Coherent Properties of FEL Light available at SCSS

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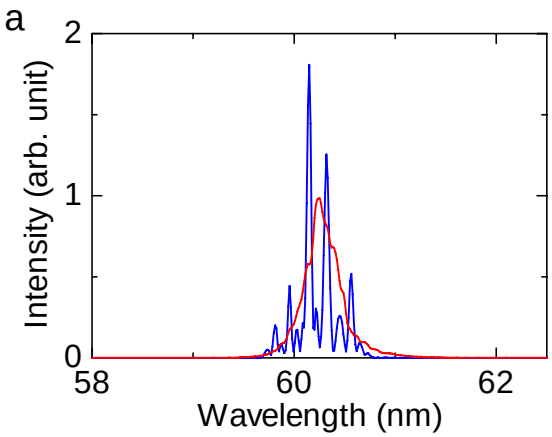
Our design concept of SCSS: SPring-8 Compact SASE Source uses lower energy of electron beam, which makes machine size compact, while limits coherence since the actual emittance becomes larger at lower energy for a given normalized emittance. Therefore, higher electron beam is favorable to produce higher coherent light, which requires longer machine size. Our SCSS concept uses a short period undulator and lower energy electron beam, higher gradient accelerator, all of which make the machine size compact. Lower electron beam energy makes emittance larger and coherency lower.

However, recent measurement on FEL gain in the SCSS test accelerator gave answer on emittance as 0.6 π.mm.mrad only. This ultra-low emittance compensates draw-back of lower beam energy design, i.e., 8 GeV with 0.6 π.mm.mrad will provide same coherency with 14 GeV with 1 π.mm.mrad, The talk will cover the experimental experience of our SCSS test accelerator and expectation of 8 GeV XFEL machine at SPring-8, which will be in operation in 2010.



Spectrum measured at SCSS. Multi-longitudinal mode limits temporal coherency, which will be drastically improved by introducing seeding laser.