European XFEL Status Overview

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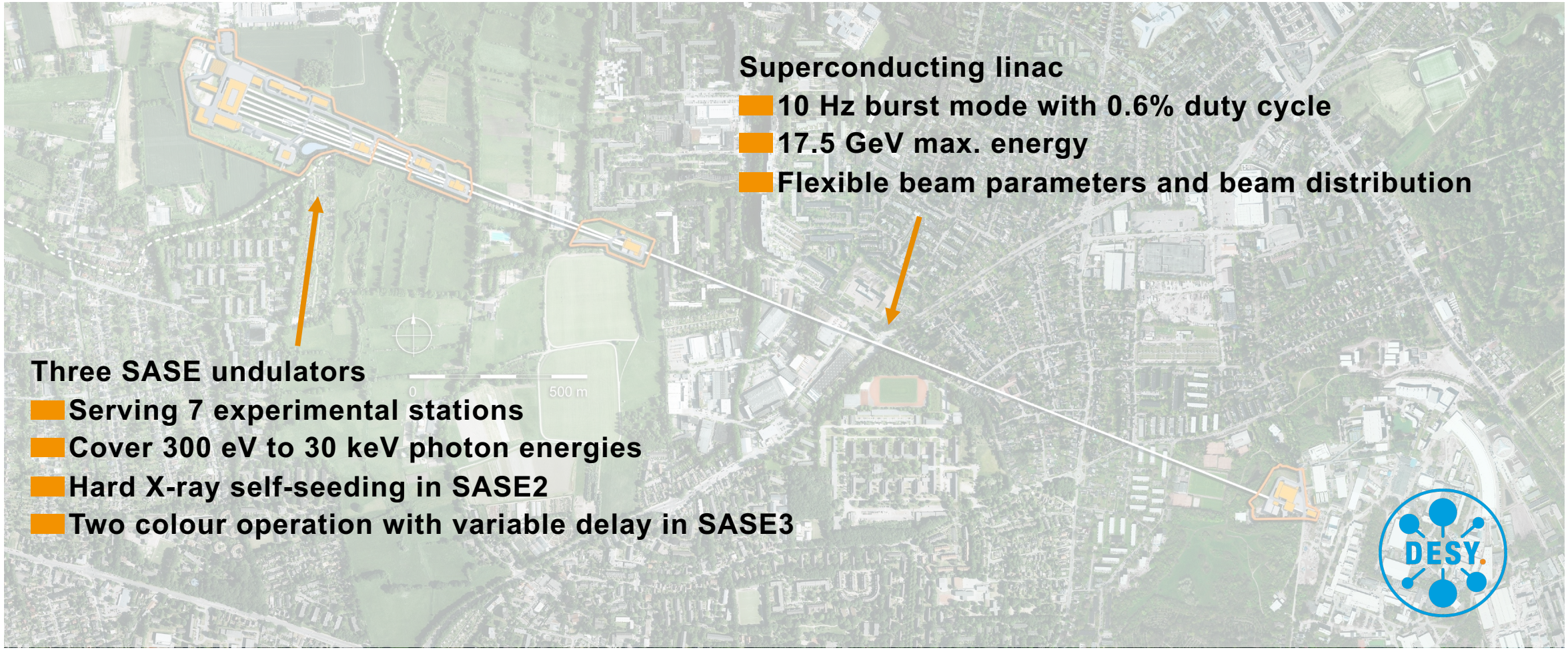
For the European XFEL operations teams from DESY and EuXFEL

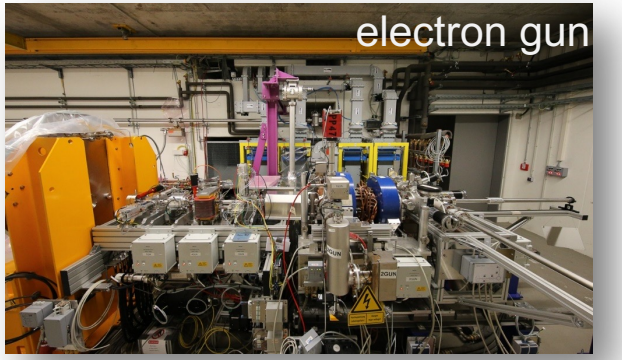
Future Light Sources FLS 2023
August 28th, 2023

