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High Pressure Electron Gun for Electron Beam Welding and Additive Manufacturing

Cooperative Research and Development Agreement Final Report

CRADA Number: FRA-2019-0051

Fermilab Technical Contact: Charles Thangaraj

Summary Report
13 August 2021

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In accordance with Requirements set forth in Article XI.A(3) of the CRADA document, this document is the final CRADA report, including a list of Subject Inventions, to be forwarded to the Office of Science and Technical Information as part of the commitment to the public to demonstrate results of federally funded research.

CRADA number: FRA-2019-0051

CRADA Title: High Pressure Electron Gun for Electron Beam Welding and Additive Manufacturing

Parties to the Agreement: U.S. Electron, Inc. and Fermi Research Alliance, LLC

Sponsoring DOE Program Office(s): Office of Science - HEP

DOE Funding Commitment Table: N/A

Abstract of CRADA work:

Electron beam welding is a premier technology for high quality welding. However, e-beam welding is viewed as very expensive method for quality results. Therefore, it is often the last choice for joining metals. U.S. Electron is developing a technology that changes the welding environment. As a result of this pursuit of technology, e-beam welding can be field deployable. U.S. Electron has received a DOE SBIR Phase I grant to demonstrate a proof of principle that the plasma cathode can be installed in an electron gun housing, generate a current and energy enough to weld stainless steel. Under this CRADA, Fermilab proposed to provide a power supply, the necessary safety expertise and the physical location for testing of the initial prototype equipment developed by U.S. Electron.

Summary of Research Results:

After receiving the Phase I SBIR award, U.S. Electron, Inc. approached Fermilab to request a safe technical space for testing as well as a suitable power supply fitting the project's technical requirements. Fermilab, as one of few laboratories with the appropriate facilities, agreed to support the work and chose to host the testing at the Heavy Assembly Building (HAB) where a suitable shielding enclosure per the Partner's specifications could be built.

U.S. Electron and Fermilab made a good faith effort to set up the test assembly in accordance with U.S. Electron's experimental run plan. Unfortunately, the project could not be completed as originally envisioned, so there are no research results to report from this CRADA.

Initial delays at U.S. Electron in preparation for the testing, technical changes in the specifications for the necessary power supply, site-access delays at Fermilab due to the COVID pandemic, and complexities associated with testing at Fermilab in accordance with site safety requirements pushed the timeline and expected costs beyond the original project scope. As a result, the CRADA was terminated early by mutual agreement of both parties.

Related Reports, Publications, and Presentations:

N/A

Subject Inventions listing:

N/A

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Technical Contact at Fermilab: Charles Thangaraj, jtobin@fnal.gov

Partner POC Name and Email Address: John Noonan, noonan@uselectron.com

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