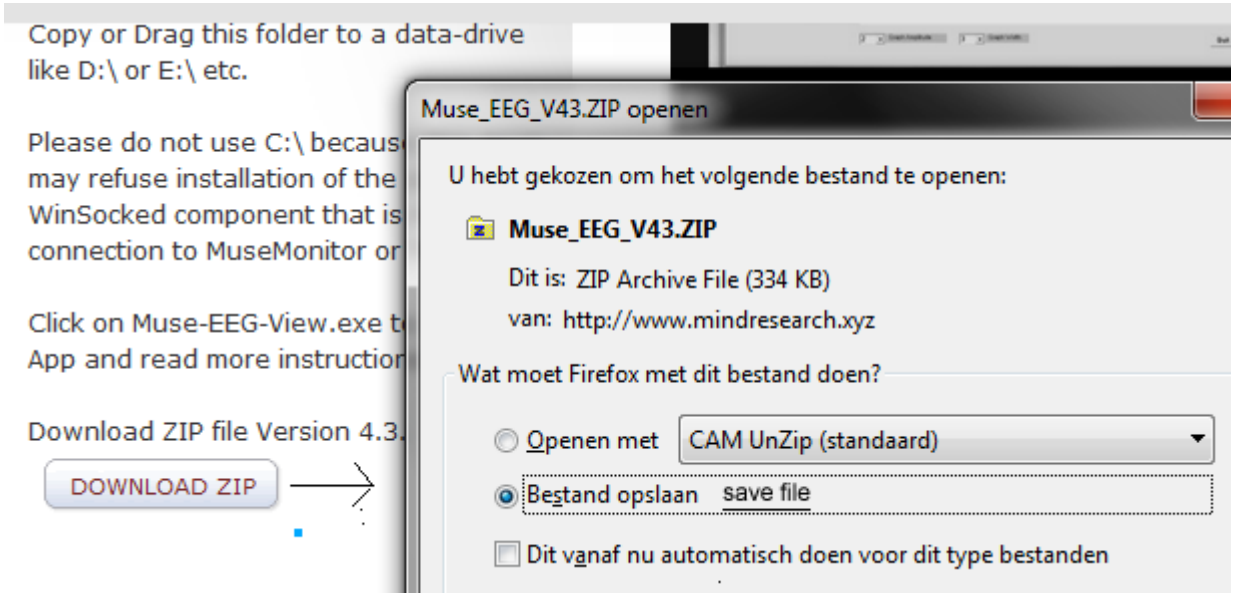
download software from www.mindresearch.xyz

Documentation (release 4.3)

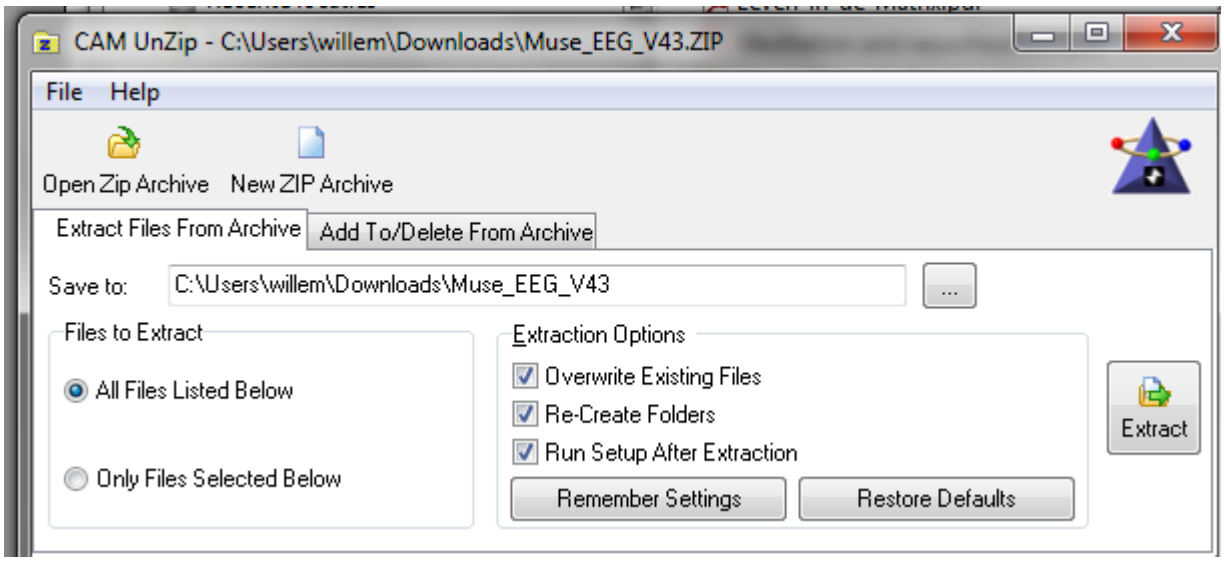
Contents:

1) Installation on Windows PC or Laptop

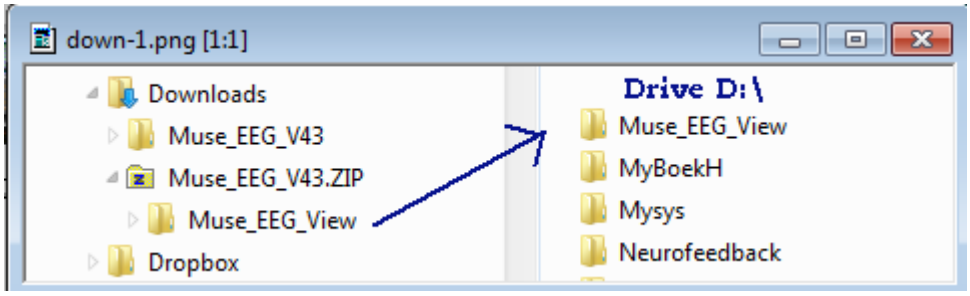
Download the App
Click the download button and save the Zip file in any folder you like.



After download: click with right-mouse button and choose to Un-zip the file



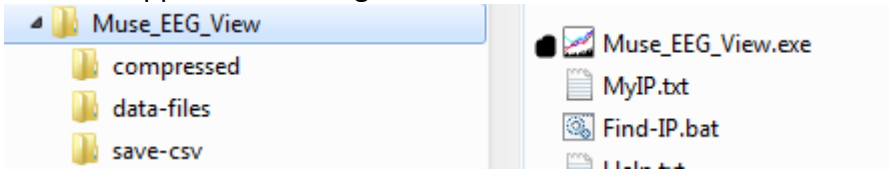
In downloads you see a Muse_EEG_V43 folder and beneath that a <Muse-EEG-View> folder.



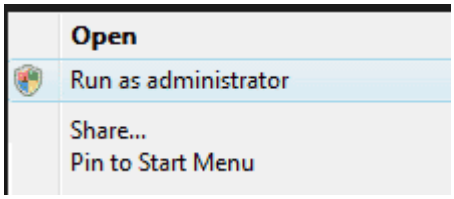
Copy or Drag this folder to a data-drive like D:\ or E:\ etc.

You can copy the <Muse EEG View> folder to any place on your computer.
But please do **not** use **C:** because this drive may refuse installation of the so called WinSocked component that is needed for connection to MuseMonitor or MuseDirect

Start the App click – with right mouse on EXE file



the first time choose to run as administrator



2. Installing "Winsock Listener" on Port 5000

To listen to Port 5000 (where the streaming data comes in) the App needs a so called WinSock component. This component is missing on most Window PC/Laptops

In the installation packet the MSWINSCK.OCX component is included, but you have to tell windows here-I-am. This registration has to be done only once. If you start the live-streaming without registration you will get a Error message.

How to register the OCX

1. Start the App with administrator permissions ! This is done by clicking with right-mouse on the Muse-EEG-View icon (or muse-eeg-view.EXE) and choose <Run as Administrator>

2. Then click the <register MSWINSCK button> on the startup screen.
   If you get ErrNum 75 that means you have no administrator-write-permissions!
   If registration is oke you probably get the message : Registration OCX succeeded

3. Now you can start the <Live stream> screen.
   If the screen appears without a error the OCX registration is oke.

4. If the above does not work and you did a installation on drive C:\ then please
   <drag or copy> the <Muse_EEG_View> folder to a data-drivre like D:\ or E:"

5. If you start streaming and no data appear there is a diagnostic screen to monitor every " bit and byte" that is received on port-5000.

3. Streaming data with the MuseMonitor App

Windows version 7 - 10
A stream from MuseMonitor works on Windows7-10, MuseDirect is only available for Windows 10.

