User Manual

Neuro-Audio.NET
(for veterinary purposes)

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5, Voronin str., Ivanovo, 153032, Russia
P.O. Box 10, Ivanovo, 153000, Russia
Phone: (4932) 24-04-34; Fax: (4932) 24-04-35
E-mail: com@neurosoft.ru; Internet: www.neurosoft.ru

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List of Abbreviations

EP — evoked potentials

ABR — auditory brainstem response

AEP — auditory evoked potentials

BAEP – brainstem auditory evoked potentials

Glossary

Exam is a data set collected during the medical examination of an animal using the Neuro-Audio device. Exam includes data from one or more tests (traces and results of their processing) and exam reports. Exams are saved in an animal card.

Exam test is a data set collected while applying a specific medical technique (e.g., **TEOAE** study) and processed (analyzed) as a single set. As a rule, the exam test includes traces recorded from an animal and results of their processing.

Patient card contains basic data of an animal (name) and includes any number of exams carried out at any moment by any Neurosoft device. Patient cards are saved in card-files.

Card-file is a pool of any quantity of patient cards. Each card-file has a unique name and, in addition to patient cards, can contain nested card-files as well. Cards can be combined into a card-file by any feature. Well-organized card-file system will help you to put in order all the stored information and speed up the access to it.

Ipsilateral is a term corresponding to the stimulated ear.

Contralateral is a term corresponding to the ear opposite the stimulated ear.

During the acquisition with repetitive stimulation the **analysis epoch** means a time interval from the beginning of each stimulus when the digital signal from the device is converted into traces for further analysis and averaging.

Attention!

The device should be used only by the specialists who are trained to operate on it. It is not recommended to use the device without having the required knowledge, experience and skills of AEP result interpretation.

If you have bought the computer separately, install the software before the first connection of the device to the computer! After the first program start open **Setup|Change** menu command and specify the proper mains supply frequency on the “Hardware” page (60 Hz). Also, please select “Insert earphones” (ER-3C) as default earphones by executing the menu command **Setup|Assign calibration information.**

If activation (i.e. the file with license key) is needed while working with the device, contact your dealer or **Neurosoft** Company and inform them about the serial number of your device to get the license key file. This file can be recorded either in the work directory of the program (by default: C:\Program Files\Neurosoft\Neuro-Audio.NET) or in the root directory of any computer disk. The license key is needed only for data recording from the device. In case the data analysis without recording is carried out on any computer, the license key is not needed. You can install the program and license key on any number of computers without restrictions. If the device has been changed, a new activation (i.e. a new file with license key) will be necessary. In case several **Neurosoft** devices are used on one computer, you will need several files with license key as well (one file for one device).

Introduction

The Neuro-Audio.NET program is intended for diagnostic hearing testing of animals by recording of evoked potentials using the Neurosoft Neuro-Audio device and also for analysis of the recorded evoked potentials, generation of the report and printing out the results.

The adjustable graphic interface of the Neuro-Audio.NET is provided. The program enables several users to work with it independently. Each user can easily customize the program settings for his/her own needs, including the possibility to create any number of test templates with required default settings.

1. Software Installation and Launch

The Neuro-Audio.NET program has been developed for Microsoft Windows operating system, so the general principles of working with the program don't differ from the other applications for Microsoft Windows. Before using the program it must be installed on the computer. To start working with the program you must run it.

1.1. System Requirements

The **Neuro-Audio.NET** program has been developed for Microsoft Windows operating system (version 7 and higher), so the general principles of working with the program don't differ from the other applications for Microsoft Windows. Your computer must have at least one USB port to connect the device. But for the comfortable work with the Neuro-Audio.NET program the additional computer resources may be required (CPU, RAM, large monitor).

Minimum hardware requirements:

- Intel Core i5 2 GHz or higher.
- RAM: 4 GB or more.
- Monitor: 17" or more, resolution 1280×1024 or higher.
- Free disk space: 1.5 GB to install the program, 3 GB or more to store the exams.
- USB port to connect the device: 2 pcs.

You can also buy the Neuro-Audio device completed with computer from Neurosoft Company. In this case, the computer is completely ready for operation with the device and all the required software is installed. If you want to use the Neuro-Audio device with some other computer, then the Neuro-Audio.NET program must be installed on it in advance. The Neuro-Audio.NET software supplied on the electronic media is included in the delivery set and can be updated free of charge during device lifetime.

If the distributive is missing or the software update is required, address to your local dealer. The authorized Neurosoft dealers are listed on the website: https://neurosoft.com/en/pages/dealers.

