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Here Comes the Sun: Solar Parameters in Long-Baseline Accelerator Neutrino Oscillations

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Long-baseline (LBL) accelerator neutrino oscillation experiments, such as
NOvA and T2K in the current generation, and DUNE-LBL and HK-LBL in the coming years, will measure the remaining unknown oscillation parameters with excellent precision. These analyses assume external input on the solar parameters, θ_{12} and Δm^2_{21}, from solar
experiments such as SNO, SK, and Borexino, as well as reactor experiments like Kam-LAND. Here we investigate their role in long-baseline experiments. We show that, without input on solar parameters, the sensitivity to detecting and quantifying CP violation is
significantly, but not entirely, reduced. Thus long-baseline accelerator experiments can actually determine the solar parameters, and thus all six oscillation parameters, without input from any other oscillation experiment. In particular, Δm^2_{21} can be determined; thus
DUNE-LBL and HK-LBL can measure both the solar and atmospheric mass splittings in their long-baseline analyses alone. While their sensitivities are not competitive with existing constraints, they are very orthogonal probes of solar parameters and provide a key consistency check of a less probed sector of the three-flavor oscillation picture. Further-
more, we also show that the true values of the solar parameters play an important role in the sensitivity of other oscillation parameters such as the CP violating phase δ.

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