

# **SwissFEL Exchange Meeting**

## **Machine report**

### **Week 4/2021**

Didier Voulot  
SEM, 1 February 2021

# Week overview

MON  
25

TUE  
26

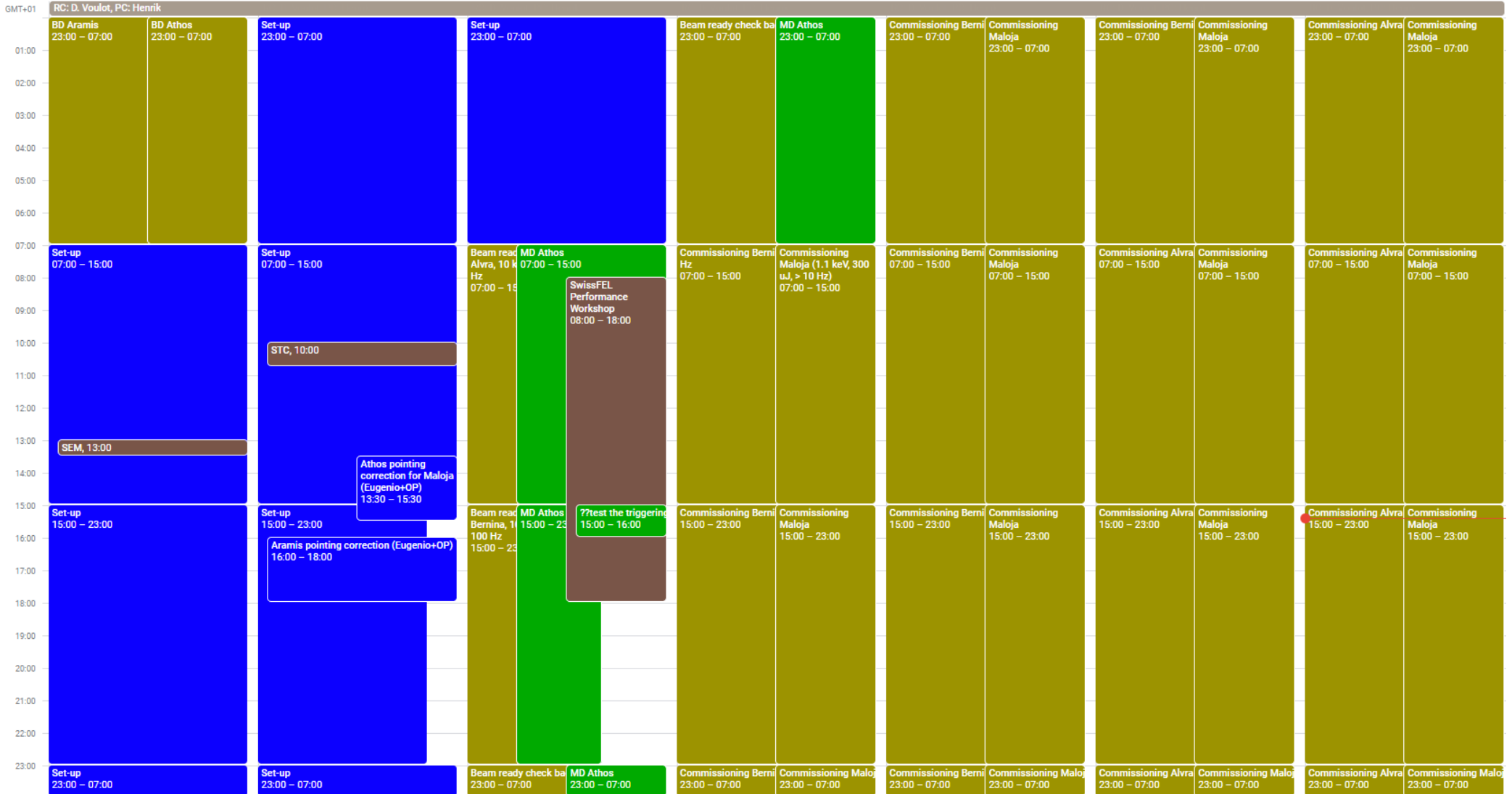
WED  
27

THU  
28

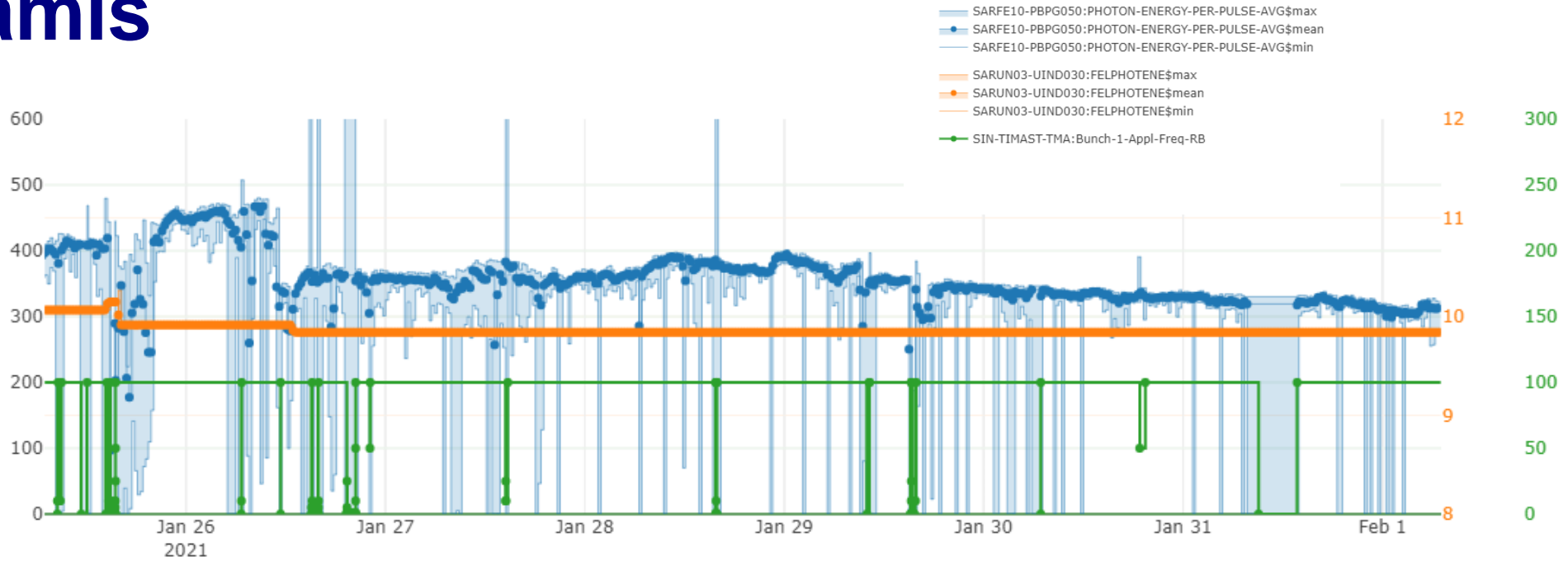
FRI  
29

SAT  
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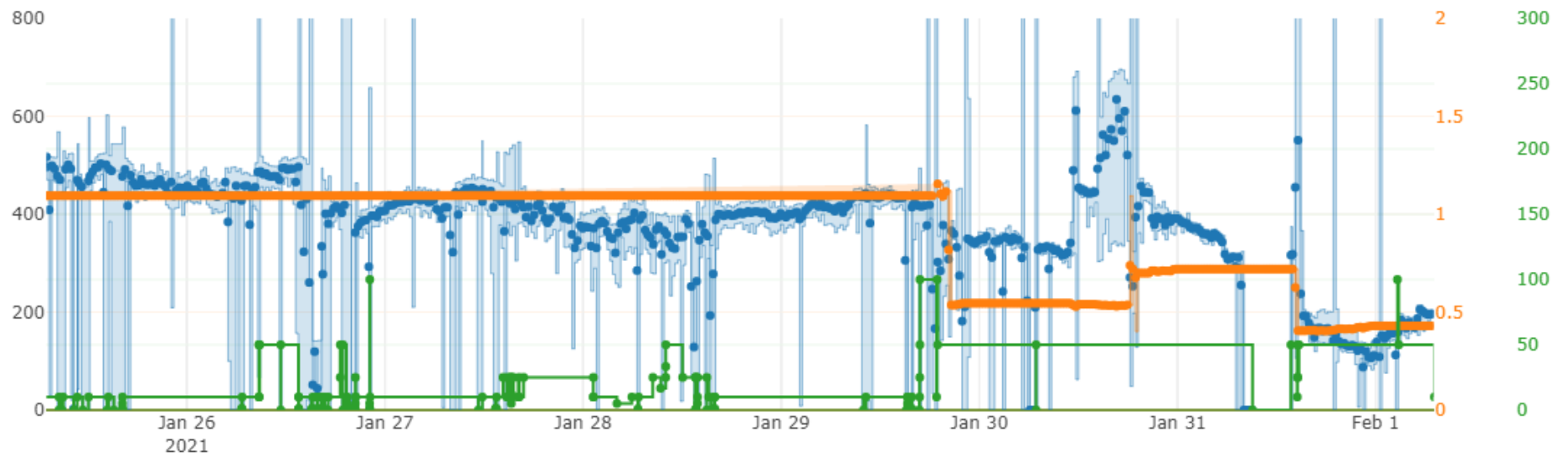
SUN  
31



# Aramis



# Athos



# Pointing

- Eugenio
  - Move full line (quads & undulators)
  - Maintain lasing even for large move
  - Works well, nice tool!
  - Problem: the mover are unreliable (move not applied, difficult to restore when hitting the limit switches)
- Florian
  - Only acts on electron orbit
  - Lasing not maintained for large change
  - Less risky

