

# User Manual



## **SLM Software for PCE-428 / 430 / 432**

**Post-process software of Sound Level Meter**

SLM Software for PCE-428 / 430 / 432 User Manual

V2.0

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## **1. Introduction**

### **1.1 About this manual**

This user's manual describes the process of using SLM PCE

This user's manual presents the software version named 1.6 and the object files are the saved files by PCE INSTRUMENTS sound level meter PCE-428 / 430 / 432 whose version is 3.01 and above. The succeeding software versions (marked with the bigger numbers) can slightly change the view of some interfaces presented in the text of the manual.

### **1.2 About SLM PCE software**

SLM PCE series software is acoustical measurement software. SLM PCE takes the advantage of computer power and performs all signal analysis within the computer. With PCE INSTRUMENTS Data Acquisition Hardware and Microphones, SLM PCE represents the most cost-effective solution for all your needs in acoustic measurement and analysis.

SLM PCE is developed based on the international standards. SLM PCE has module design with the special applications according to ISO standard requirements, such as Sound Power, Sound Insulation, and Impedance tube Measurements. SLM PCE is specially designed for the saved files by PCE-428/430/432. The saved noise time history data can be analyzed and handled by SLM PCE.

### **1.3 General**

#### **Thanks**

Thanks for purchasing SLM PCE software. May this software satisfy your diversified requirements.

## Support

PCE INSTRUMENTS product support and service is only provided to valid, registered users.

If any problems, please feel free to contact PCE INSTRUMENTS for help via send email to [info@pce-instruments.com](mailto:info@pce-instruments.com)

## UPDATE

PCE INSTRUMENTS may create, from time to time, update versions of this software. PCE INSTRUMENTS reserves the right to make changes to the software or its documentation without notice. At its option, PCE INSTRUMENTS will make such updates available to registered users.

## 2. Suitable Objects

The files that the SLM can handle are only the saved files recorded by PCE-428/430/432.

### 1. CSD file

Current data file of sound level meter, which record the data shown on the sound level meter at the saving time, under the mode of Level Meter or Octave.

### 2. SWN file

Time history data by sound level meter on the mode of Level Meter, which record 3 profiles' result in a period of time.

### 3. OCT file

Time history data by sound level meter on the mode of Octave, which record 1/1 OCT or 1/3 OCT spectrum results in a period of time.



## 3. Installation & license

### 3.1 Hardware Requirements

The hardware listings below are not to be viewed as the minimal configuration, but as a configuration enabling professional to work. SLM can be run under Windows2000 /NT/XP or Windows 7.

Towards the high end there are no limits except economics and availability.

**PC:** Pentium 2G Hz or higher if available Core Duo processors

**Operating system:** Windows NT 4.0, Windows 2000, Windows XP or Vista

**RAM memory:**  $\geq 512$  MB

**Hard disk:**  $\geq 60$  GB

**Minimum resolution:** 1024\*768

### 3.2 Installation

The first installation of SLM can be finished with a CD. Find and run "setup.exe" in the installer folder. Then open the file "SLM from PCE INSTRUMENTS.exe" in the setup path to run the software.

**Hint:** Before installing a new version, older version should be uninstalled. Or, cover the old execute file with the new one. The latter operation is recommended on this occasion.

### 3.3 License management

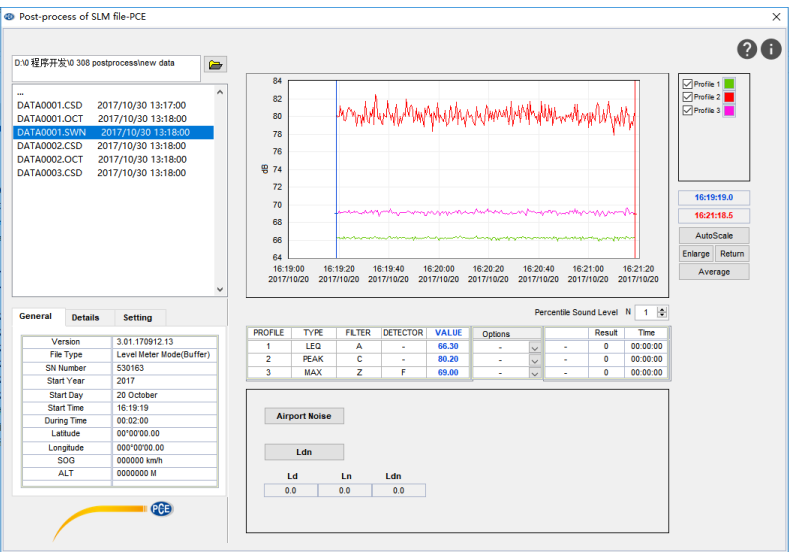
The software is only useful for the specified files, and is used with the hardware. There is no limit to install or to run SLM.

