75(1): ECE Theory of Counter-Gravitational Effects in Rotating Superconductors.

In my opinion this work by Tajmar, de Matos et. al. is repeatable, and also demonstrates the gravitational equivalent of the Faraday Law of induction. From the work of paper 55 of www.aias.us it is seen that ECE theory has already produced this law, now verified experimentally by the European Space Agency.

The first step towards understanding the explanation by Tajmar et al. is the London moment. In S.I. units this is:

$$\underline{m} = -\frac{e}{2m}\underline{J} \quad -(1)$$

where e and m are the charge and mass of Cooper pairs, and where $\underline{m}$ is the magnetic dipole moment produced by a superconductor spinning with angular momentum $\underline{J}$. In the notation of Tajmar et al. eq. (1) is given as:

$$\underline{B} = -\frac{2m}{e}\underline{\omega}. \quad -(2)$$

Unfortunately eq. (2) has ~~the~~ incorrect units because:

$$\underline{B} = J\,s\,C^{-1}m^{-2}, \quad \underline{\omega} = rad\,s^{-1}.$$

The correct S.I. description of eq. (1) should be used for the London moment. The latter is the

2) magnetic dipole moment caused by the rotation of a superconductor. Unfortunately the authors continue this error in their eq. (7):

$$\underline{B} = -\frac{2m}{e}\underline{\omega} - \frac{m}{e}\underline{B}_Z \quad -(3)$$

which should be:

$$\underline{m} = -\frac{e}{2m}\underline{J} - \frac{e}{m}\underline{J}_Z \quad -(4)$$

and the gravitomagnetic London moment should be:

$$\boxed{\underline{m}_Z := -\frac{e}{m}\underline{J}_Z} \quad -(5)$$

It is seen that this is related to the ECE hypothesis:

$$F^a = A^{(0)} T^a \quad -(6)$$

because $\underline{m}_Z$ is an electromagnetic quantity related to F^a and $\underline{J}_Z$ is a rotational quantity related to T^a. The role of $A^{(0)}$ is played by $-e/m$. The units are different in each case but the philosophy is the same.

The conclusion is that the gravitomagnetic moment is due to a component of the Cartan torsion set up by the spinning superconductor.

3) Tajmar et al. then appear to have measured the gravitational equivalent of the Faraday law of induction. This law was given in paper 55, eqs. (166) to (179). In form notation:

$$d \wedge T^a = j^a \quad -(7)$$

$$d \wedge \tilde{T}^a = \tilde{J}^a . \quad -(8)$$

In tensor notation:

$$\partial_\mu \tilde{T}^{a\mu\nu} = \tilde{j}^{a\nu} \quad -(9)$$

$$\partial_\mu T^{a\mu\nu} = \tilde{J}^{a\nu} . \quad -(10)$$

In vector notation:

$$\underline{\nabla} \cdot \underline{T_S}^a = \tilde{j}^{a0} / c \quad -(11)$$

$$\underline{\nabla} \times \underline{T_L}^a + \frac{1}{c} \frac{\partial \underline{T_S}^a}{\partial t} = \underline{\tilde{j}}^a \quad -(12)$$

$$\underline{\nabla} \cdot \underline{T_L}^a = \tilde{J}^{a0} \quad -(13)$$

$$\underline{\nabla} \times \underline{T_S}^a - \frac{1}{c^2} \frac{\partial \underline{T_L}^a}{\partial t} = \underline{\tilde{J}}^a . \quad -(14)$$

If there is no interaction between rotation and translation:

$$\boxed{\underline{\nabla} \times \underline{T_L}^a + \frac{1}{c} \frac{\partial \underline{T_S}^a}{\partial t} = \underline{0}} \quad -(15)$$

The Faraday law of induction is:

4)

$$\underline{\nabla} \times \underline{E}^a + \frac{\partial \underline{B}^a}{\partial t} = \underline{0} \quad -(16)$$

in the absence of interaction between electromagnetism and gravitation.

Equation (5) is therefore an example of:

$$\boxed{\underline{B}^a = A^{(0)} \underline{T}_s^a} \quad -(17)$$

The induced gravitational field observed by Tajmar et al. is an example of:

$$\boxed{\underline{E}^a = cA^{(0)} \underline{T}_L^a} \quad -(18)$$

Here $\underline{T}_L^a$ is the orbital part of the torsion vector as defined in paper 55, and $\underline{T}_s^a$ is the spin part of the torsion vector. These are precisely defined in paper 55.

<u>Overall Conclusion</u>

A spinning superconductor can produce a counter-gravitational field. The gravito-magnetic London moment is proportional to $\underline{T}_s^a$ and this produces $\underline{T}_L^a$ by "Faraday induction".