Hodge Experiment distinguishes between wave and particle caused diffraction patterns.

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Abstract

The Hodge Experiment was designed to support the Scalar Theory of Everything (STOE) particle model of the photon. It also rejected the wave models of light. The general model of light waves within the Hodge Experiment's conditions is shown to lead to unobserved effects. It also provides an insight into inertia. The STOE model of particles and the wave model of a continuous medium yield indistinguishable results for the screen image in the traditional diffraction experiment. Therefore, the Hodge Experiment provides a method to distinguish between a direct wave caused diffraction pattern and a particle caused diffraction pattern that resolves the wave–particle duality conundrum.

Diffraction, Interference, wave–particle duality, Newton Interpretation, Theory of Everything, STOE. PACS 42.50Ct, 42.25Hz, 42.25.Fx

1 INTRODUCTION

The Hodge Experiment is a diffraction and interference experiment. It created and used a varying intensity of light from a laser across a slit to generate images on a screen (Hodge 2015b). The nature of the images rejects wave models of light and do not reject the proposed Scalar Theory of Everything model (STOE) of photons(Hodge 2015a) and inertia(Hodge 2016). The STOE model of light is that a photon particle generates a wave in a plenum or medium. The wave in the plenum then reflects off the mask except where the slit is. The wave then directs the particle. The impinging particles then cause the screen image.

Figure 5.c of Bush (2015) for "walking drops" compared to Fig. 1 of Hodge (2015b) for photons show many similar features. The path of the drops/photons approaching the slit show a slight direction change near the slit toward the edges of the slit, a reflection to cross the centerline, and an impingement on the screen on the opposite side from which they started. Unlike the Bohm Interpretation, the drop is the source of the wave in the "walking drops", the wave must travel

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faster than the drop, and the reflected (creating a standing) wave directs the drop.

Fraunhofer and other models of single– and double–slit experiments produced diffraction patterns on the screen in the Fraunhofer domain (between a minimum distance and maximum distance with limited slit widths). This was the domain of the Hodge Experiment. Fresnel and Sommerfield models could extend Fraunhofer's domain by accounting for phase. However, these models and Young's model required a coherent incident illumination with constant amplitude and phase across a slit. The math of the full slit, diffraction experiment for STOE particles with plenum inertia can be mathematically transformed into the Fraunhofer wave model with HF assumptions (Hodge 2015a, Section 4). The transformation also shows why the HF assumptions are necessary. Therefore, the screen images of waves and particles are indistinguishable using the traditional diffraction experiment. Hence, the wave–particle duality concept was developed.

The Hodge Experiment used VARYING, COHERENT illumination across the slit. By varying the illumination, the Huygens–Fresnel (HF) assumptions of the propagation of waves were found to be inconsistent with the observations. All the wave models of light use some form of the HF assumption. If HF is false for light, the models are false for light.

This paper examines the screen pattern that should be observed for a general wave model in the Hodge Experiment. Section 2 examines the difference between a wave and a particle in the Hodge Experiment. The discussion and conclusion is in Section 3.

2 Wave model in the Hodge Experiment

Figure 5.c of Bush (2015) for "walking drops" and Fig. 1 of Hodge (2015b) for photons looks like "reflection" and some dispersal over a limited angle toward the other side of center. Young's model invokes HF in that it mentions "re-radiation" which is a more spherical dispersal. That is the slit edge appears as a source of waves. A wave model tends toward a re-radiation concept.

Consider a pendulum. At maximum swing, there is no motion (kinetic energy) and maximum potential (gravitational) energy. At center swing the potential energy is at a minimum and the kinetic (inertial) energy is maximum. This motion is described by sin() and cos() functions (wave functions). Likewise solutions of the "wave equation" have the same form. Next, consider the undulations of a medium such as water that is carrying a wave. Perhaps this medium for light is "space" as in General Relativity Space, ether, or plenum. Therefore, the "space"/plenum has the inertia property and there is a proportionality between gravitational mass and inertial mass if each hod holds the same amount of plenum captive in matter (Hodge 2016).

The HF model suggests each point in a wave re-radiates a wavelet in a spherical pattern. The obliquity factor calculates the energy moves forward, only. This is the inertia of the STOE. Consider the Fraunhofer derivation of the diffraction pattern. A constant phase and constant wave is required in the slit. Each point in the slit radiates a wavelet across the entire diffraction pattern on the screen. The wavelets from 2 points then interfere to produce the maxim and minima of the diffraction pattern. If the intensity of each wavelet is the same, the cancellation is total at the 180 degree phase difference points.

The Hodge Experiment had a point on the left–of–center side (LoC) in the slit radiating with much more intensity than a point on the right–of–center side (RoC).

A HF wave model suggests each point on the LoC illuminates the entire screen pattern so the diffraction pattern should be seen on both sides of center in the varying intensity experiment. However, most of the energy impinges on the LoC because the obliquity factor directs most of the energy forward.

Consider another point near the RoC in the slit. The wave model suggests radiation from the RoC radiates at a much lower intensity than a point on the LoC. The interference at screen minima does not totally cancel. Therefore, the pattern on the screen should have poorly defined minima. Again, the wave model suggests an unobserved pattern for light (particles).

The Hodge Experiment for particles with one edge illuminated and the other edge with little, if any, illumination could be confused with an edge effect. The Fresnel model of an edge could be of a single slit with one side of the slit removed to infinity. But, as we see, the edge effect is different with the tail "A" in Fig. 11 (not 15) in Hodge (2015b). Perhaps, the integration of all points in the slit in the Fraunhofer model should be only to the zero point of intensity not to the other slit edge. The slit width (the integral limits) is part of the placement of the maxima and minima. Comparing the full width illumination screen patterns with the varying illumination screen patterns shows the placement of minima does not change. Therefore, the other side of the mask is needed for particle models and the width of the slit still plays a role in the diffraction pattern. This is another departure from the wave models in the Hodge Experiment.

3 Discussion and conclusion

The STOE simulation considers the photon causes waves in the plenum that are reflected by matter to direct the photon as General Relativity suggests. Consequently, any matter introduced into the experiment looks like the quantum mechanics "observer" induced changes such as wires in Afshar experiment, measuring equipment, extra screens, or masks.

The Hodge Experiment should be performed for fluid waves such as water waves and for EM radiation, electrons, etc. to determine if they are particles.

The notable features of waves in the Hodge Experiment are that most of the energy illuminates the side of the screen with higher intensity in the slit and poor definition of minima.

The notable features of particles according to the STOE model in the Hodge Experiment are that a diffraction pattern with good definition at the minima and most of the energy on the opposite side of center of the higher intensity in the slit.

The STOE model of particles and the wave model of a continuous medium yield indistinguishable results for the screen image in the traditional diffraction experiment.

The general model of light waves within the Hodge Experiment's conditions is shown to lead to unobserved effects. It also provides an insight into inertia. However, the Hodge Experiment shows a difference in the observations for particles and waves. Therefore, the Hodge Experiment can resolve the wave or particle dilemma for radiations.

Acknowledgments

Dr. Wolfgang Baer, Research Director, Nascent Systems Inc. in personal communications provided some helpful comments.

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