Wave-Function Collapse

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The Wave-Function Collapse is the decoherence of tangeled states of all points of the front of quantum-wave dissemination in space. The wave front of the quantum provides instantaneous and simultaneous transmission of the impulse of every point of the front to detector, and thus excludes the possibility of inducing of new wave fluctuating and dissemination. The synchronism of the change of states of the most distant points and points arbitrarily located on the front enables to convey the information through one single-quantum channel.

The Wave-Function Collapse is usually formulated as an instantaneous change of the description of a quantum object, which occurs during its registration and determines the probability of detecting the quantum in a given point in space or detecting that the quantum has a particular impulse.

Non-locality of the process, instantaneous changes in properties, dissemination of interactions with the speed tending to infinity, not a physical process but a mathematical hook, a real physical process, the principle of the causality is not violated, information is not transmitted – these contradictory formulation are usually associated with the interpretation of the Collapse.

The paradoxes in the interpretation can be removed if we consider not the instantaneity of the probability disappearance but the instantaneity of quantum impulse vanishing in all points excepting the registration point, or in other words – where and how the energy disseminated in space is transforming?

Use the previously proposed scheme of the localization of the quanta correlation [1] for discovering the real process of the Collapse.

Consider two quanta with tangled properties. These quanta in the moment t0 begin flying away from each other. Consider also that, as opposed to [1], there are no any other wave fronts in the space. After some time the interaction of these quanta can be described by the scheme of linked pinions [Fig. 1].

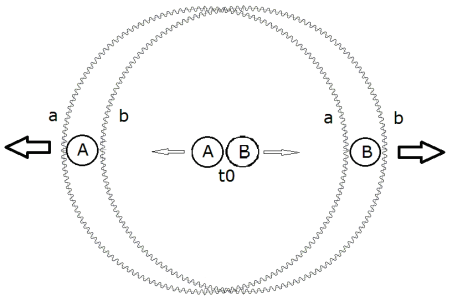

Fig. 1.

Pinion «a» constantly increasing in diameter schematizes the divergence of the front of the «quantum as a wave» and the rotation of the pinion «a» illustrates rotary properties of the «quantum as a quantum». Quantum «A» also interacts with front «b» which corresponds with quantum «B». Quantum «B» synchronizes with quantum «A» the changes of spin/polarization direction by interaction with with front «a». It's not difficult to discover that directions of rotation, or in other words, directions of spin/polarization of quanta «A» and «B» are synchronously opposite to each other.

Simplify the scheme by uniting two fronts in one «acbd» [Fig.2]. At the same time the synchronism of the change in the directions of spins of quanta «A» and «B» will remain, the determination of the «opposition» of the spins will change, but entanglement will remain.

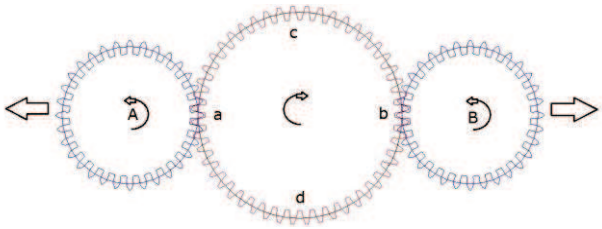

Fig. 2.

The front «acbd» is internal or own for flying away quanta «A» and «B», and for the system [Fig.3], where the front is external, earlier we presented a model explaining the possibility to transmit information only by one quantum channel. It is not important if internal or external front entangles the system of quanta in such a mechanical logic – the retention of instantaneous synchronism of the change of properties is important.

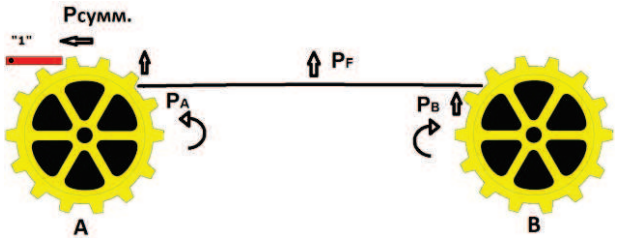

Fig. 3.

