

Mainz Microtron MAMI

A2 Collaboration at MAMI

Spokespersons: P. Pedroni, A. Thomas

Letter of Intent

Lepton Universality Test via Precise Measurements of Bethe-Heitler Production

Spokespersons for the Experiment :

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Abstract of Physics :

Currently there are several indications that the muon might couple to physics beyond the Standard Model. This letter of intent (LOI) concerns itself with a lepton universality test inspired by the proton charge radius puzzle and the anomalous magnetic moment of the muon. Pauk and Vanderhaeghen (Phys. Rev. Lett. **115** (2015) 221804) have proposed to use Bethe Heitler (BH) production, $\gamma p \rightarrow pl^+l^-$ ($l = e, \mu$) at low proton momentum transfers to test universality. For this purpose a high resolution time projection chamber (TPC) with an internal target can be used. We will use an available prototype for a test run in 2017, which will serve as a basis for a full proposal in the next run period.

Abstract of Equipment :

The test run will be performed at the tagged photon facility of MAMI with the new Glasgow Tagger. A hydrogen active-target TPC and tracker will measure the recoiling protons and leptons, respectively. A prototype is available in Darmstadt which can be transferred to Mainz. The purpose of the test is to study rates, efficiencies and resolution, in preparation for a full experiment at A2.

MAMI Specifications :

beam energy	1604 MeV
beam polarization	unpolarized

Photon Beam Specifications :

tagged energy range	450 – 1500 MeV
photon beam polarization	unpolarized

Equipment Specifications :

detectors	TPC Prototype from Darmstadt, TAPS, Tagger
target	internal target, Hydrogen, 20 bar

Beam Time Request :

set-up/test with beam	50 hours
data taking	200 hours