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Thermal Analysis of Superconducting Undulator (SCU) Cryomodules

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A cryocooler-cooled superconducting undulator (SCU0) has been operating in the Advanced Photon Source (APS) storage ring since January of 2013. Based on lessons learned from the construction and operation of SCU0, the 2nd superconducting undulator (SCU1) has been built and cold tested stand-alone. An excess cooling capacity measurement and static heat load analysis show a large improvement of cryogenic performance of SCU1 compared with SCU0. ANSYS-based thermal analysis of these cryomodules incorporating all the cooling circuits was completed. Comparisons between measured and calculated temperatures at the three operating conditions of the SCU0 cryomodule (static, beam heat only, beam heat and magnet current) will be presented.

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