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Wed-Af-Po3.16-03 [21]: Conceptual Design of a Superbend Magnet for Advance Light Source Upgrade Project

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ALS-U is an ongoing upgrade of the Advance Light Source (ALS) at Lawrence Berkeley National Lab (LBL). The upgraded ring of the ALS will use a multibend-archomat (MBA) lattice, which will allow increasing the brightness of soft x-ray sources 100-1000 times with respect to current ALS capabilities. One of the goals of the project is maintaining ALS capability of producing hard x-ray beams, which are used for a macromolecular crystallography. The hard x-ray sources will be provided by replacing six gradient dipole magnets of the upgraded ring with superbend magnets generating a higher peak field at the source point. Two defocusing quadrupoles will be installed together with each superbend magnet in order to match the quadrupole field component from removed gradient dipole. Two alternative designs are being investigated. The first design is a warm-bore superconducting magnet. Its coils are made of an internally reinforced bronze-route Nb₃Sn wire and a holmium pole is used as a flux concentrator. The second option is NdFeB permanent magnet system with build-in field clamps. Due to limited space in the accelerator lattice and the magnetic field requirements for the x-ray source points, both designs present challenges due to high magnetic forces acting on the magnet components and due to impact of the magnet cross-talk on the beam trajectory.

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