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GUGER TECHNOLOGIES

g.Recorder

BIOSIGNAL RECORDING SOFTWARE

Quickstart V5.16.00

Content:

CONVENTIONS

Item	Format	Example
String Variables	`Courier New`	Enter filename e.g. `MygRecorderSettings.xml`
Menu items	**Boldface**	Select **Save** from the **File** menu

Requirements for this Quickstart

The following equipment is needed to perform this quickstart properly:

For g.USBamp

Hardware	
g.USBamp	To acquire biosignal data from 1 EEG and 1 ECG channel
Accessories	Electrodes and electrode cables
Video camera	Webcam

Software	
g.USBamp Driver	Version 3.16.00

For g.HIamp

Hardware	
g.HIamp	To acquire biosignal data from 1 EEG and 1 ECG channel
Accessories	Electrodes and electrode cables

Software	
g.HIamp Driver	Version 2.16.00

For g.MOBIlab+

Hardware	
g.MOBIlab+	To acquire biosignal data from 1 EEG and 1 ECG channel
Accessories	Electrodes, electrode cables and electrode connector boxes
Bluetooth Dongle	Ezurio Bluetooth Dongle

Software	
g.MOBIlab Driver	Version 1.16.00

For g.Nautilus

Hardware	
g.Nautilus	To acquire biosignal data from 2 EEG channels
Accessories	Electrodes and electrode cables
Video camera	Webcam

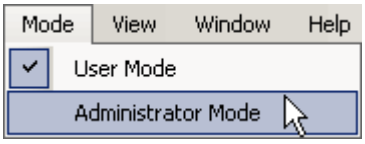
Software	
g.NEEDaccess	Version 1.16.01

Quickstart

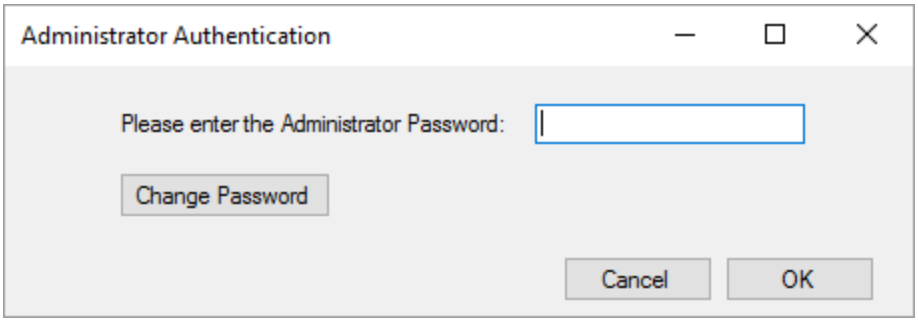
This chapter will give a short introduction on how to use g.Recorder with g.USBamp, g.HIamp, and g.MOBIlab+. The controls for other g.tec biosignal amplifiers are very similar, so these examples can be performed with other g.tec devices too.

It is recommended to turn off Microsoft Windows' automatic updates while operating g.Recorder. Concurrent Windows updates could interfere with g.Recorder functionality.

The two examples of this quickstart can only be run in **Administrator Mode**. To activate this mode select **Administrator Mode** from the **Mode** menu.



If an **Administrator Password** is set enter it and click **OK**.

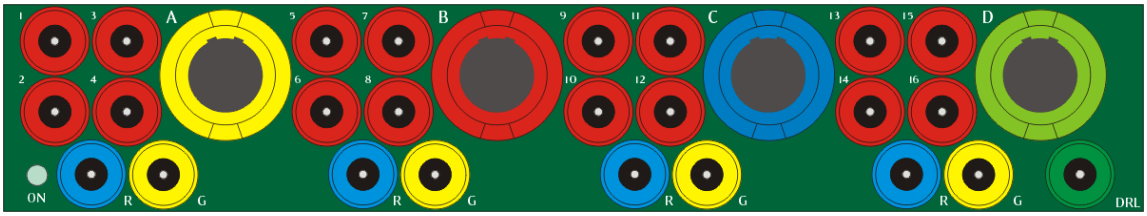


Using g.USBamp for EEG and ECG including Video recording

The setup of g.USBamp with g.Recorder for acquisition of 1 EEG channel and 1 ECG channel is explained here. This section also describes how to define keyboard markers and record the cerebral function monitor (CFM) and heart rate (HR) from EEG and ECG channels. Digital video recording is synchronized to the EEG and ECG recording.

To perform this quickstart, follow the steps below:

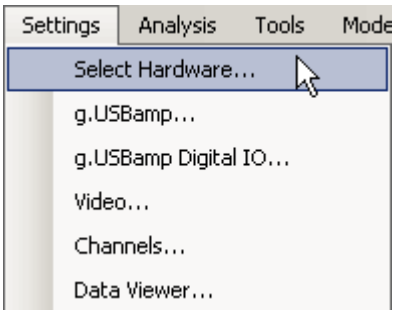
1. Connect the electrodes to the g.USBamp in the following way. The picture below displays the front side of g.USBamp. The front side is divided into four groups (**A, B, C, D** from left to right). Each group consists of four red connectors (**1**-**4**, **5**-**8**, **9**-**12**, **13**-**16**) for connecting biosignal electrodes (EEG, ECG, EMG, etc.), one blue connector for the reference electrode (**R**) and one yellow connector for the ground electrode (**G**).



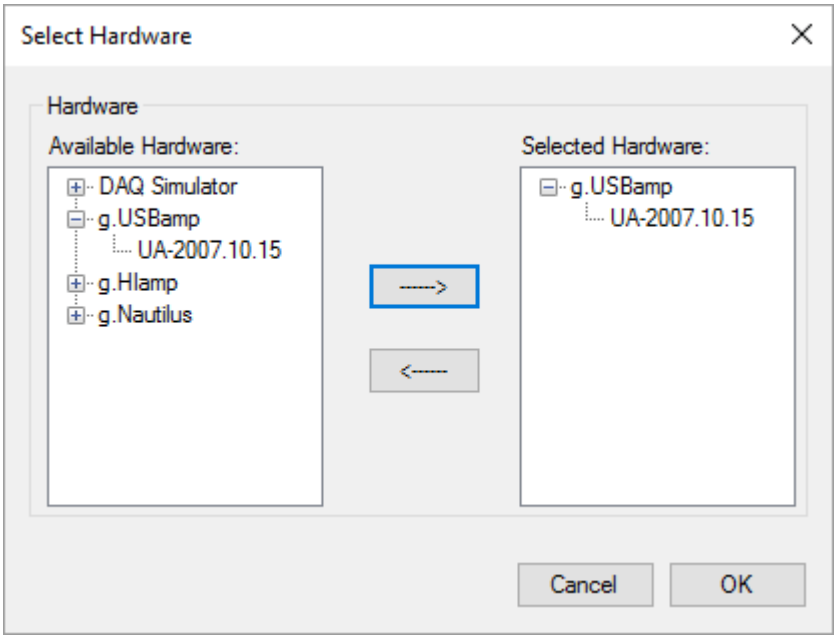
For the EEG measurement, all electrodes for EEG are connected to group **A** (first group on the left side of g.USBamp). One EEG electrode is connected to channel 1 of group **A** (red connector), the reference electrode to reference **R** of group **A** (blue connector) and the ground electrode is connected to ground **G** of group **A** (yellow connector).

For the ECG measurement, all electrodes for ECG are connected to group **B** (second group from left). One ECG electrode is connected to channel 5 of group **B** (red connector), the reference electrode to reference **R** of group **B** (blue connector) and the ground electrode is connected to ground **G** (yellow connector).

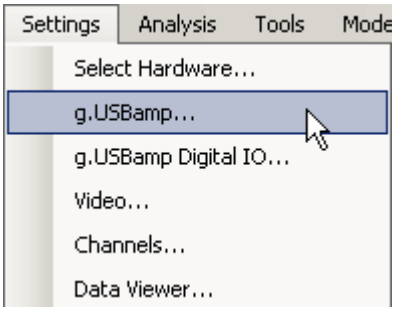
2. Make sure that your g.USBamp is switched on and connected to the PC. Then click **Select Hardware…** in the **Settings** menu.



Click on the **g.USBamp** menu entry in the **Available Hardware** list and select the serial number of your g.USBamp (e.g. UA-2008.06.37). Add the device to the **Selected Hardware** list by clicking the right arrow button. Click **OK** to close the dialog.

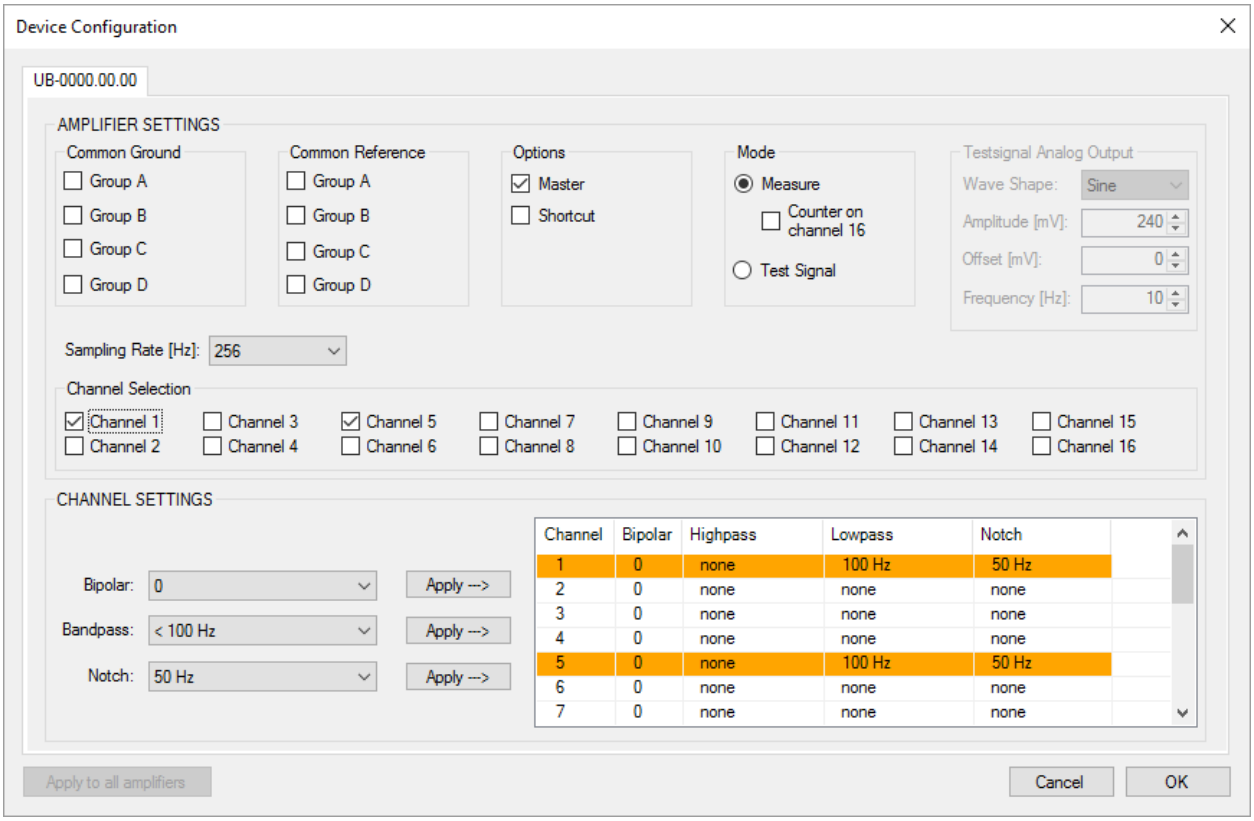


3. Click **g.USBamp…** in the **Settings** menu to perform g.USBamp configuration.

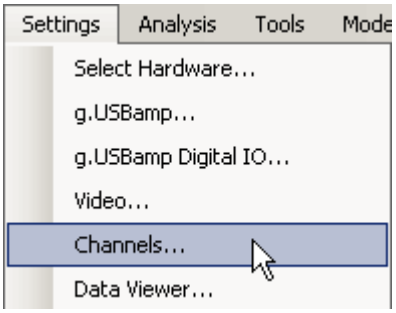


Set the **Sampling Rate** in the **AMPLIFIER SETTINGS** section to `512` Hz and select **Channel 1** and **Channel 5** with the corresponding checkboxes.

