Muon g–2 or stress testing the SM

Report of Contributions

https://agenda.infn.it/e/48021

Contribution ID: **1** Type: **not specified**

Introduction

Tuesday 14 October 2025 10:10 (20 minutes)

Presenter: FREZZOTTI, Roberto (Univ. & INFN Roma Tor Vergata)

Contribution ID: **2** Type: **not specified**

Final Results from the Muon g-2 Experiment at Fermilab

Tuesday 14 October 2025 10:30 (30 minutes)

The Muon g-2 experiment at Fermilab has recently published the final measurement of the muon anomalous magnetic moment, reaching an unprecedented precision of 127 parts per billion (ppb), well below the original design goal of 140 ppb. This result serves as a critical reference point for theory, placing a benchmark to probe the Standard Model. The experiment is based on the precise determination of the anomalous spin precession frequency of muons in a magnetic field, extracted from the time distribution of decay positrons recorded by 24 electromagnetic calorimeters placed around a 14 m diameter storage ring. Equally crucial is the precise knowledge of the storage ring magnetic field and of the beam's spatial and temporal distribution. The result presented in this talk is based on the full dataset collected between 2018 and 2023. I will present the result and discuss the experimental technique, the analysis details and the control of systematic effects that were decisive in achieving the final precision.

Presenter: SORBARA, Matteo (Univ. & INFN Roma Tor Vergata)

Contribution ID: **3** Type: **not specified**

The HVP contribution to the Muon g-2 in the SM from lattice QCD

Tuesday 14 October 2025 11:00 (30 minutes)

The Muon g-2 Collaboration has recently measured the anomalous magnetic moment of the muon, a_μ, with an unprecedented precision of about 0.13 ppm. To fully exploit this remarkable achievement, theoretical predictions must reach a comparable level of accuracy. A major challenge arises from the leading hadronic vacuum polarization (HVP) contribution, which needs to be determined with sub-percent precision. In this talk, I will discuss the latest lattice results for this contribution to a_μ evaluated "ab initio" in the Standard Model (SM) and also give an update on the ongoing calculations carried out by the Extended Twisted Mass Collaboration (ETMC).

Presenter: GAGLIARDI, Giuseppe (Univ. & INFN Roma Tre)

Contribution ID: **4** Type: **not specified**

Muon g-2 and the quest for new physics

Tuesday 14 October 2025 11:30 (30 minutes)

The hadronic vacuum polarization (HVP) contributions to the muon g−2 are the crucial quantities to resolve whether new physics is present or not in the comparison between the Standard Model (SM) prediction and experimental measurements at Fermilab. They are commonly and historically determined via dispersion relations using a vast catalogue of experimentally measured, low-energy e+e−⟶hadrons cross section data as input. These dispersive estimates result in a SM prediction that exhibits a muon g−2 discrepancy of more than 5σ when compared to experiment. However, recent lattice QCD evaluations of the HVP and a new hadronic cross section measurement from the CMD-3 experiment favor a no-new-physics scenario and, therefore, exhibit a common tension with the previous e+e−⟶hadrons data. We discuss the current and
future implications of these two scenarios on other observables, such as the electron and tau g−2, the running of α and of the weak mixing angle, and the Muonium hyperfine splitting, that are also sensitive to the HVP contributions in the hope that they may provide independent tests of the current tensions observed in the muon g−2.

Presenter: PARADISI, Paride (Univ. & INFN Padova)

Contribution ID: **5** Type: **not specified**

Muon g-2: issues with data driven approaches

Tuesday 14 October 2025 13:30 (30 minutes)

After a brief review of the data driven approach for the determination of the hadronic contribution to the vacuum polarization, the focus of the talk will be on the challenges posed by the measurement of the hadronic cross section and possible issues of theoretical origin. Also the spacelike approach, implemented through the MUonE experiment and its future perspectives will be discussed.

Presenter: PICCININI, Fulvio (GGI dir. & INFN Pavia)

Contribution ID: **6** Type: **not specified**

Muon g-2: present and future experiments

Tuesday 14 October 2025 14:00 (30 minutes)

The final result on the measurement of the muon gyromagnetic anomaly, recently released by the E989 Collaboration at Fermilab, is a solid textbook reference for theory and experiment alike. It is not, however, the end of the story. The discrepancies in the theoretical approaches between lattice and data-driven calculations, compounded by the tensions in the current experimental determinations of the leading hadronic vacuum polarization contribution, call for a precision observation conducted with a novel approach. The MUonE experiment at CERN tries to address this concern. Furthermore, a muon g-2 measurement affected by different systematic effects and uncertainties with respect to E989 is clearly highly desirable. The Muon g-2/EDM@JPARC project in Japan promises a new precision measurement of the muon gyromagnetic anomaly, exploiting a pure beam of low-energy muons and a compact magnetic environment.
I will discuss the current status of the MUonE experiment at CERN and the perspectives for joining forces with the ongoing effort at JPARC.

Presenter: CANTATORE, Giovanni (Univ. & INFN Trieste)