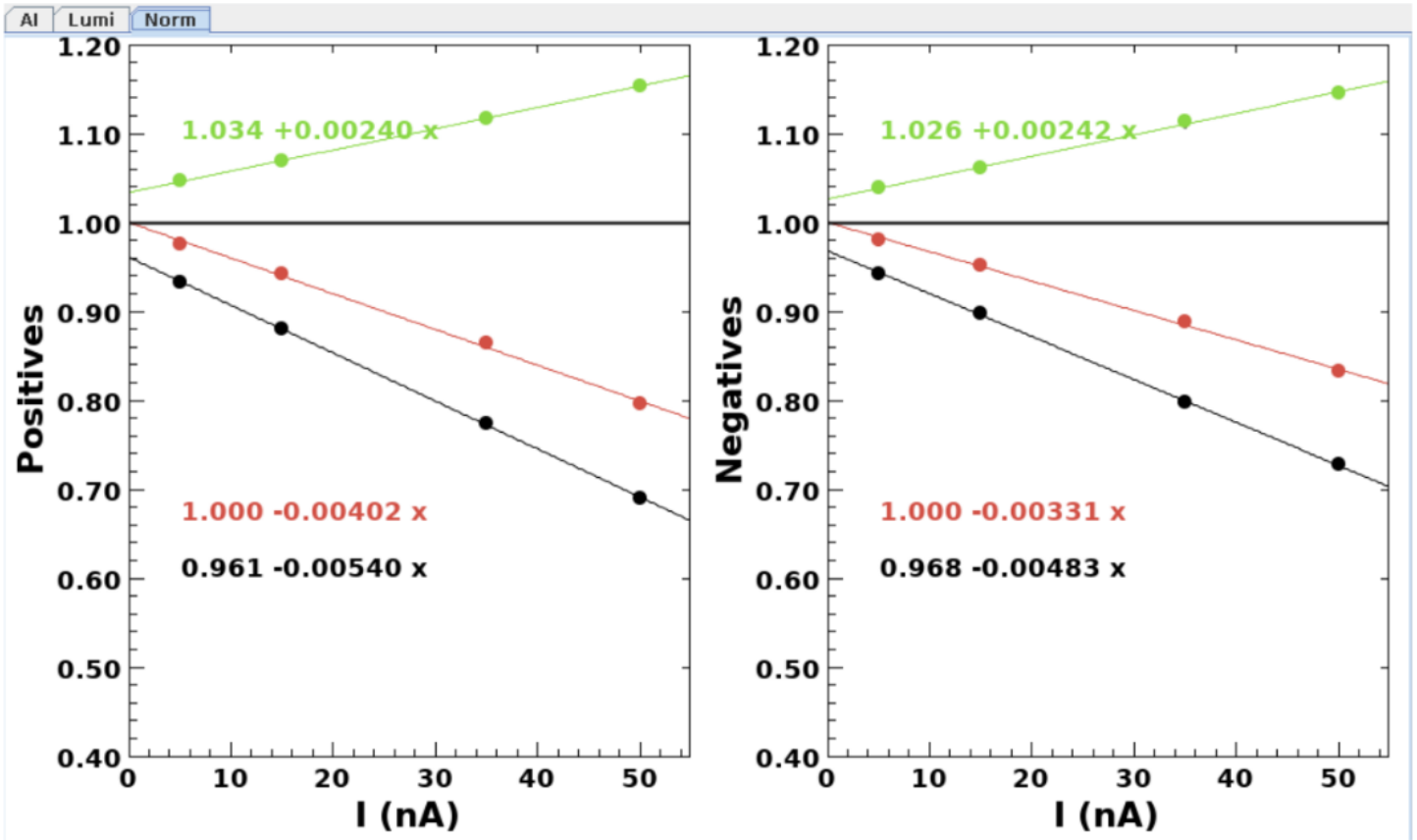
Luminosity dependence of RGB data 1

RGB Pass 2 Review

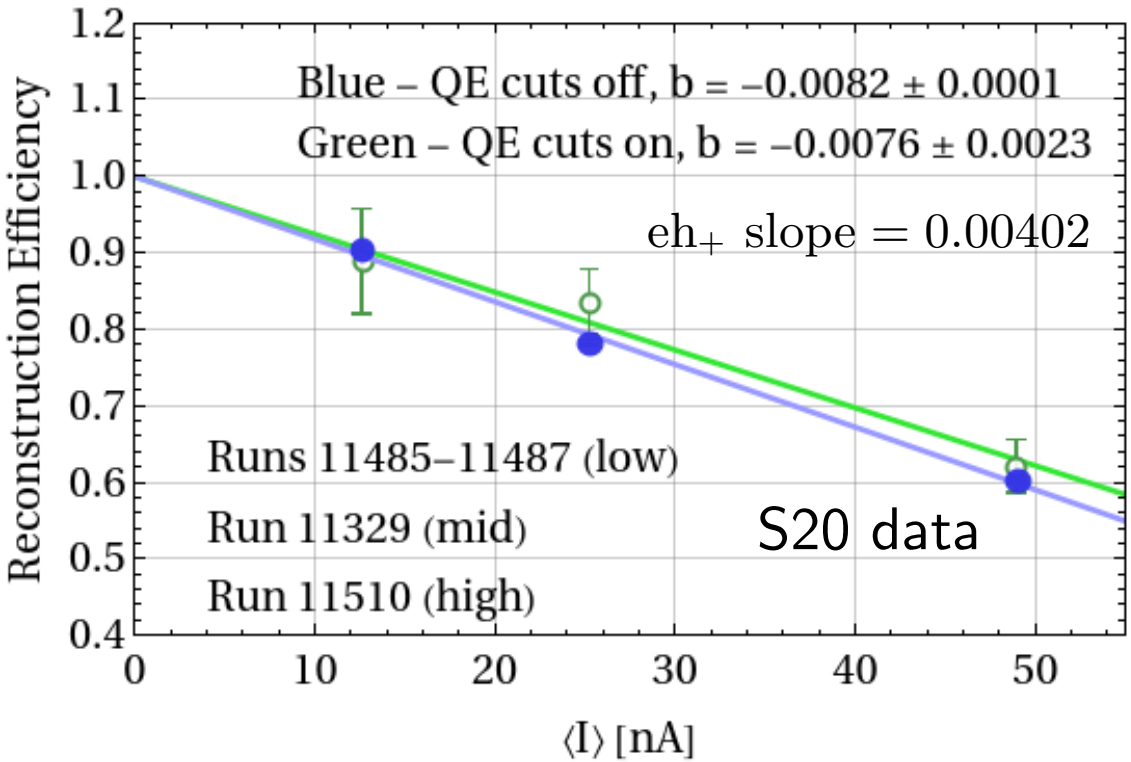


Normalized yields of eh+/-

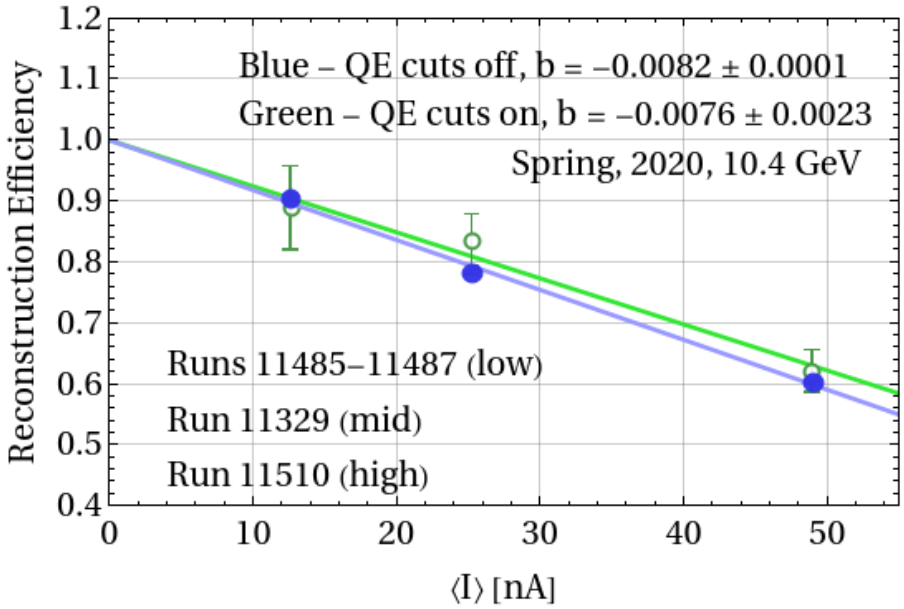
Conventional
AI-assisted
Ratio

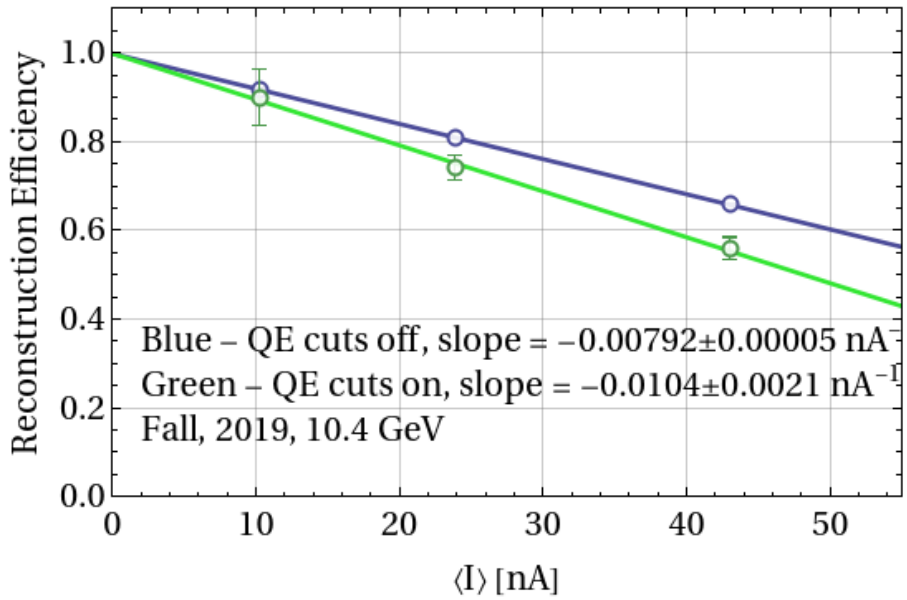
Luminosity dependence of RGB data 2

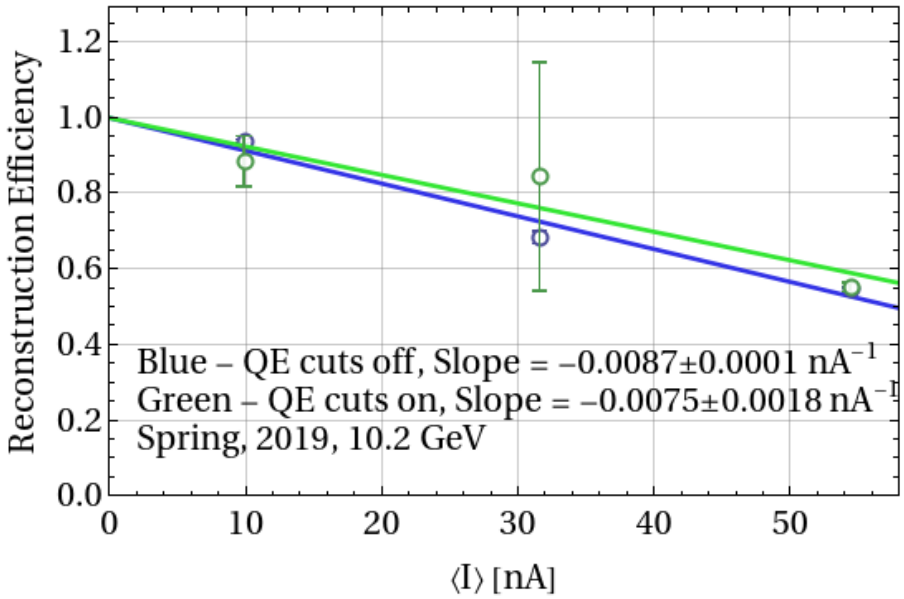
1. Check luminosity effects on G_M^n analysis (gnm train).
2. Series of cuts to select quasi-elastic (QE) *ep* events.
   1. Cut on calculated beam energy from electron and nucleon angles.
   2. In-plane cut ($\Delta\phi$).
   3. Angle between $\vec{q}$ and nucleon momentum (θ_{pq}).
3. Remove QE cuts to get more *ep* events.

