Chapter

Introductory Chapter: Advanced Communication and Nano-Processing of Quantum Signals

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1. Introduction

In the usual communication processes, the transmission of electromagnetic waves is realised with limitations given due to the scattering in continuum media, interference for appearing of other waves and signals, and also pollution by free electrons, molecular absorption of the air, or a defecting routing of the TEM and TMM, as well as their secondary modes, the latter in the case of the optical fibre. Even nonthinking is the effective transmission through impermeable media and nonpermissible or invasive media such as the communication through ambient with continuum media, saturated continuum media in communications or in the presence of multi-radiative objects of big density, etc.

Likewise, the continuum transmission media produces a limiting whose dependence of the macroscopic characteristics of the space-time do that the electromagnetic fields suffer refraction and reflection due to the substance of the proper media. For eliminate this direct action of media in the signal transmission, it is necessary that our signal communication concept does not depend on the media characteristics, even that are not 'accessible or available' in the dimension of the usual space-time where we have placed the continuum media phenomena. For example, the gravitation in the macroscopic sense has interference in the ordinary communication where field observables of an Einstein space (as could be the curvature and torsion of the space-time, seen as gravitational observable effects or of electromagnetic scattering) act as distortion waves to produce a field radiation due the background in the universe. Then the signal transmission must have the invariance of the electromagnetic fields but with quantization of these fields, in a space that topologically is viable to their transmission [1].

Considering the quantum field theory [2] (QFT) with their second duality principle, that is to say, the duality wave/field applied to certain fermions and bosons, we can give a good fundament on the possible behaviour of these particles and their action with the communication intention [3]. However, it is necessary to consider the invariance of the Maxwell equations in quantum electrodynamics (QED) [1, 4], which we can design a form of quantum communication that establishes new paradigms of information transmission through quantum waves. However, in this new communication process, the intertwining concept of the particles is required [5] that will transmit the information via a chain of photons using gauge bosons as supports (selectors or linkers) of the electrodynamic space to their quantum level.

The material part of the transmission is generated in the transceptors through their solid state. Therefore, using electrons as solid-state source to generate a source

of photons through a process derived from certain spintronic devices as dots, magnetons, etc., the bosons can be conformed to the information of the communication in waveform and the plasmons as a quantum media of transmission of these information waves. The gauge bosons also will be necessary as transmission nodes. If we want to obtain voice communication, this will be obtained introducing phonons [5] in the photonic wave. We establish some fundamental precisions using quantum mechanics to explain those particles intertwining. We must consider that to that this intertwining happens, are necessary more dimensions that Minkowski space-time dimension.

We consider a particle system $p_1, p_2, \ldots$ in a space-time $M \cong R^4$. Let $x(t) \in \Omega(\Gamma) \subset R^3 I_t$, a trajectory, which predetermines a position $x \in R^3$, for all time $t \in I_t$. Also we consider the field X, which infiltrates their action to whole space of points $x_1(t), x_2(t), x_3(t), \ldots \in \Omega(\Gamma)$, predetermining the points $\varphi_i(x_i(t))$, that are field particles of the field X and evaluated in the position of every particle. In each point, a defined force exists given by the action $\mathfrak{I}$, of X, along the geodesic γ_t, and determines direction by their tangent bundle given for $T\mathcal{X}^1(\Omega(\Gamma))$; that is to say, the field gives direction to every field particle φ_i, having their tangent bundle has a spinor bundle S, where the field X comes given as $X = \sum_i \varphi^i \frac{\partial}{\partial \varphi^i}\Big|_{(x^i,\, \varphi^i)}$, $\forall \varphi_1, \varphi_2, \varphi_3, \ldots \in \mathcal{X}^1$, on every particle $p_i = x_i(t)$, $(i = 1, 2, 3, \ldots)$. Then a *direct intention* is the map or connection $\nabla^{\mathfrak{I}} : T\Omega(\Gamma) \to T^1(\Omega(\Gamma))$, $(\simeq T*M)$, with the rule of correspondence $(x_i, \partial_t x^i) \mapsto (\varphi^i, \partial_\mu \varphi^i)$, which produces one ith-spinor field φ^i, where the action $\mathfrak{I}$, of the field X, infiltrates and transmits from particle to particle in whole space $\Omega(\Gamma)$, using a configuration given by their Lagrangian L (*conscience operator*), along all the trajectories of $\Omega(\Gamma)$. Then of a sum of trajectories, $\int D_F(x(t))$, one has the sum $\int d(\varphi(x))$, on all the possible field configurations $C_{n,\, m}$.

