Light diffraction experiments that confirm the STOE model and reject all other models

J.C. Hodge[1*]
[1]Retired, 477 Mincey Rd., Franklin, NC, 28734

Abstract

The Scalar Theory of Everything (STOE) model of single photon diffraction is a model with photons being directed by plenum forces along their trajectory (http://intellectualarchive.com/ ?link=item&id=1557). By setting initial conditions in a simulation, predictions of screen patterns can be made. Changing the altitude produces a change in the width of the pattern. Using a pattern resulting from a single slit, a second mask can examine the result of varying the intensity of the illumination across the slit and of only one of the double slits being illuminated. The resultant patterns on a screen were photographed and are on the opposite side of center from the illuminated side of the second mask. The STOE is consistent and all other models of diffraction are inconsistent with these results.

Interference, Young's experiment, Afshar's experiment PACS 42.50Ct, 42.25Hz, 42.25.Fx

1 INTRODUCTION

Hodge (2015) developed a model for photon diffraction and interference based on the Scalar Theory of Everything (STOE) model (Hodge 2013). The STOE was developed from cosmological considerations. Equations of motion for a photon were developed along a Newtonian mechanics format. A computer simulation then calculated the path each photon traveled in a single slit and a double slit experiment. The patterns on the screen were well fit by the Fraunhofer equation.

The Afshar experiment (Afshar 2005; Afshar et al. 2007) challenges the currently popular Copenhagen interpretation of quantum mechanics (CIQM). Coherent light was passed through dual pinholes, past a series of wires placed at interference minima, and through a condensing lens. The resulting images showed the dual pinholes that suggested the which-way information had been recovered. The Afshar experiment was repeated in the very low intensity photon regime with the same result. Afshar interpreted very low intensity as a single

---

[*] E-mail: jchodge@frontier.com

photon in the experiment at a time. The intensity of light with and without the wires suggested the wires stopped only a very small number of photons. This suggests that light is photons, that the photon path was between the wires, and the photons maintained their coherence property.

This Paper develops predictions of three experiments that may be conducted. These scenarios are chosen because they make predictions no other model of diffraction make although these experiments are within the bounds of the models. Section 2 predicts the change in diffraction pattern with altitude. Section 3 predicts the change in diffraction pattern of photons of varying intensity across a slit when passed through a slit and shows experimental evidence confirming the prediction. Section 4 predicts the change in interference pattern with photons passing through only one slit of the double slit and shows experimental evidence confirming the prediction. The Discussion and Conclusion are in section 5.

2 Change in diffraction pattern with altitude

A simulation (Hodge 2015) with a mask with a single slit with a width $W_\mathrm{s} = 0.44$ step was placed at $y = 100$ steps and a screen was placed at $y = 150$ steps ($L = 50$ steps). The photons were released in 0.001 step increments along the $y = 90$ step axis centered on the $x = 0$ step axis. The Ψ_max was varied to suggest the change between altitudes of two experiments.

Figure 1A shows the resulting screen pattern for $\Psi_\mathrm{max} = 1.000 \times 10^3$ erg. The correlation coefficient is 0.97. Figure 1B shows the resulting screen pattern for $\Psi_\mathrm{max} = 1.200 \times 10^3$ erg. The thicker, solid line in each figure is the result of a least squares fit to the Fraunhofer equation. The correlation coefficient is 0.97.

The Fraunhofer equation used in the figures is:

$$\vec{B}(x) = B(0)\frac{\sin^2 \beta_d}{\beta_d^2}, \tag{1}$$

where $\beta_d = K\sin(\theta(x))$, $\theta(x) = ATAN(x/L)$, x, B(x), and L are defined in Hodge (2015), and K is the proportionality constant that is plotted in Fig. 2 versus Ψ_max. The K determines the width of the screen diffraction pattern.

Figure 2 is a plot of K versus Ψ_max. The line is $K = 0.0665\Psi_\mathrm{max} - 11.0$

3 Change in diffraction pattern by photons with varying intensity across a slit

The wires used in the Afshar experiment (Afshar 2005) were placed at the minima of the diffraction pattern. The photon model of light suggests no photons pass through the minima. This idea can be used to evaluate the result of passing photons through only a portion of the slit. Figure 2 of Hodge (2015) shows the simulation path of the photons from one side of the slit comprise the pattern on the screen on the other side of center.

