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Reduced Entropic Superconductivity by Means Effective Attractor and Cooperon Propagator

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Abstract: The "cold" is causing superconductivity phenomenon, as a measurement process generating a phase transitions of second order and also permitting the rise of phenomenological parameters, but not allowing the stability of such behaviour, we will have to write this stability to be supported by a new kind of grandeur as potential entropic which learns the systems how to display over all possible micro configurations and the systems by their faculties to increase their standard entropies, dictate the form of this potential, this will be written as a recursive operatorial equations. The picture of such potential is an interference between thermodynamical length scales of entropies, it seems as a world of different undetermination orders, if a given variational principle is put down, it will transit over several definitions. The representation of entropic potential as a group transformation linking different temperature thermodynamical length scales as described by L. Landau, will suggest that among considerations brought on propagation of order parameter carving the recursive stationary state. Concerning the stability conditions, a context of matrices description will be proposed, as managing the fact that superconductor, is superconductor per pavement and the matrixes notations, is determining the interaction between order parameters as "Heredity" concerning dimensions, orientations and a mixed sub interaction, where equivalently dimensions and orientations are mutually excluded each other. The beginning of emergence of such grandeur, is rooted when combinatory formulation of matter, is taken in the order of measurement process with eigen results, corresponding to normalised macroscopicity levels. The asymptotic expression for the entropic potential, will be expressing a physical situation defining that, deflections are collected by a variational principle brought on the Landau length coherence. The introduction of covariant, contravariant and mixed current densities matrices, will establish the limit, according which the reproducible recursive configurations is only obtained by triplication of a combined fundamental states.

Key words: Entropic potential, entropies thermodynamical length scales, superconductivity

INTRODUCTION

Mathematical modelling and simulation have become an essential part of superconductivity engineering analysis[1], The study of Ginzburg-Landau model permit us the best understanding of eigen energy system[2]. It had been demonstrated that the vortex is the leading aim of the particles motion[3]. Besides, an alternative approach based on Bardeen Cooper Schrieffer (BCS) theory explores the effects of local pairing correlations and leads to the concept of "Cooperon propagator"[4]. Focusing our attention on scaling theory, we can explore bicritical phenomenon as mentioned by Hu[5] and weak coupling as pointed by Kossler *et al.*[6].

We shall have to introduce an entropic potential operator. In order to show the global macro behaviour displaying in regards to the states described by the order parameter, considering that the Landau potential distribution, will be a result of measurement process, as interaction between number of states described by order parameter and entropic potential, the number of states must obey to a phenomenological critical law.

The landau thermodynamical length scales for entropic potential: By introducing reduced entropy $S_{\alpha\beta}$ as a matrix of the form:

$$S_{\alpha\beta} = -5,0396.10^{-15}\left(\ln_{\beta}\Delta\Gamma\right) \quad (1)$$

as $\ln \Delta\Gamma_{\alpha}\Delta\Gamma_{\beta}$, where $\Delta\Gamma$ is the number of states described by the order parameter, which will be a given data for each given entropic potential.

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We write for the current density, the matrix, $div_\alpha div_\beta j_{\alpha\beta}$, where div_α is the divergence taken over the energy surface α and α is also viewed as a thermodynamical length scale temperature represented by a thermodynamical functions ratio. div_α is an operator acting on α component of $j_{\alpha\beta}$. According to the general thermodynamical law[7,8], we have:

$$\frac{d\ln T}{d\tau} = -\frac{\left(\frac{\partial V}{\partial \tau}\right)_P}{\left(\frac{\partial Q}{\partial P}\right)_\tau}$$

