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## Cosmic Neutrino Flavor Ratios with Broken v\_μ-v\_τ Symmetry

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Reactor neutrino experiments have now observed a nonzero value for \theta\_{13} with a significance above 10sigma. Nonzero values for theta\_13 break a  $\nu_{\mu}$ - $\nu_{\tau}\tau$  symmetry, which has qualitative as well as quantitative implications for the time-evolution of neutrino flavors. In particular, the large-distance flavor evolution matrix, non-invertible with  $\nu_{\mu}$ - $\nu_{\tau}\tau$  symmetry, becomes invertible. This means that measurements of neutrino flavor ratios at Earth can now be inverted to directly reveal the flavor ratios injected at cosmically distant sources. With the updated values of the three neutrino mixing angles, we obtain the inverted large-distance evolution matrix and use it to derive several phenomenological relations between the injection flavor ratios and the observable ratios at Earth. Taking the three popular injection models as examples, we also exhibit the shift of Earthly observed flavor ratios from the corresponding values in the case with  $\nu_{\mu}$ - $\nu_{\tau}\tau$  symmetry.

## **Summary**

Stated in abstract

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