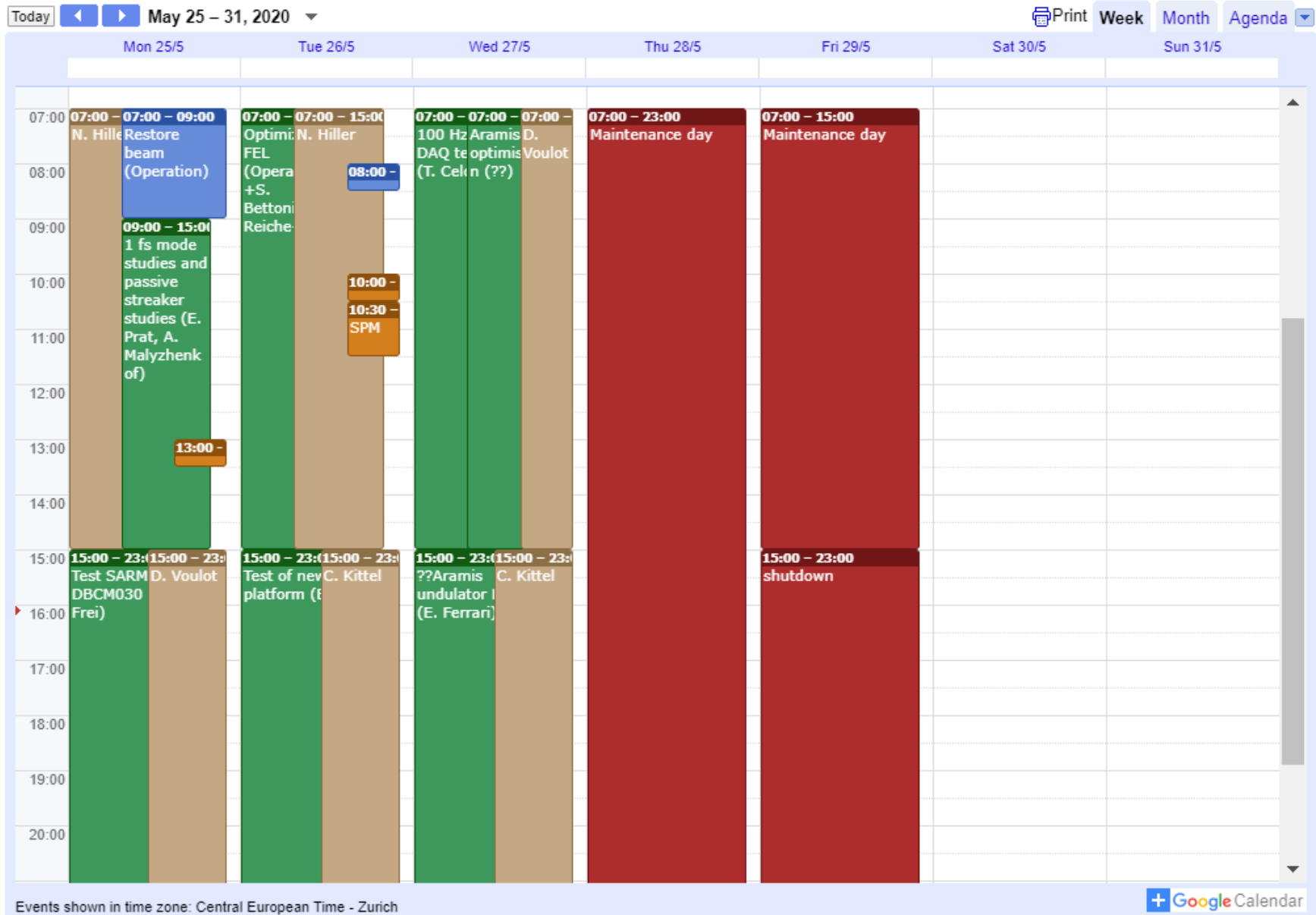


# SwissFEL weeks 22-23

- **Schedule**
- **MD week**
- **Photonics/Bernina/Alvra week**
- **Issues**
- **Conclusions**

S. Bettoni, N. Hiller, D. Voulot  
Semi-remote operation, Week 22-23

# Schedule week 22 (week1)



# 1 fs bunch studies (Mon1 AM)

Name of participants

Not received. Other report?

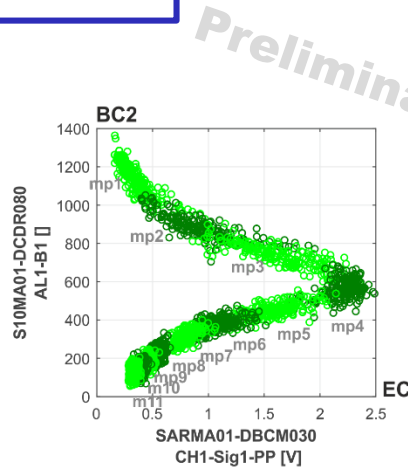
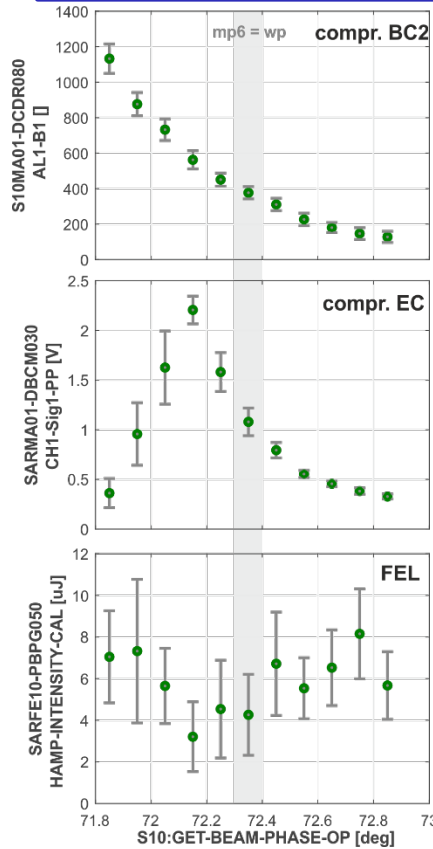
# BCM (Mon 1 PM)

