An Alternative Approach to the Calculation of Mechanical Torque, Developed by the Localized Spinning Electromagnetic Field – the Field Gyroscope.

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Earlier, the author stated that a localized spinning electromagnetic field, a Field Gyroscope, (FG), develops a mechanical torque [1, 2, 3, 4]
This approach was based on a calculating the angular speed-depending mass, angular momentum and torque of FG formed by the spinning vector E: $m(\omega, E)$, $L(\omega,E)$, $T(\omega,E)$. This has been verified in the group of the experiments with L-shaped indicator exposed to spinning electromagnetic field [5].

An important specificity of the shown experiments is that they were carried out with the experimenter as an active component of the measurement system. The active role of an experimenter in developing the angular momentum of FG was stressed in [3]. Involvement of the operator can result in the *driving FG up to speed* phenomenon, which results in origination of the mechanical torque as a first derivative of the gradually increasing angular momentum of the spinning field.

Unlike this approach, based on a calculation of the angular velocity-dependable mass and other derived values, another approach is proposed here.

It has to be said, that back in early 20th Century it was revealed that the oblique passage of a beam of light through a plate of refracting material produces a mechanical torque [6]. Later, as it reported in [7], it was refined that a circularly polarized electromagnetic wave, absorbed by a screen, develops the mechanical torque, having intensity for a unit of surface S/ω, where S is the Poynting vector and ω is the angular frequency of the wave. According to [7], the effect was first noted by A. Sadowski and later J.H. Poynting developed its complete theory.

However, unlike the traveling EM wave, in the case of the Field Gyroscope, the total Poynting vector S=0.
This can be proved in the following way.
Fig.1 shows origination of the displacement current as the vector ***E*** spins.
Here, vector $\boldsymbol{\Delta E} = \boldsymbol{E}_{t+\Delta t} - \boldsymbol{E}_t$

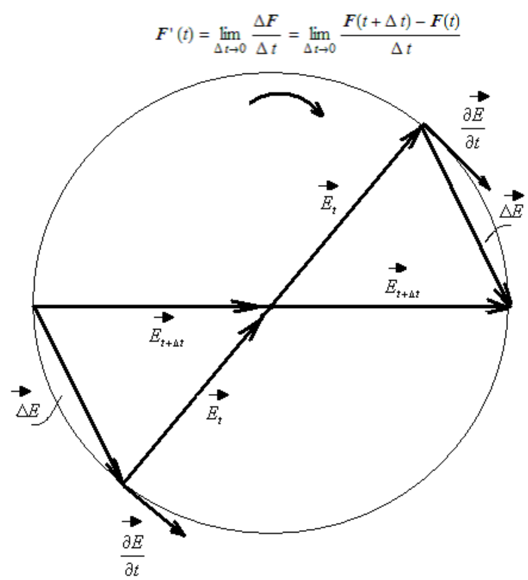

Fig.1 shows an origination of the displacement current $\boldsymbol{j}=\epsilon\epsilon_0\partial \boldsymbol{E}/\partial t$ as the vector $\boldsymbol{E}$ spins.

It has to be said that for the rotating vector $\boldsymbol{E_s}$, according to Fig.1,

$$\partial E/\partial t=\boldsymbol{\omega}\times \boldsymbol{E} \quad (1)$$

Therefore,

$$\boldsymbol{j}=\epsilon\epsilon_0(\boldsymbol{\omega}\times \boldsymbol{E}) \quad (2)$$

This system of angle–varying displacement currents is identical to a set of spinning powered conductors, which acts as one virtual conductor, Fig.2, producing a magnetic field of a strengths $\boldsymbol{H}$.

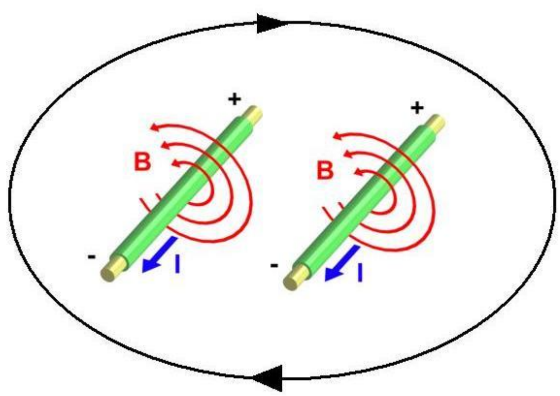

Fig.2. The angle-varying displacement currents of Fig.1 are identical to a set of the spinning powered conductors, which act as one virtual conductor of a radius R producing a magnetic field.

