

Data release

The ROOT file `JointNuMuAntiNuMuCC0piXsecDataRelease.root` contains the data-release for the paper *First combined measurement of the muon neutrino and antineutrino charged-current cross section without pions in the final state at T2K*. It contains the one-dimensional histograms (all `TH1D`) and the covariance matrices (`TMatrixTSym<double>`) in which are stored the results reported in the associated paper. The histograms are the following:

- `hNuMuCC0piXsecLinar` is a one-dimensional histogram where every bin is filled with the double differential ν_μ CC- 0π cross section for a muon momentum and cosine of the scattering angle reported in Table 1.
- `hAntiNuMuCC0piXsecLinar` same as before but for the double differential $\bar{\nu}_\mu$ CC- 0π cross section.
- `hXsecSumLinearResult` is the histograms of the sum of the two cross sections.
- `hXsecDifLinearResult` contains the difference.
- `hXsecAsyLinearResult` contains the asymmetry.

The covariance matrices of the statistical and systematics uncertainty for the two cross sections and their combinations are the following:

- `JointNuMuAntiNuMuCC0piXsecCovMatrixStat` is the covariance matrix of the statistical uncertainty associated with the two cross sections. It is a matrix 116×116 . The sub-matrix with elements from 0 to 57 refers to the ν_μ CC- 0π cross section, while from 58 to 116 to the $\bar{\nu}_\mu$ CC- 0π cross section.
- `JointNuMuAntiNuMuCC0piXsecCovMatrixSyst` is the covariance matrix of the systematics uncertainty associated with the two cross sections. As before, it is a matrix 116×116 which contains the correlations between the two cross sections.
- `covXsecSumStat` and `covXsecSumSyst` are the matrices associated to the sum.
- `covXsecDifStat` and `covXsecDifSyst` are the matrices associated to the difference.
- `covXsecAsyStat` and `covXsecAsySyst` are the matrices associated to the asymmetry.

The flux used in this analysis can be find [here](#).

| Bin index | $\cos \theta_\mu$ | p_μ [GeV/c] | Bin index | $\cos \theta_\mu$ | p_μ [GeV/c] |
|-----------|-------------------|-----------------|-----------|-------------------|-----------------|
| 0 | -1, 0.2 | 0, 30 | 29 | 0.85, 0.9 | 0.6, 0.8 |
| 1 | 0.2, 0.6 | 0, 0.3 | 30 | 0.85, 0.9 | 0.8, 1.0 |
| 2 | 0.2, 0.6 | 0.3, 0.4 | 31 | 0.85, 0.9 | 1.0, 1.5 |
| 3 | 0.2, 0.6 | 0.4, 0.5 | 32 | 0.85, 0.9 | 1.5, 30 |
| 4 | 0.2, 0.6 | 0.5, 0.6 | 33 | 0.9, 0.94 | 0, 0.4 |
| 5 | 0.2, 0.6 | 0.6, 30 | 34 | 0.9, 0.94 | 0.4, 0.5 |
| 6 | 0.6, 0.7 | 0, 0.3 | 35 | 0.9, 0.94 | 0.5, 0.6 |
| 7 | 0.6, 0.7 | 0.3, 0.4 | 36 | 0.9, 0.94 | 0.6, 0.8 |
| 8 | 0.6, 0.7 | 0.4, 0.5 | 37 | 0.9, 0.94 | 0.8, 1.25 |
| 9 | 0.6, 0.7 | 0.5, 0.6 | 38 | 0.9, 0.94 | 1.25, 2.0 |
| 10 | 0.6, 0.7 | 0.6, 0.8 | 39 | 0.9, 0.94 | 2.0, 30 |
| 11 | 0.6, 0.7 | 0.8, 30 | 40 | 0.94, 0.98 | 0, 0.4 |
| 12 | 0.7, 0.8 | 0, 0.3 | 41 | 0.94, 0.98 | 0.4, 0.5 |
| 13 | 0.7, 0.8 | 0.3, 0.4 | 42 | 0.94, 0.98 | 0.5, 0.6 |
| 14 | 0.7, 0.8 | 0.4, 0.5 | 43 | 0.94, 0.98 | 0.6, 0.8 |
| 15 | 0.7, 0.8 | 0.5, 0.6 | 44 | 0.94, 0.98 | 0.8, 1.0 |
| 16 | 0.7, 0.8 | 0.6, 0.8 | 45 | 0.94, 0.98 | 1.0, 1.25 |
| 17 | 0.7, 0.8 | 0.8, 30 | 46 | 0.94, 0.98 | 1.25, 1.5 |
| 18 | 0.8, 0.85 | 0, 0.3 | 47 | 0.94, 0.98 | 1.5, 2.0 |
| 19 | 0.8, 0.85 | 0.3, 0.4 | 48 | 0.94, 0.98 | 2.0, 3.0 |
| 20 | 0.8, 0.85 | 0.4, 0.5 | 49 | 0.94, 0.98 | 3.0, 30 |
| 21 | 0.8, 0.85 | 0.5, 0.6 | 50 | 0.98, 1.0 | 0, 0.5 |
| 22 | 0.8, 0.85 | 0.6, 0.8 | 51 | 0.98, 1.0 | 0.5, 0.7 |
| 23 | 0.8, 0.85 | 0.8, 1.0 | 52 | 0.98, 1.0 | 0.7, 0.9 |
| 24 | 0.8, 0.85 | 1.0, 30 | 53 | 0.98, 1.0 | 0.9, 1.25 |
| 25 | 0.85, 0.9 | 0, 0.3 | 54 | 0.98, 1.0 | 1.25, 2.0 |
| 26 | 0.85, 0.9 | 0.3, 0.4 | 55 | 0.98, 1.0 | 2.0, 3.0 |
| 27 | 0.85, 0.9 | 0.4, 0.5 | 56 | 0.98, 1.0 | 3.0, 5.0 |
| 28 | 0.85, 0.9 | 0.5, 0.6 | 57 | 0.98, 1.0 | 5.0, 30 |

Table 1: Binning used for the fit to the $p_\mu, \cos \theta_\mu$ distribution and for the definition of the data/MC corrections c_i .