

MarlinTPC Detailed Simulation Plans and Proposal

1st iteration overview

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Steps of Simulation

The parts of the simulation process (follows Astrid's division)

- 1 Primary Ionisation
- 2 Charge Drifting
- 3 Charge Amplification
- 4 Readout and Electronics Characteristics

Software issues:

- Make structural layout
- Definition of inputs/parameters
- Definition of internal data formats

Main topic: what do we want to know?

Primary Ionisation

a luxury problem

How

- Genuine HEED – the tool of choice, available in C++
<http://ismirnov.web.cern.ch/ismirnov/heed>
- Parametrised HEED by Astrid Muennich (for a few gases)
- (not so good) GEANT4

Parameters

- Incident particle (simplified: electron or anything else) and its energy
- Gas (molecular contents, pressure, temperature)
- Field dependence (?)

Status

- Basically done/existing

How

- Calculate track by interpolation
e.g. Runge-Kutta 4th/5th order

Parameters

- Electrical and magnetic field
- Gas properties (diffusion, drift velocity, etc.)
(fixed, input from MagBoltz/Garfield)
- Particle type (electron/ion)

Status

- Partially unknown
- Christoph R. is interested
- Work by Torsten K. exists

Charge Amplification

Highly dependent on the amplification mechanism

How

- Too specific, too detailed for here...
ask/find experts for different technologies
- Issues like: individual electrons vs. charge clouds

Parameters

- Electrical and magnetic fields
- Diffusion, defocussing
- Efficiencies, statistical fluctuations
- Gas choice (and its properties)
- ... (many more)

Status

- Partially unknown
- Work exists from Astrid M. for triple GEM stack

Readout and Electronics

... even more depending on the hardware in use

How

- Geometric effects
- Charge collection
- Signal generation and shaping

Parameters

- Readout technique
- Active readout area sizes
- Sampling frequencies
- ...

Status

- Needs dedicated expertise

Fundamental requirements

- Ability to answer the fundamental questions (a.k.a. fit to purpose)
- Modularity, i.e. the ability to exchange parts of the chain
- Reproduceability of results
- Tracking of steering

Proposed consequences:

- Start with structural layout
- Clear interface definition
- Clear internal data model, e.g. tracking of all parameters by database

- MAIN ISSUE:
What do we want to know from the simulation?
- Who has already started to work on this?
- Who is interested in participating?