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Quantum decoherence and CP violation at Protvino to ORCA

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In this work, we study the impact of the environmental decoherence at Protvino to ORCA (P2O) experiment which has a substantial baseline of 2595 kilometres. We simulate this experiment assuming different phenomenological models and by considering energy dependency of decoherence parameter, $\Gamma \propto E_\nu^n$ ($n = 0, \pm 1, \pm 2$). We estimate the sensitivity of P2O experiment to obtain the upper bounds on Γ parameters in each of these cases. Additionally, we use these bounds to illustrate the effect of environmental decoherence on mass hierarchy (MH) and CP violation sensitivity of this experiment.

We have noted that P2O poses the strong bound on $\Gamma \leq 1.89 \times 10^{-24}\ GeV$ (90% CL) for the case of $n = 0$. Moreover, we observed that while the MH sensitivity has not changed significantly in all the cases, CP violation sensitivity increased above the standard case for all true values of δ_{CP}.

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