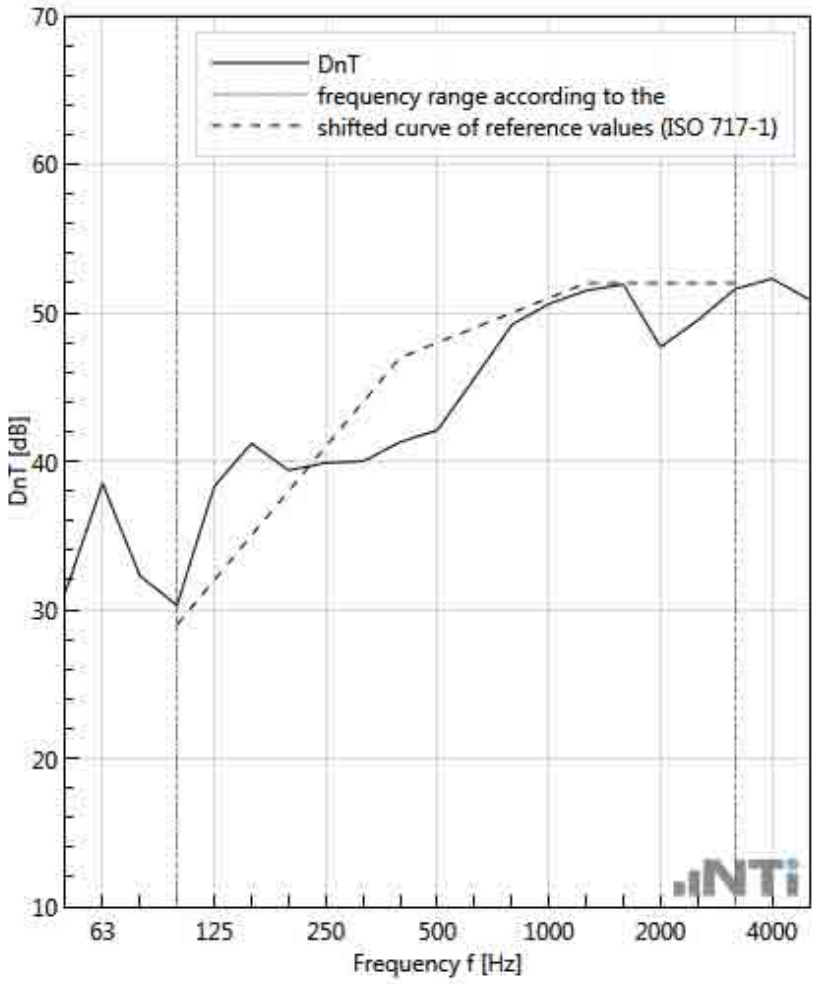
# Sound Insulation Reporter

## for XL2 Sound Level Meter



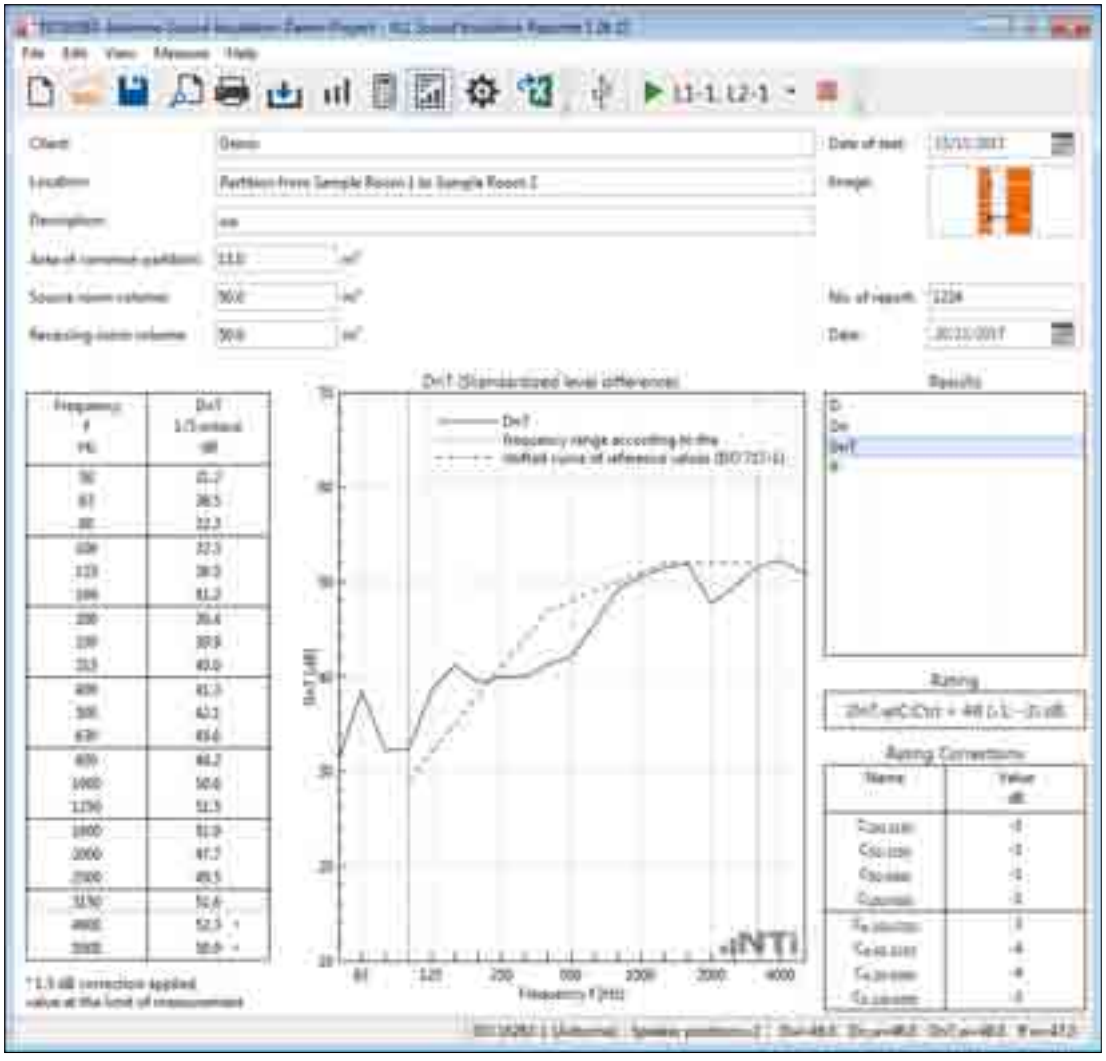

## User Manual

V1.28.02

# Index

# 1. Introduction

Thank you for purchasing the permanent Sound Insulation Option or the annual Sound Insulation Reporter 365 licence for the XL2 Sound Level Meter. This enables the import of the measurement data into the Sound Insulation Reporter PC-software. The Sound Insulation Reporter is a PC-based software application that provides all the reports for airborne, impact and facade sound insulation measurements.



Designed for acoustic consultants, this comprehensive tool uses data gathered by the XL2 Sound Level Meter, and quickly returns graphical analysis of all measurement positions. Analyzing the measurement data and producing reports is straight-forward using the Sound Insulation Reporter software. Just drag & drop the XL2 measurement data into the software and print the report.

Additionally the software offers remote measurements; one or more XL2 Sound Level Meters may be controlled directly by the software connected via USB or wireless. This offers parallel measurements of sending and receiving room onsite, thus a great time saving.

The following tutorial provides a step-by-step instruction. The appendix provides more details on a typical onsite measurement procedure.

## 2. Standards

The Sound Insulation Reporter software measures and reports in accordance with the following standards:

| Airborne Sound Insulation | Impact Sound Insulation | Facade Sound Insulation |
|---|---|---|
| • ASTM E336<br>• ASTM E413 | • ASTM E1007<br>• ASTM E989 | • ASTM E966<br>• ASTM E1332 |
| • DIN 4109 | • DIN 4109 | • DIN 4109 |
| • England/Wales: Approved Document E (2003) | • England/Wales: Approved Document E (2003) | |
| • GB/T 19889.4 - 2005 | • GB/T 19889.7 - 2005 | • GB/T 19889.5 - 2006 |
| • ISO 10140:2010 | • ISO 10140:2010 | |
| • ISO 140-4:1998 | • ISO 140-7:1998 | • ISO 140-5:1998 |
| • ISO 16283-1:2014 incl. Rooms < 25m3<br>• ISO 717-1:2013 | • ISO 16283-2:2015 incl. Rooms < 25m3<br>• ISO 717-2:2013 | • ISO 16283-3:2016 incl. Rooms < 25m3<br>• ISO 717-1:2013 |
| • SIA181:2006 | • SIA181:2006 | • SIA181:2006 |

# 3. My First Steps

Sound Insulation is the measurement of the influence that a partition (usually a wall or ceiling) has on sound; in other words, how efficiently a partition insulates the sound between rooms. To evaluate this, a reference sound signal is generated in the sending room, and the noise spectrum is measured in both the sending and the receiving room. Additionally a room correction of the receiving room is applied based on the measurement of the reverberation time RT60.

The Sound Insulation Reporter offers the following measurement modes:

- Automated Measurement (XL2 remote controlled)
  One or more XL2 Sound Level Meters may be controlled directly by the software connected via USB or wireless. This offers parallel measurements of sending and receiving room onsite.
- Manual Measurement with XL2
  The measurements are performed manually with the XL2. All data is later on imported into the Sound Insulation Reporter software.

## Software Installation

- Install the Sound Insulation Reporter software on your PC.

## Additional XL2 Sound Level Meter Requirements

- Install the optional Extended Acoustic Pack for RT60 measurements in 1/3 octave resolution.
- Install the Remote Measurement Option as required. This enables controlling one or more XL2s from the Sound Insulation Reporter software.

XL2 with firmware V4.03 or higher

- Ensure the latest firmware V4.03 or higher is installed in your XL2 Sound Level Meter.
- Install the permanent Sound Insulation Option on the XL2 or request the online activation of the annual Sound Insulation Reporter 365. This enables the data import into the Sound Insulation Reporter software.

XL2-TA with type approved firmware V3.11

- Activate the Sound Insulation Option online at https://my.nti-audio.com or request the online activation of the annual Sound Insulation Reporter 365. This enables to import the measurement data into the software. Just ensure your PC is online during the data import.
- The following limitations shall be noted for remote measurement applications
  - measurements in sending and receiving room may not start synchronized
  - measuring the RT60 reverberation time changes the filename, folder, automatic numbering and autosave settings on the XL2
  - the RT60 reverberation time result is displayed in the software upon stopping the measurement

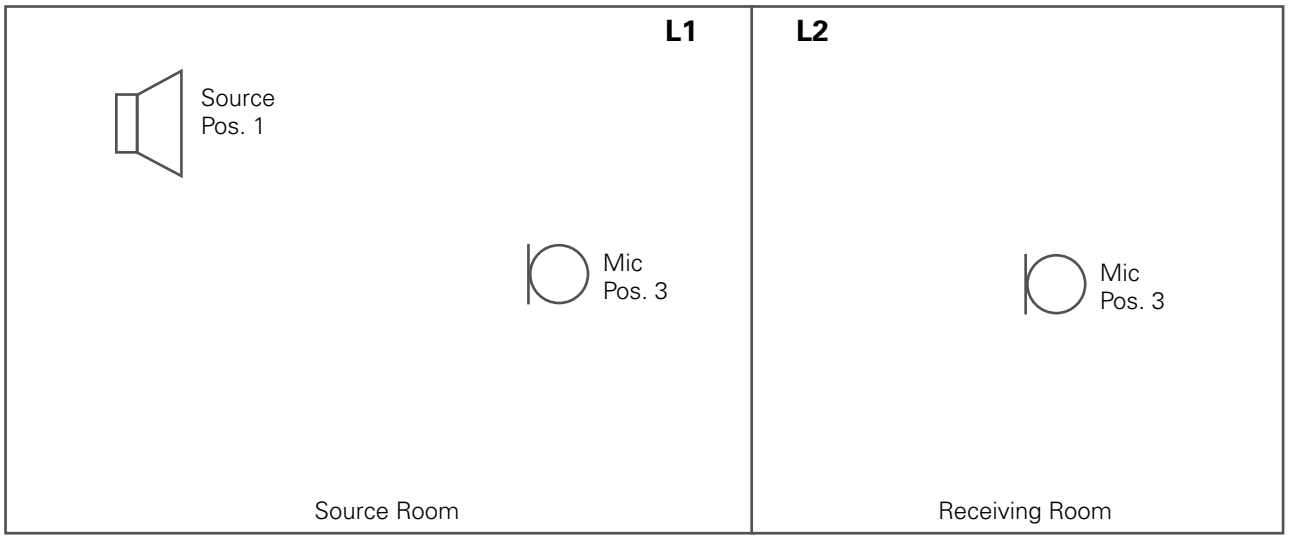
# 4. Automated Measurement (XL2 remote controlled)

The Sound Insulation Reporter software offers remote sound insulation measurements. One or more XL2 Sound Level Meters may be controlled directly by the software. For example one XL2 is positioned in the sending room and another one in the receiving room for airborne sound insulation measurements. The communication is wireless. The connected XL2s require an activated remote measurement option.

## Configuration

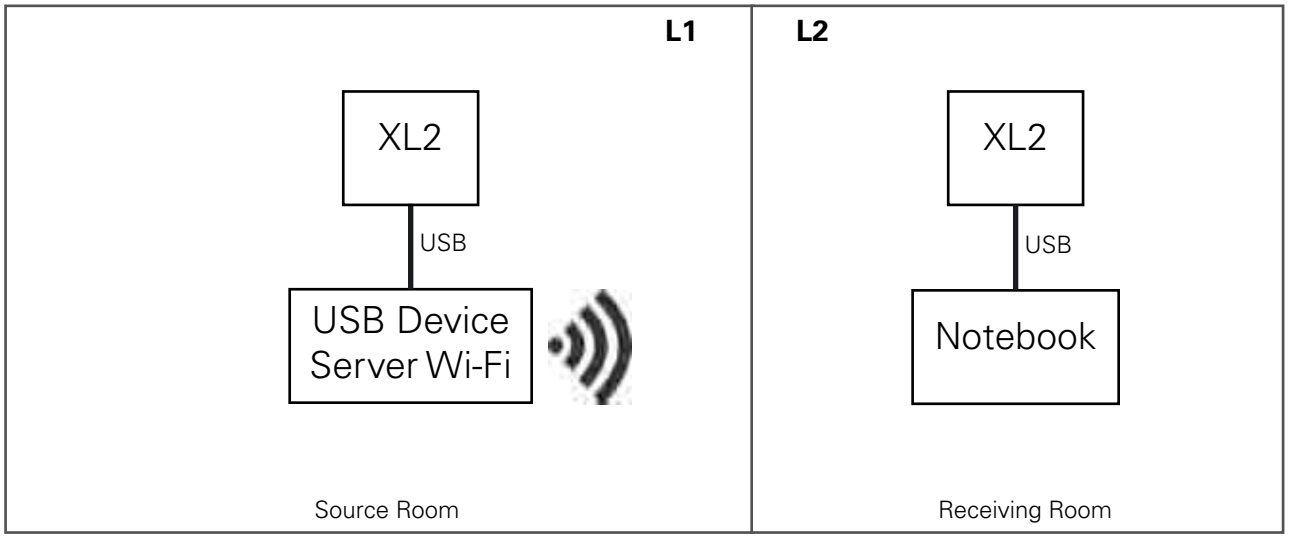
### Speaker and Microphone Configuration

The sound spectrum in the sending and receiving room is measured simultaneously by individual XL2 Sound Level Meters. The Sound Insulation Reporter Software controls the instruments and visualizes the live measurement data.



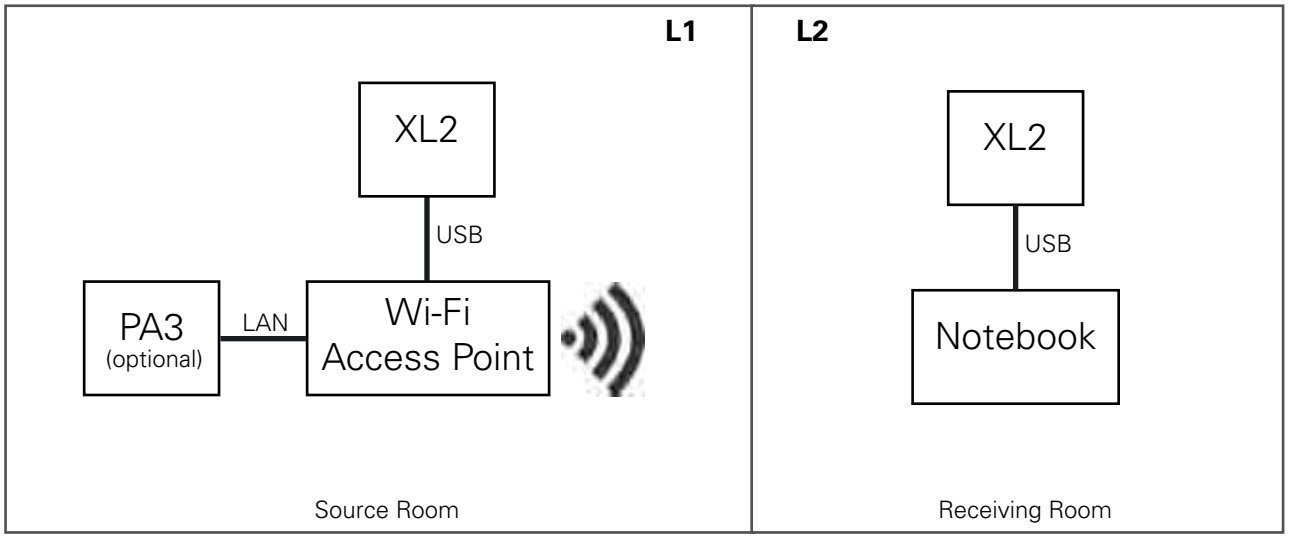
### Instrument Configuration "Wi-Fi available"

A Wi-Fi connection to the XL2 in the sending room is established using e.g. a USB Device Server Wi-Fi. Setup the measurement as follows in case of an already available Wi-Fi network:

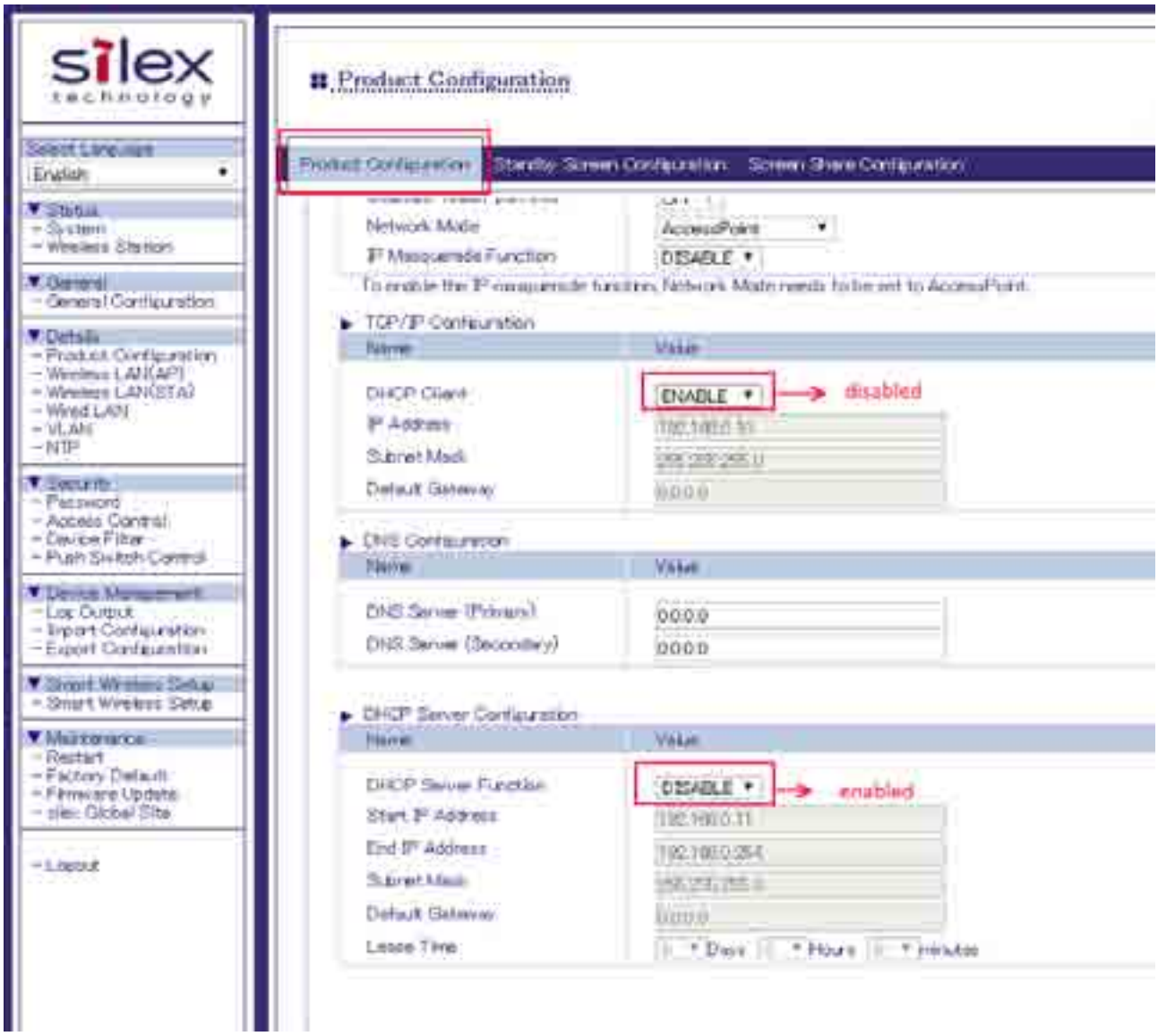



### Instrument Configuration "Own Wi-Fi network"

A Wi-Fi network is generated using a portable Wi-Fi router. The connection from the Sound Insulation Reporter software to the XL2 in the sending room is established using e.g. a Wi-Fi Access Point. Setup the measurement as follows:

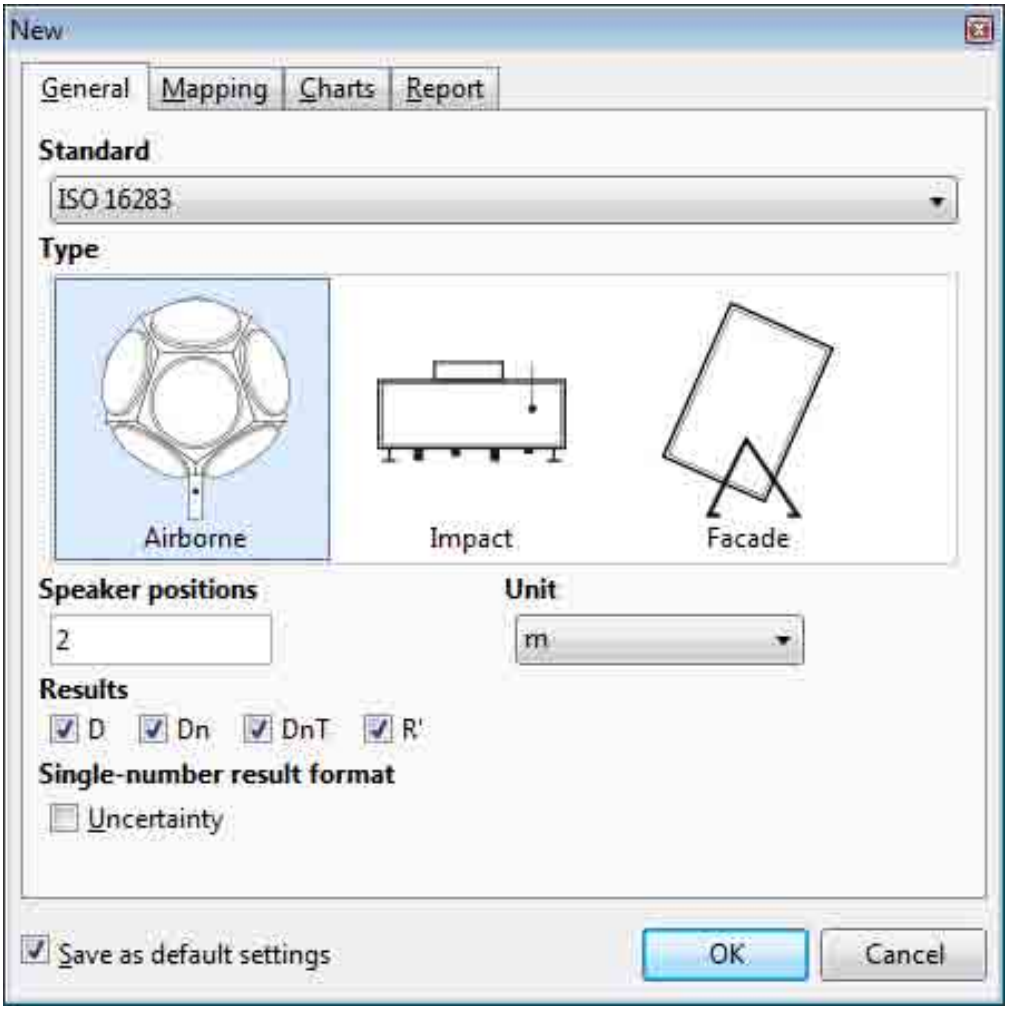


## Recommended setup configuration for Wi-Fi Access Point Type "SILEX SX-ND-4350 WAN"



## Selecting Standard and Type of Sound Insulation

- Start the Sound Insulation Reporter software.
- Click on **File** -> **New**




- Select your requested **Standard**
- Select **Airborne**, **Impact** or **Facade** Sound Insulation.
- Select the number of **Speaker positions** used.
- Select **Unit**.
- Define the required **Results**.
- Select to show the **Uncertainty** with the **Single-number result** as required.
- Confirm with **OK**.

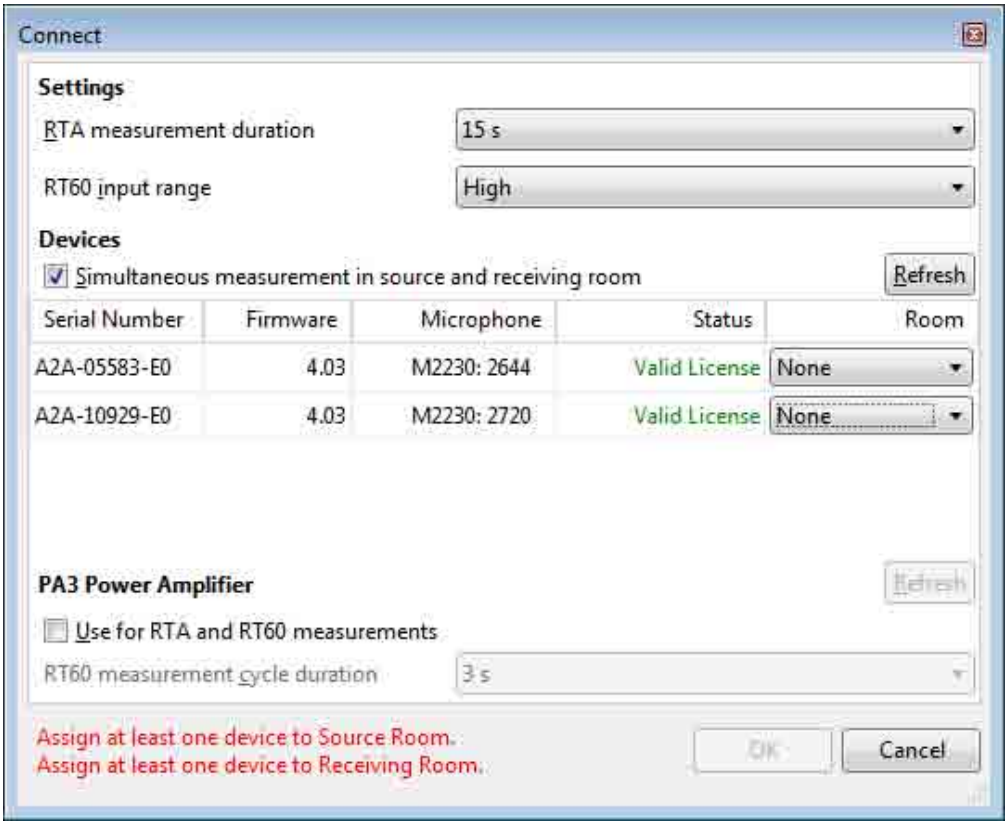
## Preparing the Measurement

• Click on **Connect...** (1) in the toolbar.

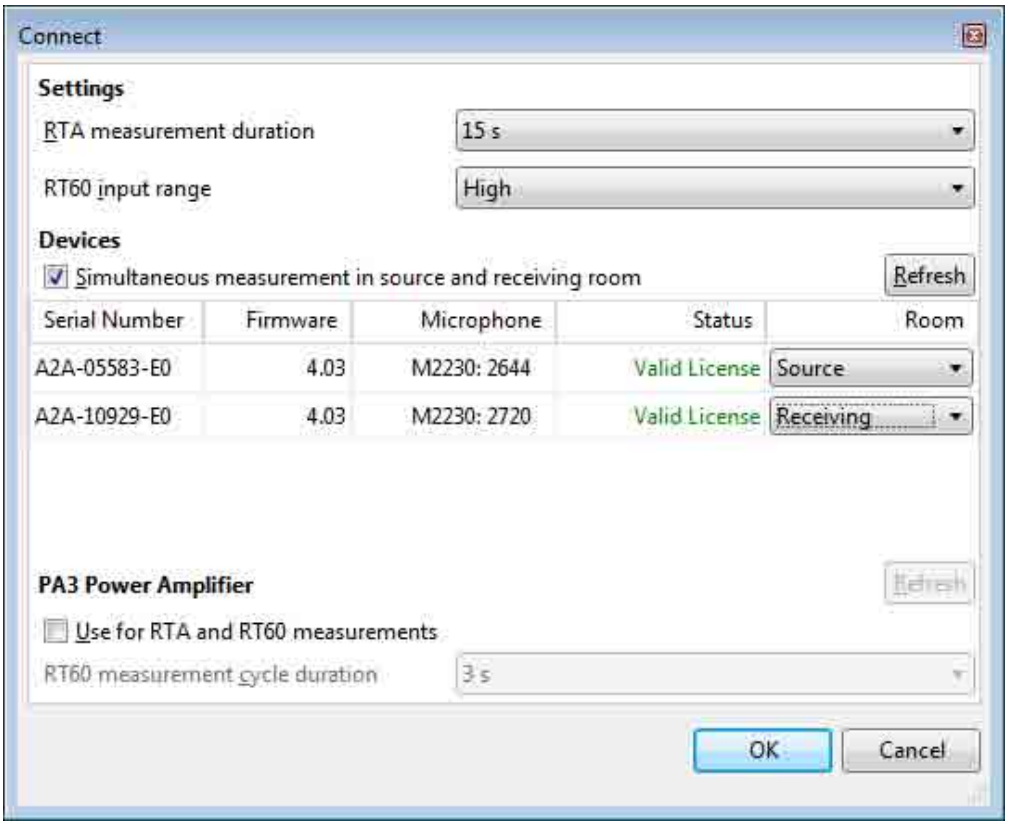

The Sound Insulation Reporter software detects all available XL2 Sound Level Meters connected in the COM-port mode.

• Verify the connected XL2 Sound Level Meters.

**Status** confirms **Valid Licence** for the connected XL2s with the options Extended Acoustic Pack, Remote Measurement Option and Sound Insulation Option or Sound Insulation Reporter 365 enabled. Using Sound Insulation Reporter 365 requires an active internet connection.



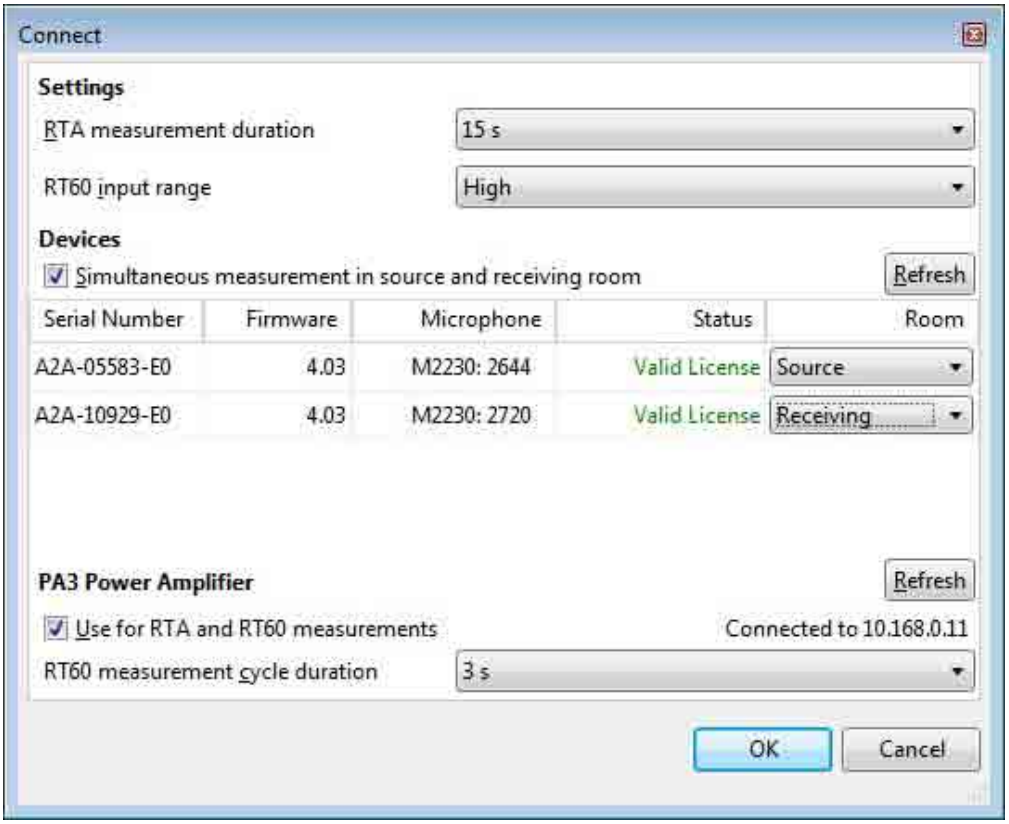
- Tick **Simultaneous measurement in source and receiving room** as applicable. This selection is dedicated for parallel measurments in source and receiving room with one or more instruments. Assign at least one device to the source room and another one to the receiving room. This is applicable for airborne or facade sound insulation measurements.



- The **PA3 Power Amplifer** for the Dodecahedron Speaker DS3 may also be remotely controlled. For this purpose you may connect the PA3 using a LAN cable to the
  - LAN network for a fixed permanent installation
  - WiFi access point for an onsite temporarily installation

- Select **Use for RTA and RT60 measurements**
- Click on **Refresh**

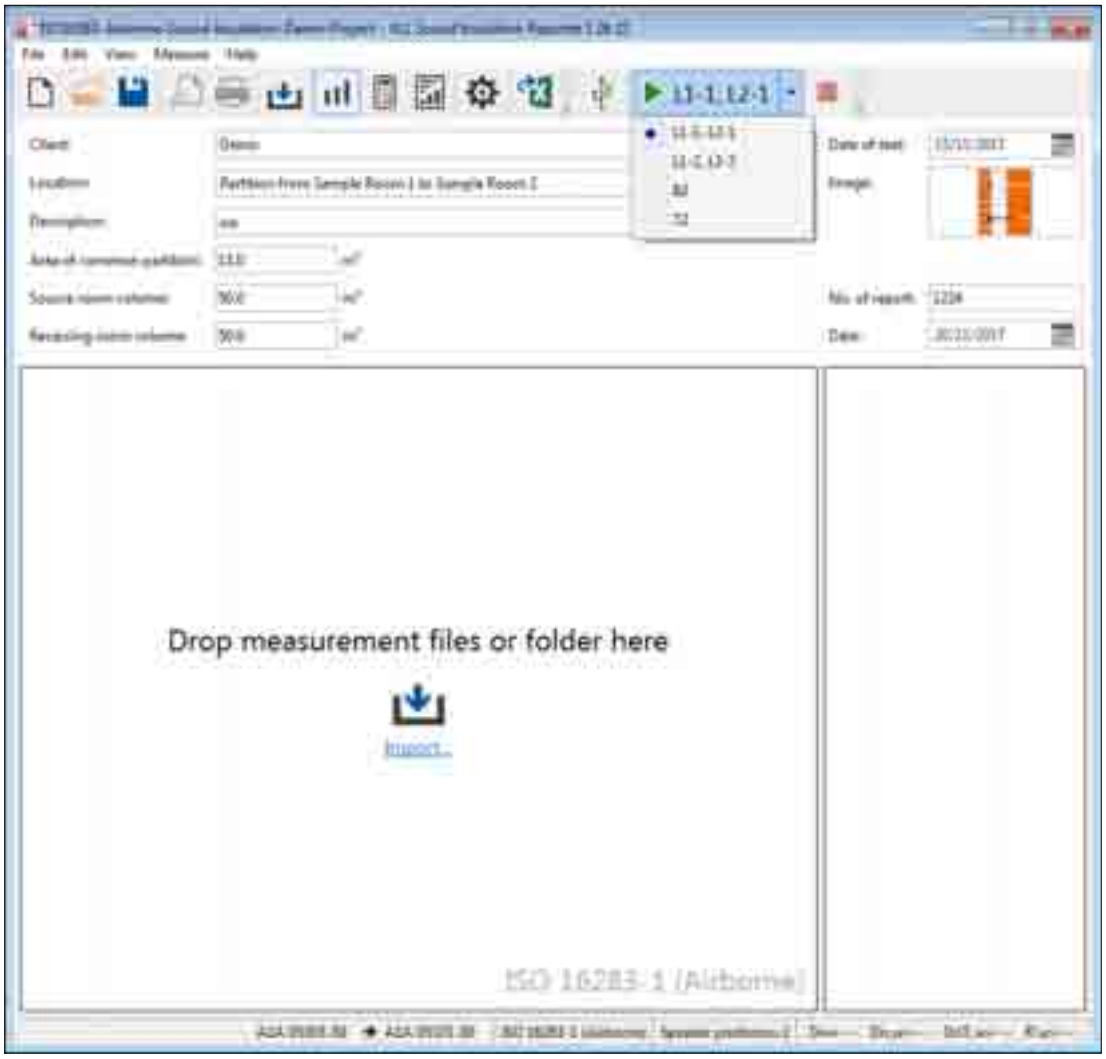
☝ The IP number of the connected PA3 Power Amplifier is displayed (**Connected to xx.xxx.x.xx**)



