



Status report on
DNNROI sigproc

Hokyeong Nam
Chung-Ang University

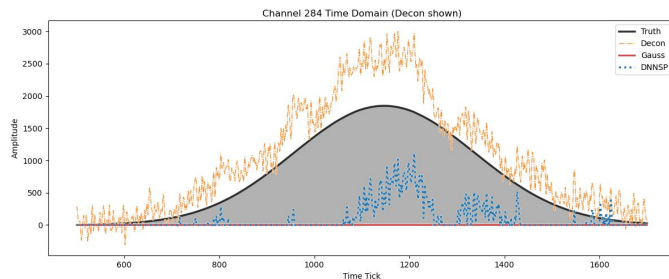
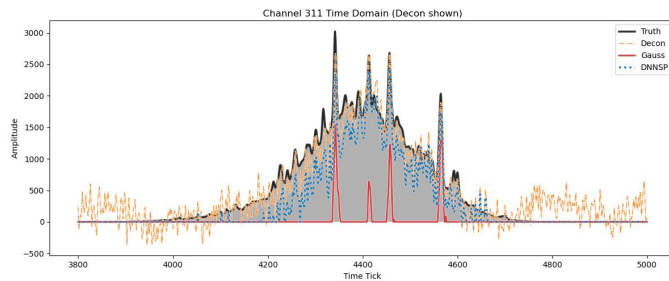
Pull Request Status

- dunereco PR #178: Updated PD-HD imaging jsonnet configuration and added DNN-imaging support - Merged
- dunereco PR #185: Increased max_rms_cut from 30 to 50 for PD-HD configuration - Awaiting
- WCT PR #458: Added TagSelector for selecting traces by tag - Awaiting
- WCT PR #459: Updated PlaneSelector to preserve trace summaries and support summary_tags - Awaiting
- WCT PR #467: Re-enabled RMS-noise-based filtering in PD-HD - Awaiting
- Plan to open a new PR to merge MobileU-Net Torchscript file for PD-HD

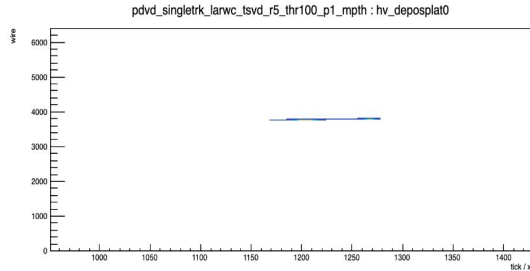
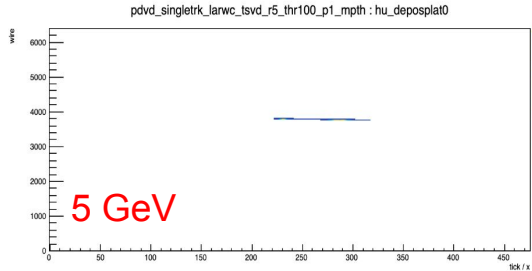
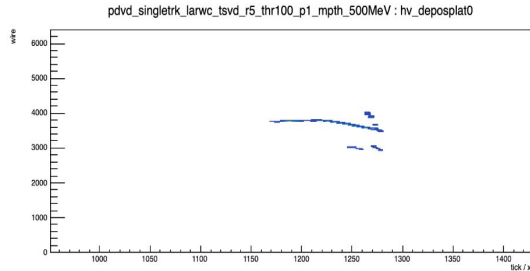
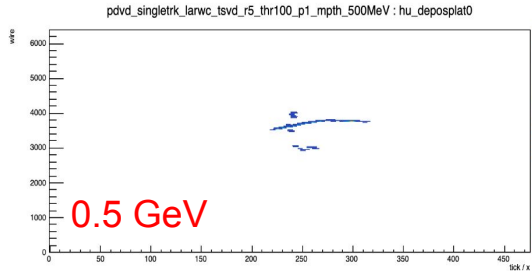
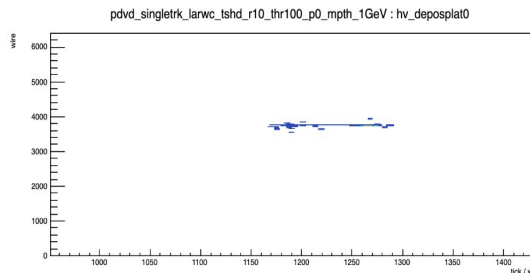
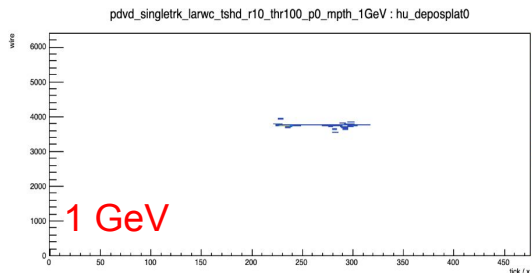
Single Track Simulation Comparison: LArWC vs. WC Standalone

