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# Unified Quantum Gravity Field Equation That Describe Everything from The Smallest to the Cosmological Scales of the Universe

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## Abstract

We introduce a new quantum gravity field equation that is derived from collision-space time. This field equation can be written on several different forms. Gravity at the deepest level is linked to change in gravitational energy over the Planck time. In our view this is again linked to the collision between two indivisible particles, and this collision last the Planck time. We also show how a new equation of the universe can be derived from the quantum gravity field equation. This equation gives a new explanation of cosmological red shift that do not seem to be related to expanding space or the big bang hypothesis. Also the 13.8 billion Hubble time do not at all seem to be related to the age of the universe, but to the collision time of the mass in the universe.

**Keywords:** quantum gravity, quantum mechanics, quantum gravity field equation, Friedmann equation, Haug universe equation, relativistic mass.

## 1 Background

To really understand this paper one should first read some of our background material on collision space-time [1–3]. In the first paper where we first published the theory about collision space-time that unify gravity and quantum mechanics we did one mistake, that was to try to force it into Minkowski space-time. This we have seen lead to a few inconsistencies in the set-up, and it is now clear that our theory predicts and is consistent with a 3-dimensional space-time, something shortly discussed and suggested already in our first paper on collision space-time. However, we go much more in depth around 3-dimensional space-time in the working paper and book chapter referred to above. Our 3-dimensional space-time can also be seen as 6-dimensional space and time theory as there are three time-dimensions and three space-dimensions. Still as the collision-space and collision-time are just two sides of the same coin it is more correct to label it 3-dimensional collision space-time than 6-dimensional space and time theory, but the label is not of great importance, the mathematics and its predictions are much more important.

Einstein [4] suggested already in 1916 the next step in gravity was quantum gravity. He worked much of the remainder of his life in the hope to come up with a unified quantum gravity theory, but with little or no success. Eddington [5] in 1918 was likely the first to suggest that quantum gravity somehow should be linked to the Planck length (Planck scale), but without telling how. We will claim little, or no progress have been made for more than hundred years since despite massive efforts among very many researchers to come up with an acceptable and powerful quantum gravity theory. Super string theory and quantum loop theory have been nice attempts, but I would say they have failed big time. Collision space-time is a new and very promising quantum gravity theory that we will explore further in this paper.

Max Planck [6, 7] introduced the Planck units in 1899, the Planck length,  $l_p = \sqrt{\frac{G\hbar}{c^3}}$ , the Planck time  $t_p = \sqrt{\frac{G\hbar}{c^5}}$ , the Planck mass  $m_p = \sqrt{\frac{\hbar}{Gc}}$ , and the Planck temperature  $T_p = \sqrt{\frac{\hbar c^3}{Gk_B}}$ . It has since that time been assumed one need to know  $G$  and the Planck constant to find the Planck units. However in recent years it has been shown how one can find the Planck length and other Planck units independent on  $G$  and  $\hbar$ , see [8–11]. This is of great importance as it indicates we indeed can detect the Planck scale, and as we will discuss further here this even leads us to a full quantum gravity theory. This papers main focus is on a new quantum gravity field equation and what it predicts for gravity and cosmology.

## 2 Mass is collision-time and energy is collision-length

In collision space-time rest mass is defined as

$$\bar{m} = \frac{l_p}{c} \frac{l_p}{\lambda} = t_p \frac{l_p}{\lambda} \quad (1)$$

we could also have used notation  $\bar{m}_0$  for the rest mass. The relativistic mass is given by

$$\bar{m} = \frac{l_p}{c} \frac{l_p}{\bar{\lambda}} \gamma = t_p \frac{l_p}{\bar{\lambda} \sqrt{1 - \frac{v^2}{c^2}}} \quad (2)$$

further the rest-mass energy as collision length is given by

$$\bar{E} = l_p \frac{l_p}{\bar{\lambda}} \quad (3)$$

and the relativistic energy is given by

$$\bar{E} = l_p \frac{l_p}{\bar{\lambda}} \gamma = l_p \frac{l_p}{\bar{\lambda} \sqrt{1 - \frac{v^2}{c^2}}} \quad (4)$$

Further we have (that holds for both relativistic and non relativistic mass and energy)

$$\bar{E} = \bar{m}c \quad (5)$$

This is different from Einstein's  $E = mc^2$ , and it is easy to think this equation therefor must be wrong and crack pot, but it is actually fully consistent with Einstein's formula. To get joule and kilogram we must multiply each side with  $\frac{hc}{l_p}$ . It is just that we use a different definition for mass and energy, that is a more complete definitions than the kilogram definition, see [2].