The front possessing impulse Pf, while moving bottom-up, is able to change synchronously the directions of rotation of spins of quanta «A» and «B» till the moment of the registration of quantum «A» by the ratchet-detector «1». At the moment when quantum «A» stops rotating, quantum "B", "not knowing" that it must stop, by its rotating gives impulse Pb to the front. The sum of the impulses Pb+Pf is transmitted by divergence of the front to the "tooth" of the quantum "A" and sums with its impulse Pa and than the sum Psum=Pb+Pf+Pa is registered by the detector "1". The impulse Psum is transmitted to the detector and the system is still. For the system comprised of two pinions and one ruler it is obvious that: rotation of "A" is impossible because of the stop of the ratchet "1" and upward movement of the ruler clutched between "teeth" of "A" and impossibility of rotation of "B" in which "teeth" the ruler is fixed. For the system of quanta which are described by quantum and wave properties it may be correct that there was lost the possibility to induce new transverse fluctuations of the front of the disseminating wave in points A and B.

Let's simplify the scheme – let's consider two entangled objects A and B as two diametrically located points of the front which disseminate as electromagnetic wave of single photon. Points of the front with entangled properties instead of entangled quanta. It is obvious that such a logic is applicable not only to diametrically located points but to any pair of points on the front of the wave dissemination ab, ac, ad, ae.

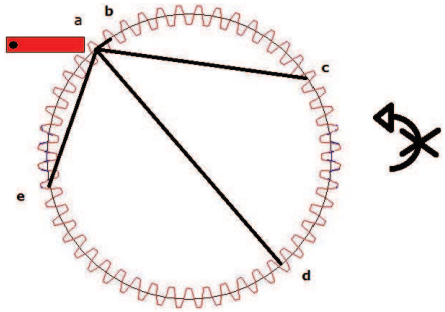

Fig. 4.

Wave-Function Collapse is the mutual decoherence of entangled states of all the points of the front of the quantum-wave dissemination.

The possibility to consider the aggregate of entangled points which make, for example, an arch of the front “abcd” [Fig.4] between “a” and “b” as a perfectly tight “ruler” is conditioned by the simultaneity of inducing transverse fluctuations of the front in every point. Transverse movement of the front “to the left/to the right” is transmitted not by a relay race from point to point but is executed by the principle “turn all suddenly”. The information about the necessity to change the state is transmitted to the next point A1 not from neighboring point A2 or An [Fig.5] but from previous in time a1. At the same moment the state of B1 is changed because of b1, and all points change the same way.

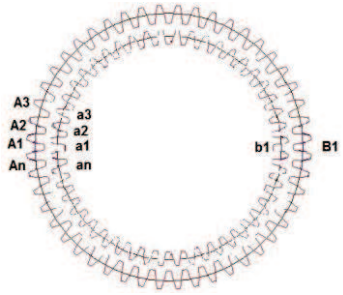

Fig. 5

Taking in account the equality of all points of the front we can improve the conditions of detecting a quantum and assume the possibility of detecting a quantum by two detectors simultaneously [Fig. 6] on two frequencies corresponding with energies of the arches “ae” and “abcde”.

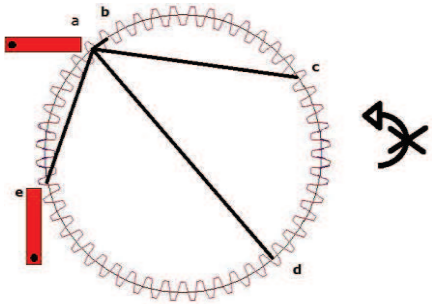

Fig. 6.

From the experimental point of view it is interesting to observe the spectrum of the signal and reveal in it the frequencies which satisfy the conditions of the front's arches. This allows to explore the existence and distribution of natural or artificial detectors in the space of quantum dissemination. By creating the asymmetry of registration conditions of spin/polarization of the quantum [1] we are able to see instantaneous connection between artificial detectors "a" and "b". And the connection is realized not between the transmitter and receiver but between two receivers which register the front of the wave already reached both of them and generated, perhaps, long before the creation of these receivers but by the transmitter which doesn't exist by this time.

Suggested logical scheme of Wave-Function Collapse gives us hope that new technical solutions, which will make it possible to communicate with one quantum channel, will be found.

[1] Alexander B. Ilin. Sending and receiving the information of decoherence entanglement.