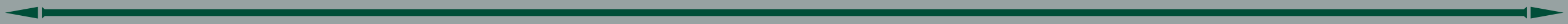




LUKE PICKERING
DUNEPRISM WEEKLY
2017-10-30



DUNEPRISM EVENT RATES UPDATE

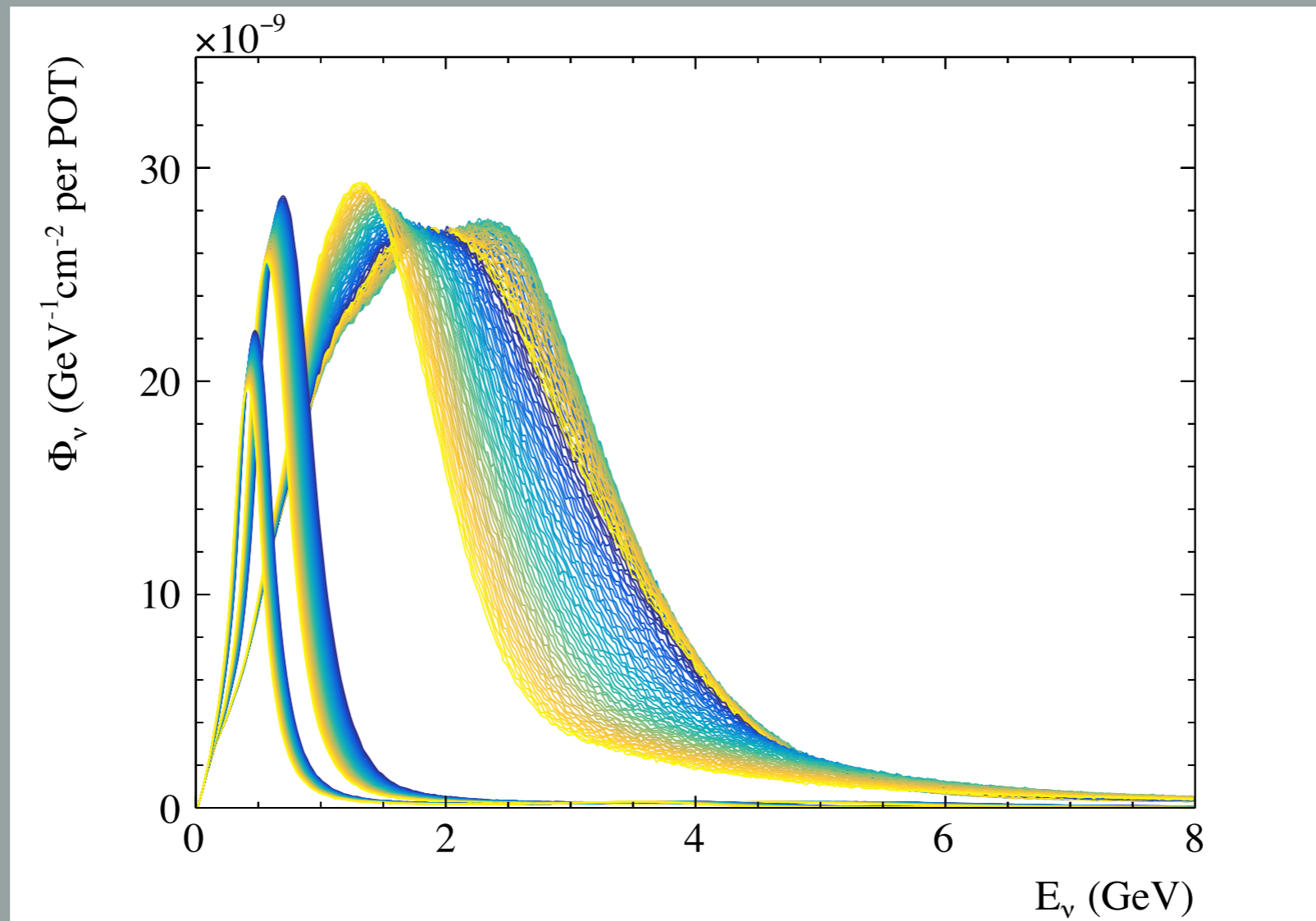
CODE UPDATES

- ▶ Added XML Run plans to my DUNEPrismTools:
- ▶ Define detector stops and measurement slices:

```
<DUNEPrism>
  <RunPlan>
    <Detector MeasurementRegionWidth_m="0.5" DetectorFiducialWidth_m="5"
    DetectorFiducialHeight_m="3.5" DetectorFiducialDepth_m="4"
    FiducialVolumeDensity_kgm3="1396" />
    <Stops>
      <Stop LateralOffset_m="0" POTExposure="5E19"/>
