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Thermionic Sources for electron cooling at IOTA

Sunday 7 May 2023 16:00 (2 hours)

A new electron cooling experiment is being planned at the Integrable Optics Test Accelerator (IOTA) at Fermilab for cooling ~2.5 MeV protons in the presence of intense space-charge. Electron cooling is integral to the study of beam dynamics and has valuable applications for producing high-intensity hadron beams in particle accelerators. For such goals, an electron lens to be placed in the IOTA ring will be used for electron cooling, space-charge compensation, and non-linear dynamics. Here we present the simulations and designs of two thermionic electron sources for the cooling at IOTA. One cooler is a basic electron source and will be used for cooling the proton beam and as a tool for other experiments at IOTA. The other cooler is a strong electron source, which will be used for studying effects of electron cooling in ion beams with intense space-charge. We particularly discuss parameters of the thermionic sources' electrodes, as well as the simulation results. We also present a new electron source test-stand at the University of Chicago, which will be used to test the thermionic electron sources. We also discuss the results from analyzing the test stand operations with a currently existing electron source. Furthermore, we present future steps for production and commissioning of these thermionic sources at IOTA.

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Footnotes

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Yes

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