Clock Synchronization based on Second-Order Quantum Coherence of Entangled Photons

Thomas B. Bahder bahder@arl.army.mil
William M. Golding Army Research Laboratory

abstract We present an algorithm for synchronizing two clocks based on second-order quantum interference between entangled photons generated by parametric down-conversion. The procedure is distinct from the standard Einstein two-way clock synchronization method in that photon correlations are used to define simultaneous events in the frame of reference of a Hong-Ou-Mandel (HOM) interferometer. Once the HOM interferometer is balanced, by use of an adjustable optical delay in one arm, arrival times of simultaneously generated photons are recorded by each clock. Classical information on the arrival times is sent from one clock to the other, and a correlation of arrival times is done to determine the clock offset.