

Neuroscope Version 5 program.

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# Introduction

The software for encephalographs “Neuroscope” of “Biola Ltd.” runs under Microsoft Windows 98, Windows 2000, Windows XP. It is also possible to use this program without encephalograph to view and analyze encephalograms recorded by Neuroscope.

The following fonts are used to highlight elements of the program in this manual:

|                                   |  |
|-----------------------------------|--|
| <b>Enter</b><br><b>Control+F3</b> | Keystrokes.<br><b>Control+F3</b> means pressing <b>F3</b> while holding <b>Control</b> |
| <b>File+Open</b>                  | Menu commands. To perform the command open menu <b>File</b> and select <b>Open</b> .   |
| <b>Printer settings</b>           | Names of dialog windows.   |
| <i>Browse...</i>                  | Buttons, lists and other controls in dialog windows.                                   |

## Other conventions

Mouse button – the main mouse button, usually on the left for right-handed, unless otherwise stated.

Click an element with mouse – position the mouse pointer on an element. Press and release the mouse button.

Drag (pull, move) with mouse – position the mouse pointer on an object. Press the mouse button and move the object holding the button. Release the button when the object is in place.

**Control** – Usually the bottom left button on the keyboard.

**Shift** – Any of Uppercase buttons.

**Right, Left, Up, Down** – arrows on the keyboard.

**Enter** – Enter (Return) keyboard button.



**Escape** – Usually the most left top keyboard button.

## Documents and windows

Every examination is recorded into a separate document that is stored in a separate file on the hard drive.

To open an examination document select menu **File+Open**.

The examination will appear in a separate window.

The window could be set to the full size of the program window using **maximize**  button, or returned to the original size using **Restore**  button. Both buttons are located in the top right corner of the document window. Small size windows could be moved around in the program window, so that several examinations are simultaneously visible, if it is necessary to compare several EEG records. Only one document at a time is active. This document is displayed over all other windows. The active document is controlled by Menu commands. To navigate between windows use **Window** menu or **Control+Tab** keystroke or just click mouse on the window you want to become active.

To close a document, use **File+Close**. If the document in the window has been changed the program prompts to save the document before closing.

To begin a new examination, create a new document choosing **File+New** menu.

One new document is automatically created on every start of the program.

## Working with encephalograms

After opening an EEG file using **File+Open** menu command you can:

View the encephalogram

Change parameters, i.e. sensitivity, filters, montage program, etc

Measure the amplitude and frequency

Print

Find, add or change events

Perform spectral analysis

Cut out or copy a part of EEG file.

## Navigation through a record

**PageUp** or **PageDown** keys scroll the EEG by the width of the document window.

The mouse wheel scrolls the EEG in smaller increments and so do **Left** and **Right** keys.

The scroll bar at the bottom of the window allows fast navigation through the EEG.

The **Space** key controls navigation with the mouse. While holding the **Space** key down press the mouse button on the EEG and pull it to the left or to the right.

When **Events List** is switched on (using **Events+List** menu), you can quickly move to an event by clicking on it.

## View Parameters

*Sensitivity* (vertical scale) changes one step by **Up** or **Down** keys.

*Paper speed* (time scale) changes one step by **Control+Right** or **Control+Left** keys.

*Lowpass filter* changes one step by **Control+Up** or **Control+Down** keys.

*Highpass filter* changes one step by **Shift+Up** or **Shift+Down** keys.

The parameters listed above are displayed on the status bar at the bottom of EEG window.

Montage program could be set in **View options, Montage** dialog box. To open the dialog window use **View+Properties** menu, then select **Montage** tab.

Parameters of the view could be also selected and changed using drop-down lists in the program toolbar.

The following elements of the document window can be displayed or hidden:

*Trace labels*. The panel containing trace labels to the left of the EEG can be displayed or hidden to save space using menu command **View+Trace labels**.

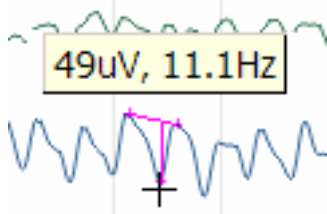
*Hidden traces.* Sometimes for a detailed examination of some traces it is useful to hide the rest of the record. To do that click the mouse on the names of the traces you wish to hide to select them. Then use **View+Hidden traces** menu command to display/hide the selected traces.

*Synchro channel* is plotted under the encephalogram. It shows the moments when audio- or photo- stimuli are applied. Every flash or sound click will be marked with a mark. Use **View+Synchro channel** menu command to display/hide synchro channel.

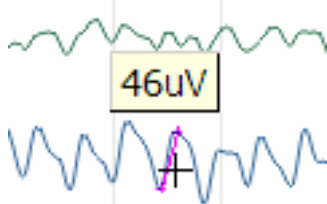
*Time labels.* Switch time labels on/off using **View+Time labels** menu command.

## Measurements

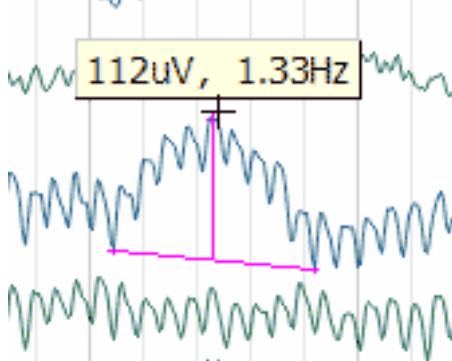
To measure an EEG wave simply position the mouse pointer over it. Do not press any buttons. When the pointer is near the peak of the wave, amplitude and frequency of the wave are displayed.



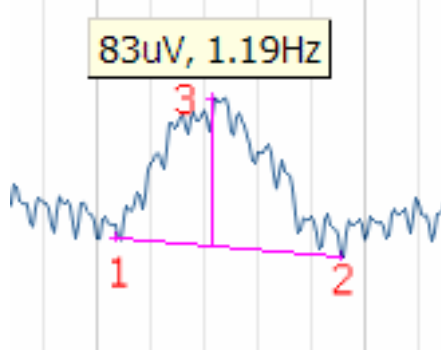
When the pointer is near the slope of the wave, the height of the slope is measured, and only voltage difference between the peaks of opposite polarity is displayed.