4. Interface of SLM

Choose the language on the welcome interface.



Click<English> to enter English interface.



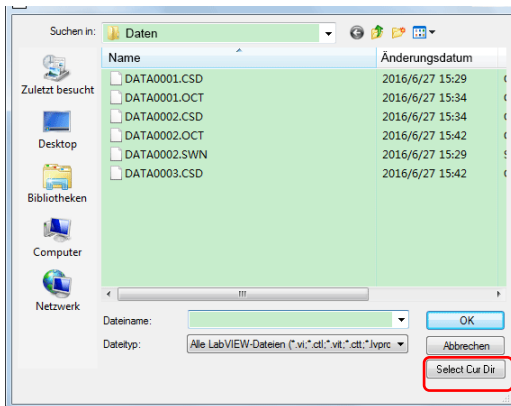
The list on the upper-left gives all the valid files in the current folder. Double click one of them, the file information will be shown in the lower-left table, and the data will shown in the right of the interface according to its type.

## 5. Function Description

### 5.1 How to Point to a new Path

SLM will generate a folder named "SLMDATA" as the default folder on the first time you run the software. This folder is on the same path as the EXE file. If the object files are copied to this folder, these files will be shown in list on the upper-left of the main interface.

If the object files are in the other folder, Click  to modify the default path. The following window will be shown after clicking.



As the graph above, Find the folder needed, and double click to enter this folder, then Click

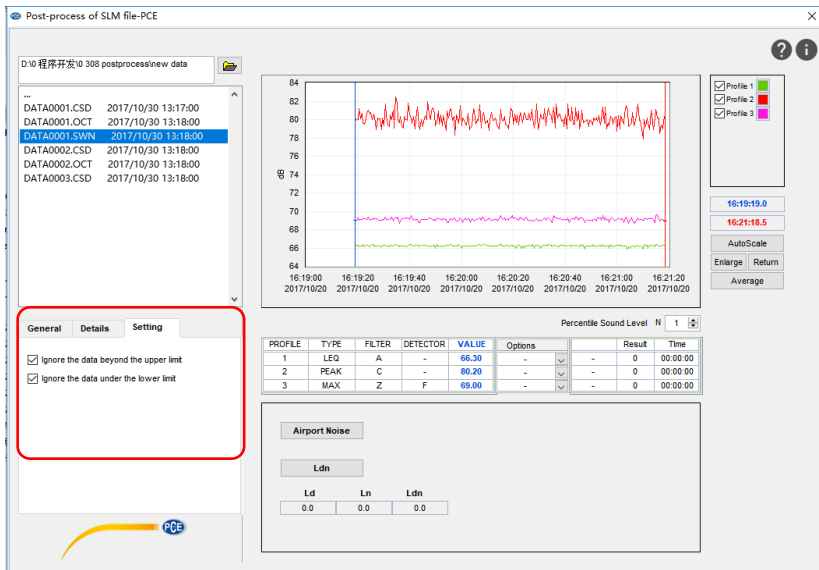
**<Select Cur Dir>** to back the main interface. The path on the top-left will point to the selected folder, and the list on the upper-left will show "...", all the folders inside, and all the valid data files whose suffix are "CSD", "SWN", or "OCT".

Click "..." to up one level, click <XXX> to enter the folder named "XXX", This is another method to find the path of the data files.

## 5.2 How to load the data file

Only the files saved by PCE-428/430/432 sound level meter will be shown in the List. Double click to open the chosen file on the upper-left of the main interface. The display modes of the three kind of file are different, the different window will be opened after double click.

