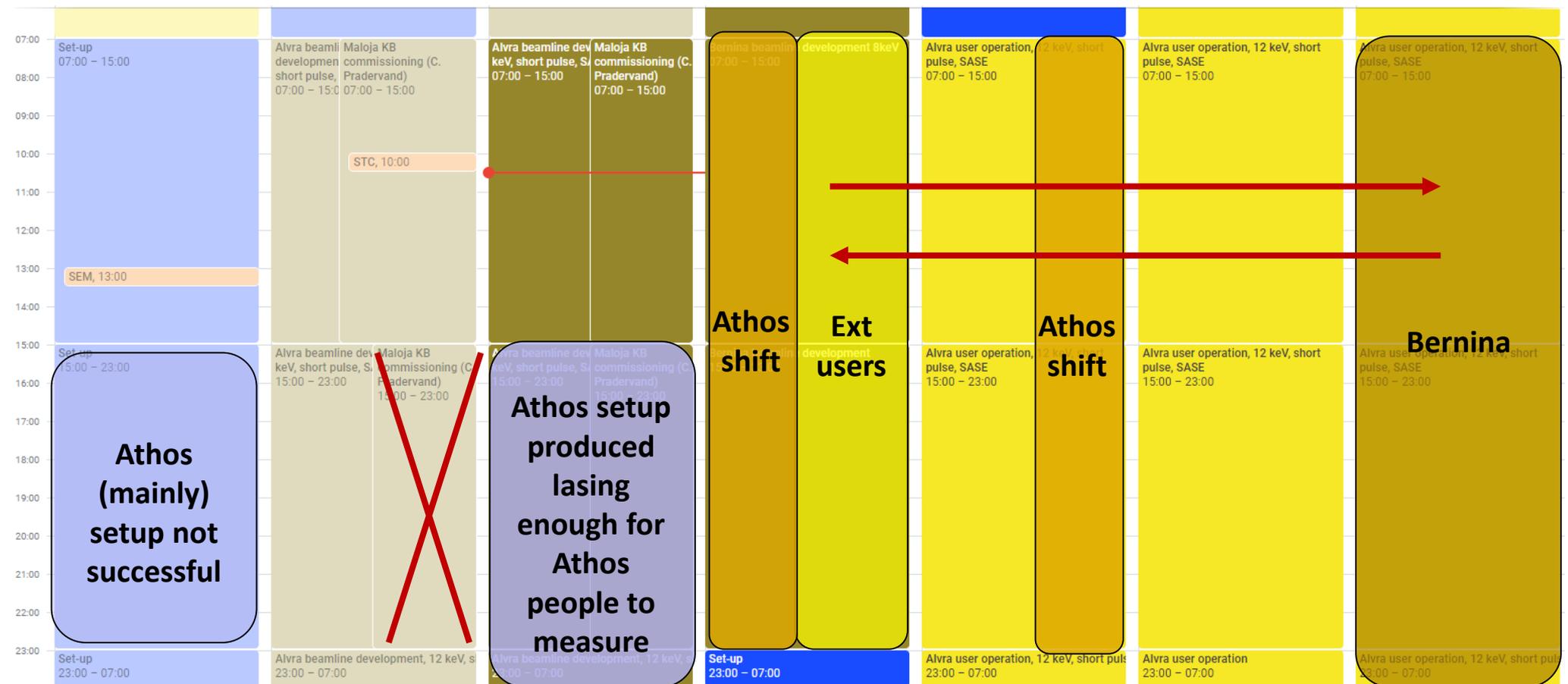


# SwissFEL week 43

- **Schedule**
- **Week activities**
- **Conclusions for this week**
- **Possible improvement**

