

PhD Thesis - MUonE - Dottorato in Fisica - UniTS

G. Cantatore - 13/6/2022

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Direct measurement of the hadronic contribution to the Muon magnetic anomaly (MUonE experiment at CERN)

Abstract

The MUonE experiment (<https://web.infn.it/MUonE/>), now in the test beam stage, aims at obtaining a precise direct measurement of the hadronic contribution to the muon anomaly from the determination of the scattering angle in the elastic scattering of muons off electrons. The basic concept is sending a muon beam on an electron target (typically Be or graphite) and reconstructing the exiting particle tracks with a set of tracking detectors. The importance of a successful measurement would be on par with the results of a “g-2” type experiment. The MUonE collaboration is implementing the design of a beamline to be installed and operated in the North Experimental Area at CERN, serviced by muon beams from the SPS accelerator complex. The first step toward this goal is the completion of a series of test beams at CERN with a fully functional but reduced size apparatus.

Specific thesis topics

The Trieste group in the MUonE collaboration, together with colleagues from INFN Pisa, has the responsibility of the mechanical design and construction of the MUonE beamline, including its alignment and the monitoring of the critical longitudinal distances between tracking sensors. The thesis will involve, among other things, studies on beamline elements, chiefly tracking modules, their positioning and alignment, and the use of a custom optical method to monitor distances before and during operation based on digital interferometric holography. The Holographic Alignment Monitor (HAM), already in operation in prototype form, will be expanded and fully integrated with the MUonE beamline at CERN. The thesis work will include periods at CERN for beamline construction and data taking.

Participating Institutions

UniTS

INFN: Trieste, Pisa, Padova, Bologna,

CERN

Other international Institutions and Universities

People locally involved

G. Cantatore (UniTS and INFN Trieste) - supervisor

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