When Neuroscope software scans the trace it skips “small” peaks and tries to find a “large” peak. You can adjust the threshold with a *Measure tolerance* slider in the program toolbar. The righter is its position the more “small” peaks are skipped. This is useful when you want to measure a slow wave with superimposed higher-frequency wave:

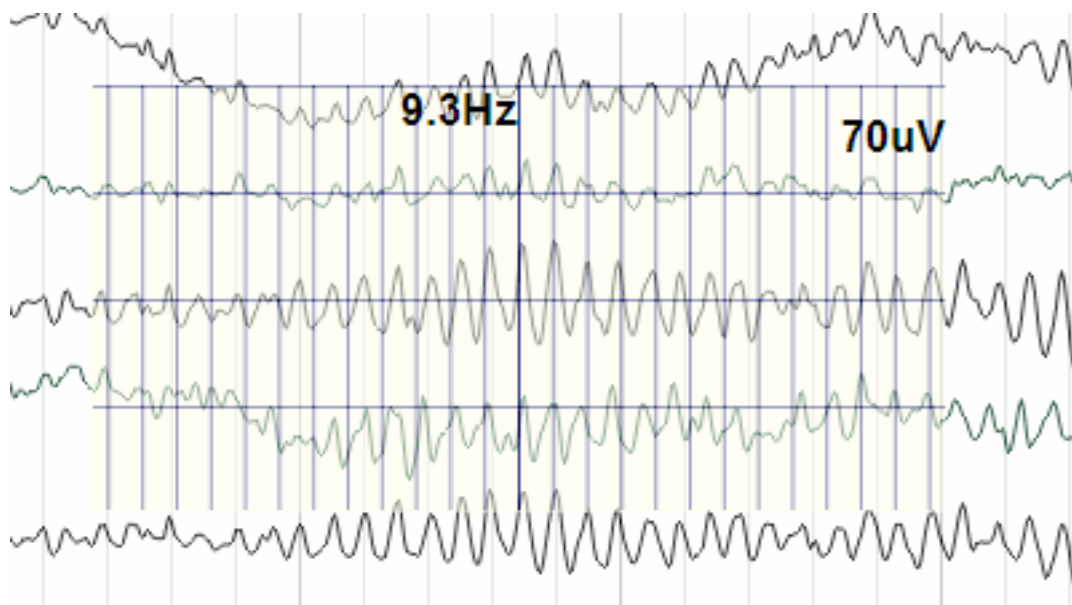


It is also possible to perform manual measurements of the waves.



To perform manual measurements press **M** key on the keyboard. Position the mouse pointer onto a point of the curve. Press the left mouse button. This fixes the point 1. Holding the button down, move the pointer to the point 2. Release the button. The point 2 is fixed. Move the pointer to the point 3. The label will show frequency and amplitude of the selected wave.

To place a transparent ruler over the encephalogram press **R** on the keyboard.



The ruler can be dragged with the mouse. You can change the period of the vertical grid rotating mouse wheel or pressing **<** (less) or **>** (more). The second hit on **R** or mouse click switches the ruler off.

## Printing the encephalogram on a printer

To print an EEG select menu **File+Print**. This will open **Print** dialog. Press *OK*.

By default one page of the EEG is printed starting from the left edge of the window. If you want to print a specific fragment of EEG select it with the mouse.

Print settings are found in the **Print** tab of **Settings** dialog, which is opened by **File+Settings** menu.

## EEG events

An event is a text associated with a certain time point in an EEG record. Usually events mark the beginning of functional tests or stimulation.

To jump between events in an EEG record open **Events list** dialog by menu command **Events+List**. Select an event in the list to move to it.

It is possible to create an event when viewing an EEG. Select menu **Events+Add event**. In the EEG area the *New event* will appear. Click with the mouse. The cursor will start to blink and the text could be added and edited. Type the text and press **Enter**. An event can be moved with mouse.

To delete selected event use **Edit+Delete** menu.

While recording, an event can be marked using menu **Events**. To add custom events to the list use **Events+Define events** command. It opens **Define events** dialog .

## Spectral analysis

Click the right mouse button in the EEG window to open context menu. Select **Spectral analysis**. The spectral analysis window will open to the right of the EEG. It can show: spectra, maps, or r.m.s. values for each of the rhythms. To switch between the modes right-click in the spectral analysis window and select **Properties** to display **Spectral analysis** tab of **View parameters** dialog.

Spectral analysis is performed either on the selected fragment of EEG, or on the fragment between left and right window edges if nothing is selected. When the fragment is shorter than one epoch of analysis the analysis is not performed. The epoch length is set in the **Advanced spectrum analysis settings** dialog, that can be called by *Advanced* button in **Spectral analysis** tab of **View parameters** dialog. .

Content of the spectral analysis window can be printed using **File+Print** menu.

## Operations with EEG fragments

It is possible to select a section of EEG with the mouse. Press the mouse button on the EEG and move the pointer holding the button down. The section will be highlighted.

You could perform the following operations with a selected EEG fragment:

- Remove using **Edit+Delete** menu.
- Print using **Edit+Print** menu
- Copy to the system clipboard or to a separate file using **Edit+Copy** or **Edit+Copy to** menu
- Analyse the fragment's spectrum

When you are starting to select a new fragment, all the previous selection is usually cancelled. If you want to select several fragments hold **Control** button down while selecting them. If you hold **Shift**, the new selection is combined with the previous fragment.

## Recording of EEG

The usual procedure of the examination:

1. Make sure the device is properly connected to the computer.
2. Start the Neuroscope program.
3. Set up the recording parameters.
4. Place electrodes on the patient and connect them to jacks on the device according to the current hookup. Press **F9** to view or change the hookup. Create a new examination file using **File+New** menu.
5. Press **F5** to start EEG monitoring. Make sure the EEG is running properly.
6. If necessary press **F7** to check electrode impedance.
7. Press **F6** to start EEG recording. The warning “Monitor. No record.” will disappear.
8. You can change viewing parameters while recording. Changes of sensitivity, paper speed, montage program, or filtering do not affect the record itself. Only on-screen representation of the record is changed.
9. Carry out the functional tests. During recording you can add events to the EEG, selecting them from the list accessible through the **Events** menu. For example, you open menu **Events**, place the mouse over **Eyes open**, and ask the patient to open eyes. When they do so click the mouse button to mark “EO” (Eyes Open) event.
10. Perform audio and photic stimulation. The stimulation can be started through **EEG+Photic** or **EEG+Audio** menu. The stimulation parameters can be changed using **EEG+Stimulator properties**.
11. To stop recording press **Escape**.
12. Save the record using **File+Save** menu.
13. Fill in the **Patient Data** . To open the dialog use **Edit+Patient Data** menu.
14. Close the EEG file using **File+Close**. When asked «Save changes?» answer **Yes**.
15. Announce the end of the examination to the patient ☺.

## Connection of the device to the computer

When the device is properly connected, the green power indicator is on, and pressing F5 key in Neuroscope program starts the EEG registration. If power indicator is not lit please check if all cables are connected. If indicator is on but you can't start recording please check program settings (see description of **Settings** dialog, **Hardware** tab).

## Recording parameters

There are two recording parameters. They are hookup and bandwidth.

### ***Scheme of electrodes (Hookup)***

You define how many electrodes are in use, their names and jacks they are connected to. These parameters are set in the **Hookup** tab of the **EEG options dialog**. To open the dialog use **EEG+Properties** menu.

