

User Guide

# Alpha-Theta Protocol

This user guide has been created to educate and inform the reader about performing Alpha-Theta training with the NeXus-10 and NeXus-32.

For more information about NeXus, our BioTrace+ software, please visit our website or contact us.

**[www.mindmedia.com](http://www.mindmedia.com)**

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## Introduction

This manual provides a step-by-step review of how to perform Alpha-Theta training with the NeXus-10 and NeXus-32. The manual provides information about the required hardware, preparation and measurement steps, background information on artefacts and care of materials.

## Measurement setup

*Before the actual measurement can start, the equipment has to be connected. Detailed information on setting up the NeXus can be found in the NeXus User Manual or Quick Start.*

### EEG/EXG sensor setup with disc electrodes

The following is required to perform EEG measurements in an EXG sensor setup with disc electrodes:

- NeXus-10 or NeXus-32
- EXG Sensor, EEG Linked Ear Sensor (2 or 4 channel)
- EXG Ground
- EEG Discs (Ag/AgCl)\*
- Nuprep
- Electrode paste (e.g. Ten20)
- Ear clips for EEG discs
- Scoop (for Electrode paste)
- Tissues
- Cotton swabs
- Measuring tape
- Skin marker
- Minicap or Microcap

\*Recommended use is 10-20 times. The layer of Ag/AgCl will gradually wear off influencing signal quality.

Connect the EXG or EEG Sensor to input A&B of the NeXus-10 and input 25&26 of the NeXus-32. Make sure the red dot of the connector is facing downward with the NeXus-10 or upward with the NeXus-32.

*With the EXG sensor A1/M1 or A2/M2 are used as reference. Alternatively, the EEG Linked Ear sensor (2 or 4 channel) can be used for a single channel linked ear referenced setup. In that case, A1/M1 and A2/M2 are used as reference and ground is preferably placed near the other reference electrodes on the scalp.*

Connect the EXG Ground to the Ground (Gnd) of the NeXus.



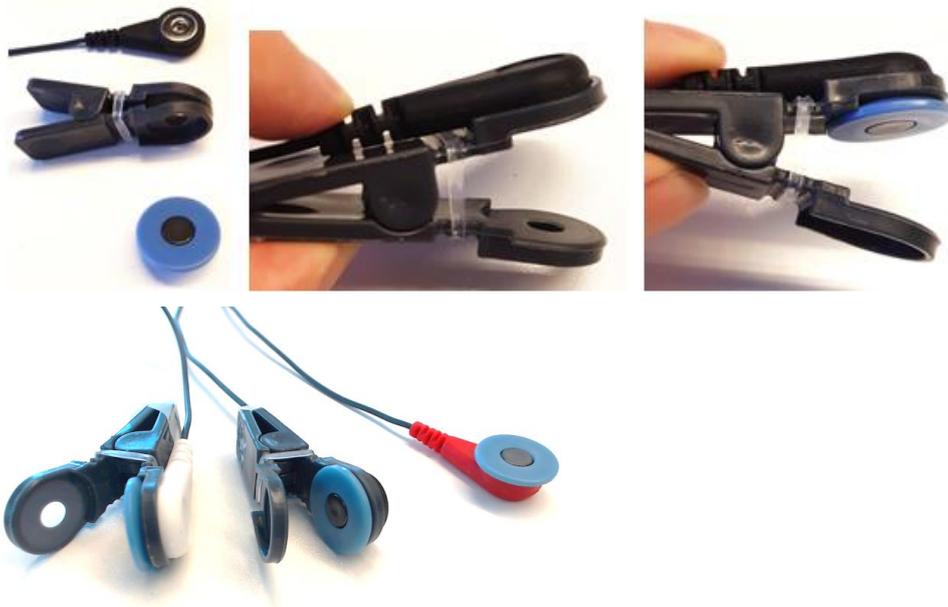
Sensors can be disconnected by pulling the silver ribbed part of the connector backward.



Place a disc electrode on to the red snap-on of pair one of the EXG or EEG sensor



Place the black snap-on of pair one of the EXG sensor and the ground snap-on together with disc electrodes on to an ear clip.



Determine electrode positions according to the 10-20 system (Appendix: 10-20 EEG system) by using measuring tape and marking positions with a skin marker.

