EEG workshop

Normal Variants and Artifacts

Dr. Suthida Yenjun

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Normal variants and normal physiologic activities seen in the posterior head region

Alpha variants

Posterior slow wave of youth

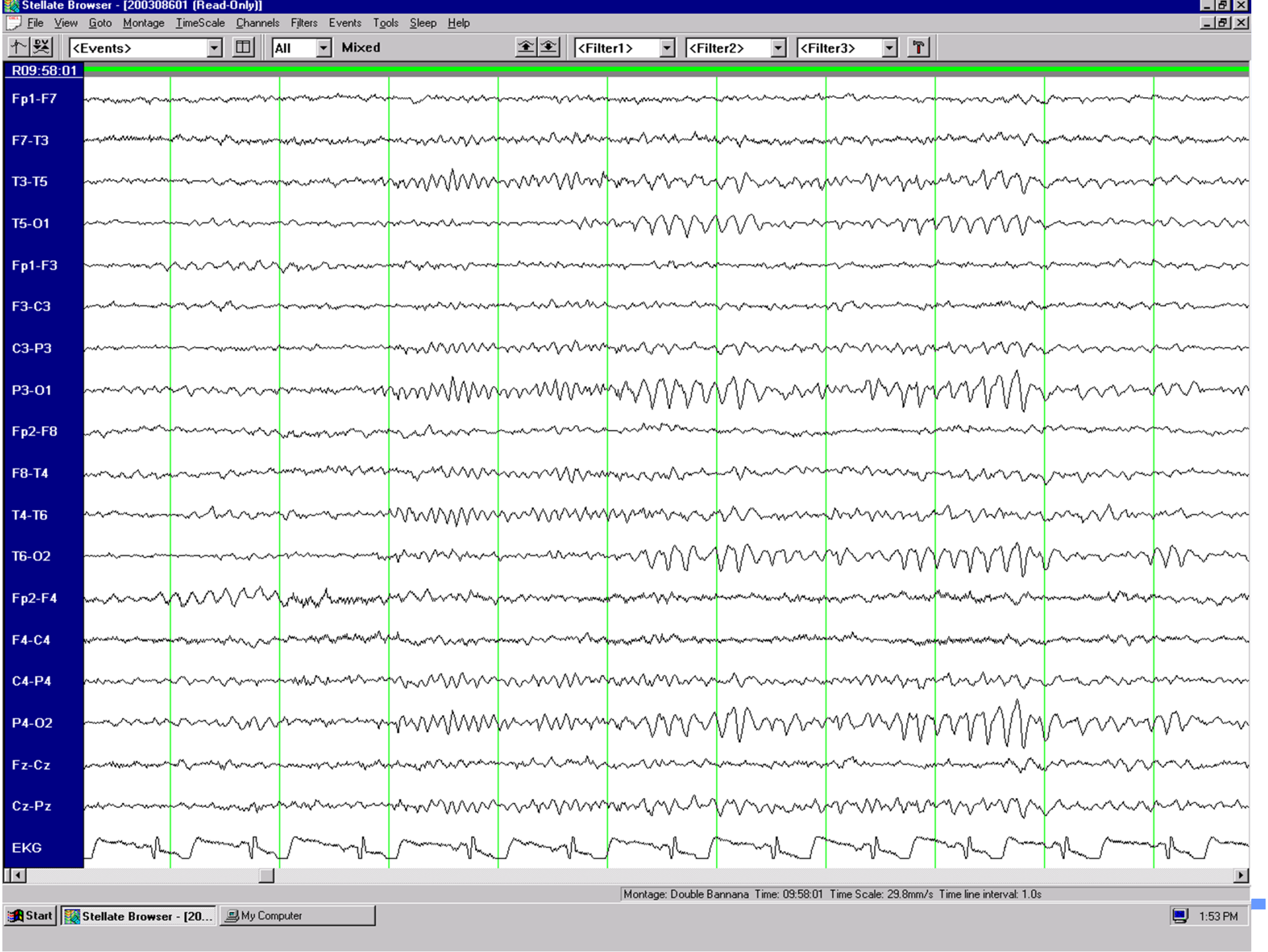
Lambda waves

Alpha variants

- First described by Goodwin in 1947
- Fast alpha variants : Superimposed harmonic rhythm, twice the frequency of basic posterior background
- Slow alpha variants : Superimposed subharmonic rhythm (half of the frequency of the posterior background)

Alpha variants

- Both patterns show the same reactivity to eye opening and eye closure as normal posterior background
- Unknown significance
- Not correlate with epilepsy or other disorders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File View Goto Montage TimeScale Channels Filters Events Tools Sleep Help
<Events>
All
Mixed
<Filter1>
<Filter2>
<Filter3>
R09:58:01
Fp1-F7
F7-T3
T3-T5
T5-O1
Fp1-F3
F3-C3
C3-P3
P3-O1
Fp2-F8
F8-T4
T4-T6
T6-O2
Fp2-F4
F4-C4
C4-P4
P4-O2
Fz-Cz
Cz-Pz
EKG
Montage: Double Bannana Time: 09:58:01 Time Scale: 29.8mm/s Time line interval: 1.0s
Start
Stellate Browser - [20...
My Computer
1:53 PM

Posterior slow wave of youth

- Frequency:3-7 Hz
- Voltage: moderate voltage
- Location: Occipital regions
- Occurrence: irregular, intermixed with alpha rhythm

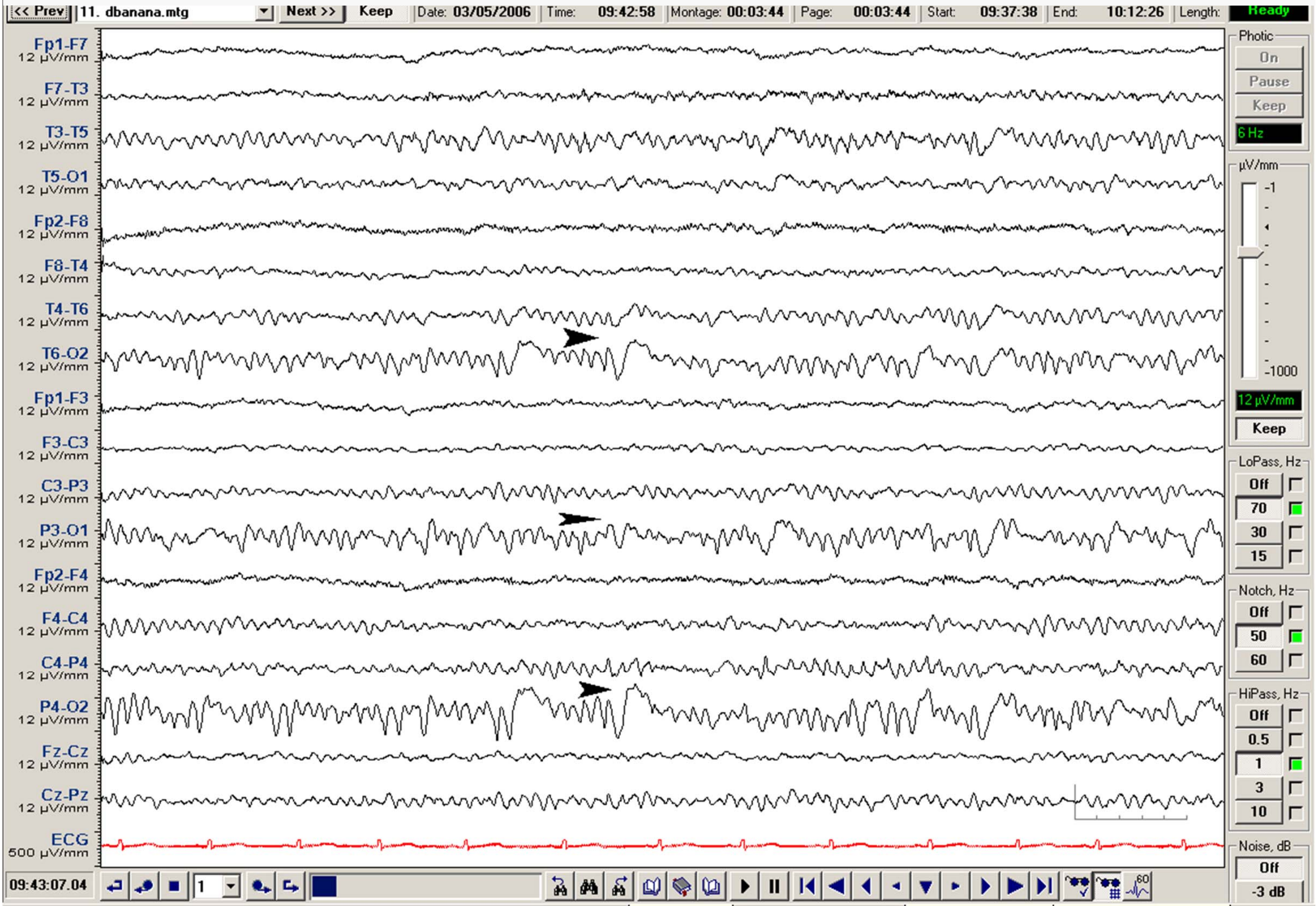
Posterior slow wave of youth

- Reactive to eye opening and closure
- Asymmetry of amplitude should not be more than 50%

Posterior slow wave of youth

- Normal in 2-15 years old
- Less common in less than 2 years old
- Most common between 8-14 years old
- 15% incidence in person between 16-20 years old
- Rare after 21 years old