In series A devices (NS408A, NS416A and NS420A) it is required to use all jacks. Other models allow to leave some jacks unconnected. For example with NS424 model you can use 19 jacks of 24.

If the electrode is assigned in the program to an input jack then it should be placed on a patient. Otherwise the record will be very noisy, and **Overload** warning will be displayed.

The neutral electrode is not shown in the hookup but must always be placed on the patient and connected to the N socket.

### ***Bandwidth***

Bandwidth is set in the **Bandwidth** tab of the **EEG options** dialog. The dialog is accessible through the **EEG+Properties** menu.

Please note! If you want to set the Lowpass filter cutoff frequency (*Lowpass cutoff frequency*) higher than 35 Hz you'll probably have to use the *50 Hz rejection* filter unless you are recording in a shielded room.

## Program modes

There are three modes of the program. They are: Stop, Monitoring, and Recording.

The Stop mode is used to view (measure, print, etc) a recorded EEG.

The Monitor mode is used before recording to check that the EEG looks reasonable, the electrodes are connected properly, etc. In this mode the data are not recorded. The warning message "Monitor. No data recording." is displayed.

In the Recording mode the EEG is recorded on the hard disk.

There is no restriction how many times you start/stop recording during examination.

The modes can be changed using:

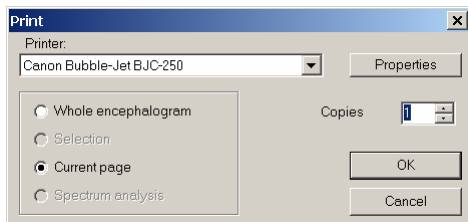
the keyboard - **F5** to Monitor, **F6** to Record, **Escape** to Stop;

or using toolbar buttons -  to Monitor,  to Record,  to Stop;

or using **EEG** menu.

## Dialogs

### Print



*Printer* (drop-down list) selects the printer.

*Properties* sets printing parameters (quality, paper layout, etc).

*Copies*. Sets the number of copies to print.

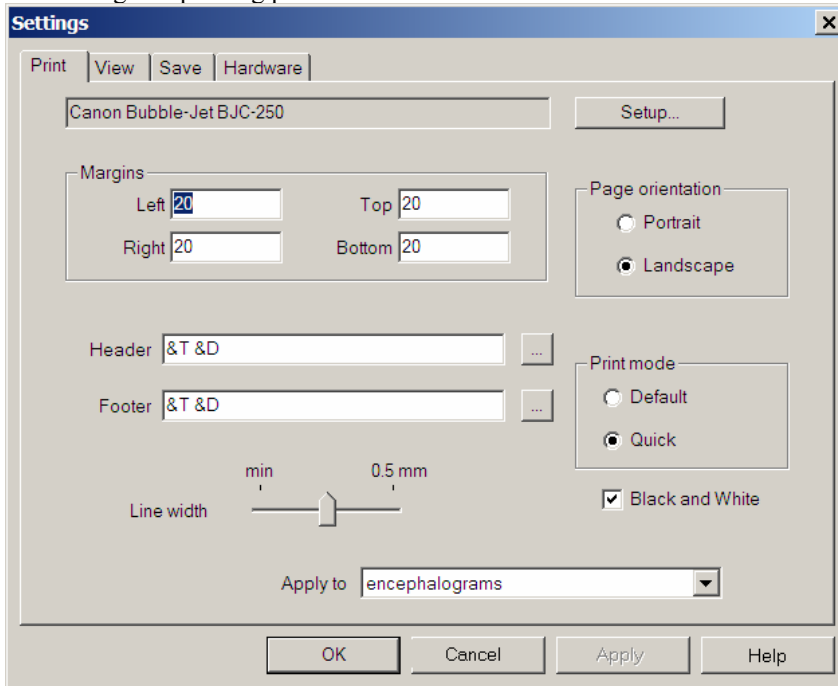
Select what you want to print

|                            |  |
|----------------------------|--|
| <i>Whole encephalogram</i> | The whole record will be printed. If the record was 5-minutes long, and every page shows a 10-second long interval, the whole set of 30 pages will be printed.                                 |
| <i>Selection</i>           | Only selected fragment (or fragments) will be printed.   |
| <i>Current page</i>        | EEG displayed in the active window will be printed starting from the left edge of the window. The width of the printed fragment depends on the paper size and orientation, and on the margins. |
| <i>Spectrum analysis</i>   | The content of the spectral analysis window is printed if the window is open inside the active EEG window.   |

The dialog is called by **File+Print** menu.

## Settings. Print

This dialog sets printing parameters.



*Setup* changes selected printer parameters (quality, paper, etc).

*Margins* (*left, top, right, bottom*). Set margins in millimeters.

*Page orientation* Select *Portrait* when page height is greater than width, otherwise *landscape*.

*Header* and *Footer*. Define the two lines of text that will be printed above and below the EEG. For example, if you enter "The Royal Sussex County Hospital" in the *Header* field, "The Royal Sussex County Hospital" will be printed above the EEG on every page.

The *Header* and *Footer* can include special symbol sequences, which will be replaced by the corresponding data from the file of EEG examination. The replacing data could be the name of the patient, the examination date, etc. For example, when the *Header* field contains «&N, check-up date &D», the corresponding printed header will be «Peter Johnson, check-up date 31/10/05». The patient's name will be taken from **Patient data**, and the date will be the date of examination taken from the examination file. You can select the sequences from the list, which is accessed by using "..." buttons to the right of *Header* or *Footer* fields.

*Print mode: Default* or *Quick*. Select one of the two printing modes. Depending on printer model the *Quick* mode may significantly reduce printing time.

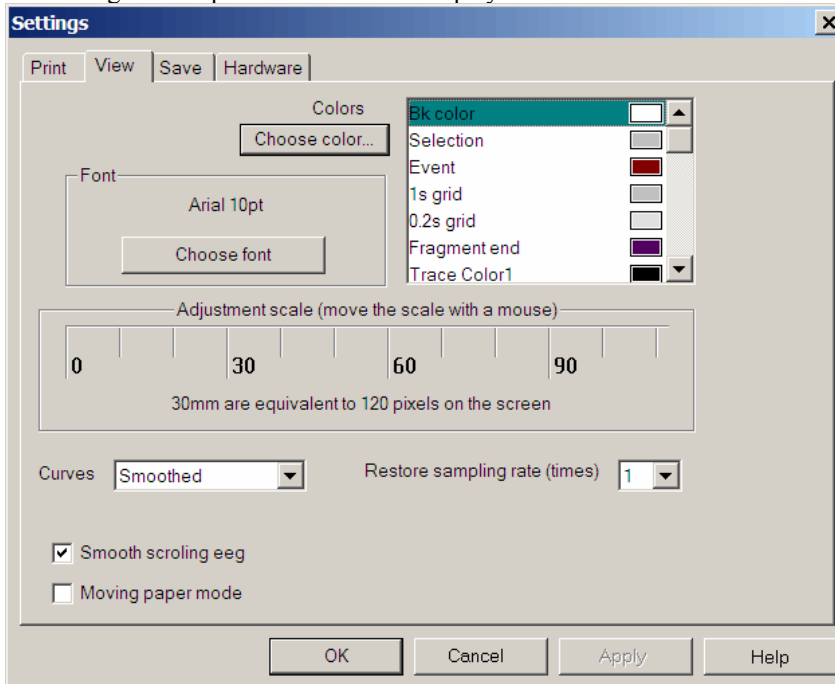
*Black and White*. The printout will be black and white. It is recommended to check the box when using a black and white laser printer. This is important because many printers report to the system that they can print color but actually present colors in grayscale. It's ok for photos but not for EEG.