Further as discussed in [2, 3] the collision-time mass and the collision-length energy are both vectors in 3 dimensional space-time (3 space dimensions and 3 time dimensions). So basically, we have

$$\bar{\mathbf{m}} = (\bar{m}_x, \bar{m}_y, \bar{m}_z) = \left( \frac{l_p}{c} \frac{l_p}{\bar{\lambda}} \gamma \mathbf{i}, \frac{l_p}{c} \frac{l_p}{\bar{\lambda}} \gamma \mathbf{j}, \frac{l_p}{c} \frac{l_p}{\bar{\lambda}} \gamma \mathbf{k} \right), \quad (6)$$

where  $\bar{\lambda} = |\bar{\boldsymbol{\lambda}}|$ , and  $\mathbf{i}, \mathbf{j}, \mathbf{k}$  are the unit vectors of the Compton wavelength. Further for energy we have

$$\bar{\mathbf{E}} = (\bar{E}_x, \bar{E}_y, \bar{E}_z) = \left( l_p \frac{l_p}{\bar{\lambda}} \gamma \mathbf{i}, l_p \frac{l_p}{\bar{\lambda}} \gamma \mathbf{j}, l_p \frac{l_p}{\bar{\lambda}} \gamma \mathbf{k} \right), \quad (7)$$

### 3 Quantum gravity field equation

Let's us first concentrate only on the  $x$ -axis then we have

$$\frac{\partial \bar{m}}{\partial t_x} = \frac{l_p}{\bar{\lambda}} \gamma \quad (8)$$

and

$$\frac{\partial \bar{E}}{\partial x} = \frac{l_p}{\bar{\lambda}} \gamma \quad (9)$$

In other words we have that

$$\frac{\partial \bar{E}}{\partial x} = \frac{\partial \bar{m}}{\partial t_x} \quad (10)$$

This can be seen as a differential equation for changes in collision-time and collision-length (space) along the  $x$ -axis, it describes how changes in mass (collision-time) is related to changes in energy (collision-length). This equation in one dimension only we introduced already in 2020, see [2] and again in the summer of 2021 [3] in a book chapter, but we did not discuss much of its implications. Extending it to 3-dimensional space-time we must have

$$\nabla \bar{E} = \nabla_t \bar{m} \quad (11)$$

where we have the following collision-space and collision-time operators;  $\nabla = \frac{\partial}{\partial x} \mathbf{i} + \frac{\partial}{\partial y} \mathbf{j} + \frac{\partial}{\partial z} \mathbf{k}$  and  $\nabla_t = \frac{\partial}{\partial t_x} \mathbf{i} + \frac{\partial}{\partial t_y} \mathbf{j} + \frac{\partial}{\partial t_z} \mathbf{k}$ . This field equation describes the relation between energy and mass, as well as between gravitational mass and gravitational energy as they ultimately are the same thing. It also explains the relation between space and time as energy is collision-space and mass is collision-time. In our theory we cannot move in time without moving in space. Further if we for example only move in the  $y$  direction in space then we can only move in the  $t_y$  direction of time. Collision-space and collision-time are two sides of the same coin, collision space-time. Space and time are deeply connected, even more so than in Einstein's theory and its Minkowski space-time where time can move without anything moving in space, something that is absurd in our view. Assume for example a light clock, how can it tick without the photon moving in space, and moving in a direction, it cannot. One could claim a photon clock is just a tool to measure time and that it has nothing to do with time itself. This we think would be a big mistake. Recent research indicates that matter are light clocks that ticks at the Compton frequency, see [1, 12, 13]. So, rest mass again consist of photons that again are indivisible particles moving at the speed of light back and forth over the reduced Compton wavelength of the particle for the to collide at the Compton frequency, the duration of each collision is the Planck time, not by assumption, but this is what we get from calibrating such model to observable gravitational phenomena, see the the papers referred to above.