MoveBeamlineTool

## ARAMIS beamline shift

Select targets Server

Horizontal Offset: 0.0000 mm Angle: 0.0000 mrad

Vertical Offset: 0.0000 mm Angle: 0.0000 mrad

Enabled

Threshold Offset: 0.005 mm

Threshold Angle: 0.0020 mrad

Update time: -1 sec

Element	Z [m]	RBV X	RBV Y	Reference X	Reference Y	Delta X	Delta Y	New X	New Y	
1	✓ SARUN01-MQUA080	501.719	-0.2298	-0.2742	-0.2299	-0.2742	-0.0000	-0.0000	-0.0000	-0.0000
2	✓ SARUN02-MQUA080	506.469	-0.2243	-0.3241	-0.2243	-0.3241	-0.0000	-0.0000	-0.0000	-0.0000
3	✓ SARUN03-MQUA080	511.219	-0.2443	-0.1065	-0.2443	-0.1065	-0.0000	-0.0000	-0.0000	-0.0000
4	✓ SARUN04-MQUA080	515.969	-0.1573	0.0876	-0.1574	0.0876	-0.0000	0.0000	-0.0000	0.0000
5	✓ SARUN05-MQUA080	520.719	-0.1191	-0.1203	-0.1190	-0.1203	-0.0000	-0.0000	-0.0000	-0.0000
6	✓ SARUN06-MQUA080	525.469	0.0291	-0.3023	0.0292	-0.3023	0.0000	-0.0000	0.0000	-0.0000
7	✓ SARUN07-MQUA080	530.219	-0.0166	-0.1208	-0.0167	-0.1208	-0.0000	-0.0000	-0.0000	-0.0000
8	✓ SARUN08-MQUA080	534.969	0.2052	-0.0687	0.2052	-0.0687	0.0000	-0.0000	0.0000	-0.0000
9	✓ SARUN09-MQUA080	539.719	-0.1118	-0.1592	-0.1119	-0.1592	-0.0000	-0.0000	-0.0000	-0.0000
10	✓ SARUN10-MQUA080	544.469	0.1261	-0.0707	0.1260	-0.0707	0.0000	-0.0000	0.0000	-0.0000
11	✓ SARUN11-MQUA080	549.219	0.0386	-0.3471	0.0386	-0.3471	0.0000	-0.0000	0.0000	-0.0000
12	✓ SARUN12-MQUA080	553.969	-0.0685	-0.1602	-0.0684	-0.1602	-0.0000	-0.0000	-0.0000	-0.0000
13	✓ SARUN13-MQUA080	558.719	-0.0563	-0.1288	-0.0562	-0.1288	-0.0000	-0.0000	-0.0000	-0.0000
14	✓ SARUN14-MQUA080	563.469	-0.1976	-0.1353	-0.1976	-0.1353	-0.0000	-0.0000	-0.0000	-0.0000
15	✓ SARUN15-MQUA080	568.219	-0.2181	-0.1529	-0.2180	-0.1529	-0.0000	-0.0000	-0.0000	-0.0000
16	✓ SARUN16-MQUA080	572.969	-0.2014	-0.2285	-0.2015	-0.2285	-0.0000	-0.0000	-0.0000	-0.0000

Update reference  Apply X

Reset reference 501.72  Apply Y

UndulatorPointingMasterAthos.xml TOOL/ATHOS\_POINTING/MASTER/

Settings Positions Part 2 of the undulator - test

**Photon pointing adjustment:**

slope (mm / und.) offset (mm)

