2023 GW Epilepsy Board Review & Best Practices

NORMAL ADULT EEG

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DISCLOSURES

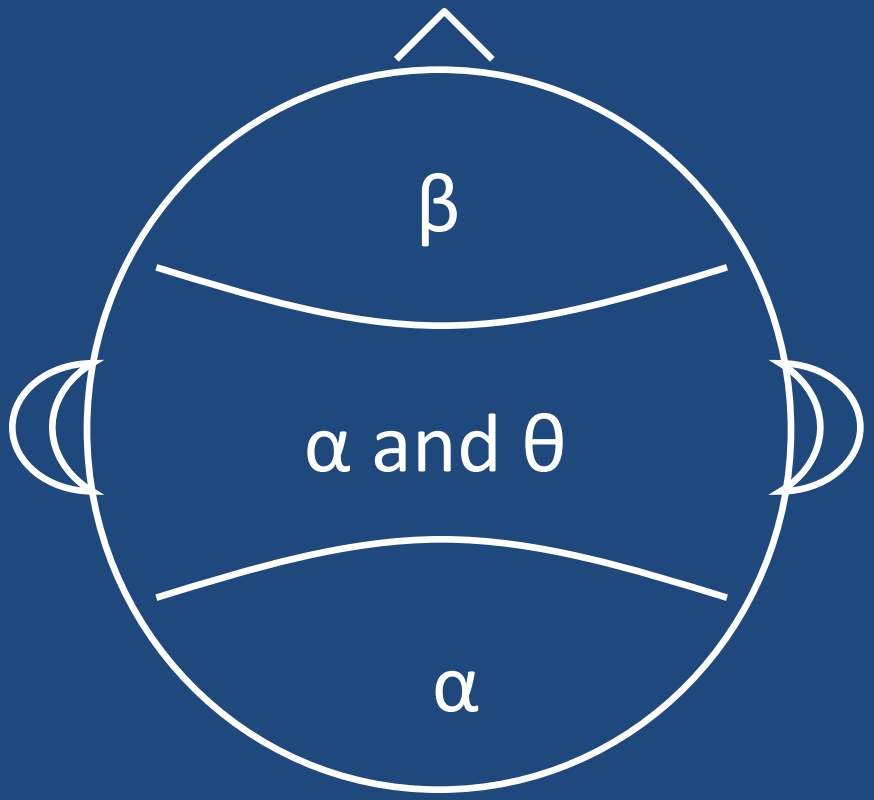
- **Disclosure of Financial Relationships**
  - **None**
- **Off-Label Usage**
  - **None**

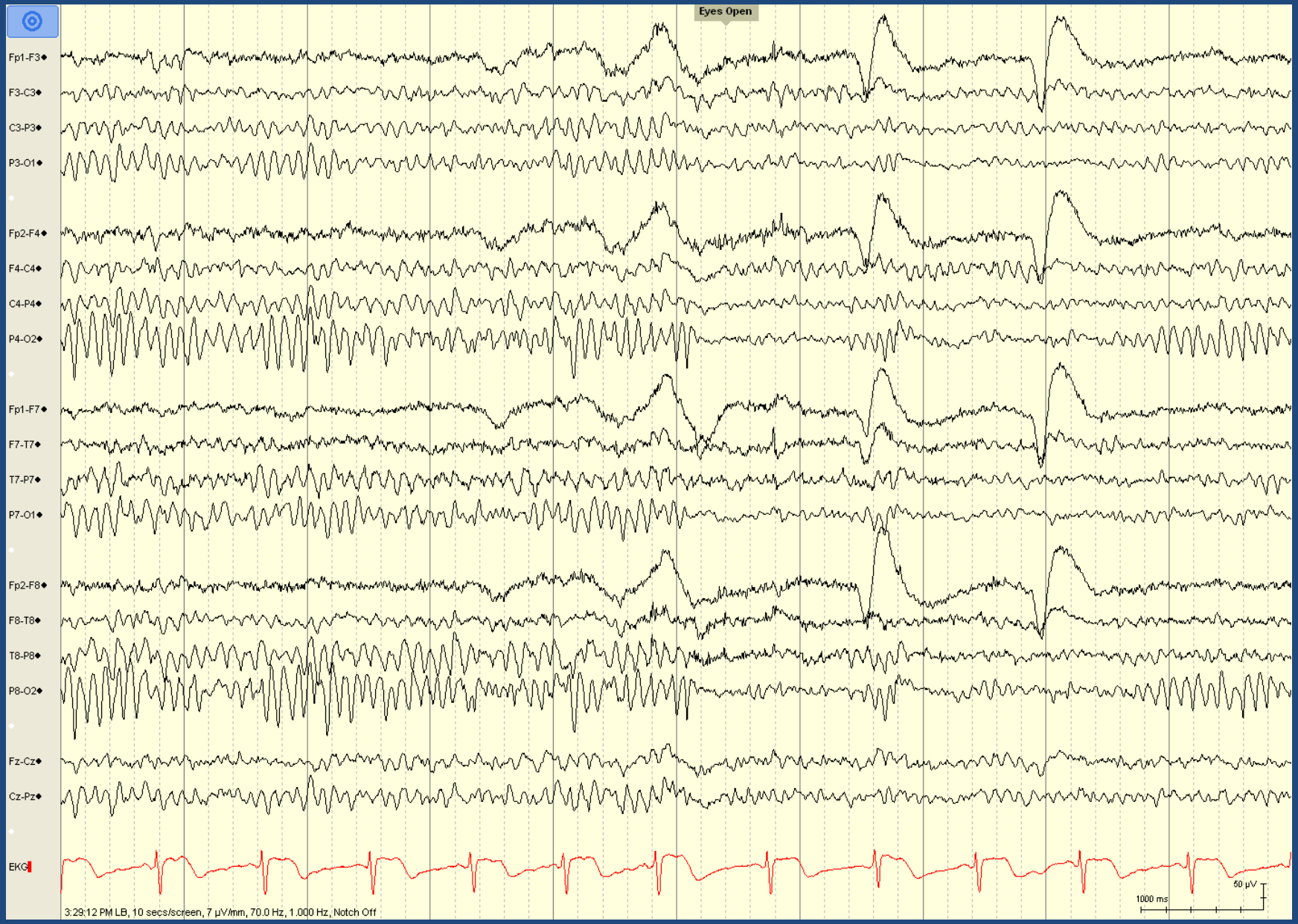
Overview

- Awake EEG
- Drowsy EEG
- Normal / Benign Variants
- Sleep EEG

Major waking rhythms

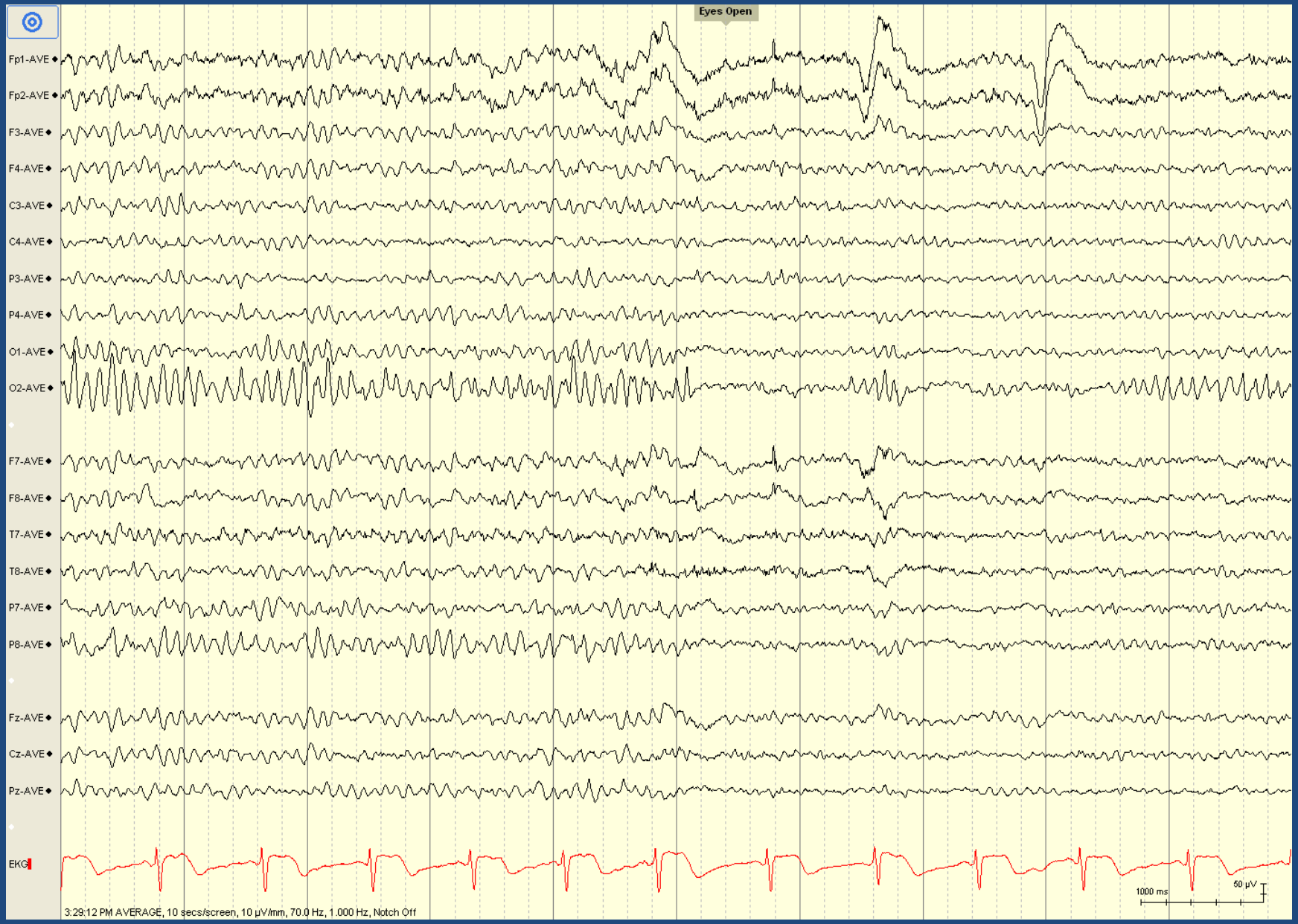
- Posterior Dominant Rhythm
- Mu rhythm
- Third rhythm




Eyes Open
Fp1-F3
F3-C3
C3-P3
P3-O1
Fp2-F4
F4-C4
C4-P4
P4-O2
Fp1-F7
F7-T7
T7-P7
P7-O1
Fp2-F8
F8-T8
T8-P8
P8-O2
Fz-Cz
Cz-Pz
EKG
50 µV
1000 ms
3:29:12 PM LB, 10 secs/screen, 7 µV/mm, 70.0 Hz, 1.000 Hz, Notch Off

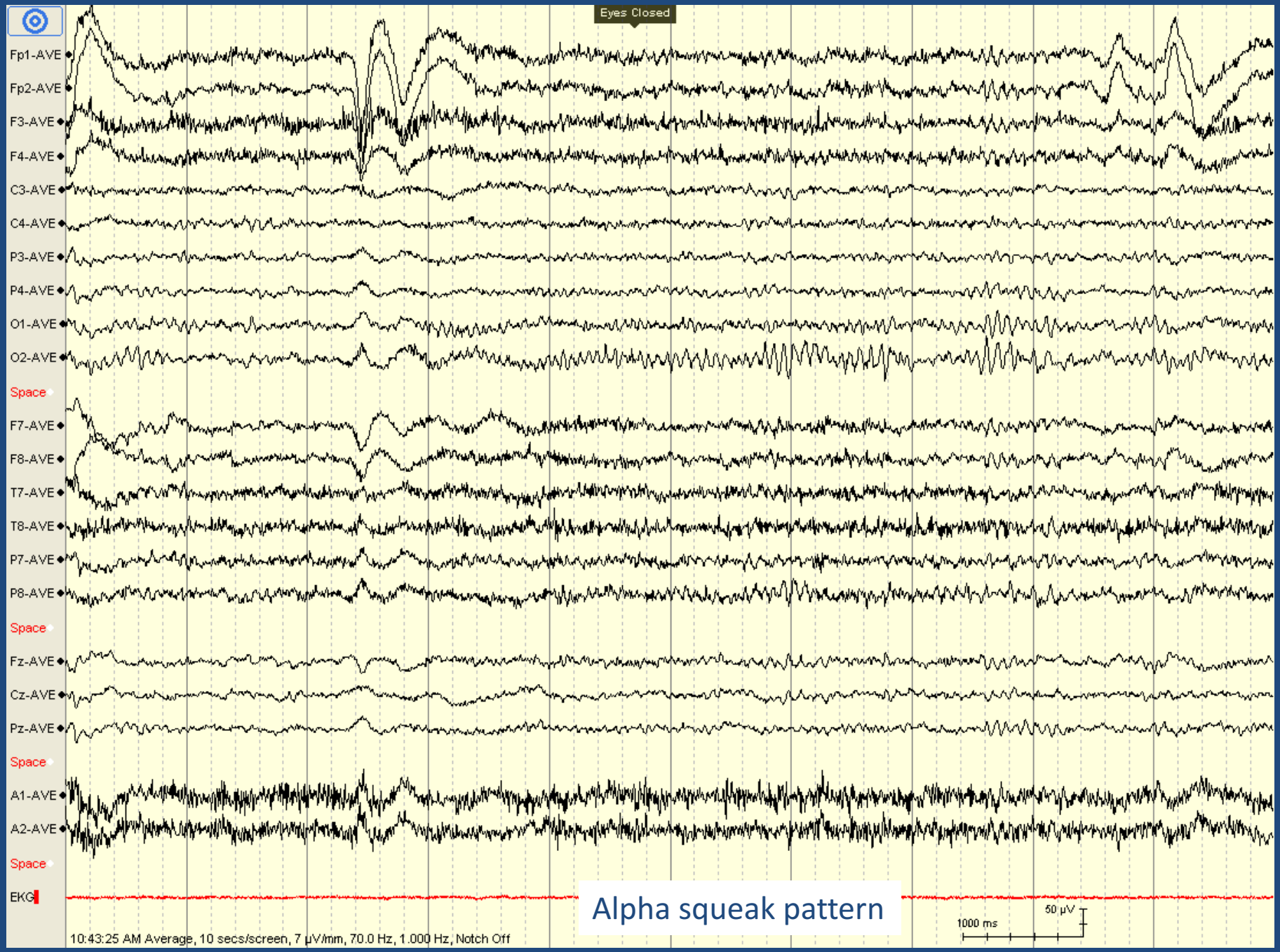
Posterior Dominant Rhythm

- “the Alpha rhythm” (resting rhythm of occipital cortex)
- Variants
  - alpha squeak
  - slow and fast variants
  - paradoxical alpha – increases with alertness
- Bancaud’s phenomenon (abnormal) – failure to attenuate with eye closure (ipsilateral pathway lesion)
- Should be symmetric…?

