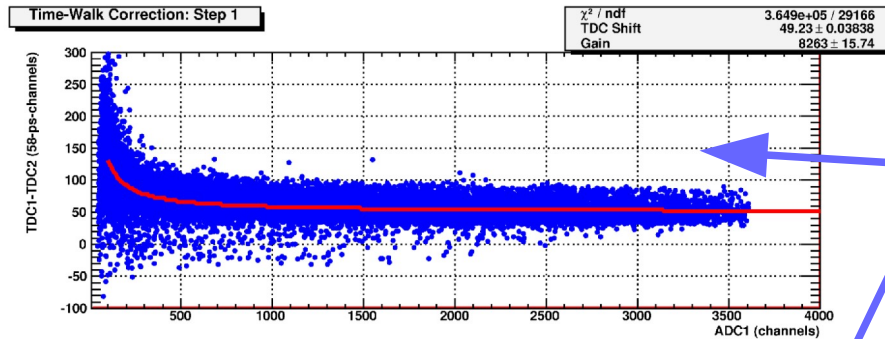


Z-Dependence in the Time Calibration of BCAL

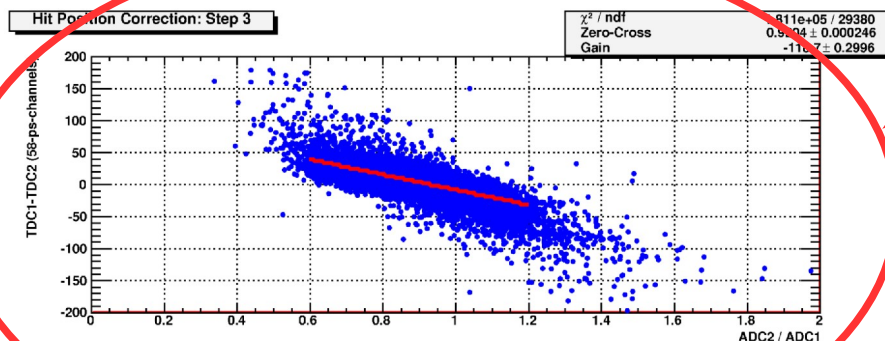
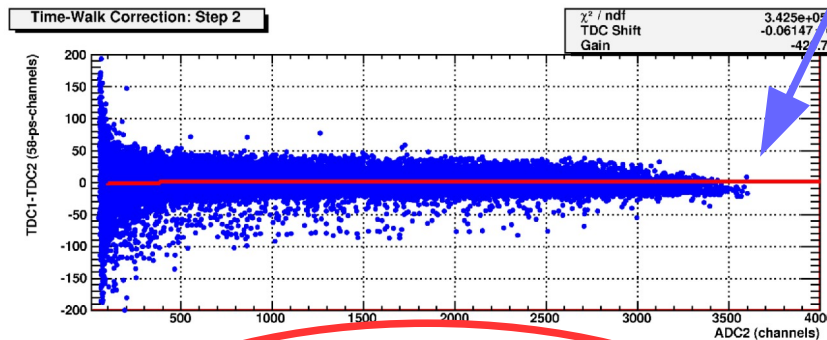
Andrei Semenov (UofR)

June 30, 2016

A.Yu. Semenov & I.A. Semenova
"Mini-BCAL Test at Hall B (2012): Time Resolution"
GlueX-doc-2503, May 2014

