NeuroLynQ User Guide v3.1

Rev. a

shimmer
DISCOVERY IN MOTION

CONTENTS

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What's New in this Release

NeuroLynQ v3.1 brings a number of new features to perform the analysis of recorded NeuroLynQ@Home trial.

Updates:

- Option to Load Event Marker File
- New Manage Data tab buttons – Refresh, Download
- NeuroLynQ@Home Trial Settings panel

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Introduction

- The Shimmer NeuroLynQ solution integrates both hardware and software to provide unprecedented insight into the emotional responses and implicit reactions of a large group.
- The solution can be applied to a variety of applications such as:
  - Focus Groups
  - Movie Screenings
  - Mock Jury Trials
  - Video Ad Testing
  - Athletic Events
  - Pilot Screenings
  - Education
  - Workforce training

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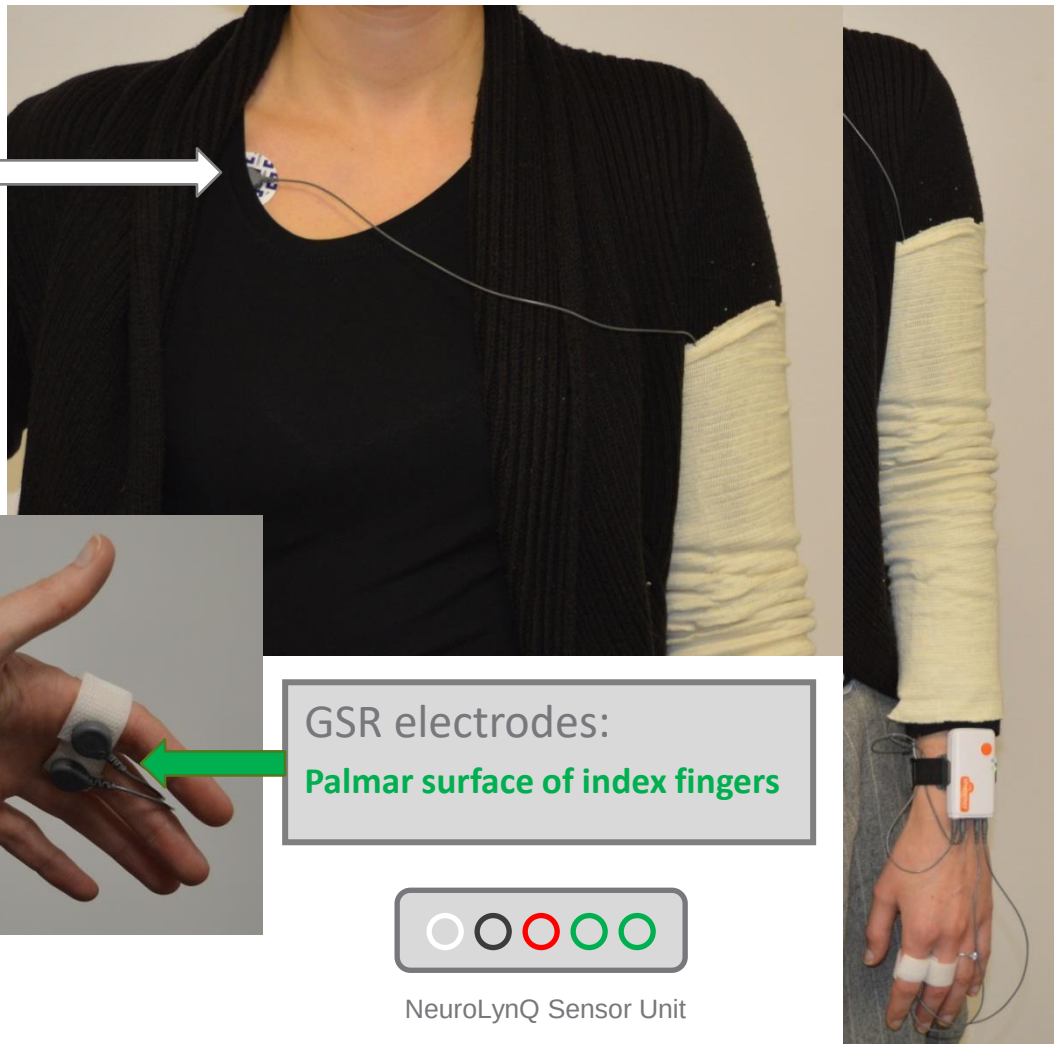
NeuroLynQ Setup (Sensor)

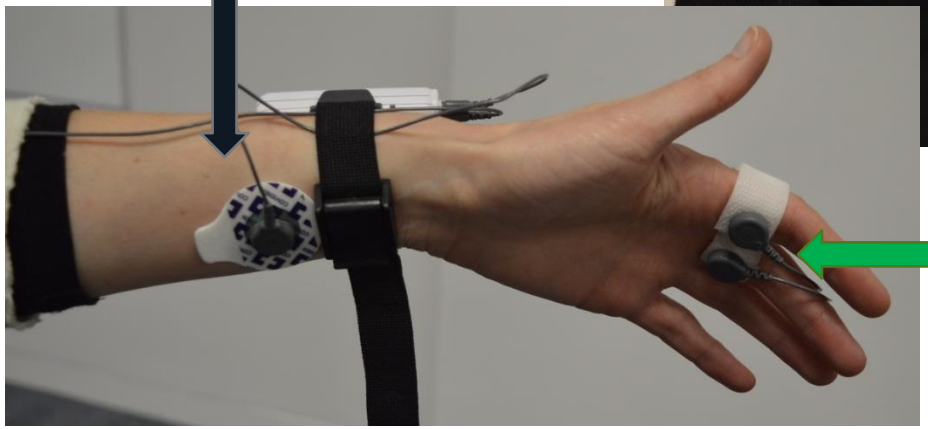
ECG electrodes:

Right chest (under collarbone)

Left wrist

NeuroLynQ Sensor Unit





GSR electrodes:

Palmar surface of index fingers

NeuroLynQ Sensor Unit

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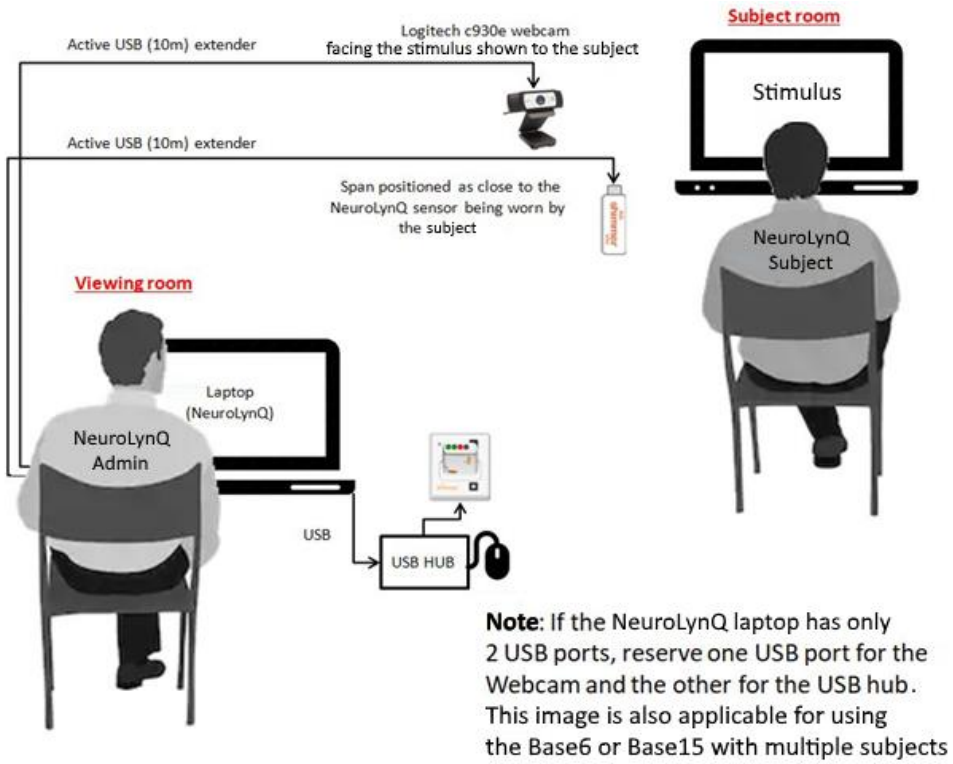
Note: It is not mandatory to connect the ECG electrodes to the subjects if you do not wish to capture ECG and HR data. NeuroLynQ hardware and software will function perfectly fine with just the GSR electrodes

NeuroLynQ Setup (System)

Recommendations

1. It is preferable if the NeuroLynQ admin is located in another room to the NeuroLynQ subject(s) or at the very least outside of the subject(s) line of sight.
2. Position the span radio module where it has the best line of sight with each NeuroLynQ sensor (often this is above the subjects).
3. Position the webcam so that the stimulus can be easily observed by the NeuroLynQ admin so that event marking is easier.



Note: It is recommended to insert the webcam and NeuroLynQ span directly into the USB ports on the laptop running NeuroLynQ via the active USB extenders and **not through** a USB hub. If the laptop running NeuroLynQ has only two USB ports then it is recommended to allocate one USB port for the webcam and the other USB port for the USB hub.

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INSTALL HARDWARE (1/8)

STEP 1 – Connect the USB Hub to its AC adapter. Insert the power plug into a mains power socket.

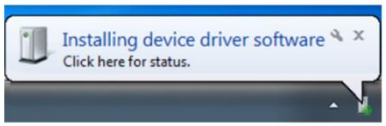
STEP 2 – Connect the USB Hub to its USB cable. Insert the other end into a USB Port of the PC either directly or via the supplied USB extender and UTP cable.

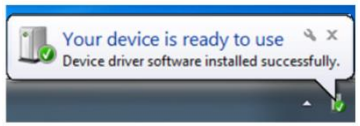
STEP 3 – Connect each *Base* with an AC adapter. Ensure you match the AC adapters accordingly, 3.5A for Base6 and 5A for Base15.

STEP 4 – Plug a power cable into each AC adapter and the other end into a mains power socket.

STEP 5 – Connect each *Base* to an USB Port on the PC (using the supplied USB-to-MiniUSB cable). Alternatively, the extra USB Port on a *Base* can be used to link other *Base*s together in a chain.

STEP 6 – Windows will now install the drivers for the *Base.* Status feedback is given in Windows' system tray (right bottom corner of the screen):





N.B. The driver installation can take up to a few minutes at the end of which the system tray icon will disappear. In case you are not sure if the installation has finished, proceed to the next STEP to verify the driver installation.

N.B. The screenshots in this section are made using Windows 7. The screens on your PC might look slightly different.

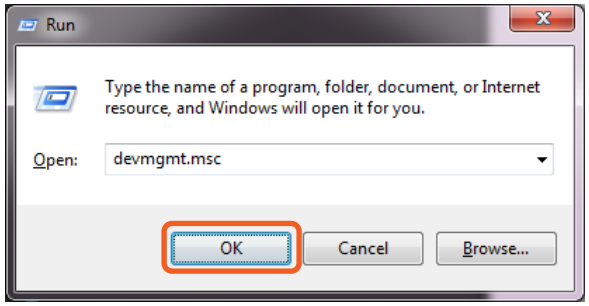
INSTALL HARDWARE (2/8)

STEP 7 – Verify driver installation:

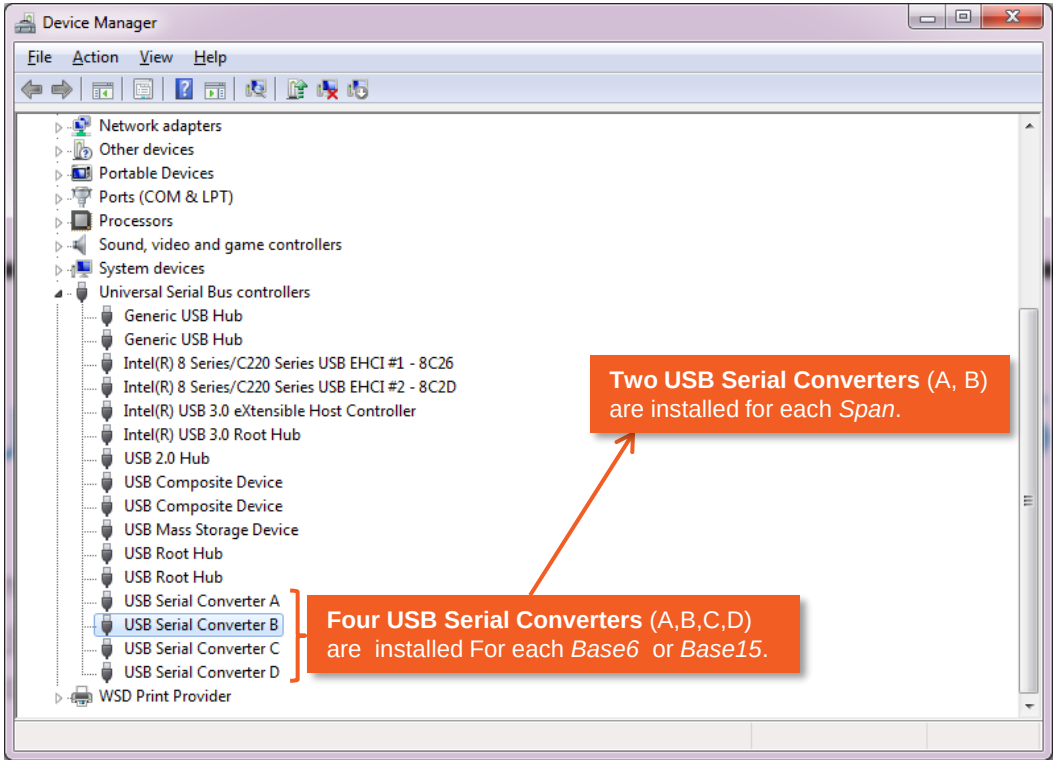
A. Run the Device Manager: Press *[Windows Key] + R*; type *devmgmt.msc*; click "OK".

B. Expand the 'Universal Serial Bus Controllers' category.

A



B



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INSTALL HARDWARE (3/8)

STEP 8 – Verify driver installation - continued:

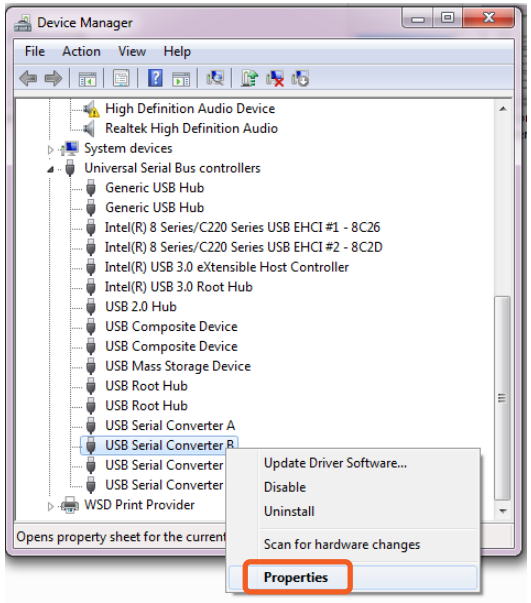
C. Right-click on one of the USB Serial Converters; click **Properties**.

D. Go to "Driver"; check if ***FTDI Driver v2.12.0.0*** or later is installed → **Correct Driver has been installed!**

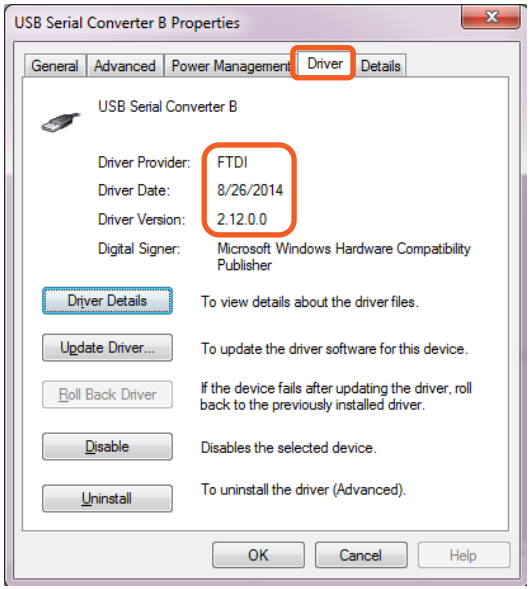
E. Go to "Advanced"; make sure ***Load VCP*** is checked.

F. Repeat for the other USB Serial converters. If the correct driver is installed for all USB Serial Converters the driver installation has been successful and the hardware is successfully setup – proceed to "Installing the software".

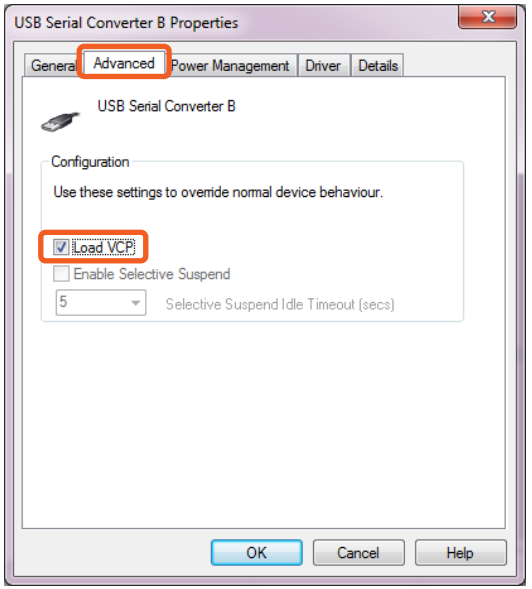
C



D



E



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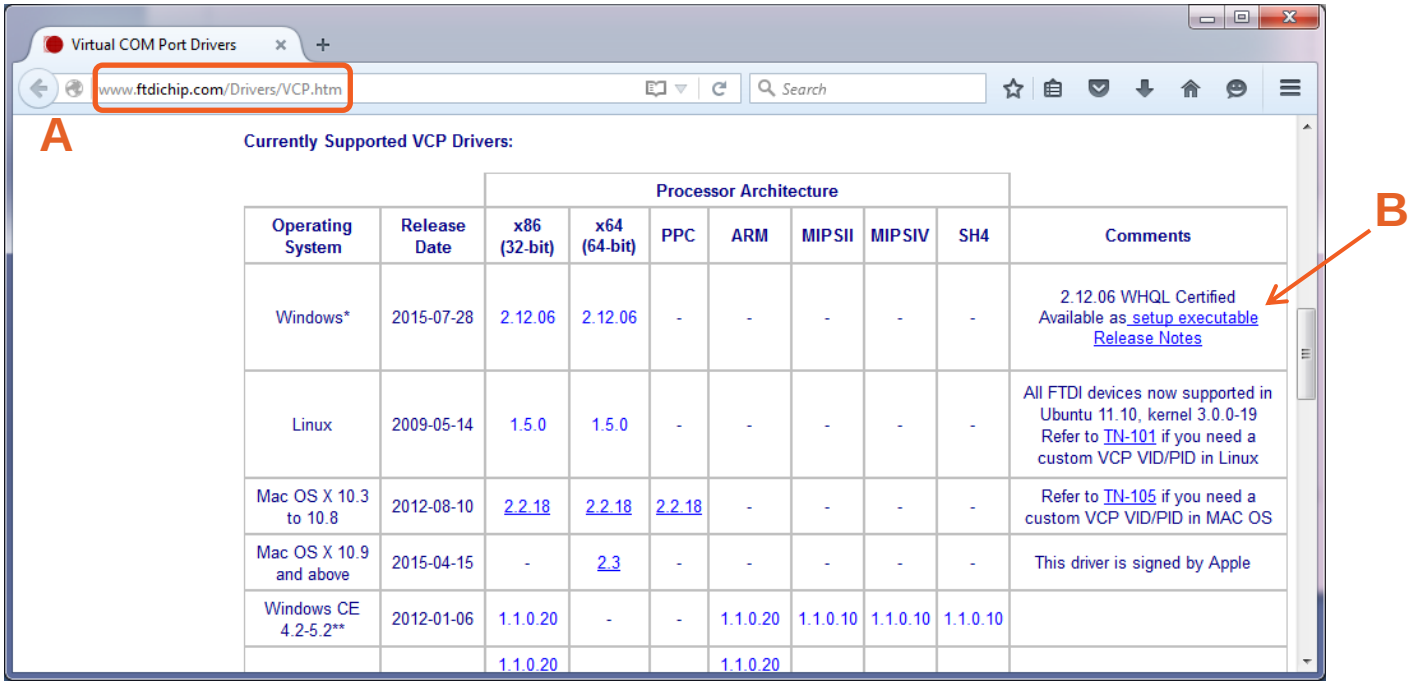
INSTALL HARDWARE (4/8)

STEP 9 – Download the FTDI Driver:

A. Go to http://www.ftdichip.com/Drivers/VCP.htm.

B. Download the latest Windows "setup executable".



Currently Supported VCP Drivers:

Operating System	Release Date	Processor Architecture: x86 (32-bit)	x64 (64-bit)	PPC	ARM	MIPSII	MIPSIV	SH4	Comments
Windows*	2015-07-28	2.12.06	2.12.06	-	-	-	-	-	2.12.06 WHQL Certified Available as setup executable Release Notes
Linux	2009-05-14	1.5.0	1.5.0	-	-	-	-	-	All FTDI devices now supported in Ubuntu 11.10, kernel 3.0.0-19 Refer to TN-101 if you need a custom VCP VID/PID in Linux
Mac OS X 10.3 to 10.8	2012-08-10	2.2.18	2.2.18	2.2.18	-	-	-	-	Refer to TN-105 if you need a custom VCP VID/PID in MAC OS
Mac OS X 10.9 and above	2015-04-15	-	2.3	-	-	-	-	-	This driver is signed by Apple
Windows CE 4.2-5.2**	2012-01-06	1.1.0.20	-	-	1.1.0.20	1.1.0.10	1.1.0.10	1.1.0.10	
		1.1.0.20			1.1.0.20				

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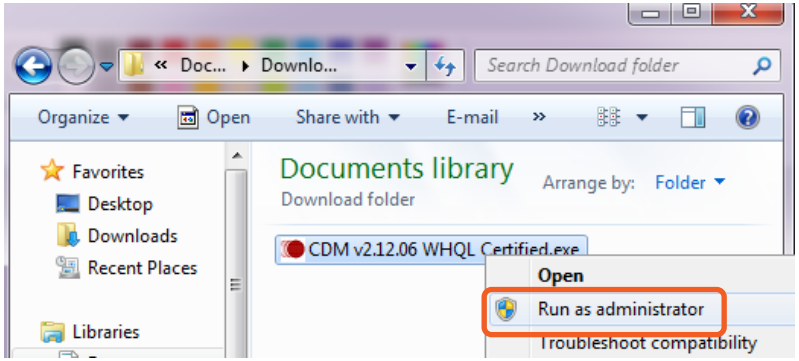
INSTALL HARDWARE (5/8)

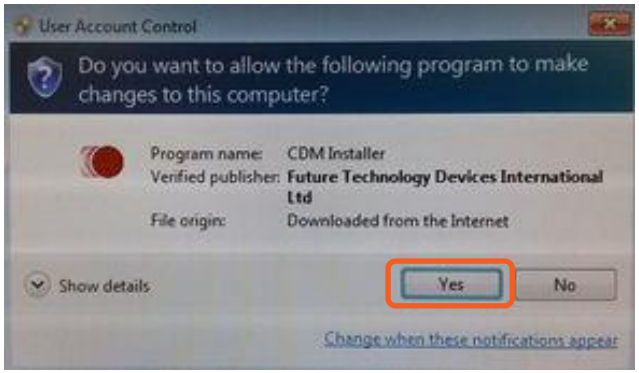
STEP 10 – Manual Driver installation:

Right-click the downloaded file;

"Run as administrator":



Press "Yes" if this screen if shown:



N.B. If a security warning pops up, click "Run".

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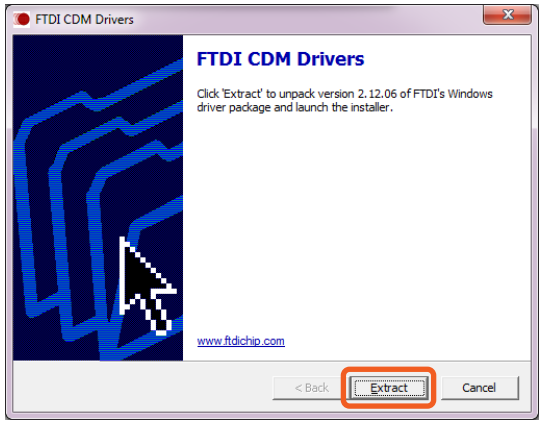
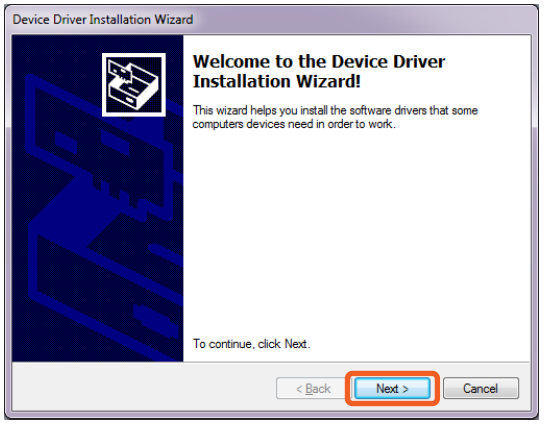
INSTALL HARDWARE (6/8)

STEP 11 – Manual Driver installation - continued:

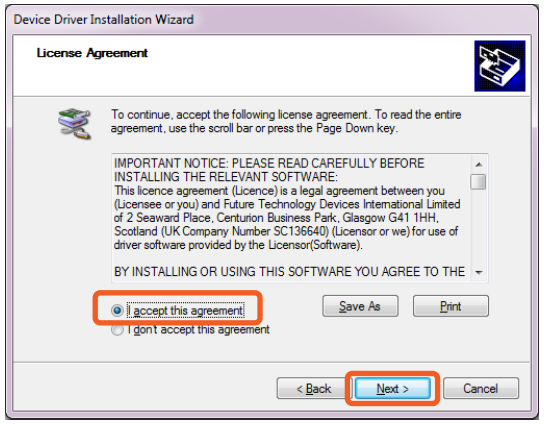
Click “Extract”:



Click “Next”:



Accept and click “Next”:



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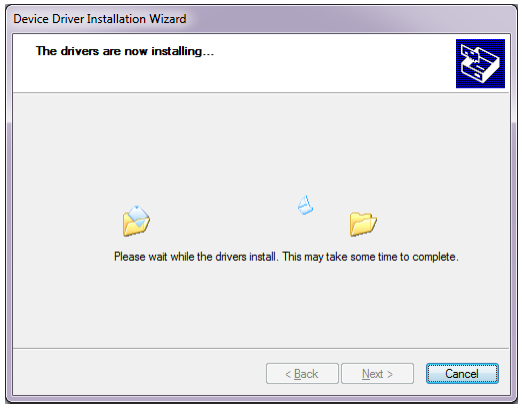
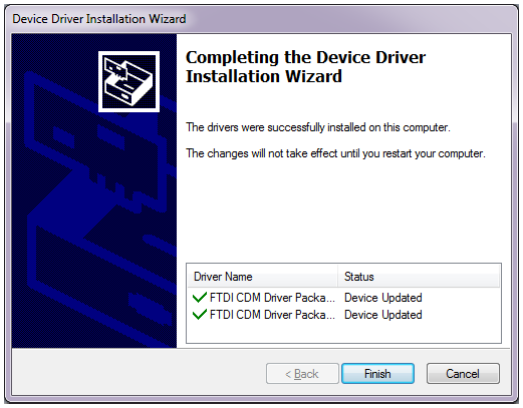
INSTALL HARDWARE (7/8)

STEP 12 – Manual Driver installation - continued:

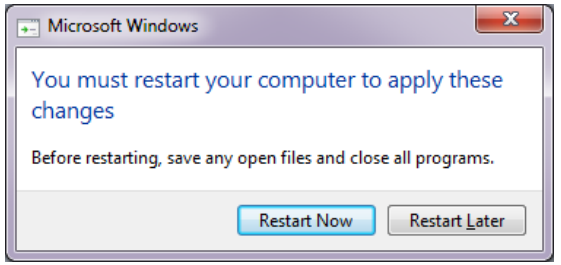
Drivers are installing:



Click “Finish”:



Click “Restart Now”:



N.B. After restart, repeat STEP 7 before proceeding!

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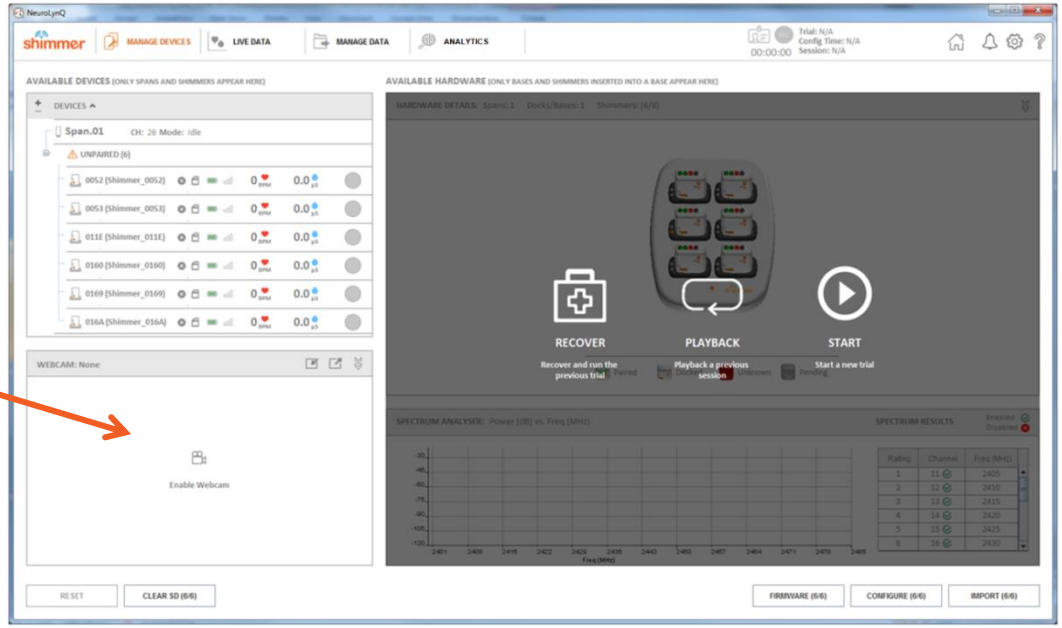
INSTALL HARDWARE (8/8)

The NeuroLynQ software supports the use of a HD webcam:

The drivers for the webcam should install automatically when inserting it into the NeuroLynQ server

- If the driver fails to install, please visit the manufacturer's website (http://support.logitech.com/en_us/product/webcam-c930e-business)
- The use of a webcam is not a requirement in order for the software to run and its use is at the user's discretion

Webcam Logitech HD C930e



INSTALL SOFTWARE

N.B. Only continue with installing the NeuroLynQ software if the driver installation has been verified (Install Hardware - STEP 8).

STEP 1 – Obtain the latest *NeuroLynQ* software.
STEP 2 – Extract the installer zip-file.
STEP 3 – Double-click "*setup.exe*" and follow the instructions.
STEP 4 – When the installation is complete, double-click the *NeuroLynQ* desktop icon to start.

LICENSING - OVERVIEW (1/3)

N.B. NeuroLynQ requires a license to utilize the software

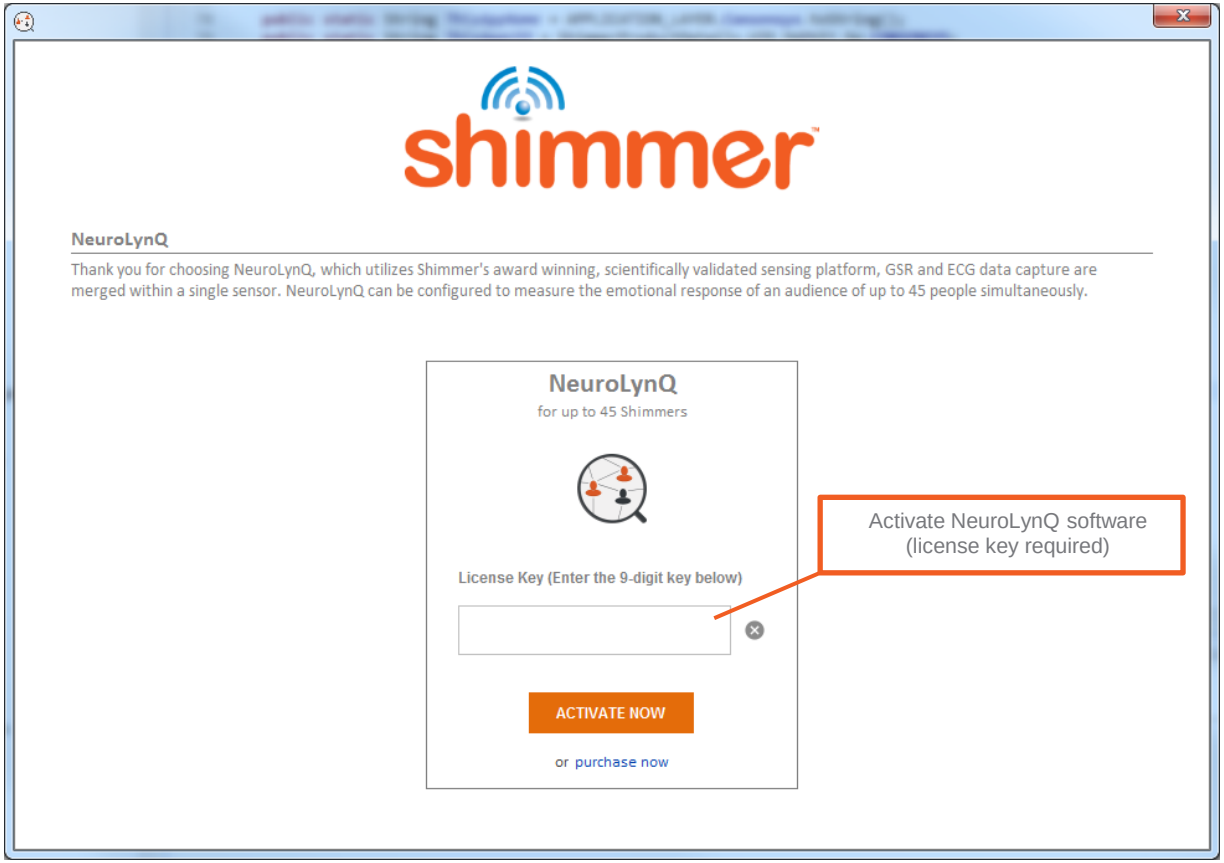
Subscription: Subscription license permits the use of NeuroLynQ for a specified time period after which time the subscription must be renewed in order to use the application. NeuroLynQ implements an annual subscription (365 day period).

Floating: Floating licensing authorizes the use of NeuroLynQ with the given number of activations. The number of concurrent activations is tracked, and the total number of running sessions of the licensed application at any time is limited by the maximum allowed activations in the floating licenses purchased by the licensee.

NeuroLynQ Sensor Limit: The number of NeuroLynQ sensor units you can use simultaneously in the software is a parameter of the license. If you buy a license for one NeuroLynQ sensor unit, you can only use the software with one unit at a time. Contact Shimmer for more info through info@shimmersensing.com

LICENSING - ACTIVATION (2/3)

N.B. NeuroLynQ requires a license to utilize the software



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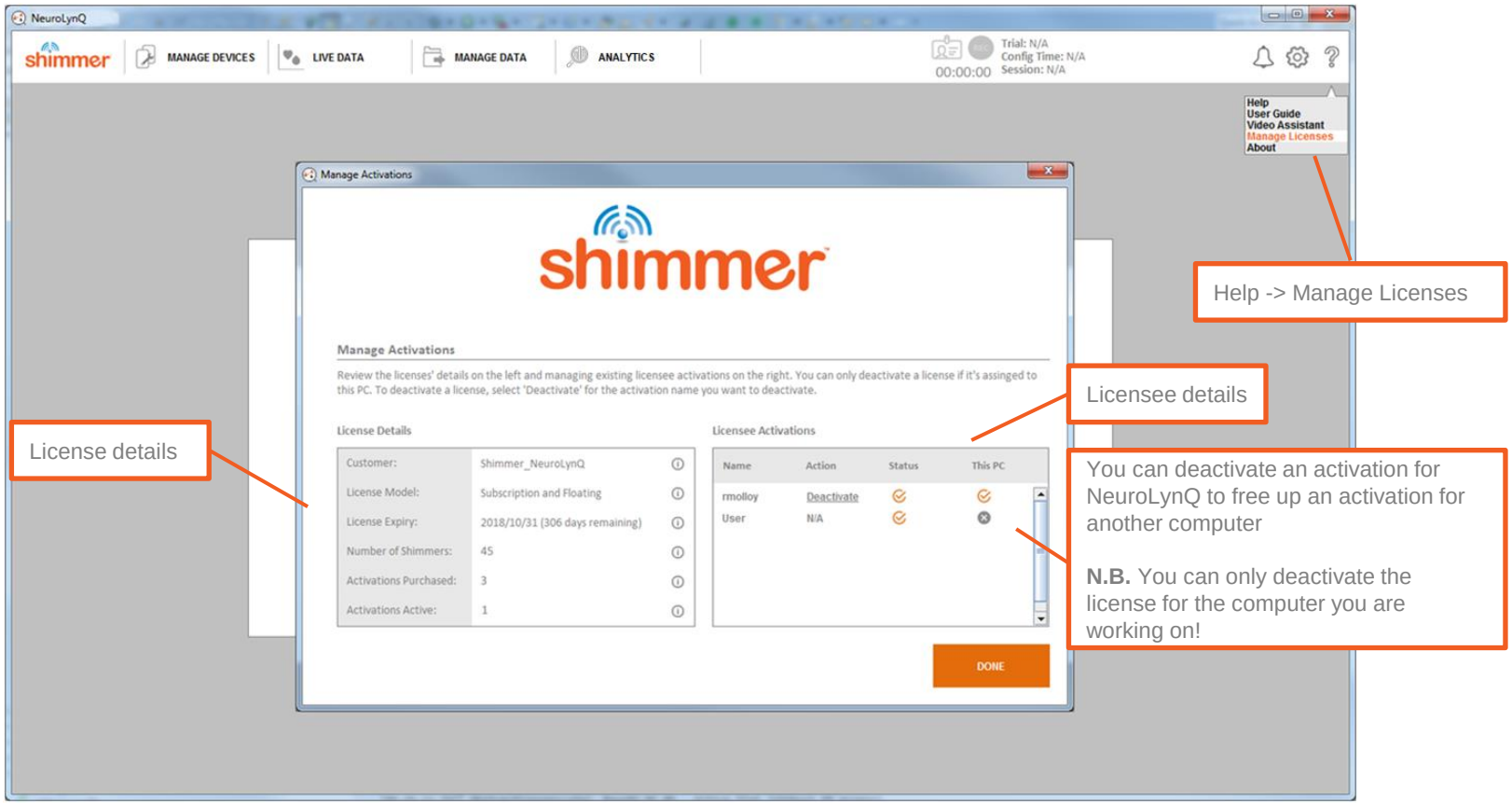
LICENSING - MANAGEMENT (3/3)



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CONDUCT A NEUROLYNQ@HOME TRIAL

STEP 1 – Create an S3 server and obtain the S3 Access and Secret Keys.

STEP 2 – Create the bucket to store the trial recording files.

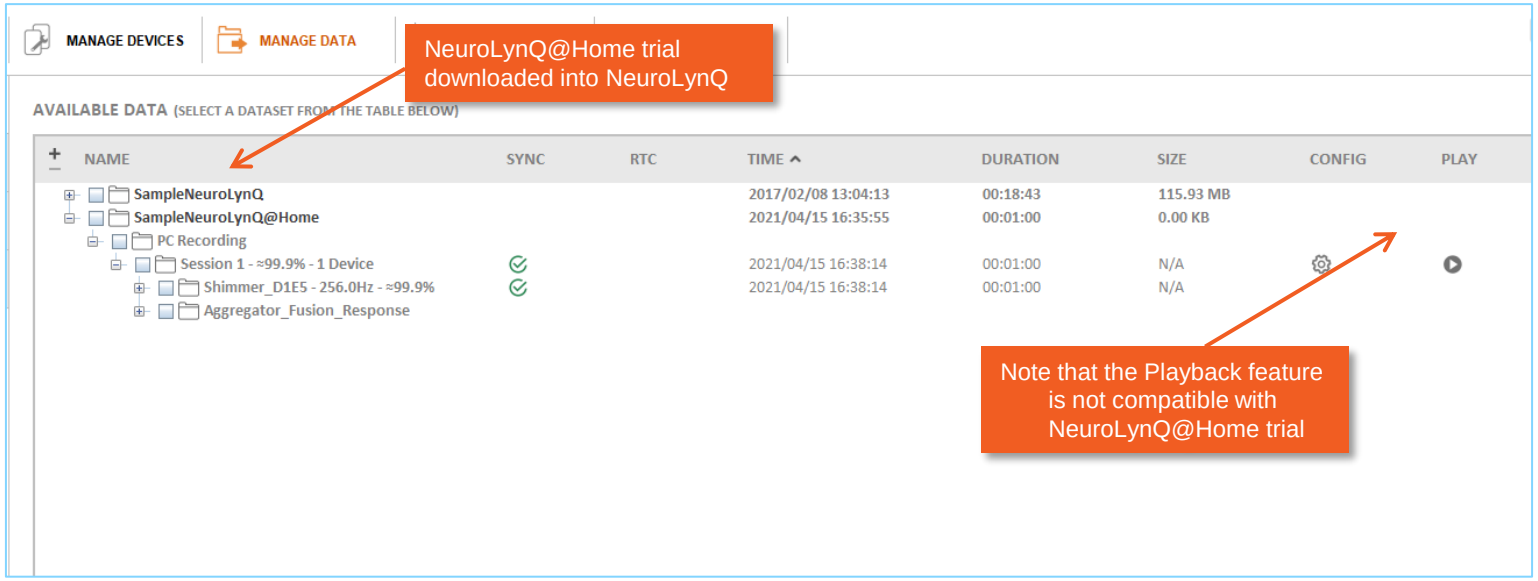
STEP 3 – Generate NeuroLynQ@Home settings file through NeuroLynQ > Application Settings > NeuroLynQ@Home

STEP 4 – Load the settings file into NeuroLynQ@Home and enter Participant ID. No repeat of Participant ID in different caps.

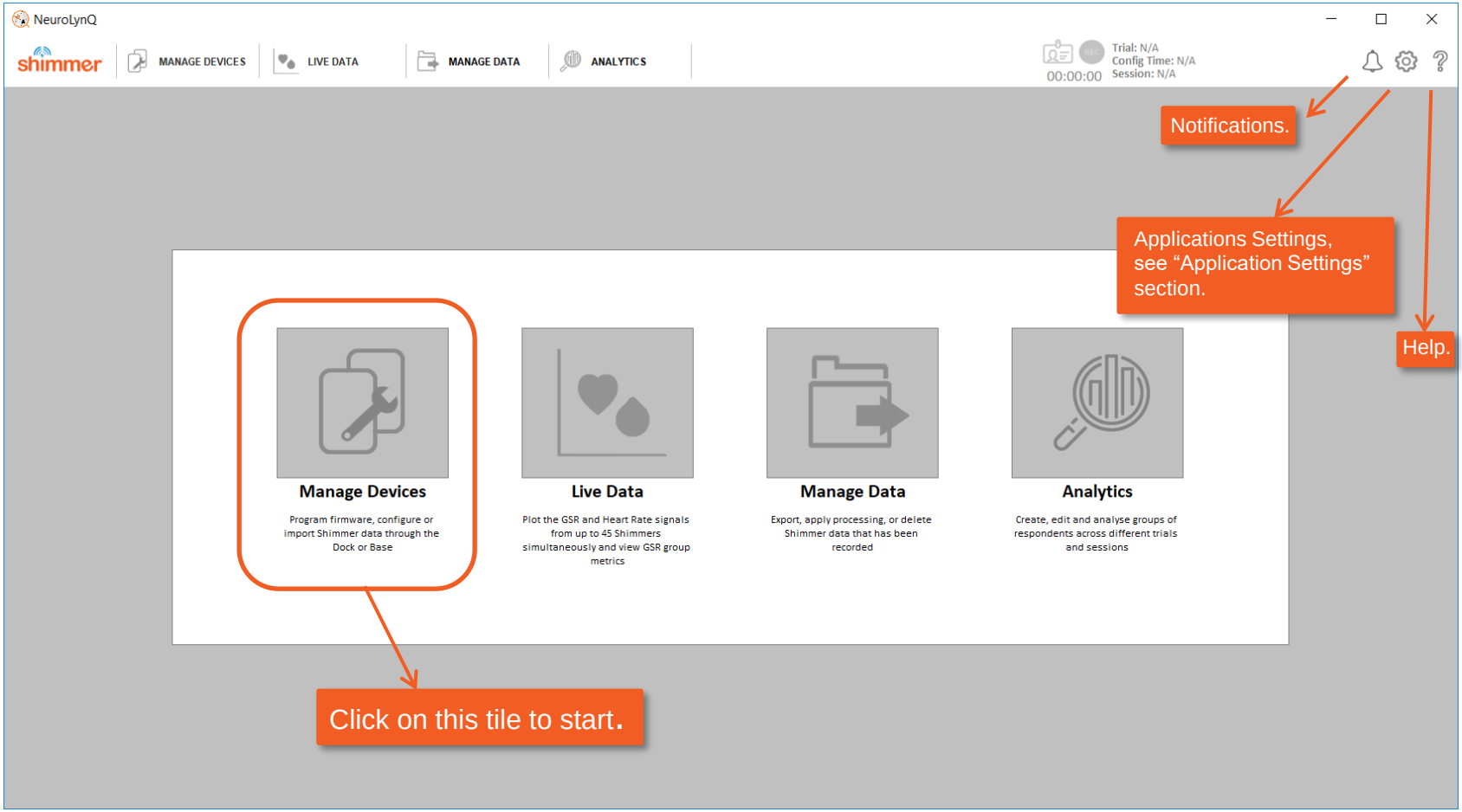
STEP 5 – Follow the instructions to wear the sensor and then connect it to start the trial.

