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C2Po1B-10: Cryogenics design of a compact, cryocooler conduction-cooled SRF accelerator for e-beam production

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Following the first successful demonstration of accelerating gradients up to 10 MV/m on a conduction-cooled 650 MHz SRF cavity in 2020, Fermilab has embarked on the design and construction of a compact SRF e-beam accelerator based on this novel cavity cryocooling technique. This accelerator will deliver a 1.6 MeV, 20 kW electron beam and is poised to be used for industrial applications such as medical device sterilization. The design of the accelerator is complete and presently the accelerator is in the construction phase. This contribution will showcase for the first time the key cryogenic features of the compact accelerator including the conduction cooled SRF cavity, integrated thermionic electron source, low-heat leak power coupler, all housed within a thermally and magnetically shielded cryostat. Plans for commissioning the accelerator as well as next steps for upgrading to a ˜8 MeV, 200 kW e-beam machine will also be discussed.

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Authors: Dr DHULEY, Ram (Fermi National Accelerator Laboratory); NICOL, Thomas (Fermilab)

Co-authors: EDWARDS, Christopher (Fermilab); GONIN, Ivan (Fermilab); THANGARAJ, Jayakar (Fermilab); KAZAKOV, Sergey (Fermilab); KROC, Thomas (Fermilab); KHABIBOULLINE, Timergali (Fermilab); YAKOVLEV, Vyacheslav (Fermilab)

Presenter: Dr DHULEY, Ram (Fermi National Accelerator Laboratory)

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