



4° CORSO RESIDENZIALE EEG e POTENZIALI EVOCATI

22 – 27 NOVEMBRE 2021

Con il Patrocinio di



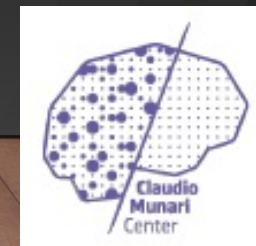
LE EPILESSIE FOCALI

LAURA TASSI

VERONICA PELLICCIA

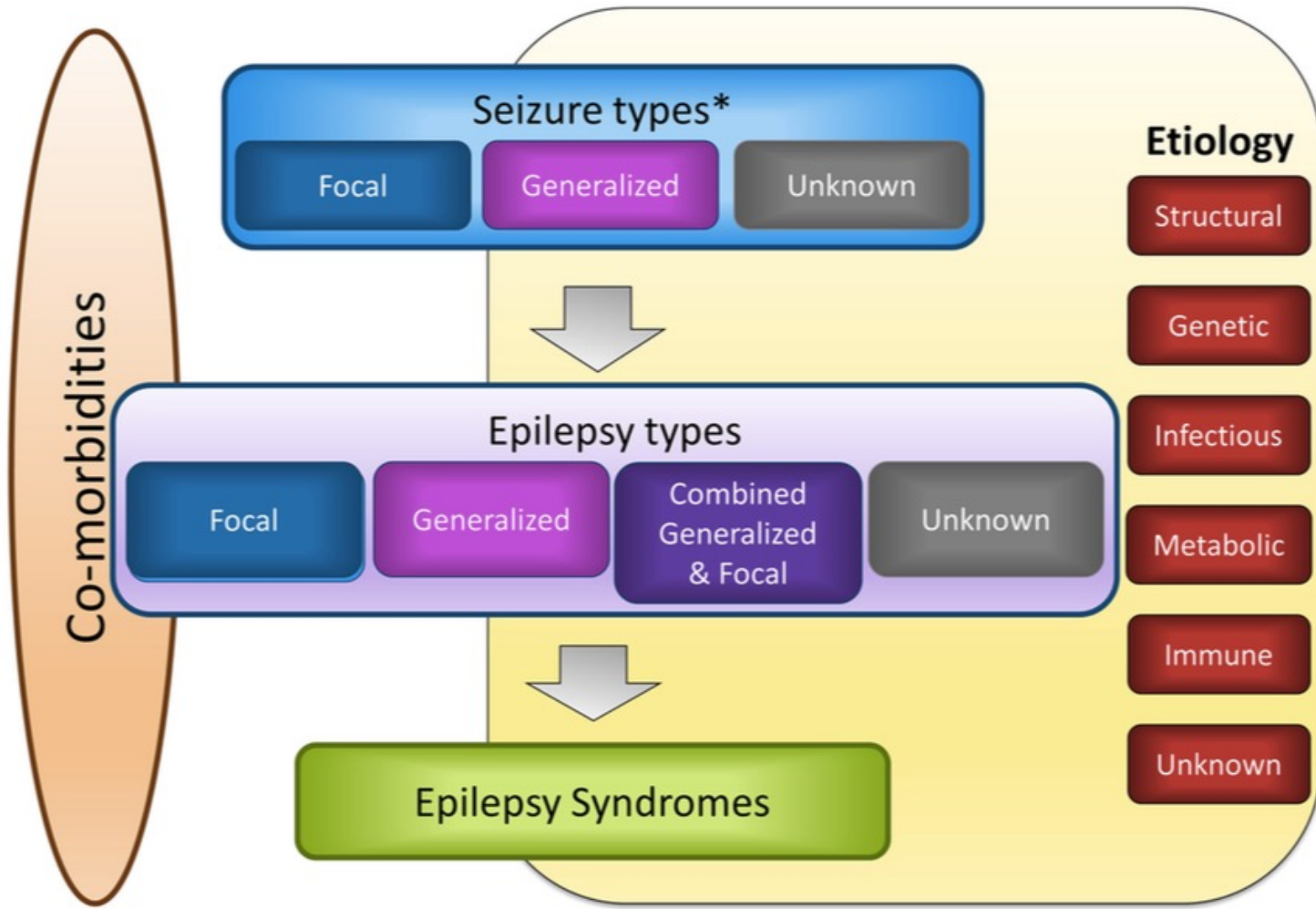
CENTRO PER LA CHIRURGIA DELL'EPILESSIA «CLAUDIO MUNARI»

OSPEDALE NIGUARDA MILANO



ILAE Classification of the Epilepsies Position Paper of the ILAE Commission for Classification and Terminology

Ingrid E Scheffer^{1,2}, Samuel Berkovic¹, Giuseppe Capovilla French⁵, Laura Guilhoto⁶, Edouard Hirsch⁷, Satish Jain⁸, G Moshé¹⁰, Douglas R Nordli¹¹, Emilio Perucca¹², Torbjörn Tönnis¹³, Hua Zhang¹⁵, and Sameer M Zuberi¹⁶



L'EEG NELLA LOCALIZZAZIONE



- Come?

- Perché?

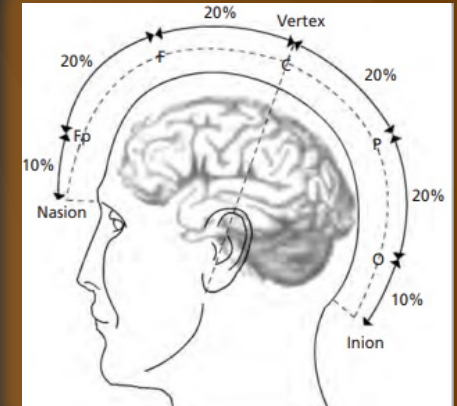
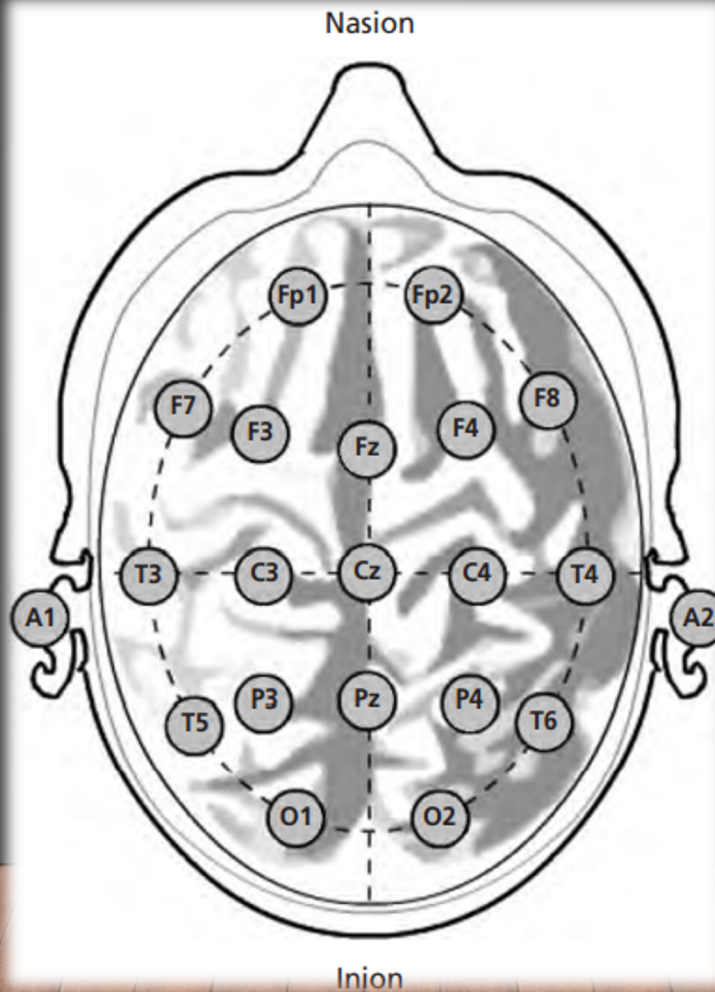
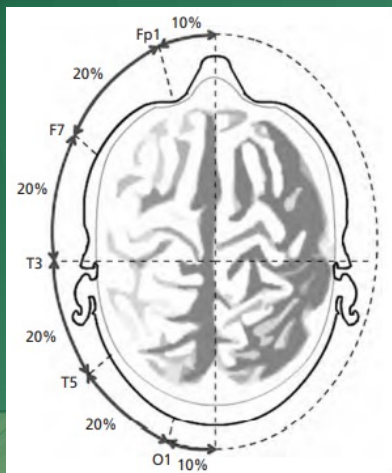
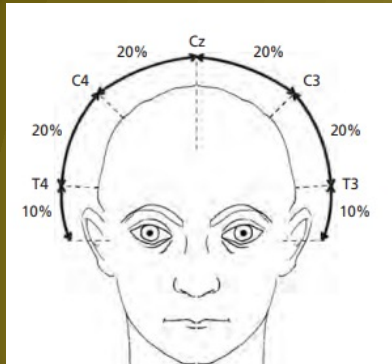
COME

- Montaggio
- Parametri di visualizzazione

- Individuare elementi fisiologici
- Individuare elementi patologici, lenti ed epilettiformi

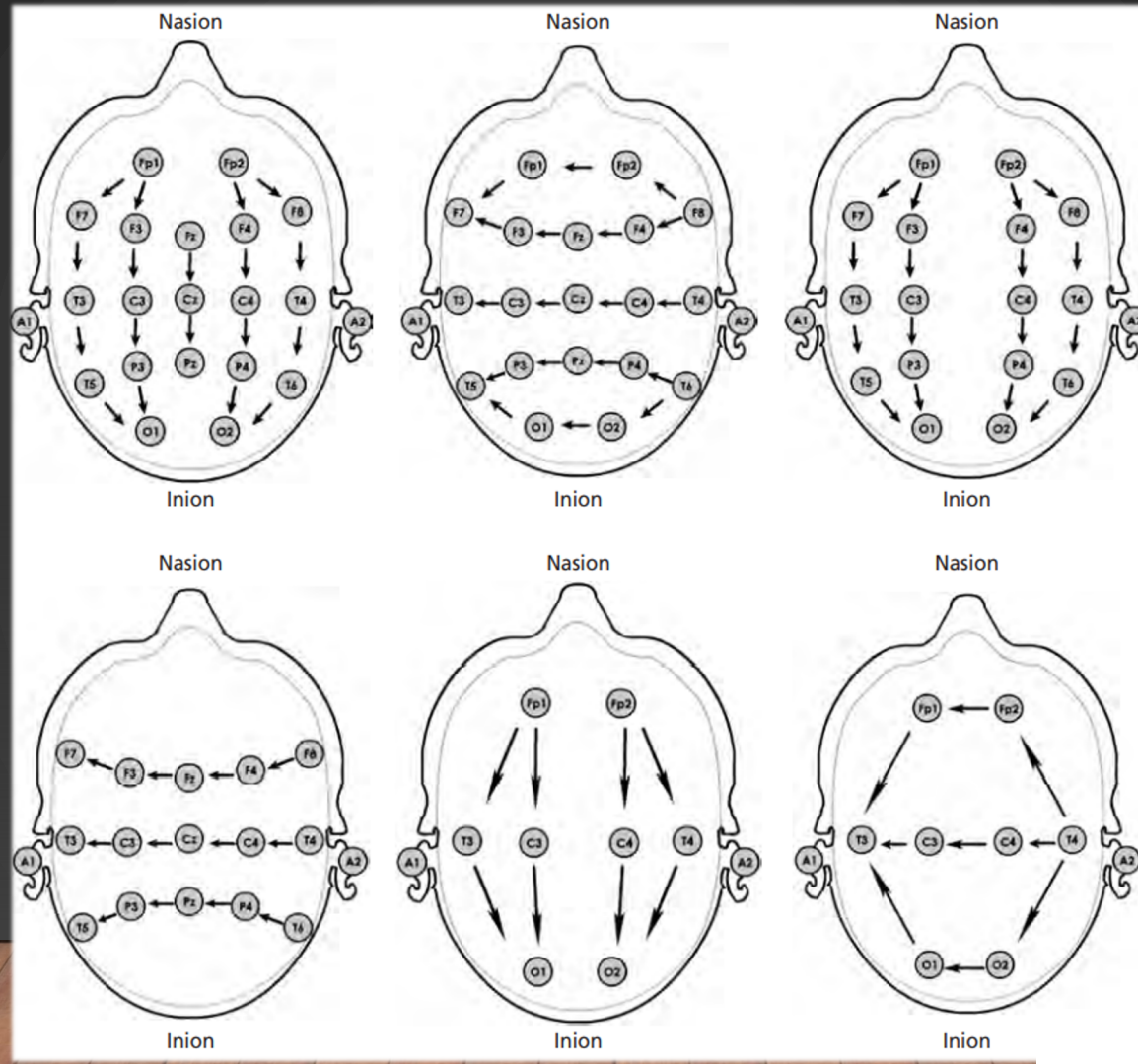
MONTAGGIO

Posizionamento elettrodi secondo Sistema Internazionale 10-20



From: **Manuale teorico pratico di Elettroencefalografia**
Oriano Mecarelli

MONTAGGIO

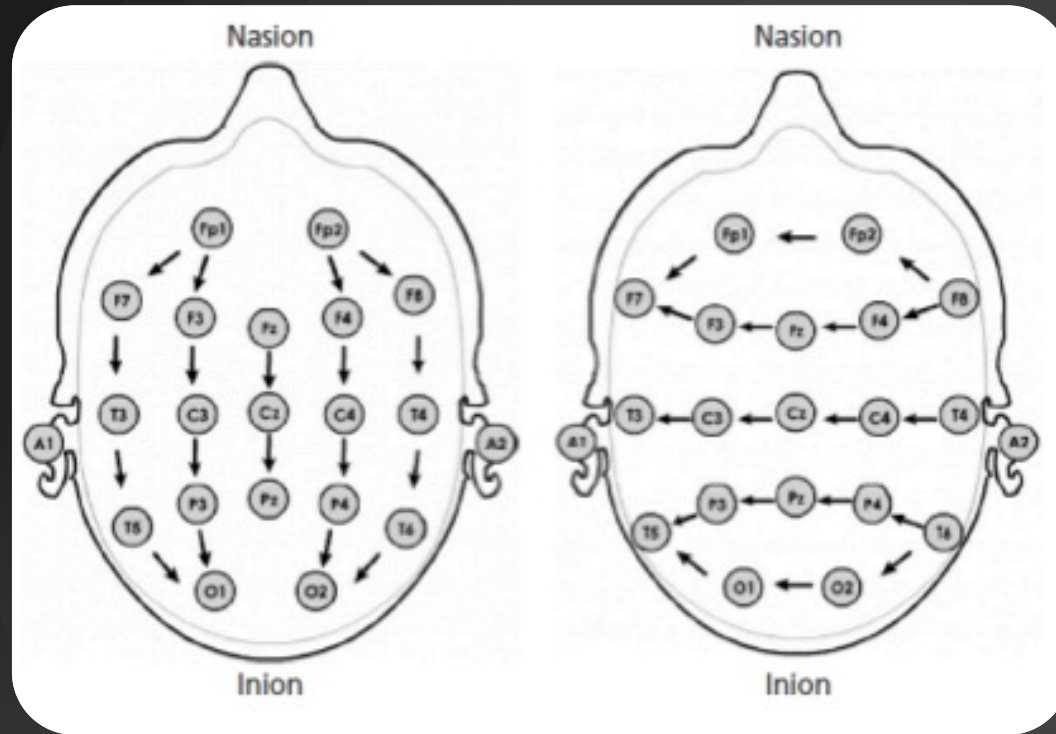


From: **Manuale teorico pratico di Elettroencefalografia**
Oriano Mecarelli

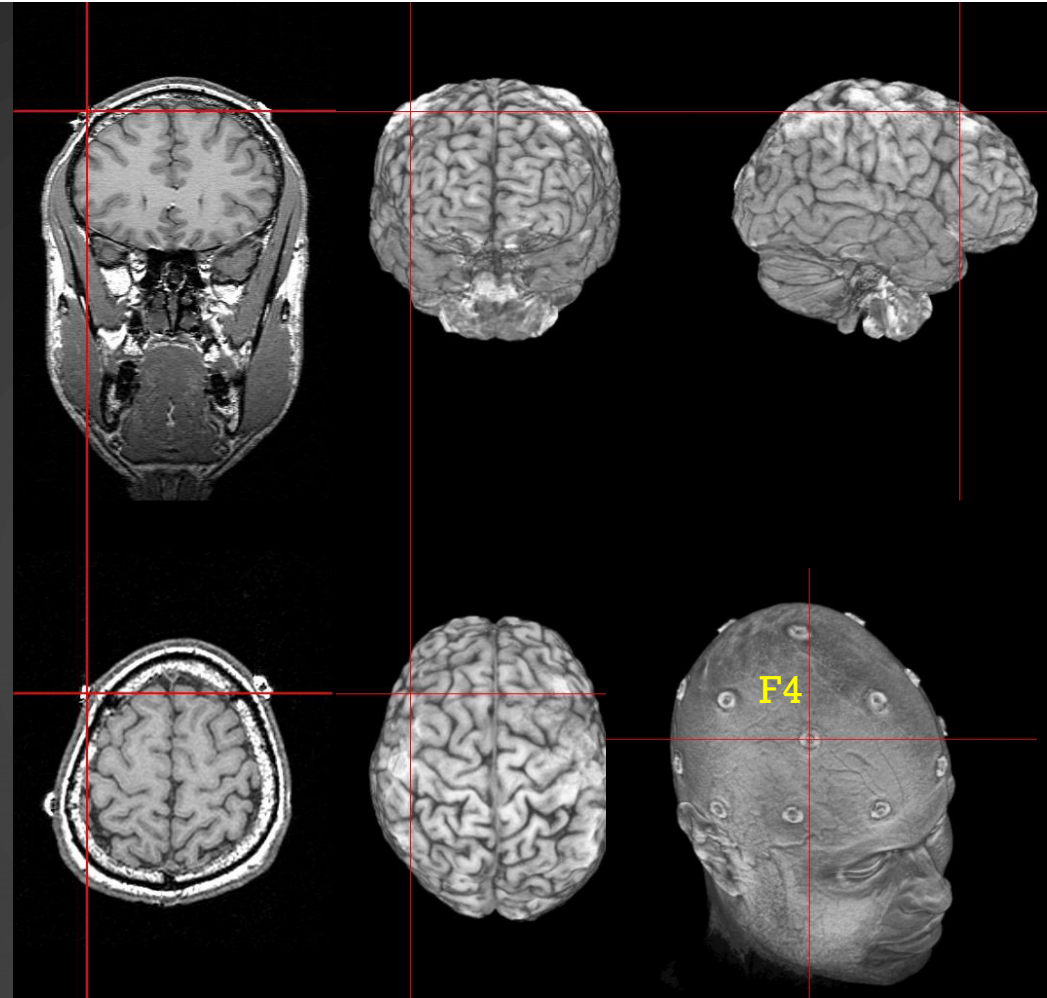
MONTAGGIO

longitudinale

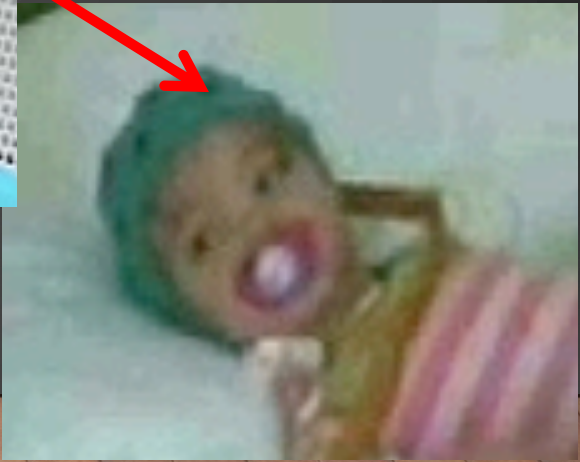
trasversale



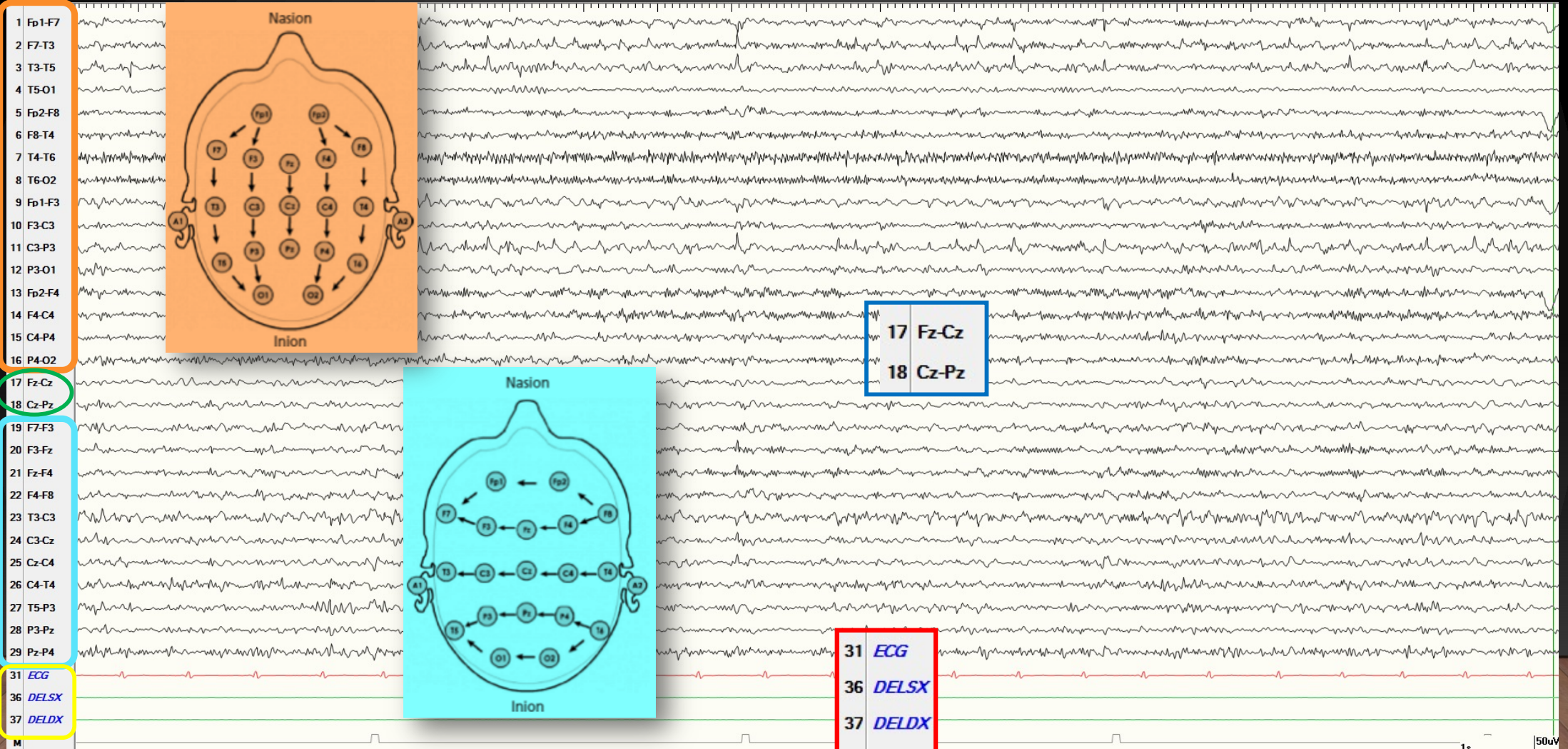
From: Manuale teorico pratico
di Elettroencefalografia
Oriano Mecarelli



