Plans for TDR Beam section

Z. Pavlovic

Planning for TDR (talk at Collaboration meeting)

The Team

- Editors selected by consortia leaders
- Several new members to the team: KSU copy editor, ND CDR editors, Karagiorgi, Sorel, Stewart, Resnati
- Plan is to produce 5 volumes …

Technical Design Report Team

Editors: Tim Bolton, Sam Zeller
Technical Support: Anne Heavey, Dave DeMuth, Brett Viren, KSU copy editor (TED)

- **Volume 1: Executive Summary** (Ed Blucher, Stefan Soldner-Rembold)
  - Computing Executive Summary (Andrew Norman, Heidi Schellman)
  - Near Detector Executive Summary (Mike Kordosky, Steve Manly)
- **Volume 2: Physics** (Albert de Roeck, Jon Urheim)
  - Calibration Strategy (Sowjanya Gollapinni, Kendall Mahn)
- **Volume 3: Single Phase Far Detector**
  - Design Motivation and Overview
  - APAs (Dave Schmitz)
  - TPC Electronics (Mike Mooney)
  - HV System (Rob Plunkett)
  - Photon Detection System (Bob Wilson)
  - DAQ (Jim Brooke, Georgia Karagiorgi, Brett Viren)
  - Cryogenics Instrumentation and Slow Controls (CISC) (Glenn Horton-Smith, Carmen Palomares)
  - Calibration Hardware (TBD)
  - Technical Coordination (Jim Stewart)
- **Volume 4: Dual Phase Far Detector**
  - Design Motivation and Overview
  - CRPs (Dominique Duchesneau, Edoardo Mazzucato)
  - TPC Electronics (Slavic Galymov, Jamie Dawson)
  - HV System (Francesco Pietropaolo, Jae Yu)
  - Photon Detection System (Burak Bilki, Michel Sorel)
  - DAQ (Jim Brooke, Georgia Karagiorgi, Brett Viren)
  - Cryogenics Instrumentation and Slow Controls (CISC) (Glenn Horton-Smith, Carmen Palomares)
  - Calibration Hardware (TBD)
  - Technical Coordination (Filippo Resnati)
- **Volume 5: Technical Coordination** (Steve Kettell)

Beam section

- Section in Volume 2: DUNE Physics
- Assigned to: Laura Fields with contributions from Luke Pickering and Zarko Pavlovic

Schedule

- **September**: Consortium/working group editors appointed. Kick-off meeting on Sept 11th to discuss plans for TDR and lessons learned from IDR
- **October**: Outlines due, including outline of protoDUNE strategy
- **November:** First drafts due including first pass at requirements table. Editors' initial review complete by November 15
- **December**: Second drafts due. Must include initial cost, risk, schedule, and interface tables, plus any iteration of protoDUNE strategy and requirements
- **January**: Review of second drafts
- **February**: Outcome of independent reviews of second drafts back to consortia/working groups for incorporation/discussion
- **March**: Final drafts due
- **April**: Review of final documents complete
- Submit final document to LBNC

- Laura made a first draft with text and figures (mostly placeholders)