1.2. Program Setup

To install the **Neuro-Audio.NET** program insert the electronic media with software into the drive of your computer and wait for the installation program to start. If the auto run does not start in a few seconds, find the *Autorun.exe* file on the electronic media and start it. The Installer Language window with interface language selection will appear on the screen (Fig. 1.1).

Fig. 1.1. Selection of program language.

After you select the program interface language, press “OK” to continue the installation or “Cancel” to cancel the installation. If you continue the installation, the Neuro-Audio.NET Setup window will appear on the screen (Fig. 1.2).

Fig. 1.2. Neuro-Audio.NET welcome screen.

Press “Next>“ to continue the installation. The “Choose Install Location” window will appear on the screen (Fig. 1.3). The program is installed in *C:\Program Files\Neurosoft\Neuro-Audio.NET* folder by default. To change the install location press “Browse…” and select the program location you need.

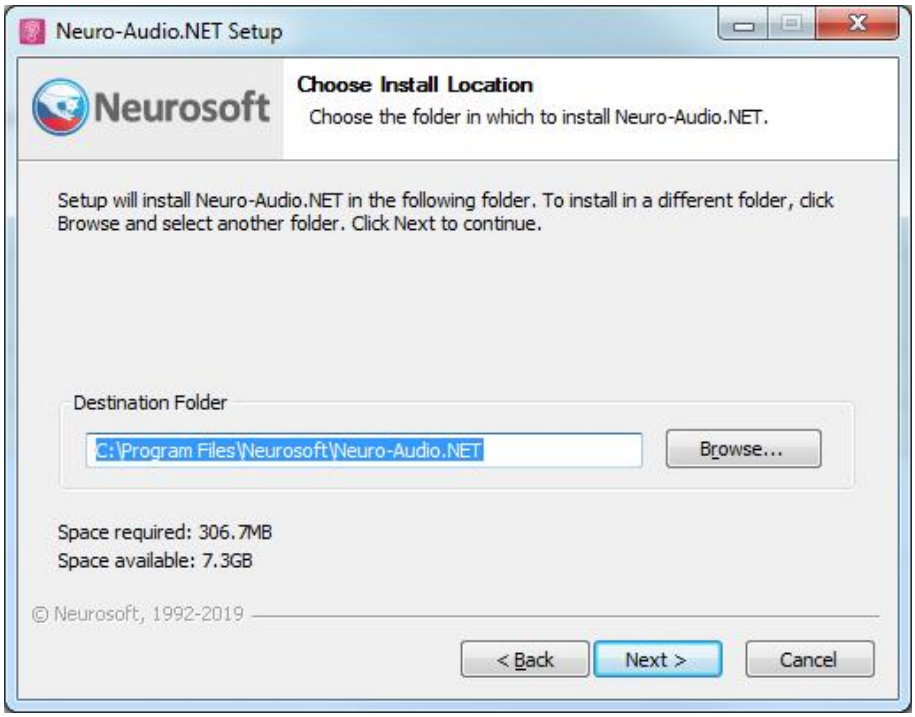


Fig. 1.3. Program install location request.

Press “Next>“ to continue the installation. To return to the previous window press “<Back”. To complete the installation press “Install” in the appeared window (Fig. 1.4).

