ON HYPOTHETICAL MULTIPOLE INTERACTION WITH DISTANT MATTER OF UNIVERSE

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Abstract

The H.Thirring effects and a shift of the masse center of a moving body with nonzero the proper angular momentum are concidered. A hypotesis about the existing of a multipole interaction with the distant matter of the Universe and the experimental test of this effect are proposed.

It is well known [1] that in the General Relativity at least a part of the centrifugal acceleration can be considered as a consequence of an interaction with the distant matter of the Universe . Besides, inside a rotation bulky sphere, a gravitational potential has such a form, that it leads to some not vanish components of the acceleration along the axis of the rotation Z besides the usual centrifugal acceleration. Z-component of the equation of the motion can be written in the following form:

$$c^2\frac{d^2z}{ds^2} = -\frac{8G\,M_s W\,z^2}{15c^2\,R_s}, \tag{1}$$

where

is the speed of light; G is the gravitational constant, M and R - are the weight and radius respectively of the bulky sphere, z is the coordinate along the axis Z in the Cartesian system of coordinates.

On the other hand it is known [2] that the center of the masse of a motioned body with a non zero the angular momentum does not coincide with its the center of the masse. This deviation is given by :

$$\vec{z} = \frac{\vec{L_0}\times\vec{v}}{M_0c^2}, \tag{2}$$

where $\vec{z}$ is the vector of a displacement of the mass center of the body; $\vec{L}$ - the self angular momentum ; $\vec{v}$ is the velocity of the body; M_0 is the rest mass of the body.

We consider that the equation of motion of a multipole along the axis Z due to the hypothetical interaction with a distant matter of the Universe up to v^2/c^2 is given by (we substitute (2) in (1)):

$$c^2\frac{d^2\vec{z}}{ds^2} = \frac{\vec{L_0}\times\vec{v}}{M_0c^2}\,W^2. \tag{3}$$

We have taken into account that for the Universe $GM/cR^2 \approx 1$.

The above interaction can be observed by the following method . Suppose we have a rotating disk of the diameter $10cm$ wich rotates with the angular velocity about $1000rad/s$. Constant

magnets are attached to the disk edge on the circle. The magnets cause the constant magnetic field about $1Tl$ directed along the disk radius.

Under the circumstances we suppose that some acceleration of the magnets about $10^{-9}m/c^2$ can be observed wich directs along the axis of rotation. This acceleration one can measure by meanse of a torsion balance.

References

[1] Thirring H., Phys. Zs., Bd 19, S.33 (1918); Bd 22, S.29 (1921).

[2] Moller C., The theory of relativity, p.128-131, p.310 (1972).

[3] Papapetrou A., Proc. Roy. Soc., Vol.209, p.248-268 (1951).