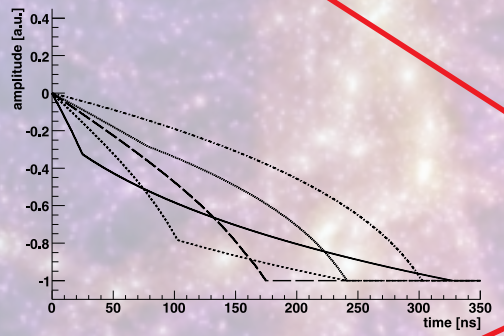
Uncertainties on Input Parameters For Pulse Shape Simulation



GDT Symposium 2013

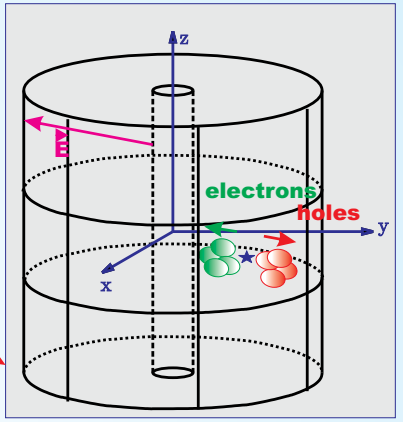
I.Abt, MPI für Physik

Worrisome Parameters

- **Impurities**

0.5 10^{10}

1.5 10^{10}

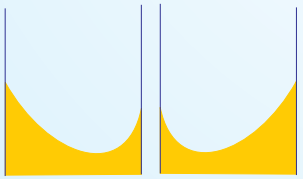


- **Mobilities**

  Drift Carrier Velocities

