Atlas: Quantitative EEG Spectrogram Nomenclature

Solid Flames

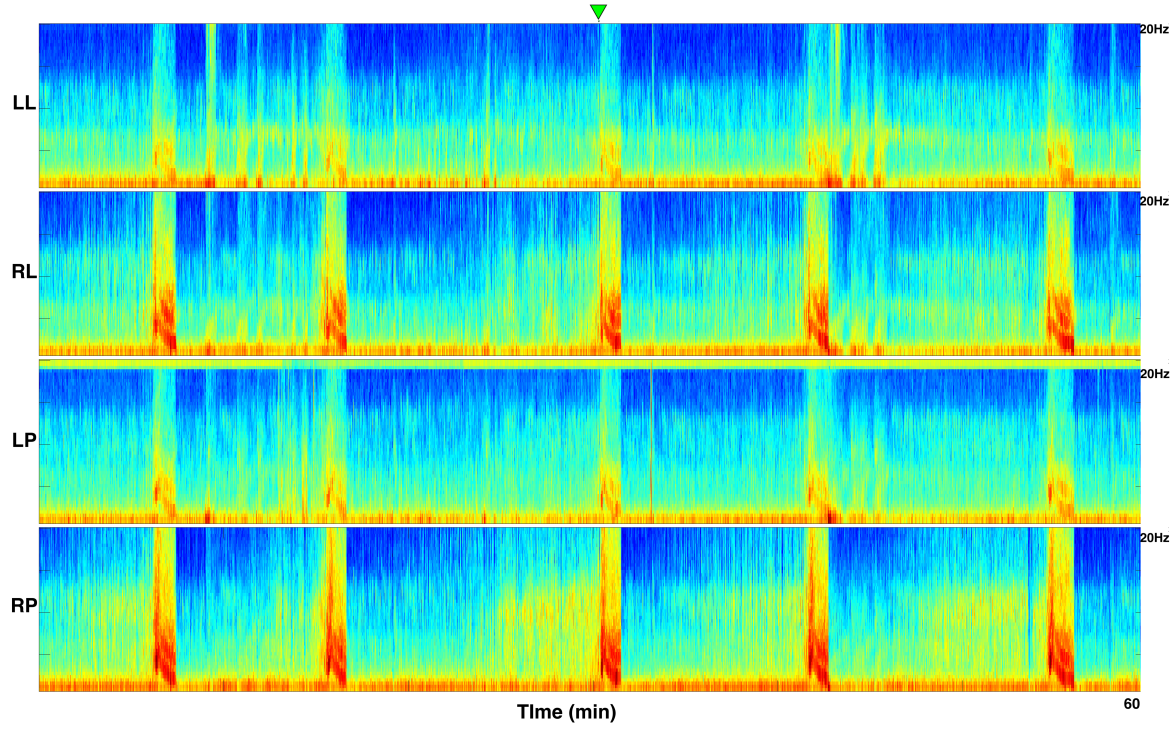
Solid flames are characterized by an abrupt appearance of spectrogram segments with higher power and bandwidth, similar in appearance to candle flames. Solid flames are regular and have smooth edges**.**

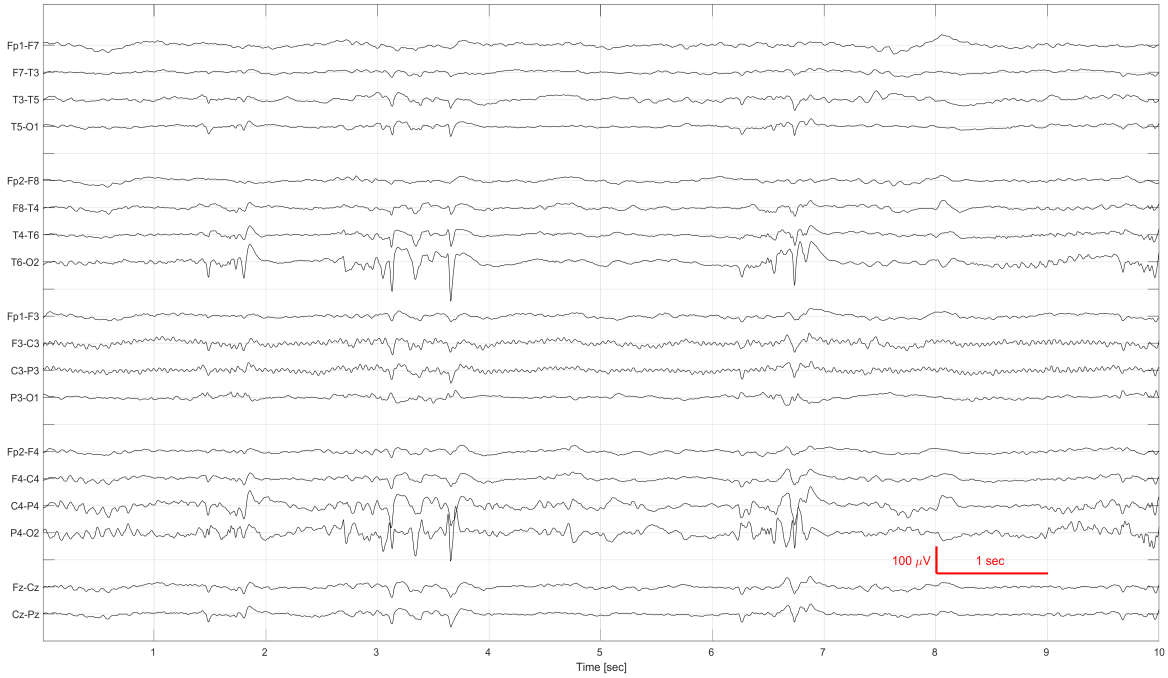
The probability of Ictal-interictal continuum (IIC) vs. other raw EEG patterns seen with solid flames on the spectrogram nomenclature survey completed by electroencephalographers was as follows: Seizures or other IIC patterns 69.4%; focal or generalized slowing 19.3%; other 5.0%; burst suppression 3.1%; artifact 2.5%; generalized suppression 0.6%.

Examples of solid flames with corresponding raw EEG are shown. The scalp is divided into 4 different regions for spectrogram construction: Left lateral (Fp1, F7, T3, T5, O10; right lateral (Fp2, F8, T4, T6, O2); left parasagittal (Fp1, F3, C3, P3, O1); right parasagittal (Fp2, F4, C4, P4, O2). Each spectrogram image has four panels: left lateral (LL), right lateral (RL), left parasagittal (LP), right parasagittal (RP). Each spectrogram image shows one hour of recording. The vertical axis represents the spectrogram frequency from 0–20 Hz. For each example of solid flames we have shown raw EEG clips from the start, center and end of the flame. The green arrow represents the segment (start, center or end) from which the raw EEG clip is taken. Each raw EEG image shows a 10 second clip of recording in a longitudinal bipolar montage.