Concerning the entropies thermodynamical length scales, A is a potential distribution viewed as a transformation class, which keeping invariant the entropic potential operator, the 2ond Landau condition curlA = B, is replaced by $\overline{A_{\alpha\beta}} = (curl_\alpha curl_\beta A_\alpha A_\beta)^{1/2}$, in such a way[9-11]

$$\frac{\partial^2 A_{\alpha\beta}}{\partial E_\alpha \partial E_\beta} = \overline{S_{\alpha\beta}} = -5{,}0396.10^{-15}\left(\ln_\beta \Delta\Gamma\right) = \int \frac{1}{T} dE - 5{,}0396.10^{-15} \quad (2)$$

-5, 0396.10^{-15} is the computation origin of reduced entropy, it doesn't affect the entropic potential (with rank classification as $\int \frac{1}{T} dE - 5{,}0396.10^{-15}$; first rank, $-5{,}0396.10^{-15}\left(\ln_\beta \Delta\Gamma\right)$; second rank and $\frac{\partial^2 A_{\alpha\beta}}{\partial E_\alpha \partial E_\beta}$; third rank).

An entropic potential variation is equivalent to the sum:

$$dj_{\alpha\beta} + \dot{T}\, dS = dA_{\alpha\beta} \quad (3)$$

By analogous way with the fundamental thermodynamical law: dE = dR+dQ, this writing is very simplified, because it admits an operatorial transcription, the precedent mentioned writing is correct to describe regions governed by fluctuating order parameters just near the threshold neighbourhood in order of -5, 0396.10^{-15} (T $dS_{\alpha\beta}$ may represent an "eigenvalue" of the exchange heat).

According the analogous thermodynamical length scales defined by Landau, we have:

$$\frac{d\left(k\ln_\alpha(k\ln_\beta \Delta\Gamma)\right)}{d\left(k\ln_\beta \Delta\Gamma\right)} = -\frac{\Delta F}{\dot{T}\, dS_{\alpha\beta}} \quad (4)$$

ΔF is representing the free energy density variation of states, which replaces the volume variation in usual thermodynamics.

According to the following calculations:

$$d\left(k\ln_\alpha(k\ln_\beta \Delta\Gamma)\right) = k^2 \frac{d(\ln_\beta \Delta\Gamma)}{k\ln_\beta \Delta\Gamma} = k\frac{d(\ln_\beta \Delta\Gamma)}{\ln_\beta \Delta\Gamma} = \frac{\frac{k}{\Delta\Gamma}}{\ln_\beta \Delta\Gamma} = \frac{k}{\Delta\Gamma}\frac{1}{\ln_\beta \Delta\Gamma},$$

$$d(k\ln_\beta \Delta\Gamma) = k\frac{1}{\Delta\Gamma}$$

where ΔΓ is the β energy of number states, then

$$\frac{d\left(k\ln_\alpha(k\ln_\beta \Delta\Gamma)\right)}{d(k\ln_\beta \Delta\Gamma)} = \frac{\frac{k}{\Delta\Gamma}\frac{1}{\ln_\beta \Delta\Gamma}}{\frac{k}{\Delta\Gamma}} = \frac{1}{\ln_\beta \Delta\Gamma},$$

$$\frac{1}{\ln_\beta \Delta\Gamma} = -\frac{\Delta F}{\dot{T}\, dS_{\alpha\beta}}$$

then

$$\frac{\dot{T}\, dS_{\alpha\beta}}{\ln_\beta \Delta\Gamma} = -\Delta F \quad (5)$$

The length scale defined as $dS_{\alpha\beta} = -\frac{\ln_\beta \Delta\Gamma}{\dot{T}}\Delta F$, expresses that a finite interval ΔF is reduced to an infinitesimal $dS_{\alpha\beta}$ by $\ln_\beta \Delta\Gamma$ for a given value of $\dot{T}$.

The equivalence between thermodynamical length scales of entropies and the extremums of

$$\int_{\tau_1}^{\tau_2} \xi(T, \dot{T}, \tau) d\tau \quad (6)$$

It will mean that a coherence length of the scale variation is resulting as a reduced entropy variation; the multitude of minimums of the above integral will justify the matrix nature of reduced entropy.

