

## Proposal to avoid inserting leap seconds

\*Kozo Takahashi

In the following \*\* means 'power

O means omega

P: pi

### Introduction

The leap seconds are introduced to fill the difference between UTC and UT1, and have been inserted 27 times during past 45 years.

Decrease of Earth rotation rate

T ; rotation period,

O ; angular speed,

i; means equal,

P; means pi.

Present definition of one second is that 9192631770 times multiply of one period of Cs radiation  $f = 9.192631770$  GHz. As 27 times leap seconds are inserted during 45 years, the leap seconds become unnecessary where the time is made longer by 27 seconds during 45 years. Namely  $f$  is made to be  $f_c = 9.192631673$ . Because

$$T = 2 \pi / O$$

$$dT/dt = 27 \text{ sec} / 45 \text{ year}$$

$$= 19.01 \times 10^{-8}$$

$$f \cdot dT/dt = 97 \text{ Hz}$$

$$9192631770 / 9192631673 = 1 + 1.055 \times 10^{-8}$$

This means one second becomes longer by  $1.055 \times 10^{-8}$  sec

The definition of light speed  $c$  changes, as the definition of time changed, the value is unchanged because the speed and time duration are offset.

Calculation shows that present half life of the angular speed becomes shorter than that of the ancient one. This will be caused by the increase of the moment of inertia of the earth which is caused by the global warming.

Although astronomical observation has shown the decrease of the earth rotation rate, this paper shows the rate has become larger, and the reason is the global warming. And the change of the definition of time makes the insertion of leap seconds unnecessary (Refer to attached figure).

Keywords: leap second, avoid leap seconds, global warming

(In the following, \*\* : power, \* : multiply)

Where T : period of Earth rotation

$\omega$  : angular speed of Earth rotation,

$$T = 2 \pi / \omega \quad (1) \quad dT/dt = -T \ d \omega / dt / \omega \quad (1)'$$

$$\omega = \{ \omega_0 \} \exp \{ -k \ t \} \quad k : \text{atten. coef.} \quad (2)$$

$$\text{i.e.} \quad \log \{ \omega / \{ \omega_0 \} \} = -k \ t \quad (2)'$$

$$d \omega / dt = -k \ \{ \omega_0 \} \exp \{ -k \ t \} = -k \ \omega \quad (2)''$$

$$k = \{ dT/dt \} / T \quad (3) \quad r * \{ \omega_0 \} **2 = g$$

$$r = 6378100 \text{m}, \ g = 9.80665 \text{ m/s} **2,$$

$$\{ \omega_0 \} = 1.2400 * 10 ** -3 \text{ rad/sec} = 107 \text{ rad/day} \quad (2)'''$$

$$\omega = 7.292115 \times 10 ** -5 \text{ rad/sec} \quad (2)''''$$

$$\omega / \{ \omega_0 \} = (7.292 * 10 ** -5) / (1.240 * 10 ** -3)$$

$$= 0.05889 \quad \text{i.e.} \quad \log \{ \omega / \{ \omega_0 \} \} = -2.832$$

$$k = 2.832 / 45.5 \text{ hund.mill.years} = 0.06224 / \text{hund.mil.y} \quad (4)$$

$$\text{Half-life :Th} \quad \log \{ \omega / \{ \omega_0 \} \} > -k \ \text{Th}$$

$$\text{Th} < 0.6931 / 0.06224 \text{ hund.mil.y} = 11.14 \text{ hund.mil.y} \quad (6)$$

$$dT/dt = 27 \text{ sec} / 45 \text{ y} = 1.901 * 10 ** 8 \quad (1)''$$

$$k = (1.901 \times 10 ** -8) / T \quad (3)''$$

$$= (1.901 \times 10 ** -8) / \text{year} \quad (3)'''$$

$$\text{Th} = 0.6931 / k = \{ 0.6931 / 1.901 \times 10 - 8 \} / \text{year}$$

$$= 0.363 \times 10 ** 8 \text{ year} = 0.365 \text{ hund. mil. y}$$

$$f = 1 / T \quad \Delta f \text{ varia of } f, \quad T \ \Delta f \doteq -f \ \Delta T$$
$$\Delta f \doteq -f \ \Delta T / T \quad \Delta f \doteq (1.901 \times 10 ** 8) \ f$$
$$\Delta f \doteq 174.75 / \text{sec} \quad (7''')$$

Cs:  $f = 9.192631770 \text{ GHz}$ . Cs is made to be  $9.192631695 \text{ GHz}$ .

$$(9192631770 - 174.75) / 9192631770 = 1.19.01 \times 10 ** -9,$$

i.e. One second gets longer by  $19.01 * 10 ** -9$ , i.e. during 45 years, the time gets longer by 27 secs.

The above mentioned proposal makes influence to basic unit other than time.

Present attenuation coefficient k is (3)''', on the contrary last one is (4), there is much difference. This will show that the earth rotation rate recently gets larger because of the global warming caused by the increase of moment of inertia of the earth.

Althou it has been shown the decrease of the earth rotation rate by the astronomical observation, this paper shows the rate has get larger, and the reason is the global warming. Unnecessary.

