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Natural Time Base

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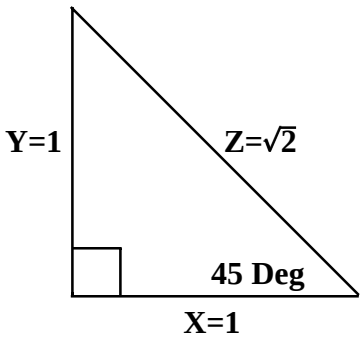
Keywords: time, second, absolute time, constants

The currently defined Earth second provides an emulation of our planetary rotation based upon 1/86,400th divisions for one rotation. The process that provides synchronization between the actual rotation and the fixed atomic second allows for the insertion or removal of a second when the error is at least 0.9 second. There are processes that require an absolute time standard, but there hasn't been a consensus how this should be done nor how it could be justified mathematically.

There exists a geometric-mathematical matrix**,** which is symmetrical, that defines the relationship between specific characteristics of the physical universe and time. The geometric attributes are those of a right triangle. The mathematical attributes are those of the wave equation, $\lambda=c/f$, and the mathematical value that defines a full wavelength, 2π. The parameters of the physical universe that fit within the matrix are the wavelength of the precession emission of neutral hydrogen, and the propagation speed of an electromagnetic wave in free space, the speed of light. Time is the length of the time segment that is used to define the elements in the wave equation that use time as part of their definitions, c and f. The formulation of the geometric-mathematical relationship is illustrated in Table 1.

Table 1. Natural Time Base Formulation



Constants		f (10^6)	λ (cm)
2π	Y	2π*Y	C/(2π*Y)
2π	Z	2π*Z	C/(2π*Z)
		λ (cm)	f (10^6)
λ_H	Y	λ_H*Y	C/(λ_H*Y)
λ_H	Z	λ_H*Z	C/(λ_H*Z)

The symmetry of the geometric-mathematical matrix exists irrespective of the dimensional system used, Metric or English.The process that defines the Natural Time Base (NTB) utilizes the natural values of a 45 degree right triangle, the mathematical value of 2π and the wavelength of the precession emission of neutral hydrogen, which will be identified as λ_H.

The column headers within the table change to reflect the characteristics of the table values, which can be either that of a wavelength or a frequency. When the conversions are made by the wavelength formula, from the values in the first column labelled with λ or f, it should be noted that all the values were known except the length of the time segment, which will be identified as $\mathbf{T_N}$. When the value of this time segment is precisely identified, the values in the last column will inversely mirror those in the previous column, but with a multiplier of 100. The mathematical and physical values used to construct Table 2 are:

1	Absolute
√2	1.41425……
π	3.14159……
C	299,792,458m s^{-1}
λ_H	21.10611…… cm
m	unknown

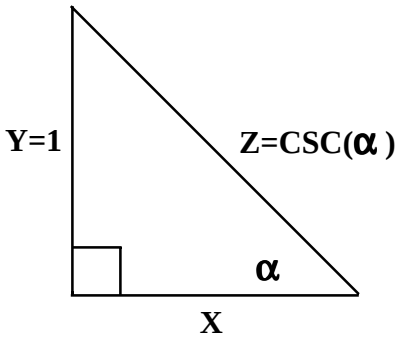
A mathematical model was constructed to calculate the "value" of $\mathbf{T_N}$ and it used a precision greater than what is presented by the table values. The values shown are not intended to show the best precision that can be achieved, but merely to illustrate the concept of the NTB geometric-mathematical matrix. Where the value of **C** is shown in Table 1, it was replaced in the mathematical model with **C*m,** where **m** is the multiplier that is adjusted until the last two columns are inversely mirrored. The value of **m** will be less than 1 and will show the ratio of the difference between the earth second and that of $\mathbf{T_N}$. The mathematical model could have adjusted the value of C until the values mirrored. The values obtained in the 3rd column by the multiplication of 2π and λ_H, and the basic values of a 45 degree right triangle are essentially constants. The results obtained by the iteration of the value of **m** are shown in Table 2.

Table 2. Natural Time Base - Metric			
Constants		**f (10^6)**	**λ (cm)**
2π	**Y**	**6.283**	**2984.8**
2π	**Z**	**8.885**	**2110.6**
		λ (cm)	**f (10^6)**
λ_H	**Y**	**21.106**	**888.5**
λ_H	**Z**	**29.848**	**628.3**

The speed of light based upon the $\mathbf{T_N}$ time segment resulted in a value of 187,543,964m $\mathbf{T_N^{-1}}$. The final value of **m** in the iteration was 0.6255793302, indicating that the earth second is 1.5985… longer than the $\mathbf{T_N}$ time segment.

