Lepton and Quark Flavour Structures

Wednesday, 16 October 2024 - Saturday, 19 October 2024

Book of Abstracts

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Conceptual design report of muonium to antimuonium conversion experiment (MACE)

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The spontaneous conversion of muonium to antimuonium is one of the interesting charged lepton flavor violation phenomena, offering a sensitive probe of potential new physics and serving as a tool to constrain the parameter space beyond the Standard Model. Utilizing a high-intensity muon beam, a Michel electron magnetic spectrometer and a positron transport solenoid together with a positron detection system, MACE aims to discover or constrain this rare process at the conversion probability beyond the level of 10^{-13}. This talk will release the conceptual design report for MACE.

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Revealing the Origin of Neutrino Masses through Displaced Shower Searches in the CMS Muon System

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We study the potential to probe the origin of neutrino masses, by searching for long-lived right-handed neutrinos (RHNs) N in the $B - L$ model. Despite the small active-sterile mixing $|V_{\ell N}|^2$, RHNs are produced abundantly via SM and exotic Higgs production, as long as the Higgs mixing is sufficiently large. We reinterpret a search for displaced showers in the CMS muon system and we find that it is sensitive to parameter space at and below the seesaw floor, $|V_{\ell N}|^2 \approx 10^{-12}$ ($\ell = e, \tau$) for $m_N \approx 40$ GeV. With existing data constraining such a well-motivated scenario of neutrino mass generation, we determine the projected sensitivity at the HL-LHC, motivating dedicated searches for long-lived RHNs with decay lengths ≈ 10 m.

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Calculable neutrino Dirac mass matrix in the minimal left-right symmetric model

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Based on the paper: arXiv:2404.16740 (PRD). In the context of minimal left-right symmetric model, where parity is taken as the left-right symmetry, we propose a general parametrization of the right-handed neutrino mixing matrix and construct the heavy neutrino mass matrix that maintains the Hermiticity of neutrino Dirac mass matrix. We further apply it to calculate the strong CP parameter from the leptonic CP violation at the one-loop level, which inversely constrains the heaviest sterile neutrino mass at the TeV scale.

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An SU(8) theory of the SM quarks and leptons

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We propose an SU(8) theory to originate the observed SM quark/lepton mass hierarchies and the CKM mixing pattern with the non-universal embedding structure, as well as the gravitational effect.

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