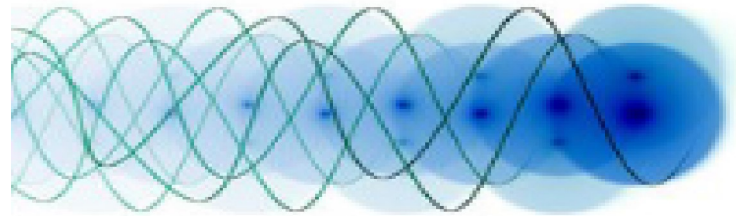
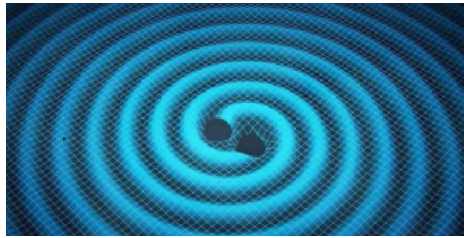


COLLOQUIUM



Classical Model: Waves

Quantum Model: Photons / Gravitons

Dr. Nathan Inan and students from



Clovis Community College

Bridging the Classical and Quantum Realms – the Correspondence Principle Applied to Photons and Gravitons

Abstract

The classical energy of electromagnetic waves is *amplitude* dependent, while the quantum energy of photons is *frequency* dependent. We show this seeming contradiction is resolved by the Bohr Correspondence Principle (BCP) in the limit of large quantum numbers. Furthermore, the roles of the Schwinger limit, the Planck scale, and the Heisenberg Uncertainty Principle are used to explore the notion of a photon volume. We show that contrary to the literature, describing photon volume as the wavelength cubed is a violation of the BCP and is inconsistent with Quantum Electrodynamics. Lastly, the analysis is extended to gravity by employing linearized General Relativity to describe the classical energy of gravitational waves, and assuming the quantization of the gravitational field. The result is a Correspondence Principle for gravitons, a quantitative description of gravitational vacuum fluctuations (“quantum space-time foam”), and a Schwinger-like effect for the gravitational field.

3:00 p.m. – 4:00 pm Friday, November 15th