Radiation Safety of New X-ray Free Electron laser facility at SPring-8

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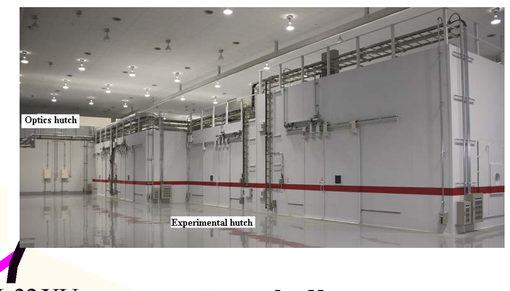
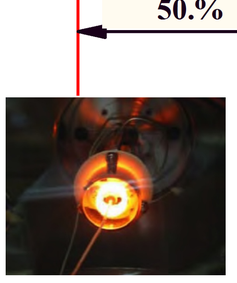


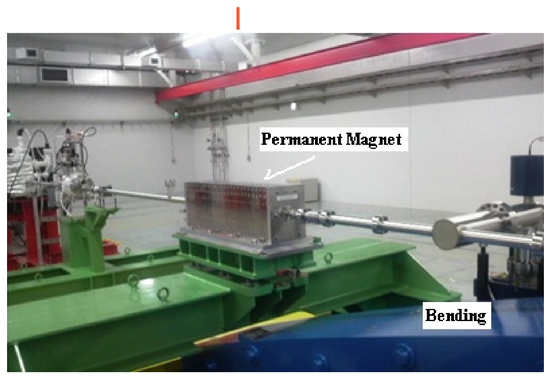
Exp. hall



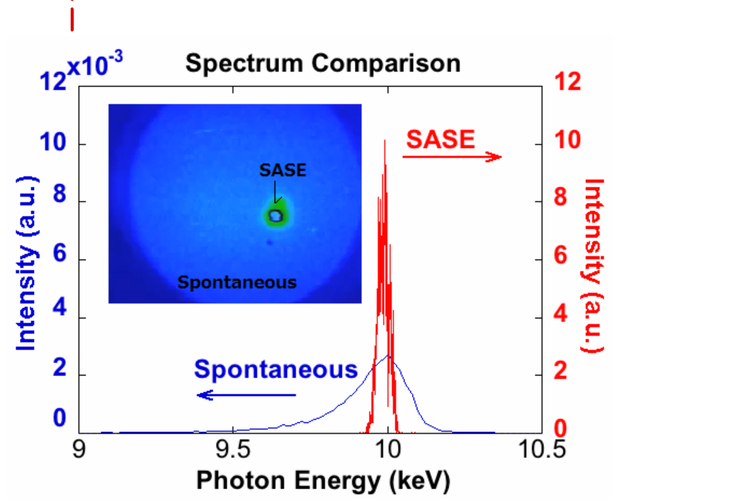
Electron gun

C-band accelerator

Undulator

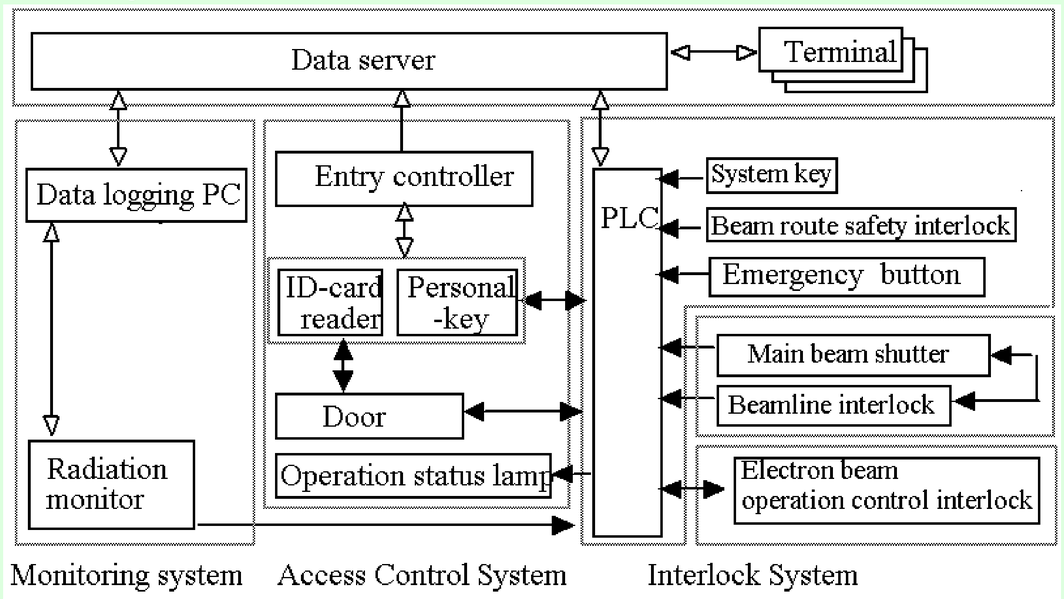


Front-end (dump magnet, permanent mag., collimators)

