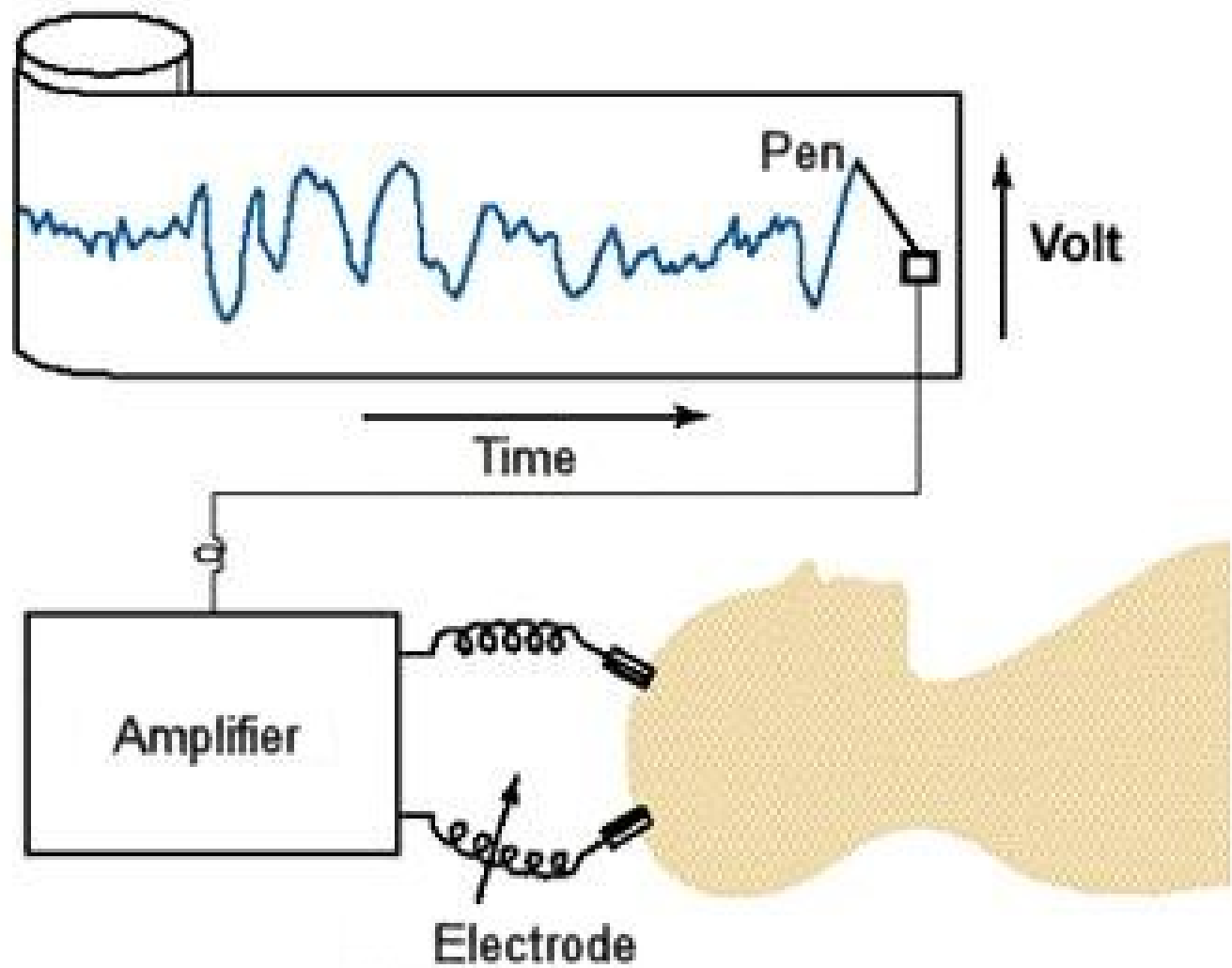


EEG a evokované potenciály

HISTÓRIA:

**Hans Berger, profesor psychiatrie v
Jene v roku 1929**



Encefalografia - snímanie spontánnej elektrickej aktivity z povrchu mozgu. EEG aktivita závisí od veku, stavu bdenia, užívania liekov a mnohých iných faktorov. EEG dozrieva do 18. - 20. roku života. U zdravého človeka v bdelom stave prevláda alfarytmus (8 - 12 vln za sekundu = Hz) s maximom pri snímaní nad zadnou časťou hlavy (okcipitálne). Pri otvorení očí sa tento rytmus na určitý čas stráca. Rýchla aktivita (13 a viac Hz) sa označuje ako beta aktivita. Môže byť prítomná v norme u zdravého človeka.

Spomalenie EEG aktivity sa vyskytuje abnormálne pri patologických stavoch - ložiskovo (nádory, ischemia) alebo difúzne (napr. demencie). Pri ochoreniach mozgu sa objavuje thétarytmus (4 - 8 Hz) alebo aj deltarytmus (frekvencia menej ako 4 Hz). U epileptikov sa môžu vyskytovať typické grafoelementy - hroty, ostré vlny, komplexy hrotu s pomalou vlnou a pod.

V spánku sa EEG aktivita výrazne mení a pomáha určovať spánkové štádia (hĺbku spánku). Hodnotenie EEG vyžaduje skúsenosti i keď počítačové hodnotenie umožňuje aj grafické znázornenie EEG aktivity (mapovanie EEG).

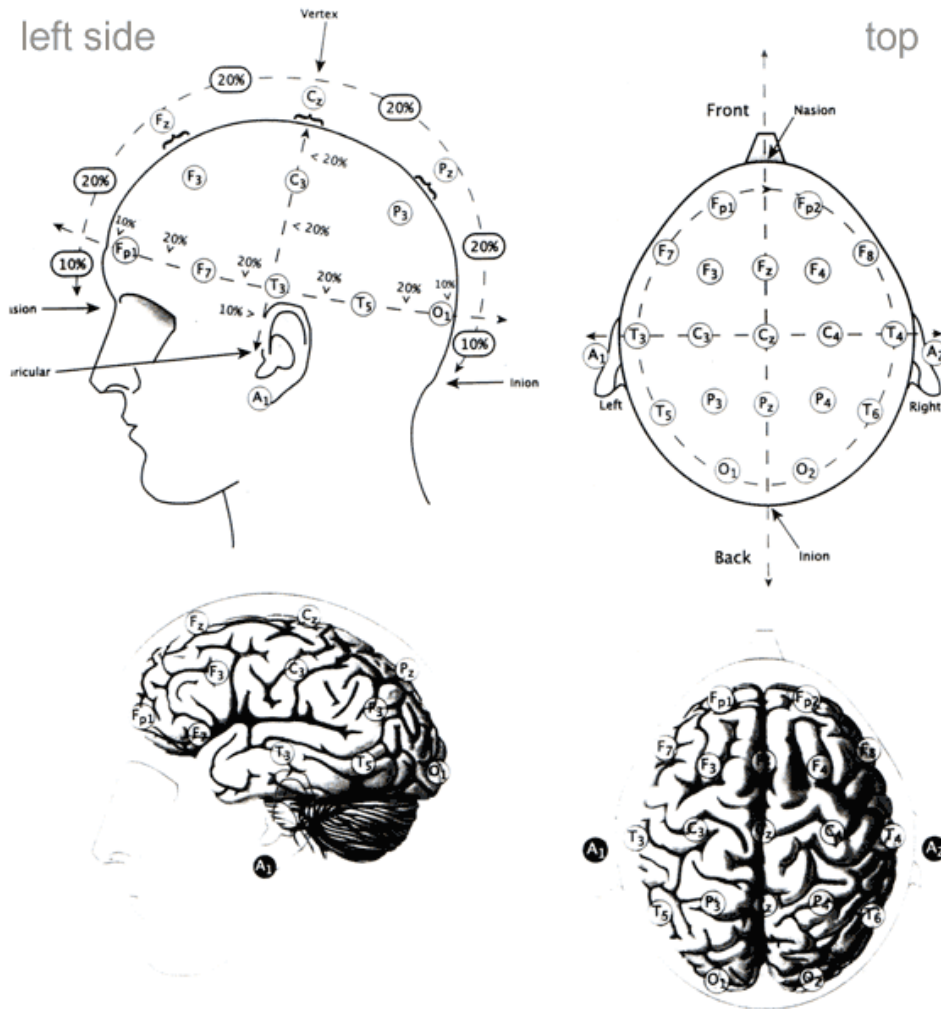
Vzhľadom na krátku dĺžku záznamu sa nemusia abnormality v EEG zachytiť za štandardných podmienok. V indikovaných prípadoch sa používa dlhodobé monitovanie EEG (Long Term Monitoring - LTM) spolu aj s monitorovaním EKG (24, 48 alebo i viac hodín). EEG vyšetrenie indikuje najčastejšie neurológ.

Beta > 13 Hz

Alfa 8 – 13 Hz

Theta 4 – 8 Hz

Delta < 4 Hz



Relationship between brain and electrode positions

ELECTRODE PLACEMENT International 10-20 System

Awake — Low Voltage — Random, Fast

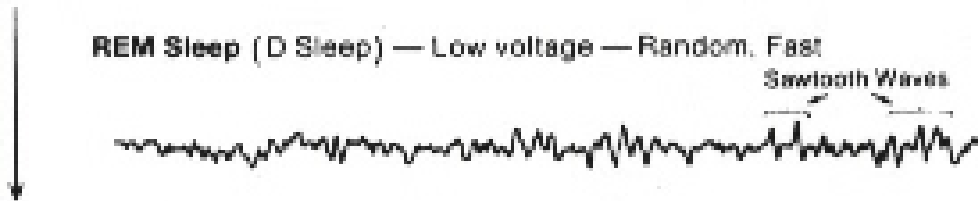


Drowsy — 8 to 12 cps — Alpha Waves



REM Sleep (D Sleep) — Low voltage — Random, Fast

Sawtooth Waves



Stage 1 — 3 to 7 cps — Theta Waves

Theta Waves



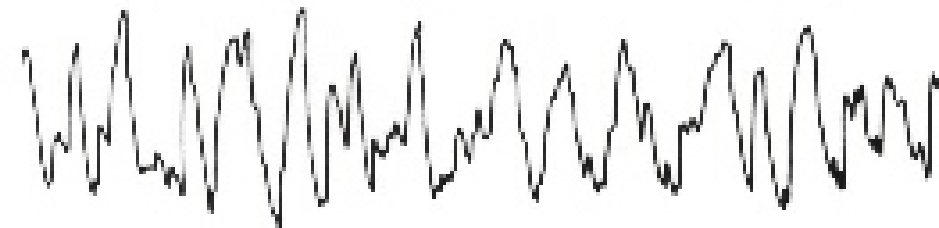
Stage 2 — 12 to 14 cps — Sleep Spindles and K Complexes