Make sure you have the new version of MuseMonitor App on your smartphone.
Because in the old version only ONE value was given for each wave (delta, beta etc)
In the new version a value for each wave on each elektrode is transmitted.
If the MuseMonitor App is running go to settings (the little wheel)

To stream data from MuseMonitor I use these settings:
* Show values = activated
* Recording interval - while streaming the interval setting does not matter
* Recording format : avarage
* OSC Stream IP - the IP-adress of your PC/Laptop
* OSC Stream IP – default = 5000
* OSC stream brainwaves : All (not avarage)
* Graph type = plot absolute waves ...
* Brain-waves(absolute)
  Activate : Delta - Theta – Alpha – Beta - Gamma
* Menu Wave-type (absolute)
  Average values for ALL sensors TP9 AF7AF8 TP10)

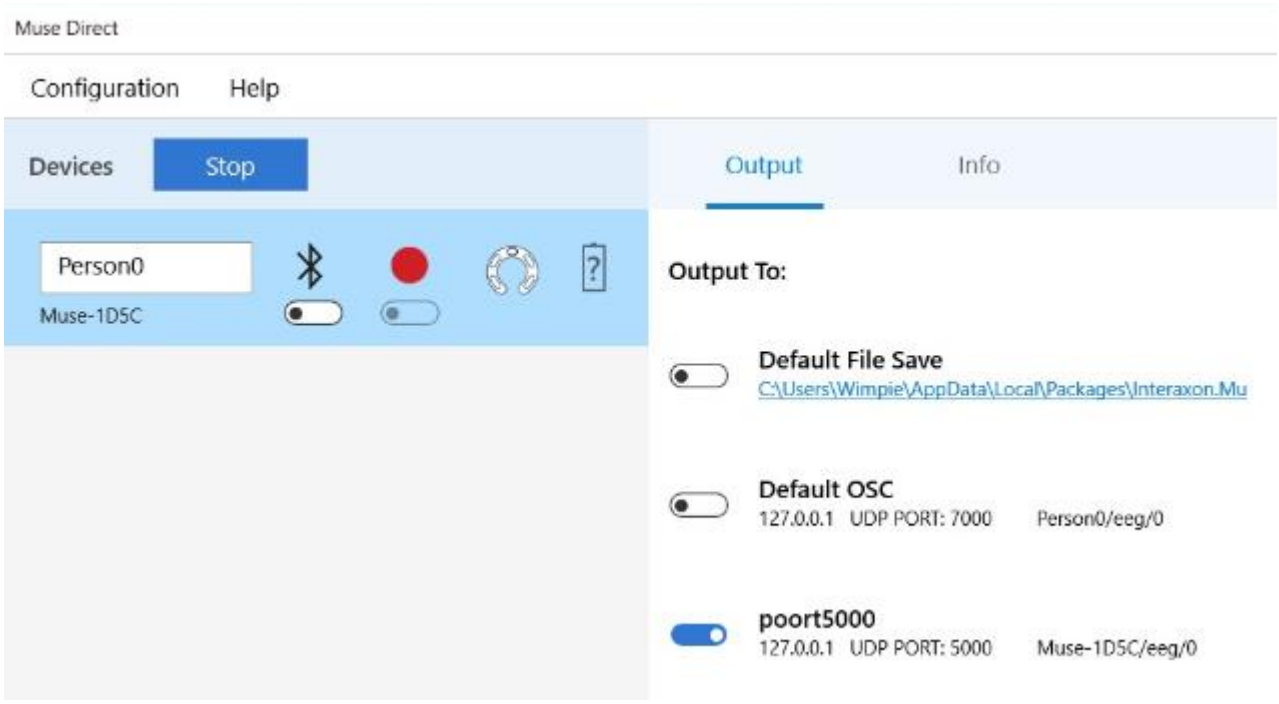
* Advances settings
  Check notch -> in USA = 60

Start streaming
There is a button on MuseMonitor and the word “streaming” appers.

