



Milind Diwan <milind.diwan@gmail.com>

NuMI vs WideBand beam rates

1 message

Mary Bishai <mbishai@bnl.gov>

Tue, Feb 19, 2008 at 3:57 PM

To: bonnie.fleming@yale.edu

Cc: Milind Diwan <diwan@bnl.gov>

Dear Bonnie,

The appearance sensitivities for a 5kT LAr detector in the NuMI on-axis beam at 735km or the on-axis wide band beam at 1300km are the same. The appearance rates at $\sin^2 2\theta_{13}=0.02$ are 11 and 9 nue events/MW yr. This may seem intuitive since at DUSEL the flux is 0.32 at Soudan baseline, but let me try to explain why

- 1) The wide-band on-axis beam starts out with 1.5x the rate of the NuMI on-axis beam mostly because of the wider tunnel and higher horn currents which increases the low E neutrino flux. Basically we fixed what was wrong with the NuMI design for low energy oscillations.
- 2) The larger neutrino rate at Soudan from NuMI on-axis peaks at 3 GeV, whereas the maximum of the oscillation actually occurs at 1.5 GeV i.e., only a small part of the NuMI flux contributes to the nue appearance signal. At the 1st oscillation maxima in Soudan the rate is less than a 1/3 of the peak rate - so you have lost what you gained in the shorter distance. In contrast at DUSEL the oscillation maximum is at 2.4 GeV which is right where the 60 GeV beam peaks - so all the rate in the focusing peak contributes to the appearance signal.
- 3) CPV and hierarchy are better at DUSEL given the same appearance rate for all the reasons discussed before.

I need to go now, but hopefully after the SLAC meeting we can get together and go through more numbers.

Cheers - and GOOD LUCK

Mary Bishai Office: 3-181
Associate Physicist Pager:
Brookhaven National Laboratory Tel: 631-344-4877
Bldg 510E, P.O. Box 5000 FAX: 631-344-4741
Upton, NY 11973-5000 E-mail: mbishai@bnl.gov
