



Artifacts Virtual EEG Course

18 September 2022

Kullasate Sakpichaisakul, MD

Division of Neurology, Department of Pediatrics

Queen Sirikit National Institute of Child Health

Outline

- What is an artifact?
- Approach to artifacts
- Physiologic artifacts
- Non-physiologic artifacts





Artifacts

- Unwanted electrical activity arising from different sources, **other than cerebral activity**
- Often contaminate the recording
- Can result in misinterpretation of the EEG



Clues to Artifact

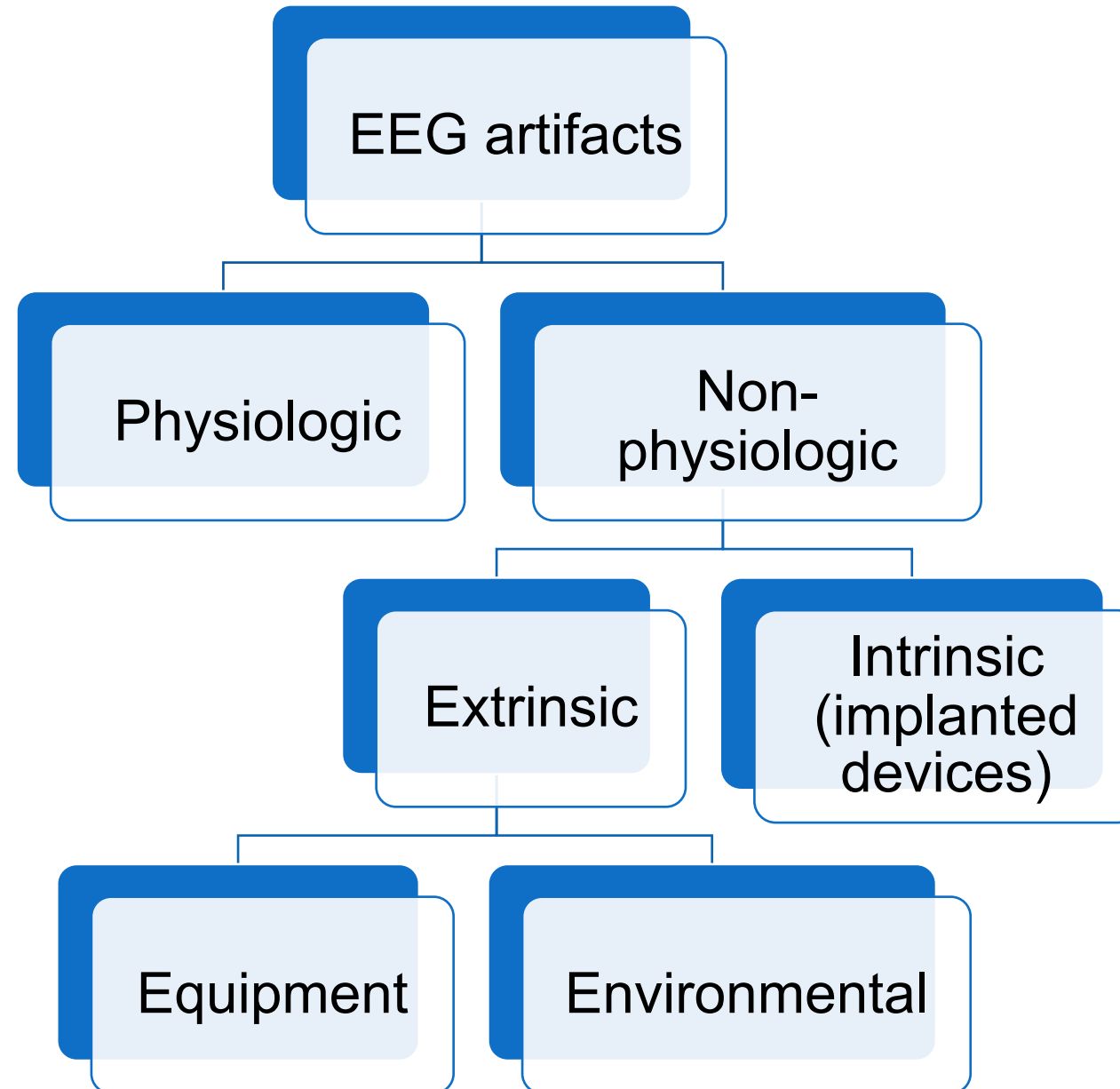
- A restricted to only 1 channel
- Noncontiguous head regions
- Affect non-scalp electrodes
- Complex waveforms
- Atypical generalized waveforms
- Precise periodicity and uniformity
- Very fast (>70 Hz) or very slow (<1 Hz)



Approach to Artifacts

- Appearance: Morphology, polarity, amplitude, duration, frequency, evolution, disruption of the background
- Distribution: Single electrode, beyond scalp
- Setting: ICU, EMU, OR
- State: Wakefulness, drowsiness, sleep, comatose
- Video recording: Tremor, patting, CPR

Approach to Artifacts





Artifacts

- **Physiological/ biological artifacts:** from patient's own physiological generator sources other than the brain
 - Eyes & eyelids: eye movement or blink artifacts
 - Tongue movement: glossokinetic, chewing, swallowing
 - EMG
 - ECG
- **Nonphysiological artifacts:** externally generated
 - Electrical phenomena
 - Devices in the recording environment

Physiologic Artifacts



- Ocular
- Cardiac
- Myogenic
- Glossokinetic
- Respiratory
- Sweat
- Movement
- Bone (breach)

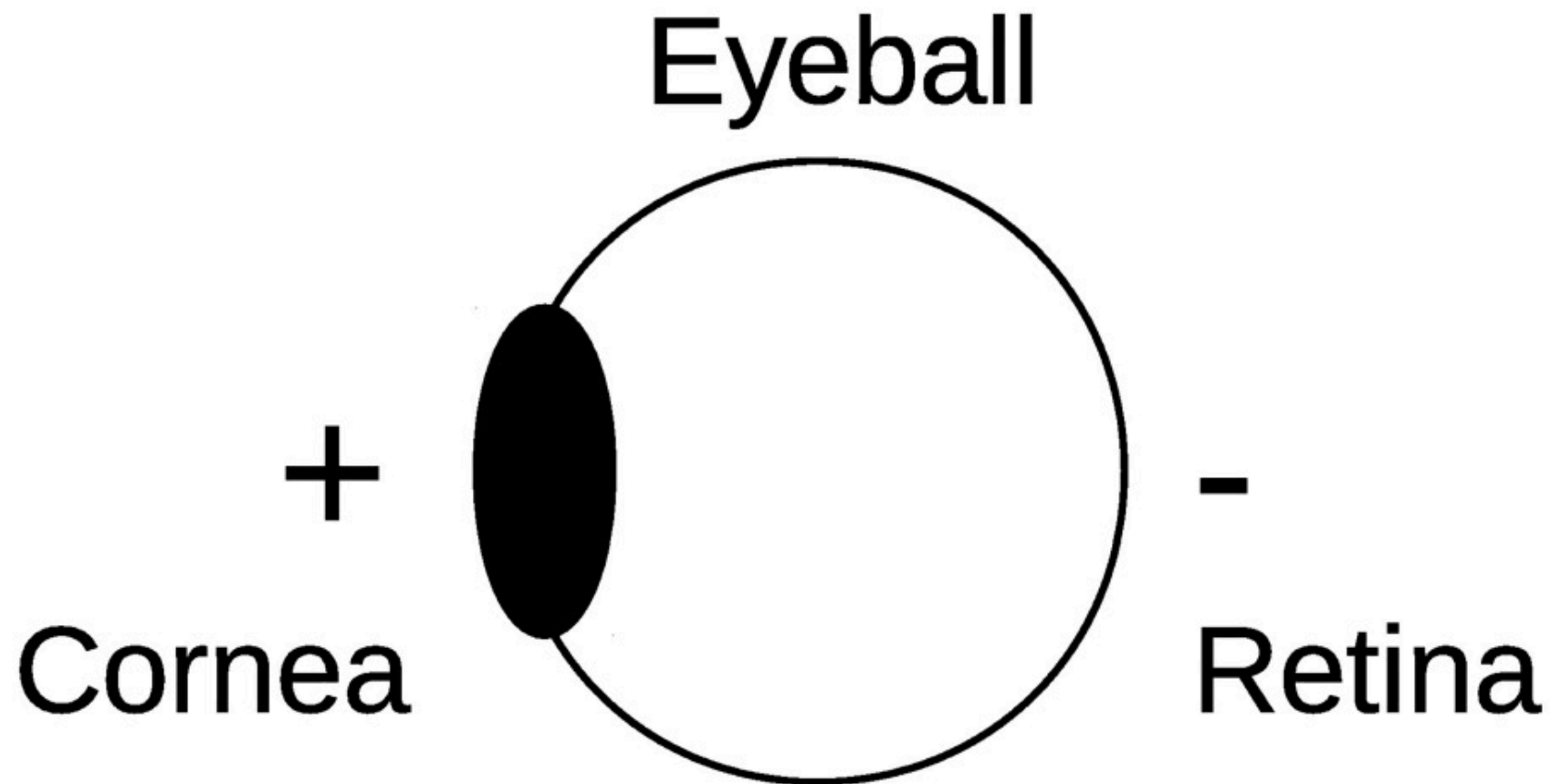


Eye Movement Artifacts

- Corneo-retinal potentials
- Fp1, Fp2, F7, F8 are locations
- Frontopolar rhythmic slow wave activity: simulating brain activity