- The single track performance evaluation showed that the WC standalone results were worse
- The 1D waveform comparison showed that WC standalone had a wider distribution in time domain
- The dumped json file was compared, and they were mostly the same
 - Wire: protodunevd-wires-larsoft-v3.json.bz2
 - Field Response: protodunevd_FR_3view_speed1d55.json.bz2
 - Bottom Noise: pdvd-bottom-noise-spectra-v1.json.bz2
 - Top Noise: dunevd-coldbox-elecresp-top-psnorm_400.json.bz2
 - Bottom ElecResponse:

```
{
  "data": {
    "filename": "",
    "gain": 1.2496976598600002e-12,
    "nticks": 6646,
    "postgain": 1.1365000000000001,
    "shaping": 2200,
    "tick": 500
  },
  "name": "elecresp0",
  "type": "ColdElecResponse"
},
```



Adjust track length within LArWC Simulation

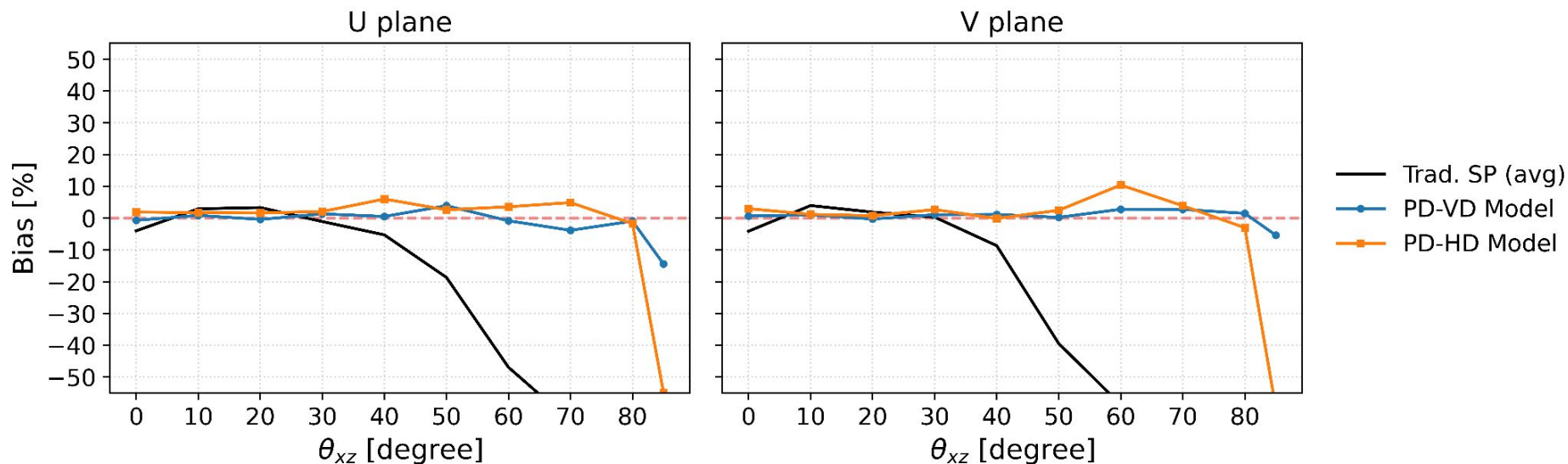


- For a fair comparison, the muon track generated by LArWC should be longer
- Increasing or lowering the energy does not seem to change the track length
- The dumped fcl file confirmed that the specific energy setting was applied

Single Track Performance Eval.