The field equation above, eqn. (11), is a very general field equation that looks very unfamiliar for those used to standard physics and general relativity theory as well as standard quantum mechanics. This new field equation can also be written in form the Compton momentum, as the Compton momentum  $\bar{p}_c = \bar{m}c\gamma$  is identical to the collision-length energy. Our theory is also fully consistent with the standard relativistic energy momentum relation  $E^2 = p^2c^2 + m^2c^4$ , because this is linked to standard momentum that again is linked to the de Broglie wavelength that is a derivative of the Compton wavelength. So standard momentum is a derivative of the Compton momentum, so if re-written from the Compton momentum the relativistic energy momentum relation can be simplified  $E^2 = p_c^2$  and even to  $\bar{E} = \bar{p}$ , see [2] for mathematical proof of this. We can in other words also derive the standard relativistic energy momentum relation from our theory, but it is simply a derivative of a simpler reality.

Our theory is not linked to Minkowski space-time, but 3-dimensional space-time. It is also hard to see how it is related to gravity before we work with our field equation a bit, as we will do below:

$$\begin{aligned}\nabla\bar{E} &= \nabla_t\bar{M} \\ c^3t_p\nabla\bar{E} &= c^3t_p\nabla_t\bar{M} \\ \frac{c^3t_p\nabla\bar{E}}{R^2} &= \frac{c^3t_p\nabla_t\bar{M}}{R^2}\end{aligned}\quad (12)$$

Now keep attention to that  $c^3t_p\nabla_t\bar{M}$  is equal to  $c^3\bar{M}$ , that again is equal to  $GM$  so we must have

$$\begin{aligned}\frac{c^3t_p\nabla\bar{E}}{R^2} &= \frac{GM}{R^2} \\ \frac{c^3t_p\nabla\bar{E}}{R^2} &= g\end{aligned}\quad (13)$$

That is the gravitational acceleration field is created by gravitational energy (collision-length) over the Planck time. The gravitational acceleration field  $g$  is still the same as before,  $g = \frac{GM}{R^2}$  that also can be written as  $g = \frac{c^3\bar{M}}{R^2}$ . So, it does not give new predictions for gravitational acceleration, at least not at first glance, even if we will look at some interesting special cases later in this paper.

Still even at this stage this field equation gives deep insight into how gravity is linked to the Planck scale. Gravity is in this view detection of the Planck scale and is why we in recent years have been able to demonstrate how to find the Planck length and Planck time from a series of gravitational observations without any knowledge of  $G$  or  $\hbar$ . The Planck scale is not only something we can derive from dimensional analysis as Max Planck did, but gravity is also the Planck scale. Each single Planck event (collisions between two indivisible particles) is so incredible small (the Planck length radius) and has so short duration, the Planck time, that it is impossible now and likely any time in the future to detect a single such event directly. However, in macroscopic amount of matter contains an enormous amount of these Planck events, so we can easily detect the aggregate of them as gravity even from a handful of matter. And since we also can find the Compton frequency in matter, we can even extract the information about a single such event from a long series of observable gravity phenomena. And when this is understood we can also predict all sorts of observable gravity phenomena from just two constants, namely the Planck length and the speed of gravity  $c_g = c$ . For example, even in half a kilogram clumps size of matter we can measure for example the gravitational acceleration it causes on a much smaller body by using a Cavendish apparatus.

We can re-write the equation above as

$$\frac{c^2l_p\nabla_t\bar{M}}{R^2} = g \quad (14)$$

That is we can decide if we want to describe gravity as change in collision-space (energy) or as here as change in collision-time (mass), this because collision-space and collision-time are two sides of the same coin. Again, one cannot move in time without moving the same in space or move in space without moving the same in time. Collision space-time is the very essence of gravity.

We can also re-write the field equation above as

$$\frac{c^2l_p\nabla\bar{E}}{R^2} = g \quad (15)$$

and also we have

$$\frac{c^3t_p\nabla_t\bar{M}}{R^2} = g \quad (16)$$

In standard gravity one often like to express equations through energy density or mass density, we can easily also re-write our equations to do this

$$\begin{aligned}
\frac{c^3 t_p}{R^2} \nabla \bar{E} &= \frac{GM}{R^2} \\
\frac{c^3 t_p}{R^2} \nabla \bar{E} &= \frac{c^3 \bar{M}}{R^2} \\
\frac{c^3 t_p \nabla \bar{E}}{R^3} &= \frac{\frac{4}{3} \pi c^3 \bar{M}}{\frac{4}{3} \pi R^3} \\
\frac{t_p \nabla \bar{E}}{R^3} &= \frac{4\pi \bar{\rho}}{3}
\end{aligned} \tag{17}$$