- Luke is working on off-axis neutrino flux and uncertainties - next talk

- Following slides show the plots in the first draft

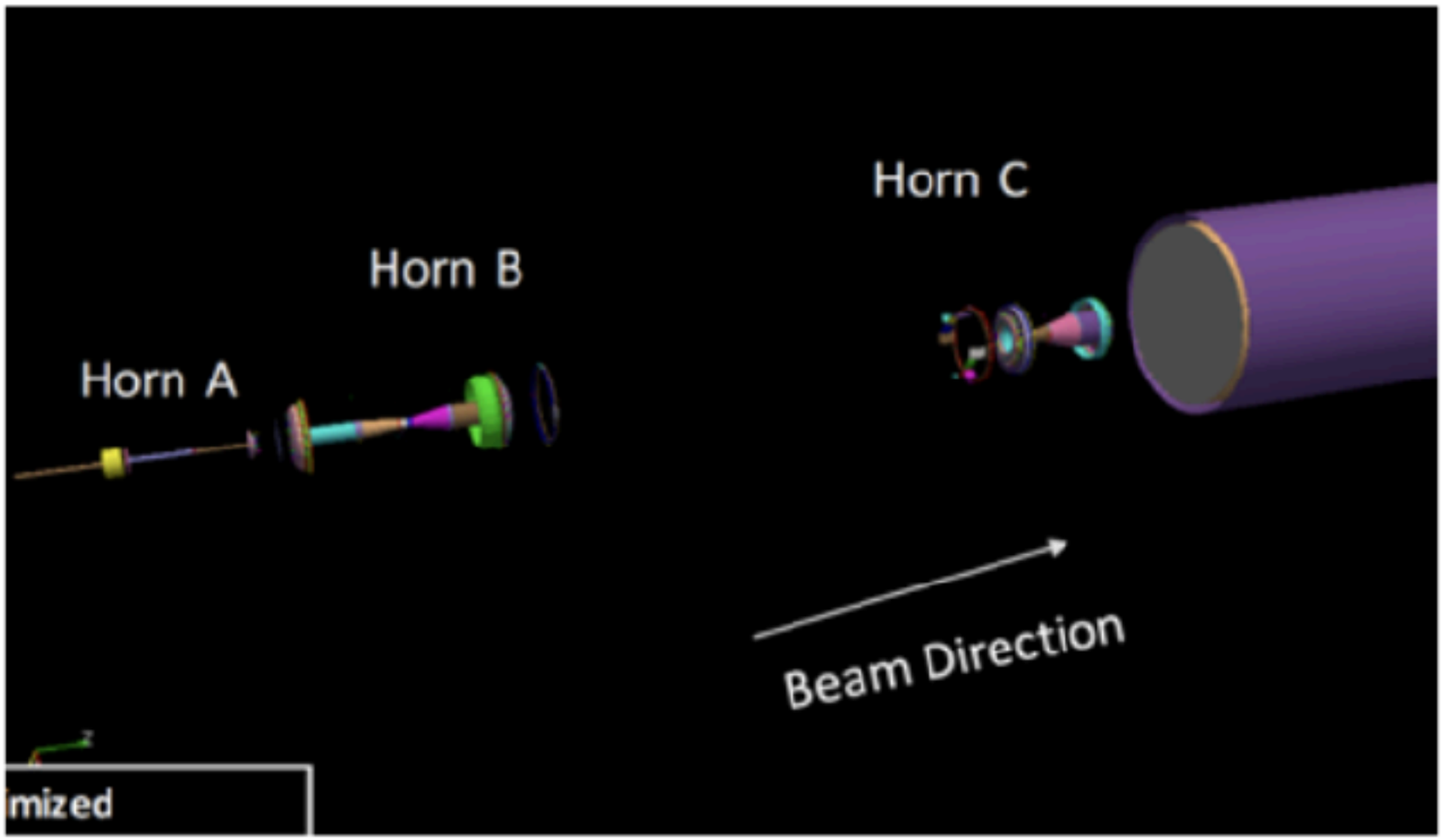
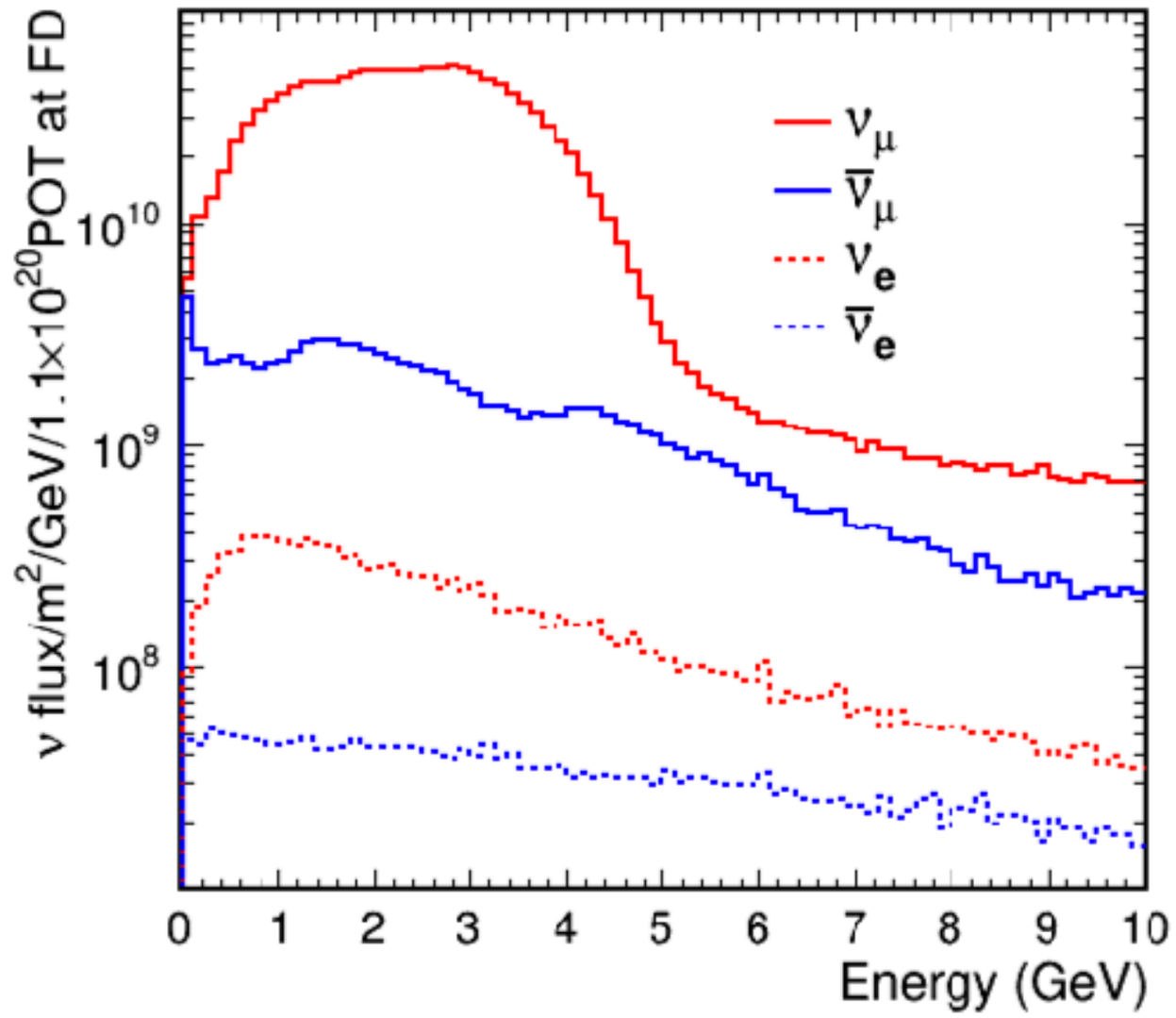
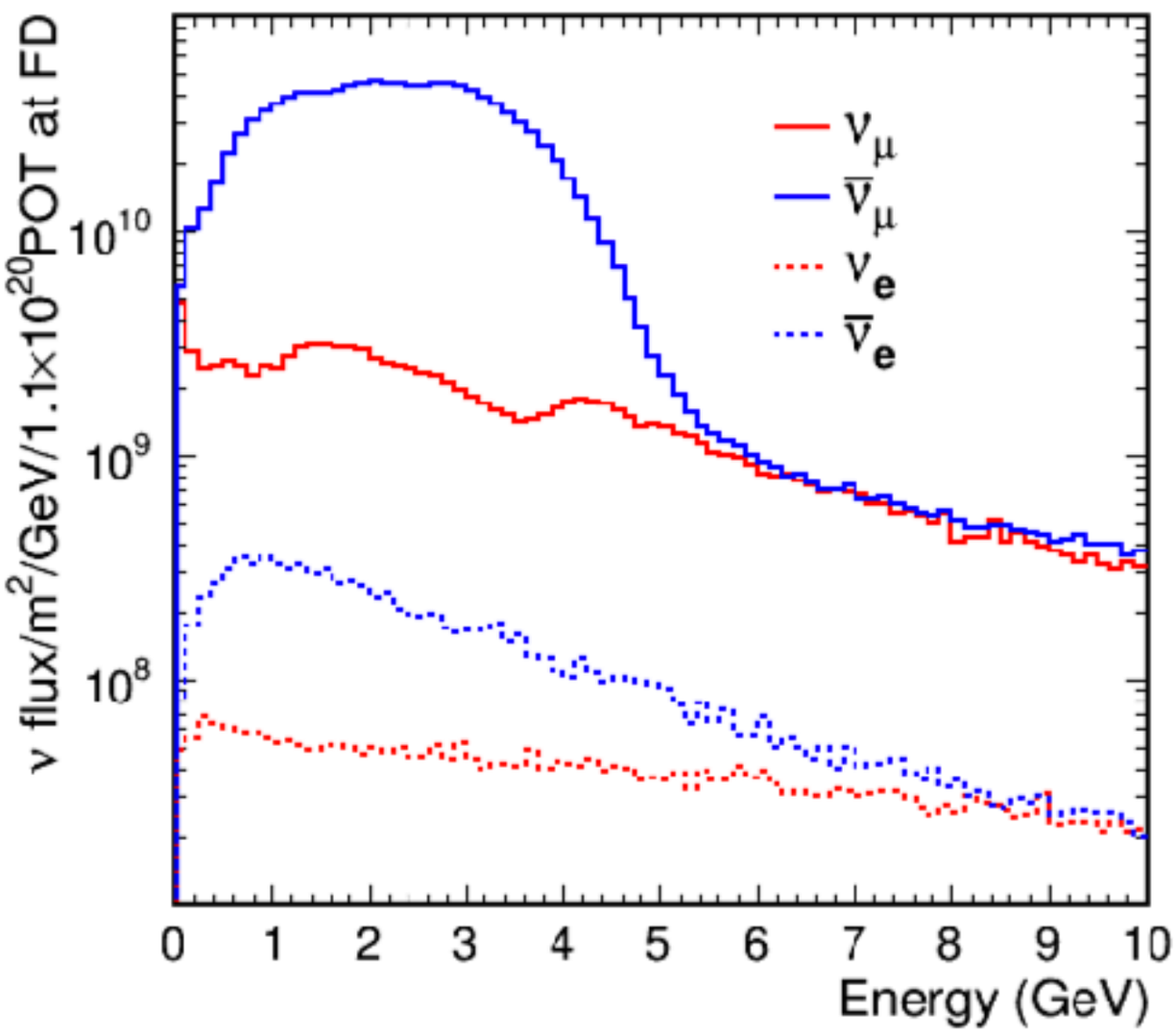


