Straight-Sections Upgrade of the Photon Factory Storage Ring

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At the 2.5-GeV light source of the Photon Factory (PF), a large reconstruction around the straight sections has been accomplished in 2005. The lattice is constituted of 28 bending magnets and there were ten straight sections originally. The PF ring has about 70 experimental stations and the all available straight sections were used for various types of insertion devices, such as undulators, multi-pole wigglers (MPW) and a super conducting wiggler. In order to satisfy increasing demands for the undulator radiation in the x-ray range and needs for new-type undulators, a large-scale upgrade project for the straight sections was proposed and the preparation for the upgrade had continued for several years.

The PF ring has a circumference of 187 m. In the area over two thirds of the storage ring, all the quadrupole magnets and all the beam ducts have been renewed and rearranged to modify the lattice configuration. The reconstruction work of the storage ring was conducted during a scheduled shutdown from March to September, 2005. As a result, four short straight sections of 1.5 m have been newly created and the lengths of the existing ten straight sections have been extended. The short straight sections are exploited for mini-pole x-ray undulators. A new undulator of VUV-SX is being designed for one of the extended straight sections. Since the successful recommissioning of the ring at October 2005, recovery of the beam lifetime has favorably progressed due to the vacuum scrubbing by the synchrotron radiation. As the beam ducts have been replaced in a large portion of the ring, some interesting changes have been observed in the appearance of the beam instability.