Contribution ID: **206** Type: **Oral presentaion**

Two-Photon Interference in An Optical Gating Michelson Interferometer

Thursday 9 June 2016 15:00 (15 minutes)

We investigate the interference of two photons in an optical gating Michelson interferometer both theoretically and experimentally. Theoretically, the phenomenon is studied using two different representations of photons, the space-time domain and a step-by-step two-photon state evolution. Both representations lead to identical results. The evolution analysis describes the result by the interference of four two-photon traveling states, whereas the space-time domain analysis reveals that the classical interference of the high-intensity light source is identical to a two-photon interference in the quantum regime, except for a multiplicative factor of nC2, where n is the number of photons. Experimentally, the picosecond pulse with a 808-nm wavelength is used as a photon source and a second harmonic generation (SHG) process in BBO crystal as an optical AND gate. Then, the two-photon interference is measured through the SHG signal. The interference pattern agrees with the theoretical prediction.

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Session Classification: Session XXVII

Track Classification: Atomic Physics, Quantum Physics, Molecular and Chemical Physics