Sending Signals to Space-Like Separated Regions

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Two recent works suggest a possibility of sending signals to a space-like separated region, contrary to the spirit of special relativity. In the first work (J. Grunhaus, S. Popescu, and D. Rohrlich, Phys. Rev. A **53**, 3781 (1996)) it has been shown that sending signals to a particular union of space-like separated regions cannot cause causality paradoxes. Another work (Y. Aharonov and L. Vaidman, Phys. Rev. A **61**, 052108 (2000)) showed that the relative phase of the quantum superposition of a particle at two separate locations can be measured locally. Together with the possibility of changing the relative phase in a nonlocal way using the potential effect we, apparently, have a method of sending signals to space-like separated regions. These arguments are critically analyzed in this paper.

Key words: Superluminal Signaling; Quantum Nonlocality; Quantum Paradoxes.