STEP 6 – The trial database and video recording file (if available) will be uploaded to S3 server once the trial is stopped

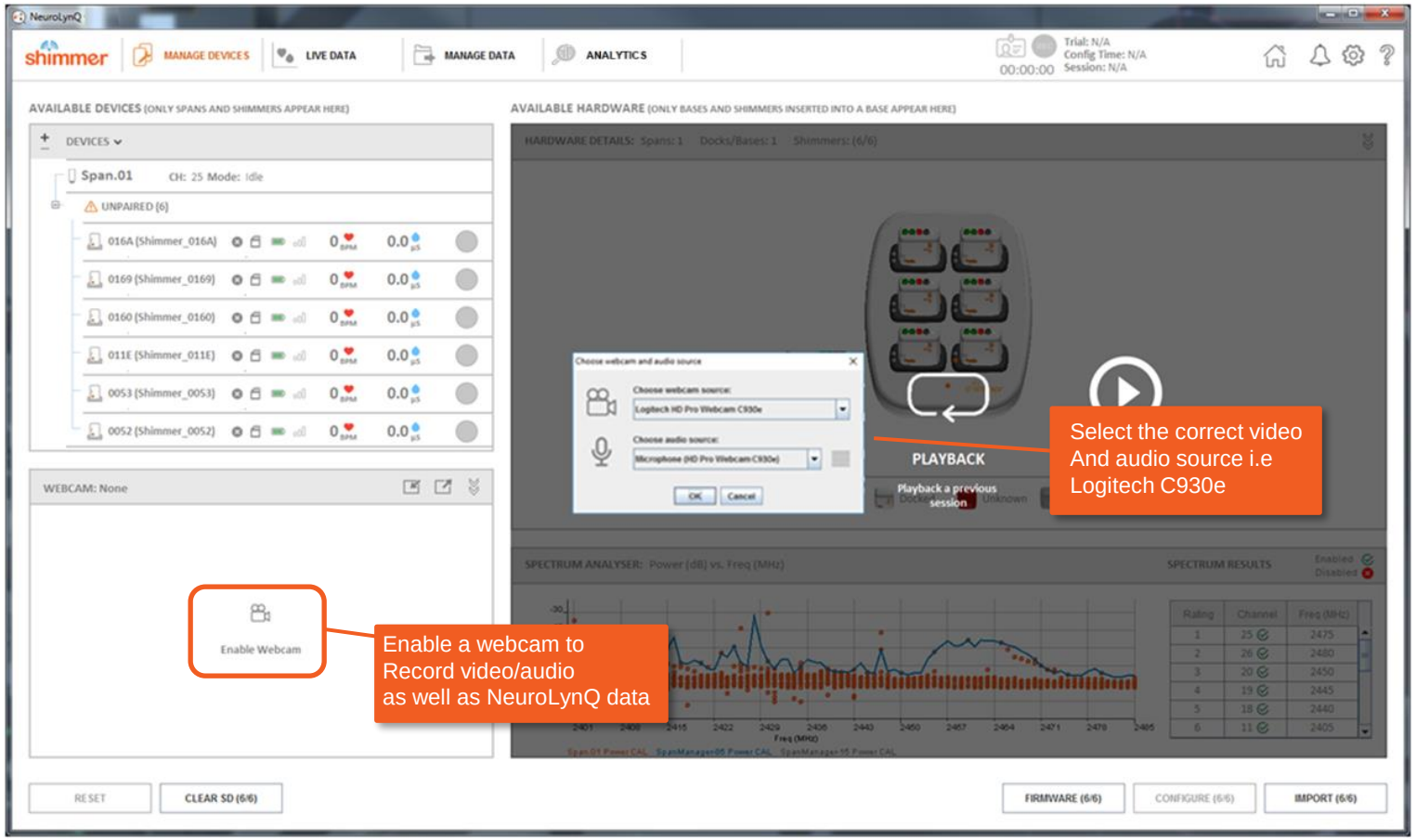
STEP 7 - To analyze/aggregate participant response, you will need to download all the participant databases via NeuroLynQ by using the Download button in Manage Data tab. Each participant will be a single database represented in the Manage Data tab



Home Screen

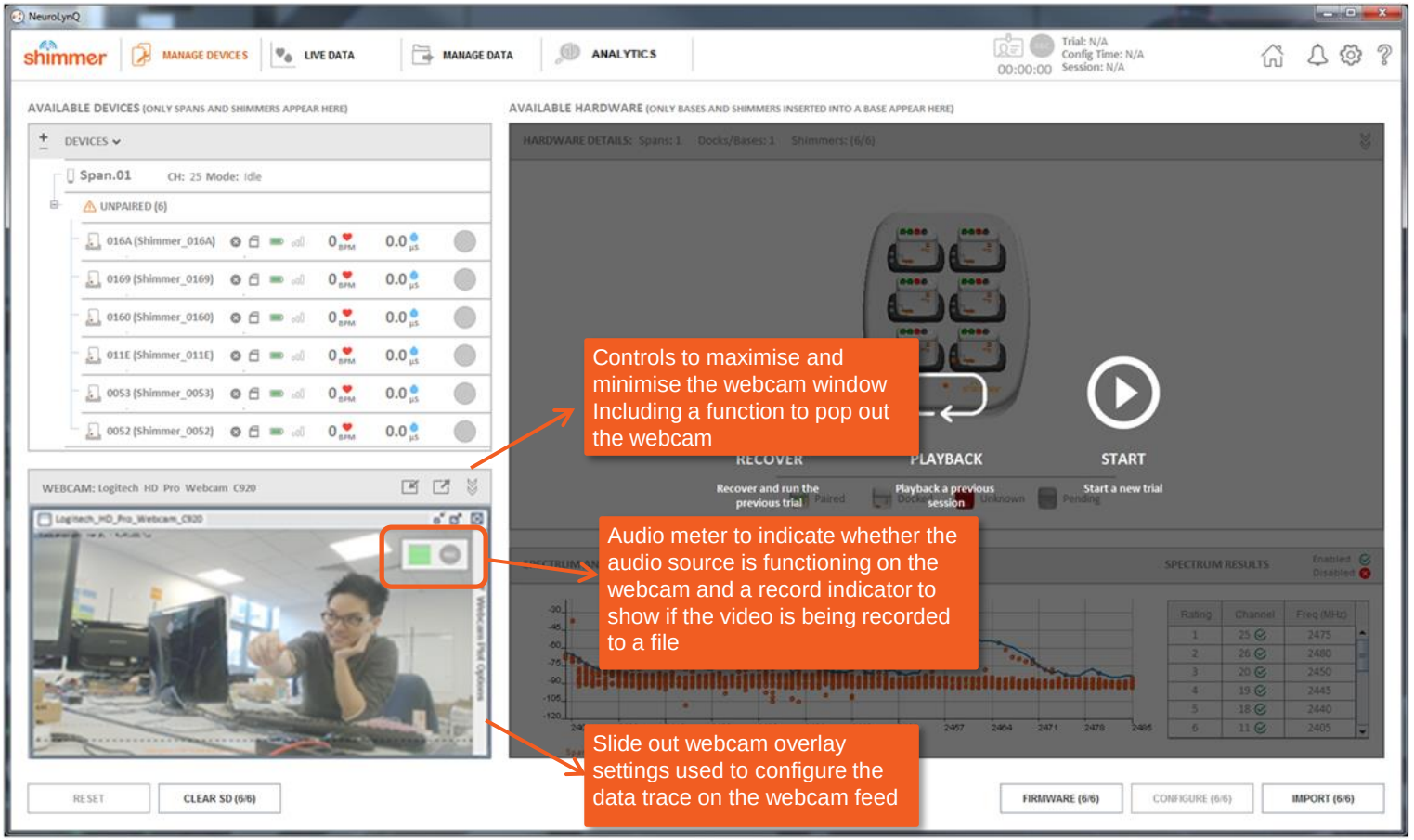

NeuroLynQ
shimmer
MANAGE DEVICES
LIVE DATA
MANAGE DATA
ANALYTICS
Trial: N/A
Config Time: N/A
Session: N/A
00:00:00
Notifications.
Applications Settings, see “Application Settings” section.
Help.
Manage Devices
Program firmware, configure or import Shimmer data through the Dock or Base
Live Data
Plot the GSR and Heart Rate signals from up to 45 Shimmers simultaneously and view GSR group metrics
Manage Data
Export, apply processing, or delete Shimmer data that has been recorded
Analytics
Create, edit and analyse groups of respondents across different trials and sessions
Click on this tile to start.

MANAGE DEVICES – PART 1 – ADD WEBCAM



NB: The use of a webcam is not a requirement in order for the software to run and it's use is at the user's discretion

MANAGE DEVICES – PART 1 – ADD WEBCAM



NB: The use of a webcam is not a requirement in order for the software to run and it's use is at the user's discretion

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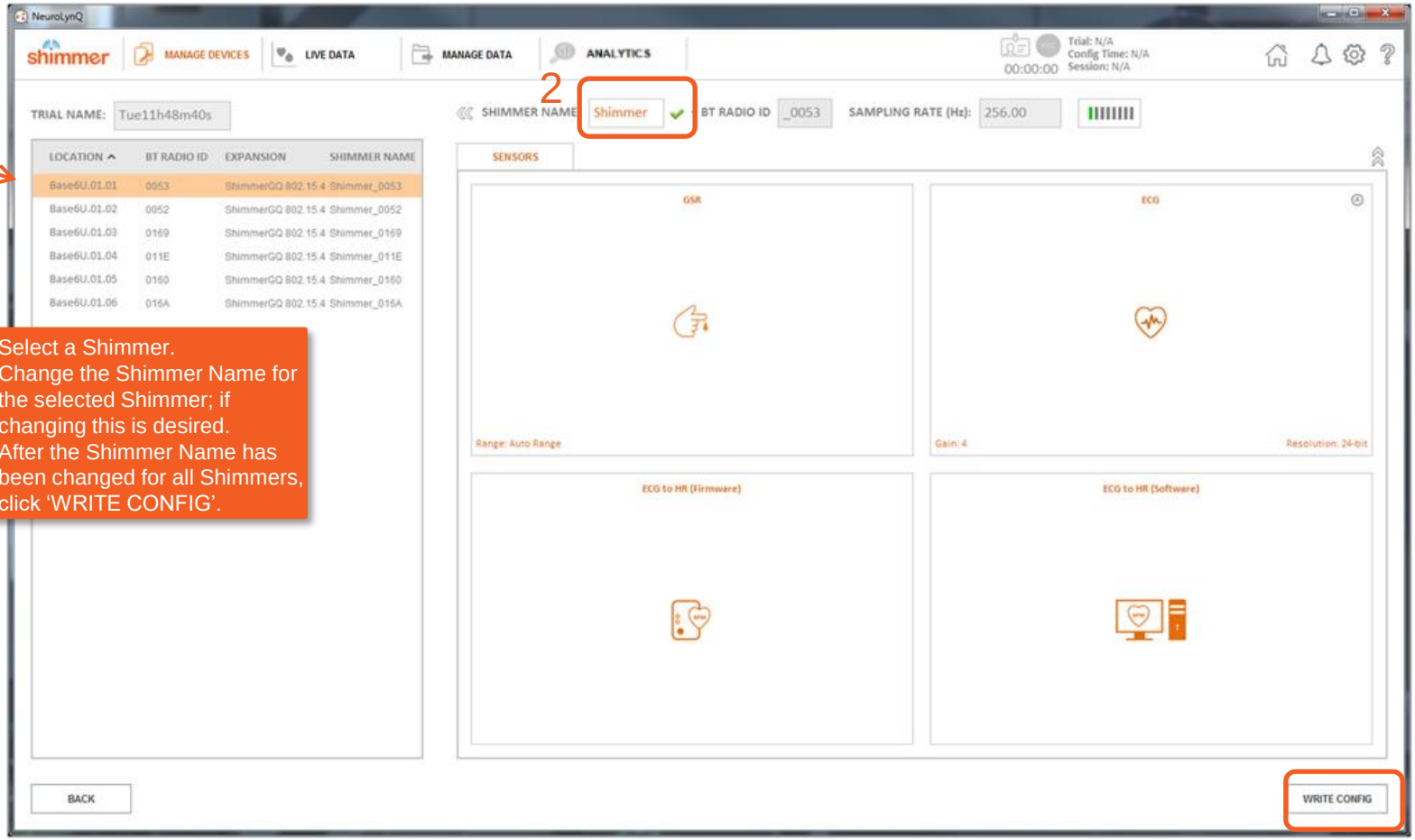
MANAGE DEVICES – PART 1 - CONFIGURE



1) Select a Shimmer.
2) Change the Shimmer Name for the selected Shimmer; if changing this is desired.
3) After the Shimmer Name has been changed for all Shimmers, click 'WRITE CONFIG'.

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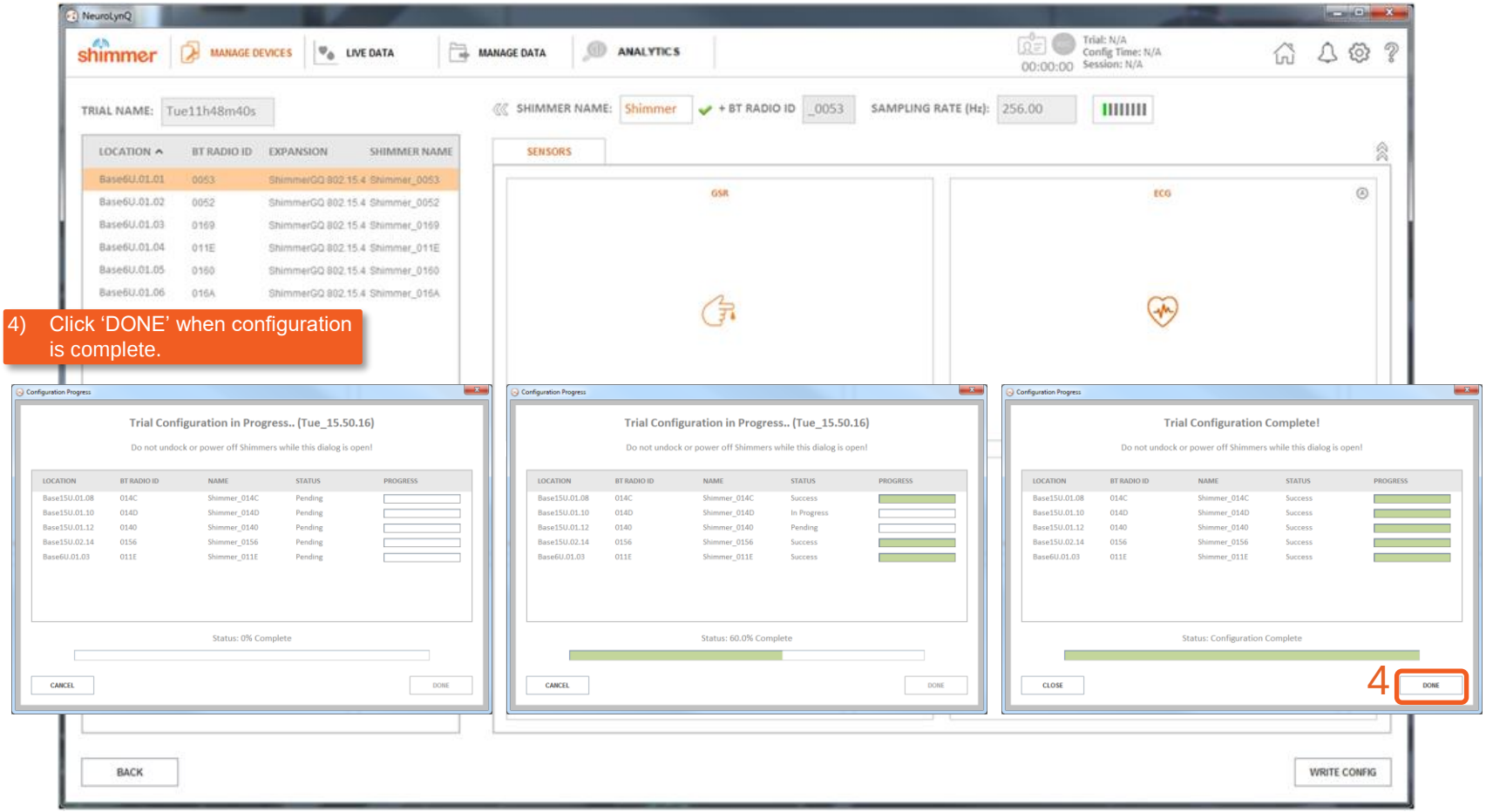
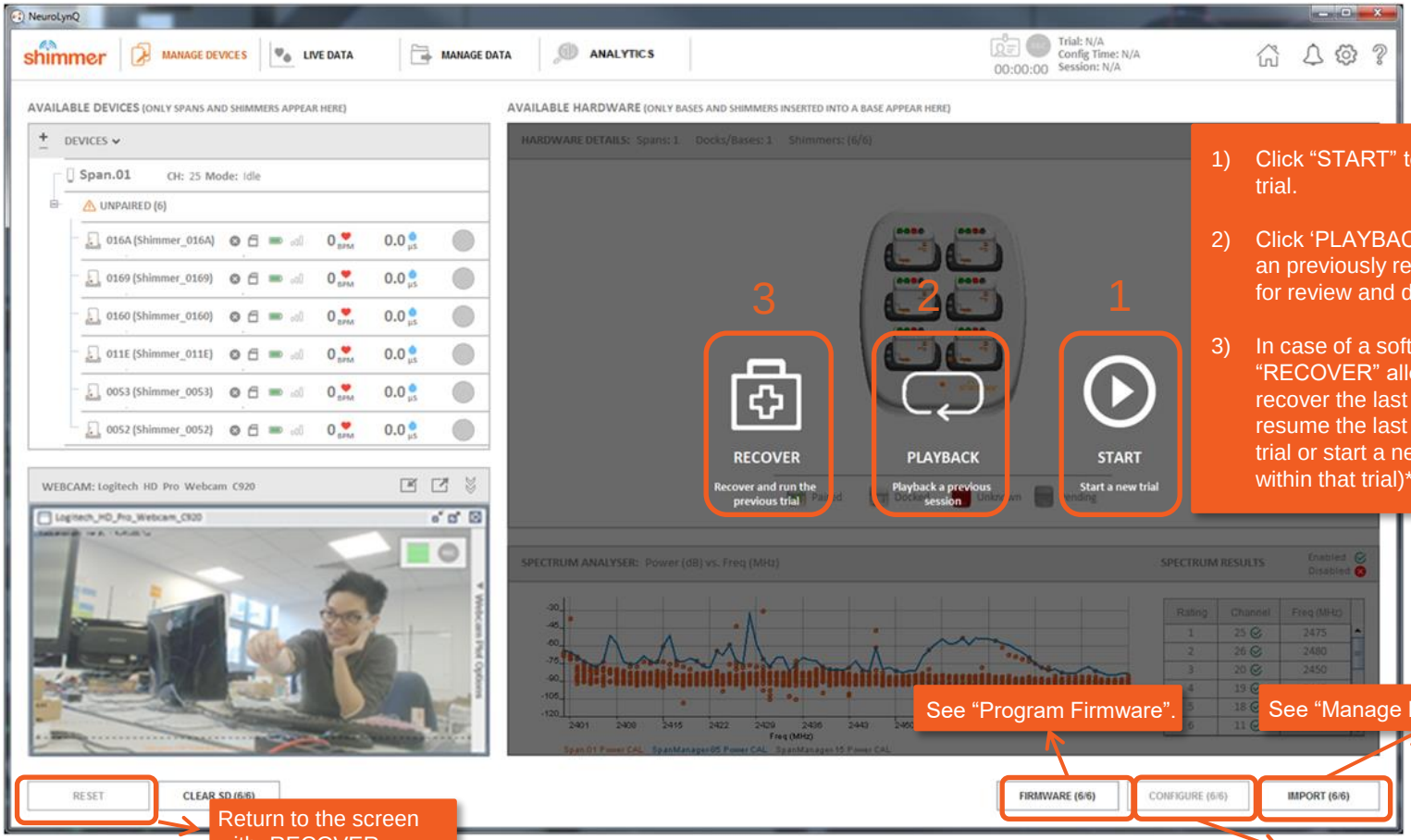
MANAGE DEVICES – PART 1 - CONFIGURE



MANAGE DEVICES – PART 1 – START TRIAL



1) Click “START” to start a new trial.

2) Click ‘PLAYBACK’ to playback an previously recorded dataset for review and demo purposes

3) In case of a software issue, “RECOVER” allows you to recover the last trial (either resume the last session of that trial or start a new session within that trial)*.

See “Program Firmware”.

See “Manage Devices – Part 2”.

Return to the screen with RECOVER, PLAYBACK & START.

See “Manage Devices – Part 1 – Configure”.

*Note: The “RECOVER” feature should not be used as part of normal operating procedure and should only be used if the software unexpectedly closed during a trial.

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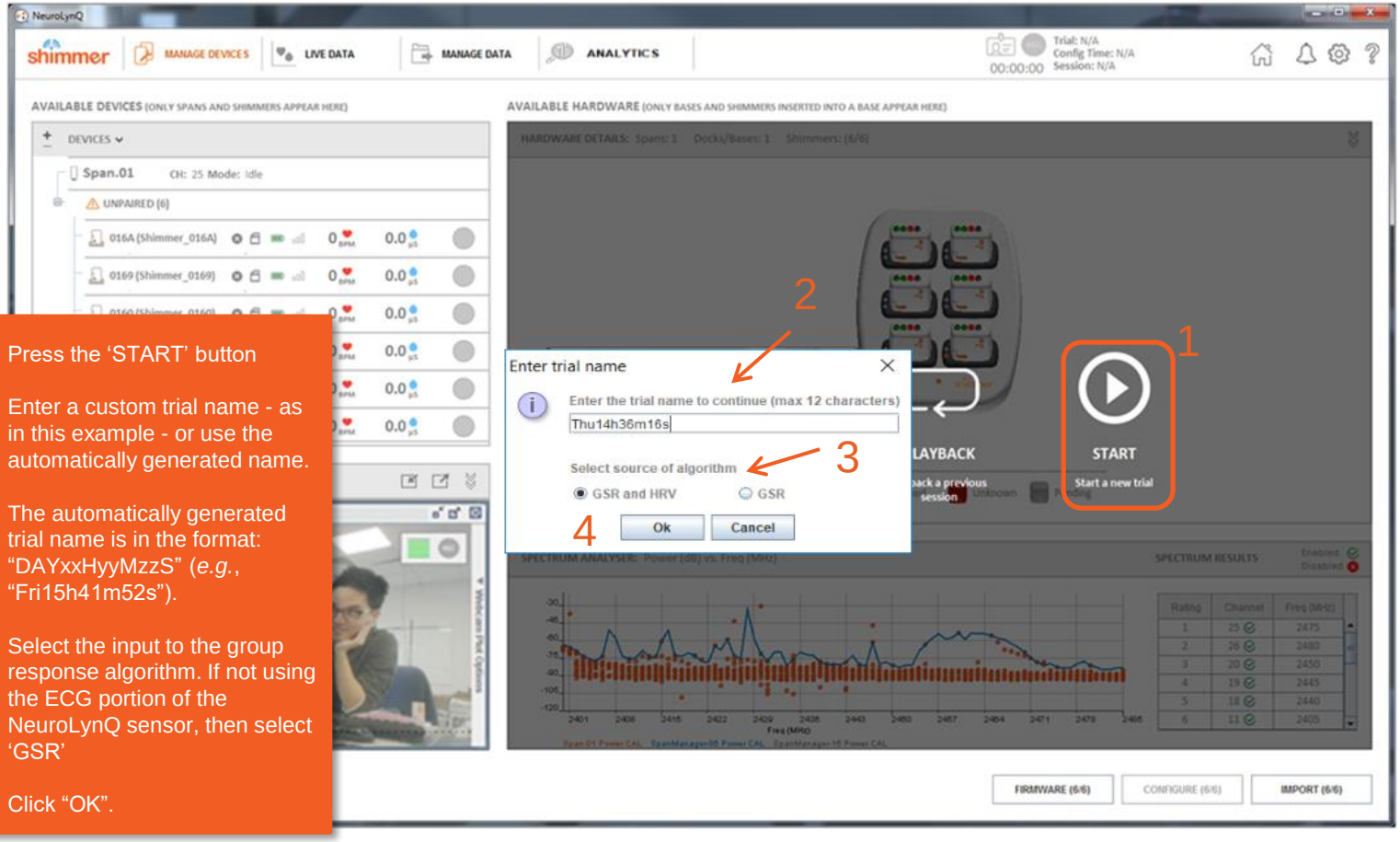
MANAGE DEVICES – PART 1 – TRIAL NAME



1) Press the ‘START’ button

2) Enter a custom trial name - as in this example - or use the automatically generated name.

   The automatically generated trial name is in the format: “DAYxxHyyMzzS” (*e.g.*, “Fri15h41m52s”).

3) Select the input to the group response algorithm. If not using the ECG portion of the NeuroLynQ sensor, then select ‘GSR’

4) Click “OK”.

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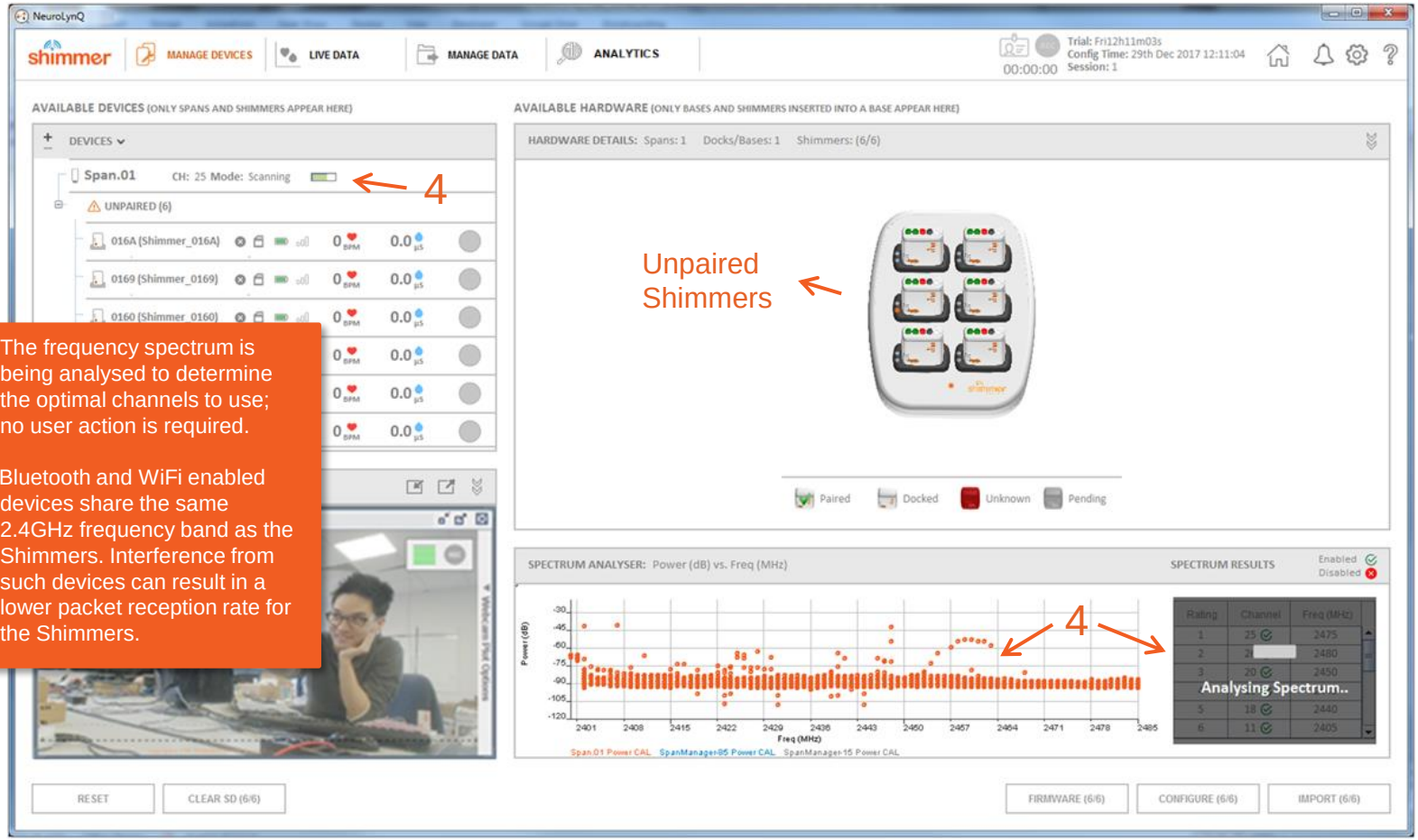
MANAGE DEVICES – PART 1 - PAIRING



4) The frequency spectrum is being analysed to determine the optimal channels to use; no user action is required.

NB: Bluetooth and WiFi enabled devices share the same 2.4GHz frequency band as the Shimmers. Interference from such devices can result in a lower packet reception rate for the Shimmers.

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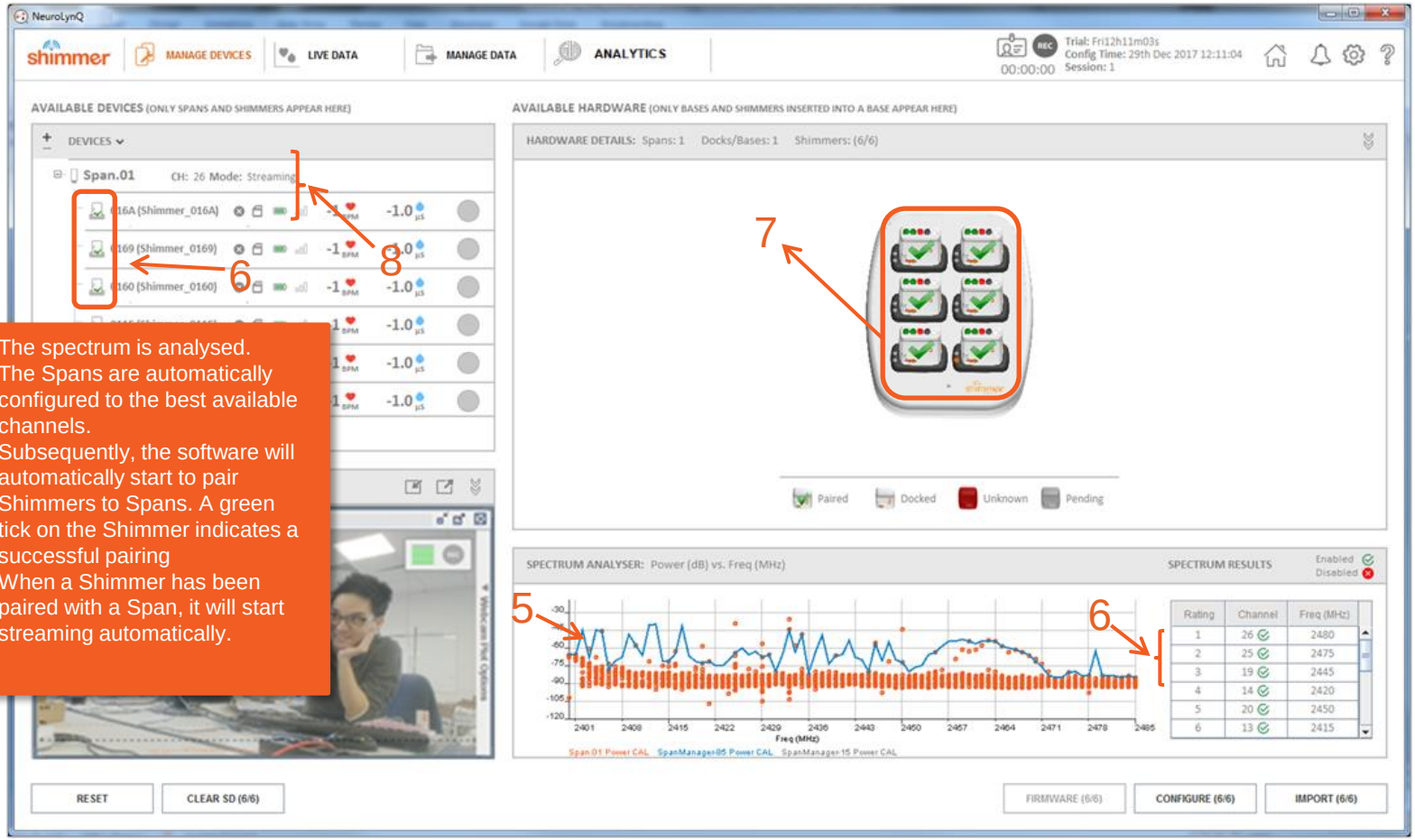
MANAGE DEVICES – PART 1 - PAIRED



5) The spectrum is analysed.
6) The Spans are automatically configured to the best available channels.
7) Subsequently, the software will automatically start to pair Shimmers to Spans. A green tick on the Shimmer indicates a successful pairing
8) When a Shimmer has been paired with a Span, it will start streaming automatically.

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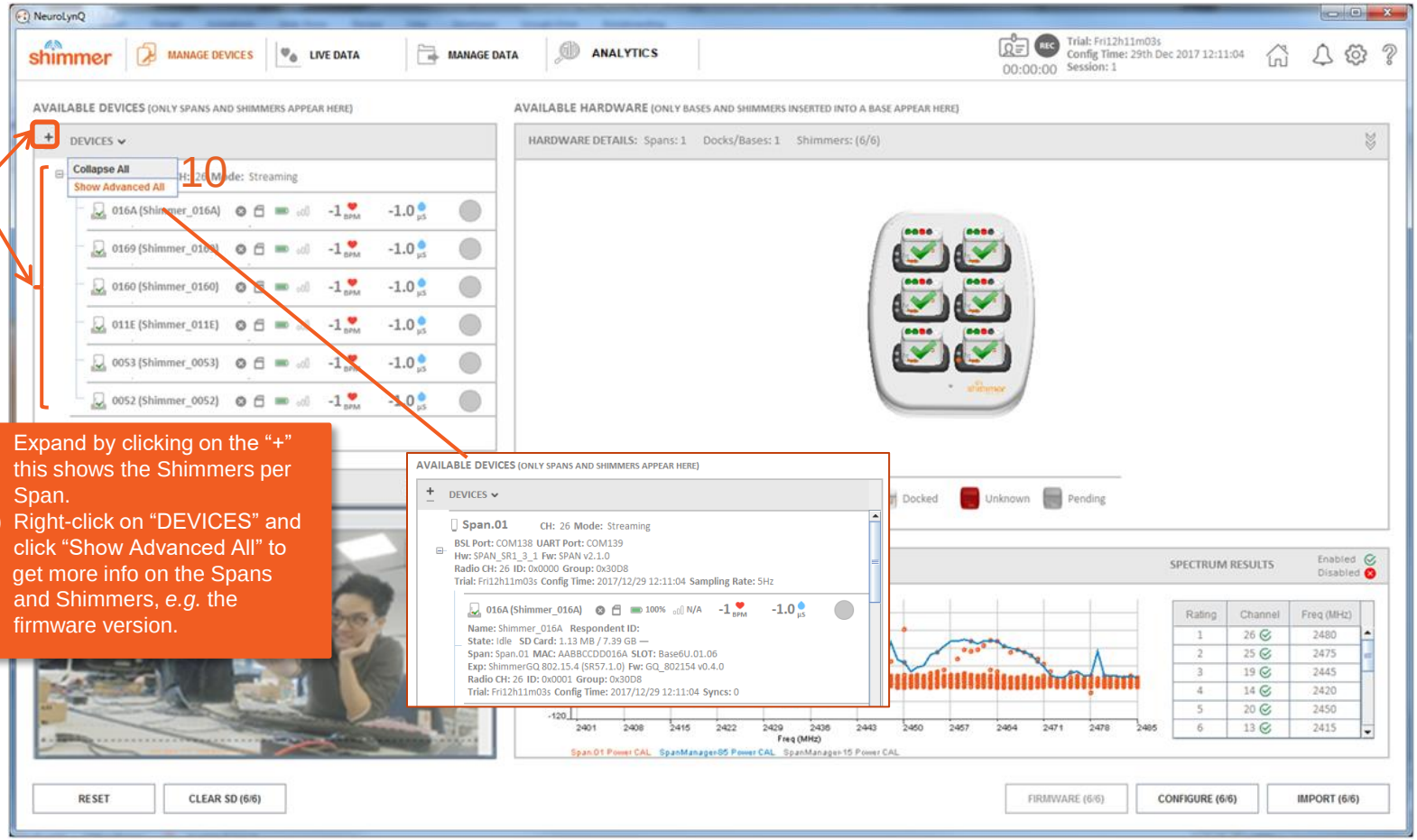
MANAGE DEVICES – PART 1 - EXPAND



9) Expand by clicking on the "+" this shows the Shimmers per Span.
10) Right-click on "DEVICES" and click "Show Advanced All" to get more info on the Spans and Shimmers, *e.g.* the firmware version.

