Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Improved coded optical communication error rates using joint detection receivers[1] ZACHARY DUTTON, SAIKAT GUHA, JIAN CHEN, JONATHAN HABIF, RICHARD LAZARUS, Raytheon BBN Technologies — It is now known that coherent state (laser light) modulation is sufficient to reach the ultimate quantum limit (the Holevo bound) for classical communication capacity. However, all current optical communication systems are fundamentally limited in capacity because they perform measurements on single symbols at a time. To reach the Holevo bound, joint quantum measurements over long symbol blocks will be required. We recently proposed and demonstrated the "conditional pulse nulling" (CPN) receiver – which acts jointly on the time slots of a pulse-position-modulation (PPM) codeword by employing pulse nulling and quantum feedforward – and demonstrated a 2.3 dB improvement in error rate over direct detection (DD). In a communication system coded error rates are made arbitrary small by employing an outer code (such as Reed-Solomon (RS)). Here we analyze RS coding of PPM errors with both DD and CPN receivers and calculate the outer code length requirements. We find the improved PPM error rates with the CPN translates into >10 times improvement in the required outer code length at high rates. This advantage also translates increase the range for a given coding complexity. In addition, we present results for outer coded error rates of our recently proposed "Green Machine" which realizes a joint detection advantage for binary phase shift keyed (BPSK) modulation.

[1]This work supported by the DARPA InPho program.

Zachary Dutton
Raytheon BBN Technologies

Date submitted: 11 Nov 2011 Electronic form version 1.4