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C1Or2C-03: Conduction cooled cryostat for small-scale superconducting radio frequency accelerator applications

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Fermilab's Illinois Accelerator Research Center (IARC) is designing small-scale, ˜10 MeV prototype conduction cooled superconducting accelerators for projects ranging from medical device sterilization to road pavement modification. These accelerators are built using high-Q Nb3Sn coated superconducting radio-frequency cavities. The cryostat design for one such prototype being developed for the U.S. Army Engineer Research Development Center (ERDC) will be described. Cryostats for such conduction cooled accelerators require stringent control of thermal losses since the available power from cryocoolers is restricted to a few watts. The present state of the vacuum vessel, conduction cooling system, thermal shield, cavity support, and other ancillary system designs will be described as well as presentation of thermal and structural simulations. The results of this paper will lead to the engineering construction of a cryostat which will accelerate an electron beam to high energy, ˜10 MeV, with extremely low thermal losses.

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