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Measuring the Leptonic Dirac CP Phase with Muon Decay at Rest

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With the 1-3 mixing angle measured at reator neutrino experiments Daya Bay and RENO, there are still three unknown oscillation variables: the neutrino mass hierarchy, the octant of the atmospheric mixing angle, and the leptonic CP phase. Of these three, the CP phase is the most difficult to be measured precisely and important for distinguishing flavor symmetries. I will first review the status of CP measurement and then introduce a new proposal with muon decay at rest (muDAR). Currently, accelerator neutrino experiments such as T2K, NOvA, and DUNE are the most promising for CP measurement. Nevertheless, they suffer
from several problems of degeneracy, efficiency, sensitivity, and theoretical armbiguities such as non-unitarity mixing (NUM) and
non-standard interaction (NSI). The situation can be improved by adding a muon decay at rest (muDAR) source. With T2(H)K running in neutrino mode and muDAR in anti-neutrino mode, both using the same detector, the CP measurement becomes more precise can break the degeneracy between \delta and 180ˆo - \delta. Most importantly, muDAR can guarantee the CP sensitivity against NUM and NSI. The same configuration can also apply to next-generation medium baseline reactor neutrino experiments like JUNO and RENO-50, enhancing their physics potential from just mass hierarchy to also CP. With only one source and no extra detectors, this dessign is much better than DAEdLAS which requires 3 sources, but only 20% duty factor and 4 times higher luminosity for each.

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