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Preliminary electromagnetic design of a high-temperature superconducting superbend for the Hefei Advanced Light Facility

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The National Synchrotron Radiation Laboratory is constructing a 2.2 GeV diffraction-limited storage ring, the Hefei Advanced Light Facility (HALF), using the modified hybrid 6BA lattice, which consists of a total of 20 cells. The synchrotron radiation primarily covers the vacuum ultraviolet (VUV) to soft X-ray bands. To extend the photon energy into the hard X-ray range, two 0.9 T normal-conducting bending magnets are to be replaced with 6 T superconducting magnets. This upgrade demands a magnet that achieves high magnetic field strength while seamlessly integrating with the storage ring's compact geometry and operational constraints. The C-shaped yoke design allows the magnet to be easily inserted and removed from its position in the storage ring vacuum chamber. The coil is planned to be wound with ReBCO tape due to its higher current-carrying capacity and critical temperature. This paper discusses the design requirements of the superbend and presents two electromagnetic design schemes.

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Author: XIA, Jincheng (University of Science and Technology of China)

Co-authors: XU, Jianhao (University of Science and Technology of China); CHEN, Chao (University of Science and Technology of China); BAI, Zhenghe (University of Science and Technology of China); ZHU, Zian (University of Science and Technology of China)

Presenter: XU, Jianhao (University of Science and Technology of China)

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