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Analysis and study of the problems on the wires used in the MEG CDCH and the construction of the new drift chamber

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In the MEG II detector, the measurement of the momentum of the charged particle is performed by a high transparency single volume, full stereo cylindrical Drift Chamber (CDCH). It is composed of 9 concentric layers, each consisting of 192 drift cells. The single drift cell is approximately square, with a 20 μm gold plated W sense wire surrounded 40 μm/50 μm silver plated Al field wires in a ratio of 5:1. During the construction of the first CDCH, we had the breaking of a hundred cathode wires: of these, 97 are 40 μ aluminum wires while 10 are 50 μm wires.Since the number of broken cathodes is less than 1\% of the total, one can expect the influence on the track reconstruction efficiency to be not so dramatic. We verified by means of simulations that the loss of one cathode does not change the cell electric field appreciably. We present the results of the analysis of the effects of mechanical stress and chemical corrosion observed on these broken wires and a simple empirical model that relates the number of broken wires to their exposure time to atmospheric relative humidity and their mechanical tension. Finally we will show the study carried out on new wires to overcome the weaknesses found and the process that will be used for the construction of the new drift chamber (CDCH2). It will be built with the same modular technique, as for the first, the wiring robot will be used by improving some weak points and using new wires with a diameter of 25\% thicker diameter, which has very little effects on the resolution and efficiency of the detector. Furthermore these wires are made with a manufacturing process different from their used previously.

Collaboration

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