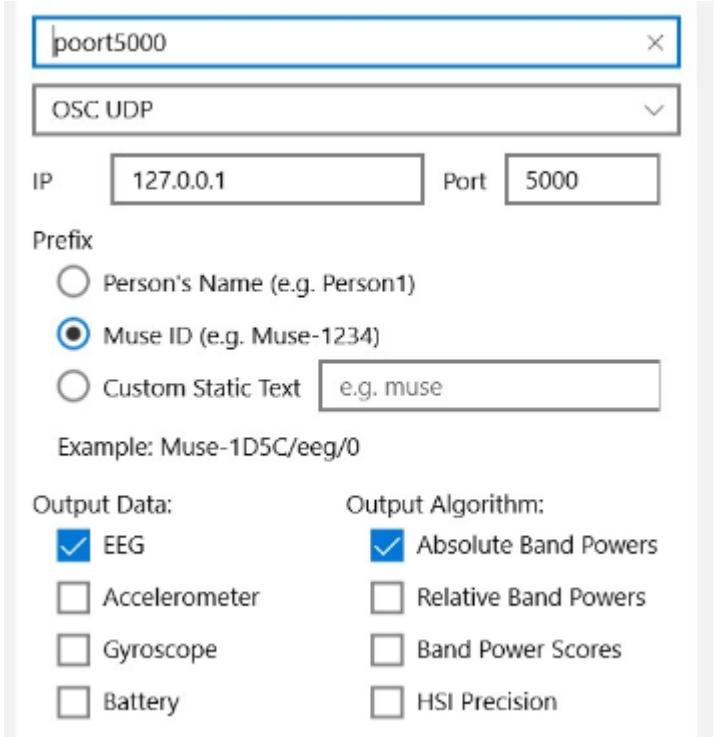
4. Streaming data with MuseDirect (on Windows 10)

The MuseDirect App is for free. It is the substiture for Muse-IO used on headband-I (2014).

Add a new port -5000 (any name you like)



Settings (of the new port)



5) Playback recorded files

You can playback files that are recorded on the “live screen” in Muse-EEG-View.
You can also playback CSV files that where recorded with MuseMonitor.

a. CSV Files from MuseMonitor

Please put the CSV files from muse-monitor in the Muse_EEG_view/data folder.
They will show up in the file-display-box in the App with the extention CSV.
After you click on it – and graph it for the first time - the App will do a file-conversion.
After that it gets a TXT extension and the layout is changed.
The original file it placed in the <save-csv> folder so you can always retrieve it.

b. Possibility’s on the PlayBack screen

Two windows

There are 2 sub-screens in which you can draw a graph and switch between the two.
That makes it easily to compare 2 graphs or persons for example :
** asymmetrie on AF7-AF8 in the upper versus TP9-TP10 in lower screen
** the relative eef waves of Maria versus those of James
** compare high pieks in the delta-wave with bad-disconnection in the raw-data graph

Quick display / Playback

With quick display the graph is drawn directly and stops at the end of the screen. You have to click <continue> to go to the next screen.

With “play back” activated the recording will be played back in the same ‘time dimension’ and you may click <pause> to halt for a moment

Graph Width / Amplitude

With some people the activity is quite strong and gets out of the picture-box. Then you can make the amplitude a bit smaller. During meditation the band-power (waves) are smaller and you might want to amplify a bit to see more distinction.
With a recording of 256Hz (data-points pro second) the separate point are drawn very close together and you might give them more stretch/width. Or you want to see the result of 2 screens on 1 screen then set the width to 2 and the data-points are drawn closer together.

From time – until time

You can choose a certain time-interval. The graph begins at starting-time and stops at end-time. Also the (avarage) calculations are done only over this period. This comes in handy when you do a recording with different activity's and what to see the changes between them. Or when there is a bad connection over a period of time which you want to exclude in the calculations.

