Contribution ID: **622**   Type: **Talk**

Performance studies of RPC detectors operated with new environmentally friendly gas mixtures in presence of LHC-like radiation background

Thursday 30 July 2020 11:30 (15 minutes)

Resistive Plate Chamber (RPC) detectors are widely used thanks to their excellent time resolution and low production cost. At the CERN LHC experiments, the large RPC systems are operated in avalanche mode thanks to a Freon-based gas mixture containing C2H2F4 and SF6, both greenhouse gases with a very high global warming potential (GWP). The search of new environmentally friendly gas mixtures is advisable for reducing greenhouse gas emissions, costs as well as to optimize RPC performance and possible detector aging issues. Several hydrofluorocarbons, hydrofluoroolefins (HFOs) and innovative industrial alternative to SF6 gases with very low GWP have been identified as possible replacements of C2H2F4 and SF6. More than 60 environmentally friendly gas mixtures have been investigated on 2 mm single-gap RPCs. The RPC detectors have been tested in laboratory conditions and at the CERN Gamma Irradiation Facility (GIF++), which provides a high energy muon beam combined with an intense gamma source allowing to simulate the background expected at HL-LHC.

RPCs performance have been studied at different gamma rates with the new environmentally friendly gases by measuring efficiency, streamer probability, rate capability, induced charge, cluster size and time resolution. Encouraging results of RPC operation in avalanche mode have been obtained with 4 and 5 components gas mixtures.

A complete overview of the results obtained will be presented. To finalize the studies, the RPCs are now operated under gas recirculation with the selected new gas mixture and exposed to the intense gamma radiation at the CERN GIF++ facility for evaluating possible long-term aging effects, gas damage due to radiation and compatibility of LHC gas system with new gases.

Secondary track (number)

12

Authors: MANDELLI, Beatrice (CERN); GUIDA, Roberto (CERN); RIGOLETTI, Gianluca (Universite Claude Bernard Lyon I (FR))

Presenter: MANDELLI, Beatrice (CERN)

Session Classification: Detectors for Future Facilities (incl. HL-LHC), R&D, Novel Techniques

Track Classification: 13. Detectors for Future Facilities (incl. HL-LHC), R&D, Novel Techniques