Practical EEG monitoring in ICU

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What is it?

- EEG monitoring in ICU = urgent/emergent EEG+/- video, that has to be done outside lab.
- AKA bedside EEG monitoring (BEM).

Some BEM is for nonurgent >> for immobile cases.

Why do we need BEM?

- Some clinical signs is hardly interpreted (e.g., seizure VS psychogenic NES).
- Seizures could continue without accompanying signs (e.g., subtle SE/non convulsive seizure).
- Some critical treatments (several AEDs/ anesthetic agents; ANES) need to be adjusted meticulously.

Why do we need BEM?

- Purposes > for diagnosis
  > for follow up course
  > for estimate suitable treatment

- Very clear and only few indication for getting BEM but problems occur at all time >> not employ BEM appropriately (right place and time).

When do we need it and for how long?

For diagnosis

- Seizure is clinical sign or symptom and is diagnosed, using visual inspection and recognition patterns.
- No any other test needed, especially if clinical sign/ symptom is so typical for seizure: tonic, clonic etc.

*** Examples of atypical one:

Behavioral events >> screaming, tossing,

Abnormal movements like>> tremors, chorea etc.

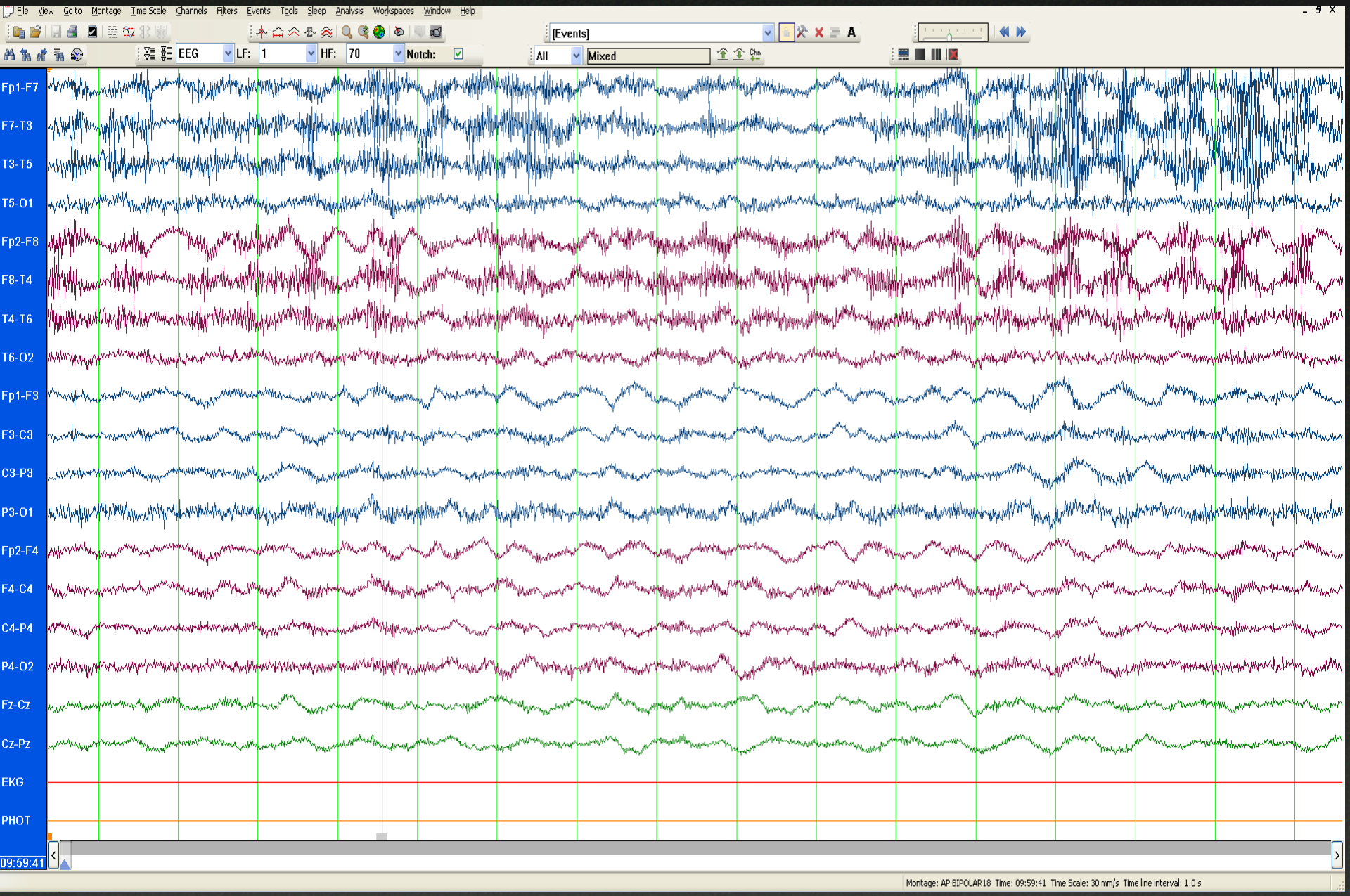
When do we need it and for how long?

For diagnosis

*** Some equivocal one : hypermotor, gelastic etc.

- Definite diagnosis can be made when EEG is done during event. Otherwise relative evidences eg focal slow, focal sharp wave may be useful.
- After diagnosis is made, no need to continue on BEM except additional subclinical seizures is detected.

VIDEO


File View Go to Montage Time Scale Channels Filters Events Tools Sleep Analysis Workspaces Window Help
[Events]
EEG
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HF: 70
Notch:
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Mixed
Fp1-F7
F7-T3
T3-T5
T5-O1
Fp2-F8
F8-T4
T4-T6
T6-O2
Fp1-F3
F3-C3
C3-P3
P3-O1
Fp2-F4
F4-C4
C4-P4
P4-O2
Fz-Cz
Cz-Pz
EKG
PHOT
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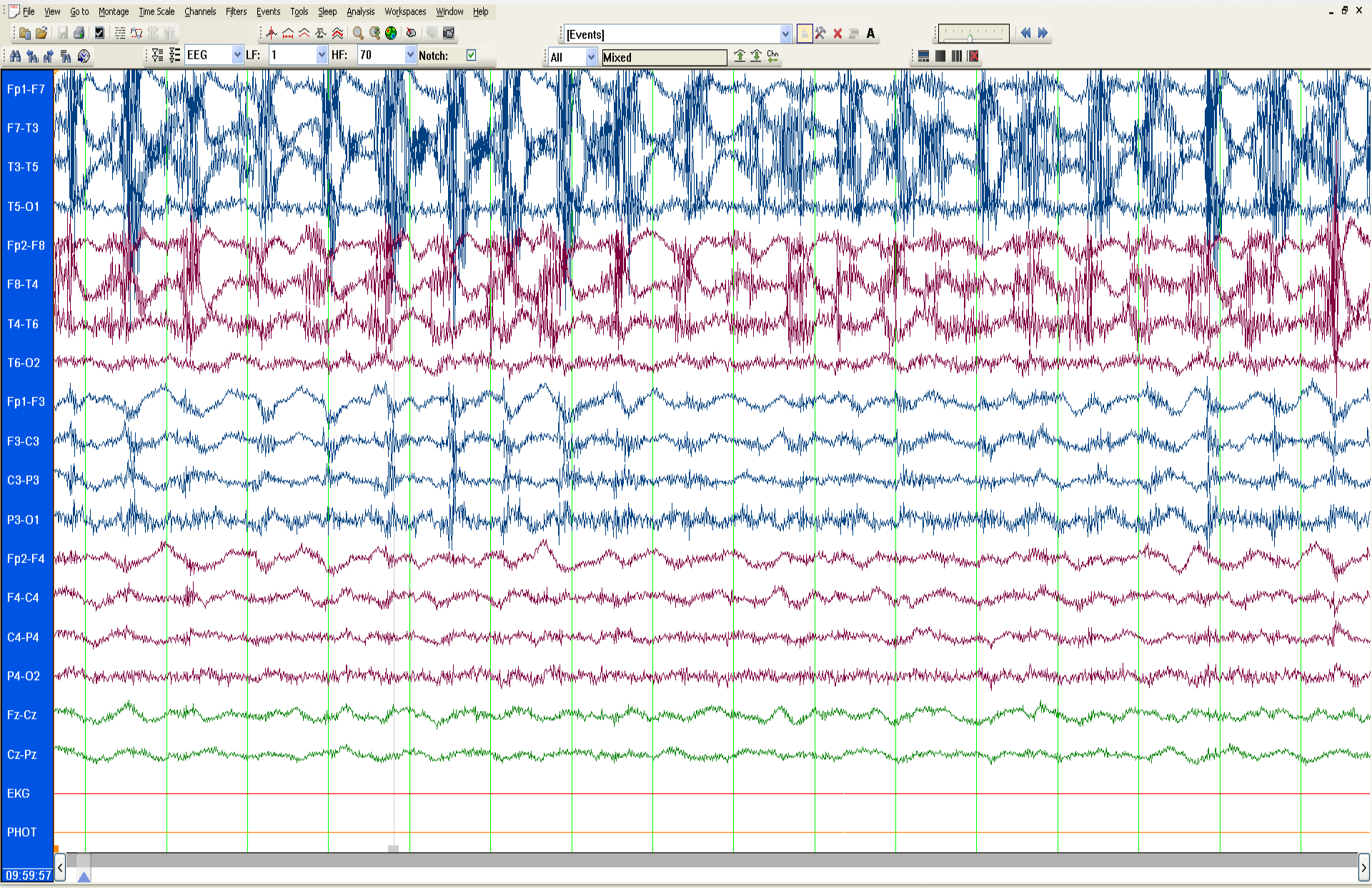
Montage: AP BIPOLAR18 Time: 09:59:41 Time Scale: 30 mm/s Time line interval: 1.0 s


