

Nonintercepting Imaging Diagnostics for the APS Injector during Storage Ring Top-up Operations*

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Abstract

The Advanced Photon Source (APS) is a third-generation x-ray synchrotron radiation user facility. We have recently implemented a top-up fill procedure for the 7-GeV storage ring (SR) that involves injection of beam every two minutes into the targeted rf bucket of the fill pattern to maintain the 100-mA stored beam current. This reduces the time available to evaluate beam quality in the injector, so intercepting screens are not practical. This scenario resulted in a plan to upgrade our existing optical synchrotron radiation (OSR) monitors on the accumulator ring (AR) and the injector synchrotron (IS) and to evaluate other nonintercepting (NI) diagnostics techniques for the linac and various transport lines between the accelerators. We are exploring the addition of an OSR monitor on one dipole of the chicane bunch compressor located at the 150-MeV point in the linac and an optical diffraction radiation (ODR) monitor on the 7-GeV transport line between the IS and SR. In the first case, the signal level or OSR from 1 nC of charge in a single pulse is a challenge. In the latter case, the high gamma beam can be used with an ~ 1 -mm slit aperture to generate ODR in the visible wavelength regime. The challenge here is to extract useful transverse beam parameter information. Status and design aspects of the various systems will be presented.

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