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Characterisation of Carbon Fibre thermal expansion coefficient for the tracking system of the MUonE experiment

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There is a long-standing discrepancy between theory and experiment in the evaluation of the muon g-2. The leading order hadronic contribution to the muon anomalous magnetic moment, aμHLO is the highest source of uncertainty in this evaluation. The MUonE experiment aims to measure aμHLO with high precision using a novel approach. The MUonE experiment will take place in CERN's North area, using the M2 beam line which produces 160 GeV muons, which will be scattered on a fixed low Z target. The experiment has a modular structure composed of multiple 1m long tracking systems that have individual targets. aμHLO can be evaluated by the extraction of the effective electromagnetic coupling from the shape of the differential cross section of the μ-e elastic interactions. The main challenge for MUonE is to keep the systematic error at the level of 10ppm in the signal region. In order to meet this requirement, the longitudinal distances within a tracking station must be stable at the level of 10μm. The current tracking system mechanics is made of Invar, a material which meets the stringent requirements on the longitudinal stability, despite high production costs. In order to optimize the production, an investigation of carbon fibre as an alternative material was carried out. Results of a study to characterize its thermal expansion will be presented.

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