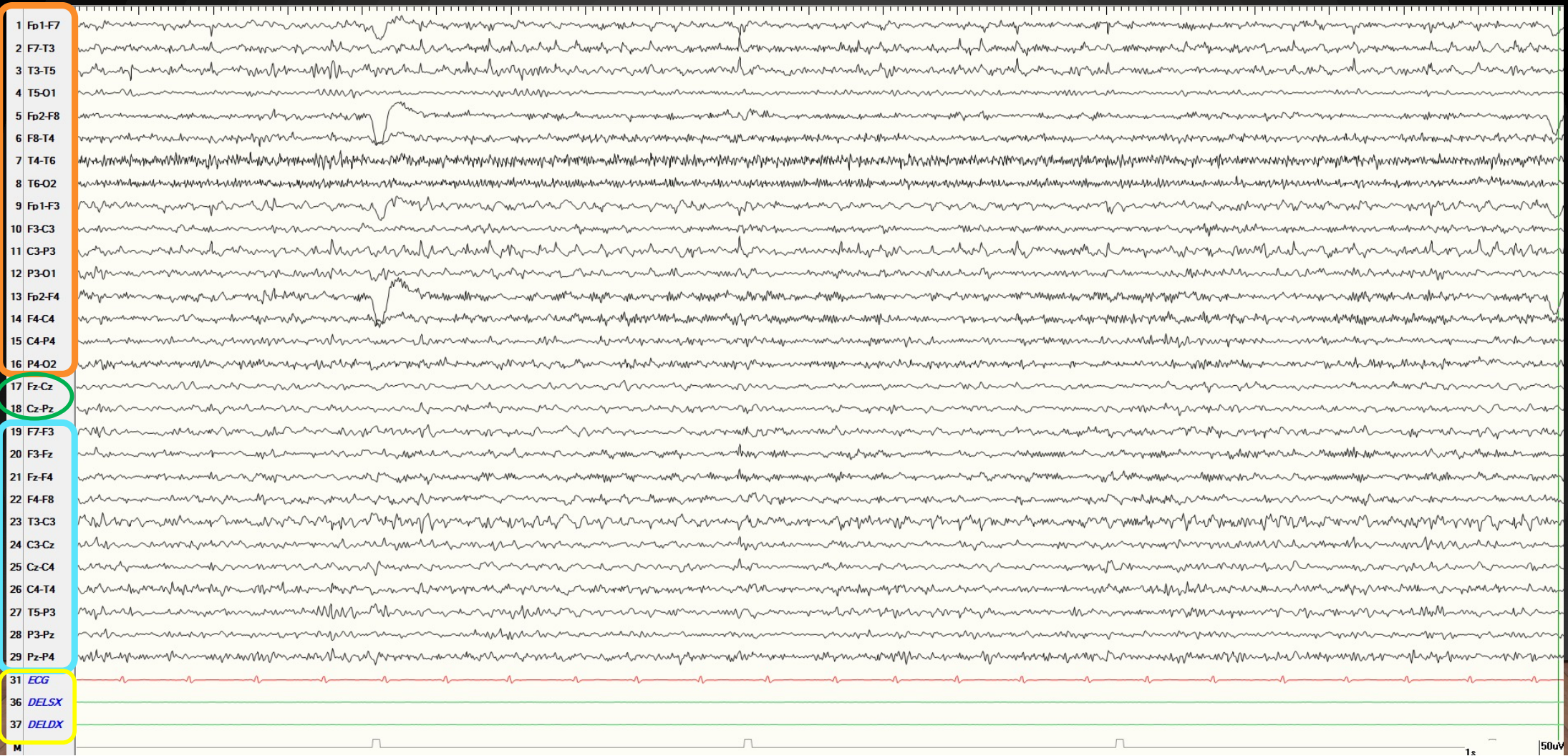




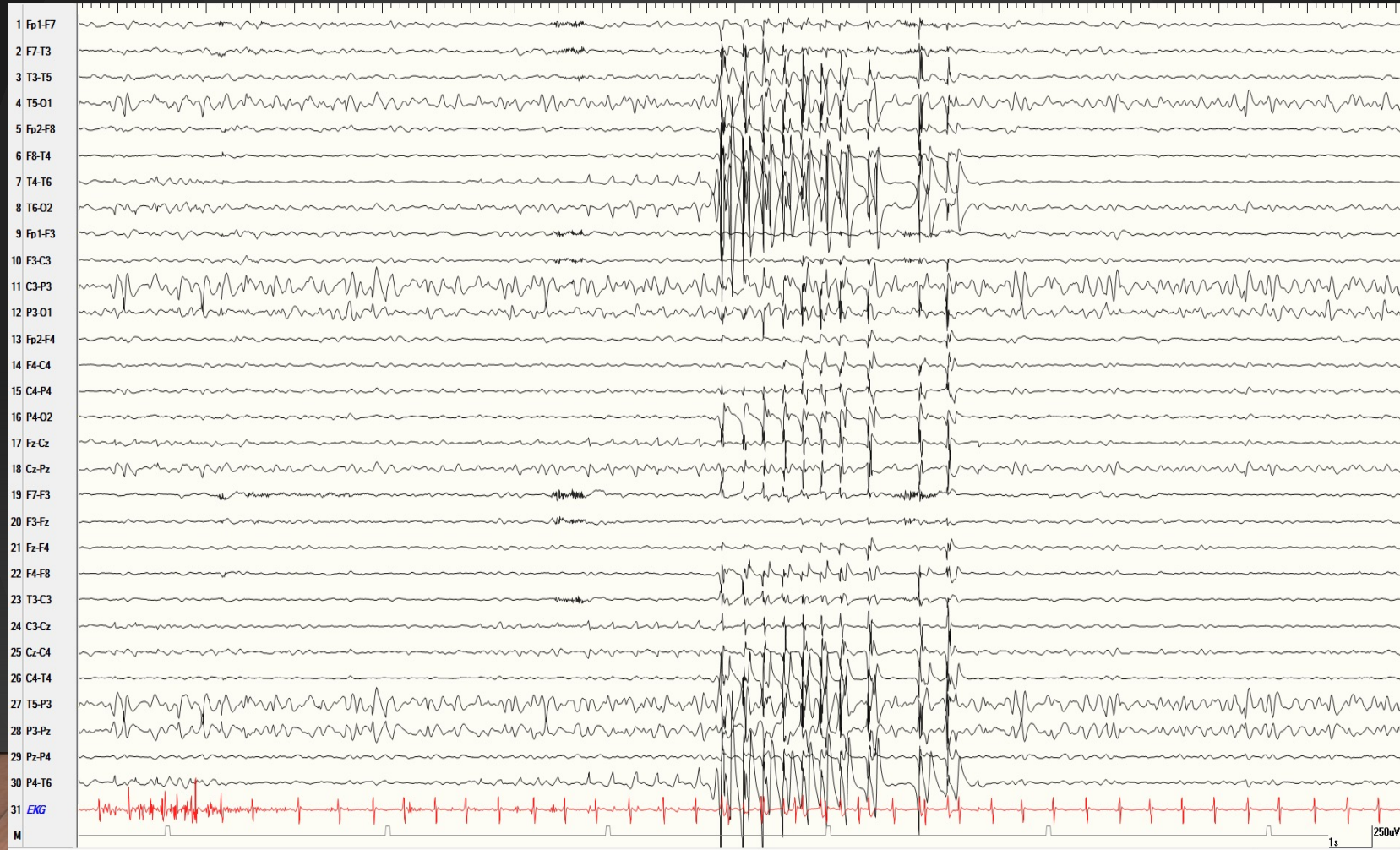
MONTAGGIO



MONTAGGIO



ARTEFATTO TOCCAMENTO TESTINA



COME

- Montaggio
- Parametri di visualizzazione

COME

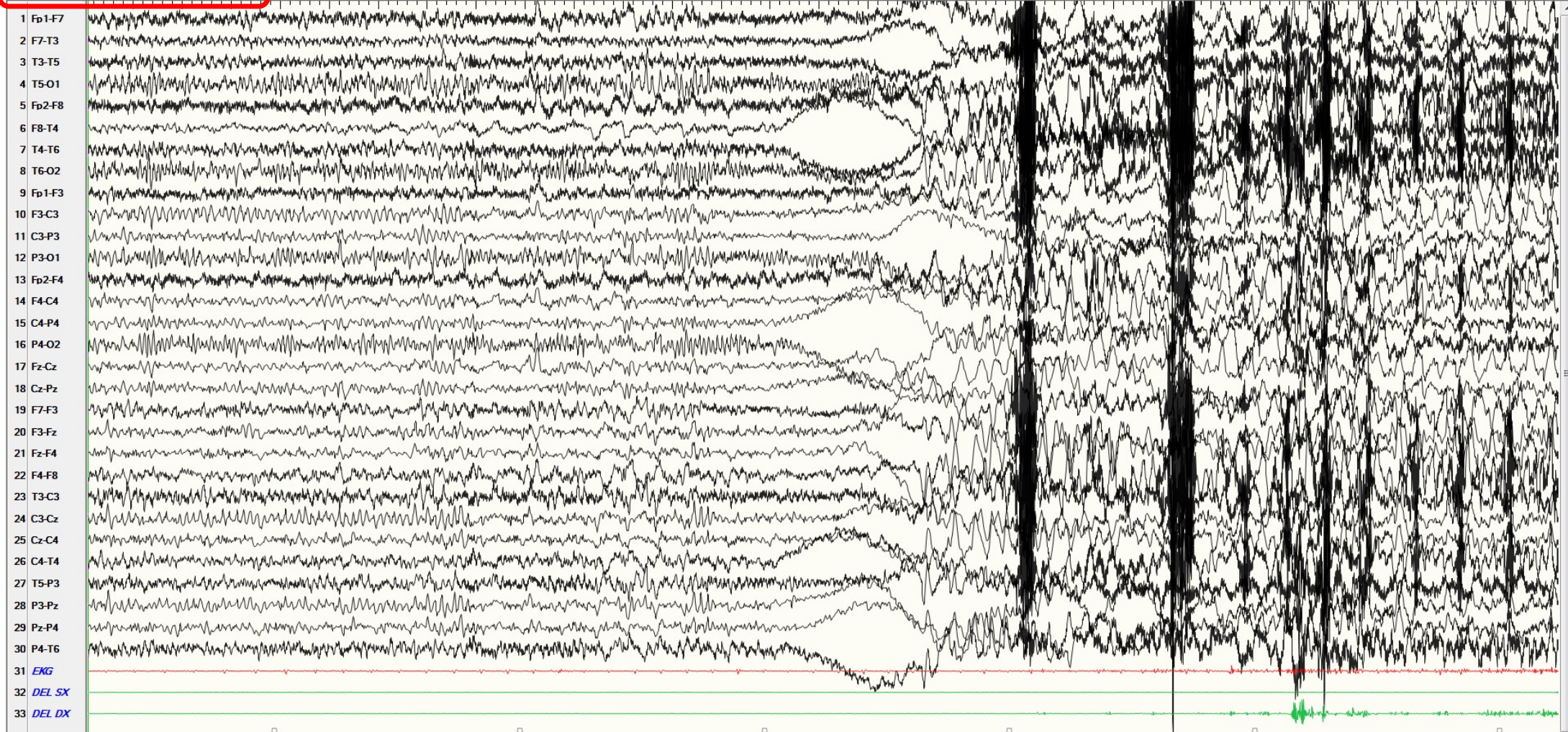
- Filtro passa alto HF (0.53Hz-5.3Hz), di solito 1.6Hz -> accentua le attività rapide o lente
- Filtro passa basso LF (15-120Hz), di solito 70Hz -> riduce gli artefatti

Costante di Tempo (s)	Filtro Passa Alto (Hz)
10	0,016
1,0	0,16
0,3	0,53
0,1	1,6
0,03	5,3
0,003	53,0
0,001	160,0

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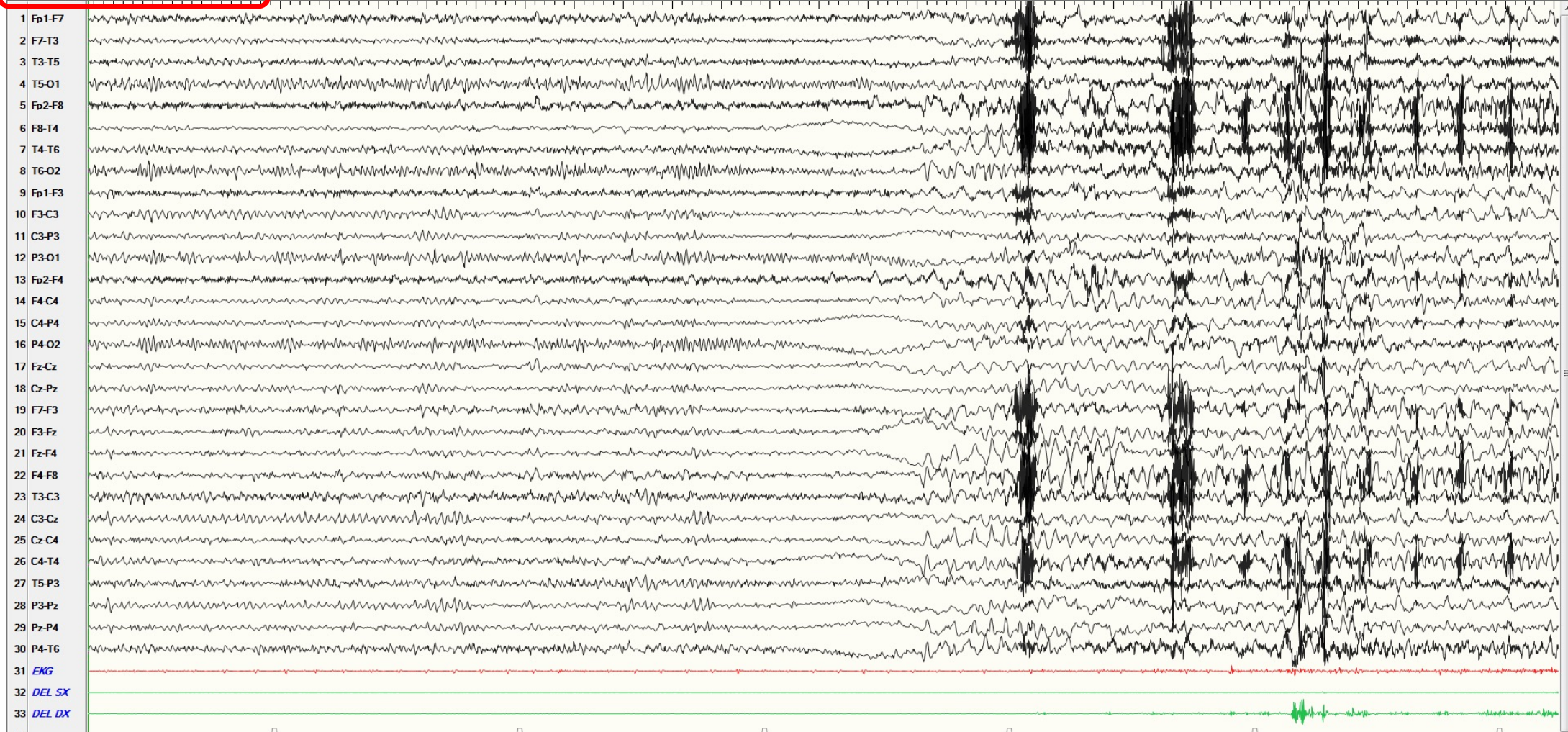
7 μ V 1.6 Hz 120 Hz Traccia OFF 29/04/2019 Trascorso Epoca Piccole Grandi 19 Inizializza 30 s

SENS LF HF PAT RIF 18:23:12 00:03:55 24



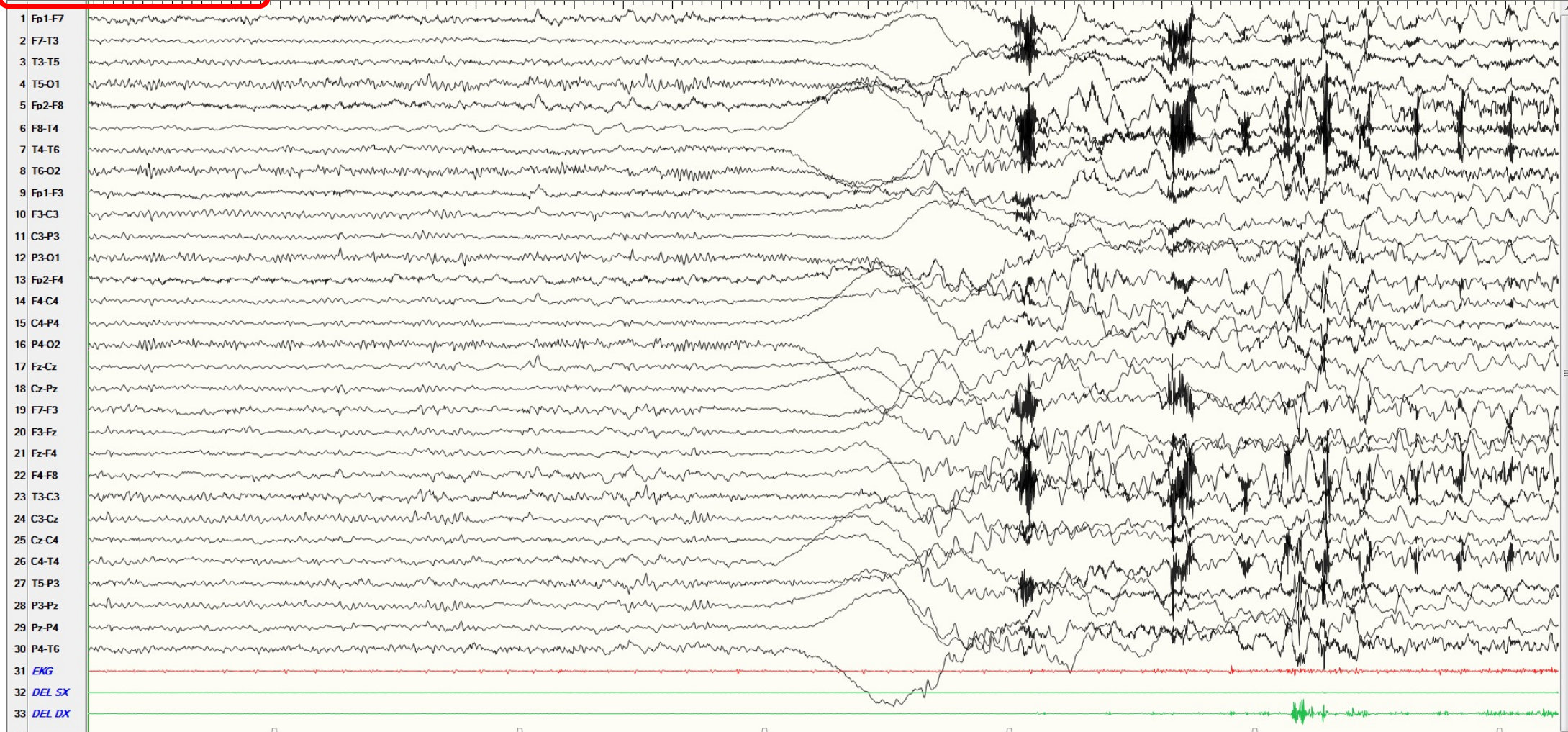
10 uV 5.3 Hz 60 Hz **Traccia** OFF 29/04/2019 Trascorso Epoca Piccole Grandi 19 Inizializza 30 s

SENS LF HF PAT RIF 18:23:12 00:03:55 24



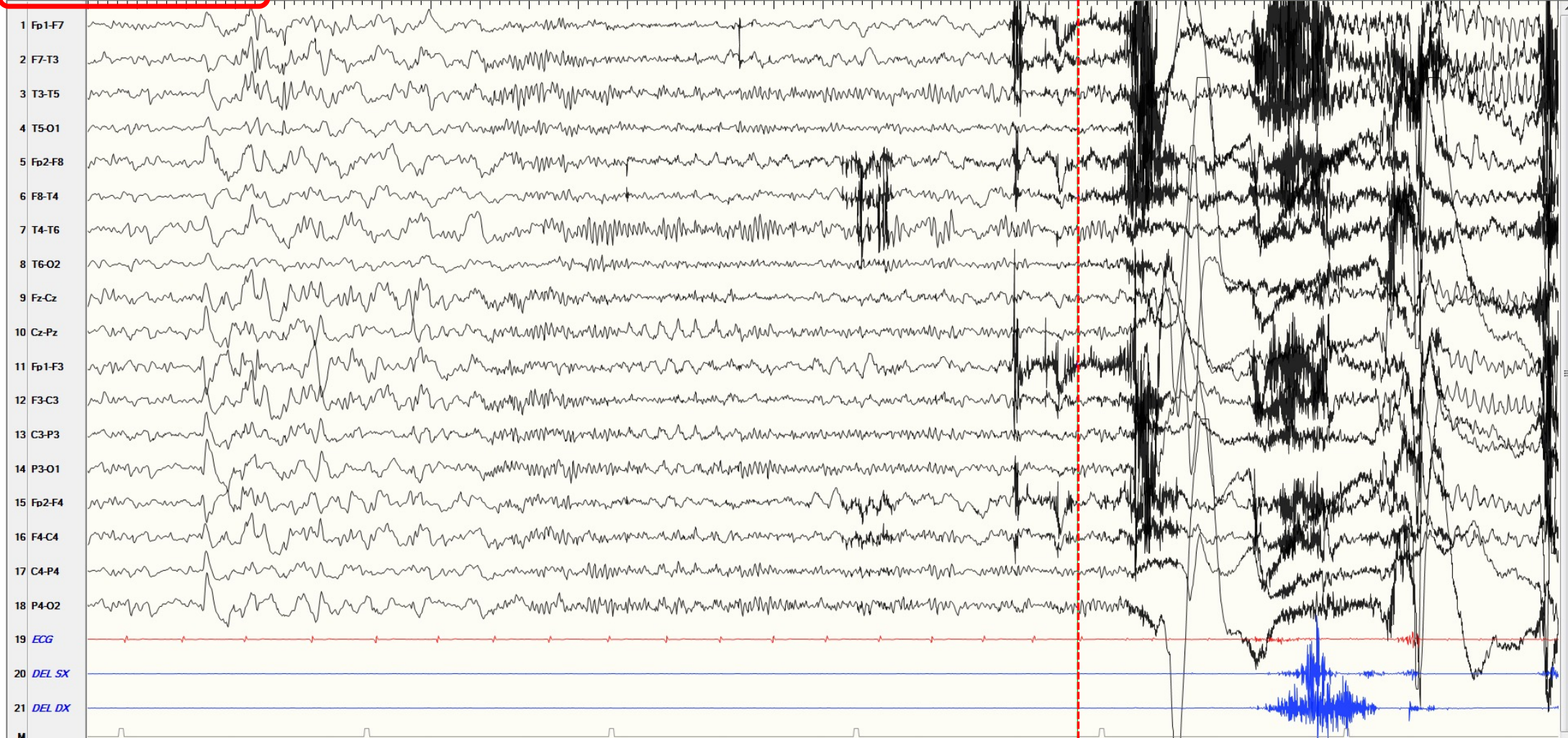
15 uV 0.53 Hz 60 Hz Traccia OFF 29/04/2019 Trascorso Epoca Piccole Grandi 19 Inizializza 30 s

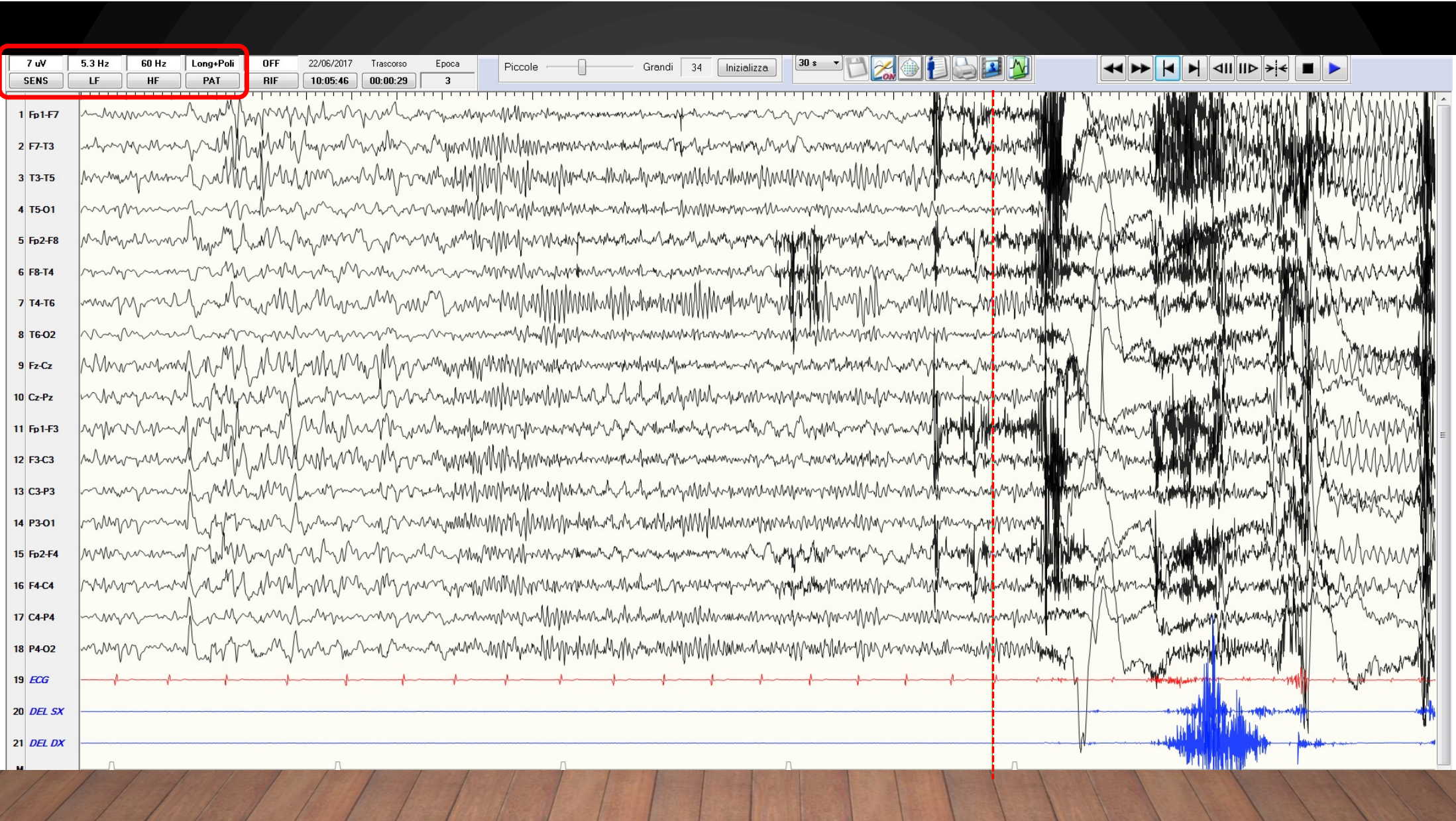
SENS LF HF PAT RIF 18:23:12 00:03:55 24



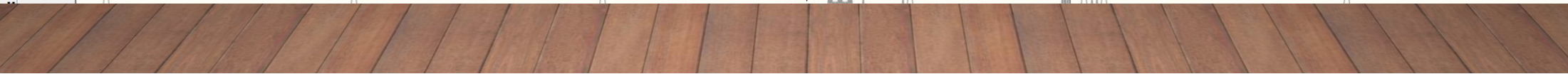
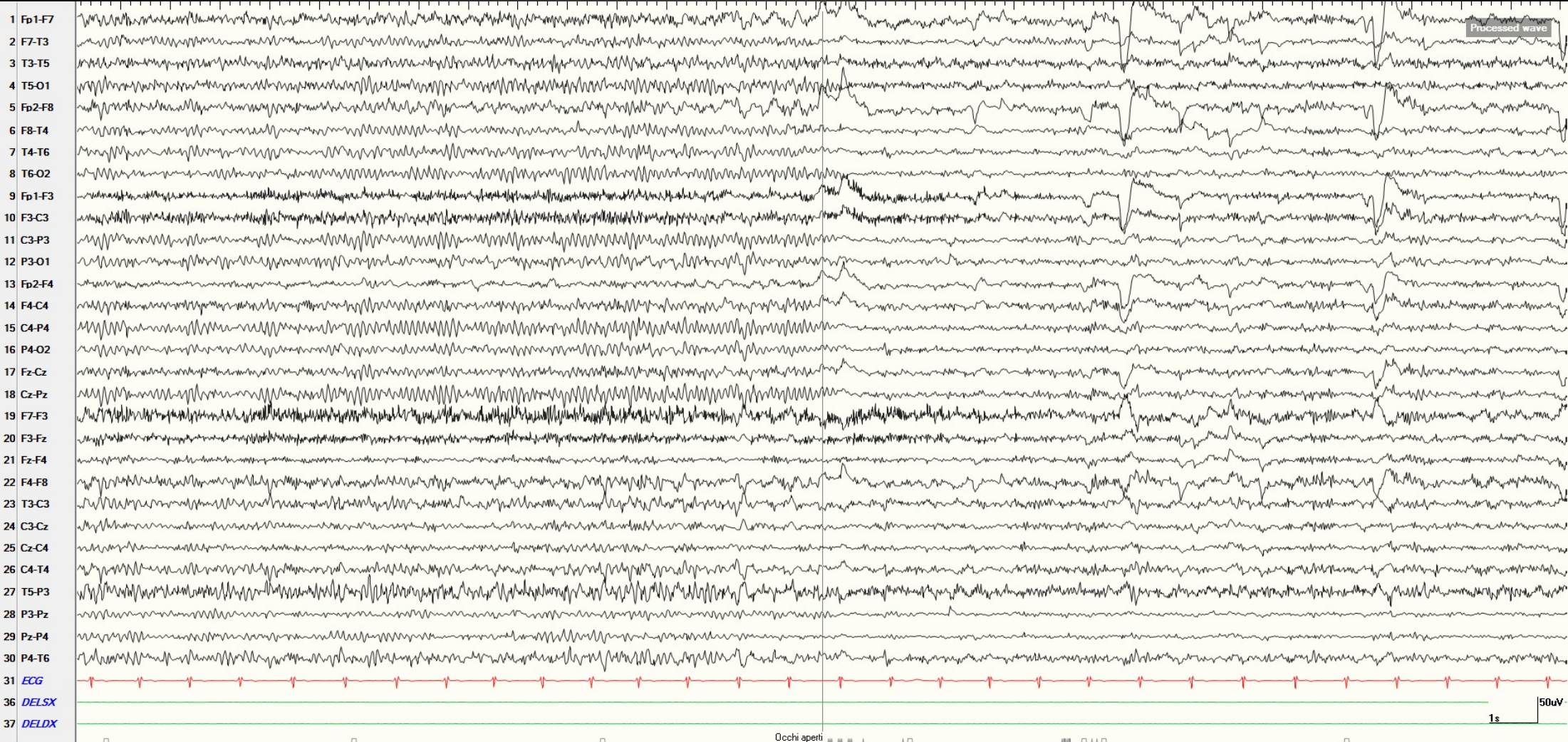
7 uV 1.6 Hz 120 Hz Long+Poli OFF 22/06/2017 Trascorso Epoca Piccole Grandi 19 Inizializza 30 s