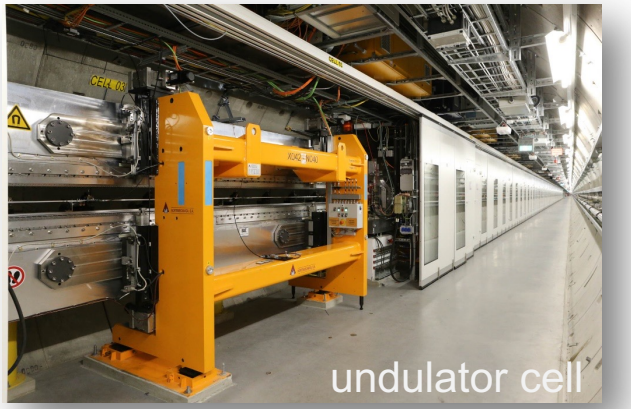
European XFEL

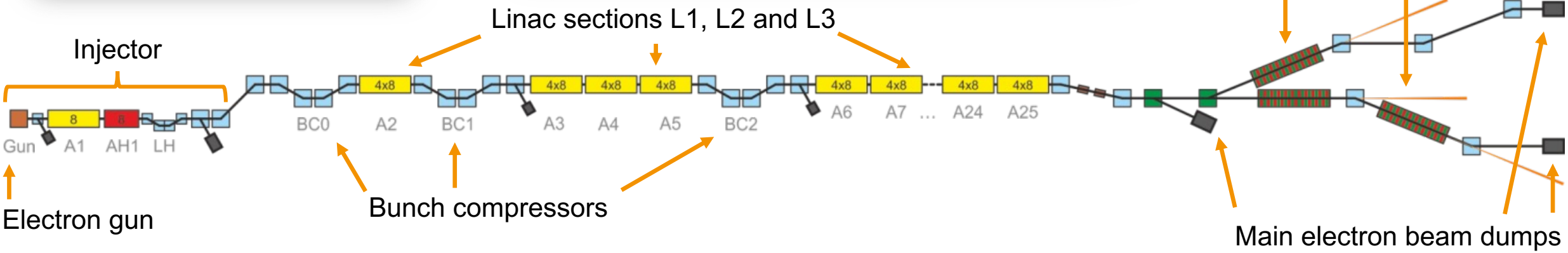
European XFEL



EuXFEL Accelerator





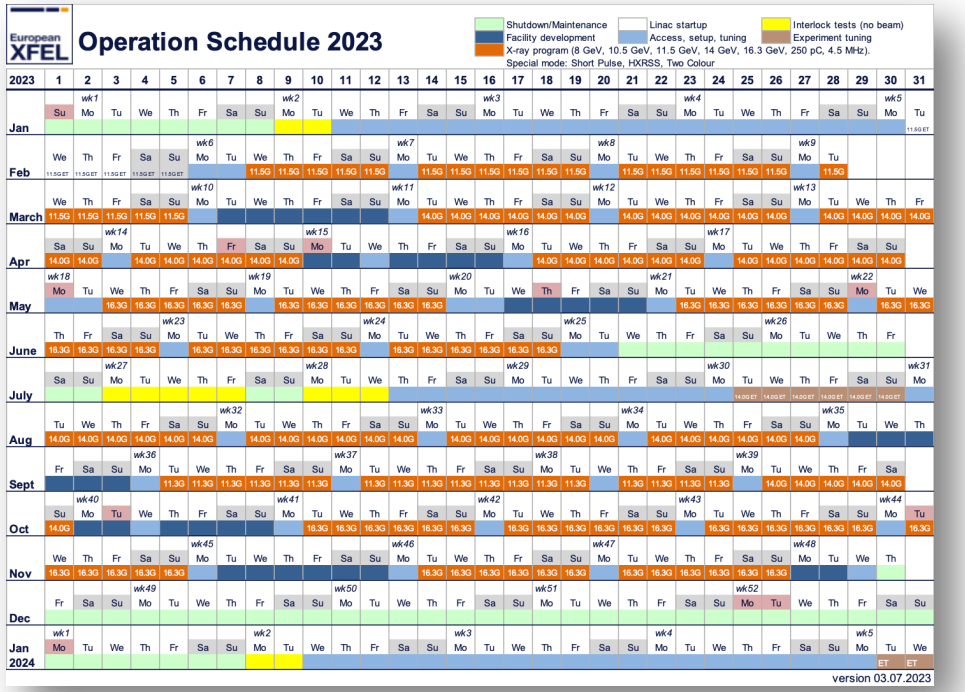


Electron accelerator is operated from the DESY campus in Hamburg Bahrenfeld.

