Data structure of animal Koz5 (30 channel electrode):

The data structure is the same as for the former animal Koz4 (explained on example “140429” from the former animal “Koz4”):

Koz4_140429_lfp_ch 1-16:

- Three-dimensional variable that contains information about LFP channels 1 to 16 (for information about channels see “Channel map.docx”)
- 1st dimensions: raw LFP data from channels 1 to 16 (hardware filtered at 0.1 and 300 Hz)
- 2nd dimension: sample rate (the “weird” non-integer value of our SR is due to the intrinsic maximum SR of the Tucker Davis recording system)
- 3rd dimension: channel list (list of numbers from 1-16 for offline channel mapping if needed)

Koz4_140429_lfp_ch 17-32:

- Same as for “Koz4_140429_lfp_ch 1-16” but for LFP channels 17 to 32 (for information about channels see “Channel map.docx”)

Koz4_140429_info_Tria:

- Three-dimensional variable that contains information about the trial onset
- 1st dimensions: name
- 2nd dimension: timestamps indicating the start of each trial in seconds
- 3rd dimension: trial list

Koz4_140429_info_Stro:

- Three-dimensional variable that contains information about tone onset and Go/NoGo trials

- 1st dimensions: name
- 2nd dimension: timestamps indicating the onset of each FM-tone in seconds
- 3rd dimension: list of 0s and 1s matching the list of tone onsets (“0” indicates that the respective tone was played during a Go trial, “1” indicates that the tone was played during a NoGo trial)

Koz4_140429_info_Shoc:

- Three-dimensional variable that contains information about the onset and offset of shocks
- 1st dimensions: name
- 2nd dimension: timestamps indicating the onset and end of each shock in seconds
- 3rd dimension: list of 0s and 1s matching the list of shock onset and end (“1” indicates the start of the shock, “1” indicates end of the shock)

The experiment:

The gerbil is in the shuttle box. A rectangular electrode array with 20 electrodes has been implanted above the auditory cortex on top of the dura mater (for the spatial arrangement of surface array electrodes see “Channel map.docx”). In addition, a wire bundle of 8 depth electrodes has been implanted into the striatum.

The gerbil is exposed to two different types of tones: linear **rising** frequency modulated tones (FM 2-4 kHz, duration 200ms) and **falling** FM (FM 4-2 kHz, duration 200ms). These FM tones are presented not as single tones but in a short sequence: FM-pause-FM-pause-FM-pause ….

A pause is 300 ms long (corresponding to an inter-stimulus-interval of 500 ms). Every sequence consists solely of rising **OR** falling FMs, but **not** of a mixture of alternating rising and falling FMs.

The gerbil is supposed to learn to move from one side of the box (by crossing a small hurdle) to the other side of the box when the **FM rise** occurs (which is why we call it **Go tone** or **Go trial**). If the animal crosses the hurdle within a time period of 6 s after tone sequence onset (**Hit**) the tone is switched off, the trial ends and after an inter-trail interval of 25 to 30 s, the next tone sequence (and, therefore, the next trial) starts. If the animal misses to jump within the 6 s window (**Miss**), it receives a mild to moderate electrical foot shock via the metallic grid floor of the shuttle-box. This results in a forced escape response to the other side of the box after which both shock and tone are switched off (end of trial). One can see the foot shock in the LFP-signal.