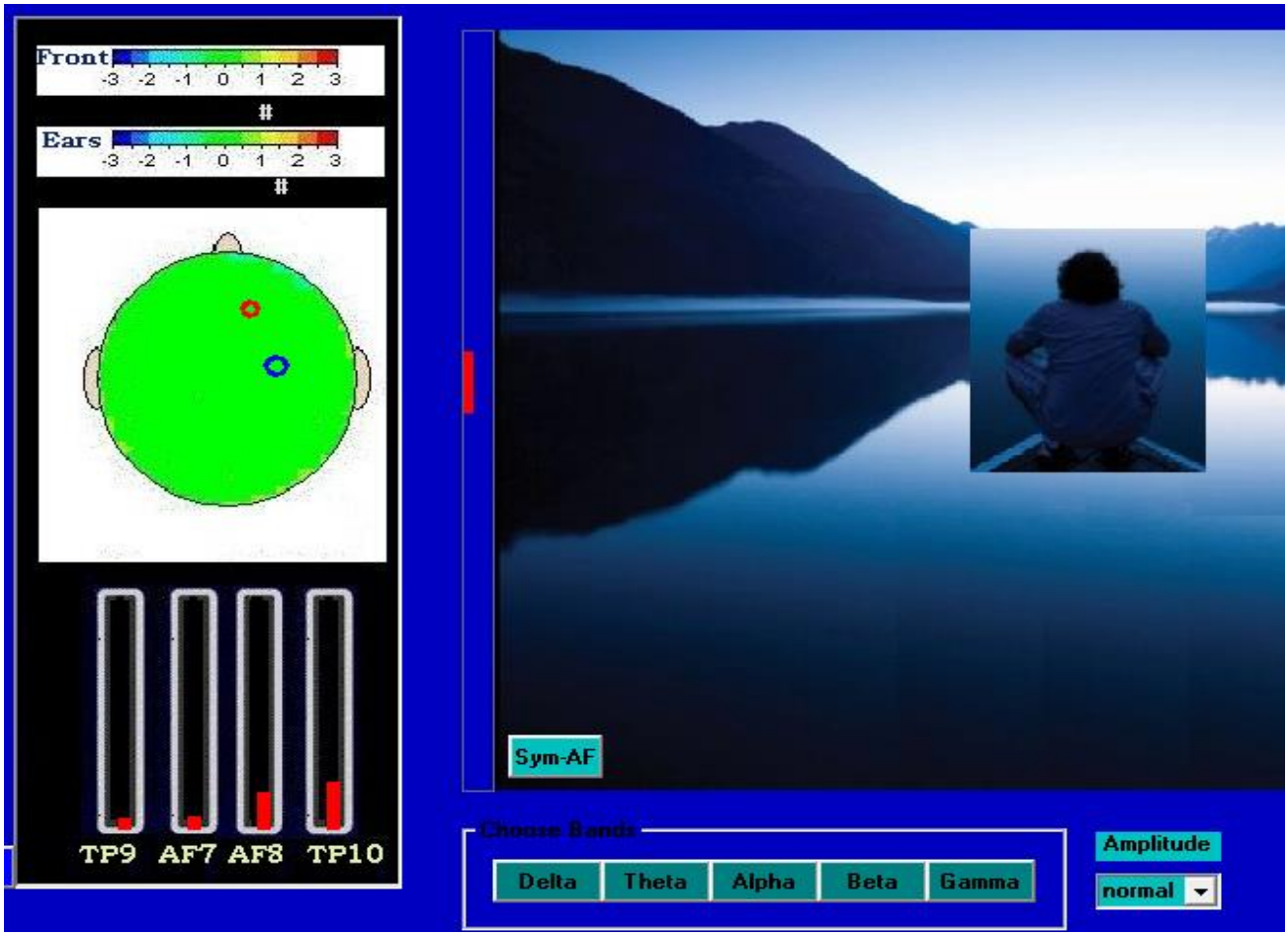
Compress files

Compress File ->	Compression is handy if you want to see the average display of a long session. You can choose the compression-time pro 1 seconds or 10 or 30 or 1 minuut

For example you did a recording of half hour with measurement every 0.5 second
and want to see the values pro minuut on one screen. Or you did a <constant> recording of 256 measurements pro second and want to see the results pro second.

The average is calculated and written in a new file. The original file will is not changed
To view/select the compression click on <show compressed files>.
When the name begint with C1- it is a second-compression, C10 is 10 second compression etc
So you can do more time-compressions on one file c.q. one recording session.

