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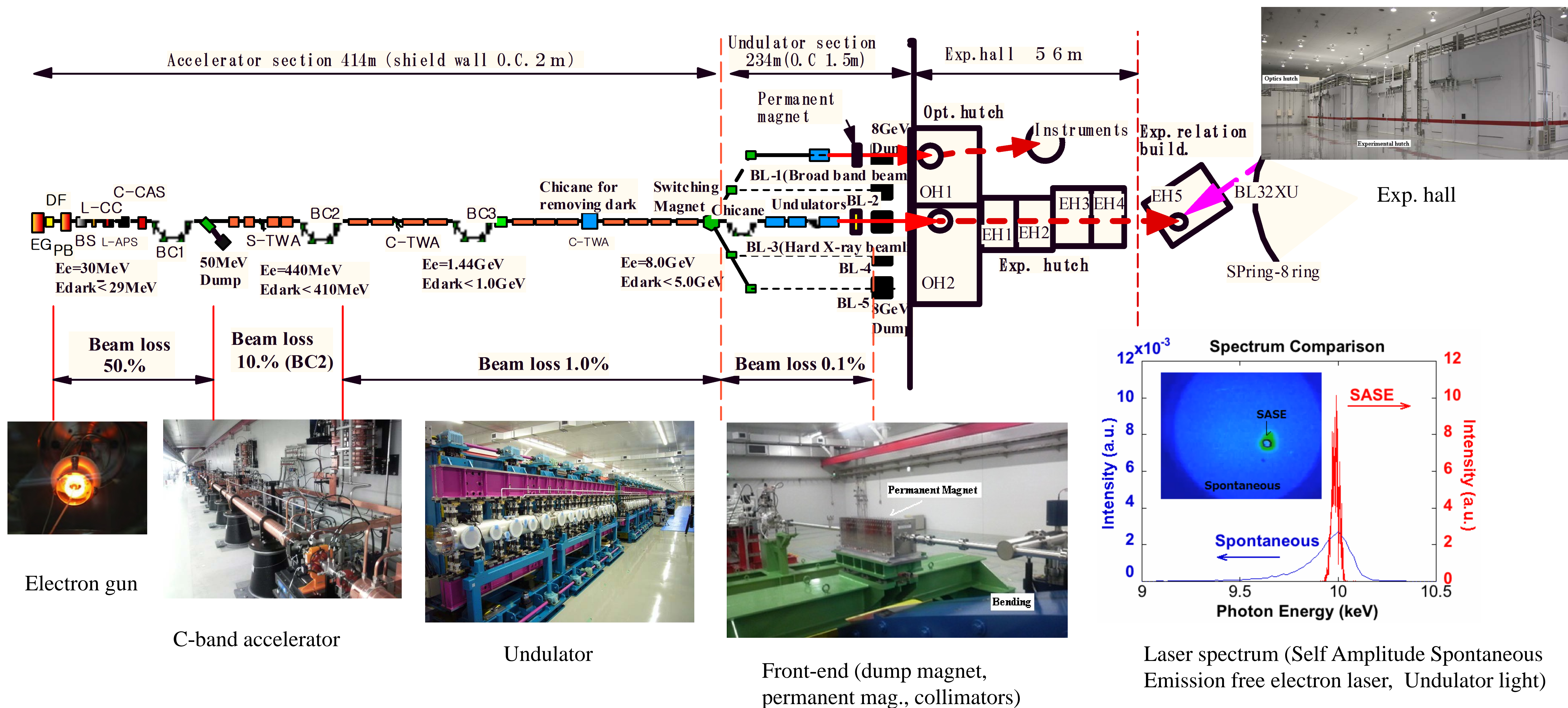
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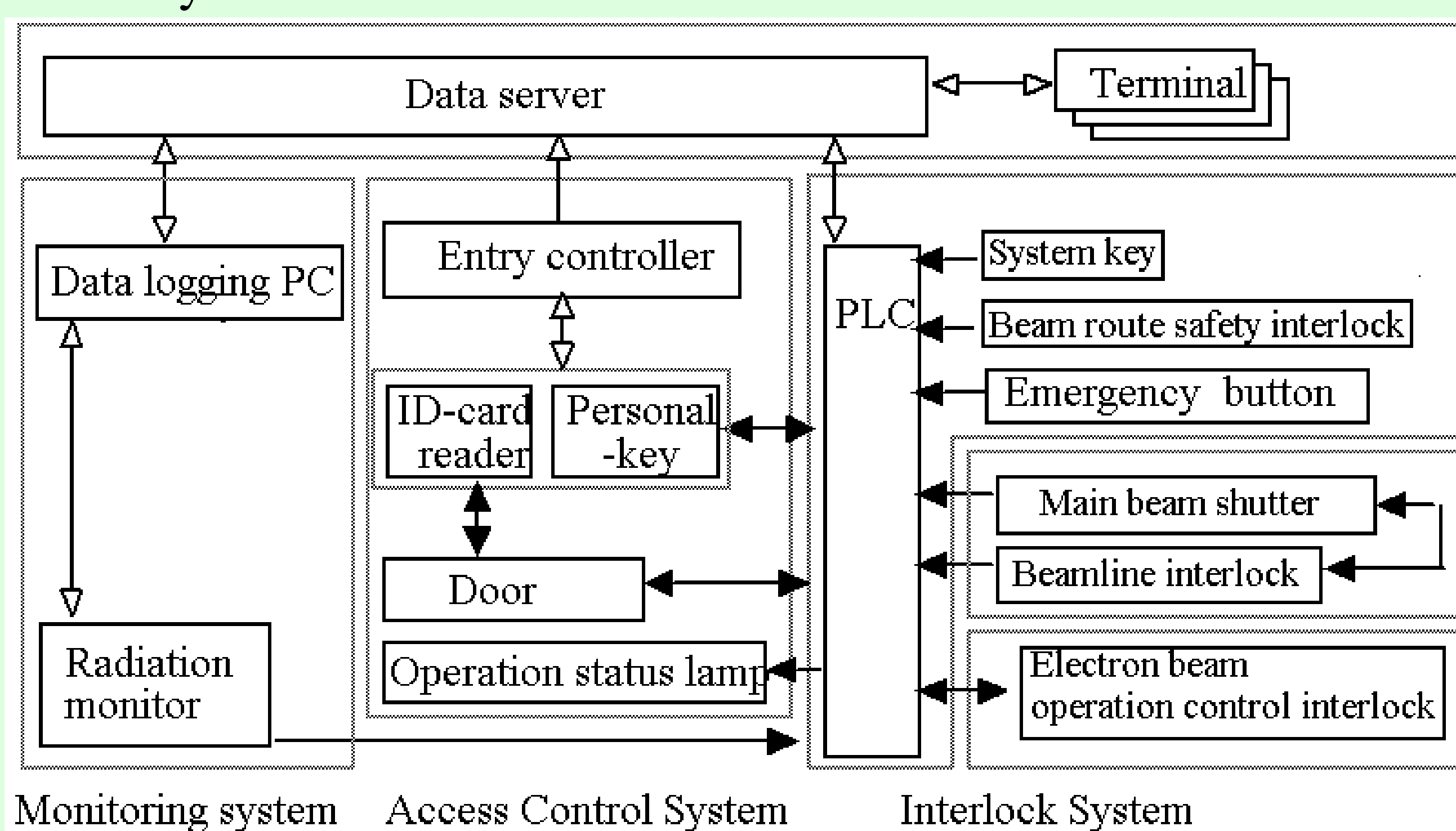


Introduction:

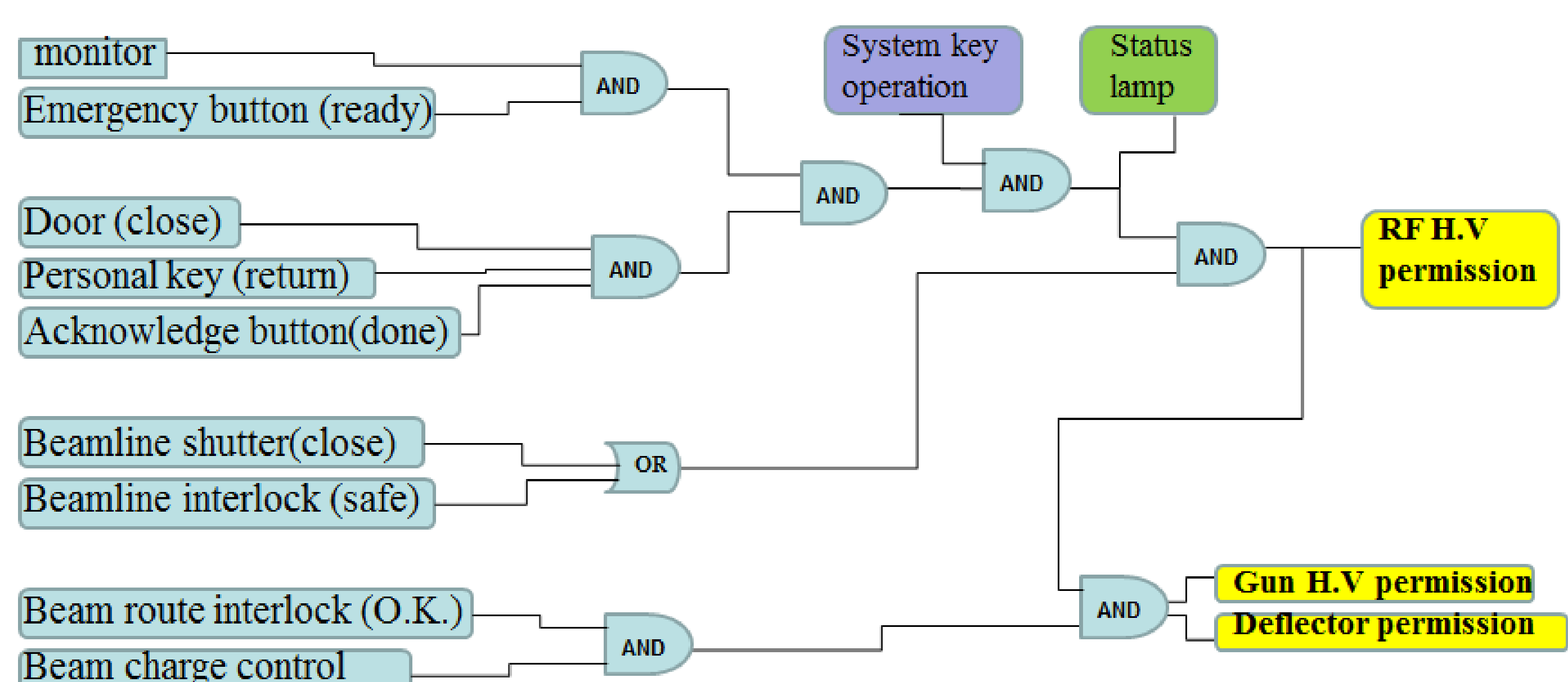
The 8 GeV class X-ray Free Electron Laser facility at SPring-8 (SACLA; SPring-8 Angstrom Compact free electron LASer) has just started the operation to provide the X-ray laser with the shortest wavelength of less than 0.1 nm. SACLA is based on three new technologies. One is the low emittance thermionic gun, one is the C-band accelerators of up to 8.5 GeV and 30 nC/s, the other is the in-vacuum type undulators. The length of this system is about 414m, 234m, and 56m for the accelerator section, the undulator section, and the experimental hall, respectively. Based on the ALARA principles, the radiation shielding design criteria at the SPring-8 site are 8.5 $\mu\text{Sv/h}$, 2.5 $\mu\text{Sv/h}$, and 100 $\mu\text{Sv/y}$, for the radiation controlled area, the boundary of the controlled area, and the site boundary, respectively. In addition to the radiation monitors outside the shield tunnel, a beam halo monitor and beam loss monitors have been installed inside the tunnel to prevent unwanted electron beam losses.