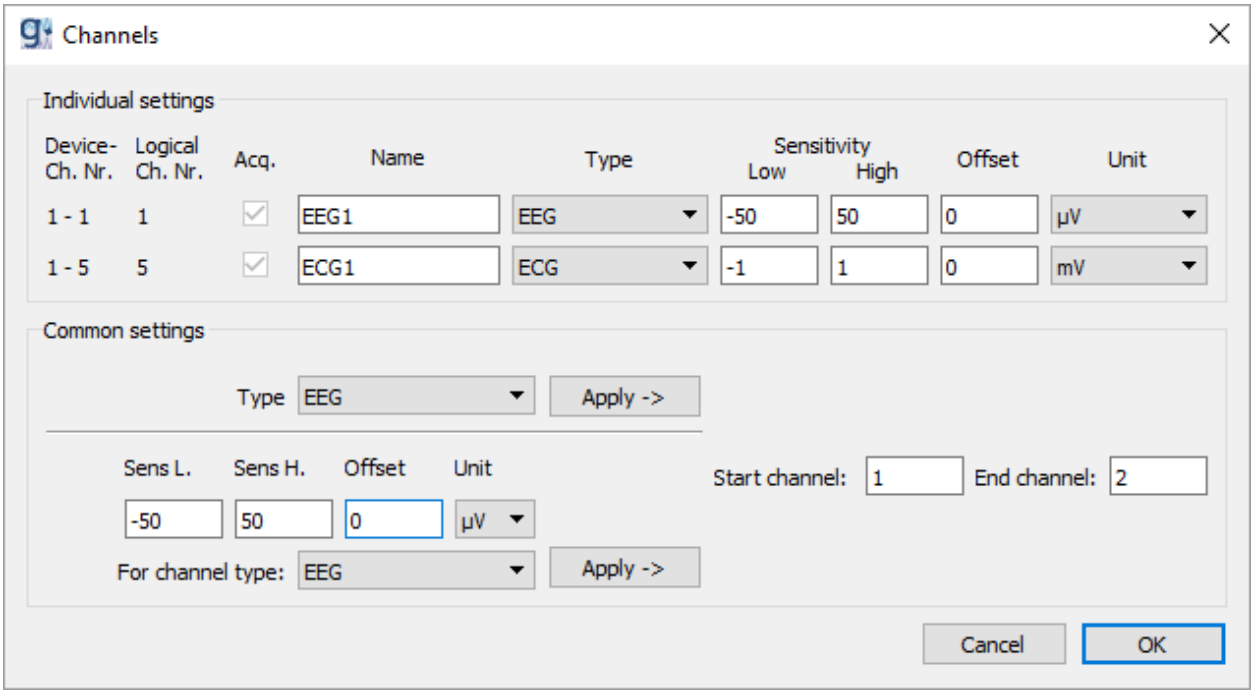
In the **CHANNEL SETTINGS** section select the channels 1 and 5 apply a **Bandpass** filter with **HP: 0Hz / LP: 100Hz** and a **Notch** filter with **50Hz** or **60Hz**, depending on your local power line hum. Click **OK** to apply the settings.



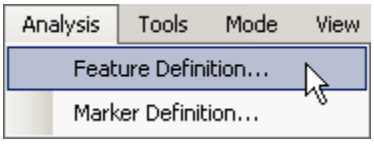
4. Configure the g.Recorder display by opening the **Channels** dialog from the **Settings** menu.

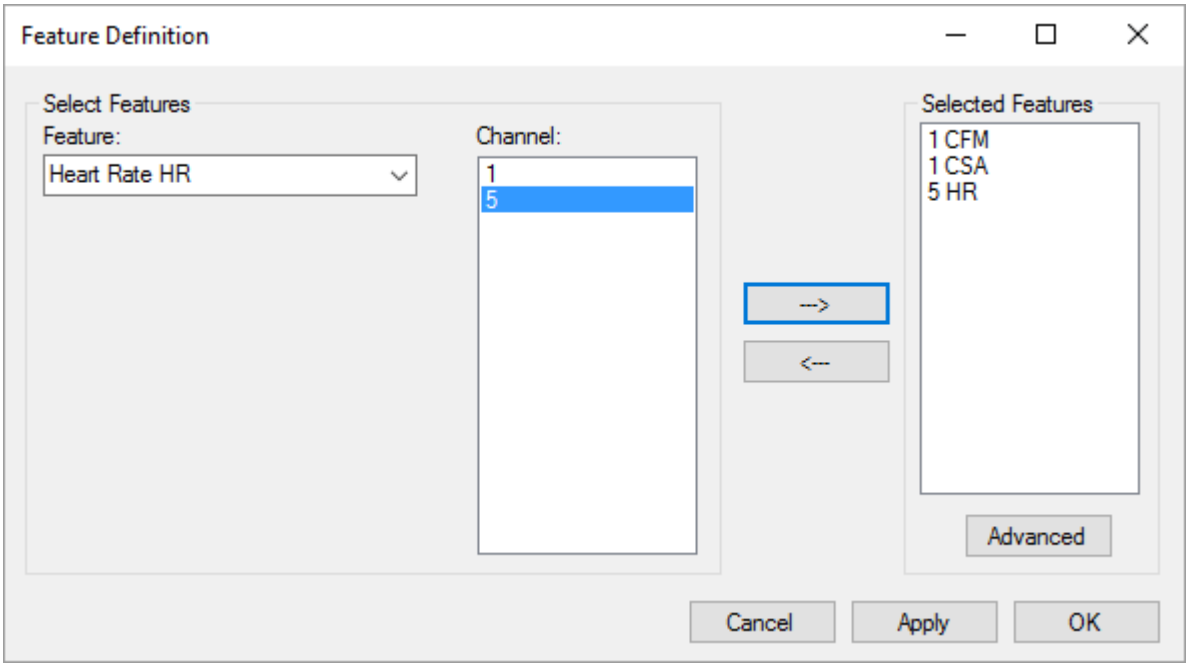


Provide a proper **Name** (e.g. `EEG1`) and a **Type** (e.g. **EEG**) for the channels selected in g.USBamp configuration dialog. The **Sensitivity** is set automatically, but can be changed manually. However, these changes influence data visualization in the Data Viewer window only. Click **OK** to close the dialog. Use the **Use default values of device** to apply device settings to the data display in the Data Viewer.

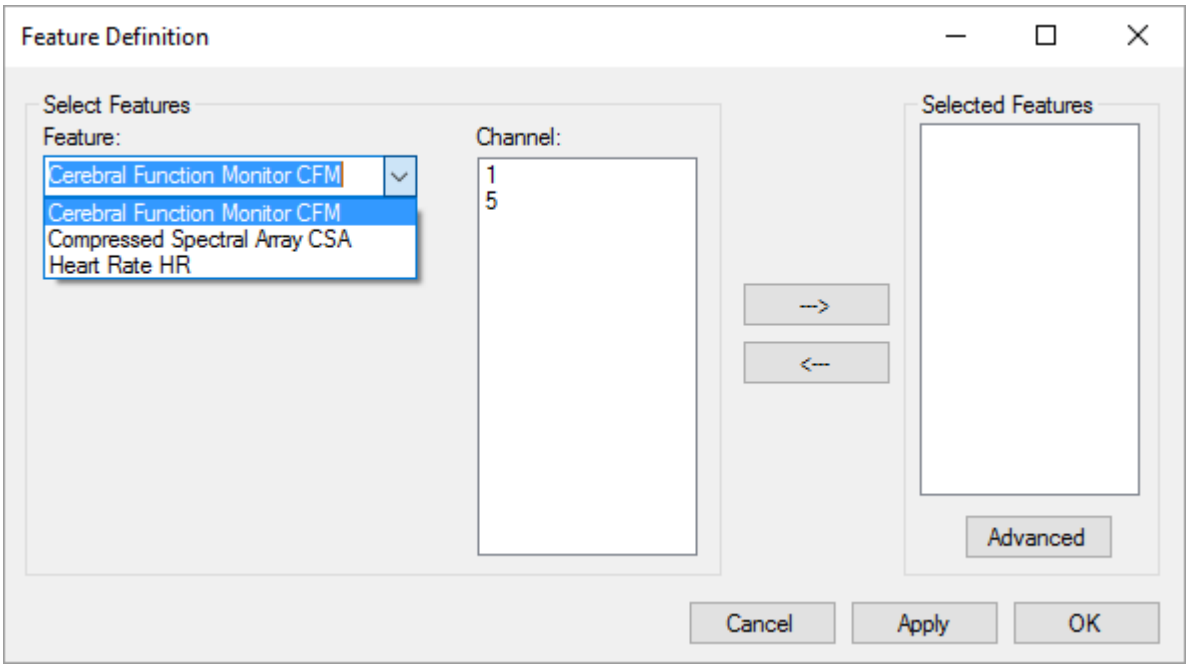


5. To configure features click **Feature Definition…** in the **Analysis** menu.

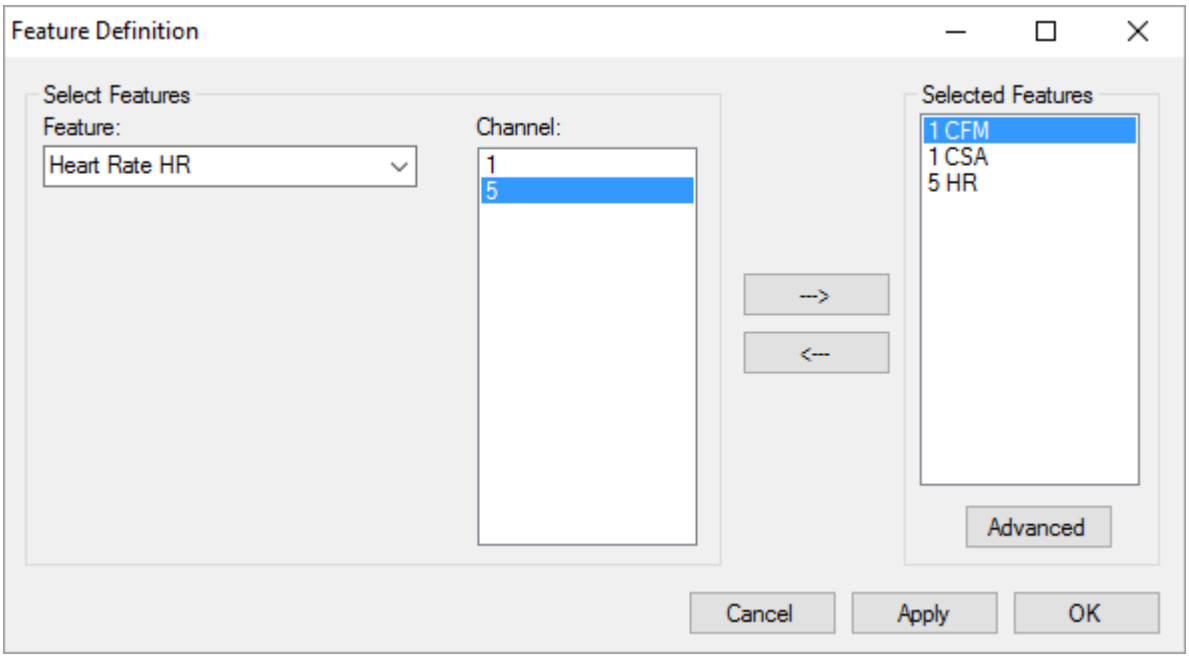




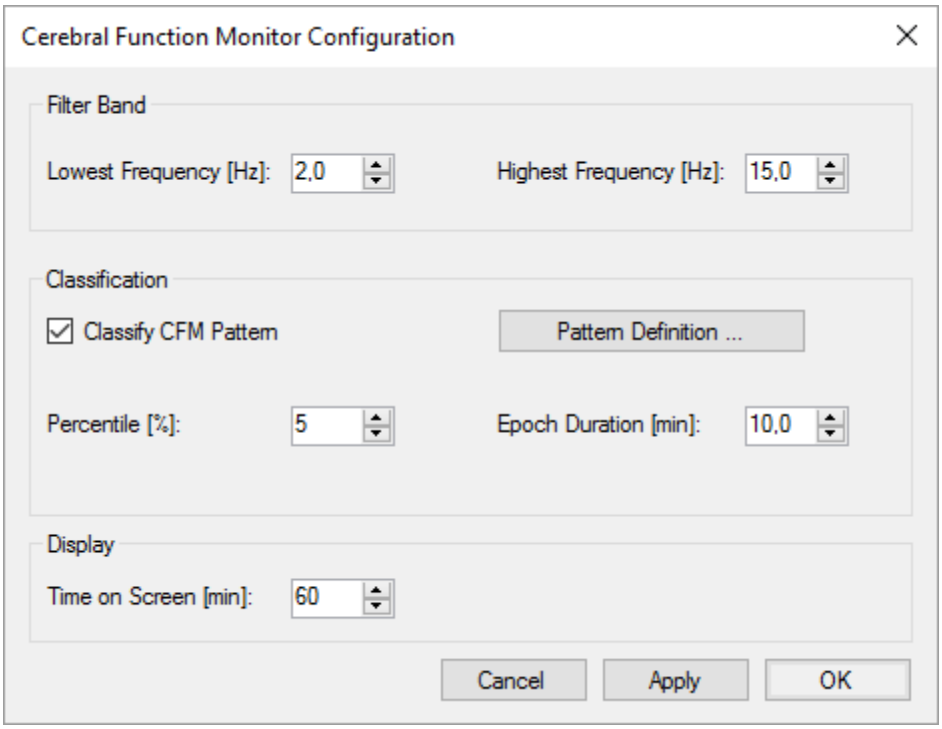
In the Feature listbox, select **Cerebral Function Monitor CFM** and `1` from the **Channel** list. Click the right arrow button to add the CFM feature to the **Selected Features** list. Then select the **Compressed Spectral Array CSA** and `1` from the channel list and add the feature to the **Selected Features**. Finally, select **Heart Rate HR** and `5` from the channel list and add the feature to the **Selected Features**.



