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RPPR Final Report
as of 19-Apr-2021

Agency Code: 21XD

Proposal Number: 70019ELRIP **Agreement Number: W911NF-17-1-0197**
INVESTIGATOR(S):

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DUNS Number: 044387793 EIN: 560532129
Report Date: 14-Jul-2019 Date Received: 18-Apr-2021
Final Report for Period Beginning 15-Apr-2017 and Ending 14-Apr-2019
Title: Cryogen-free dilution refrigerator system for studies of superconductor - quantum Hall hybrid samples
Begin Performance Period: 15-Apr-2017 **End Performance Period:** 14-Apr-2019
Report Term: 0-Other

Submitted By: Gleb Finkelstein Email: gleb@phy.duke.edu
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Distribution Statement: 1-Approved for public release; distribution is unlimited.

STEM Degrees: 0 **STEM Participants:** 2

Major Goals: The goal of this project was to purchase and install a cryogen-free dilution refrigerator with a base temperature of 10 mK and magnetic fields up to 12 Tesla. The refrigerator is to be dedicated to measuring superconductor – quantum Hall hybrid samples.

Accomplishments: The PI's group has purchased and installed Triton 500 dilution refrigerator with a 12 Tesla magnet. The instrument was installed and fully tested in 2019, and in 2020 the PI's group upgraded the cryogenic wires and filters to greatly improve the electrical measurements that could be performed with this instrument.

Training Opportunities: The cryogen-free dilution refrigerator allows graduate students to spend more time working on the challenging low-noise electronic measurements at cryogenic temperatures, contributing to their professional growth.

Results Dissemination: Nothing to Report

Honors and Awards: Nothing to Report

Protocol Activity Status:

Technology Transfer: Nothing to Report

PARTICIPANTS:

Participant Type: PD/PI
Participant: Gleb Finkelstein
Person Months Worked: 2.00 **Funding Support:**
Project Contribution:
National Academy Member: N

Participant Type: Graduate Student (research assistant)
Participant: Ethan Arnault

RPPR Final Report
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Person Months Worked: 6.00 **Funding Support:**
Project Contribution:
National Academy Member: N

Participant Type: Graduate Student (research assistant)
Participant: Trevyn Larson
Person Months Worked: 6.00 **Funding Support:**
Project Contribution:
National Academy Member: N

Partners

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I certify that the information in the report is complete and accurate:
Signature: Gleb Finkelstein
Signature Date: 4/18/21 10:52AM

Final report for ARO Award W911NF1710197
"Cryogen-free dilution refrigerator system for studies of superconductor - quantum Hall hybrid samples"

PI: Gleb Finkelstein (Duke University), email: gleb@phy.duke.edu
Program manager: Dr. Marc Ulrich, e-mail: marc.ulrich@us.army.mil

The goal of this project was to purchase and install a cryogen-free dilution refrigerator with a base temperature of 10 mK and magnetic fields up to 12 Tesla. The refrigerator aimed to be dedicated to measuring superconductor – quantum Hall hybrid samples.

The PI's group has purchased and installed Triton 500 dilution refrigerator with a 12 Tesla magnet manufactured by Oxford Instruments. The instrument was installed and fully tested in 2019, and in 2020 the PI's group upgraded the cryogenic wires and filters to greatly improve the electrical measurements that could be performed with this instrument.

The cryogen-free dilution refrigerator allows graduate students to spend more time working on the challenging low-noise electronic measurements at cryogenic temperatures, contributing to their professional growth.

In the attached figure, a group of graduate students is working on installation of the refrigerator.