Rub the skin with a cotton swab and Nuprep at all electrode positions. Remove residual gel with a tissue. As an alternative to using Nuprep, alcohol pads are sometimes used.



Use the clip of the EXG cable to attach the EXG sensor to prevent pulling of the cables.



Apply some electrode paste (e.g. Ten20) to the electrodes by using for example a scoop.



Place the ear clip with the black (reference) snap-on with electrode on to the earlobe of the same side (ipsilateral) of the location of interest.



Place the earclip with ground snap-on with electrode on to the other earlobe.

Place the red (positive) snap-on with electrode on to the skin at the location of interest (Pz).

### Additional Biofeedback sensors

Additional biofeedback sensors (Skin Conductance, Temperature) can be applied, using the following NeXus inputs.

<b>NeXus-10</b>		<b>NeXus-32</b>	
<b>E</b>	 Skin Conductance	<b>29</b>	 Skin Conductance
<b>F</b>	 Temperature	<b>32</b>	 Temperature

Now go to chapter 'BioTrace+' for further instructions.

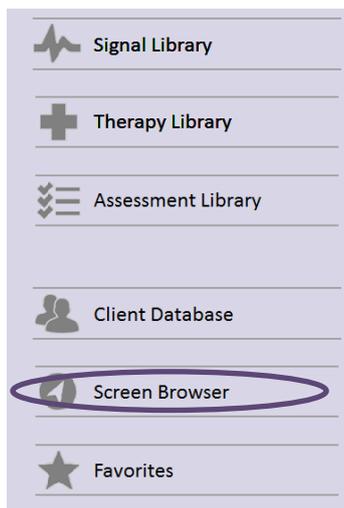
## BioTrace+

Make sure to install the Alpha-Theta screens first (Appendix: Installation).

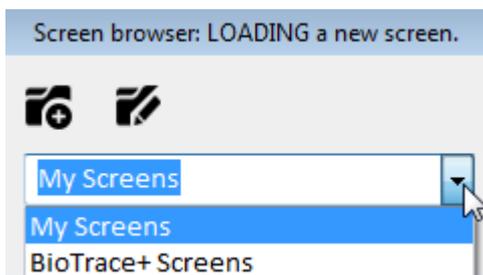
Start the BioTrace+ Software.



Select **Screen Browser**.



Select **My Screens**.



Select **Alpha-Theta**.

Double Click the **Alpha-Theta** screen to open the therapist screen.

Make sure the person sits comfortable, preferably in a slight recline with feet elevated. A rolled towel can be used to support the neck. This is an eyes closed exercise, position the client so that they can hear the audio feedback.

Switch the NeXus on.

Click the **recording** button.

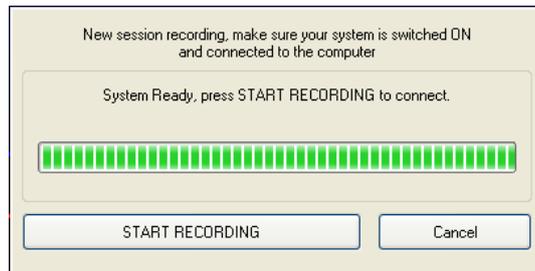


The *select a client* dialog box will appear.

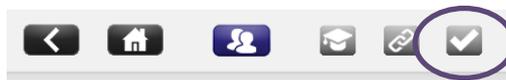


Select a client and click **Continue...** or click **Add New** for adding a new client.

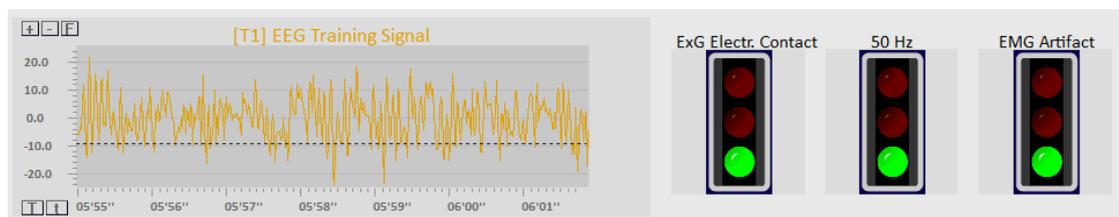
The *New session recording* screen will appear. Click **Start recording** to start recording a session.



