Abstract Submitted
for the DAMOP17 Meeting of
The American Physical Society

A state comparison amplifier with feed forward state correction[1]
LUCA MAZZARELLA, University of Strathclyde, ROSS DONALDSON, ROBERT COLLINS, UGO ZANFORLIN, GERALD BULLER, Heriot-Watt University, JOHN JEFFERS, University of Strathclyde — The Quantum State Comparison AMPlifier (SCAMP) is a probabilistic amplifier that works for known sets of coherent states. The input state is mixed with a guess state at a beam splitter and one of the output ports is coupled to a detector. The other output contains the amplified state, which is accepted on the condition that no counts are recorded. The system uses only classical resources and has been shown to achieve high gain and repetition rate. However the output fidelity is not high enough for most quantum communication purposes. Here we show how the success probability and fidelity are enhanced by repeated comparison stages, conditioning later state choices on the outcomes of earlier detections. A detector firing at an early stage means that a guess is wrong. This knowledge allows us to correct the state perfectly. The system requires fast-switching between different input states, but still requires only classical resources. Figures of merit compare favourably with other schemes, most notably the probability-fidelity product is higher than for unambiguous state discrimination. Due to its simplicity, the system is a candidate to counteract quantum signal degradation in a lossy fibre or as a quantum receiver to improve the key rate of continuous variable quantum communication.

[1]The work was supported by the QComm Project of the UK Engineering and Physical Sciences Research Council (EP/M013472/1).

Luca Mazzarella
University of Strathclyde

Date submitted: 27 Jan 2017 Electronic form version 1.4