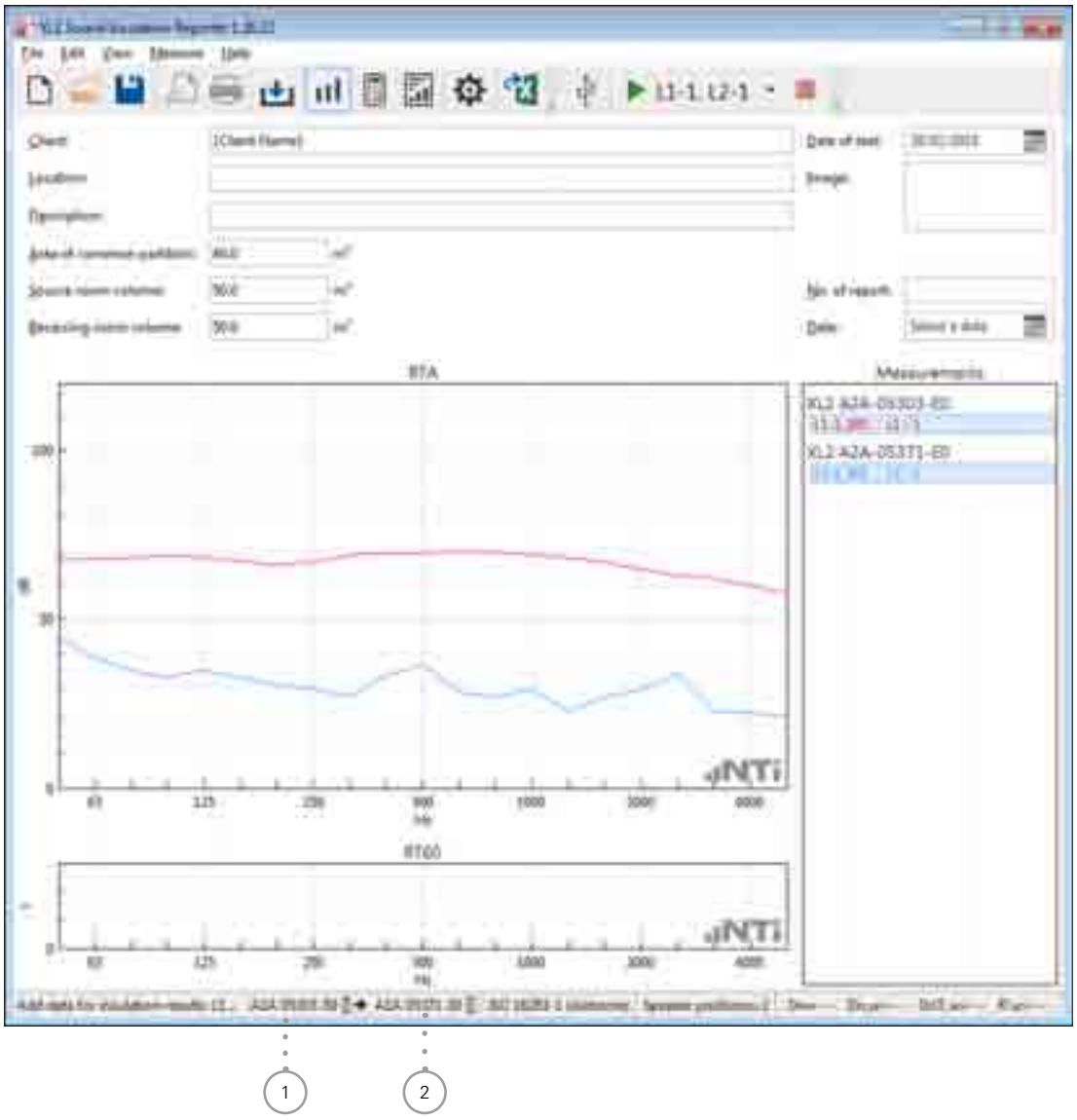

- Verify the firewall settings on the connected computer; the access to the displayed IP adress has to be enabled. In case of the message **A critical error occured** is shown at the start of your next measurement, then disable the firewall for evaluation shortly.
- Confirm your settings with **OK**.

## Sound Spectrum Measurement

- Select the measurement in the drop down menu, e.g. **L1-1, L2-1** for simultaneous measurement of sending and receiving room at speaker position 1.



• Press Start in the toolbar.




The remote measurement is started. The actual levels are visualized in the software.

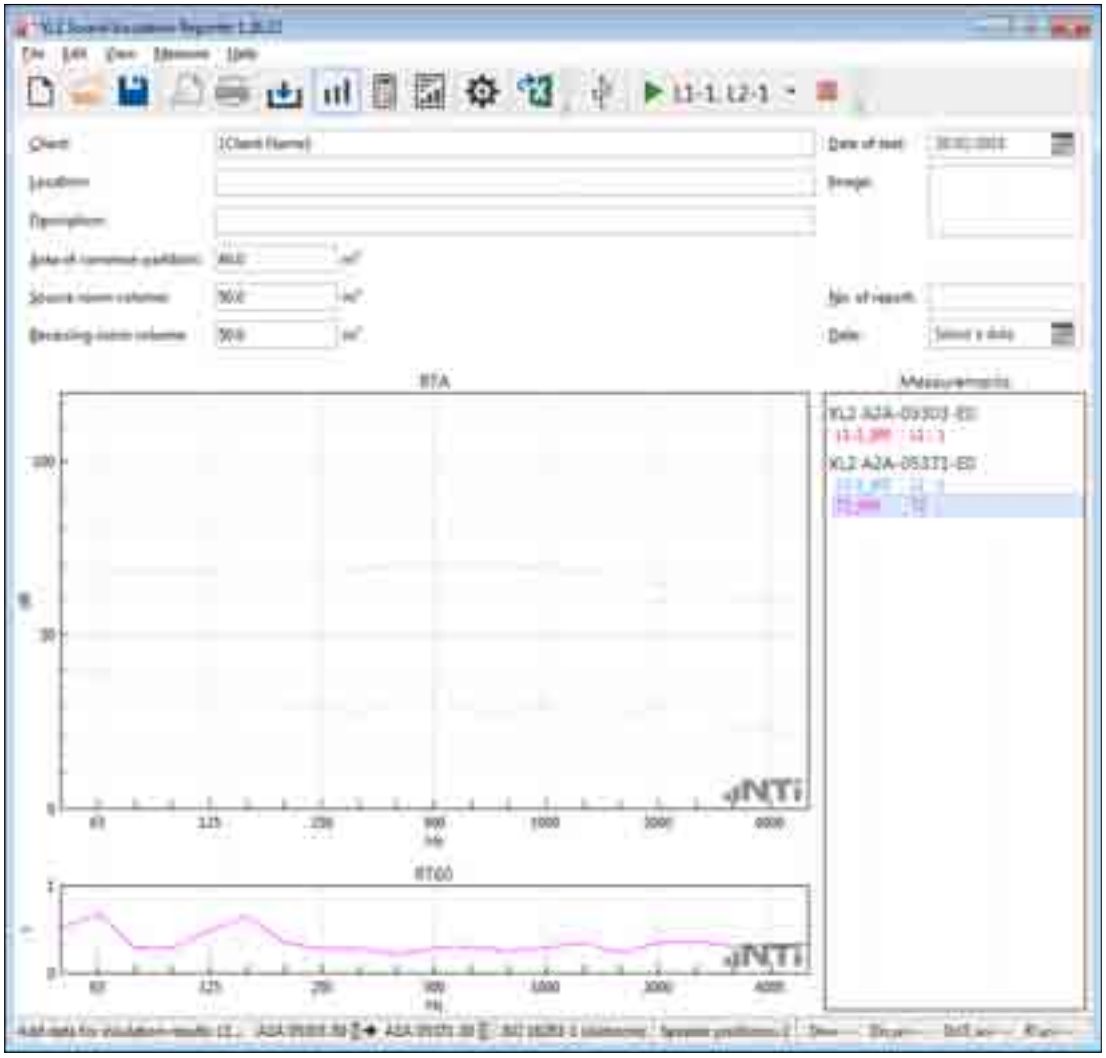
1 **Sending Room**
Serial number of XL2 assigned to sending room and measurement timer.

2 **Receiving Room**
Serial number of XL2 assigned to receiving room and measurement timer.

• The measurement stops automatically after the preset measurement duration.
• Move the microphone position and continue with the next measurement.
• Follow the same procedure for the second speaker position and the background noise recording.

## Reverberation Time RT60 Measurement

- Select **T2** for the RT60 measurement in the toolbar.




- Press Start in the toolbar.
- Activate the dodecahedron speaker with pink noise or the impulse sound source.

The XL2 measures the RT60 reverberation time. The averaged test result is visualized in the software.

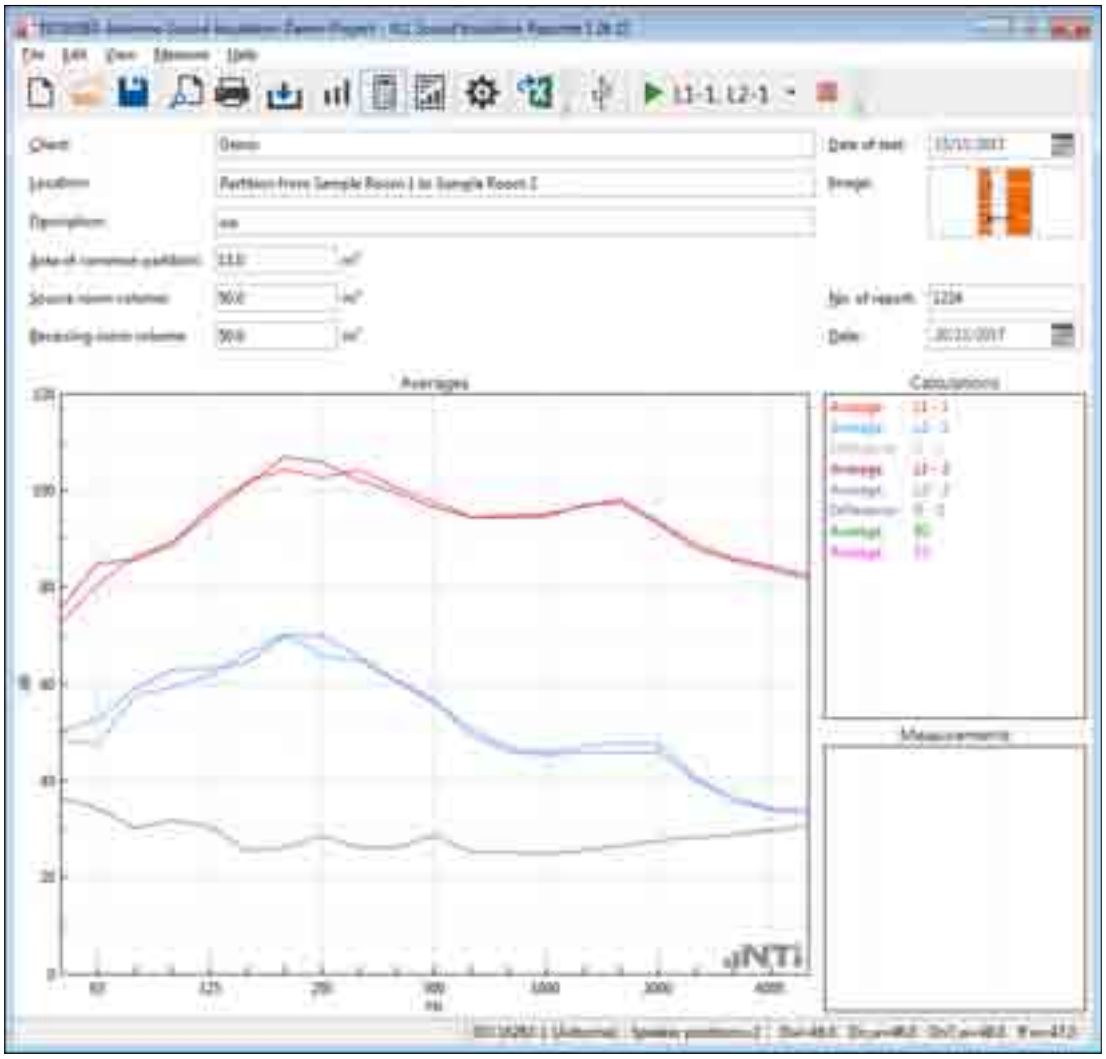
- Press Stop in the toolbar.

The RT60 reverberation time measurement is completed.

- Move the microphone position and continue with the next measurement.
- Verify the measurement data and delete any false readings from the **Measurements** list on the right.

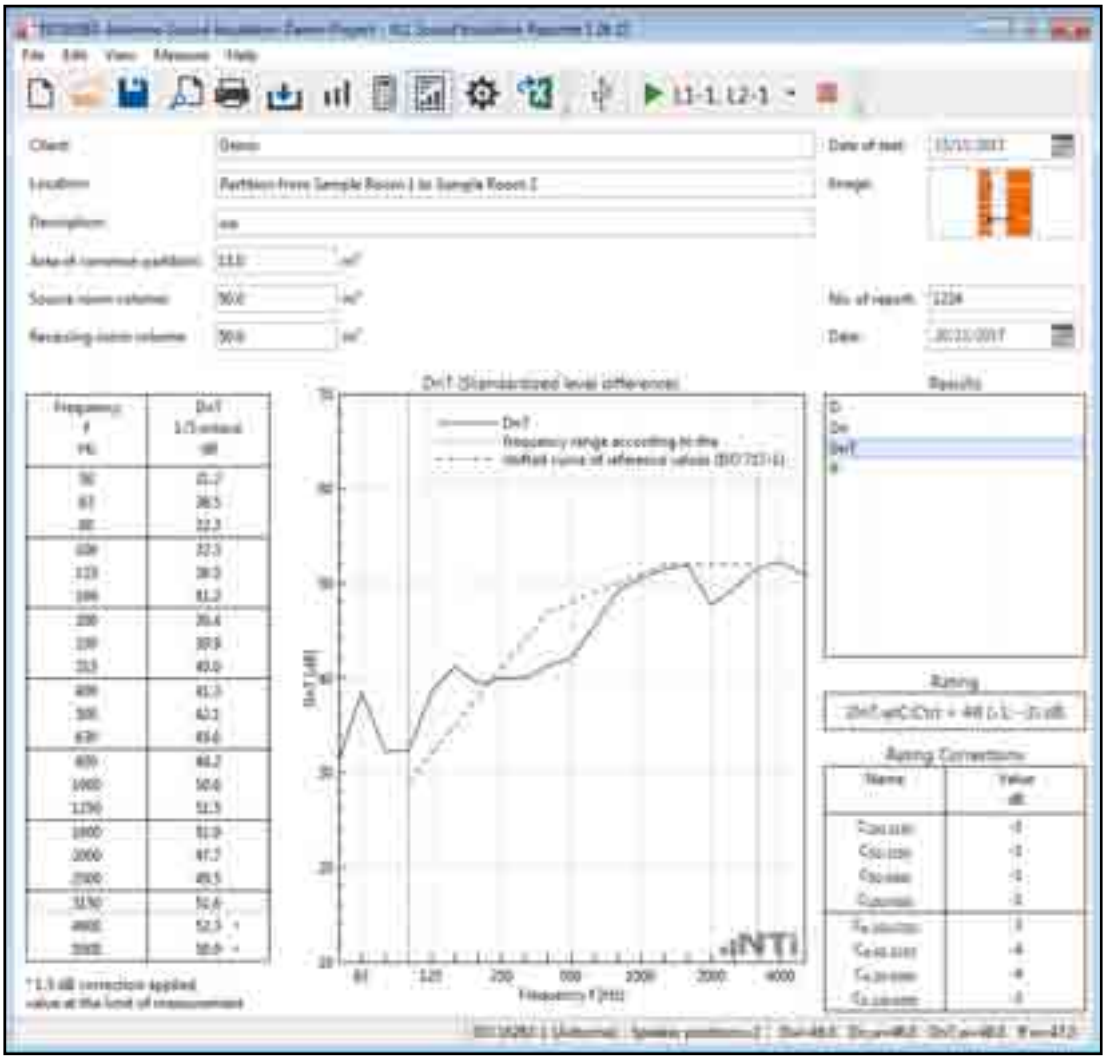
## Measurement Report

- Select **View** -> **Calculations** in the menu.
- Verify the individual averaged results.



- Select the **View** -> **Results.**

  The sound insulation data and chart are displayed.



- Complete the header data with information about client, object, description, partition area and room volumes.
- Print the sound insulation report.

Congratulations, your report is completed!

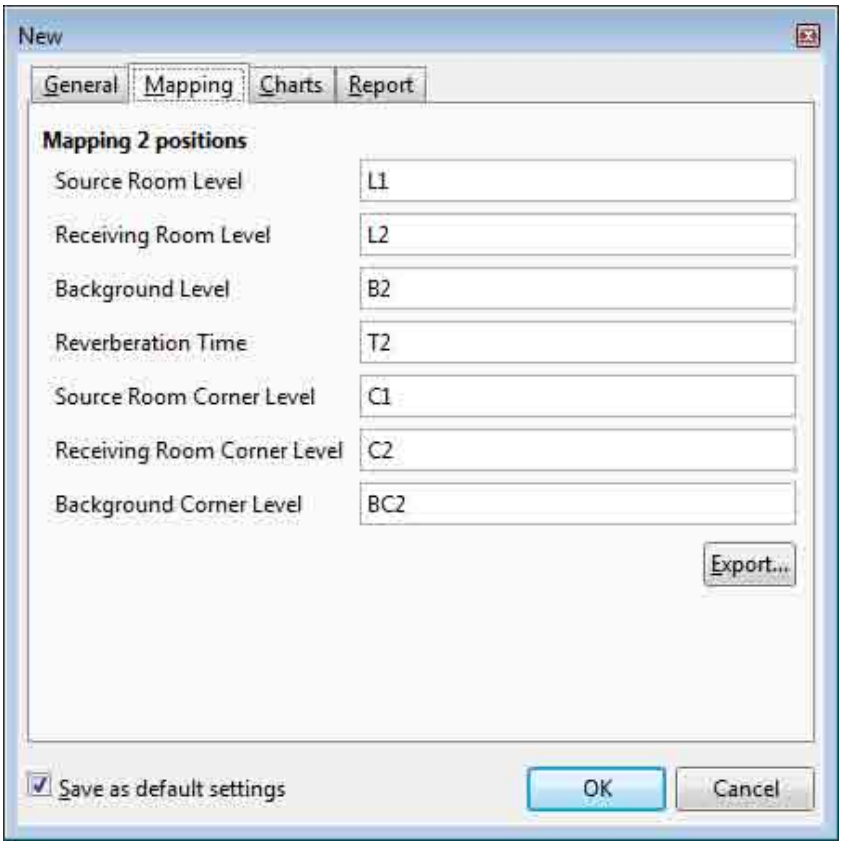
# 5. Manual Measurement with XL2

## Mapping File for XL2

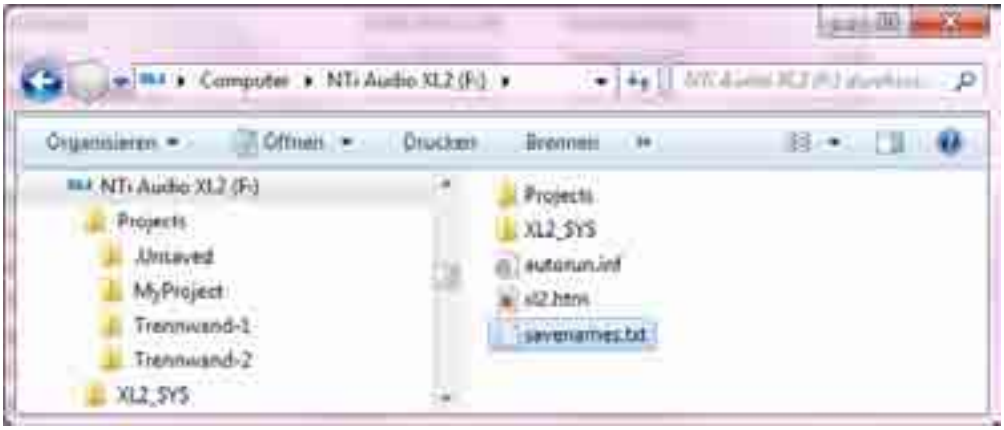
The measurement task onsite is made up of a several separate measurements. The XL2 Sound Level Meter may assign each of these measurements with a dedicated mapping, e.g. "L1-1" for the readings taken in the sending room with speaker position 1. This feature supports automated post-processing and reporting in the Sound Insulation Reporter software.

