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APP GRATUITA

NoiseCalc

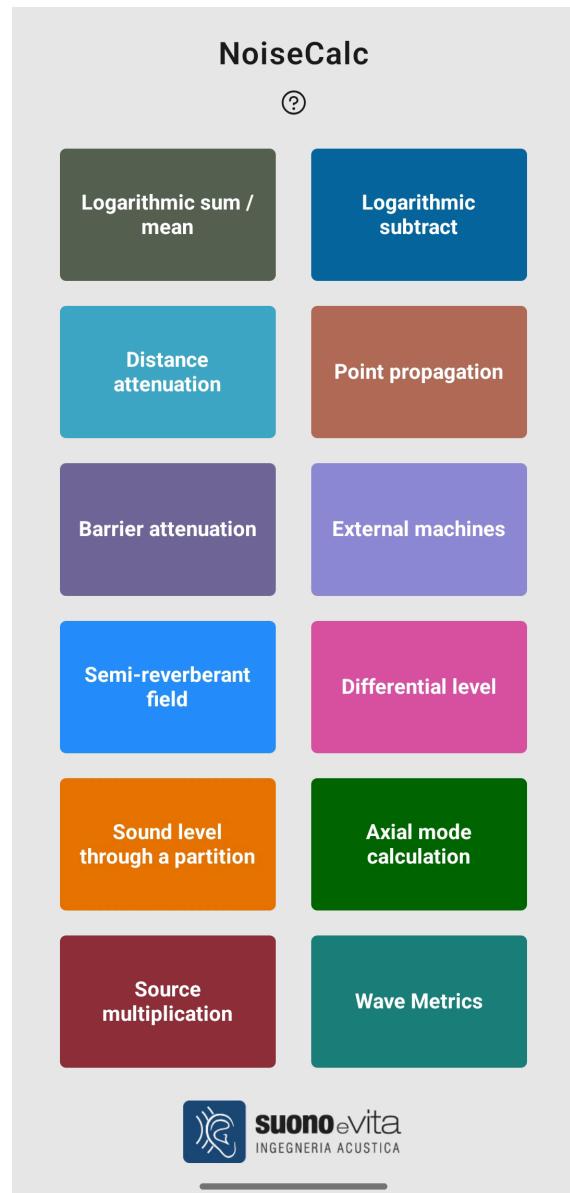
For consultants in environmental and building acoustics,
for HVAC professionals,
for music and audio professionals,
for those studying or interested in applied acoustics

NoiseCalc



SUMMARY

- Project presentation
- Brief introduction to the 12 functions
- Glossary of some terms
- Credits



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NoiseCalc



Developed by the acoustic

engineering studio **Suonoevita**,

Lecco Italy.

Started in 2020 during the
COVID period.

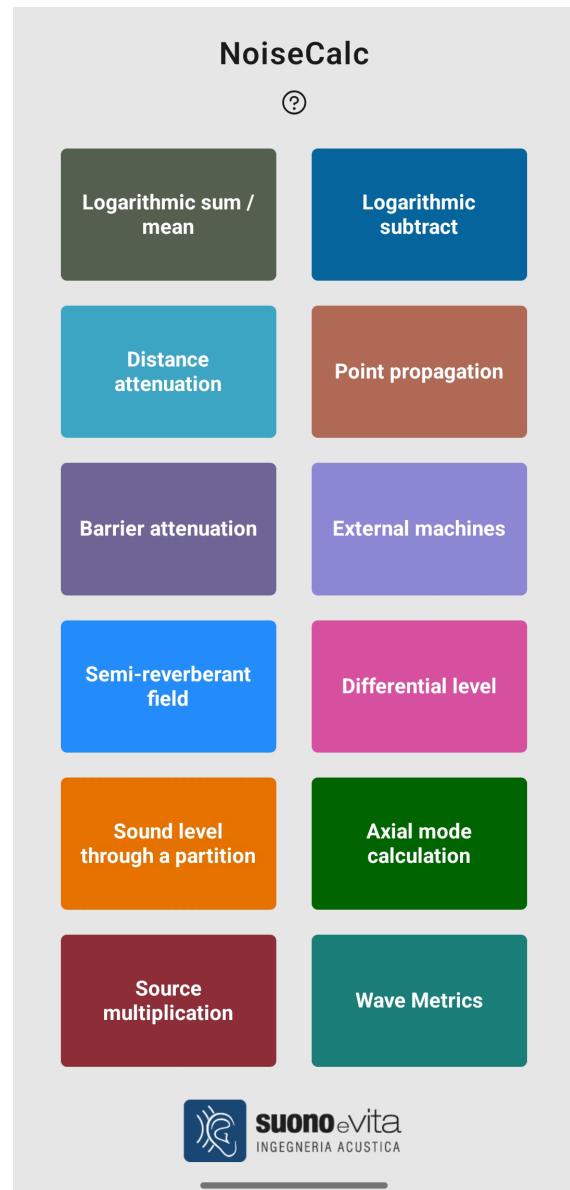
Its fifth release is released in
February 2026 with some new
features.

