Exact Formulas of the Age of the Universe and of the Gravitational Constant dependent on Physical Constants

Version 4

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Abstract:

The british Physicist Paul Dirac (1902 - 1984) founded the Large Number Hypothesis[1], which handles with strange relations using numbers in order of magnitude 10^{40}. Also the german Physicist, Mathematician and Philosopher Hermann Weyl (1885 - 1955) was occupied with relations of High Order Numbers. In this report Formulas are presented, which give the Age of the Universe and the Gravitational Constant within their Tolerance Range both in dependence on Physical Constants.

Equation for the Age of the Universe:

The Age of the Universe is given to $13{,}787 \pm 0{,}02 \cdot 10^9$ years[2].

The Age of the Universe Age_{Univ} in SI-Unit s is: $13{,}787 \cdot 10^9 \cdot 3600 \cdot 24 \cdot 356{,}256 = 4{,}35092 \cdot 10^{17}$ s.

The maximal allowable relative tolerance range is: $(13{,}787 \pm 0{,}02) / 13{,}787$

that means a relative tolerance range from 0,99855 to 1,00145

The Large Number Equation LN_T, which is known since nearly 100 years, is written by use of the Age of the Universe, the Light Velocity c_L[3.1] and the Electron Radius r_e[3.2] to:

$$LN_T = Age_{Univ} \cdot c_L / r_e = 4{,}628815 \cdot 10^{40} \qquad \text{(LN-T1)}$$

A pretty simple, but harmonic Approximation of the quantity LN_T can be given by the following Equation LN_{TAppr}, at which the Fine Structure Constant α[3.3] and the Circle Figure π are used:

$$LN_{TAppr} = (4\,\pi / \alpha)^{4\pi} = 4{,}627378 \cdot 10^{40} \qquad \text{(LN-T2)}$$

The values of the used quantities Light Velocity c_L, Electron Radius r_e and Fine Structure Constant α can be taken from the section Used Data of Physical Constants at page 6.

The Equation for the Approximation Age_{Univ_Appr} of the Universe Age is given by Equating of Equations (LN-T1) and (LN-T2) and by conversion of the Equation it can be written to:

$$Age_{Univ\_Appr} = (4\,\pi / \alpha)^{4\pi} \cdot r_e / c_L = 4{,}349567 \cdot 10^{17}\ \text{s} = 13{,}783 \cdot 10^9\ \text{a} \qquad \text{(Age-Appr)}$$

The ratio of the calculated value Age_{Univ_Appr} to the set value is:

$13{,}783 / 13{,}787 = 0{,}99969$

The calculated value Age_{Univ_Appr} is far within the tolerance range of the set value[2] of the Universe Age. If one uses the terms "$1{,}000017 \cdot (4\,\pi)$" or "$0{,}999988 \cdot (4\,\pi)$" at the basis as well as at the exponent of Equation (Age-Appr) instead of the term "$4\,\pi$", the result is outside the tolerance range of the set value.

The term "$4\,\pi$" can also be observed at the Equation of the Magnetic Field Constant μ_0[3.5]:

$$\mu_0 = 4\,\pi \cdot (m_e \cdot r_e) / e^2$$

See values of the Magnetic Field Constant μ_0[3.5], the Electron mass m_e[3.6], the Electron Charge e[3.7] at page 6 at the section Used Data of Physical Constants.

The term "$4\,\pi$" is also used at the Equation (G-EK) of Dr. Endre Kerezturi at page 2.

The Approximation LN_{TAppr} of the Large Number LN_T isn't too difficult to find. One takes an Equation with the form $(A \cdot B)^A$ preferably for the Quantities with relatively big tolerance range, as for example the Gravitational Constant G or the Age of Universe. One can determine quite fast the exact value of the quantity A by use of the tool "Target Value Search", which is offered by most spreadsheet programs. The quantity B is in the case of Equation (Age-Appr) the reciprocal of the Fine Structure Constant α.

By this circumstance it may possible, that Equation (LN-T2) was already found by someone else, but who is unknown to the author. If this person or group had found Equation (LN-T2) before the time, when the author of this report found the Equation (LN-T2), this person or group naturally can claim its performing.

Large Numbers for the Gravitational Constant G:

The value of Gravitational Constant G is given according literature [3.8] to:

$$G = (6{,}67430 \pm 0{,}00015) \cdot 10^{-11}\ m^3\ kg^{-1}\ s^{-2} \quad \text{(LN-G)}$$

In the following some Large Number LN_G are presented by use of Physical Constants and with the goal to eliminate the SI-Units of the Gravitational Constants:

$$LN_{G1} = c_L^2 \cdot r_e / (m_e \cdot G) = 4{,}1656088 \cdot 10^{42} \quad \text{(LN-G1)}$$

$$LN_{G2} = c_L^2 \cdot r_p / (m_p \cdot G) = 6{,}7696584 \cdot 10^{38} \quad \text{(LN-G2)}$$

$$LN_{G3} = c_L^3 \cdot Age_{Univ\_Appr} / (m_e \cdot G) = 1{,}9275845 \cdot 10^{83} \quad \text{(LN-G3)}$$

$$LN_{G4} = c_L^3 \cdot Age_{Univ\_Appr} / (m_p \cdot G) = 1{,}0497953 \cdot 10^{80} \quad \text{(LN-G4)}$$

See value of the Proton Radius[4], [5] r_p and the Proton Mass[6] m_p at page 6 at the section Used Data of Physical Constants.

