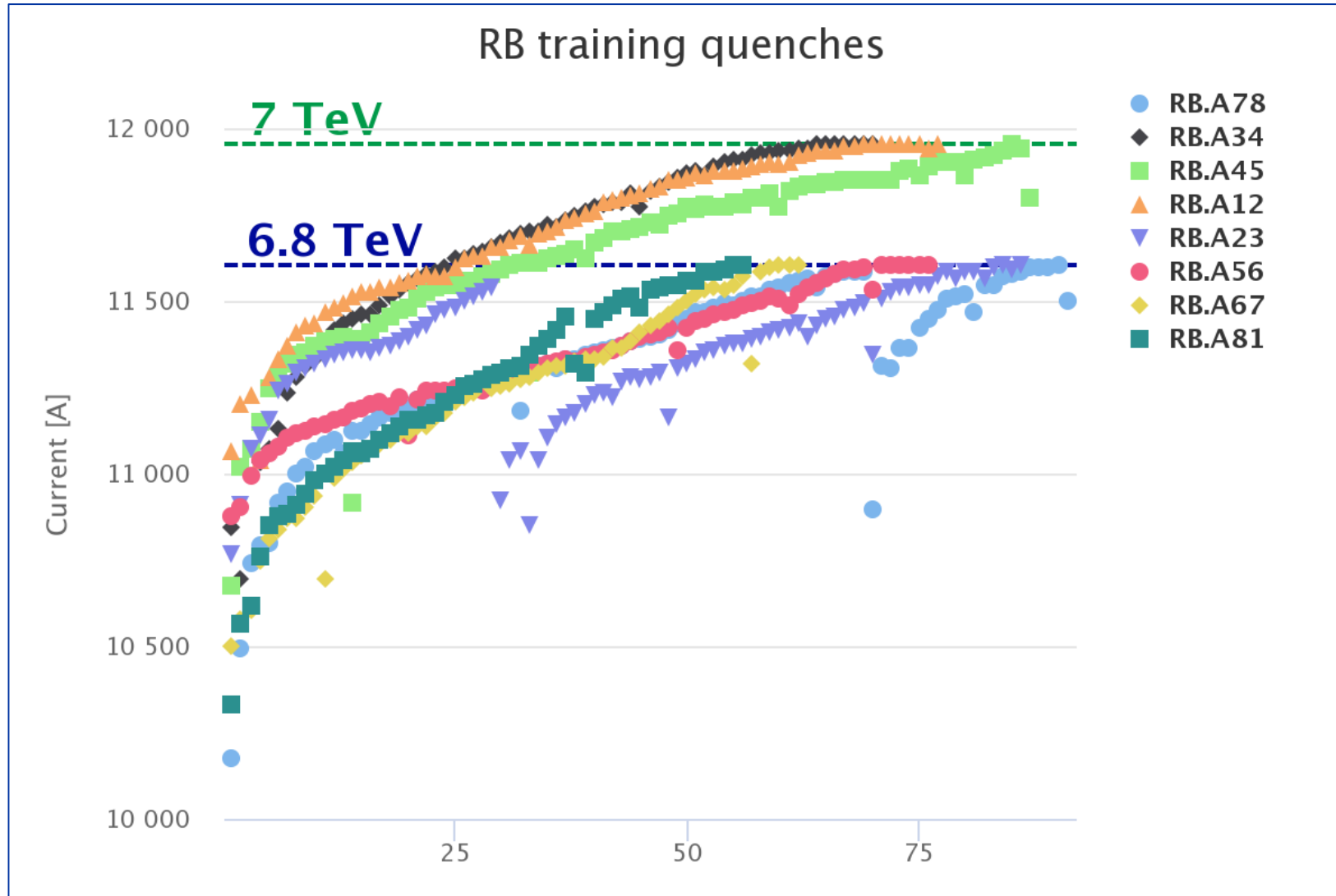
Today



- Cryogenics
- EIQA
- } Powering tests
- } Powering tests

Beam Commissioning started Friday 22<sup>nd</sup> April

