



Sistemas de Sonido

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Ingeniero en Electrónica

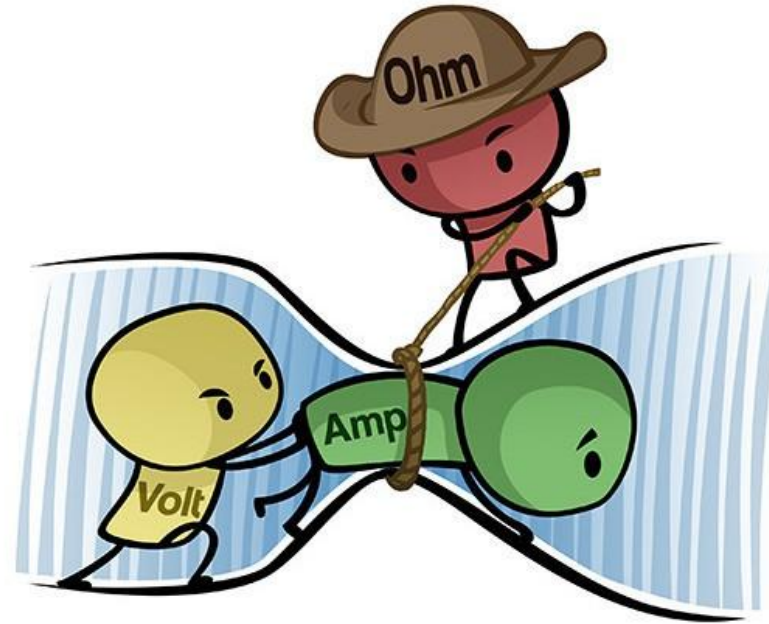
Especialista en Audio y Sonido

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Ingeniero en Acústica

Mg. en Acústica Arquitectónica y Medioambiental

Principios de Electricidad, Electrónica y Magnetismo



Tensión

Volt

Corriente

Ampere

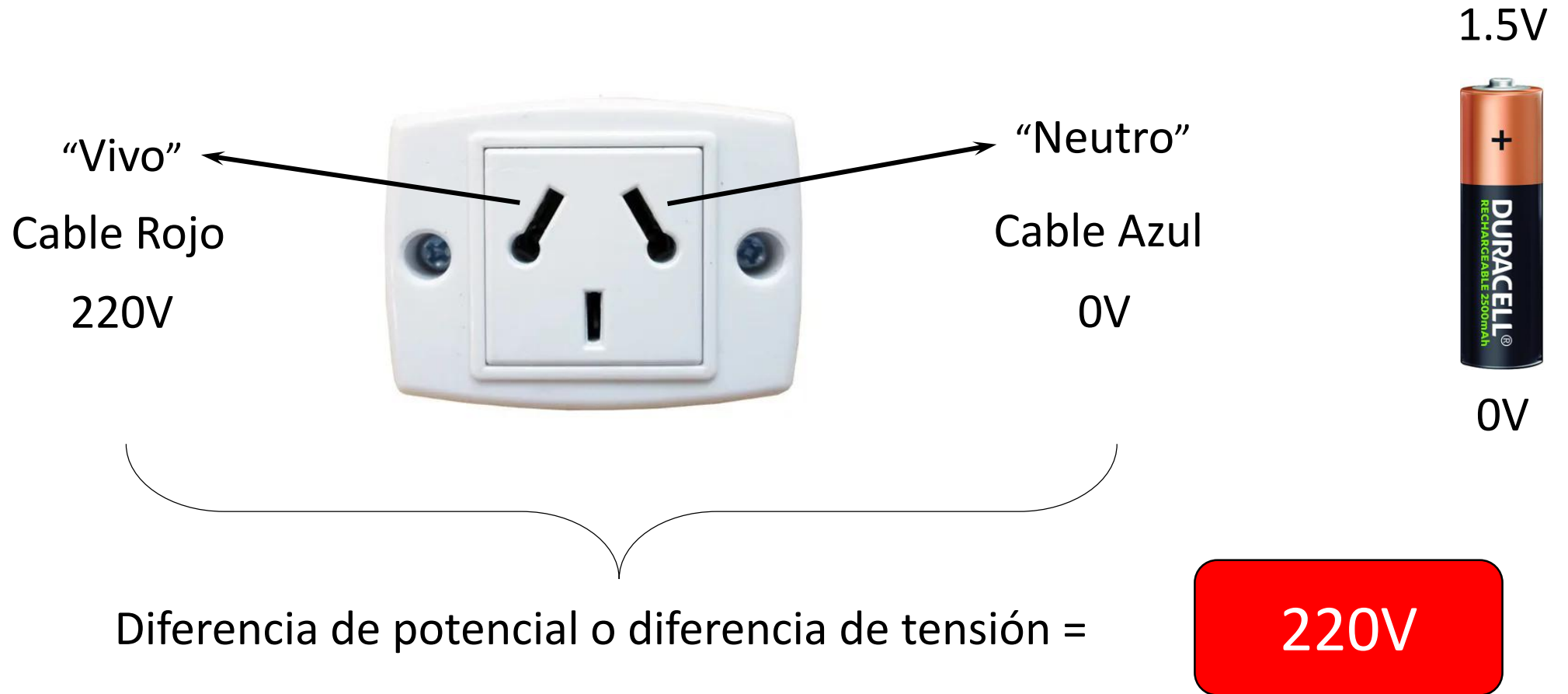
Resistencia

Ohm

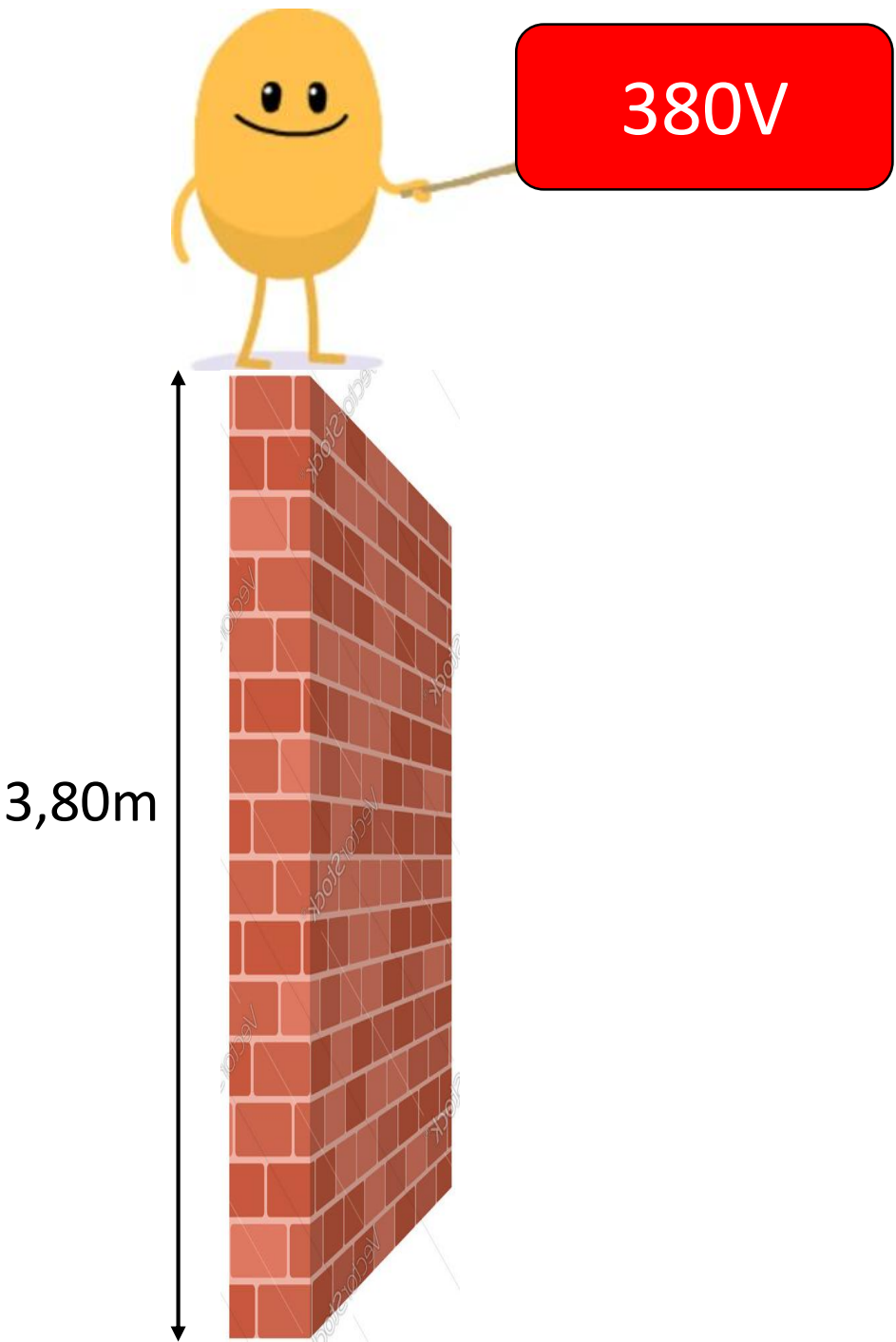
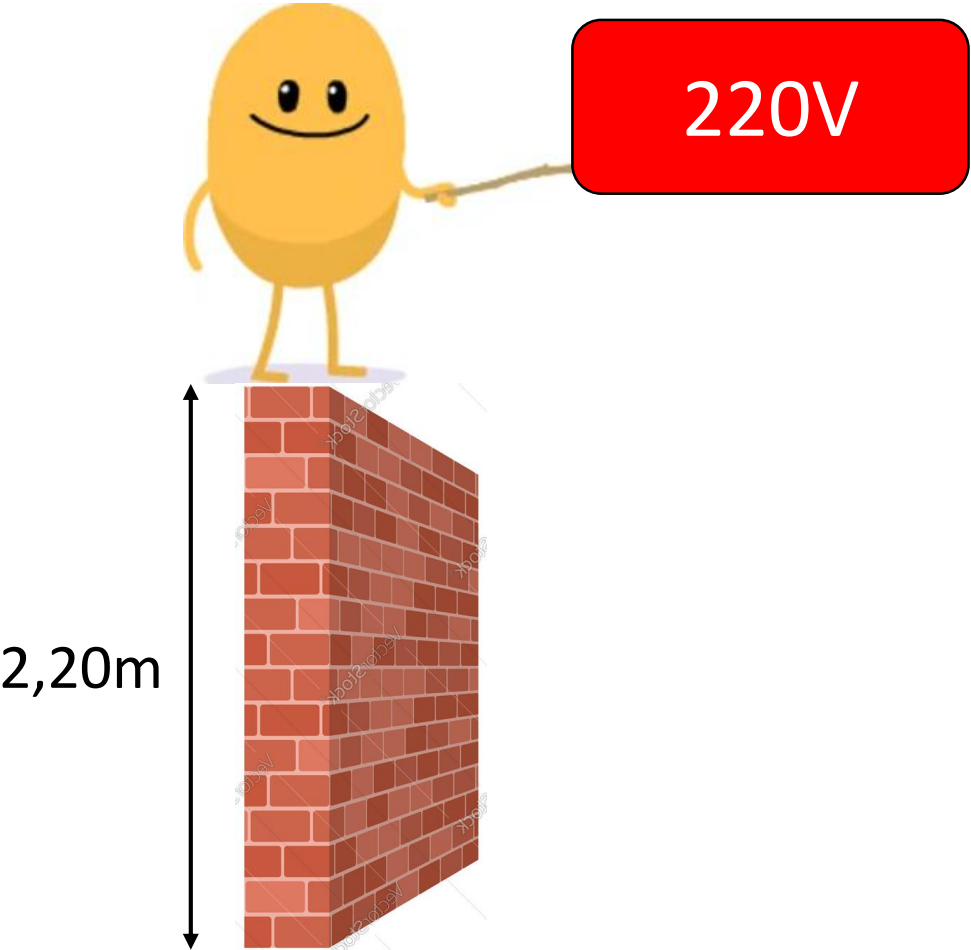
Tensión