*Line width* Sets thickness of EEG trace. The leftmost position of the slider corresponds to the thinnest line the printer can print. In the rightmost position, the line width is about 0.5 mm.

The **Print Settings** dialog is under **File+Settings** menu, **Print** tab.

## Settings. View

The dialog defines parameters of EEG display common for all examinations.

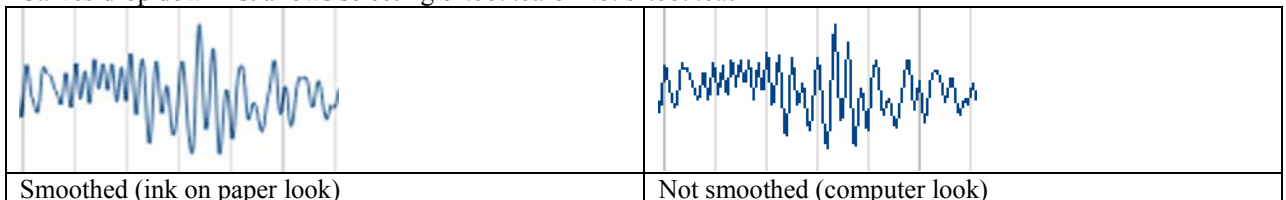


The *Colors* list allows to set the color of any element of the EEG window. To change color double-click an element in the list or press the *Choose color* button.

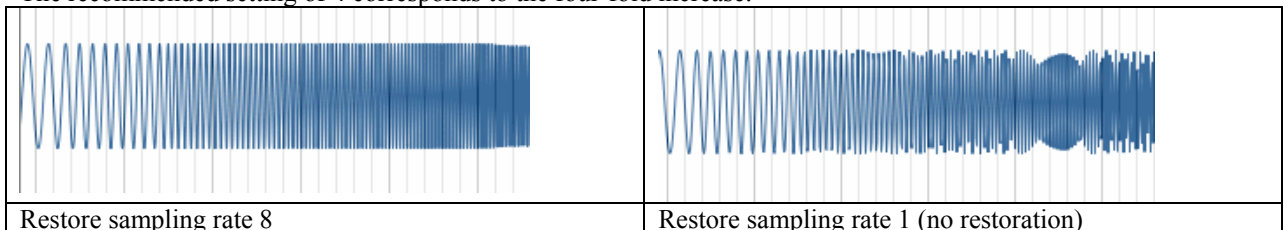
*Font* sets font of Events in the EEG window.

*Scale* sets the absolute on-screen scale. Default value is 100 pixels per 30 mm. You can drag the ruler with a mouse to match your screen resolution.

*Curves* drop down list allows selecting *Smoothed* or *Not smoothed*.



*Restore sampling rate*. To display an encephalogram accurately, it can be restored by increasing the sampling rate. The recommended setting of 4 corresponds to the four-fold increase.

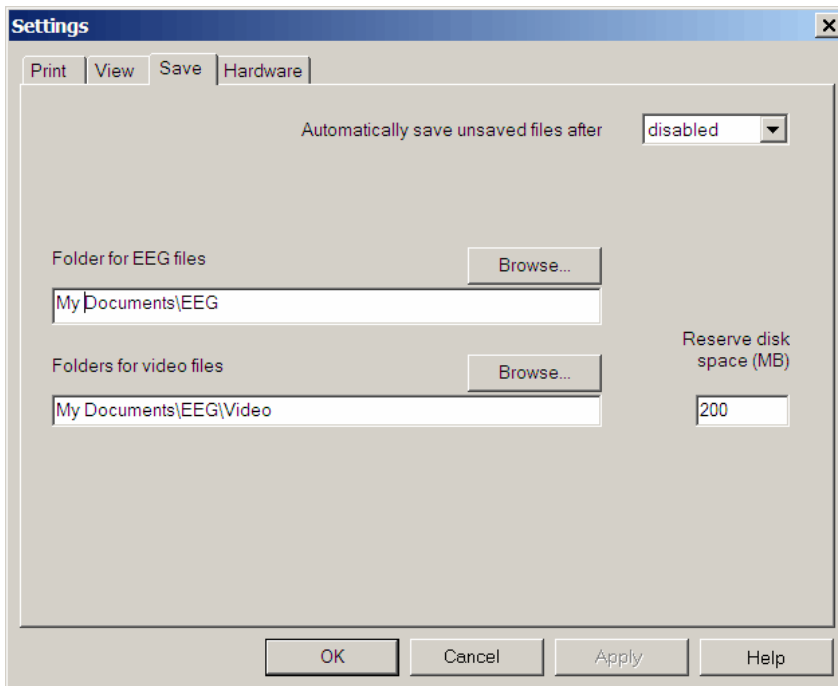


*Smooth scrolling* is recommended for CRT and fast LCD displays. If your display is slower, uncheck this box, otherwise you will see an unpleasant smearing when you scroll the EEG.

*Moving paper mode*. When this mode is on during recording the EEG moves to the left like paper of a pen recorder. When the mode is off, the EEG does not move. Instead, vertical cursor moves from the left to the right, and new EEG is drawn after the cursor.

The **View Settings** dialog is under **File+Settings** menu, **View** tab.

## Settings. Save



*Automatically save unsaved files every* Defines the autosave interval.

*Folder for EEG files* Defines default location of EEG files.

The *Browse* button allows you to choose a folder from the list.