Free calculator for acousticians
and anyone involved with sound
and noise control.

Used in the Applied Acoustics
course at the University of
Bergamo and can be useful to all
students of Physics, Acoustics
and Technical Physics in general.

Works on smartphones with iOS
and Android systems.

Currently both have the release
2.6.0



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The app applies the basic formulas of applied acoustics.

It is designed for immediate use in the field and for the development of simple technical reports.

Let's introduce the 12 modules and discuss when they can be applied and what precautions to take when using them.



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1. LOGARITHMIC SUM/AVERAGE

Since it's based on logarithms, the mathematics of decibels is very different from that of everyday life.

This tab is useful for adding together acoustic powers or sound pressures, or for averaging them.

This module can be used, for example, if there are many machines close to each other, when we have measured or calculated the energy values of multiple sources at a single point and we want to add them together (and to the residual level of that point).

< **Logarithmic sum / mean**

Fill in up to four SPL in deciBel to obtain a result.

First level [dB] +

Second level [dB] +

Third level [dB] +

Fourth level [dB] =

Fill the fields to get the result



2. LOGARITHMIC SUBTRACTION

The mathematics of decibels is very different from that of everyday life.

This tab is also useful for **defining the energy of a sound source.**

It can be used, for example, when we carry out sequential Lp measurements with the machine on and off in the same SPL measurement point: by making the log subtraction, we can obtain the pure energy sound pressure level emitted by that source at that measurement point.

We can use this calculated value in the other modules of the app.



Logarithmic subtract

Insert two SPL in deciBel to obtain their subtraction (L1 must be higher than L2).

First level [dB]

—

Second level [dB]

=

Fill the fields to get the result



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3. ATTENUATION BY DISTANCE

By measuring the sound level given by a source at a point P1 and the distance from the source, we can estimate what level we will have in P2 at another distance.

Added calculation for linear sources (e.g. roads).

Remember, however, that if the source is large, it cannot be immediately considered point-like and that this formula is valid in free field (be careful of reflections!).

Remember that the residual level at that P2 point should always be added to the calculated energy.



Distance attenuation

Knowing a point source or linear source SPL1 value at distance d1 (meters) it is possible to calculate SPL2 at distance d2 (meters).

Point source

Linear source

$$L_{p2} = L_{p1} - 20 \log_{10} \frac{d_2}{d_1} \text{ [dB]}$$

Result will be shown when fields are filled

Pressure Lp1 [dB]

Distance d1 [m]

Distance d2 [m]

=

Fill the fields to get the result



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4. POINT PROPAGATION

When we know from the technical data sheet the declared power level L_w of a sound source, we can estimate what pressure level L_p we will have at a distance of d . We have to indicate how many surfaces there are near and around the source.