Sleep Spindle

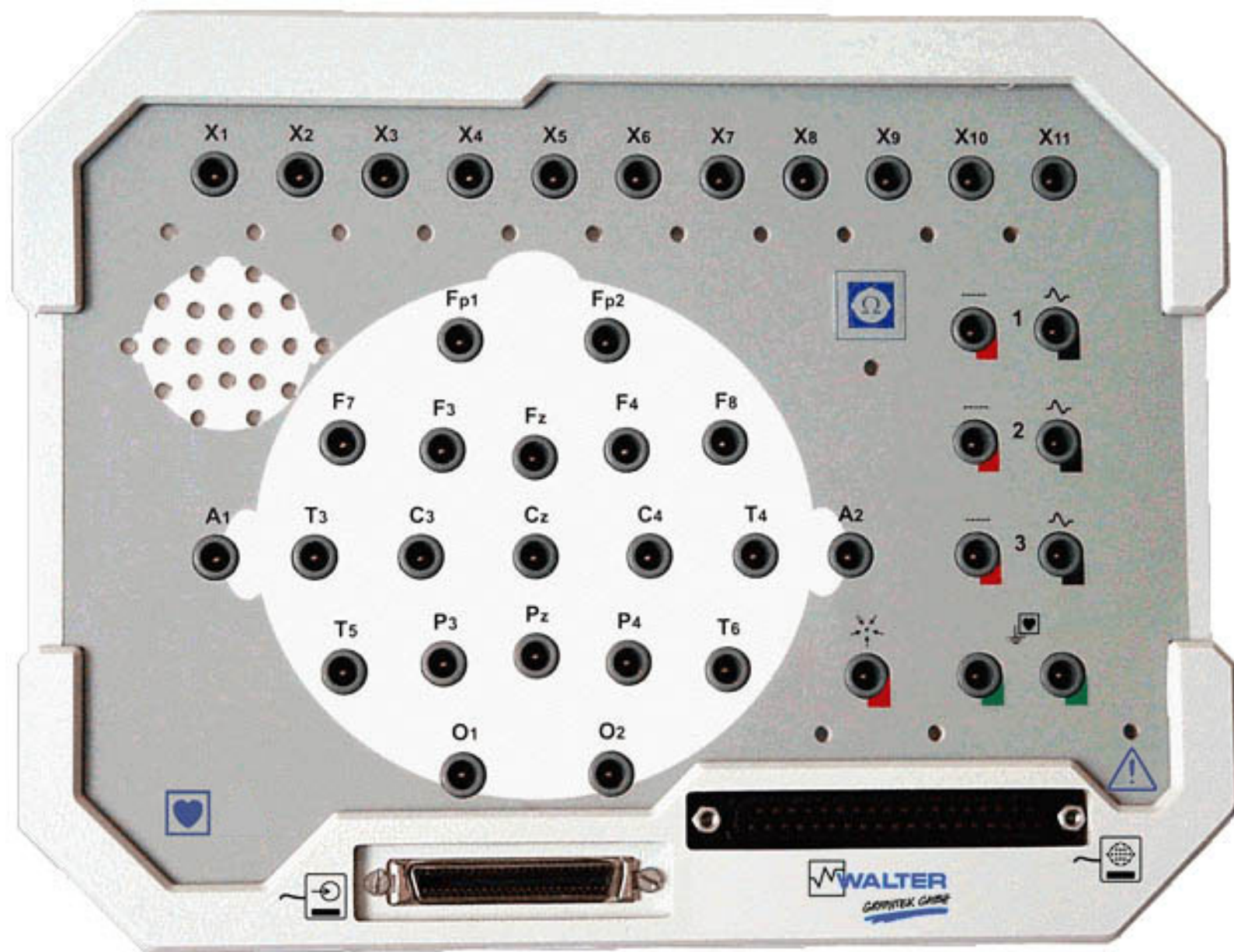
K Complex

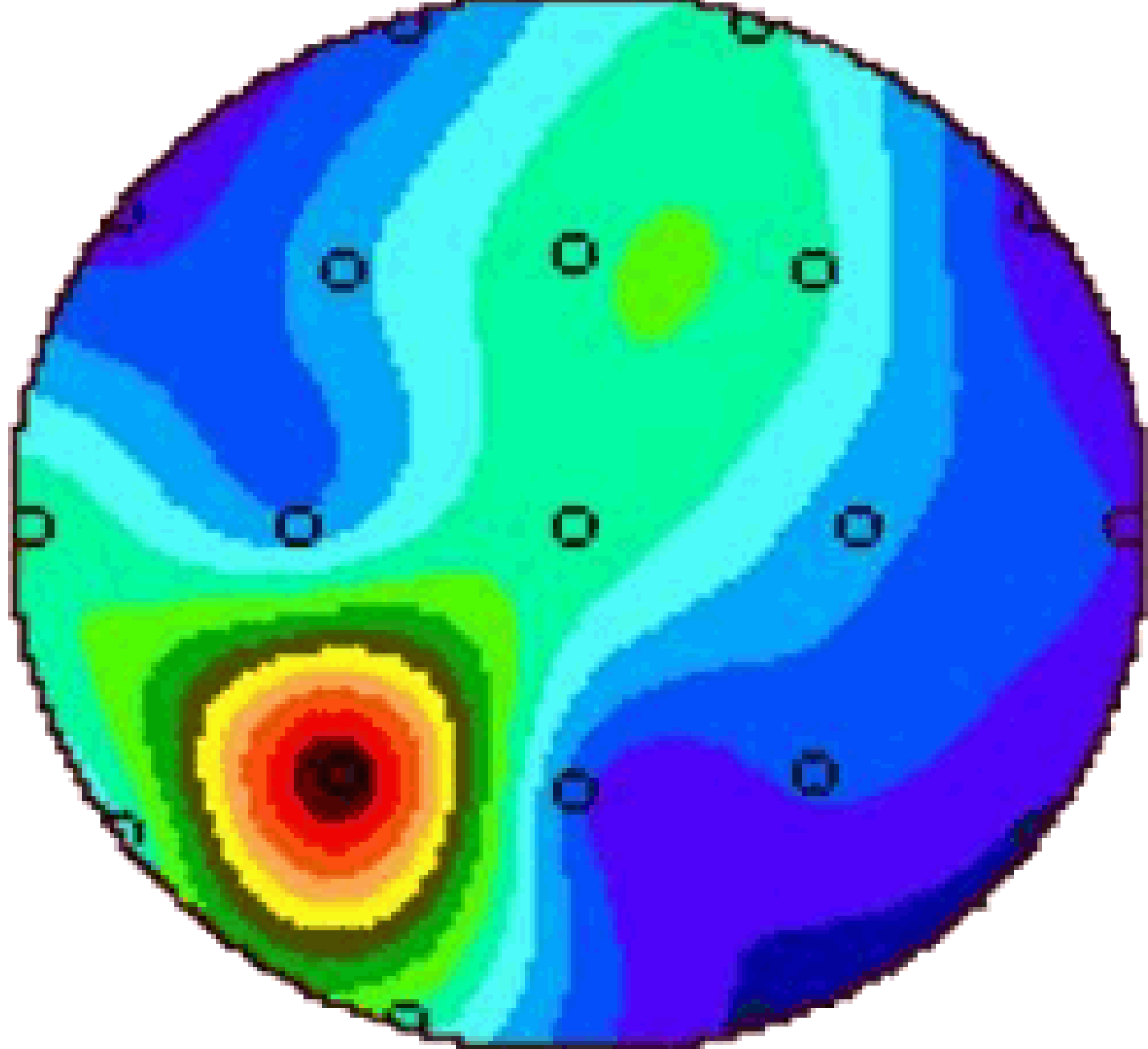


Delta Sleep (S Sleep) — 1/2 to 2 cps — Delta Waves

















BRAIN WAVE ACTIVITY

Beta



Alpha



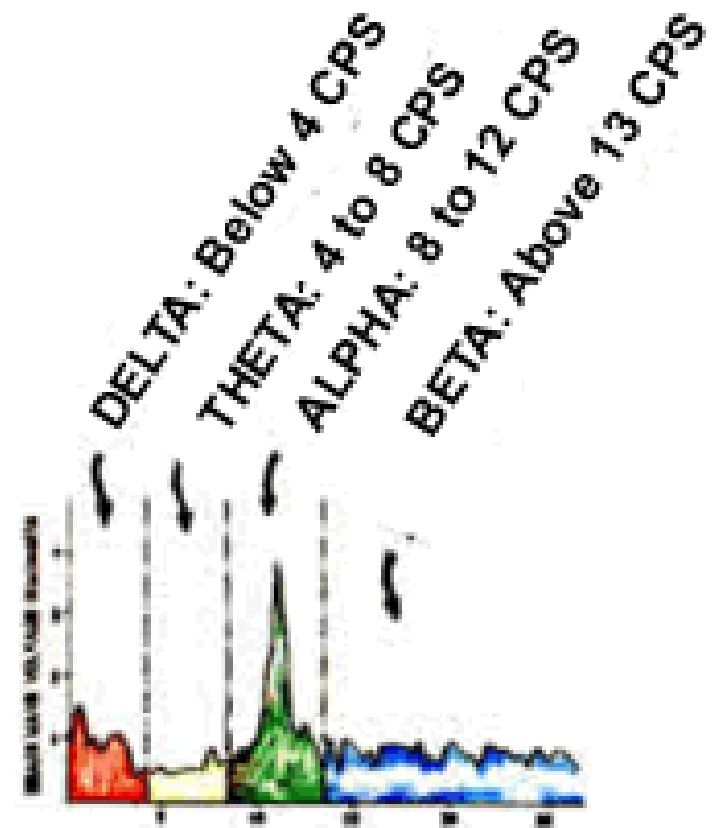
Theta

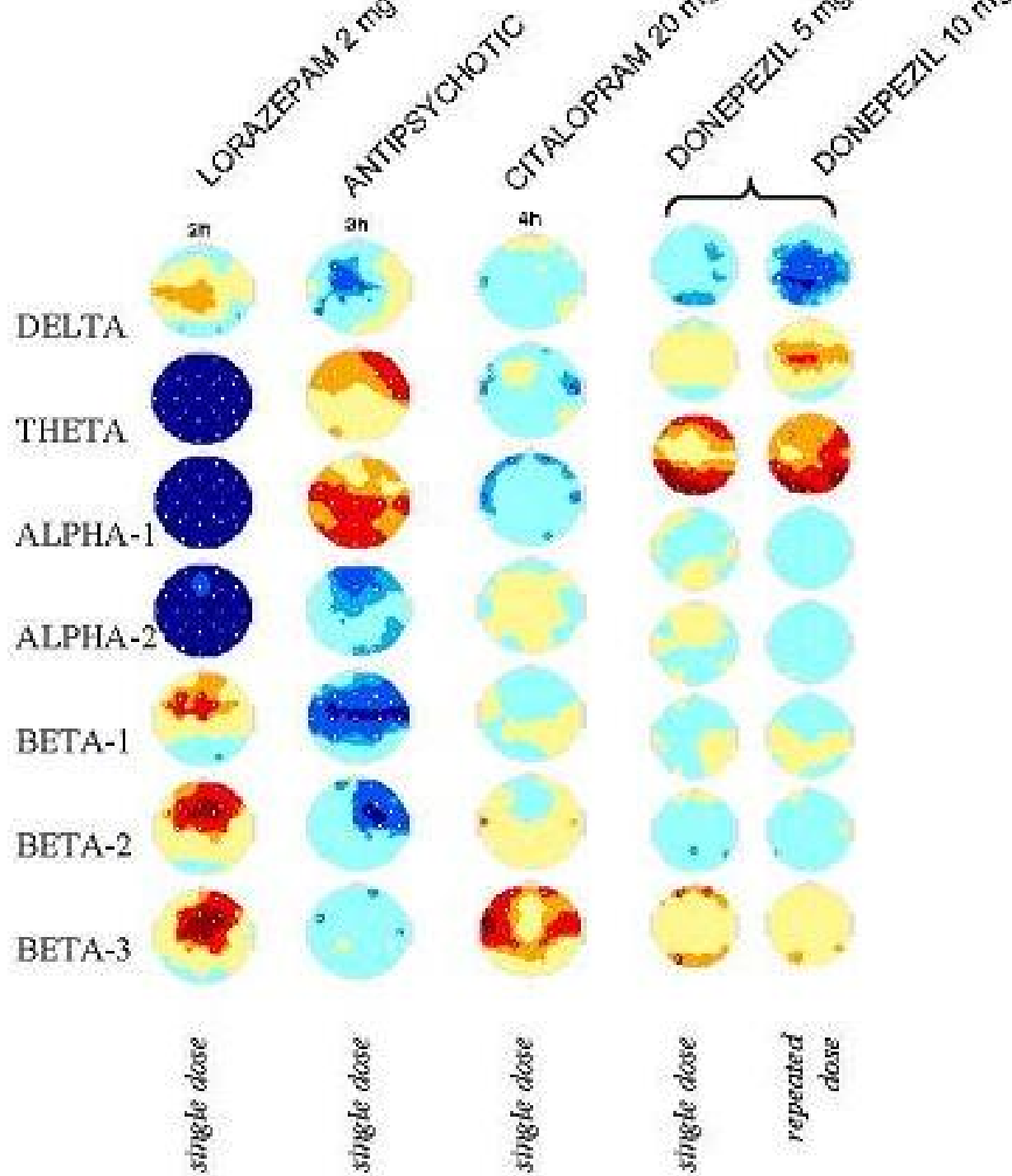


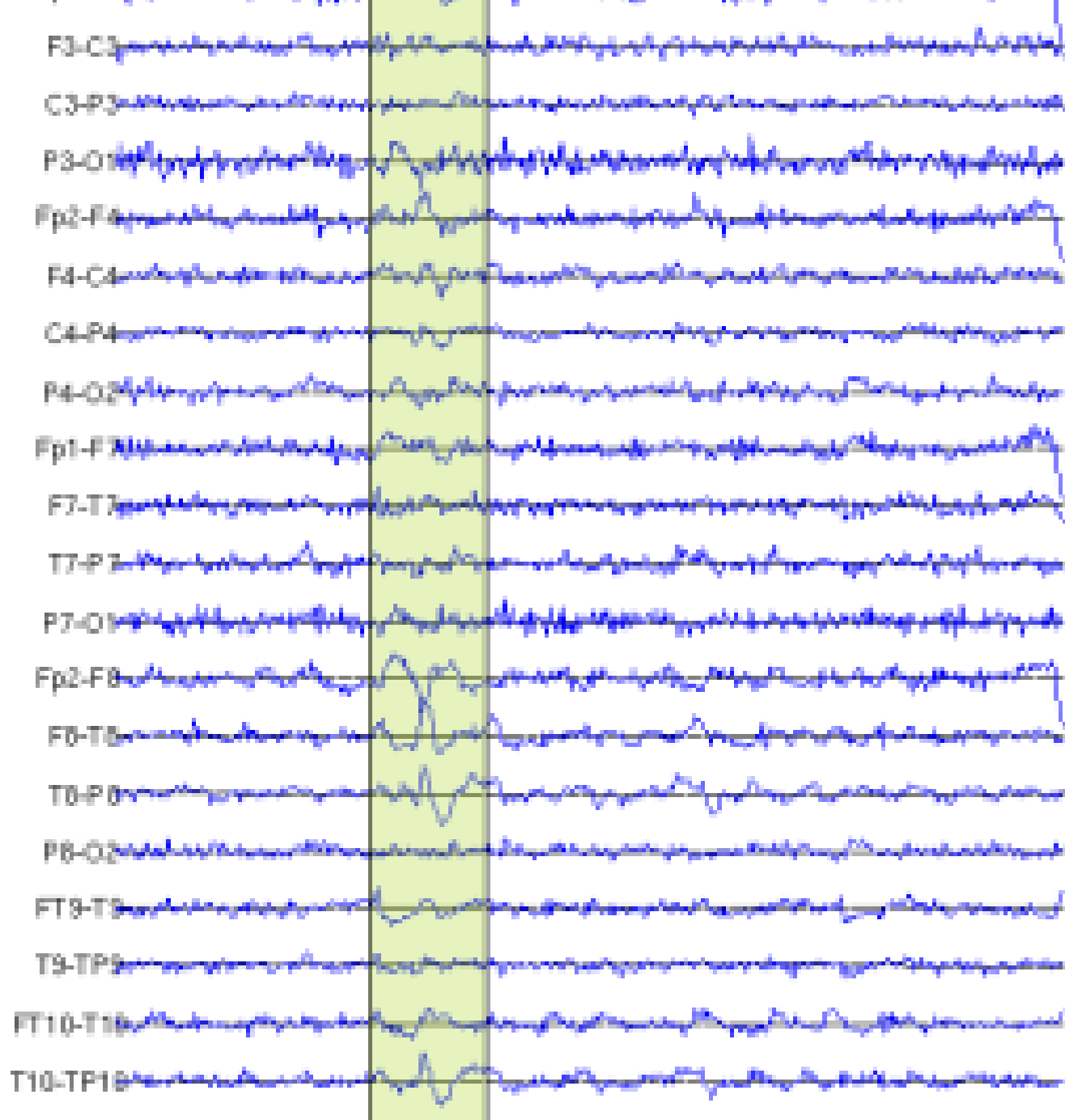
Delta

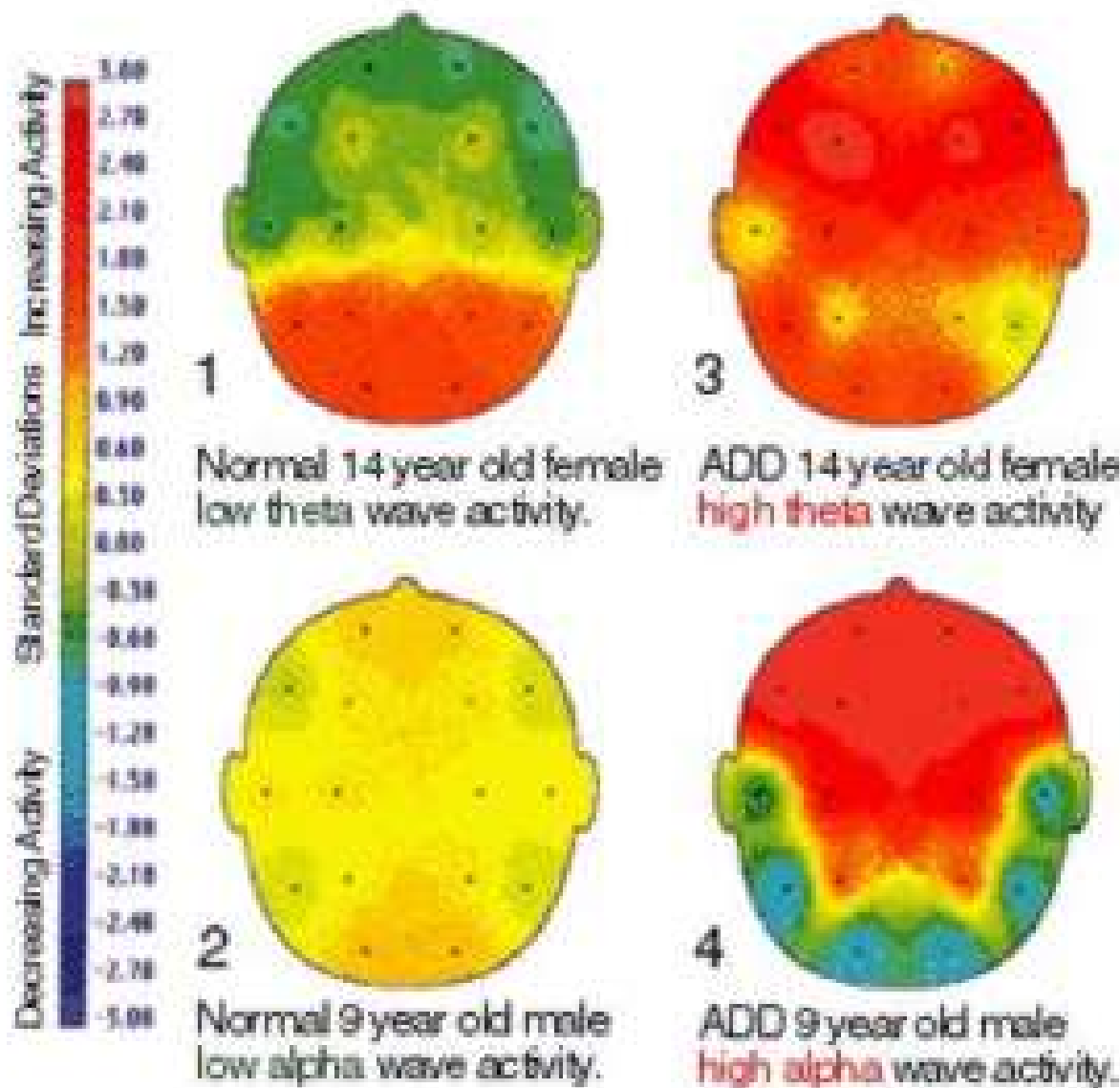


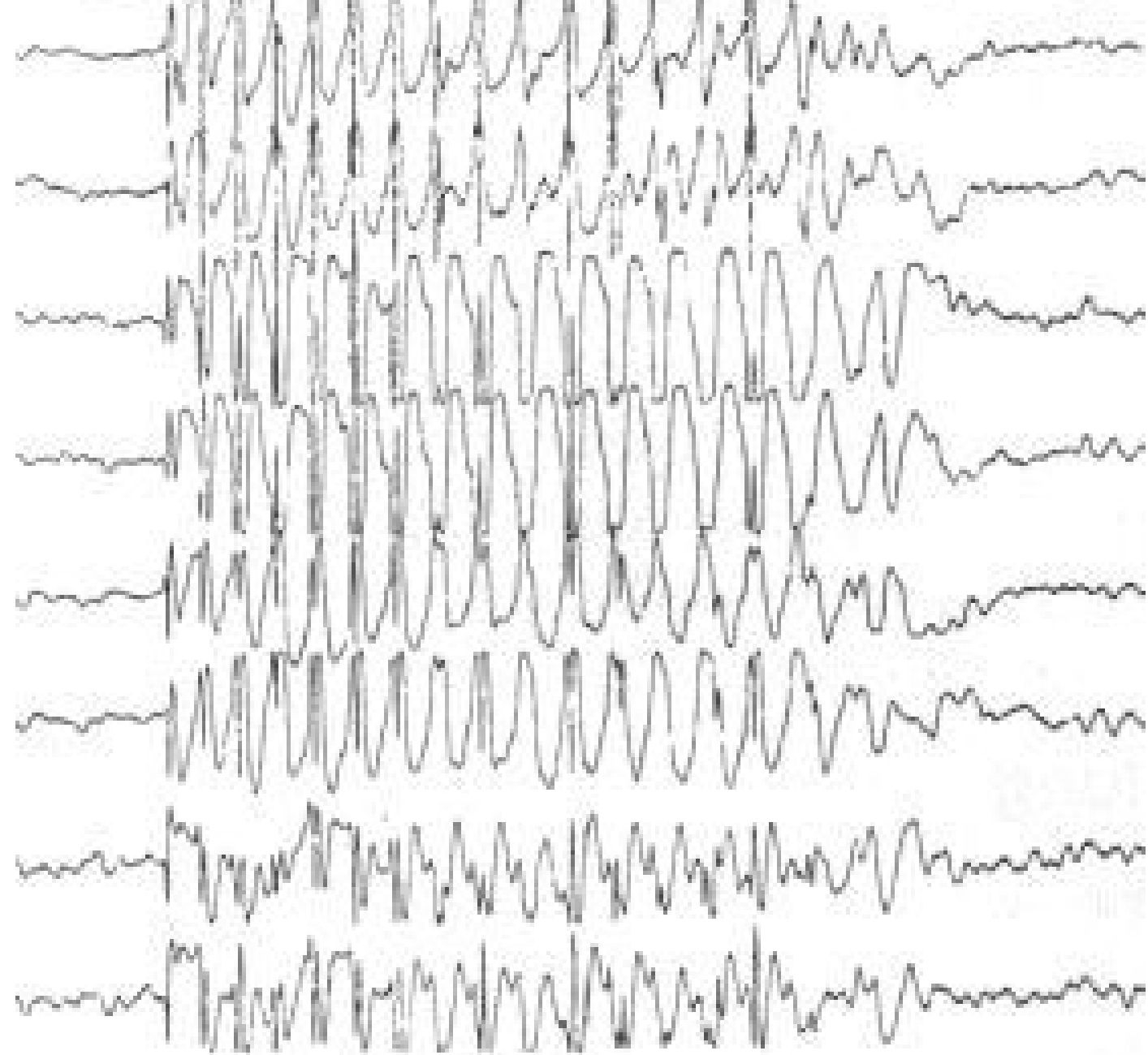
TIME (Seconds)