X 0.0000 0.0000

Y 0.0000 0.0000

**Photon pointing feedback:**

feedback targets (mm) active monitor positions

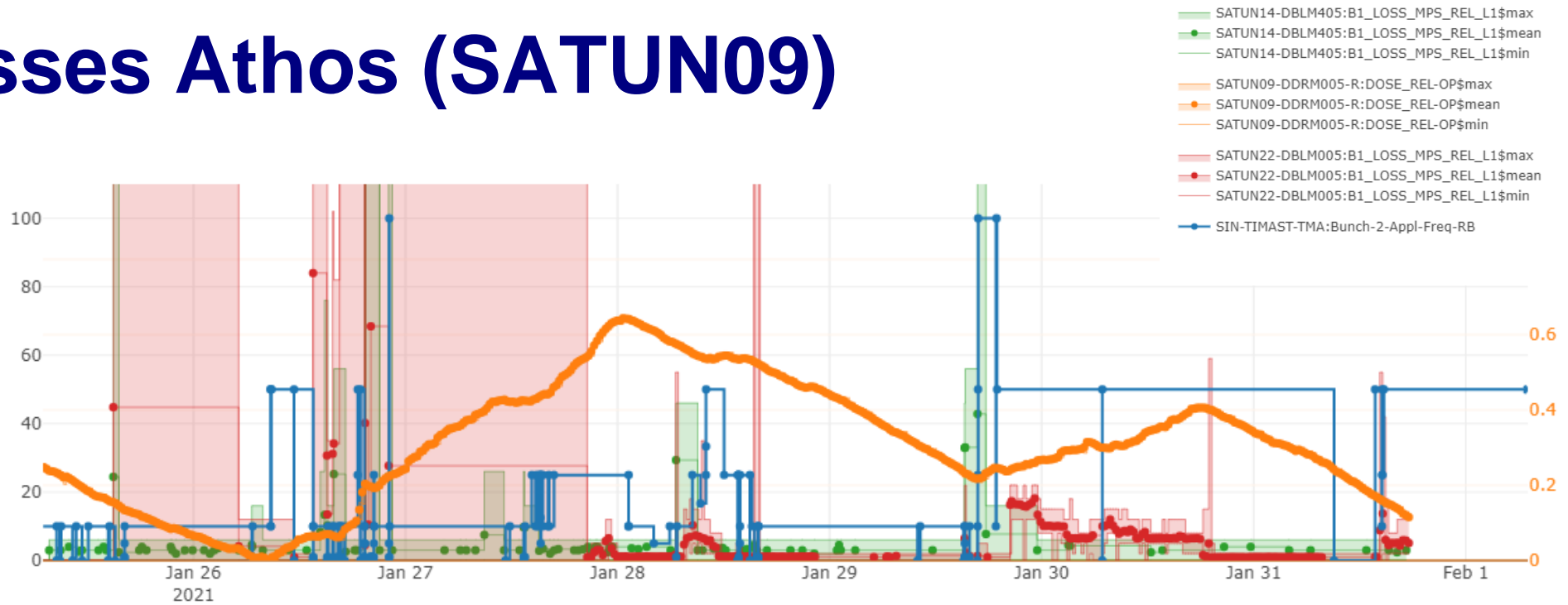
X 0.0191 0.0151

Y -0.0428 -0.0458

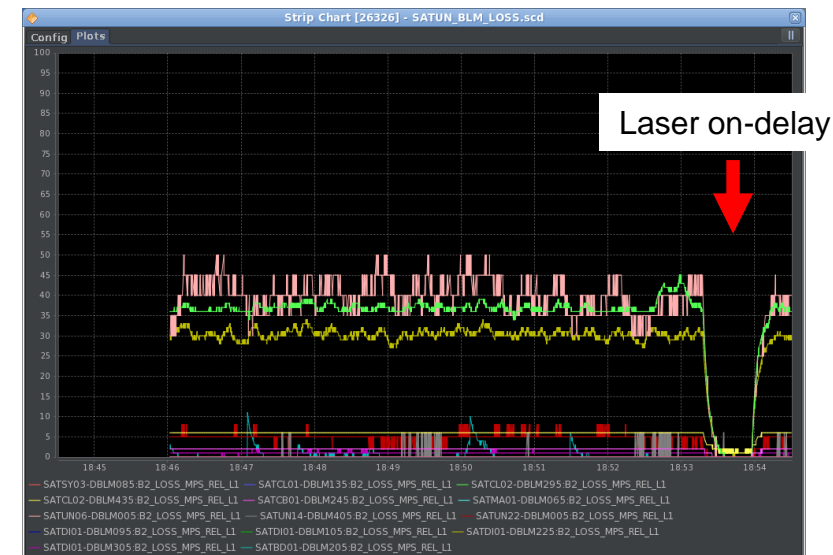
	PSICO hor.	PSICO vert.	hor. offset contrib.	vert. offset contrib.	hor. slope contrib.	vert. slope contrib.	hor. temp.	vert. temp.	X-REF-FB	Y-REF-FB
SATUN04-DBPM010	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	0.000	NaN	NaN
SATUN04-DBPM070	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	0.000	0.0000	0.0000
SATUN05-DBPM410	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	0.000	0.0000	0.0000
SATUN06-DBPM070	-0.0002	-0.0037	0.0000	0.0000	-0.0000	-0.0000	0.000	0.000	-0.0002	-0.0037
SATUN07-DBPM070	-0.0004	-0.0074	0.0000	0.0000	-0.0000	-0.0000	0.000	0.000	-0.0004	-0.0074
SATUN08-DBPM070	-0.0024	-0.0221	0.0000	0.0000	-0.0000	-0.0000	0.000	0.000	-0.0024	-0.0221
SATUN09-DBPM070	-0.0090	0.0014	0.0000	0.0000	-0.0000	-0.0000	0.000	0.000	-0.0090	0.0014
SATUN10-DBPM070	0.0096	0.0083	0.0000	0.0000	-0.0000	-0.0000	0.000	0.000	0.0096	0.0083
SATUN11-DBPM070	-0.0013	-0.0046	0.0000	0.0000	-0.0000	-0.0000	0.000	0.000	-0.0013	-0.0046
SATUN12-DBPM070	-0.0030	-0.0069	0.0000	0.0000	-0.0000	-0.0000	0.000	0.000	-0.0030	-0.0069
SATUN13-DBPM070	0.0202	-0.0035	0.0000	0.0000	-0.0000	-0.0000	0.000	0.000	0.0202	-0.0035
SATUN14-DBPM410	-0.0035	0.0105	0.0000	0.0000	0.0000	0.0000	0.000	0.000	-0.0035	0.0105
SATUN15-DBPM070	0.0011	0.0151	0.0000	0.0000	0.0000	0.0000	0.000	0.000	0.0011	0.0151
SATUN16-DBPM070	-0.0070	-0.0003	0.0000	0.0000	0.0000	0.0000	0.000	0.000	-0.0070	-0.0003
SATUN17-DBPM070	0.0016	0.0026	0.0000	0.0000	0.0000	0.0000	0.000	0.000	0.0016	0.0026
SATUN18-DBPM070	-0.0039	0.0087	0.0000	0.0000	0.0000	0.0000	0.000	0.000	-0.0039	0.0087
SATUN19-DBPM070	0.0005	0.0017	0.0000	0.0000	0.0000	0.0000	0.000	0.000	0.0005	0.0017
SATUN20-DBPM070	0.0003	0.0016	0.0000	0.0000	0.0000	0.0000	0.000	0.000	0.0003	0.0016
SATUN21-DBPM070	-0.0003	-0.0033	0.0000	0.0000	0.0000	0.0000	0.000	0.000	-0.0003	-0.0033
SATUN22-DBPM070	-0.0013	0.0007	0.0000	0.0000	0.0000	0.0000	0.000	0.000	-0.0013	0.0007
SATMA02-DBPM030	-0.0006	0.0004	0.0000	0.0000	0.0000	0.0000	0.000	0.000	NaN	NaN

Photon positions from active monitor:

# Losses Athos (SATUN09)



- Difficult to tune down without BLM readings (DRMs are too slow)
- Seems to be mostly beam related, dark current can be mitigated with collimators and dechirpers
- Tuned down by Psico (Florian) using optics and orbit, 50 Hz is ok (maybe also 100 Hz)
- BLM and LLM have been activated and adjusted during the week
- Losses could be easily tuned down on Sunday