Let us we write the entropic action:

$s = \int_{\tau_1}^{\tau_2} \xi(T, \dot{T}, \tau) d\tau$, the reduced entropy will be maximal when it takes the form:

$S_{\alpha\beta} = a_{\alpha\beta} e^{-i7{,}63.10^{-12} s_\alpha s_\beta}$, which means that if this form is taking, the whole regions; described by the fluctuating order parameters; is conquest by the entropic potential $A_{\alpha\beta}$.

Because of the relation $\widehat{e^{S_0}}\Delta F = S_{n0} j_{\alpha\beta}$, we can write

For the asymptotic form $S_{\alpha\beta} = a_{\alpha\beta} e^{-i7,63.10^{-12} s_\alpha s_\beta}$; the expression:

$$a_{\alpha\beta}\left(-\left(\hbar^2 \nabla_\alpha \nabla_\beta\right)^{\frac{1}{2}} + \frac{e^*}{c} A\right)\left(\Psi_\alpha \Psi_\beta^*\right)^{\frac{1}{2}} e^{-i7,63828.10^{-12} s_\alpha s_\beta} = -A\int \left|\mathrm{div}_\alpha \mathrm{div}_\beta j_{\alpha\beta}\right|^{\frac{1}{2}} dt + S_{n0} j_{\alpha\beta} \quad (7)$$

Which gives the "resonant" $j_{\alpha\beta}$.

Such $j_{\alpha\beta}$ are induced by the matrix elements of the reduced entropy, for which we have: $|a_{\alpha\beta}|^2 = 1$

And:

$$\begin{cases} S_\alpha = \int_{\tau_1}^{\tau_2} \xi_\alpha\left(T, \dot{T}, \tau\right) d\tau \\ S_\beta = \int_{\tau_1}^{\tau_2} \xi_\beta\left(T', \dot{T}', \tau\right) d\tau \end{cases} \quad \text{(8-a and b)}$$

Which are related by the equations:

$$\begin{aligned} & c_\alpha \int_{\tau_2}^{\tau_2} \xi_\alpha\left(T, \dot{T}, \tau\right) d\tau + c_\beta \int_{\tau_2}^{\tau_2} \xi_\beta\left(T', \dot{T}', \tau\right) d\tau \\ & = \int_{\tau_2}^{\tau_2} c_\alpha \xi_\alpha\left(T, \dot{T}, \tau\right) d\tau + \int_{\tau_2}^{\tau_2} c_\beta \xi_\beta\left(T', \dot{T}', \tau\right) d\tau \\ & = \int_{\tau_1}^{\tau_2} \left(c_\alpha \xi_\alpha + c_\beta \xi_\beta\right) d\tau \sim -5{,}0396.10^{-15}\left(\ln_\beta \Delta\Gamma\right) \end{aligned} \quad (9)$$

Physically those $j_{\alpha\beta}$ are eigen results of first order entropies, having the same phases.

For $S_{\alpha\beta} = a_{\alpha\beta} e^{-i7,63.10^{-12} s_\alpha s_\beta}$, the equations can be written:

$$\begin{cases} \widehat{e^{S_0}}\Delta F = S_{\alpha\beta} j_{\alpha\beta} = a_{\alpha\beta} e^{-i7,63.10^{-12} s_\alpha s_\beta} \\ \widehat{e^{S_0}}\Delta F = a_{\alpha\beta} e^{-i7,63.10^{-12} s_\alpha s_\beta} \end{cases} \quad \text{(10 a and b)}$$

The expression (10 a-b) is giving the "suffocating law" of first order entropies; this is due to the fact that, the first order entropy converging to the nullity of ancient pattern will forge entropy of second order.

$\widehat{e^{S_0}}$ is a particular operator playing the role of "effective attractor", by consuming the statistical weights of first order belonging to the wave functions, will make up a state with entropy of second order.

Matrix description context for the stabilized super-conducting state: In this study, we consider the "Landau states causal heredity", this term was used by F. FER in 1956.

