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Construction technique for the MEG Drift Chambers and its related readout electronics

In the search for the charged lepton flavor violating decay: μ+ ⟶ e+ γ, the MEG experiment, at the Paul Scherrer Institute near Zurich, has published in 2013 the upper limit BR (μ+ ⟶ e+ γ) < 5.7×10−13, 90% CL. Final results, based on the complete data set will be published within 2015.
A substantial further improvement of the MEG results requires an improvement of the detector performances in order to reject the background contributions, which limit the signal sensitivity. An upgrade of the experiment is ongoing, aiming at reaching a sensitivity ~5×10−14. A new positron tracker of the magnetic spectrometer is being built as a single-volume cylindrical drift chamber made of:
• 10 layers of drift cells with anodes at alternating stereo angles of about 8°;
• drift cells with an approximately 7×7 mm2 square shape;
• an ultra-low mass gas mixture with helium and iso-butane in the ratio 85:15;
• total material yielding less than 2×10-3 radiation lengths per positron track;
• 20 μm gold-plated tungsten wires as anodes;
• 40÷50 μm silver-plated aluminum wires as cathodes and guard wires;
• dual readout for longitudinal coordinate estimate.
We present a novel construction technique for the new positron tracker of MEG. It consists of a semi automatic wiring machine with a high degree of control over both wire positioning and mechanical tensioning; a contact-less IR laser soldering tool designed for a feed-through-less wire anchoring system and an automatic handling system for storing and transporting the multi-wire layers, before they are mounted on the drift chamber end-plates.
The tracker must achieve a resolution of 100 μm in the measurement of the impact parameter. To fulfilling this goal, we designed and produced a new eight-channel front-end electronic board with a high speed and low noise.
The new construction technique has been successfully implemented at INFN-Lecce and University of Salento and is currently being used.

Primary author: CHIARELLO, Gianluigi (LE)

Co-authors: CORVAGLIA, Alessandro (LE); MICCOLI, Alessandro (LE); PEPINO, Aurora (LE); Mr PINTO, Carlo (Università del Salento -iNFN Lecce); CHIRI, Claudio (LE); GRANCAGNOLO, Francesco (LE); Dr TASSIELLI, Giovanni Francesco (LE); PANAREO, Marco (LE); SPEDICATO, Matteo (L); PRIMICERI, Patrizio (LE)

Presenter: CHIARELLO, Gianluigi (LE)