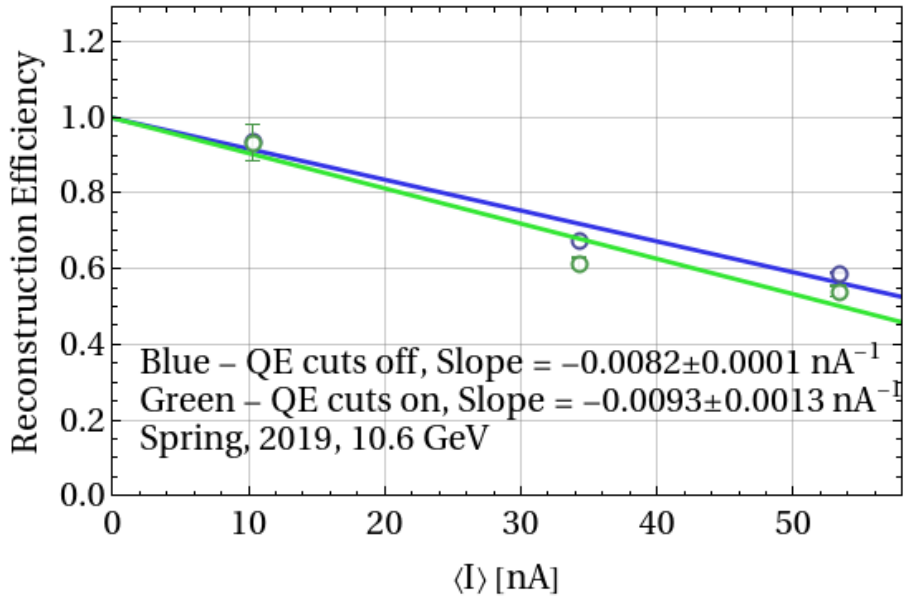


Results from four data sets (*ep* events) 3



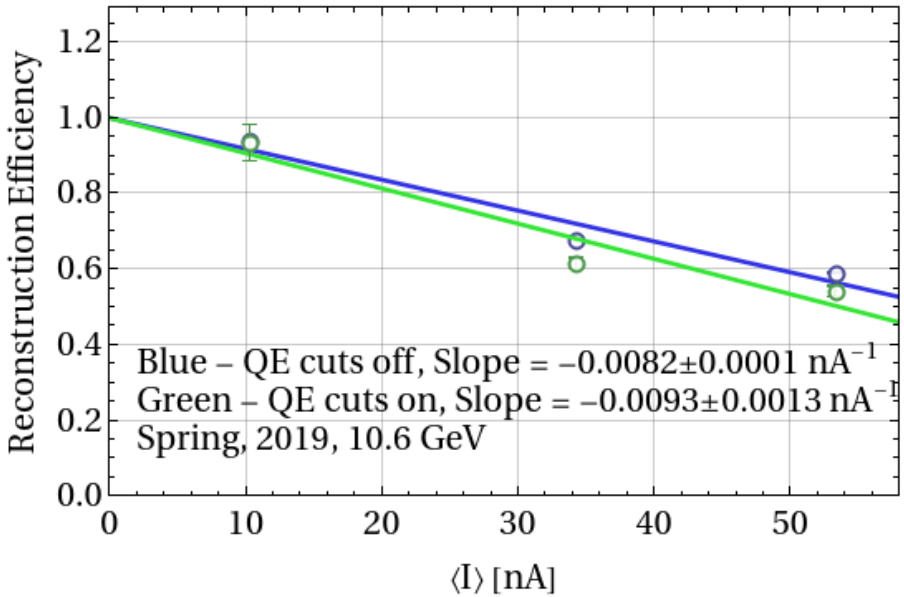


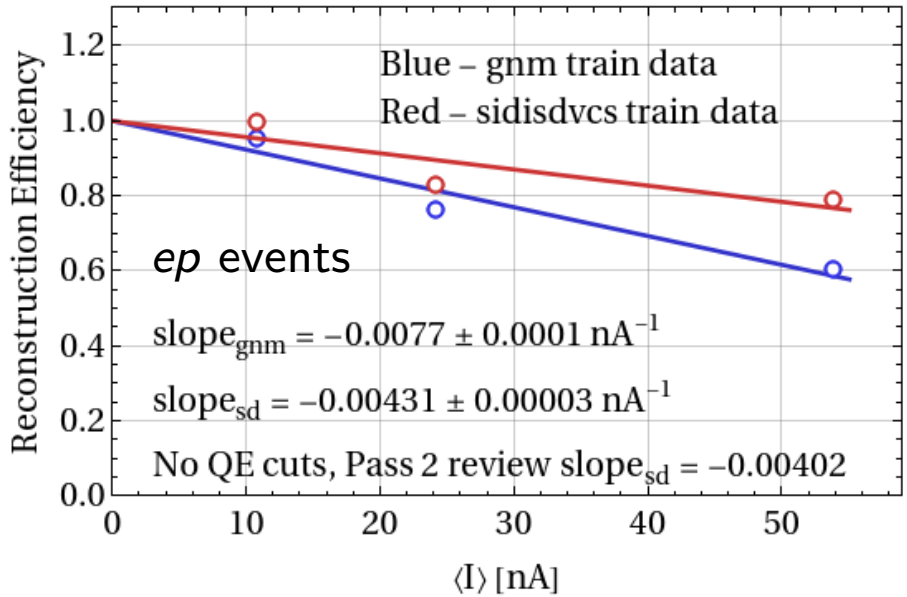




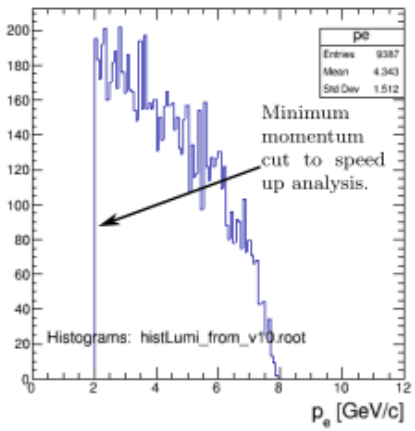
Slope of reconstruction efficiency in RGB