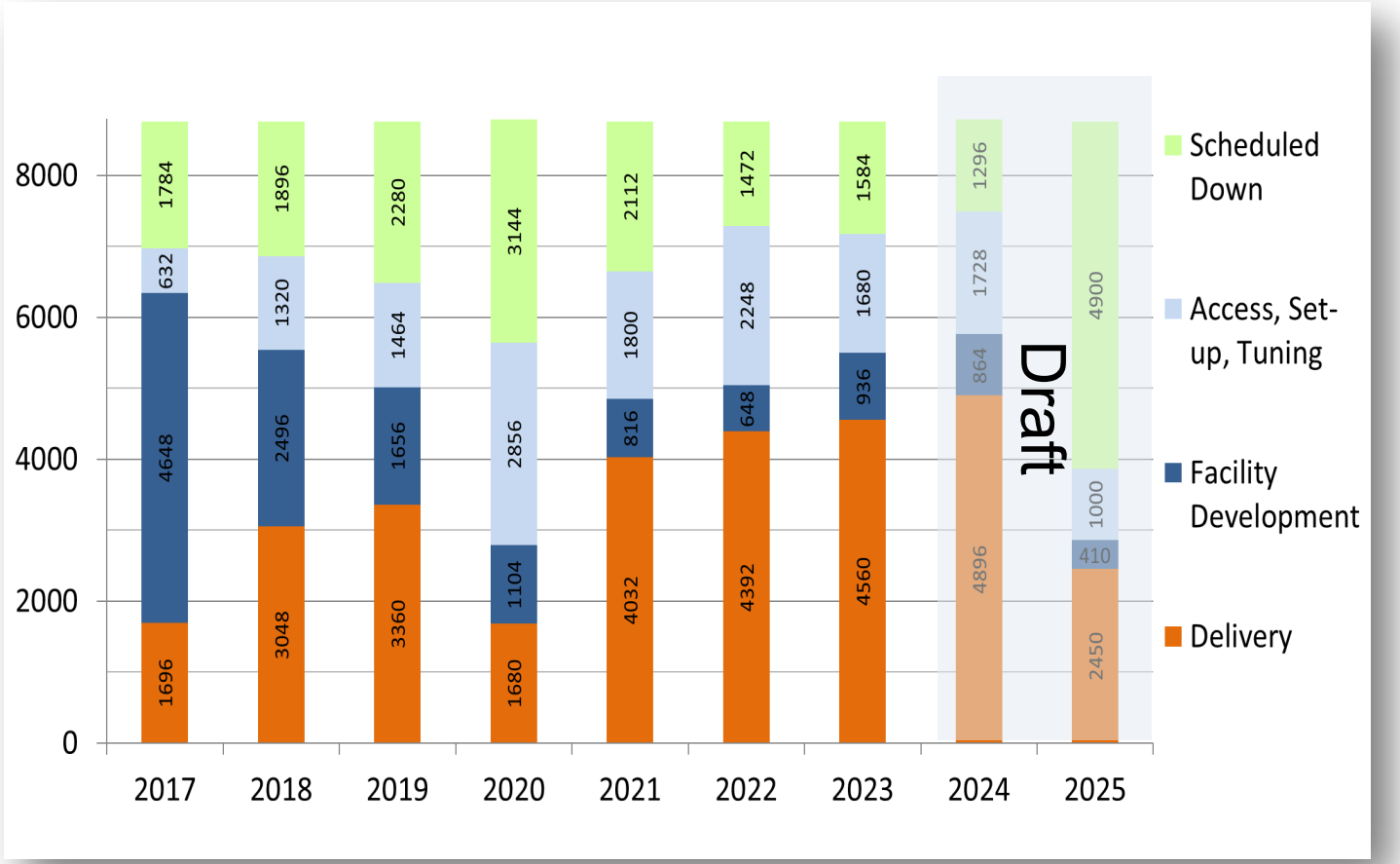
The photon beamlines and photon diagnostics as well as the instruments are operated from the EuXFEL campus in Schenefeld.