Or if we use energy density (collision-space energy which is gravitational energy) instead of mass density then we get

$$\frac{l_p \nabla \bar{E}}{R^3} = \frac{4\pi \bar{\rho}_e}{3} \tag{18}$$

where  $\bar{\rho}_e = \frac{\bar{E}}{\frac{4}{3} \pi R^3}$ . We also get

$$\frac{l_p \nabla_t \bar{M}}{R^3} = \frac{4\pi \bar{\rho}_e}{3} \tag{19}$$

or we can re-write this to

$$\frac{t_p \nabla_t \bar{M}}{R^3} = \frac{4\pi \bar{\rho}}{3} \tag{20}$$

This last result is in particular nice, because in the special case of  $R = R_h = \frac{GM}{c^2} = \frac{c^3 \bar{M}}{c^2} = \bar{M} c$  we get

$$\begin{aligned}
\frac{t_p \nabla_t \bar{M}}{\bar{M}^3 c^3} &= \frac{4\pi \bar{\rho}}{3} \\
\frac{1}{\bar{M}^2 c^3} &= \frac{4\pi \bar{\rho}}{3} \\
\frac{1}{\bar{M}^2} &= \frac{4\pi c^3 \bar{\rho}}{3}
\end{aligned} \tag{21}$$

and if we set  $\bar{\rho}$  equal to the mass density of the Haug universe ( $\bar{\rho} = \bar{\rho}_u = \frac{\bar{M}_u}{\frac{4}{3} \pi R_h^3}$ ), then we have  $H_0 = \frac{1}{\bar{M}_u}$  and therefore

$$H_0^2 = \frac{4\pi c^3 \bar{\rho}_u}{3} \tag{22}$$

Further  $c^3 \bar{M} = GM$  so we have that

$$H_0^2 = \frac{4\pi G \rho_u}{3} \tag{23}$$

where  $\rho = \frac{M_u}{\frac{4}{3} \pi R_h^3}$ . That is we are using the kilogram mass instead of the collision-time mass, just so researcher familiar with the standard model (general relativity theory) and not our theory more easily can see how this is similar and different to the Friedmann [14] equation. The Friedmann critical universe equation is given by

$$H_0^2 = \frac{8\pi G \rho_c}{3} \tag{24}$$

So this means our new model predict twice the mass density in the observable universe as in the Friedmann model when using only the critical mass of the Friedmann model. However, the Friedmann equation above is only valid for a critical universe, the full Friedman equation has a  $k$  parameter in addition and a ad-hock inserted cosmological constant. This we do not get or need in our model, neither if we derive our cosmological model from our quantum gravity field equation as here or if derived from full relativistic Newtonian theory [15]. If derived from relativistic Newton mechanics the  $k$  parameter is initially there but cancels out in the full derivation.

This is of great importance as it shows that the Haug universe equation derived only based on considering relativistic mass in Newton mechanics is consistent with and can be derived from our quantum gravity field equation. In the case of general relativity theory the field equation of Einstein came first, then Friedmann found the Friedmann solution to it. In our case we had the quantum gravity theory first with a field equation, but we did not go ahead and derive an equation for the cosmos from it, we only had the general field equation and only in one dimension. We then derived a new equation for the universe considering relativistic mass in the Newton equation, but now we see that this also can be derived from our new quantum gravity field equation.

The cosmological red shift is given by

$$Z = \frac{dH_0}{c} \tag{25}$$

where  $H_0$  is the Hubble constant. What standard physics have not understood is that the Hubble constant is one divided by the mass of the universe. Well, this is not the case in their model using the incomplete kilogram mass. Further in addition the Friedmann critical mass is off by  $\frac{1}{2}$  from what it is in our mode. However, the Hubble constant in our model is given by

$$H_0 = \frac{c\bar{\lambda}_u}{l_p^2} = \frac{1}{t_p \frac{l_p}{\lambda_u}} = \frac{1}{M_u} \quad (26)$$

The cosmological red-shift is therefore given by

$$Z = \frac{1}{\frac{c\bar{M}_u}{d}} = \frac{1}{\frac{c^3\bar{M}_u}{c^2d}} = \frac{1}{\frac{GM_u}{c^2d}} \quad (27)$$

which is nothing else than one divided by gravitational red shift. Why it is one divided by the standard gravitational red-shift one can first understand by reading the next section.

