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Recent Neutrino Parameters Impact on the Effective Majorana Neutrino Mass in $0\nu\beta\beta$ Decay

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We explore the impact of recent updates to neutrino oscillation parameters and the sum of neutrino masses on the sensitivity of neutrinoless double-beta ($0\nu\beta\beta$) decay experiments. By incorporating the latest cosmological constraints on the sum of neutrino masses and laboratory measurements on oscillations, we constrain the sum of neutrino masses for both the normal hierarchy (NH) and the inverted hierarchy (IH). Our analysis reveals a narrow range for the sum of neutrino masses, approximately 0.06 eV/c^2 for NH and 0.102 eV/c^2 for IH. Using these constraints, we compute the effective Majorana masses for both NH and IH scenarios and establish the corresponding allowed regions. Notably, we find that the minimum neutrino mass is non-zero, as constrained by the current oscillation parameters. Furthermore, we estimate the half-life of $0\nu\beta\beta$ decay using these effective Majorana masses for both NH and IH. Our findings indicate that upcoming ton-scale experiments will comprehensively explore the IH scenario, while 100-ton-scale experiments will effectively probe the parameter space for the NH scenario.

Primary author: MEI, Dongming

Presenter: MEI, Dongming

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