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Office of the Director

July 26, 2007

Dr. Tony Chan
Assistant Director
Directorate for
Mathematical & Physical
Sciences
National Science Foundation
4201 Wilson Boulevard
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Dr. Dennis Kovar
Associate Director
Office of Nuclear Physics
U. S. Department of Energy
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Dr. Robin Staffin
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Dear Drs. Chan, Kovar, and Staffin:

In a letter dated March 7, 2005, NSAC and HEPAP were charged to establish a Neutrino Scientific Assessment Group (NuSAG) as a joint subcommittee, which would exist for two years, to advise the DOE Offices of Nuclear and High Energy Physics and the NSF Programs of Nuclear Physics and Elementary Particle Physics on issues relating to the U.S. neutrino physics program. NuSAG, which has been co-chaired by Eugene Beier of the University of Pennsylvania and Peter Meyers of Princeton, was created in March 2005. Initially three charges were posed for NuSAG—two involving neutrino oscillation experiments and one on neutrinoless double-beta decay. NuSAG reports answering these charges were transmitted by NSAC to DOE and NSF in September, 2005 and March, 2006. On February 21, 2006, NuSAG was asked to report on the scientific potential, associated detector options, optimal timeline and other scientific considerations, for an accelerator-based neutrino program which assumed a megawatt class proton accelerator as a neutrino source. The subcommittee has submitted a Report to NSAC, dated July 13, 2007, which provides guidance for such a program.

The NuSAG Report states that the science goals for a future U.S. long-baseline neutrino oscillation program are to measure the mixing parameter $\sin^2 2\theta_{13}$, to determine the order of the states in the neutrino mass spectrum and to determine if CP violation occurs in the neutrino sector. Two different approaches—a wide-band beam and an off-axis beam—and two different detector technologies—liquid argon and water Cherenkov—are considered. As indicated in the Report, the optimum choice of beam and detector technology depends on the size of $\sin^2 2\theta_{13}$. The Report also notes that a large detector located deep underground at an appropriate distance

from a neutrino beam source 'would have good sensitivity to all the parameters of neutrino oscillations and would also extend the search for nucleon decay.'

The Report gives four recommendations for a future U.S. program in long-baseline neutrino oscillation studies. The recommendations support continued R&D on intense proton beams and on both liquid argon and water Cherenkov detector options, with the goal of making 'a technology decision and a decision to proceed when the next round of results on $\sin^2 2\theta_{13}$ becomes available, which could be as early as 2012.'

NSAC unanimously accepts the Report, concurring with its findings and recommendations. A copy of the final Report is enclosed with this letter.

Sincerely,

Robert E. Tribble
Chair, NSAC

cc: Joseph Dehmer
Brad Keister