

# **True Epileptiform Patterns (and some others)**

- a) What is epileptiform
- b) Some possible surprises
- c) Classification of generalized epileptiform patterns

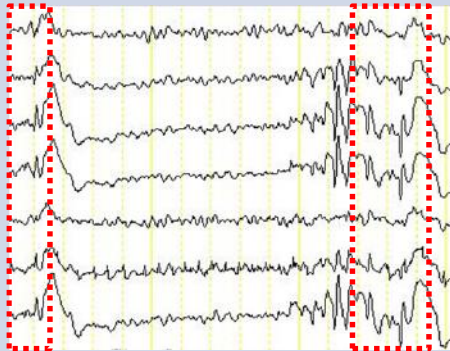
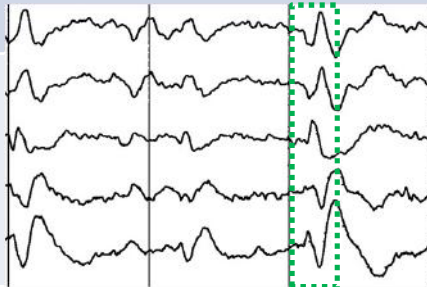
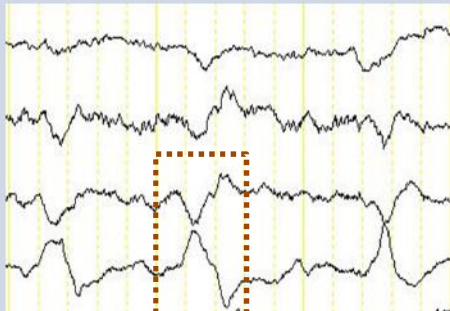
# An epileptiform pattern

Interpretative term based on pattern recognition involving:

- ❑ Distinctive waves – spikes or sharp waves
- ❑ They occur alone or with slow waves to make complexes
- ❑ They occur singly or in paroxysms lasting some seconds
- ❑ They resemble those patterns that distinguish a proportion of subjects with epilepsy from non-epileptics

## **Spikes and sharp waves**

- ❑ A transient with a pointed peak (apiculate shape) in displays of conventional length.
- ❑ Conventional length is a 10 sec epoch occupying about 30 cm in length. (Watch out for long flat computer screens.)
- ❑ These transients need to be distinguished from:
  - features of background activity
  - benign/normal events in drowsiness & sleep
  - artefacts

Transient	Frequency	Example
Spike	>13 Hz	 
Sharp wave	5-13 Hz	
Broad sharp wave	< 5 Hz	

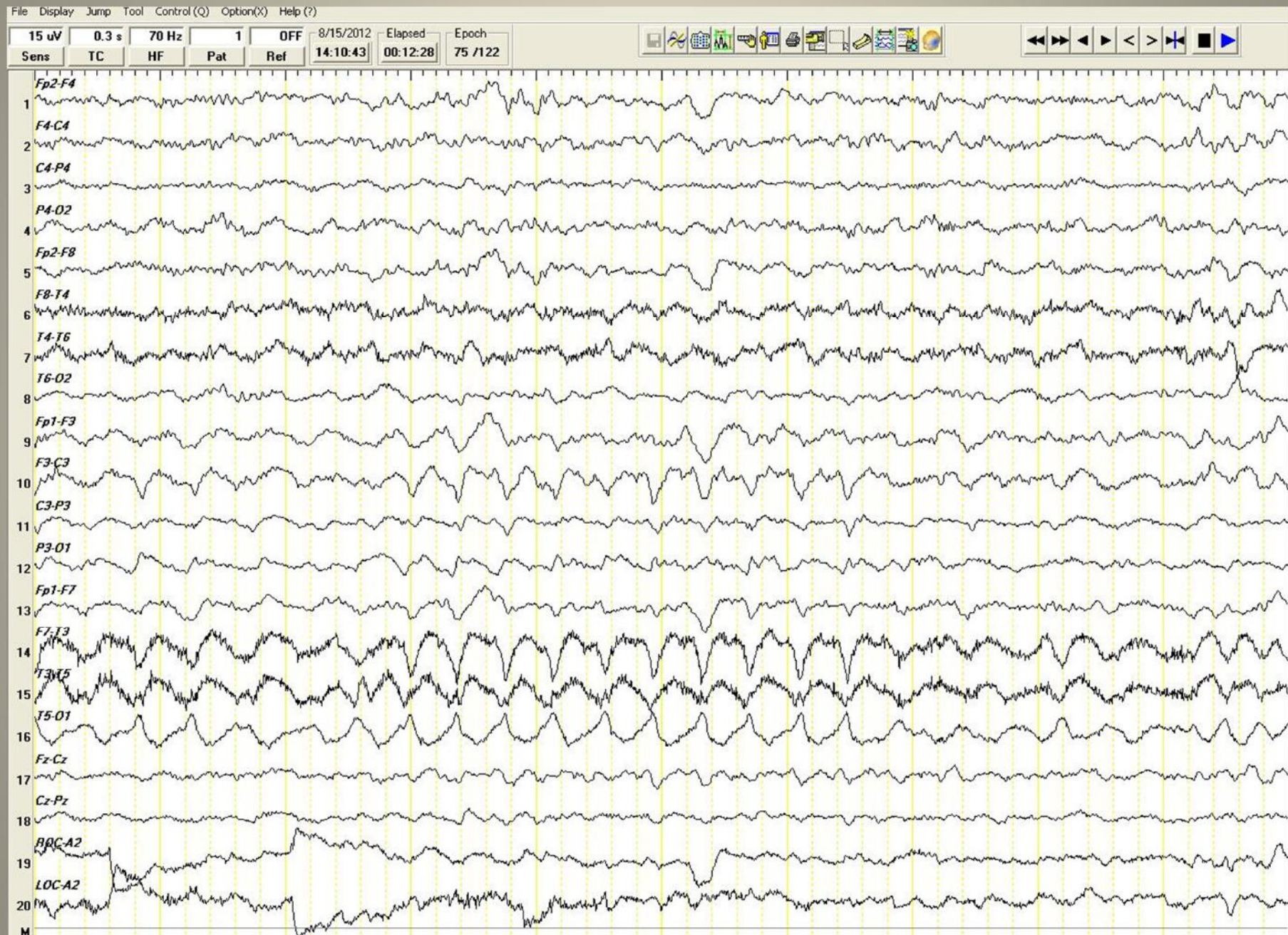
Non-epileptiform EEG patterns  
predictive of seizures

# Temporal intermittent rhythmic delta (TIRDA)

- Short runs ( $\geq 3$  sec) of intermittent, rhythmic saw-toothed or sinusoidal delta over the anterior temporal regions.
- More frequent during drowsiness & light sleep.
- An additional spike focus is common as is mesiotemporal atrophy on MRI.
- Is highly indicative of ipsilateral pathology + high positive predictive value for mesial temporal lobe epilepsy.



