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RPC performance with an alternative eco-friendly gas mixture

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The use of R134a-based gas mixture containing SF₆ for operating RPC is not recommended owing to its high global warming potential (GWP). The effective GWP of the standard gas mixture of R134a (95.2%), i-C₄H₁₀ (4.5%) and SF₆ (0.3%) is about 1300 which is well beyond the permissible limit (less than 150) set in order to reduce the greenhouse gas (GHG) emissions. This work presents experimental qualification of an eco-friendly, non-flammable, inexpensive gas mixture of Ar (5%), CO₂ (60%), and N₂ (35%) for operating Resistive Plate Chamber (RPC) in avalanche mode, proposed on the basis of a numerical work [1]. The performance of RPC using the proposed gas mixture has been investigated and compared to the available experimental data for the standard gas mixture to study its efficacy and limitation.

[1] J. Datta, S. Tripathy, N. Majumdar, and S. Mukhopadhyay, Journal of Instrumentation 16 (2021) P07012.

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