Equation of Dr. Endre Kereszturi:

There is a spectacular Equation (G-EK) for the Gravitational Constant G of Dr. Endre Kereszturi[7]. The result with extra added Units (Meter $\mathbf{m}^{-5}$ and second **s**) is very exact referring the tolerance:

$$G_{EK} = h^5 \cdot \alpha^2 / [(c_L^2 \cdot m_e^6) \cdot (4\pi)^3] \cdot \mathbf{m}^{-5}\,\mathbf{s} = 6{,}6743017 \cdot 10^{-11}\ m^3\ kg^{-1}\ s^{-2} \quad \text{(G-EK)}$$

See the value of the Plancks Constant h[3.9] at page 6 at the section Used Data of Physical Constants.
Remarkable: Equation (G-EK) contains the term "4 π", which is used two times at Equation (LN-T2)!
[A short Insert: dear Scientists, do you really think, that the result of Equation (G-EK) is random? This Equation contains the relatively big exponent values 5 and 6 for the Physical Constants h and m_e, in the whole the sum of exponents is 18. And the values of the corresponding basis (the Physical Constants) are highly exact, by that it is very remarkable, that one gets this excellent result for the Gravitational Constant by combining four Physical Constants with full number exponents, even if missing units have to be added!].

The following Equation (G-EK0) is introduced with the goal to avoid working with extra added Units:

$$G_{EK0} = h^5 \cdot \alpha^2 / [(c_L^2 \cdot m_e^6) \cdot (4\pi)^3] = 6{,}6743017 \cdot 10^{-11}\ m^8\ kg^{-1}\ s^{-3} \quad \text{(G-EK0)}$$

To solve the missing units "$\mathbf{m}^{-5}$ **s**" at Equation (G-EK0), two kinds of Large Numbers LN_{G_EK} are introduced. The first kind of the Large Numbers possesses the just mentioned units "$\mathbf{m}^{-5}$ **s**":

$$LN_{G\_EK1} = 1 / (c_L \cdot r_e^4) = 5{,}28995684 \cdot 10^{49}\ m^{-5}\ s \quad \text{(LN-G\_EK1)}$$

$$LN_{G\_EK2} = 1 / (c_L \cdot r_e^3 \cdot r_p) = 1{,}77278089 \cdot 10^{50}\ m^{-5}\ s \quad \text{(LN-G\_EK2)}$$

$$LN_{G\_EK3} = 1 / (c_L \cdot r_e^2 \cdot r_p^2) = 5{,}94097871 \cdot 10^{50}\ m^{-5}\ s \quad \text{(LN-G\_EK3)}$$

$$LN_{G\_EK4} = 1 / (c_L \cdot r_e \cdot r_p^3) = 1{,}99095264 \cdot 10^{51}\ m^{-5}\ s \quad \text{(LN-G\_EK4)}$$

$$LN_{G\_EK5} = 1 / (c_L \cdot r_p^4) = 6{,}67212024 \cdot 10^{51}\ m^{-5}\ s \quad \text{(LN-G\_EK5)}$$

$$LN_{G\_EK6} = 1 / (c_L \cdot r_e^{-1} \cdot r_p^5) = 2{,}23597425 \cdot 10^{52}\ m^{-5}\ s \quad \text{(LN-G\_EK6)}$$

The second kind of the Large Numbers takes the values of the just presented Equations, but these Large Numbers are reduced to values without any SI-Units:

$$LN_{G\_EK1\#} = LN_{G\_EK1} \cdot m^5\ s^{-1} = 5{,}28995684 \cdot 10^{49} \quad \text{(LN-G\_EK1\#)}$$

$$LN_{G\_EK2\#} = LN_{G\_EK2} \cdot m^5\ s^{-1} = 1{,}77278089 \cdot 10^{50} \quad \text{(LN-G\_EK2\#)}$$

$LN_{G\_EK3\#} = LN_{G\_EK3} \cdot m^5\ s^{-1} = 5{,}94097871 \cdot 10^{50}$ (LN-G_EK3#)
$LN_{G\_EK4\#} = LN_{G\_EK4} \cdot m^5\ s^{-1} = 1{,}99095264 \cdot 10^{51}$ (LN-G_EK4#)
$LN_{G\_EK5\#} = LN_{G\_EK5} \cdot m^5\ s^{-1} = 6{,}67212024 \cdot 10^{51}$ (LN-G_EK5#)
$LN_{G\_EK6\#} = LN_{G\_EK6} \cdot m^5\ s^{-1} = 2{,}23597425 \cdot 10^{52}$ (LN-G_EK6#)

The Equations for the Gravitational Constant G are written in the following:

$G_{EK1} = G_{EK0} \cdot LN_{G\_EK1} / LN_{G\_EK1\#}$ (G-EK1)
$G_{EK2} = G_{EK0} \cdot LN_{G\_EK2} / LN_{G\_EK2\#}$ (G-EK2)
$G_{EK3} = G_{EK0} \cdot LN_{G\_EK3} / LN_{G\_EK3\#}$ (G-EK3)
$G_{EK4} = G_{EK0} \cdot LN_{G\_EK4} / LN_{G\_EK4\#}$ (G-EK4)
$G_{EK5} = G_{EK0} \cdot LN_{G\_EK5} / LN_{G\_EK5\#}$ (G-EK5)
$G_{EK6} = G_{EK0} \cdot LN_{G\_EK6} / LN_{G\_EK6\#}$ (G-EK6)

The mathematical art is finding appropriate, reasonable Approximations for the Large Numbers $LN_{G\_EK1\#}$ to $LN_{G\_EK6\#}$. Furthermore the results of the Equations (G-EK1) to (G-EK6) have to be within the tolerance range of the Gravitational Constant G.
This was already performed in the author's report [8] (see page 6 and 7), although at that time the Large Number Hypothesis was not yet known to the author.

