NuFIT 6.0: Three-neutrino fit based on data available in September 2024

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Abstract: We present updated results for our global analysis of solar, atmospheric, reactor, and accelerator neutrino data in the framework of three-neutrino oscillations. We also provide χ^2 tables for various one-, two- and three-dimensional projections of the global analysis. If you use these results, please refer to both [1] and [2].

Solar experiments

- *External information*: Standard Solar Models [3].
- Chlorine total rate [4], 1 data point.
- Gallex & GNO total rates [5], 2 data points.
- SAGE total rate [6], 1 data point.
- SK1 1496-day energy and zenith spectrum [7], 44 data points.
- SK2 791-day energy and day/night spectrum [8], 33 data points.
- SK3 548-day energy and day/night spectrum [9], 42 data points.
- SK4 2970-day energy and day/night spectrum [10], 46 data points.

- SNO combined analysis [11], 7 data points.
- Borexino Phase-I 741-day low-energy data [12], 33 data points.
- Borexino Phase-I 246-day high-energy data [13], 6 data points.
- Borexino Phase-II 1292-day low-energy data [14], 192 data points.
- Borexino Phase-III 1432-day low-energy data [15], 120 data points.

Atmospheric experiments

- *External information*: Atmospheric neutrino fluxes [16].
- IC19 IceCube/DeepCore 3-year data (2012-2015) [17, 18], 140 data points.
- ◦ IC24 IceCube/DeepCore 9.3-year data (2012-2021) χ^2 map [19, 20] added to our global analysis.
- ◦ SK1-5 484.2 kiloton-year data [21], χ^2 map [22] added to our global analysis.

Reactor experiments

- KamLAND separate DS1, DS2, DS3 spectra [23] with Daya Bay reactor ν fluxes [24], 69 data points.
- SNO+ spectrum from partial fill 114 ton-yr [25] data and full fill 286 ton-yr data [26, 27], 17 data points.
- Double-Chooz FD/ND spectral ratio, with 1276-day (FD), 587-day (ND) exposures [28], 26 data points.
- Daya Bay 3158-day separate EH1, EH2, EH3 spectra [29], 78 data points.
- Reno 2908-day FD/ND spectral ratio [30], 45 data points.

Accelerator experiments

- MINOS 10.71×10^{20} pot ν_μ-disappearance data [31], 39 data points.
- MINOS 3.36×10^{20} pot $\bar{\nu}_\mu$-disappearance data [31], 14 data points.
- MINOS 10.6×10^{20} pot ν_e-appearance data [32], 5 data points.
- MINOS 3.3×10^{20} pot $\bar{\nu}_e$-appearance data [32], 5 data points.
- T2K 21.4×10^{20} pot ν_μ-disappearance data [33], 28 data points.
- T2K 21.4×10^{20} pot ν_e-appearance data [33], 9 data points for the CCQE and 7 data points for the CC1π samples.
- T2K 16.3×10^{20} pot $\bar{\nu}_\mu$-disappearance data [34], 19 data points.
- T2K 16.3×10^{20} pot $\bar{\nu}_e$-appearance data [35], 9 data points.
- NOvA 26.6×10^{20} pot ν_μ-disappearance data [36], 22 data points.
- NOvA 26.6×10^{20} pot ν_e-appearance data [36], 15 data points.
- NOvA 12.5×10^{20} pot $\bar{\nu}_\mu$-disappearance data [37], 76 data points.
- NOvA 12.5×10^{20} pot $\bar{\nu}_e$-appearance data [37], 13 data points.

Description of the χ^2 data tables

We provide four xz-compressed files, containing the χ^2 data tables for both Normal and Inverted Ordering of our global «IC19 w/o SK-atm» and «IC24 with SK-atm» analyses. Each file is divided into 22 sections, identified by a unique tag and corresponding to a particular one-, two- or three-dimensional projection. The tags and the meaning of the data columns for each section are listed below (note that $\ell = 1$ for NO and $\ell = 2$ for IO).

