Simulations of a pixelized readout for an ILD-TPC

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Introduction

- Simulate complete background in the ILD-TPC with the current detector geometry (at 500 GeV and 1 TeV)
  - Beamstrahlungs pairs
  - $\gamma\gamma \rightarrow$hadrons
- Calculate field distortions resulting from these backgrounds and ion backdrift (redo and extend Keisukes work)
- Examine the occupancy of the TPC
- Determine the impact of field distortions on momentum resolution

Full detector simulation

Mokka

- Versions:
  - mokka-08-00-02 (pairs)
  - mokka-08-00-03 ($\gamma\gamma \rightarrow$ hadrons)
- Detector model: modified ILD_o1_v05
  - SField01 $\rightarrow$ fieldX03 1000
  - /Mokka/init/TPCLowPtStepLimit true
  - /Mokka/init/TPCLowPtCut 3 TeV
  - /Mokka/init/TPCLowPtMaxStepLength 0.05 mm
  - ...

TPC geometry

- Inner radius: 384 mm
- Outer radius: 1718 mm
- Drift length: 2225 mm

Data

Generator

500 GeV:

- Pairs:
  lfn:/grid/ilc/prod/ilc/mc-dbd/generated/1000-B1b_ws/eepairs
- $\gamma\gamma \rightarrow$ hadrons:
  lfn:/grid/ilc/prod/ilc/mc-dbd/generated/1000-B1b_ws/aa_minijet

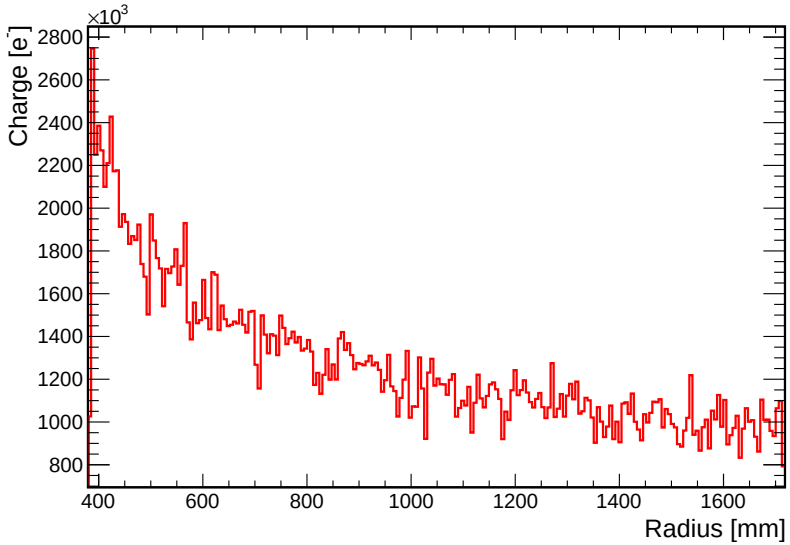
1 TeV:

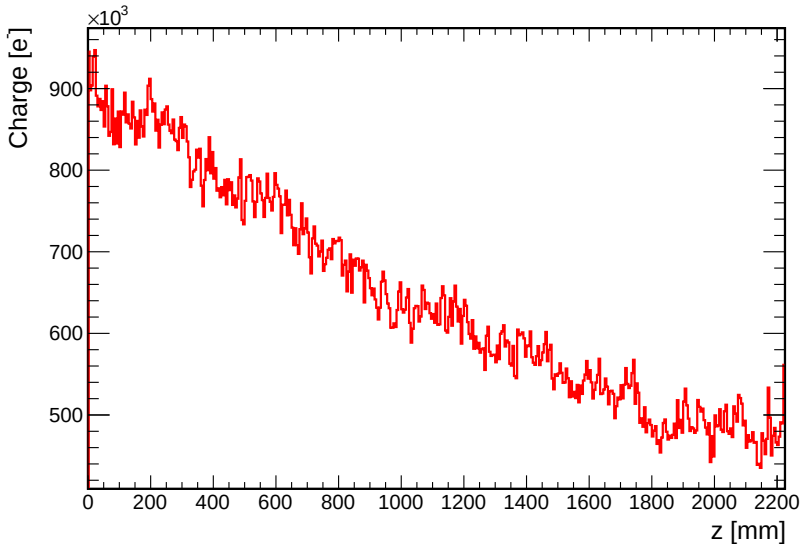
- Pairs:
  lfn:/grid/ilc/prod/ilc/mc-dbd/generated/500-TDR_ws/eepairs
- $\gamma\gamma \rightarrow$ hadrons:
  lfn:/grid/ilc/prod/ilc/mc-dbd/generated/500-TDR_ws/aa_minijet

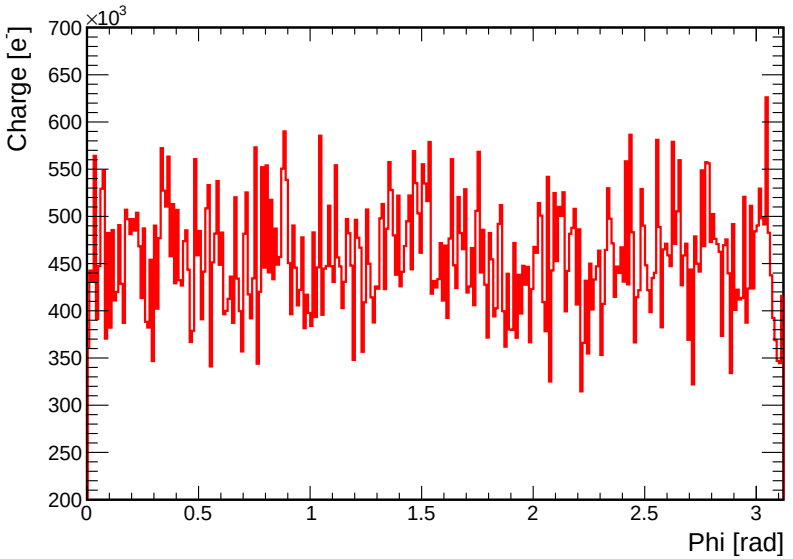
Simulation

- ??? - upload to which location?

Charge distribution - 500 GeV







First conclusions

- Strong r-dependency
- Minor fluctuations in ϕ
- Linear decrease towards anode

$\Rightarrow$ Similar behavior like old data

Roadmap

1. Background on generator level (pairs and $\gamma\gamma \rightarrow$ hadrons)
   $\Rightarrow$ done
2. Full simulation of background interactions with the ILD (Mokka)
   - Pairs: $\Rightarrow$ done
   - $\gamma\gamma \rightarrow$ hadrons: $\Rightarrow$ work in progress
3. Calculation of the field distortions (our own package)
   - Implementation $\Rightarrow$ done
   - Validation with Keisukes method/code $\Rightarrow$ done
   - Field calculations $\Rightarrow$ work in progress
4. Simulation of tracks in a distorted field for a pixelized readout (mainly MarlinTPC)
   - Implementation and validation $\Rightarrow$ done
   - Simulation $\Rightarrow$ to be done
5. Reconstruction of tracks in a ILD scale TPC with a pixelized readout (MarlinTPC) $\Rightarrow$ to be done
6. Analysis of the resulting data (MarlinTPC/Root) $\Rightarrow$ to be done