Observations on Cathode Aging (Malter effect) in High–Irradiation–Load Drift Tubes

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The 'Malter' effect (ignition of self-sustaining discharges) in honeycomb drift chambers with cathodes of conductive plastics, using CF_4–containing drift gases, as observed in prototypes of the outer tracker in HERA–B, is reviewed. In addition to the observations from irradiation tests, the results of additional studies of cathode surface properties are presented.

Summary of Poster: The main observations discussed here are connected to a form of cathode aging known as 'Malter' effect, with special attention to the following influencing factors:

- Surface properties: The presence of an isolating, irradiation-dependent surface layer could be demonstrated by various methods (electron- and X-ray spectroscopy, among others).
- Beam conditions: According to observations of striking differences in aging effects for various beams, the decisive role of local peaks in ion current densities, as caused by heavily ionizing particles ('HIPS'), became very likely.
- Influence of quencher: The use of CH_4 as quencher in CF_4 containing gases was found responsible for enhanced plasma polymerization on both electrodes.

Some semi-quantitative estimates are included, in order to promote some discussion on the physical explanation and systematization of the often not-easy-to-interpret observations.