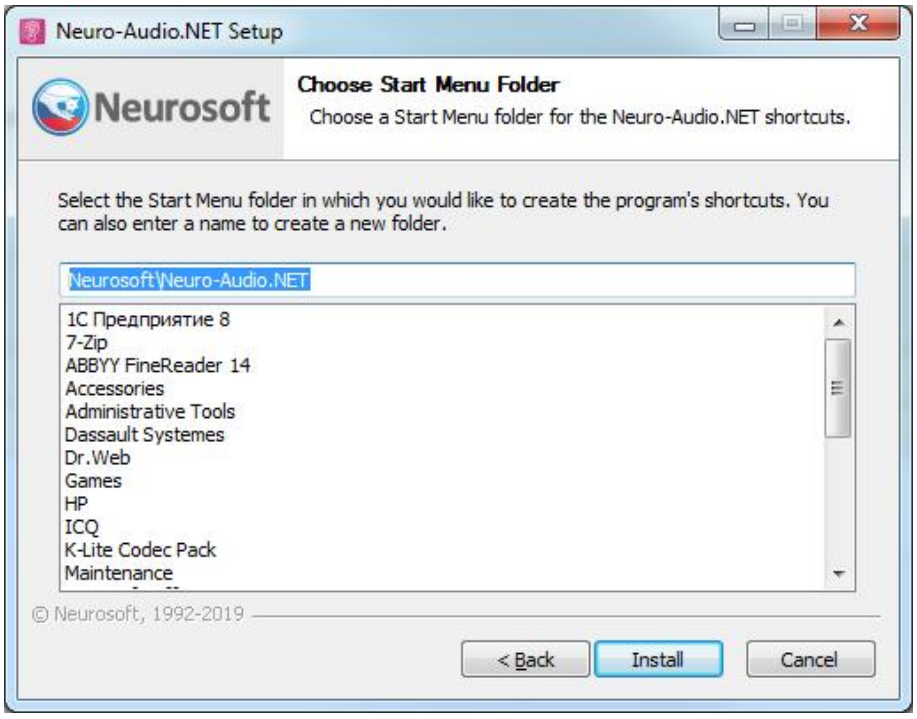


Fig. 1.4. Start Menu Folder selection.

In the next window (Fig. 1.5) wait until the installation is completed, press “Next>“ and finally, press “Finish” in the last appeared window (Fig. 1.6) to finish the installation.

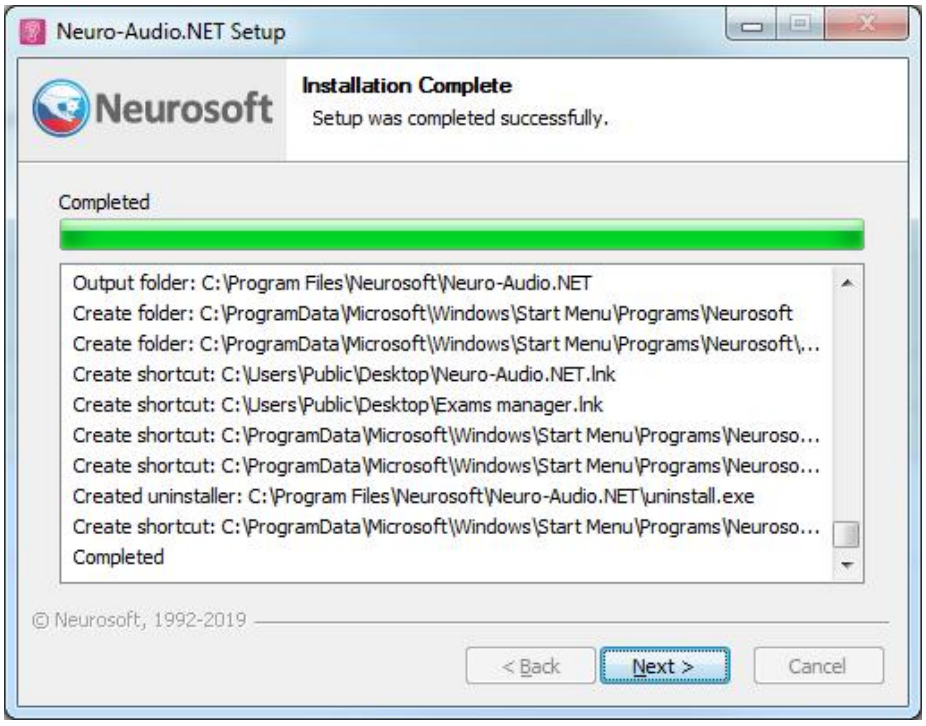


Fig. 1.5. Program installation process.

