The Deflection of Light by the Sun Follows From Newton's Gravitation Alone, And Does Not Confirm General Relativity

H. Vic Dannon
vic0@comcast.net
August, 2019

Abstract: Since a photon has mass $m = h\nu \,/\, c^2$, it is attracted to the sun when it passes by it, and its path bends.

Consequently, the position of the star where the photon originated is aberrated.

The aberration angle was given by Einstein in 1911 in a most unreadable paper, inundated with errors.

In one instance, Einstein's belief replaces computation, and his result is 200 times smaller than the correct result.

In another instance, he shows ignorance of differentiation.

And he cannot perform integration.

In the over hundred years that passed, there was no mention of these errors. Apparently, no one has been able to read Einstein's paper, and supply the derivation of the aberration angle.

Einstein keeps talking about coordinate systems, insisting that the result follows from his relativistic gravitation. Hence, our incomprehension of his paper is due to our ignorance of his high leveled physics.

But the bending of light is due only to Newtonian Gravitation. And Einstein paper cannot explain the bending by any relativistic argument.

Keywords: Mass-Energy, Frequency Shift, Gravitational Bending, Aberration Angle

Physics & Astronomy Classification Scheme: 42.15.Fr,

Contents

0.

Einstein's Errors

Since a photon has mass $m = h\nu \,/\, c^2$, it is attracted to the sun when it passes by it, and its path bends.

Consequently, the position of the star where the photon originated is aberrated.

The aberration angle was given by Einstein in 1911 in a most unreadable paper inundated with errors.

Einstein waits until the end of his paper to inform the reader that his paper is under par

> *"It is greatly desired that astronomers take up the question raised here,* ***even if the considerations presented here may appear unsubstantiated or even adventurous****"*

0.1 Contradicting the Constancy of the Speed of light

We have shown[1] that Einstein's founding of his relativity on

[1]H. Vic Dannon, "*The Invariance of the Energy-Momentum Under the Lorentz Transformation*", Gauge Institute Journal of Math and Physics, Vol. 14, No. 4, November 2018

postulating that the speed of light is constant, shows his lack of understanding of the role, and meaning of the Lorentz transformation.

Here, the speed of light depends on position, and Einstein is not concerned. Another day, another theory:

> *"The principle of the constancy of the velocity of light does not hold in this theory..."*

0.2 Does not Compute

In section 3 here, we show that believing that some experimental results follow from his Relativity, Einstein did not compute the frequency shift, and never knew that the correct frequency shift is over 200 times larger than the experimental result that was due to something else.

0.3 Does Not Know to Differentiate

By Equation 3,

$$c = c_0 + c_0 \frac{\Phi}{c^2},$$

where the light speed c, and the potential Φ depend on the location n'.

Einstein claims

$$\frac{\partial c}{\partial n'} = \frac{\partial \Phi}{\partial n'},$$

which is untrue.

To obtain the derivative $\frac{\partial c}{\partial n'}$, we need to differentiate implicitly, and use the chain rule. We have,

$$c^3 - c_0 c^2 = c_0 \Phi,$$

$$3c^2 \frac{\partial c}{\partial n'} - 2c_0 c \frac{\partial c}{\partial n'} = c_0 \frac{\partial \Phi}{\partial n'},$$

$$\frac{\partial c}{\partial n'}(3c - 2c_0)\frac{c}{c_0} = \frac{\partial \Phi}{\partial n'}$$

Clearly,

$$\frac{\partial c}{\partial n'} \neq \frac{\partial \Phi}{\partial n'}.$$

0.4 Does Not Wish to Integrate

The total aberration angle,

$$2\frac{1}{c^2} G \frac{M_{sun}}{R_{sun}},$$

follows from integration in our sections 4, and 5 here. Einstein skipped that integration and guessed what seemed to him to be an average of the integration.

1.

Gravitational Acceleration on the Sun

Newton's Gravitational Force between the Sun's mass

$$M_{sun} = 9.9891 \cdot 10^{30} \mathrm{kg}\,,$$

and a photon of frequency ν, and mass

$$m = \frac{h\nu}{c^2}$$

on the Sun's surface is

$$F = G\frac{M_{sun}}{R_{sun}^2}\frac{h\nu}{c^2}\,,$$

where

$$R_{sun} = \ 6.96 \cdot 10^{8} \mathrm{m}\,.$$

By Newton's Second Law,

$$F = ma\,.$$

Therefore, the gravitational acceleration of $\frac{h\nu}{c^2}$ towards the Sun is

$$a = G\frac{M_{sun}}{R_{sun}^2} \equiv \gamma\,.$$

That is,

$$\boxed{\gamma = 6.67259 \cdot 10^{-11}\frac{1.9891 \cdot 10^{30}}{(6.96 \cdot 10^{8})^2} = 273.988653\frac{\mathrm{m}}{(\mathrm{sec})^2}}$$

2.

