

SBN Analysis Workshop: Topic 1 – 2D TPC Simulation and Signal Processing *Workshop Summary*

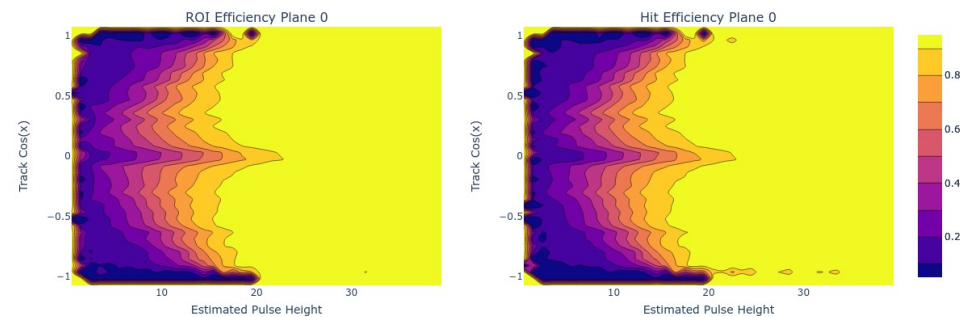
Michael Mooney (Colorado State University),
Hanyu Wei (Louisiana State University)

SBN Analysis Workshop
July 28th, 2023

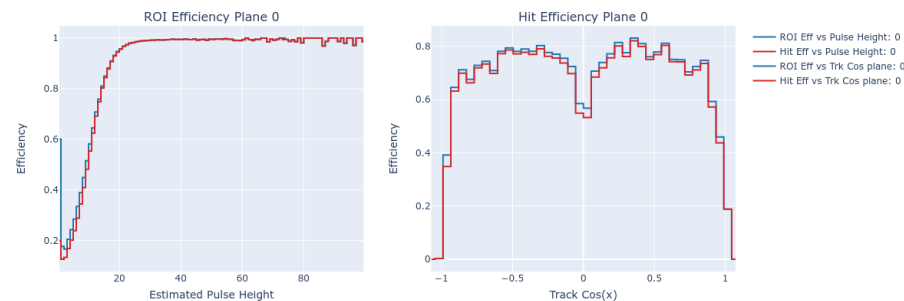
Reminder: Topic 1 Items

- ◆ Update Calibration Ntuple Production Workflows – Mike Mooney
- ◆ Update TPC Wire Geometry - Gustavo Valdivieso, Lane Kashur
- ◆ TPC Field Response Calibration/Tuning - Harry Scott, London Cooper-Troendle
- ◆ Implementation of Spatial Variation in TPC Field Response w/ Wire-Cell - Joseph Zennamo
- ◆ Estimation of ROI-finding and Hit-finding Efficiency - Mike Mooney, Tracy Usher
- ◆ Estimation of Charge Bias/Resolution - Lynn Tung, Ewerton Belchior, Tracy Usher
- ◆ Improvement of ROI Finding for 2D TPC Signal Deconvolution - Moon Jung, Hanyu Wei
- ◆ Tune Hit-finding Thresholds - PROJECT FOR NEW PERSON

