

The terahertz features of transport of nerve impulse along the nerve fibers driven by the bio-energy in life organizations

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We here research the features of transport of nerve impulse along the nerve fiber using modern theory of molecular biology, in which we think this transport is due to the driving of bio-energy released from the hydrolyses reaction of ATP molecules in the cells because they are often attached on the protein molecules, where the energy is transported along the protein molecules from the position of generation of hydrolyses reaction to the position used in virtue of transport of the soliton formed by the excitons through the mechanism of self-trapping, where the exciton is a quantum produced by the C=O stretching (or amide-I) vibrations. We studied and obtained the properties of transport of bio-energy by Pang's soliton along α -helical protein molecules and found further the lifetimes of Pang's soliton, which is between 0.53×10^{-10} S 0.65×10^{-10} S at physiological temperature $T=300$ K. In this lifetime Pang's soliton can travel over several hundreds of amino acid residues. This means that Pang's theory is a relevant and correct model of bio-energy transport and Pang's soliton is a real carrier of bio-energy transport in protein molecules. The bio-energy is transported into the nerve membrane to drive the works of sodium pump and potassium pump on the surface of membrane of cells, which drive also the transport of action electric-potential or nerve impulse along the nerve membranes. We confirm that there is not the nerve impulse, or the action electric-potential without the works of sodium pump and potassium pump, or the bio-energy. This means that the nerve impulse can be transported along the nerve membrane, only if the bio-energy are absorbed really by the sodium pump and potassium pump. In order to obtain a stable nerve impulse we must ensure that the times forming it must be shorter than the lifetime of Pang's soliton and its experimental values, or else, the nerve impulse is not stable and is useless. Thus we can judge and affirm that the nerve impulse is a terahertz wave. Thus we can affirm and verify that the nerve impulse can be transport along the nerve systems in the terahertz wave, instead the millimeter wave. We here determinate and discuss further its features. We determinate for the first time the terahertz features of transport of nerve impulse along the nerve fibers in life systems, which promotes the development of nerve science.

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