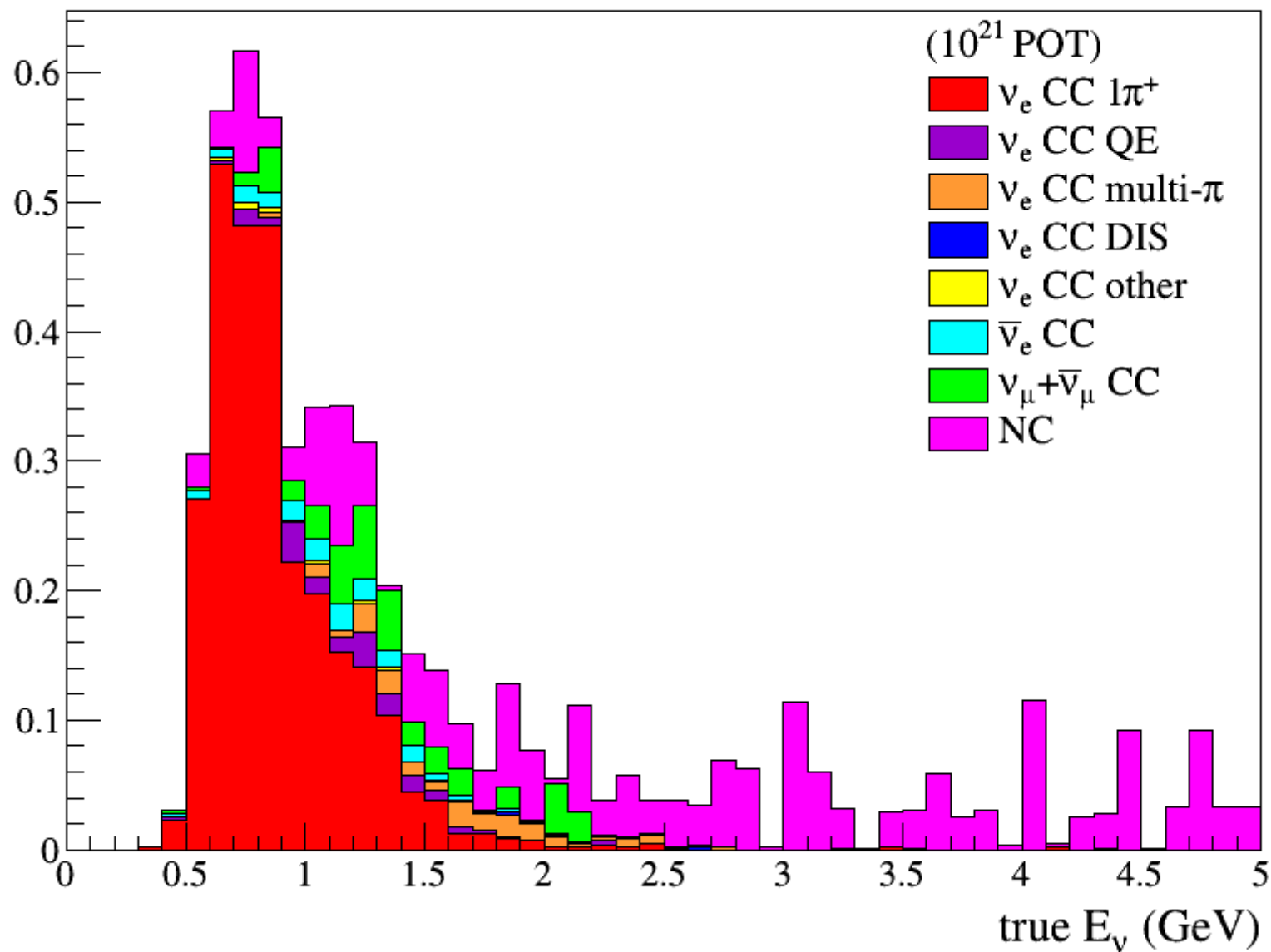# Progress Update

Trevor Towstego
2-Ring ν_e CC1π^+ Meeting
January 16, 2018

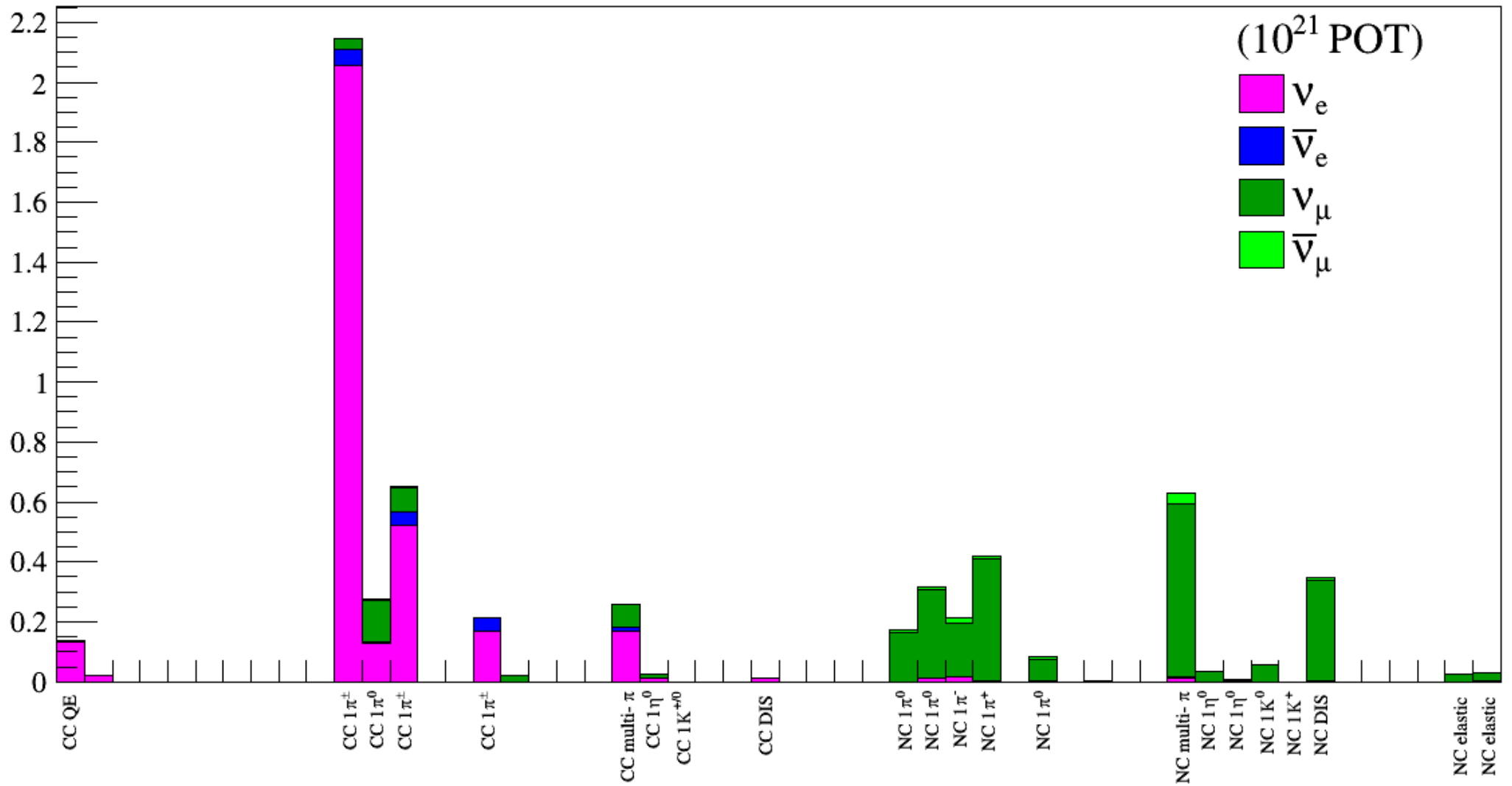# NIWG Plots

- Over the break, Roger Wendell asked me to produce some plots for the NIWG

  - based on similar plots Yoshida-san had made for the ν_μ CC1π^+ sample

- Plots show the combined 0 decay e and 1 decay e sample

- Event selection was done using the v1 trial 8 BDT (the best-performing BDT so far)
