

# CC-Inclusive Cross Section Measured With The T2K Near Detector

Alfons Weber<sup>a,b</sup> for the T2K Collaboration

<sup>a</sup>University of Oxford; DWB, Keble Rd.; Oxford OX1 3RH; United Kingdom

<sup>b</sup>STFC Rutherford Appleton Laboratory; Harwell, Didcot OX11 0QX; United Kingdom

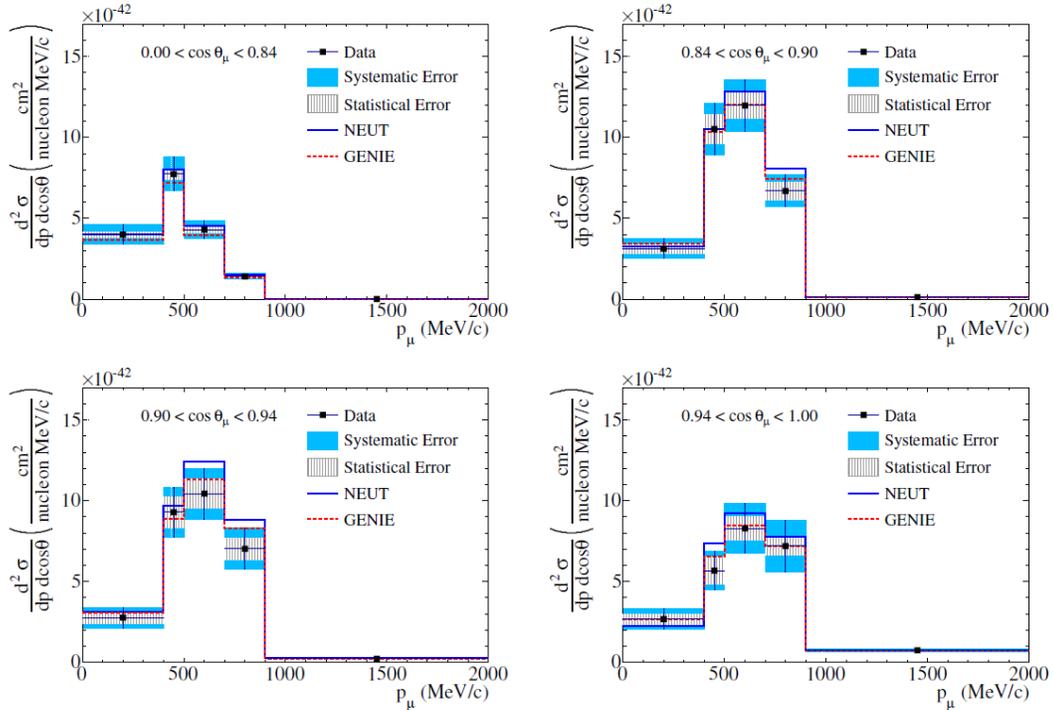
**Abstract.** T2K has performed the first measurement of muon neutrino inclusive charged current interactions on carbon at neutrino energies of  $\sim 1$  GeV where the measurement is reported as a flux-averaged double differential cross section in muon momentum and angle. The flux is predicted by the beam Monte Carlo and external data, including the results from the NA61/SHINE experiment. The data used for this measurement were taken in 2010 and 2011, with a total of  $1.08 \cdot 10^{20}$  protons-on-target. The analysis is performed on 4485 inclusive charged current interaction candidates selected in the most upstream fine-grained scintillator detector of the near detector. The flux-averaged total cross section is  $\langle \sigma_{CC} \rangle = (6.91 \pm 0.13(\text{stat}) \pm 0.84(\text{syst})) \cdot 10^{-39} \text{ cm}^2/\text{nucleon}$  for a mean neutrino energy of 0.85 GeV.