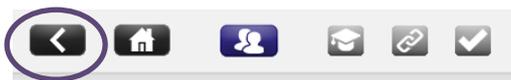
Click the **signal check** button to check electrode contact, 50/60 Hz artifact and muscle tension (EMG) interference.



Electrode contact, 50/60 Hz artifact and muscle tension (EMG) interference can be checked for the selected positions.

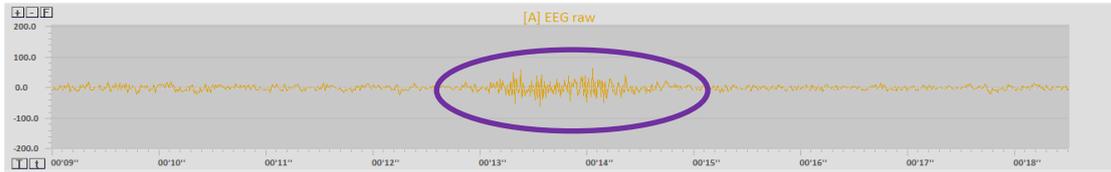


Click the **back** button.

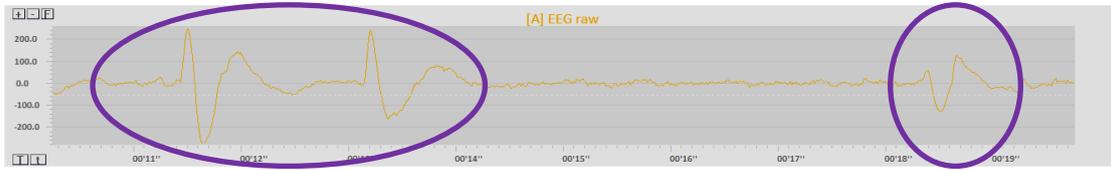


Visually inspect the EEG to pinpoint and possibly reduce artifacts. Prevention is better than to cure and prevents having to mark and remove artifacts afterwards. For more details about the following artifacts, see the Appendix: Artifacts.

- **Muscle tension**  
Electrical activity of the muscles occurs, (head, shoulders, tongue, jaws, etc.). Make sure to relax.



- **Eye movement**  
Looking up or down.



After having checked signal quality, the actual exercise can be started. Have Client Close Eyes and begin training.

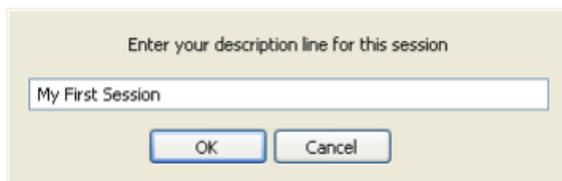
In order to stop the recording, click the **stop** button.



An alert box will appear.



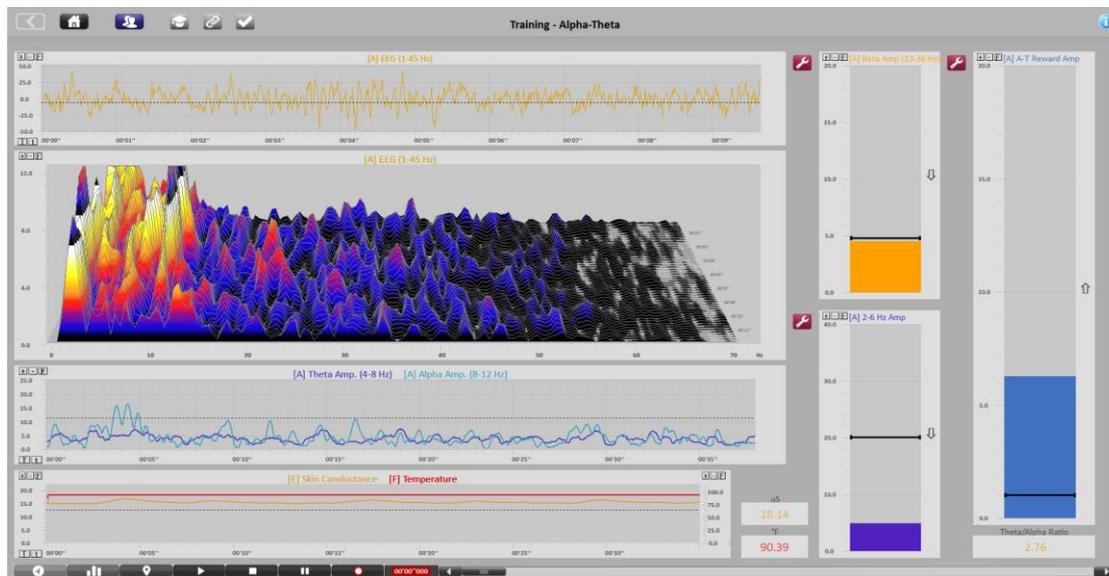
Click **Yes** and save the session and enter a description of the session.