Posterior slow wave of youth



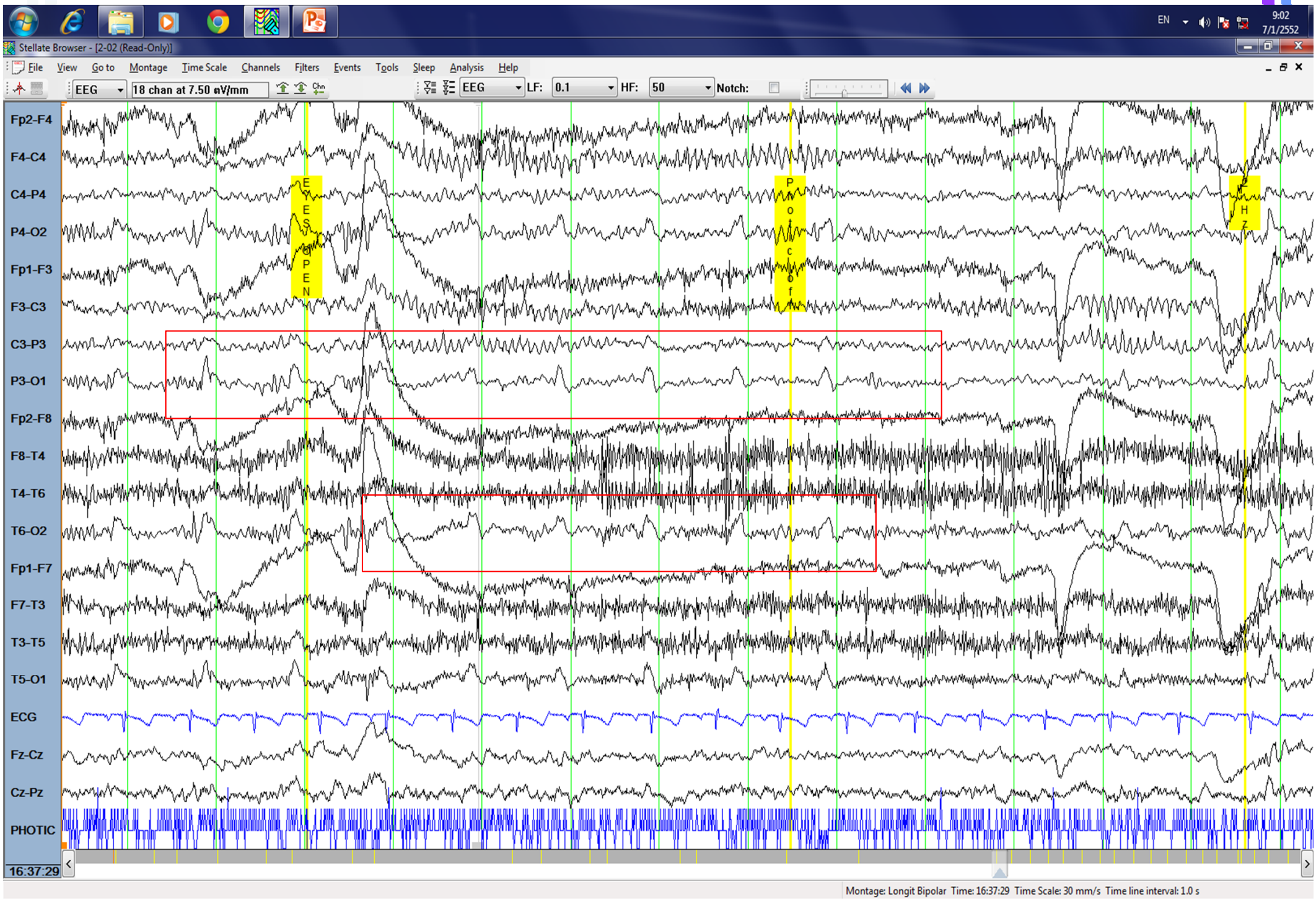
Lambda waves

- First described by Gastaut in 1951
- Broad sharp transients of 160-250 msec in duration
- Presence when the patient is looking at pattern designs in a well illuminated room
- Voltage: moderate amplitude 40-60 uV
- Location: occipital region, may be asymmetric

Lambda waves

- Occurred in children or young adult, rare in elderly
- Morphology: surface positive in the occipital region, reverse check marks
- Need to differentiated from occipital sharp waves

Lamda waves response with photic stimulation



Normal variants that mimic sharp waves

In the temporal region

Benign Epileptiform Transients of sleep (BETS) or Small Sharp Spikes

Wicket spikes

Rhythmic Midtemporal Theta of Drowsiness (RMTD) or Psychomotor variant

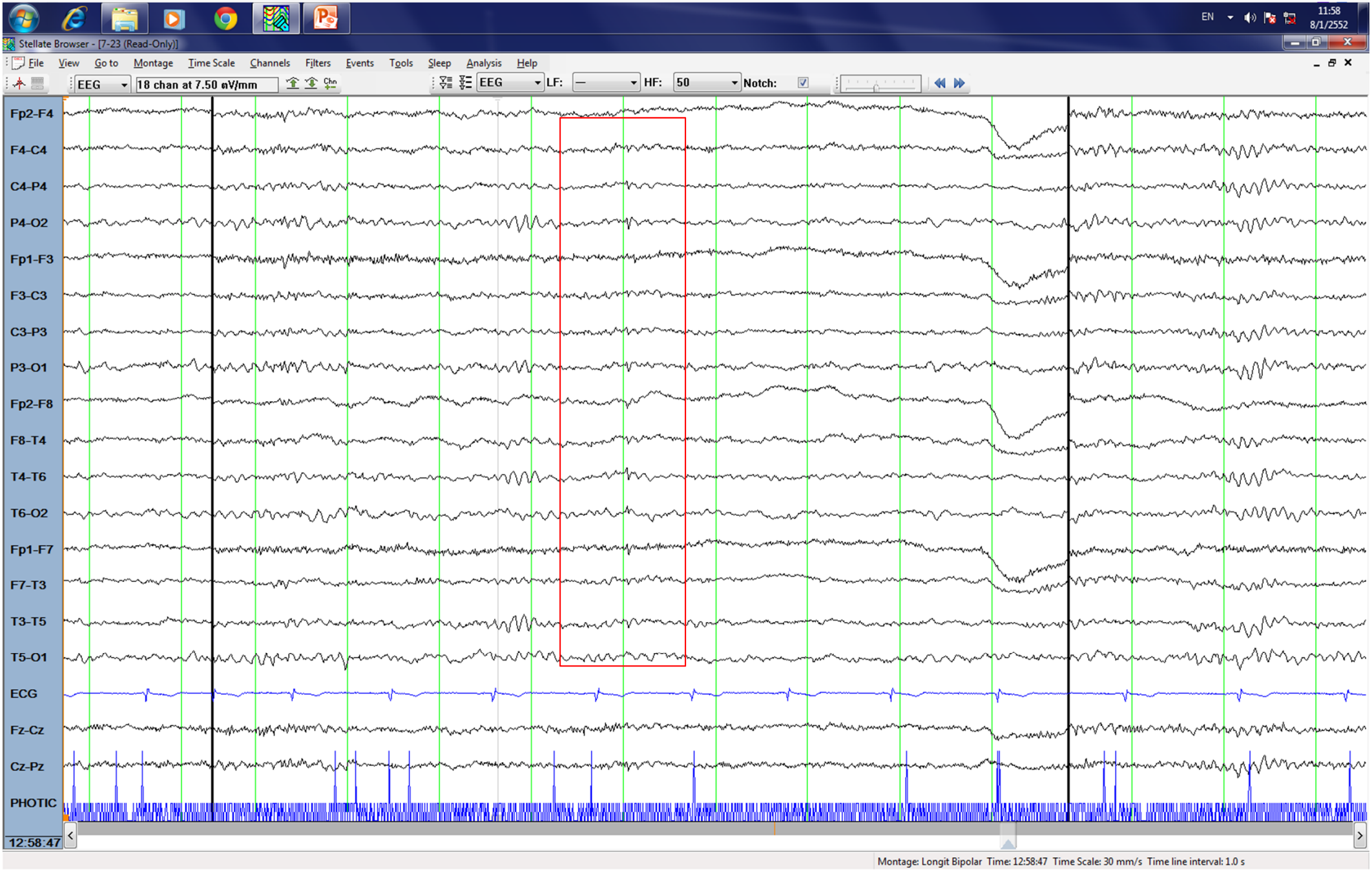
14 and 6 Hz positive spikes

Benign Epileptiform Transients of sleep (BETS) or Small Sharp Spikes

- Wave form: short spikes, usually small
- Duration: < 50 msec for single phase
- Distribution: mid- and anterior temporal, often shifting in distribution; unilateral, bilaterally independent or bisynchronous
- Age: adults, adolescents
- Vigilance: sleep

Benign Epileptiform Transients of sleep (BETS)