S. Bettoni  
October 19-25 2020

# Activities of the week: normally the easy slide

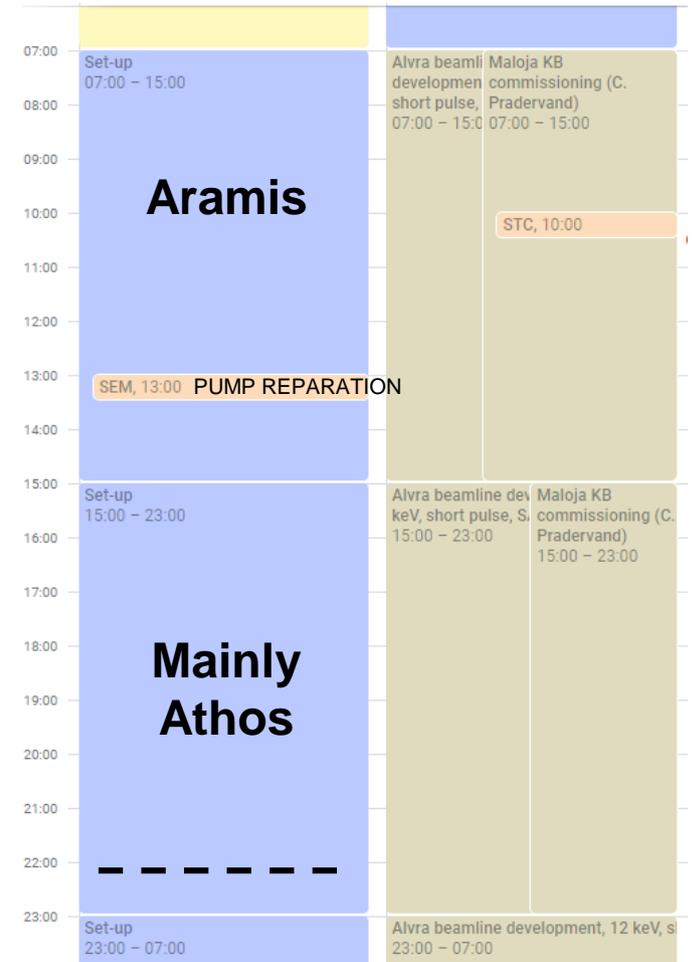


## What happened:

- ◆ Time to setup Aramis cut, because lasing already good to give time to BD to setup Athos
- ◆ Some “soft” tuning of Aramis during the week (keeping always good lasing in Aramis)
- ◆ BD succeeded on Wednesday to setup some lasing in Athos
- ◆ Athos shifts happened on Thu and Fri
- ◆ External users asked to swap Thu with Sun. Bernina and Alvra accepted it

# Monday: summary

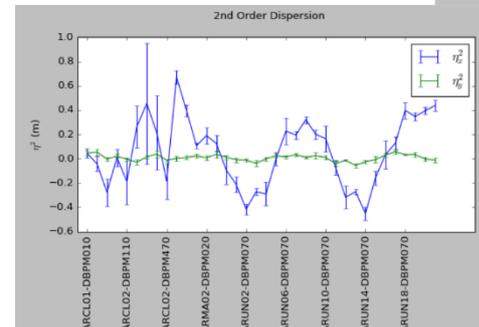
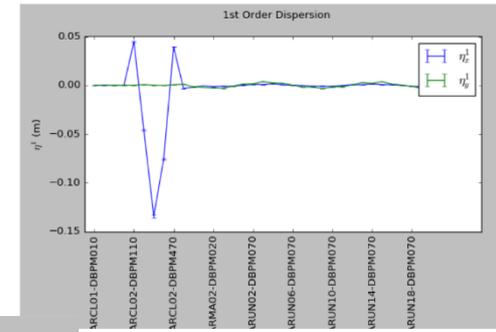
- Aramis setup until 13
- In the night between Sun and Mon failure of a pump of the gas detector. Access to repair it during the SEM
- Scan of the electron bunch in view of Alvra's scans at different bunch lengths (28, 65, 92, 108 fs)
- After the SEM lasing in Aramis considered to be good (not optimal, but good) enough to give time to BD to setup Athos (more in one of the next slides)
- BD stopped at 22



# Monday: Aramis setup

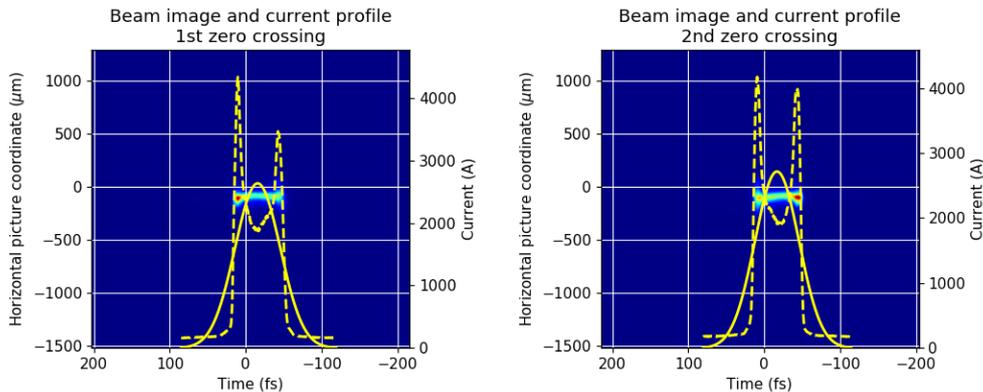
S. Bettoni, N. Hiller,  
operation

- Operation started at 7 AM with the procedure and from a previous good 12 keV run snapshot
- Laser delay checked
- Full machine phased
- Emittance checked at the LH
- Bunch length optimized at BC1
- Dispersion corrected
- Arrival time feed-back enabled
- Situation in the night (23:30): 360 uJ at 12 keV, bunch length = 28 fs rms (reference length for the week). After that started PSICO for the night