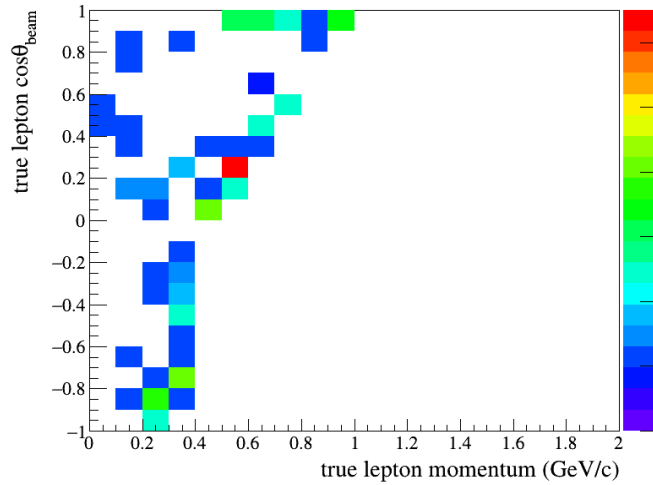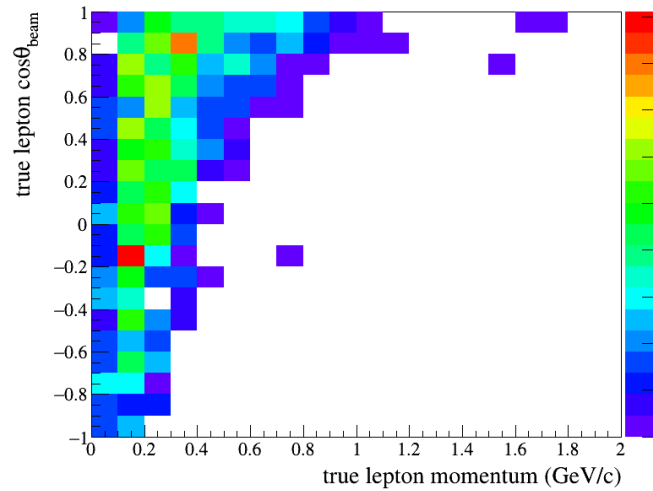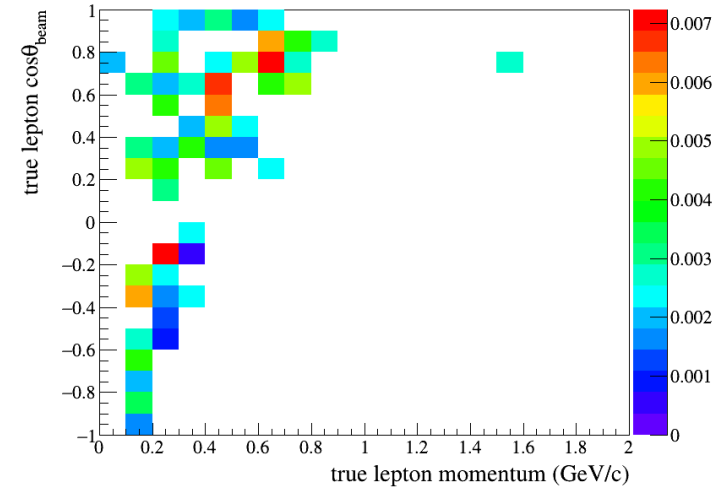
True neutrino energy

NEUT mode

(10^{21} POT)

ν_e

$\overline{\nu}_e$

ν_μ

$\overline{\nu}_\mu$

CC QE CC $1\pi^{\pm}$ CC $1\pi^0$ CC $1\pi^{\pm}$ CC $1\pi^{\pm}$ CC multi-π CC $1\eta^0$ CC $1K^{+0}$ CC DIS NC $1\pi^0$ NC $1\pi^0$ NC $1\pi^-$ NC $1\pi^+$ NC $1\pi^0$ NC multi-π NC $1\eta^0$ NC $1\eta^0$ NC $1K^0$ NC $1K^+$ NC DIS NC elastic NC elastic