Diferencia de potencial eléctrico entre dos puntos



Diferencia de potencial



Corriente

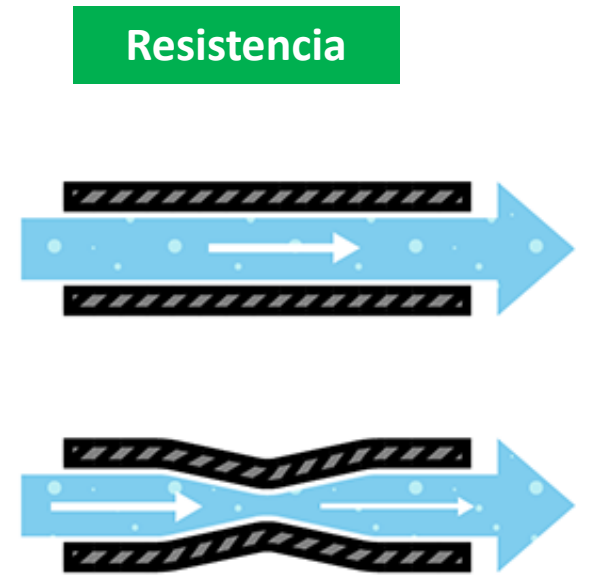
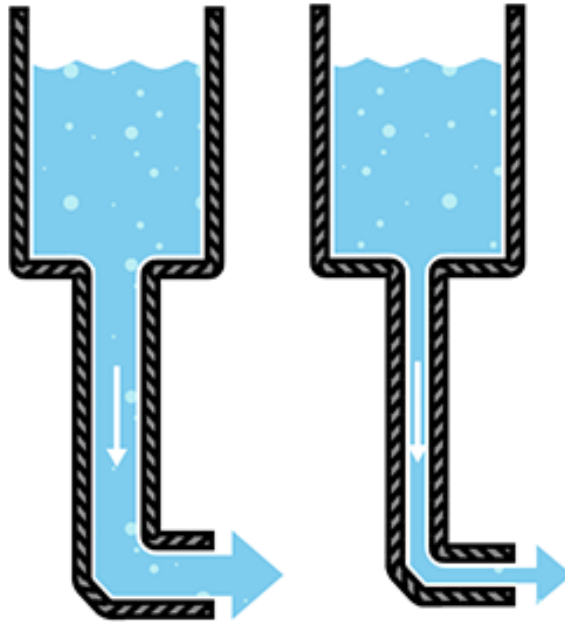
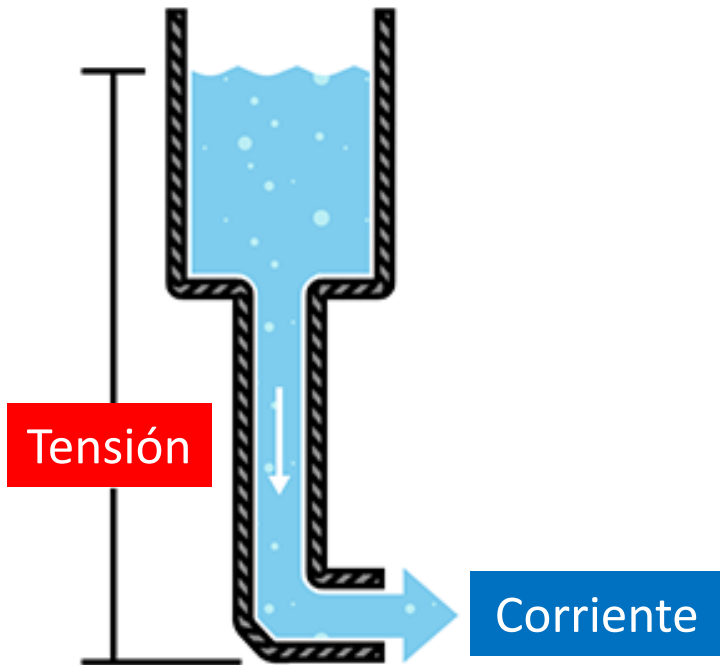


Flujo de electrones por un conductor por unidad de tiempo

Oposición al flujo de corriente eléctrica a través de un conductor

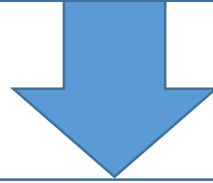


Resistencia



Ley de Ohm

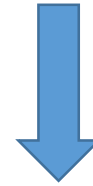
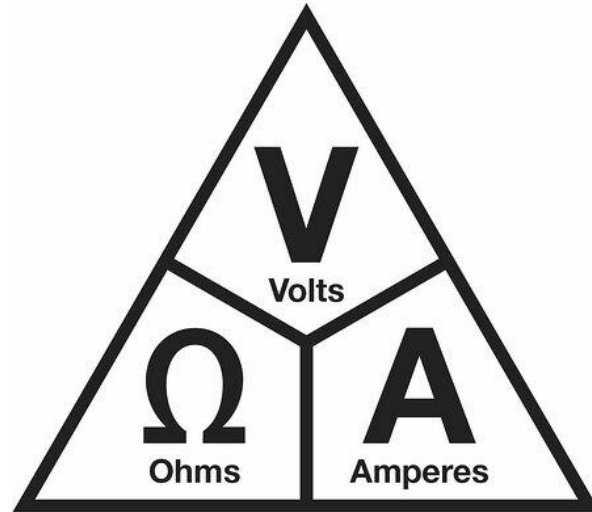
$$\text{Caudal de Agua} = \frac{\text{Altura del Agua}}{\text{Rugosidad de la Tuberia}}$$