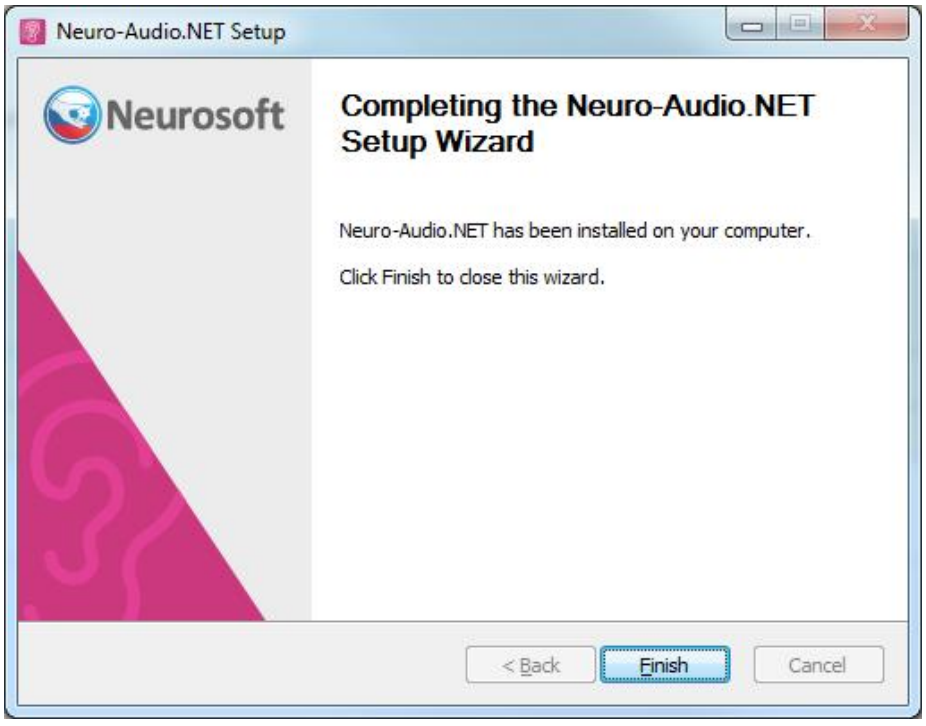


Fig. 1.6. Completion of program installation.

If you install the Neuro-Audio.NET program on your computer for the first time (from the electronic media), then the Microsoft.NET and Intel IPP library, the system components required for the proper work of the program, will be installed on your computer by the Neuro-Audio.NET setup wizard automatically.

1.3. Program Run

To run the **Neuro-Audio.NET** program, install it on your computer in advance (see sec. 1.2 “Program Setup”). In case the program has been already installed, execute one of the following actions:

- Double-click the program shortcut on the desktop by the left mouse button:  .
- Select the program in the **Start** menu of the operating system: **Start\Programs\Neurosoft\Neuro-Audio.NET**.
- Run the *C:\Program Files\Neurosoft\Neuro-Audio.NET\ NeuroSoft.NeuroAudio.exe* file.

1.4. Program Main Window

When the program is started, the user identification window appears on the screen (Fig. 1.7). Neuro-Audio.NET is a program which enables several users to work with it independently. If you run the program for the first time, enter your login. If you run the program not for the first time, select your login from the dropdown list. If you don’t want another user to work under your login, enter a password and the program will ask you for password at each program start. In case the multiuser operation is outside your plans, check the “Do not show this window” check box at the bottom of the screen and the user identification window will not appear at further startups. To finish the identification press “OK”.

Fig. 1.7. User identification.

When the identification is finished, the main window of the program appears on the screen (Fig. 1.8).

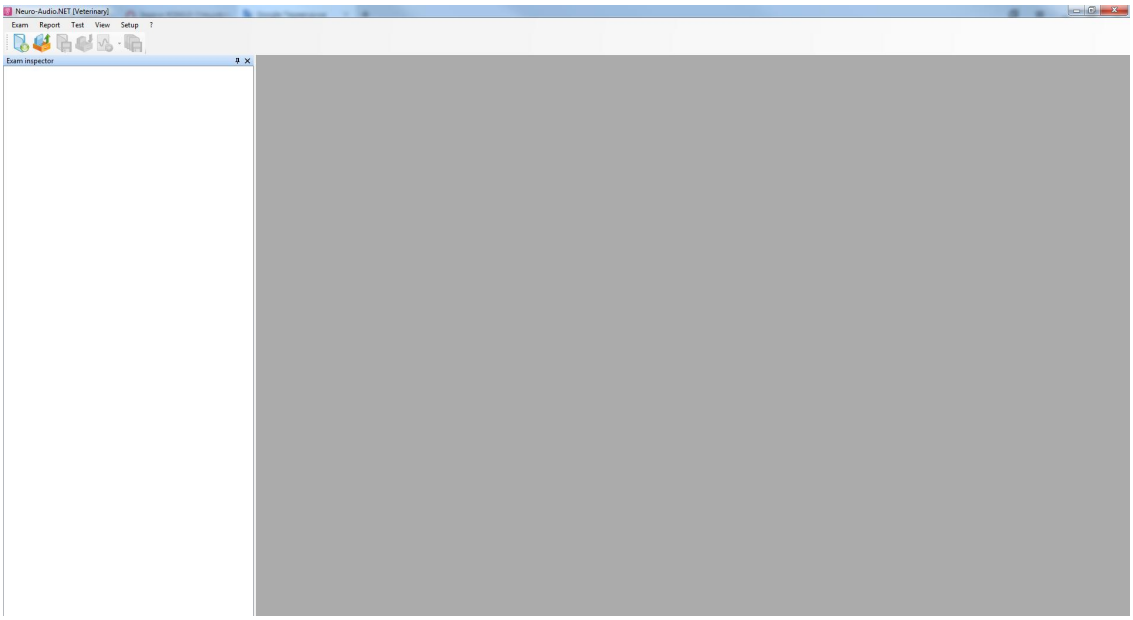


Fig. 1.8. Neuro-Audio.NET main window.

