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Additional experimental evidence for the transfer of information at a speed greater than the speed of light.

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1. Introduction

As stated earlier, it is considered axiomatic that information cannot be transferred faster than the speed of light. It is also clear that modern physics, and astrophysics in particular, has encountered several vexing problems that have led to speculations about 'dark matter', 'dark energy', and 'dark flow'. A companion paper, "Possible link between Dark Matter, Dark Energy, Dark Flow and other astronomical anomalies", suggests an explanation of those phenomena and others, which is based on the hypothesis that gravitational influence is transferred at a speed that is many orders of magnitude greater than that of light, but not infinite, nor in accordance with General Relativity. Theoretical 'gravity waves' have been regularly described by assuming that there is a 'magneto-gravitational' component which, in conjunction with the 'electro-gravitational' component, results in gravity wave propagation that is analogous to electromagnetic waves, and travels at the speed of light. The present papers use the gravity-EM (electro-magnetic) analogy in reverse to argue that the axial component of gravitational influence (along the line of motion) is analogous to the Coulomb force in an electrodynamic case. This analogy is useful because of the great difficulty in making measurements of forces between masses in the laboratory and the relative ease of doing so with electrical charges. The experiment involves measurement of the delay time for Coulomb force effects and contrasts this delay with the delay time for EM propagation.

2. Experimental considerations

The radiation pattern of a quarter-wave monopole antenna is simple and well-understood. The radiation pattern is a maximum in the radial direction, perpendicular to the antenna. The radiation pattern is zero in the axial direction, parallel to the antenna. However, charges surging back and forth in the transmitting antenna must surely affect free charges in a receiving antenna placed close to and on the axis of the transmitting antenna. The experiment involves comparing the phase differences between the transmitted and received signals as the spatial relation between the two antennas is changed. The phase shift as a function of antennas separation gives a direct method of estimating the speed of the transfer of information about charge location. The experiment was first conducted in a school classroom, but was repeated out-of-doors to minimize local reflection and interference effects. It has now been performed a third time using a vertical tower and tighter controls. The results are substantially the same.

3. Experimental equipment

The equipment used in the experiment consisted of a 75 MHz transmitter with its one-meter antenna, a one-meter receiving antenna (¼ wavelength), a dual trace oscilloscope, a 10-meter RG-58A/U coaxial cable, and a digital camera to record oscilloscope data. The transmitter was low power of the type used for radio control of model airplanes. The dual trace oscilloscope was a Tektronix 454. It is old, but it has a sweep capability of 5ns cm^{-1}. The inductances used previously were removed. Instead, the cable was terminated at the receiving antenna with a 50 ohm resistor (characteristic impedance of the cable). The transmitter signal on channel-1 was used as the sweep trigger for both channels.

4. Experimental procedure

In the original experiments, both antennas were laid horizontally on the ground. The transmitter, with its antenna connected to the oscilloscope channel-1 via a 10 meter cable, was moved to progressively farther locations from receiving antenna. The receiving antenna was connected via a 70 cm cable to channel-2 of the oscilloscope.

In the present experiment, the transmitter was at ground level with its antenna pointing vertically upward. The antenna movements and connections were reversed compared to the earlier experiment; the base of the transmitter antenna was connected via a 70 cm RG-58 cable to channel-1 of the oscilloscope. The oscilloscope was also on the ground. The receiving antenna was connected to the oscilloscope via the 10 meter cable and was hoisted to progressively farther locations above the transmitter antenna. A photograph of the experimental setup is presented in figure 3.

There were two phases to the experiment. The propagation speed of the horizontal E-M wave was measured first, as a proof of validity of the general approach. The receiving antenna was moved horizontally in .5-meter increments (1/8 wavelength), photographing the transmitter and receiver wave-shapes at each interval. Because cable layout has a small but detectable effect on the result, this phase was further divided into a set of measurements in which the cable exited the antenna horizontally, at right angle to its axis, and a set in which the cable exited vertically, along the axis of the antenna.

In the second phase, the receiving antenna was moved vertically by hoisting it up a 24-foot tower, again in .5-meter increments, and repeating the photographing procedure.

