STOE simulation of photon spectrographic behavior

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

Abstract

Spectrographic behavior of light has been attributed to the wave model of light. The Scalar Theory Of Everything (STOE) model of light suggests photons are composed of hods that are one of the two components of the universe. The Hodge diffraction experiments rejected the wave models of light. The Fraunhofer pattern of coherent light on a screen from a slit in a mask is compared to the STOE computer simulation of spectrographic effects. The number of hods serves the same place as the frequency (energy) of light. Thus, the energy of light is proportional to the number of hods in the photons. An additional hod in a photon adds Planks constant amount of energy to the photon. Therefore, the STOE incorporates spectrographic observations.

keywords: Diffraction, Light, photon, STOE, spectrum

1 INTRODUCTION

Coherent light such as from a laser shown through a slit produces a diffraction pattern on a distant screen such as in Fig. 1. When a uniform intensity of light passes through the slit, the Fraunhofer equation is a close description to the intensity pattern on the screen. The Fraunhofer equation relates the intensity I at a point on the screen to the frequency λ of the light, to the slit width b_f, and to the angle θ from the centerline of the experiment to the point on a screen from the slit:

$$\begin{aligned} I &= I_{fo}\frac{\sin^2\beta_f}{\beta_f^2} \\ \beta_f &= \pi\frac{b_f}{\lambda}\sin(\theta) \\ \theta &= \arctan\left(\frac{x_f}{L_f}\right), \end{aligned} \tag{1}$$

*E-mail: jchodge@frontier.com

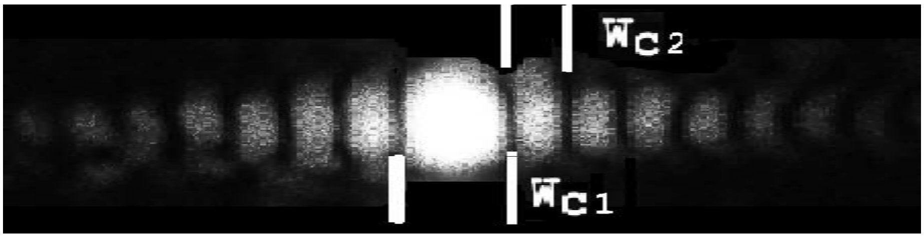

Figure 1: Photograph (converted to black and white for printing) of a single slit diffraction pattern with the W_c shown.

where I_{fo} is the maximum intensity of the pattern, x_f is the distance on the screen from the center of the principle peak of the pattern to the point being evaluated, and L_f is the distance from the mask to the screen.

The minima occur when $\beta = \pm m\pi$ where m is an integer. The λ dependence suggests the diffraction effect exhibits spectrographic characteristics of light.

The Scalar Theory Of Everything (STOE) developed a model of light (Hodge 2012). This photon model and a simulation program were developed to yield a diffraction pattern after passing the simulated photons through a slit. The STOE model reduces to the Fraunhofer like model when a large number of photos are simulated through a slit. The screen image matched the Fraunhofer pattern when a uniform distribution of photons passed through the slit. This model was applied to single photon experiments (Hodge Experiments) that rejected all wave models of light when a non-uniform distributions passed through the slit (Hodge 2015a,b,c, 2017).

The intensity of photons on the screen in the simulation is similar to Eq. 1:

$$
\begin{aligned}
I &= I_o \frac{\sin^2 \beta_s}{\beta_s^2} \\
\beta_s &= \pi N b_s K_s \sin(\alpha) \\
\alpha &= \arctan(\frac{x_s}{L}),
\end{aligned} \tag{2}
$$

where N is the number of hods in the photon simulation, b_s is the simulated slit width, x_s is the simulated distance on the screen from the peak of the pattern to the point being evaluated, L the simulated distance from the mask to the simulated screen, and K_s is the constant.

This Paper relates the simulated parameters to the actual diffraction experiment parameters. The experiment with lasers is discussed in section 2. The simulation experiment is discussed in section 3. The Discussion and Conclusion are in section 4.

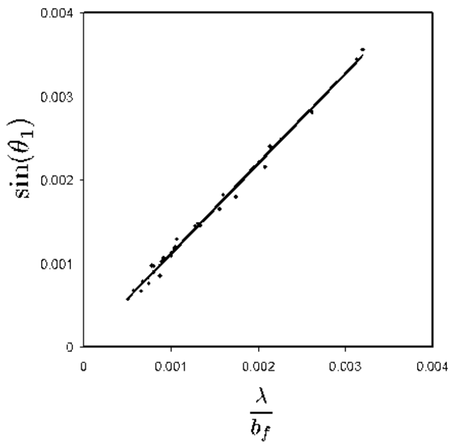

Figure 2: Plot $\sin(\theta)$ versus λ/b_f.

2 The experiment with lasers

At the first ($m = 1$) minima,

$$\sin(\theta_1) = \frac{\lambda}{b_f}, \tag{3}$$

and $x_f = W_{c1}/2$ where W_{c1} is the distance from the first minima on one side of the central peak to the first minima on the other side of the central peak as shown in Fig. 1. The λ dependence suggests the diffraction effect exhibits spectrographic characteristics of light.

Figure 2 shows the result of plotting the $\sin(\theta_1)$ versus $\frac{\lambda}{b_f}$ for a sample of diffraction experiments. The λ used were 650±10 nm, 635±10 nm, 532±10 nm, and 408±10 nm of commercially available laser pointers. The b_s were 0.813 mm, 0.711 mm, 0.610 mm, 0.508 mm, 0.406 mm, 0.305 mm, and 0.203 mm. The $L = 7724$ mm. The straight line is:

$$\sin(\theta) = 1.08(\lambda/b_s) + (3.92 \times 10^{-5}), \tag{4}$$

where the standard deviation is 0.0008 and the correlation coefficient is 0.99+.