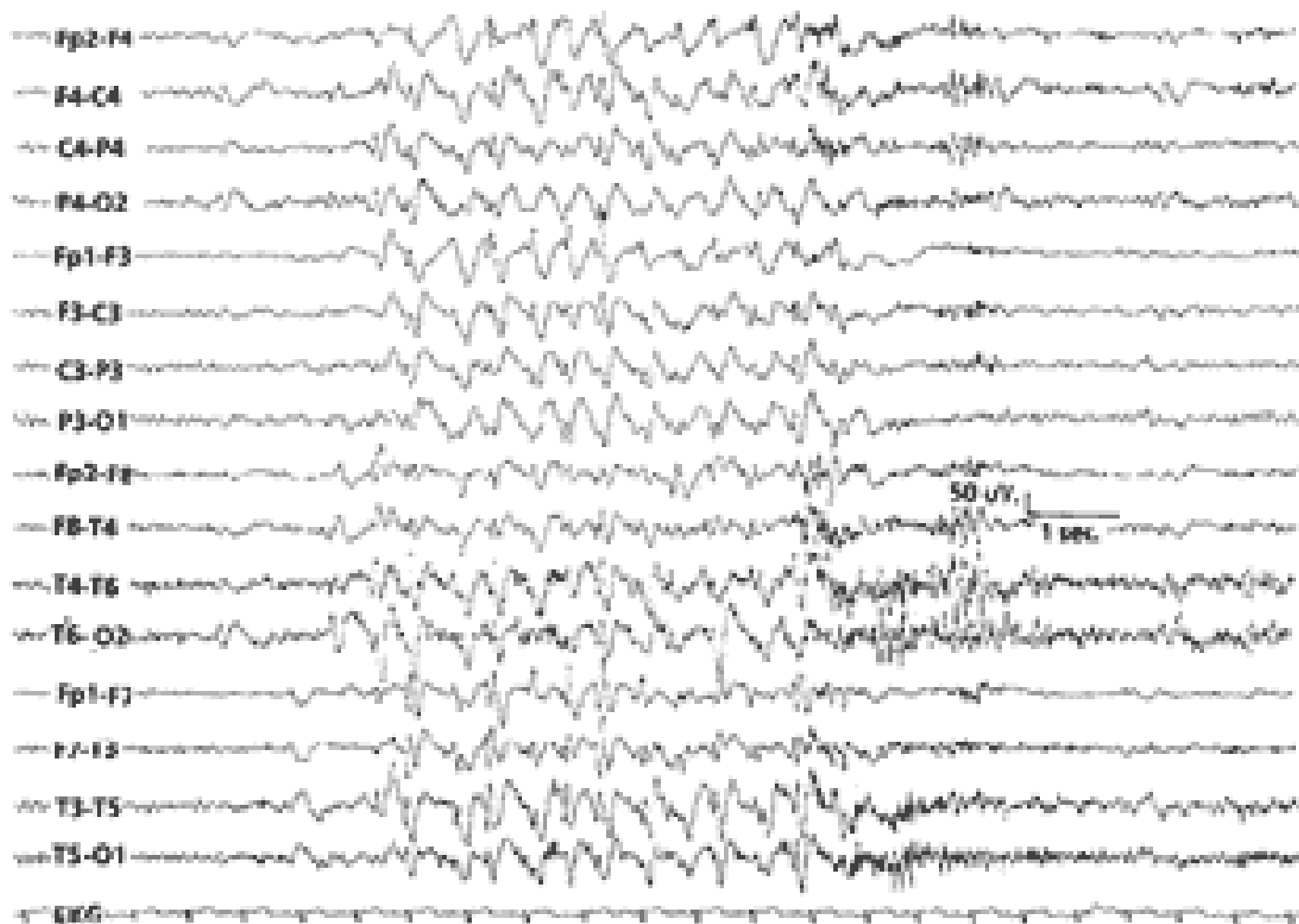










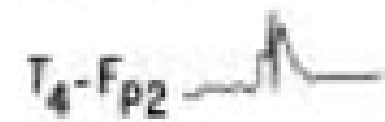
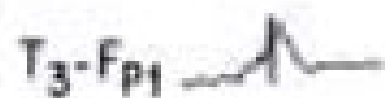


NO CLINICAL SIGNS





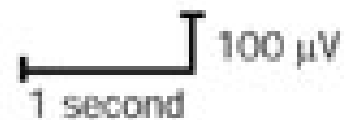
Sharp wave
(>70 ms)



Spike
(<70 ms)



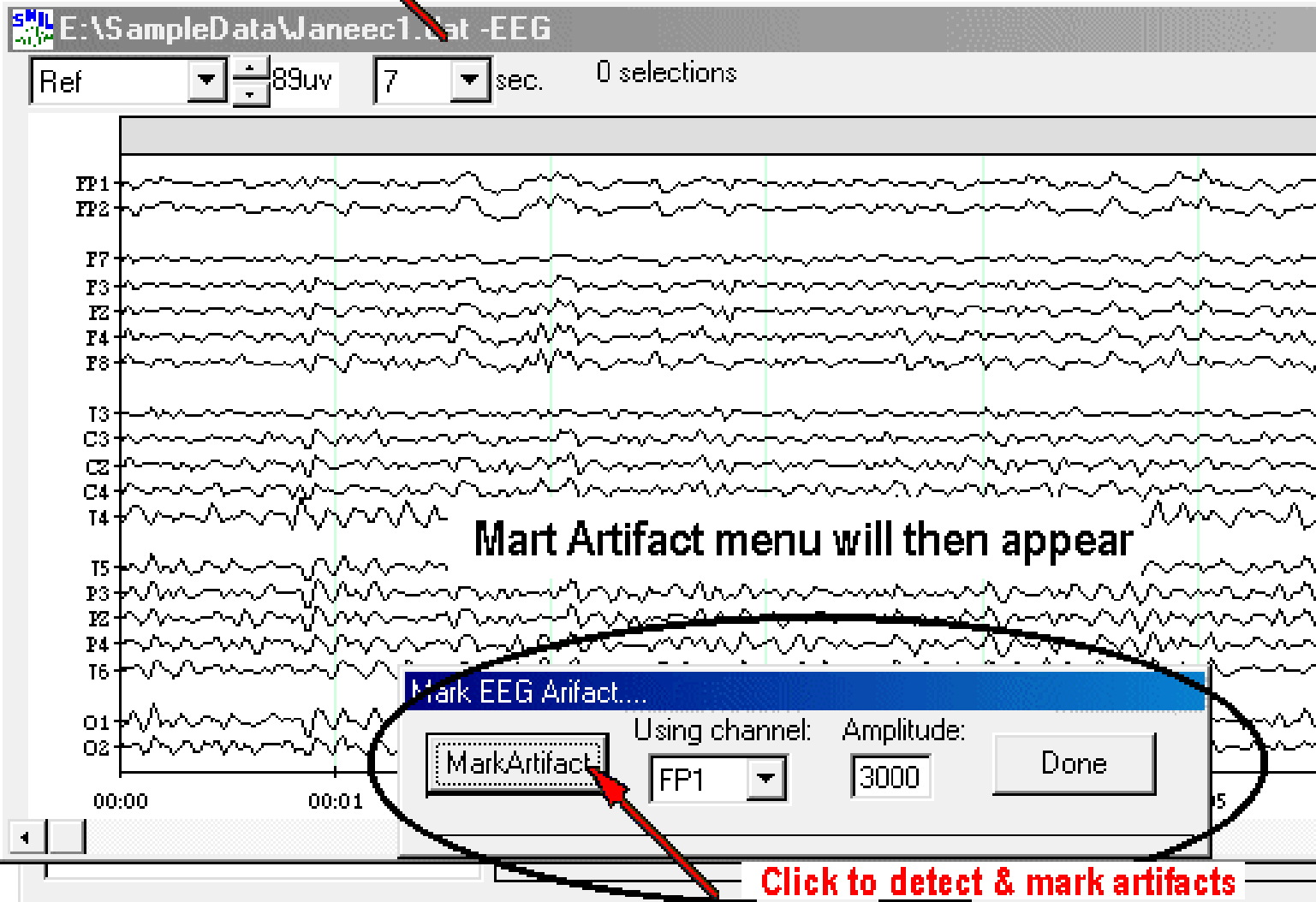
Spike-and-slow wave



- Automatic EEG Interpretation
- Automatic Detection of EEG Spikes
- Artifacts Elimination in EEG Records



