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Mass Eigenstate Composition of ^{8}B Solar Neutrinos[1]

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Abstract. 91±2% of ^{8}Boron solar neutrinos observed by SNO are ν_2 mass eigenstates.

Around the MSW "triangle" , where $\langle P(\nu_e \to \nu_e)\rangle = 0.35$, the composition of ^{8}Boron solar neutrinos is either 65% or 100% ν_2 except at the top and bottom right hand corners of this triangle. Nature's choice for the solar oscillation parameters is at the top right hand corner, the LMA corner, where the fraction of ν_2 is 91±2%, see Fig. 1. Details of this two flavor calculation can be found in [1] using the analytical formulation of [2] and the global solar analysis of SNO, [3]. For non-vanishing θ_{13}, the ν_2 fraction is reduced by $\sin^2\theta_{13}$, see Ref. [1].

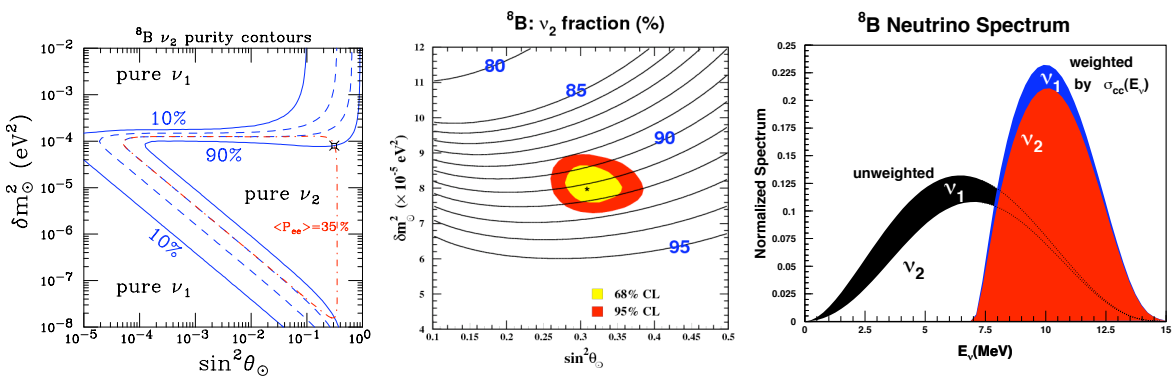

Figure 1. Left panel: The mass eigenstate composition of ^{8}Boron solar neutrinos in $\delta m^2_\odot$ v $\sin^2\theta_\odot$ plane showing the MSW triangle (red) dotdashed line. Middle panel: Focusing in on the current allowed region. Right panel: The normalized ^{8}B spectrum broken into its ν_1 and ν_2 components both unweighted, left, and weighted, right, by the charge current cross section using a 5.5 MeV threshold on the kinetic energy of the recoil electron and the best fit point for the solar oscillation parameters given in [3]. These weighted mass eigenstate fractions are the fractions that SNO is sensitive to. All panels of this figure are for vanishing $\sin^2\theta_{13}$.

[1] H. Nunokawa, S. J. Parke and R. Zukanovich Funchal, "What fraction of boron-8 solar neutrinos arrive at the earth as a nu(2) mass eigenstate?," Phys. Rev. D **74**, 013006 (2006) [arXiv:hep-ph/0601198].
[2] S. J. Parke, Phys. Rev. Lett. **57**, 1275 (1986); S. J. Parke and T. P. Walker, Phys. Rev. Lett. **57**, 2322 (1986).
[3] B. Aharmim *et al.* [SNO Collaboration], Phys. Rev. C **72**, 055502 (2005) [arXiv:nucl-ex/0502021].

[1] Poster presented at "XXII International Conference on Neutrino Physics and Astrophysics," June 13-19, 2006; Santa Fe, NM, USA.