SENS LF HF PAT RIF 10:05:46 00:00:29 3

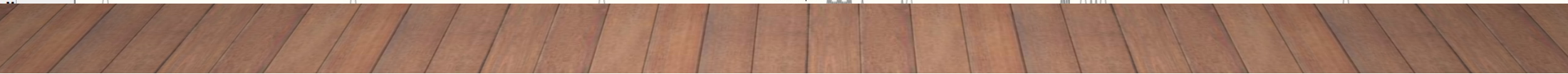




HF 70Hz



HF 30Hz



COME

- Individuare elementi fisiologici
- Individuare elementi patologici, lenti ed epilettiformi

COME

Caratterizzare ogni elemento per:

- ❖ Ampiezza
- ❖ Frequenza
- ❖ Morfologia
- ❖ Modalità di comparsa
- ❖ Localizzazione

COME

Caratterizzare ogni elemento per:

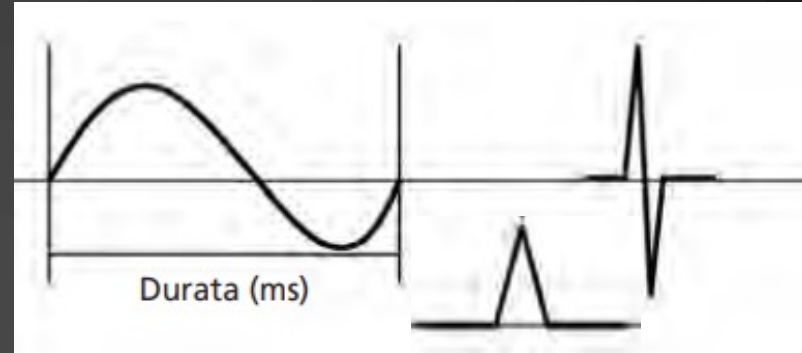
❖ Ampiezza

❖ Frequenza

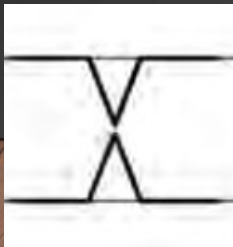
❖ **Morfologia**

❖ Modalità di comparsa

❖ Localizzazione



- Punta: apice puntuto, ampiezza variabile, brevissima durata 20-70 ms
- Onda punta: apice puntuto, ampiezza variabile, durata 70-200ms
- Onda lenta: morfologia rotondeggiante, durata >200ms



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COME

Caratterizzare ogni elemento per:

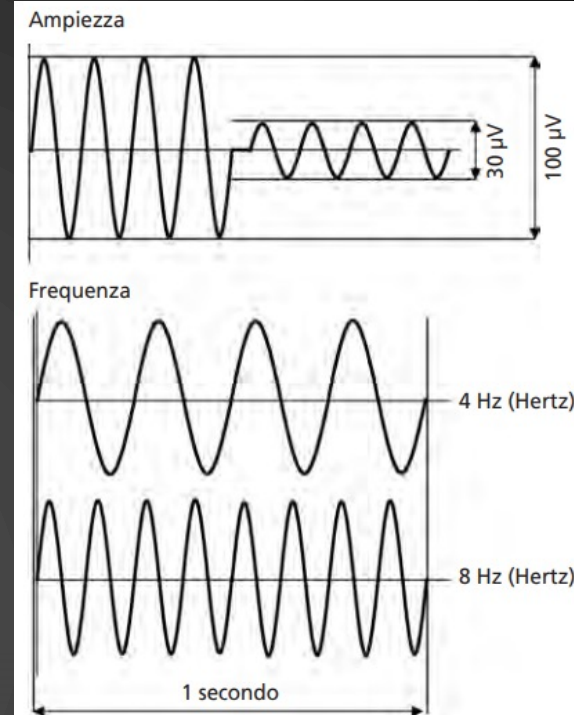
❖ **Ampiezza**

❖ **Frequenza**

❖ **Morfologia**

❖ **Modalità di comparsa**

❖ **Localizzazione**



- **Ampiezza:** si misura valutando l'altezza dell'onda picco-picco. Fondamentale la simmetria/asimmetria tra i due emisferi
- **Frequenza:** numero di cicli completi di onde ripetitive o di complessi che si verificano in un secondo

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COME

Caratterizzare ogni elemento per:

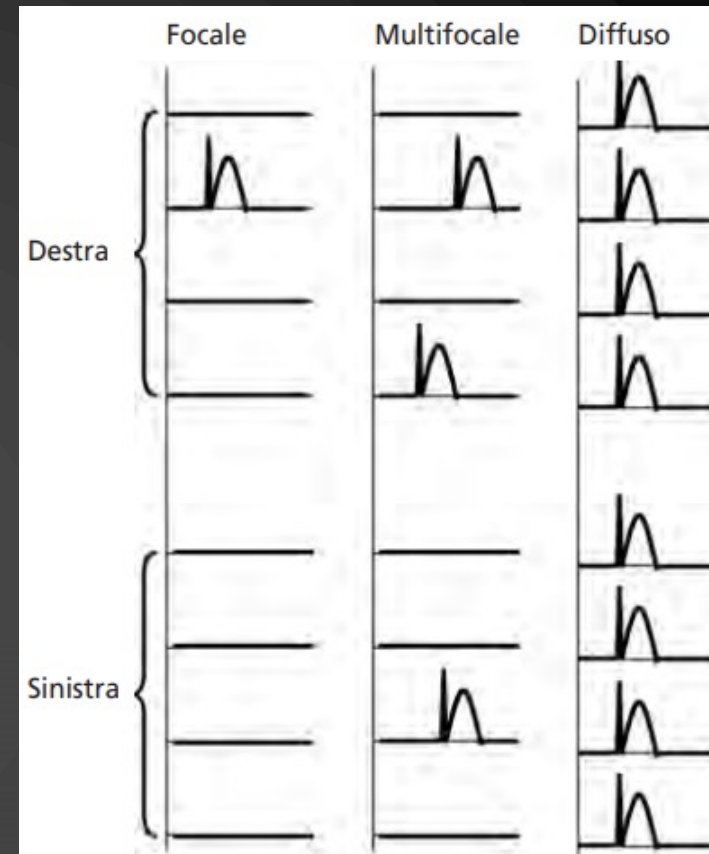
❖ Ampiezza

❖ Frequenza

❖ Morfologia

❖ Modalità di
comparsa

❖ Localizzazione



- Grafoelementi isolati o ad andamento periodico
- Diffusi, focali o multifocali

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GRAFOELEMENTI FISIOLOGICI

Beta > 12.5 Hz



Alfa 8-12 Hz

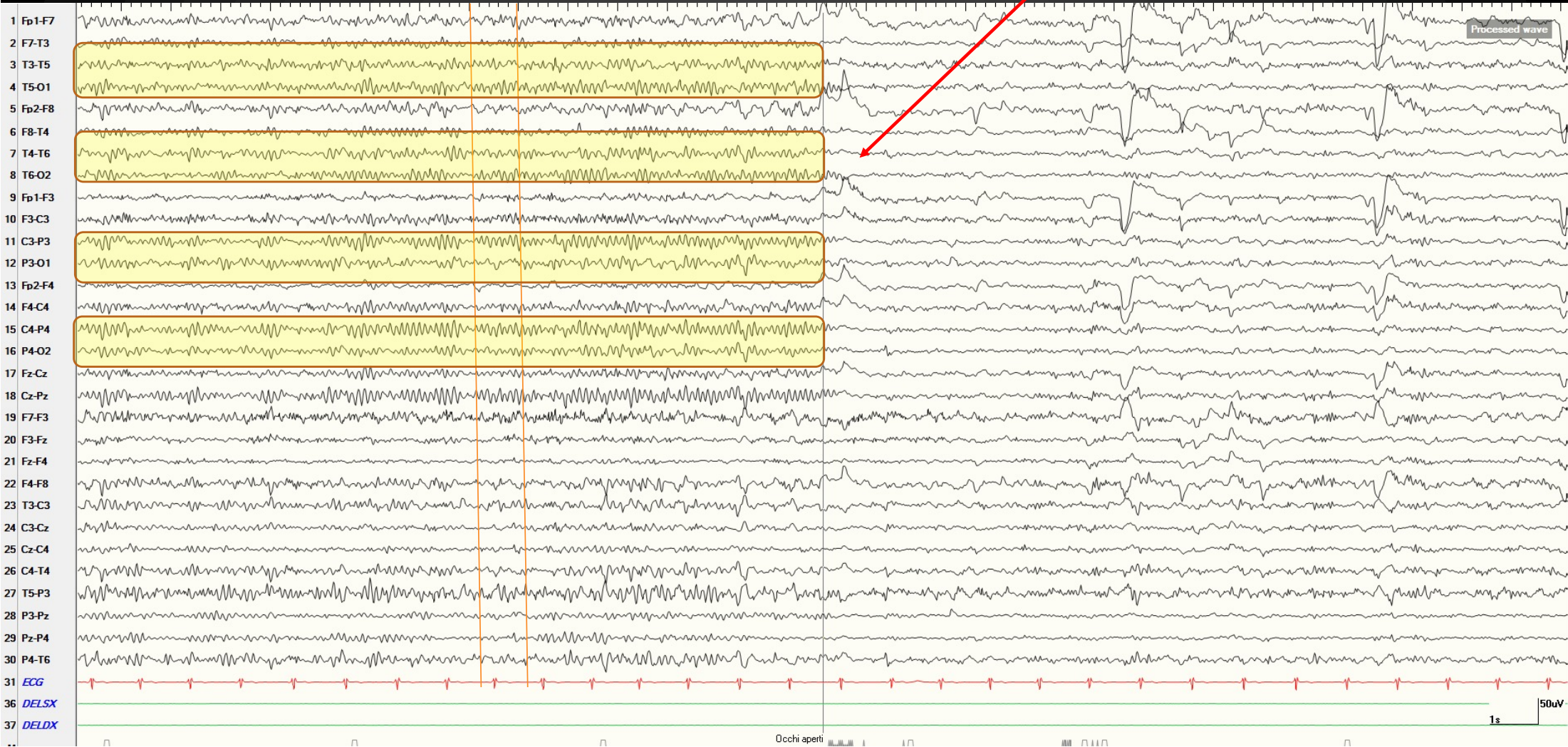
Theta 4-7.5Hz



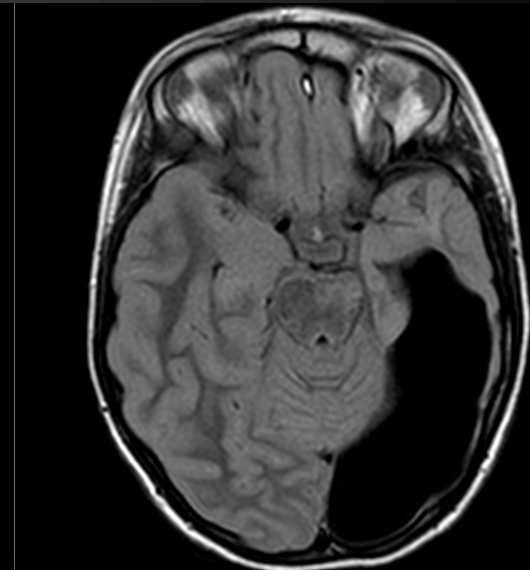
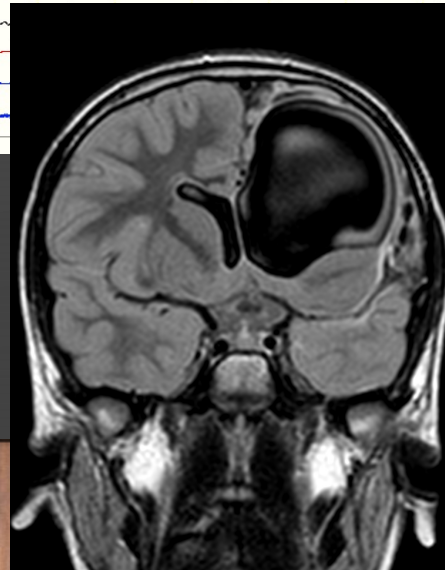
Delta < 4Hz