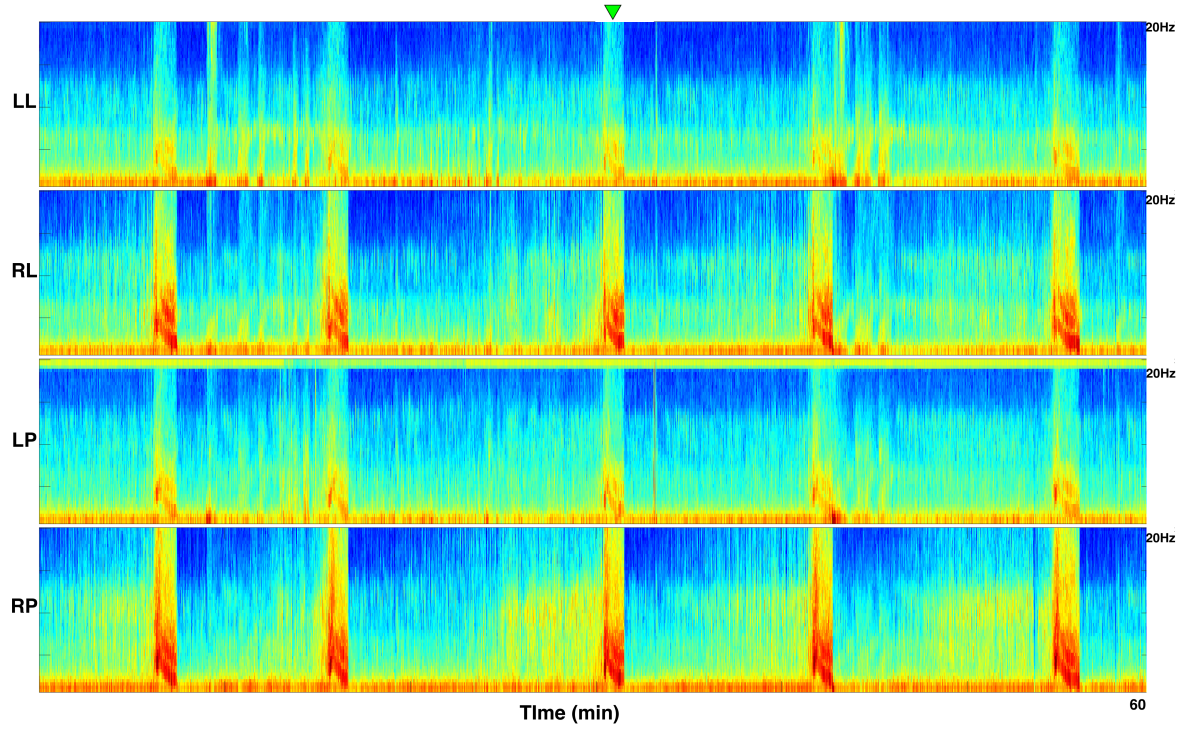
Solid flames: Example 1

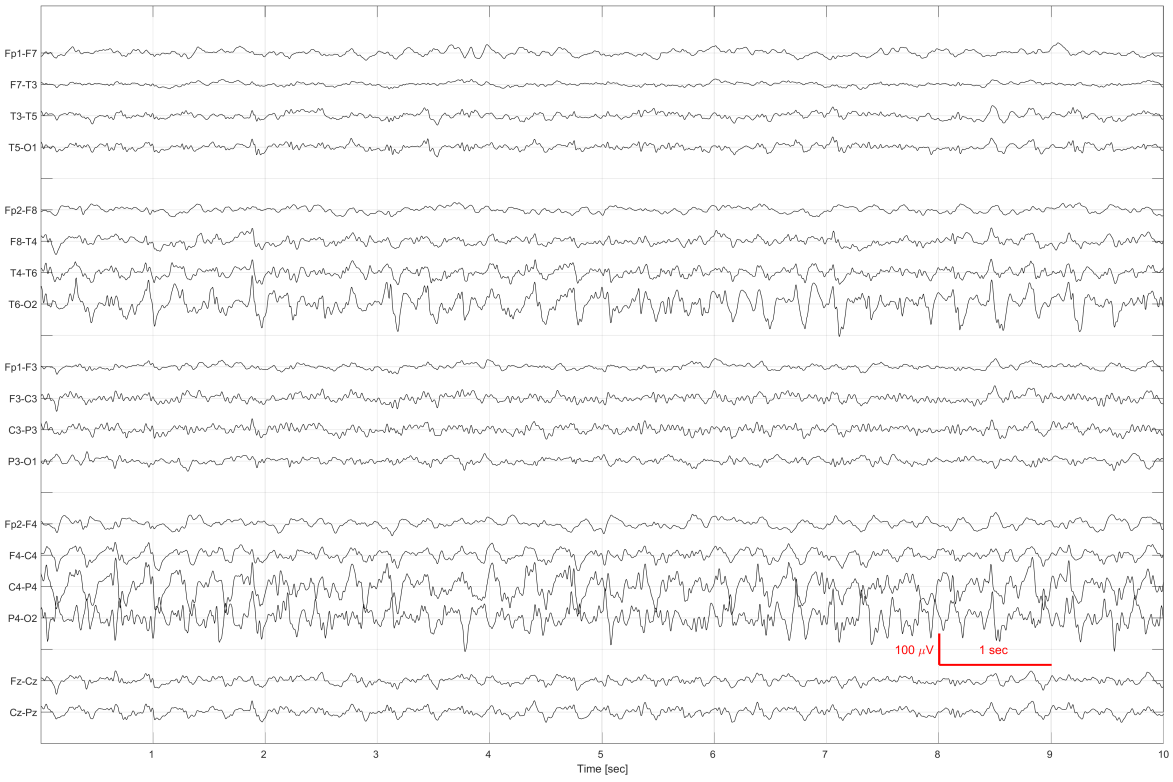
Flame start



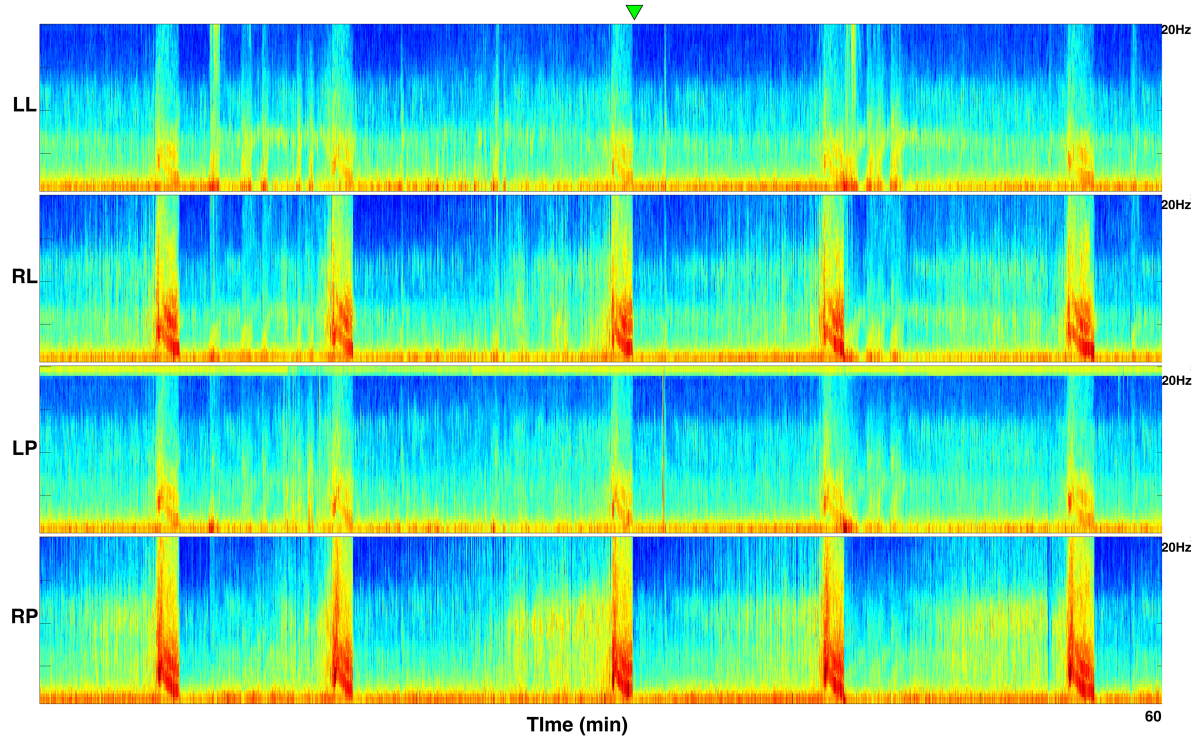


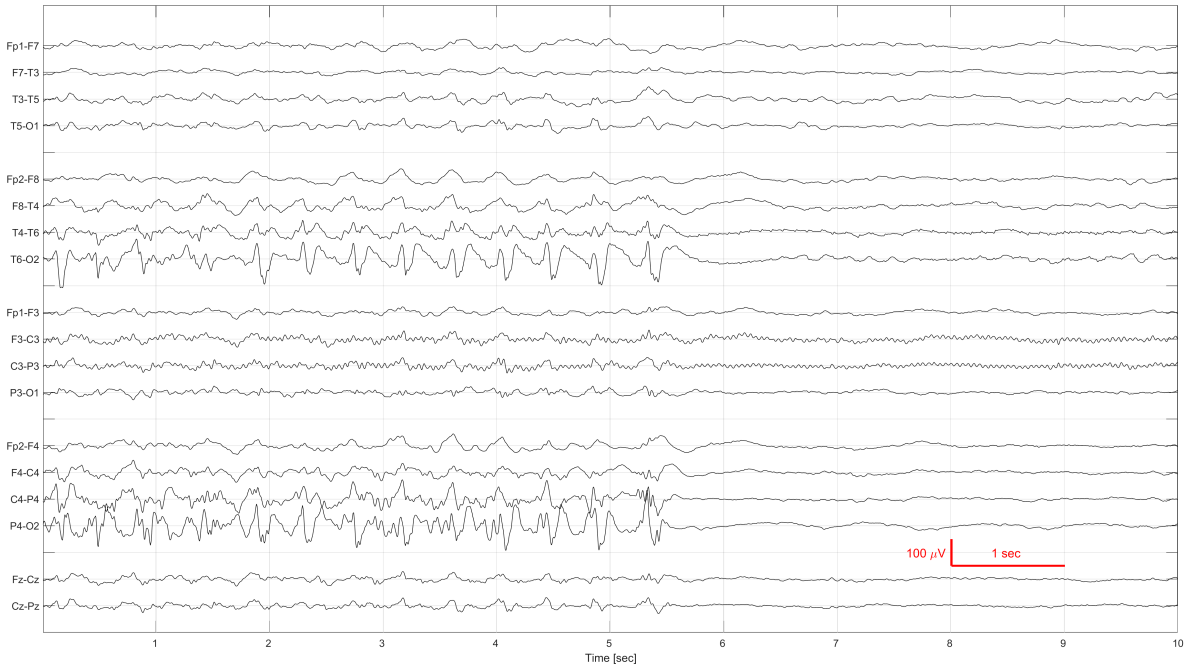
Flame center





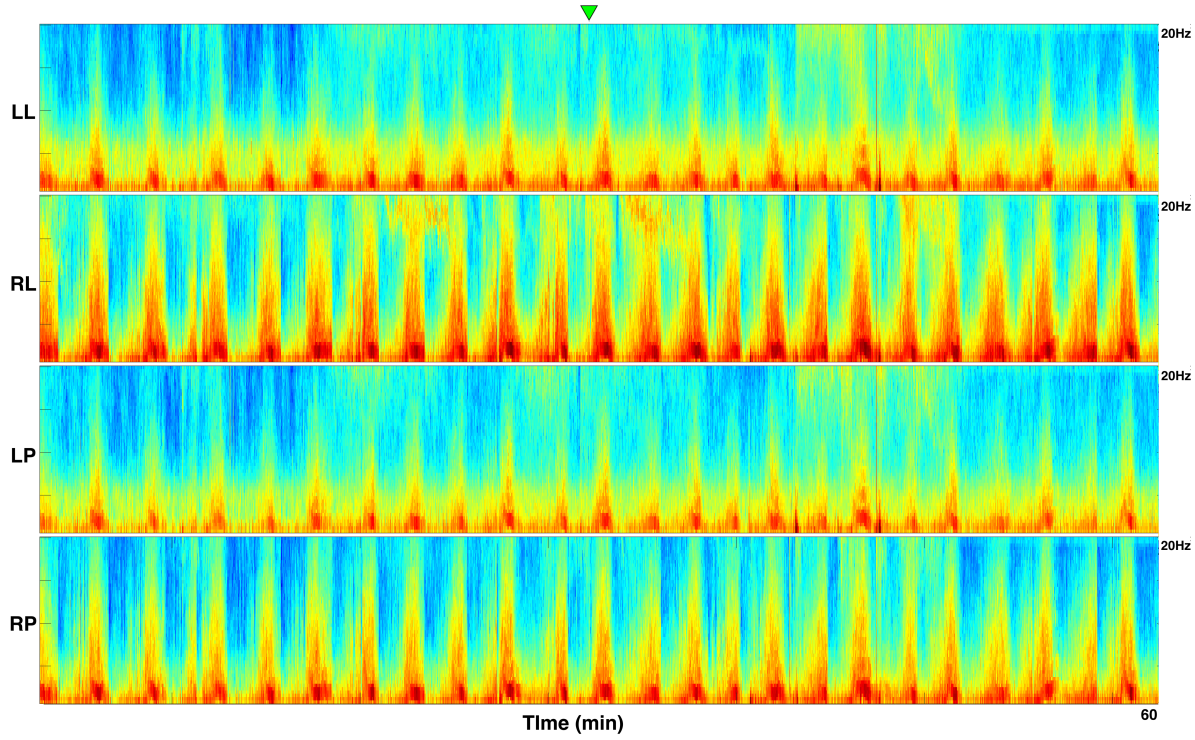
Flame end

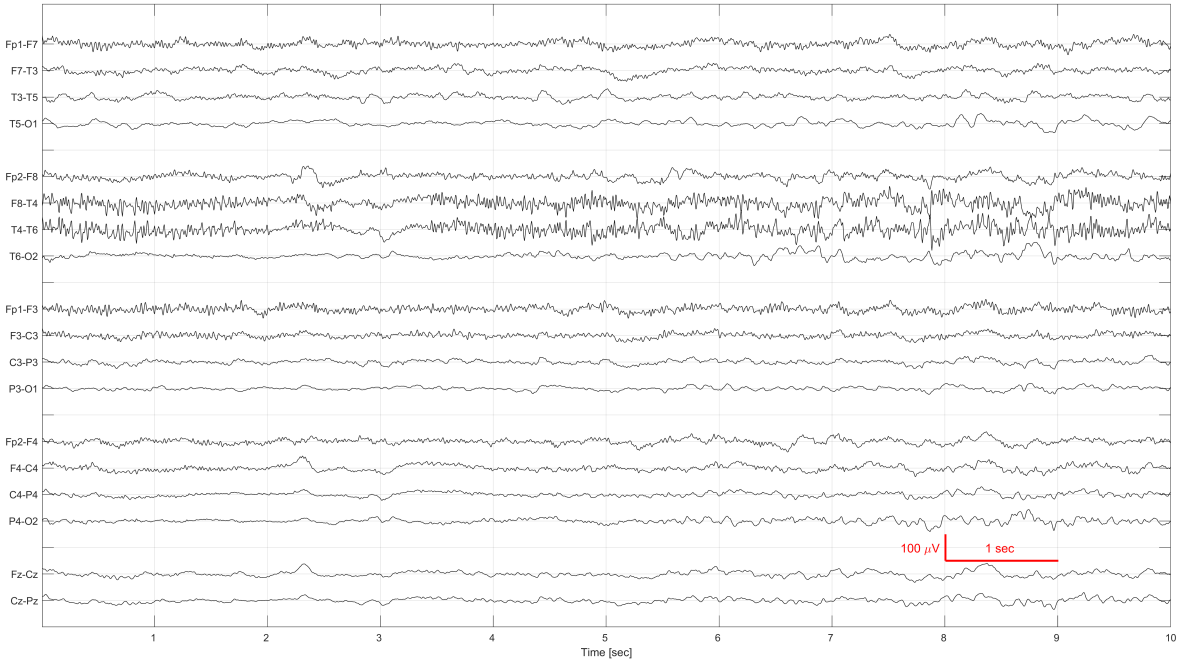

LL
RL
LP
RP
20Hz
20Hz
20Hz
20Hz
TIme (min)
60


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
100 μV
1 sec
1
2
3
4
5
6
7
8
9
10
Time [sec]