Figure 1.1: Visualization of the focusing system taken from the Geant4-based simulation.

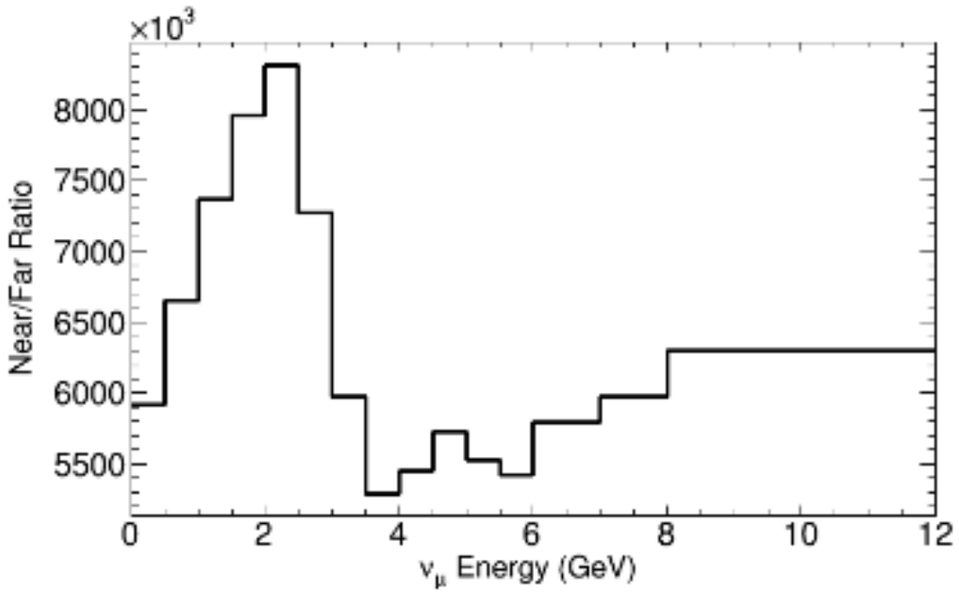
On-axis flux and uncertainties





- Fig 1.2: Neutrino flux at the FD in neutrino mode (left) and antineutrino mode (right)

On-axis flux and uncertainties



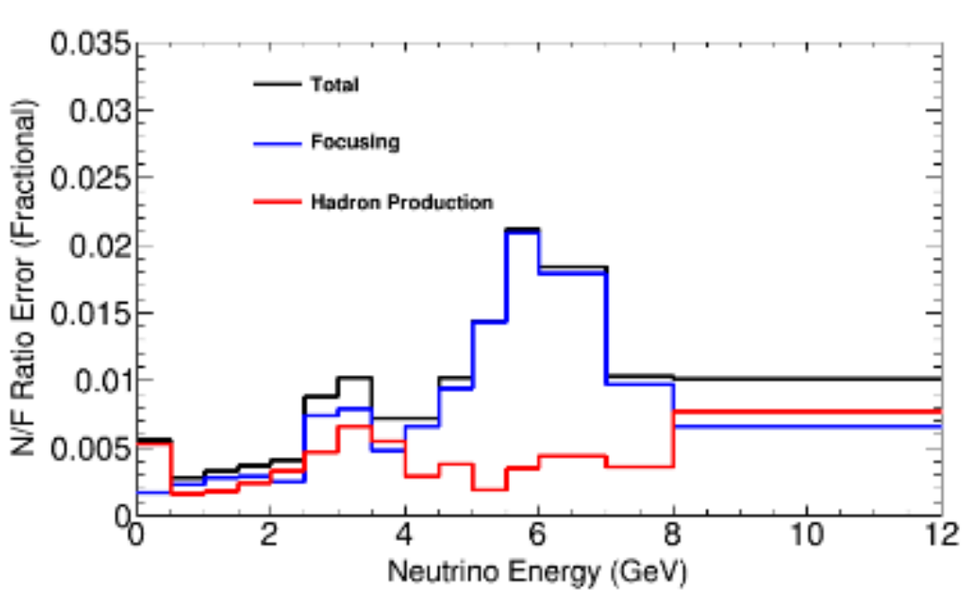


Figure 1.3: Ratio of neutrino mode muon neutrino fluxes at the near and far detectors (left) and uncertainties on the ratio (right) (right). To be updated.