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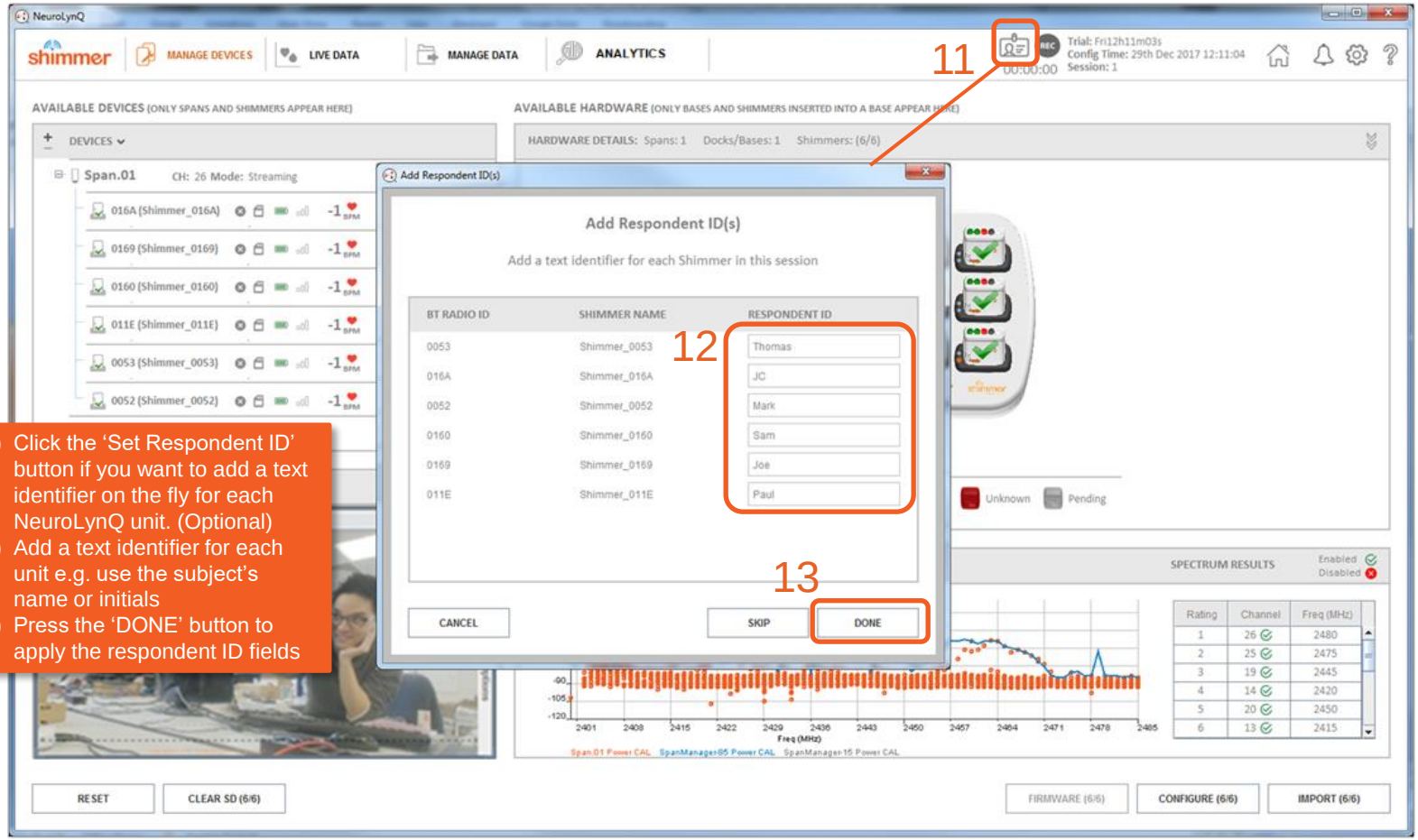
MANAGE DEVICES – PART 1 – RESPONDENT ID



11) Click the 'Set Respondent ID' button if you want to add a text identifier on the fly for each NeuroLynQ unit. (Optional)
12) Add a text identifier for each unit e.g. use the subject's name or initials
13) Press the 'DONE' button to apply the respondent ID fields

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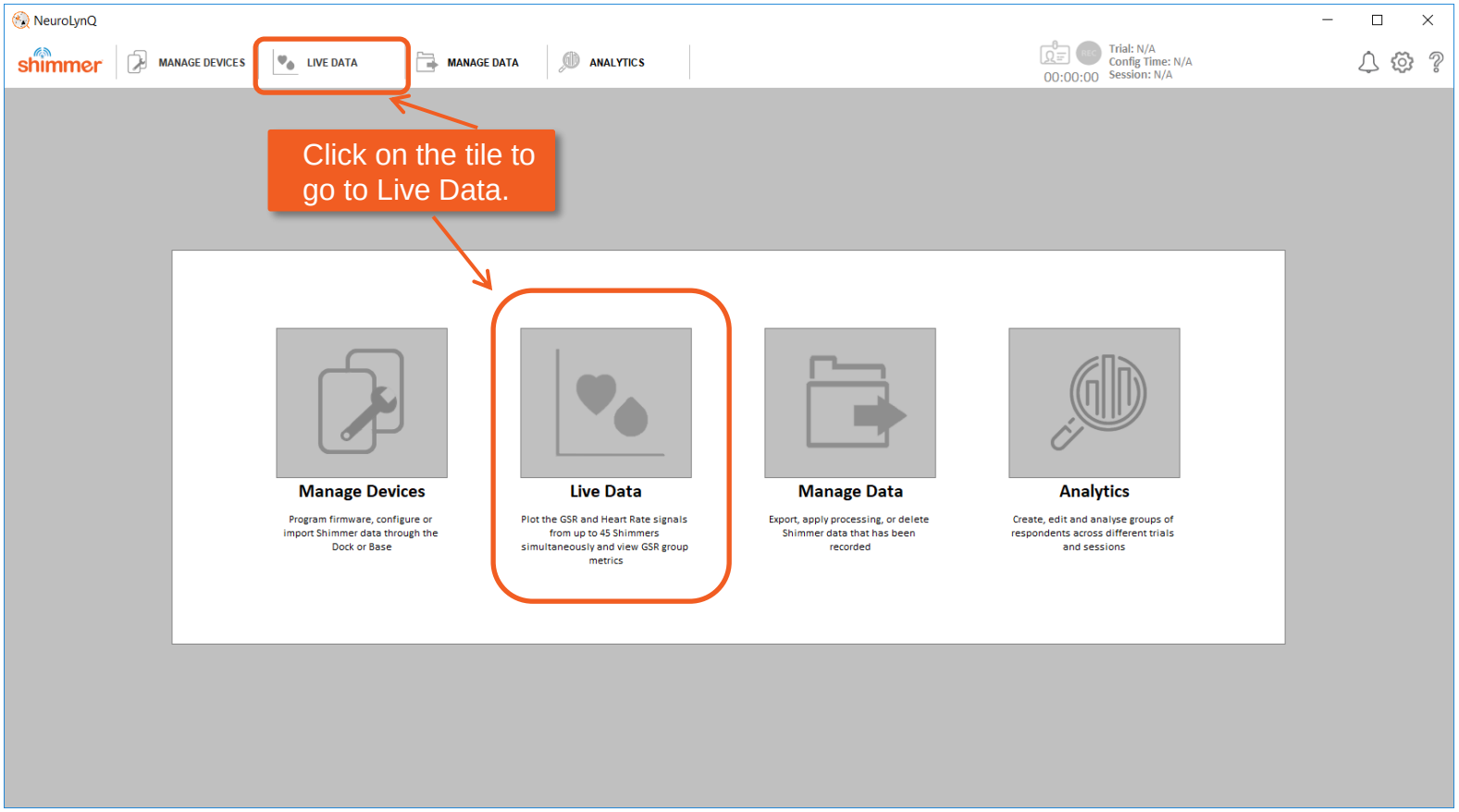
LIVE DATA - START



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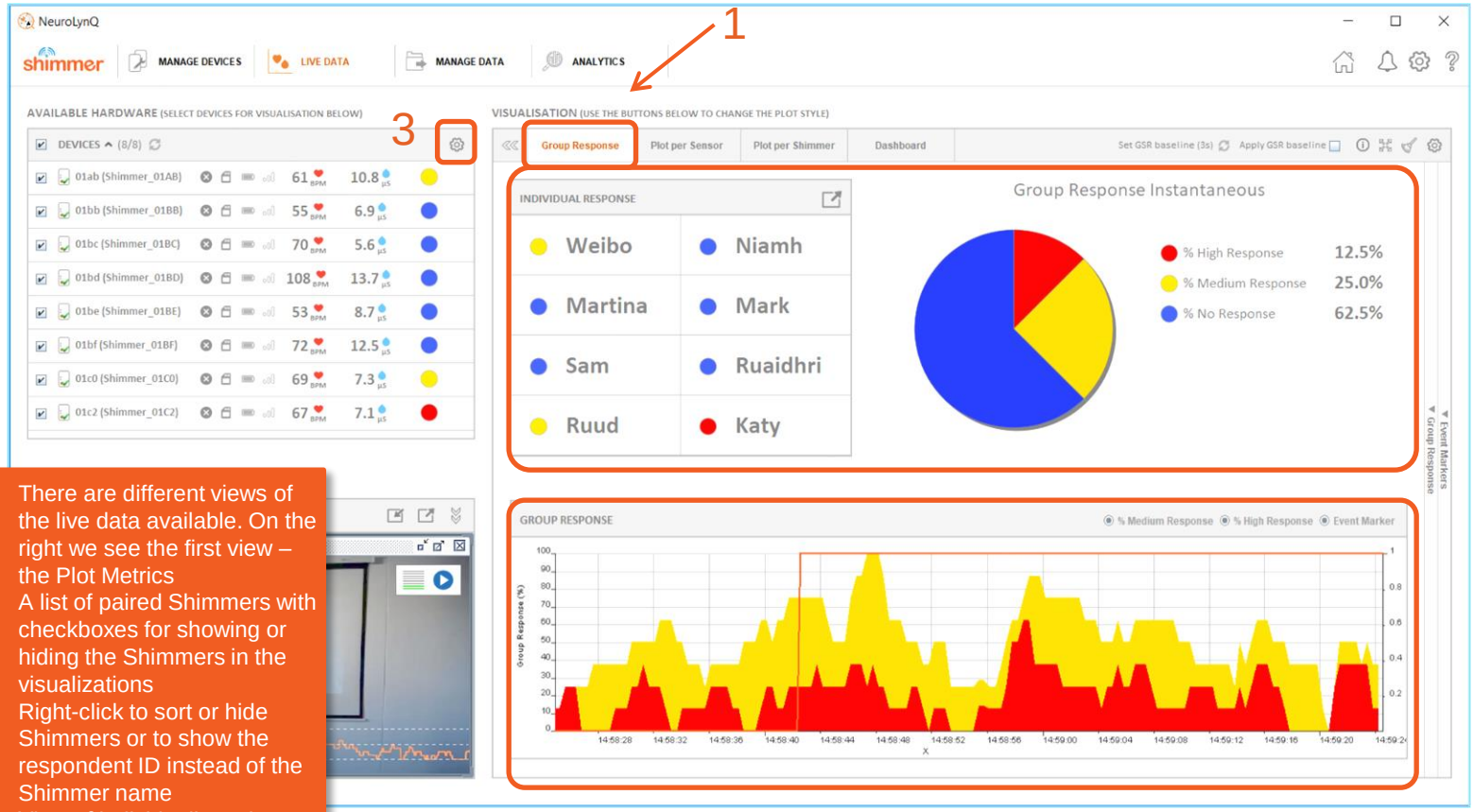
DISCOVERY IN MOTION

Live Data – View 1 – Group Response



1) There are different views of the live data available. On the right we see the first view – the Plot Metrics
2) A list of paired Shimmers with checkboxes for showing or hiding the Shimmers in the visualizations
3) Right-click to sort or hide Shimmers or to show the respondent ID instead of the Shimmer name
4) View of individual's and group response instantaneously
5) View of individual's and group response over time

shimmer
DISCOVERY IN MOTION

Live Data – View 1 – Group Response Explained

The NeuroLynQ software provides a colour coded output to indicate how subject group is responding to the stimulus

High response – The subject is very engaged with the stimulus

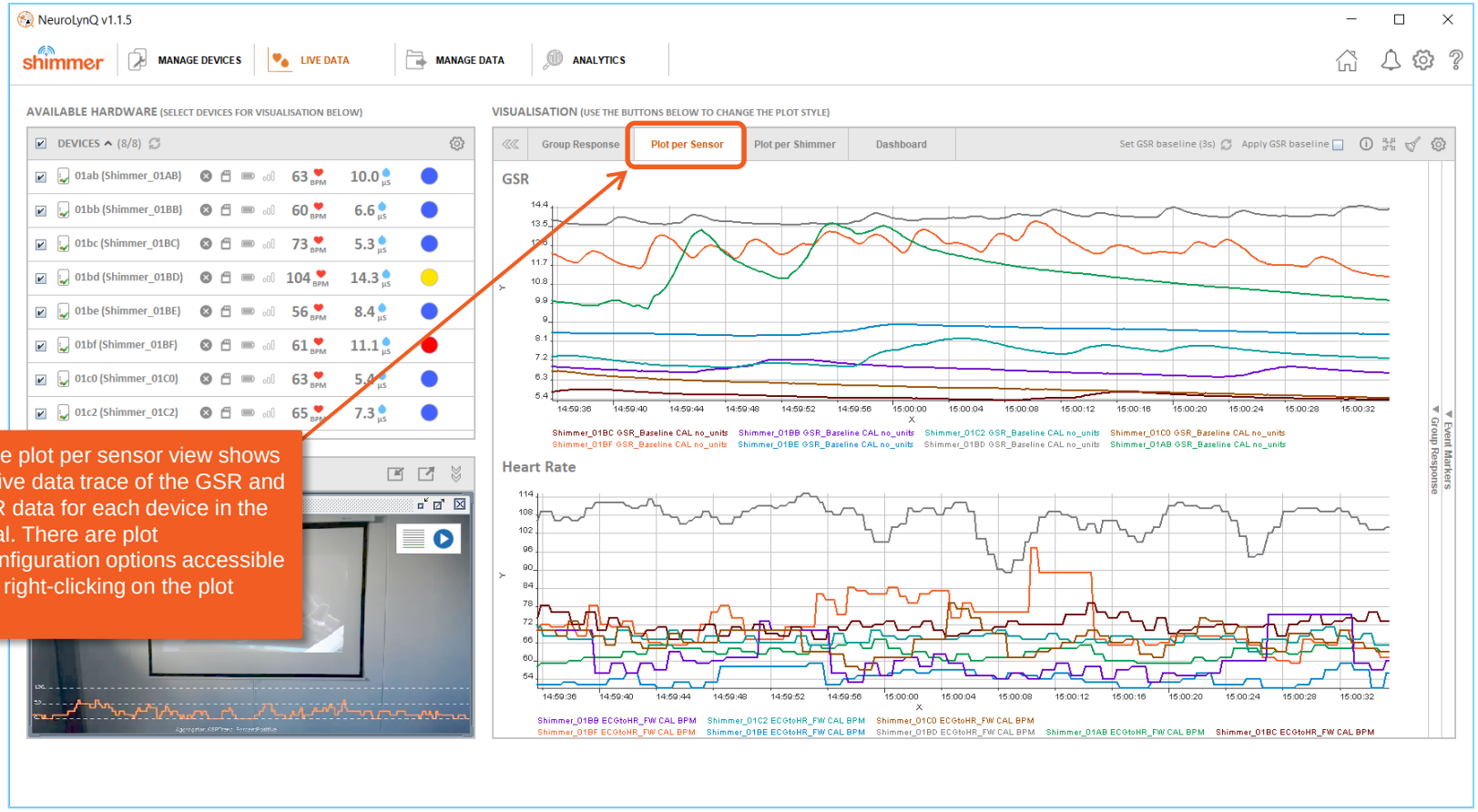
Medium response– The subject is somewhat engaged with the stimulus

No response – The subject is not engaged with the stimulus

Note: The source of the algorithm that produces the four level response is by default GSR and HRV (derived from the ECG signal), however the user has the ability to change the source of the algorithm to just GSR, see Application Settings.

shimmer
DISCOVERY IN MOTION

Live Data – View 2 – Plot per Sensor



The plot per sensor view shows a live data trace of the GSR and HR data for each device in the trial. There are plot configuration options accessible by right-clicking on the plot

shimmer
DISCOVERY IN MOTION

LIVE DATA – VIEW 2 – NORMALIZED GSR

1. **Normalized GSR**
   - Shows GSR signals normalized to a baseline that can be reset any time at the push of a button
   - Reported as the percent deviation from the original baseline
   - Provided a quick impression of individual experience

1) Calculate GSR baseline per NeuroLynQ device and apply the normalization calculation respectively
2) GSR normalized as can be seen by the signals starting at the same value and dispersing over time

$$\text{GSR normalized} = \frac{\text{GSR} - \text{GSR average over window}}{\text{GSR average over window}} \times 100\%$$

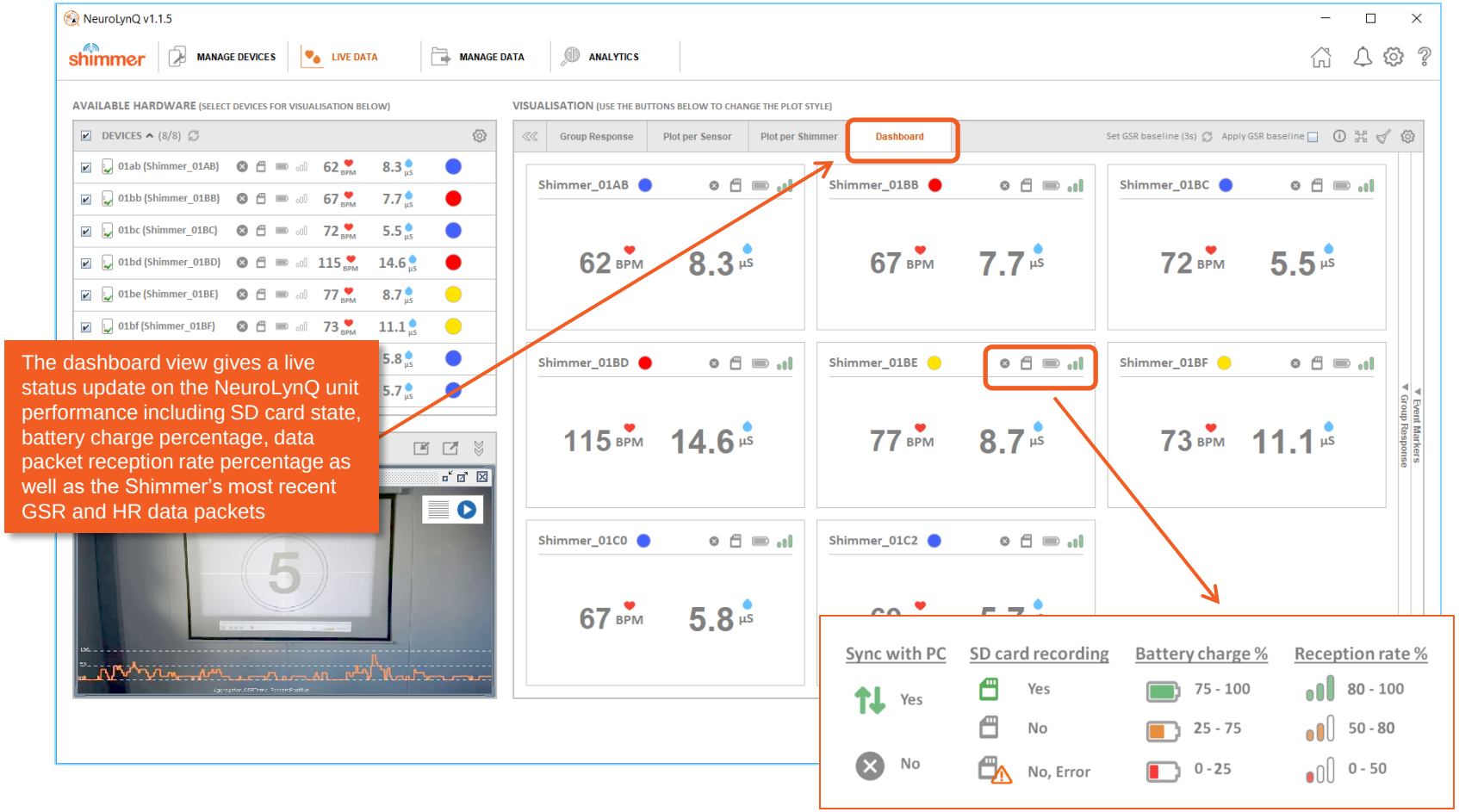
shimmer
DISCOVERY IN MOTION

Live Data – View 3 – Plot per Shimmer

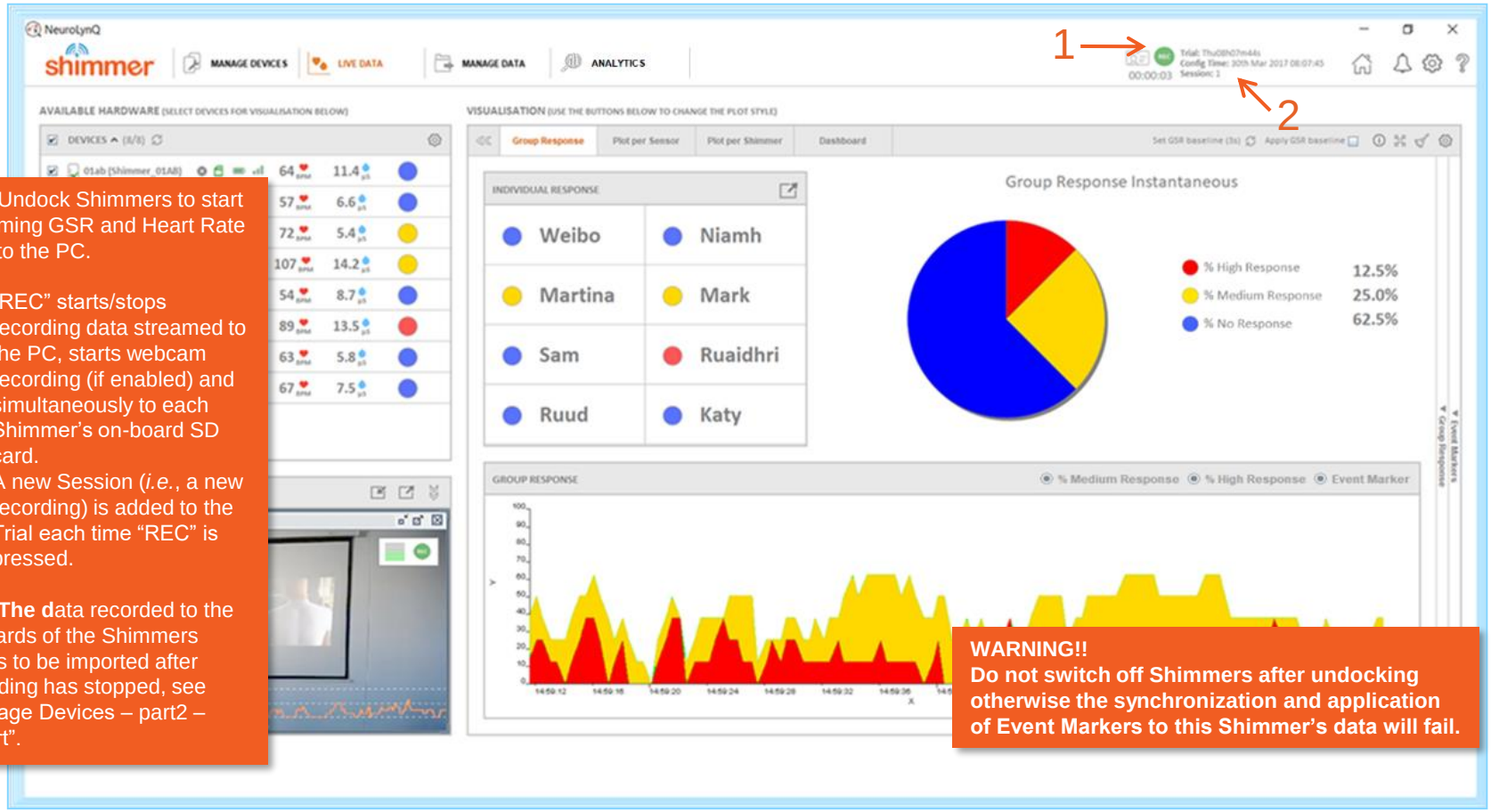
The plot per Shimmer view shows a live data trace of the GSR and HR data for each device in the trial. There are plot configuration options accessible by right-clicking on the plot

shimmer
DISCOVERY IN MOTION

Live Data – View 4 – Dashboard



LIVE DATA – RECORDING (1/2)



N.B. Undock Shimmers to start streaming GSR and Heart Rate data to the PC.

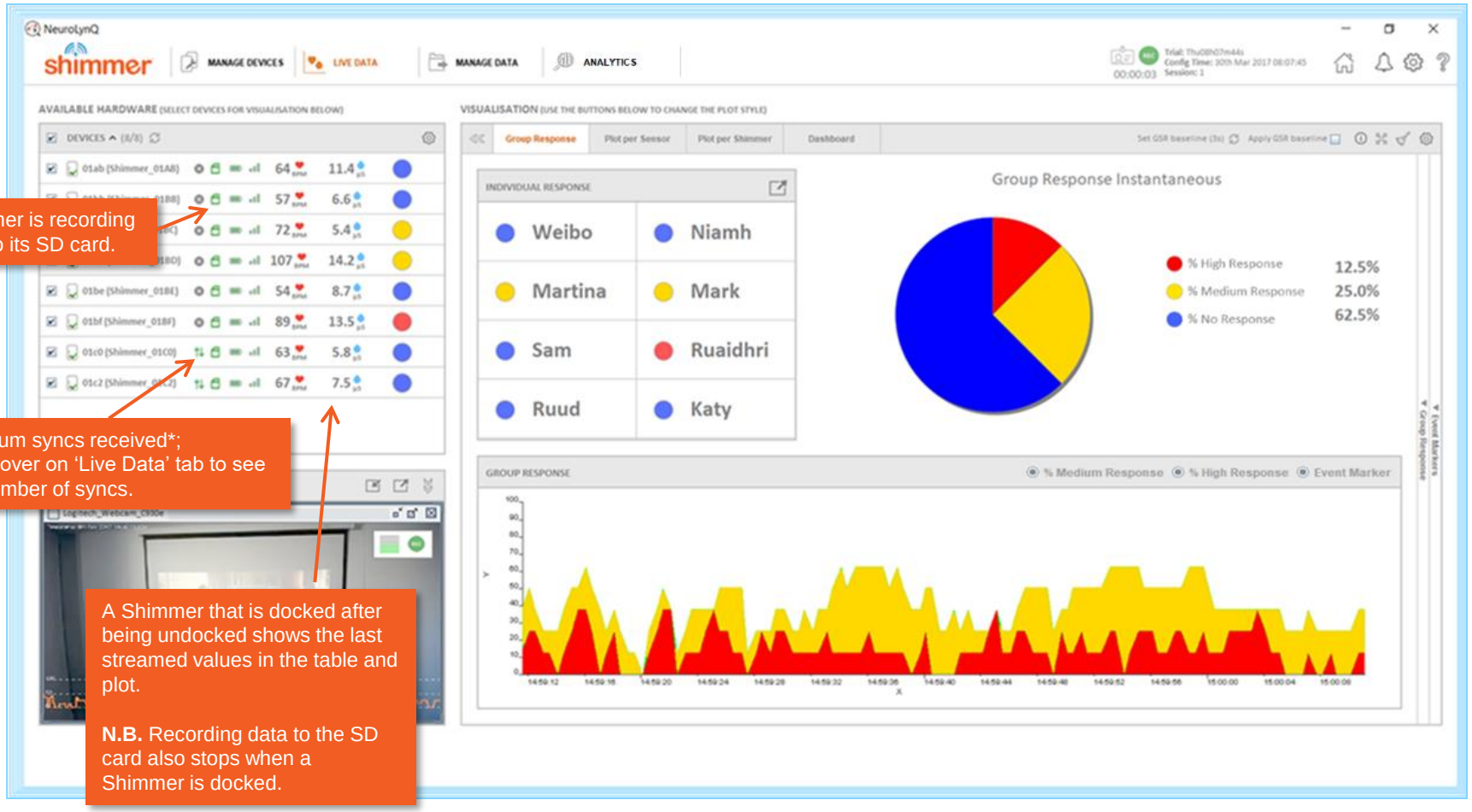
1) "REC" starts/stops recording data streamed to the PC, starts webcam recording (if enabled) and simultaneously to each Shimmer's on-board SD card.
2) A new Session (*i.e.*, a new recording) is added to the Trial each time "REC" is pressed.

N.B. The data recorded to the SD cards of the Shimmers needs to be imported after recording has stopped, see "Manage Devices – part2 – import".

WARNING!!
Do not switch off Shimmers after undocking otherwise the synchronization and application of Event Markers to this Shimmer's data will fail.

shimmer
DISCOVERY IN MOTION

LIVE DATA – RECORDING (2/2)



Shimmer is recording data to its SD card.

Minimum syncs received*; hover over on 'Live Data' tab to see the number of syncs.

A Shimmer that is docked after being undocked shows the last streamed values in the table and plot.

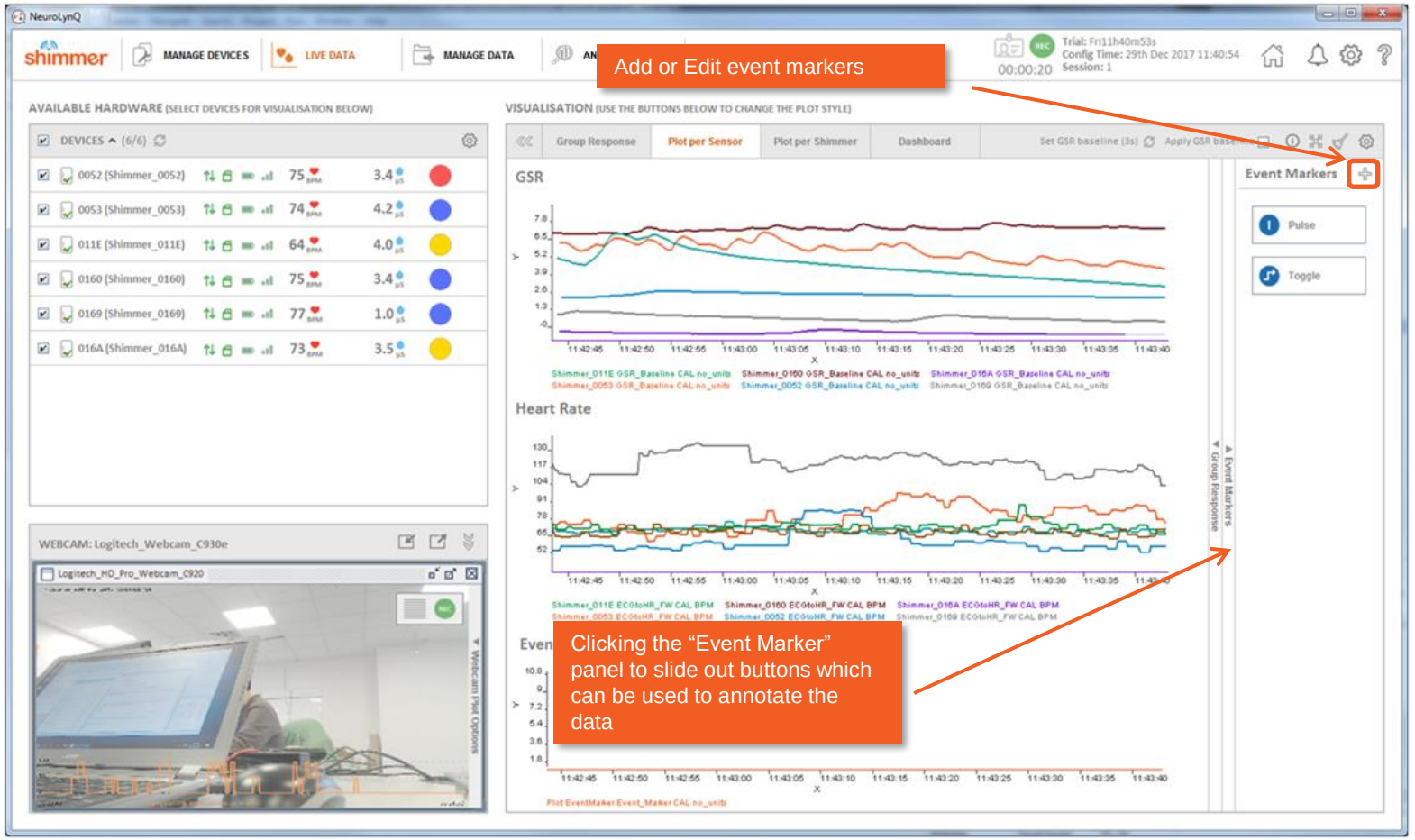
N.B. Recording data to the SD card also stops when a Shimmer is docked.

*Note: the minimum number of syncs must be obtained in order to ensure a valid timestamp output from the Shimmer data. Sync messages are transmitted from the Spans to the Shimmers every 30 seconds.

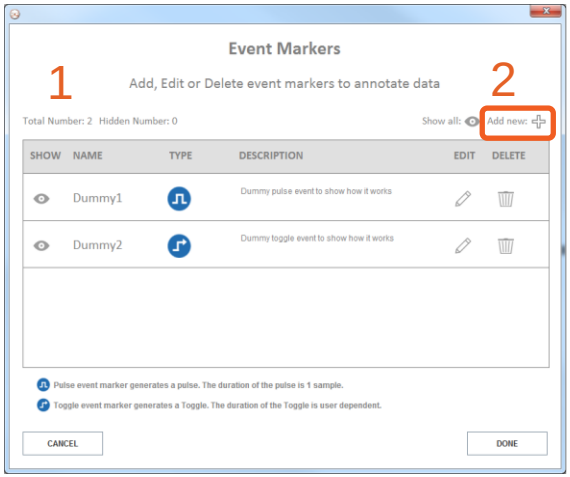
shimmer DISCOVERY IN MOTION

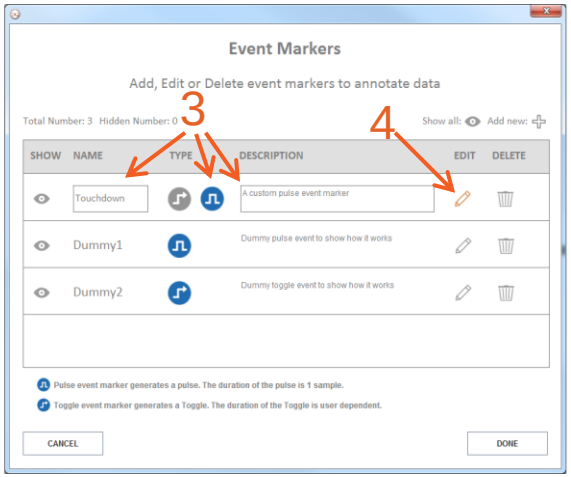
Live Data – Using Event Markers

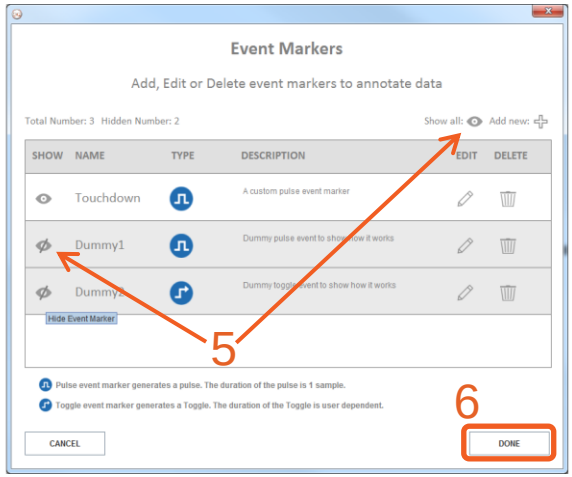
Event markers can be used to annotate incidents that occur during a data recording



Live Data – Editing Event Markers







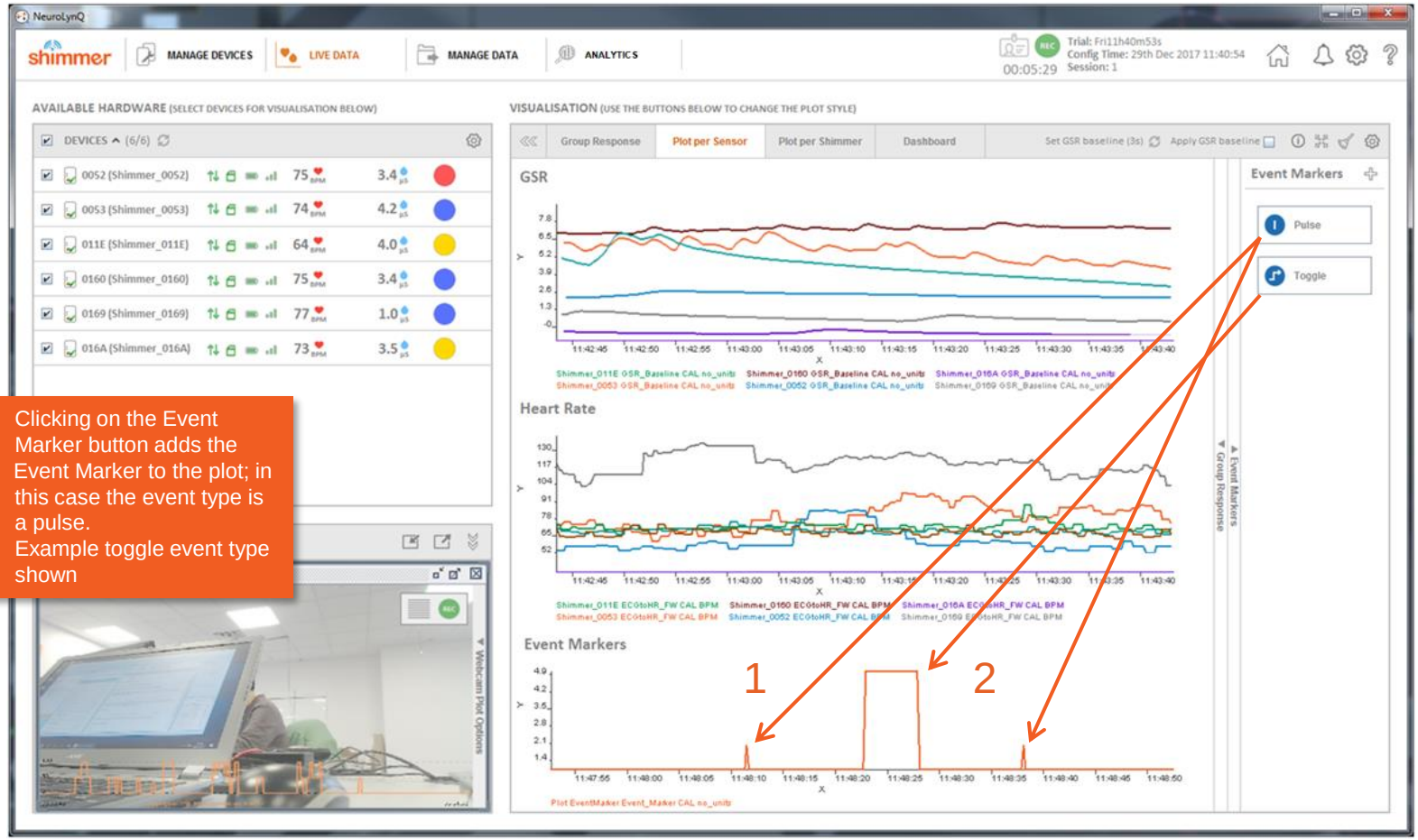
1) This screen appears after clicking the Edit/Add Event Markers button.
2) Click on the '+' to add new Event Markers.

3) Enter "NAME", select "TYPE" and add "DESCRIPTION.
4) Click on the highlighted pencil to confirm the new Event Marker.

5) Hide individual Event Markers or all Event Markers.
6) Click "DONE" when finished editing the Event Markers.

shimmer
DISCOVERY IN MOTION

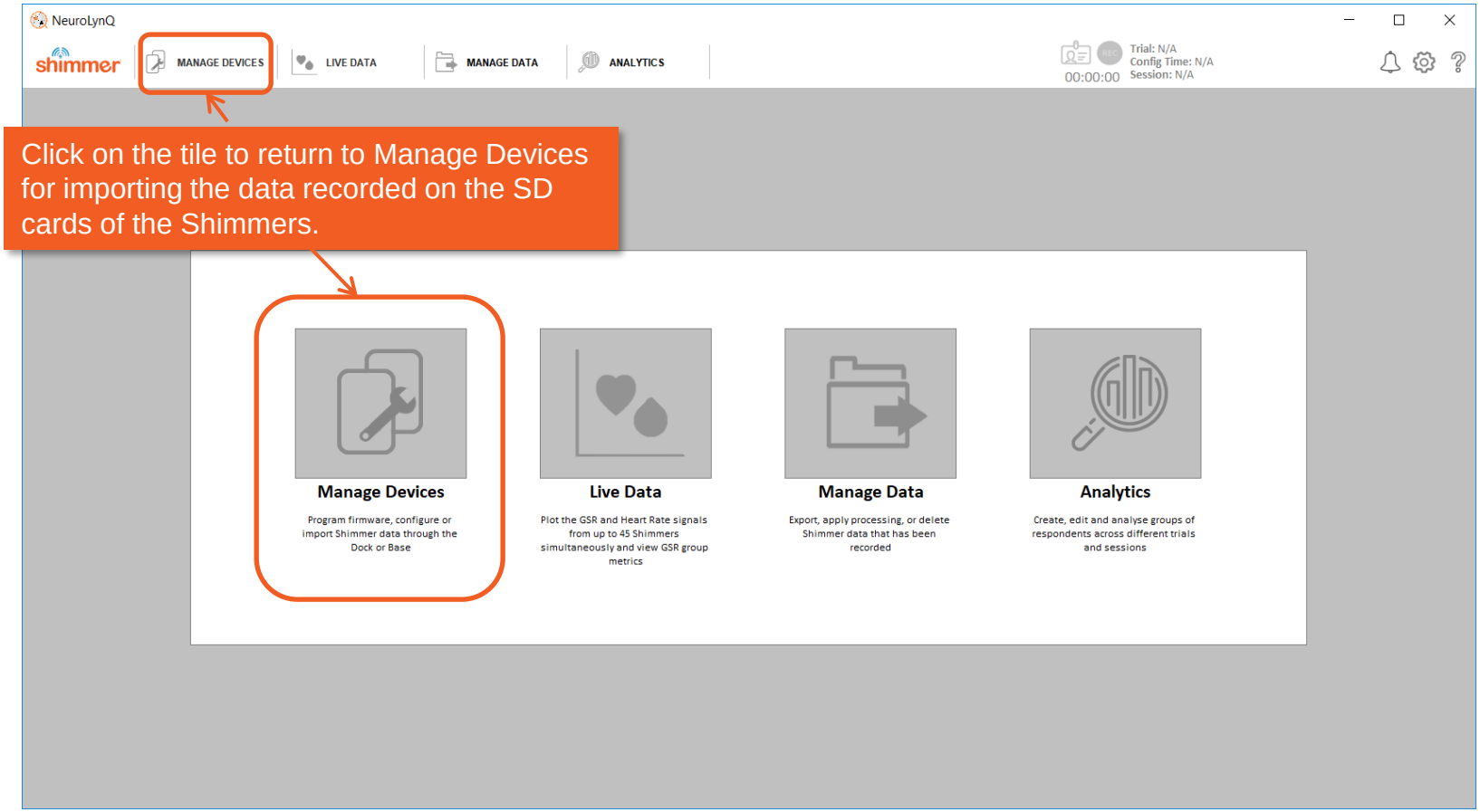
Live Data – Event Marker in plot



1) Clicking on the Event Marker button adds the Event Marker to the plot; in this case the event type is a pulse.
2) Example toggle event type shown

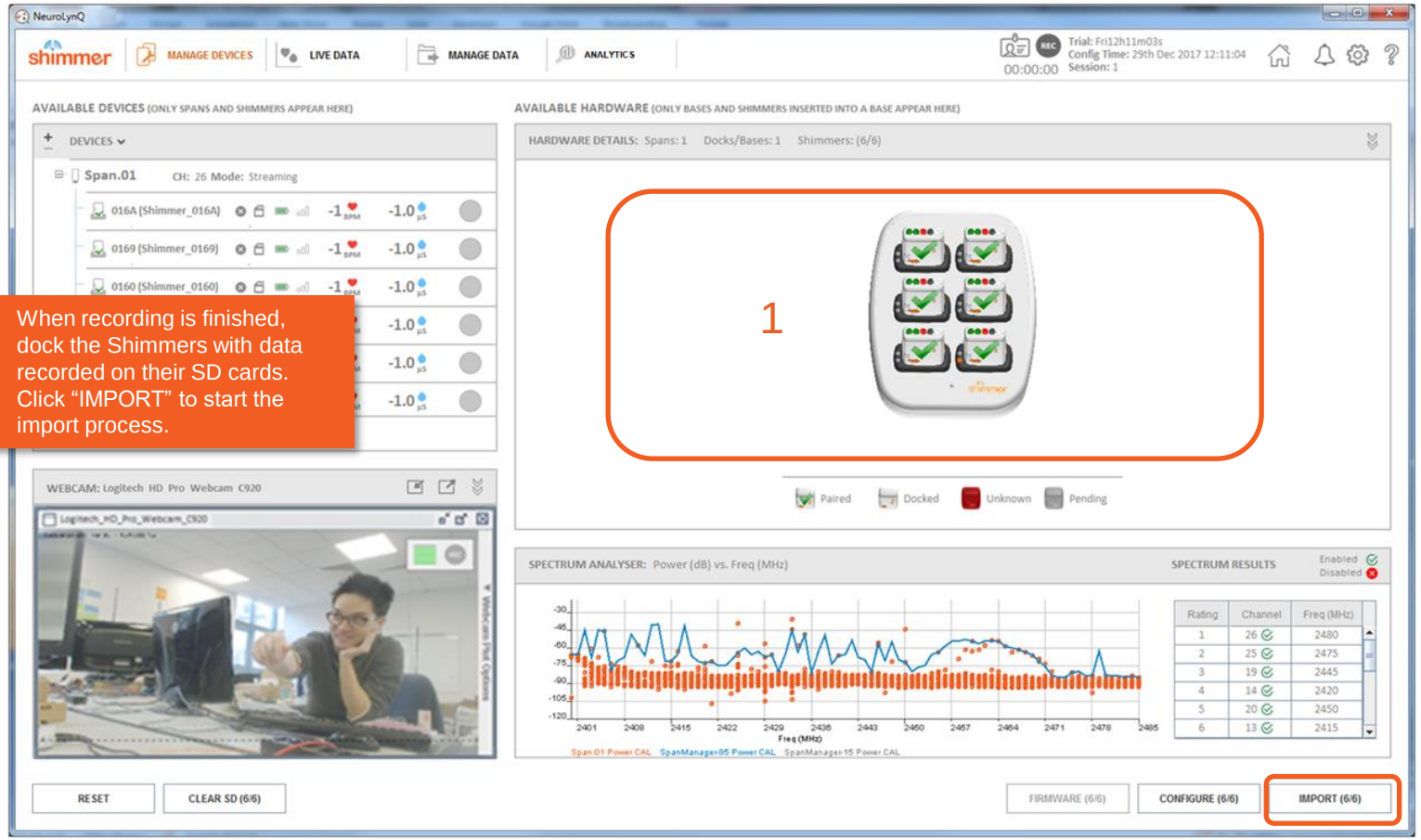
shimmer
DISCOVERY IN MOTION

MANAGE DEVICES – PART 2 - IMPORT

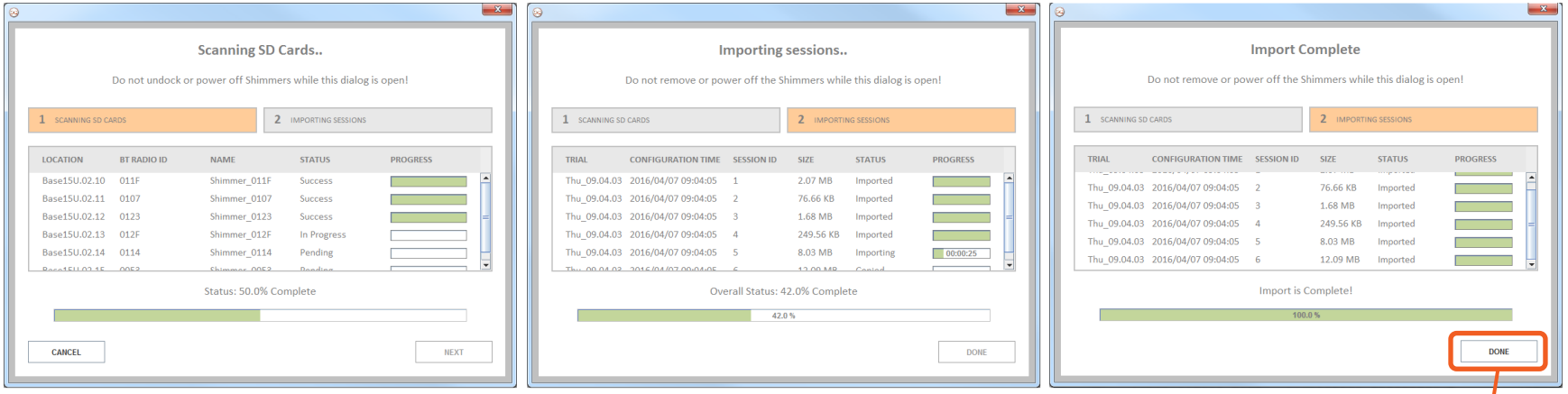


shimmer
DISCOVERY IN MOTION

MANAGE DEVICES – PART 2 - IMPORT



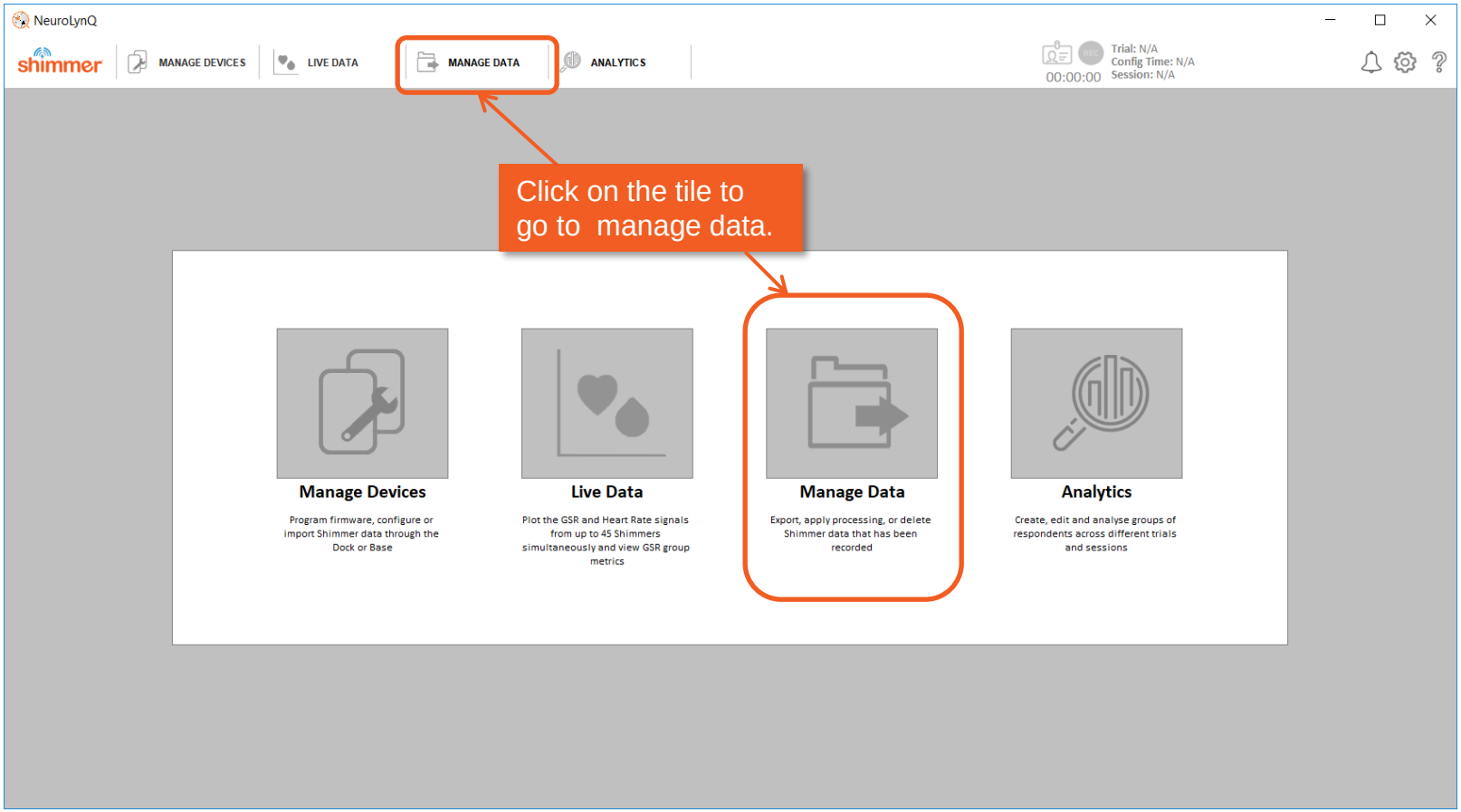
MANAGE DEVICES – PART 2 - IMPORT



Click “DONE” when import is complete.

