Ion Backdrift Simulation in a GEM-based TPC

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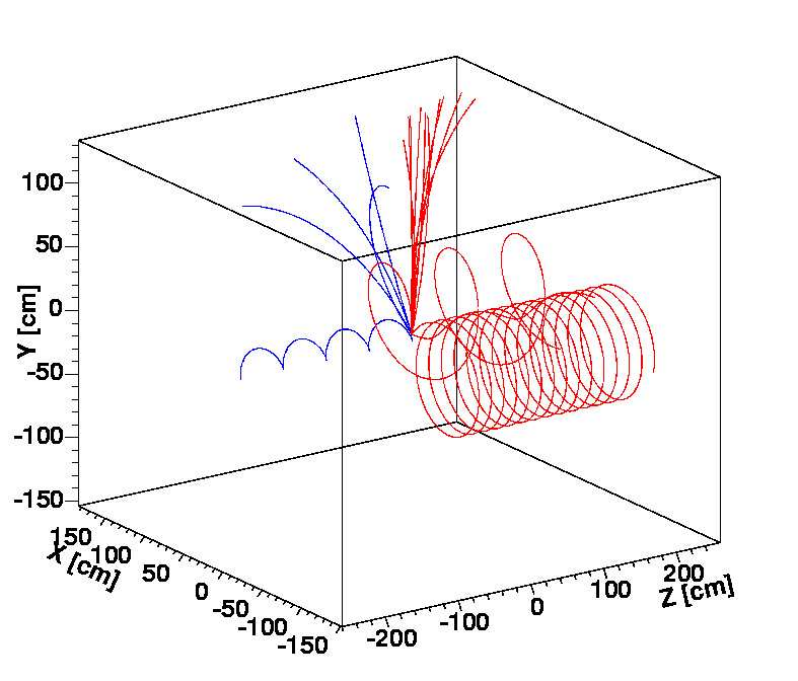
Simulation Framework

4 Modules:

1. Create primary ionisation based on parametrisations of HEED data
2. Drifting of electrons based on parametrisations of Magboltz data
3. Gas amplification with GEMs based on parametrisation of charge transfer
4. Electronics (shaper, ADC)



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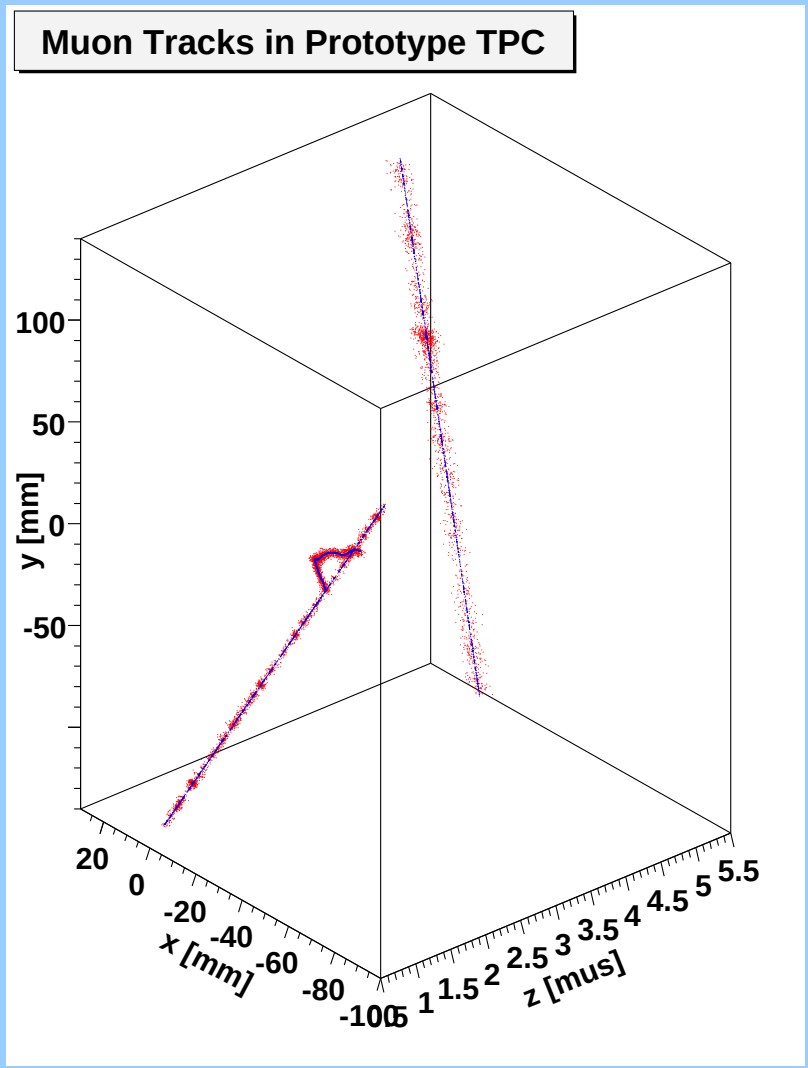