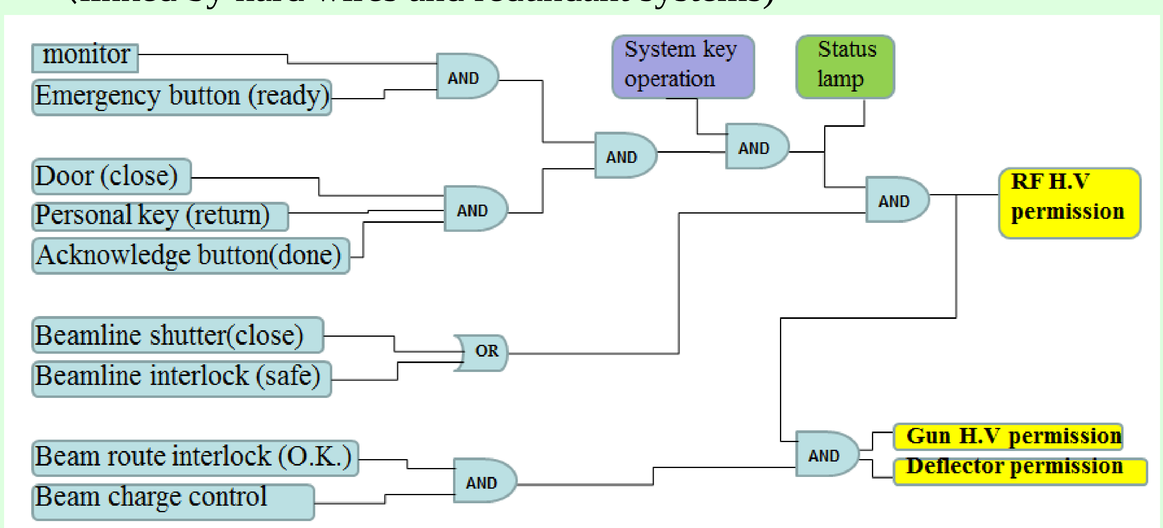


Laser spectrum (Self Amplitude Spontaneous Emission free electron laser, Undulator light)

Interlock system

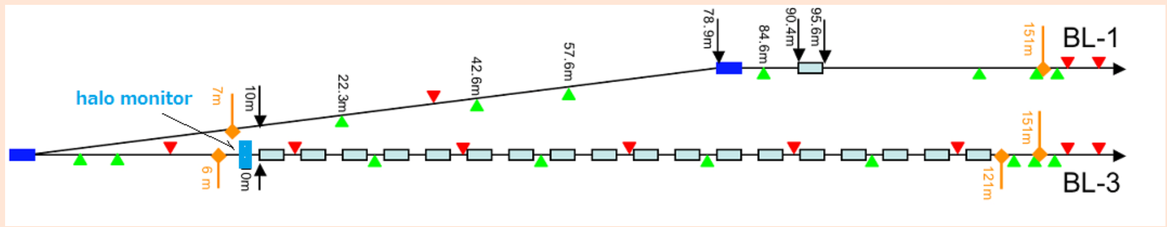


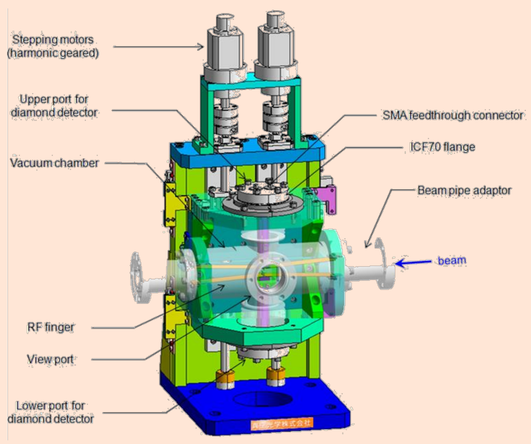
The system is fundamentally same between SR and XFEL (linked by hard wires and redundant systems)



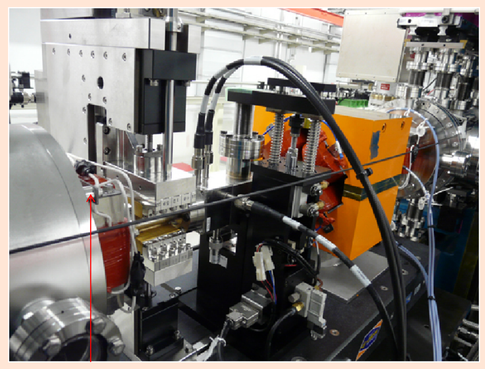
Outline of accelerator interlock logic (the permissions of the gun H.V and deflector are canceled within 16ms when the significant failure of the safety interlock system is occurred. [(3)])

Inside monitors within shield tunnel to reduce unwanted electron beam loss and leakage dose





Diamond based beam halo monitor[(1)]



Fiber based Cherenkov beam loss monitor [(2)]

Summary

There are no marked increase of leakage doses outside the shield tunnel including the optics hutches until now including the commissioning even though the lower repetition rates. Using a beam halo monitor and Cherenkov beam loss monitors, unwanted accelerated electron beam losses can be decreased successfully. The safety interlock system of SACLA is fundamentally same as that of SPring-8, however the beam loss rates at the SACLA beamlines are one order or more higher than the SPring-8 beamlines so that radiation safety design should be more carefully such as installing a permanent magnet.

Reference

(1) H.Aoyagi, Y.Asano, et al., Physical Review ST Accelerators and beams 15 (2012)
(2) X.M.Marechal, Y.Asano, T.Itoga , Nuclear Instruments and Methods A 673 (2012)
(3) M.Kago et al., Proceedings of ICALEPS2011 ESRF France (2011)