Here the abstract of the study where an algebraic term was found for constant u :

PHASE SPACES IN SPECIAL RELATIVITY : TOWARDS ELIMINATING GRAVITATIONAL SINGULARITIES

from PETER DANENHOWER → see weblink : **https://arxiv.org/pdf/0706.2043.pdf**

Abstract : This paper shows one way to construct phase spaces in special relativity by expanding Minkowski Space. These spaces appear to indicate that we can dispense with gravitational singularities. The key mathematical ideas in the present approach are to include a complex phase factor, such as, eιφ in the Lorentz transformation and to use both the proper time and the proper mass as parameters. To develop the most general case, a complex parameter σ = s + im, is introduced, where s is the proper time, and m is the proper mass, and σ and σ /|σ| are used to parameterize the position of a particle (or reference frame) in space-time-matter phase space. A new reference variable, u = m/r , is needed (in addition to velocity), and assumed to be bounded by 0 and $c^2/G = 1$, in geometrized units. Several results are derived: The equation $E = mc^2$ apparently needs to be modified to $E^2 = (s^2c^{10})/G^2 + m^2c^4$, but a simpler (invariant) parameter is the "energy to length" ratio, which is c^4/G for any spherical region of space-time-matter. The generalized " momentum vector" becomes completely "masslike" for **u ≈ 0.7861...,** which we think indicates the existence of a maximal gravity field. Thus, gravitational singularities do not occur. Instead, as u → 1 matter is apparently simply crushed into free space. In the last section of this paper we attempt some further generalizations of the phase space ideas developed in this paper.

Extract from page 11 of the study (equation 4.9) :

$$\hat{\mathbf{P}} = \frac{[(\sqrt{1-u^2}-u^2)+i(u\sqrt{1-u^2}+u)]}{\sqrt{1+u^2}}\gamma < 1, v >$$

In this form the real and imaginary part of **P** have a very interesting property, namely, if

(4.10) $u = \frac{\sqrt{2\sqrt{5}-2}}{2}$ **≈ 0.786151377... = u ,** then the real part of **P** is zero, and the imaginary part takes its maximum value (= 1).

I think it makes sense to argue that when the real part of **P** = 0, **P** is entirely "mass like", which we could understand to be representative of the state of space-time-matter for which the maximal gravity field occurs. In this picture gravity is understood to be the propensity of space-time-matter to become completely mass like. The more mass-like a region of space-time-matter is, then the stronger the external gravity field. Thus, within the discussion of this paper, I think **the only reasonable interpretation of the existence of the special value of u given in equation 4.10 is that there is a maximal gravity field at this value of u.** It is important to observe that the **value of u** considered above, substantially exceeds **the value of u for a typical neutron star (≈ 0.1 – 0.2).**
Thus, I think the maximal gravity field concept can be used to explain all of the experimental evidence for enormous gravity fields.

→ Now we can equate the two algebraic terms which represent the same constant ! :

$$\sqrt{\varphi^2 - 2} = \frac{\sqrt{2\sqrt{5} - 2}}{2}$$; we square both sides

→ $4\varphi^2 - 8 = 2\sqrt{5} - 2$; and transform

$$\varphi^2 = \frac{\sqrt{5} + 3}{2}$$; (1) we solve for φ^2

$$\sqrt{5} = 2\varphi^2 - 3$$; (2) we solve for $\sqrt{5}$

→ Now we use the following right triangle :

$$(\sqrt{6})^2 = (\sqrt{5})^2 + 1^2$$; Pythagorean theorem

$$6 = (2\varphi^2 - 3)^2 + 1$$; we replace $\sqrt{5}$ by (2)

→ $$3 = \frac{\varphi^4 + 1}{\varphi^2} \quad (3) \rightarrow \sqrt{3} = \sqrt{\frac{\varphi^4 + 1}{\varphi^2}} \quad (4)$$

→ square root 3 expressed by φ and 1 !

