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Freons in Parallel Plate Avalanche Counters (PPACs) E. NORBECK, J.E. OLSON, Y. ONEL, University of Iowa — Freons that contain only C, H, and F are still allowed at National Laboratories because they do not harm the ozone layer. The perfluoroalkanes, no H or double bonds, have the additional advantage of being nontoxic and can be recirculated through a purifier cartridge that removes all impurities except noble gasses. At atmospheric pressure small molecules are preferred because they require less voltage. As a PPAC gas, CF₄ and R134A (CFH₂CF₃), the working fluid in automobile air conditioners, give similar results. With a plate spacing of 0.6 mm at 3050 V and 700 torr, R134A gave signals of amplitude 350 mV and width 1.5 ns with the detector directly coupled into 50 Ω cable. The radiation source was Compton scattered electrons from a 7 mCi ¹³⁷Cs gamma-ray source. Methane, CH₄, gave similar results, but with much less primary ionization because of the small molecular weight. The mixture, 95% Ar + 5% CO₂, required only 1000 V, but the signals were smaller and slower. If low pressures are required, heavy gasses are preferred because of the larger amount of primary ionization. Perfluoropropane, C₃F₈, and perfluorocyclobutane, C₄F₈, are gasses at room temperature that work well in the 20 to 100 torr range with a 0.6 mm plate spacing, but are less useful with a 2.5 mm spacing. For all of the PPAC gasses, small amounts of impurities reduce the threshold voltage for sparking.

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