IFCN criteria for identifying Epileptiform Discharges

Transients distinguishable from background activity with a characteristic morphology.

Criteria:

1. Di- or tri-phasic waves with sharp or spiky morphology (i.e. pointed peak).

2. Different wave-duration than the ongoing background activity: either shorter or longer.

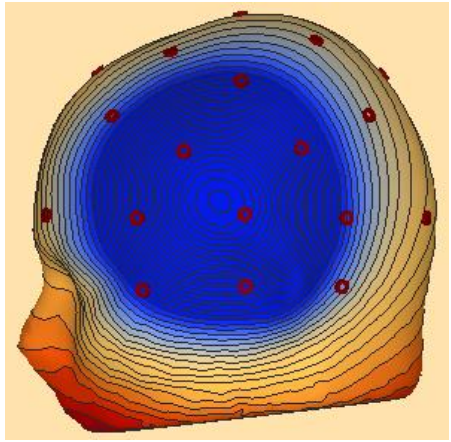
3. Asymmetry of the waveform: a sharply rising ascending phase and a more slowly decaying descending phase, or vice versa.

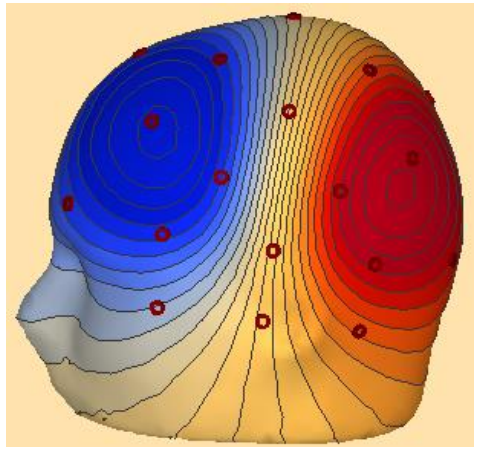
4. The transient is followed by an associated slow after-wave.

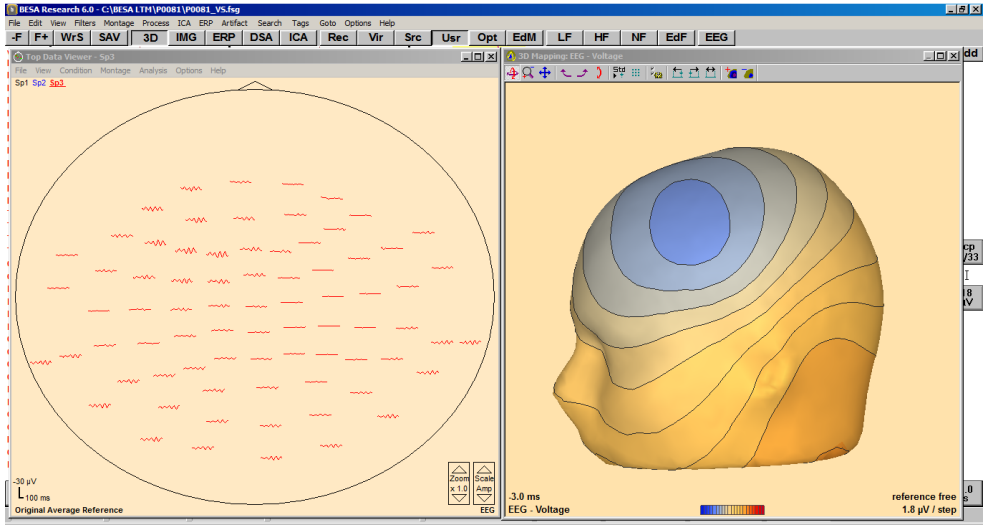
5. The background activity surrounding epileptiform discharges is disrupted by the presence of the epileptiform discharges.

6. Distribution of the negative and positive potentials on the scalp suggests a source of the signal in the brain, corresponding to a radial, oblique or tangential orientation of the source (see dipole). This is best assessed by inspecting voltage maps constructed using common-average reference.

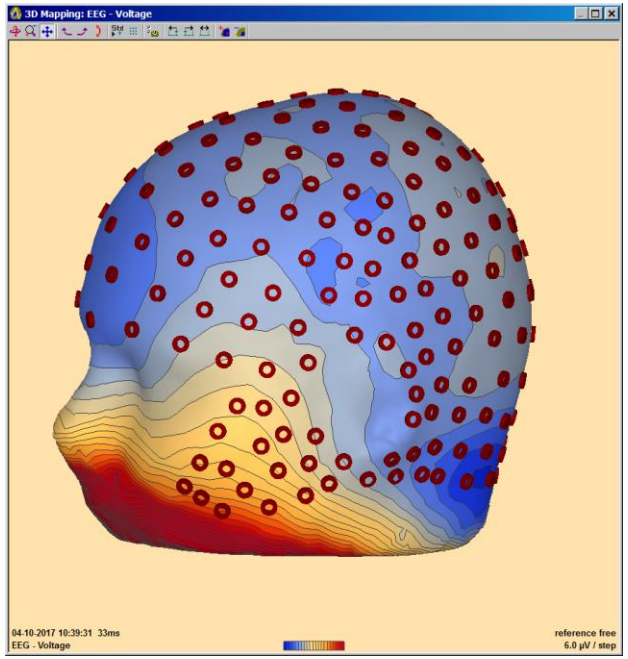
Examples of voltage-maps that fulfill criterion-6:

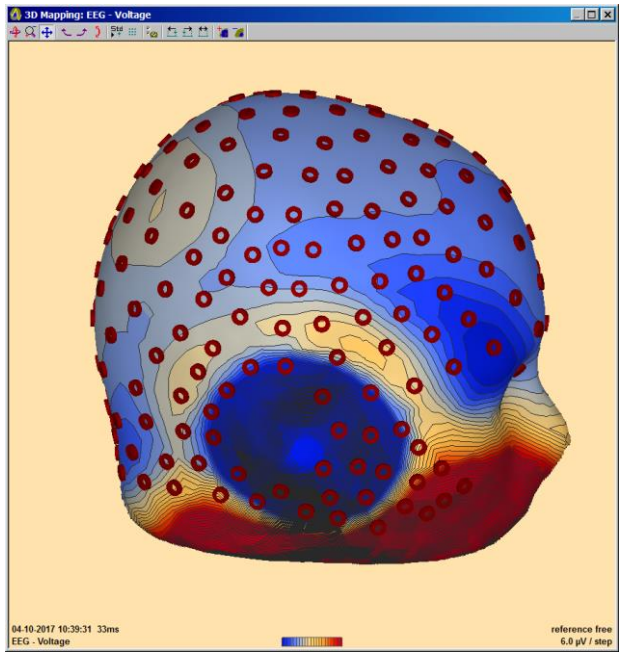


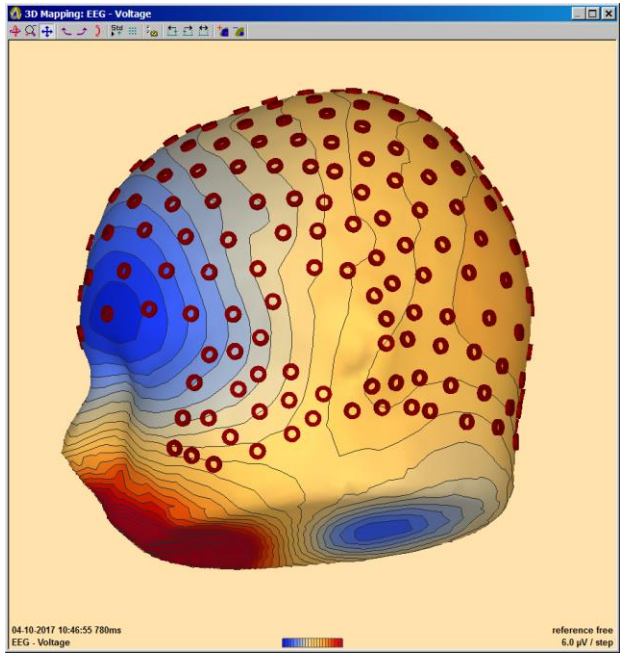


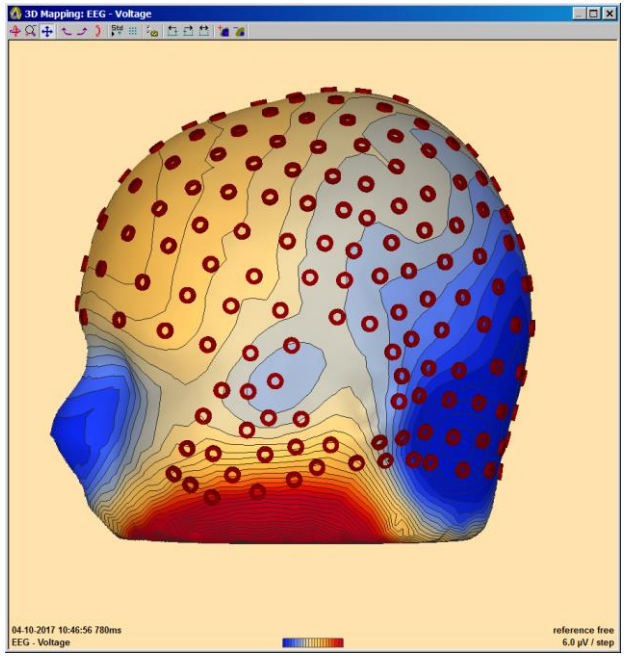


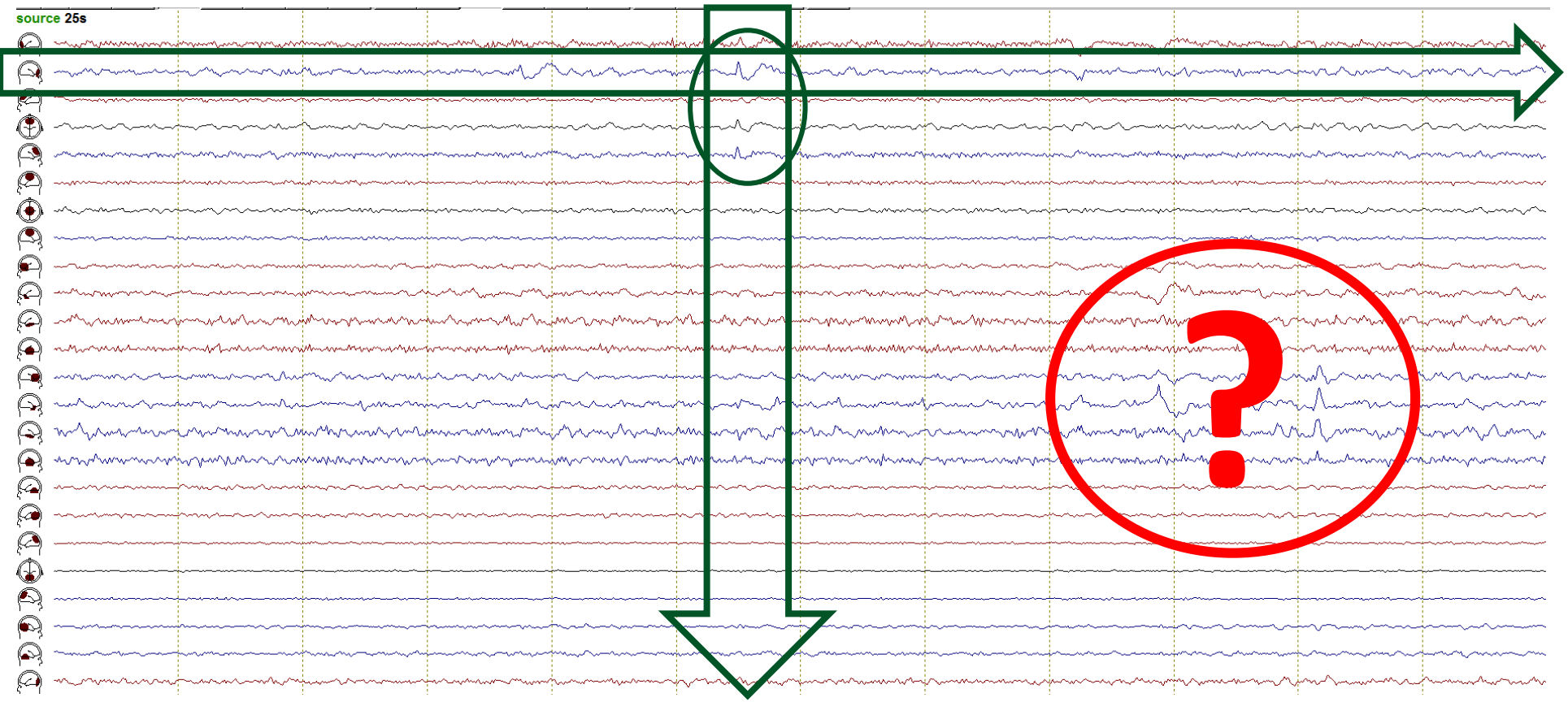
Examples of voltage maps that do not correspond to a source in the brain, and that do not fulfill criterion-6:











1. In time:

The sharp transient is clearly distinguishable from the ongoing (background) activity, based on its amplitude, duration and morphology. Check this in the source channel(s) where the discharge is visible.

2. In space:

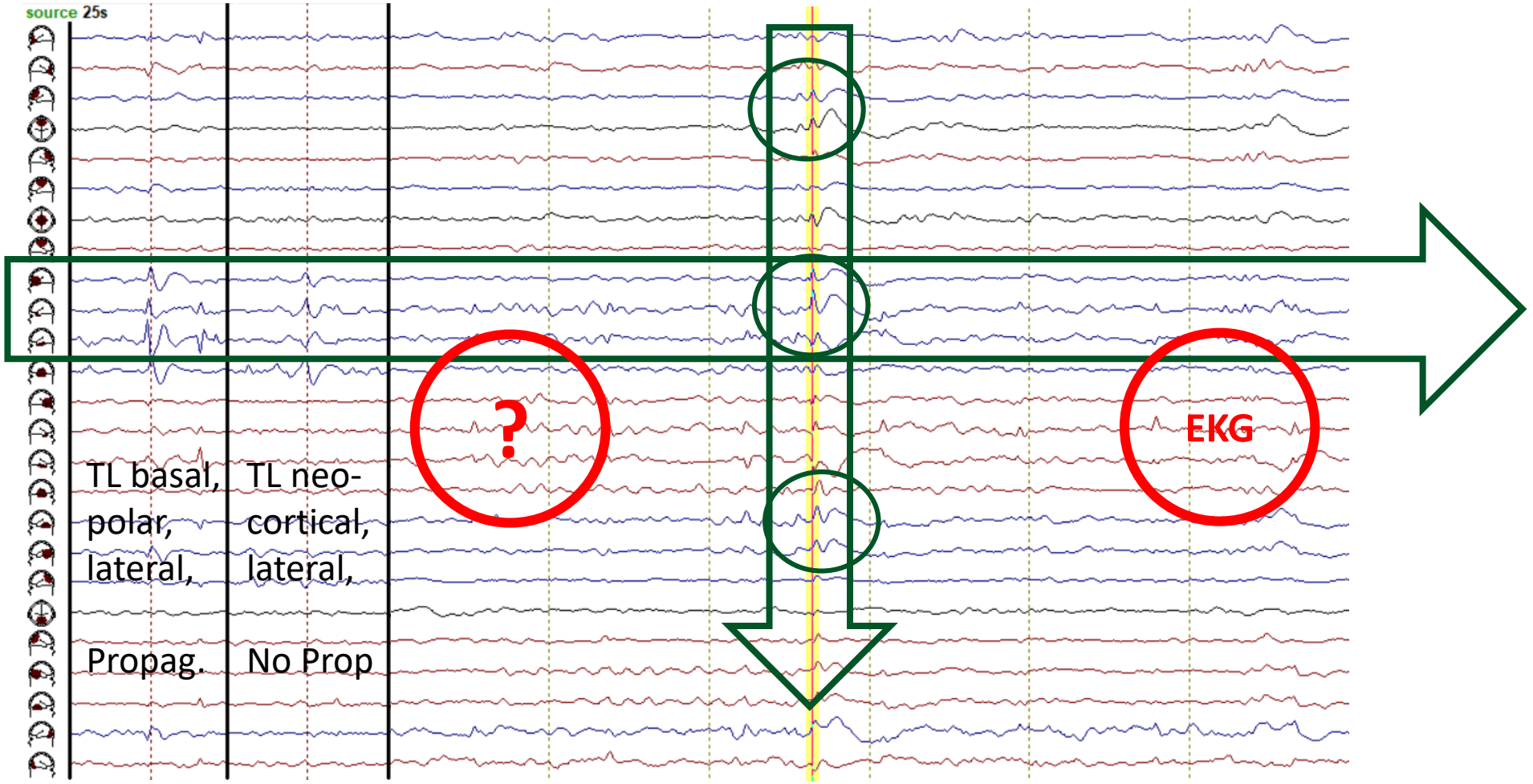
The location of the signal should make sense anatomically.

Check this across all channels: Regions with the same polarity should be close together. Opposite polarity may be observed in the other hemisphere or more remote regions (caveat: temporal lobe traces may show opposite polarities!)

Compare latencies of sharp transients to observe propagations as an additional indicator of epileptiform transients.

3. Exclude:

- Artifacts
- Normal variants



1. In time:

The sharp transient is clearly distinguishable from the ongoing (background) activity, based on its amplitude, duration and morphology. Check this in the source channel(s) where the discharge is visible.

2. In space (3 different cases shown, 2 TL one FL):

The location of the signal make senses anatomically.

Case 1 & 2 left TL, only case 1 shows propagation.

Case 3 shows propagation from frontal left (top) over left anterior TL (middle) to posterior temporal-parietal (bottom).

3. Exclude:

- Artifacts
- Normal variants

Caveat: EKG projects to the right and left temporal polar traces with the same polarity, whereas lateral EOG shows opposite polarities, see previous page.

