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A New Hypothesis of Spin Supercurrent as Plausible Mechanism of Biological Nonlocal Interaction, Synchronicity, Quantum Communication

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Abstract

We start with citing a seminal paper by Josephson-Pallikari-Viras, that biological entities can be assumed to be able to communicate nonlocally, i.e., instantaneously. However, they also admit that the underlying mechanism of such an entangled communication is not clear yet from the wave mechanical equations. Similar arguments have been pointed out by several authors, citing that quantum equations themselves have not described anything on a possible mechanism of quantum-type interaction between two biological entities. This chapter intends to fill that research gap by suggesting a new hypothesis of spin supercurrent as a physical mechanism, based on the assumption of macroquantum condensate having nonlocal effects. Moreover, we also draw several potential applications including superconductor quasi-crystalline structure of space and plausible new method of quantum communication. Such an argument is outlined herein partly based on our personal encounter with astrophysical quantization in the past 17 years or so.

Keywords: biological nonlocal interaction, quantum nonlocality, entanglement, spin supercurrent, superfluid dynamics, superconductor quasicrystalline, quantum communication

1. Introduction

In a seminal paper by Prof. Brian Josephson—Pallikari-Viras, they argued that despite quantum nonlocal interaction tends to be undetected by statistical averaging, but by assuming macroquantum system, biological entities can be assumed to be able to communicate nonlocally, i.e. instantaneously. However, they also admit that the underlying *mechanism* of such an entangled communication is not clear yet from the wave mechanical equations [1, 2].

Actually, it is known for a long time that quantum physics allows quantum correlations—common reliance of attributes of wave capacity of supposed entangled quantum substances while there is space partition. This may include a phenomenon called the near-field antenna effect, i.e. the presence close to radio wire (a wavering electric dipole) of superluminally spreading electromagnetic field [3].

Nonetheless, various arguments have been pointed out by several authors, citing that quantum equations themselves have not described anything on the possible mechanism of quantum-type interaction between two biological entities.

In this chapter, we will discuss some existing literature and then we come up with a new hypothesis that spin supercurrent provides the sought-after physical mechanism for biological nonlocal interaction, synchronicity, and plausible new quantum communication method.

2. Literature survey

2.1 Wave mechanics equations

In quantum mechanics, the depiction of action of the field-free magnetic vector potential depends on Schrödinger's equations without presenting any actual interaction. As the activity of the field-free magnetic vector likely takes place in space where the electromagnetic field is missing, this potential has both non-electric and non-attractive nature. While there are researchers who did try to develop an electric representation of quantum wave mechanics, such as Gabriel Kron, but it did not give new results, as far as our knowledge. Moreover, in our previous book, Shpenkov and Kreidik have shown that Weyl provided cut-off to solutions of the original Schrodinger equation (3D), to achieve a quite good agreement with experimental data at the time. It is clear that in most textbooks on QM, whenever the authors discuss solutions of spherical Schrodinger equations, they rarely compare the results with actual experimental data, because they know, there is no agreement at all between spherical wave mechanics and experiment. It should be clear, that despite fairytale stories have been circulated to invoke certain mystical elements to wave mechanics origin, the fact is, it was a failed attempt since the beginning [4].

2.2 Classical EM theory approach

As Boldyreva wrote, which can be paraphrased as follows: “EM hypothesis portrays field-free magnetic vector potential. In traditional electrodynamics, the magnetic field of acceptance B is resolved by condition $\text{curl} = B \text{ curl } A$, where A will be an attractive vector potential. In protecting of attractive field, $0 = B$, the accompanying may happen: $0 \neq A$. This case is alluded to as the without field vector potential. Magnetic vector potential has its very own actual significance. In 1949, Erenberg furthermore Siday anticipated the capacity of attractive vector potential to impact straightforwardly the attributes of quantum substances despite the fact that there is no electromagnetic field at the area of the elements. In 1959, the chance of such an impact was considered by Aharonov and Bohm. Hence, an extraordinary number of tests have been directed which affirmed the hypothesis” [3].