# TIRDA

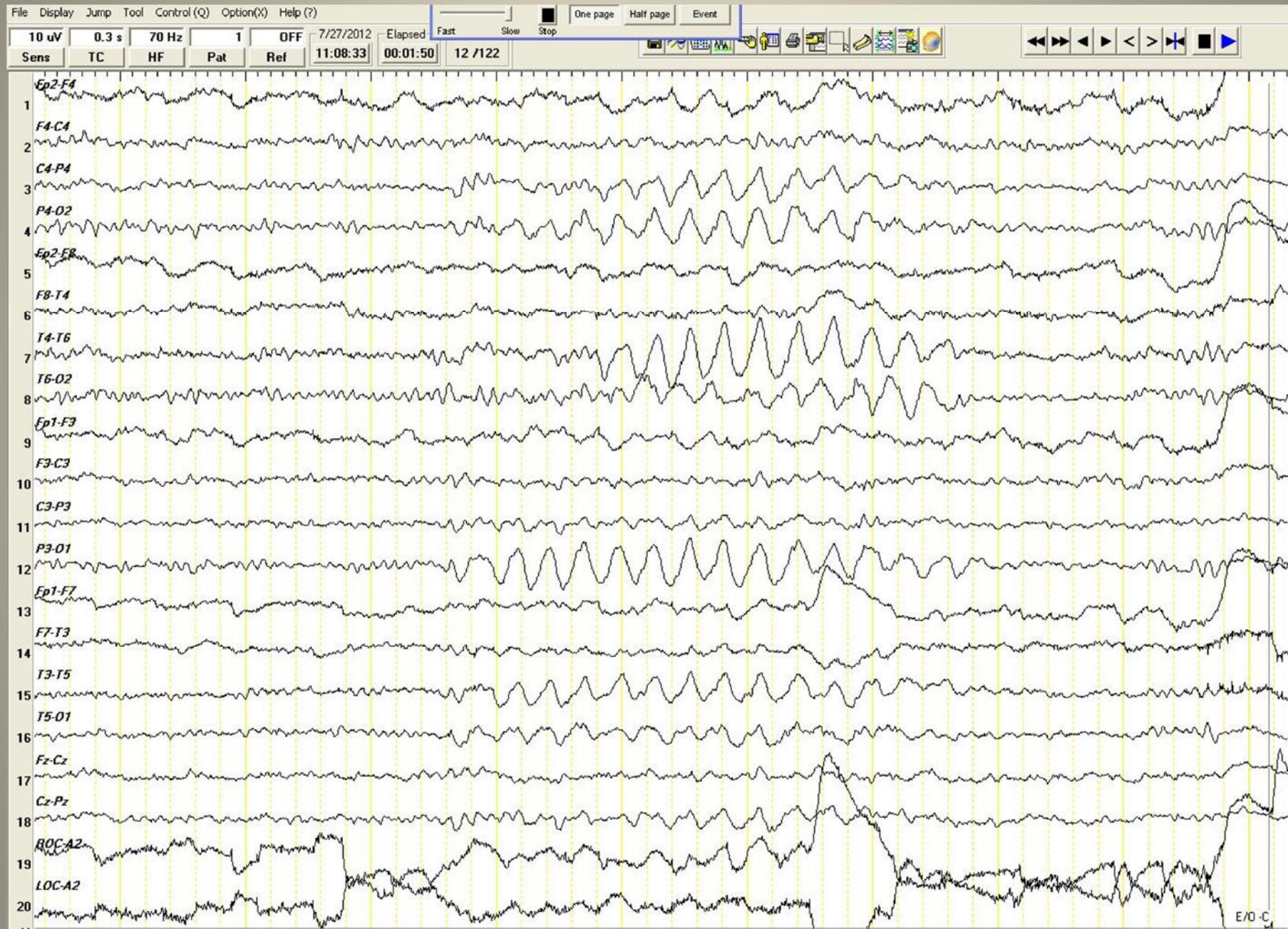


# Occipital intermittent rhythmic delta (OIRDA)

- Frequently associated with primary generalized epilepsy in children – generalized tonic-clonic or absences, as well as localization-related.
- Not pathognomonic of epilepsy, e.g. may occur in juvenile Huntington's disease.