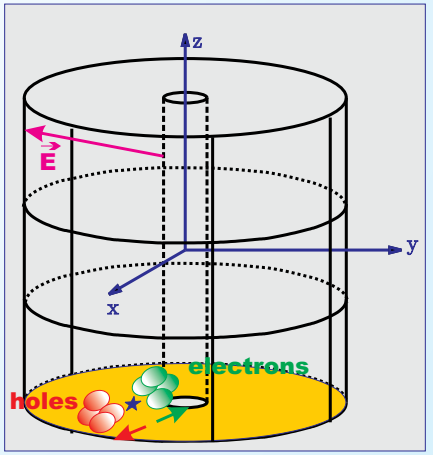
- **"Dead" Layers**

  Areas of low fields

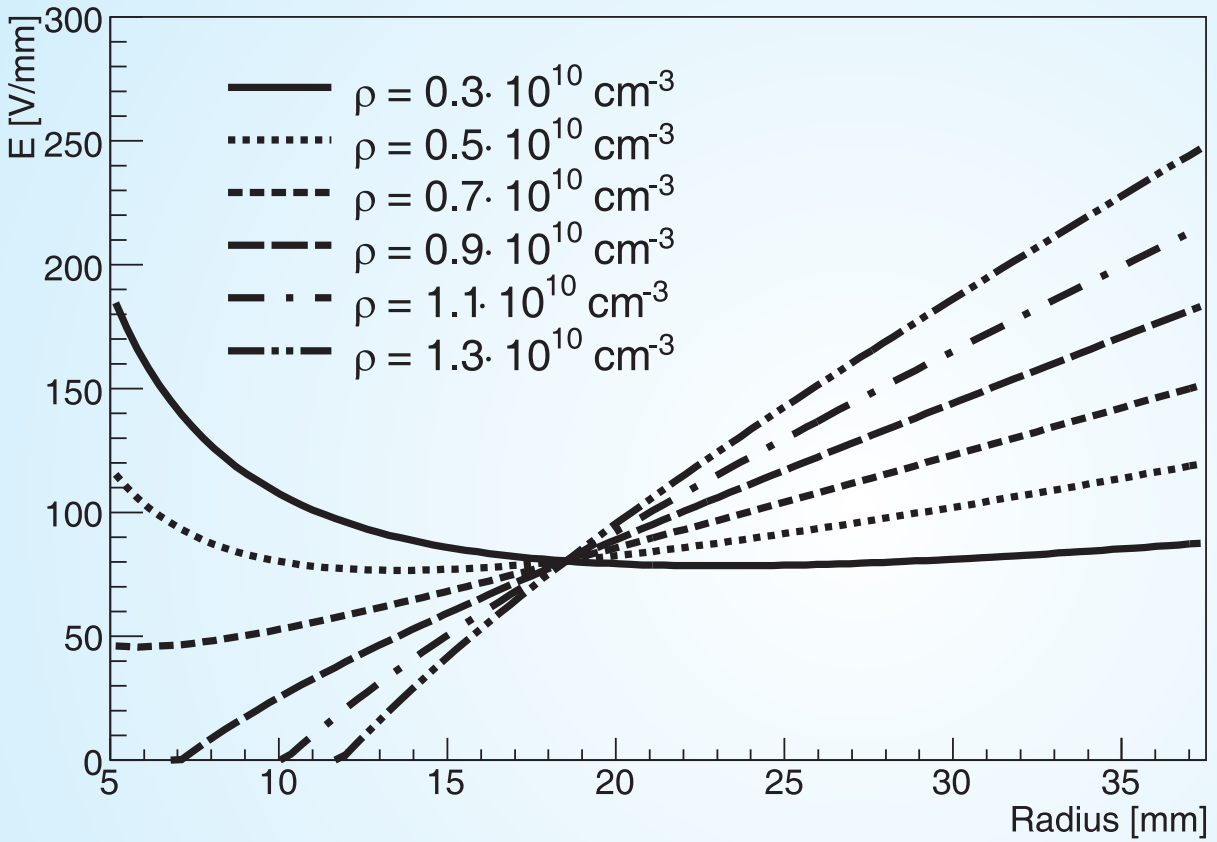


not really

a parameter



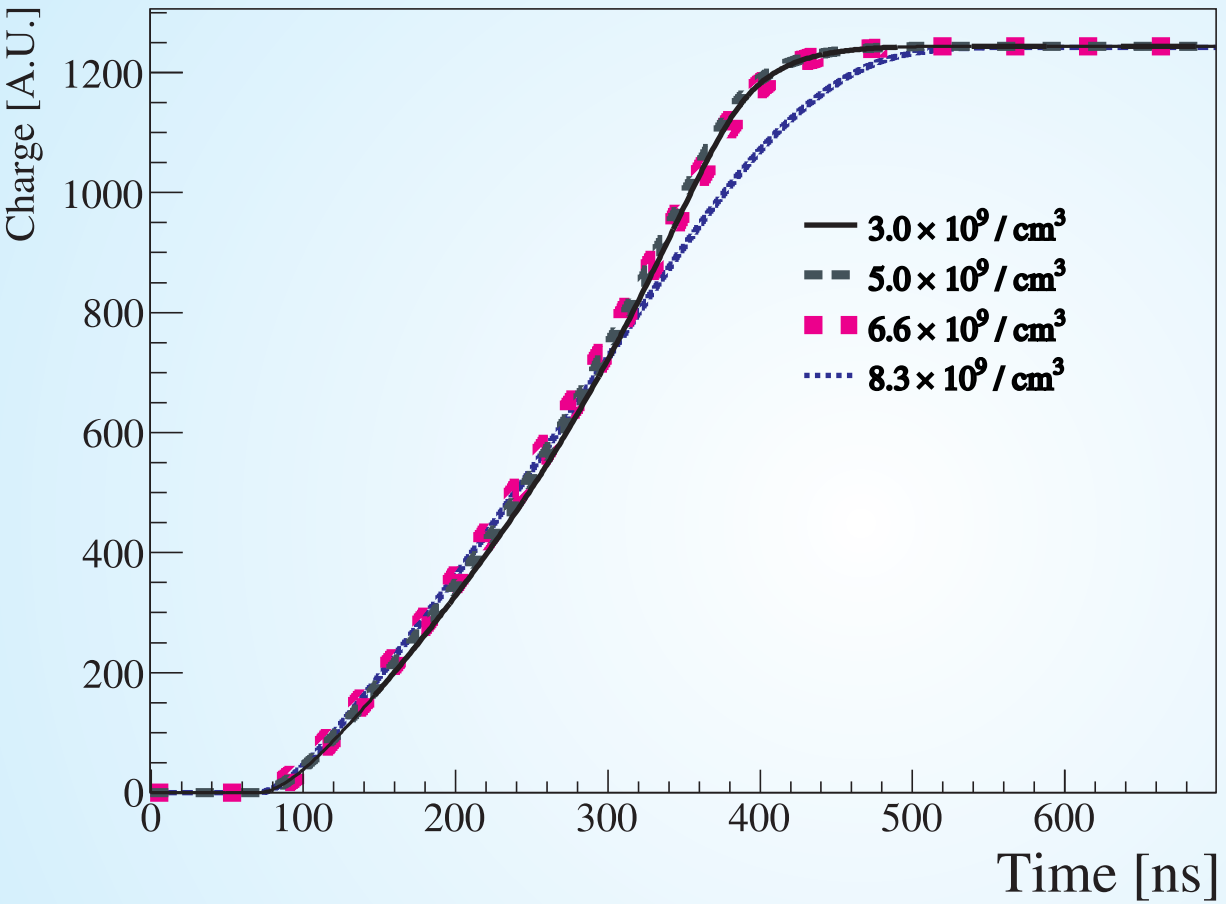
Impurities and the Field



We get impurities and depletion/ operational voltages from the manufacturer.

According to this, we operated the detector without a field.