On-axis flux and uncertainties

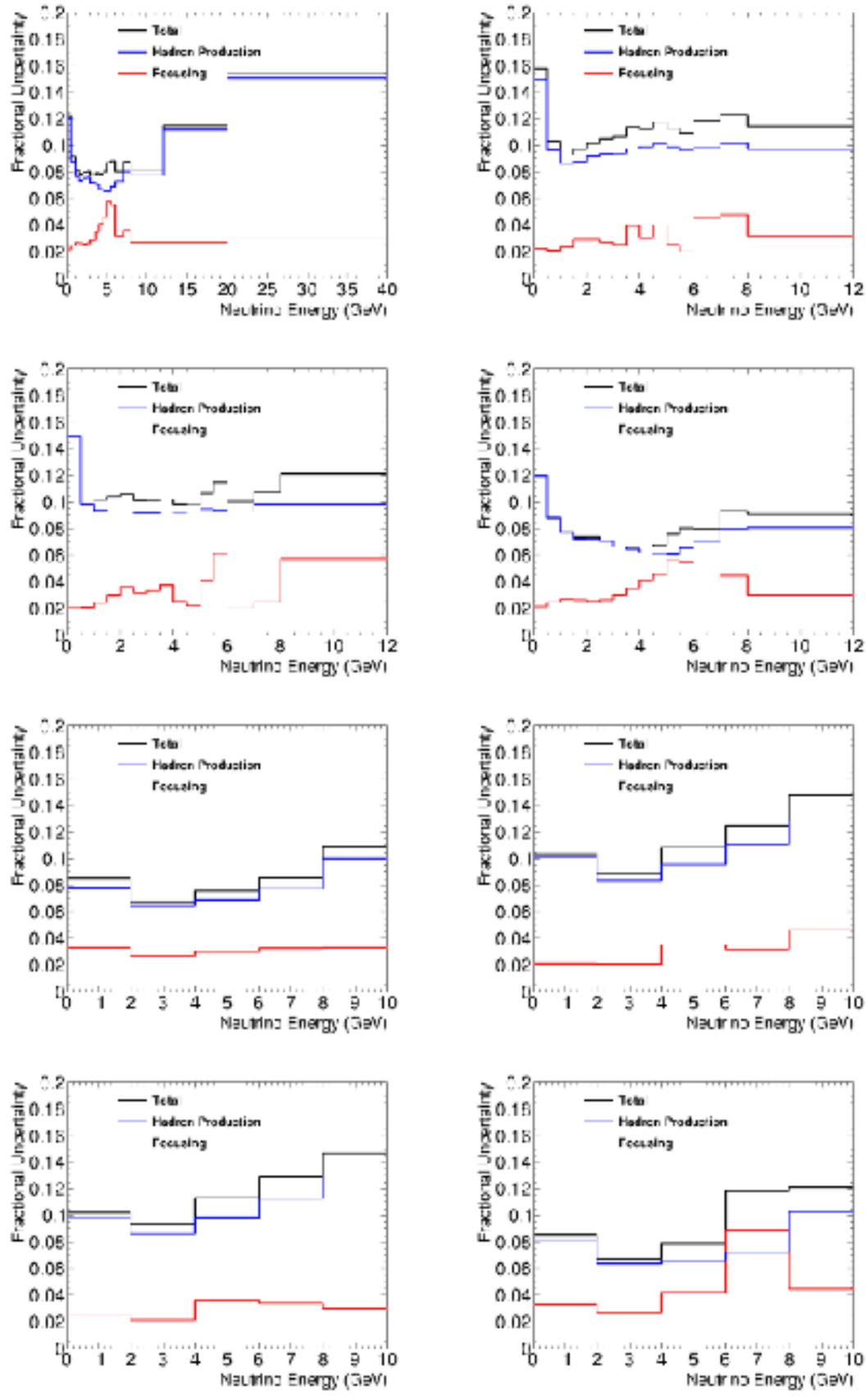


Figure 1.4: Flux uncertainties at the far detector as a function of neutrino energy in neutrino mode (left) and antineutrino mode (right) for, from