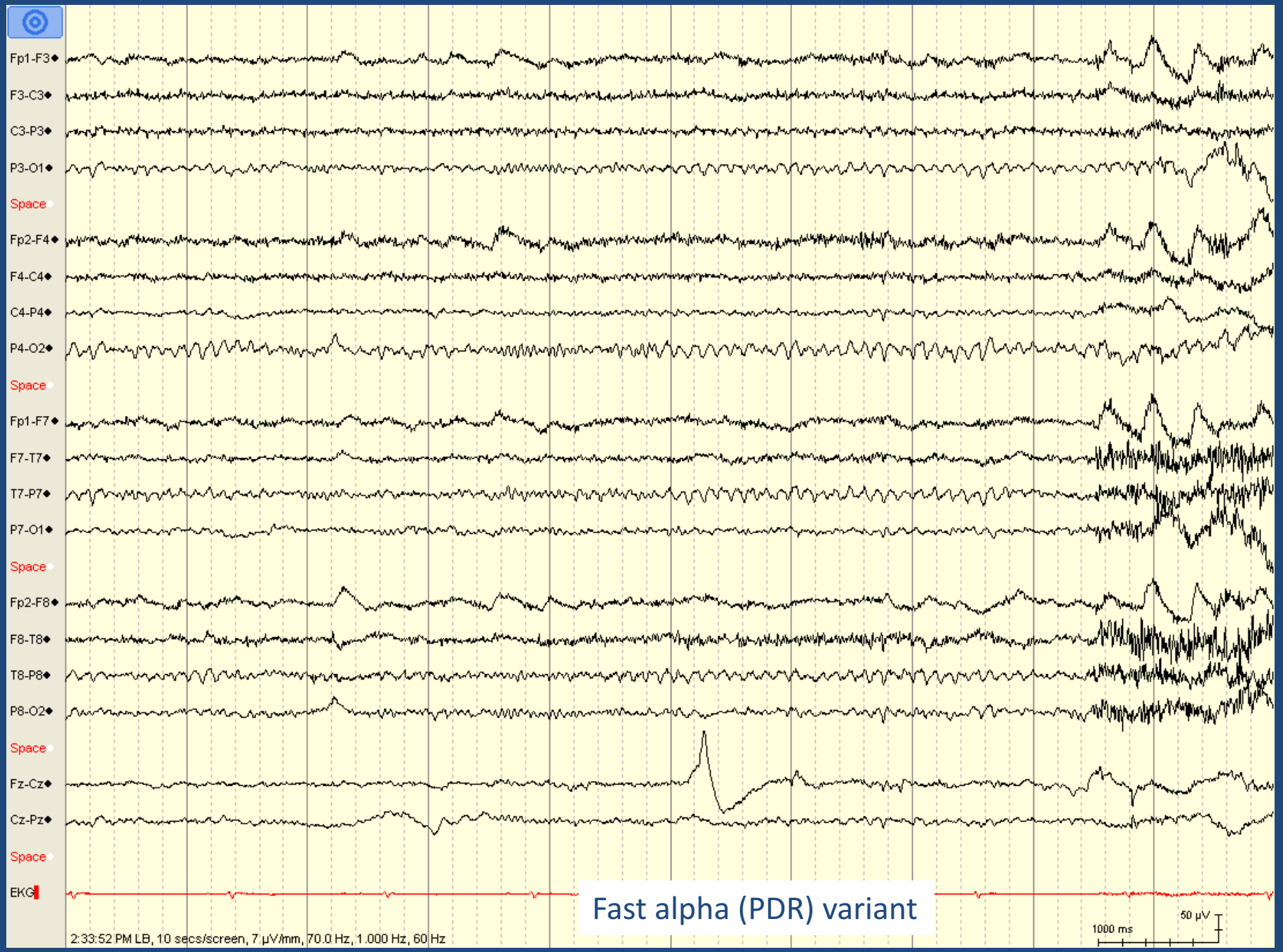

Eyes Open
Fp1-AVE
Fp2-AVE
F3-AVE
F4-AVE
C3-AVE
C4-AVE
P3-AVE
P4-AVE
O1-AVE
O2-AVE
F7-AVE
F8-AVE
T7-AVE
T8-AVE
P7-AVE
P8-AVE
Fz-AVE
Cz-AVE
Pz-AVE
EKG
1000 ms
50 µV
3:29:12 PM AVERAGE, 10 secs/screen, 10 µV/mm, 70.0 Hz, 1.000 Hz, Notch Off

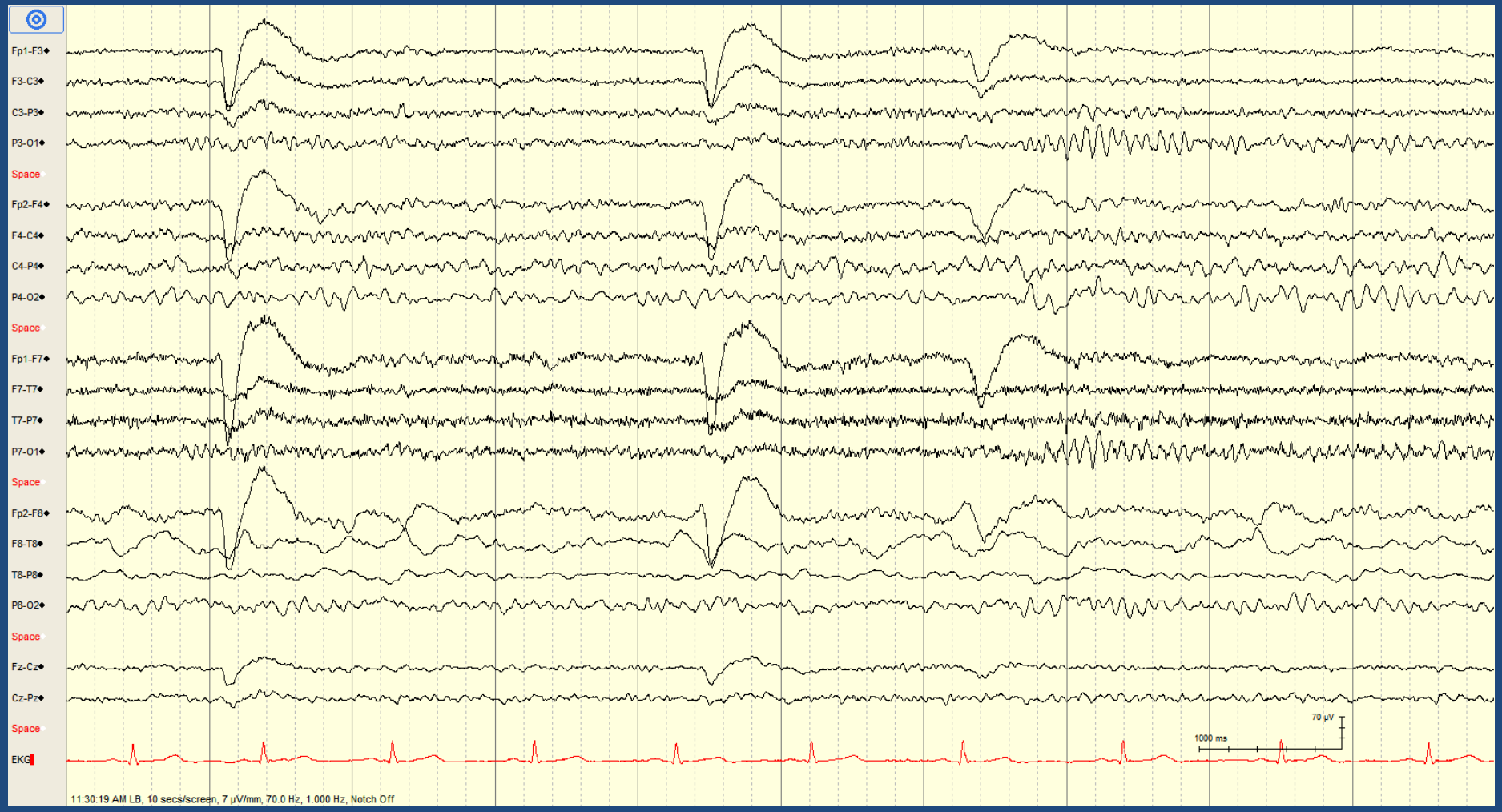
What is the allowable, normal asymmetry regarding the posterior dominant rhythm (alpha rhythm)?

A. Up to 35% higher amplitude on the right, and up to 35% higher amplitude on the left.
B. Up to 50% higher amplitude on the right, and up to 35% higher amplitude on the left.
C. Up to 35% higher amplitude on the right, and up to 50% higher amplitude on the left.
D. Up to 50% higher amplitude on the right, and up to 50% higher amplitude on the left.
E. Any asymmetry is considered abnormal

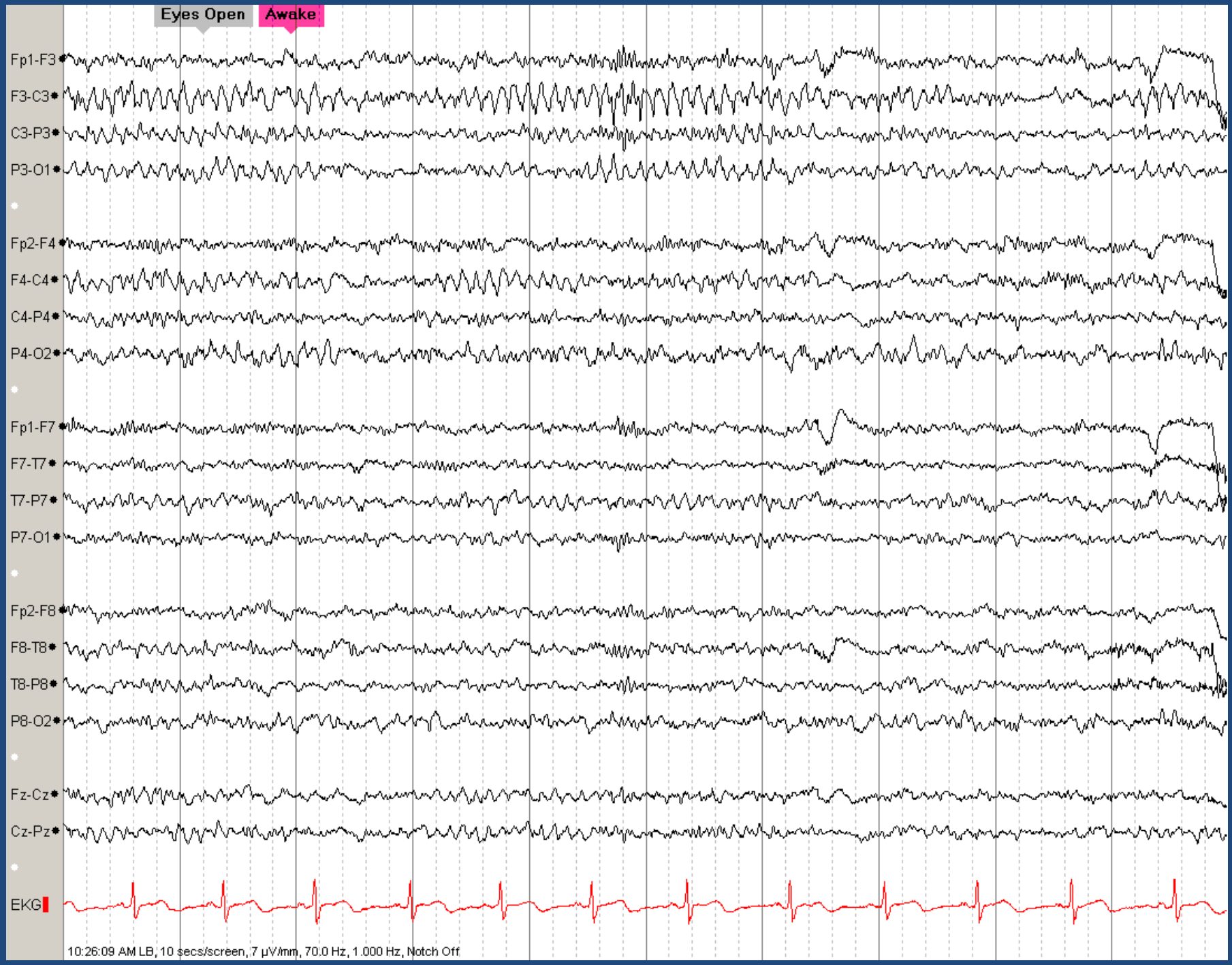


Alpha squeak pattern


Fp1-F3
F3-C3
C3-P3
P3-O1
Space
Fp2-F4
F4-C4
C4-P4
P4-O2
Space
Fp1-F7
F7-T7
T7-P7
P7-O1
Space
Fp2-F8
F8-T8
T8-P8
P8-O2
Space
Fz-Cz
Cz-Pz
Space
EKG
2:33:52 PM LB, 10 secs/screen, 7 µV/mm, 70.0 Hz, 1.000 Hz, 60 Hz
Fast alpha (PDR) variant
50 µV
1000 ms

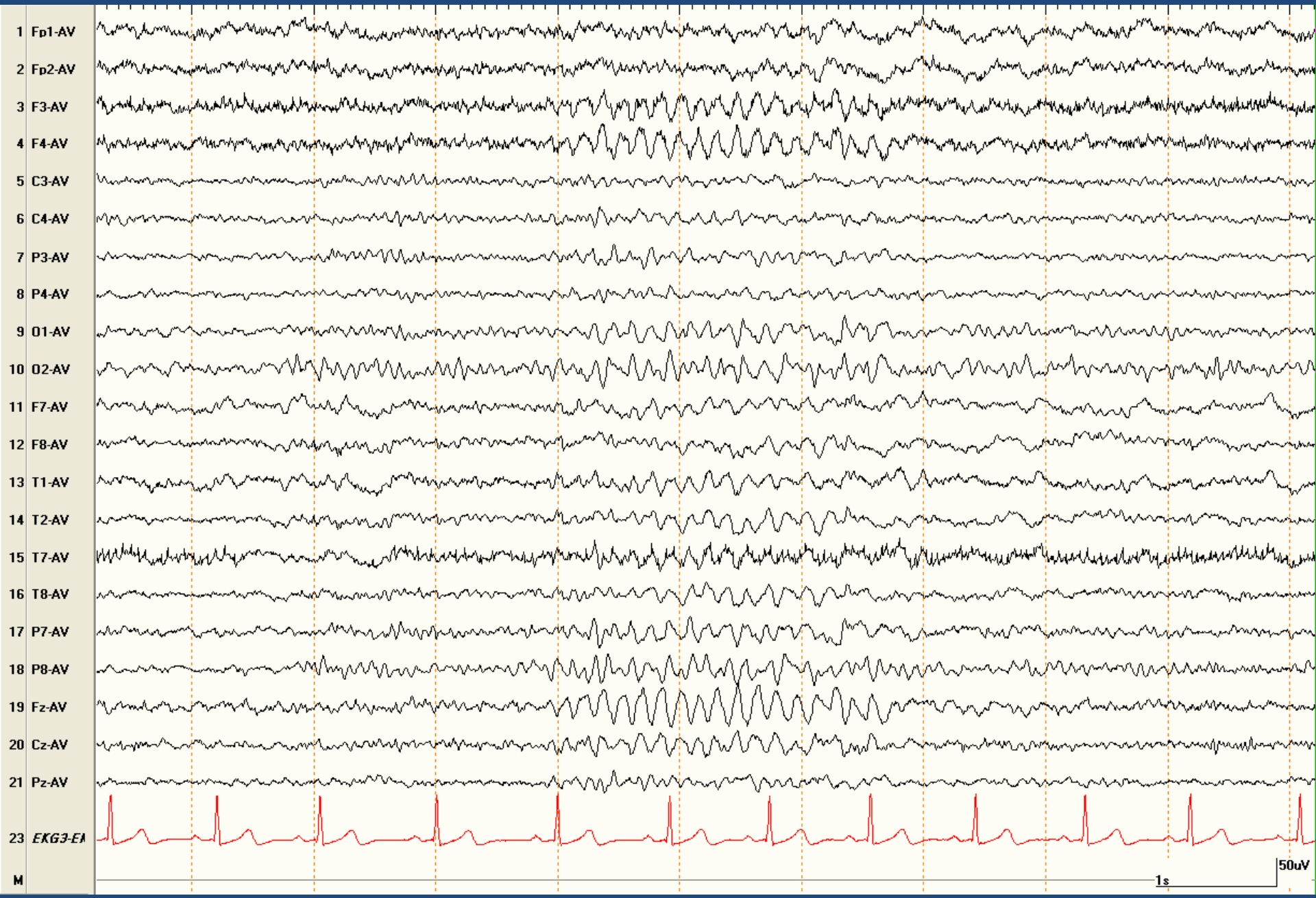


Bancaud phenomenon
(and right temporal-occipital slow activity)


Eyes Open
Awake
Fp1-F3
F3-C3
C3-P3
P3-O1
Fp2-F4
F4-C4
C4-P4
P4-O2
Fp1-F7
F7-T7
T7-P7
P7-O1
Fp2-F8
F8-T8
T8-P8
P8-O2
Fz-Cz
Cz-Pz
EKG
10:26:09 AM LB, 10 secs/screen, 7 µV/mm, 70.0 Hz, 1.000 Hz, Notch Off

Mu rhythm

- resting rhythm of central (premotor) cortex
  - Alpha or theta (7-11 Hz) spiky rhythm
  - Looks like the letter “μ”
- Attenuates with contralateral limb movement (or even thinking about movement)
- Often enhanced in presence of breach rhythm


1 Fp1-AV
2 Fp2-AV
3 F3-AV
4 F4-AV
5 C3-AV
6 C4-AV
7 P3-AV
8 P4-AV
9 O1-AV
10 O2-AV
11 F7-AV
12 F8-AV
13 T1-AV
14 T2-AV
15 T7-AV
16 T8-AV
17 P7-AV
18 P8-AV
19 Fz-AV
20 Cz-AV
21 Pz-AV
23 EKG3-EM
M
50uV
1s

Midline theta

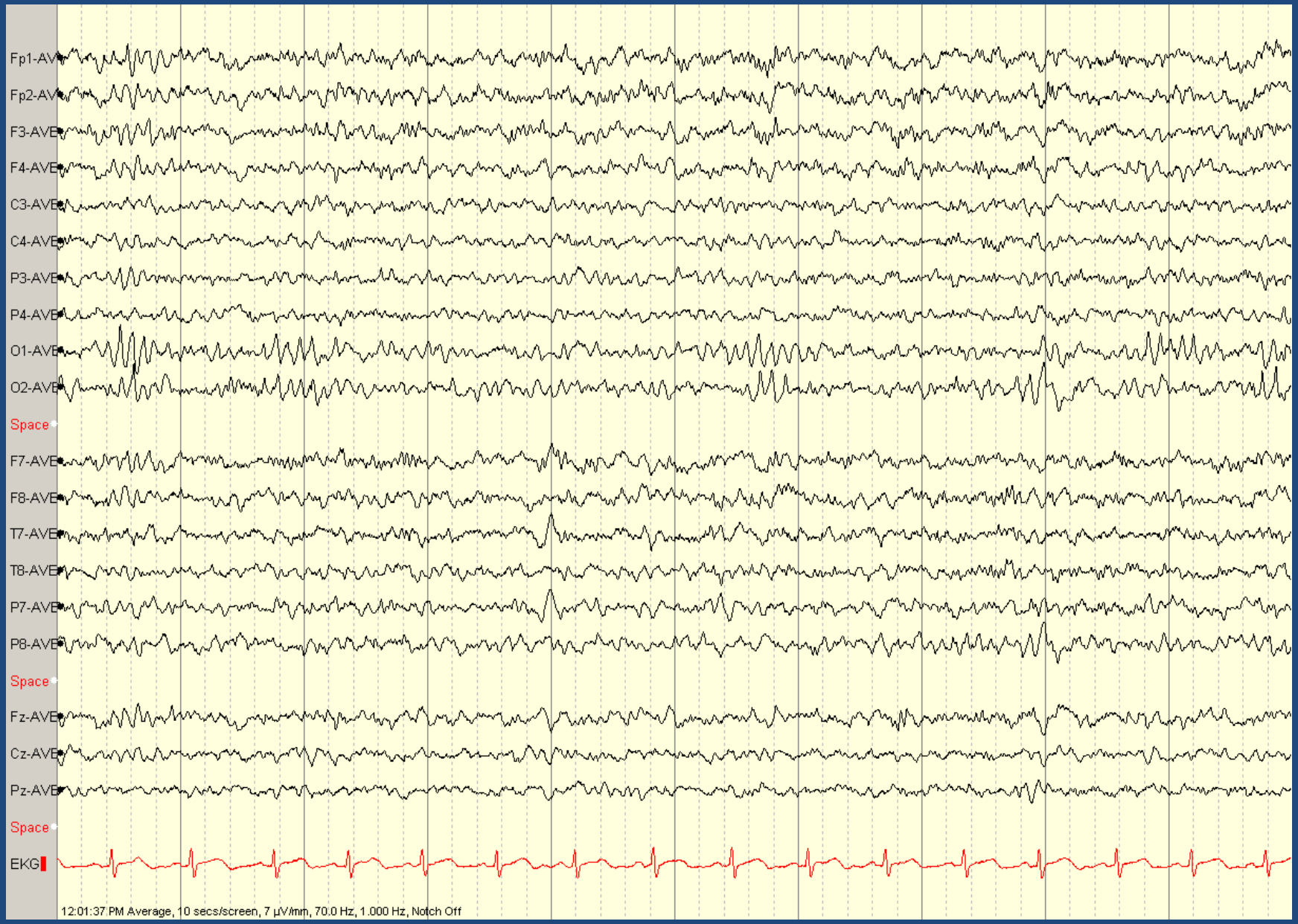
- a.k.a. Ciganek rhythm
- 5-7 Hz sinusoidal activity maximal at Cz or Fz
- may be spiky or arciform (mu-like)
- Present in awake and drowsy states
- Unrelated to eye opening, alerting, limb mvmt
- May enhance with concentration (midline frontal theta)