Over 4500 hours of scheduled X-ray delivery in 2023

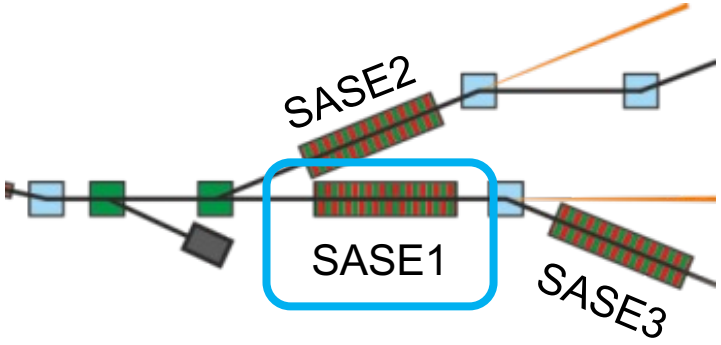
Operation schedule 2023



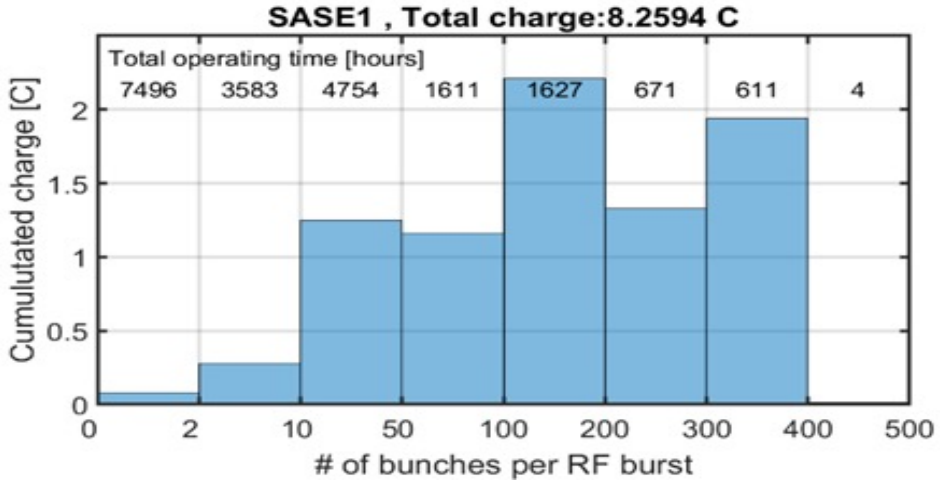
Development since start of the facility

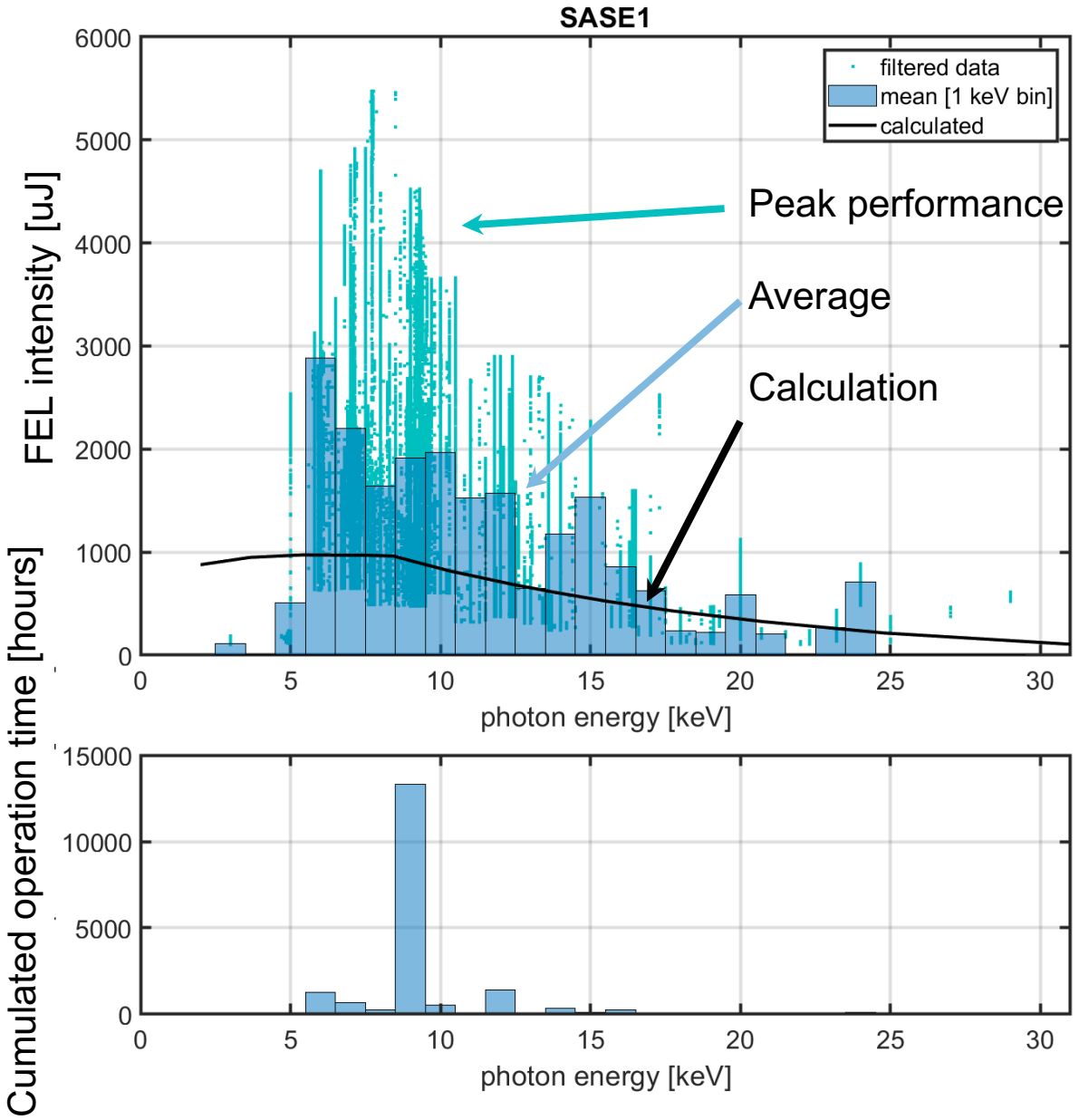


SASE performance - SASE1

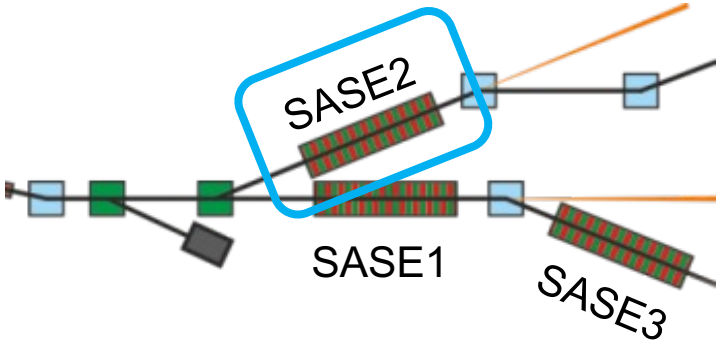


- Peak performance with >5 mJ @ 6 keV photon energy
- SASE1 is mainly operated at 9.3 keV