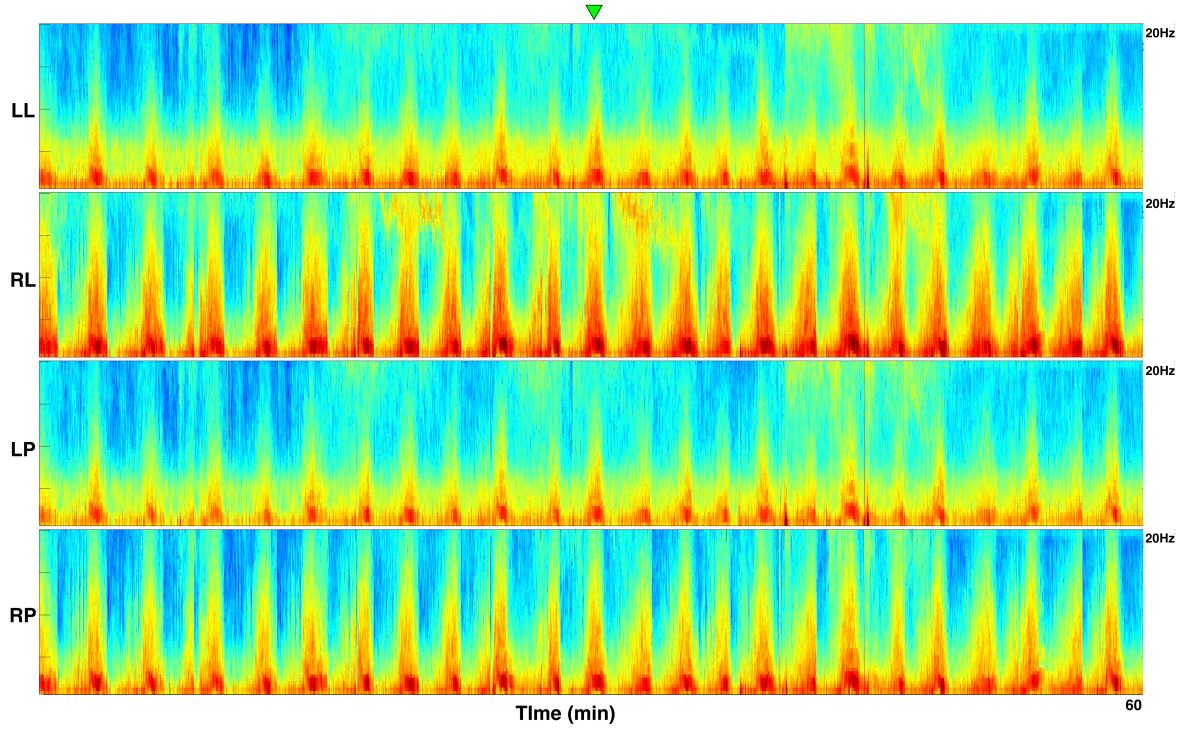
Solid flames: Example 2

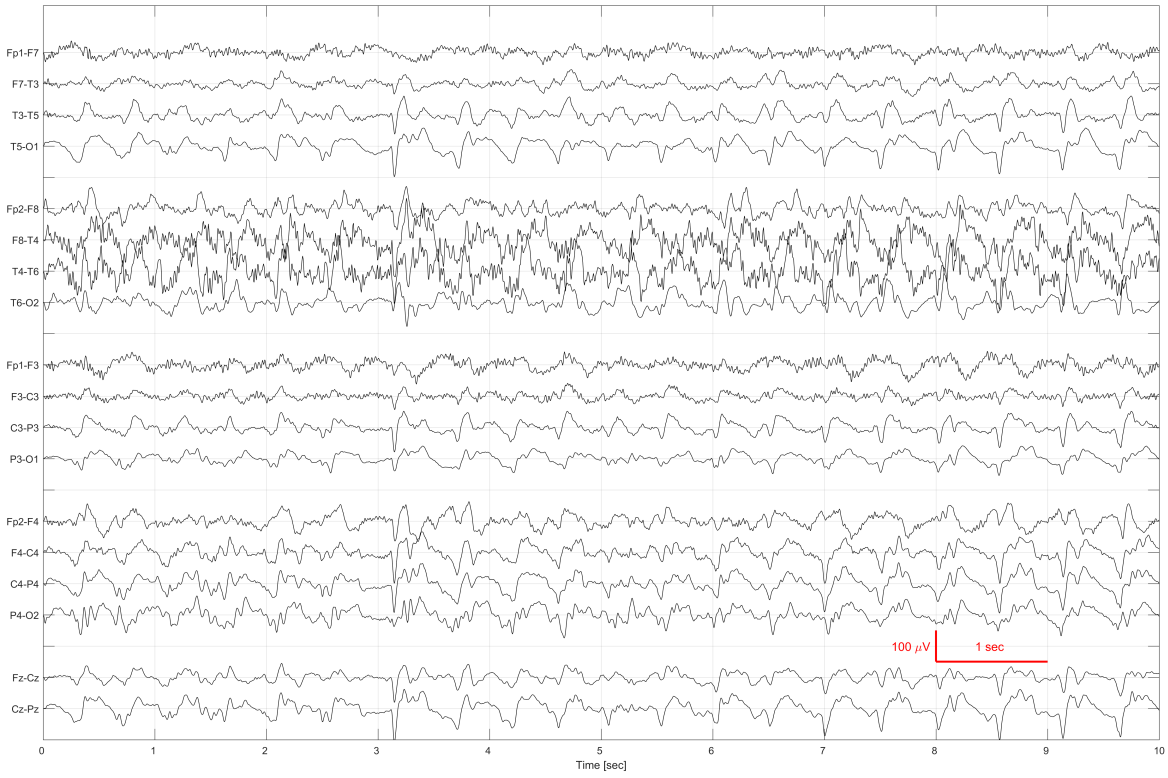
Flame start



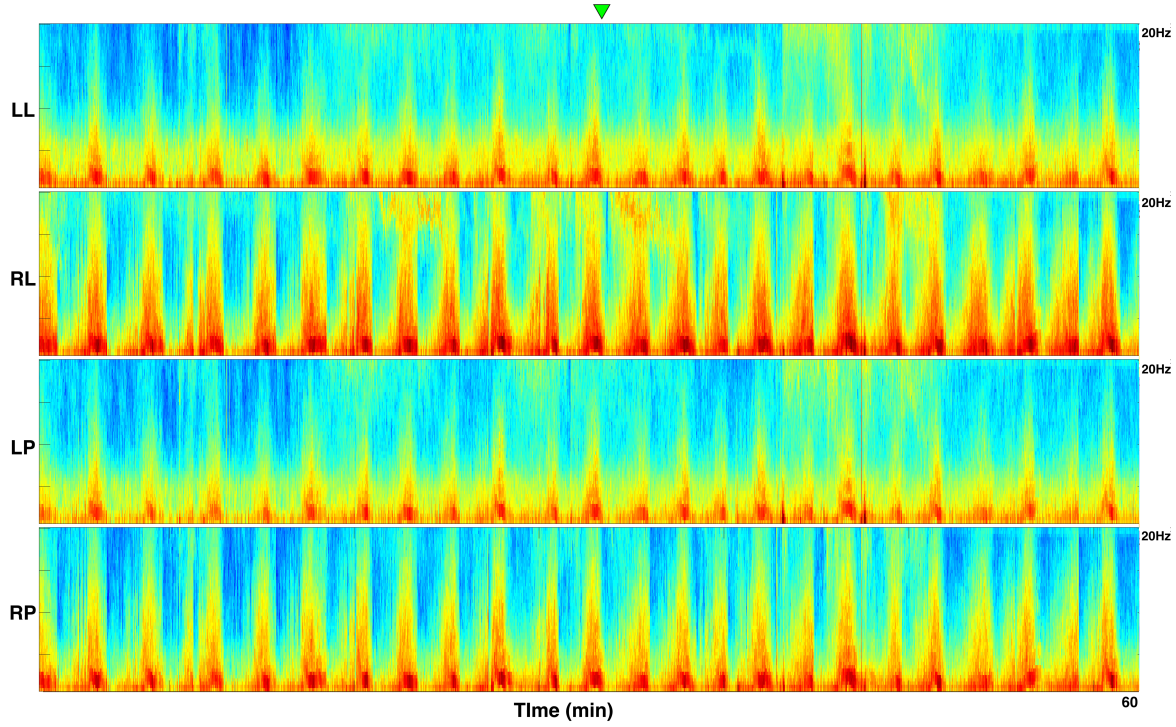


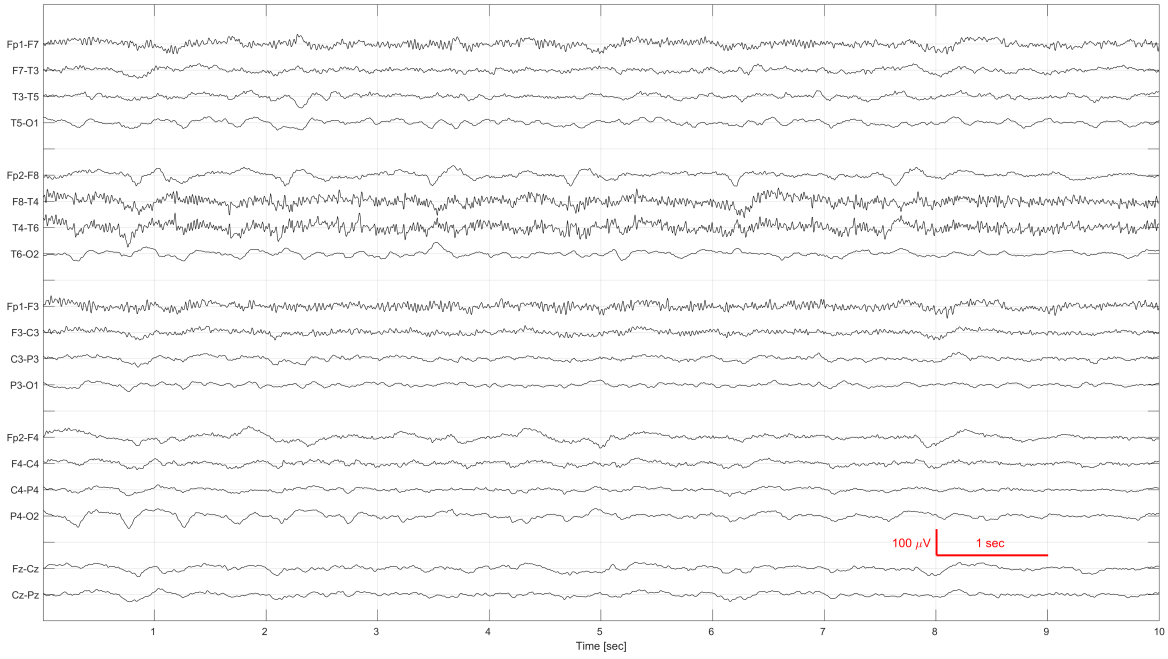
Flame center





Flame end


LL
RL
LP
RP
20Hz
20Hz
20Hz
20Hz
TIme (min)
60


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
100 μV
1 sec
1
2
3
4
5
6
7
8
9
10
Time [sec]

