UNIVERSITÄTSKLINIKUM OWL

Krankenhaus **MARA**

Bethel
KRANKENHAUS Mara
UNIVERSITÄTSKLINIKUM OWL
der Universität Bielefeld
Campus Bielefeld-Bethel

Bethel

www.mara.de

Update Modul
Pädiatrische Neurophysiologie

EEG-Normvarianten und Anfallsmuster

Bethel
KRANKENHAUS Mara
UNIVERSITÄTSKLINIKUM OWL
der Universität Bielefeld
Campus Bielefeld-Bethel

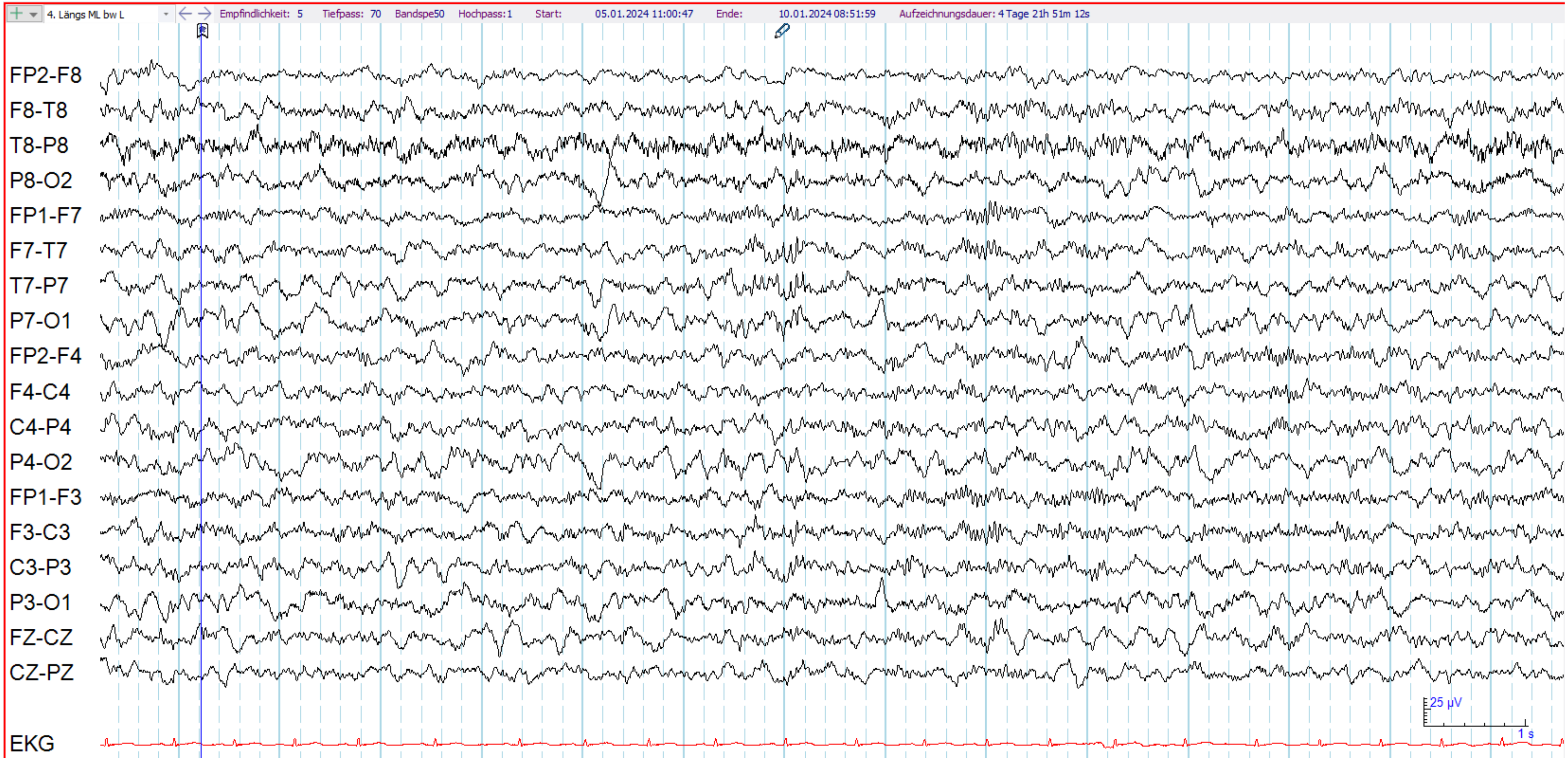
Tilman Polster

Stuttgart, 10.10.2024

Disclosures

Honorare / Unterstützung von Desitin, Eisai, Jazz, Takeda, UCB

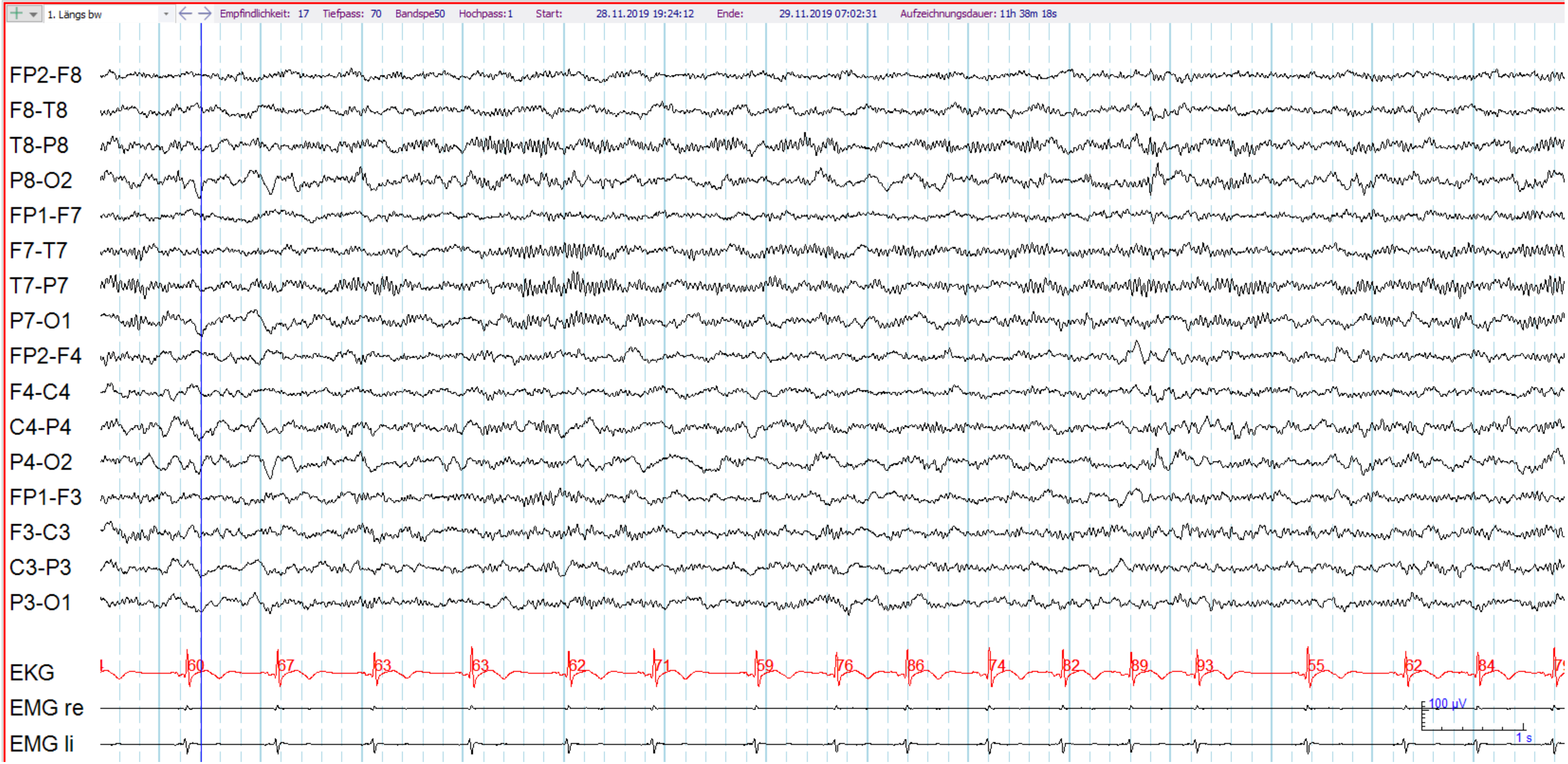
Zum Aufwärmen



4. Längs ML bw L Empfindlichkeit: 5 Tiefpass: 70 Bandspe50 Hochpass: 1 Start: 05.01.2024 11:00:47 Ende: 10.01.2024 08:51:59 Aufzeichnungsdauer: 4 Tage 21h 51m 12s

FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
FZ-CZ
CZ-PZ
25 µV
1 s
EKG

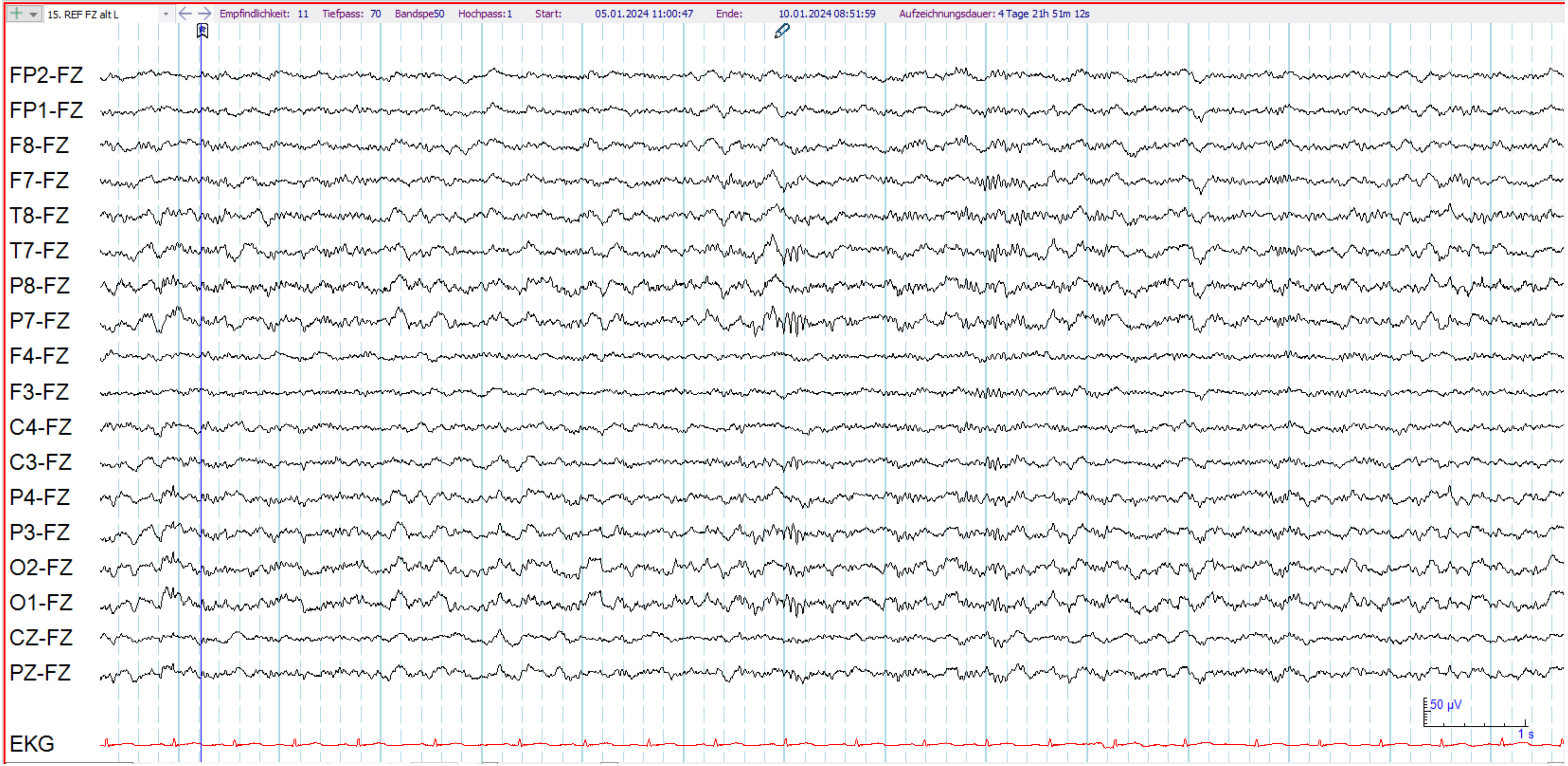
Nächste Seite



1. Längs bw
Empfindlichkeit: 17 Tiefpass: 70 Bandspe50 Hochpass: 1 Start: 28.11.2019 19:24:12 Ende: 29.11.2019 07:02:31 Aufzeichnungsdauer: 11h 38m 18s

FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
EKG
60
67
63
63
62
71
59
76
86
74
82
89
93
55
62
84
EMG re
EMG li
100 µV
1 s

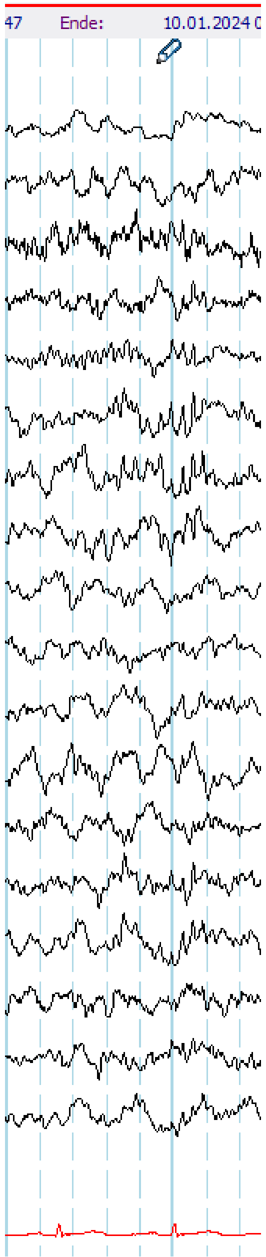
Positive Spikes



15. REF FZ alt L Empfindlichkeit: 11 Tiefpass: 70 Bandspe50 Hochpass: 1 Start: 05.01.2024 11:00:47 Ende: 10.01.2024 08:51:59 Aufzeichnungsdauer: 4 Tage 21h 51m 12s

FP2-FZ
FP1-FZ
F8-FZ
F7-FZ
T8-FZ
T7-FZ
P8-FZ
P7-FZ
F4-FZ
F3-FZ
C4-FZ
C3-FZ
P4-FZ
P3-FZ
O2-FZ
O1-FZ
CZ-FZ
PZ-FZ
EKG
50 µV
1 s

14 & 6 Hz positive bursts



- arkadenartig (kamm-ähnlich (ctenoids)
- Oberflächen-positiv
- niedrig-amplitudig (meist <75 µV)
- Dauer 0.5–2 s

- Frequenz 14 Hz (13–17 Hz) oder 6 Hz (5–7 Hz)

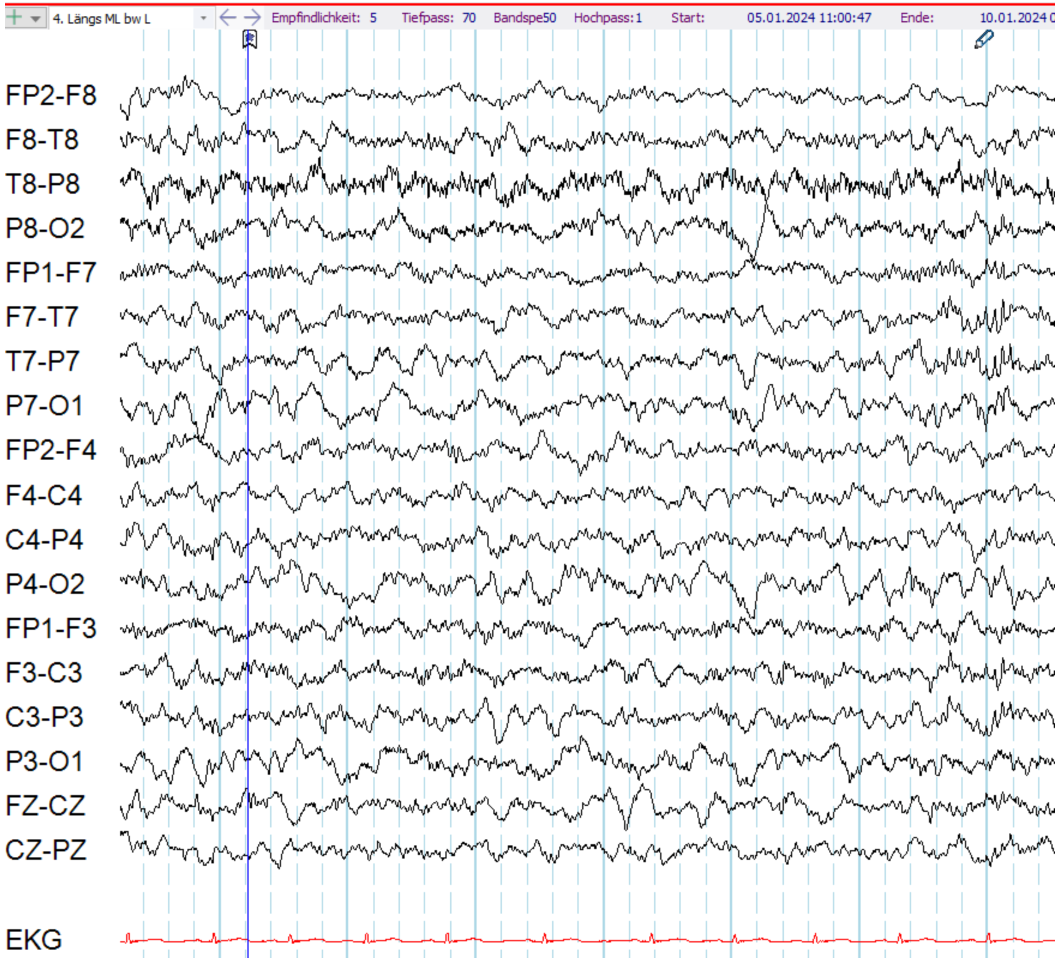
- meist posterior temporal

- meist in Müdigkeit / leichtem Schlaf

- ab 5 Jahren in 10% / bei Jugendlichen 20%

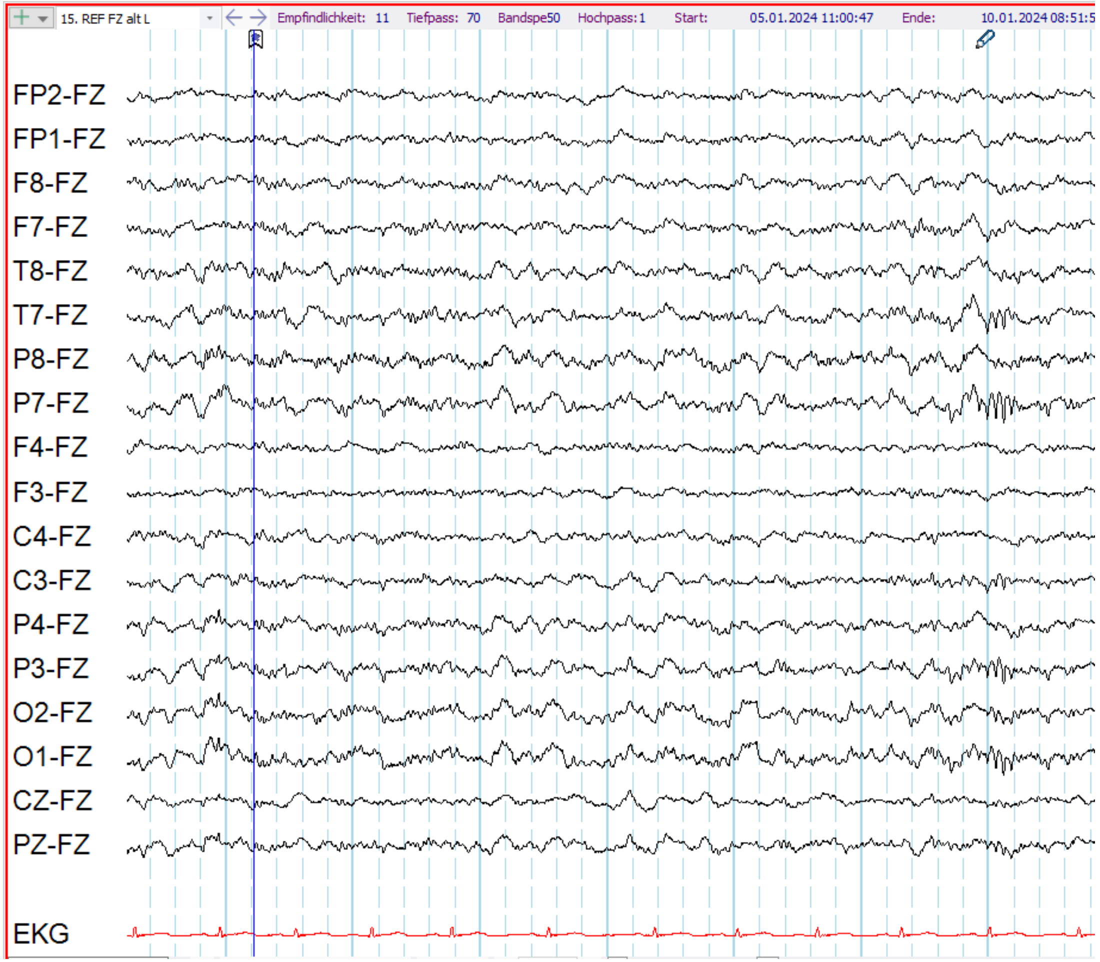
- Tipp: Positivität in der Referenz

14 & 6 Hz positive bursts



4. Längs ML bw L | Empfindlichkeit: 5 | Tiefpass: 70 | Bandspe50 | Hochpass: 1 | Start: 05.01.2024 11:00:47 | Ende: 10.01.2024 (

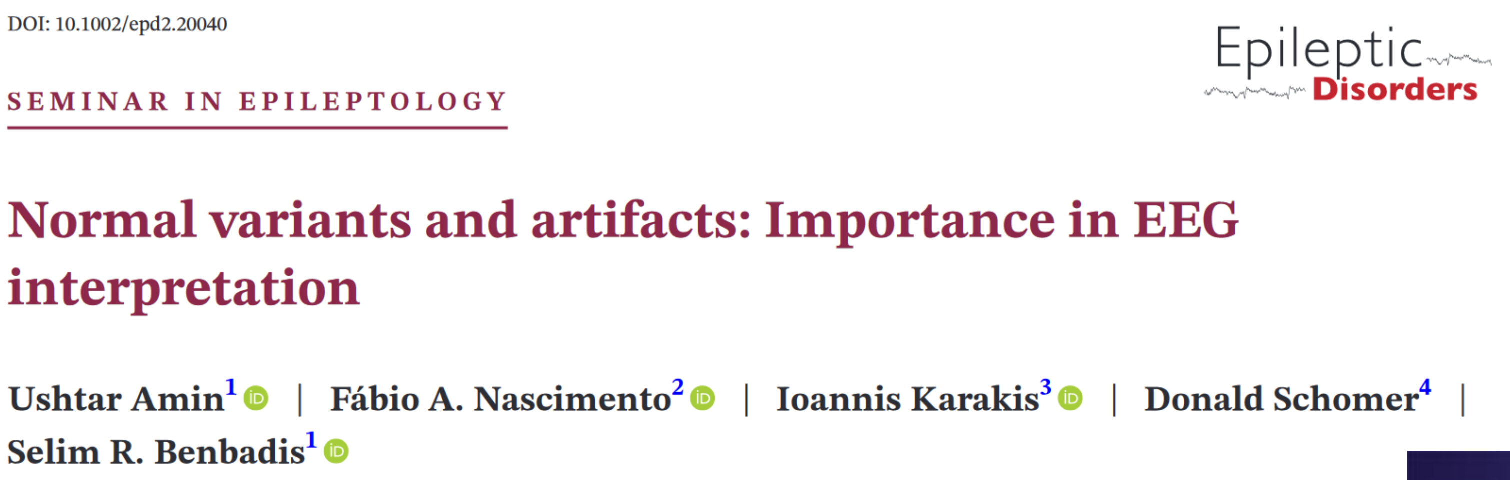
FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
FZ-CZ
CZ-PZ
EKG



15. REF FZ alt L | Empfindlichkeit: 11 | Tiefpass: 70 | Bandspe50 | Hochpass: 1 | Start: 05.01.2024 11:00:47 | Ende: 10.01.2024 08:51:5

FP2-FZ
FP1-FZ
F8-FZ
F7-FZ
T8-FZ
T7-FZ
P8-FZ
P7-FZ
F4-FZ
F3-FZ
C4-FZ
C3-FZ
P4-FZ
P3-FZ
O2-FZ
O1-FZ
CZ-FZ
PZ-FZ
EKG

Nachlesen?



DOI: 10.1002/epd2.20040

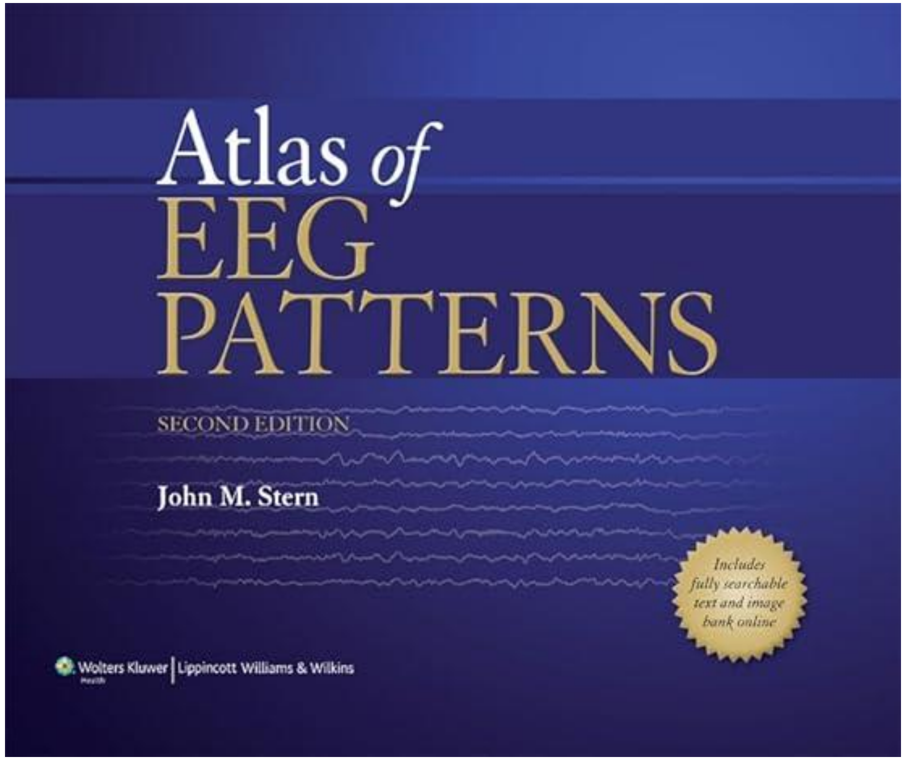
Epileptic Disorders

SEMINAR IN EPILEPTOLOGY

Normal variants and artifacts: Importance in EEG interpretation

Ushtar Amin[1] | Fábio A. Nascimento[2] | Ioannis Karakis[3] | Donald Schomer[4] | Selim R. Benbadis[1]

Nachschlagen!



Atlas of EEG PATTERNS

SECOND EDITION

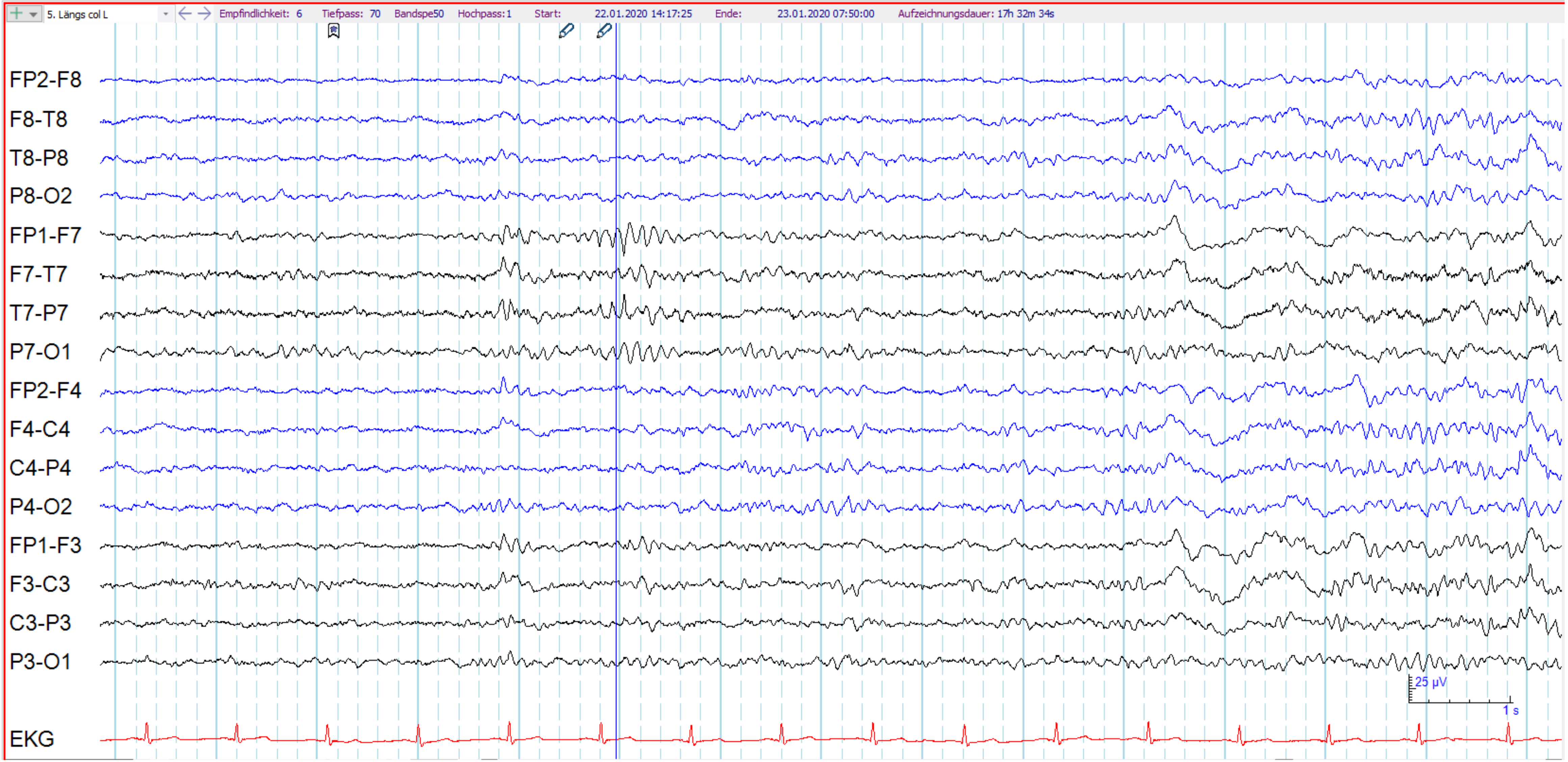
John M. Stern

Includes fully searchable text and image bank online

Wolters Kluwer | Lippincott Williams & Wilkins

Amin, Ushtar, et al. "Normal variants and artifacts: importance in EEG interpretation." *Epileptic Disorders* 25.5 (2023): 591-648.

Temporale Spikes?