Interlock system

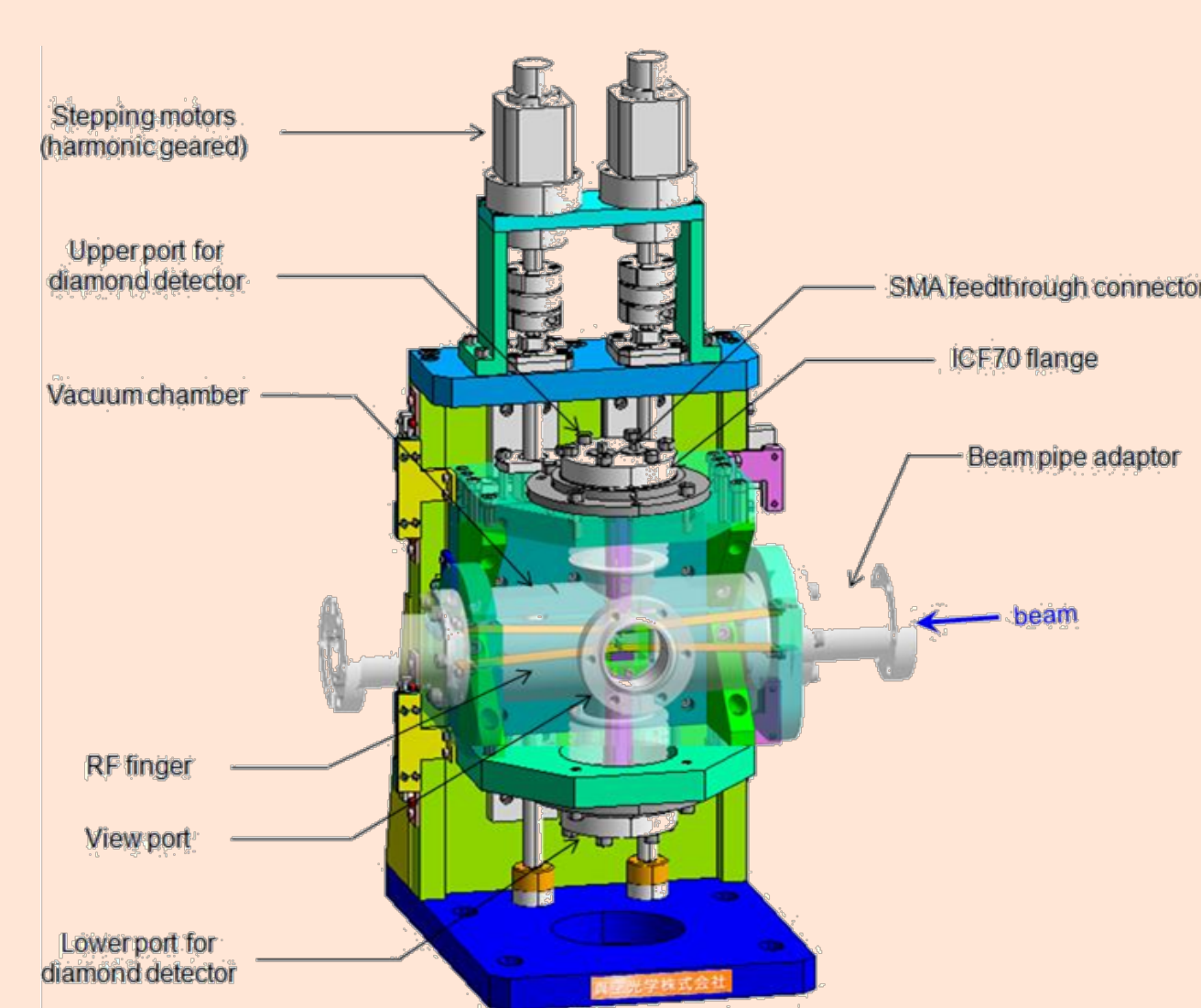
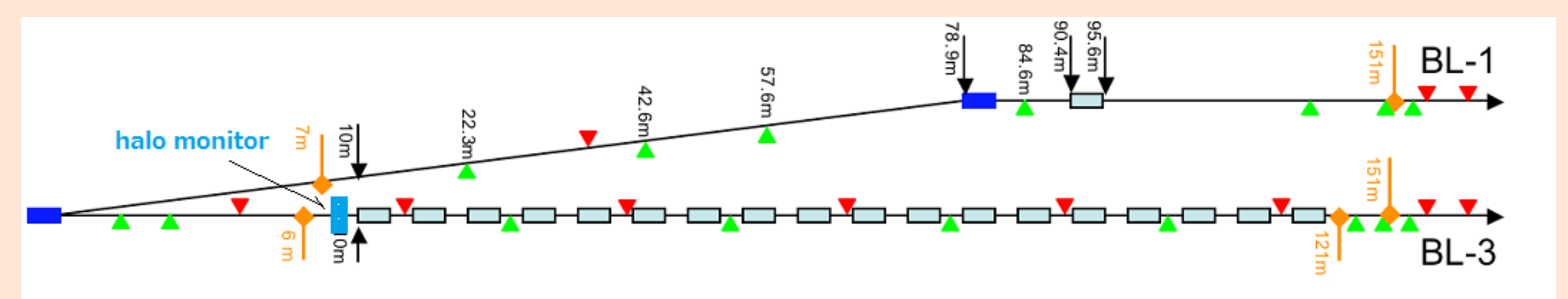


The system is fundamentally same between SR and XFEL (linked by hard wires and redundant systems)

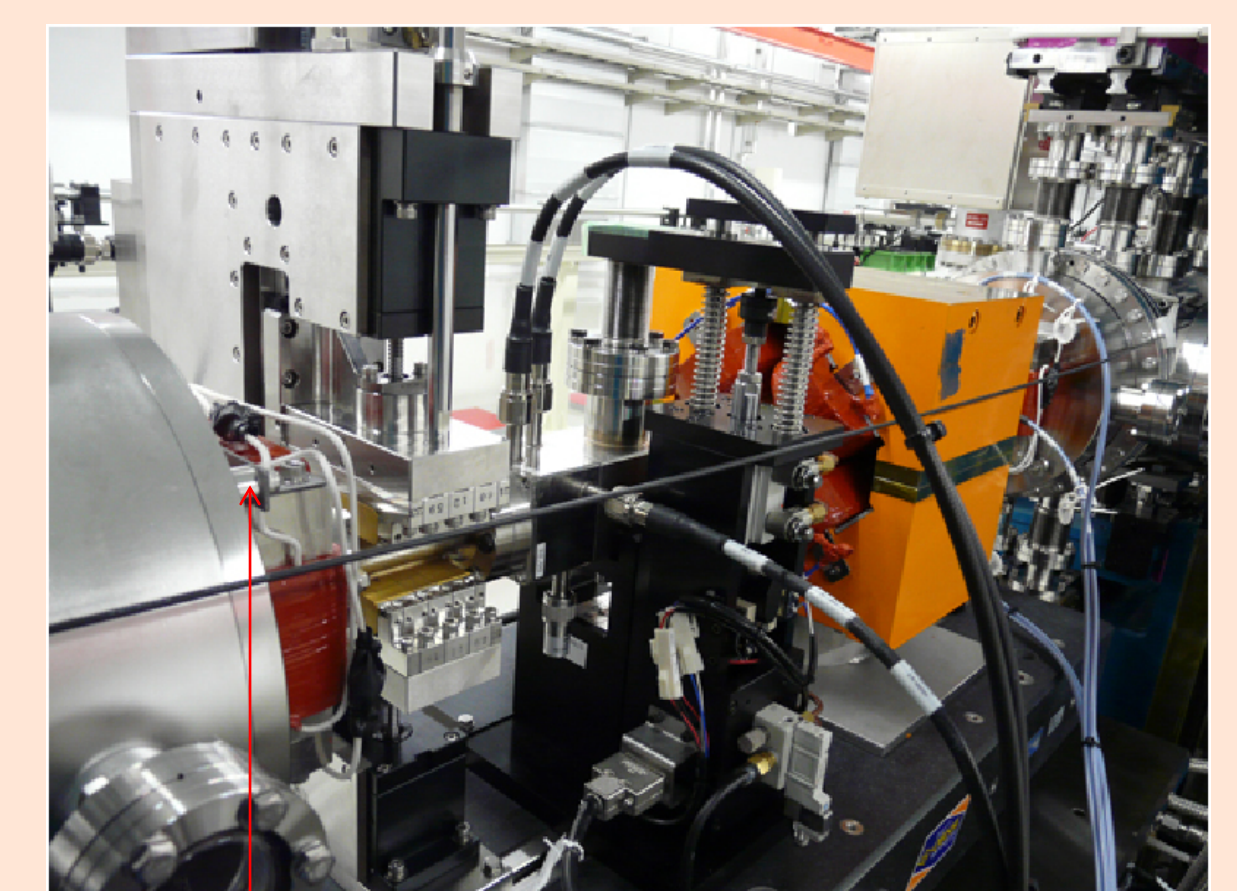


Outline of accelerator interlock logic (the permissions of the gun H.V and deflector are canceled within 16ms when the significant failure of the safety interlock system is occurred. ⁽³⁾)

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)