True lepton kinematics
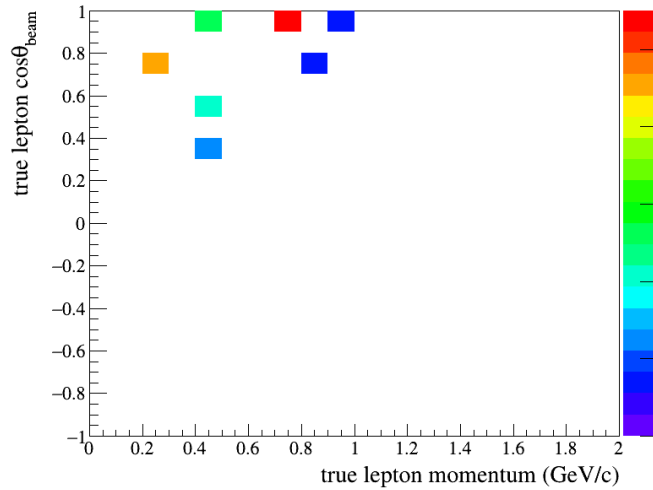

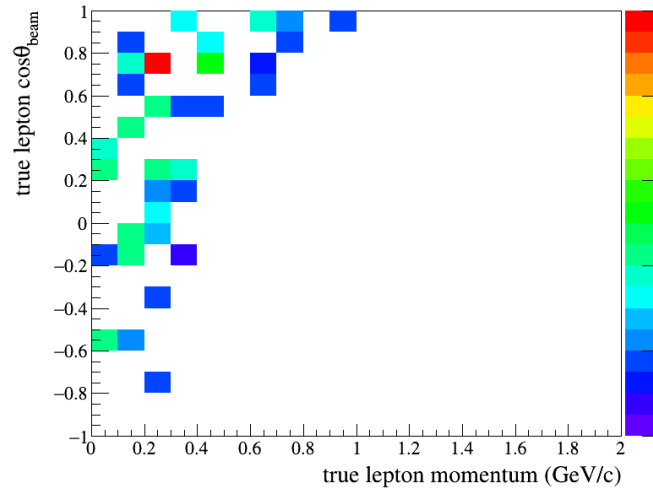True lepton kinematics: ν_e CC QE

True lepton kinematics: ν_e CC $1\pi^+$

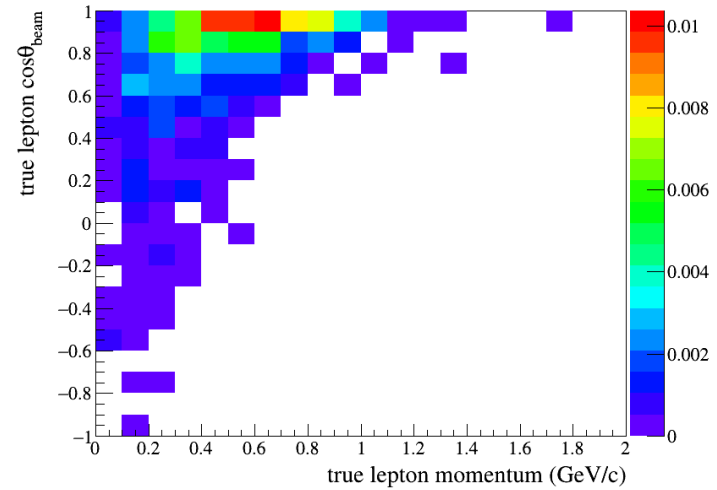True lepton kinematics: ν_e CC multi-π
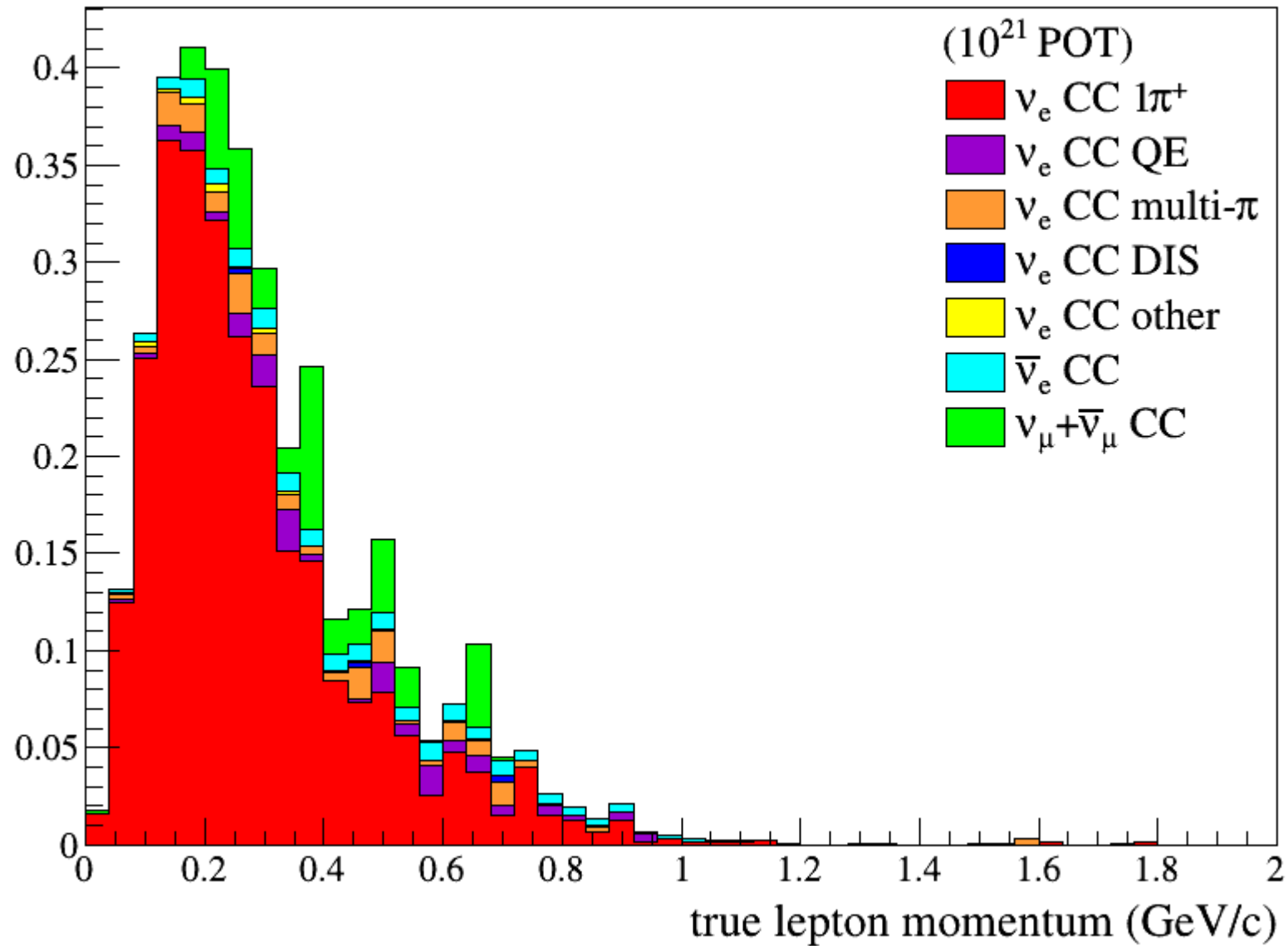
True lepton kinematics: ν_e CC DIS

True lepton kinematics: ν_e CC other

True lepton kinematics: $\overline{\nu}_e$ CC

True lepton momentum

True cos(θ_{beam}) of lepton

Legend:
- ν_e CC $1\pi^+$ (red)
- ν_e CC QE (purple)
- ν_e CC multi-π (orange)
- ν_e CC DIS (blue)
- ν_e CC other (yellow)
- $\overline{\nu}_e$ CC (cyan)
- $\nu_\mu + \overline{\nu}_\mu$ CC (green)