F. Frei, G. L. Orlandi, N. Kivel,  
D. Voulot

## Composed are results for a scan of LINAC1 phase (+/- 0.5°)

recorded:

- BCM signals (BC2 + Pyro signal vom BCM-EC) + HAMP + PSSS + BPM + RF beamsynchronously
- bunch length measurement in LINAC3 (so before EC) for all phases set during the scan
- energy profiles from the e-bunch for all phases set during the scan in the aramis beam dump

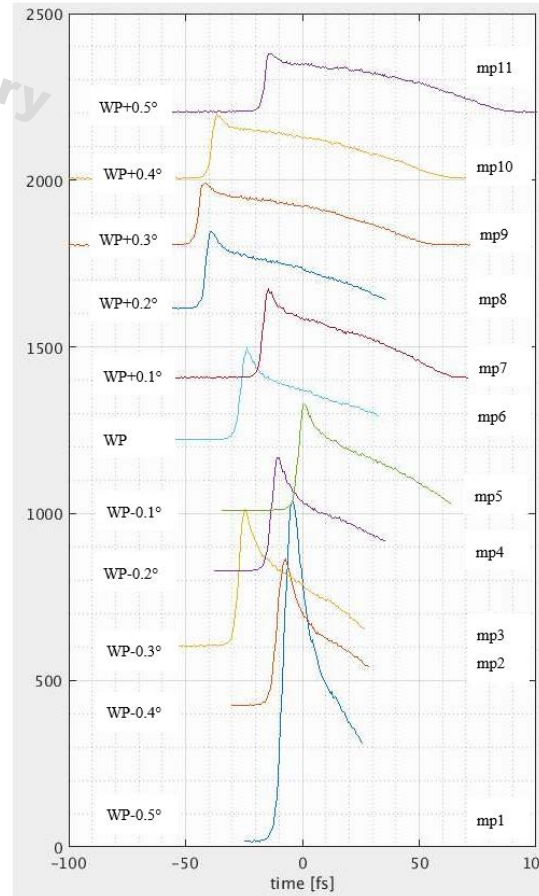


From the data I suspect:

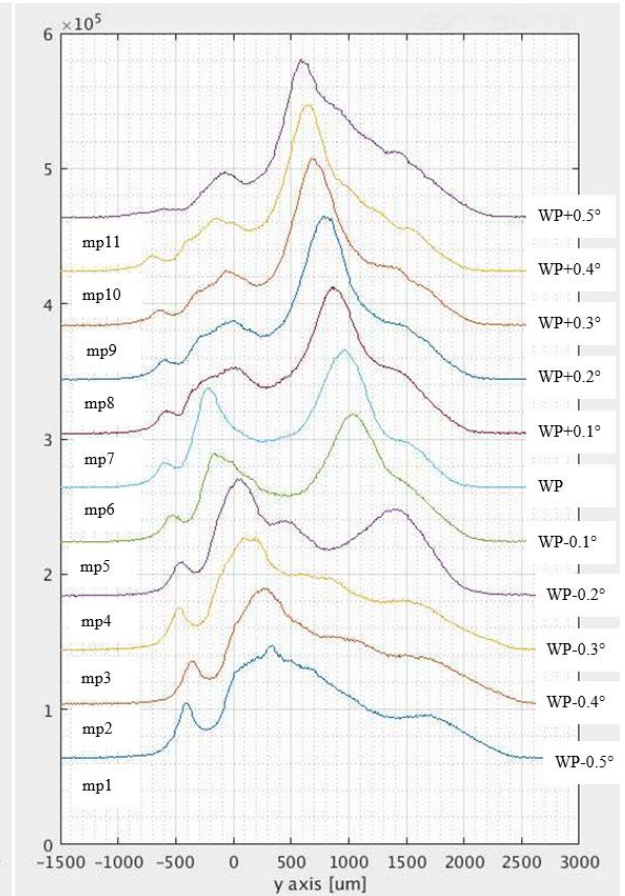
- mp 5-11: under-compression after EC
- mp4: Full compression after EC
- mp1-3: in over-compression after EC but still under-compression after BC2

Results to be discussed with beamdynamics.

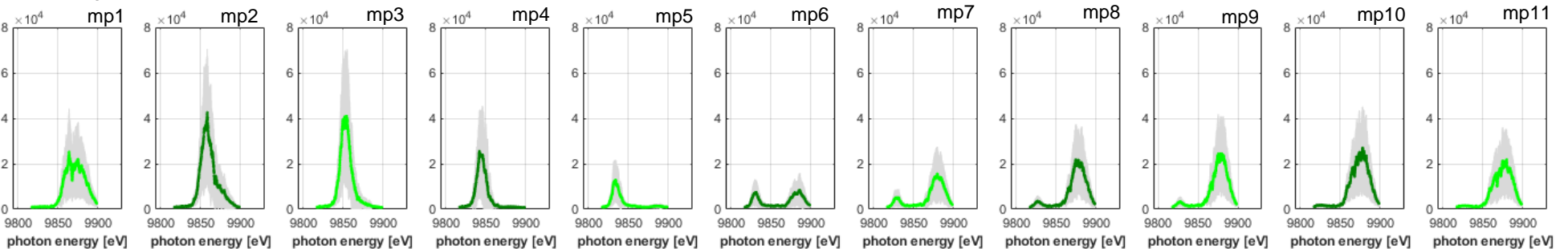
TDC profiles after BC2, before EC!



