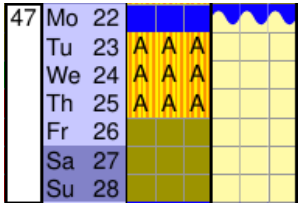
Thomas Schietinger :: Paul Scherrer Institut

Machine report week 47/2021

SwissFEL Exchange Meeting, 29 November 2021

Calendar


47
Mo 22
Tu 23
We 24
Th 25
Fr 26
Sa 27
Su 28
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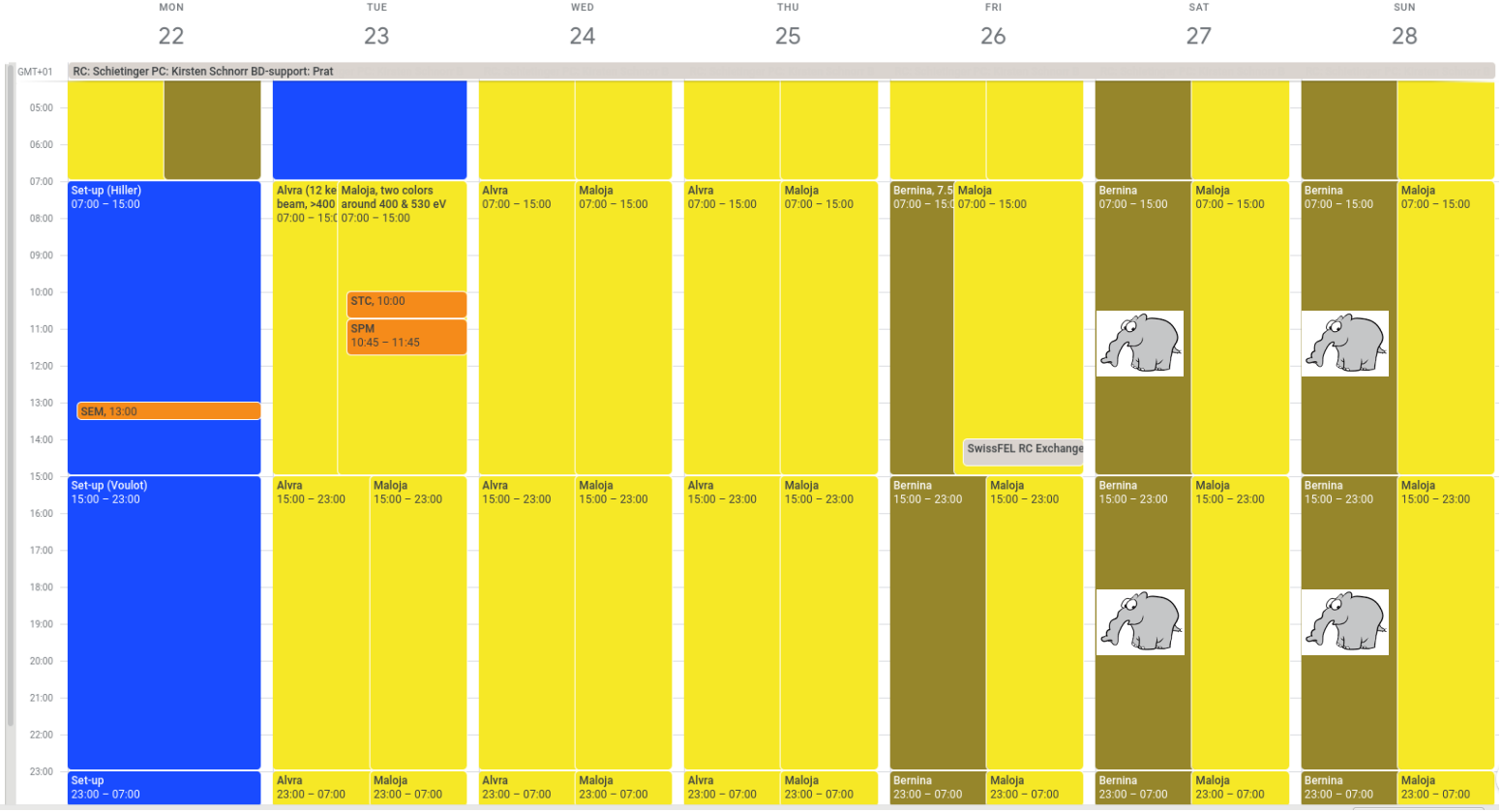
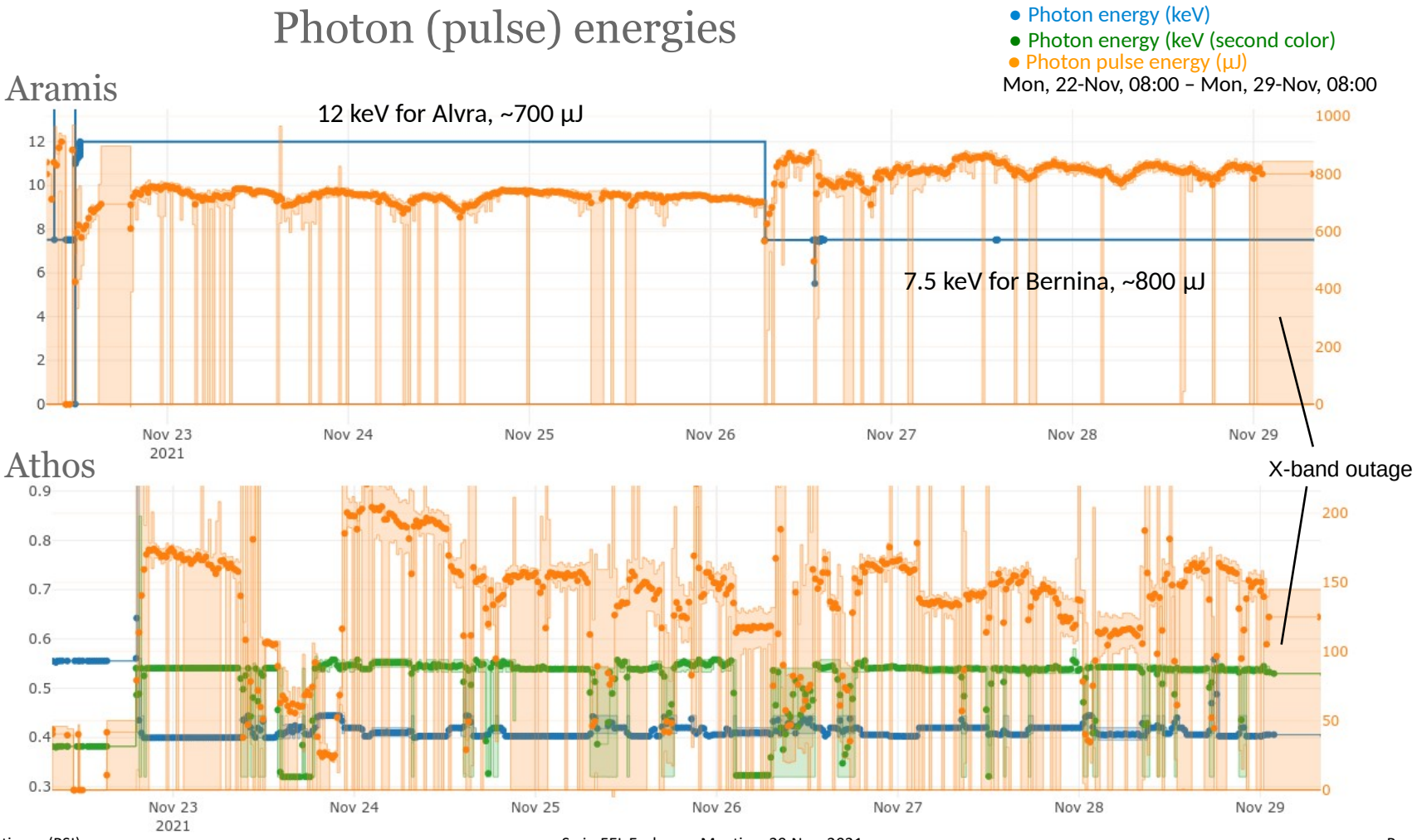