top to bottom, muon neutrinos, muon antineutrinos, electron neutrinos and electron antineutrinos.

On-axis flux and uncertainties

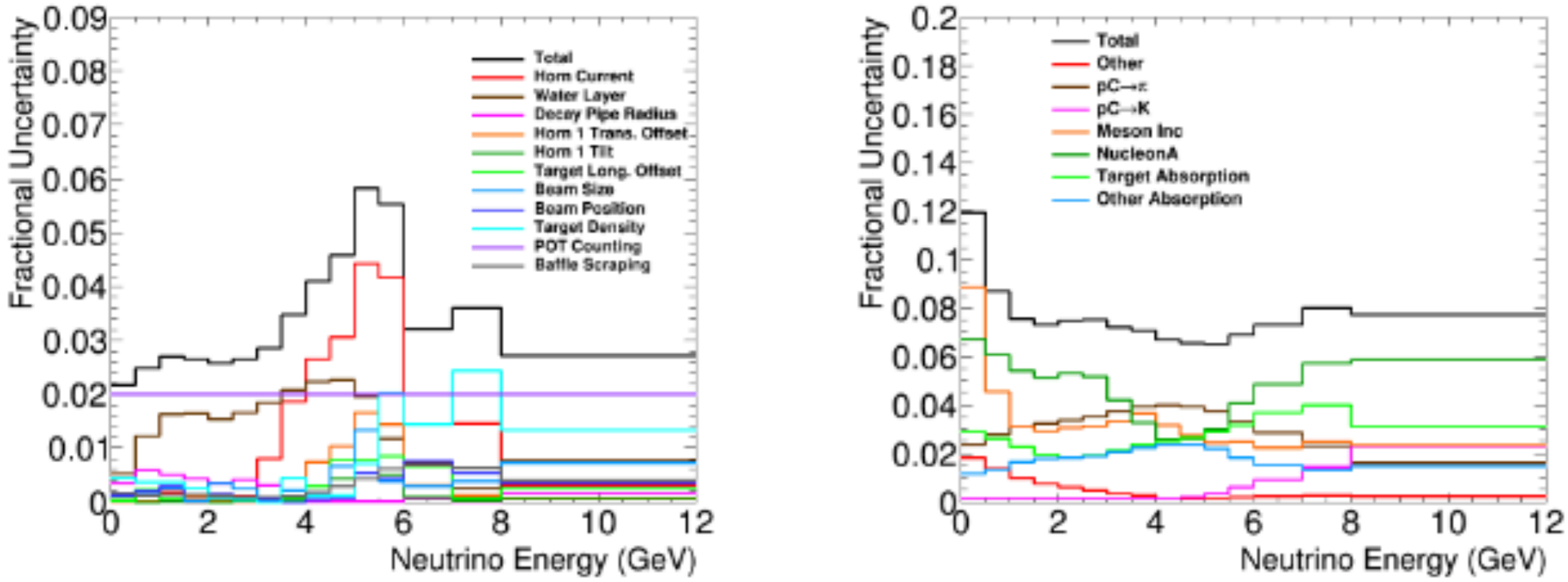
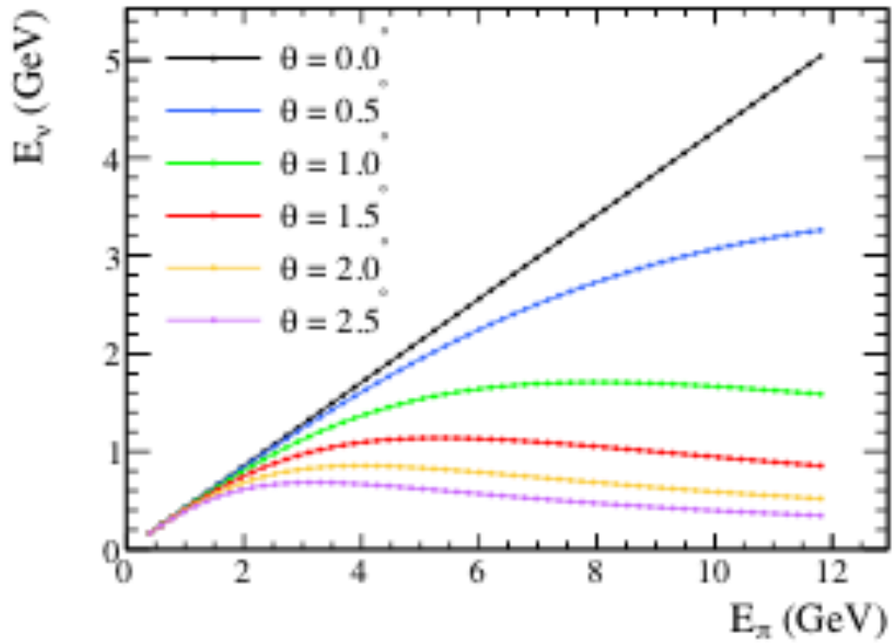


