

# Wave Synchronizer for Brain Rejuvenation

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**Abstract** — This paper deals with Brain Rejuvenation in which healing occurs in brain cells through brain wave synchronizer. In this study, five different types of brain waves such as alpha, beta, gamma, delta and theta brain waves are discussed. Here, sensing is done on the brain signals with the help of a device called Electroencephalogram and this can be coupled with circuit for signal sensing. The frequencies of drowsy and active brain wave signals are analyzed by connecting the electrodes to the electroencephalogram. The main purpose of this study is to create a portable and affordable brain wave synchronizer not only to heal brain nerves but also to help people to recover quickly from brain disorders.

**Keywords** — Frequency, brain waves, electrodes, healing and rejuvenation.

## I. INTRODUCTION

Certain psychological issues weakens the nerves of an individual, leading to neurological disorders like multiple sclerosis, Alzheimer's disease, Parkinson's disease, epilepsy, and stroke, cerebral palsy, Schizophrenia. It becomes very difficult for a person to recover quickly. Moreover these disorders are caused as a result of over stress,

hypertension and nerve weakening. This brain synchronizer device can reduce the time taken for healing. Here we use the concepts of sampling in signals, signal sensing, Arduino based circuits for signal generation. Very small magnitude of electromagnetic waves are generated by the brain at the scalp. This shows that the brainwave of amplitude 50  $\mu$ V must be amplified on the order of 103 dB before a useful signal can be recognised. The disturbance signals or unwanted signals has to be eliminated. EEGs commonly use high, low and notch filters to remove noise generated from muscle movement and other physiological factors.

## II. BRAIN NATURAL HEALING

The brain's ability to learn when its recovered from an injury is called neuroplasticity. After injury, neuroplasticity allows intact areas of the brain to adapt and attempt to compensate for damaged parts of the brain. The axons and the peripheral nervous system in the growing or developing brain can regenerate, but occurs very slowly in adult brain. This is because of factors produced by cells in the brain that influences and inhibit this regeneration. After severe brain injury,

neuroplasticity is less likely to occur without help from health professionals. Recent studies have found collagen is extensively distributed throughout the brain and may be essential in protecting the brain against degeneration such as that in Alzheimers.

### **III. NEUROREGENERATION**

Neuroregeneration refers to the regrowth or repairing of nervous tissues, cells or cell products. Neuroregeneration differs between the peripheral nervous system (PNS) and the central nervous system (CNS) by their operative mechanisms and especially the speed. When an axon is damaged, the distal segment undergoes Wallerian degeneration, losing its myelin sheath. The proximal segment can either die by apoptosis or undergo the chromatolytic reaction, which is an attempt at repair. In the CNS, synaptic stripping occurs as glial foot processes invade the dead synapse.

### **IV. NEUROSCIENCE**

Neuroscience is the study of the nervous system which helps understand the functionalities of nerves and maintains itself both in healthy individuals and in individuals with brain, psychiatric disorders. Neuroscience gives information on the structure and development of the central nervous system.

### **V. NERVE SIGNAL TRANSMISSION**

The electric charges produced by billions of nerves in our body facilitates us in sensing the parts of our body and beauty of the world. The three major functions of the nerves are going to be discussed. Firstly, nerves carry messages from the CNS to

muscles to other parts of our body(organs). Secondly, nerves carry messages from our sensory organs and others to the CNS, consisting of the spinal cord and brain. Third, within the central nervous system, the processing of signals take place which is transmitted by the nerves.

### **VI. BRAIN WAVES**

#### **6.1 DELTA WAVES (.5 TO 3 HZ):**

Delta brainwaves are slow, loud brainwaves. Deepest meditation and dreamless sleep produce this way often. Delta waves suspends external awareness. Stimulation of healing and regeneration occurs in this state, and that is why deep restorative sleep is required for healing process. It also acts as the source of empathy.

#### **6.2 THETA WAVES (3 TO 8 HZ):**

These waves are often produced in deep meditation as well as in sleep. Theta provides the portal where the key to learning, memory, and intuition can be obtained. In theta, our senses can be altered or focused from the external world and on to the signals that originate from within and help us to better understand us. It is that twilight state which we experience when fleetingly as we wake or drift off to sleep.

#### **6.3 ALPHA WAVES (8 TO 12 HZ):**

These brain waves are dominant during quietly flowing thoughts (self-realisation),

and in some meditative states. Alpha is the resting state for the brain. Alpha wave provides overall mental balance, calmness, bright and cautious thinking, mind integration and learning.

**6.4 BETA WAVES (12 TO 38 HZ):** Beta brainwaves dominate our normal waking state of consciousness we perform some cognitive tasks in the outside world. Beta wave occur when we are cautious, attentive, sorting a solution for a problem, decision making, adaptive or focused mental thinking.

