

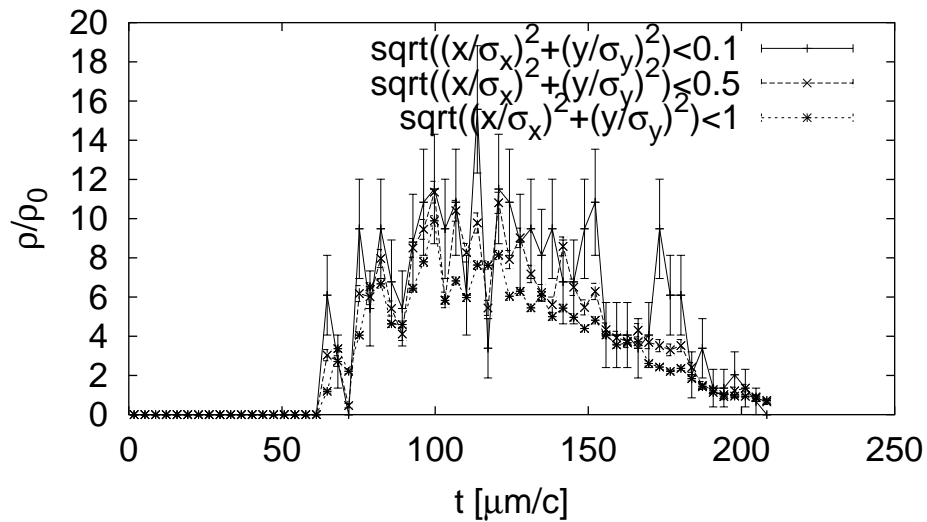
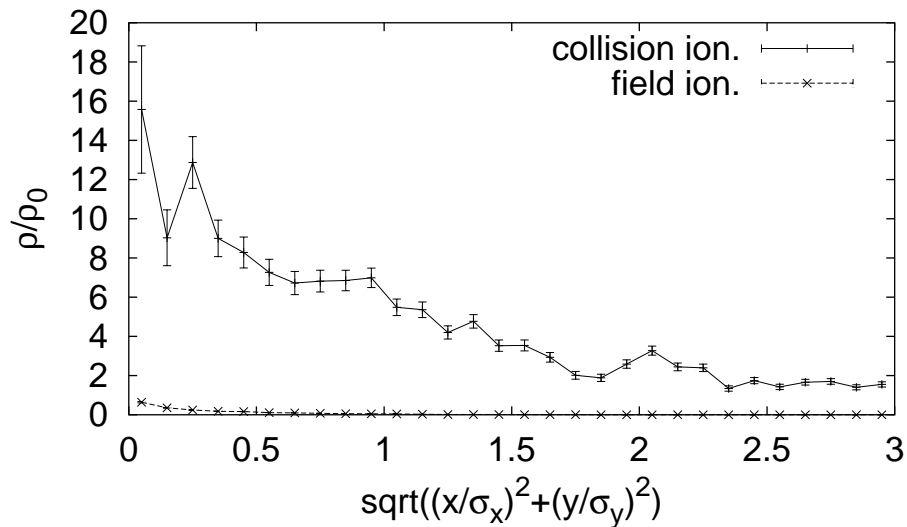
# Electron-Cloud Effects in the Positron Linacs of Future Linear Colliders

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- Electron cloud effects can be a problem in damping rings
- Can lead to beam instabilities and heat load, could interact with the RF and lead to breakdown

# Ionisation

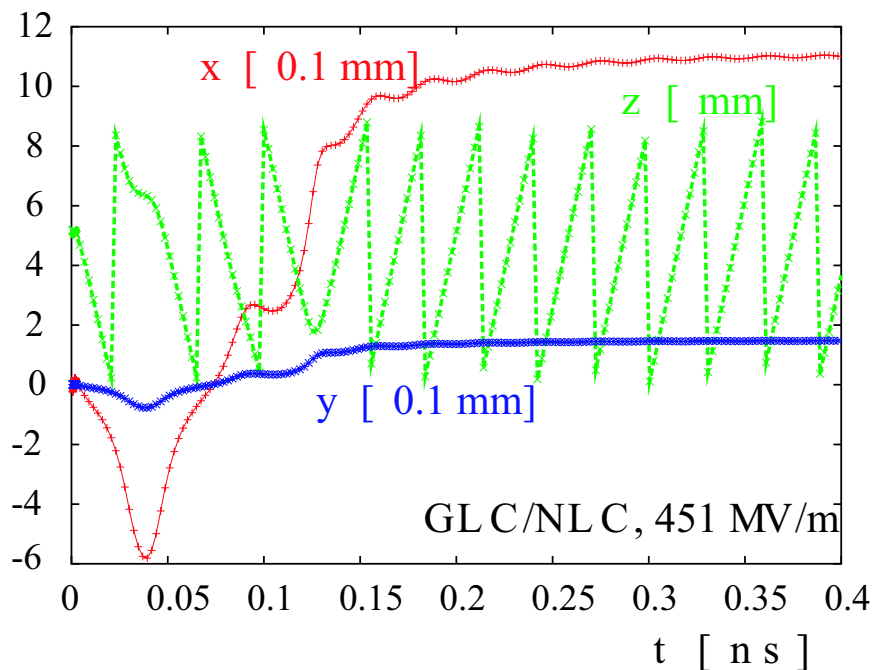
- Collisional ionisation (2MBarn)
- Field ionisation (at  $\approx 20\text{GV/m}$ )
- Pinch due to fields of the beam