2.3 Macroquantum condensate hypothesis

Here allow us to mention our chapter in a journal of Foundation Louis de Broglie 2006, suggesting that astrophysical quantization can be explained for instance by assuming macroquantum condensate of astrophysical bodies [5].

Provided such astrophysical macroquantum effects can be accepted, then it seems not so hard to suppose that under certain circumstances biological nonlocality interaction can happen, once we assume similar macroquantum condensates.

2.4 Spin supercurrent in superfluid helium

What we can read in some recent papers by Liudmila Boldyreva, she puts forward an argument of the existence of spin supercurrent to mediate biological quantum-type interactions [3].

Boldyreva wrote among other things, which can be paraphrased as follows:

“This work proposes basically another way to deal with portrayal of the above-thought about peculiarities: specifically, it is shown that it is conceivable to portray these peculiarities as far as such actual interaction as spin supercurrent. The twist supercurrent arises between objects having turn, and its activity will in general make equivalent the individual characteristics of precession of twists of collaborating objects. (Note that Yuri Bunkov, Vladimir Dmitriev and Igor Fomin were granted the Fritz London Memorial Prize in 2008 for the investigations of spin supercurrents in superfluid 3 He-B).”

In this model, quantum correlations between quantum entities may be performed by spin supercurrent emerging between virtual photons (virtual particles pairs) created by those quantum entities.

2.5 Carl Jung’s synchronicity

Limar wrote a review on the possible link between Carl Jung’s concept of synchronicity with quantum non-local effect, known as entanglement. He argues in favor of cellular level or DNA level quantum type interaction, such as meiosis etc. Nonetheless, he also admits that many paper streams on this subject are plagued by the non-existence (as yet) of the physiological or physical mechanism of such non-local interaction [6].

2.6 Research gap

Similar arguments have been pointed out by several authors, citing that quantum equations themselves have not described anything on the possible mechanism of quantum-type interaction or communication between two biological entities. This chapter intends to fill that research gap by suggesting a new hypothesis of spin supercurrent as the physical mechanism, based on the assumption of macroquantum condensate having nonlocal effects. Moreover, we also draw several potential applications including superconductor quasi-crystalline structure of space and plausible new method of quantum communication. Such an argument is outlined herein partly based on our personal encounter with astrophysical quantization in the past 17 years or so.

3. A new hypothesis

If now we put all the above findings from macroquantum condensate (or close to superfluid 3 He) to spin supercurrent, hence, we come up with a new hypothesis, that we will state here for the first time:

3.1 Hypothesis

“There is spin supercurrent to be observed to mediate interaction between biological entities, between consciousness which known as synchronicity (in Jungian term), and also to provide quasi-crystalline structure of space, and in turn, it allows a new model of quantum-type nonlocal communication.”

3.2 Simple physical model

According to Bunkov and Volovik, the superfluid current of twists—turn supercurrent—is another agent of superfluid flows, for example, the superfluid current of mass and molecules in superfluid 4He; superfluid current of electric charge in superconductors [7].

According to Boldyreva, such spin supercurrent mechanism can be helpful to mediate biological nonlocal interaction, can be modeled as follows:

$$J_z = g_1(a_1 - a_2) + g_2(t_1 - t_2), \quad (1)$$

where g_1 and g_2 are coefficients depending on deflection angles and the properties of the medium where spin supercurrent emerges. Turn supercurrent is certainly not an electric or attractive interaction and therefore it is not protected by electromagnetic screens [3].

Moreover, Boldyreva also argues that such a spin supercurrent interaction can find implications in alternative medicine, which can be paraphrased as follows: “...a deterministic portrayal of the association is utilized, which continues as per the laws overseeing the conduct of sub-atomic fluid when the temperature of the last option is near outright zero (the properties of superfluid 3He-B). This methodology concurs with E. Schrödinger’s perspective communicated in his book ‘*What is life?*’, i.e. “The living organic entity is by all accounts a naturally visible framework which to a limited extent of its conduct ways to deal with that absolutely mechanical (as differentiated with thermodynamical) direct to which all frameworks tend, as the temperature moves toward outright zero and the atomic problem is taken out” [8].