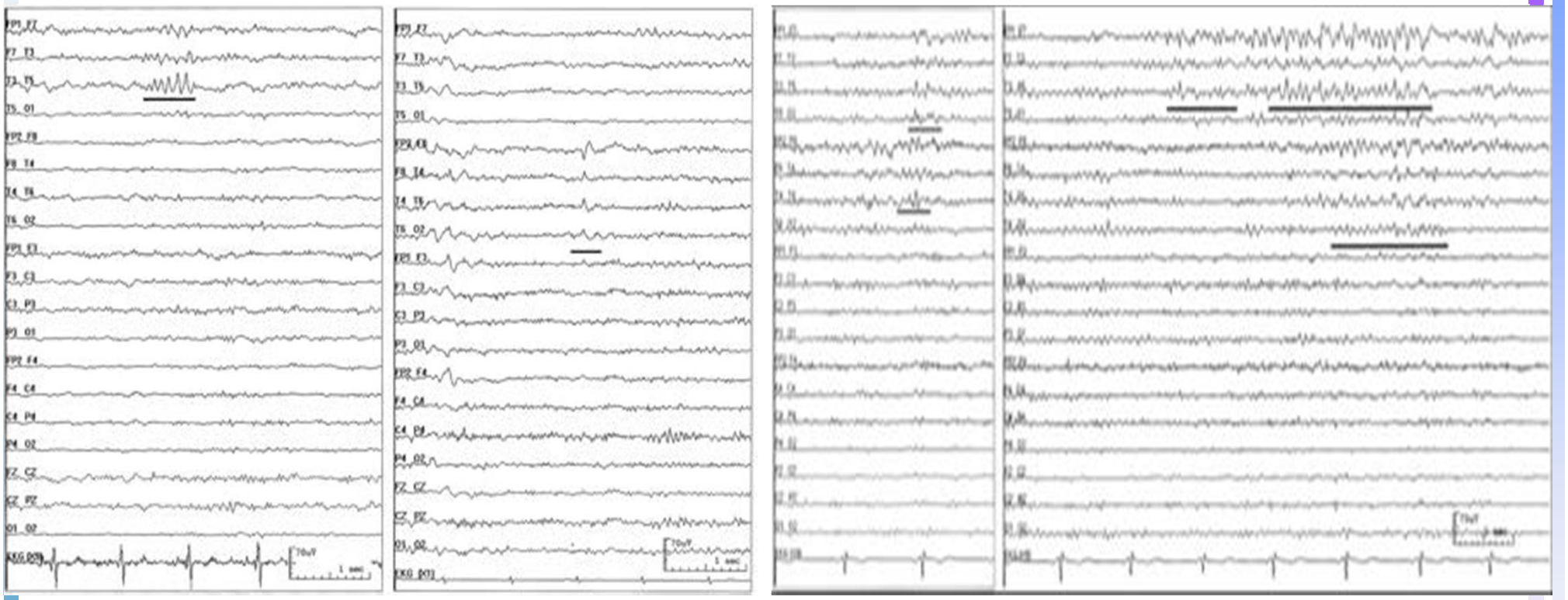
or Small Sharp Spikes



Wicket spikes

- Wave form: often repetitive spikes forming arches ,no disruption of background, no following slow waves
- Duration: a few seconds
- Distribution: anterior and middle temporal
- Age: mainly adults
- Vigilance: awake, asleep

Wicket spikes



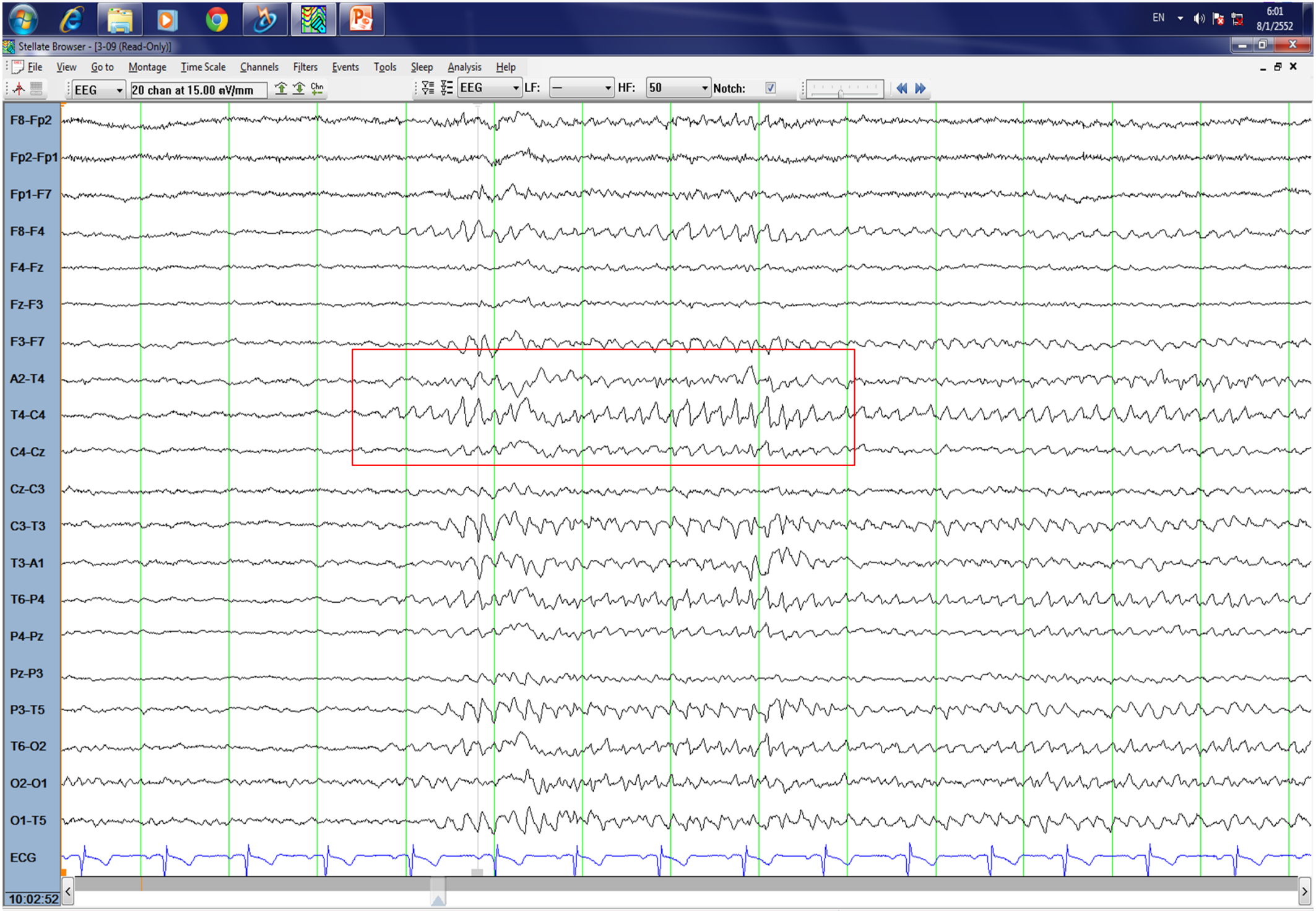
A. Wicket spike in arciform wave compared to right temporal sharp wave

B. Prolonged Wicket activity at left temporal lobe

Rhythmic Midtemporal Theta of Drowsiness (RMTD) or Psychomotor variant

- Wave form: 6 (4-7) Hz negative sharp waves with notched or flat positive phases
- Duration: up to a few seconds
- Distribution: midtemporal, uni- or bilateral, independent or bisynchronous
- Age: middle age
- Vigilance: Sleep

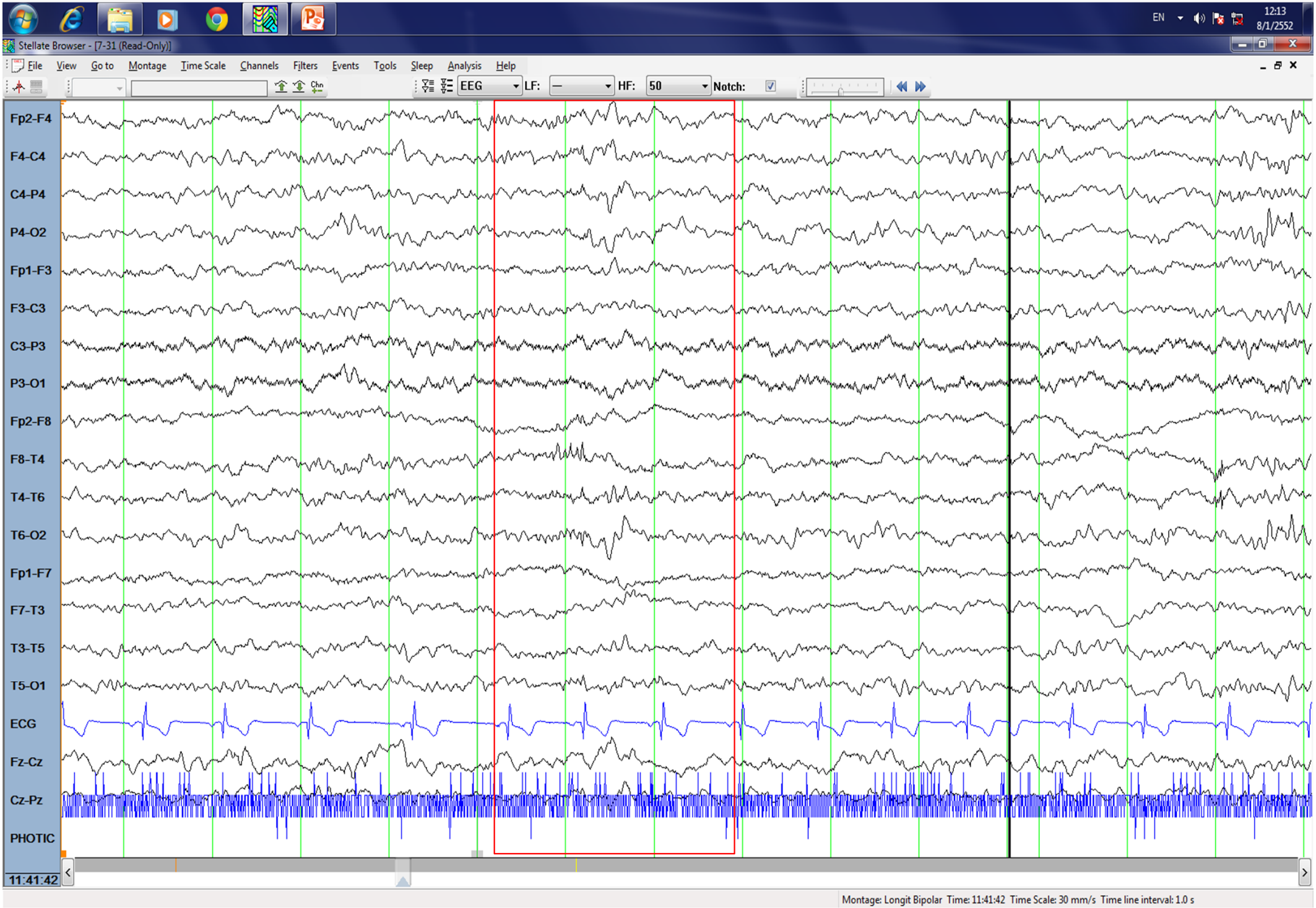
Rhythmic Midtemporal Theta of Drowsiness (RMTD) Or Psychomotor variant



