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The anomalous magnetic moment of the muon from lattice QCD

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The anomalous magnetic moment of the muon, defined as the fractional difference of its gyromagnetic ratio from the naive value of 2, has been measured with an impressive accuracy of 0.54 parts per million in experiment (BNL E821), thus providing one of the most stringent tests of the Standard Model. Intriguingly, the experimentally measured anomaly disagrees by around 3 standard deviations with the calculated value from the Standard Model. The current theoretical uncertainty is dominated by that from the calculation of the lowest order “hadronic vacuum polarisation (HVP)”. Improvements in the experimental uncertainty by a factor of 4 in the upcoming experiment at Fermilab (E989) are expected and improvements in the theoretical determination would make the discrepancy (if it remains) really compelling in trying to ascertain the possibility of new physics beyond the Standard Model. I will report on progress (Phys. Rev. D 89, 114501 (2014)) and plans for improving the theoretical calculation of the HVP contribution to the anomaly using our (HPQCD) new lattice QCD method.

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