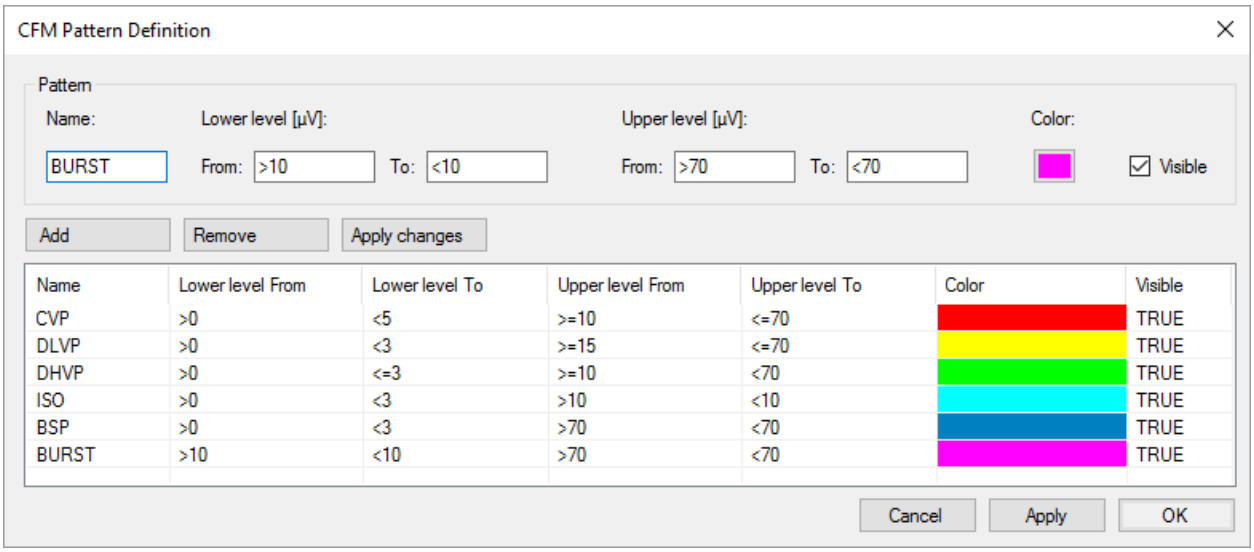
After feature selection, proceed with the feature definition. To do so, select the feature `1 CFM` in the **Selected Features** list and click the **Advanced** button.



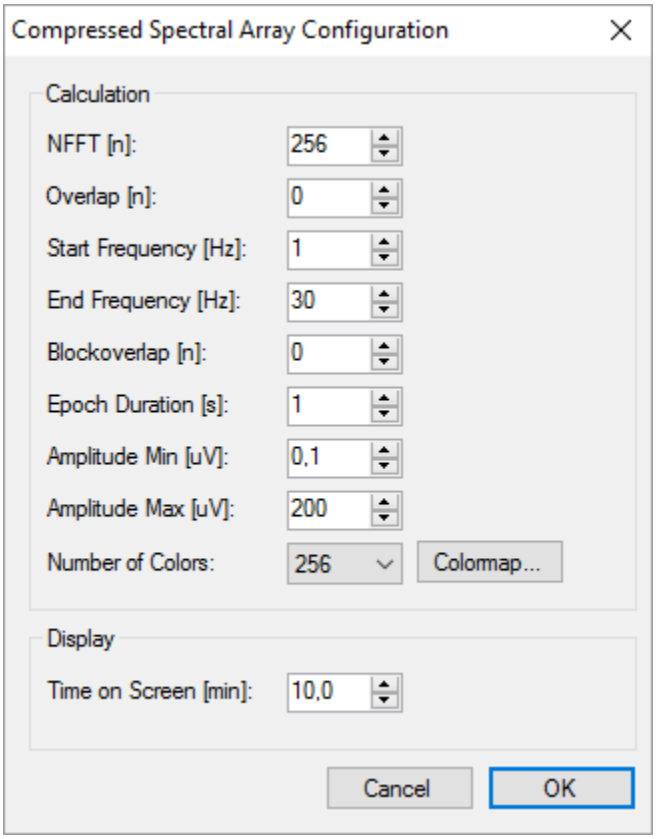
Provide all settings as shown in the dialog below and click the **Pattern Definition** button.



Define all patterns as shown in the dialog below. Close the **CFM Pattern Definition** and the **Cerebral Function Monitor** dialog by clicking the **OK** button.

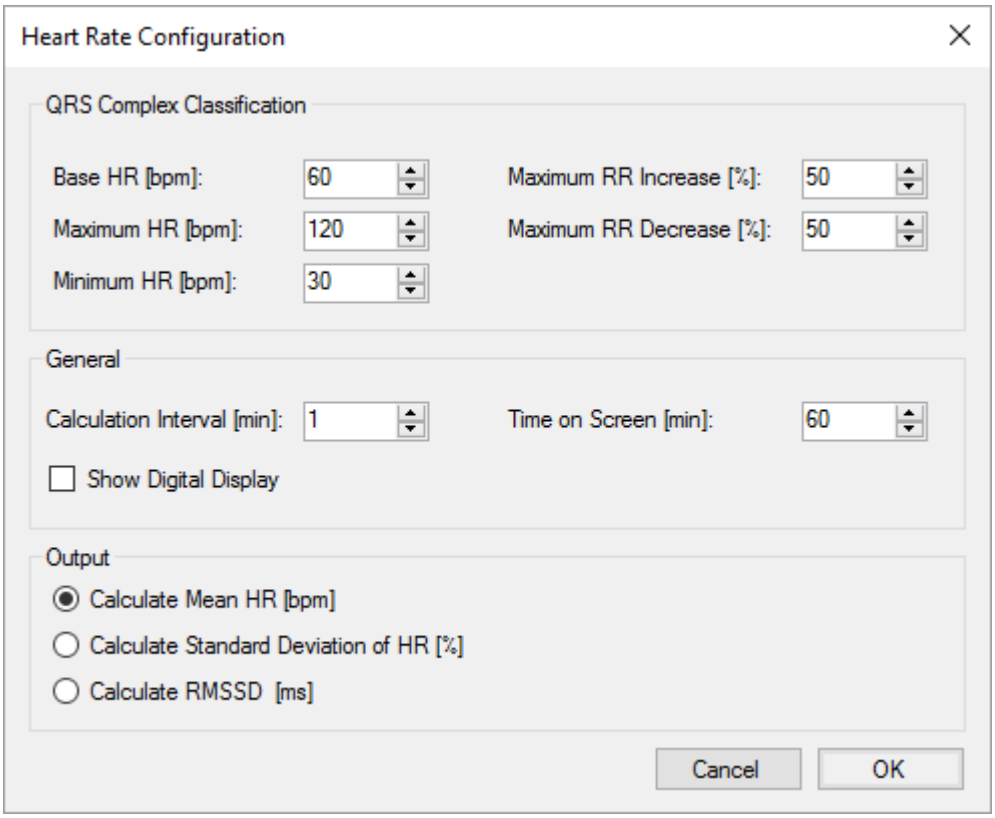


In the **Feature Definition** dialog, select the `1 CSA` feature and click **Advanced**. In the upcoming **Compressed Spectral Array Configuration** dialog set all variables as shown below. Close the dialog with the **OK** button.

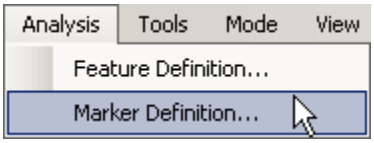


6. To configure the heart rate feature, select the `5 HR` feature in the **Feature Definition** dialog and click **Advanced**.

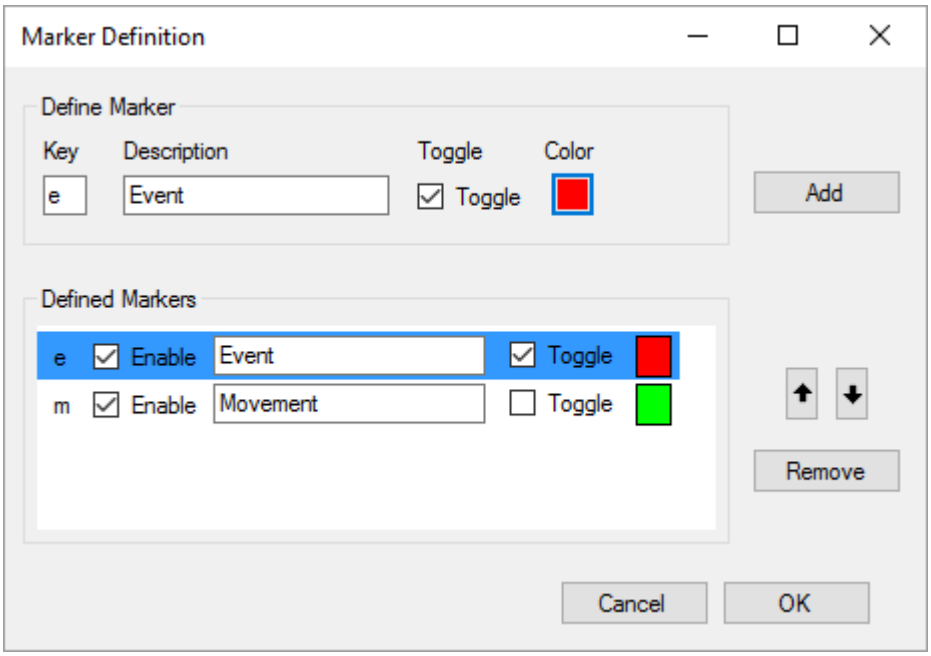
   As for the other features, provide the settings as shown below (in this case, heart rate settings for an adult person) and close all dialogs with their respective **OK** buttons.



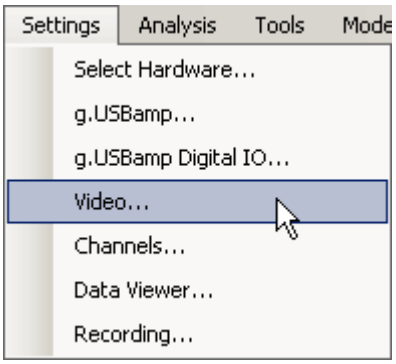
7. In the Analysis menu, click **Marker Definition…** to define markers.

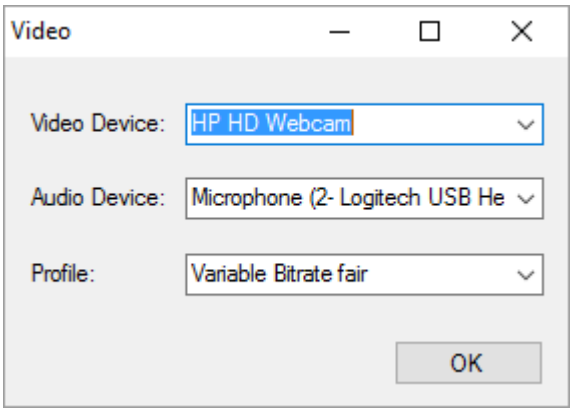


Enter a **Key**, a **Description**, set the **Toggle** checkbox, select a **Color** and click **Add** to add the marker to the **Defined Markers** list. Click **OK** to finish marker definition.

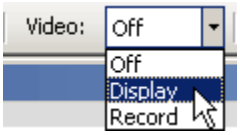


8. Video can be recorded if a webcam is plugged into the PC. Click the **Video…** button in the **Settings** menu to view camera settings.