4. Sideways and rationale

4.1 Our personal encounter with macroquantum condensate astrophysics

This segment permits us to recount an account of our experience with macroquantum condensate in astrophysics. Everything started by a to some degree “reasonable deduction” (or readers might call it: *einführung*), when one of us (VC) got an old book by Nozieres and Pines [9], on superfluid Bose liquid. He inquired: Let us see what this

book can bring to the domain of astronomy and cosmology. Before long, he tracked down many fascinating discoveries with regards to the writing, from W.H. Zurek to Grigory Volovik and so forth. That is the start of our undertaking for more than 18 years up to this point, coming about a few papers in a series [5, 10–14]. The soonest paper called “Cantorian superfluid vortex hypothesis” was distributed in January 2004, where VC presented a forecast of potential areas of three new circles of planetoids on the external side of Pluto. Then, at that point, after 2 years, VC distributed a paper in AFLB [5], where he laid out what are potential clarifications of macroquantum impacts in astronomy (for example, noticed likewise by Tifft and furthermore Virginia Trimble and so forth). One of the contentions in that AFLB paper is macroquantum condensate, for example, conceivable quantum impact actuated by BEC or superfluid-type medium [5].

More recently, we (VC, FS, YU) come up with an argument of cosmological entanglement supposing such a macroquantum effect is real.

4.2 Observational evidence

4.2.1 Quantization of planetary orbit distances in the solar system

In this section, we will review the work and results by us, during the past 17 years or so. The basic assumption here is that the Solar System’s planetary orbits are quantized. But how do their orbits behave? Do they follow Titius-Bode’s law? Our answer can be summarized as follows (**Figure 1**):

Navier-Stokes equations --> superfluid quantized vortices --> Bohr’s quantization rule

Figure 1.
From NS turbulence to quantized vortices.

And it seems that the proposed model is slightly better compared to Nottale-Schumacher’s gravitational Schrödinger model and also Titius-Bode’s empirical law [1, 11]. The evidence of quantization of planetary orbit distances seem to suggest to wave mechanics model at a large scale [5, 10–14]. See also Peter Coles [15].

4.2.2 Observational finding on cosmological entanglement

Interestingly there is a recent report from MIT suggesting that ancient quasars support such quantum entanglement at large-scale phenomena. In an article, it is reported about the possibility of cosmological entanglement [16], which can be paraphrased as follows:

“In 2014, ... the William Herschel Telescope and the Telescopio Nazionale Galileo, both located on the equal mountain and separated via about a kilometer. One telescope focused on a particular quasar Meanwhile, researchers at a station located between the two telescopes created pairs of entangled photons and beamed particles from each pair in contrary directions toward every telescope” [17].

Therefore, such a discovery has opened up a new way to look at the Universe: *an entangled Cosmos* [18, 19].

4.2.3 Newtonian action at a distance: Smarandache's

Hypothesis expresses that there is no speed limit of anything, including light and particles [20]. Eric Weisstein likewise composed ramifications of Smarandache's Hypothesis [21], which can be summarized as follows: "...the speed of light c is as of now not a biggest at which estimations can be sent and that abstract speeds of data or mass switch can occur. These confirmations fly notwithstanding every idea and investigation, as they misuse both Einstein's exceptional rule of relativity and causality and don't have any test support. It is genuine that current preliminaries have confirmed the presence of positive sorts of quantifiable superluminal quirks....." [21].

While the thought is very basic and in view of known speculation of quantum mechanics, called Einstein-Podolski-Rosen bridge, actually such a superluminal material science appears to be still difficult to acknowledge by the greater part of physicists. Beginning around 2011, there was a clear astounding outcome as declared by the OPERA group. Regardless, hardly any months after the fact, it was disavowed on the ground of mistakes in dealing with the estimation.

