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The Cylindrical Drift Chamber of the MEG II Experiment

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The MEG experiment at the Paul Scherrer Institut (PSI) represents the state of the art in the search for the charged Lepton Flavour Violating $\mu^+ \to e^+\gamma$ decay, setting the most stringent upper limit on the BR $(\mu^+ \to e^+\gamma) \leq 4.2 \times 10^{-13}$ (90% C.L.). An upgrade of MEG, MEG II, was designed and it recently started the physics data taking, aiming at reaching a sensitivity level of 6×10^{-14}. In order to reconstruct the positron momentum vector a Cylindrical Drift CHamber (CDCH) was built, featuring angular and momentum resolutions at 6.5~mrad and 100~keV/c level. The MEG II drift chamber presents a series of unprecedented peculiarities. CDCH is a 2-meter long, 60 cm in diameter, low-mass, single volume detector with high granularity: 9 layers of 192 drift cells, few mm wide, defined by 12000 wires in a stereo configuration for longitudinal hit localization. CDCH is the first drift chamber ever designed and built in a modular way. The filling gas mixture is Helium:Isobutane 90:10. The total radiation length is 1.5×10^{-3} X_0, thus minimizing the Multiple Coulomb Scattering and allowing for a single-hit resolution < 120 μm. After the assembly phase at INFN Pisa, CDCH was transported to PSI and integrated into the MEG II experimental apparatus since 2018. The commissioning phase lasted for the past three years with several hardware improvements until the operational stability was reached in 2020. The analysis software is continuously developing and the tuning of the reconstruction algorithms is one of the main activities. The last updates on the single-hit and positron momentum vector resolutions and tracking efficiency will be presented.

Collaboration

MEG

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