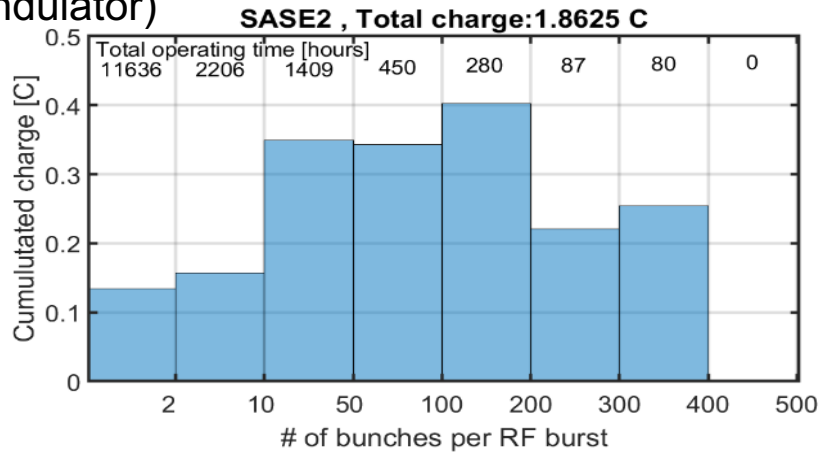


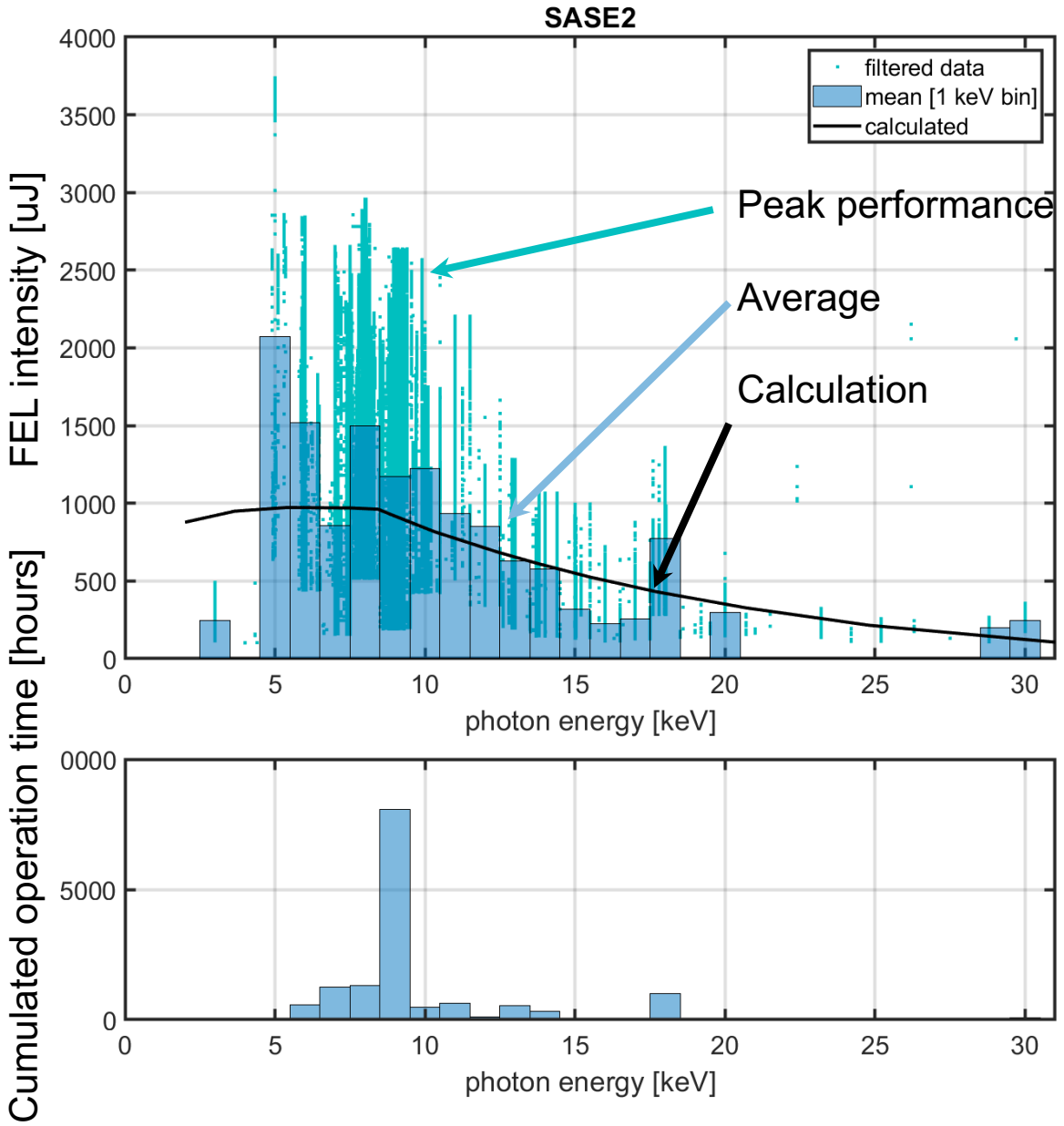


SASE performance - SASE2

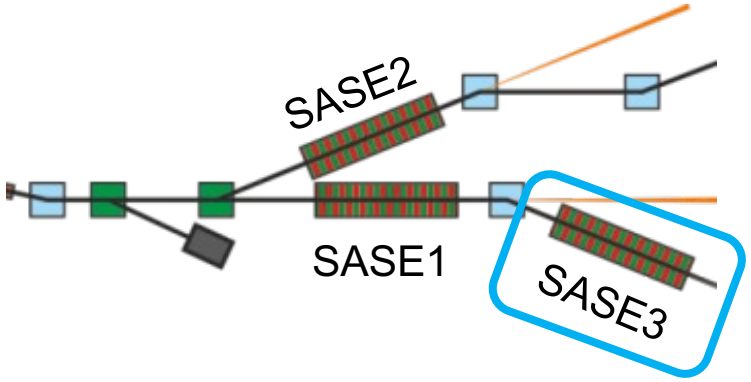


- Peak performance >3.5 mJ @ 5 keV
- Overall performance below SASE1. Attributed to more complicated beamline upstream (extraction arc), more frequent energy changes, special mode operations
- Specific Modes: Hard X-ray Self-Seeding, 2 color (split undulator)