6. Live stream Screen en Neurofeedback

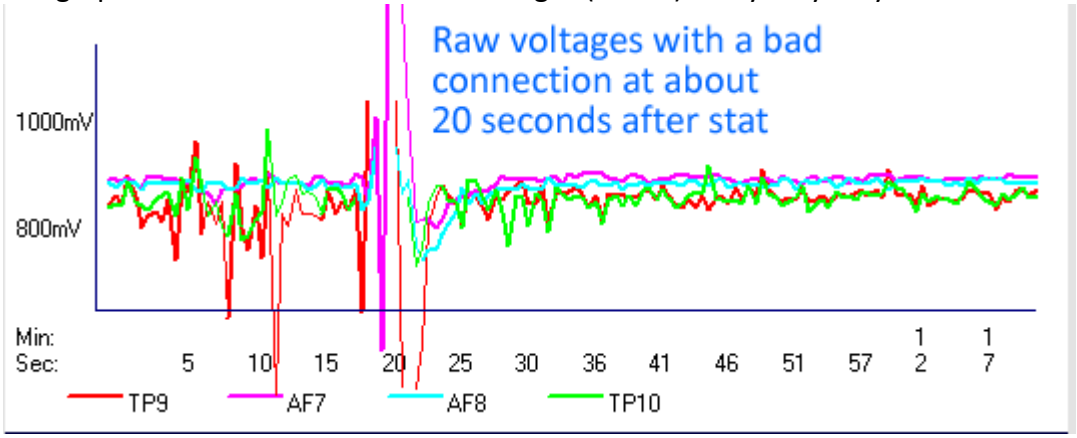


(Above: snapshot of neurofeedback screen)

The possibility's of "Live EEG stream" are the same as on the playback screen
You can do neurofeedback on a specific wave-band (delta to gamma) or on the synchronicity (symmetry) between eleft-and-right hemisphere.
Feedback can be done by moving a boat on a lake. Other possibility's are coming soon ...

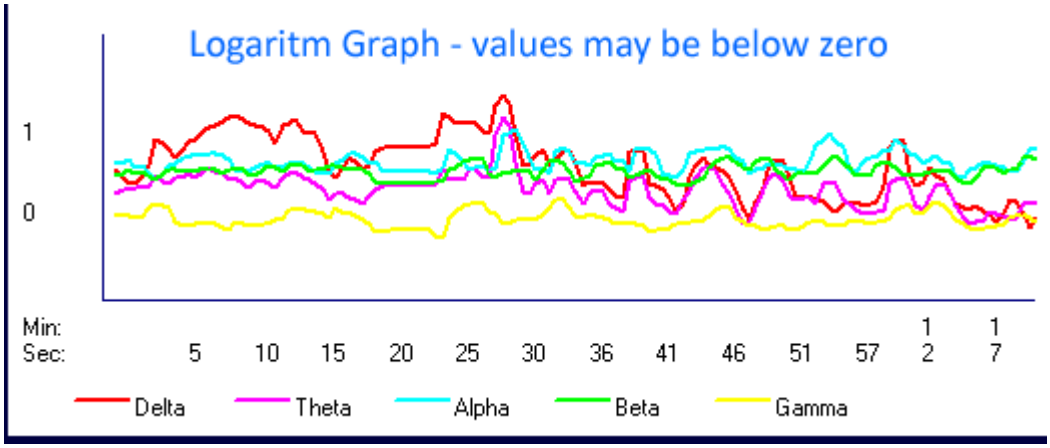
8) RAW voltages

This graph shows the so called RAW voltages (mVolt). They may vary between 600 and 1000mV



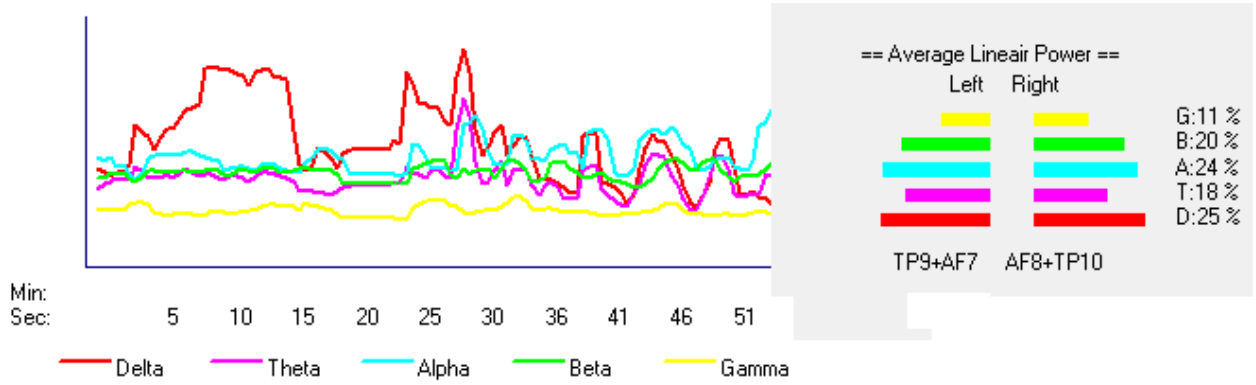
Bad connection
During recording there may be a bad connection on 1 of the 4 electrodes. In the graph you may see much up-and-downs (heavy swing). With a bad connection the App changes the draw-thickness of the graph-line of that elektrode and make it thinner so you may recognize the bad connection (in the raw-voltage graph).