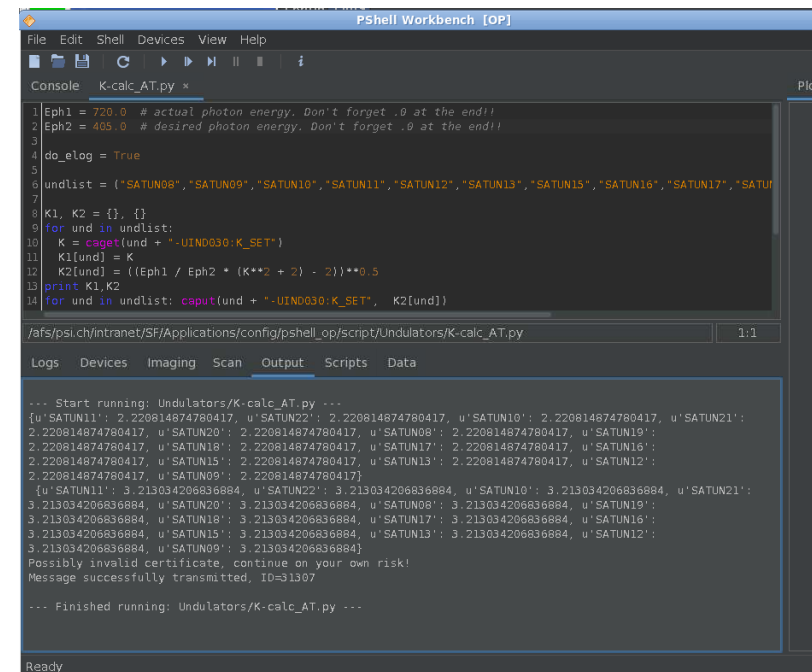
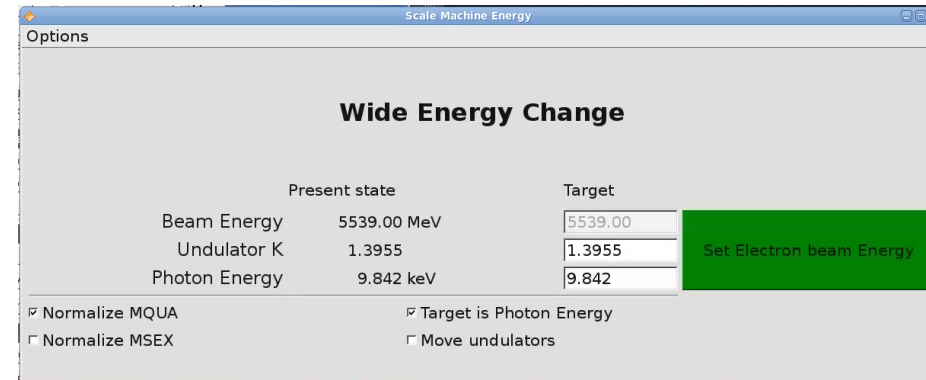
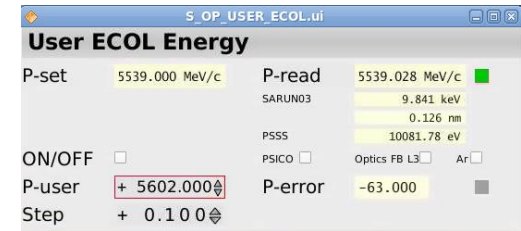
# Energy changes

- Aramis

- Electron beam energy scaling works well
- Two versions:
  - Florian's: uses feedbacks, ramping
  - Eugenio: scaling script, single step
- Large energy change possible
- But tend to generate leaked dispersion, with design ECOL optics
- Undulator K scaling: script exist, could be used for small changes, not much experience