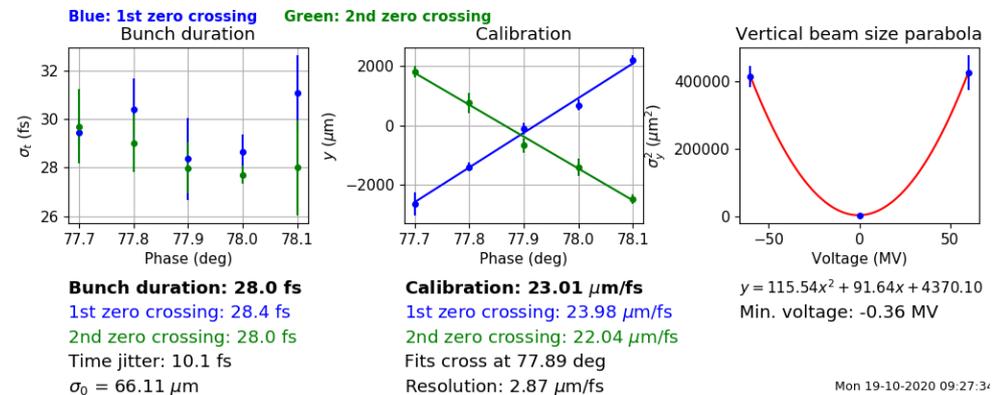
## Bunch length measurement

RF Deflector: S30CB14  
Profile Monitor: SARCL01-DSCR170



## Bunch length measurement

RF Deflector: S30CB14  
Profile Monitor: SARCL01-DSCR170



# Monday: Athos setup

C. Kittel, E. Ferrari,  
E. Prat

## Done:

- Orbit check at the gun area
- Matching and emittance check at LH (similar to bunch 1)

## Problems:

- Bad orbit and dark current generating losses
- Beam Loss Monitor well functioning and correctly detecting high losses
- DOSFET alarm did not stop the beam (related problem to DRPS alarm the previous week, discussions ongoing, problem seems understood)
- Florian informed shift crew in the evening that operation with such high losses is not possible (0.3 Gy in 2 hours)

## Conclusion:

- Some transmission, no lasing, and losses. Stop at 22.

# Wednesday: Athos

M. Boll, E. Ferrari, A.  
Malyzhenkov, E. Prat,  
S. Reiche

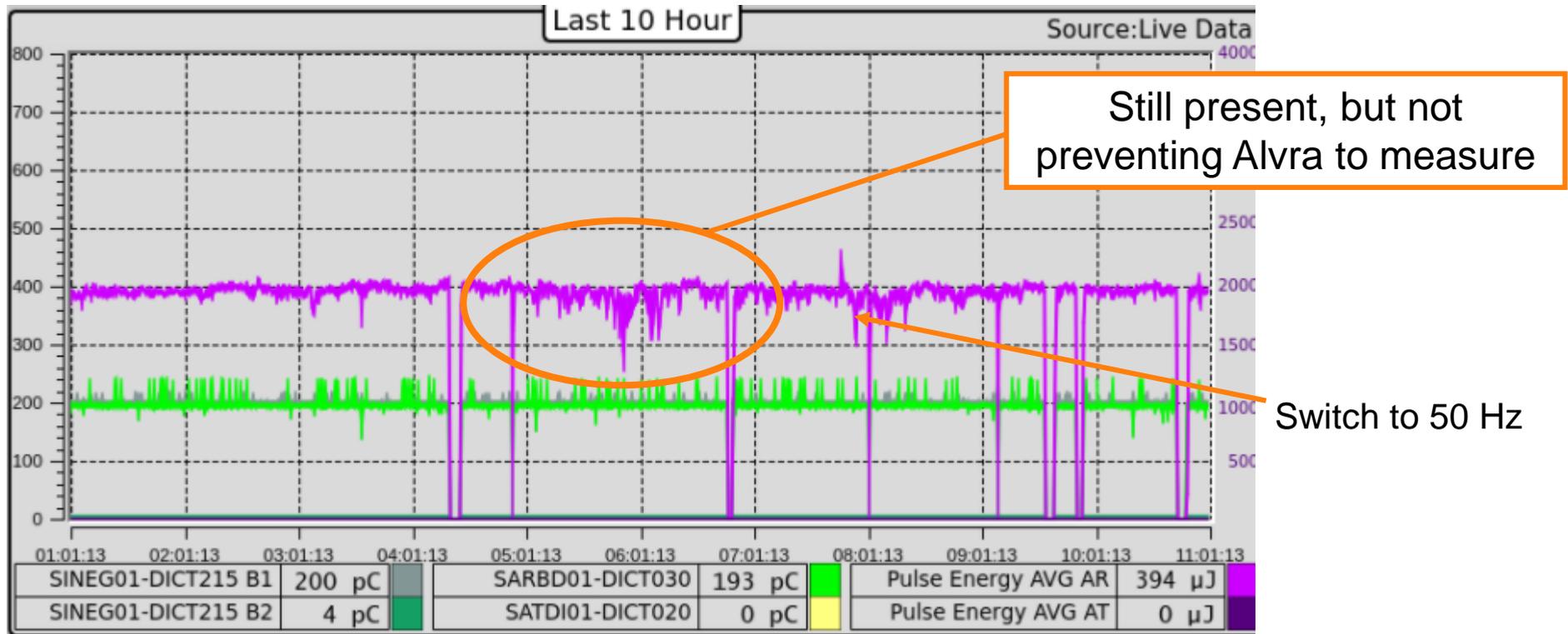
- Another trial to setup Athos from 14 till midnight with the agreement that no perturbations for Alvra should be generated. Alvra people informed.
- Main issue found was that some undulators were in the wrong position
- Better conditions found

