

ESRF

The European Synchrotron

Activity report

T. Martin on behalf of the Detector Unit

➤ First high-energy synchrotron of the new generation

- Replacement of the 32 cells in the ring
- Increase of brilliance and coherence (less divergence and smaller in size)
- Flux: 100x more intense than previous source



➤ Current and emittance

- Today: 200mA with 126.6pm H and 10pm V
- Availability: 96.08% in 2020, 98.8% in 2021
- Objective Dec. 2021: 200mA : 135pm H and <10pm V

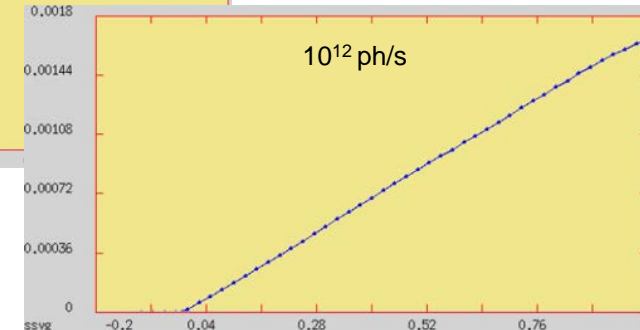
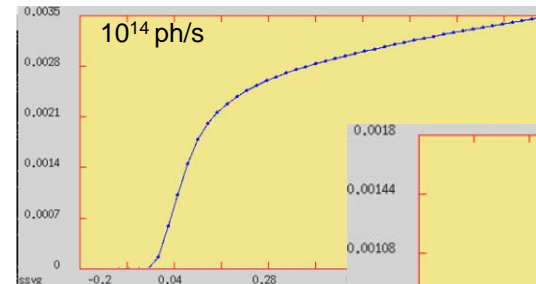
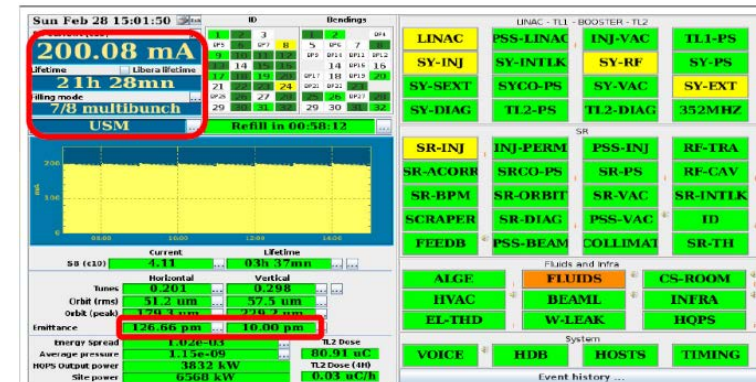


➤ Beamlines are operational

- Flux: up to 10^{16} ph/sec in monochromatic

➤ Our Challenges

- Flux (non linearity, radiation damage)
- Detection of higher energy X-rays



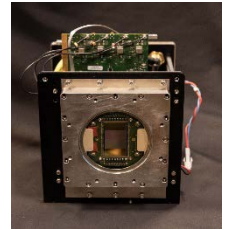
Cameras for imaging detectors

- 16-channel Frelon Camera, $16 \times 16 \mu\text{m}^2$, 1920×1920 pixels, 37fps, 270ke
- Characterization campaign of new sCMOS sensor (Gpixel and custom) : ANDOR, FLI, Princeton, Ximea, AXIS Photonique



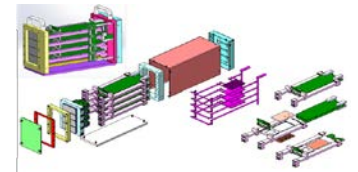
Optics design

- Design of detector head for ultra fast XRI applications
- Design of zoom optics for pink beam XRI applications



Engineering and production of thin film scintillators

- Production of GGG:Eu, GGG:Tb and LSO:Tb (1 to $50 \mu\text{m}$)
- Dev. & production of LSO:Ce on YbSO for ultra fast imaging (1 to $20 \mu\text{m}$)
- Dev. of free standing LYSO:Ce , down to $40 \mu\text{m}$