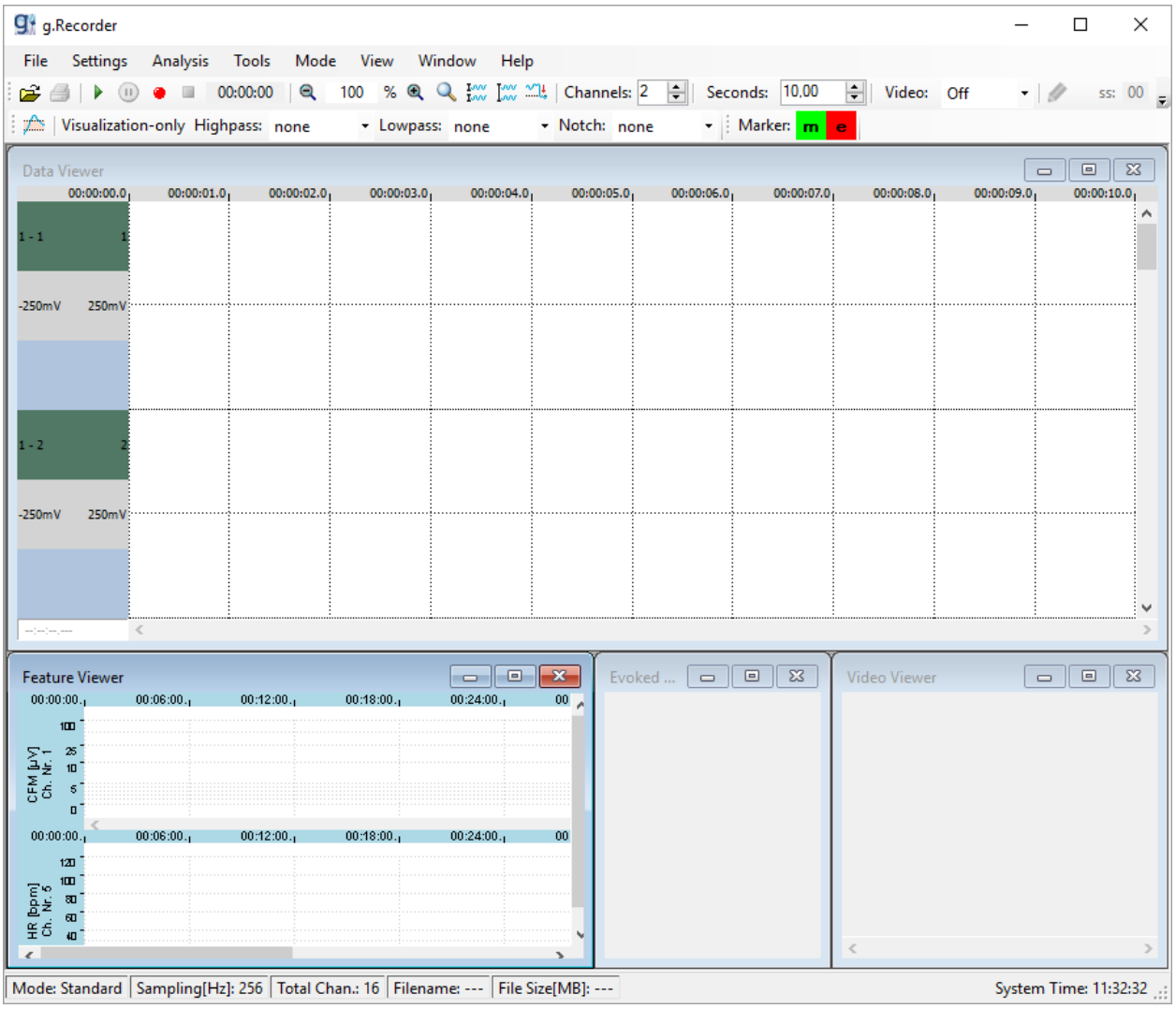




In the toolbar, set the **Video** listbox either to **Off** to not show the video, to **Display** to just show the video or to **Record** to store the video to hard disk.



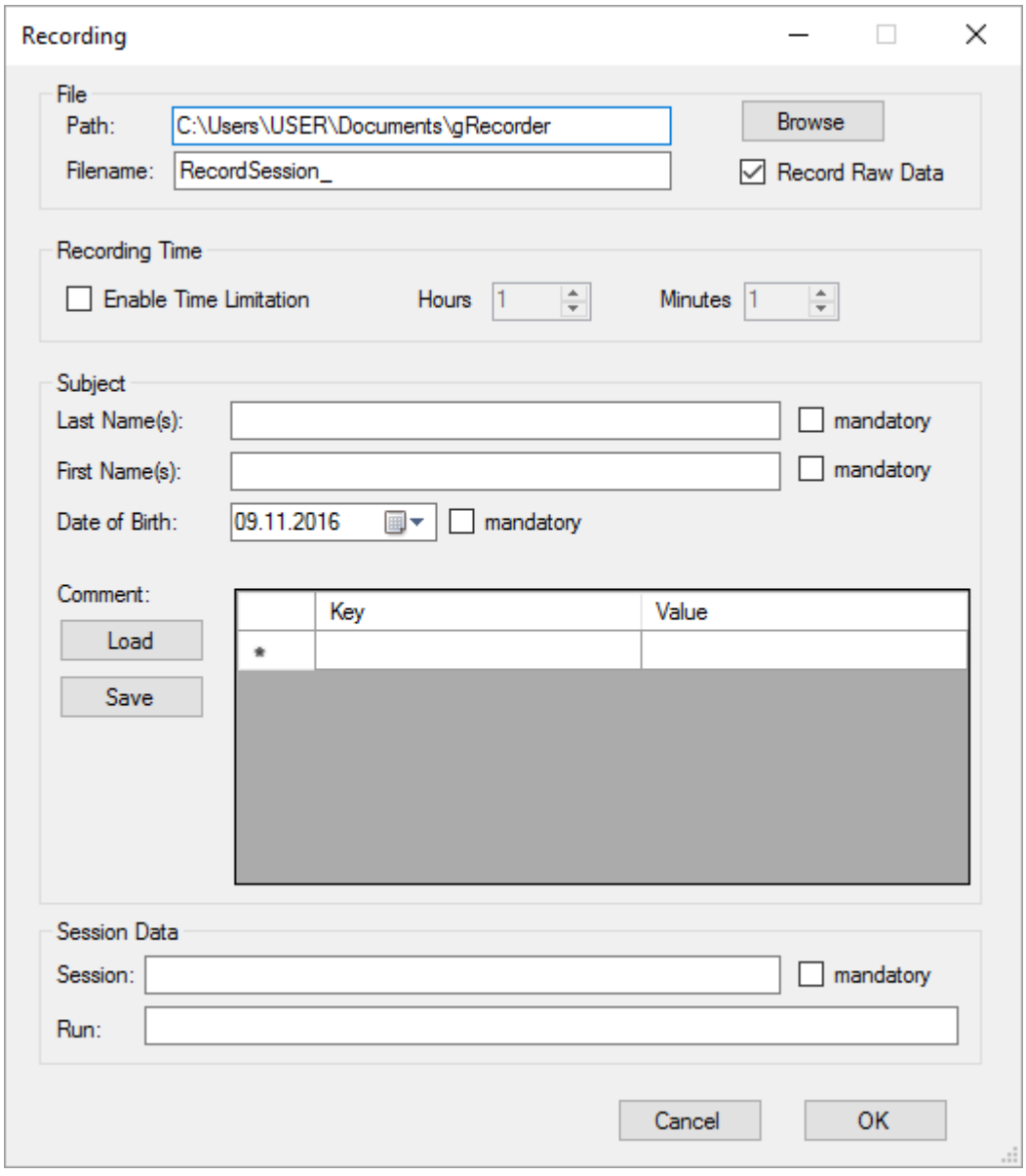
9. After providing all the settings as described in the step above, the g.Recorder window should look like the picture below.



10. Start data acquisition either by clicking the **Start Data Viewing** button to display data without recording it to the hard disk:

or by clicking the **Record** button to store acquired data to the hard disk:

11. When the **Record** button is clicked, the **Recording** dialog opens.



File

A **Path** for the data file can be entered or the desired path can be chosen by clicking on the **Browse** button.

The **Filename** defines the name of the data file. The default filename is `RecordSession_` with date and time added. When the measurement is started, the data and the time are added automatically to the filename (e.g. `RecordSession_2016.11.09_18.47.11.hdf5`). The data is stored in HDF5 file format. For more information about this format, see www.hdfgroup.org or refer to the MATLAB help.

The checkbox **Record Raw Data** can be used to decide whether or not the raw data from the amplifier is stored in the HDF5 file. For offline processing after measurement it is recommended to record raw data.

Recording Time

In the **Recording Time** section with the **Enable Time Limitation** checkbox, a time limitation for the measurement can be set. After this time, the measurement is stopped automatically.

Subject

In the **Subject** section information about the subject like **Last Name(s)**, **First Names(s)** and **Date of Birth** can be entered. In the **Comment** section additional information (e.g. medications) can be added.

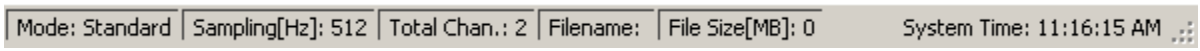
Session Data

Enter the **Session** and **Run** identifier for your recordings.

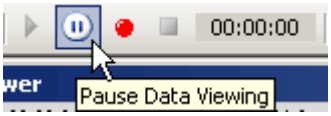
After finishing these settings, click **OK**.

Note: Mandatory fields (the keyword mandatory is displayed next to this field) must be filled out correctly. Otherwise, the recording cannot be started.

12. The actual mode of data acquisition is shown in the bottom left corner of g.Recorder in the status bar. **Standard** is displayed, if data is acquired without storing it to the hard disk, **Recording** if data is stored to the hard disk.



13. To stop data acquisition, click the **Pause Data Viewing** button, which stops data acquisition in display mode or data display in recording mode.



To finish recording click the **Stop** button.

Using g.HIamp for EEG and ECG

The setup of g.HIamp with g.Recorder for acquisition of 1 EEG channel and 1 ECG channel is explained.

To perform this quickstart, please follow the steps below:

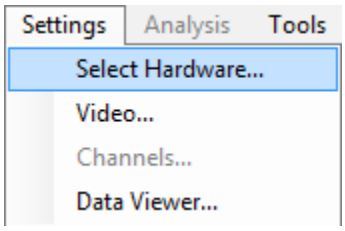
1. Connect the electrodes to the g.HIamp in the following way.

   For EEG measurement, connect one EEG electrode to channel 1. Connect the EEG reference electrode to channel 2.

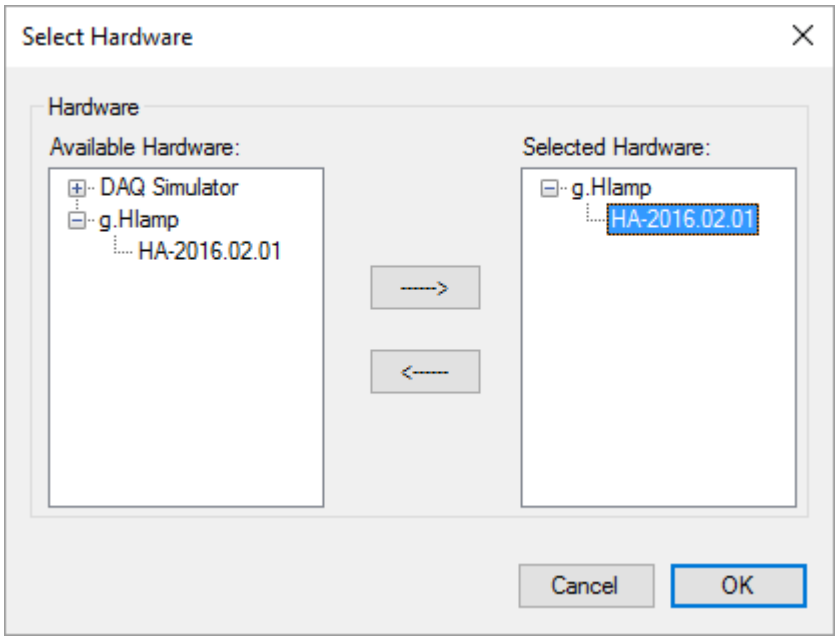
   For ECG measurement, connect one ECG electrode to channel 3. Connect the ECG reference electrode to channel 4. Connect the ECG ground electrode to the ground connector (yellow connector).

   Note: only one ground electrode is used for both measurements. In this case, the ECG ground electrode is also used as ground electrode for the EEG electrode.

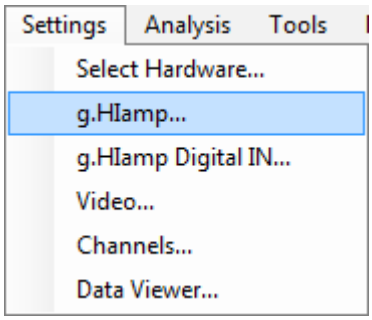
2. Ensure that your g.HIamp amplifier is turned on and connected to the PC. Click **Select Hardware…** in the **Settings** menu.



Click on the **g.HIamp** menu entry in the **Available Hardware** list and select the serial number of your g.HIamp (e.g. HA-2010.08.00). Add the device to the **Selected Hardware** list by clicking the right arrow button. Click **OK** to close the dialog.



