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New physics searches in low-energy precision experiments

Various extensions of the Standard Model give rise to BSM particles with masses in the MeV to sub-GeV range. Such particles are often associated with dark matter, the strong CP problem and the $(g-2)_\mu$ anomaly. In this work, we examine the experimental constraints on such particles that can be derived from near-future high-precision experiments, including the MESA facility and the JLab program utilizing polarized positrons, alongside recent measurements of $(g-2)_l$. Special focus is placed on lepton couplings, which remain weakly constrained within this mass range.

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