## Conclusion:

- About 0.5 mJ at 540 eV
- Still some losses
- Athos people measuring from Thu AM till Fri night

# Tuesday: summary

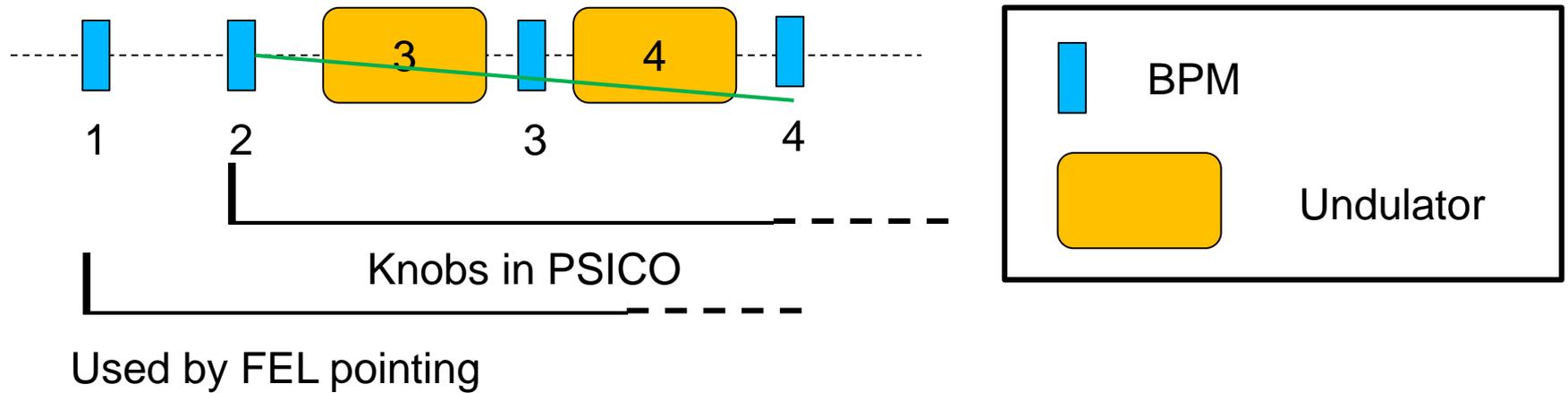
- The previous week Alvra could not measure, so looking for a working point where the machine is less sensitive to noise (SB), check on feed-backs (Florian), laser (with Carlo), orbit (after), ...
- Scans done by Alvra at two electron bunch lengths: no difference observed
- Thanks to Alvra who gave some time to optimize the BW in view of the Bernina time on Thursday (trying not to start from a point with too low lasing for them)



- Strategy: run PSICO on parameters which do not alter BW in view of the Bernina switch (supposed to be on Thursday). The idea was to push for more intensity from Friday, but plans changed. In any case this is more tolerable by Athos. All good at the end.

