



**S N BOSE NATIONAL CENTRE
FOR BASIC SCIENCES**

Block JD, Sector III, Salt Lake, Kolkata 700 106

DEPARTMENTAL SEMINAR

Department of Astrophysics and High Energy Physics

30th November, 2023

4.00 PM

ONLINE/ FERMION

SPEAKER

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(KIT), Germany

TITLE OF THE TALK

**Impact of Non-Standard Neutrino Interactions in the current and
future Long-Baseline Neutrino Experiments**

ABSTRACT

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 δ_{CP} extracted by the two experiments is evident in the normal neutrino mass ordering. While NOvA prefers values close to $\delta_{CP} \sim 0.8\pi$, T2K identifies values of $\delta_{CP} \sim 1.4\pi$. 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 $|\epsilon_{e\mu}| \sim |\epsilon_{e\tau}| \sim 0.2$. Remarkably, in the presence of such NSI, both experiments point towards the same common value of the standard CP-phase $\delta_{CP} \sim 3\pi/2$. 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 $\varphi_{e\mu} \sim \varphi_{e\tau} \sim 3\pi/2$, hence pointing towards imaginary NSI couplings. We also explore how the combined analysis of both the above-mentioned couplings even fit better to both the T2K and NOvA data and hence alleviates the tension. In addition, we show how well these NSI couplings can be reconstructed in the future long-baseline experiments like DUNE and T2HK.

We further show that DUNE wide-band spectra plays an important role in breaking the degeneracies between these couplings at appreciable confidence levels.

HOST FACULTY

Prof. Amitabha Lahiri, Senior Professor
Dept. of ASTROPHYSICS AND HIGH ENERGY PHYSICS