Profiles in the beam dump:



Corresponding photon spectra (PSSS):



# BPM (Tue1 PM)

Not received.

From the logbook:

B. Keil, Goran  
Marinkovic, Mathias  
Gloor (part time),  
Radek Rybaniek  
(part time), Christof  
Kittel

We tested a new type of BPM electronics called "DBPM3" in Athos. One DBPM3 unit handles 4 BPMs, presently the unit is connected to SATUN08/09/10/12.

The beam angle, sign, charge and position scaling factors of the four BPMs were successfully calibrated. Position and charge readings looked reasonable, at 170pC, and 2pC. Beam response looked O.K. Movement of BPMs with quad movers gave reproducible scaling factor measurements for the position.

The four new BPMs are already integrated into the Athos BPM panel, but the operators should not yet rely on the readings, since we need to make further tests.

After power outages, the DBPM3 unit does not yet restore their settings completely, and needs a recalibration with beam (to be fixed).

At the end of the shift, we let Athos run at 1 Hz, 180pC, orbit feedback off. The four new BPMs are archived in the CA archiver (BSRead not yet active), thus the archived data can be used to determine position and charge noise by correlating the readings of adjacent BPMs.

# 100 Hz (Wed1 AM)

Name of participants

Not received. Other report?

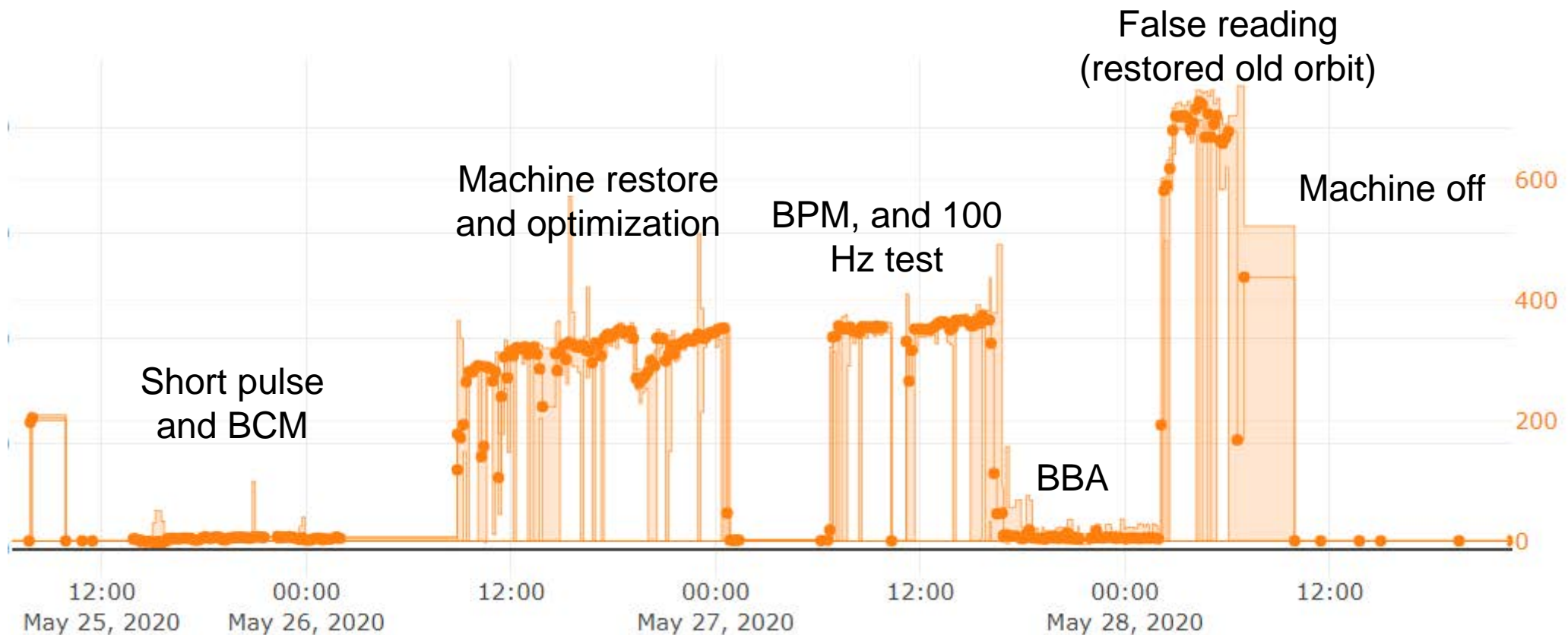
# BBA (Wed1 PM)

Name of participants

Not received. Other report?

