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## Development of X-ray Ionization Beam Position Monitor for PAL-XFEL Soft X-ray

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The Pohang Accelerator Laboratory X-ray Free-Electron Laser (PAL-XFEL) operates hard X-ray and soft X-ray beamlines for scientific experiments with providing intense ultrashort X-ray pulses based on the self-amplified spontaneous emission (SASE) process. X-ray Free-Electron Laser is characterized by strong pulse-to-pulse fluctuations due to the SASE process. Thus, online photon diagnostics are very important for the rigorous measurements. The photo-absorption and emission concept using solid materials is very limited in the soft X-ray beamline diagnostics. Instead, the gas monitoring detectors (GMDs) that utilize the photo-ionization of the gas are installed at the optics hutch and the experimental hall of the soft X-ray beamline, and employed for monitoring the beam intensity status and for normalizing the experimental data. To track the beam position at the soft X-ray beamline in addition to those intensity monitors, we developed a X-ray ionization beam position monitor (XIBPM). The XIBPM uses ionization of either residual gas in the vacuum or Kr gas injected, and microchannel plate with phosphor. The XIBPM was installed at the experimental hall, and it was tested separately for horizontal and vertical beam position monitoring. Electrostatic field-map of the XIBPM is analyzed using the CST (Computer Simulation Technology) Studio Suite, and multiparticle tracking studies on the field-maps obtained from the CST Studio Suite are in progress to quantitatively analyze and identify error components. Here, we introduce the newly developed XIBPM about a basic structure and test results and a design optimization considering beam-gas interaction and particle tracking on a realistic field-map.

### Journal of Synchrotron Radiation Special Issue: will you submit your contribution?

yes

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