1) 69(1): Outline of the Effect of Gravitation on IFE and RFR

Using indexless notation the effect of gravitation may be measured through the equations:

$$F = d \wedge A + \omega \wedge A \quad \text{— (1)}$$

and

$$d \wedge F = \mu_0 j \quad \text{— (2)}$$

where:

$$j = \frac{A^{(0)}}{\mu_0} \left(R \wedge q - \omega \wedge T \right) \quad \text{— (3)}$$

and:

$$A = A^{(0)} q \quad \text{— (4)}$$

$$F = A^{(0)} T. \quad \text{— (5)}$$

Here the various differential forms are as follows. F is the electromagnetic field, A is the electromagnetic potential, ω is the spin connection, j is the homogeneous current, R is the curvature, q is the tetrad, and T is the torsion. $cA^{(0)}$ is the primordial voltage and μ_0 is the vacuum permeability. S.I. units are used.

The resonance equation from eqs. (1) and (2) is:

$$d \wedge (d \wedge A + \omega \wedge A) = \mu_0 j \quad \text{— (6)}$$

$$= \mu_0 \left(R \wedge q - \omega \wedge T \right).$$

The effect of gravitation on the electromagnetic field is governed by j. If there is no effect:

$$j = R \wedge q - \omega \wedge T = 0 \quad -(7)$$

and:

$$d \wedge (d \wedge A + \omega \wedge A) = 0. \quad -(8)$$

In this case, translational and rotational motions become independent. The translational motion governs the gravitational field and the rotational motion governs the electromagnetic field. The translational motion gives the Einstein Hilbert field theory as follows:

$$R \wedge q = 0 \quad -(9)$$

$$T = 0 \quad -(10)$$

$$D \wedge R = 0. \quad -(11)$$

Eq. (9) is the Ricci cyclic equation, and eq (11) is the second Bianchi identity. The well known Einstein Hilbert field equation is obtained from the second Bianchi identity (11) and from Noether's Theorem. As can be seen from eq. (10), there is no torsion in the Einstein Hilbert theory.

From eqs. (9) and (10):

$$j = 0 \quad -(12)$$

self-consistently.

Note carefully that if $\tilde{R}$ is the Hodge dual of R, then:

$$\tilde{R} \wedge q \neq 0. \quad -(13)$$

The rotational motion defines the electromagnetic field by:

$$d \wedge F = 0 \quad -(14)$$

and its Hodge dual:

$$d \wedge \tilde{F} = \mu_0 J, \quad -(15)$$

where:

$$J = \tilde{j} = \mu_0 \left(\tilde{R} \wedge q - \omega \wedge \tilde{T} \right) \quad -(16)$$

is the inhomogeneous current. For rotational motion:

$$R \wedge q = \omega \wedge T \quad -(17)$$

$$\tilde{R} \wedge q = \omega \wedge \tilde{T} \quad -(18)$$

and

$$j_{\text{rotation}} = \tilde{j}_{\text{rotation}} = 0, \quad -(19)$$

but from eq. (13):

$$J = \frac{A^{(0)}}{\mu_0} \left(\tilde{R} \wedge q \right)_{\text{translation}} \neq 0. \quad -(20)$$

Eqs (14) and (15) give the ECE laws of electrodynamics unaffected by gravitation.

Eqs (17) and (18) indicate that for pure rotational motion the rotational curvature R is the dual of the torsion, and the tetrad is the dual of the spin connection.

From eqs. (6) and (8) it is seen that the influence of gravitation on electromagnetism is to change A and ω through the presence of j. This change also introduces the possibility of resonance amplification through eq. (6) and its Hodge dual. If the effect of gravitation is weak, then ω is approximately dual to A in eq. (6), and we may consider the effect of gravitation to be a change in A produced by j. The ECE spin field is defined by:

$$B^{(3)} = -ig \, A \wedge A^* \quad -(21)$$

where A^* is the complex conjugate of A, and where:

$$g = \frac{\kappa}{A^{(0)}} , \quad -(22)$$

κ being a wavenumber.

Therefore $\underline{B}^{(3)}$ (vector notation) is changed by gravitation. This means that the RFR frequency is shifted by gravitation. At resonance from eq. (6) it is seen that this RFR shift is greatly amplified.

Similar considerations apply for all types of atomic and molecular resonance spectroscopy. We may also bring into consideration quantum electrodynamics ~~through~~ the ECE Lemma applied to A:

$$\square A = R A \quad -(23)$$

where:

$$R = -kT. \quad -(24)$$

Here $\square$ is the d'Alembertian, R is the scalar curvature, k is Einstein's constant and T is the index contracted canonical energy-momentum density. The latter contains contributions from electromagnetism, gravitation, and interaction terms.