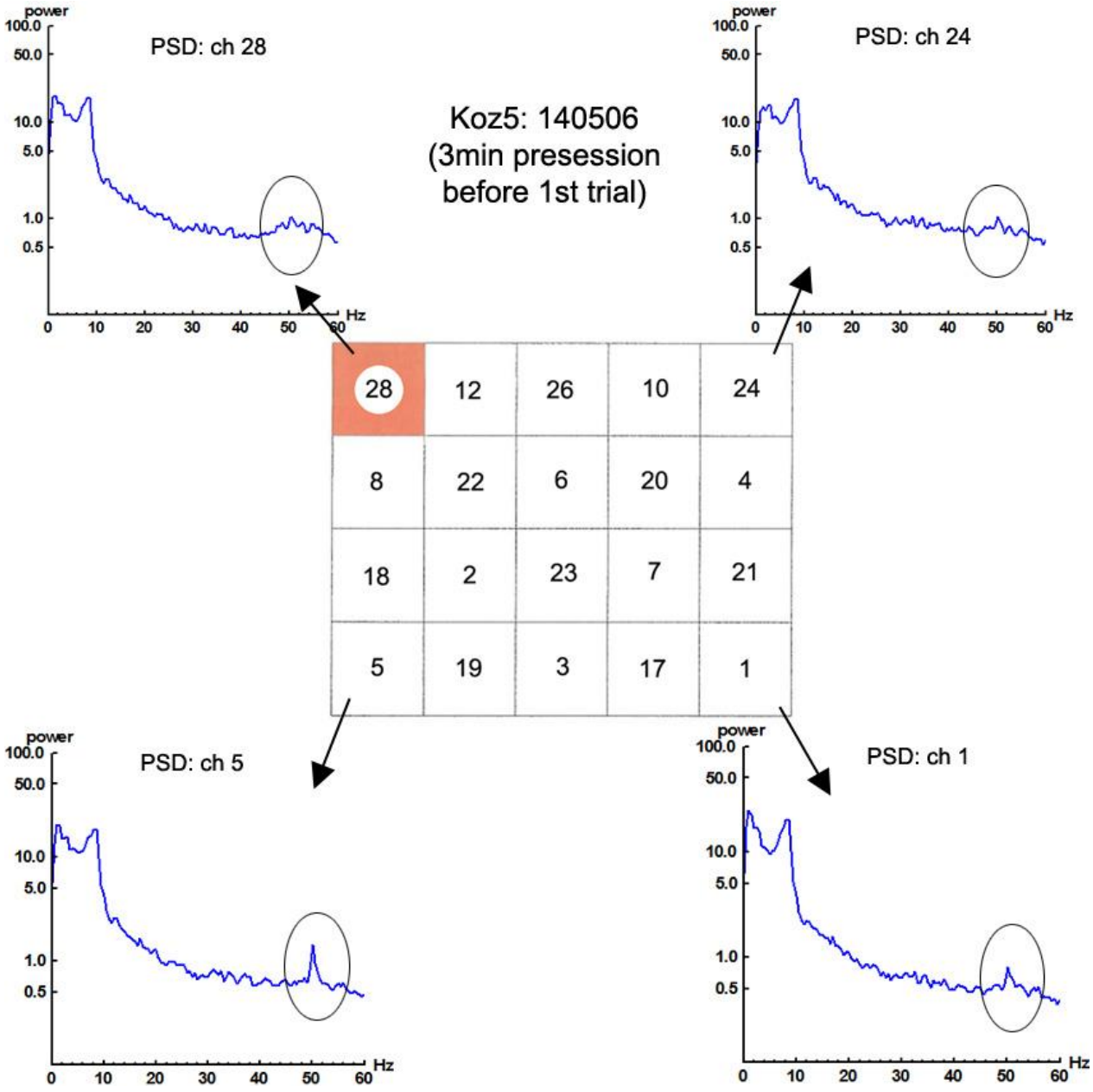
For the **FM fall** the animal is supposed to stay within the presently occupied compartment of the box for at least 10s (which corresponds to a **Correct Rejection** and ends the trial). If it does change compartments during such a **NoGo trial** (**False Alarm**), it will receive a foot shock after crossing the hurdle and the trials ends with the end of the foot shock.

One training session (which corresponds to one full training day) consist of **96 trials** (48 Go and NoGo 48 trials). The trial sequence is the same for every day and is coded in an offline list (based on a Gellermann sequence).

So we present 96 trials, but, however, there are 97 time stamps. This is due to the fact that the last trial timestamp only serves to indicate the end of the training session and can thus be ignored.