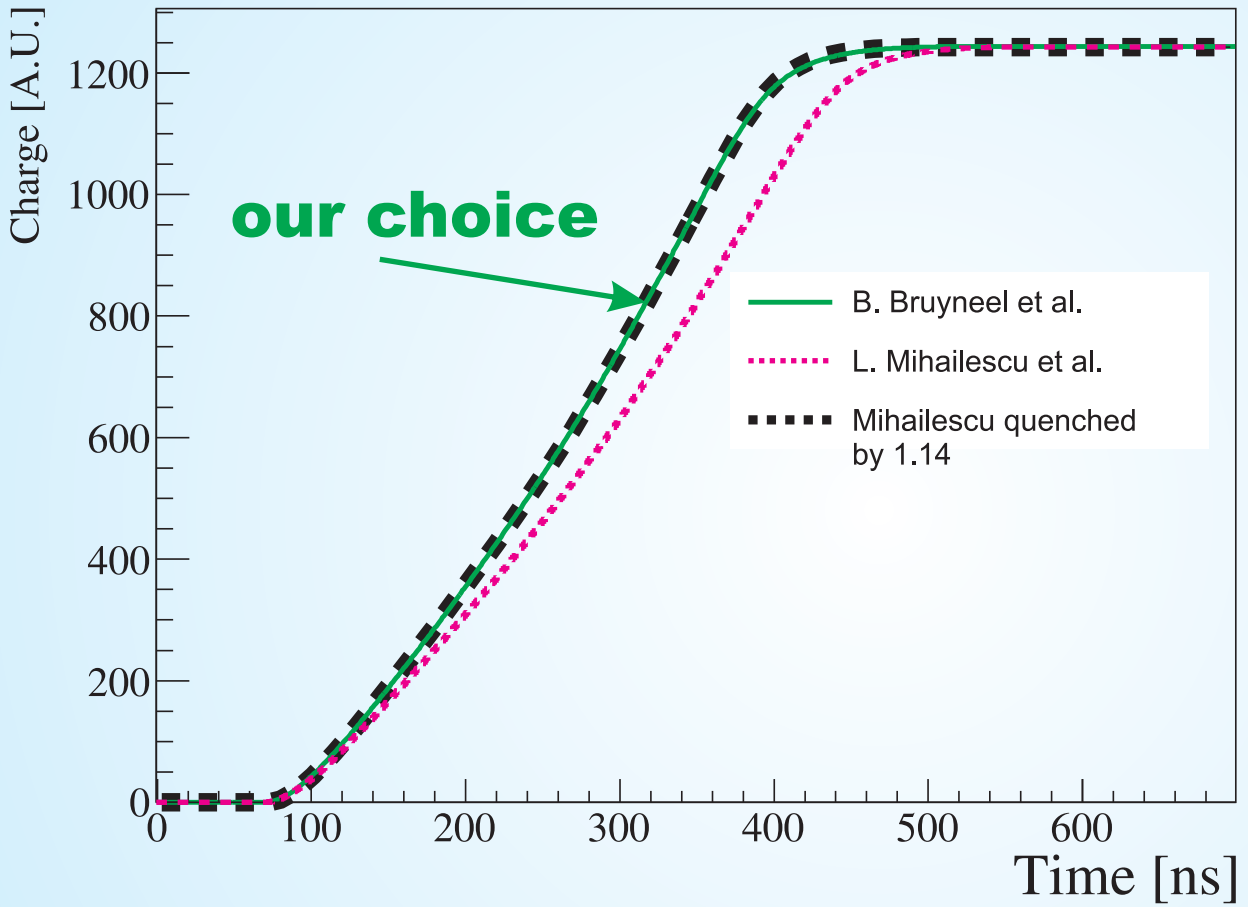
Impurities and the Pulse



The pulse shapes are actually changed. The 90% level is moved.

And in reality, the impurity density is expected to vary with the radius.