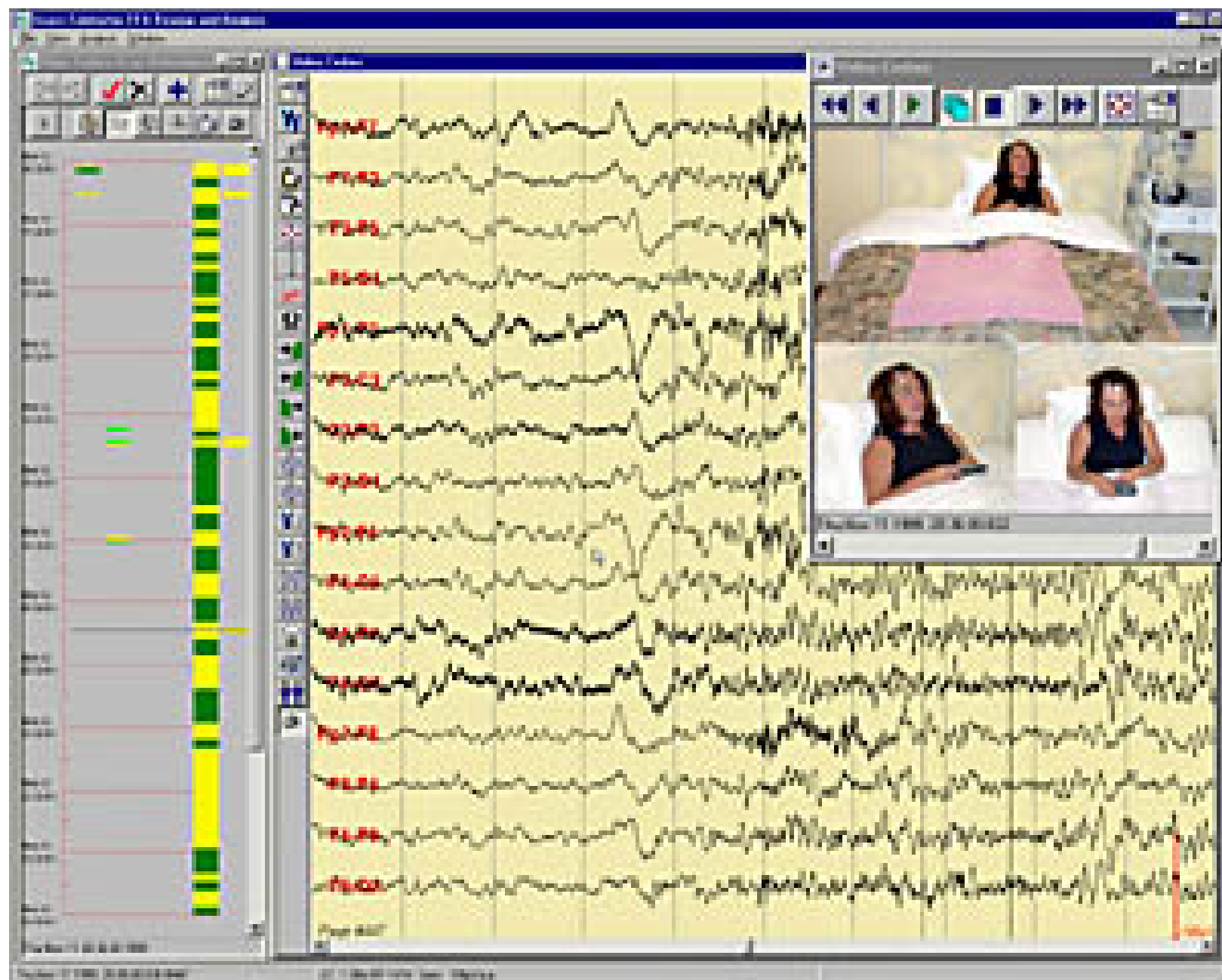
Click the Mart Artifact icon

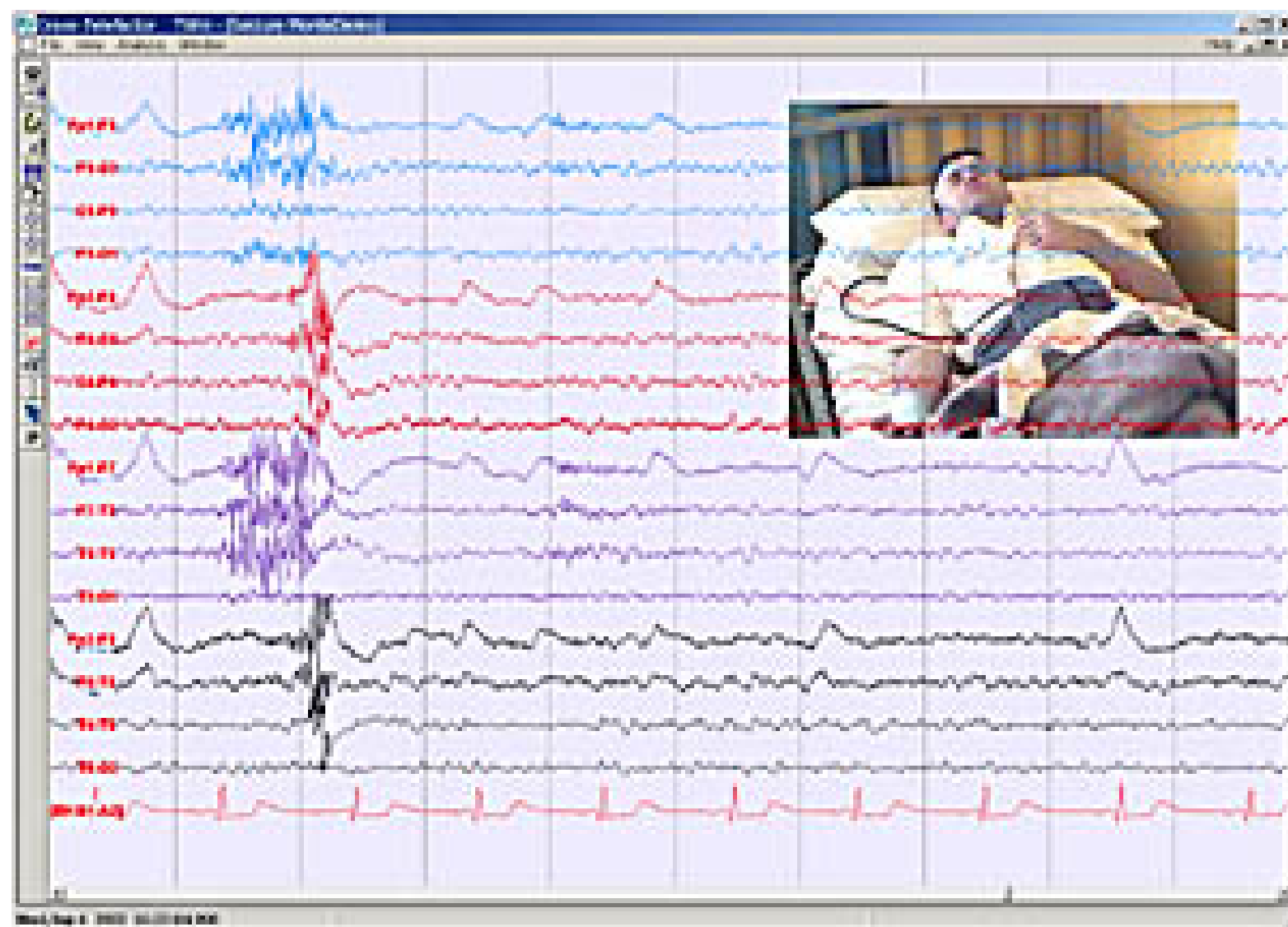


Mart Artifact menu will then appear

**Click to detect & mark artifacts
then click Done button**





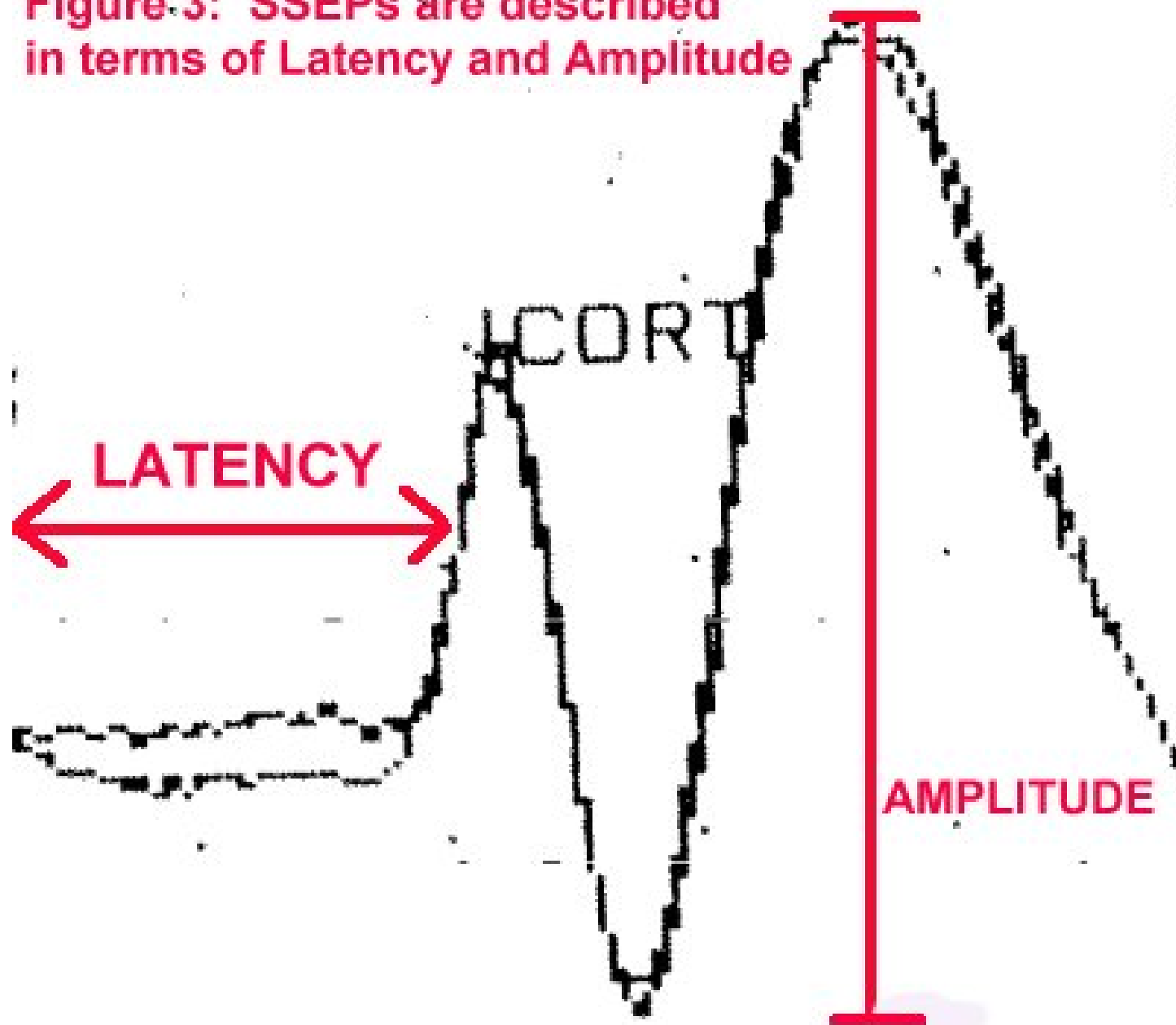




Holter monitoring solárny

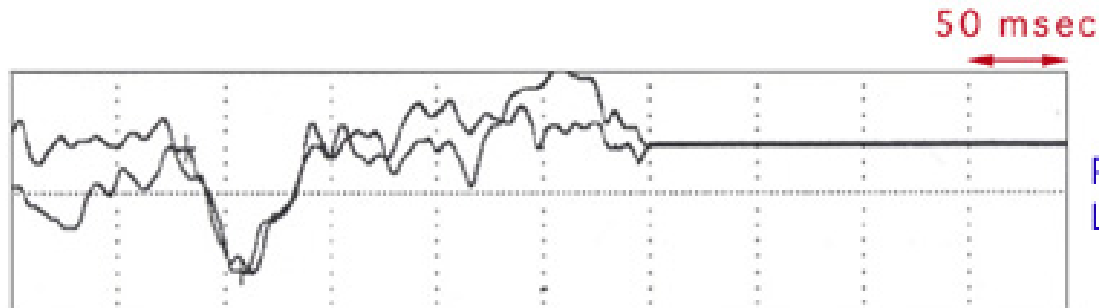


Figure 3: SSEPs are described in terms of Latency and Amplitude



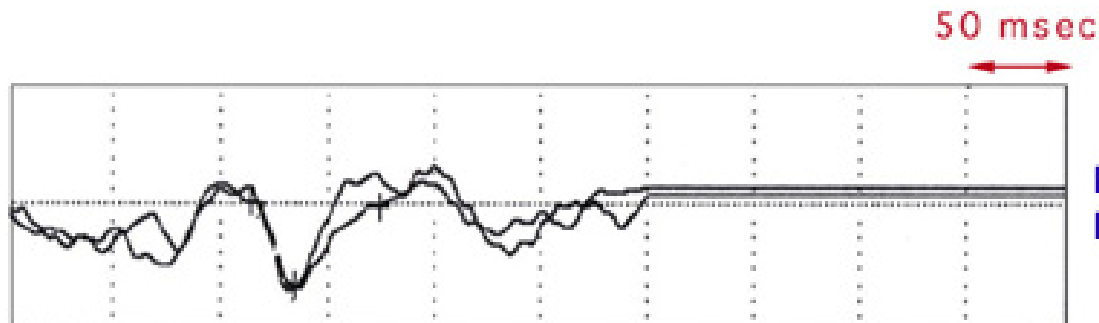
Visual Evoked Potentials

normal

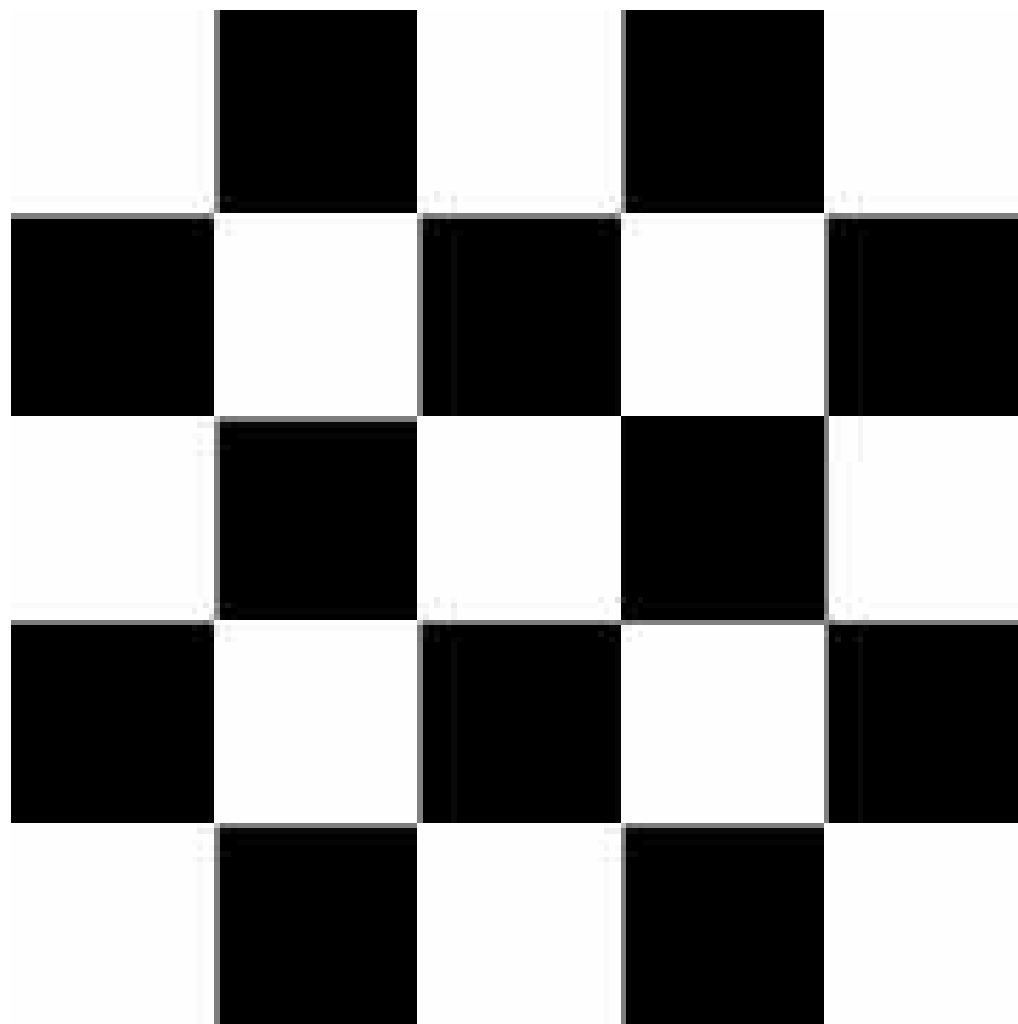


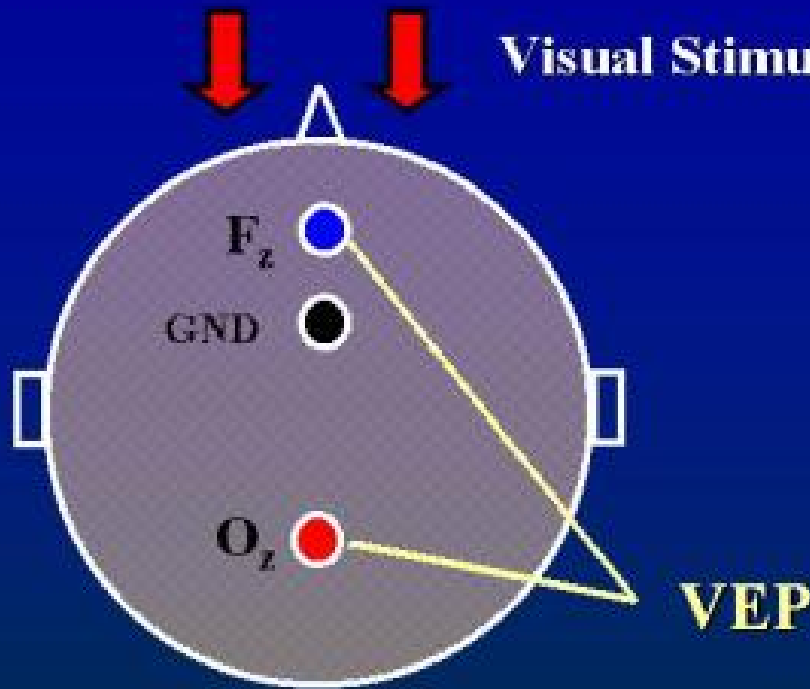
P100 wave
Latency: 107 msec

abnormal

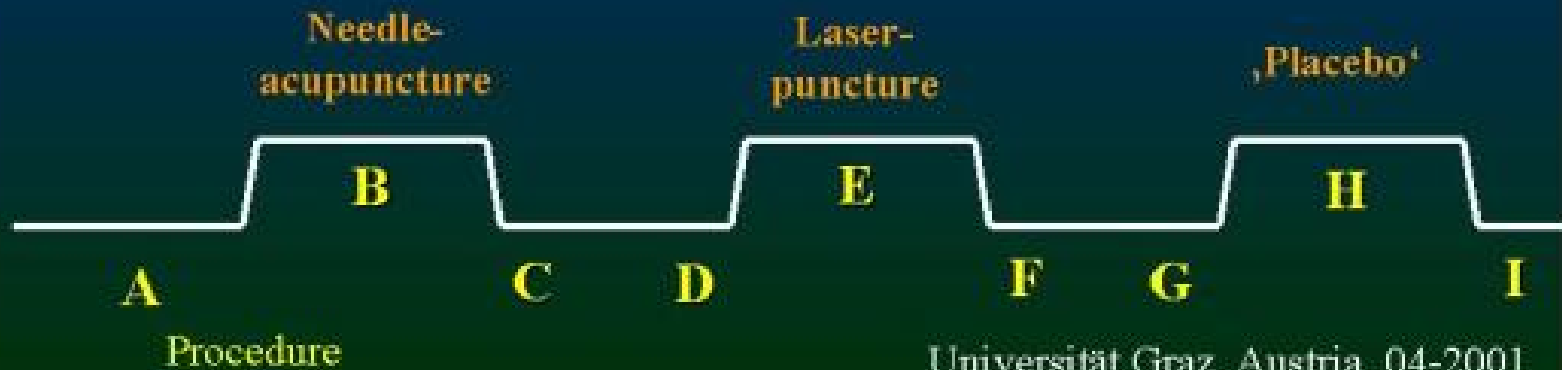


P100 wave
Latency: 134 msec



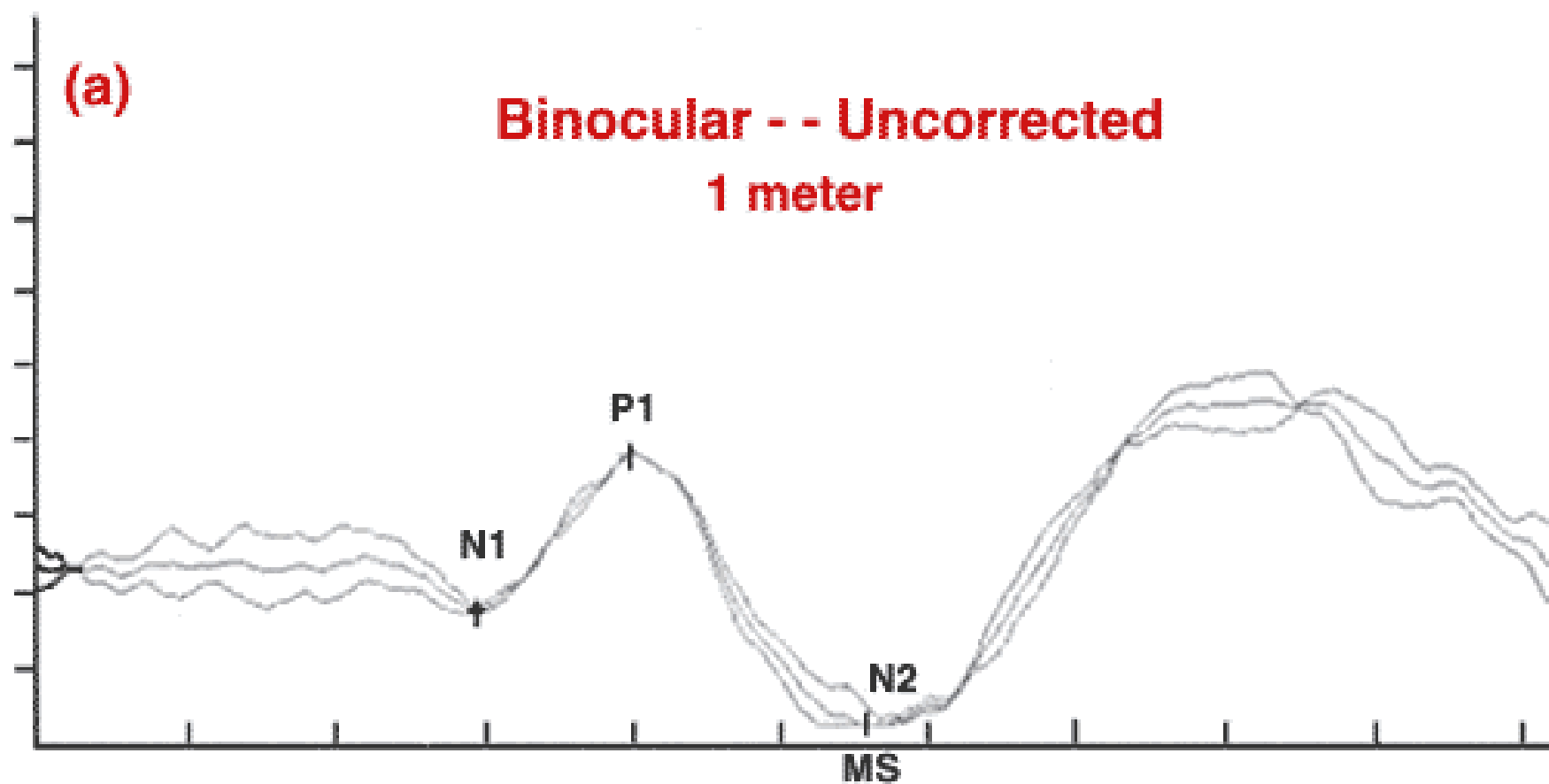


1,8 Hz
 n = 130
 1,0 - 100 Hz
 0 - 400 ms