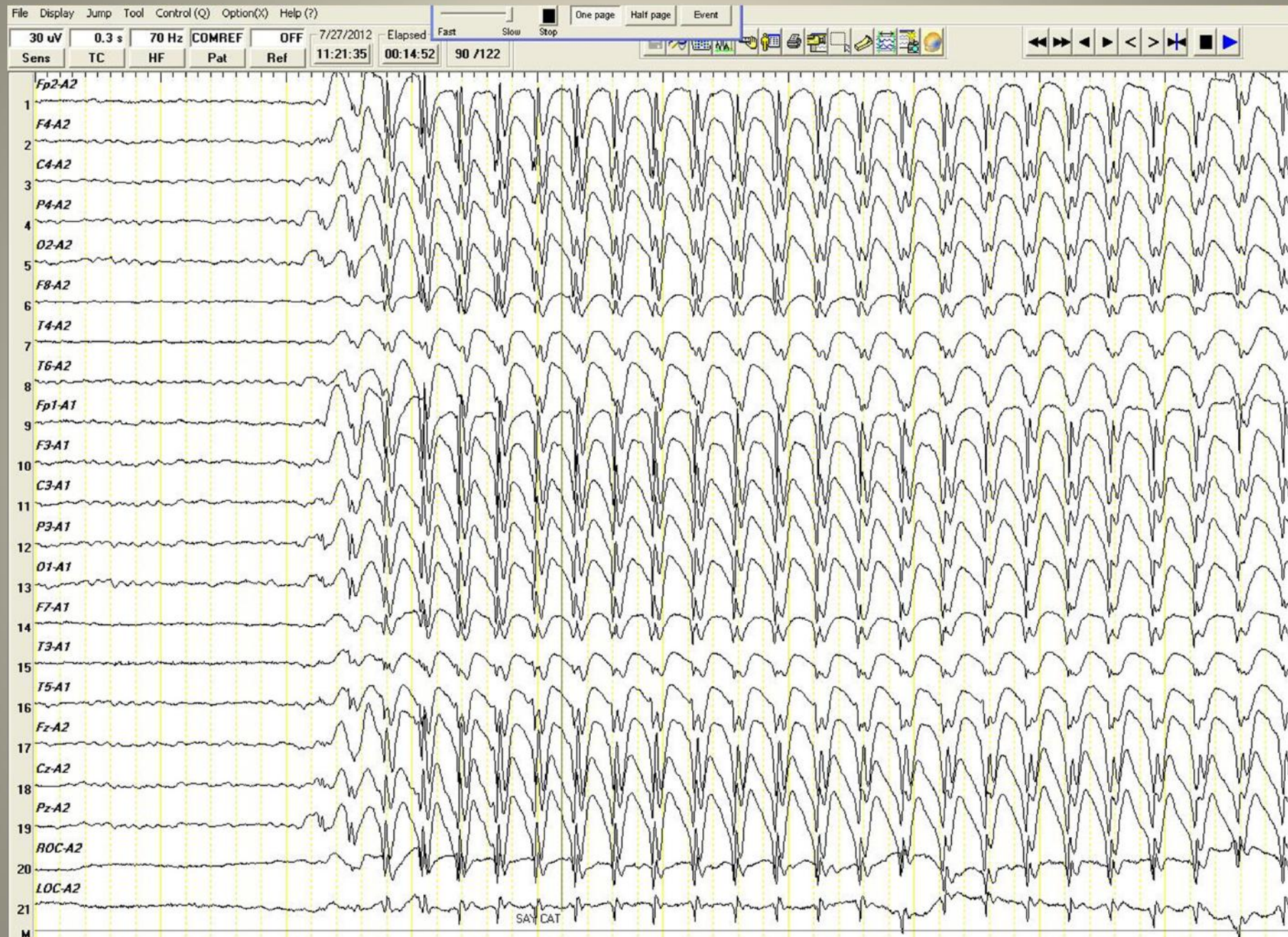


# OIRDA





In the same EEG as the previous slide

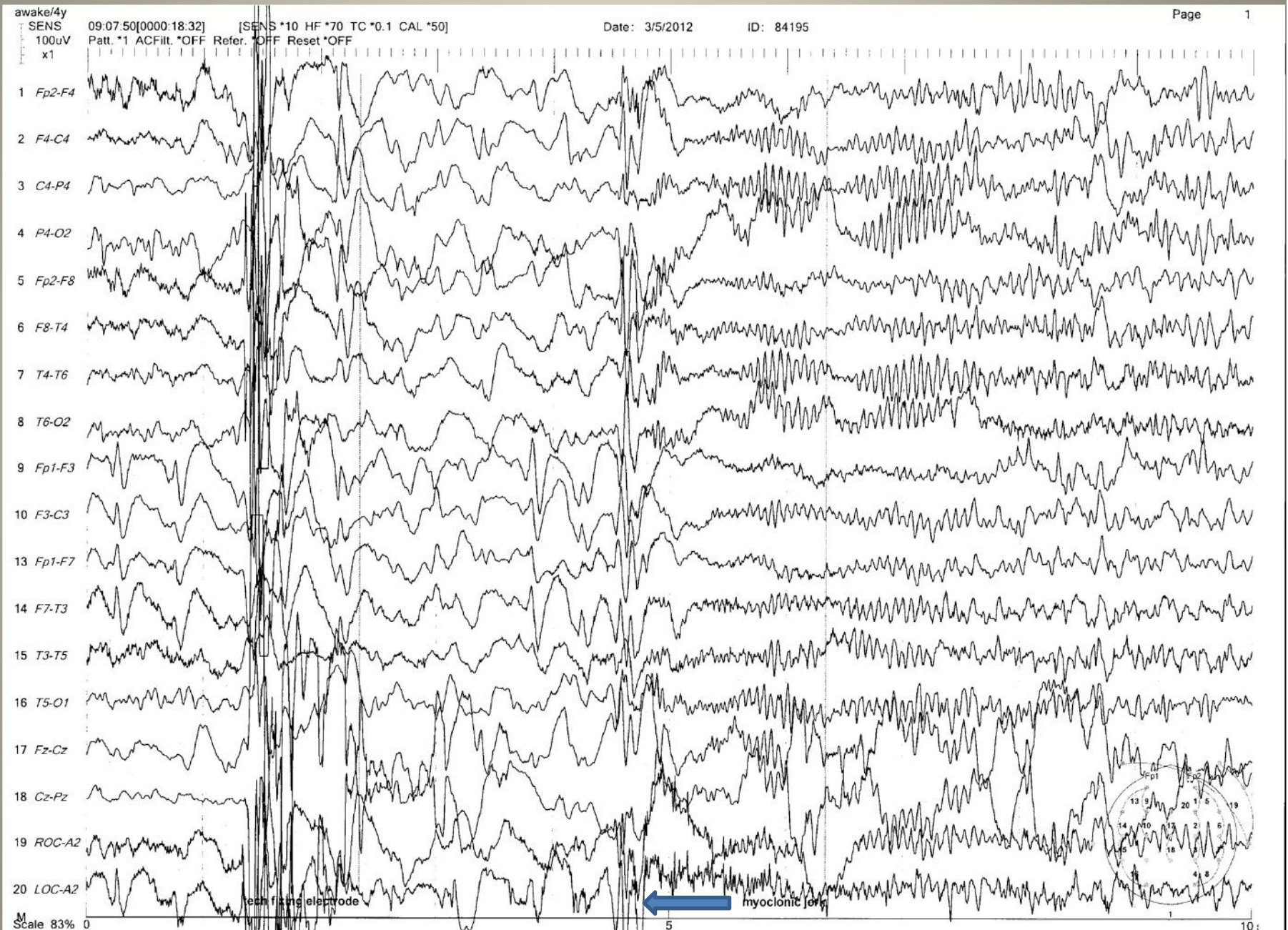


## Diffuse fast activity (alpha-beta frequency) in Lennox-Gastaut syndrome

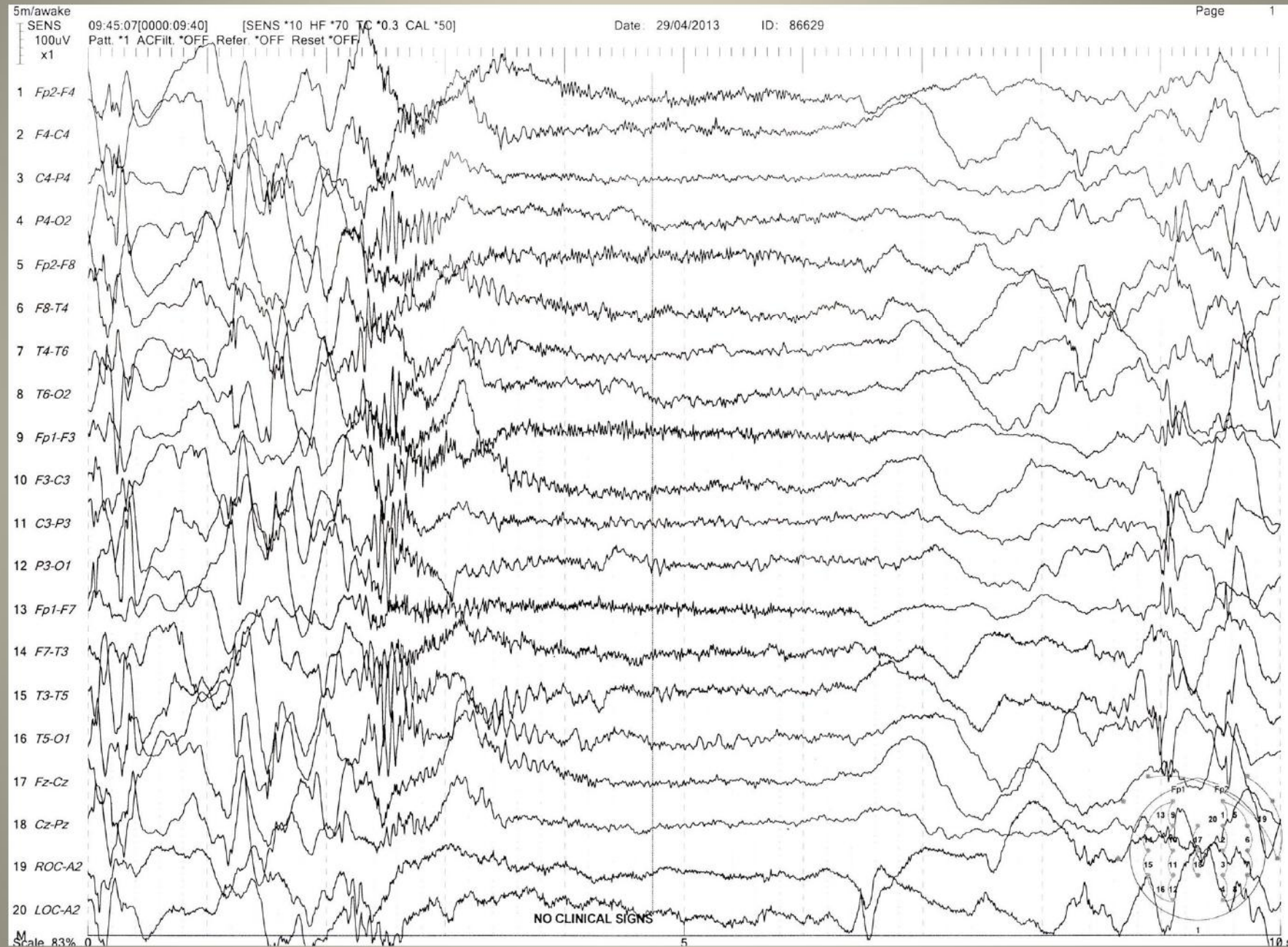
- Sudden “flattening” – electrodecremental periods mainly during sleep.
- Bursts of rhythmical 10-25 Hz activity may occur for up to 10 sec.
- Can be ictal or interictal (subclinical).