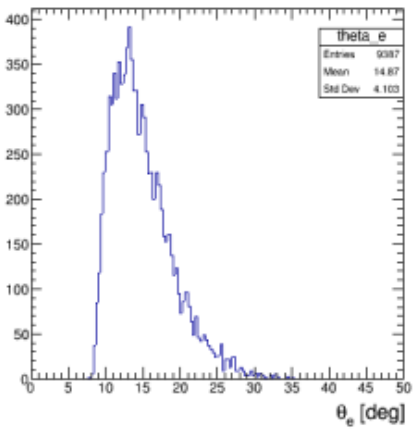
1. Steeper slope of reconstruction efficiency with luminosity observed for *ep* events from gnm train (left-hand-panel) compared with eh_+ slope for pass 2 review.
2. Investigate differences between *ep* final states with different kinematics.
3. Compare *ep* final state from gnm (no pions) and sidisdvcs (has protons, pions) trains.
4. Left-hand panel shows the gnm train results for QE cuts on and off.
5. Right-hand-panel is a comparison of *ep* events from different trains, spring 2019, runs 6157, 6371, 6378.

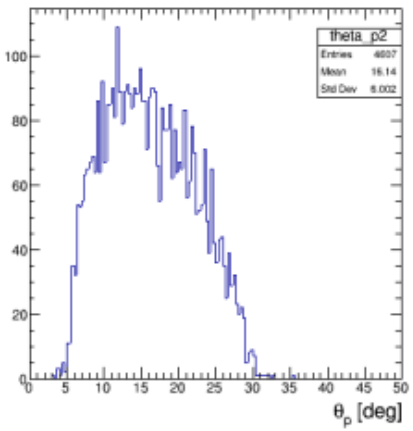


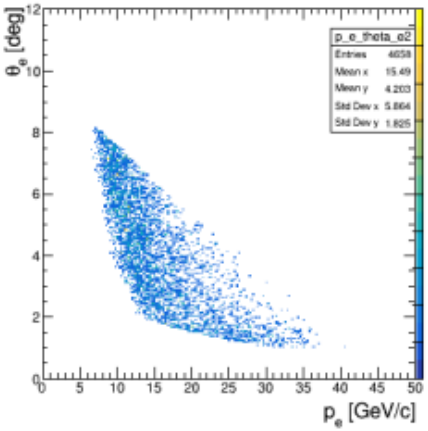


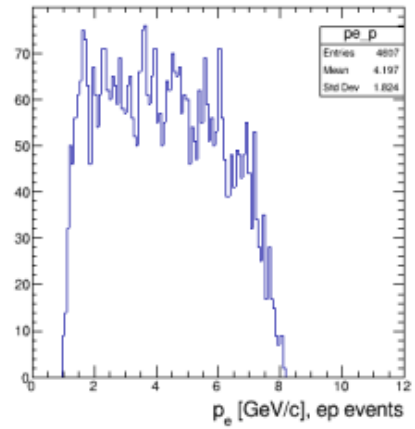
Kinematic distributions for *ep* events (gmn train, S19)

