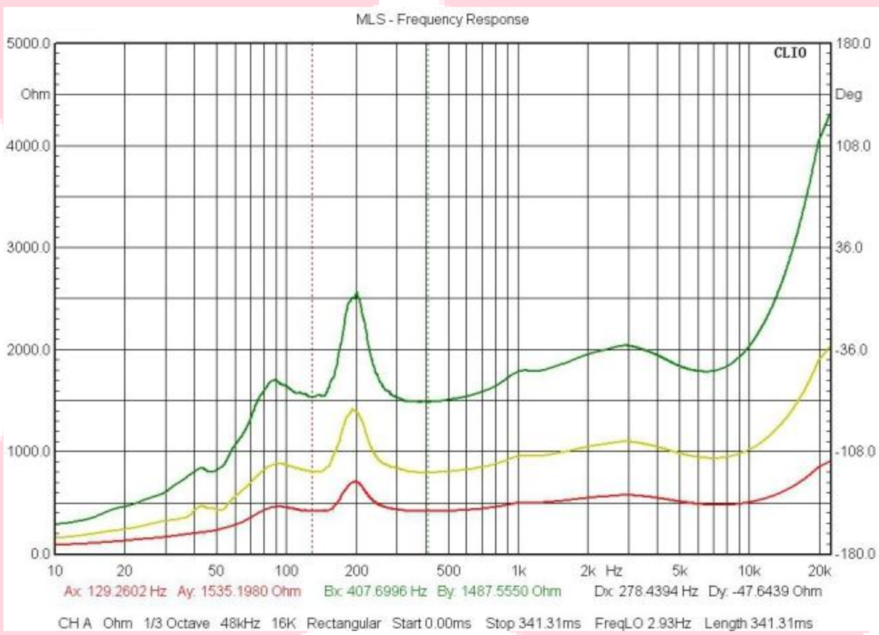
A. Line Impedance. Component measurement LCR

The impedance of a line of speakers should be taken with an LCR Component Measurement as the power amplifiers work in the audio frequency range (20Hz-20KHz).

When we speak of impedance, we take the measurement with a component meter in the frequency domain (this value is not equal to the resistance taken with a multimeter on the same line). The impedance is represented by the following equation:

$Z = R + jX$.

Let be R the resistive or real part and X is the reactive or imaginary part of the impedance, there being two types of reactances: inductive, due to the existence of inductors, and the capacitive, due to the existence of capacitors.

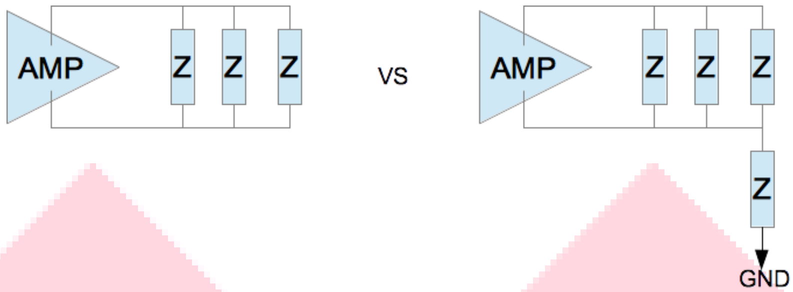


Impedance of a speaker in frequency

The resistance value taken with a tester or multimeter corresponds only to the real part of the impedance when the frequency is 0Hz, that is to say, for a continuous signal. In the case of public address system, the valid value is taken with the impedance meter, since we work in the frequency domain, making measurements at 120Hz and 1KHz for example.

Likewise, the value of the impedance must be controlled both between poles and between pole and ground, since a derivation (not necessarily short circuit) between the branches of the line and ground causes the amplifier not to be working in its specified range and this causes damage to the exciter that will depend on the exposure time, signal level, etc. (There is more information in the attached support manual)

For example, a 6W@100V speaker has an impedance of 1.7 KΩ, if we have an impedance between a pole and ground below that value it is as if a speaker is connected between a pole and ground, modifying the impedance and topology of the load seen by the amplifier, being able to be working outside its specified range.



A.1. Theoretical impedance

The theoretical impedance of a line with the speakers connected in parallel is obtained by the equation Z = V2 / P. If we connect 20 speakers of 10W to a line of 100V, the impedance will be:

$Z = V^2 / P = 100^2 / (20 \times 10) = 50\ \Omega$.

A.2. Real impedance

In order to avoid problems in the amplifier channels and to ensure that there is no short circuit, open circuit or grounding in the speakers line, it is necessary to take measurements of the impedance between the poles of the line and between each pole and ground:

1) Z between poles: the value should be approximately the theoretical, if the value is:

    a. Zreal ≅ 0, the line is shorted circuit.

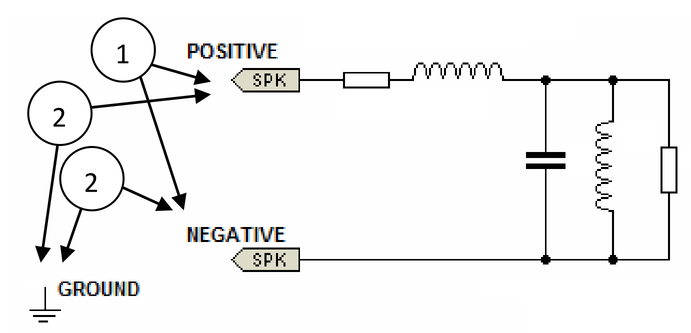
    b. Zreal ≅ Ztheoretical, the line does not present problems.

    c. Zreal ≅ ∞, the line is in open circuit.

2) Z between poles and ground: the value must be infinite, there must be no connection between the ground and the positive pole of the speaker line, if the value is:

    a. Zreal ≠ ∞, the line is grounded.

    b. Zreal = ∞, the line does not present problems.



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