Ritmo di fondo

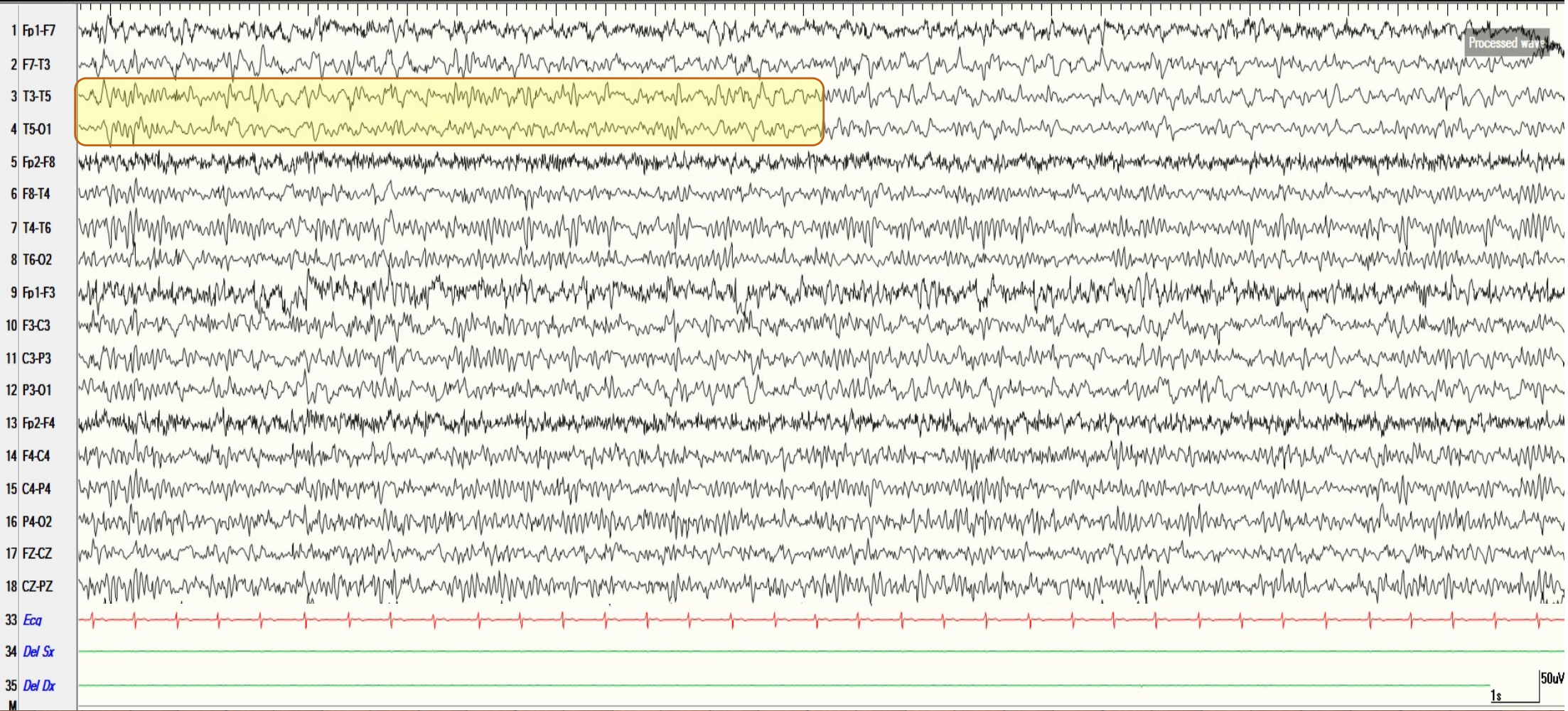


Ritmo di fondo



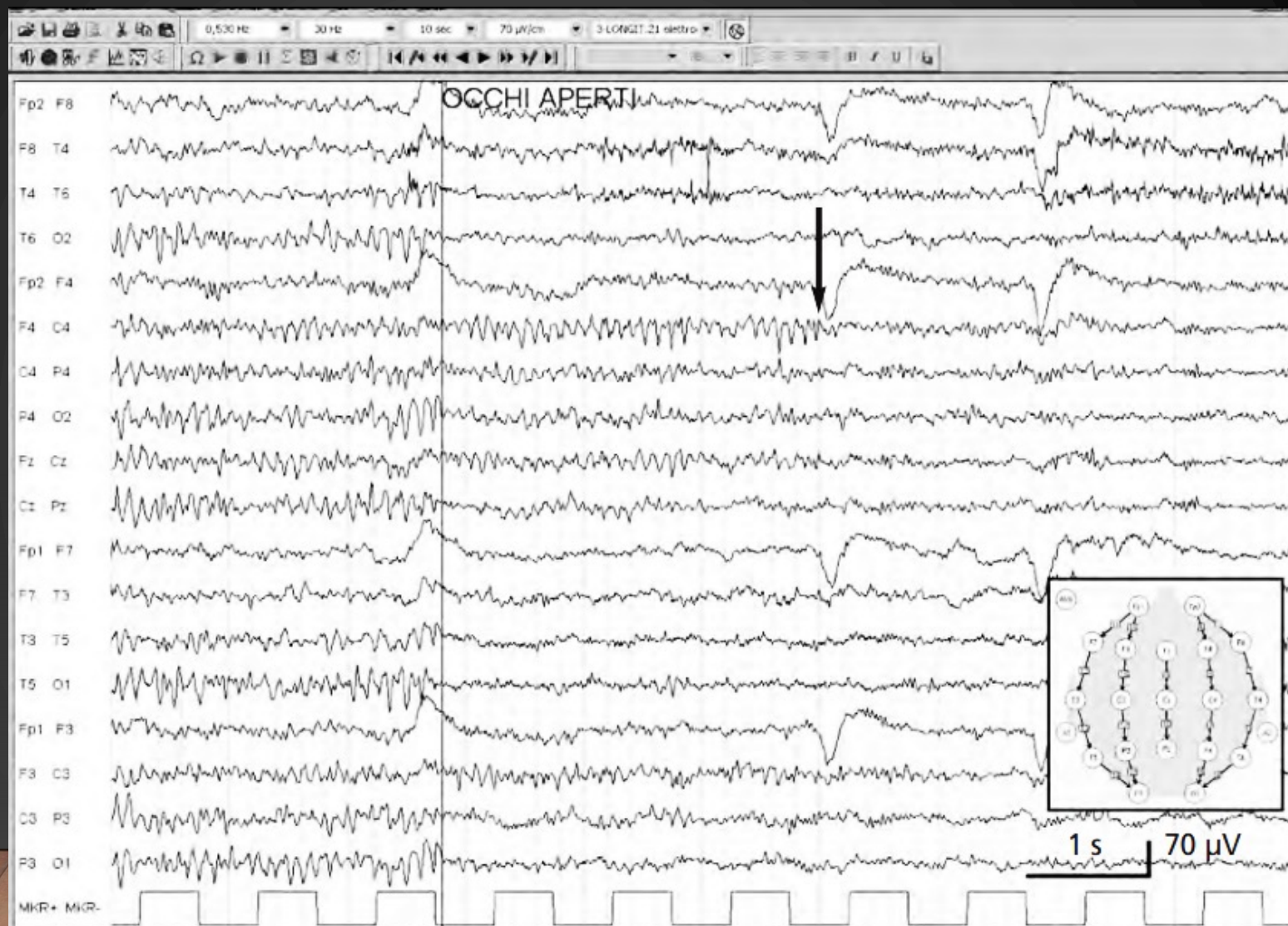


Ritmo di fondo

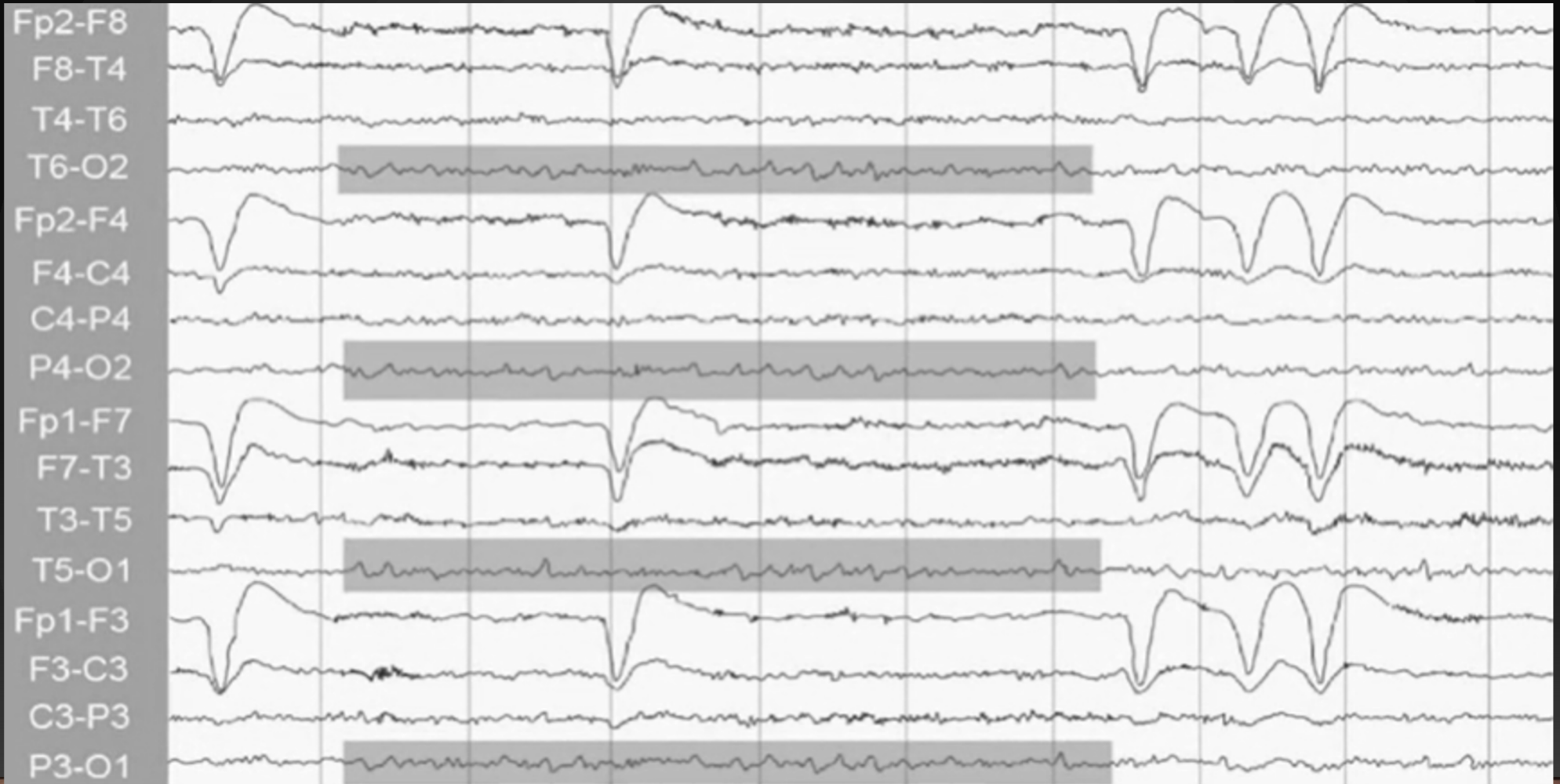


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mu

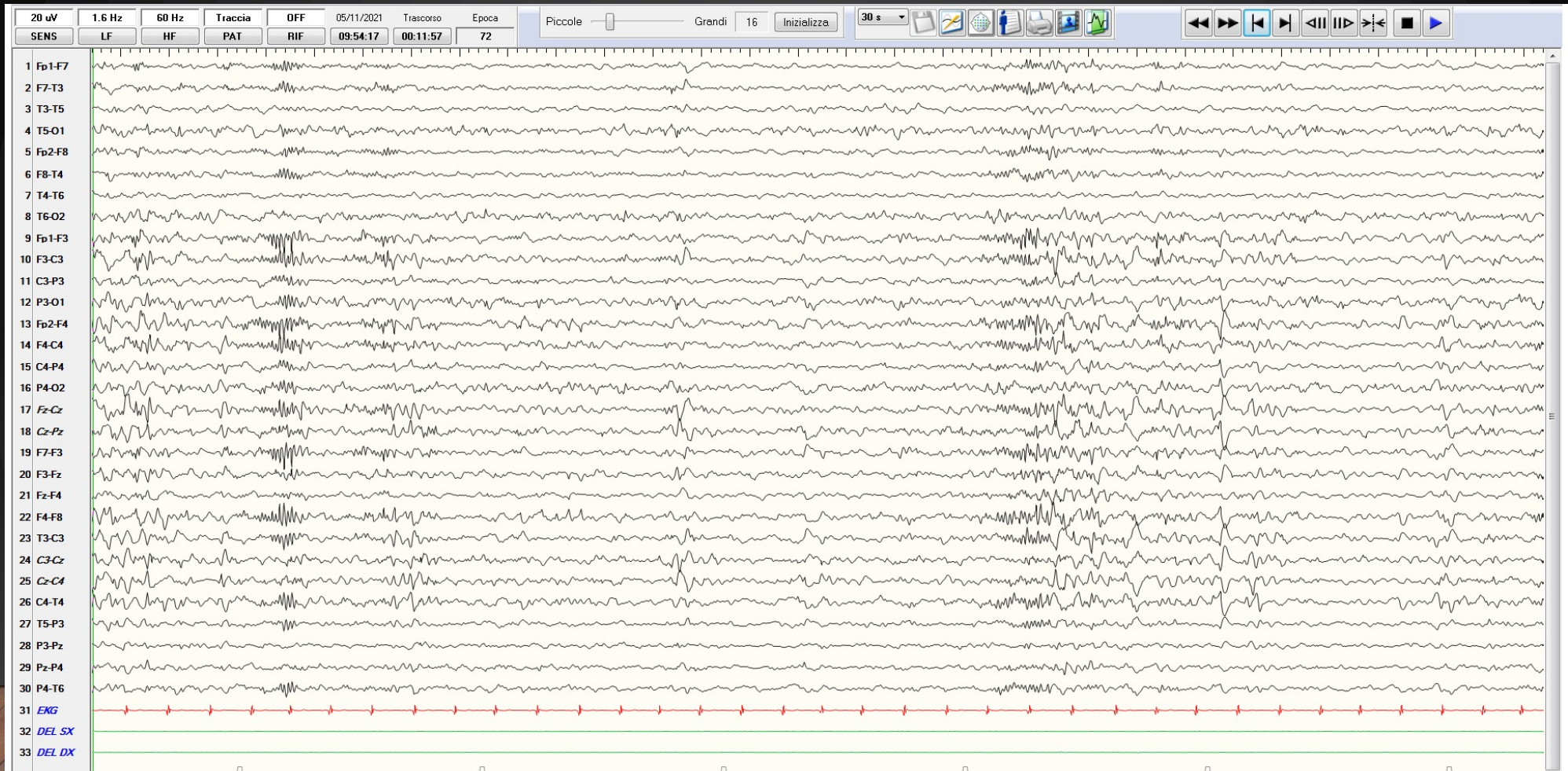


Lamba



GRAFOELEMENTI FISIologici

sonno



GRAFOELEMENTI FISIOLGICI

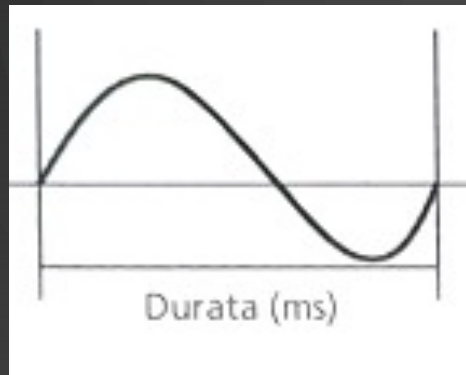
sonno



GRAFOELEMENTI PATOLOGICI



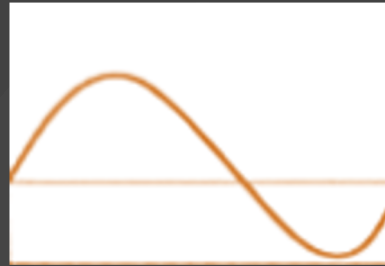
Grafoelementi lenti



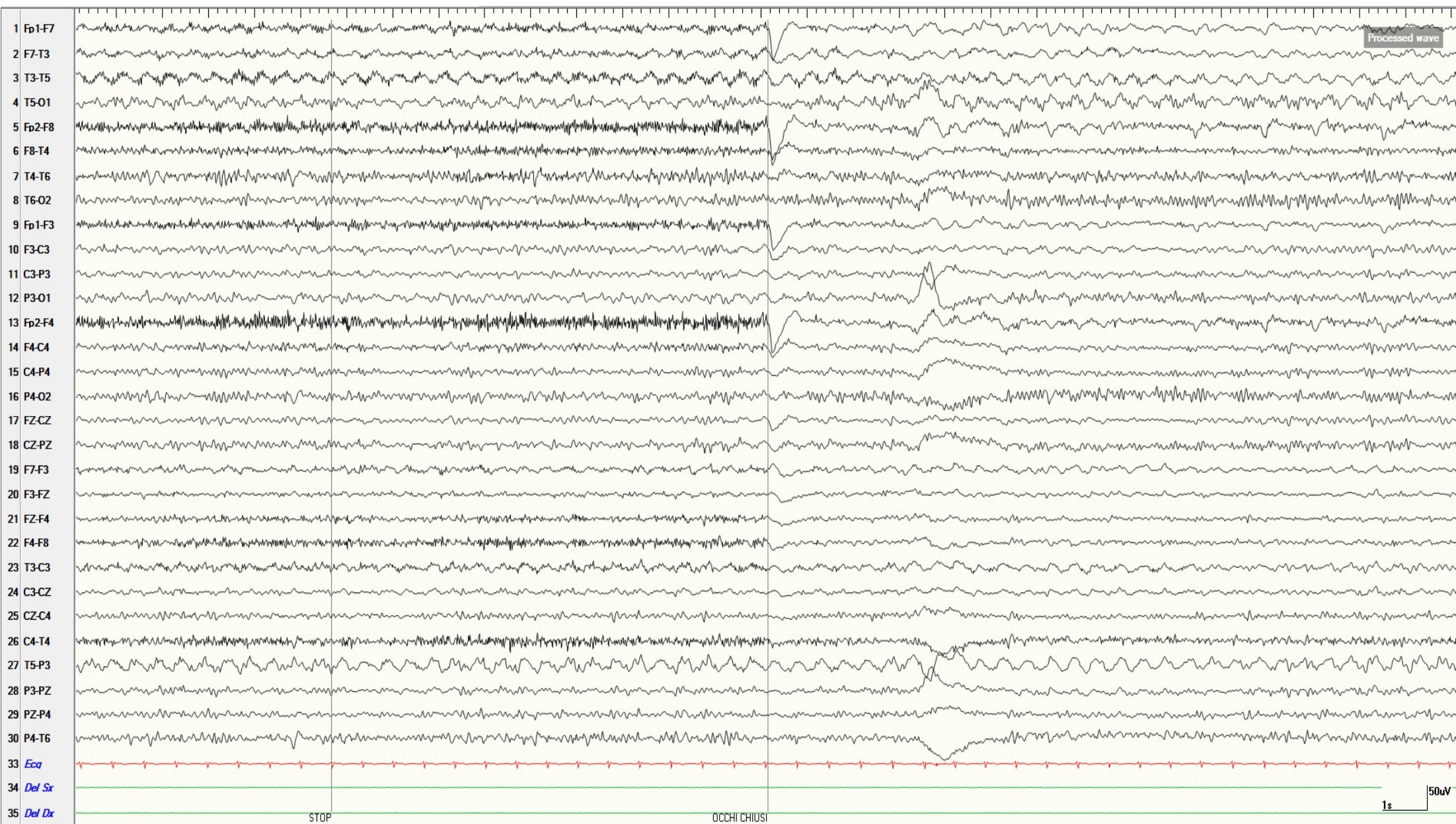
Grafoelementi epilettiformi



GRAFOELEMENTI LENTI

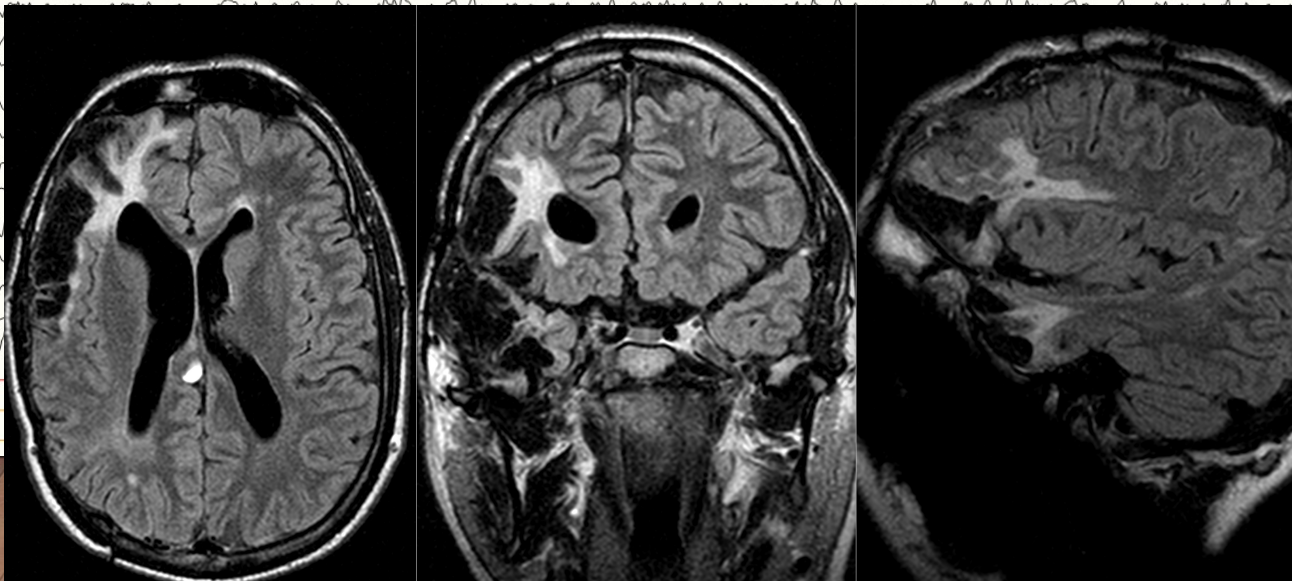


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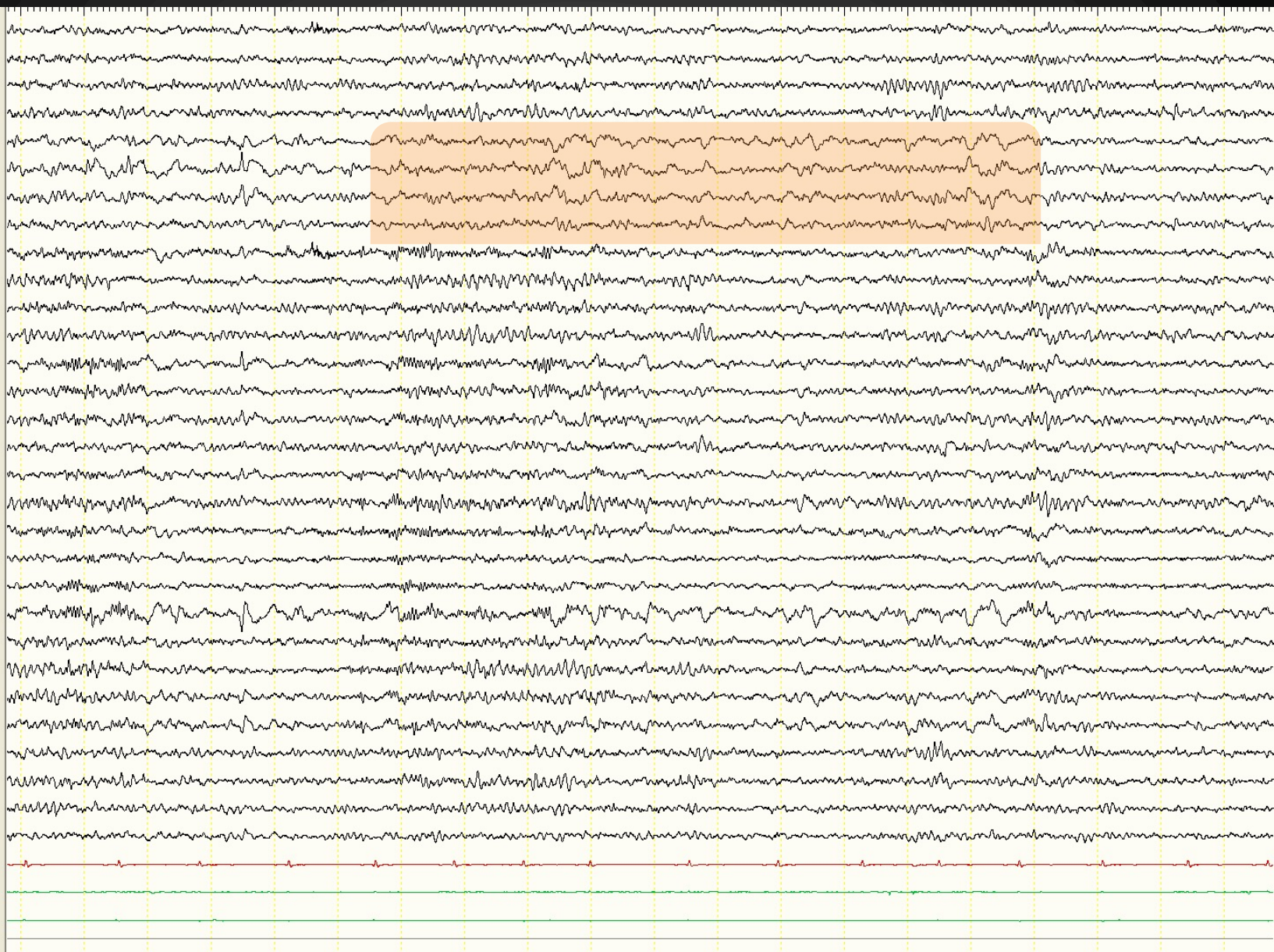
Processed wave

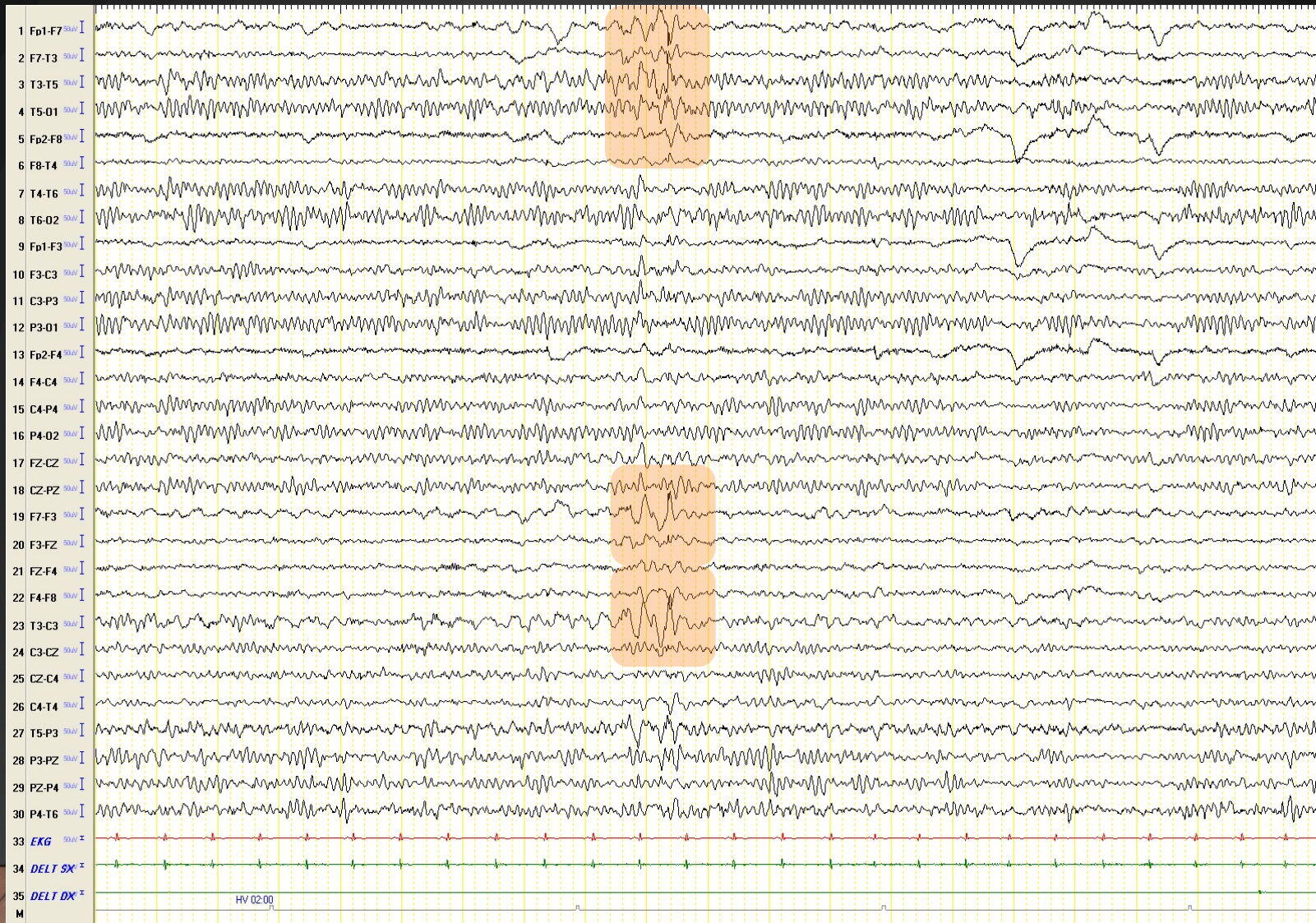
- 1 Fp1-F7
- 2 F7-T3
- 3 T3-T5
- 4 T5-O1
- 5 Fp2-F8
- 6 F8-T4
- 7 T4-T6
- 8 T6-O2
- 9 Fp1-F3
- 10 F3-C3
- 11 C3-P3
- 12 P3-O1
- 13 Fp2-F4
- 14 F4-C4
- 15 C4-P4
- 16 P4-O2
- 17 Fz-Cz
- 18 Cz-Pz
- 19 F7-F3
- 20 F3-Fz
- 21 Fz-F4
- 22 F4-F8
- 23 T3-C3
- 24 C3-Cz
- 25 Cz-C4
- 26 C4-T4
- 27 T5-P3
- 28 P3-Pz
- 29 Pz-P4
- 30 P4-T6
- 31 *EKG*
- 32 *DEL SX*
- 33 *DEL DX*



1s | 50uV

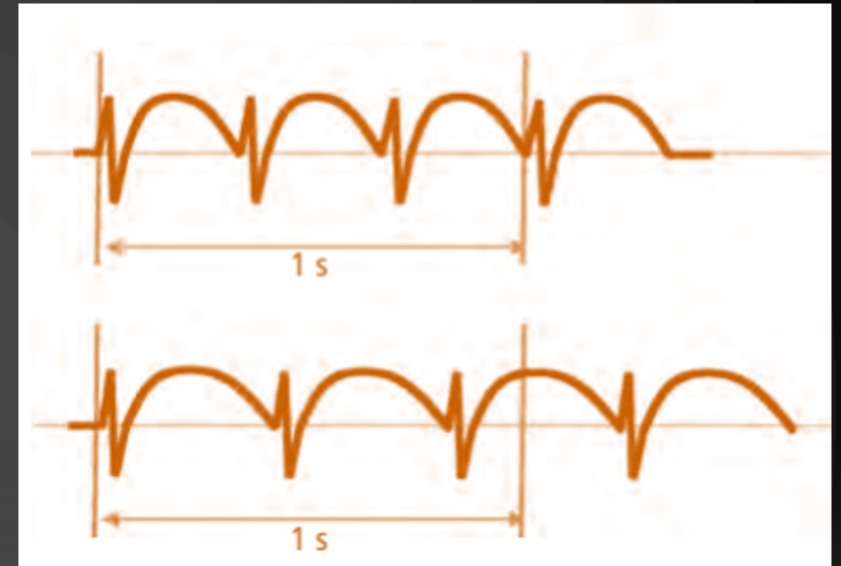
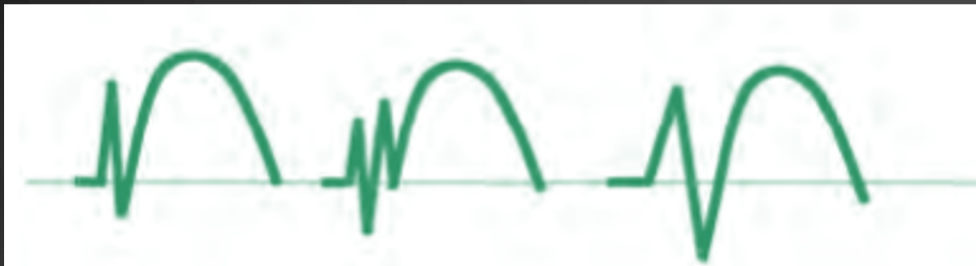
1 Fp1-F7
2 F7-T3
3 T3-T5
4 T5-O1
5 Fp2-F8
6 F8-T4
7 T4-T6
8 T6-O2
9 Fp1-F3
10 F3-C3
11 C3-P3
12 P3-O1
13 Fp2-F4
14 F4-C4
15 C4-P4
16 P4-O2
17 FZ-CZ
18 CZ-PZ
19 F7-F3
20 F3-FZ
21 FZ-F4
22 F4-F8
23 T3-C3
24 C3-CZ
25 CZ-C4
26 C4-T4
27 T5-P3
28 P3-PZ
29 PZ-P4
30 P4-T6
33 ECG
34 DELSx
35 DEL Dx
M





GRAFOELEMENTI EPILETTIFORMI

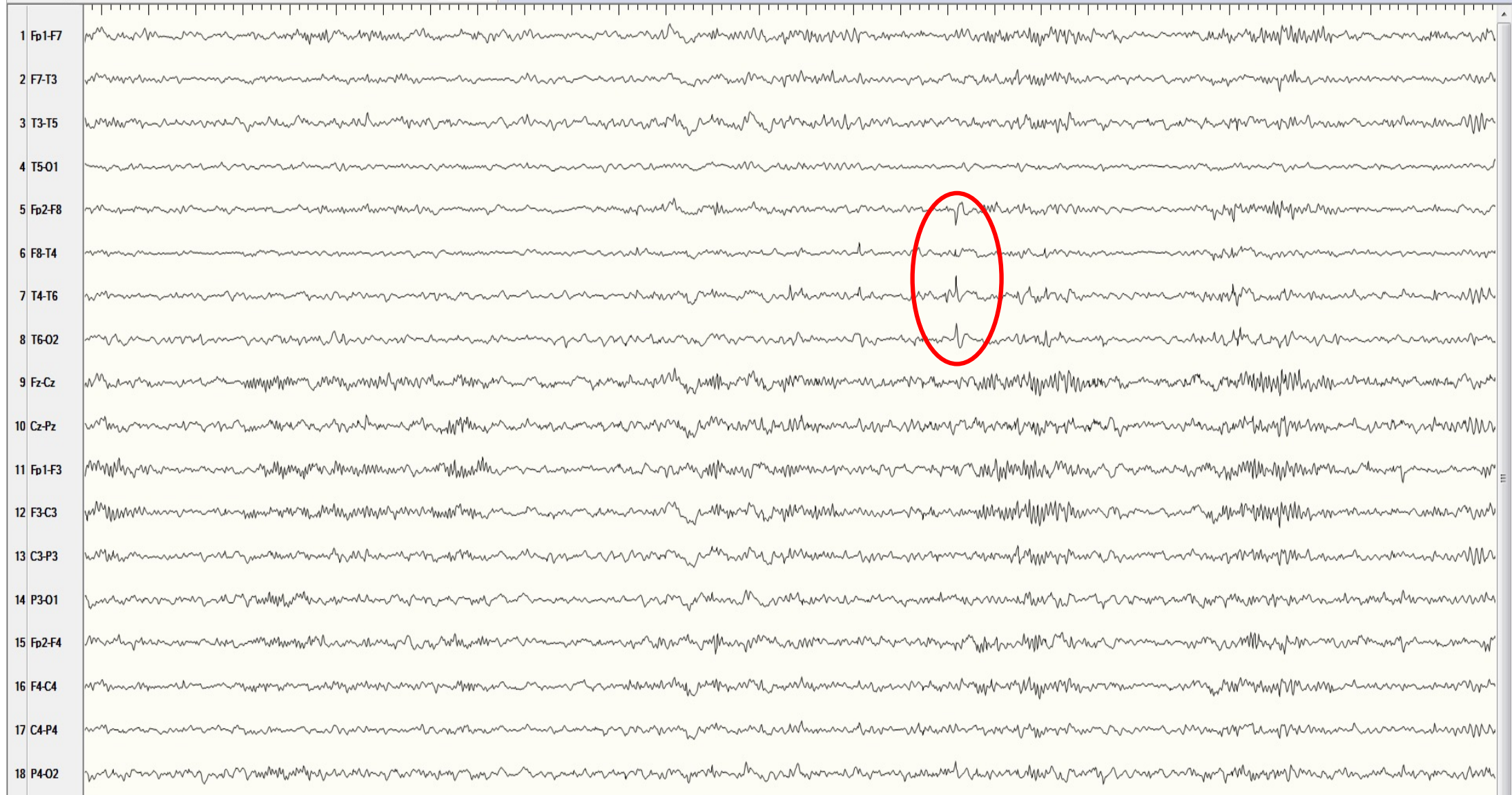
GRAFOELEMENTI EPILETTIFORMI

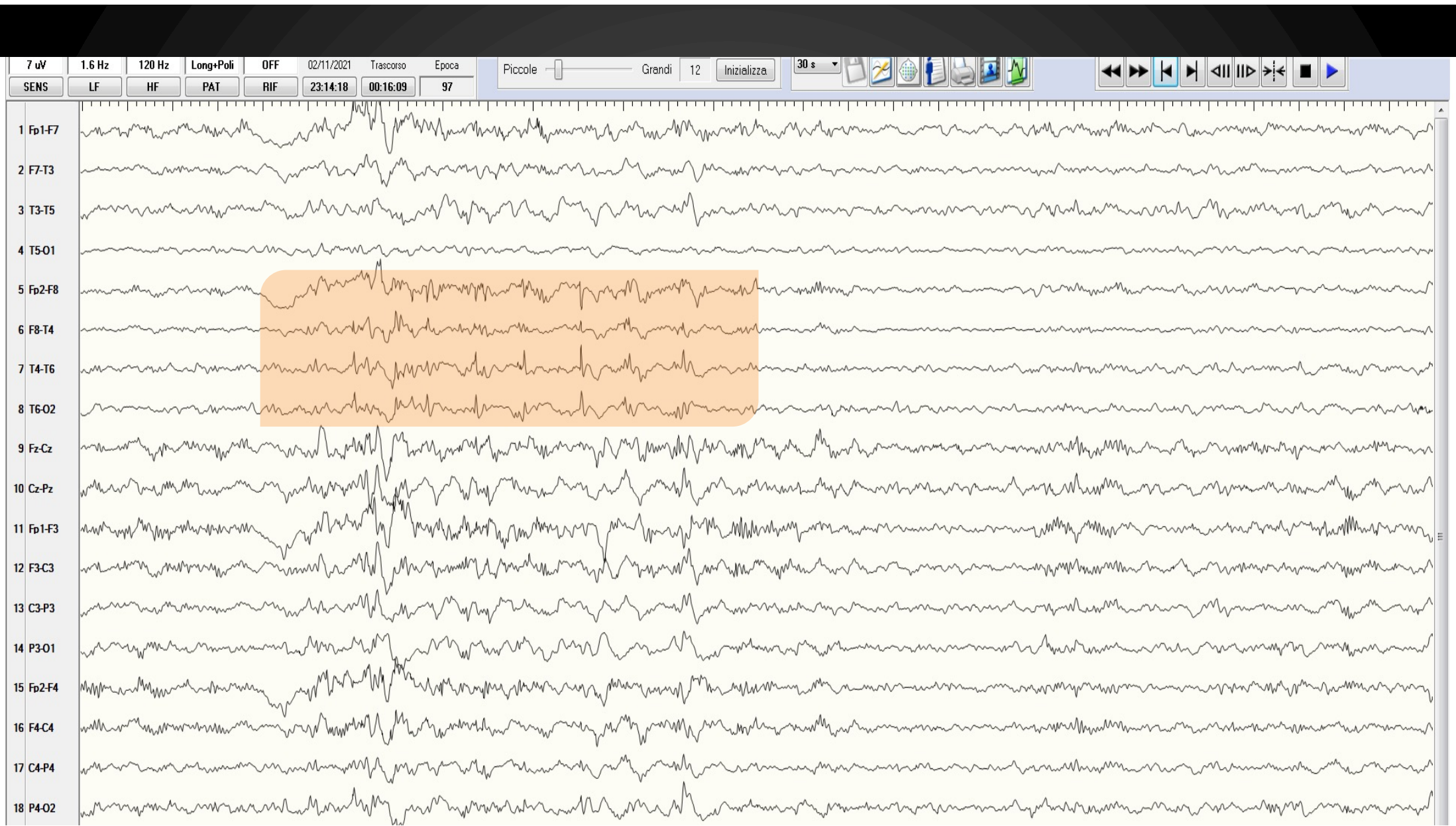


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Oriano Mecarelli

7 μ V 1.6 Hz 120 Hz Long+Poli OFF 02/11/2021 Trascorso Epoca
SENS LF HF PAT RIF 23:06:18 00:08:09 49