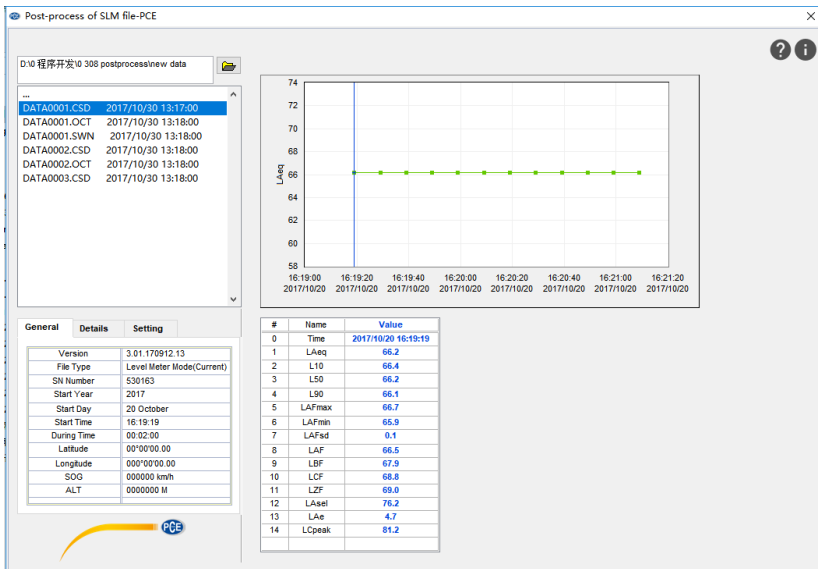
In the data file, the validity of the sound level at each time are recorded synchronously. The software will judge if the data are out of the limit while reading. As shown in the red frame below, the software can choose the data in the valid range only by checking the box options.



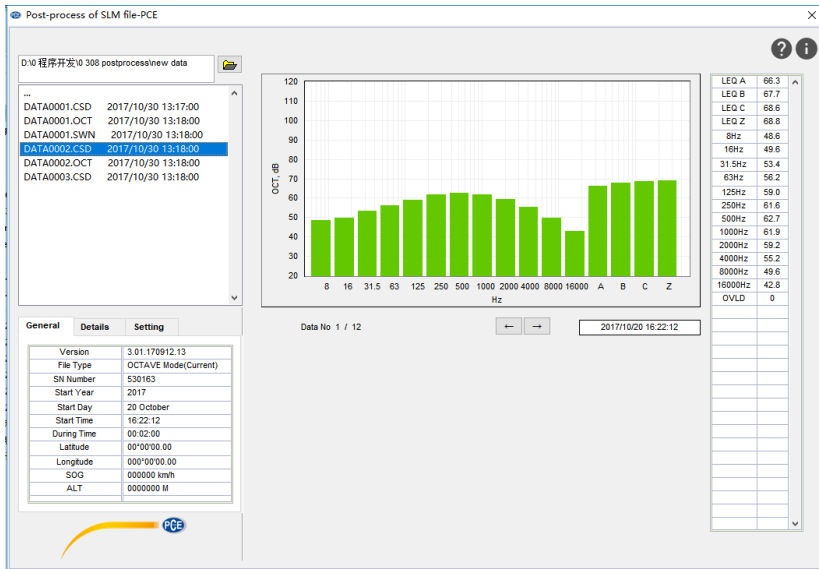
### 5.3 Read the CSD file

Double click the .CSD file in the list to open the CSD format file.

CSD file is the current saved file by sound level meter. There are two modes in sound level meter PCE-428/430/432: Level Meter & OCTAVE. Then there will be two interfaces to show the results of the CSD files.



The figure above is the Level Meter display mode of CSD file. The CSD files save 14 acoustic parameters at each time point. All these 14 parameters of chosen time are shown in the table below. Move the cursor of the graph can change the chosen time. The default curve's amplitude shown on the graph is the first defined acoustic parameter. Click the other row of table can change to the other acoustic parameter.



The Figure above is the OCTAVE display mode of CSD file. The CSD files save the spectrum of 1/1 OCTAVE or 1/3 OCTAVE at each time point. The values of the spectrum on the first time point are shown in the table on the right side, and the graph of the spectrum is shown in the middle. Click the key <←> or <→> to choose the other time point and the graph and the table will be changed accordingly.

*Note 1: the OVLD value in the last row of table gives the validity of the data on the chosen time point, 0: valid; 1: under the floor level, and 2: exceed the upper limit.*

*Note 2: the CSD data are the current process results of sound level meter under the appointed setting, that has no sense of statics.*

## 5.4 Read the SWN file

Double click the .SWN file in the list to open the SWN format file.