File View Go to Montage Time Scale Channels Filters Events Tools Sleep Analysis Workspaces Window Help
[Events]
EEG
LF: 1
HF: 70
Notch:
All
Mixed
Fp1-F7
F7-T3
T3-T5
T5-O1
Fp2-F8
F8-T4
T4-T6
T6-O2
Fp1-F3
F3-C3
C3-P3
P3-O1
Fp2-F4
F4-C4
C4-P4
P4-O2
Fz-Cz
Cz-Pz
EKG
PHOT
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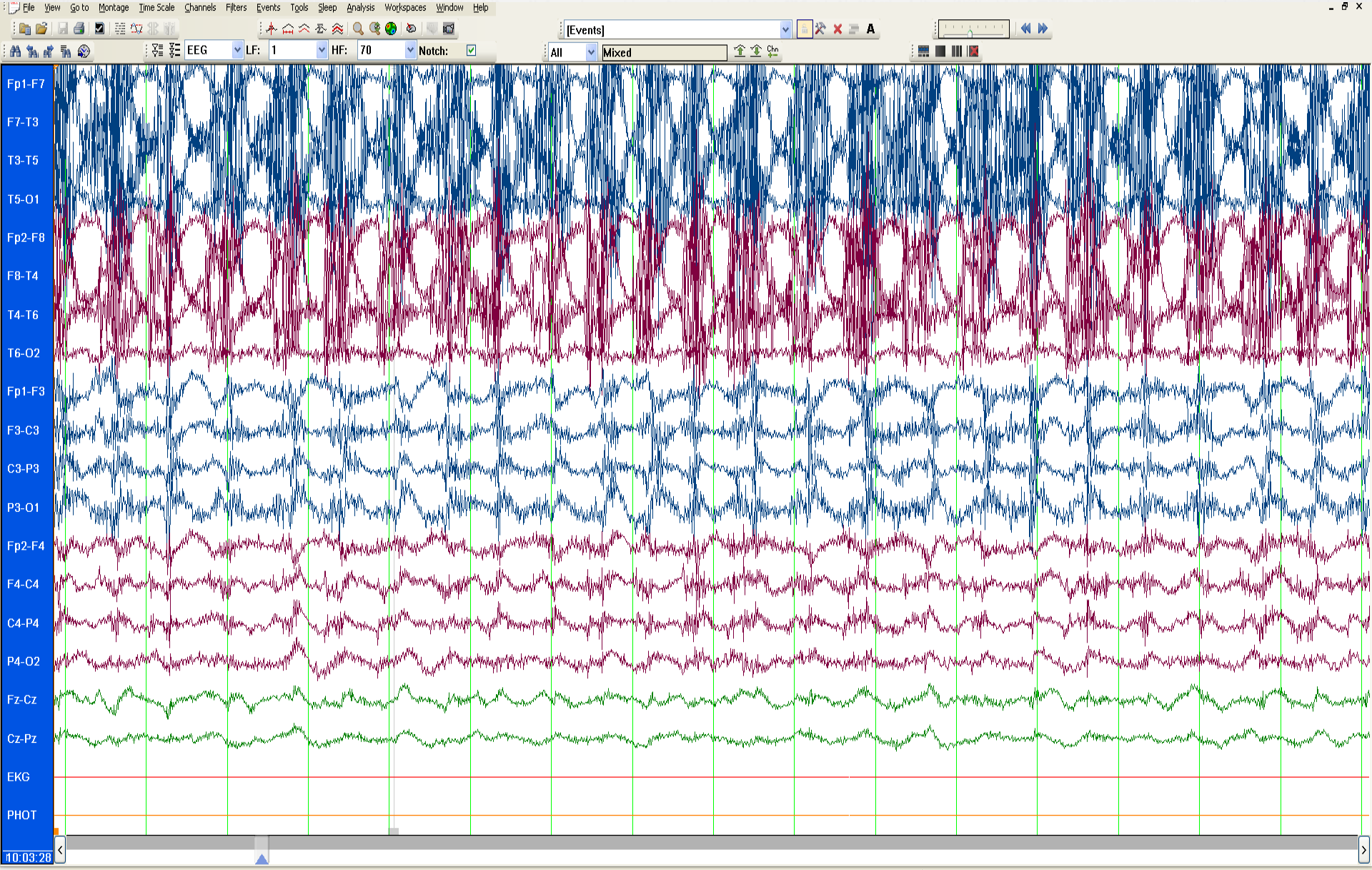
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[Events]
EEG
LF: 1
HF: 70
Notch:
All
Mixed
Fp1-F7
F7-T3
T3-T5
T5-O1
Fp2-F8
F8-T4
T4-T6
T6-O2
Fp1-F3
F3-C3
C3-P3
P3-O1
Fp2-F4
F4-C4
C4-P4
P4-O2
Fz-Cz
Cz-Pz
EKG
PHOT
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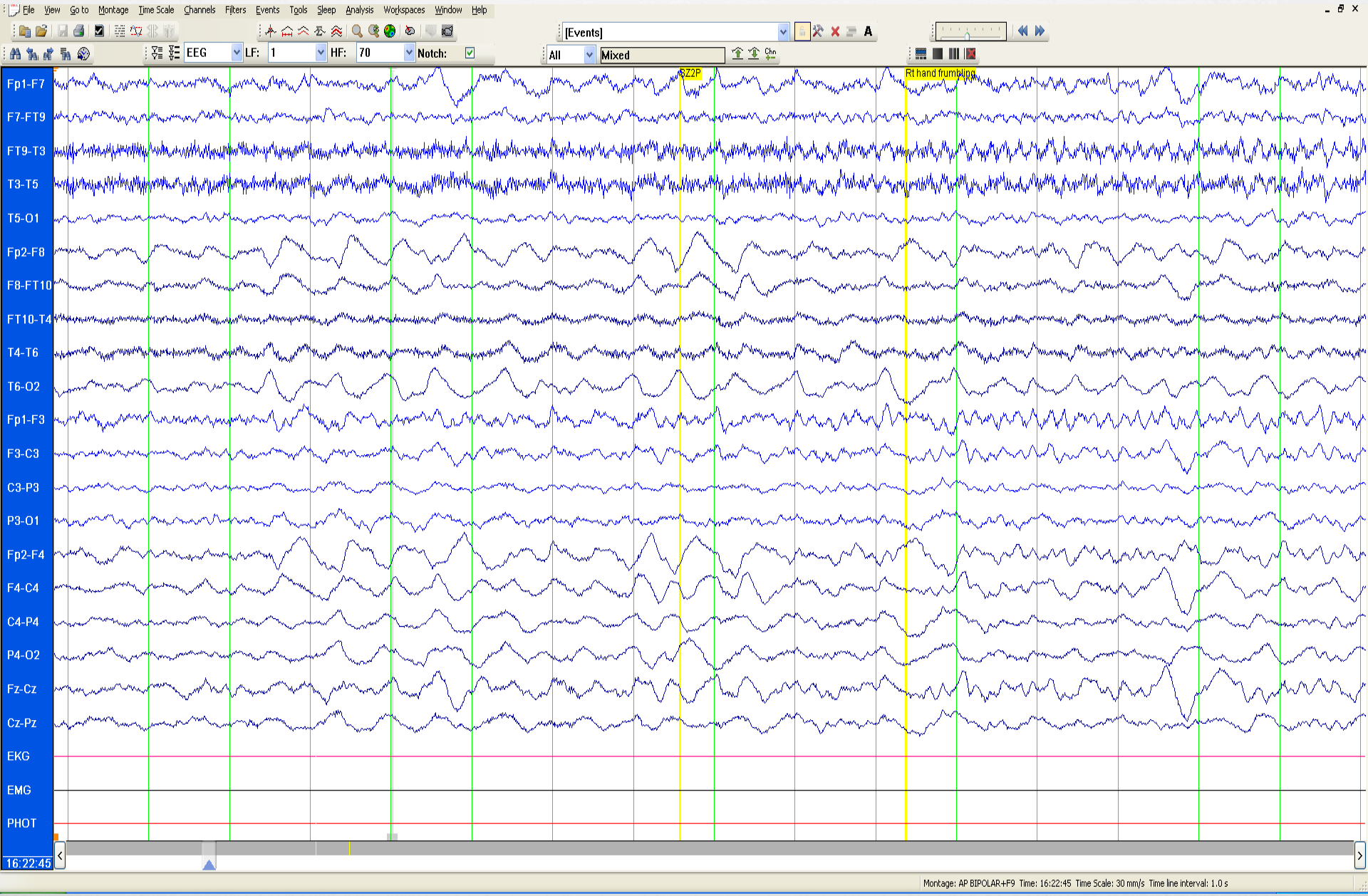
VIDEO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All Mixed
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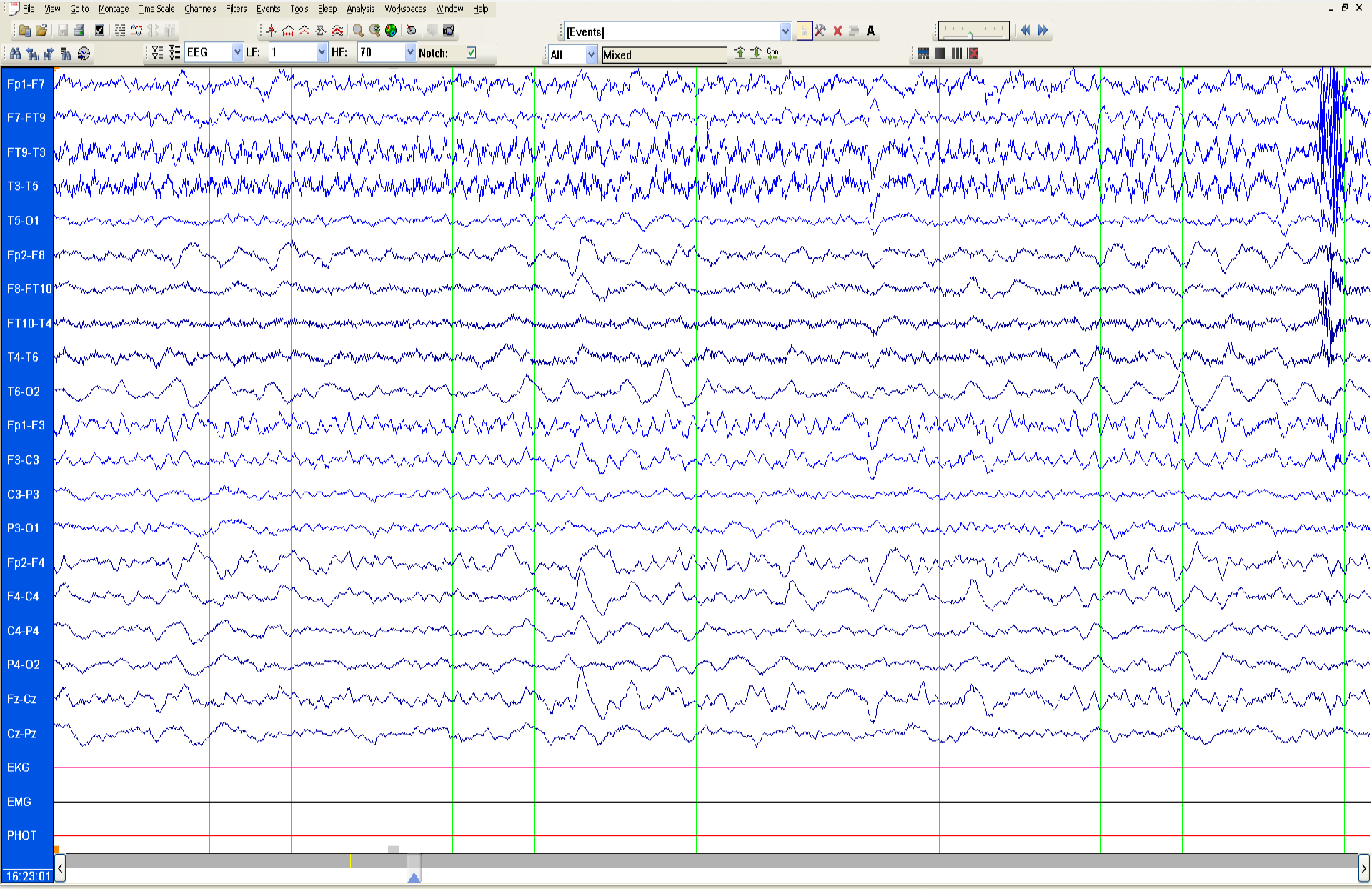
Rt hand frumpling
Fp1-F7
F7-FT9
FT9-T3