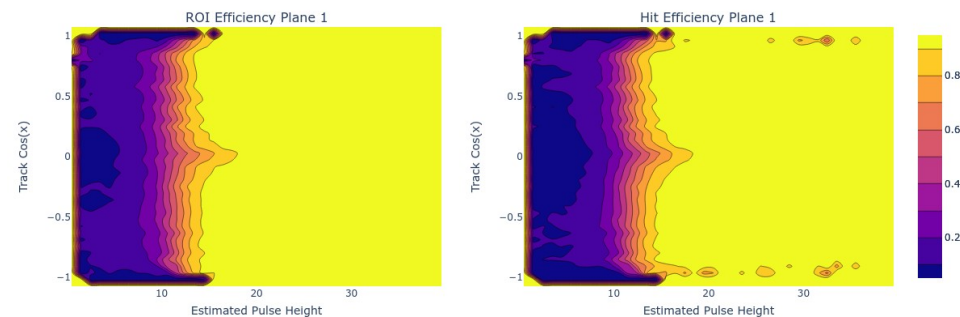
ROI/Hit Finding Efficiency



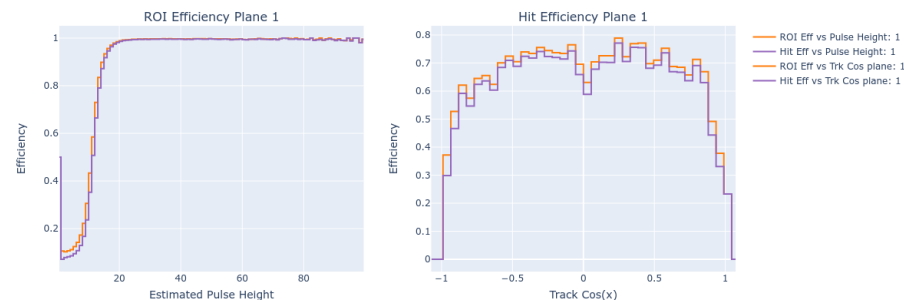
ROI/Hit Finding Efficiency



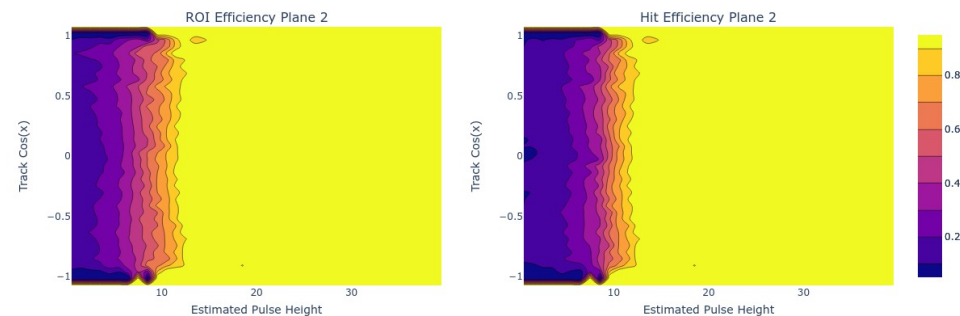
