Effective Velocities in the Barrel Calorimeter

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Method

1. Use code of Will M. to get the matched showers and the corresponding matched tracks
2. Plot the z-coordinate of the points in the cluster versus the z-coordinates of the matched track for every channel and perform a linear fit on the outcome
3. Since $z_{point} = \frac{c_{eff}(t_{up} - t_{down})}{2}$, the slope of the fit is:
   $p1 = \frac{c_{eff,software}}{c_{eff,actual}}$ where:
   $c_{eff,software} = 16.75\frac{cm}{ns}$ (the value from DBCALGeometry.cc)
   $c_{eff,actual}$: the value we are after
4. Grab the p1 parameter of the fit and compute the effective velocity for each channel:
   $c_{eff,actual}[i] = \frac{c_{eff,software}}{p1[i]}$ where i: the number of the channel
5. z_{track} calculation: find z_{track} at the beginning of each layer and then take the mean value of two subsequent measurements as the value of z_{track} in the middle of each layer
6. Dataset: Fall Commissioning Run 2400 ($\approx 1.2M$ events)

Lots of feedback from Mark, Elton, Tegan

Results

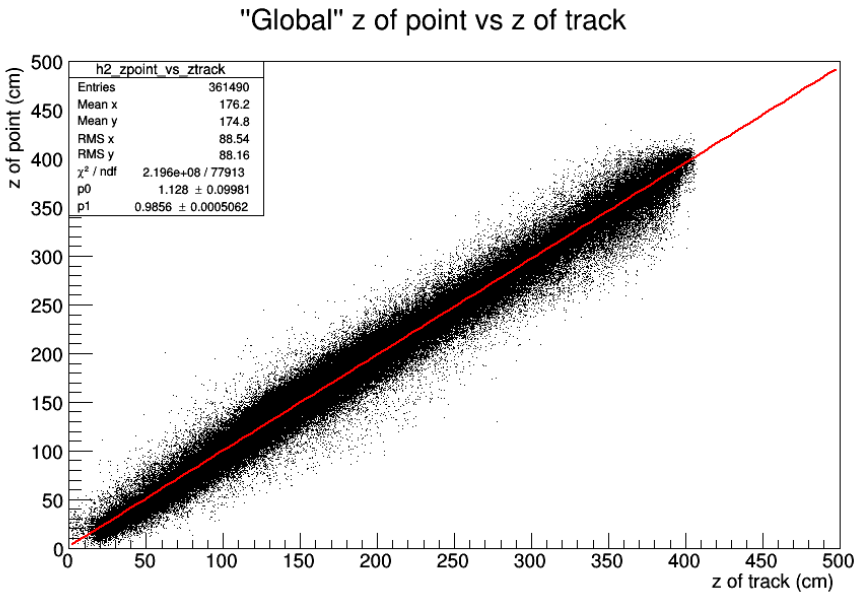


Figure 1: ”Global” plot of z_{point} versus z_{track}

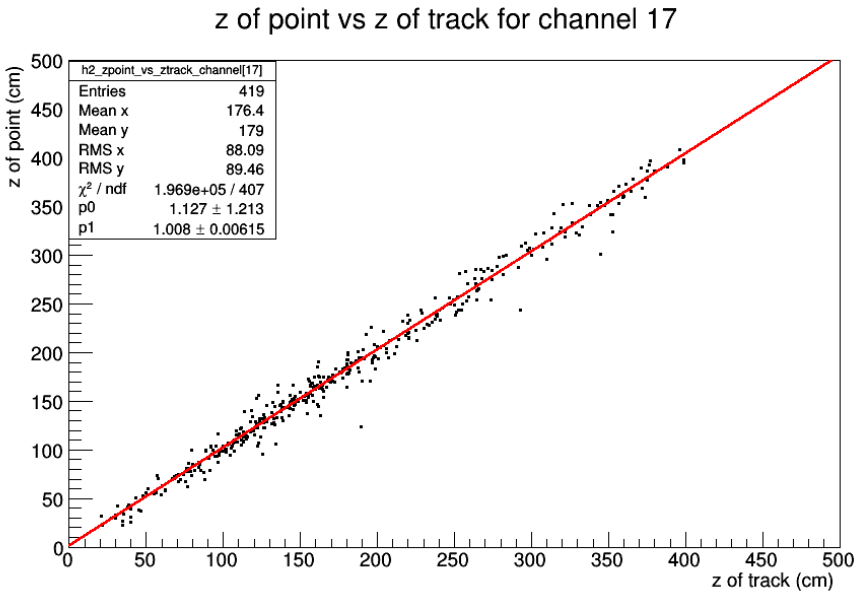
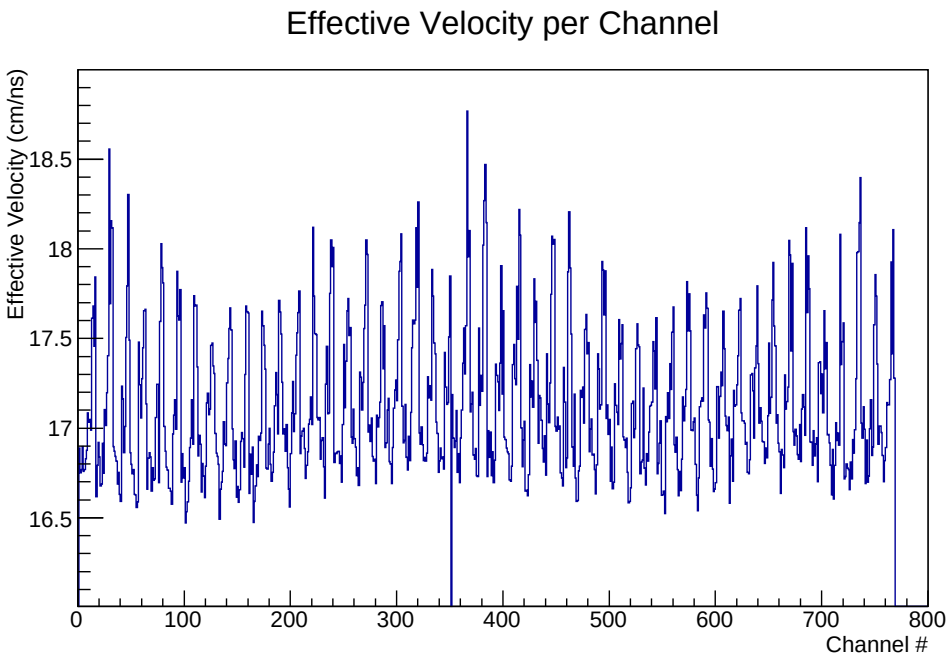
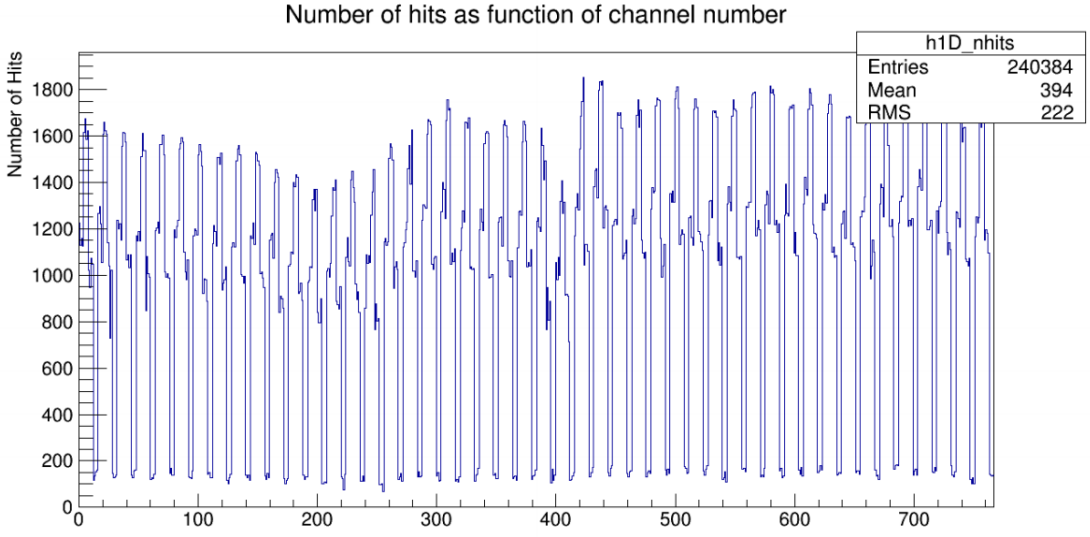


Figure 2: Random channel plot of z_{point} versus z_{track}

Results



Will's plot from his talk at the collaboration meeting:



Results

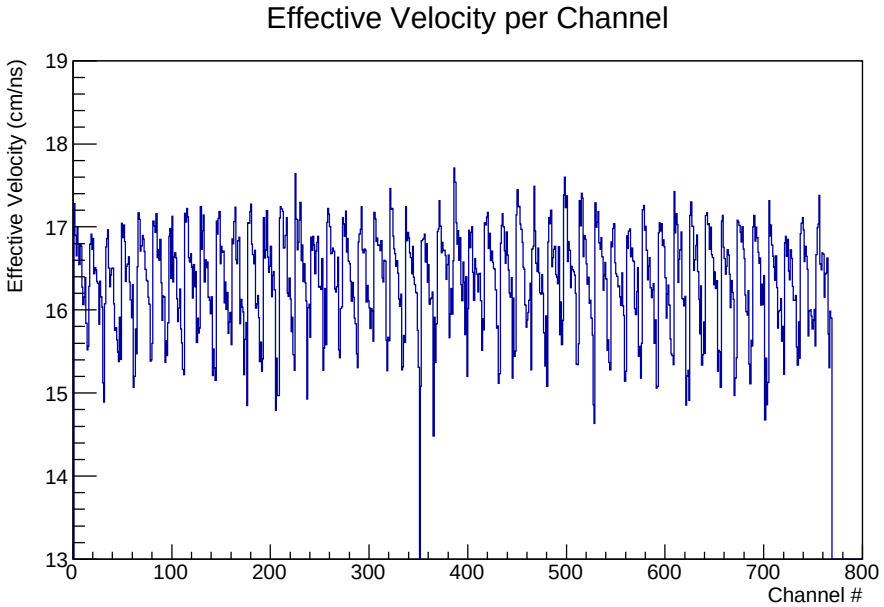


Figure 3: Effective Velocity with z_{track} calculated only for Layer 1

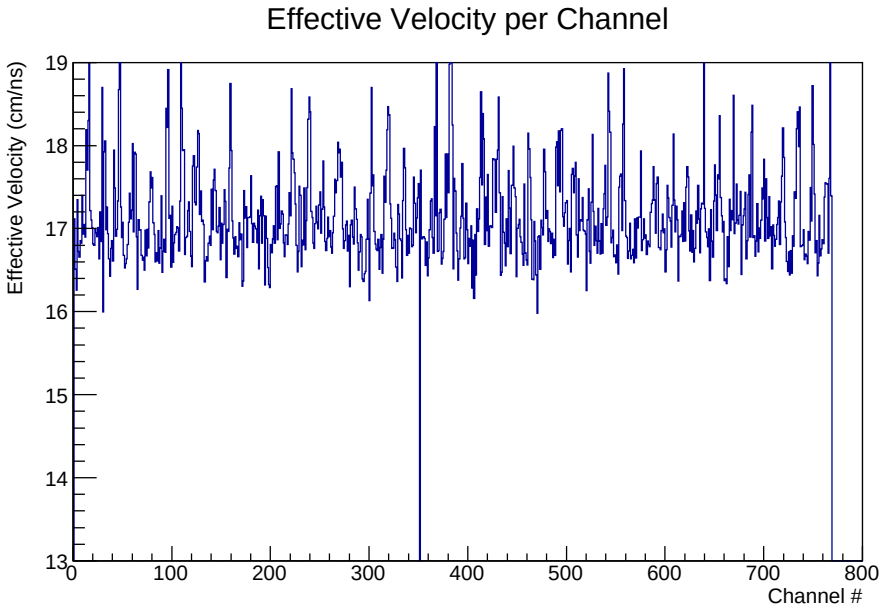


Figure 4: Effective Velocity with z_{track} calculated for each layer (4 different values)

Comments

1. Channel 351 appears to be dead. No hits whatsoever. However, Will's plot at the collaboration meeting shows that there are hits in Channel 351. Maybe it was inactive in the run I used (run 2400)
2. Oscillatory behaviour still there (even after calculating a different z_{track} for each layer)
3. Two kinds of "oscillations": one which is module-dependent and one for each half of the BCAL (upper half and lower half in css view, assuming cell_id numbering begins from module 1 and goes clockwise)

To-Do

1. Errors
2. Investigate further (improve code, statistics)
3. Try to use another method to get c_{eff} to cross check the results (maybe using time information)