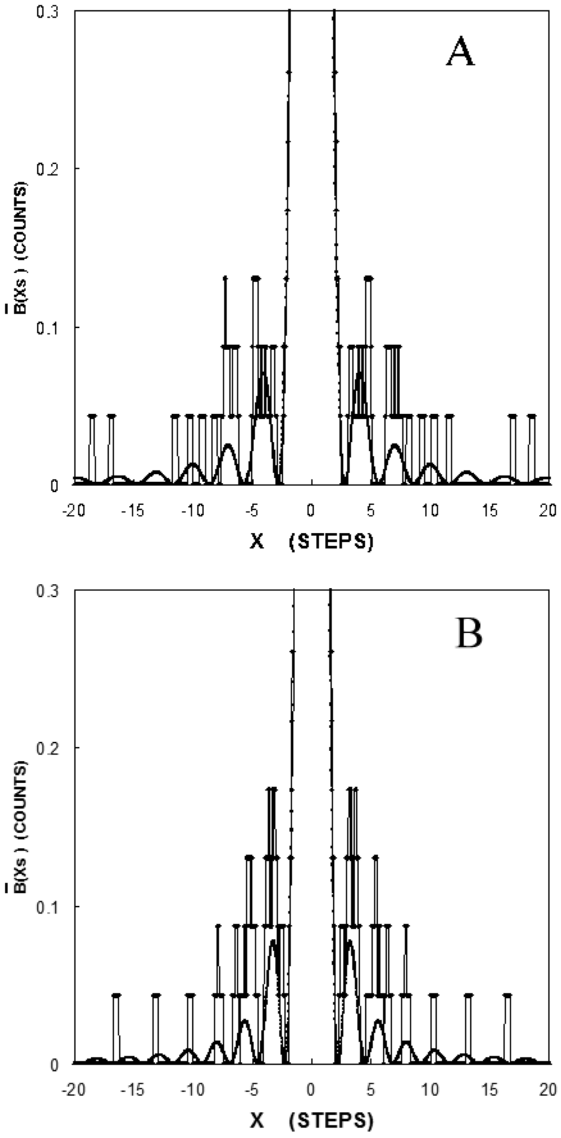

Figure 1: Plot of the single slit screen pattern of (A) $\Psi_{\max} = 1.000 \times 10^3$ erg and (B) $\Psi_{\max} = 1.200 \times 10^3$ erg. The bolder line is the best–fit Fraunhofer equation.

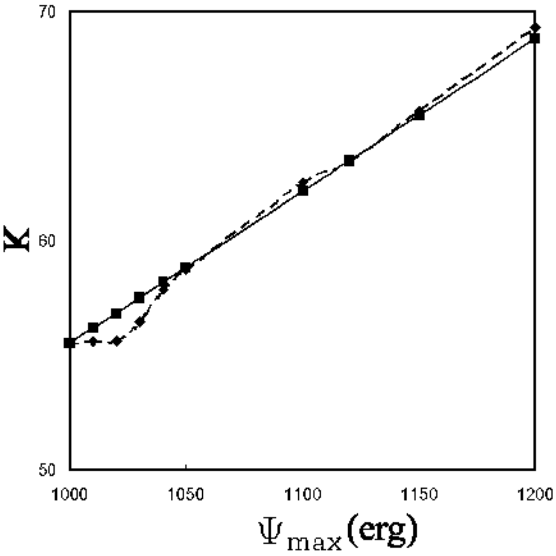

Figure 2: Plot of K versus $\Psi_{\max}$. The regression line is $K = 0.0665\Psi_{\max} - 11.0$.

A situation that can be achieved is a variation of the intensity I across the slit. The I in the simulation is the number of photons that follow the same path. Figure 3 shows the pattern that is input to the simulation. The pattern is the Fraunhofer equation for a single slit following Eq. 1 with the parameters changed to yield an appropriate pattern across the slit.

This situation can be done experimentally by placing a single slit in a first mask and placing a second mask with a single slit such that the minimum of the diffraction pattern from the first slit is at one side of the second mask slit. The second mask slit was positioned to be as marked in fig. 3.

The laser was a 635nm, 5 mW laser pointer. The first mask slit was 1 mm wide and was 10 cm from the laser. The second slit was 2 mm wide and 157 cm from the first mask. The distance to the second mask was determined such that the image of the first slit covered the second mask slit from the maximum to the first minimum. The screen was 638 cm from the second mask.

Figure 4 shows the result of the simulation (A) in relation to the screen image of this experiment (B).