ROI/Hit Finding Efficiency



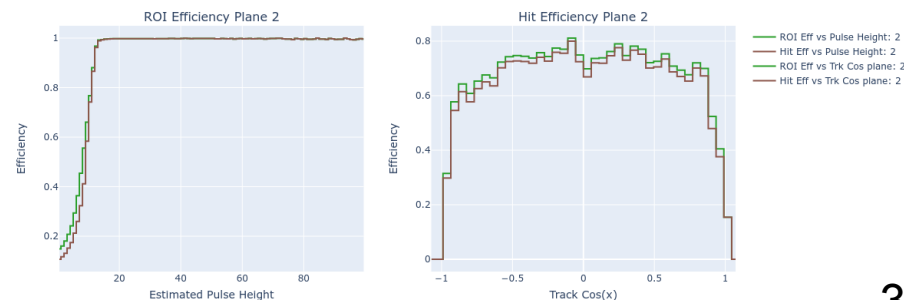
ROI/Hit Finding Efficiency

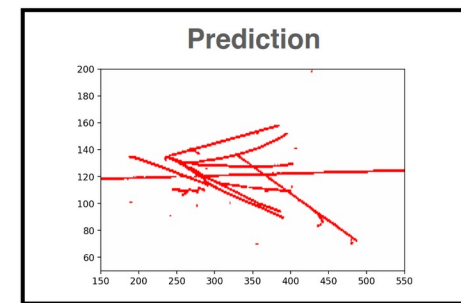
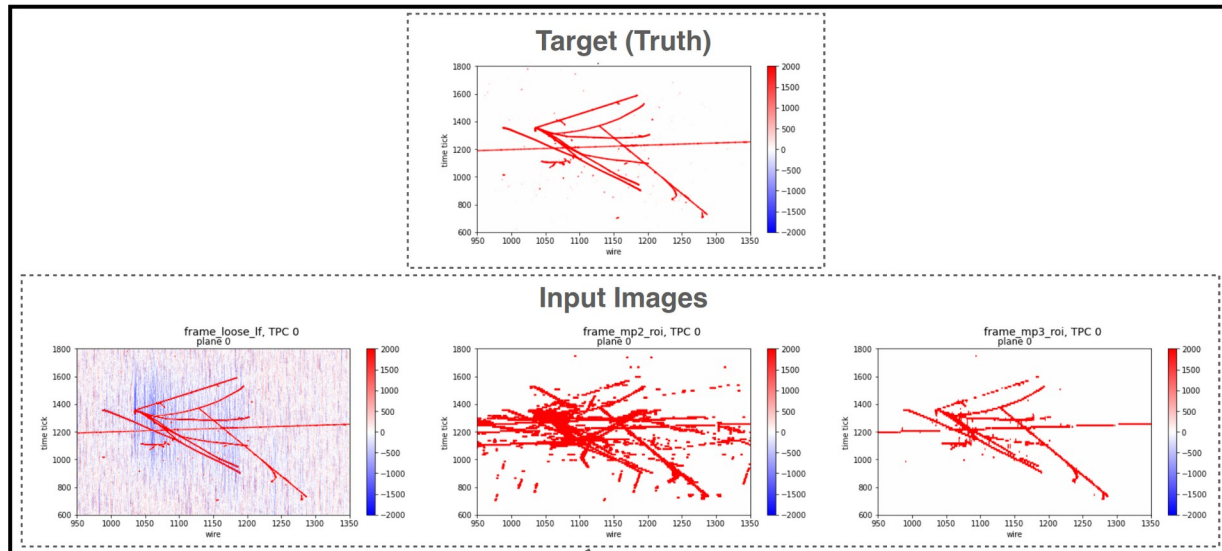


