the general science journal

From Planck units and opposites to limits

Email: *bzivlak@gmail.com*

Abstract: Nothing exists for itself, everything is connected. Here we will focus on the limits of some physical parameters.

Keywords: Planck units, opposites, limit

Introduction

The relations that will be shown would not have been possible if there were no discoveries of Max Planck, and everything is given in the Planck units.

One special case of relationship are the opposites, which deserve much more attentive in natural sciences than it is the case so far. Interesting is the text in [1] from where we quote:

Our world seems to be a massive collection of opposites.

A good feature of the opposites is that they are easy to be noticed in the plenty of information. So we will better recognize love and hatred than all the other manifestations of the feelings that exist between them. It is the same in physics, as can be seen in [2].

Relationships of opposites

Planck's values are often extremes that are in opposition to some other extreme or are the geometric mean of opposites, for example: The hypothetical quantum mass ($2.723388288 * 10^{-69}$ kg) and the mass of the universe ($1.73944912 * 10^{53}$ kg) have a Planck mass for the geometric mean.

Also:
-The Planck length is believed to be the shortest meaningful length, the limiting distance below which the very notions of space and length cease to exist **[3].**

Another reason that we will show relationships in Plank's units is to simplify formulas. So we calculate with dimensionless values, for example, we express the mass of the protons as $7.68488*10^{-20}$ part of the Planck mass.

Here the results are based on dimensionless constant q:

$$q=[3*e^{2\pi}/2+3*\log_2(2\pi)+1/(2\pi\beta+2)]/2-1=404,6284554$$

where ß is ratio classical electron radius / proton Compton wavelength. Note that $2^q = 6{,}387*10^{121}$ is number of Planck oscillators or maximum number of actions. We also use: universal gravitational constant, speed of light and reduced Planck constant, G,c,~~ħ~~=1 (in Planck units). It is to be expected that following values are also equal to "1", expressed in Planck's units, Table 1. Also, in appendix 1 same table is in **[m-kg-s].**

Table 1. Planck units and domain of parameter value at Planck units

Planck …	formula/value	lower limit	geom. mean	upper limit
mass	$m_{pl}=\sqrt{(\hbar c/G)}$	$m_q=m_{pl}*2^{-q/2}$		$m_u=m_{pl}*2^{q/2}$
	1	1,25126E-61	1	7,99192E+60
length	$l_{pl}=\sqrt{(\hbar G/c^3)}$		$r_{gm}=\sqrt{(l_{pl}*r_u)}$	$r_u=l_{pl}*2^{q/2}$
	1	1	2,82700E+30	7,99192E+60
time	$t_{pl}=\sqrt{(\hbar G/c^5)}$		$t_{gm}=\sqrt{(t_{pl}*t_u)}$	$t_u=t_{pl}*2^{q/2}$
	1	1	2,82700E+30	7,99192E+60
Momentum	$M_{pl}=\sqrt{(\hbar c^3/G)}$	M=m*c		
	1	1,25126E-61	1	7,99192E+60
Energy	$E_{pl}=\sqrt{(\hbar c^5/G)}$	$E=m*c^2$		
	1	1,25126E-61	1	7,99192E+60
Force	$F_{pl}=c^4/G$	$F=E/r_u=m*c^2/r_u$		
	1,00000000E+00	1,56566E-122	1,25126E-61	1,00000000E+00
acceleration	$a_{pl}=\sqrt{(c^7/\hbar G)}$	$a=F/m_{pl}=m*c^2/(m_{pl}r_u)$		
	1	1,56566E-122	1,25126E-61	1
Power	$P_{pl}=c^5/G$	$P=F*c=m*c^3/r_u$		
	1	1,56566E-122	1,25126E-61	1
density	$\rho_{pl}=c^5/\hbar G^2$	$\rho=m/(l_{pl}^2 r_u)$		
	1	1,56566E-122	1,25126E-61	1

The process of obtaining the value q has been extensively explained in [4, f 32 and Table]. For this work it is less important whether these formula is correct, because the aim is to show significance of the opposites.

In Table 1 lower limits are written in blue, the upper limits are red and the geometric meanings are green. Black formulas from the momentum ahead mean that they apply to all three columns.

Planck's mass is the geometric mean of all masses in universe. The upper and lower limits, i.e. the mass of the universe and the hypothetical mass quantum, m_q, are obtained by multiplying the Planck mass with $2^{q/2}$ i.e. $2^{-q/2}$.

Planck length is lower limit and its opposition is the upper limit obtained by multiplying Planck's length with $2^{q/2}$. Their geometric mean is shown in green between opposites. Thus, Planck's length is in opposition to the radius of the universe. Similar to the length, it is also obtained for Planck time. The ratio of the upper and lower limits of the Plank mass is $\approx 10^{121}$, which is the same for all parameters from the momentum to the bottom of the Table 1. This is to be expected because all of these parameters are derived from the mass by multiplying with a constant value (see bold black formulas). This does not mean that there is something special that separates the mass from other parameters. We could thus take, for example, force as the basic parameter.

