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Generation of twin beams using four-wave mixing: theory and experiments QUENTIN GLORIEUX, ROMAIN DUBESSY, SAMUEL GUIBAL, LUCA GUIDONI, JEAN PIERRE LIKFORMAN, THOMAS COUDREAU, Laboratoire Materiaux et Phenomenes Quantiques - Univ. Paris Diderot-Paris 7, ENNIO ARIMONDO, Universita di Pisa — Recently, four-wave mixing has drawn a large interest as a simple and efficient source of non classical light [1]. Using a strong pump (400 mW) propagating in a heated rubidium cell, it is possible to generate quantum correlated beams. The set-up has the advantage of both simplicity (no resonant cavity) and efficiency (we measure up to 9.5 dB of noise reduction below the standard quantum limit). However, up to now, no microscopic model was proposed for this phenomenon. Here we present for the first time such a model [2] based on the Heisenberg-Langevin input-output formalism [3] and we verify that the classical gain and the quantum correlations are in very good agreement with our experimental datas. A new regime of correlation generation in absence of gain is also proposed.

[1] C.F. McCormick et al., Opt. Lett (2007) vol. 32 p. 178
[2] Q. Glorieux et al., in preparation (2010)
[3] P. Kolchin, Phys. Rev. A (2007) vol. 75 p. 33814

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