# Electrodecremental and fast



# Electrodecremental and fast in hypsarrhythmia





# The MAULSBY Guidelines for Assessing Spikes (1971)

*3. Clinically significant spikes are almost always surface negative in polarity or at least the sharpest or highest component.*

*4. Most spikes of clinical importance are followed by a slow wave(s) or occur in an area with abnormal slow wave activity*



# GENERALIZED EPILEPTIFORM DISCHARGES

- Electroencephalographers may restrict themselves to “generalized spike-and-wave paroxysms” for all paroxysms
- Clinically useful information likely to be lost
- Carefully distinguishing between and describing these events in detail is far preferable
- This has been the standard in SA Neurology

## Categories of Generalized Interictal Epileptiform Discharges

1. Hypsarrhythmia
2. Sharp-and-Slow-Wave Complexes (<3 Hz)
3. 3 Hz Spike-and-Slow-Wave Complexes
4. Multiple-(Poly)-Spike-and-Slow-Wave Complexes or Multiple (Poly) Spike Discharges
5. Atypical Spike/Sharp-Wave-and-Slow-Wave Discharges

# Hypsarrhythmia

## Interictal characteristics

- ✓ Prototypical pattern (esp. early stages, younger infants): Chaotic, high voltage, irregular, asynchronous, diffuse slow waves (mainly delta)
- ✓ Multifocal spikes, bilaterally
- ✓ Absence of almost all normal activity, except for sleep spindles in some patients
- ✓ Amelioration with time: Less chaotic, reduced voltage, increased interhemispheric symmetry & synchrony
- ✓ Can occur in wakefulness + sleep, but most often in sleep

# HYPSARRHYTHMIA. PAH. 14 m. West's syndrome

HYPSARRHYTHMIA 14m

11:46:52 AM [00:07:50] [SENS \*10 HF \*35 TC \*0.3 CAL \*100]  
Patt. \*1 ACfilt. \*OFF Refer. \*OFF