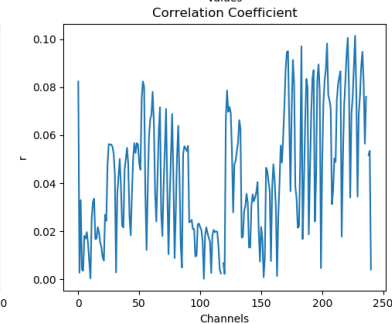
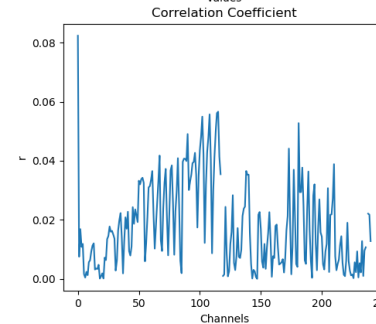
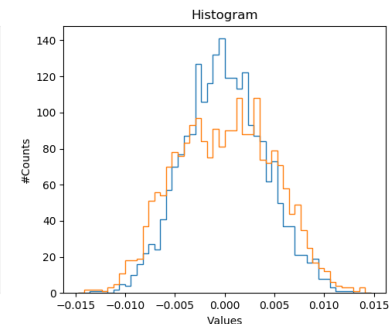
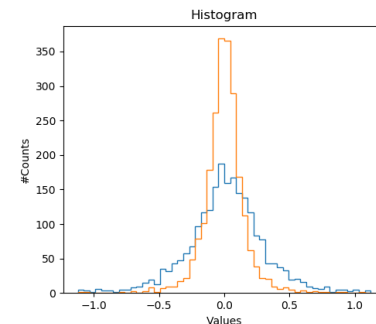
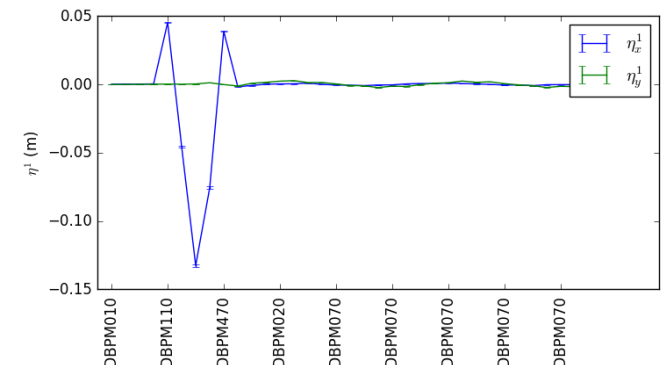
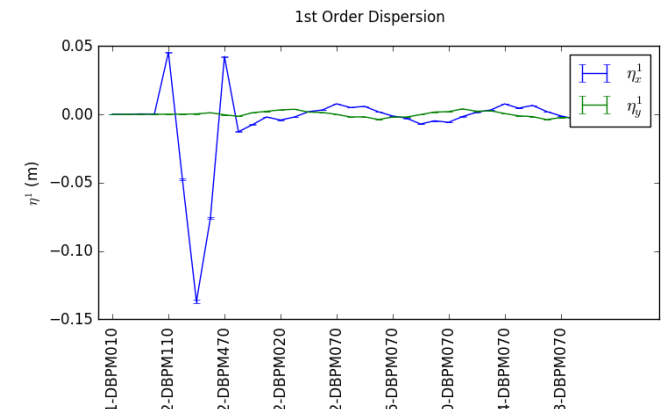
- Athos

- Used K scaling during the week (Pshell script)
- Large changes are possible 1.1 -> 0.4 keV
- CHIC settings need readjusting
- Undulator kicks generate losses



# Aramis beam jitter

- Problem investigated by Sven on Friday
- Large jitter in horizontal
- Real effect visible on both PBPS and screens
- Closed dispersion in x and y => no improvement for Bernina
- Try to correlate beam position jitter w different channels
- Conclusions (?)

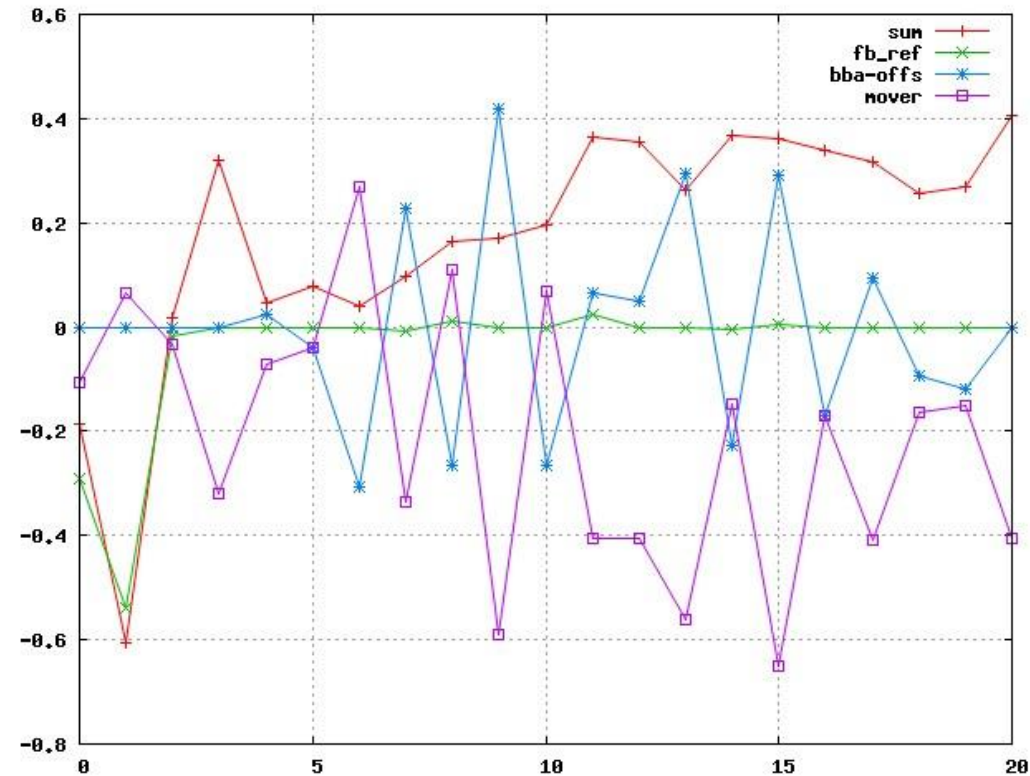


# Findings from B. Keil

Quad movers and BBA offsets have zig-zag pattern with opposite values

<https://elog-gfa.psi.ch/SwissFEL+commissioning/18066>

- Movers seem to compensate BBA-offsets
- This only happens in x
- Not good for BPMs, better performance close to mechanical center
- Is it real? Could it be an artefact of the BBA?





