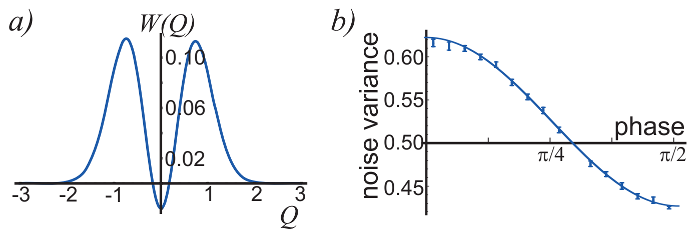

Fig. 4. Cross-section of the Wigner Function of the single-photon state (a) and the quadrature noise of the squeezed state as a function of the optical phase (b), obtained from their respective density matrices, experimentally reconstructed without correcting for detection inefficiency. The squeezing variance features a solid curve obtained from maximum-likelihood reconstruction, while the points with error-bars from 0 to $\pi/2$ are representative of the binned raw quadrature data. The error bars correspond to $\sigma_i\sqrt{2/N_i}$, σ_i being the width of a Gaussian distribution from N_i samples in each bin [19].

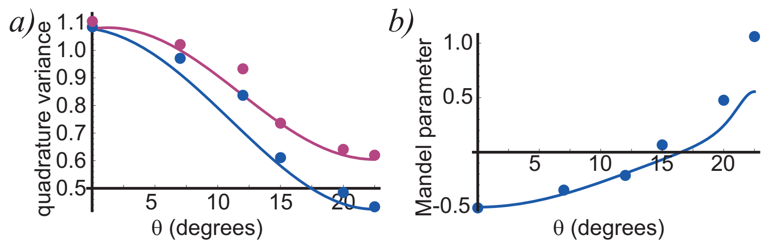

Fig. 5. Maximum and minimum variances of the measured quadratures (a) and the Mandel parameter of the reconstructed states (b) as functions of the HWP angle. The theoretical predictions are calculated for $\eta = 0.55$, $\gamma^2 = 0.025$ in the limit of low single-photon detection efficiency. The states with the minimum quadrature variance below $1/2$ or with a negative Mandel parameter are nonclassical.

of the signal state. The squeezed-vacuum limit, on the contrary, exhibits photon bunching. The discrepancy between the theory and experiment in this limit is explained by a low value of the denominator $\langle n \rangle$ that makes the experimental Mandel parameter susceptible to errors. Figs. 5(a) and (b) show complementarity of the two criteria of a quantum optical state's nonclassical character [20]: quadrature squeezing appears and photon antibunching disappears at about the same θ.

3. Summary

By mixing the output modes of a parametric down-converter on a variable beam splitter and detecting single photons in one of the beam splitter output channels, we prepared a variety of quantum states ranging from the single-photon Fock state to the squeezed-vacuum state in the other output channel. This experiment explicitly demonstrates that the discrete-variable and continuous-variable domains of quantum optics can be connected through a continuous set of states.

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