

Status of LLRF technology at SPring-8

Tuesday, October 1, 2013 8:52 AM (17 minutes)

SPring-8 campus has three major accelerator complexes, which are the 8 GeV SPring-8 storage ring, the 1 GeV New-SUBARU storage ring, and the X-ray free-electron laser, SACLA. The individual accelerators have own independent LLRF systems to stably drive their high-power rf sources. These LLRF systems almost are independently working each other among SPring-8, New SUBARU and SACLA. The biggest future plan at the SPring-8 campus to expand ability for user experiments is an upgrade of the SPring-8 storage ring to a diffraction-limited ring, which is called SPring-8 II. A major change of the LLRF systems will be enforced by the SPring-8 II plan. An injection of an electron beam from SACLA to SPring-8 II ring is going to be necessary, because of a small dynamic aperture of the diffraction-limited ring. This means the injected electron beam must have a very small emittance of less than 1 mm mrad, which is already established by SACLA. From this relation, the LLRF systems of SACLA and the ring should be strongly coupled. A reference rf signal and a timing pulse should control both the SACLA and ring LLRF systems, respectively. However, the rf frequency of SACLA does not have any simple integer relationship to that of SPring-8. Therefore, we presently started design work for the synchronization system between the SACLA linac and SPring-8 II ring, and replacement from the present LLRF system for SPring-8 to SPring-8 II. The idea of the synchronization system is fully digital phase control architecture by using a 10 MHz accurate time reference signal to drive main signal oscillators of both the linac and ring and to realized about a 1 ps temporal accuracy to inject electron beam into the very small dynamic aperture of the ring. The replacement of the ring LLRF system will be done by using state-of-art technology, such as advanced TCA, to obtain further controllability than that of the present ring. This presentation introduces overall future plan of SPring-8 campus and some details of the synchronization system and the replacement of the ring LLRF system.

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Session Classification: Session1: Lab Status/Activities/Highlights