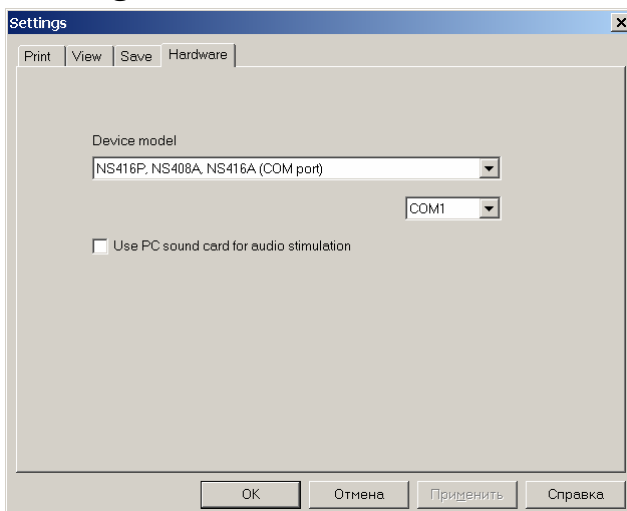
*Folder for video files* Defines location where the program stores video files if synchronous video recording is used.

The *Browse* button allows you to choose an existing folder.

*Reserve disk space (MB)*. Defines reserved space on the disk. When this limit is reached video capture will be terminated.

The **View Settings** dialog is under **File+Settings** menu, **View** tab.

## Settings. Hardware



*Device connection* Sets the type of device connection to PC. Should match the model you are using, otherwise the program will display an error message **No device found**.

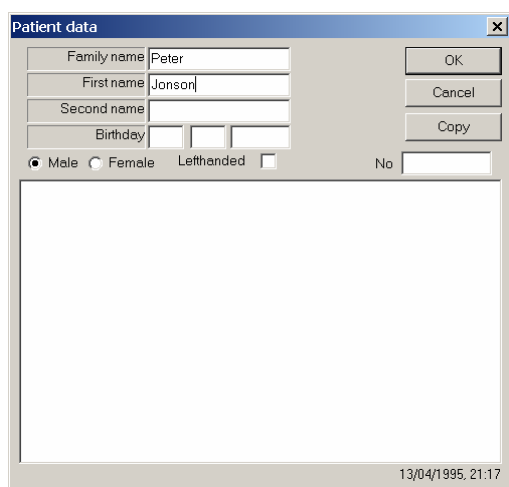
There are three types of connection:

- Universal Serial Bus (USB). The cable connects the device to one of USB ports of the PC or hub.
- Serial (COM) port. The power supply is connected (1) to the device by the special cable “patch-cord”, (2) to the COM-port of the computer by the cable with a 9-contact connector and (3) to mains (usually 220V) by the mains cable. If your device is connected through a COM port, make sure the COM port number is set up correctly.
- Special interface board. The interface board installed in the computer is connected to the device by the interface cable.

When “Demo. Device emulation” is selected, the EEGs will contain a pseudorandom sequence of potentials, generated by computer. It is used for the purpose of demonstration.

The **Settings Hardware** dialog is under **File+Settings** menu, **Hardware** tab.

## Patient data

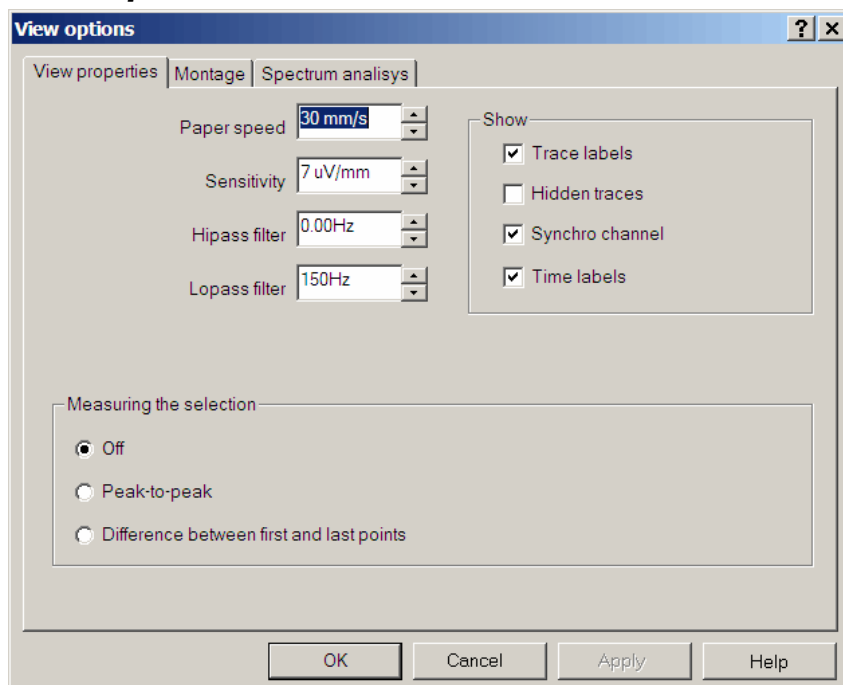


The dialog contains patient’s personal and other data. They can be used later to search for a particular examination file(s). See **File Index**.

The data from the dialog could be printed together with the encephalogram, when it is specified in the **Print Settings** dialog.

The dialog is under **Edit+Patient data** menu.

## View options



The dialog controls parameters of appearance of the active window: time and amplitude scales, (*Paper speed* and *Sensitivity* respectively), and frequency band (*Highpass filter* and *Lowpass filter*).

You can also show or hide the following elements:

|                      |  |
|----------------------|--|
| <i>Trace labels</i>  | The panel to the left of the encephalogram   |
| <i>Hidden traces</i> | Some traces in the montage can be made hidden. Check the box to display hidden traces. |

|                        |   |
|------------------------|---|
| <i>Synchro channel</i> | The channel which contains marks of audio and photic stimuli. |
| <i>Time labels</i>     | Time labels below the encephalogram.                          |

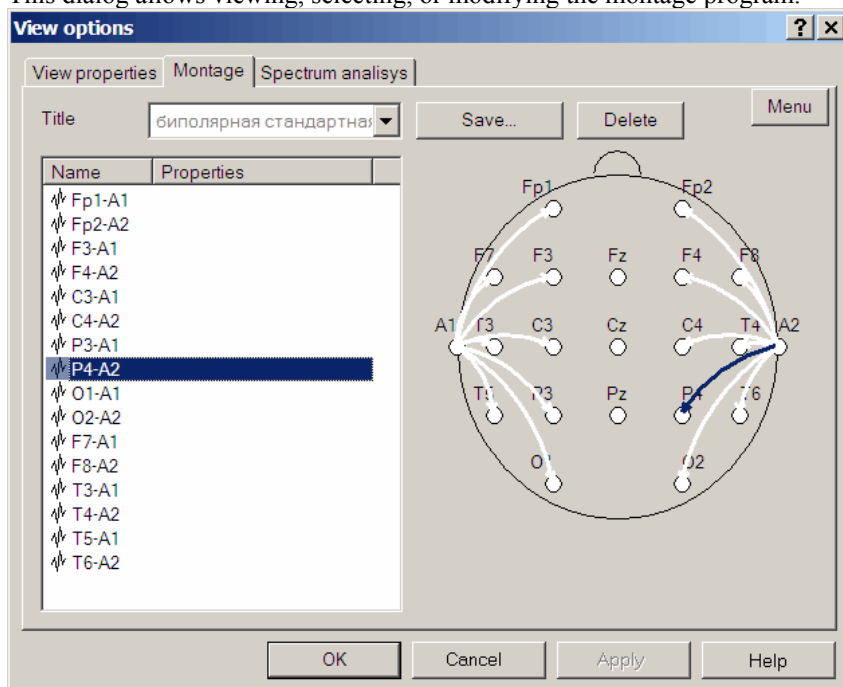
*Measuring the selection* – When a section from encephalogram is selected, amplitude value is displayed next to the trace label: either *peak-to-peak*, which is calculated as the difference between minimum and maximum values within the selection, or the *Difference between the first and the last point*.

