

Shielding Design of the SPring-8 XFEL Facility

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Abstract

The 8 GeV class X-ray Free Electron Laser facility at SPring-8 (SPring-8/XFEL) is now under construction to obtain the laser with the shortest wavelength of less than 0.1 nm based on the practical experience of the SCSS prototype facility (250MeV, 30nC/s) [1]. SPring-8/XFEL is based on three new technologies. One is the low emittance thermionic gun, one is the C-band accelerators of up to 8GeV and 60 nC/s, the other is the in-vacuum type undulators. The length of this system is about 415m, 235m, and 66m for the accelerator section, the undulator section, and experimental section, respectively. The location of the SPring-8/XFEL and SPring-8 are shown in Fig.1 as an image photo. The accelerated 8 GeV electrons passing through the undulator with about 120m length go down into beam dump with the inclined angle of 20 degrees, and then the laser lights go straight into the experimental area through the shield wall. Based on the ALARA principles, the design criteria at SPring-8 site are $8 \mu\text{ Sv/h}$, $2.5 \mu\text{ Sv/h}$, and $100 \mu\text{ Sv/y}$, for radiation controlled area, the boundary of the controlled area, and the site boundary, respectively. For the shielding design of the facility, we employed the SHIELD11 code [2], analytical methods and the Monte Carlo code FLUKA [3], and the results were compared with each other.

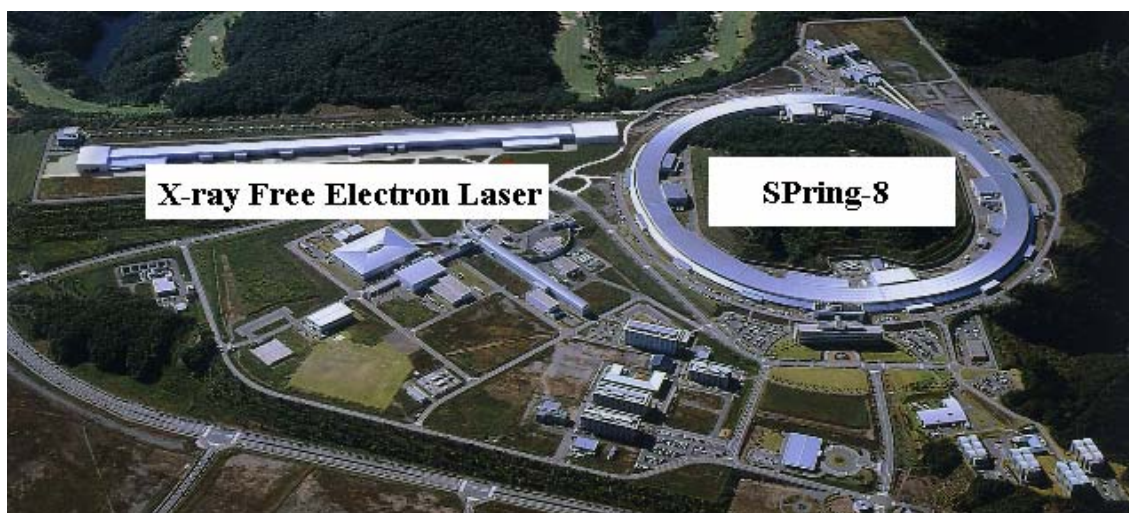


Fig.1 Image picture at the SPring-8 site.

References

- [1] T.Shintake et al., "A Compact free-electron laser for generating coherent radiation in the extreme ultraviolet region", Nature Photonics Vol.2 p555-559 (2008)
- [2] W.R.Nelson & T.M.Jenkins, "The SHIELD 11 Computer code", SLAC-Report 737 (2005).
- [3] A.Fasso, A.Ferrari, J.Ranft and P.R.Sala, FLUKA Proc. Monte Carlo 2000 Conf. Lisbon 955-960 (2001) [http:// www.fluka.org](http://www.fluka.org)