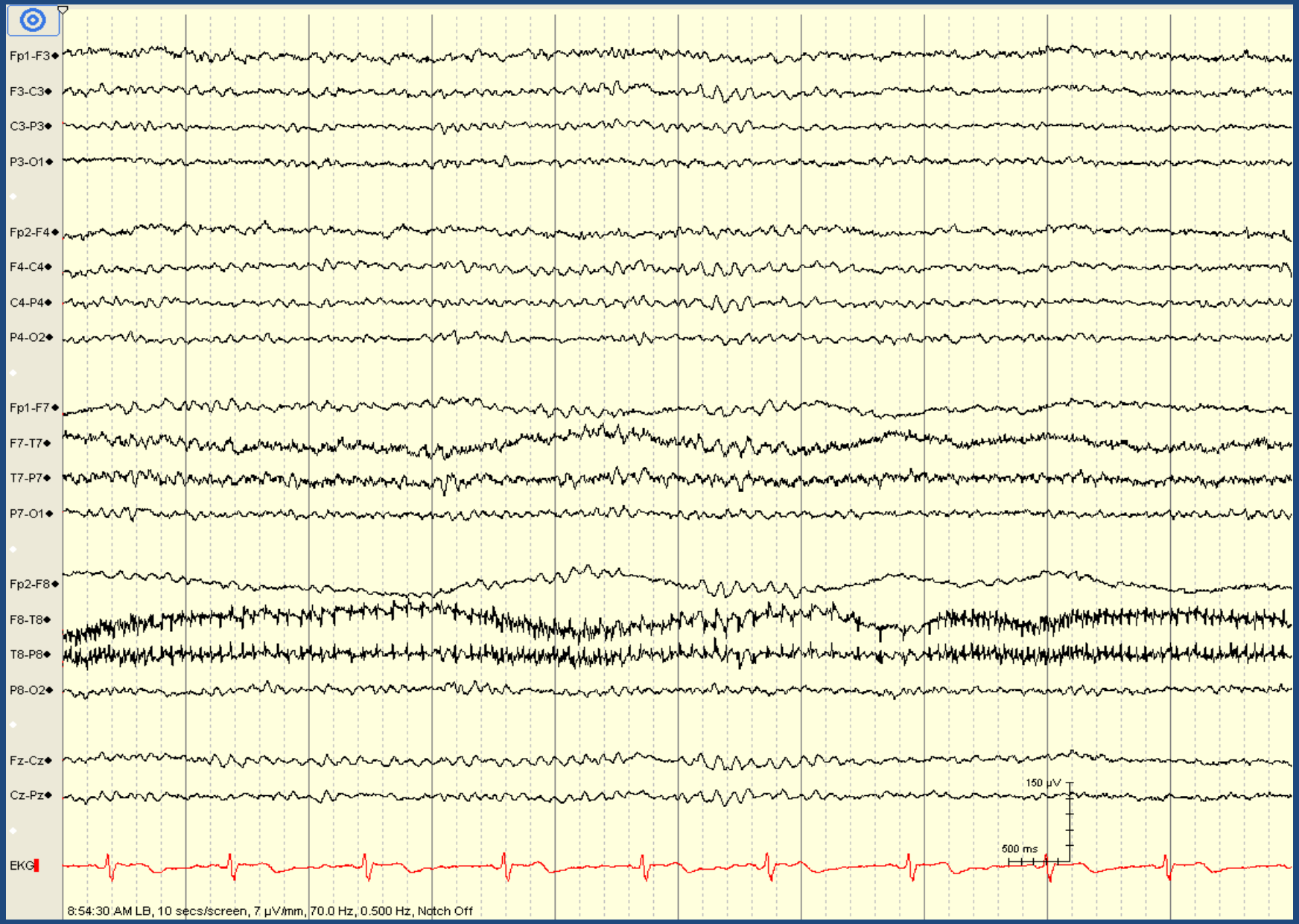
Which of the following is NOT a characteristic of Stage N1 Sleep?

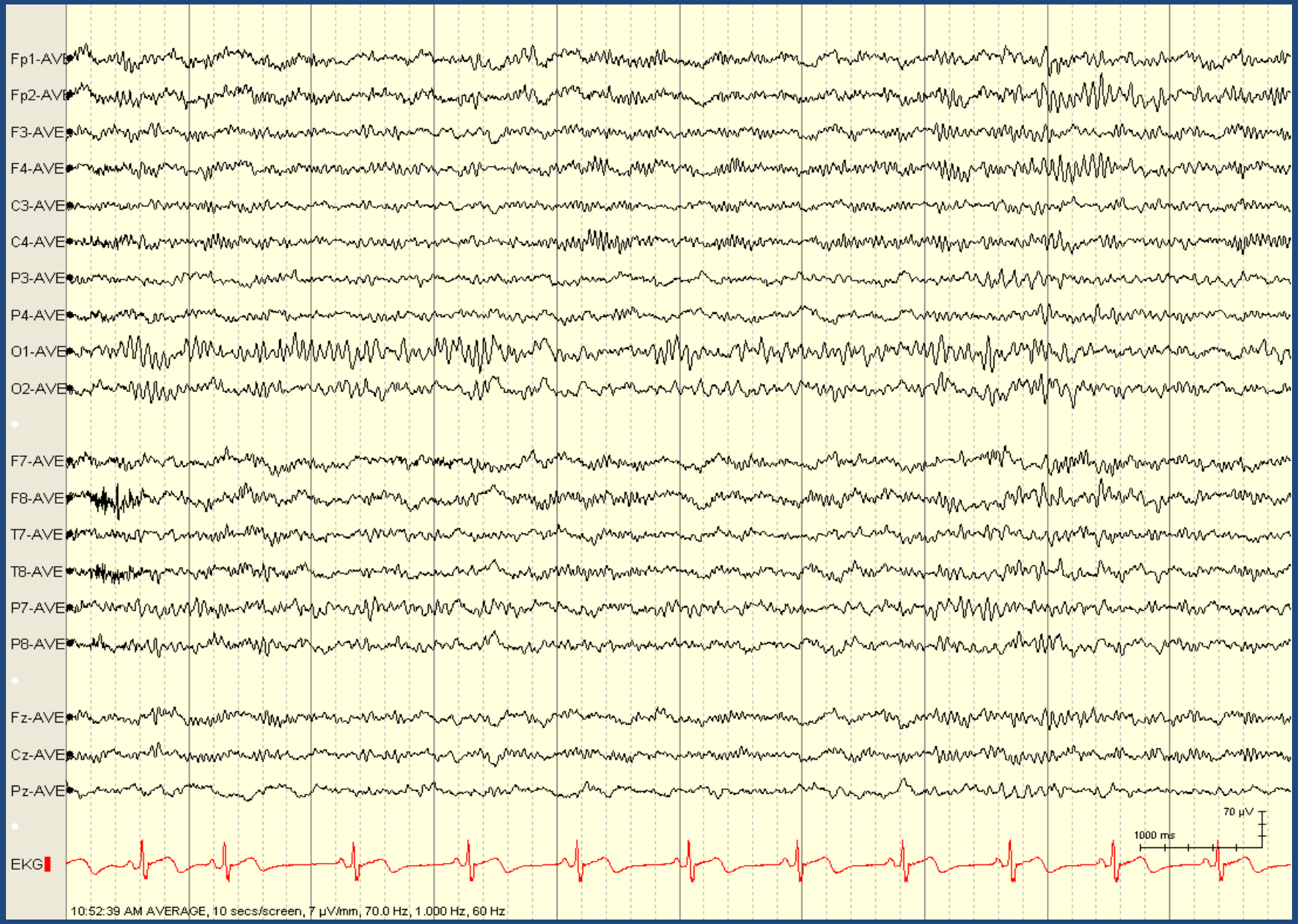
A. Slow lateral eye movements
B. Attenuation of posterior dominant rhythm
C. Emergence of sleep spindles
D. Emergence of vertex waves
E. Emergence of theta activity

Drowsy EEG

- Changes in PDR
  - Attenuation without eye opening
  - May slow by up to 1 Hz
  - May become anteriorly projected
- Slow lateral eye movements
- Emergence of theta activity (often bursts)
- Emergence of frontal beta activity


Fp1-AVE
Fp2-AVE
F3-AVE
F4-AVE
C3-AVE
C4-AVE
P3-AVE
P4-AVE
O1-AVE
O2-AVE
Space
F7-AVE
F8-AVE
T7-AVE
T8-AVE
P7-AVE
P8-AVE
Space
Fz-AVE
Cz-AVE
Pz-AVE
Space
EKG
12:01:37 PM Average, 10 secs/screen, 7 µV/mm, 70.0 Hz, 1.000 Hz, Notch Off


Fp1-F3
F3-C3
C3-P3
P3-O1
Fp2-F4
F4-C4
C4-P4
P4-O2
Fp1-F7
F7-T7
T7-P7
P7-O1
Fp2-F8
F8-T8
T8-P8
P8-O2
Fz-Cz
Cz-Pz
EKG
150 µV
500 ms
8:54:30 AM LB, 10 secs/screen, 7 µV/mm, 70.0 Hz, 0.500 Hz, Notch Off

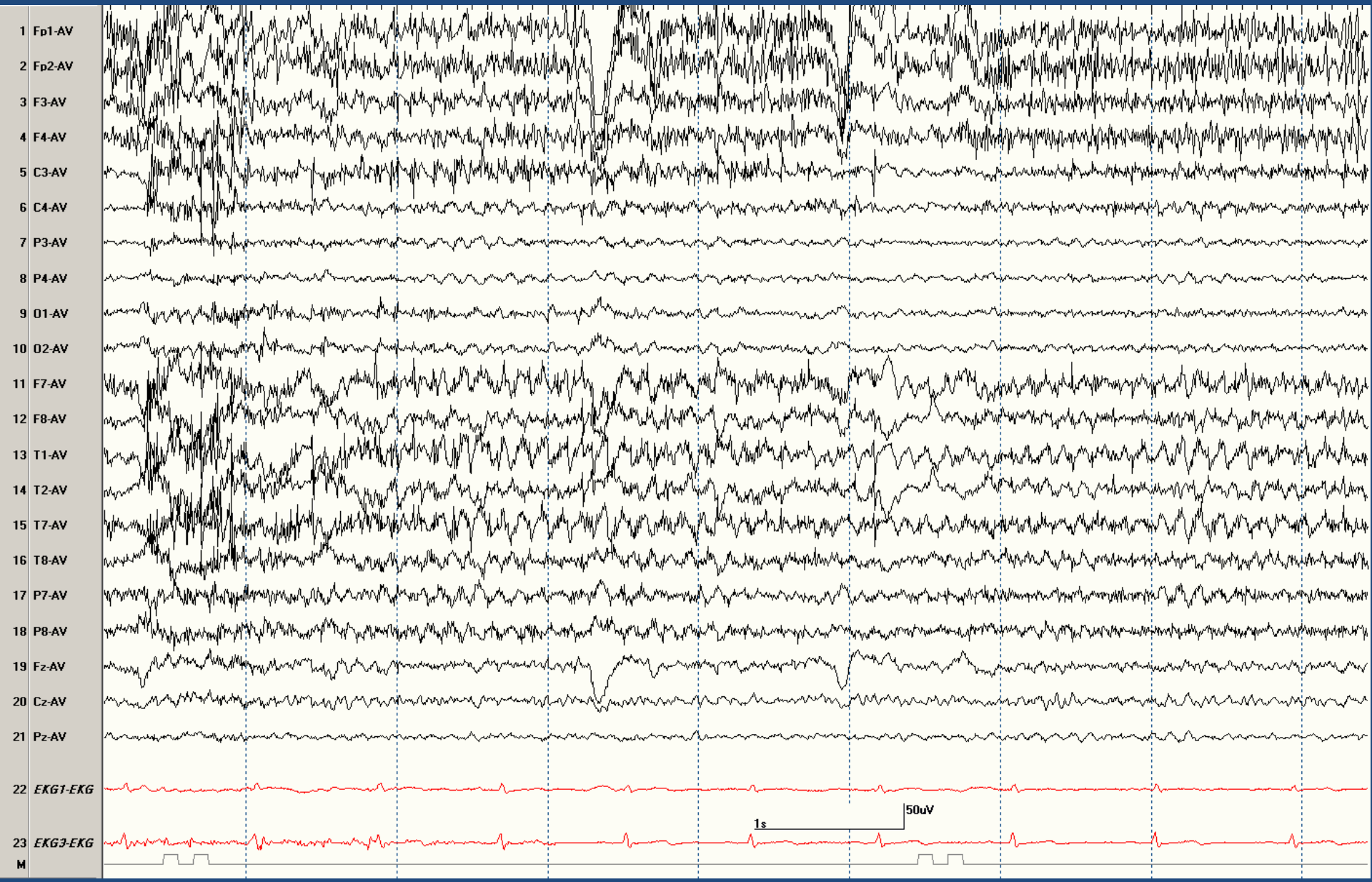

Fp1-AVE
Fp2-AVE
F3-AVE
F4-AVE
C3-AVE
C4-AVE
P3-AVE
P4-AVE
O1-AVE
O2-AVE
F7-AVE
F8-AVE
T7-AVE
T8-AVE
P7-AVE
P8-AVE
Fz-AVE
Cz-AVE
Pz-AVE
EKG
70 µV
1000 ms
10:52:39 AM AVERAGE, 10 secs/screen, 7 µV/mm, 70.0 Hz, 1.000 Hz, 60 Hz

Frontal Beta Activity

- Resting rhythm of the frontal lobes
- Best seen in drowsiness

- Abnormal*
  - Generalized
  - High voltage (>30 µV)
  - Persistent in sleep or awake states

*think benzodiazepines, barbiturates, and propofol


1 Fp1-AV
2 Fp2-AV
3 F3-AV
4 F4-AV
5 C3-AV
6 C4-AV
7 P3-AV
8 P4-AV
9 O1-AV
10 O2-AV
11 F7-AV
12 F8-AV
13 T1-AV
14 T2-AV
15 T7-AV
16 T8-AV
17 P7-AV
18 P8-AV
19 Fz-AV
20 Cz-AV
21 Pz-AV
22 EKG1-EKG
23 EKG3-EKG
M
1s
50uV

Third rhythm

- Resting rhythm of temporal cortex
- Alpha or theta (7-11 Hz) sinusoidal rhythm
- May be asynchronous or unilateral
- Can be seen in waking or drowsiness
- If not seen, EEG may still be normal

Which of the following features is especially useful in differentiating normal / benign variants from true epileptiform discharges?