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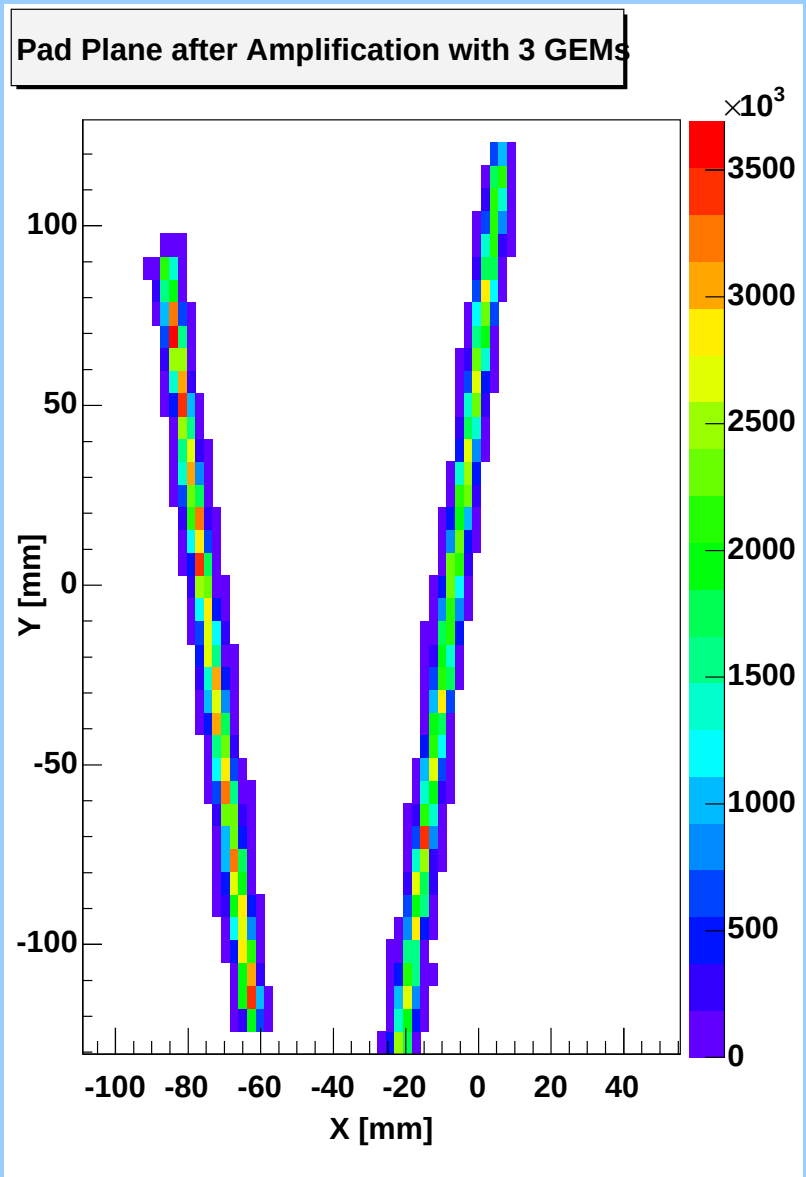