      <Stop LateralOffset_m="2.5" POTExposure="2.5E19"/>
      <Stop LateralOffset_m="5" POTExposure="1E19"/>
      <Stop LateralOffset_m="7.5" POTExposure="1E19"/>
      <Stop LateralOffset_m="10" POTExposure="1E19"/>
      <Stop LateralOffset_m="12.5" POTExposure="1E19"/>
      <Stop LateralOffset_m="15" POTExposure="1E19"/>
      <Stop LateralOffset_m="17.5" POTExposure="1E19"/>
      <Stop LateralOffset_m="20" POTExposure="1E19"/>
      <Stop LateralOffset_m="22.5" POTExposure="1E19"/>
      <Stop LateralOffset_m="25" POTExposure="1E19"/>
      <Stop LateralOffset_m="27.5" POTExposure="1E19"/>
      <Stop LateralOffset_m="30" POTExposure="1E19"/>
    </Stops>
  </RunPlan>
</DUNEPrism>
```

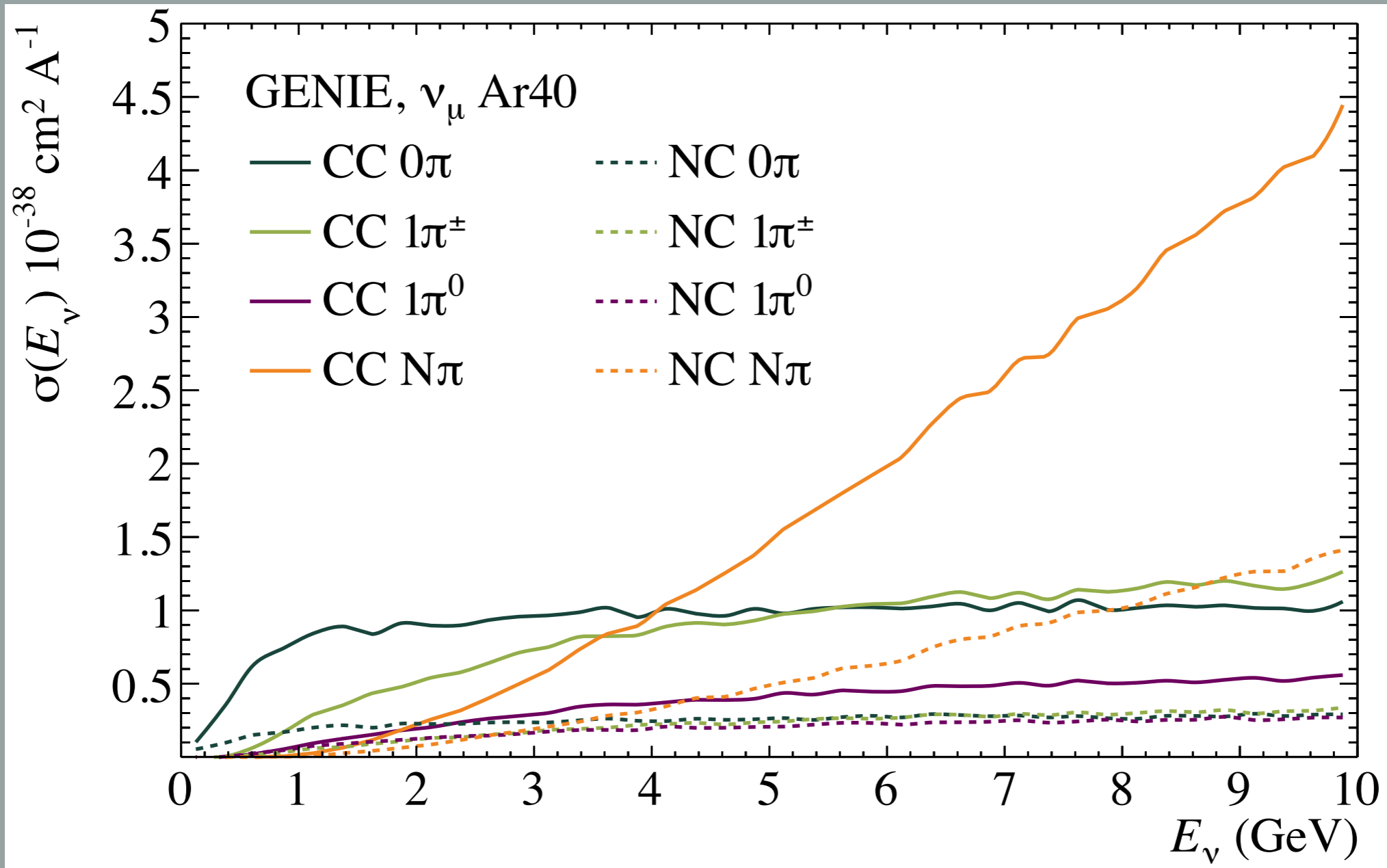
- ▶ Calculates the plane-averaged flux for each slice at each stop.
- ▶ Can use these fluxes to perform linear combination fits.
- ▶ Can be supplied XSecs, detector definition, and stop POT exposure to determine realistic event rate predictions and associated statistical uncertainties.