A. Benign variants attenuate during deeper sleep
B. Benign variants disrupt the background rhythms
C. Benign variants have associated slow activity
D. Benign variants are blunt (not sharp or spike)
E. Benign variants are low voltage

Benign Variants

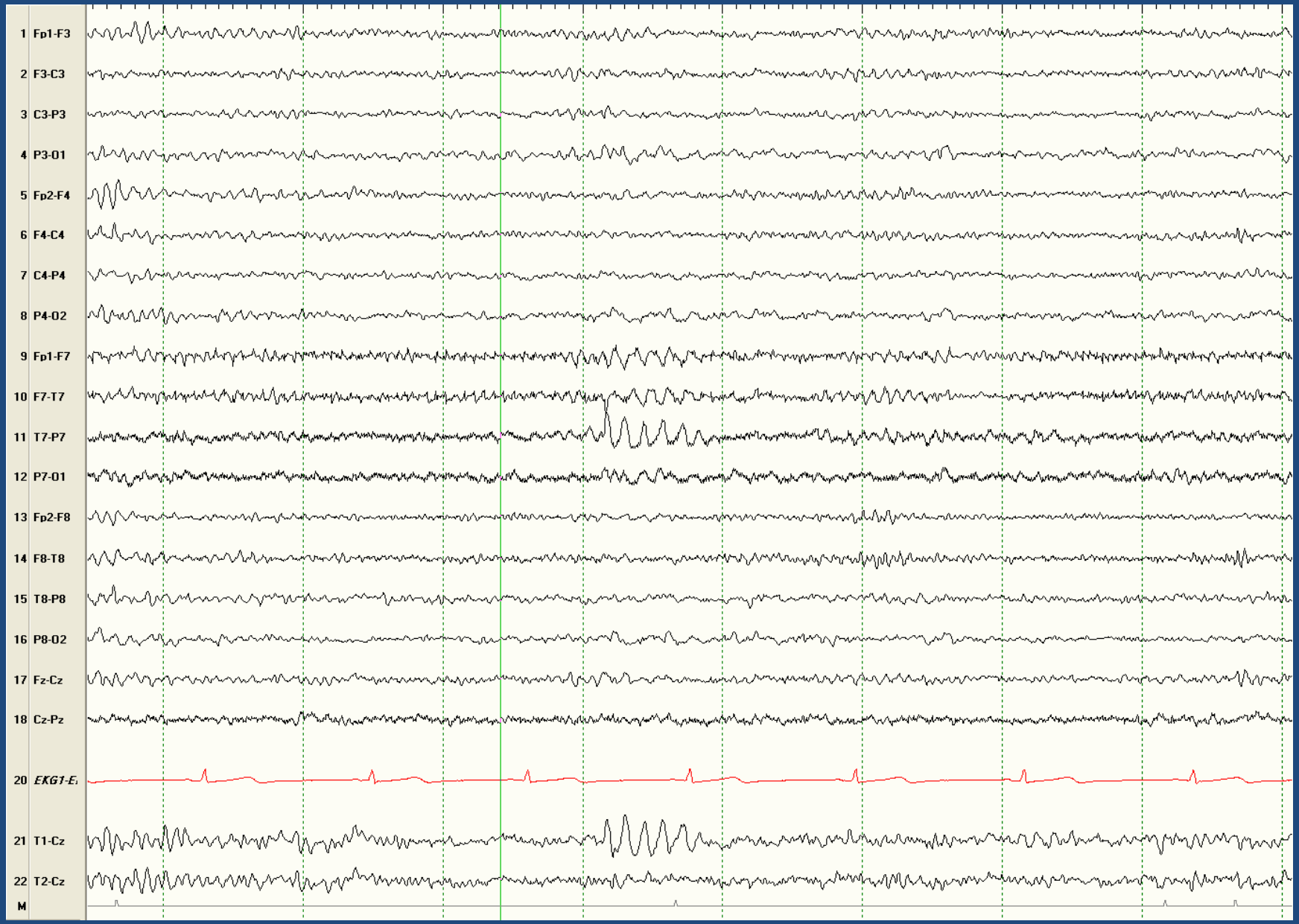
- May be rhythmic or occur in isolation
- May be high or low voltage (typically low)
- May be quite “sharp” or “spiky”

- Usually in drowsiness (not in deeper sleep)

- Should not disrupt the background
  - Have a “smooth” rhythm
  - No associated slow / delta activity

Which of the following normal / benign variants occurs in waking (and not drowsiness)?

A. Wicket waves
B. 14- and 6-Hz positive bursts
C. Small sharp spikes
D. Lambda waves
E. Psychomotor variant


1 Fp1-F3
2 F3-C3
3 C3-P3
4 P3-O1
5 Fp2-F4
6 F4-C4
7 C4-P4
8 P4-O2
9 Fp1-F7
10 F7-T7
11 T7-P7
12 P7-O1
13 Fp2-F8
14 F8-T8
15 T8-P8
16 P8-O2
17 Fz-Cz
18 Cz-Pz
20 EKG1-E
21 T1-Cz
22 T2-Cz
M


1 Fp1-AV
2 Fp2-AV
3 F3-AV
4 F4-AV
5 C3-AV
6 C4-AV
7 P3-AV
8 P4-AV
9 O1-AV
10 O2-AV
11 F7-AV
12 F8-AV
13 T1-AV
14 T2-AV
15 T7-AV
16 T8-AV
17 P7-AV
18 P8-AV
19 Fz-AV
20 Cz-AV
21 Pz-AV
22 EKG1-E
M

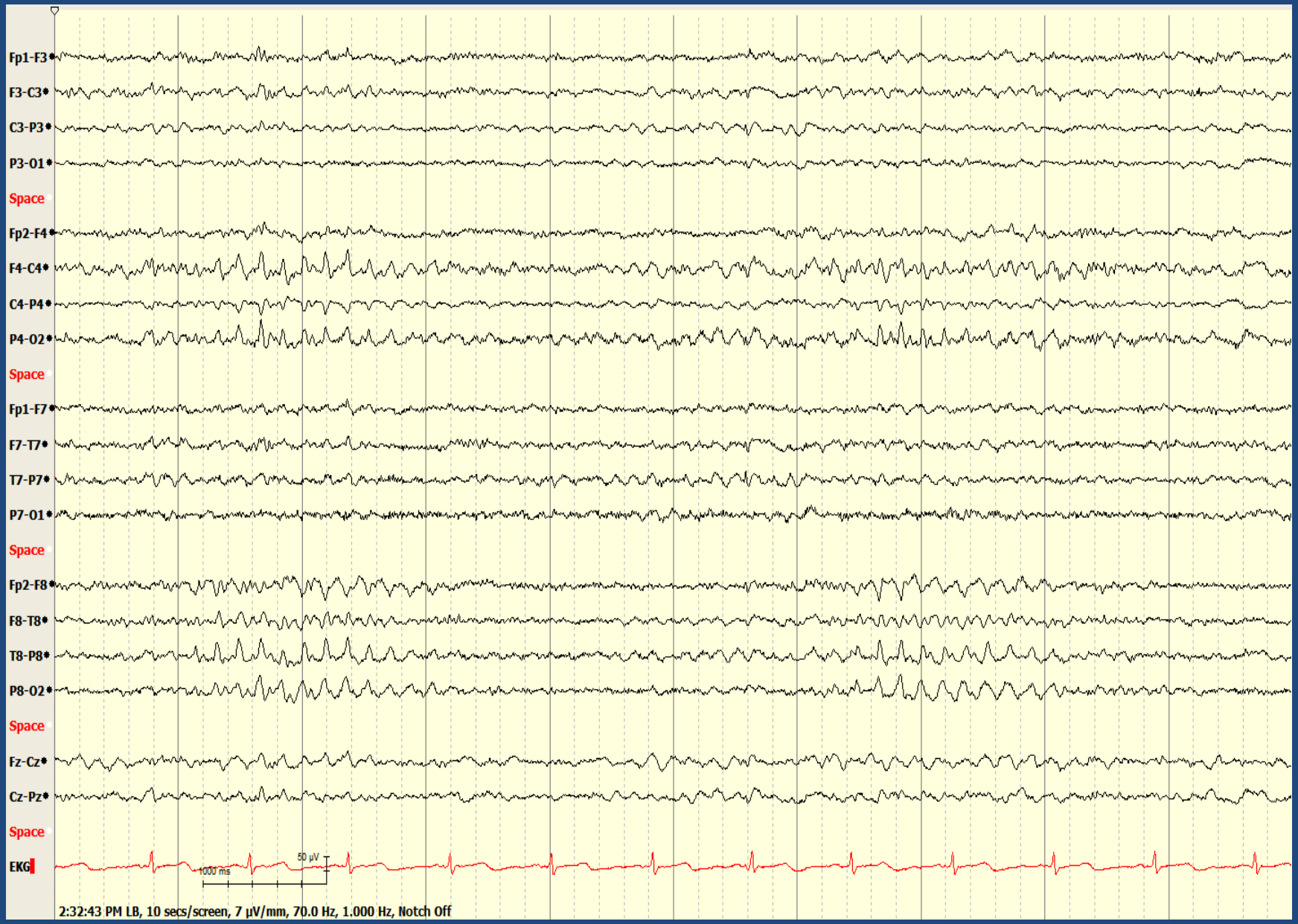
Wickets

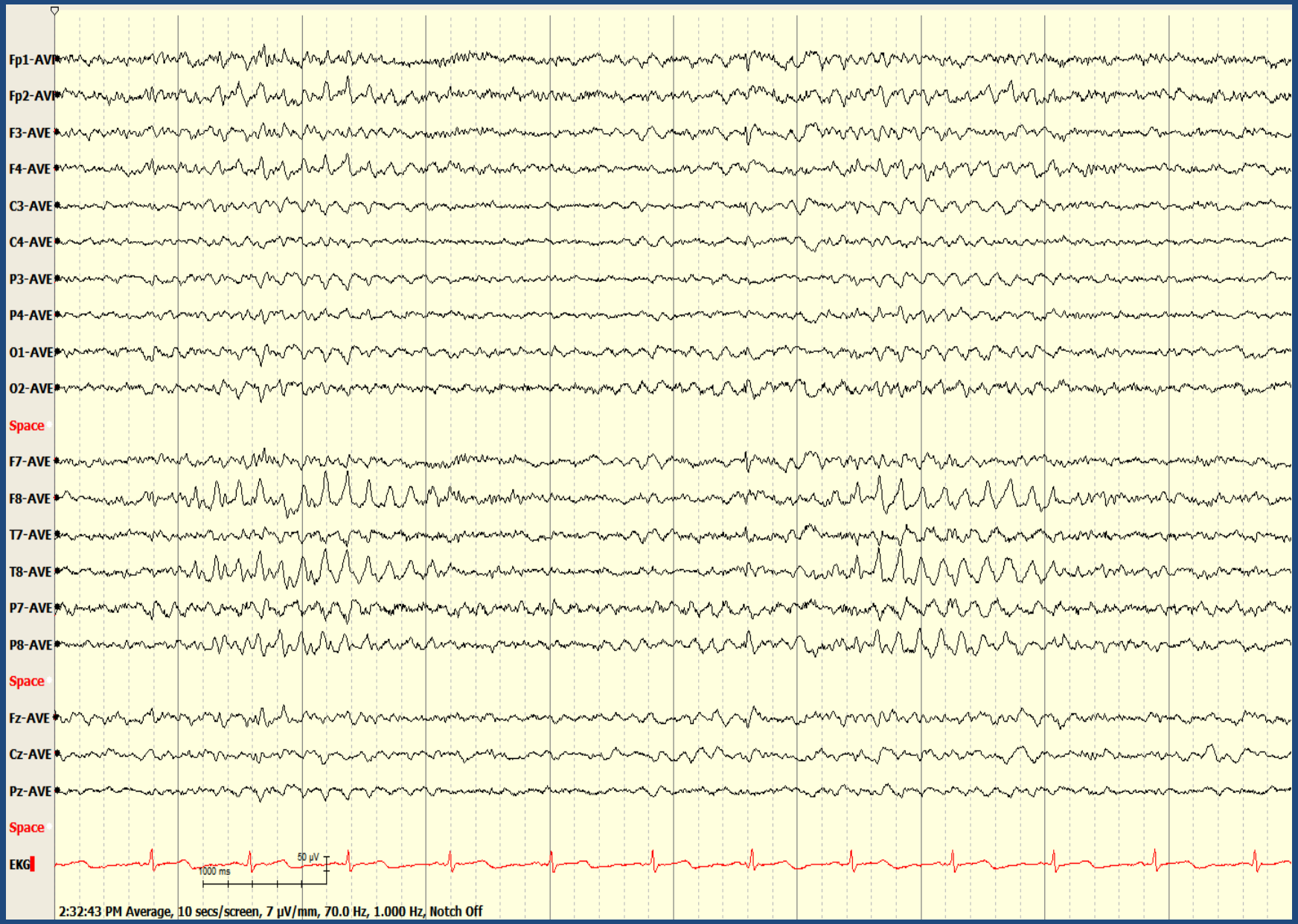
- Rhythmic bursts of monophasic 6-11 Hz activity
- Seen bitemporally in drowsiness (not in deep sleep)
- Typically occur in trains or runs
  - don’t disrupt background
  - tend to be “isosceles” (no aftergoing slow wave)
  - when seen as single waves – may be overinterpreted
  - surrounded by similar waves (may be lower amplitude)
- On a spectrum with third rhythm

Wickets

- One of the most commonly over-read benign variants
- One study re-read EEGs of patients referred to an epilepsy center
  - over 50% (25/46) had wicket rhythms misinterpreted as epileptiform
  - these 25 patients had nonepileptic clinical episodes
- Wicket rhythms tend to be more LEFT sided (“classic” teaching is incorrect)

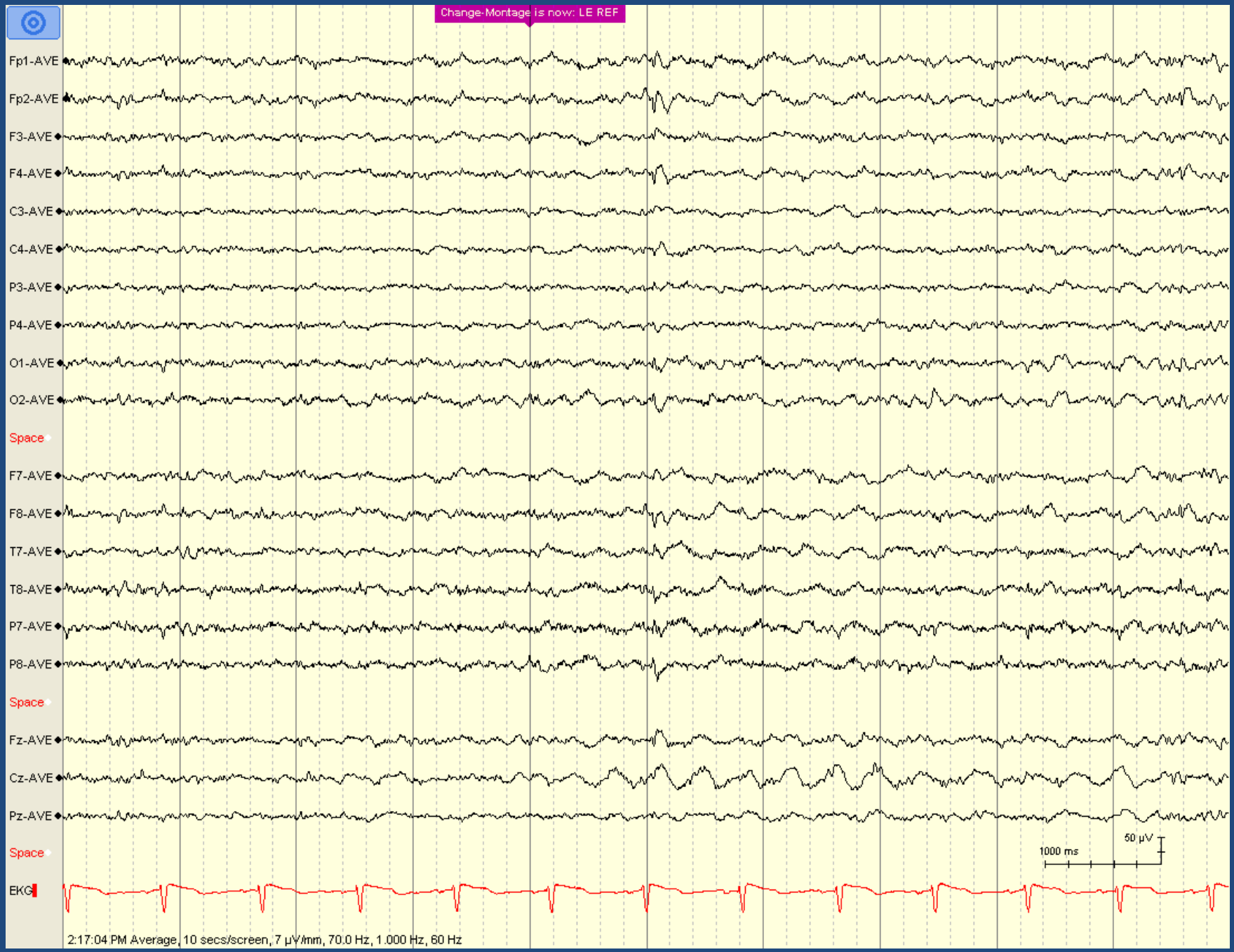
Krauss GL, et al. "Clinical and EEG features of patients with EEG wicket rhythms misdiagnosed with epilepsy." *Neurology* 64.11 (2005): 1879-1883.
Azzam RH, Arain AM, and Azar NJ. "Revisiting the Laterality of Wicket Spikes With Continuous EEG." *Journal of Clinical Neurophysiology* 32.2 (2015): e8-e11.
Vallabhaneni M, et al. "A case–control study of wicket spikes using video-EEG monitoring." *Seizure* 22.1 (2013): 14-19.