Training samples

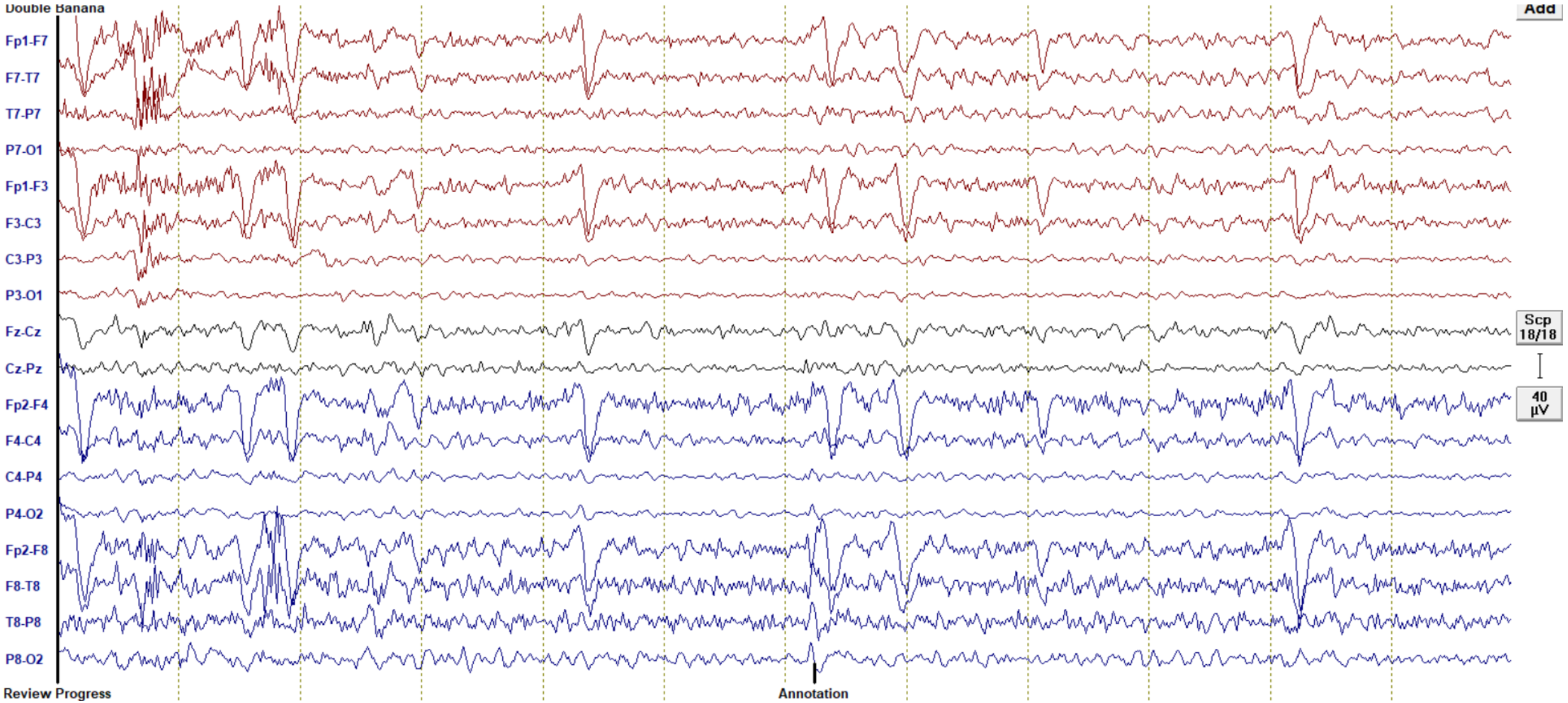
- Sample 1-5:

Interictal epileptiform discharge

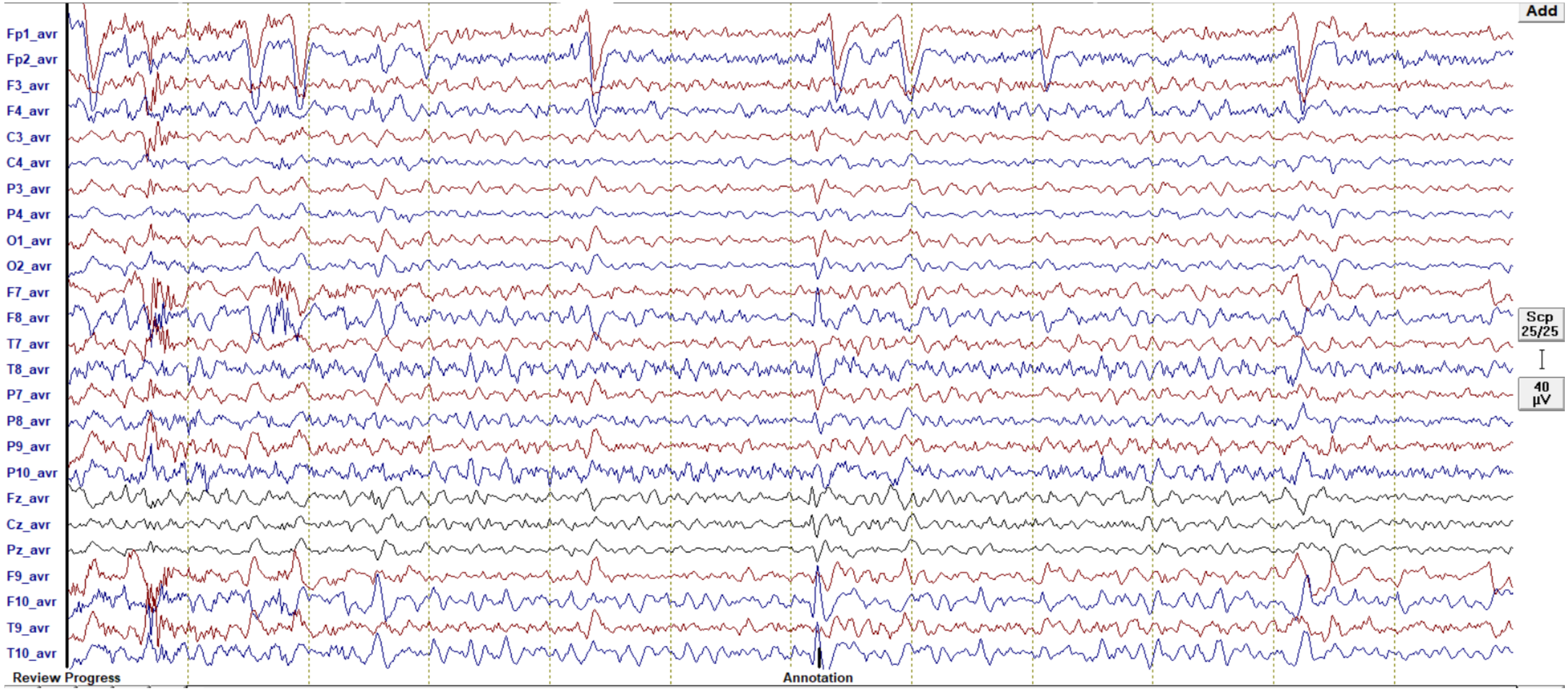
- Sample 6-10:

Non-epileptiform sharp transients

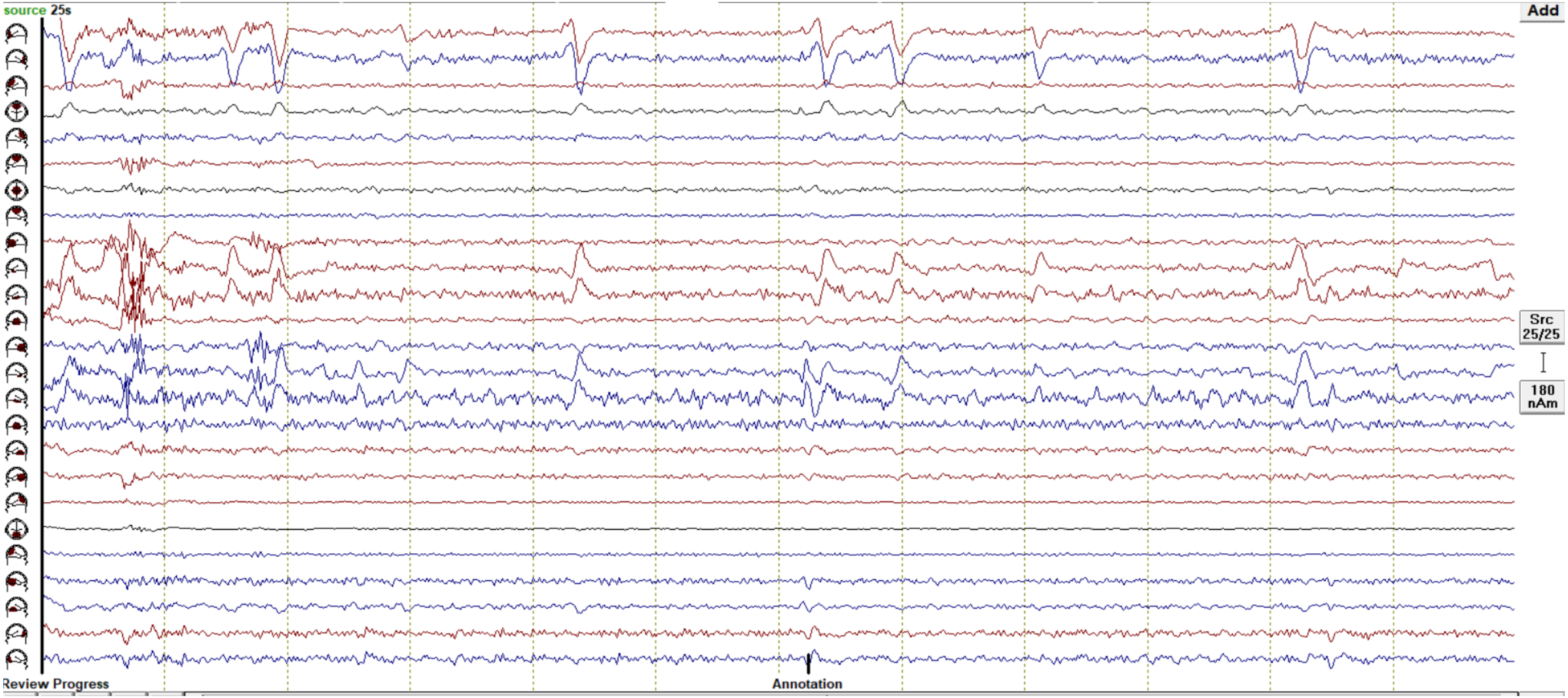
Sample 1: IED (longitudinal bipolar montage)



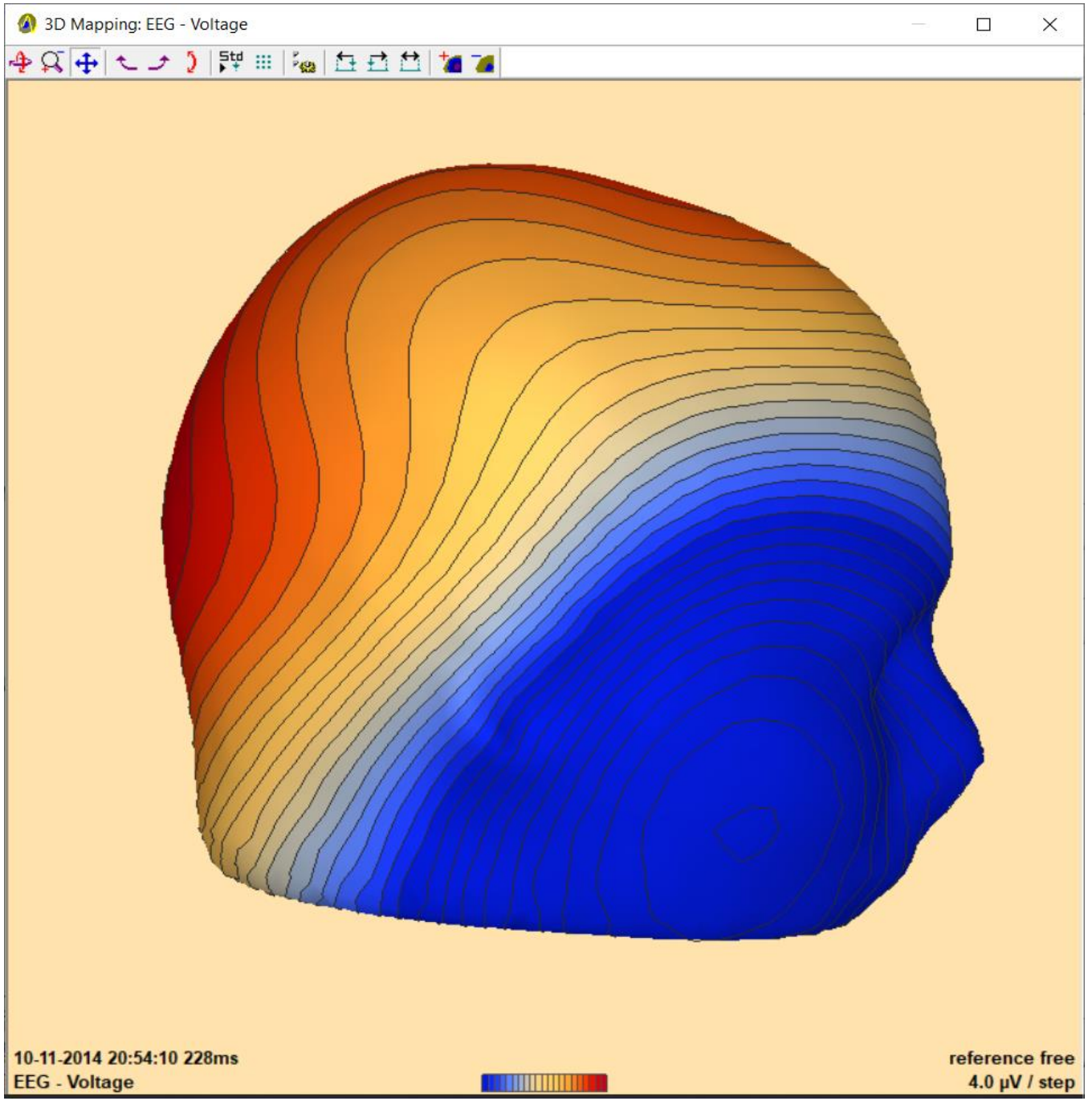
Sample 1: IED (common average montage)



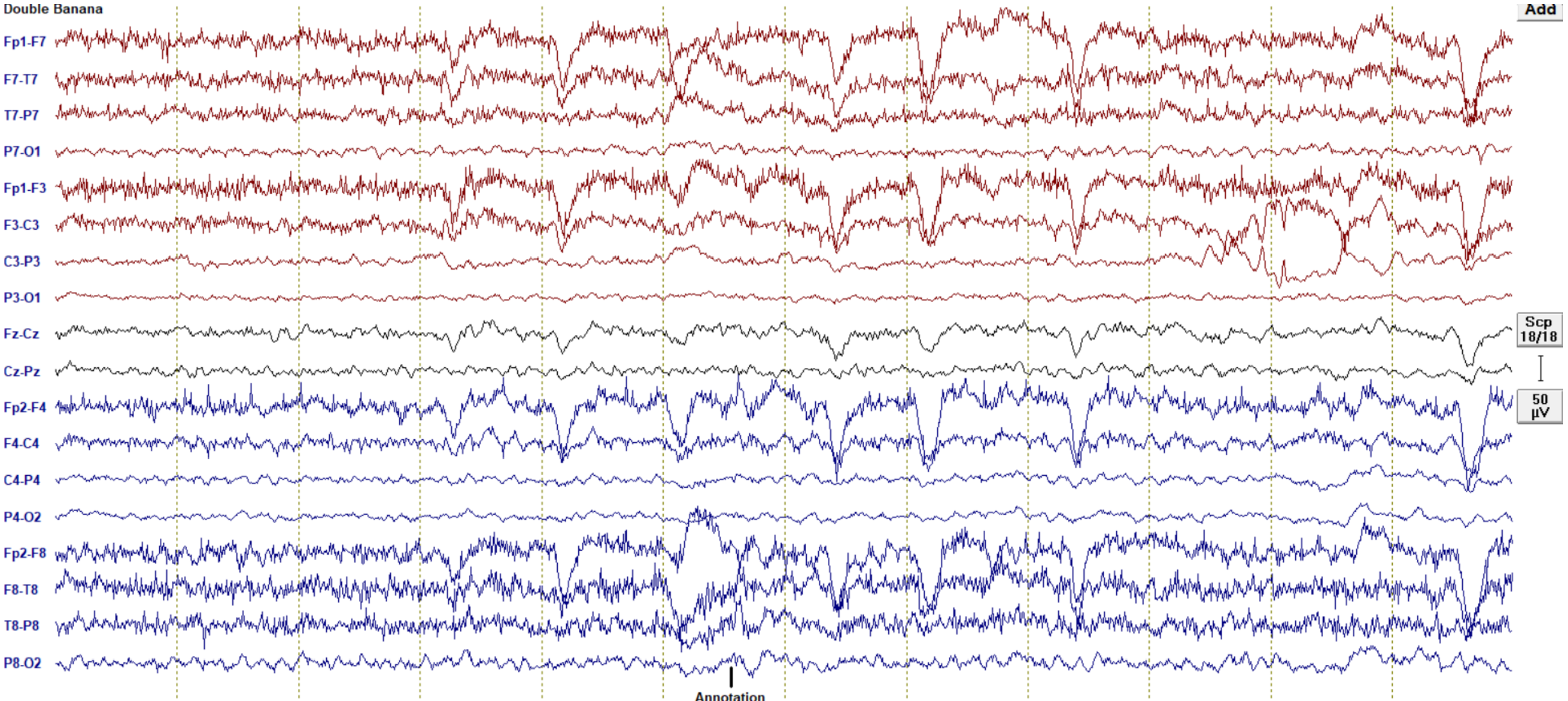
Sample 1: IED (source space)