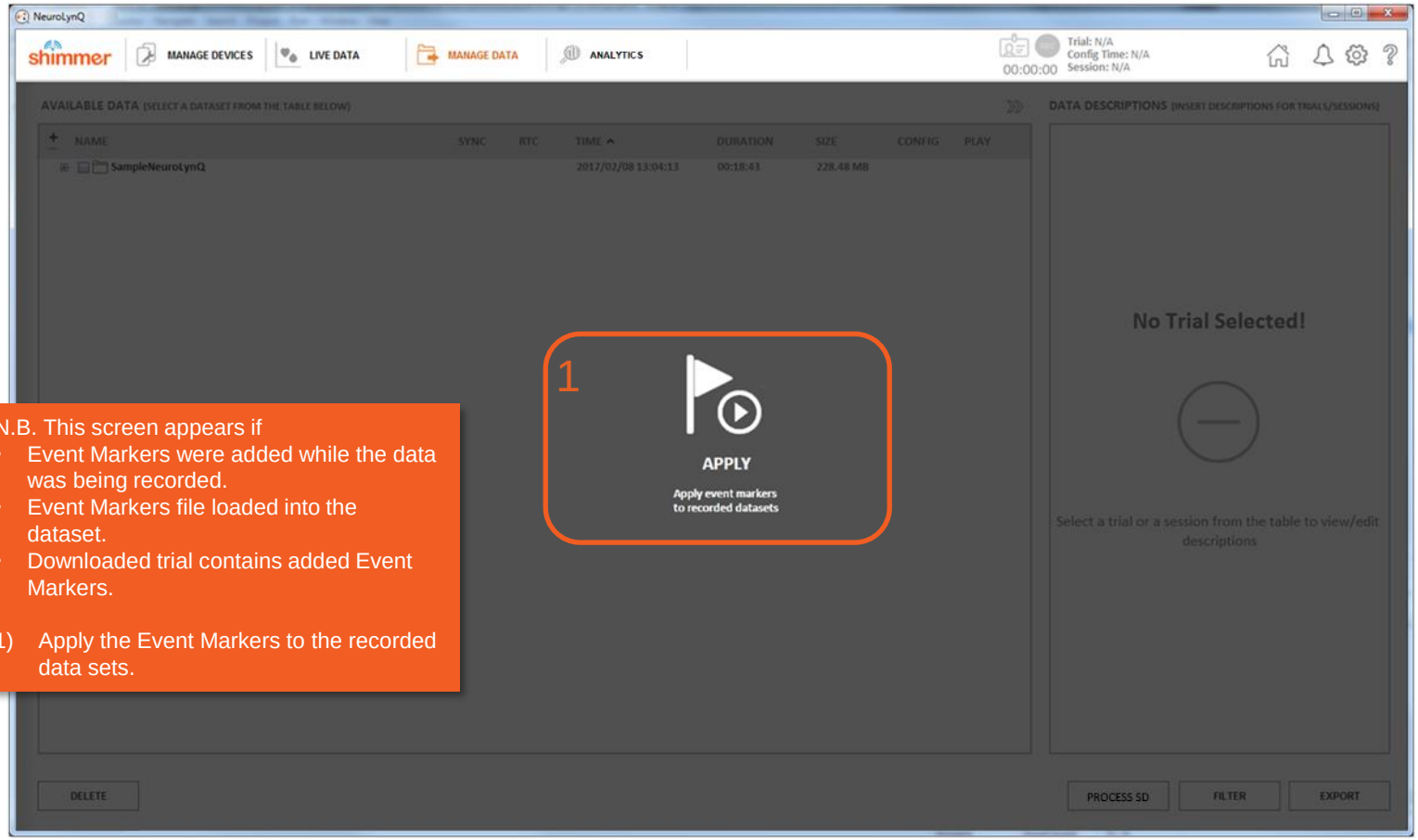
shimmer DISCOVERY IN MOTION

MANAGE DATA - START



shimmer
DISCOVERY IN MOTION

Manage Data – Apply Event Markers



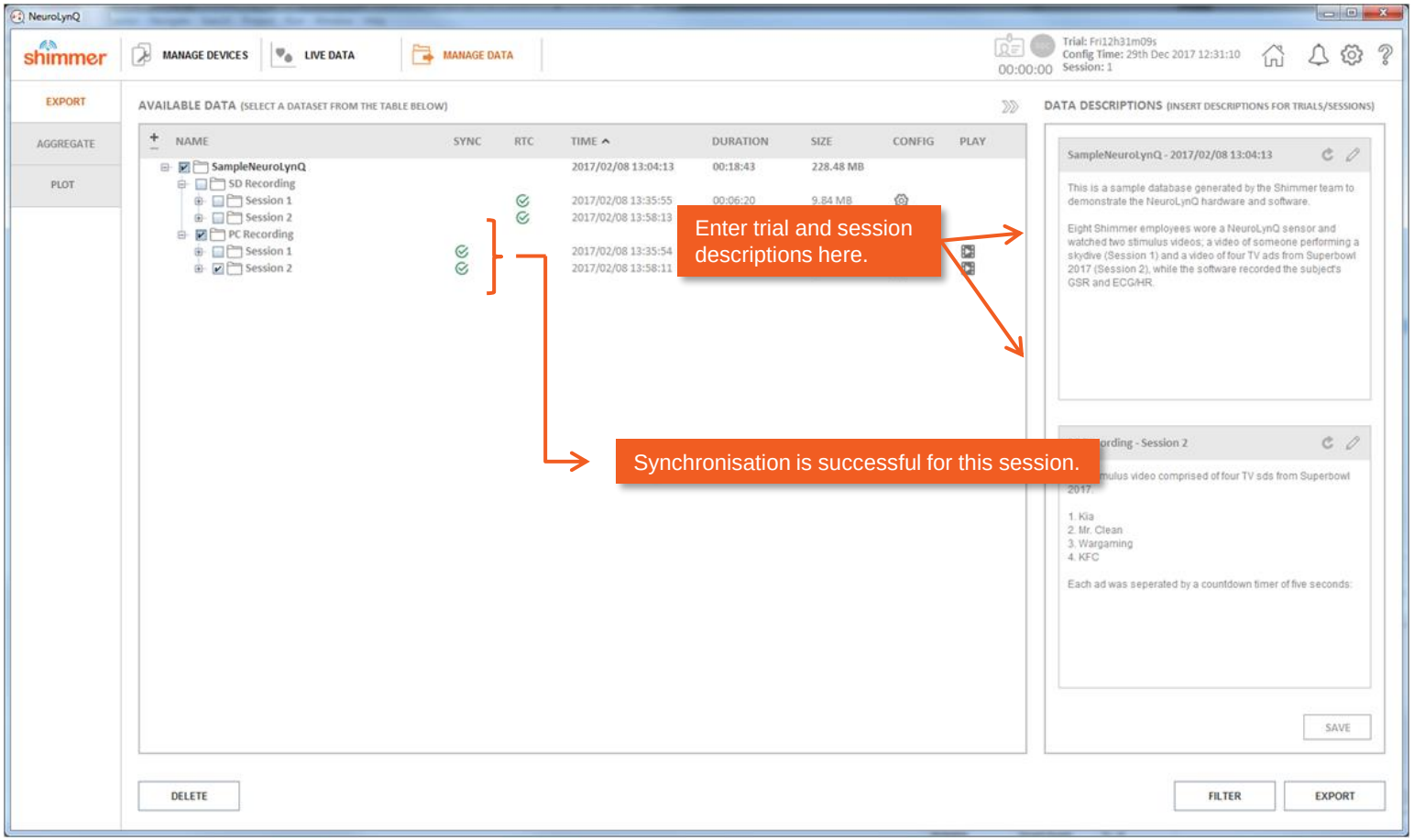
N.B. This screen appears if

- Event Markers were added while the data was being recorded.
- Event Markers file loaded into the dataset.
- Downloaded trial contains added Event Markers.

1) Apply the Event Markers to the recorded data sets.

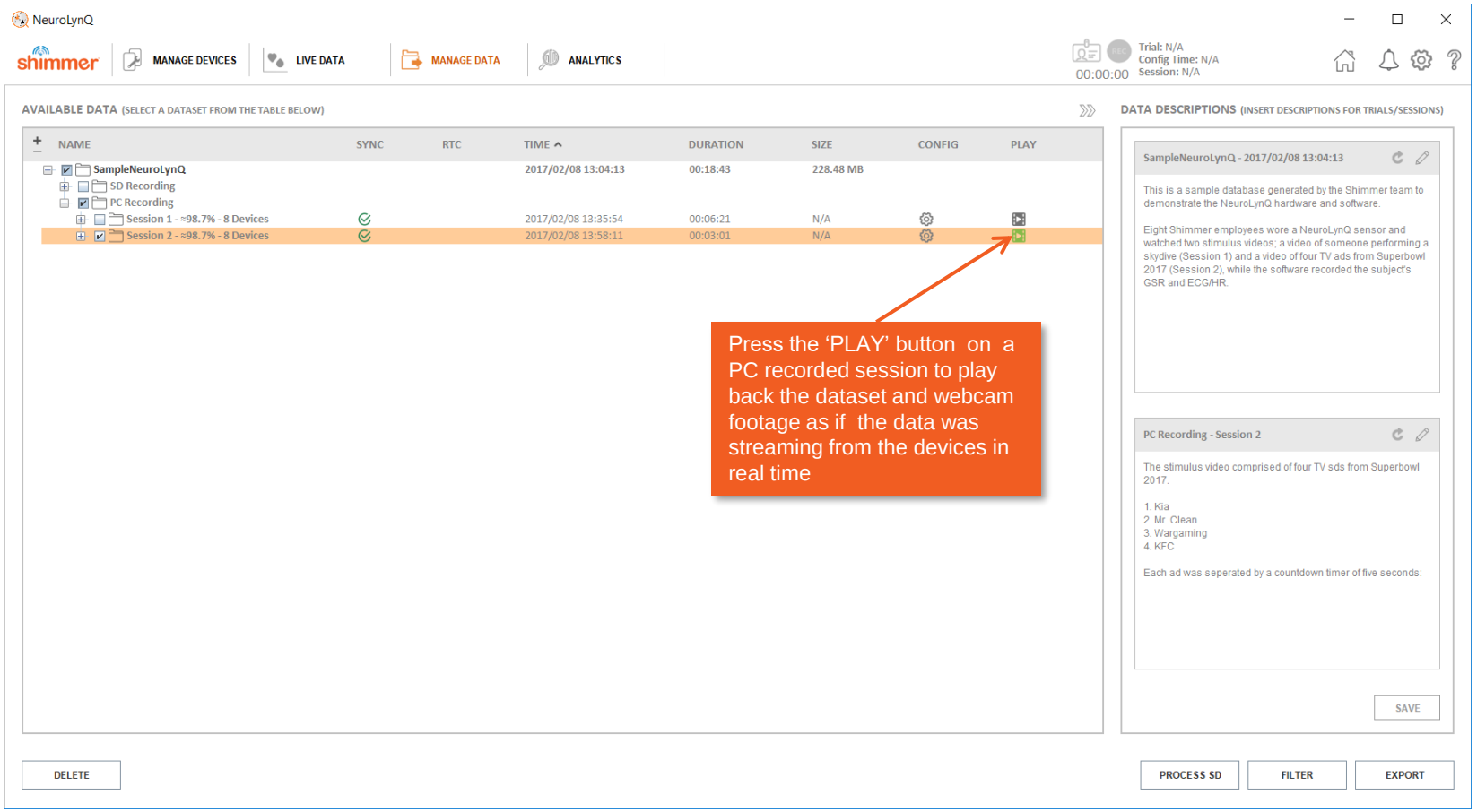
shimmer
DISCOVERY IN MOTION

MANAGE DATA - GENERAL



shimmer
DISCOVERY IN MOTION

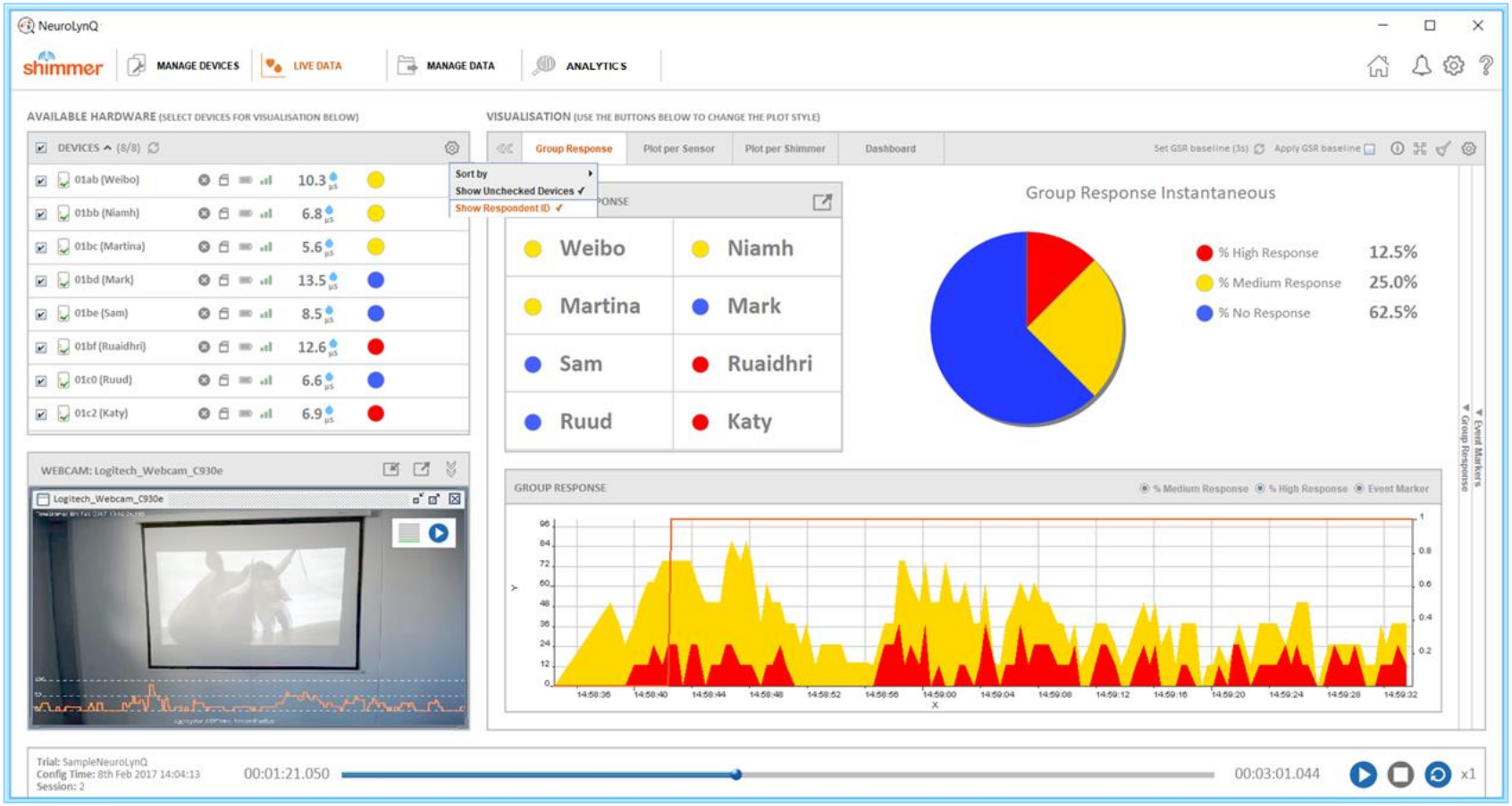
MANAGE DATA - PLAYBACK



shimmer
DISCOVERY IN MOTION

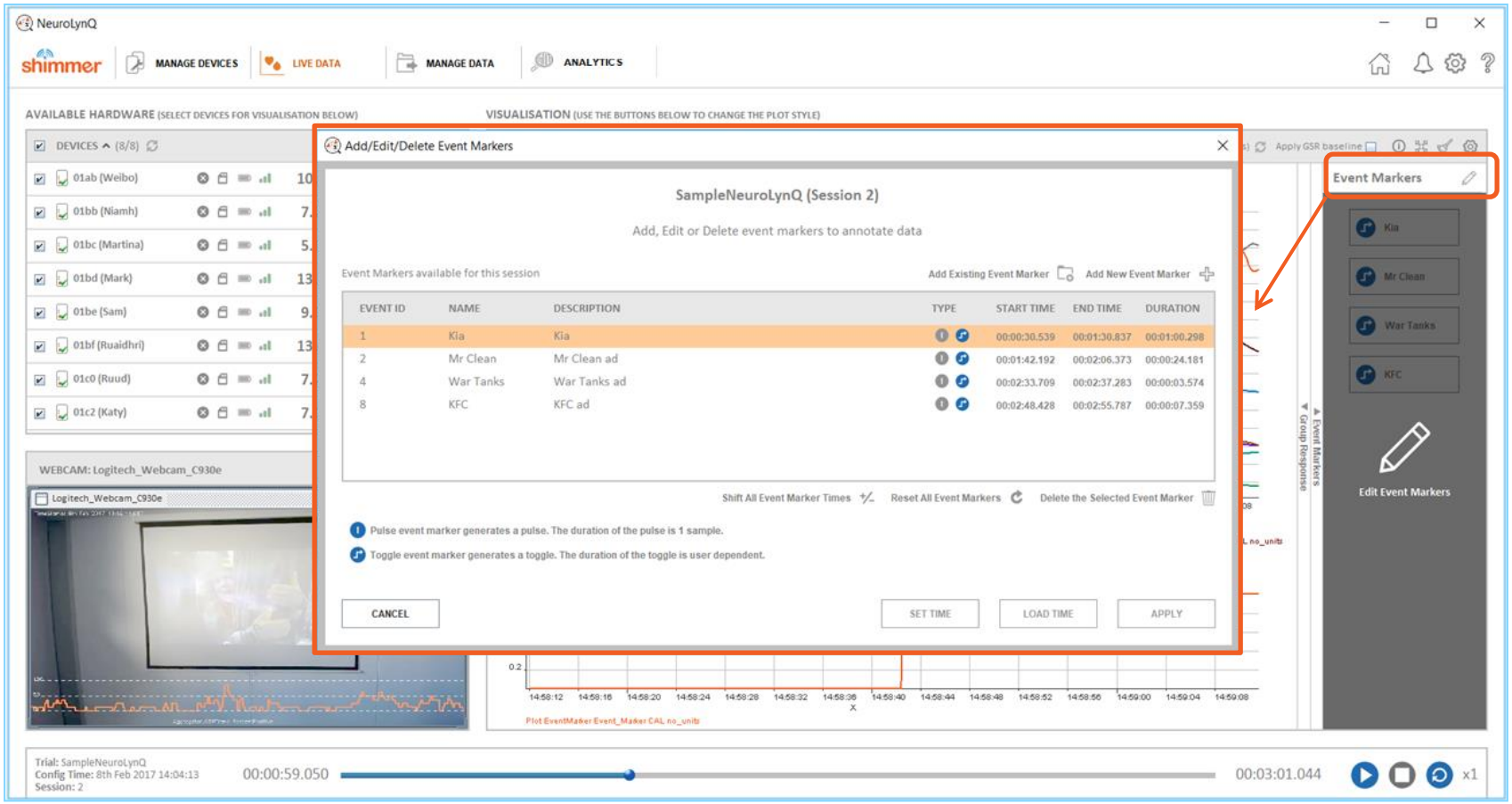
MANAGE DATA - PLAYBACK

All of the visualisation tools are available when playing back data!



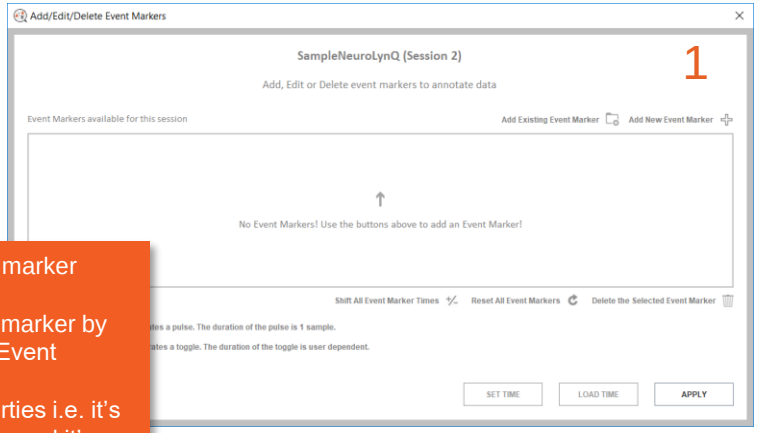
MANAGE DATA – ADD/EDIT EVENT MARKERS

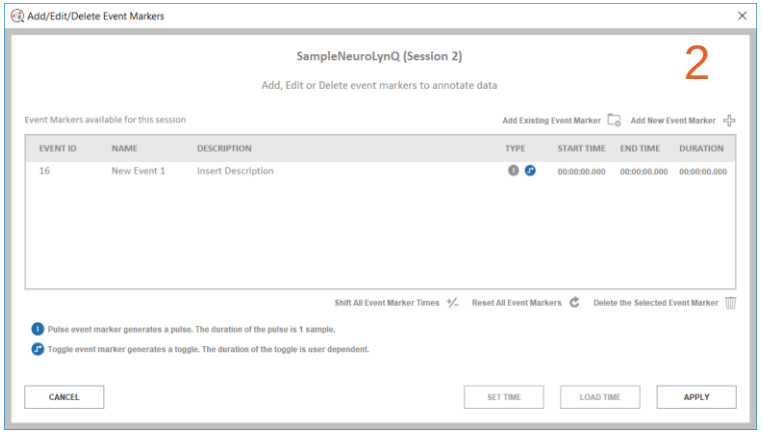
Add, edit or delete event markers post data collection to segment data

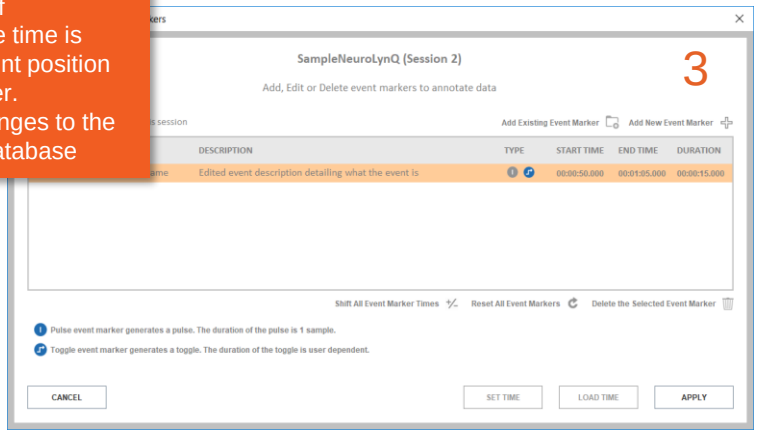


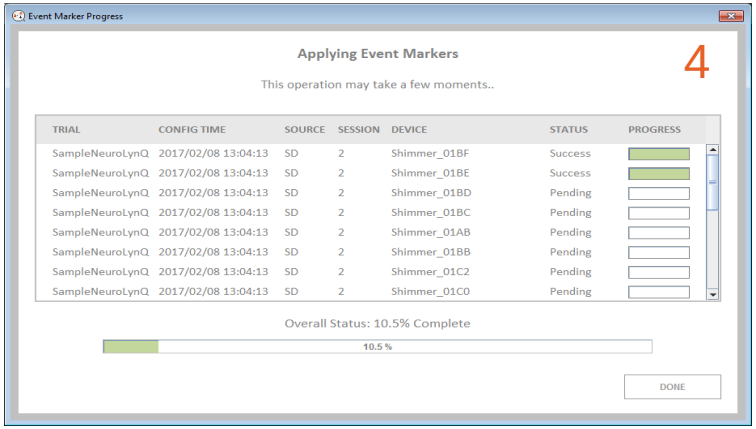
Manage Data – Add/Edit Event Markers

1) Open the edit event marker dialog
2) Create a new event marker by pressing “Add New Event Marker”
3) Edit the event properties i.e. it’s name, it’s description and it’s start (and end time if applicable). Note the time is taken from the current position of the playback slider.
4) Apply the event changes to the data stored in the database



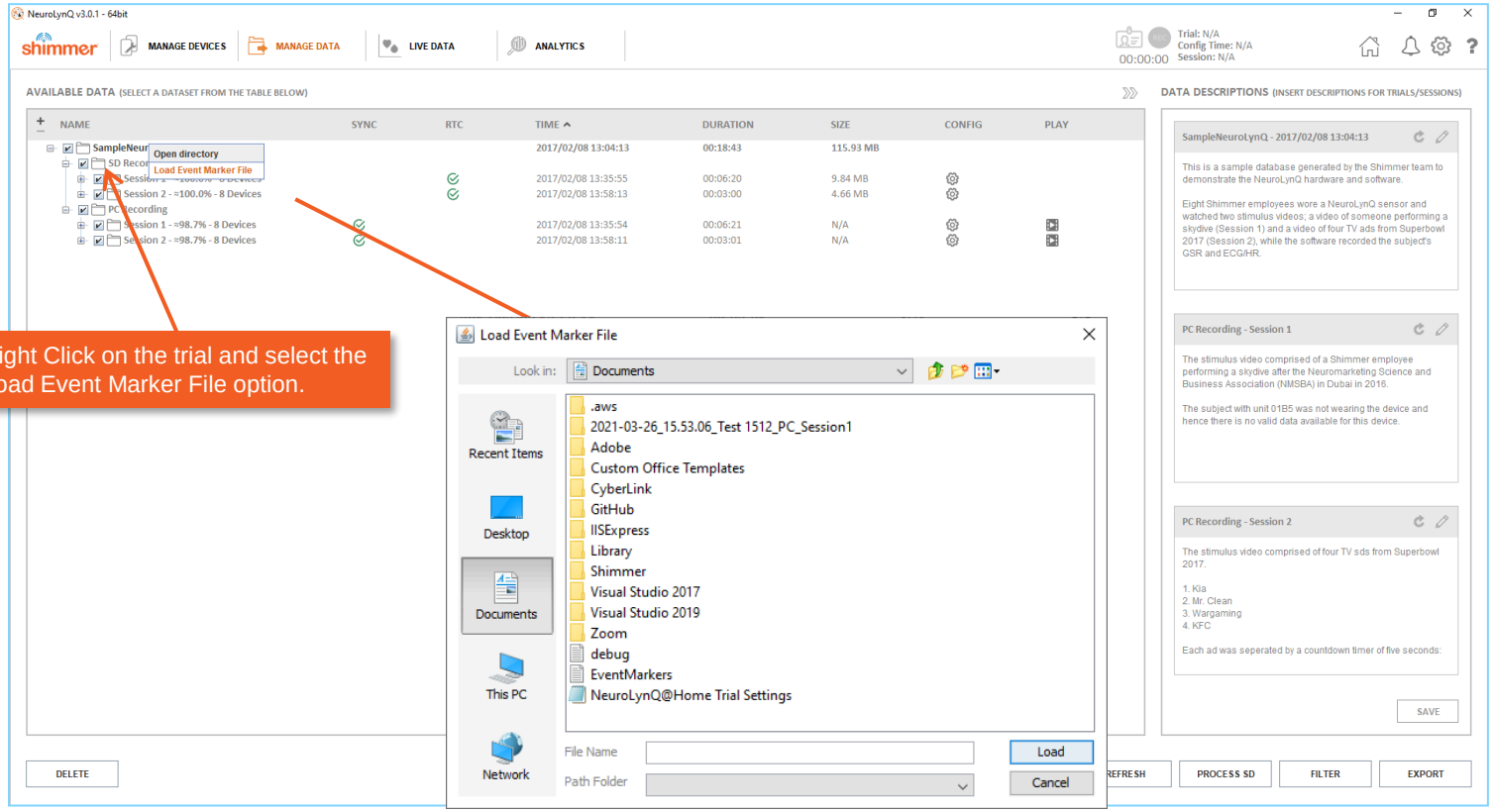






shimmer
DISCOVERY IN MOTION

MANAGE DATA – LOAD EVENT MARKERS

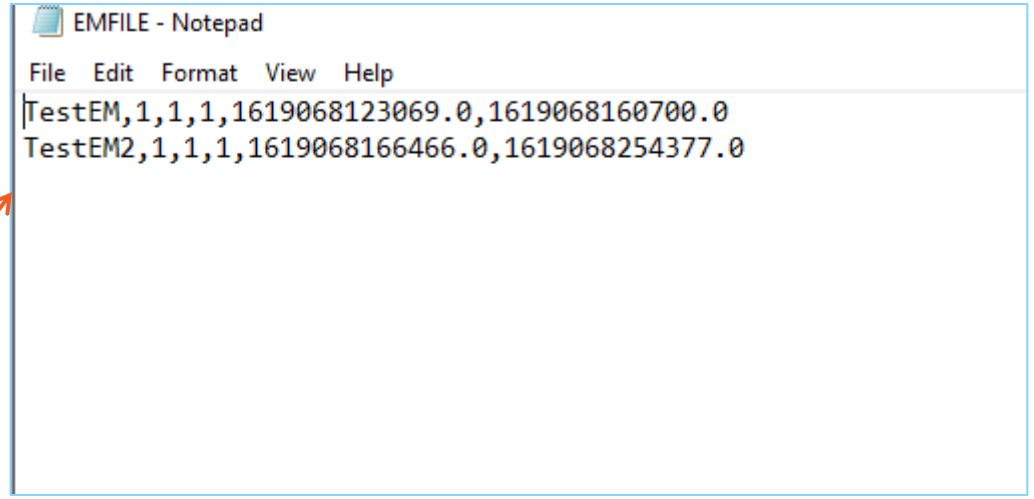


Note: We do not recommend using this function on databases which already have existing Event Markers

Manage Data – Load Event Markers

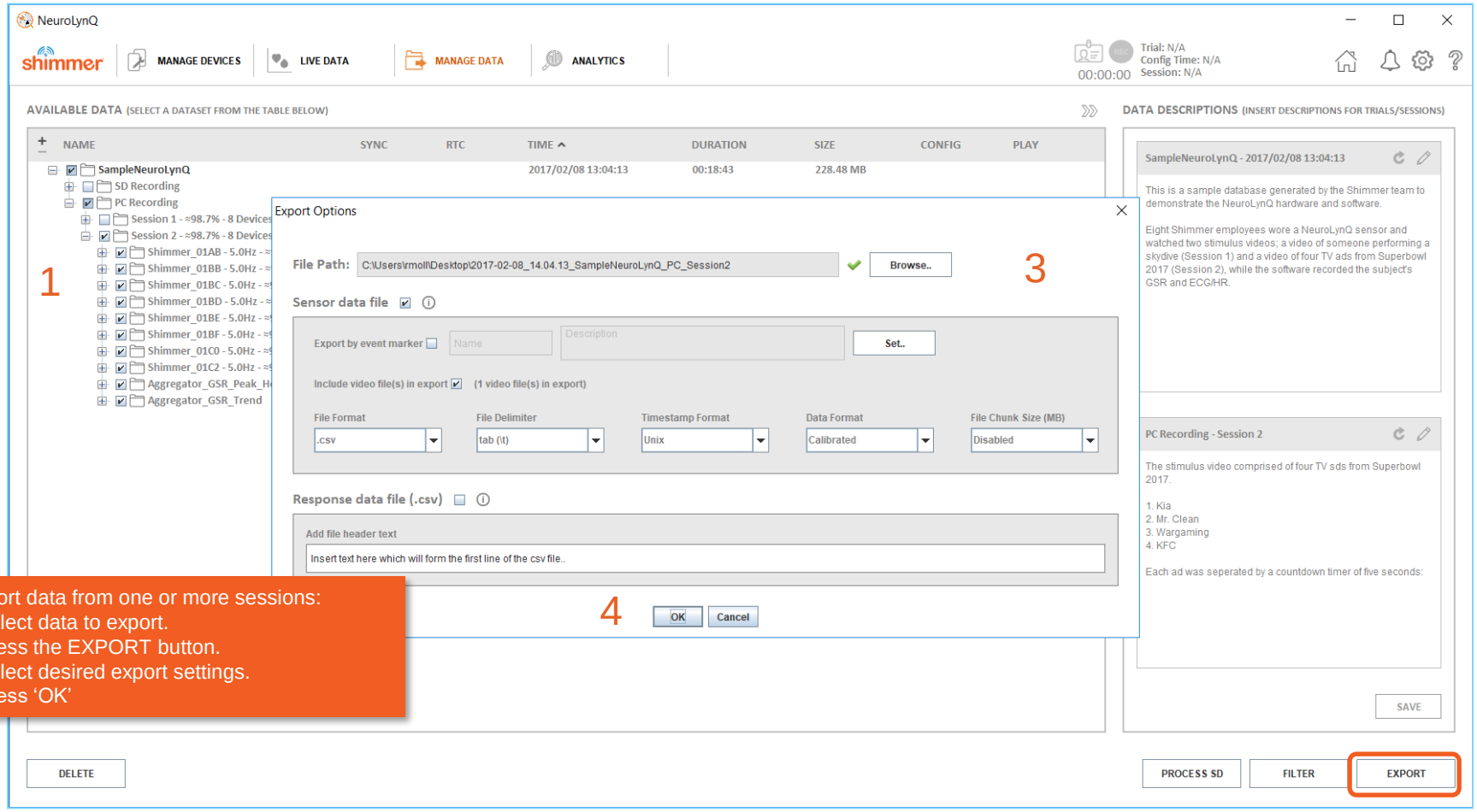
Event Marker file should be in the following format Event Name, Event Marker Type, BT Session ID, SD Session ID, Start Time Stamp (unix), Stop Time Stamp (unix)

1. Event Marker Type to be set to 1, to identify it as a Toggle Type Event.
2. The BT and SD session ID for the purpose of NeuroLynQ@Home should be set to 1 respectively.
3. The Start Time Stamp (unix) is the start of the toggle, and the end time stamp the end of the toggle.



shimmer
DISCOVERY IN MOTION

MANAGE DATA – EXPORT

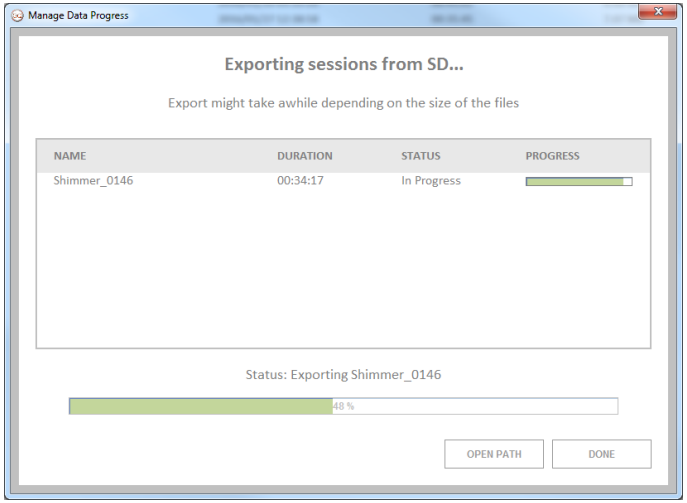


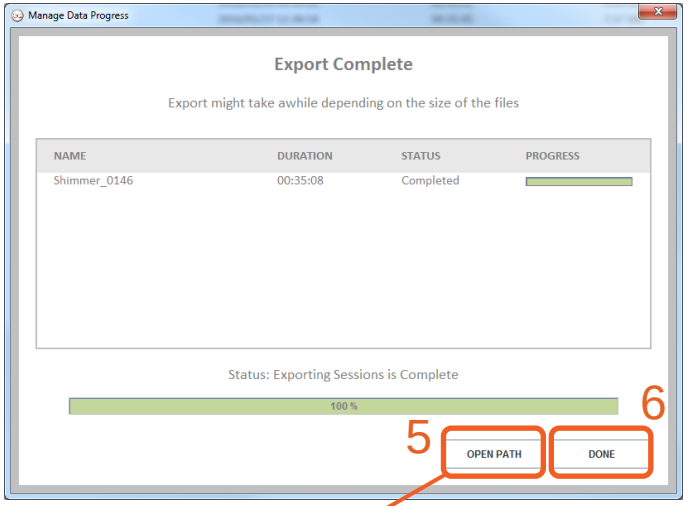
To export data from one or more sessions:

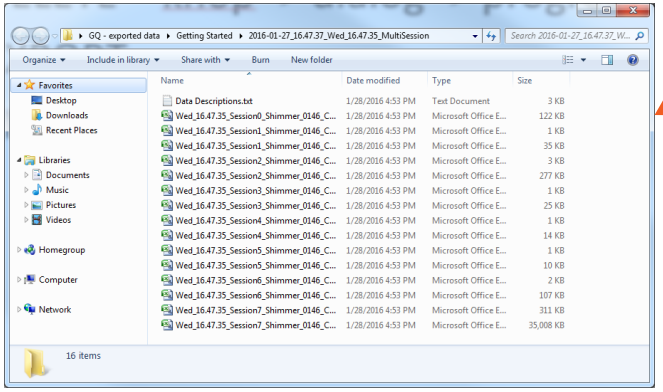
1) Select data to export.
2) Press the EXPORT button.
3) Select desired export settings.
4) Press 'OK'

shimmer
DISCOVERY IN MOTION

MANAGE DATA - EXPORT



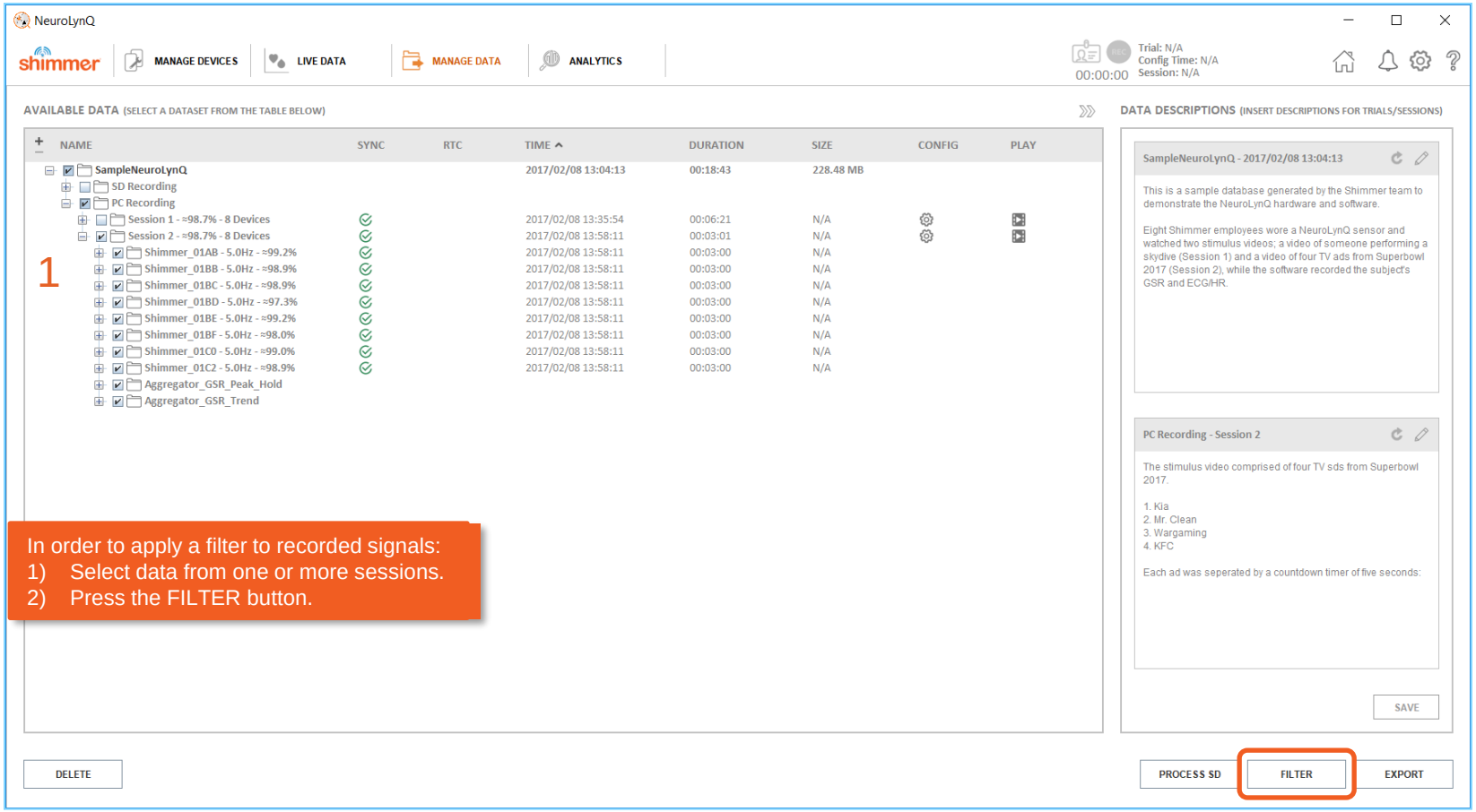




5) Click “OPEN PATH” to open the location of the exported data.
6) Click “DONE” to close the progress dialog.

shimmer
DISCOVERY IN MOTION

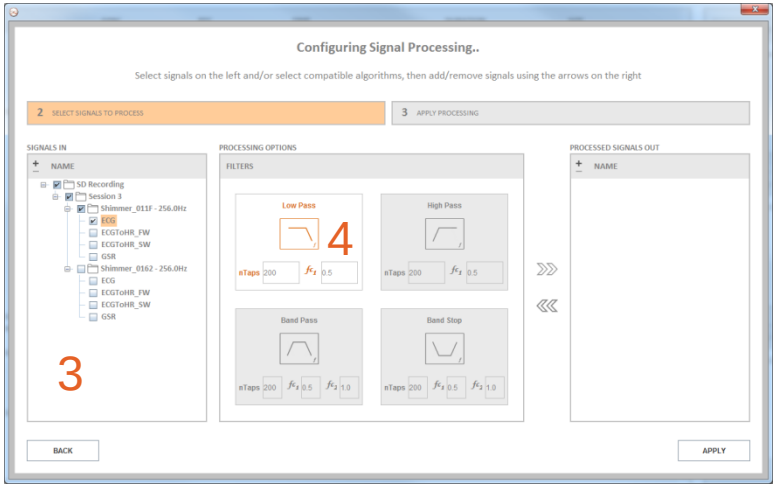
MANAGE DATA – FILTER

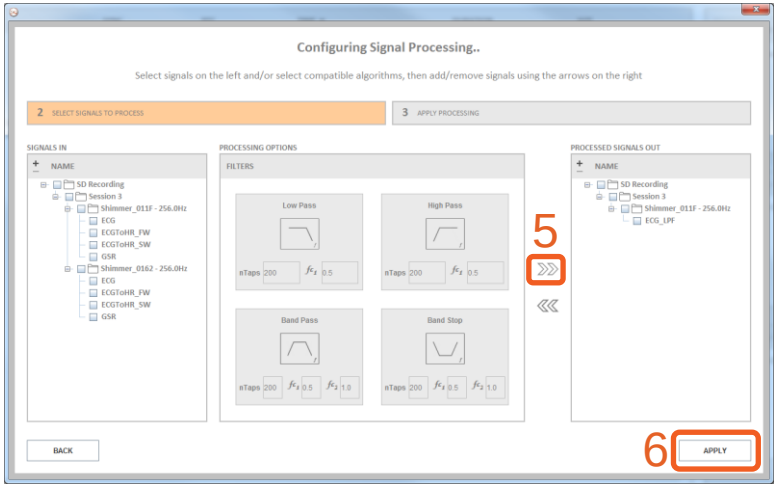


In order to apply a filter to recorded signals:
1) Select data from one or more sessions.
2) Press the FILTER button.