The term "$\alpha/(2\cdot\pi)$" [$=\Delta_{JS}$] is dedicated to the deceased Nobel Prize-Winner Julian Schwinger[9].
Next Large Number Equation is performed with the "Julian Schwinger"-Term Γ_{JS} [$= 1+\Delta_{JS} = 1+\alpha/(2\cdot\pi)$]:

$LN_{G\_EK6a} = (5\,\pi/\alpha)^{5\pi} / \Gamma_{JS}^{8{,}848} = 2{,}23597693 \cdot 10^{52}$ (LN-G_EK6a)

Remarkable: the exponent 8,848 of the Fine Tuning term of upper Equation (LN-G_EK6a) is 1/1000 of the height of the highest mountain Mount Everest with 8848 [in unit m]. Please see also some relations using the figure 8,848 and 8848 at the author's report [10], page 15.
The main part $(5\,\pi/\alpha)^{5\pi}$ ($= 2{,}259059 \cdot 10^{52}$) of upper Large Number contains two times the term "$5\,\pi$".

By use of upper Large Number LN_{G_EK6a} a quite good result of the Gravitational Constant G is given by the following Equation:

$G_{EK6a} = G_{EK0} \cdot LN_{G\_EK6} / LN_{G\_EK6a} =$
$= 6{,}6743017 \cdot 10^{-11}\ m^8\ kg^{-1}\ s^{-3} \cdot (2{,}23597425 \cdot 10^{52}\ m^{-5}\ s) / (2{,}23597693 \cdot 10^{52}) =$
$= 6{,}6742937 \cdot 10^{-11}\ m^3\ kg^{-1}\ s^{-2}$ (G-EK6a)

Result of Equation G_{EK6a} lies far within the tolerance range ($= \pm\, 0{,}00015 \cdot 10^{-11}\ m^3\ kg^{-1}\ s^{-2}$) of the Gravitational Constant G and uses only 4,2% of the lower tolerance limit.

A very accurate result for the Gravitational Constant G is given as follows:

$LN_{G\_EK6b} = (0{,}99 \cdot \Gamma_{JS})^{1{,}15544} \cdot (5\,\pi/\alpha)^{5\pi} = 2{,}23597423 \cdot 10^{52}$ (LN-G_EK6b)

$G_{EK6b} = G_{EK0} \cdot LN_{G\_EK6} / LN_{G\_EK6b} = h^5 \cdot \alpha^2 / [(4\,\pi)^3 \cdot c_L^3 \cdot m_e^6 \cdot (r_e^{-1} \cdot r_p^5) \cdot LN_{G\_EK6b}] =$
$= 6{,}6743017 \cdot 10^{-11}\ m^8\ kg^{-1}\ s^{-3} \cdot (2{,}23597425 \cdot 10^{52}\ m^{-5}\ s) / (2{,}23597423 \cdot 10^{52}) =$
$= 6{,}6743018 \cdot 10^{-11}\ m^3\ kg^{-1}\ s^{-2}$ (G-EK6b)

Result value of Equation (G-EK6b) corresponds very close to the set value G of the Gravitational Constant ($= 6{,}67430 \cdot 10^{-11}\ m^3\ kg^{-1}\ s^{-2}$).
Remarkable referring the figure 115544: $11+44=55$; $11+55+44=110$ [$\ln(110) = 4{,}70048 \approx 4{,}7$];
$\ln(110)\cdot\ln(99) = 21{,}59927$ [$\approx 21{,}6 = 6^3/10$]; $216-47 = 13^2$; $99+110+47 = 16^2$; $13^2 - 2\cdot 16 = 137$;
$1{,}15544/\ln(1{,}15544) = 7{,}99716$; $7{,}997 - 11^3 = 6666$; $7997/11 - 2\cdot 314 = 99$ [$314 \approx 100\cdot\pi$]

The term 0,99 of Equation (LN-G_EK6b) consists of the figures 0,9 and 1,1 ($0{,}9 \cdot 1{,}1 = 0{,}99$). And these figures - the 9 and 11 in combination with 10-powers - are named in the author's report [8] (see page 2) as helpful figures, by which one is able to perform astonishingly accurate Approximations of Physical Constants and of Data of Earth, Moon and Sun.

Term “0,99 · 0,99” delivers the value 0,9801. The figures 9801 and 396 (= 4 · 99) are used at the Serie Formula[11] for the Circle Figure π of the Indian Mathematician Srinivasa Ramanujan[11] (1887 - 1920).