# Suspicious for the noise sensitivity

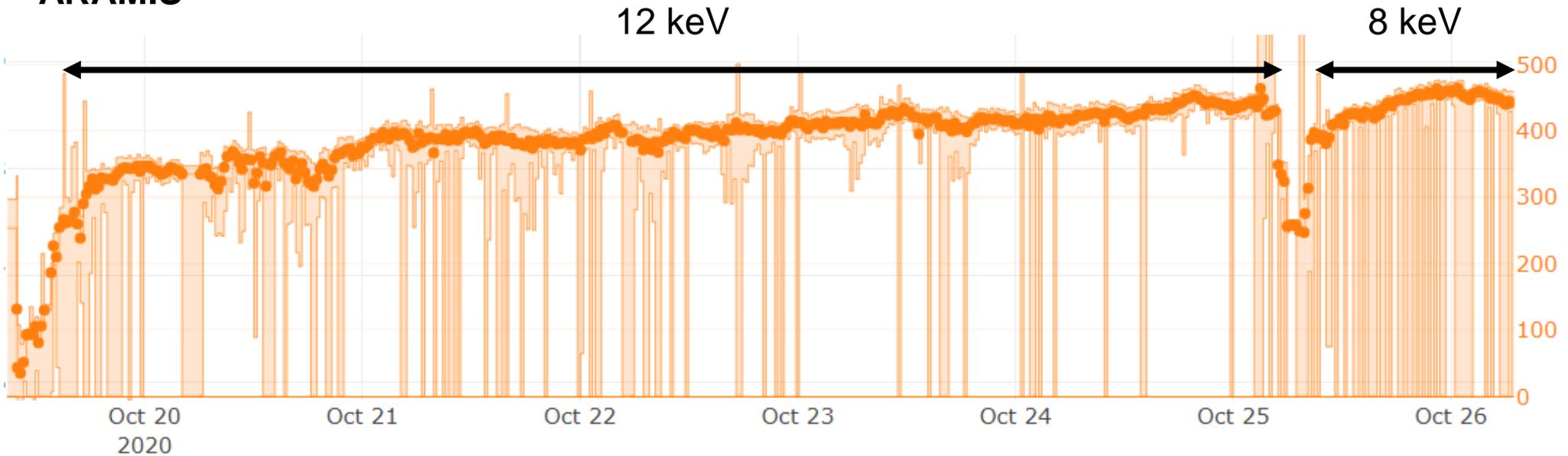
- Operation is trying to investigate about the source
- From the last BBA/undulator alignment shifts at the beginning of October the orbit and the undulator area positions were supposed to be sent back
- During the week found that this did not happen for the SARMA02 section (controlling the launching orbit to the undulators)
- The best would have been to send them, but this would have required to send also BPM in the undulator, K values, tapering, ... not ideal during photon delivery, also because users could measure in this conditions
- Florian was available to add SARUN01 BPM in PSICO to have a softer change (to have 2 degrees of freedom), but we agreed to avoid risking the functioning of the FEL pointing



- To be checked at the next startup

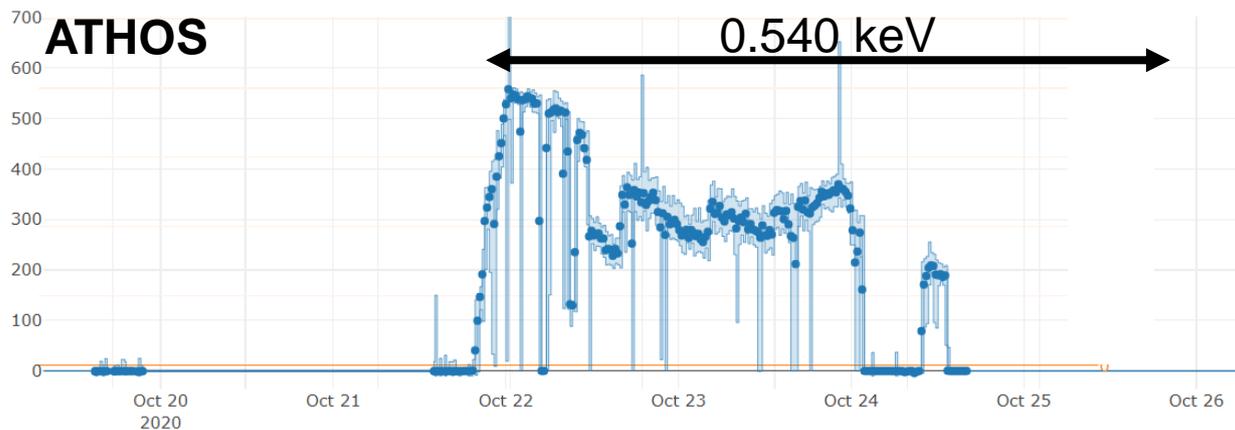
# Lasing during the week

## ARAMIS



- Manually recovered 360  $\mu\text{J}$  in few hours, and after PSICO on, except when some manual tweaks done to not degrade too much Alvra and improve BW in view of the Bernina beam time
- Energy switch for Bernina from 12 to 8 keV

## ATHOS



- Manually setup
- Still some losses
- Asked to the operators to stop Athos after the users finished their shifts to avoid losses

# Conclusions for this week

## Machine performances:

- **Hardware** amazingly well behaving. Only a problem in S10CB07 and magnet IOC failure
- **Alvra** lasing up to 460  $\mu\text{J}$  at 12 keV (in average always around 400  $\mu\text{J}$ )
- Beam prepared for **Bernina** (acceptable BW). The plan was to keep it until Thu, and push for more intensity from Fri, but plans changed due to corona
- Beam BERNINA: from 420  $\mu\text{J}$  up to 480  $\mu\text{J}$  at 8 keV BW around 0.17%
- BD tried to setup **Athos** on Monday without success, and on Wednesday night they succeeded to produce 0.5 mJ at 0.540 eV
- Athos shifts could take place

## Some general comments:

- Re-arrangement the machine activities (cut Aramis setup time, Athos setups, Athos shift “shifted”, swap of Thu with Sun) with a lot of tolerance from all sides to allow everybody to measure
- Only few hours on Monday to switch from 6 keV (about 420  $\mu\text{J}$ ) LBW to 12 keV 400  $\mu\text{J}$  not LBW to give time to Athos setup
- The more or less full BD team needed more than 15 hours to generate 500  $\mu\text{J}$  at 540 eV (still with some losses issues to be understood). Just squeeze all in a blue day sounds a bit “optimistic”

# Proposal for the next startup

In several occasions demonstrated the **parallel operation** of Aramis and Athos (also in case of high lasing in both lines)

**Goal:** try to better organize already from the coming startup to make parallel operation as the **standard** and not as the exception.

