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To: Robin Staffin, Department of Energy/Division of High Energy Physics
Steve Geer, Neutrino Factory and Muon Collider Collaboration Spokesperson
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From: Piermaria Oddone, Director, Fermilab, and on behalf of,
Sam Aronson, Interim Director, Brookhaven National Laboratory, and
Steven Chu, Director, Lawrence Berkeley National Laboratory

SUBJECT: TRANSMISSION OF THE REPORT OF THE MUON COLLABORATION TECHNICAL ADVISORY COMMITTEE MEETING OF MARCH 16-17, 2006 AND COMMENTS/RECOMMENDATIONS OF THE MUON COLLIDER OVERSIGHT GROUP.

Attached please find the report from the seventh meeting of the Muon Collaboration Technical Advisory Committee (MUTAC), held at Fermi National Accelerator Laboratory on March 16-17, 2006. The MUTAC report is based on presentations describing the R&D program and plans of the Neutrino Factory and Muon Collider Collaboration (NFMCC, aka "the Collaboration") and accompanying discussions. The report has been reviewed by the Muon Collider Oversight Group (MCOG) who have provided the following response to the report and their specific recommendations. The Laboratory directors concur in the MCOG response:

> "In advance of the 2005 MUTAC the NFMCC prepared a new 5-year plan based on the then-current view of realistic funding levels (which were considerably below prior expectations). This plan was reviewed in the 2005 MUTAC meeting, and was accepted and endorsed by MUTAC and MCOG. At the time both bodies recognized that the Collaboration continues to pursue a forefront R&D program under very constraining fiscal conditions. This environment is unchanged within the last year and as such the previously established 5-year plan provided the basis for the 2006 MUTAC Meeting."
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> "The MCOG believes that the Collaboration is operating effectively under the leadership of its two spokespersons and the R&D Project Manager. The NFMCC effort is currently focused in three areas: 1)development and testing of hardware required for ionization cooling (MuCool), accompanied by significant participation in the effort to mount the muon international cooling experiment (MICE); 2)preparations for the targetry experiment (MERIT) at CERN; and 3)continuing development of design concepts for a Neutrino Factory and a Muon Collider guided by simulations and cost optimization models. The MUTAC has judged these activities as well focused on the critical R&D areas for determining and demonstrating feasibility of muon storage ring based facilities. Significant progress has been made in the last year including initial operations of the MuCool Test Area (MTA) at Fermilab, preparations for MERIT and MICE, and further development of novel design

concepts. The long range goal of the collaboration remains to develop the Neutrino Factory concept, and associated technology components, to a level that could form the basis for a complete conceptual design sometime in the decade of 2011. A particularly exciting development at the 2006 meeting was a reexamination of Muon Collider concepts and the introduction of several new ideas that not only provide the promise of a more realizable Muon Collider, but also a more complete alignment of Neutrino Factory and Muon Collider requirements within the facility's front ends."

"The current funding level for the Collaboration is approximately $3.6M, the same level as in FY2005, and down from a high of $8.0M six years ago. At current funding levels the Collaboration remains viable but has been living close to the edge. MUTAC and MCOG endorse the dual priority that the Collaboration has assigned to the MICE/MuCool and MERIT activities. However within the current funding environment this choice has left preparations roughly 1-2 years out of synch with the requirements on MICE. Of particular concern is the lack of a large solenoidal "coupling" coil that is required to demonstrate the feasibility of operating 200 MHz accelerating structures in a strong magnetic field. The MUTAC has identified the associated $1M required as the highest priority for any supplemental funding that might be available"

"The 5-year plan that the NFMCC is working toward is well targeted given the financial realities. However it leaves no flexibility and it is the judgment of MCOG that additional funding at the level of at least $400K/year would establish a workable context in which to proceed. We note that the MICE experiment, which will provide the critical ionization cooling measurements is now being prepared at the Rutherford Appleton Lab (RAL) and Phase 1 has been approved by their funding agency PPARC. The U.S. is playing a leading role in this effort both intellectually and in terms of component development."

"In summary, the MCOG accepts and endorses the MUTAC Report attached here and offers the following specific recommendations:

1. MCOG recommends that the U.S. continue its active participation in the MICE Collaboration and support it via the MuCool program: this is the most ambitious program for demonstrating a practical implementation of muon cooling in a full experimental context. MCOG recommends that the funding agencies consider an immediate funding supplement in the amount of $1M to support the coupling coil solenoid required to move this program forward on a reasonable schedule.
2. MCOG strongly supports the NFMCC efforts to carry out the MERIT experiment to investigate high intensity beam interactions with a liquid mercury target, currently being prepared at CERN."
3. MCOG recommends strong participation of the NFMCC within the World Design Study which represents the next iteration of the "Feasibility Study " series conducted within the U.S. over the last several years.
4. MCOG recommends that an assessment be made of new Muon Collider design concepts with a goal of establishing the long term prospects.
5. MCOG recommends that DOE consider additional funding of at least $0.4M/year to provide important flexibility within the program and increased confidence that technical milestones can be met on a reasonable timescale.

In our judgment, the MUTAC did an excellent job of responding to the difficult charge they were provided. We believe that their report, and the MCOG response, represent very helpful advice in setting the future directions of the NFMCC. We would suggest that a joint meeting involving the Collaboration, MCOG, and the DOE/HEP Division in the near future could be helpful in resolving issues relating to the future evolution of the muon program. We note that the Neutrino Factory and/or Muon Collider represent one of the very few elementary particle physics accelerator ideas on the horizon, and R&D in support of a complete design a decade from now will take a consistent effort.

Cc

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