## 4 Field equation taking into account $M$ and relativistic mass $m$

Einstein [16] in the end of his famous 1905 paper came up with incorrect suggestions for relativistic mass. He was likely also unaware that Lorentz [17] had published the correct relativistic mass formula already in 1899. Einstein and the general relativity community has abandoned relativistic mass before even investigating fully what it can lead to [18, 19]. The relativistic mass concept indeed does not seem fully compatible with 4-dimensional Minkowski space time, but instead of abandoning relativistic mass one should have investigated other forms for space-time and looked at the many implications from introducing relativistic mass. Again, we are using a 3-dimensional space-time. We have in previous papers shown that taking into account relativistic mass gives predictions that fit supernova data extremely well without the need of the dark energy hypothesis [20], as well as how it gives us a new and simpler cosmology [15], and a perfect fit to the Planck scale for micro black holes, something that general relativity theory not can do. Introducing relativistic mass also means wormholes are impossible and therefore just a hypothesis that comes out as a mathematical artifact from an incomplete theory: GRT.

The field equations presented in the previous section do not consider relativistic mass for the small mass  $m$  that  $M$  is acting on, that is they are for cases where  $m$  is moving slow relative to the speed of light. Here we will extend this to also when  $m$  can move close to the speed of light due to gravitational acceleration. We start with a relativistic modified Newtonian equation

$$\bar{m}c^2\gamma - \bar{m}c^2 - \frac{c^3\bar{M}\bar{m}\gamma}{R} = 0 \quad (28)$$

Here we use the collision-time mass and not the kilogram mass. However as  $G$  in standard theory is indirectly used without the physics community being aware of it to turn  $M$  into a collision-time mass, this because  $\frac{GM}{c^3} = \bar{M}$ . So to make it easier to understand also for researchers used to standard gravity theory we can also start to work out from the more standard  $GM$  notation. The only difference is we are making  $m$  relativistic by multiplying it with the Lorentz factor,  $m\gamma = \frac{m}{\sqrt{1-\frac{v^2}{c^2}}}$ . This gives us

$$\begin{aligned} mc^2\gamma - mc^2 - \frac{GMm\gamma}{R} &= 0 \\ mc^2 - mc^2\sqrt{1-\frac{v^2}{c^2}} &= \frac{GMm}{R} \end{aligned} \quad (29)$$

The mass  $M$  is not relativistic as we are observing  $m$  from  $M$  (only  $m$  is relativistic relative to us). Solved with respect to  $v$  gives  $v = \sqrt{\frac{GM}{R} - \frac{G^2M^2}{c^2R^2}}$ , and replacing this back into the equation gives

$$\begin{aligned} mc^2 - mc^2\sqrt{1-\frac{2GM}{c^2R} + \frac{G^2M^2}{c^4R^2}} &= \frac{GMm}{R} \\ \frac{c^2}{R} - \frac{c^2}{R}\sqrt{1-\frac{2GM}{c^2R} + \frac{G^2M^2}{c^4R^2}} &= \frac{GM}{R^2} \end{aligned} \quad (30)$$

Next keep in mind that  $\bar{M} = \frac{G}{c^3}M = t_p \frac{l_p}{\lambda_M}$  and that  $\frac{\partial\bar{M}}{\partial t} = \frac{l_p}{\lambda_M}$ ,  $\bar{E} = \frac{G}{c^2}M = \bar{M}c = l_p \frac{l_p}{\lambda_M}$  and  $\frac{\partial\bar{E}}{\partial t} = \frac{l_p}{\lambda_M}$ , so we must have

$$\begin{aligned} \frac{c^2}{R} - \frac{c^2}{R}\sqrt{1-\frac{2c\bar{M}}{R} + \frac{c^2\bar{M}^2}{R^2}} &= g \\ \frac{c^2}{R} - \frac{c^2}{R}\sqrt{1-\frac{2\bar{E}}{R} + \frac{c^2\bar{M}^2}{R^2}} &= g \\ \frac{c^2}{R} \left( 1 - \sqrt{1-\frac{2l_p\nabla\bar{E}}{R} + \frac{c^2t_p^2\nabla_t\bar{M}^2}{R^2}} \right) &= g \end{aligned} \quad (31)$$

where  $g = \frac{GM}{R^2} = \frac{c^3\bar{M}}{R^2}$ . We can also write it as

$$\frac{c^2}{R} - \frac{c^2}{R} \sqrt{1 - \frac{2ct_p \nabla_t \bar{M}}{R} + \frac{c^2 t_p^2 \nabla \bar{E}^2}{R^2}} = g \quad (32)$$

