

# Infographic #5: Understanding Wavelength in Neuroimaging

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## Understanding Wavelength in Neuroimaging

A guide to Frequency, amplitude, and sampling in neuroimaging signals.

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### INTRODUCTION: IDENTIFYING WAVE CHARACTERISTICS

**Crest:** B & F  
**Troughs:** D & H  
**Wavelength (λ):** EX: B to F  
**Amplitude:** X-axis to F  
**Oscillation:** A to E

### FREQUENCY

Definition:  
The property or condition occurring at frequent intervals.  
The number of times an event occurs within a given period.

**Explanation:**

- Recurrence rate.
- Number of cycles per second.
- The unit of Frequency is Hertz [Hz].

**Key Points:**

- Amplitude is the size of the signal
- Oscillation is the movement between points

High Frequency wave

Low Frequency wave

### WAVELENGTH FORMULA

$$\lambda = \frac{v}{f}$$

λ = wavelength [meters]  
v = velocity [m/s]  
f = Frequency [Hz]

20 waves in 1 second: 20Hz  
f = 20Hz

1 wave is 1/20<sup>th</sup> of a second  
T = .05sec

$$\frac{v}{f \lambda}$$

### Sample of waves in neuroimaging

EEG showing typical brain waves of sleep and wakefulness (relaxed state)

Neurophysiological Monitoring during Intradural Spinal Tumor Surgery [Ihan et al. 2024]

### Quick Quiz

1. Which wave has the largest λ?
2. Which wave has the highest f?
3. Which wave has the highest amplitude?
4. Which waves have the same λ?

1:B ; 2:D ; 3:A ; 4:BC