T3-T5
T5-O1
Fp2-F8
F8-FT10
FT10-T4
T4-T6
T6-O2
Fp1-F3
F3-C3
C3-P3
P3-O1
Fp2-F4
F4-C4
C4-P4
P4-O2
Fz-Cz
Cz-Pz
EKG
EMG
PHOT
16:22:45
Montage: AP BIPOLAR+F9 Time: 16:22:45 Time Scale: 30 mm/s Time line interval: 1.0 s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EEG LF: 1 HF: 70 Notch:
All Mixed
Fp1-F7
F7-FT9
FT9-T3
T3-T5
T5-O1
Fp2-F8
F8-FT10
FT10-T4
T4-T6
T6-O2
Fp1-F3
F3-C3
C3-P3
P3-O1
Fp2-F4
F4-C4
C4-P4
P4-O2
Fz-Cz
Cz-Pz
EKG
EMG
PHOT
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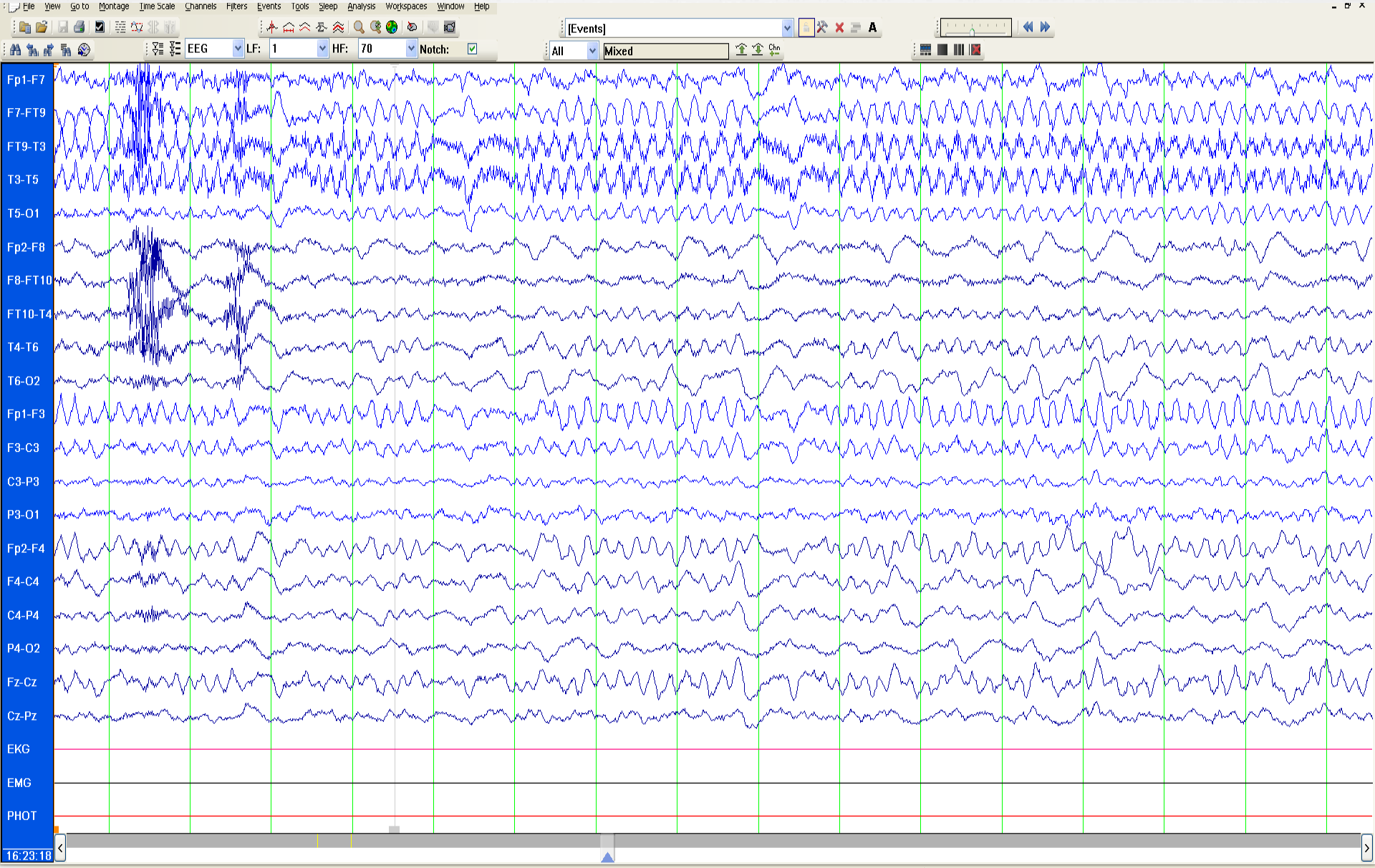
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[Events]
EEG LF: 1 HF: 70 Notch:
All Mixed
Fp1-F7
F7-FT9
FT9-T3
T3-T5
T5-O1
Fp2-F8
F8-FT10
FT10-T4
T4-T6
T6-O2
Fp1-F3
F3-C3
C3-P3
P3-O1
Fp2-F4
F4-C4
C4-P4
P4-O2
Fz-Cz
Cz-Pz
EKG
EMG
PHOT
16:23:18
Montage: AP BIPOLAR+F9 Time: 16:23:18 Time Scale: 30 mm/s Time line interval: 1.0 s