# Lasing week 22

SARFE10-PBPG050:PHOTON-ENERGY-PER-PULSE-AVG\$max  
SARFE10-PBPG050:PHOTON-ENERGY-PER-PULSE-AVG\$mean  
SARFE10-PBPG050:PHOTON-ENERGY-PER-PULSE-AVG\$min



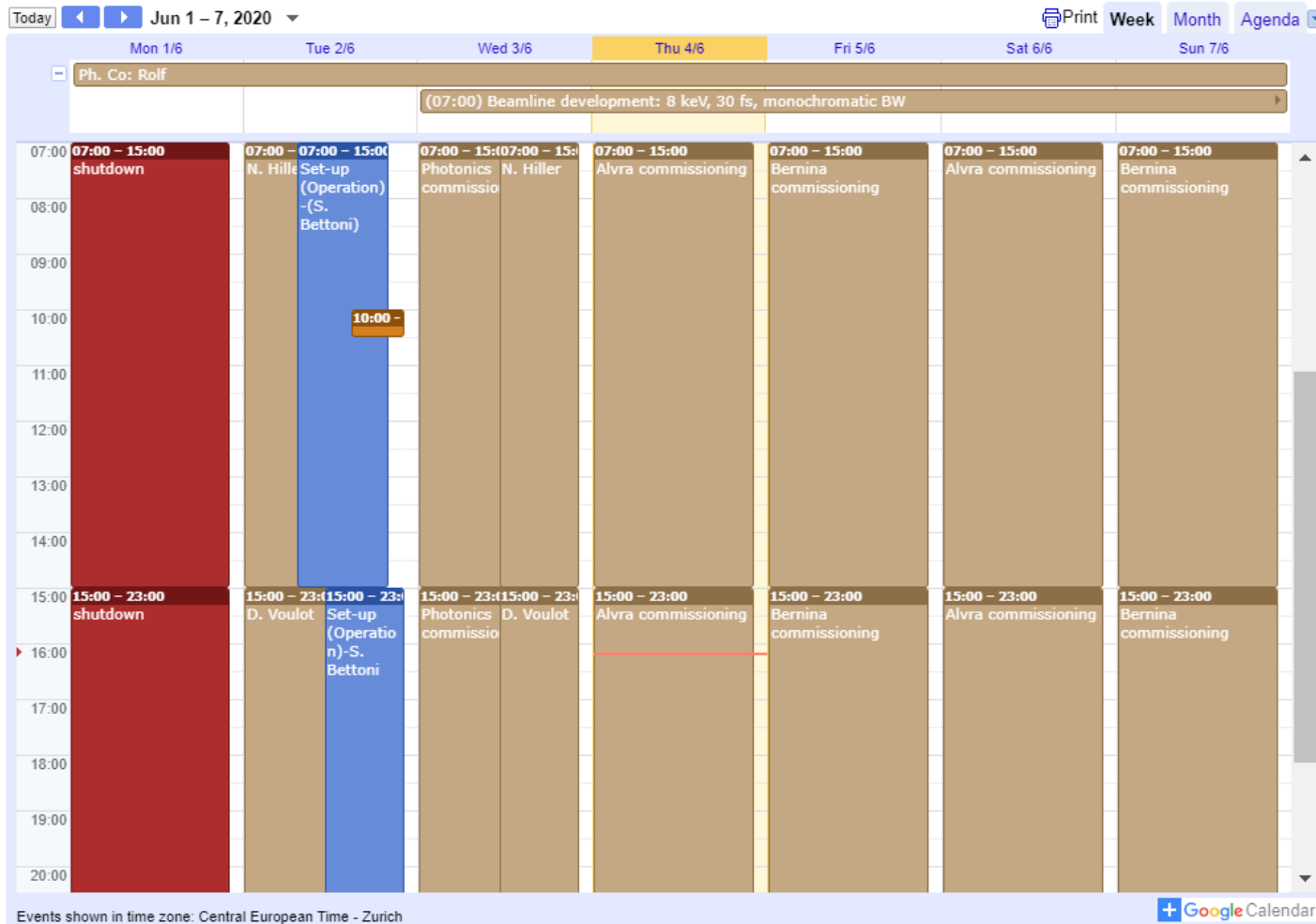
More attention paid to restore the lasing between a day and the following, noting down what was changed. Lasing not lost during the week.



# Gas detector “optimistic” reading



# Schedule week 23 (week2)



## Machine steps:

- ◆ RF off for few days
- ◆ RF back and e- beam on Tue mid morning
- ◆ AM: recovery of the previous week conditions
- ◆ PM: setup of the pulse shorter than usually, small BW for Bernina (Alvra)

# Checks Bunch 2 (Tue2 AM)

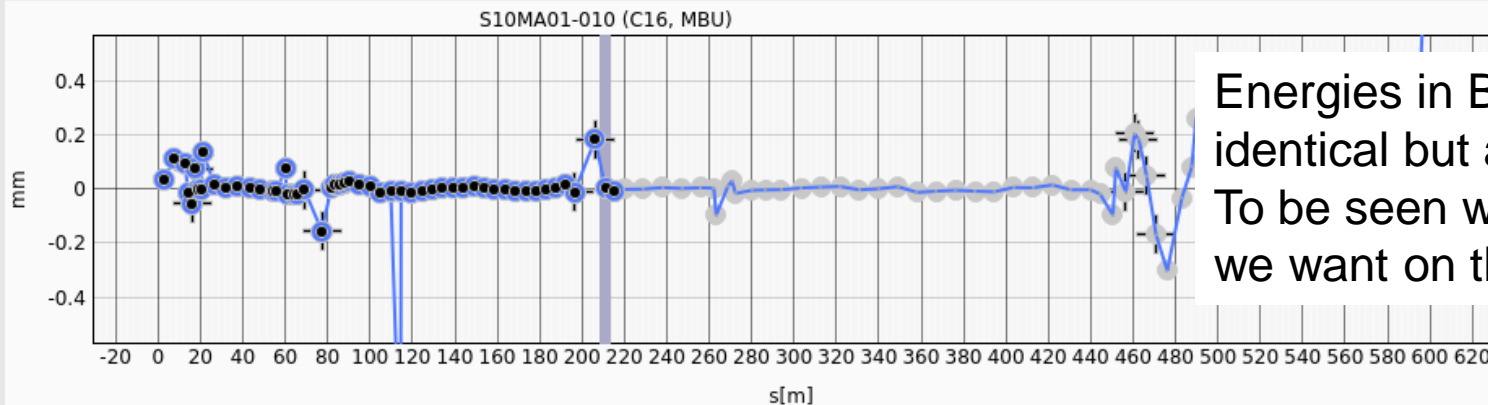
N. Hiller, C. Vicario

Laser-Gun-Setup was done Jaguar -> alignment on iris was bad (fixed by Carlo)