The three Bands of beta waves are Lo-Beta (Beta1, 12-15Hz) can be thought of as a idle fast one. Beta (Beta2, 15-22Hz) is produced when we are actively figuring something out. Hi-Beta (Beta3, 22-38Hz) is produced during complex thinking, integrating new experiences, high anxiety, and excitement. These complex thinking at all the time involves high frequency processing that consumes huge amount of energy.

**6.5 GAMMA WAVES (38 TO 42 HZ):**

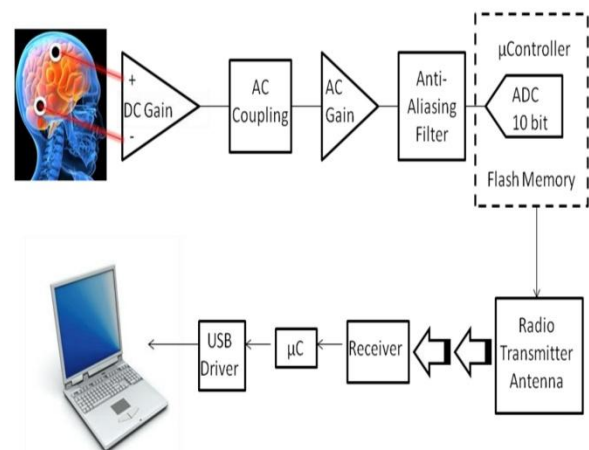
Gamma brainwaves are the fastest of brain waves and provide processing of information simultaneously from different brain areas. The information messages are transferred rapidly and silently.

Gamma was dismissed as 'spare brain noise' and were ignored until researchers discovered it was highly active when in states of universal love and altruism. Gamma is also above the frequency of neuronal firing and the generation of these waves still remain a mystery. Gamma rhythms alters perception and consciousness capabilities, and high production of gamma initiates

expanded consciousness and spiritual emergence.

**VII. ELECTROENCEPHALOGRAM (EEG)**

This device can be used to sense the brain signals and this can be coupled with our Arduino circuit for signal sensing and generation Clinical EEGs must be administered and interpreted by a trained EEG technician or neurologist. During the procedure, the tech places electrodes on head in a pattern known as 10-20 system pattern. These electrodes are the human-to-machine interface, and Figure 1 - Characteristic Brain Waves .The electrodes are often made of silver/silver chloride and covered in an adhesive electrolytic gel. Potential difference between electrodes are detected by EEG machine.

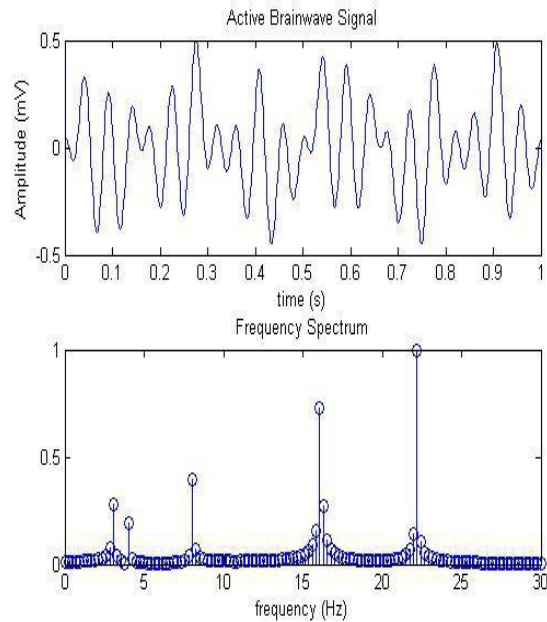


**Fig.1 Brain Wave Analysis**

The schematic was designed with the assumption that contact between the electrode and skin creates a battery-like potential. This potential should be the same for both electrodes, and in this case, the

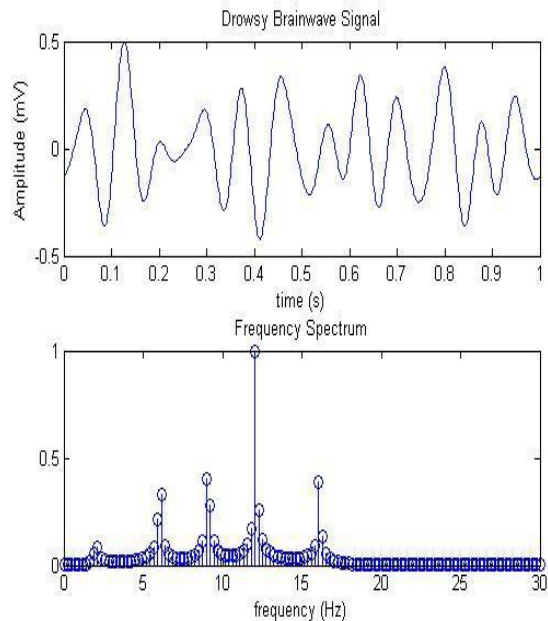
contact potential does not affect the quiescent point of the amplifier.