3. Click **g.HIamp…** in the **Settings** menu to configure the g.HIamp device.

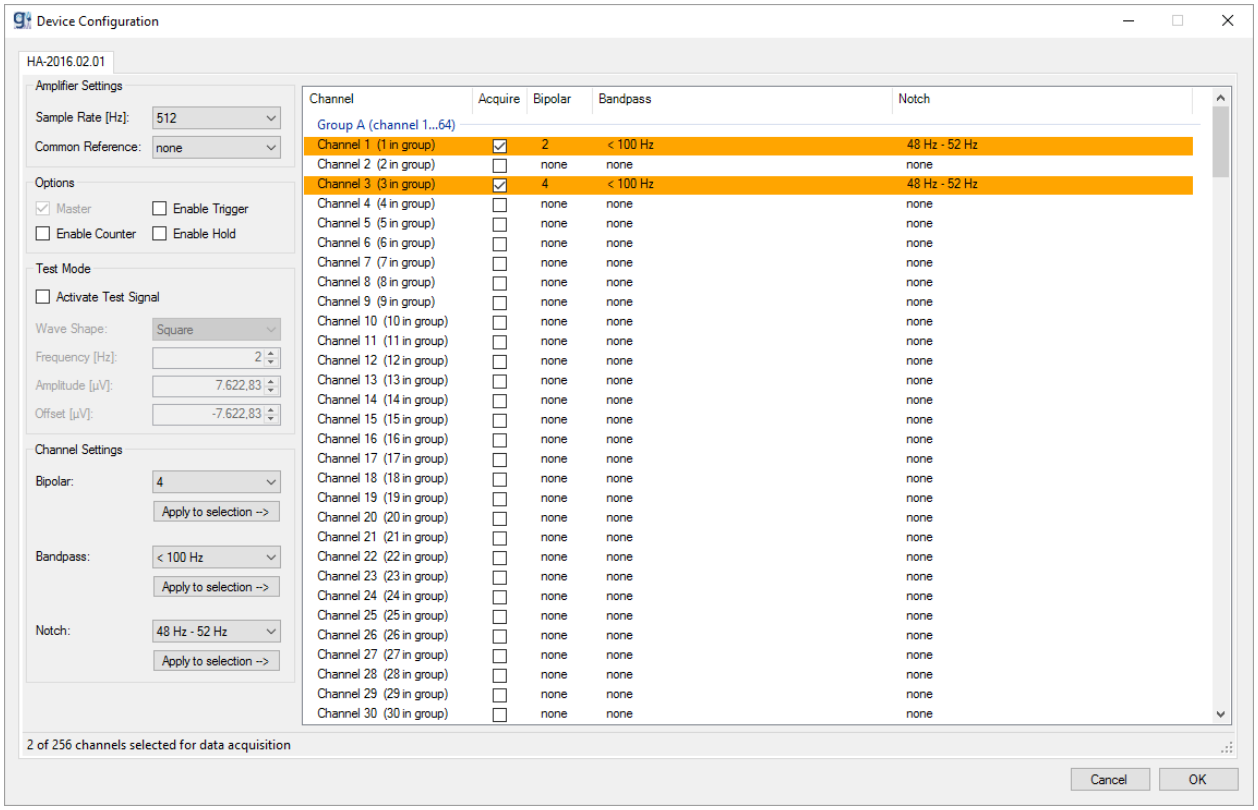


Set the **Sample Rate** in the **Amplifier Settings** section to `512` Hz and ensure that the **Acquire** checkboxes of channel 1 and channel 3 are checked only. You can use the shift key or the control key to select multiple channels. You can use the keystroke combination Ctrl + A to select all channels. To check or uncheck the **Acquire** checkboxes of the selected channels, click the **Acquire** checkbox of one of them.

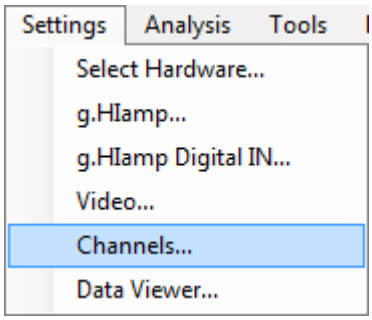
Select channels 1 and 3, apply a **Lowpass** filter **<100Hz** and a **Notch** filter with **48Hz-52Hz** or **58Hz-62Hz**, depending on your local power line hum.

For channel 1, apply **Bipolar** derivation with channel 2. For channel 3, apply bipolar derivation with channel 4.

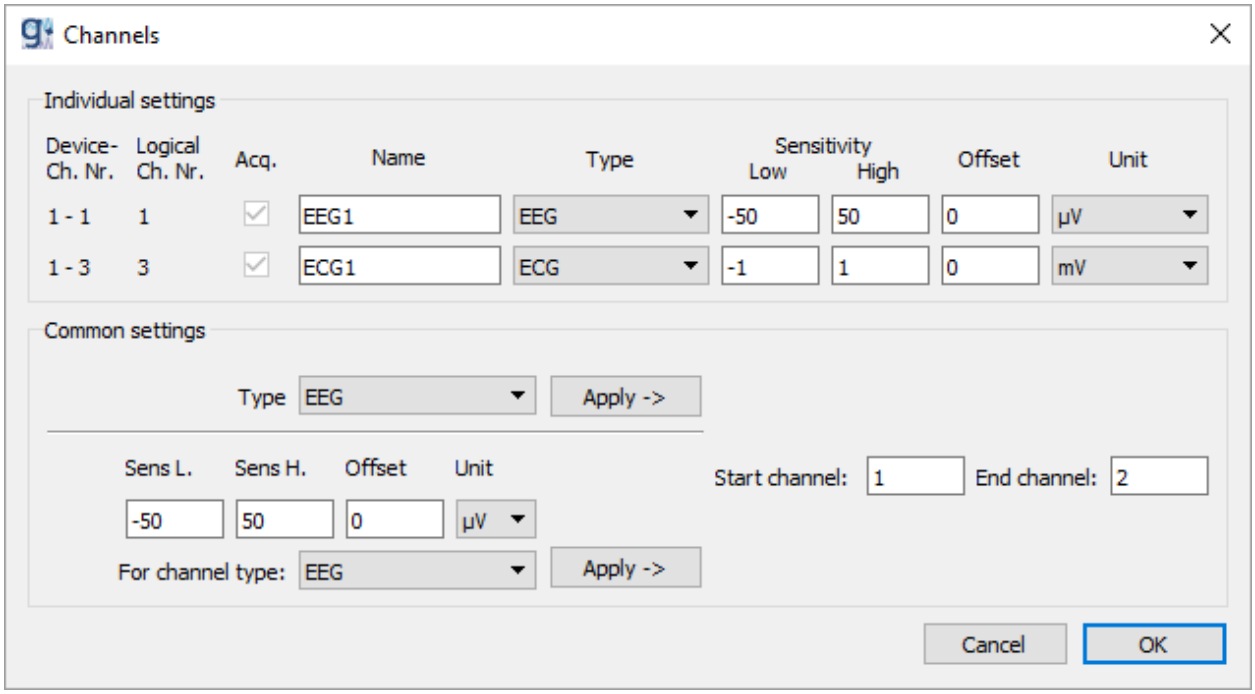
Click **OK** to close the dialog.



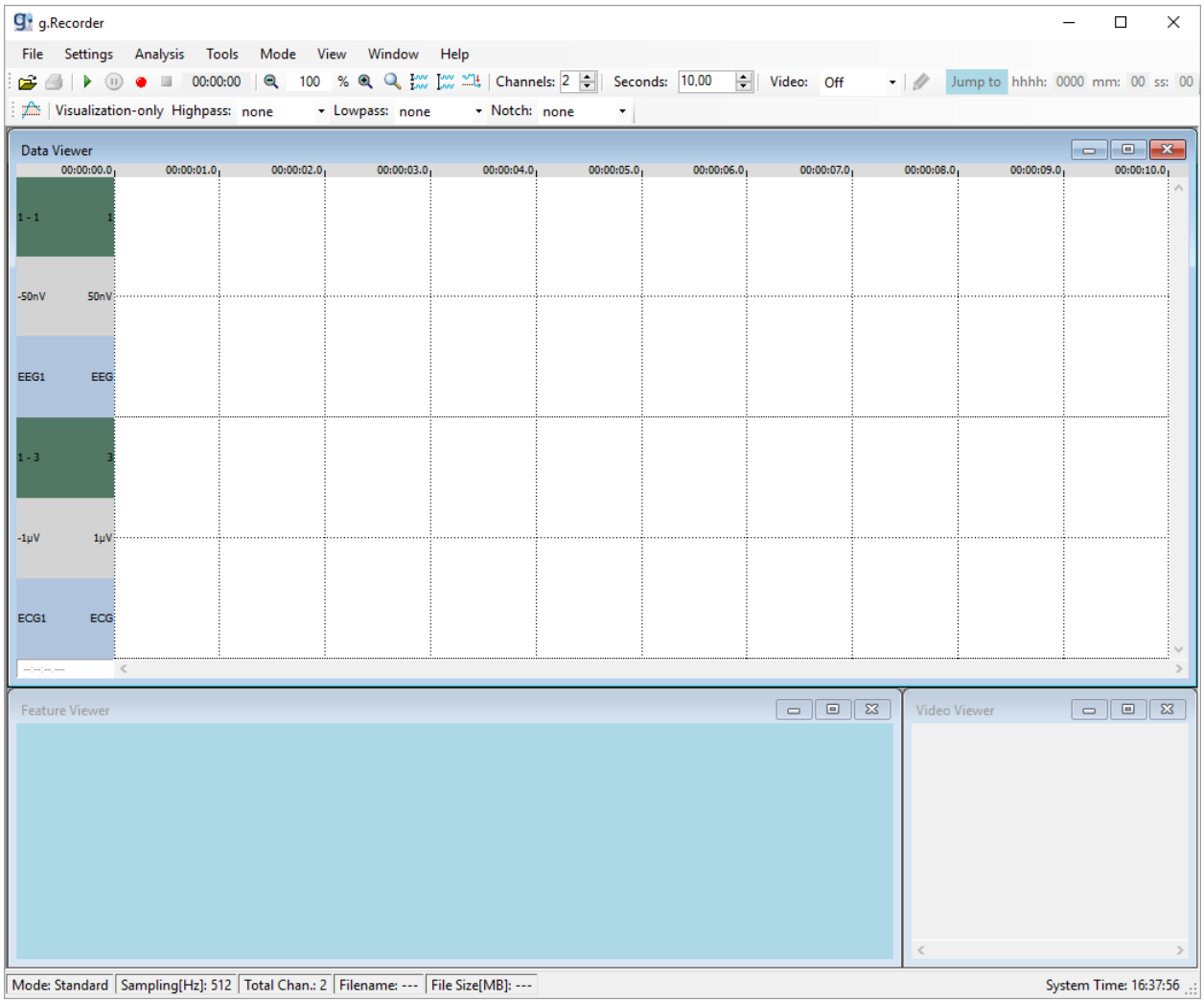
4. Configure the g.Recorder display by opening the **Channels** dialog from the **Settings** menu.



Provide a proper **Name** (e.g. `EEG1` for channel 1 and `ECG1` for channel 3) and a **Type** (e.g. **EEG** for channel 1 and **ECG** for channel 3) for the channels selected in the g.HIamp configuration dialog. The **Sensitivity** is set automatically, but can be changed manually. However, these changes influence data visualization in the Data Viewer window only. Click **OK** to close the dialog.



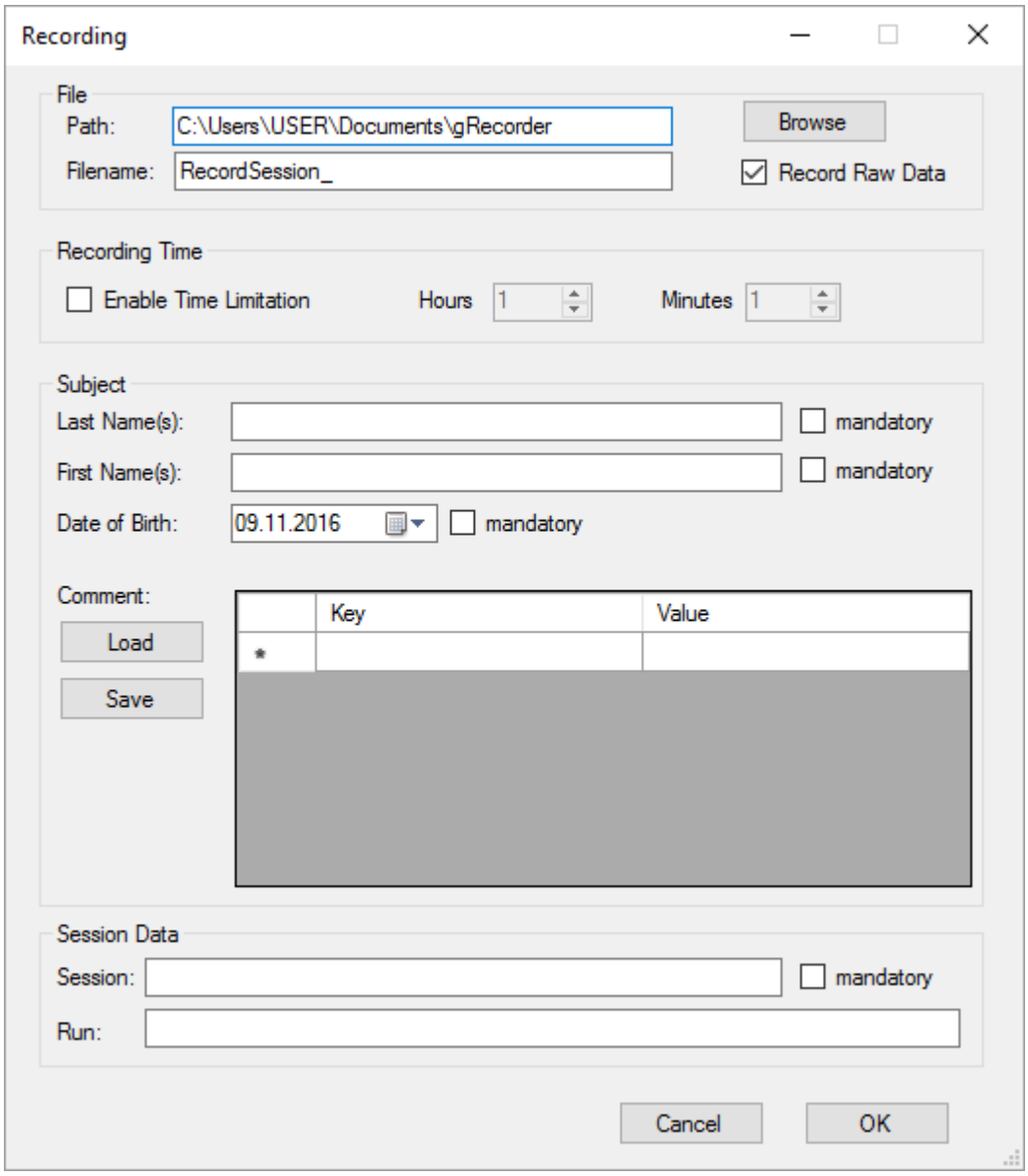
5. After providing all the settings described in the steps above, the g.Recorder window should look like in the picture below.