Remember, however, that if the source is large, it cannot be considered point-like and that this formula is valid in a free field.

Remember that the residual level at that distant point should always be added to the calculated energy.



Point propagation

Knowing a point source sound power level SWL in deciBel you can calculate its Sound Pressure Level SPL at a distance d in meters using the free field propagation formula, where ID is the directivity index.

$$L_p = L_w - 20\log_{10}d + ID - 11 \text{ [dB]}$$

Result will be shown when fields are filled

Power L_w [dB]

ID = 0 (omni)

ID = 3

ID = 6

ID = 9

Distance d [m]

Fill the fields to get the result



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5. BARRIER ATTENUATION

Useful for making a first estimate of how much I can reduce with a sound barrier.

NEW: Starting from the SPL measured at 1 [m] from the source, this module returns the user an estimated L_p at the receiver, considering both the direct path (through the barrier) and diffracted path (above the barrier).

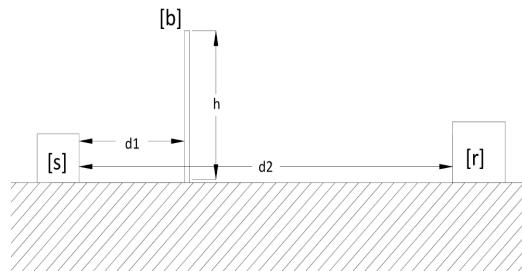
It is used for simple assessments of outdoor mitigation.

Please note that here the calculation is performed for each individual third octave frequency band. The first choice in the table will give a single number estimate, which uses the R_w value of the panel and the diffraction calculated at 500 Hz.



Barrier attenuation

This module will calculate a **SIMPLIFIED** barrier attenuation by ISO 9613-2. Note we'll consider a single diffraction barrier, with an infinite length, with source and receiver aligned and on the same plane. The situation is resumed in the following sketch.



Select the frequency at which you'd like to compute the barrier attenuation. Use 500 Hz if the frequency is not known.

500 Hz

Select the type of panel for your barrier.

Fill the fields to get the result



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5. BARRIER ATTENUATION

Once all the necessary data has been entered, the user will be provided with:

The sound reduction of the selected panel (R_w or $R(f)$) if working in a specific frequency band)

The diffraction attenuation of the barrier (D_z or $D_z(f)$)

The pressure value L_{p2} according to the direct path, calculated as: $L_{p2,dir} = L_{p1} - 20\log(d_1+d_2) - R(f)$

The pressure value L_{p2} according to the diffracted path, calculated as: $L_{p2,diff} = L_{p1} - D_z(f)$

$L_{p2,tot}$ as the logarithmic sum of $L_{p2,dir}$ and $L_{p2,diff}$

Barrier attenuation

Height h [m] =

Sound reduction $R(f) = -$

Diffraction attenuation $D_z(f) = -$

$L_{p2,dir(f)} = -$

$L_{p2,diff(f)} = -$

Warning!
Evaluate the static strength and wind resistance of the barrier.
Please remember this result is a simplified estimate: the formula does not count for sound reflections, height differences and misalignment between source and receiver.
Contact us for more info www.suonoevita.it/it/contatti/.

Fill the fields to get the result



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6. NOISE FROM EXTERNAL MACHINES

Designed for those who are not used to acoustic calculations.

Knowing from a technical data sheet the declared sound power level L_w of the source or the pressure data L_p measured at a certain distance (d_0) we can estimate what sound level we will have at a distance d from the source.

We have to indicate how many surfaces there are around the source.

The app will already give me an initial automatic response if the sound source will have administrative problems by the Italian law.



External machines

Noise propagated from a machine can be calculated from its technical spread sheet data.

This data can be expressed as a Sound Power Level SWL or L_w or as a Sound pressure Level SPL or L_p , this is measured at a certain distance that must be stated.

Power L_w

Pressure L_p

Power L_w [dB]

Select the correct directivity index ID based on the machine position close to reflecting surfaces.

