

# Gravitational Resonances and their Possible Role in the Functioning of Living Organisms

A bridge to the 24 Hz as one of the fundamental frequencies for biological life on Earth

## ABSTRACT

We are using some results from previous articles regarding the hypothesis of gravitational resonance and apply the hypothesis to Earth and its living organisms. We calculate the anti-resonant frequency, at which gravitational waves are extinguished on the surface of the planet, 24 Hz. We assume that at this frequency there is an opacity window for gravitational waves, in the same sense that there is an opacity window, due to atmospheric absorbance, in the EHF electromagnetic band, that allows living organisms to use these frequencies for exchanging signals within the organism. As a result, it is hypothesised that the anti-resonant frequency of 24 Hz may be one of the fundamental frequencies for living organisms evolving on Earth, acting as a general metronome for these organisms.

## INTRODUCTION

In a previous article we examined possible resonance phenomena arising from the gravitational interaction between objects of the Solar System. We also presumed that such phenomena are not limited only to the interaction of stars and planets, but also extend to all bodies possessing mass. However, all our previous reasoning related to point mass objects. As we make the transition from astronomical to human scale such a simplification may prove to be too rough.

Let us assume that an object of mass  $m$  is positioned on the Earth's surface. In the approximation of point masses, the main resonance and antiresonance gravitational frequencies will be (refer to our previous article "*On a Possible Impact Mechanism of Micro-Powerful Gravitational Radiation on Matter and Physical Processes Occurring within it*")

$$f_R = \frac{c}{4R} = 11.76 \text{ Hz} \quad (1)$$

$$f_A = \frac{c}{2R} = 23.52 \text{ Hz} \quad (2)$$

where  $c$  is the speed of light and  $R$  is the Earth's radius, taken to be equal to 6371 km. We can also calculate the distribution of the delay time intervals of the gravitational interaction, if we consider the Earth as multitude of elementary mass elements. The shape of the Earth may be imagined as a sphere and the PREM model<sup>[1]</sup> may be used that gives the Earth's density as a function of the distance from the Earth's centre (Fig.1).

Integrating numerically by all elementary volumes of the Earth, considering the change in density with respect to depth, we can obtain a distribution of gravitational interaction delay times  $T$ , for an object located on the Earth's surface and subsequently calculate the corresponding frequencies  $f = 1/T$ . Fig.2 shows the result of this calculation.

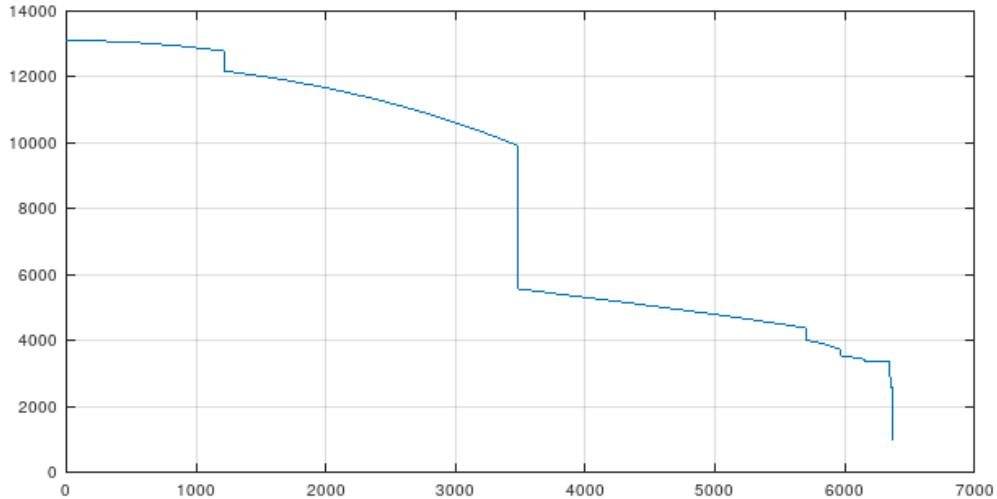


Fig.1

The change in Earth's density with depth according to data from the PREM-model.

