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## Advancements in Simulating C<sub>3</sub>H<sub>2</sub>F<sub>4</sub>-Based Gas Mixtures for Resistive Plate Chambers

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One of the primary objectives of R&D strategies for Resistive Plate Chambers (RPCs) is to replace the currently used gases with more environmentally friendly alternatives. Current research is particularly focused on substituting C<sub>2</sub>H<sub>2</sub>F<sub>4</sub>, which is widely used in high concentrations in RPCs, with C<sub>3</sub>H<sub>2</sub>F<sub>4</sub>, a more environmentally friendly gas.

This contribution presents a comprehensive set of scattering cross sections for electrons in C<sub>3</sub>H<sub>2</sub>F<sub>4</sub>. These cross sections are validated through a systematic comparison of electron swarm parameters calculated using the Monte Carlo simulation MATOQ with experimental data obtained from a pulsed Townsend experiment. Furthermore, we demonstrate that simulation results for the effective Townsend coefficient and drift velocity are in good agreement with measurements obtained directly from an RPC using a laser beam to ionize C<sub>3</sub>H<sub>2</sub>F<sub>4</sub>-based mixtures. Finally, we discuss the dependence of the effective Townsend coefficient and drift velocity on the electric field for gas mixtures currently under study in the RPC community, especially those investigated by the RPC-ECOGAS@GIF++ collaboration.

The findings from this work can contribute to simulating the behavior of RPCs operating with gas mixtures containing C<sub>3</sub>H<sub>2</sub>F<sub>4</sub>. These results have the potential to significantly advance experimental research aimed at identifying environmentally friendly gas mixtures for RPCs.

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