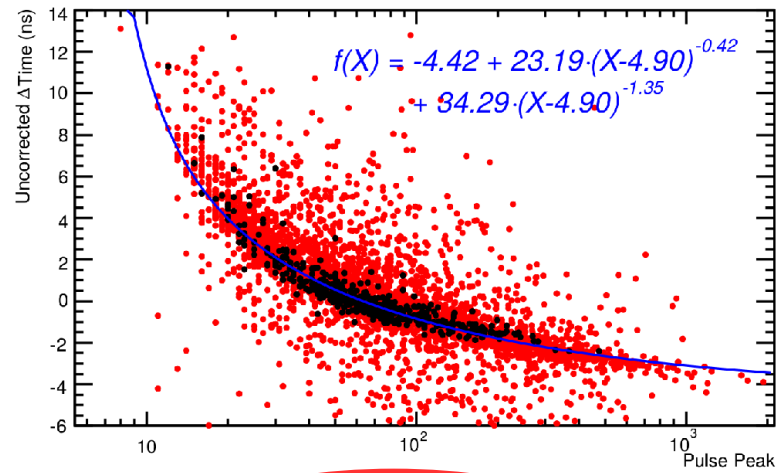


Difference of the times from the module edges: time-walk correction

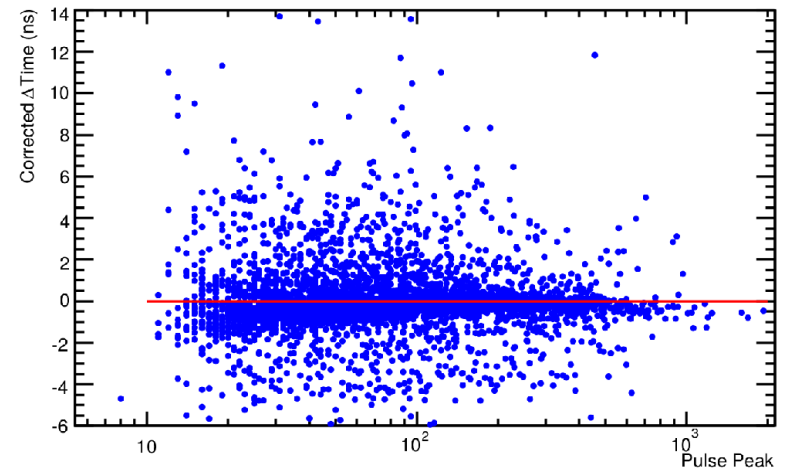


Additional correction on the ratio of pulse amplitudes (viz., on Z-position)

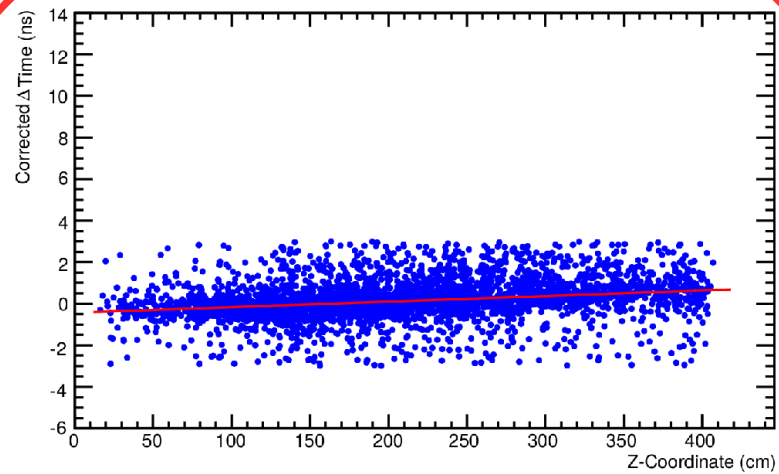
All Hits: Run 10913_020, Module=22, Sector=1, Layer=2, End=0



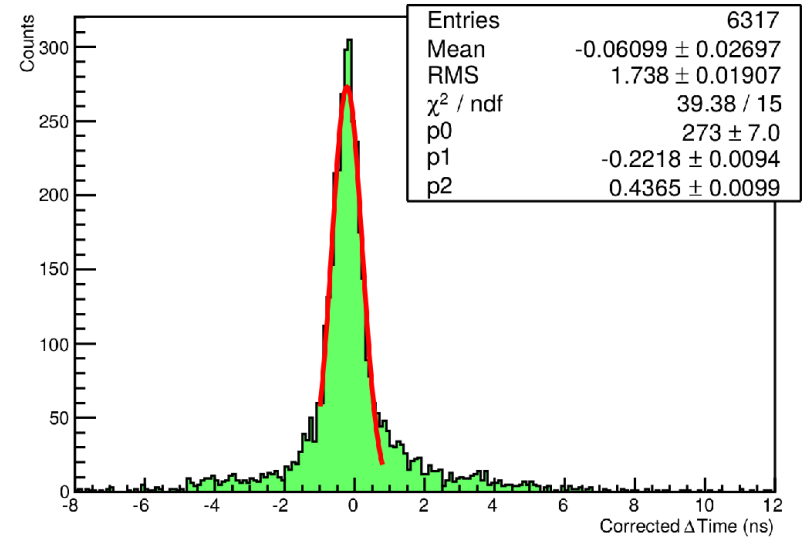
All Hits: Run 10913_020, Module=22, Sector=1, Layer=2, End=0