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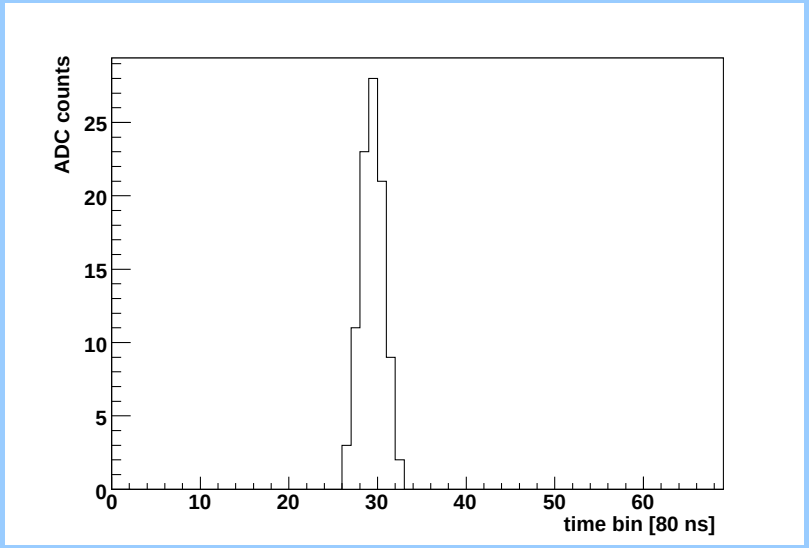
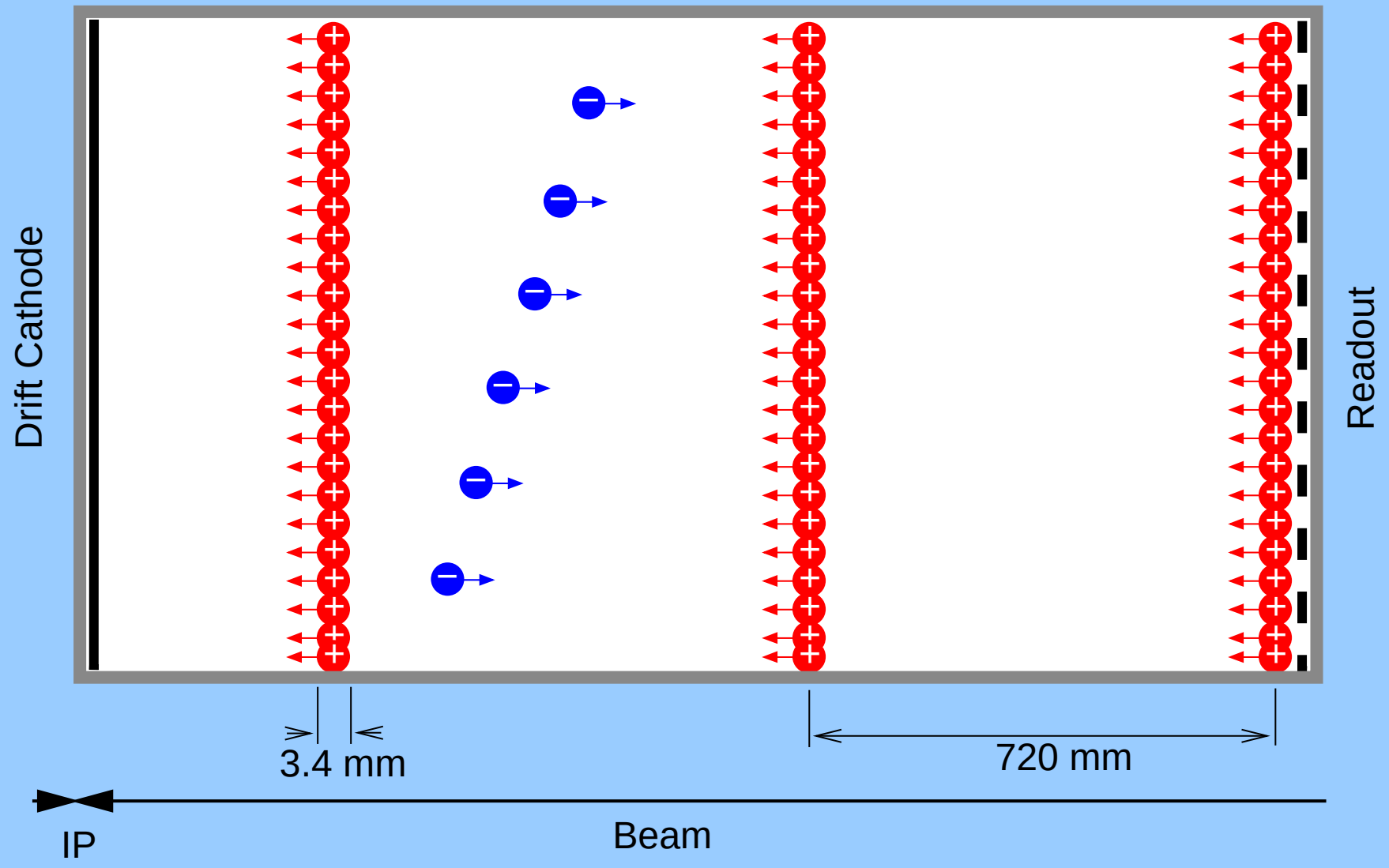