DATE: 7/28/99

ID: 58443 Page 1

SENS  
100uV  
x1

1 FP2-F4

2 F4-C4

3 C4-P4

4 P4-O2

5 FP2-F8

6 F8-T4

7 T4-T6

8 T6-O2

9 FP1-F3

10 F3-C3

11 C3-P3

12 P3-O1

13 FP1-F7

14 F7-T3

15 T3-T5

16 T5-O1

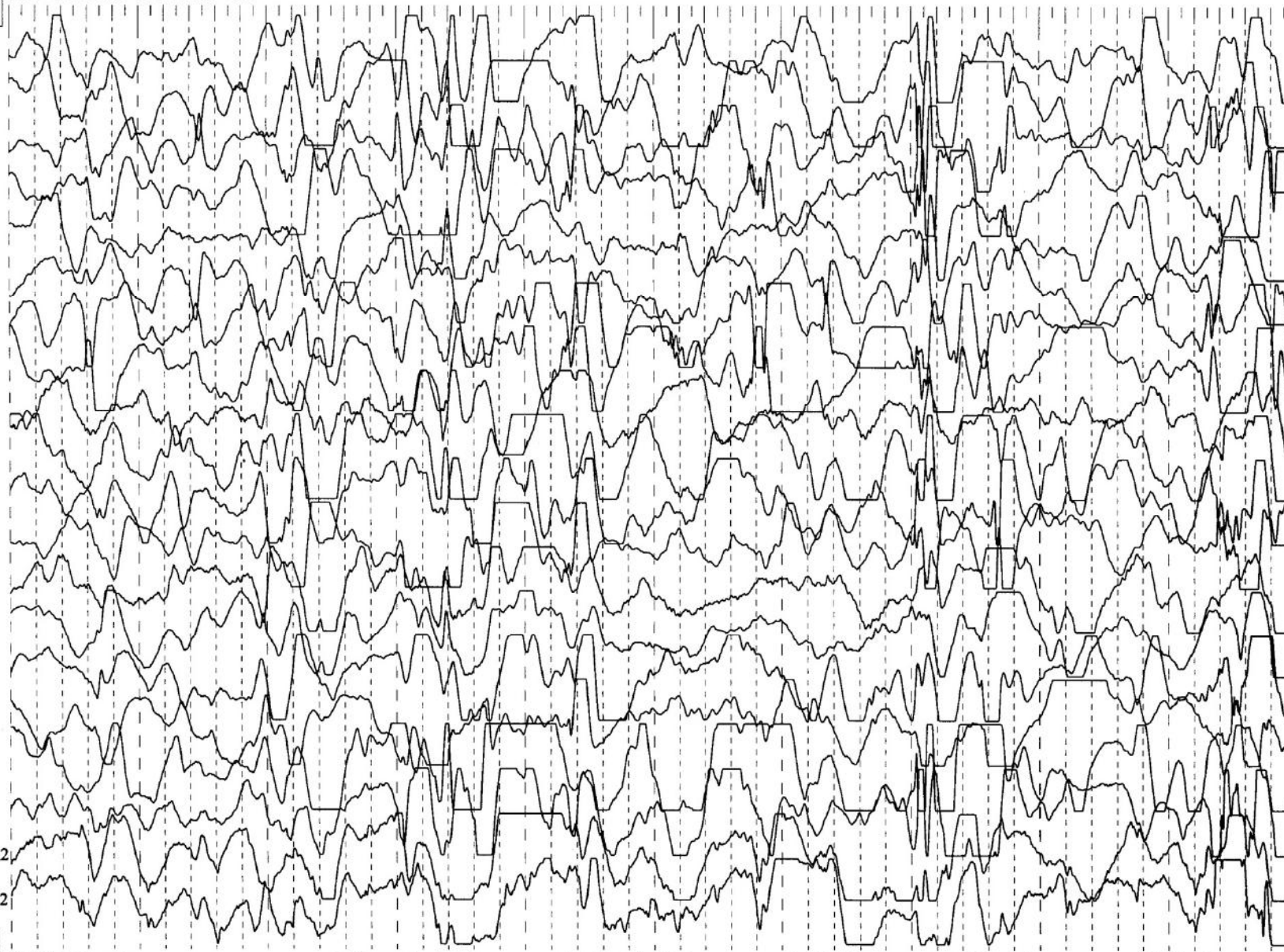
17 Fz-Cz

18 Cz-Pz

19 ROC-A2

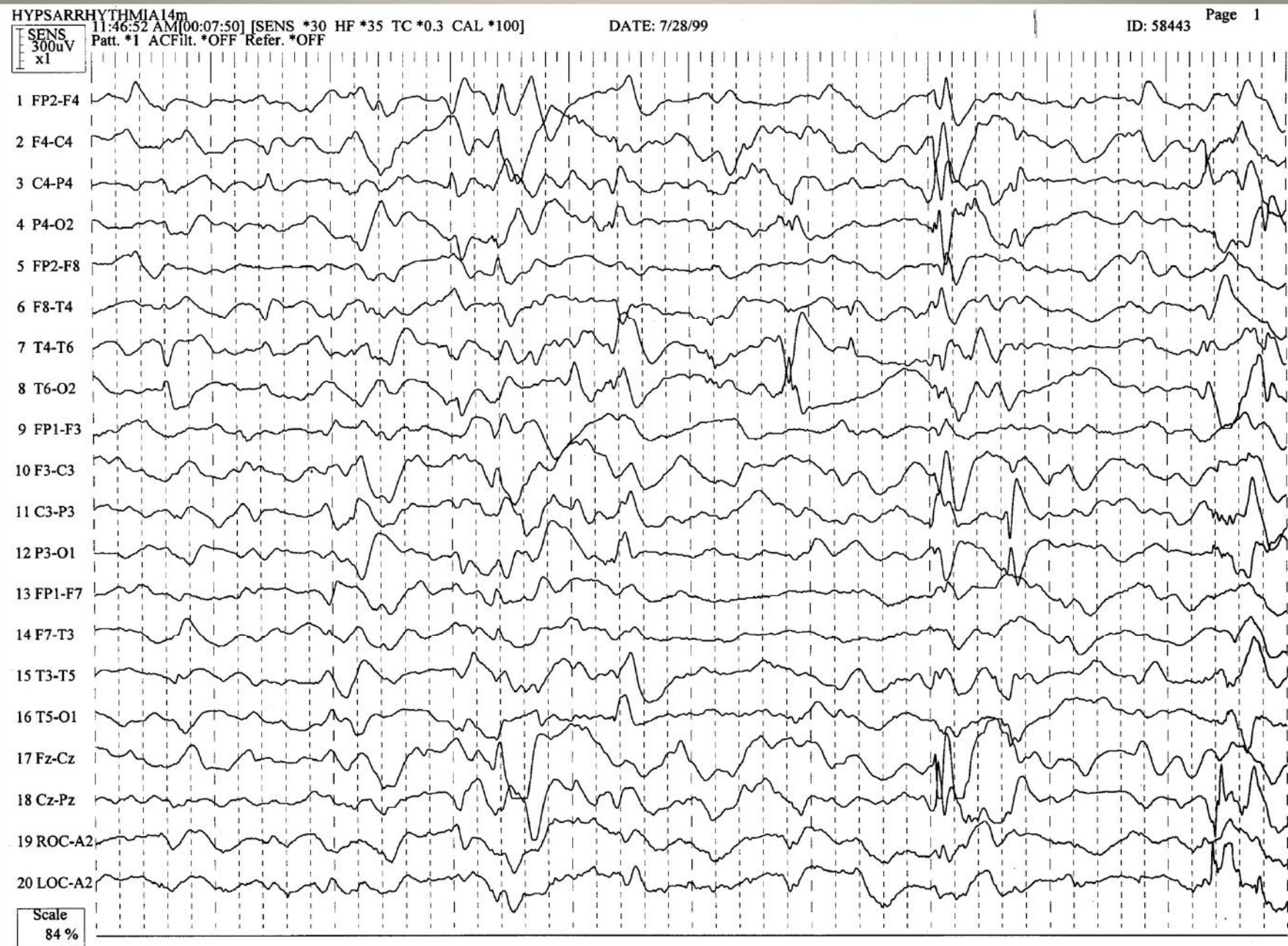
20 LOC-A2

Scale  
84 %





# HYPSARRHYTHMIA. PAH. 14 m. West's syndrome



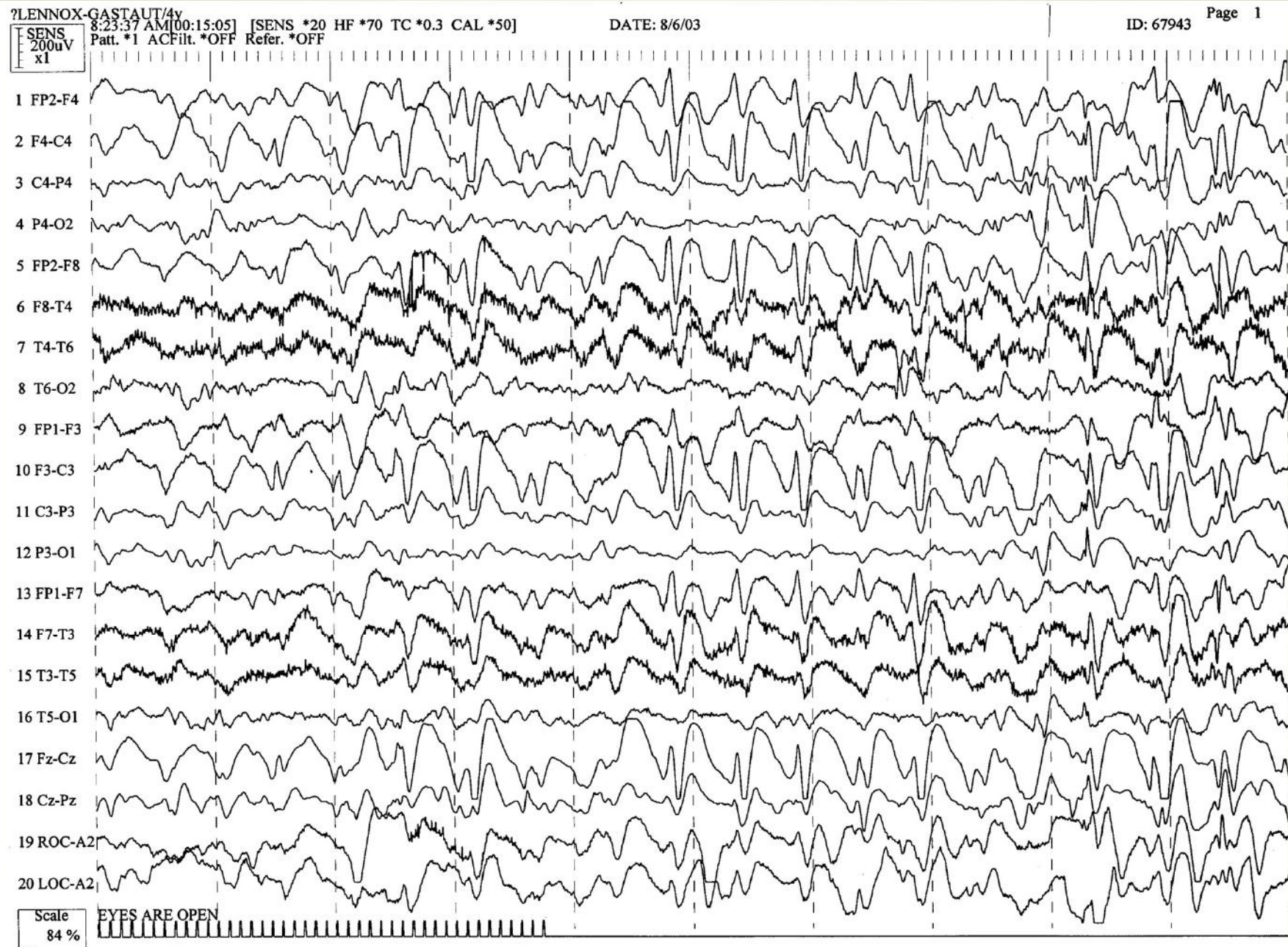
# Sharp-and-Slow-Wave Complexes

## Interictal characteristics.

- ✓ Complex comprises biphasic/triphasic, surface negative, 5-6 Hz sharp wave + a high voltage (approx 300-400  $\mu$ V) surface negative delta wave, the complex lasting about  $\frac{1}{2}$  s (2 Hz)
- ✓ Strongly, but not exclusively associated with Lennox-Gastaut syndrome
- ✓ Many variations in morphology, distribution, frequency, amplitude
- ✓ Maximal bifrontally, may be asymmetrical
- ✓ Often in extended runs – can be nearly continuous without clinical signs
- ✓ Sleep activates in the vast majority, but may suppress discharges in a small minority