Figure 1.5: Focusing (left) and hadron production (right) uncertainties on the neutrino mode muon neutrino flux at the far detector.

Off-axis flux and uncertainties



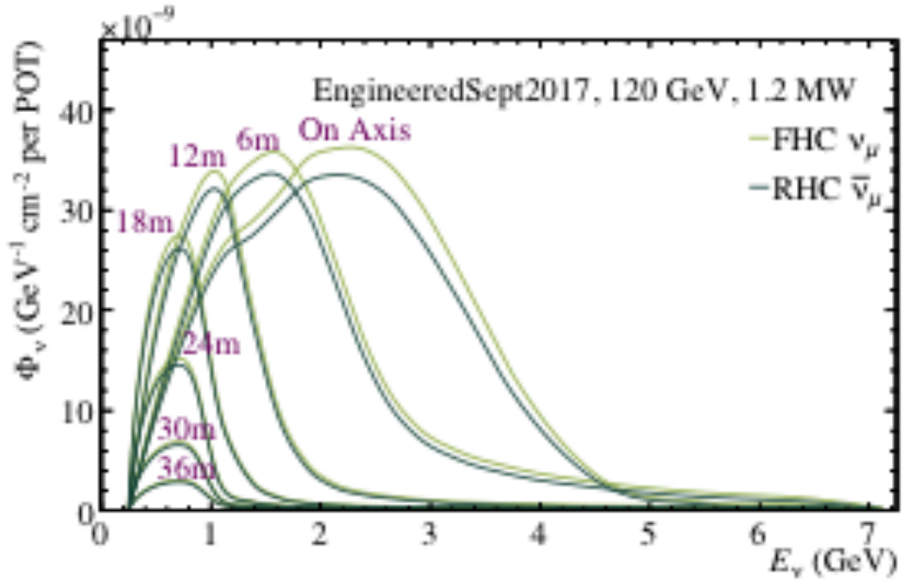
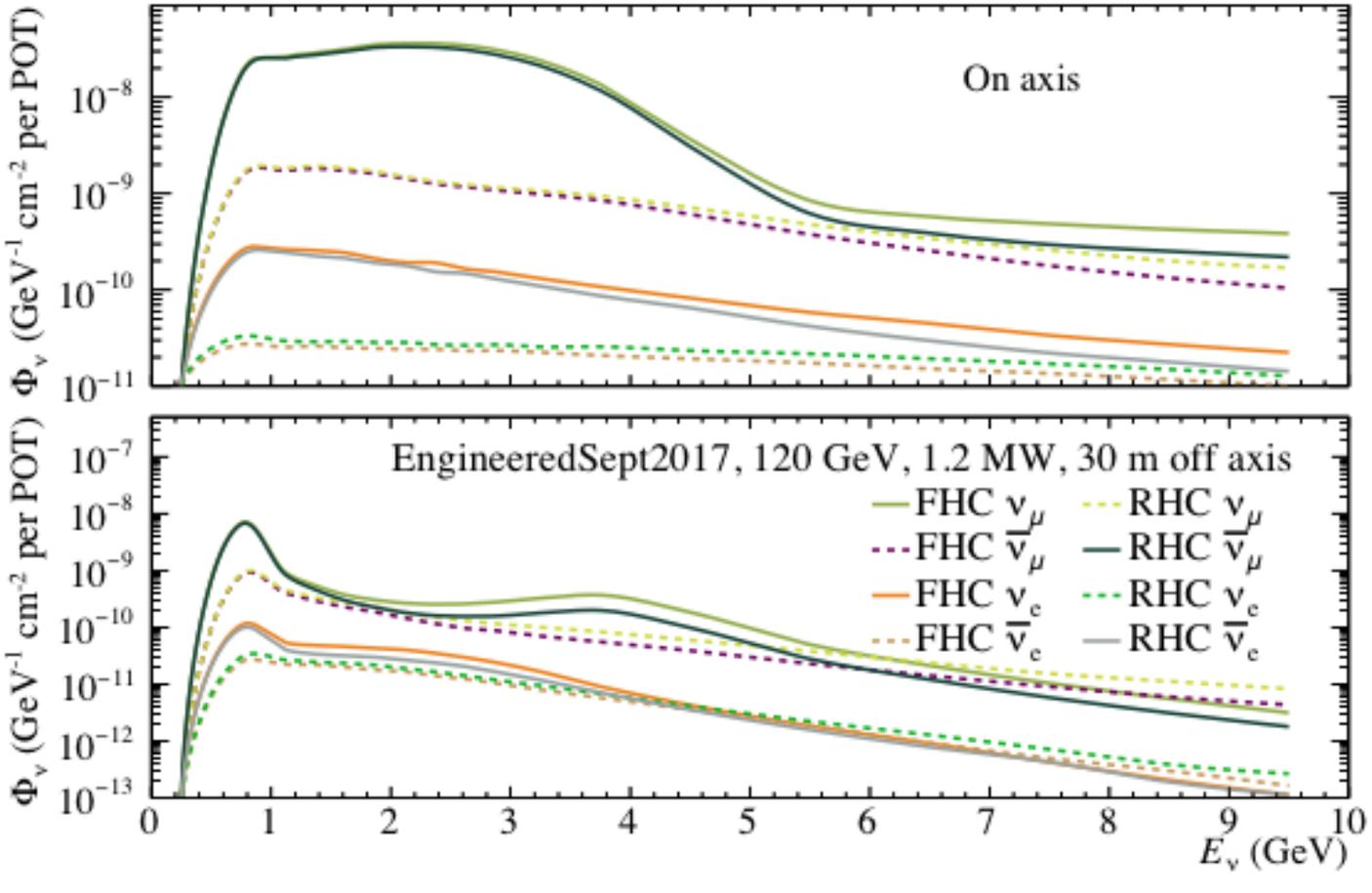


