

NuFIT 5.2: Three-neutrino fit based on data available in November 2022

Ivan Esteban,^a M. C. Gonzalez-Garcia,^{b,c,d} Michele Maltoni,^e Thomas Schwetz,^f
Albert Zhou^f

^a*Center for Cosmology and AstroParticle Physics (CCAPP) and Department of Physics, Ohio State University, Columbus, Ohio 43210, USA*

^b*Departament de Física Quàntica i Astrofísica and Institut de Ciències del Cosmos, Universitat de Barcelona, Diagonal 647, E-08028 Barcelona, Spain*

^c*Institució Catalana de Recerca i Estudis Avançats (ICREA), Pg. Lluís Companys 23, 08010 Barcelona, Spain.*

^d*C.N. Yang Institute for Theoretical Physics, State University of New York at Stony Brook, Stony Brook, NY 11794-3840, USA*

^e*Instituto de Física Teórica UAM/CSIC, Calle de Nicolás Cabrera 13-15, Universidad Autónoma de Madrid, Cantoblanco, E-28049 Madrid, Spain*

^f*Institut für Astroteilchenphysik, Karlsruher Institut für Technologie (KIT), D-76021 Karlsruhe, Germany*

E-mail: esteban.6@osu.edu, maria.gonzalez-garcia@stonybrook.edu,
michele.maltoni@csic.es, schwetz@kit.edu, albert.zhou@kit.edu

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]. Data sets which have been updated with respect to NuFIT 5.1 are marked by the “ $\Rightarrow$ ” tag.

Solar experiments

- *External information:* Standard Solar Model [3].
- Chlorine total rate [4], 1 data point.
- Gallex & GNO total rates [5], 2 data points.
- SAGE total rate [6], 1 data point.
- SK1 full energy and zenith spectrum [7], 44 data points.
- SK2 full energy and day/night spectrum [8], 33 data points.
- SK3 full energy and day/night spectrum [9], 42 data points.
- SK4 2970-day day-night asymmetry and energy spectrum [10], 24 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.
- $\Rightarrow$ Borexino Phase-II 1292-day low-energy data [14], 192 data points.

Atmospheric experiments

- *External information:* Atmospheric neutrino fluxes [15].
- IceCube/DeepCore 3-year data [16, 17], 64 data points.
- SK1-4 364.8 kiloton years [10], χ^2 map [18] added to our global analysis.

Reactor experiments

- KamLAND separate DS1, DS2, DS3 spectra [19] with Daya Bay reactor ν fluxes [20], 69 data points.
 - Double-Chooz FD/ND spectral ratio, with 1276-day (FD), 587-day (ND) exposures [21], 26 data points.
- ⇒ Daya Bay 3158-day separate EH1, EH2, EH3 spectra [22], 78 data points.
- Reno 2908-day FD/ND spectral ratio [23], 45 data points.

Accelerator experiments

- MINOS 10.71×10^{20} pot ν_μ -disappearance data [24], 39 data points.
- MINOS 3.36×10^{20} pot $\bar{\nu}_\mu$ -disappearance data [24], 14 data points.
- MINOS 10.6×10^{20} pot ν_e -appearance data [25], 5 data points.
- MINOS 3.3×10^{20} pot $\bar{\nu}_e$ -appearance data [25], 5 data points.
- T2K 19.7×10^{20} pot ν_μ -disappearance data [26], 35 data points.
- T2K 19.7×10^{20} pot ν_e -appearance data [26], 23 data points for the CCQE and 16 data points for the CC1 π samples.
- T2K 16.3×10^{20} pot $\bar{\nu}_\mu$ -disappearance data [26], 35 data points.
- T2K 16.3×10^{20} pot $\bar{\nu}_e$ -appearance data [26], 23 data points.
- NOvA 13.6×10^{20} pot ν_μ -disappearance data [27], 76 data points.
- NOvA 13.6×10^{20} pot ν_e -appearance data [27], 13 data points.
- NOvA 12.5×10^{20} pot $\bar{\nu}_\mu$ -disappearance data [27], 76 data points.
- NOvA 12.5×10^{20} pot $\bar{\nu}_e$ -appearance data [27], 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 «w/o SK-atm» and «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	1 st column	2 nd column	3 rd column	4 th column
1	# T23/DMA/DCP	$\sin^2 \theta_{23}$	$\Delta m_{3\ell}^2 / [10^{-3} \text{ eV}^2]$	$\delta_{\text{CP}} / [\text{deg}]$	$\Delta\chi^2$
2	# T13/T12	$\sin^2 \theta_{13}$	$\sin^2 \theta_{12}$	$\Delta\chi^2$	—
3	# T13/DMS	$\sin^2 \theta_{13}$	$\log_{10}(\Delta m_{21}^2 / [\text{eV}^2])$	$\Delta\chi^2$	—
4	# T12/DMS	$\sin^2 \theta_{12}$	$\log_{10}(\Delta m_{21}^2 / [\text{eV}^2])$	$\Delta\chi^2$	—

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

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