Contribution ID: **73** Type: **Report**

The Schrödinger equation for muon-related bound-state systems is solved numerically employing the Gaussian expansion method

Muonic bound states ($\mu^+\mu^-$, μ^-p^+, μ^+e^-) serve as important platforms for studying lepton interactions, testing the Standard Model (SM), and probing Beyond the Standard Model (BSM) phenomena, offering unique physical significance. Among these, true muonium ($\mu^+\mu^-$), composed purely of second-generation leptons, exhibits cleaner and more tractable physical properties due to its purely leptonic composition and larger reduced mass, making it particularly suitable for high-precision tests of quantum electrodynamics (QED) and searches for potential new physics effects. The precise calculation of its energy-level structure especially fine and hyperfine splittings is crucial for understanding fundamental lepton interactions. At the same time, μ^+e^- (muonium) and μ^-p^+ (muonic hydrogen) bound states play an irreplaceable role in investigating lepton-matter interactions and low-energy-scale new physics phenomena.
In this work, we employ the Gaussian expansion method combined with QED corrections to numerically solve the Schrödinger equation for these muonic bound states, systematically computing their energy spectra and fine-structure splittings. The results provide a theoretical foundation for future high-precision experimental measurements and theoretical validation.

Primary author: 刘, 廷廷 (湖南大学)

Presenter: 刘, 廷廷 (湖南大学)