Fig.3 shows a distribution of the magnetic field strength inside this virtual conductor.

$$H = \left(\frac{I_0}{2\pi R^2}\right) r \quad (3)$$

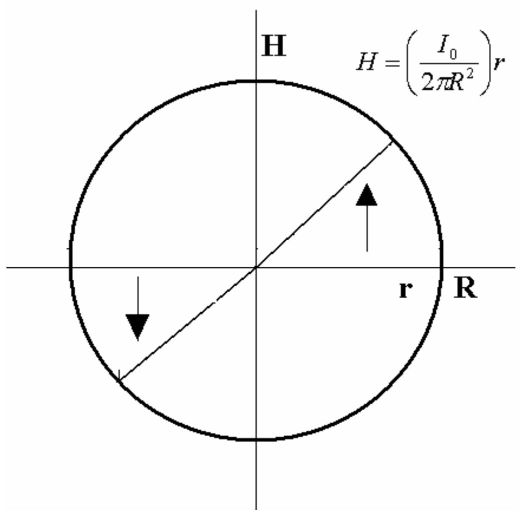

Fig.3. Distribution of magnetic field inside a virtual conductor of Fig.2.

Because directions of the original spinning vector ***E*** and its rotation-caused displacement current $\vec{j} = \varepsilon\varepsilon\partial\vec{E}/\partial t$ are mutually normal, the total Poynting vector ***S=0***, Fig.4.

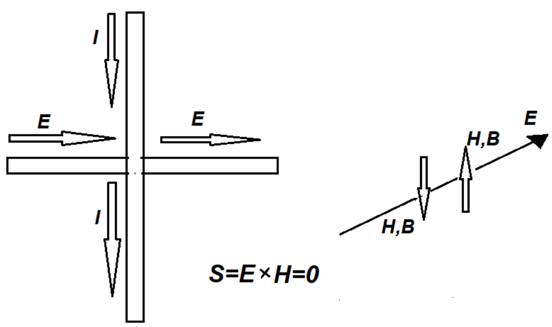

Fig.4. Total Poynting vector of the crossing displacement current and electric field equals zero. However, it's composed of two opposite Pointing vectors at the ends of the vector E, which experience rotation together with this vector. These local opposite vectors can produce a real mechanical torque.

However, it's composed of two oppositely directed Poynting vectors along the spinning vector ***Es***, Fig.5. These Poynting vectors $\boldsymbol{S_1}$ and $\boldsymbol{S_2}$ and original spinning vector ***Es*** are located in one plane. Two opposite fluxes of energy in one object can result in origination of the torque which strives to move the object in the plane of the rotation vector ***Es***.

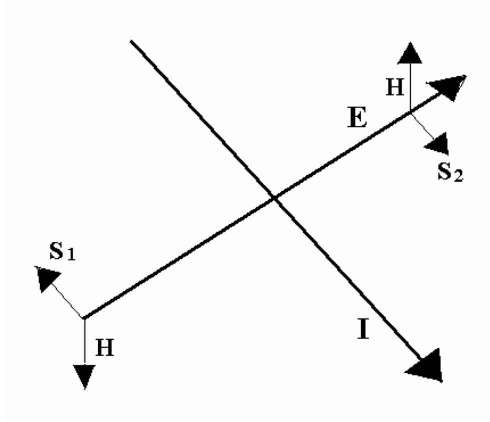

Fig.5. Mutual allocation of the spinning vector E and its derived current I and magnetic fields H. An interaction of these vectors results in origination of local Poynting vectors S, having opposite directions and the total zero value.

This torque can be estimated by the following approach.
Because Poynting vector shows a power per a unit of a total surface ***A*** and, on the other hand, the power is a dot product of force ***F(r)*** and linear speed ***v(r)***, then

$$\int_A S(r)dA = \int_A v(r)\, dF(r) \quad (4)$$

However, we can consider some average values of Poynting vector and the speed:

$$SA = FV, \quad (5)$$

where ***A*** is a total surface crossed by the flux of energy ***S***.

The value of the total displacement current *I*, developed by the spinning process is

$$I = \varepsilon\varepsilon_0 \frac{\partial E_s}{\partial t} A = \varepsilon\varepsilon_0 \omega E_s A = \varepsilon\varepsilon_0 \omega E_s \pi R^2 \quad (6)$$

Taking into consideration (3) and (6),

$$S(r) = H(r)E_s = \left(\frac{\varepsilon\varepsilon_0 \omega E_s \pi R^2}{2\pi R^2}\right) r E_s = \frac{1}{2}\varepsilon\varepsilon_0 \omega E_s^2 r \quad (7)$$

Considering average values at $r=R/2$ and $v=\omega R/2$, the force ***F*** is

$$F = \frac{SA}{\omega R/2} = \frac{1}{4}\varepsilon\varepsilon_0 E_s^2 \pi R^2 \quad (8)$$

Therefore, the value of mechanical torque ***T*** is

$$T = \frac{FR}{2} = \frac{1}{8}\pi\varepsilon\varepsilon_0 E_s^2 R^3 \quad (9)$$

It's directed normally to the plane of spinning $\boldsymbol{E_s}$ and *I*.

