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"ARTIFICIAL" GRAVITY FIELDS CREATED BY INTENSE ELECTROMAGNETIC FIELDS

Abstract

It is well-known that mass and energy are equivalent in relativity. Thus, the large amount of energy possessed by an intense electric or magnetic field creates a tiny "artificial" gravitational field whose effects might possibly be measured experimentally. The mathematical theory of this effect, for the special case of stationary and either purely electric or purely magnetic fields only, was given as early as 1917 by Tullio Levi-Civita (1873-1941) (ref. [1]). In 1995 this author (ref. [2]) used the Levi-Civita exact solution to the Einstein-Maxwell equations to prove a new equation, relating the speed of light at the center of a uniform, intense magnetic field, to the field intensity and its size in space. He then proposed (unsuccessfully) a laboratory experiment to be conducted at Sandia Labs by virtue of the "z machine" in order to verify experimentally the properties of this "Levi-Civita"effect. In this paper more details are given about this possibility of creating "artificial" gravitational fields by virtue of electromagnetic fields. In particular, two possible ways of checking the Levi-Civita effect are suggested: 1) A more refined experiment by virtue of the "z-machine" at Sandia, and 2) Performing the experiment in space by virtue of light coming from a distant radio source and grazing the surface of a pulsar or a magnetar, where the tiny "artificial" gravitational field is created by the high magnetic field just above the surface of the star.

REFERENCES

[1] T. Levi-Civita, "Realta' fisica di alcuni spazi normali del Bianchi", Rendiconti della Reale Accademia dei Lincei, Series 5, Vol. 26 (1917), pp. 519-533.

[2] C. Maccone, "Interstellar Travel Through Magnetic Wormholes", JBIS, Vol. 48, No. 11, (1995) pp. 453-458.