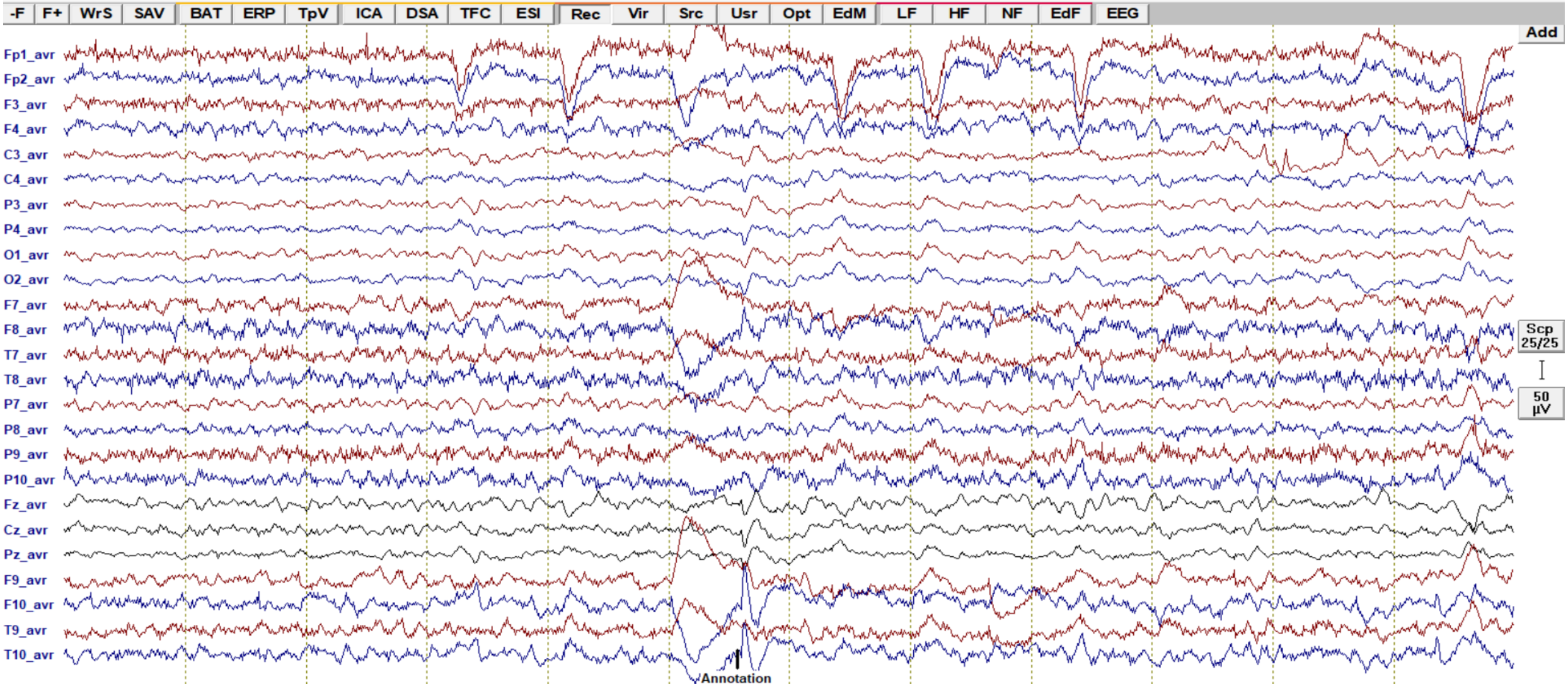
IED: Sample 1 voltage map



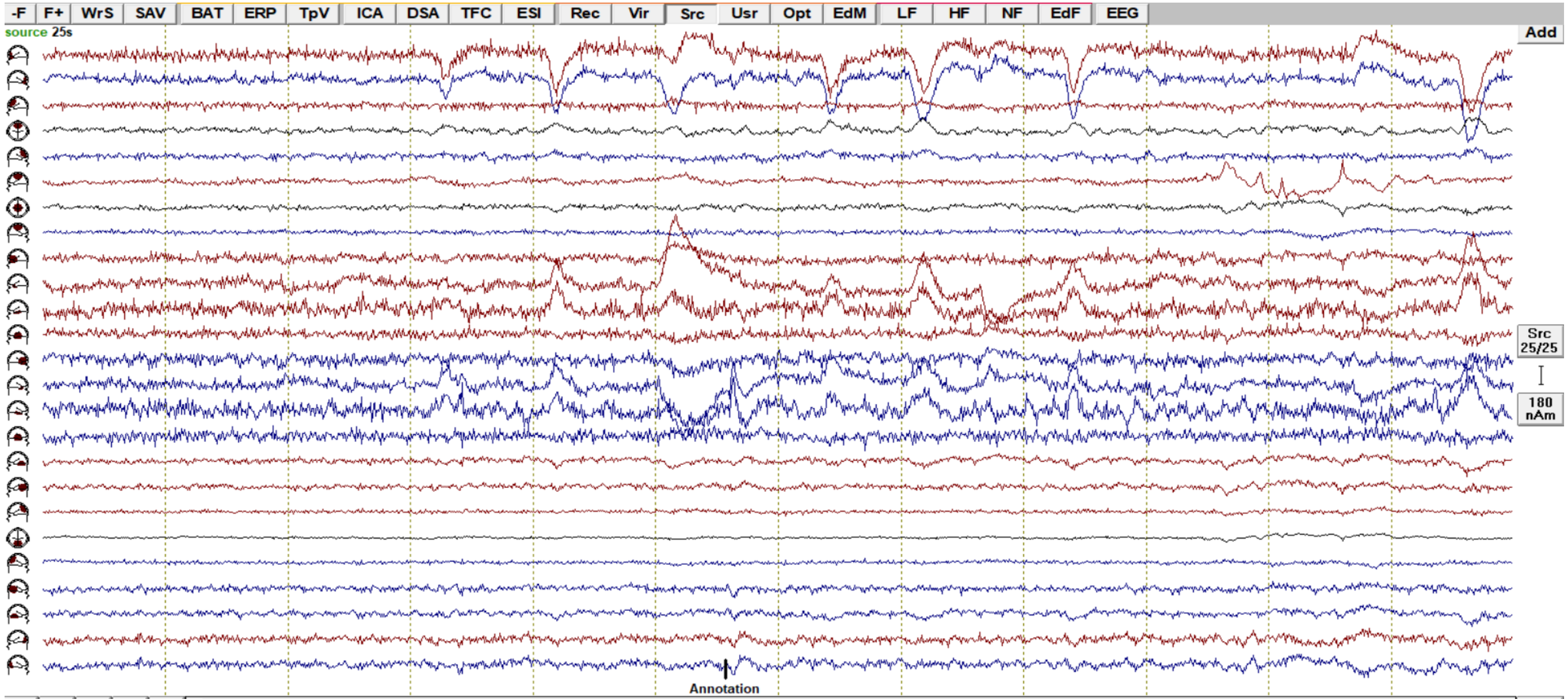
Sample 2: IED (longitudinal bipolar montage)



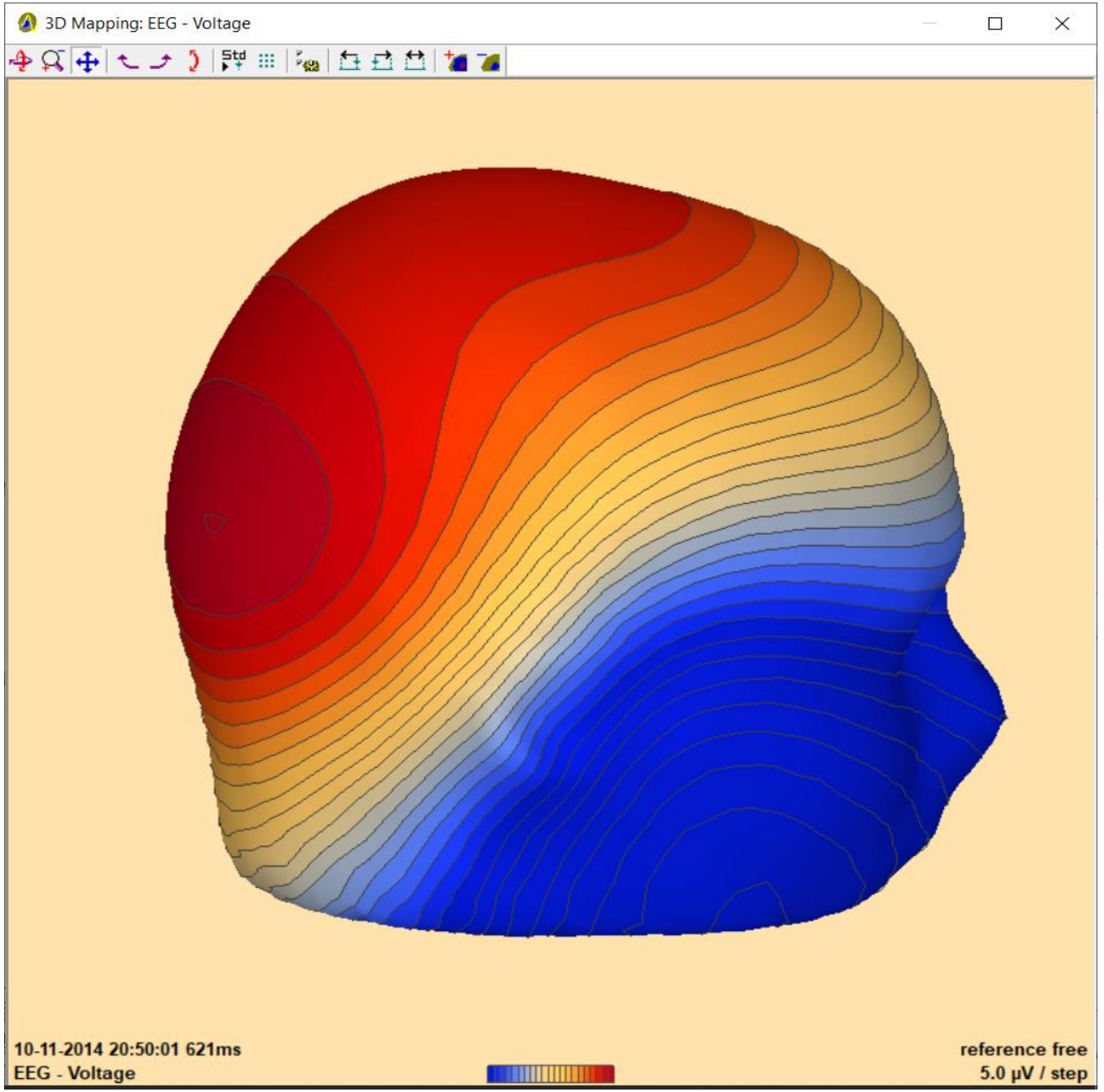
Sample 2: IED (common average montage)



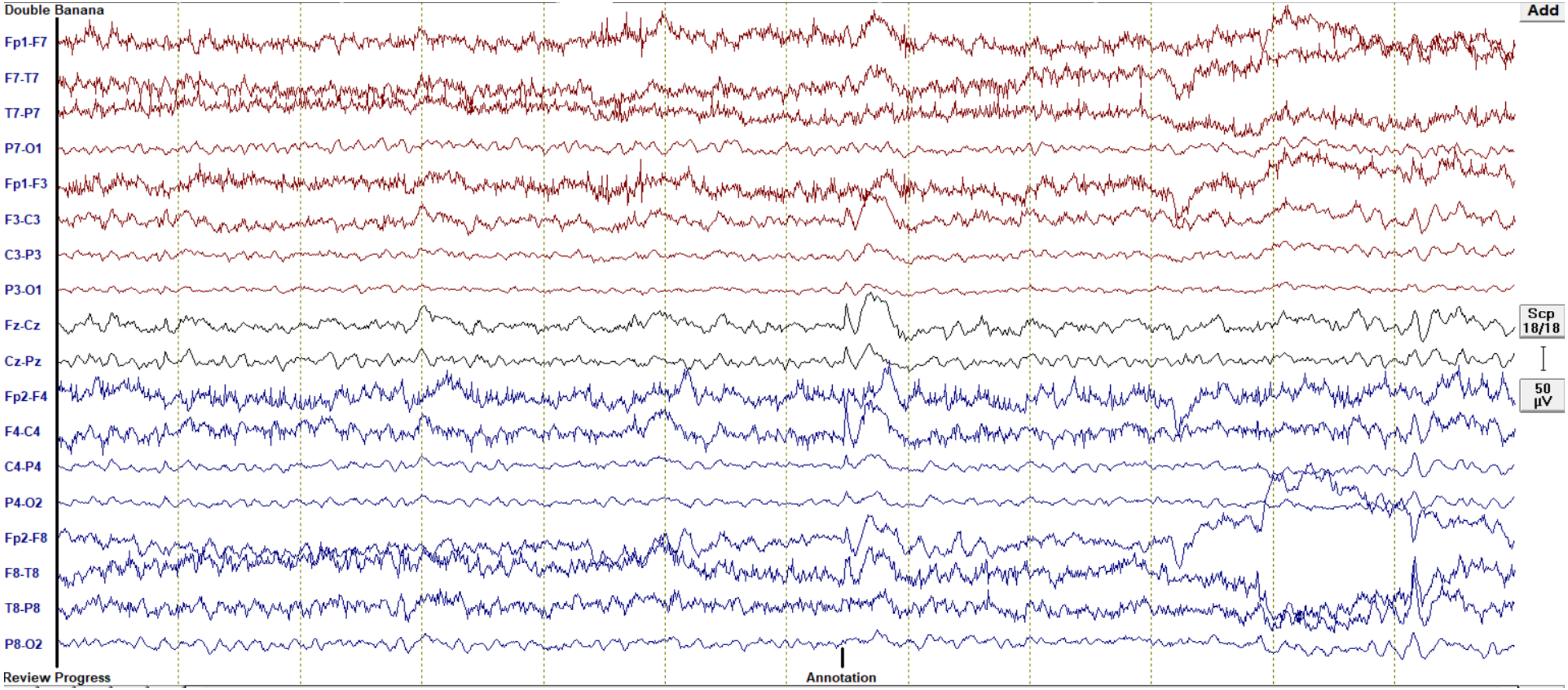
Sample 2: IED (source space)



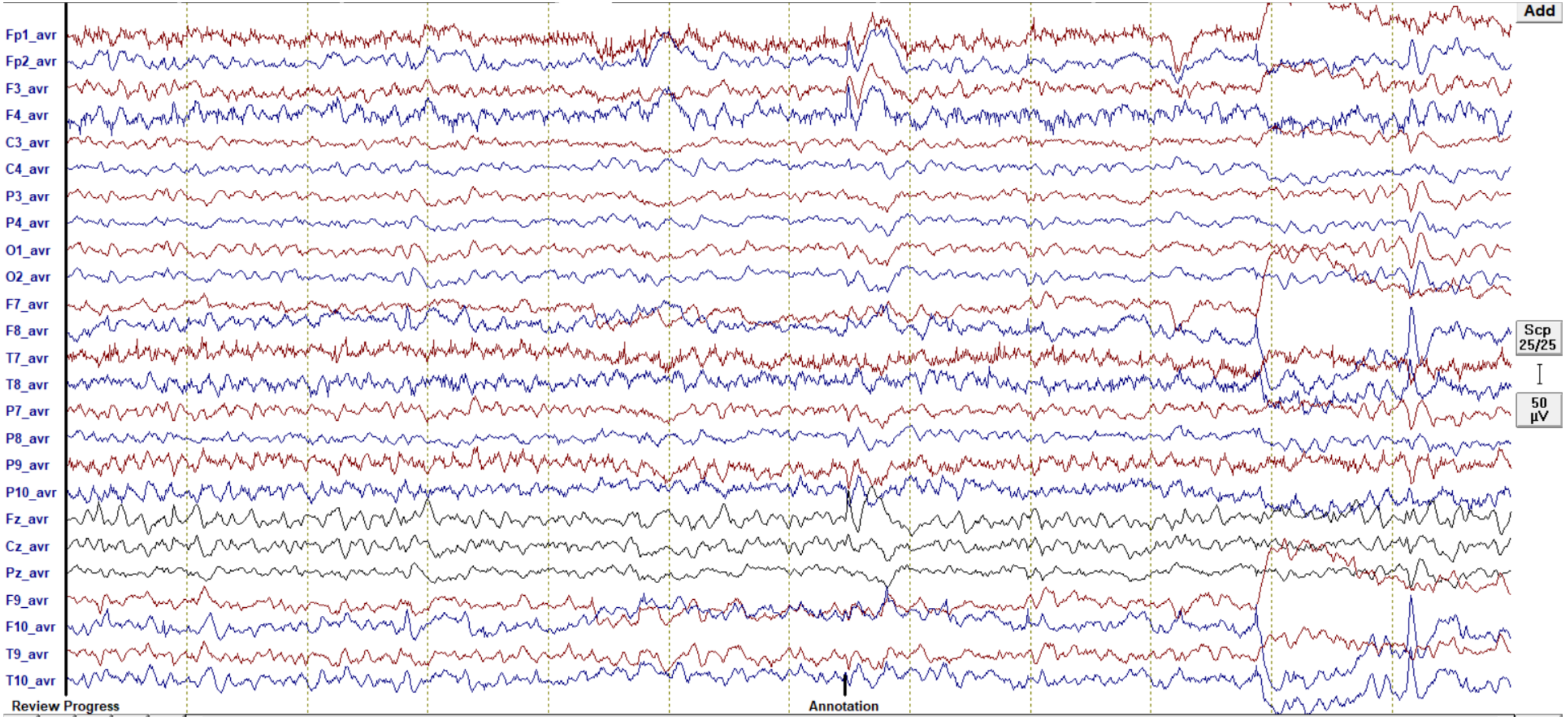
IED: Sample 2 voltage map



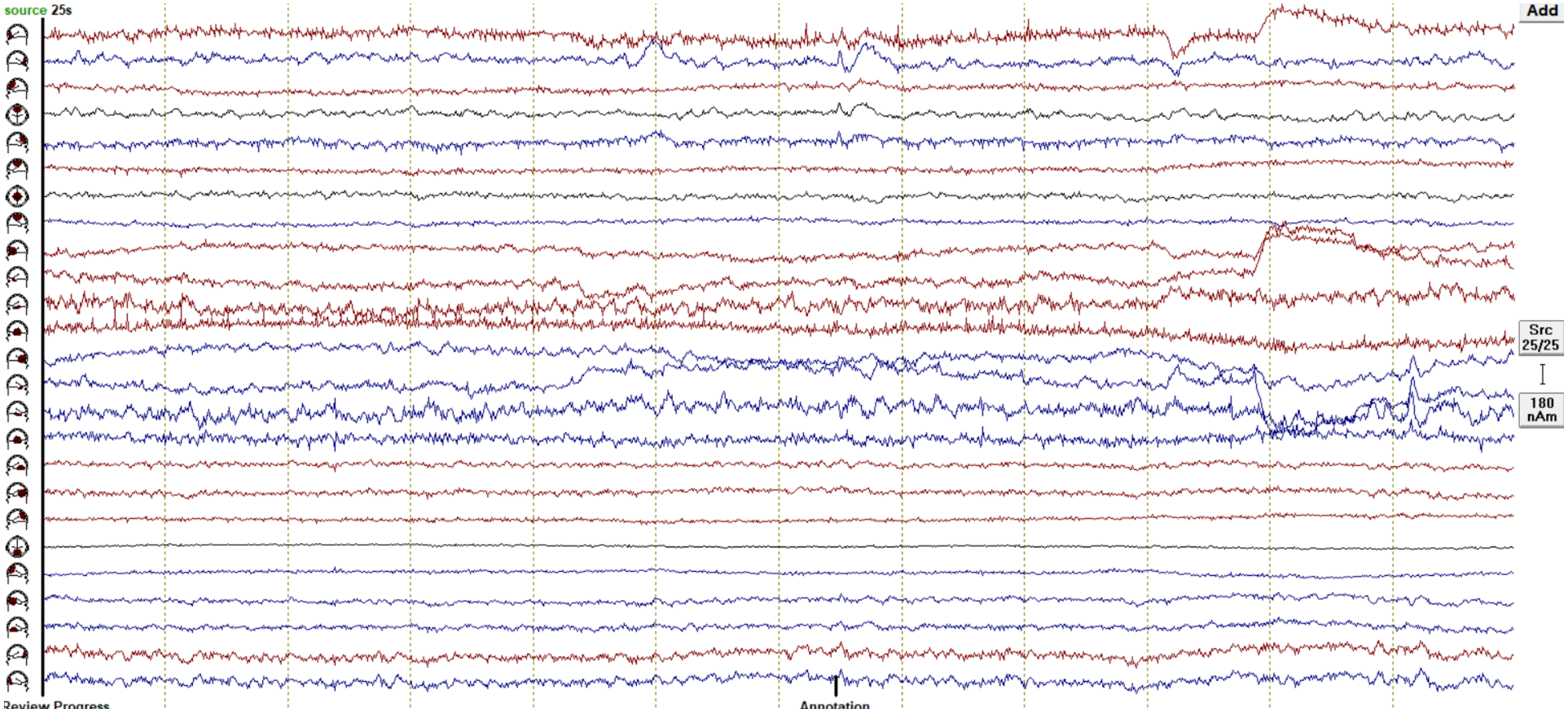
Sample 3: IED (longitudinal bipolar montage)