14 and 6 Hz positive spikes

- Rhythmic, arch-form, positive waves, maximal posterior temporal region
- Occur in burst, lasting 0.5-1 sec
- “Comb like” shape
- Unilateral or bilateral
- Deep drowsy state or light sleep
- Best seen in reference
- 10-30% of normal adolescents

14 and 6 Hz positive spikes



Normal variants that mimic sharp waves In other locations

Phantom 6 Hz spike wave paroxysm

Rhythmic midline theta

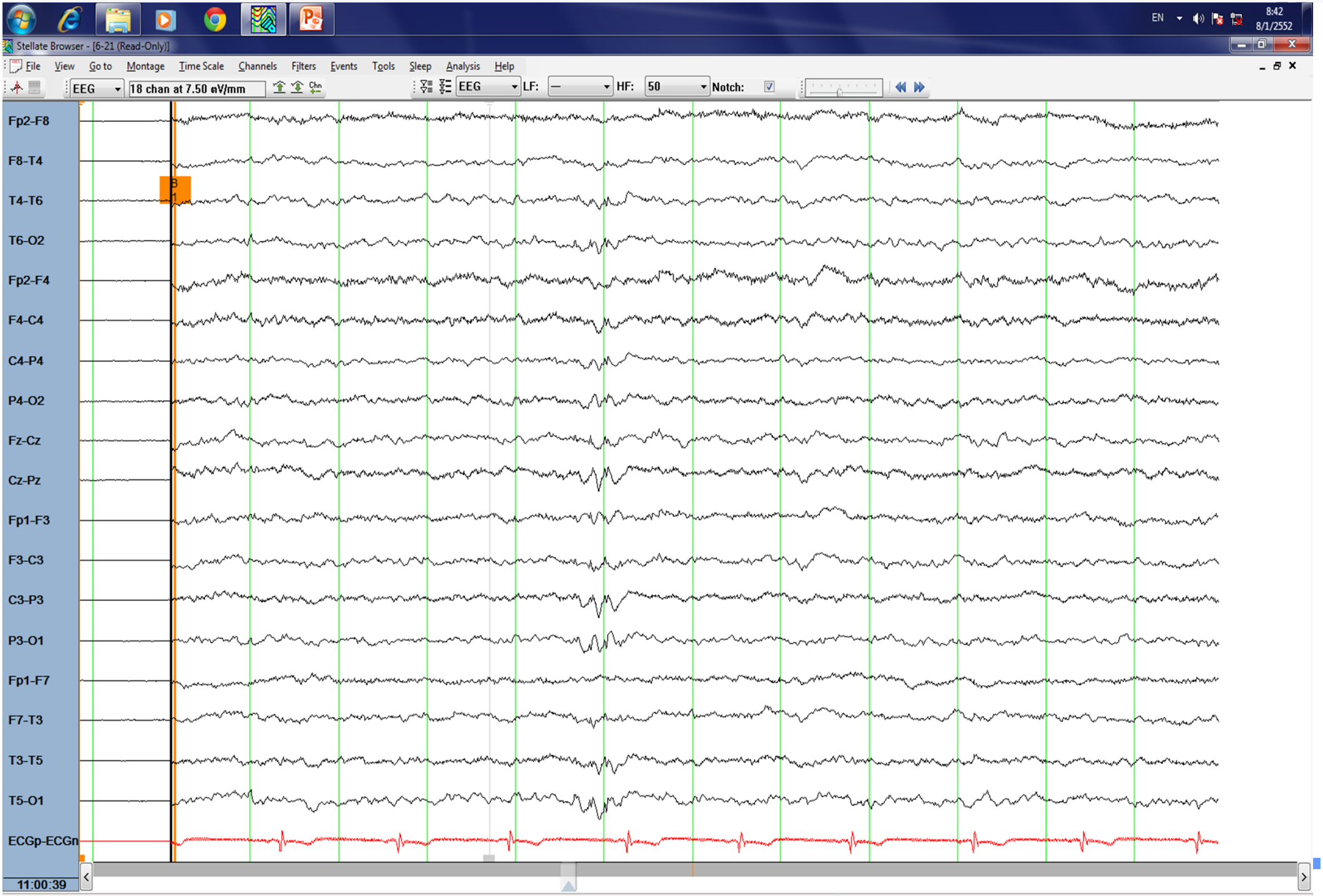
Subclinical Rhythmic Electroencephalographic Discharge of Adult (SREDA)

Mu rhythm

Phantom 6 Hz spike wave paroxysm

- Wave form: miniature spike-and wave at 4-7 Hz
- Duration: < 1 sec
- Distribution: generalized, maximum often posterior
- Age adult, less often adolescents
- Vigilance: drowsy, awake