5. Längs col L

Empfindlichkeit: 6

Tiefpass: 70

Bandspe50

Hochpass:1

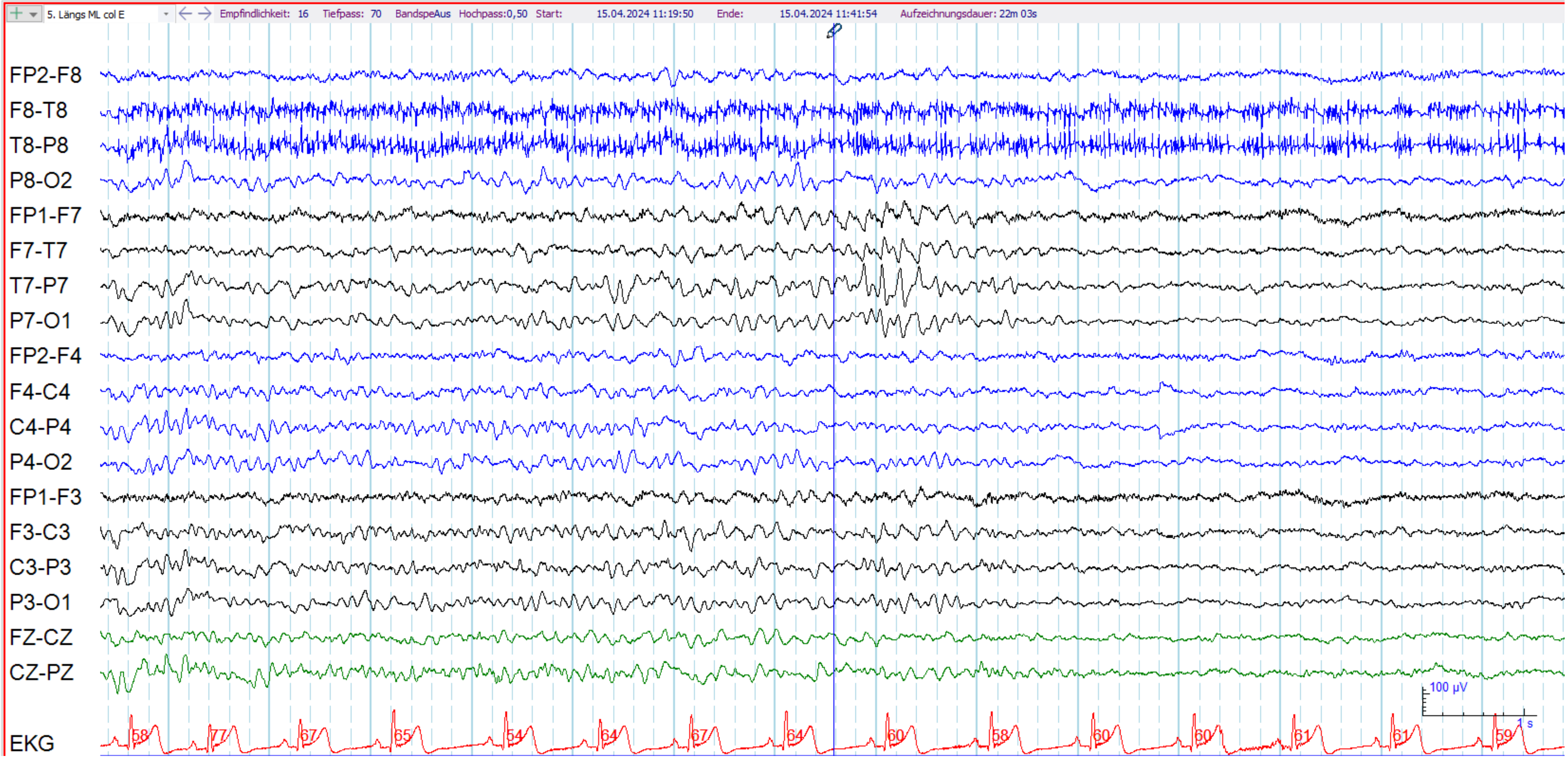
Start: 22.01.2020 14:17:25

Ende: 23.01.2020 07:50:00

Aufzeichnungsdauer: 17h 32m 34s

FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
25 µV
1 s
EKG

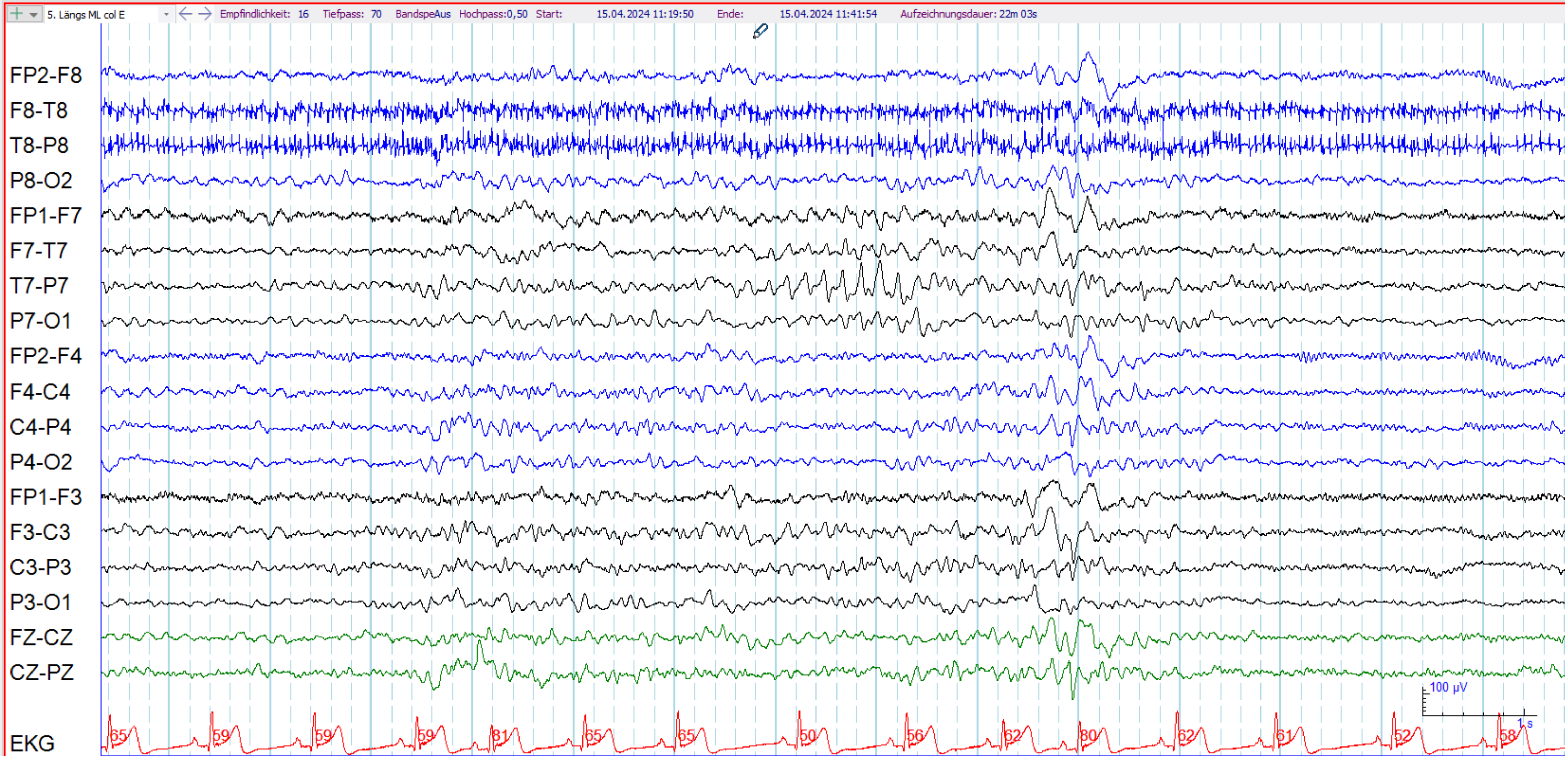
Temporale Spikes?



5. Längs ML col E Empfindlichkeit: 16 Tiefpass: 70 BandspeAus Hochpass:0,50 Start: 15.04.2024 11:19:50 Ende: 15.04.2024 11:41:54 Aufzeichnungsdauer: 22m 03s

FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
FZ-CZ
CZ-PZ
EKG
58
77
67
65
54
64
67
64
60
58
60
60
61
61
59
100 µV
1 s

Temporale Spikes?

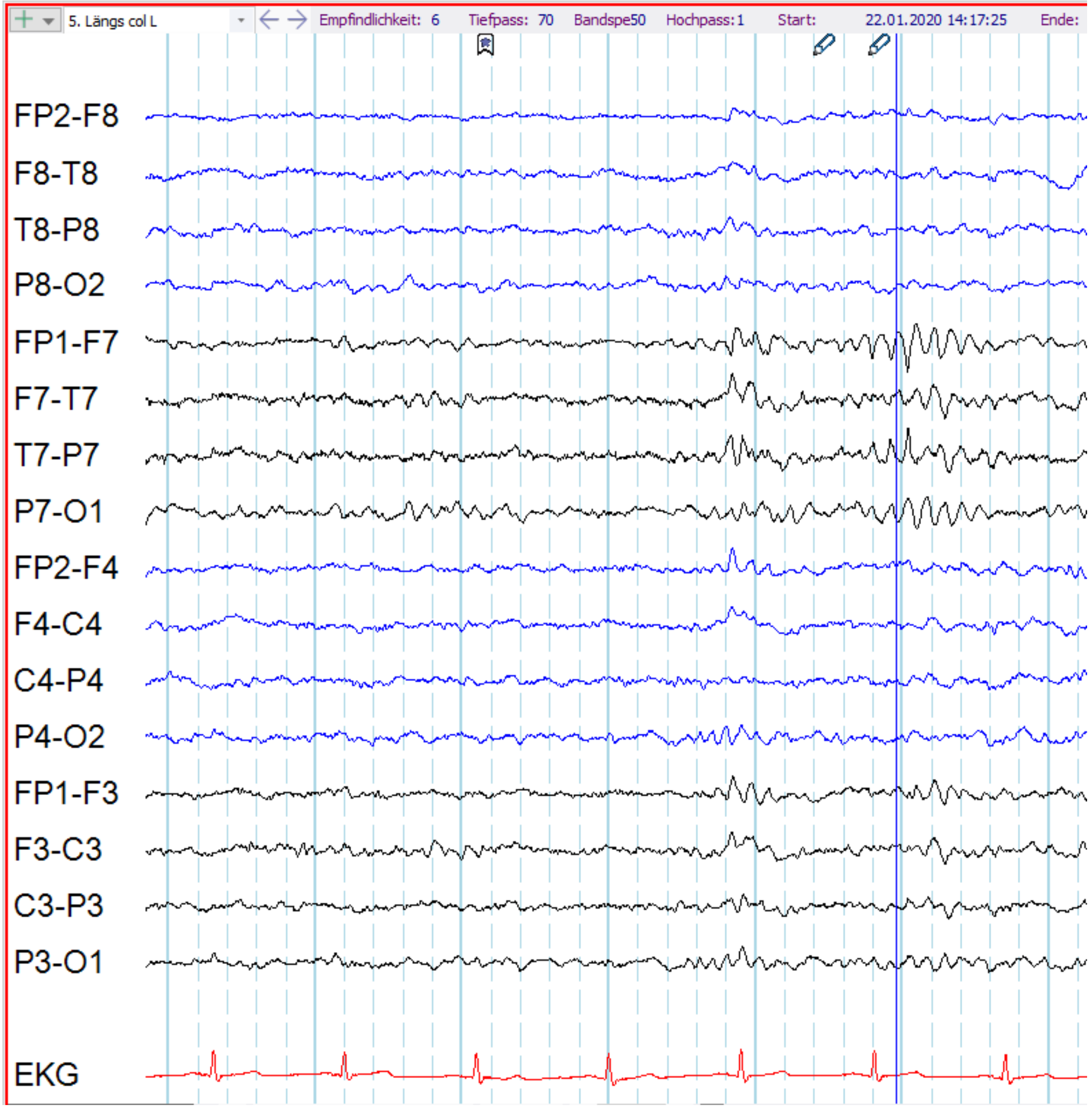


5. Längs ML col E

Empfindlichkeit: 16 Tiefpass: 70 BandspeAus Hochpass:0,50 Start: 15.04.2024 11:19:50 Ende: 15.04.2024 11:41:54 Aufzeichnungsdauer: 22m 03s

FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
FZ-CZ
CZ-PZ
EKG
65
59
59
59
81
65
65
50
56
62
80
62
61
52
58
100 µV
1 s

Temporale Spikes?



5. Längs col L
Empfindlichkeit: 6
Tiefpass: 70
Bandspe50
Hochpass:1
Start:
22.01.2020 14:17:25
Ende:

FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
EKG

- Torbogen-ähnlich
- Oberflächen-negativ
- Spitz
- (60) bis 200µV
- Dauer 0.5–3 s

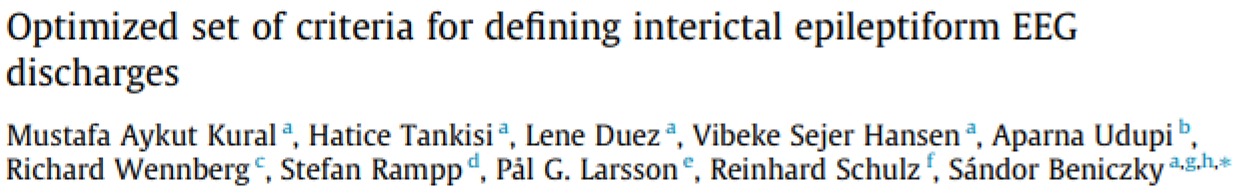
- Frequenz 6-11Hz

- Temporal, häufiger links

- meist in Müdigkeit / leichtem Schlaf

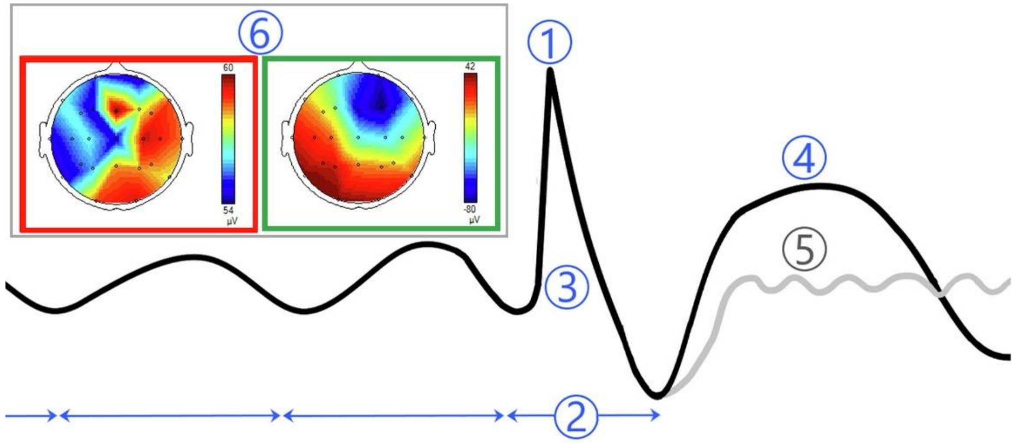
- häufiger bei Erwachsenen

- Tipp: Spike-Kriterien erfüllt?



Optimized set of criteria for defining interictal epileptiform EEG discharges

Mustafa Aykut Kural[a], Hatice Tankisi[a], Lene Duez[a], Vibeke Sejer Hansen[a], Aparna Udupi[b], Richard Wennberg[c], Stefan Rampp[d], Pål G. Larsson[e], Reinhard Schulz[f], Sándor Beniczky[a,g,h,*]



(1) Bi/ Triphasische Welle mit Spitze

(2) Potenzialdauer anders als Hintergrundaktivität

(3) Asymmetrie: steiler Anstieg mit langsamem Abfall (oder umgekehrt)

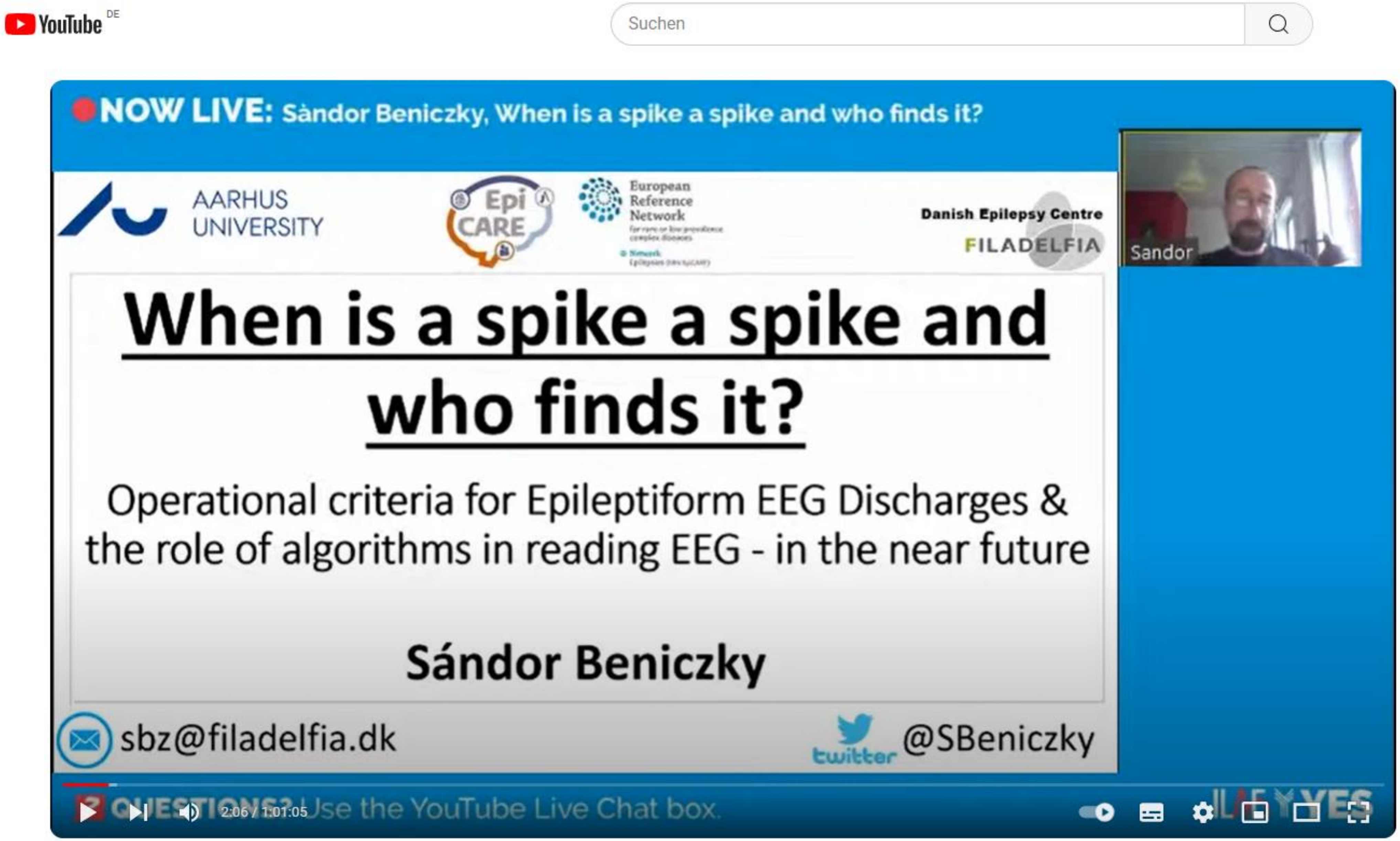
(4) Langsame Nachschwankung folgt dem steilen Transienten

(5) Hintergrundaktivität ist unterbrochen

(6) Potenzialverteilung hat plausibles Feld für Quelle im Gehirn

🟩 plausibles Feld (negative Pol anterior)

🟥 kein plausibles Feld


YouTube DE
Suchen
Sandor
AARHUS UNIVERSITY
Epi CARE
European Reference Network
Danish Epilepsy Centre
FILADELFIA
2:06 / 1:01:05
ILAE YES

NOW LIVE: Sàndor Beniczky, When is a spike a spike and who finds it?

When is a spike a spike and who finds it?

Operational criteria for Epileptiform EEG Discharges & the role of algorithms in reading EEG - in the near future

Sándor Beniczky

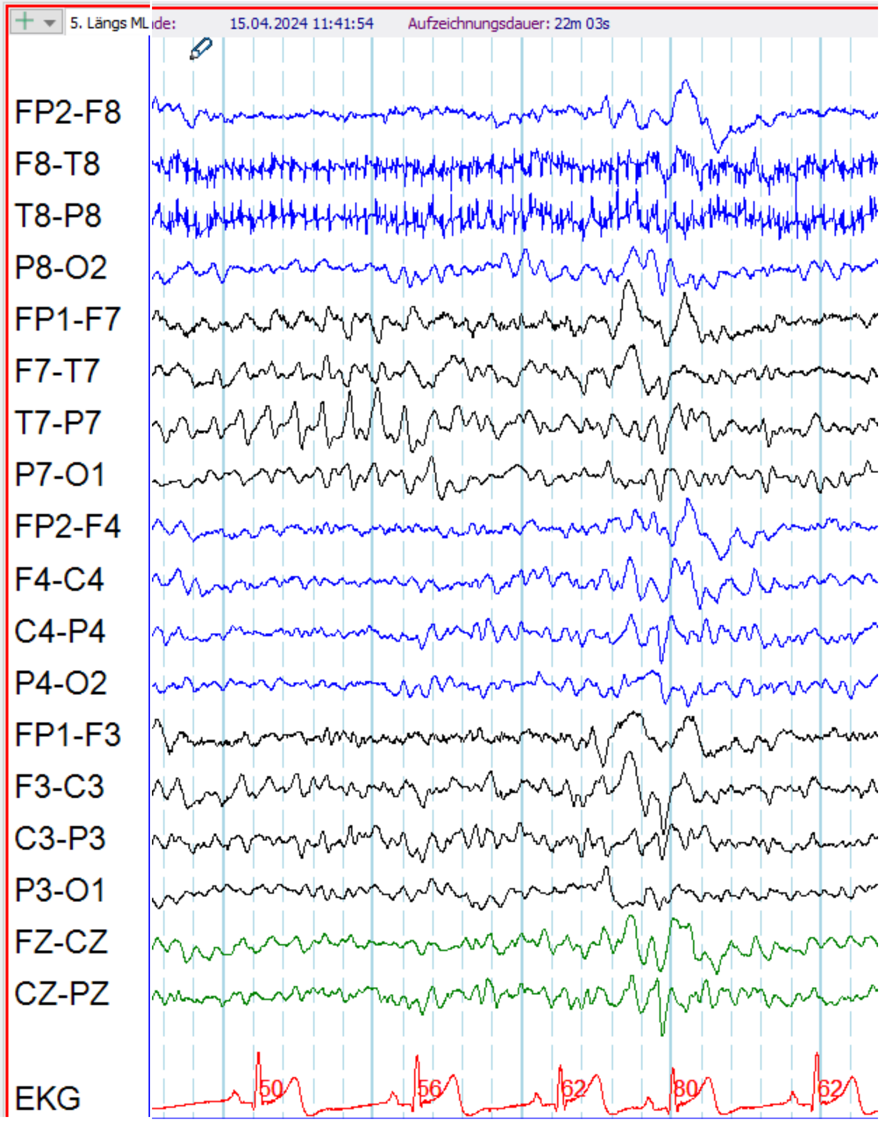
sbz@filadelfia.dk

twitter @SBeniczky

QUESTIONS? Use the YouTube Live Chat box.

YES ILAE Webinars 2020 - Prof Sàndor Beniczky - When is a spike a spike and who finds it?

Wicket Spikes
keine epileptiformen Muster


5. Längs ML
ide:
15.04.2024 11:41:54
Aufzeichnungsdauer: 22m 03s
FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
FZ-CZ
CZ-PZ
EKG
50
56
62
80
62

- ➢ Torbogen-ähnlich
- ➢ Oberflächen-negativ
- ➢ Spitz
- ➢ (60) bis 200µV
- ➢ Dauer 0.5–3 s

- ➢ Frequenz 6-11Hz

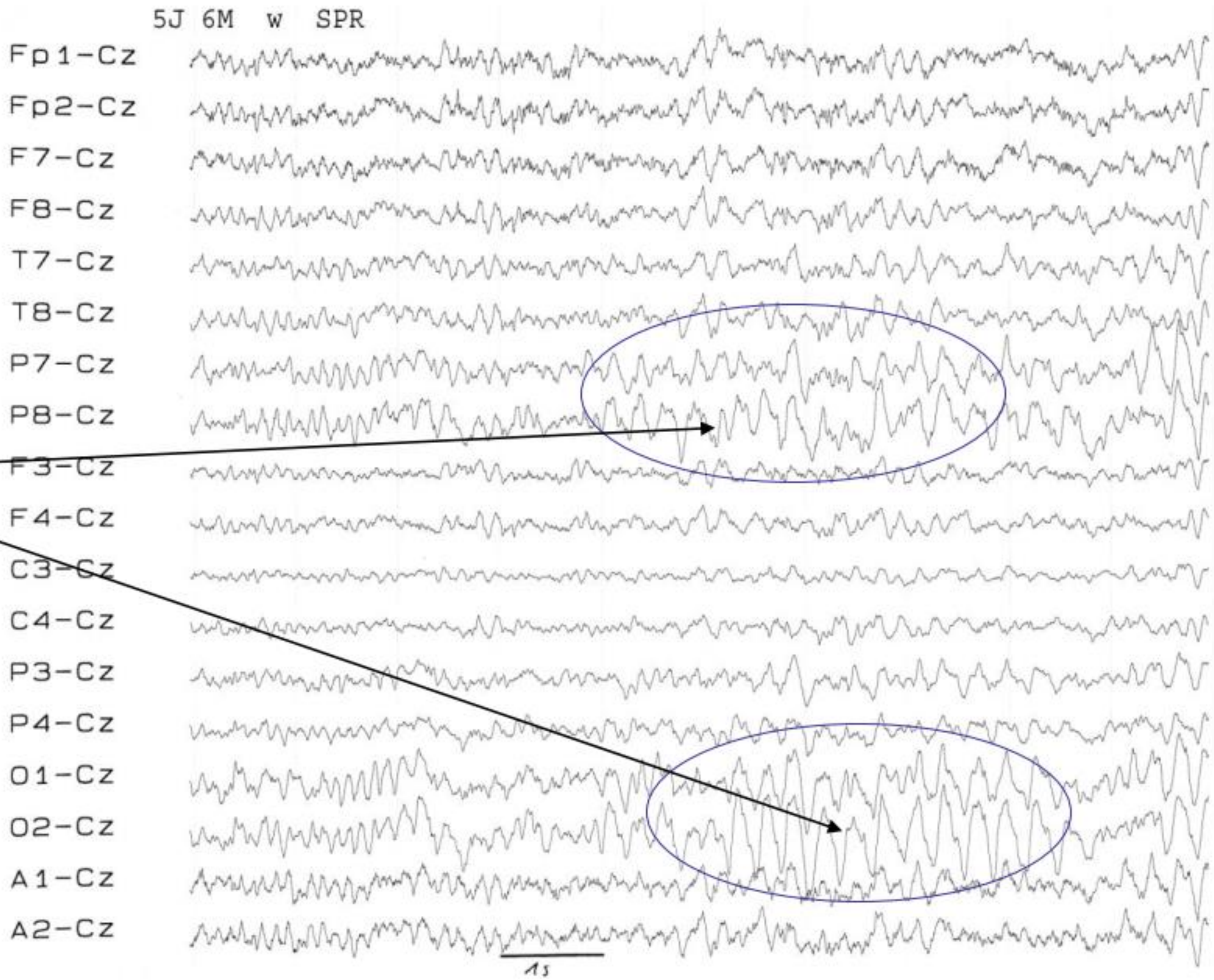
- ➢ Temporal, häufiger links

- ➢ meist in Müdigkeit / leichtem Schlaf

- ➢ häufiger bei Erwachsenen

- ➢ Tipp: Spike-Kriterien (ILAE) nicht erfüllt

Posteriore Rhythmen


5J 6M w SPR
Fp1–Cz
Fp2–Cz
F7–Cz
F8–Cz
T7–Cz
T8–Cz
P7–Cz
P8–Cz
F3–Cz
F4–Cz
C3–Cz
C4–Cz
P3–Cz
P4–Cz
O1–Cz
O2–Cz
A1–Cz
A2–Cz
1s

Rhythm. Delta posterior

Posteriore Rhythmen

asynchron

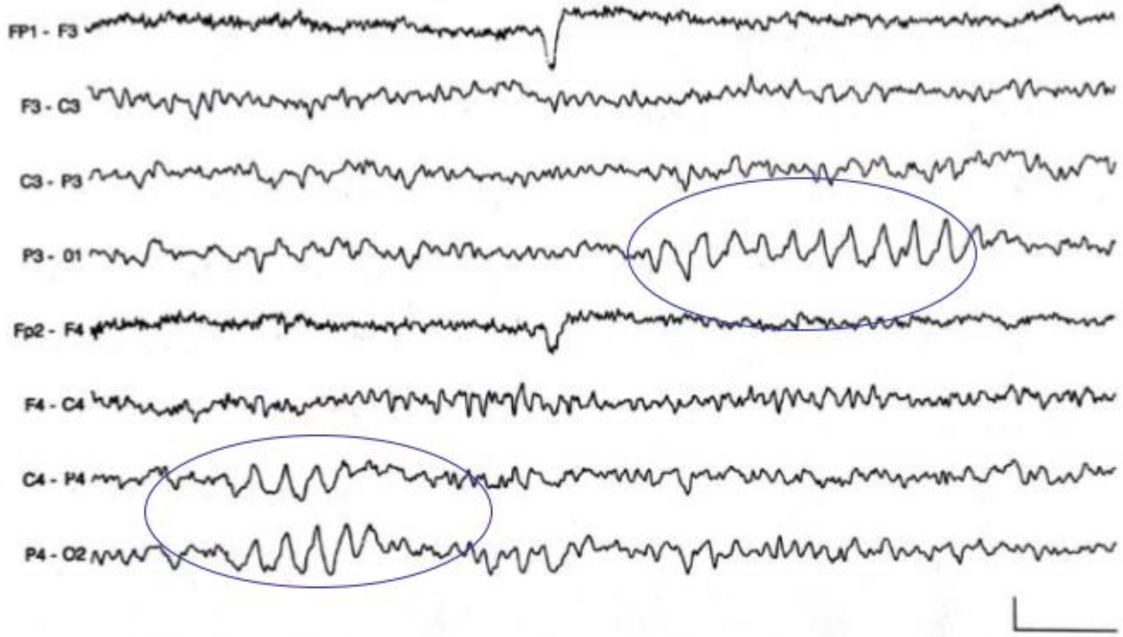

FP1 - F3
F3 - C3
C3 - P3
P3 - 01
Fp2 - F4
F4 - C4
C4 - P4
P4 - O2

FIG. 34. Posterior rhythmic waves. Four years. Eyes closed. Rhythmic 3- to 4-Hz posterior waves may shift from side to side, as in this example. Their sharply contoured appearance in this segment does not necessarily indicate hidden spike waves and simply may be the result of a combination of wave forms. Calibration signal 1 second, 150 µV.

synchron

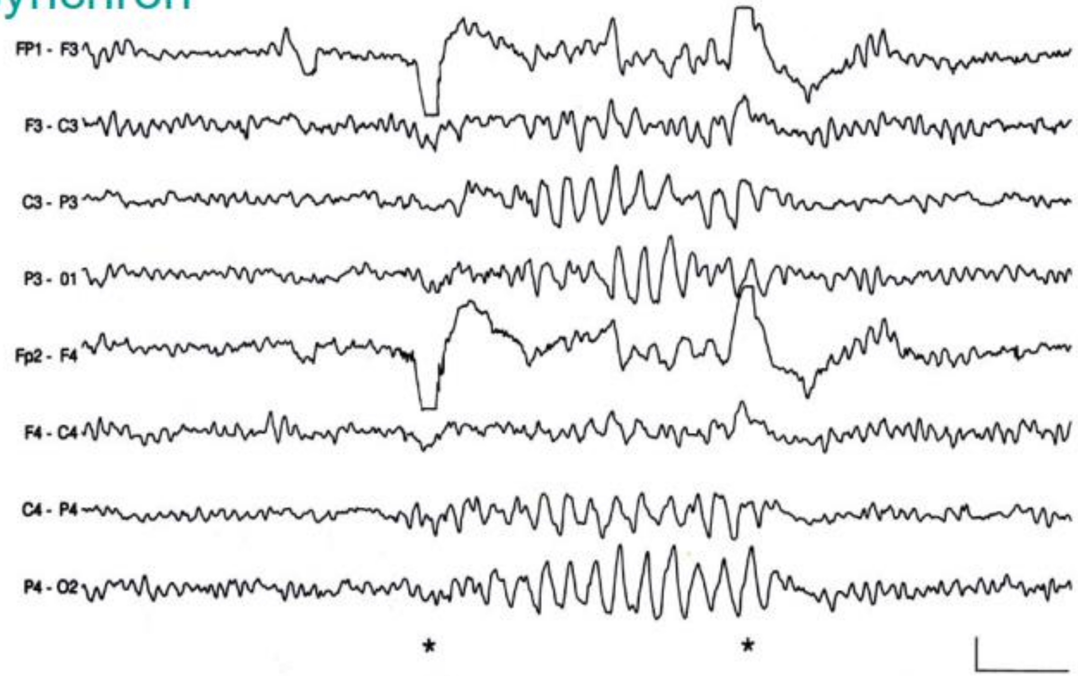
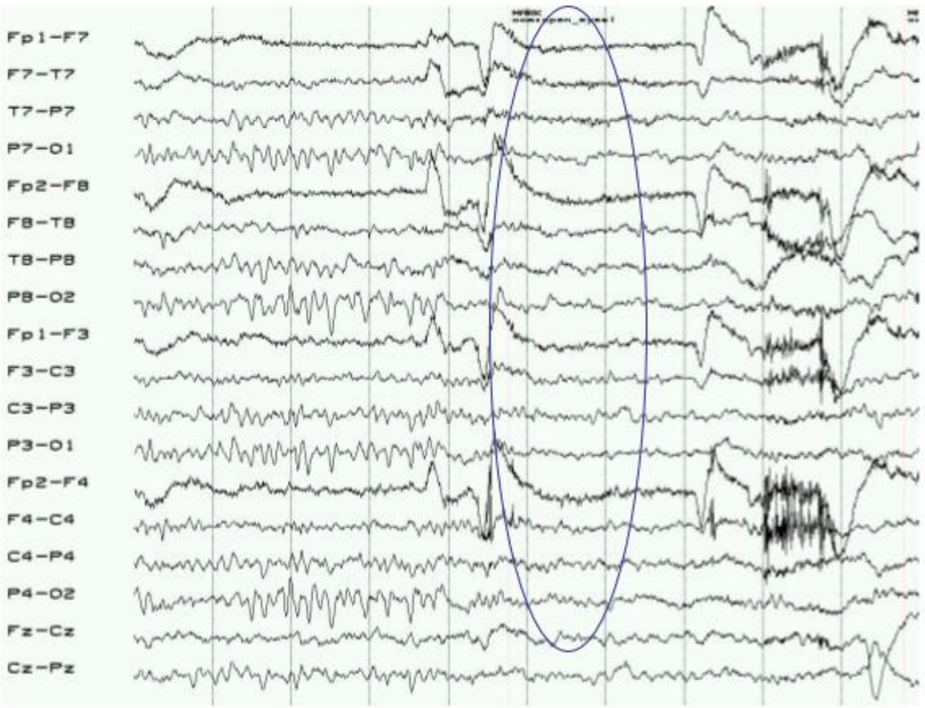

FP1 - F3
F3 - C3
C3 - P3
P3 - 01
Fp2 - F4
F4 - C4
C4 - P4
P4 - O2
*
*

FIG. 36. Eye closure elicits posterior rhythmic waves. Six years. Eye closure and then eye opening (*) elicit and abolish such normal potentials. Calibration signal 1 second, 70 µV.