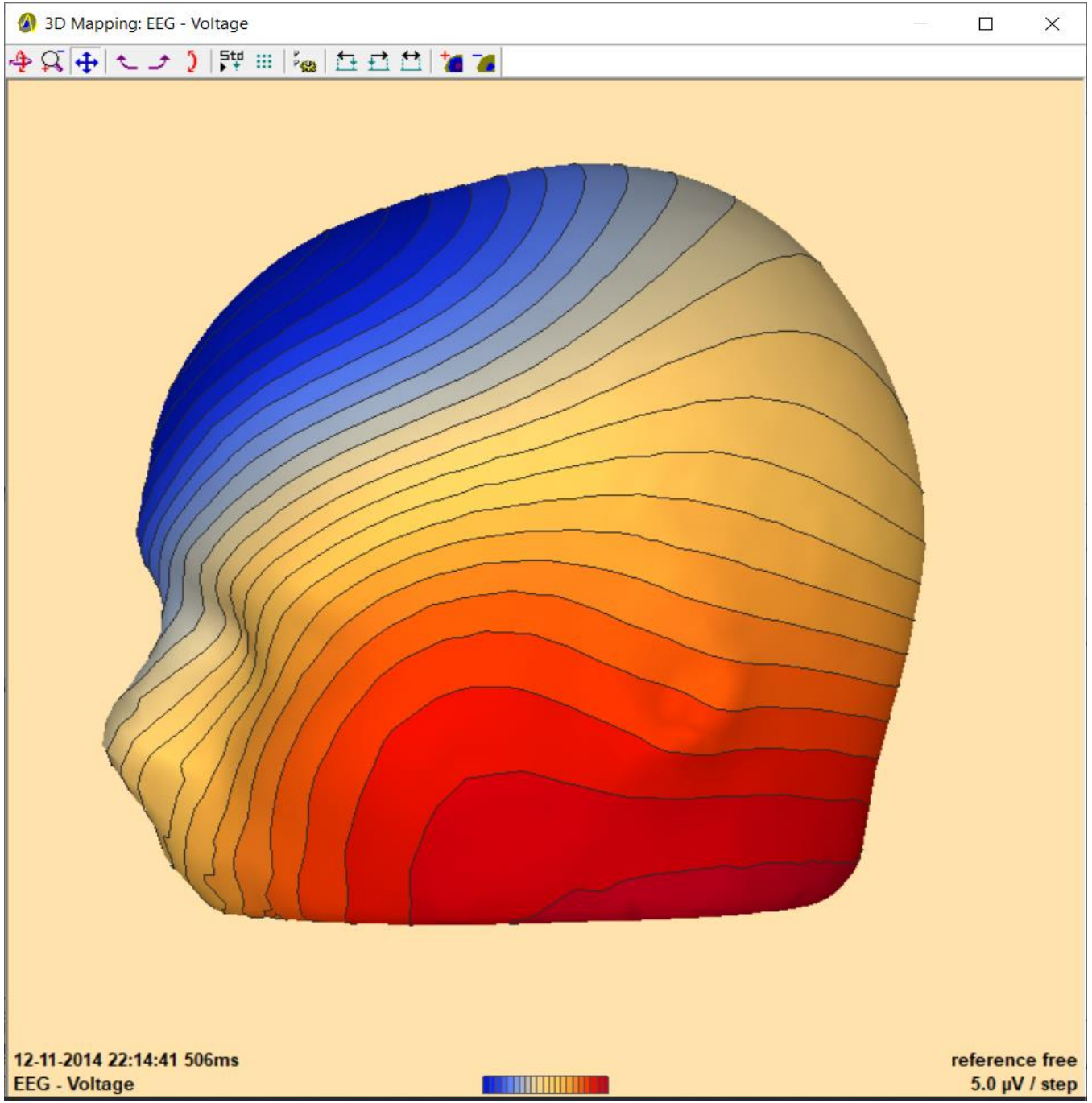
Sample 3: IED (common average montage)



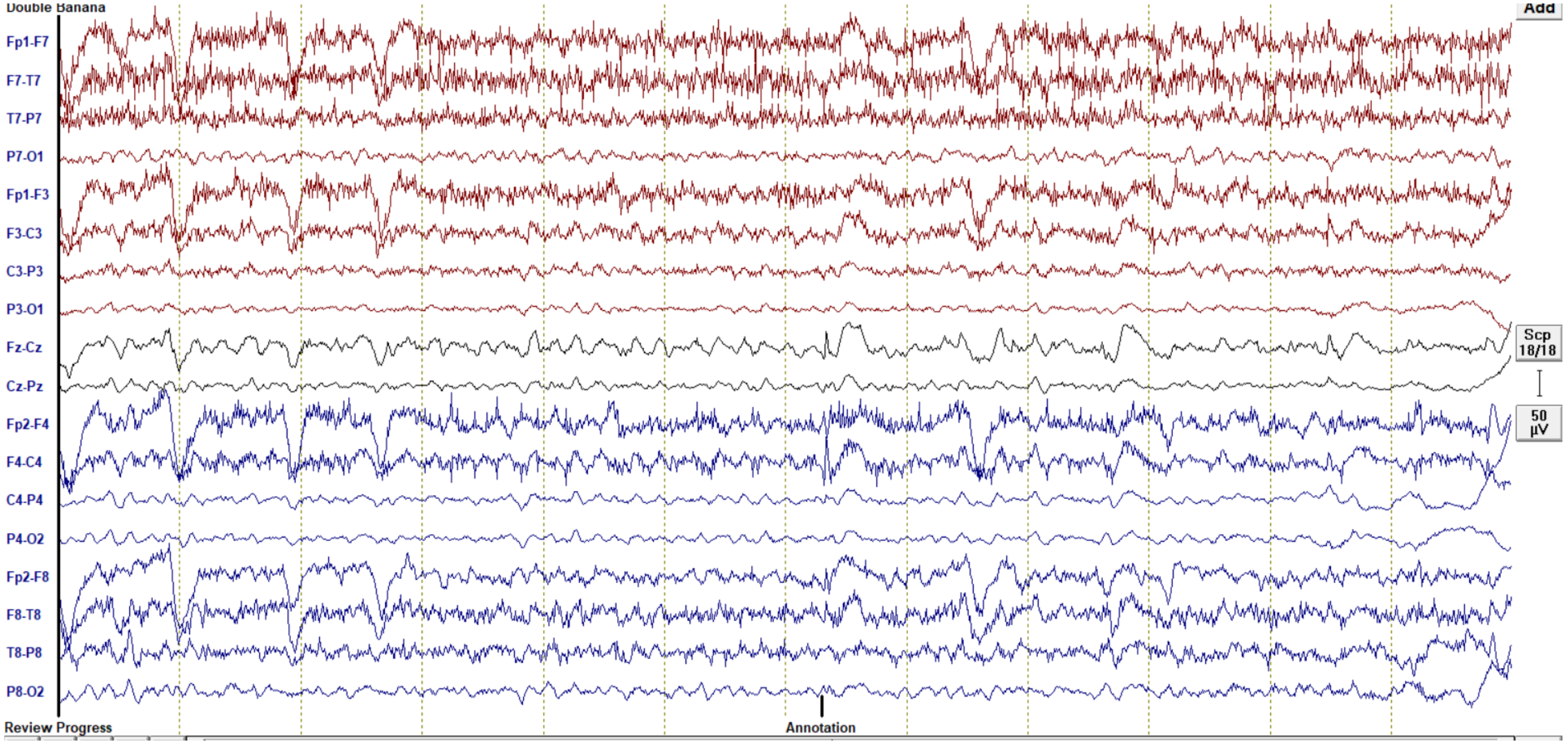
Sample 3: IED (source space)



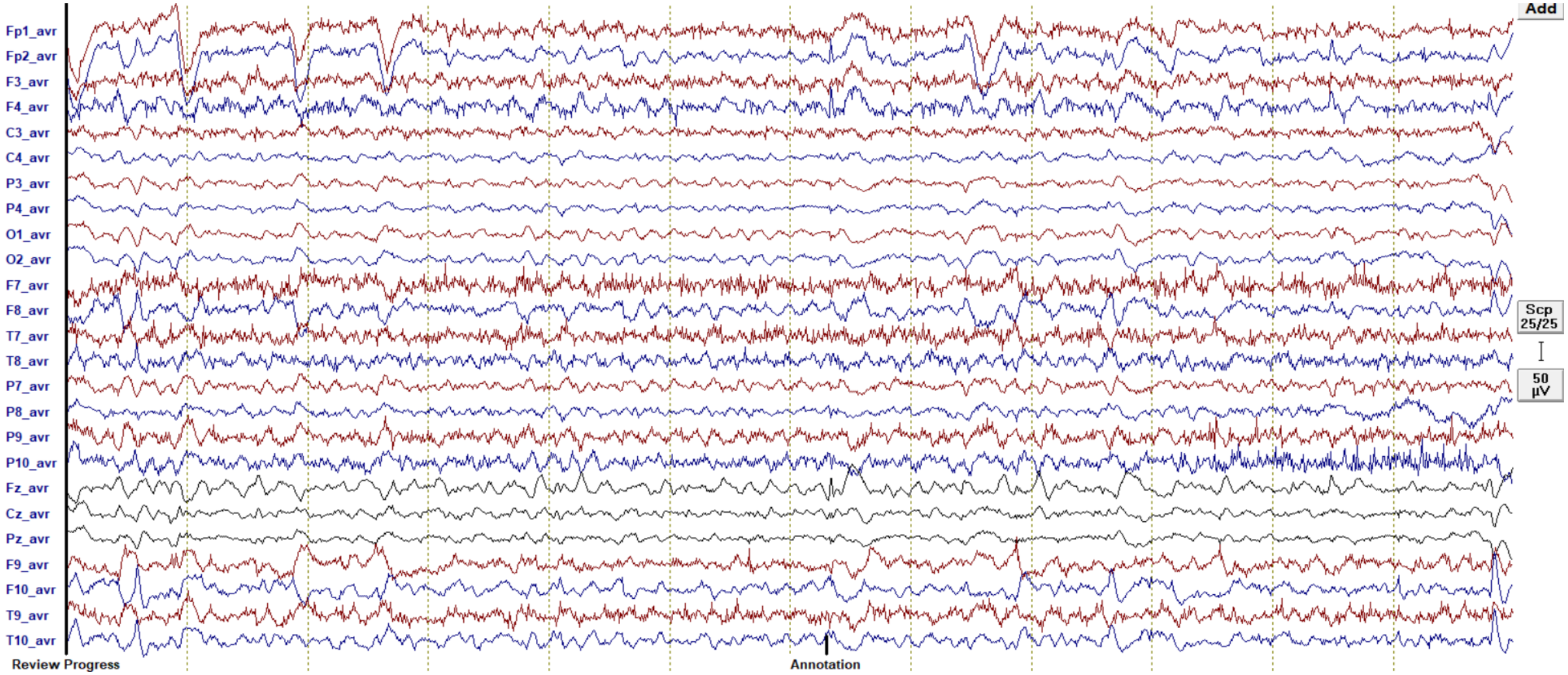
IED: Sample 3 voltage map



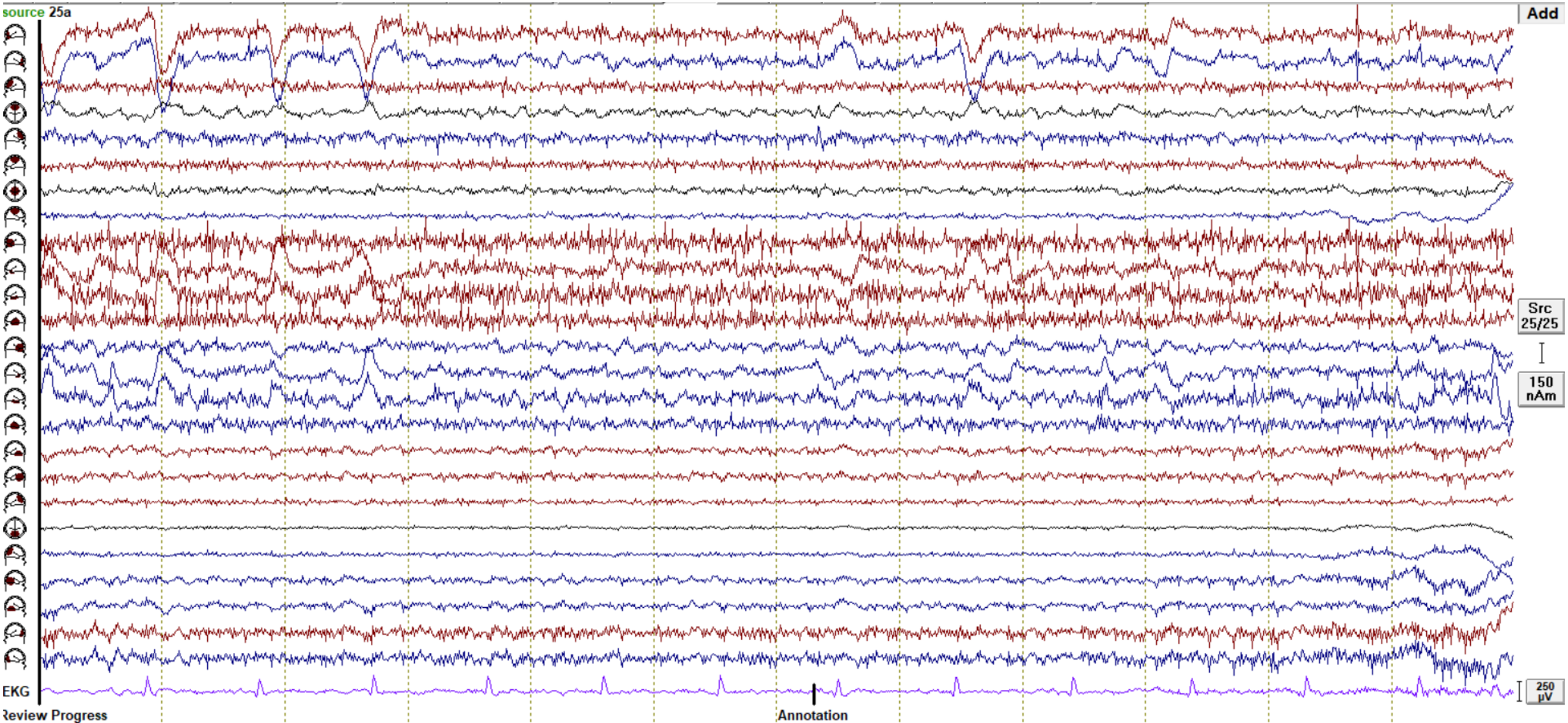
Sample 4: IED (longitudinal bipolar montage)



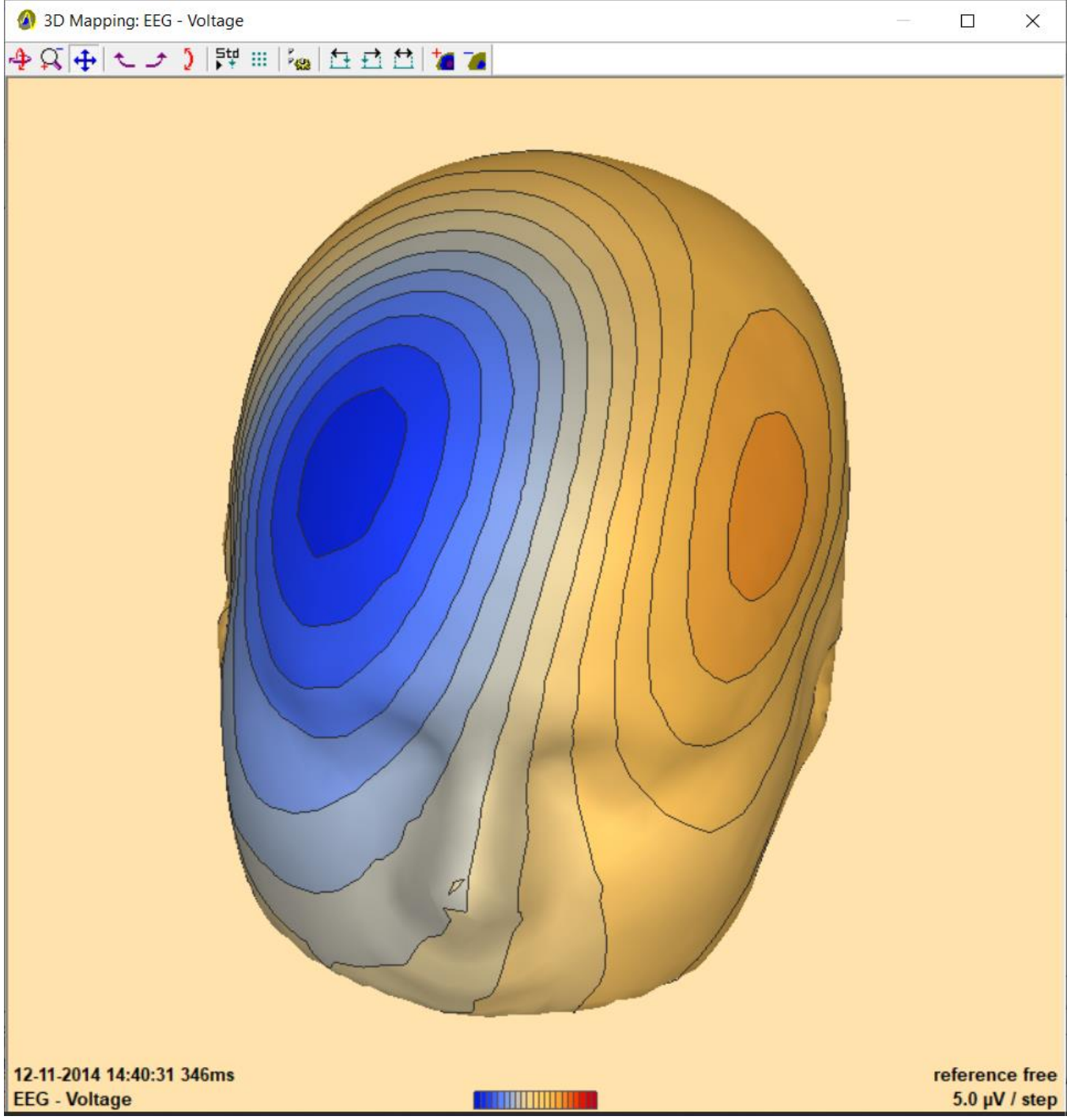
Sample 4: IED (common average montage)



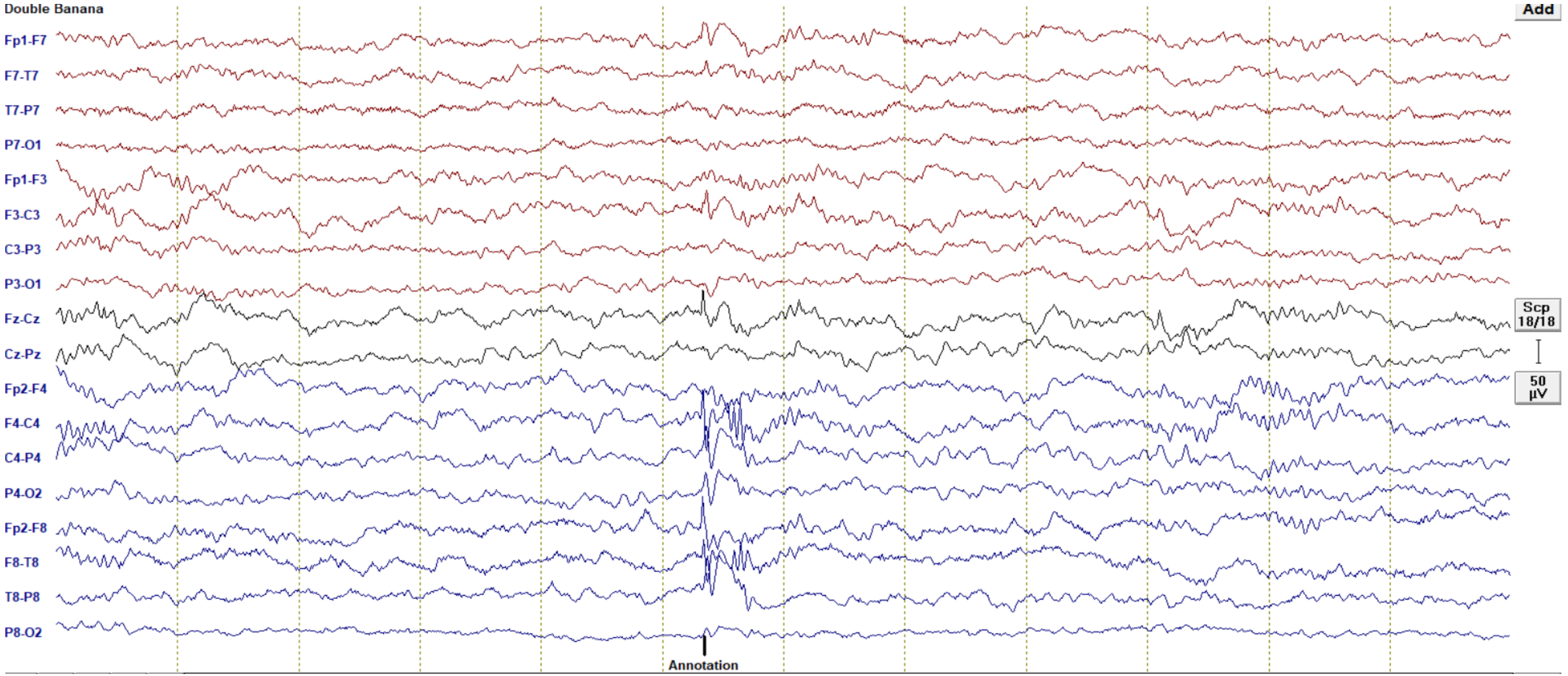
Sample 4: IED (source space)