$(10^{21}$ POT)

true lepton $\cos\theta_{beam}$
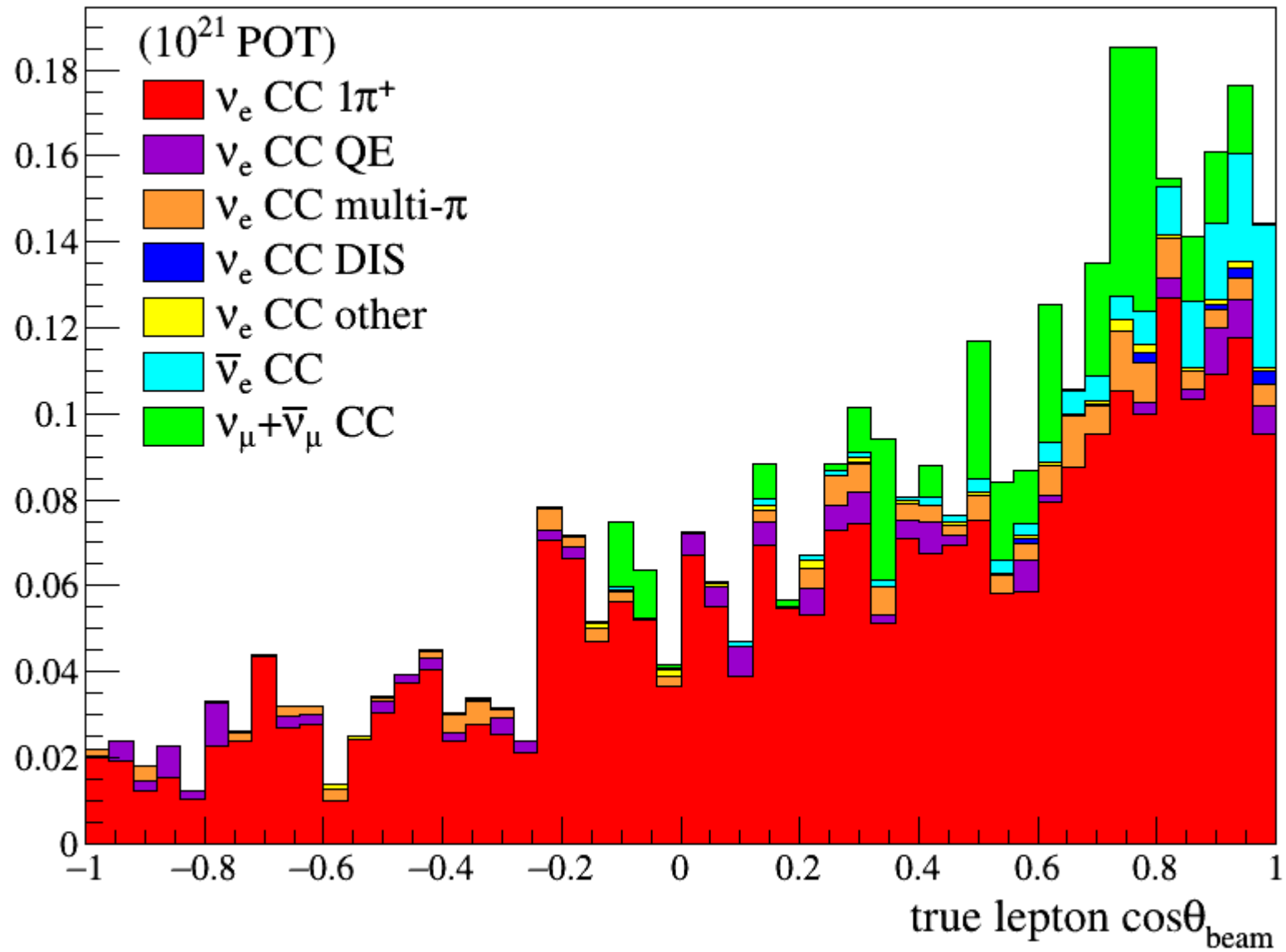
True kinematics of greatest-momentum hadron

True momentum of greatest-momentum hadron

$(10^{21}$ POT)

- ν_e CC $1\pi^+$
- ν_e CC multi-π
- ν_e CC DIS
- ν_e CC other
- $\overline{\nu}_e$ CC
- $\nu_\mu + \overline{\nu}_\mu$ CC
- NC

true greatest-momentum hadron momentum (GeV/c)

True cos(θ_{beam}) of greatest-momentum hadron

(10^{21} POT)
- ν_e CC $1\pi^+$
- ν_e CC multi-π
- ν_e CC DIS
- ν_e CC other
- $\overline{\nu}_e$ CC
- $\nu_\mu + \overline{\nu}_\mu$ CC
- NC

true greatest-momentum hadron cosθ_{beam}

PID of greatest-momentum hadron

Legend (10^{21} POT):
- ν_e CC $1\pi^+$
- ν_e CC multi-π
- ν_e CC DIS
- ν_e CC other
- $\bar{\nu}_e$ CC
- $\nu_\mu + \bar{\nu}_\mu$ CC
- NC

x-axis: π^-, π^0, π^+, η, $\omega(782)$, K^0, K^+, n, p

True kinematics of 2nd-greatest-momentum hadron

True kinematics of 2nd-greatest-momentum hadron: ν_e CC multi-π

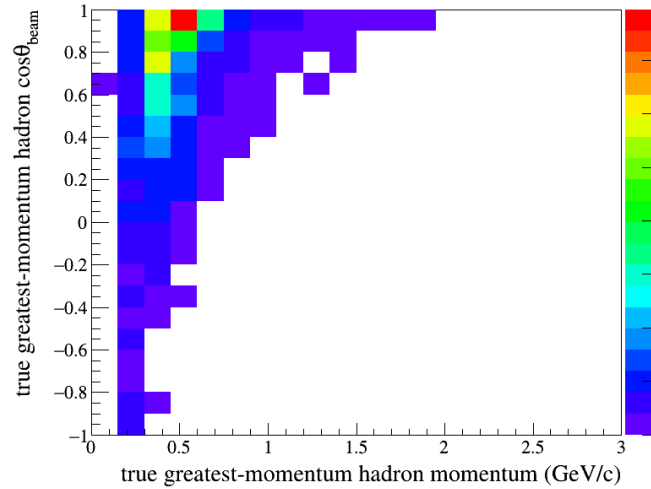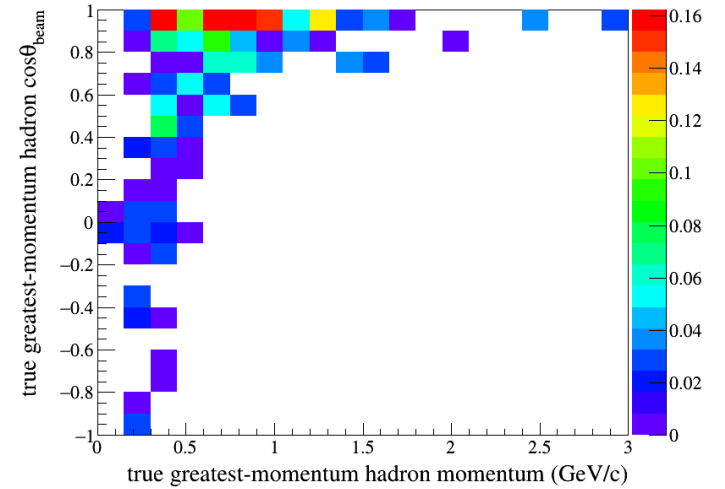True kinematics of 2nd-greatest-momentum hadron: ν_e CC DIS