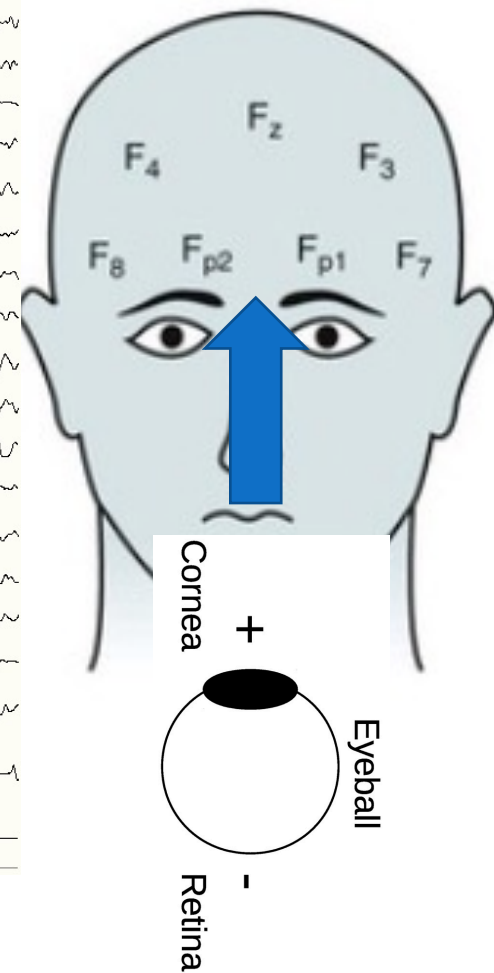
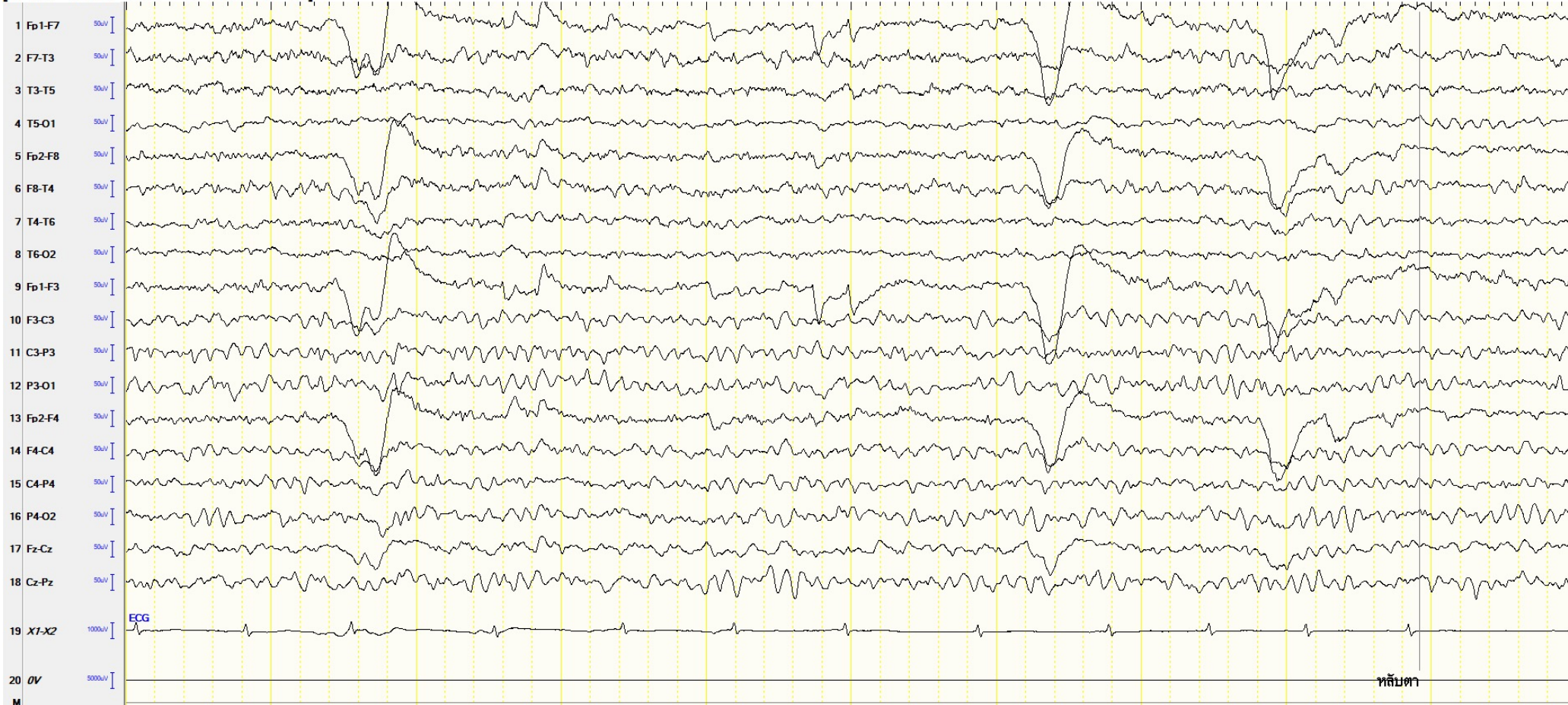
Corneoretinal Potential





Blink Artifact

[SENS *10 HF *50RP TC *0.1 CAL *50]



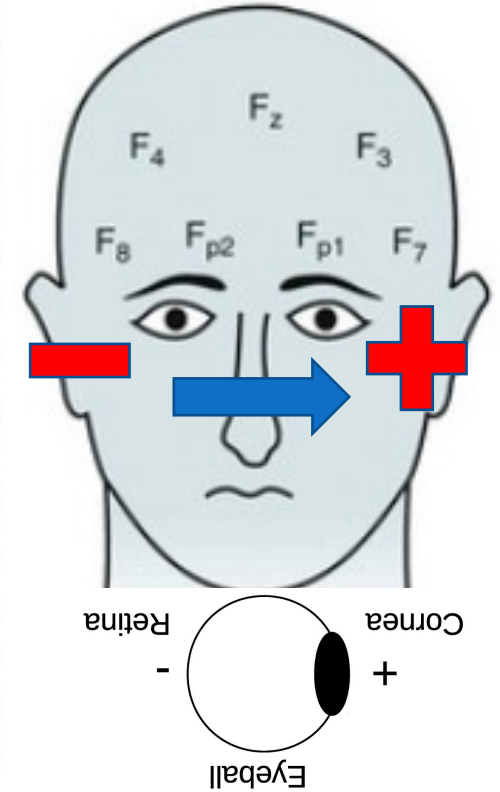
Blink Artifact



[SENS *20 HF *50RP TC *0.1 CAL *50]