SWN files record the time history data of 3 profiles on the Level Meter mode.



After the SWN file is read, the time curves will be shown in the graph, and the cursors will be fixed on both sides of the curve at first. The column "Value" in the table under the graph will show the reading of the blue cursor. Move the blue cursor to get the reading of the other time. Make sure that the blue cursor is earlier than the red cursor if you want to deal with the data between the two cursors.

### 5.4.1 The OPTIONS of data postprocessing

The options include:

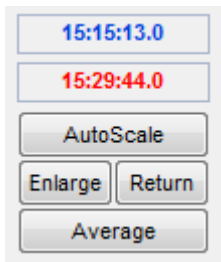
**Linear mean:** gives the arithmetic mean of the data between the two cursors, namely,  $\frac{\sum_{i=1}^n a_i}{n}$ , and the integrated time.

**Exp mean:** gives the exponential mean of the data between the two cursors, namely,  $10 * \lg\left(\frac{\sum_{i=1}^n 10^{0.1*a_i}}{n}\right)$ , and the integrated time.

**Maximum:** Gives the maximum of the data between the two cursors, and the time of the maximum value.

**Minimum:** Gives the minimum of the data between the two cursors, and the time of the minimum value.

**LN:** Cumulative statistical sound level, the LN value is the level just exceeded for N% of the time, and the integrated time, N should be defined in advance.

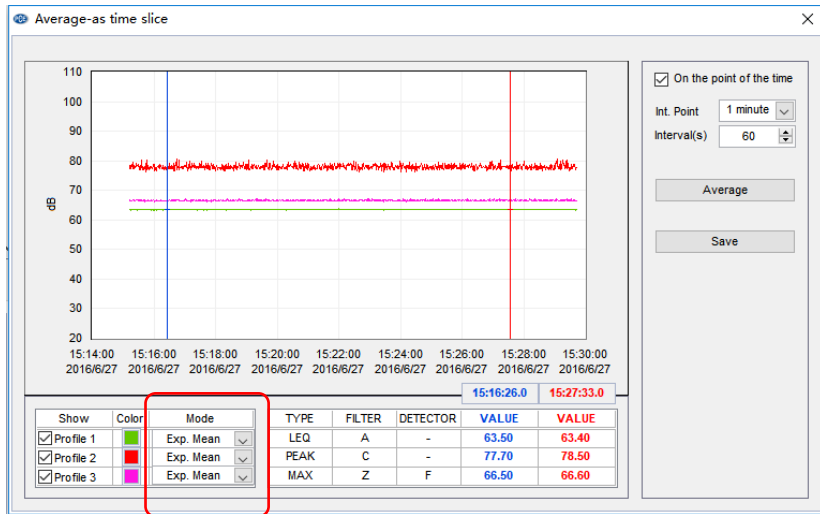


The keys above are to change the display mode of the curve. If you want to check the details of a period of time, move the cursor to the both sides of the period of time frame, be sure that the blue cursor is earlier than the red cursor, and then click **<Enlarge>** to magnify the curve. And click **<Return>**, the curve will return to the initial situation. **<AutoScale>** is to change the range of Y axis to make the curves shown in the middle.



### 5.4.2 Average of the SWN data

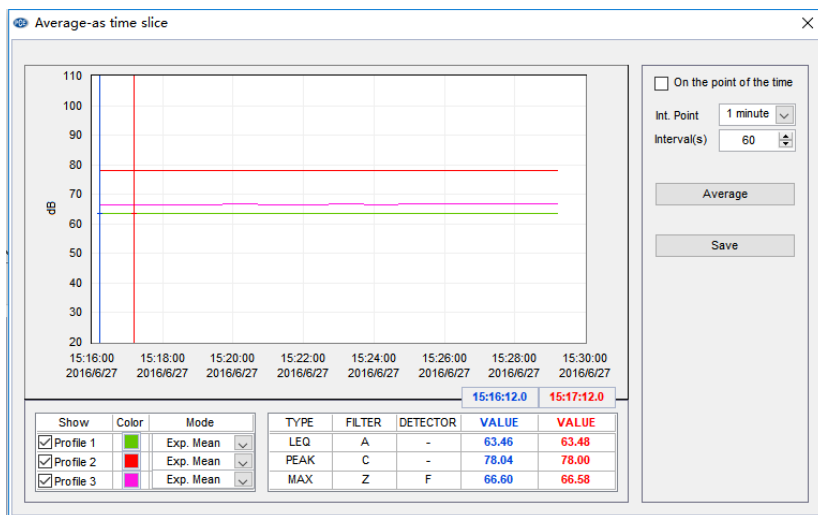
**<Average>** is to average the data between the two cursors according to the setting of time slice. The average window will be shown after click.



