

## **Tevatron 2014 Impact on the Muon (g-2) Experiment**

### **ABSTRACT**

The extension of the Tevatron through FY2014 would have the following impact:

- The proposed building site near AP0 could not be constructed during Tevatron running. A new site would need to be found.
- The beginning of data collection would be delayed between 12 and 24 months from the present technically driven schedule.
- This extension would not impact the physics reach of the experiment, but would delay the availability of a new result to further constrain the interpretation of results found at the LHC.

### **Introduction and Physics Reach**

The New (g-2) Collaboration proposes to measure the muon anomaly  $a = (g-2)/2$  to a relative precision of 0.14 parts per million (ppm), a factor of four beyond E821 at BNL. This level of precision should provide a definitive signal for physics beyond the standard model, and place significant constraints on the interpretation of new physics that might be discovered at the LHC.

This requires constructing a new (general purpose) building to house the muon storage ring, disassembling the storage ring at BNL, moving it to Fermilab, and re-commissioning it there. This could proceed in parallel with Tevatron running. However, modifications to the accelerator complex are also required and could not begin until Tevatron operations cease.

### **Changes resulting from the extended Tevatron running**

The plan for installation of the muon (g-2) experiment at Fermilab was prepared assuming that construction on the building and beamline stub could begin during the shutdown at the end of FY2011, along with work on the recycler, target station, etc. Simultaneously disassembly of the ring would begin at BNL so that the magnet could be moved to Fermilab and re-assembled once the building was completed.

The critical path for (g-2) is primarily determined by the 9 months to construct the building, the 18 months needed to disassemble, ship and reassemble the storage ring, plus the 9 months required to re-shim the magnetic field. (The ring disassembly and the building construction can be simultaneous.) Thus the critical item is the relocation of the muon storage ring to Fermilab, which requires construction of a building on site to begin as quickly as possible. This work can proceed in parallel to Tevatron running, and regardless of the presently proposed shutdown for accelerator modifications in FY2012.

A generic building plan has been prepared by FESS, but the detailed engineering awaits funding. With the Tevatron running, the proposed building location near AP0 would not work, since construction could not be carried out when the beam is present in the machine. Alternate sites are being considered that would permit construction during Tevatron operation. Since the

detailed building engineering has not been carried out yet, the relocation would not cost additional money or time. This relocation of the (g-2) experiment would permit the re-commissioning of the storage ring magnet, and shimming to begin in parallel with the Tevatron operations.

The work in reconfiguring the AP0 target region, and some other work to the beamlines cannot be done until the Tevatron running is finished. This could delay the final commissioning with beam until sometime in 2016. We emphasize that the delay that could result does not diminish the physics interest or impact of the (g-2) experiment.