

## **Note on Electromagnetic Superconducting Mass Gap Origin**

Paris S. Miles-Brenden

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The initial observation of superconducting magnetic levitation implies that both the principles of electromagnetism and gravity are respected and in agreement for a singular phenomenon. These must remain consistent yet independent by the nature of the static inertial state so produced. For; in the presence of gravity, despite the fact they are static, the inertial condition is preserved for both forces. They are therefore under agreement over the concept of inertia within quantum mechanics and general relativity.

In addition, the Lorentz invariance of a quantum system is insisted a priori as an assumption of quantum field theory. What is not forbidden (and there is no indication of Lorentz invariance symmetry breaking in superconductors) is *phase* gauge symmetry breaking. Because QED is preserved, it appears it is indeed spontaneous phase gauge symmetry breaking, and participates in a total lowering of the energy of the system.

A methodology by which phase symmetry breaking may occur has been explored in relation the Pauli exclusion principle and the eigenvector eigenvalue expansion of the quantum wave functions of a two body system of electrons. The dual proof by negation with these principles insists on orthogonality of spin & charge projections in the eigen-space and reveals a purely abstract spatiotemporal representational degree of freedom for the description of charge and spin in the two body Dirac electron equation.

The abstract representational attribute of the spin seen as a continuum is that by which the covariant differentials of the spin gauge connection are differentiable and carry spatiotemporal dependence. The caveat of the spin charge separation is that the quantifiable property of the electron that is spin is independent from charge within the wavefunction; yet dependent for any such normalization. This is insisted because the spin one form and vector one form are independent and both must be taken into account for the evaluation of the spin distribution in space and time with unitarity.

It has been hypothesized that the electrons fall into a lower energy state as a consequence of a net accumulation of indistinguishable energy momentum outwards into electron pairs under spontaneous symmetry breaking. Given that the speed of light must encompass a larger area and volume comparatively to its measure, its effective speed must be interpreted differently, and therefore the effective energy mass content of electrons is hypothesized to be measurably lesser or greater. The fact that the second moment of variance cannot be larger than the first moment of variance indicates that the speed of light is effectively slowed down in relation to matter, and therefore there is a lessening of the effects of relativity and the effective mass energy of the bodies.

As a consequence of decoupling of these representations, mass becomes inertial, charge becomes non-interacting interiorly, and spin becomes asymptotically of a null geodesic. All three groups decouple, which is necessary for the sake of a net accumulative & indistinguishable mass energy lowering to take place for the electrons. These should henceforth rightly be called 'electromagnetic symmetry breaking superconductors;' as a particularity that is the electromagnetic contribution.

As a consequence at least two main ingredients to resolution of the problem of superconductivity in the high temperature and novel superconductors are required:

- 1.) An indistinguishable electromagnetic light energy lowering simultaneous with inertial mass energy lowering; by decoupling of the light field from mass with formation of a 'lighter' inertial condition for rest mass under the considerations of covariance.

- 2.) Phase gauge symmetry breaking of spin and charge groups as a consequence of representational spatiotemporal dependence to spin and charge, as a result of independence and covariance of these properties under dynamical exchange.

As a consequence an energy mass gap for the groups of charge, spin, mass, & electromagnetism is predicted if there is a net sum indistinguishable reciprocation of charge and mass and an electromagnetic decoupling of matter from light.

The nature of the diamagnetism is qualified by the gauge interaction; which is the effect of the speed of light from inside to outside to determine a mass gap by the slowing of the speed of light and a 'lightness condition' of measurement. Hence the translation from the 'laboratory' measurement frame to that of the interior is the reciprocal nature of the Lorentz transformation. Hence the speed of light is observed as growing from the inside to the outside, and observed as decreasing from the outside to the inside.

Hence by the separation of charge and spin; yet of a spatiotemporal distribution of representational dependence there exists an indistinguishable covariant lowering in energy of both. The attribute of the electrons is therefore a displacive expansion of the common covariant notion of electromagnetic energy lowering and inertial mass energy lowering in relation to spin and charge separation under phase gauge symmetry breaking. This phase gauge symmetry breaking occurs into a dimension higher than a singular local or global condition and is measurable under adherence to a constant speed of light and local departure of the definition of measure for energy. The separation and independence of the groups of spin, charge, and mass into inertial groups is the principle by which the groups remain as irreflexively expanded upon.