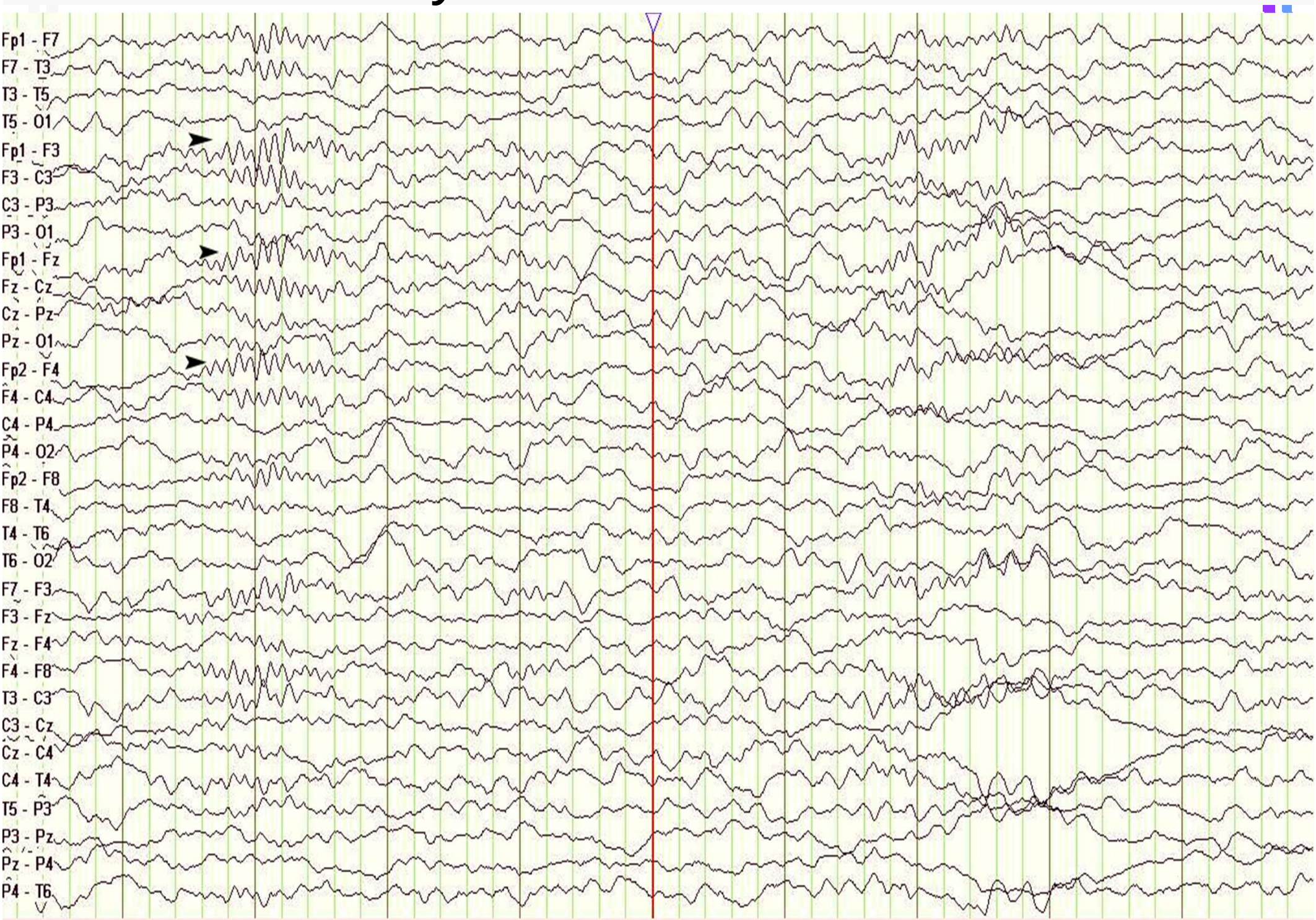
Phantom 6 Hz spike wave paroxysm



Rhythmic midline theta

- Rhythmic 6-8 Hz midline activity
- Occur during sleep

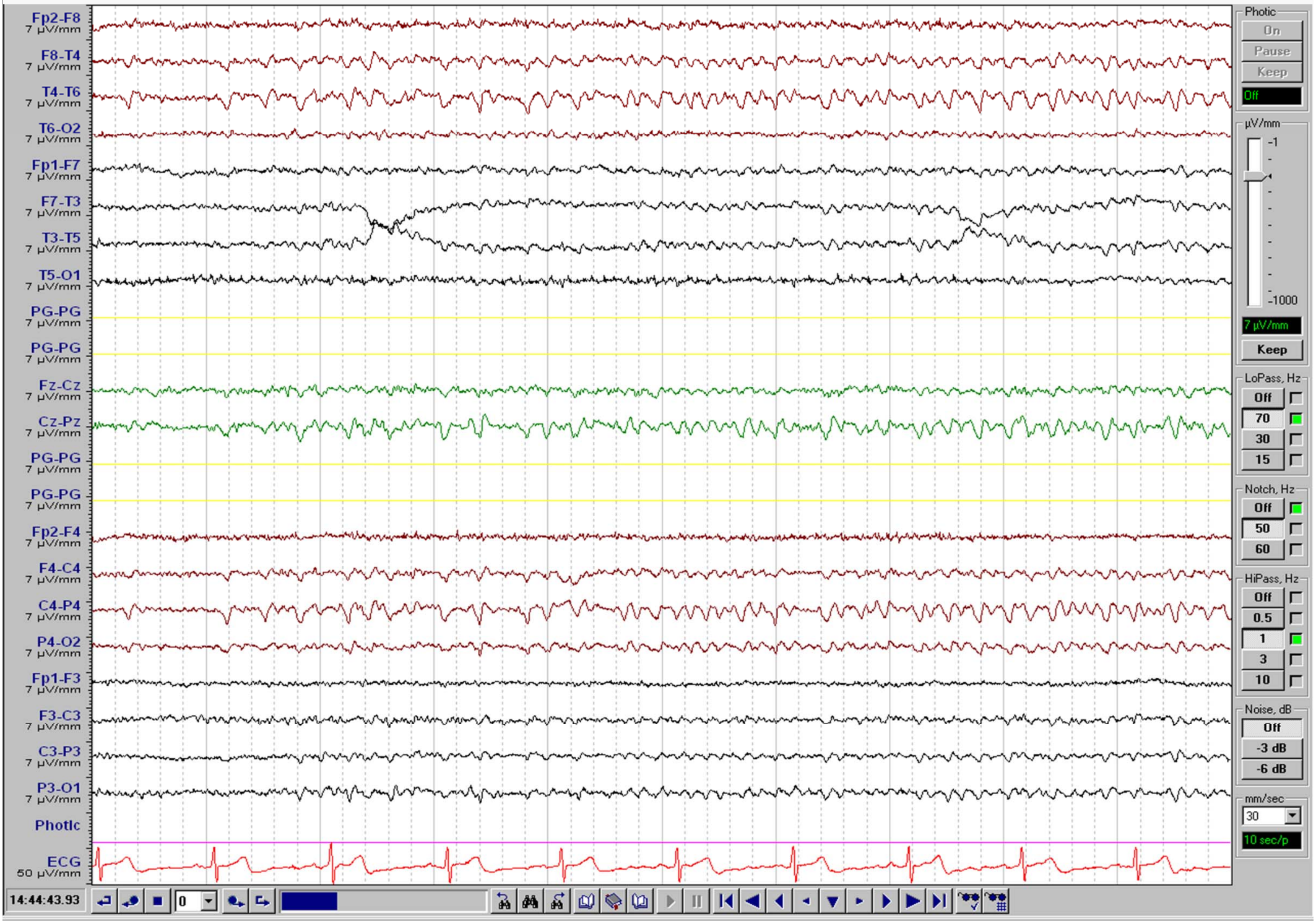
Rhythmic midline theta



Subclinical Rhythmic Electroencephalographic Discharge of Adult (SREDA)

- Wave form: mono or bi-phasic sharp waves followed by rhythmic 4-7 Hz waves
- Duration: usually 40-80 sec (<10 sec to> 5 min)
- Distribution: often symmetrical and posterior temporal and parietal maximum, may be asymmetrical or unilateral
- Age: adults
- Vigilance: awake, asleep

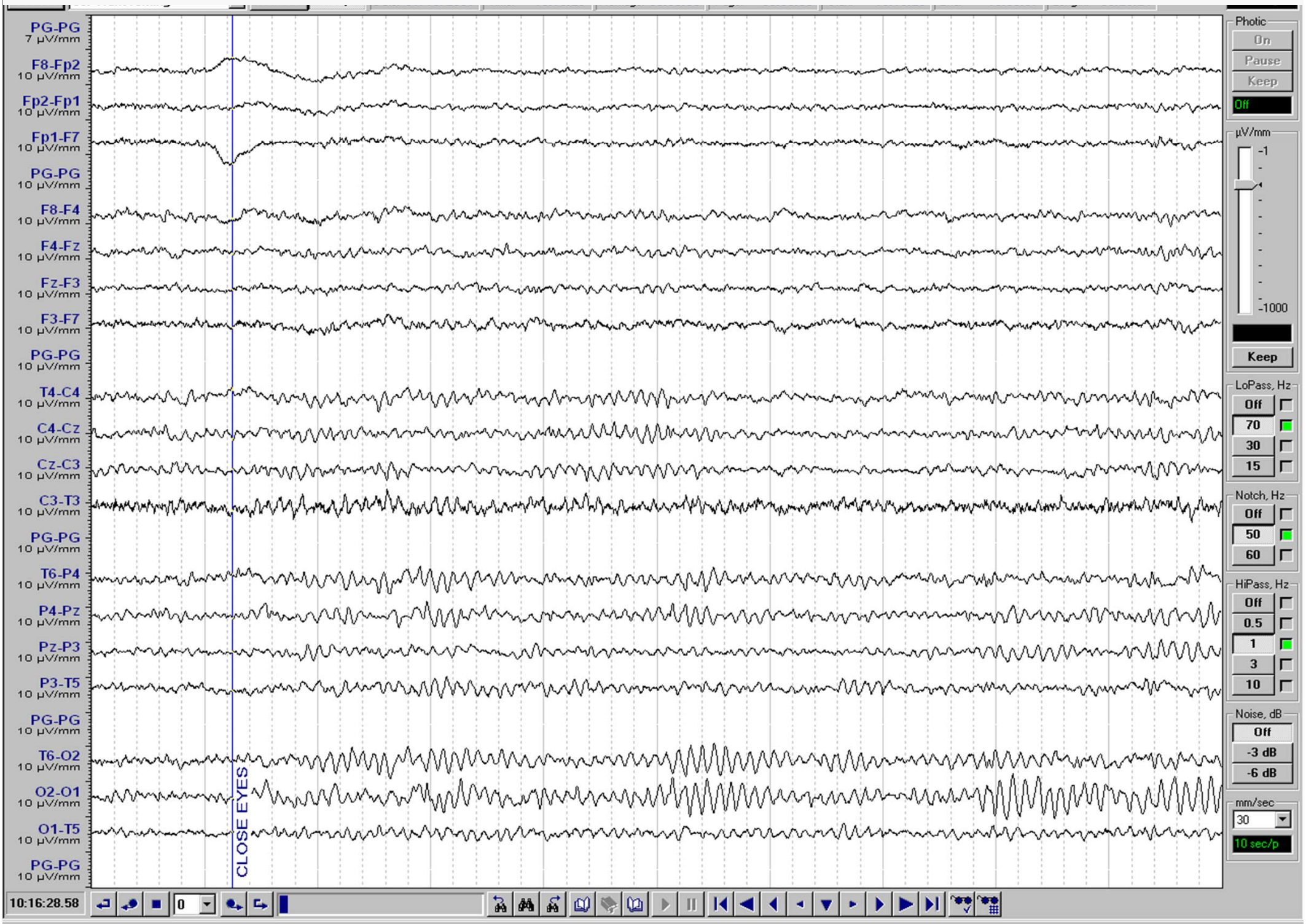
Subclinical Rhythmic Electroencephalographic Discharge of Adult



Mu rhythm

- Arch-shaped waves at 7-11 Hz, up to a few seconds over the central or centro-parietal regions
- Often appear at different times on both sides
- Blocked by voluntary, reflex or passive movement

