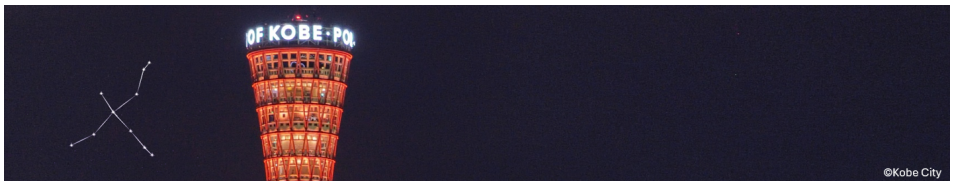

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Drift Properties of Noble Gases in Negative Ion Drift TPCs

Tuesday, 24 February 2026 11:30 (25 minutes)

Low pressure gas TPCs operating with negative ion drift (NID) provide numerous advantages required for low energy rare searches requiring directionality. Near-thermal diffusion and slow drift velocities enable the excellent spatial resolution required to resolve low energy particle tracks in 3D. The NID components most commonly studied are CS2 and SF6, which can be added to other target gases depending on the applications. We present measurements of drift properties–longitudinal diffusion, mobility, relative gas gains, and (in some cases) capture length–with Xe, Ar, He, or CF4 mixed with CS2 or SF6, maximizing the target-gas fraction while maintaining stable gas gain. These mixtures demonstrate near-thermal diffusion with very small partial pressures (as low as 1 Torr) of the NI additive, which can be up to 10 times lower than the diffusion expected from pure nobles. Many of these mixtures have additional NID species with distinct drift velocities, which enable events to be fully fiducialized in the TPC.

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