- Load the text file "savenames.txt" with the user defined mapping, such as "L1-1", "L1-2",..., into the root directory of the XL2. The text file "savenames.txt" may be generated by the Sound Insulation Reporter software:

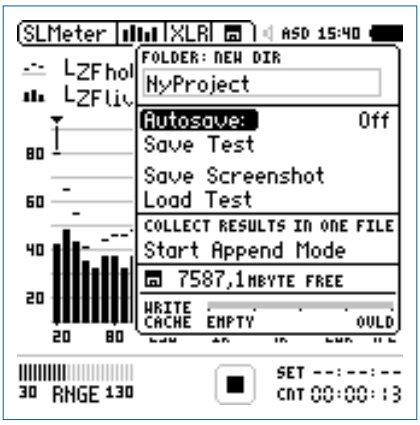
  - Click on **Settings**
  - Select the tab **Mapping**
  - Click **Export**




- Load the txt-file "savenames.txt" with the various mappings onto the root directory of the XL2.



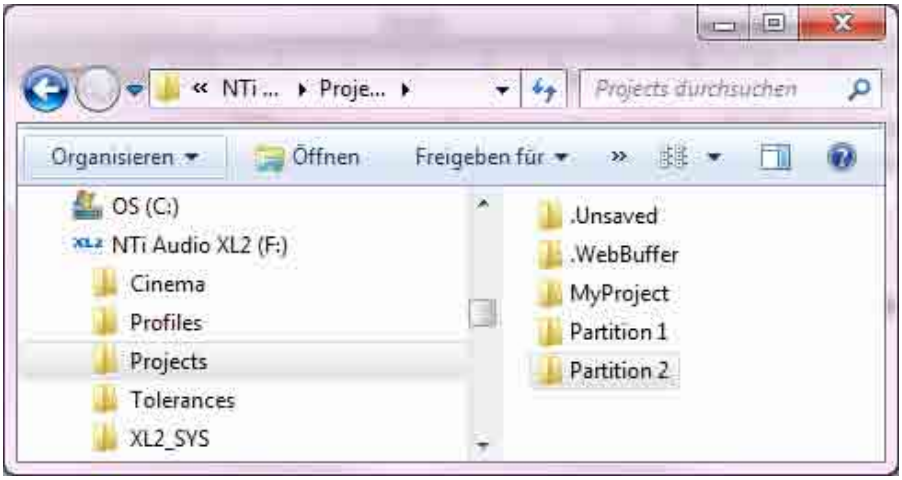

- Next select "Autosave: Off" in the XL2 memory menu. This allows you to store each individual measurement with the desired mapping. The XL2 then uses the same mapping for subsequent measurements by default.



## Set XL2 Memory Structure for Multiple Partitions

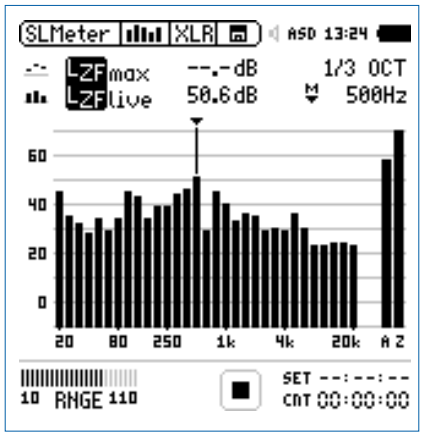
In applications with multiple partitions it is recommended to use a separate memory folder on the XL2 Sound Level Meter for each partition. All measurements belonging to a single partition are then stored in the same folder on the XL2 memory card. Measurements belonging to multiple partitions can be later copied into the individual partition folders on the computer. Each partition will be an individual project later on in the Sound Insulation Reporter software.

- Connect the XL2 to the computer and select "Mass Storage"
- Open the folder "Projects"
- Generate new subfolders for each partition, e.g. Partition 1, Partition 2, PartitionRoom 1-2, ...

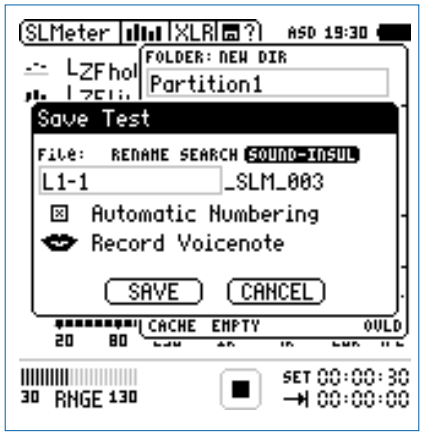


## Perform RTA Noise Measurements

- Select the SLMeter measurement function on the XL2.
- Select the RTA screen and 1/3 octave resolution measurements.
- Ensure the frequency weighting "Z" is selected (= no weighting).
- Start the measurement.
- Stop the measurement after 15 seconds.



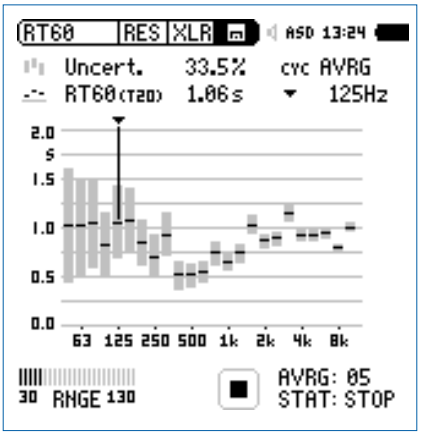

- Open the memory menu and select "Save Test"
- The XL2 displays the Save Test pop-up; select "Sound-Insul" at the right end of the first line.



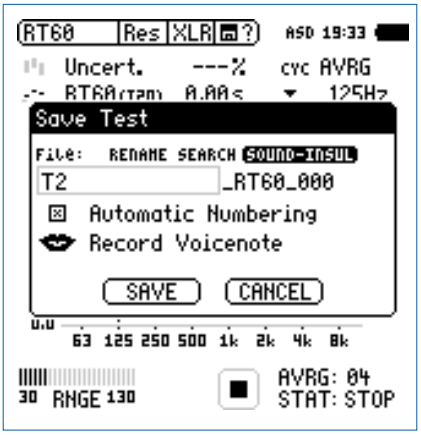

- Select the applicable mapping
- Confirm your selection with the enter key and save the measurement. The XL2 saves the measurement data with a file name such as "L1-1_SLM_003_RTA_3rd_Report.txt"
- Continue with the further measurements "L1-2..., etc." in the same manner.

## Perform RT60 Reverberation Time Measurements

- Select the RT60 measurement function on the XL2.
- Select 1/3 octave resolution (requires the optional Extended Acoustic Pack pre-installed in the XL2).
- Start the measurement.
- Stop the measurement.




- Open the memory menu and select "Save Test"
- The XL2 displays the Save Test pop-up; select "Sound-Insul" at the right end of the first line.

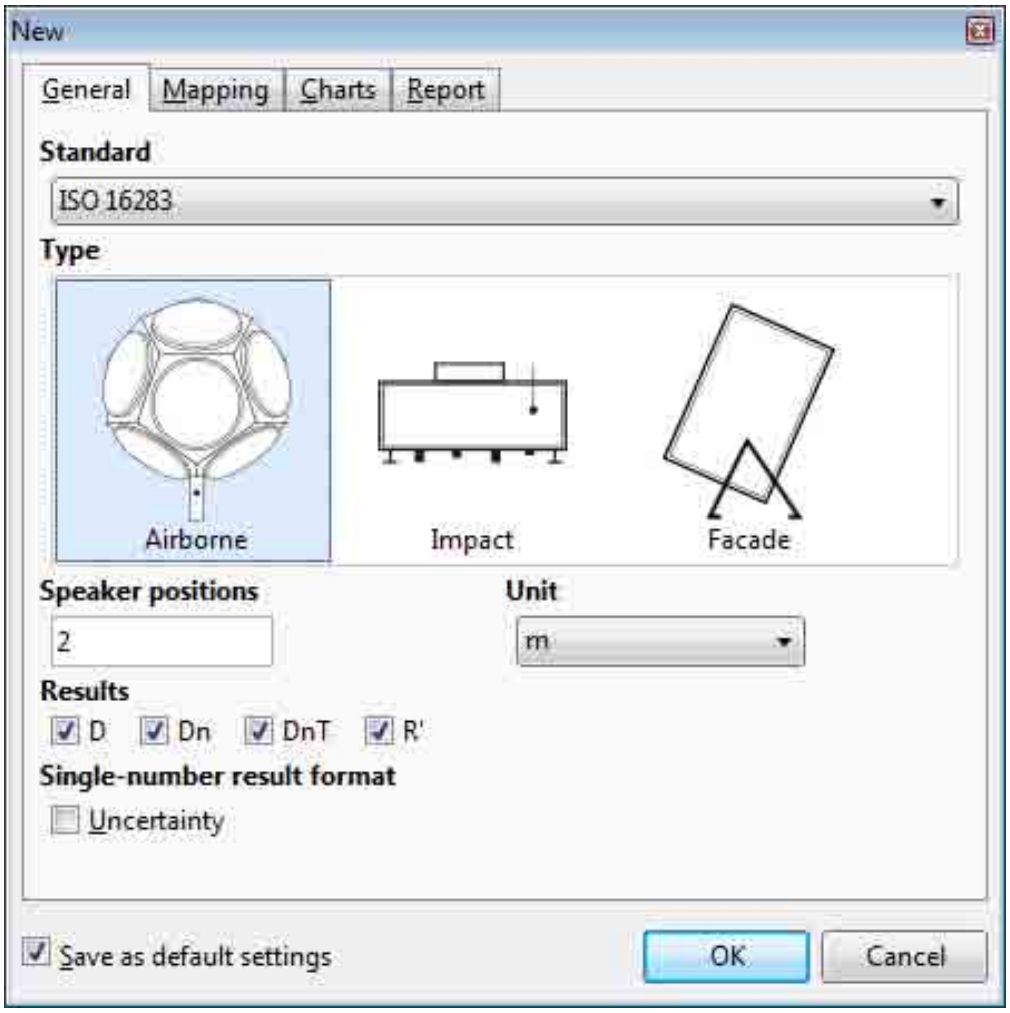



- Select the applicable mapping
- Confirm your selection with the enter key and save the measurement. The XL2 saves the measurement data with a file name such as "T2_RT60_000_Report.txt"
- Continue with the further measurements in the same manner.

## Data Import

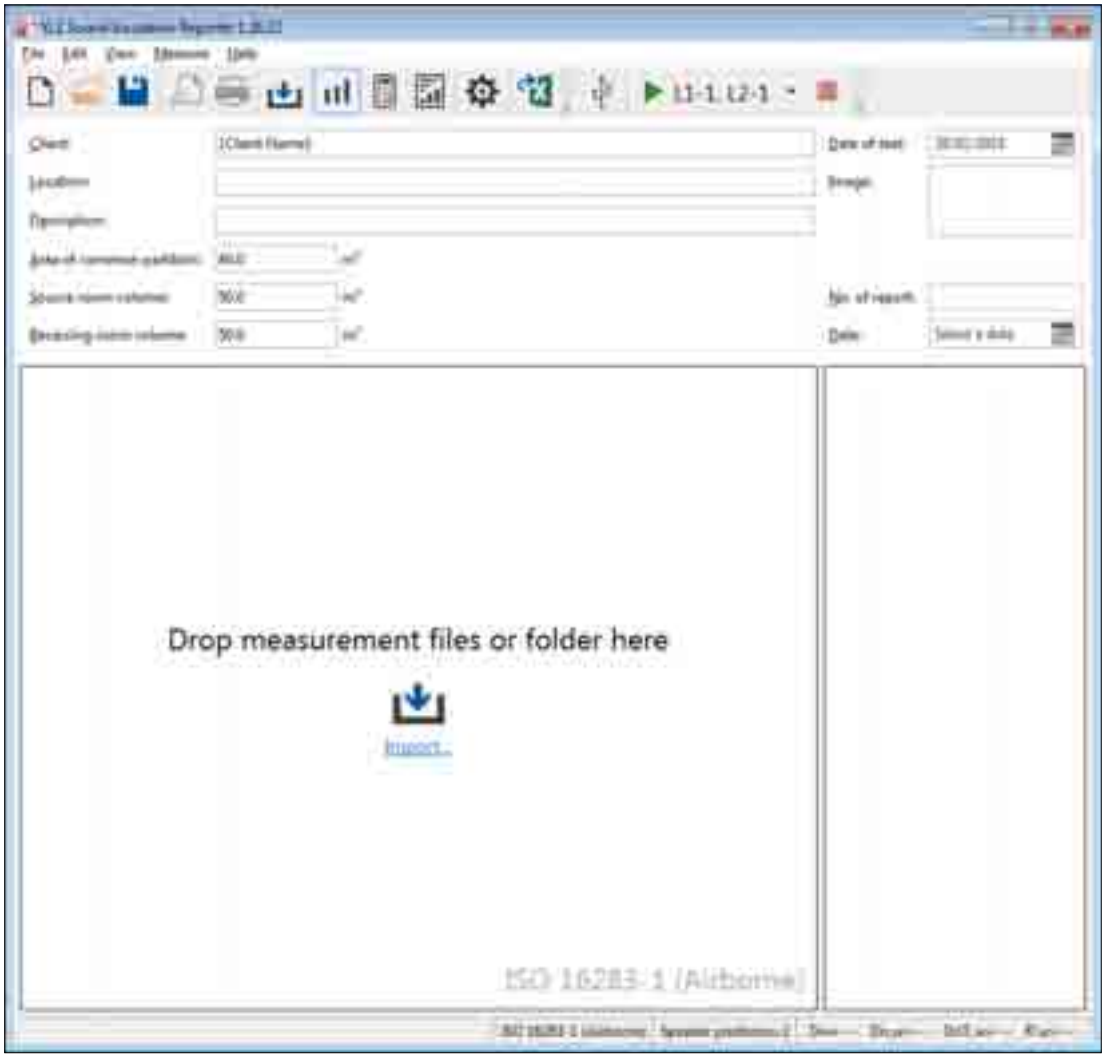
The XL2 measurement data may be imported into the software by drag and drop. The minimum requirement for a successful data import is an XL2 with firmware V4.03 or higher and activated Sound Insulation Option. Instruments using an older firmware may benefit from the online activation of the option without installation on the device. The Sound Insulation Reporter software verifies the available option online during the data import. Any recorded data with A- or C-weighting is automatically corrected to Z-weighting (=no weighting).

- Start the Sound Insulation Reporter software.
- Click on **File** -> **New**




- Select your requested **Standard**
- Select **Airborne**, **Impact** or **Facade** Sound Insulation.
- Select the number of **Speaker positions** used.
- Select **Unit**.
- Define the required **Results**.

- Select to show the **Uncertainty** with the **Single-number result** as required.
- Confirm with **OK**.




☝ The measurement view with the message "Drop measurement files or folder here" is displayed.

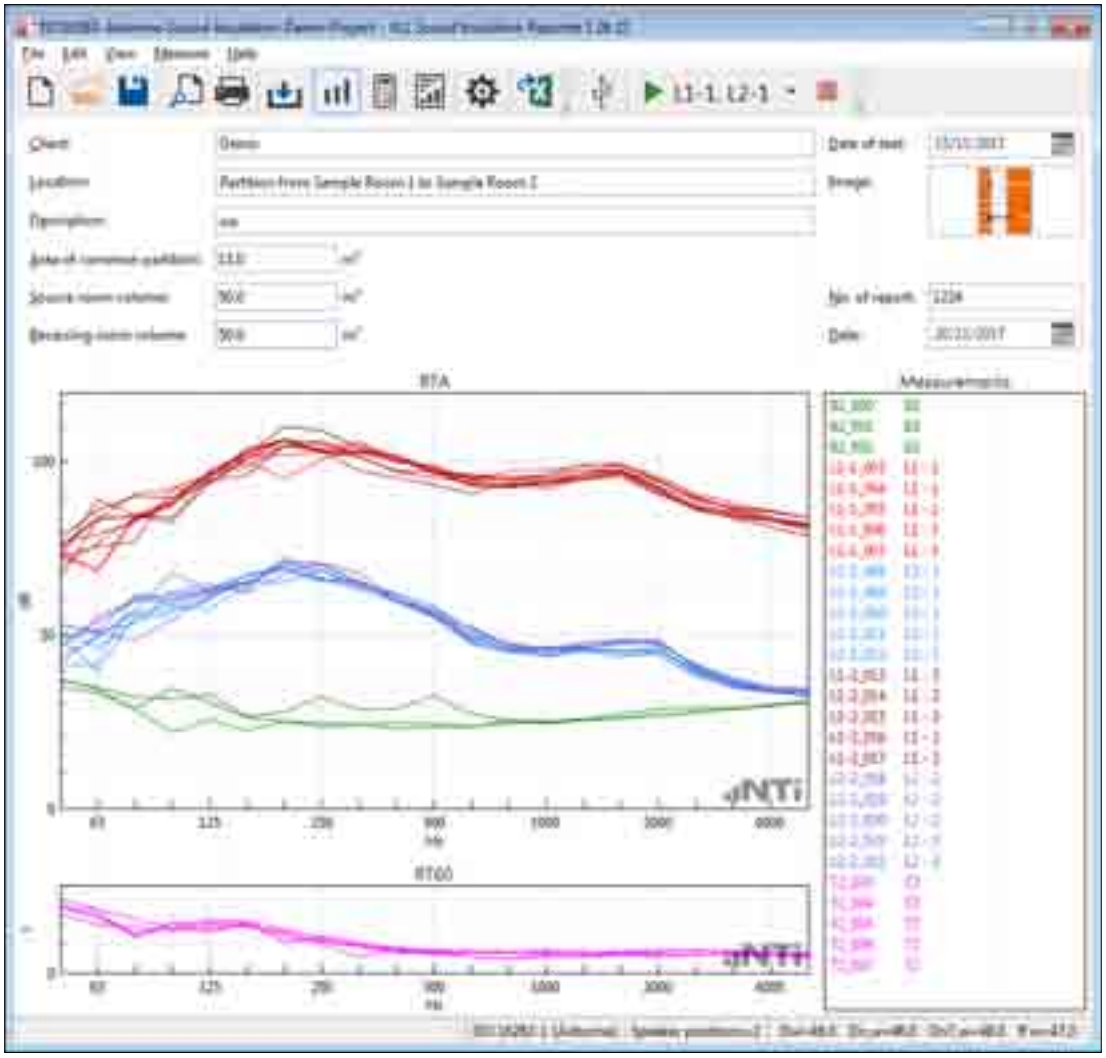
Kindly ensure, prior the data import, that the partition folder contains all required measurement data (*.txt) and *.xl2 system files of each recorded measurement.

- Drag and drop the complete partition folder from the XL2 memory card into the field **Drop measurement files or folder here**. The partition folder should include the RTA data, the RT60 data and the *.xl2 system files.

Sound Insulation Reporter offers further possibilities to import measurement data:

- Select all *.xl2 files in the partition folder with all measurement data. Drag and drop the data into the **Drop measurement files or folder here** field.

- Click on **Import** in the main window and select the partition folder. Confirm the selection.
- Click on **Import** in the main window and open the partition folder. Confirm the selection.
- Click on **File** -> **Import** and select the folder, single or multiple data files. Confirm the selection.