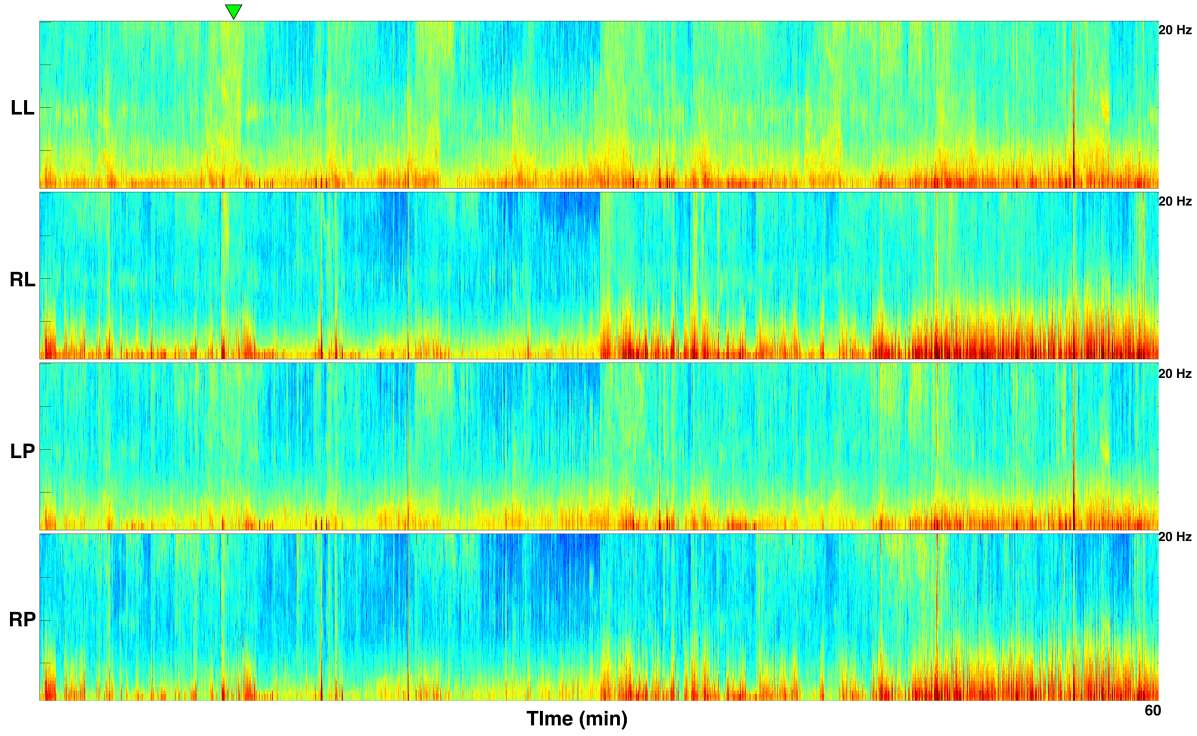
Irregular flames

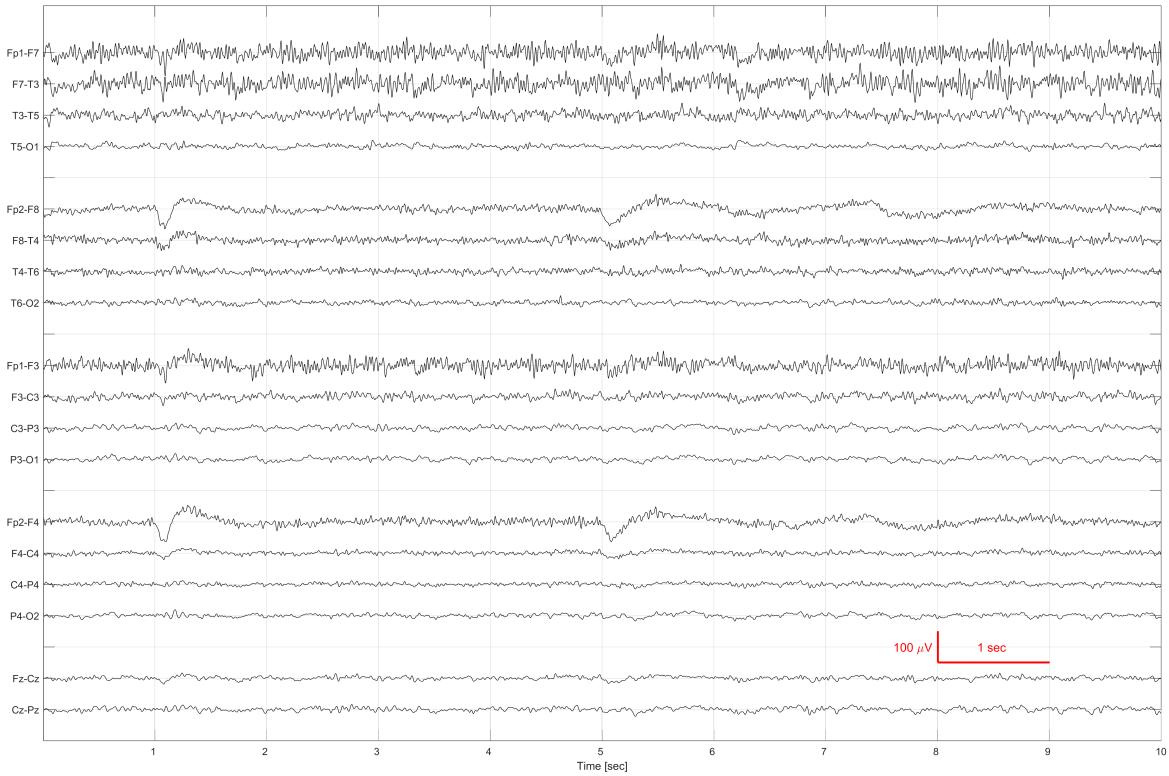
Irregular flames do not have smooth edges and instead are characterized by "choppiness" or "irregularity". They do not have the stereotyped and regular appearance that characterizes solid flames.

The probability of IIC vs. other raw EEG patterns seen with irregular flames on the spectrogram nomenclature survey completed by electroencephalographers was as follows: Seizures or IIC patterns 38.7%; focal or generalized slowing 32.3%; artifact 15.5%; generalized suppression 5.9%; other 5%; burst suppression 2.9%.

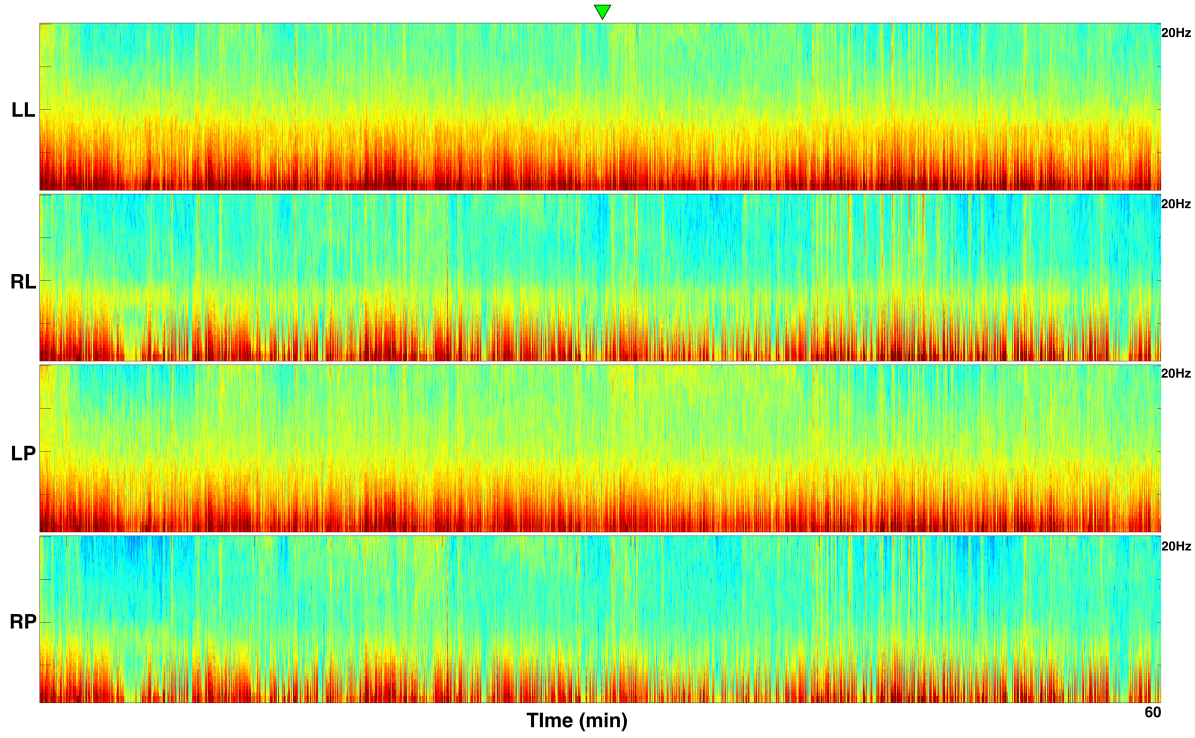
Examples of irregular flames with corresponding raw EEG are shown. The scalp is divided into 4 different regions for spectrogram construction: Left lateral (Fp1, F7, T3, T5, O10; right lateral (Fp2, F8, T4, T6, O2); left parasagittal (Fp1, F3, C3, P3, O1); right parasagittal (Fp2, F4, C4, P4, O2). Each spectrogram image has four panels: left lateral (LL), right lateral (RL), left parasagittal (LP), right parasagittal (RP). Each spectrogram image shows one hour of recording. The vertical axis represents the spectrogram frequency from 0–20 Hz. For each example of irregular flames the green arrow represents the segment from which the raw EEG clip is taken. Each raw EEG image shows a 10 second clip of recording in a longitudinal bipolar montage.