True kinematics of 2nd-greatest-momentum hadron: ν_e CC other

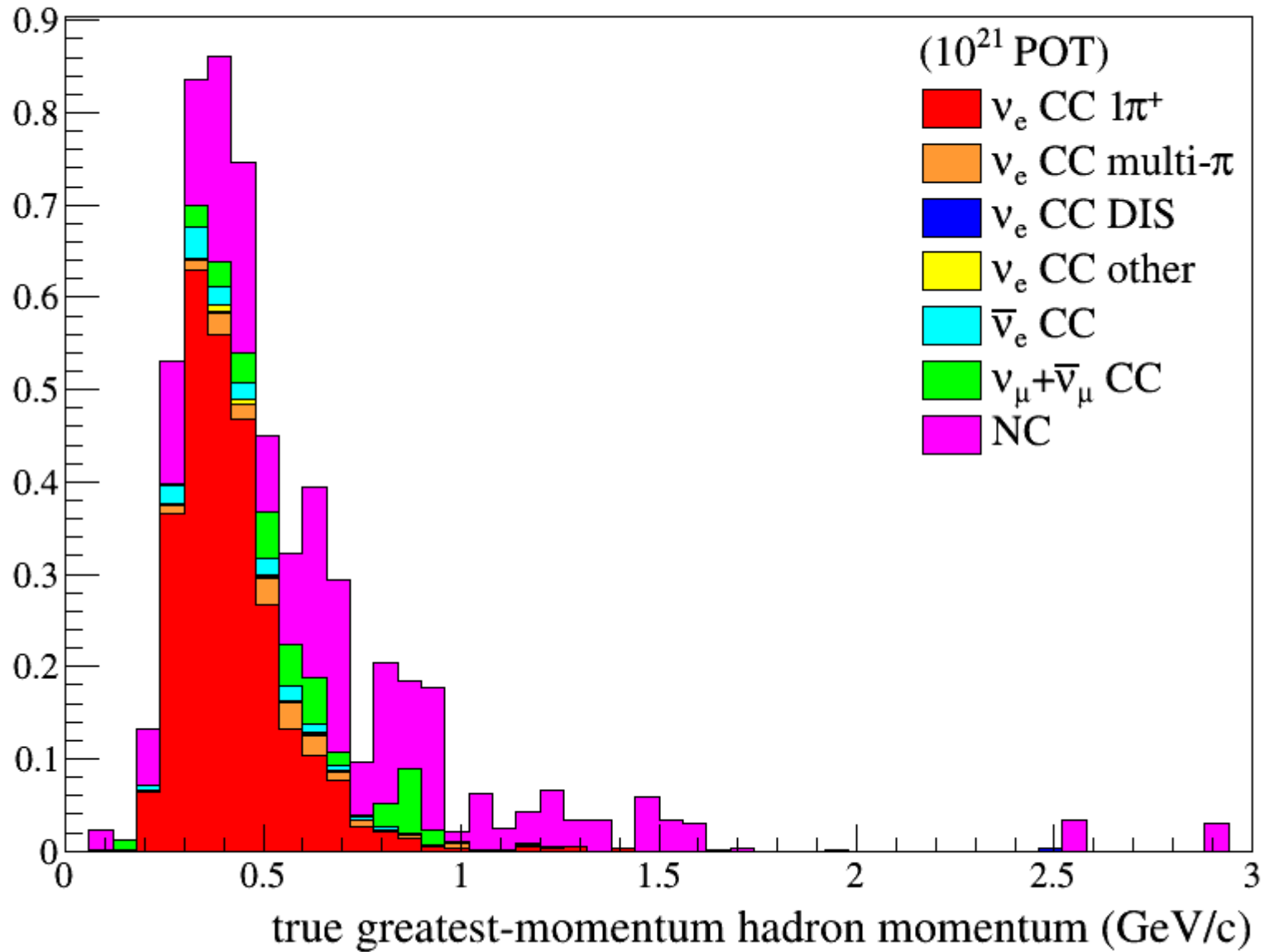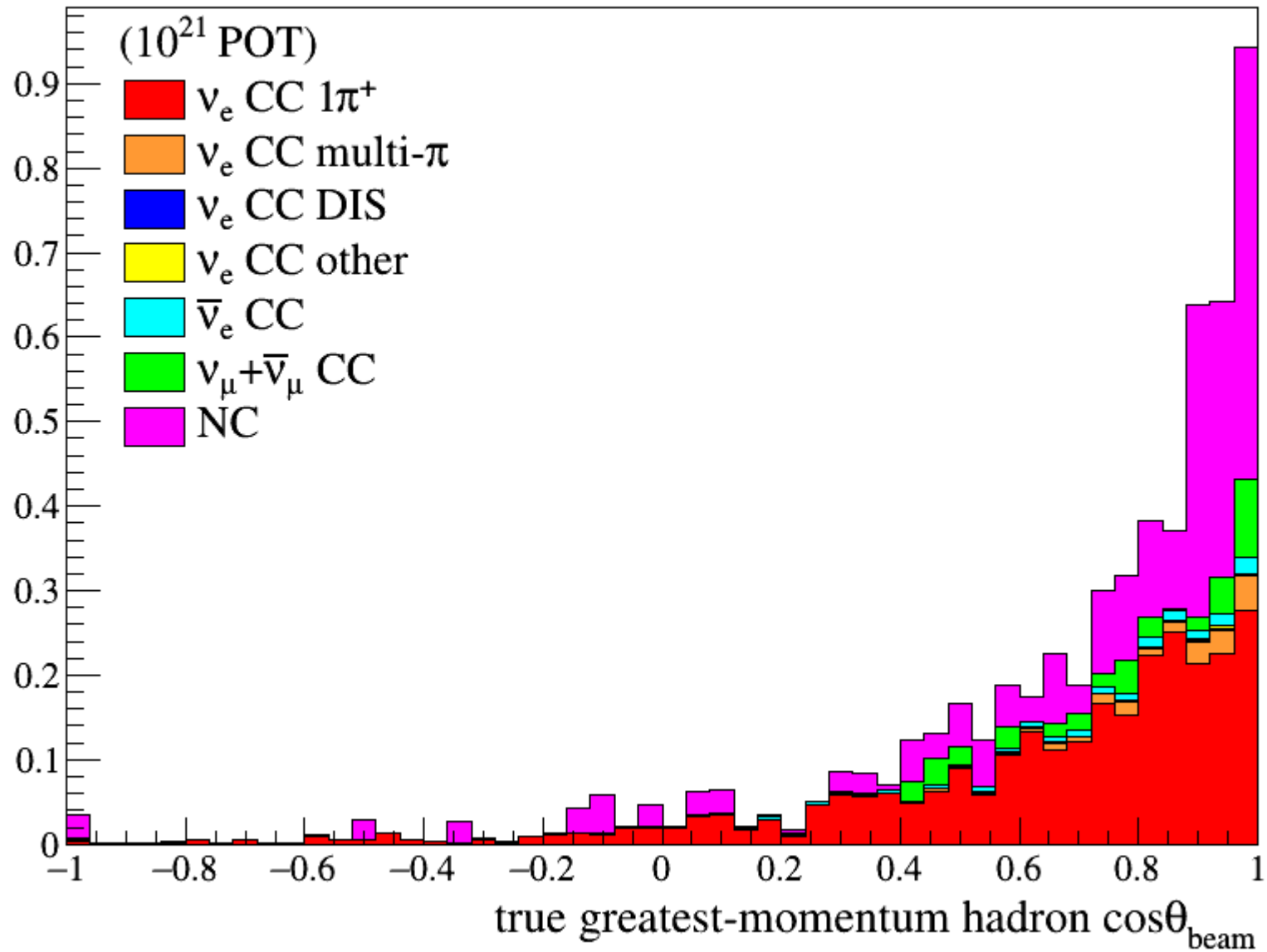True kinematics of 2nd-greatest-momentum hadron: $\overline{\nu}_e$ CC