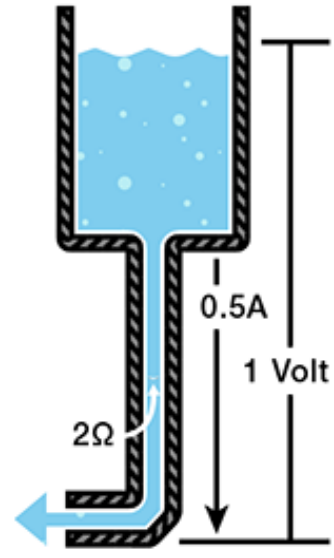
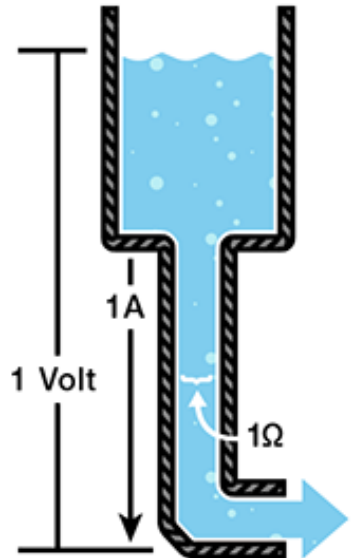
$$\text{Corriente} = \frac{\text{Diferencia de Tensión}}{\text{Resistencia}}$$



$$V = I \cdot R$$



$$R = \frac{V}{I}$$



Ley de Ohm

$$V = I \cdot R$$

$$I = \frac{V}{R}$$

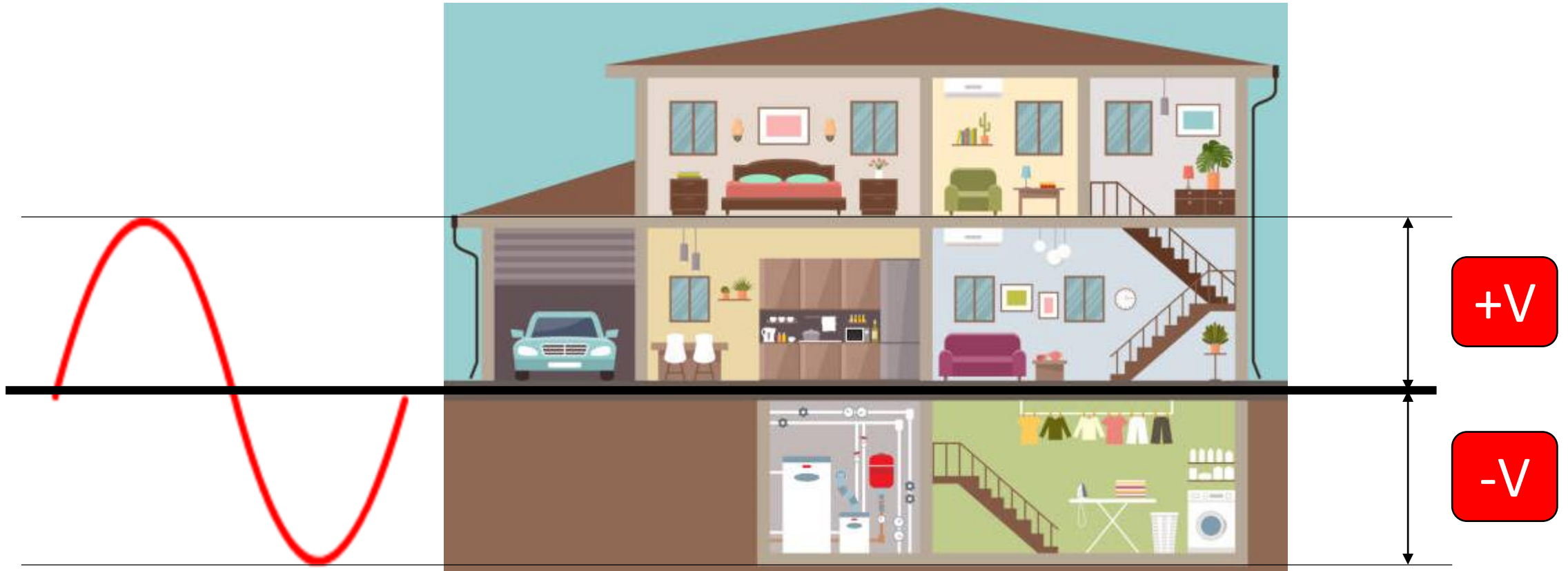
$$R = \frac{V}{I}$$

$$P = I \cdot V$$

$$P = \frac{V^2}{R}$$

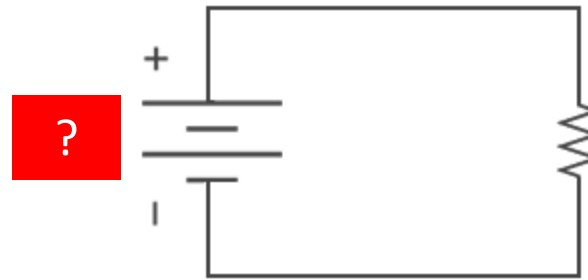
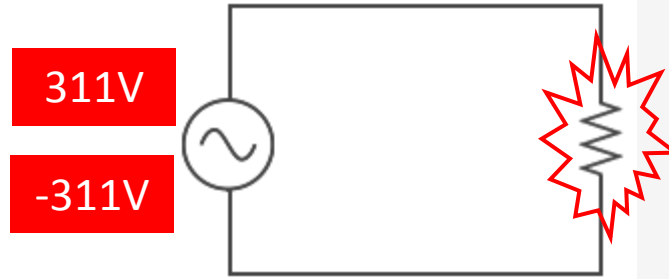
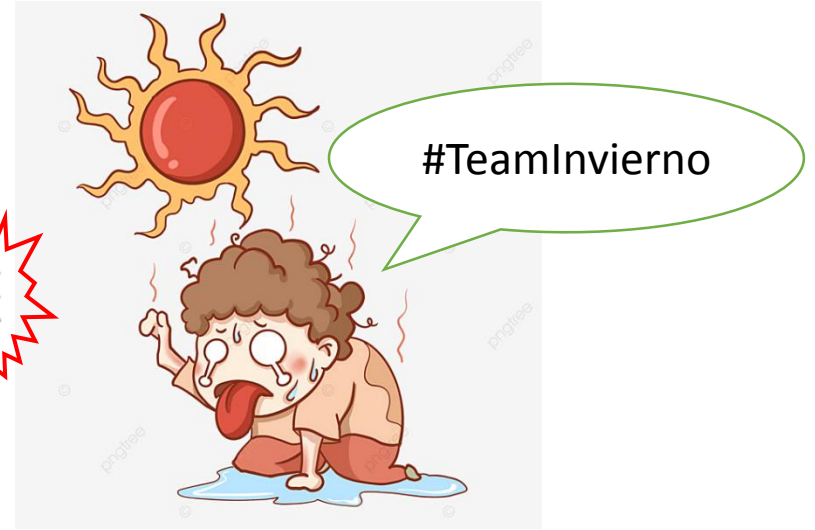
$$P = I^2 \cdot R$$

Tensión Alternada o Diferencia de potencial alterno



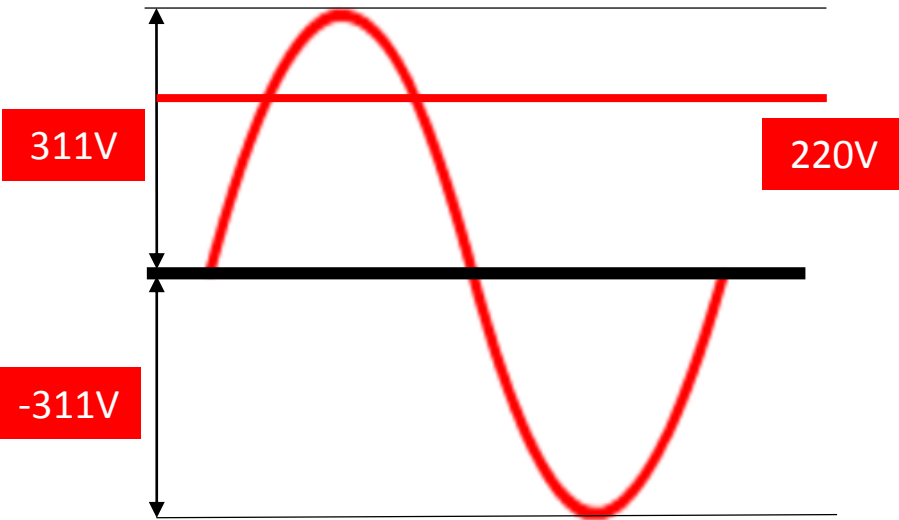
¿Qué son los 220v entonces?

Tensión R.M.S o “Tensión Eficaz”



$$V_{equivalente} = \frac{V_{pico}}{\sqrt{2}} = V_{RMS}$$

R.M.S = *Root Mean Square*



$$\frac{V_{pico}}{\sqrt{2}} = \frac{311V}{\sqrt{2}} = 220V$$

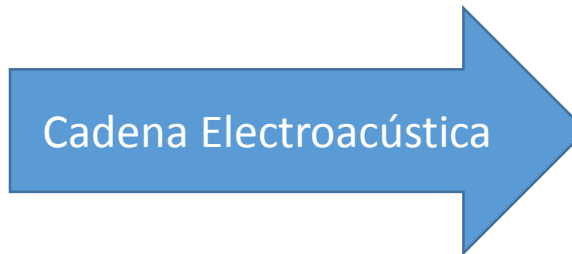
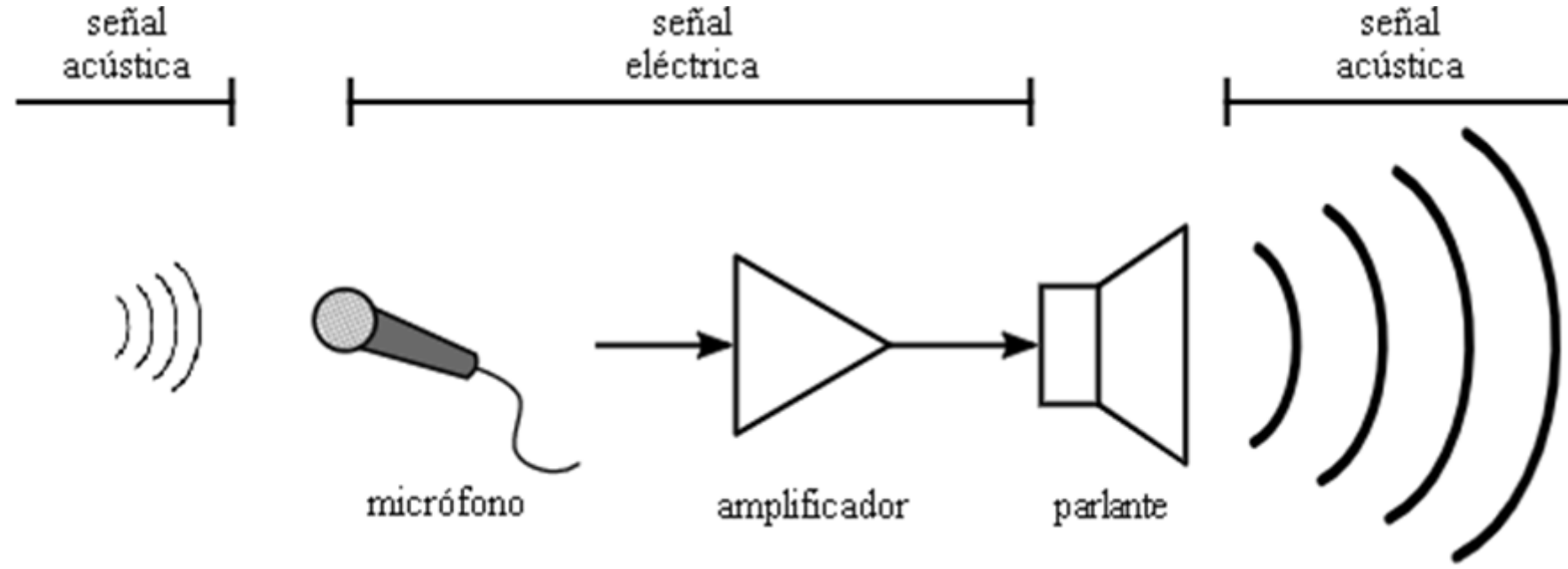
¿Quién se encarga del sonido?

