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Lepton universality test with MUSE at PSI

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Lepton universality (LU) typically refers to the lepton coupling, which is considered to be the same for e and μ if the interaction is electroweak according to the Standard Model, and it is hence a compelling probe for New Physics.

The same principle of universal electroweak lepton interaction leads to the expectation that lepton scattering yields are equal for e and μ under the same kinematic condition. The mere mass difference between e and μ affects kinematic quantities (such as the relation between scattering angle and Q^2), and the lepton mass dependence of elastic cross sections for leptons scattered from structured and pointlike objects are taken into account.

By comparing e^+ , e^- , μ^+ , and μ^- scattering yields, two-photon exchange (TPE) effects, universal or not, can be separated from the general lepton universality test of the e/μ yield ratio.

With its separable mixed beams of e^+/μ^+ and e^-/μ^- , respectively, the MUSE experiment at PSI is not only designed to measure the proton charge radius with four lepton species, but is also uniquely suited to probe TPE and LU, while benefitting from partial cancellations of certain shared systematics.

An overview will be given of the MUSE experiment, the sensitivity, and the present status.

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