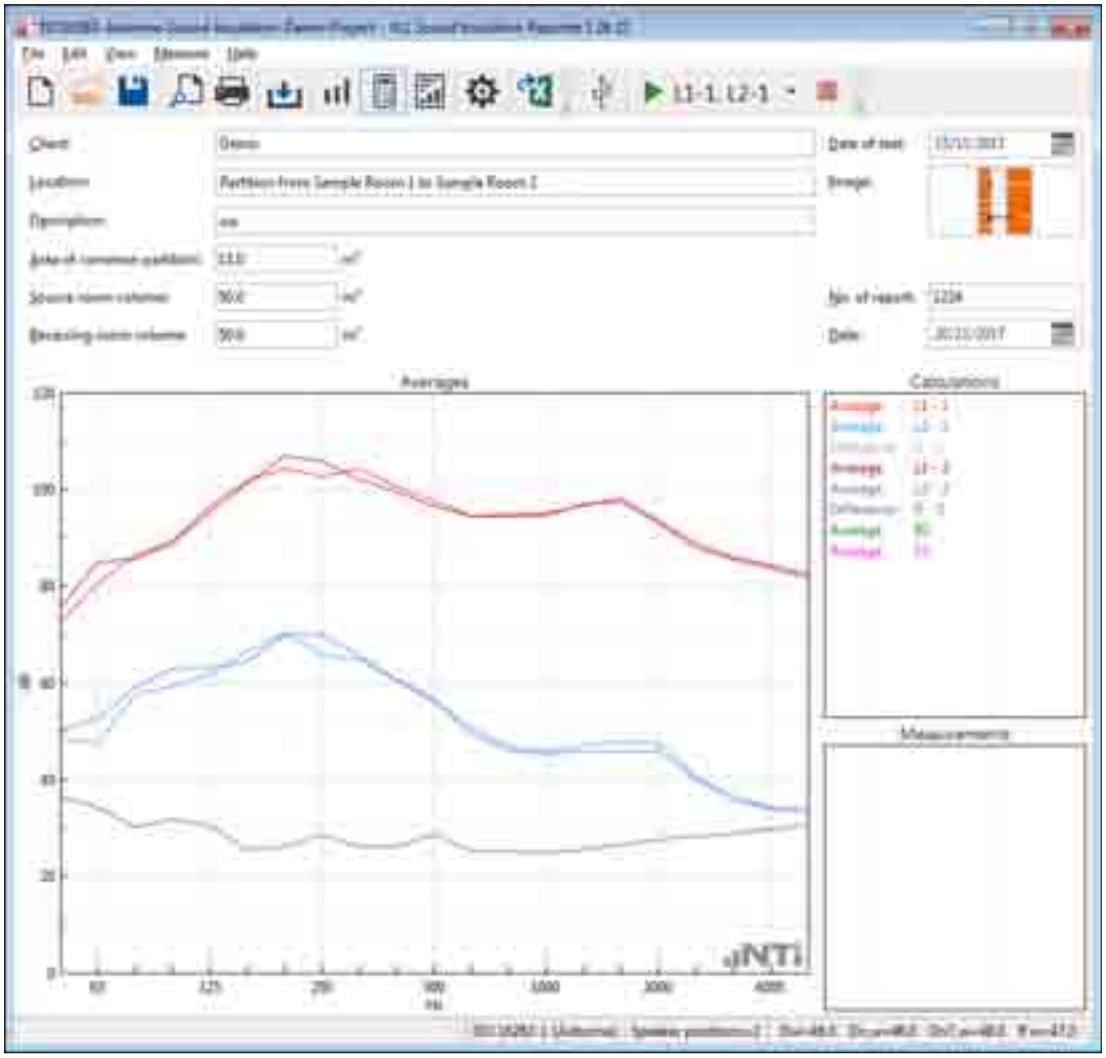

The measurement data is imported.

All measurement data with mapping information in the file name are assigned automatically by the software, e.g. “L1-1_SLM_001_RTA_3rd_Report.txt” is assigned to L1-1 (=speaker position 1 in the sending room). Alternatively the mapping may be assigned manually to sending room or receiving room and the individual speaker positions:

- Select the measurement with the mouse
- Click on the right mouse button
- Select **Assign To**
- Assign the measurement
- Verify the measurement data and delete any false readings from the **Measurements** list on the right.

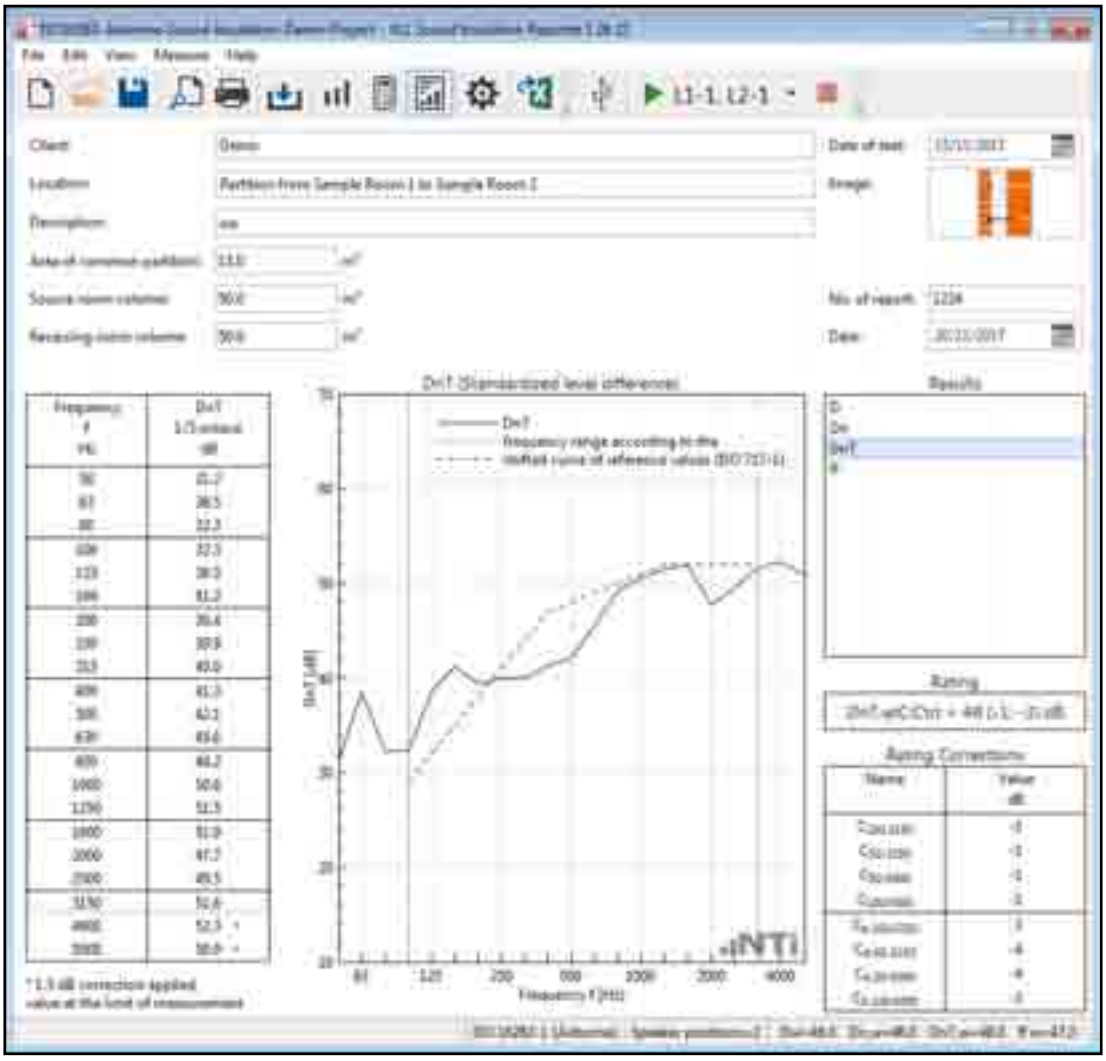
## Measurement Report

- Select **View** -> **Calculations** in the menu.
- Verify the individual averaged results.



- Select the **View** -> **Results.**

  The sound insulation data and chart are displayed.

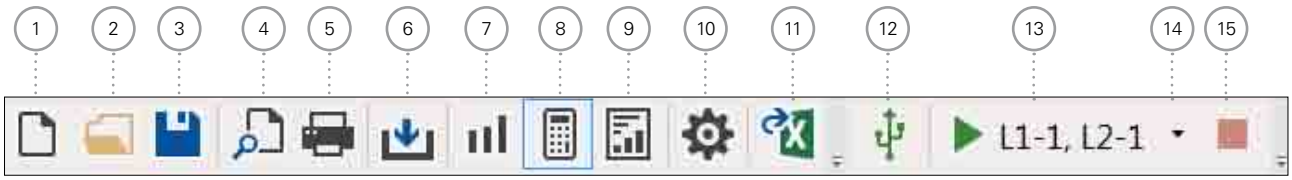


- Complete the header data with information about client, object, description, partition area and room volumes.
- Print the sound insulation report.

Congratulations, your report is completed!

# 6. Main Menu

## Toolbar




(1) **New Project**
A project contains the measurement data of one partition. The airborne or impact sound insulation of a new project is calculated in accordance with the selected standard.

- Select the number of **Speaker positions** used for the measurements with the XL2 Sound Level Meter.
- Select **Unit**.
- Select the **Results** required.
- For the standards ISO 16283 or DIN4109 you may view the measurement **uncertainty** for the **Single-number result format**. The result is provided in the format 40.5 dB +/- 0.4 dB. In case this is not selected, then the default format is used, e.g. Dw(C;Ctr) = 41 (-1;-3) dB.
- Confirm the settings with **OK**.

(2) **Open Project File**
Select an existing project file *.xlba.

(3) **Save Project File**
Save the actual sound insulation data as project file *.xlba.

(4) **Print Preview**
The sound insulation reports for the selected results are displayed.

(5) **Print**
The sound insulation reports for the selected results are printed.

(6) **Import**
Select the folder containing the original XL2 measurement data *.txt and *.xl2 files and confirm with "Select folder". All measurement files within the selected folder are imported into the software. Any recorded data with A- or C-weighting is automatically corrected to Z-weighting (=no weighting).

7 **Measurements View**

The original XL2 measurement data is visualized in the frequency range from 50 Hz to 5 kHz. By default all measurement data, as well as the speaker position for the sound insulation calculation, are automatically assigned to the corresponding sending or receiving room. Alternatively the data can be assigned manually.

8 **Calculations View**

Displays the average of the

- sending room level for each speaker position
- receiving room level for each speaker position
- background noise level
- reverberation time RT60

9 **Results View**

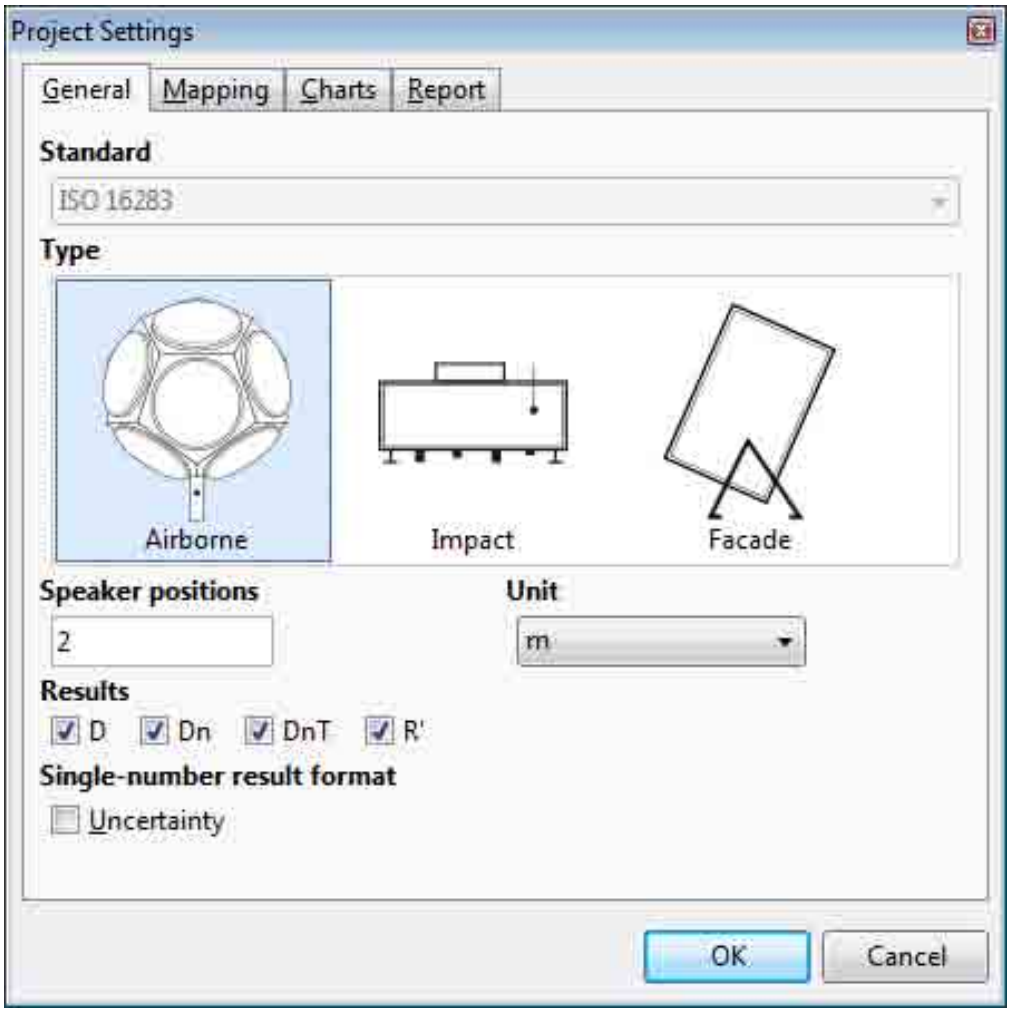
Displays the following sound insulation results based on the selected result type:

- Table from 50 Hz - 5 kHz
- Standardized chart from 50 Hz - 5 kHz
- Single number sound insulation rating
- Rating corrections Cxx

## (10) Settings

**General**

- Select the number of **Speaker positions** used for the measurements.
- Select **Unit**.
- Select the **Results** required.



## 10 Settings

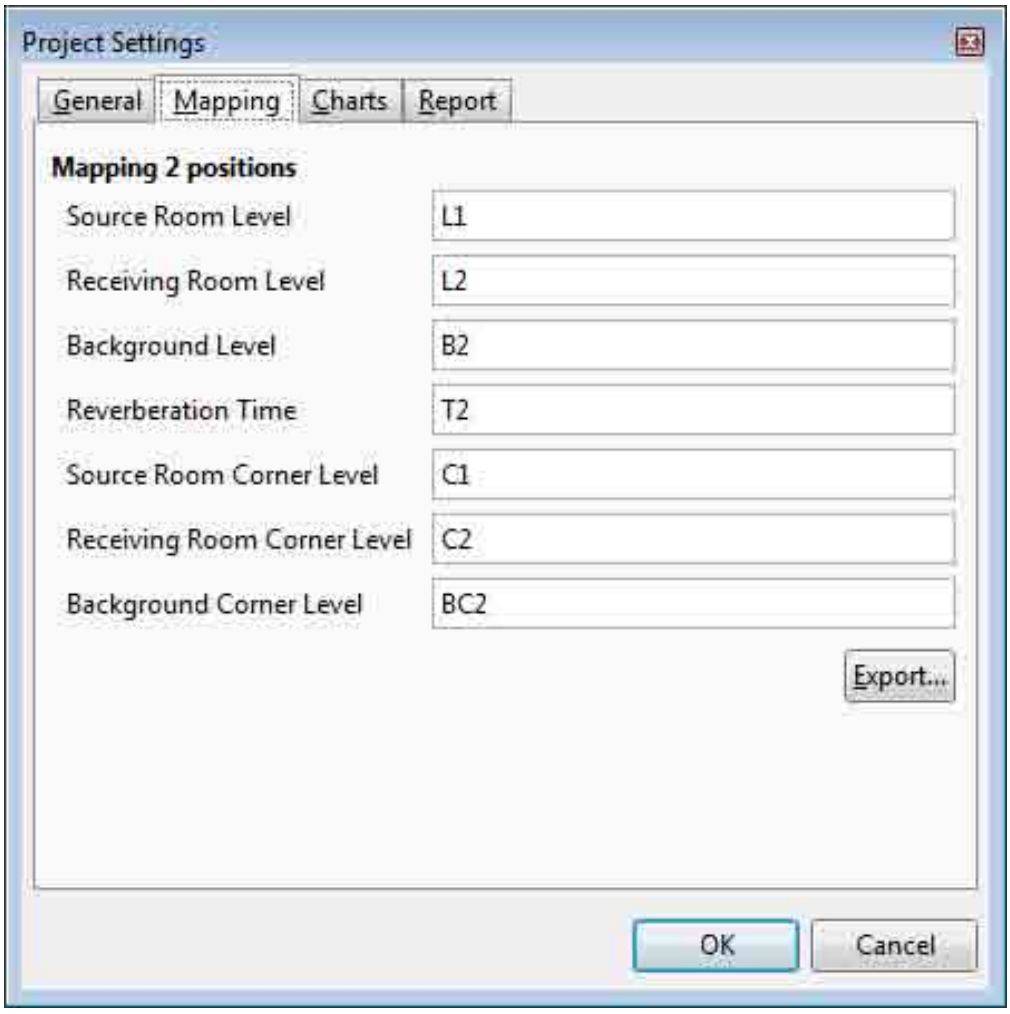
### Mapping

Sound insulation measurements require the recording of multiple noise spectras in the sending and the receiving rooms. The XL2 with firmware V4.03 or higher simplifies the data handling of these measurements by recording each data set with a dedicated location mapping, such as "L1-1" for a measurement carried out in the sending room with speaker position 1.

Storing the measurement data with this mapping on the XL2 supports the automated data assigning to the corresponding room and speaker position during the data import into the Sound Insulation Reporter software.

- Click on **Export...**; this generates the text file savenames.txt
- Load the txt-file "savenames.txt" with the various mappings, like "L1-1", "L1-2"... onto the SD card of the XL2.
- Copy this file onto the root directory of the XL2 memory card
- Select the memory menu on the XL2 and set **Autosave: Off**

Each measurement can be manually stored on the XL2 with one of the predefined mappings.



