Special Notice 14-SN-0005
Special Program Announcement for 2014 Office of Naval Research
Research Opportunity: Basic Research Challenge on Majorana Fermions

I. INTRODUCTION

This announcement describes a research thrust, entitled "Basic Research Challenge on Majorana Fermions " to be launched under the ONRBAA14-001, Long Range Broad Agency Announcement for Navy and Marine Corps Science and Technology which can be found at http://www.onr.navy.mil/Contracts-Grants/Funding-Opportunities/Broad-Agency-Announcements.aspx. The research opportunity described in this announcement specifically falls under numbered paragraph 2 of the "Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (Code 31)" sub-section. The submission of proposals, their evaluation and the placement of research grants will be carried out as described in that Broad Agency Announcement.

The purpose of this announcement is (1) to focus attention of the scientific community on the area to be studied, (2) to open dialogue amongst those interested in this area, and (3) to provide the planned timetable for the submission of proposals.

II. TOPIC DESCRIPTION

The proposed topic will detect, characterize and manipulate Majorana fermions in solid state systems. The program will pursue a thorough understanding and experimental validation of various theoretical predictions of Majorana fermion modes that are realizable in solid state systems, and assess their application potential in areas such as quantum information technology.

Background:
The pursuit of the Majorana fermion has recently emerged as a topic of intense interest after a long dormancy since its predicted existence in 1937 by the Italian physicist Ettore Majorana. The theoretically predicted particle was initially proposed as a special solution to the Dirac equation that allows it to be its own anti-particle, possessing zero energy, charge and spin. Neutrino has been identified as an early candidate for Majorana fermion, although its experimental confirmation is still lacking but the pursuit continues in the high energy physics community. The latest excitement, however, stems from recent theoretical predictions of Majorana fermions emerging as quasiparticle excitations in specially engineered solid state systems. Many groups have already obtained experimental results that are in broad agreement with the initial prediction, although an unambiguous and definitive experimental proof of the existence of Majorana fermions in solid state systems is still lacking. Majorana quasiparticles in solid state systems, due to their predicted inherent robustness against quantum de-coherence, have special appeal for quantum information processing systems.

Objective:

The Office of Naval Research (ONR) is interested in receiving proposals on detection, characterization and manipulation of Majorana fermions in solid state systems.

This *objective* of this Basic Research Challenge (BRC) program is to encourage fundamental research and achieve a thorough understanding of the mechanisms, conditions and materials constraints that ultimately leads to unambiguous demonstration of Majorana fermions in solid state systems.

Program Focus and Scope:

Semiconductor nanowires, with strong spin-orbit interactions and proximity coupling to conventional s-wave superconductors, are the main focus of current experimental pursuit of Majorana fermions. ONR encourages proposals that further refine and improve upon this important theme of research that seeks to eliminate ambiguity and alternative interpretations. In addition, ONR highly encourage alternative approaches for realizing Majorana fermion modes in other solid state systems that either complement or add significant advantages to existing approaches. Also encouraged are potential application schemes involving Majorana fermions in areas such quantum information processing. Research must include both experimental and theoretical components.

III. WHITE PAPER SUBMISSION

White papers are NOT required for this solicitation.

IV. FULL PROPOSAL SUBMISSION AND AWARD INFORMATION

Full proposals should be submitted under **ONRBAA14-001** by **December 6, 2013**. Full proposals received after that date will be considered as time and availability of funding permits.

ONR anticipates only **grants** will be issued for this effort. All full proposals must be submitted through www.grants.gov. The following information must be completed as follows in the SF 424 to ensure that the application is directed to the correct individual for review:

Block 4a, Federal Identifier: Enter N00014;
Block 4b, Agency Routing Number, Enter the three (3) digit Program Office Code and the Program Officer's name, last name first, in brackets: "312 (Baatar, Chagaan)".

All attachments to the application should also include this identifier to ensure the proposal and its attachments are received by the appropriate Program Office.

ONR plans to fund up to two (2) awards that will typically average $750,000 per year for a total period of performance of four (4) years. The maximum number of team members should not

exceed five (5) individual investigators. The total estimated amount available for award over four (4) years is $6M. NOTE: Lower funding amounts will be considered.

Although ONR expects the above described program plan to be executed, ONR reserves the right to make changes.

Funding decisions should be made by January 10, 2014. Selected projects will have an estimated award date of March 1, 2014.

V. SIGNIFICANT DATES

Event	**Date**
Recommended Full Proposal Deadline	December 6, 2013
Funding Decisions*	January 10, 2014
Awards*	March 1, 2014

Note: * These are approximate dates.

VI. POINTS OF CONTACT

In addition to the points of contact listed in ONRBAA14-001, the specific points of contact for this announcement are listed below:

Technical Points of Contact:
Dr. Chagaan Baatar, Program Officer, Code 312
Chagaan.baatar@navy.mil

Business Point of Contact:
Alan Kesten, Contract Specialist, Code 252
alan.kesten@navy.mil

VII. SUBMISSION OF QUESTIONS

Any questions regarding this announcement must be provided to the Technical Points of Contact and the Business Point of Contact listed above. All questions shall be submitted in writing by electronic mail.

Questions regarding **Full Proposals** should be submitted NLT two weeks before the dates recommended for receipt of Full Proposals. Questions after this date may not be answered.