The main window of the program represents a traditional structure common to Windows applications. The window title and control buttons are located at the top of the window. The main menu bar is situated immediately under the title. Using the menu commands you can create new exams and open the existing ones, control the acquisition, make analysis and create exam reports. Using the menu you can access all program functions. The favorite menu functions can be added to the toolbar as buttons. The main toolbar is located under the menu bar of the program. In the Neuro-Audio.NET program there are several toolbars for acquisition, analysis, report creation etc. Each toolbar can be placed in any part of the window at user's desire. You can adjust the visibility of the whole toolbars as well as the visibility, size and view of their separate buttons. In the working space of the program, occupying the rest part of the main window, the recording, review and analysis windows as well as the exam report editors can be situated.

1.5. Program Exit

When your work with the program is finished, it must be closed. To exit Neuro-Audio.NET program execute one the following actions:

- Press the X button in the top right corner of the main window.
- Select the menu command **Exam|Exit**.
- Press the **[Alt+X]** key combination.

2. General Principles of Working with Program

In this chapter the workflow for the conventional ABR test (BAEP-test) using the Neuro-Audio.NET program is described. Before using the program it must be installed on your computer (see chapter 1.2 Program Setup) and the Neuro-Audio device must be connected to the USB port of the computer.

In the text the square brackets (**[ ]**) show the hotkeys which can be used instead of the described menu commands to speed up the work.

1. Run the Neuro-Audio.NET program. To get more information about installation and running of the program, see chapter 1.

2. When the program is started, the user identification window appears on the screen (Fig. 2.9). Enter the user's name and press "OK" (or just press "OK").

Fig. 2.9. User identification

3. Before the first exam you must execute the menu command **Setup|Change** and on the "Hardware" page check whether the mains supply frequency corresponds to that of your region accepted by default (for the USA – 60 Hz). Also, please select the default earphones (insert earphones ER-3C) by executing the menu command **Setup|Assign calibration information.**

4. To start a new examination of a new animal, select the menu item **Exam|New** (**[Ctrl+N]**). In the appeared “New exam” dialog box enter animal’s data and client's name (all these are optional) and press “OK” (Fig. 2.1). If you are short of time, just press “OK” (**[Enter]**) without entering any information.