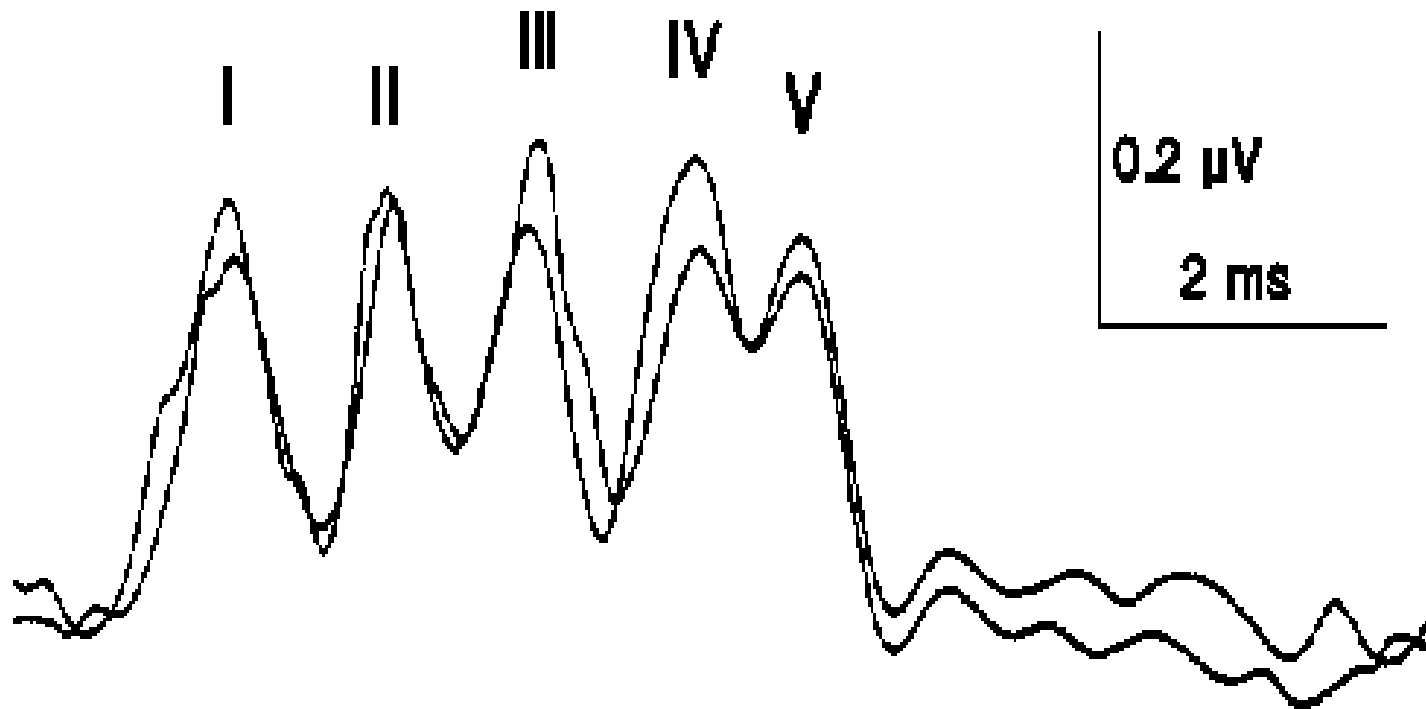


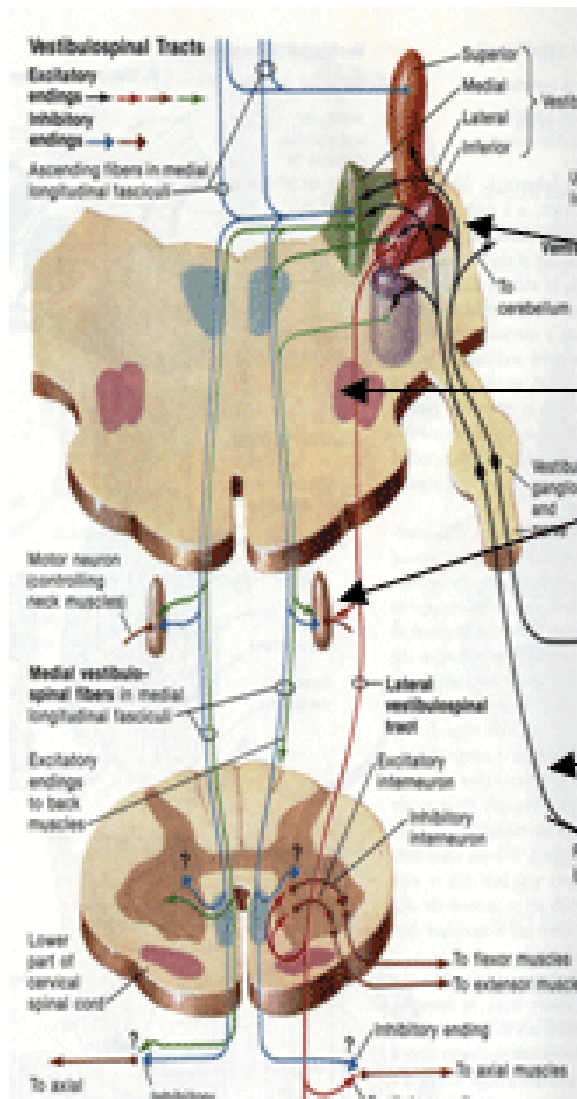
(a)

Binocular - - Uncorrected
1 meter



Sluchový kmeňový evokovaný potenciál (ABEP, BAEP)





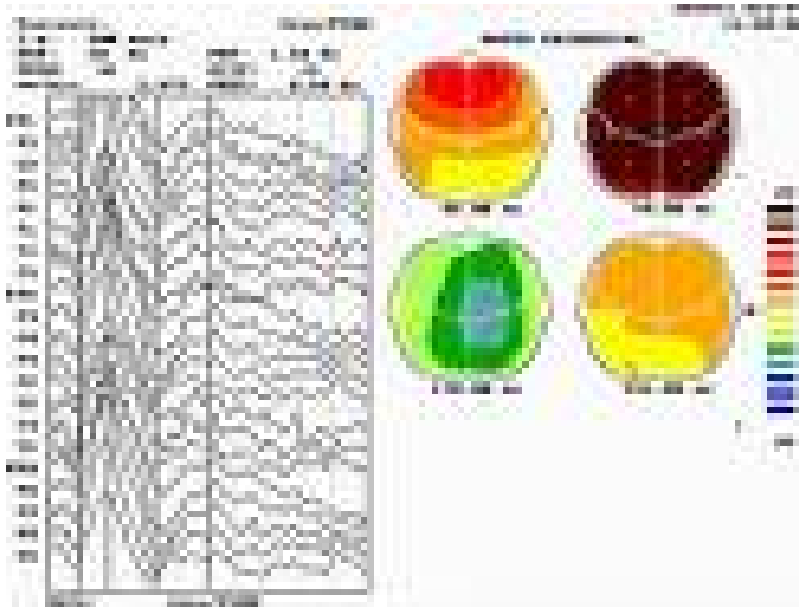
The inferior vestibular nerve carries a signal from the saccule to the vestibular nerve and into the **vestibular nuclei** in the pons. The message is carried via the **vestibulospinal tract** to the **motor neurons serving the neck muscles** where the Wave I and II VEMP complex is generated.

Inferior vestibular nerve

Saccule

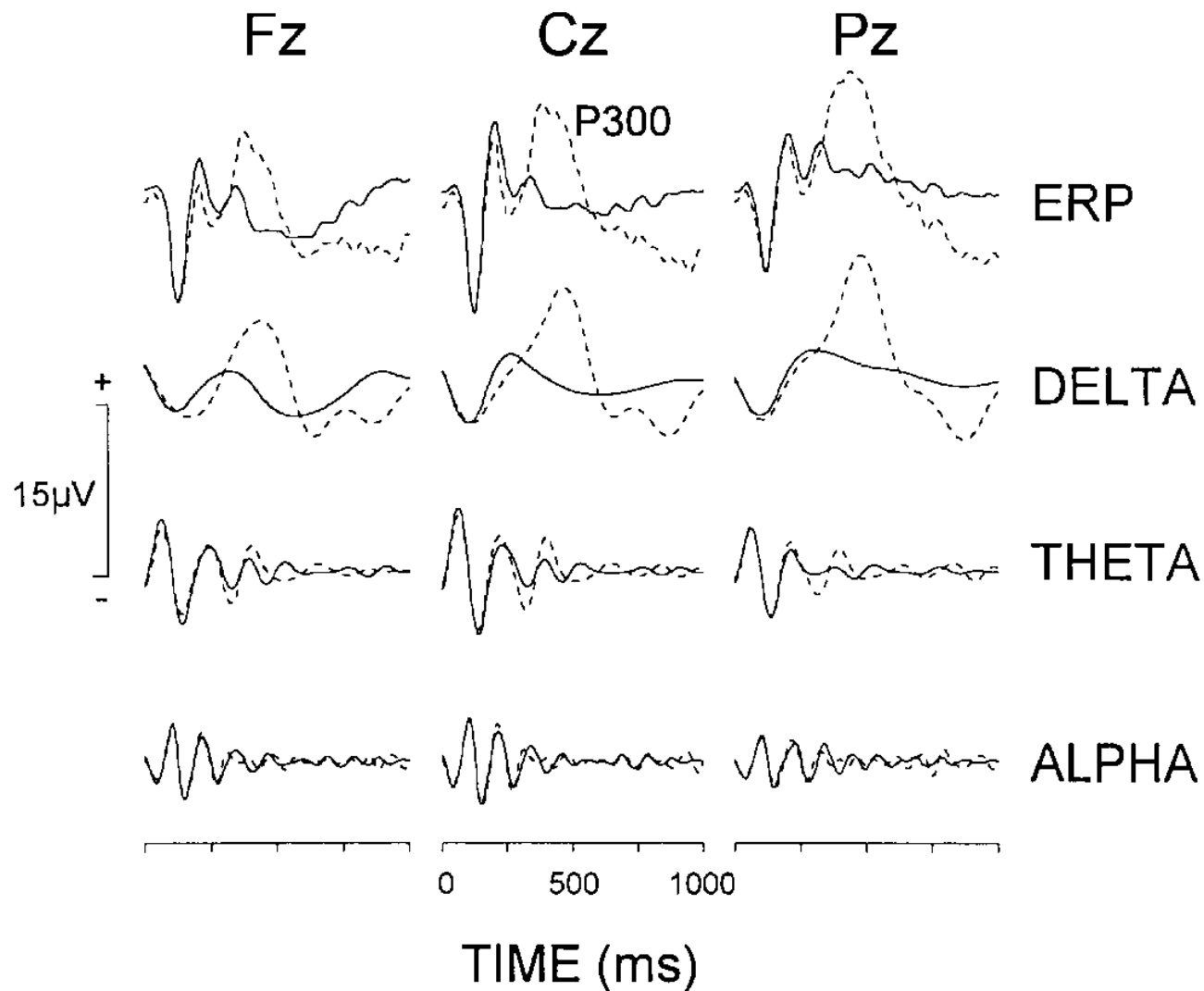


Sluchová P 300

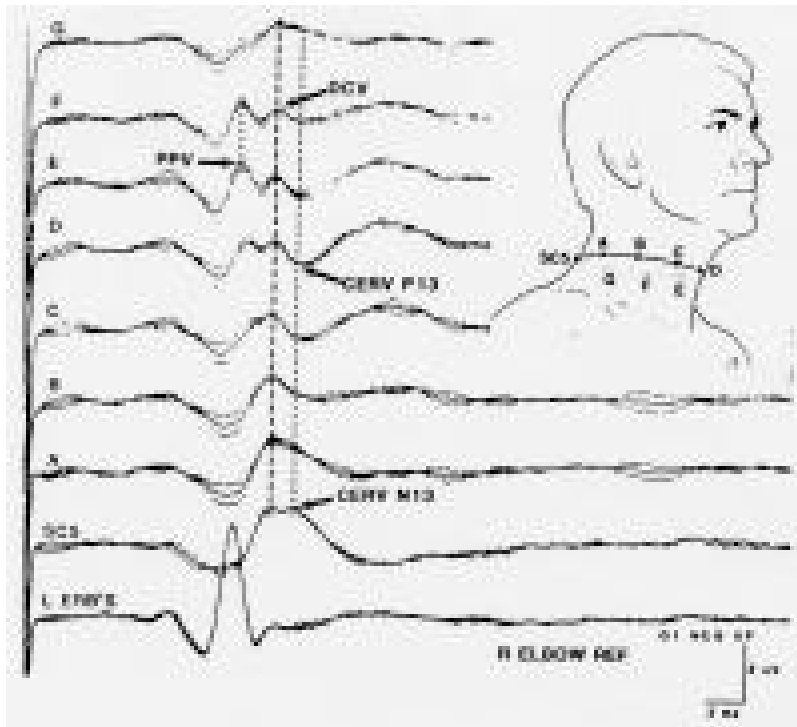


- Kognitívne funkcie, spracovanie signálu
- Latencia je predĺžená najmä u dementných pacientov