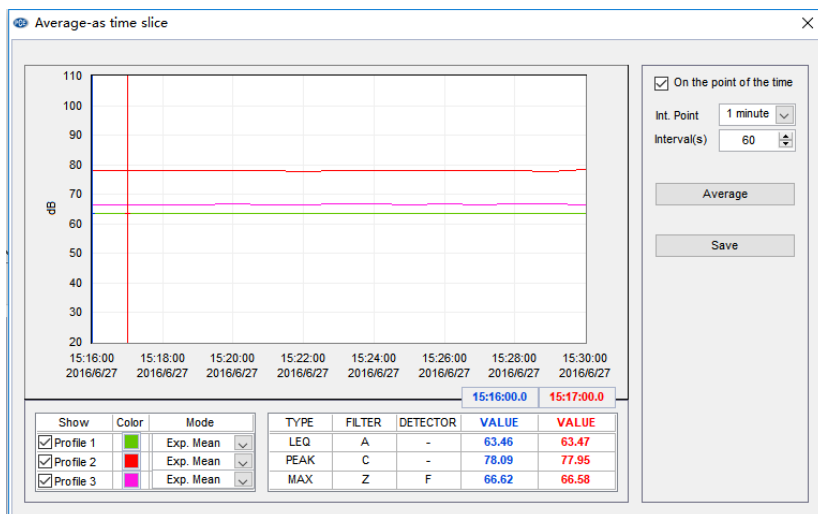
For the different acoustic parameters, the average mode would be different. As shown in the red frame above, the options of the average mode could be: Exp. Mean, Lin. Mean, Maximum, and Minimum.

The average time slice is defined by **Interval(s)**, which can be input directly, or chosen by the **Int. Point**. The use of time slice has two ways: **On the point of Time** or **not**.

As the figure above, **Interval(s)** is 60. If the “**On the point of time**” is NOT checked, the average will be done every data number of **Interval(s)** / time step (Time Step is the sampling interval of the raw data in file). As the figure below, after averaging, the first result will be on 15:16:12, and the second result will be on 15:17:12...



And if the **"On the point of time"** is checked, the average will be given when the time is the integral point. As the figure shown below, after averaging the first result will be in 15:16:00, and the second result will be in 15:17:00...



**Note 1: Click <Average> to do the calculation base on the raw data every time.**

Note 2: If the “On the point of time” is checked, the average time of first result and the last one may less then the definition of Interval(s).

### 5.4.3 WECPNL calculation

If the raw data is the monitoring result around an airport, the WECPNL of airport can be calculated according to the approximation method. To do this calculation, the MAX value should be recorded, and check the box in the left of the relevant profile.

Note: Choose and only choose one profile to calculate WECPNL, the software will not recognize whether or not the MAX Profile is chosen.

Click **<Airport Noise>** to enter the calculation window. As shown below.

The screenshot shows the 'WECPNL Calculation' window. It features a large table on the left with columns labeled '#', 'Time', and 'LAmass'. The table has many rows, most of which are empty. To the right of the table are several control panels. The first panel includes a 'Find Fight Event' button, a 'Threshold(dB)' input set to 67, a 'Delete the Wrong Event' button, and a '# to delete' input set to 0. Below this is a 'Time Interval' section with three time ranges: 'Day time' (7), 'Evening time' (19), and 'Night time' (22). Further down is a 'Calculate' button. At the bottom right, there are inputs for noise levels: 'N1=' (22), 'N2=' (22), 'N3=' (22), and a final result 'WECPNL(dB)= 22.0'. The interface uses a light gray color scheme with standard Windows-style controls like spinners and buttons.

After the **Threshold (dB)** is set, Click **<Find Fight Event>** to find all the time and level exceed the value defined. In general, it is the first step to find the fight event. Then according to the fight information to delete the unreasonable data by using **<Delete the Wrong Event>**. After the time interval of the day, evening, and night are affirmed, Click **<Calculation>** to obtain the fighting number and the average EPNL of the 3 time intervals, then the WECPNL

[illegible]

#### 5.4.4 Calculate Ld & Ln

If the raw data is the monitoring result of a whole day, and the LEQ (RMS) MAX value are recorded, Click <Ldn> to calculate the value of Ld, Ln and Ldn.