Mu rhythm


PG-PG
7 µV/mm
F8-Fp2
10 µV/mm
Fp2-Fp1
10 µV/mm
Fp1-F7
10 µV/mm
PG-PG
10 µV/mm
F8-F4
10 µV/mm
F4-Fz
10 µV/mm
Fz-F3
10 µV/mm
F3-F7
10 µV/mm
PG-PG
10 µV/mm
T4-C4
10 µV/mm
C4-Cz
10 µV/mm
Cz-C3
10 µV/mm
C3-T3
10 µV/mm
PG-PG
10 µV/mm
T6-P4
10 µV/mm
P4-Pz
10 µV/mm
Pz-P3
10 µV/mm
P3-T5
10 µV/mm
PG-PG
10 µV/mm
T6-O2
10 µV/mm
O2-O1
10 µV/mm
O1-T5
10 µV/mm
PG-PG
10 µV/mm
CLOSE EYES
Photic
On
Pause
Keep
Off
µV/mm
-1
-1000
Keep
LoPass, Hz
Off
70
30
15
Notch, Hz
Off
50
60
HiPass, Hz
Off
0.5
1
3
10
Noise, dB
Off
-3 dB
-6 dB
mm/sec
30
10 sec/p
10:16:28.58
0

Artifacts

- Physiological artifacts arise from the patient’s variety of body activities
- Non-physiological artifact

Physiological artifacts arise from a variety of body activities

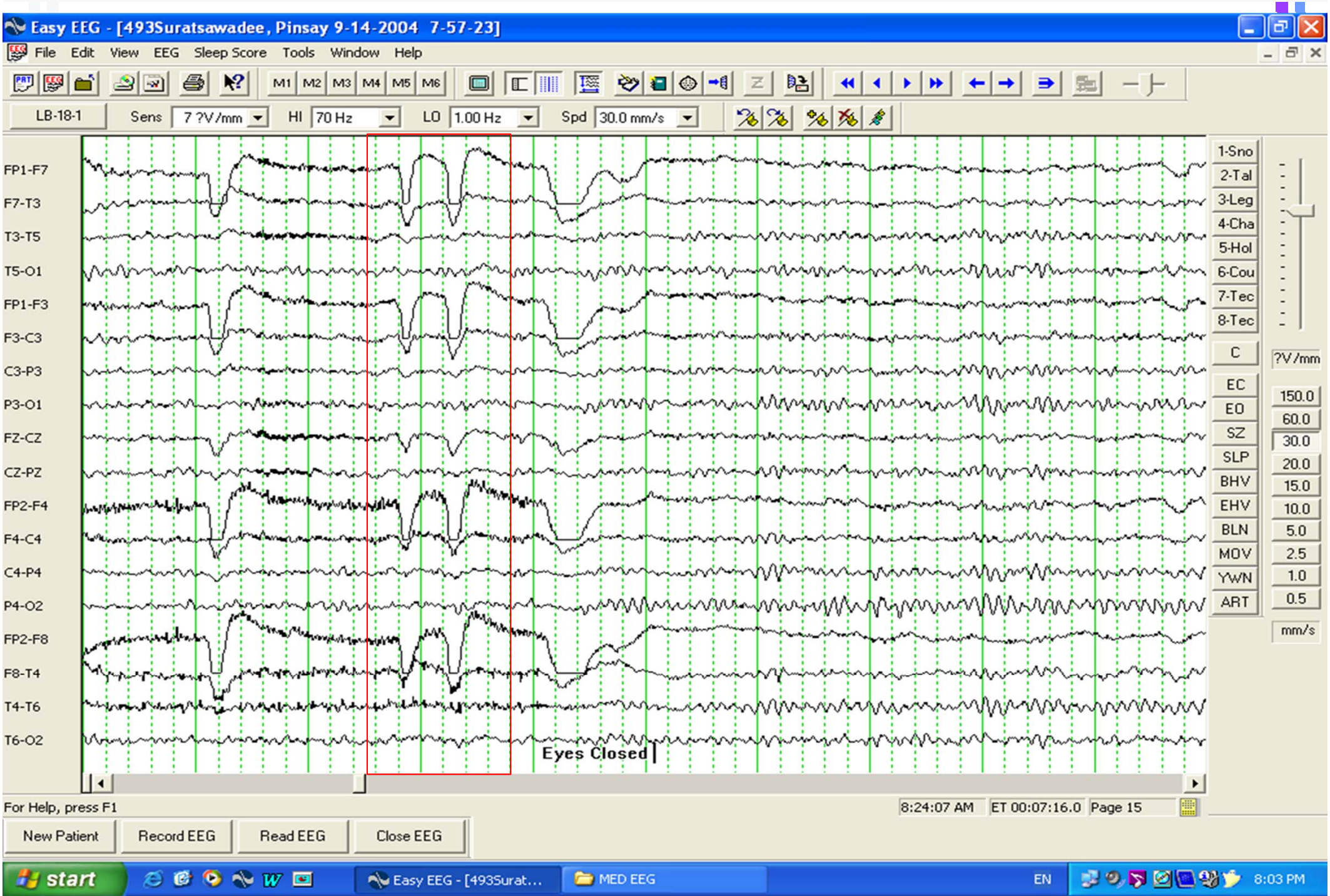
- Eye movement artifacts
- Muscle artifact
- EKG artifact
- Pulse wave artifact

Non-physiological artifact

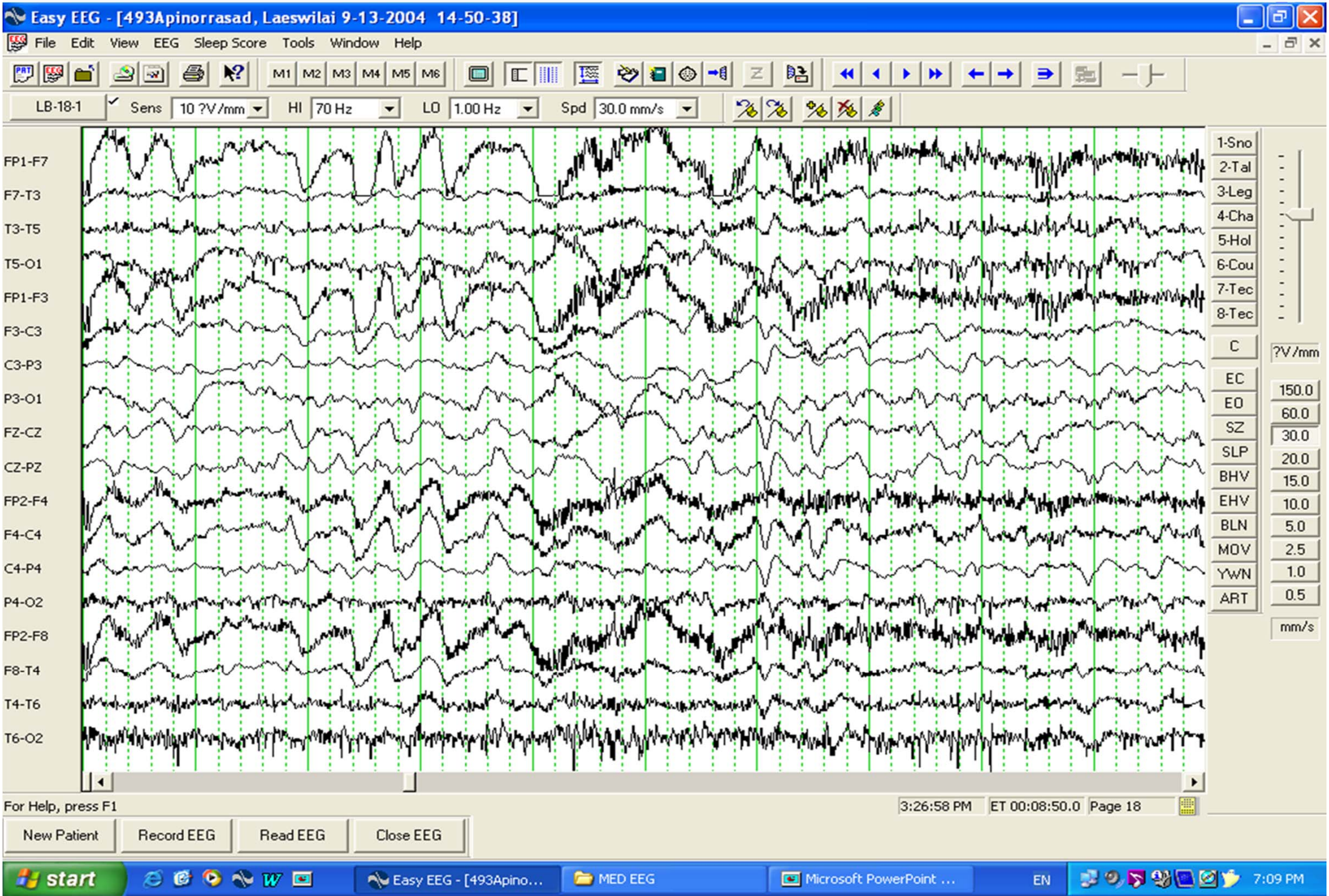
- Artifacts arising from electrodes, electrode terminal board, input cable and selector switches

