The muon anomalous magnetic moment

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The experiment at Brookhaven National Laboratory to make a precise measurement of the muon anomalous g value, $a_\mu = (g-2)/2$, has obtained extensive new data in the past 1 1/4 year since the report [1] of its first result $a_{\mu+} = 1\ 165\ 925(15) \times 10^{-9}$ (13 ppm), obtained with pion injection into the muon storage ring. The new data have used muon injection which provided an increase to about 4000 stored muons per injection pulse and a large reduction in background. In addition, major improvements in the magnetic field of the storage ring, in detector efficiency, and in beam tuning were achieved. Greater than 2×10^9 e^+ from μ^+ decays were recorded, which implies a statistical error in a_μ of 1 ppm. The overall systematic error is expected to be at the 1 ppm level. Analysis of about 4 % of the new data provides the preliminary value $a_{\mu+} = 1\ 165\ 919(6) \times 10^{-9}$ (5 ppm) in which the error is dominantly statistical. Combining the measured values from CERN [2] and BNL [1] we obtain $a_\mu(\text{expt}) = 11\ 659\ 208(46) \times 10^{-10}$ (3.9 ppm), which is in agreement with the latest theoretical value [3] $a_\mu(\text{theor}) = 116\ 591\ 628(77) \times 10^{-11}$ (0.66 ppm). Analysis of the bulk of our new data is in progress, and a more precise value of $a_{\mu+}$ may be available at the ICAP meeting.

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