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**Advances in weak-values based metrology** ANDREW JORDAN, GERARDO VIZA, JULIÁN MARTÍNEZ-RINCÓN, University of Rochester, GABRIEL ALVES, Universidade Federal do Rio de Janeiro, JOHN HOWELL, University of Rochester, PAUL KWIAT, University of Illinois at Urbana-Champaign — We theoretically [1] and experimentally [2] describe the relative advantages of implementing weak-values-based metrology versus standard methods. To accomplish this, we measure small optical beam deflections both a weak-values-based technique, and a standard technique. By introducing controlled external modulations of the detector, and transverse beam-jitter, we quantify the mitigation of these sources in the weak values-based experiment versus the standard experiment. In all cases, the weak-values technique performs the same or better than the standard technique by up to two orders of magnitude in precision for our parameters. We further measure the statistical efficiency of the weak-values-based technique. By post-selecting on 1% of the photons, we obtain 99% of the available Fisher information of the beam deflection parameter. We also discuss ways to recycle the discarded events [3], obtaining much greater precision on a measured parameter.

- [1] A. N. Jordan, J. Martínez-Rincón, J. C. Howell, Phys. Rev. X 4, 011031 (2014).
- [2] G. I. Viza, J. Martínez-Rincón, G. B. Alves, A. N. Jordan, J. C. Howell, arXiv:1410.8461 (2014).
- [3] J. Dressel, K. Lyons, A. N. Jordan, T. M. Graham, P. G. Kwiat, Phys. Rev. A 88, 023821 (2013).

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