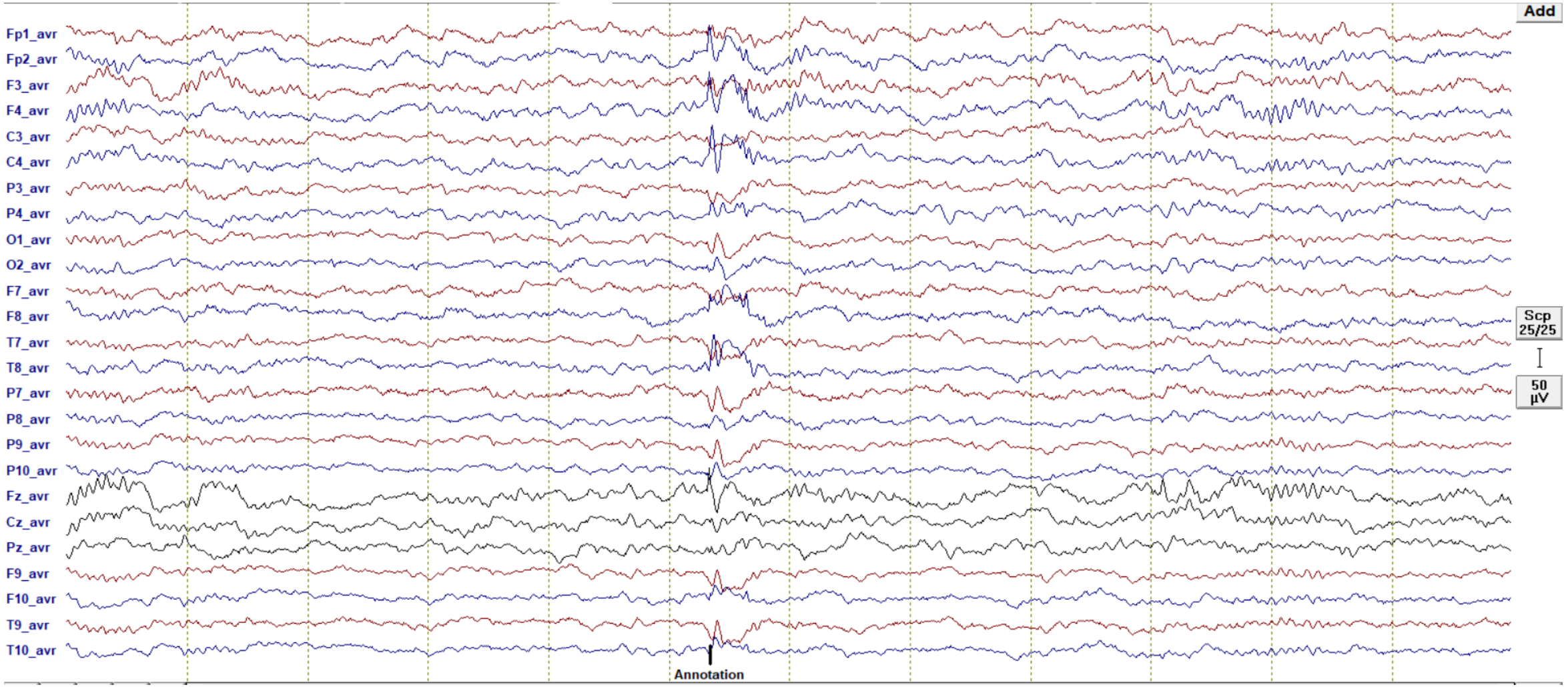
IED: Sample 4 voltage map



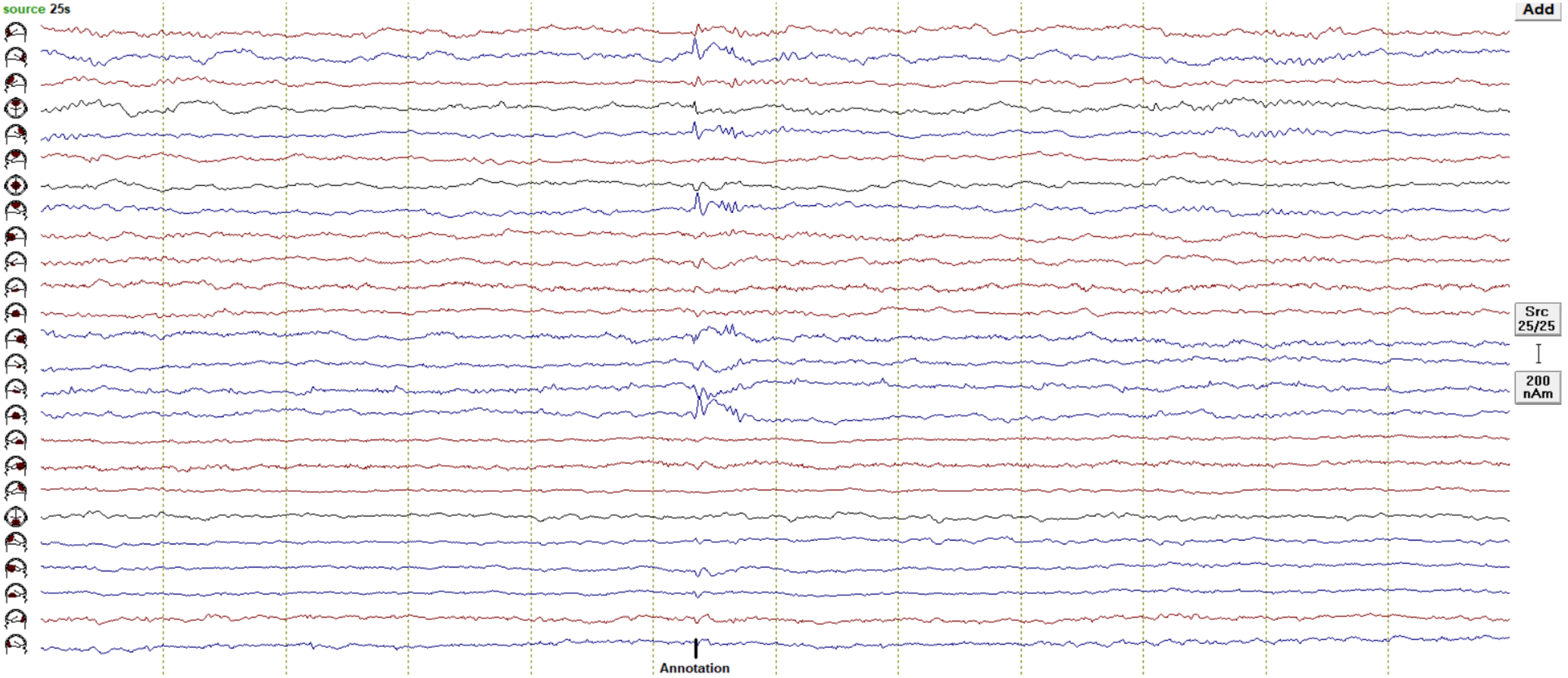
Sample 5: IED (longitudinal bipolar montage)



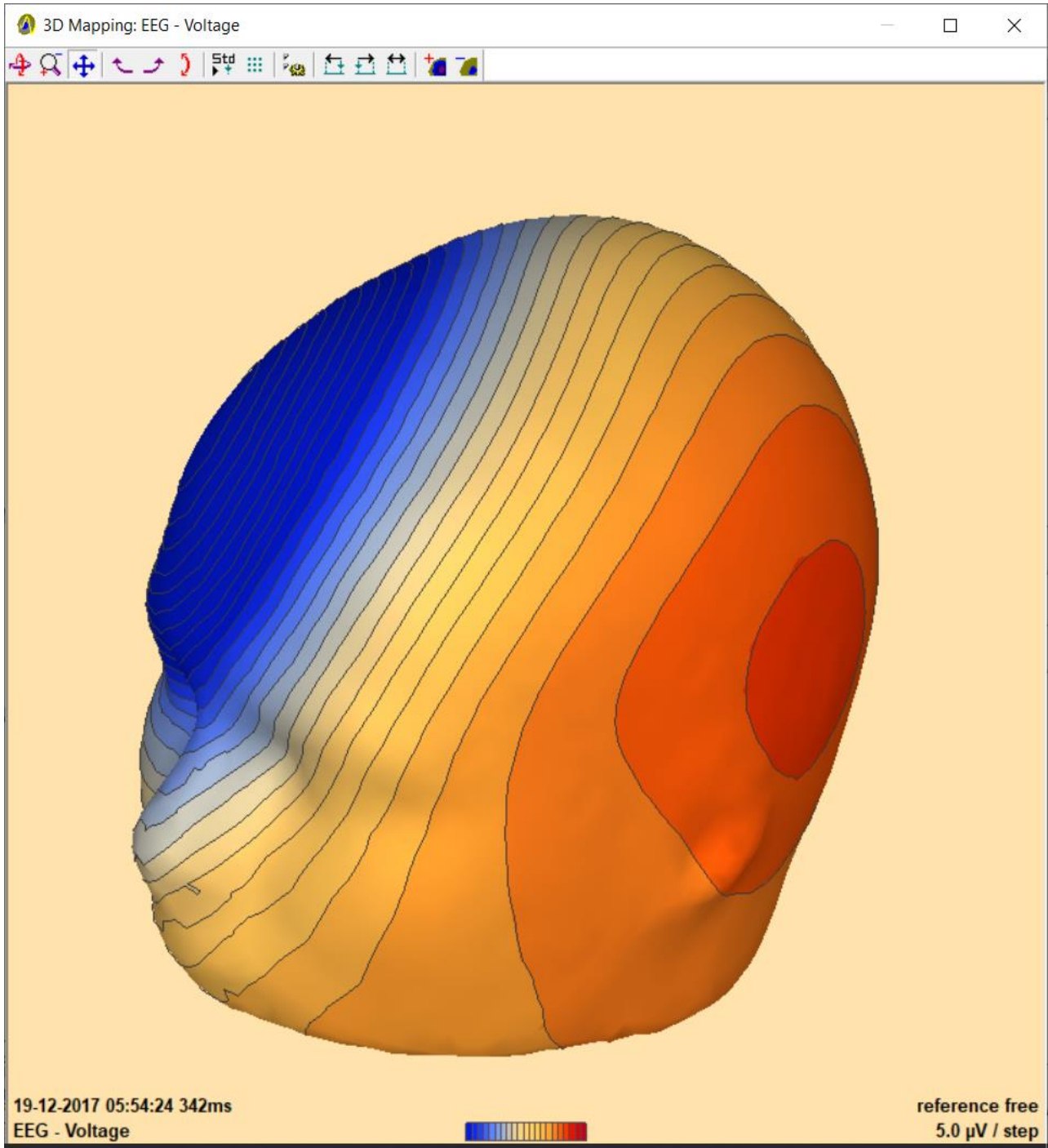
Sample 5: IED (common average montage)



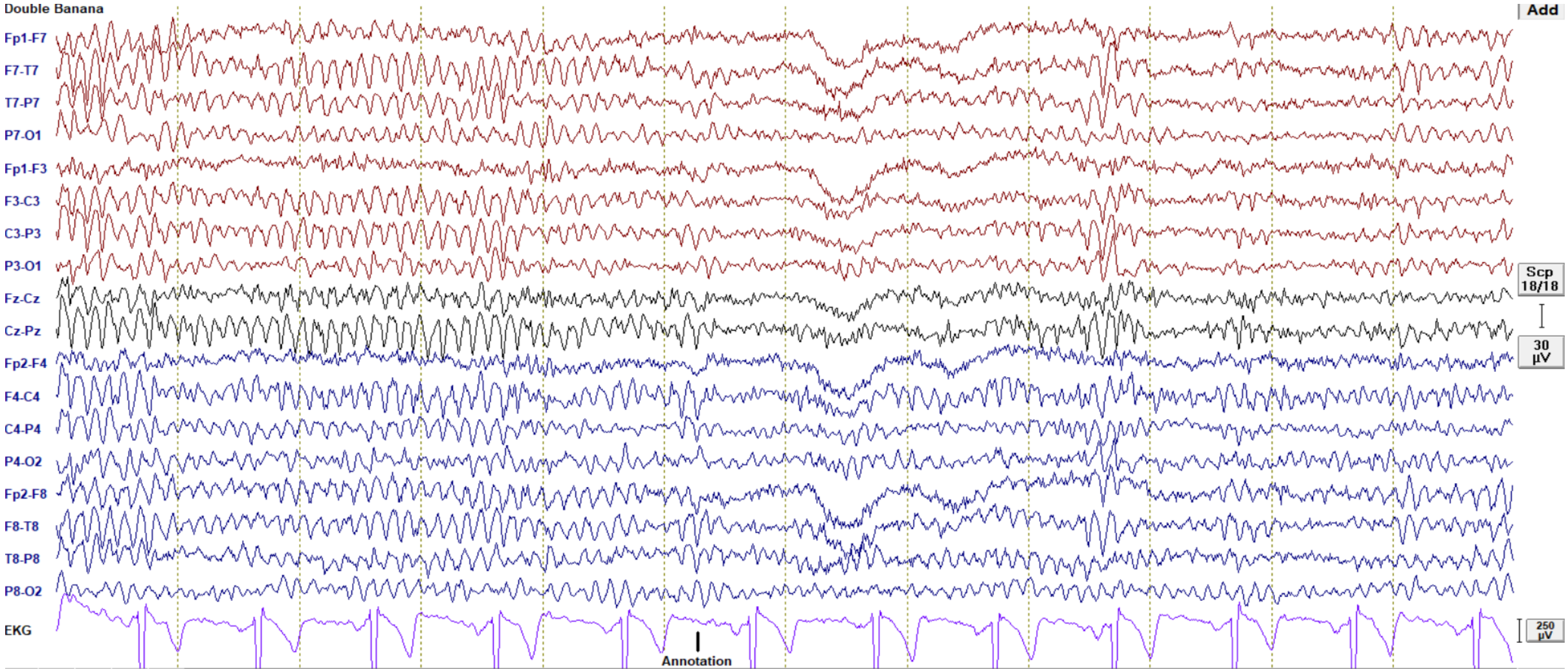
Sample 5: IED (source space)



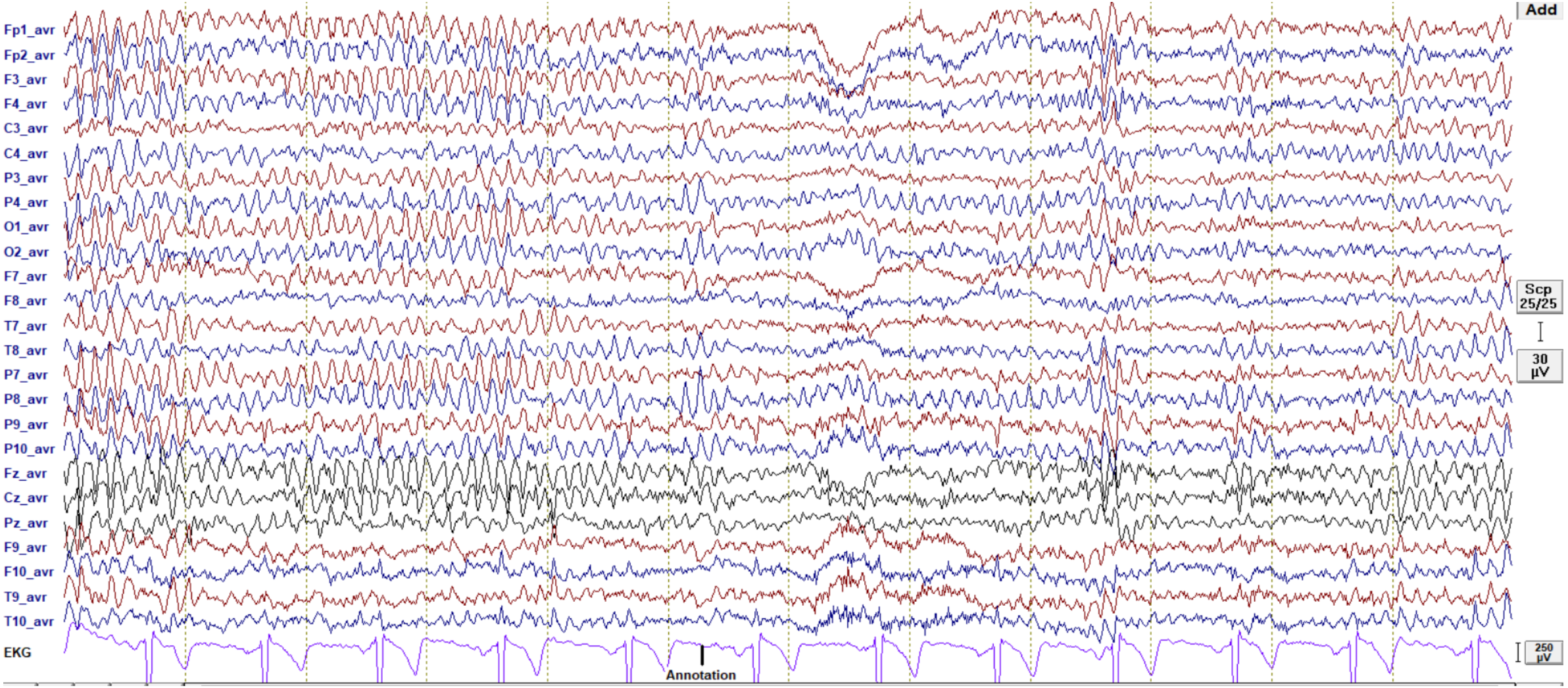
IED: Sample 5 voltage map



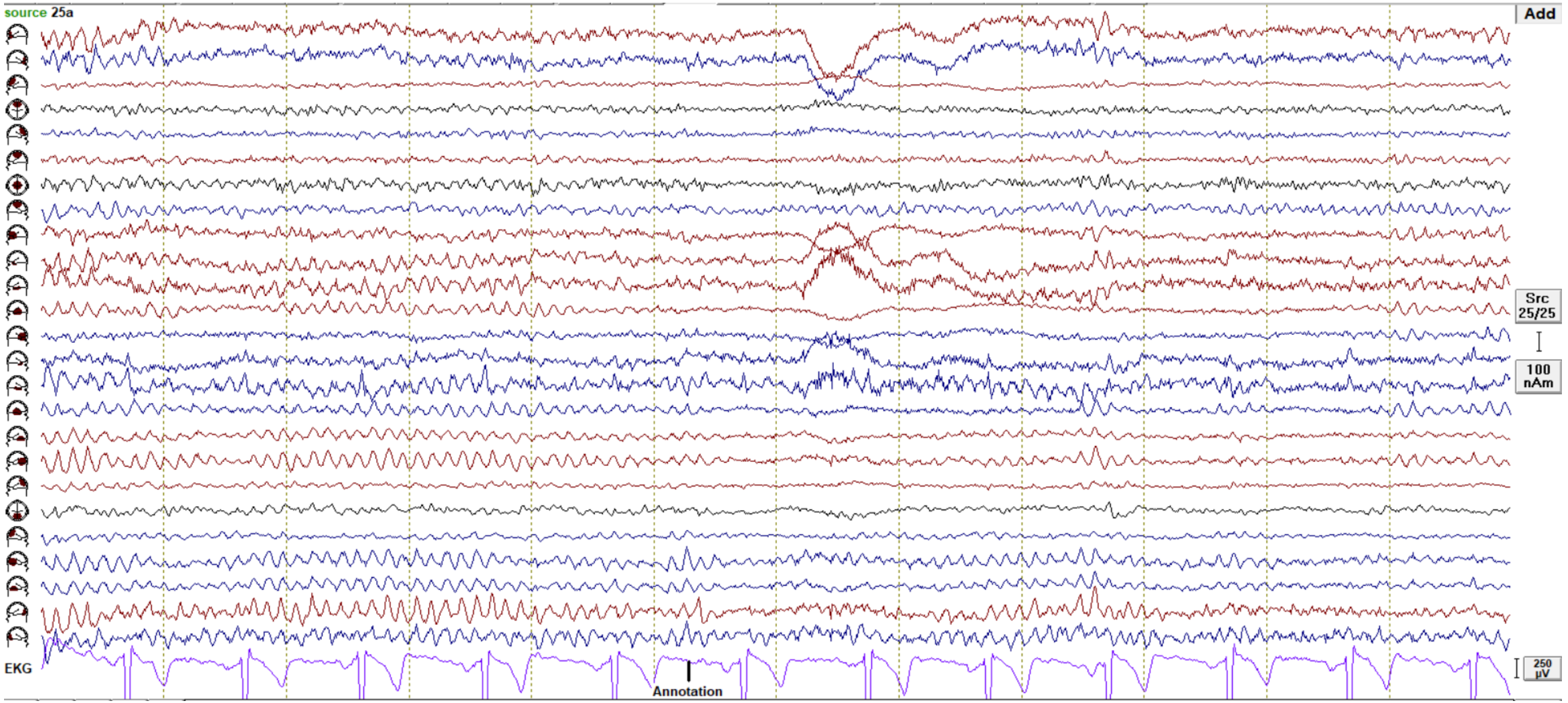
Sample 6 – normal sharp transient (longitudinal bipolar montage)