If the directivity is already measured in the technical spread sheet, use $ID = 0$.



$ID = 0$ (omni)



$ID = 3$



$ID = 6$



$ID = 9$

Fill the fields to get the result

If in doubt, contact a Competent Acoustic Consultant.



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7. SEMI-REVERBERANT FIELD

Useful for estimating the influence of acoustic correction on the average sound pressure level within a room.

If there is little sound absorption, the result is that we amplify the overall sound level within that environment.

A transition frequency is also estimated, below which the effect of the resonance room modes will have to be considered.

NEW: The module calculates the critical distance of the room, at which the sound pressure level of the direct and reverberant sound fields are equal.

It is used for example in simpler acoustic impact studies with emissions at closed windows (i.e. restaurants).



Semi-reverberant field

You can use the semi-reverberant field room formula to estimate the sound pressure level in a closed room

$$L_p = L_w + 10\log_{10}\left(\frac{Q}{4\pi r^2} + \frac{4}{R_c}\right) \text{ [dB]}$$

where L_w is the SWL, Q is the source directivity factor, r is the distance from the source and R_c is the room constant

The room coefficient R_c is expressed by the formula

$$R_c = \frac{\alpha S}{1 - \alpha}$$

where α is the average sound absorption coefficient in the room and S is the overall room surface (walls + floor + ceiling)

Insert the room dimensions (length, width, height) in meters

Room length: L [m]

Room width: W [m]

Fill the fields to get the result



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8. DIFFERENTIAL LEVEL

We can carry over the calculated energy level from one of the previous screens or enter it here.

We insert the residual level (the level that exists at the spatial point without the active source).

The app will already give me an initial automatic response if I am inserting a machine/source that may have administrative problems with the administrative Italia law

If in doubt, contact a Competent Acoustic Consultant .



Differential level

In this tab you can estimate a differential level from an energetic SPL that arrives from the sound source and the base noise level at the receiver.

A 3 dB difference is a good engineering estimate for annoyance, especially in the night.

Energetic Sound Pressure Level - SPL [dB]

Base Noise level - NL [dB]

=

There are limitations - decide if you have consider the receiver situation at open windows or at the facade.

Fill the fields to get the result



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9. LEVEL THROUGH A PARTITION

Useful for making an initial estimate of how much noise can pass through a wall or a ceiling, given the average sound level LAeq in the disturbing room and the sound insulating power R'w of the partition itself.

That value is an energetic estimation, and it must be added to the residual level (L1) that exists in the receiving room.

Remember that R'w parameter is a very weak value for studying complex frequency situations.

< Sound level through a partition

In this tab you can estimate a Sound level through a partition

$$L2 = L1 - R'_W + 10\log_{10}\left(\frac{S}{A}\right) \text{ [dBA]}$$

Sound reduction index R'w [dB]

Sound level at source side L1 [dBA]

Equivalent sound absorbing surface at receiver side A [metric Sabine]

Select an item

Partition surface S [m²]

Fill the fields to get the result



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10. RESONANCE MODES

Useful for understanding room behaviour below 250 Hz: useful on the tonal components of noise and the fundamentals of music in everyday 'small' rooms.

A probable transition frequency is also estimated, below which Sabine's model loses value and the resonances becomes 'dangerous'.

It is used for example when you are taking a measurement with the windows closed and a pure tone is present, or when a machine has a very strong fundamental frequency in its sound emission, it is used a lot to optimize listening rooms.



Axial mode calculation

In this tab you can perform an axial mode calculation of a rectangular-shaped room

$$f_{n_L n_W n_H} = \frac{c}{2} \sqrt{\left(\frac{n_L}{L}\right)^2 + \left(\frac{n_W}{W}\right)^2 + \left(\frac{n_H}{H}\right)^2} \text{ [Hz]}$$

Room length: L [m]

Room width: W [m]

Room Height: H [m]

Modes number [nL - nW - nH]

0

0

0

Fill the fields to get the result



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11. SOURCE MULTIPLICATION

NEW: The source multiplication module allows the user to estimate the overall sound pressure level emitted by N identical sources, all having the same acoustic power level.