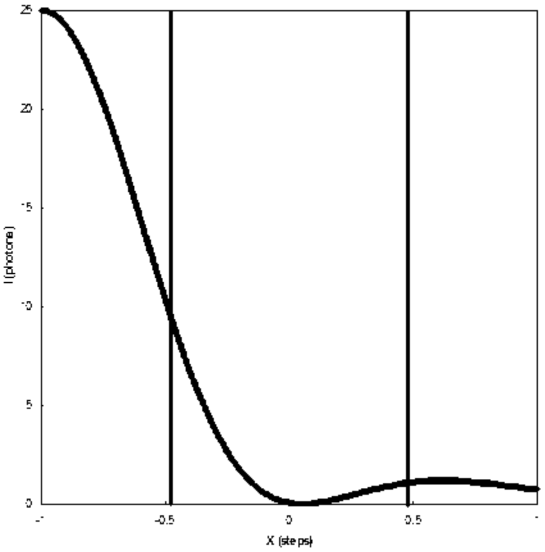

Figure 3: Plot of the intensity I pattern across the slit in the simulation. The vertical lines mark the width of the second mask slit.

4 Change in interference pattern with photons through only one slit of a double slit experiment

The simulation was achieved by directing the photons through only one slit (X = -20 steps to 0 steps on the graph).

Figure 5A shows the double slit simulation and the best fit Fraunhofer equation of the experiment. Figure 5B shows the one slit illuminated of double slit simulation.

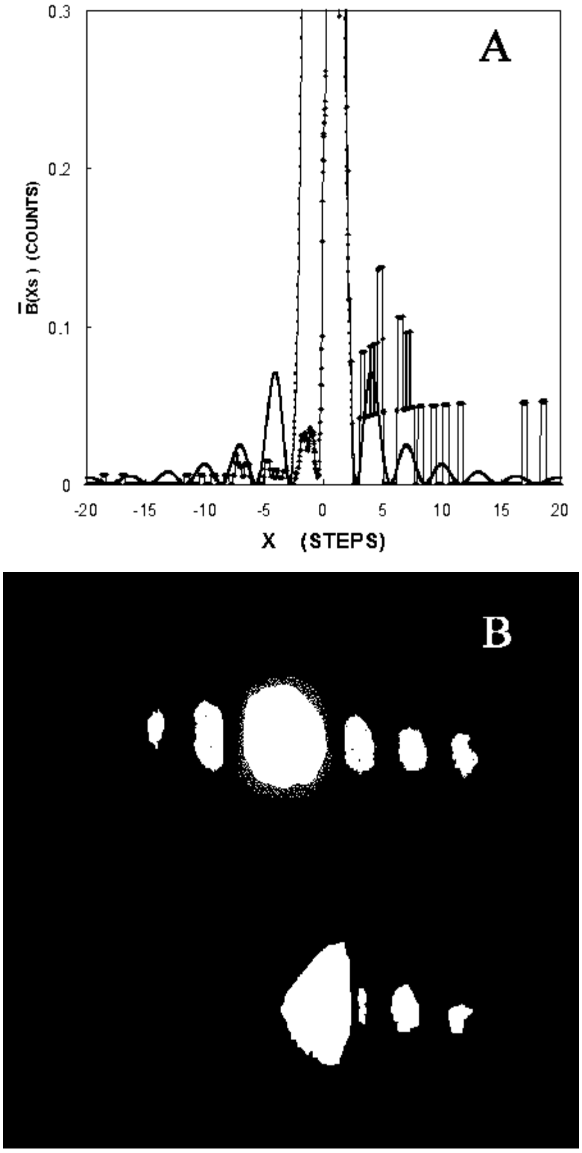

Figure 4: Plot of (A) the simulation of a variance across the slit and (B) the result of the experiment of such a variation. The top part of B is the result of the first mask slit without a second mask. The bottom part of B is the image with the second mask in the pattern of the first mask.

Figure 6 shows the result of experiment. The experimental arrangement was as in section 3 except the second mask was two slits 2 mm apart and each 0.2 mm wide. The second mask was positioned such that the left slit from the point of view of the laser source (X = -20 steps to 0 steps on the graph) was illuminated. The right slit was place at the minimum of the first mask's diffraction image.

5 Discussion and Conclusion

These experiments are based on simulations of one photon in the experiment at a time, which was achieved by low intensity coherent light in Afshar's experiments. The laser used has a higher intensity. That is the photon–photon interaction explored in Hodge (2012) has been ignored.

The change of altitude required in section 2 is likely to be at least 100s of kilometers.

The STOE suggests gravity is the divergence of the Ψ field. Therefore, the K is related to gravity and gravity effects such as time and space gravitational dilation.

The STOE model of light diffraction and interference makes predictions that have been confirmed by experiment and that no other model makes. One on the key features is that the photons cross the center of the slits to form an image on the other side of the center–line. The photos in this experiment confirm this.

This experimental confirmation of prediction is only a small part of the STOE. The STOE also describes many other mysterious observations in one model. This paper adds to the list of popular model inconsistency with observation problems.