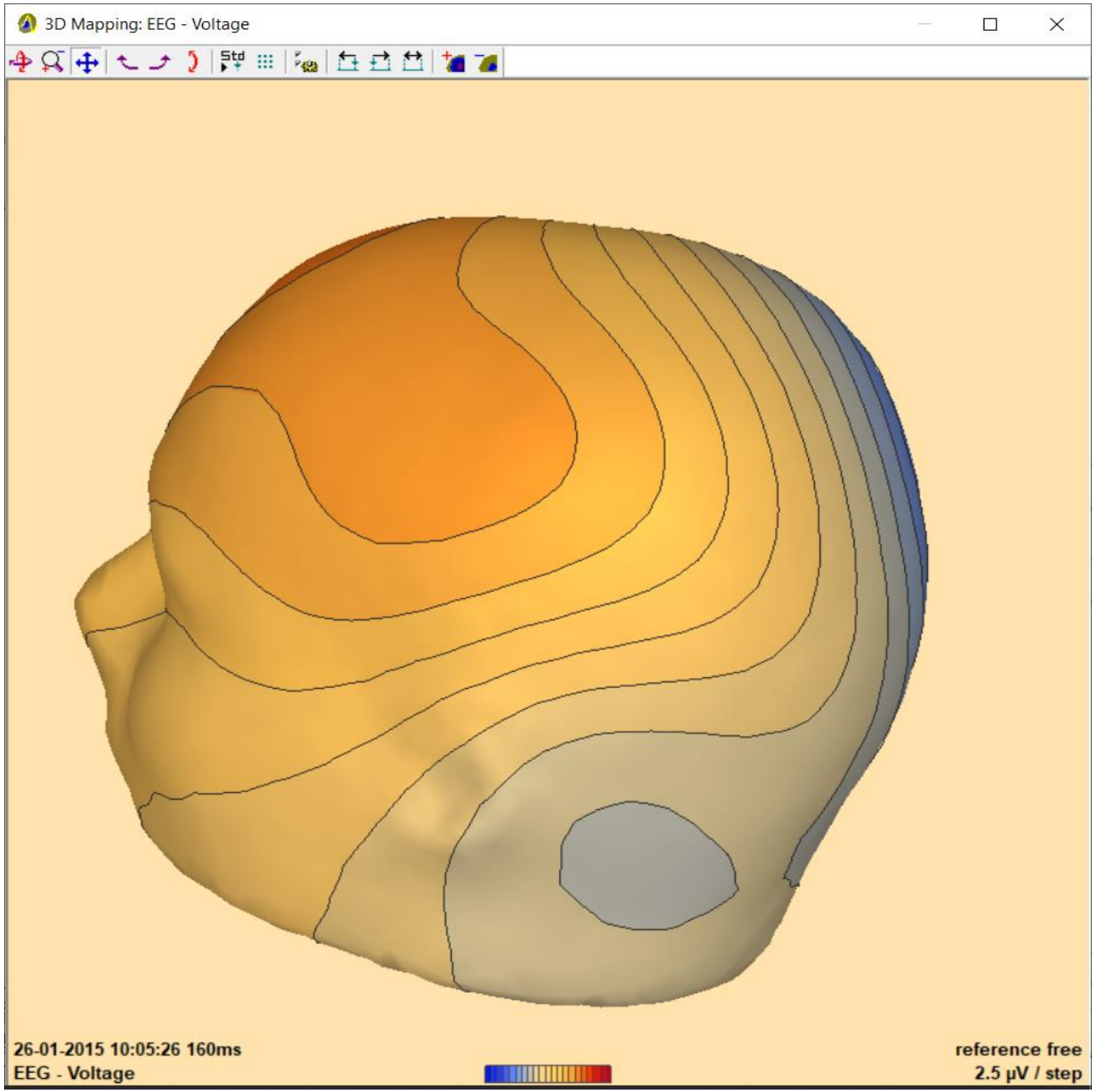
Sample 6 – normal sharp transient (common average montage)



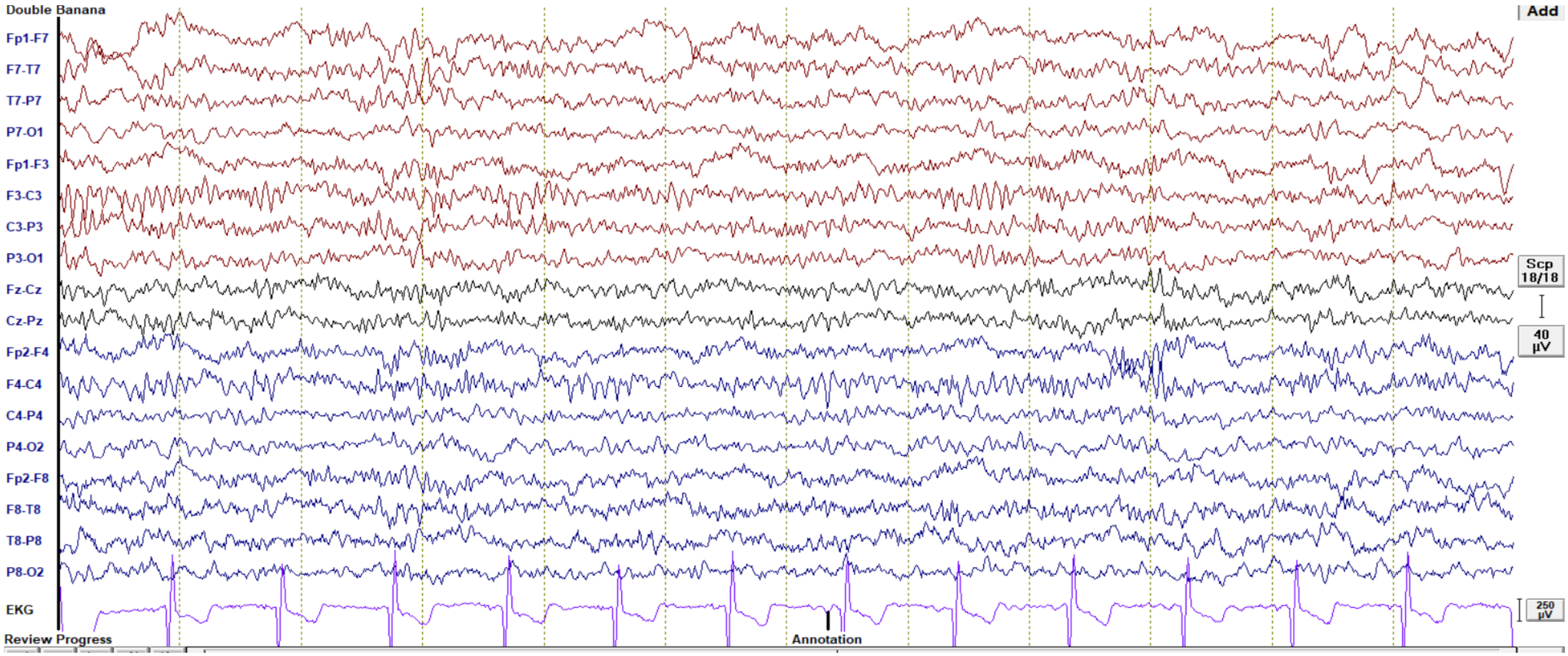
Sample 6 – normal sharp transient (source space)



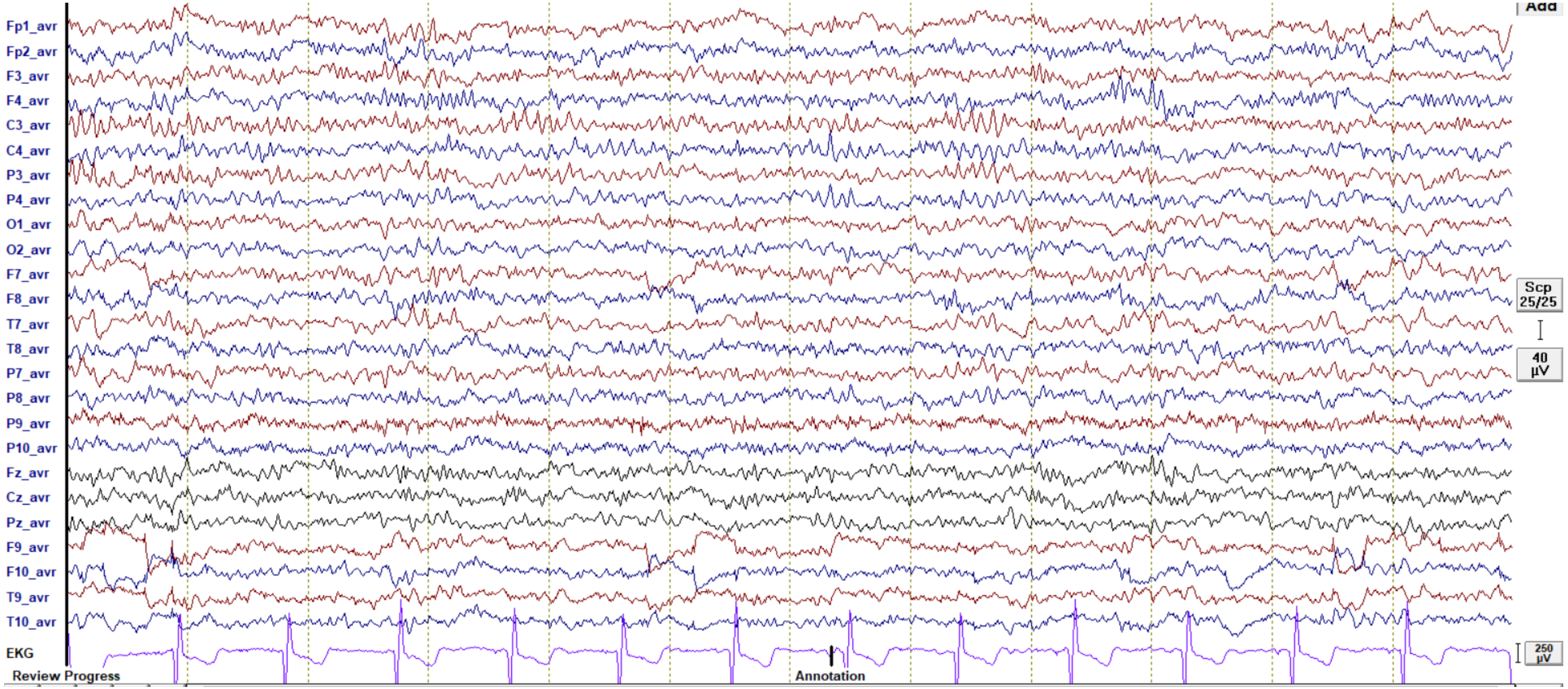
Sample 6 – normal sharp transient: voltage map



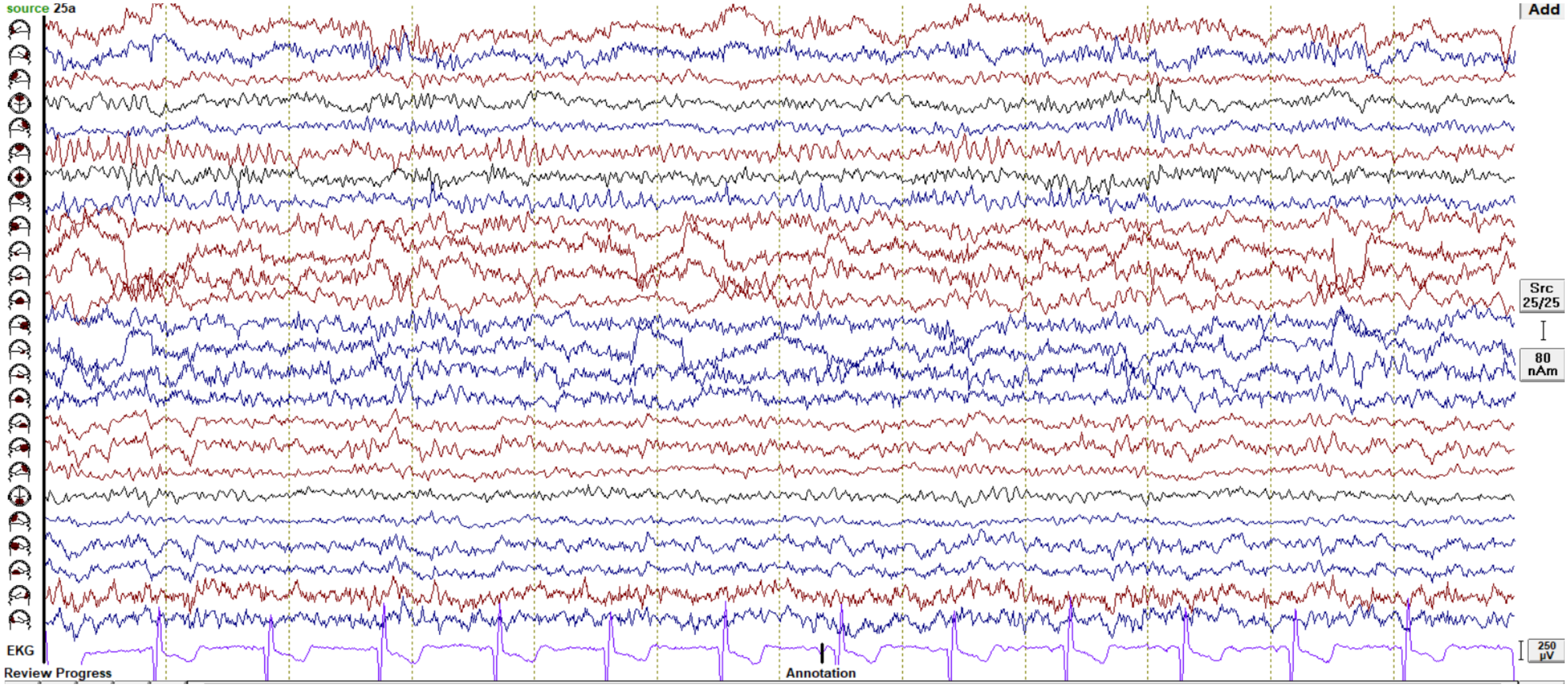
Sample 7 – normal sharp transient (longitudinal bipolar montage)



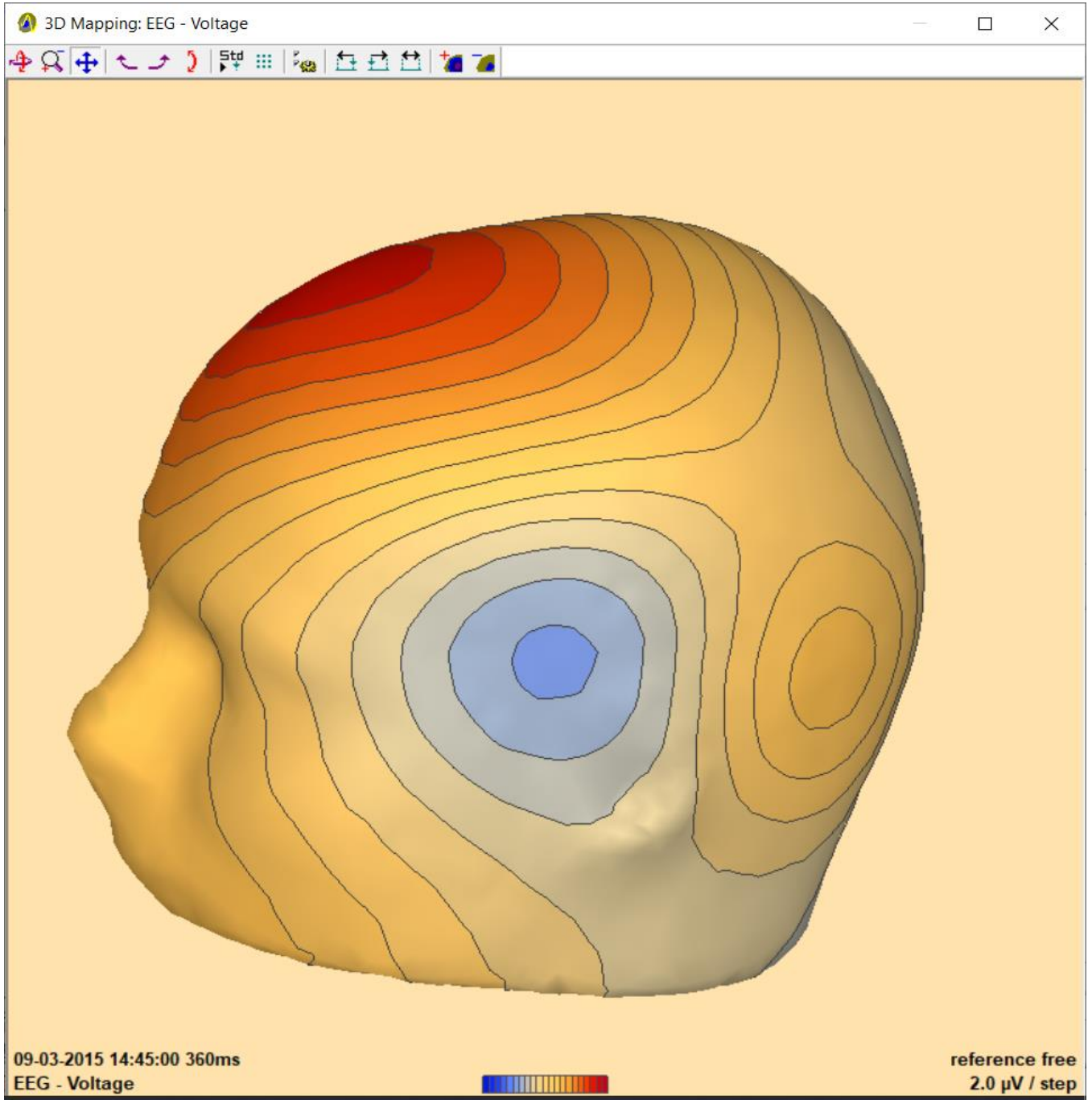
Sample 7 – normal sharp transient (common average montage)