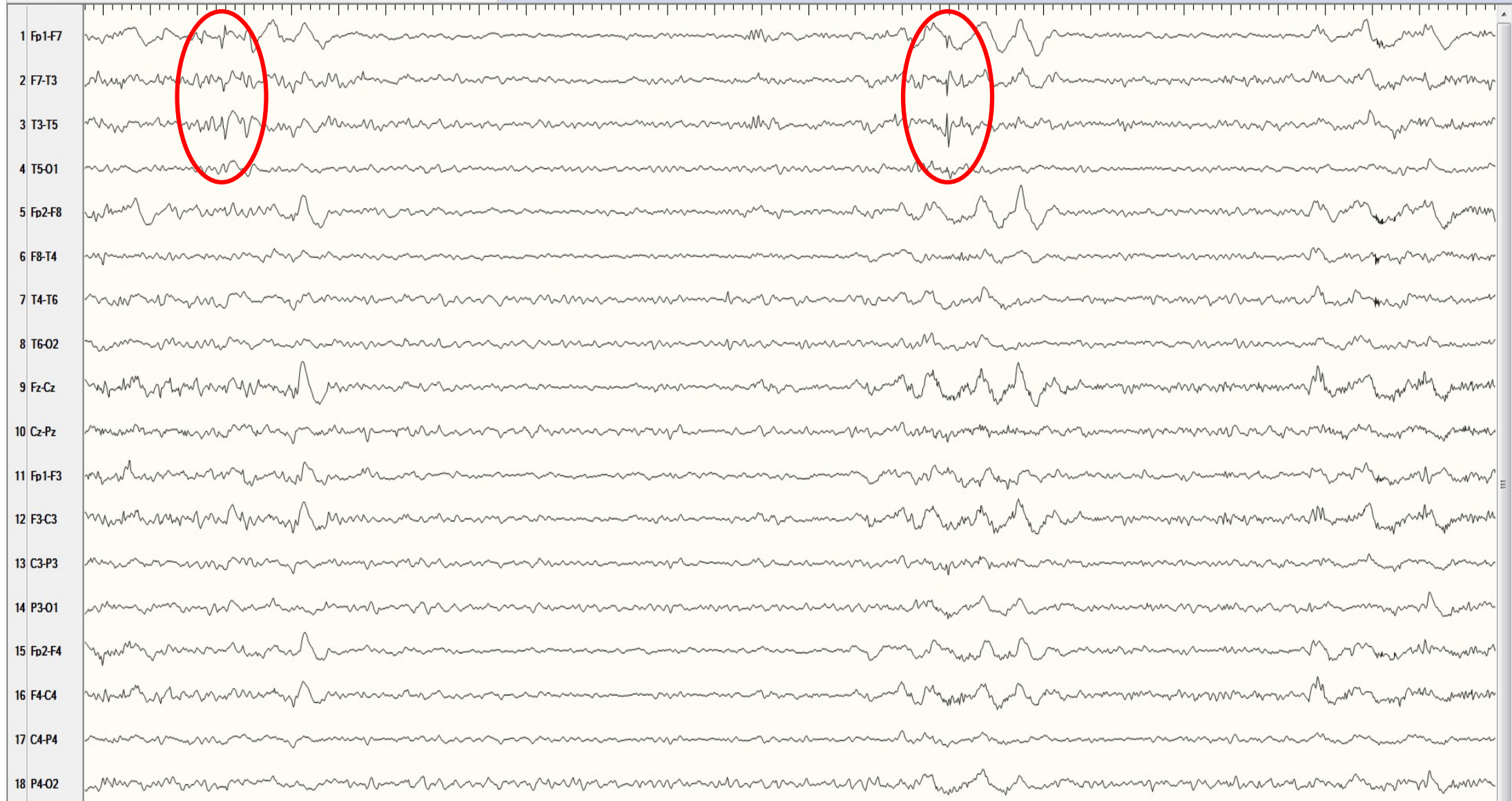
Piccole Grandi 12 Inizializza 30 s





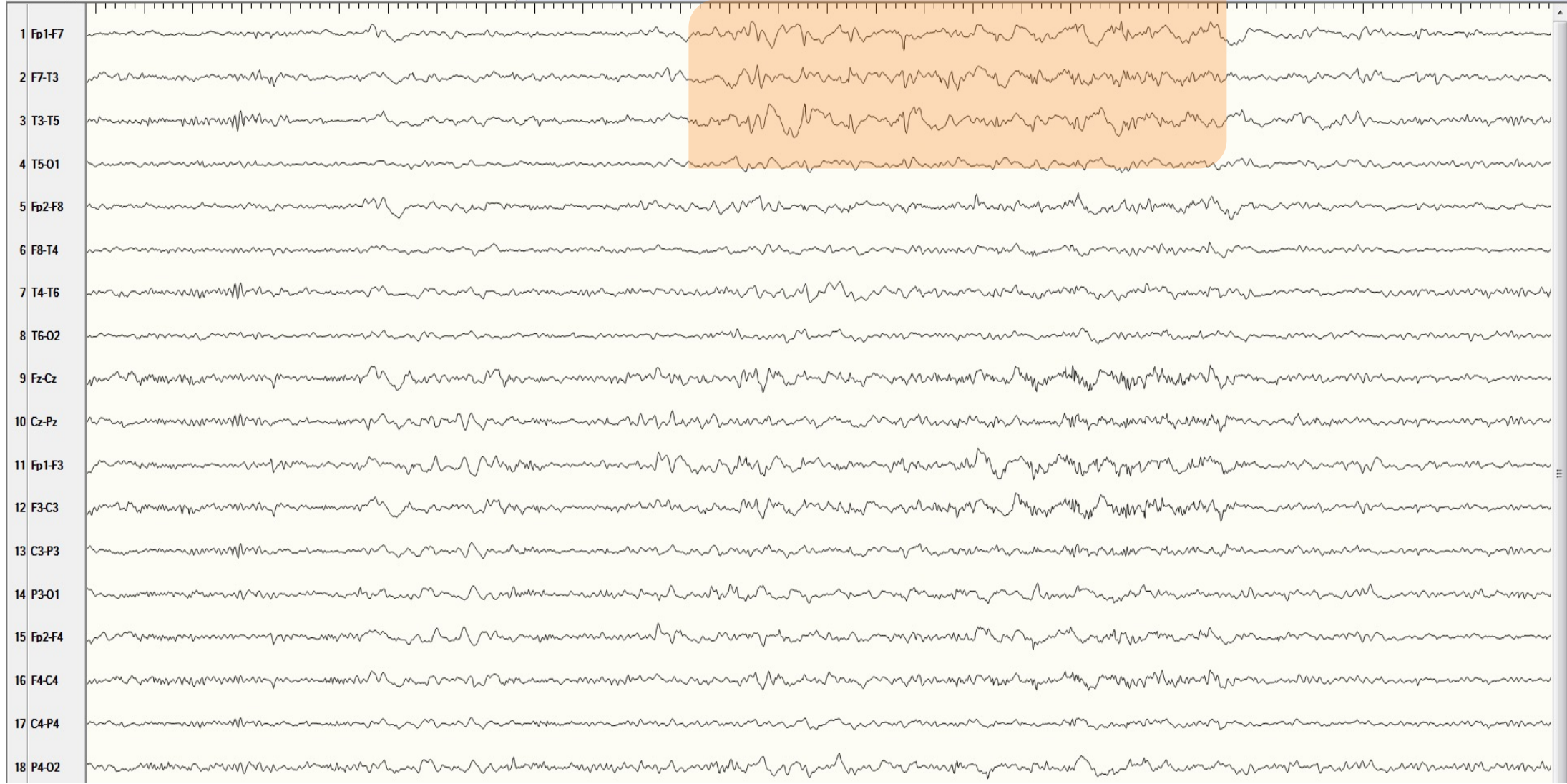

7 μ V 1.6 Hz 120 Hz Long+Poli OFF 20/06/2017 Trascorso Epoca
SENS LF HF PAT RIF 08:47:53 01:35:20 573

Piccole Grandi Inizializza 30 s



7 uV 1.6 Hz 120 Hz Long+Poli OFF 20/06/2017 Trascorso Epoca
SENS LF HF PAT RIF 08:54:02 01:41:29 609

Piccole Grandi 12 Inizializza 30 s

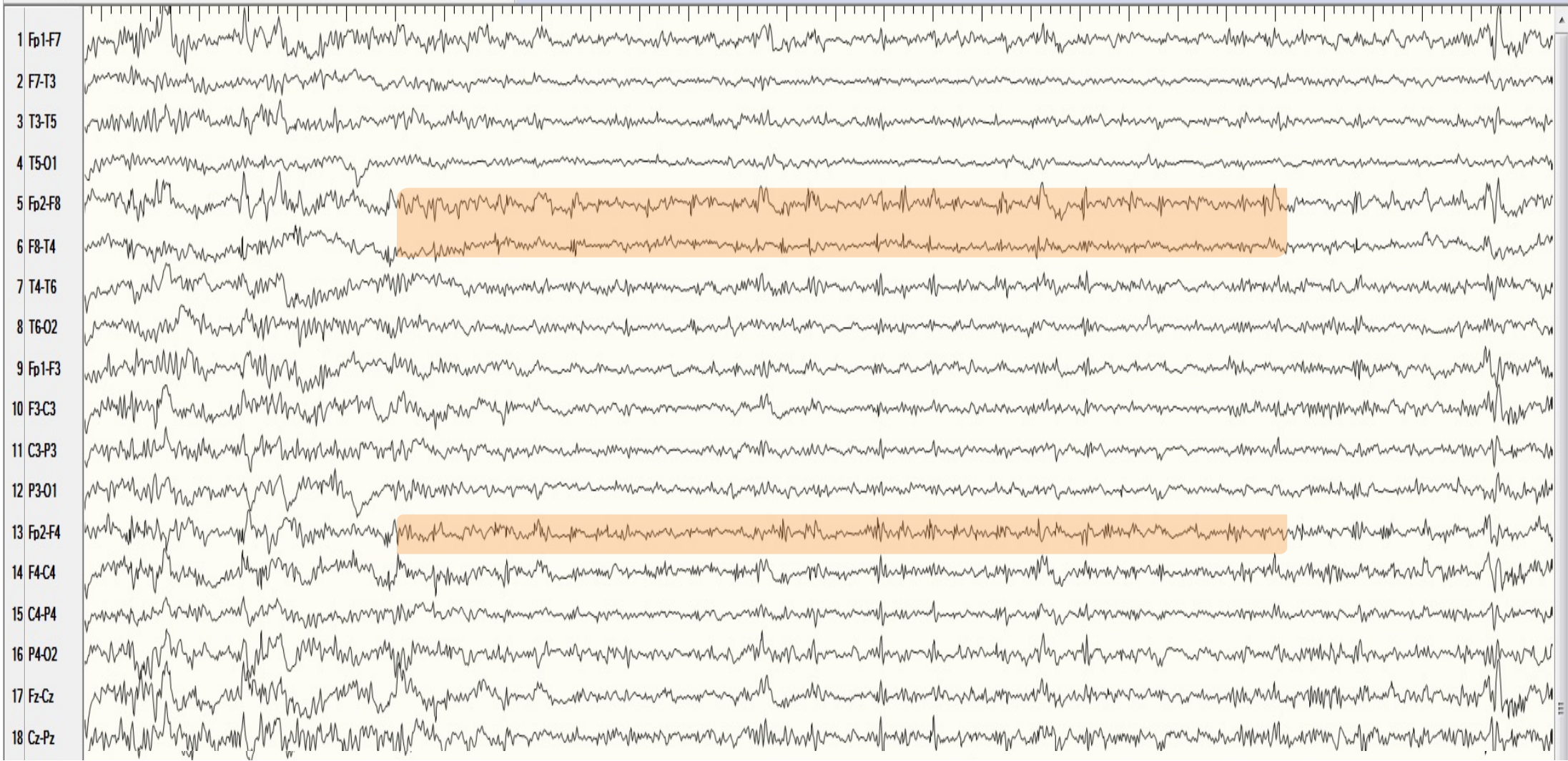


7 μ V	1.6 Hz	60 Hz	Traccia	OFF	18/09/2019	Trascorso	Epoca
SENS	LF	HF	PAT	RIF	01:26:58	02:41:24	969

Piccole Grandi 16 Inizializza

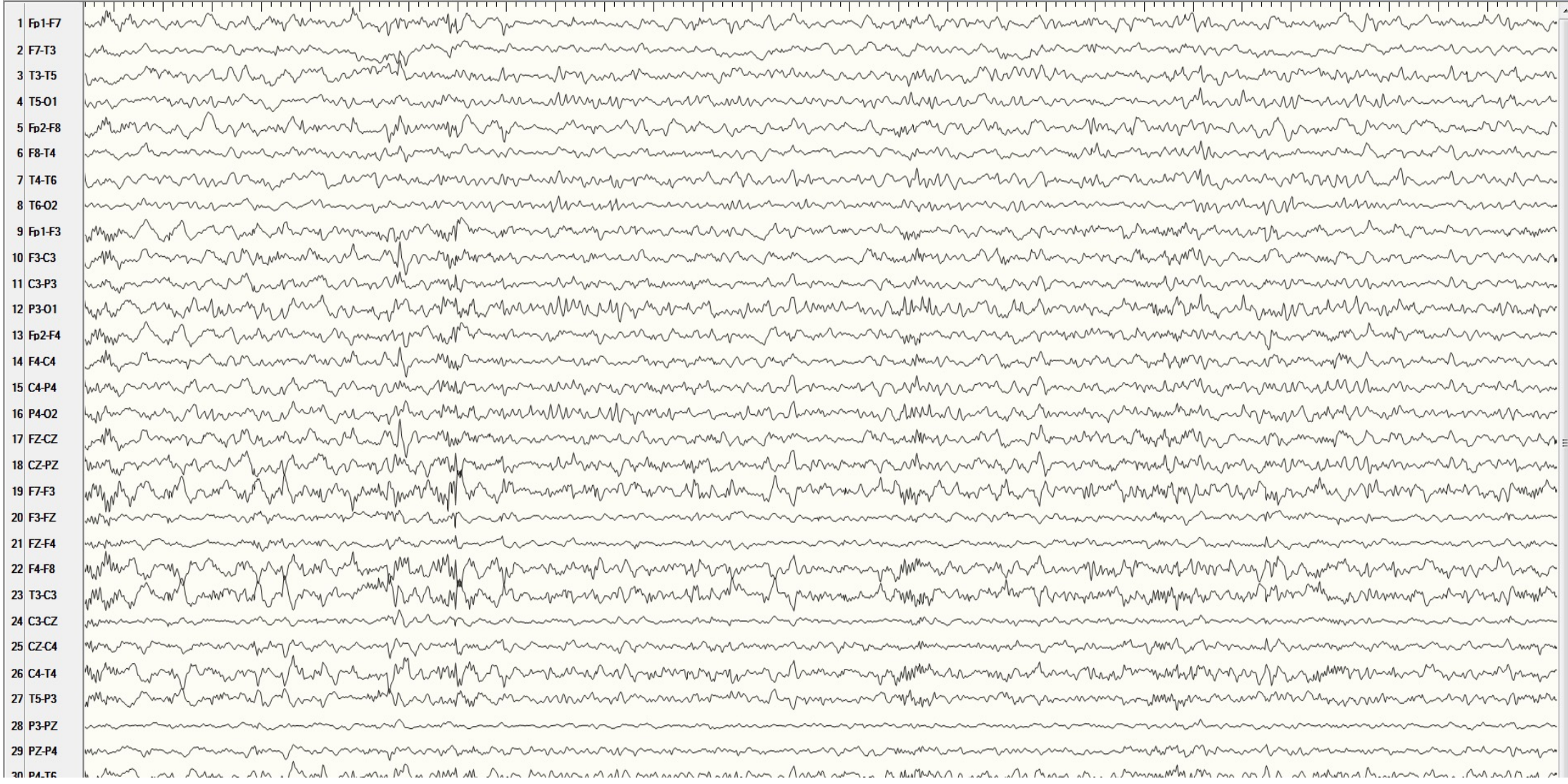
30 s      



7 uV 1.6 Hz 60 Hz Traccia OFF 25/09/2015 Trascorso Epoca
SENS LF HF PAT RIF 00:52:56 00:58:04 349

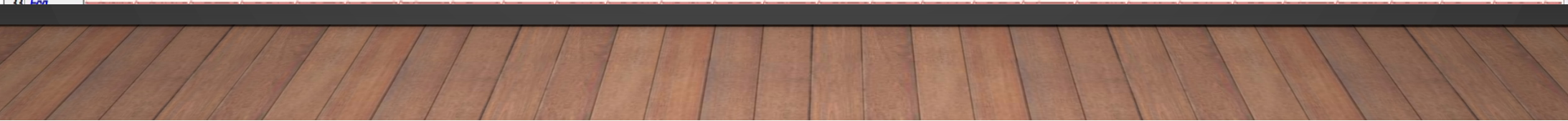
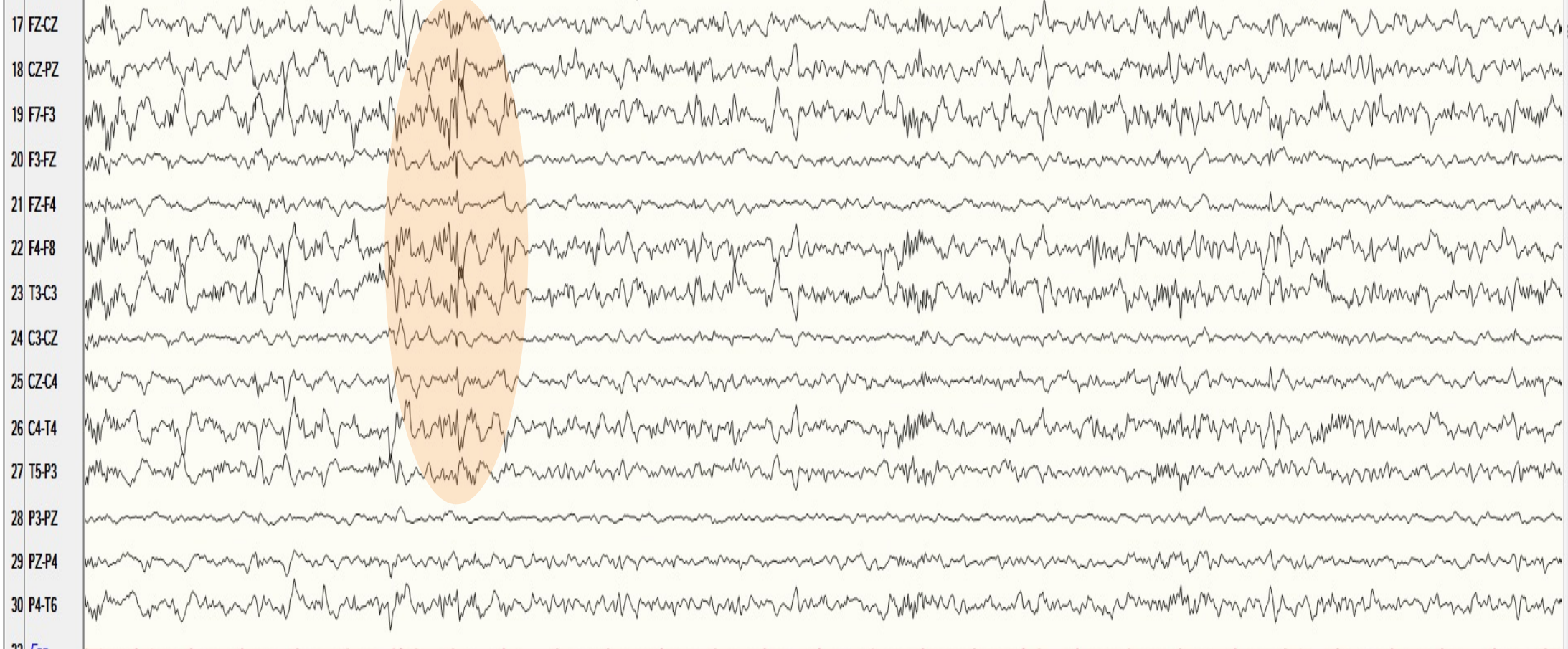
Piccole Grandi 19 Inizializza 30 s

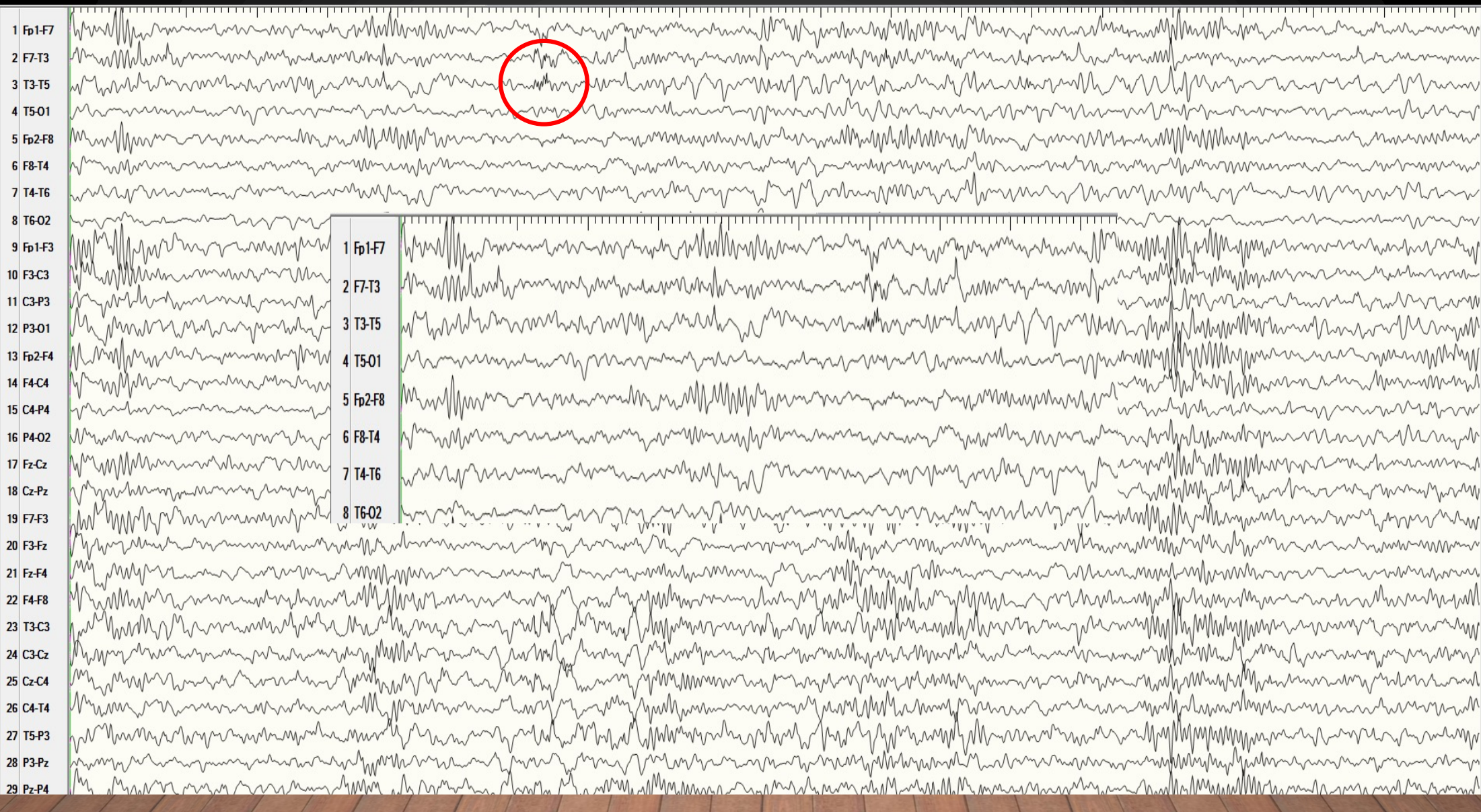


7 μ V 1.6 Hz 60 Hz Traccia OFF 25/09/2015 Trascorso Epoca
SENS LF HF PAT RIF 00:52:56 00:58:04 349

Piccole Grandi 19 Inizializza

30 s





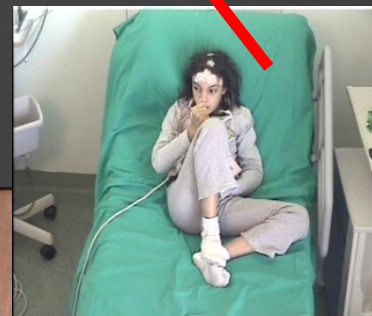
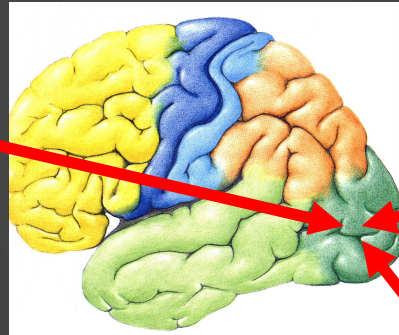
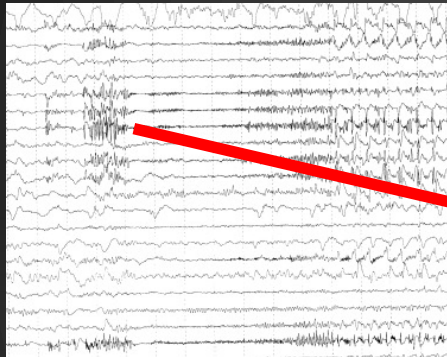
PERCHÈ

- Refertare **e** descrivere anomalie lente ed epilettiformi

- Refertare **con l'obiettivo di** individuare anomalie lente ed epilettiformi a supporto o meno dei dati clinici e neuroradiologici