- Artifacts arising from the recording instrument

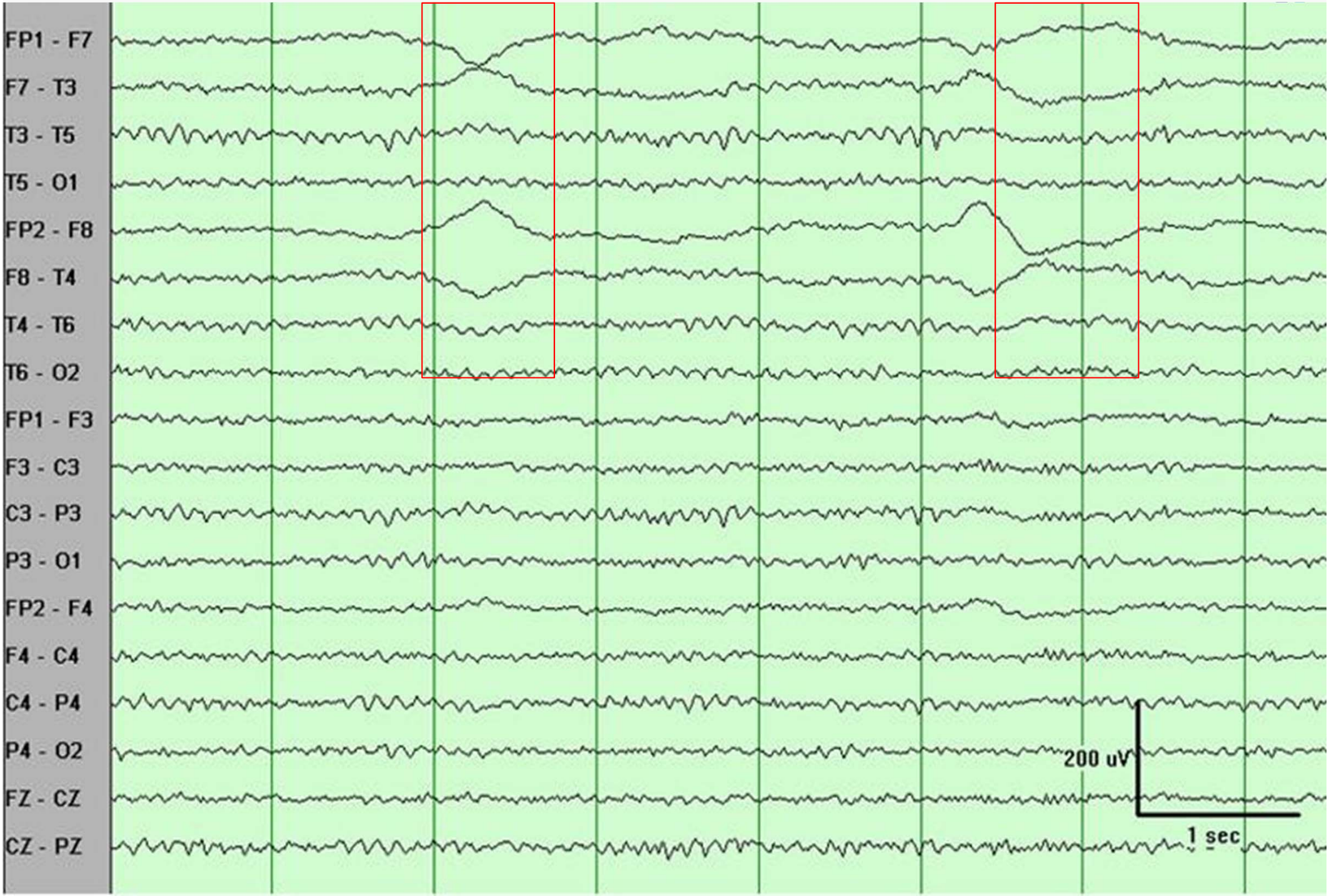
Eye blink artifact



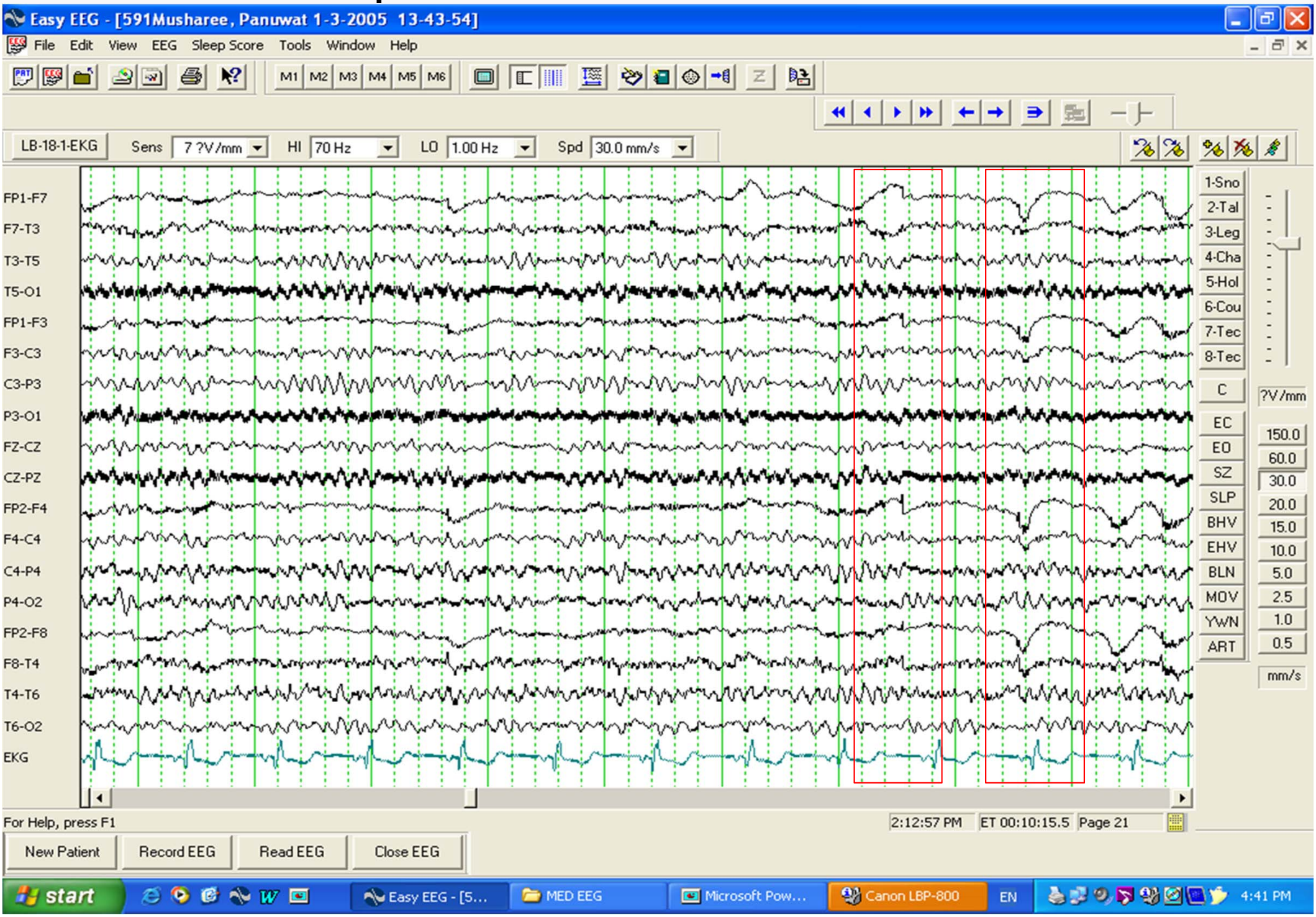
Muscle artifact



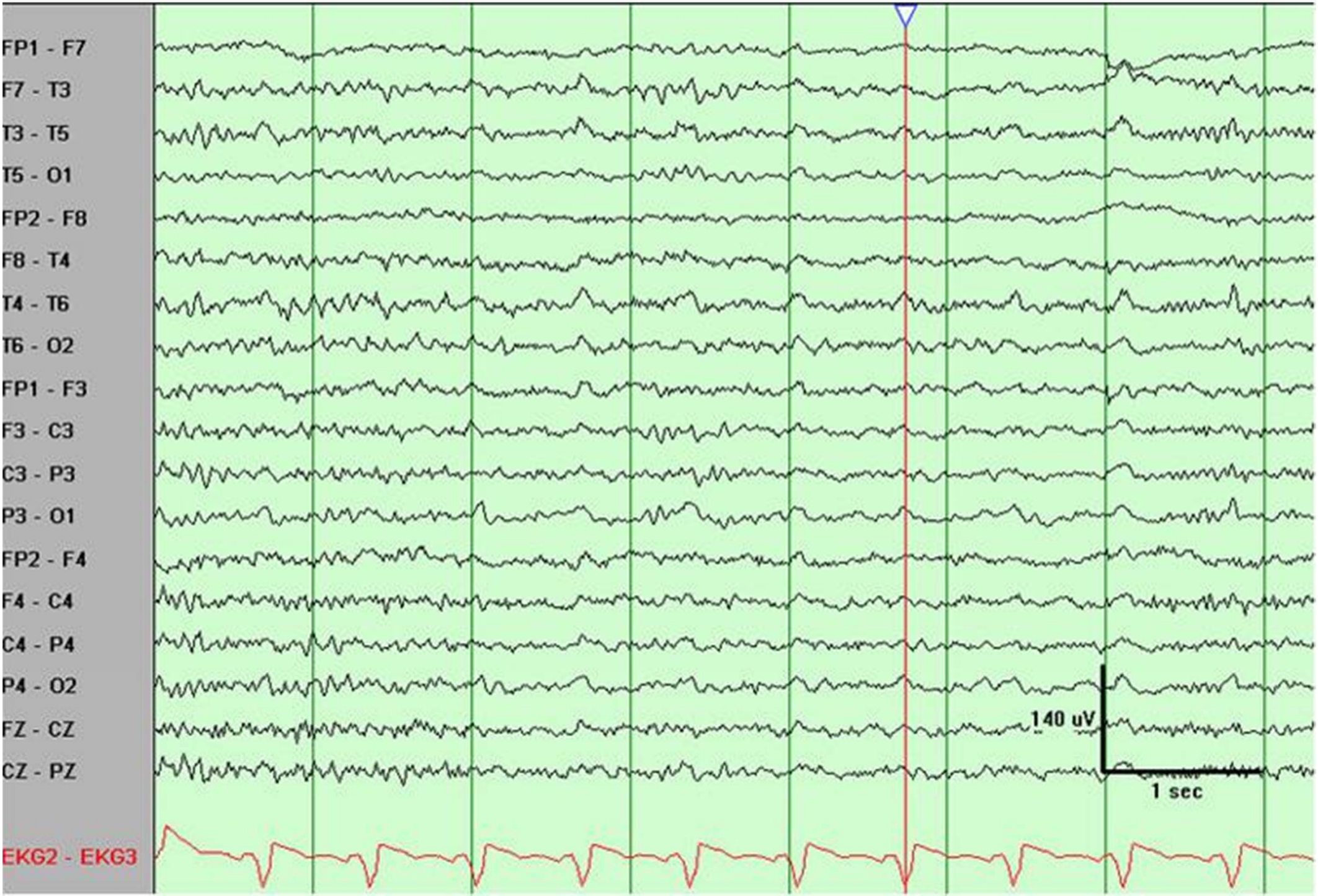