Confirm by clicking **OK**, the session is now saved.

## Background information and screen adjustments

The Alpha-Theta Neurofeedback screen has three bar graph instruments, one representing the A-T reward (6-9 Hz), one representing the Beta (13-36 Hz) inhibit and one representing the Delta/Theta (2-6 Hz) inhibit. It also has a line graph and a spectral display showing the EEG data, a trend line graph showing Theta and Alpha amplitude and a Skin Conductance and Skin Temperature graph.



The A-T reward bar graph produces music when the bar is above threshold. The Threshold is set at 1  $\mu\text{V}$  as default. Audio feedback (music) becomes louder when the bar rises higher and is more quiet when the bar is lower in the graph, both in relation to the threshold.

The Beta amplitude bar graph (13-36 Hz) represents the beta and fast beta frequencies and produces an ocean wave sound when the bar is above threshold. This is a proportional audio feedback sound that becomes louder when the bar is lower and closer to the threshold. Audio only occurs when the bar is above threshold. The Threshold is set at 5  $\mu\text{V}$  as default.

The Delta-Theta amplitude bar graph (2-6 Hz) bar graph produces a bird chirping sound when the bar is above threshold. The Threshold is set at 20  $\mu\text{V}$  as default.

Custom frequency band ranges can be set by clicking the **wrench** button.



Set a frequency range between 1 and 50.0 Hz. Click **OK** after setting the custom range.

Set the FREQUENCY range:

-  Hz.

