

# Characterizations of terahertz wave of transfer of nerve impulse along the nerve fibre cells in life systems

Pang Xiao Feng

University of Electronic Science and Technology, China

## Abstract

We investigated first the form and features of the action electro-potential on the nerve-cell membranes, which are directly cognate to the non uniformity of distribution of sodium ions and potassium ions between the inner and exterior of cell-membranes as well as their properties of forms of kineticism under the affection of an electro-information. However, the action electro-potential, in essence, is only a static impulse; it cannot propagate along the nerve organizations. But, if the nerve organizations are acted by the bio-energy, which could lead to the periodic variation of the sodium ions and potassium ions in the inner and exterior of the never cell membranes can be varied periodically under the action of bio-energy by virtue of the works of sodium pump and potassium pump on the surface of membrane of cells, then the nerve impulse can propagate along the nerve fiber cell membranes. Our investigations verify that the bio-energy relinquished from the hydrolyses reaction of adenosine phosphate (ATP) molecules in the cells can play the role, it relinquished the bio-energy of 0.42 eV can be conveyed by the protein molecules to these sodium pump and potassium pump to work, thus the propagation of the nerve impulse can be carried out automatically in living systems. This is just the mechanism of propagation of the nerve impulse along the nerve cell membrane. This designates that the energy relinquished from the hydrolyses reaction of adenosine phosphate (ATP) molecules controlled the propagation of the nerve impulse. Because ATP molecules are often affixed on the protein molecules, where the energy is conveyed along the protein molecules from the position of generation of hydrolysis reaction to the position utilized the energy in virtue of convey of the soliton composed by the excitons through the mechanism of self-trapping, where the exciton is a quantum engendered by the C=O stretching (or amide-I) vibrations. We studied and obtained the properties of convey of bio-energy, which is carried by Pang's soliton, along  $\alpha$ -helical protein molecules and found further the lifetimes of Pang's soliton, which is between  $0.53 \times 10^{-10}$  s to  $0.65 \times 10^{-10}$  s at physiological temperature  $T=300$  K. In this lifetime Pang's soliton can peregrinate over several hundreds of amino acid residues. This implicatively insinuates that Pang's theory is a germane and redress theory of bio-energy convey, then Pang's soliton is a genuine carrier of bio-energy convey in protein molecules. If the bioenergy was conveyed into the nerve membrane to drive the works of sodium pump and potassium pump, then the transfer of nerve impulse along the nerve membranes can be carried out. So, we can verbally express that there is not the convey of nerve impulse without the works of sodium pump and potassium pump, or the bio-energy. This betokens that the nerve impulse can be conveyed along the nerve membrane, only if the bio-energy was provided and was absorbed genuinely by the sodium pump and potassium pump. In order to compose a stable propagation of nerve impulse, then its times composing must be shorter than the lifetime of Pang's soliton or its experimental values, or else, the nerve impulse is not stable and is nugatory. Thus we can affirm that the nerve impulse is a terahertz wave. Thus we can affirm and verified that the nerve impulse can be convey along the nerve systems in the terahertz wave, instead the millimeter wave. We determinate and discuss further its features. This is first time to determinate the terahertz features of convey of the nerve impulse along the nerve fibers in life systems, which will promote great the development of the nerve science.

**Keywords:** nerve impulse, nerve membrane, nerve system, bio-energy, protein molecule, atp molecule, energy transport

## Introduction

### The properties of structure of nerve cells

The form of the action electric-potential in nerve membranes in the nerve cell-membranes are first described, it is, in essence, a nerve impulse and can be composed by virtue of periodic and ruled changes of non-uniform distribution of the sodium and potassium ions in the inner and surface of nerve cell-membranes. The nerve impulse can be additionally conveyed along the nerve fiber membranes under action of periodic works of sodium pump and potassium pump arising from the bio-energy relinquished from the hydrolyses reaction of ATP molecules, which is conveyed

by Pam's split on along the protein molecules. The experiments verified that there is not the nerve impulse, or the action electric-potential without the works of sodium pump and potassium pump, or the bioenergy. We investigated further the properties of convey of the nerve impulse along the nerve Ferber membranes.

### The mechanism of generation of Synaptic Structures and its features

The synaptic structures have very paramount roles in the nerve activities, its structure and features are worth to study solemnly. Its form is described as follows. The axons at the grown position in the neuron are grown and elongated some more sizably voluminous

cones, in this case their cone terminus of the protuberance or bumps can contact or cumulate to compose a function wide organ with the bottom of axons or dendrites or cell-body of neighboring neuron.

#### **The chemic synapses and the electric synapses**

The affection of action potential of the presynaptic on electric potential of after membranes is small the action potential of presynaptic is a direct factor of the transport presynaptic potential caused a large number of synchronous releasing of neurotransmitters by the small bubble under action of cooperation of  $Ca^{2+}$  without this effect the releases of euro-transmitter produce the appearing of local and different potentials of postsynaptic membrane, its sizes can be integrated, the postsynaptic potential

can be inverted when it is varied the postsynaptic potential has not been inverted, when it is varied there is synaptic vesicles in this case without synaptic vesicle it can be both excited and inhibited it can only be excited it is easily influenced in chemical factors it is not influenced its effect can be summarized in the space and time, it has also a integrated effect.

#### **The convey of the nerve impulsion**

We now study the concrete process of form of the action electrical-potential and its transfer along single nerve fiber membranes, which can be represented in .In the front afore part of the exhilarated area or first end the cell membrane is in the recuperated polarization state, which is denoted in “static membrane” in this figure.