Abstract Submitted
for the DAMOP06 Meeting of
The American Physical Society

Polarization squeezing of ultrashort pulses in fibres PETER DRUMMOND, JOEL CORNEY, University of Queensland, JOEL HEERSINK, VINCENT JOSSE, GERD LEUCHS, ULRIK ANDERSEN, University of Erlangen — We report on new experimental data and numerical simulations of quantum polarization squeezing in optical fibres. The experiment is a robust method for producing bright squeezed pulses of light. Because it can produce highly entangled states, the experiment operates in a very nonclassical regime, making the results sensitive to additional dissipative and thermal effects in the fibre. To characterize such experiments, we have performed quantum dynamical simulations of photonic pulses in a birefringent fibre, including all significant quantum effects and thermal noise. We use a novel experimental configuration combined with a detailed theoretical treatment that includes non-Markovian dissipative effects, to allow a quantitative comparison of experiment with quantum dynamical field theory simulations. The theory involves a first principles space-time evolution simulation of a many-body interacting quantum Bose gas, including dissipation. The high quality of the experimental data enables a comparison of simulation and experiment to well below the vacuum noise level, resulting in excellent agreement between theory and experiment over a wide range of pulse energies and fiber lengths. From the simulations, we identify the particular noise sources limiting the squeezing at high and low input energy.

Peter Drummond
University of Queensland

Date submitted: 24 Feb 2006 Electronic form version 1.4