Contribution ID : **67** Type : **not specified**

Analytical description of neutrino oscillations in the earth

Monday, 6 October 2008 19:00 (0:30)

Abstract content

We derive an analytical description of neutrino oscillations in matter based on the Magnus exponential representation of the time evolution operator. Our approach is valid in a wide range of the neutrino energies and properly accounts for the modifications that the respective probability transitions suffer when neutrinos originated in different sources traverse the Earth. The present approximation considerably improves over other perturbative treatments existing in the current literature. Furthermore, the analytical expressions derived inside the Magnus framework are remarkably simple, which facilitates their practical use. When applied to the calculation of the day-night asymmetry in the solar neutrino flux our result reproduces the numerical calculation with an accuracy better than 1% for the first order approximation. When the approximation is extended to the second order, the accuracy of the method is further improved by almost one order of magnitude, and it is still better than 5% even for neutrino energies as large as 100 MeV. In the GeV regime characteristic of atmospheric and accelerator neutrinos this accuracy is complemented by a good reproduction of the position of the maxima in the flavor transition probabilities.

Summary

Primary author(s) : Dr. SUPANITSKY, Daniel (Dep. Altas Energias, Inst. de Ciencias Nucleares, Universidad Nacional Autonoma de Mexico, Mexico DF, CP 04510)

Presenter(s) : Dr. SUPANITSKY, Daniel (Dep. Altas Energias, Inst. de Ciencias Nucleares, Universidad Nacional Autonoma de Mexico, Mexico DF, CP 04510)

Session Classification : Neutrino Physics