The experiments herein could be better performed with more accurate equipment. They should be repeated with electrons and X–rays.

References

Afshar, S.S., 2005, *Violation of the principle of Complementarity, and its implications*, Proceedings of SPIE 5866 (2005): 229-244. preprint http://www.arxiv.org/abs/quant-ph/0701027v1.

Afshar, S.S. et al., 2007, *Paradox in Wave-Particle Duality*, preprint http://www.arxiv.org/abs/quant-ph/0702188.

Hodge, J.C., 2012, *Photon diffraction and interference*, IntellectualArchive, Vol.1, No. 3, P. 20,. http://intellectualarchive.com/?link=item&id=597

Hodge, J.C., 2013, *Scalar Theory of Everything model correspondence to the Big Bang model and to Quantum Mechanics*, IntellectualArchive, Vol.3, No. 1, P. 20,. http://intellectualarchive.com/?link=item&id=1175

Hodge, J.C., 2015, *Single Photon diffraction and interference*, http://intellectualarchive.com/?link=item&id=1557

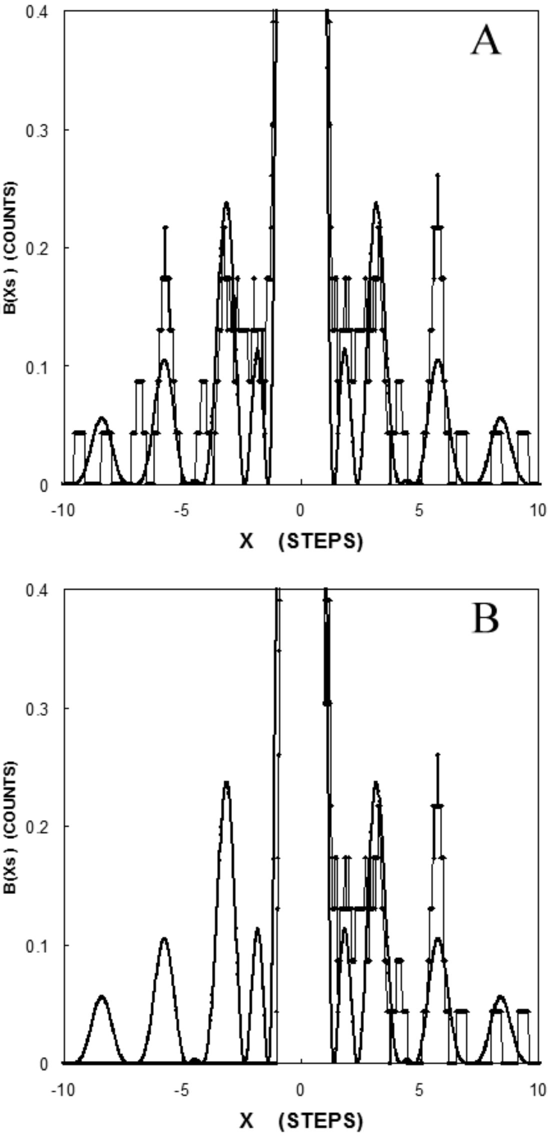

Figure 5: Plot of (A) the double slit simulation and the best fit Fraunhofer equation of the experiment and (B) the one slit of two simulation and the Fraunhofer equation plot from (A) above. The solid line is the best fit Fraunhofer equation.

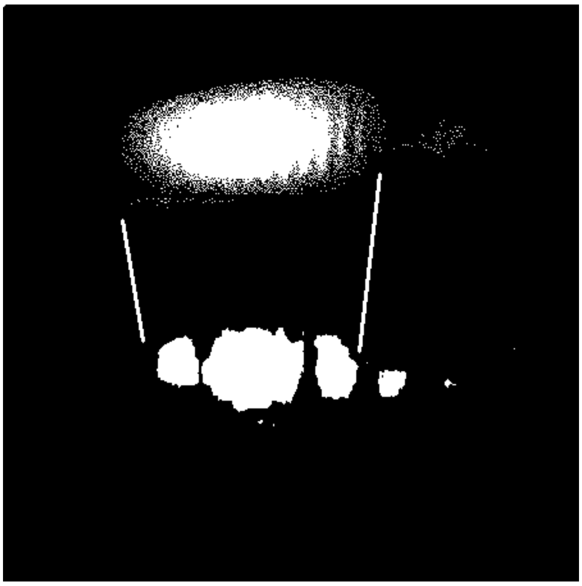

Figure 6: The photograph image of the photons through one slit of the double slits changed to two color. The top image is exposure and expansion to show that the double slit character is maintained. The bottom image is exposed to show the fainter parts of the image to the right of the main component. The lines indicate the corresponding parts of each image.