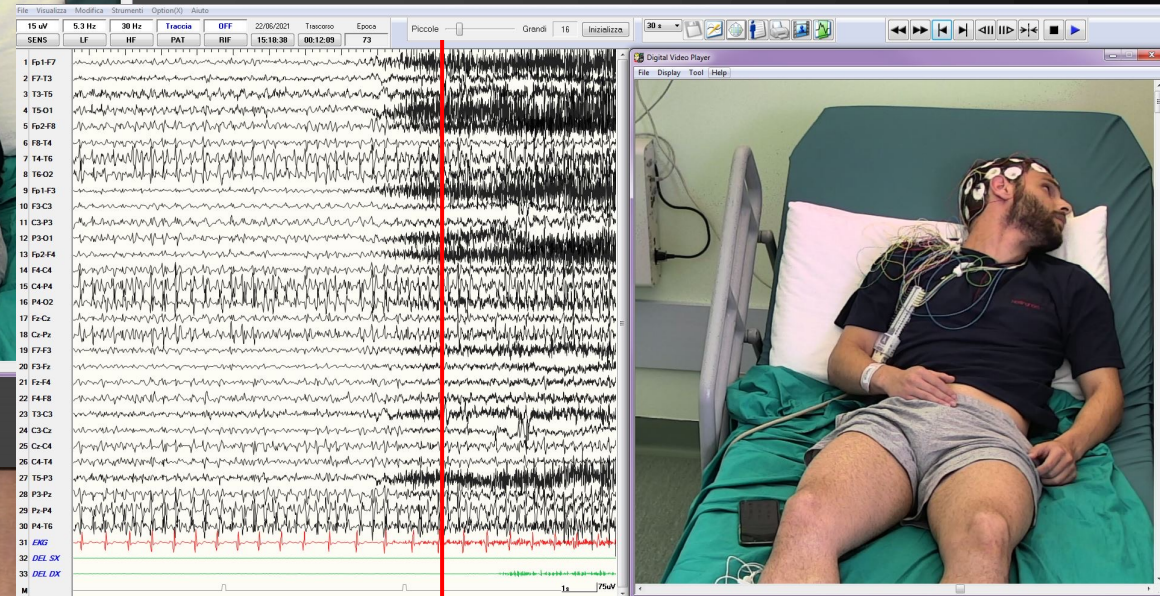
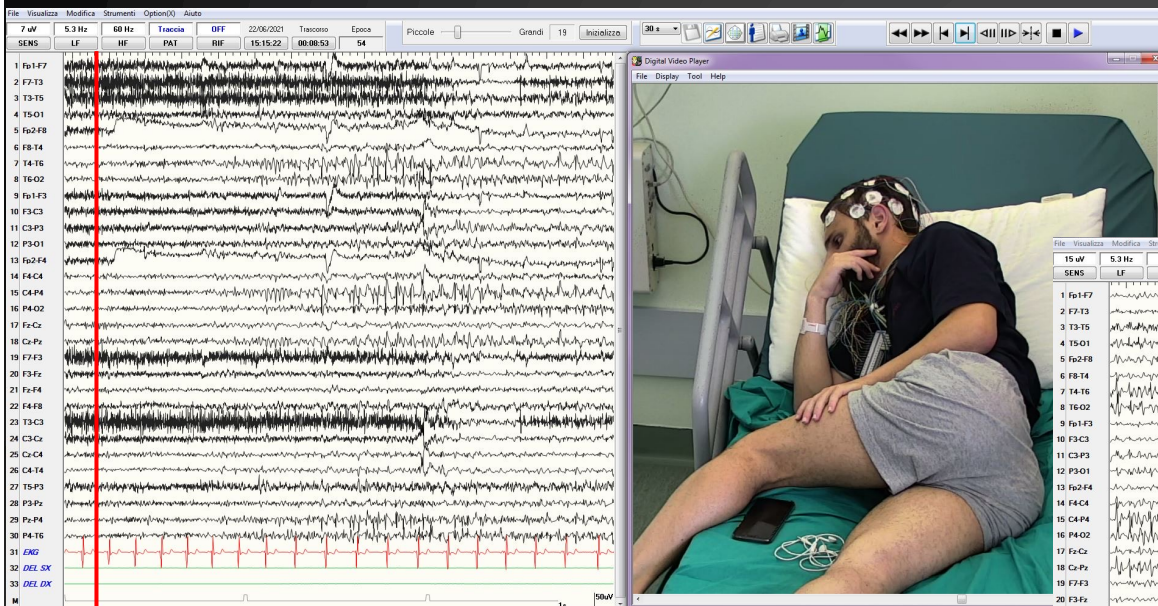
LA CHIRURGIA DELL'EPILESSIA

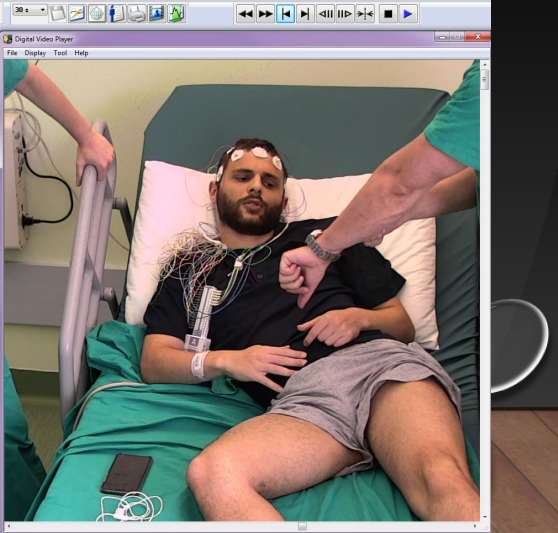
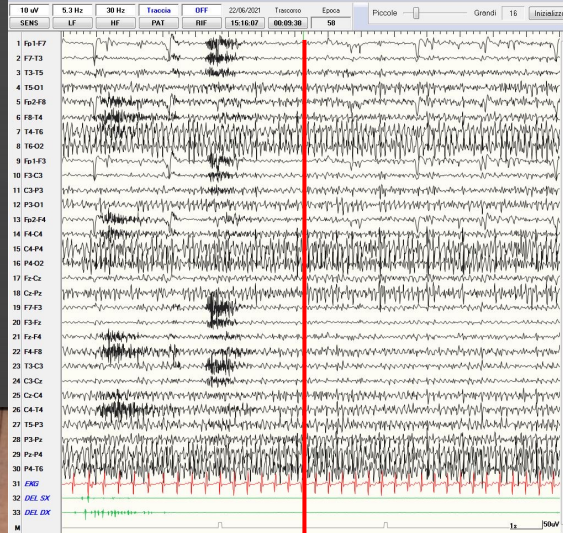
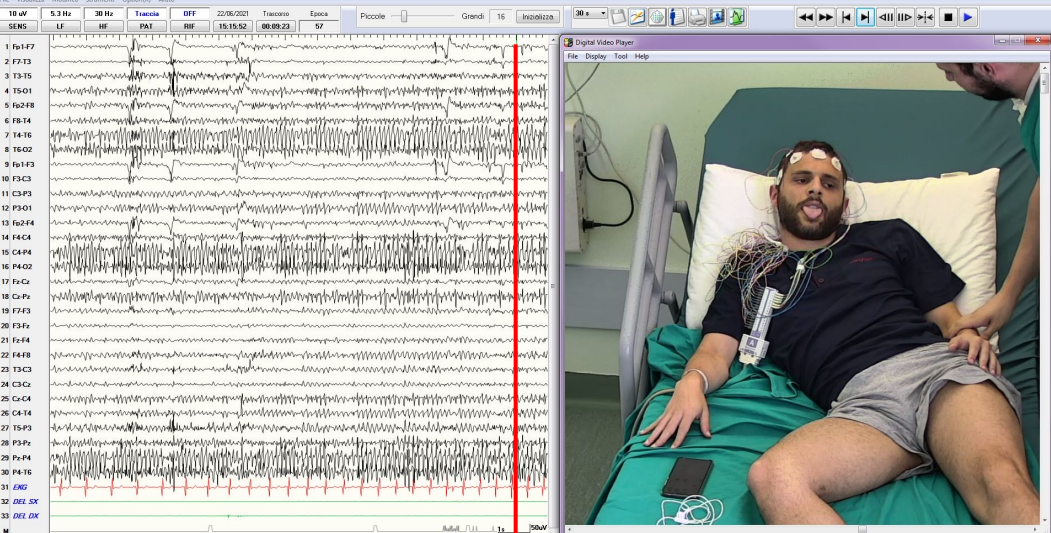
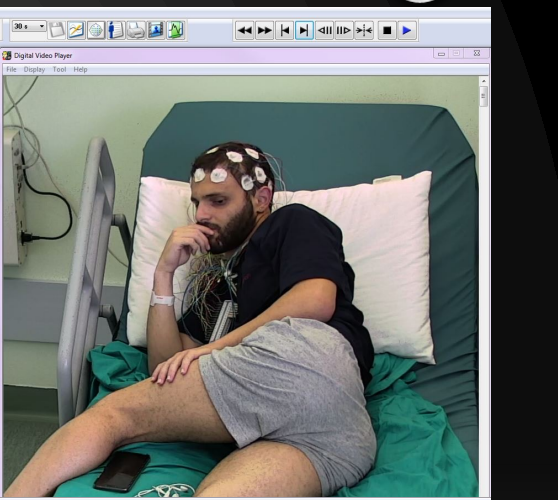
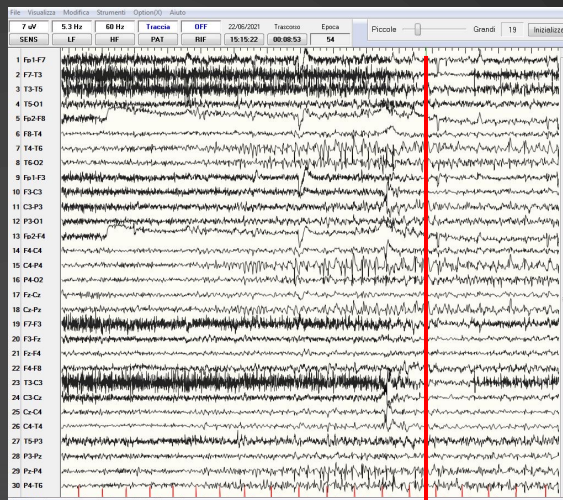
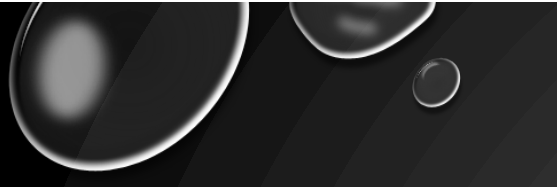
Attraverso le correlazioni anatomico-elettro-cliniche individua la zona epilettogena, ossia l'area cerebrale responsabile delle crisi del paziente



EEG CRITICO

- Descrizione clinica dettagliata della crisi
- Descrizione dettagliata dell'elettroencefalogramma critico





EEG CRITICO

- PATTERN EEG CRITICO INIZIALE
- PATTERN EEG CRITICO SUCCESSIVO

- PATTERN EEG CRITICO INIZIALE

modificazione EEG prima del primo segno clinico

EEG CRITICO

MODIFICARE I PARAMETRI DI VISUALIZZAZIONE (FILTRI, SENSIBILITÀ)

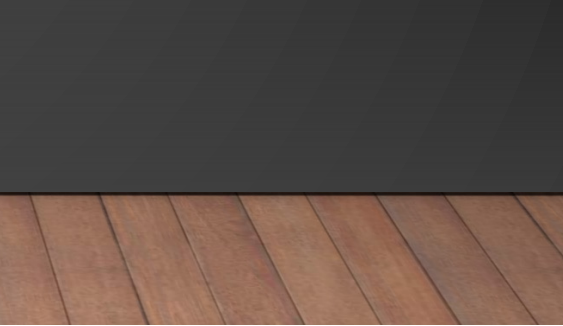
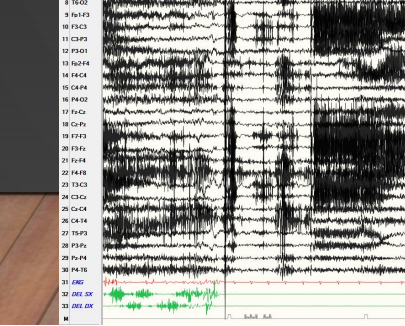
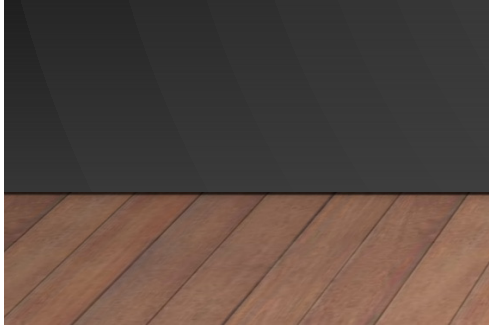
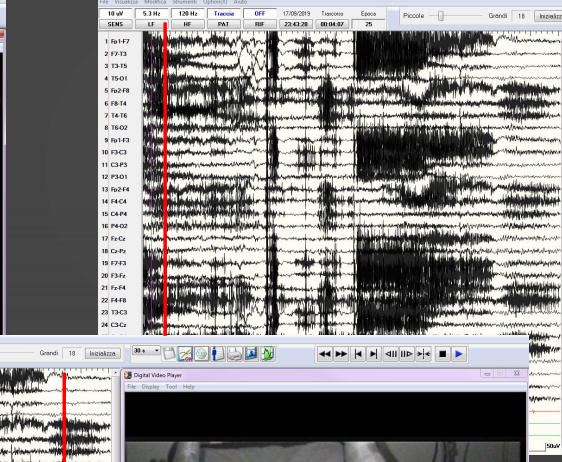
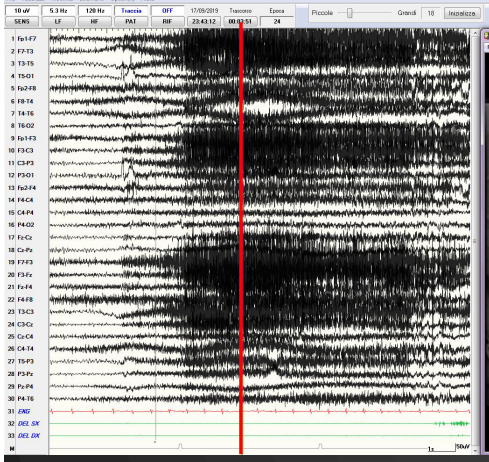
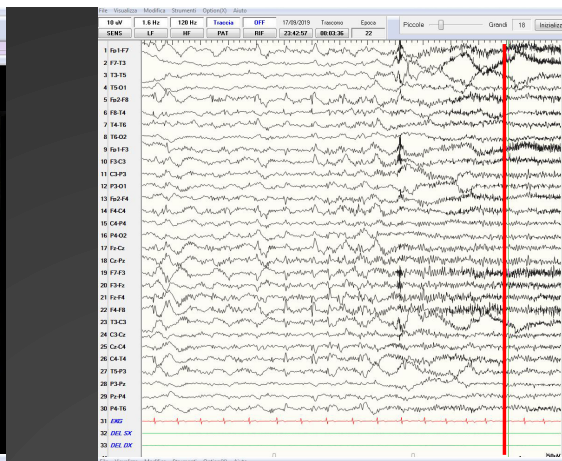
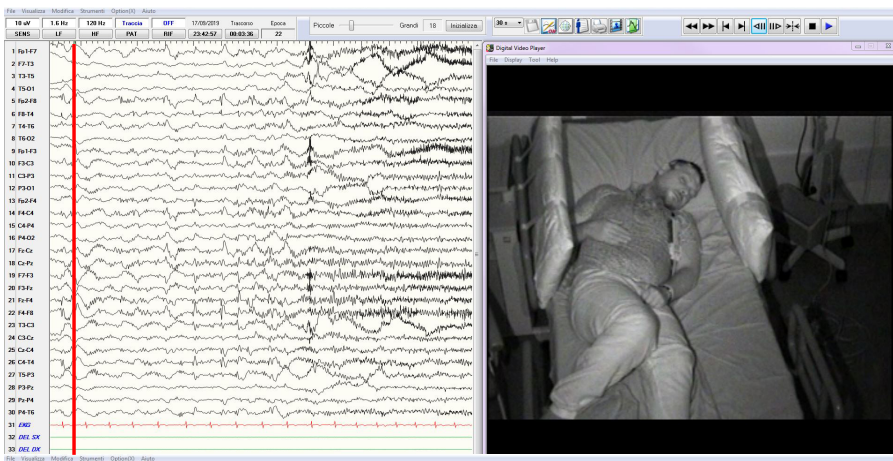
MODIFICARE IL MONTAGGIO SE NECESSARIO

POLIGRAFIA

CRISI CON COMPONENTE MOTORIA SIGNIFICATIVA

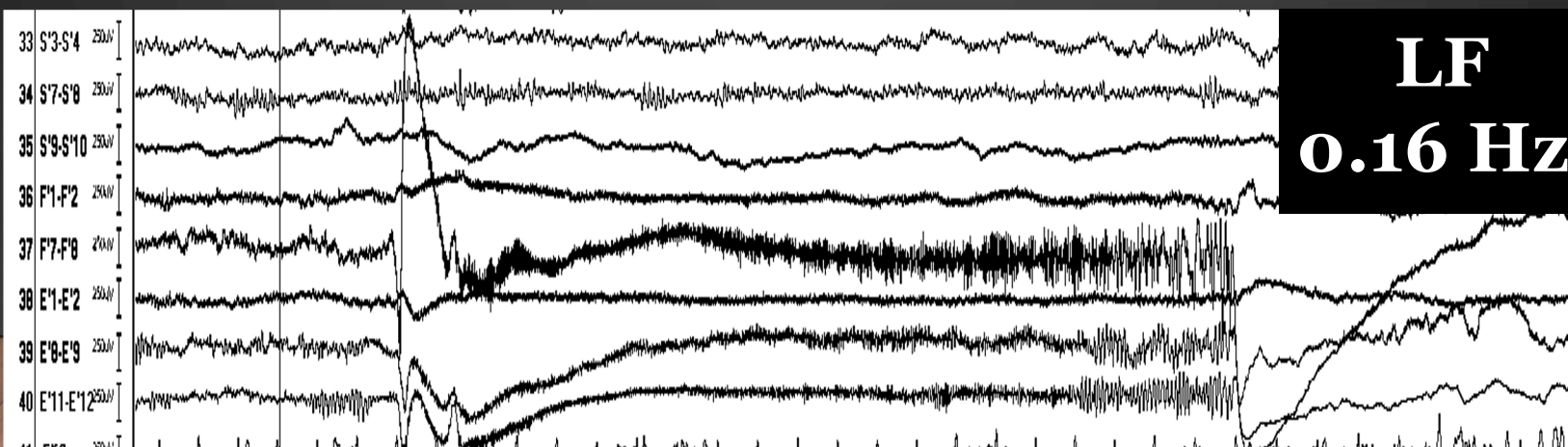
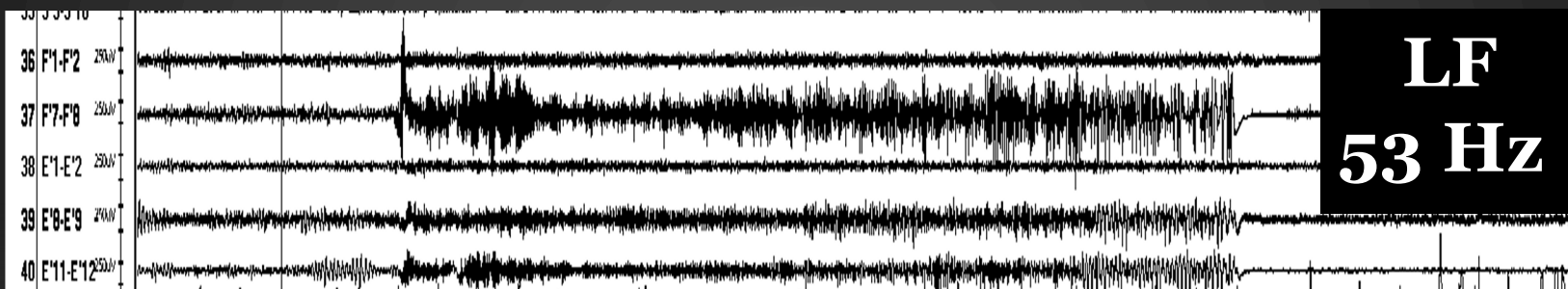
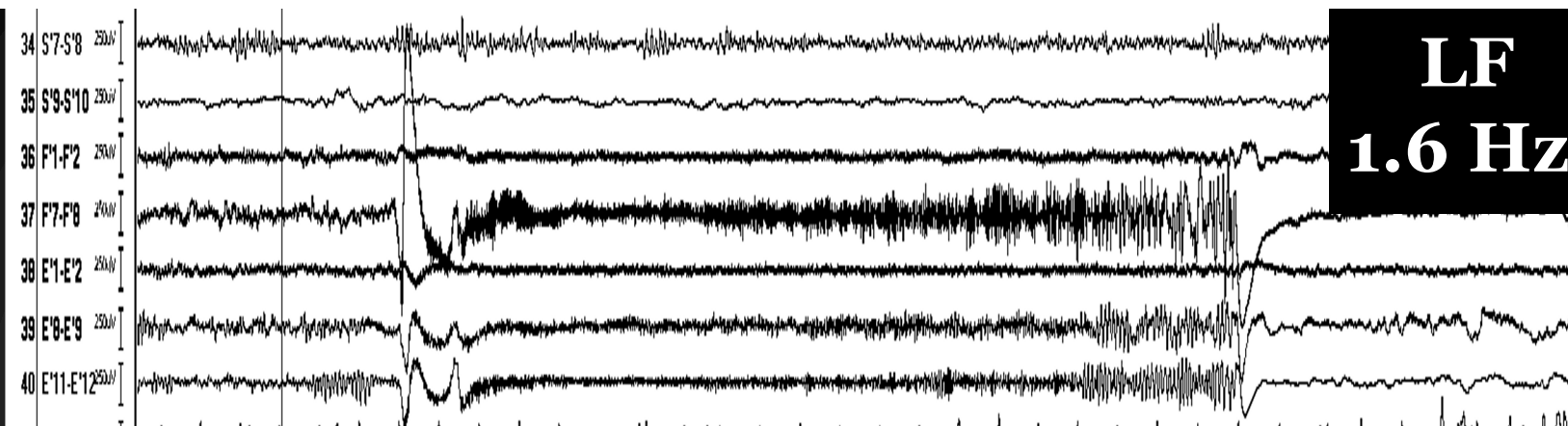
AREE CEREBRALI NON ELOQUENTI (DAL PUNTO DI VISTA EEG)

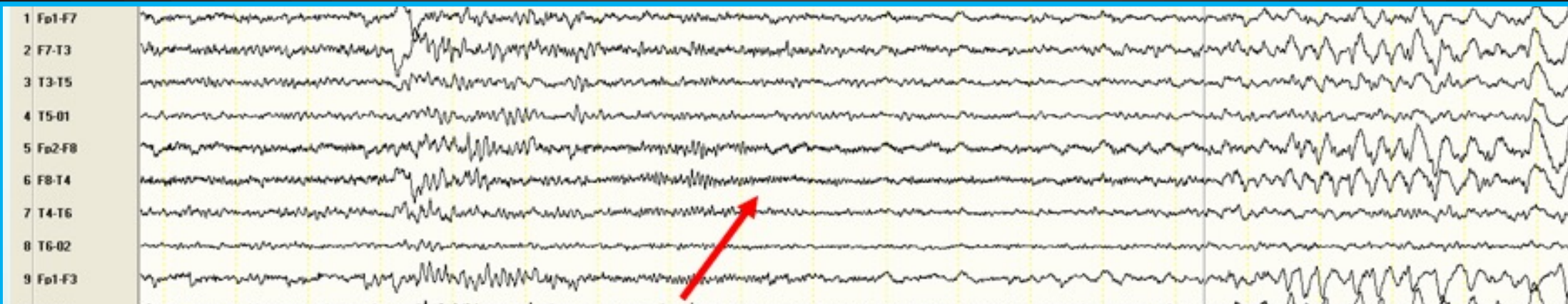
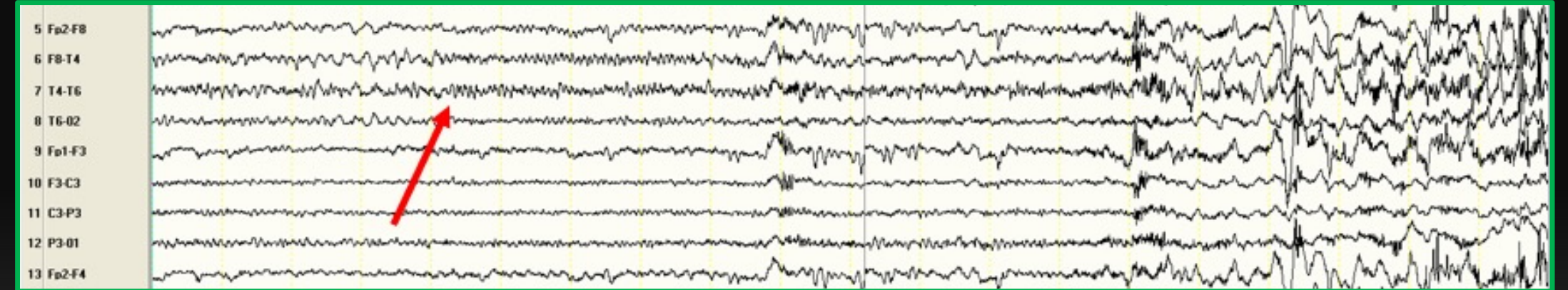
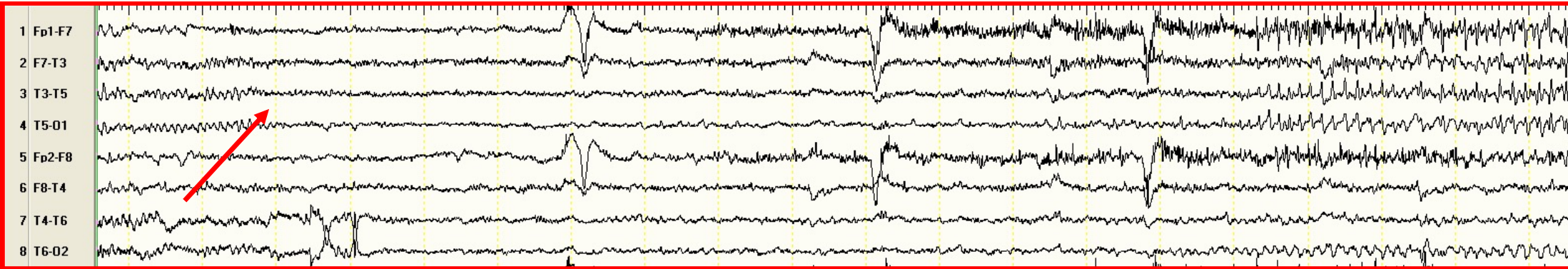
ELEMENTI CLINICI LATERALIZZANTI



EEG CRITICO: PATTERN INIZIALE

- ✓ pattern non visibile
- ✓ reazione di arresto diffusa
- ✓ riduzione delle anomalie intercritiche
- ✓ appiattimento del tracciato
- ✓ attività rapida
- ✓ attività rapida di basso voltaggio





EEG CRITICO: PATTERN SUCCESSIVO

- ✓ punte ritmiche
- ✓ attività lenta ritmica (con frequenza theta o delta, reclutante o meno)
- ✓ attività rapida