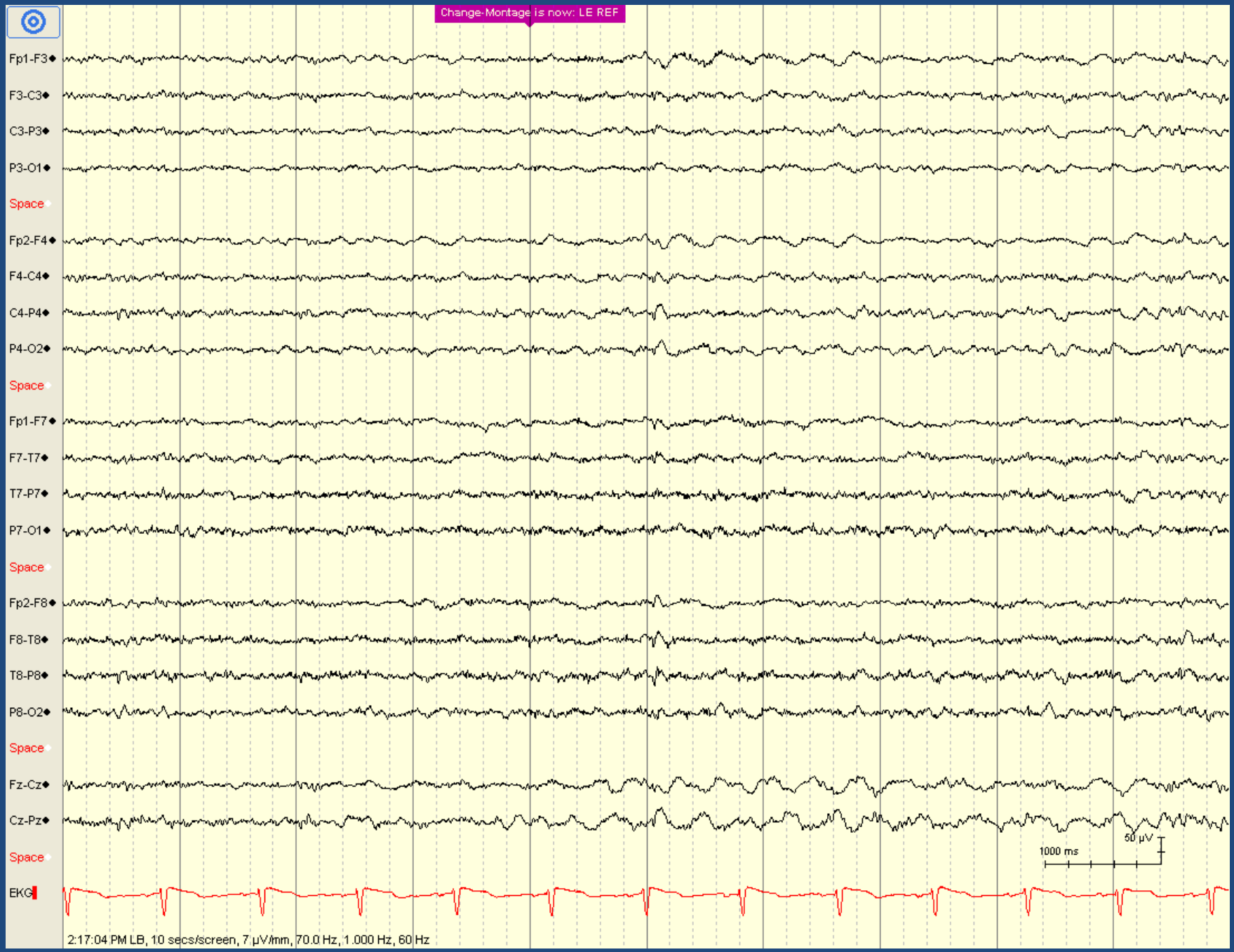

Fp1-F3*
F3-C3*
C3-P3*
P3-O1*
Space
Fp2-F4*
F4-C4*
C4-P4*
P4-O2*
Space
Fp1-F7*
F7-T7*
T7-P7*
P7-O1*
Space
Fp2-F8*
F8-T8*
T8-P8*
P8-O2*
Space
Fz-Cz*
Cz-Pz*
Space
EKG
50 µV
1000 ms
2:32:43 PM LB, 10 secs/screen, 7 µV/mm, 70.0 Hz, 1.000 Hz, Notch Off

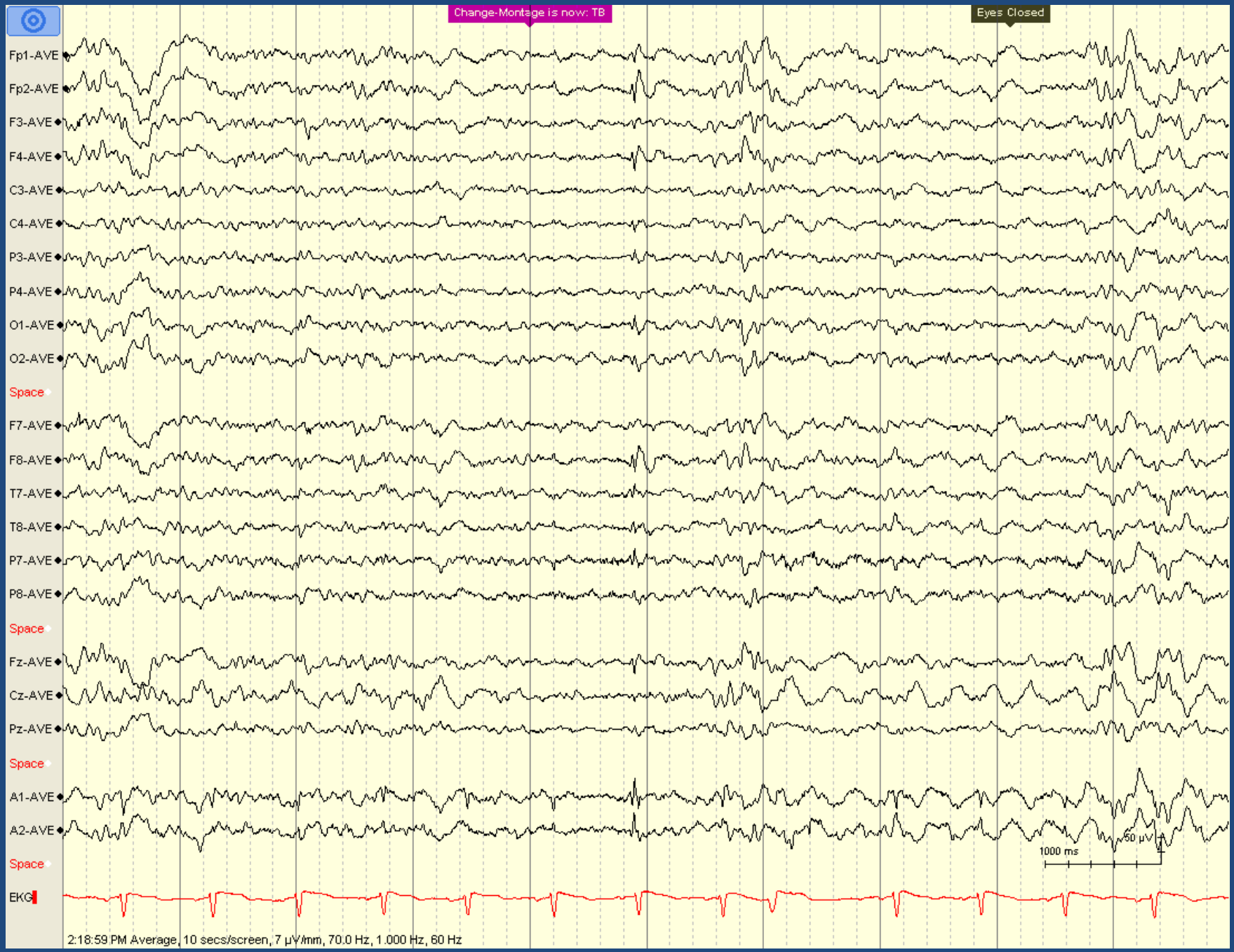

Fp1-AVE
Fp2-AVE
F3-AVE
F4-AVE
C3-AVE
C4-AVE
P3-AVE
P4-AVE
O1-AVE
O2-AVE
Space
F7-AVE
F8-AVE
T7-AVE
T8-AVE
P7-AVE
P8-AVE
Space
Fz-AVE
Cz-AVE
Pz-AVE
Space
EKG
50 µV
1000 ms
2:32:43 PM Average, 10 secs/screen, 7 µV/mm, 70.0 Hz, 1.000 Hz, Notch Off

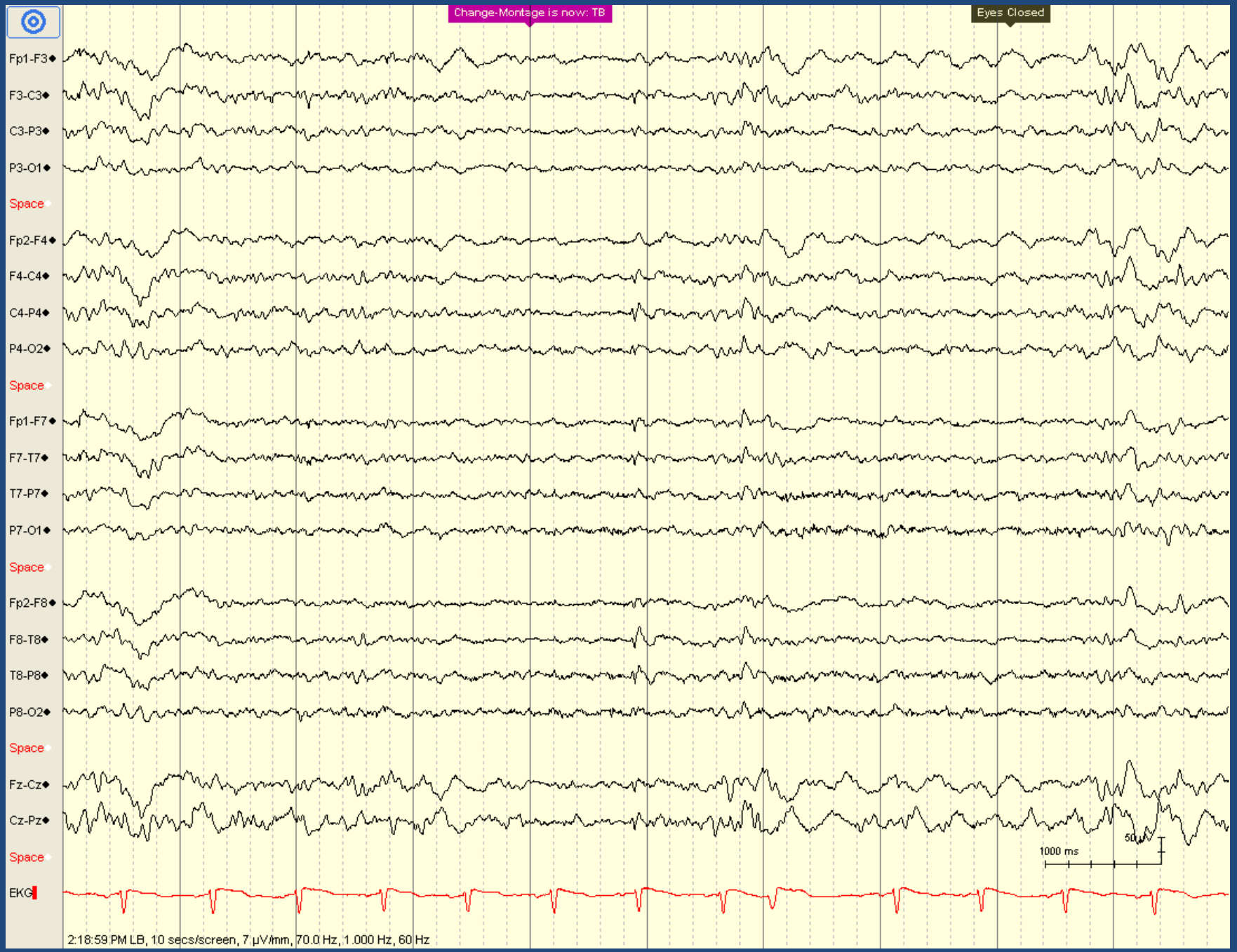
Rhythmic Temporal Theta Bursts of Drowsiness (RTTBD)
Rhythmic Midtemporal Theta of Drowsiness (RMTD)
Psychomotor variant

- Bursts of rhythmic, notched 5-7 Hz activity
- Bi-synchronous or bilateral independent in the midtemporal regions
- Seen in drowsiness (disappear in deeper sleep)


Change-Montage is now: LE REF
Fp1-AVE
Fp2-AVE
F3-AVE
F4-AVE
C3-AVE
C4-AVE
P3-AVE
P4-AVE
O1-AVE
O2-AVE
Space
F7-AVE
F8-AVE
T7-AVE
T8-AVE
P7-AVE
P8-AVE
Space
Fz-AVE
Cz-AVE
Pz-AVE
Space
EKG
50 µV
1000 ms
2:17:04 PM Average, 10 secs/screen, 7 µV/mm, 70.0 Hz, 1.000 Hz, 60 Hz

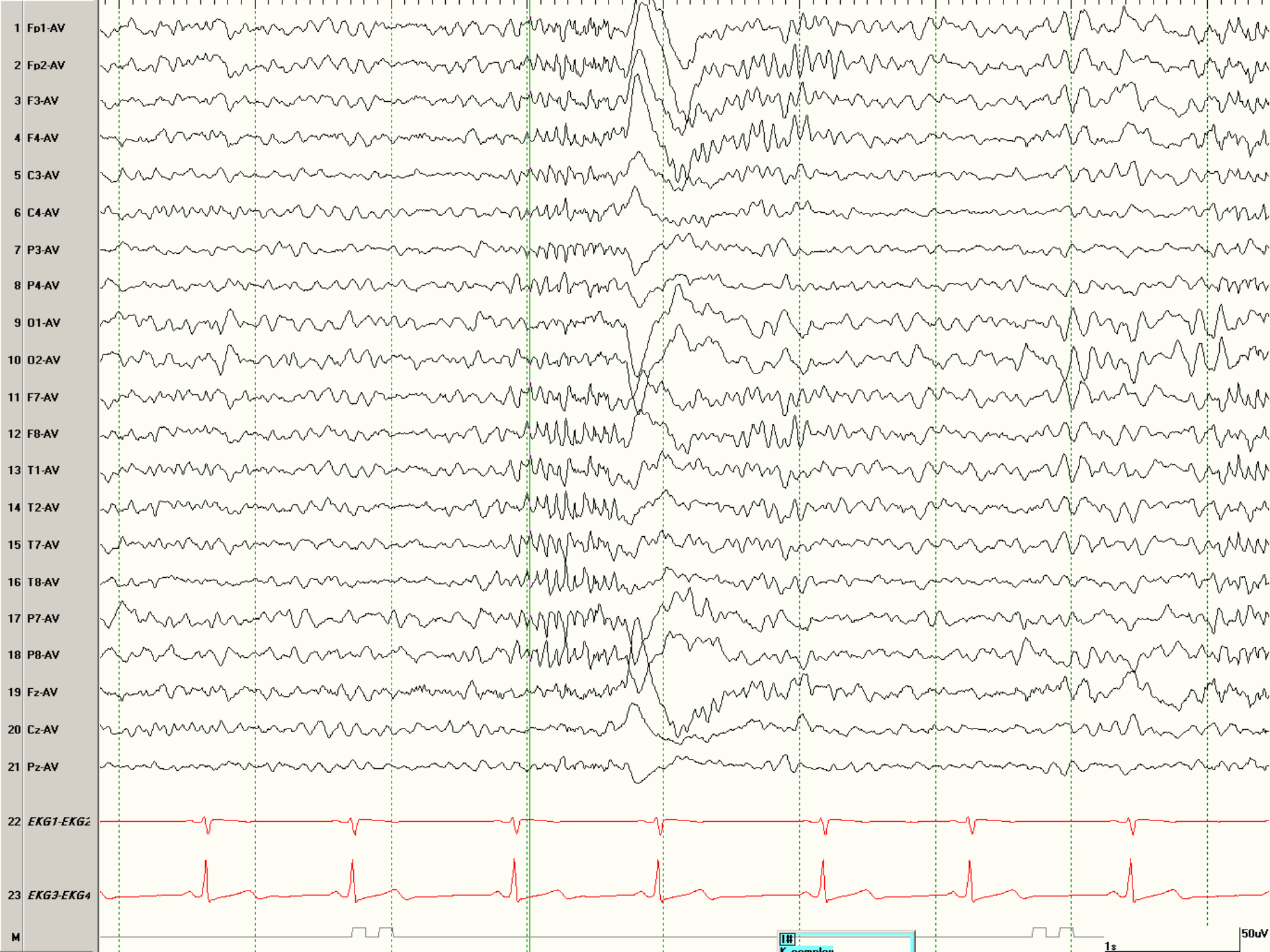

Change-Montage is now: LE REF
Fp1-F3
F3-C3
C3-P3
P3-O1
Space
Fp2-F4
F4-C4
C4-P4
P4-O2
Space
Fp1-F7
F7-T7
T7-P7
P7-O1
Space
Fp2-F8
F8-T8
T8-P8
P8-O2
Space
Fz-Cz
Cz-Pz
Space
EKG
50 µV
1000 ms
2:17:04 PM LB, 10 secs/screen, 7 µV/mm, 70.0 Hz, 1.000 Hz, 60 Hz


Change-Montage is now: TB
Eyes Closed
Fp1-AVE
Fp2-AVE
F3-AVE
F4-AVE
C3-AVE
C4-AVE
P3-AVE
P4-AVE
O1-AVE
O2-AVE
Space
F7-AVE
F8-AVE
T7-AVE
T8-AVE
P7-AVE
P8-AVE
Space
Fz-AVE
Cz-AVE
Pz-AVE
Space
A1-AVE
A2-AVE
Space
EKG
50 µV
1000 ms
2:18:59 PM Average, 10 secs/screen, 7 µV/mm, 70.0 Hz, 1.000 Hz, 60 Hz