shimmer
DISCOVERY IN MOTION

MANAGE DATA - FILTER

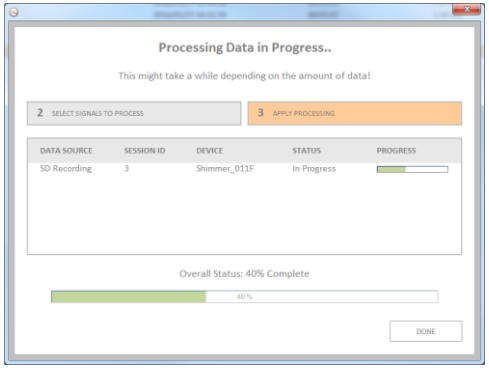


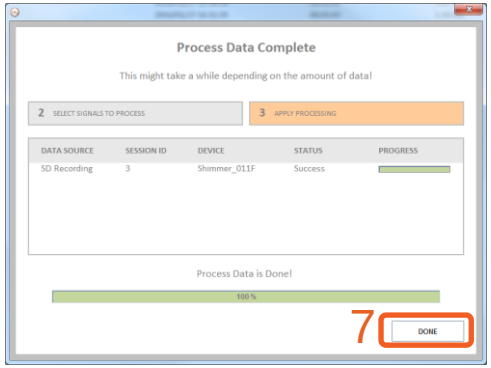


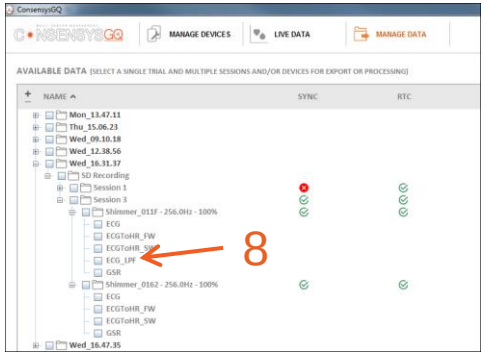
3) Select the signals to filter.
4) Click the tile to select filter type and filter parameters.
5) Click the arrows to add a selection of filtered signal(s).
6) Press “APPLY” to start applying the filter(s).

shimmer
DISCOVERY IN MOTION

MANAGE DATA - FILTER



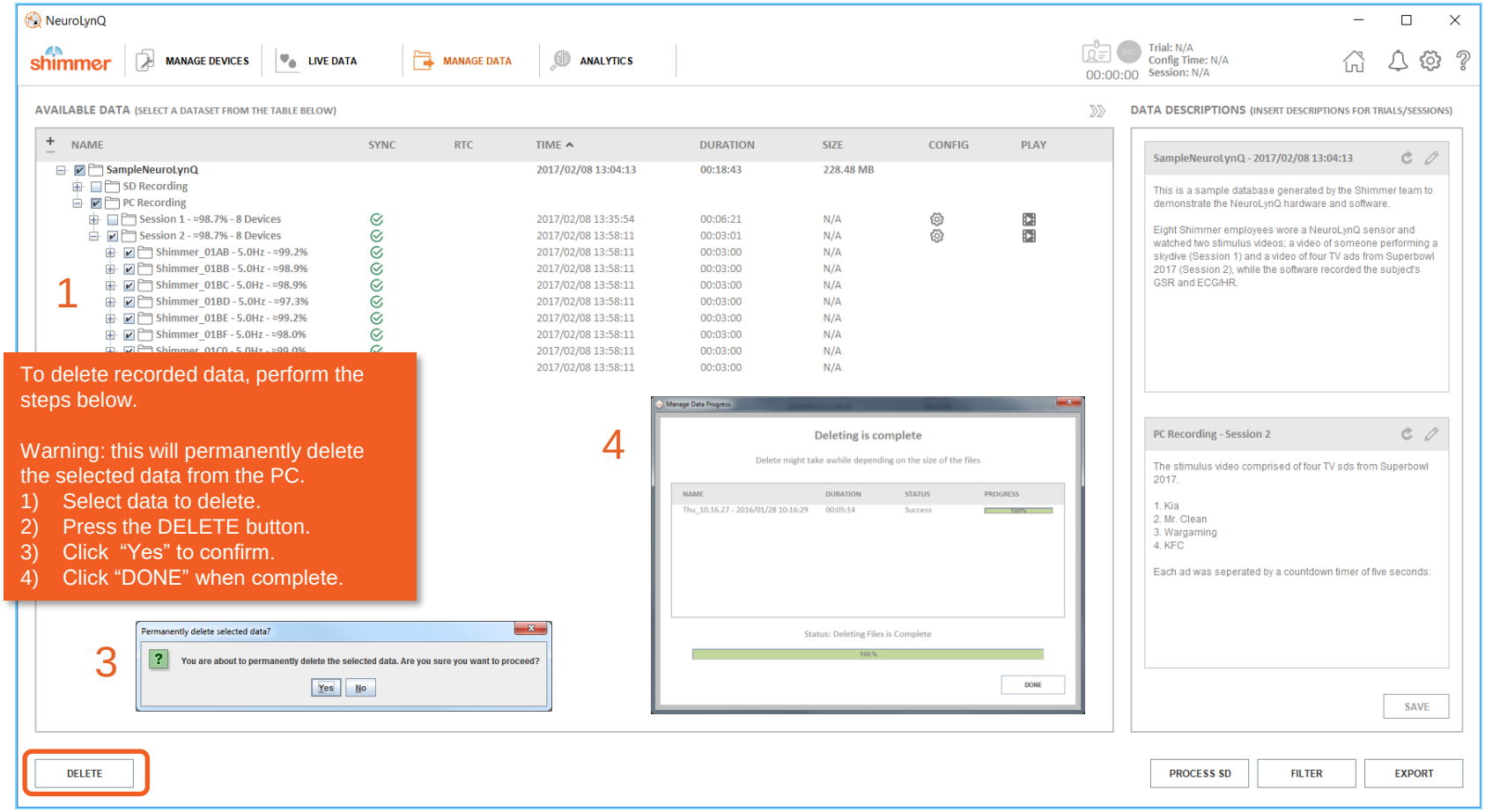




7) Click “DONE” when processing is complete.
8) Filtered signal(s) are added to the MANAGE DATA list.

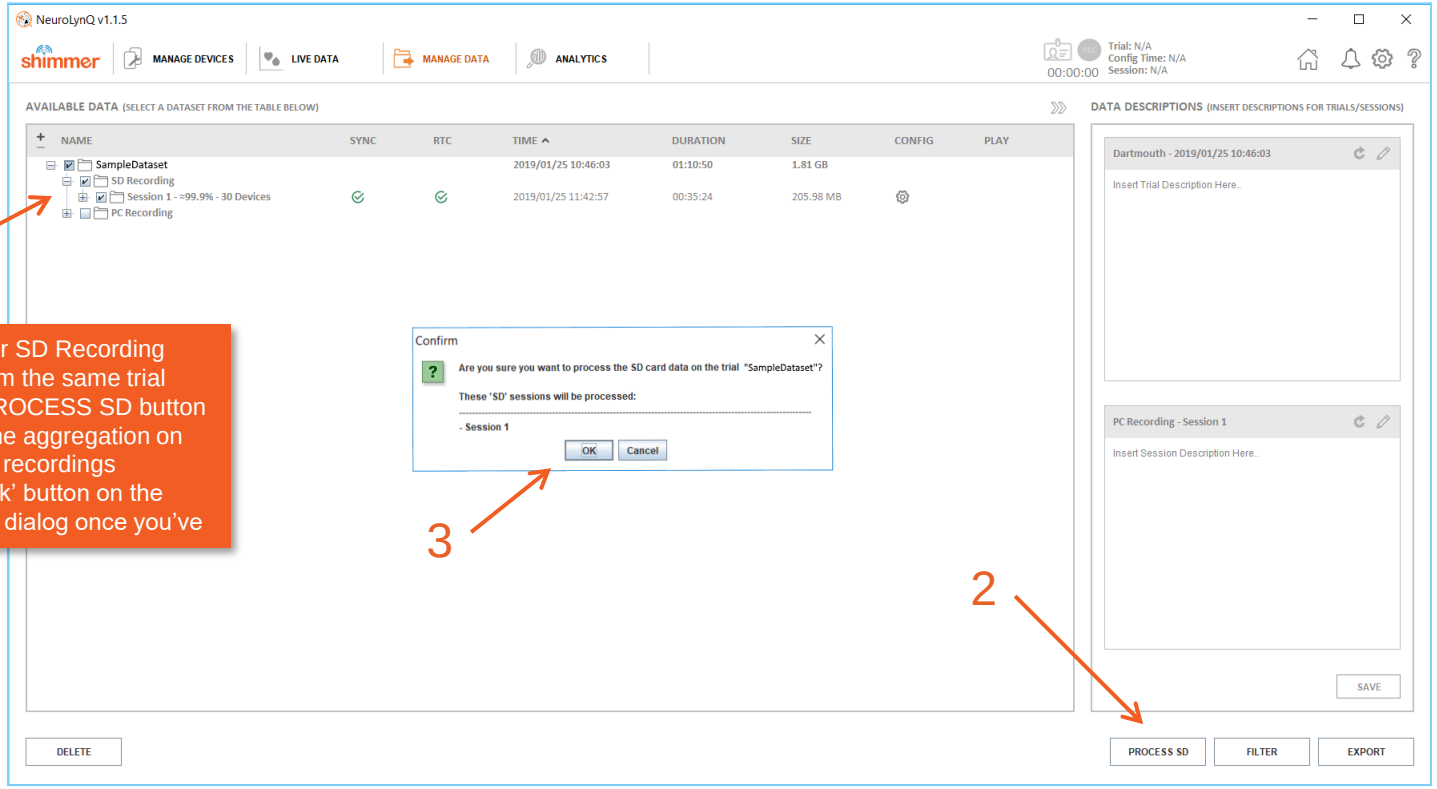
shimmer
DISCOVERY IN MOTION

MANAGE DATA – DELETE



MANAGE DATA – PROCESS SD – PART 1

Run the group GSR + HR algorithm on SD recorded data to produce the same form of group response output as obtained when capturing live data as on page 31/32



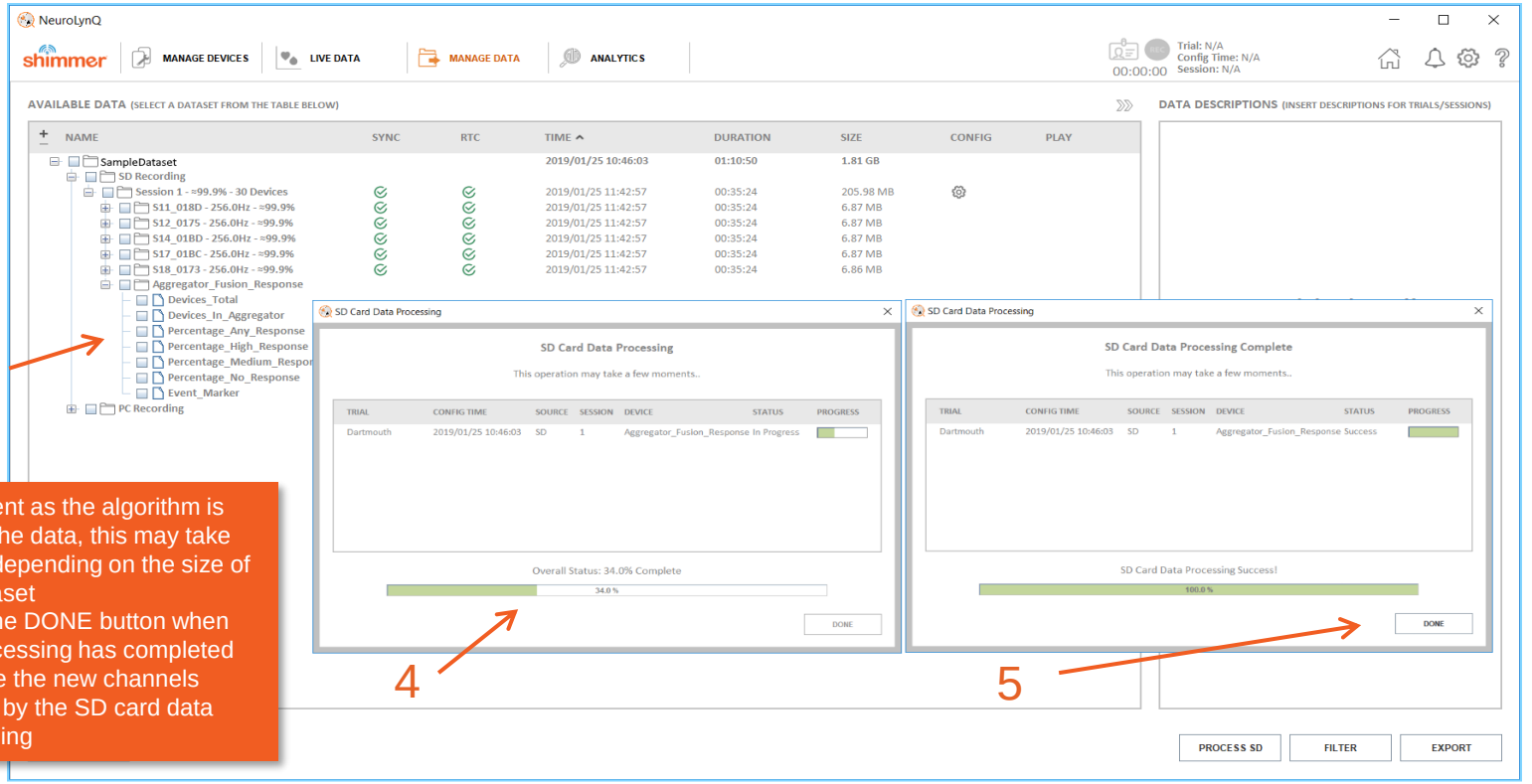
1) Select one or SD Recording sessions from the same trial
2) Press the PROCESS SD button to perform the aggregation on the selected recordings
3) Press the 'Ok' button on the confirmation dialog once you've

Note: You can only run the algorithm on SD data that was imported in v2.0.0 or later

shimmer
DISCOVERY IN MOTION

MANAGE DATA – PROCESS SD – PART 2

Run the group GSR + HR algorithm on SD recorded data to produce the same form of group response output as obtained when capturing live data as on page 31/32

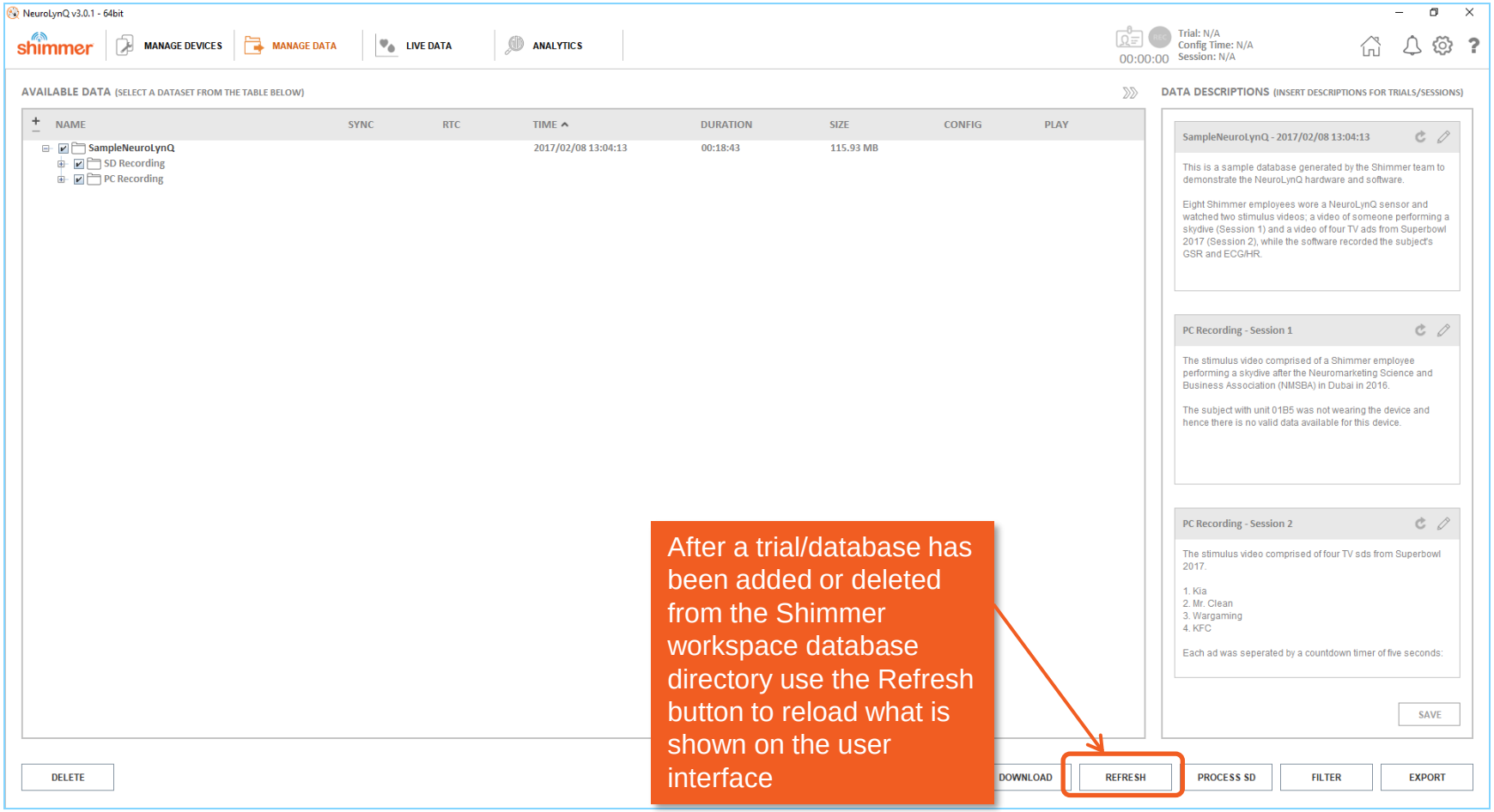


4) Be patient as the algorithm is run on the data, this may take awhile depending on the size of the dataset
5) Press the DONE button when the processing has completed
6) Observe the new channels created by the SD card data processing

Note: You can only run the algorithm on SD data that was imported in v2.0.0 or later

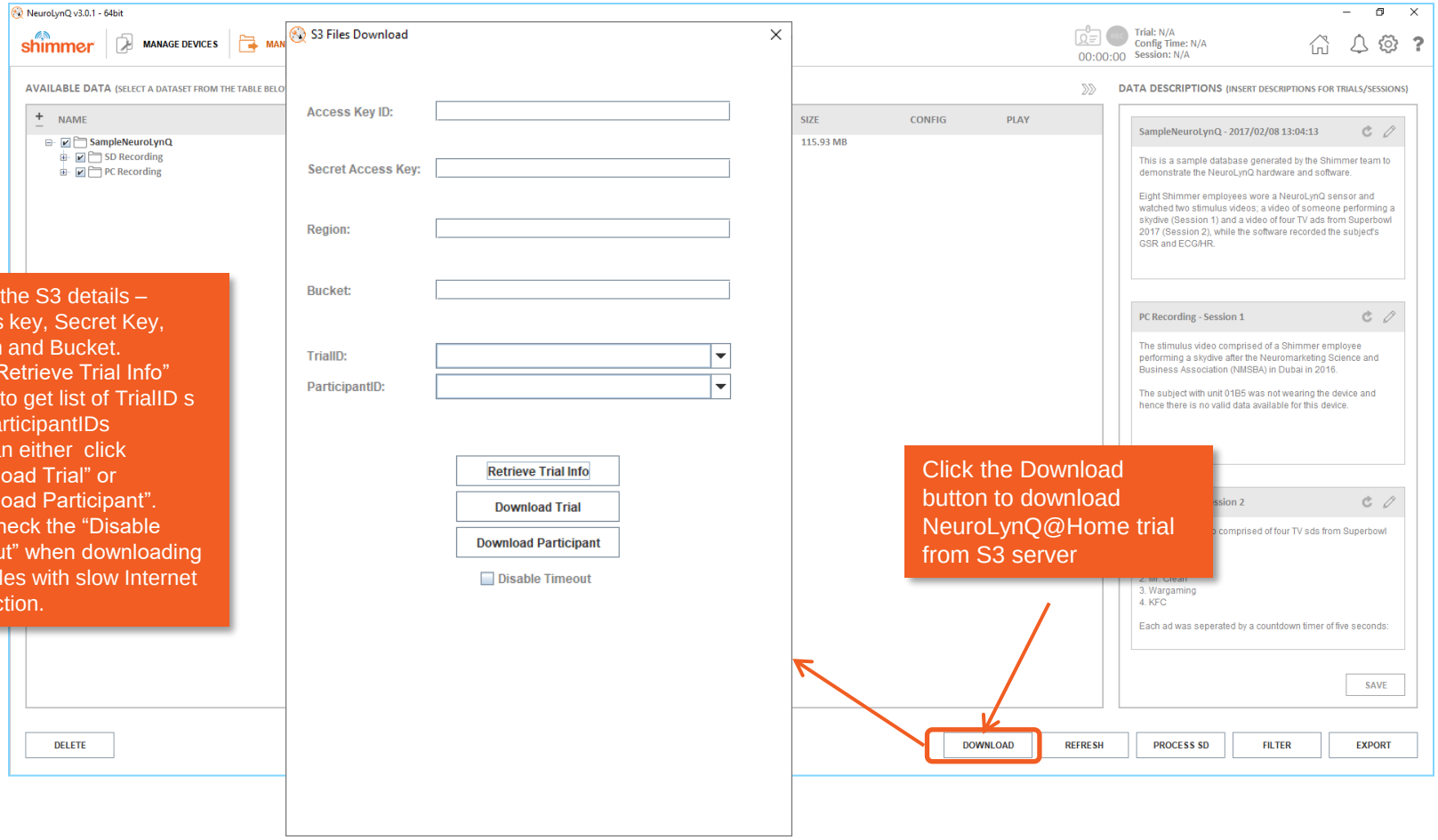
shimmer
DISCOVERY IN MOTION

MANAGE DATA - REFRESH



shimmer
DISCOVERY IN MOTION

MANAGE DATA - DOWNLOAD



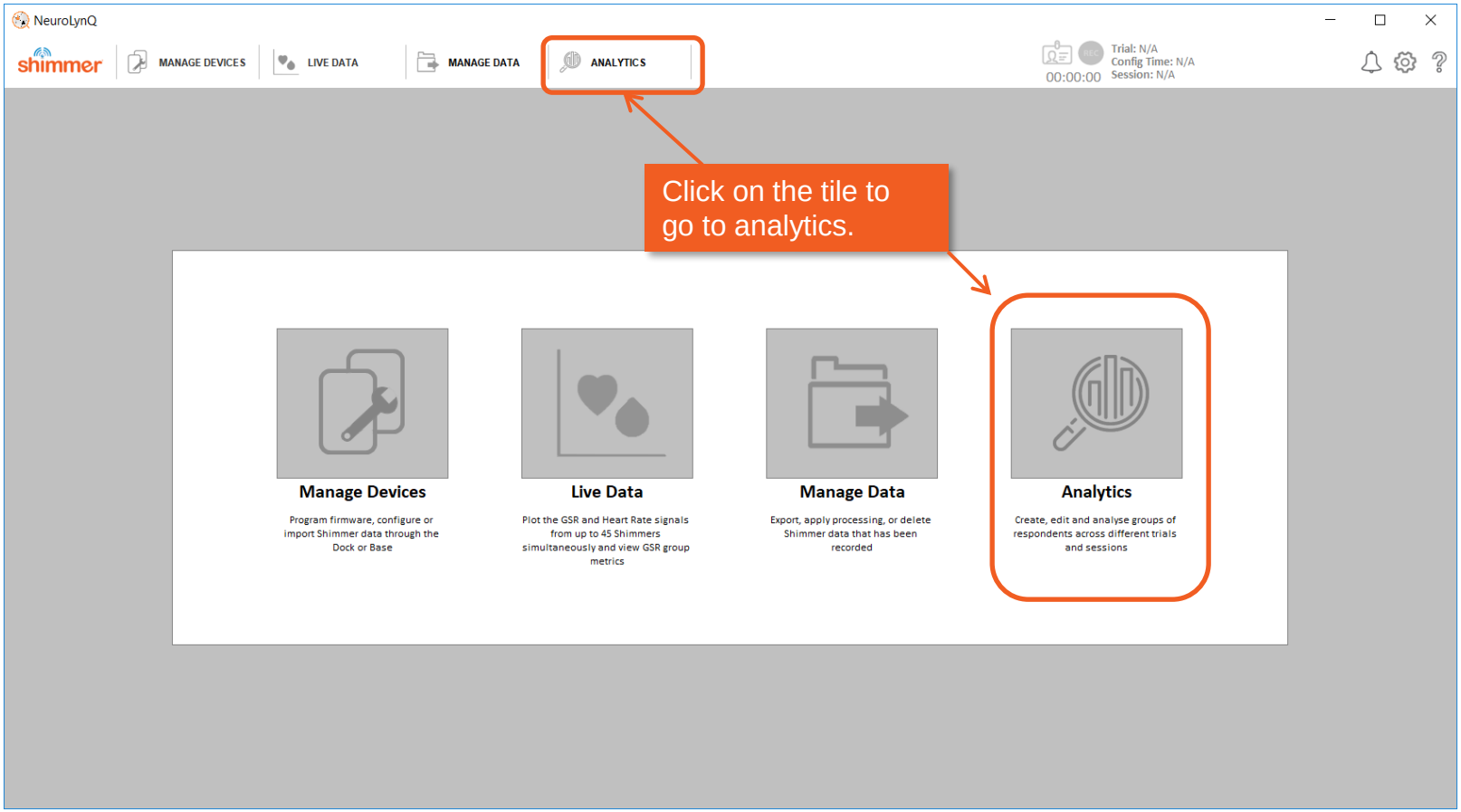
1. Key in the S3 details – Access key, Secret Key, Region and Bucket.
2. Click “Retrieve Trial Info” button to get list of TrialID s and ParticipantIDs
3. You can either click “Download Trial” or “Download Participant”.
4. Only check the “Disable Timeout” when downloading large files with slow Internet connection.

Click the Download button to download NeuroLynQ@Home trial from S3 server

Note: You are not recommended to cancel the ongoing download progress as it will corrupt the files.

shimmer
DISCOVERY IN MOTION

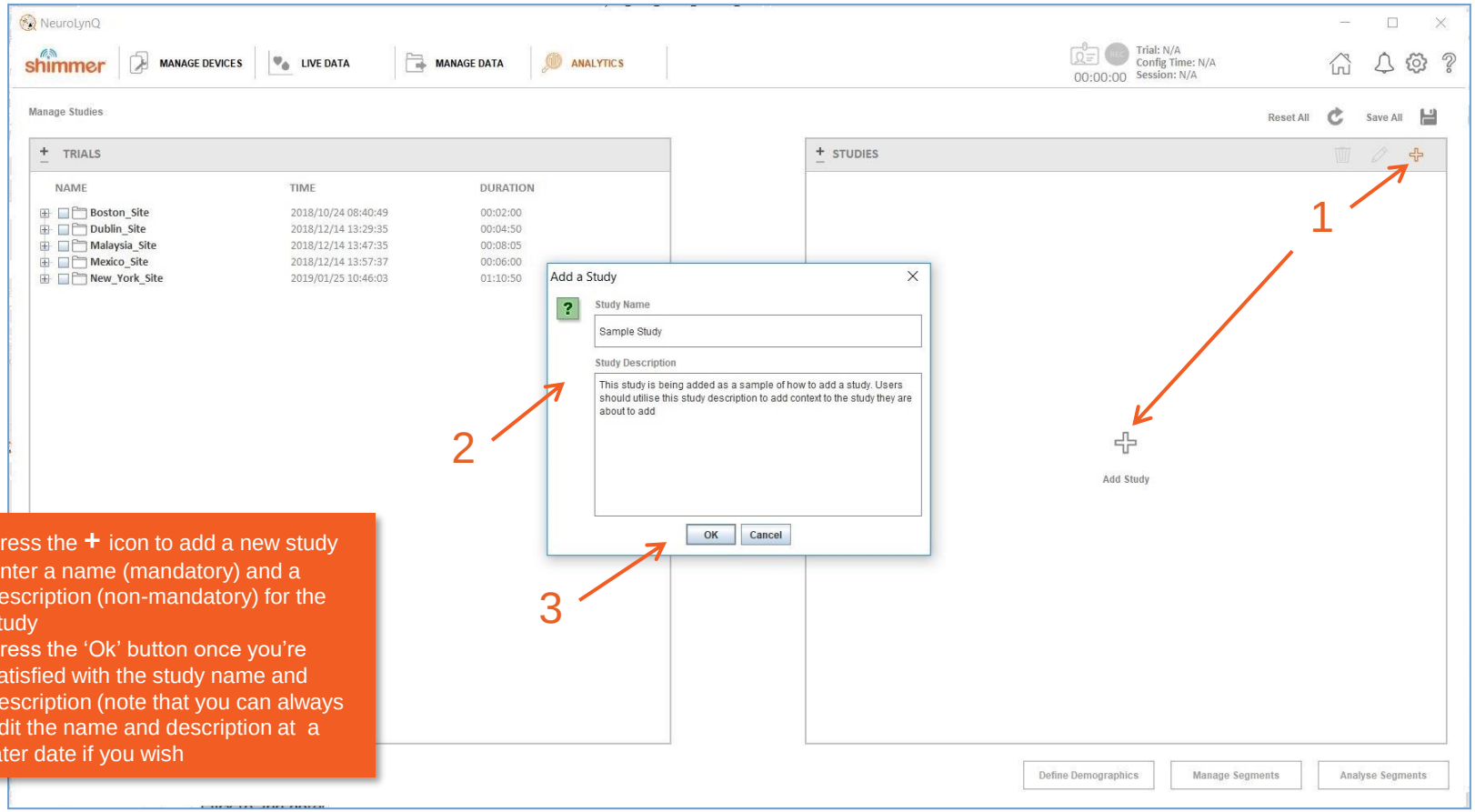
ANALYTICS - START



shimmer
DISCOVERY IN MOTION

Analytics – Manage Studies – Add Study

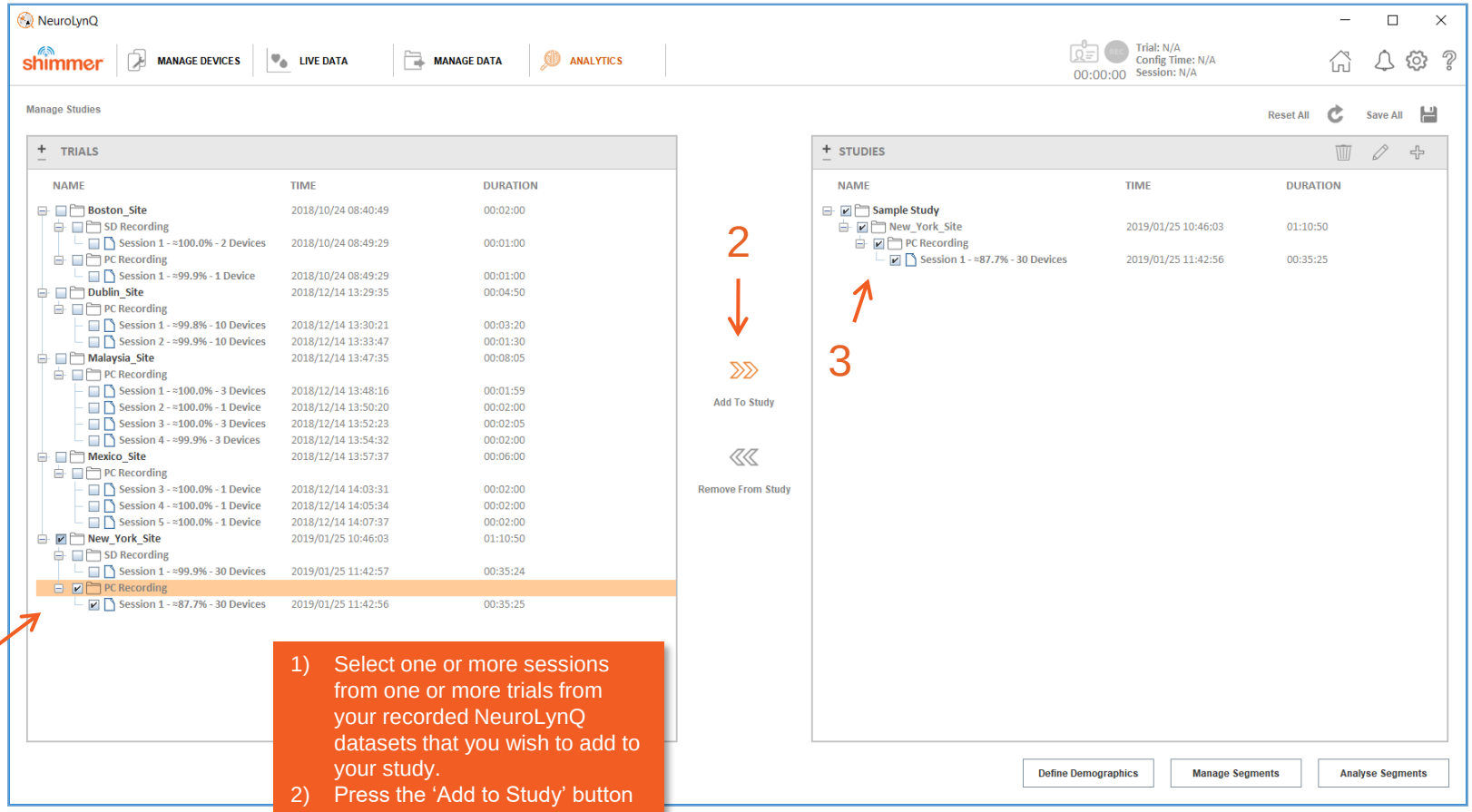
A study can be defined as a collection of one or more trials each containing one or more sessions that are grouped together in order to perform analysis on the collection



1) Press the + icon to add a new study
2) Enter a name (mandatory) and a description (non-mandatory) for the study
3) Press the 'Ok' button once you're satisfied with the study name and description (note that you can always edit the name and description at a later date if you wish

shimmer DISCOVERY IN MOTION

Analytics – Manage Studies – Add Data to a Study

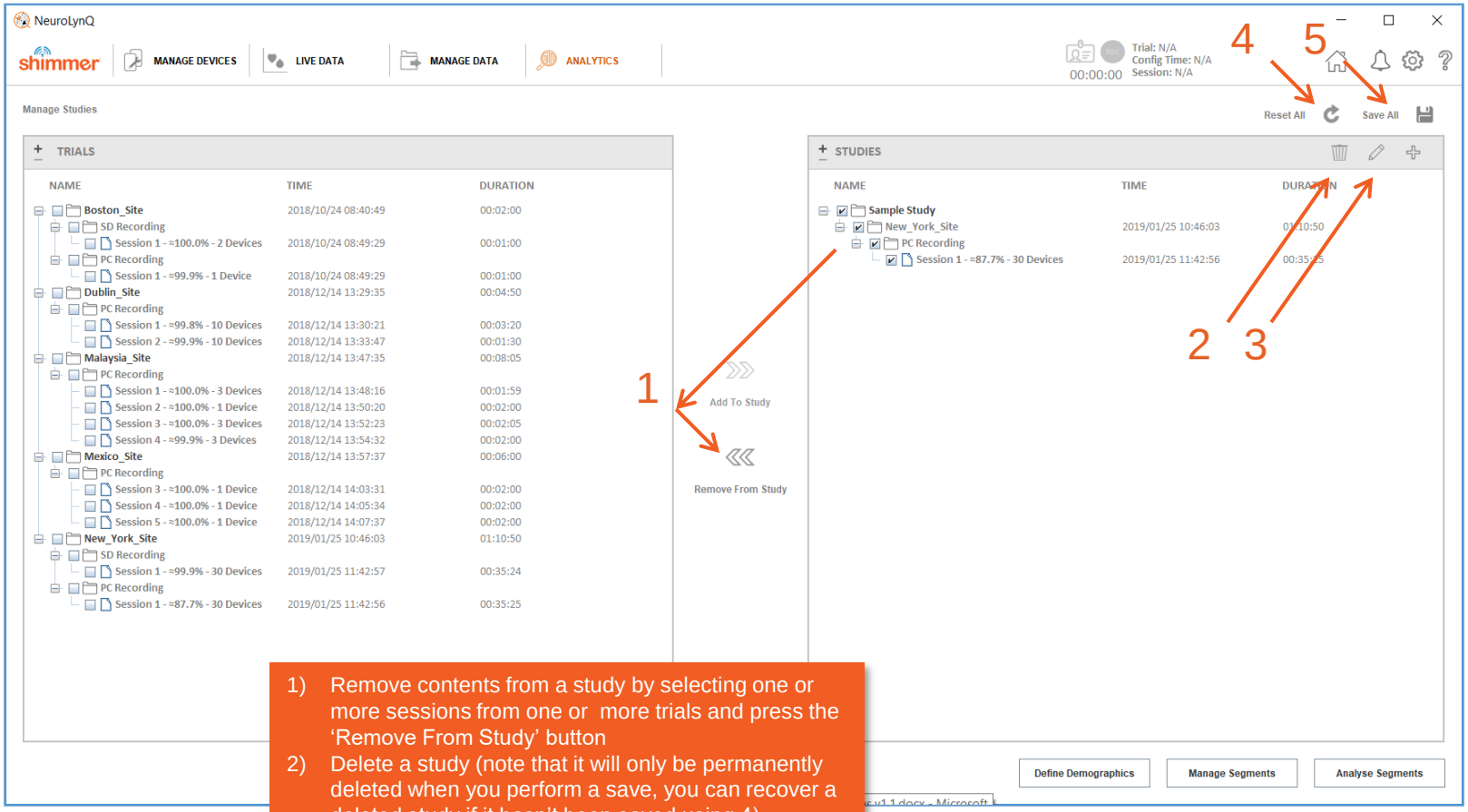


1) Select one or more sessions from one or more trials from your recorded NeuroLynQ datasets that you wish to add to your study.
2) Press the 'Add to Study' button
3) Observe that your study now contains the datasets selected in 1)

shimmer DISCOVERY IN MOTION

Analytics – Manage Studies – Other Ops

There are a number of other useful operations you can perform on a study

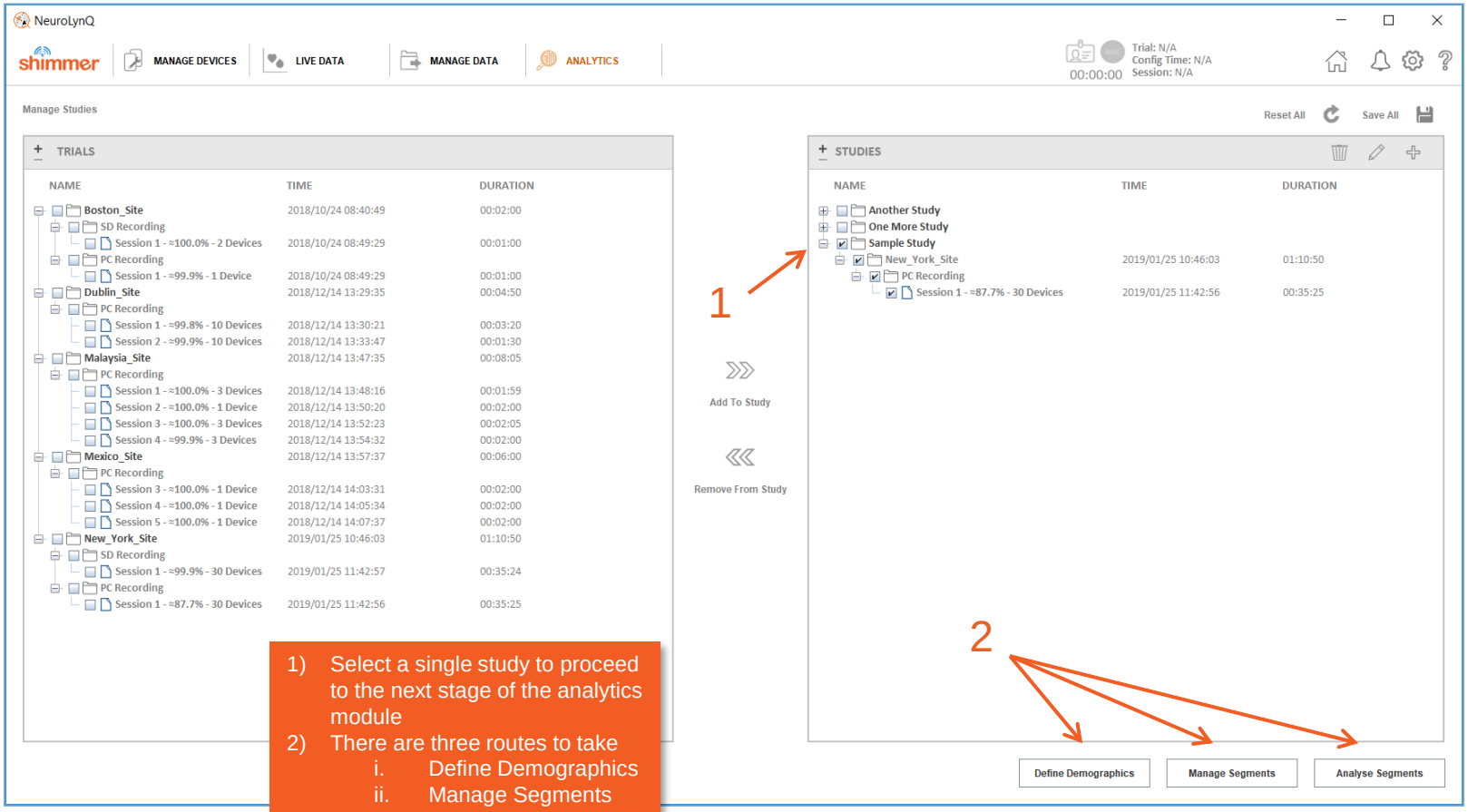


1) Remove contents from a study by selecting one or more sessions from one or more trials and press the 'Remove From Study' button
2) Delete a study (note that it will only be permanently deleted when you perform a save, you can recover a deleted study if it hasn't been saved using 4)
3) Edit a study's name and/or description
4) Reset all studies to their last saved state
5) Save all studies

shimmer DISCOVERY IN MOTION

Analytics – Manage Studies – Select Study

When you're satisfied with your study (or studies), you can select a single study to proceed through the analytics module, there are number of avenues available.



