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Heavy sterile neutrinos contributions to the angular distribution of $B \to D^* \ell \nu$ decays

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In this talk, I will review the bounds that can be inferred on New Physics couplings to heavy sterile neutrinos N from the recent measurements performed by the Belle collaboration of the angular analysis of $B \to D^* \ell \nu$ decays, with $\ell = e, \mu$. Indeed, a sterile neutrino N may lead to competing $B \to D^* \ell N$ decays and Belle might have measured an incoherent sum of these two independent channels. After reviewing the theoretical formalism required to describe this phenomenon in full generality, I will first discuss the bump hunt in the $M^2_{\rm miss}$ Belle distribution performed to search for evidences of an additional massive neutrino, which produced a small hint at $M^2_{\rm miss} \sim (354\,{\rm MeV})^2$. However, the Belle angular analysis is sensitive to N masses up to $O(50\,{\rm MeV})$, preventing us to further inspect this hint. I will therefore review the studied potential impact of this additional channel in the allowed mass range on the measured angular distributions and extract model-independent bounds on the new-physics couplings which could mediate such an interaction. In particular, in the mass window that we inspected, I will give the most stringent bounds for vector and left-handed scalar operators to date.

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