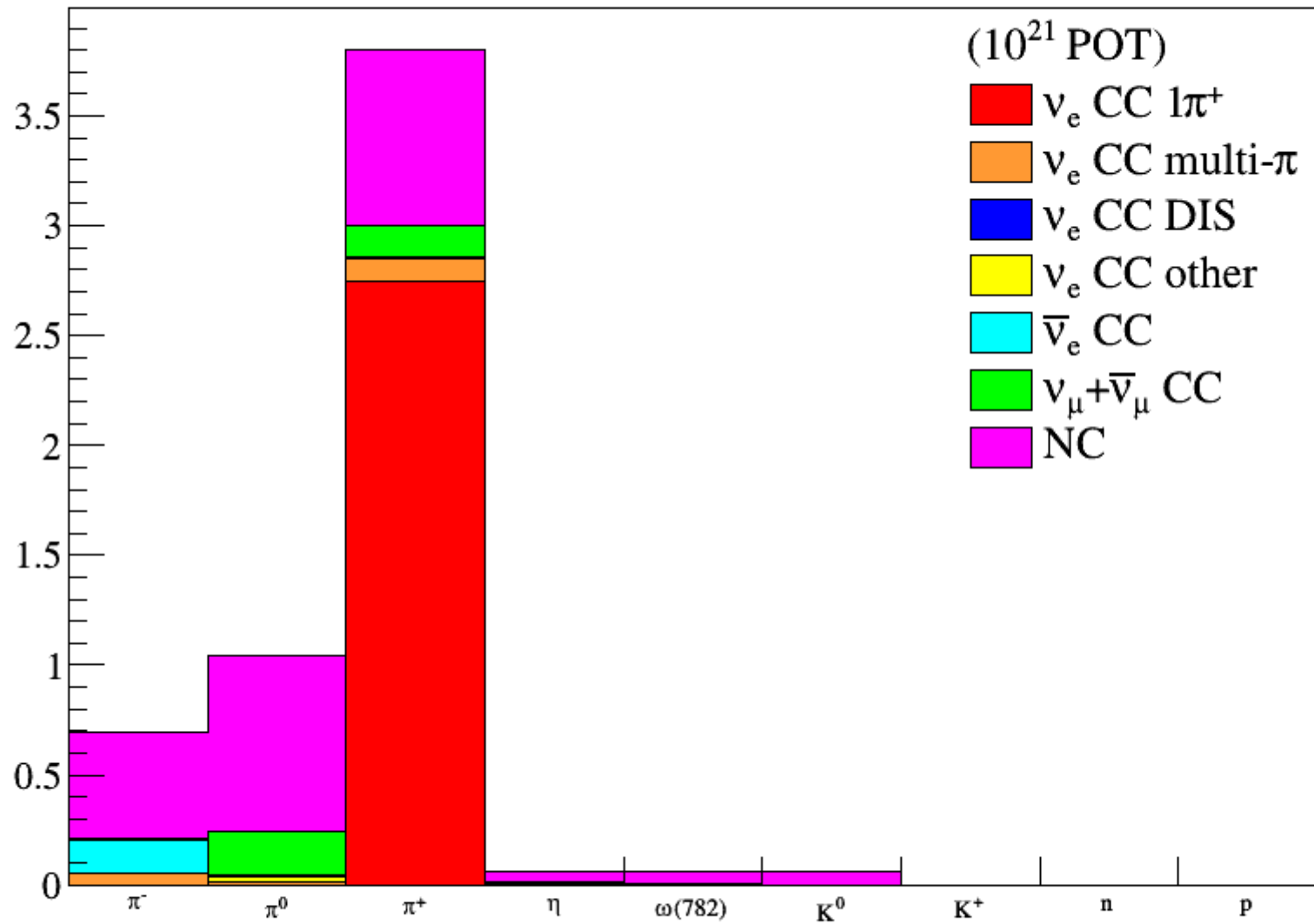
True kinematics of 2nd-greatest-momentum hadron: NC
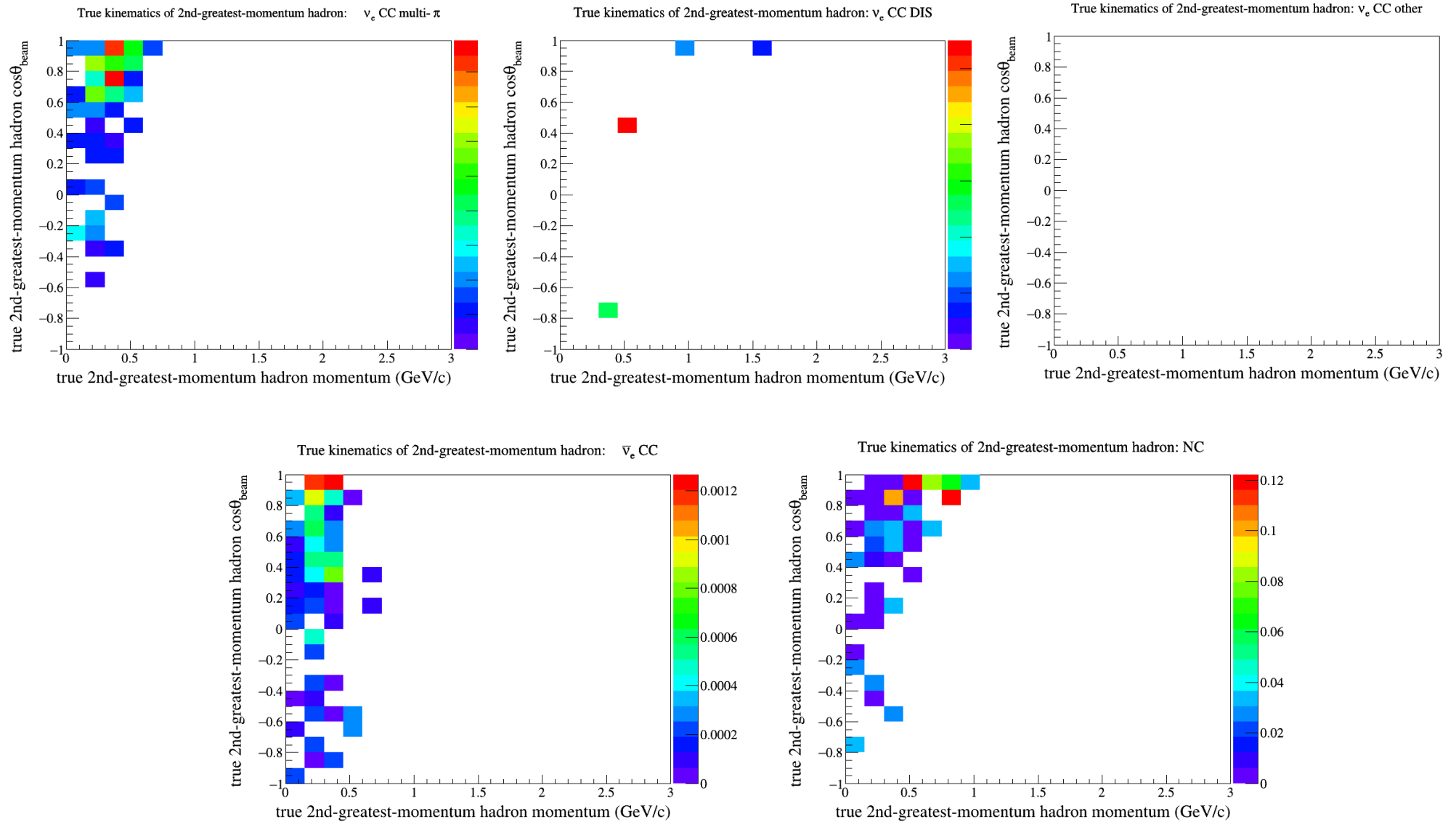
True momentum of second-greatest-momentum hadron