Posteriores Theta/Delta / Slow fused transients

7J w


Fp1-F7
F7-T7
T7-P7
P7-O1
Fp2-F8
F8-T8
T8-P8
P8-O2
Fp1-F3
F3-C3
C3-P3
P3-O1
Fp2-F4
F4-C4
C4-P4
P4-O2
Fz-Cz
Cz-Pz

Blockade bei Augenschluss

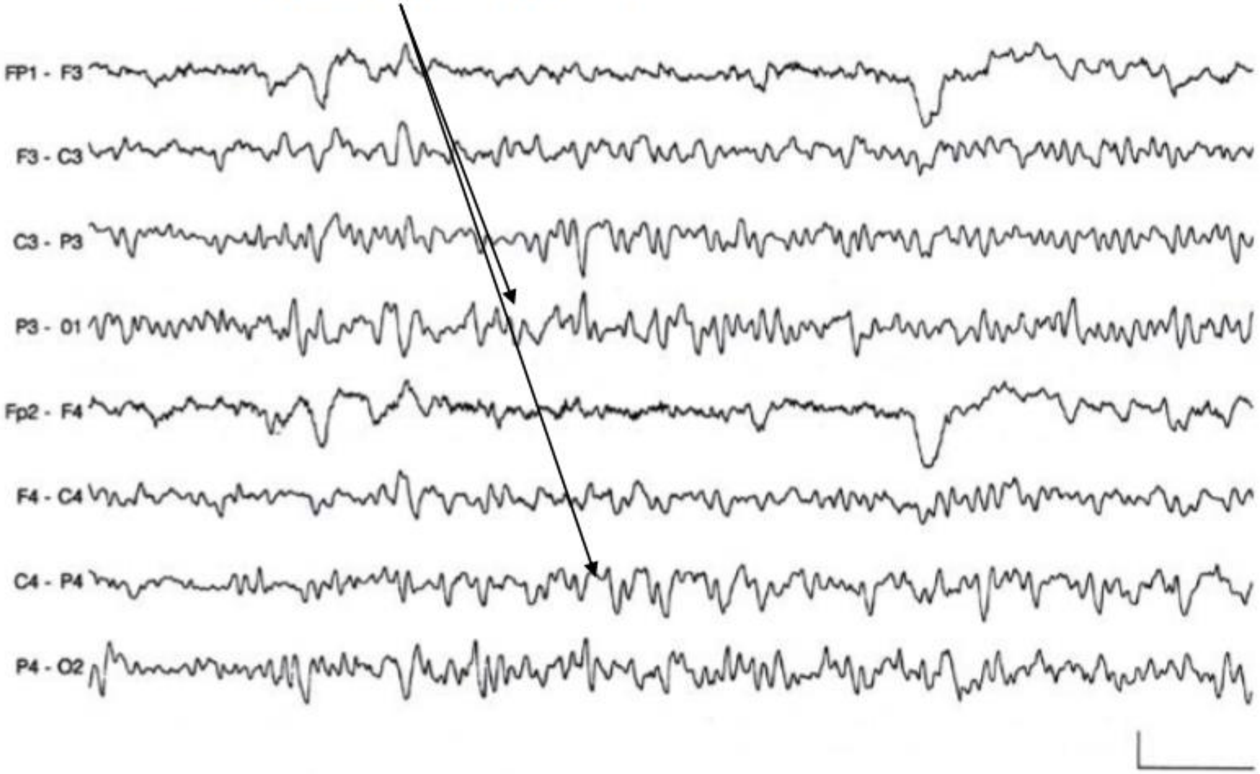
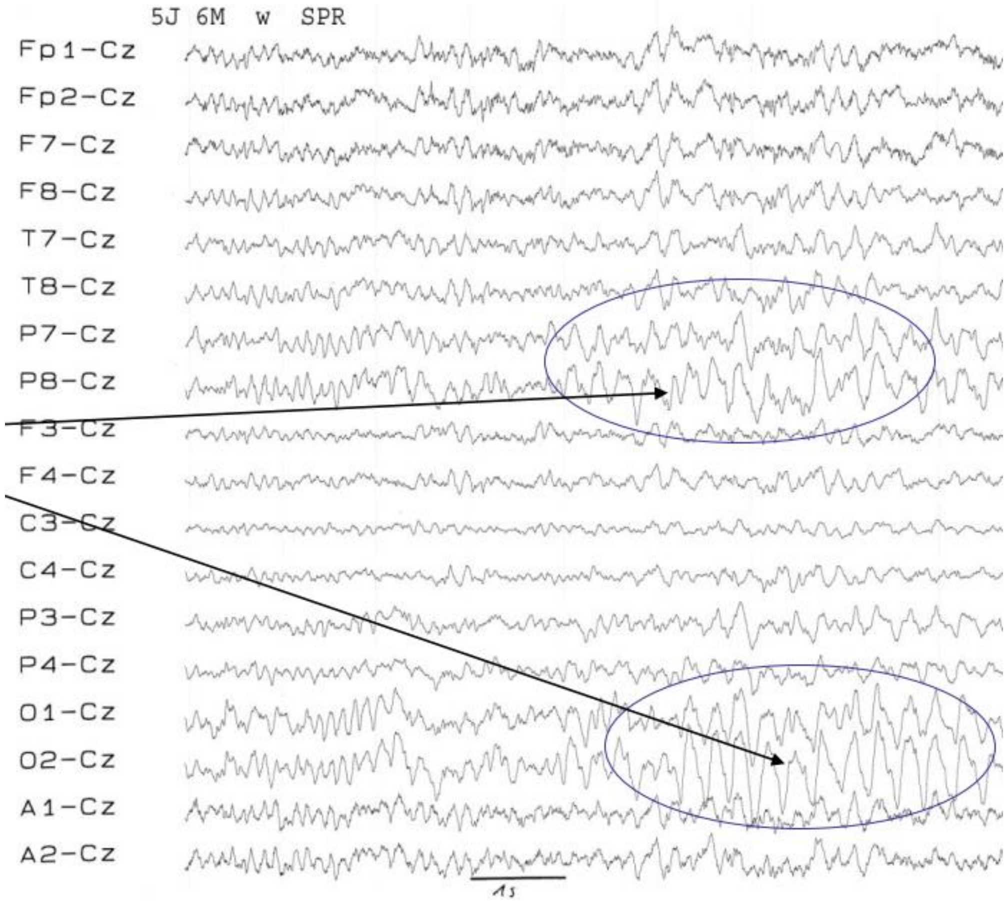

FP1 - F3
F3 - C3
C3 - P3
P3 - 01
Fp2 - F4
F4 - C4
C4 - P4
P4 - O2

FIG. 50. Prominent theta and delta. Eight years. Eyes closed. There is a greater quantity of theta and delta in this figure as compared to some others in this age group. Note the sensitivities when comparing samples. Calibration signal 1 second, 100 µV.

Blume und Kaibara, 1999

Posteriore Rhythmen


5J 6M w SPR
Fp1-Cz
Fp2-Cz
F7-Cz
F8-Cz
T7-Cz
T8-Cz
P7-Cz
P8-Cz
F3-Cz
F4-Cz
C3-Cz
C4-Cz
P3-Cz
P4-Cz
O1-Cz
O2-Cz
A1-Cz
A2-Cz
1s

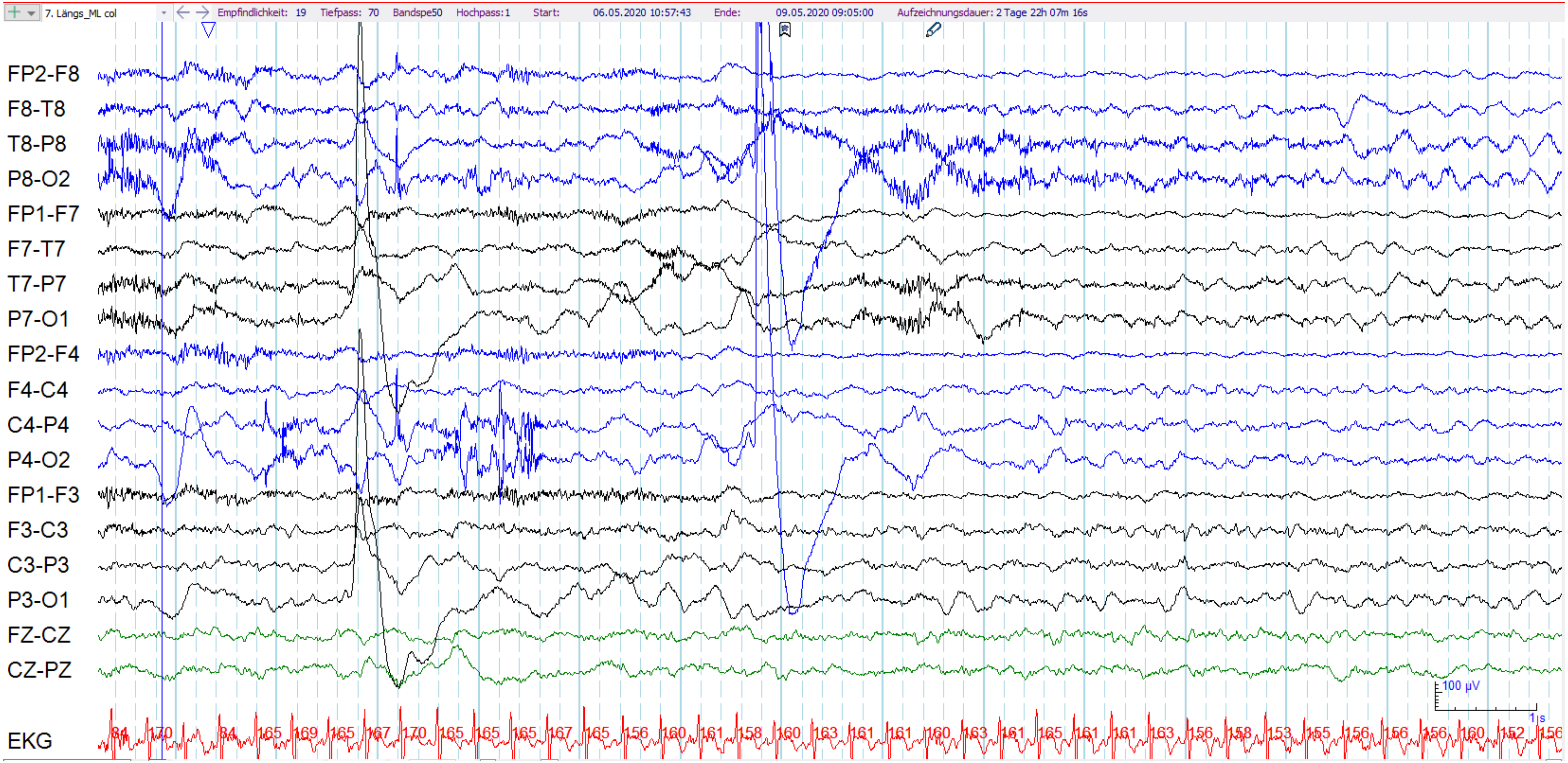
posteriore rhythmische Wellen (slow posterior rhythm)
(rhythmische Variante der POSWY)

- sinusförmig, niedrig - mittelhoch
- Amplituden 50-100 µV bei 90%, >100 µV bei 10%
- 2,5 - 4,5 Hz
- in kurzen Folgen oder längeren Abläufen; 25% ≥ 3 sec
- seltener in bursts: mittlere/hohe Amplituden
- bei 25% der normalen Kinder

Maximum 5. – 7. Lebensjahr
2-10% der normalen posterioren Aktivität, bei 10% häufiger

Petersen & Eeg-Oloffson, 1971

Posteriore Rhythmen

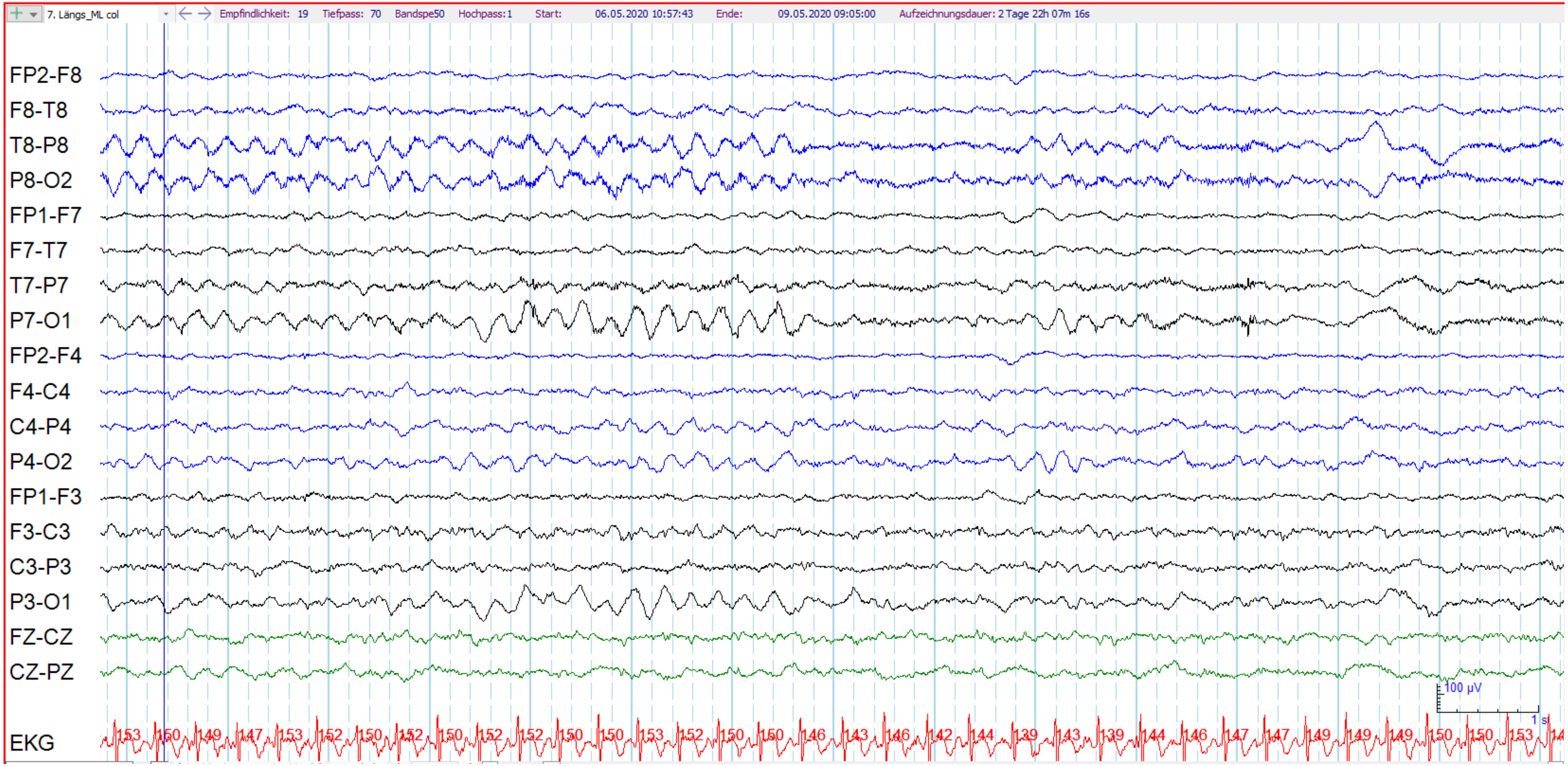


7. Längs_ML col

Empfindlichkeit: 19 Tiefpass: 70 Bandspe50 Hochpass:1 Start: 06.05.2020 10:57:43 Ende: 09.05.2020 09:05:00 Aufzeichnungsdauer: 2 Tage 22h 07m 16s

FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
FZ-CZ
CZ-PZ
EKG
84 170 84 165 169 165 167 170 165 165 165 167 165 156 160 161 158 160 163 161 161 160 163 161 165 161 161 163 156 158 153 155 156 156 156 160 152 156
100 µV
1 s

Posteriore Rhythmen

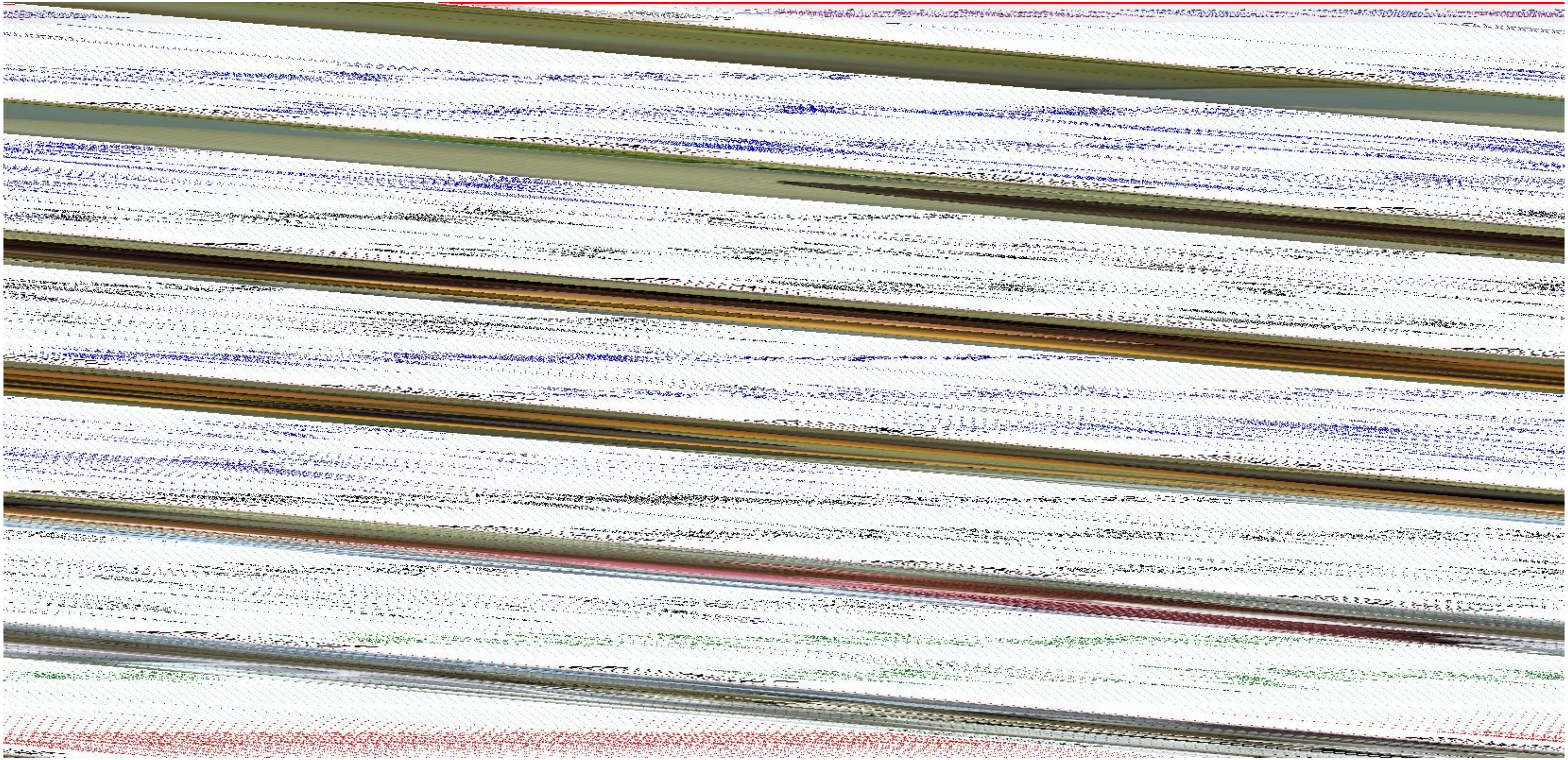


7. Längs_ML col

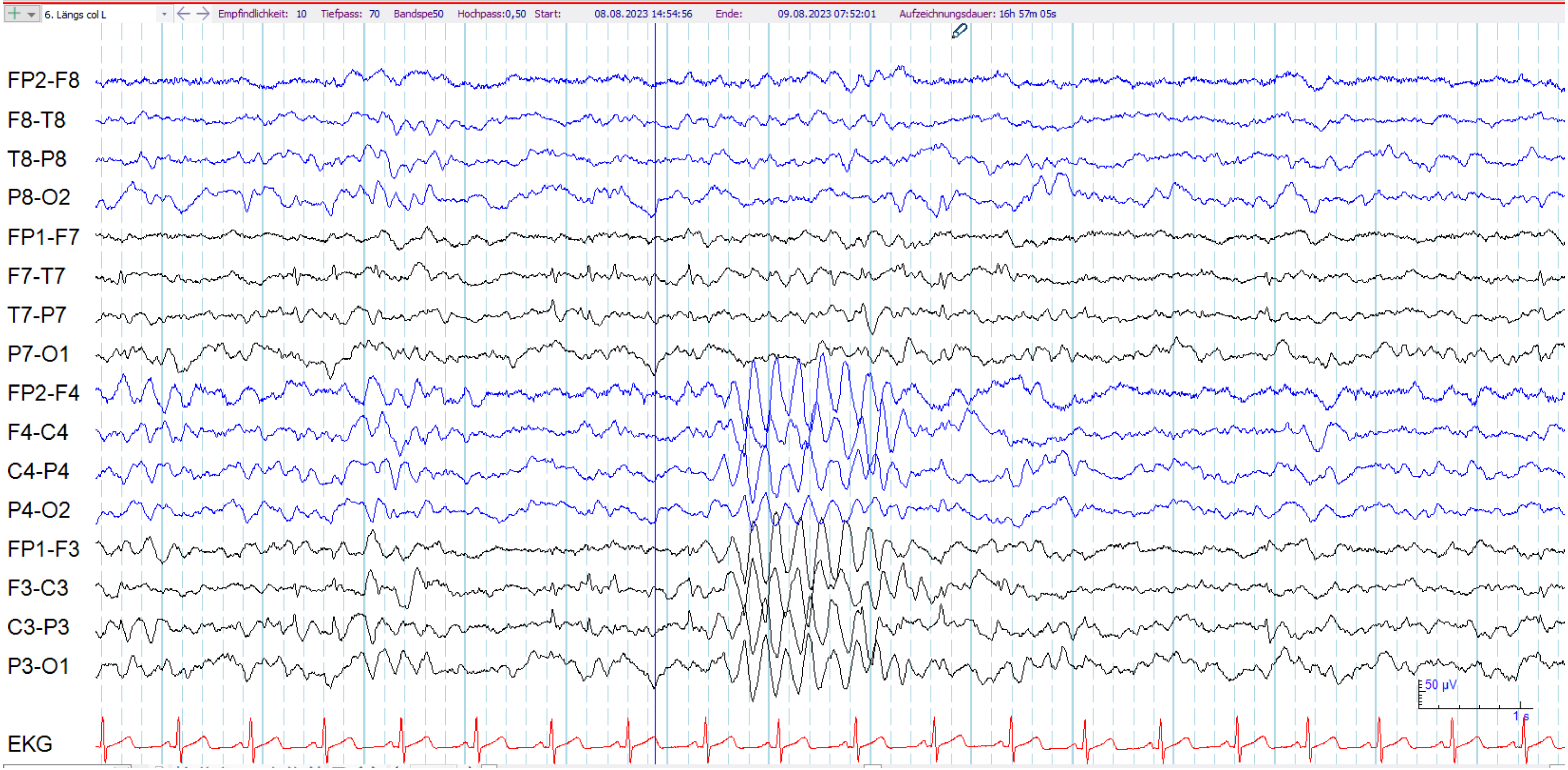
Empfindlichkeit: 19 Tiefpass: 70 Bandspe50 Hochpass: 1 Start: 06.05.2020 10:57:43 Ende: 09.05.2020 09:05:00 Aufzeichnungsdauer: 2 Tage 22h 07m 16s

FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
FZ-CZ
CZ-PZ
EKG
100 µV
1 s
153 150 149 147 153 152 150 152 150 152 152 150 150 153 152 150 150 146 143 146 142 144 139 143 139 144 146 147 147 149 149 149 150 150 153

Posteriore Rhythmen



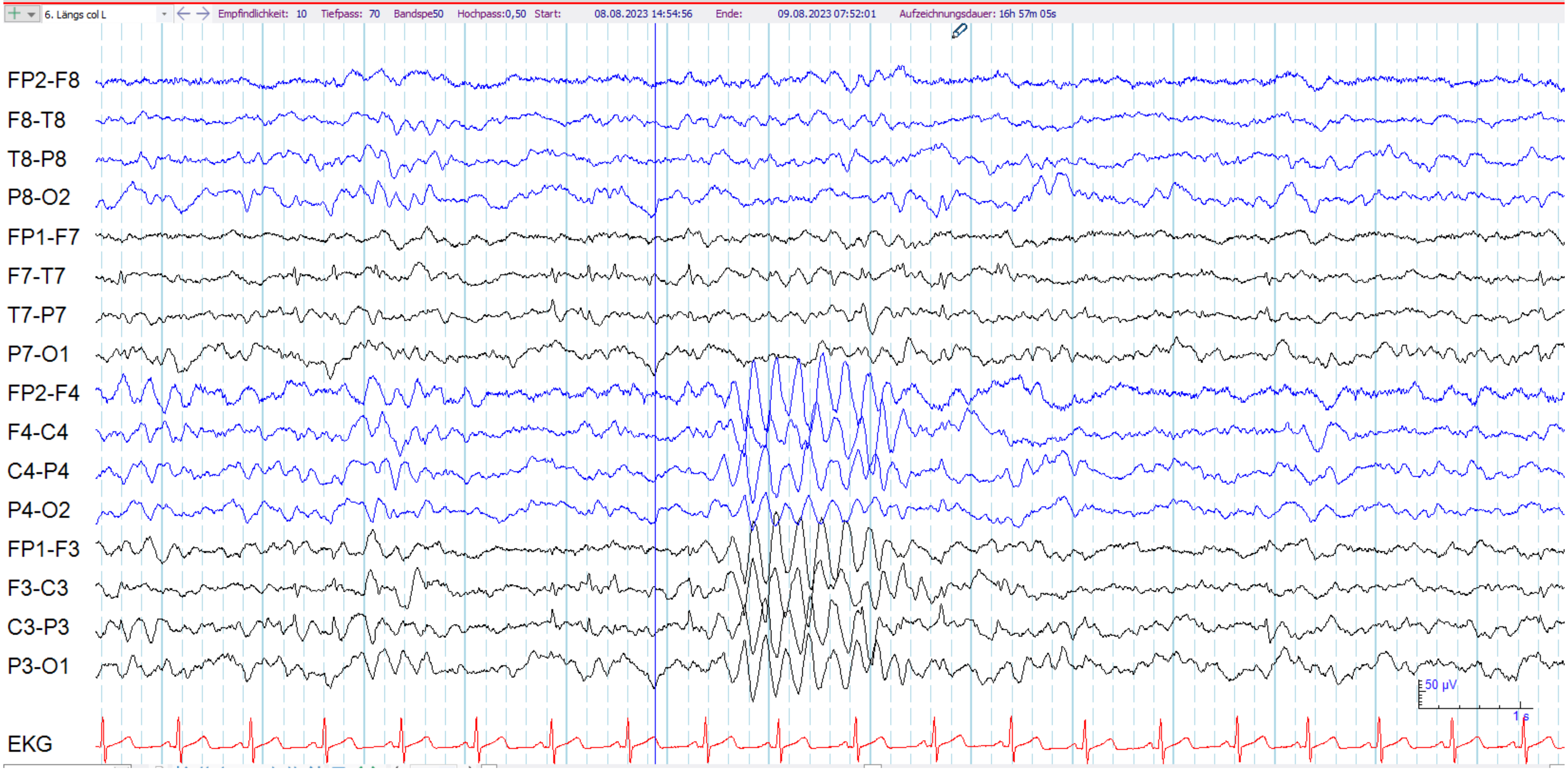
Epileptiforme Muster?