Probabilidad 1 Especialista 3-5%

Probabilidad 2 Yo conozco a... 60-80%

Probabilidad 3 Se puede hacer
cargo usted? 20-40%

Cadena Electroacústica

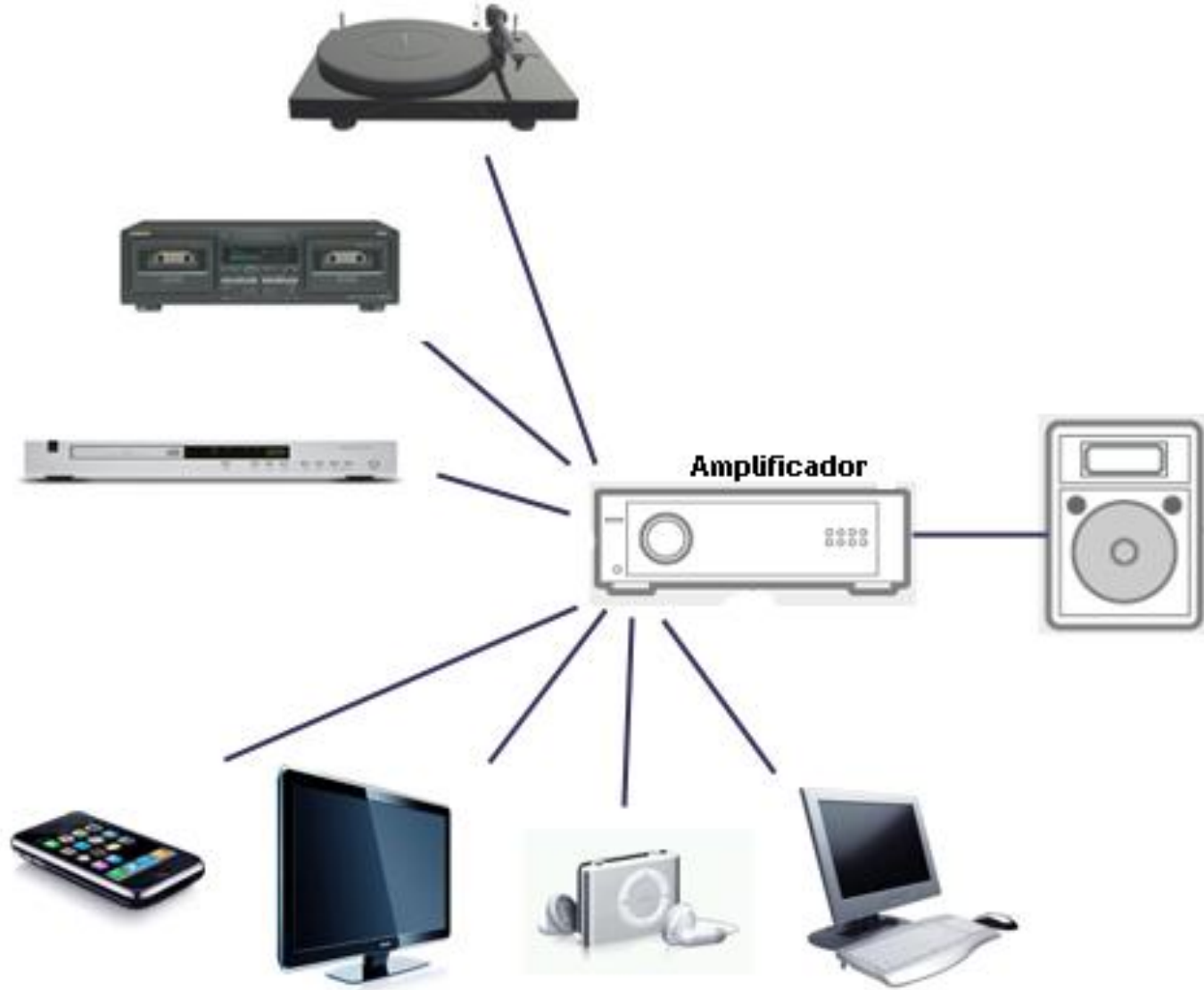
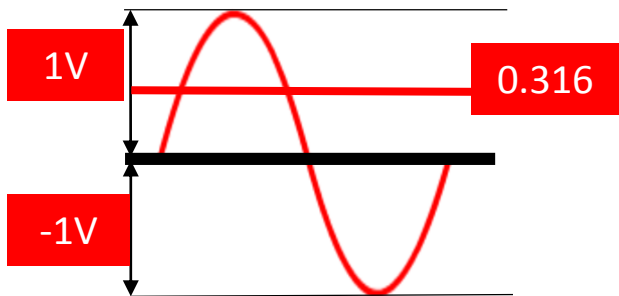


Señales de Entrada

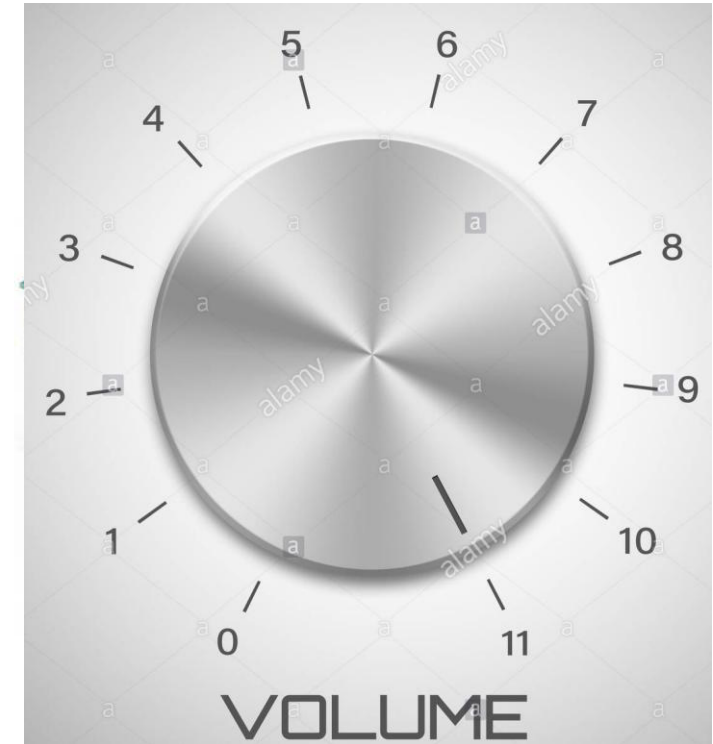
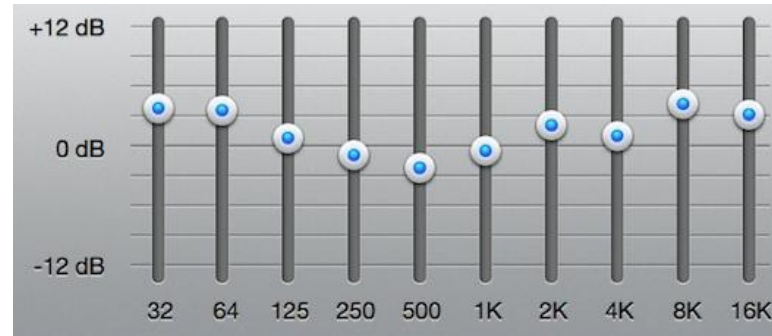
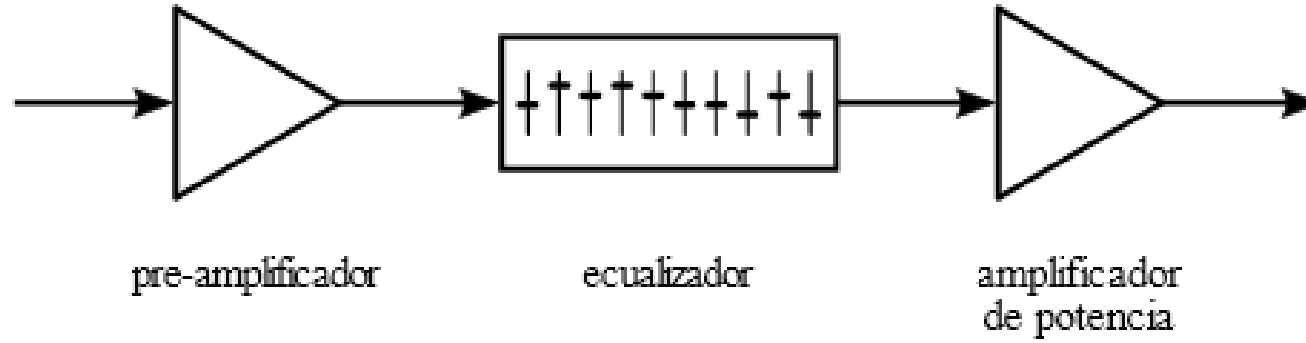