Auditory cortex (AC) channels:

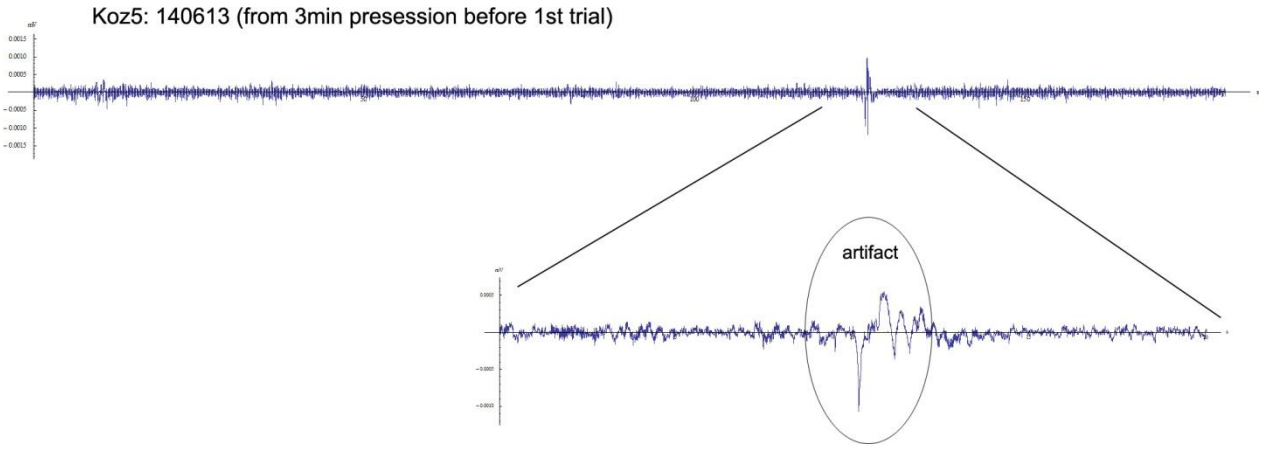
As announced, the current dataset (Koz5) no longer has large amplitude movement artifacts that posed a problem in the previous datasets. Also, for most auditory cortex (AC) channels, we managed to considerably reduce the amount of 50 Hz noise. However, as written in the logfiles that are attached to each training day, the amount of 50 Hz noise varies between AC-channels as the example figure below illustrates.



The figure above shows data of the first training day (140506) from the 3min-presession period before the first trial starts. You can see a “50Hz-gradient” from the lower channels 5 and 1 (with relatively pronounced 50Hz peaks) to the upper channels 28 and 24 (with very small or no 50Hz peaks). We are not exactly sure yet where this gradient comes from, but when analyzing activity in the gamma-band, it’s always good to keep such things in mind. However, since this “50 Hz-gradient” does not change over the course of the training (i.e. it’s the same from one training day

to the other), it should not systematically affect the classification procedure pre-learning vs. post-learning.

Despite the large amplitude movement artifacts being no longer present, this and future dataset will never be a 100% free from occasional non-biological voltage deflections. Often these artifacts appear in the form of “unnatural” spikes in the trace, like in the example below and are thus relatively easy to identify.



I took a quick look at the first 4 s after the start of each trial for all trials of all training days for one AC-channel (ch 5) and they all looked ok at first glance. Since these artifacts often appear somewhat homogeneously across all channels, it is not unreasonable to assume that, for the most part, all of the AC channels should be free of at least such salient artifacts like the one shown above within the first 4s after the start of a trial. I don’t know how much time you spend on looking at the raw recording traces at all (which is more our job anyway), but just as a general rule: whenever part of the recording pops out or looks odd in some way (like the spike in the example above), chances are that it’s probably not brain activity.

However, as there is no reason to assume that these occasional artifacts should in any ways systematically affect the classification of AC-patterns pre- vs. post-learning, you probably shouldn't worry too much about it for now.

Striatum (Str) depth electrode channels:

As written in the logfiles that are attached to each training day, for the depth electrode channels only 1 out of 8 gave a good signal (ch 27). The reason for this is unknown to us yet; this has to be figured out on our side for the next dataset.

However, since the Str-channels are not of relevance for the AC-pattern classification that you've just begun, this issue can be ignored for now.