5. Experimental analysis

Progressively larger separations between the transmitter and receiver antennas could be expected to produce and increasing offset between the peaks of the transmitter and receiver as displayed and photographed on the oscilloscope. The sweep speed was set at 5 nsec/cm. The transmitted wave was crystal-controlled to be 75 MHz, so that the period is 13.3 nsec. The photographs reveal that the actual sweep speed was close to 5.8 nsec/cm. This will not have a significant effect on the experiment. Note that the receiver signal reached the oscilloscope via 10 meters of coax cable. Since the goal is to determine the rate at which the delay changes as a function of separation of the antennas, the precise absolute delay is immaterial and unknown. In the case of zero antennas separation (antennas adjacent), the delay of the received signal was measured from a peak of the transmitter signal to the following peak of the receiver signal. For increasing separations, the corresponding peaks were used. The offset between transmitter and receiver peaks are presented in figure 1.

Ant Sep	0.0m	0.5m	1.0m	1.5m	2.0m	2.5m	3.0m	3.5m	4.0m	4.5m	5.0m	6.0m
Horizont												
cable V	**-0.5**	**0.5**	**2.5**	**4.2**	**5.0**	**7.0**	8.9	**10.3**	**11.4**		**15.5**	**17.8**
cable H	**-1.5**	**-0.9**	**2.5**	**3.0**	**4.5**	**6.1**	**7.5**	**9.5**	**10.5**		**14.5**	**19.8**
Vertical	**0.2**	**0.5**	**0.5**	**0.5**	**0.5**			1.5	2.0	1.5	1.0	

Figure 1. Receiver time offset in nanoseconds as a function of antennas separation in meters

The delay of the Electromagnetic wave as the separation increased is depicted by the blue and green data. The blue data resulted when the cable exited vertically from the receiving antenna for about half a meter. The green data resulted when the cable exited horizontally from the receiving antenna.

The red data is the result of the Coulomb force when the receiving antenna was hoisted vertically above the transmitting antenna. It is broken into two groups because the cable had to be re-routed between the light red and the orange groups.

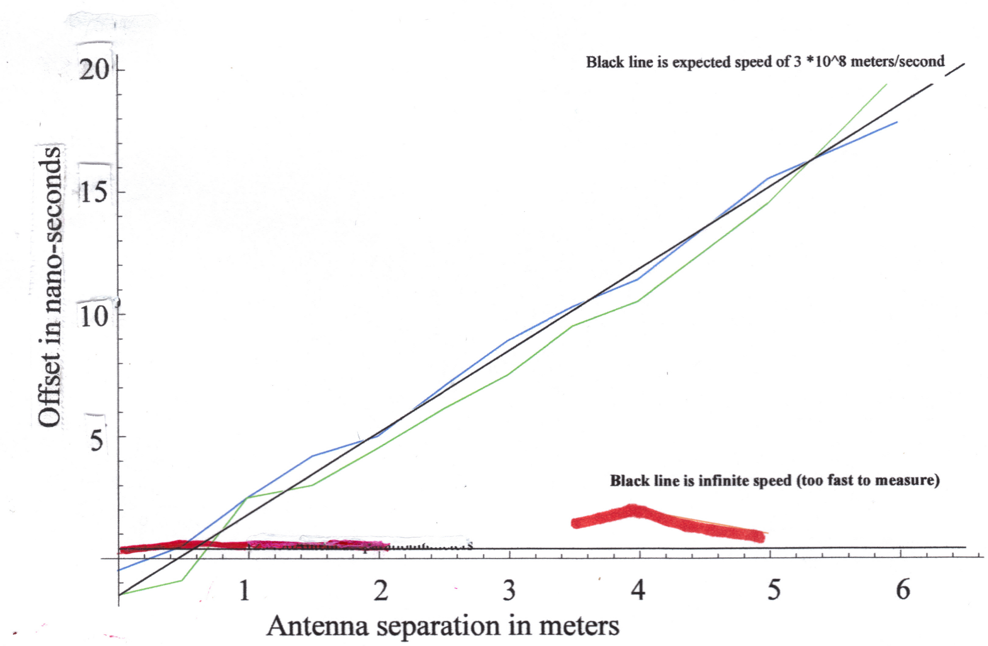

Figure 2. Differential delay as a function of transmitter-receiver separation

6. Experimental results

The data are plotted in figure 2. Two lines have been added depicting theoretical results if the velocity were c (radial case) and if the velocity were infinite (axial case). In the radial case, the deviation from the theoretical line is attributed to the fact that, at separations less than a quarter wavelength, 1 meter, the receiving antenna will be affected by direct Coulomb forces, and will have a significant feedback effect on the transmitting antenna. This effect is called the 'near field' effect. At distances greater than 2 meters, the axial signal became too small to distinguish from noise levels.