To get the same energy on the gun spectrometer for Jaguar one has to operate it at a delay that corresponds to +2.3 DEG from the min energy spread leading to a momentum spread of about 26 keV/c instead of 21 keV/c -> to be seen if this is a problem (for Alcor, we have about 23.5 keV/c). Life should be much simpler with the Mizar.

## Aramis: Horiz. Position X (Bunch 1)

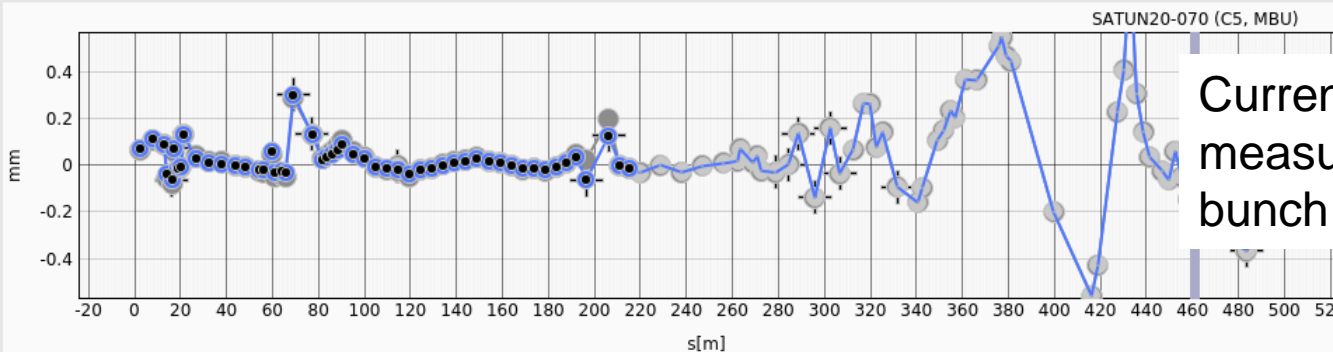
0.003 mm @ S10MA01-DBPM010 (C16, MBU)



Energies in BC1 and BC2 are not identical but agree reasonably well. To be seen what compression setup we want on the long run for bunch 2

## Athos: Horiz. Position X (Bunch 2)

-0.243 mm @ SATUN20-DBPM070 (C5, MBU)



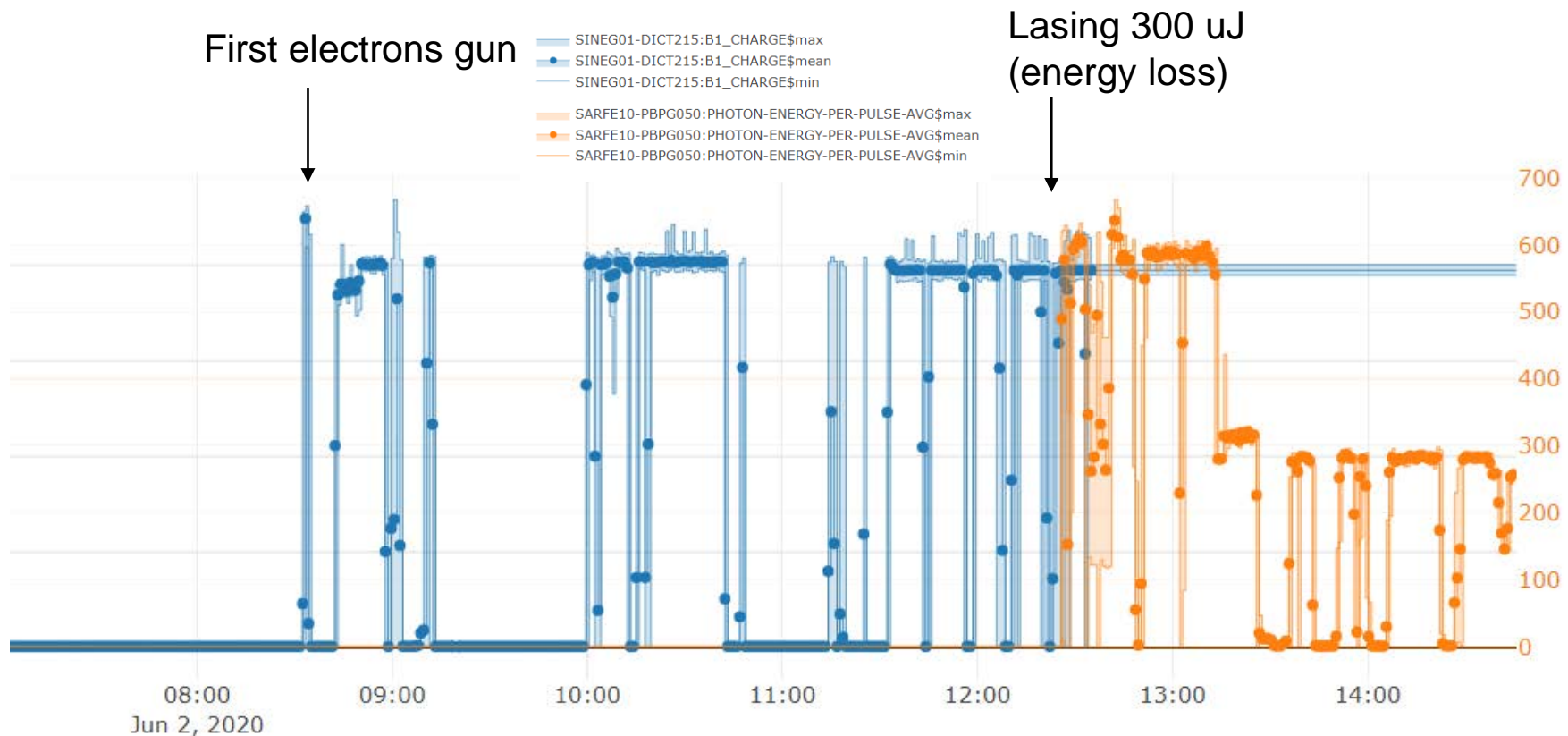
Currently no easy possibility to measure longitudinal profile of bunch 2 after BC2.

