Contribution ID : **113** Type : **plenary talk**

The Role of Mesons in Muon g-2

Saturday, 9 June 2018 09:30 (0:30)

Collaboration

Abstract content

The muon anomaly $a_\mu = (g_\mu - 2)/2$ showing a persisting 3 to 4 σ deviation between the SM prediction and the experiment is one of the most promising signals for physics beyond the SM. As is well known, the hadronic uncertainties are limiting the accuracy of the Standard Model prediction. Therefore a big effort is going on to improve the evaluations of hadronic effects in order to keep up with the 4-fold improved precision expected from the new Fermilab measurement in the near future. A novel complementary type experiment planned at J-PARC in Japan, operating with ultracold muons, is expected to be able to achieve the same accuracy but with completely different systematics. So exciting times in searching for New Physics are underway. I discuss the role of meson physics in calculations of the hadronic part of the muon g-2. The improvement is expected to substantiate the present deviation $\Delta a_\mu^{\text{New Physics}} = \Delta a_\mu^{\text{Experiment}} - \Delta a_\mu^{\text{Standard Model}}$ to a 6 to 10 standard deviation effect, provided hadronic uncertainties can be reduced by a factor two. This concerns the hadronic vacuum polarization as well as the hadronic light-by-light scattering contributions, both to a large extent determined by the low lying meson spectrum. Better meson production data and progress in modeling meson form factors could greatly help to improve the precision and reliability of the SM prediction of a_μ and thereby provide more information on what is missing in the SM.

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Session Classification : Plenary Session