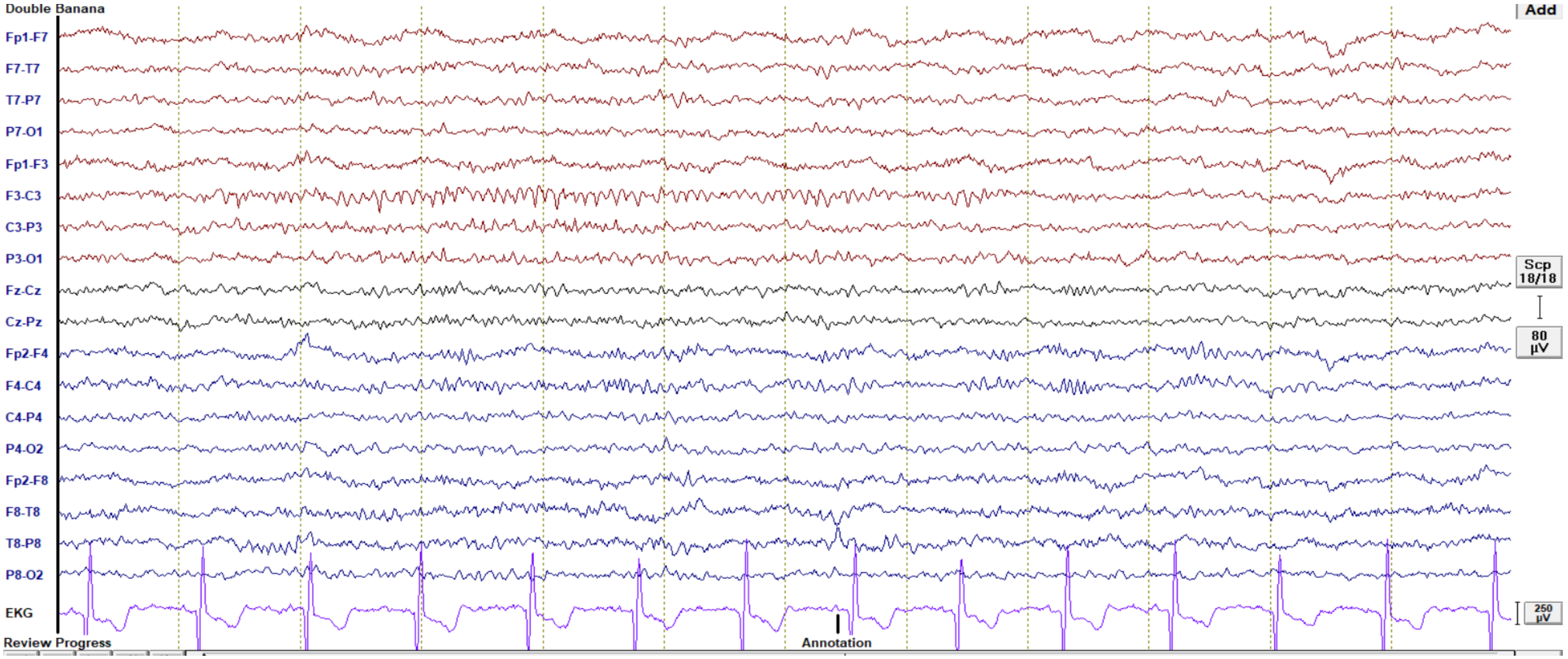
Sample 7 – normal sharp transient (source space)



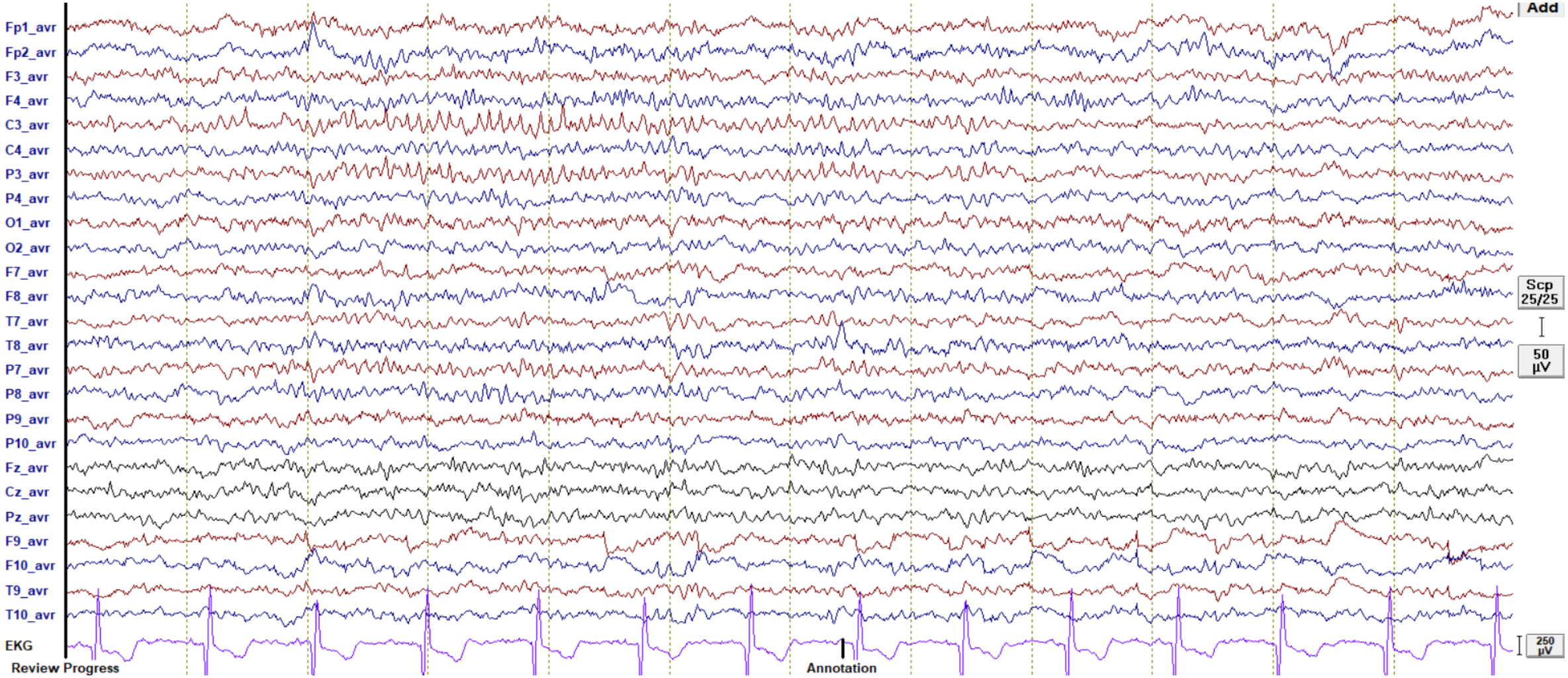
Sample 7 – normal sharp transient: voltage map



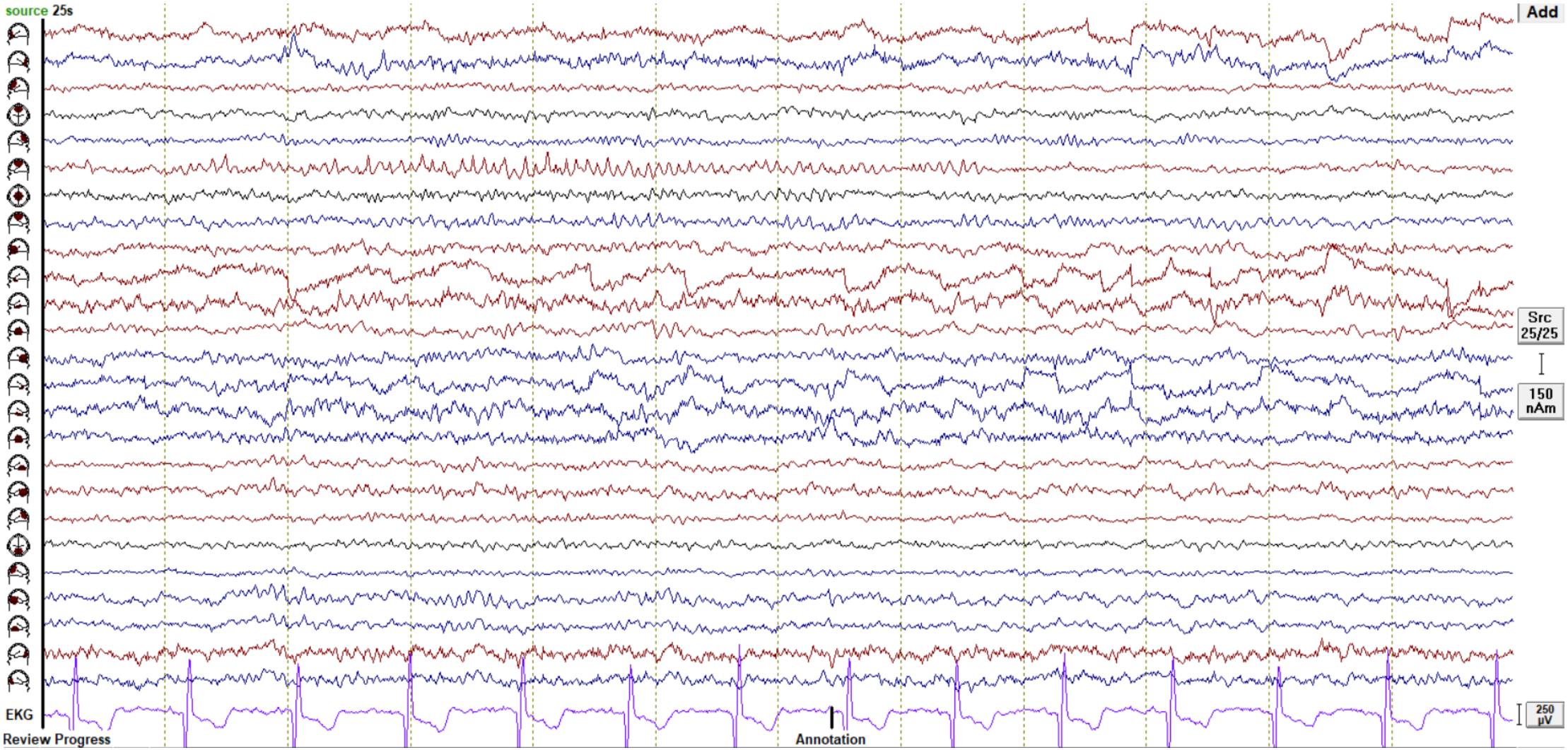
Sample 8 – normal sharp transient (longitudinal bipolar montage)



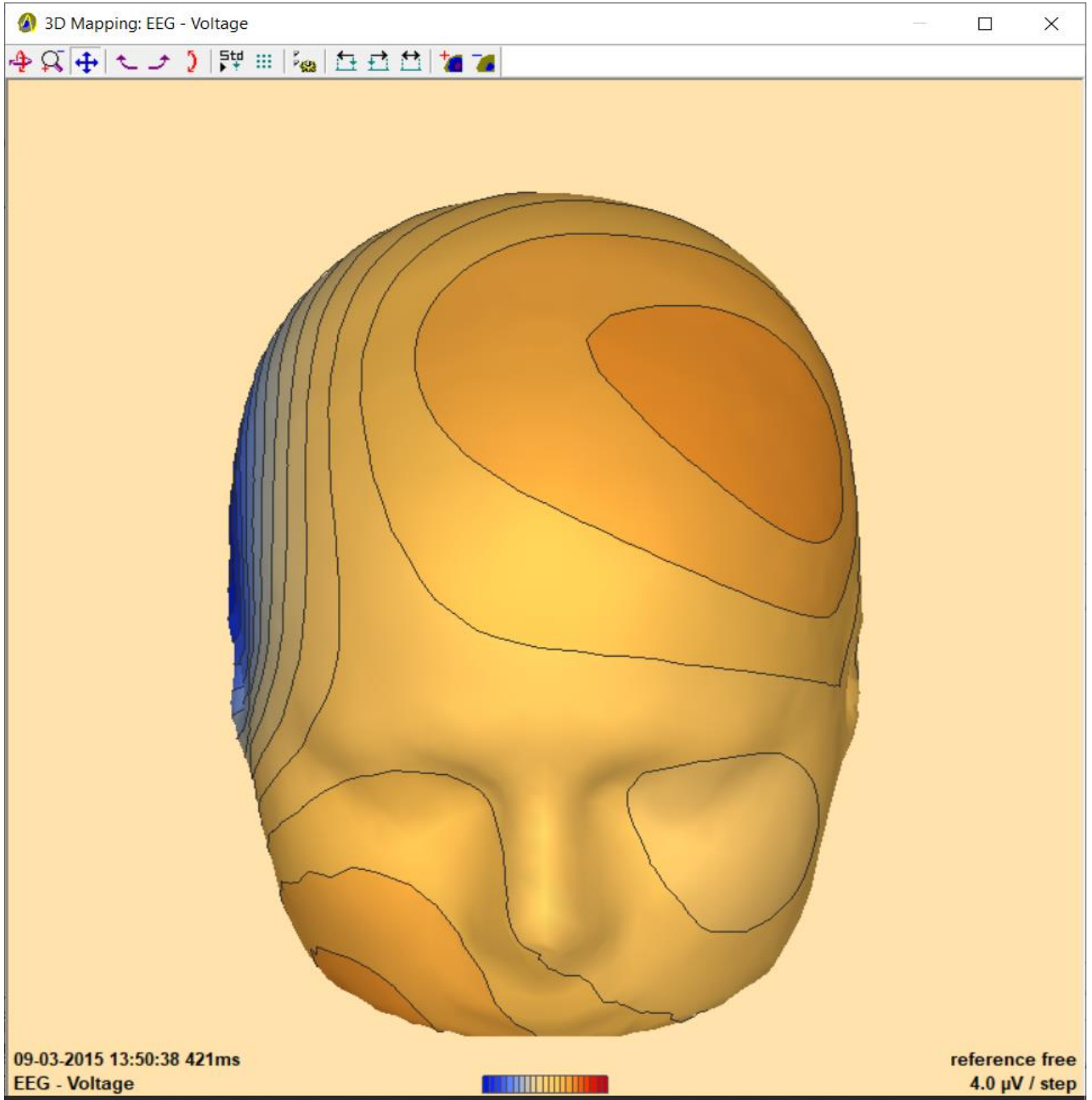
Sample 8 – normal sharp transient (common average montage)



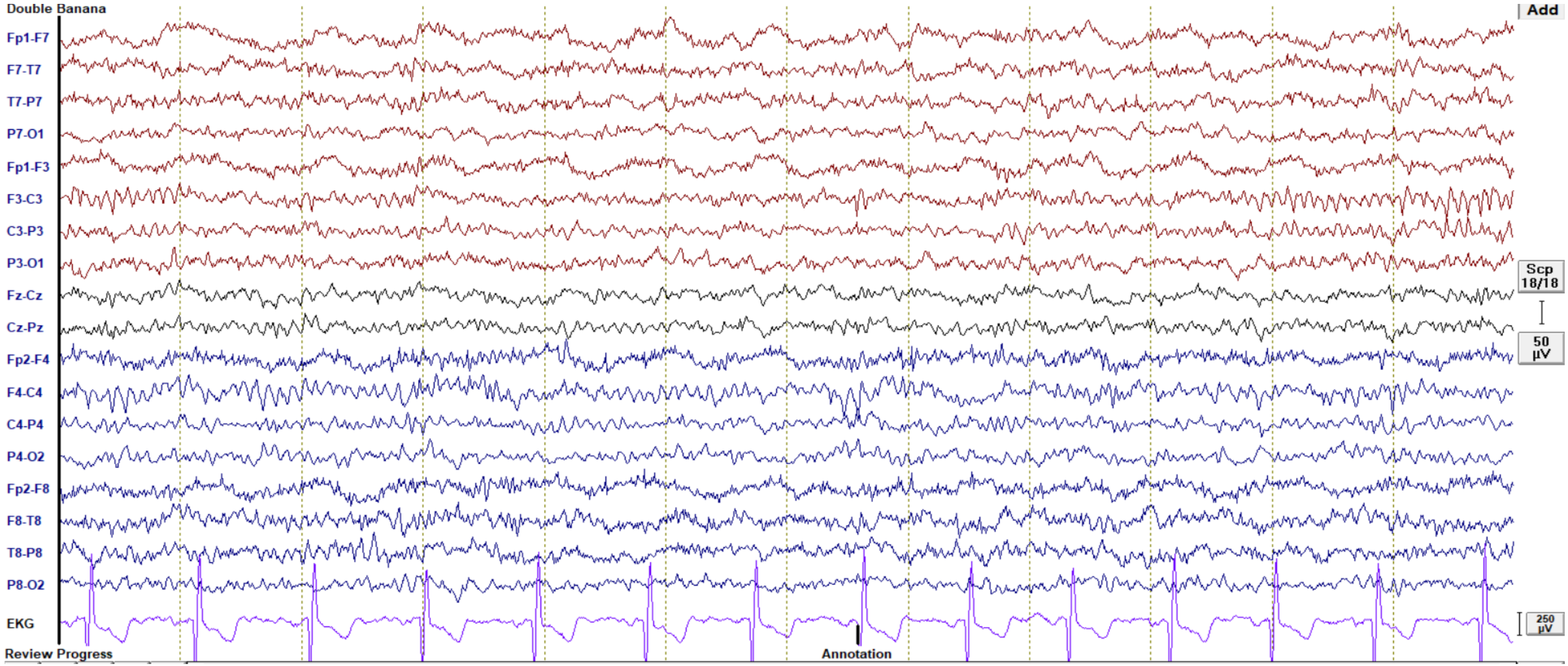
Sample 8 – normal sharp transient (source space)