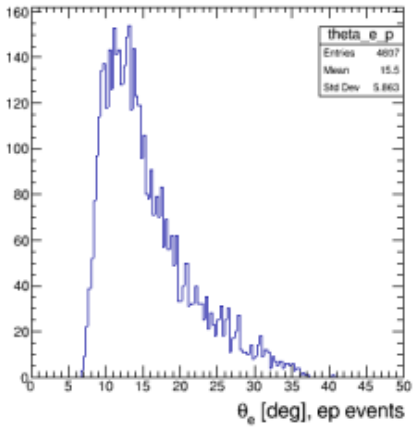


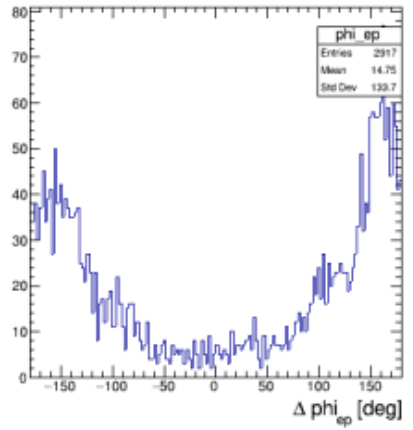


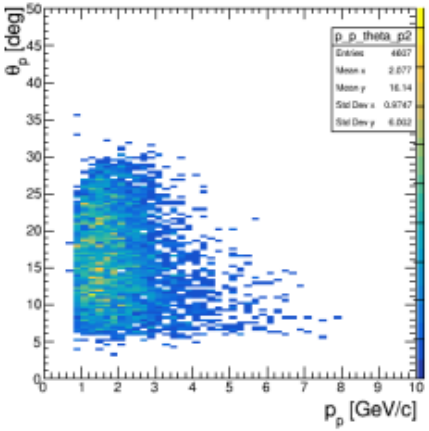




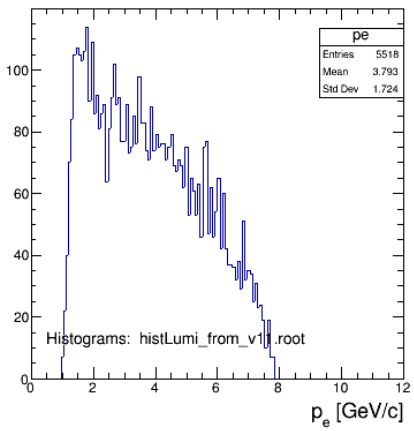


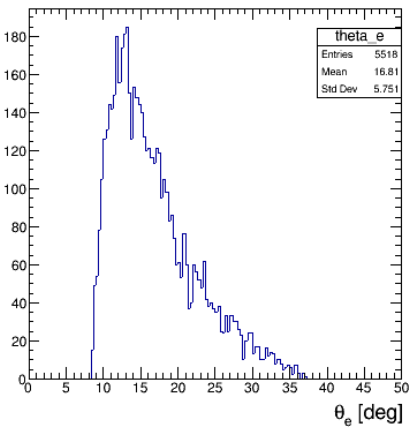


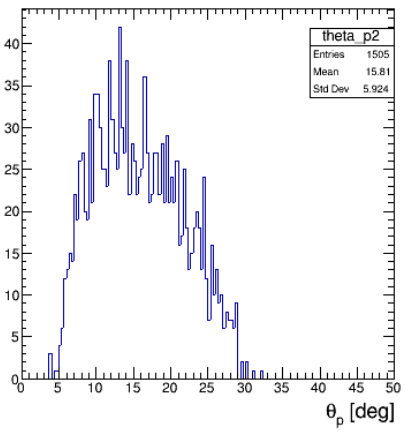


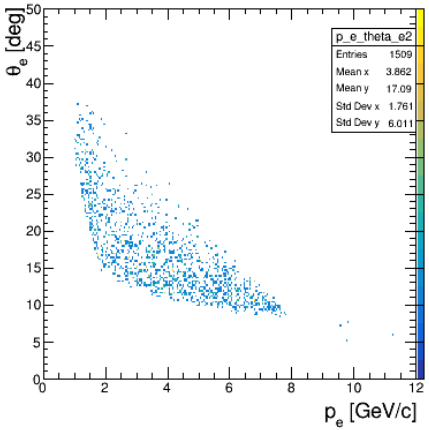


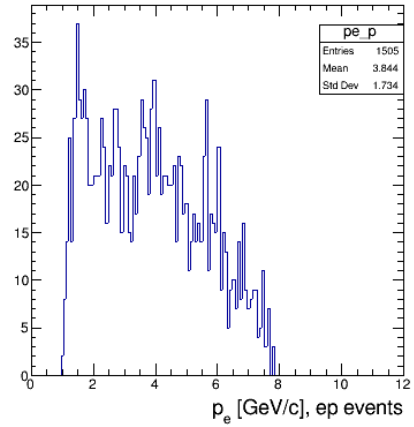
Revised distributions for *ep* events (gmn train, S19)

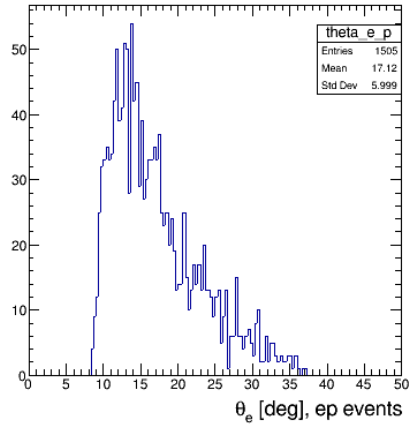


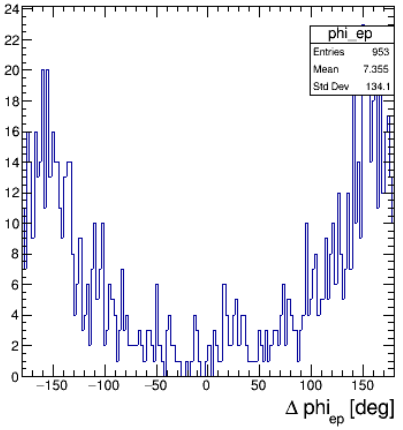


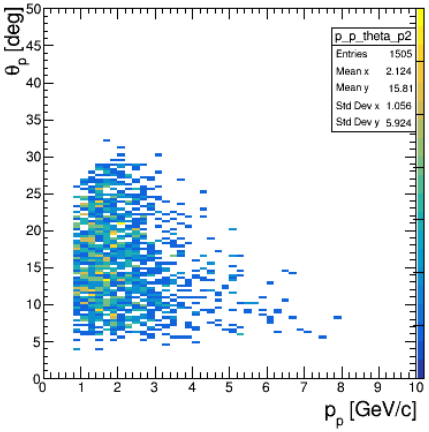




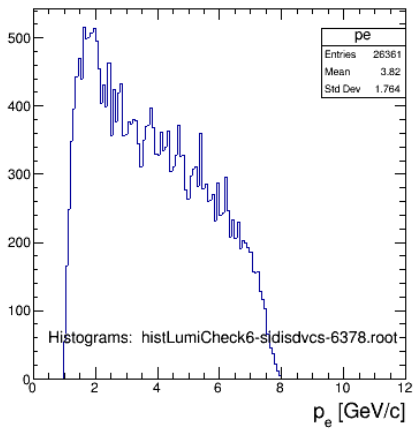


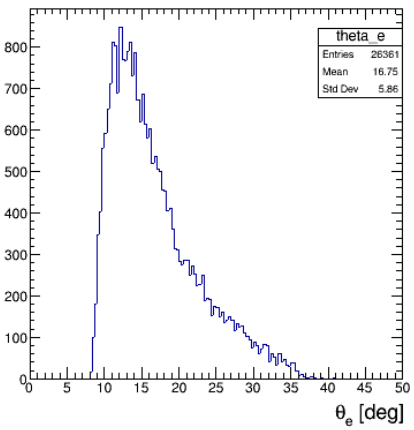


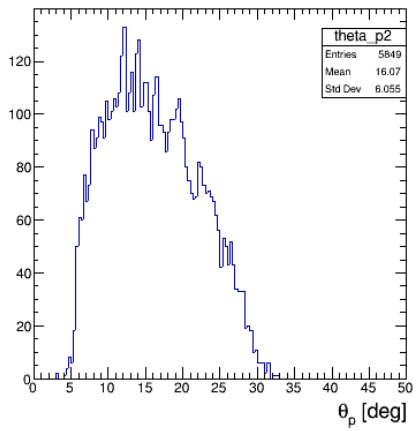


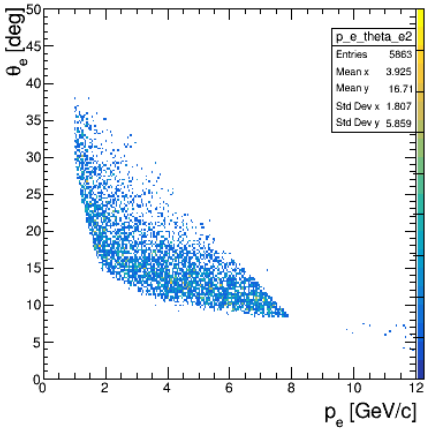


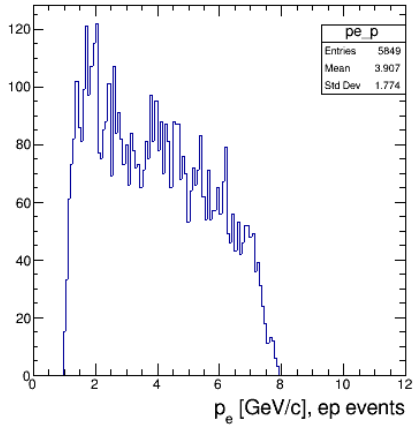
Revised distributions for *ep* events (sidisdvcs trains, S19)