- LArWC Simulation with a 1 GeV muon
- Comparison of the PD-HD and PD-VD models

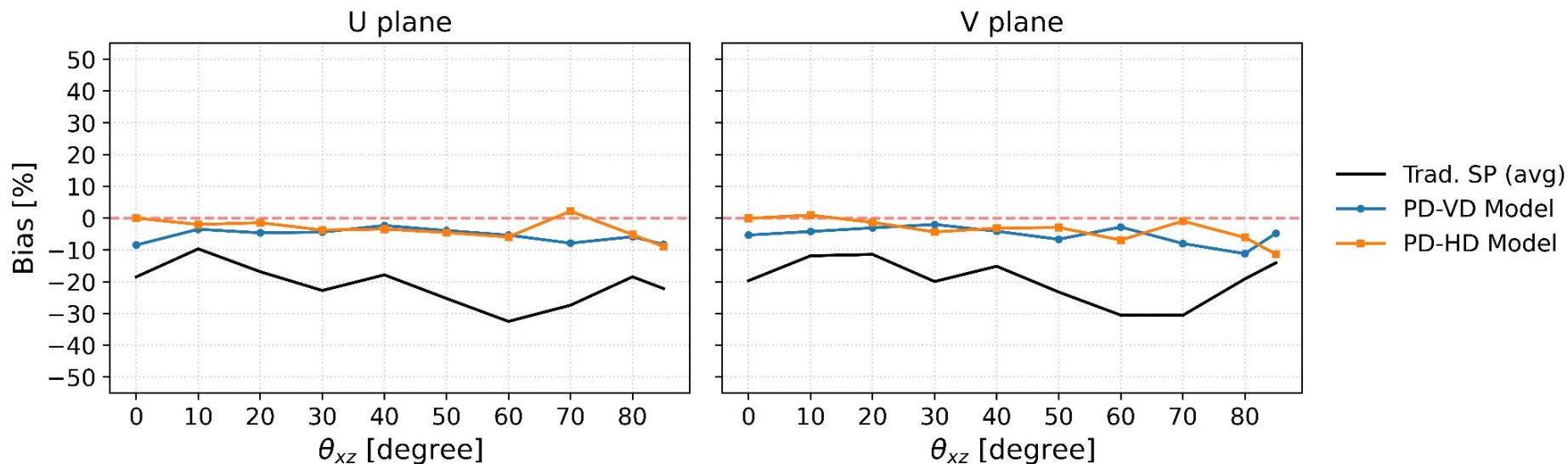
Bias vs θ_{xz} | n500 | Trad. SP (avg) vs DNN SP



Single Shower Performance Eval.

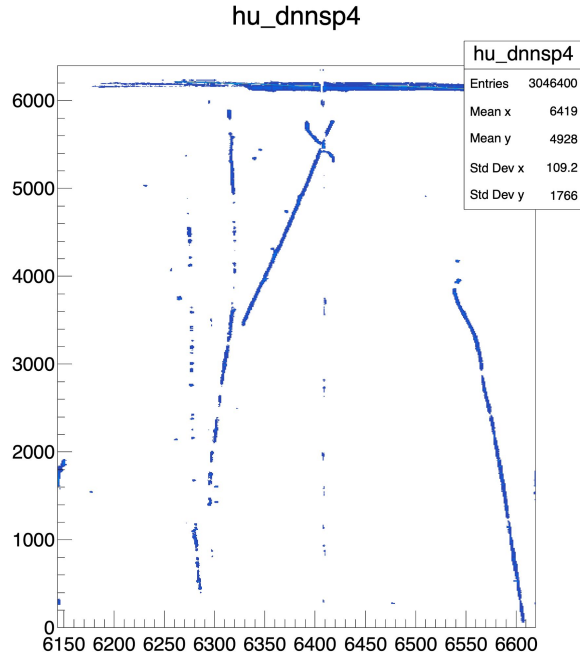
- LArWC Simulation with a 1 GeV electron
- Comparison of the PD-HD and PD-VD models

Bias vs θ_{xz} | 1GeV | Trad. SP (avg) vs DNN SP

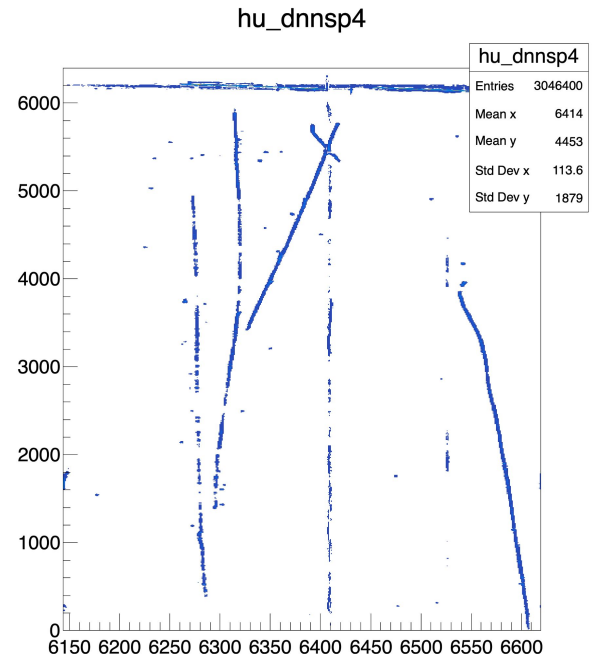


Retraining Results

- New PD-VD sample w/ change mp_th are generated
- Retrained the MobileU-Net V3 model, (rebin:5, truth_th: 100, padding: 1)
- In terms of noise level, retrained model is better, but previous model showed better charge reconstruction