6. Start data acquisition either by clicking the **Start Data Viewing** button to display data without recording it to the hard disk

or by clicking the **Record** button to store acquired data to the hard disk.

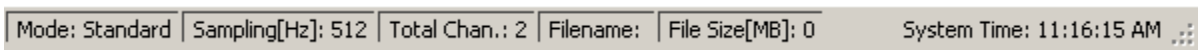
7. When the **Record** button is clicked, the **Recording** dialog opens.



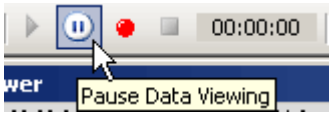
This dialog has already been described in the chapter *Using g.USBamp for EEG and ECG including Video recording*. See that section for a detailed description of the available options.

Click the **OK** button to start data acquisition and recording.

8. The actual data acquisition state is shown in the status bar at the bottom left corner of g.Recorder. **Standard** is displayed, if data is acquired without storing it to the hard disk, **Recording** if data is stored to the hard disk.



9. To stop data acquisition, click the **Pause Data Viewing** button, which stops data acquisition in display mode or data display in recording mode.



To finish recording, click the **Stop** button.

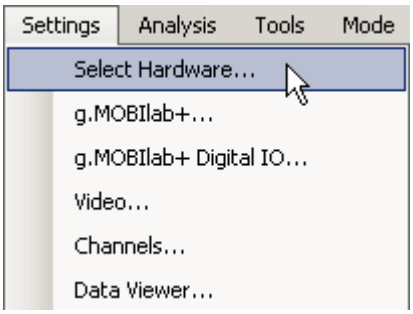
Using g.MOBIlab+ for EEG and ECG

The setup of g.MOBIlab+ with g.Recorder for acquisition of 1 EEG and 1 ECG channel is explained here.

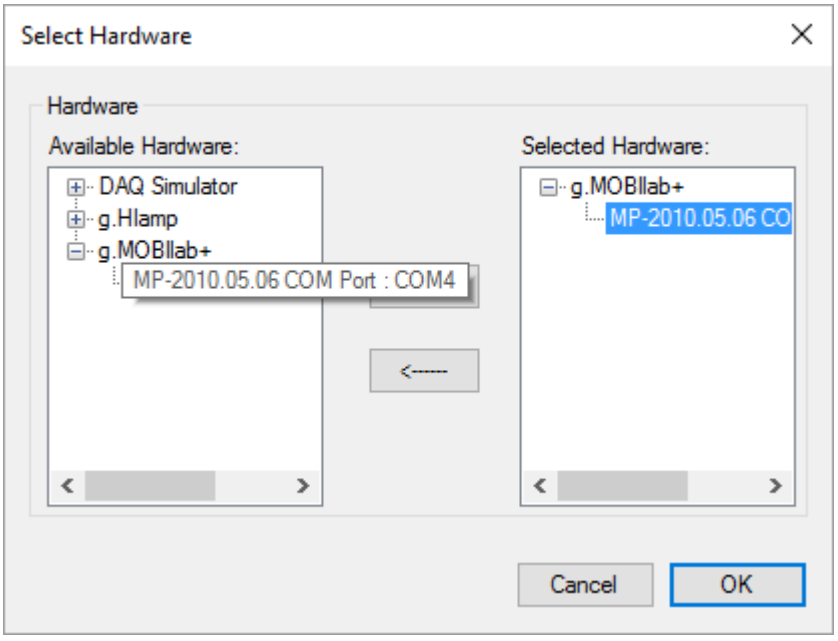
g.MOBIlab+ can stream its data either to the recording PC or notebook via Bluetooth or directly to the built-in SD Card. These two recording modes are described in this chapter.

To perform this example, please follow the steps below:

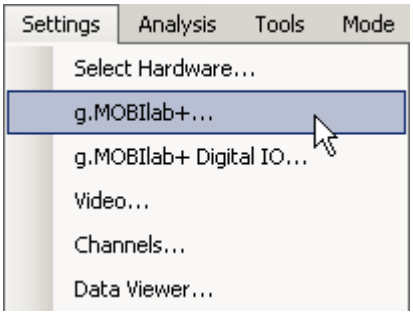
1. Make sure that your g.MOBIlab+ is switched on and connected to the PC. Click **Select Hardware…** in the **Settings** menu.



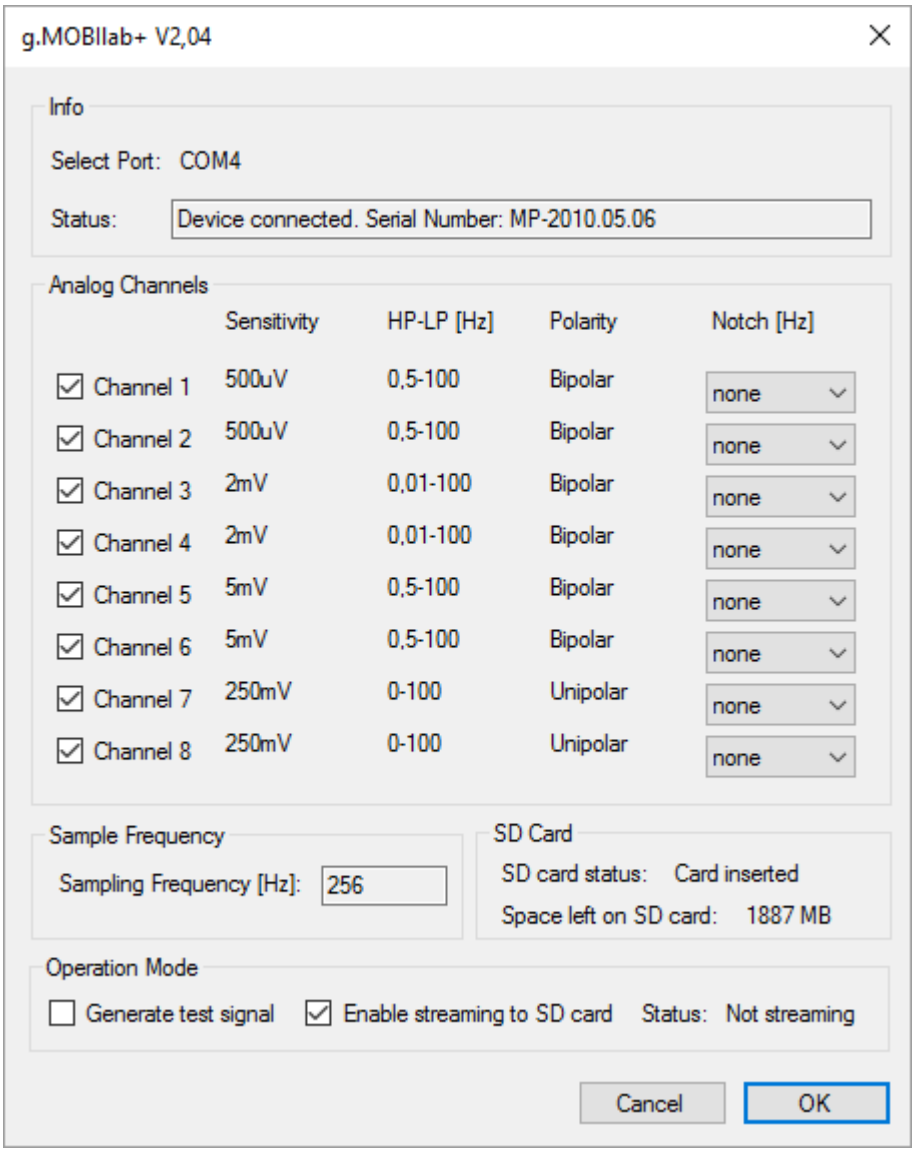
Click on the **g.MOBIlab+** menu entry in the **Available Hardware** list and select your g.MOBIlab+ (e.g. `MP-2007.10.06 COM Port : COM12`). Add the device to the **Selected Hardware** list by clicking the right arrow button. Click **OK** to close the dialog.



2. Click **g.MOBIlab+…** in the **Settings** menu to perform g.MOBIlab+ configuration.

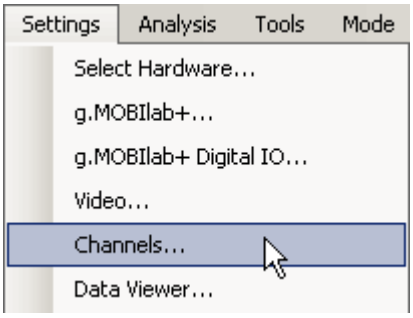


In the **Analog Channels** section select the checkboxes of **Channel 1** and **Channel 5**. Select the checkbox **Enable streaming to SD card** in the **Operation Mode** section to record data acquired by g.MOBIlab+ to the built in SD card of g.MOBIlab+. To start data acquisition see step 6. Leaving this checkbox will either let the user record data to the hard disk or just display data in g.Recorder, see step 8. Click **OK** to apply the settings.

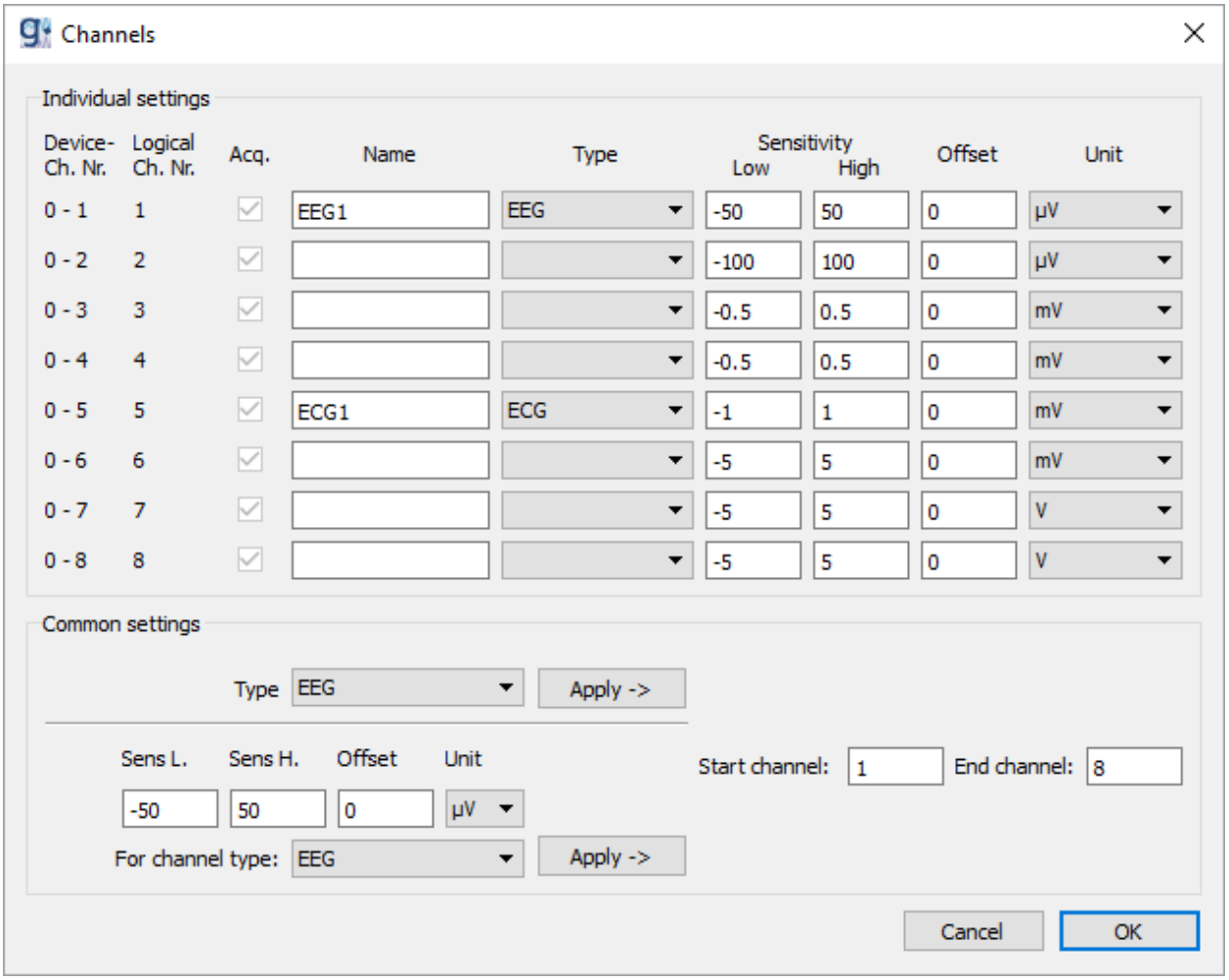


3. Set features and markers as needed. To see how to configure markers and features, see steps 7 and 8 in the previous section.