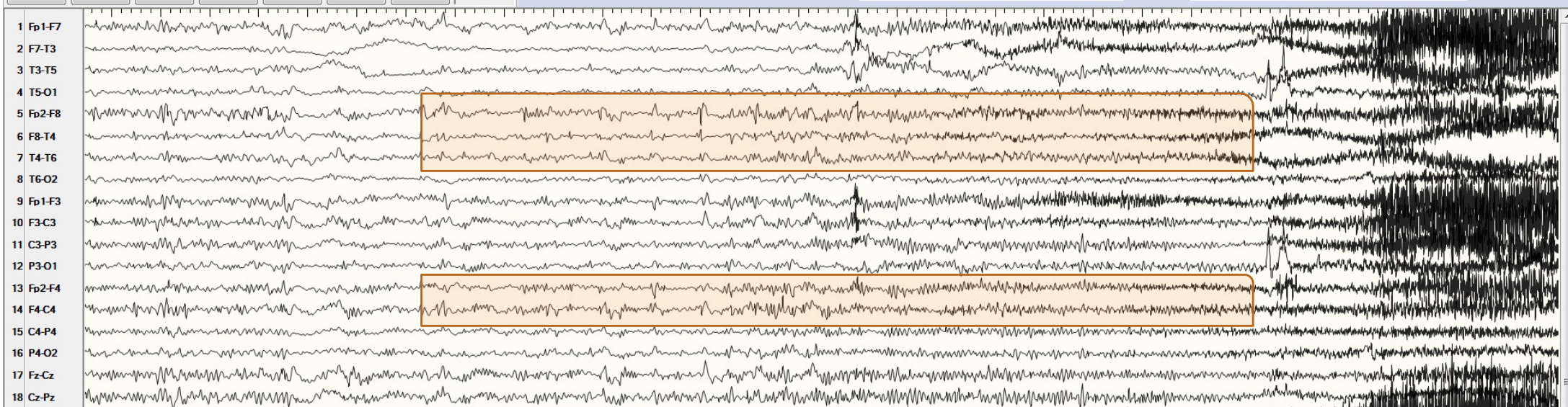
Crisi a

Sens 7 UV, LF 5.3 Hz, HF 60 Hz

File Visualizza Modifica Strumenti Option(X) Aiuto

7 uV 5.3 Hz 60 Hz Traccia OFF 17/09/2019 Trascorso Epoca
SENS LF HF PAT RIF 23:42:51 00:57:17 344

Piccole Grandi 16 Inizializza 30 s



Crisi b

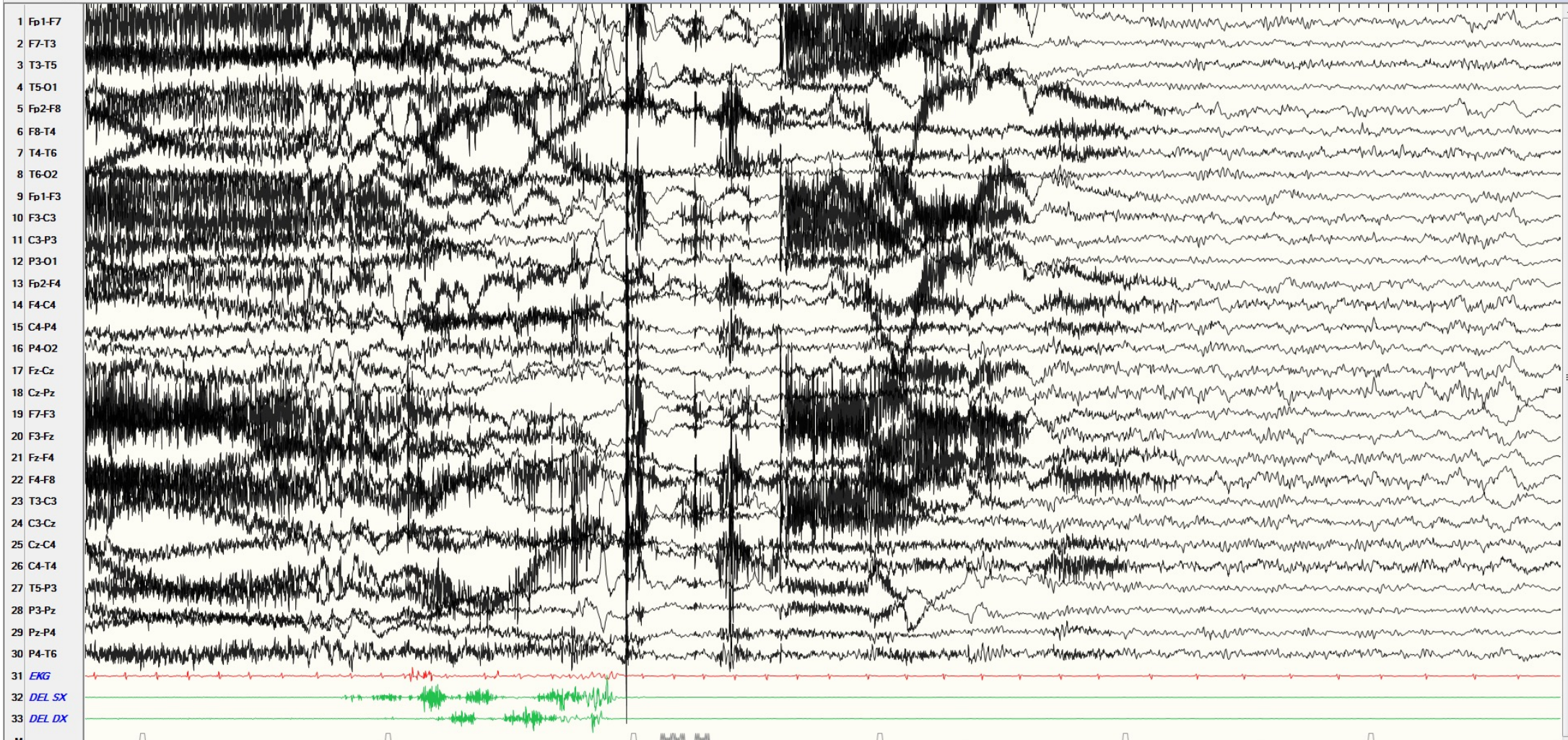
Sens 7 uV, LF 1.6 Hz, HF 60 Hz

File Visualizza Modifica Strumenti Option(X) Aiuto

7 uV 1.6 Hz 60 Hz Traccia OFF 17/09/2019 Trascorso Epoca
SENS LF HF PAT RIF 23:43:21 00:57:47 347

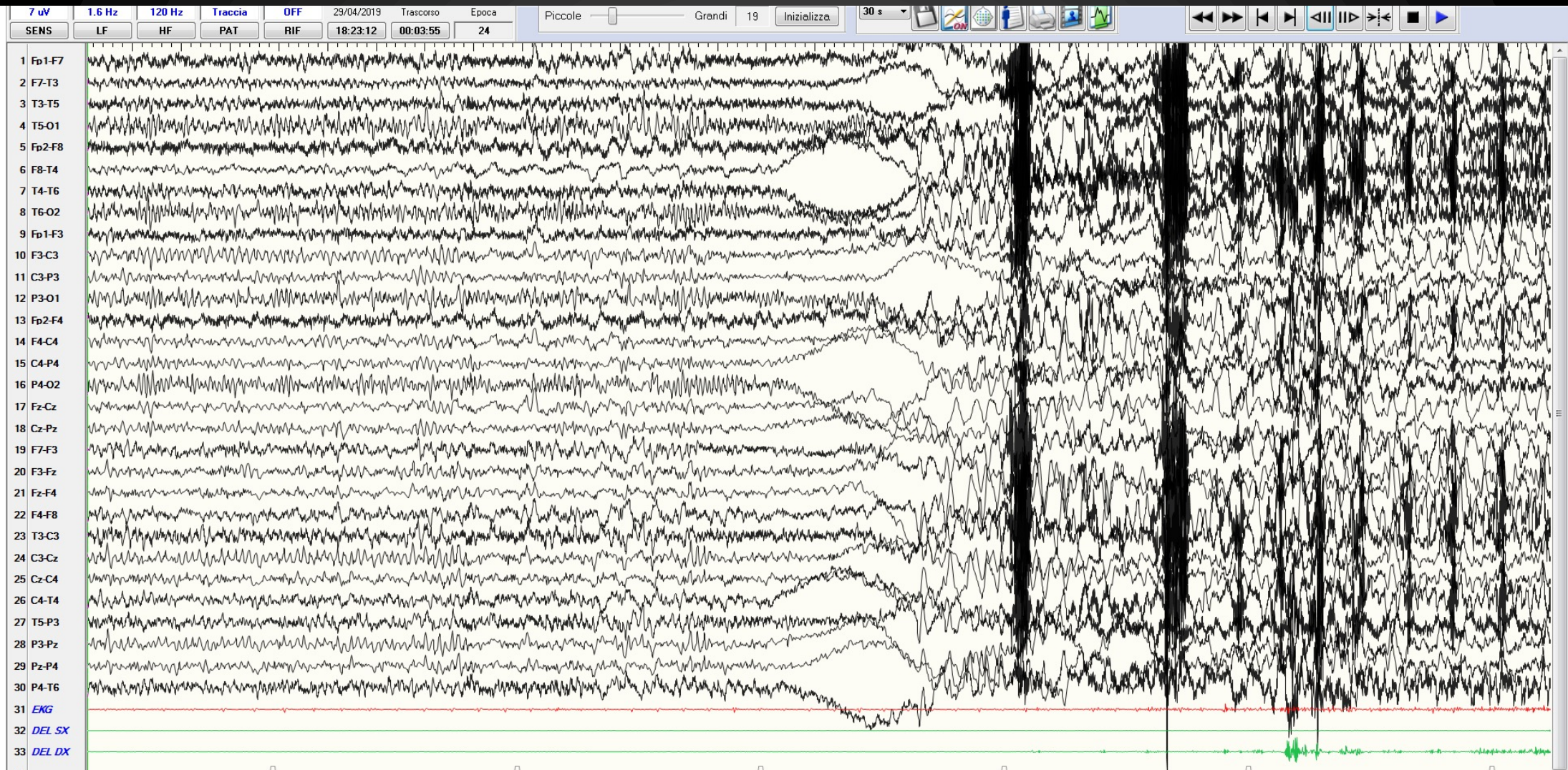
Piccole Grandi 16 Inizializza

30 s



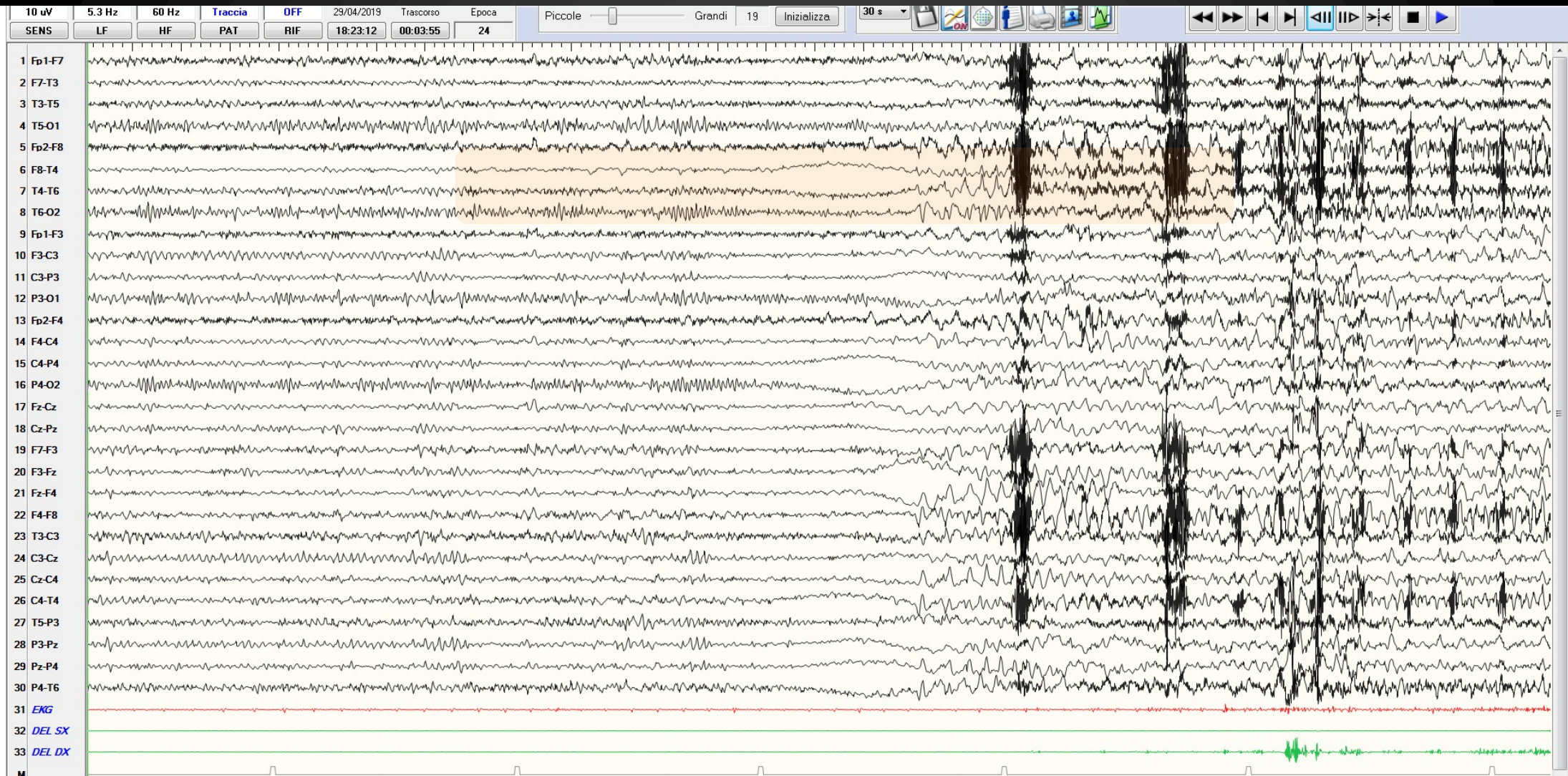
Crisi a

Sens 7 uV, LF 1.6 Hz, HF 120 Hz



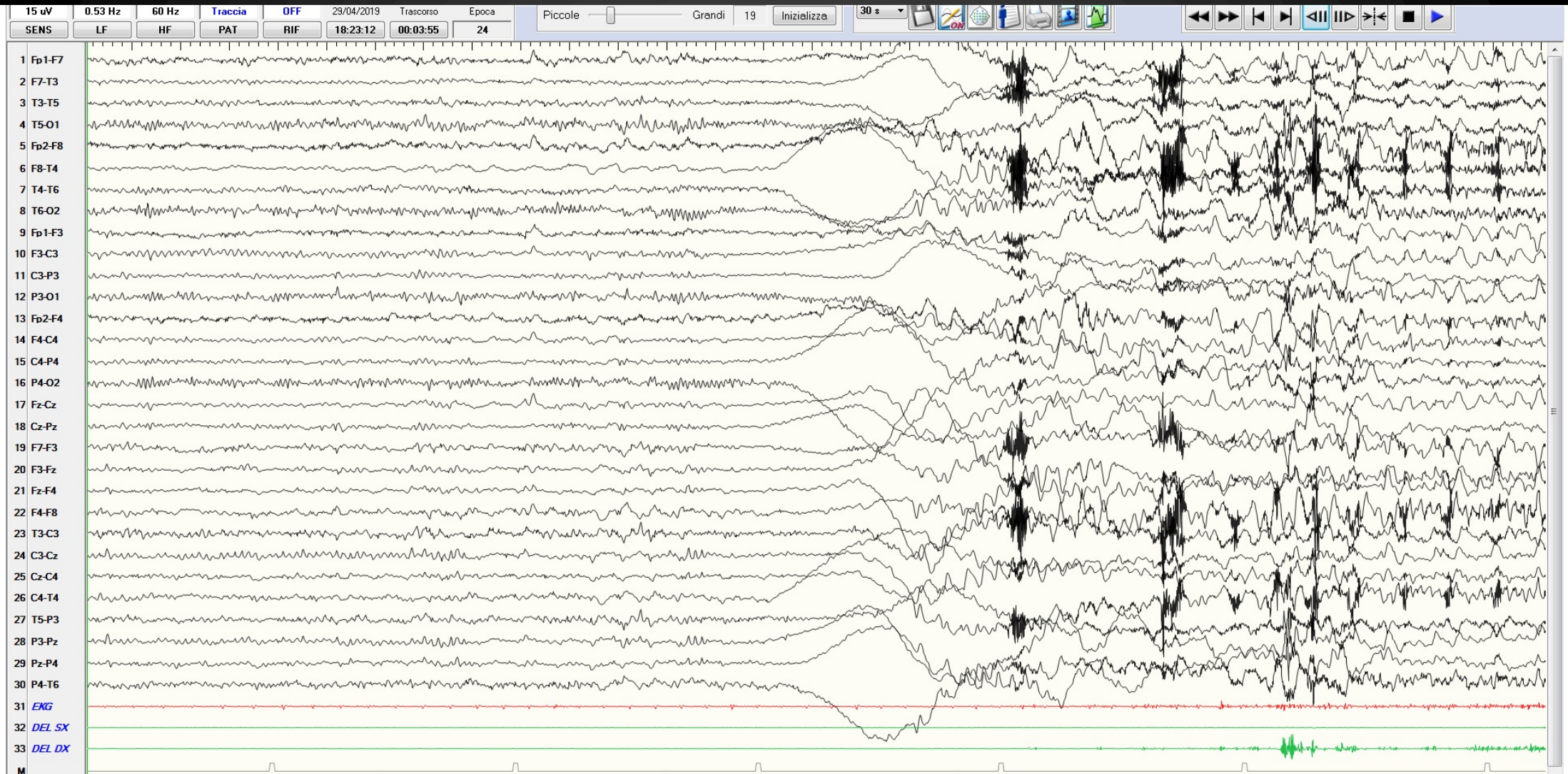
Crisi a

Sens 10 uV, LF 5.3 Hz, HF 60 Hz



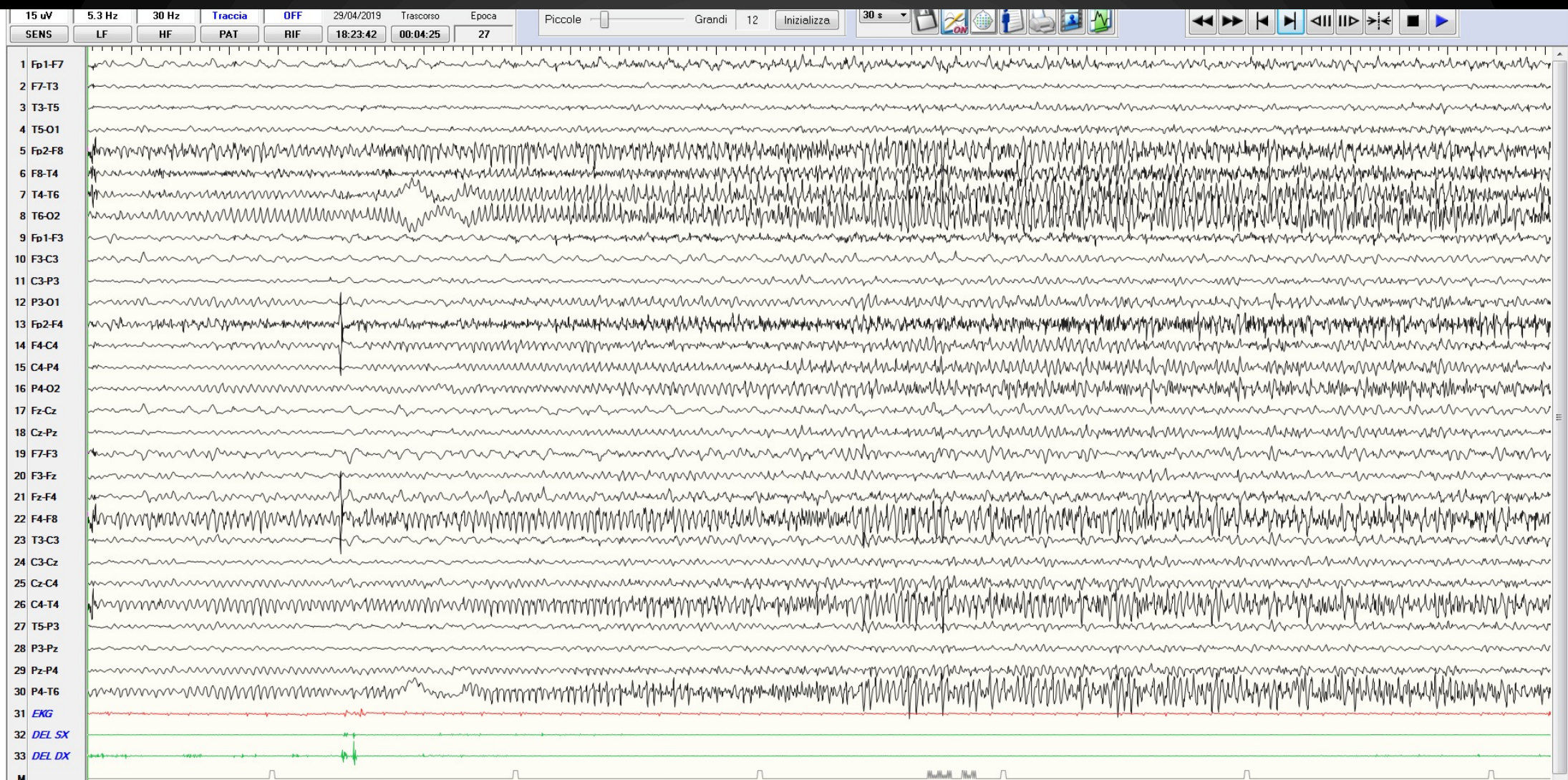
Crisi a

Sens 15 uV, LF 0.53 Hz, HF 60 Hz



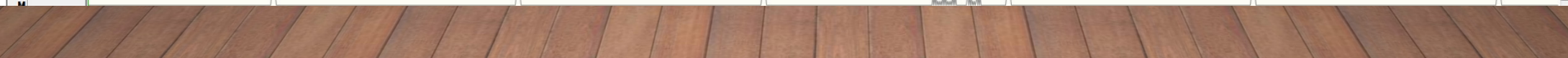
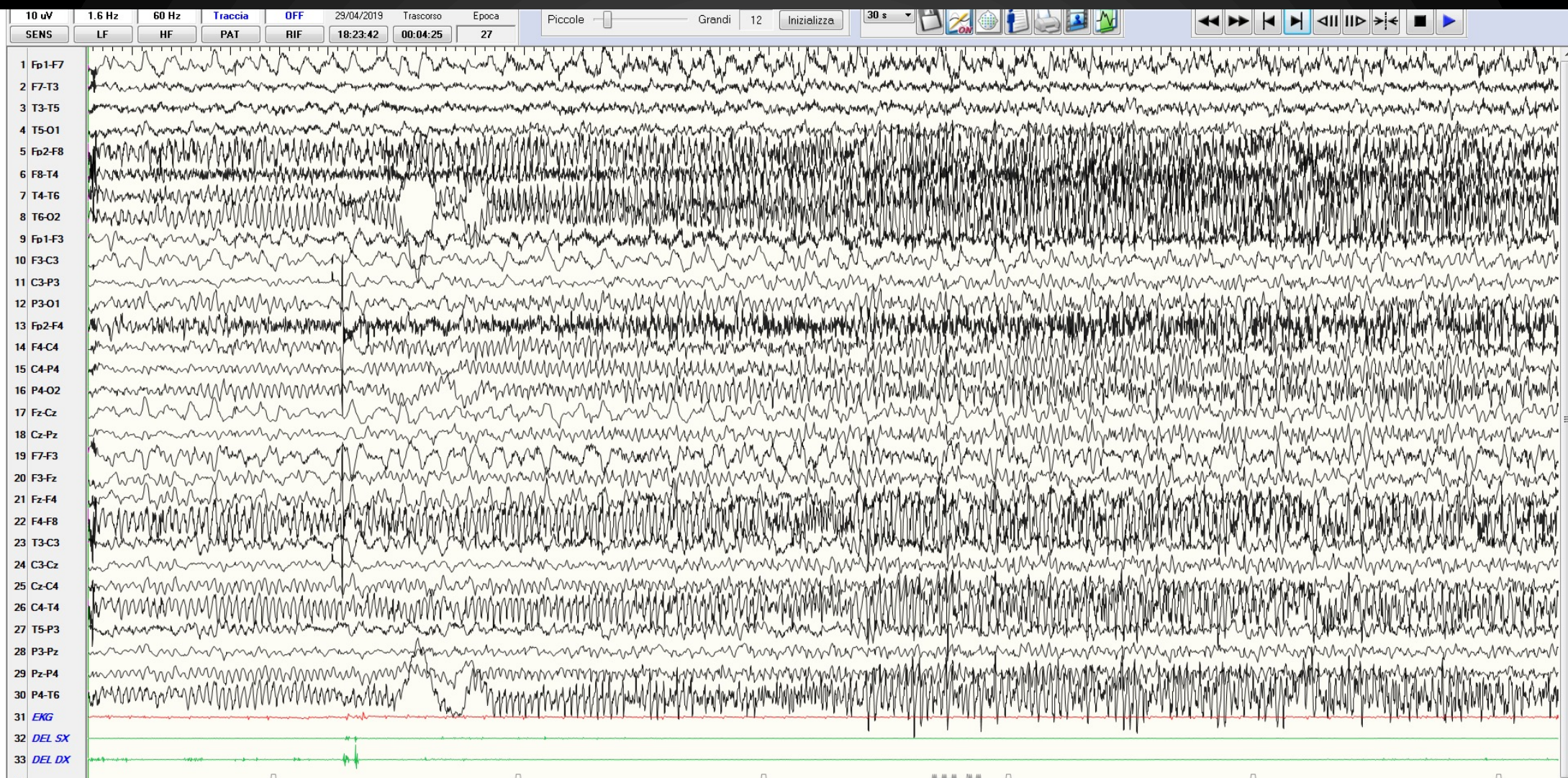
Crisi b

