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Development of New XBPMs for the SOLEIL Synchrotron Upgrade

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SOLEIL's storage ring front-ends are presently equipped with a few tens of X-ray Beam Position Monitors (XBPMs) to measure the position of the photon beam before it is delivered to the beamline users. Those XBPMs consist of four metallic (copper or tungsten) blades placed in the beam halo. When the beam halo hits the blades, a current is produced by photoemission, a simple center of mass calculation on the blade currents enables to infer the photon beam position at the XBPM plane. The drawback of these systems is that they suffer from a low sensitivity, especially on beamlines based on helical undulators.

In the context of SOLEIL-II, upgrade of SOLEIL's storage ring to a fourth-generation synchrotron light source, the Diagnostics group is working on two new types of XBPMs. The first one will be used on bending magnets and planar undulators based beamlines. This type of XBPM replicates the existing four-blade systems but using CVD diamond blades instead of metallic ones. In this case, the current will be produced by photoconduction in the diamond, which should significantly increase the sensitivity of the position measurement. The second type of XBPM will be dedicated to beamlines based on helical undulators. It is well known that four-blade systems are hardly usable in this case, since helical undulators deliver more complicated photon beam transverse distributions down to lower photon energies. Therefore, we have chosen to develop an XBPM working as a white beam imager. It will be based on a CVD diamond ring whose fluorescence produced by the photon beam halo will be detected by a camera.

We will present the advancements on both projects, as well as the difficulties found during the design process, essentially resulting from the high-power densities reached at the XBPM location

Summary

In the context of SOLEIL-II, the Diagnostics group is working on two new types of XBPMs based on CVD diamond. We will present the advancements on both projects, as well as the difficulties found during the design process, essentially resulting from the high-power densities reached at the XBPM location.

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