DCH Lifetime Calculation

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DCH Parallel at the 1st SuperB CM
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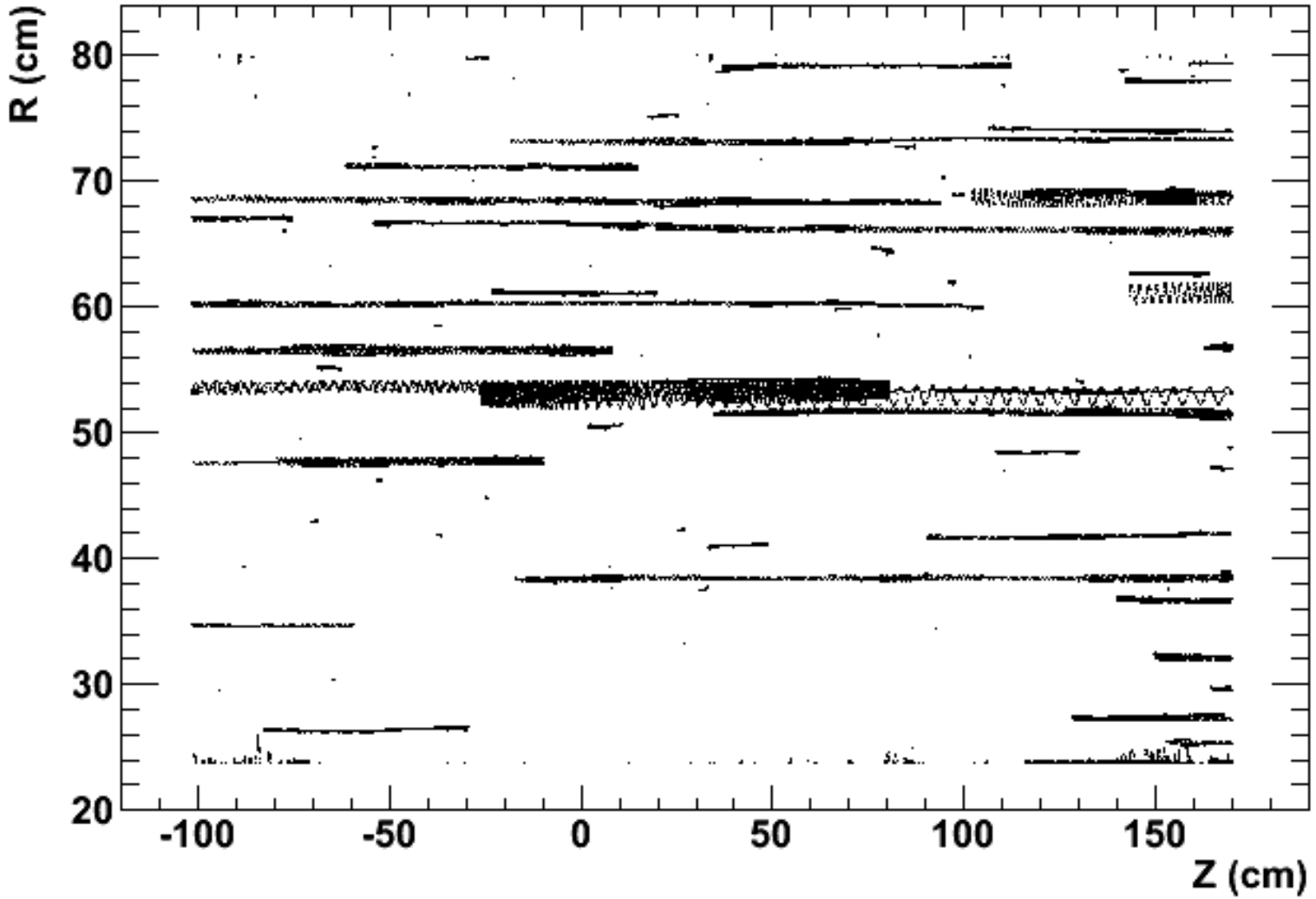
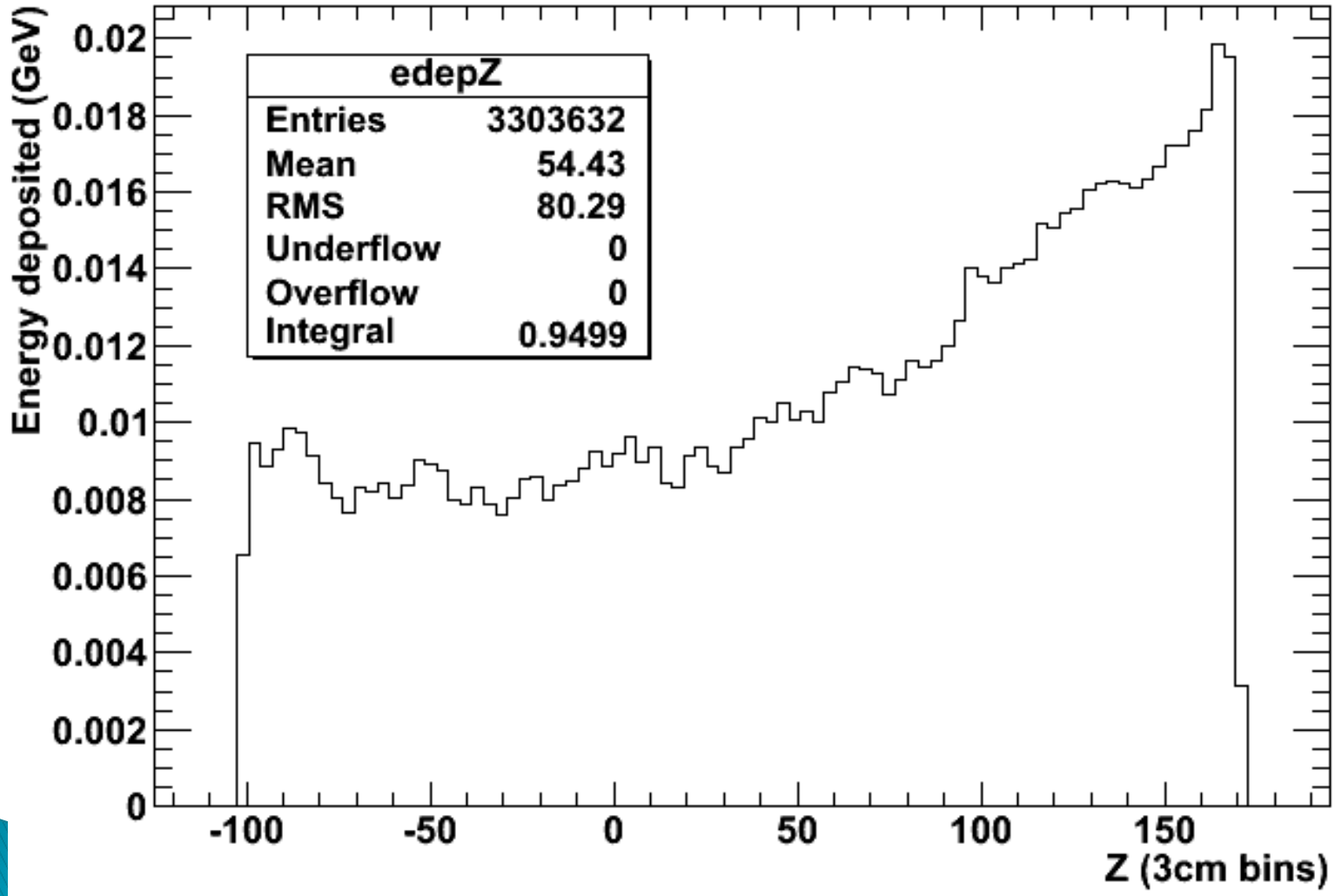
Overview

