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Helical muon beam cooling channel engineering design (Phase I)

Cooperative Research and Development Agreement Final Report

CRADA Number: FRA-2011-0005

Fermilab Technical Contact: Alexander Zlobin

Summary Report
7 August 2015

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CRADA number: FRA-2011-0005

CRADA Title: Helical Muon Beam Cooling Channel Engineering Design

Parties to the Agreement: MUONS, Inc and Fermi Research Alliance, LLC

Abstract of CRADA work:

Develop a design for the integration of 805 MHz RF cavities into a 10 T Nb₃Sn based HCC test section. Several SBIR-STTR developed inventions will be combined in an innovative practical engineering solution for a muon cooling channel suitable for a muon collider or for high-brightness muon beams for other applications. Supported in part by DOE STTR grant application DE-SC0006266

Summary of Research Results:

The first phase of this project saw the development of a conceptual design for the integration of 805 MHz RF cavities into a 10 T Nb₃Sn based HS test section. Two very novel ideas are required to realize the design. The first idea is the use of dielectric inserts in the RF cavities to make them smaller for a given frequency so that the cavities and associated plumbing easily fit inside the magnet cryostat. Calculations indicate that heat loads will be tolerable, while RF breakdown of the dielectric inserts will be suppressed by the pressurized hydrogen gas. The second new idea is the use of a multi-layer Nb₃Sn helical solenoid. The technology demonstrations for the two aforementioned key components of a 10T, 805 MHz HCC were proposed for Phase II. (See OSTI Technical Report 1266464 for final description of both Phase I and Phase II work.) This agreement was funded in part by DOE STTR award DE-FG02-11ER86492.

Related Reports, Publications, and Presentations:

FERMILAB-CONF-12-229-APC-TD, June 2012, Flanagan, G. et al, "Helical Muon Beam Cooling Channel Engineering Design"

PAC2013, Pasadena, CA, Flanagan, G. et al, "Helical Muon Beam Cooling Channel Engineering Design" (THPBA22)

Johnson, Rolland. Helical muon beam cooling channel engineering design. United States: N. p., 2015. Web. doi:10.2172/1266464.

Subject Inventions listing:

None

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