The objectivity or the conservation of causality between probabilities density, is of the first order when the measurement processes is defined as the variation of the classical being action (this action is taken according to the uniformity of time, homogeneity and isotropy of space and also according to the combination of those fundamental features).

However, if we consider the measurement process as follows:

We consider the entropy as the logarithm of the number of extremals of action integral.

We consider only the recursive extremals (corresponding to the configurations reheating linear dimensions each from other, it reheating this by a length scales temperatures interactions).

By considering the mean quadratic fluctuation over the set of standard configurations, as in the order of the mean intensity of interaction between recursive configurations, for realising this, a threshold is required when it still -5, 0396.10^{-15} possibilities for the system to increase its entropy.

The threshold of the transition of the Landau coherence length is also considered; it will be an amount with the components:

$$\begin{cases} \Delta\xi_i(T)\Delta\xi_j(T) \\ \nabla\xi_i(T)\nabla\xi_j(T) \\ \begin{vmatrix} \Delta\xi_i(T) & \Delta\xi_j(T) \\ \nabla\xi_i(T) & \nabla\xi_j(T) \end{vmatrix} \end{cases}$$

Our approach follows at the first level (the procedure of establishing the canonical equation as in the classical mechanics, the temperature leads to superconductivity, but does not insure its stability independently from the temperature itself. This means that the systems macroscopicity in nature appears as the shadow of physical conditions, we can reach a superconducting state by decreasing the number of configurations corresponding to a system which action variation is less than the Boltzmann's constant, in such a way, the system will behave as to be independent from the temperature.

The entropic potential $A_{\alpha\beta}$ is in the ancient description appearing latent or absent according to the mean of Landau integral.

Asymptotic expression for the entropic potential: The entropic potential must follow the law,

$$A_{\alpha\beta} = c_\alpha c_\beta e^{-i7,63.10^{-12} s_\alpha s_\beta} \tag{11}$$

It is a bi-complex potential, with the modulus is as a measurement of the recursivity of two sets of configurations ($|c_\alpha c_\beta|^2$ must be universal, its constancy implies $\overline{A_{\alpha\beta}} = (\text{curl}_\alpha \text{curl}_\beta A_\alpha A_\beta)^{1/2}$).

In general one gauge condition is imposed in such a way that, $\int (\text{curl}_\alpha \text{curl}_\beta A_\alpha A_\beta)^{1/2} dt$, must have extremals (the littlest are chosen).

The interpretation of entropic potential, here will take the mean of a choice faculty, on one hand, brought on the birth of entropy deflection of the set of standard configurations, to the mean entropy of the same set, under the "cold"; on other hand, of selection rules of wave functions candidate to generate recursive conditions.

This will not assumed as a contradiction with Ginzburg- Landau equations and with the natural character of grandeurs, because the entropic potential before the appearance of superconductivity was existed as grandeur of first order or a function of grandeur of first order.

Those physical considerations do not intend a kind of amendment, but the natural passage to a description, which include the condition of stability of the super-conducting state, using the $A_{\alpha\beta}$ potential.

The concept of heredity introduced, will replace the causality limit (the causality term implies that a state is "extracted" from another, all extracted and absolutely, but heredity implies that a state will be extracted from another, not all extracted and not absolutely).

In our case, the action of a potential distribution on a wave function, will generate "a vacuum which must be paved by a set of configurations, which number is as a great, as it still not possibilities for the system to display over, less than -5, 0396.10^{-15} ".

Gauge transition definition: Against which a potential distribution must submit a wave function to obtain an order parameter propagating with Landau length coherence (it will be a gauge imposed to the vector potential about wave functions).

Against which conditions must be submit the whole of set of configurations above, to obtain a fluctuation replacing the order parameter and propagating according to trio

$$\left(\Delta\xi_i \Delta\xi_j,\ \nabla\xi_i \nabla\xi_j,\ \begin{vmatrix} \Delta\xi_i & \nabla\xi_j \\ \nabla\xi_i & \Delta\xi_j \end{vmatrix} \right)$$

This will be a gauge of second order with regard to the ordinary wave function.

