**Master Draft – F**

I propose that a massive object induces a “field” in the surrounding space. I propose that when a photon travels through this “field,” the momentum of the photon is shifted in an additive and linear manner – in accordance with the following equation:

Δ*p*=∫*pathp*⃗ ⋅*dl*⃗

where we integrate along the path of the photon and *p*⃗ is defined as

*p*⃗ =*r*^*Gm*ℏ*r*2

in units where c = 1.

Based on this proposition, we can make various calculations without using General Relativity. The results accord with empirical observation, thus “saving the appearances.”

**Bending of light.**

We imagine a photon that emanates from a distant source, passes close by a massive object, then continues beyond the object to an observer. The closest point while passing, i.e., the impact parameter, is at a distance of b from the center of the object. For ease of calculation, we will say that both the point of emanation and the observer are infinitely far from the massive object.

[figure]

We assume that to a first-order approximation the trajectory of the photon is a straight line. To calculate its change in momentum, we integrate along the straight-line path of the photon:

Δ*p*=∫*p*⃗ ⋅*dl*⃗ =∫+∞−∞*Gm*ℏ*r*3  *r*⃗ ⋅(*ωdz*⃗ )

*We divide the problem into two parts: The momentum change in the direction parallel to the direction of travel of the photon and the momentum change perpendicular to the direction of travel. In calculating the momentum change in the direction parallel to the direction of travel, we note that as the photo approaches and then recedes from the massive object, the change in momentum cancels out to leave zero net change in the parallel direction.* We can easily calculate the change in momentum in the direction perpendicular to the direction of travel:

Δ*py*=∫+∞−∞*b*  *Gm*ℏ(*z*2+*b*2)3/2  *ωdz*

This yields:

Δ*py*=ℏ*ω*2*Gmb*

We therefore get:

*θ*≈Δ*pypz*=2*Gmb*

which yields the deflection angle:

*α*=4*Gmb*

This is the same result as in the theory of General Relativity.

**Blue-shift of light**

Using the same initial proposition, we can calculate the blue-shift of light. As a photon falls into a gravitational well, the momentum and hence the energy of the photon is shifted. Because the energy of a photon is generally expressed as a frequency, we say that the frequency of the photon observed at infinity is changed compared to when it is observed in a gravitational field at a distance *R* from the center of the massive object. We use the following equation to express this change:

ℏ*ω*′=ℏ*ω*+Δ*p*

To calculate the change in momentum, we again integrate along the path of the photon:

Δ*p*=∫*R*∞*p*⃗ ⋅*r*^*ωdr*=∫*R*∞*Gm*ℏ*r*2*ωdr*=ℏ*ωGmR*

This yields:

ℏ*ω*′=ℏ*ω*(1+*GmR*)

In the theory of General Relativity the equation is given as:

ℏ*ω*′=ℏ*ω*1(1−2*Gm*/*R*)1/2

As Gm/R approaches zero, equations [X] and [Y] converge. As Gm/R approaches one, the equations diverge.This could be a testable difference between my theory and Einstein's.