# Technical difficulties

## SINSB03

- Thu. Florian notice a phase jump in SINSB03 causing electron beam instability
- Confirmed by Qiao => instability comes from the pre-amplifier
- Saturday: Down time (1h) due to Klystron Arcs (Lukas Stingelin)
- Sunday: Down time (6h), more arcing at Klystron (Lukas Stingelin)

## Mizar energies

- Mizar UV energy wave-plate is slowly increasing
- Could not be recovered with capillary alignment
- Possibly some aging UV optics
- Intervention on Monday morning (Carlo)

# DUO calendar

← SwissFEL Calendar from January to June 2021 →

W	January			OP	W	February			OP	W	March			OP	W	April			OP	W	May			OP	W	June			OP
	ARAMIS	ATHOS				ARAMIS	ATHOS				ARAMIS	ATHOS			ARAMIS	ATHOS					ARAMIS	ATHOS			ARAMIS	ATHOS			
53	Fri 1	Shutdown	Shutdown		05	Mon 1	User Operation Reserve	Machine start-up / FEL set-up		09	Mon 1	Beamline development	Preliminary User Operation		13	Thu 1	Shutdown	Shutdown		17	Sat 1	Beamline development	Beamline development		22	Tue 1	Preliminary User Operation	Preliminary User Operation	
	Sat 2	Shutdown	Shutdown			Tue 2	Preliminary User Operation	Machine development			Tue 2	Beamline development	Preliminary User Operation			Fri 2	Shutdown	Shutdown			Sun 2	Beamline development	Beamline development			Wed 2	Preliminary User Operation	Preliminary User Operation	
01	Sun 3	Shutdown	Shutdown			Wed 3	Preliminary User Operation	Machine development			Wed 3	Beamline development	Preliminary User Operation		14	Sat 3	Shutdown	Shutdown		18	Mon 3	Machine start-up / FEL set-up	User Operation Reserve			Thu 3	Beamline development	Machine development	
	Mon 4	Shutdown	Shutdown			Thu 4	Preliminary User Operation	Machine development			Thu 4	Beamline development	Preliminary User Operation			Sun 4	Shutdown	Shutdown			Tue 4	Beamline development	Preliminary User Operation			Fri 4	Preliminary User Operation	Machine development	
	Tue 5	Shutdown	Shutdown			Fri 5	Preliminary User Operation	Machine development			Fri 5	Beamline development	Preliminary User Operation		15	Mon 5	Shutdown	Shutdown			Wed 5	Beamline development	Preliminary User Operation			Sat 5	Preliminary User Operation	Machine development	
	Wed 6	Shutdown	Shutdown			Sat 6	Beamline development	Machine development			Sat 6	Beamline development	Preliminary User Operation			Tue 6	Shutdown	Shutdown			Thu 6	Beamline development	Preliminary User Operation			Sun 6	Preliminary User Operation	Machine development	
	Thu 7	Shutdown	Shutdown			Sun 7	Beamline development	Machine development			Sun 7	Beamline development	Preliminary User Operation			Fri 7	Shutdown	Shutdown			Fri 7	Beamline development	Preliminary User Operation		23	Mon 7	User Operation Reserve	Machine start-up / FEL set-up	
	Fri 8	Shutdown	Shutdown		06	Mon 8	User Operation Reserve	Machine start-up / FEL set-up			Mon 8	Machine development	Machine development			Thu 8	Shutdown	Shutdown			Sat 8	Beamline development	Preliminary User Operation			Tue 8	Beamline development	Beamline development	
	Sat 9	Shutdown	Shutdown			Tue 9	Preliminary User Operation	Machine development			Tue 9	Machine development	Preliminary User Operation			Fri 9	Shutdown	Shutdown			Sun 9	Beamline development	Preliminary User Operation			Wed 9	Preliminary User Operation	Machine development	
	Sun 10	Shutdown	Shutdown			Wed 10	Preliminary User Operation	Machine development			Wed 10	Machine development	Preliminary User Operation		16	Sat 10	Shutdown	Shutdown		19	Mon 10	User Operation Reserve	Machine start-up / FEL set-up			Thu 10	Preliminary User Operation	Machine development	
02	Mon 11	Shutdown	Shutdown			Thu 11	Preliminary User Operation	Machine development			Thu 11	Machine development	Preliminary User Operation			Sun 11	Shutdown	Shutdown			Tue 11	Beamline development	Preliminary User Operation			Fri 11	Preliminary User Operation	Machine development	
	Tue 12	Shutdown	Shutdown			Fri 12	Preliminary User Operation	Machine development			Fri 12	Machine development	Preliminary User Operation		15	Mon 12	Shutdown	Shutdown			Wed 12	Beamline development	Preliminary User Operation			Sat 12	Preliminary User Operation	Machine development	
	Wed 13	Machine start-up / FEL set-up	Machine start-up / FEL set-up			Sat 13	Beamline development	Machine development			Sat 13	Beamline development	Preliminary User Operation			Tue 13	Shutdown	Shutdown			Thu 13	Beamline development	Preliminary User Operation			Sun 13	Preliminary User Operation	Machine development	
	Thu 14	Machine start-up / FEL set-up	Machine start-up / FEL set-up			Sun 14	Beamline development	Machine development			Sun 14	Beamline development	Preliminary User Operation			Wed 14	Shutdown	Shutdown			Fri 14	Beamline development	Preliminary User Operation		24	Mon 14	Machine development	Machine development	
	Fri 15	Machine start-up / FEL set-up	Machine start-up / FEL set-up		07	Mon 15	Machine development	Machine development			Mon 15	Machine start-up / FEL set-up	Machine start-up / FEL set-up			Thu 15	Shutdown	Shutdown			Sat 15	Beamline development	Preliminary User Operation			Tue 15	Machine development	Machine development	