When do we need it and for how long?

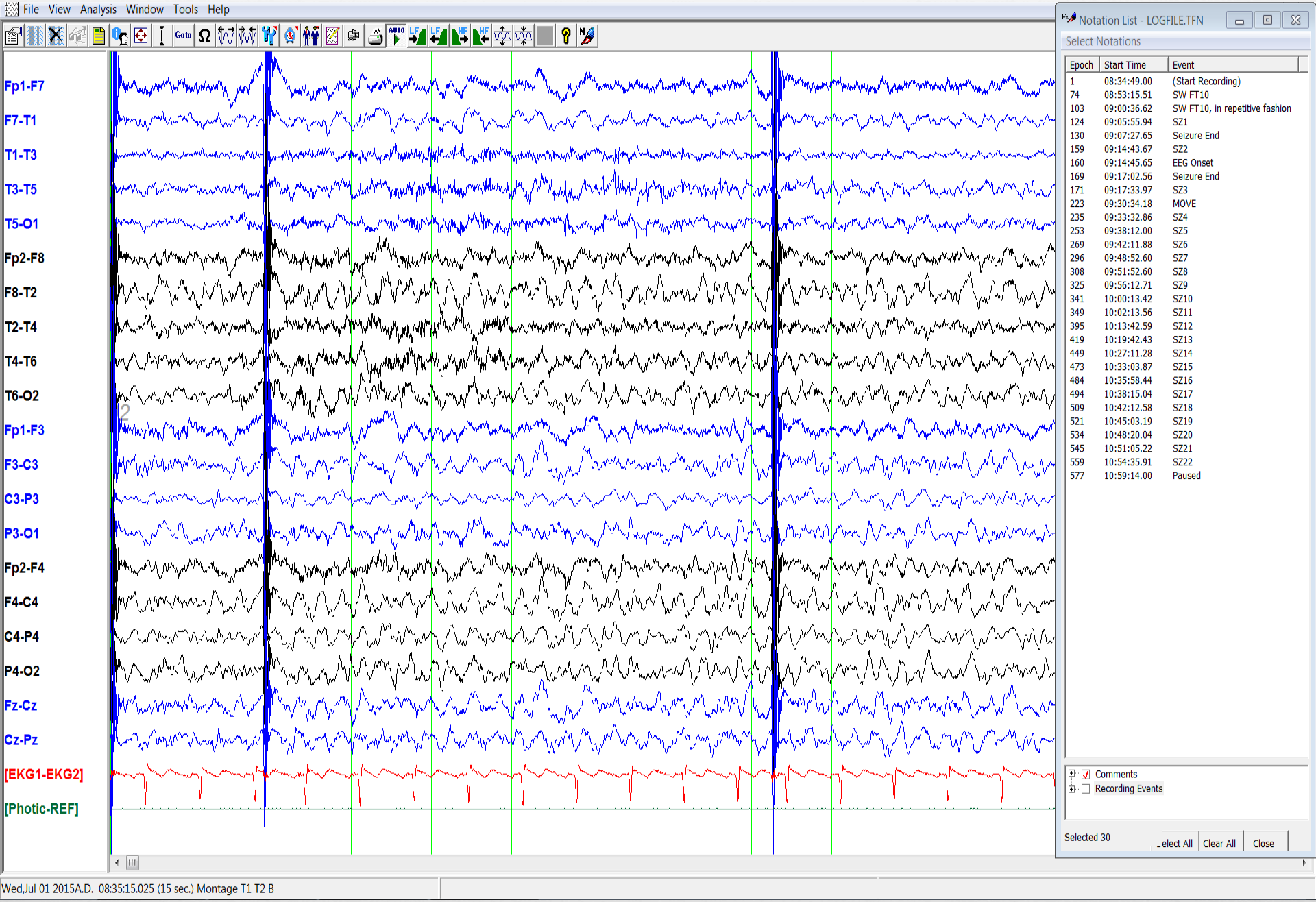
For follow up course

- Usually we know exactly that was seizure.
- Quantitative and qualitative data of EEG seizures before and after treatment is of interests.
- Quantative parameter >> how many of their onsets, how often they come
- Qualitative parameter >> how far they go (spread to the other side), how long they stay

When do we need it and for how long?

For follow up course

- Those data are essential for adjusting both specific and symptomatic (AEDs) treatments.
- How long to keep on (BEM)>> for at least 24-48 hours after treatment started or until we catch up their rhythms, then rehook time to time until seizures are subsided.
- Rehook urgently if worsening of clinical status or new clinical sign emerges.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Fp1-F7
F7-T1
T1-T3
T3-T5
T5-O1
Fp2-F8
F8-T2
T2-T4
T4-T6
T6-O2
Fp1-F3
F3-C3
C3-P3
P3-O1
Fp2-F4
F4-C4
C4-P4
P4-O2
Fz-Cz
Cz-Pz
[EKG1-EKG2]
[Photic-REF]
Notation List - LOGFILE.TFN
Select Notations
Epoch Start Time Event
1 08:34:49.00 (Start Recording)
74 08:53:15.51 SW FT10
103 09:00:36.62 SW FT10, in repetitive fashion
124 09:05:55.94 SZ1
130 09:07:27.65 Seizure End
159 09:14:43.67 SZ2
160 09:14:45.65 EEG Onset
169 09:17:02.56 Seizure End
171 09:17:33.97 SZ3
223 09:30:34.18 MOVE
235 09:33:32.86 SZ4
253 09:38:12.00 SZ5
269 09:42:11.88 SZ6
296 09:48:52.60 SZ7
308 09:51:52.60 SZ8
325 09:56:12.71 SZ9
341 10:00:13.42 SZ10
349 10:02:13.56 SZ11
395 10:13:42.59 SZ12
419 10:19:42.43 SZ13
449 10:27:11.28 SZ14
473 10:33:03.87 SZ15
484 10:35:58.44 SZ16
494 10:38:15.04 SZ17
509 10:42:12.58 SZ18
521 10:45:03.19 SZ19
534 10:48:20.04 SZ20
545 10:51:05.22 SZ21
559 10:54:35.91 SZ22
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Comments
