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Quantifying the Effectiveness of Muon Detector Purification Systems[1] NAOMI MBURU, Univ of Maryland-Balt County, ROBERTO GUIDA, BEATRICE MANDELLI, European Center for Nuclear Research — The experiments along the Large Hadron Collider (LHC) at the European Organization for Nuclear Research (CERN) were developed to study the fundamental particles that govern our universe. These experiments utilize gaseous detectors to track muons in the outermost portion of the experiment. For example, in the Compact Muon Solenoid (CMS) experiment three types of gaseous detectors are used as muon trackers: Resistive Plate Chambers (RPCs), Drift Tubes (DTs) and Cathode Strip Chambers (CSCs). RPCs use a gas mixture of Freon ($C_2H_2F_4$), sulfur hexafluoride (SF_6) and isobutane (iC_4H_{10}). The components of this gas mixture are both expensive and have high global warming potentials, so most of the gas mixture must be recycled and purified through a gas recirculation system. For this reason, RPCs employ purification systems that remove impurities due to the contamination and irradiation of the gas mixture that occur during normal operation of the LHC. Ion selective electrodes, gas chromatography, and mass spectrometry are set up and employed to study impurities produced in the RPCs and to quantify the ability of the purification systems to remove these impurities.

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