MRPC update

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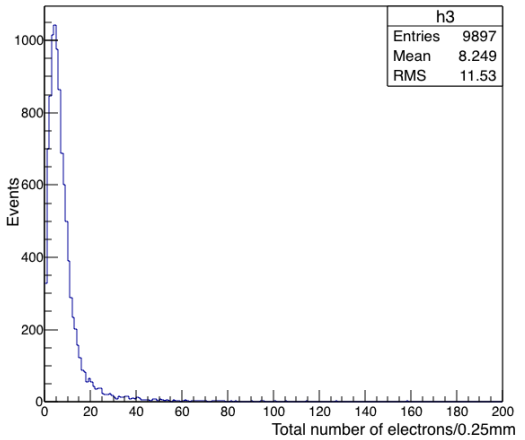
Primary ionization

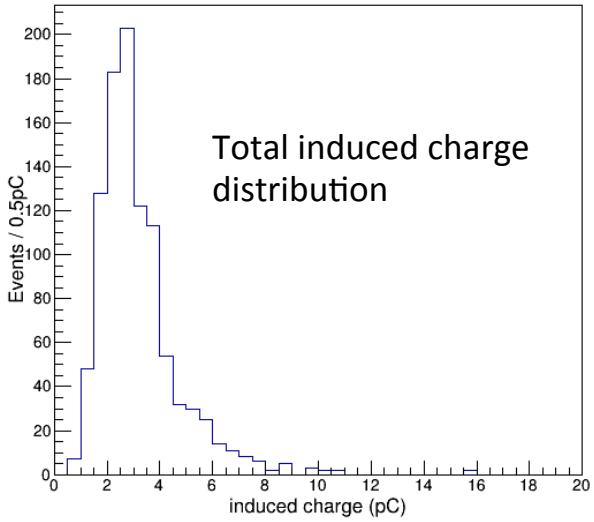
- N_ion = E_dep / E_ion
  - N_ion: # of primary E-ion pairs
  - E_dep: energy deposit given by Geant4
  - E_ion: minimum ionization energy (set to 20 eV)
- In the current output format, we have an average position of hit and total edep inside the volume, but no step-by-step position and eloss information.

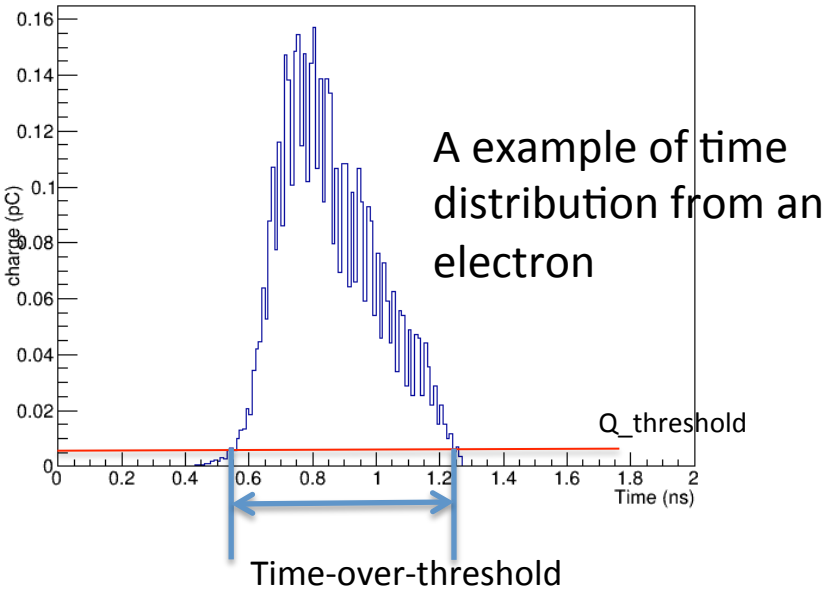
- Poisson statistics with a mean of N_ion
- Random distribution of electrons from primary ionization along the gas gap