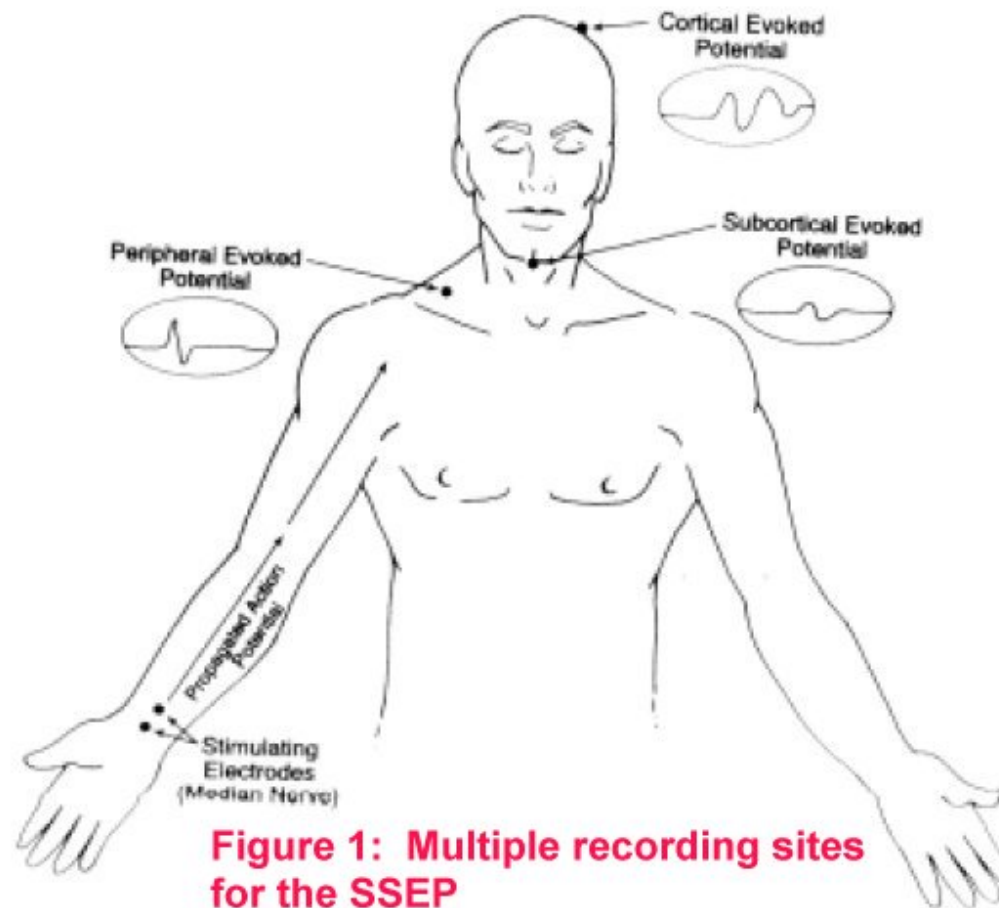
--- TARGET — NONTARGET

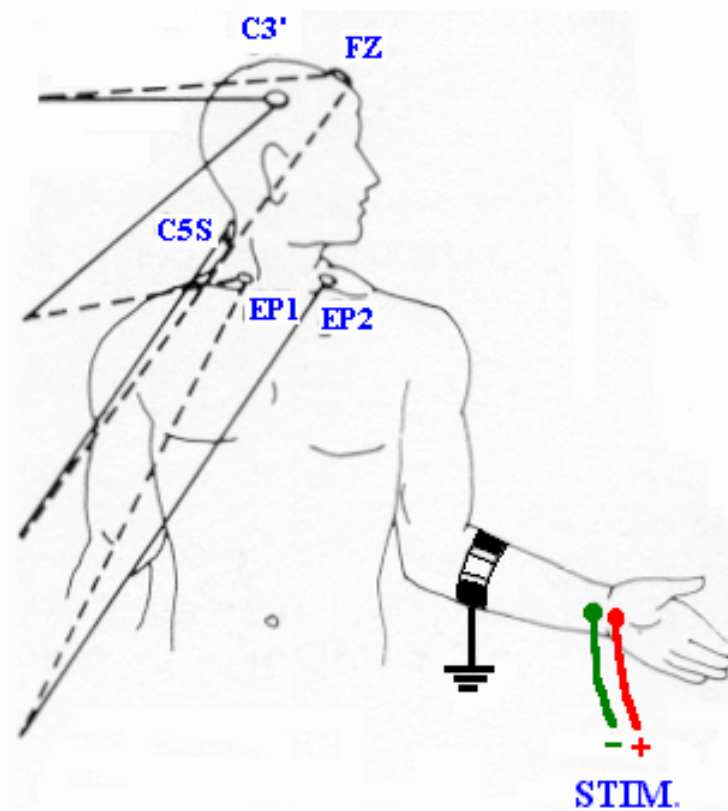
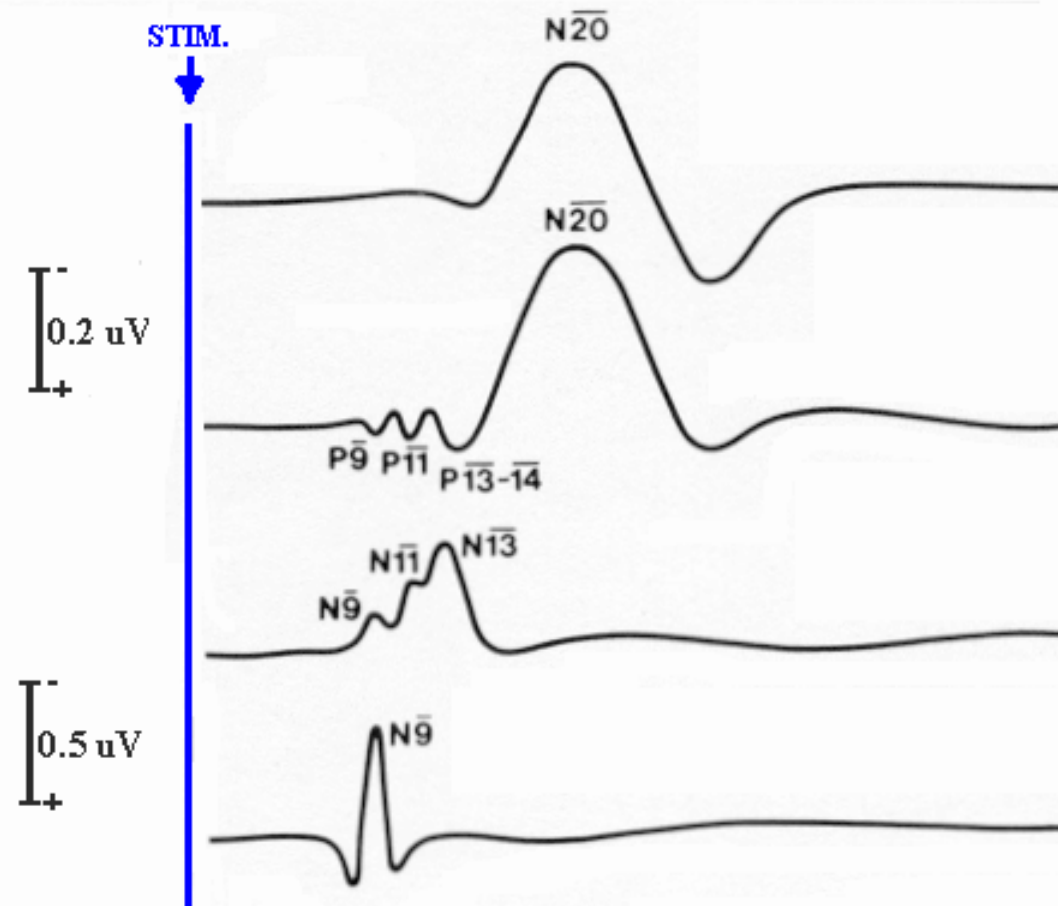


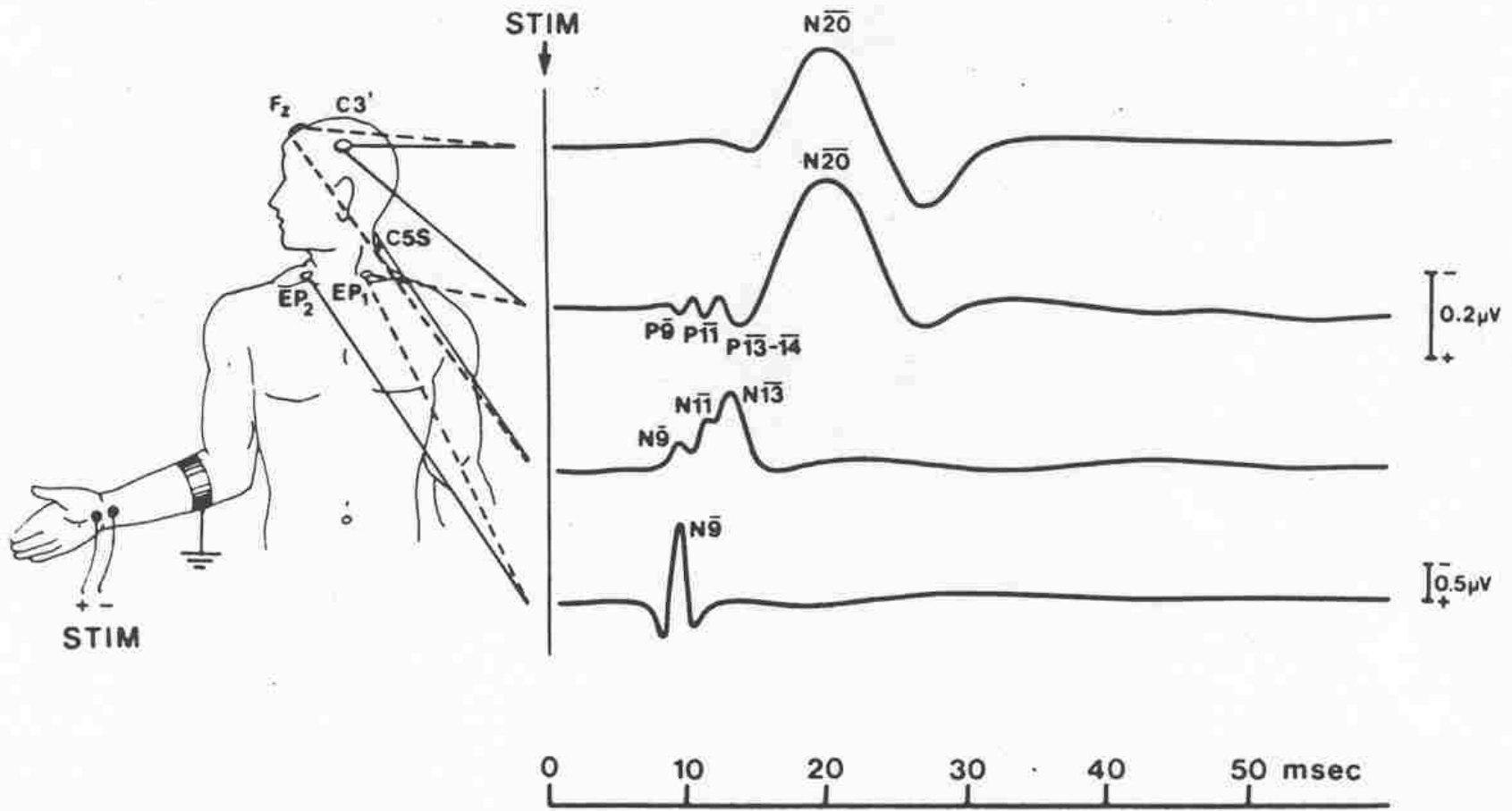
SEP – somatosenzorické evokované potenciály



- Stimulácia nervus medianus
- Trvá asi 15 ms prenos do mozgového kmeňa, 18 ms do thalamu a 20 ms do mozgovej kôry
- kontralaterálne







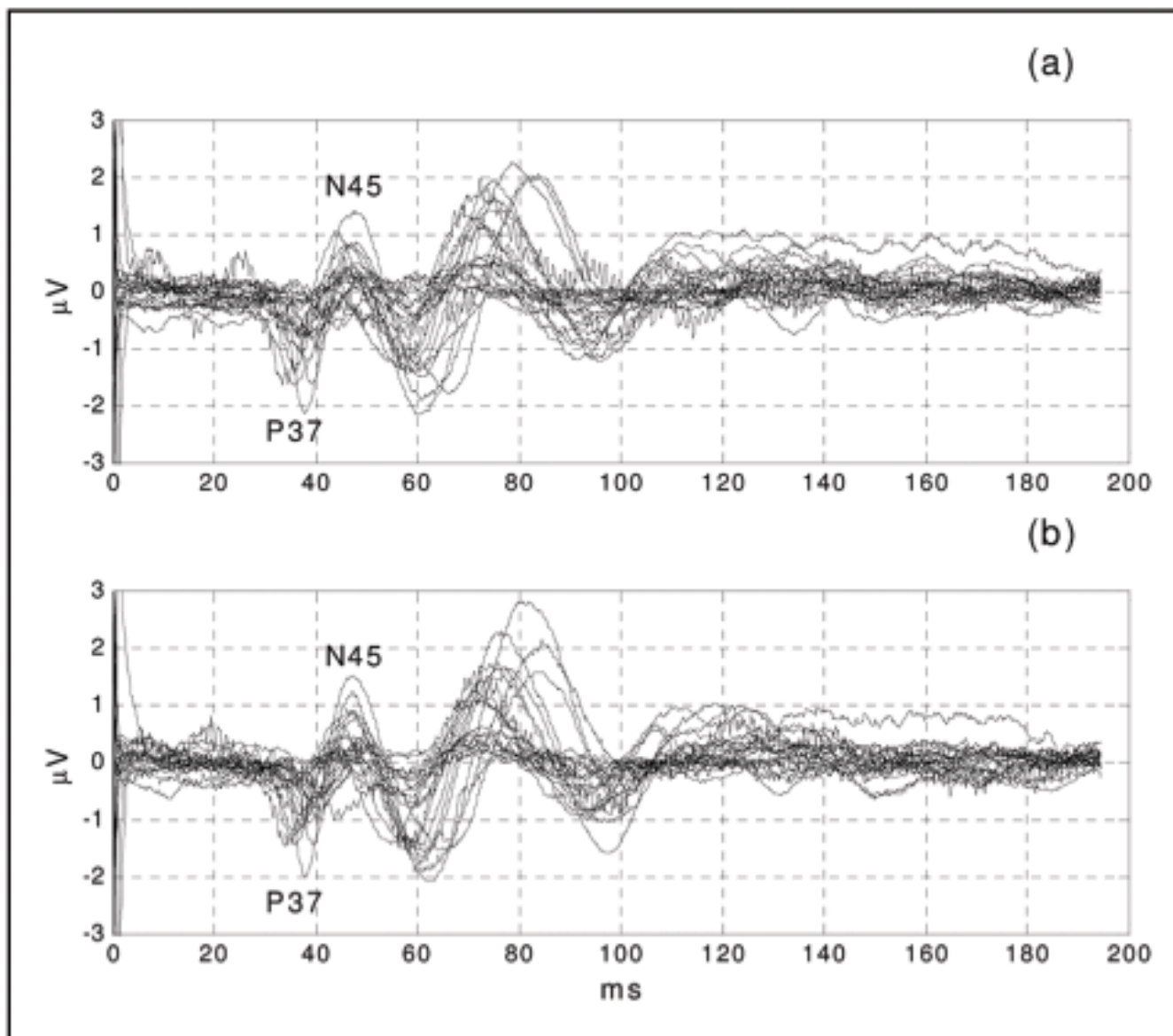
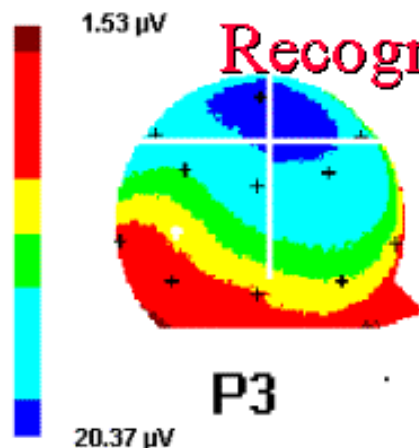
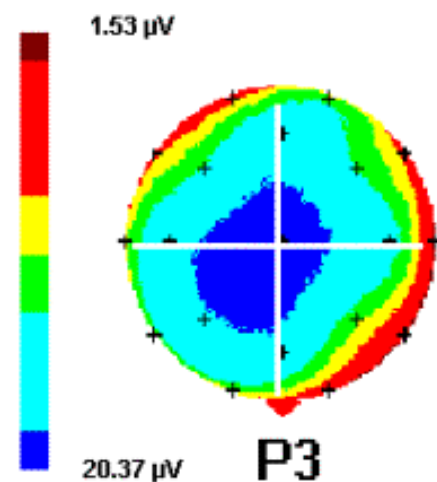


Fig. 1. SEP (Cz' Fpz' derivation) of 31 volunteers with M-800 epochs during (a) MT