FLUXES



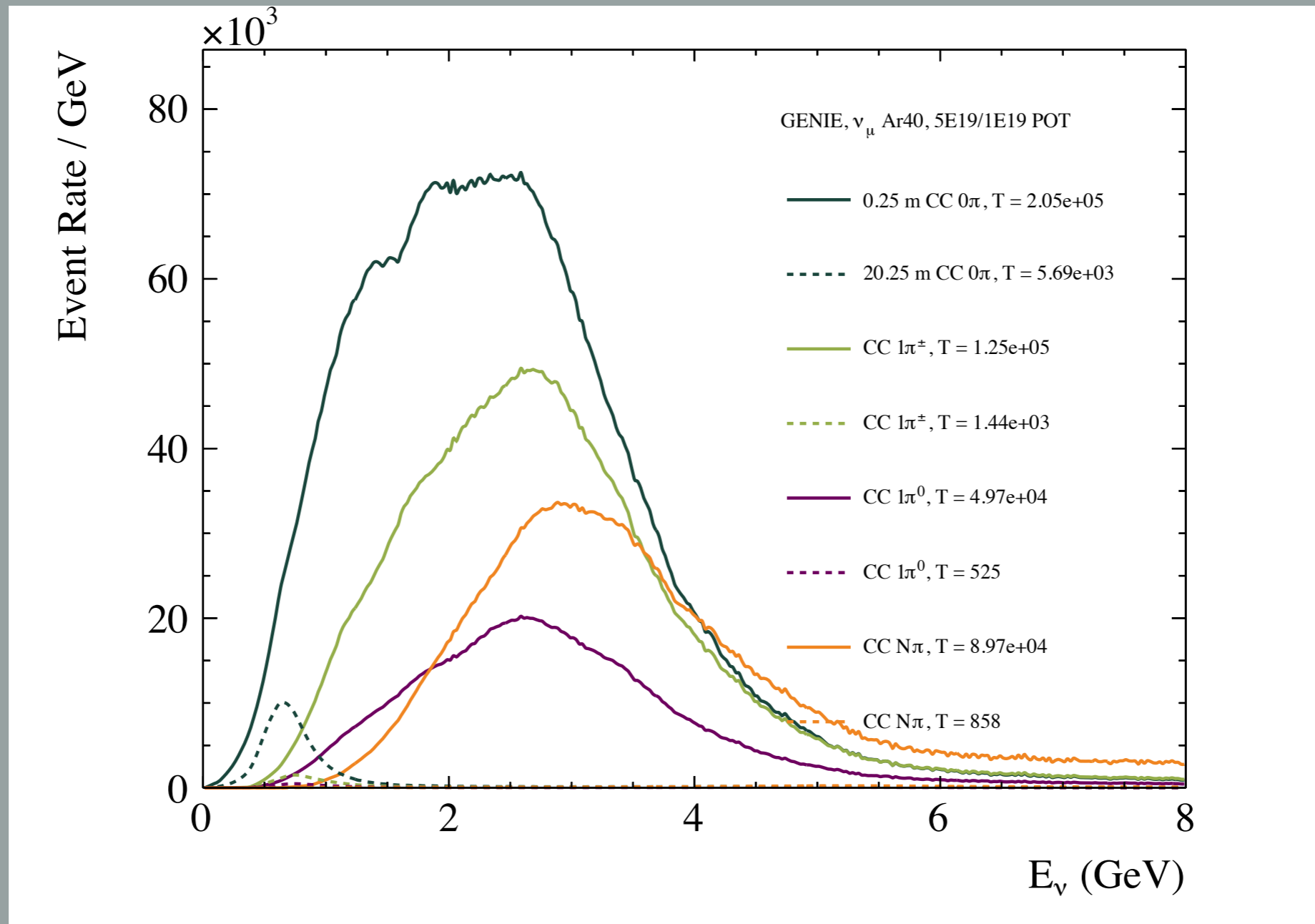
- ▶ Fluxes for 50x 10cm slices at 4 stops, on axis, 2.5m 20m and 30m displacement.
 - ▶ Neutrino's fired randomly and uniformly through measurement plane
- ▶ Rise in normalisation looks odd, checked code against Laura's, and predictions sent to Mike, seem to match up, will quintuple check again.

