The phenomenology of Sterile neutrinos at Long-baseline.

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A major goal of present and future long-baseline neutrino oscillation experiments is to establish that leptons violate CP, or else to place a stringent upper limit on any such violation. Our thinking about these experiments usually assumes the standard neutrino paradigm, in which there are just three neutrino mass eigenstates separated by just two independent mass-squared splittings, three mixing angles, and just one CP-violating phase relevant to oscillation. However, a variety of short-baseline anomalies hint at the possible existence of short-wavelength oscillations, driven by one or more O(1 eV2) mass-squared splittings that are much larger than the two splittings of the standard paradigm. These short-wavelength oscillations are purportedly already significant when the (Travel distance L)/(Energy E) of neutrinos in a beam is only ~1 km/GeV. Of course, they are still present at the far detector of any long-baseline experiment, where L/E is, say, ~ 500 km/GeV.

I will talk about the consequences of the short-wavelength oscillations - should they be real - for measurements at long baselines, especially measurements that probe CP violation. We find that these consequences could be considerable. For example, it is possible for long-baseline results, interpreted without taking the short-wavelength oscillations into account, to imply that CP violation is very small or totally absent, when in reality it is very large. In addition, long-baseline measurements interpreted as determining the sole oscillation-relevant CP-violating phase in the standard paradigm could in fact be measuring something else.