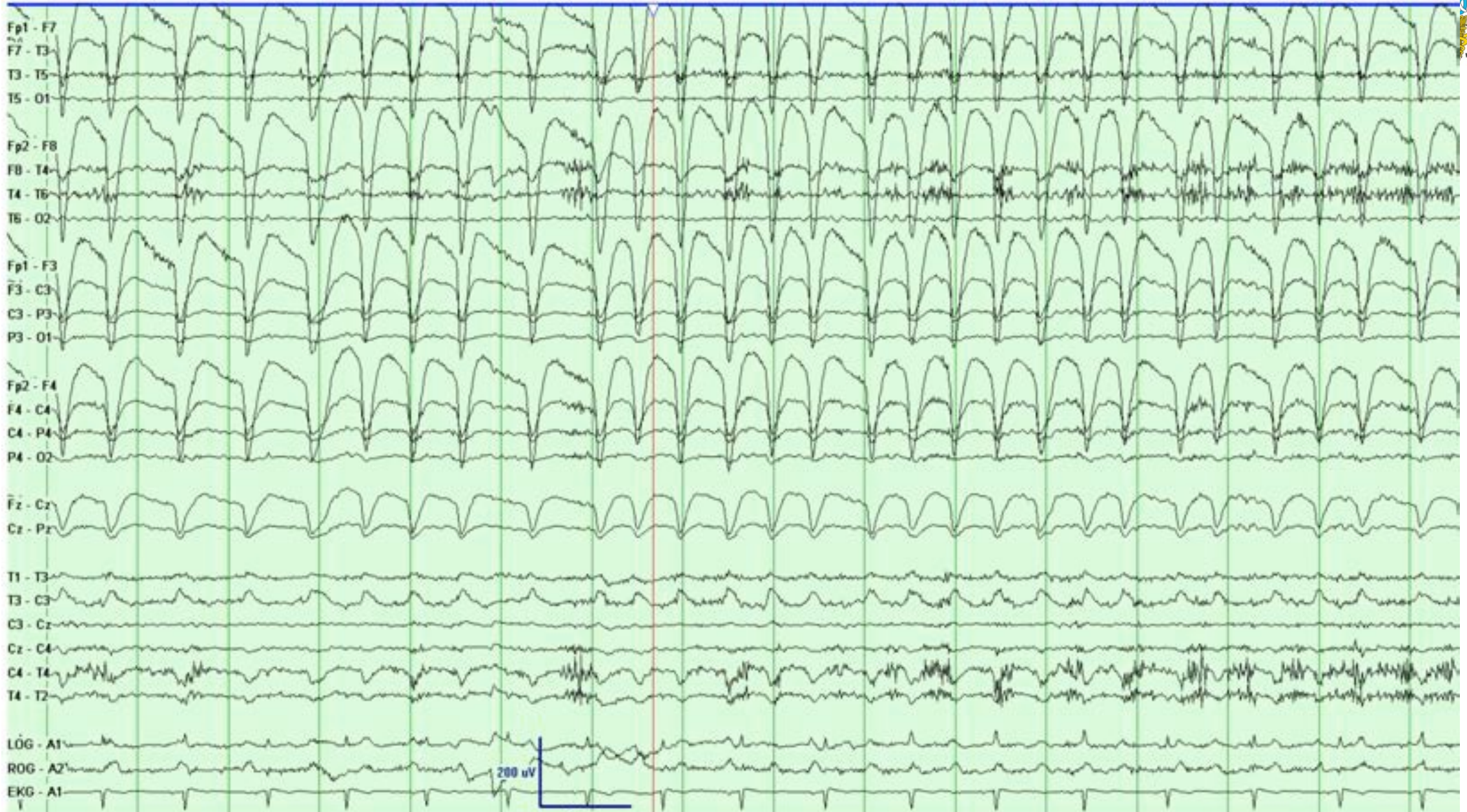
Left Lateral Eye Movement



Lateral Rectus Spikes



Ocular Flutter





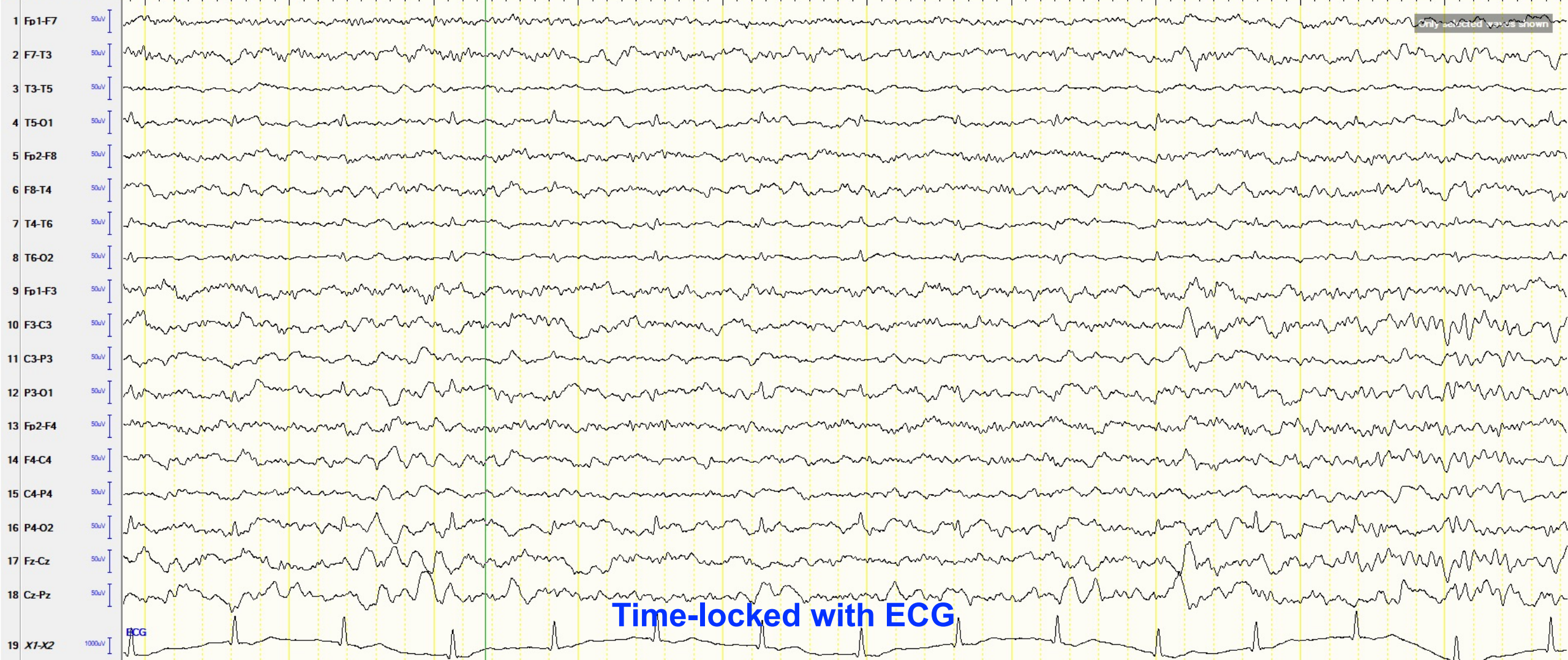
Cardiogenic Artifact

- Electrical potential arising in the cardiac muscles, high amplitude
- Spread to scalp by volume conduction
- Prominent in babies, obese, short-neck, cardiomegaly

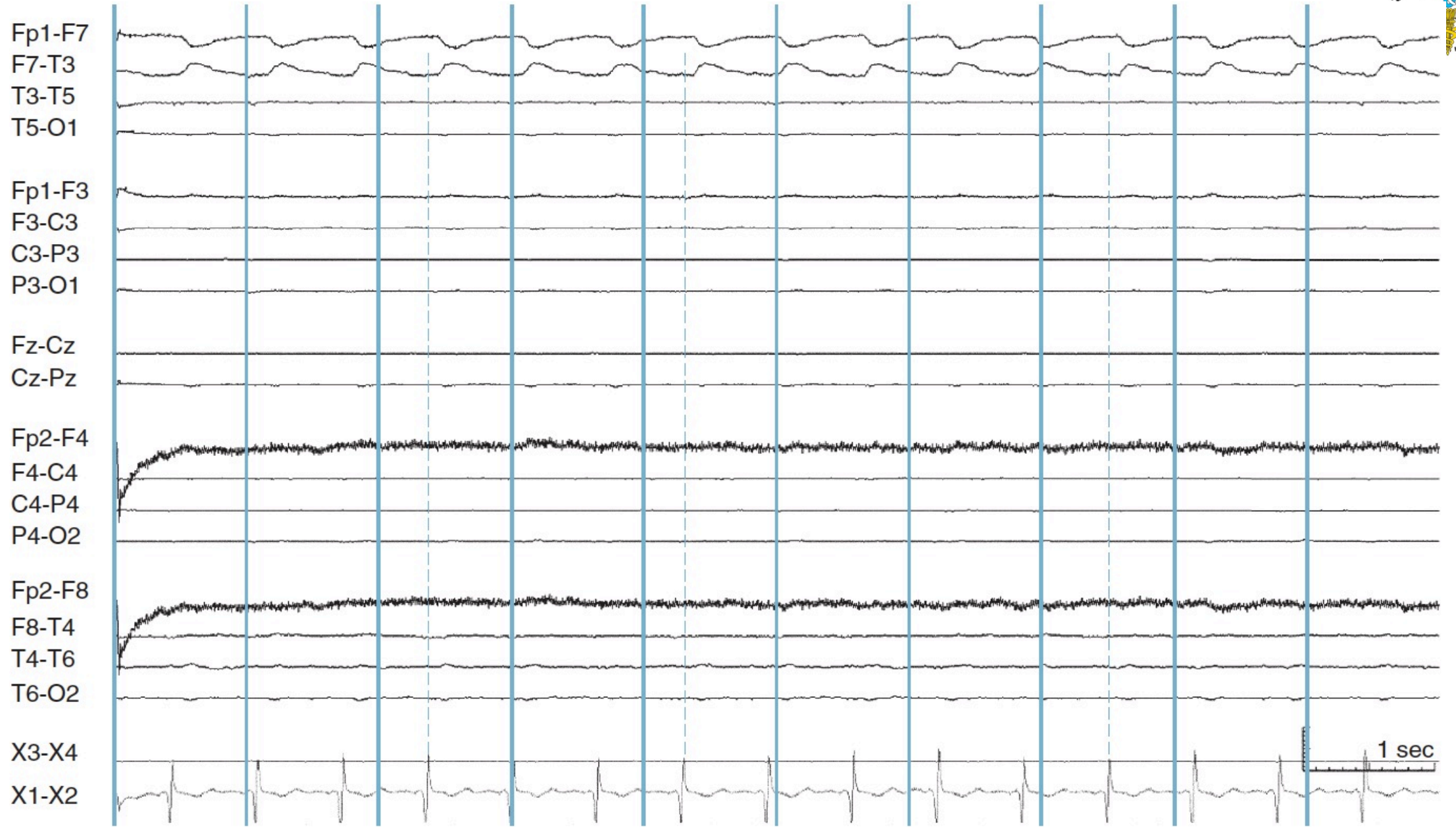
ECG Artifact



[SENS *7 HF *50RP TC *0.1 CAL *50]



Pulse Artifact

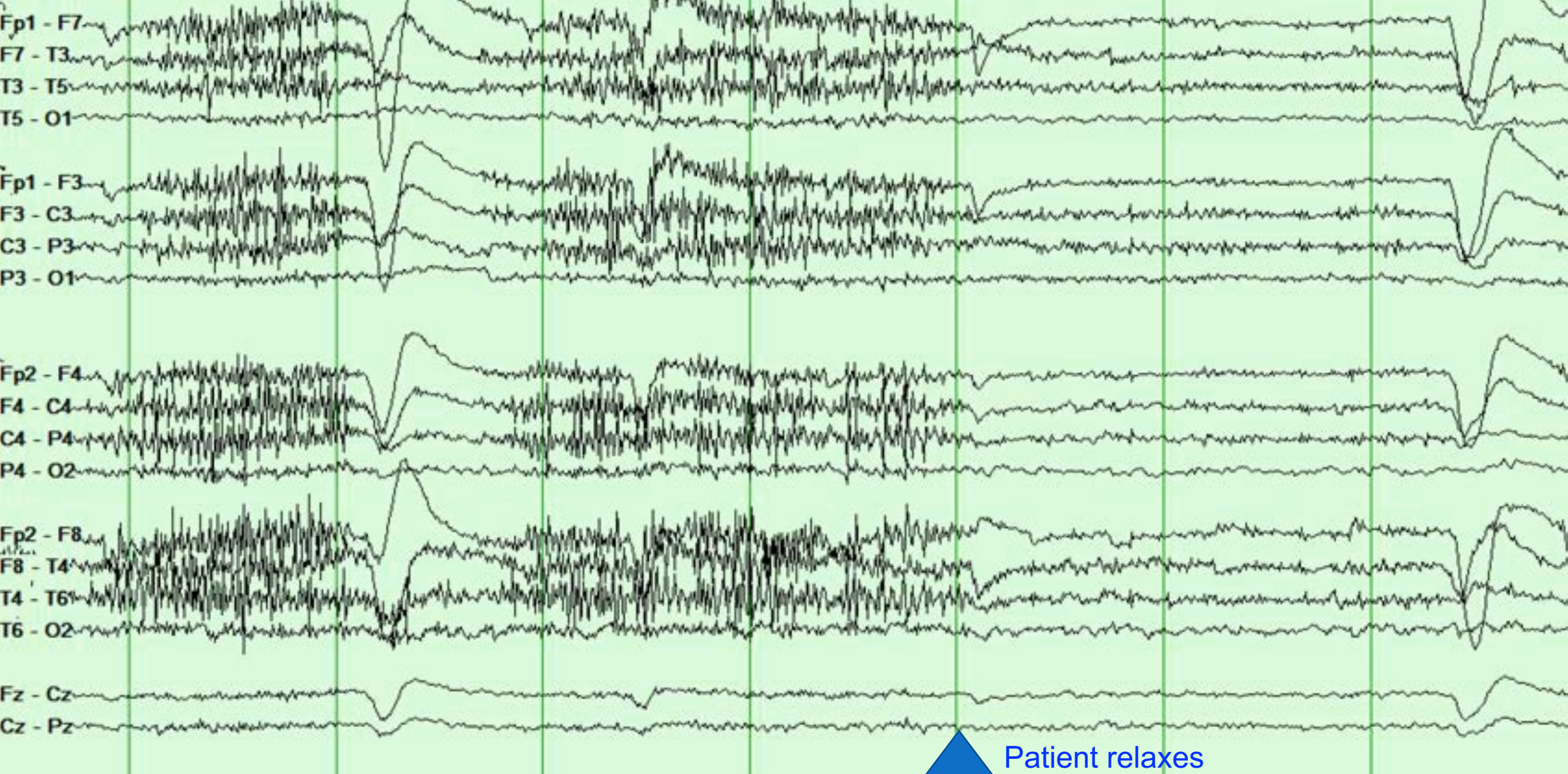




Muscle (EMG) Artifacts

- Muscle contraction superimposed upon the EEG activity
- The motor unit action potential arising from the scalp muscles may cause misinterpretation by resembling spike or cortical activity
- Extremely short duration and spiky morphology
- During sleep EMG activity is reduced whereas cortical spikes increase