## At the upcoming (?) startup

**Day 1:** System checks

**Day 2:** Basic check with the beam: emittance, compression, phasing at 11 keV (for practical reason)

**Day 3:** Aramis optimization starting from a good lasing snapshot file

**Day 4:** Athos setup

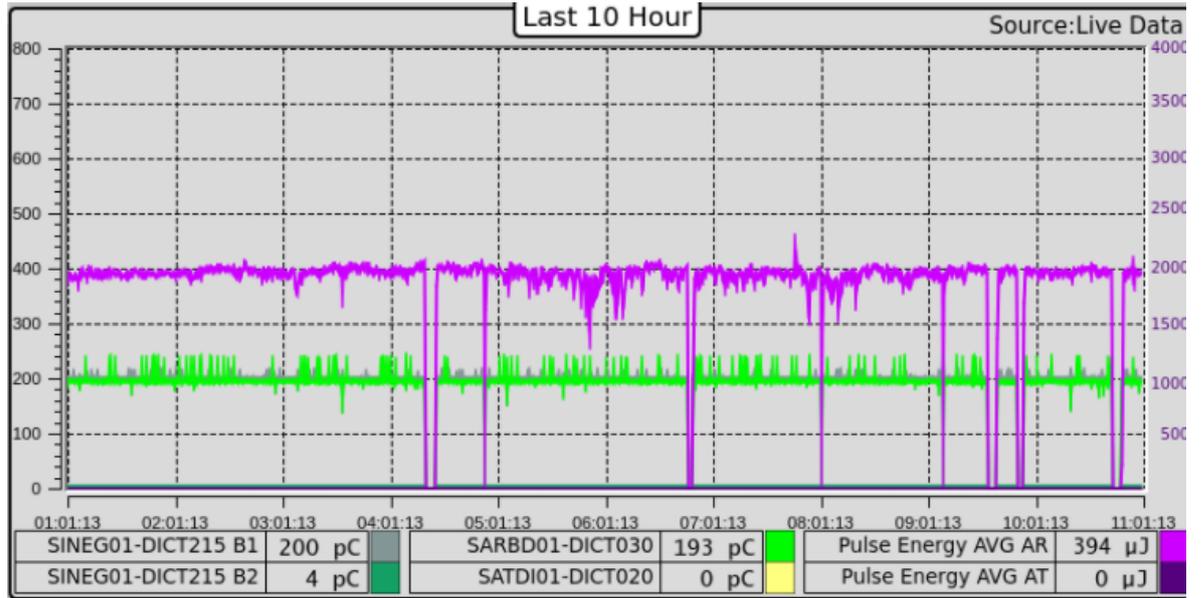
- Athos optimization changing step by step the Aramis settings which have a bad impact on Athos (if there are-to be investigated)
- Trying to keep as high as possible also the Aramis and Athos lasing
- Run PSICO on both lines?