6. Längs col L
Empfindlichkeit: 10 Tiefpass: 70 Bandspe50 Hochpass:0,50 Start: 08.08.2023 14:54:56 Ende: 09.08.2023 07:52:01 Aufzeichnungsdauer: 16h 57m 05s

FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
EKG
50 µV
1 s

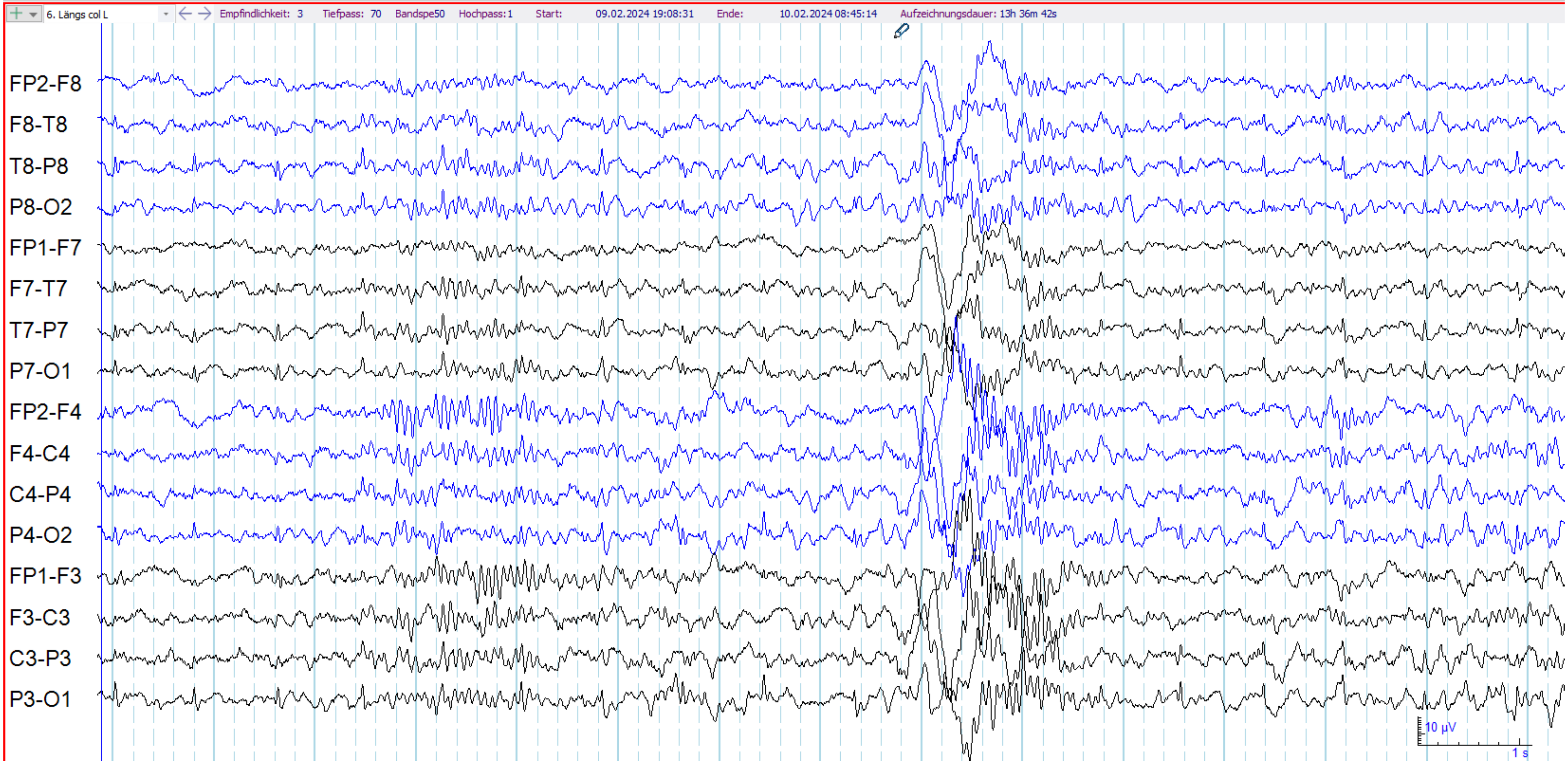
Epileptiforme Muster: Wo?



6. Längs col L — Empfindlichkeit: 10 Tiefpass: 70 Bandspe50 Hochpass:0,50 Start: 08.08.2023 14:54:56 Ende: 09.08.2023 07:52:01 Aufzeichnungsdauer: 16h 57m 05s

FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
EKG
50 µV
1 s

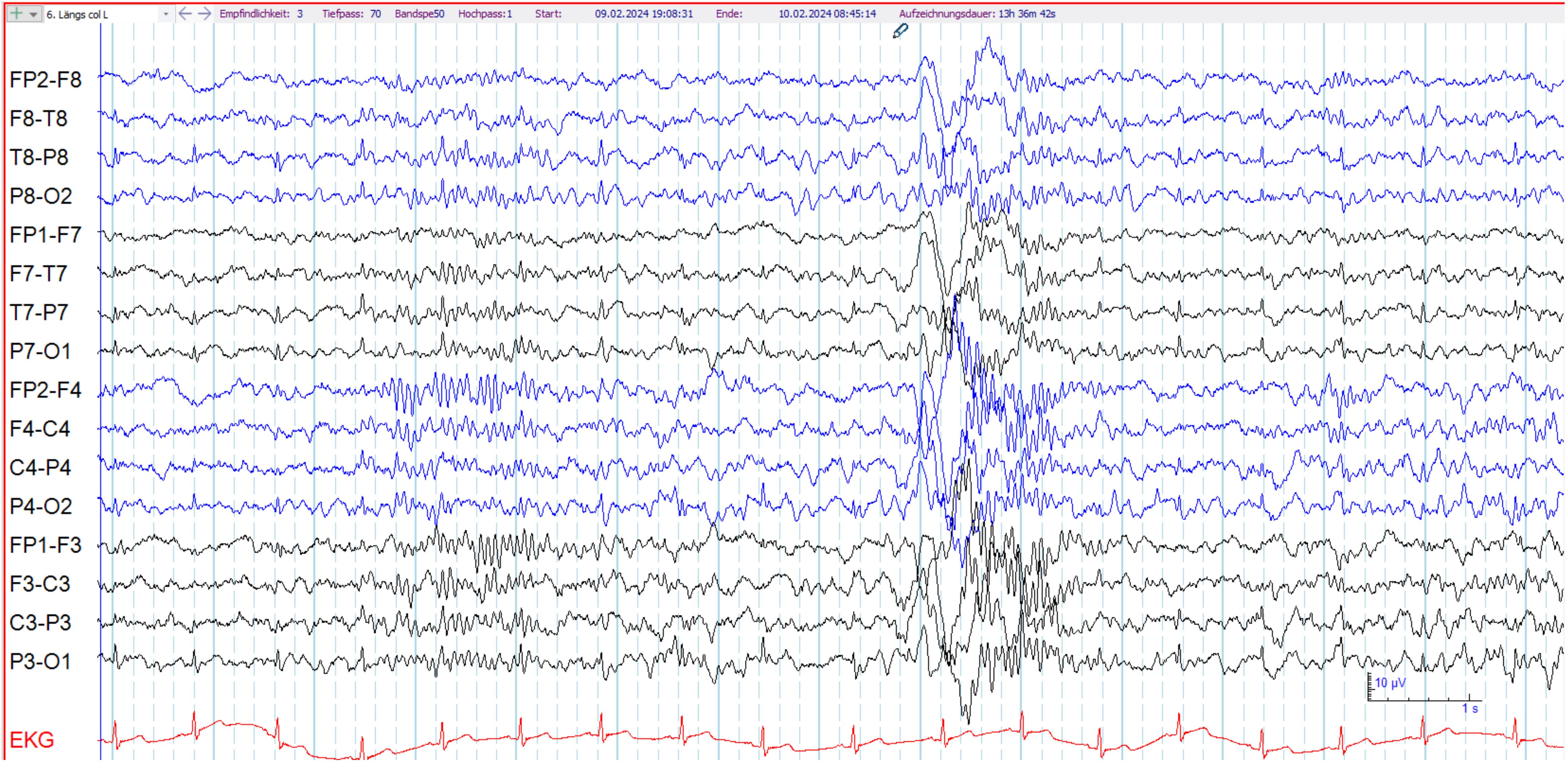
Schon wieder posterior?



6. Längs col L Empfindlichkeit: 3 Tiefpass: 70 Bandspe50 Hochpass: 1 Start: 09.02.2024 19:08:31 Ende: 10.02.2024 08:45:14 Aufzeichnungsdauer: 13h 36m 42s

FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
10 µV
1 s

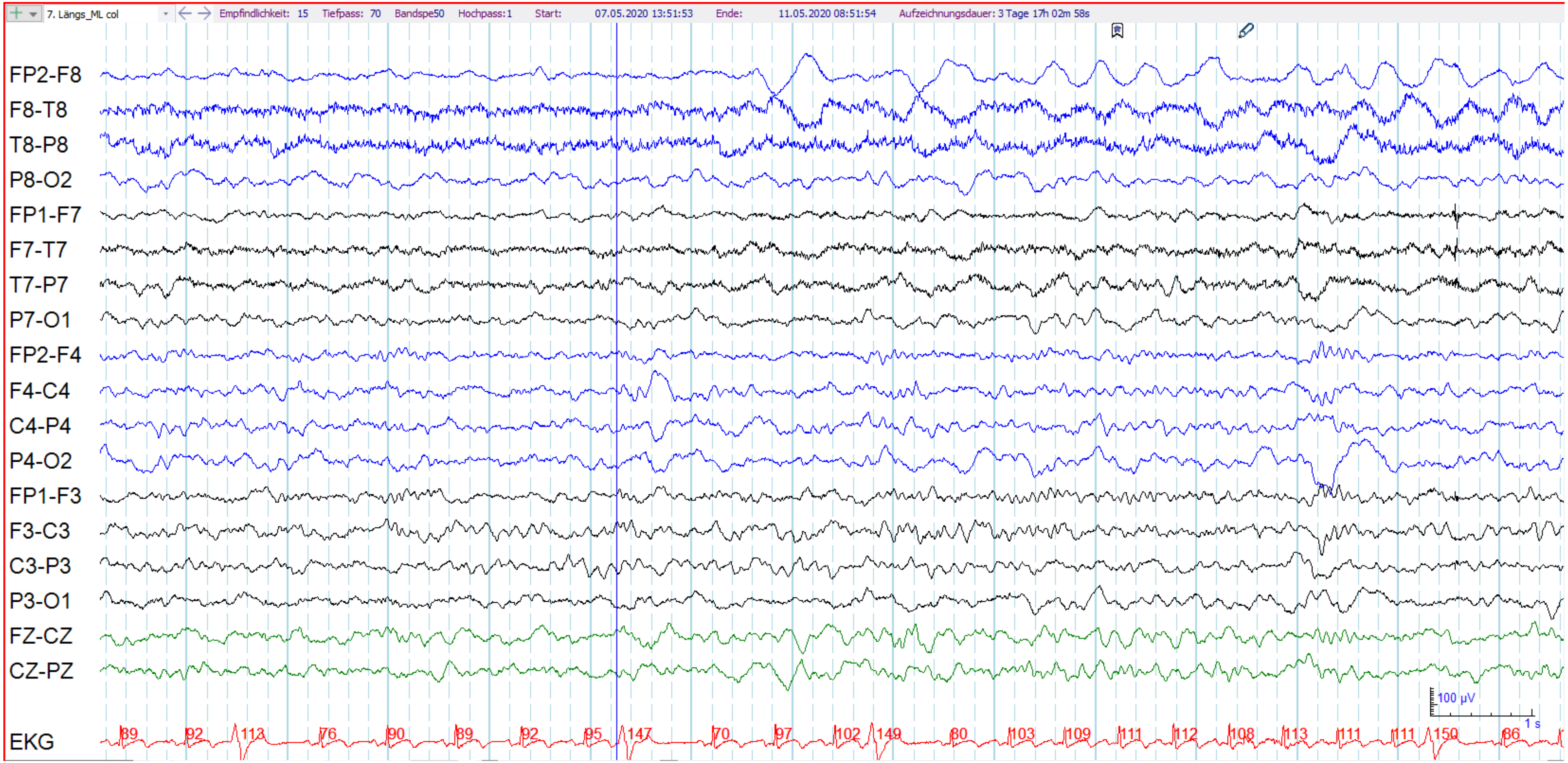
Schon wieder posterior?



6. Längs col L
Empfindlichkeit: 3 Tiefpass: 70 Bandspe50 Hochpass: 1 Start: 09.02.2024 19:08:31 Ende: 10.02.2024 08:45:14 Aufzeichnungsdauer: 13h 36m 42s

FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
EKG
10 µV
1 s

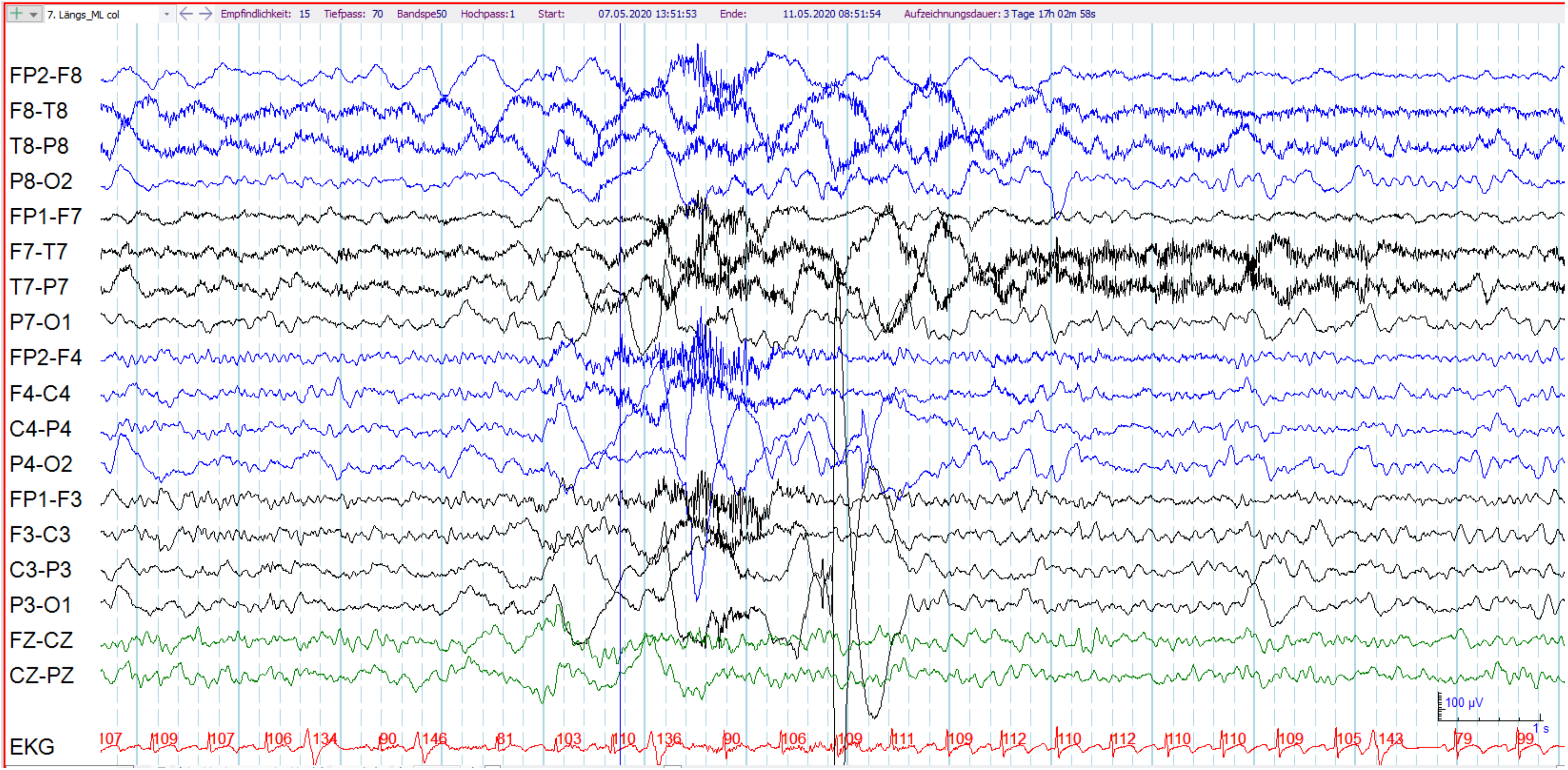
Fokale langsame Wellen



7. Längs_ML col Empfindlichkeit: 15 Tiefpass: 70 Bandspe50 Hochpass:1 Start: 07.05.2020 13:51:53 Ende: 11.05.2020 08:51:54 Aufzeichnungsdauer: 3 Tage 17h 02m 58s

FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
FZ-CZ
CZ-PZ
EKG
89
92
113
76
90
89
92
95
147
70
97
102
149
80
103
109
111
112
108
113
111
111
150
86
100 µV
1 s

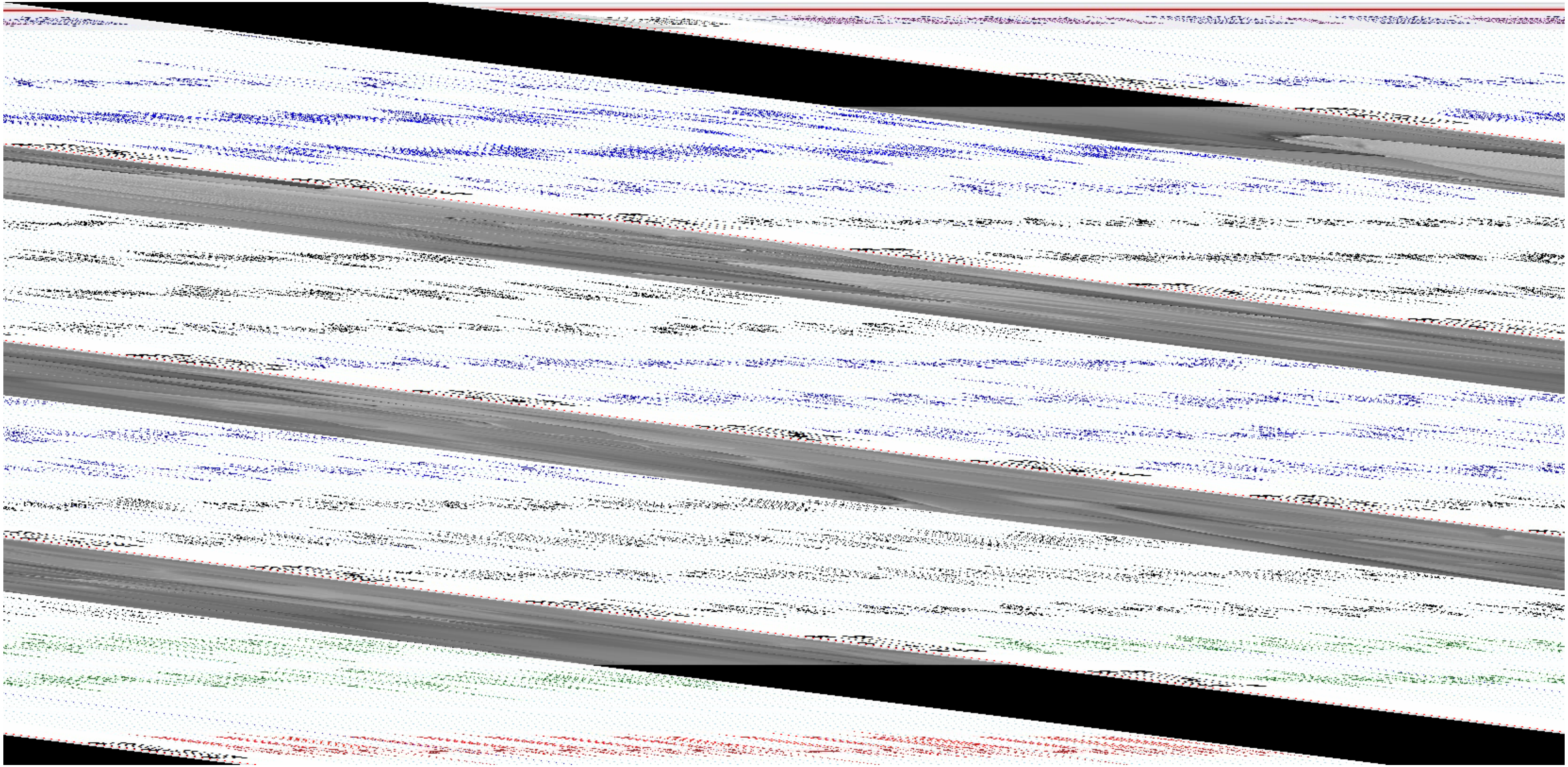
Fokale langsame Wellen



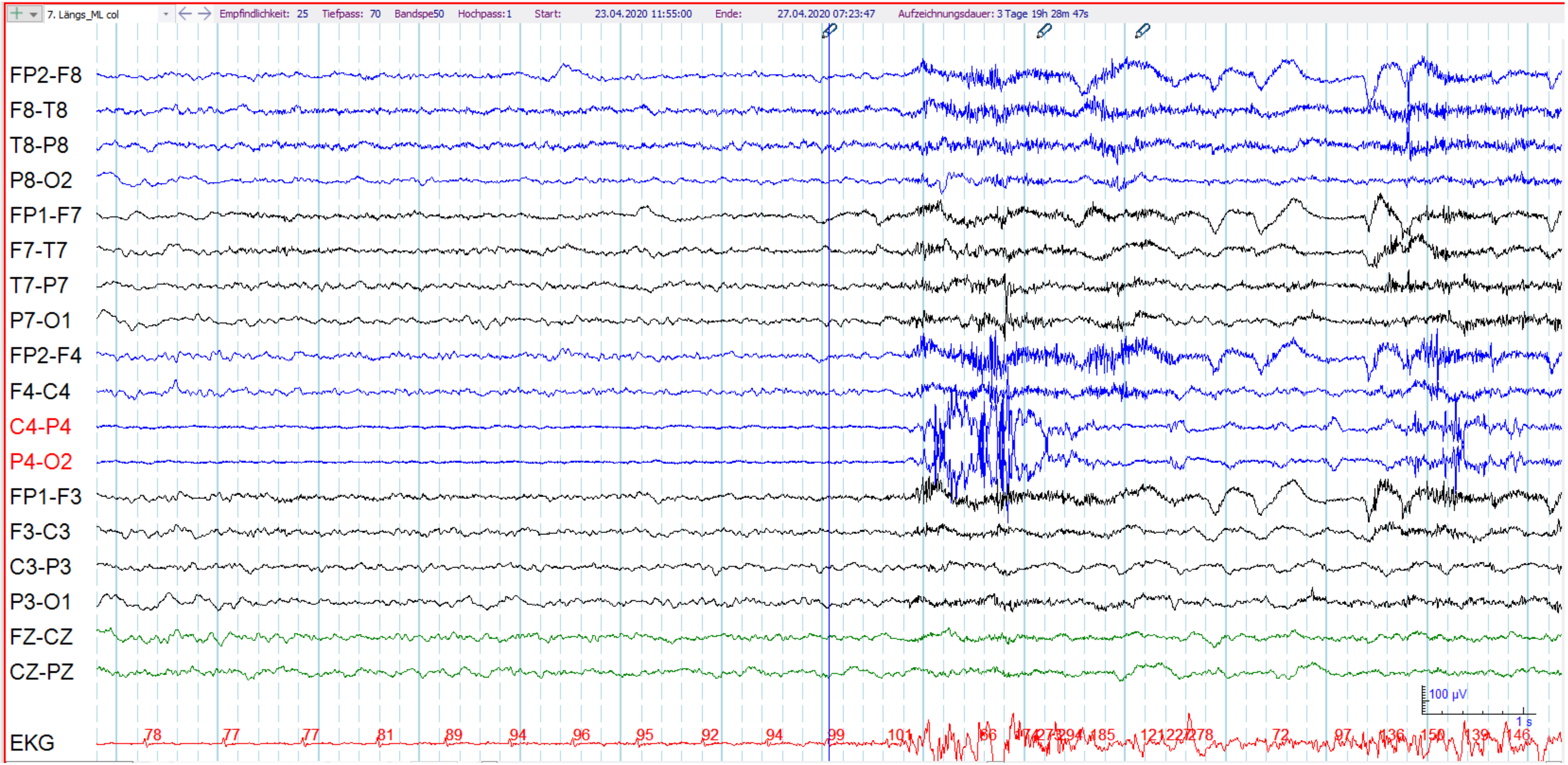
7. Längs_ML col Empfindlichkeit: 15 Tiefpass: 70 Bandspe50 Hochpass: 1 Start: 07.05.2020 13:51:53 Ende: 11.05.2020 08:51:54 Aufzeichnungsdauer: 3 Tage 17h 02m 58s

FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
FZ-CZ
CZ-PZ
EKG
100 µV
1 s
107 109 107 106 134 90 146 81 103 110 136 90 106 109 111 109 112 110 112 110 110 109 105 143 79 99

Glossokinetisches Artefakt



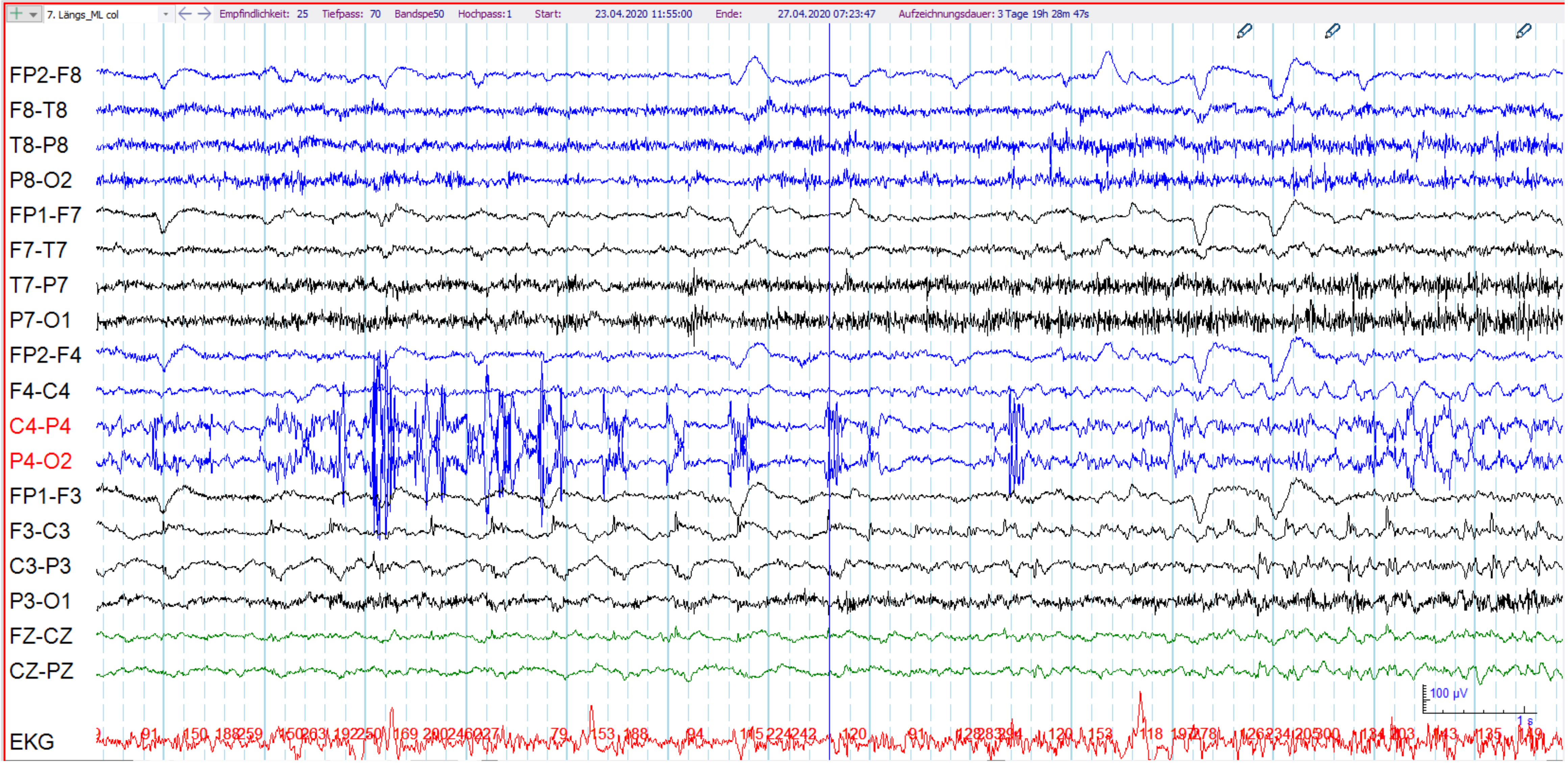
Delta-Wellen?



7. Längs_ML col Empfindlichkeit: 25 Tiefpass: 70 Bandspe50 Hochpass: 1 Start: 23.04.2020 11:55:00 Ende: 27.04.2020 07:23:47 Aufzeichnungsdauer: 3 Tage 19h 28m 47s

FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
FZ-CZ
CZ-PZ
EKG
100 µV
1 s
78
77
77
81
89
94
96
95
92
94
99
101
72
97

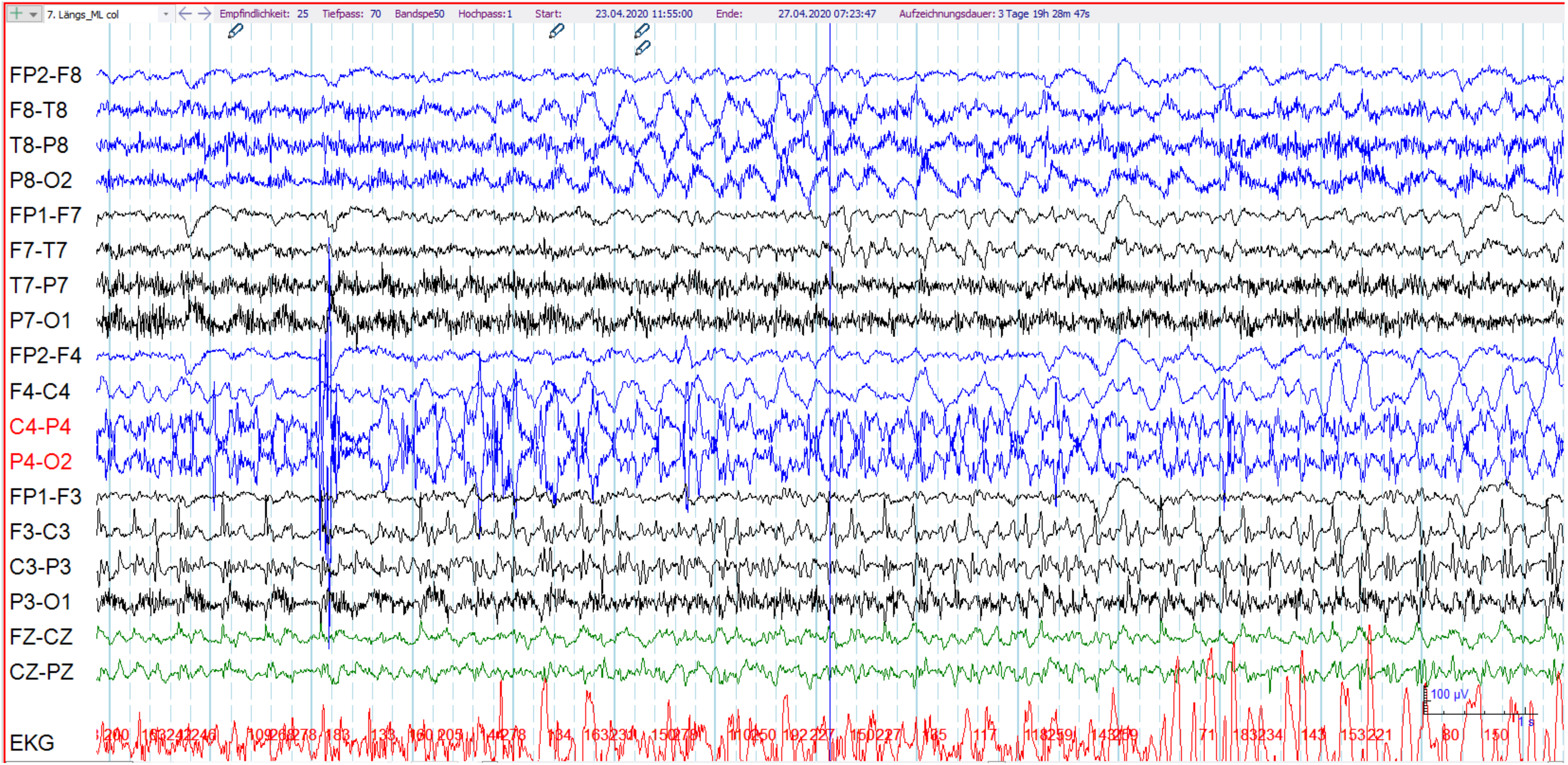
Delta-Wellen + Artefakte



7. Längs_ML col Empfindlichkeit: 25 Tiefpass: 70 Bandspe50 Hochpass: 1 Start: 23.04.2020 11:55:00 Ende: 27.04.2020 07:23:47 Aufzeichnungsdauer: 3 Tage 19h 28m 47s