There is another exact approximation by use of the Kereszturi-Formula, at which the term “5 π” is used three times:

$$LN_{G\_EK6c} = (5\pi/\alpha)^{5\pi} / [1+\alpha/(5\cdot\pi)]^{\mathbf{22,1144}} = 2{,}23597475 \cdot 10^{52} \qquad \text{(LN-G\_EK6c)}$$

$$G_{EK6c} = G_{EK0} \cdot LN_{G\_EK6} / LN_{G\_EK6c} = h^5 \cdot \alpha^2 / [(4\pi)^3 \cdot c_L^3 \cdot m_e^6 \cdot (r_e^{-1} \cdot r_p^5) \cdot LN_{G\_EK6c}] =$$
$$= 6{,}6743017 \cdot 10^{-11}\ m^8\ kg^{-1}\ s^{-3} \cdot (2{,}23597425 \cdot 10^{52}\ m^{-5}\ s) / (2{,}23597475 \cdot 10^{52}) =$$
$$= 6{,}6743002 \cdot 10^{-11}\ m^3\ kg^{-1}\ s^{-2} \qquad \text{(G-EK6c)}$$

Result value of Equation (G-EK6c) is extremely accurate!

Connection of the figures: $\ln(22{,}1144)/22{,}1144 = 0{,}14001$ [$\approx 2 \cdot 7/100$]; $22+11+44 = 77$;
$0{,}14 \cdot 5 \cdot \pi = 2{,}19927$ [$\approx 22/10$; $22/7 \approx \pi$]

$$LN_{G\_EK6d} = (5\pi/\alpha)^{5\pi} \cdot (1-5\cdot\pi\cdot\alpha)^{\mathbf{1/(3,773\cdot\pi)}} = 2{,}23597489 \cdot 10^{52} \qquad \text{(LN-G\_EK6d)}$$

$$G_{EK6d} = G_{EK0} \cdot LN_{G\_EK6} / LN_{G\_EK6d} = h^5 \cdot \alpha^2 / [(4\pi)^3 \cdot c_L^3 \cdot m_e^6 \cdot (r_e^{-1} \cdot r_p^5) \cdot LN_{G\_EK6d}] =$$
$$= 6{,}6743017 \cdot 10^{-11}\ m^8\ kg^{-1}\ s^{-3} \cdot (2{,}23597425 \cdot 10^{52}\ m^{-5}\ s) / (2{,}23597489 \cdot 10^{52}) =$$
$$= 6{,}6742998 \cdot 10^{-11}\ m^3\ kg^{-1}\ s^{-2} \qquad \text{(G-EK6d)}$$

Result value of Equation (G-EK6d) is also extremely accurate!

Connection of the figures: $3773 - 2 \cdot 11^3 = 1111$; $3773 - 11^3 - 5 \cdot 314 - 23^2 = 7^3$ [$314 \approx 100 \cdot \pi$]

$$LN_{G\_EK6e} = (5\pi/\alpha)^{5\pi} \cdot [1-\alpha/(6\cdot\pi)]^{\mathbf{500/(6\cdot\pi)}} = 2{,}23597489 \cdot 10^{52} \qquad \text{(LN-G\_EK6e)}$$

$$G_{EK6e} = G_{EK0} \cdot LN_{G\_EK6} / LN_{G\_EK6e} = h^5 \cdot \alpha^2 / [(4\pi)^3 \cdot c_L^3 \cdot m_e^6 \cdot (r_e^{-1} \cdot r_p^5) \cdot LN_{G\_EK6e}] =$$
$$= 6{,}6743017 \cdot 10^{-11}\ m^8\ kg^{-1}\ s^{-3} \cdot (2{,}23597425 \cdot 10^{52}\ m^{-5}\ s) / (2{,}23597489 \cdot 10^{52}) =$$
$$= 6{,}6742998 \cdot 10^{-11}\ m^3\ kg^{-1}\ s^{-2} \qquad \text{(G-EK6e)}$$

Result value of Equation (G-EK6e) is also extremely accurate and is close to the one of Equat. (G-EK6e)!

Connection of the figures: $500 - 137 = 3 \cdot 11^2$; $500 - 314 + 6 = 3 \cdot 8^2$; $11^3 + 9^3 - 6 \cdot 314 = 144 \cdot 11/9$;
$(500/6) \cdot \pi = 26{,}17994$ [$\approx 10 \cdot \Phi^2$; Golden Ratio $\Phi = 1{,}61803399$; $\Phi^2 = \Phi + 1$]

$$LN_{G\_EK6f} = (5\pi/\alpha)^{5\pi} \cdot (1-2\cdot\pi\cdot\alpha)^{\mathbf{1,375/(2\cdot\pi)}} = 2{,}23597474 \cdot 10^{52} \qquad \text{(LN-G\_EK6f)}$$

$$G_{EK6f} = G_{EK0} \cdot LN_{G\_EK6} / LN_{G\_EK6f} = h^5 \cdot \alpha^2 / [(4\pi)^3 \cdot c_L^3 \cdot m_e^6 \cdot (r_e^{-1} \cdot r_p^5) \cdot LN_{G\_EK6f}] =$$
$$= 6{,}6743017 \cdot 10^{-11}\ m^8\ kg^{-1}\ s^{-3} \cdot (2{,}23597425 \cdot 10^{52}\ m^{-5}\ s) / (2{,}23597474 \cdot 10^{52}) =$$
$$= 6{,}6743003 \cdot 10^{-11}\ m^3\ kg^{-1}\ s^{-2} \qquad \text{(G-EK6f)}$$

Result value of Equation (G-EK6f) is also extremely accurate and is close to the one of Equat. (G-EK6c)!