Retrained PD-VD model

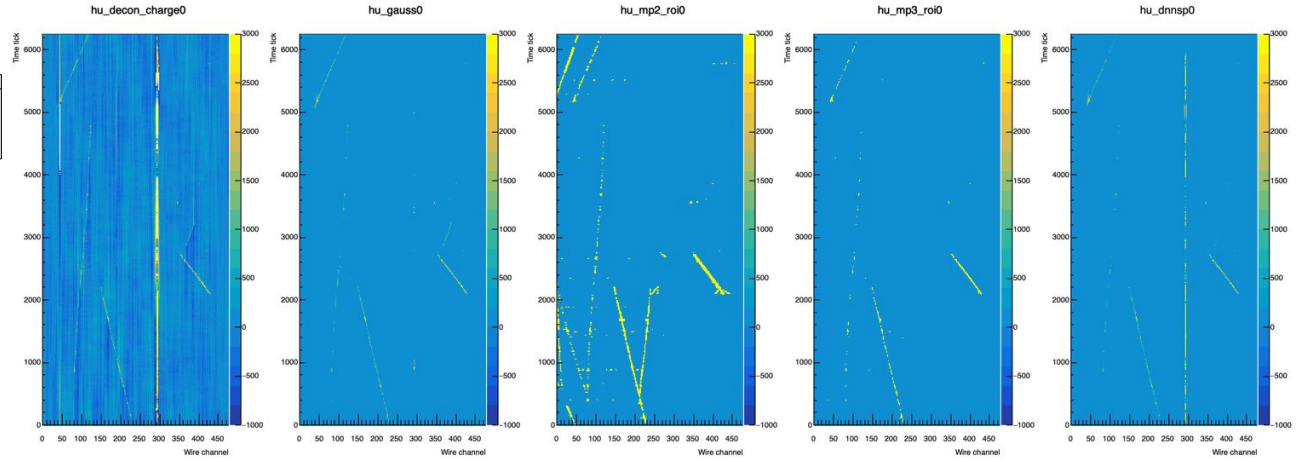
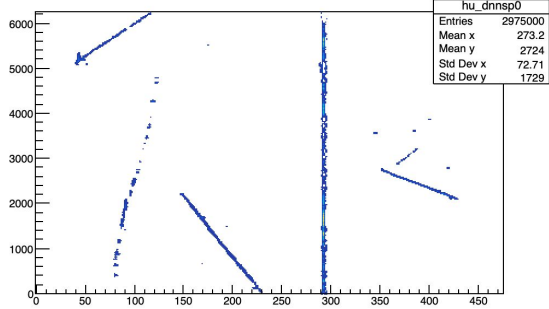


Existing PD-VD model

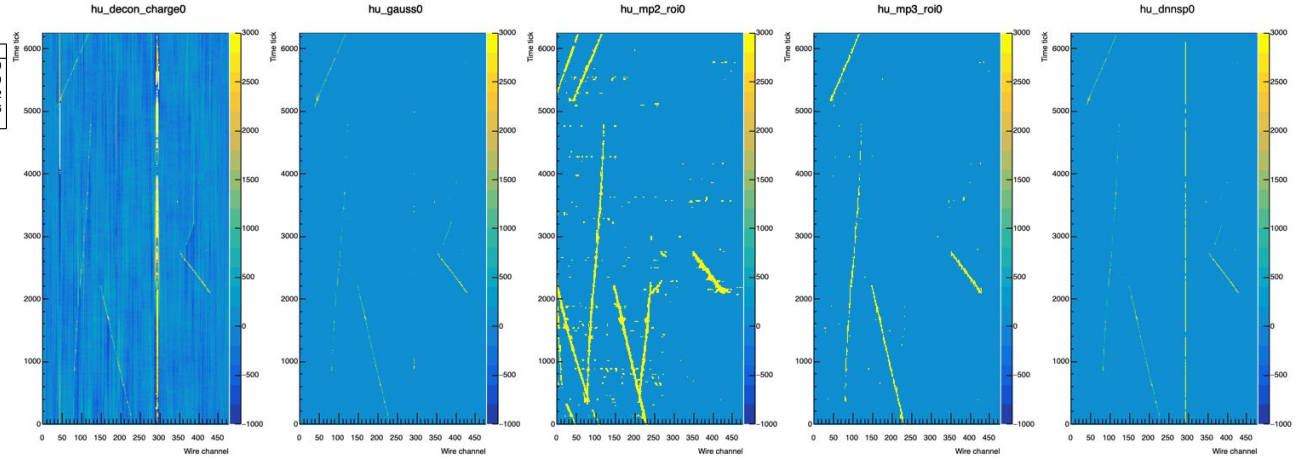
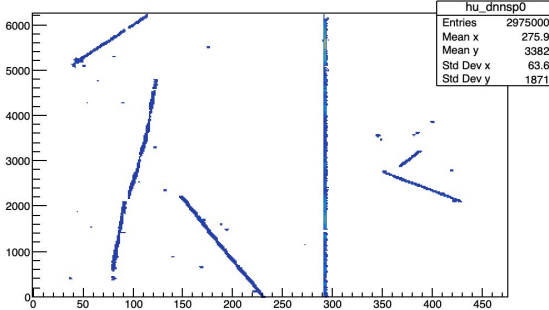
Back Up