Recording Events
Selected 30
Clear All
Close
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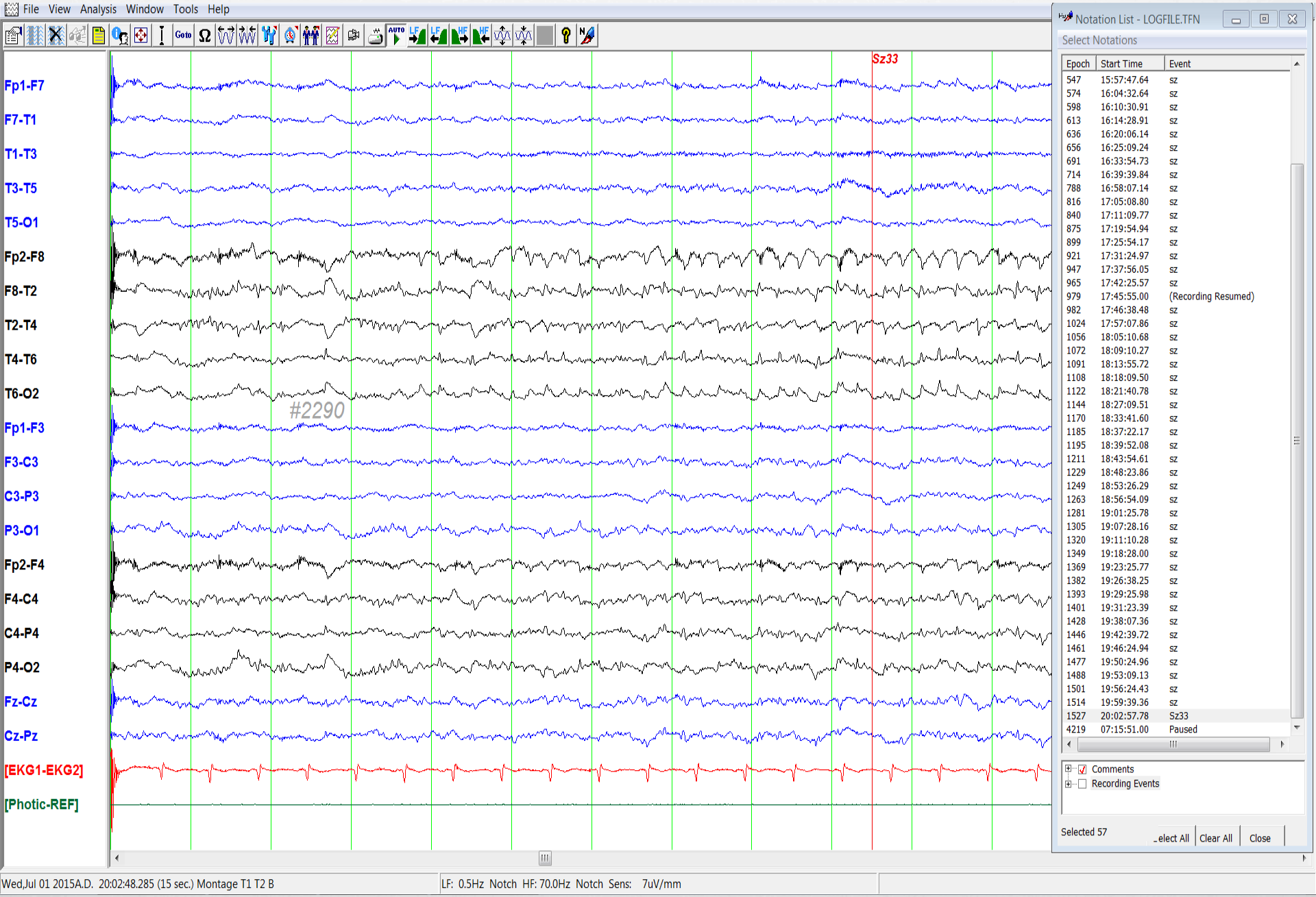
File View Analysis Window Tools Help
Fp1-F7
F7-T1
T1-T3
T3-T5
T5-O1
Fp2-F8
F8-T2
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T4-T6
T6-O2
Fp1-F3
F3-C3
C3-P3
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C4-P4
P4-O2
Fz-Cz
Cz-Pz
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[Photic-REF]
Sz33
#2290
Notation List - LOGFILE.TFN
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547 15:57:47.64 sz
574 16:04:32.64 sz
598 16:10:30.91 sz
613 16:14:28.91 sz
636 16:20:06.14 sz
656 16:25:09.24 sz
691 16:33:54.73 sz
714 16:39:39.84 sz
788 16:58:07.14 sz
816 17:05:08.80 sz
840 17:11:09.77 sz
875 17:19:54.94 sz
899 17:25:54.17 sz
921 17:31:24.97 sz
947 17:37:56.05 sz
965 17:42:25.57 sz
979 17:45:55.00 (Recording Resumed)
982 17:46:38.48 sz
1024 17:57:07.86 sz
1056 18:05:10.68 sz
1072 18:09:10.27 sz
1091 18:13:55.72 sz
1108 18:18:09.50 sz
1122 18:21:40.78 sz
1144 18:27:09.51 sz
1170 18:33:41.60 sz
1185 18:37:22.17 sz
1195 18:39:52.08 sz
1211 18:43:54.61 sz
1229 18:48:23.86 sz
1249 18:53:26.29 sz
1263 18:56:54.09 sz
1281 19:01:25.78 sz
1305 19:07:28.16 sz
1320 19:11:10.28 sz
1349 19:18:28.00 sz
1369 19:23:25.77 sz
1382 19:26:38.25 sz
1393 19:29:25.98 sz
1401 19:31:23.39 sz
1428 19:38:07.36 sz
1446 19:42:39.72 sz
1461 19:46:24.94 sz
1477 19:50:24.96 sz
1488 19:53:09.13 sz
1501 19:56:24.43 sz
1514 19:59:39.36 sz
1527 20:02:57.78 Sz33
4219 07:15:51.00 Paused
Comments
Recording Events
Selected 57
Select All
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Close
Wed,Jul 01 2015A.D. 20:02:48.285 (15 sec.) Montage T1 T2 B
LF: 0.5Hz Notch HF: 70.0Hz Notch Sens: 7uV/mm

