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Experimental investigation of the connection between weak measurements and violation of the Leggett-Garg Inequality MICHAEL GOGGIN, Truman State University, USA, MARCELO ALMEIDA, University of Queensland, Australia, MARCO BARBIERI, Institut d'Optique - Graduate School, France, BENJAMIN LANYON, University of Queensland, Australia, JEREMY O'BRIEN, University of Bristol, UK, ANDREW WHITE, University of Queensland, Australia, GEOFF PRYDE, Griffith University, Australia — By weakly measuring the polarization of a photon between two strong polarization measurements, we experimentally demonstrate that there is a one-to-one correlation between achieving strange weak values and violating the Leggett-Garg inequality (LGI) as was recently predicted by Williams and Jordan [N. S. Williams, and A. N. Jordan **100**, 026804 (2008)]. Furthermore, we investigate the effect of measurement strength on the magnitude of the anomalous weak values and the extent of the LGI violation.

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