There is another way to demonstrate that the geometric-mathematical relationship exists beyond the formulation shown in Table 1. A geometric-mathematical configuration exists that will precisely identify a right triangle that identifies Earth time based upon the second. Table 3 illustrates the formulation.

Table 3. Earth Time Base Formulation



Constants		f (10^6)	λ (cm)
2π	Y	2π*Y	C/2π*Y
2π	Z	2π*Z	C/2π*Z
		λ (cm)	f (10^6)
λ_H	Y	λ_H*Y	C/λ_H*Y
λ_H	Z	λ_H*Z	C/λ_H*Z

The right triangle shown in Table 3 will have an angle other than 45 degrees and that is the only unknown in the formulation. A mathematical model was created using the formulation wherein the angle **α** was varied until the value of **Z** resulted in values wherein the 3rd and 4th colums were inversely mirrored, but differing by a factor of 100.

Table 4 illustrates the results of the final iteration of the angle **α.**

Table 4. Earth's Time Base - Metric			
Constants		**f (10^6)**	**λ (cm)**
2π	**Y**	**6.283**	**4771.4**
2π	**Z**	**14.204**	**2110.6**
		λ (cm)	**f (10^6)**
λ_H	**Y**	**21.106**	**1420.4**
λ_H	**Z**	**47.714**	**628.3**

The final value entered for **α** was 26.254… degrees, which gave **Z** a value of approximately equal to 2.2606…. The ratio of this value to that of the hypotenuse of the 45 degree triangle is approximately 1.5985…, which is the inverse of the multiplier, **m**, derived in the Table 2 calculation. Everything fits within a predictable geometric-mathematical formulation. The value of 1420.4(10^6) in Table 4 is the frequency of the precession emission of neutral hydrogen.

Application

An obvious application is to use the NTB as one characteristic of a planetary identifier, its rotation period. Earth's rotation identifier could use the ratio its theoretical 1/86,400th time segment differs from that of $\mathbf{T_N}$, or alternately the value of the hypotenuse, the angular identifier. I would consider the angular value superior to the ratio value, as this value is an absolute geometric identifier, whereas the ratio is a subset value based upon two hypotenuse values. The angular value could be the formal designator , but it is recognized that the ratio is more intuitive and could be designated as the Planetary Time Ratio (PTR). The Earth's angular identifier would be 2.2606 whereas the PTR is 1.5985.

The manner in which astronomers identify the rotational characteristics of other planets is a good example of how the Earth second is "stretched" to cover off terrestrial values. The rotation of Mars is typically cited as 24 hours, 37 minutes and 23 seconds, or 88,643 seconds. The rotation period of Mars could be noted as have a PTR of 1.640, with its angular designator being 2.319. The use of the NTB as a method of identifying planetary characteristic is just one of several uses for a time base that is independent of any

planetary characteristics. The precision of the calculation of $\mathbf{T_N}$, using the formulation shown in Table 1, is primarily based upon our ability to measure the values of the physical constants within the geometric-mathematical matrix.

The Table 1 formulation can be used to define a "primal" time segment, one that is theoretically universal. This universal time segment would be quite small, but its application would be primarily in scientific applications. The value for **C,** I'll call it $\mathbf{C_U}$, in the Table 1 formulation would be defined as the period light travelled the length of one wavelength of the precession emission of neutral hydrogen. The length and the time segment would both be given a value of one, giving $\mathbf{C_U}$ a base value of **one**. The speed of light can be given a "unity" value in the NTB. To illustrate how small the $\mathbf{C_U}$ time segment is can be determined by dividing the current value of the speed of light, in meters, by 21.10611 cm or 0.2110611, giving a value of about 1,420,406,025 $\mathbf{C_U}$'s in an Earth second.

Conclusion

The formulation for the NTB illustrates that seemingly unrelated geometric, mathematical and physical values can be linked by very basic characteristics. Actually, the formulation illustrated by Table 1 may very well be a fundamental definition of time that unifies mathematical and physical characteristics. The preceding text illustrates that the formulation can support a time segment value that can be used for a planetary reference or a very basic time segment.

Another question that needs to be addressed is, "What does the Earth second have to do with the rest of the universe?" I believe the question can be answered simply, "Not much."