MON 22
TUE 23
WED 24
THU 25
FRI 26
SAT 27
SUN 28
GMT+01
RC: Schietinger PC: Kirsten Schnorr BD-support: Prat
Set-up (Hiller) 07:00 – 15:00
SEM, 13:00
Alvra (12 ke beam, >400 07:00 – 15:0
Maloja, two colors around 400 & 530 eV 07:00 – 15:00
STC, 10:00
SPM 10:45 – 11:45
Alvra 07:00 – 15:00
Maloja 07:00 – 15:00
Bernina, 7.5 07:00 – 15:
Maloja 07:00 – 15:00
SwissFEL RC Exchange
Bernina 07:00 – 15:00
Maloja 07:00 – 15:00
Set-up (Voulot) 15:00 – 23:00
Alvra 15:00 – 23:00
Maloja 15:00 – 23:00
Bernina 15:00 – 23:00
Maloja 15:00 – 23:00
Set-up 23:00 – 07:00
Alvra 23:00 – 07:00
Maloja 23:00 – 07:00
Bernina 23:00 – 07:00
Maloja 23:00 – 07:00

Photon (pulse) energies

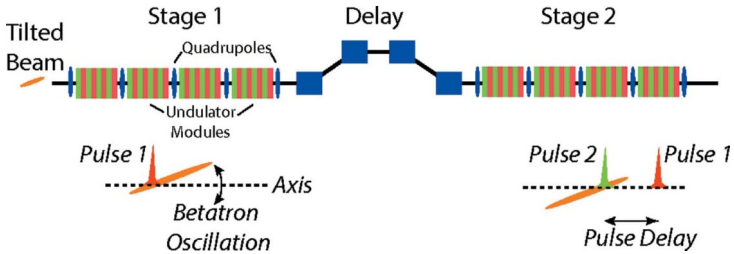


Setup

N. Hiller, D. Voulot, E. Prat
(S. Reiche, E. Ferrari)

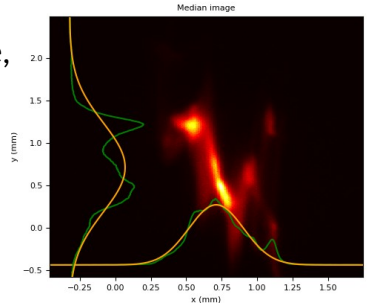
Aramis

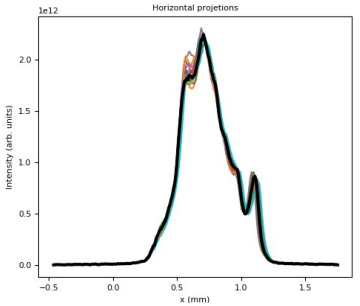
- Excellent setting from previous week (7.5 keV/840 µJ for Bernina).
- Adjustments to beam optics and laser give up to 930 µJ at 7.5 keV.
- Energy change to 12 keV. Optimization up to ~770 µJ (close to record value at 12 keV).
- Friday morning energy change to 7.5 keV (with Eugenio's tool). Optimization by N. Hiller (mainly phase shifters) to well over 800 µJ.



Athos (two-color setup)

- Restore setting from previous week, scale colors to new targets.
- Color 1 at ~400 eV, color 2 at ~540 eV, about 70 µJ in each pulse, later 100/50 µJ.
- Loss optimization allows operation at 50 Hz.
- Increase of pulse energy in color 2 by moving the lasing part in the head (Friday) changes the loss pattern → increases losses in SATUN07 DRM (see issues).





Issues

Causing downtime:

- Failure of RF station SINXB01 (Monday morning 1:30). Repair and recovery took well into the morning…
- Athos undulator SATUN19 got stuck (Saturday evening). Power-cycling of the PLC helped (M. Calvi).

Causing compromised machine performance:

- Strong drift of Mizar arrival time can drive the bunch-2 energy-compression feedback (Athos) to its limit. Compromises stabilization of electron energy in Athos (and therefore photon energy).
- Linac-2 running out of energy margin (Thursday evening). Increase accelerating voltage of one station (S20CB03) by 8 MV to have more margin.
- Controls problem with Athos undulators SATUN15,16,17,18: for large changes in K, the “GO” command does not make it to the PLC. Going in smaller steps still worked… A. Alarcon is investigating (see next slide).

