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## Studies of F- Impurities Formation in ALICE MID RPC detectors: A Comparison between RUN2 and RUN3

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ALICE MID system consists of 72 single-gap Resistive Plate Chamber (RPC) detectors, operated with a gas mixture composed of  $C_2H_2F_4$  (R134a)/ $iC_4H_{10}$ /SF<sub>6</sub> - 89.7%/10%/0.3%, along with about 40% of relative humidity. The combined effects of background irradiation and the electric field within the detector's gas result in the production of F<sup>-</sup> ions and F-based impurities, also due to the high concentration of fluorinated gases used to operate the detector.

During RUN2, a preliminary setup was installed to monitor the formation of these impurities, which could lead to the formation of hydrofluoric acid, potentially damaging the detectors and the gas system irreparably. This setup successfully demonstrated the production of HF and other impurities, and the purifier's capability to trap them, ensuring the feasibility of operating the gas system in recirculation mode.

During LS2, the set up was improved and was commissioned for the restart of RUN3. It consists of a gas chromatograph to monitor the correct composition of the gas mixture and F-based impurities and an Ion Selective Electrode (ISE) setup for detecting the F<sup>-</sup> concentration.

This study provides a comprehensive overview of the creation of impurities in the RPC detectors under irradiation. Furthermore, it presents a comparative analysis between the results obtained during RUN2 and those ongoing in RUN3.

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