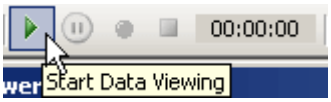
4. Click on **Channels…** in the **Settings** menu.



Set the **Individual Settings** as shown in the image below.



5. After selecting the **Enable Streaming to SD card** checkbox in step 2 it is possible either to stream data to SD card or just display data acquired by g.MOBIlab+ in g.Recorder. Click the **Start Data Viewing** button.

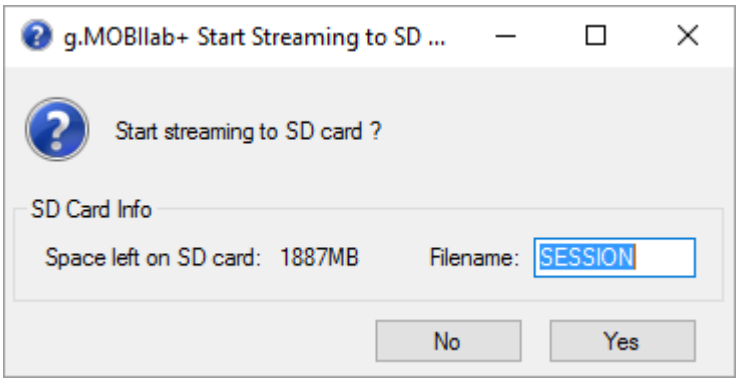


The **Start Streaming to SD Card** dialog asks the user to provide a **Filename** for the data recorded to the SD card.

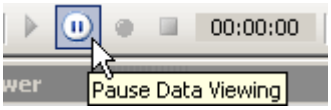
Default filename is `SESSION`, characters entered are set to uppercase automatically. Characters not allowed for a filename are <, >, \, /, :, *, |, ? and ”. Numbers can also be used.

The **Space left on SD card** in MB is also displayed

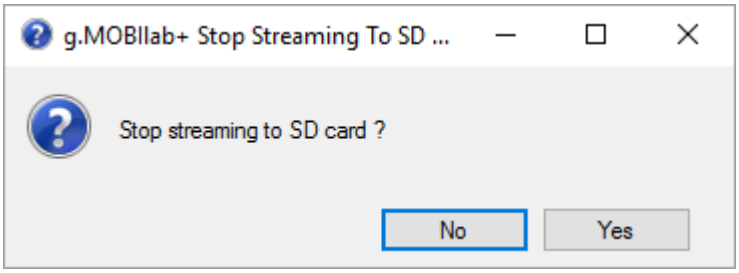
To confirm streaming to SD card click **Yes**. Click **No** to simply display data in g.Recorder.



6. If the **Enable Streaming to SD card** button in step 2 is selected, data acquisition is stopped with the **Pause Data Viewing** button.



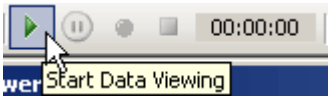
The **Stop Streaming to SD Card** dialog will pop up asking the user whether to stop streaming or not. If streaming is not stopped with the **No** button, g.MOBIlab+ will continue to acquire data to the SD card but g.Recorder will stop displaying and can even be closed. To stop streaming click the **Yes** button.



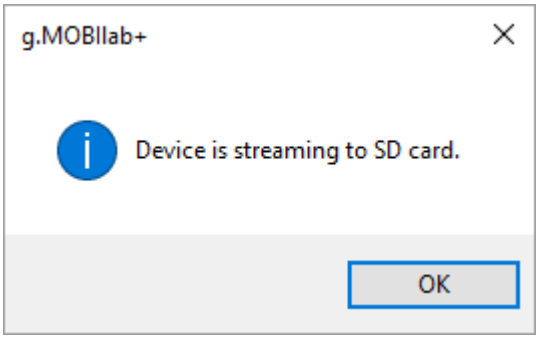
7. If the checkbox in step 2 is not selected, recording data to hard disk is stopped with the **Stop** button.

In this mode the **Pause Data Viewing** button stops data display in g.Recorder, but does not stop recording data to hard disk.

8. To reconnect to g.MOBIlab+ click the **Start Data Viewing** button in g.Recorder.



A message box will give the information that g.MOBIlab+ is streaming. Click **OK** to display data in g.Recorder again.



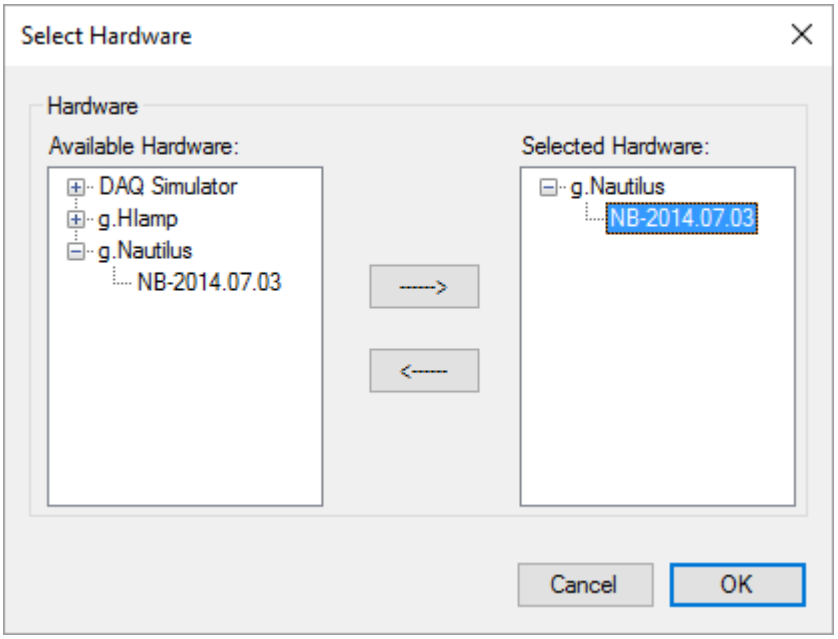
9. To proceed return to step 7.

Using g.Nautilusfor EEG

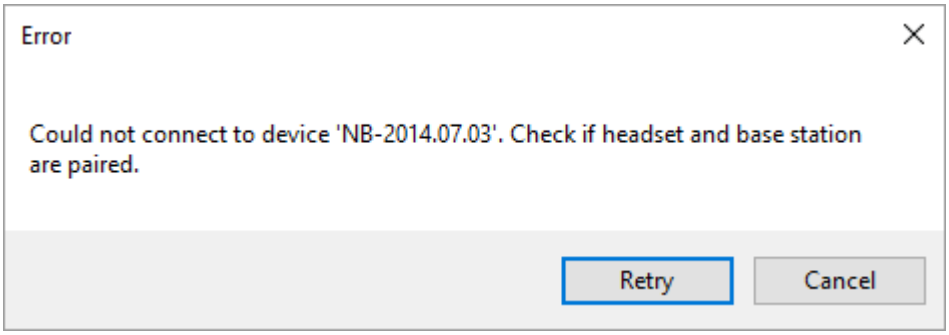
This section describes the setup of g.Nautilus for EEG data acquisition with g.Recorder.

To perform this example, please follow the steps below:

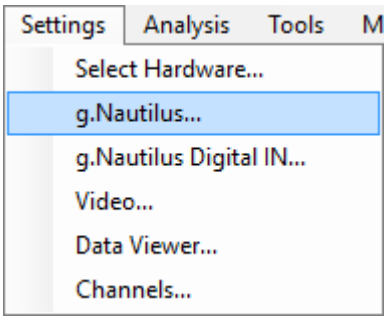
1. Connect the g.Nautilus Basestation to the PC and open the Hardware selection dialog by clicking **Select Hardware…** in the **Settings** menu.



Click on the **g.Nautilus** menu entry in the **Available Hardware** list and select the serial number of your g.Nautilus (e.g. UA-2014.07.03). Add the device to the **Selected Hardware** list by clicking the right arrow button. Make sure that the g.Nautilus base-station and headset are paired and close the dialog with OK. If the devices are not paired, an information dialog will pop up. Turn the g.Nautilus headset on, then wait until base-station and headset are paired. Finally, terminate the dialog with **Retry.**



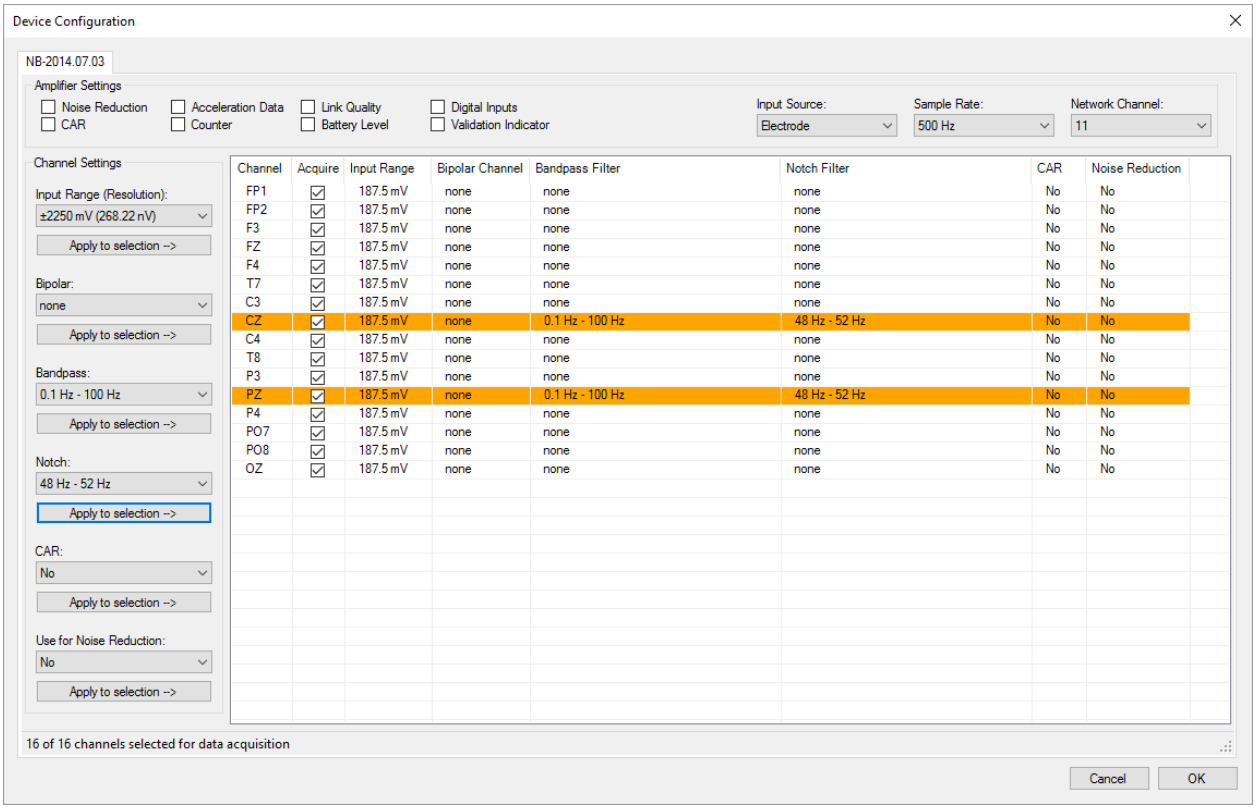
2. Click **g.Nautilus…** in the **Settings** menu to configure the g.Nautilus device.