Mobilities and Pulses

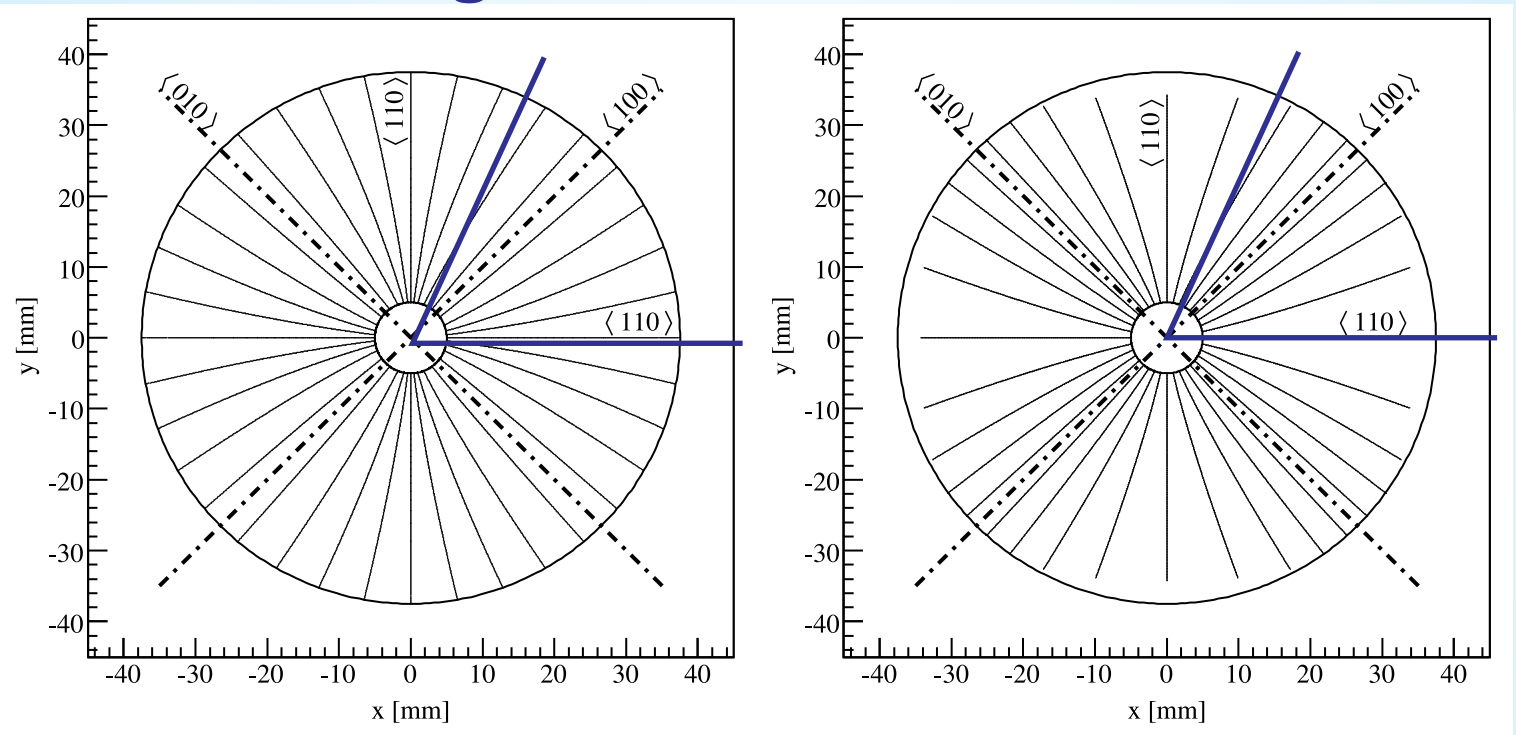


The pulses also depend on measured mobilities, for which the carrier velocities are para-meterised.

There are two standard papers with different parameters.