ROI/Hit Finding Efficiency

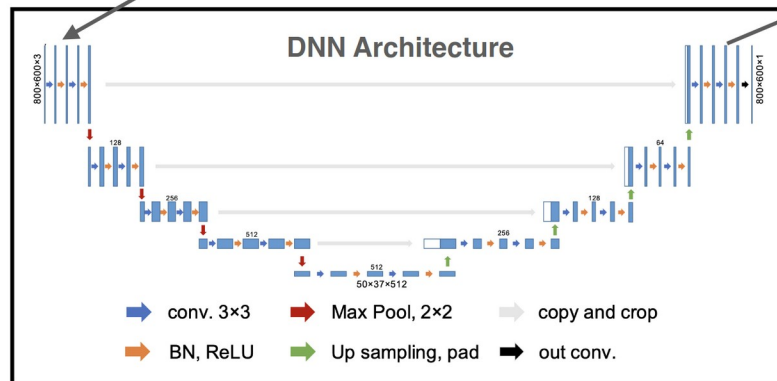


ROI/Hit Finding Efficiency

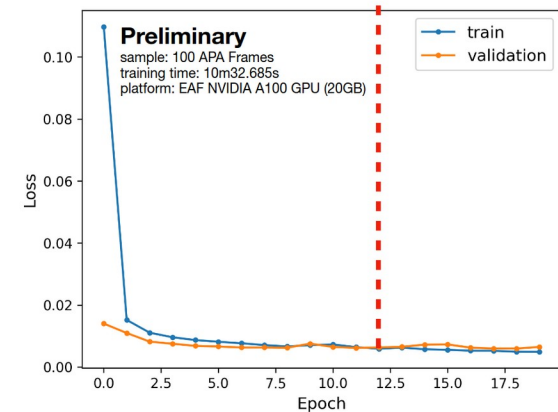


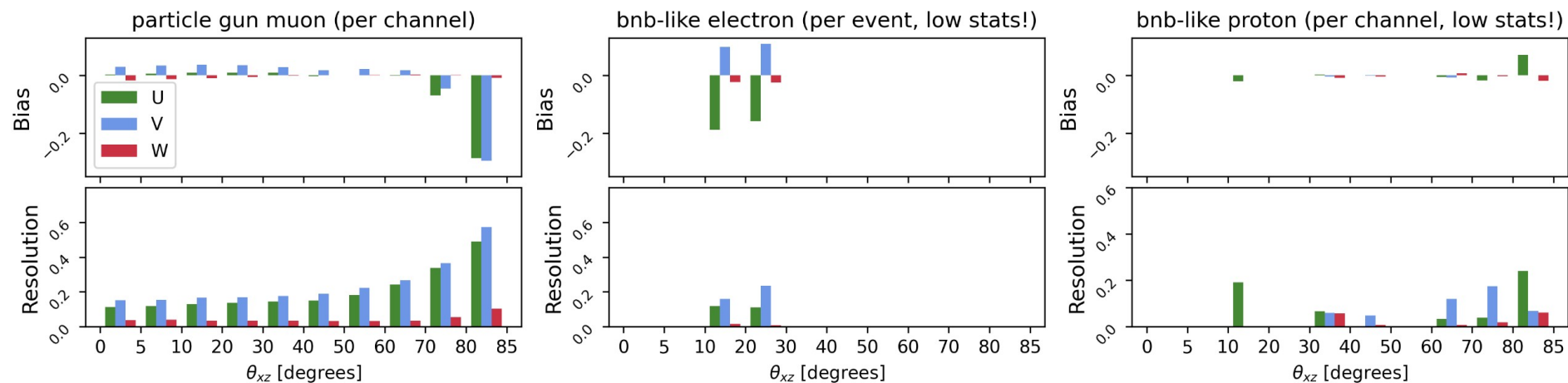


**DNN
ROI**



"Augmented Signal Processing in Liquid Argon Time Projection Chambers with a Deep Neural Network", JINST 16, P01036 (2021)





- ◆ Study of Wire-Cell charge bias/resolution with new proton/electron samples, comparing to previous studies w/ muons
- ◆ Seems like some statistical issues with MC production – 10k events for both samples, but generator-level repetition limiting phase space?
- ◆ Mike M. will fix and produce new MC simulation files