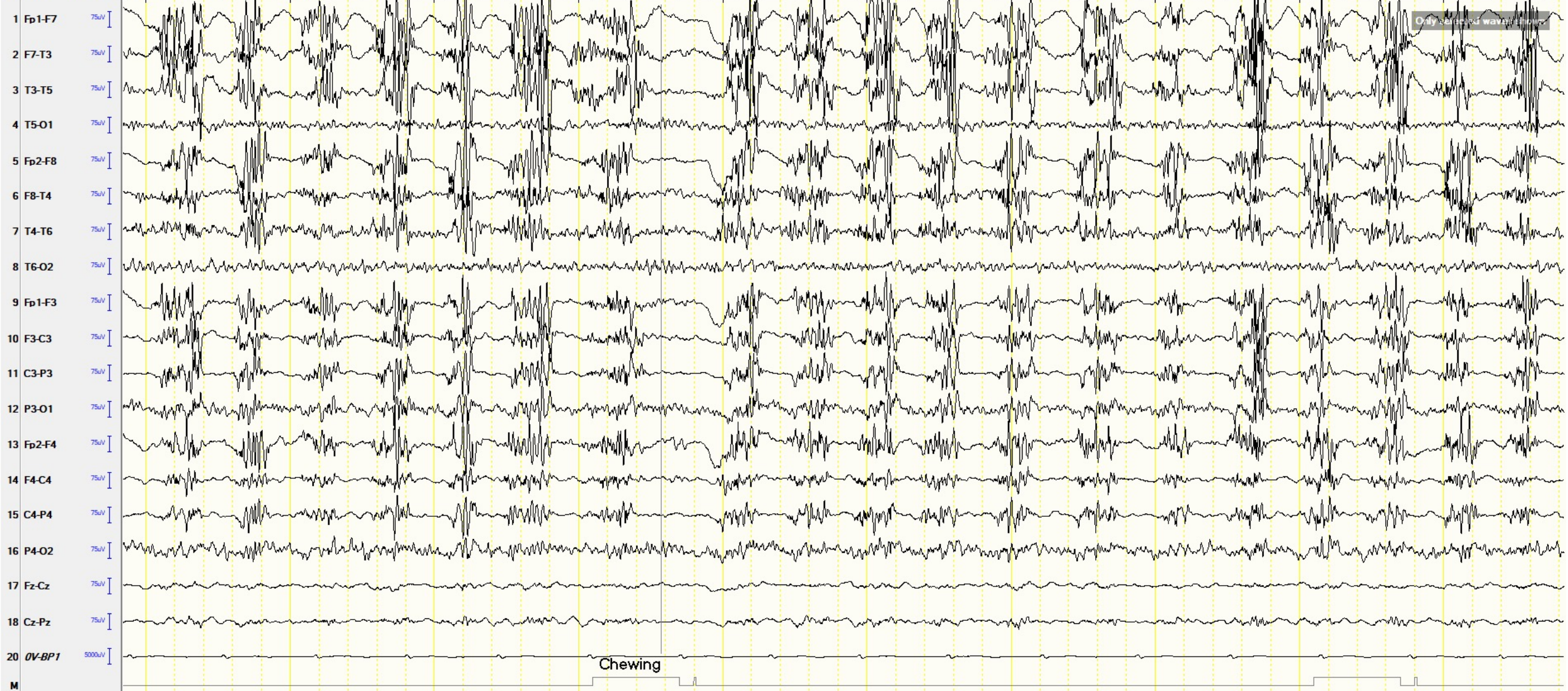
Myogenic Artifact



Chewing Artifact



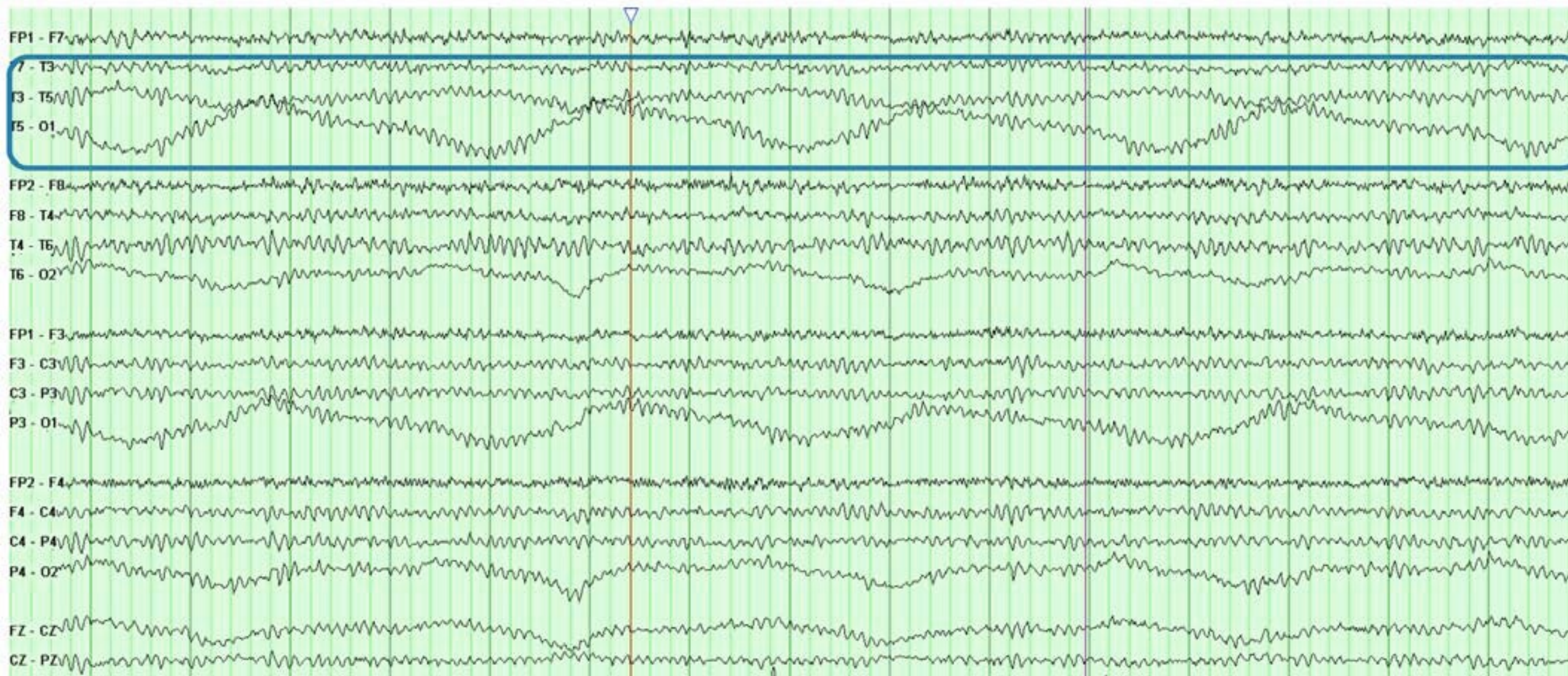
[SENS *15 HF *50RP TC *0.1 CAL *50]