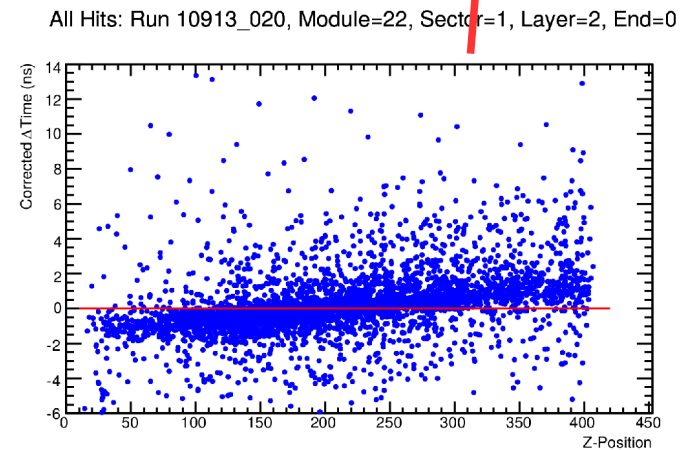
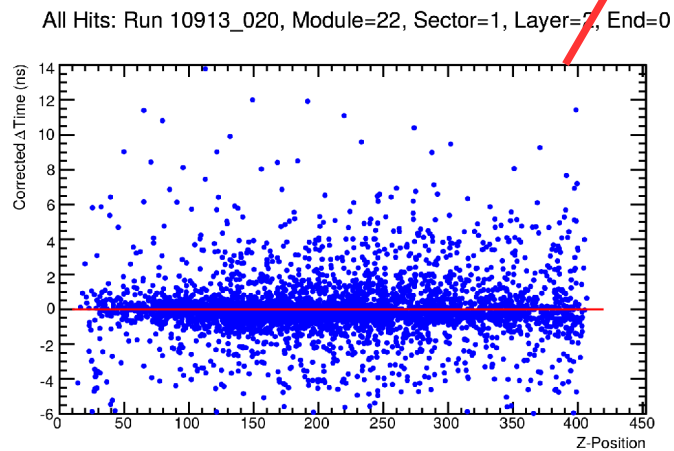
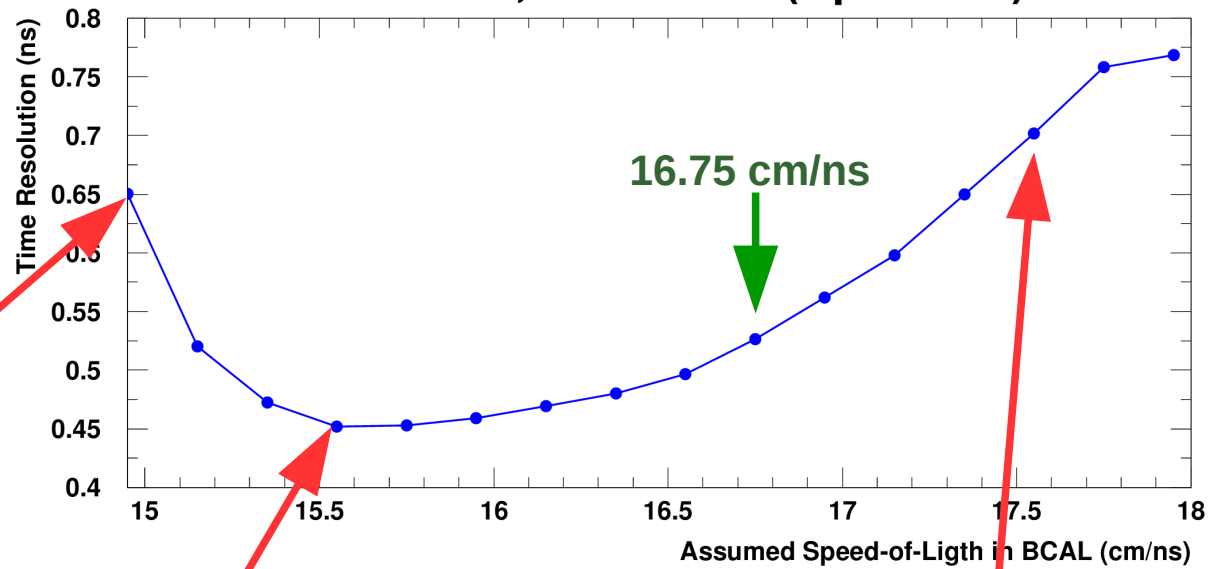
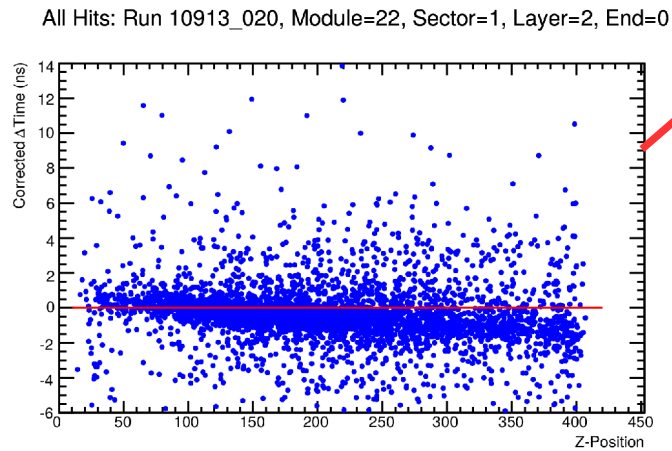
All Hits: Run 10913_020, Module=22, Sector=1, Layer=2, End=0