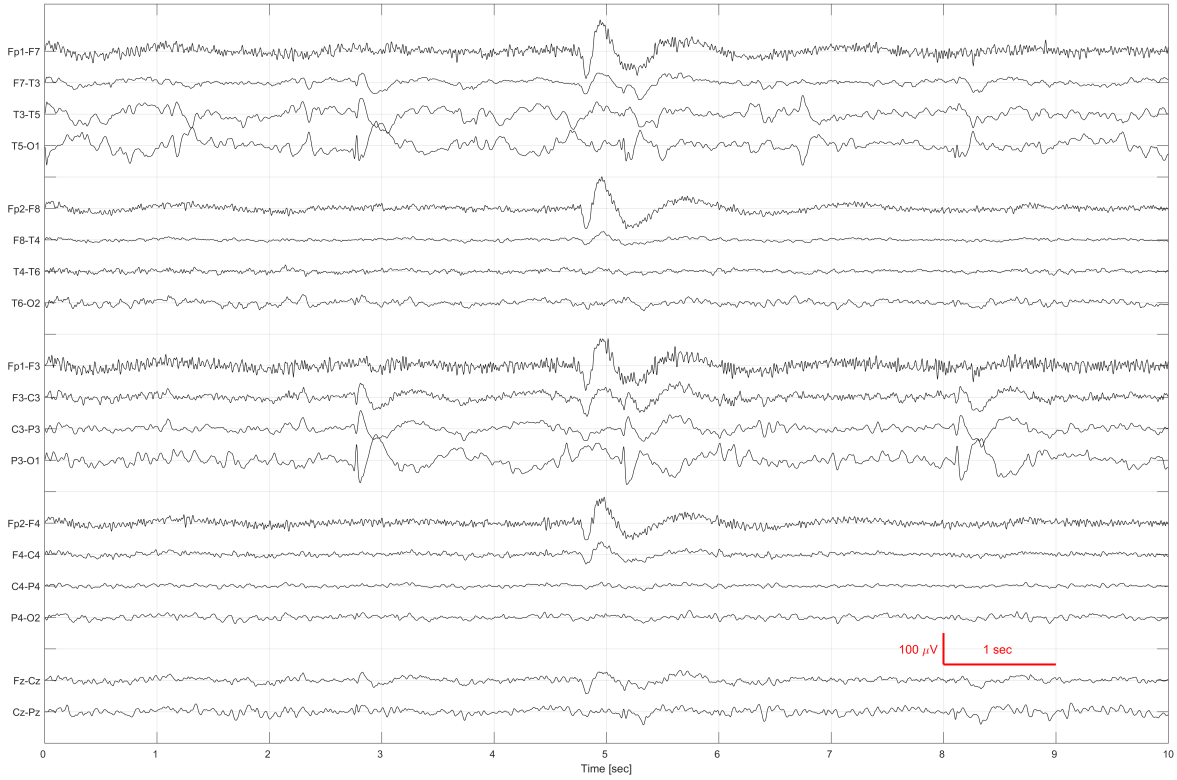
Irregular falmes: Example 1





Irregular flames: Example 2





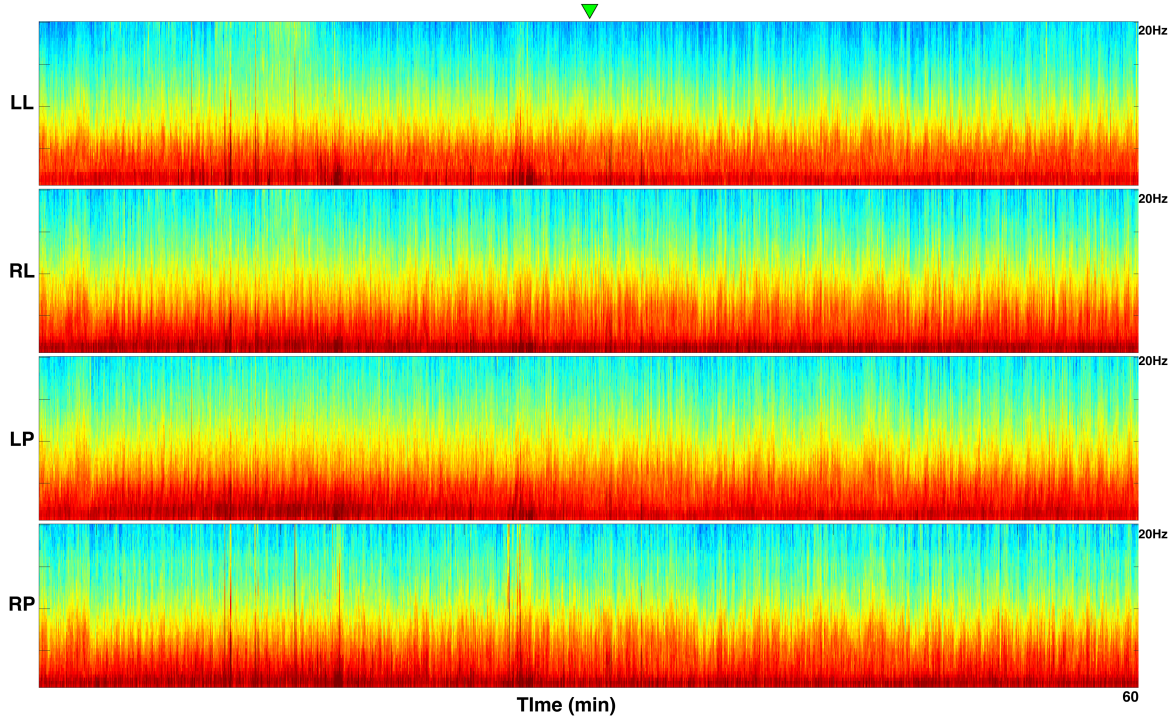
Broadband-monotonous

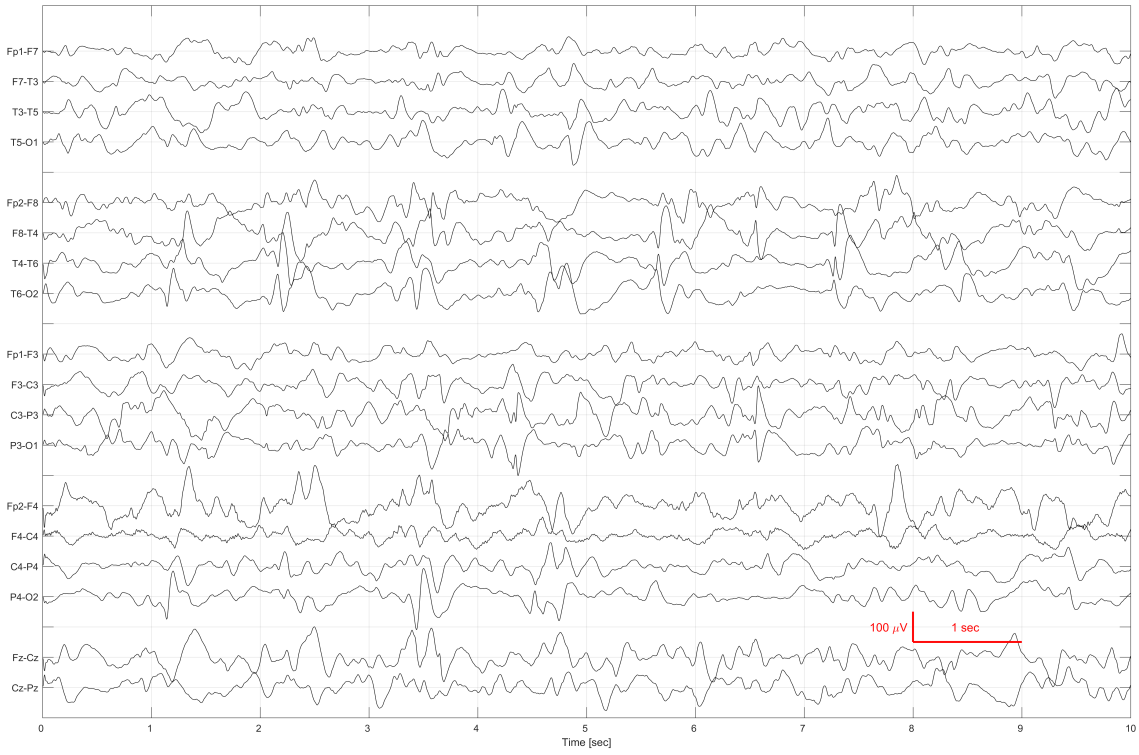
Broadband-monotonous spectrograms are characterized by sustained higher power at low frequencies. There is minimal variation or very gradual waxing and waning of frequencies within the high-power band.

The probability of IIC vs. other raw EEG patterns seen with broadband-monotonous on the spectrogram nomenclature survey completed by electroencephalographers was as follows: Seizures or IIC patterns 54.3%; focal or generalized slowing 32.9%; artifact 8.1%, other 4.8%.

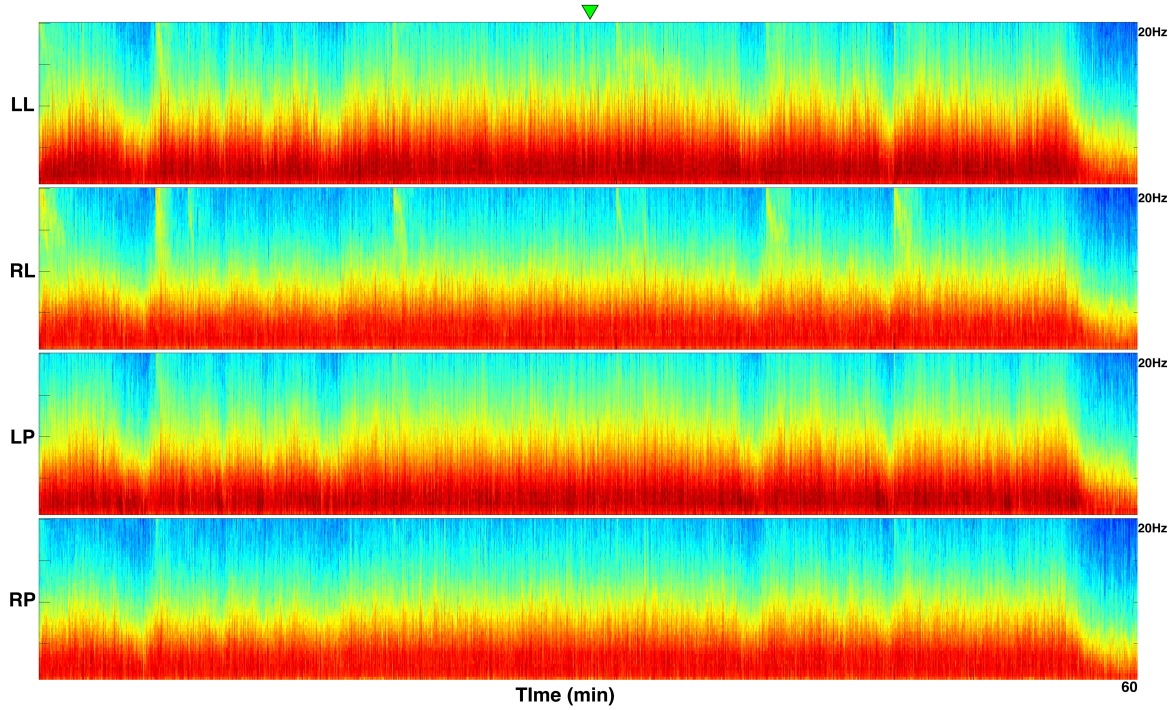
Examples of broadband-monotonous with corresponding raw EEG are shown. The scalp is divided into 4 different regions for spectrogram construction: Left lateral (Fp1, F7, T3, T5, O10; right lateral (Fp2, F8, T4, T6, O2); left parasagittal (Fp1, F3, C3, P3, O1); right parasagittal (Fp2, F4, C4, P4, O2). Each spectrogram image has four panels: left lateral (LL), right lateral (RL), left parasagittal (LP), right parasagittal (RP). Each spectrogram image shows one hour of recording. The vertical axis represents the spectrogram frequency from 0–20 Hz. For each example of broadband-monotonous, the green arrow represents the segment from which the raw EEG clip is taken. Each raw EEG image shows a 10 second clip of recording in a longitudinal bipolar montage.

Broadband-monotonous: Example 1





Broadband-monotonous: Example 2



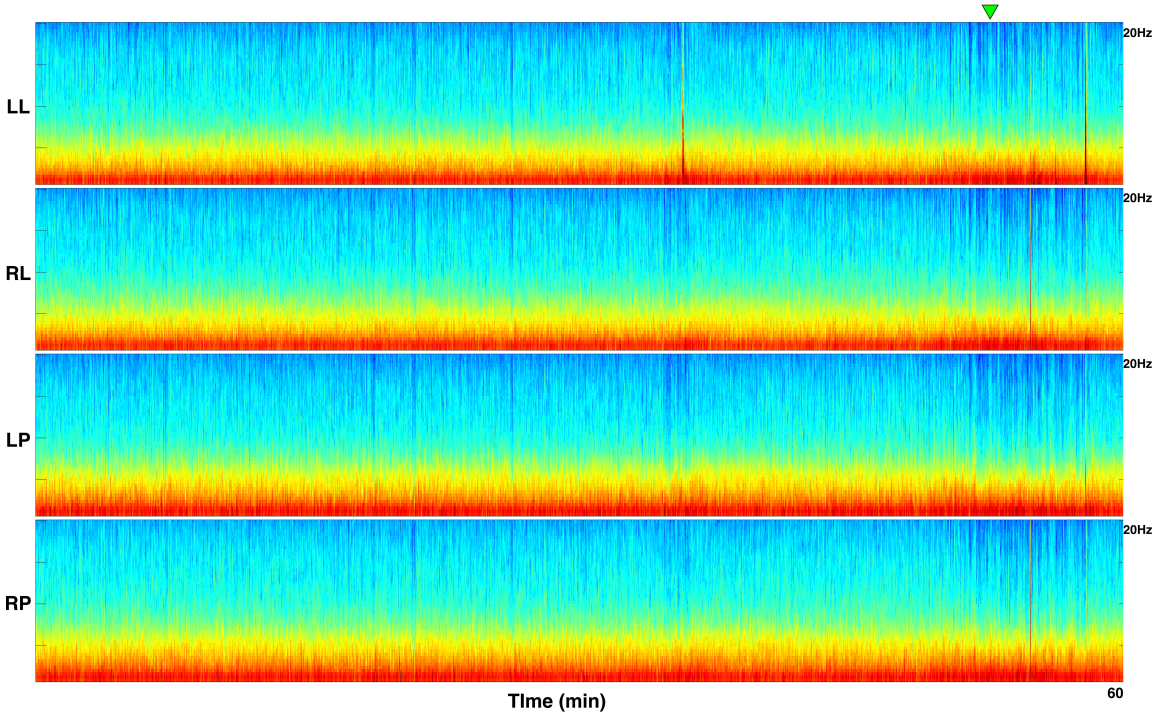
Narrowband-monotonous

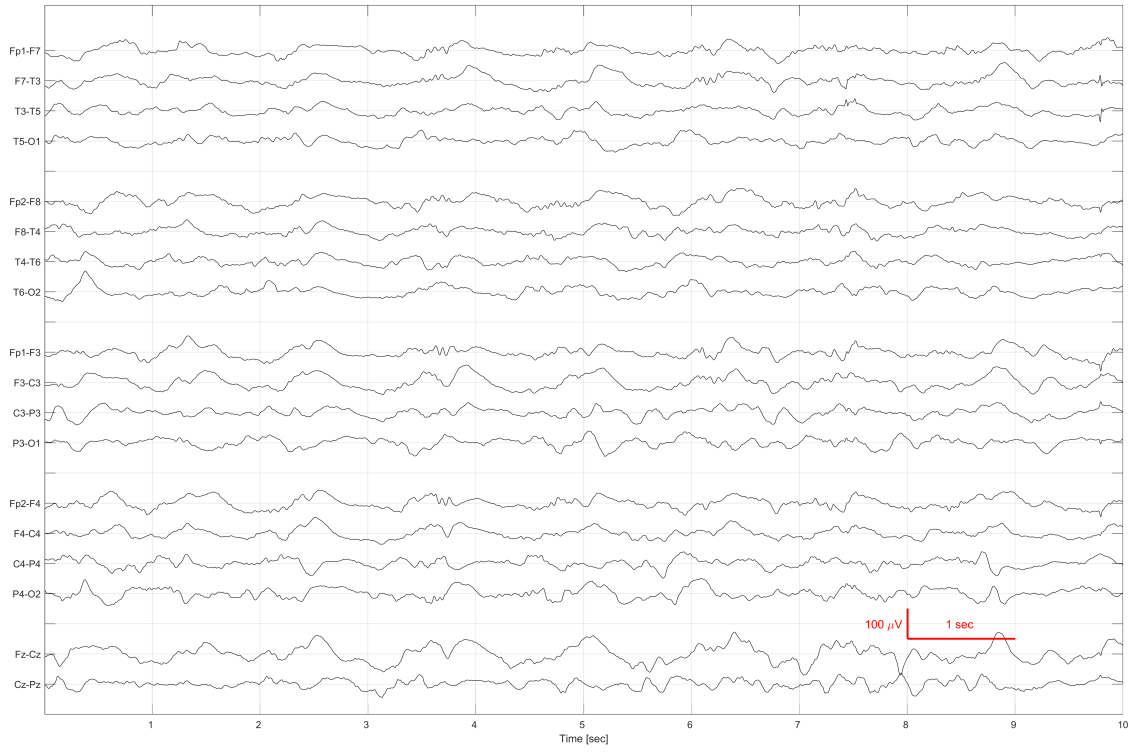
Low power is characterized by a sustained <5Hz band of high power (yellow/red).

The probability of IIC vs. other raw EEG patterns seen with narrowband-monotonous on the spectrogram nomenclature survey completed by electroencephalographers was as follows: Focal or generalized slowing 43.8%; generalized suppression 23.5%; seizures or IIC patterns 24.2%; other 1.9%; artifact 1.2%.