Glossokinetic Artifact



Respiratory Artifact

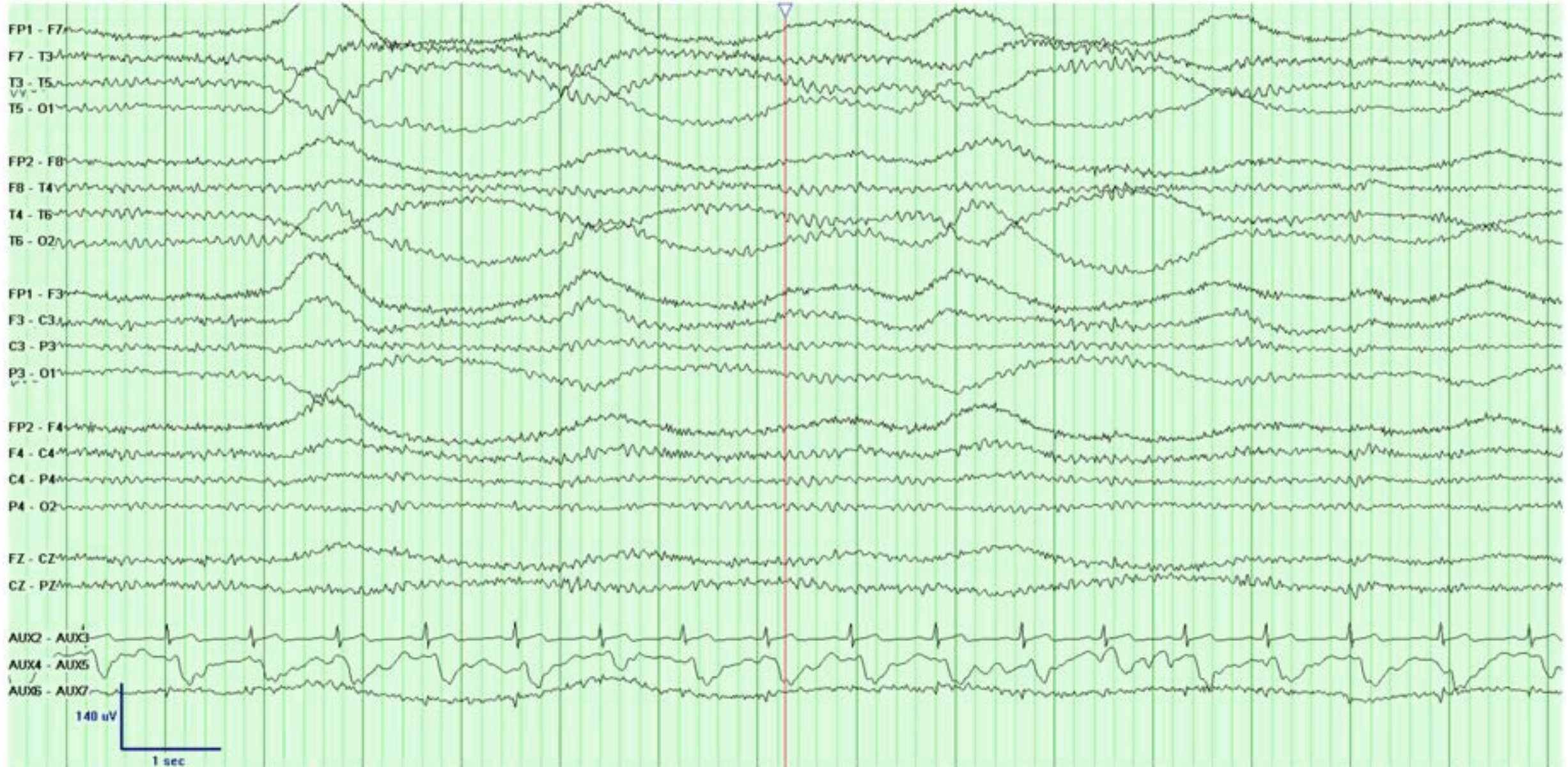




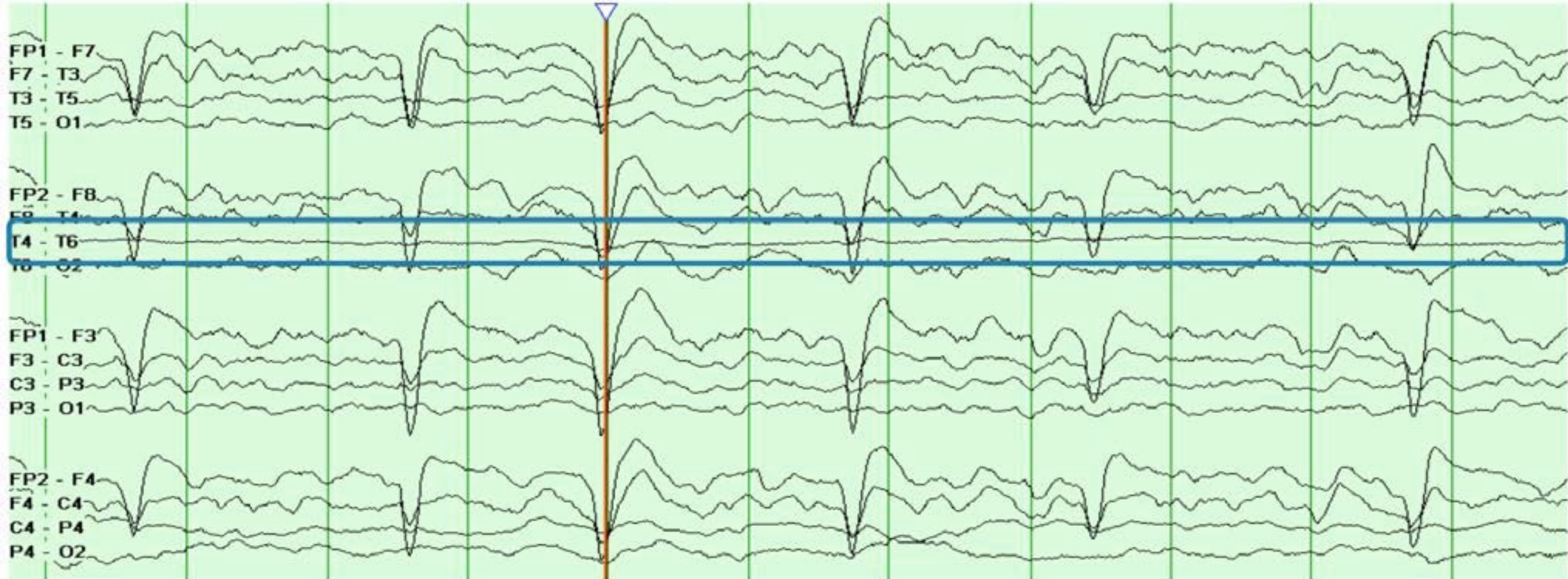
Sweat Artifact

- Warm and humid recording room
- Anxiety and emotional tension
- Autonomic dysfunction
- Electrical potentials due to sweat glands
- Reduction in the skin resistance
- NaCl and lactic acid of sweat may produce large baseline sways

Sweat Artifact



Salt Bridge Artifact

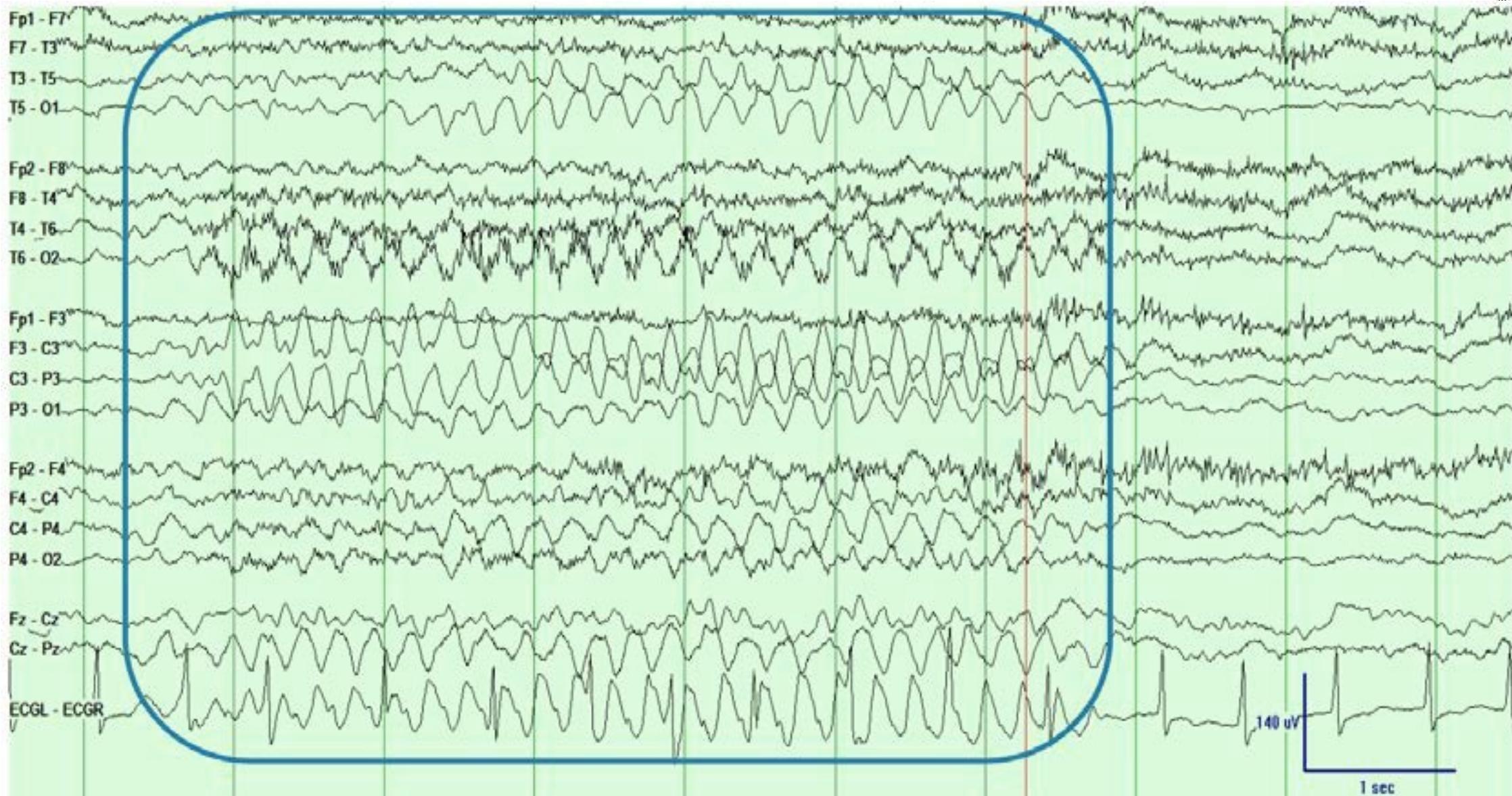




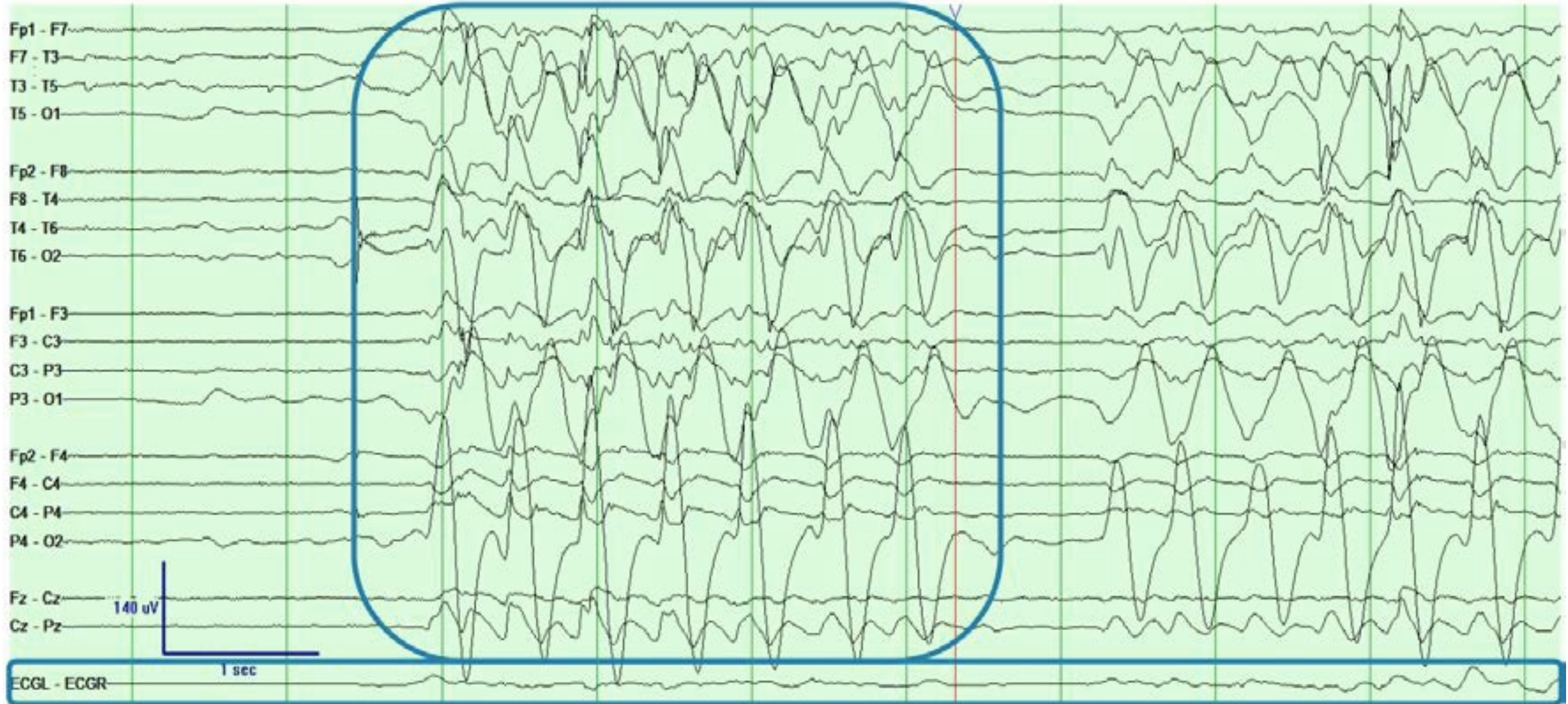
Movement Artifacts

- Movement of head, body, and limbs produce irregular high voltage potentials
- Movement of the head during HV or respiration can produce occipital electrode artifacts
- Movement associated with seizure may obscure cerebral activity
- Artifacts may occur in essential tremor and other movement disorders

