Photon Diagnostics @ Synchrotron SOLEIL

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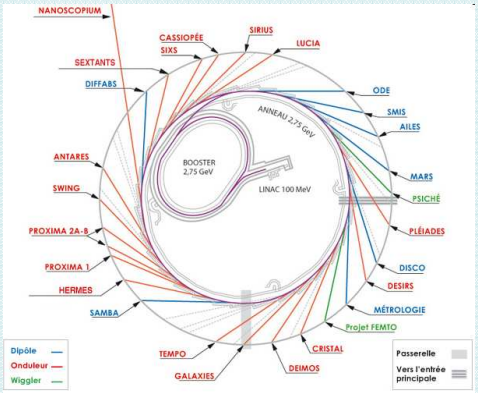
SOLEIL light source :

Main e- beam parameters:

E=2.75 GeV
Circumference=354 m
Rev. periode=1.18 µs (846 kHz)
Energy dispersion=0.1016%
Emittance=3.74 nm.rad
Pulse duration= 13.8 ps-rms

Implemented beam lines:

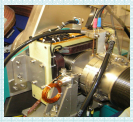
26 beam lines in operation
Photon energies: from IR to hard X rays (<100 keV)
Bending magnet + ID beamlines

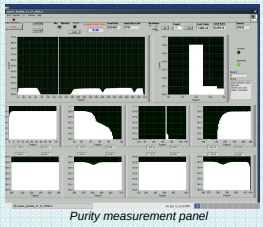


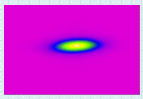
The Diagnostics Group:

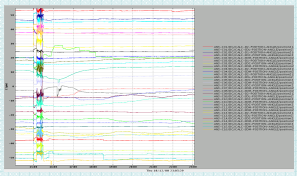
Diagnostics for machine operation:

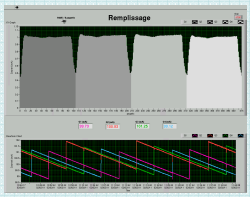
* FCT/DCCT:
  → Beam charge measurement
* BPMs:
  → Beam position measurement
  → Slow Orbit Feedback
  → Fast Orbit Feedback
* XBPM:
  → Photon beam position measurement
* Pinhole camera:
  → emittance measurement
* Streak camera:
  → Bunch length measurement
* Fast diodes:
  → Filling measurement
  → Purity measurement
* Dosimeters / scintillators:
  → Beam loss measurement


BPM + fast corrector


Purity measurement panel

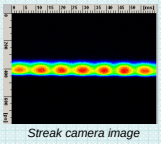

Pinhole camera image


Stabilization of source points with FOFB



Filling measurement panel


XBPMs before installation


Streak camera image

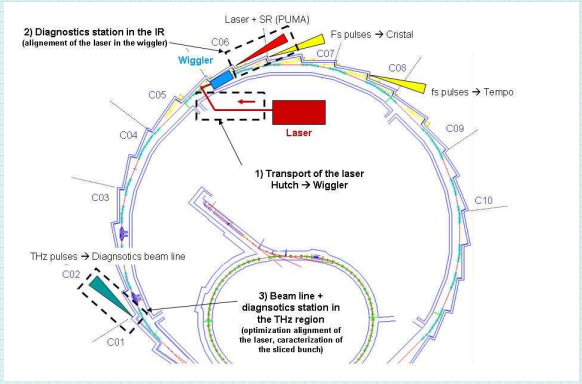
The Slicing Project:

Principles:

A femtosecond laser + picosecond electron bunch
→ fs slice of an electron bunch
A fs slice of electron bunch + Insertion device
→ fs X-ray pulse ➔ **Time resolved experiments**

Tasks = Provide diagnostics to:

* Transport the laser from the hutch to the wiggler
  → Near field imaging on CCD
* Align the laser (spatial, temporal and spectral)
  → Diodes, spectrometer, direct imaging inside tunnel
* Maintain laser alignment over ~1 week:
  → Feedback loops on CCD or 4Q-diodes signals
* Monitor the efficiency of the slicing:
  → Fast bolometer to monitor the THz signal intensity



Other activities :

- @ Thom-X: support to the design of the ring diagnostics of the Compton based X-ray future source Thom-X (Orsay, France)
- @ SPARC: support to FEL experiments using harmonics generated in gas for seeding (Frascati, Italy)
- @ SOLEIL:
  - Design of the next beamline XBPMs
  - Simulations for 4th generation light source projects
  - Support to new bunch length experiments (cf. M.A. Tordeux)
  - Support to bunch transverse size measurement for beam instability studies (cf. R. Nagaoka)