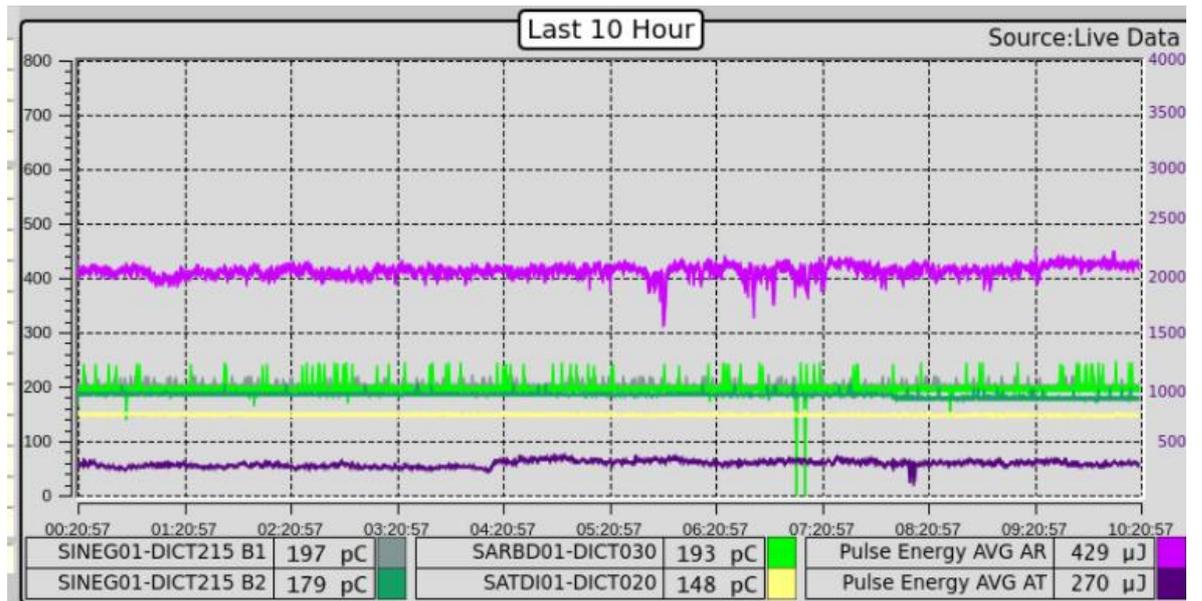
# SPARE SLIDES

# Jitter

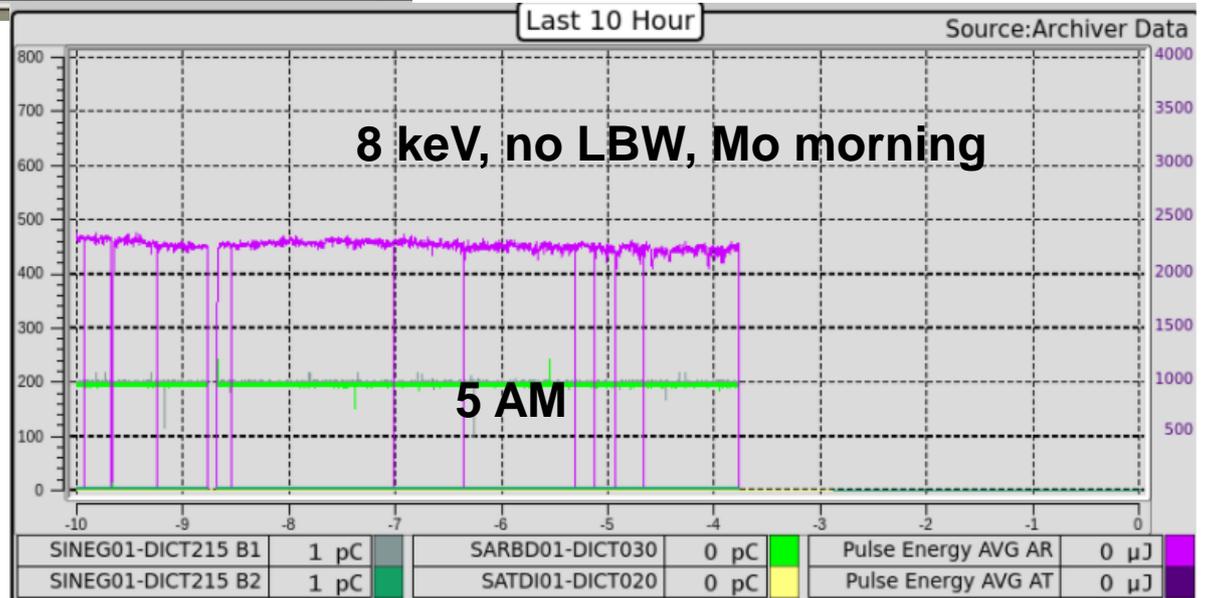
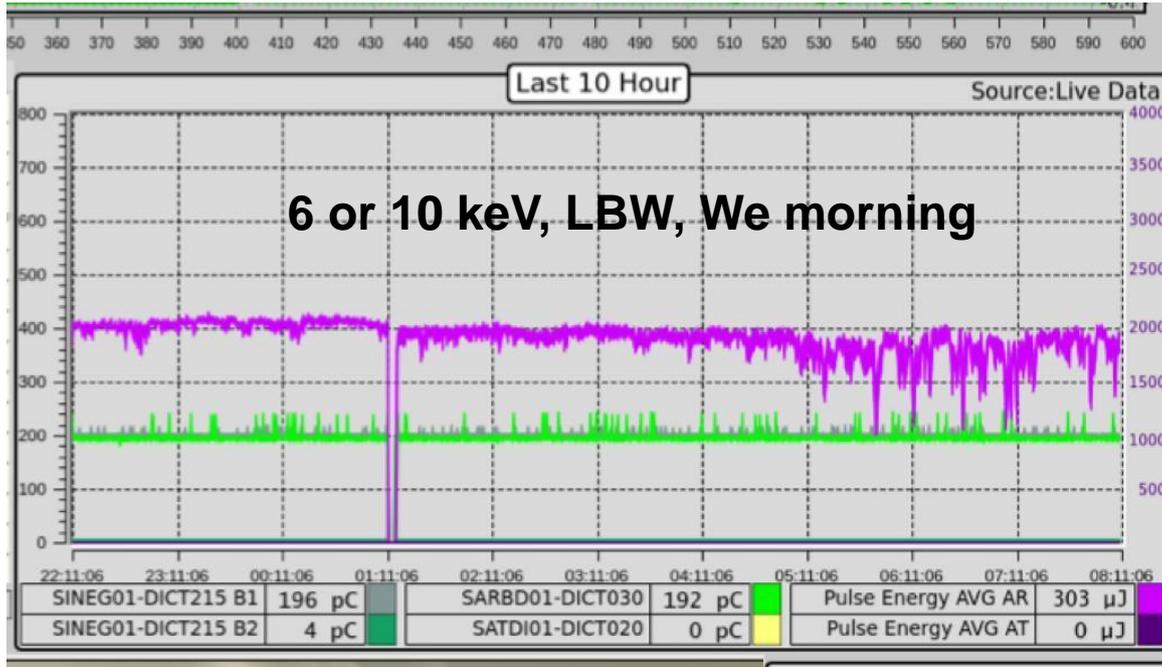
Tuesday