# Training to 6.8 TeV completed



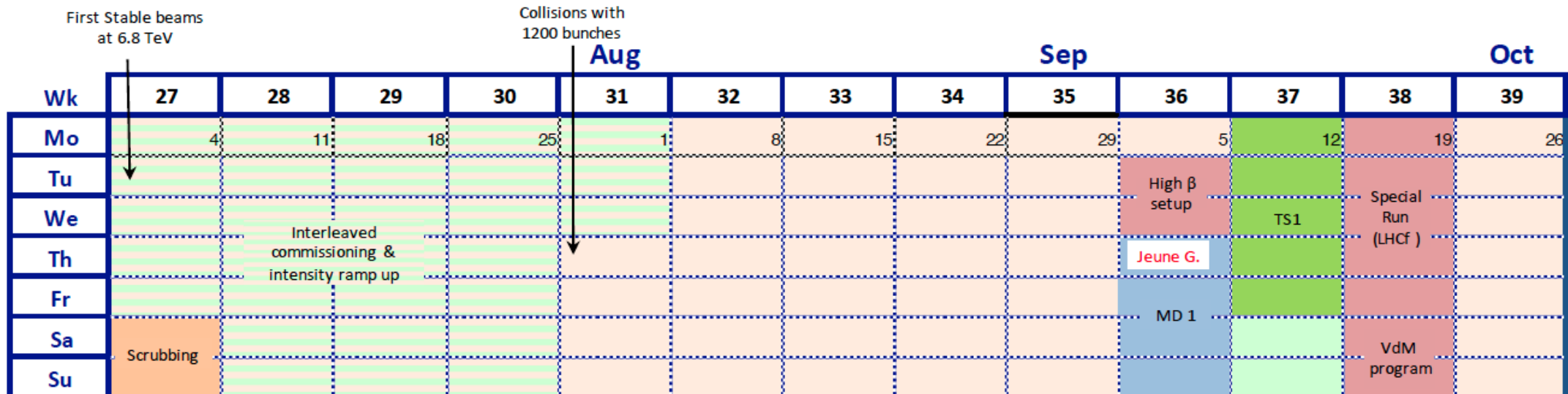
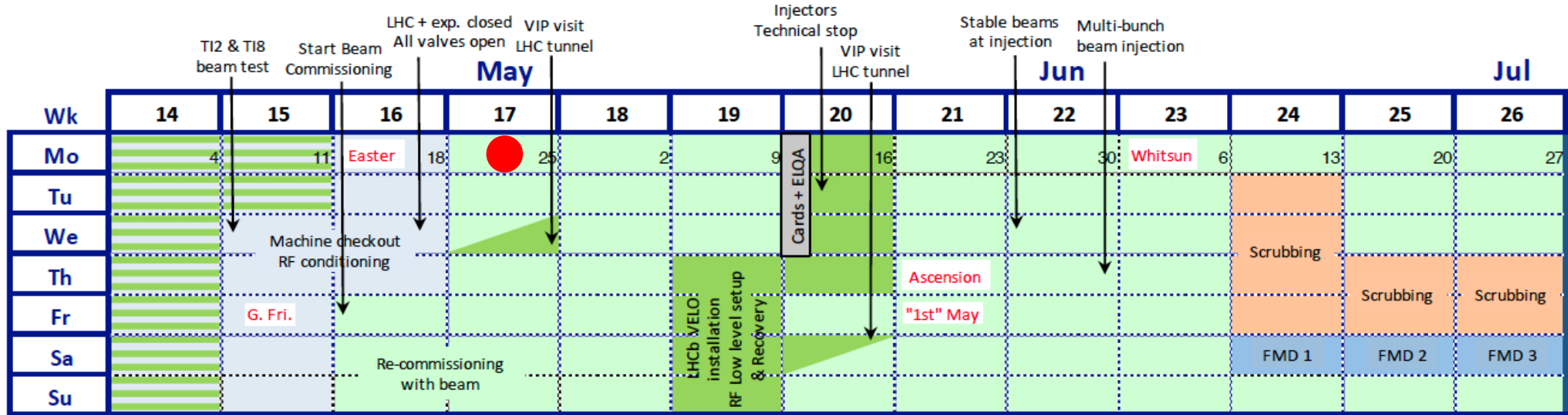
# LHC Schedule