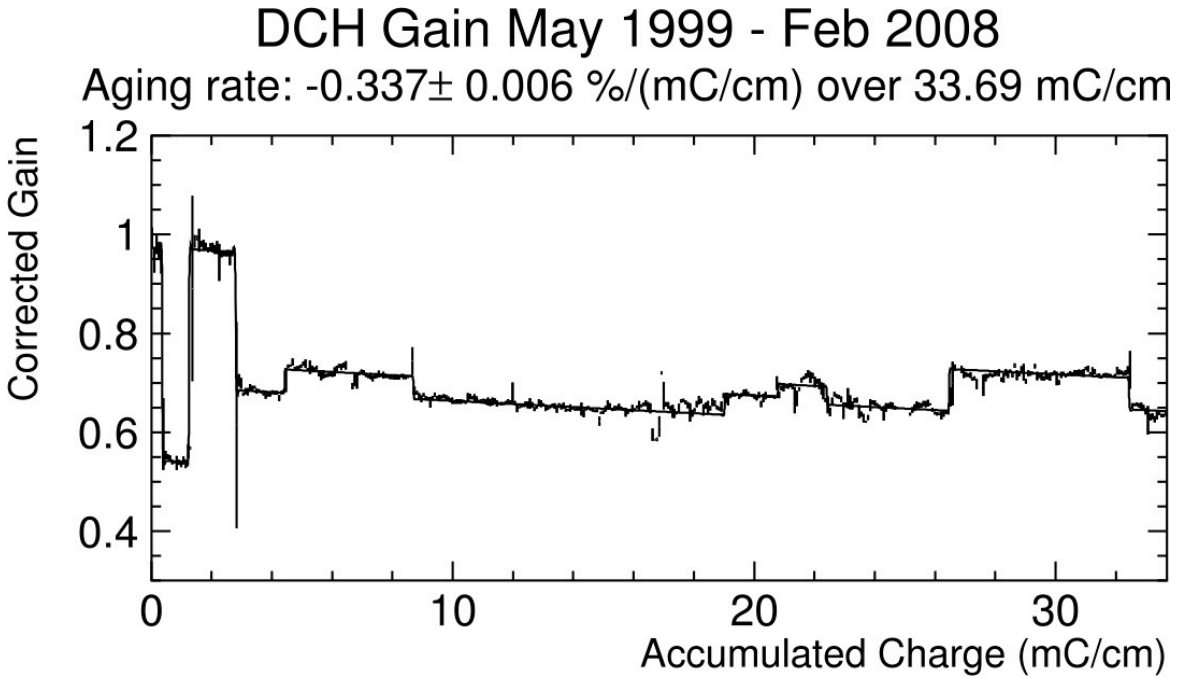
- Use FullSim to calculated energy deposited into DCH over the lifetime of SuperB to come up with an age limit
- Winter 2010 data analysis
- Zero angle Bhabbas $e^+e^- \rightarrow \gamma\ e^+e^-$
- edep > 0

