

Generation of Non-Classical Surface-Plasmon-Polaritons

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Surface plasmon polaritons (SPPs) have strongly attracted the attention of the quantum optics community due to their unique properties. For instance, SPPs are predicted to couple to single emitters [2, 3] allowing huge non-linear interaction on the single photon level [4]. The first plasmon experiment in the quantum optics regime demonstrates the preservation of entanglement under plasmon assisted transmission through sub-wavelength holes [1]. What is still missing is a complete quantum characterization of SPPs. In our contribution we investigate the efficient generation of non-classical long-range SPPs in the continuous variable regime by exciting them with a squeezed optical light field. Our results show quantum fluctuations of up to $-0.5dB$ below the shot noise limit, as presented in Fig. 1.

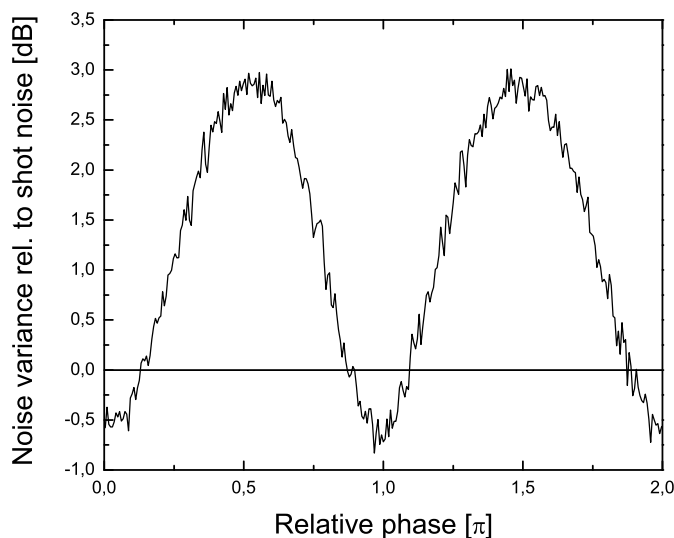


FIG. 1: Measured noise variance of long-range SPPs relative to the shot noise limit. The fluctuations below the shot noise level clearly show the non-classical property of the excited SPPs.

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[2] D.E. Chang et al., *Phys. Rev. Lett.* **97**, 053002 (2006).

[3] A.V. Akimov et al., *Nature (London)* **450**, 402 (2007).

[4] D.E. Chang et al., *Nature Physics* **3**, 807-812 (2007).

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