## The LHC schedule has been impacted by:

- *Magnet training of Sector 2-3 was slower than expected*
- *Cryo-RF incident on 18 March*
- *LHCb needs ~1 week stop for Side A VELO installation*

**Introduced a total delay of ~2 weeks**

# Latest LHC schedule Q2/Q3

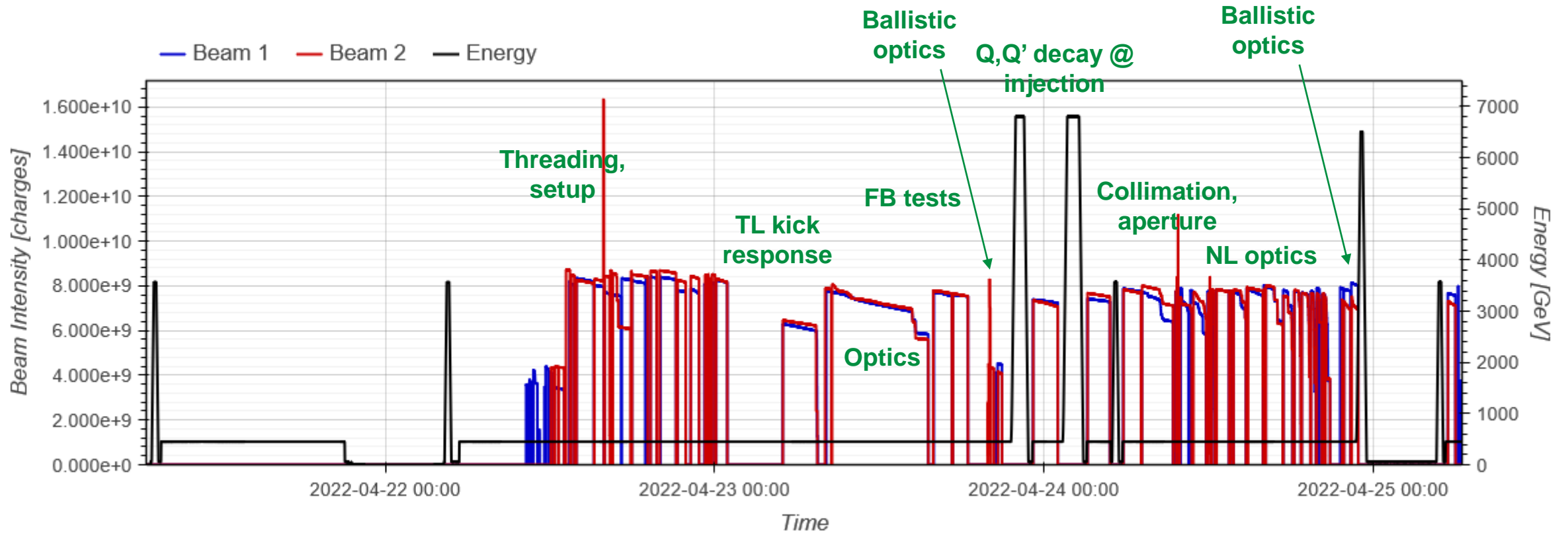




# LHC beam commissioning

Commissioning with beam started Friday 22<sup>nd</sup> April

Two optics commissioned at injection within the first two day ... pilots ramped to 6.8 TeV this morning



[Generated at: 2022-04-25 06:34:58]

# Conclusions

- **Linac4, Booster, PS, SPS up and running**
  - Physics to all facilities except ELENA which joins in this Thursday
- **LHC beam commissioning has started**
  - ~1 week late
  - Time to be made for installation of LHCb's VELO side A
  - Looking good so far