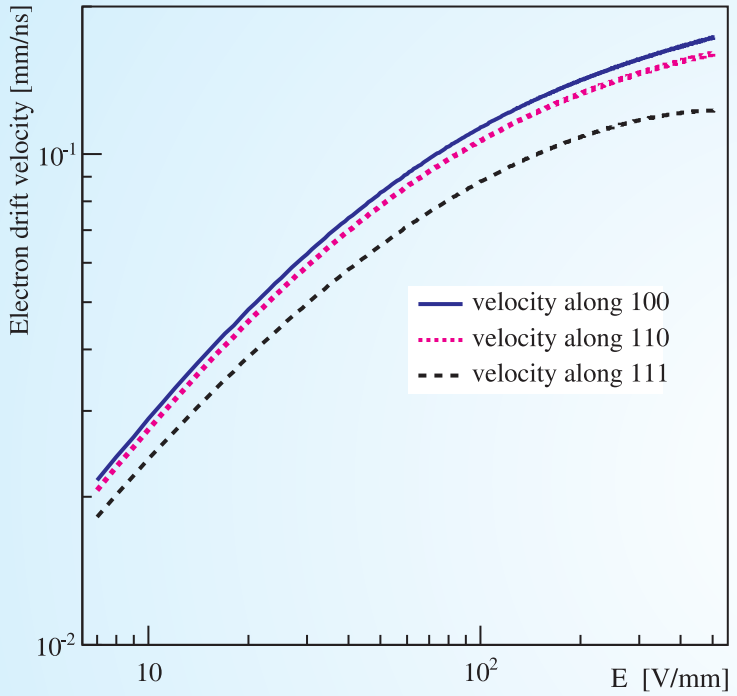
Mobilities and Trajectories

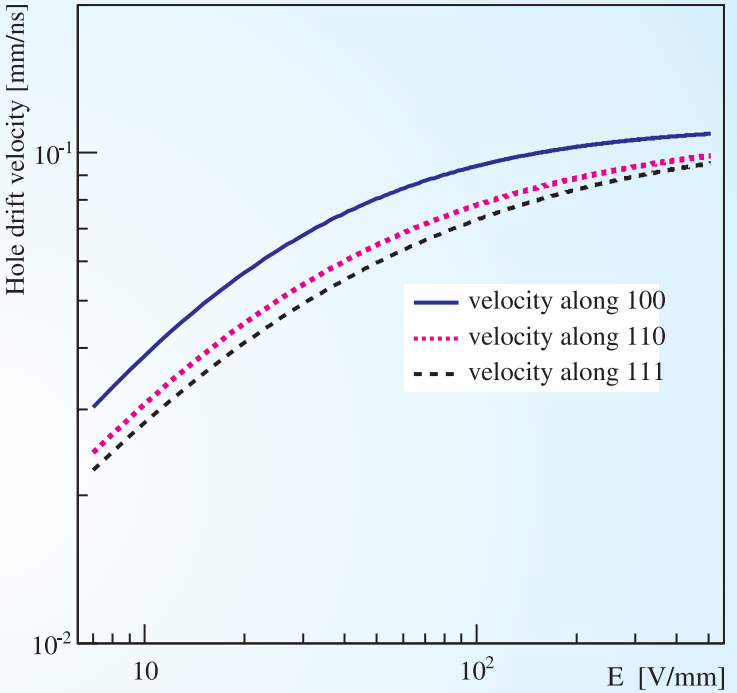
Effective Volumes of Segments are not the naive geometrical volumes.