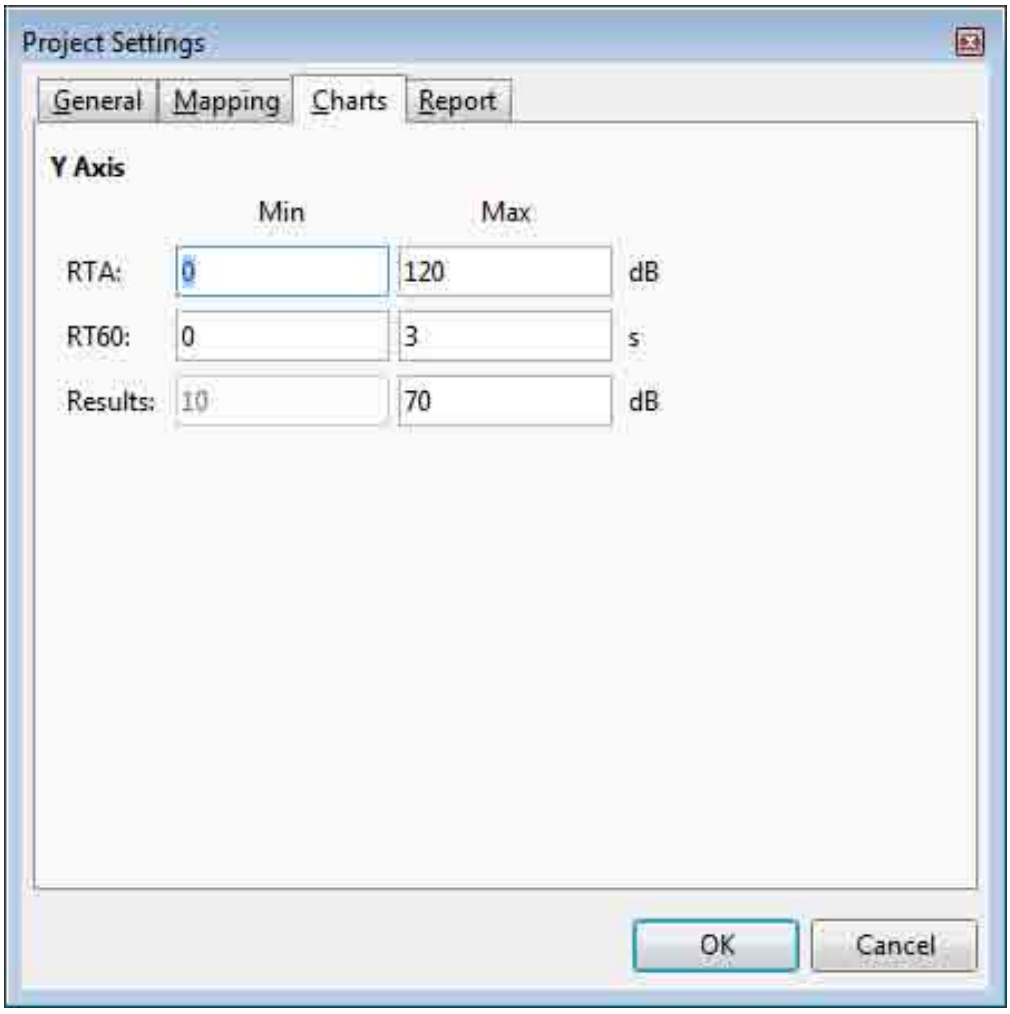
## 10 Settings

### Charts

**RTA** Set the Y-axis scaling for measurements and calculations view

**RT60** Set the Y-axis scaling for measurements and calculations view

**Results** Set the Y-axis scaling for the chart in results view. The default span is 60 dB.



## (10) Settings

**Report**

- Load your company logo for the printed measurement reports
- **Align title to the left** offers more space for your company logo in the report header.
- **Hide equipment** offers more space for the description in the report.
- **Hide source room volume** offers also more space for the description in the report.
- Set the **Name of the test institute**, e.g. your company name
- Load your **Signature** for the printed measurement reports

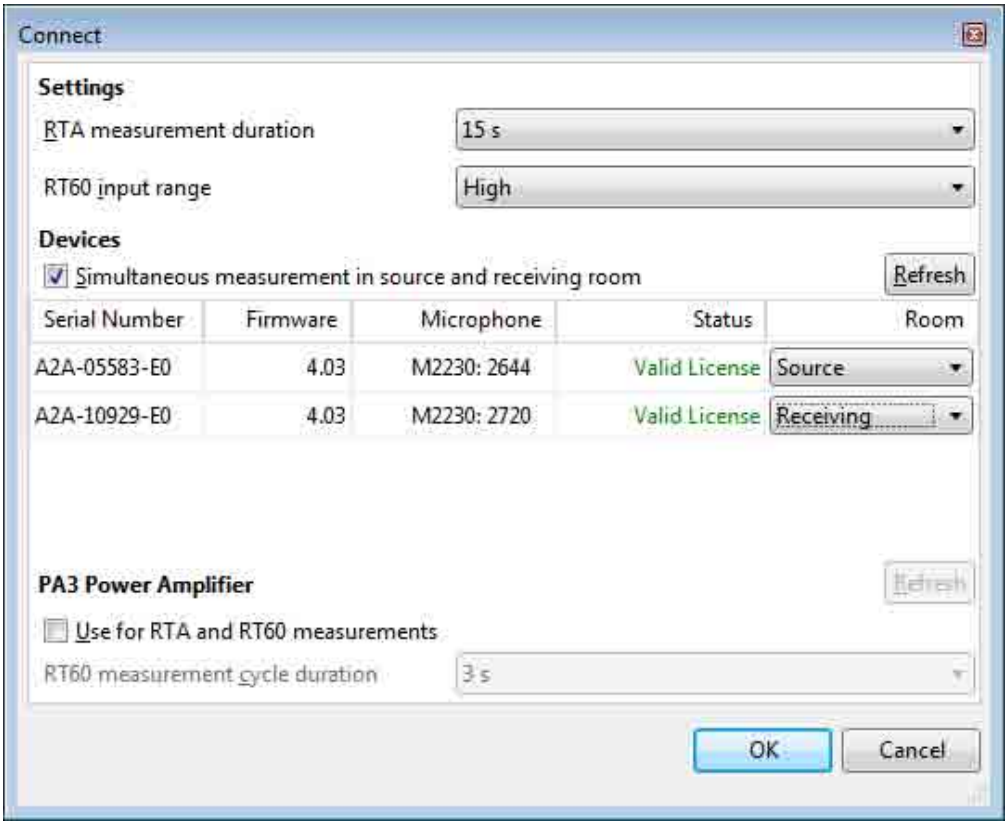

The recommended maximum size for the imported picture is

- Logo: 120 x 30 px
- Signature: 350 x 70 px

(11) **Export to Excel**
Exports all measurement data and results into MS Excel.

(12) **Connect**

- Select the **RTA measurement duration** (default = 15 seconds).
- Select the **RT60 measurement range** (default = High)
- Click **Refresh** to detect the connected XL2 Sound Level Meters.




- **Simultaneous measurement in source and receiving room**
  This selection is dedicated for parallel measurments in source and receiving room with one or more instruments. Assign at least one device to the source room and another one to the receiving room for airborne or facade sound insulation measurements. The Sound Insulation Reporter software may operate multiple instruments at the same time.

- Measuring with one or more instruments in the same room
  - Do not select **Simultaneous measurement in source and receiving room**
  - Assign the applicable instruments to **Any**

- The **Status** column list one of the following information
  - **Valid Licence**
  - **Upgrade required**
  - **Unassigned Device** (XL2 will not be used to measure)
  - **Not Connected** (the XL2 was previously connected and assigned to the specified room; if you forgot to connect it, then place it in the assigned room, connect it and click **Refresh**; if you don't want to use this device anymore, then ignore this message)

(12) **PA3 Power Amplifier**

- Tick this setting to remotely control the PA3 power amplifier for the RTA and RT60 measurements, which needs to be connected via LAN or Wi-Fi to the network.
- Set the **RT60 measurement cycle duration** from 1 to 10 seconds.

(13) **Start Remote Measurement**

Start here the selected measurement. The measurement will automatically stop after the preset measurement duration.

(14) **Select Measurement**

Select one of the following measurements at airborne sound insulation testing

- L1-1, L2-1 (sending & receiving room simultaneously @ speaker position 1)
- L1-2, L2-2 (sending & receiving room simultaneously @ speaker position 2)
- B2 (background noise)
- T2 (reverberation time)

(15) **Stop Remote Measurement**

- Stop here the selected measurement prior the automated stop according the preset measurement duration.

## Menu

The software offers the following menu functionalities:

**File**

**New...**

A project contains the measurement data of one partition. The airborne or impact sound insulation of a new project is calculated in accordance with the selected standard.

- Select the number of **Speaker positions** used for the measurements with the XL2 Sound Level Meter.
- Select **Unit**.
- Select the **Results** required.
- For the standards ISO 16283 or DIN4109 you may view the measurement **uncertainty** for the **Single-number result format**. The result is provided in the format 40.5 dB +/- 0.4 dB. In case this is not selected, then the default format is used, e.g. Dw(C;Ctr) = 41 (-1;-3) dB.
- Confirm the settings with **OK**.

**Open...** Select an existing project file *.xlba.

**Save** Save the actual sound insulation data as project file *.xlba.

**Save as...** Save the project with selectable name and path.

**Print Preview** The sound insulation reports for the selected results are displayed.

**Print** The sound insulation reports for the selected results are printed.

**Import**

| | |
|---|---|
| **Folder...** | Select a folder in order to import all measurement data stored in this folder |
| **File...** | Select a single measurement data file *.xl2 |
| **Airborne Difference ...** | Applicable for standard DIN 4109 only. Select an airborne sound insulation project based on DIN 4109. |

Any recorded data with A- or C-weighting is automatically corrected to Z-weighting (=no weighting).

**Export to Excel...** Export all measurement data and results into MS Excel.

**File** **Preferences...** **General**

The Sound Insulation Reporter software is available in Chinese, English and German language. The default setting uses the language of the operating system installed on your computer. Select the language as follows:

- Select **File** in the menu.
- Select **Preferences...**
- Select the language. Changing the language will require a restart of the software.
- Confirm the settings with **OK.**

☝ The software closes and restarts with the selected language.

**Microphone Corrections**

Enter any applicable frequency response correction for the used measurement microphones here with type and serial number. This correction is automatically applied at the import of any data recorded with this microphone or any remote measurements performed. The data set requires to list the same type and serial number in the header data in order to detect the microphone type and serial number.

Note: the correction is not applied on any existing projects.

**Recent** Select a recently-opened project.

**Exit** Close the software.

**Edit** **Cut** Cut the text from any text box.

**Copy** Copy the data selected in the right-hand **Measurements**, **Calculations** or **Results** box.

**Paste** Paste the copied text into any text box.

**Delete** Delete the data selected in the right-hand selection box in **Measurements.**

**Select All** Select all data in the right-hand **Measurements** box (applicable in Measurements View only).

**Deselect All** Deselect all earlier selected data in the right-hand **Measurements** box (applicable in Measurements View only).

| | | |
|---|---|---|
| **View** | **Measurements** | Select the Measurements View. |
| | **Calculations** | Select the Calculations View. |
| | **Results** | Select the Results View. |
| | **Settings** | Opens the Project Settings window. |
| **Measure** | **Connect...** | Opens the window **Connect** |
| | **Start** | Starts the selected measurement. |
| | **Stop** | Stops the selected measurement. |
| | **Measurements e.g. L1-1/L2-1** | Select the measurement. |
| **Help** | **Online Help** | Link to download the user manual in PDF form |
| | **Check for Updates...** | Checks for available updates of the XL2 Sound Insulation Reporter software. |
| | **About** | Lists version and copyright details of the software. |

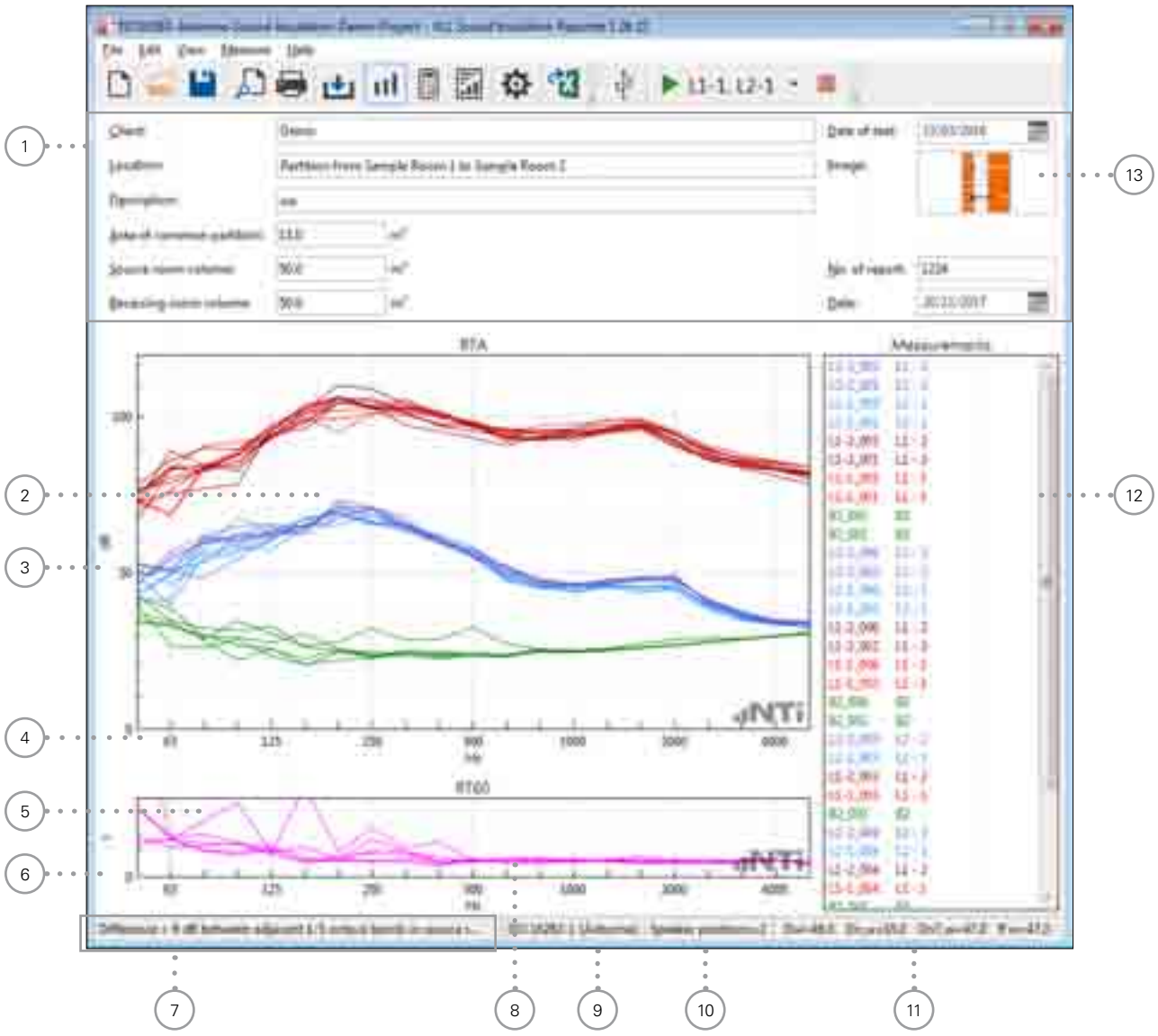
# 7. Analysis and Reporting Views

The Sound Insulation Reporter software offers three views for fast data analysis and straight-forward reporting in accordance with the standard.


1. **Measurements View**
2. **Calculations View**
3. **Results View**

## Measurements View

By default all measurement data are automatically assigned to the corresponding sending or receiving room, as well as the speaker position for the sound insulation calculation. Alternatively the data can be assigned manually.



1 **Details**
Header data of the sound insulation report. The partition area and volume parameters are used for the sound insulation calculation.

2 **RTA Measurements Chart**
The original XL2 measurement data is visualized in the frequency range from 50 Hz to 5 kHz.

3 **Y-Axis of RTA Measurements Chart**
Set the Y-axis in **Settings** -> **Charts**

4 **X-Axis of RTA Measurements Chart**
The X-axis is fixed to 50 Hz - 5 kHz.

5 **RT60 Measurements Chart**
The original XL2 measurement data is visualized in the frequency range from 50 Hz to 5 kHz.

6 **Y-Axis of RT60 Measurements Chart**
Set the Y-axis in **Settings** -> **Charts**

7 **Guideline Bar**
Additional information about displayed measurement data is listed here.

8 **X-Axis of RT60 Measurements Chart**
The X-axis is fixed to 50 Hz - 5 kHz.

9 **Standard**
Selected standard for the sound insulation calculation and reporting.

10 **Speaker Positions**
Reads the number of set speaker positions.

11 **Single Number Sound Insulation**
Reads the single number results. Select the calculated results in **Settings** -> **General**

12 **Measurements List with Mappings**
List all the imported XL2 measurement data files with the automatically-assigned mapping. The mapping may be assigned manually to sending room or receiving room and the individual speaker positions:

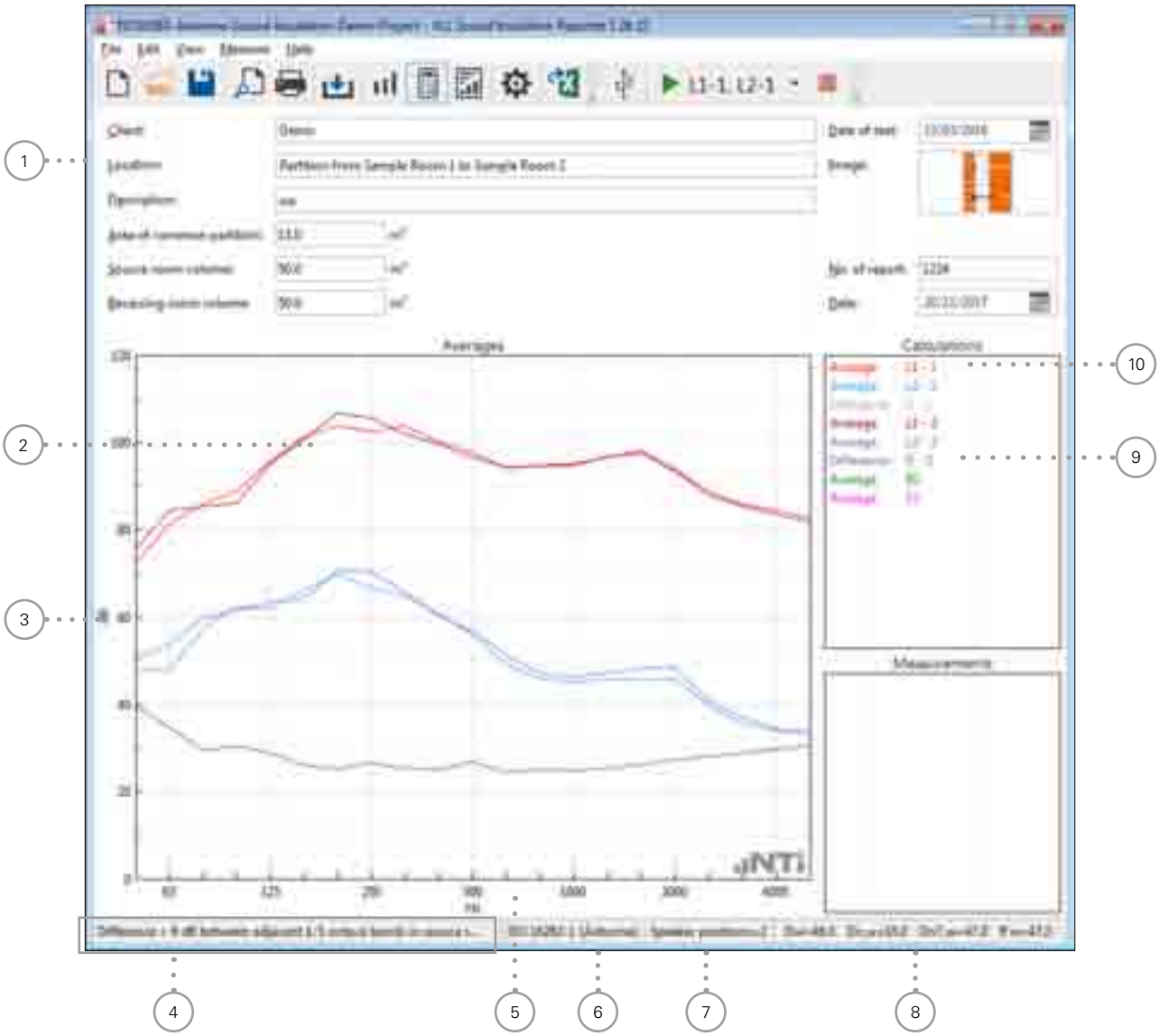
- Select the measurement with the mouse
- Click on the right mouse button
- Select **Assign To**
- Assign the measurement

