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September 18, 2004

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Dear David, Bill and Lee:

This comes to thank Lee for an excellent oral presentation to the BNL Program Advisory Committee (PAC) at their Meeting of September 8-10, 2004 and convey to you the outcome of the consideration by the PAC of your Proposal, P969, "A $(g-2)_\mu$ Experiment to +/- 0.2 ppm Precision". The Committee examined the proposal, heard the oral presentation and discussed the proposal in executive session at that meeting. They then provided me with the following written advice:

> *"The PAC enthusiastically recommends approval of P969 with its highest 'must do' ranking for its physics goals and their potential impact. It strongly encourages the Lab to seek support and embark on this experiment as soon as possible and to make it a very high priority."*

The PAC went on to provide me with an expanded set of written comments that I append to this letter, all of which are supportive of the proposal and which delineate their views on how this significantly improved version of the $(g-2)_\mu$ experiment will positively impact the field of particle physics.

This strong endorsement by the PAC complements my own very strong and positive views about the value of carrying out this timely and important extension of your recently completed E962, and earlier E821, measurements of $(g-2)_\mu$. Accordingly, I am happy to accept the advice of the PAC and provide scientific approval of your proposal. It will, henceforth, be known as AGS Experiment E969.

As you know, the awarding of scientific approval by BNL for experiments intended to be run at the Brookhaven AGS must next be followed by a process to obtain funding for construction and operation of the experiment, this because the AGS is no longer a baseline facility of the U.S. DOE HENP program. The next step is for the Laboratory to submit E969 to the DOE Office of Nuclear Physics, DOE Landlord for the AGS-RHIC facility, for approval to include this experiment in the AGS fixed-target physics program. We have previously succeeded in obtaining all the necessary DOE and NSF agency approvals in the case of the upcoming RSVP experiments sponsored by the NSF, and we anticipate funding for RSVP construction to

commence in the near future. I am, therefore, optimistic that we will be able to succeed in obtaining agency approval and funding for E969 and will soon be in contact with the three of you to plan a coordinated effort by the Laboratory and the Experiment to pursue these goals.

Finally, let me take this opportunity to congratulate you and your entire Collaboration on successful presentation of the case for upgrading the existing $(g\text{-}2)_\mu$ Experiment to reduce the overall measurement error by more than a factor two, thereby, providing a very important extension of its experimental capability. Happily, this occurs just as the impact on particle physics of an improved experimental value of $(g\text{-}2)_\mu$ is reaching a new and very compelling level of importance to the whole field. This capability, along with advances in precision of the theoretical predictions for the Standard Model value of $(g\text{-}2)_\mu$, foreseen to occur in the next few years, will be of great importance as the worldwide particle physics program moves into the LHC era. You have all done a great job!

Sincerely,

(Original signed by T. Kirk)

Thomas B.W. Kirk
Associate Laboratory Director
High Energy and Nuclear Physics

Attachment (1)

Cc: PAC Members
A. Byon-Wagner, DOE-OHEP
G. Rai, DOE-ONP
J. Simon-Gillo, DOE-ONP
B. Tippens, DOE-ONP

BNL PAC Recommendations
Meeting of September 8-10, 2004

P969: Measurement of the μ Anomalous Magnetic Moment to 0.2 ppm

The PAC enthusiastically recommends approval of P969 with its highest "must do" ranking for its physics goals and their potential impact. It strongly encourages the Lab to seek support and embark on this experiment as soon as possible and to make it a very high priority.

Experiment E821 successfully completed its measurement of the muon anomalous magnetic moment (g-2) with a precision of 0.54 ppm, about a factor of 14 improvement over the classic CERN results of the 1970s. It finds a provocative 2.7 σ deviation from the Standard Model prediction, even when hadronic loop uncertainties are included. Such a discrepancy is suggestive of a large new physics effect, with supersymmetric loop contributions representing the most natural candidate explanation. If that interpretation is correct, it has dramatic implications for future collider studies, dark matter searches, flavor-changing neutral current reactions etc. In addition, it would represent a first sighting of a fundamental new space-time symmetry in Nature.

Proposal P969 aims to further improve the experimental determination of the muon g-2 by an additional overall factor of 2.5. That level of improvement is well matched to anticipated reductions in the theoretical hadronic loop uncertainties that will benefit from several sources of new e^+e^- and $\gamma\gamma \rightarrow$ hadrons data expected to become available during the next several years. Together, such improvements in theory and experiment could elevate evidence for new physics in g-2 to the more robust 5 sigma level, or if the discrepancy fades, lead to an important stringent constraint on potential new physics which future high energy physics discoveries would have to confront. In either case, the proposed improvement would be very important for the coming LHC era when roughly the same scale of new physics accessible to the muon g-2 will be directly probed in high energy pp collisions.

The PAC unanimously agreed that the physics motivation for P969 was very strong and that the proposed upgrades and running strategy were well formulated. The collaboration draws on the experience gained from E821 and the existing storage ring infrastructure that represents a major financial investment. The PAC believes that the P969 collaboration is capable of accomplishing its physics goals if properly supported. It feels that the required upgrades and AGS running need to be carried out in a timely manner. Otherwise, the expertise of the collaboration might be lost. Also, the physics it explores is naturally matched to possible LHC discoveries that are expected by the end of this decade.