GENIE XSECS



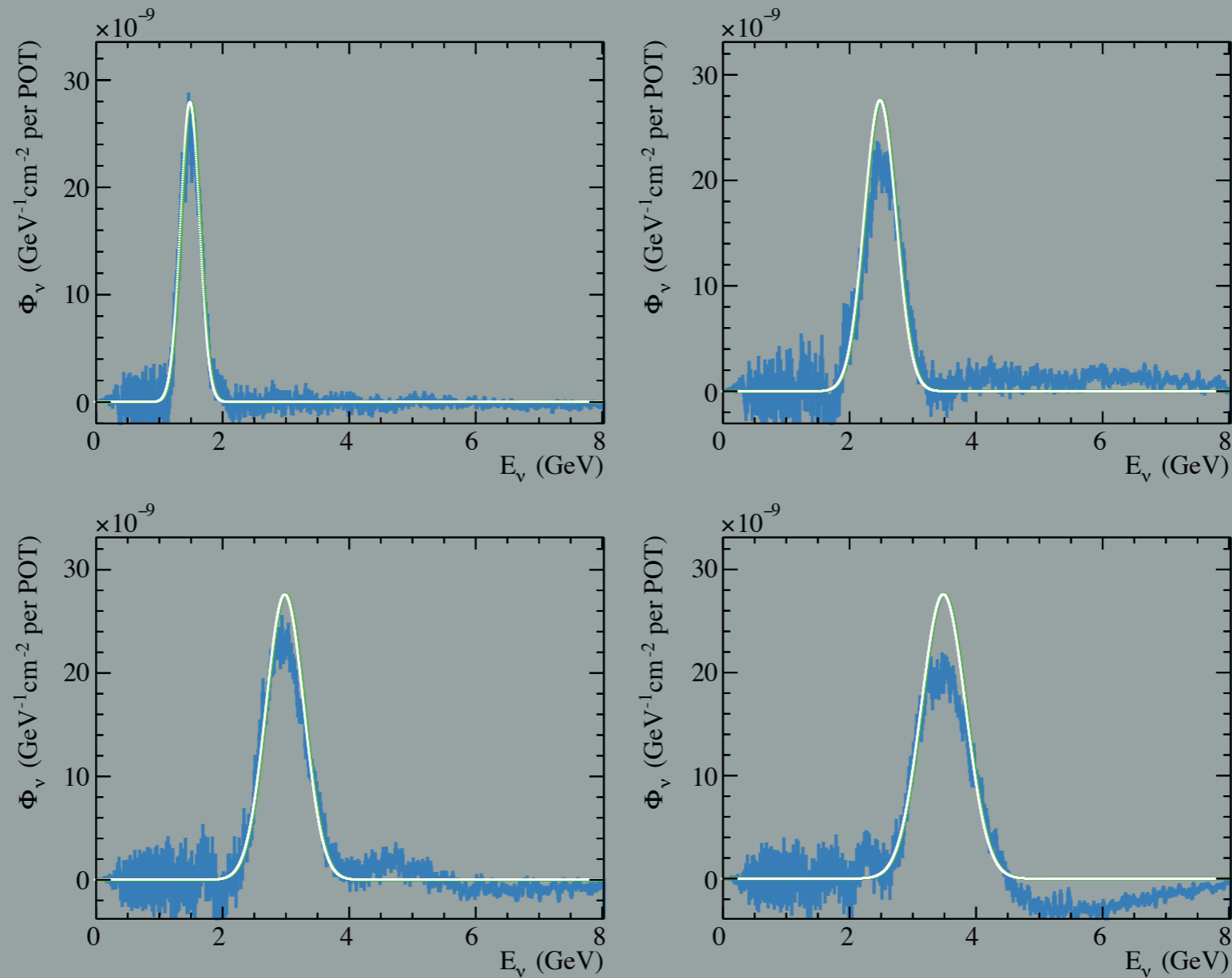
- ▶ Throw (GENIE) events, sort into true FS topologies, calculate $\sigma(E_\nu)$.
- ▶ Will throw 10 times these stats to smooth out curves.
- ▶ Have nu-e elastic, but didn't have time to include before meeting... will update.

