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Strategies to reduce the Global Warming impact in the MRPC array of the EEE experiment

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The Extreme Energy Events (EEE) Project employs Multi-gap Resistive Plate Chambers (MRPC) detectors for studying the secondary cosmic ray muons in Extensive Air Showers. The array is made up by ~60 tracking detectors, sparse on Italian territory and CERN. Each EEE telescope consists of 3 layers of MRPCs with an active area of 158 x 82 cm^2, operated in avalanche mode. The MRPCs are fluxed in daisy chain with a standard gas mixture 98%/2% of C2H2F4 and SF6 at a continuous flow of 2 l/h, at atmospheric pressure. This means the array emission in atmosphere is order of 10^6 l/year, where the Global Warming Potential (GWP) of its gas mixture is 1880. This value results far beyond the limits of the new law restrictions and regulations of the European Union.

The gases as C2H2F4, under commercial name R134a, SF6, etc, continue to be available for research purposes but their cost largely increased due to the reduced interest from industry. Thus the greenhouse gases are becoming an important issue for gas detector experiments budget, as the EEE Project.

With the aim of containing costs and decreasing environmental impact, the EEE Collaboration has started a campaign along different lines, to reduce gas emission and employ new, eco-firendly, gas mixtures.
The main goal is reducing the gas mixture flow in the MRPC, that means to measure and fix any possible gas pressure leak in the MRPC telescopes. It includes the development of new gas recirculation system of which a dedicated prototype has been installed in a EEE telescope at CERN. Jointly a parallel strategy is focused on searching for environmental-friendly gas mixtures which are able to substitute the standard mixture without an excessive impact on costs.

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