CAEN HG/LG Comparison with MIP plots, update

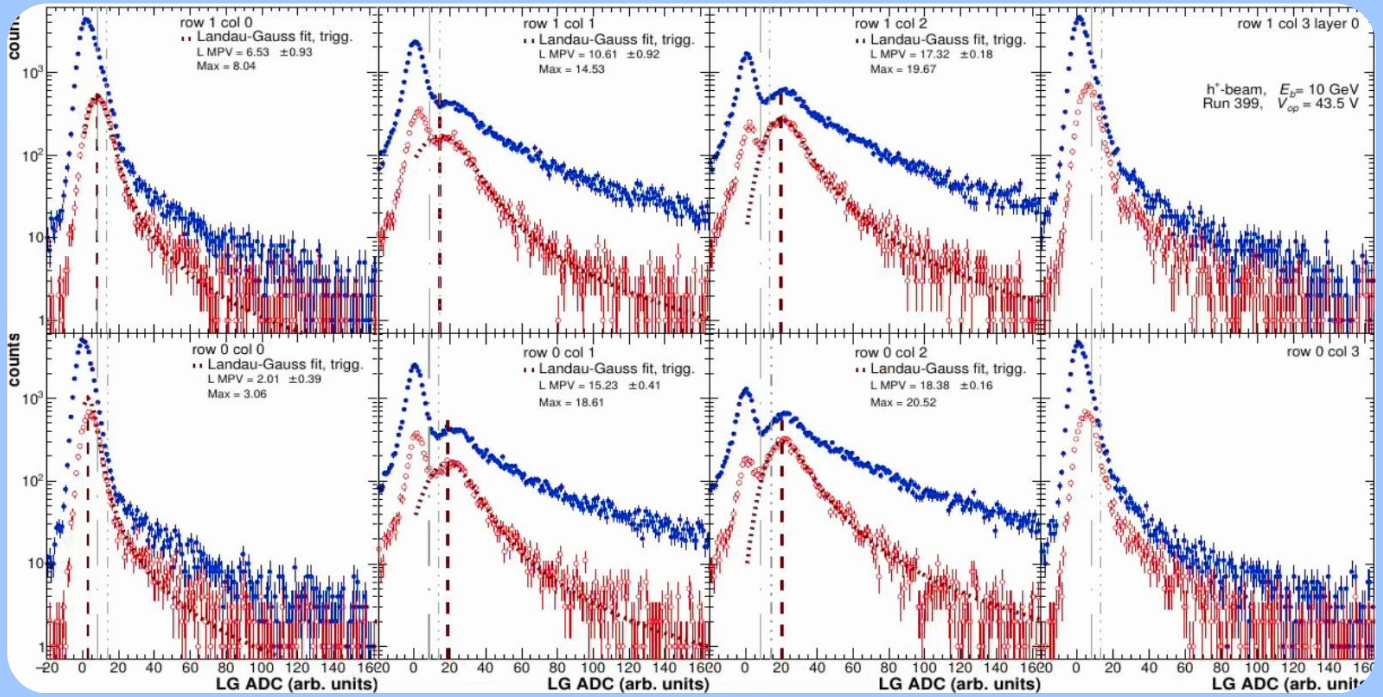
Following from last week

https://indico.bnl.gov/event/28925/

https://indico.bnl.gov/event/28925/contributions/110193/attachments/63611/109205/Investigating%20the%20High%20Gain%20vs%20Low%20Gain%20Discrepancy%20with%20MIP%20Plots%20-%2007_21_25.pdf

