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# Revisiting quantum black holes from effective loop quantum gravity #21

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Abstract: This work examines a family of loop quantizations for the classical Kruskal spacetimes using the effective description motivated from loop quantum gravity for four generic parameters, $c_o, m, \delta_b$, and $\delta_c$, where the latter two denote the polymerization parameters capturing the underlying quantum geometry. The focus lies on the family where polymerization parameters remain constant on dynamical trajectories, and of which the Ashtekar-Olmedo-Singh (AOS) and Corichi-Singh (CS) models emerge as special cases. General features of singularity resolution in all these models due to quantum gravity effects are studied, and the solutions are analytically extended across the white hole (WH) and black hole (BH) horizons to the exterior. It is found that the leading term in the asymptotic expansion of the Kretschmann scalar is $r^{-4}$. However, for AOS and CS models, black holes with masses greater than solar mass exhibit the dominant term behaving as $r^{-6}$ for the size of the observable universe, allowing for the analysis to phenomenologically constrain the choice of parameters for other models. Additionally, the parameter $c_o$ can be uniquely fixed by requiring the Hawking temperature at the BH horizon to the leading order to be consistent with its classical value for a macroscopic BH. Assuming that the BH and WH masses are of the same order, a family of choices of $\delta_b$ and $\delta_c$ is identified, which share all the desired properties of the AOS model.

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