

REPORT DOCUMENTATION PAGE

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a. REPORT UU	b. ABSTRACT UU	c. THIS PAGE UU	UU	19a. NAME OF RESPONSIBLE PERSON Brian DeMarco	
				19b. TELEPHONE NUMBER 217-244-9848	

RPPR Final Report
as of 23-Sep-2021

Agency Code: 21XD

Proposal Number: 70004PHRIP

Agreement Number: W911NF-17-1-0171

INVESTIGATOR(S):

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DUNS Number: 041544081

EIN: 376000511

Report Date: 14-Jan-2020

Date Received: 20-Sep-2021

Final Report for Period Beginning 15-Apr-2017 and Ending 14-Oct-2019

Title: Laser Systems for Measurements of Local Relaxation in Disordered Atomic Hubbard Models

Begin Performance Period: 15-Apr-2017

End Performance Period: 14-Oct-2019

Report Term: 0-Other

Submitted By: Ph.D Brian DeMarco

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Distribution Statement: 1-Approved for public release; distribution is unlimited.

STEM Degrees: 1

STEM Participants: 2

Major Goals: The major goal of this project is to create an improved laser system for trapping and cooling 40K atoms. The purpose of this laser system is to speed up the cycle time of the an instrument that creates ultracold quantum gases trapped in a disordered lattice.

Accomplishments: The components of the laser system were acquired and integrated into the experiment. A 200 W 1064 nm fiber laser was used to create a high-power dipole trap to capture atoms directly from a quadrupole trap. The optics needed to create a magneto-optic trap were also integrated into the "science" region of the vacuum system to provide a boost in cooling power.

Training Opportunities: The students working on this project had the opportunity to learn cutting-edge optics and optoelectronics.

Results Dissemination: Nothing to Report

Honors and Awards: DeMarco was awarded the University of Illinois University Scholar award. This program aims to recognize outstanding members of the faculty. University Scholar awards represent recognition of the recipient's excellence and the University's commitment to foster outstanding people and their work.

Protocol Activity Status:

Technology Transfer: Nothing to Report

PARTICIPANTS:

Participant Type: Graduate Student (research assistant)

Participant: William Morong

Person Months Worked: 1.00

Funding Support:

Project Contribution:

National Academy Member: N

Participant Type: Graduate Student (research assistant)

RPPR Final Report
as of 23-Sep-2021

Participant: Nathan Fredman
Person Months Worked: 1.00
Project Contribution:
National Academy Member: N

Funding Support:

Partners

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I certify that the information in the report is complete and accurate:

Signature: Brian DeMarco

Signature Date: 9/20/21 5:04PM

The major goal of this instrument award was to create a high-power laser trapping system to improve the cycle time of an apparatus that produces ultracold quantum gases confined in an optical lattice. A 200 W crossed-beam dipole trap was created using a 1064 nm fiber laser. A control system for the optical power was designed and deployed. Optics for creating a magneto-optic trap in the “science” region of the vacuum system were also acquired and integrated. Testing and optimization of a sequence to transfer atoms from a quadrupole trap to the magneto-optic trap and then into the dipole trap are underway.