Connection of the figures: $11 \cdot 5^3 = 1375$; $1375 - 2 \cdot 314 - 666 = 3^4$; $1618 - 1375 = 3^5$ [$1618 \approx 1000 \cdot \Phi$]

$$LN_{G\_EK6g} = (5\pi/\alpha)^{5\pi} \cdot [1-(r_p/r_e)^2/(4\cdot\pi)]^{\mathbf{(4\cdot\pi)/8,7}} = 2{,}23597484 \cdot 10^{52} \qquad \text{(LN-G\_EK6g)}$$

$$G_{EK6g} = G_{EK0} \cdot LN_{G\_EK6} / LN_{G\_EK6g} = h^5 \cdot \alpha^2 / [(4\pi)^3 \cdot c_L^3 \cdot m_e^6 \cdot (r_e^{-1} \cdot r_p^5) \cdot LN_{G\_EK6g}] =$$
$$= 6{,}6743017 \cdot 10^{-11}\ m^8\ kg^{-1}\ s^{-3} \cdot (2{,}23597425 \cdot 10^{52}\ m^{-5}\ s) / (2{,}23597484 \cdot 10^{52}) =$$
$$= 6{,}6743000 \cdot 10^{-11}\ m^3\ kg^{-1}\ s^{-2} \qquad \text{(G-EK6g)}$$

Result value of Equation (G-EK6g) is also extremely accurate. In the basis of the Fine Tuning Term the radius relation “r_p/r_e” is used!

Connection of the figures: $4 \cdot \pi / 8{,}7 = 1{,}44441$; $144441/11 - 111^2 = 144 + 666$;

$\ln(144441) - \ln(4 \cdot \pi \cdot 87) = 4{,}88369$ [$\approx 4884/1000$]; $4884 - 2 \cdot 11^3 = 2222$;

$4884/11^3 = 3{,}66942$ [$\approx Ø_{Earth}/Ø_{Moon}$; this relation and also figure 4884 are described on page 15[10]];

$4884 = 4 \cdot 1221$ [see use of figure 1,221 at first section of the next page and of figure 1221 at the Addendum on page 7]; $1221 = 11 \cdot 111$

Electrical and Gravitational Forces:

The Electrical Force (absolute value) between a Proton and an Electron is determined to:

$$F_{e\_pe} = e \cdot |-e| \cdot \mu_0 \cdot c_L^2 / [4\pi \cdot (r_e + r_p)^2] = m_e \cdot r_e \cdot c_L^2 / (r_e + r_p)^2 = 17{,}23385\ \text{N} \qquad \text{(F1)}$$

with $\mu_0 = 4\pi \cdot m_e \cdot r_e / e^2$

The Gravitational Force between a Proton and a Electron is determined to:

$$F_{G\_pe} = G \cdot m_e \cdot m_p / (r_e + r_p)^2 = 7{,}59649 \cdot 10^{-39}\ \text{N} \qquad \text{(F2)}$$

The Ratio "$LN_{F\_pe} = F_{e\_pe} / F_{G\_pe}$", which also can be seen as a Large Number, is written to:

$$LN_{F\_pe} = F_{e\_pe} / F_{G\_pe} = 2{,}268661 \cdot 10^{39} \qquad \text{(LN-F1)}$$

The Ratio "F_{e_pe} / F_{G_pe}" combined with the Large Number LN_{TAppr} [$= (4\pi/\alpha)^{4\pi}$] delivers the following Equations: see definition of quantity Age_{Univ_Appr} on page 1

$$LN_{TAppr} \cdot LN_{F\_pe} = 4{,}62738 \cdot 10^{40} \cdot 2{,}268661 \cdot 10^{39} = 1{,}0498 \cdot 10^{80} = c_L^3 \cdot Age_{Univ\_Appr} / (m_p \cdot G) \quad [\approx 10^{80}]$$

$$LN_{TAppr} / LN_{F\_pe} = 4{,}62738 \cdot 10^{40} / (2{,}268661 \cdot 10^{39}) = 20{,}396951 \quad [\approx 3 \cdot 1{,}221 \cdot \pi^{1,5} = 20{,}396785]$$

Another remarkable and helpful Relations:

$$Rel_1 = [5\pi / (4\pi/\alpha)^{4\pi}] \cdot [(r_e + r_p)/r_e] \cdot LN_{F\_pe} = 0{,}9999142 \quad [\approx 1] \qquad \text{(Rel1)}$$

$$Rel_2 = [1 - \alpha/(3\pi)]^{1/(3\pi)} = 0{,}9999178 \quad [\approx Rel_1] \qquad \text{(Rel2)}$$

By Equalization of the mid parts of the two upper Equations one gets an exact Formula for the Gravitational Constant G, which is derived by the Electrical and Gravitational Forces (see Equations F1 and F2) and which lies far within its tolerance range:

$$G_{F1} = \{(5\pi) \cdot (4\pi/\alpha)^{-4\pi} \cdot [1 - \alpha/(3\pi)]^{-1/(3\pi)}\} \cdot c_L^2 \cdot (r_e + r_p) / m_p = 6{,}674276 \cdot 10^{-11}\ \text{m}^3\ \text{kg}^{-1}\ \text{s}^{-2} \qquad \text{(G-F1)}$$

Result of Equation (G-F1) uses only 16% of the lower Tolerance Range of the Gravitational Constant G. One considers, that the figures 3, 4 and 5 belong to the terms with the Circle Figure π.