A locally compact spatiotemporal representation of spin exists; as the two body interaction (and in other words the multi-body problem) is locally established by the covariant differential. There exists independence of the groups of charge and spin upon one another for one or two bodies; implicating a continuous representation of spin by the indistinguishability of electrons from one another. As a consequence, the interpretation of the spin state should not be seen as exclusively a factoring of the eigenbasis but as a representational degree of freedom. This degree of freedom scales contravariantly and therefore must be interpreted by an inverse scaling in relation to the observer. This is the same as the generally covariant interpretation of a physical spin as instanced in reality for physical observables as it is conventionally. Although purely representational this representation carries the full unitary normalization of the wavefunction, and all such degrees of freedom, as a consequence of a locally existent superposition and unitary normalization. Hence the following hypothesis is cast fourth:

**Hypothesis:** *“The existence of a mass gap in superconductivity is explained as a manifestation of separation and reciprocation of spin and charge with phase gauge symmetry breaking as a decoupling of electromagnetic from inertial considerations.”*

The breaking of spin from charge, produces the inertial condition. The origin of non-Lorentz invariance symmetry breaking thus implies the preservation of rest mass and that with a lowering of the effective speed of light under inertial decoupling from all electromagnetic sources that there exists an indistinguishable energy momentum lowering of all four such contributions. As for the displacive; this occurs between the groups of spin and charge, and separably for the mass-inertial content and effective electromagnetic energy momentum relative to an effectively slower speed of light.

The derivative of this work is that the relation between physical quantities becomes ‘decoupled’ for the sake of the electromagnetic interaction by way of:

1.) Regularization under colocal relationship of energy momentum rest mass lowering by way of an effectively lower measure comparative to the speed of light under measurement. This alternative of measurement indicates a lowering of energy mass momentum comparative to the common standard of the speed of light.

2.) A covariant differential of spin predictive of a mass energy momentum lowering; as a result of effectively lowered kinetic and potential energy reciprocation and indistinguishability under two body electromagnetic exchange. As a consequence existent spin and charge are as well equivalently displacive in relation to light and mass.

All such precedents must be set by the original supposition that charge and spin separate (yet what is envisaged is more of an independence and recombination). Given the hypothesis of the effective common nature of inertia and that of the inclusion of an effectively slower passing of the speed of light within the material there exists an effectively lower energy-mass. Hence there exists covariance under independence of charge and spin and a reduction of the effective inertia and energy content of the body.

Hence the predictability of a mass gap reduces to the separation of the group of charge, spin, & mass from one another of an indistinguishable nature and an energy momentum reduction (a gap) by the principle of relativity. Thus; ultimately the existence of a mass gap comes down to the comparative notions of inertia and light under the process of measurement. Without the standard that is a coupling between spin, charge, & mass; light is independent of these properties of the electron locally and globally. In addition they are in turn formative of independent relationships interior to the electron wavefunction description within these variances for the representation.

With the additional ingredient that is phase gauge symmetry breaking there exists an indistinguishable energy momentum lowering of the groups of charge and spin for the two body equation which are not displacive; for mass retains it's unitary interpretation. With this relationship the regularization that is a colocal lowering of one side of the two body Dirac equation there exists a global lowering of the energy of the other side of this eigenvector/value equation. Hence the comparative slowing of the speed of light for either side of the two body electron equation for that which is the other side is a net accrual of a lighter electromagnetic energy state for both such bodies.

This is true as the comparative measure of energy and momentum is made lighter by a less restrictive speed of light, and hence for measurements the comparative lessening of the effect of relativity is covariant with a diminishment in the speed of light. This advantage with the two other ingredients of superconductivity; the phase gauge symmetry breaking, spin and charge separation and reciprocation, and decoupling of the electromagnetic light like condition from the quantum mechanical Dirac electron equation lead to an effective net energy mass lowering of the superconductor.

The exact diamagnetism and the condition of a magnetic field of zero; as well as the 'inertial' interaction properties are a result of the decoupling of massful inertia from electromagnetic light. With exchange there exists a net energy momentum lowering of both bodies as a consequence of electron superposition and indistinguishability. The magnetic free condition which results is nothing more than the weightlessness of inertia.