The derived result looks pretty strange, because it does not contain the angular frequency ω, unlike that shown above in [1,2,3,4,7]. On the other hand, the ω-dependence of the torque takes a place for the propagating circularly-polarized EM wave, while the Field Gyroscope has no spatial propagation.

Looks like the very fact of a spatial turn plays a major role, no mater what is a rate of the turn.
Moreover, comparison of the results of ω-dependable torque [1,2,3,4,5,7] and that shown above can witness in a favor of existence of two mechanisms of this phenomenon.

Estimation of Real Values of the FG-related Torques.

For a rotating E=100 V/m electric vector, (compatible to that of Earth-produced), localized in R=1m volume, the torque is 3.5E-08 N·m.

Contemporary precision torsion balances can develop as order of 10^{-10} N m rad^{-1} sensitivity, so it looks like they are capable to respond to this 3.5E-08 N·m torque **even without an operator, who contributes the additional angular momentum.**

More coarse rotating instruments, the Divining Rods, practiced in Dowsing, Fig.6, are estimated by the author as needed the minimal torque as order of 2.5E-04 N·m.

Fig.6. The dowsing instrument- a Divining Rod (designed by N. Virtuozov). The minimal force to turn this 0.25 m rod in a horizontal plane was estimated as order of 1.0E-03 N, which results in 2.5E-04 N·m of the needed minimal torque.

So, this above estimated natural 3.5E-08 N·m torque is not enough to drive this instrument itself, without an operator, who contributes an additional angular momentum into the system and develops the torque, according to [3]. The series of the experiments [5] confirms an active role of an experimenter in such the type of the experiments.

During the years, the precision torsion balances were employed in the unconventional experiments where some forces caused their turns [8,9,10,11] even with no direct participation of an experimenter. The author believes that the natural Field Gyroscopes played an important role in these phenomena.

Literature

1. M. Krinker. *Some Physical Aspects of Artificial and Natural Field Gyroscopes. Relation to Atmospheric Phenomena and Geo-Pathogenic Zones.* http://vixra.org/abs/1407.0025. 2014.

2. M. Krinker. *A Phenomenon of Driving the Field Gyroscope up to Speed by a Light.* www.vixra.org./abs/1606.0170

3. M. Krinker. *Driving a Field Gyroscope up to Speed by Means of External Actions.* Torsion Fields and Informational Interactions. International Conference. Moscow 2016, pp.141-147. (Russian-English).

4. M. Krinker. *An Alternative Look at Operation of EM Drive. Role of the Electromagnetic Field Gyroscope.* www.vixra.org/abs/1702.0236

5. M. Krinker. *The Field Gyroscope and Divining Rod*. Series of the Experiments.2016. www.youtube.com/watch?v=jjbKrA9pRV8 ; www.youtube.com/watch?v=82C5xCc6OT4 ; www.youtube.com/watch?v=TVY2ymoY9EQ

6. Guy Barlow. *On the Torque Produced by a Beam of Light in Oblique Refraction Trough a Glass Plate.* Proceedings of The Royal Society. 1912. Downloaded from http://rspa.royalsocietypublishing.org/

7. Carrara, N. (1949). *Torque and angular momentum of centimetre electromagnetic waves.* Nature, 164 (4177) 882-884.
8. Н.П. Мышкин. *Движение Тела, Находящегося в Потоке Лучистой Энергии*. (N. P. Myshkin. *Motion of the Body in the Flux of a Radiant Energy)***.** International Journal of Unconventional Science, No.1, pp. 89-104, 2013. Restored by V.A. Zhigalov, http://www.unconv-science.org/n1/myshkin/ (in Russian).

9. N.A. Kozyrev Torsion Balance. https://www.youtube.com/watch?v=x0BZSa2pKPA

10. А.Ф. Пугач. *Торсинд-прибор новой физики. Часть 1. Описание конструкции и особенностей прибора.* www.unconv-science.org/pdf/5/pugach-ru.pdf, 2014. A. F. Puguch. *Torsind – an Instrument of new physics. Part 1. Description of the design and specificities of the instrument.* (in Russian)

11. А.Ф. Пугач. *Торсинд-прибор новой физики. Часть 2. Реакция торсинда на астромомические феномены.* www.unconv-science.org/pdf/6/pugach-ru.pdf, 2014. A. F. Puguch. *Torsind – an Instrument of new physics. Part 2. Reaction of Torsind to astronomical phenomena.* (in Russian).