Vertical axis: Density in  $\text{kg}\cdot\text{m}^{-3}$

Horizontal axis: Distance from the Earth's centre in km

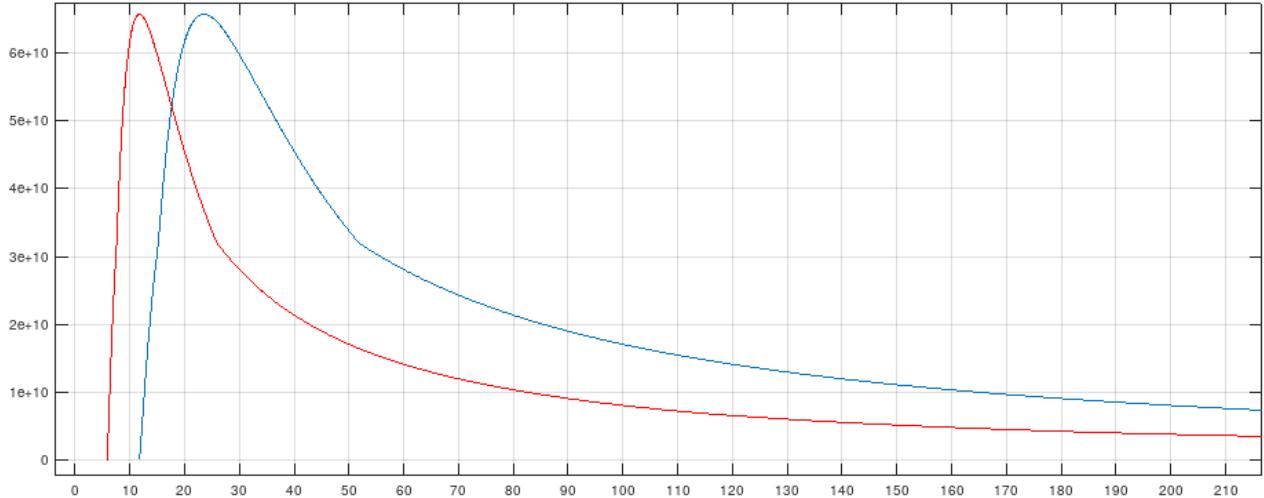


Fig.2

Horizontal axis: Frequency in Hz

Red line: Resonance

Vertical axis: Response amplitude

Blue line: Antiresonance

The frequencies at the maxima are equal to  $f_R = 11.78 \text{ Hz}$  for resonance and  $f_A = 23.55 \text{ Hz}$  for antiresonance. These are very close to the values obtained in the point mass model (11.76 Hz and 23.52 Hz respectively calculated in (1) and (2)).

Resonance is possible under the condition that the Q-factor  $Q \geq 1$ . When calculations are based on the PREM model, this condition is met at a depth of around 10 km and upwards up to the surface and going on above the surface. Analogous results hold for antiresonance.

The Q-factor of the resonant maxima is equal to  $Q = 1.04$  on the Earth's surface. As height increases the resonant frequencies decrease and the Q-factor increases. At a height of 35 800 km above the Earth's surface (at the geostationary orbit) we have  $f_R = 1.81 \text{ Hz}$ ,  $f_A = 3.62 \text{ Hz}$ ,  $Q = 5.3$ .

At the resonant frequency the oscillations are amplified, caused by the movement of mass near the Earth's surface (seismic and atmospheric oscillations, movement of lithospheric plates, oceanic phenomena). At the anti-resonant frequency such oscillations, on the contrary, are extinguished. As a result, at the anti-resonant frequency on the Earth's surface we register gravitational noise of substantially lower level compared to neighbouring frequencies. This result is verified by the data of our sensor network.

## BIOLOGICAL CONSEQUENCES

Biological life on Earth appeared and evolved in the presence of the full array of cosmic and telluric natural fields and radiation, including electromagnetic waves, gravitation, gravitational waves and gravitational resonances. Studies of living organisms, that were conducted for a considerable period of time in weightlessness, have shown that gravity is a necessary condition for their normal development.