Señales
sonoras
muy
pequeñas

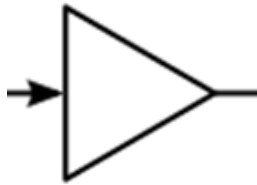
$$V_{RMS} = 0.316 V_{RMS}$$



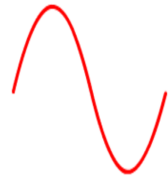
Amplificador de potencia



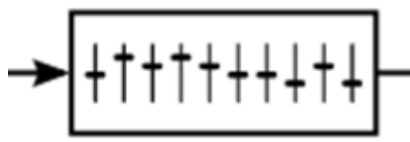
Repaso de lo visto hasta ahora



pre-amplificador



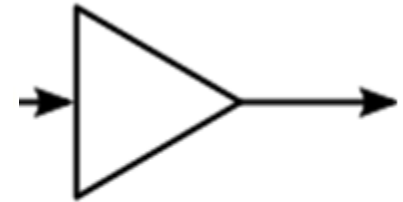
$0.316 V_{RMS}$



ecualizador



$0.353 V_{RMS}$

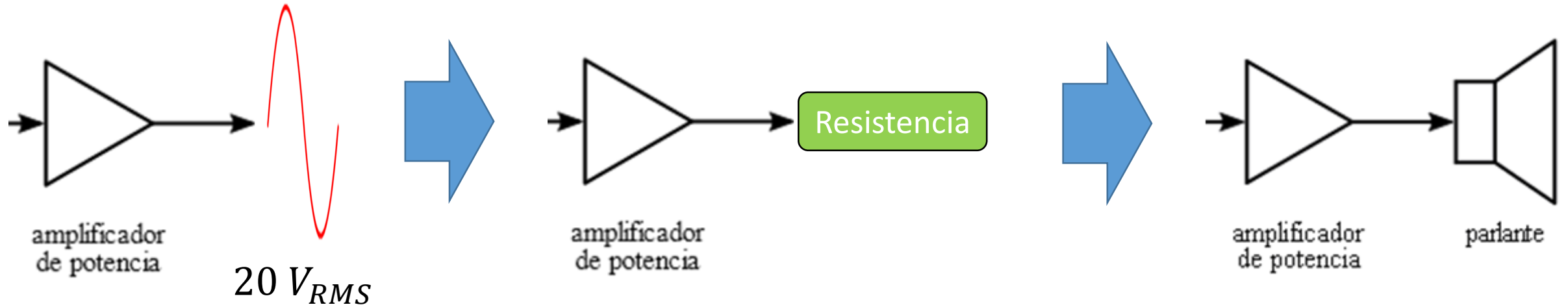


amplificador de potencia



$20 V_{RMS}$

Potencia de un Amplificador

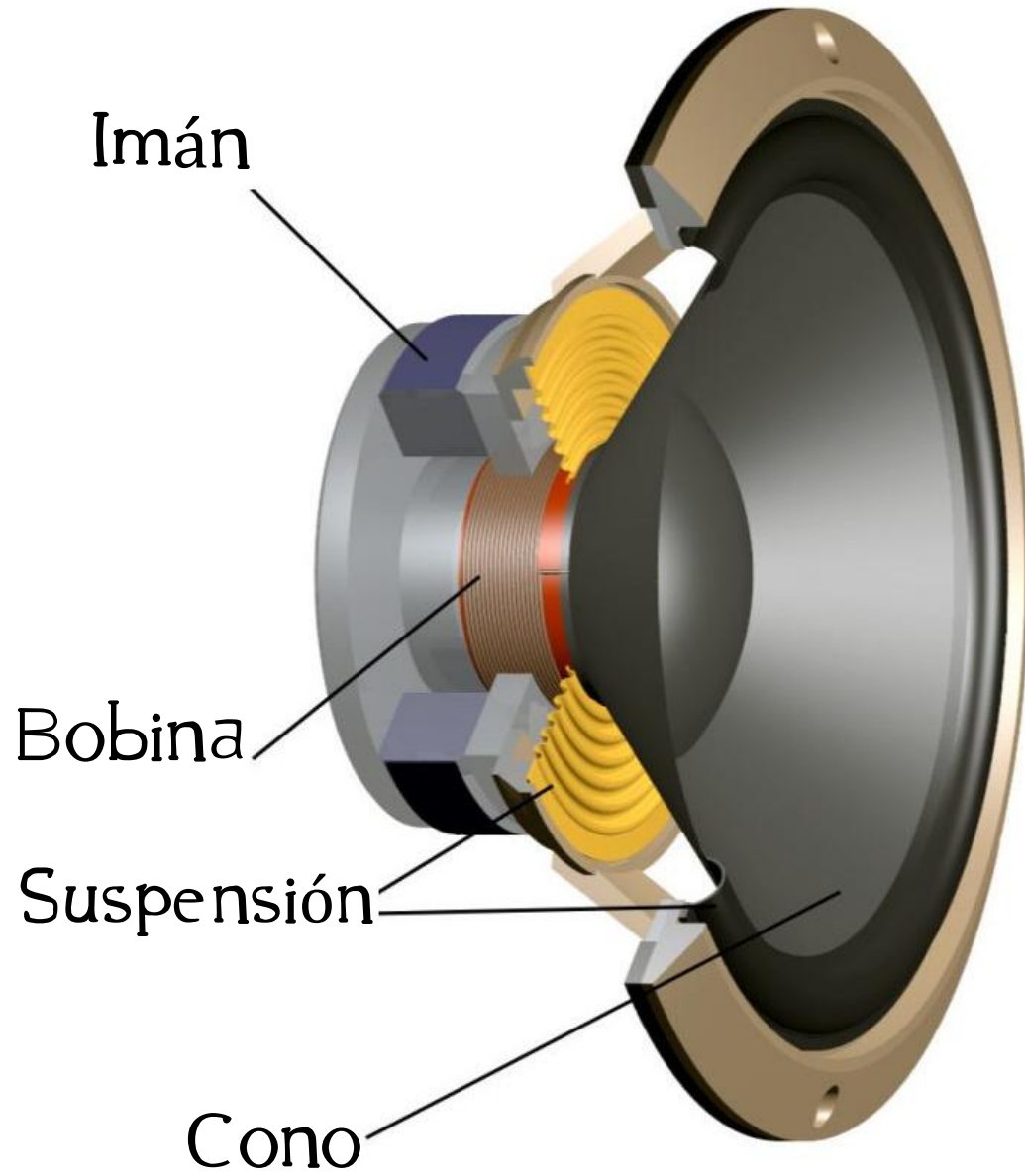