N°	Section tag	1st column	2nd column	3rd column	4th column
1	`# T23/DMA/DCP`	$\sin^2\theta_{23}$	$\Delta m^2_{3\ell}\,/\,[10^{-3}\text{ eV}^2]$	$\delta_{CP}\,/\,[\text{deg}]$	$\Delta\chi^2$
2	`# T13/T12`	$\sin^2\theta_{13}$	$\sin^2\theta_{12}$	$\Delta\chi^2$	—
3	`# T13/DMS`	$\sin^2\theta_{13}$	$\log_{10}(\Delta m^2_{21}\,/\,[\text{eV}^2])$	$\Delta\chi^2$	—
4	`# T12/DMS`	$\sin^2\theta_{12}$	$\log_{10}(\Delta m^2_{21}\,/\,[\text{eV}^2])$	$\Delta\chi^2$	—

N°	Section tag	1st column	2nd column	3rd column	4th column
5	`# T13/T23`	$\sin^2\theta_{13}$	$\sin^2\theta_{23}$	$\Delta\chi^2$	—
6	`# T13/DMA`	$\sin^2\theta_{13}$	$\Delta m^2_{3\ell}\,/\,[10^{-3}\text{ eV}^2]$	$\Delta\chi^2$	—
7	`# T23/DMA`	$\sin^2\theta_{23}$	$\Delta m^2_{3\ell}\,/\,[10^{-3}\text{ eV}^2]$	$\Delta\chi^2$	—
8	`# T13/DCP`	$\sin^2\theta_{13}$	$\delta_{CP}\,/\,[\text{deg}]$	$\Delta\chi^2$	—
9	`# T23/DCP`	$\sin^2\theta_{23}$	$\delta_{CP}\,/\,[\text{deg}]$	$\Delta\chi^2$	—
10	`# DMA/DCP`	$\Delta m^2_{3\ell}\,/\,[10^{-3}\text{ eV}^2]$	$\delta_{CP}\,/\,[\text{deg}]$	$\Delta\chi^2$	—
11	`# T12/T23`	$\sin^2\theta_{12}$	$\sin^2\theta_{23}$	$\Delta\chi^2$	—
12	`# T12/DCP`	$\sin^2\theta_{12}$	$\delta_{CP}\,/\,[\text{deg}]$	$\Delta\chi^2$	—
13	`# T12/DMA`	$\sin^2\theta_{12}$	$\Delta m^2_{3\ell}\,/\,[10^{-3}\text{ eV}^2]$	$\Delta\chi^2$	—
14	`# DMS/T23`	$\log_{10}(\Delta m^2_{21}\,/\,[\text{eV}^2])$	$\sin^2\theta_{23}$	$\Delta\chi^2$	—
15	`# DMS/DCP`	$\log_{10}(\Delta m^2_{21}\,/\,[\text{eV}^2])$	$\delta_{CP}\,/\,[\text{deg}]$	$\Delta\chi^2$	—
16	`# DMS/DMA`	$\log_{10}(\Delta m^2_{21}\,/\,[\text{eV}^2])$	$\Delta m^2_{3\ell}\,/\,[10^{-3}\text{ eV}^2]$	$\Delta\chi^2$	—
17	`# T13`	$\sin^2\theta_{13}$	$\Delta\chi^2$	—	—
18	`# T12`	$\sin^2\theta_{12}$	$\Delta\chi^2$	—	—
19	`# T23`	$\sin^2\theta_{23}$	$\Delta\chi^2$	—	—
20	`# DCP`	$\delta_{CP}\,/\,[\text{deg}]$	$\Delta\chi^2$	—	—
21	`# DMS`	$\log_{10}(\Delta m^2_{21}\,/\,[\text{eV}^2])$	$\Delta\chi^2$	—	—
22	`# DMA`	$\Delta m^2_{3\ell}\,/\,[10^{-3}\text{ eV}^2]$	$\Delta\chi^2$	—	—

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