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Origin of Dynamical Quantum Non-locality[1] CESAR E. PACHON, Universidad Industrial de Santander, LEONARDO A. PACHON, University of Antioquia — Non-locality is one of the hallmarks of quantum mechanics and is responsible for paradigmatic features such as entanglement and the Aharonov-Bohm effect. Non-locality comes in two "flavours": a *kinematic non-locality*– arising from the structure of the Hilbert space– and a *dynamical non-locality*– arising from the quantum equations of motion–. Kinematic non-locality is unable to induce any change in the probability distributions, so that the "action-at-a-distance" cannot manifest. Conversely, dynamical non-locality does create explicit changes in probability, though in a "causality-preserving" manner. The origin of non-locality of quantum measurements and its relations to the fundamental postulates of quantum mechanics, such as the uncertainty principle, have been only recently elucidated. Here we trace the origin of dynamical non-locality to the superposition principle. This relation allows us to establish and identify how the uncertainty and the superposition principles determine the non-local character of the outcome of a quantum measurement. Being based on group theoretical and path integral formulations, our formulation admits immediate generalizations and extensions to to, e.g., quantum field theory.

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