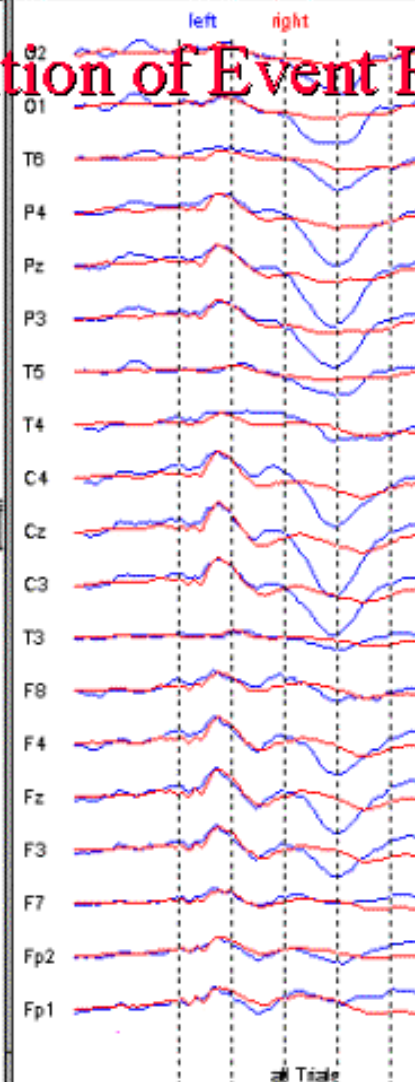
Spherical Spline Map



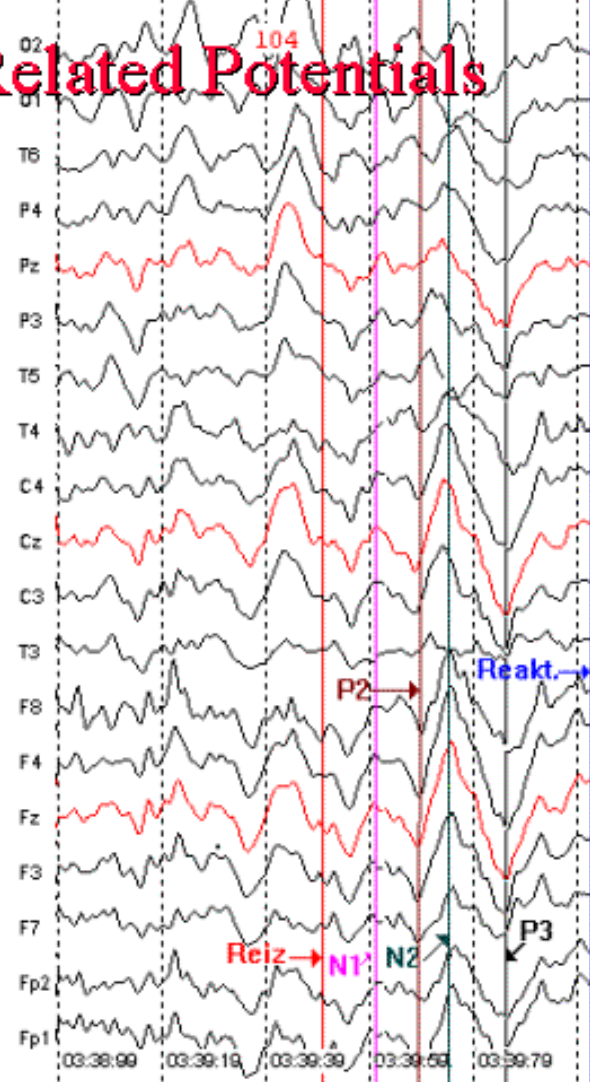
Spherical Spline Map



Averaging of both stimuli



EEG



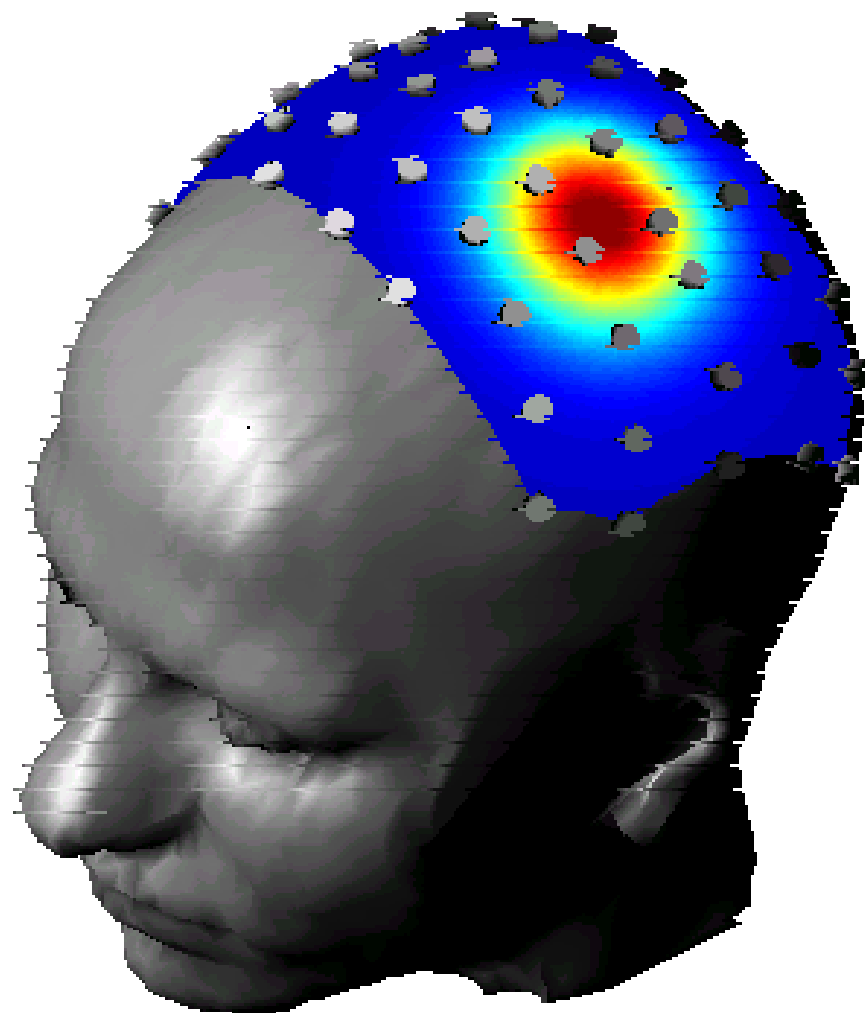




Fig. 1a

Motorické evokované potenciály



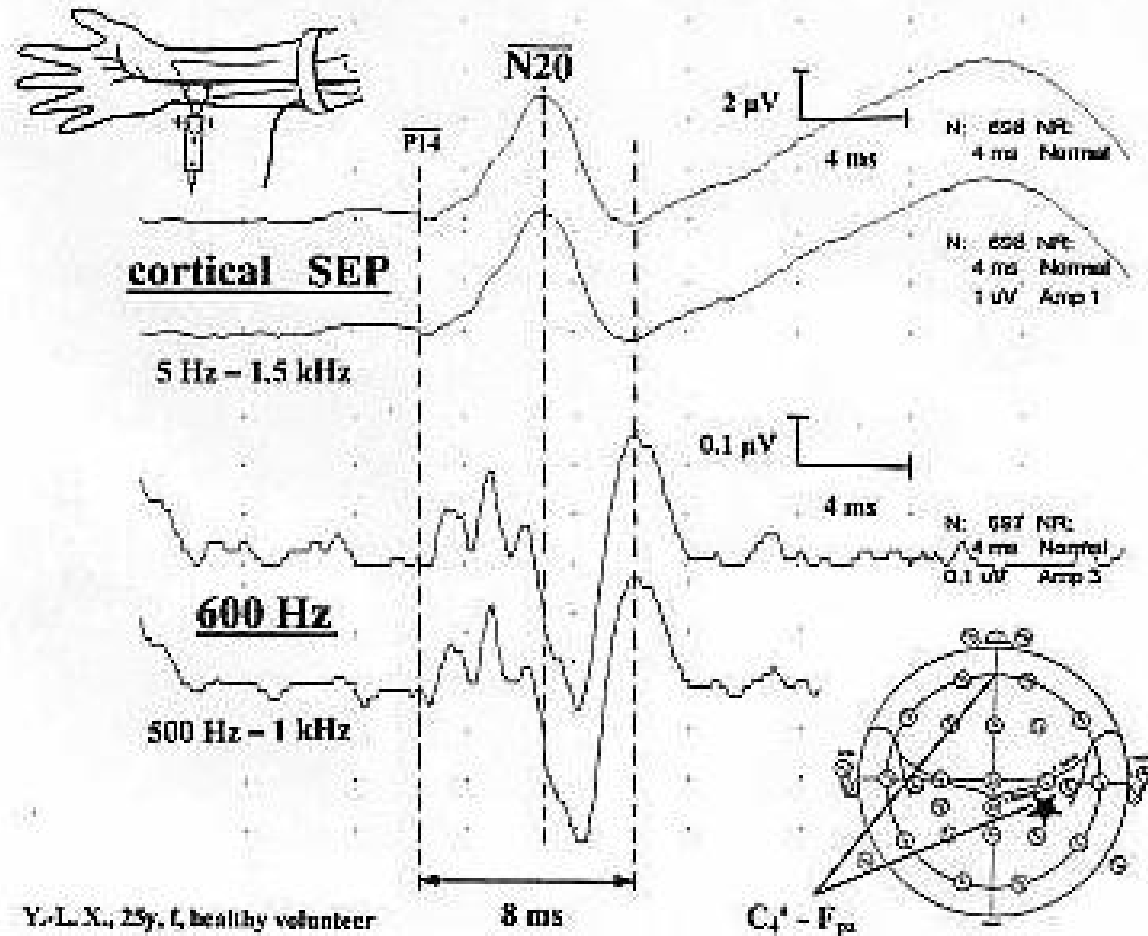
600 Hz

ICM RECORD

#8 YaeLiXu

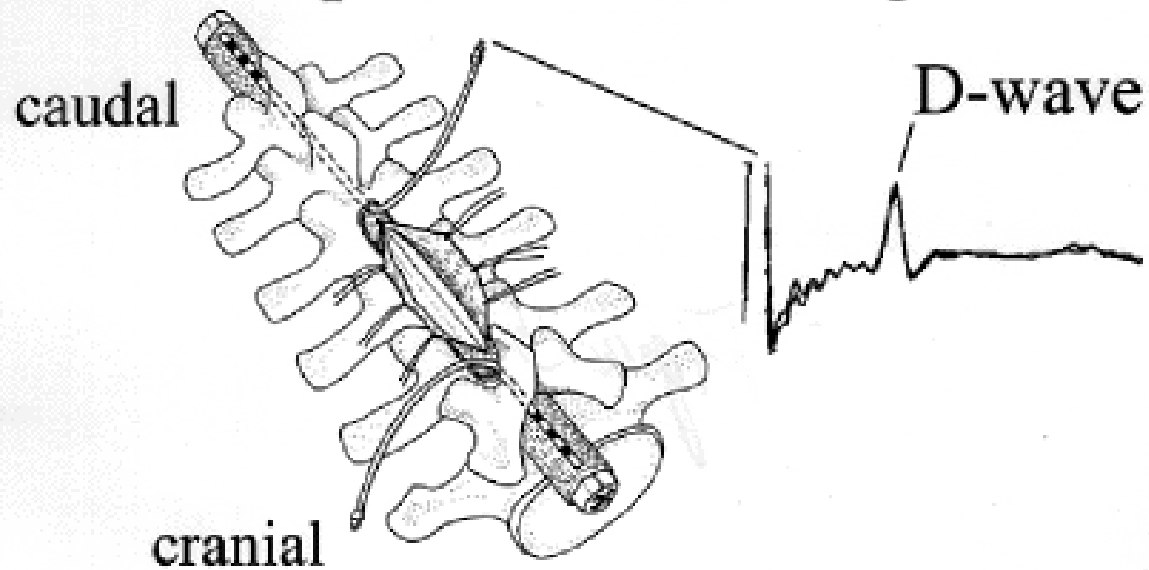
11:00:14

Switch: Run	Avg: Stop					
TDI:BT 1.2g/m	Rate: 4.7Hz	Lev: 3.0 mA	Dur: 2 ms	Single	Delay: 0 ms	
	Delay/Middle	Lev: 0.0 mA	Dur: 0.2 ms	Single	Delay: 0 ms	