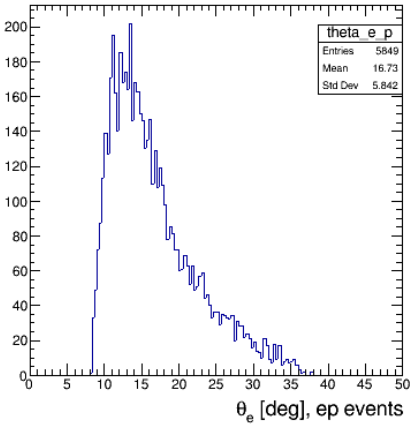


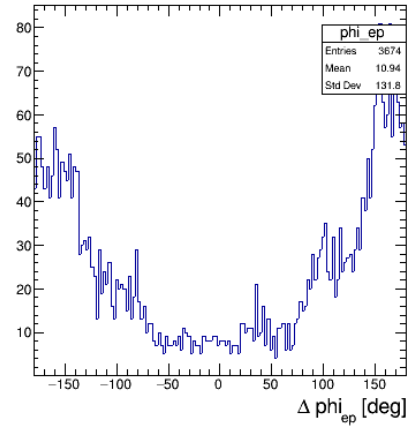


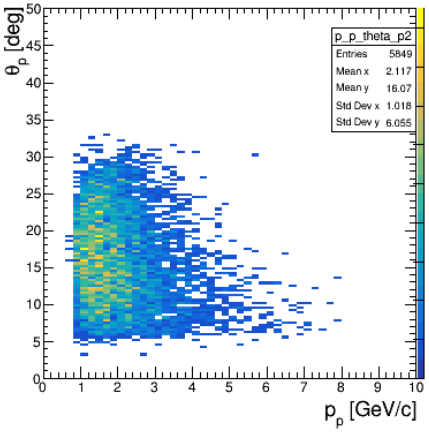






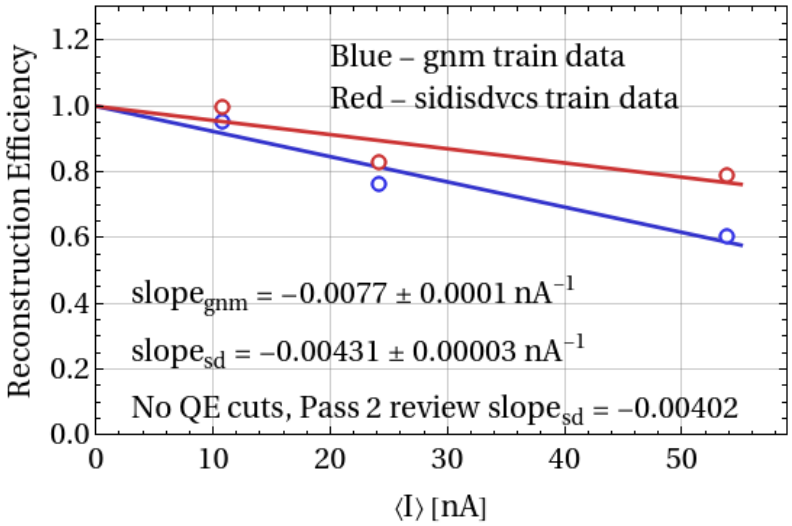




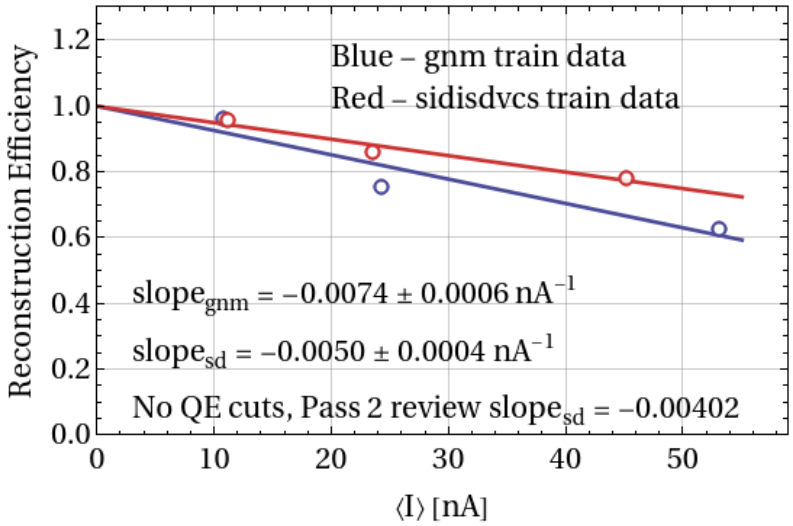


Effect of removing low, electron momentum cut (S19)

