NuFIT 3.2: Three-neutrino fit based on data available in January 2018

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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 \( \chi^2 \) tables for the various one- and two-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 3.1 are marked by the “⇒” 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 2055-day day-night asymmetry [10] and 2365-day energy spectrum [11], 24 data points.
- SNO combined analysis [12], 7 data points.
- Borexino Phase-I 741-day low-energy data [13], 33 data points.
- Borexino Phase-I 246-day high-energy data [14], 6 data points.
- Borexino Phase-II 408-day low-energy data [15], 42 data points.
Atmospheric experiments

- **External information**: Atmospheric neutrino fluxes [16].
- IceCube/DeepCore 3-year data [17, 18], 64 data points.

Reactor experiments

- KamLAND separate DS1, DS2, DS3 spectra [19] with Daya-Bay reactor $\nu$ fluxes [20], 69 data points.
- Double-Chooz FD-1/ND and FD-II/ND spectral ratios, with 455-day (FD-I), 363-day (FD-II) and 258-day (ND) exposures [21], 56 data points.
- Daya-Bay 1230-day EH2/EH1 and EH3/EH1 spectral ratios [22], 70 data points.
- Reno 1500-day FD/ND spectral ratios [23], 26 data points.

Accelerator experiments

- MINOS $10^{7.1} \times 10^{20}$ pot $\nu_\mu$-disappearance data [24], 39 data points.
- MINOS $3.36 \times 10^{20}$ pot $\bar{\nu}_\mu$-disappearance data [24], 14 data points.
- MINOS $10.6 \times 10^{20}$ pot $\nu_e$-appearance data [25], 5 data points.
- MINOS $3.3 \times 10^{20}$ pot $\bar{\nu}_e$-appearance data [25], 5 data points.
- T2K $14.93 \times 10^{20}$ pot $\nu_\mu$-disappearance data [26], 55 data points.
- T2K $14.93 \times 10^{20}$ pot $\nu_e$-appearance data [26], 39 data points.
- T2K $7.62 \times 10^{20}$ pot $\bar{\nu}_\mu$-disappearance data [26], 55 data points.
- T2K $7.62 \times 10^{20}$ pot $\bar{\nu}_e$-disappearance data [26], 23 data points.

⇒ NO$\nu$A $8.85 \times 10^{20}$ pot $\nu_\mu$-disappearance data [27], 72 data points.
⇒ NO$\nu$A $8.85 \times 10^{20}$ pot $\nu_e$-appearance data [27], 19 data points.

Description of the $\chi^2$ data tables

We provide two gzip-compressed files (one for Normal and one for Inverted Ordering) containing the $\chi^2$ data tables for our global analysis. Each file is divided into 21 sections, identified by a unique tag and corresponding to a particular one- or two-dimensional projections. 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).

<table>
<thead>
<tr>
<th>N°</th>
<th>Section tag</th>
<th>1st column</th>
<th>2nd column</th>
<th>3rd column</th>
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<tr>
<td>1</td>
<td># T13/T12</td>
<td>$\sin^2 \theta_{13}$</td>
<td>$\sin^2 \theta_{12}$</td>
<td>$\Delta \chi^2$</td>
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<tr>
<td>2</td>
<td># T13/DMS</td>
<td>$\sin^2 \theta_{13}$</td>
<td>$\log_{10}(\Delta m^2_{21}/[\text{eV}^2])$</td>
<td>$\Delta \chi^2$</td>
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<tr>
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<tr>
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<td>$\sin^2 \theta_{23}$</td>
<td>$\Delta \chi^2$</td>
</tr>
<tr>
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<tr>
<td>6</td>
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<td>$\Delta m^2_{3\ell}/[10^{-3}\text{ eV}^2]$</td>
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<td></td>
<td>$\Delta \chi^2$</td>
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</table>

References


[12] SNO collaboration, B. Aharmim et al., Combined Analysis of all Three Phases of Solar Neutrino Data from the Sudbury Neutrino Observatory, 1109.0763.