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Search for environmental friendly gas mixtures for the CMS Resistive Plate Chambers detectors

Resistive Plate Chamber (RPC) detectors are widely used in major CERN experiments as muon triggers due to their excellent time resolution. However, the gas mixtures employed in RPCs contain greenhouse gases (R134a - SF_6), contributing significantly to environmental emissions; during Run 2, about 85% of particle detector emissions were due to RPC gas leaks. Therefore, environmentally friendly alternative gas mixtures have been investigated. Building on these studies, this work aims to develop a neural network capable of predicting RPC efficiency curves for low-impact gas mixtures. Preliminary results show good agreement between predictions and test data when gas components and concentrations lie within the training range. The goal is to extend the model's predictive power to mixtures with arbitrary combinations of existing components, or new components absent from the training dataset, providing a versatile tool for studying sustainable RPC operation. This poster will present the current status and planned next steps.

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