$$Potencia = \frac{(V_{RMS})^2}{R} [W]$$

$$V_{RMS} \rightarrow \boxed{W_{RMS}}$$



Parlantes



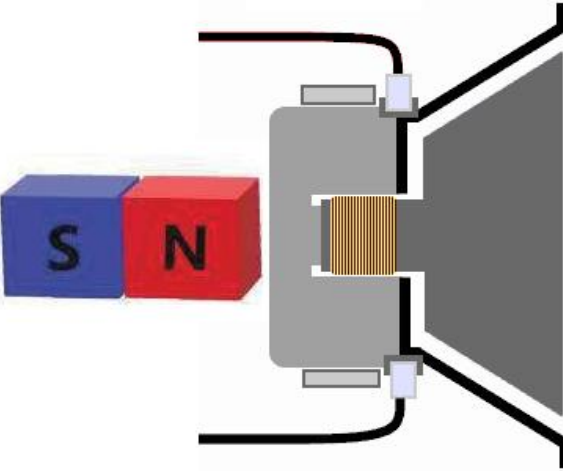
Imán



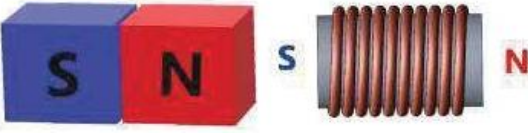
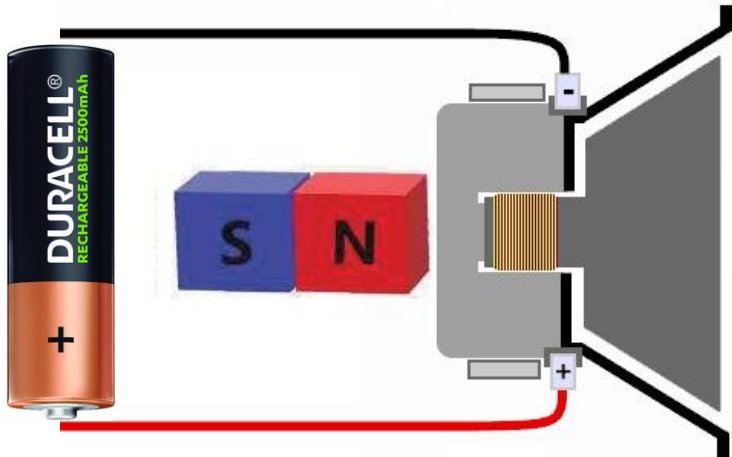
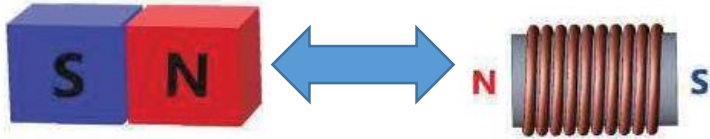
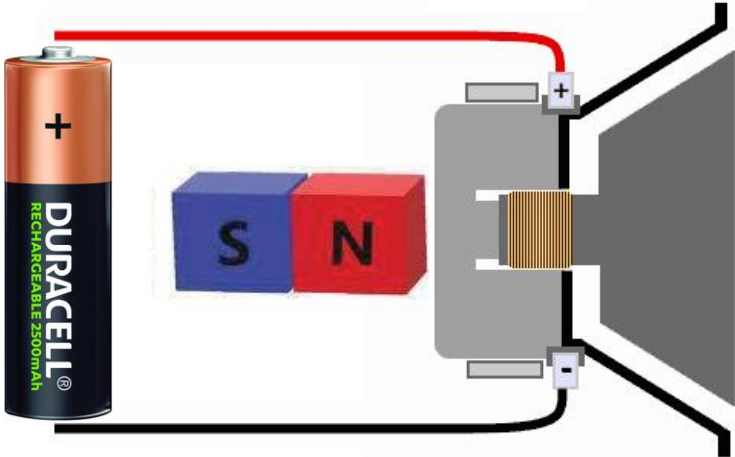
Bobina

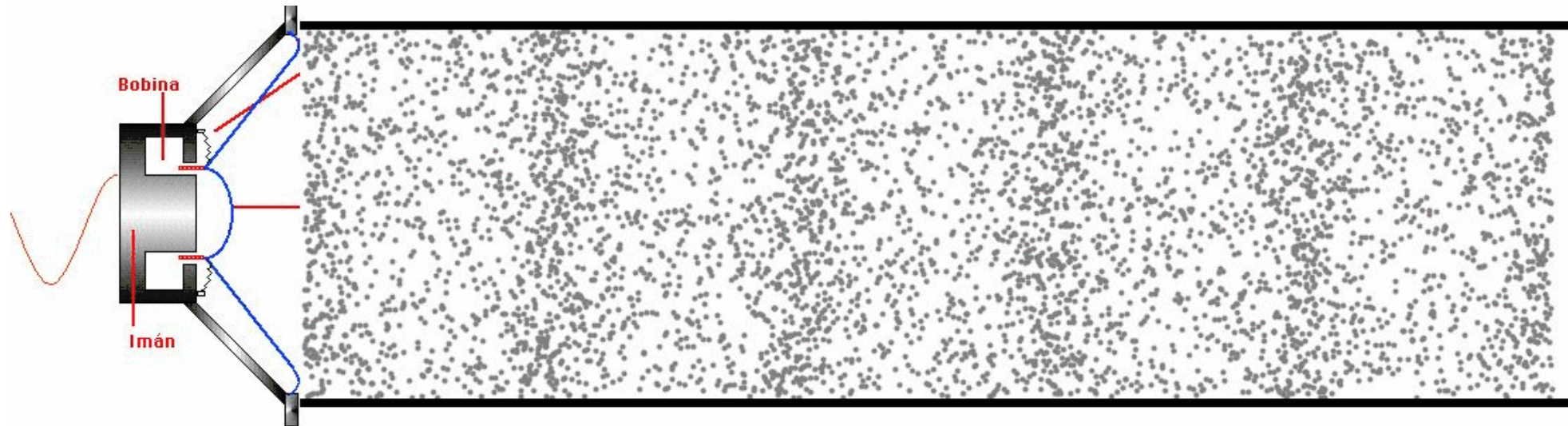


Funcionamiento

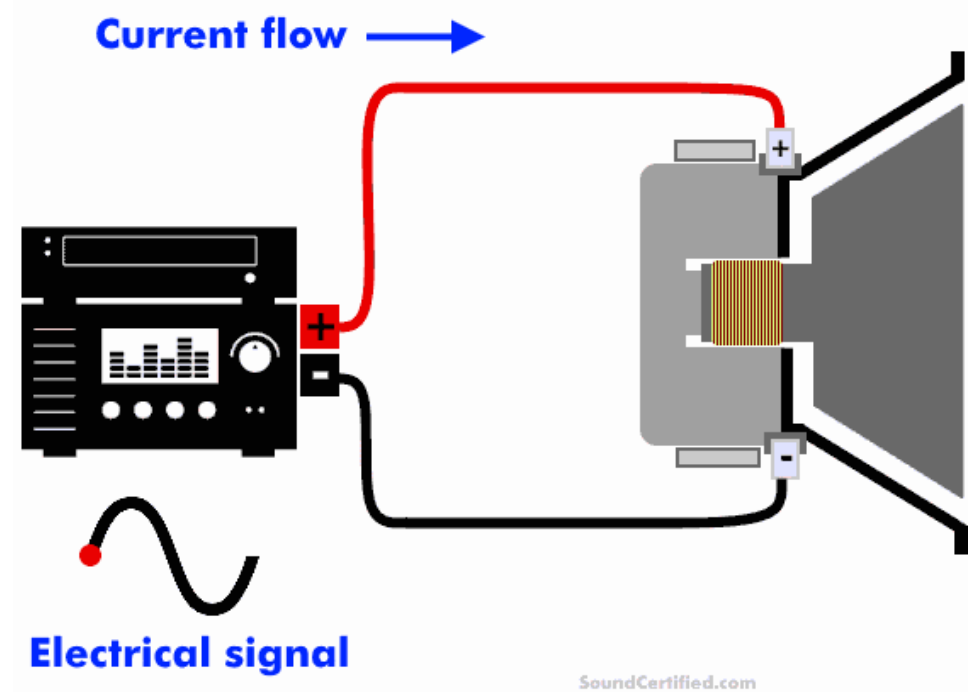
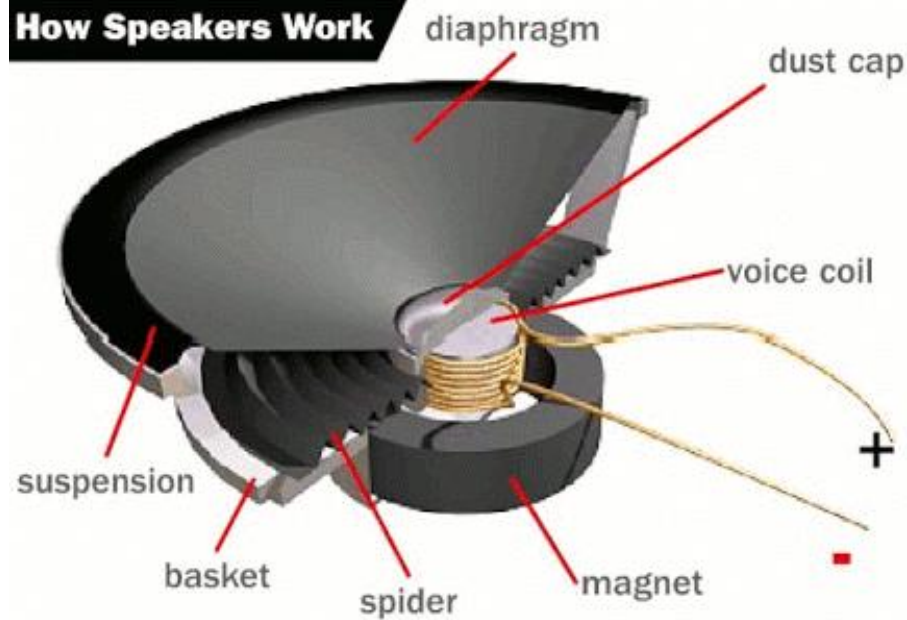


Sin Señal





How Speakers Work



Características

Impedancia "Z"