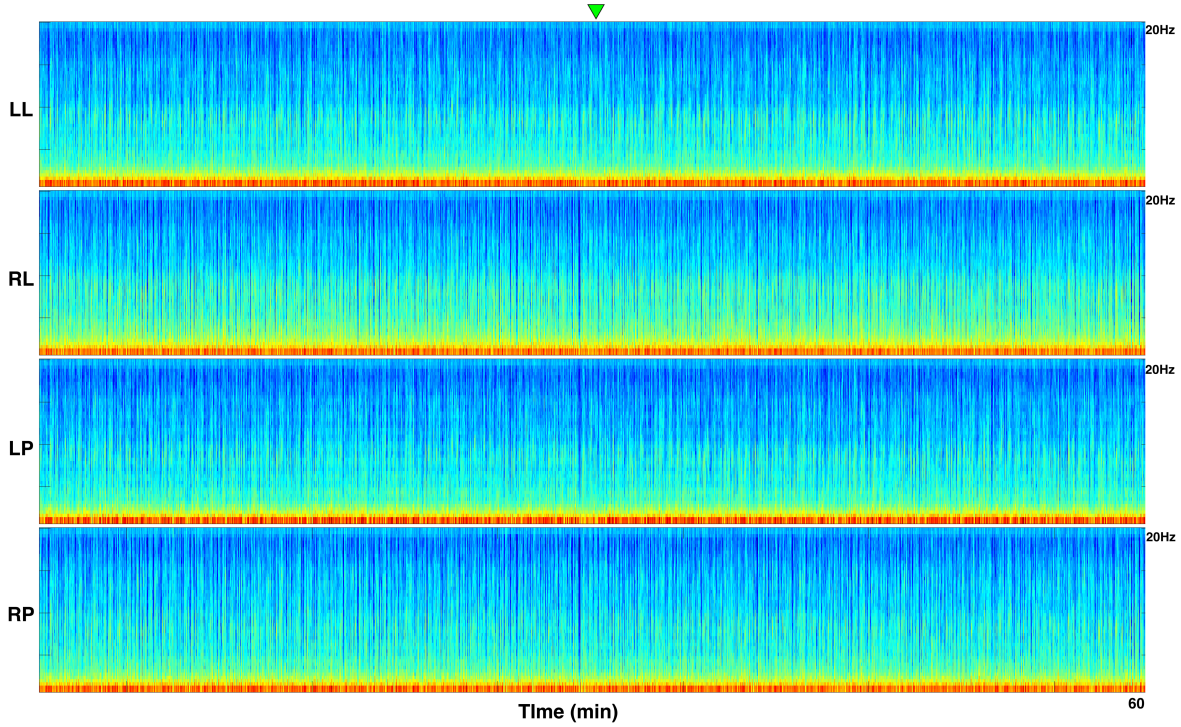
Examples of narrowband-monotonous with corresponding raw EEG are shown. The scalp is divided into 4 different regions for spectrogram construction: Left lateral (Fp1, F7, T3, T5, O10; right lateral (Fp2, F8, T4, T6, O2); left parasagittal (Fp1, F3, C3, P3, O1); right parasagittal (Fp2, F4, C4, P4, O2). Each spectrogram image has four panels: left lateral (LL), right lateral (RL), left parasagittal (LP), right parasagittal (RP). Each spectrogram image shows one hour of recording. The vertical axis represents the spectrogram frequency from 0–20 Hz. For each example of narroband-monotonous, the green arrow represents the segment from which the raw EEG clip is taken. Each raw EEG image shows a 10 second clip of recording in a longitudinal bipolar montage.

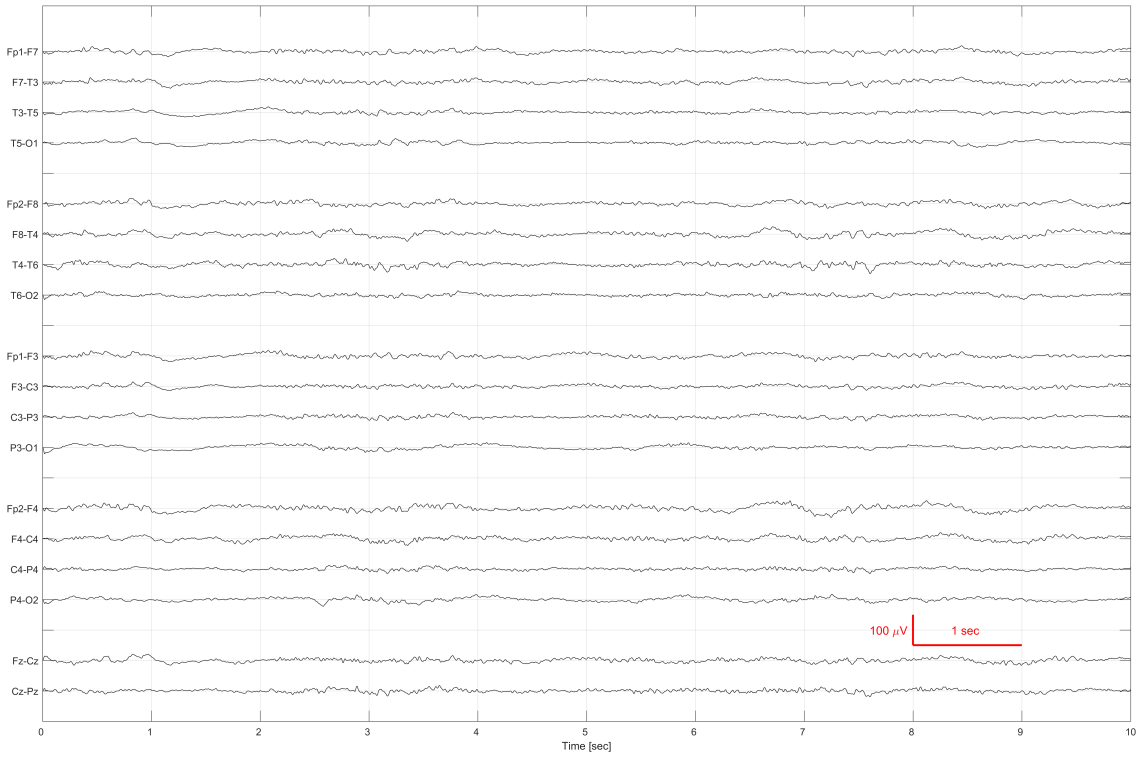
Narrowband-monotonous: Example 1





Narrowband-monotonous: Example 2





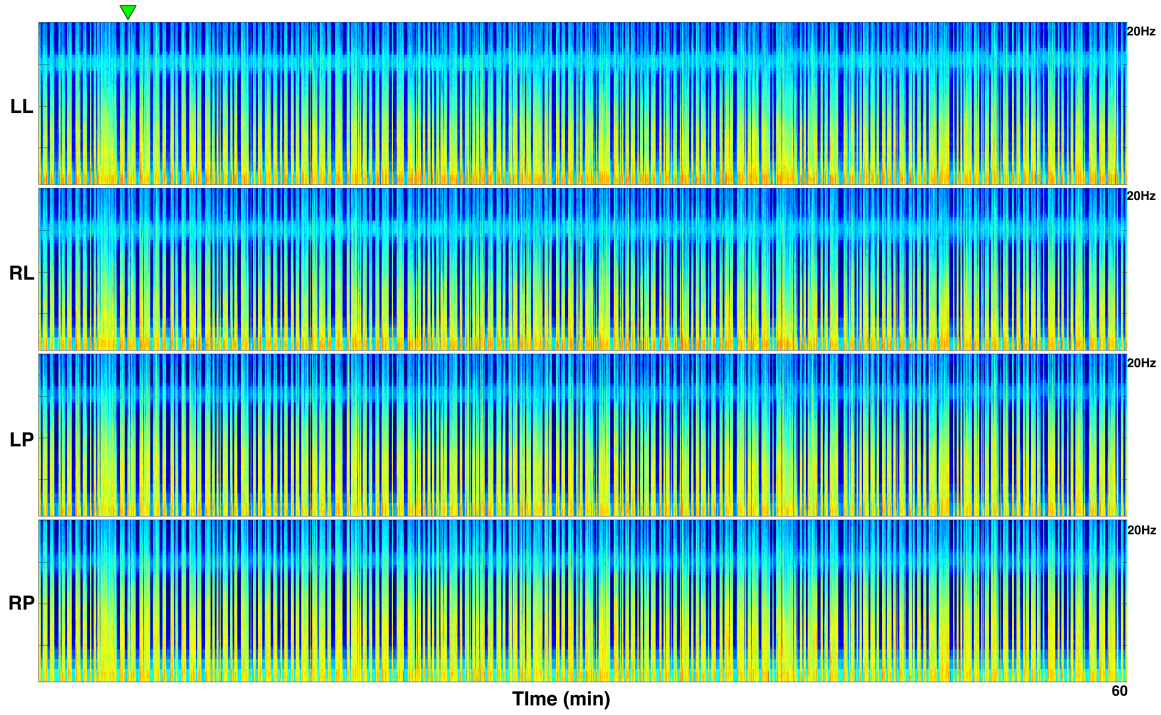
Stripes

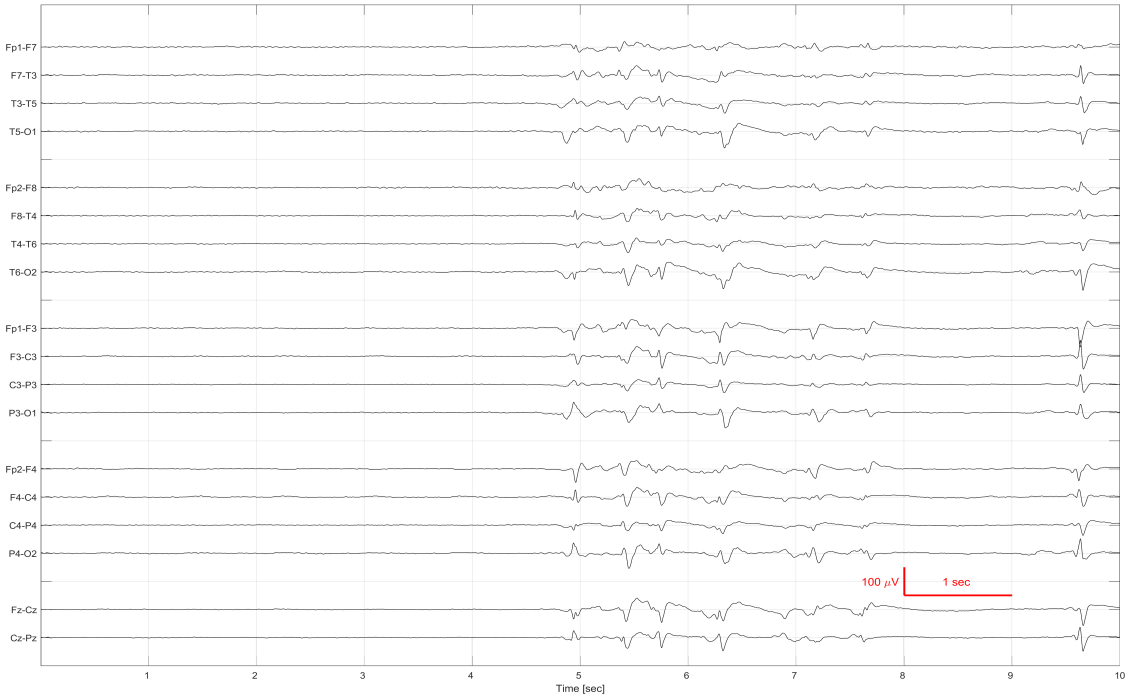
Stripes are characterized by rapid alternation between diffuse low power and high power and high frequencies, giving the spectrogram a striped appearance.

The probability of IIC vs. other raw EEG patterns seen with stripes on the spectrogram nomenclature survey completed by electroencephalographers was as follows: Burst suppression 37.2%; generalized suppression 34.4%; focal or generalized slowing 17.6%, seizures or IIC patterns 6.8%, artifact 2%, other 2%.