9) Logaritmic Graph



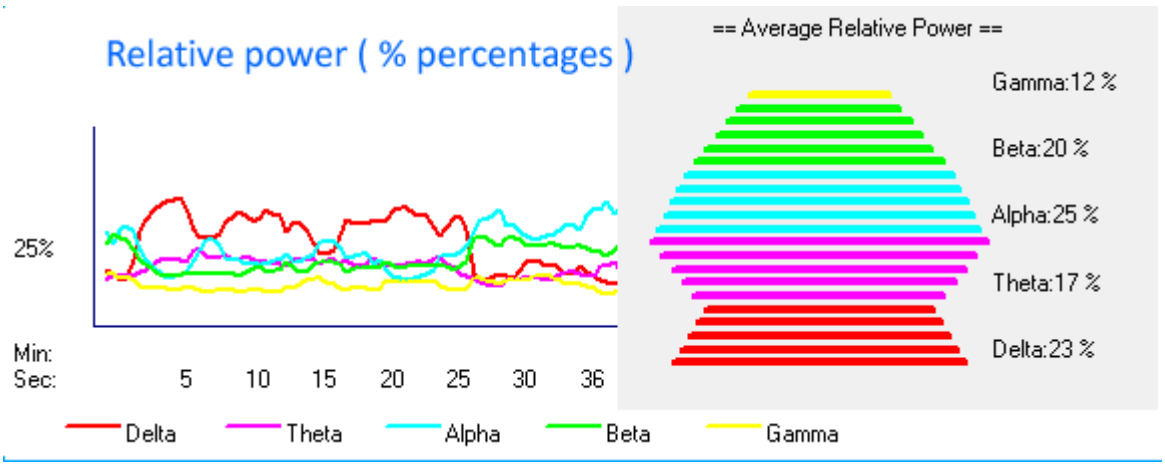
The power of a frequency range (for instance alpha 9-13Hz) is called absolute lineair band power. First these are calculated in units dB (f.i. the average alpha-power is 60 dB). After that – to make a nicer graph – the Logaritm values are calculated. In the CSV file the band-power is in logaritm values. Some of these will be negative (i.e. when the absolute lineair power is less than 1).

10) Lineair Graph



To draw this graph the logaritm values are transformed to there 'original' lineair values.
The linear-scale band power can be calculated from the log-scale band power thusly:
-> linear-scale band power = 10^ (log-scale band power).

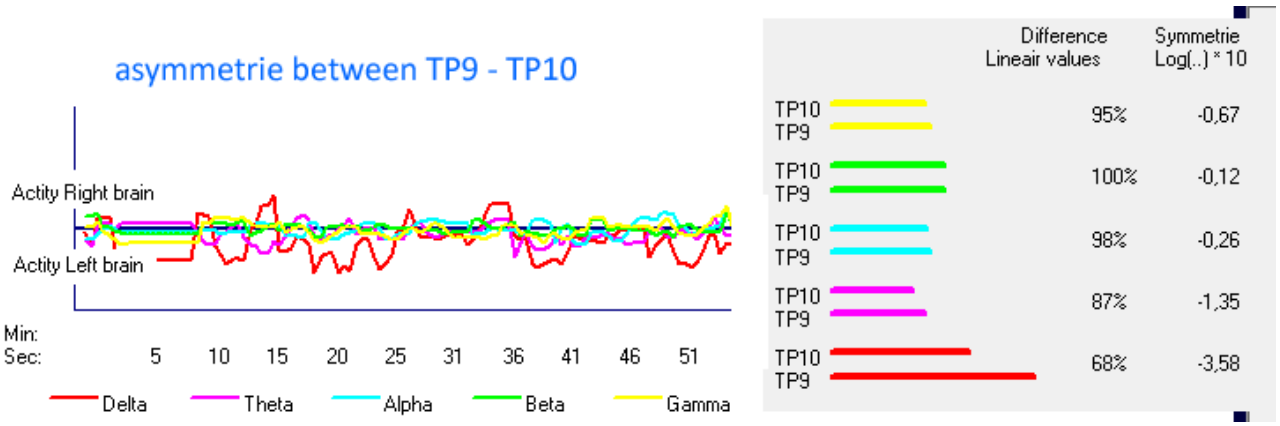
11) Relative Graph



Reseachers often use the relative power (percentages) as a measurement in there research.
These are calculated as percentages of linear band powers in each band.
The relative-values is the power of 1 band (wave) compared to the total of all bands.
i.e. alpha-relative-% = (alpha / (delta+theta+alpha+beta+gamma)) * 100

