Contribution ID: **457** Type: **Parallel**

Status of the Muon g-2/EDM Experiment at J-PARC

Thursday 10 July 2025 09:45 (15 minutes)

The muon magnetic anomaly, ,a_mu= (g −2)/2, can be both measured and computed to a very high precision, making it a powerful probe to test the Standard Model of particle physics and search for new physics. At the beginning of the 2000s, the E821 experiment at Brookhaven (USA) measured with a precision of 0.54 parts per million (ppm), finding a discrepancy of about three standard deviations with the theoretical prediction of the Standard Model. In recent years (2021-2023), the Muon g−2 Experiment at Fermilab has measured a_mu with an improved precision of 0.21 ppm, showing good agreement with the previous experimental result at Brookhaven, and a new result at 140 ppb accuracy with the full statistics is expected this year. While the comparison with the Standard Model is currently limited by tensions in the theory, a new measurement of a_mu with a different approach will be crucial for independently verifying the current prediction of the muon anomaly and exploring possible new physics beyond the Standard Model. The Muon g-2/EDM Experiment at J-PARC will employ a novel way to measure a_mu, by using a low-emittance beam of positive muons stored in a compact muon storage magnet. The experimental method includes new technologies such as a three-dimensional spiral injection, an MRI-type storage magnet with superb field uniformity, and a positron tracking detector. The experiment aims at an initial accuracy of 450 ppb corresponding to 2 years of data taking. The experiment also aims to measure the muon EDM with a sensitivity of 1.5 x10^-21 e cm. Currently, the experiment is in the construction phase, with key components such as the storage magnet and beam injection system undergoing final optimizations. First beam tests have been conducted successfully, validating the feasibility of the novel injection method. I will present the current status of the experiment, ongoing tests and design optimizations, and the plans for improvements of the experimental precision.

Secondary track

T07 - Flavour Physics and CP Violation

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Session Classification: T09

Track Classification: T09 - Beyond the Standard Model