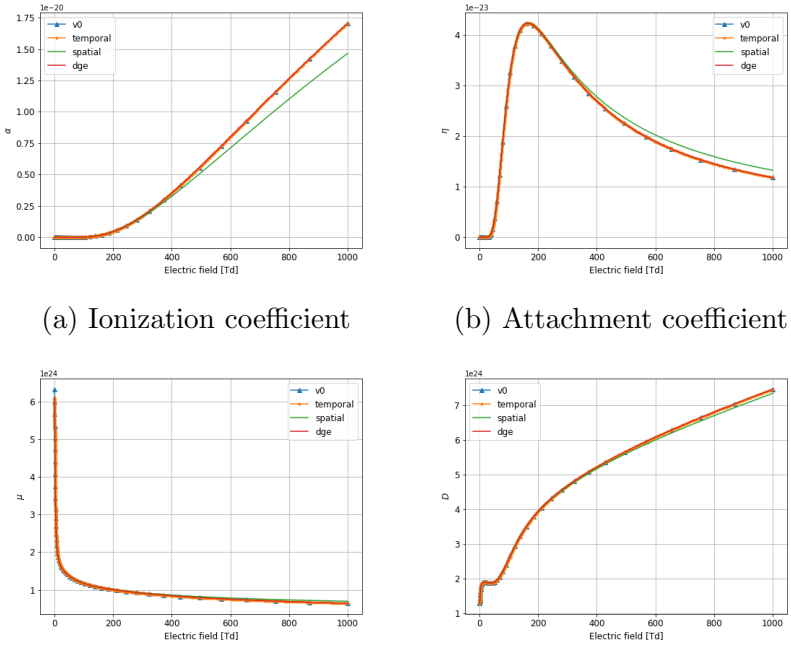
There are several points to note when using Bolsig+

Transport coefficients are affected by the chosen electron density growth condition, which is by default assumed to be exponential in time on online Bolsig+ calculations. When using the offline version of Bolsig+, the user can choose between exponential temporal growth, exponential spatial growth, excitation and attachment not included, and density gradient expansion (see Bolsig+ manual at http://www.bolsig.laplace.univ-tlse.fr/manual.html). The rates in afivo-streamer/transport_data/air_chemistry_v0.txt used exponential temporal growth.



(a) Ionization coefficient

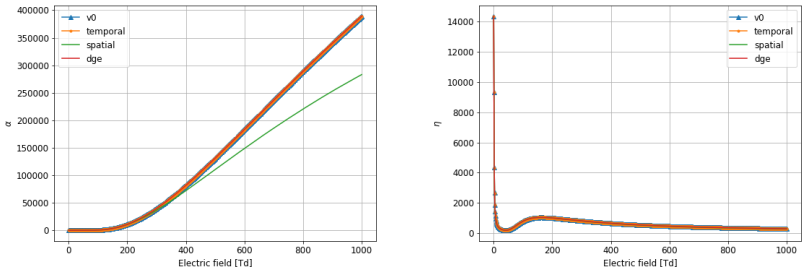
(b) Attachment coefficient

(c) Mobility coefficient

(d) Diffusion coefficient

Figure 1: Transport coefficients with different growth conditions

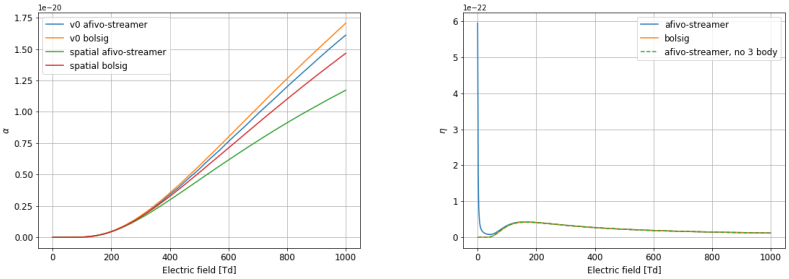
The ionization and attachment coefficients are also calculated by afivo-streamer from the reaction rate coefficients provided in the chemistry file. In the afivo-streamer calculations, the ionization coefficient is affected by the selected growth condition.



(a) Ionization coefficient (b) Attachment coefficient

Figure 2: Ionization and attachment coefficients computed from reaction rates from data sets with different growth conditions

If the coefficients calculated by Bolsig+ and the coefficients calculated by afivo-streamer are compared, we see some difference in the ionization coefficient. We also notice that Bolsig+ does not include three-body attachment in its calculation of the attachment coefficient.



(a) Ionization coefficient (b) Attachment coefficient

Figure 3: Ionization and attachment coefficients calculated by afivo-streamer and Bolsig+

As of 20/11/2019, including chemistry when using afivo-streamer results to a simulation that employs two ionization coefficients. The photoionization module considers the ionization coefficient calculated by Bolsig+ while afivo-streamer also calculates a separate ionization coefficient from the reaction rate coefficients. These two ionization coefficients do not match.