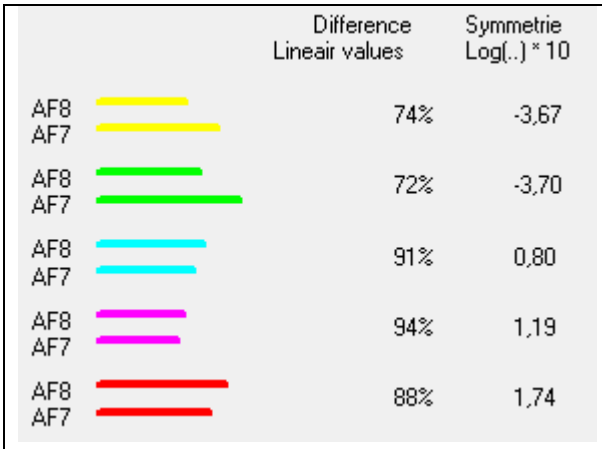
12) Asymmetrie Graph

When our state-of-mind changes by the actions we perform not only the power (amplitude) of the waves change but also the contribution of right and left part of the brain (hemisphere).
A-symmertry is the (relative) difference in power between left and right hemisphere of the brain.
These data are important when reseaching i.e. meditation, concentration. learning problems etc.
Want to know more? Search on Google for <alpha power symmetry index>



There are two graphs in the App that show the asymmetrie in power of different waves.
* a graph for the frontal channels AF8 (right) compared to AF7 (left)
* a graph for the pariental channels TP10 (right) compared to TP9 (left)

There are several algoritms (ways of calculating) these differences.
The most common is: take the logaritm of right devided by left
for example: index-frontal-alpha-asymmetrie = log(alpha-AF8/alpha-AF7)



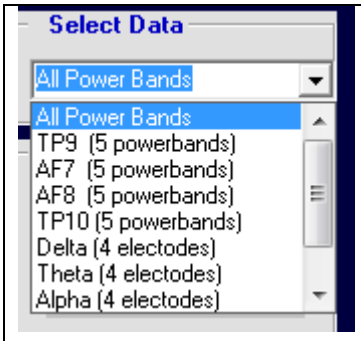
The percentage of correspondance is the % of difference in the total lineair power right/left. i.e. if beta on TP9 is 50dB and on TP10 is 45dB their correspondence is 90%

The average symmetrie over the session.

- If this logaritm has a positive (+) value it means more activity at the right site.
- If the logaritm has a negative (-) value it means more activity at the left site.

13) Specific waves

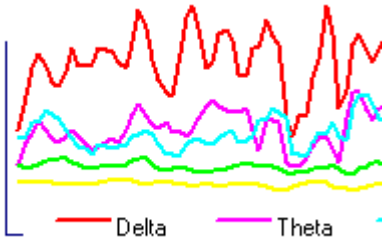
Specific waves



If you want to dive deeper into a specific problem you can:
* display a single waves on 4 different electrodes
* display 5 bands/waves on 1 single elektrode/channel

Suppose you want to know where the high-alpha comes from ?
Select alpha in the < select data > box and you see alpha on 4 the elektrodes. You may find that delta on AF7 is very high (due to a bad connection of the haedband)

Why is Delta so high ?

	The Muse headset has relative high Delta values. As James - the developper of MuseMonitor - explains there are 2 reasons :

a) During eye movement there are electrical (non brain) signals that make big slow (relatively) arcs in the raw data. These electrical currents interfere with the brain data, especcialy in the lowest frequency band and causes Delta to rise. So – while recording a session – try to avoid eye movements.

b) It is due to the kind of FFT (fast fourier) calculation the Muse headset uses.
Because the EEG wave bands represent a power spectrum, their values will vary exponentially, meaning the lower-frequency bands (such as delta and theta) will be exponentially larger values than the higher-frequency bands (alpha and beta).

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