We can to extend these to whole space $\Omega(\Gamma) \subset M$, on all the elections of possible paths whose statistical weight corresponds to the determined one by the intention of the field, and realising the integration in paths for an infinity of particles-fields in $T\Omega(\Gamma)$, is had that

$$I(\varphi^i(x)) = \int_{T\Omega(\Gamma)} \omega(\varphi(x)) = \lim N \underset{\delta s \to 0}{\to} \infty \frac{1}{B} \int_{-\infty}^{+\infty} \frac{d\varphi_1}{B} \cdots \int_{-\infty}^{+\infty} \frac{d\varphi_n}{B} \cdots$$
$$= \prod_{i=1}^{\infty} \int_{-\infty}^{+\infty} e^{i\mathfrak{I}[\varphi^i, \partial_\mu \varphi^i]} d\varphi^i(x(s)) \tag{1}$$

where $B = \left[\frac{m}{2\pi\, i\delta s}\right]^{1/2}$ is the amplitude of their propagator. Then we have the corresponding Feynman integral of the volume form $\omega(\varphi(x))$, obtaining the real path of the particle (*where we have chosen quantized trajectories*, that is to say, $\int d(\varphi(x))$. But this superposition of paths is realised under an action whose corresponding energy Lagrangian is $\omega(\varphi(x)) = \mathfrak{I}_{\xi(x)} d(\varphi(x))$.

Then to a configuration on the space-time M, given for $C(M)$, in a space-time region where there have been *interfered paths in the experiment given by multiple split*, given for $\Omega(M)$, we have the pairing $\int : C(M) \times \Omega*(M) \to R$, where $\Omega*(M)$ is some dual complex ('forms on configuration spaces'), and then the 'Stokes theorem' holds

$$\int_{\Omega \times C} \omega = <\mathfrak{I}, d\omega> \tag{2}$$

then Eq. (1) can be written as (to m-border points and n-inner points)

$$\begin{aligned}\int \mathfrak{I}(\varphi(x))d\varphi(x) &= \int \mathfrak{I}_q d\varphi_{1^{m_1}} \ldots d\varphi_{n^{m_n}} \ldots \\ &= \int \left(\int \left(\int \mathfrak{I} d\varphi_{1^{m_n}} \right) \ldots d\varphi_{n^{m_1}} \right) \ldots\end{aligned} \tag{3}$$

This defines an infiltration in the space-time due to the action $\mathfrak{I}$ that happens in the space $\Omega \times C$, to each component of the space $\Omega(\Gamma)$, with energy conservative principle expressed for the Lagrangian ω, of Eq. (2). Likewise, in Eq. (3), the integration of the space is realised with the infiltration of the time, integrating only spinor elements of the field.

2. Quantum communication link waves

Let $\mathbb{M}$ be the space-time constituted by the particles $x_1(t), x_2(t), x_3(t), \ldots,$ whose states $\varphi_1, \varphi_2, \varphi_3, \ldots$are such that satisfies Eq. (3); then the information is transmitted like the quantum wave ϕ, of the state φ, replaced with the state φ'_i, $(i = 1, 2, 3, \ldots)$, in the infinite homomorphism (which is of the type $\phi(n * m) = \phi(n)\phi(m)$):

$$\phi\left(t_{\varphi'_1} * t_{\varphi'_2} * t_{\varphi'_3} * t_{\varphi'_4} \cdots\right) = \phi_{\varphi_1}\left(t_{\varphi'_1}\right)\phi_{\varphi_2}\left(t_{\varphi'_2}\right)\phi_{\varphi_3}\left(t_{\varphi'_3}\right)\phi_{\varphi_4}\left(t_{\varphi'_4}\right)\cdots \tag{4}$$

where the transmission of the quantum wave is realised on the spinor space (see spinor technology [6]) of t_σ and where t_σ is *the intertwining* technology that is created in the class σ.

The states of distinguishable particles that are bosons or fermions realise the arrangement that eliminates an infinity of the states that by their sum of spins are annulled, remaining only those that realise an effective action. These are annulled between the perturbed states and those that are affected by scattering. We consider again the space of configuration $C_{n,m}$, equivalent to the complex given for $C(M)$, which can be thought as composed for $n-$hypercubes U, defined by 000...0 boxes. Then we can define a net of paths that will be able to establish routes of organised transformations on diagrams of Feynman type (with path integrals with actions given by O_c and path integrals as Eq. (1)). Likewise the ideal route of the intention is established, considering the action in every node of the net.

Then these arrangements can happen in the nets designed on a field of particles that can be arranged in 0000...0 boxes [7], where the action can be calculated in a point (node of the crystalline net of a field [7]) corresponding to the $n-$ states of energy $\varphi_i(i = 1, 2, 3, \ldots, n)$, having the superposition n the node given for

$$\oint [x]_U = \int\limits_{000\cdots0-\text{boxes}} dz^n \phi(X^{\alpha_1} W_{\alpha'_1})\phi(X^{\alpha_2} W_{\alpha'_2})\cdots\phi(X^{\alpha_n} W_{\alpha'_n}) \tag{5}$$

In the quantum zone, the quantum particles field is permanent and interminable, since matter and energy are equivalent and the electrons are interminable and thus the photon production also. What gets worn is that there are the linkages between atoms which can weaken or get lost for the absence of a transmission of the states of suitable energy (routes given by path integrals). Infiltrating the intention on every path γ and under the condition of permanent field given by the operators O_c, the transmission of the states will be revitalised by every node, transmitting the

same information about every 0000...0 box, we will call this characteristic an *intentionality* [8]. However, every particle with regard to others takes their corresponding position, since they all have the same infiltrated intention, by what the synergic action is realised.

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