The interference of two wave functions described as a parameterized pavement that is limited by the quantum and thermodynamical requirements represented by the two constants: $7,63.10^{-12}$ and $2,76.10^{-12}$.

We shall say that the proposition $\mathbf{\Psi\Psi^*}$ is $|\mathbf{\Psi}|^2$ is replaced by the propositions that

$\Delta\Psi\Delta\Psi^* \sim c_1 = 7,63.10^{-12}$, $\nabla\Psi\nabla\Psi^* \sim c_2 = 2,76.10^{-6}$ and

$$\begin{vmatrix} \Delta\Psi\Delta\Psi^* & \Delta\Psi^*\Delta\Psi \\ \nabla\Psi\nabla\Psi^* & \nabla\Psi^*\nabla\Psi \end{vmatrix} \sim c_3$$

are three uncertainty principles.

First, means the limitations imposed to the pavement with regard to the linear dimensions.

Second, means the limitations imposed to the pavement with regard to the orientations.

Third, means the limitations imposed to the pavement with regard to the birth of mixed current density, which will be corresponding to the transition of magnetic features.

The limitations imposed to the pavement, will be considered as the origin of the deflexion of entropy and will give a great number of minimums for the Landau functional.

The Landau phenomenological parameters are the results of measurement process of first order, $A_{\alpha\beta}$ will be a result of "the transition of measurement process", $A_{\alpha\beta}$ is governing the order of fluctuations of the set of the configurations above, which will appear as a result of measurement process here "application of entropic potential".

This description permit the appearance of relations between entropic potential and fluctuations described above, as recursively, where every equilibrium state between fluctuations and entropic potential, will be recursive partial equilibrium state (the measurement process generate results, results will be dictated how to be generated, it is a kind of a J. A. Wheeler law).

According to these considerations, the mean of value of the entropic potential must follow the law:

$$\overline{A_{\alpha\beta}} \sim c \frac{\Delta\Gamma\Delta\Gamma'}{\xi^2(T)} \tag{12}$$

this general expression, will follow the limitations imposed by the pavement described above as follows:

$$\overline{A_{\alpha\beta}} \sim c_1 \frac{\Delta\Gamma_\alpha \Delta\Gamma_\beta}{\Delta\xi_\alpha(T)\Delta\xi_\beta(T)} \quad (13\text{-a})$$

$$\underline{A_{\alpha\beta}} \sim c_2 \frac{\nabla\Gamma_\alpha \nabla\Gamma_\beta}{\nabla\xi_\alpha(T)\nabla\xi_\beta(T)} \quad (13\text{-b})$$

$$\overline{\underline{A_{\alpha\beta}}} \sim \begin{vmatrix} c_{11} & c_{12} \\ c_{21} & c_{22} \end{vmatrix} \frac{\begin{vmatrix} \Delta\Gamma_\alpha & \nabla\Gamma_\beta \\ \nabla\Gamma_\alpha & \Delta\Gamma_\beta \end{vmatrix}}{\begin{vmatrix} \Delta\xi_\alpha(T) & \nabla\xi_\alpha(T) \\ \nabla\xi_\beta(T) & \Delta\xi_\beta(T) \end{vmatrix}} \quad (13\text{-c})$$

The operatorial transcription of the variational principle[3], $\iint \Psi(q)\Psi^*(q)\varphi(q,q')dqdq'$, will be as follows:

$$\widehat{e^{S_0}}\Delta F = \iint S_\alpha(E)S_\beta(E)A_{\alpha\beta}dt^2 \quad (14)$$

dt^2 is an infinitesimal of second order which generates the transition of the universal uncertainty order to an eigen uncertainty orders.