MP Threshold Study

hu_dnns0

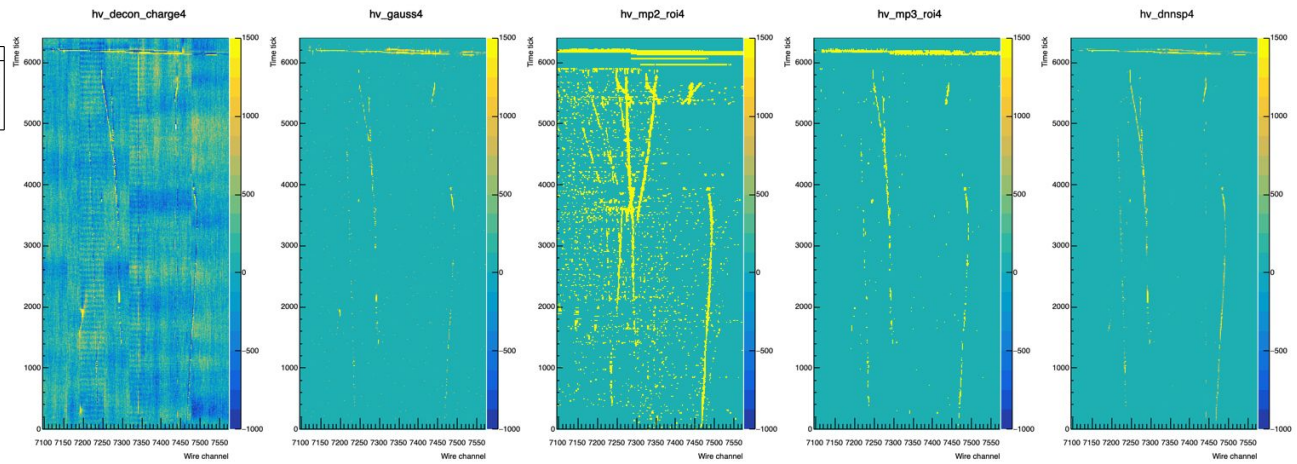
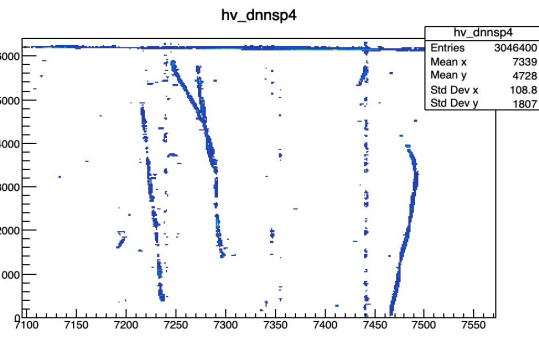
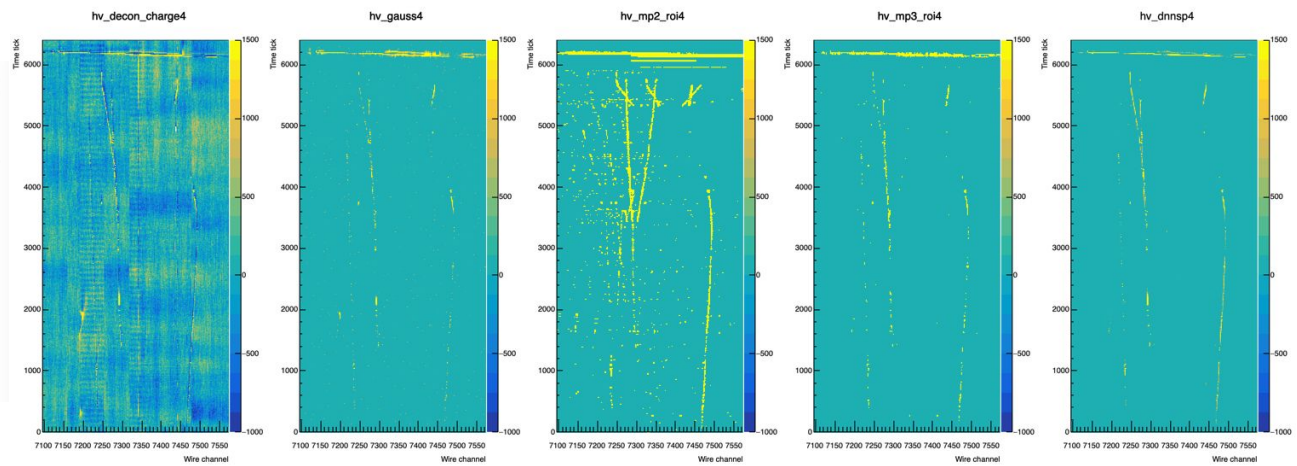
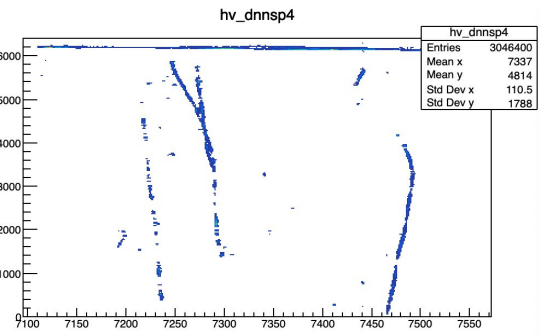