# Recover Aramis (Tue2 AM)

S. Bettoni, N. Hiller

## Restoring the machine

- Machine about **300 uJ** from about **350 uJ** of the previous week immediately after phasing and systems check
- Gas detector showed more than 600 uJ from the last shift of the week before. Found out (with Pavle) that the gas detector had the wrong energy at the beginning of the BBA shift (last shift before machine stopped)-wrong reading pointed out also by Eugenio after his shift doubting on UV contribution.



# Set up for the Aramis run (Tue2 PM)

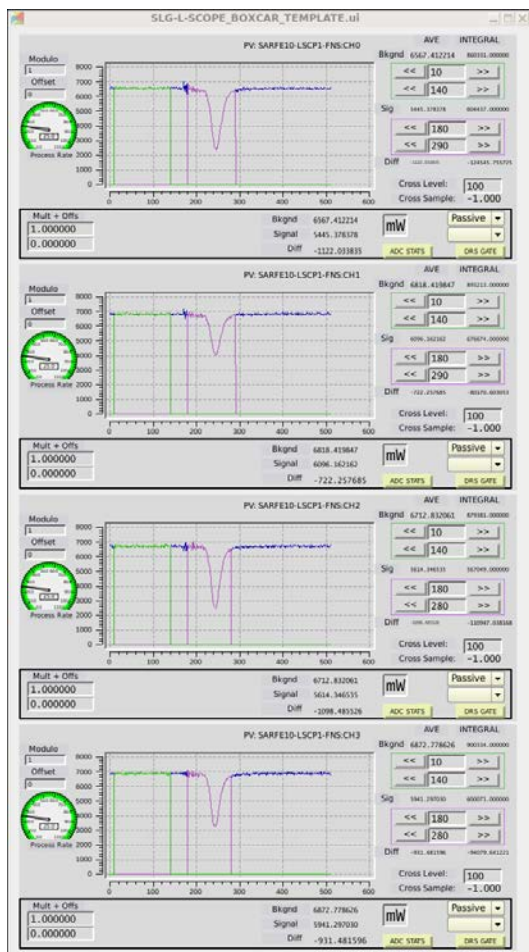
Bernina acceptable beam

- 8 keV, small BW, 200 uJ, relatively short bunch

Alvra acceptable beam:

- 8 keV, we assumed 200 uJ

S. Bettoni, D. Voulot

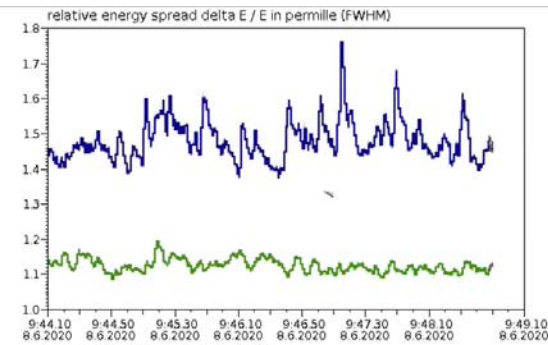
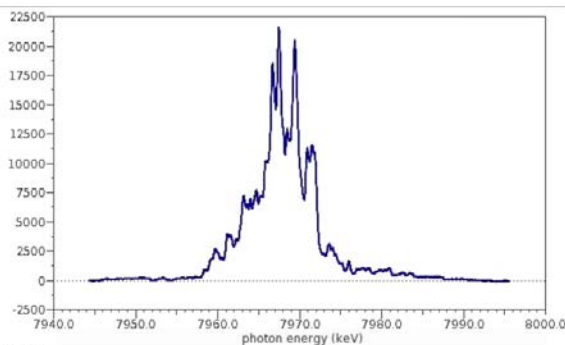


BW manually optimized until we had something acceptable in terms of photon intensity and BW (1.6-1.3 per mille, about 200 uJ)

The idea was to have some more intensity to reduce the BW the day after (without interrupting the photon delivery). BW reduced and intensity increased with PSICO: BW between 1.3-1.4 per mille, intensity around 360 uJ

No UV contribution (checked on Wed AM)

