Contribution ID: **43** Type: **Talk**

Neutrino Non-Standard Interactions: a solution to the NOvA and T2K tension

Tuesday 13 December 2022 15:30 (15 minutes)

The latest data of the two long-baseline accelerator experiments NOvA and T2K, interpreted in the standard 3-flavor scenario, display a discrepancy. A mismatch in the determination of the standard CP-phase $\delta_{\rm CP}$ extracted by the two experiments is evident in the normal neutrino mass ordering. While NOvA prefers values close to $\delta_{\rm CP} \sim 0.8\pi$, T2K identifies values of $\delta_{\rm CP} \sim 1.4\pi$. Such two estimates are in disagreement at more than 90% C.L. for 2 degrees of freedom. We show that such a tension can be resolved if one hypothesizes the existence of complex neutral-current non-standard interactions (NSI) of the flavor changing type involving the $e-\mu$ or the $e-\tau$ sectors with couplings $|\varepsilon_{e\mu}| \sim |\varepsilon_{e\tau}| \sim 0.2$. Remarkably, in the presence of such NSI, both experiments point towards the same common value of the standard CP-phase $\delta_{\rm CP} \sim 3\pi/2$. Our analysis also
highlights an intriguing preference for maximal CP-violation in the non-standard sector with the NSI CP-phases having best fit close to $\phi_{e\mu} \sim \phi_{e\tau} \sim 3\pi/2$, hence pointing towards imaginary NSI couplings.

Session

Neutrino Physics

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Session Classification: WG7 - Neutrino Physics