There is another Formula with Relation (Rel3), which fits very good to Equation (G-F2):

$$Rel_3 = [1 - \alpha \cdot (3\pi)]^{1/(36\pi)} = 0{,}9993702 \qquad \text{(Rel3)}$$

$$G_{F2} = \{(5\pi) \cdot (4\pi/\alpha)^{-4\pi} \cdot [1 - \alpha \cdot (3\pi)]^{-1/(36\pi)}\} \cdot c_L^2 \cdot (r_e + r_p) / (m_e + m_p) = 6{,}674298 \cdot 10^{-11}\ \text{m}^3\ \text{kg}^{-1}\ \text{s}^{-2} \qquad \text{(G-F2)}$$

Result of Equation (G-F2) uses only 1,2% of the lower Tolerance Range of the Gravitational Constant G. Please look at figure 36, which is also used as an exponent part at the next Equation (G-F3).

At the next formula figure 36 ($= 4 \cdot 9$) is used besides the figure 99 ($= 9 \cdot 11$). Last one is also observable at Equation (LN-G_EK6b) with the form 0,99 and at Equation (G-F6) with the form 9,9:

$$G_{F3} = \{99^{-1} \cdot (4\pi/\alpha)^{-4\pi} \cdot [36 \cdot r_p / r_e]^{36 \cdot r_p \cdot r_p/(r_e \cdot r_e)}\} \cdot c_L^2 \cdot r_e / m_p = 6{,}674234 \cdot 10^{-11}\ \text{m}^3\ \text{kg}^{-1}\ \text{s}^{-2} \qquad \text{(G-F3)}$$

Result of Equation (G-F3) uses about 44% of the lower Tolerance Range of the Gravitational Constant G.

At the next formula the Large Numbers $(3\pi/\alpha)^{3\pi}$ and $(4\pi/\alpha)^{4\pi}$ are used:

$$G_{F4} = \{(3\pi/\alpha)^{3\pi} \cdot (4\pi/\alpha)^{-4\pi} \cdot [(28{,}445566/\pi)/\alpha]^{-28{,}445566/\pi}\} \cdot c_L^2 \cdot r_e / m_p = 6{,}6743001 \cdot 10^{-11}\ \text{m}^3\ \text{kg}^{-1}\ \text{s}^{-2} \qquad \text{(G-F4)}$$

Result of Equation (G-F4) is very accurate. Connection of the figures: $44 + 55 + 66 - 28 = 137$

$$G_{F5} = 5\pi \cdot (4\pi/\alpha)^{-4\pi} \cdot [1 - 1/(10 \cdot \pi)]^{-1/(12 \cdot 10 \cdot \pi)} \cdot c_L^2 \cdot (r_e + r_p) / m_p = 6{,}6742999 \cdot 10^{-11}\ \text{m}^3\ \text{kg}^{-1}\ \text{s}^{-2} \qquad \text{(G-F5)}$$

$$G_{F6} = 5\pi \cdot (4\pi/\alpha)^{-4\pi} \cdot [1 - 1/(11 \cdot \pi)]^{-1/(9{,}9 \cdot 11 \cdot \pi)} \cdot c_L^2 \cdot (r_e + r_p) / m_p =$$
$$= 6{,}6743000 \cdot 10^{-11}\ m^3\ kg^{-1}\ s^{-2} \qquad \text{(G-F6)}$$

Conclusion

By application of the Physical Constants Light Velocity c_L, Classical Electron Radius r_e and Fine Structure Constant α and of a relative simple, but harmonic Equation for a Large Number LN an Approximation for the Age of the Universe could be presented, which result lies far within the Tolerance Range.

If the values of the Physical Constants "Fine Structure Constant, Classical Electron Radius, Light Velocity", which are used at the Formula (Age-Appr) for the Age of the Universe, haven't changed since the Big Bang, the following question arises: what meaning has it to the Formula (Age-Appr), because the Formula is only valid for a certain time period within the tolerance range of the Age of the Universe?

Referring this context an extract of the author's report [8] is repeated because of the time range analogy: *Please look again at the two Equations (RT_{Earth}) and (RT_{Moon})* [RT: Rotation Time] *with their reciprocal terms to each other! Consider that the result values are only valid during a certain earthly time period and that the relations were found in this period. If the development of the earth with the moon or mankind itself had changed just a little bit different, the result values never would have been possessed this correctness to the existing values, neither in the past nor in the future!* [extract of page 2 from report [8]]

Furthermore some Large Numbers LN in dependence on the Proton Radius are presented, which are applied for an exact calculation of the Gravitational Constant. The Large Number $(5\pi/\alpha)^{5\pi}$, which possesses the similar form as the Large Number $(4\pi/\alpha)^{4\pi}$ of the Equation for the Age of the Universe, leads to very accurate Equations for the Gravitational Constant G.

Please look again at the impressive used terms:

$$\mathbf{(4\pi/\alpha)^{4\pi}} \quad \text{and} \quad \mathbf{(5\pi/\alpha)^{5\pi}} \quad \text{and} \quad \text{applied once } \mathbf{(3\pi/\alpha)^{3\pi}}$$

At the end the author takes the permission to present an Aphorism, which begins with a question:

Dear Reader, can you imagine the invisible note below these mathematical terms and the signature?