When the sources have the same phase, and are therefore **coherent**, the pressure level can be used to compute the overall LpTot.

This doesn't apply to **incoherent** sources, having different phases, for which the sound intensity L_I will be used.

This module can be useful to estimate how much sound pressure level is obtained by placing two or more noise sources together (use the incoherent system).



Source multiplication

Enter the sound level of a single source, the number of identical sources, and specify whether they operate coherently (in phase) or incoherently.

Coherent sources will be added in pressure, while intensity will be used for incoherent sources.

Incoherent

Coherent

$$L_{p,tot} \approx L_{I,tot} = L_I + 10 \log_{10}(N) [dB]$$

Result will be shown when fields are filled

Sound intensity level L_I [dB]

Number of sources N

=

Fill the fields to get the result



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12. WAVE METRICS

NEW: The wave metrics module converts a given frequency value in its corresponding wavelength, and vice versa!

The user can also change the temperature, impacting the sound speed value. Moreover, by clicking on the temperature side button, the measurement system can be switched from SI units (meters and Celsius) to the Imperial units (ft and Fahrenheit).

The standard temperature values are 20°C and 68°F.

This module is useful for quickly obtaining the lambda value of a given frequency value, or the other way around, without having to manually compute the conversion.

<Wave Metrics

Enter the frequency or wavelength value. The result will show the converted value and the values for $\lambda/2$ and $\lambda/4$. Insert the temperature T to change the sound speed (default values are 20°C or 68°F).

f to λ λ to f

Frequency [Hz]=

Temperature [°C]°C

c(T) = 343.215 m/s

$\lambda/2$ = -

$\lambda/4$ = -

Fill the fields to get the result



(?). TUTORIAL

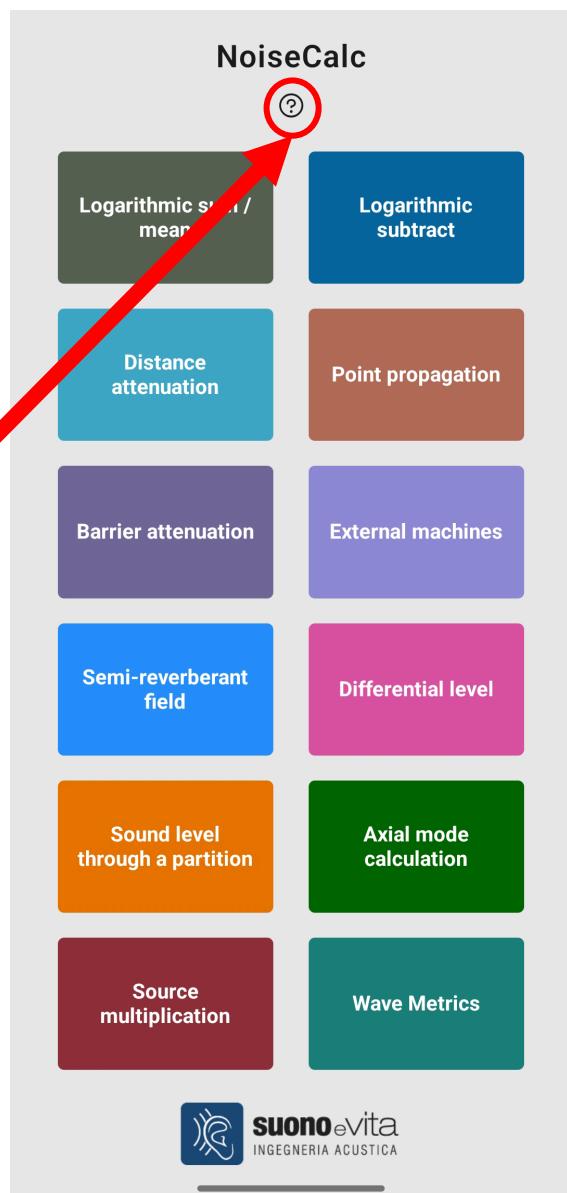
NEW: It is possible to view the app presentation through the application itself.