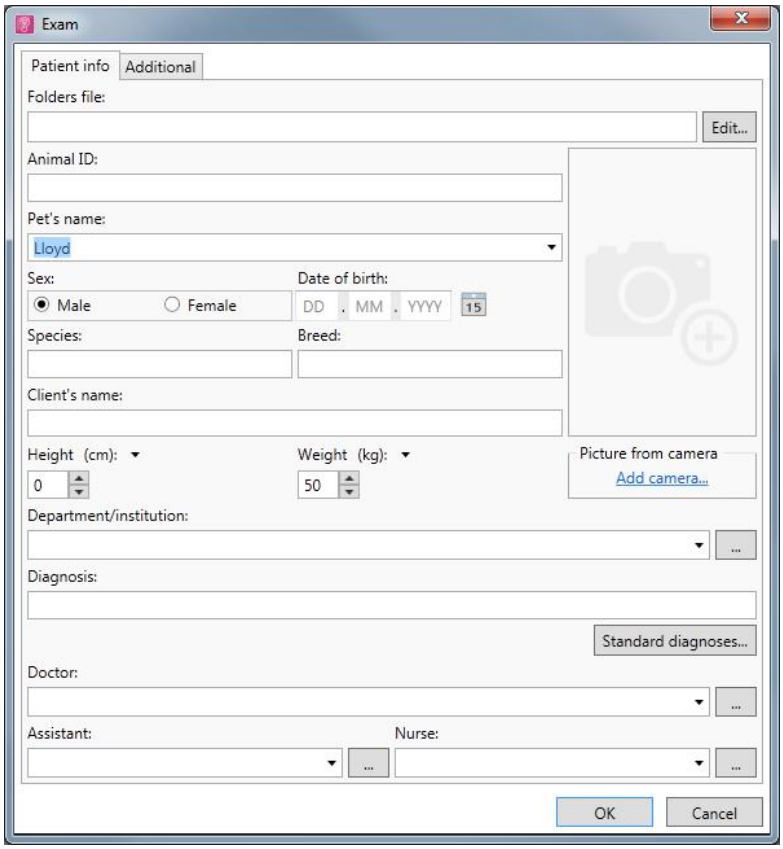


Fig. 2.1. “New exam” dialog box

5. To select a test type use either the menu command **Test|New test** or the quick-access toolbar button  . The “New test” dialog box will appear on the screen (Fig. 2.2). Click the left mouse button on the ABR test and then press “OK” (or **[Enter]).**

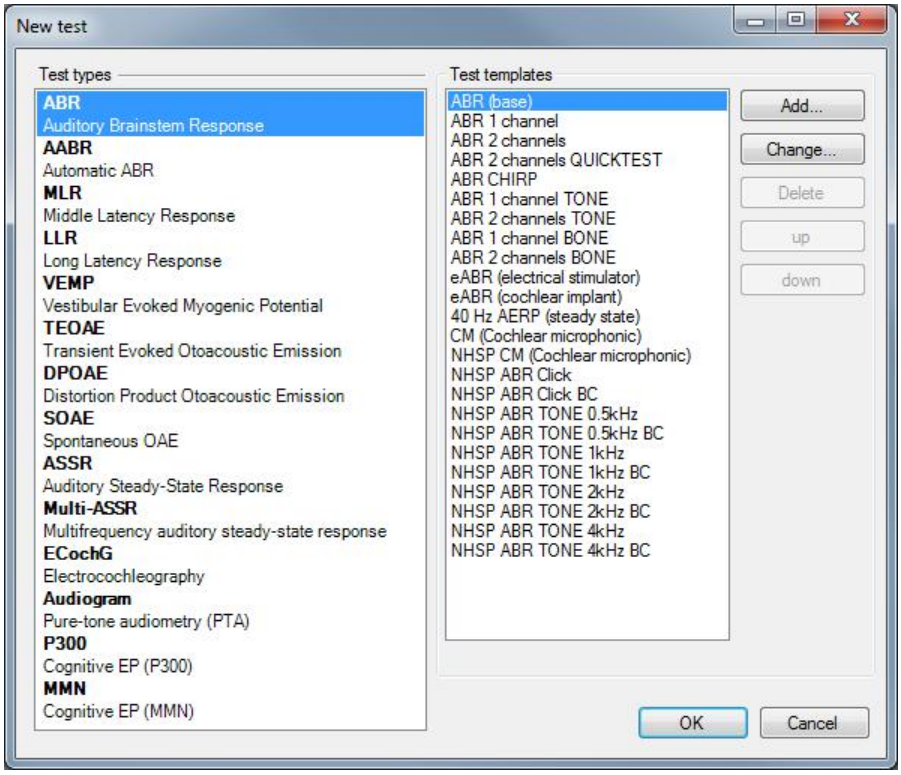


Fig. 2.2. “New test” window.

The main ABR test window will appear in the working space of the main window (Fig. 2.3). New items and toolbars specific to the selected test will be added to the main menu.