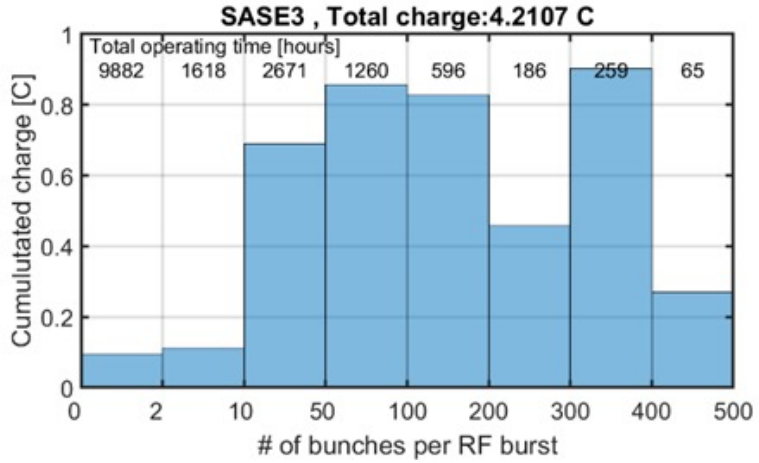


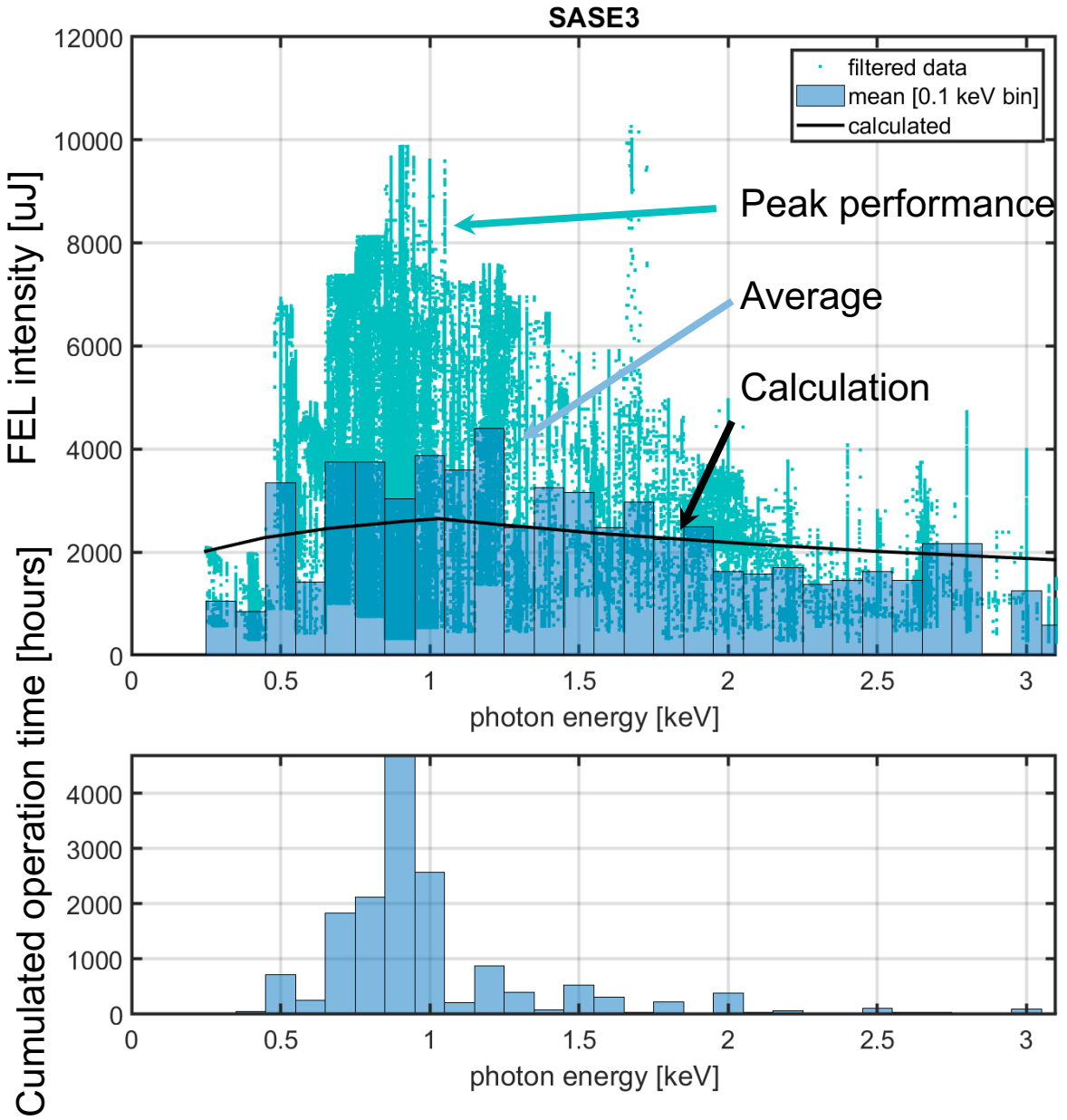


SASE performance - SASE3

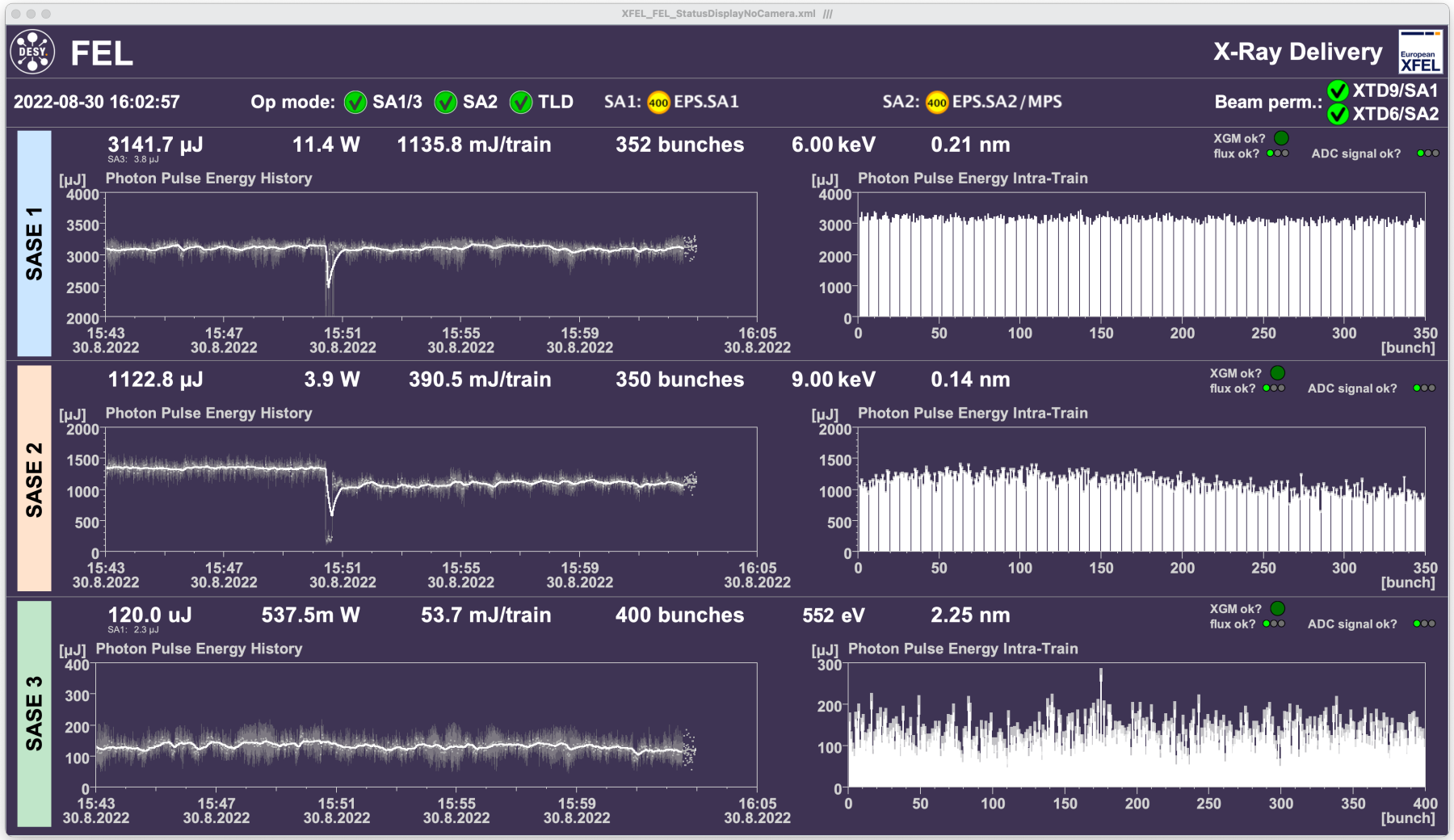


- Dominant photon energy around 900 eV
- Often not request max pulse energies but often also short source lengths or small bandwidths.
- Specific Modes: Two color (split undulator), variable polarization





Long pulse trains



Many bunch capabilities of European XFEL are more and more apparent during user runs.