PREDICTED EVENT RATES



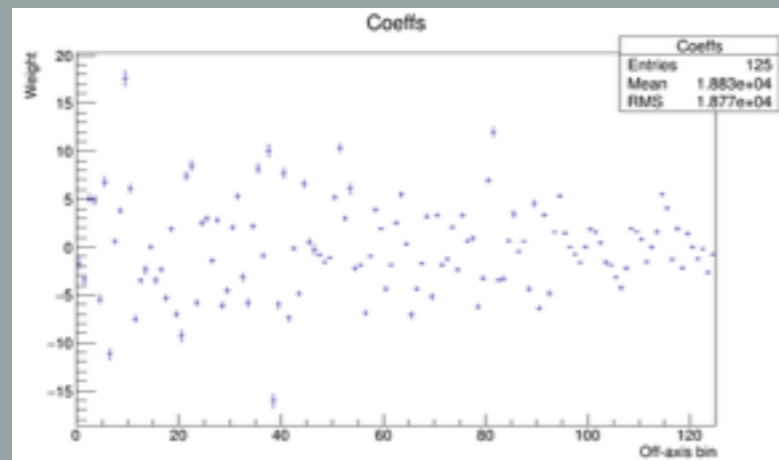
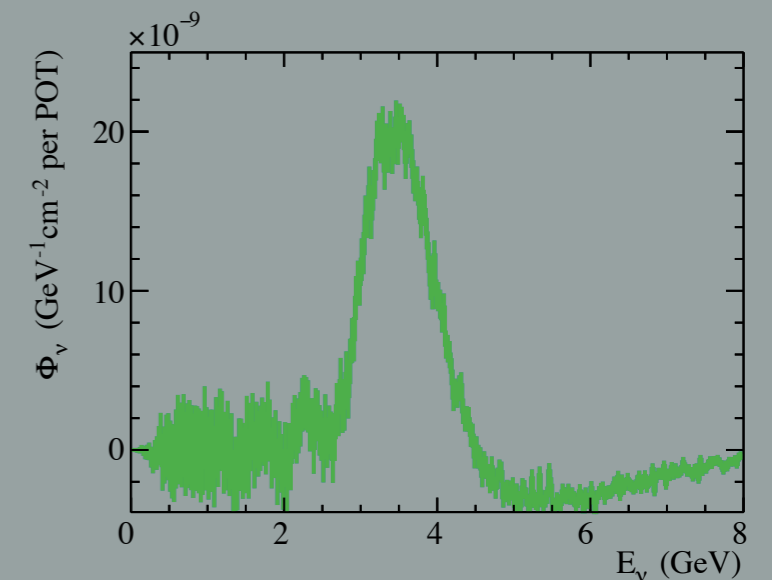
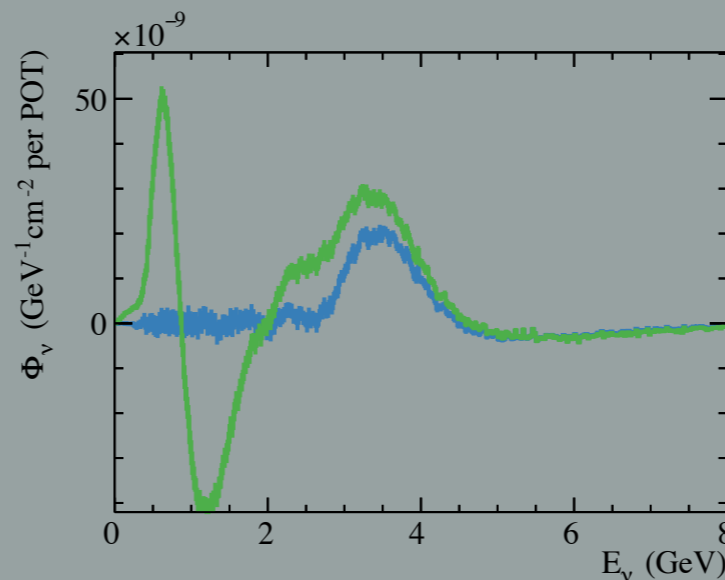
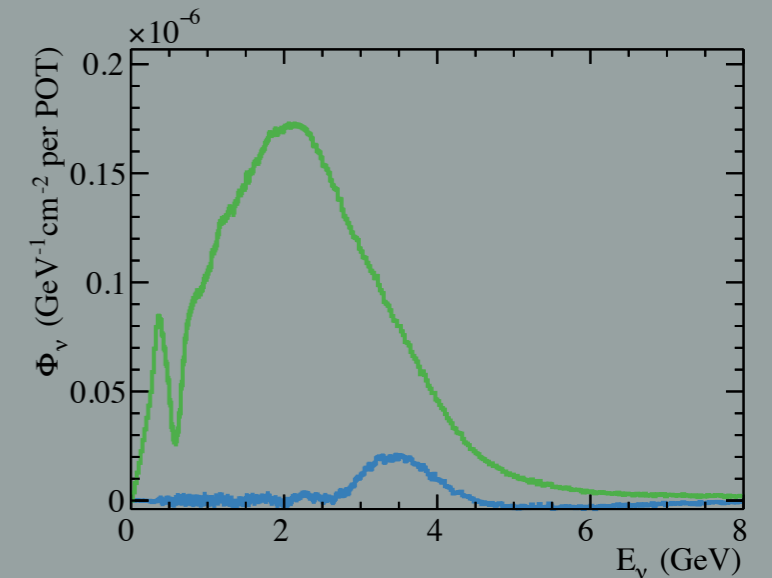