Figure 1.6: (a) The neutrino energy as a function of parent pion energy for different angles away from the pion momentum vector. Figure from Ref. [**?**]. (b) The DUNE near detector flux predictions over a range of off-axis positions for a near detector at $575\,\mathrm{m}$ downstream of the target station.

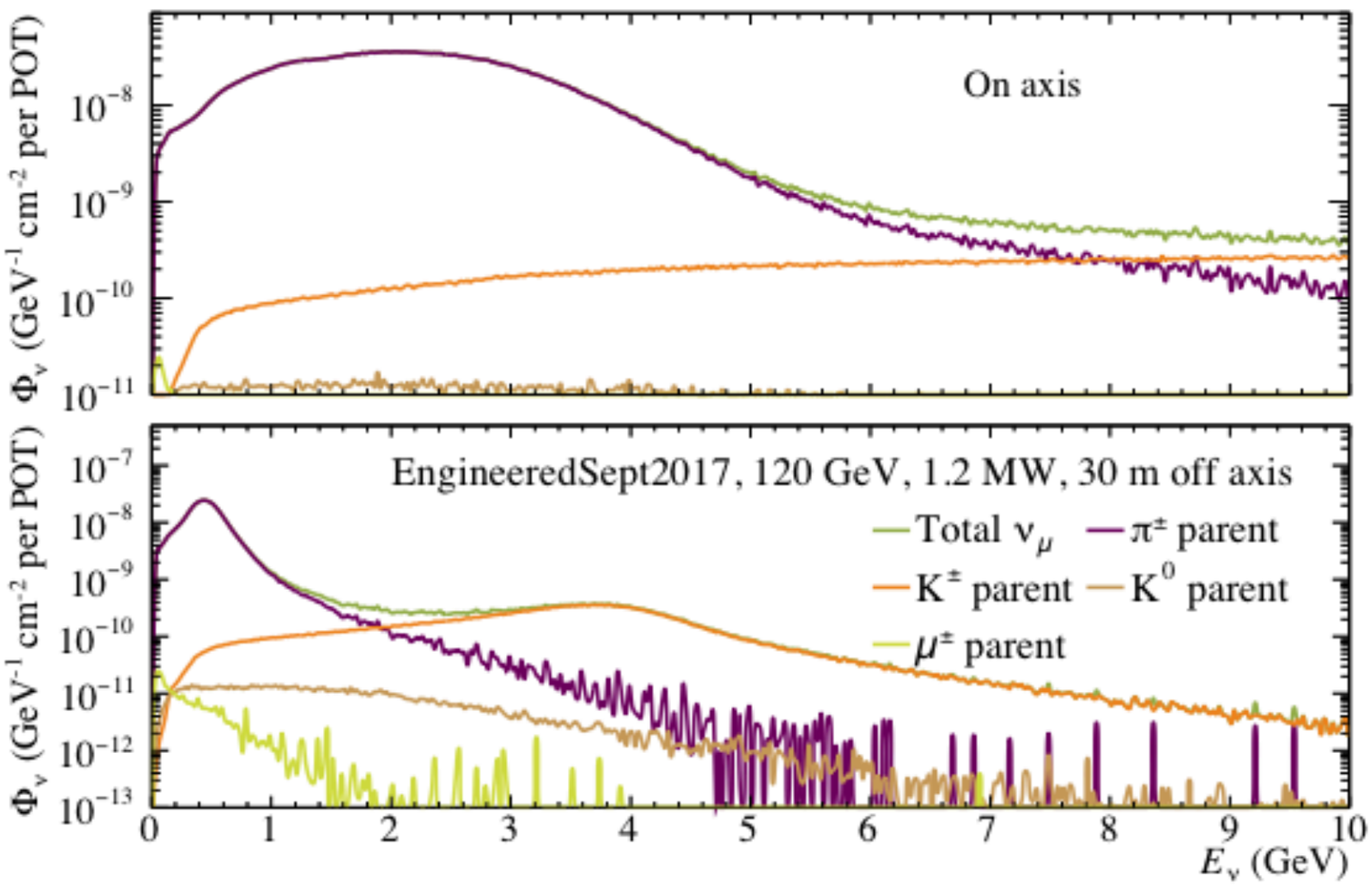
Off-axis flux and uncertainties

- Neutrino flux comparison at ND on-axis and off-axis for all flavors in FHC and RHC



Off-axis flux and uncertainties

- Muon neutrino flux broken by parent for on-axis and off-axis flux at ND



Alternate beam configurations

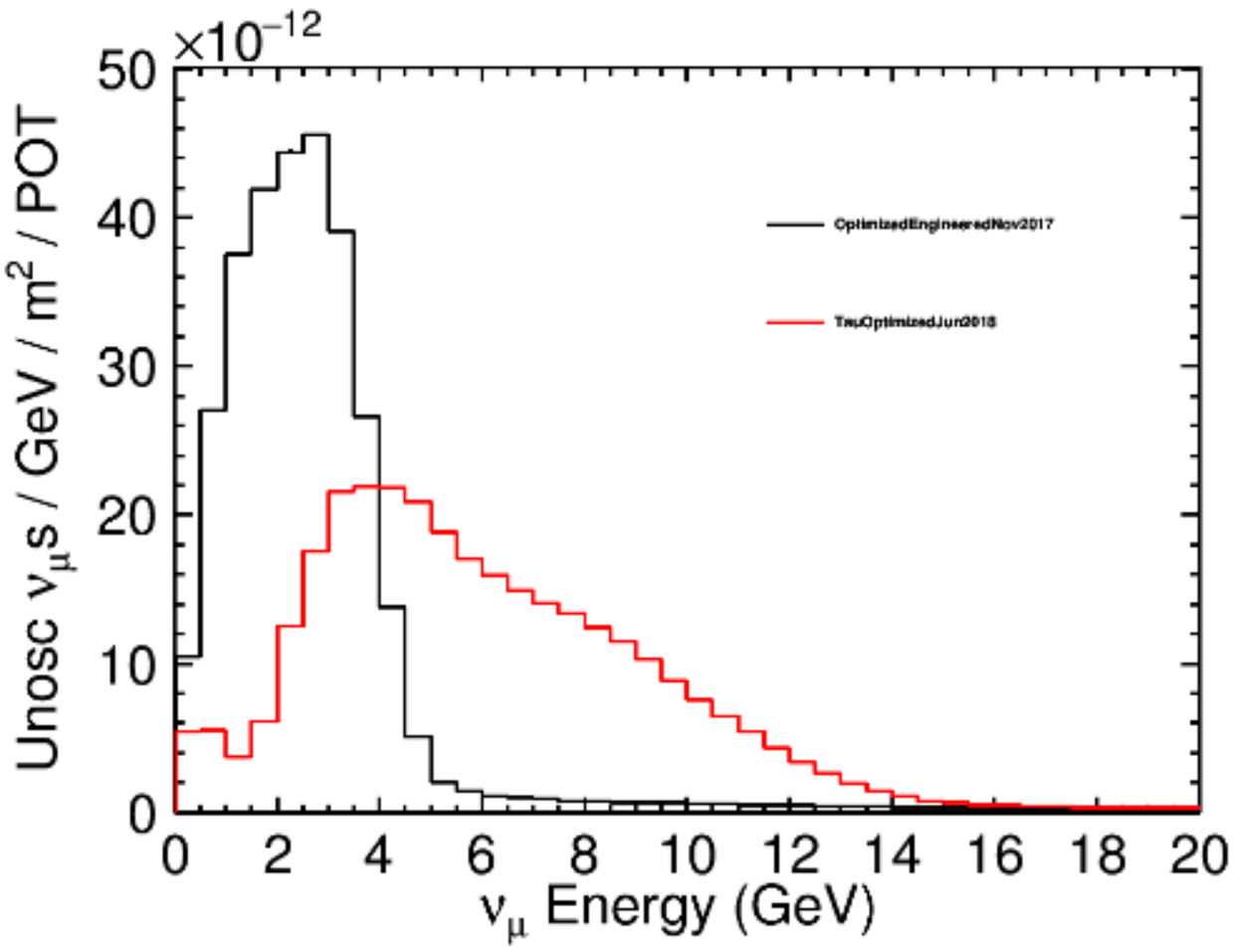


Figure 1.8: Comparison of standard and tau-optimized neutrino fluxes.

Toward TDR

- First draft due November 1st
    - Report on status and plans for missing pieces due today
- Goal of the first draft is to identify any holes in the document early
- Laura already put in text and figures
    - next: polish/update/add any missing plots