The **View Options** dialog is under View+Properties menu, **View properties** tab.

See also **View parameters**.

## Montage program

This dialog allows viewing, selecting, or modifying the montage program.



The montage contains a list of leads.

Every lead is formed by two electrodes. The trace shows the difference of potentials between the first and the second electrode of the lead.

In the dialog the leads are shown as arrows. The selected lead is highlighted.

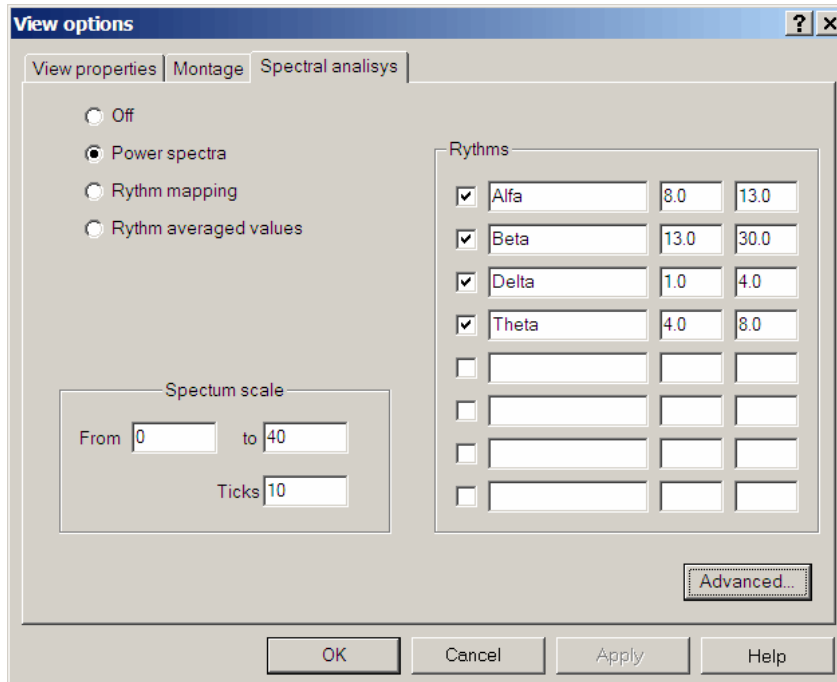
The leads can be:

|                                      |   |
|--------------------------------------|---|
| Created                              | To create a lead, connect two electrodes with an arrow. Press left mouse button above the SECOND electrode of the lead, then drag to the FIRST electrode and release the mouse button.  |
| Removed                              | Press <b>Delete</b> to remove the selected lead   |
| Set up individual parameters         | Every lead can be given individual settings of color, sensitivity, frequency band. Double-click the mouse on the list of leads to show or hide the parameters of the selected lead. If sensitivity and frequency band of a lead are not set, the common values from <b>View options</b> dialog or the program's toolbar will be used. |
| Change order of leads in the montage | Drag the leads up or down in the list using mouse.  |

You can define as many montages as you want and easily switch between them. There is no need to edit the same montage every time by adding and removing leads. To save montage press *Save...* and give it a unique name. To use a saved montage, select it from the *Montage name* list. To remove a montage from the list, select its name in the field *Montage name* and press *Delete*.

## Spectral analysis

The dialog configures spectral analysis.



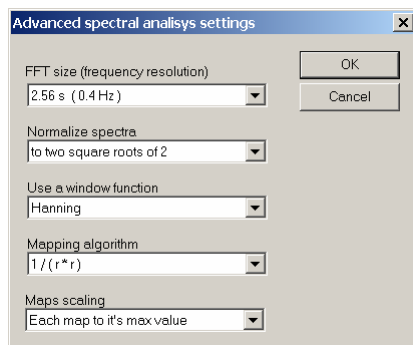
The spectral analysis can be in one of four modes: *Off*, *Power spectra*, *Rhythm mapping*, or *Rhythm averaged values* of spectral power.

Each of the *Rhythms* has a name and the frequency band where the average spectral power is computed.

For example, Alpha rhythm is usually defined between 8 and 13 Hertz. Checkboxes to the left of rhythm names control the display of corresponding maps.

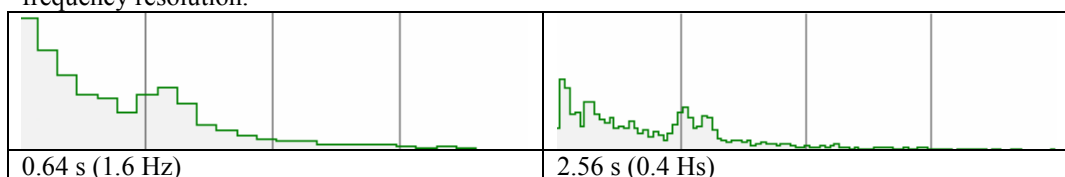
*Advanced*. The button opens the **Advanced spectral analysis settings** dialog. See also **Spectral analysis**.

## Advanced spectral analysis settings



*FFT Size (frequency resolution)*

To perform spectral analysis data are divided into time intervals. The longer is the time interval the higher is the frequency resolution.



When there is not enough data for the spectrum (the selected interval is shorter than the *FFT Size*), analysis is not performed.

*Normalize spectra*

Several ways to normalize spectra can be used. When *two square roots of two* is selected, then for a clean 10Hz, 100  $\mu$ V peak-to-peak sinusoidal signal the Alpha rhythm will accumulate exactly 100  $\mu$ V of power.

*Use a window function*

The window superimposed on the signal prior to spectrum calculation prevents smearing of spectral peaks.