Permit us to offer not many remarks on such a clear inability to identify quicker than light speed as follows: Despite those discussions over the OPERA results, we believed that a seriously persuading test has been finished by Alain Aspect and so on; he had the option to show that quantum non-territory association is genuine. In 1980, Alain Aspect played out the first EPR try (Einstein-Podolski-Rosen) which demonstrated the presence of room nonlocality (Aspect 1982). Alain Aspect and his group at Orsay, Paris, led three Bell tests utilizing calcium course, i.e. the first and last utilized the CH74 disparity. The second was the first use of the CHSH imbalance.

The third (and generally well known) was organized with the end goal that the decision between the two settings on each side was made during the flight of the photons (as initially proposed by John Bell). A few experimenters demonstrated a comparative outcome until the distance of more than 90 km.

So, the thought of "spooky action at a distance" is a genuinely actual peculiarity. In addition, activity a way off was at that point referenced in Newton's *Principia Mathematica*. Regardless of obviously Einstein was attempting to make each of Newton's demeanors into nothing, our result suggests that the Maxwell equations in classical electrodynamics have "spooky interaction at a distance" type of interactions (as it has also been proven for Coulomb potential), which might be noticed both at limited scope tests just as in a cosmological scale, as ongoing confirmations show similar effect at a distance in relation to Smarandache's hypothesis.

4.2.4 Evidence of Cooper-pair tunneling in nuclei is likely to indicate superfluid vacuum model instead of gluon

In a recent report published in *Phys. Rev. C*, Potel et al. wrote on a breakthrough on the subject was made through the study of one- and two-neutron transfer reactions with heavy-ion collisions in inverse and direct kinematics, enabled by the use of magnetic and γ -ray spectrometers, which suggest that there can be Cooper-pair tunneling in nuclei [22]. In retrospect, this finding seems to indicate that the superfluid vacuum model can be a better approach than the gluon model as in the Standard Model. See also [23, 24].

Besides, the superfluid nuclear matter hypothesis is known for a quite long time, especially going beyond BCS theory, cf. Walecka, Matsuzaki, Lombardo *etc.* [25, 26].

4.2.5 Initial evidence on the synchronicity between patient and doctor

In a 2008 article, Alex Hankey argues in favor of Macroscopic Quantum Coherence in Patient-Practitioner-Remedy Entanglement. An interesting remark in his article goes, which can be paraphrased as follows: “A different relationship length implies that the quantum cognizance’s initially infinitesimal connection length currently becomes naturally visible. We reason that, for the most part, at every basic precariousness (remembering input dangers for natural administrative frameworks), quantum vacillation fields display plainly visible quantum cognizance” [27].

Although he did not come up yet with a clear physical mechanism of such macro-quantum coherence, one can arrive at a similar hypothesis of spin (supercurrent) interaction like Boldyreva’s, as it is known in biological phenomena. See Likhtenshtein [28].

4.2.6 Initial evidence on galactic synchronicity

Although it is known that “One of the cornerstones of inflationary cosmology is that primordial density fluctuations have a quantum mechanical origin,” as Kanno & Soda wrote, however, most physicists consider that such quantum mechanical effects disappear in CMB data due to decoherence [29].

We have discussed before that cosmological entanglement has been observed, which in turn, it can be attributed to the superfluid turbulent interstellar medium.

Presently, there is a new striking report by Charlotte Olsen et al., proposing that 36 cosmic systems appear to have “facilitated” in a such way that they seem to give synchronized stars arrangement. From Olsen et al. paper, they do not give a potential hypothetical explanation [30].

Notwithstanding, by theorizing such a twist supercurrent system likewise can occur at cosmic scale in view of superfluid interstellar medium, we can concoct a “potential” clarification, that such a lucid star arrangement is because of some sort of “*galactic synchronicity*.” We know that such a term is not accessible yet in present cosmological vocabularies, however, we can predict that time for that term will come as well, as there is likewise a book, proposing that synchronicity is probably going to show up all around in Cosmos [31].