Change-Montage is now: TB
Eyes Closed
Fp1-F3
F3-C3
C3-P3
P3-O1
Space
Fp2-F4
F4-C4
C4-P4
P4-O2
Space
Fp1-F7
F7-T7
T7-P7
P7-O1
Space
Fp2-F8
F8-T8
T8-P8
P8-O2
Space
Fz-Cz
Cz-Pz
Space
EKG
50
1000 ms
2:18:59 PM LB, 10 secs/screen, 7 µV/mm, 70.0 Hz, 1.000 Hz, 60 Hz

Benign Sporadic Sleep Spikes (BSSS)
Benign Epileptiform Transients of Sleep (BETS)
Small Sharp Spikes (SSS)

- Typically < 50 ms and < 50µV
- May be diphasic (morphology varies)
- May have a transverse dipole
- Usually seen bilaterally independently
- Appear in drowsiness (disappear in deeper sleep)
- Do not distort background; no associated slow activity


1 Fp1-AV
2 Fp2-AV
3 F3-AV
4 F4-AV
5 C3-AV
6 C4-AV
7 P3-AV
8 P4-AV
9 O1-AV
10 O2-AV
11 F7-AV
12 F8-AV
13 T1-AV
14 T2-AV
15 T7-AV
16 T8-AV
17 P7-AV
18 P8-AV
19 Fz-AV
20 Cz-AV
21 Pz-AV
22 EKG1-EKG2
23 EKG3-EKG4
M
K-complex
1s
50uV


1 Fp1-$M2
2 Fp2-$M1
3 F3-$M2
4 F4-$M1
5 C3-$M2
6 C4-$M1
7 P3-$M2
8 P4-$M1
9 O1-$M2
10 O2-$M1
11 F7-$M2
12 F8-$M1
13 T7-$M2
14 T8-$M1
15 P7-$M2
16 P8-$M1
17 Fz-$M2
18 Cz-$M2
19 Pz-$M2
20 T1-$M2
21 T2-$M1
22 EKG1-EKG2
23 EKG3-EKG4


1 Fp1-$M2
2 Fp2-$M1
3 F3-$M2
4 F4-$M1
5 C3-$M2
6 C4-$M1
7 P3-$M2
8 P4-$M1
9 O1-$M2
10 O2-$M1
11 F7-$M2
12 F8-$M1
13 T7-$M2
14 T8-$M1
15 P7-$M2
16 P8-$M1
17 Fz-$M2
18 Cz-$M2
19 Pz-$M2
20 T1-$M2
21 T2-$M1
22 EKG1-EKG2
23 EKG3-EKG4
M
1s
50uV

14- and 6-Hz positive bursts (ctenoids)

- Intermixed 14 Hz and 6-7 Hz activity
- Wide field positive polarity (posterior temporal predominance)
- Best confirmed on contralateral ear montage (long distance referential)
- Occur in N1 or N2 sleep
- Seen in normal adolescents but also in hepatic disease (Reye syndrome, hepatic encephalopathy)

6-Hz Phantom Spike-and-Wave

- Spike is often very low voltage (“phantom”)
- Occur in two forms:

WHAM	FOLD
Waking	Female
High Amplitude	Occipital
Anterior	Low Amplitude
Male	Drowsiness

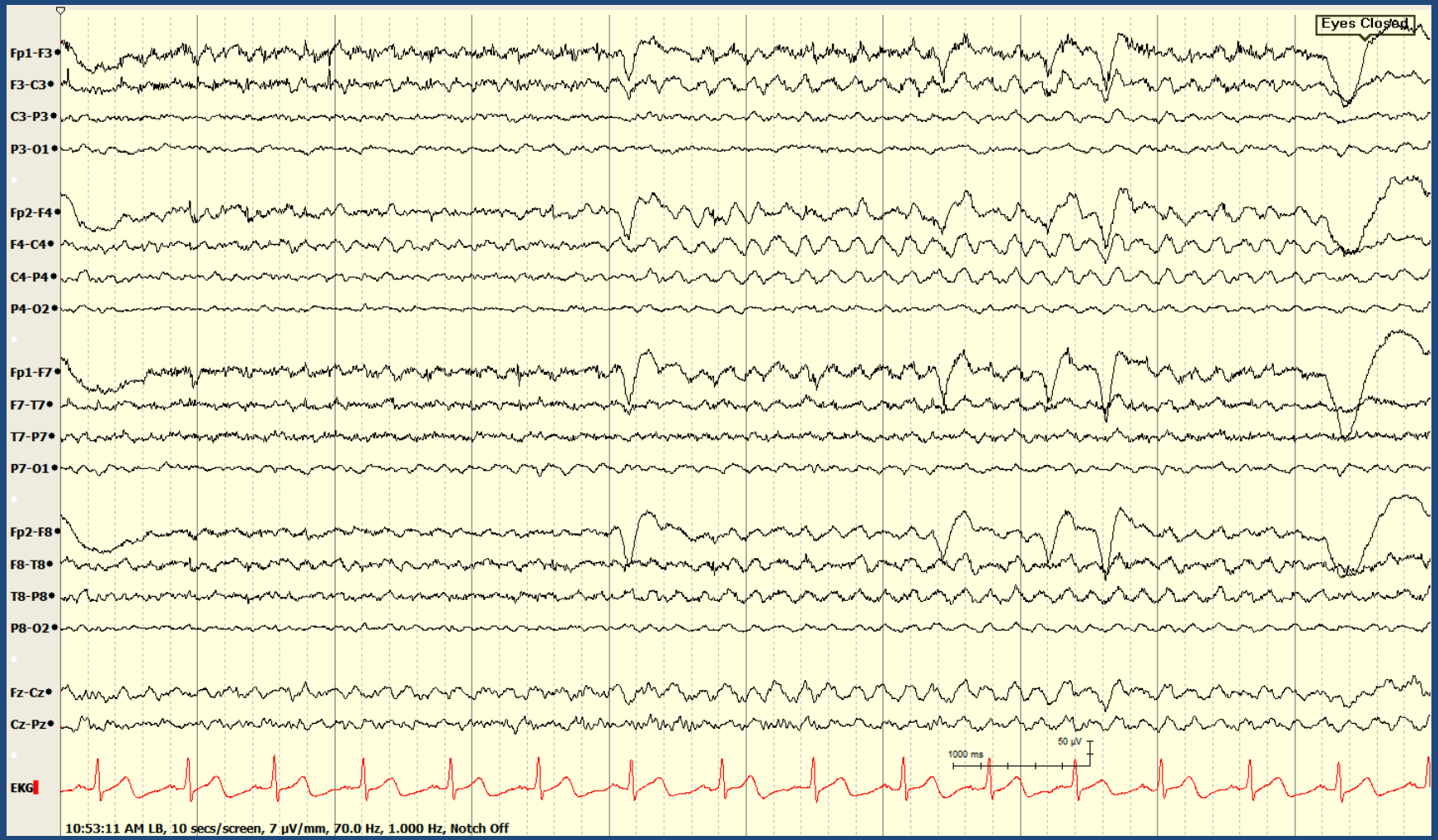
- WHAMs have an association with epilepsy (may actually represent true epileptiform frontally predominant generalized spike-and-wave)

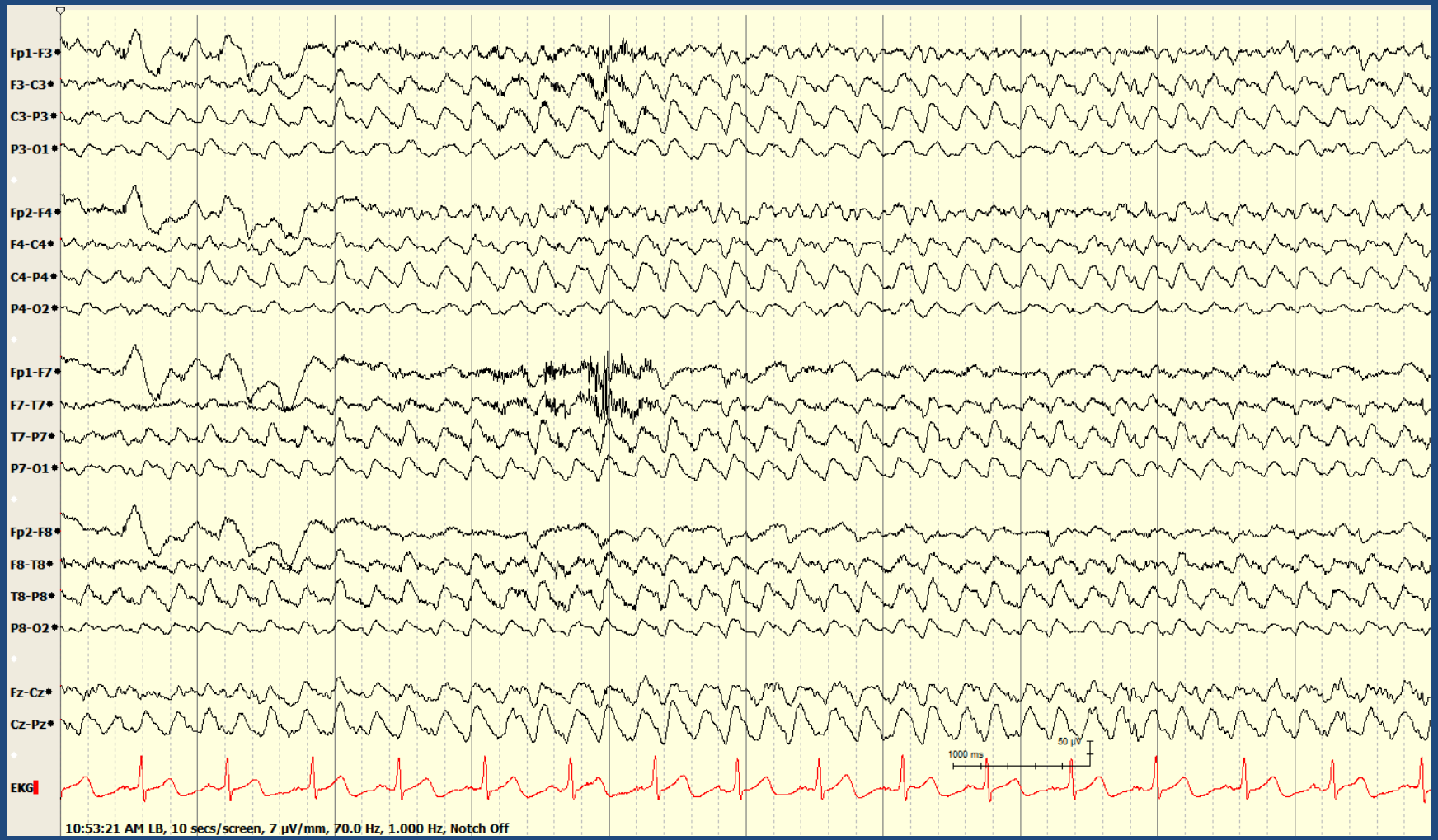
Which of the following features is necessary to diagnosis SREDA (subclinical rhythmic electrographic discharges of adults)?

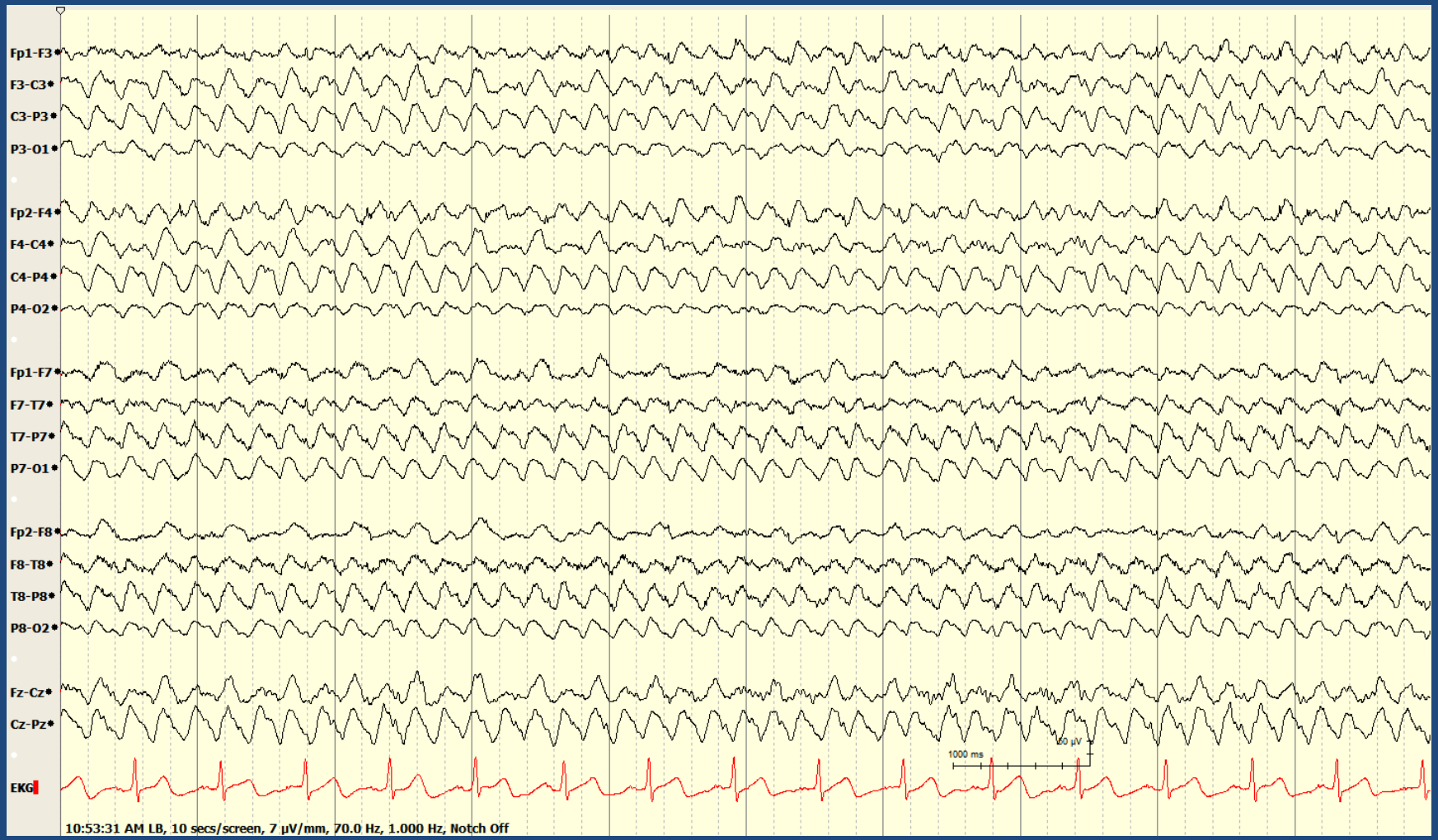
A. Age > 65 years
B. Lack of clinical signs during discharge
C. Normal EEG outside of SREDA
D. Occurs during N2 sleep
E. Occurs during N3 sleep

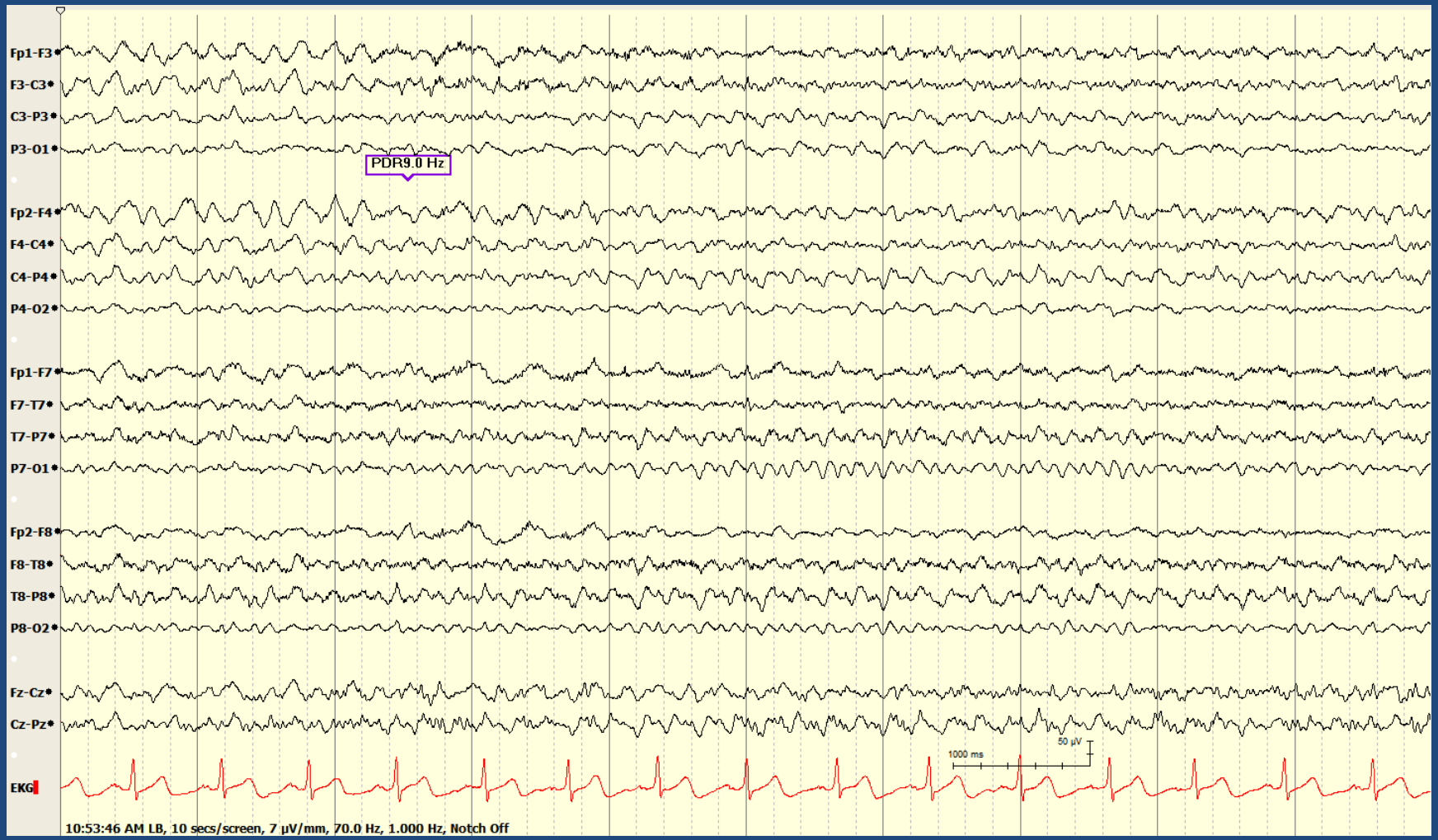
Subclinical Rhythmic Electrographic Discharges in Adults (SREDA)

