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Wed-Af-Po3.16-04 [22]: The Cooling Design for the Magnetic Structure of the SHINE Superconducting Undulator

Wednesday 25 September 2019 14:00 (2 hours)

Abstract: Forty planar superconducting undulators (SCUs) with 4 m long magnetic structure will be used in Shanghai High Repetition rate XFEL and Extreme Light (SHINE). As the longest SCUs being developed in the world, they can produce the photons with energy of 10 keV – 25 keV. NbTi/Cu wire with the diameter of 0.6 mm and the ratio of Cu to NbTi 0.9 is adopted to fabricate the superconducting coils and the temperature of the coils must be below 5 K when the operating current is up to 400 A. The magnetic gap is no more than 5 mm in order to obtain the peak field of 1.58 T and it is impossible to design a beam vacuum chamber inside the gap. Instead, two copper foils parallel to each other are installed near the pole surfaces in the gap to shield the beam heat load. The special copper spacers are designed to cool the copper foils while four liquid Helium pipes are located symmetrically around the beam channel which is comprised of copper foils and spacers. The liquid Helium is provided by the cryogenic plant of the SHINE.

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