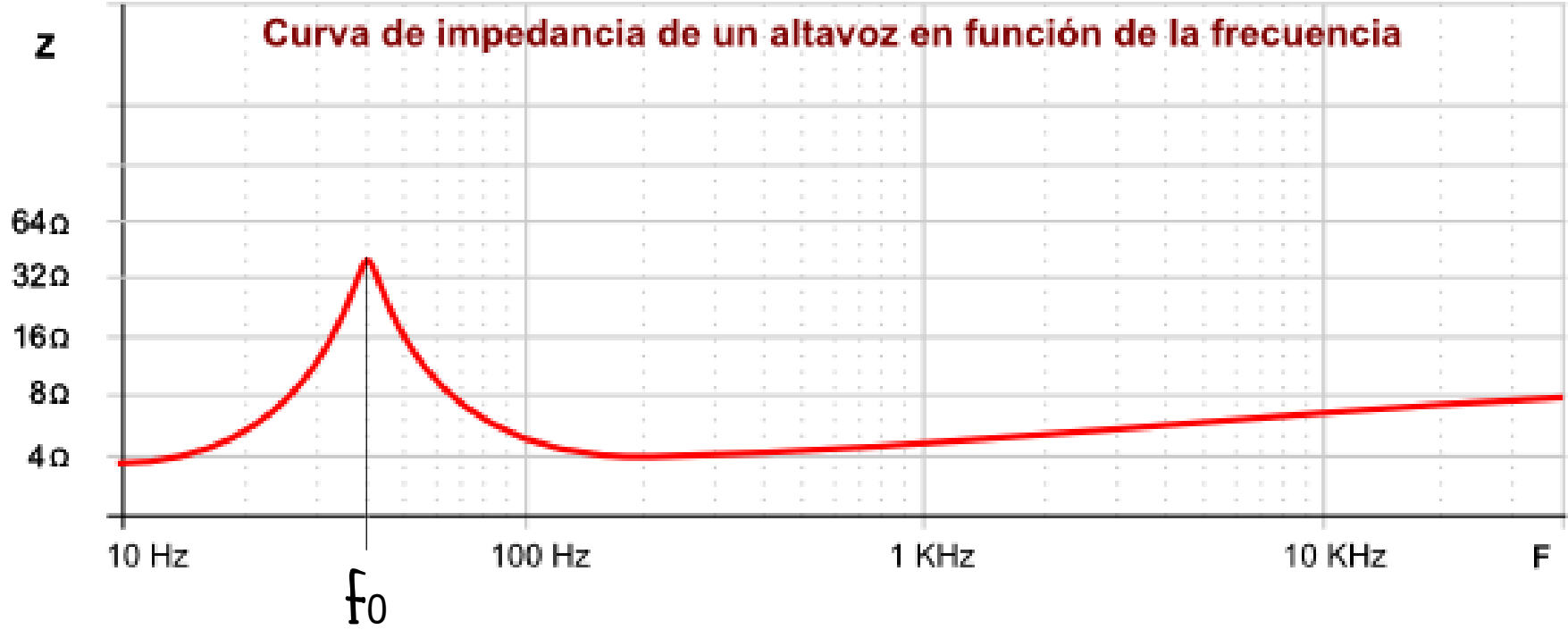
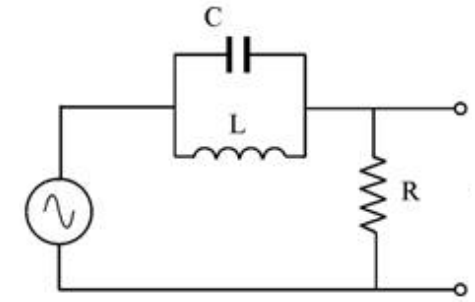
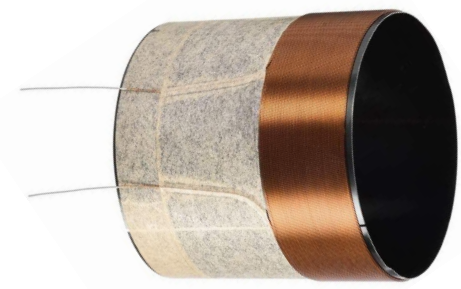
4 Ohm

8 Ohm

16 Ohm

$$Z = R + X$$

Resistencia + Reactancia



Potencia y Sensibilidad



Watts RMS es la potencia ELÉCTRICA que SOPORTA un parlante antes de quemarse



Sensibilidad



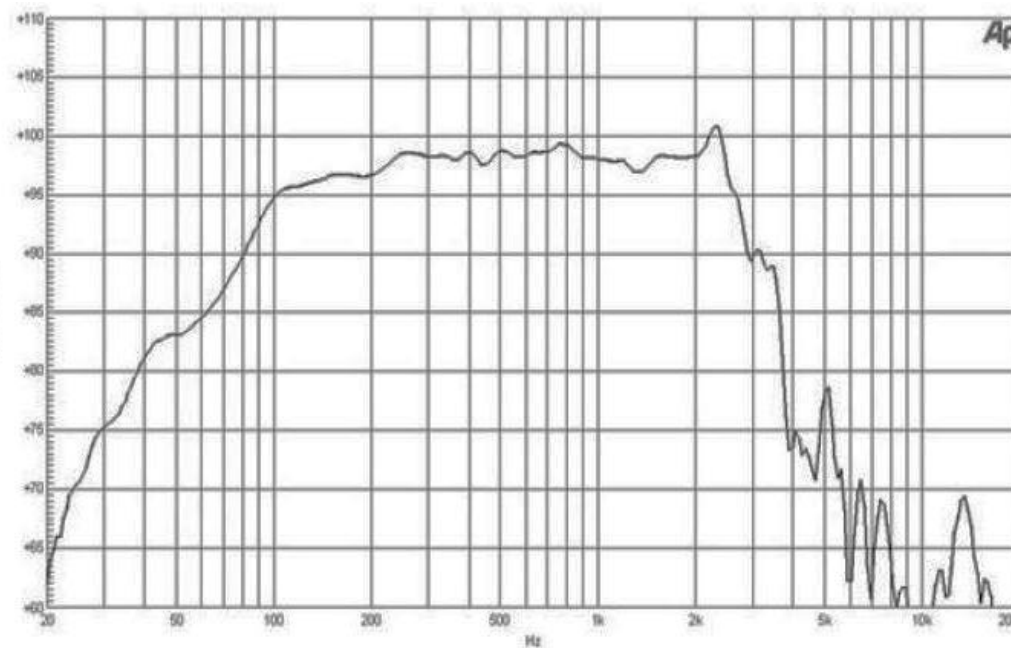
Capacidad de un parlante de transformar
POTENCIA ELECTRICA
en
INTENSIDAD SONORA