**Keywords:** charge current, neutrino interaction cross section, T2K experiment

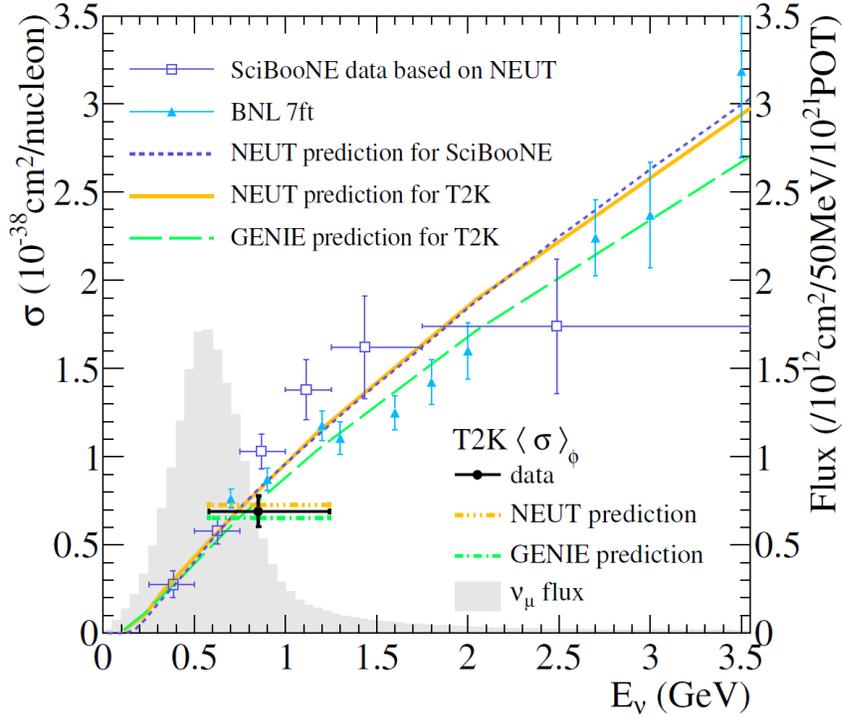
**PACS:** 13.15.+g, 14.60.Lm, 25.30.Pt

## SUMMARY

The flux integrated charge current inclusive cross section measurement as measured by the T2K near detector has just been submitted to PRD[1]. The main results are summarized in Figure 1 and 2.



**FIGURE 1.** The 4 plots show the CC-inclusive differential cross section in  $\text{cm}^2/\text{nucleon}/\text{MeV}$ , with statistical and systematics errors. Each graph corresponds to a different range of muon angle.



**FIGURE 2.** The figure shows the T2K total flux-averaged cross section with the NEUT and GENIE predictions for T2K and SciBooNE. The T2K data point is placed at the flux mean energy. The vertical error bars represent the total (statistical and systematic) uncertainty and the horizontal bar represents 68% of the flux of each side of the mean energy. The T2K flux distribution is shown in grey.

## ACKNOWLEDGMENTS

We thank the J-PARC accelerator team for the superb accelerator performance and CERN NA61 colleagues for providing essential particle production data and for their fruitful collaboration. We acknowledge the support of MEXT, Japan; NSERC, NRC and CFI, Canada; CEA and CNRS/IN2P3, France; DFG, Germany; INFN, Italy; Ministry of Science and Higher Education, Poland; RAS, RFBR and the Ministry of Education and Science of the Russian Federation; MEST and NRF, South Korea; MICINN and CPAN, Spain; SNSF and SER, Switzerland; STFC, U.K.; NSF and DOE, U.S.A. We also thank CERN for their donation of the UA1/NOMAD magnet and DESY for the HERA-B magnet mover system. In addition, participation of individual researchers and institutions in T2K has been further supported by funds from: ERC (FP7), EU; JSPS, Japan; Royal Society, UK; DOE Early Career program, and the A. P. Sloan Foundation, U.S.A.

## REFERENCES

1. K. Abe et al. (T2K collaboration), “Measurement of the Inclusive NuMu Charged Current Cross Section on Carbon in the Near Detector of the T2K Experiment”, arXiv:1302.4908, submitted to PRD.