$(10^{21}$ POT$)$

- ν_e CC multi-π
- ν_e CC DIS
- ν_e CC other
- $\overline{\nu}_e$ CC
- $\nu_\mu + \overline{\nu}_\mu$ CC
- NC

true 2nd-greatest-momentum hadron momentum (GeV/c)
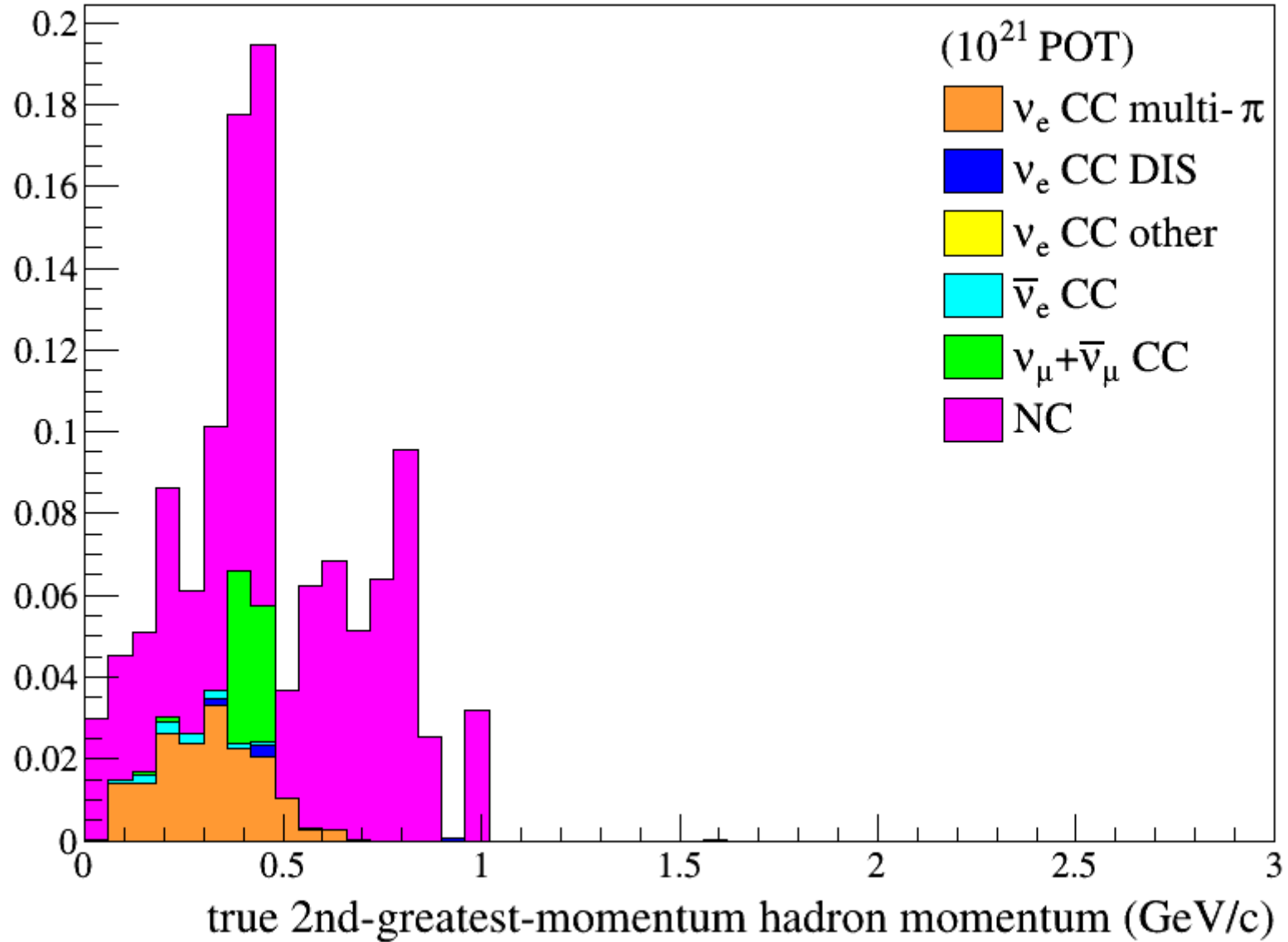
True $\cos(\theta_{beam})$ of second-greatest-momentum hadron

$(10^{21}$ POT)

- ν_e CC multi-π
- ν_e CC DIS
- ν_e CC other
- $\overline{\nu}_e$ CC
- $\nu_\mu + \overline{\nu}_\mu$ CC
- NC