At the second ($m = 2$) minima,

$$\theta_2 = \arctan\left(\frac{x_{f2}}{L_f}\right), \tag{5}$$

$$\sin(\theta_T) = \frac{\lambda}{b_f}, \tag{6}$$

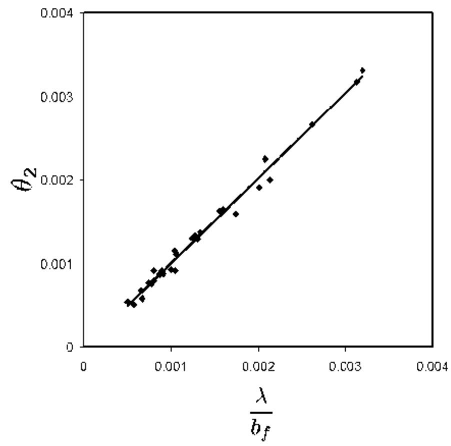

Figure 3: Plot θ_2 versus λ/b_f.

where $x_{f2} = W_c/2 + W_{c2}$ and W_{c2} is the distance from the first minima on one side of the central peak to the second minima as shown in Fig. 1. For the small angles, $\sin(\theta_1) \approx \theta_1$ and,

$$\theta_2 = \theta_T - \theta_1. \tag{7}$$

$$(\theta_2) = 1.02(\lambda/b_s) - (1.5 \times 10^{-5}). \tag{8}$$

where the standard deviation is 0.0007 and the correlation coefficient is 0.99+.

3 The simulation experiment

Equation 2 has a minima when $\alpha = \pi$. Solving Eq. 3 yields:

$$\sin(\alpha|_{minima}) = K_s \frac{1}{N b_s}, \tag{9}$$

where $|_{minima}$ means to evaluate the parameter at the respective first minima of the pattern and the constants are included in the proportionality constants of the parameters.

Figure 4 shows an example of the simulation's screen pattern for $N = 10$ and $b_s = 0.22$ step. Several simulation runs were made with N equal to 7, 8, 9, 10, 11, and 12. The b_s was equal to 0.44 step, 0.54 step, and 0.64 step. Figure 5 shows the plot of $\sin(\alpha)$ versus $1/(N b_s)$. The straight line is:

$$\sin(\alpha) = 0.18/(N b_s) + 0.02. \tag{10}$$

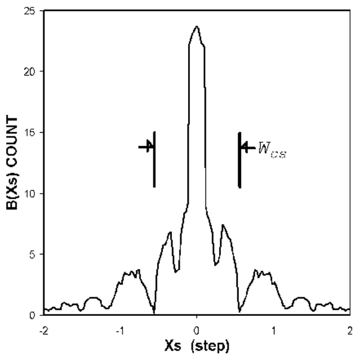

Figure 4: Example of the screen image of the simulation. This is $N = 10$ and $b_s = 0.22$ step.

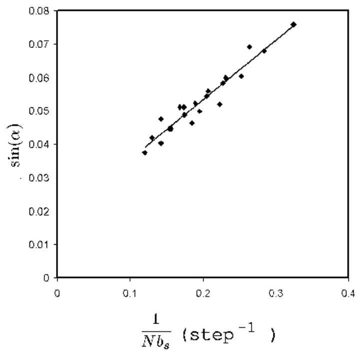

Figure 5: Plot of $\sin(\alpha)$ versus $1/(Nb_s)$.

where the standard deviation is 0.08 and the correlation coefficient is 0.96.

4 Discussion and Conclusion

The Fraunhofer pattern of coherent light on a screen from a slit in a mask is compared to the STOE computer simulation of spectrographic effects. The number of hods serves the same place as the frequency (energy) of light. Thus, the energy of light is proportional to the number of hods in the photons. An additional hod in a photon adds Planks constant amount of energy to the photon.

References

Hodge, J.C., 2012, *Photon diffraction and interference*, IntellectualArchive, Vol.1, No. 3, P. 15, 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., 2015a, *Single Photon diffraction and interference*, http://intellectualarchive.com/?link=item&id=1557

Hodge, J.C., 2015b, *Light diffraction experiments that confirm the STOE model and reject all other models*, http://intellectualarchive.com/?link=item&id=1578

Hodge, J.C., 2015c, *Diffraction experiment and its STOE photon simulation program rejects wave models of light*, IntellectualArchive, Vol.4, No. 6, P. 11,.

http://intellectualarchive.com/?link=item&id=1603
see video "stoe photon diffraction".
(https://www.youtube.com/channel/UCc0mfCssV32dDhDgwqLJjpw)

Hodge, J.C., 2015d, *Universe according to the STOE*, IntellectualArchive, Vol.4, No. 6, P. 6,. http://intellectualarchive.com/?link=item&id=1648

Hodge, J.C., 2016a, *STOE assumptions that model particle diffraction and that replaces QM*, IntellectualArchive, Vol.5, No. 3, P. 1,. http://intellectualarchive.com/?link=item&id=1719

Hodge, J.C., 2017, *Hodge experiment (continued) of interference with a slit in a transparent mask rejects wave models of light*, IntellectualArchive, Vol.6, No. 5. http://intellectualarchive.com/?link=item&id=1862