This simulation overestimates the effect by up to 40%.

Mobilities Measured

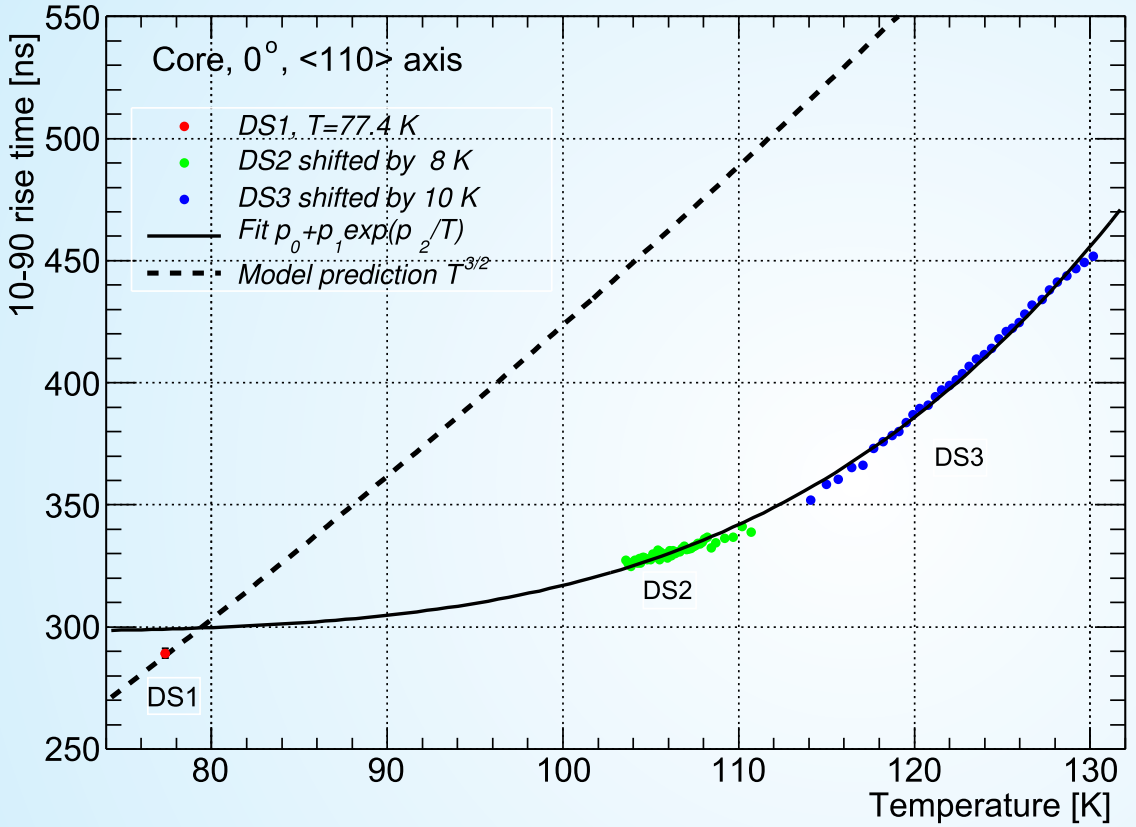




Only velocities along <100> and <111> were measured.

The velocities along <110> are calculated using model assumptions.