	Sat 16	Machine start-up / FEL set-up	Machine start-up / FEL set-up			Tue 16	Machine development	Machine development			Tue 16	Machine start-up / FEL set-up	Machine start-up / FEL set-up			Fri 16	Shutdown	Shutdown			Sun 16	Beamline development	Preliminary User Operation			Wed 16	Shutdown	Shutdown	
	Sun 17	Machine development	Machine development			Wed 17	Shutdown	Shutdown			Wed 17	Machine development	Preliminary User Operation		16	Sat 17	Shutdown	Shutdown		20	Mon 17	Machine development	Machine development			Thu 17	Machine start-up / FEL set-up	Machine start-up / FEL set-up	
03	Mon 18	Machine start-up / FEL set-up	Machine start-up / FEL set-up			Thu 18	Machine start-up / FEL set-up	Machine start-up / FEL set-up			Thu 18	Machine development	Preliminary User Operation			Sun 18	Shutdown	Shutdown			Tue 18	Machine development	Machine development			Fri 18	Machine development	Machine development	
	Tue 19	Machine start-up / FEL set-up	Machine start-up / FEL set-up			Fri 19	Machine development	Machine development			Fri 19	Machine development	Preliminary User Operation		17	Mon 19	Shutdown	Shutdown			Wed 19	Machine development	Machine development			Sat 19	Machine development	Machine development	
	Wed 20	Beamline development	Machine development			Sat 20	Machine development	Machine development			Sat 20	Machine development	Preliminary User Operation			Tue 20	Shutdown	Shutdown			Thu 20	Machine development	Machine development			Sun 20	Machine development	Machine development	
	Thu 21	Beamline development	Machine development			Sun 21	Machine development	Machine development			Sun 21	Machine development	Preliminary User Operation			Wed 21	Machine start-up / FEL set-up	Machine start-up / FEL set-up			Fri 21	Machine development	Machine development		25	Mon 21	Machine start-up / FEL set-up	Machine start-up / FEL set-up	
	Fri 22	Beamline development	Machine development		08	Mon 22	Machine start-up / FEL set-up	User Operation Reserve			Mon 22	Machine development	Preliminary User Operation			Thu 22	Machine start-up / FEL set-up	Machine start-up / FEL set-up			Sat 22	Machine development	Machine development			Tue 22	Machine start-up / FEL set-up	User Operation Reserve	
	Sat 23	Beamline development	Machine development			Tue 23	Machine start-up / FEL set-up	User Operation Reserve			Tue 23	User Operation Reserve	Machine start-up / FEL set-up			Fri 23	Machine start-up / FEL set-up	Machine start-up / FEL set-up			Sun 23	Machine development	Machine development			Wed 23	Beamline development	Preliminary User Operation	
	Sun 24	Beamline development	Machine development			Wed 24	Beamline development	Preliminary User Operation			Wed 24	Preliminary User Operation	Machine start-up / FEL set-up			Sat 24	Machine start-up / FEL set-up	Machine start-up / FEL set-up		21	Mon 24	Machine start-up / FEL set-up	Machine start-up / FEL set-up			Thu 24	Beamline development	Preliminary User Operation	
04	Mon 25	Machine start-up / FEL set-up	Machine start-up / FEL set-up			Thu 25	Beamline development	Preliminary User Operation			Thu 25	Beamline development	Preliminary User Operation			Sun 25	Machine development	Machine development			Tue 25	Machine start-up / FEL set-up	Machine start-up / FEL set-up			Fri 25	Beamline development	Preliminary User Operation	
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	Wed 27	Machine development	Machine development			Sat 27	Beamline development	Preliminary User Operation			Sat 27	Machine start-up / FEL set-up	Machine start-up / FEL set-up			Tue 27	Machine start-up / FEL set-up	Machine start-up / FEL set-up			Thu 27	Beamline development	Preliminary User Operation			Sun 27	Machine development	Machine development	
	Thu 28	Beamline development	Machine development			Sun 28	Beamline development	Preliminary User Operation			Sun 28	Machine start-up / FEL set-up	Machine start-up / FEL set-up			Wed 28	Beamline development	Preliminary User Operation			Fri 28	Beamline development	Preliminary User Operation		26	Mon 28	User Operation Reserve	Machine start-up / FEL set-up	
	Fri 29	Beamline development	Machine development			Mon 29	Shutdown	Shutdown		13	Mon 29	Shutdown	Shutdown			Thu 29	Beamline development	Preliminary User Operation			Sat 29	Beamline development	Preliminary User Operation			Tue 29	Beamline development	Beamline development	
	Sat 30	Beamline development	Machine development			Tue 30	Shutdown	Shutdown			Tue 30	Shutdown	Shutdown			Fri 30	Beamline development	Preliminary User Operation			Sun 30	Beamline development	Preliminary User Operation			Wed 30	Beamline development	Beamline development	
	Sun 31	Beamline development	Machine development			Wed 31	Shutdown	Shutdown			Wed 31	Shutdown	Shutdown		22	Mon 31	User Operation Reserve	Machine start-up / FEL set-up			Mon 31	User Operation Reserve	Machine start-up / FEL set-up						

Click on one box below to select the type of scheduling

 Shutdown	 Machine start-up / FEL set-up	 Machine development	 Beamline development
 User Operation	 User operation reserve	 Preliminary User Operation	 Other FEL
 FEL set-up / User operation			