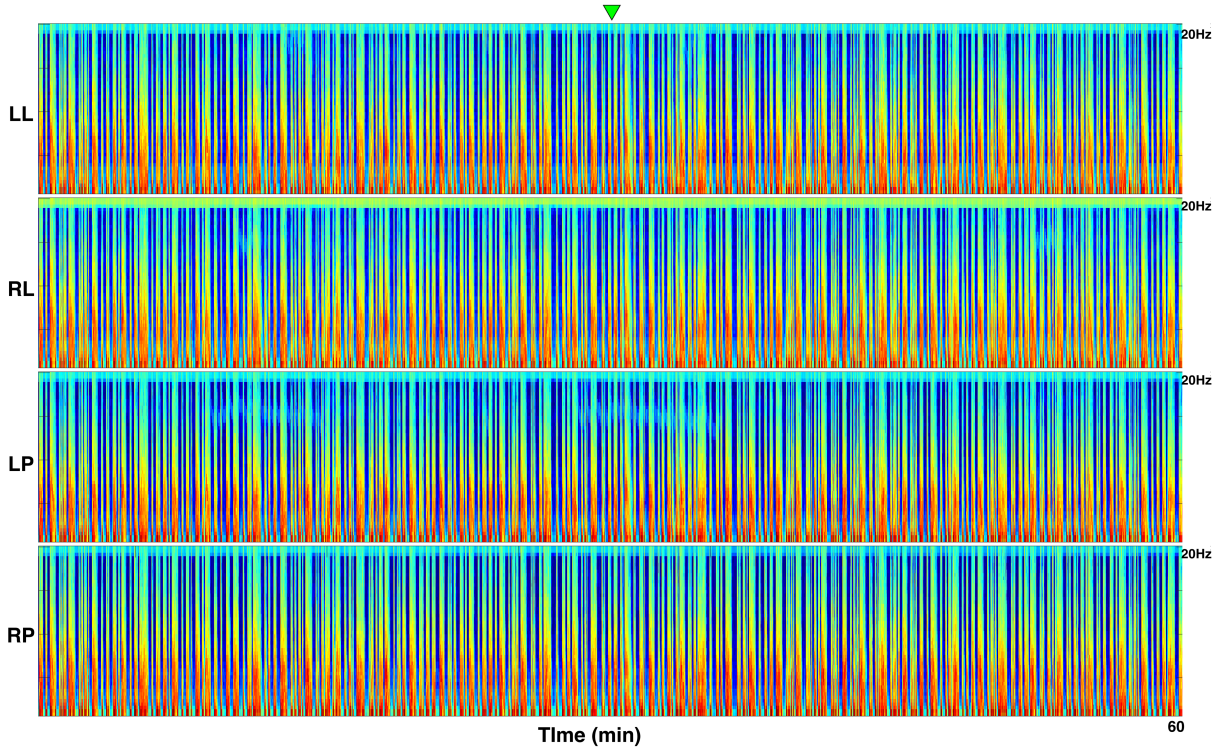
Examples of stripes, with corresponding raw EEG are shown. The scalp is divided into 4 different regions for spectrogram construction: Left lateral (Fp1, F7, T3, T5, O10; right lateral (Fp2, F8, T4, T6, O2); left parasagittal (Fp1, F3, C3, P3, O1); right parasagittal (Fp2, F4, C4, P4, O2). Each spectrogram image has four panels: left lateral (LL), right lateral (RL), left parasagittal (LP), right parasagittal (RP). Each spectrogram image shows one hour of recording. The vertical axis represents the spectrogram frequency from 0–20 Hz. For each example of stripes, the green arrow represents the segment from which the raw EEG clip is taken. Each raw EEG image shows a 10 second clip of recording in a longitudinal bipolar montage.

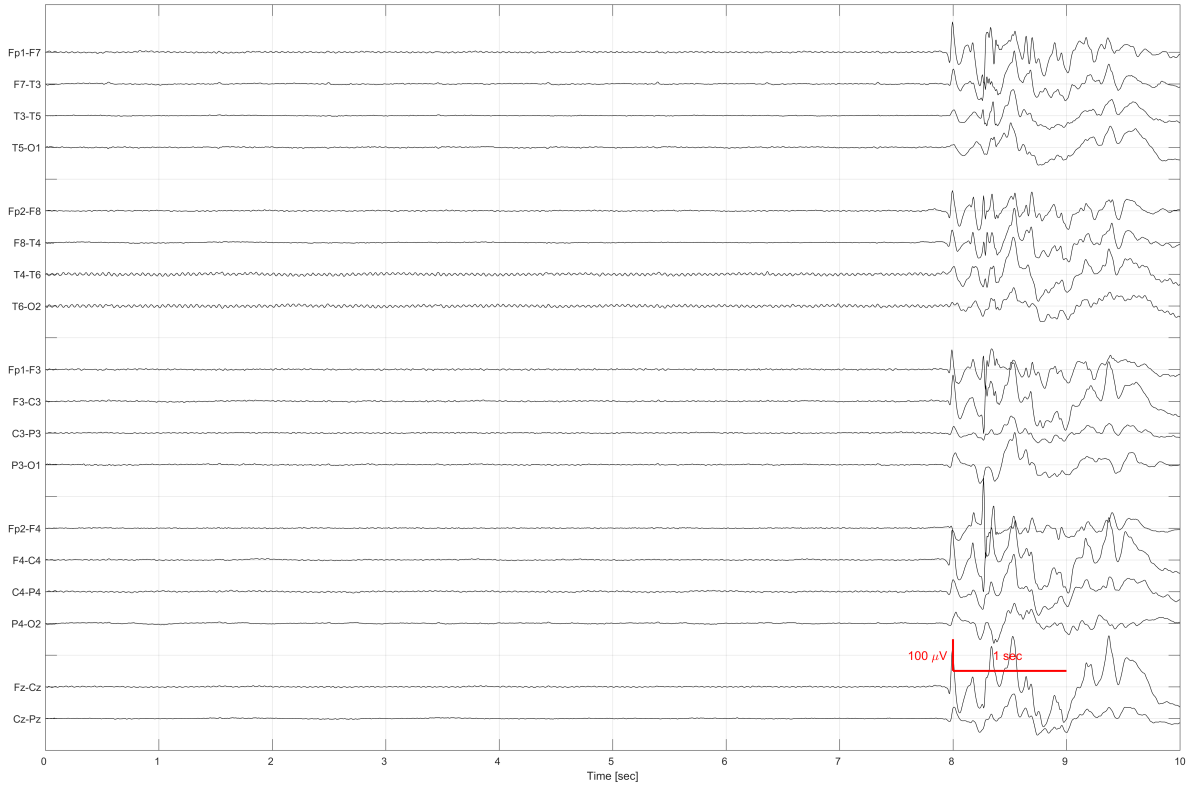
Stripes: Example 1





Stripes: Example 2





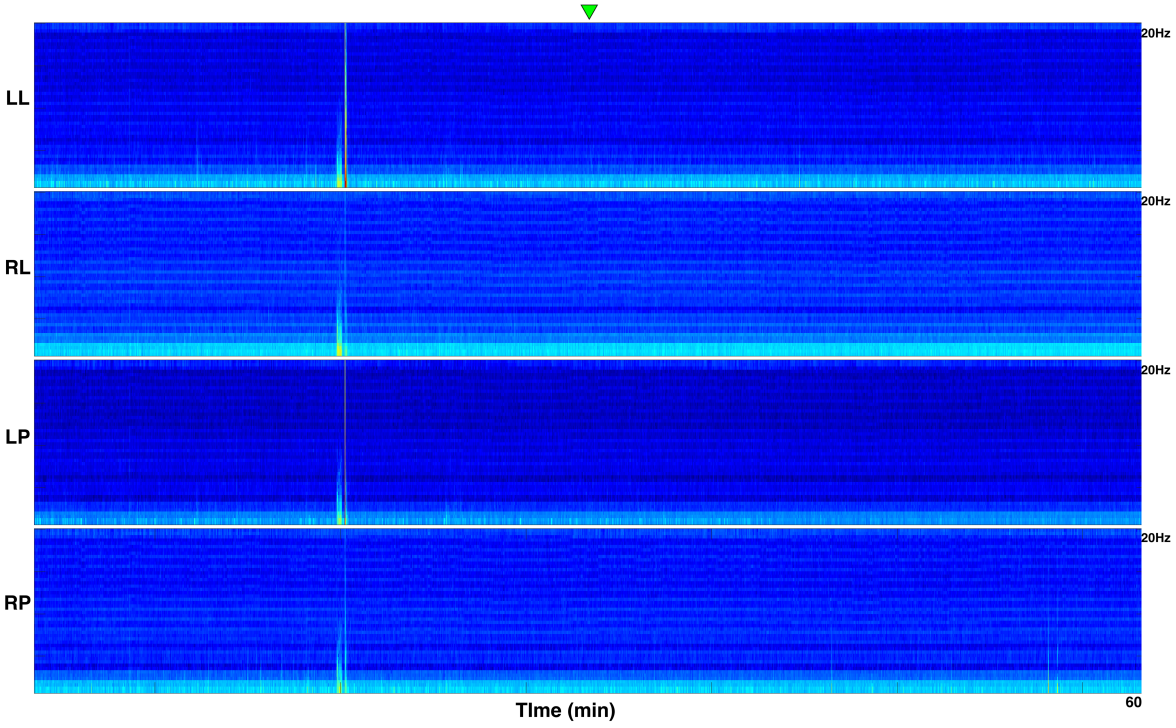
Low power

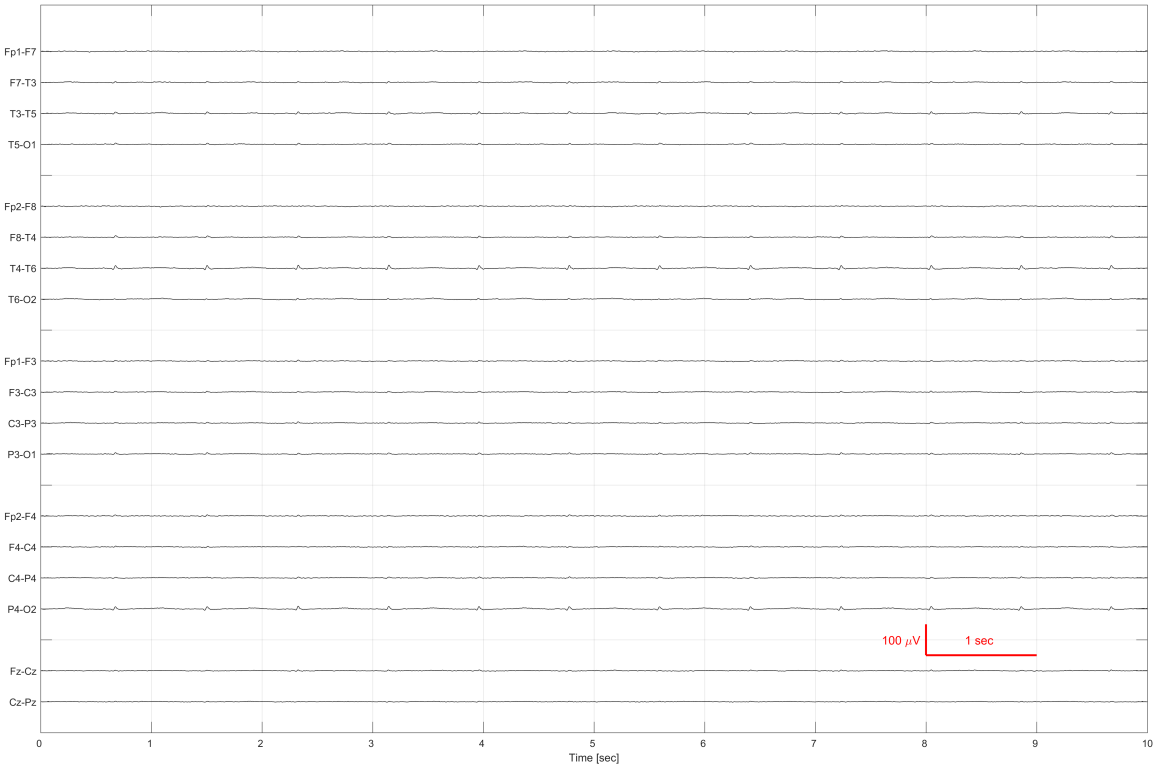
Low power spectrograms are characterized by diffuse low power, and appear monotonous. There is often a cyan/green narrowband, which should be distinguished from the higher power yellow/red band seen in narrowband/monotonous.

The probability of IIC vs. other raw EEG patterns seen with low power on the spectrogram nomenclature survey completed by electroencephalographers was as follows: Generalized suppression 94%; artifact 5%; focal or generalized slowing 1%.