Sens 15 uV, LF 5.3, Hz, HF 30 Hz



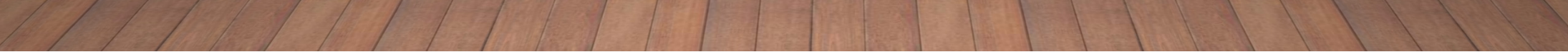
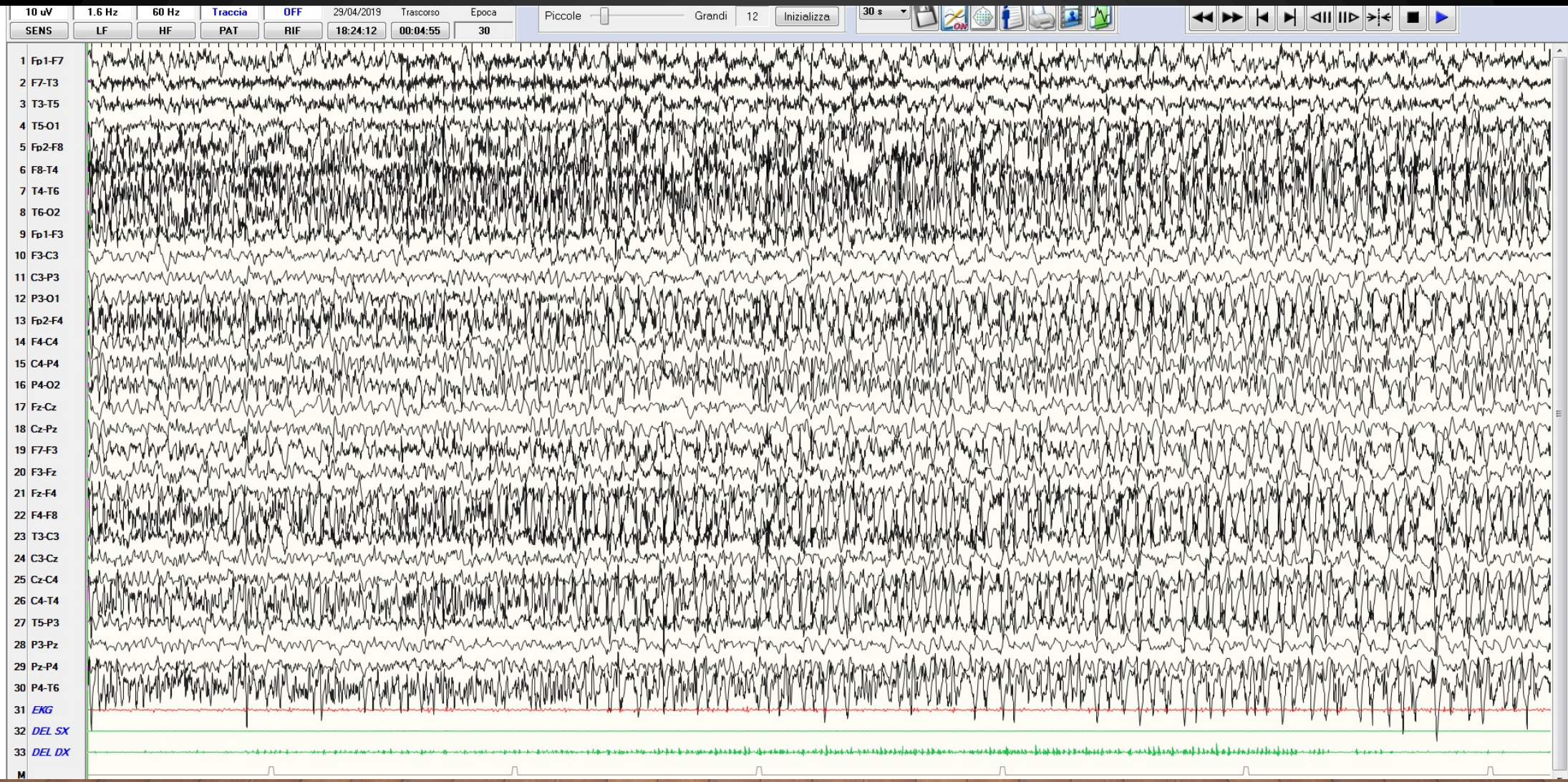
Crisi b

Sens 10 μ V, LF 1.6 Hz, HF 60 Hz



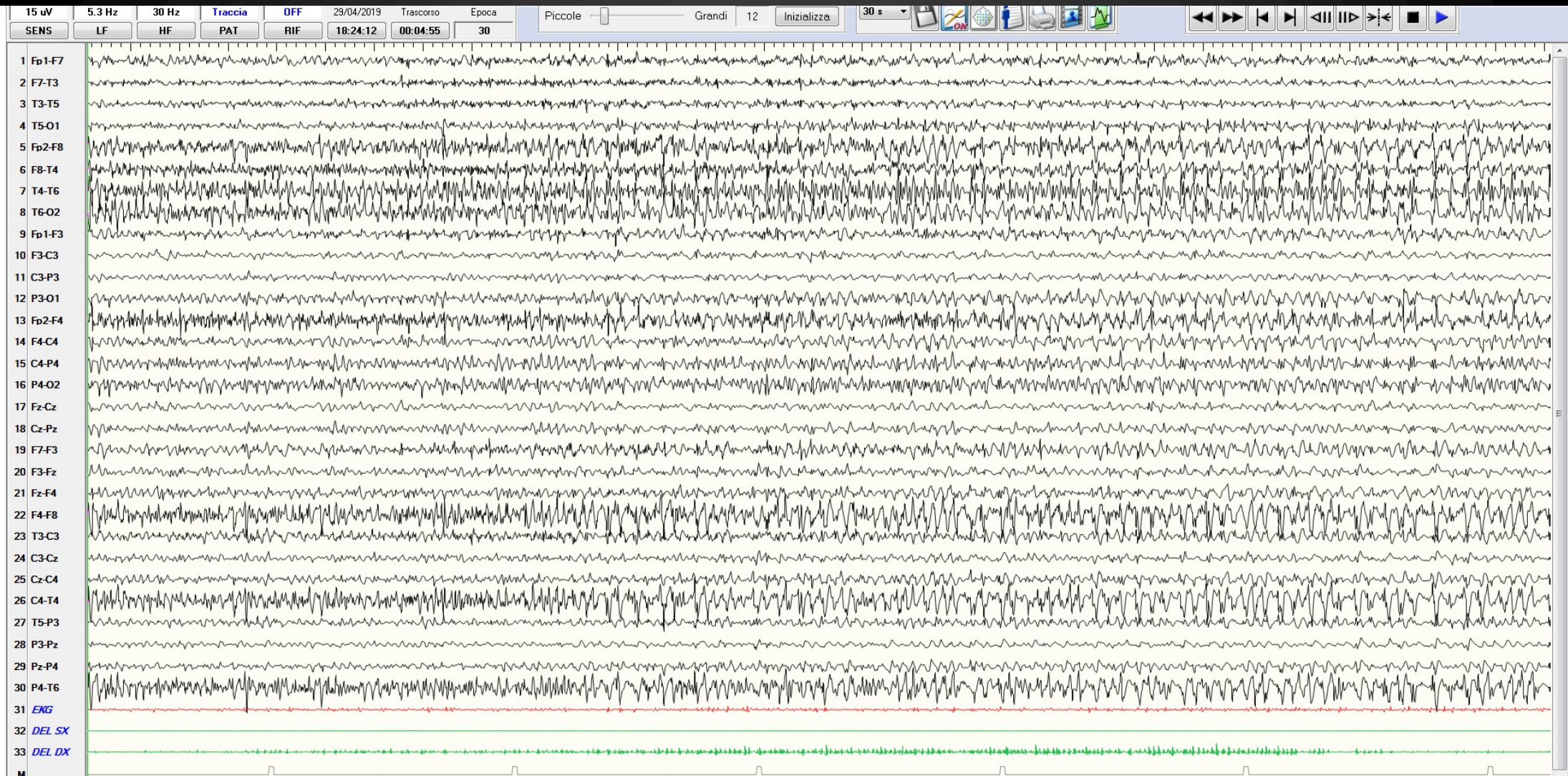
Crisi c

Sens 10 uV, LF 1.6 Hz, HF 60 Hz



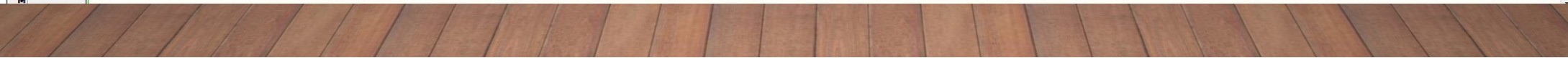
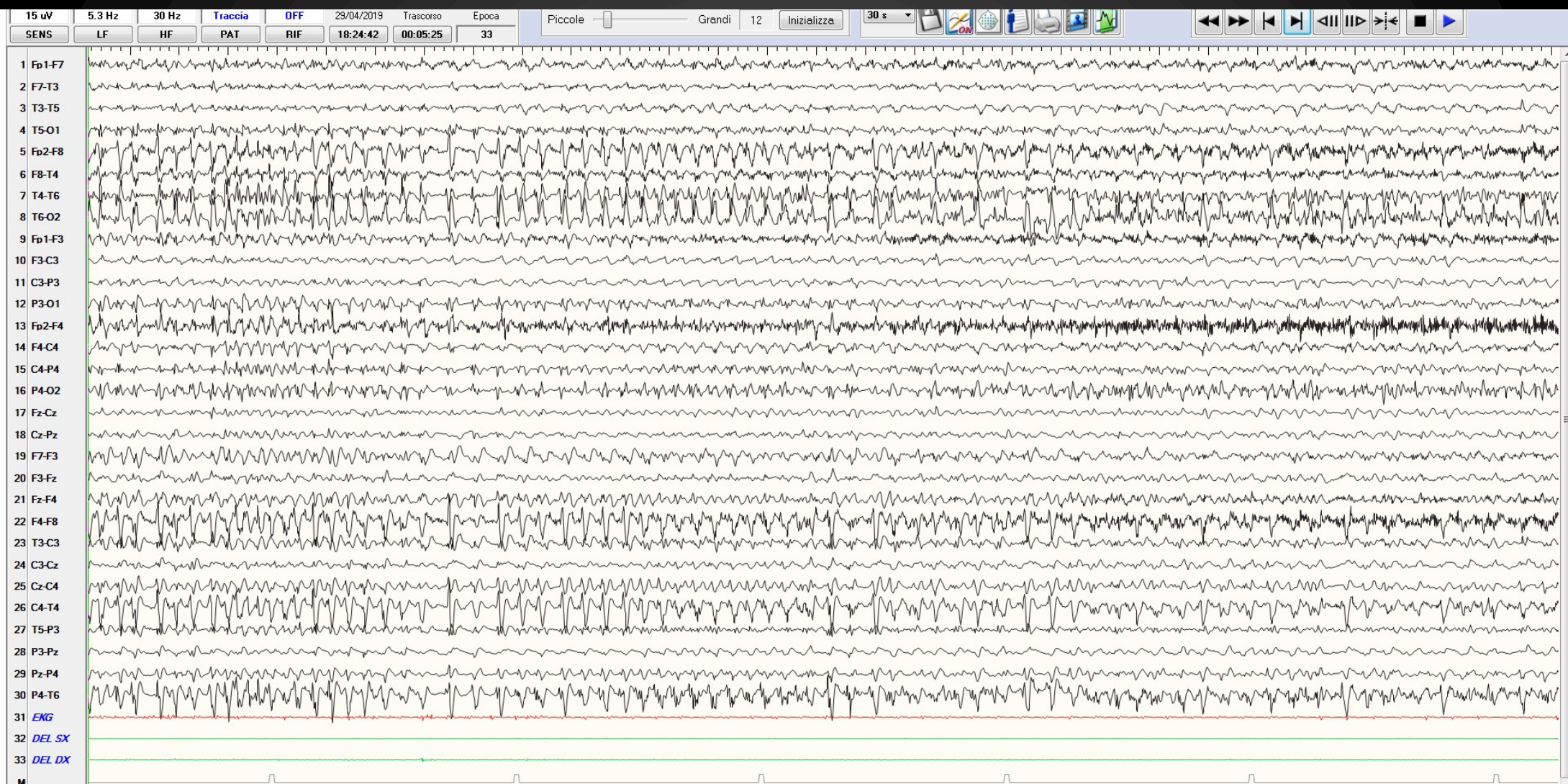
Crisi c

Sens 15 uV, LF 5.3 Hz, HF 30 Hz



Crisi d

Sens 15 uV, LF 5.3 Hz, HF 30 Hz



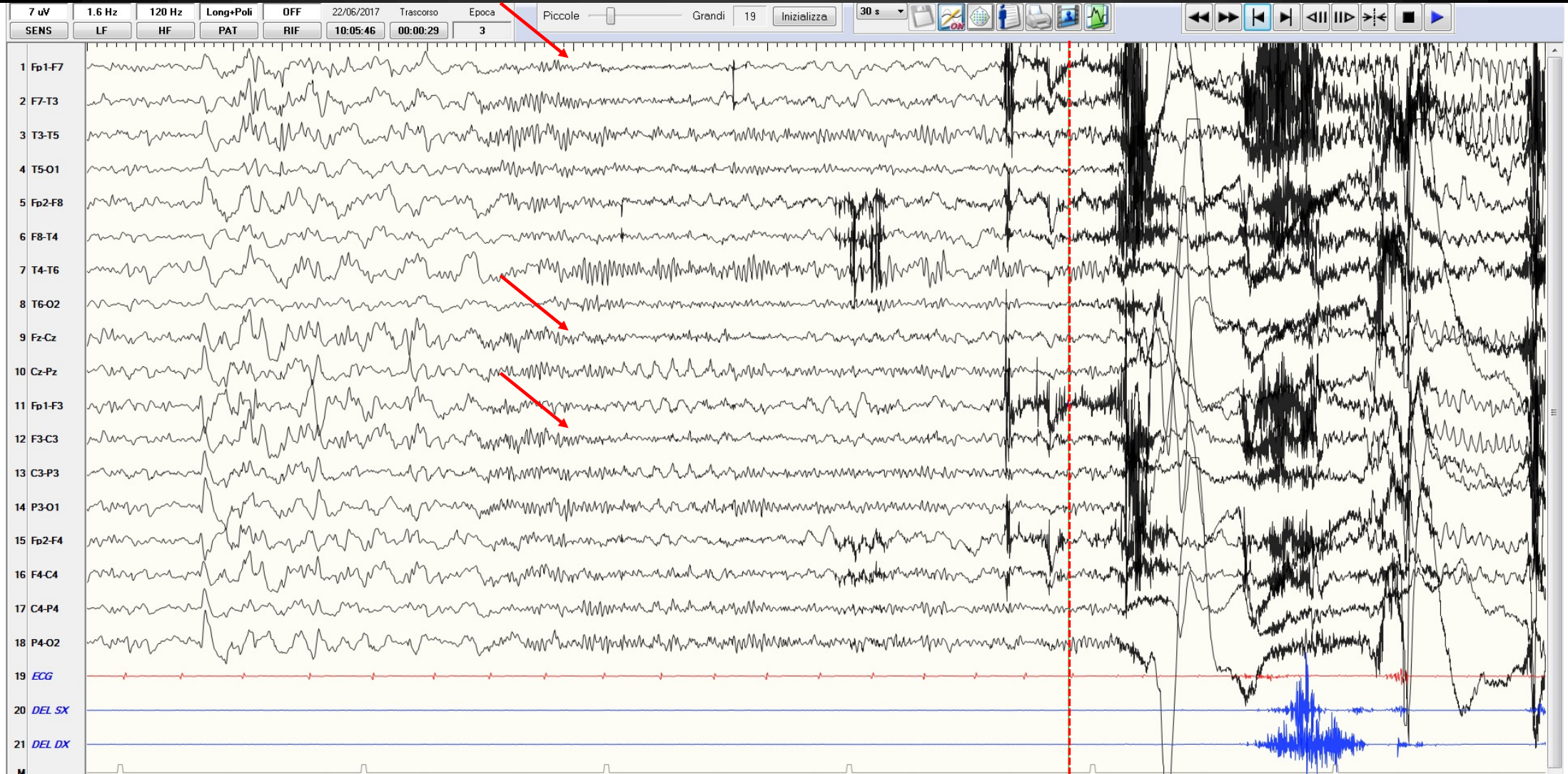
Crisi e

Sens 15 uV, LF 1.6 Hz, HF 30 Hz



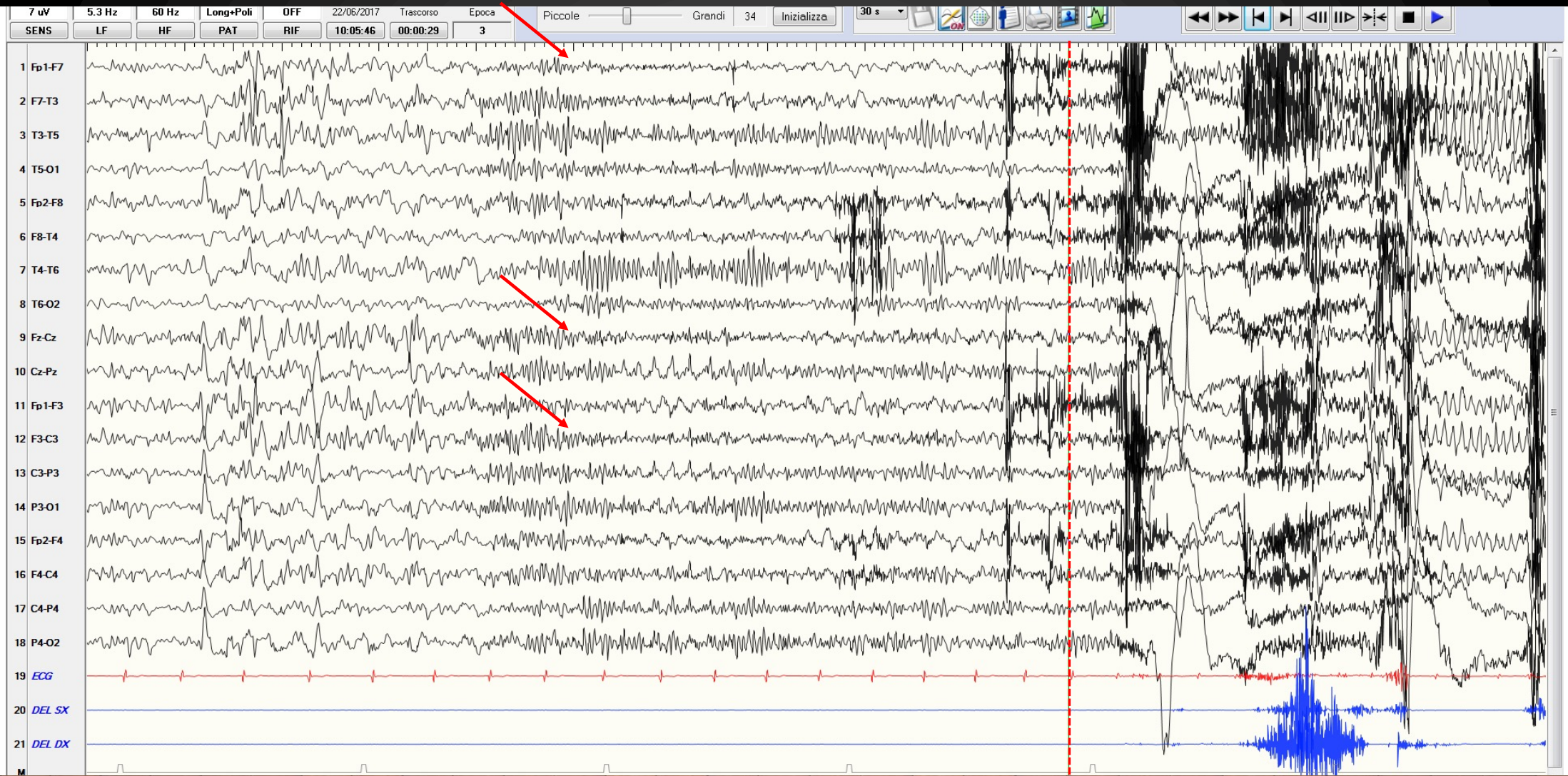
Crisi a

Sens 7 uV, LF 1.6 Hz HF, 120 Hz



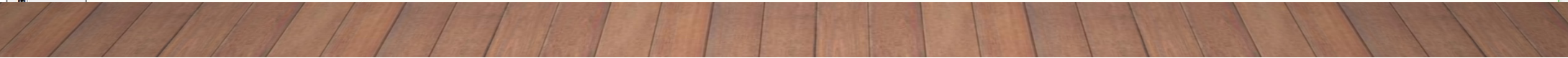
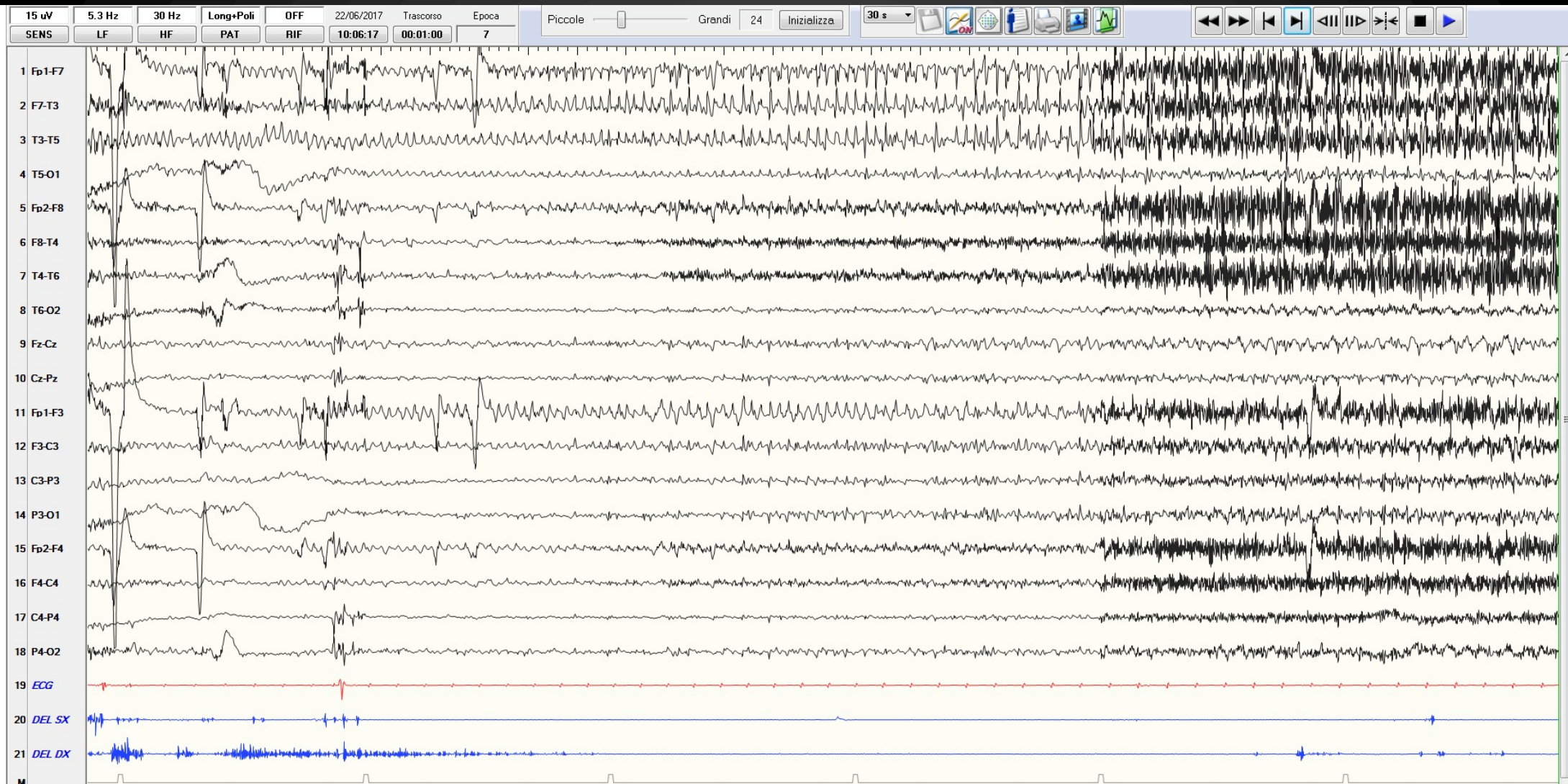
Crisi a

Sens 7 uV, LF 5.3 Hz, HF 60 Hz



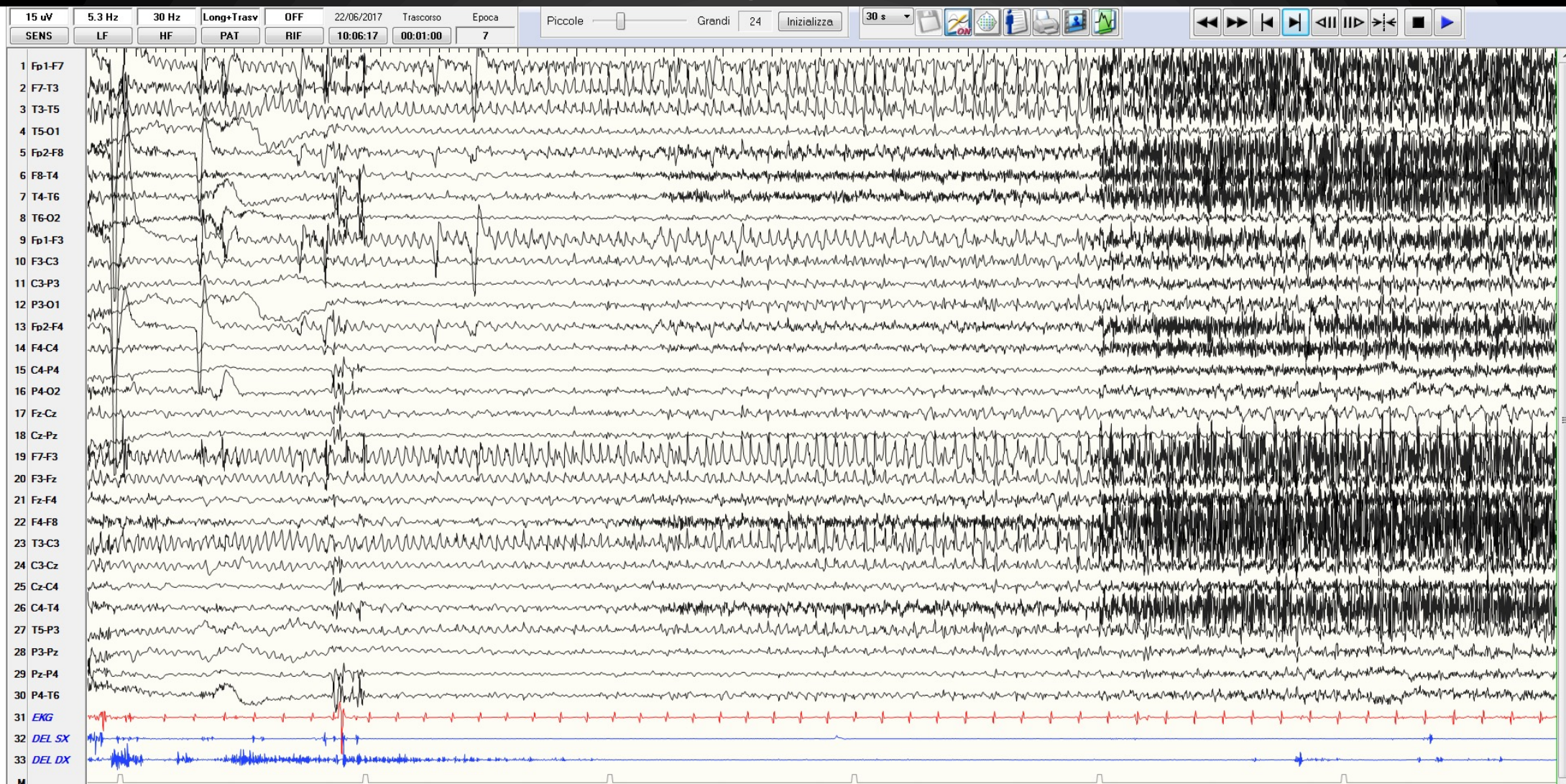
Crisi b

Sens 15 uV, LF 5.3 Hz, HF 30 Hz



Crisi b

Sens 15 uV, LF 5.3 Hz, HF 30 Hz



Take Home Messages



PER CONCLUDERE...

Per localizzare è necessario:

- fare correttamente l'EEG
- utilizzare al meglio gli strumenti a disposizione per visualizzare l'EEG
- individuare, descrivere e caratterizzare ciò che è presente sul tracciato

INTERPRETARE!!!

PER CONCLUDERE...

Per interpretare correttamente il tracciato (e localizzare nel modo migliore):

➤ EEG (intercritico - critico)

+

➤ clinica (storia - semeiologia crisi)

+

➤ neuroradiologia

CORRELARE!!!