Note 1: if one of the time interval has no data, the result of that time interval will shown "NaN", so the Ldn.

*Note 2: The software will give the value of  $L_d$  or  $L_n$  as long as there is a period of data. In fact, the result is valid only when data acquisition rate satisfy the requirement of Standard.*

## 5.5 Read the OCT file

Double click the .OCT file in the list to open the OCT format file.

OCT files record the time history data of 1/1 Octave or 1/3 Octave on the OCTAVE mode.



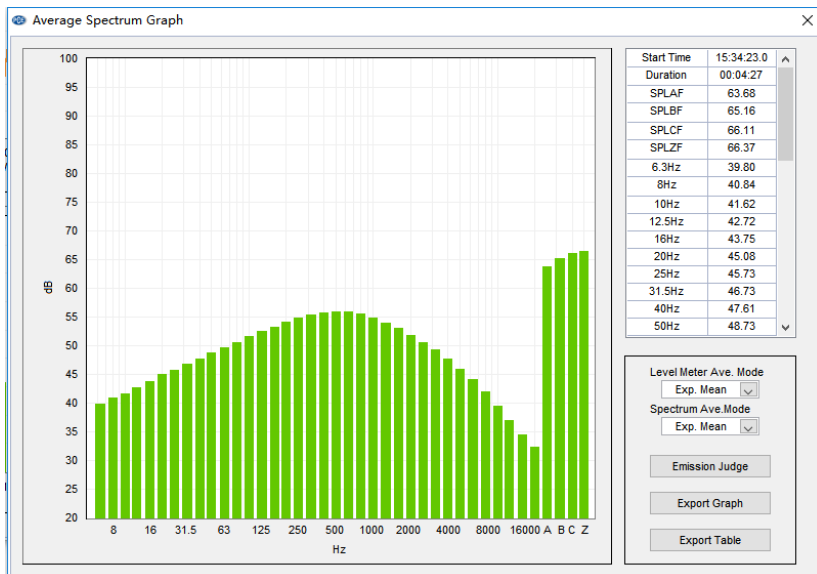
After the OCT file is read, the time curves of total SPL of A-weighting, B-weighting, C-weighting, Z-weighting and chosen frequency will be shown in the upper-middle graph, and the cursors will be fixed on both sides of the curve at first. The lower-middle graph gives the spectrum at the position of blue cursor and the values of the spectrum are shown in the lower-right table. Move the blue cursor to get the spectrum of the other time. Make sure that the blue cursor is earlier than the red cursor if you want to deal with the data between the two cursors.

The display of curves in the upper-middle graph can be controlled by the checking the ☐ in the right side. The first four are the overall sound level of different filter, and the fifth is the filter of the spectrum data.

If you want to check the details of a period of time, move the cursor to the both sides of the curve, be sure that the blue cursor is earlier then the red cursor, and then click **<Enlarge>** to magnify the curve. And click **<Return>**, the curve will return to the initial situation. **<AutoScale>** is to change the range of Y axis to make the curve shown in the middle.