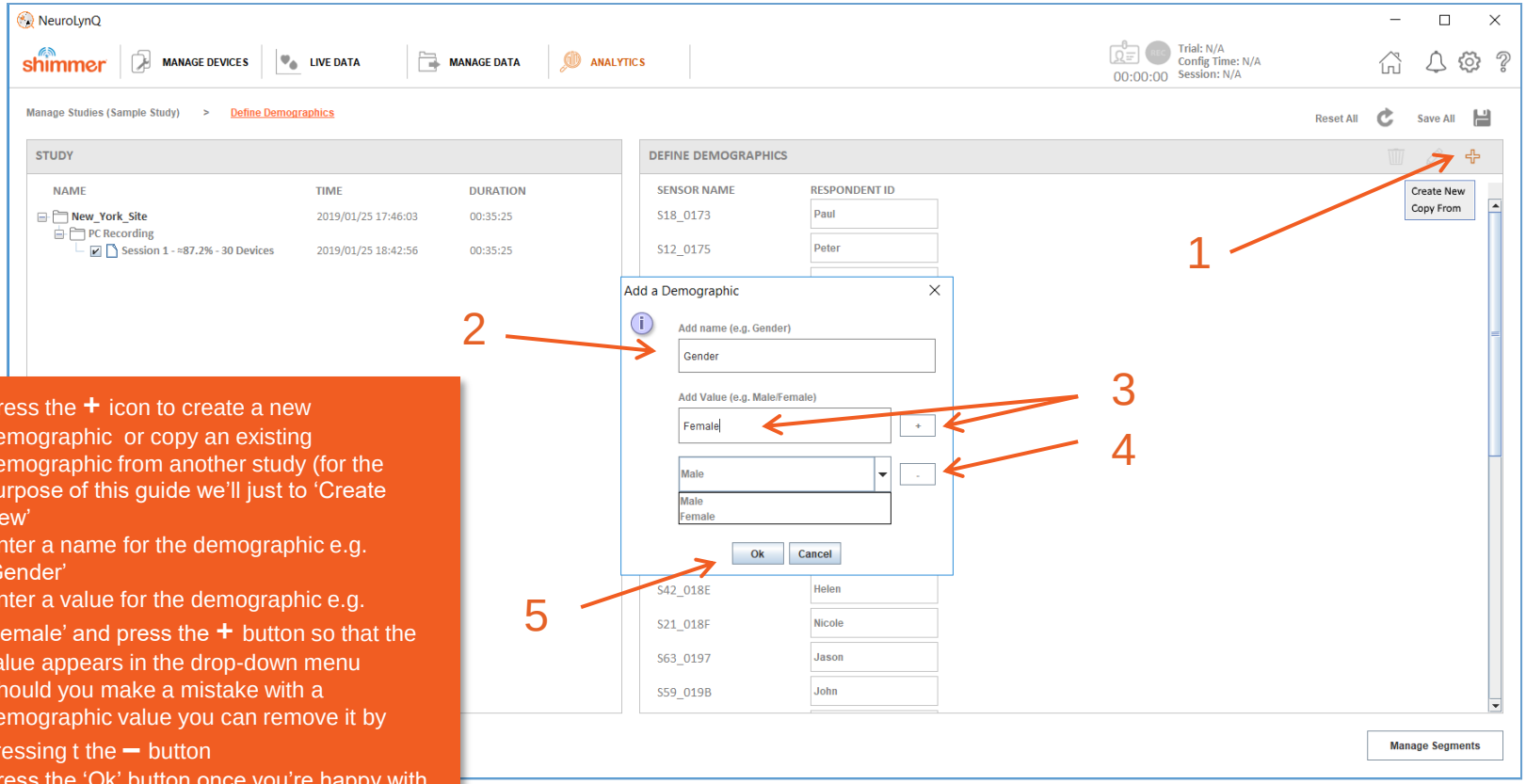
1) Select a single study to proceed to the next stage of the analytics module
2) There are three routes to take
   i. Define Demographics
   ii. Manage Segments
   iii. Analyse Segments

   Each of these routes are discussed in subsequent pages of this document

shimmer DISCOVERY IN MOTION

Analytics – Define Demographics – Create Demographic

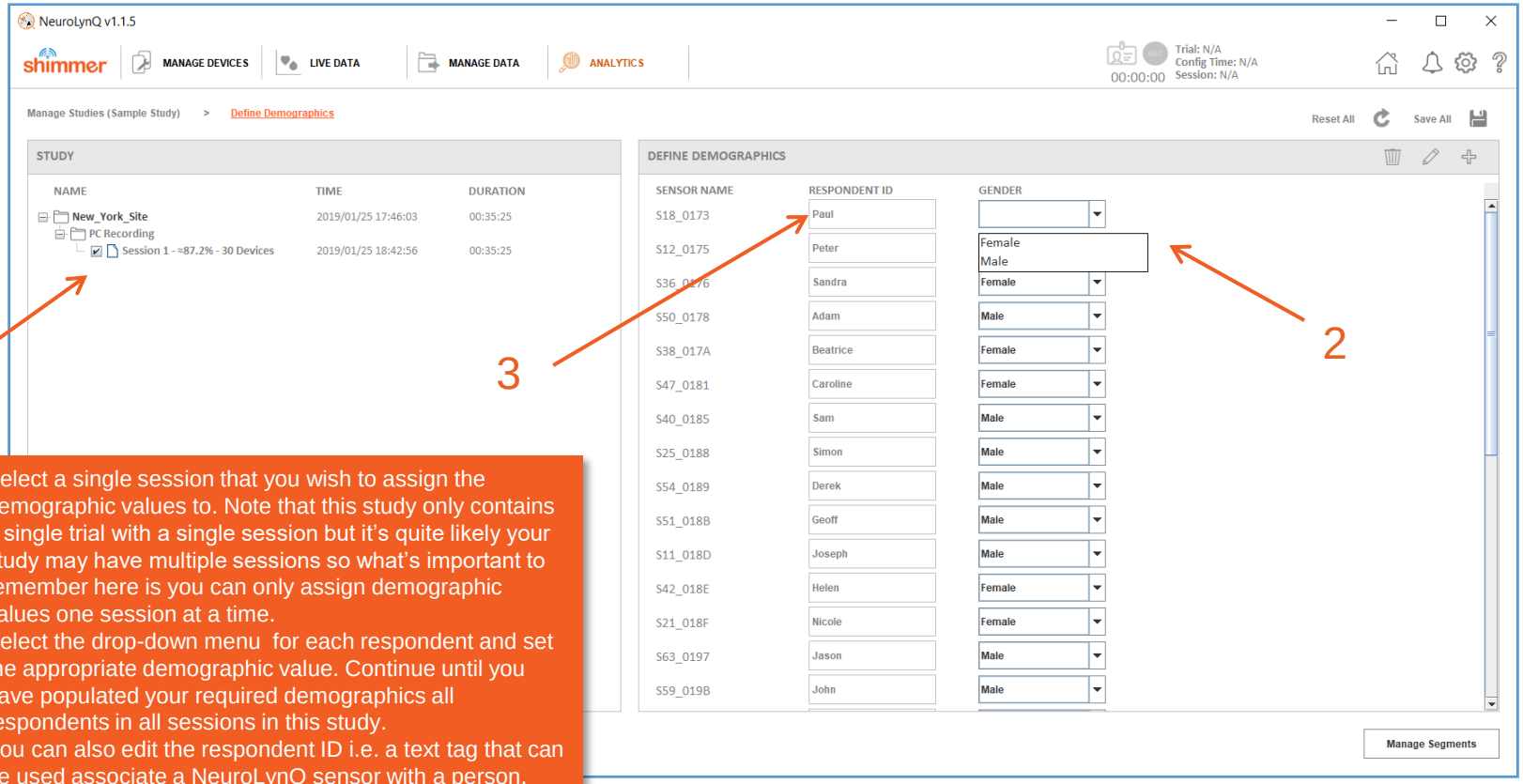
Demographics can be used (not mandatory) to add context to each participant e.g. if they're male or female, if they are over 30 years old or under 30 years old etc.



1) Press the + icon to create a new demographic or copy an existing demographic from another study (for the purpose of this guide we'll just to 'Create New'
2) Enter a name for the demographic e.g. 'Gender'
3) Enter a value for the demographic e.g. 'Female' and press the + button so that the value appears in the drop-down menu
4) Should you make a mistake with a demographic value you can remove it by pressing t the – button
5) Press the 'Ok' button once you're happy with the demographic name and values

shimmer
DISCOVERY IN MOTION

Analytics – Define Demographics – Assign Demographic Values to Respondents

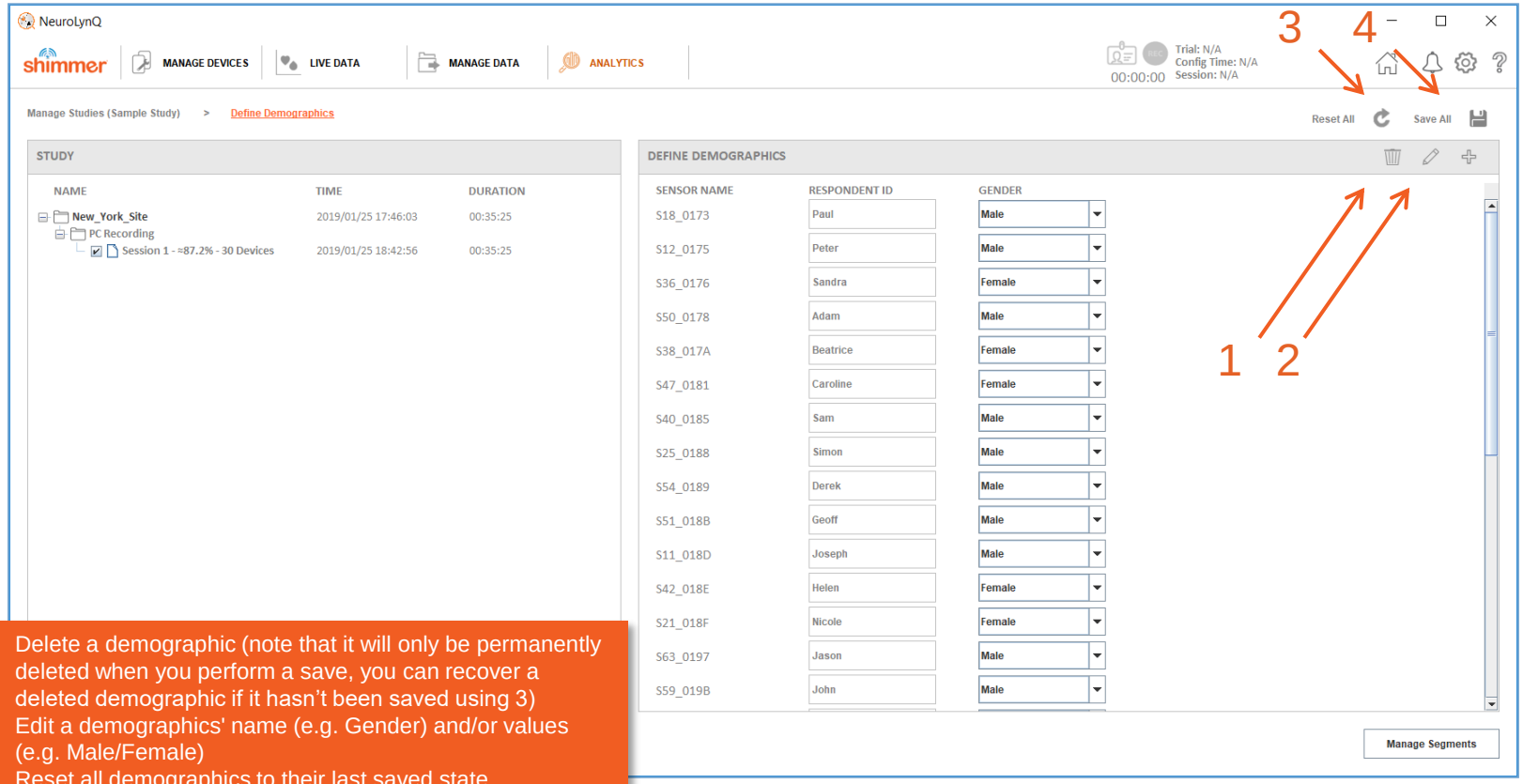


1) Select a single session that you wish to assign the demographic values to. Note that this study only contains a single trial with a single session but it's quite likely your study may have multiple sessions so what's important to remember here is you can only assign demographic values one session at a time.
2) Select the drop-down menu for each respondent and set the appropriate demographic value. Continue until you have populated your required demographics all respondents in all sessions in this study.
3) You can also edit the respondent ID i.e. a text tag that can be used associate a NeuroLynQ sensor with a person.

shimmer
DISCOVERY IN MOTION

Analytics – Define Demographics – Other Ops

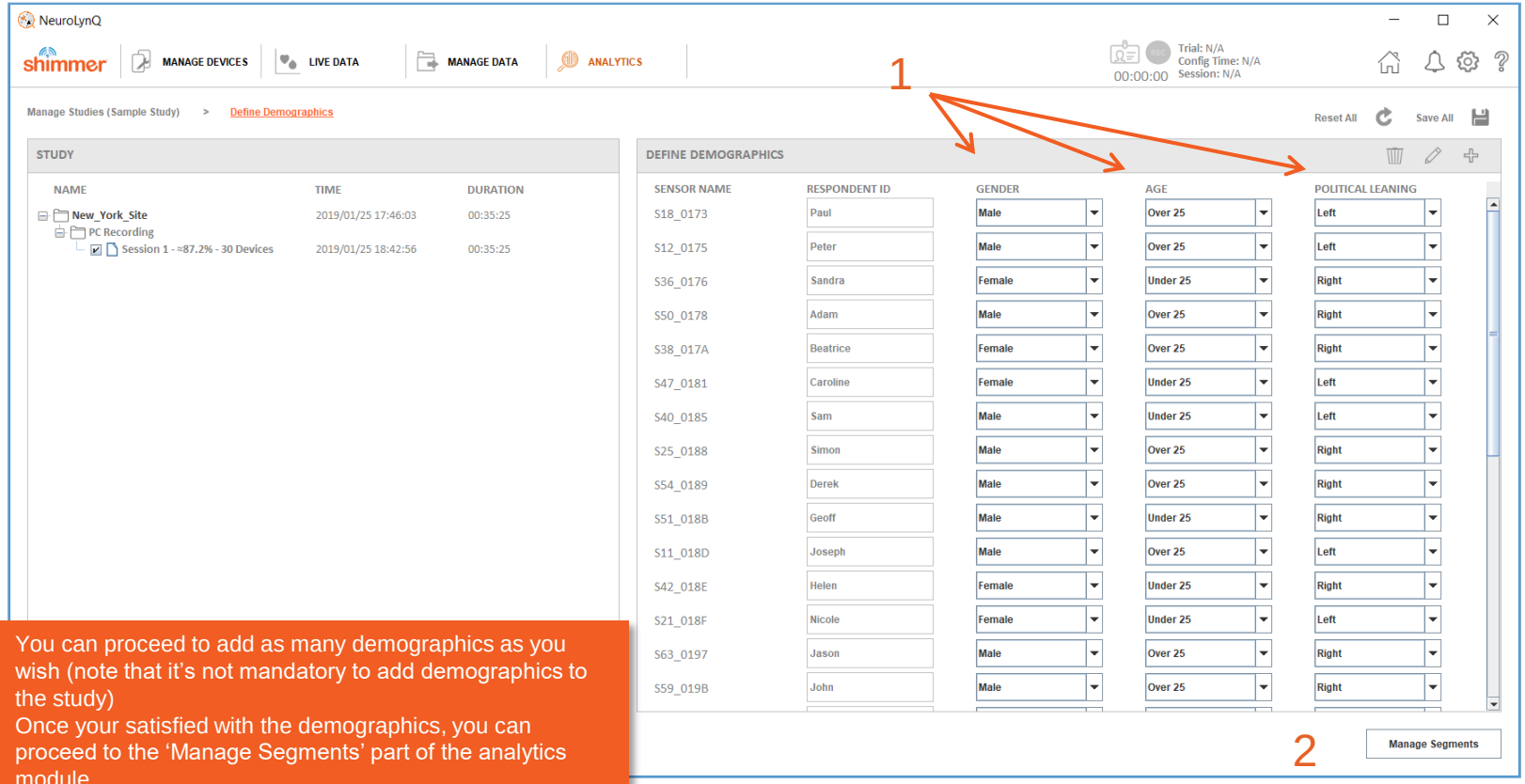
There are a number of other useful operations you can perform on the demographics



1) Delete a demographic (note that it will only be permanently deleted when you perform a save, you can recover a deleted demographic if it hasn't been saved using 3)
2) Edit a demographics' name (e.g. Gender) and/or values (e.g. Male/Female)
3) Reset all demographics to their last saved state
4) Save all demographics

shimmer
DISCOVERY IN MOTION

Analytics – Define Demographics – Example Showing More Demographics

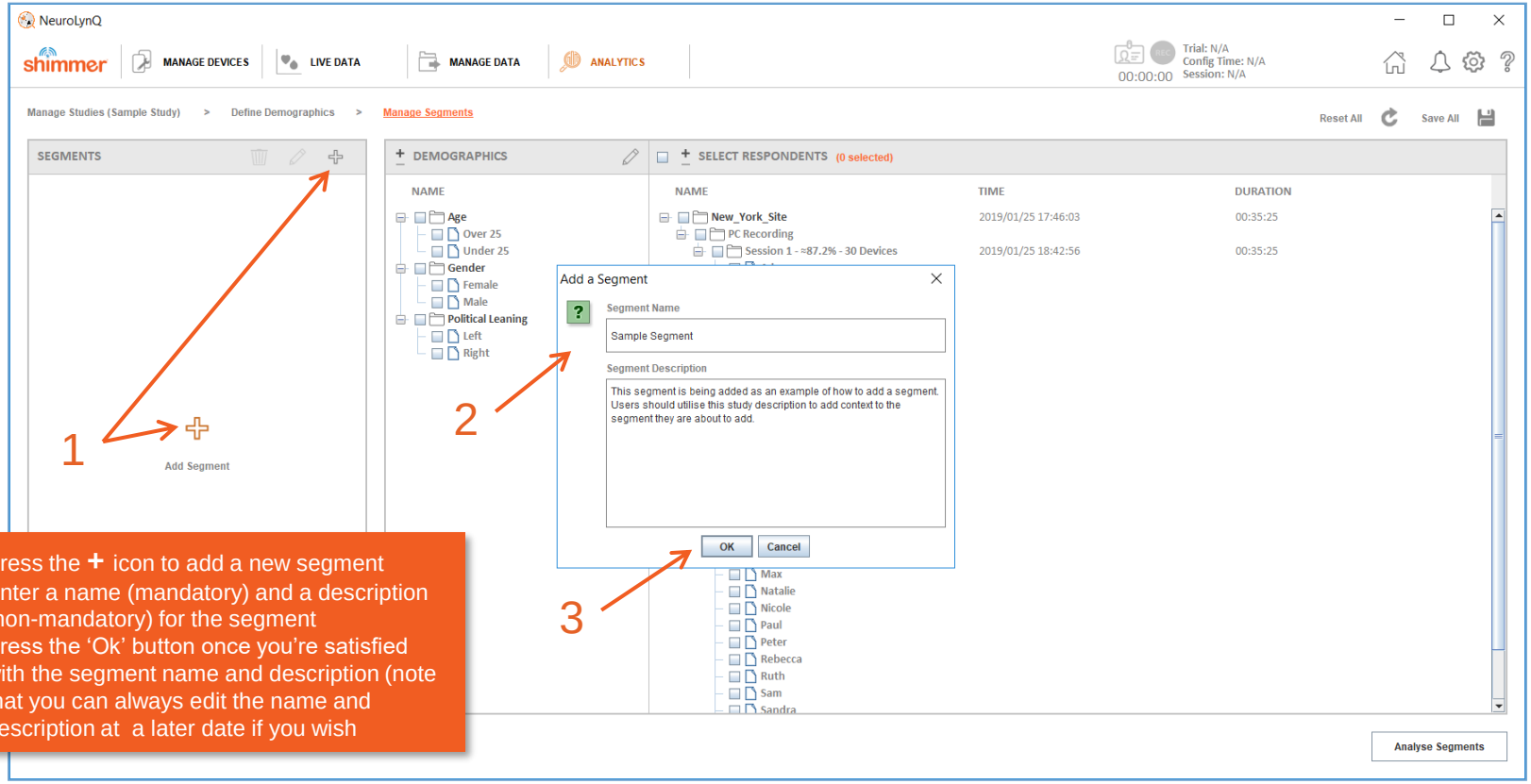


1) You can proceed to add as many demographics as you wish (note that it's not mandatory to add demographics to the study)
2) Once your satisfied with the demographics, you can proceed to the 'Manage Segments' part of the analytics module.

shimmer
DISCOVERY IN MOTION

Analytics – Manage Segments – Add Segment

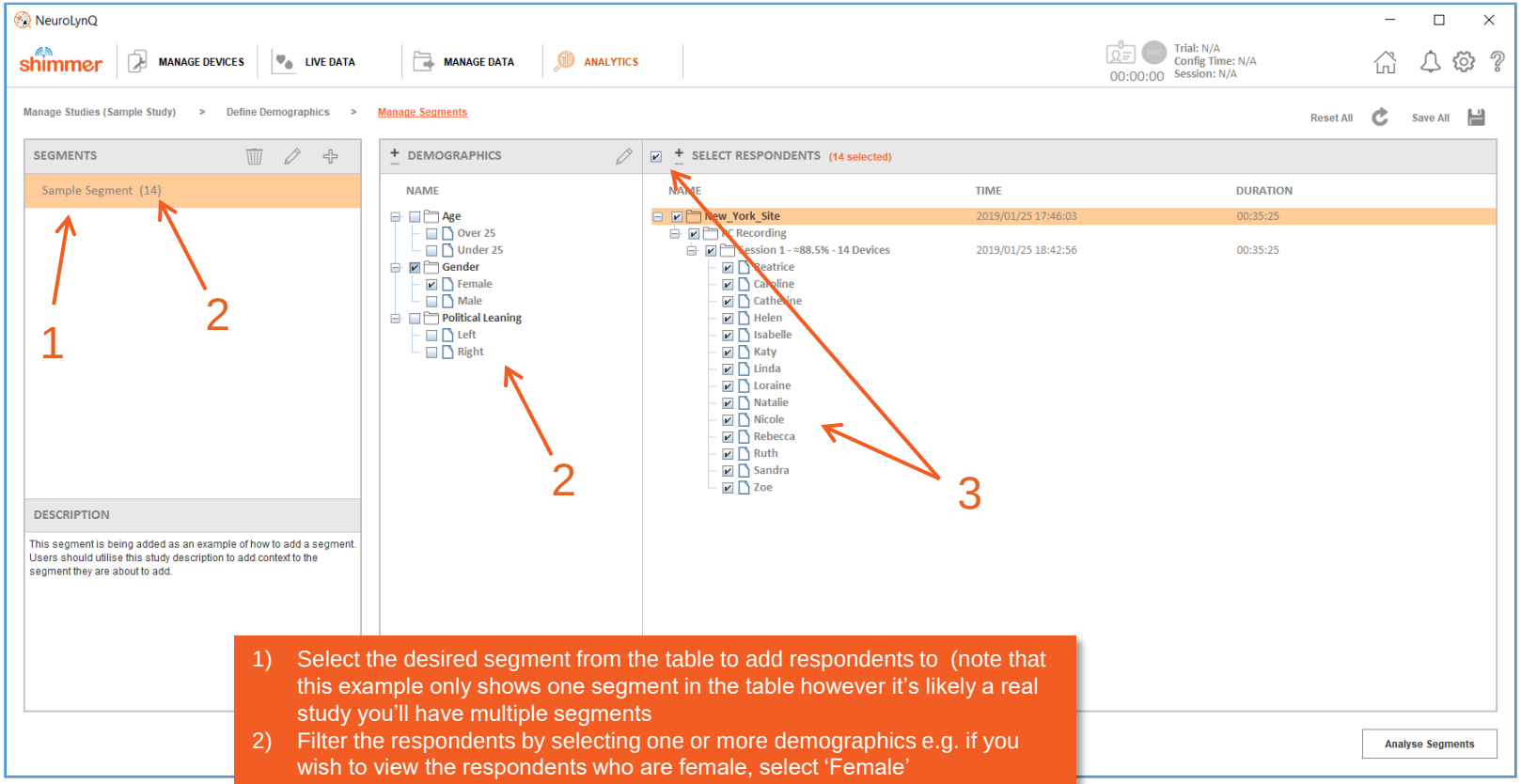
A segment can be defined as a group of one or more respondents in a study. Users can add/edit/delete as many segments as they wish.



1) Press the + icon to add a new segment
2) Enter a name (mandatory) and a description (non-mandatory) for the segment
3) Press the 'Ok' button once you're satisfied with the segment name and description (note that you can always edit the name and description at a later date if you wish

shimmer
DISCOVERY IN MOTION

Analytics – Manage Segments – Add Respondents To A Segment

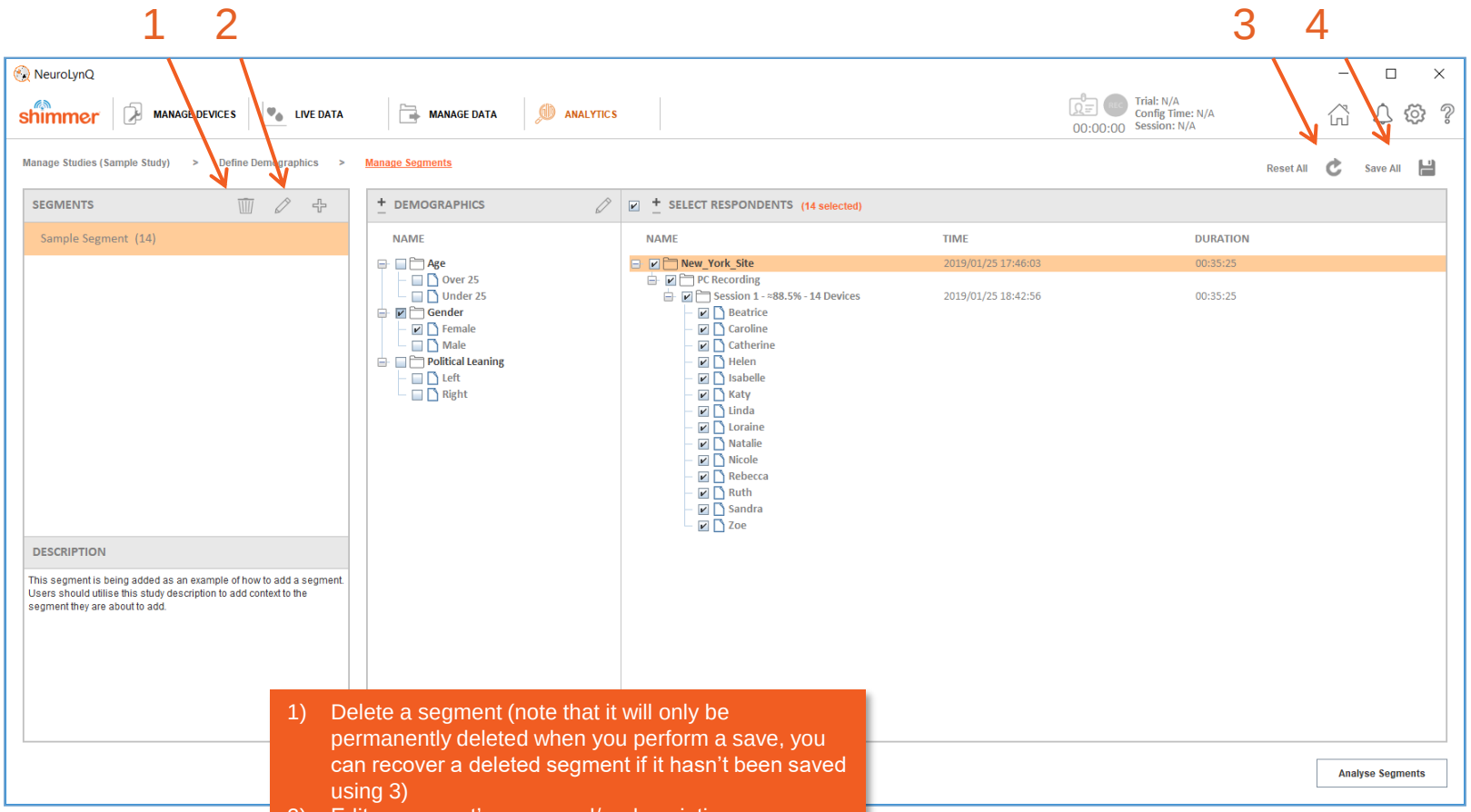


1) Select the desired segment from the table to add respondents to (note that this example only shows one segment in the table however it's likely a real study you'll have multiple segments
2) Filter the respondents by selecting one or more demographics e.g. if you wish to view the respondents who are female, select 'Female'
3) Add respondents to the select segment by selecting individual respondent checkboxes or the master respondent checkbox to select and all visible respondents to the segment
4) Observe the number of respondents in the selected segmeng

shimmer
DISCOVERY IN MOTION

Analytics – Manage Segments – Other Ops

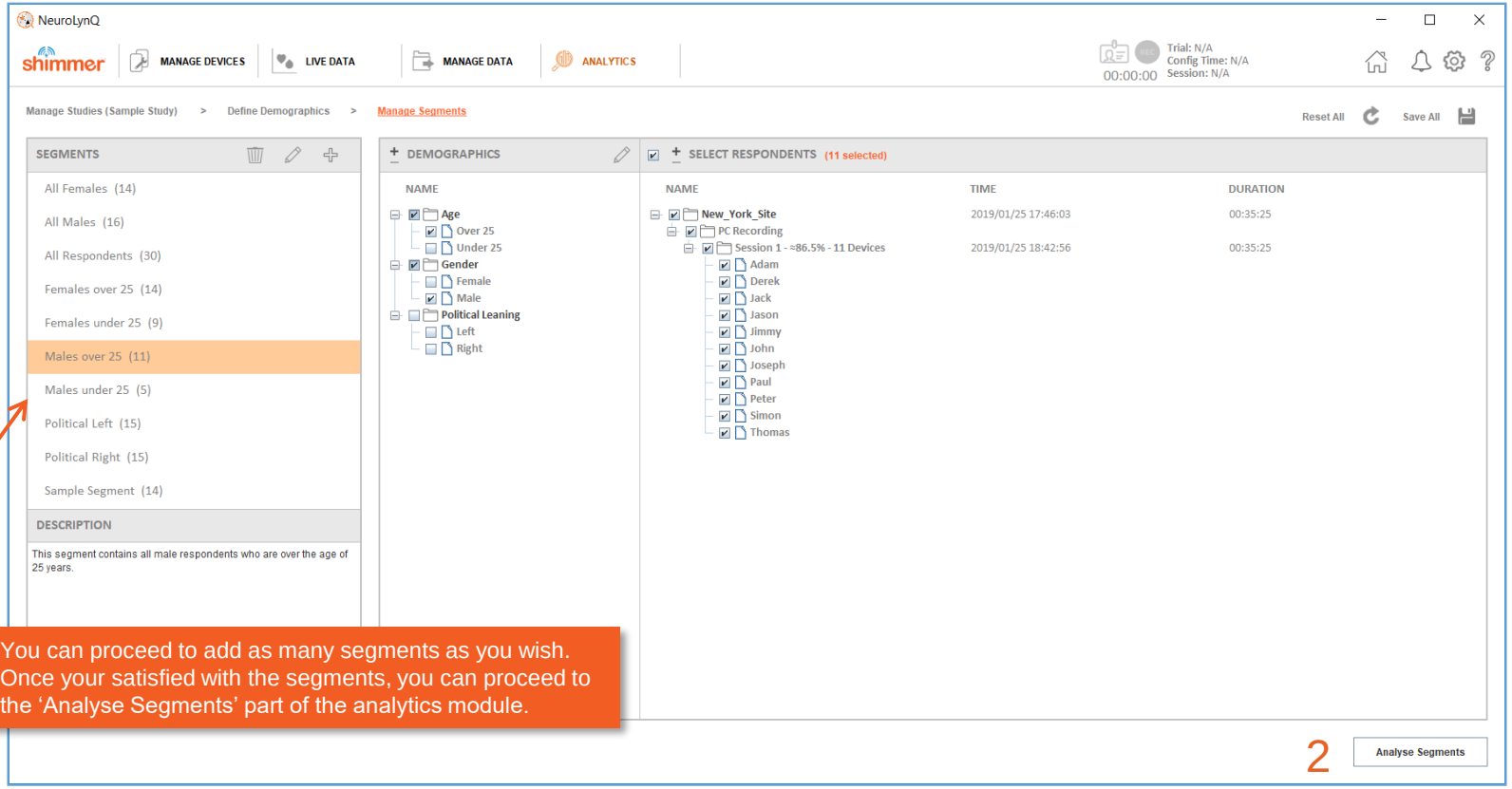
There are a number of other useful operations you can perform on the segments



1) Delete a segment (note that it will only be permanently deleted when you perform a save, you can recover a deleted segment if it hasn't been saved using 3)
2) Edit a segment's name and/or description
3) Reset all segment to their last saved state
4) Save all segments

shimmer
DISCOVERY IN MOTION

Analytics – Manage Segments – Example Showing More Segments

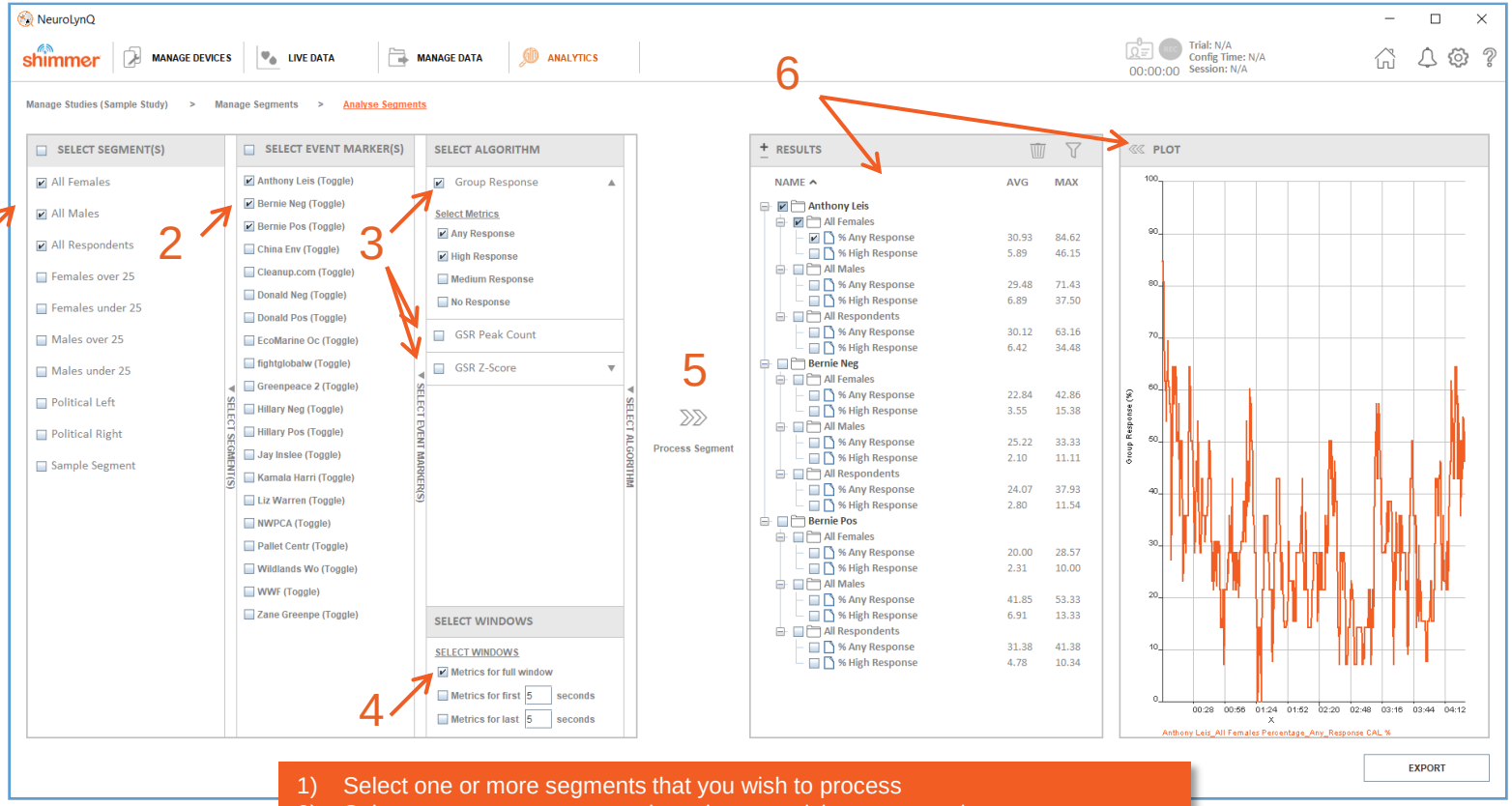


1) You can proceed to add as many segments as you wish.
2) Once your satisfied with the segments, you can proceed to the 'Analyse Segments' part of the analytics module.

shimmer
DISCOVERY IN MOTION

ANALYTICS – ANALYSE SEGMENTS - PROCESSING

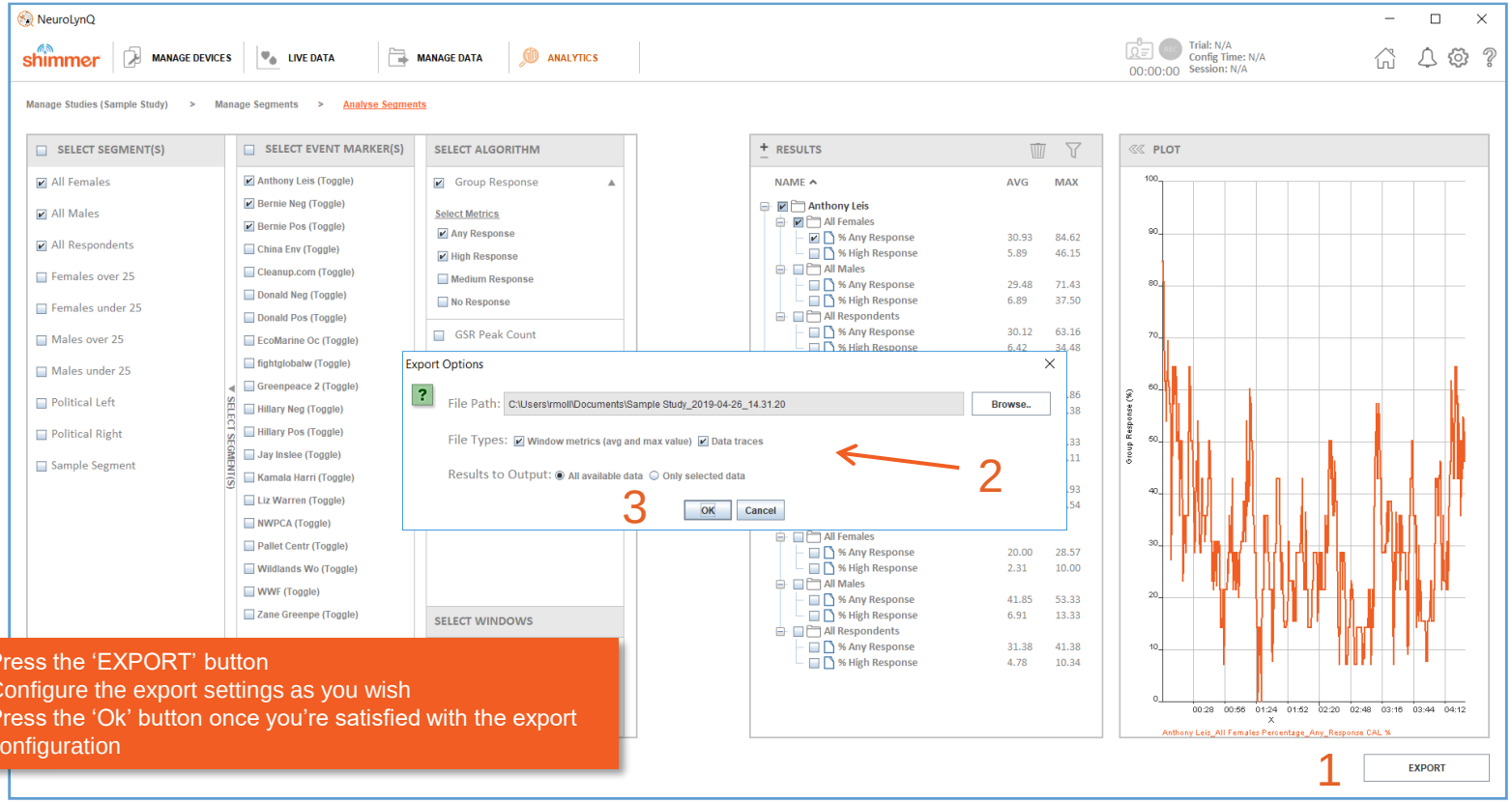
A study can be defined as a collection of one or more trials each containing one or more sessions that are grouped together in order to perform analysis on the collection



1) Select one or more segments that you wish to process
2) Select one or more event markers that you wish to process the segment over.
3) Select a single algorithm to run on your segment and event marker combinations
4) Select the window over which you want to produce results for
5) Press the 'Process Segment' button to run the selected algorithm
6) View the output of the processing in the 'RESULTS' table and on the plot (selecting a checkbox) in the 'RESULTS' table adds a signal to the plot

shimmer DISCOVERY IN MOTION

Analytics – Analyse Segments – Export Part 1

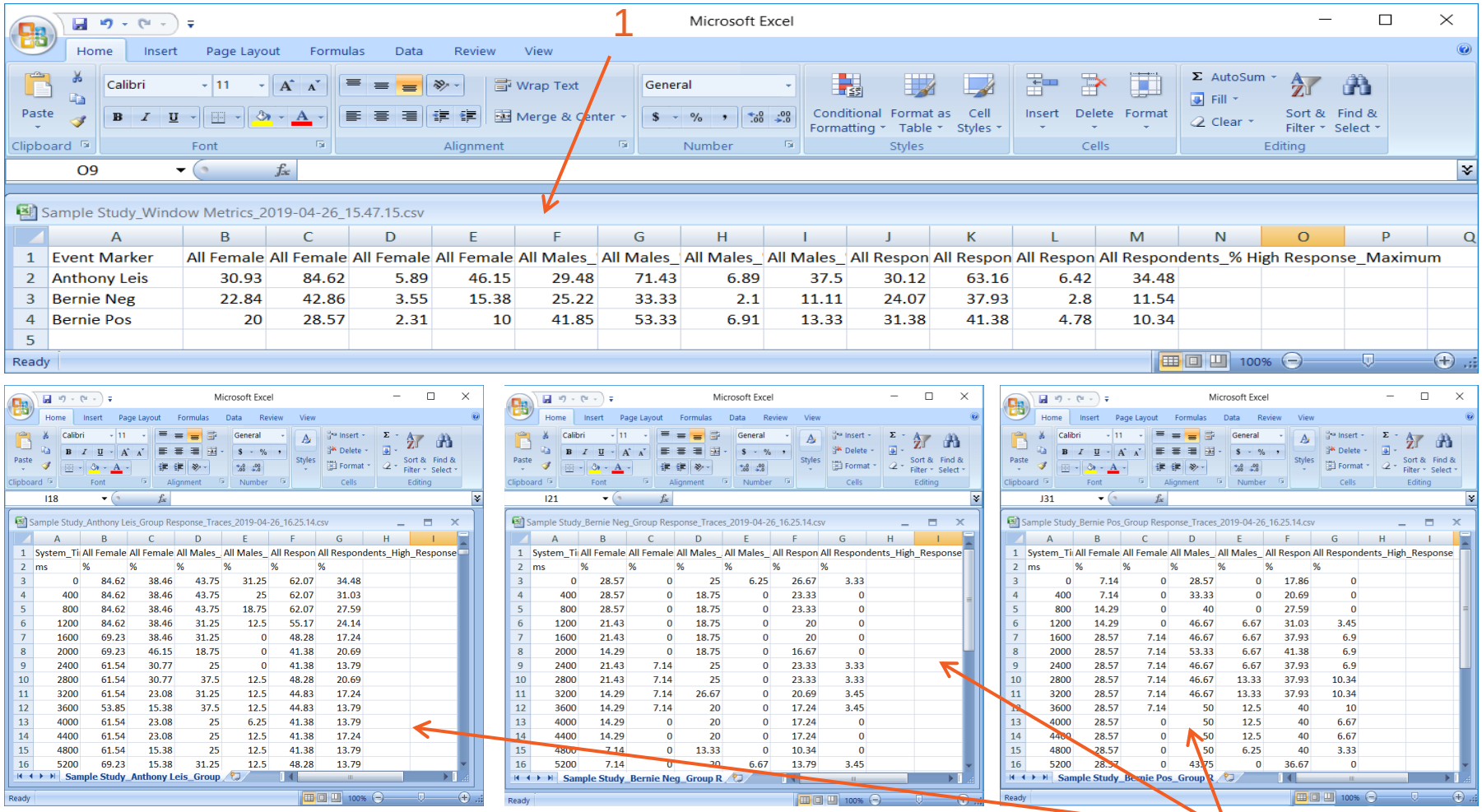


1) Press the ‘EXPORT’ button
2) Configure the export settings as you wish
3) Press the ‘Ok’ button once you’re satisfied with the export configuration

shimmer
DISCOVERY IN MOTION

Analytics – Analyse Segments – Export Part 2

Two different file types can be exported 1) Window metric file 2) Data trace file