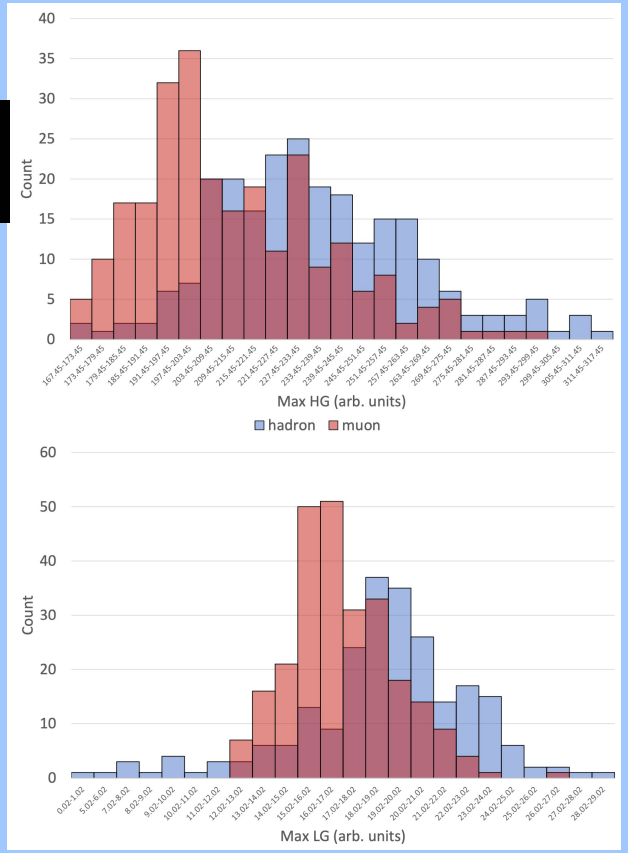
Adam Gibson, for Leah Shafer
Valparaiso University
LFHCal Test Beam Analysis Meeting

07/28/2025



Reminder:

Using the "Max" from the four central tiles. Those four seemed cleanest for the hadron run, particularly the lower-right (row 0, col 2).



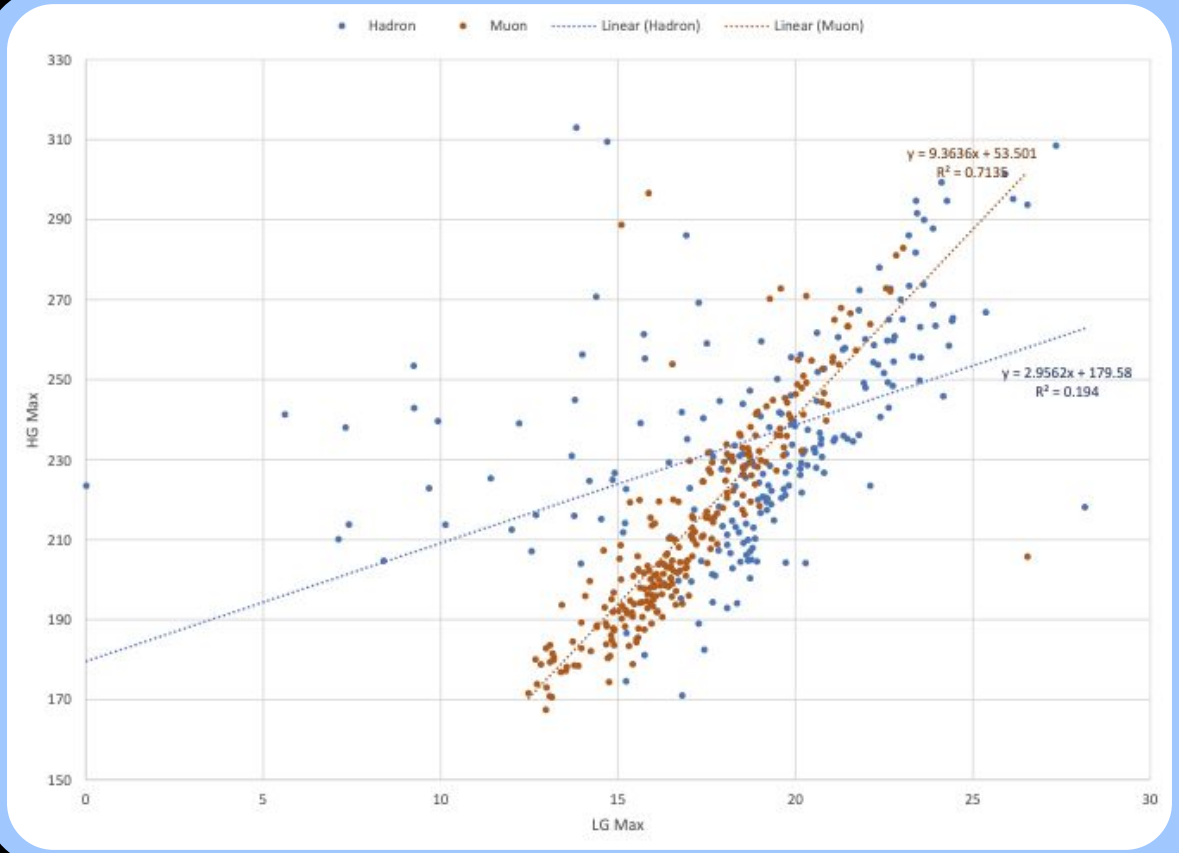
Reminder:

Investigating HG/LG discrepancy

We have the maxes of fitted MIP peaks from two types of runs

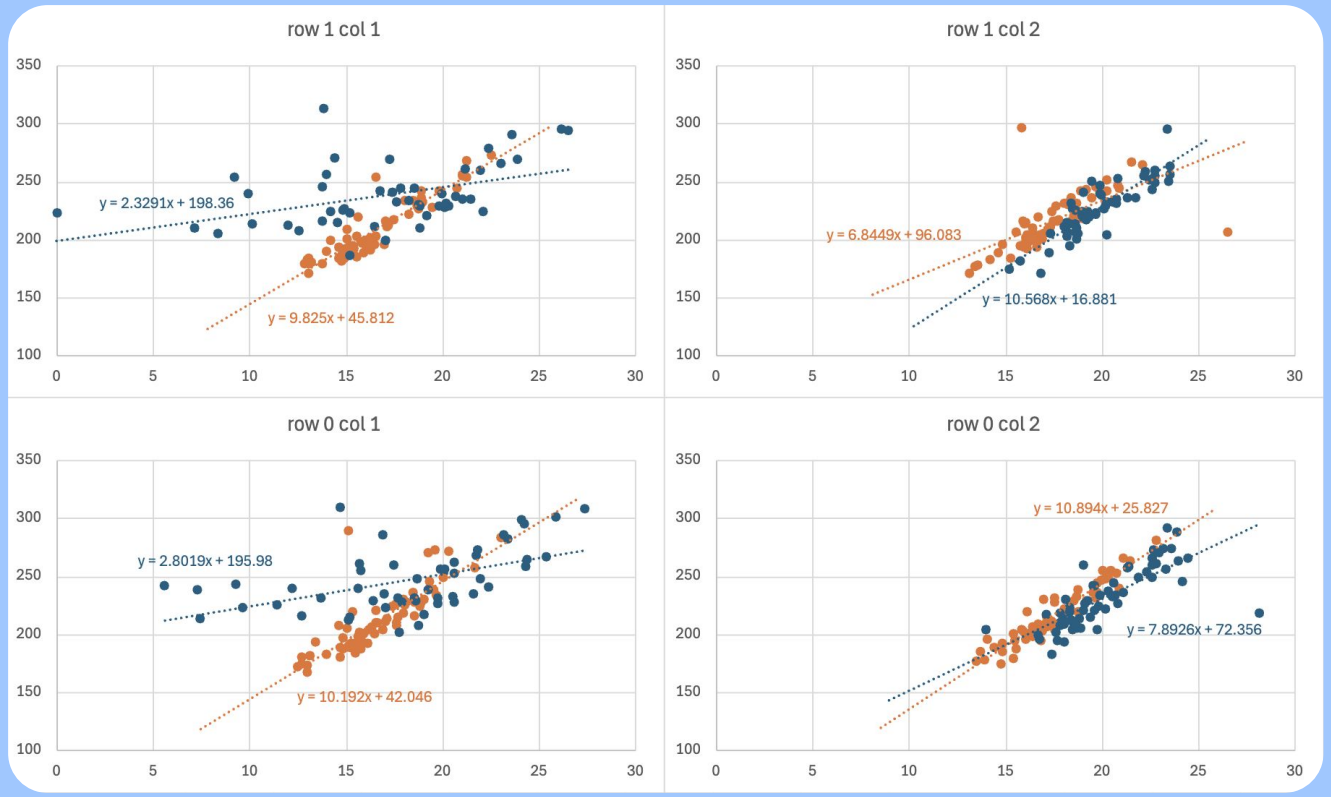
HG/LG ratio of the means of these max distributions