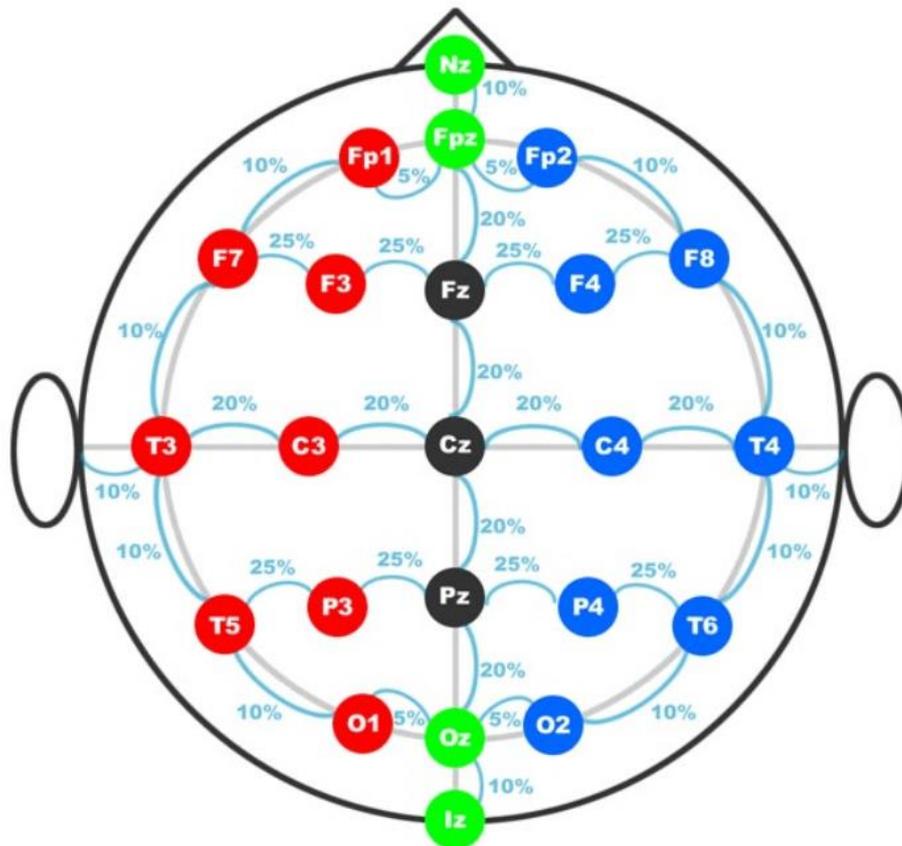
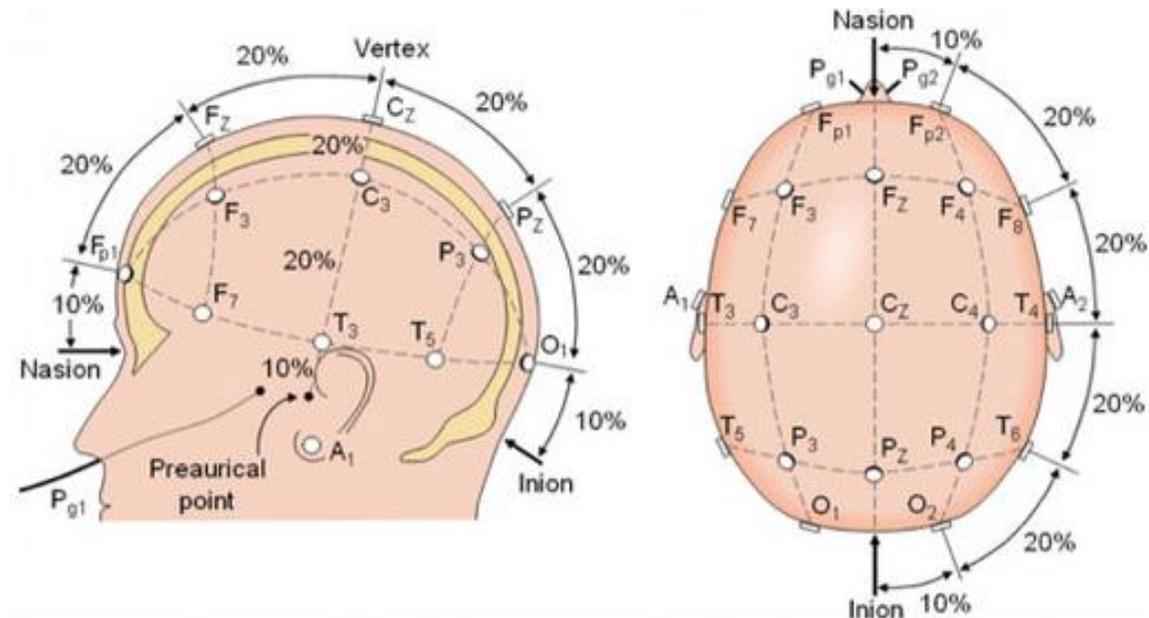
Y-scales can be adjusted with the + and - buttons in upper left corner of each graph.



This will change the volume gradient. Set the Y-scale on each instrument for optimum volume changes. For more specific Y-scale changes, right click in the bar graph you wish to change, choose **Display Options and Ranges** and change the y-scale at the top of this menu.

## Appendix 1: 10-20 EEG system

Use the Internationally accepted 10-20 EEG system for EEG electrode placement.



## Appendix 2: Artifacts

- **50/60 Hz interference** The EEG activity has very low voltages, expressed in microvolts. Electrical interference can arise from electrical devices, lighting, etc. Electrical devices and cables transport electrical power at a level of 110-230 Volts AC. This power is alternating 50 or 60 times per second and therefore called “alternating current” or AC. This 50 or 60 Hertz activity can show up in the EEG, especially where the electrode doesn’t make good contact, or where there are simply too many cables and electrical devices around. This is a very common artifact. The quality and design of the hardware also strongly influences the presence of 50/60 Hz.
- **Muscle tension**  
Electrical activity of the muscles (head, shoulders, jaws, tongue, etc) can interfere with the EEG. EMG activity can reach amplitudes of more than 100 microvolts. Thus the EMG is more powerful than the EEG signal. Too much muscle tension can completely contaminate the EEG. Make someone aware of EMG artifacts by instructing them to clench teeth, chewing, frown, raise eyebrows, move the head side to side, up and down and swallow to produce artefacts while looking to their EEG signals. Pay close attention to the temporal electrodes T3, T4, T5 and T6 (modified combinatorial nomenclature or 10-10 system- T7, T8, P7 and P8) to identify muscle artifact from the masseter muscles. EMG may also be observed quite strongly in the frontal and occipital electrodes.
- **Eye movement**  
Eye movement, both slower (looking up or down) and faster (blinking the eye) can cause artifacts, which are larger than the actual EEG signals. These artifact are very frequent. Eye blinks are most visible in the frontal locations (Fp1, Fp2, F3, F4, F7, F8). Make someone aware of eye movement artifacts by instructing them to blink, move eyes up, down, right and left while looking at their EEG signals.
- **Cardiac signals**  
In some cases the electrical signal of the heart (ECG) can show up in the EEG. The pulsation of veins below an electrode can also cause short spike in the EEG. This artifact is relatively rare.

