

# Improvements of transverse and longitudinal beam diagnostics in SACLA

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In the X-ray FEL facility SACLA, an electron beam with low slice emittance ( $\gamma\epsilon < 1 \mu\text{m rad}$ ), high peak-current ( $\sim 10 \text{ kA}$ ) and short bunch length ( $\sim 10 \text{ fs}$ ) is required for high quality FEL operations. We initially installed optical transition radiation (OTR) screen monitors for a beam profile measurement. Since the beam profile could not be observed due to intense coherent OTR, we replaced the OTR targets with Ce:YAG scintillator screens. We developed some techniques to separate scintillation light from COTR geometrically and temporally. As a result, COTR is now reduced to a negligible level and the beam profile and beam emittance are appropriately obtained. For the longitudinal diagnostics, one of the key issues was the adjustment of the longitudinal beam profile in the low-energy velocity-bunching section. Therefore, we newly installed a L-band transverse deflector cavity in this section. It helps tuning of the bunch compression in the low-energy part and the reproducibility of the longitudinal beam profile after a long shutdown period is substantially improved. In this presentation, we show the developed techniques and some of the results from the transverse and longitudinal diagnostics.

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