When do we need it and for how long?

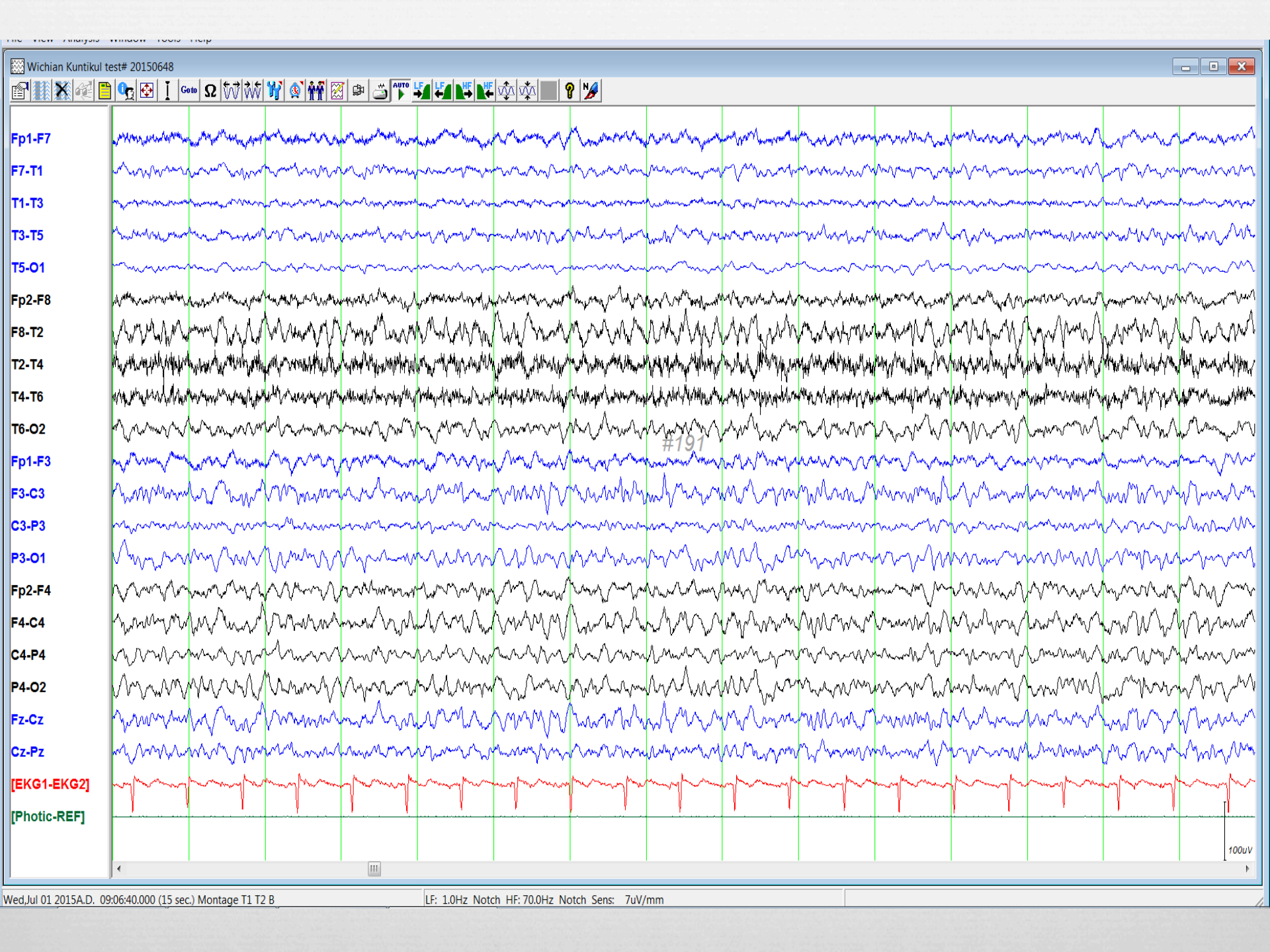
For estimate suitable treatment

- Generally use in refractory (subtle) status epilepticus, when trying to increase level of ANES to get rid of EEG seizures (MDZ, PPF) or to obtain burst suppression (TPT).
- Also when trying to withdraw ANES.

When do we need it and for how long?

For estimate suitable treatment

- How long to keep on >> when patient is getting ANES (usually in first 24-48 hrs), especially when dose is increased.
- For ANES withdrawal, BEM could be hooked intermittently, depending on clinical status. However 24 hrs after tapering off, continuation of BEM is recommended.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HF
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F7-T1
T1-T3
T3-T5
T5-O1
Fp2-F8
F8-T2
T2-T4
T4-T6
T6-O2
Fp1-F3
F3-C3
C3-P3
P3-O1
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C4-P4
P4-O2
Fz-Cz
Cz-Pz
[EKG1-EKG2]
[Photic-REF]
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Wed,Jul 01 2015A.D. 09:06:40.000 (15 sec.) Montage T1 T2 B
LF: 1.0Hz Notch HF: 70.0Hz Notch Sens: 7uV/mm