Frequency Shift of a Sun's Photon

A light photon on the sun's surface has energy

$$h\nu_0 = mc^2$$

Hanging over the earth at height

$$H = \text{Astronomical Unit} = 1.495979 \cdot 10^{11}\text{m}$$

the photon's Energy measured at the earth is

$$\underbrace{h\nu_0 + m\gamma H}_{h\nu} = h\nu_0 + \underbrace{mc^2}_{h\nu_0}\frac{\gamma H}{c^2}.$$

Therefore,

$$\nu = \nu_0 + \nu_0\frac{\gamma H}{c^2}.$$

The frequency shift is

$$\frac{\nu - \nu_0}{\nu_0} = \frac{\gamma H}{c^2}$$

$$= \frac{1}{c^2} G \frac{M_{sun}}{R_{sun}^2} H$$

3.

Einstein's Error in the Frequency Shift

Einstein knew of papers that attributed a frequency shift of

$$\frac{\nu - \nu_0}{\nu_0} = 2 \cdot 10^{-6},$$

to pressure in the absorbing layer.

In a footnote he wrote,

> *"L. F. Jewell (Journal de Physics, 6 ,1897, p. 84) and particularly Charles Fabry, and H. Boisson (Competes Rendus, 148, 1909, pp. 688-690) have actually found such displacements of fine spectral lines towards the red end of the spectrum, of the order of magnitude calculated here. but they have attributed them to an effect of the pressure in the absorbing layer"*

Einstein believed that the frequency shift followed from his Theory of Relativity.

And with no checking claimed that his shift of

$$\frac{1}{c^2} G \frac{M_{sun}}{R_{sun}^2} H$$

equals the observed shift of

$$2 \cdot 10^{-6}.$$

In fact,

$$\frac{1}{c^2} G \frac{M_{sun}}{R_{sun}^2} H = \frac{1}{(3 \cdot 10^8)^2} 6.67259 \cdot 10^{-11} \frac{1.9891 \cdot 10^{30}}{(6.96 \cdot 10^8)^2} 1.495979 \cdot 10^{11}$$

$$= 455.423635 \cdot 10^{-6}$$

Einstein had

An Error of the order of a Hundred

The frequency shift attributed to the effect pressure in the absorbing layer, cannot be considered even as noise compared with the Einstein's Frequency Shift of

$$\frac{1}{c^2} G \frac{M_{sun}}{R_{sun}^2} H$$

It is clear that Einstein never computed the value of his shift

He firmly believed that the shift of

$$2 \cdot 10^{-6}$$

is due to his Theory of Relativity.

So he made a claim without any checking, and it stood for over hundred years without any correction...

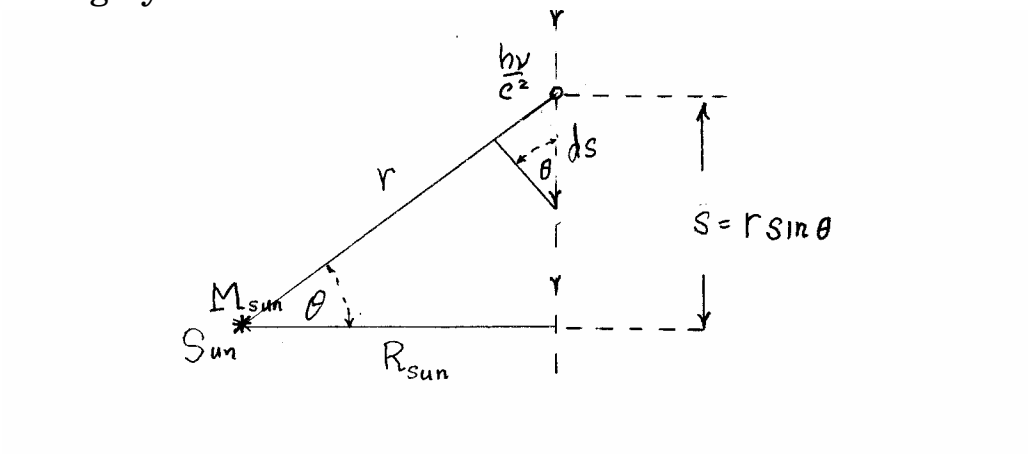
4.