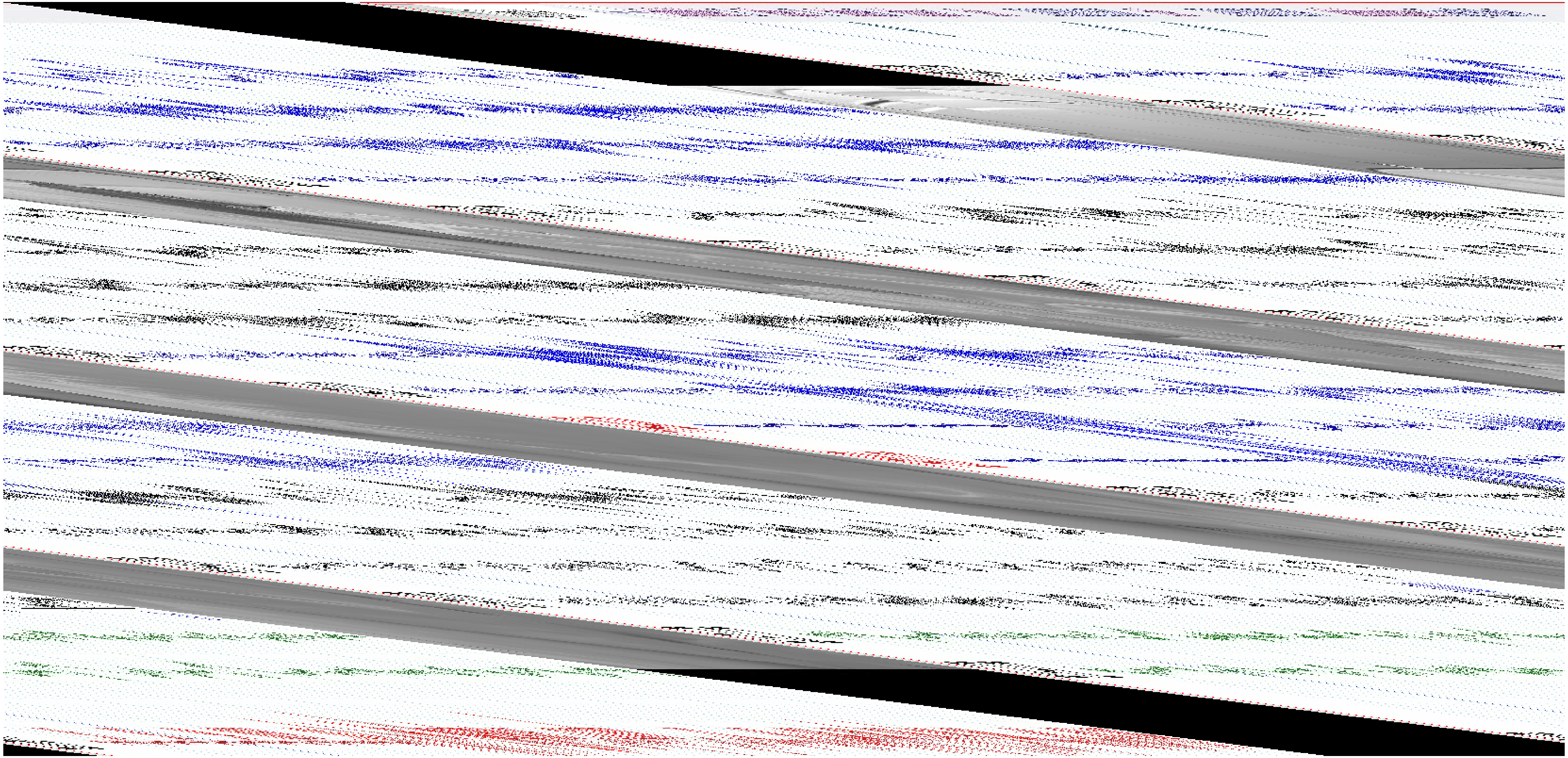
FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
FZ-CZ
CZ-PZ
EKG
100 µV
1 s

Delta-Wellen + Artefakte

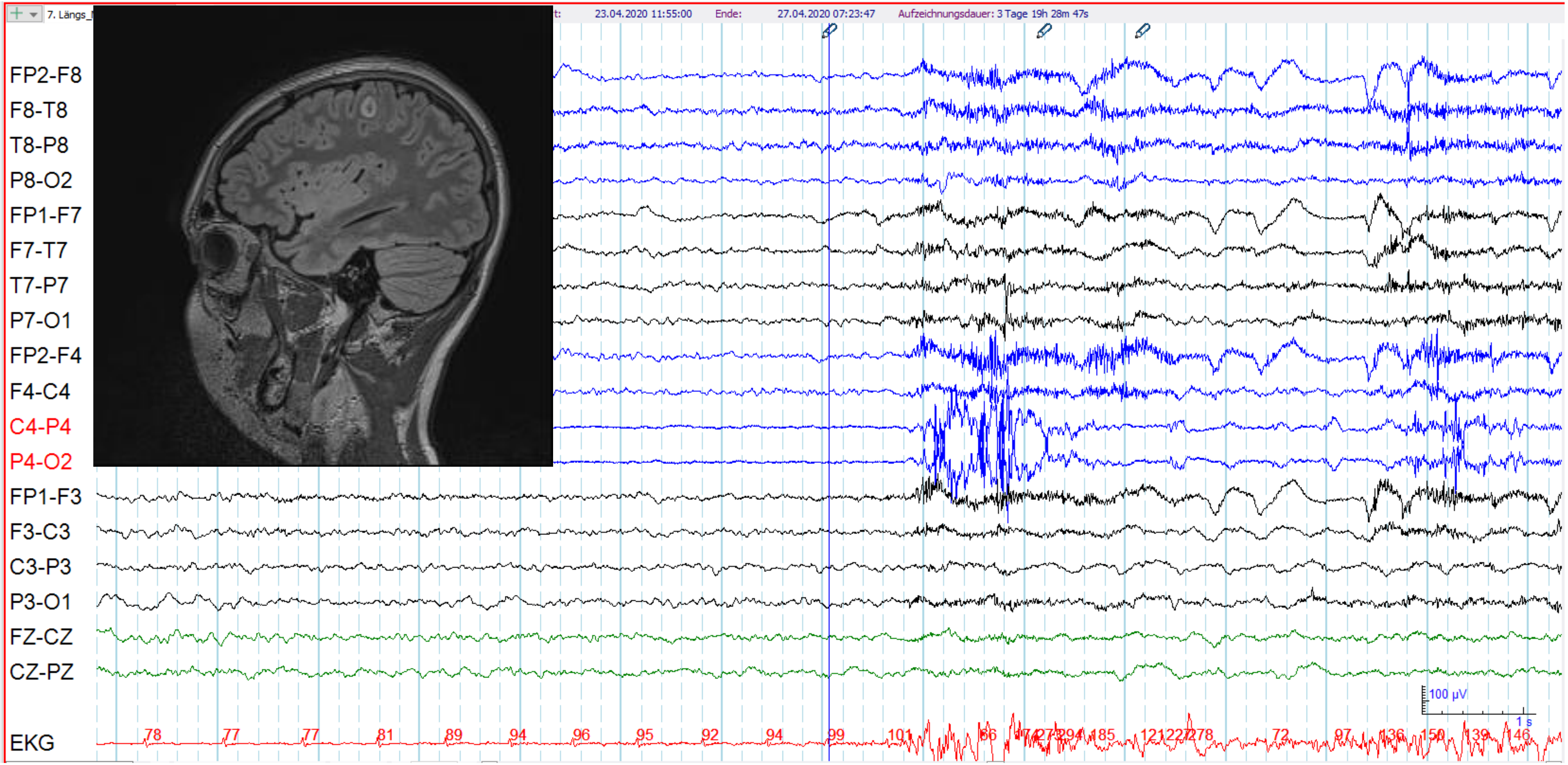

7. Längs_ML col
Empfindlichkeit: 25 Tiefpass: 70 Bandspe50 Hochpass: 1 Start: 23.04.2020 11:55:00 Ende: 27.04.2020 07:23:47 Aufzeichnungsdauer: 3 Tage 19h 28m 47s

FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
FZ-CZ
CZ-PZ
EKG
100 µV
1 s

Anfallsmuster links zentral



Delta-Wellen?



7. Längs_

t: 23.04.2020 11:55:00 Ende: 27.04.2020 07:23:47 Aufzeichnungsdauer: 3 Tage 19h 28m 47s

FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
FZ-CZ
CZ-PZ
EKG
100 µV
1 s

REVIEW ARTICLES

EEG of Partial Seizures

Amit Verma and Rodney Radtke†*

The EEG in Selected Generalized Seizures

Richard A. Hrachovy‡ and James D. Frost Jr.*†*

The EEG in Nonepileptic Seizures

Selim R. Benbadis

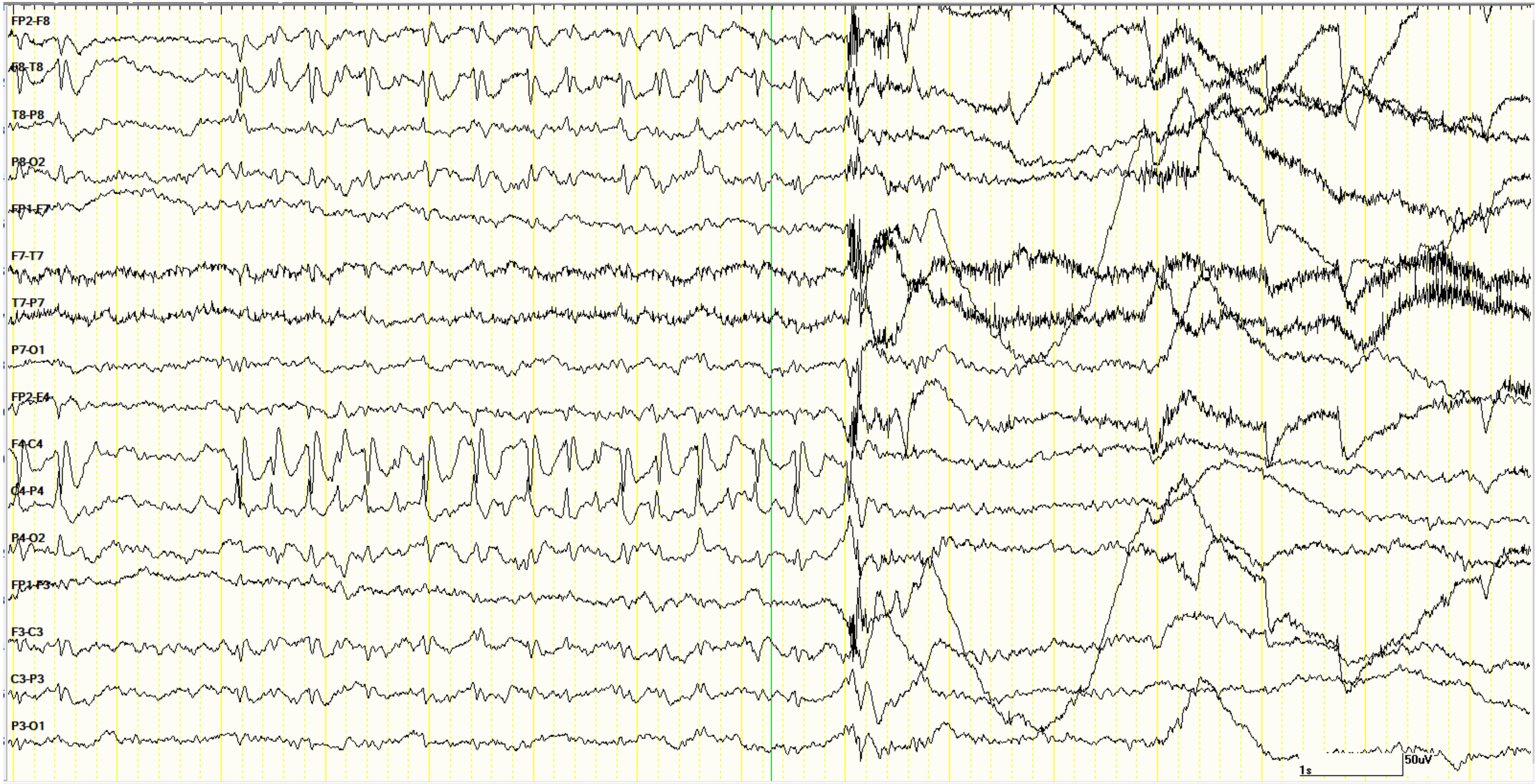
J Clin Neurophysiol 2006;23

Fokale Anfallsmuster

- Abbruch interiktaler epileptiformer Muster
- Abflachung: schnelle, niedrigamplitudige Aktivität
- rhythmische Aktivität: Alpha-, Theta- oder Delta

Verma & Radtke; EEG of partial seizures; J Clin Neurophys, 2006

Abbruch interiktale Aktivität


FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
1s
50uV

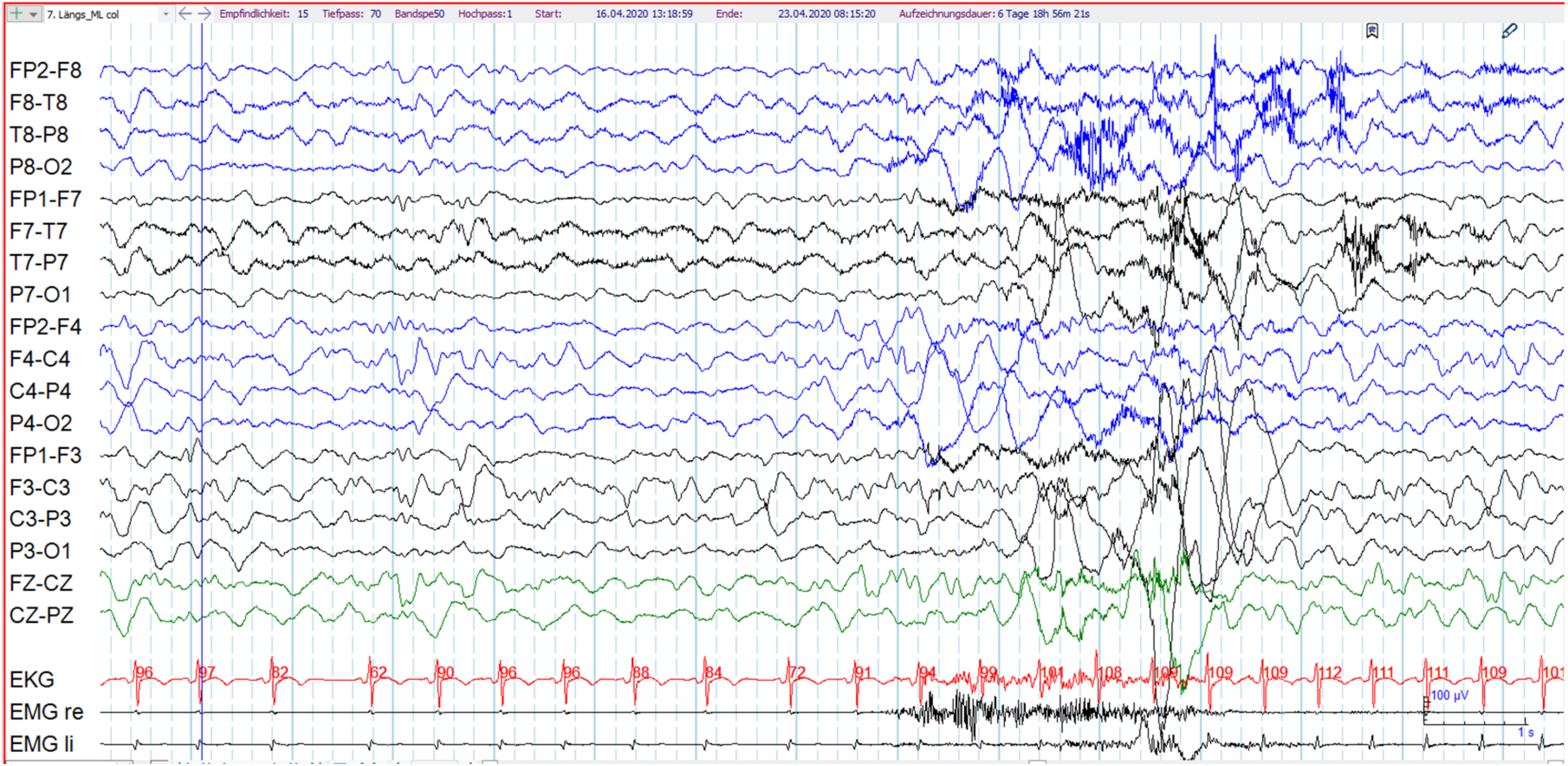
Fokale Anfallsmuster

“There is a change, and a change in the change”

- Variabel
- Beginn:
  abgrenzbare Änderung zur bestehenden Hintergrundaktivität
- Verlauf:
  Evolution in Frequenz / Amplitude / Feld
- Ende:
  abgrenzbares Ende des rhyhtmischen Musters,
  das wieder in die Hintergrundaktivität übergeht.
- Entscheidendes Merkmal: Evolution

Verma & Radtke; EEG of partial seizures; J Clin Neurophys, 2006)

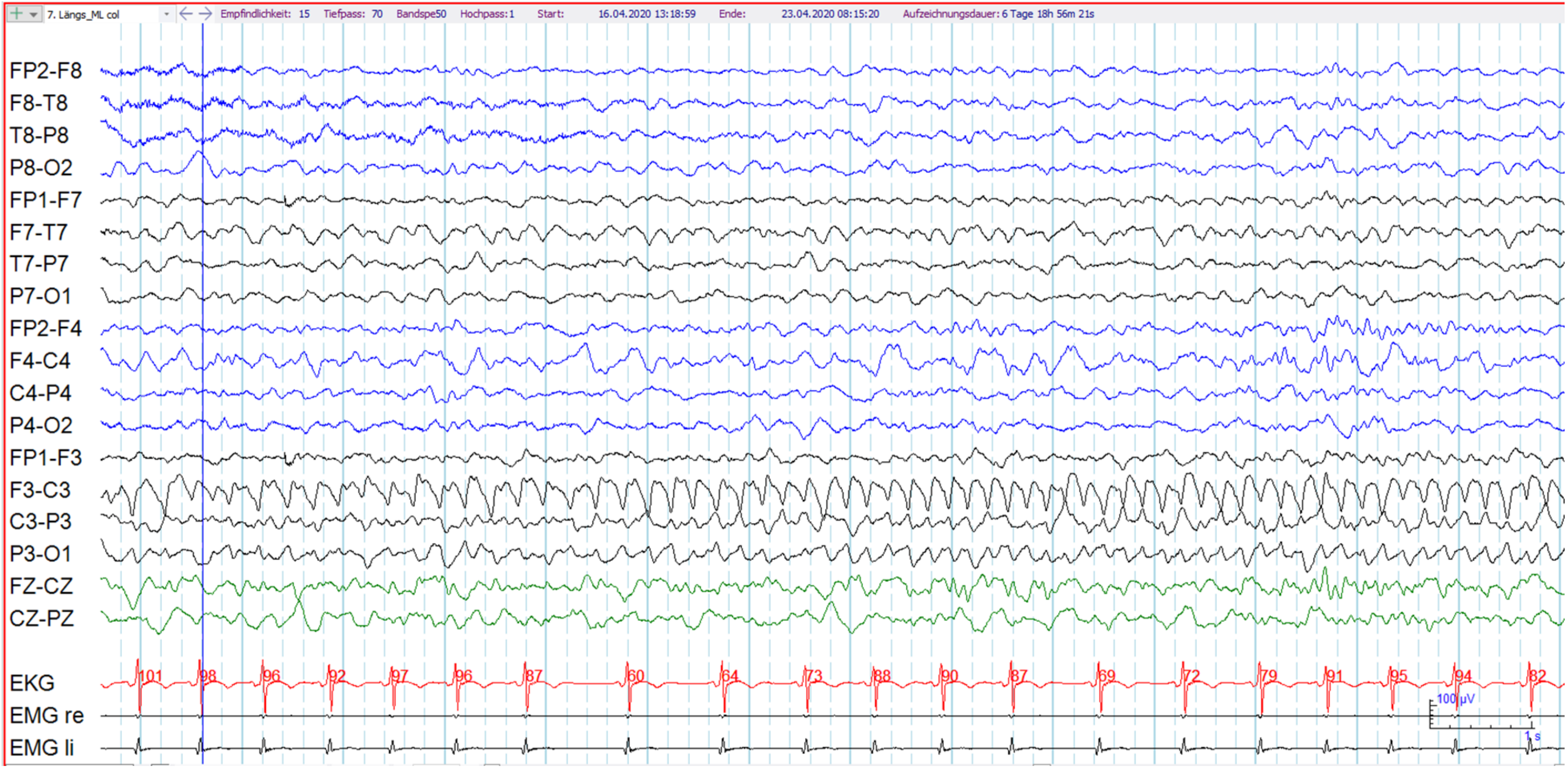
“There is a change, and a change in the change”



7. Längs_ML col Empfindlichkeit: 15 Tiefpass: 70 Bandspe50 Hochpass: 1 Start: 16.04.2020 13:18:59 Ende: 23.04.2020 08:15:20 Aufzeichnungsdauer: 6 Tage 18h 56m 21s

FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
FZ-CZ
CZ-PZ
EKG
EMG re
EMG li
96 97 82 62 90 96 96 88 84 72 91 94 99 101 108 109 109 109 112 111 111 109 101
100 µV
1 s

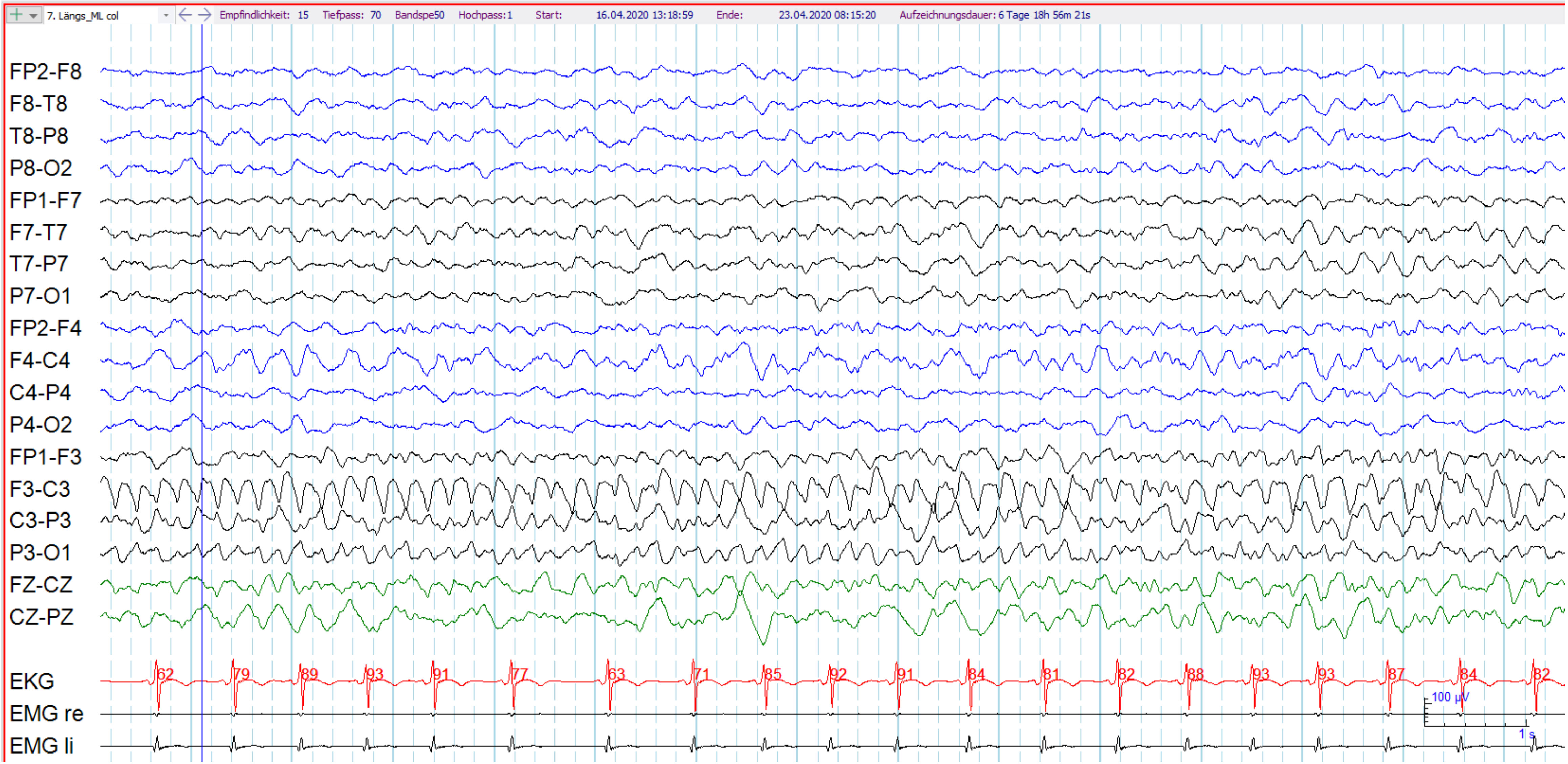
abgrenzbare Änderung zur bestehenden Hintergrundaktivität



7. Längs_ML col Empfindlichkeit: 15 Tiefpass: 70 Bandspe50 Hochpass:1 Start: 16.04.2020 13:18:59 Ende: 23.04.2020 08:15:20 Aufzeichnungsdauer: 6 Tage 18h 56m 21s

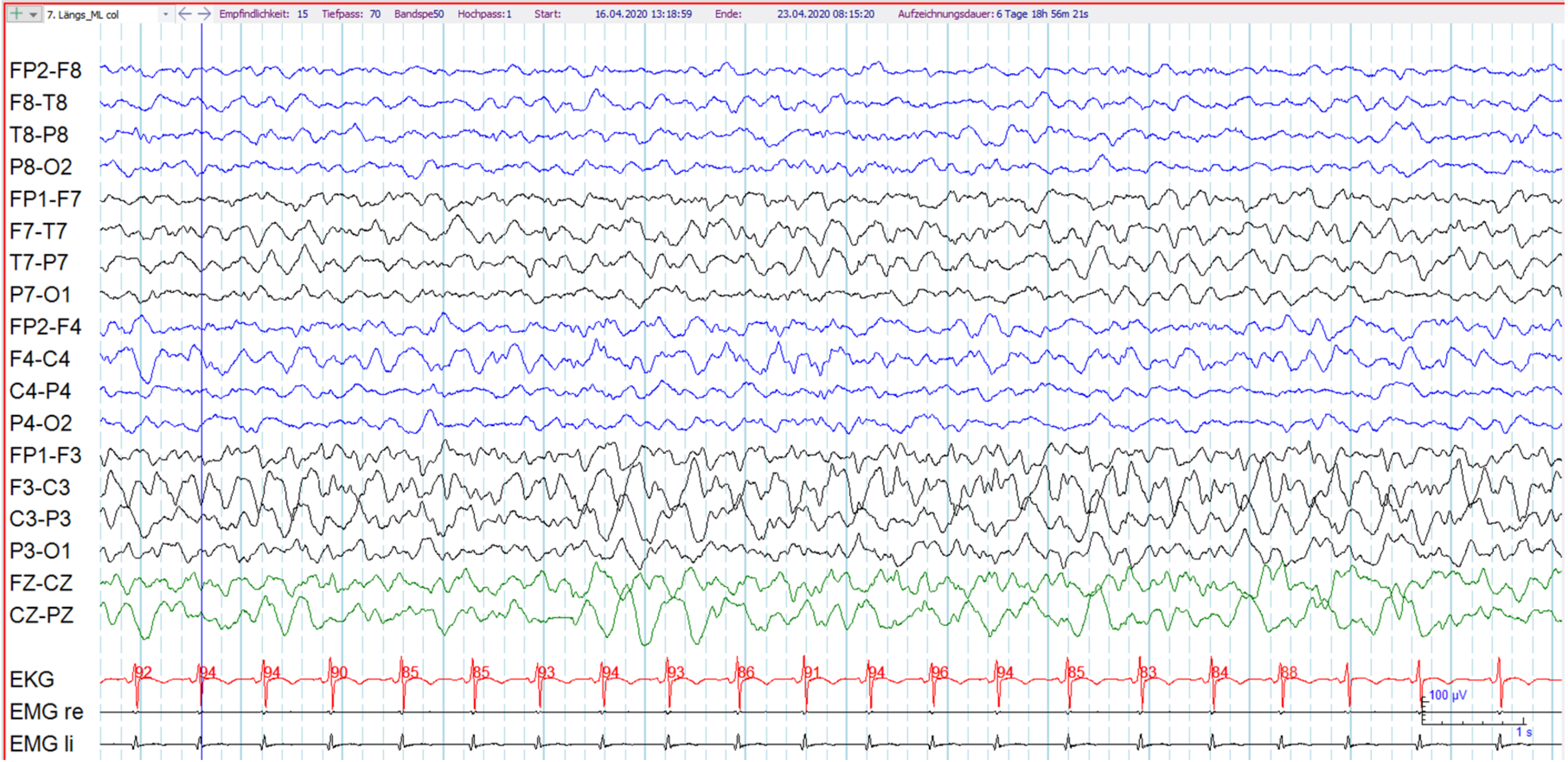
FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
FZ-CZ
CZ-PZ
EKG
EMG re
EMG li
101
98
96
92
97
96
87
60
64
73
88
90
87
69
72
79
91
95
94
82
100 µV
1 s

“There is a change, and a change in the change”


7. Längs_ML col Empfindlichkeit: 15 Tiefpass: 70 Bandspe50 Hochpass: 1 Start: 16.04.2020 13:18:59 Ende: 23.04.2020 08:15:20 Aufzeichnungsdauer: 6 Tage 18h 56m 21s

FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
FZ-CZ
CZ-PZ
EKG
EMG re
EMG li
62
79
89
93
91
77
63
71
85
92
91
84
81
82
88
93
93
87
84
82
100 µV
1 s

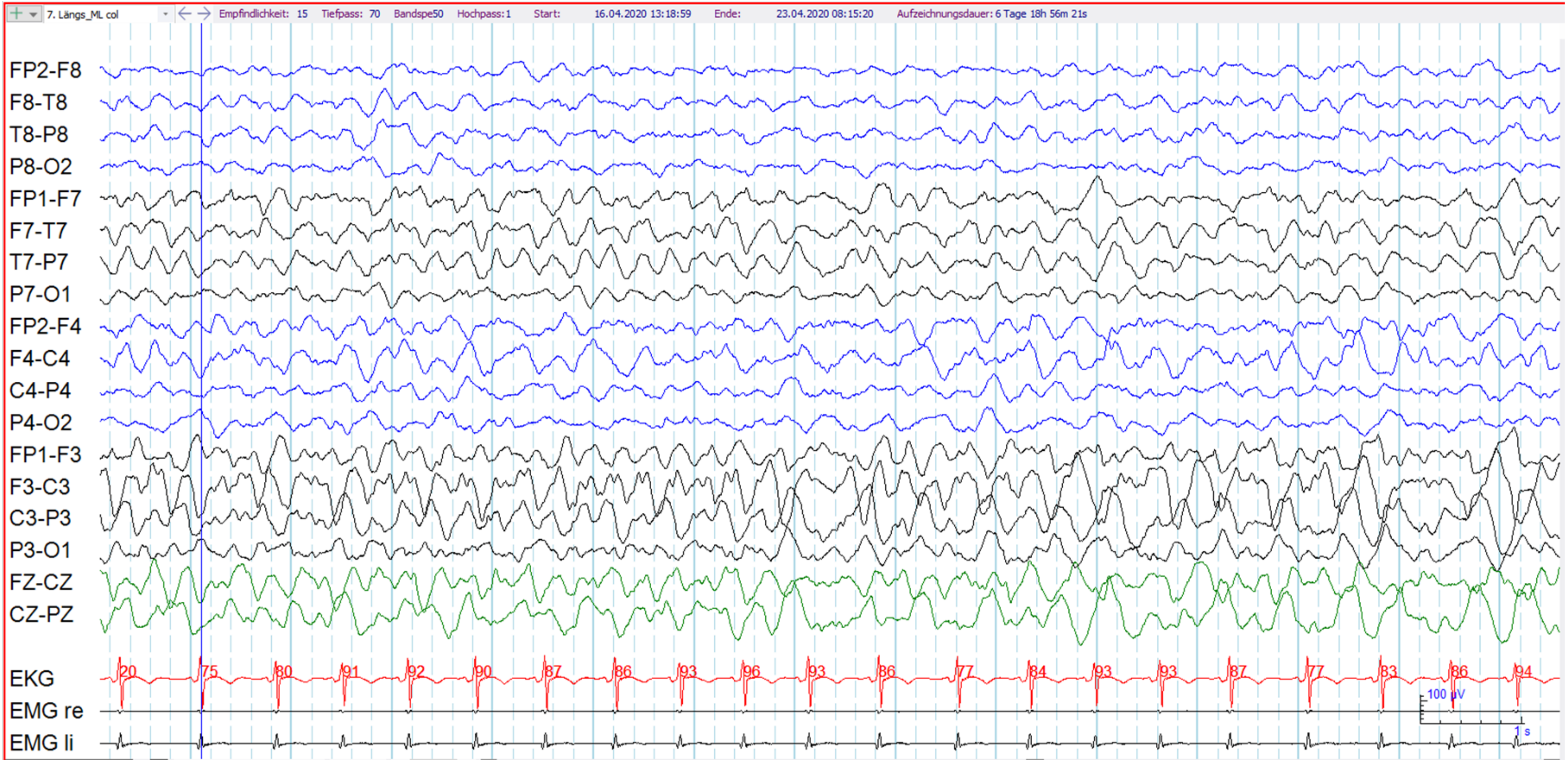
Evolution in Frequenz / Amplitude / Feld



