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Vertical Testing and Preparation of an Acid-Free Electropolished SRF Cavity

Cooperative Research and Development Agreement Final Report

CRADA Number: FRA-2014-0011

Fermilab Technical Contact: Allan Rowe

Summary Report
29 November 2016

NOTICE

In accordance with Requirements set forth in Article X of the CRADA, 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-2014-0011

CRADA Title: Vertical Testing and Preparation of an Acid-Free Electropolished SRF Cavity

Parties to the Agreement: Faraday Technology, Inc. and Fermi Research Alliance, LLC

Abstract of CRADA work:

The project team proposes to build upon recent work to develop a robust, high throughput vertical Final Electropolishing process for SRF cavities, based on an Acid-Free Bipolar Electropolishing process, to replace conventional electropolishing for single and nine-cell cavities at the alpha/beta scale. The development of Bipolar EP for final surface finishing step will enable a manufacturing process that controls costs and reduces the environmental and health hazards associated with using acid solutions.

The proposed outcome is a cost effective and robust process for final electropolishing of niobium SRF cavities. The market size for SRF cavities for the International Linear Collider is ~16,000 cavities, with applicability to many other cavity configurations and applications. Other markets for Acid-Free Bipolar EP include niobium-alloys that are hypoallergenic and commonly alloyed with titanium and zirconium to make implantable medical devices and require HF acid for polishing. Elimination of acids for electropolishing of medical implants is an important need and represents a strong commercial opportunity with a US market of ~$45B by 2014.

Under this CRADA, Fermilab provided a 1.3 GHz RF cavity to Faraday Technology to use for acid-free electropolishing studies. The original scope of work also provided for up to two tests of the electropolished cavity in Fermilab's Vertical Test Stand (VTS).

Summary of Research Results:

Due to scheduling difficulties, the testing work could not be performed at Fermilab.

Related Reports, Publications, and Presentations:

Paper MOPB101 from the Proceedings of SRF2015, Whistler, BC, Canada entitled:
ELECTROPOLISHING OF NIOBIUM SRF CAVITIES IN ECO-FRIENDLY AQUEOUS ELECTROLYTES WITHOUT HYDROFLUORIC ACID, M. Inman et al

Subject Inventions listing:

NONE

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Technical Contact at Fermilab: Allan Rowe

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