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## **Phase and Frequency Locked Magnetrons for SRF Sources**

### **Cooperative Research and Development Agreement Final Report**

**CRADA Number: FRA-2009-0002**

**Fermilab Technical Contact: Roger Dixon**

**Summary Report**  
**6 January 2020**

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**CRADA number:** FRA-2009-0002

**CRADA Title:** Phase and Frequency Locked Magnetrons for SRF Sources

**Parties to the Agreement:** Muons, Inc. and Fermi Research Alliance, LLC

**Abstract of CRADA work:**

Magnetrons are low-cost highly-efficient microwave sources, but they have several limitations, primarily centered about the phase and frequency stability of their output. When the stability requirements are low, such as for medical accelerators or kitchen ovens, magnetrons are the very efficient power source of choice. But for high energy accelerators, because of the need for frequency and phase stability - proton accelerators need 1-2 degrees source phase stability, and electron accelerators need .1-.2 degrees of phase stability - they have rarely been used. We describe a novel variable frequency cavity technique which will be utilized to phase and frequency lock magnetrons.

**Summary of Research Results:**

A test fixture was built and tested.

**Related Reports, Publications, and Presentations:**

1. Technical Report 1156696
2. Final Project Report "Phase and Frequency Locked Magnetrons for SRF Sources", Neubauer, Michael., Muons, Inc. <https://www.osti.gov/servlets/purl/1156596>

**Subject Inventions listing:**

None

**Report Date:** 6 January 2020

**Technical Contact at Fermilab: Roger Dixon**

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6 January 2020