"Now it may possible for the mankind to see, that I am the Creator of the Universe.
Every Human Being has its free will to accept it or not."
[Signature] God

Used Data of Physical Constants:

Electron Charge e[3.7]:	$1{,}602\,176\,634 \cdot 10^{-19}$ C
Fine Structure Constant α[3.3]:	$7{,}297\,352\,5693(11) \cdot 10^{-3}$
Reciprocal of Fine Structure Constant 1/α[3.4]:	137,035 999 084(21)
Gravitational Constant G[3.8]:	$6{,}67430(15) \cdot 10^{-11}\ m^3\ kg^{-1}\ s^{-2}$
Light velocity c_L[3.1]:	299 792 458 m/s
Magnetic Field Constant μ_0[3.5]:	$1{,}256\,637\,062\,12(19) \cdot 10^{-6}$ kg m C^{-2}
Mass of Electron m_e[3.6]:	$9{,}109\,383\,7015(28) \cdot 10^{-31}$ kg
Mass of Proton m_p[6]:	$1{,}672\,621\,923\,69(51) \cdot 10^{-27}$ kg
Plancks Constant h[3.9]:	$6{,}626\,070\,15 \cdot 10^{-34}$ J s
Radius of Electron r_e[3.2]:	$2{,}817\,940\,3262(13) \cdot 10^{-15}$ m
Radius of Proton r_p[4]:	$0{,}84087(39) \cdot 10^{-15}$ m

The figures in the brackets behind the data descibe the uncertainty referring the last places of the given value[3].

Addendum:

"Hans de Vries Formula"[12] with Euler Figure e (= 2.7182818) and Circle Figure π:

$\alpha_1 = \Gamma_{\alpha 1}{}^2 \cdot e^{-\pi \cdot \pi / 2}$ with

$\Gamma_{\alpha 1} = 1 + \alpha_1/(2\cdot\pi)^0 \cdot (1+ \alpha_1/(2\cdot\pi)^1 \cdot (1 + \alpha_1/(2\cdot\pi)^2 \cdot (1 + \alpha_1/(2\cdot\pi)^3 \cdot (1 + \ldots))))$

Equation α_1 is only iteratively, but sufficient exactly to solve. Therefore the quantity $\mathbf{\Gamma_{\alpha 0}}$ is used:

$$\boldsymbol{\alpha_{HdV}{}^{-1} = \Gamma_{\alpha 0}{}^{-2} \cdot e^{\pi \cdot \pi / 2}} = 1{,}007\,305\,829\,35^{-2} \cdot 139{,}045\,636\,6606 = 137.035999096 \qquad (\alpha\text{-HdV})$$

$$\boldsymbol{\Gamma_{\alpha 0}} = 1 + \alpha_0/(2\cdot\pi)^0 \cdot (1+ \alpha_0/(2\cdot\pi)^1 \cdot (1 + \alpha_0/(2\cdot\pi)^2 \cdot (1 + \alpha_0/(2\cdot\pi)^3 \cdot (1 + \ldots))))$$

An appropriate exact input value for $\alpha_0{}^{-1}$ ($\alpha_0{}^{-1}$ between 137.035999084 and 137.035999110) is required to get the above result value (with 9 digits behind the decimal point) for $\alpha_{HdV}{}^{-1}$.

In the following the term $\mathbf{\Gamma_{\alpha 0}}$ is named $\mathbf{\Gamma_{dV}}$ according to Hans **d**e **V**ries, who performed upper Formula.

Connections to Figure 3,4111777:

Another formula with serie form (see Literature [8], page 4):

$$\alpha_{\#7}{}^{-1} = \Gamma_{\alpha 1} \cdot [2 \cdot \pi^{e \cdot e / 2}] = 137{,}035999088\,323 \qquad (\alpha 7)$$

$$\Gamma_{\alpha 1} = 1 - \alpha_1 / Z_1{}^1 \cdot (1 - \alpha_1 / Z_1{}^2 \cdot (1 - \alpha_1 / Z_1{}^3 \cdot (1 - \alpha_1 / Z_1{}^4 \cdot (1 - \alpha_1 / Z_1{}^5 \cdot (1 + \ldots))))) \qquad (\alpha 7\text{-}1)$$

$$\text{with} \quad \mathbf{Z_1 = 3{,}4111777} = 2 \cdot 17 \cdot 10^{-1} + 111777 \cdot 10^{-7} \qquad (Z1)$$

An appropriate exact input value for $\alpha_1{}^{-1}$ ($\alpha_1{}^{-1}$ between 137.0359990880 and 137.0359990884) is required to get the above exact value (with 11 digits behind the decimal point) for $\alpha_{\#7}{}^{-1}$.

Connection of the figures: figures 17 and 111777, both consist of figure 1 and figure 7.

