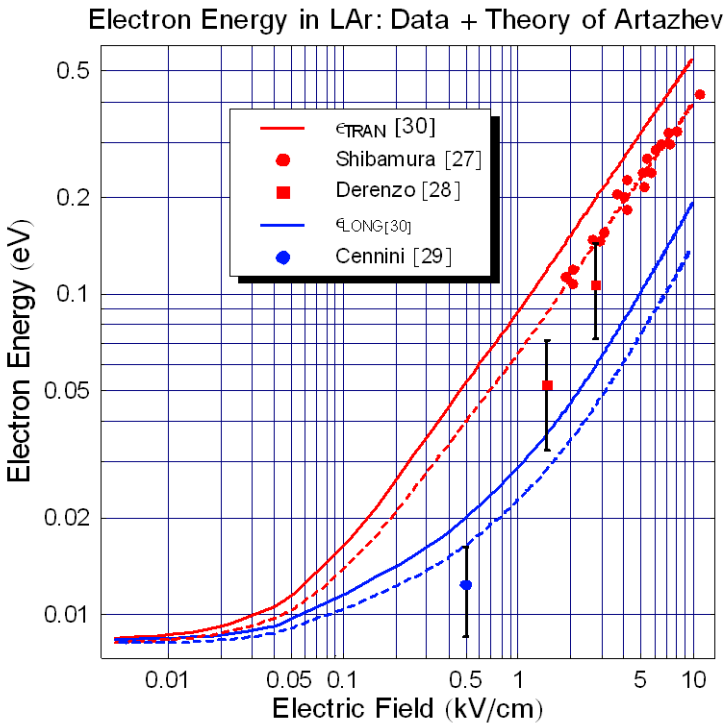
Electron diffusion [27, 28, 29, 30]



The data for transverse diffusion come from [27, 28]. The longitudinal diffusion is a single measurement from [29]. The transport theory calculation (solid lines) is from Atrazhev and Timoshkin [30], interpolated to the normal boiling point. We plot the electron energy, ε, rather than the diffusion coefficient, D, because the electron energy is the quantity directly measured by experiment (for longitudinal diffusion at least) and is the quantity directly entering in the calculation of the RMS spatial spread of an ensemble of electrons:

$$\sigma_{T(L)} = \sqrt{\frac{2\,\varepsilon_{T(L)}\,\Delta z}{E}}$$

with Δz the drift distance and E the field in volts per unit of drift distance. The Einstein-Smoulchowski relation defines the diffusion constant in terms of the electron energy:

$$D = \mu\,\varepsilon\,,$$

so that the diffusion constant requires the additional knowledge of the electron mobility μ. The dashed lines are the Atrazhev and Timoshkin theory scaled to the transverse data which give ε_{TRAN} = 40 meV (D_{TRAN} = 12.8 cm^2/s) and ε_{LONG} = 16.5 meV (D_{LONG} = 5.3 cm^2/s) at 500 V/cm.