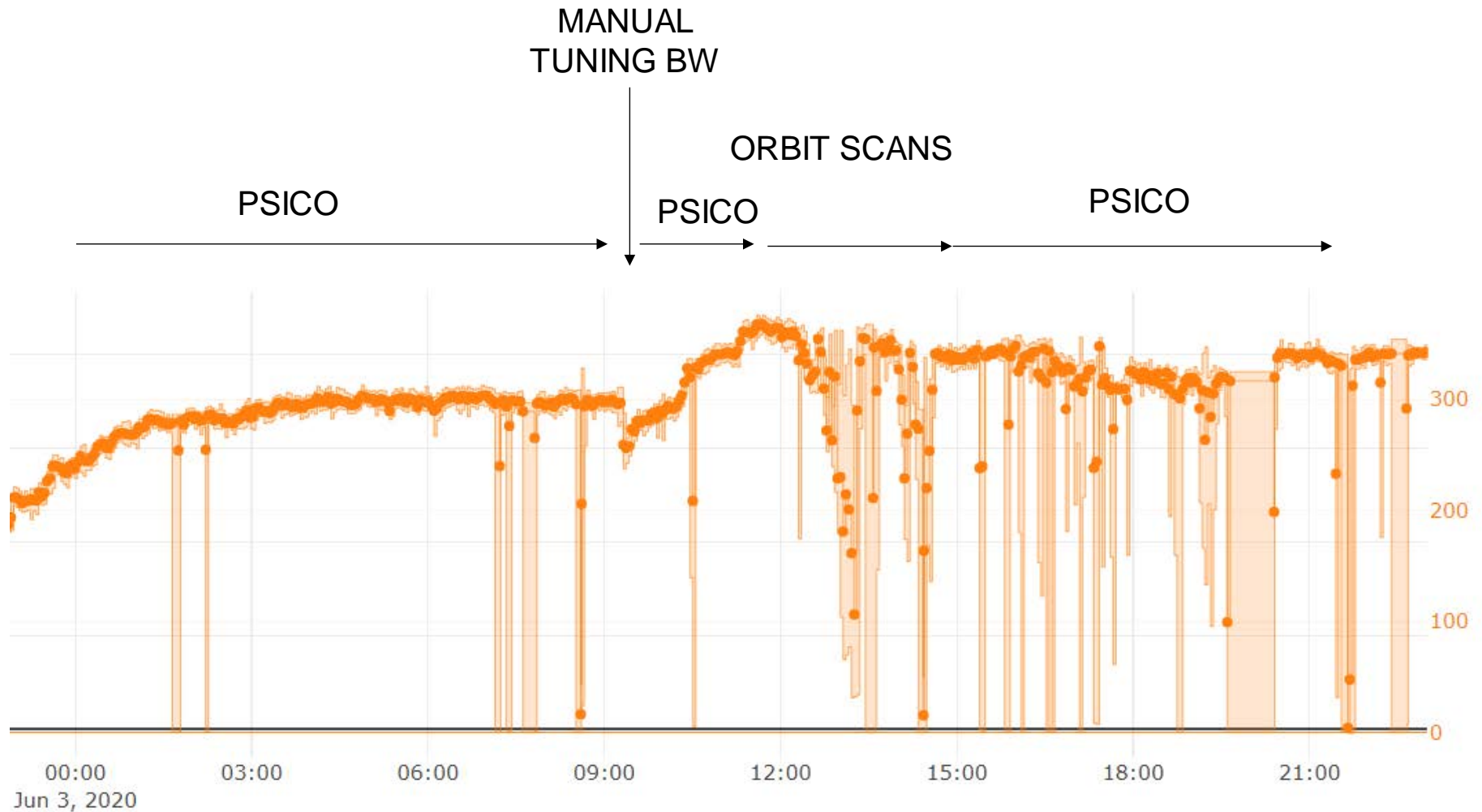
In view of the experiment, run PSICO in the nights on PSSS or good enough?



