

Abstract Submitted
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Ion signals with R134a and R134 in a parallel plate proportional counter EDWIN NORBECK, J.E. OLSON, Y. ONEL, University of Iowa — The electrical signals from a PPAC (parallel plate avalanche counter) are identical for R134a (1,1,1,2-tetrafluoroethane) and R134 (1,1,2,2-tetrafluoroethane) except for the ion part, which, for R134a, is slower and smaller, but with the same area. The two compounds are identical except for the location of one fluorine atom. With three fluorine atoms on one end, the more common R134a has a large electric dipole moment, about the same as water; while R134 is symmetric, with no dipole moment. The attraction of the polar R134a molecules interferes with the motion of the ions, which results in a longer ion collection time. The counter is two circular plates of 1.0 cm² area separated by 0.5 mm operating at 700 torr and 2120 V. The ion signal is constant for a time t_0 and then goes linearly to zero at time t_1 . The values of t_0 and t_1 are 1.3 μ s and 1.8 μ s for R134a, but only 0.8 μ s and 1.3 μ s for R134. These are not precise times because the signals are very small and the values depend on the location of the primary ion formation (from a ¹³⁷Cs γ source). During the constant part of the signal the ions are moving between the plates. The signal goes toward zero as the ions are collected at the cathode. For both gasses the large signal from electrons is fast with a full width at half maximum of only 1.0 ns.

Edwin Norbeck
University of Iowa

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