Pilot Wave Model for Impulsive Thrust from RF Test Device Measured in Vacuum

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Abstract

Pilot wave theories are a family of realist interpretations of quantum mechanics that conjecture that the statistical nature of the formalism of quantum mechanics is due to an ignorance of an underlying more fundamental real dynamics, and that microscopic particles follow real trajectories over time just like larger classical bodies do. The first pilot wave theory was proposed by de Broglie in 1923 [1] where he proposed that a particle interacted with an accompanying guiding wave field, or pilot wave, and this interaction is responsible for guiding the particle along its trajectory orthogonal to the surfaces of constant phase. In 1952, Bohm [2] published a pilot wave theory where the guiding wave is equivalent to the solution of the Schrödinger equation and a particle's velocity is equivalent to the quantum velocity of probability. A family of models categorized as vacuum-based pilot wave theories or Stochastic Electrodynamics (SED) [3] explore the idea that the zero point field, electromagnetic vacuum fluctuations represent a natural source of stochasticity in the subquantum realm and provides classical explanations for the origin of the Planck constant, Casimir effect, ground state of hydrogen, and much more. While the idea of a pilot wave or realist interpretation of quantum mechanics is not the dominant view of physics today (which favors the Copenhagen Interpretation), it has seen a strong resurgence of interest over the last decade based on some quantum analog experimental work pioneered by Couder and Fort [4]. In addition to these quantum analogs, Bohmian trajectories in an interferometer may have recently been observed in the lab [5].

In the approach used in the Quantum Vacuum Plasma Thruster (Q-thruster) supporting physics models, the Zero Point Field (ZPF) plays the role of the guiding wave in a similar manner to the vacuum based pilot wave theories. To be specific, the vacuum fluctuations (virtual fermions and virtual photons) serve as the dynamic medium that guides a real particle on its way. During this talk, a physics model will be developed in detail and its place in the taxonomy of ideas about the nature of the quantum vacuum will be discussed. The experimental results from the recently completed vacuum test campaign evaluating the impulsive thrust performance of a tapered RF test article excited in the TM212 mode at 1,937 megahertz (MHz) will be summarized. The empirical data from this campaign will then be compared to the predictions from the physics model tools. The talk will conclude with a discussion on the follow-on activities being pursued in the investigation of the conjectured physics models.

Keywords: Pilot Wave, Quantum Vacuum, Dynamic Vacuum

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