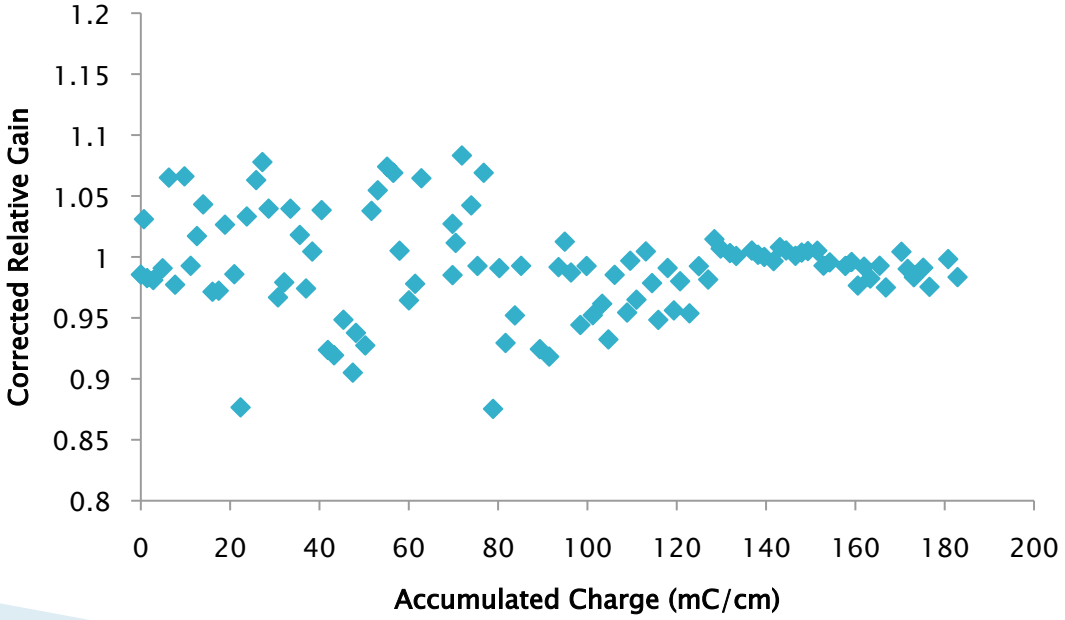
Sanity Check (0.1ms of FullSim)



Energy along length of chamber




DCH Gain May 1999 - Feb 2008
Aging rate: -0.337± 0.006 %/(mC/cm) over 33.69 mC/cm
Corrected Gain
1.2
1
0.8
0.6
0.4
0
10
20
30
Accumulated Charge (mC/cm)


Corrected Relative Gain
1.2
1.15
1.1
1.05
1
0.95
0.9
0.85
0.8
0
20
40
60
80
100
120
140
160
180
200
Accumulated Charge (mC/cm)

Rate of energy deposit per cell

- Total energy deposited = 0.95GeV (±30%)
- Simulated time = 4.644ns/bunch x
  250 bunches/ntuple x 4000 ntuples = 0.0046s
- Rate of energy deposit in chamber
- = Total energy deposited / simulated time
- = 200GeV/s
- Number of cells = 10000
- Rate of energy deposit per cell = 0.02GeV/s (±30%)

Predicted Age

- Rate of energy deposit per cell = 0.02GeV/s (±30%)
- Total time ≈ 5years ≈ 10^8 s (±20%)
- Electrons liberated per unit energy
  = 26e^-/keV (90:10 He:Isobutane) ← use this for calculation
  = 29e^-/keV (80:20 He:Isobutane)
- Gas gain ≈ 50000 (±20%) Babar gain
- Fraction of current at worst part of wire ≈ 2 x (1/270cm) = 0.0074/cm (±50%)
- Age: 3mC/cm (±60%)
- Wire could survive 200mC/cm