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C2Po1B-06: Thermal simulation and analysis of a FEL SCU cryostat

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An ANL-SLAC collaboration is working on a design of a planar superconducting undulator (SCU) demonstrator to be tested at SLAC Free Electron Laser (FEL). The demonstrator cryostat is multi-segmented, and each segment includes a ˜1.5-m-long superconducting undulator as well as other magnetic components like a phase shifter and a beam position monitor (BPM). This LHe-based cryostat is cooled by two stage pulse tube cryocoolers (Cryomech PT425). A detailed load map of the cryocooler was measured and bench marked with the manufacturer's load map. A thermal model of one segment of the cryostat which includes all cooling circuits has been created in ANSYS and analyzed using the measured cryocooler load map. This paper presents the calculated cooling power requirement and the temperatures in the cryostat.

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