Wichian Kuntikul test# 20150648
Goto
AUTO
Fp1-F7
F7-T1
T1-T3
T3-T5
T5-O1
Fp2-F8
F8-T2
T2-T4
T4-T6
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#2097
Fp1-F3
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F4-C4
C4-P4
P4-O2
Fz-Cz
Cz-Pz
[EKG1-EKG2]
[Photic-REF]
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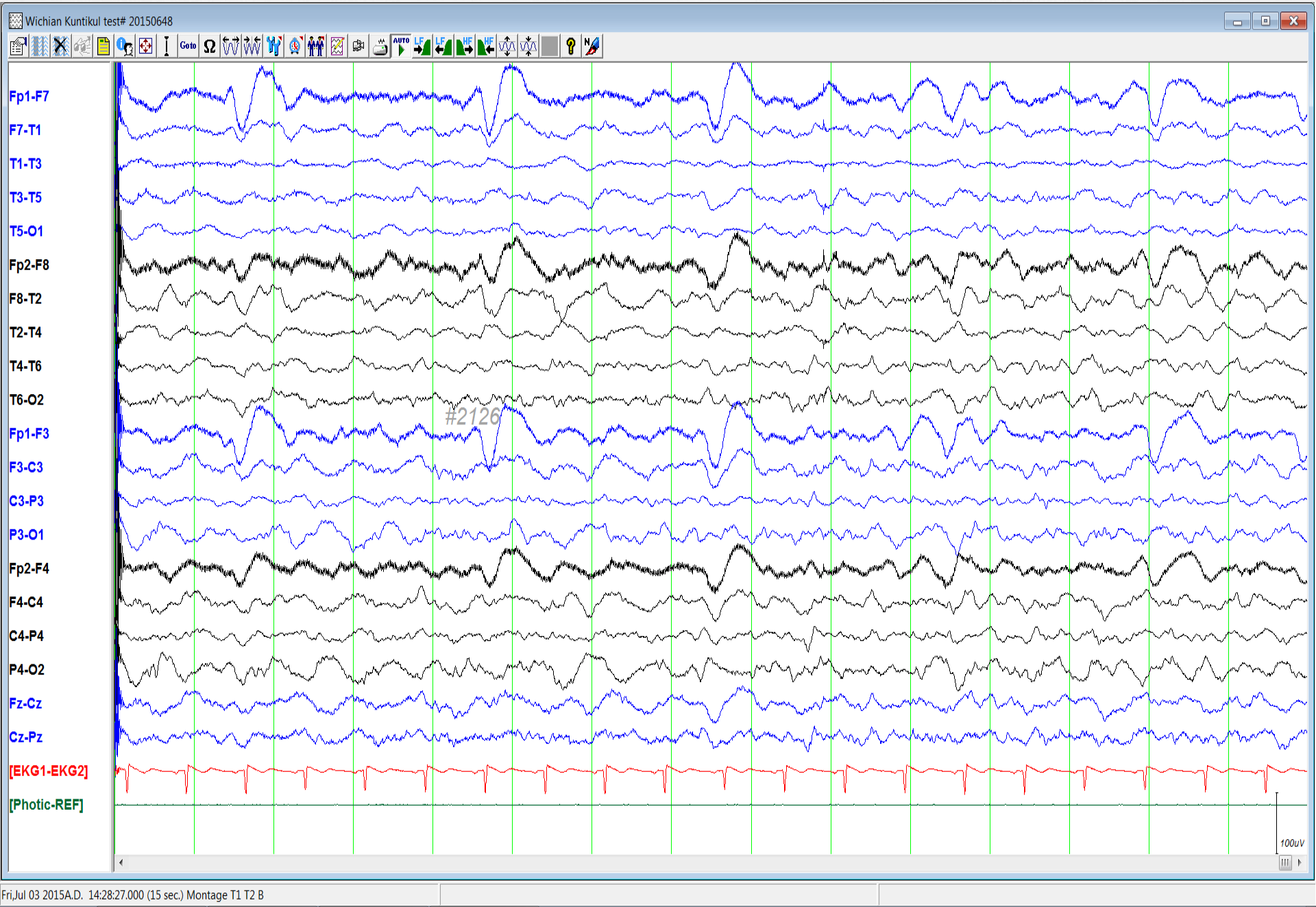
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HF
HF
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T1-T3
T3-T5
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Fp2-F8
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C4-P4
P4-O2
Fz-Cz
Cz-Pz
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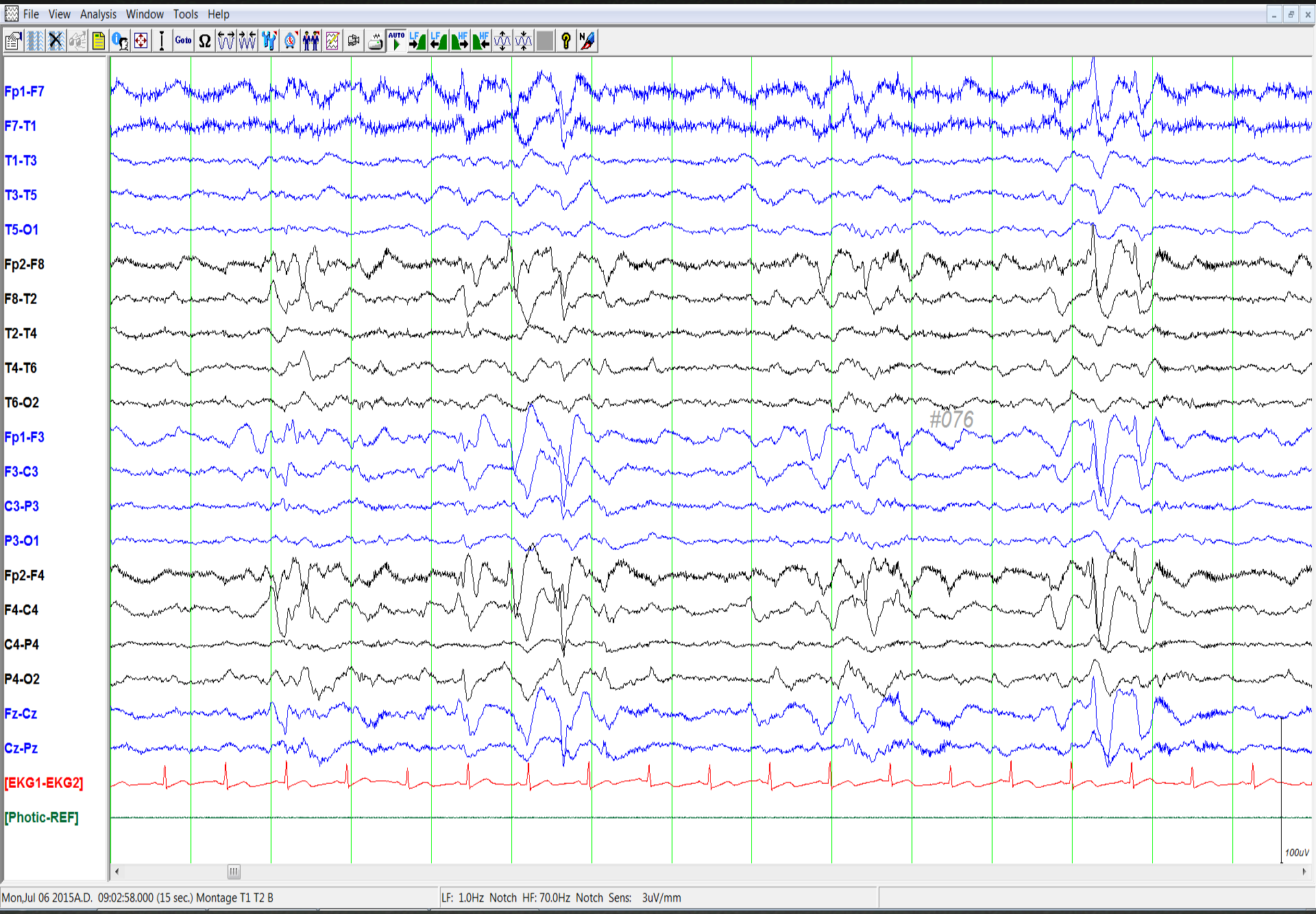
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T1-T3
T3-T5
T5-O1
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T6-O2