In the second half of the 20<sup>th</sup> century, with the development of high-frequency electronics, it was discovered that living organisms are extremely sensitive to the millimetre wave band of the electromagnetic radiation (EHF, 30-300 GHz), as analysed in relatively fresh reviews<sup>[2,3]</sup>. Cosmic electromagnetic radiation at these frequencies is fully absorbed by the atmosphere, as a result of which there are practically no natural signals in this range, a distinctive property of this wave band. As a hypothesis concerning the mechanism of impact of these frequencies on living tissue, it was proposed that these are used by the organism to transmit signals at the level of cells, groups of cells and organs, because natural noise at these frequencies is absent and has always been absent in the process of biological evolution on Earth.

We presume that a similar mechanism could also be at work for  $f_A = 23.55$  Hz, the anti-resonant Earth frequency. The opacity window for radio waves lies in the EHF range, while the opacity window for gravitational waves lies in the frequency range of the antiresonance (including the main anti-resonant frequency). At this frequency, free from noise from gravitational waves, signals within the organism could also be transmitted, either in the form of gravitational waves or signals of different physical nature triggered by gravitational waves. The informational capacity of the data transmission channel at the frequency of about 24 Hz is approximately a billion times lower than that of electromagnetic signals in the EHF range. We cautiously presume that the range of 24 Hz is used for the synchronisation of processes in cells, between cells, in groups of cells, organs and the organism as a whole. It is the frequency of the metronome (or one of the metronomes) of the organism, a relatively simple signal in terms of its time structure that maintains a unified system of biological rhythms.

An important fact that points towards this hypothesis is the functioning of molecular motors of the mitochondrial cellular respiration (ATP synthesis), which in a quite wide range of external conditions tend to a cycle speed of about 4 rounds per sec (3.9 rps)<sup>[4]</sup>. Every revolution consists of 3 steps of 120°, every step consists of a mobile phase and a resting phase. In other words, the frequency of phase shifting is equal to

$$3.9 \times 3 \times 2 = 23.4 \text{ Hz}$$

which is extremely close to the value of  $f_A$ .

A number of processes in nature are known to be synchronised at frequencies around 24 Hz. For example, the flapping of wings of locusts is around 24 Hz and it is so stable, despite possible changes in the external conditions, that it is used in the discovery of locust migrations with the use of a Doppler radio locator<sup>[5]</sup>. Intrafrontal interactions of the human brain have a somewhat broadband spectral profile, with a median peak frequency of 24 Hz (IQR: 19–29 Hz)<sup>[6]</sup>; the range belongs to beta waves, associated with normal waking consciousness. The Critical Flicker Frequency (in which a flashing light is perceived as unchanging) is 24 Hz for dim light<sup>[7]</sup>.

In our experiments we have also recorded considerable changes in vital processes of living tissues (plants) when acted upon by a generator of micro-powerful gravitational wave (Gertsenshtein generator) with a modulation frequency of around 24 Hz.

Assuming that gravitational waves are used by living organisms for signal transmission, we are not aware of any mechanism for generating significant gravitational waves within the frame of energies and functional processes of living tissues. If such signals exist then their power, according to modern views, is extremely low. Which, at least partially, may be compensated by a high signal/noise ratio (absence of disturbances) and extremely high penetrating ability of gravitational waves.

## EXPERIMENTS WITH THE GERTSENSHTEIN GENERATOR

We have developed a micro-powerful generator of gravitational waves based on the Gertsenshtein effect (the Vega apparatus series) and we have conducted (and continue to do so) a series of experiments on the influence of its radiation on various physical processes and vital activity of organisms. The experiments show encouraging results, and we have filed patent applications on the method and apparatus affecting physical and biological processes<sup>[8,9]</sup>.

As an example, we present the impact of the generator on the development of agricultural cultures in laboratory conditions.

Three types of taxonomically unrelated plants were sown, 69 seeds in each of 2 cuvettes (the test and control). We examined the overall number of germinated living samples with and without impact from the generator. The soil, temperature, luminous flux (controlled by luxmeter), supply of water and amount of fertiliser were the same in both cuvettes. The graph in Fig.3 shows the germination data by day. The experiment lasted for a month. The vertical axis shows number of germinated plants, the horizontal axis shows the day of experiment.