7. Längs_ML col Empfindlichkeit: 15 Tiefpass: 70 Bandspe50 Hochpass: 1 Start: 16.04.2020 13:18:59 Ende: 23.04.2020 08:15:20 Aufzeichnungsdauer: 6 Tage 18h 56m 21s

FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
FZ-CZ
CZ-PZ
EKG
EMG re
EMG li
92
94
94
90
85
85
93
94
93
86
91
94
96
94
85
83
84
88
100 µV
1 s

“There is a change, and a change in the change”

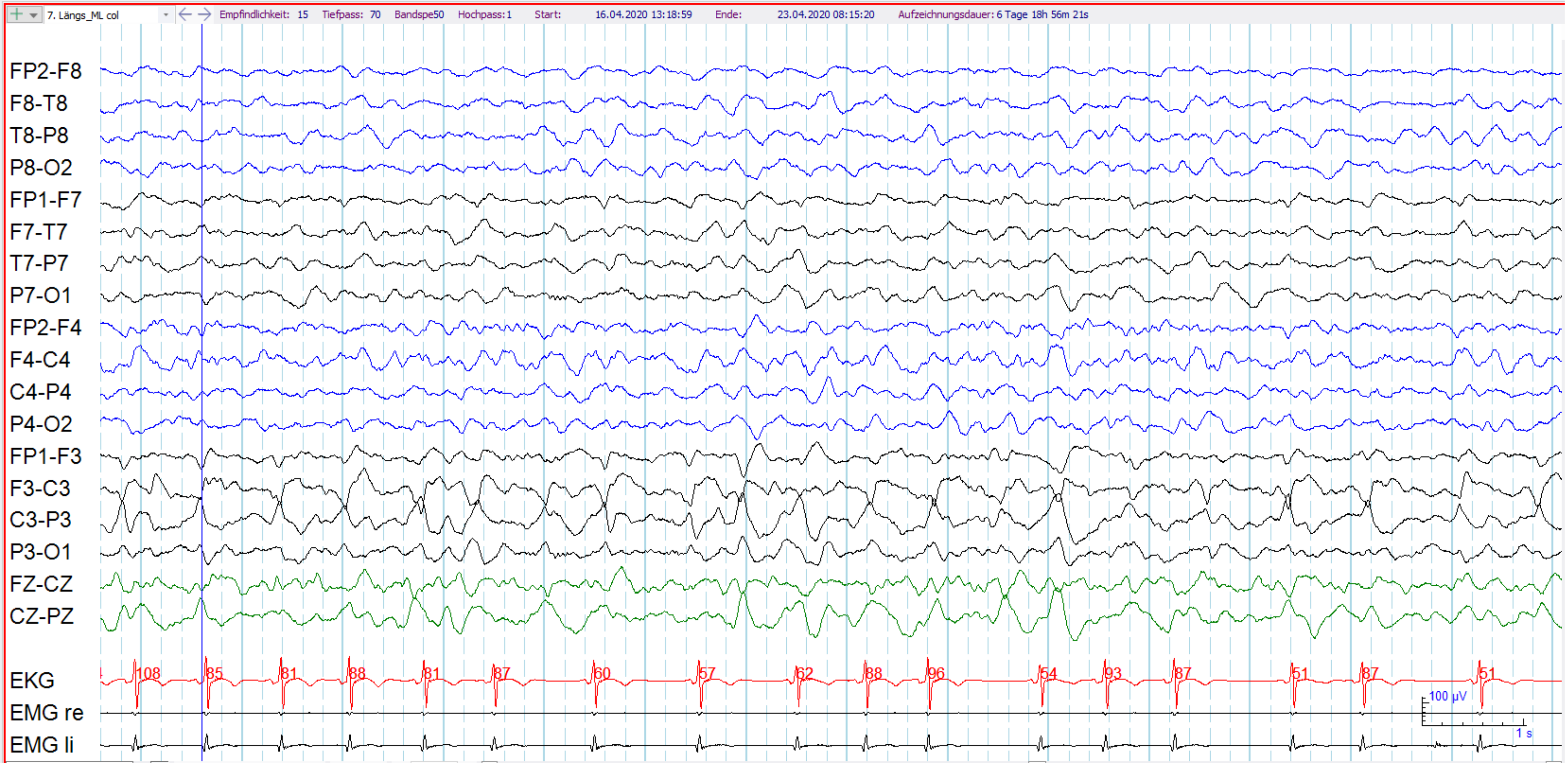


7. Längs_ML col

Empfindlichkeit: 15 Tiefpass: 70 Bandspe50 Hochpass: 1 Start: 16.04.2020 13:18:59 Ende: 23.04.2020 08:15:20 Aufzeichnungsdauer: 6 Tage 18h 56m 21s

FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
FZ-CZ
CZ-PZ
EKG
EMG re
EMG li
20
75
80
91
92
90
87
86
93
96
93
86
77
84
93
93
87
77
83
86
94
100 µV
1 s

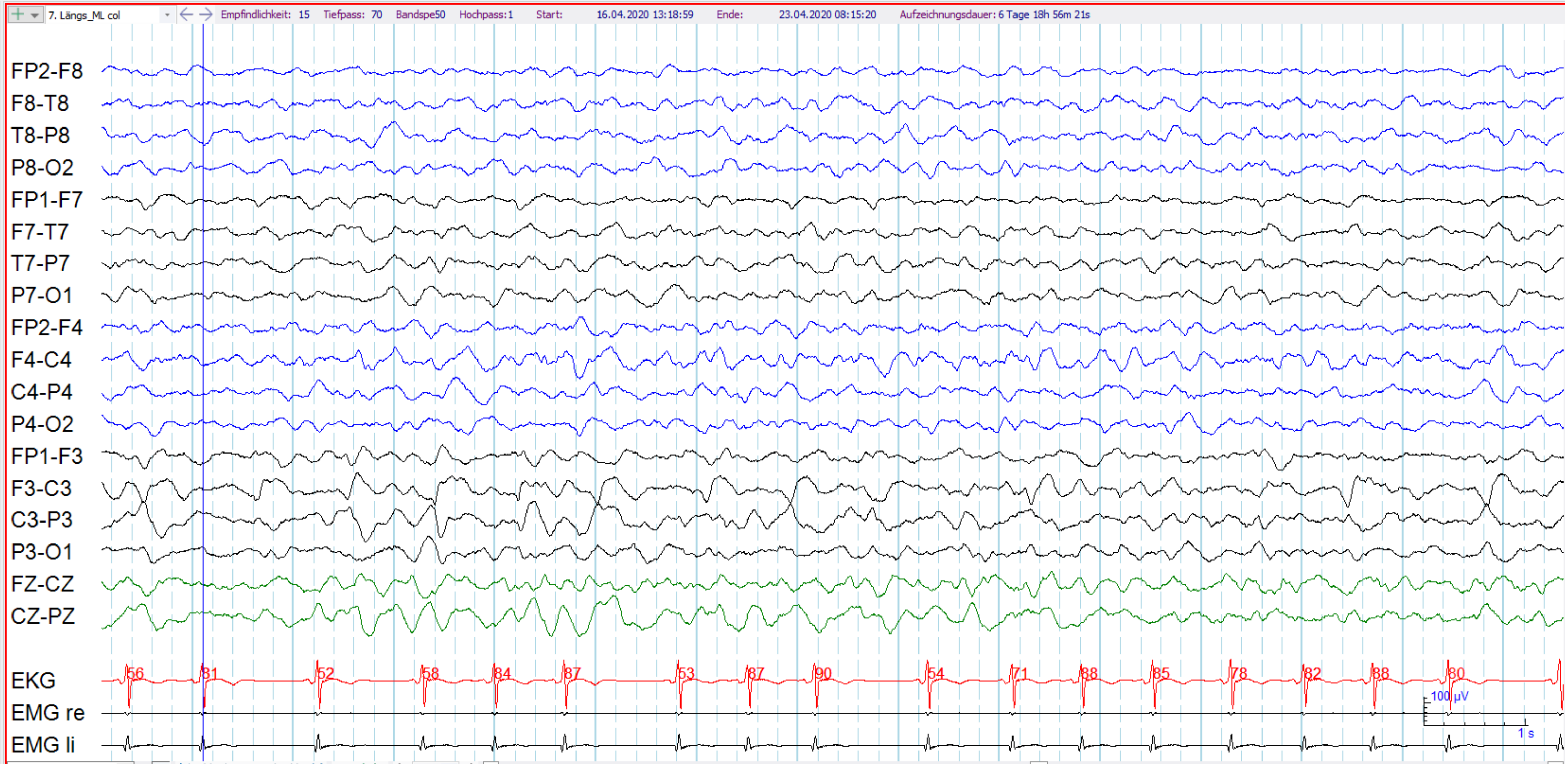
“There is a change, and a change in the change”



7. Längs_ML col Empfindlichkeit: 15 Tiefpass: 70 Bandspe50 Hochpass: 1 Start: 16.04.2020 13:18:59 Ende: 23.04.2020 08:15:20 Aufzeichnungsdauer: 6 Tage 18h 56m 21s

FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
FZ-CZ
CZ-PZ
EKG
EMG re
EMG li
108
85
81
88
81
87
60
57
62
88
96
54
93
87
51
87
51
100 µV
1 s

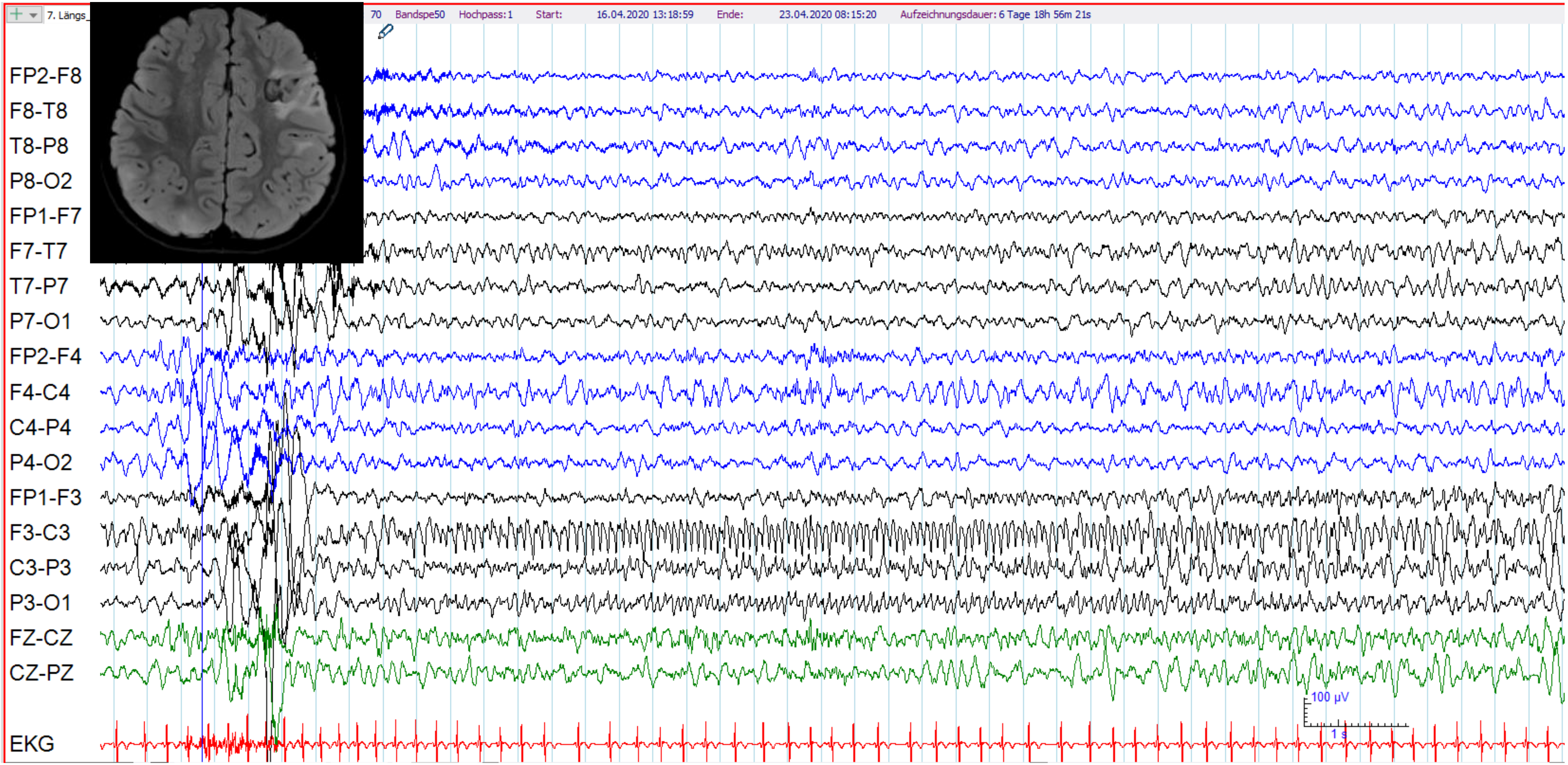
Ende abgrenzbar: Übergang in Hintergrundaktivität



7. Längs_ML col Empfindlichkeit: 15 Tiefpass: 70 Bandspe50 Hochpass:1 Start: 16.04.2020 13:18:59 Ende: 23.04.2020 08:15:20 Aufzeichnungsdauer: 6 Tage 18h 56m 21s

FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
FZ-CZ
CZ-PZ
EKG
EMG re
EMG li
56
81
52
58
84
87
53
87
90
54
71
88
85
78
82
88
80
100 µV
1 s

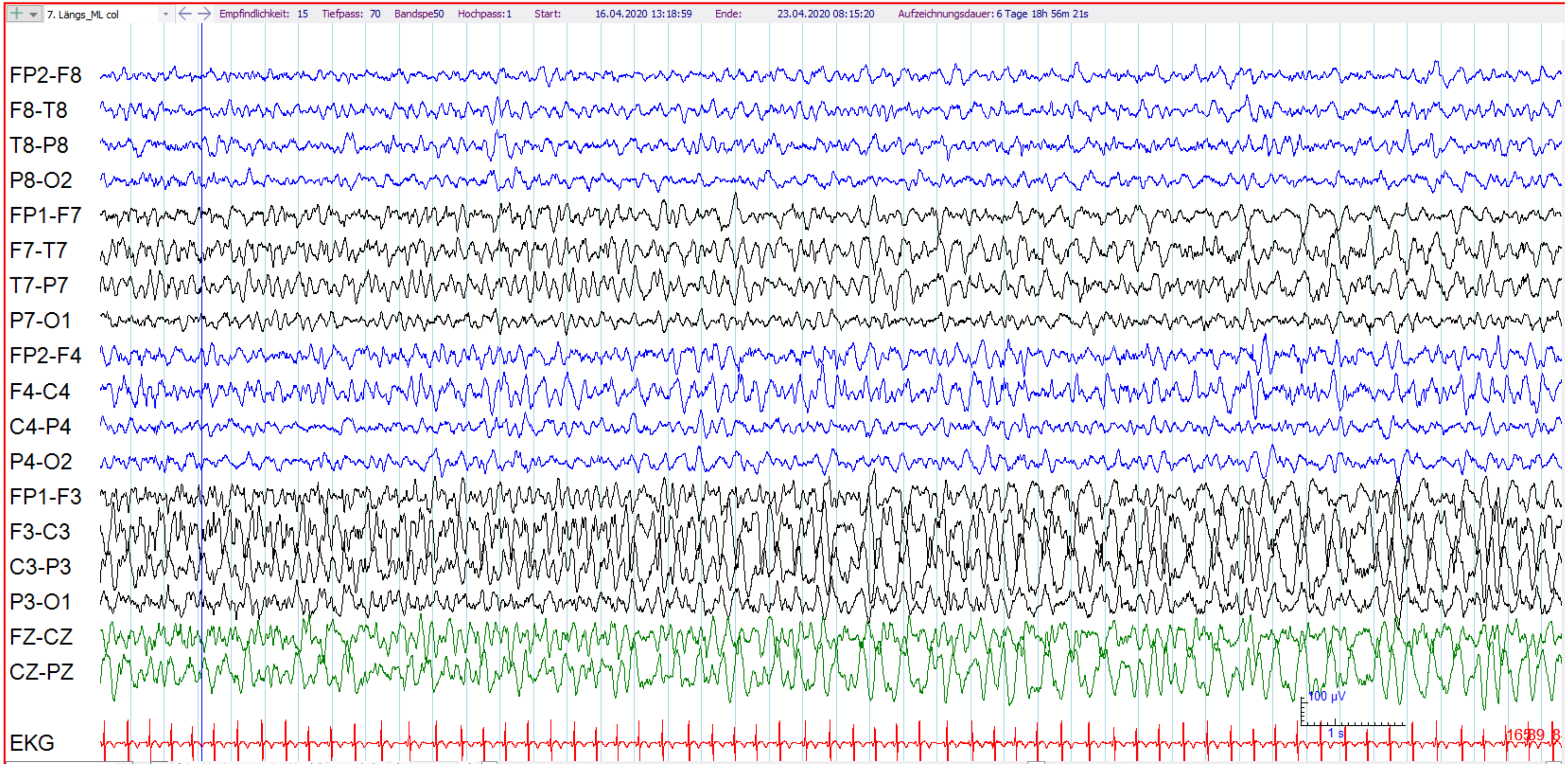
Bessere Übersicht über Dynamik durch andere Zeitachse



7. Längs_ 70 Bandspe50 Hochpass: 1 Start: 16.04.2020 13:18:59 Ende: 23.04.2020 08:15:20 Aufzeichnungsdauer: 6 Tage 18h 56m 21s

FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
FZ-CZ
CZ-PZ
EKG
100 µV
1 s

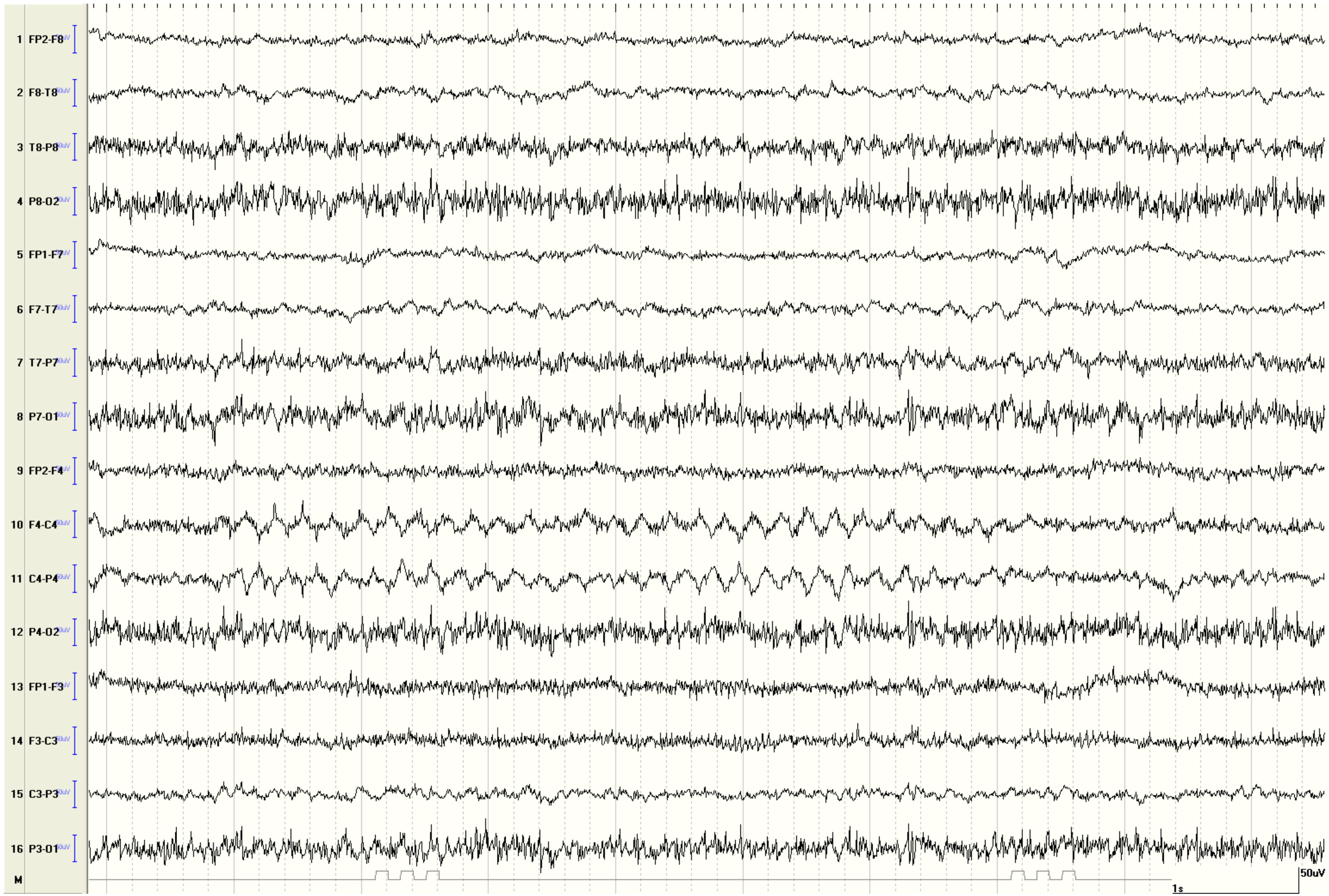
Bessere Übersicht über Dynamik durch andere Zeitachse



7. Längs_ML col
Empfindlichkeit: 15 Tiefpass: 70 Bandspe50 Hochpass: 1 Start: 16.04.2020 13:18:59 Ende: 23.04.2020 08:15:20 Aufzeichnungsdauer: 6 Tage 18h 56m 21s

FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
FZ-CZ
CZ-PZ
EKG
100 µV
1 s
16539 8

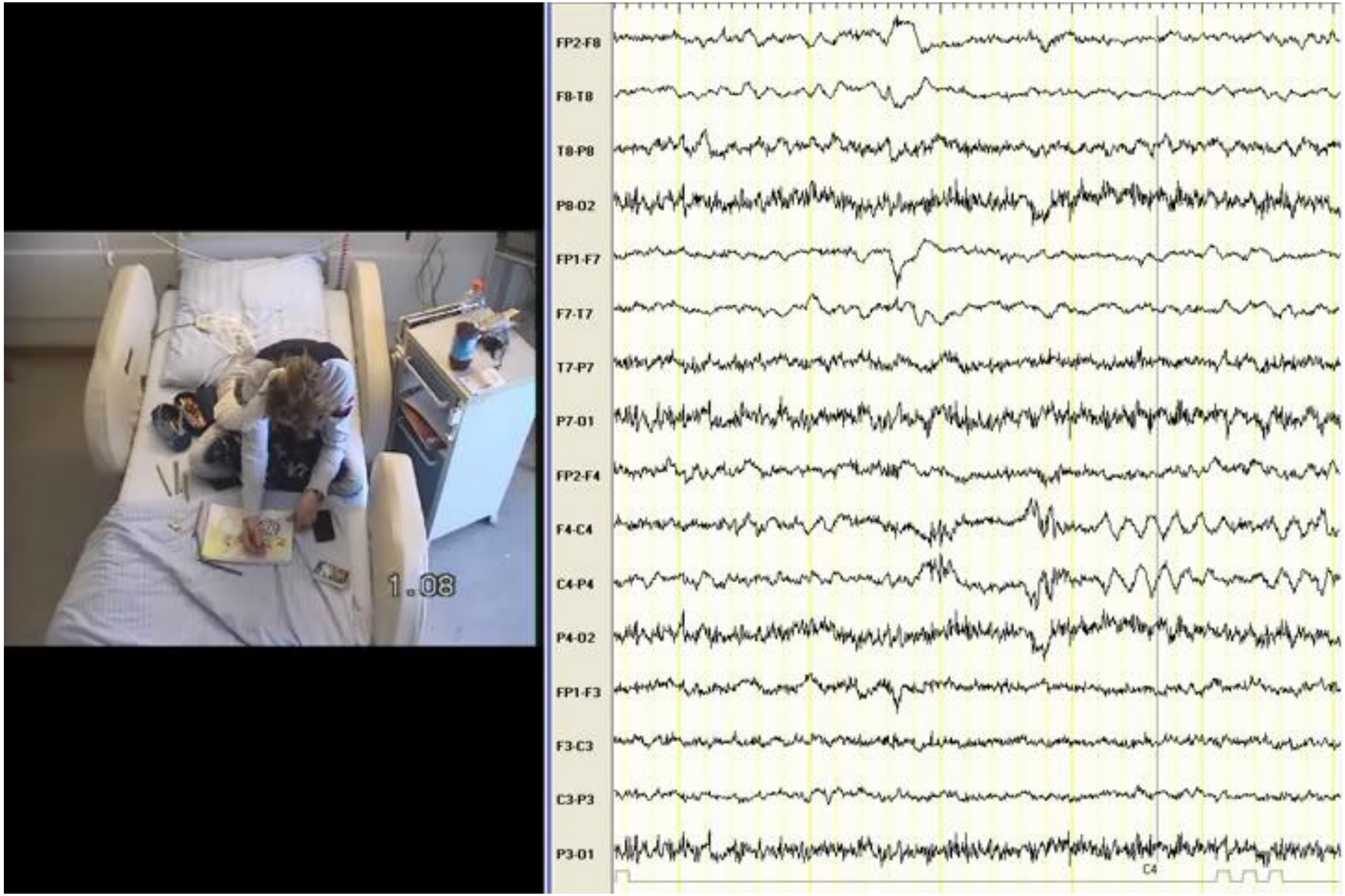
Theta-Aktivität


1 FP2-F8
2 F8-T8
3 T8-P8
4 P8-O2
5 FP1-F7
6 F7-T7
7 T7-P7
8 P7-O1
9 FP2-F4
10 F4-C4
11 C4-P4
12 P4-O2
13 FP1-F3
14 F3-C3
15 C3-P3
16 P3-O1
M
50uV
1s