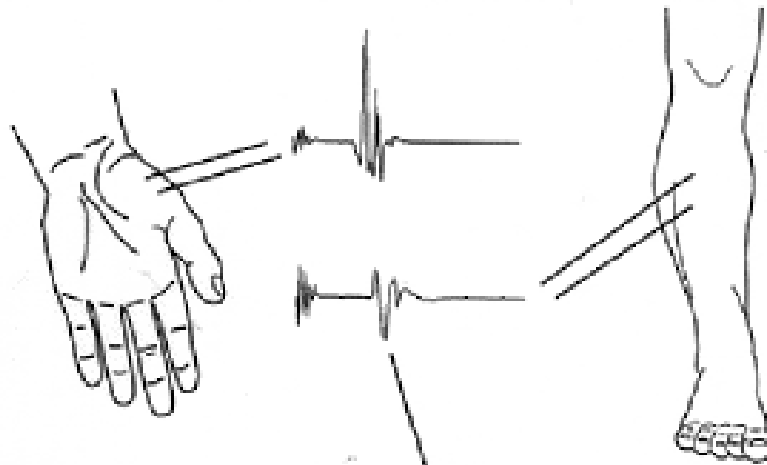


Y.-L. Xu, 25y, f, healthy volunteer

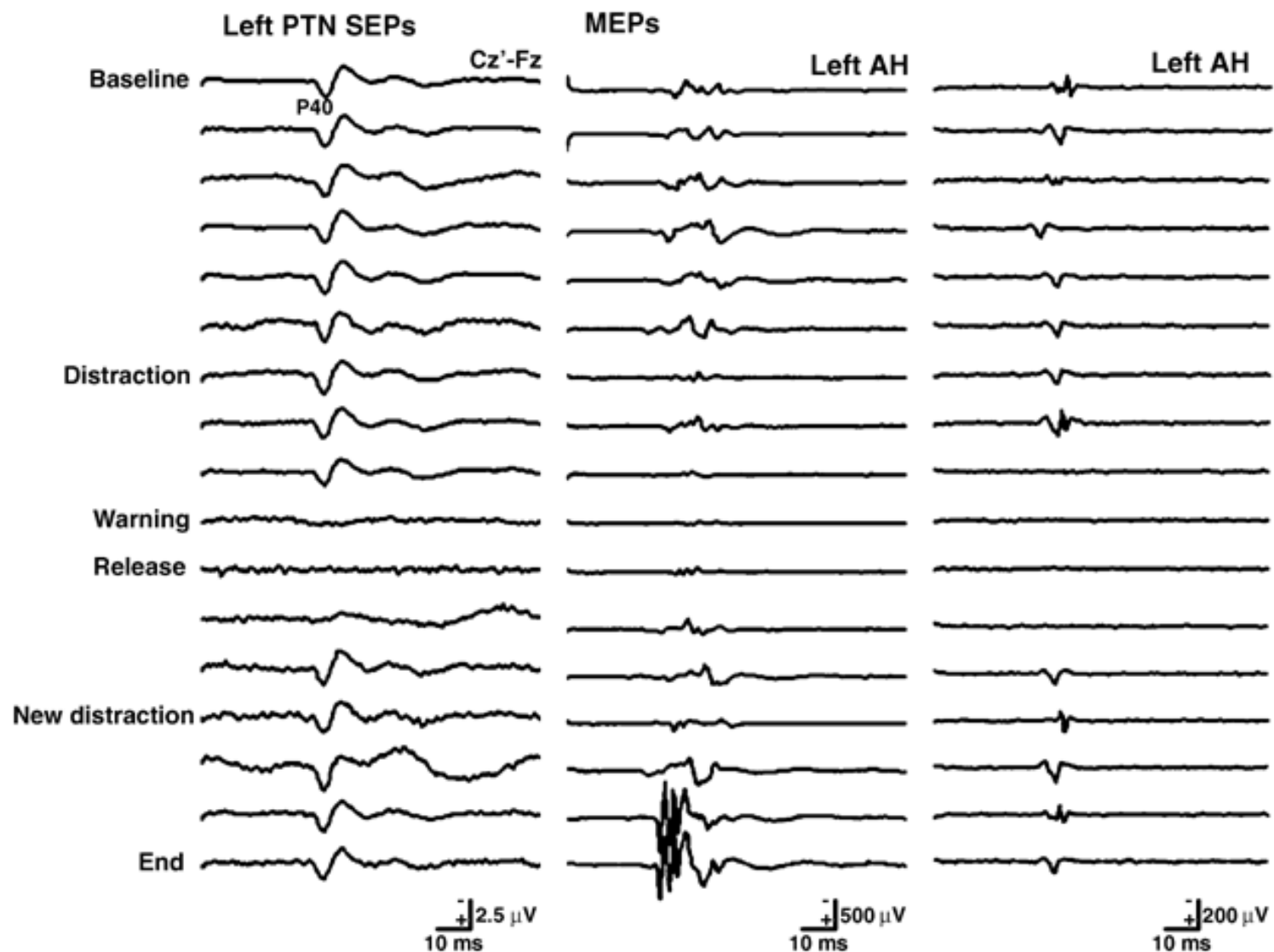
Epidural Recording

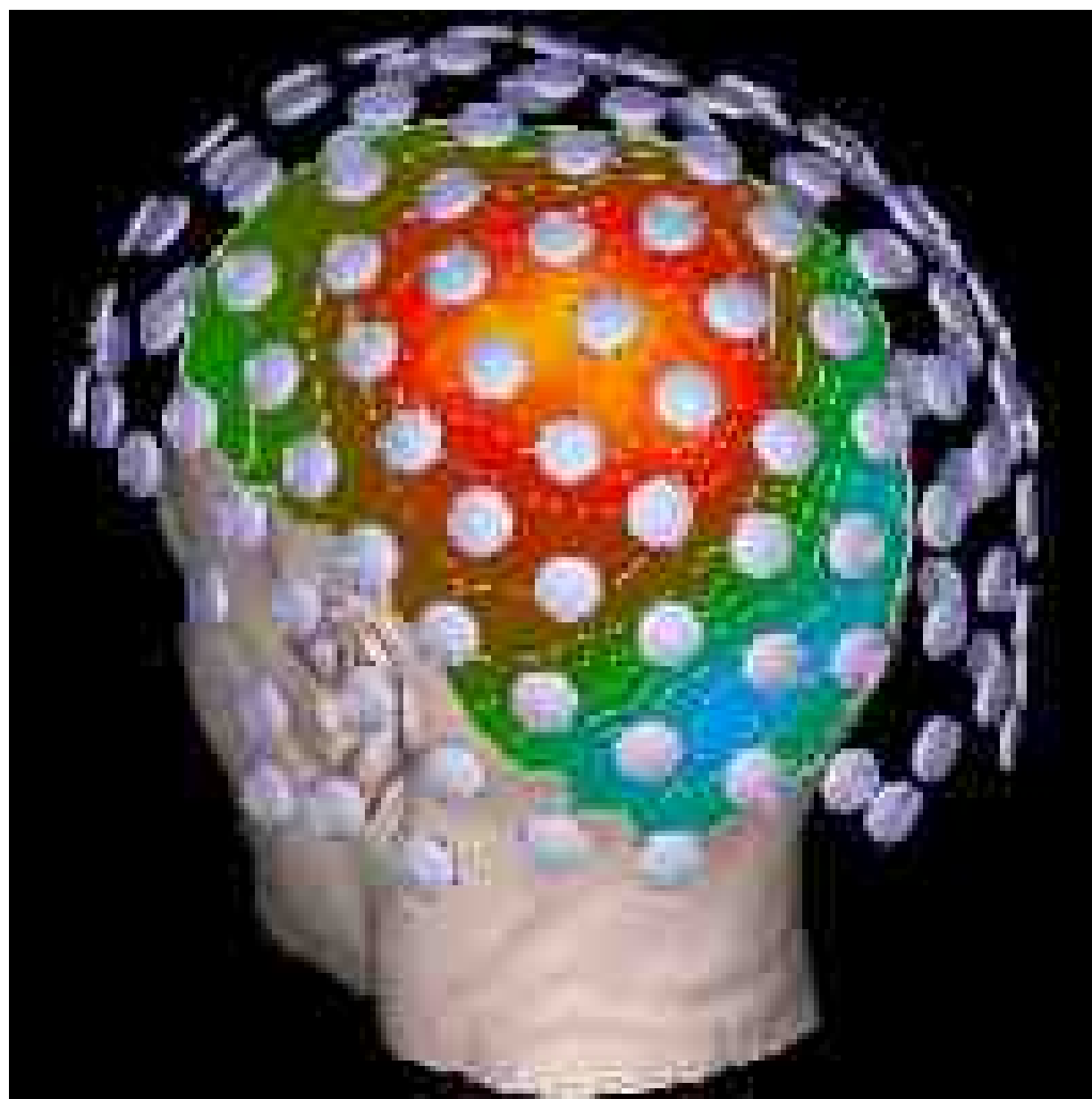


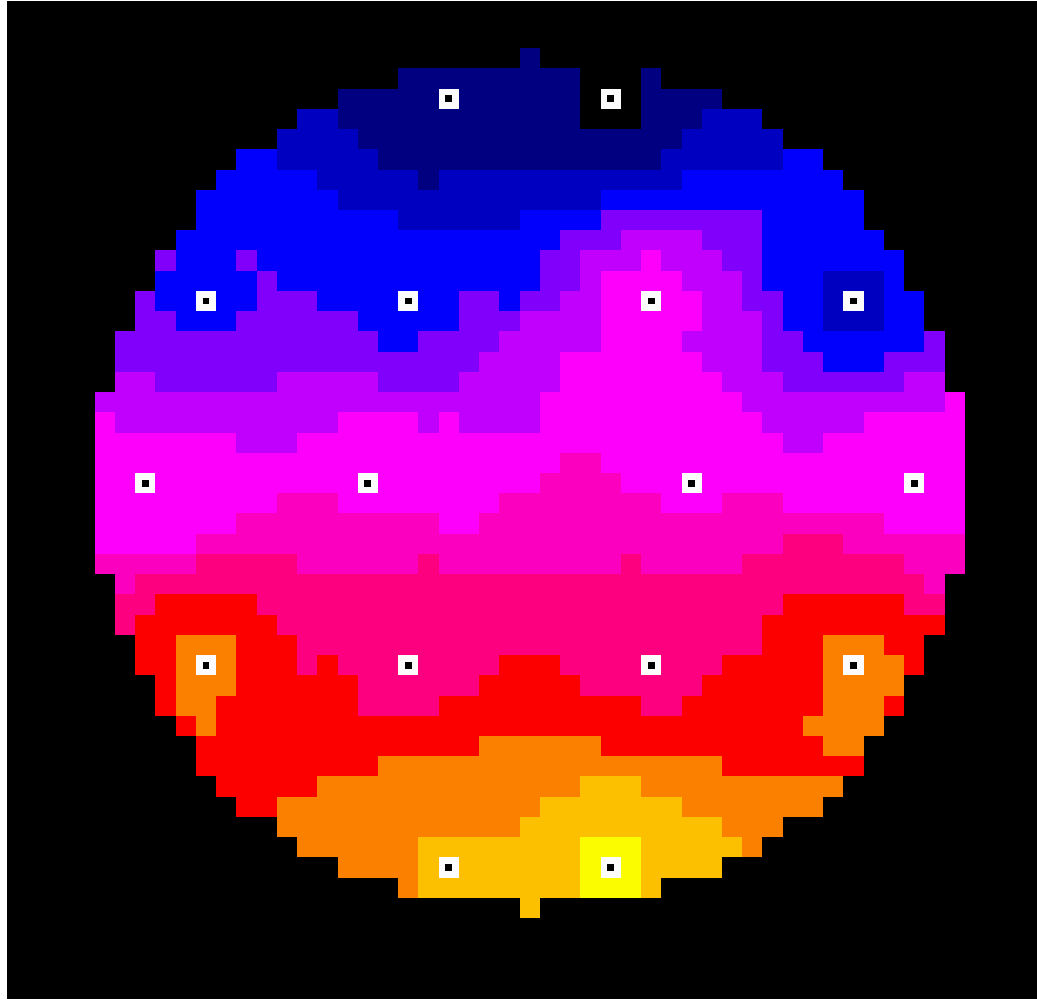
Muscle Recording

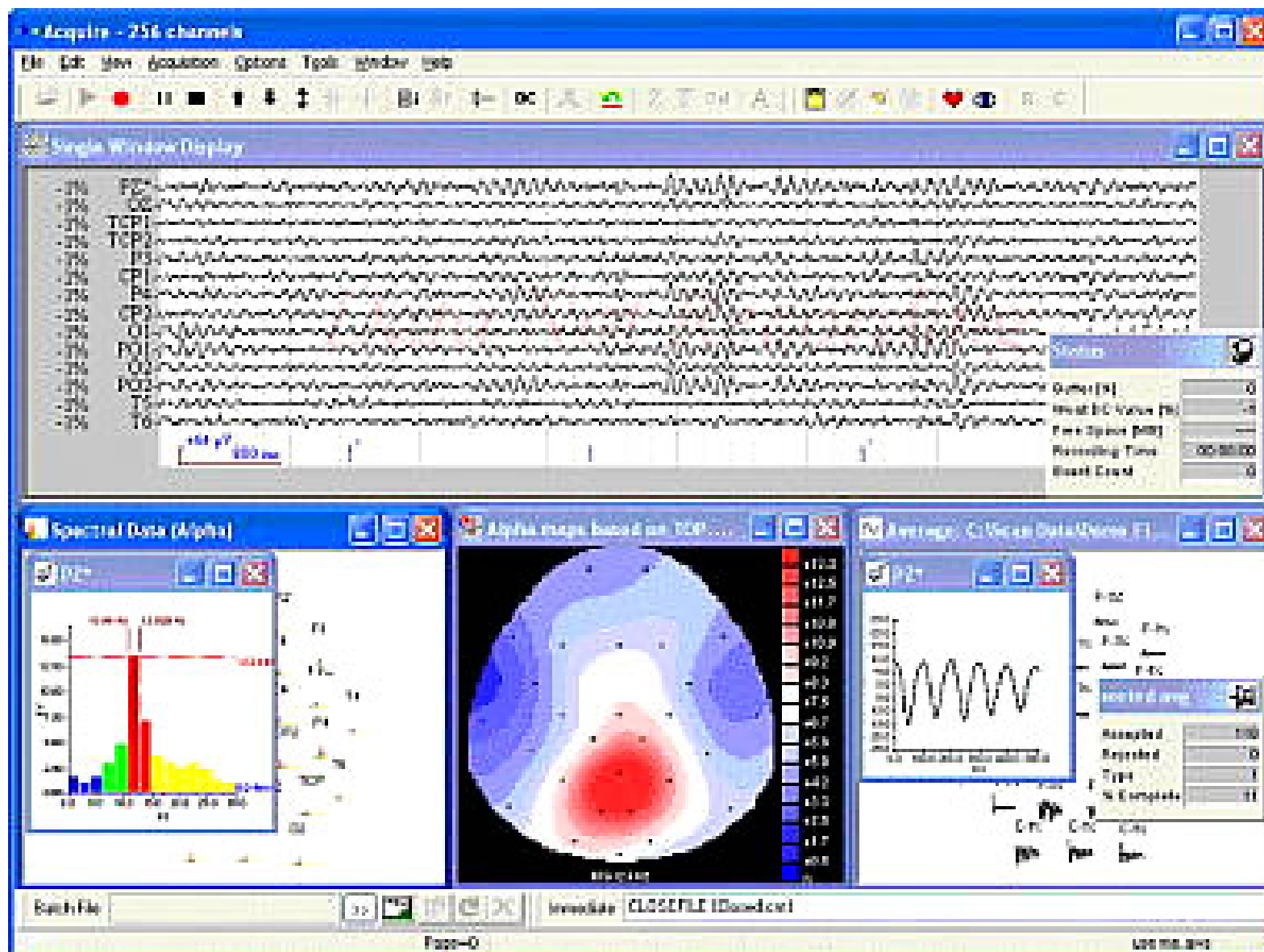


Muscle MEP

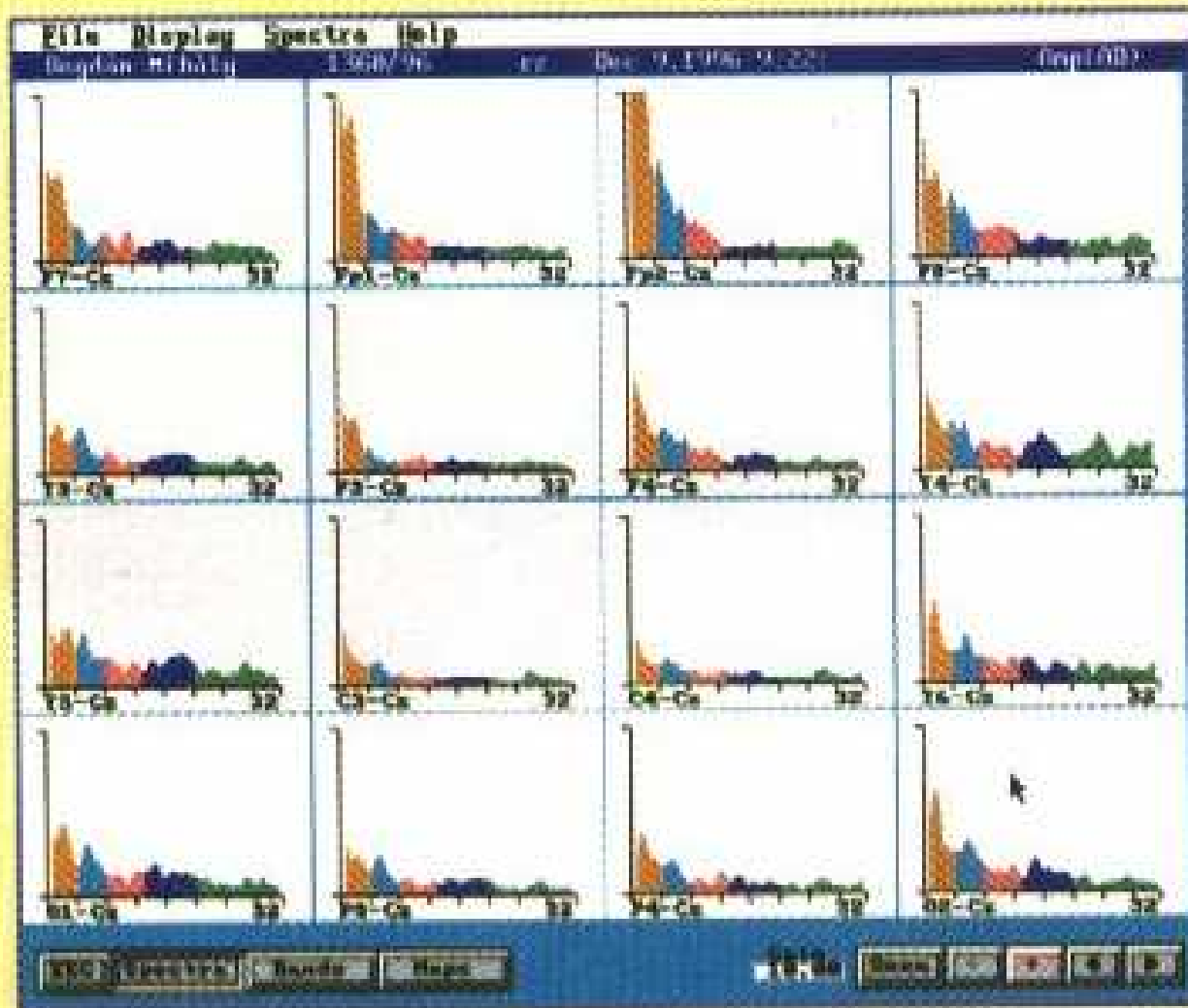


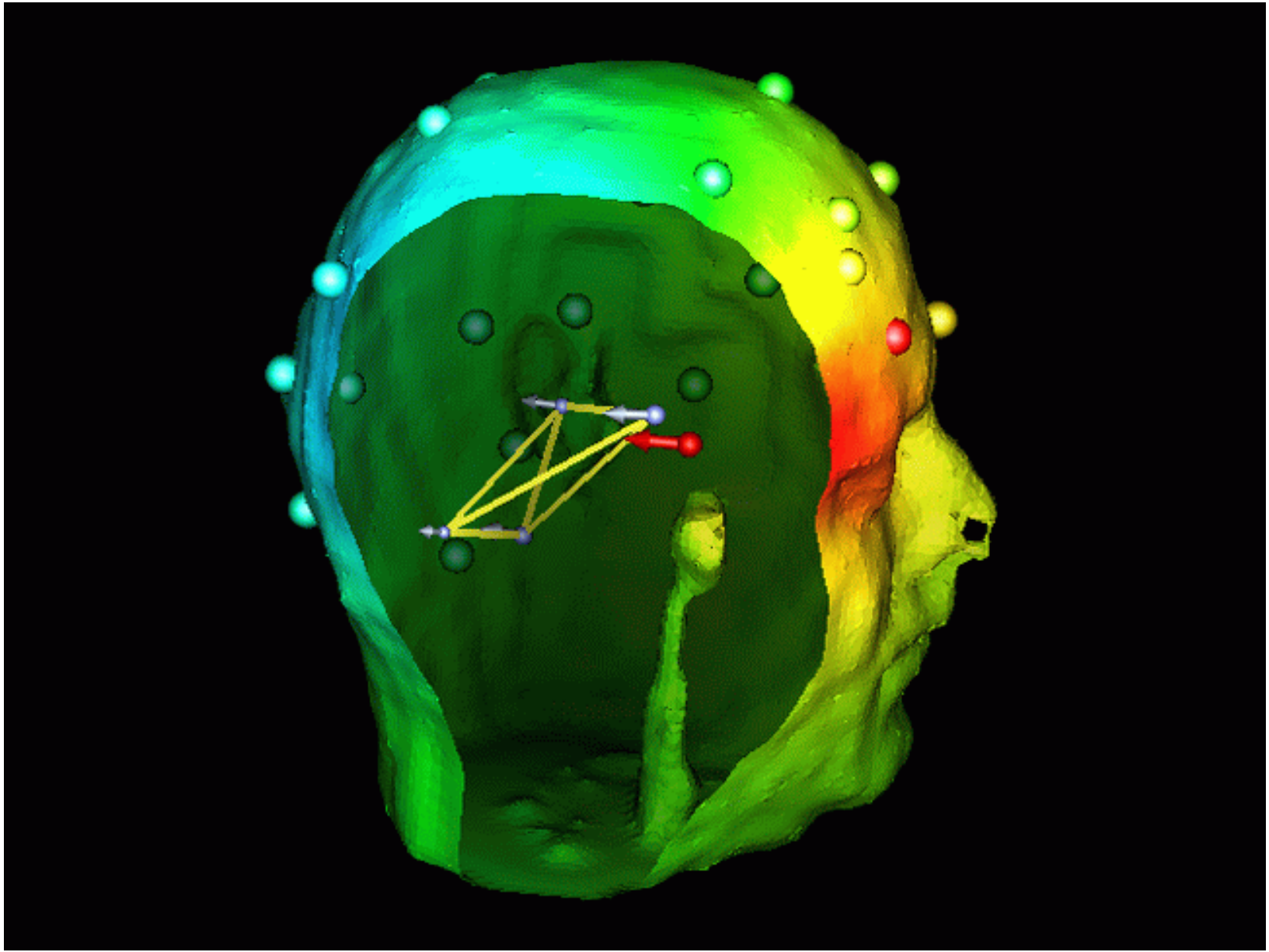






Spektrum





Využitie evokovaných potenciálov

- **Sclerosis multiplex**
- **Borelióza**
- **Diabetes mellitus**
- **Neurinóm VIII. Nervu**
- **Nádory miechy**

**Motorické evokované
potenciály – magnetická
stimulácia motorickej kôry
a pyramídovej dráhy**

**Vlna P300 = kognitívny
evokovaný potenciál**

**Poruchy kognitívnych funkcií
(demencie)**