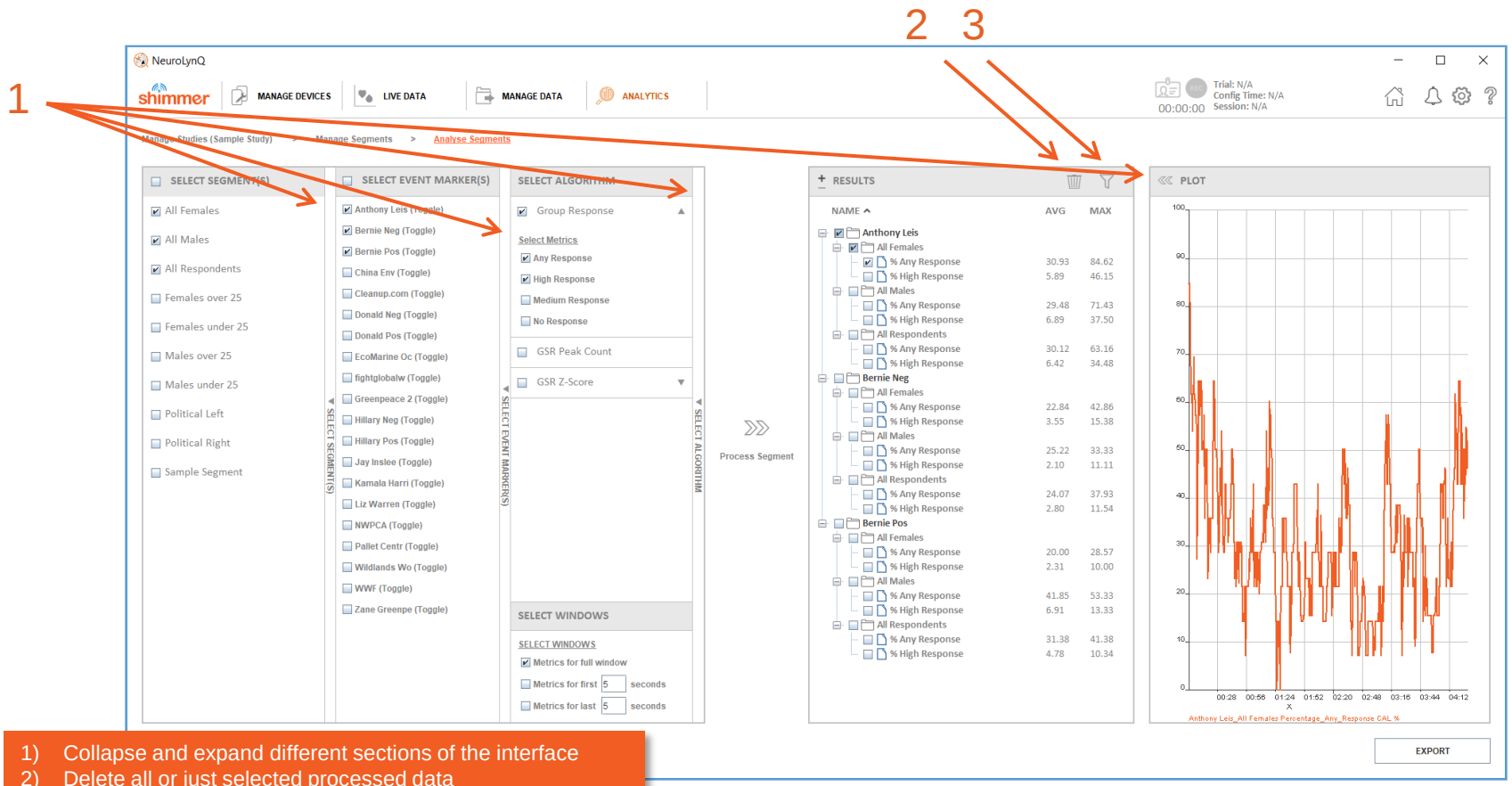


1) A single window metrics file with the maximum and average values for each segment and event marker
2) A data trace file per event marker

shimmer
DISCOVERY IN MOTION

Analytics – Analyse Segments – Other Ops

There are a number of other useful operations you can perform when analysing segments



1) Collapse and expand different sections of the interface
2) Delete all or just selected processed data
3) Quick select/deselect or processed data

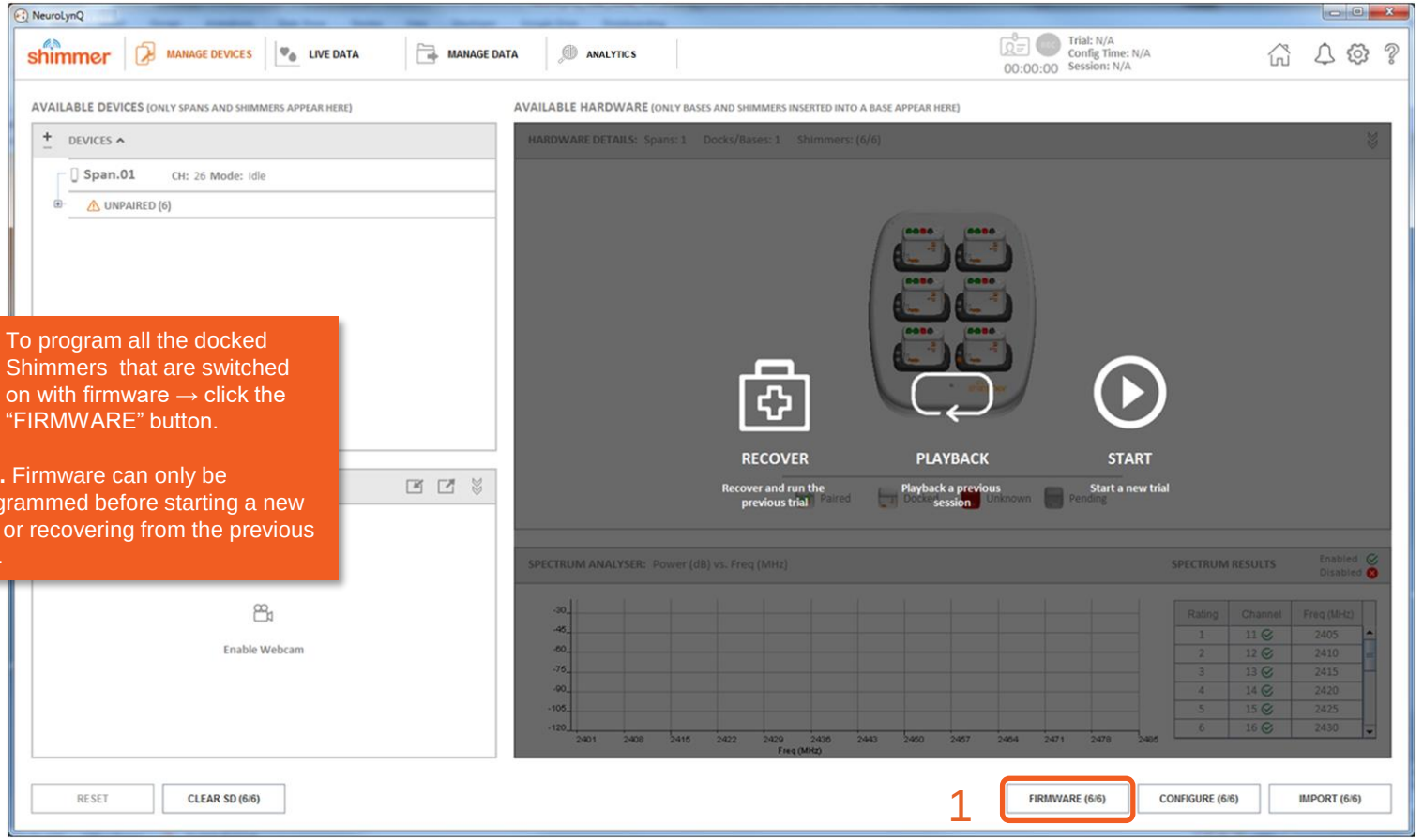
shimmer
DISCOVERY IN MOTION

APPENDICES

The following options and functionality may be useful from time-to-time but will mostly likely not be needed on regular occasions.

PROGRAM FIRMWARE - SHIMMER

You should only need to update the firmware on the NeuroLynQ units if you see this 



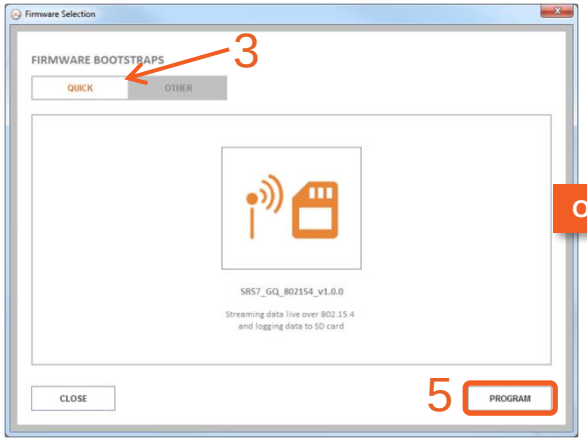
1) To program all the docked Shimmers that are switched on with firmware → click the "FIRMWARE" button.

N.B. Firmware can only be programmed before starting a new trial or recovering from the previous trial.

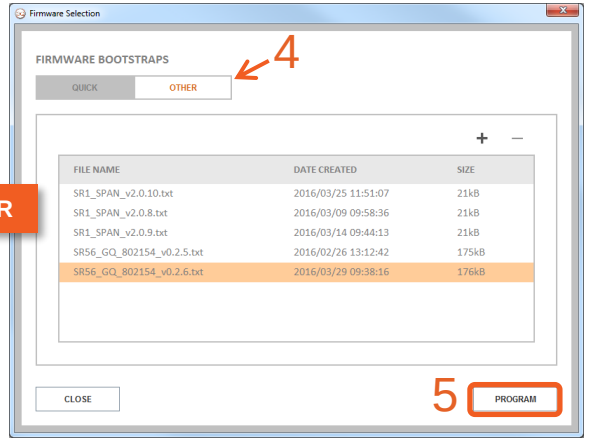
shimmer
DISCOVERY IN MOTION

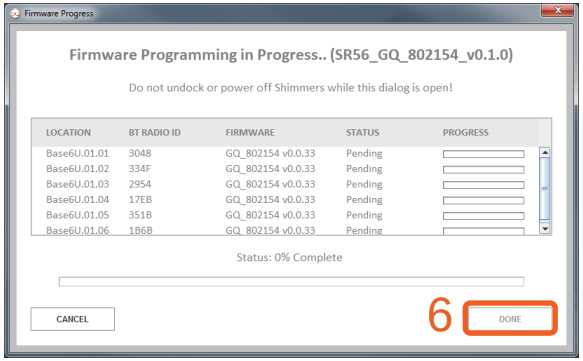
PROGRAM FIRMWARE - SHIMMER

You should only need to update the firmware on the NeuroLynQ units if you see this 



OR

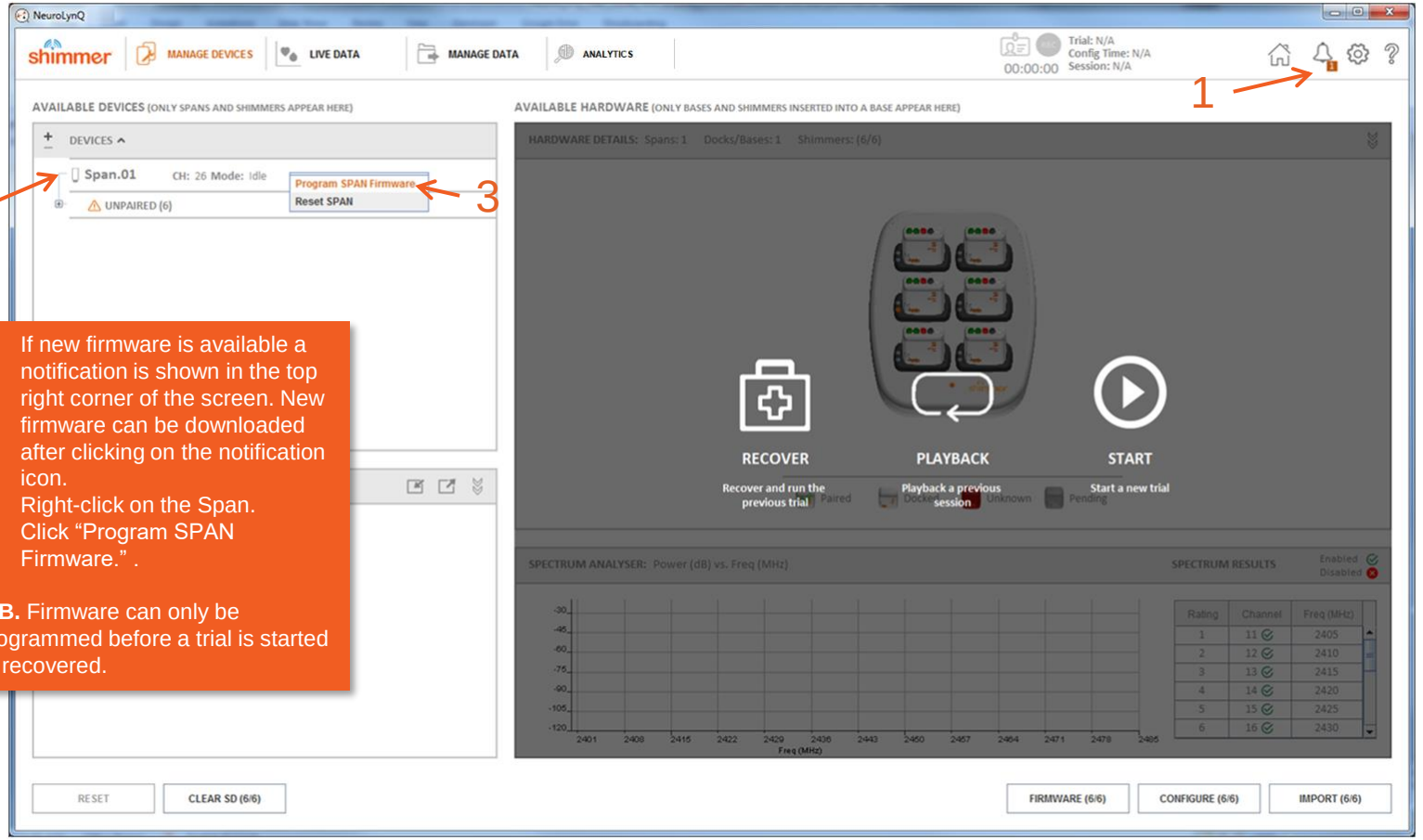




3) Select the most recently released firmware – "QUICK".
4) Or select manually added firmware – "OTHER".
5) Click "PROGRAM".
6) Click "DONE" when complete.

shimmer
DISCOVERY IN MOTION

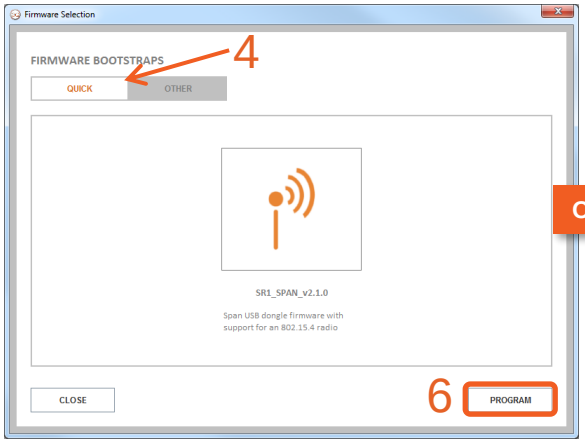
Program Firmware - Span



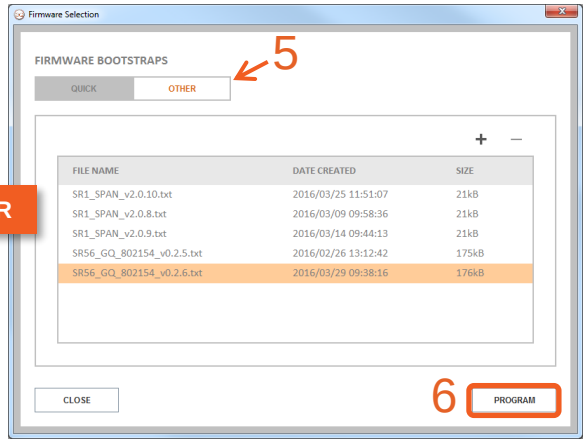
1) If new firmware is available a notification is shown in the top right corner of the screen. New firmware can be downloaded after clicking on the notification icon.
2) Right-click on the Span.
3) Click “Program SPAN Firmware.” .

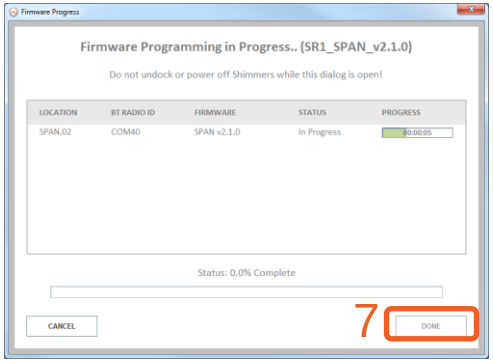
N.B. Firmware can only be programmed before a trial is started or recovered.

PROGRAM FIRMWARE - SPAN



OR

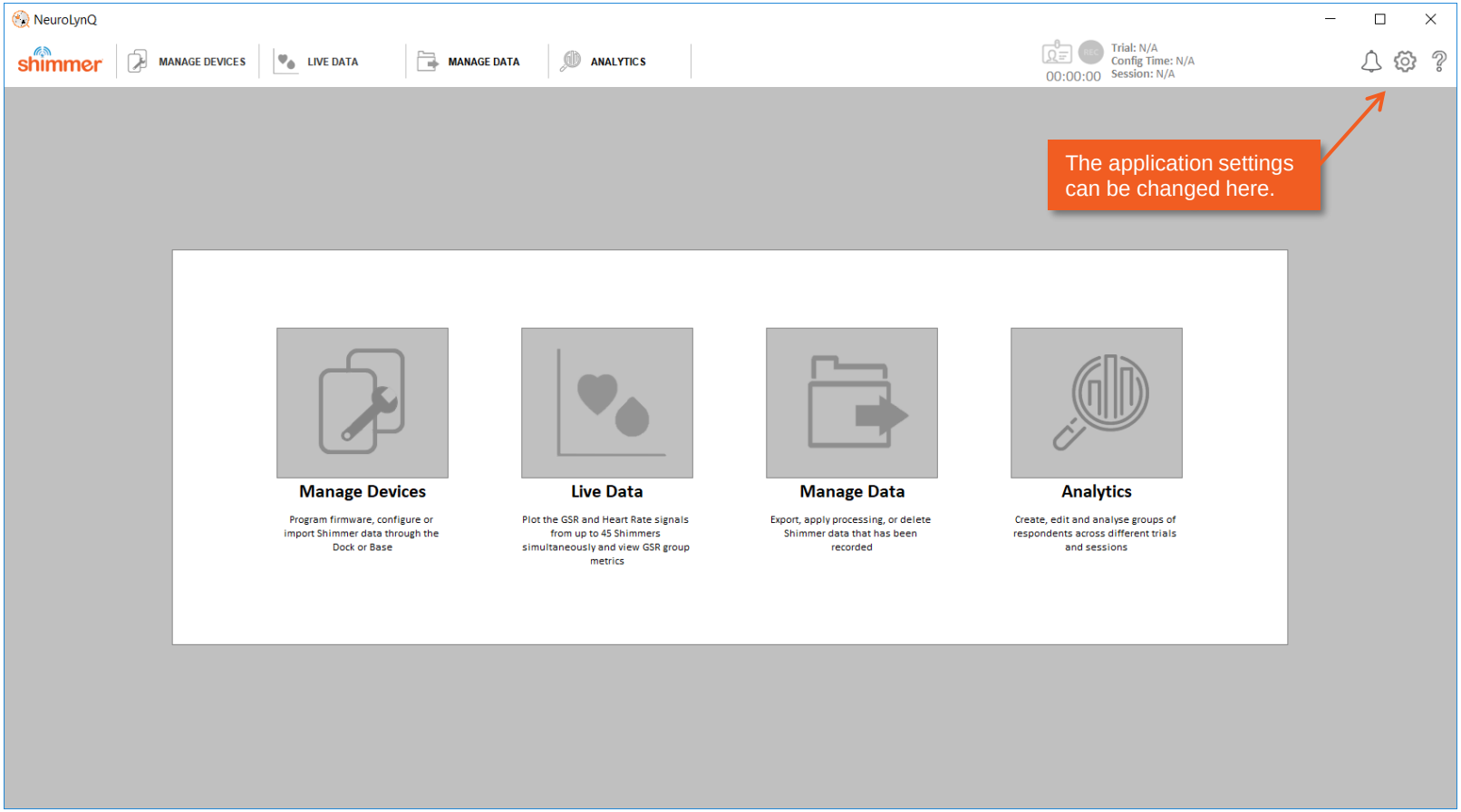




4) Select the most recently released firmware – "QUICK".
5) Or select manually added firmware – "OTHER".
6) Click "PROGRAM".
7) Click "DONE" when complete.

shimmer
DISCOVERY IN MOTION

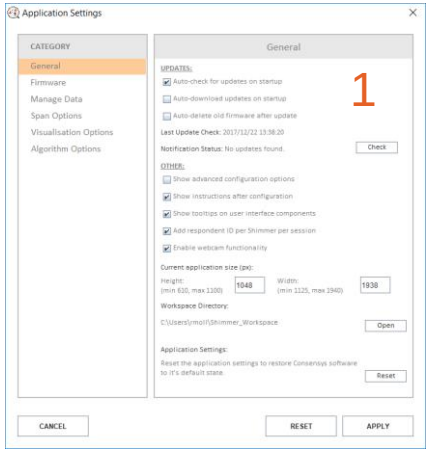
Application Settings

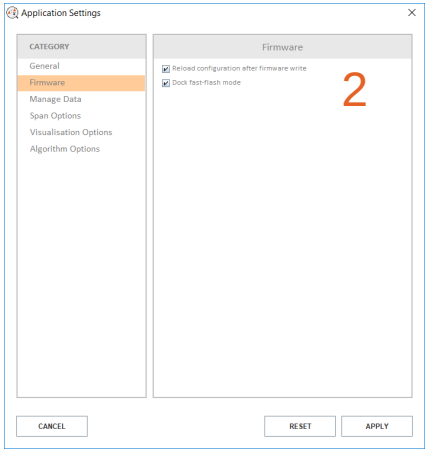


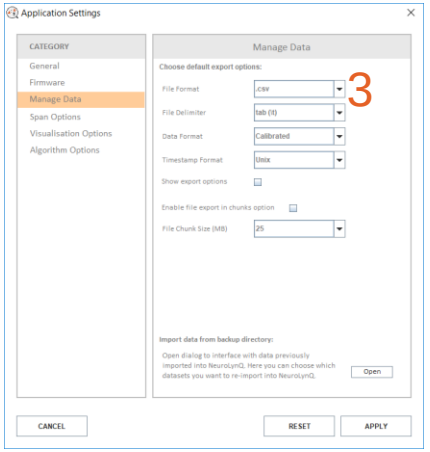
shimmer
DISCOVERY IN MOTION

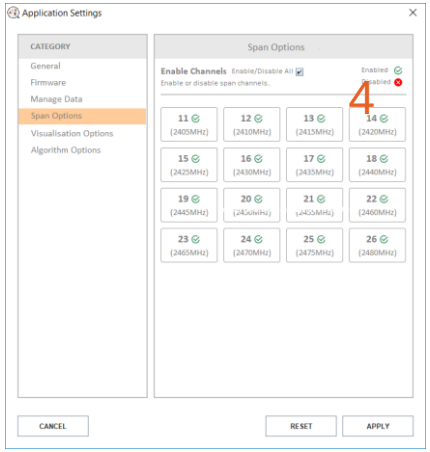
Application Settings

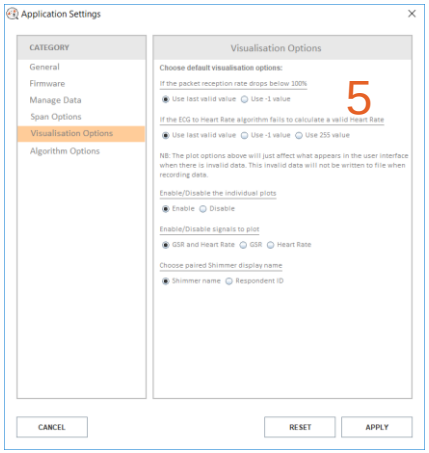
1) General application settings.
2) Settings in relation to firmware programming.
3) Default export options for the Manage Data tab.
4) Enable/disable Span channels.
5) Adjust plot options – only relating to the visualization of the signals in “Live Data” – not to the actual data that is being recorded.
6) Change the algorithm parameters including the source of algorithm.
7) Hit “CANCEL” to cancel changing settings.
8) Hit “RESET” to restore settings – before they have been applied.
9) Apply settings by hitting “APPLY”.

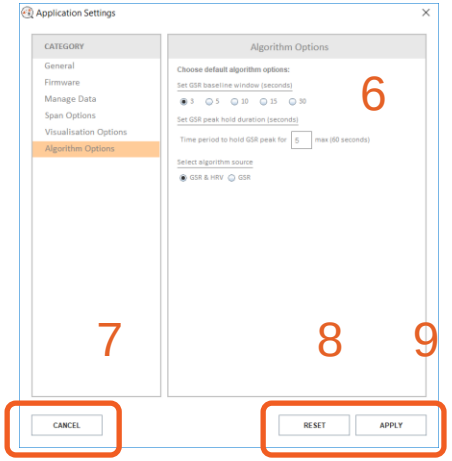








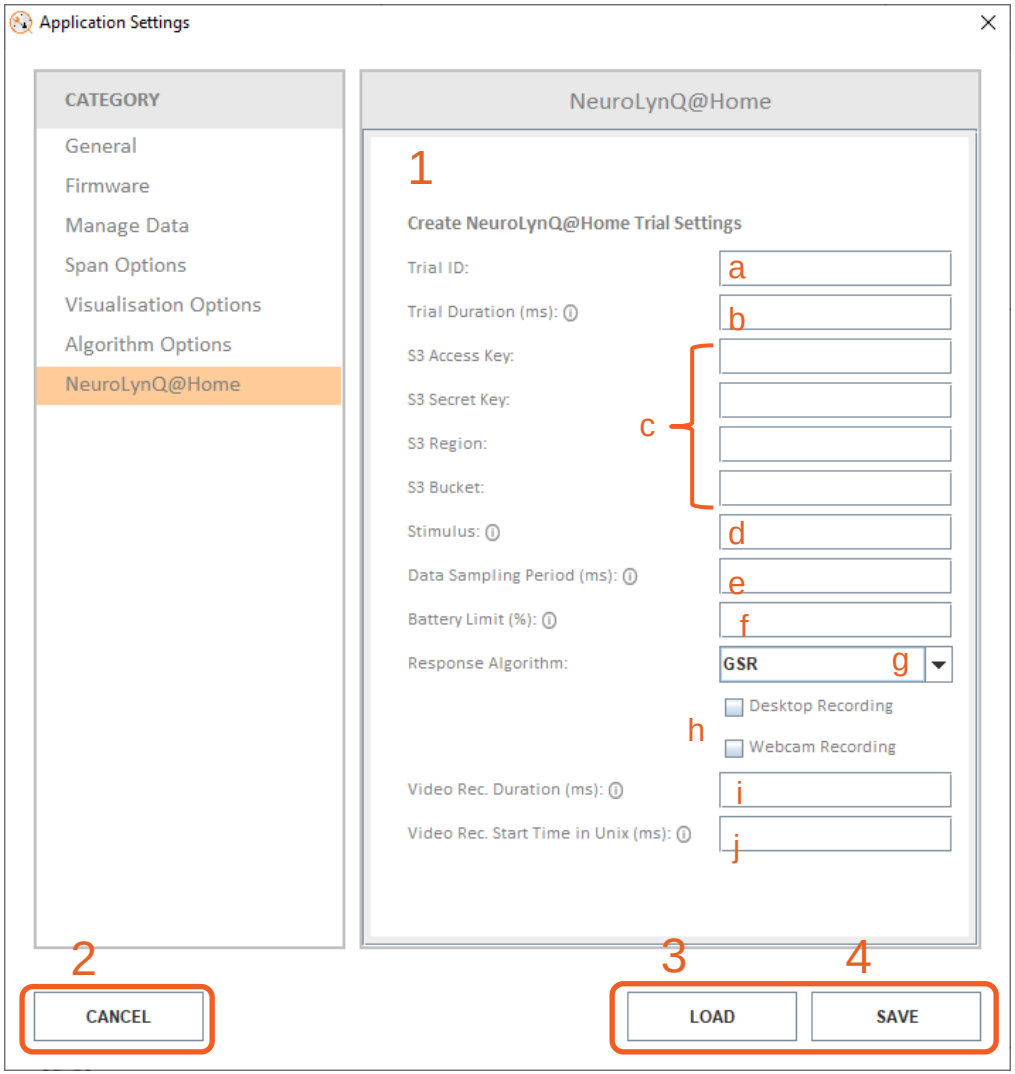




shimmer
DISCOVERY IN MOTION

Application Settings

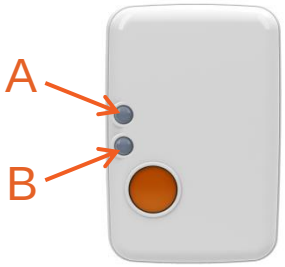
1) Panel to add or edit Trial Settings to be used for NeuroLynQ@Home trial recording.
2) Hit “CANCEL” to cancel changing settings.
3) Hit “LOAD” to load existing NeuroLynQ@Home trial settings file (.nlq)
4) Save settings by hitting “SAVE”.



a) Set trial name
b) Set the trial duration. Set it to zero when you want the trial to record continuously until the stop button is pressed
c) Key in S3 Details
d) Set a URL which will open in an internet browser once the trial starts. Leave it empty if you don’t have a URL.
e) Enter approximate data sampling period, This cannot exceed 256Hz. We recommend setting it to 200ms.
f) Enter required battery limit threshold to start the trial. E.g. setting it to 70% will prevent users from starting a trial if the Shimmer device battery capacity is not >70%. A value of 75% is recommended.
g) Choose the Response Algorithm to be used for the recording, either GSR only or GSRandHRV. Choosing GSR only will disable the optical sensor (HRV).
h) If required you can enable either Desktop or Webcam recording.
i) Set duration for the video recording, Set it to zero when you want the video to record continuously until the stop button is pressed .
j) Set the start time of the video recording. Setting it to zero will start the video recording immediately when the trial starts.

shimmer
DISCOVERY IN MOTION

LED Behavior – Shimmer - A

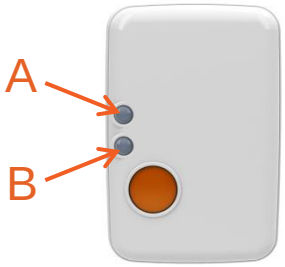


LED Position A: Operational Status

Status		LED Sequence	Description
Docked	Standby		GREEN - 0.1s ON/2s OFF
	Programming FW		BLUE - 0.1s ON/0.1s OFF
Undocked	Streaming Only		BLUE - 1s ON/1s OFF
	Recording Only		GREEN - 1s ON/1s OFF
	Streaming and Recording		1s BLUE/1s OFF/1s GREEN/1s OFF
	General Error		0.1s BLUE/0.1s GREEN

shimmer
DISCOVERY IN MOTION

LED Behavior – Shimmer - B

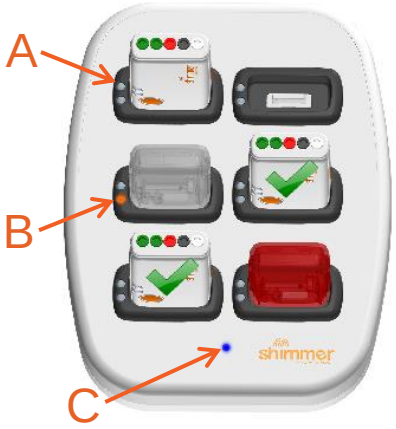


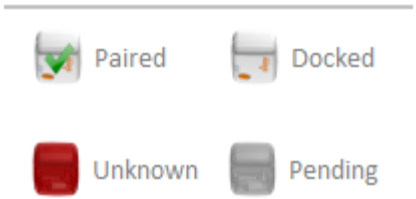
LED Position B: Battery Status and Specials

Status		LED Sequence	Description
Docked	Fully Charged		GREEN – solid ON
	Charging		ORANGE – solid ON
Undocked	Fully Charged		GREEN - 0.1s ON/5s OFF
	Medium Charge		ORANGE - 0.1s ON/5s OFF
	Low Battery		RED - 0.1s ON/5s OFF
Specials undocked	Invalid Heart Rate		ORANGE – 0.1s ON/0.1s OFF
	User Button Press		GREEN – solid ON while User Button is pressed.

shimmer
DISCOVERY IN MOTION

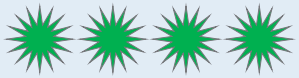
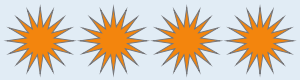
LED Behavior - Base





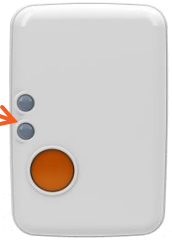
N.B. The table below applies to Bases that are switched on with NeuroLynQ running.

When a Base is powered up all the LEDs in positions A, B and C are solid ON until the Base detects the USB Port of the PC.

Position	Shimmer in slot	Active slot	Communicating with Shimmer (UART)	Accessing SD card of Shimmer	Description
A – per slot		N/A	N/A	N/A	GREEN – solid ON
B – per slot	N/A		N/A	N/A	ORANGE – solid ON
C	N/A	N/A			ORANGE / BLUE blinking

shimmer
DISCOVERY IN MOTION

USEFUL THINGS TO KNOW

- The **green** and **blue** LED (in LED location B)  are **blinking rapidly**.
  1. Start *NeuroLynQ* and connect *Shimmer Dock* or *Base*.
  2. Place the Shimmer in the *Shimmer Dock or Base.*
  3. The Real Time Clock (RTC) of the Shimmer will be set.
  4. The blinking stops after the RTC has been set.

- **RTC:** If the **"**Real Time Clock" on the Shimmer is set, a relationship between "real-world time" and the local clock on the Shimmer is established, enabling synchronisation to a "common clock" among multiple Shimmer and external devices. **N.B.** Switching off Shimmers results in the loss of the RTC information. To set the RTC on the Shimmer, insert the Shimmer into a Shimmer Dock or Base while the Consensys software is running.

- **Session:** A dataset containing data from one or more Shimmers belonging to the same **Trial**, *i.e.* configured at the same time.

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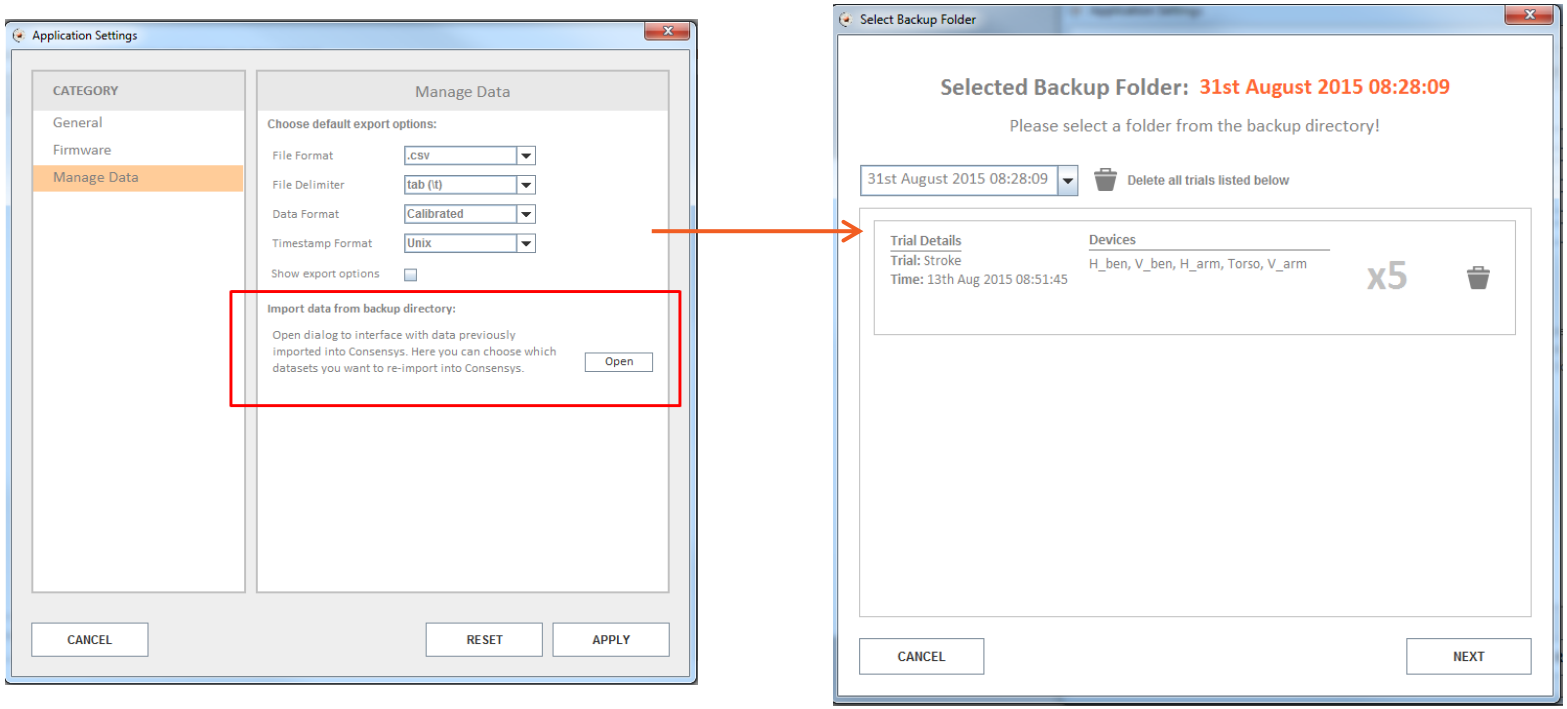
DISCOVERY IN MOTION

USEFUL THINGS TO KNOW

- To import data from the backup, you only need to open the *Manage Data* category in the Application Settings and click on *Open* the backup



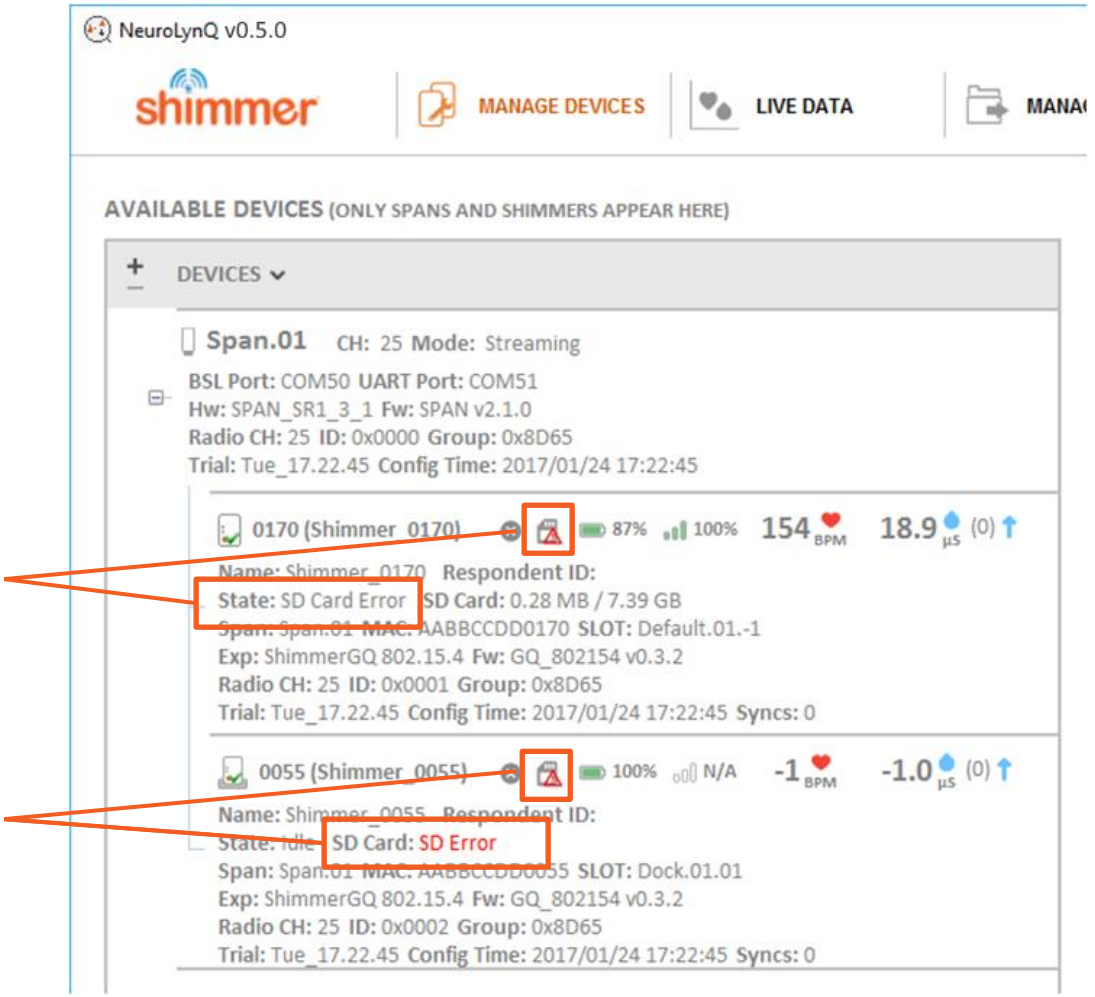
- After selecting a backup directory and clicking *Next*, you will be direct to <u>the second step of the import process</u>

USEFUL THINGS TO KNOW

- There are two different SD error states - internal SD error and PC-to-Shimmer SD error. These can be identified through NeuroLynQ through the 'Advanced' device view

1. The Shimmer is having difficulty accessing the SD card internally.

2. The NeuroLynQ software is having difficulty communicating with the SD card.



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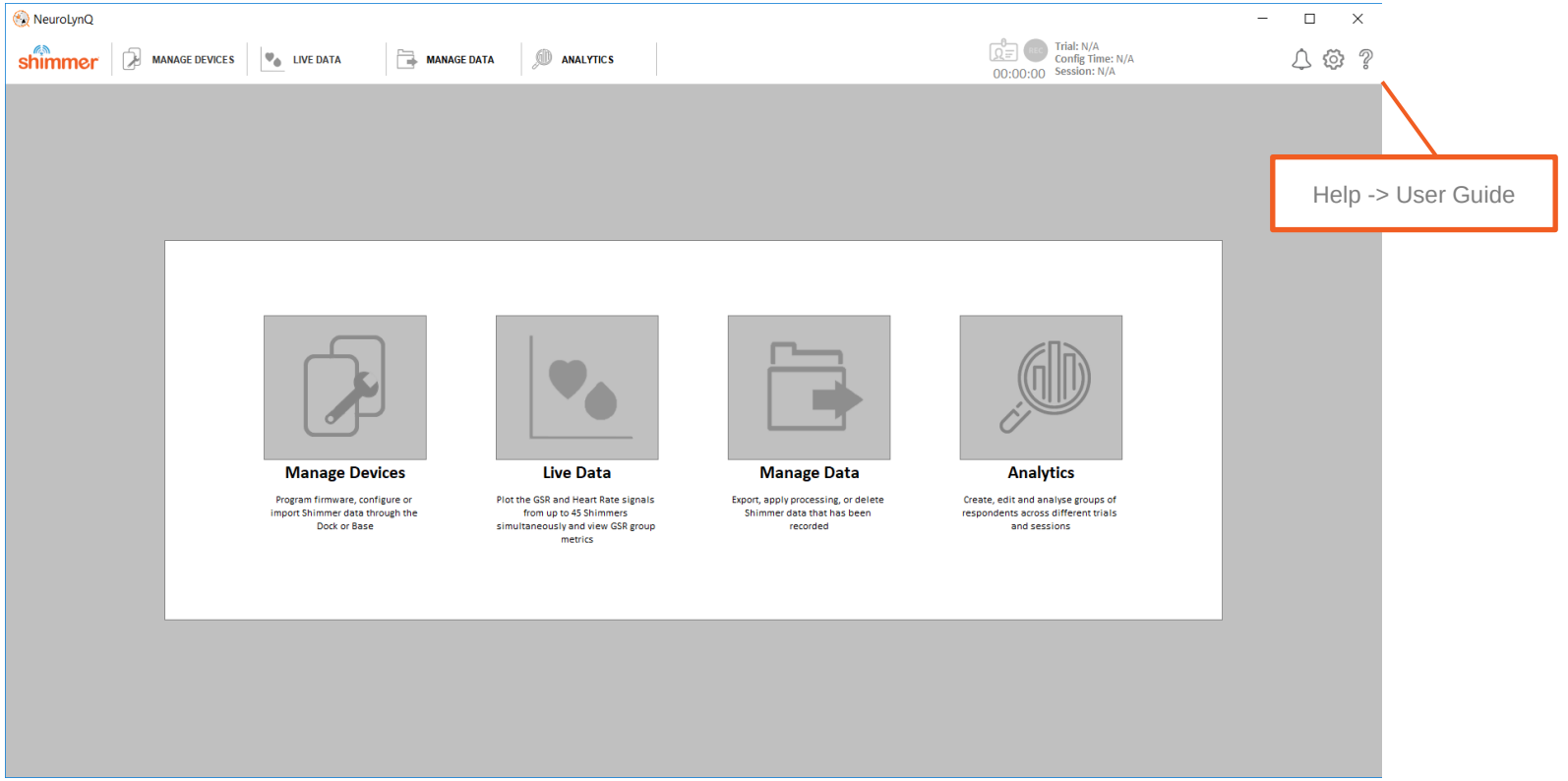
DISCOVERY IN MOTION

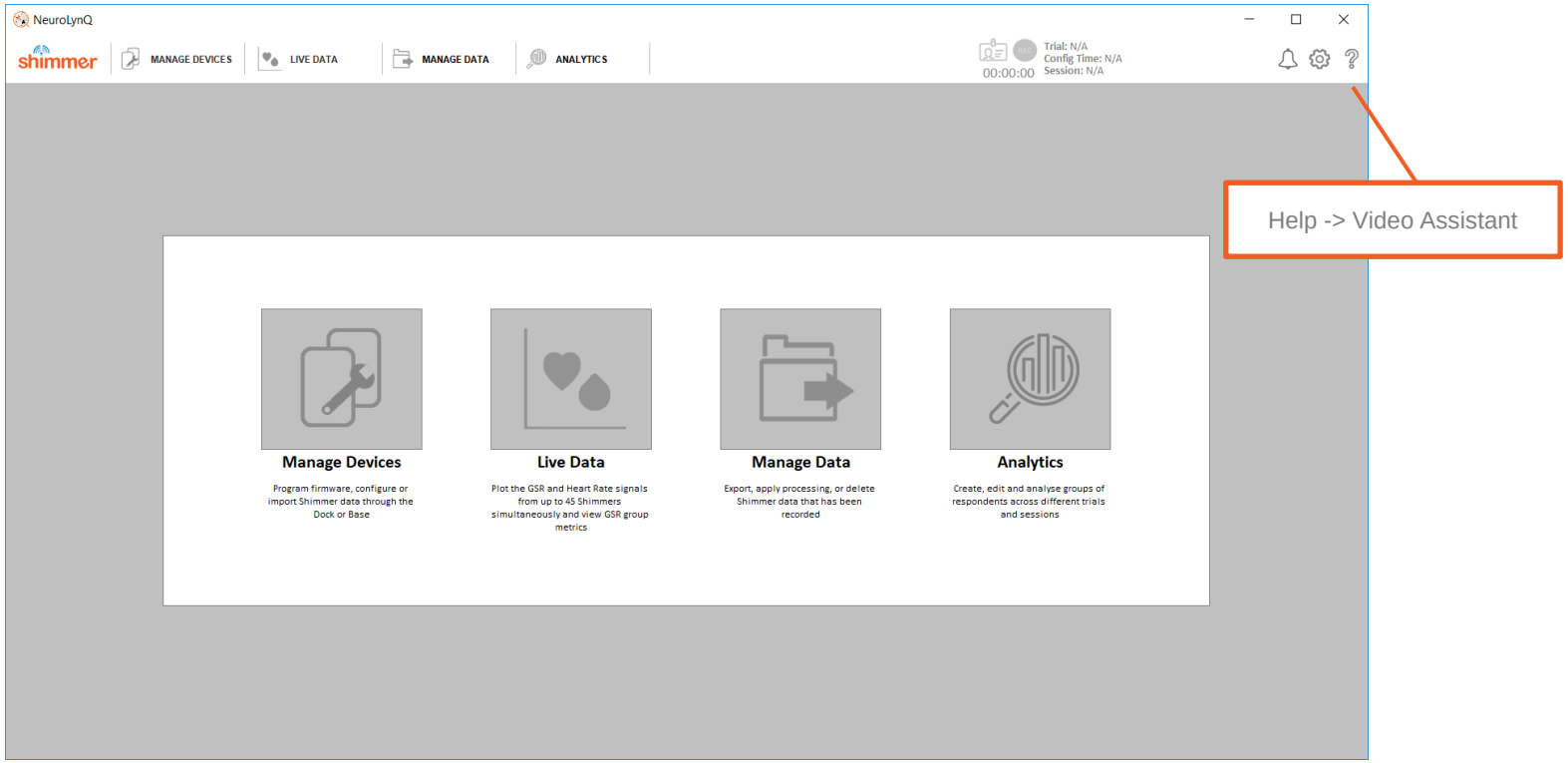
USEFUL THINGS TO KNOW

- NeuroLynQ includes a link to this guide in the software. Please consult this document if encountering an issue with the NeuroLynQ software or hardware.



