

Design and Construction of a New Medical Beamline and Its Commissioning of PLS-II

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Pohang Accelerator Laboratory (PAL) runs a third generation electron synchrotron facility named Pohang Light Source-II (PLS-II), which is operated with a ring electron energy of 3 GeV and beam currents of 100-50 mA as of 2012. Upgrade of the facility is continuing and it is scheduled to achieve beam currents of 400 mA in top up mode by the end of the year 2013. In 2010, PAL has started construction of a new wiggler beamline for medical applications of X-ray imaging and radiation therapy. Request was from a group of medical doctors in South Korea and they demanded high energy X-ray photons of 30-70 keV with the largest beam size possible comparable to that of medical X-ray imaging equipment routinely employed in hospitals. Upon the request, PAL has allocated one of the three wiggler ports in the PLS-II to this beamline and conceived the use of a beam expander to achieve larger beam pan at the sample position. The concept of the beam expander is implemented in the double crystal monochromator (DCM) design of the beamline by the use of an asymmetrical-cut crystal as the first crystal. The benefits of this novel design include the increased beam size, the increased total intensity, distributed heat load on the first crystal, the uniformity of the beam profile and collimation effect on the outgoing beam. However, the energy tunability is much limited compared to the normal DCMs and the surface quality of the asymmetric-cut crystal would be a critical concern for operation of the DCM for X-ray imaging purpose. By the end of the year 2012 the construction will be finished and its commissioning is planned concomitantly. In this talk, the design of the beamline and status of the construction as well as the commissioning plan will be presented.