hu_dnns0



- Applied to real data

MP Threshold Study

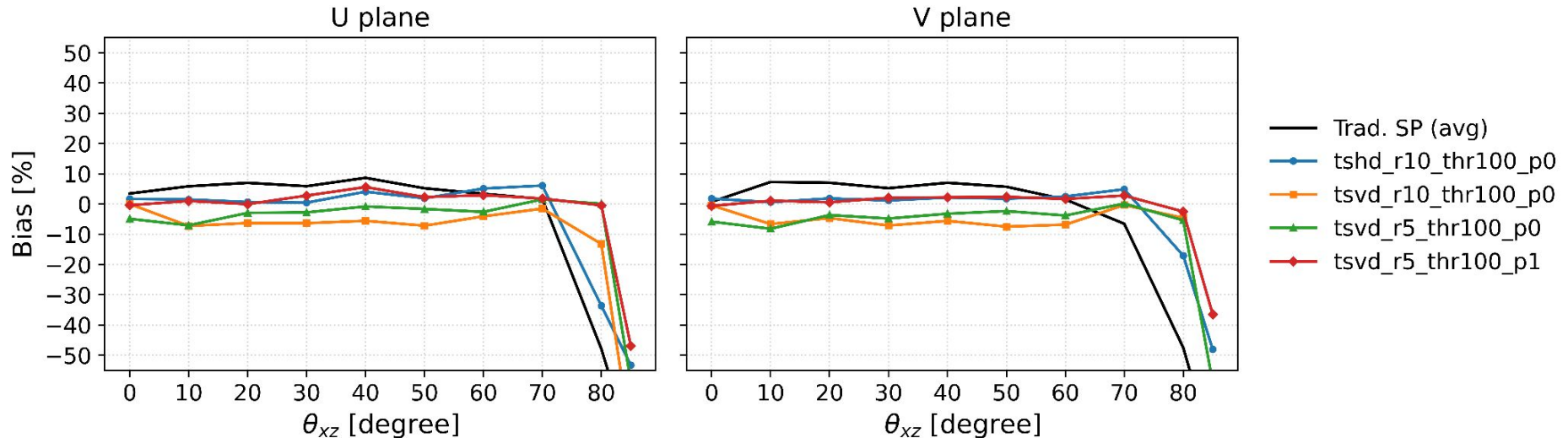


● Applied to real data

MP Threshold Study

- The values are changed to: mp_th1 = 200, mp_th2 = 100
- Performance evaluation is done for single track generated by WCT standalone simulation
- Until the XZ angle of 80, DNN ROI performance was good as PD-HD case we've seen
- For the angle higher than 80, the performance is lower than PD-HD case
- Among the model [rebin5, truth threshold = 100, padding abled] showed best performance

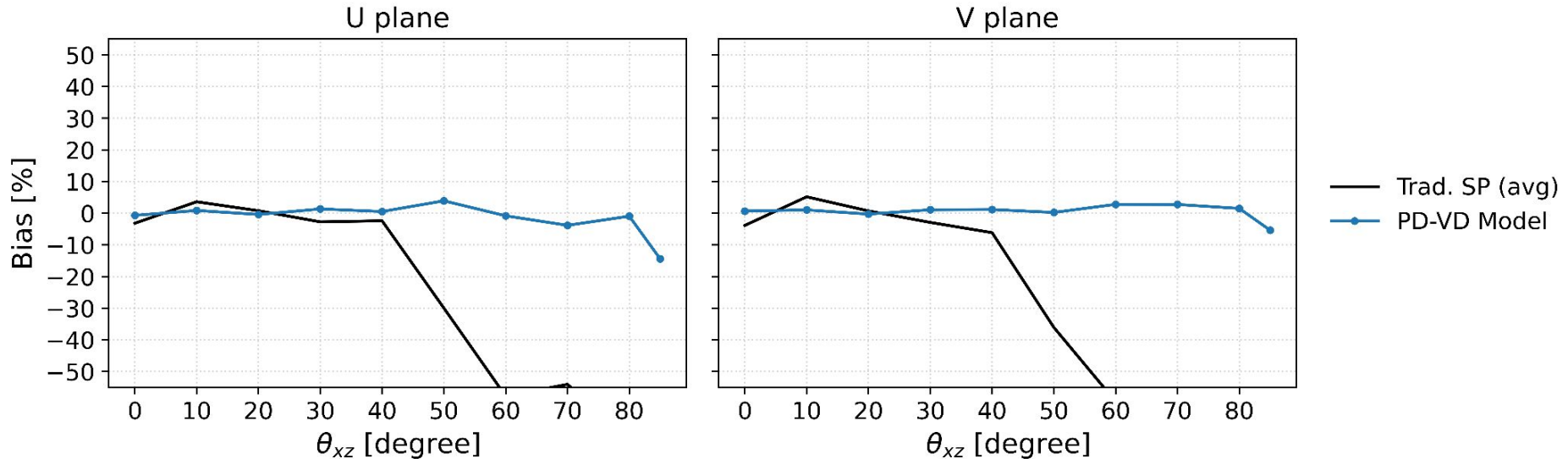
Bias vs θ_{xz} | n500 | Trad. SP (avg) vs DNN SP