Infinitesimal Frequency Shift

A photon with frequency ν, and mass

$$\frac{h\nu}{c^2}$$

is passing by the Sun



The photon is attracted to the Sun by the Gravitational Force

$$F = G\frac{M_{sun}\dfrac{h\nu}{c^2}}{r^2} = G\frac{M_{sun}\dfrac{h\nu}{c^2}}{\left(\dfrac{R_{sun}}{\cos\theta}\right)^2} = \frac{h\nu}{c^2}G\frac{M_{sun}}{R_{sun}^2}\cos^2\theta$$

This force applies along the infinitesimal distance

$$(ds)\cos\theta = d(R_{sun}\tan\theta)\cos\theta = R_{sun}\frac{d\theta}{\cos^2\theta}\cos\theta = R_{sun}\frac{d\theta}{\cos\theta}$$

The Gravitational Energy due to this Force along $ds\cos\theta$ is

$$Fds\cos\theta = \left(\frac{h\nu}{c^2}G\frac{M_{sun}}{R_{sun}^2}\cos^2\theta\right)\left(R_{sun}\frac{d\theta}{\cos\theta}\right)$$

$$= \frac{h\nu}{c^2}G\frac{M_{sun}}{R_{sun}}\cos\theta d\theta$$

This infinitesimal change in the gravitational energy will generate an infinitesimal frequency shift,

$$\boxed{\frac{d\nu}{\nu} = \frac{1}{c^2}G\frac{M_{sun}}{R_{sun}}\cos\theta d\theta}$$

5.

The Total Deflection Angle

The speed of a photon with wavelength λ is

$$c = \lambda\nu\,.$$

Assuming that to first order, an infinitesimal change in the speed is

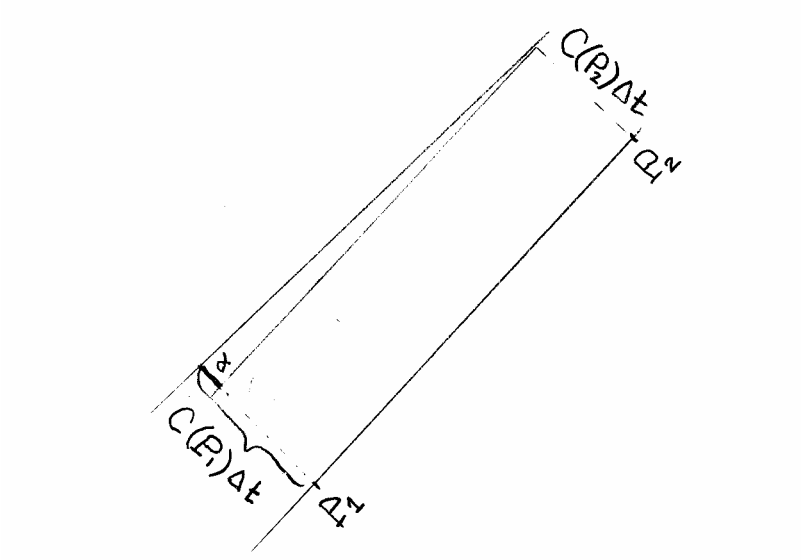
$$dc \approx \lambda d\nu\,,$$

we have

$$\frac{dc}{c} \approx \frac{1}{c^2} G \frac{M_{sun}}{R_{sun}} \cos\theta d\theta$$

Thus, the speed of the photon depends on its location.

Let P_1, and P_2 be at one meter distance



Then, at time interval

$$\Delta t\,,$$

$$\frac{c(P_1)\Delta t - c(P_2)\Delta t}{1} = \tan\alpha \approx \alpha$$

is the infinitesimal deflection angle of the photon path.

The total deflection of the photon path is

$$\sum_{\theta=-\pi/2}^{\theta=\pi/2} \alpha = \int_{\theta=-\frac{\pi}{2}}^{\theta=\frac{\pi}{2}} \frac{1}{c^2} G \frac{M_{sun}}{R_{sun}} \cos\theta d\theta = \frac{1}{c^2} G \frac{M_{sun}}{R_{sun}} \underbrace{\int_{\theta=-\frac{\pi}{2}}^{\theta=\frac{\pi}{2}} \cos\theta d\theta}_{2}$$

That is, the Total Deflection Angle is

$$\boxed{2\frac{1}{c^2} G \frac{M_{sun}}{R_{sun}}}$$

Einstein concludes that

> "*A ray of light traveling past the sun would undergo a deflection amounting to*
>
> $$4 \cdot 10^{-6} = 0.83 \text{ seconds of arc}."$$

Indeed,

$$2\frac{1}{c^2} G \frac{M_{sun}}{R_{sun}} = 2\frac{1}{(3\cdot 10^8)^2} 6.67259 \cdot 10^{-11} \frac{1.9891 \cdot 10^{30}}{6.96 \cdot 10^8}$$

$$= 4.23769117 \cdot 10^{-6}$$

References

[Dannon] H. Vic Dannon, "*The Invariance of the Energy-Momentum Under the Lorentz Transformation*", Gauge Institute Journal of Math and Physics, Vol. 14, No. 4, November 2018

[Einstein] Albert. Einstein, "*On the Influence of Gravitation on the propagation of Light*", in
"Einstein: The Principle of Relativity" pp. 99-108, Dover, 1952.
And in
The "Collected Works of Albert Einstein", Volume 3, Document 23, pp. 379-387, 1911, Princeton University Press, 1993

[Woan] Graham Woan, "The Cambridge Handbook of Physics Formulas", Cambridge University Press, 2000.