Hadrons - 12.5259
Muons - 12.5146



Oskar had suggested a 2D plot. For each tile, we plot HG Max vs. LG max

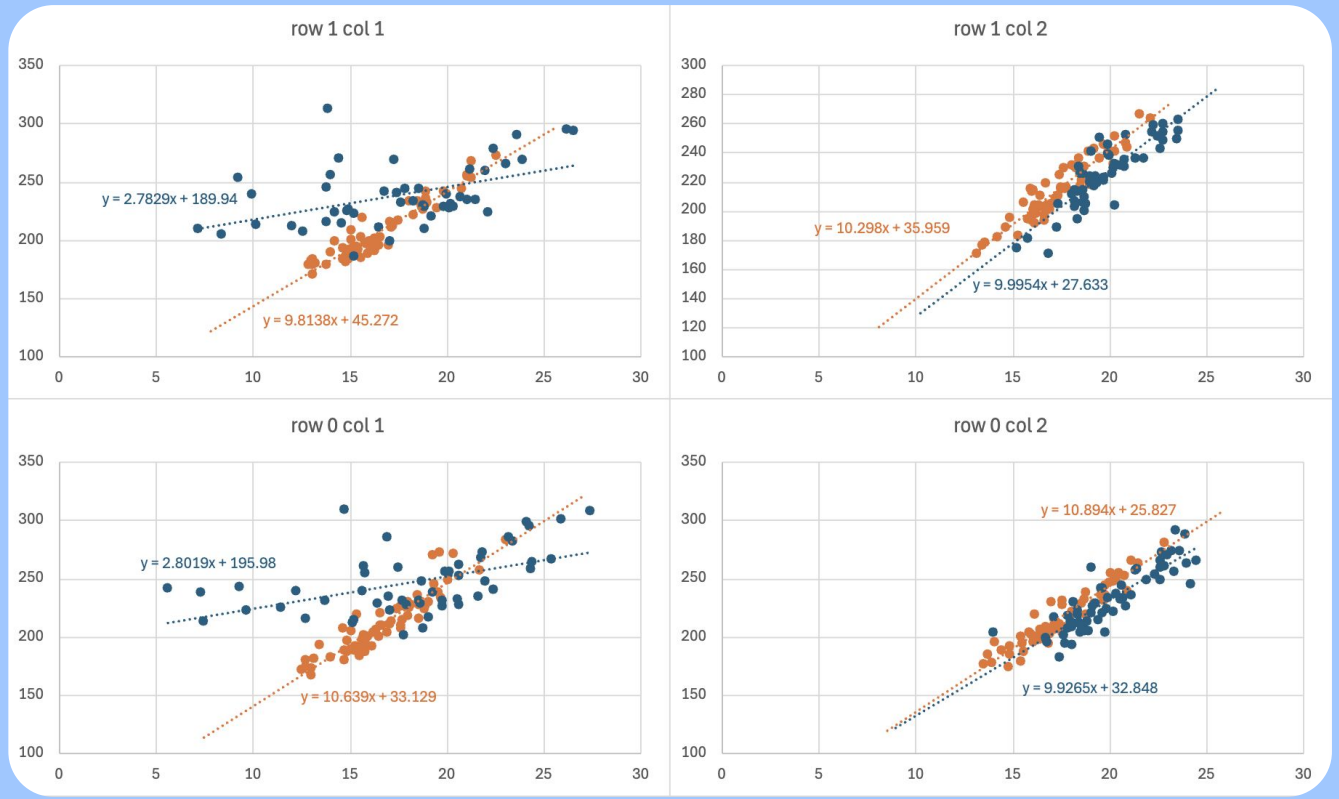
The muons are plotted in orange and the hadrons in blue



This graph shows both the hadrons (blue) and the muons (orange)

Muon Slopes:
9.824 ± 0.516
6.844 ± 0.998
10.191 ± 0.884
10.893 ± 0.428

Hadron Slopes:
2.329 ± 0.685
10.568 ± 0.797
2.802 ± 0.670
7.892 ± 0.889



This graph has the outliers removed
Example fits:

Hadron (blue)

10.00 +- 0.77

Muon (orange)

10.30 +- 0.48

10.89 +- 0.43

Intercept

25.8 +- 7.6

Summary

The hadron MIP peak is higher than the muon MIP peak, in HG *and* LG (as shown last week)

For the cleanest hadron cases, (third column of tiles) the HG/LG ratios are similar for hadron and muon runs (within about 5%?) and seem consistent within errors.

So, the MIPs aren't *that* standard of a candle. The peaks shift in both LG and HG.

And something seems different about this muon-tagged sample than the original (global?) analyses that showed significant changes in HG/LG ratio.

In the muon-tagged samples the shift seems modest, or absent.

(Various caveats apply: including, for this analysis we're looking at only the MIP Maxes.)