4.2.7 Other experimental results

Other reports seem to indicate that there are reasons to believe such a quantum effect between consciousness, mind-matter interaction, and also Aharonov-Bohm type interaction in the superfluid vortex [16, 32, 33]. Suter et al. also provide other experiment evidence, as they wrote in the abstract: “The data unambiguously show that Bz clearly deviates from an exponential law and represent the first direct, model independent proof for a nonlocal response in a superconductor” [34].

5. Discussion: four plausible applications in various fields

- a. A new theoretical model of high-temperature superconductivity may lead to extremely efficient energy generation and transmission

- b. A new type of electronic device.
- c. Superconductor quasi-crystalline vacua hypothesis.
- d. The plausible new method of quantum communication.

The explanation for each of the aforementioned plausible applications will be discussed shortly below:

5.1 A new theoretical model of high-temperature superconductivity may lead to extremely efficient energy generation and transmission

It is known that a superconductor permits the flow of current without resistance. The conventional way of thinking about the transition from normal to superconducting is called the Bardeen-Cooper-Schrieffer (BCS) theory. But last year, H. Koizumi, a researcher at Tsukuba University has announced a new theoretical model of high-temperature superconductivity, which may lead to extremely efficient energy generation and transmission. Instead of focusing on the pairing of charged particles, this new theory uses the mathematical tool called the Berry connection. This value computes a twisting of space where electrons travel. In the standard BCS theory, the origin of superconductivity is electron pairing. In this new theory, the supercurrent is identified as the dissipation less flow of the paired electrons [35]. We will discuss later; we may come up with an alternative method of quantum communication based on such Berry connection.

5.2 A new type of electronic device

Hua Chen et al. wrote experimental evidence which can lead to a new type of electronic device based on spin supercurrent, according to their abstract which can be paraphrased as follows: “In slight film ferromagnets with amazing simple plane anisotropy, the part of absolute twist perpendicular to the simple plane is a decent quantum number and the relating turn supercurrent can stream without scattering. In this Letter we clarify how turn supercurrents couple spatially remote turn blending vertical vehicle channels, in any event, when simple plane anisotropy is flawed, and examine the likelihood that this impact can be utilized to manufacture new kinds of electronic device” [36, 37].

5.3 Superconductor quasicrystalline vacua hypothesis

As we discussed in a forthcoming paper [38], we discuss on the possibility that the space consists of discrete cells, to become cells composed of superconductor quasi-crystalline. We put forth a new hypothesis that the discrete cellular structure of space consists of cells of superconductor quasi-crystalline. It is argued that the definition of quasicrystals should not include the requirement that they possess an axis of symmetry that is forbidden in periodic crystals. The term “quasicrystal” should simply be regarded as an abbreviation for “quasiperiodic crystal,” possibly with two provisos.

To sum up, quasicrystals display a non-periodic, yet ordered, arrangement of atoms. They contain a small set of local environments which reappear again and again, albeit not in a periodic fashion. Their structure is not random either, since the diffraction pattern shows sharp Bragg peaks, although their symmetry is noncrystallographic,

with the n -fold symmetries ($n = 5, 8, 10, \dots$) stemming from the fact that these local environments occur with n equiprobable orientations. A recent discovery suggests that quasi-crystalline has a superconductive phase at a very low temperature [39].

It may resemble Finkelstein's hypercrystalline model of vacuum. What if the quasicrystalline model is not in semiconductor solid...but a superconductor quasicrystalline? We may call it: super-crystalline structure of 3D space.

Quasicrystalline solid is also good because it brings in more than three dimensions, which may be very relevant. This would also bring in Finkelstein and Penrose and some of Frank Tony Smith's investigations. The next item to consider is a super-quasicrystalline solid (SQC).

Because of its fractal properties, we can expect that the SQC can extend down to the structure of space, similar to what Finkelstein envisaged [40].