Anfälle mit

- Übelkeit
- Sprachstörung

Artefakt

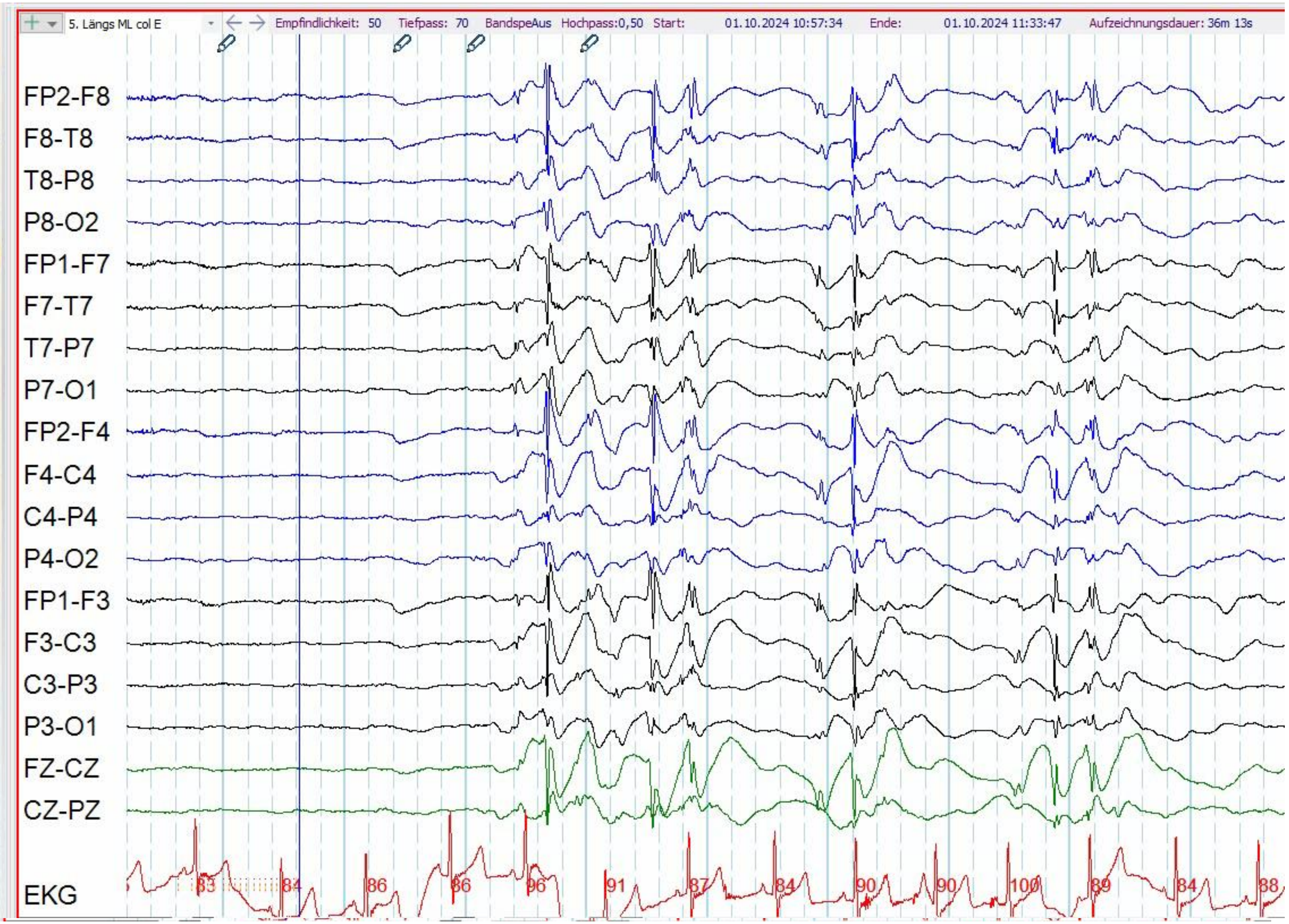

1.08
FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
C4

Anfälle mit

- Übelkeit
- Sprachstörung

Anfallsmuster

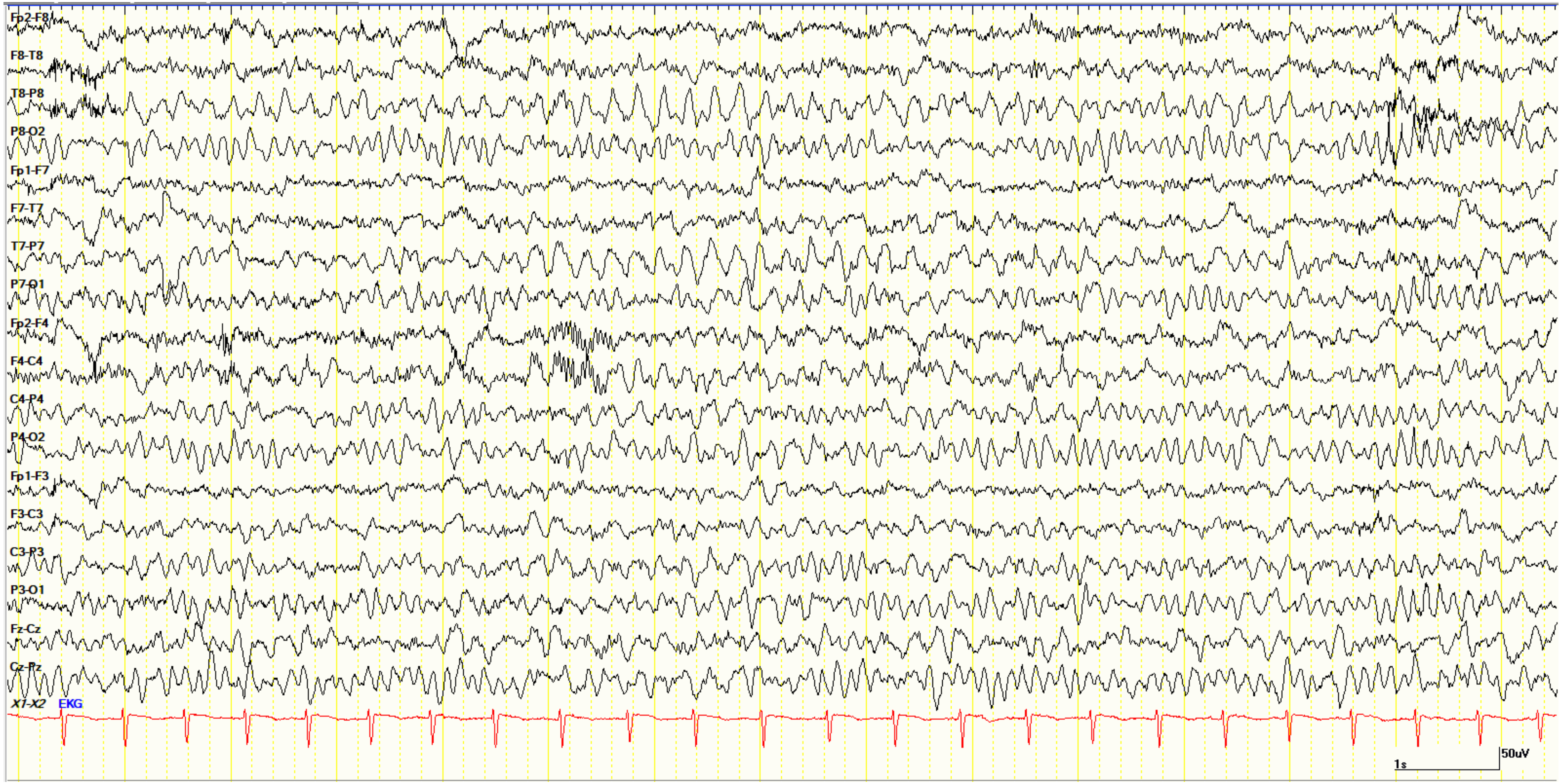
[redacted]
CALIFORNIA


5. Längs ML col E

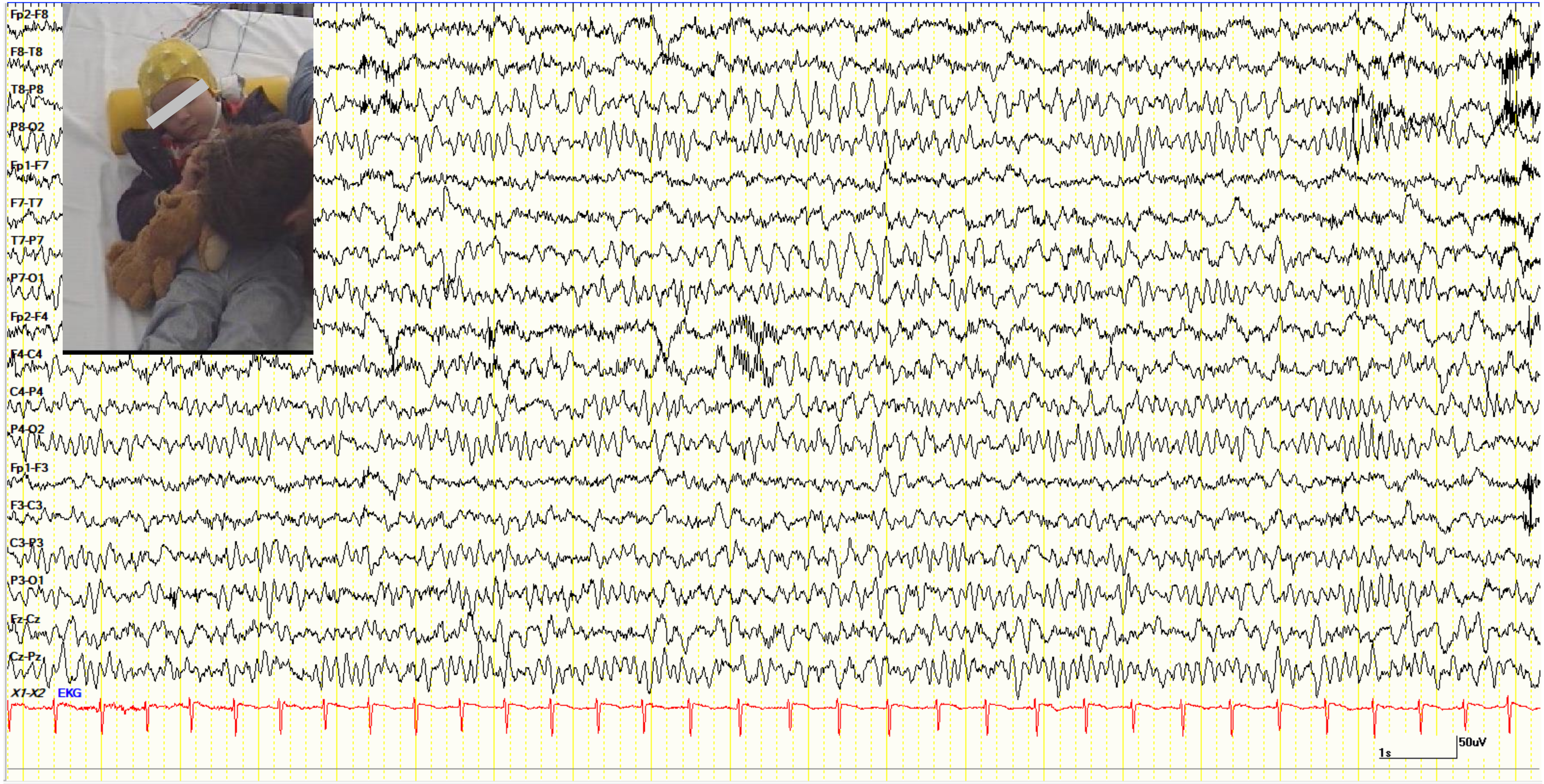
Empfindlichkeit: 50 Tiefpass: 70 BandspeAus Hochpass:0,50 Start: 01.10.2024 10:57:34 Ende: 01.10.2024 11:33:47 Aufzeichnungsdauer: 36m 13s

FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
FZ-CZ
CZ-PZ
EKG
83
84
86
86
96
91
87
84
90
90
100
89
84
88

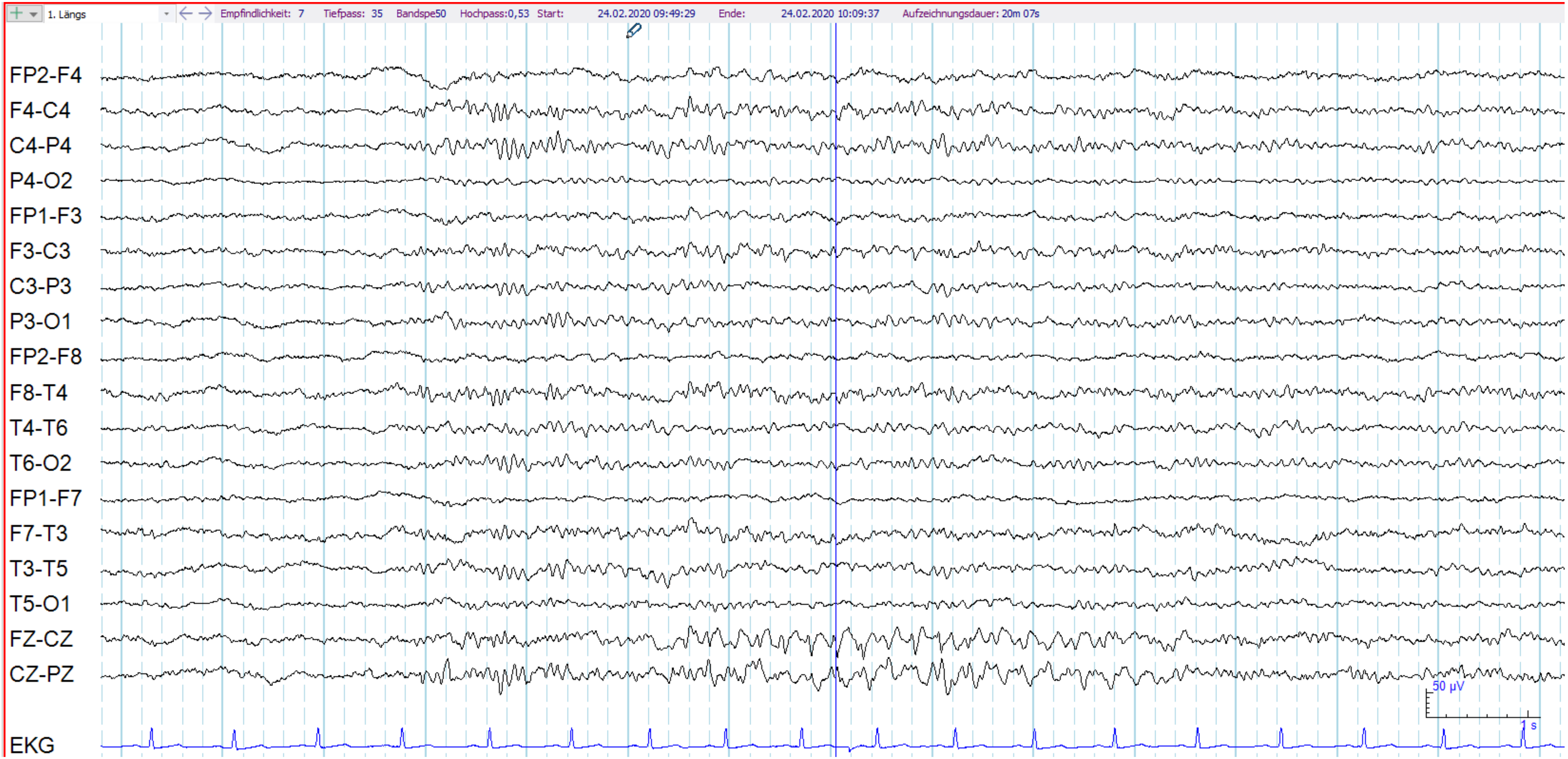
?


Fp2-F8
F8-T8
T8-P8
P8-O2
Fp1-F7
F7-T7
T7-P7
P7-O1
Fp2-F4
F4-C4
C4-P4
P4-O2
Fp1-F3
F3-C3
C3-P3
P3-O1
Fz-Cz
Cz-Pz
X1-X2
EKG
1s
50uV

Posteriores rhythmisches Theta


Fp2-F8
F8-T8
T8-P8
P8-O2
Fp1-F7
F7-T7
T7-P7
P7-O1
Fp2-F4
F4-C4
C4-P4
P4-O2
Fp1-F3
F3-C3
C3-P3
P3-O1
Fz-Cz
Cz-Pz
X1-X2
EKG
1s
50uV

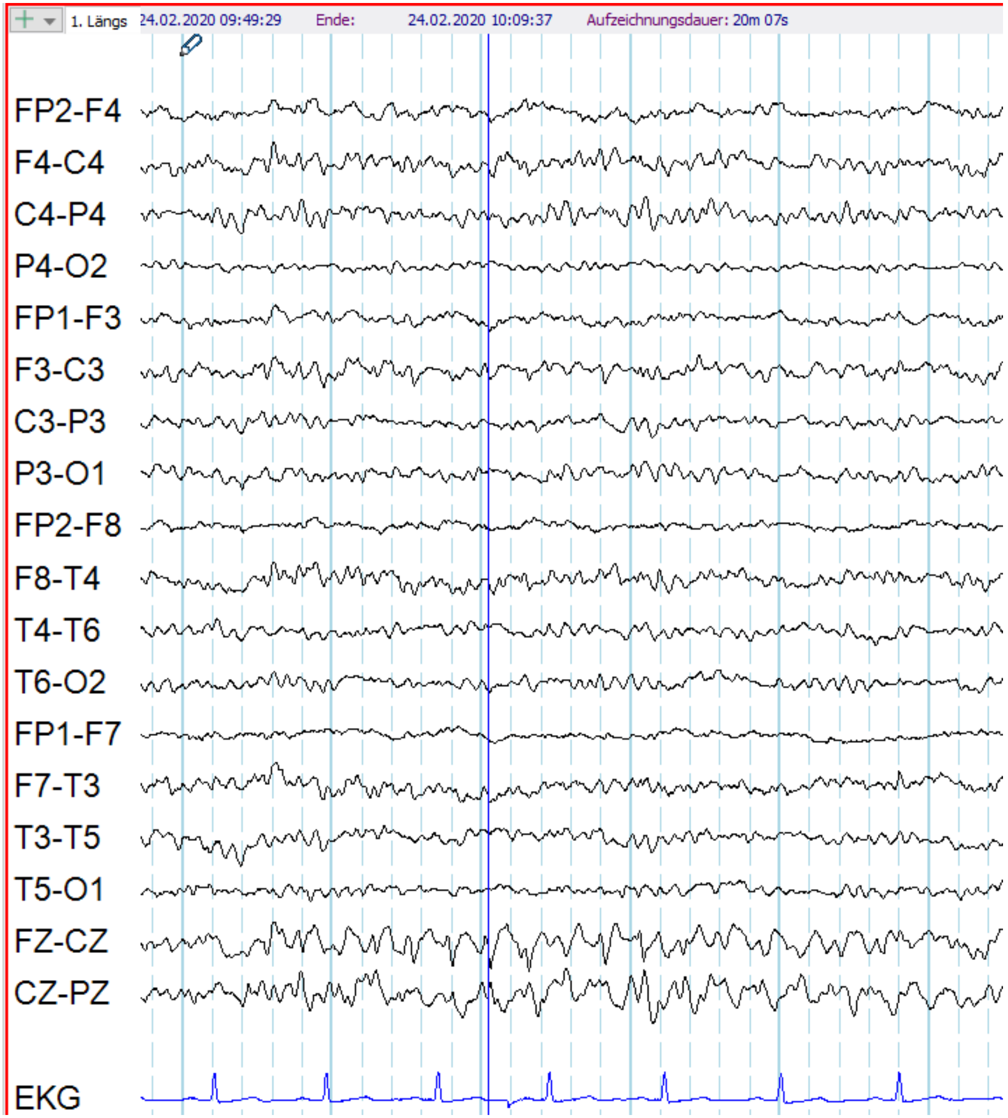
Theta zentral



1. Längs
Empfindlichkeit: 7 Tiefpass: 35 Bandspe50 Hochpass:0,53 Start: 24.02.2020 09:49:29 Ende: 24.02.2020 10:09:37 Aufzeichnungsdauer: 20m 07s

FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
FP2-F8
F8-T4
T4-T6
T6-O2
FP1-F7
F7-T3
T3-T5
T5-O1
FZ-CZ
CZ-PZ
EKG
50 µV
1 s

Cigánek Rhythmus (midline central theta)



1. Längs 24.02.2020 09:49:29 Ende: 24.02.2020 10:09:37 Aufzeichnungsdauer: 20m 07s

FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
FP2-F8
F8-T4
T4-T6
T6-O2
FP1-F7
F7-T3
T3-T5
T5-O1
FZ-CZ
CZ-PZ
EKG

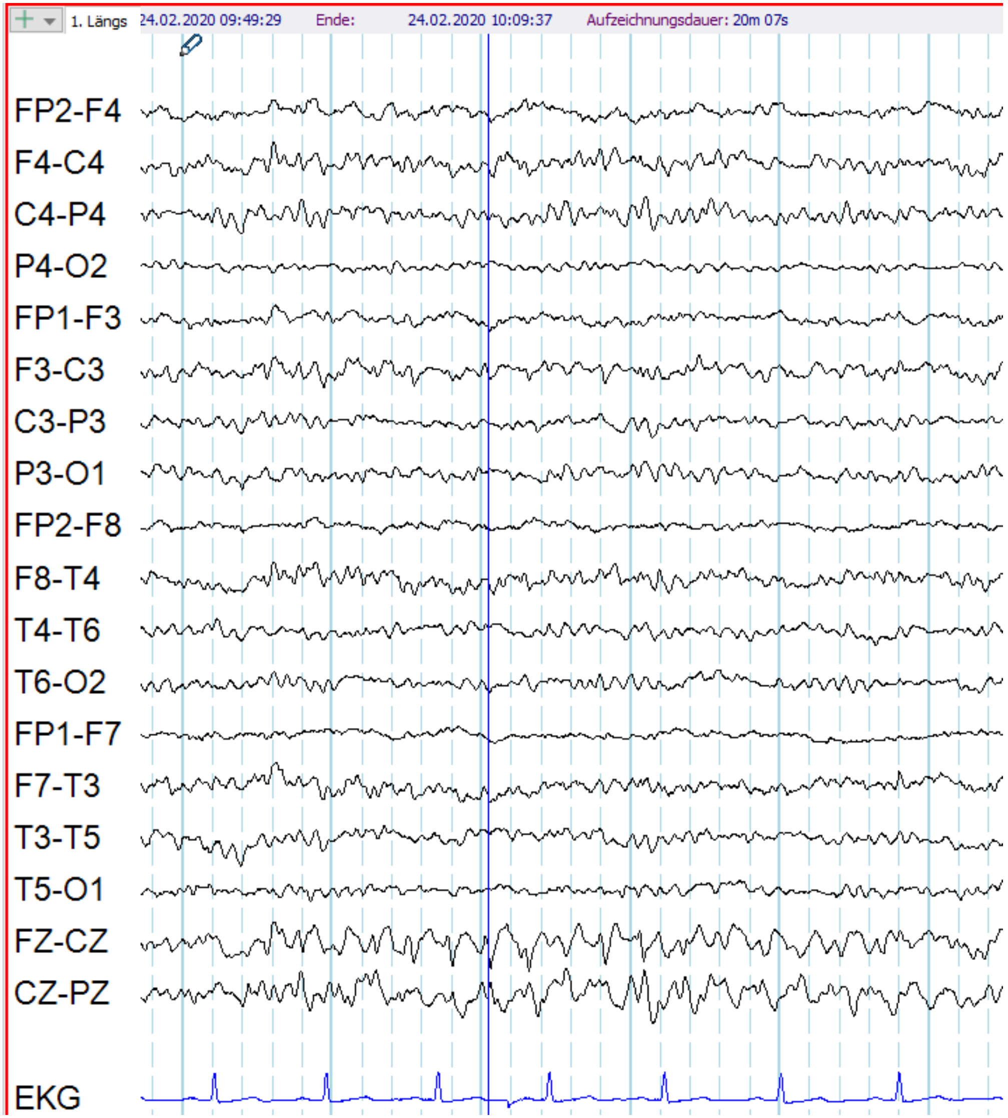
- Theta (4-7 Hz)
- Rhythmische, sinusoidale, bogenförmige Wellen
- an- und abschwellend
- Irregulär oder triangulär

- Mittellinie (Maximum Cz)

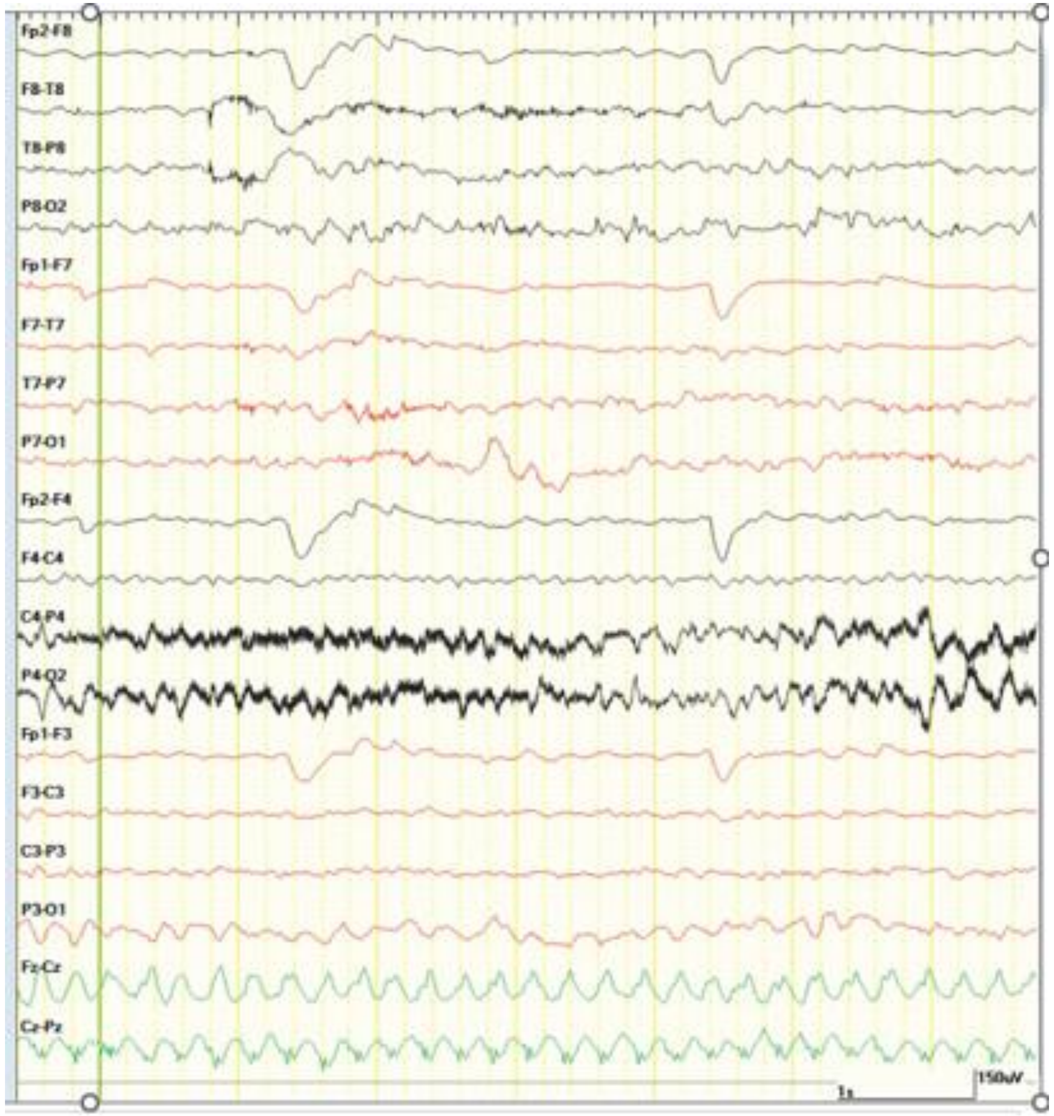
- Dauer ≥3s
- Amplitude >50µV

- wach (Konzentration) und Müdigkeit

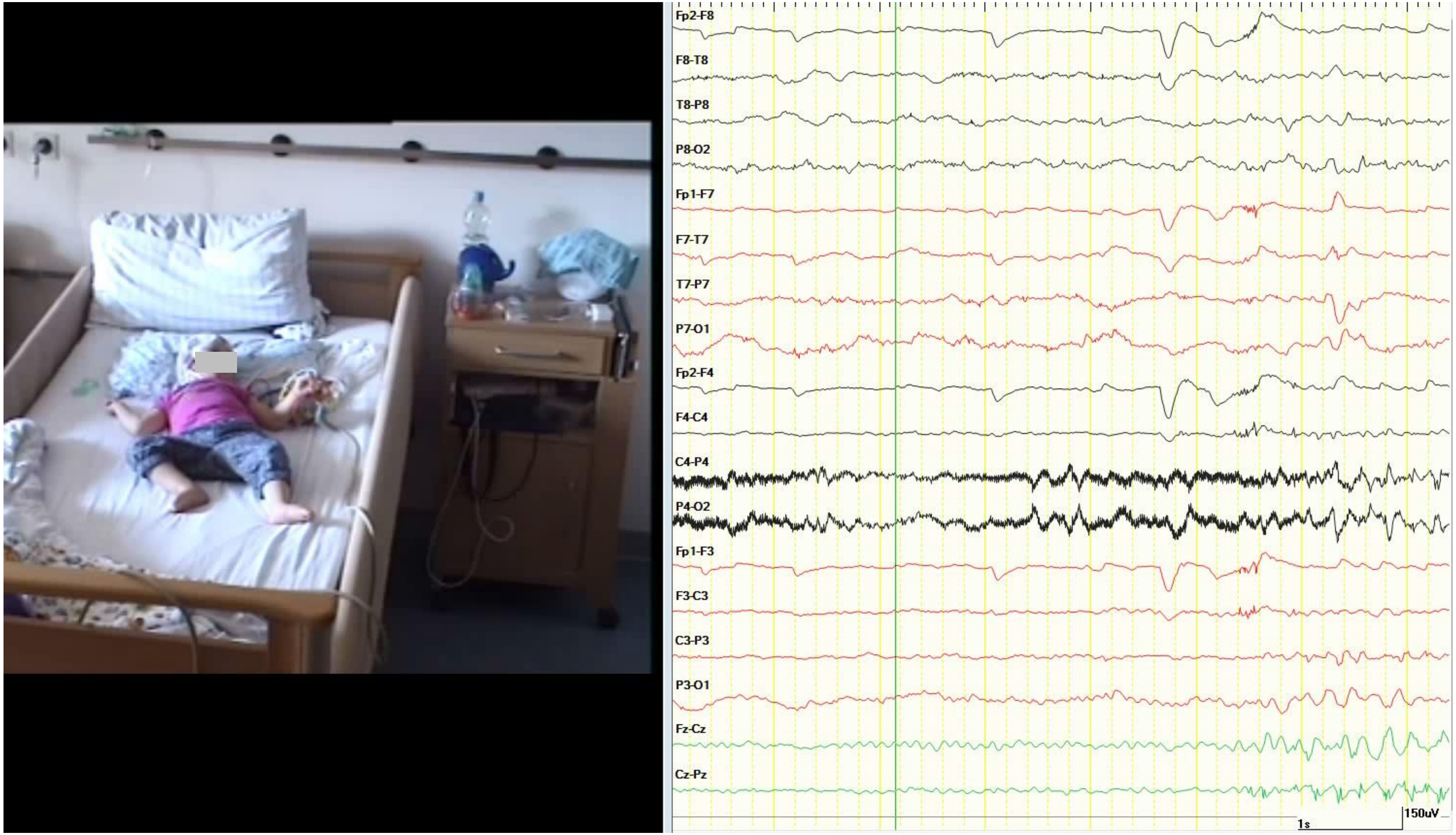
Cigánek Rhythmus


1. Längs
24.02.2020 09:49:29
Ende:
24.02.2020 10:09:37
Aufzeichnungsdauer: 20m 07s
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
FP2-F8
F8-T4
T4-T6
T6-O2
FP1-F7
F7-T3
T3-T5
T5-O1
FZ-CZ
CZ-PZ
EKG

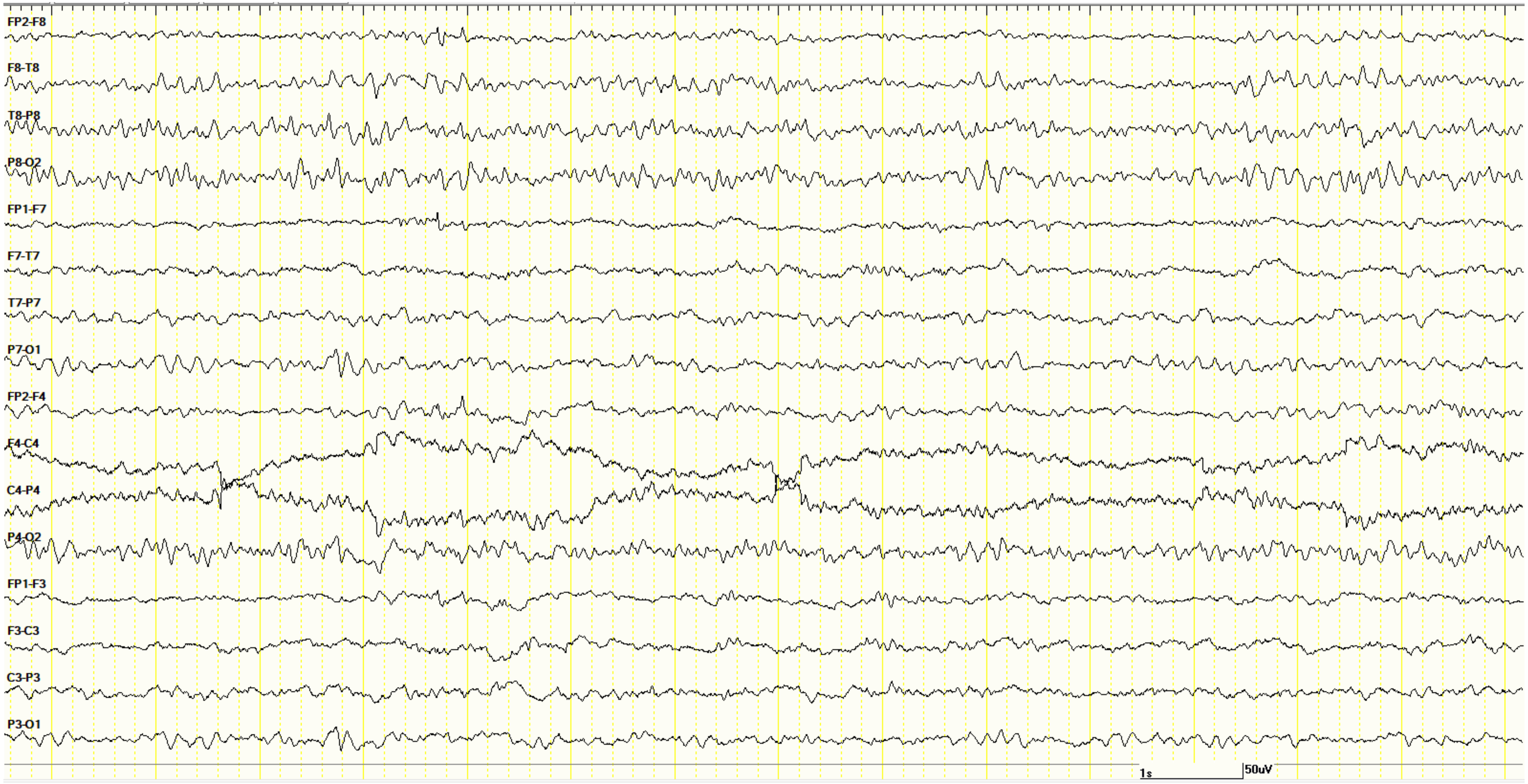
Und dies?


