

Studies on impurities and F-radicals production in gaseous detectors operated with Freon based gas mixtures at LHC Experiments

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At the CERN LHC experiments several gaseous detectors are operated with Freon based gas mixtures. CF₄ is used for wire chambers and Gas Electron Multiplier (GEM) detectors while C₂H₂F₄ and SF₆ for Resistive Plate Chambers (RPCs). Under the effects of electric field and radiation, these gases undergo radiolytic dissociation producing new molecules and radicals, which could be detrimental to detector long term operation.

During LHC Run 2 several gas analyses were performed on the gas mixtures of RPCs and GEMs operated in ALICE, CMS and LHCb experiments. It was observed that several impurities and F- radicals are created inside the detectors and their concentration depends on several factors. Systematic studies on F- production in RPC and GEM detectors have been performed at CERN GIF++ with high background radiation. Correlations between impurities, gas flow, integrated charge, rate and detector currents were established.

A comprehensive overview of the results obtained will be presented

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