The quasicrystal structure of space may be composed of solid matter or soft matter, of which its general dynamics have been outlined by Fan et al. [41]. Plausible assembly of soft matter quasicrystal is shown in **Figure 2**:

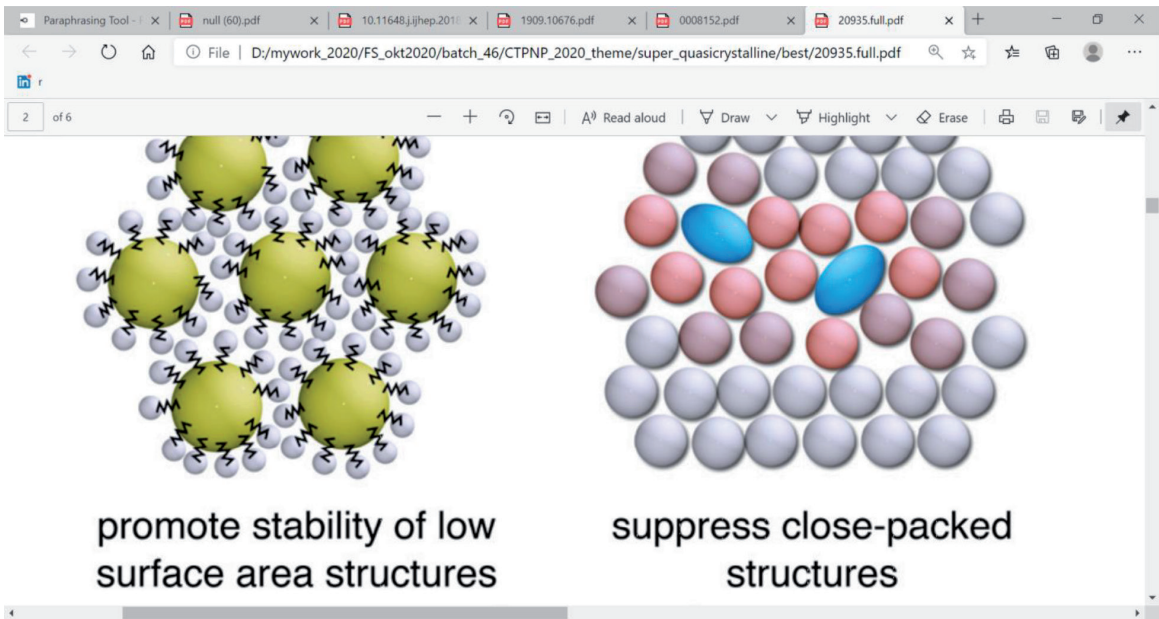


Figure 2.
Plausible assembly of soft-matter quasi-crystal.

It exhibits close-packed structures. This dense-packed structure of space should be verified with experiment. A few observables:

5.4 Natural quasicrystal in rock:

Steinhardt and Bindi [42] argued a unique hypothesis, proposing that quasicrystals might conceivably be pretty much as hearty and steady as gems, maybe, in any event, framing normally. These contemplations roused a very long term look for a characteristic quasicrystal finishing in the revelation of icosahedrite ($\text{Al}_{63}\text{Cu}_{24}\text{Fe}_{13}$), an icosahedral quasicrystal found in a stone example made fundamentally out of khatyrkite (translucent $(\text{Cu}, \text{Zn})\text{Al}_2$) named as coming from the Koryak Mountains of far eastern Russia. In their paper, they contended that the examination demonstrates the example to be of an extraterrestrial beginning (**Figure 3**).



Figure 3.
Light image of entire MSNF specimen prior to sampling, Khatyrka CV₃ meteorite [42].