Here a total of 1142 pulses lasing at the same time

Reference to related FLS contributions

WE4P05 Jiawei, HXRSS with Orbital Angular Momentum

WE4P06 Jiawei Bayesian optimization of XFELs

MO1L3 Talk by Ye
Hard X-rays beyond 25 keV

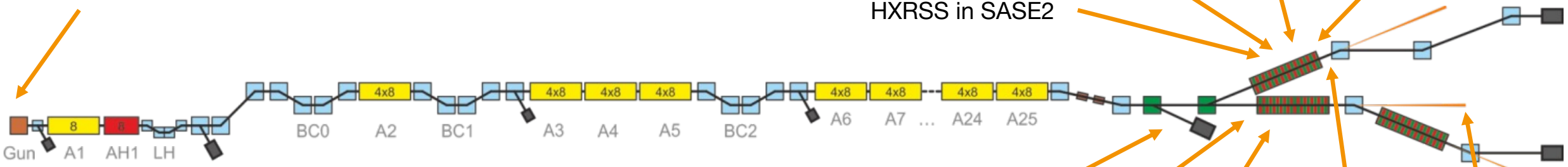
WE4P01 Christoph, SC afterburner simulations

TH1D1 Talk by Johann, SU

WE3A5 Talk by Sandeep
Cathode development

WE3D1 Talk by Holger
Femtosecond Synchronization

TU2A3 Talk by Shan
HXRSS in SASE2



MO4C3 Talk by Illya (INFN)
Generation of GeV photons

WE4P07 Philipp, long. phase space diagnostic

WE4P02 Matthias, High duty cycle operation

WE4P04 Bolko
RF modulation

WE4P08 Philipp, long. phase space manipulation

WE3A1 Talk by Romain, High pulse rate experiments

TH3D2 Andrew
Radiation studies

TH2A1 Talk by Weilun
Dechirper System

TH2A2 Talk by Jiawei
Attosecond pulses

Only the first authors are listed. Titles are shortened. Please have a look at the contributions!

Developments

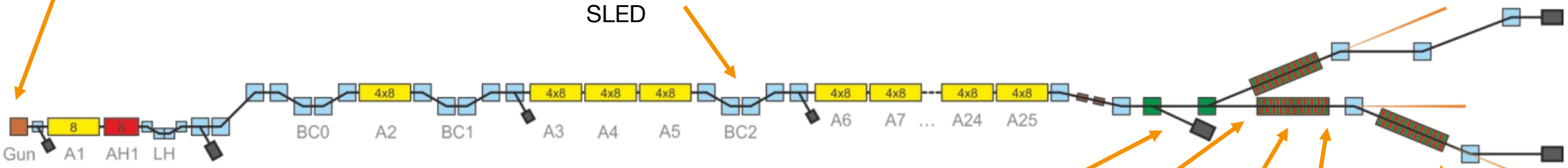
He valve maintenance (-> long shutdown in 2025 including warm up of the linac)

Super conducting undulators

Gun 5 (will be installed in 2025)

BC2 TDS SLED

THz generation



QED studies (LUXE)

XFELO Demo

NEPAL laser (already tested)

CW gun development

Short pulses (ASPECT)

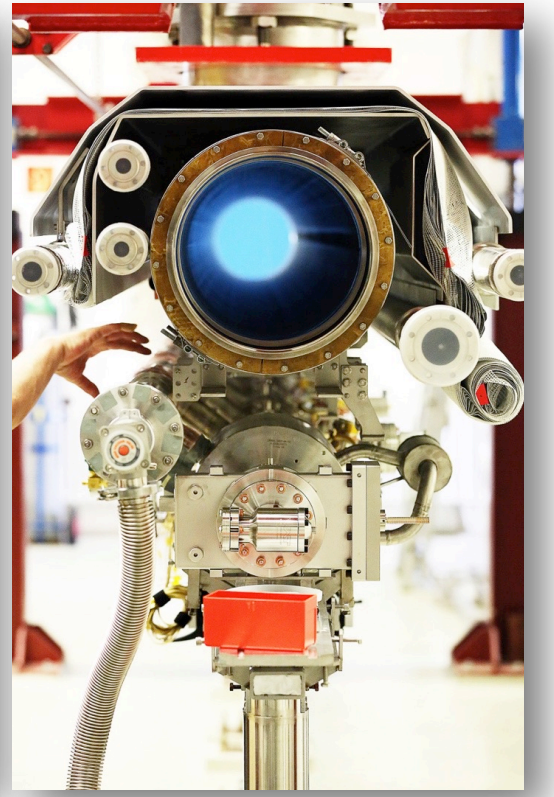
Seeding SASE1

Apple X undulator re-installation

Magnetic bearings for cold compressors

Developments with various time scales





Thank you for your attention