To access the presentation page, simply click on the question mark button on the homepage.

This shortcut is very useful if you have any doubts about how to use a specific module or need help understanding which tab to use based on your needs.

The presentation is available in both wide-screen format for PCs and vertical format for smartphones.

Find this presentation and much more on our website:
www.suonoevita.it



NoiseCalc



GLOSSARY

Energy level - is the sound level emitted by the source, propagated and/or measured at a point in space

Residual Level - This is the 'background' level that exists in a location without the sound source I am studying.

Administrative Laws – In Italy
DPCM 14/11/97 regulates the limits of noise pollution. In Italy there is also all the legislation of the Civil Court which is more severe (art. 844 cc)

TCA - Competent Technician in Acoustics – Italian technical figure recognized by the Ministry of the Environment (ENTECA list) who can carry out SPL measurements and can draw up valid documents on the evaluation of noise pollution and passive acoustic requirements.



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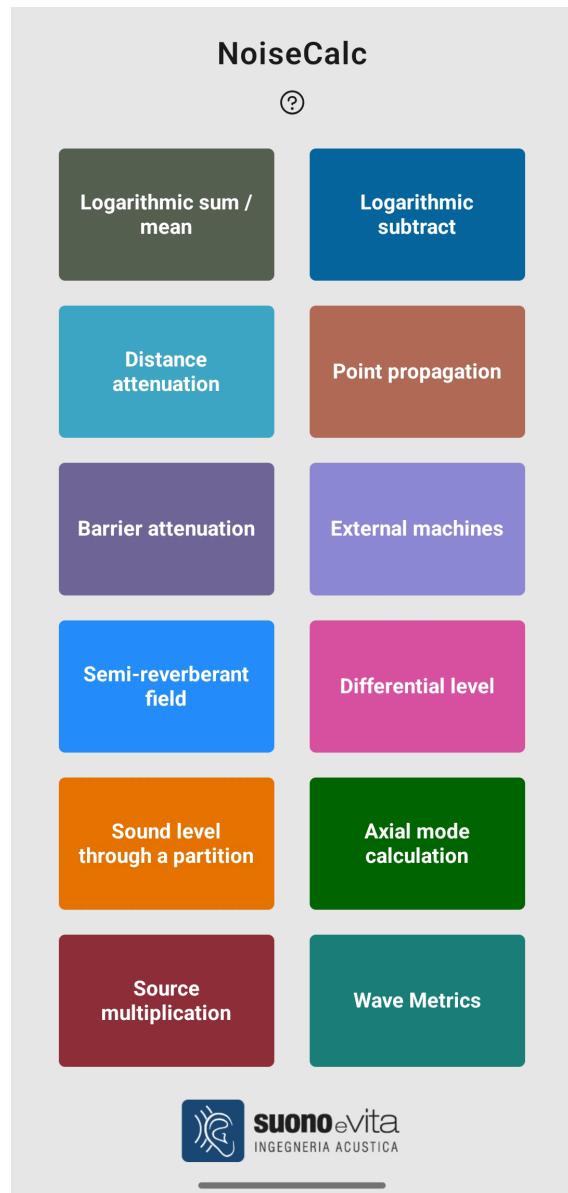


CREDITS

Concept: Eng. Gabriele Ghelfi -
Eng. Lorenzo Rizzi
Development: Eng. Stefano
Redaelli - MSc. Nicolò Chillè

We thank the sponsors and
colleagues who supported us in
this free project.

For comments and suggestions,
to ask to participate as a sponsor
write an email to:
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