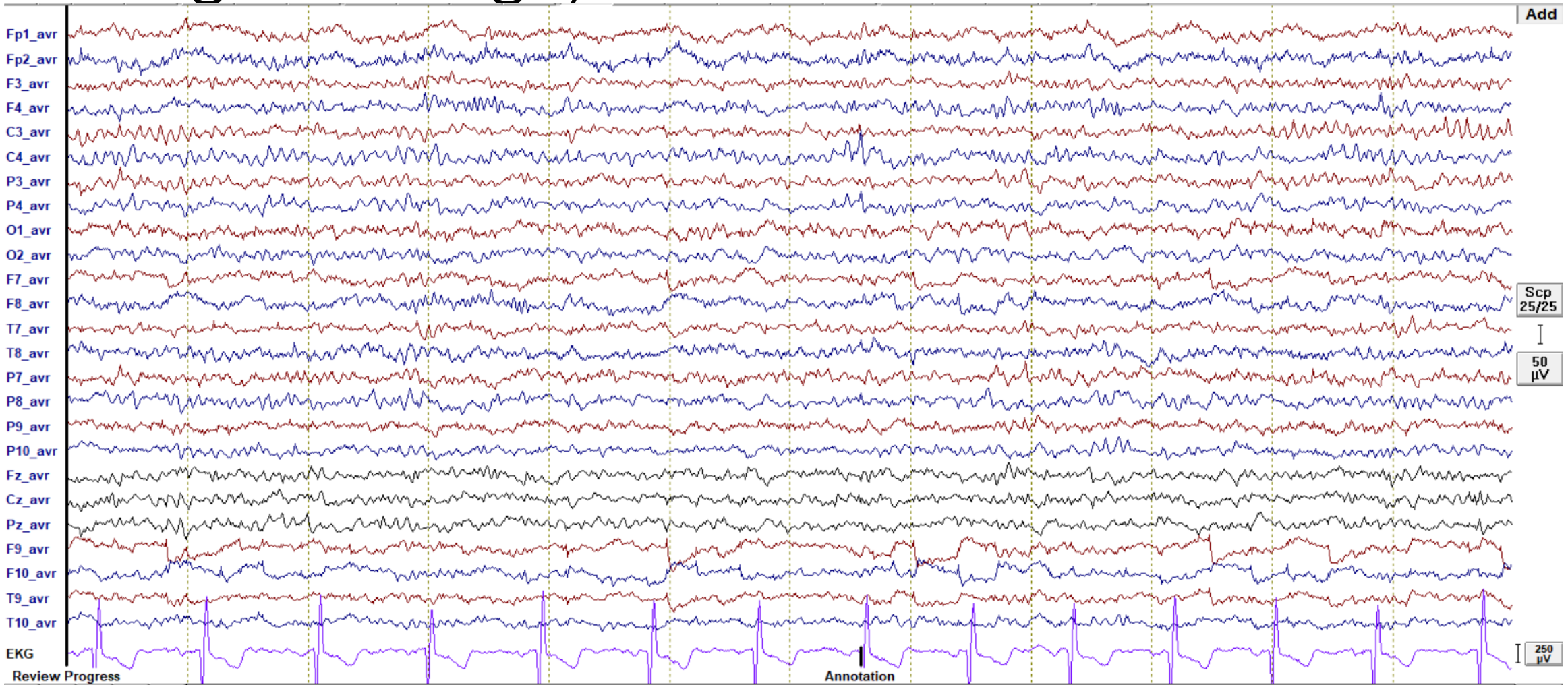
Sample 8 – normal sharp transient: voltage map



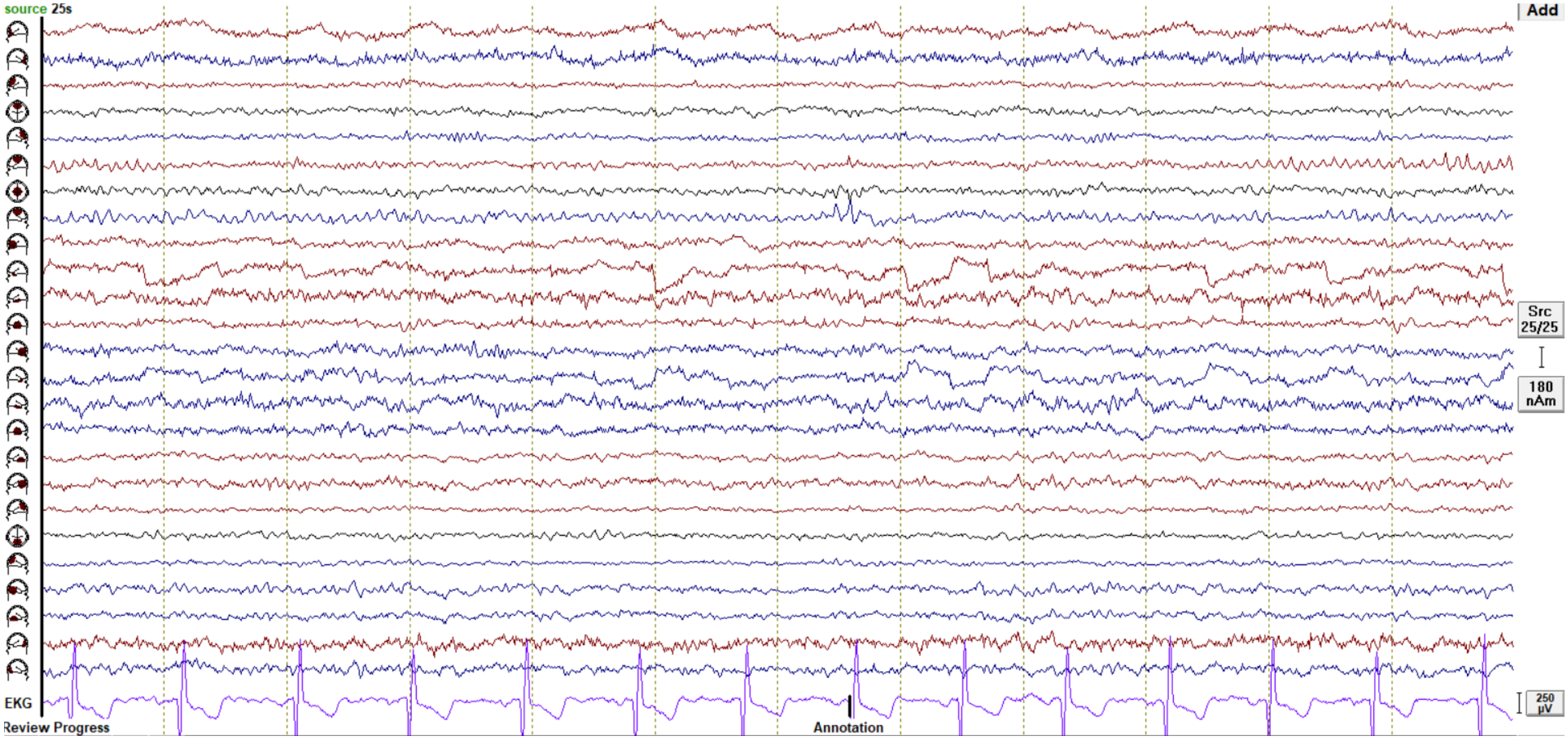
Sample 9 – normal sharp transient (longitudinal bipolar montage)



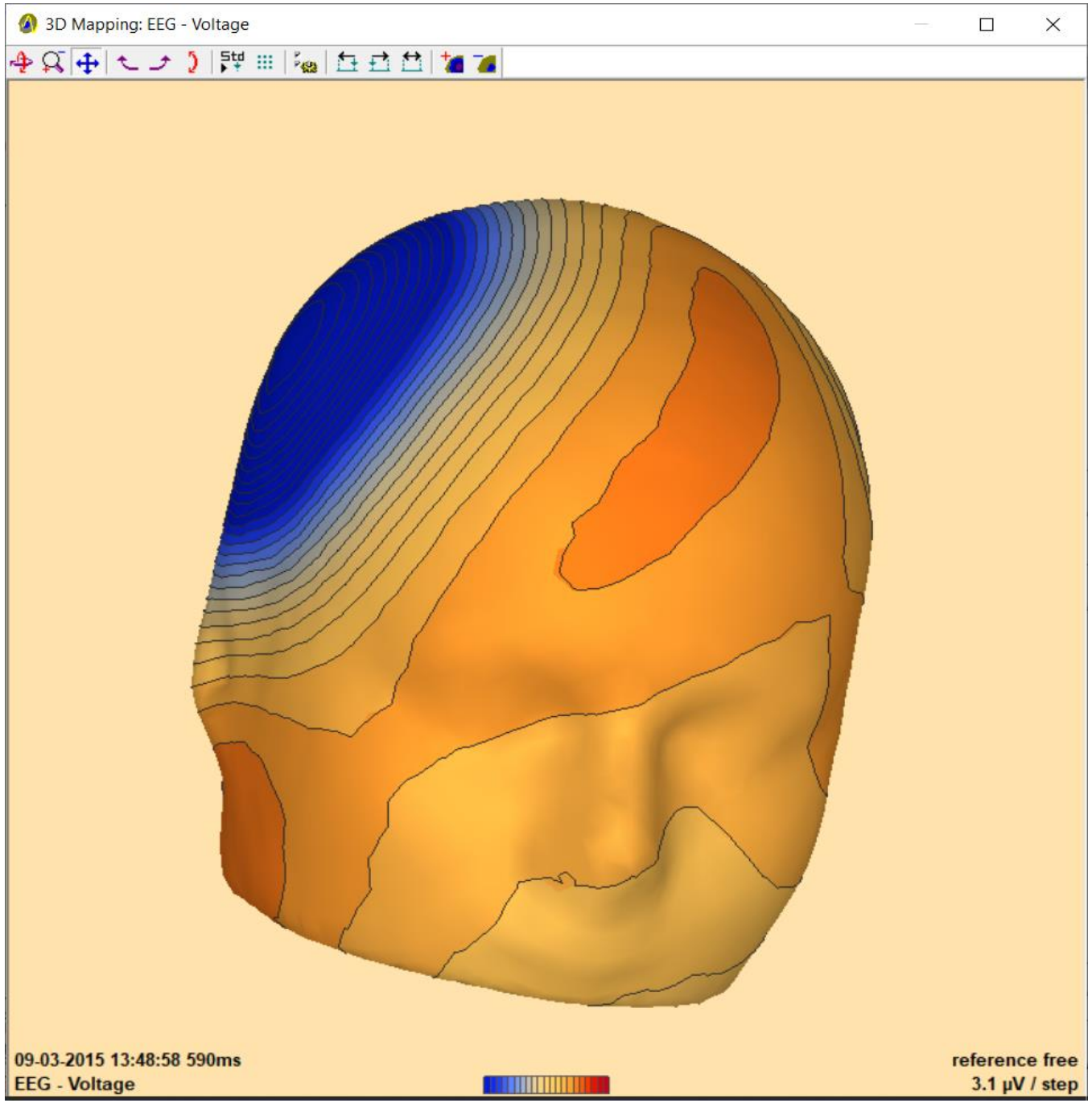
Sample 9 – normal sharp transient (common average montage)



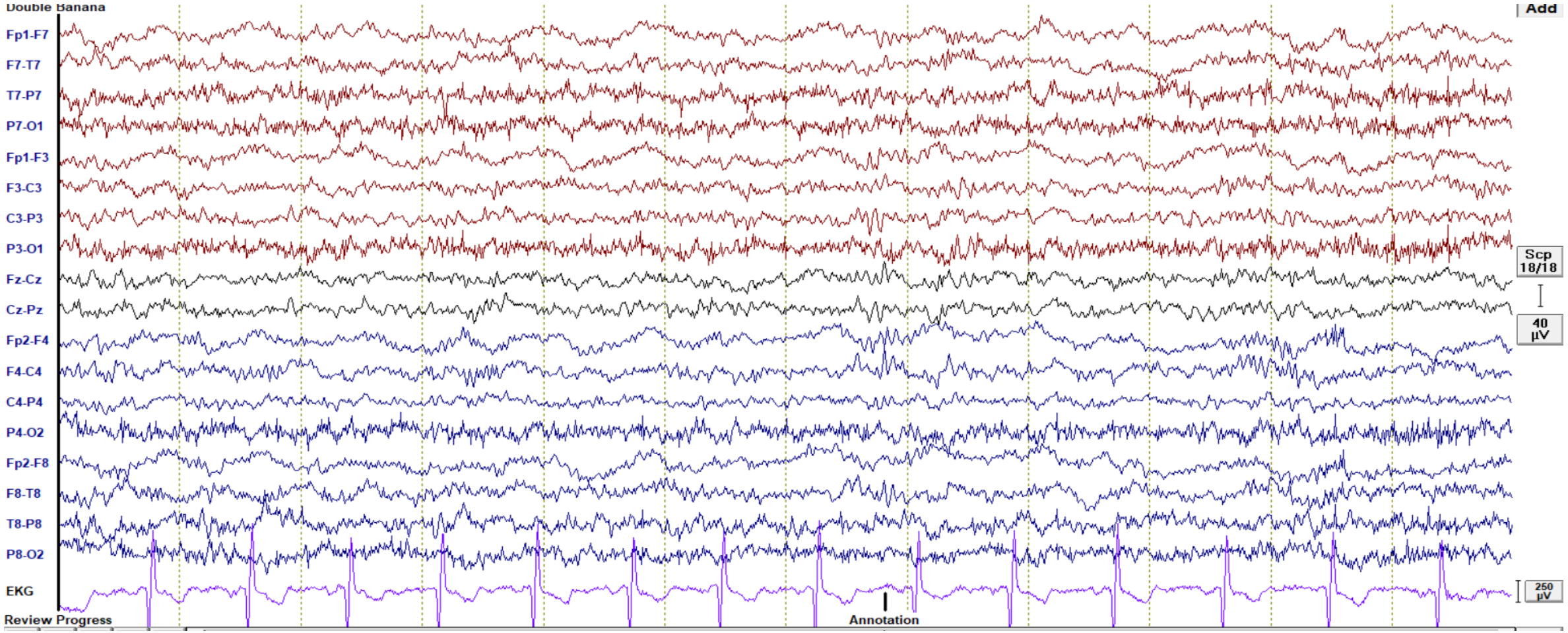
Sample 9 – normal sharp transient (source space)



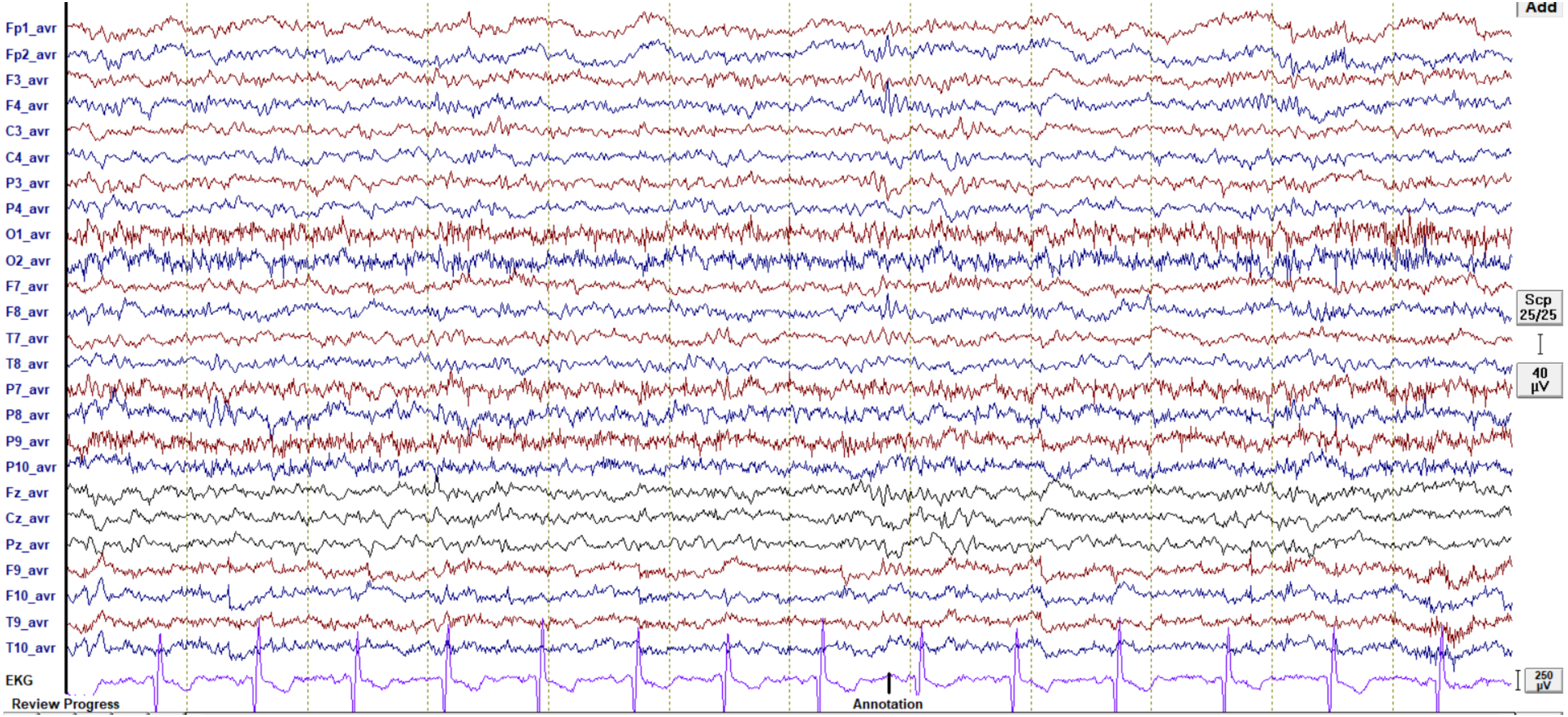
Sample 9 – normal sharp transient: voltage map



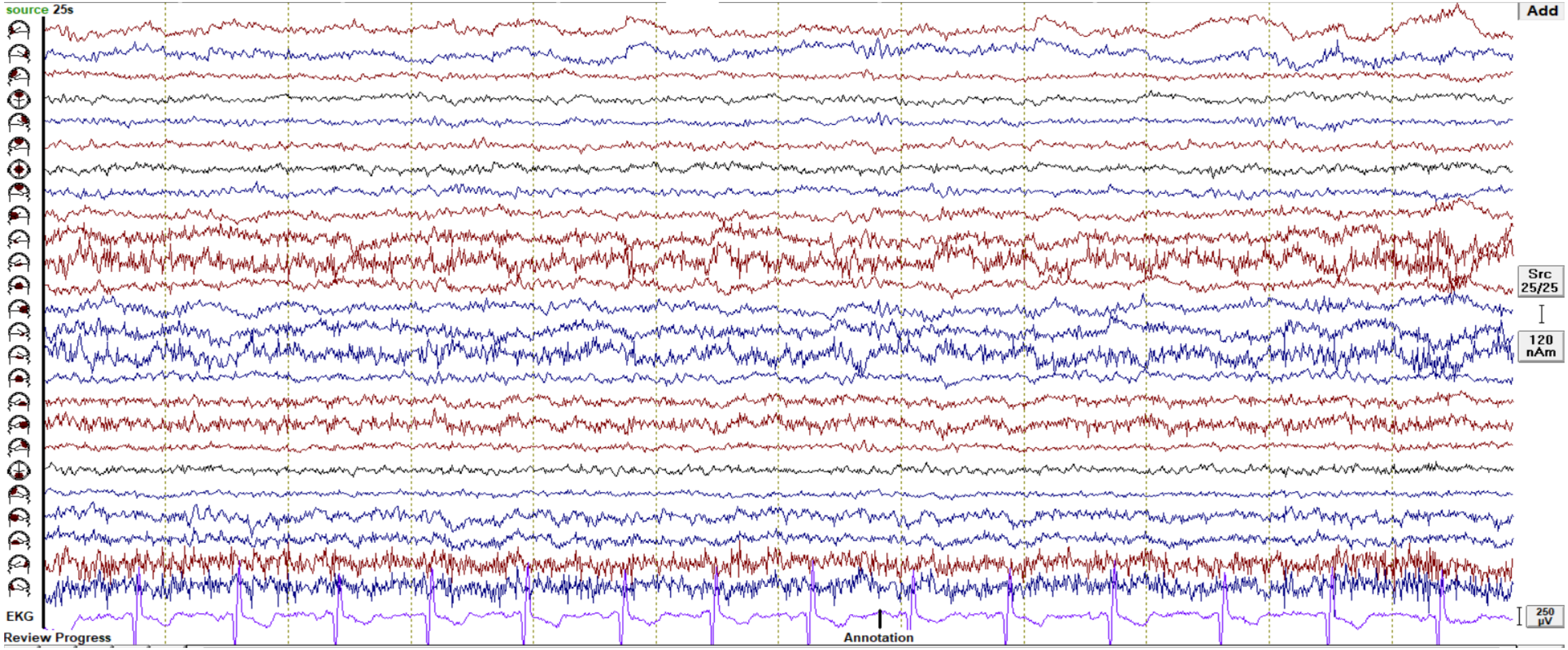
Sample 10 – normal sharp transient (longitudinal bipolar montage)



Sample 10 – normal sharp transient (common average montage)



Sample 10 – normal sharp transient (source space)



Sample 10 – normal sharp transient: voltage map