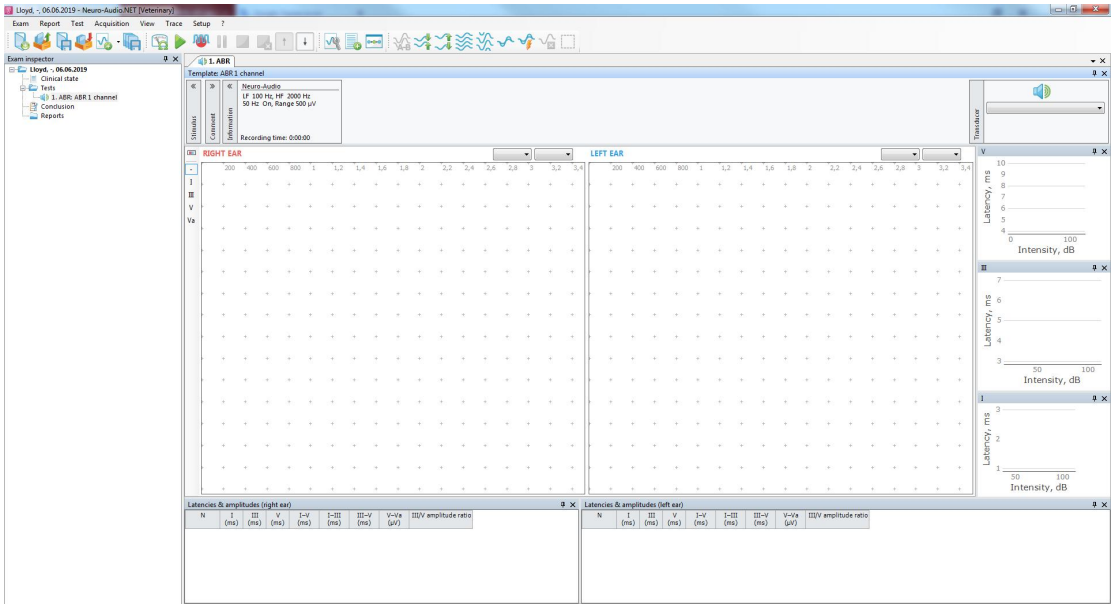


Fig. 2.3. Main ABR test window.

6. Start the process of electrode impedance measurement (the menu command **Acquisition|Impedance** or **[Ctrl+Z]**) (Fig. 2.3). Place the recording electrodes on the scalp of the examined animal and connect them to the amplifier inputs (with touch-proof connectors). At the same time control the electrode impedance. Close the impedance measurement window (**[Esc]**) at admissible impedance level (when the on-screen and on-device impedance LEDs are all green). One amplifier channel is used by default. To specify two channels use the menu command **Test|Template setup** (recommended). Then choose the "Channels" page to customize two channels. By selecting "Hardware"/"Stimulator" tab choose the required stimulus intensity scale (**dB SPL)**. Then press "OK".

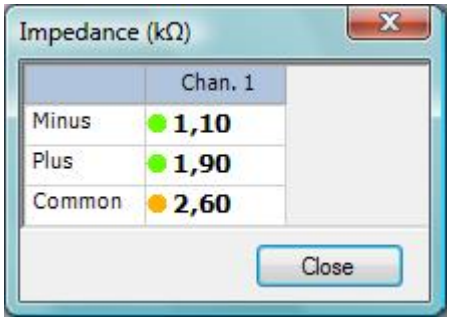


Fig. 2.4. Electrode impedance measurement window.

During BAEP acquisition the electrodes are connected to the amplifier in the following way:

- **Inverting (-)**: the electrode must be plugged in the "–" connector of the amplifier. Its color usually depends on the recording side: the left side is blue, the right side is red;

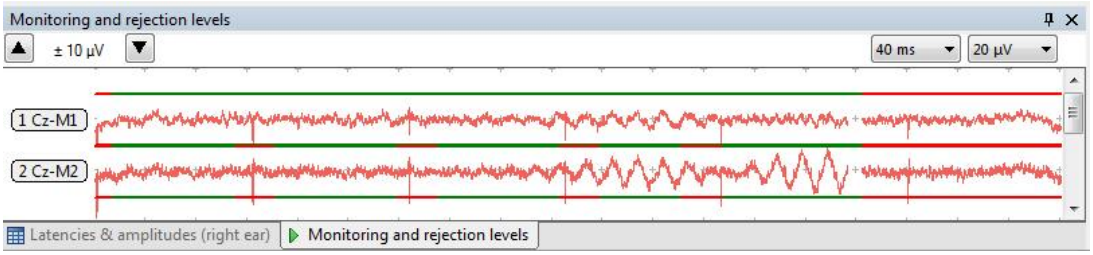
- **Non-inverting (+)**: the electrode must be plugged in the "+" connector that is usually of white color (if you use two channels, only one electrode is used and connected to the amplifier via Y-adapter).

Do not forget to place the **ground** (common) electrode on an animal (its connector on the amplifier electronic unit is usually of black color). If the ground electrode is not available, the interference (noise) level can be too high and you will fail to get good quality BAEP recording.

7. Take the auditory stimulator (earphones), choose the corresponding eartips and place them on the sound delivery tubes. Hold the tip between thumb and index finger and insert it into the ear of the animal. Please make sure that the ear tip is fully inserted into the ear canal, not leaving the ear canal open. Then connect the earphones to the corresponding device connector.

8. Press the "Monitoring" button on the toolbar to control the incoming EEG signal. Wait for an animal to calm down and ensure the ongoing signal is being displayed. If the signal level exceeds the target values (there are horizontal lines in the monitoring window), press the button with upward arrow (see screenshot below) to increase the rejection threshold for the artifacts or wait

for an animal to calm down (the noise level should be reduced and then it will be within the normal limits).