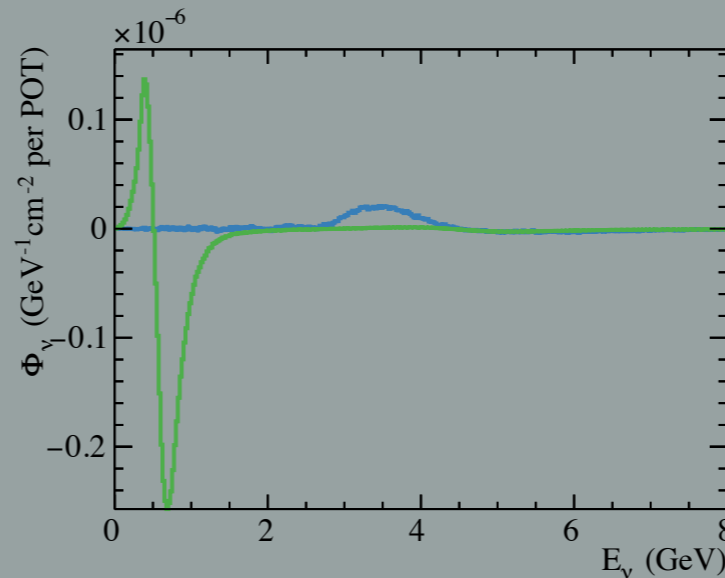
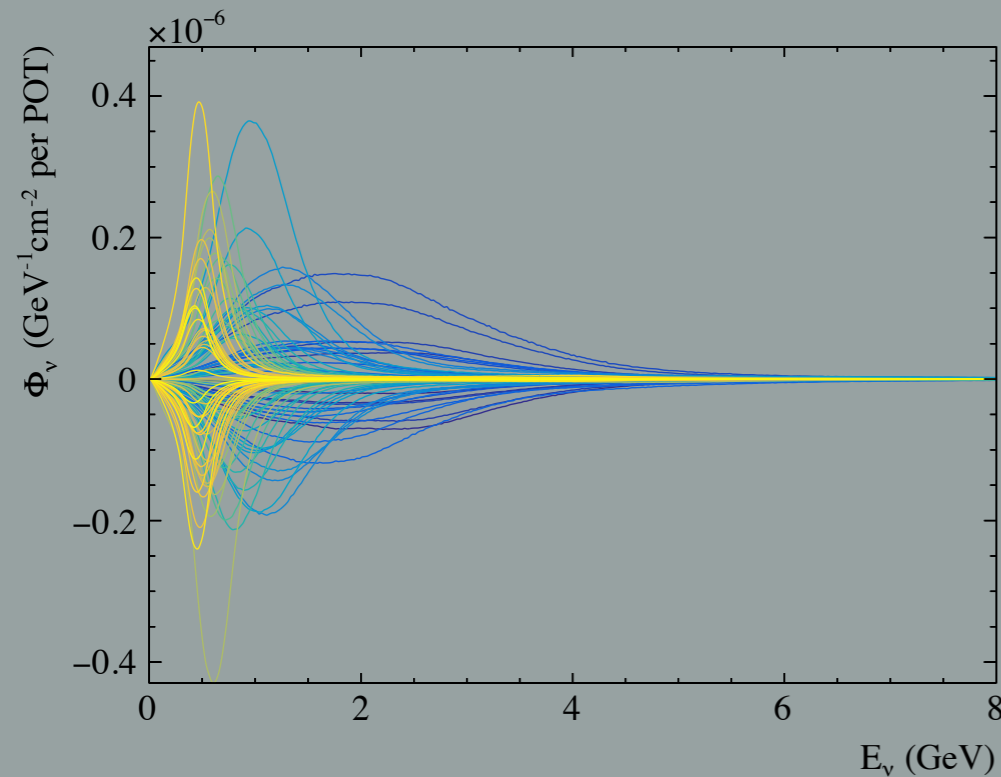
- ▶ One multiplied by the other...
- ▶ Reference POT is $1E21$ / year (I think?)