All Hits: Run 10913_020, Module=22, Sector=1, Layer=2, End=0



Run 10913, M22-S1-L2 (Upstream)



Hypothesis #1: Different cells have different light-propagation velocities. Different distances from the photodetector creates different error in timing in the case of wrong assumed light-propagation velocity => Slope => Varying the assumed light-propagation velocity, we can find the minimum in the time resolution that corresponds to the real velocity.

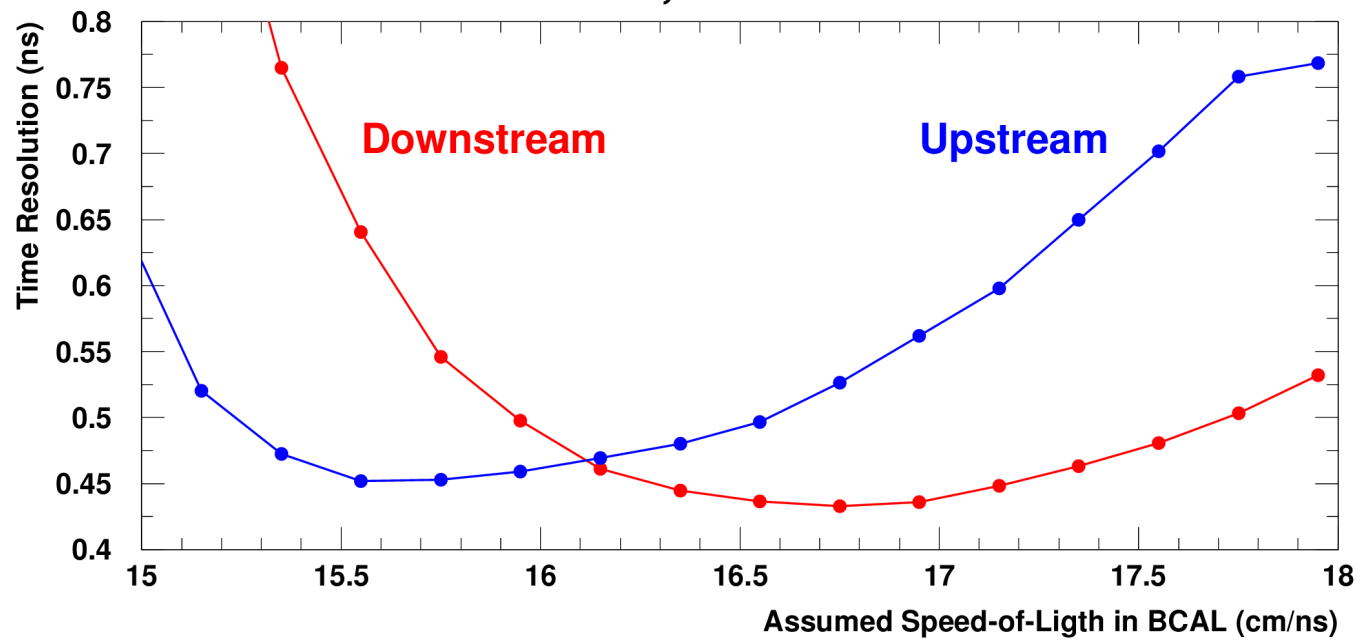
The minima for upstream and downstream readout must be in the same place.

Hypothesis #2 (by Mark and George): Shower size removes part of the travelling distance for the light inside the calorimeter => Slope even if the velocity is correct => Varying the assumed velocity, we can compensate the “original” slope, but the minimum is not correspond to the correct velocity.