true 2nd-greatest-momentum hadron $\cos\theta_{beam}$
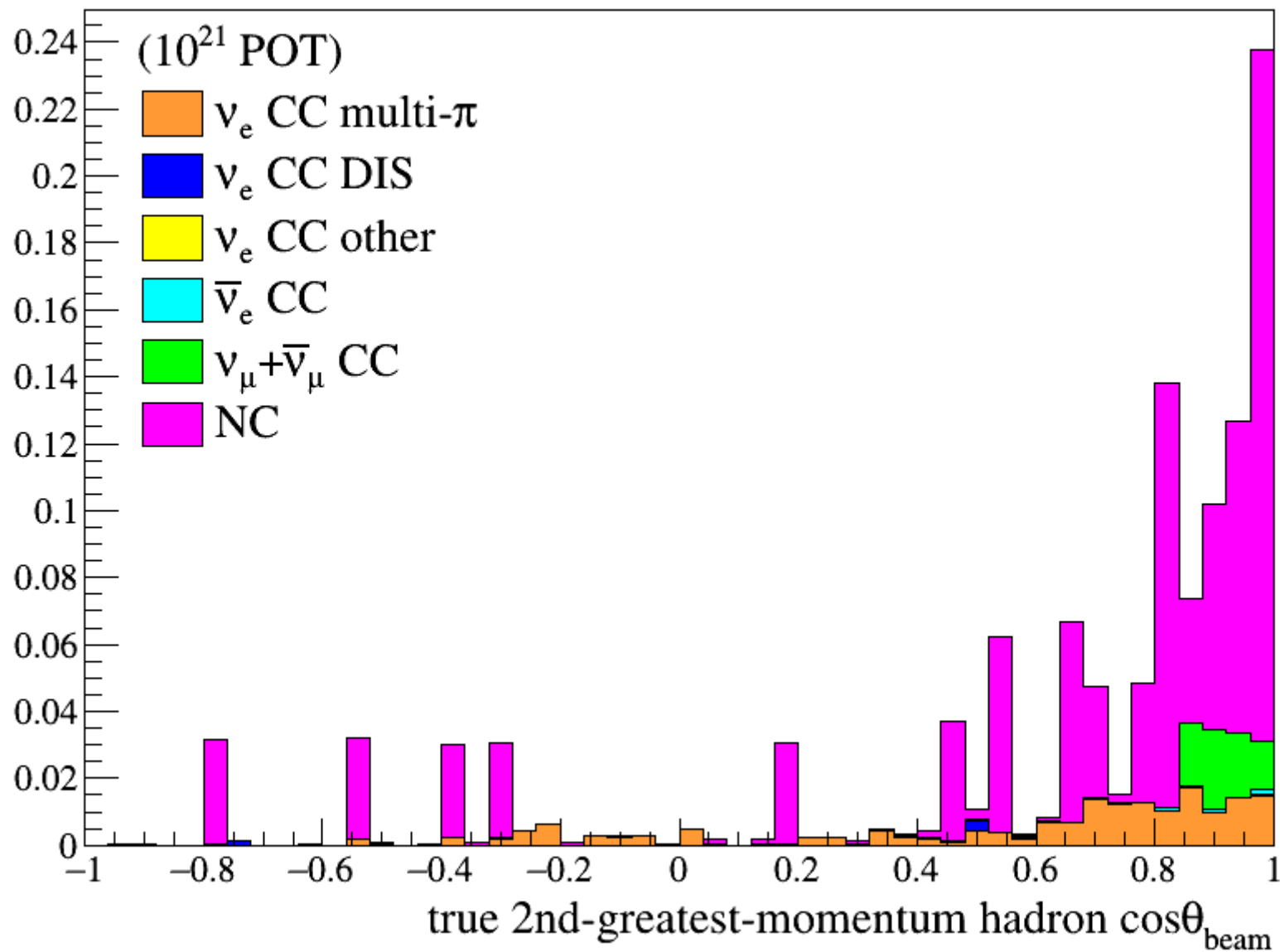
PID of second-greatest-momentum hadron
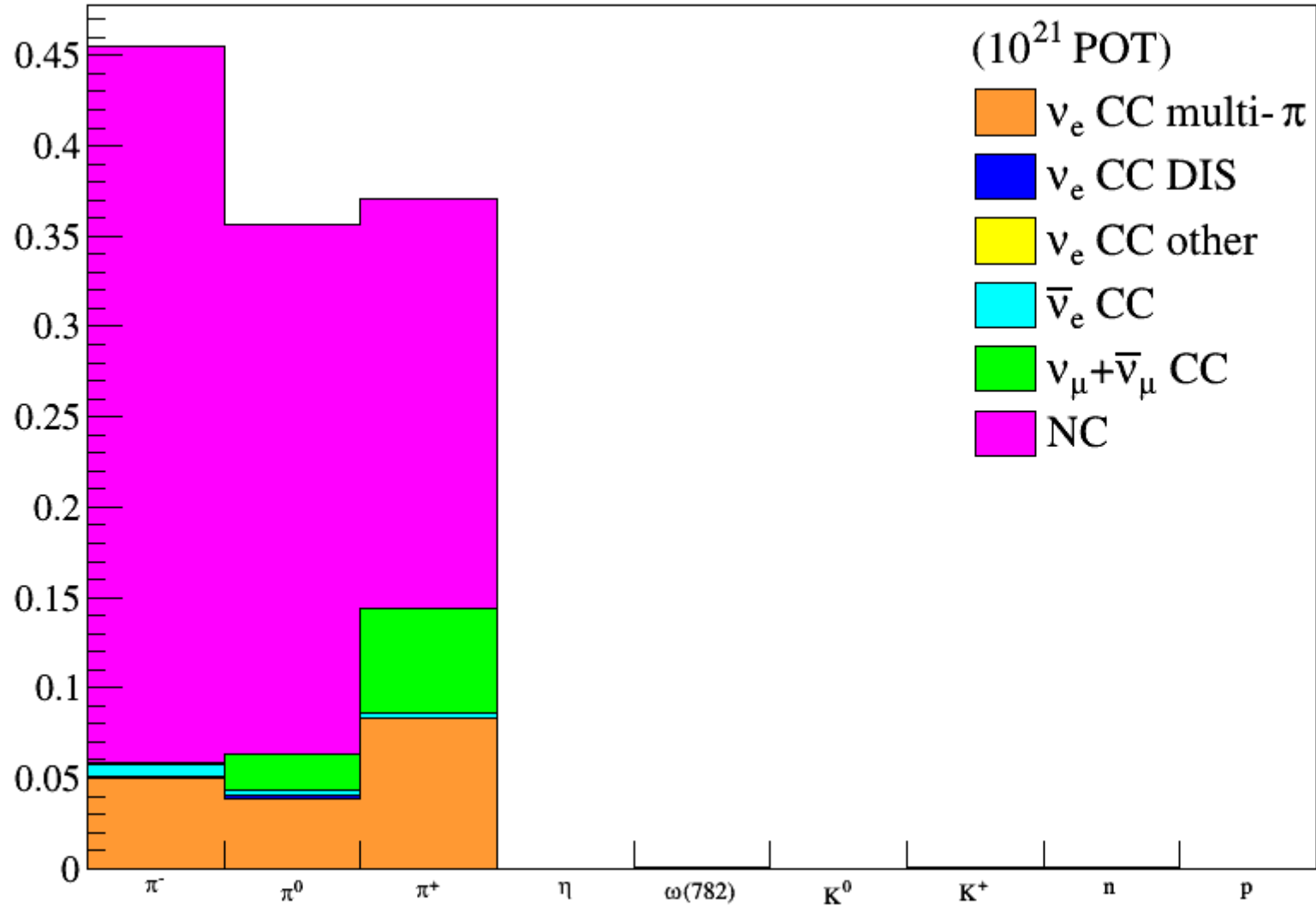
Current Work

- fiTQun jobs still running on Cedar
  - Two "array jobs" submitted before the break – one for GENIE and one for NuWRO
    - Each array consisted of 2800 individual jobs
  - Vast majority have now been completed
    - Hopefully finished within a week or two
- Streamline code and scripts
  - pre-BDT cuts, BDT training/testing, event selection, plots/tables
- Start focusing on FSI/SI systematics
  - Elder's covariance matrix
  - Existing code to pull from parameter space and re-weight events?
    - E-mail Elder and Sophie