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Wed-Mo-Po.01-01: Design and magnetic measurement of the longitudinal gradient dipole magnet for WALS

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Six longitudinal gradient dipole magnets (DLGs) are used in every standard arc of the storage ring at Wuhan Advanced Light Source to reduce the beam emittance. Each DLG is made of 5 permanent magnetic units, providing the transverse filed gradient by tilting the polar faces and the longitudinal gradients simultaneously. The field designs, assembly, and detailed magnetic measurement of the DLG1 prototype are presented. By optimizing the shapes of the pole faces in OPERA3D, the field integrals uniformity is optimized to lower than $5.0\text{E-}4$. The magnetic field can be controlled accurately by adjusting the transverse position of each magnet-unit, and the temperature stability is better than $10\text{ppm}/^\circ\text{C}$ by filling several iron nickel alloy sheets between the poles and returning yokes. Magnetic measurement results indicates that the field integrals uniformity is below $5.0\text{E-}4$ within the good field region.

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