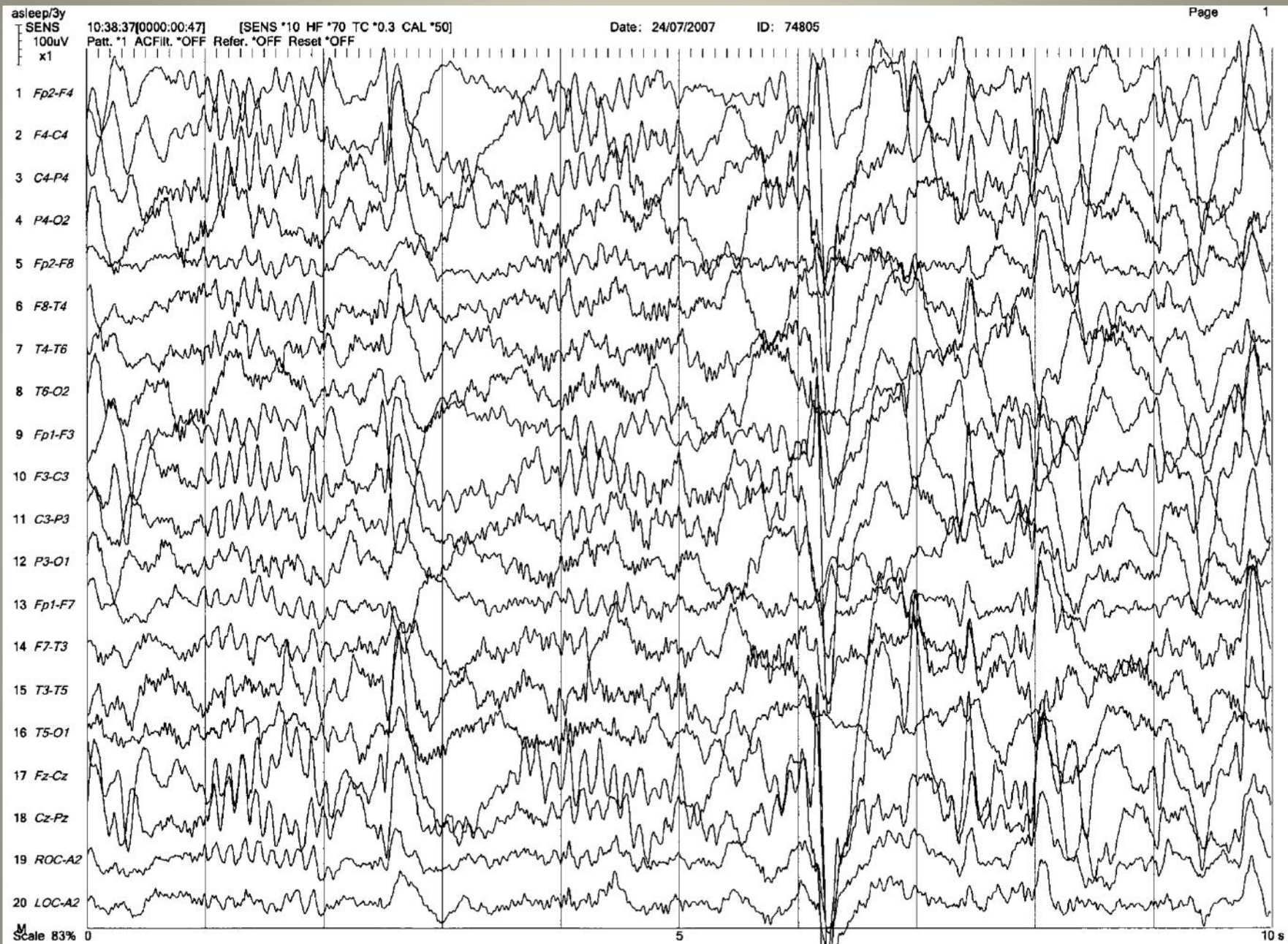


# S-&-SW COMPLEXES. 4 yr. Lennox-Gastaut syndrome.





# S-&SW + rhythmic fast activity. 3 yr. Lennox-Gastaut syndrome



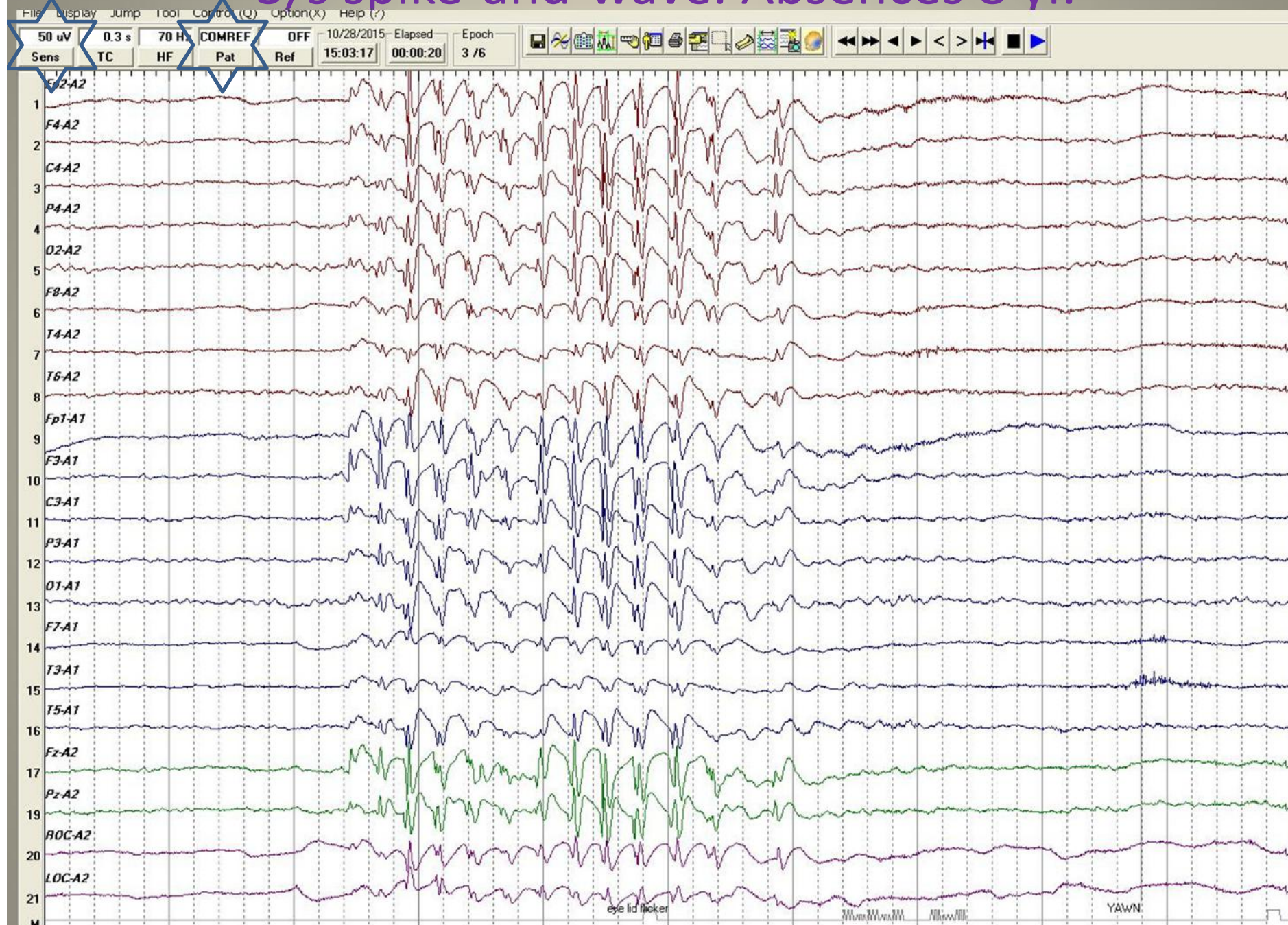
# 3-Hz Spike-and-Slow-Wave Complexes

## Interictal/ictal characteristics

- ✓ “Classical” discharge comprising a surface-negative spike followed by a surface-negative slow wave
- ✓ Tend to be bisynchronous and symmetrical, often maximal frontally (MEEG/QEEG/fMRI – complex pattern of cortical activation)
- ✓ Frequency of discharges may be 3.5-4.5 at onset, gradually slowing to 2.5 Hz at termination