Connection of Z_1 to figure e: $\mathbf{Z_{1e}} = 2 \cdot e - (0{,}9^2 + 4 \cdot 0{,}034) \cdot (0{,}9^2 + 1{,}1^3) = 3{,}411177657$ (≈ **Z1**)

Z_1 to figure π: $\mathbf{Z_{1\pi}} = 2 \cdot \pi - (2^2 \cdot 7^2 \cdot 11^2) \cdot (11^3 + 13^2 - 17^2) \cdot 10^{-7} = 3{,}411177707$ (≈ **Z1**)

Quantity $\mathbf{Z_{1\pi}}$ is dependent on the Serie Primes 7, 11, 13, 17

Grotesque Relations with the Figure Z_1 (=3,4111777) in connection with the Hans de Vries-Term Γ_{dV} and the Julian Schwinger Term Γ_{JS} [$= 1+\Delta_{JS} = 1+\alpha/(2\cdot\pi)$]:

$\mathbf{Z_1}^{0,666} \cdot 5{,}55 = 12{,}566296$ [$\approx 4\cdot\pi = 12{,}566371$]; 777 - 111 = 666; 1221 = 555 + 666;

$[\mathbf{Z_1}^{0,666} \cdot 5{,}55 / (4\cdot\pi)] \cdot \Gamma_{dV}{}^{1/\mathbf{1221}} = 1{,}000000003$; $11 \cdot 111 = 1221$; $4 \cdot 1221 = 4884$ [figure 4884 is also mentioned below]

$[\mathbf{Z_1}^{0,666} \cdot 5{,}55 / (4\cdot\pi)] \cdot \Gamma_{JS}{}^{1/(2 \cdot \pi \cdot \pi \cdot \pi \cdot \pi)} = 0{,}999\,999\,9993$; $(2 \cdot \pi^4) \cdot (2 \cdot \pi) = 1224{,}079$;

Formula for the Proton Radius in dependence on Figure 3,4111777:

$r_p = [\pi^{1/3} \cdot 3{,}4111777^{2/3} / 11{,}1222) \cdot r_e = 8{,}40867 \cdot 10^{-16}$ m; Set value[4] is: $8{,}4087(39) \cdot 10^{-16}$ m

Formula for the Gravitational Constant in dependence on Figure 3,4111777:

$$LN_{G\_EK1} = 1 / (c_L \cdot r_e{}^4) = 5{,}2899568 \cdot 10^{49} \text{ m}^{-5} \text{ s} \qquad (\text{LN-G\_EK1})$$

$$LN_{G\_EK1a} = 0{,}99^{\mathbf{1,11}} \cdot (4{,}4 \cdot 3{,}4111777 / \alpha)^{\mathbf{4,4 \cdot 3,4111777}} = 5{,}2899523 \cdot 10^{49} \qquad (\text{LN-G\_EK1a})$$

$$G_{EK1a} = G_{EK0} \cdot LN_{G\_EK1} / LN_{G\_EK1a} = h^5 \cdot \alpha^2 / [(4\,\pi)^3 \cdot c_L{}^2 \cdot m_e{}^6 \cdot (c_L \cdot r_e{}^4) \cdot LN_{G\_EK1a}] =$$
$$= 6{,}6743017 \cdot 10^{-11} \text{ m}^8 \text{ kg}^{-1} \text{ s}^{-3} \cdot (5{,}2899568 \cdot 10^{49} \text{ m}^{-5} \text{ s}) / (5{,}2899523 \cdot 10^{49}) =$$
$$= 6{,}6743074 \cdot 10^{-11} \text{ m}^3 \text{ kg}^{-1} \text{ s}^{-2} \qquad (\text{G-EK1a})$$

Connection of the figures: $44 \cdot 111 = 4884$; $LN_{G\_EK1a} = 5{,}2899523 \cdot 10^{49}$ [$\approx 5{,}29 \cdot 10^{49} = 23^2 \cdot 10^{47}$]; see figure 4884 on page 4 and also in the author's report [10] on page 15; $\ln(99) = 4{,}5951$ [$\approx 2 \cdot 2{,}3$]; $1 / [\ln(111) - \ln(99)] = 8{,}7405$ [$874 = 23 \cdot 38$]; $1 / [\ln(99) - \ln(44)] = 1{,}23315$ [$1233 = 9 \cdot 137$]

Literature and wikipedia.de-Entries:

The data of the physical Constants are taken from the entries of Wikipedia Germany. The Physical Constants given in the corresponding entries refer mostly to CODATA 2018.
The reason of this choice can be read in the authors report[13] at section 8 (Page 13 and 14). For the calculation of the Universe Age by the Equation (Age-Appr) it takes a very neclegtable influence independent, if one uses the values of CODATA 2018 or a later CODATA-Version.

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[3] Wikipedia.de-Entry “Physikalische Konstante“; Status May 2024

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[3.2] Electron Radius r_e:
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[3.3] Fine Structure Constant α:
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[3.7] Electron Charge e:
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[3.8] Gravitational Constant G:
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[3.9] Plancks Constant h:
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[4] "Measuring the size of the proton"; Dr. Randolf Pohl (Max-Planck-Institut für Quantenoptik); 12 Dec 2013;
https://indico.ph.tum.de/event/3056; Status August 2025

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[The Proton Radius is listed at page 3 and page 58]

[6] Wikipedia.de-Entry “Proton“; Status March 2024
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Atomic+and+nuclear.x=114&Atomic+and+nuclear.y=16) National Institute of Standards and Technology, abgerufen am 21. Juli 2019.

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[The Formula for the Gravitational Constant is listed at page 16 with Equation (19)]

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[9] Wikipedia.en-Entry "Julian Schwinger"; Status August 2025

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Additional Informations:

Calculations were performed with the LibreOffice-Calculation-Software.