The following calculation shows that:

$$\iint S_\alpha(E)S_\beta(E)A_{\alpha\beta}dt^2 = S_{n0}j_{\alpha\beta} \quad (15)$$

and

$$\widehat{e^{S_0}}\Delta F = a_{\alpha\beta}e^{-i7,63.10^{-12}s_\alpha s_\beta}j_{\alpha\beta}, \text{ then}$$

$$\iint S_\alpha(E)S_\beta(E)A_{\alpha\beta}dt^2 = a_{\alpha\beta}e^{-7,63.10^{-12}}j_{\alpha\beta} \quad (16\text{-a})$$

$$\frac{d^2}{dt^2}\left(\widehat{e^{S_0}}\Delta F\right) = S_\alpha(E)S_\beta(E)A_{\alpha\beta} + |c|^2 \quad (16\text{-b})$$

$$\frac{d}{dt}\left(\frac{i}{\hbar}\left[\widehat{He^{S_0}} - e^{S_0}\widehat{H}\right]\right)\Delta F = S_\alpha(E)S_\beta(E)A_{\alpha\beta} + |c|^2 \quad (16\text{-c})$$

$|c|^2$ ensures the recursivity between the fluctuations (by fluctuation we mean the one of system fluctuating over a number of configurations) and the entropic potential, this leads to the uniformity of $A_{\alpha\beta}$, it does not change sign (the reverse means the appearance of extremal symmetries or a dislocated configurations).

With regard to the energies, the expression of the mean value of entropic potential is:

$$\overline{S_{\alpha\beta}} = \frac{\partial^2 A_{\alpha\beta}}{\partial E_\alpha \partial E_\beta} = -5{,}0396.10^{-15}\left(\ln_\beta \Delta\Gamma\right) = \int \frac{1}{T}dE - 5{,}0396.10^{-15} \quad (17)$$

This fact shows that $\frac{1}{(T-T_c)}dE - 5{,}0396.10^{-15}$, implies a computation origin of reduced entropy, situated not as far as it exist a real situation, where the integral is less than -5, 0396.10^{-15}.

The appearance of entropic potential is per pavement and the reduced entropy is per ratios of displaying faculties.

Entropic potential exists as a latent form of the first order. It seems as a Landau potential distribution different by a constant potential. The Landau distribution is in this case a tangent space to the flat manifold represented by entropic potential, by the transition it will transit in grandeur of second order with regard to the wave function, the entropic potential is collected in terms of effective action variation density per pavement as:

$$\frac{\delta^3 s}{\delta q_i \delta q_j \delta q_k}, \frac{\delta^3 s}{\delta \dot{q}_i \delta \dot{q}_j \delta \dot{q}_k}, \frac{\delta^3 s}{\delta\varphi_i \delta\varphi_j \delta\varphi_k}$$

and their linear or non linear combinations.

CONCLUSION

The equivalence: $\frac{\partial^2 A_{\alpha\beta}}{\partial E_\alpha \partial E_\beta} \sim \int \frac{1}{T}dE - 5{,}0396.10^{-15}$, leads to estimate the contraction of macroscopic levels as in the order of dE - -8,75.10^{-13} erg, a part of the interval ΔE (in the order of mean fluctuation of macroscopic level), will seem disappearing in the meaning of standard entropy measured under the Heisenberg uncertainty , but really this part doesn't disappear, but transformed to correspond to recursive configurations. On other hand, this amount of energy dE represents the displaying of ΔE over inner freedom degrees of the system, which corresponds to the inner dimensions of the antisymmetric order parameter, one inner local dimension is reverse to be a global external dimensions.

Such considerations are making that the interaction processes can be view as excluded inner dimensions to realize external dimensions.

It had been mentioned that the repulsive interaction between quasi particles is determined by the exponent α of the Anderson propagator[10]. Following this idea, we can postulate that the exponent $\alpha\_$ can take another value to bascule at attractive interaction[11]. If we assume a quasi particle incident, the Andreev reflection can generate a vortex state as shown by Maly *et al.*[12].

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