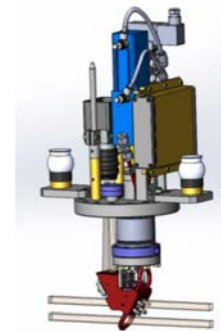


Hybrid pixel detectors

- Installation of EIGER detectors from PSI: Cooling and software integration (2 systems + 1 to come)

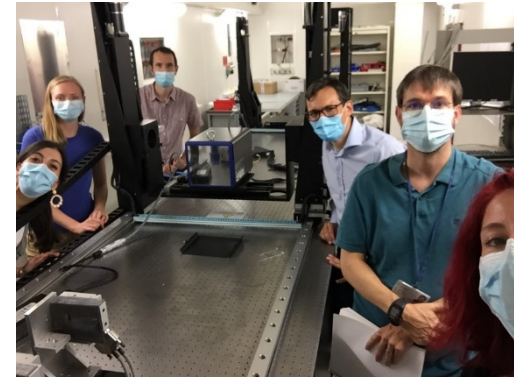
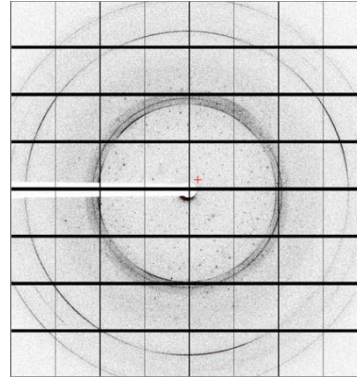
Diagnostics

- Installation of white beam viewers for BLs restart
- Design of compact 4-quadrants Si with a central hole
- Design of fast Ionization Chamber



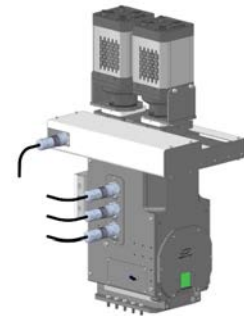
Hybrid pixel detectors

- EIGER2 (8 systems, 1M-W to 16M)
- Pilatus3 (2 systems, custom and 2M)
- Sensors: 8x CdTe, 2x Si



Cameras

- sCMOS cameras: PCO, ANDOR, Ximea, Axis Photonique
- Ultra fast camera: Photron (CFT, 3 cameras tested)



Optics

- White beam microscopes: Monochromatic and twin microscope objectives
- Compact zoom optics with 4 scintillators and 2 cameras



Spectroscopy detectors

- Single element : 2mm thick Si from Hitachi
- Multi-elements: 3 and 7 elements from Hitachi
- Multi-elements: 18elts Ge from Mirion on CRG (2 systems)



THE ESRF DETECTOR DEVELOPMENT PLAN (DDP)

- Development to address the new MBA ESRF-EBS lattice
- Collaboration with microelectronics design groups
 - Dev. phase ->2023

- In-house expertise
- Custom design for BLs
 - TSV
- Vehicle for data acquisition

- Collaboration with PSI
- Evaluation of charge integrating detector
- BLs deployment

- Collaboration with SPring-8
- Optical coupling for indirect detection

DETECTORS

TECHNOLOGY

R&D activities

XIDER *

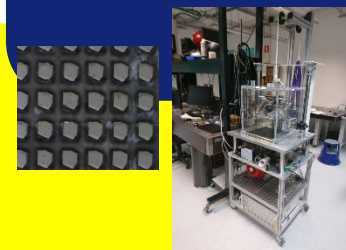
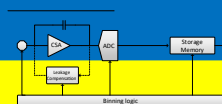
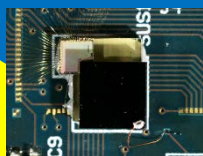
SPHIRD *

Medipix3

SMARTPIX

JUNGFRAU

CITIUS



Pixelated semiconductor sensors

Distributed control and data acquisition *

Scintillator sensors* and FOP coupling

SDD and Ge Detectors

* : flash talk