Status of the Standard Diagnostic Systems of the European XFEL

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For the E-XFEL Diagnostic Team

Abstract:
The European XFEL, an international X-ray free-electron-laser user facility based on a 17.5 GeV superconducting LINAC, is currently under construction close to the DESY site at Hamburg. The facility is organized as a limited liability company, with shareholders from all participating countries. DESY is in charge of the construction and operation of the accelerator. This contribution will report the status of the standard diagnostic systems of this facility. The design phase has finished for all main systems; most of the components are in production or are already produced. This paper will show details of the main systems, their installation issues and will report on the future time schedule.

17.5 GeV Superconducting LINAC
- 2700 bunches per RF cube
- 10 Hz Rep Rate
- Arbitrary bunch patterns
- 5 Beamlines possible, start with
  2 Hard X-Ray (0.5 Å)
  1 Soft X-Ray SASE line
- 2 further SASE or stationary devices possible
- Future Option: 2nd Fan out.

BPM System supplied by PSI, CEA and DESY as a common InKind Contribution
Working Horse: Button BPMs, 297 BPMs, Mechanics DESY, Electronics PSI

Beam Tests; Resolution:
- 30 µm (cold) / 11 µm (warm) @ 30 µA
- 5 µm (cold) / 3 µm (warm) @ 0.1 - 1 nC

2 Types of Cavity BPMs, 103 “Undulator”, 26 “Beamline”, Mechanics DESY; Electronics PSI
- Both types work at 3.3 GHz with similar (keV/Q)
- Same Electronics for both
- Already commissioned and in use @ FLASH

BPM Resolution:
- Unit: 0.5 µm @ 0.1 - 1 nC
- 11 µm @ 2 µA
- BL: 1 µm @ 0.1 - 1 nC

Chargemetricine (C) - XEFEL - 3 Faraday Cups, 9 Current Monitors, 26 Toroids
Faraday Cups only at the Gun
- Dark Current Monitor (3 GHz low Q Cavity)
- Injector, around chicane and after Collimation
- Sensitive to nA DC and IC Bunches
- Toroids:
  - based on DESY standard Devices
  - Front-End with differential Signals
  - pTCA Electronics with Bunch by Bunch FPGA processing, providing low latency transmission, Bunch Pattern and Charge Validation Interlocks

E-XFEL Commissioning and Schedule

XFEL Schedule
- First Module installed in XTL @
- Griders Assembly for Injector and BC started @
- Complete Gun Section and start RF => Sept 14
- First Photoelectrons from Gun => Oct 14
- Complete Installation of the injector => May 15
- LINAC installation completes, start Cool down => July 16
- First beam down the SASEI Dump => Dec 16
- First Lasing => March 16
- LIT

Many XFEL Systems are also used for FLASH II
- Cavity BPMs
- BLM System
- Screen System

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References

www.xfel.eu