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## Assessment of Outgassing and Ageing in Resistive Plate Chambers Using Gas Chromatography

Resistive Plate Chambers (RPCs) are widely used in high-energy physics experiments to detect charged particles. However, their performance can degrade over time due to outgassing and ageing effects, impacting long-term detector reliability. This study aims to investigate these potential outgassing and ageing effects in RPCs, which can compromise sustained high-performance operation.

Data were collected in two phases, in 2018 and 2024, using Gas Chromatography (GC) to examine the gaseous environment within the detectors as the gas exits the system. In addition, both the input gases and the output from the gas mixing unit (GMU) were analyzed for impurities, moisture, and other potential outgassing sources.

Key performance metrics of the RPC detectors, including operating voltage, efficiency, leakage current, and dark count rate, were compared between the 2018 and 2024 datasets to assess any signs of ageing over time. Furthermore, GC analysis was conducted in both phases to identify any additional peaks indicative of outgassing in the 2024 data relative to the 2018 baseline.

## Field of contribution

Experiment

Author: Dr PHOGAT, Aman (Hansraj College, University of Delhi)

**Co-authors:** PRAKASH, Chandra (University of Delhi (IN)); Mr KUMAR, Hemant (Instituto de Alta Investigacion, Universidad de Tarapaca); KUMAR, Ashok (University of Delhi); NAIMUDDIN, Mohammad (University of Delhi (IN))

Presenter: Dr PHOGAT, Aman (Hansraj College, University of Delhi)

Track Classification: Future experiments and detector development