- Mainly seen in older adults in waking or drowsiness (often during HV)
- Wide field (parietal or posterior temporal predominance)
- Mixed delta-theta rhythmic activity that evolves to faster frequencies over 20-80 seconds
- Has been described as ‘seizure’ in reverse
- Must be <u>without</u> clinical signs


Eyes Closed
Fp1-F3
F3-C3
C3-P3
P3-O1
Fp2-F4
F4-C4
C4-P4
P4-O2
Fp1-F7
F7-T7
T7-P7
P7-O1
Fp2-F8
F8-T8
T8-P8
P8-O2
Fz-Cz
Cz-Pz
EKG
50 µV
1000 ms
10:53:11 AM LB, 10 secs/screen, 7 µV/mm, 70.0 Hz, 1.000 Hz, Notch Off


Fp1-F3*
F3-C3*
C3-P3*
P3-O1*
Fp2-F4*
F4-C4*
C4-P4*
P4-O2*
Fp1-F7*
F7-T7*
T7-P7*
P7-O1*
Fp2-F8*
F8-T8*
T8-P8*
P8-O2*
Fz-Cz*
Cz-Pz*
EKG
1000 ms
50 µV
10:53:21 AM LB, 10 secs/screen, 7 µV/mm, 70.0 Hz, 1.000 Hz, Notch Off


Fp1-F3*
F3-C3*
C3-P3*
P3-O1*
Fp2-F4*
F4-C4*
C4-P4*
P4-O2*
Fp1-F7*
F7-T7*
T7-P7*
P7-O1*
Fp2-F8*
F8-T8*
T8-P8*
P8-O2*
Fz-Cz*
Cz-Pz*
EKG
1000 ms
50 µV
10:53:31 AM LB, 10 secs/screen, 7 µV/mm, 70.0 Hz, 1.000 Hz, Notch Off


Fp1-F3
F3-C3
C3-P3
P3-O1
PDR9.0 Hz
Fp2-F4
F4-C4
C4-P4
P4-O2
Fp1-F7
F7-T7
T7-P7
P7-O1
Fp2-F8
F8-T8
T8-P8
P8-O2
Fz-Cz
Cz-Pz
50 µV
1000 ms
EKG
10:53:46 AM LB, 10 secs/screen, 7 µV/mm, 70.0 Hz, 1.000 Hz, Notch Off

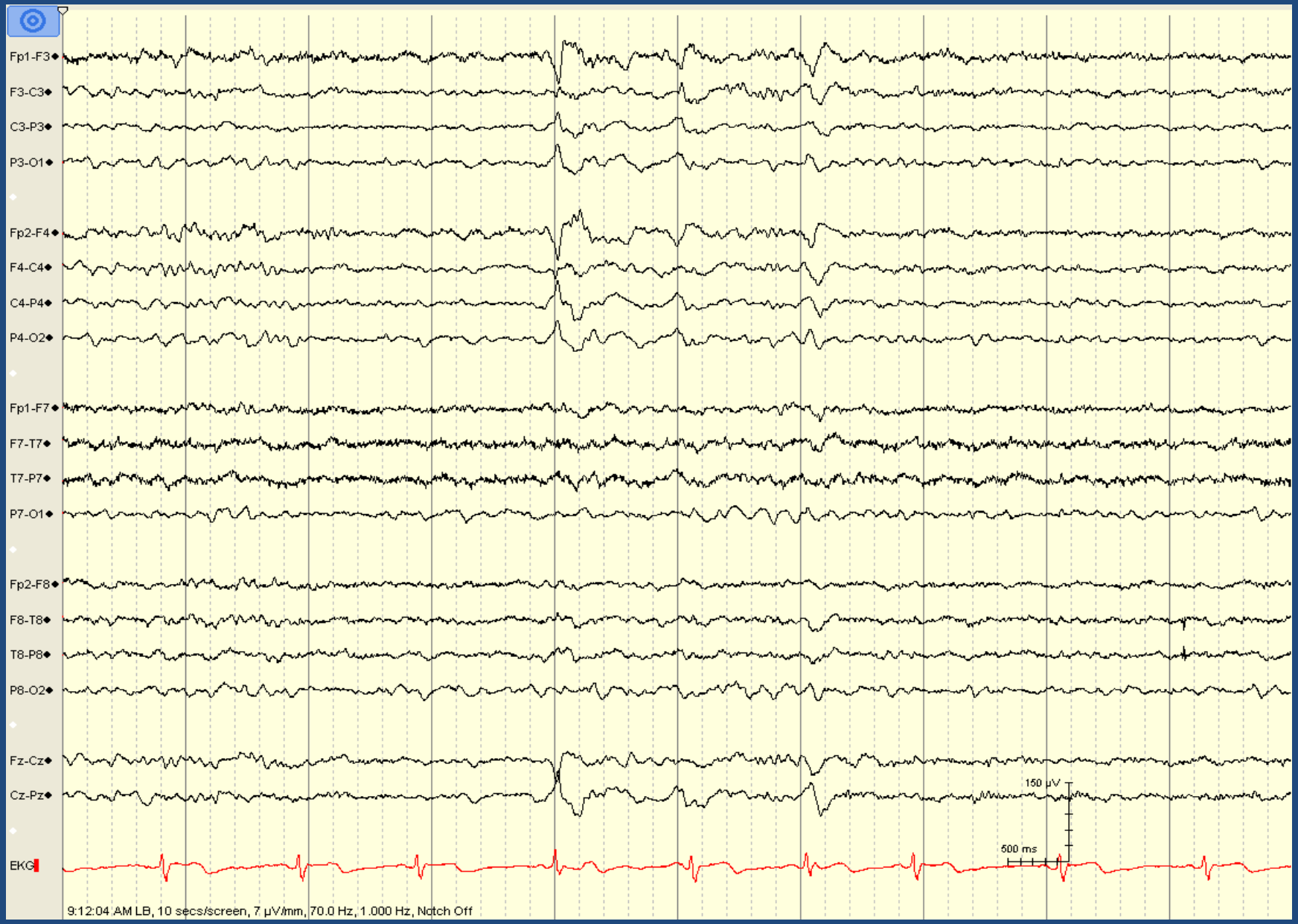
Sleep EEG

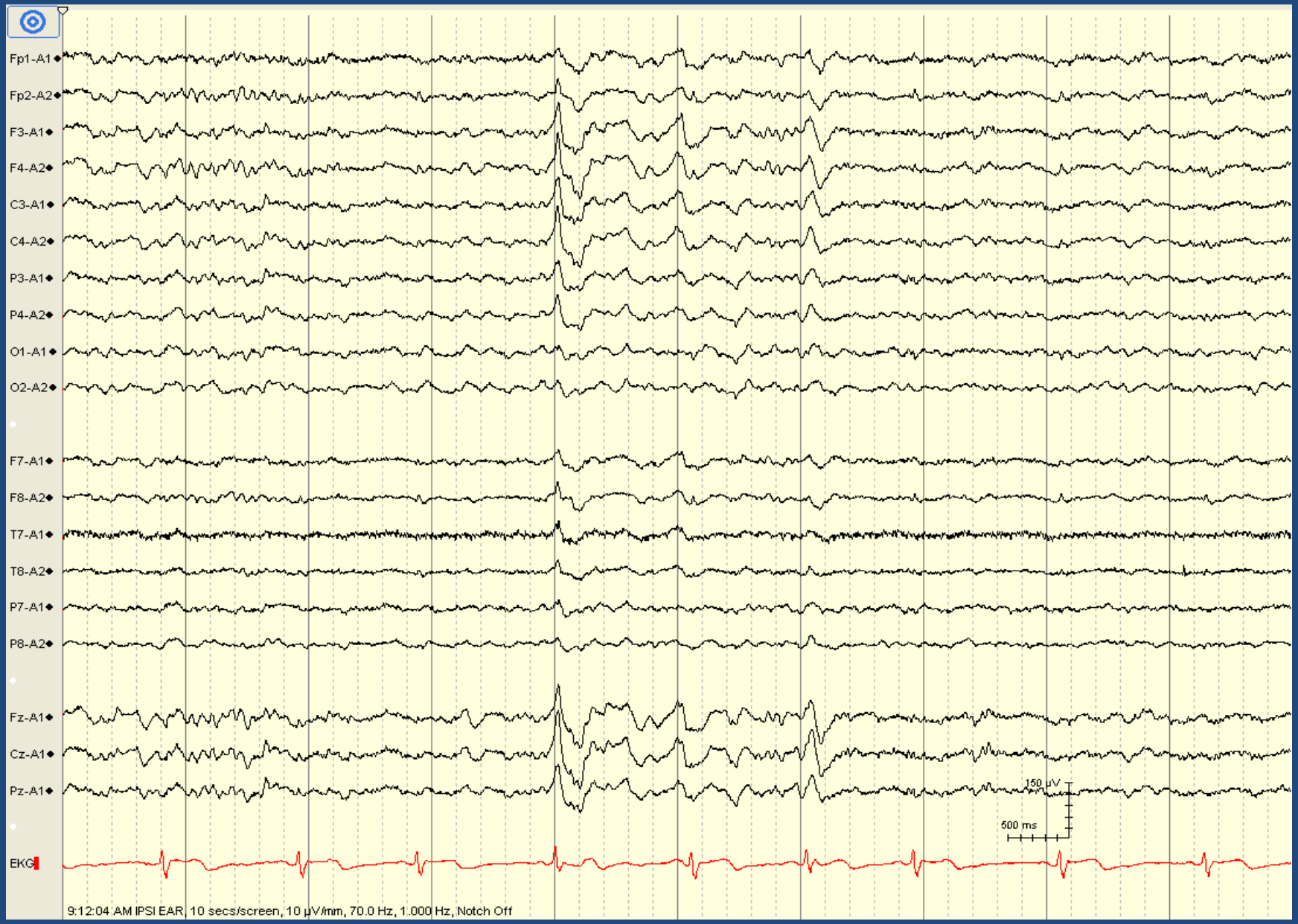
- Stage N1 - drowsiness
- Stage N2 - specific architecture
- Stage N3 - slow wave sleep
- REM - rapid eye movement

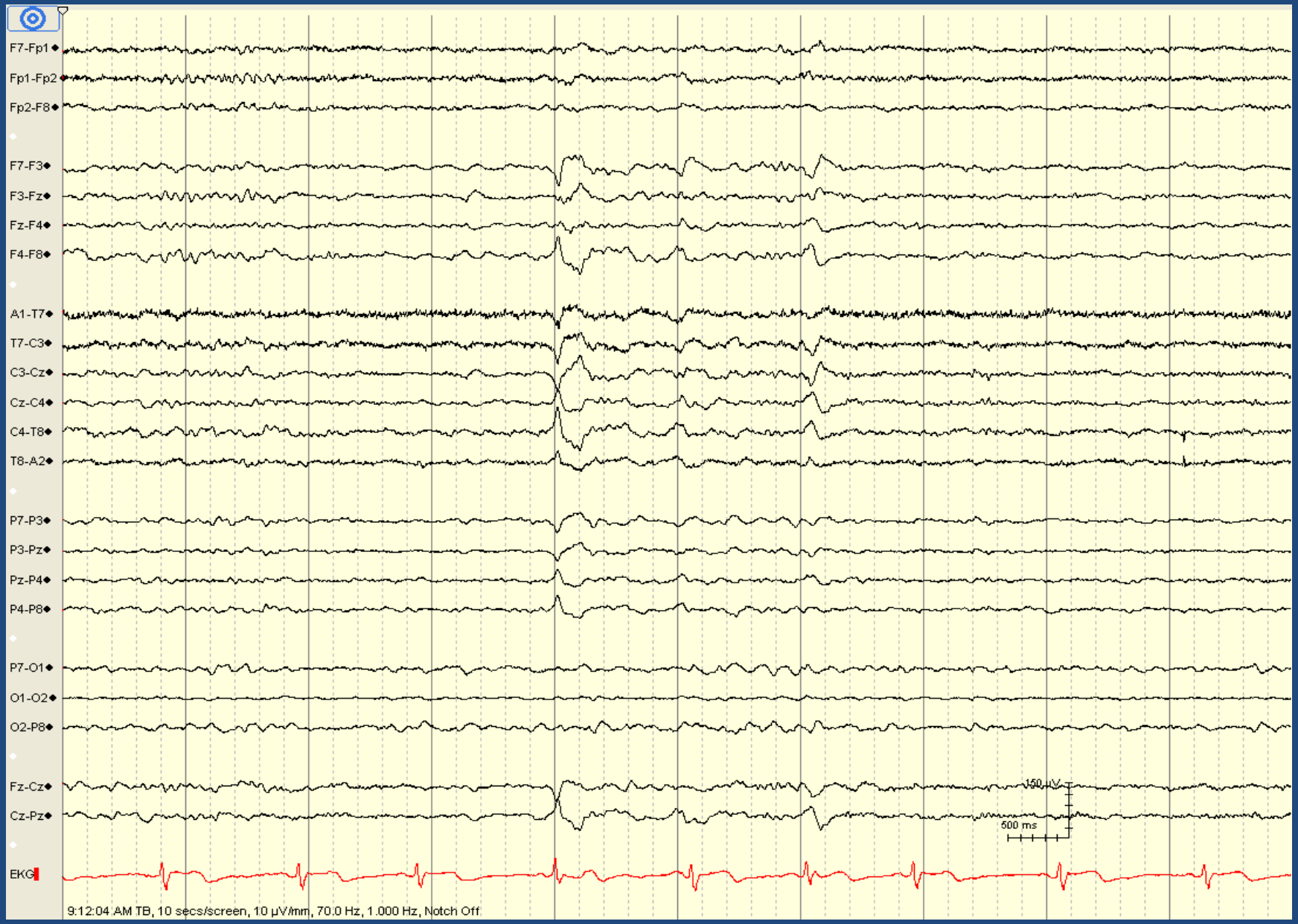
Patterns in Stage N2 Sleep*

- Sleep spindles
- K complexes
- Vertex waves (can also be in stage 1)
- POSTS

* all are normal, though some appear “sharp”

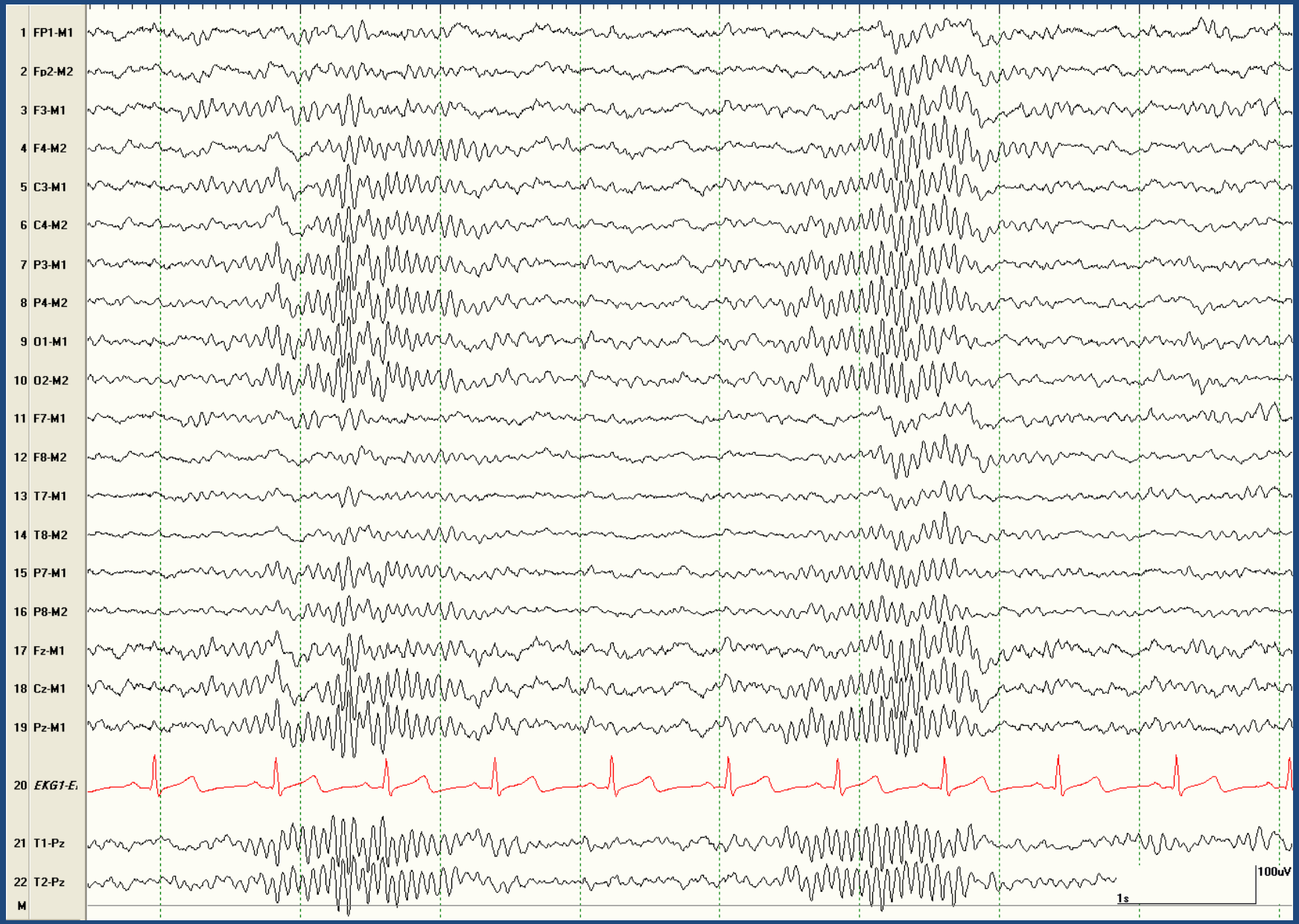

Fp1-F3
F3-C3
C3-P3
P3-O1
Fp2-F4
F4-C4
C4-P4
P4-O2
Fp1-F7
F7-T7
T7-P7
P7-O1
Fp2-F8
F8-T8
T8-P8
P8-O2
Fz-Cz
Cz-Pz
EKG
150 µV
500 ms
9:12:04 AM LB, 10 secs/screen, 7 µV/mm, 70.0 Hz, 1.000 Hz, Notch Off