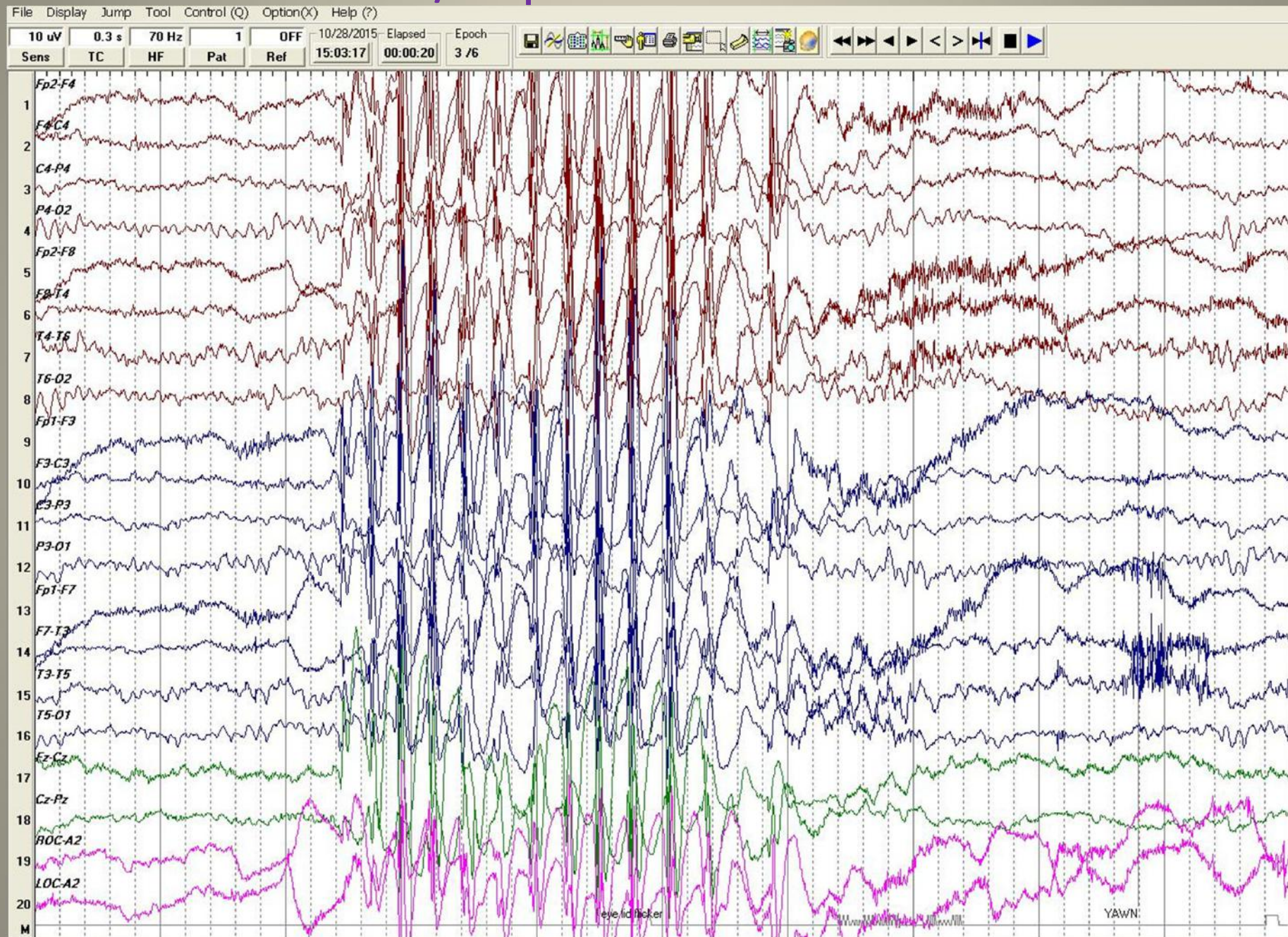


3/s spike-and-wave. Absences 8 yr.



