68(1): Spin Connection Resonance in Counter-Gravitation.

The interaction of electromagnetism and gravitation is described by the homogeneous current:

$$j^a = \frac{A^{(0)}}{\mu_0}\left(R^a{}_b \wedge q^b - \omega^a{}_b \wedge T^b\right). \quad -(1)$$

The condition for interaction is:

$$R^a{}_b \wedge q^b \neq \omega^a{}_b \wedge T^b. \quad -(2)$$

Here $R^a{}_b$ is the curvature form, q^b is the tetrad form, $\omega^a{}_b$ is the spin connection form and T^b is the torsion form. If condition (2) is fulfilled the electromagnetic field has an effect on the gravitational field or the classical level. An example is polarization effects in light bent by gravitation, (paper 67).

In paper 68 it will be shown that j^a can be greatly amplified by spin connection resonance.

The homogeneous current is governed by the field equation:

$$d \wedge F^a = \mu_0 j^a \quad -(3)$$

where:

$$F^a = d \wedge A^a + \omega^a{}_b \wedge A^b. \quad -(4)$$

The Hodge dual of eq. (3) is:

$$d \wedge \tilde{F}^a = \mu_0 J^a = \mu_0 \tilde{j}^a. \quad -(5)$$

2) The Coulomb law (papers 61 and 63) is part of eq. (5), in which the Hodge dual current is:

$$\tilde{j}^a = \frac{A^{(0)}}{\mu_0}\left(\tilde{R}^a{}_b \wedge q^b - \omega^a{}_b \wedge \tilde{T}^b\right). \quad -(6)$$

Therefore, for a given $A^{(0)}$, an initial driving voltage $cA^{(0)}$, the quantity $\tilde{R}^a{}_b \wedge q^b - \omega^a{}_b \wedge \tilde{T}^b$ is greatly amplified at spin connection resonance. This means that the effect of the electromagnetic field on the gravitational field is greatly amplified.

From eqs. (3) and (4), the structure of the resonance equation is:

$$d \wedge (d \wedge A^a + \omega^a{}_b \wedge A^b) = \mu_0 j^a \quad -(7)$$

The Hodge dual of eq. (7) can be taken to give another resonance equation.

From paper (55), eqs. (32) and (33), the Newtonian force is:

$$f^a = -m_1 m_2 G \left(R^a{}_b \wedge q^b - \omega^a{}_b \wedge T^b\right),$$

$$\boxed{f^a = -m_1 m_2 \frac{\mu_0 G}{A^{(0)}} j^a} \quad -(8)$$

where m_1 and m_2 are gravitating masses, and where G is the Newton gravitational constant.

The method adopted for paper 68 is to investigate the effect of the j^a term on the Coulomb Law. In papers (61) and (63) it was assumed that:

$$R^a{}_b \wedge q^b = \omega^a{}_b \wedge T^b \quad -(9)$$

i.e. that the electromagnetic field and gravitational field do not interact. In this case the only contribution to $\tilde{j}^a$ is from the source mass, so:

$$\tilde{j}^a = \frac{A^{(0)}}{\mu_0} \left(\tilde{R}^a{}_b \wedge q^b \right)_{source} \quad -(10)$$

This is explained in detail in the first paper of volume 2, and also in paper 6 of volume 2, where it was shown that under condition (9), the Coulomb law is:

$$\underline{\nabla} \cdot \underline{E}^0 = -\phi^{(0)} \left(R^0{}_1{}^{10} + R^0{}_2{}^{20} + R^0{}_3{}^{30} \right)$$

This is a particular example of:

$$\underline{\nabla} \cdot \underline{E}^a = -\phi^{(0)} R^a{}_i{}^{i0}, \quad i = 1, 2, 3$$

$$-(11)$$

It was shown in paper 66 that $\underline{E}^a$ is a vector boson with $a = 1, 2, 3$, so:

$$\underline{\nabla} \cdot \underline{E}^1 = -\phi^{(0)} R^1{}_i{}^{i0} \quad -(12)$$

$$\underline{\nabla} \cdot \underline{E}^2 = -\phi^{(0)} R^2{}_i{}^{i0} \quad -(13)$$

$$\underline{\nabla} \cdot \underline{E}^3 = -\phi^{(0)} R^3{}_i{}^{i0} \quad -(14)$$

where there is summation over repeated space indices i, i.e.:

$$R^1{}_i{}^{i0} = R^1{}_1{}^{10} + R^1{}_2{}^{20} + R^1{}_3{}^{30} \quad -(15)$$

and so on.

In eqs. (12) - (15) the Riemann form elements are generated by the source mass. The electromagnetic contribution is zero. In the notation of paper 63:

$$\boxed{\underline{\nabla} \cdot \underline{E}^a = \mu_0 \tilde{j}^a = -\phi^{(0)} R^a{}_i{}^{i0}} \quad -(16)$$

<u>Effect of the Electromagnetic Field</u>

The Coulomb law is changed to:

$$\underline{\nabla} \cdot \underline{E}^a = -\phi^{(0)} \left(R^a{}_i{}^{i0} + \omega^a{}_{1b} T^{b10} + \omega^a{}_{2b} T^{b20} + \omega^a{}_{3b} T^{b30} \right)$$

$$:= \mu_0 \tilde{j}^a \quad -(17)$$

The effect of the electromagnetic field on the

5) elements $R^a{}_i{}^{io}$ is given by $\omega^a{}_{1b}T^{b10} + \omega^a{}_{2b}T^{b20} + \omega^a{}_{3b}T^{b30}$.

The spin connection elements can be worked out as in paper 66 and the torsion tensor elements are proportional to electric field elements. In eq. (17) there are contributions to $R^a{}_i{}^{io}$ from the interaction of ~~the~~ elm and gravitational fields. The complete term (17) is :

$$\underline{\nabla} \cdot \underline{E}^a = -\phi^{(0)} \left(\left(R^a{}_i{}^{io} \right)_{source} + \overbrace{\left(R^a{}_i{}^{io} + \omega^a{}_{ib} T^{bio} \right)_{int}}^{\text{initially very small}} \right) \quad - (18)$$

The interaction term is :

$$\tilde{j}^a{}_{int} = -\phi^{(0)} \left(R^a{}_i{}^{io} + \omega^a{}_{ib} T^{bio} \right)_{int} \quad - (19)$$

This is usually very tiny, but for a given $\phi^{(0)}$ may be amplified by resonance, i.e. spin connection resonance.