Fp1-A1
Fp2-A2
F3-A1
F4-A2
C3-A1
C4-A2
P3-A1
P4-A2
O1-A1
O2-A2
F7-A1
F8-A2
T7-A1
T8-A2
P7-A1
P8-A2
Fz-A1
Cz-A1
Pz-A1
EKG
150 µV
500 ms
9:12:04 AM IPSI EAR, 10 secs/screen, 10 µV/mm, 70.0 Hz, 1.000 Hz, Notch Off


F7-Fp1
Fp1-Fp2
Fp2-F8
F7-F3
F3-Fz
Fz-F4
F4-F8
A1-T7
T7-C3
C3-Cz
Cz-C4
C4-T8
T8-A2
P7-P3
P3-Pz
Pz-P4
P4-P8
P7-O1
O1-O2
O2-P8
Fz-Cz
Cz-Pz
EKG
150 µV
500 ms
9:12:04 AM TB, 10 secs/screen, 10 µV/mm, 70.0 Hz, 1.000 Hz, Notch Off

Vertex Waves

- High voltage, sharp looking, surface negative waves
- Originate at Cz (the vertex)
- Thought to be generated by the thalamus


1 FP1-M1
2 Fp2-M2
3 F3-M1
4 F4-M2
5 C3-M1
6 C4-M2
7 P3-M1
8 P4-M2
9 O1-M1
10 O2-M2
11 F7-M1
12 F8-M2
13 T7-M1
14 T8-M2
15 P7-M1
16 P8-M2
17 Fz-M1
18 Cz-M1
19 Pz-M1
20 EKG1-E
21 T1-Pz
22 T2-Pz
M
100uV
1s

Sleep spindles

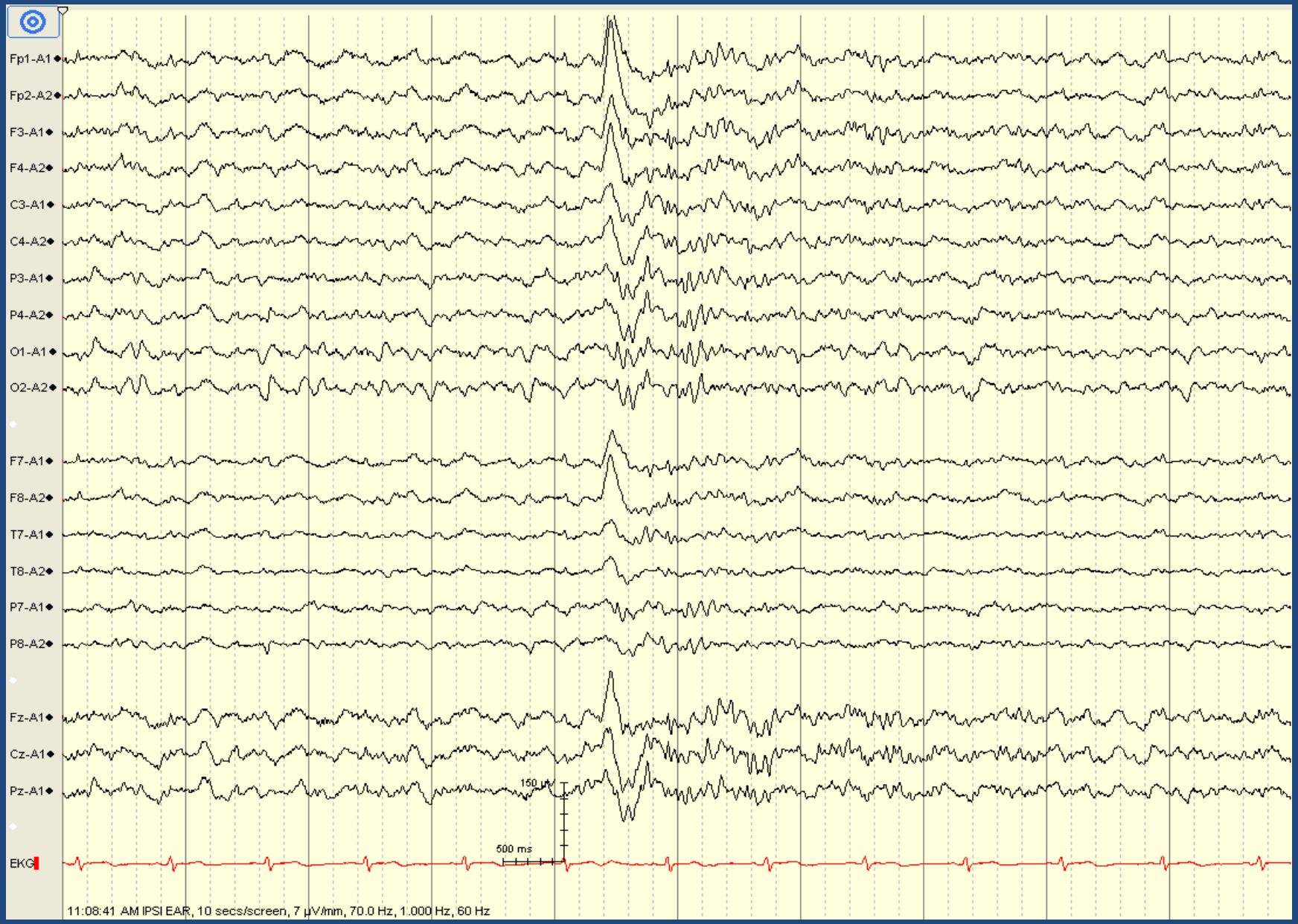
- Bursts of beta activity (12-16 Hz)
  - symmetric and synchronous (age > 2 yrs)
  - fronto-central head region
  - last 1-1.5 seconds

- Thought to be generated by the thalamus


Fp1-F3
F3-C3
C3-P3
P3-O1
Space
Fp2-F4
F4-C4
C4-P4
P4-O2
Space
Fp1-F7
F7-T7
T7-P7
P7-O1
Space
Fp2-F8
F8-T8
T8-P8
P8-O2
Space
Fz-Cz
Cz-Pz
1000 ms
70 µV
Space
EKG
2:25:46 PM LB, 10 secs/screen, 10 µV/mm, 70.0 Hz, 1.000 Hz, 60 Hz

By what age should sleep spindles become synchronous?

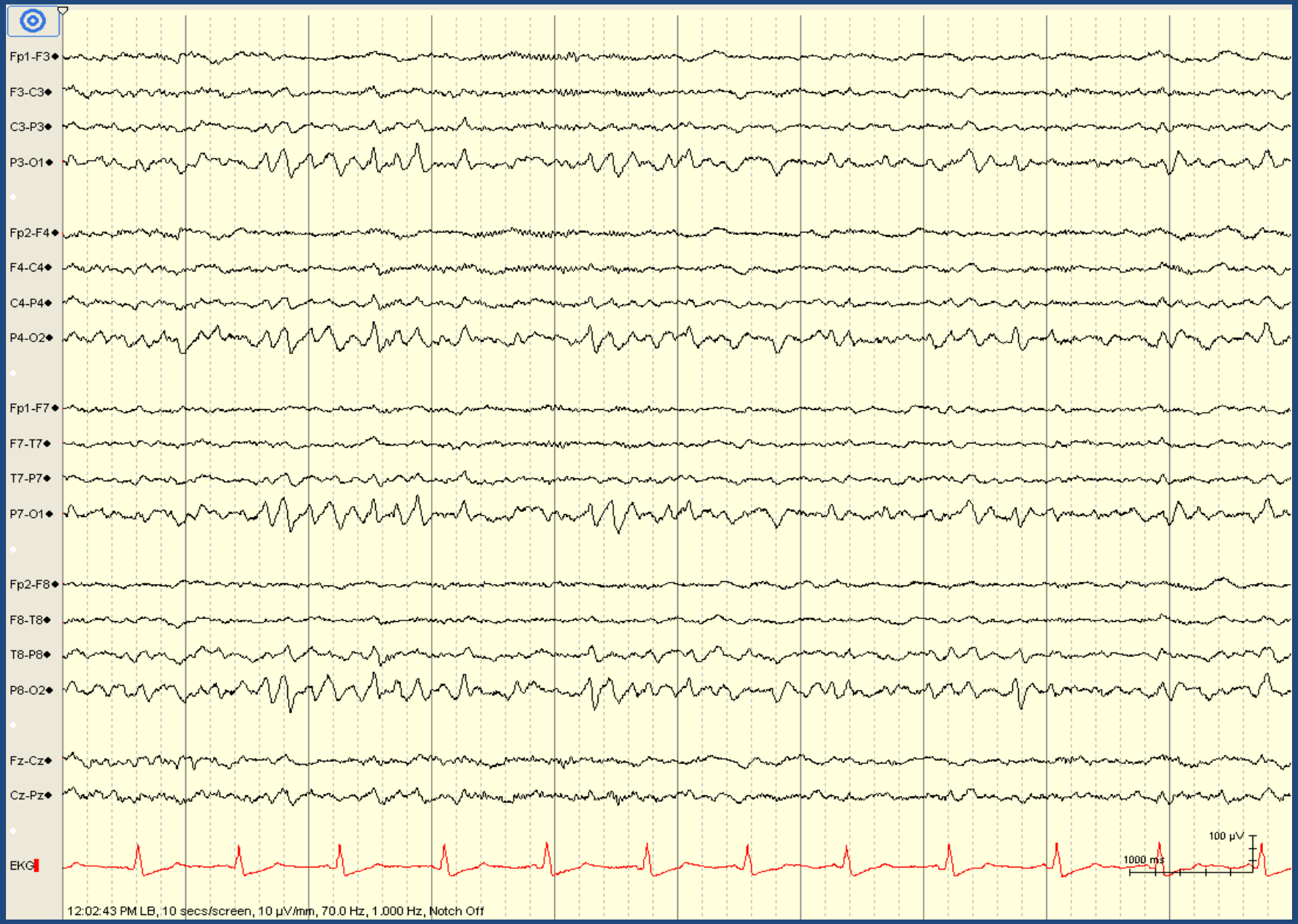
A. 2 months
B. 6 months
C. 12 months
D. 2 years
E. 6 years


Fp1-A1
Fp2-A2
F3-A1
F4-A2
C3-A1
C4-A2
P3-A1
P4-A2
O1-A1
O2-A2
F7-A1
F8-A2
T7-A1
T8-A2
P7-A1
P8-A2
Fz-A1
Cz-A1
Pz-A1
150 µV
500 ms
EKG
11:08:41 AM IPSI EAR, 10 secs/screen, 7 µV/mm, 70.0 Hz, 1.000 Hz, 60 Hz

K complexes

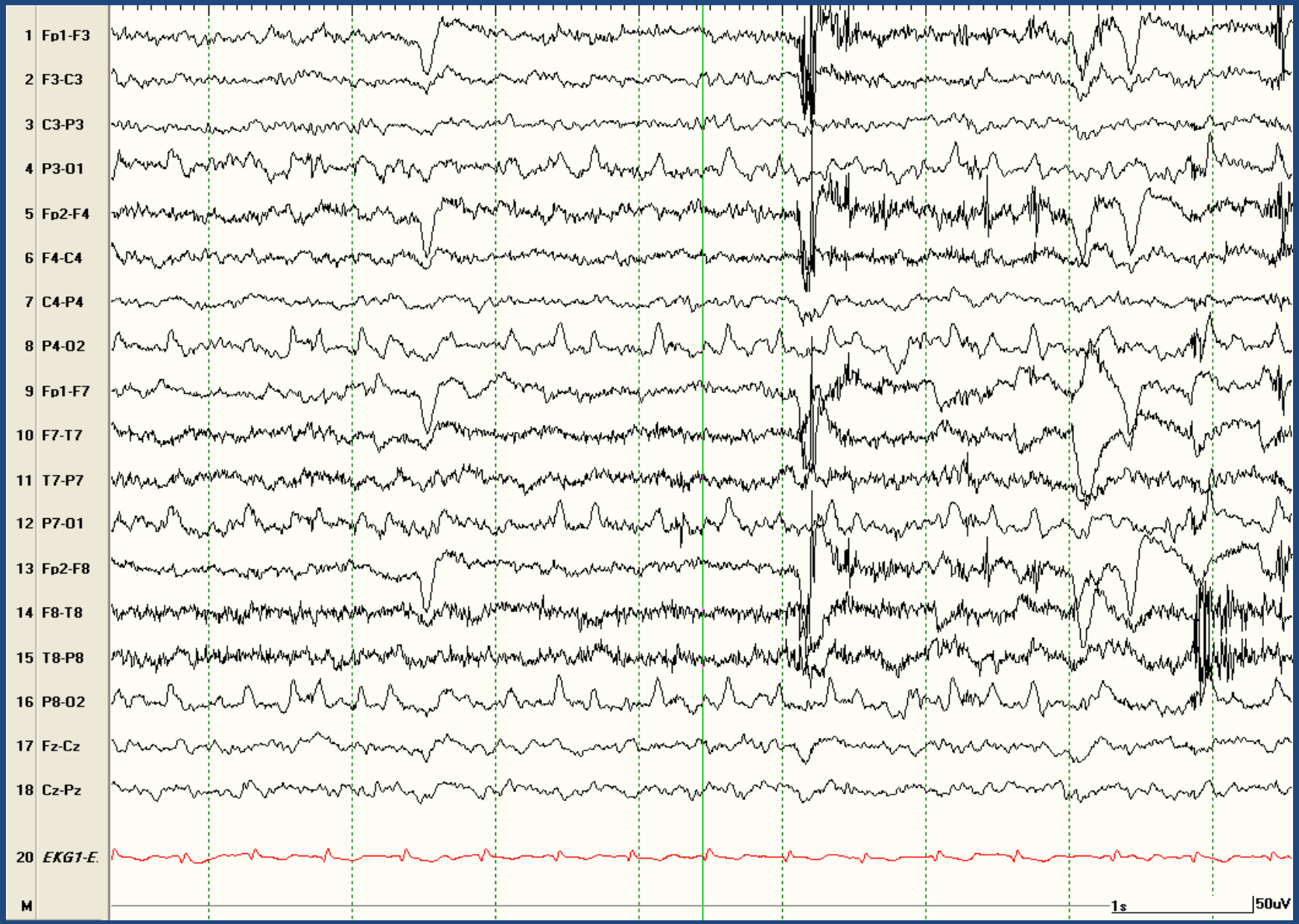
- Broad 0.5-2 second long wave
- Fronto-central predominance
- Might be followed by a sleep spindle

- related to arousal (noise, clapping, knock)


Fp1-F3
F3-C3
C3-P3
P3-O1
Fp2-F4
F4-C4
C4-P4
P4-O2
Fp1-F7
F7-T7
T7-P7
P7-O1
Fp2-F8
F8-T8
T8-P8
P8-O2
Fz-Cz
Cz-Pz
EKG
100 µV
1000 ms
12:02:43 PM LB, 10 secs/screen, 10 µV/mm, 70.0 Hz, 1.000 Hz, Notch Off

POSTS

- Positive Occipital Sharp Transients of Sleep
- That’s exactly what they are.
- Should be symmetric and synchronous.



Are these POSTS?

Lambda Waves

- A sharp looking wave that has a positive polarity in the occipital regions

- looks like the letter “λ”
- synchronous and symmetric

- Occurs when scanning lines or looking at an picture (visual activity)

Summary

- Awake EEG includes PDR, Mu, and third rhythm
- Benign variants do not disrupt the background, do not persist into deep sleep, and must not be over-interpreted
- Normal N2 sleep structures include K complexes, vertex waves, sleep spindles, and POSTS