7. Experimental errors

While the coax cable does not provide perfect shielding, tests of varying configurations indicate that they did not appreciably affect the principle goal of the experiment. It may have helped that they were resting in moist grass which could act as a ground plane. The cables were arranged in such a way that the portion in close proximity to the antennas were perpendicular to the antennas, thus minimizing the effect of EM wave pickup. It will be noted that the radial and axial delays at zero separation should have been identical, but differ by .6ns. This is an indication of the degree of repeatability of the experimental results. The precision is not optimal, but does not impair the overall conclusion.

8. Conclusion

It appears clear that charges which oscillate in a transmitting antenna communicate their motion to an axially arranged receiving antenna at a rate that is far in excess of the speed of light. If that speed is less than infinite, then the laws of the conservation of energy and of momentum stand in jeopardy. Such effects would be small and difficult to detect, but nonetheless finite. More to the point, if Coulomb force effects are transmitted at a speed which is orders of magnitude greater than c, but still finite, then gravitational forces may do likewise. The implications of this hypothesis are treated in the companion paper, "Possible link between Dark Matter, Dark Energy, Dark Flow and other astronomical anomalies"

9. Historical note

Given that the experiment described is easy to perform, why has the result not been previously observed? It may be concluded that 50 years ago the experiment would not have been easy to perform, and that, since that time, investigators have felt confident that all of the fundamental questions had been exhaustively examined.