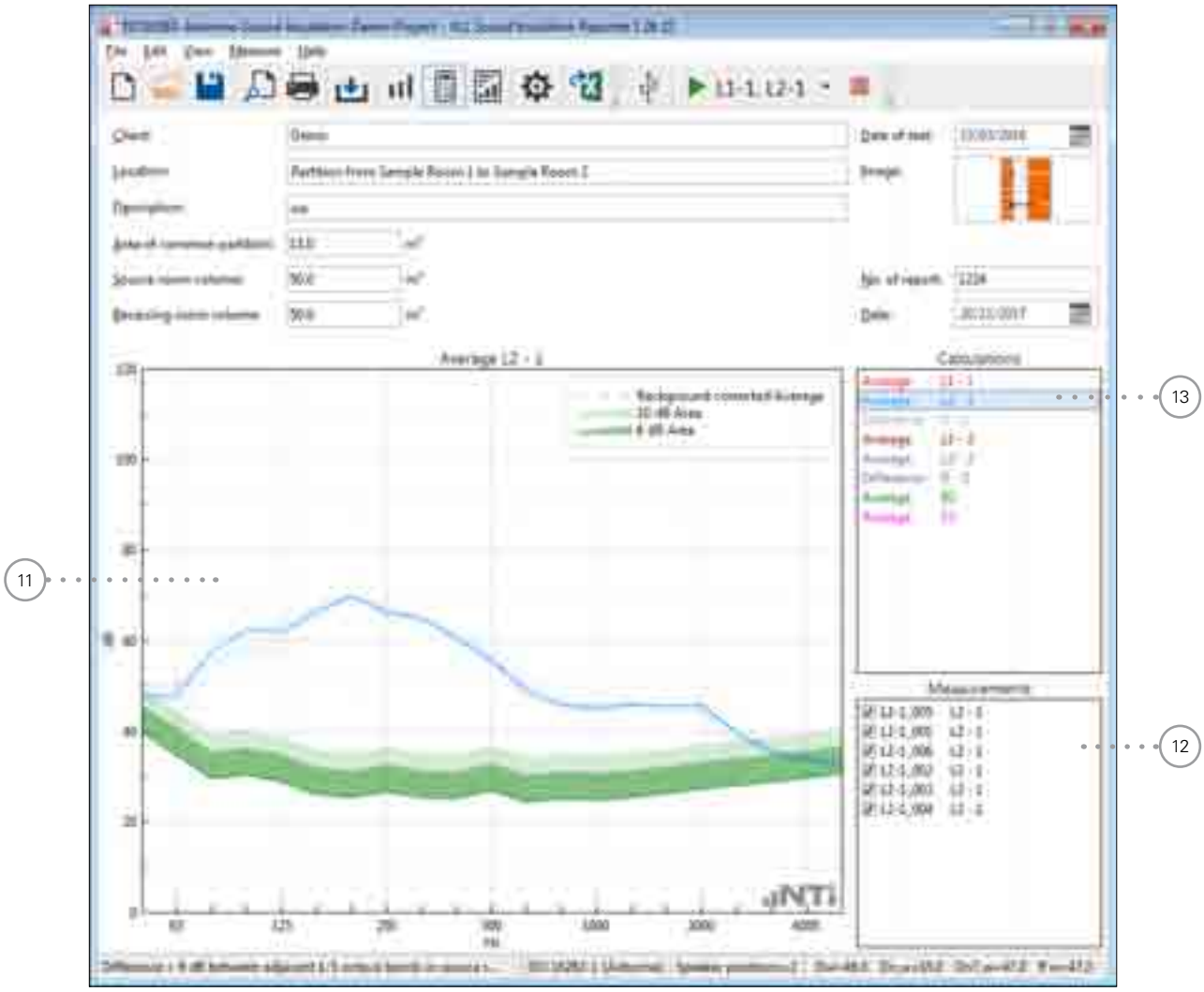
(13) **Image**

Click into the image field and load a drawing or picture describing the partition. The recommended maximum size is for

- A4 Reporting: 340 x 160 px
- Letter Reporting: 350 x 130 px

## Calculations View






1 **Details**
These data are listed in the header of the sound insulation report. The partition area and volume parameters are used for the sound insulation calculation.

2 **Chart**
The averaged measurement data for sending room, receiving room and individual speaker position is visualized in the frequency range from 50 Hz to 5 kHz.

3 **Y-Axis**
Set the Y-axis in **Settings** -> **Charts**

4 **Guideline Bar**
Additional information about displayed measurement data is listed here.

5 **X-Axis**
The X-axis is fixed to 50 Hz - 5 kHz.

6 **Standard**
Selected standard for the sound insulation calculation and reporting.

7 **Speaker Positions**
Reads the number of set speaker positions.

8 **Single Number Sound Insulation**
Reads the single number results. Select the calculated results in **Settings** -> **General**

9 **Differences**
Select **Difference D-1** and view the averaged sending room, averaged receiving room and the calculated difference for the speaker position 1. Any applicable background noise correction is included by default.

10 **Average**
- Averaged data sets for sound insulation calculation.
- Select e.g. **Average L1-1** for detailed verifications of the measurement data used for the average calculation.
- Press ESC on the keyboard to return to the default view with all averaged measurements.

11 **Detailed View**
Displays all measurement data and the averaged result for the selected parameter.

12 **Measurements Selection**
Disable any measurement data, which shall not be used for the average calculation.

13 **Selected Average Parameter**
Select the parameter for detailed analysis.

## Results View

The results view displays the following sound insulation results based on the selected result type:

- Table from 50 Hz - 5 kHz
- Standardized chart from 50 Hz - 5 kHz
- Single number quantity
- Spectrum adaption terms C and Ctr

(1) **Details**
These data are listed in the header of the sound insulation report. The partition area and room volume parameters are used for the sound insulation calculation.

(2) **Results Table**
Sound insulation results in the frequency range from 50 Hz to 5 kHz.

The fixed background noise correction of 1.3 dB is automatically applied in case the receiving room level differs by less than 6 dB from the background noise level, e.g. in accordance with ISO 16283. In case this fixed correction is applied, then the applicable frequency bands are marked by a "*", see (3).

(3) **Information about Background Noise Correction**
A fixed background noise correction applied in the table (2) at frequency bands marked by "*".

(4) **Guideline Bar**
Additional information about displayed measurement data is listed here.

(5) **Results Chart**
Sound insulation results spectrum with shifted reference curve in the frequency range from 50 Hz to 5 kHz.

(6) **Standard**
Selected standard for the sound insulation calculation and reporting.

(7) **Speaker Positions**
Reads the number of set speaker positions.

(8) **Single Number Sound Insulation**
Reads the single number results. Select the calculated results in **Settings** -> **General**.

(9) **Spectrum Adaption Terms**
Value, in decibels, to be added to the single-number rating (e.g. R'w) in accordance with ISO standards. These take into account different spectra of noise sources; such as pink noise (C) and road traffic noise (Ctr).

Application examples

- C
  Living Area Noise (talking, music, radio, TV), trains at middle and high speed, highway traffic @ speed > 80 km/h, jets in near distance, factories with mainly middle- and high-frequency noise
- Ctr
  traffic noise in cities, trains at low speed, jets in far distance, airplanes, factories with mainly low-frequency noise

(10) **Single Number Quantity**

This is the single number sound insulation result. The single number result equals the level of the shifted reference curve at 500 Hz.

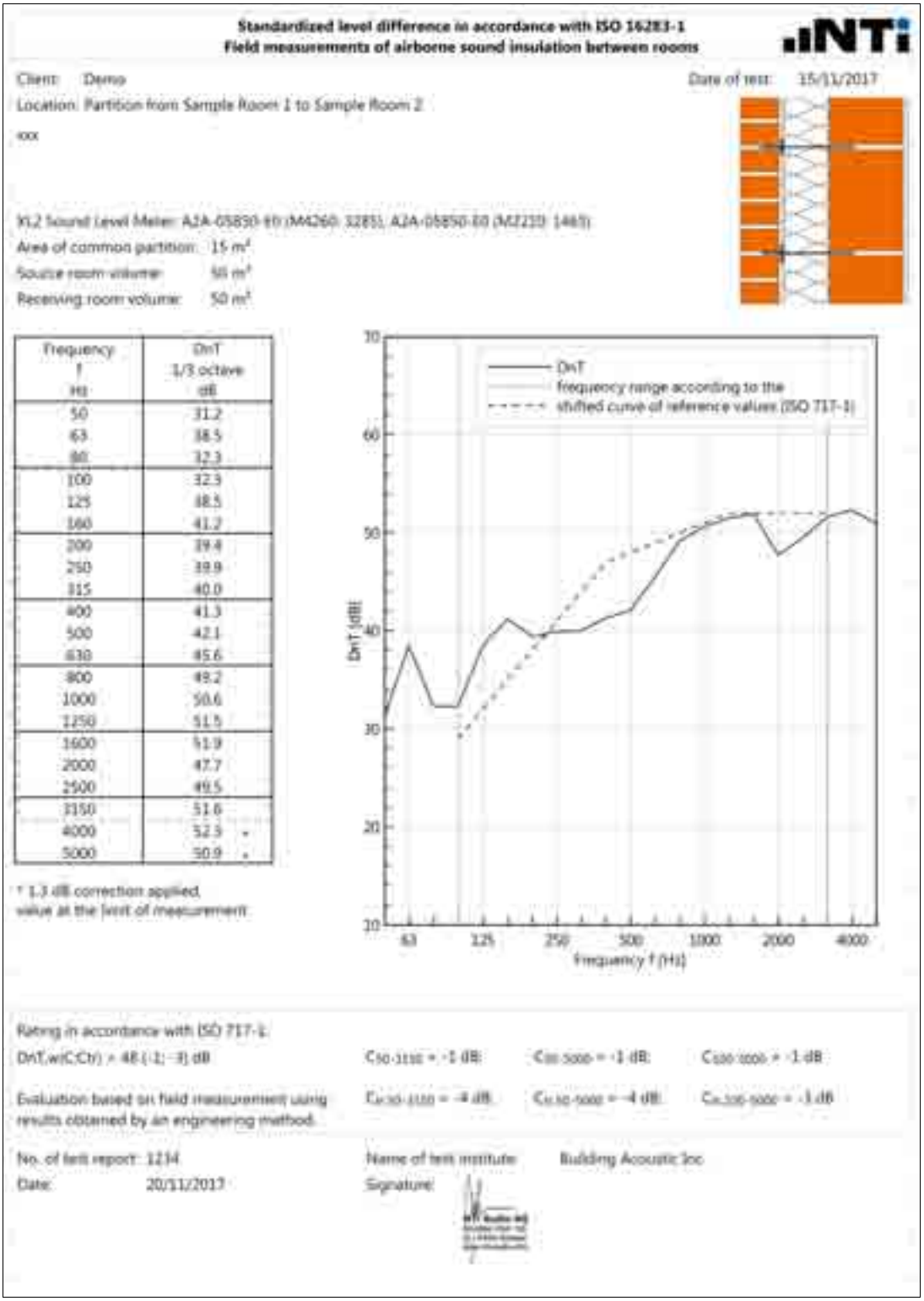
For the standards ISO 16283 or DIN4109 you may view the result with the measurement **uncertainty**. Select the **Project Settings** and tick **uncertainty** at **Single-number result format**. The result is provided in the format 40.5 dB +/- 0.4 dB. In case this is not selected, then the default format is used, e.g. Dw(C;Ctr) = 41 (-1;-3) dB.

(11) **Result Selector Box**

Select the required sound insulation result here. The available results are preset in **Settings** -> **General**.

# 8. Sound Insulation Report

The software generates automated reports in accordance with the supported standards. Print the reports for the selected results.



**Standardized level difference in accordance with ISO 16283-1**
**Field measurements of airborne sound insulation between rooms**

Client: Demo
Date of test: 15/11/2017
Location: Partition from Sample Room 1 to Sample Room 2
xxx

XL2 Sound Level Meter: A2A-05830-E0 (M4260: 3285); A2A-05850-E0 (MZ210: 1465)
Area of common partition: 15 m²
Source room volume: 55 m³
Receiving room volume: 50 m³

| Frequency f Hz | DnT 1/3 octave dB |
|---|---|
| 50 | 31.2 |
| 63 | 38.5 |
| 80 | 32.3 |
| 100 | 32.3 |
| 125 | 38.5 |
| 160 | 41.2 |
| 200 | 39.4 |
| 250 | 39.9 |
| 315 | 40.0 |
| 400 | 41.3 |
| 500 | 42.1 |
| 630 | 45.6 |
| 800 | 49.2 |
| 1000 | 50.6 |
| 1250 | 51.5 |
| 1600 | 51.9 |
| 2000 | 47.7 |
| 2500 | 49.5 |
| 3150 | 51.6 |
| 4000 | 52.5 * |
| 5000 | 50.9 * |

* 1.3 dB correction applied, value at the limit of measurement



Rating in accordance with ISO 717-1:
$D_{nT,w}(C;C_{tr})$ = 48 (-1; -3) dB

$C_{50-3150}$ = -1 dB $C_{50-5000}$ = -1 dB $C_{100-5000}$ = -1 dB

Evaluation based on field measurement using results obtained by an engineering method.

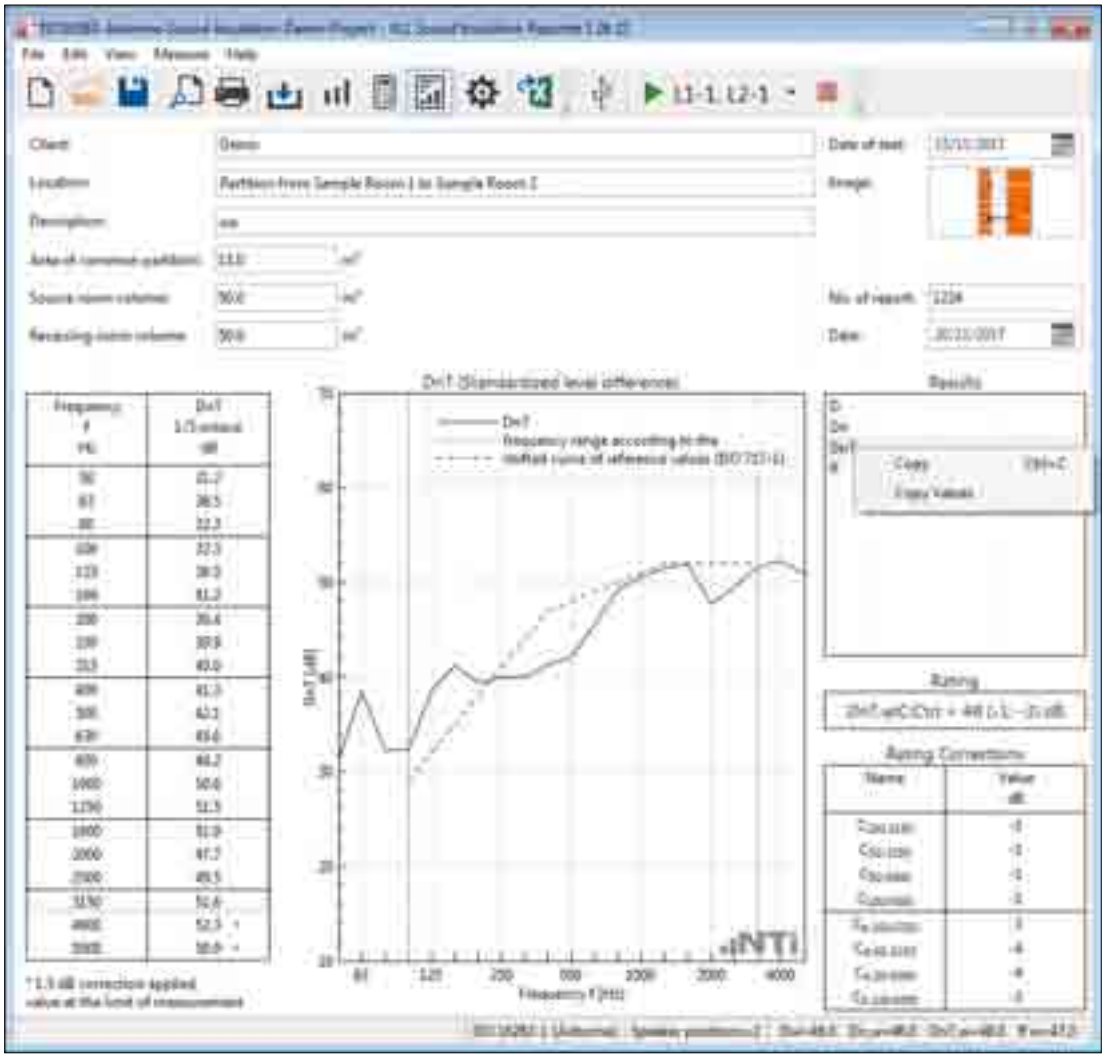
$C_{tr,50-3150}$ = -4 dB $C_{tr,50-5000}$ = -4 dB $C_{tr,100-5000}$ = -1 dB

No. of test report: 1234
Name of test institute: Building Acoustic Soc
Date: 20/11/2017
Signature:

# 9. Export Measurement Data

Click on the "Export to Excel ..." button in the menu bar. This exports all measurement data and results into MS Excel. Alternatively you may export individual data and charts for user defined analysis and reporting as follows:

- Select the required result or data set in the right hand column and click with the right mouse key.



- Select **Copy** or **Copy values**. **Copy** selects the data with headers - **Copy values** just the data.
- Alternatively press CTRL+C on the computer keyboard.
- Open the application e.g. Microsoft Excel.
- Press CTRL+V on the computer keyboard for the data or Paste Special for the chart.

The selected measurement data is exported.

# 10. Standard DIN 4109

The standard DIN 4109 can be selected at the start of a new project. The functionalities and calculations are identical to the standard ISO 16283. Additionally is the German requirement to perform an airborne sound transmission correction at impact insulation assessments listed in Appendix A of DIN 4109-4:2016.

In case a high airborne sound level is generated by the tapping machine in the sending room, then the measured impact noise level in the receiving room can be influenced by the airborne noise transmission through the partition under investigation. Follow these steps to include the correction for the airborne sound transmission:

- Assess the airborne sound insulation D between the two partitions (create a new project and select the standard DIN 4109)
- Verify the impact sound insulation without any airborne sound correction.
- Measure the sound pressure level of the tapping machine in the sending room and assign the data sets to the sending room **L1** in the software.
- Select in the menu **File**-> **Import** -> **Airborne Difference...** and choose the project with the airborne sound insulation D.

☝ The project with the airborne sound insulation D is loaded and the correction applied for the impact sound insulation calculation.

- Evaluate the effect with or without airborne sound transmission correction by deleting the **Airborne Difference D** in the **Measurements** view and import this correction again as required.