Ion backdrift in ILC TPC

One ion slice per bunch train mainly due to background



Ion Backdrift Module

Goal:

Compute ion distribution in slice created by one bunch train

Input:

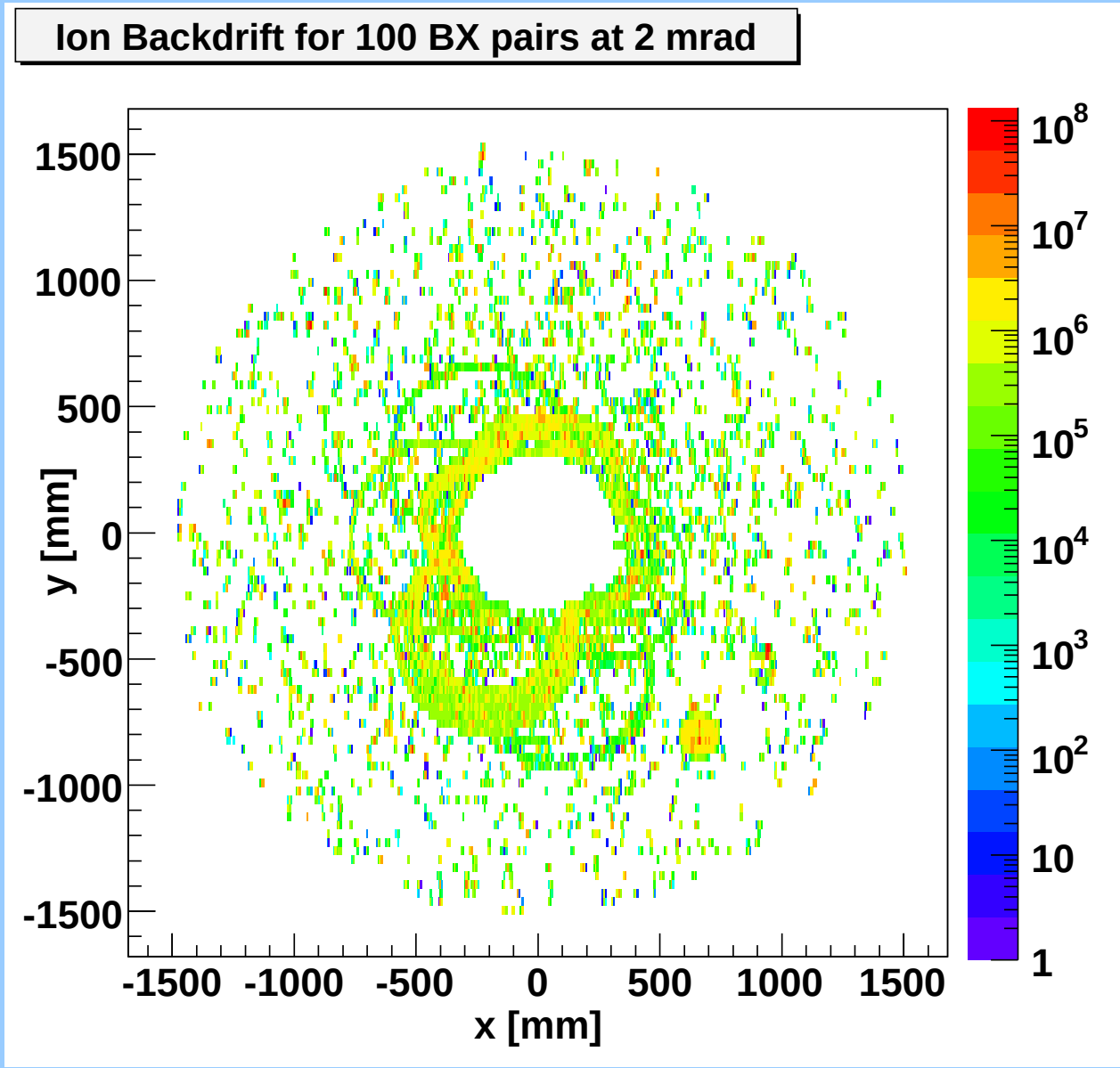
- Particles from 100 BX pair background from full detector simulation with MOKKA (A. Vogel)
- Detailed simulation gives electrons detected on one pad (before electronics module)
- Ion backrift propability for given GEM setting according to charge transfer parametrisation