With Minimum Momentum Cut

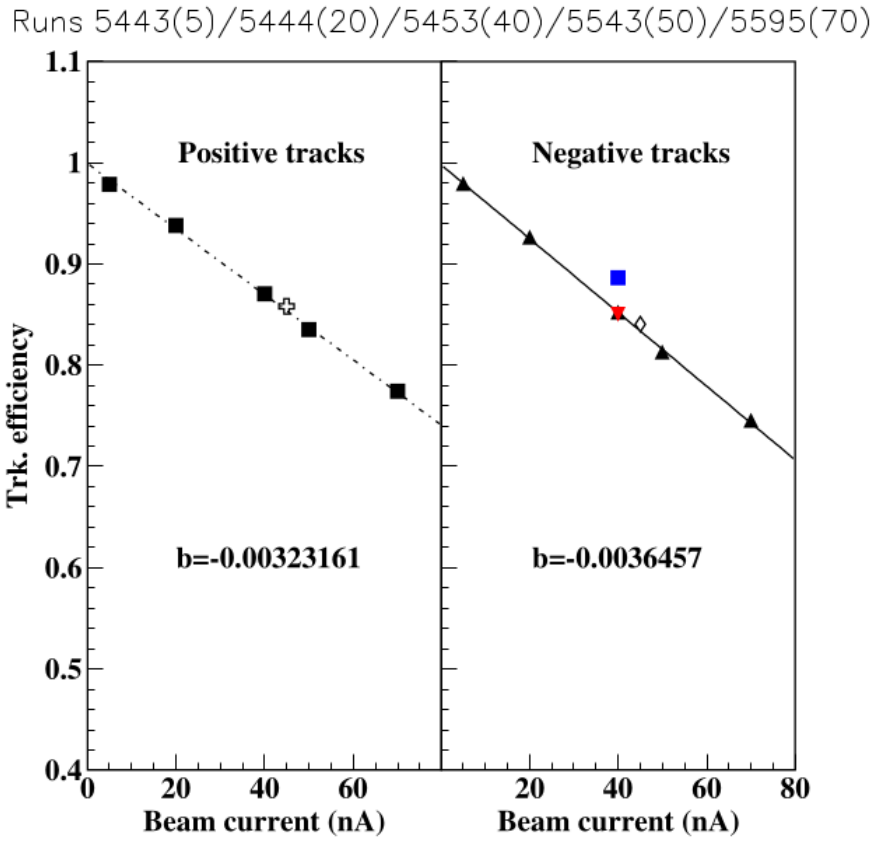


Without Minimum Momentum Cut



Additional Slides

Luminosity dependence of $N_{eh\pm}/N_e$, RG-A Data



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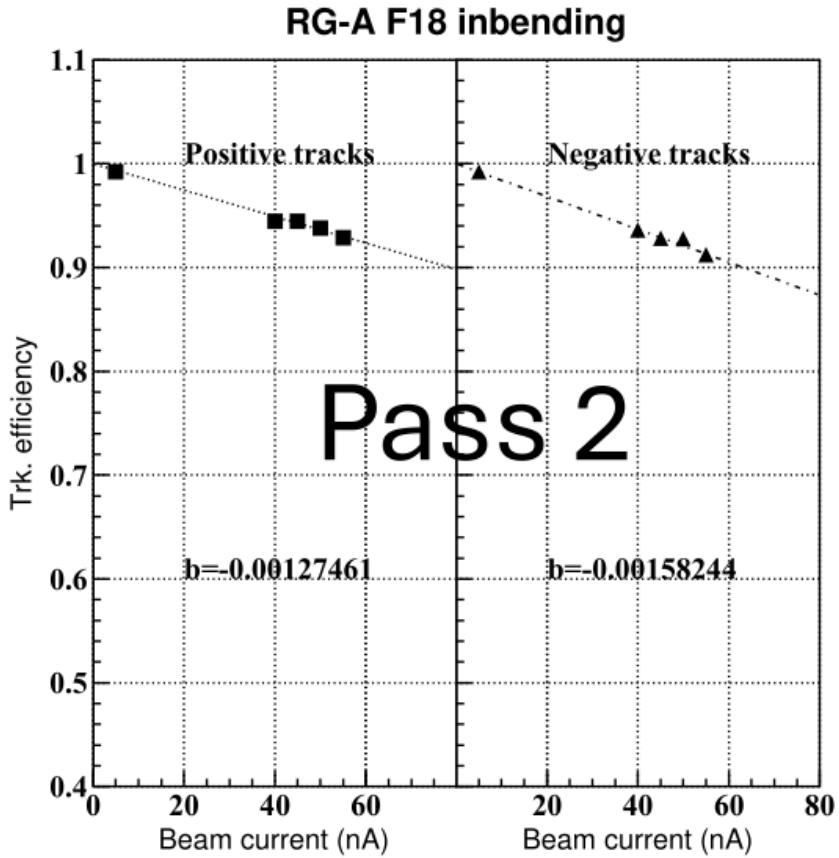
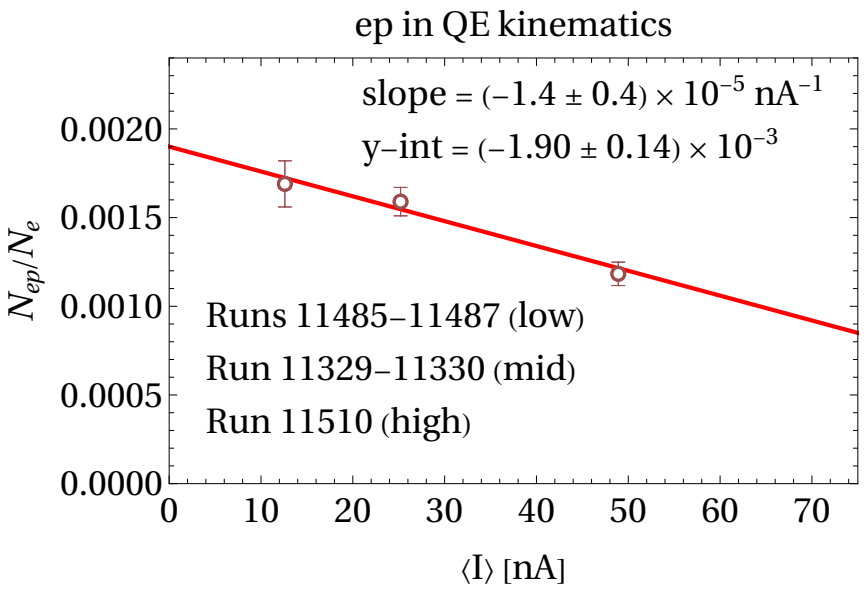
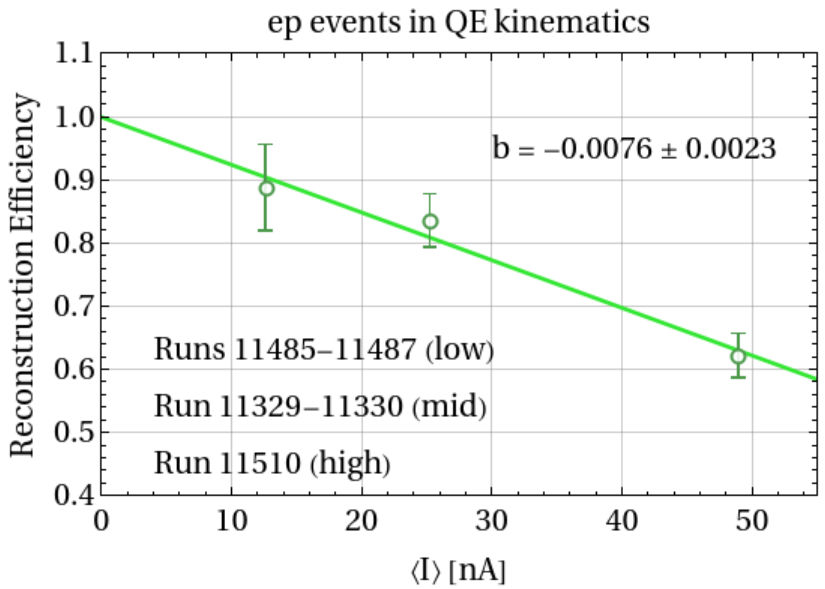