Sternal Nub Artifact



CPR Artifact

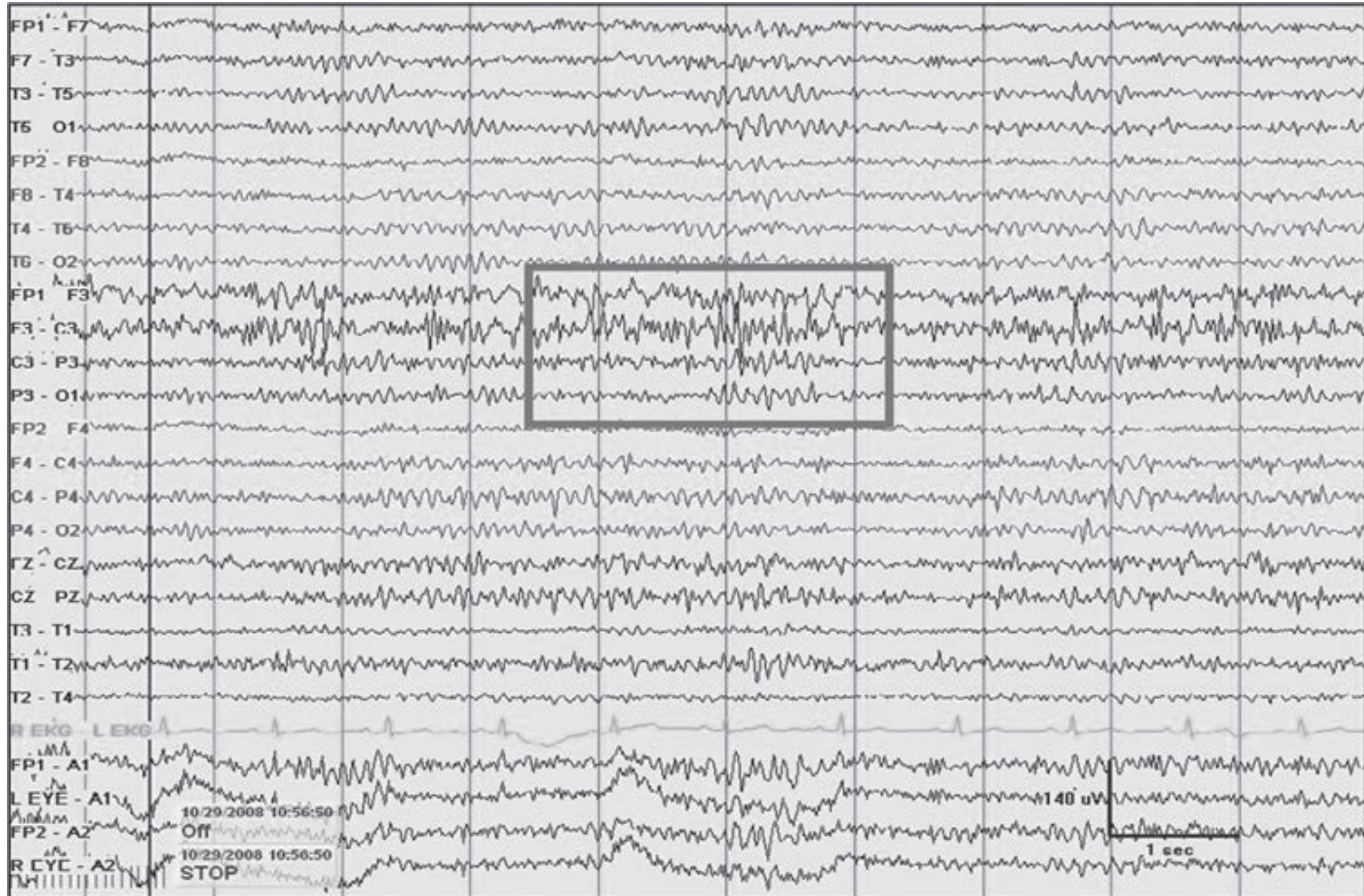




Breach Rhythm

- Focal, asymmetrical, high voltage 6-11 Hz, admixed with lower or faster components
- Arch-like shaped waveforms, sometimes with spiky morphology
- Associated with skull defect
- “Conservative reading” should be emphasized
- No after-going slow waves

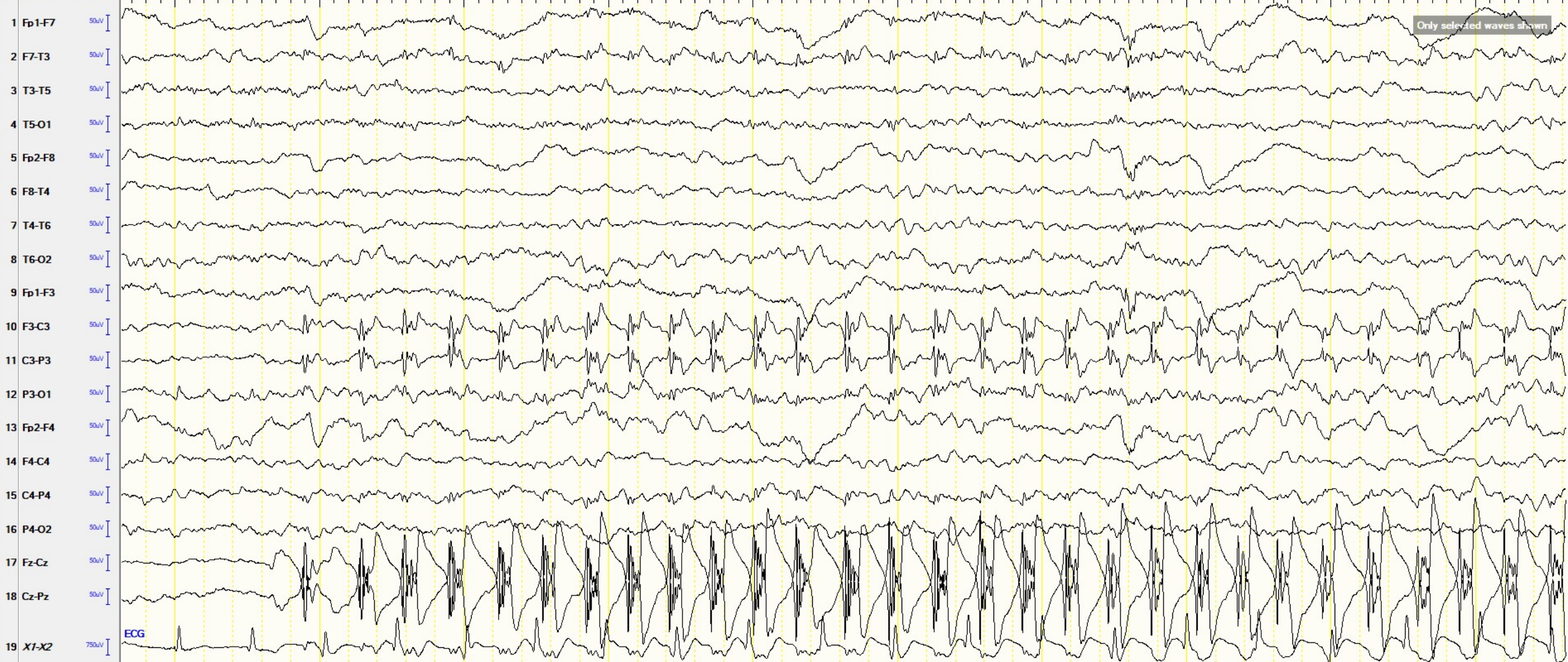
Breach Rhythm



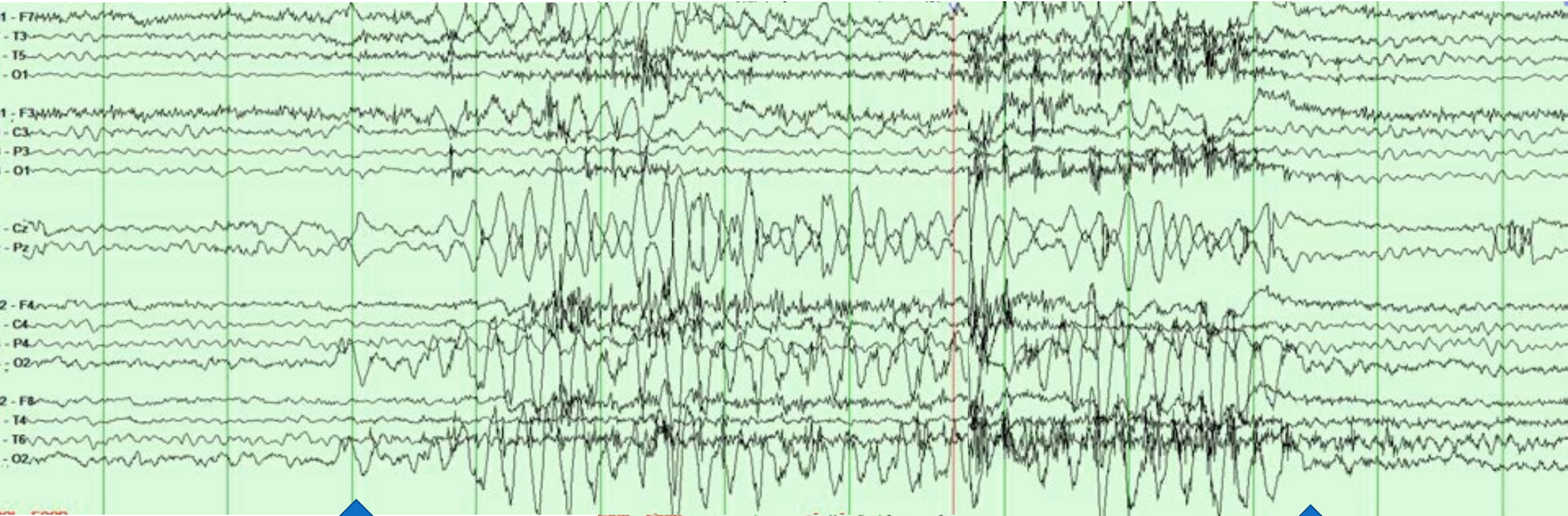
Patting Artifact



[SENS *10 HF *50RP TC *0.1 CAL *50]