LINEAR COMBINATIONS



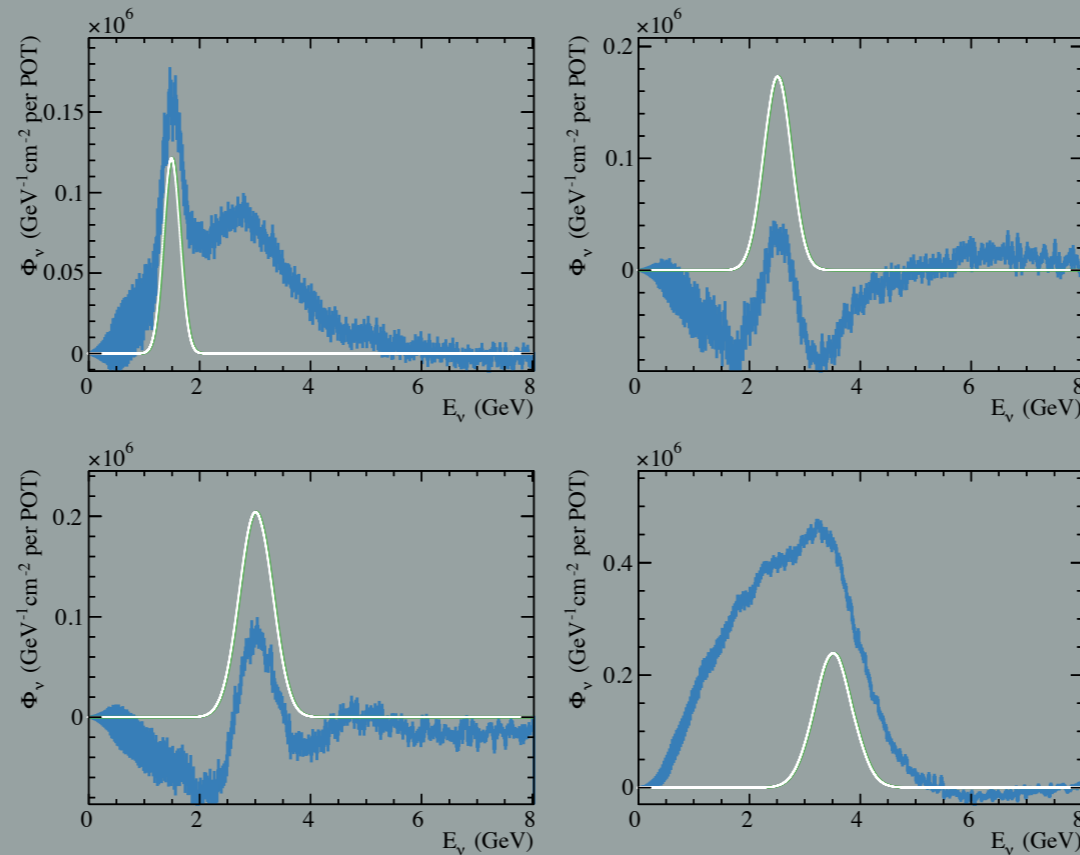
- ▶ Off-axis fits still not as great as they could be...
- ▶ Have nuPrism regularisation from Mark Scott, was going to have a play this week.

LINEAR COMBINATIONS – BUILDING



- ▶ Added some fit diagnostics, rushed to make these plots, better ones to follow.
- ▶ Have nuPrism regularisation from Mark Scott, was going to have a play this week.

LINEAR COMBINATIONS – EVENT RATES



- ▶ ‘Correct’ each fitted coefficient for the relative POT exposure of each stop.
 - ▶ *N.B.* in the on-axis position, the two halves of the FV see fluxes at the same off-axis angle, so measurement slice stats are collected twice as fast.
- ▶ Sum measurement slice event rates weighted by fitted coeffs.
- ▶ **Clearly broken**, was hacking it together before the meeting – will try and fix this week. (But work is mostly redundant c.f. Cris.)

FOR UPDATED

- ▶ Add nu-e Elastic event rates: I have the curve, just didn't have time to include here.
- ▶ Redo osc. flux fits and more gaussians and send around updated slides ASAP:
 - ▶ Interest in also RHC flux fits?

FOR NEXT WEEK

- ▶ Look into regularisation — Mark Scott sent me some of the NuPrism fitting code and suggested that I nab the regularisation: stops neighbouring coefficients being wildly different from each other.
- ▶ Teijin has a number of varied flux simulations — try and run/mock up a correlated flux uncertainty to show off the systematic error propagation:
 - ▶ Fit for linear combination coefficients assuming nominal
 - ▶ Build combination from flux throws within correlated uncertainty.

WE APOLOGISE FOR ANY INCONVENIENCE

THANK YOU