When  $v \ll c$  then  $\frac{G^2 M^2}{c^4 R^2}$  will be insignificant relative to  $\frac{GM}{R}$ , so we can then skip this part and we then can simplify the equation above to

$$\frac{c^2 l_p \nabla \bar{E}}{R^2} = g \quad (33)$$

as well as

$$\frac{c^3 t_p \nabla \bar{E}}{R^2} = g \quad (34)$$

These are the same equations we got directly from our general field equation when not considering that the gravitational mass  $M$  reacted on was relativistic ( $m\gamma$ ). Also here we see that the gravitational acceleration field is linked to the change in gravitational energy (collision length) over the Planck time.

We can alternatively write this as

$$\frac{c^3 t_p \nabla_t \bar{M}}{R^2} = g \quad (35)$$

as well as

$$\frac{c^2 l_p \nabla_t \bar{M}}{R^2} = g \quad (36)$$

It can seem perhaps absurd that we can link the gravitational acceleration field to only changes in collision-space ( $\nabla \bar{E}$ ) or only to changes in collision-time ( $\nabla_t \bar{M}$ ), but this is no mystery as soon as one understands time and space are just two sided of the same coin. This is naturally inconsistent with Minkowski space-time which in our view is an incomplete and actually flawed model of reality. Despite Minkowski space times great success it has not led us to any accepted unified quantum gravity theory.

In the extreme case where  $v = c$  we get that  $R = \frac{GM}{c^2} = \bar{M}c = R_h$ . This is not the Schwarzschild radius  $R_s = \frac{2GM}{c^2}$ , but the Haug [15] radius  $R_h$ , because we are taking into account relativistic mass which is ignored in general relativity theory and also therefore also in the derivation of the Schwarzschild metric and the Schwarzschild radius. In this special case (when  $m$  are at the Haug radius) we get that  $v = \sqrt{\frac{GM}{R} - \frac{G^2 M^2}{c^2 R_h R}} = \sqrt{\frac{GM}{R_h}} = c$  so we have that

$$\begin{aligned} \frac{c^2}{R_h} - \frac{c^2}{R_h} \sqrt{1 - \frac{GM}{c^2 R_h}} &= \frac{GM}{R_h^2} \\ \frac{c^2}{R_h} - \frac{c^2}{R} \sqrt{1 - \frac{GM}{c^2 \frac{GM}{c^2}}} &= \frac{GM}{R_h^2} \\ \frac{c^2}{R} &= \frac{GM}{R_h^2} \\ \frac{c^4}{GM} &= \frac{GM}{R_h^2} \\ \frac{c}{t_p \nabla \bar{E}} &= g_h \end{aligned} \quad (37)$$

where  $g_h = \frac{GM}{R_h^2} = \frac{c^3 \bar{M}}{R_h^2}$ . We also have

$$\frac{c^2}{l_p \nabla \bar{E}} = g_h \quad (38)$$

that also can be written as

$$\frac{c}{t_p \nabla_t \bar{M}} = g_h \quad (39)$$

That is consistent with

$$\frac{c^2}{l_p \nabla_t \bar{M}} = g_h = \frac{c^4}{GM} \quad (40)$$

In general relativity theory one would have  $g_s = \frac{GM}{R_s^2} = \frac{c^4}{4GM}$ . Further in our theory we have

$$\begin{aligned}
\frac{c^2}{l_p \nabla_t \bar{M}} &= = \frac{c^4}{GM} \\
\frac{c^2}{l_p \nabla_t \bar{M}} &= = \frac{1}{\frac{GM}{c^4}} \\
\frac{1}{l_p \nabla_t \bar{M}} &= = \frac{1}{\frac{GM}{c^2}} \\
\frac{1}{ct_p \nabla_t \bar{M}} &= = \frac{1}{\frac{GM}{c^2}}
\end{aligned} \tag{41}$$

and since  $H_0 = \frac{1}{M_u} = \frac{1}{t_p \frac{l_p}{\lambda_u}} = \frac{1}{t_p \nabla_t M_u}$  where  $\bar{\lambda}_u$  is the reduced Compton wavelength of the mass in the Haug universe, then we have

$$\frac{H_0}{c} = = \frac{1}{\frac{GM_u}{c^2}} \tag{42}$$

Next we multiply on both sides with the distance to the observed gravitational red-shift, and we get