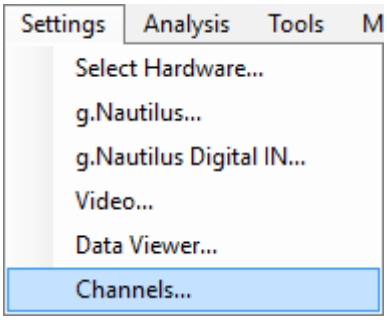
Set the **Sample Rate** in the **Amplifier Settings** section to `500` Hz and ensure that only the **Acquire** checkboxes of channel CZ and channel PZ are checked. You can use the shift key or the control key to select multiple channels. You can use the keystroke combination Ctrl + A to select all channels. To check or uncheck the **Acquire** checkboxes of the selected channels, click the **Acquire** checkbox of one of them.

Select channels CZ and PZ, apply a **Bandpass** filter **0.1 Hz – 100 Hz** and a **Notch** filter with **48Hz-52Hz** or **58Hz-62Hz**, depending on your local power line hum.

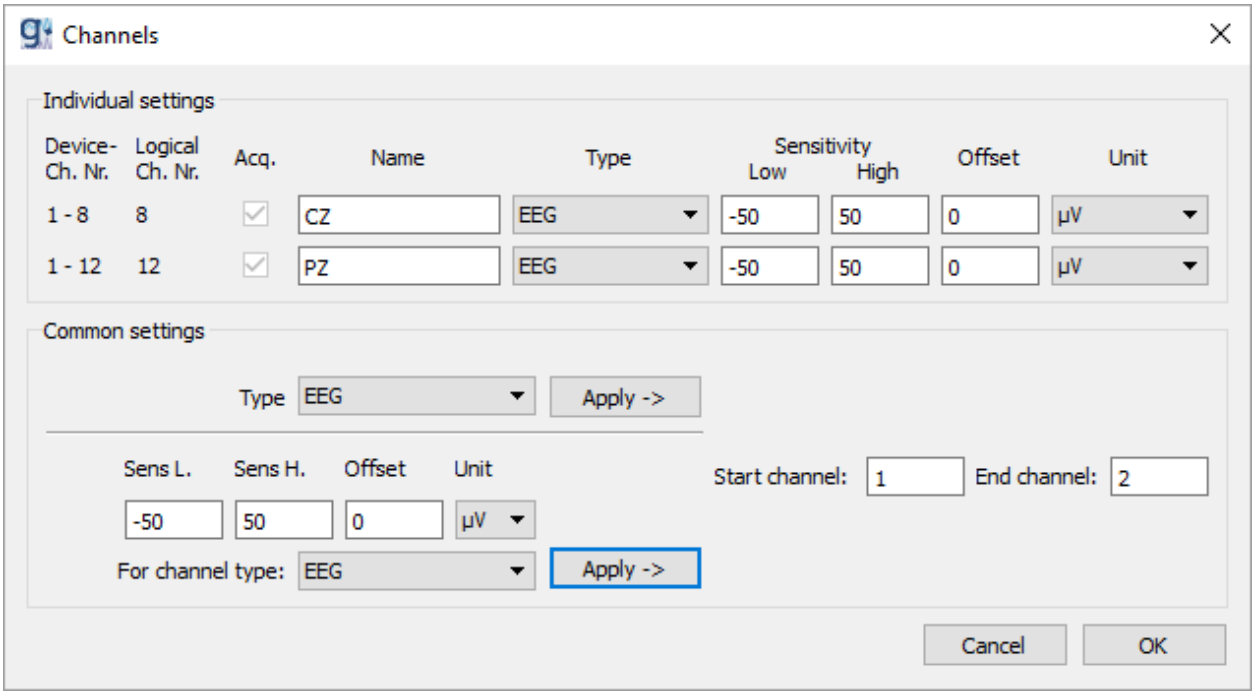
Click **OK** to close the dialog.



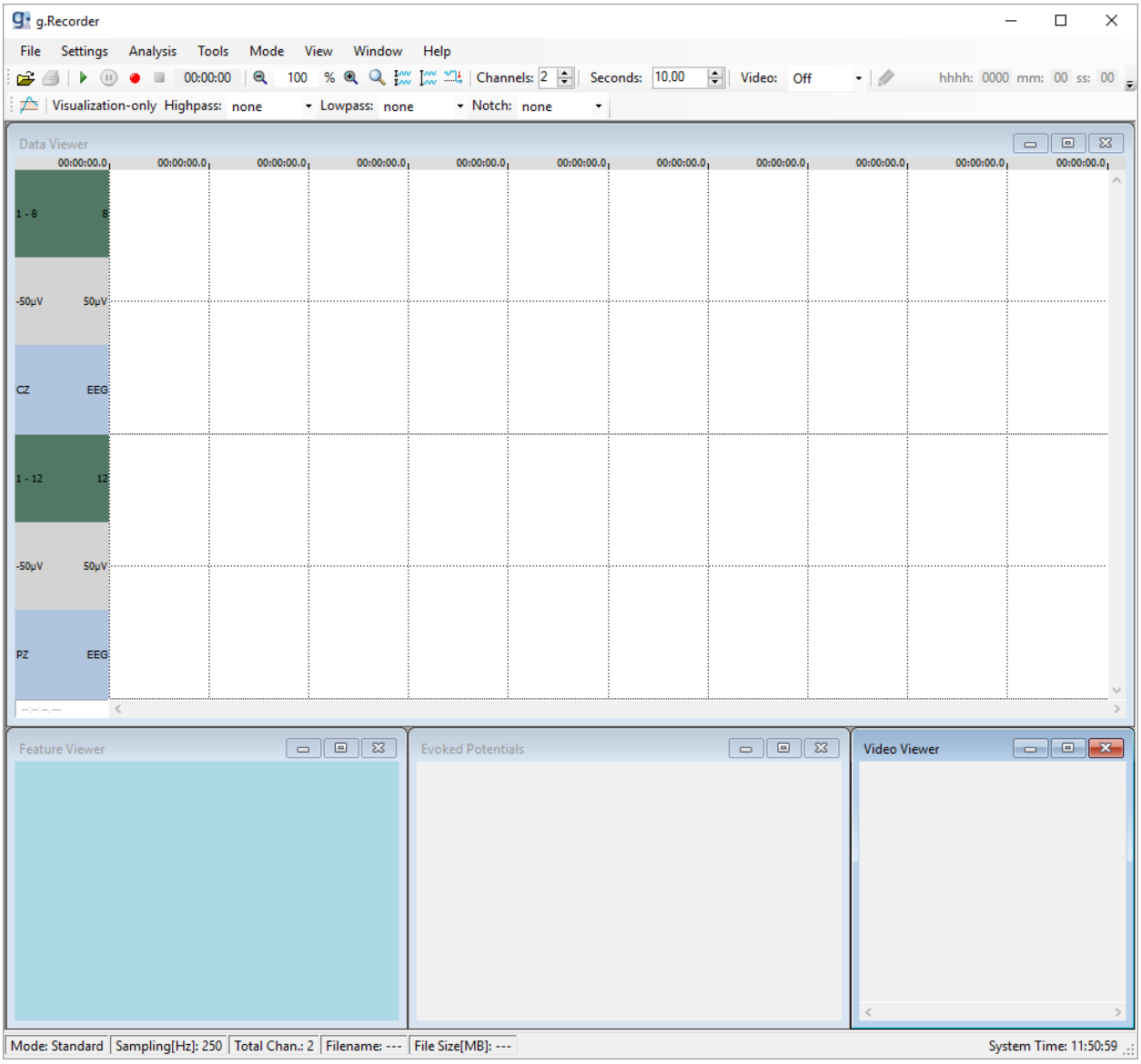
3. Configure the g.Recorder display by opening the Channels dialog from the Settings menu.



The channel **Name** of each in the configuration dialog selected channel should be assigned automatically. Provide a proper **Type** (e.g. **EEG**) for the selected channels. The **Sensitivity** is set automatically, but can be changed manually. However, these changes influence data visualization in the Data Viewer window only. Click **OK** to close the dialog.



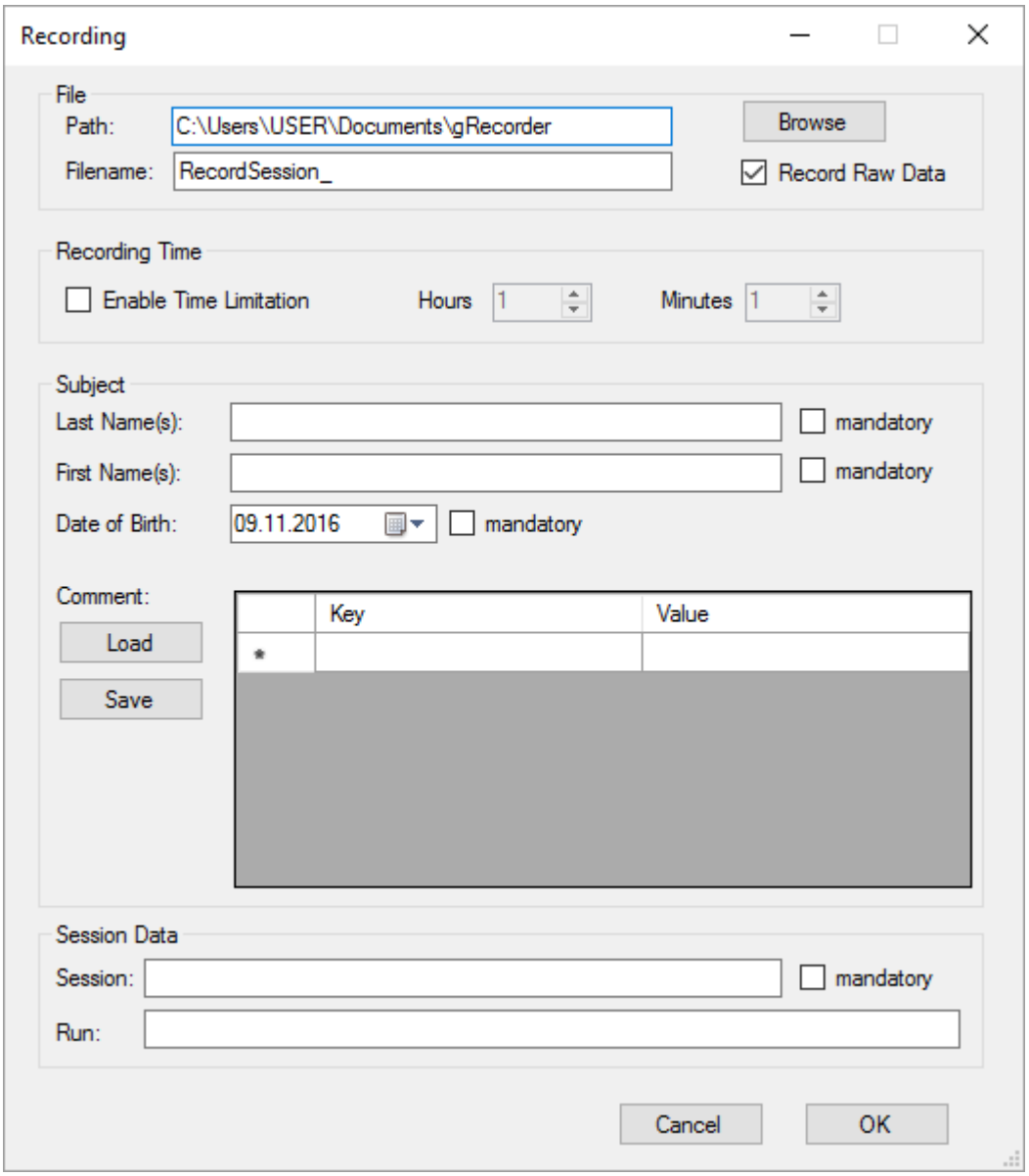
4. After providing all the settings described in the steps above, the g.Recorder window should look like in the picture below.



5. Start data acquisition either by clicking the **Start Data Viewing** button to display data without recording it to the hard disk

or by clicking the **Record** button to store acquired data to the hard disk.

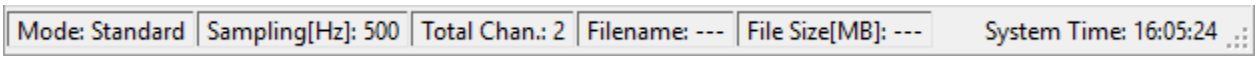
6. When the **Record** button is clicked, the **Recording** dialog opens.



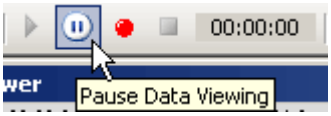
This dialog has already been described in the chapter *Using g.USBamp for EEG and ECG including Video recording*. See that section for a detailed description of the available options.

Click the **OK** button to start data acquisition and recording.

7. The actual data acquisition state is shown in the status bar at the bottom left corner of g.Recorder. **Standard** is displayed if data is acquired without storing it to the hard disk, while **Recording** is displayed if data is stored to the hard disk.



8. To stop data acquisition, click the **Pause Data Viewing** button, which stops data acquisition in display mode or data display in recording mode.



To finish recording, click the **Stop** button.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