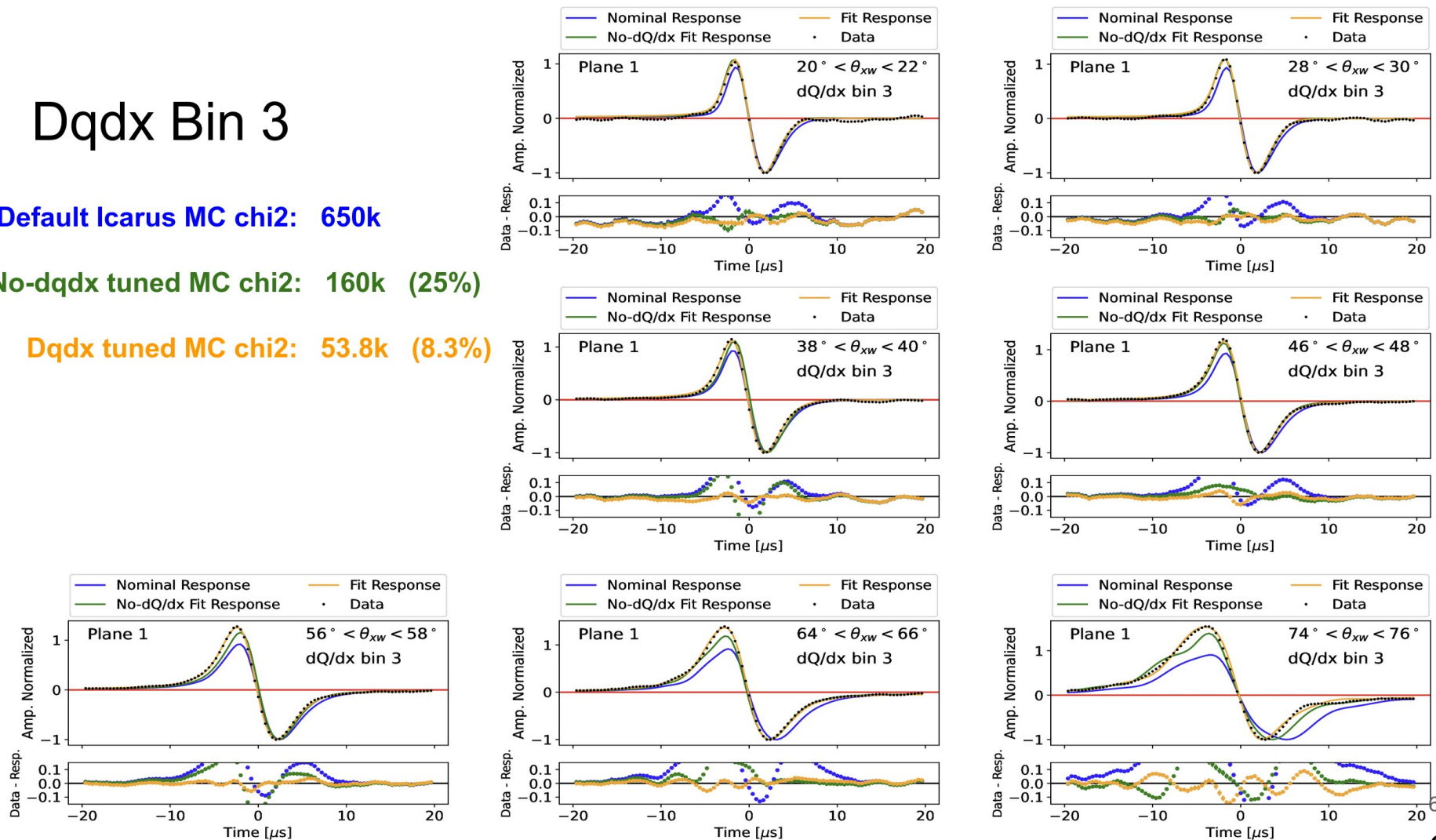
Dqdx Bin 3

Default Icarus MC chi2: 650k

No-dqdx tuned MC chi2: 160k (25%)

Dqdx tuned MC chi2: 53.8k (8.3%)

London Cooper-Troendle



- ◆ “Michel Electron Reco/Calibration Discussion” – Tuesday, 2pm CT
 - Discussion about use of calibration ntuples for Michel electron reconstruction
 - Convenient from data processing perspective; may need more info added to files
- ◆ “Calibration Ntuple Workflow Discussion” – Wednesday, 2pm CT
 - Discuss issues that arose during workshop MC production
 - Conclusion: we need better organization of FHiCL file sets used for specific purposes, and suitable documentation – discuss in SBN AI meeting sometime?
- ◆ “SBND-WireCell Signal Processing Discussion” – Wednesday, 3pm CT
 - Updates on use of single proton/electron samples for evaluation of ROI-finding and charge reconstruction performance
 - Presentation of plans for low-energy (“blip”) reconstruction via WireCell
- ◆ “ICARUS-WireCell Signal Processing Discussion” – Thursday, 2pm CT
 - Discussion of timing offsets associated with 2D signal simulation
 - Discussion of simulation of spatial variations in field response (transparency)