**Fig 2. Drowsy Brain Wave Signal and its Frequency**



**Fig 3. Active Brain Wave Signal and its Frequency**

### VIII. WAVE REPRESENTATION



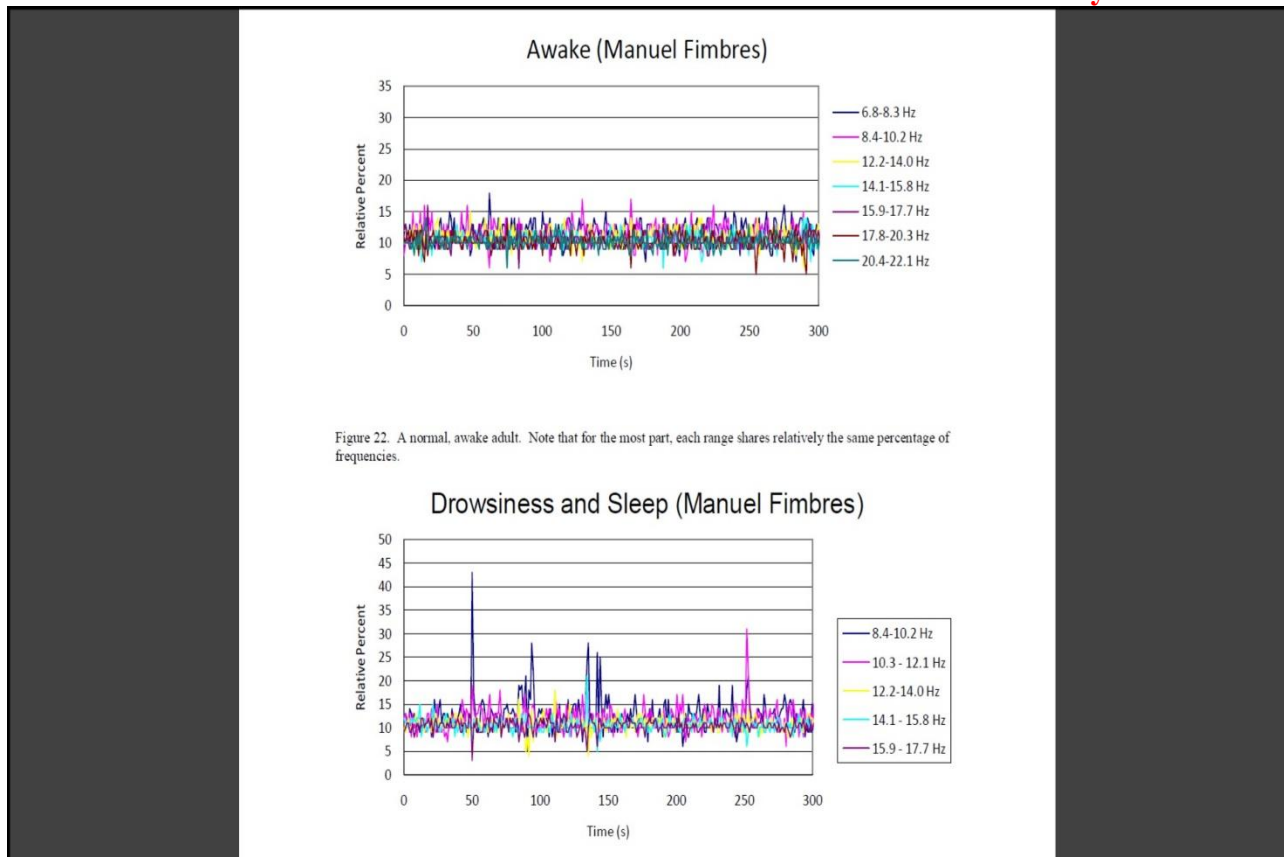


Figure 22. A normal, awake adult. Note that for the most part, each range shares relatively the same percentage of frequencies.

Fig 4. Graphical Representation

### IX. CONCLUSION

Even though we get advanced in the field of medicine and technology, our body depends on nature for everything. This device will help people to recover quickly but that is not 100% equivalent to healing naturally. Meditation is the best way to stimulate our brain to heal naturally and by also which we get evolved. These self-healing meditational techniques had already been informed in our ancient Vedic texts.

Disorders/

<http://grantome.com/grant/NIH/R01-AG053382-01>

- [2]. Mechanisms of brain rejuvenation  
Villeda, Saul A. University of California San Francisco, San Francisco, CA, United States.

- [3]. Circuit

<https://www.arduino.cc/en/Tutorial/DueSimpleWaveformGenerator>

- [4]. Design

<https://www.instructables.com/id/Arduino-Waveform-Generator-1/>

### REFERENCES

- [1]. <https://www.scientificamerican.com/article/sound-waves-can-heal-brain->