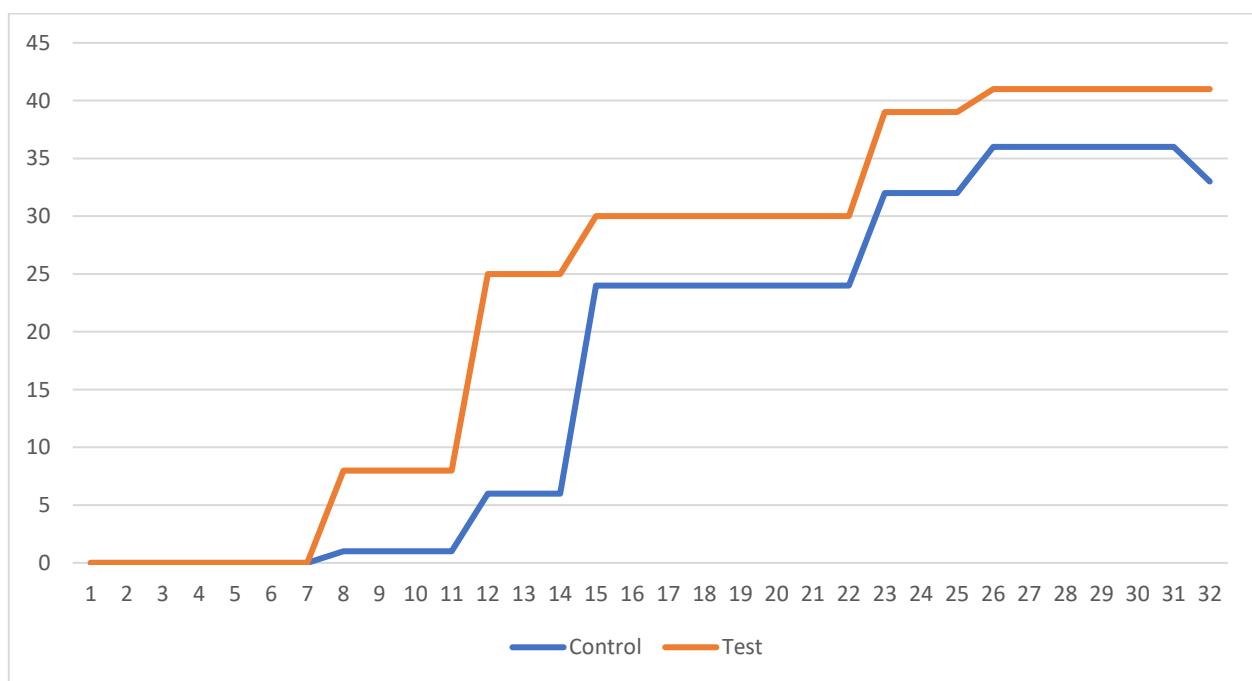


Fig.3

In Fig.4 is the same data smoothed and in the form test/control in percentage. We can see that the germination under the influence of the generator is considerably higher (the growth phase is more intense).

