

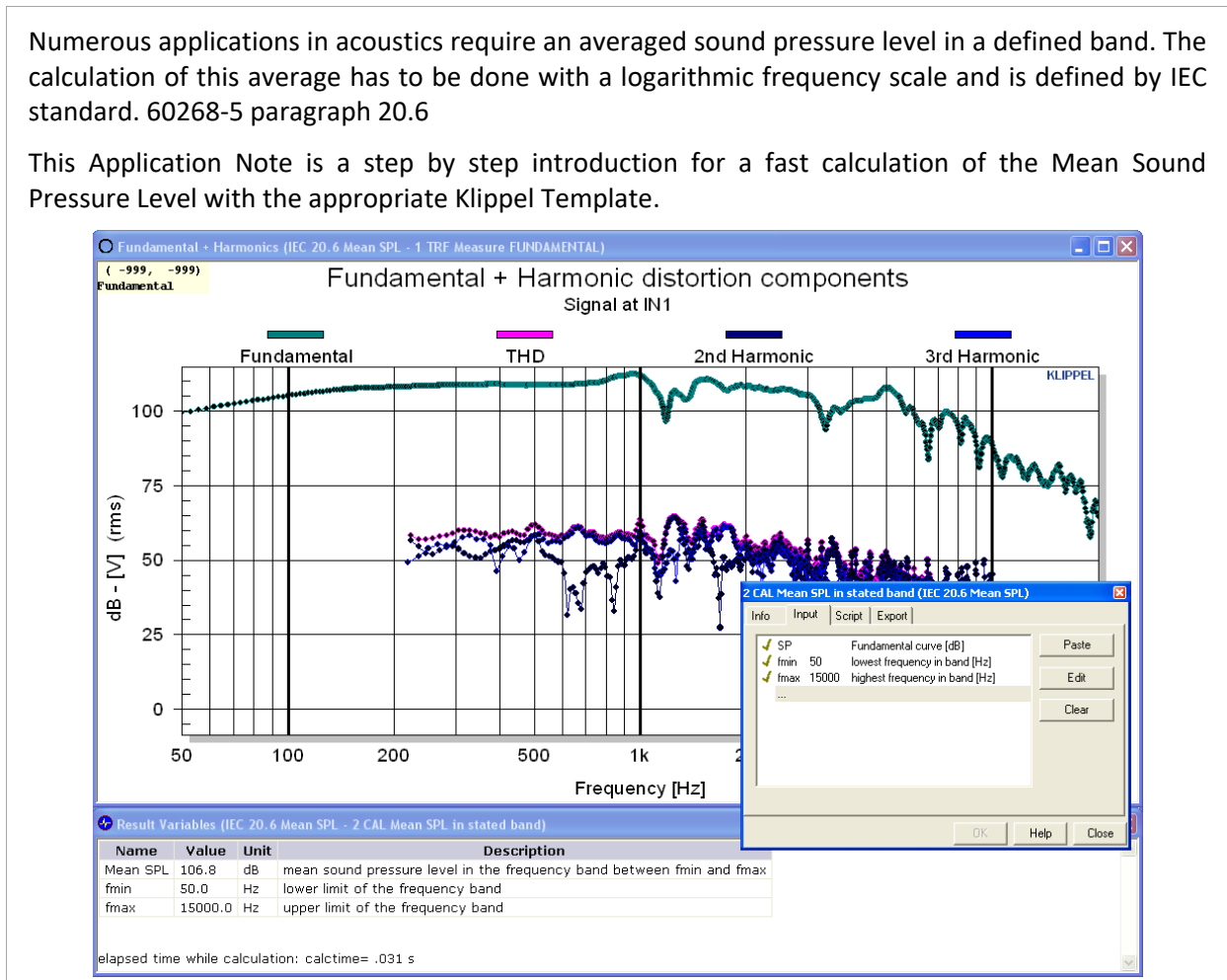
IEC 60268-5:

Mean SPL in a stated frequency band AN 34

Application Note of the KLIPPEL ANALYZER SYSTEM (Document Revision 1.1)

Numerous applications in acoustics require an averaged sound pressure level in a defined band. The calculation of this average has to be done with a logarithmic frequency scale and is defined by IEC standard. 60268-5 paragraph 20.6

This Application Note is a step by step introduction for a fast calculation of the Mean Sound Pressure Level with the appropriate Klippel Template.



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1 Definition

<p>MEAN SOUND PRESSURE LEVEL</p>	$p_r = \sqrt{\sum_{i=1}^n \frac{p_i^2}{n}}$ $\overline{L}_p = 20 \log \frac{p_r}{20 \mu\text{Pa}} \text{ dB}$	<p>Regarding the human frequency resolution and an equivalent sound power distribution the calculation of the mean sound pressure level is defined by the IEC standard 60268-5 paragraph 20.6. This standard averages over squared sound pressure values measured in equal logarithmical frequency bands (p_i is the sound pressure in a definite 1/k octave band). The mean sound pressure level will be calculated afterwards from the root mean square sound pressure.</p>
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2 Requirements

<p>START UP</p>	<p>To measure and calculate the Mean Sound Pressure Level the following equipment is required:</p> <ul style="list-style-type: none"> • Install the RnD Analysis Software on your computer • Create a new object and select the <i>IEC 60268-5 §20.6 Mean SPL</i> Template to start the analysis • Enter the sensitivity of the microphone in property page <i>Input</i> of the operation <i>1 TRF Measure FUNDAMENTAL</i> or use a pistonphone to calibrate the microphone.
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3 Procedure

<p>TRF MEASUREMENT</p>	<p>Motivation: We start with the measurement of the transfer function between input (voltage at the terminals) and sound pressure output using a sinusoidal sweep as stimulus.</p> <p>How to do it:</p> <ul style="list-style-type: none"> • Adjust the measurement microphone normal to the driver as preferred and select the <i>TRF Measure FUNDAMENTAL</i> operation. • Set F_{\min} to a lower and F_{\max} to a higher value than the boundary frequencies of your required averaging band in <i>Properties</i> → <i>Stimulus</i> • Modify the voltage if necessary • Run the measurement • Select the curve “<i>Fundamental</i>” from the window <i>Fundamental + Harmonic distortion components</i> and copy it to the clipboard.
<p>DETERMINATION OF THE MEAN SOUND PRESSURE LEVEL</p>	<p>Motivation: The mean SPL can easily be determined by the <i>2 CAL Mean SPL in stated band</i> operation in a frequency band where the limits are defined by the user.</p> <p>How to do it:</p> <ul style="list-style-type: none"> • Select <i>SP</i> in <i>Properties</i> → <i>Input</i> of <i>2 CAL Mean SPL in stated band</i> and paste the <i>Fundamental</i> curve from Clipboard. • Determine your frequency band for averaging the sound pressure level by defining the upper and lower bounds f_{\max} and f_{\min} as defined on the input page.

RESULTS	After running the script the result variables window will appear showing the mean sound pressure level mSP . The frequency bounds f_{min} and f_{max} are usually identical with input parameters, but might deviate if they exceeded the bounds of the curve. If an error occurred it will be displayed in the result variables window as well.
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4 More information

APPLICATION NOTE	AN35 – Effective Frequency Range
STANDARDS	IEC 60268 Sound System Equipment – Part 5 Loudspeakers, 21.2 Effective frequency range IEC 60268 Sound System Equipment – Part 5 Loudspeakers, 20.6 Mean sound-pressure level in a stated frequency band

Find explanations for symbols at:

<http://www.klippel.de/know-how/literature.html>

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