9. Start acquisition with repetitive stimulation using **Acquisition|Repetitive stimulation** (**[Ctrl+R]**) menu command and follow the process of signal averaging. If you fail to get the required evoked potentials, you can stop averaging by **Acquisition|Cancel** (**[Ctrl+T]**) menu command and then restart it. The **Acquisition|Reset** menu command can be also used to start signal averaging again (without stop of stimulation). Click stimulus is used by default.

10. When you get a clear waveform of auditory evoked potentials, finish the acquisition and save the traces for further analysis using the menu command **Acquisition**|**Stop**. If you do not want to save the traces, press **[Ctrl+T]** or **[Esc].** Repeat the acquisition for the chosen ear and the stimulus volume once again.

With the “Information” control panel at the top of the window change the stimulated ear and repeat the recording twice using the other ear. Here you can also adjust the auditory stimulation parameters:

- stimulus amplitude in dB SPL;
- stimulation rate (Hz);
- stimulated ear (left or right).

All the recorded traces can be analyzed after the acquisition. To select a current trace for analysis, click on it with the left mouse button. The analysis windows will refresh and the information about the selected trace will be displayed (or a table line corresponding to the current trace will be selected). Analysis tables and graphs are usually displayed below or alongside of the main display area of the recorded traces. To switch their visibility use **View|Windows layout|Show/hide all analysis windows** (**[Ctrl+Shift+Tab]**) menu command.

11. As a rule, during the acquisition, two traces are recorded simultaneously from each amplifier channel: in one trace the even epochs are averaged, in the other – the odd ones (i.e. buffers A and B). To make sure the response waveform is repeatable, press the **[Ctrl+E]** key combination when the panel with the averaged traces is in focus (click on the panel with the left mouse button if necessary). So you can switch the visibility between the summarized averaged trace and even/odd averaged traces

Check repeatability of the EP traces. Press the **[Ctrl+E]** key combination to switch between all (summarized) and even/odd averaged traces (see Fig. 2.5). To control signal repeatability the traces are averaged in two buffers during the acquisition: the even traces are averaged in buffer A and the odd ones – in buffer B. In case the shapes of even and odd averaged traces differ significantly, it means that you probably fail to get the response.

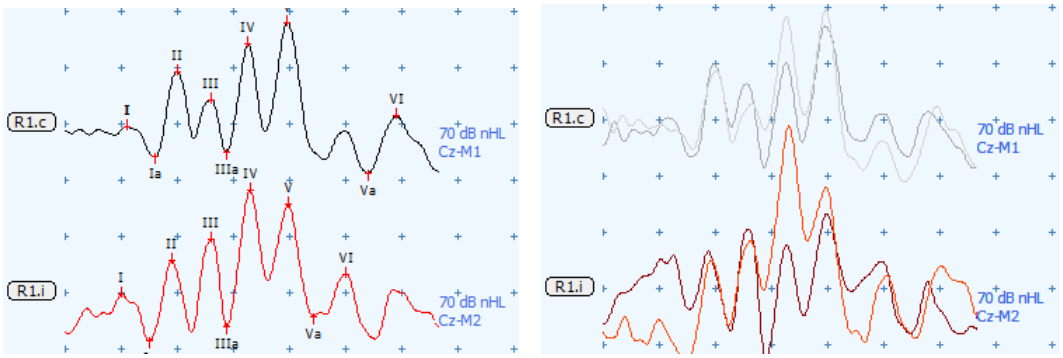


Fig. 2.5. Switching the visibility between summarized (left) and even/odd averaged traces (right)

12. The main method of getting the results of analysis in printed form is to generate an exam report and print it.

To create a new exam report use the menu command **Report**|**Templates** and select the template you need in the appeared submenu. To print the exam report use **Report**|**Print** (**[Ctrl+P]**) menu command. Before printing you can preview your exam report and make all necessary corrections (there is a possibility to edit the contents of the exam report).

After generation of the exam report you can either continue signal acquisition in any available test or create new tests.

13. To save the exam, execute **Exam**|**Save** menu command.

14. To finish the exam execute **Exam**|**Close** menu command.

15. To review the previous exams run the program and execute **Exam**|**Open** (**[Ctrl+O]**) menu command. Select the exam you need in the appeared “Exams manager” dialog box and press “Open”. To finish your exam review, execute **Exam**|**Close** menu command.

16. To close the program, execute **Exam**|**Exit** menu command.