Other:

- Excessive radiation seen in dose rate monitor SATUN07-DDRM005-R. Temporarily raised the radiation budget by a factor of two to allow Maloja to complete their energy scans under the same settings.
- Monday during setup:
  - Tunnel access to fix SATUN18 bottom-right array (motor exchanged, but it turned out to be a bad cable…)
  - Linac-3 stations went to blackheating before 4 hour limit… this made the access break (for the SATUN18 repair) unnecessarily longer!
  - Mizar: mirror-piezo was at the limit, automatic centering no longer worked, needed a manual intervention.

Undulator movement problems

Information from **Arturo Alarcon** after investigating the problem (29-Nov-2021):
The Athos undulators are back to nominal working conditions. There are three ongoing issues:

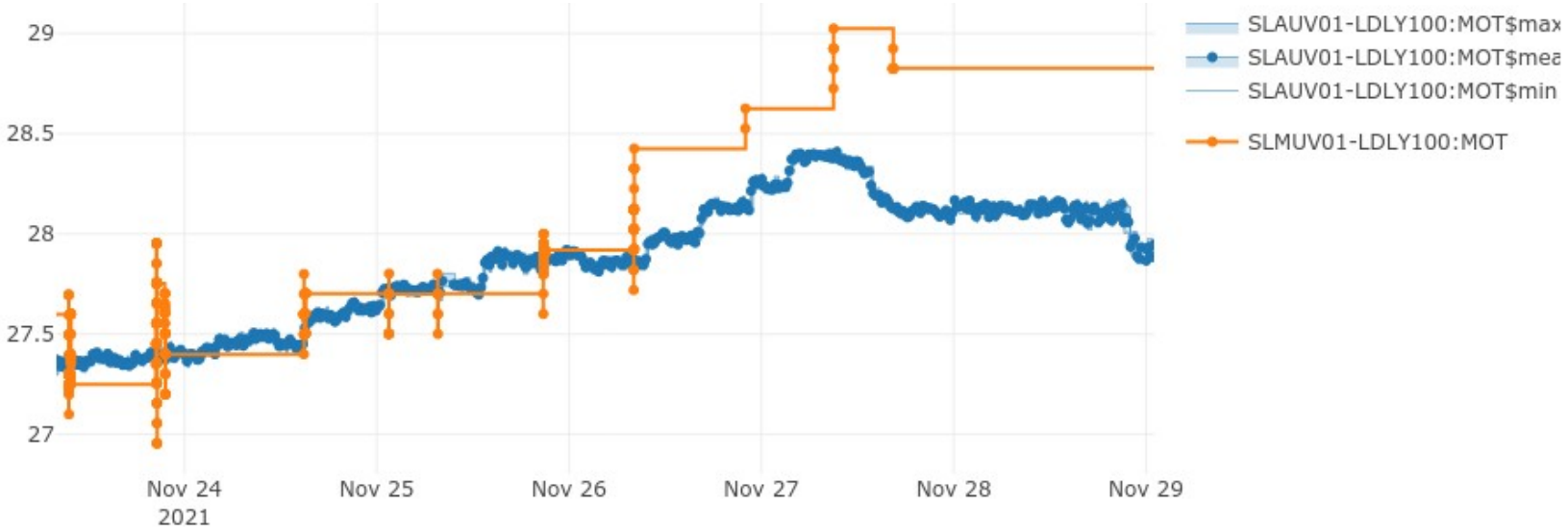
1) PLC communication is interrupted. This leads to a complete loss of control from the EPICS controls system, and it can usually only be recovered with a PLC power cycle.

2) Some K commands don't lead to motion of the undulators. This is due to EPICS being overwhelmed by commands from users, likely from the scanning utility. This can be recovered by rebooting the IOC.

3) Some individual motors don't turn on when requested. This leads to one segment of the undulator not moving, and a K error. It can be fixed by hitting the reset errors button for the motors.

Issue 1 is likely also the result of too many commands being sent too quickly. We should review the way the undulators are being scanned, or in any case, slow it down.

Alcor and Mizar arrival times



- The Alcor arrival time often changes in steps.
- The Mizar appears to drift (to first order) in sync with the Alcor.
- Suggestion: until we have figured out a proper solution to regulate the Mizar arrival time, could the Mizar just automatically follow the Alcor? (Instead of the run coordinator doing it by hand)