By using the Planck area, the ratio of the opposites would be as for mass. But, Planck area is the lower limit and not the geometric mean as Planck mass.

All physical constants in Table 1 will always have a value of "1" and also an unchanging value in any system of measurements.

Planck acceleration is the upper limit [5]. Geometric mean of all acceleration at [kg-m-s] system is $a_o = 6{,}95818 * 10^{-10}$ m/s^2, and it is responsible for pioneer anomaly [6] .

Planck energy [7] and Planck momentum [8] are geometric mean, so that occurs on a human scale.

Planck force [9] power and density are upper limits.

I would be grateful if someone would determine the limits of pressure.

Based on Table 1, knowing the limits for a single parameter, we can determine the limits for all other parameters.

But someone can ask what is with the speed and action domains. Even a gravitational constant is considered by some to be variable. It is easy to see that the ratio of the upper and lower limits for speed is $2^{q/4}=2{,}827*10^{30}$ and for action $2^q = 6{,}387*10^{121}$.

Values of limits for speed and action can be found in Appendix 2 at [m-kg-s] system. Gravity constant is truly universal, and it is unchangeable.

Conclusion

It has been shown that:

The Plank units are either limits or geometric mean among values.

As such, they have always existed and will exist. For example, the fact that changes within the entire mass of the universe are continually occurring does not affect the Planck mass, which will always be the geometric mean.

So we can agree with the quote from [1] and add that this is true in physics too:

Our world seems to be a massive collection of opposites.

Novi Sad, January 2018.

Appendix 1

Table 1. Planck units and domain of parameter value at [m-kg-s]

Planck …	formula/value	lower limit	geom. mean	upper limit
mass	$m_{pl}=\sqrt{(\hbar c/G)}$	$m_q=m_{pl}*2^{-q/2}$		$m_u=m_{pl}*2^{q/2}$
	2,17651E-08	2,72339E-69	2,17651E-08	1,73945E+53
length	$l_{pl}=\sqrt{(\hbar G/c^3)}$		$r_{gm}=\sqrt{(l_{pl}*r_u)}$	$r_u=l_{pl}*2^{q/2}$
	1,6162E-35	1,6162E-35	4,56899E-05	1,29165E+26
time	$t_{pl}=\sqrt{(\hbar G/c^5)}$		$t_{gm}=\sqrt{(t_{pl}*t_u)}$	$t_u=t_{pl}*2^{q/2}$
	5,39106E-44	5,39106E-44	1,52405E-13	4,30849E+17
Momentum	$M_{pl}=\sqrt{(\hbar c^3/G)}$	M=m*c		
	6,525012538	8,16451E-61	6,525012538	5,21474E+61
Energy	$E_{pl}=\sqrt{(\hbar c^5/G)}$	$E=m*c^2$		
	1956149547	2,44766E-52	1956149547	1,56334E+70
Force	$F_{pl}=c^4/G$	$F=E/r_u=m*c^2/r_u$		
	1,21033971E+44	1,89498E-78	1,51445E-17	1,21033971E+44
acceleration	$a_{pl}=\sqrt{(c^7/\hbar G)}$	$a=F/m_{pl}=m*c^2/(m_{pl}r_u)$		
	5,56092E+51	8,70652E-71	6,95818E-10	5,56092E+51
Power	$P_{pl}=c^5/G$	$P=F*c=m*c^3/r_u$		
	3,62851E+52	5,68101E-70	4,54022E-09	3,62851E+52
density	$\rho_{pl}=c^5/\hbar G^2$	$\rho=m/(l_{pl}^2 r_u)$		
	5,15557E+96	8,07187E-26	6,45097E+35	5,15557E+96

Appendix 2

Table 2 domain of parametar value for speed, G, action

parameter	lower limit	geom. mean	upper limit
speed of light	$v=r/\sqrt{(t*t_u)}$		
	1,06046E-22	1,78303E-07	299792458
universal gravi-tational constant	$G=rv^2/m=r^3/(m*t*t_u)$		
	6,67384E-11	6,67384E-11	6,67384E-11
reduced Planck constant	$action=mc^2t_u$		
	1,05457E-34	8,42805E+26	6,73563E+87

References:

[1] https://theunboundedspirit.com/unity-in-the-world-of-opposites/

[2] Zivlak B, Opposites in Physics**,** http://gsjournal.net/Science-Journals/Essays/View/6423

[3] https://en.wikipedia.org/wiki/Planck_length, edited on 17 December 2017, at 06:46

[4] Zivlak B, Cycle towards Methodology of Everything, http://gsjournal.net/Science-Journals/Research%20Papers-Unification%20Theories/Download/6731

[5] https://en.wikipedia.org/wiki/Planck_acceleration

[6] https://en.wikipedia.org/wiki/Pioneer_anomaly

[7] https://en.wikipedia.org/wiki/Planck_energy

[8] https://en.wikipedia.org/wiki/Planck_momentum

[9] https://en.wikipedia.org/wiki/Planck_force