Moreover, some papers argue that such a rock may be of manmade origin, as Bindi et al. noted:

“The proof for the presence of the quasicrystal deliberately work in the stone is thusly predominantly solid. Be that as it may, the perception of intermetallic compounds with copper and iron, which requires a profoundly lessening climate, is profoundly bewildering. It raises the likelihood that the example started from slag or another anthropogenic interaction. Nonetheless, the example was found in a far-off locale exceptionally a long way from any modern action.” [43]

While we admit that it would need further studies, as we see it such a hypothetical origin of meteorites and rock from extraterrestrial or manmade origin remains puzzling. It may be more possible to argue in favor that the quasicrystalline that happens in nature was caused by the structure of space itself is composed of SQC.

5.4.1 Natural quasicrystals in the solar system

Luca Bindi and also Matthias Meier et al. seem to suggest that quasicrystals have a cosmic origin [44, 45]. While such a hypothesis is quite reasonable, allow us to add a possibility that such a cosmic origin might yield from hidden structure of space itself. Such a hypothetical origin may be more “workable” than most quantum gravity hypotheses [46].

What is more interesting here is that Sakai has presented superconductor effects of quasicrystals [47].

5.4.2 A plausible new method of quantum communication

Inspired partly by Koizumi’s research at Tsukuba Univ., we may come up with an alternative method of quantum communication based on such Berry

connection. Prof. M.V. Berry is widely known for his research, but mostly for his theorem called Berry phase and Berry connection, which are often linked to the Aharonov-Bohm effect.

While there are various researchers who have come up with a number of possible quantum information or quantum internet methods, such as Pomorski & Staszewski, who wrote: “The idea of quantum web was.

displayed in this work. The more definite picture requires considering different impacts as decoherence processes that drive the quantum position-base qubit out of its cognizance just as decoherence processes that annihilate the cognizance of qEC (quantum Electromagnetic Cavity) [48].

Nonetheless, just yesterday an idea came to us, inspired by Berry connection and also crystalline structure of space. Actually, Tesla came up first with an idea to propagate telecommunication with the help of the telluric field of Earth, but alas it was canceled because Marconi obtained the patent first before him.

As we mentioned above, Sakai presented evidence of superconductivity of quasi-crystal, therefore provided, we accept the super-quasi-crystalline model of 3D space, we may come up with an idea that can be considered as quantum communication built on the crystalline structure of space itself. The outline of our idea is as follows, as we began to read papers by Prof. Michael V. Berry from UK (**Figure 4**):

Super-crystalline vacua -> Berry connection -> spin supercurrent -> nonlocal information transmission -> quantum communication system.

Figure 4.
A process flow of quantum communication based on Berry connection.

If we can prove this can work, at least a conceptual design, then may it can be a quite viable alternative to the 5G cellular network.

Moreover, such an assumption of superconductor crystalline structure of space, it seems to find support from our descriptive model of the Solar System in terms of superconductors. See our recent paper [49, 50].

6. Concluding remarks

In this chapter, we discuss how conventional wave mechanics does not provide a physical mechanism which is supposed to mediate nonlocal biological interaction, as discussed by Josephson-Pallikari Viras and others. Based on the hypothesis and also research findings by Yuri Bunkov, L. Boldyreva et al., we submit wholeheartedly that a new hypothesis of spin supercurrent is the sought-after physical mechanism, based on the assumption of macroquantum condensate having nonlocal effects.

In the last section, we discuss four plausible applications of such a scheme, including: a. A new theoretical model of high-temperature superconductivity may lead to extremely efficient energy generation and transmission; b. A new type of electronic device; c. Superconductor quasi-crystalline vacua hypothesis; d. Plausible new method of quantum communication. Clearly, more research is recommended to verify further what we outlined herein.

Acknowledgements

The authors would like to express sincere gratitude to Robert Neil Boyd, Ph.D., Prof. The Houw Liong, Ph.D., and numerous scholars for many discussions.

Version 1.0: 29th May 2021, pk. 15:01.

Version 1.1: 30th May 2021, pk. 16:25.

Version 1.2: 13th June 2021, pk. 14:30.

Version 1.3: 18th Jan. 2022, pk. 2:31.

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