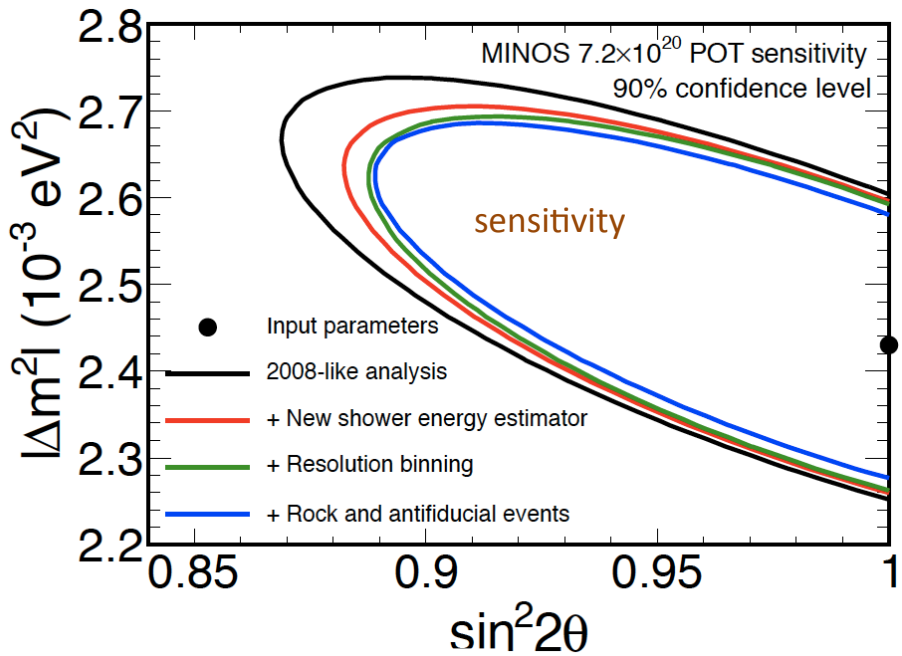
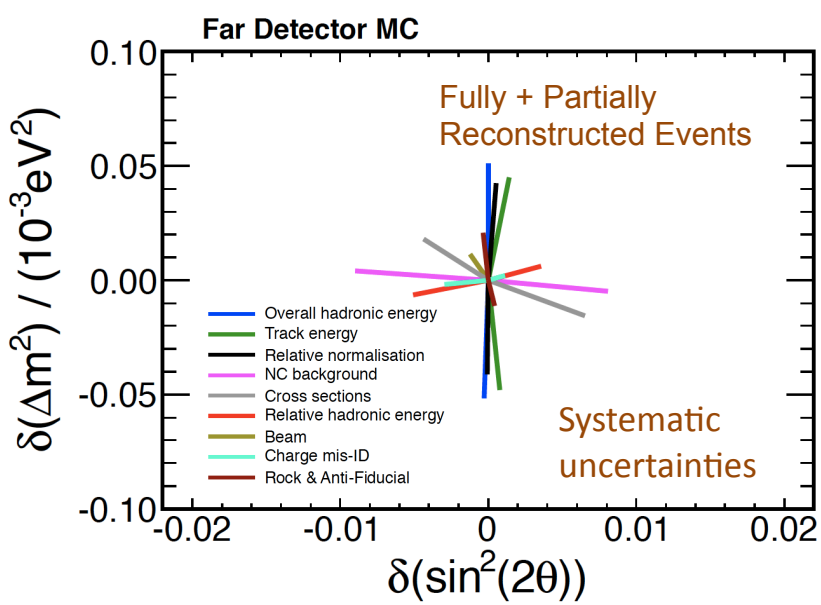
MINOS muon neutrino charged current disappearance: analysis improvements and results (arXiv:1103.0340)

April 2011

Since the previous result, MINOS has more than doubled the dataset: $3.4\times10^{20} \rightarrow 7.25\times10^{20}$ POT, and incorporated several analysis improvements:

1) New hadronic shower energy estimation, based on a kNN technique, improves energy resolution at low energy
2) No track charge-sign requirement to include low momentum events
3) Enhanced charged current event selection at low energy
4) Include partially reconstructed events originating outside of the Far Detector fiducial volume [also referred to as rock and antifiducial (RAF) events]
5) Grouping events according to their energy resolution





Run Period	POT (10^{20})	Predicted (No oscillations) Fully	Predicted (No oscillations) Partially	Observed (Far Detector) Fully	Observed (Far Detector) Partially
I	1.269	426	375	318	357
II	1.943	639	565	511	555
III	3.881	1,252	1,130	1,037	977
HE	0.153	134	136	120	128
Total	7.246	2,451	2,206	1,986	2,017

TABLE II: Numbers of events classified in the Far Detector as fully and partially reconstructed charged current interactions shown for all running periods. The predicted numbers are calculated under the assumption of no oscillations.