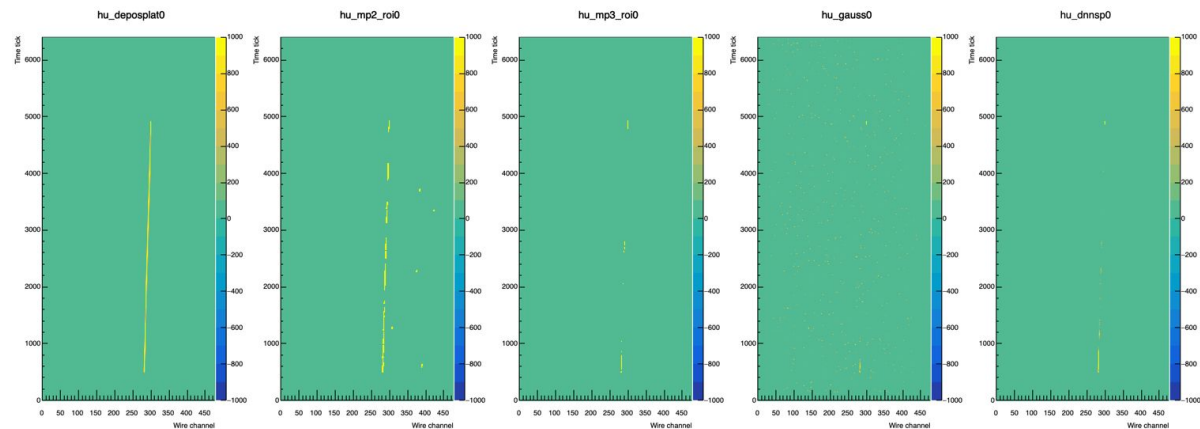
MP Threshold Study

- This time, single muon track sample generated by LArWC is used for performance evaluation
- Performance is significantly better then using the WCT standalone sim sample

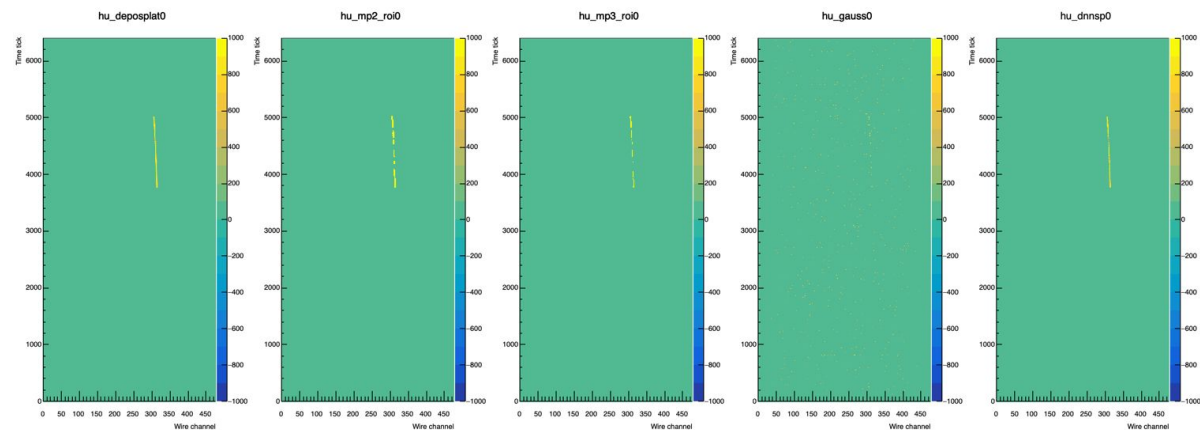
Bias vs θ_{xz} | n500 | Trad. SP (avg) vs DNN SP