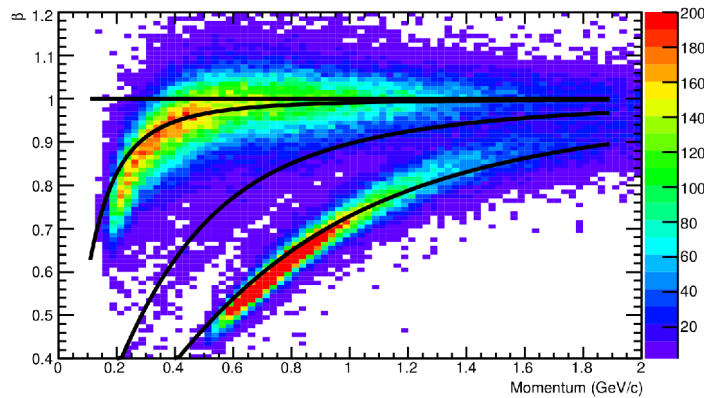
Because the upstream readout is more affected with the shower-size distortion, the minimum for the upstream readout should be for lower velocities than the one for the downstream readout.

Neutrals + Charged @ Layer 2

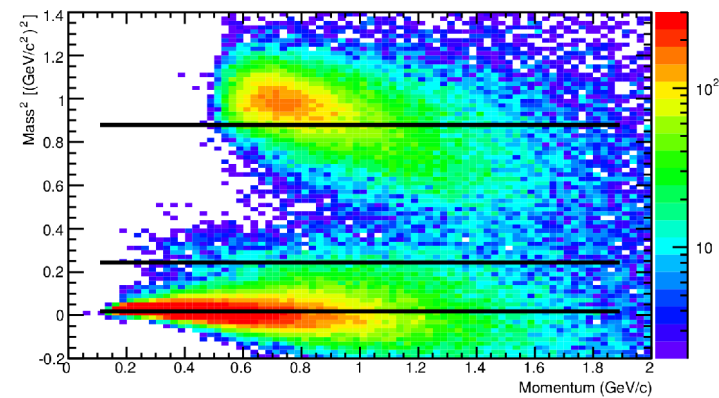
Run 10913, M22-S1-L2



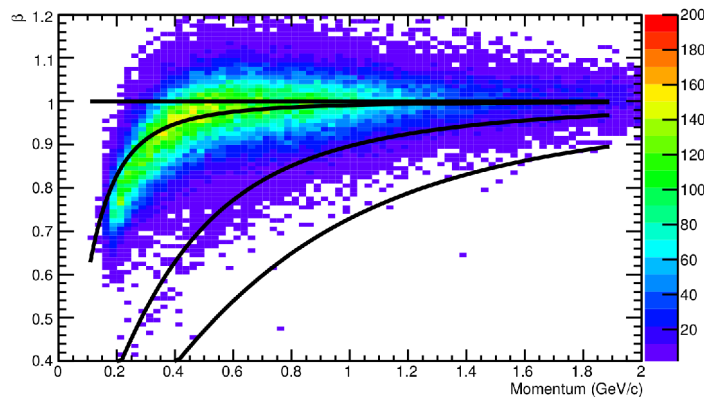
Run 10913 (3 files): Positively-Charged



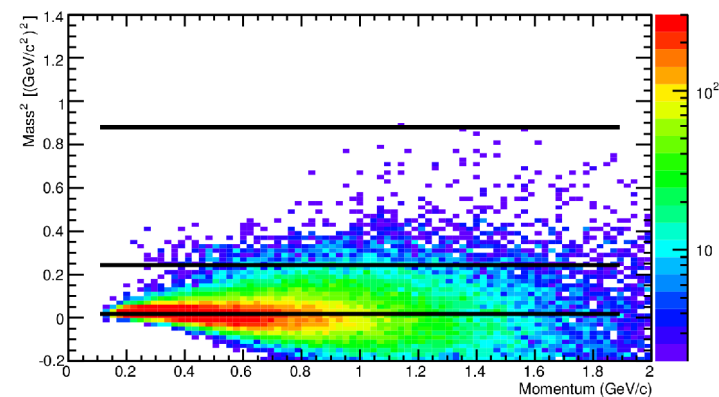
Run 10913 (3 files): Positively-Charged



Run 10913 (3 files): Negatively-Charged



Run 10913 (3 files): Negatively-Charged



The calibration was done with the pions, and the pions are pretty good, but the protons and kaons have some problems (shifted positions and the momentum slope).

Most probably, we need PID-dependent sets of calibration constants.