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## **(G\*) (POS-25) Quantum signatures of black hole mass superpositions**

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In his seminal work, Bekenstein conjectured that quantum-gravitational black holes possess a discrete mass spectrum, due to quantum fluctuations of the horizon area. The existence of black holes with quantized mass implies the possibility of considering superposition states of a black hole with different masses. Here we construct a spacetime generated by a BTZ black hole in a superposition of masses, using the notion of nonlocal correlations and automorphic fields in curved spacetime. This allows us to couple a particle detector to the black hole mass superposition. We show that the detector's dynamics exhibits signatures of quantum-gravitational effects arising from the black hole mass superposition in support of and in extension to Bekenstein's original conjecture.

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