Signal induction

- 200 MeV electron beam, 108kV/cm





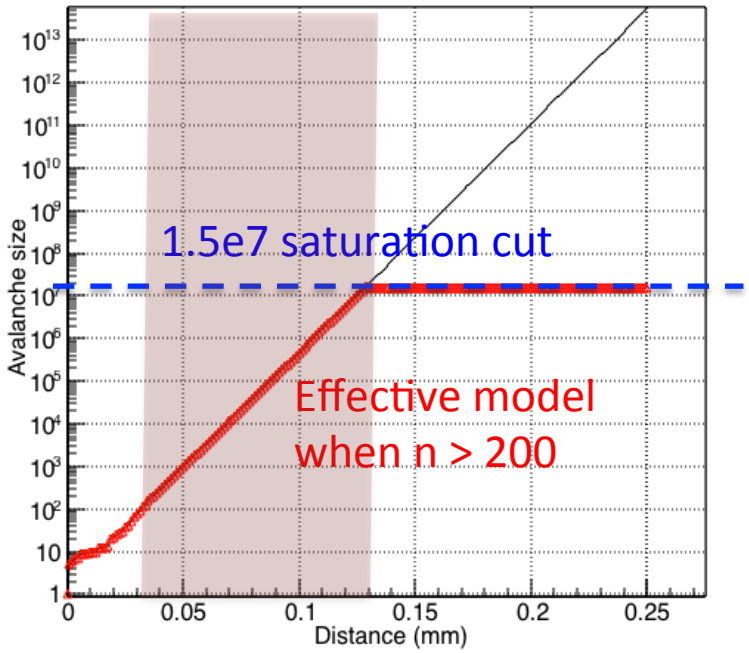
backup

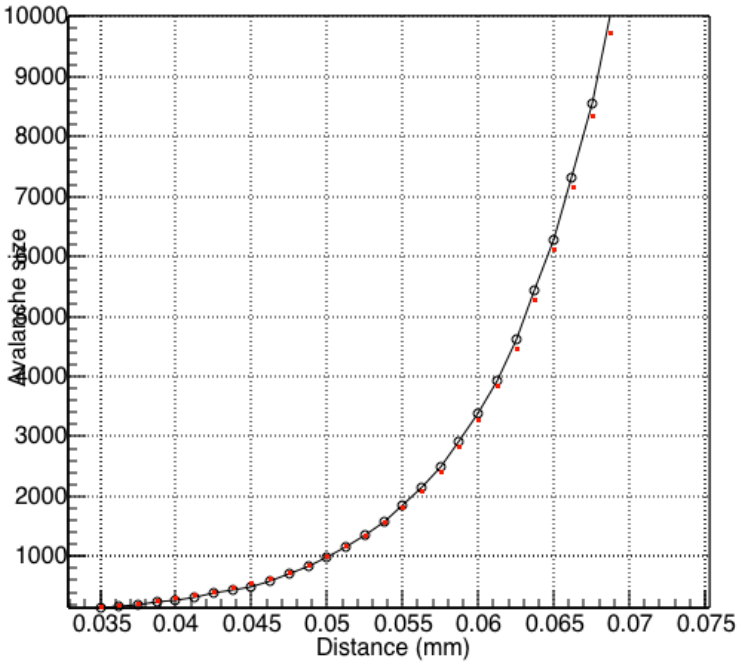
Avalanche simulation

- Single gap module tested and compared with the NIM reference.
- Implemented to be used with MRPC
- Basically looping over all electrons from primary ionization using a 1D model

  → switched to an effective model once # total electrons in a gap > 200 to reduce computing time
- 1.5e7 saturation cut (simplified space charge effect)

Avalanche simulation





E = 108 kV/cm
Townsend coefficient (α) = 129/mm
Attachment coefficient (η) = 5.435/mm
Drift velocity = 0.201 mm/ns

- Used the same random seed for the comparison.
- Only minor difference in the avalanche size between the general solution and the effective model.