A Gravity Equation

Abstract: A nontrivial way of expressing the Universal Gravity constant with an error rate less than one part in a million. (Planck time)*(Ampere)/(Elementary Charge) = (Fine Structure constant)^(1/4 coth(7^(19/49)/pi^4)). Which is the fractional part of a charge that passes through a boundary during a Planck time.

Main Body: I claim that a Planck time times an Ampere divided by Elementary Charge is equal to the Fine Structure constant raised to the power of one forth times the hyperbolic cotangent function of seven raised to nineteen/forty ninths and divided by pi raised to the forth power as shown in Equation #1.

$$\frac{T_p \; A}{e} = \alpha^{\frac{1}{4}\coth\left(\frac{7^{\frac{19}{49}}}{\pi^4}\right)} \qquad (1)$$

https://www.wolframalpha.com/input/?i=+%28Planck+time%29+%28ampere%29%2F%28elementary+charge%29+%3D+%28fine+structure+constant%29^%281%2F4+coth%287^%2819%2F49%29%2Fpi^4%29%29
(copy and paste above blue url text into a web browser to check Eq. #1)

The left hand side of Eq. #1 has a direct physical meaning, it is the fractional part of a charge that passes through a boundary during a Planck time. The right hand side of the equation is a guess. The reason the right hand side of the equation is a guess is not because there is one RIGHT answer and many wrong answers but because ALL possible answers are wrong to a greater or lesser extent.

Notice that the terms of Eq. #1 are based on measurements which have limited accuracy and analytic expressions by definition have infinite accuracy. Clearly limited accuracy can not equal infinite accuracy thus it is impossible to prove that an analytic expression is the most unique and exact within the limits of measurement technology.

If we do not know which analytic expression is the most correct, that should not stop us from using analytic expressions that are mostly correct till a better one can be found.

If and only if the reader is willing to entertain the thought that Eq. #1 is an acceptable answer to the question of how many charge carriers pass through a boundary in a Planck time then we can unite the family of electromagnetic constants $(c, \varepsilon, \mu, \alpha, ...)$ and the family of gravity mass constants $(G, m_p, m_{e,} ...)$ into the same logical structure.

Using the definition of Planck time and rewriting Eq. #1 as Eq. #2 then the Universal Gravity constant can be expressed as a set of physical constants with an error rate of less than one part in a million as seen in Figure #1. Figure #1 shows Eq. #1 and Eq. #2 being checked in the Maple program with the present known values of the physical constants.

$$G = \frac{c^5 e^2 \alpha^{\frac{1}{2}\coth\left(\frac{7^{\frac{19}{49}}}{\pi^4}\right)}}{A^2 \bar{h}} \qquad (2)$$

https://www.wolframalpha.com/input/?i=%28speed+of+light%29^5*%28Elementary+Charge%29^2*%28fine+structure+constant%29^%28coth%287^%2819%2F49%29%2Fpi^4%29%2F2%29*%28ampere%29^-2*%28reduced+planck+constant%29^-1*%28gravity+constant%29^-1%3D1 (copy and paste above blue url text into a web browser to check Eq. #2)

```
with(ScientificConstants):
c0 := evalf(Constant(c), 100):
hb0 := evalf(Constant(hbar), 100):
G0 := evalf(Constant(Newtonian_constant_of_gravitation), 100):
A0 := 1:
e0 := evalf(Constant(elementary_charge), 100):
α0 := evalf(Constant(fine_structure_constant), 100):
Pt0 := evalf(Constant(t[P]), 100):
```

Check Eq #1

$$evalf\left(1 = \frac{e0\ \alpha 0^{\frac{1}{4}\coth\left(\frac{7^{19/49}}{\pi^4}\right)}}{Pt0\ A0}, 20\right)$$

$$1. = 1.0000000791385315955$$

Check Eq #2

$$evalf\left(1 = \left(\frac{c0^5\ e0^2\ \alpha 0^{\frac{1}{2}\coth\left(\frac{7^{19/49}}{\pi^4}\right)}}{A0^2\ hb0\ G0}\right), 20\right);$$

$$1. = 1.0000001582770694539$$

Figure #1 - Checking the equation in the Maple program.

Summary: If reader does not believe the results seen in Figure #1, does that not call all of mathematics into question? On the other hand, if the reader accepts that (Planck time)*(ampere)/(elementary charge) equals the (fine structure constant)^(1/4 *coth(7^(19/49) /pi^4)) then we can unify the physical constants.

The choice is yours.