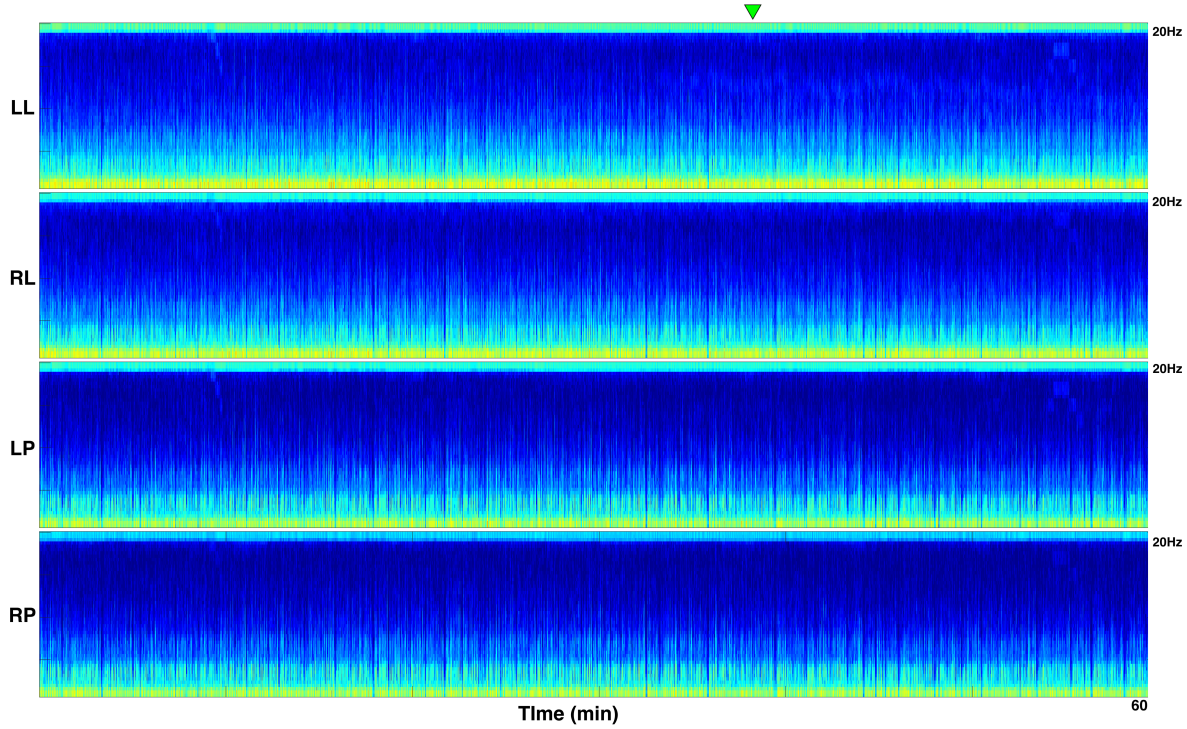
Examples of low power spectrograms with corresponding raw EEG are shown. The scalp is divided into 4 different regions for spectrogram construction: Left lateral (Fp1, F7, T3, T5, O10; right lateral (Fp2, F8, T4, T6, O2); left parasagittal (Fp1, F3, C3, P3, O1); right parasagittal (Fp2, F4, C4, P4, O2). Each spectrogram image has four panels: left lateral (LL), right lateral (RL), left parasagittal (LP), right parasagittal (RP). Each spectrogram image shows one hour of recording. The vertical axis represents the spectrogram frequency from 0–20 Hz. For each example of low power, the green arrow represents the segment from which the raw EEG clip is taken. Each raw EEG image shows a 10 second clip of recording in a longitudinal bipolar montage.

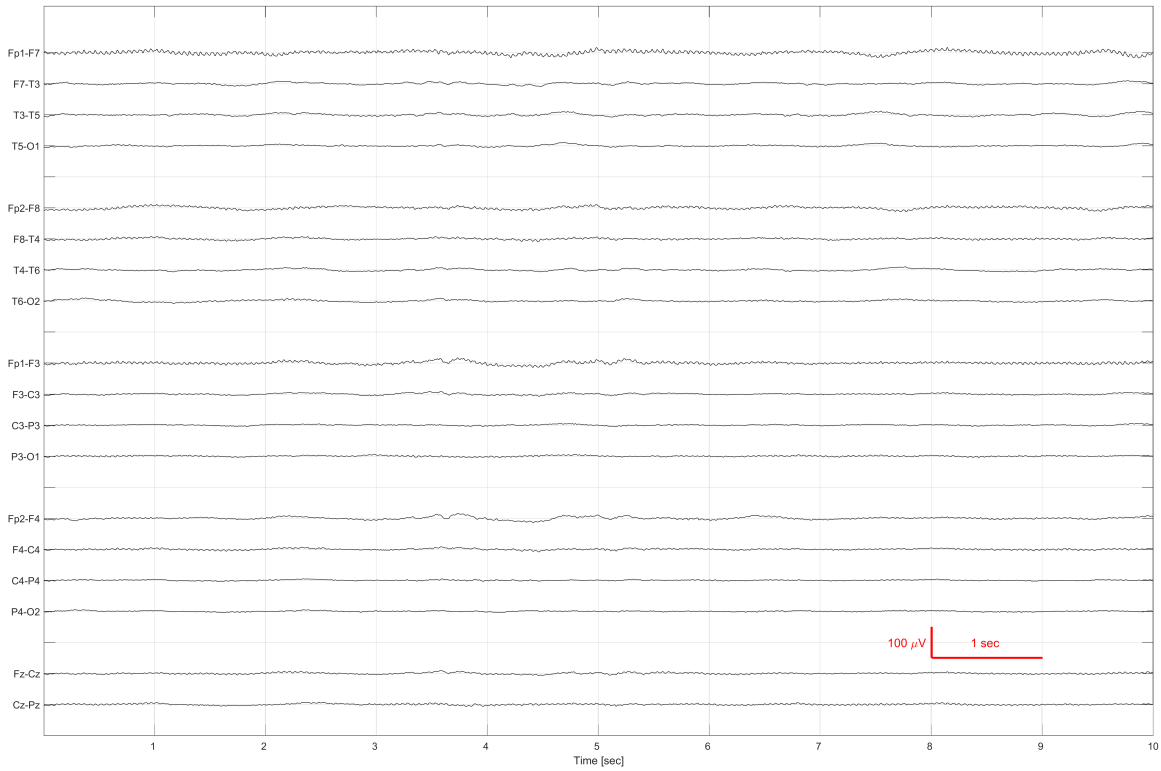
Low power: Example 1





Low power: Example 2





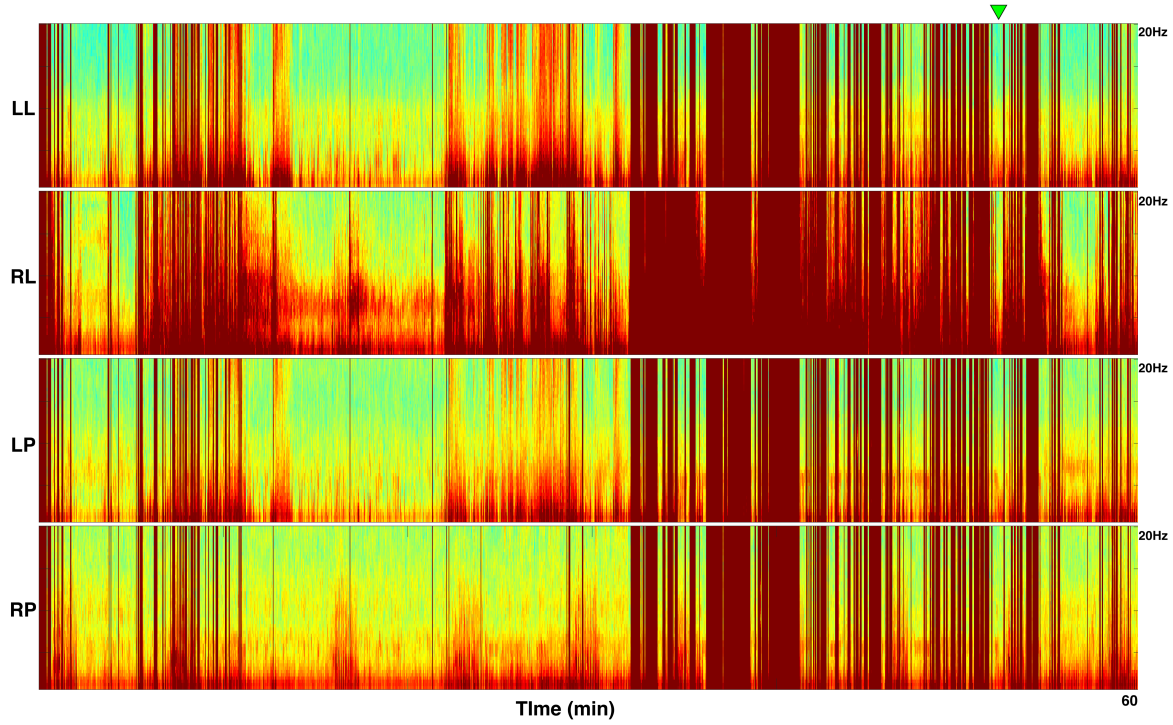
Artifact

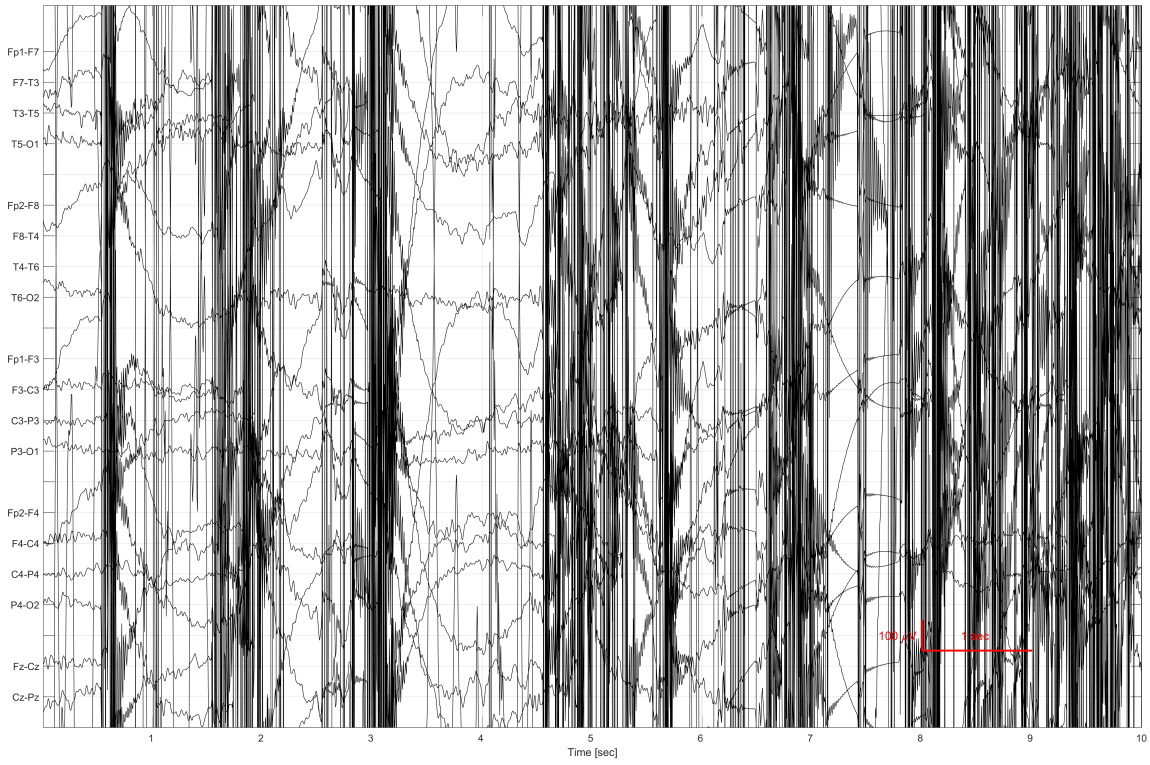
Artifact is characterized by irregular high-power signal saturating all frequencies.

The probability of IIC vs. other raw EEG patterns seen with artifact on the spectrogram nomenclature survey completed by electroencephalographers was as follows: Artifact 66%; generalized suppression 20%; burst suppression 6%; focal or generalized slowing 4%; seizures or IIC patterns 2%; other 2%.

Examples of artifact, with corresponding raw EEG are shown. The scalp is divided into 4 different regions for spectrogram construction: Left lateral (Fp1, F7, T3, T5, O10; right lateral (Fp2, F8, T4, T6, O2); left parasagittal (Fp1, F3, C3, P3, O1); right parasagittal (Fp2, F4, C4, P4, O2). Each spectrogram image has four panels: left lateral (LL), right lateral (RL), left parasagittal (LP), right parasagittal (RP). Each spectrogram image shows one hour of recording. The vertical axis represents the spectrogram frequency from 0–20 Hz. For each example of artifact, the green arrow represents the segment from which the raw EEG clip is taken. Each raw EEG image shows a 10 second clip of recording in a longitudinal bipolar montage.

Artifact: Example 1





Artifact: Example 2