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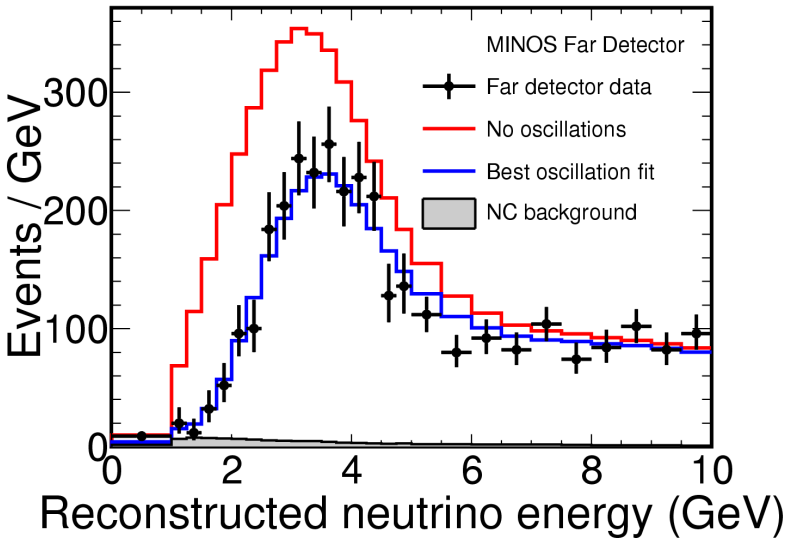
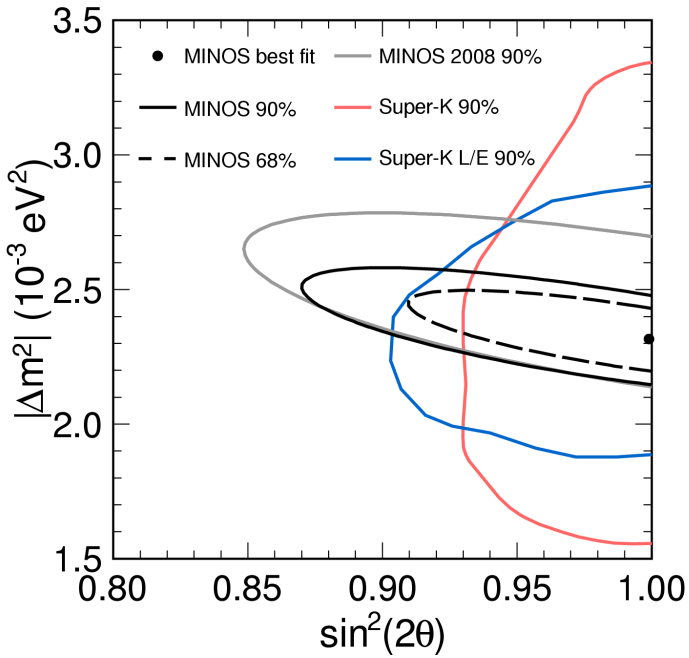
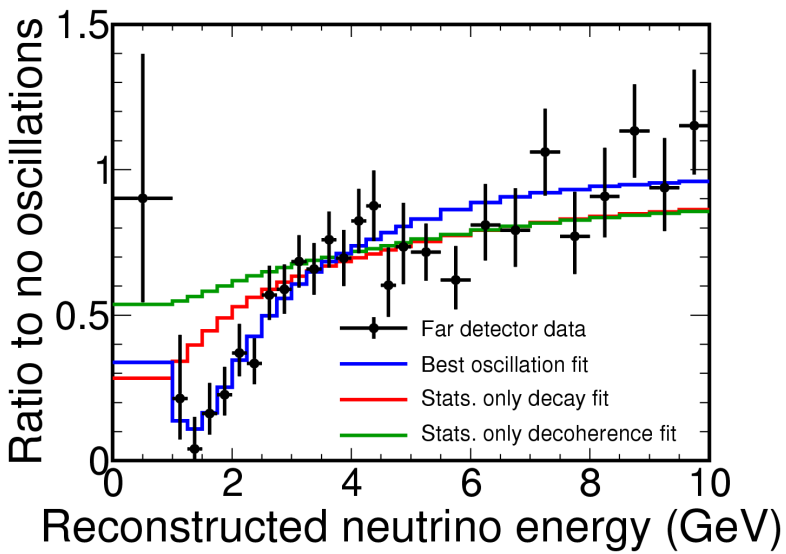
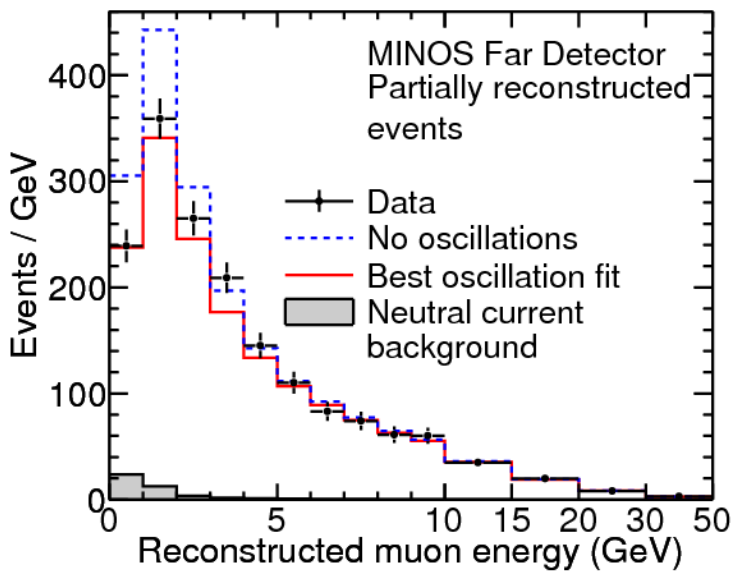
Best fit: $\left|\Delta m^2\right| = 2.32^{+0.12}_{-0.08} \times 10^{-3}\ \mathrm{eV}^2$

$\sin^2(2\theta) > 0.90$ (90% C.L.)