Psychogenic Nonepileptic Events (PNES)



Shaking starts



Shaking stops



Non-Physiologic Artifacts

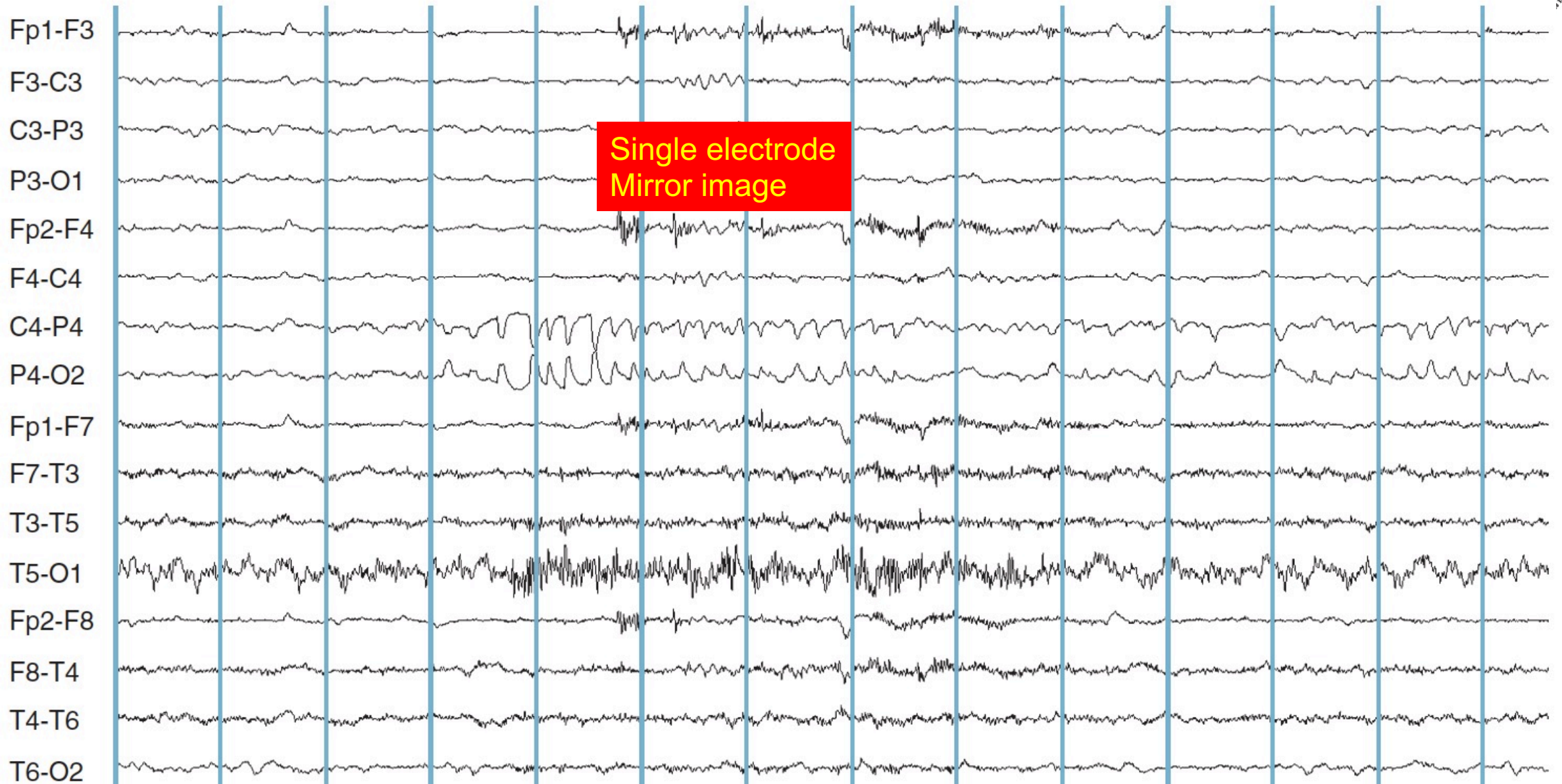
- Electrode pop
- Electrode disconnection
- Drip
- Ventilator
- Cell phone
- Neurostimulators

Electrode Artifacts

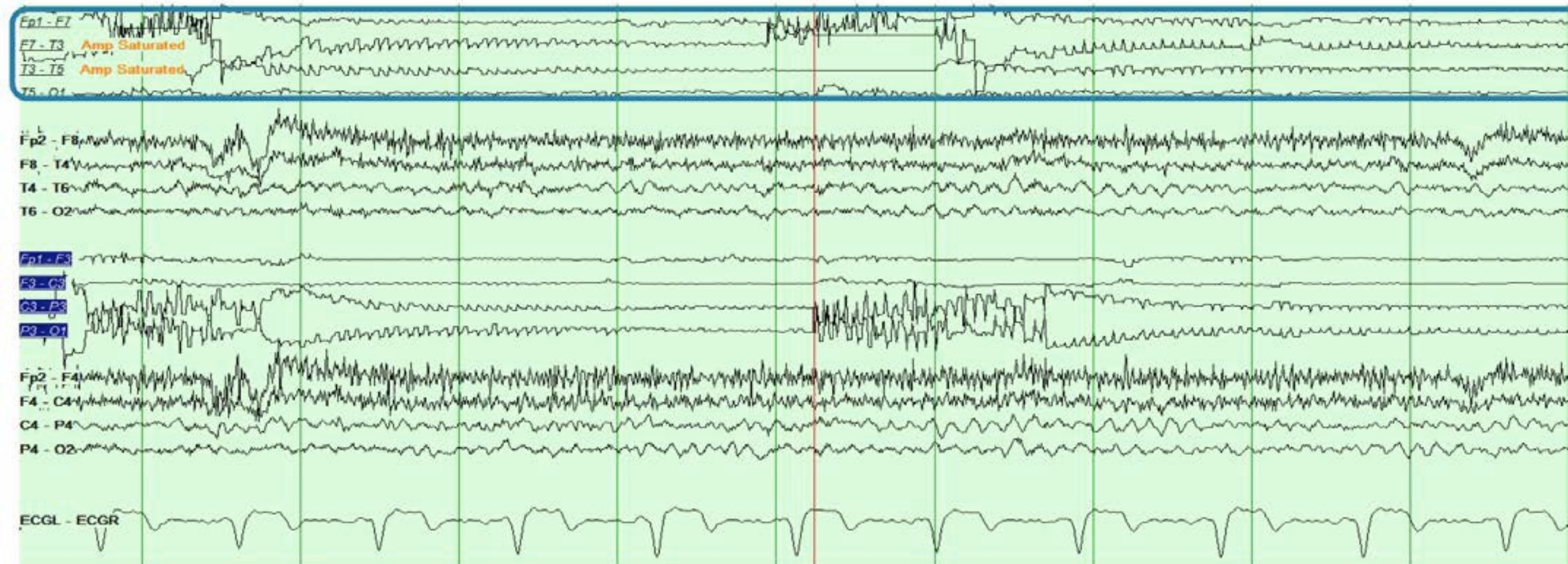


- The scalp-electrode junction is an important and delicate link in the whole system
- Electrode artifacts occur due to the change in the resistance or electrode potential between the scalp and the electrode
- Poor contact, improper electrolyte application, broken lead, poor contact at the junction box, dry out of electrode paste
- Strictly confined to one lead or channels having input from this electrode
- Wave morphology may change from time to time