$$\frac{dH_0}{c} = = \frac{1}{\frac{GM_u}{dc^2}} \tag{43}$$

and since  $\frac{dH_0}{c}$  is also an observable in relation to  $d$  and cosmological red-shift we can now understand that the Cosmological red-shift is nothing more than a special form of gravitational red-shift. The cosmological red shift is in other words predicted from our new quantum gravity theory, while in standard theory it is a separate phenomenon that need a separate constant, the Hubble constant. While in our model the Hubble constant is simply one divided by the collision-time mass of the observable universe. And since the collision-time mass multiplied by  $c$  is the collision-length energy, then the cosmological red-shift is the distance to the observation (emitter) divided by the collision-length energy of the observable universe (the Hubble sphere).

The cosmological red-shift has likely nothing to do with expanding space, there was likely no big-bang. Any large volume with a given density of mass-energy (collision space-time) will have an information horizon, which is in this case identical to the Hubble radius, the Haug radius and also to the Schwarzschild radius of the Friedmann critical universe. This because  $R_h = \frac{GM_u}{c^2} = \frac{2GM_c}{c^2}$ , because the mass density is predicted to be twice as high in our model as in the Friedmann model. That is  $M_u = 2M_c$ .

Much of modern cosmology is interpreted through a mathematical lens, this lens has been general relativity theory. This lens one has not been able to unify with quantum mechanics, nor the Planck scale. Our new theory is a new and more powerful mathematical lens (model) that unifies quantum mechanics as well as quantum gravity from the smallest to the largest scales of the universe.

It is said that the age of the universe is about  $\frac{1}{H_0} \approx 13.8$  billion years. However in our model the Hubble constant is one divided by the collision time of the universe, so the Hubble time of the universe is the collision-time of the universe

$$T_H = \frac{1}{H_0} = \bar{M}_u = t_p \frac{l_p}{\lambda_u} \approx 13.8 \text{ billion years} \tag{44}$$

This has nothing to do with the age of the universe, this has to do with that there are  $\frac{l_p}{\lambda_u} \approx 8,16 \times 10^{60}$  collisions per Planck time that each last one Planck time per Planck time, that aggregated is 13.8 billion years. Is it like you have an enormous amount of clocks standing in the same room and ticking, each tick for example one second, and you aggregate for example thousand clocks in the room, and you say they together ticked 1000 seconds in per second. It has nothing to do with that 1000 seconds have gone by since something, it is just that you have 1000 clocks that each ticked one second. The 13.8 billion years has in other words nothing to do with a big bang and the age of the universe or time since the hypothetically big bang. The universe is likely everlasting and infinite. But there is an information horizon which is linked to the Hubble radius, inside this radius the aggregated ticking time per Planck time from all the particles in the universe that each tick at their Compton frequency, but where the collision at each of these Compton periodicities is the Planck time, so this adds up to 13.8 billion years per Planck time. This naturally goes strongly against the big bang model. Despite the popularity of the big bang model, we hope researchers not based on prejudice will reject this model but study it carefully before making up their minds. This model after all unifies the Planck scale with gravity in a very simple and powerful way.

## 5 Conclusion

We have presented a new field equation that also holds for quantum gravity theory and relativistic quantum mechanics. It describes the processes at the very quantum level as well as it describes gravity at quantum level and macroscopic level, it also describes cosmos. All gravity is directly linked to the change in gravitational



energy over the Planck time. The Planck scale has in recent years been detected [9] or we should say understood to a much deeper extent than before, detection of gravity is detection of the Planck scale.

We get a new universe equation (model) linked to the Hubble scale of the universe. It shows that the Hubble constant in reality is one divided by the collision-time of the observable universe. It shows that cosmological red-shift is nothing more than a special type of gravitational red-shift. It has nothing to do with the hypothetical expansion of the universe. The cosmological red shift has likely nothing to do with expansion of space or the big bang hypothesis. Also, the Hubble time has likely nothing to do with the age of the universe, this is simply the collision-time of the whole mass of the observable universe. It is like having  $8.16 \times 10^{60}$  clocks each ticking the Planck time per Planck time, the aggregated tick time of all these clocks (that ultimately are mass) is approximately 13.8 billion years per Planck time. This simply means there is a lot of particles in the universe, but also that mass is linked to Compton time and again to the Planck time.

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