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C4-P4
P4-O2
Fz-Cz
Cz-Pz
[EKG1-EKG2]
[Photic-REF]
#076
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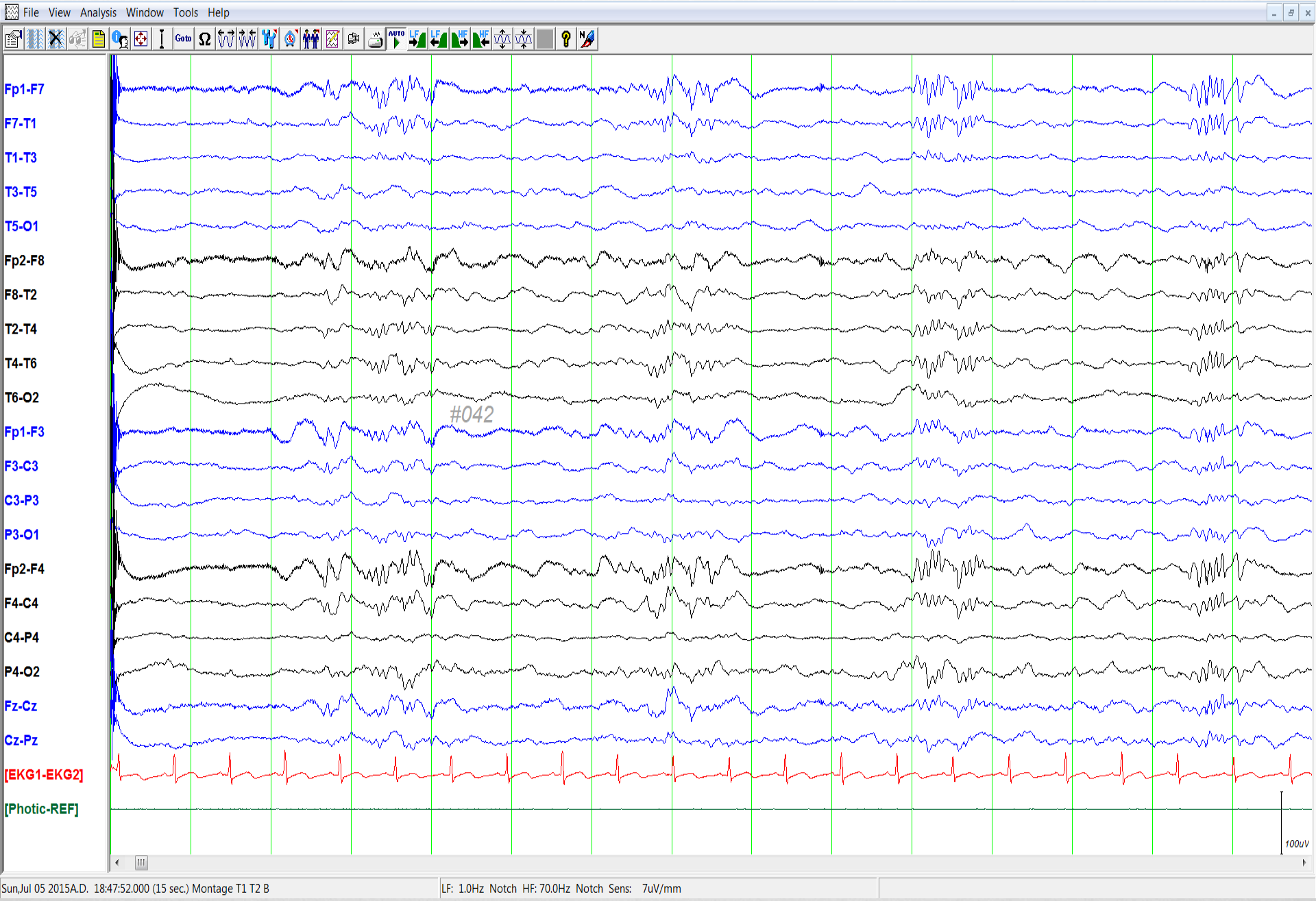
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Fp1-F7
F7-T1
T1-T3
T3-T5
T5-O1
Fp2-F8
F8-T2
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T4-T6
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C4-P4
P4-O2
Fz-Cz
Cz-Pz
[EKG1-EKG2]
[Photic-REF]
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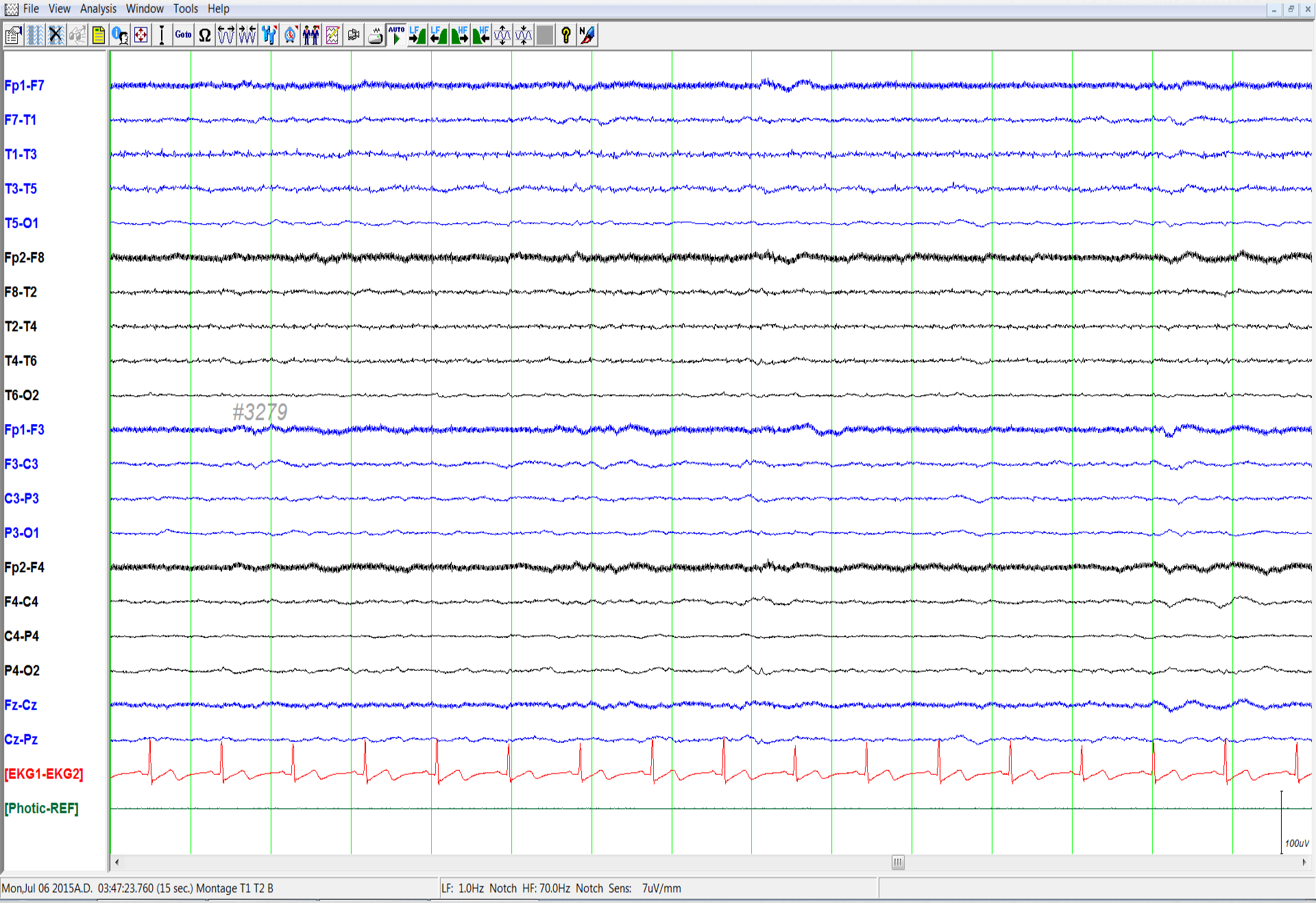
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Fp1-F7
F7-T1
T1-T3
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C4-P4
P4-O2
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Cz-Pz
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