Lateral eye movement artifact



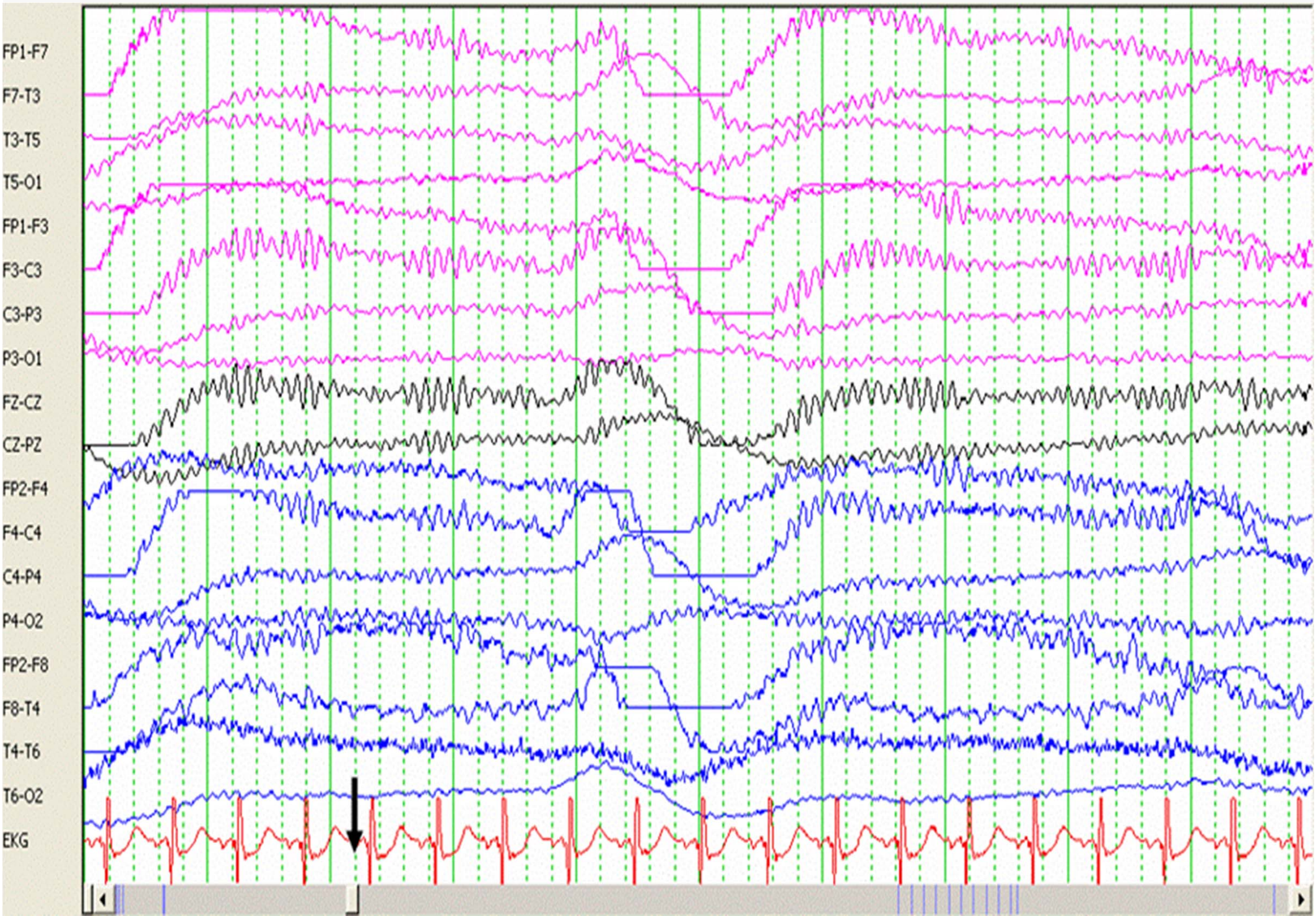
Rectus muscle spike artifact



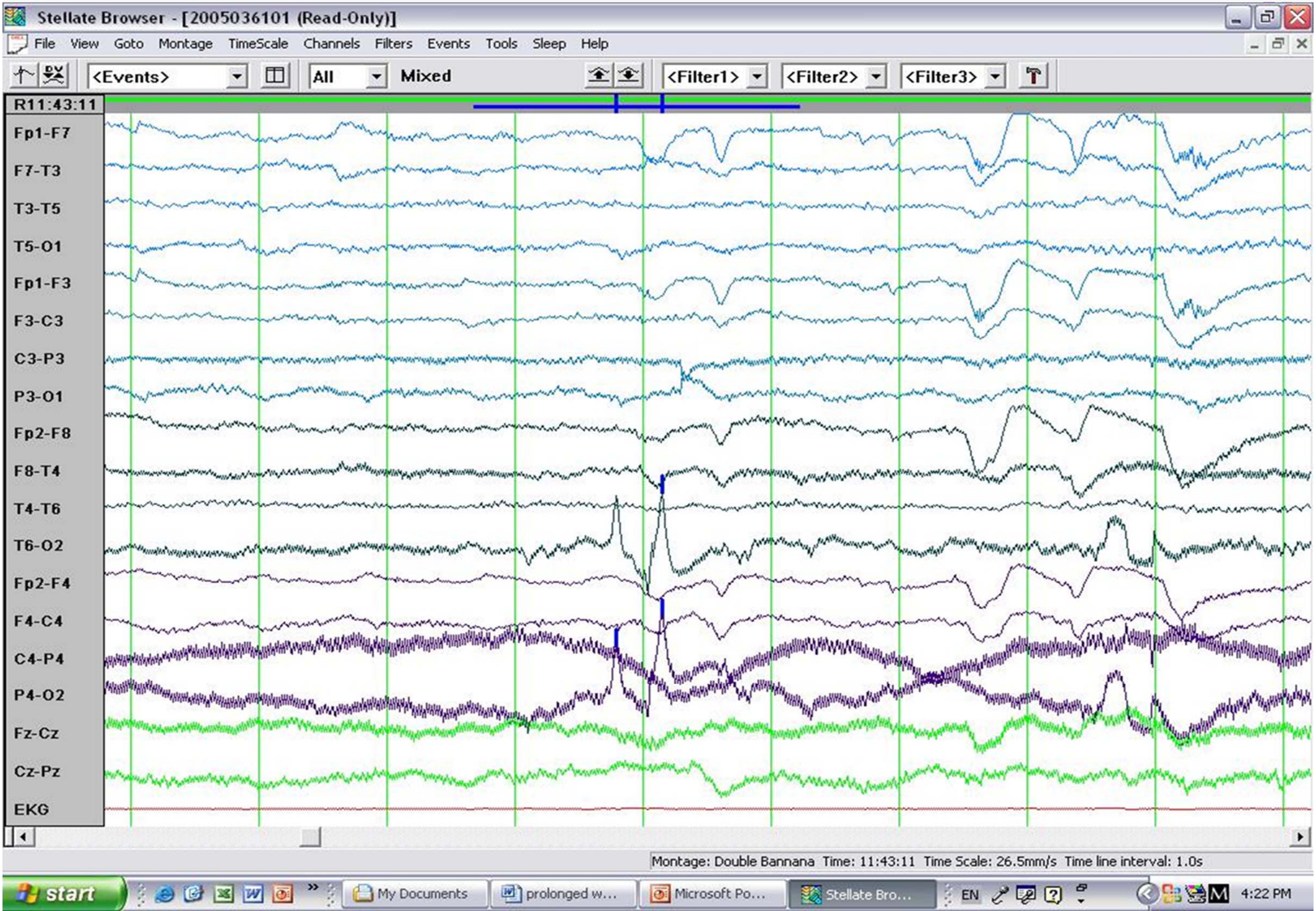
EKG artifact



Sweat artifact



Electrode pop up artifact



Electrode pop up artifact