CLIC at the end of the linac

# Simulation of Build-Up

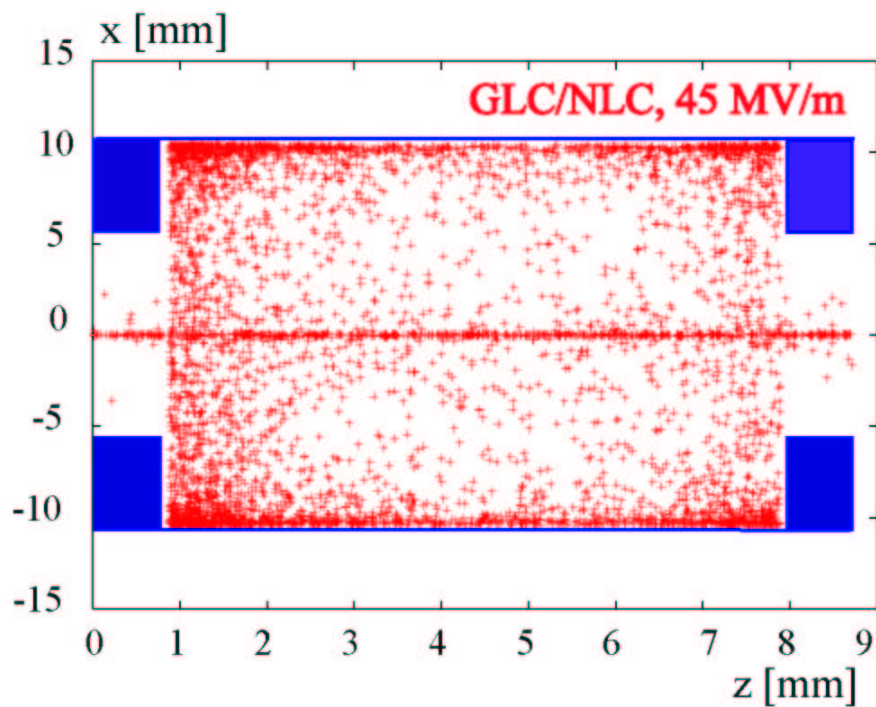
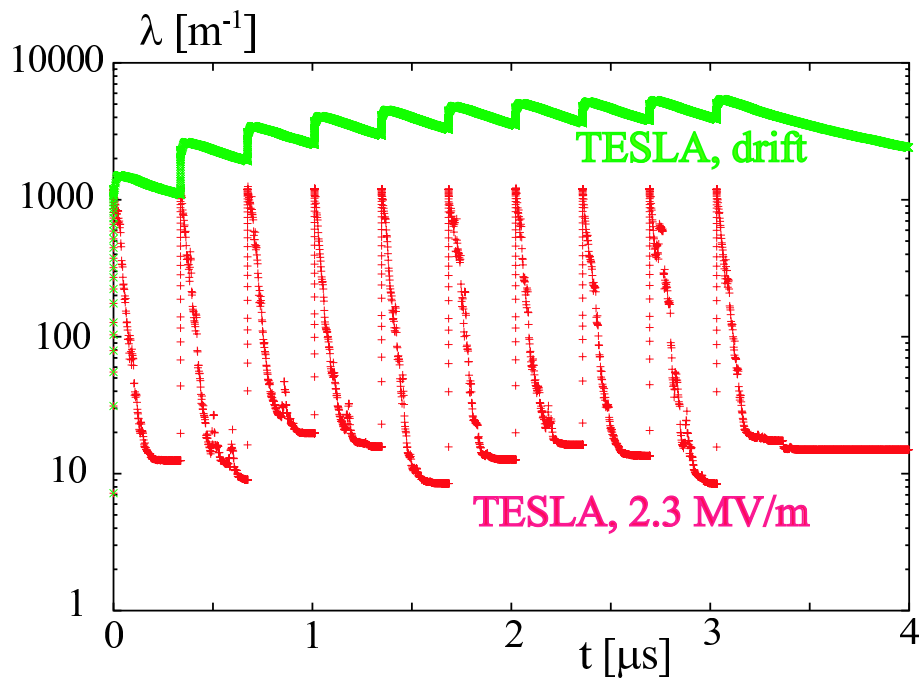
- Use modified version of ECLLOUD code
- Added RF fields for simplified structure design
- Simulations are delicate,  $1\ \mu\text{m}$  position error can lead to  $\approx 200\ \text{eV}$  energy error (close to maximum of secondary emission)
- Free space approximation used for beam fields



- Electrons are first accelerated against the beam
- At high gradients they tend to turn around

# Results

- No build-up is seen for nominal gradients
- Small (but harmless) build-up in field free regions



# Conclusion

- High electron densities can result from collision ionisation
- Field ionisation can further increase the number of free electrons (CLIC at the end of the linac)
- The beam field will focus them
- But density seems still acceptable if pressure is 10ntorr
- Higher pressure may be a problem
- Model of RF has been implemented into ELOUD
- No build-up of the cloud with nominal RF gradient
- Should investigate the ion build-up and fast beam-ion instability in the electron beam
- More work to be done. . .