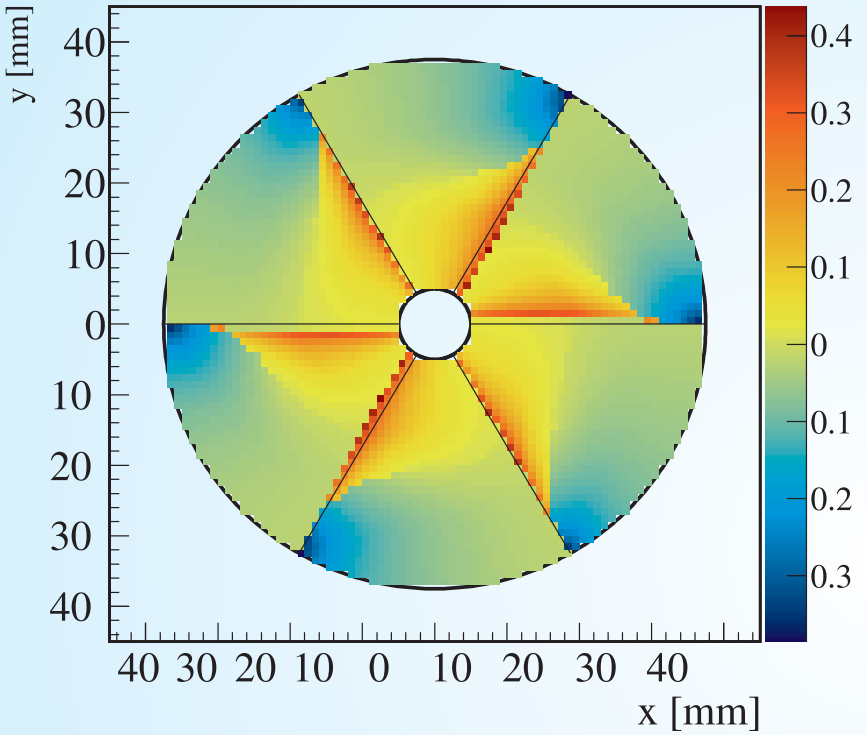
Mobilities and Temperatures



The same kind of models predict a $T^{3/2}$ dependence of the mobility/ velocity.

The measured dependence is completely different.

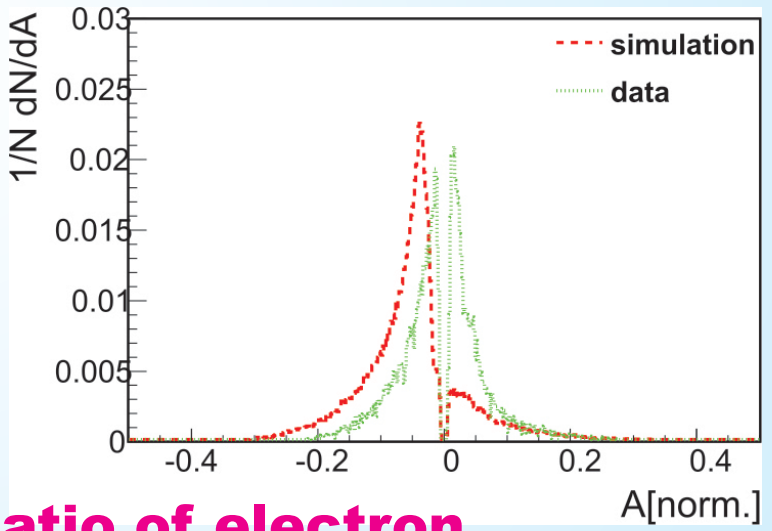
Mobilities and Mirror Charges



pos. mirror

charge pulse

neg. mirror

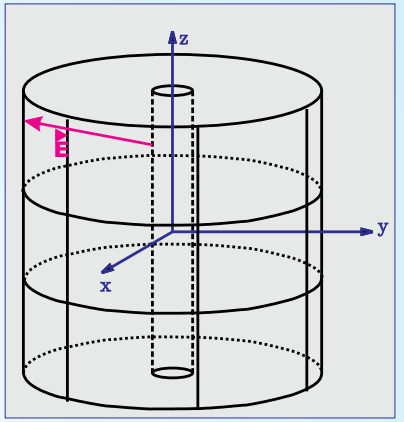


Our simulation seriously underestimates the number of positive pulses [and wiggles]

Ratio of electron to hole mobilities?

[In]Famous Last Words

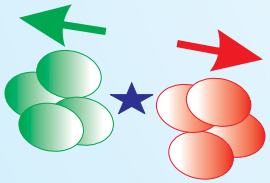
Our pulse shape simulations depend on input parameters about the detector and germanium in general.



We need to get better information on impurities.

electrons

holes



We need more measurements on mobilities and perhaps better models.