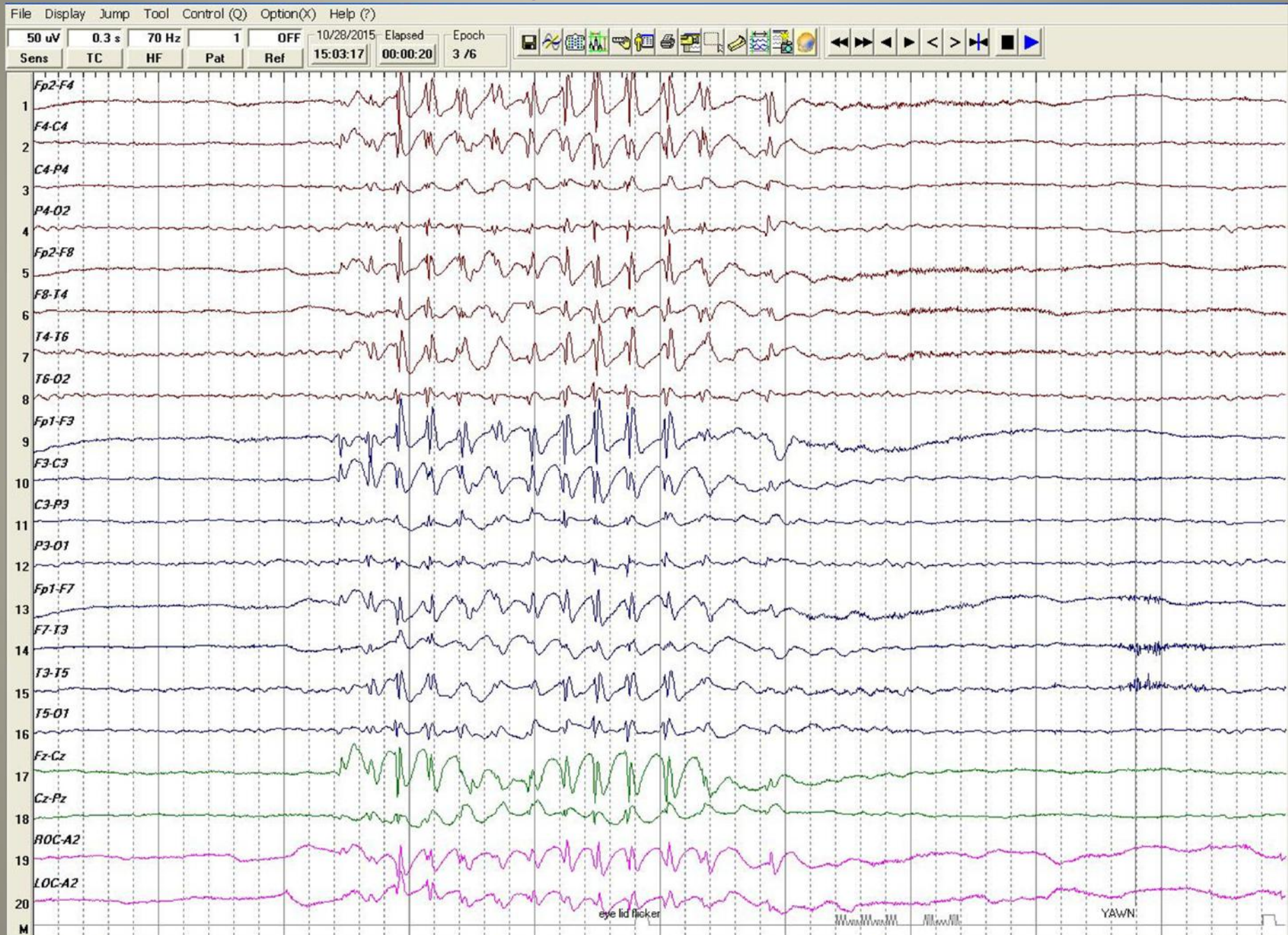


# 3/s Spike-And-Wave.



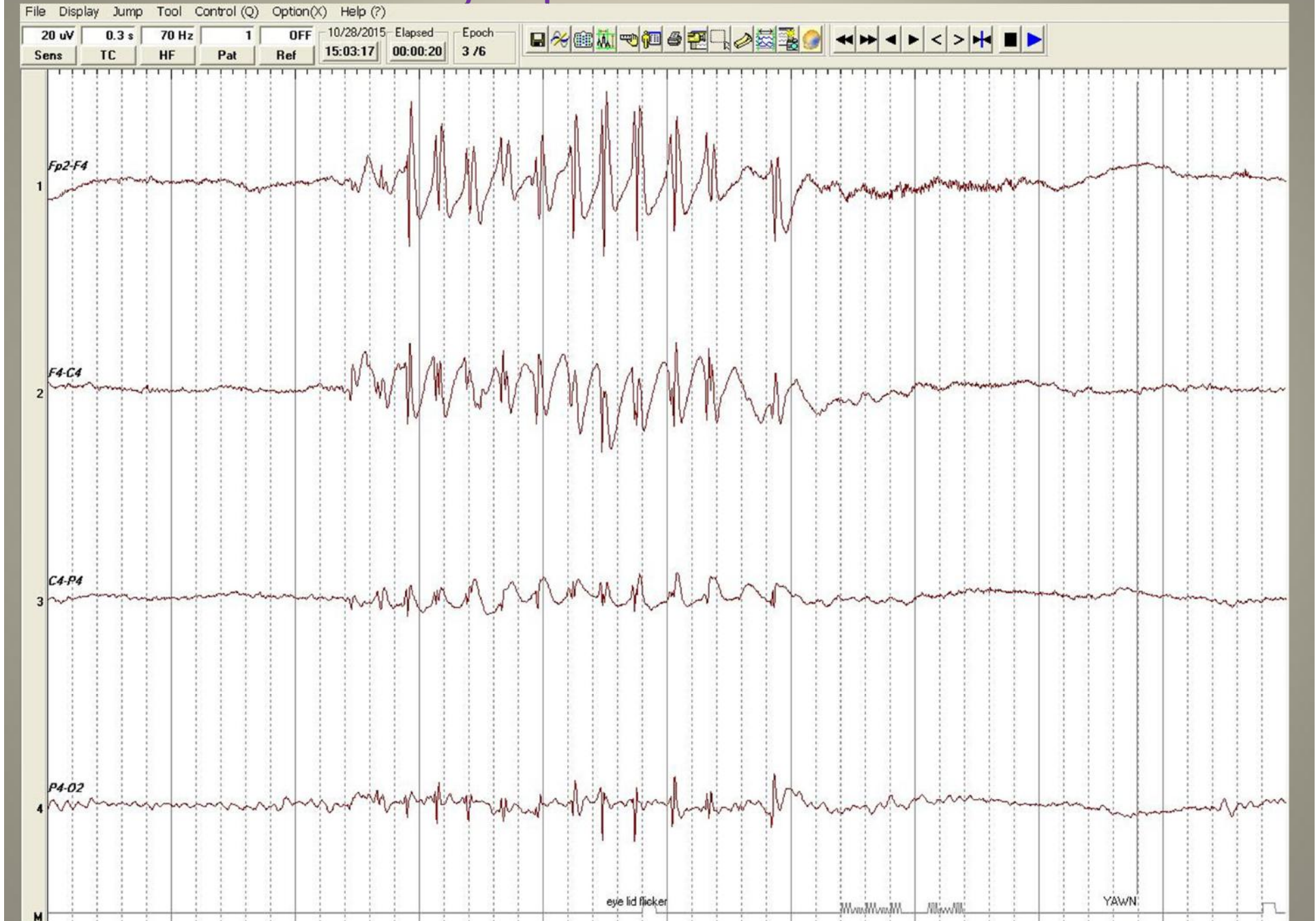


# 3/s Spike-And-Wave.





# 3/s Spike-And-Wave.

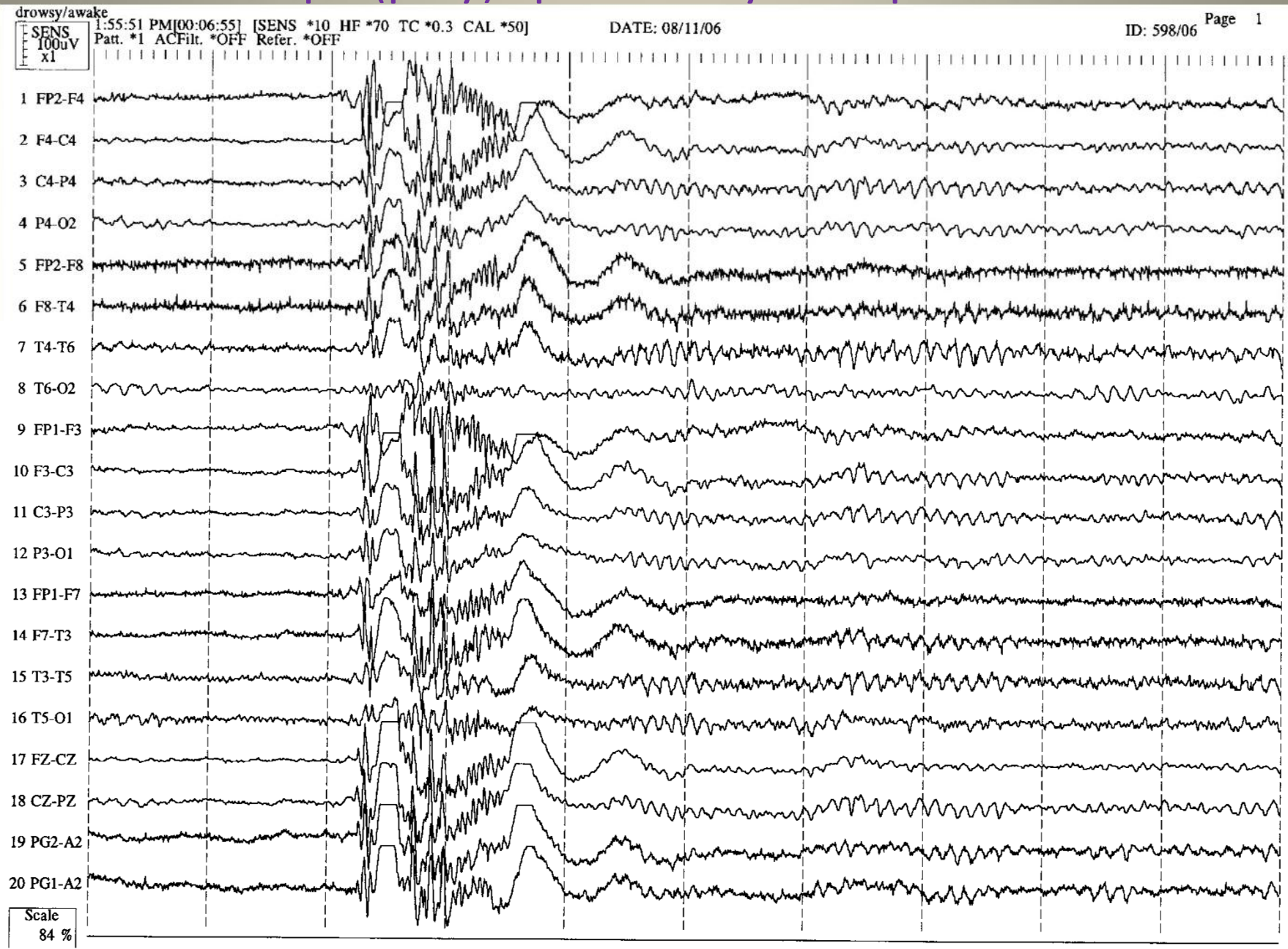


# Multiple-(Poly)-Spike-and-Slow-Wave Complexes

## Some clinical aspects

- ✓ Long association with myoclonus – but much more complicated.
- ✓ Also associated with generalized tonic-clonic epilepsy
- ✓ Occur in primary & secondary generalized epilepsies, usually after 1<sup>st</sup> decade
- ✓ Current EEG lit. emphasizes juvenile myoclonic epilepsy (JME)

# Multiple(poly) spikes. 31 yr. Idiopathic GTC



# Atypical Spike-and-Wave Discharges

- ✓ Inexact nosology, but important for (many) instances that do not fit in first 4 categories
- ✓ Used for paroxysms consisting of sharp waves and/or spikes and 3-6 Hz irregular slow waves, or even lower frequency slow waves.
- ✓ Occur in a wide range of primary & secondary generalized seizures, e.g. tonic-clonic, progressive myoclonic etc. etc.



# ATYPICAL. 28 yr. Idiopathic GTC.

