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EXTERNAL FREQUENCIES NEURON ENSEMBLES TO THE ACTIVITY THE IMPACT COMPLEX ANALYSIS TO DO

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Abstract : This in the thesis external frequencies (sound , light , electromagnetic fields , transcranial variable vine stimulation – tACS and others) neuron ensembles to the activity the impact complex analysis to do goal made . Neuron ensembles – together synchronous activity indicative neuron groups – brain rhythms (oscillations) are produced in doing main role plays . External frequencies this ensembles phase synchronization , frequency resonance and spike activity change possible . In the thesis theoretical basics , mathematics models , experimental results , mechanisms and practical importance in detail seeing Research results this shows that the external frequencies neuron ensembles through entrainment (adaptation) cognitive functions improve , therapeutic effect to give possible , but too much increased impact negative to the consequences take arrival probability available . Complex analysis EEG, MEG, computer modeling and clinical tests based on done increased . Thesis neurobiology , neurophysiology and medicine in the field experts for useful It will be .

Key words : neuron ensembles , external frequencies , oscillations , entrainment , phase synchronization , resonance , tACS , EEG analysis , brain rhythms , cognitive modulation .

Introduction The brain is complex neuron networks system to be , to be activity neuron ensembles – together working neuron groups synchronous oscillations based on organization finds . Neuron ensembles rhythmic activity (theta – 4-8 Hz , alpha – 8-12 Hz , beta – 12-30 Hz , gamma – 30-100 Hz) perception , memory , attention and the movement in management important importance has . External from the environment coming frequencies (acoustic , visual , electromagnetic or artificial stimulation) is to ensembles impact and their internal rhythm change This process is called " entrainment " . and neurons phase to block is based on . __ Cmi

Last in years external frequencies neuron to the activity impact neurobiology current from the topics one become For example , transcranial variable vine through stimulation (tACS) brain rhythms artificial accordingly modulation to do cognitive abilities increase and neurological in the treatment of diseases (Alzheimer's , Parkinson's, depression) Neurophysiology is also being used in Uzbekistan . and neurology in the field research is developing , but external frequencies the impact complex analysis to do according to special affairs enough This is not thesis purpose – topic theoretical , experimental and practical in terms of lighting , Uzbekistan under the circumstances application opportunities is to show .

Functions : • Neuron ensembles and their oscillations about theoretical the basics analysis • External frequencies revealing mechanisms (resonance , synchronization) to give ; • Mathematics models and experimental methods seeing output ; • Scientific the results discussion to do and offers to give

Home part Neuron ensembles – brain in the cortex , in the hippocampus and other in structures together synchronous activity indicative neuron groups . Their activity bioelectric potentials (membrane potential , action potential) based on harvest It will be . Man in physiology neurons electricity activity in detail described : each one neuron synaptic entrance signals acceptance do it yourself frequency change possible . Neuron ensembles synchronization to the theory of "binding by synchrony" based on – various features unifying mechanism . Lib.tiet

External frequencies impact following mechanisms through done increases :

1. **Phase blocking (phase-locking)** - neuron or ensemble external to the rhythm suitable accordingly spike For example , sound frequency (528 Hz) DNA and cell at the level resonance harvest to do possible . Instagram

2. **Frequency resonance** – internal frequency external to the frequency close if yes , ensemble power increases (gamma waves 30-80 Hz between).

3. **Entrainment effect** – external rhythm internal " pulling " the oscillations " takes ". Binaural beats, isochronous sounds or light stimulation through is being followed . Reddit

Mathematician Models : Kuramoto model neuron ensembles between synchronization describes :

$$\frac{d\theta_i}{dt} = \omega_i + \frac{K}{N}\sum_{j=1}^{N}\sin(\theta_j - \theta_i)$$

bu yerda θ_i – faza, ω_i – tabiiy chastota, K – bog‘lanish kuchi. Tashqi kuch (forcing term) qo‘shilsa, entrainmant paydo bo‘ladi. Hodgkin-Huxley modeli esa bitta neyronning chastota javobini simulyatsiya qiladi.

Experimental analyses : via EEG and MEG brain rhythms is studied . External stimulation (tACS 10 Hz alpha rhythm (enhances) neuron gamma activity of ensembles increase , work memory improves . Uzbekistan scientists in neurophysiology main concepts taught is , neurons bioelectric events in detail illuminated . Music in therapy frequency impact (Salimova research) neuron ensembles used for calming . Lib.tiet

Complex analysis Results : • Low frequencies (theta) – memory consolidation • High frequencies (gamma) – attention and perception improves , but not too much if it increases epileptic activity brought release possible . • Electromagnetic fields (EMF) – resonance frequencies organism own rhythms with suitable if it comes , positive , negative without negative has an effect . 314159

Discussion External frequencies neuron to ensembles impact two one-sided : positive (cognitive) improvement , therapy) and negative (plus) stimulation – fatigue , epilepsy risk). Mechanisms mainly synaptic to plastic surgery related – LTP / LTD processes in Uzbekistan city noise and electromagnetic pollution external frequencies the impact strengthen possible , therefore for local research necessary . Rakhimbayeva GS neurology in the textbook neuron activity clinical importance emphasized this is the topic continue to hold possible .

International experiments (tACS clinical tests) in Uzbekistan application opportunity shows – for example , students attention increase alpha stimulation for . However , individual differences (age , gender , genetics) must be taken into account to be taken need .

Conclusion and offers External frequencies neuron ensembles activity entrainment , resonance and synchronization through complex accordingly This brain rhythms modulation cognitively and therapeutic effect gives . In the thesis as shown , theoretical models and experimental information each other fills .

Offers : • In Uzbekistan tACS and EEG laboratories development ; • Music and light therapy school and in clinics application ; • Artificial neuron networks with biological models combining , simulation to do ; • Future in research local in the population frequency sensitivity study .

This work neurobiology in the field the space to fill service does and practical to apply road opens .

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