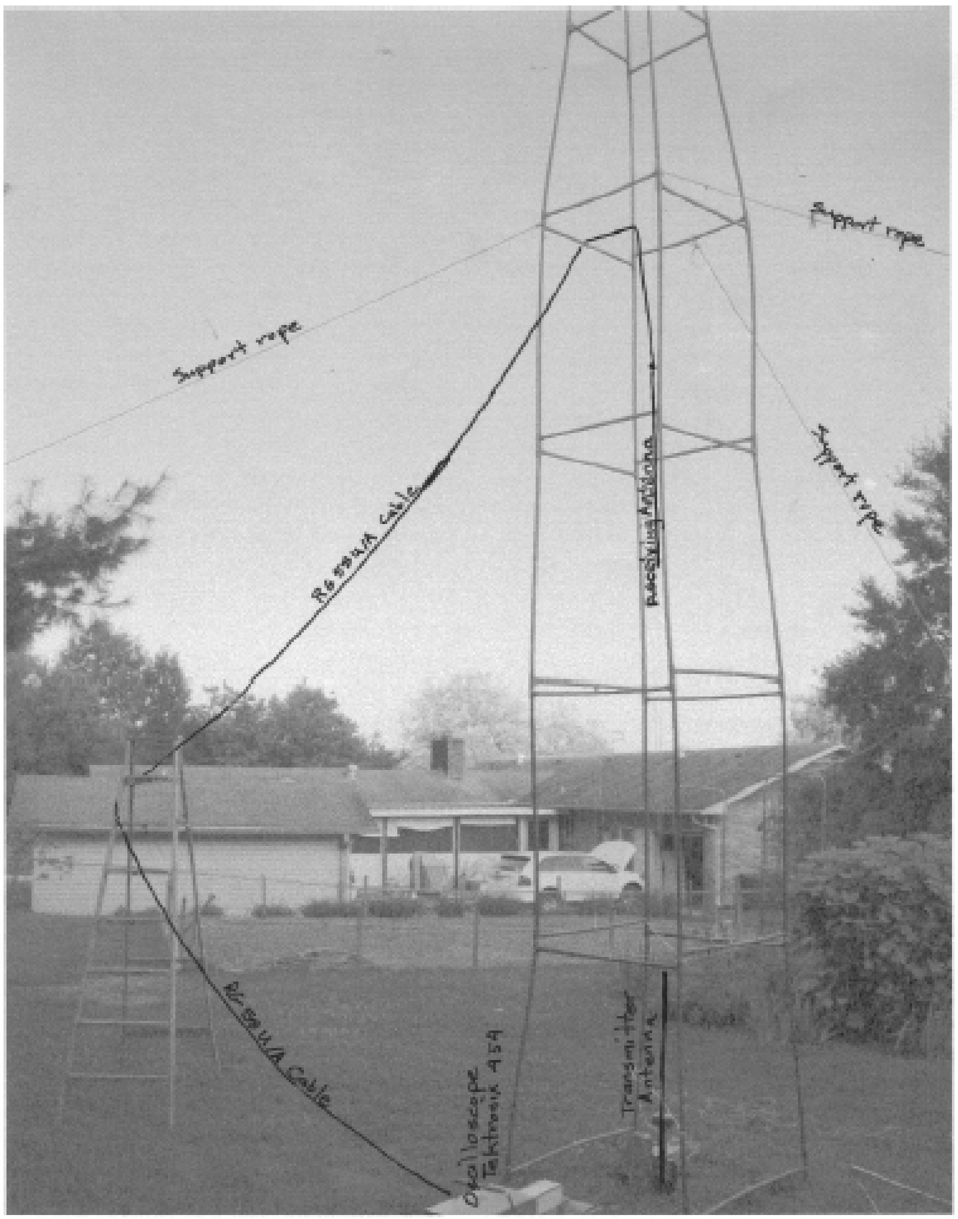

Figure 3. Experimental setup

The upper trace is the transmitter signal with a sensitivity of 2 volts per cm. The lower trace is the receiver signal with a sensitivity of .05 volts per cm. The sweepspeed is nominally 5 nano-seconds per cm, but using the crystal-controlled transmitter signal as a standard, the actual sweep-speed is 5.8 nsec/cm. In this particular instance, the gap between the antennas was 1 meter.

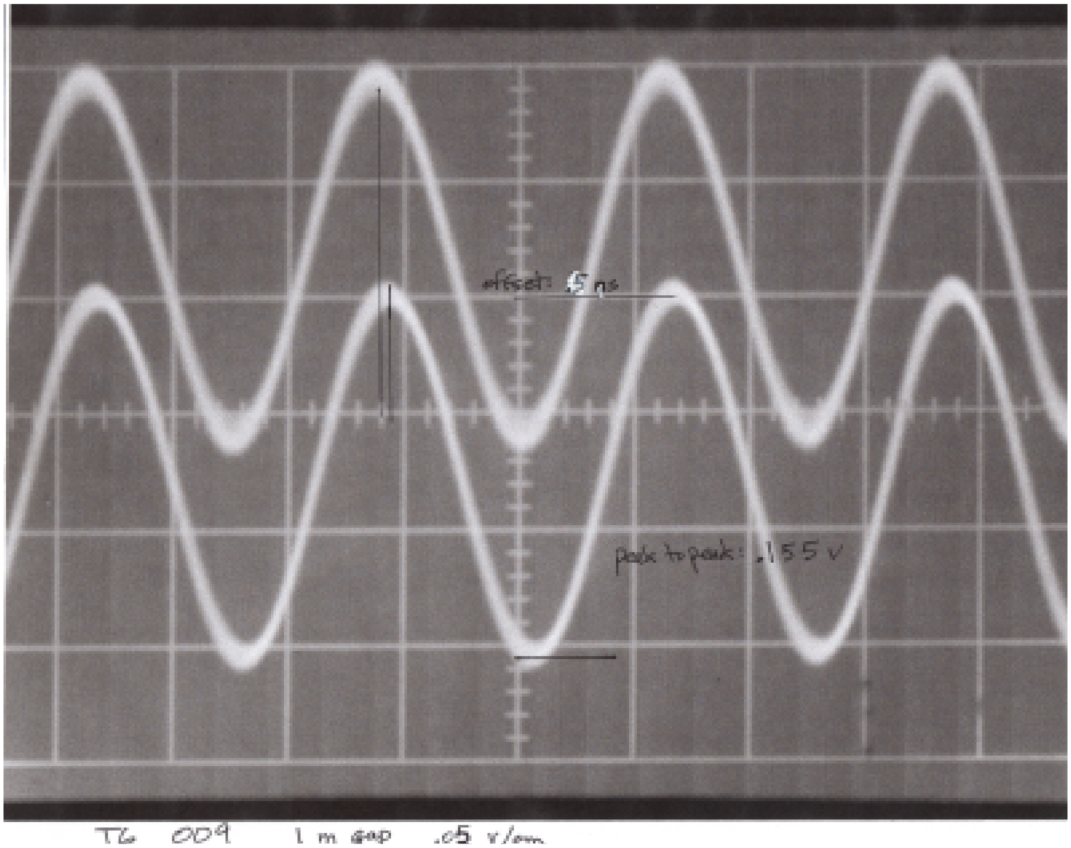

Figure 4 Typical data waveform