U.S. Department of Energy
and the
National Science Foundation

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Professor Frederick Gilman
Chair, HEPAP
Carnegie-Mellon University
5000 Forbes Avenue
Pittsburgh, PA 15213

Professor Richard F. Casten
Chairman, NSAC
Wright Nuclear Structure Laboratory
Yale University
New Haven, CT 06520

Dear Professors Gilman and Casten:

This letter is to request that, in response to the Office of Science & Technology Policy led interagency working group report on a federal strategy for the Physics of the Universe, you form a subcommittee to address issues involving neutrinos that cross disciplinary and agency boundaries. Specifically, we ask that the High Energy Physics Advisory Panel (HEPAP) and the Nuclear Science Advisory Committee (NSAC) establish a Neutrino Scientific Assessment Group (NuSAG) as a joint sub-committee to advise the Department of Energy (DOE) Offices of Nuclear and High Energy Physics and National Science Foundation Programs of Nuclear Physics and Elementary Particle Physics on specific questions concerning the U.S. neutrino physics program.

There has been a growing recognition of the important role played by neutrinos in answering some of the most compelling questions in subatomic physics. Two National Research Council studies (*Quarks to the Cosmos, Neutrinos and Beyond*), two long range planning exercises (HEPAP and NSAC), and most recently a multi-divisional year-long American Physical Society (APS) study have all identified compelling discovery opportunities involving neutrinos. These studies laid the scientific groundwork for the choices that must be made during the next few years. They did an excellent job of explaining the new paradigm of neutrino science, why this science is filled with important and interesting questions, and why the time is right to address these questions.

It is clear that a number of experimental directions should be pursued, but none of the studies mentioned made recommendations on particular projects. For those directions where the timescale is long-term, we will wait to take advantage of additional input, such as from the National Academy Sciences study on Elementary Particle Physics (EPP2010). However, for those directions where expeditious action is appropriate, we ask the NuSAG to make recommendations on the specific experiments that should form part of the broad U.S. neutrino science program. In addition, on a similar time line to NuSAG, the NSAC will be reviewing the full DOE Nuclear Physics program. Timely recommendations from NuSAG will be important input for this review.

NuSAG will be constituted for a fixed period of two years as a joint subpanel of HEPAP and NSAC. It will report to the agencies though HEPAP and NSAC who will consider its recommendations for approval and transmittal to the agencies.

The recommendations of the APS Neutrino Study form the basis for the first three charges for NuSAG listed below.

Charge 1

We request that NuSAG address the APS Study's suggestion that the U.S. participate in *"An expeditiously deployed multidetector reactor experiment with sensitivity to ν_e disappearance down to $\sin^2 2\theta_{13}=0.01$, an order of magnitude below present limits."*

The options to be considered should include, but need not be limited to:

- A U.S. experiment (in Diablo Canyon, CA, Braidwood, IL, or elsewhere)
- U.S. participation in a European reactor experiment (Double Chooz or elsewhere)
- U.S. participation in a Japanese reactor experiment
- U.S. participation in a reactor experiment at Daya Bay, China.

Charge 2

NuSAG is requested to address the APS Study's recommendation of a phased program of sensitive searches for neutrino-less nuclear double beta decay. In particular, a timely assessment of the scientific opportunities and resources needed should be performed of the initiatives that are presently under discussion in the research community. These include, but should not be limited to:

- U.S. experiments (Majorana, EXO, others)
- U.S. participation in an Italian experiment (Cuoricino/Cuore)
- U.S. participation in a Japanese experiment (Moon).

Charge 3

We request that NuSAG address the APS Study's suggestion that the U.S. participate in *"A timely accelerator experiment with comparable $\sin^2 2\theta_{13}$ sensitivity [to the recommended reactor experiment, i.e. $\sin^2 2\theta_{13}=0.01$]* and sensitivity to the mass-hierarchy through matter effects."

The options to be considered should include, but not be limited to:

- U.S. participation in the T2K experiment in Japan
- Construction of a new off-axis detector to exploit the existing NUMI beamline from Fermilab to Soudan, as proposed by the Nova collaboration
- As above but using a large liquid argon detector.

Within each of these three charges, NuSAG should consider the various initiatives that have been proposed. NuSAG should look at the scientific potential of each initiative, the timeliness of its scientific output together with the likely costs to the U.S., and its place in the broad international context. In addition, for the off-axis initiatives (charge 3), the context should include a consideration of what is likely to be learned from other experiments, and the likely future extensibility of each option as part of an evolving U.S. neutrino program. For all three charges NuSAG should then recommend a strategy of one (or perhaps more than one) experiment in that direction, which in its opinion should be pursued as part of the U.S. program.

It is requested that the NuSAG Report be sent to HEPAP and NSAC by no later than the end of June 2005.

We thank you for your help in establishing this advisory group; its input is very important. We look forward to working with you in this endeavor.

Sincerely,

Dennis Kovar
Associate Director
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Department of Energy

Robin Staffin
Associate Director
Office of High Energy Physics
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