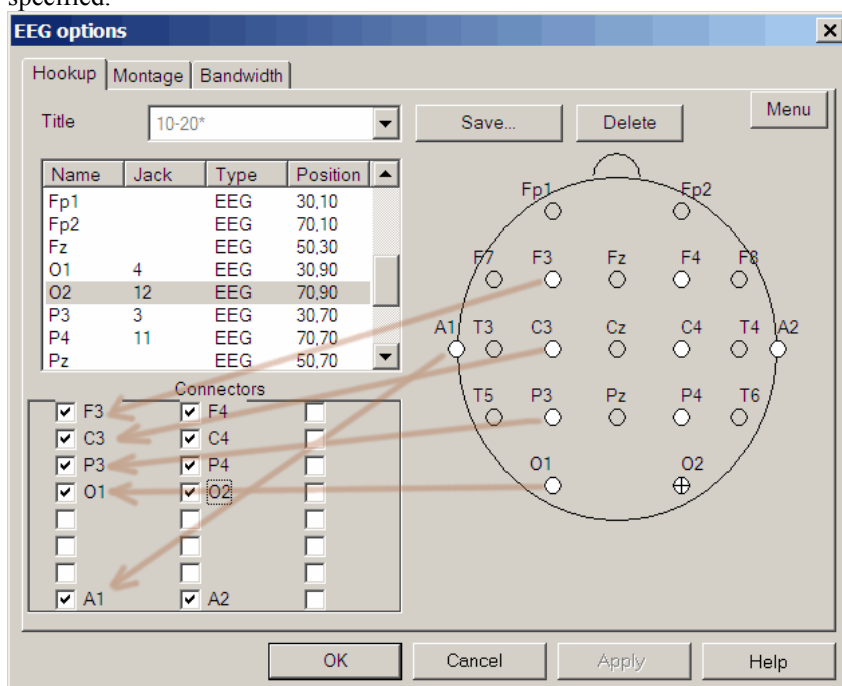
*Mapping algorithm*. Several algorithms can be used to build spectral density maps. When few electrodes are employed, the  $1/(r*r)$  algorithm is more relevant. For 16 or more electrodes the *triangulation* is recommended.

*Maps scaling* The spectral density maps can be scaled to the common maximum of spectral density, or each of the maps can be scaled to its own maximum. In the former case a color (green for instance) corresponds to a certain power density (100  $\mu$ V) for all displayed maps. In the latter case the same color will correspond to different values in different maps unless the maximum values in the maps are the same.

## EEG options. Hookup.

The dialog is used to switch between, change, delete, and create electrode hookups.

To record an encephalogram, the set of electrodes and the corresponding input jacks for each electrode must be specified.



For example, you are going to use 10 electrodes of standard 10-20 scheme. The figure shows the arrangement, where 10 electrodes of 21 are connected: the electrode A1 is connected to jack 8, electrode F3 to jack 1, C3 to jack 2, P3 to jack 3, etc. The jacks 5, 6, 7, 13, 14, 15, 17-24 are left unconnected (this is not possible with series A devices).

To tell the program that electrode is connected to a jack: Select an electrode in the list or click it on the scheme. The selected electrode is marked with a cross. In the figure, the O2 electrode is selected. Then click the mouse on empty jack in the *Jacks* area, and selected electrode will be connected to it.

To disconnect an electrode uncheck the corresponding box in the *Jacks* area.

Besides connecting and disconnecting electrodes, you can also:

|                         |  |
|-------------------------|--|
| Add more electrodes     | Press <i>Menu</i> button and select <b>Add electrode</b>   |
| Remove an electrode     | Select an electrode in the list or on the scheme, press <i>Menu</i> button and select <b>Delete electrode</b>                              |
| Rename an electrode     | Select an electrode from the list, press <b>F2</b> , enter new name.   |
| Reposition an electrode | Select an electrode in the list, move it on the scheme with mouse. The coordinates of electrodes are used to build maps of spectral power. |

If you use different hookups for example for adults and children, you could save the hookups under the different names and select for use from the drop-down list *Hookup name*.

To save hookup press *Save* button. Enter the name and press *OK*.

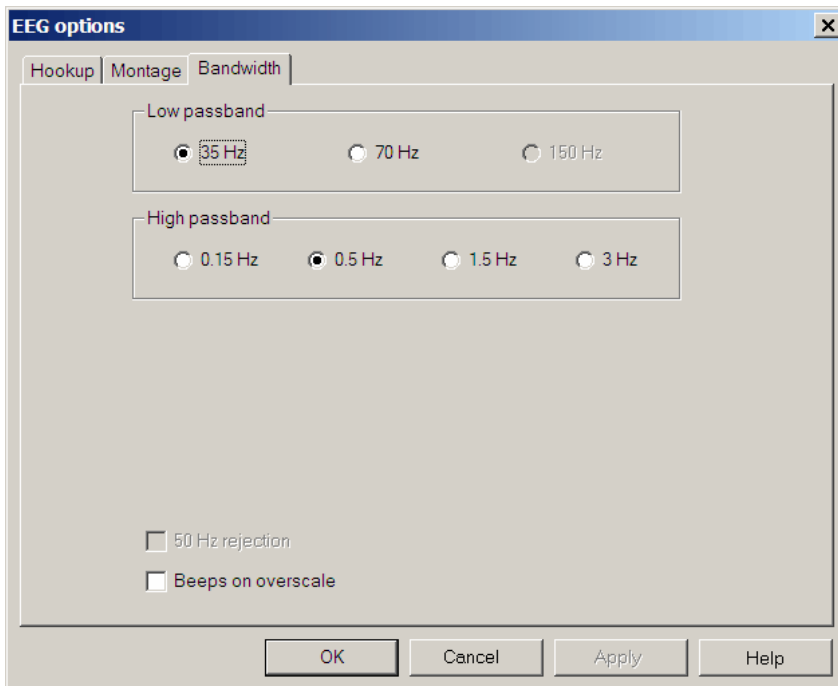
To delete a hookup from the list press *Delete*.

The current hookup is saved with the EEG during recording. Therefore you can always view your old examination even if the hookup which had been used was deleted. When you open the file, the hookup is temporarily included in the list. When you save the temporarily added hookup, it becomes permanent, and you can use it again for EEG recordings.

The dialog is called by menu **EEG+Properties...** or with **F9** key.

## EEG options. Bandwidth.

The dialog sets frequency band of the recording.

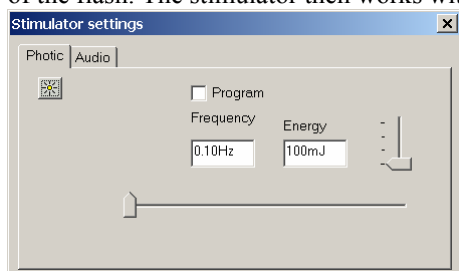


It is possible to further restrict passband while viewing. But the viewing passband can not be wider than the recording passband. For example, if the EEG was recorded in 0.5Hz to 35Hz band, you can set the viewing passband 3 to 25 Hz, but not 0.15 to 70 Hz.

If your recording passband exceeds 35Hz, you will probably need the *50 Hz rejection* filter to suppress the interference from mains.