Output:

Number of ions drifting back from a pad through GEM stack

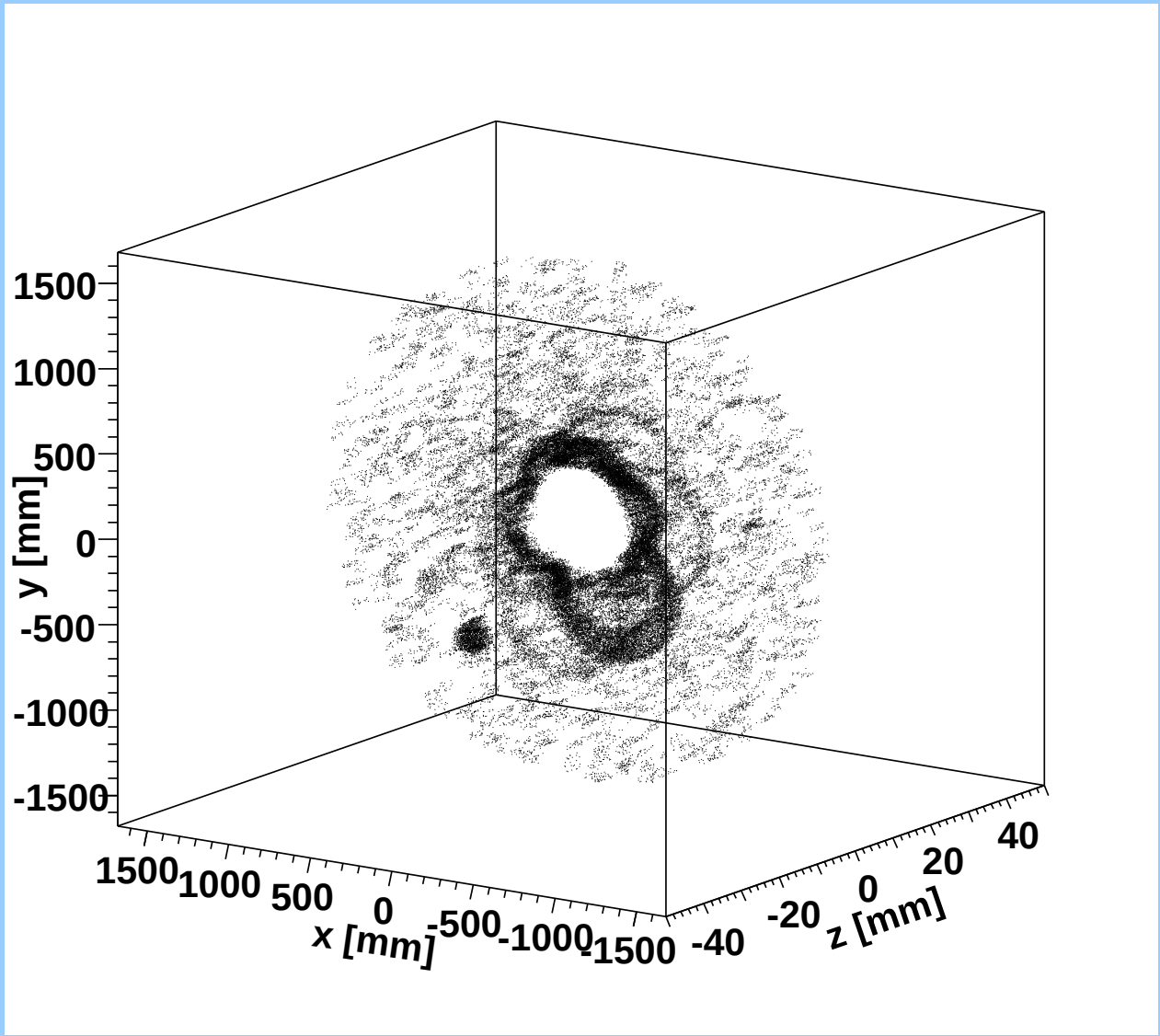
Ion backdrift: 2D

Back drifting ions from pad plane



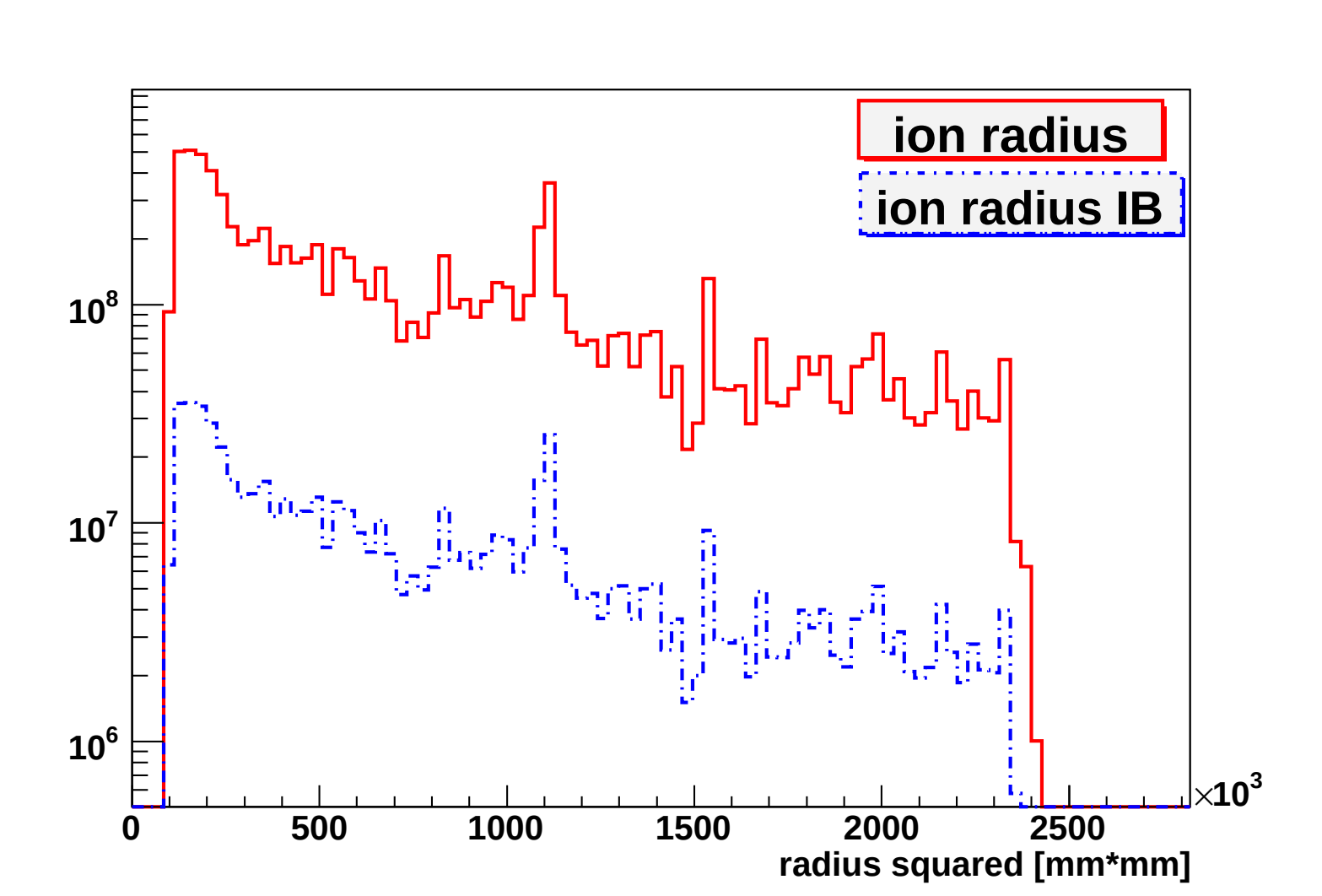
Ion backdrift: 3D

Ion slice in 3D



Ion backdrift in ILC TPC (3)

Radial distribution of charge from 100 BX pair background



Outlook

Possible use:

- Test different GEM settings, drift gases, background studies ....
- Use ion density in slice as input for field map studies of distortions

Concerning primary ionisation:

Use electrons from primary ionisation module to represent ions

Simulation framework is part of MarlinTPC package:

https://twiki.cern.ch/twiki/bin/view/ILCTPC/MarlinTPC