Spacetime curvature caused by an inhomogeneous distribution of matter unveiled by a pattern of fringes

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Abstract

Einstein's general relativity is a theory of the nature of time, space and gravity in which gravity is a curvature of space and time that results from the presence of matter or energy. Spacetime curvature caused by an inhomogeneous distribution of matter unveiled by a discontinuous pattern of fringes instead of the expected continuous pattern

Spacetime curvature

In the general theory of relativity the Einstein field equations relate the geometry of spacetime to the distribution of matter. [1]

$R_{\mu\nu} - \frac{1}{2}Rg_{\mu\nu} + \Lambda g_{\mu\nu} = \kappa T_{\mu\nu}$

The system is on the Earth surface and consists of a front wall 10 meters high (+z axis) and 10 meters wide (+x axis), a side wall on the left 10 meters high (+z axis) and 30 meters long (+y axis) joined to the front wall forming an L shape.

To start the point a plastic ball (40 grams) is thrown against the front wall and bounces off both walls a certain number of times.

After years and thousands and thousands of points a discontinuous pattern of fringes eroded by the hitting of the ball appears on the left wall, this pattern is not found in other similar systems, the difference of this system is that on the left side (-x axis) there is a small hill while to the right (+x axis) is a flat area.

On the Earth surface z axis is curved causing an acceleration $g_{-\mathrm{z}} = 9.80665$ m/s^2, this acceleration causes the ball to bounce off the ground (x-y plane, z = 0).

This inhomogeneous distribution of matter causes a tiny curvature, a tiny acceleration $g_{-\mathrm{x}}$, we can imagine the ball "bouncing off" the left wall (y-z plane, x = 0).

This acceleration is so tiny that it can only be detected after thousands and thousands of bounces.

Please, click on this link to see the discontinuous pattern into the hitting area

Spacetime curvature confirmations

The perihelion precession of Mercury, Mercury deviates from the precession predicted from the Newtonian effects. In general relativity, this remaining precession, or change of orientation of the orbital ellipse within its orbital plane, is explained by gravitation being mediated by the curvature of spacetime. [2]

The deflection of light by the Sun, the observations were performed by Arthur Eddington during the total solar eclipse of May 29, 1919 [3]

The detection of gravitational waves, in February 2016, the Advanced LIGO team announced that they had directly detected gravitational waves from a stellar binary black hole merger. In 2017, the Nobel Prize in Physics was awarded to Rainer Weiss, Kip Thorne and Barry C. Barish "for decisive contributions to the LIGO detector and the observation of gravitational waves".

Perhaps nature is giving us subtle clues for another confirmation of the spacetime curvature with the tiny effects on a small plastic ball.

References

[1] See Page 175 in: Albert Einstein, “El significado de la relatividad” / “The meaning of relativity” , Planeta - De Agostini, Barcelona 1985

[2] See Page 159 in: Albert Einstein, “El significado de la relatividad” / “The meaning of relativity” , Planeta - De Agostini, Barcelona 1985

[3] See Page 155 in: Albert Einstein, “El significado de la relatividad” / “The meaning of relativity” , Planeta - De Agostini, Barcelona 1985