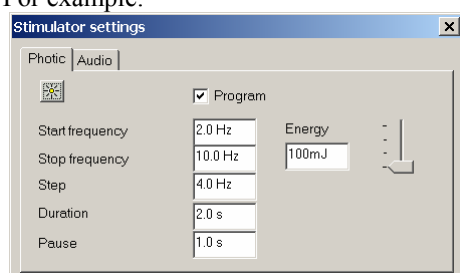
## Stimulator settings. Photic.

You can control the stimulator manually or use a *Program*. In manual mode you set the *Frequency* and the *Energy* of the flash. The stimulator then works with these parameters until switched off.



When *Program* is used flash frequency is varied automatically.

For example:



When the stimulator is switched on the following pattern will be generated:

First for 2 seconds (*Duration*) flash frequency will equal 2 Hz (*Start Frequency*)

Then the flash will pause for 1 second (*Pause*) and then continue at 6 Hz (the previous frequency of 2 Hz + 4 Hz *Step*). After 2 seconds it will again pause for one second. Then it will generate 2 seconds of flashes at 10 Hz and the program will be completed because 10 Hz is the *Stop frequency*.

If you select high frequency of flashes, the energy will be automatically reduced to prevent overheating of the flash.



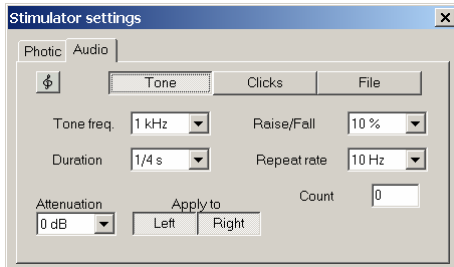
- is the *stimulator On/Off button*. Switches stimulator on and off (duplicates toolbar button). If you adjust the stimulation parameters while the stimulation is running, switch the stimulation off and on to apply changes.

The **Stimulator settings. Photic** dialog can be called by EEG+Stimulator Settings menu, **Photic** tab or **Shift+F3** key combination.

## Stimulator settings. Audio.

The dialog sets parameters of sound stimulation. The *Tone*, *Clicks* and *File* buttons select the type of sound. The sound could be a pure tone, short clicks, or for some device models a computer sound file as well.

### Tone



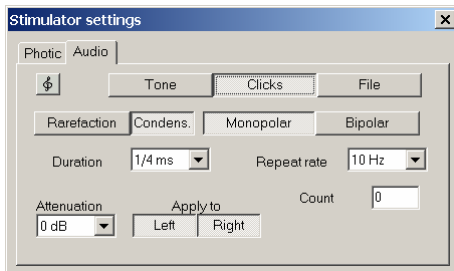
When the tone type of sound is selected, the following parameters can be set:

*Tone frequency* in Hertz.

*Duration* of a single tone in seconds.

*Raise/Fall* time interval in percent of *Duration*.

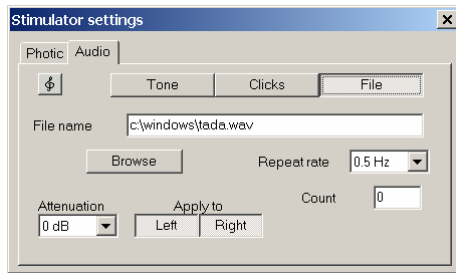
### Clicks



The polarity of clicks can be either Rarefaction or *Condensation*. They can also be *Bipolar* or *Monopolar*. These settings determine how the loudspeaker diaphragm is moving while producing the sound.

*Duration* sets the duration of the click in milliseconds.

## File



*File name* – sets the name of the file with sound that will be reproduced by the sound stimulator. The *Browse* button helps to choose the required sound file.


## Controls common for different sound types.

*Repeat rate* of signals in Hertz. For example when the repetition rate is 0.5 Hz, the sound is repeated every 2 seconds.

*Count* – The number of sounds before the stimulation automatically completed. If 0 is indicated, the stimulation will continue until terminated manually.

*Attenuation* is in decibel of maximum volume. **Please take care! Under a small attenuation the sound could be very loud that could harm the patient!**

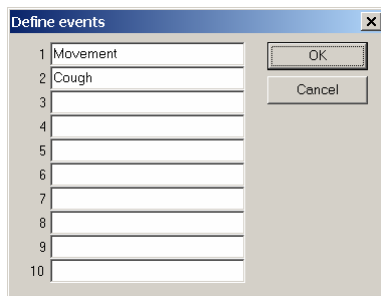
*Apply to* – the sound can be directed to the left, right or both loudspeakers.

 - is the *sound stimulator On/Off* button. Switches the stimulator on or off, the same as the toolbar button.

If the stimulation parameters have been changed, the stimulation will continue with old parameters until you switch the stimulation off and on.

The dialog is called by EEG+Stimulator Settings menu, **Sound** tab or **Shift+F4** key combination.

## Define events



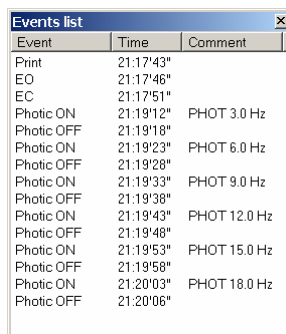
In this dialog you can define events, which will then be available from the **Events** menu during recording. The standard events such as **Eyes open**, **Eyes closed**, **Hyperventilation**, etc. always exist in the menu **Events**.

Using this dialog you can expand the menu with other event types. You can for instance create event types **Movement** or **Cough**.

To insert an event during recording select it from menu **Events**.

The dialog is called by **Events+Define Events** menu. See also **EEG Events**.

## Event list



| Event      | Time      | Comment      |
|------------|-----------|--------------|
| Print      | 21:17'43" |              |
| EO         | 21:17'46" |              |
| EC         | 21:17'51" |              |
| Photic ON  | 21:19'12" | PHOT 3.0 Hz  |
| Photic OFF | 21:19'18" |              |
| Photic ON  | 21:19'23" | PHOT 6.0 Hz  |
| Photic OFF | 21:19'28" |              |
| Photic ON  | 21:19'33" | PHOT 9.0 Hz  |
| Photic OFF | 21:19'38" |              |
| Photic ON  | 21:19'43" | PHOT 12.0 Hz |
| Photic OFF | 21:19'48" |              |
| Photic ON  | 21:19'53" | PHOT 15.0 Hz |
| Photic OFF | 21:19'58" |              |
| Photic ON  | 21:20'03" | PHOT 18.0 Hz |
| Photic OFF | 21:20'06" |              |

Allows browsing through the events of an encephalogram.

When an event is selected in the list, the EEG window shows the region of the encephalogram with the event.

The dialog can be displayed or hidden using **Events+List** menu. See also **EEG Events**.