## Appendix 3: Care of materials

### *NeXus EXG sensor cleaning*

The NeXus EXG sensors can only be cleaned. There are no procedures or prescriptions for disinfecting.

The sensor cables and snap-ons can be cleaned with lukewarm water and with an alcohol solution (70%) or alcohol prep pads (do not submerge in water or in alcohol solution).

Please avoid cleaning the connector, as this may affect its performance.

### *Electrode (Ag/AgCl) cleaning*

Electrodes can be cleaned with lukewarm water.

Pay attention to the residual layer of gel or paste, which could dry and influence signal quality. This creates high resistance layer that prevents the recording.

Do not use abrasive or sharp objects which may result in permanent damage of the electrodes.

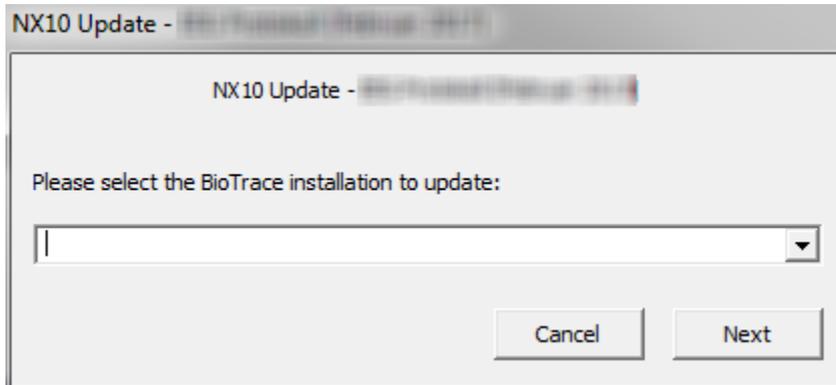
### *Electrode (Ag/AgCl) storage*

If the electrodes will not be used for a few days or longer, it is recommended to clean and dry the electrodes before they are stored.

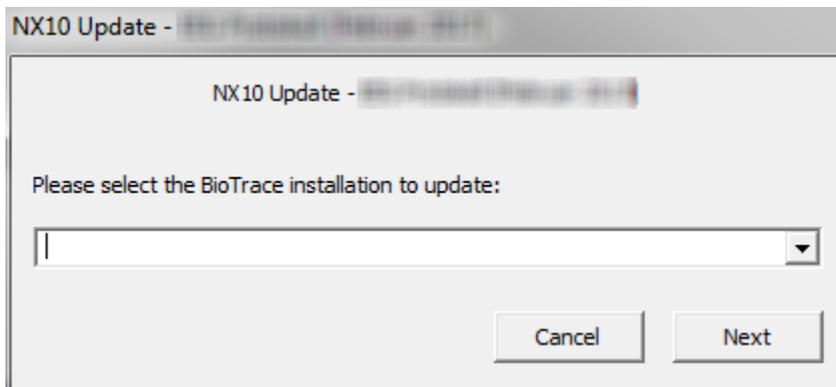
Put them in e.g. a re-sealable plastic bag, so that the moisture cannot act on the electrode.

## Appendix 4: Installing Alpha-Theta screens in BioTrace+

1. Close BioTrace+
2. Run the file **NX\*\*\_Alpha-Theta.exe** (the software will now search for BioTrace+ installs on the computer).



3. Select the BioTrace+ directory where the protocol needs to be installed (this step is only necessary when there are multiple versions of BioTrace+ installed) and click **Next**.



4. Click **Exit** once installation has finished.

