Quantum Physics

Experimental implementation of a four-player quantum game

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Game theory is central to the understanding of competitive interactions arising in many fields, from the social and physical sciences to economics. Recently, as the definition of information is generalized to include entangled quantum systems, quantum game theory has emerged as a framework for understanding the competitive flow of quantum information. Up till now only two-player quantum games have been demonstrated. Here we report the first experiment that implements a four-player quantum Minority game over tunable four-partite entangled states encoded in the polarization of single photons. Experimental application of appropriate quantum player strategies give equilibrium payoff values well above those achievable in the classical game. These results are in excellent quantitative agreement with our theoretical analysis of the symmetric Pareto optimal strategies. Our result demonstrate for the first time how non-trivial equilibria can arise in a competitive situation involving quantum agents and pave the way for a range of quantum transaction applications.

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