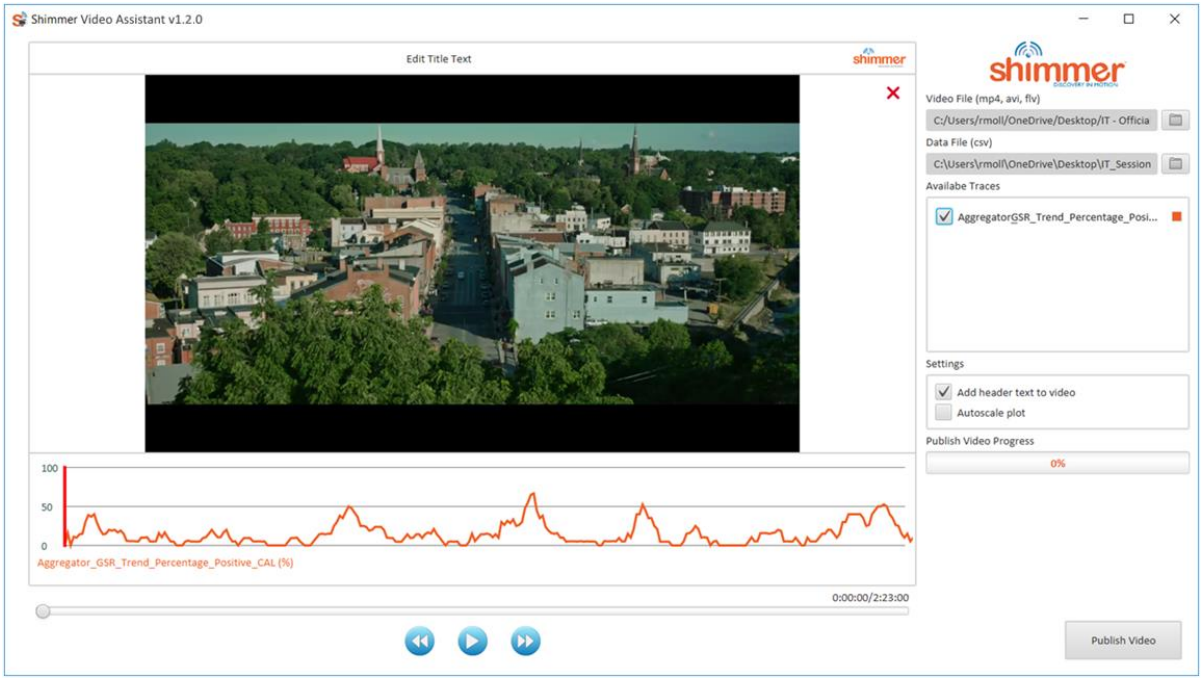
USEFUL THINGS TO KNOW

- The NeuroLynQ package includes a separate software application that enables the user to add a data trace from a NeuroLynQ csv file onto an arbitrary video file and produce an output video file of same.



USEFUL THINGS TO KNOW

- Simply import a video file and a csv file and both will play back simultaneously when the *play* button is pressed. A new video file combining the source video and csv file can be produced by pressing the *Publish Video* button.

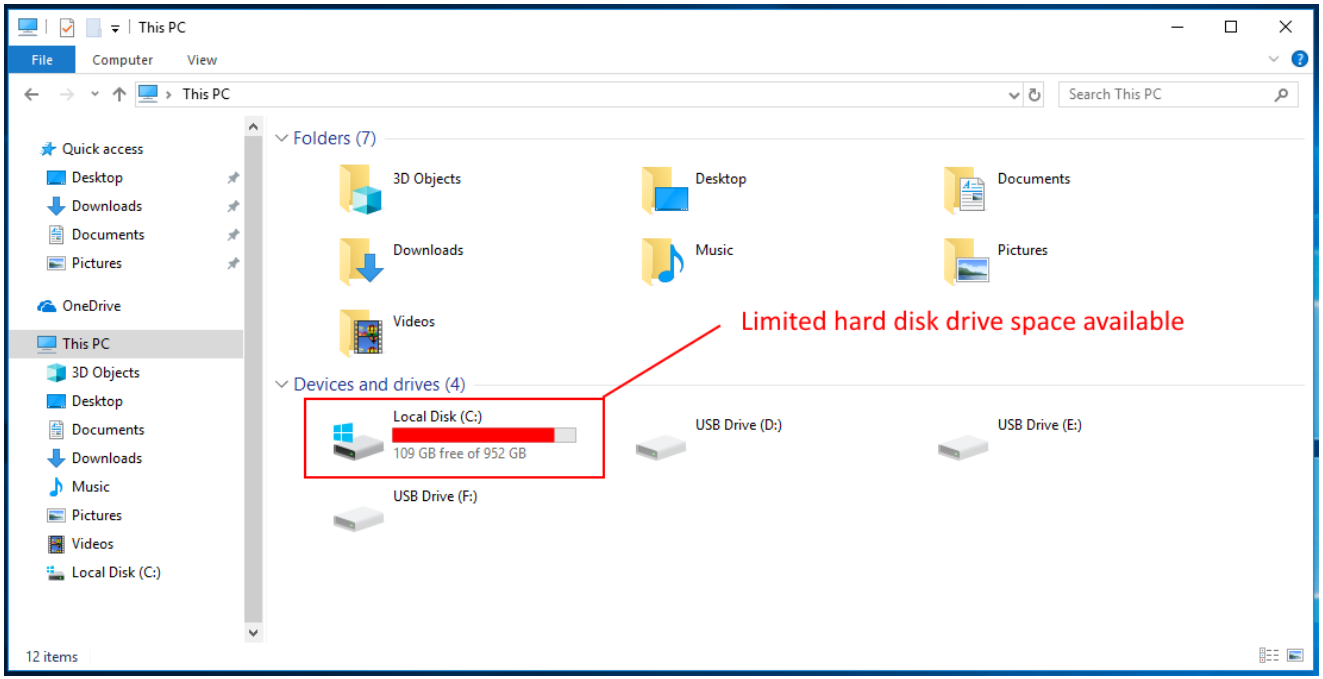


Note: It is a known issue that some media players e.g. Windows Media Player fail to play the audio From video files produced by the Shimmer Video Assistant software. It is strongly recommended to use the VLC media player to play the published video files.

https://www.videolan.org/vlc/download-windows.html

Troubleshooting – Limited Free Hard Disk Drive Space (P1)

1. If recording a significant amount of data in NeuroLynQ you may find the available memory on the hard disk drive nearing capacity which will limit the ability to record further data (see below for illustration of hard disk drive nearing capacity)
2. If step 1. above is observed, NeuroLynQ datasets should be moved from the hard disk drive to a secure external location, example procedural steps to follow on the next page.



Troubleshooting – Limited Free Hard Disk Drive Space (P2)

Example procedure to free-up hard disk drive space

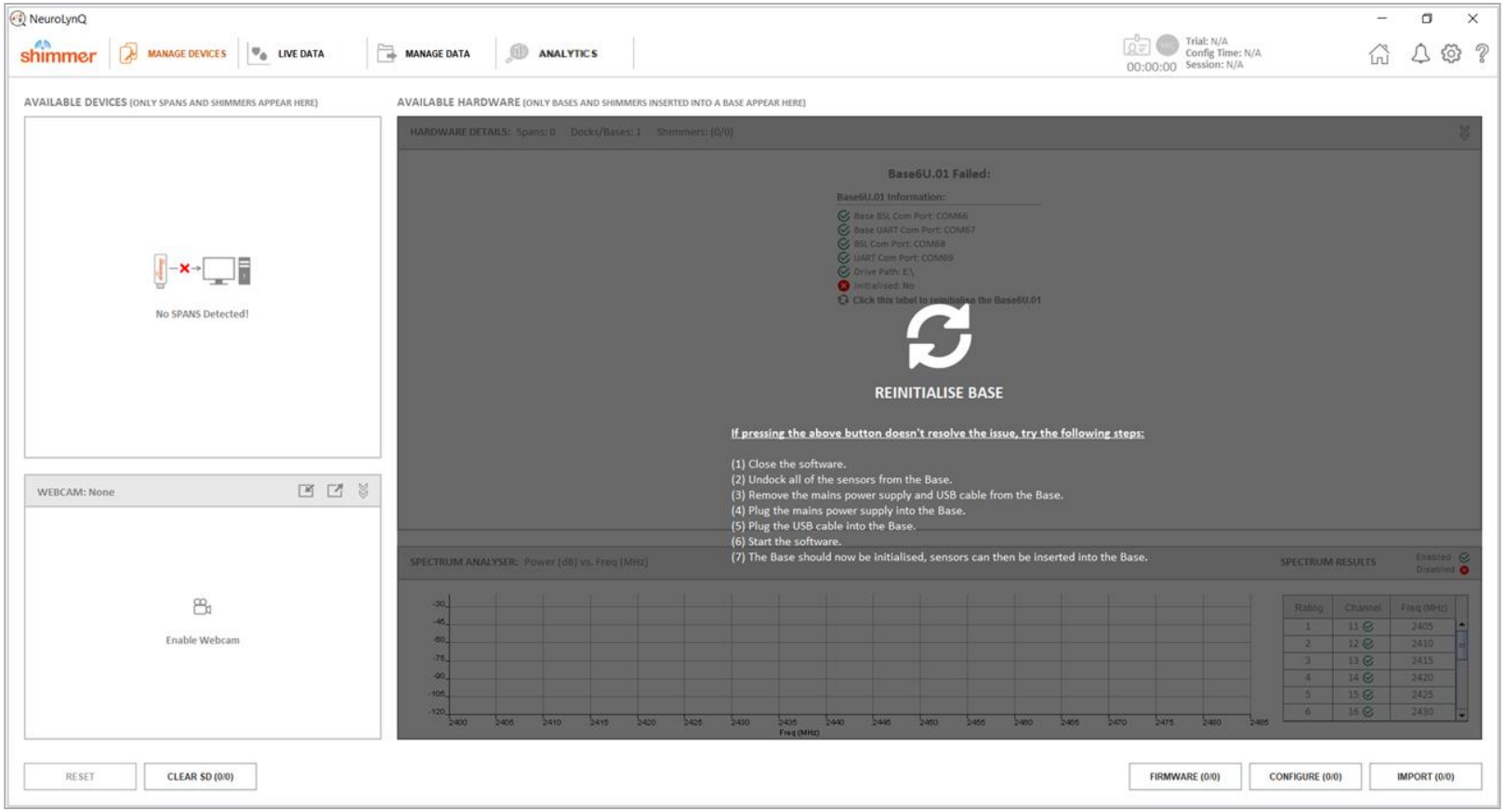
1. Choose the NeuroLynQ datasets that you would like to archive from the 'Manage Data' tab.
2. Identify the dataset's database name (a set of ten digits e.g., '1435243126.db'). See page 84 for how to do this.
3. Locate the corresponding folder (name of the folder is same as the database name e.g., '1435243126') in the 'Database' directory.
4. Make sure this folder has a database file (.db) and the corresponding video file(s) (.flv).
5. Move this folder safely to a secure location e.g. an external hard disk drive (Do not rename the folder.)
6. Once you restart the software, you will no longer find the dataset in the 'Manage Data' tab

A few points to keep in mind..

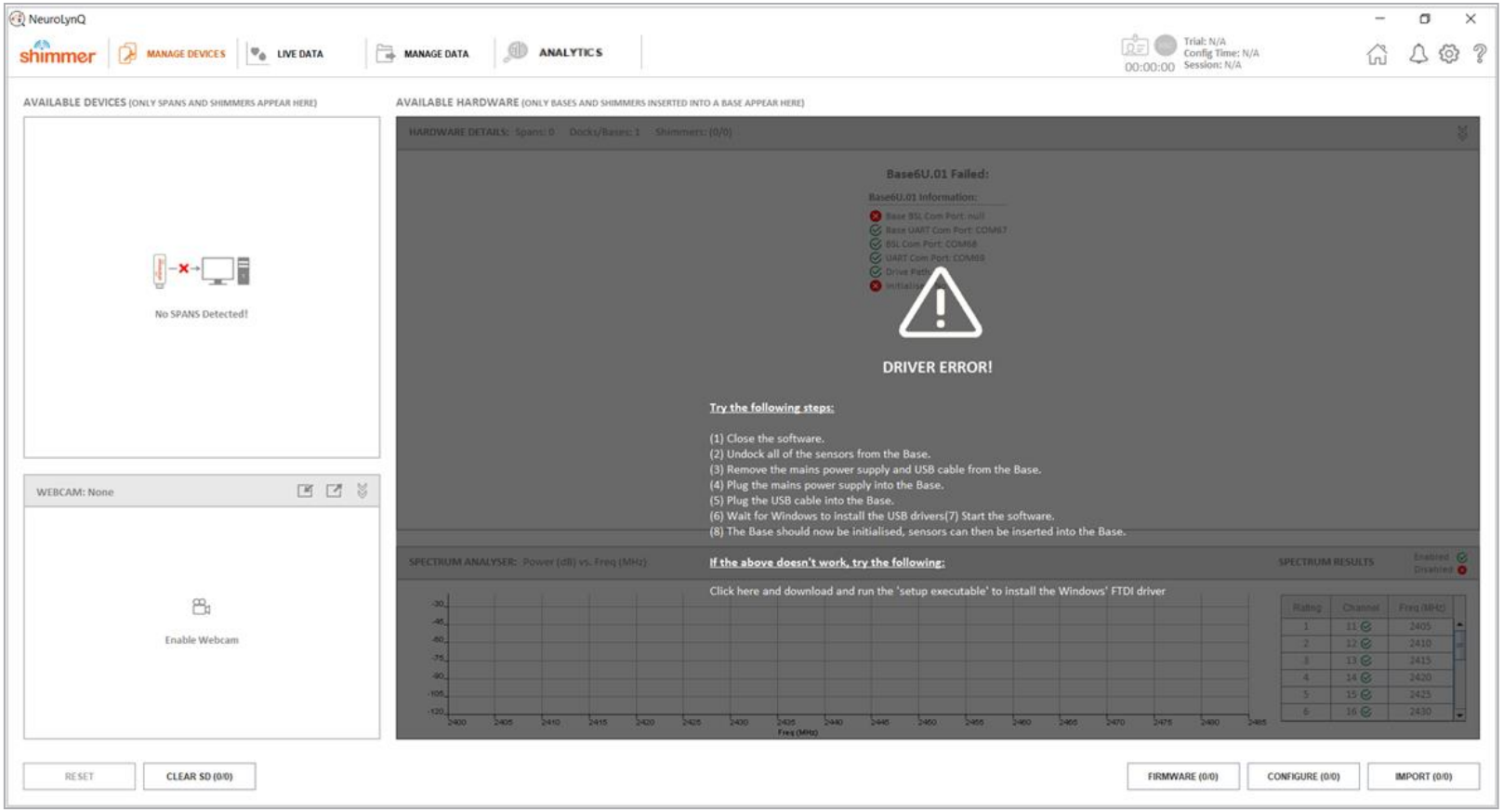
- Once archived, for your convenience maintain a document with the dataset's details such as the trial name, database name, study details etc.
- If you would like to view the archived data in NeuroLynQ, please copy the dataset's folder to the 'Database' directory of the PC running NeuroLynQ and restart the software.
- Store the archived data in secure location.

Troubleshooting –Dock/Base Issues

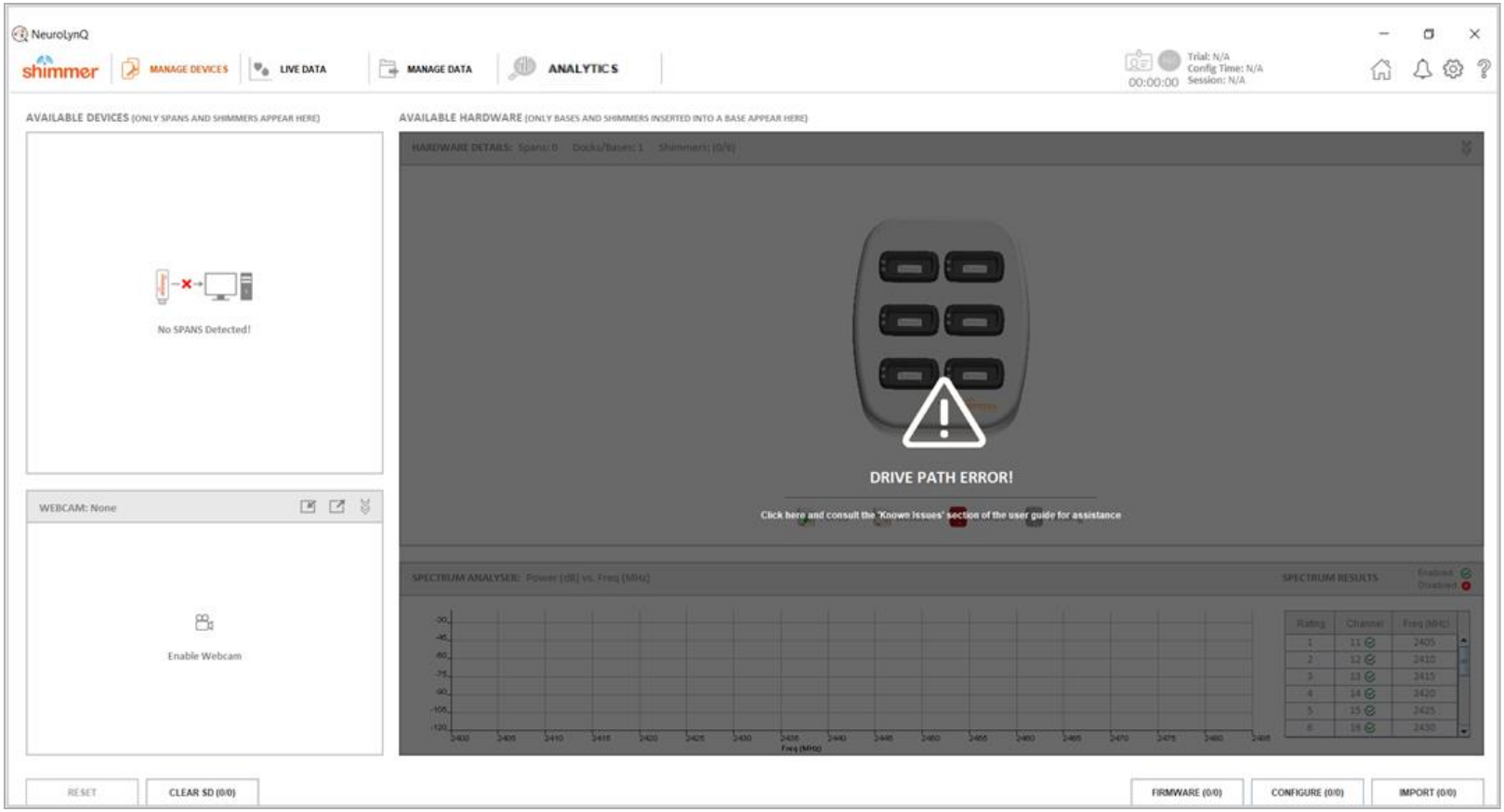
Initialisation Error



Troubleshooting –Dock/Base Issues
Driver Error



Troubleshooting –Dock/Base Issues
Drive Path Error



Contact the technical support team through Shimmer's online support system should you see this error.
http://shimmersensing.com/support/wearable-sensing-support/

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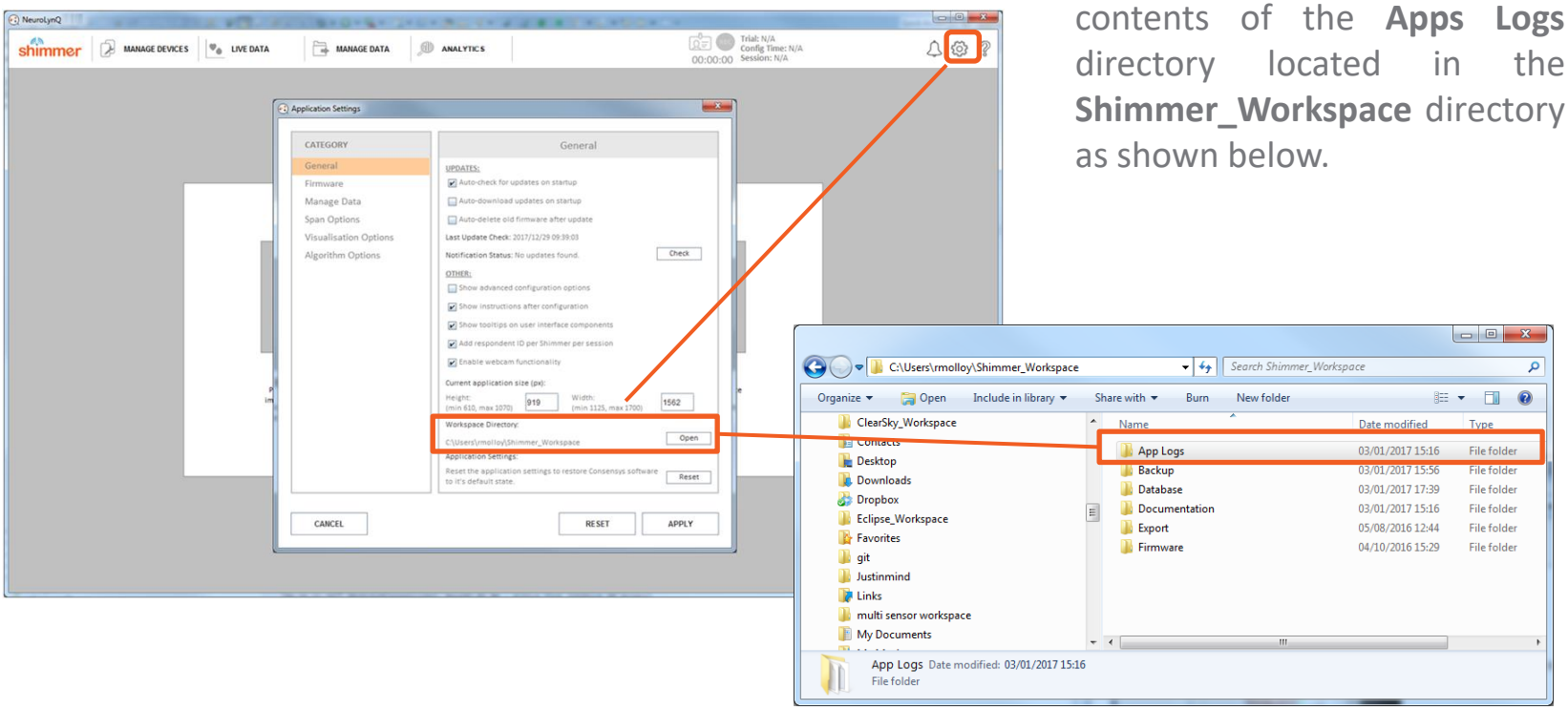
TROUBLESHOOTING –DOCK/BASE ISSUES

- If you experience any issue while installing or using the Shimmer Dock or Consensys Base, please consult the relevant sections of this guide. If the issue has not been resolved, please submit a support query through the support section of our website[1].



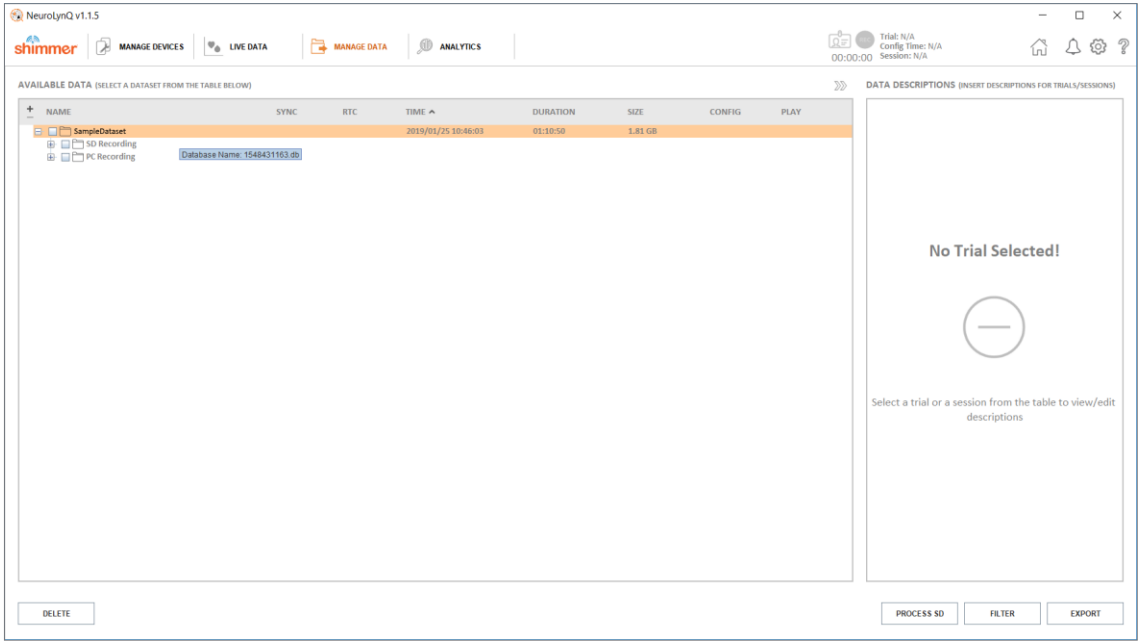
N.B. Make sure to include the contents of the **Apps Logs** directory located in the **Shimmer_Workspace** directory as shown below.

[1] http://www.shimmersensing.com/support/wearable-sensing-support/

TROUBLESHOOTING – RECORDED DATA

- If you experience an error with your recorded data in NeuroLynQ 'Manage Data', please consult this document first. If the issue has not been resolved, please submit a support query through the support section of our website[1]. **N.B.** please include the relevant **Database File(s)** from the Database directory and **Binary File(s)** from the Backup directory as outlined in this section.

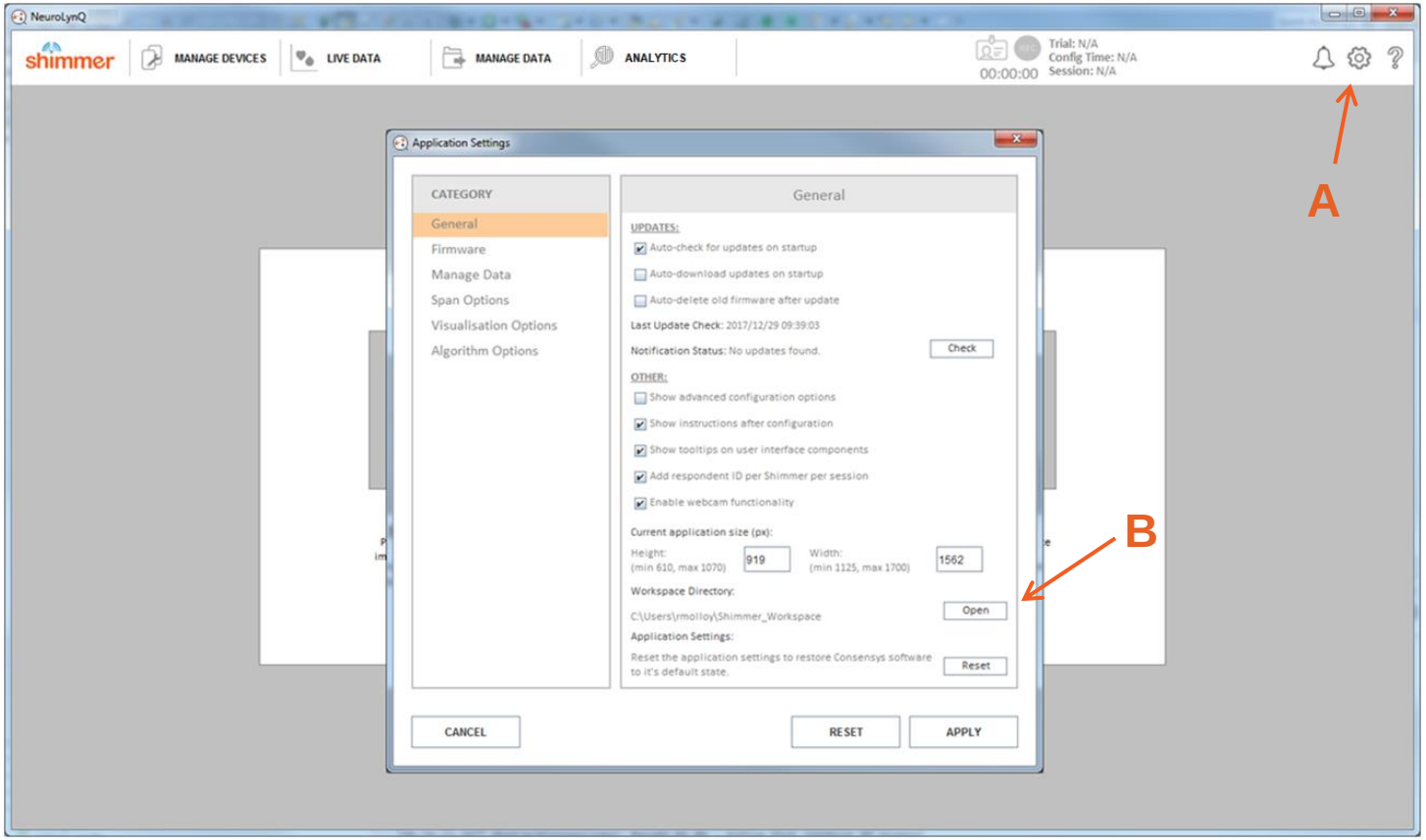
1. To identify the appropriate database file, hover your mouse over the trial in the NeuroLynQ 'Manage Data' tab. The file name will be a set of digits (*e.g.*, '1435243126.db') as below. You can navigate to the database file by right click -> Open Directory



[1] http://www.shimmersensing.com/support/wearable-sensing-support/

Troubleshooting – Recorded Data

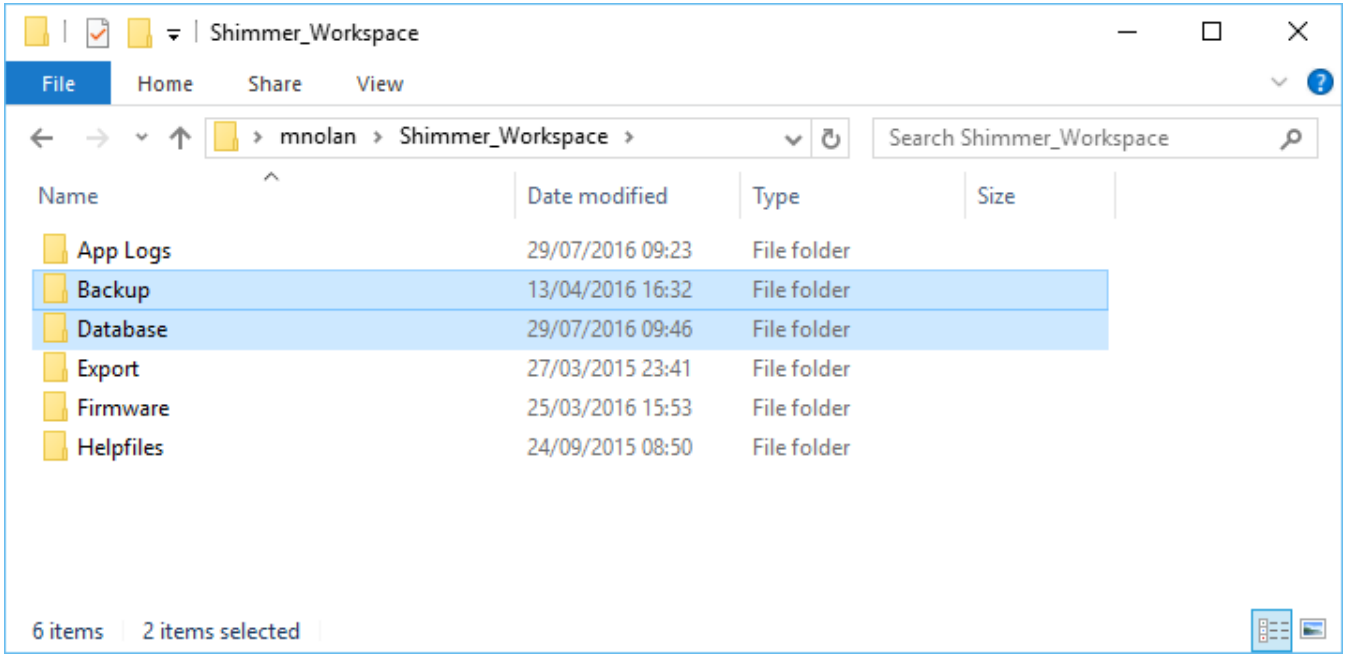
2. To navigate to the **Shimmer_Workspace** directory:
   A. Click on the NeuroLynQ 'Application Settings' menu
   B. Click on the 'Open' button to open the workspace directory



TROUBLESHOOTING – RECORDED DATA

3. The Shimmer Workspace will appear as below. The important directories to note are the 'Backup' and 'Database' directories - as highlighted.

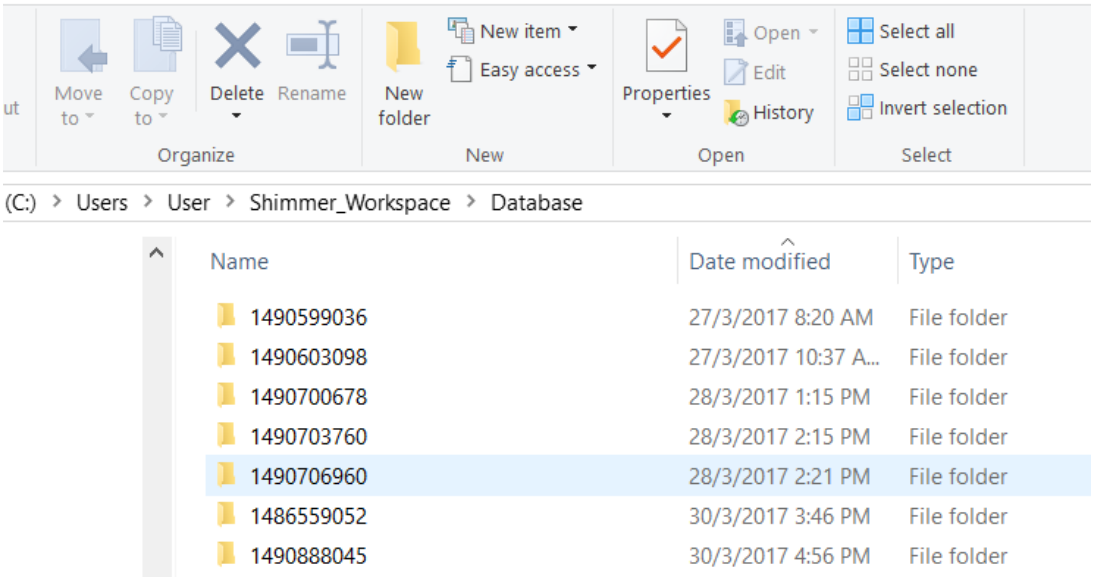
   The 'Backup' directory is only relevant if data was imported from the Shimmer's SD card and is not used if data is solely recorded over a Bluetooth connection.



TROUBLESHOOTING – RECORDED DATA

4. **'Database' Directory:**

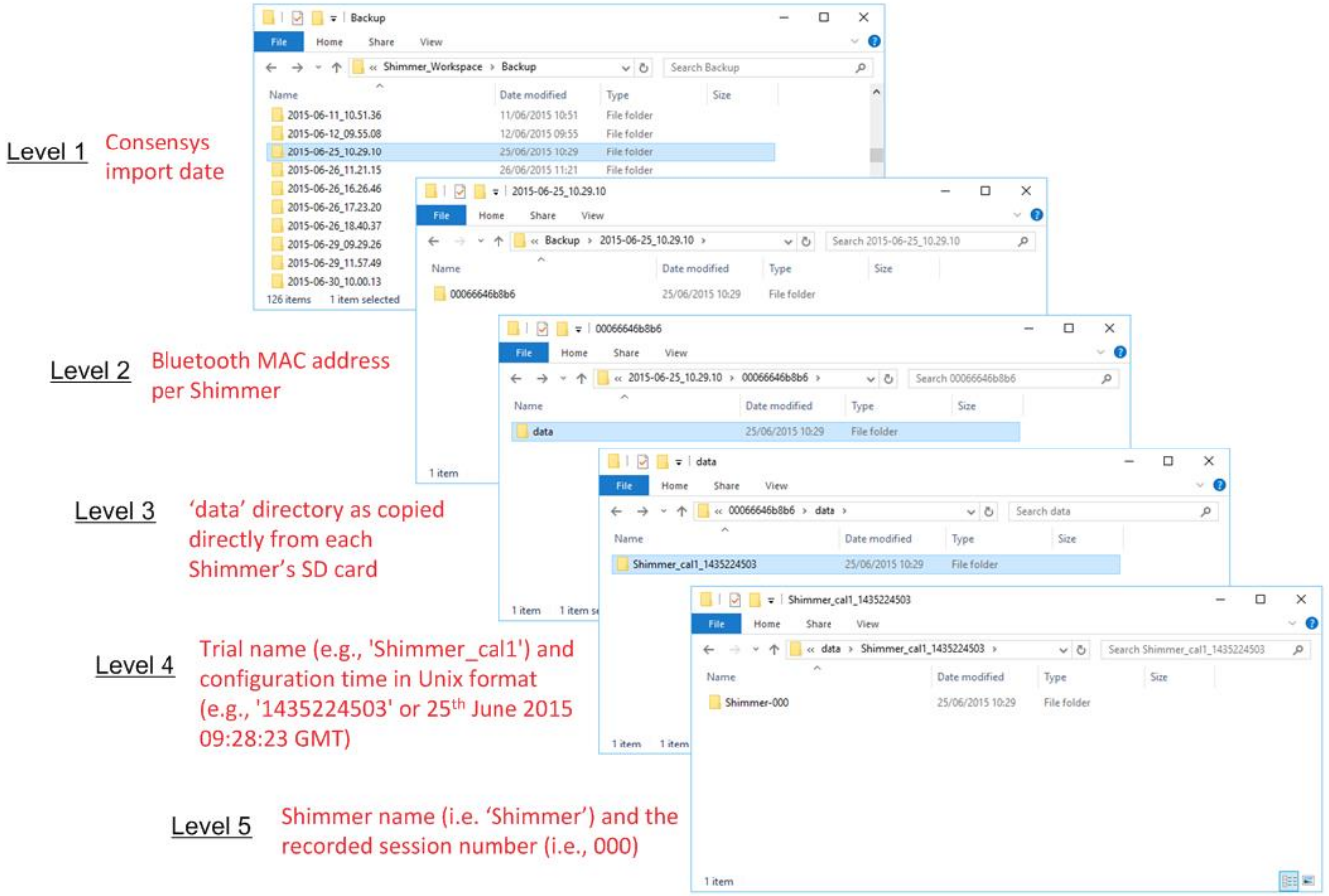
   This directory stores a database folder per 'trial' whereby the database filename is the trial configuration time in Unix Timestamp format. For example, the selected database below, '*1490706960*', corresponds to a trial which was configured on the '*28th March 2017 at 14:16 GMT+1*' (online converter example here).



TROUBLESHOOTING – RECORDED DATA

5. **‘Backup‘ Directory:**

This directory contains the binary data files copied from the Shimmer during the import of data that was recorded to the Shimmer’s on-board SD card. The structure of the directory is as shown below. If sending this data to Shimmer Support, it is sufficient to just identify the import date, create a ZIP of that directory and send that to Shimmer support’.



Known Issues

Firmware

It is a known issue in *SR57_GQ_802154_v1.1.0.txt* firmware that on very rare occasions (~1 in 50 power cycles) a sensor unit can freeze or lock-up indicated by the LED pattern shown in the image below. There is a **known workaround** solution for this issue should it arise which is to:

1. Power OFF the sensor unit
2. Wait for ~5seconds
3. Power ON the sensor unit

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FURTHER QUESTIONS?

Why not reach out to us through our online ticketing support system?

http://shimmersensing.com/support/wearable-sensing-support/

Or contact us through one of our social media channels

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