MP Threshold Study

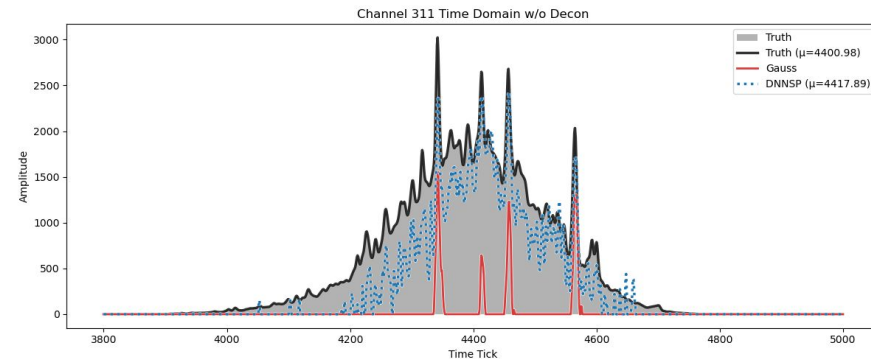
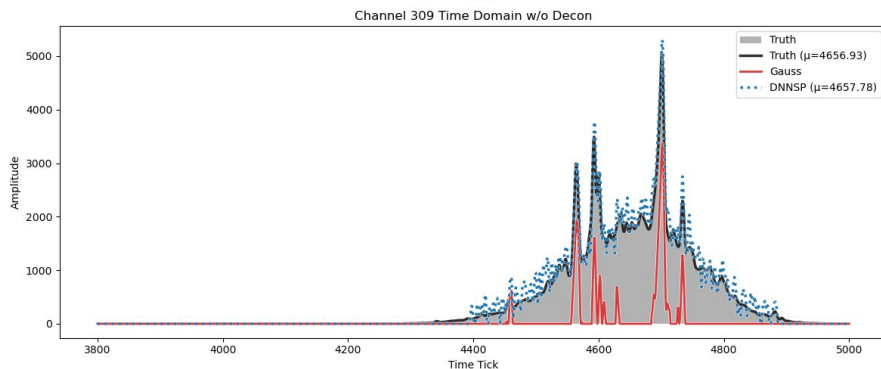
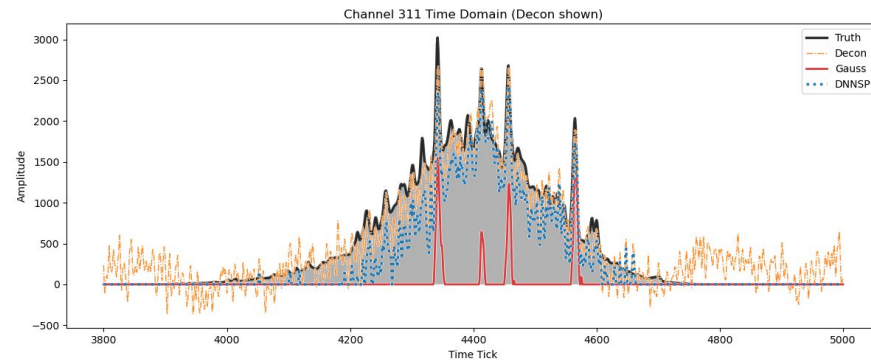
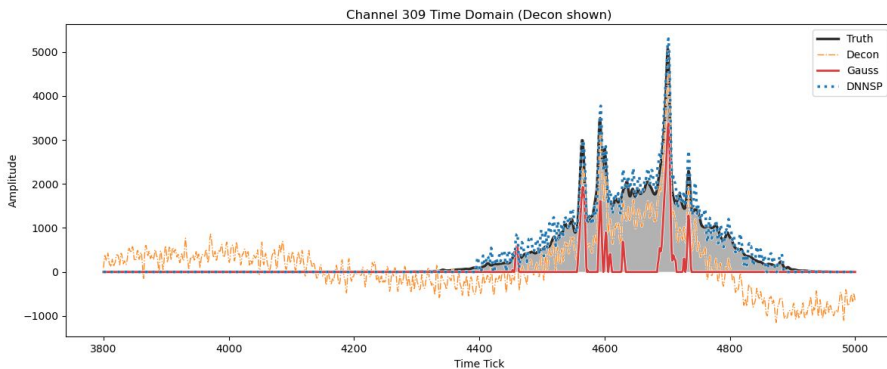


- Comparison:
 - WCT Standalone (top)
 - LArWC (bottom)



MP Threshold Study

- 1D waveform from LArWC (angle of 85): good case (left) vs. bad case (right)



MP Threshold Study

- 1D waveform from WCT standalone (angle of 85)

