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Gravitons in Heracletean Dynamics

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Abstract: *The gravitons in Heracletean dynamics have been discussed.*

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1. Introduction

We have deal with certain symmetry in nature represented by Newton's third law which states that forces always occur in pairs, and one body cannot exert a force on another without experiencing a force itself. Thus every exerted action is experienced by a consequence of its reaction. Let us propose that the concerned event is enabled by the sphere universe [1] from which edge every action is repelled as reaction. And the action of the gravitational force is no exception.

2. The Gravitons

Let us imagine the gravitation edge of the present universe taking place at the radius of the observable universe $R_{observable\ universe} = 4.4\ x\ 10^{26}m$ away from the origin of the gravitational attraction where the wave carrier of gravitational force is repelled at half the wavelength. Compton wavelength of the graviton wave then equals:

$$\lambda_{graviton} = 2\ x\ R_{observable\ universe} = 8.8\ x\ 10^{26}m. \tag{1}$$

Corresponding graviton mass is the next:

$$m_{graviton} = \frac{h}{\lambda_{graviton} c} = 0.25\ x\ 10^{-68}kg. \tag{2}$$

If all matter in the observable universe possessing mass $m_{observable\ universe} = 1.5\ x\ 10^{53}kg$ is made of gravitons their number is the next:

$$n_{gravitons} = \frac{m_{observable\ universe}}{m_{graviton}} = 6\ x\ 10^{121}. \tag{3}$$

The average distance between graviton waves is estimated as

$$d_{graviton\ waves} = \frac{2R_{observable\ universe}}{n_{gravitons}} = 1.5\ x\ 10^{-95}m. \tag{4}$$

Compton wavelength of the observable universe possessing mass $m_{observable\ universe} = 1.5\ x\ 10^{53}kg$ is of the same value:

$$\lambda_{observable\ universe} = \frac{h}{m_{observable\ universe}\ c} = 1.5\ x 10^{-95}m. \tag{5}$$

Compton wavelength of the observable universe (5) thus equals the average distance between graviton waves (4):

$$\frac{d_{graviton\ waves}}{\lambda_{observable\ universe}} = 1. \tag{6}$$

The above statement (6) holds true in general for any mass and size of the observable universe (See appendix 1).

The radius of the whole universe where a graviton particle could be found is given by the uncertainty relation in Heracletean dynamics [1] (See Appendix 2):

$$R_{whole\ universe} = \frac{4\sqrt[4]{24}}{\pi}\sqrt{\frac{c}{h}}(R_{observable\ universe})^2 = 3.7\ x\ 10^{74} m. \qquad (7)$$

The graviton particles are thus dispersed in much greater universe than graviton waves are located since:

$$R_{whole\ universe} = 3.7\ x\ 10^{74} m > R_{observable\ universe} = 4.4\ x\ 10^{26} m. \qquad (8)$$

The average distance between graviton particles in the whole universe is estimated to be:

$$d_{graviton\ particles} = \frac{2R_{whole\ universe}}{n_{gravitons}} = 1.2\ x\ 10^{-47} m. \qquad (9)$$

So graviton particles are expected to be frequently present in the observable universe as well as outside it. Of course the average distance between them should be much greater than that between graviton waves as follows from (4), (9):

$$d_{graviton\ particles} = 1.2\ x\ 10^{-47} m > d_{graviton\ waves} = 1.5\ x\ 10^{-95} m. \qquad (10)$$

3. Conclusion

In Heracletean dynamics graviton waves are expected to be present exclusively in the observable universe. Contrarily graviton particles are expected to be present outside the observable universe, too, and especially there.

Dedication

On the occasion of the Slovene Cultural Holiday to the symmetry in nature

Figure1. *Si vis amari, ama*

References

[1] Janez Špringer, (2021). Uncertainty in Heracletean Dynamics. International Journal of Advanced Research in Physical Science (IJARPS) 8(1), pp.14-16, 2020.

APPENDIX 1

$$\boldsymbol{n_{gravitons}} = \frac{m_{observable\ universe}}{m_{graviton}} = \frac{\lambda_{graviton}}{\lambda_{observable\ universe}} = \frac{2R_{observable\ universe}}{\lambda_{observable\ universe}}$$
$$= \frac{\boldsymbol{n_{gravitons}\ x\ d_{graviton\ waves}}}{\boldsymbol{\lambda_{observable\ universe}}}. \qquad (11a)$$

So

$$\frac{d_{graviton\ waves}}{\lambda_{observable\ universe}} = 1. \qquad (11b)$$

APPENDIX 2

$h = 6.626\ 070\ 04\ x\ 10^{-34}\ m^2kg\ s^{-1}\ and\ \ c = 2.997\ 924\ 58\ x\ 10^8 ms^{-1}$

$$\frac{h}{\lambda_{graviton}c} = \frac{h}{2R_{observable\ universe}c} = m_{graviton} = \sqrt{\frac{\frac{\sqrt[4]{24}}{\pi}\sqrt{\frac{h^3}{c^3}}}{R_{\ whole\ universe}}}. \qquad (12a)$$

So

$$R_{whole\ universe} = \frac{4\sqrt[4]{24}}{\pi}\sqrt{\frac{c}{h}}(R_{observable\ universe})^2 = 1.9\ x\ 10^{21}(R_{observable\ universe})^2. \qquad (12b)$$

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