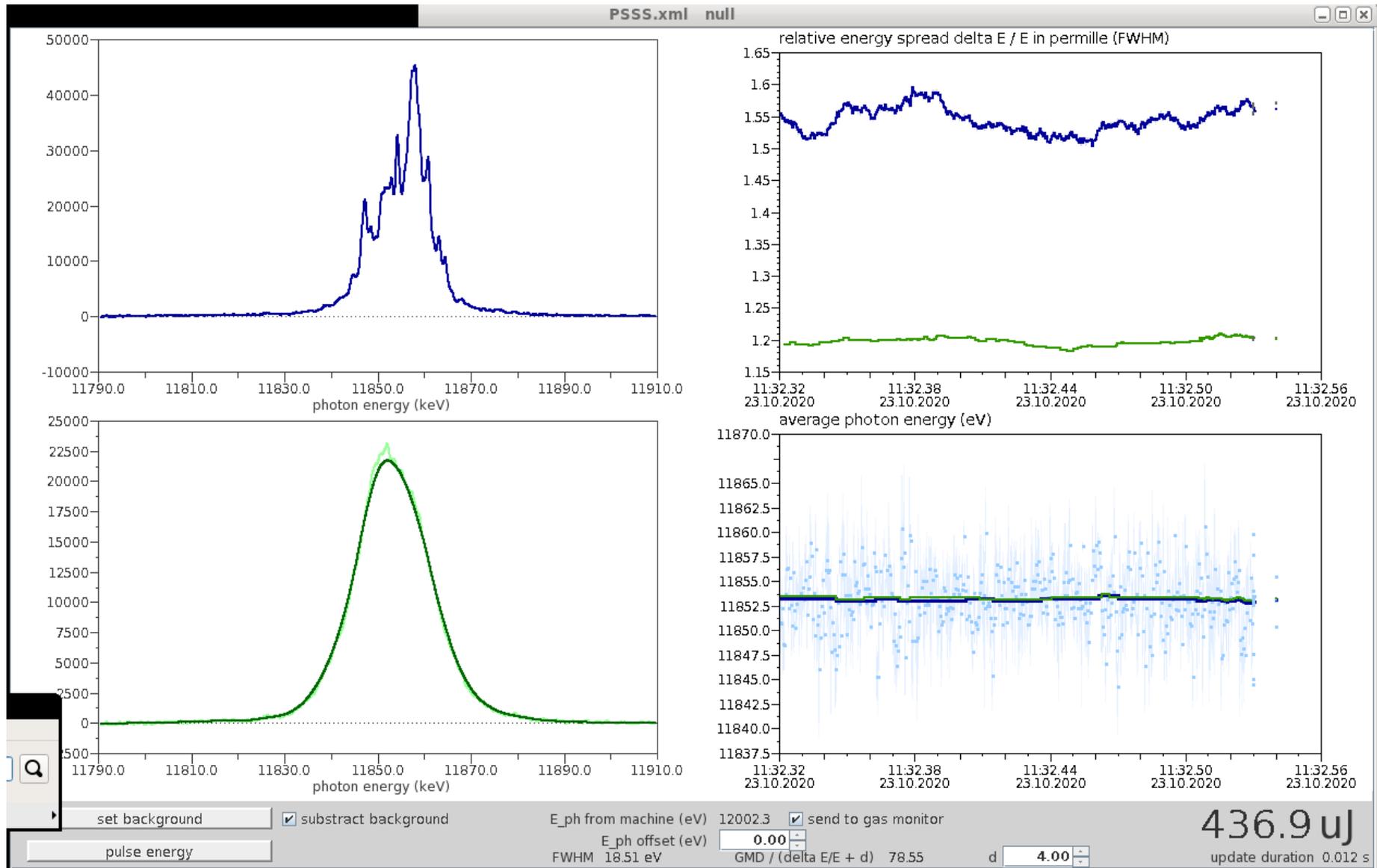
Friday



# Change in the effect or the source?



# Friday AM



# Schedule calendar

<https://intranet.psi.ch/de/swiss-fel/sfoperation>