Fp2-F8
F8-T8
T8-P8
P8-O2
Fp1-F7
F7-T7
T7-P7
P7-O1
Fp2-F4
F4-C4
C4-P4
P4-O2
Fp1-F3
F3-C3
C3-P3
P3-O1
Fz-Cz
Cz-Pz
1s
150uV

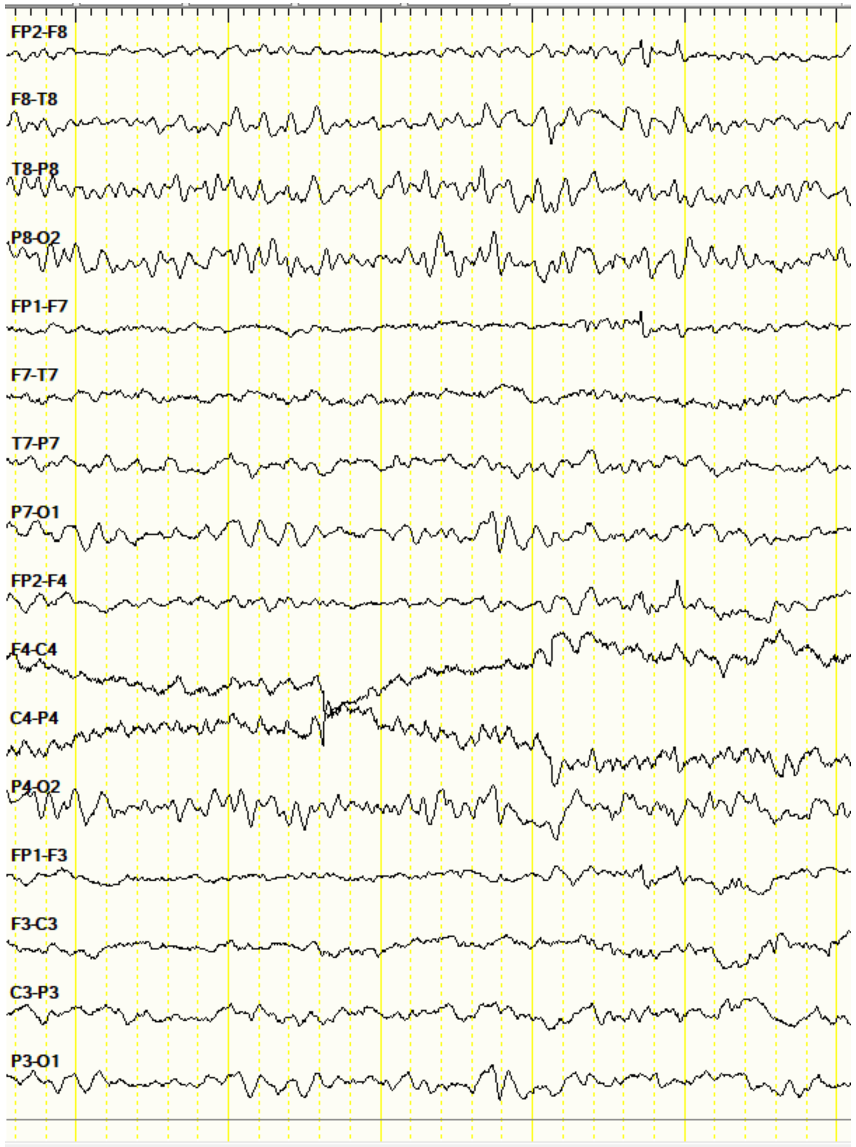
Klonischer Anfall Zentralregion


Fp2-F8
F8-T8
T8-P8
P8-O2
Fp1-F7
F7-T7
T7-P7
P7-O1
Fp2-F4
F4-C4
C4-P4
P4-O2
Fp1-F3
F3-C3
C3-P3
P3-O1
Fz-Cz
Cz-Pz
1s
150uV

schon wieder temporal


FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
1s
50uV

Rhythmisches temporales Theta


FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1

rhythmic midtemporal Theta / psychomotorische Variante

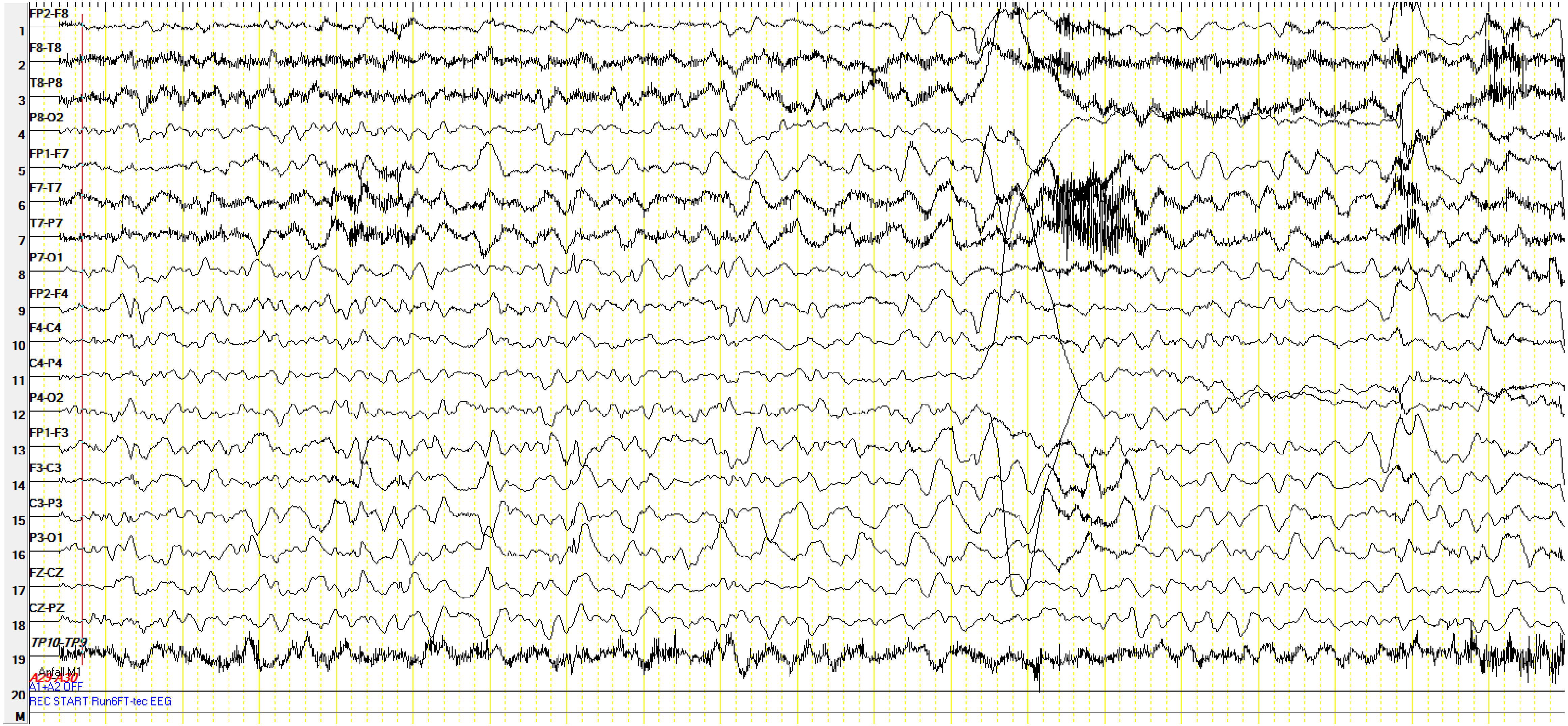
- Form variabel (bogenförmig)
- Rhythmisch
- Keine Evolution
- Oberflächen-negativ
- Mittlere Amplituden
- 4-7 Hz
- Temporal (kann sich ausbreiten)

- Sekunden bis Minuten

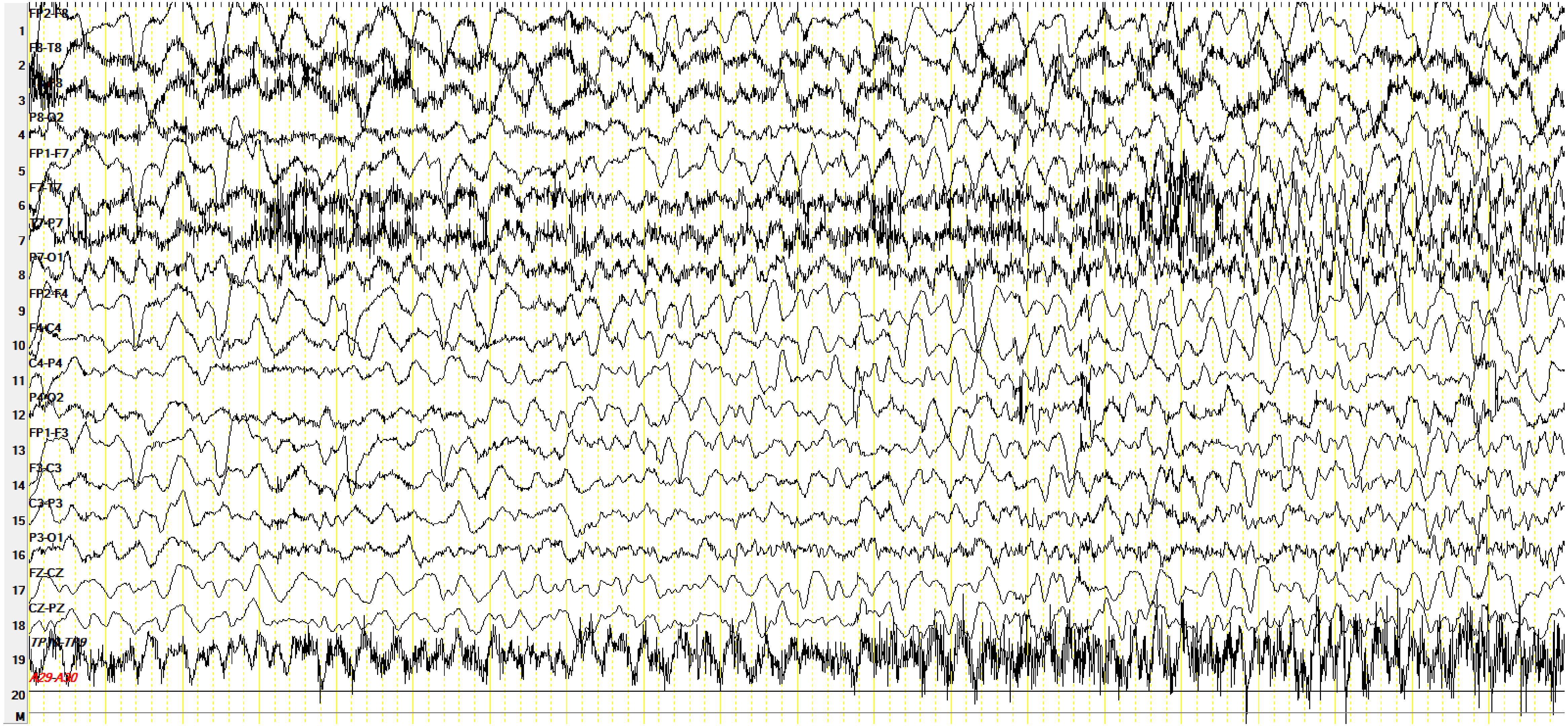
- Müdigkeit
- Jugendliche / Erwachsene

Petersen & Eeg-Oloffson, 1971

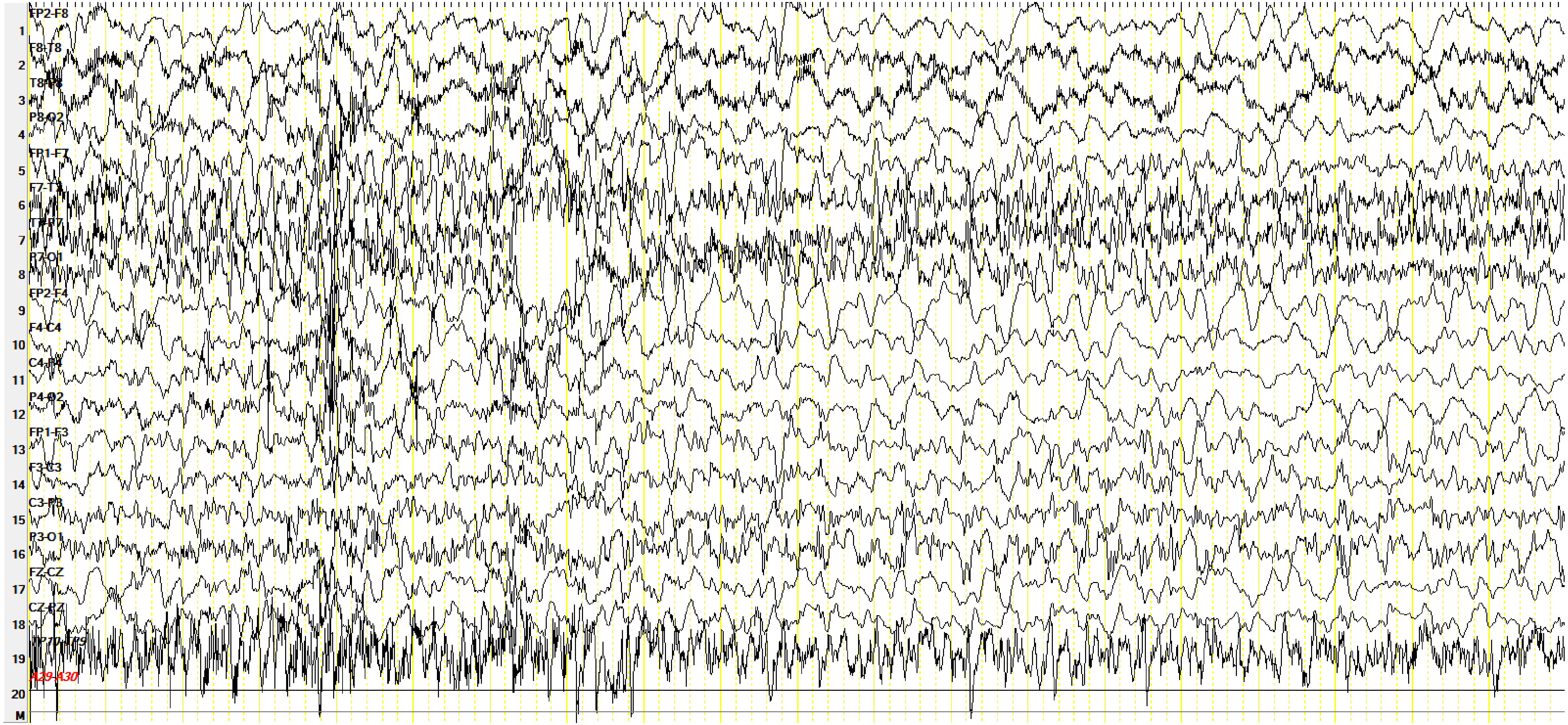
Anfallsmuster temp anterior


FP2-F8
1
F8-T8
2
T8-P8
3
P8-O2
4
FP1-F7
5
F7-T7
6
T7-P7
7
P7-O1
8
FP2-F4
9
F4-C4
10
C4-P4
11
P4-O2
12
FP1-F3
13
F3-C3
14
C3-P3
15
P3-O1
16
FZ-CZ
17
CZ-PZ
18
TP10-TP9
19
20
M
Anfall M
A29-A30
A1+A2 OFF
REC START Run6FT-tec EEG

Anfallsmuster Hippocampus li


FP2-F8
1
F8-T8
2
T8-P8
3
P8-O2
4
FP1-F7
5
F7-T7
6
T7-P7
7
P7-O1
8
FP2-F4
9
F4-C4
10
C4-P4
11
P4-O2
12
FP1-F3
13
F3-C3
14
C3-P3
15
P3-O1
16
FZ-CZ
17
CZ-PZ
18
TP10-TP9
19
A29-A30
20
M

Anfallsmuster linke Hemisphäre


FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
FZ-CZ
CZ-PZ
TP10-TP9
A29-A30
1
2
3
4
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6
7
8
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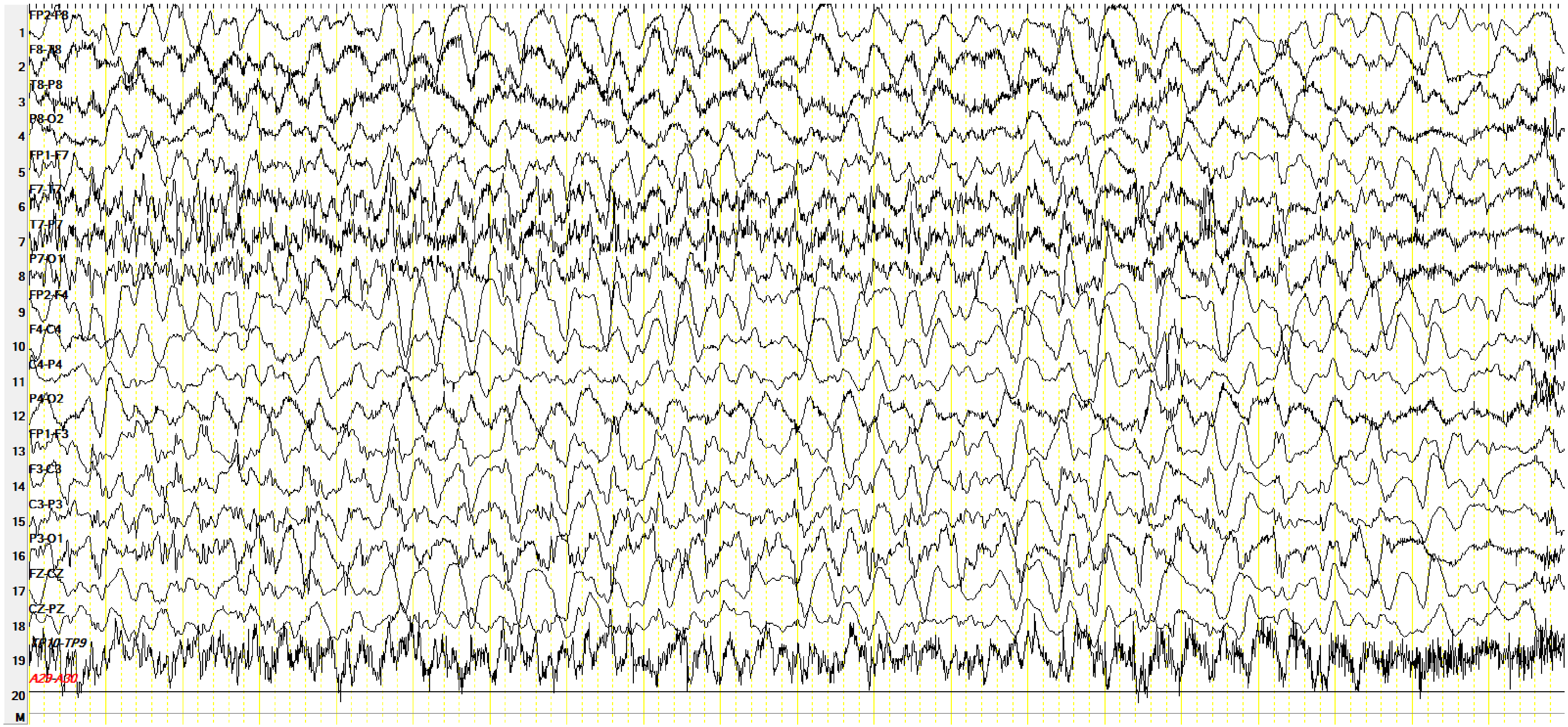
10
11
12
13
14
15
16
17
18
19
20
M

Anfallsmuster links temporal


FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
FZ-CZ
CZ-PZ
TP10-TP9
A29-A30
1
2
3
4
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6
7
8
9
10
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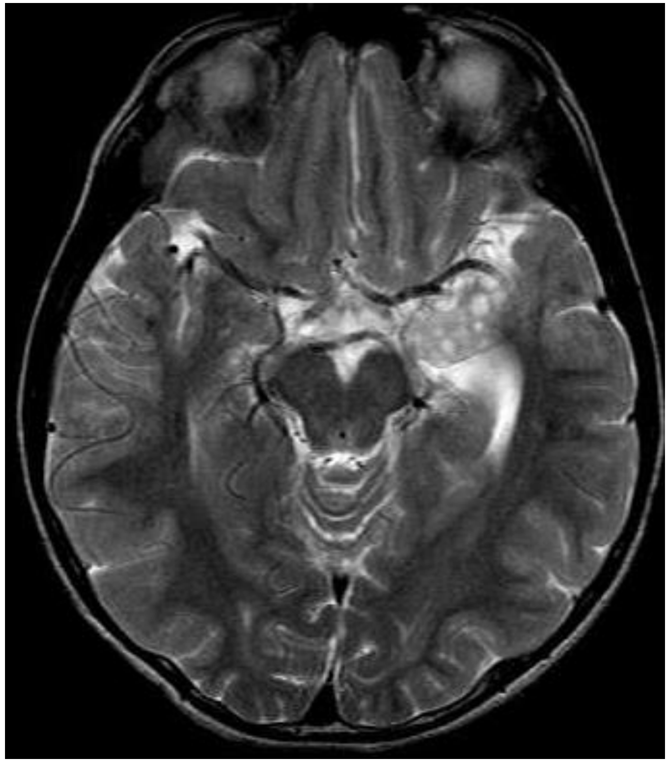
17
18
19
20
M

Fokaler Anfall

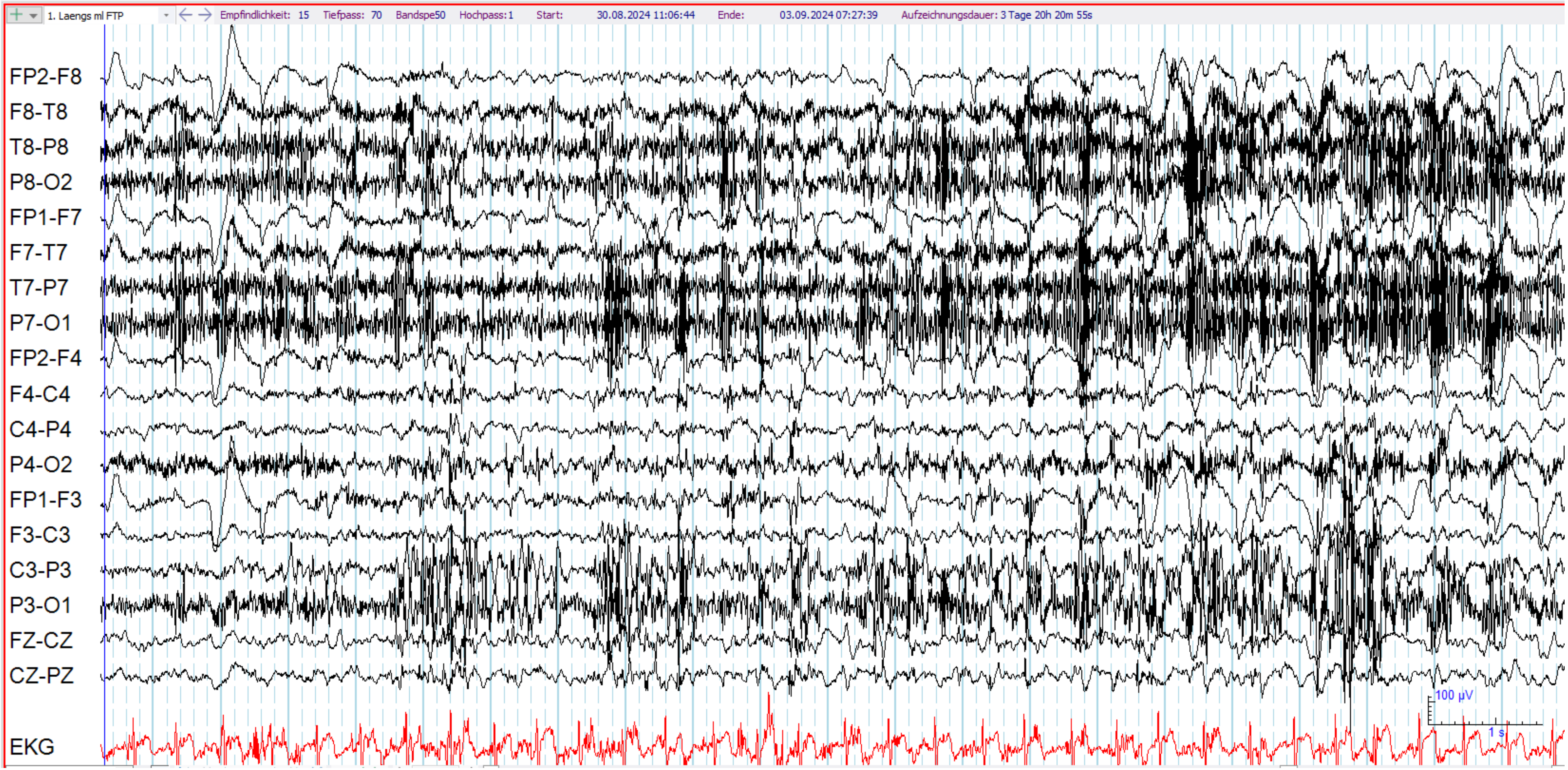
Aus datenschutzrechtlichen Gründen wurde das Videomaterial an dieser Stelle entfernt.



Im Alltag

- Kriterien für Spikes / Sharp Waves und Anfallsmuster prüfen
- Kontext? Alter / Vigilanz
- Varianten benennen / nachschlagen
- Bei Anfällen immer die Patienten / Eltern fragen
- EEG-Muster und Klinik müssen zusammenpassen
- Nicht an einer Seite “festbeißen”

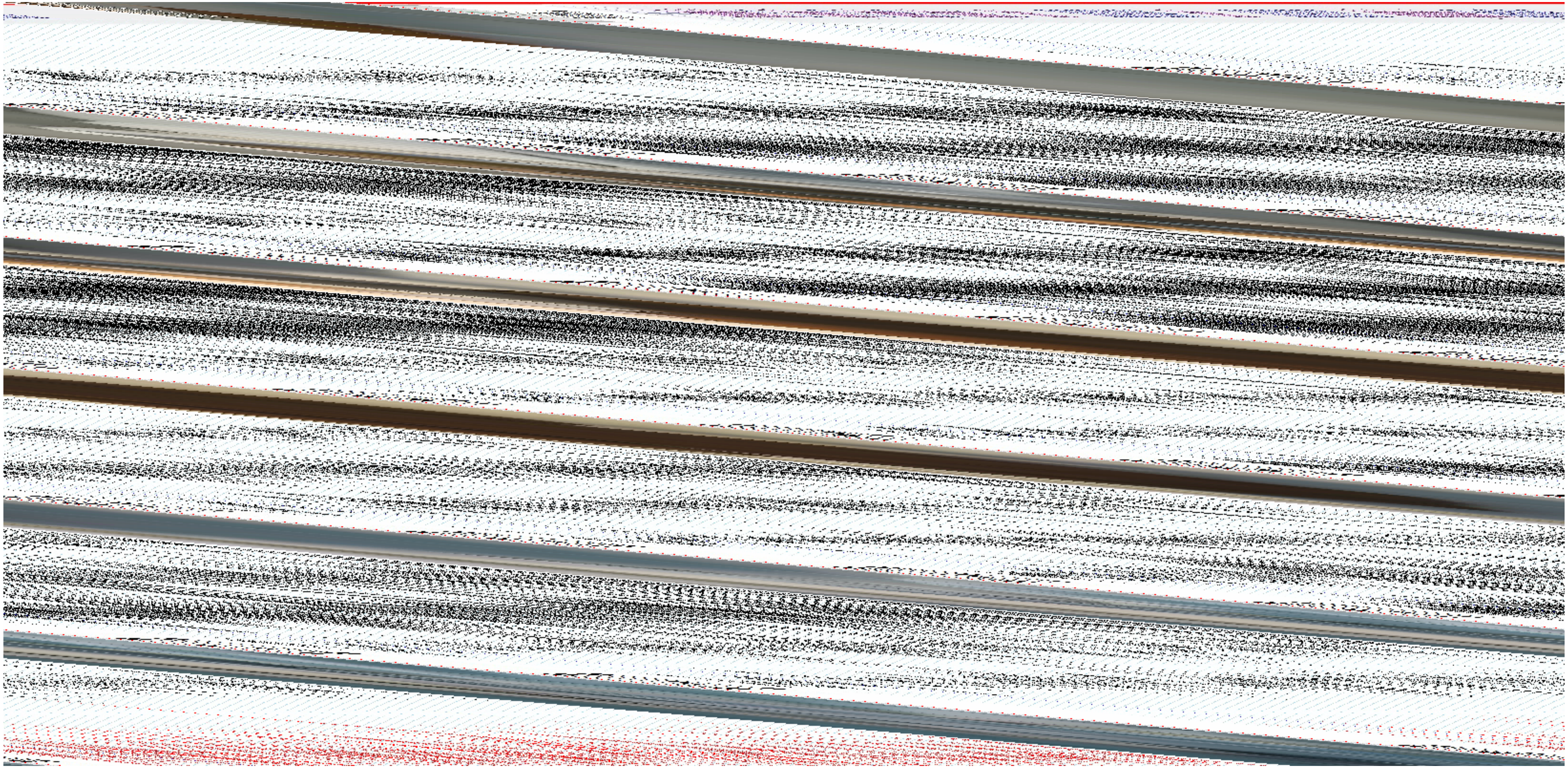
Artefakte, rhythmisch?



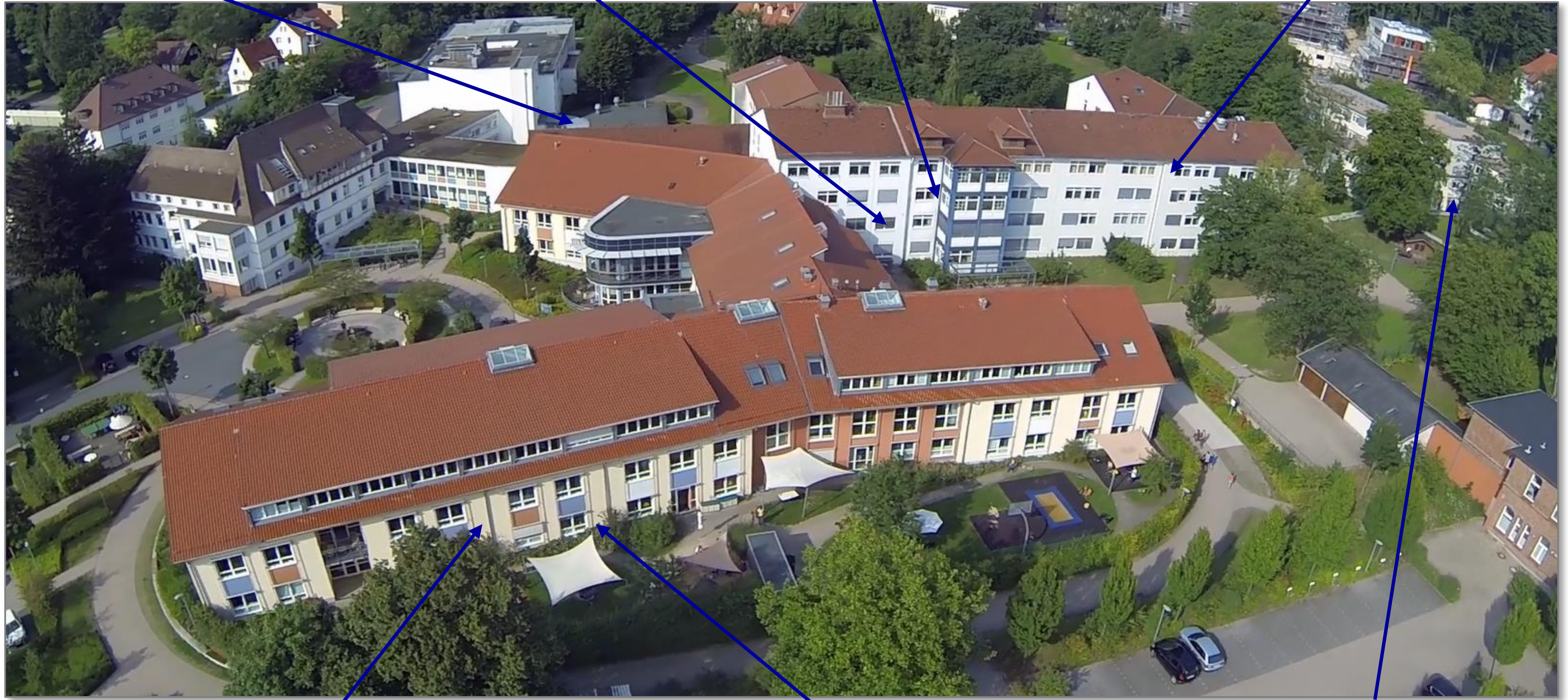
1. Laengs ml FTP Empfindlichkeit: 15 Tiefpass: 70 Bandspe50 Hochpass:1 Start: 30.08.2024 11:06:44 Ende: 03.09.2024 07:27:39 Aufzeichnungsdauer: 3 Tage 20h 20m 55s

FP2-F8
F8-T8
T8-P8
P8-O2
FP1-F7
F7-T7
T7-P7
P7-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP1-F3
F3-C3
C3-P3
P3-O1
FZ-CZ
CZ-PZ
EKG
100 µV
1 s

Artefakte, rhythmisch!



Epilepsie-Zentrum Bethel: Krankenhaus Mara



3-Tesla-MRT

EP1: Behinderte Menschen mit Epilepsie, 27 Betten

EP2: Diagnostikstation, 30 Betten

EP3: Therapiestation, 30 Betten

Junge Erwachsene 18 Betten

Kinderepileptologie „Kidron“ 30 Betten

Reha-Klinik 35 Plätze

Wenn Sie das und vieles mehr intensiver diskutieren möchten

- ✓ ***im Alltag***
- ✓ ***mit Gehalt***
- ✓ ***in einem supernetten Team***

melden Sie sich gerne!

tilman.polster@mara.de