With the other right triangles of the square root spiral we can calculate all square roots of the natural numbers expressed only by φ and 1 : (see Appendix of study !)

$$2 = \frac{\varphi^4 - \varphi^2 + 1}{\varphi^2} \quad (5) \text{ and } \sqrt{2} = \sqrt{\frac{\varphi^4 - \varphi^2 + 1}{\varphi^2}} \quad (6)$$

$$\sqrt{5} = 2\varphi^2 - \frac{\varphi^4 + 1}{\varphi^2} \rightarrow \sqrt{5} = \frac{\varphi^4 - 1}{\varphi^2} \quad ; (7)$$

$$6 = \frac{\varphi^8 - \varphi^4 + 1}{\varphi^4} \quad (8) \text{ and } \sqrt{6} = \sqrt{\frac{\varphi^8 - \varphi^4 + 1}{\varphi^4}} \quad (9)$$

$$7 = \frac{\varphi^8 + 1}{\varphi^4} \quad (10) \rightarrow \sqrt{7} = \sqrt{\frac{\varphi^8 + 1}{\varphi^4}} \quad (11)$$

$$8 = \frac{\varphi^8 + \varphi^4 + 1}{\varphi^4} \quad (12) \quad \sqrt{8} = \sqrt{\frac{\varphi^8 + \varphi^4 + 1}{\varphi^4}} \quad (13)$$

$$10 = \frac{\varphi^8 + 3\varphi^4 + 1}{\varphi^4} \quad (14) \quad \sqrt{10} = \sqrt{\frac{\varphi^8 + 3\varphi^4 + 1}{\varphi^4}} \quad (15)$$

$$11 = \frac{\varphi^8 + 4\varphi^4 + 1}{\varphi^4} \quad (16) \quad \sqrt{11} = \sqrt{\frac{\varphi^8 + 4\varphi^4 + 1}{\varphi^4}} \quad (17)$$

$$12 = \frac{\varphi^8 + 5\varphi^4 + 1}{\varphi^4} \quad (18) \quad \sqrt{12} = \sqrt{\frac{\varphi^8 + 5\varphi^4 + 1}{\varphi^4}} \quad (19)$$

The constant Pi (π) can also be expressed only by using the constant φ and 1 !

We use **Viete's formula from 1593 :**

$$\pi = \frac{2}{\sqrt{2}} \frac{2}{\sqrt{2+\sqrt{2}}} \frac{2}{\sqrt{2+\sqrt{2+\sqrt{2}}}} \cdots$$

→ It is also possible to derive from Viète's formula a related formula for π that still involves nested square roots of two, but uses only one multiplication :

$$\pi = \lim_{k\to\infty} 2^k \underbrace{\sqrt{2-\sqrt{2+\sqrt{2+\sqrt{2+\sqrt{2+\cdots+\sqrt{2}}}}}}}_{k \text{ square roots}}$$

If we replace the number 2 in the above shown formulas by the found equation (5) where number 2 can be expressed by constant φ and 1, then we can express the constant Pi (π) also by only using the constant φ and 1 !

Replace Number 2 in the above shown formulas with this term.

$$\rightarrow \quad 2 = \frac{\varphi^4 + 1}{\varphi^2} - 1 \quad \rightarrow \quad \boxed{2 = \frac{\varphi^4 - \varphi^2 + 1}{\varphi^2}} \; (5) \quad \text{and} \quad \sqrt{2} = \sqrt{\frac{\varphi^4 - \varphi^2 + 1}{\varphi^2}} \quad (6)$$

Constant Pi (π) can now be expressed in this way, by only using constant φ and 1 :

$$\pi = \lim_{k\to\infty} \left[\frac{\varphi^4-\varphi^2+1}{\varphi^2}\right]^k \underbrace{\sqrt{\frac{\varphi^4-\varphi^2+1}{\varphi^2} - \sqrt{\frac{\varphi^4-\varphi^2+1}{\varphi^2} + \sqrt{\frac{\varphi^4-\varphi^2+1}{\varphi^2} + \cdots + \sqrt{\frac{\varphi^4-\varphi^2+1}{\varphi^2}}}}}}_{k \text{ square roots}}$$

It becomes clear that the irrationality of Pi (π) is also only based on the constant φ and 1, in the same way as the irrationality of all irrational square roots, is only based on constant φ & 1 !

Numbers don't seem to exist ! Natural Numbers, their square roots and irrational transcendental constants like Pi (π) can be expressed by only using constant φ and 1 !!

This is an interesting discovery because it allows to describe most (maybe all) geometrical objects only with φ & 1 !

The result of this discovery may lead to a new base of number theory. Not numbers like 1, 2, 3,….. and constants like Pi (π) etc. are the base of number theory ! Only the constant φ and the base unit 1 (which shouldn't be considered as a number) form the base of mathematics and geometry. This will certainly also have an impact on physics !

And constant φ and the base unit 1 must be considered as the fundamental „space structure constants" of the real physical world ! With constant φ and 1 all geometrical objects including the Platonic Solids can be expressed !