# Improvement Aramis (Wed AM)

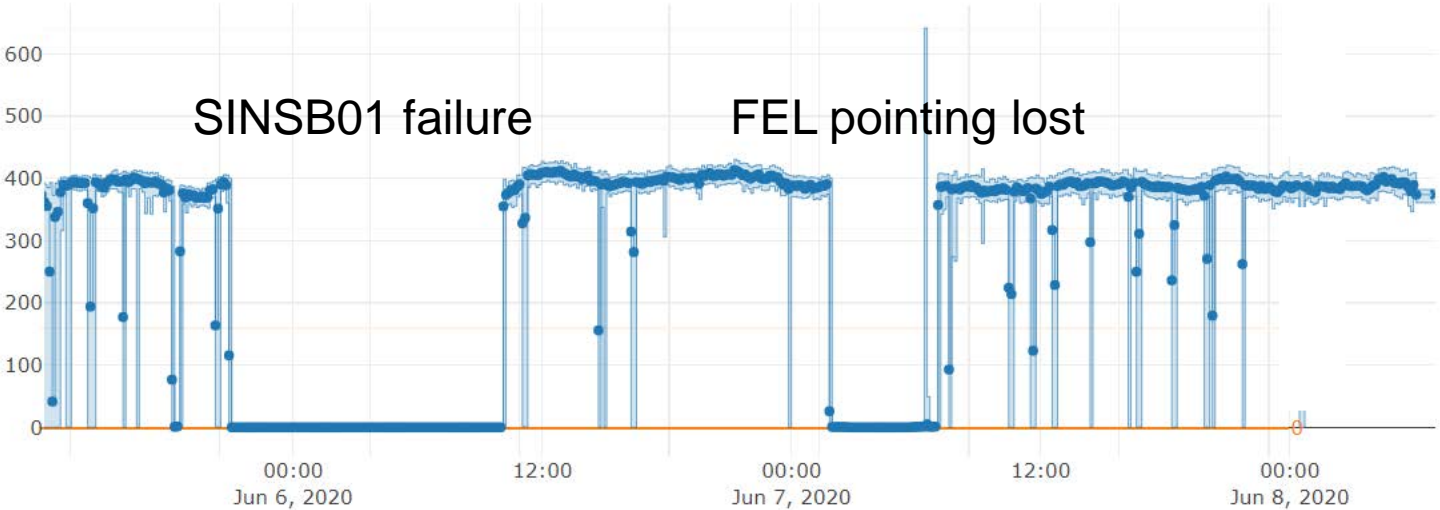
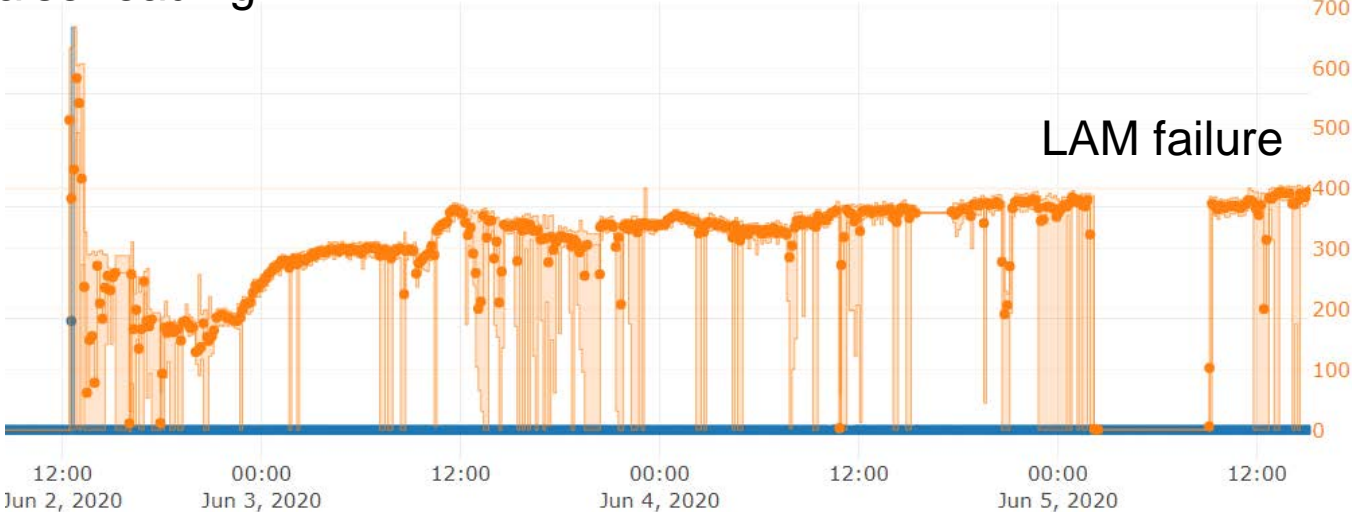
S. Bettoni, N. Hiller,  
D. Voulot

BW between 1.2 and 1.3 permille, same bunch length, lasing around 360  $\mu\text{J}$



# Lasing week2

False reading



# Checks Athos (Wed2 PM)

D. Voulot, E. Prat, E. Ferrari, C. Kittel

- Tuesday evening
  - Could not use the gas detector (photon shutter interlocked, was fixed by Reno the next day)
  - Lasing seen on first photon screen, 350 eV 6 undulators  $K=3.5$ , circular polarization, less intensity than 2 weeks ago
- Wednesday evening
  - Check undulator contribution, all are contributing
  - Undulator controls are working
  - But low lasing 15-20 uJ only, similar as 2 weeks ago with 4 undulators (expect 100s of uJ)
  - Possible reason:
    - Poor electron beam at undulator entrance (could not correct in injector without affecting Aramis set-up)
    - Orbit in the undulators
    - Incorrect kick correction in SATUN18 (bug was found later)
- Need more dedicated beamtime for Athos commissioning (next shift on Monday)



# Issues (if system not indicated no issues at all)

- IT:
  - GFA machines switched off. Not possible to run SwissFEL via NX. Temporary solution: via remote desktop to the office PC. Temporarily fixed
- RF:
  - S20CB01 multipacting: changed energy gain (C. Bear, J. Alex)
  - Night between Fri and Sat: problem on SINSB01. It could be fixed on Sat morning (Quiao)
- Laser:
  - Jaguar issue: promptly fixed (C. Vicario)
  - Alcor. LAM failure in night Thu-Fri (no piquet, no run): fixed in the morning, beam back in the same conditions (check V. Arsov, C. Vicario)
- Diagnostics:
  - BLM IOC reboots: G. L. Orlandi
- Gas detector reading: software issue: fixed (P. Juranic)

# Conclusions

- ✓ More attention dedicated to maintain lasing also during the MD week (noting down what changed in the previous shift seems to be already good)
- ✓ After the machine phasing back to 300 uJ from 360 uJ after 5.5 days with the machine completely off
- ✓ Starting from this point setup a factor between 2-3 shorter bunch, and moderate BW. More optimization for BW possible, but we decided not to compromise too much intensity for Alvra, and Bernina ok at least on Sunday, PSSS some times removed. Run PSICO this week in the nights?
- ✓ Week concentrating on the Aramis setup (half a day for the new beam). Some limited time for Athos (not scheduled): lasing and optimizations
- ✓ Technically the machine behaved very well, except LAM failure, quickly fixed on Friday morning (no users in the night), and RF failure fixed on Saturday morning