

Leggett-Garg inequality violation exploiting Weak Measurements

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Measurement represents one of the key features of Quantum Mechanics [1]. The impossibility of interpreting the results of a measurement on a quantum system in terms of pre-existing values has been recognised, apart in Bell's nonlocality [2, 3] and non-contextuality [4] tests, by Leggett and Garg in the behaviour of macroscopic systems when subject to subsequent measurements [5].

In this work, we present the experimental violation of a four-measurements (including the state preparation) Leggett-Garg inequality, realised by exploiting single [6] and sequential [7] weak measurements of the polarisation of heralded single photons.

We perform our test in four different experimental conditions, obtaining results in good agreement with the quantum mechanical predictions and showing, in each case, a clear violation of the classical bound (between 3.4 and 4.4 standard deviations).

References:

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