# 11. Specifications

| | Airborne Sound Insulation | Impact Sound Insulation | Facade Sound Insulation |
|---|---|---|---|
| Standards | • ASTM E336<br>• ASTM E413<br>• DIN 4109<br>• England/Wales: Approved Document E (2003) | • ASTM E1007<br>• ASTM E989<br>• DIN 4109<br>• England/Wales: Approved Document E (2003) | • ASTM E966<br>• ASTM E1332<br>• DIN 4109 |
| | • GB/T 19889.4 - 2005<br>• ISO 10140:2010<br>• ISO 140-4:1998<br>• ISO 16283-1:2014 incl. Rooms < 25m3<br>• ISO 717-1:2013<br>• SIA181:2006 | • GB/T 19889.7 - 2005<br>• ISO 10140:2010<br>• ISO 140-7:1998<br>• ISO 16283-2:2015 incl. Rooms < 25m3<br>• ISO 717-2:2013<br>• SIA181:2006 | • GB/T 19889.5 - 2006<br>• ISO 140-5:1998<br>• ISO 16283-3:2016 incl. Rooms < 25m3<br>• ISO 717-1:2013<br>• SIA181:2006 |
| Results (ASTM) | • NR, NIC<br>• NNR, NNIC<br>• ATL, ASTC | • ISPL, ISR<br>• RTNISPL, AIIC<br>• ANISPL, NISR | • OINR, OINIC<br>• AOITL, AOITC |
| Results (ISO) | • Dw<br>• Dn,w<br>• DnT,w<br>• R'w<br>• Spectrum adaption terms C, Ctr | • L'n<br>• L'nT<br>• Spectrum adaption terms CI | • Dls,2m,w<br>• Dls,2m,n,w<br>• Dls,2m,nT,w<br>• R'45°,w<br>• Spectrum adaption terms C, Ctr |
| Reporting | • PDF via PDF-printer<br>• XPS<br>• Copy/paste data into User Reports | | |
| Languages | • English, German and Chinese | | |
| Operating System | • Windows Vista, 7, 8.x and 10 | | |
| Licensing | • Install Sound Insulation Option into XL2 or activate Sound Insulation Reporter 365 online at my.nti-audio.com; this enables the import of measurement data into the Sound Insulation Reporter software<br>• Sound Insulation Reporter can be installed on multiple computers | | |

| | |
|---|---|
| XL2 Requirements | • Installed optional Extended Acoustic Pack to measure the RT60 reverberation time in 1/3 octave band resolution.<br>• Installed Remote Measurement Option to measure sending and receiving room simultaneously with two connected instruments controlled directly within the Sound Insulation Reporter software. |
| Order Information | • Sound Insulation Option<br>NTi Audio # 600 000 432<br>• Sound Insulation Reporter 365<br>(annual subscription service)<br>NTi Audio # 600 000 433 |

All information is subject to change without notice.

# 12. Appendix: Airborne Sound Insulation acc. ISO16283

This appendix lists the detailed proceedings for airborne sound insulation measurements in accordance with ISO 16283-1 for rooms with a volume larger or equal than 25 m3.

**Instrument Configuration**

The sound level meter shall meet the requirements of a class 1 instrument in accordance with the standard IEC 61672-1. The recommended configuration consists of

- XL2-TA Sound Level Meter
  (XL2 Sound Level Meter with Type Approval Option installed)
- Optional Extended Acoustic Pack installed
  (required for the RT60 measurement in 1/3 octave resolution)
- Sound Insulation Option or an
  enabled Sound Insulation Reporter 365 annual subscription
- M2230 Measurement Microphone
- ASD Cable
- NTi Audio Precision Calibrator
- Microphone Tripod
- DS3 Dodecahedron Speaker
- PA3 Power Amplifier
- Computer/Tablet with Sound Insulation Reporter Software

| | |
|---|---|
| ⓘ | The sound pressure level measuring system shall be calibrated at intervals not exceeding two years. |

**Required measurements**

- Noise level in source room
- Noise level in receiving room
- Background noise level in receiving room
- Reverberation time RT60 in receiving room

At the beginning and at the end of each measurement day, the entire sound pressure level measuring system shall be checked with the precision calibrator. This shall meet the class 1 requirements in accordance with IEC 60942.

| | |
|---|---|
| ⚠ | Wear hearing protection for all measurements! |

## 1. Room Selection

The airborne sound insulation is measured between two rooms. One room is chosen as the source room and the other one is chosen as the receiving room. In case the volumes of the two rooms differ, then the smaller room shall be used as receiving room.

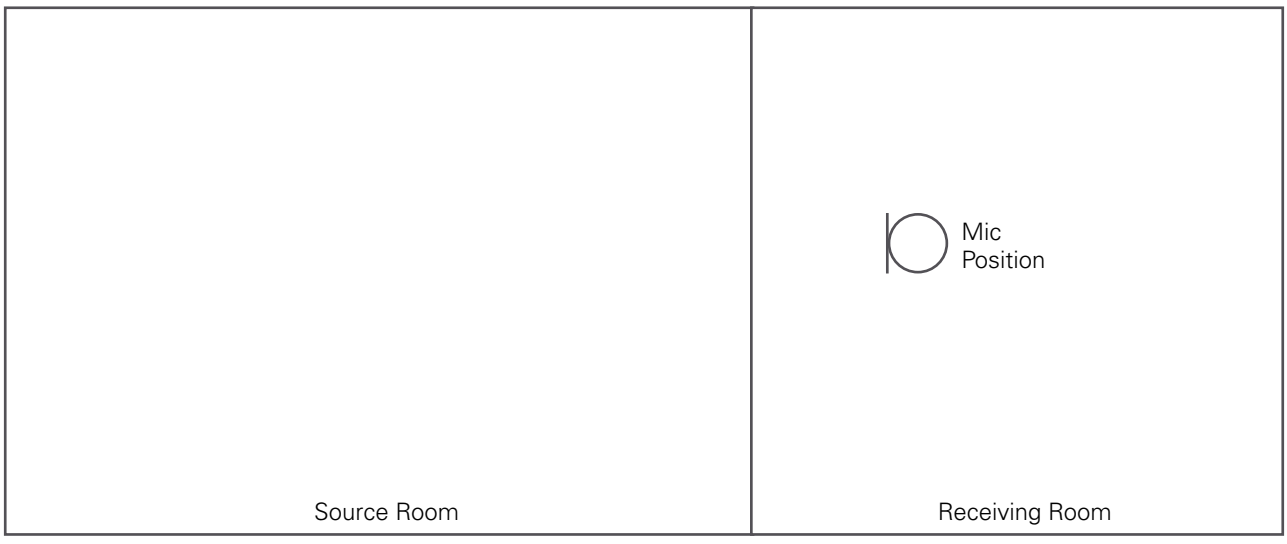
## 2. Measure Background Noise Level Lb in Receiving Room

Preparation

- Select the RTA page of SLMeter function on XL2-TA Sound Level Meter.
- Select third-octave resolution measurement.
- It's recommended to leave the room for this measurement thus any noise generated by the operator will not affect the measurement.

Measurement

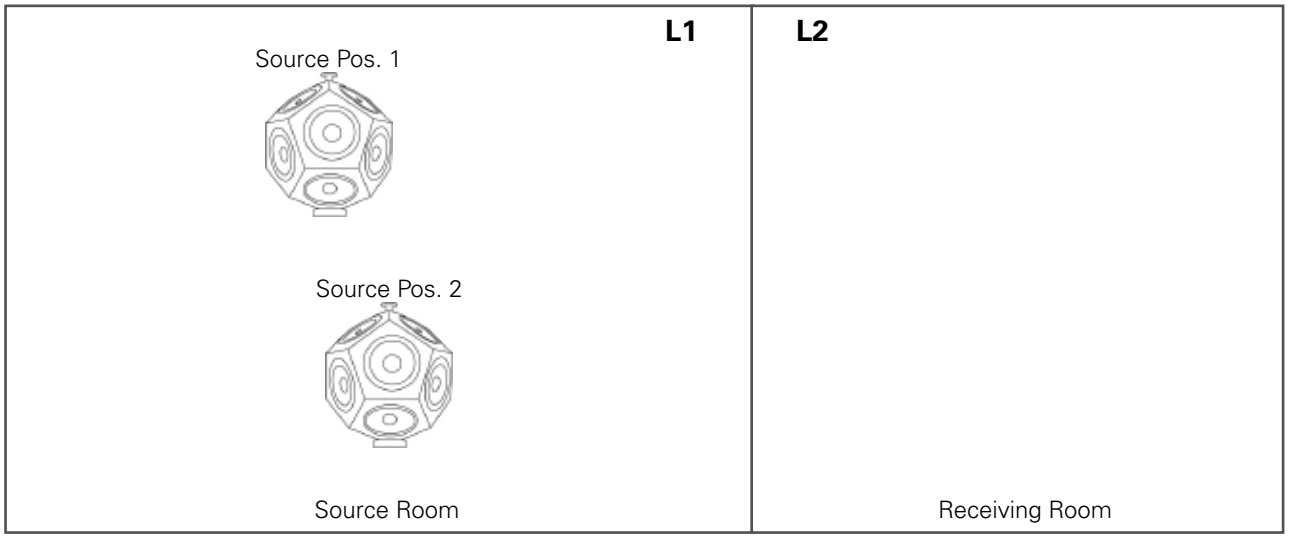
- Measure the background noise LZeq in the receiving room for 30 seconds.
- Store the reading in the XL2. This is required for post calculation of the sound insulation.
- Capture the reading as a reference for the next step. This is required to adjust the speaker output level accordingly.




Measure background noise level Lb

## 3. Test Signal for Sound Level Measurement

- Position the speaker in the source room.
- The measurements have to be carried out at least at two different speaker positions thus define the both positions.
- Choose position 1 at least 0.5 m from any room boundary and at least 1.0 m from the separating partition. Position 2 shall be in a different plane relative to the room boundaries with a minimum 1.4 m distance to position 1. The distances are measured from the center of the Dodecahedron Speaker DS3. In case the separation partition is a floor and the speaker is in the upper room, then the Dodecahedron Speaker DS3 has to be at least 1 m above the floor.
- Start the pink noise test signal at a low level.
- Increase the level until it is minimum 10 dB higher in each frequency band from 50 Hz to 5000 Hz in the receiving room than the background noise measured in step 2. In case this is not possible, then the MS Excel calculation form will automatically apply corrections in accordance with ISO 16283-1.




Position the test signal for the sound level measurements

## 4. Measure Sound Levels L1 and L2 at speaker position 1

Preparation

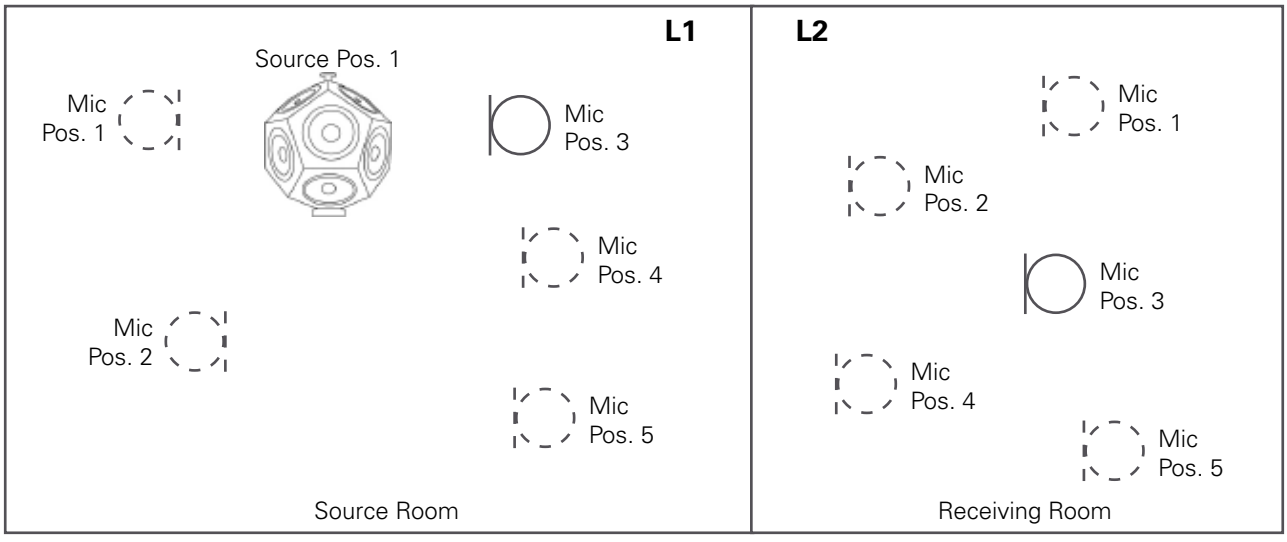
- Define five microphone positions in the source- and receiving room distributed within the maximum permitted space throughout the room. The positions shall be in a different plane relative to the room boundaries and shall not form a regular grid. For example mark the positions on the floor with a tape. The following minimum distances apply:
  - 0.7 m between microphone positions
  - 0.5 m between any microphone position and any room boundary
  - 1.0 m between any microphone position and the speaker
- It's recommended to leave the room for the level measurement as the operator introduces additional absorption.

Measurements in Source Room

- Measure the sound level spectrum LZeq in the source room at each position for a measurement period of 15 seconds.
- Store the individual readings in the XL2 for post calculation of the sound insulation.

Measurements in Receiving Room

- Measure the sound level spectrum LZeq in the source room at each position for a measurement period of 15 seconds.
- Store the individual readings in the XL2 for post calculation of the sound insulation.




Measure the sound levels in source and receiving room at speaker position 1

## 5. Measure Sound Levels L1 and L2 at Speaker Position 2

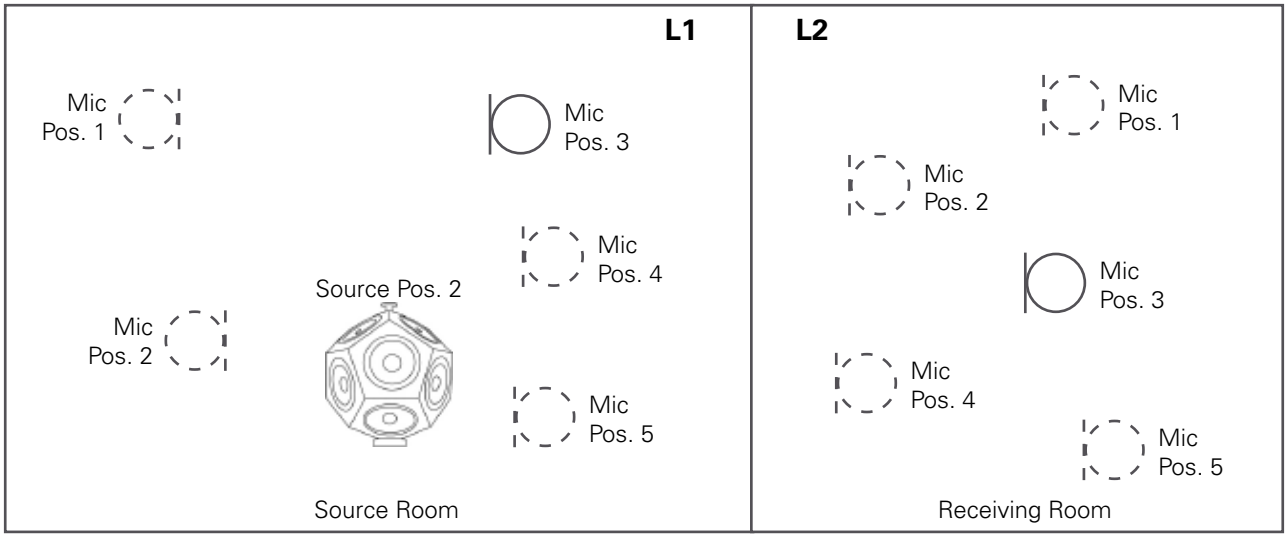
- Move the Dodecahedron Speaker DS3 to position 2 in the source room.

Measurements in Source Room

- Measure the sound level spectrum LZeq in the source room at each position for a measurement period of 15 seconds.
- Store the individual readings in the XL2 for post calculation of the sound insulation.

Measurements in Receiving Room

- Measure the sound level spectrum LZeq in the source room at each position for a measurement period of 15 seconds.
- Store the individual readings in the XL2 for post calculation of the sound insulation.




Measure the sound levels in source and receiving room at speaker position 2

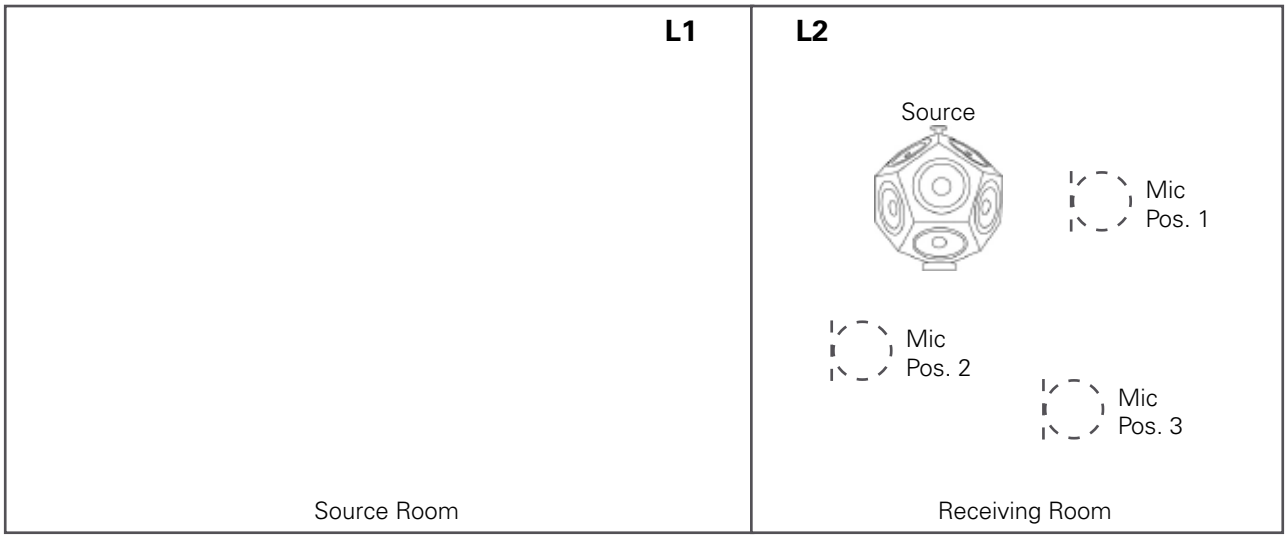
## 6. Measure Reverberation Time T2 in Receiving Room

Preparation

- Move the Dodecahedron Speaker DS3 to the receiving room.
- Select three microphone positions in the receiving room.
- Select the RT60 measurement function on XL2 Sound Level Meter.
- Select the 1/3 octave resolution on the XL2.

Measure the Reverberation Time T2 in the Receiving Room

- Start the measurement on the XL2.
- Start / stop the test signal.
  Guideline: The on/off-cycle time shall be longer than the expected reverberation time.
- Measure at least two decays.
- Stop the measurement on the XL2.
- Repeat the same at the other microphone positions.
- Store the individual readings on the XL2 for post calculation of the sound insulation.




Measure the reverberation time T in receiving room

## Sound Insulation Reporter

Verify and document all readings by using the Sound Insulation Reporter software.

You may load all measurement records into the software and generate the Airborne Sound Insulation report. The form calculates the level difference $D_w$, the standardized level difference $D_{nT,w}$, the normalized level difference $D_{n,w}$ and the apparent sound reduction index $R'_w$ based on the reference curve shifting method in accordance with the standard ISO 717-1.

The following calculations are used:

- $D = L1 - L2$
- $D_{nT} = D + 10 \lg (T/0.5)$
- $R' = D + 10 \lg (S/A)$
- $A = 0.16 * V / T$

with

| | |
|---|---|
| A | Equivalent absorption area of the receiving room in m2 |
| D | Level difference between source and receiving room |
| $D_{nT}$ | Standardized level difference (the level difference D is standardized to the 0.5 seconds reference value of the reverberation time in the receiving room) |
| $D_{nT,w}$ | Weighted standardized level difference (is the value of the reference curve at 500 Hz after shifting the reference curve) |
| L1 | Sound pressure level in the source room in dB |
| L2 | Sound pressure level in the receiving room in dB |
| R' | Apparent sound reduction index of field measurement |
| $R'_w$ | Weighted apparent sound reduction index of field measurement (= value of the reference curve at 500 Hz after shifting the reference curve) |
| $R_w$ | Weighted apparent sound reduction index of laboratory measurement; $R_w$ is typically 4 to 8 dB higher than $R'_w$ based on room size and the partition is light or heavy. |
| S | Partition area in m2 of the wall between source and receiving room |
| T | Reverberation time RT60 in receiving room |
| V | Volume of receiving room in m3 |