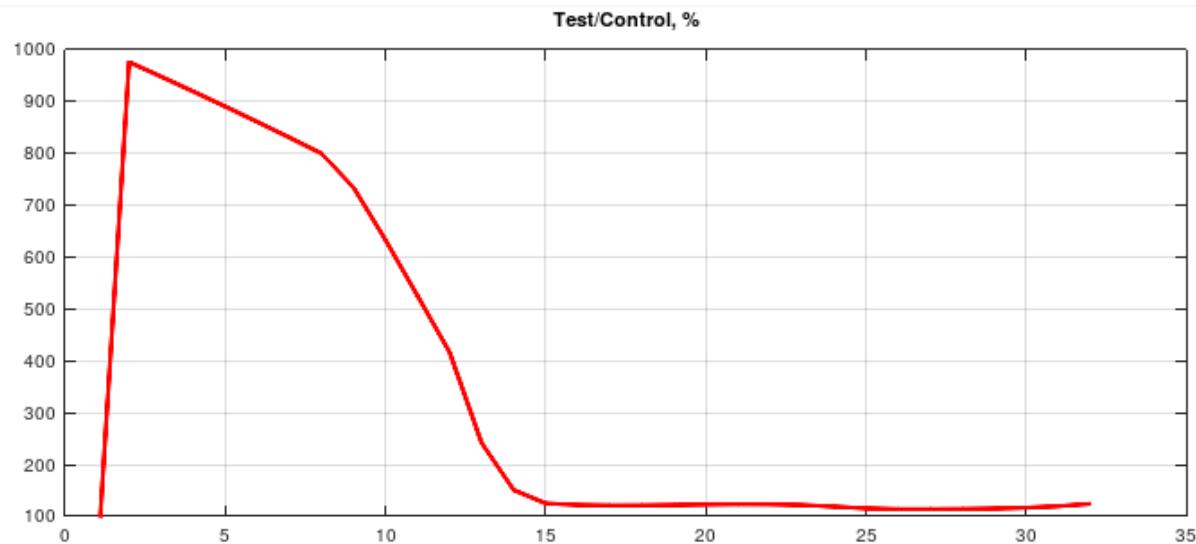


Fig.4

Currently we are expanding our experimental basis, engaging more test sites, different cultures and living organisms.

In our experiments we are using high-quality signals, usually a harmonic monochromatic signal of the given frequency (24 Hz). Similar signals lasting for a significant amount of time (more than several seconds) are very rarely met in the cosmic background. However, there are natural cosmic broadband and relatively brief signals ("clicks", "flashes" and so on), that give a response at the frequency  $f_A$  as well. The power of such natural cosmic signals is higher than the signal power of our generator by more than a billion times (this is by how much the power of a large nuclear power plant is greater than the power of an AA battery). Life on Earth evolved in the presence of these signals, and obviously, to a large extent, is stable with respect to them. In this sense we presume that the influence of the generator on biological tissues at the frequency of the antiresonance should not lead to any negative consequences for the organism. On the contrary, a weak gravitational radiation at the frequency of the antiresonance of biological oscillators, due to the Frequency Following Response effect, is acting as a single metronome for the organism, restoring the rhythm in areas where it has been affected (weakened or distorted) as a result of pathologies of various origin. The external rhythm driver (the Gertsenshtein generator) at first causes the synchronisation of healthy rhythms in the area of impact, gradually engaging the areas where rhythm has been affected and establishing a common synchronisation in the whole area. After switching off the generator, the ensemble of oscillators continues to oscillate synchronously (coherently), maintaining a healthy rhythm in affected areas. Depending on the character and level of rhythm damage its recovery could require several impact sessions. Undoubtedly there are severe pathologies, for which rhythm recovery with the help of an external rhythm driver is either difficult or altogether impossible. However, the recovery of normal rhythm in living cells and tissues with the help of micro-power gravitational wave has a series of fundamental advantageous features:

- gravitational radiation has total penetrating power for body tissues,
- gravitational radiation does not cause a forceful reaction or heating effect in the tissues, molecules and atoms in the area of impact.

The hypothesis concerning the physical mechanism of impact of micro-powerful gravitational radiation on molecules and tissues is presented in our article "On a Possible Impact Mechanism of Micro-Powerful Gravitational Radiation on Matter and Physical Processes Occurring within it".

## CONCLUSION

In this article we extend further our hypothesis of gravitational resonance, this time specifically for Earth and living organisms evolving here. We show that the anti-resonant frequency for the planet, either calculated in the approximation of point masses or by using the PREM model, is  $\approx 24$  Hz. At this frequency gravitational noise from the Earth is extinguished, securing a high signal/noise ratio for whatever sources of such radiation may exist. Similar opacity windows for the EHF band of the electromagnetic waves provide a hypothesis that these frequencies may be used for signal transmission between cells in the organism, as cosmic background radiation has no frequencies in this band, that would interfere with these signals. In the electromagnetic case, the cosmic radiation of the EHF band is absorbed by the Earth's atmosphere. In the gravitational case the 24 Hz opacity window is established by the mere size and structure of the planet.

We are not aware of any biological sources of gravitational radiation, but using the same analogy with the electromagnetic radiation we hypothesise that the corresponding anti-resonant gravitational radiation, or signals triggered by it, may act as a general and fundamental metronome. We have also presented experiments with seed germination, in which the signal from the Gertsenshtein generator, modulated at the anti-resonant frequency, is shown to enhance the growth phase of the germinated seeds. We intend to further conduct similar experiments broadening the type of samples and living organisms that will be tested under the impact of the Gertsenshtein generator.

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