Electrode “pop” Artifact



Electrode Disconnection



60-Cycle



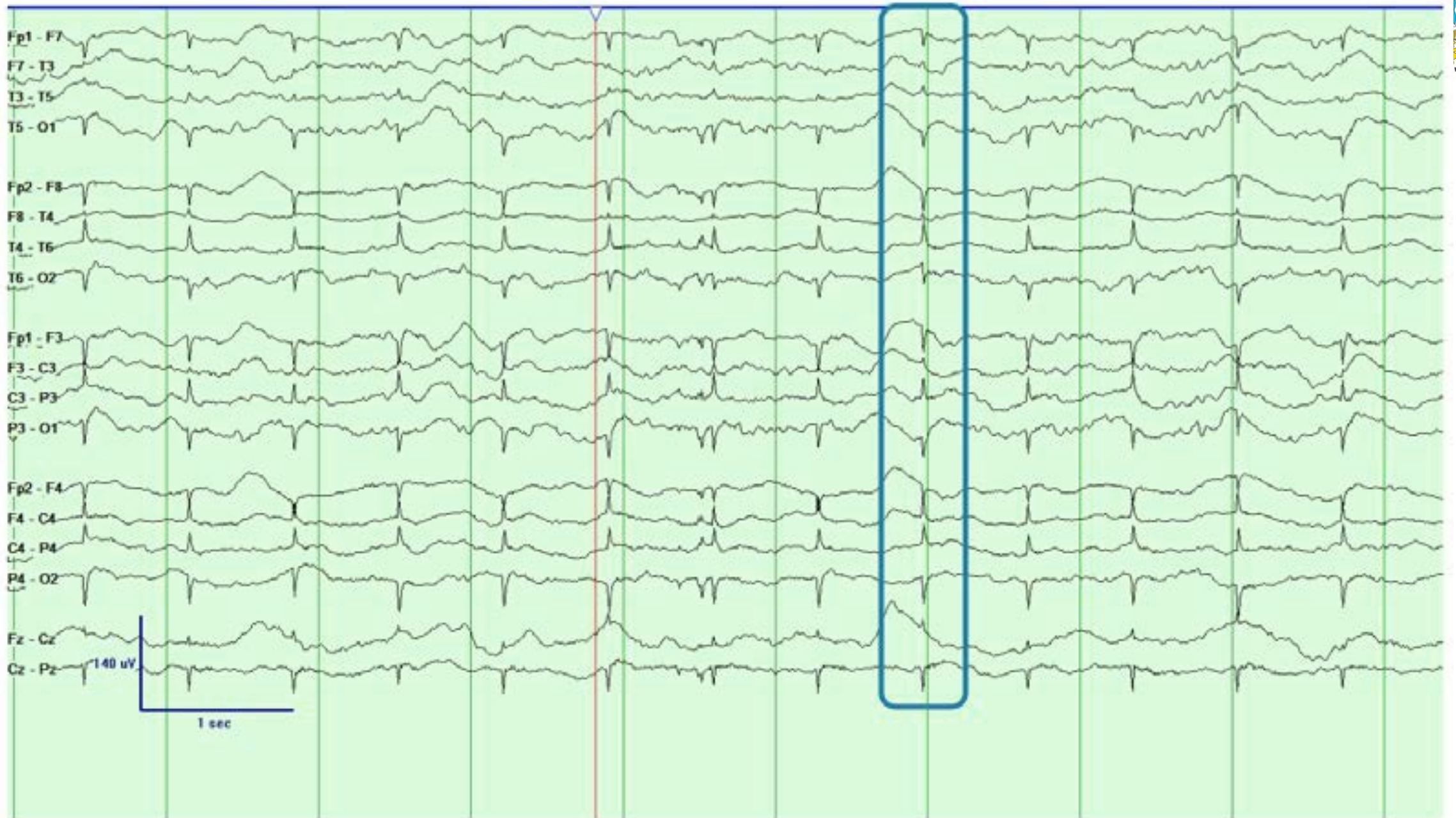
Notch off



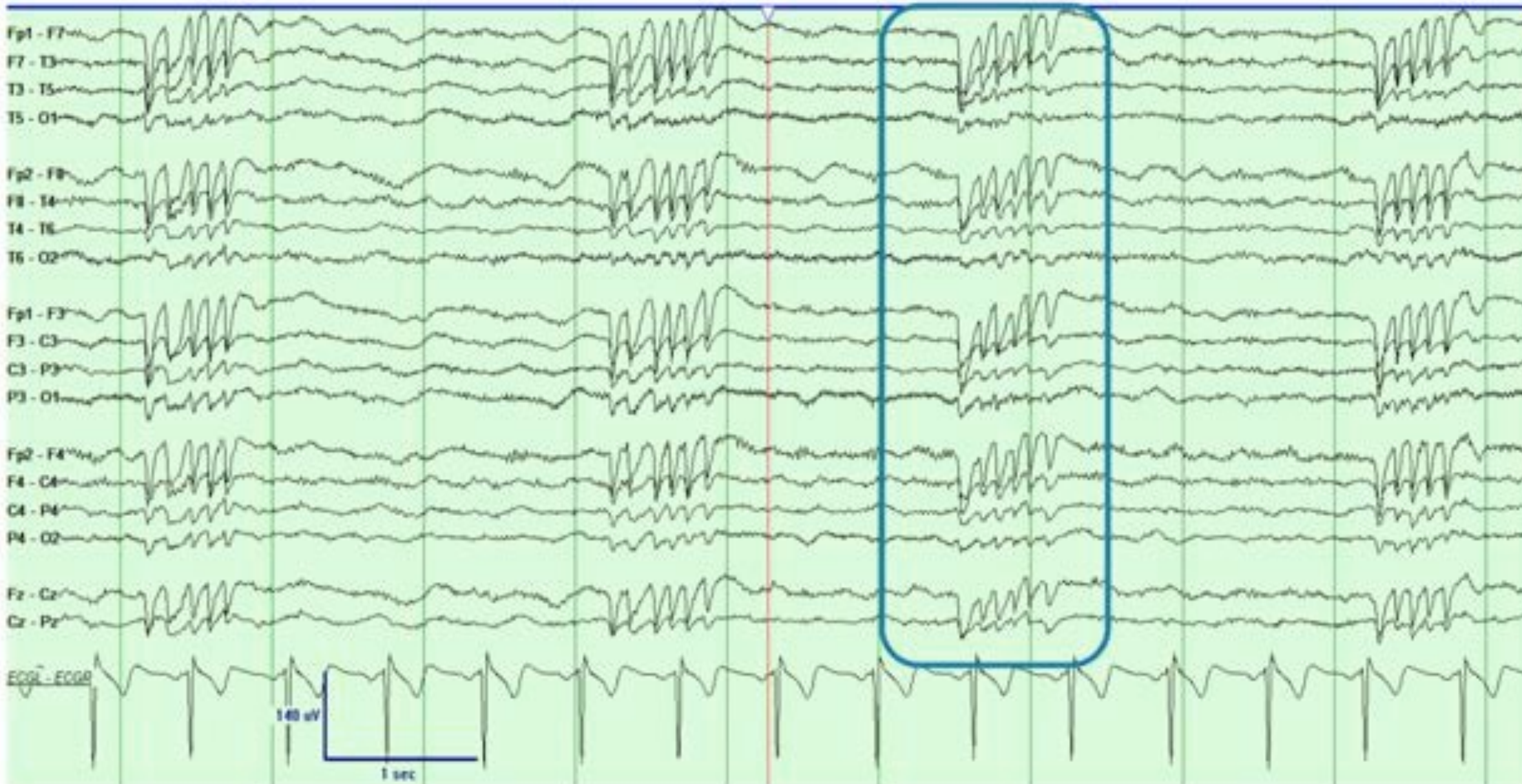
Notch on



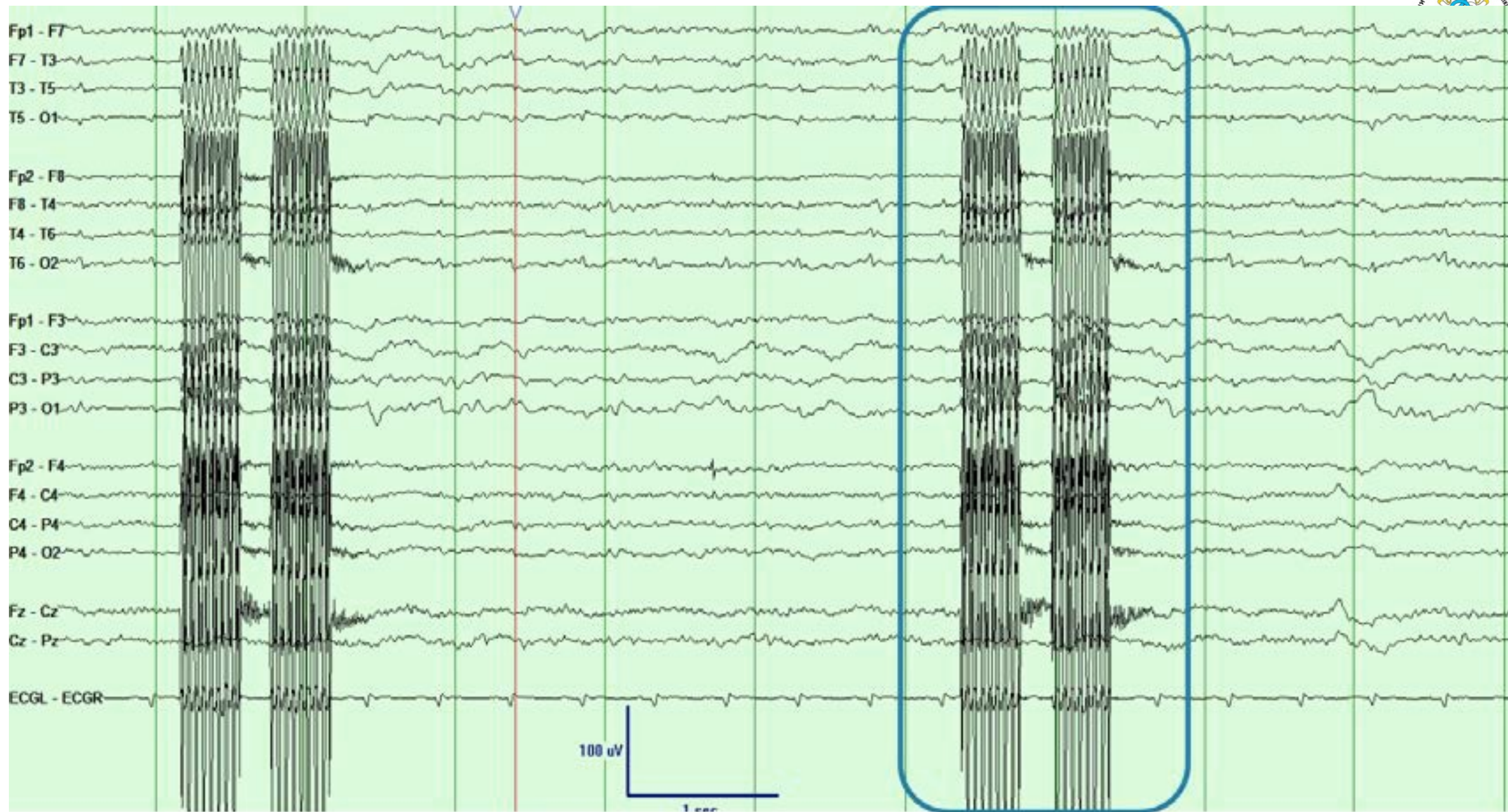
IV Drip



Ventilator



Cell Phone





Conclusion

- EEG artifacts are commonly encountered
- It is essential to avoid misinterpretation of EEG
- Many artifacts can be easily identified, but others may be difficult to identify and may mimic brain activity including ictal or interictal findings
- Video can often be helpful in identifying the source
- Single electrode, nonreasonable field, or positive phase reversal indicate artifactual in nature
- Solid understanding of neurophysiologic principle is helpful