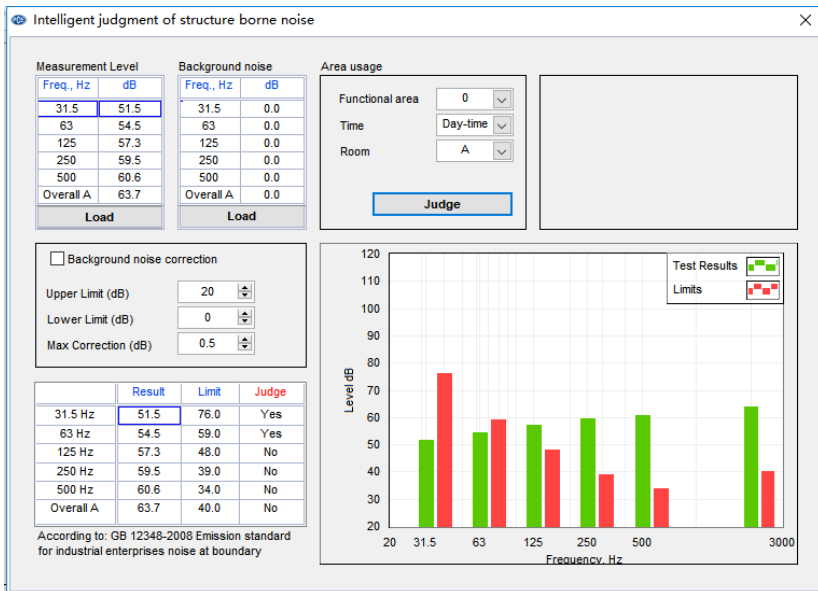
### 5.5.1 Overall average

**<Aver. All>** is to average the all data between the two cursors. Click this key to enter the average window. As the figure below, the left is the graph show of the average result, and the right is the result table of average. Both of them can be exported to the files.



The average mode of the overall sound level and the spectrum can be set respectively. The graph and the table will be rewritten automatically according to the average mode. The options of the average mode include: Exp. Mean, Lin. Mean, Maximum, and Minimum.

If the spectrum is the indoor structure borne noise, click <Emission Judge> to judge the noise situation in the room.



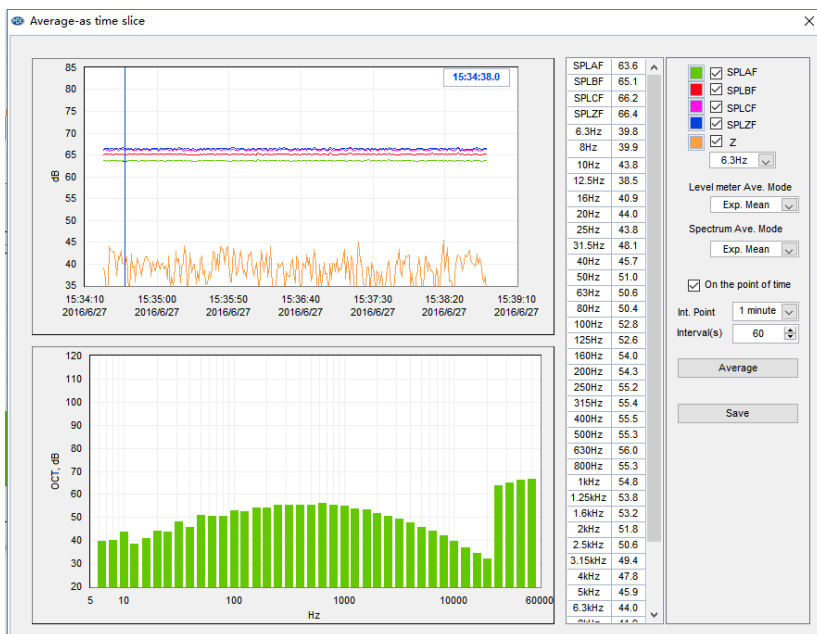
As shown above, the average spectrum of 31.5Hz to 500Hz will be input to the upper-left table, Click <**Judge**> after the Functional area is affirmed, Software will evaluate the structure borne noise inside according to GB12348-2008.

*Note1: For 1/1 Octave, the 5 values of 31.5Hz to 500Hz will be obtained from spectrum directly. For 1/3 Octave, the 5 values will be obtained by energetical sum the adjacent 3 frequency band*

*Note 2: Might as well click <Load> to read the saved file of average spectrum.*

### 5.5.2 Average as time slice

**<Average>** is to average the data between the two cursors according to the setting of Time Slice. Click this key to enter the average window. As shown below, the average spectrum is shown in the left graph, the average value are shown in the middle table, the display mode and the setting of average mode are in the right side.



As described in 5.4.2, the average time slice is defined by **Interval(s)**, which can be input directly, or chosen by the **Int. Point**. The use of time slice has two ways: **On the point of Time** or **not**. The average mode of the overall sound level and the spectrum can be set respectively. The options of the average mode could be: Exp. Mean, Lin. Mean, Maximum,



and Minimum.

The display of curves in the upper-left graph can be controlled by the checking the ☐ in the right side. The first four are the overall sound level of difference filter, and the fifth is the curve of one appointed frequency, "Z" means the filter of the spectrum.

Click **<Save>** after **<Average>**, the average result will be saved to the specified file.

## 6. Others



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License information of SLM

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