The Muon Anomalous Magnetic Moment and the Standard Model

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The muon anomalous magnetic moment measurement, when compared with accurate theory, is a test of physics beyond the standard model. I will discuss the most recent measurement[1] made by the Brookhaven E821 Collaboration. Our new result reduces the uncertainty on the world average of a_μ to 0.7 ppm, comparable now with theory. Given the hadronic light-by-light sign error correction to the theory made last year, the relative difference between experiment and published theory[2] is 2.6 standard deviations (σ). A recent preprint,[3] based on new data from Novosibirsk and additional tau decay data from LEP, gives two new evaluations of the important first-order hadronic vacuum polarization component. Using only the e^+e^- result, one obtains a 3.0 σ difference between experiment and theory, while only using the tau input gives a more modest 1.6 σ discrepancy. I plan to outline the key steps in the data analysis and also to discuss the issues behind the current theory controversy. The figure shown below summarizes the situation at the time of this abstract submission.

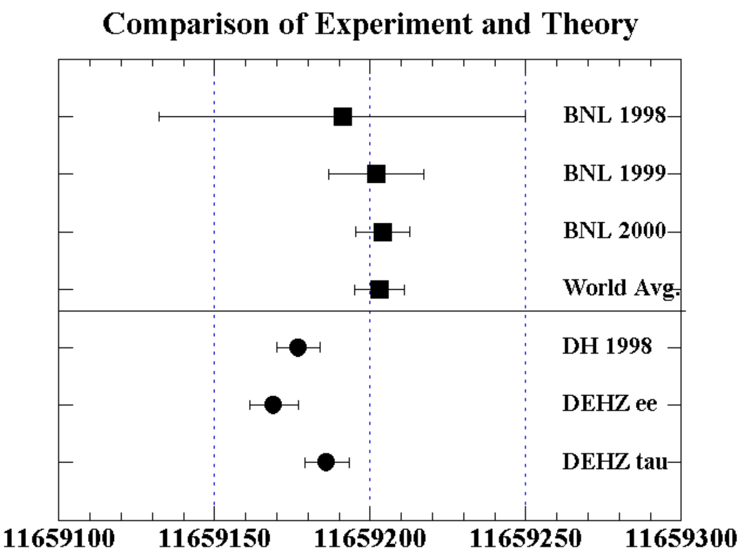

Figure 1: Experiment and theory comparison as of August, 2002 for the muon anomalous magnetic moment. The most recent theory preprint of DEHZ includes results from use of only e^+e^- and from only tau decays. The reason for the difference is not yet resolved.

References

1. Muon $g-2$ Collaboration: G.W. Bennett et al., Phys. Rev. Lett. **89** (2002) 101804.
2. M. Davier and A. Höcker, Phys. Lett. **B435** (1998) 427.
3. M. Davier, S. Eidelman, A. Höcker and Z. Zhang, hep-ph/0208177, Aug. 20, 2002.