S.Stepanyan, RG-B, 9/7/24

Luminosity dependence of RGB data, QE cuts on (S20) 11

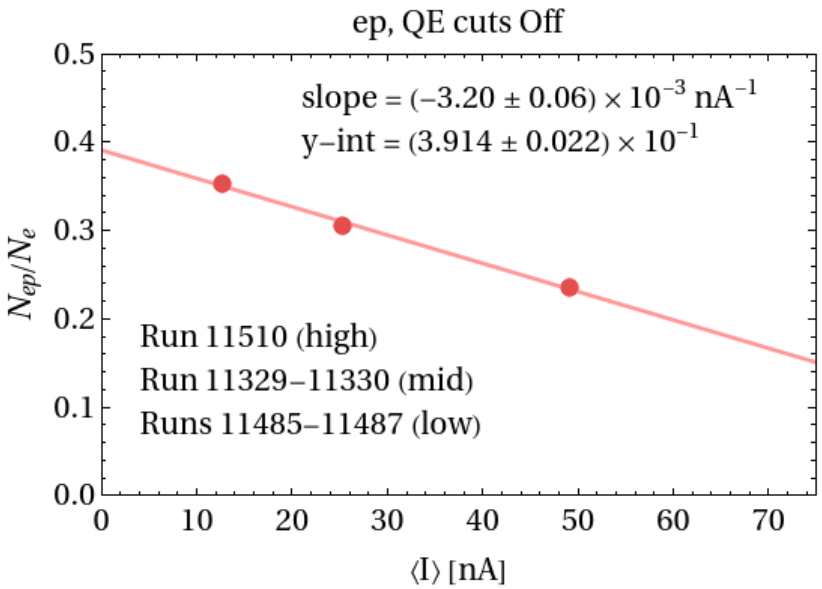
RGB N_{ep}/N_e luminosity dependence with QE cuts on - beam energy calculated from particle angles, θ_{pq}, and $\Delta\phi$.

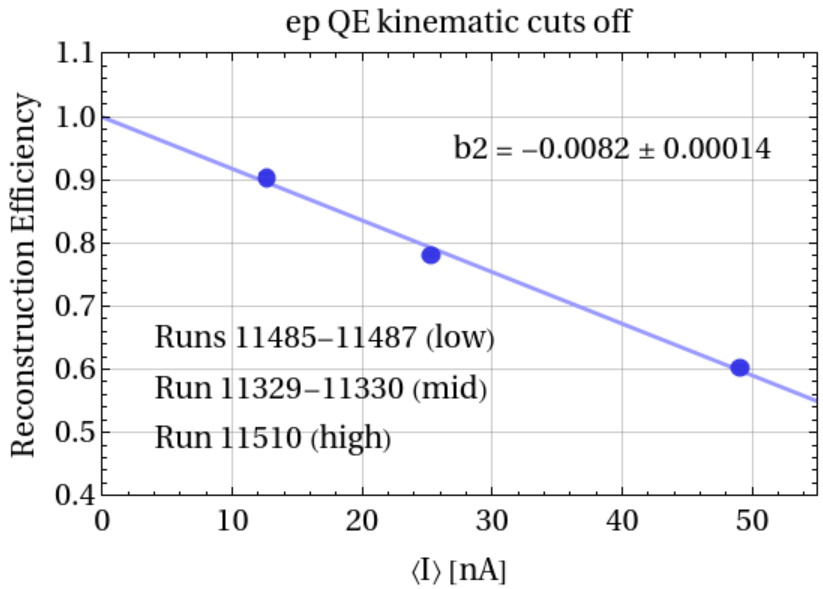




Luminosity dependence of RGB data, QE cuts off (S20) 12

RGB N_{ep}/N_e luminosity dependence with QE cuts off - dropped cuts on beam energy calculated from particle angles, θ_{pq}, and $\Delta\phi$.





Comparison of Tracking Efficiency Slopes 13

	QE cuts on	QE cuts off	$\mathrm{E_{beam}[GeV]}$
Spring, 2020	$-0.0076 \pm 0.0023\ nA^{-1}$	$-0.0082 \pm 0.0001\ nA^{-1}$	10.4
Fall, 2019	$-0.0104 \pm 0.0021\ nA^{-1}$	$-0.0079 \pm 0.0001\ nA^{-1}$	10.4
Spring, 2019	$-0.0075 \pm 0.0018\ nA^{-1}$	$-0.0087 \pm 0.0001\ nA^{-1}$	10.2
Spring, 2019	$-0.0093 \pm 0.0013\ nA^{-1}$	$-0.0082 \pm 0.0001\ nA^{-1}$	10.6

Weighted averages:

For QE cuts on: $\langle b \rangle = 0.0087 \pm 0.0014\ nA^{-1}$

For QE cuts off: $\langle b \rangle = 0.00883 \pm 0.00005\ nA^{-1}$

Extracting average beam currents 14

1. Use NB method to get the current at frequent intervals - Get ungated Faraday cut reading in RUN::config bank which records integrated current since last time the bank was written out.
2. Get the timestamp from Trigger Interface board in RUN::config.
3. Divide by the time since the last recording of RUN::config bank.
4. Require the current exceed a threshold of 1 nA to remove beam trips.

From CLAS12-NOTE 2020-005

1. $p_{\pm} > 0.4\ \mathrm{GeV/c}$
2. $|\chi 2PID| < 5$, $|\chi 2| < 10|$
3. Reject tracks with FTOF Panel 2 - don't see any.
4. Vertex $-15 < v_z < 5\ cm$ in RGA. RGB had $-13 < v_z < 12\ cm$ for inbending.
5. fiducial cuts