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Feasibility study of the Polarization control of synchrotron radiation in NSRRC

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Synchrotron radiation (SR) is a unique high-brightness and fully polarized light source. However, typical insertion devices supply only linearly polarized radiation, precluding studies of chiral dynamics and spin structures. To fulfill a strong demand for circularly polarized radiation, an elliptically polarized undulator (EPU) provides the greatest merit flux and thus has become the workhorse in several facilities. NSRRC has also been developing its own EPU. Up to phase II, in total five EPUs have been installed at Taiwan Photon Source (TPS, 3-GeV ring) to serve EUV and soft X-ray user community. For the next generation light source with multi-bend achromat (MBA) lattices, we revisit EPU and study a new structure to solve the problem of reduced photon flux caused by shortened installation length in an MBA lattice. The tight available length in the MBA lattice also caused us to re-evaluate a scheme of rapid polarization switching. A new device composed of an electromagnet (EM) and a permanent magnet (PM), therefore, has been developed to switch rapidly the right- or left-circularly polarized radiation. We present the results of the EPU development in NSRRC and show new researches to meet the needs of the next generation of SR.

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