dB con $1W_{rms}$ a 1metro

Respuesta en Frecuencia



B&C 15HPL76w



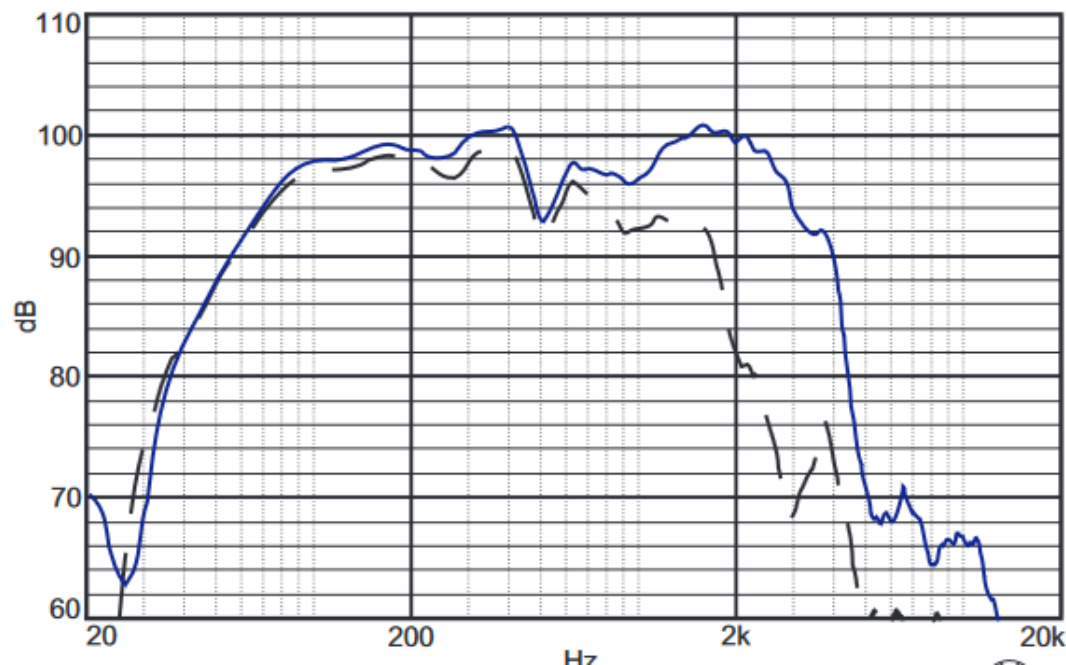
4 Ohm

350W

99dB



Selenium 15PW6



8 Ohm

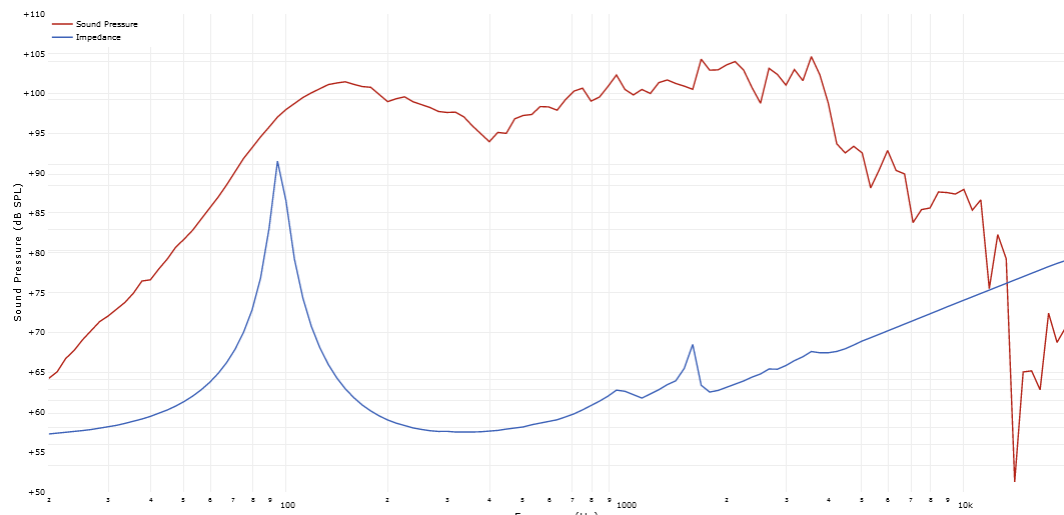
400W

97dB

Respuesta en Frecuencia



Jensen 12-70



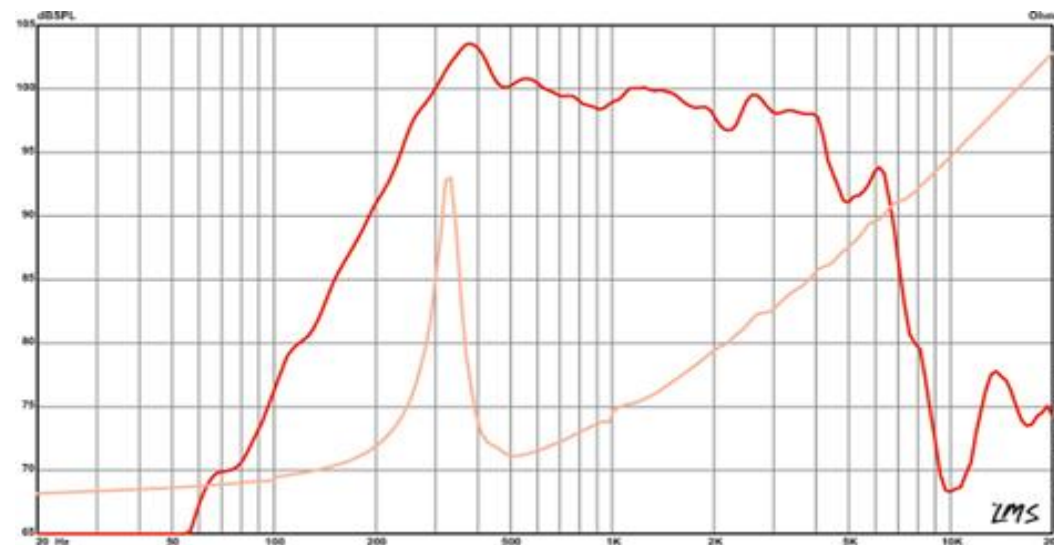
8 Ohm

70W

97dB



Eminence Beta 10 CBMRA



8 Ohm

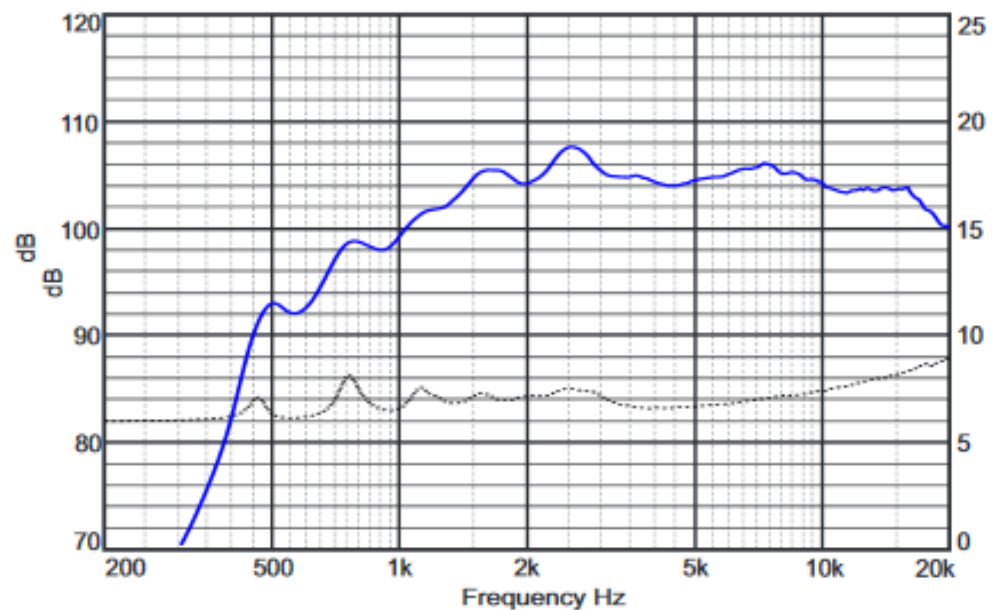
200W

99.6dB

Respuesta en Frecuencia



JBL D202TI



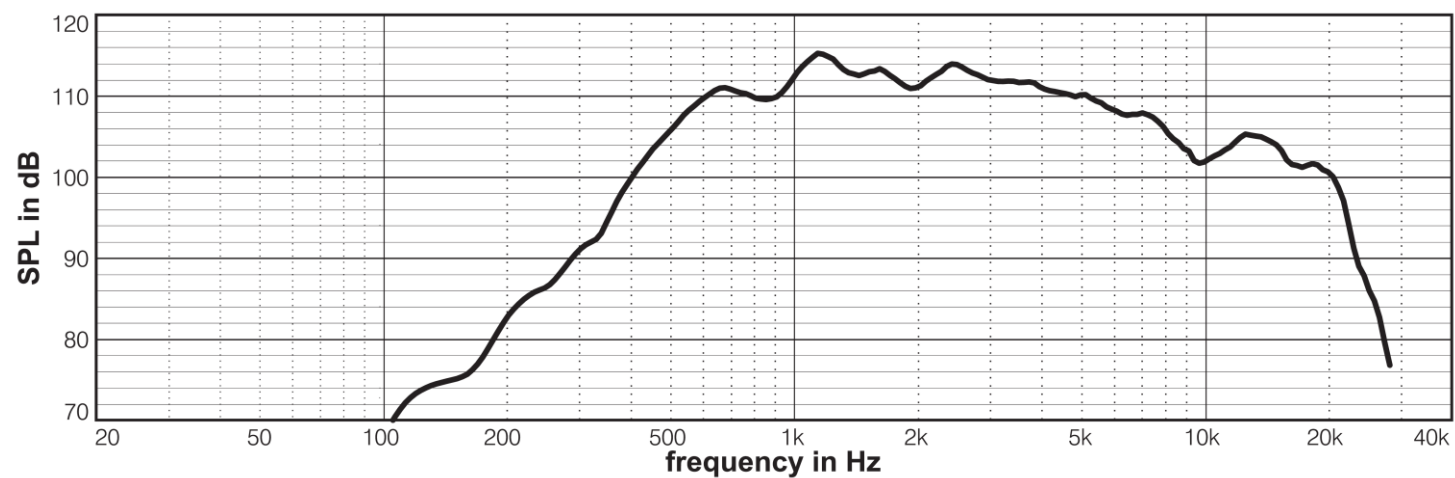
8 Ohm

60W

106dB



D.A.S K-8



16 Ohm

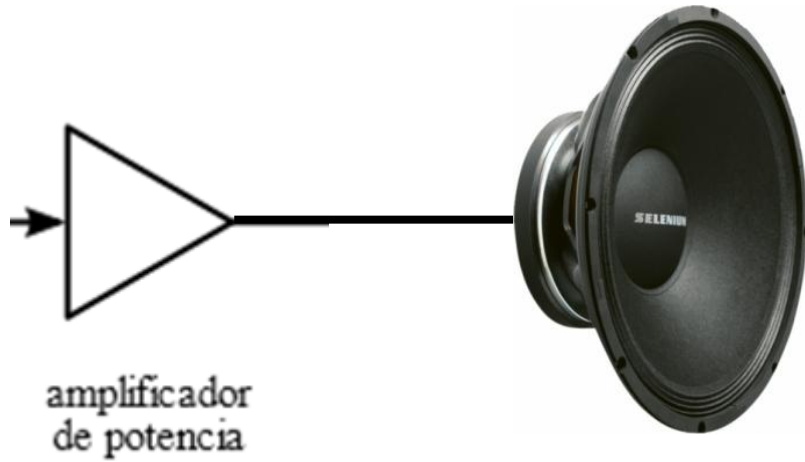
125W

110dB

Cornetas para Drivers



¿Cuánto sonará un parlante?



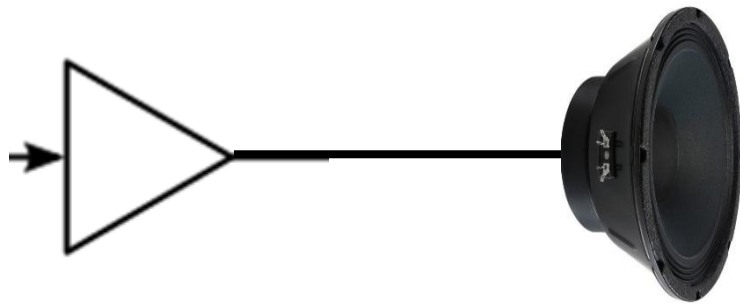
amplificador
de potencia

400 W_{RMS} 8 Ohm, 400W y 97dB

$$1W \rightarrow 97dB \quad L_{[SPL]} = 10 \log \frac{400W}{1W} = 26dB$$

Máximo
Volumen

$$\rightarrow 97dB + 26dB = \boxed{123dB}$$



amplificador
de potencia

8 Ohm, 200W y 99.6dB

$$1W \rightarrow 99.6dB \quad L_{[SPL]} = 10 \log \frac{200W}{1W} = 23dB$$

Máximo
Volumen

$$\rightarrow 99.6dB + 23dB = \boxed{122,6dB}$$

400 W_{RMS}

¿Cuánto sonará un parlante?

8 Ohm, 400W y 97dB



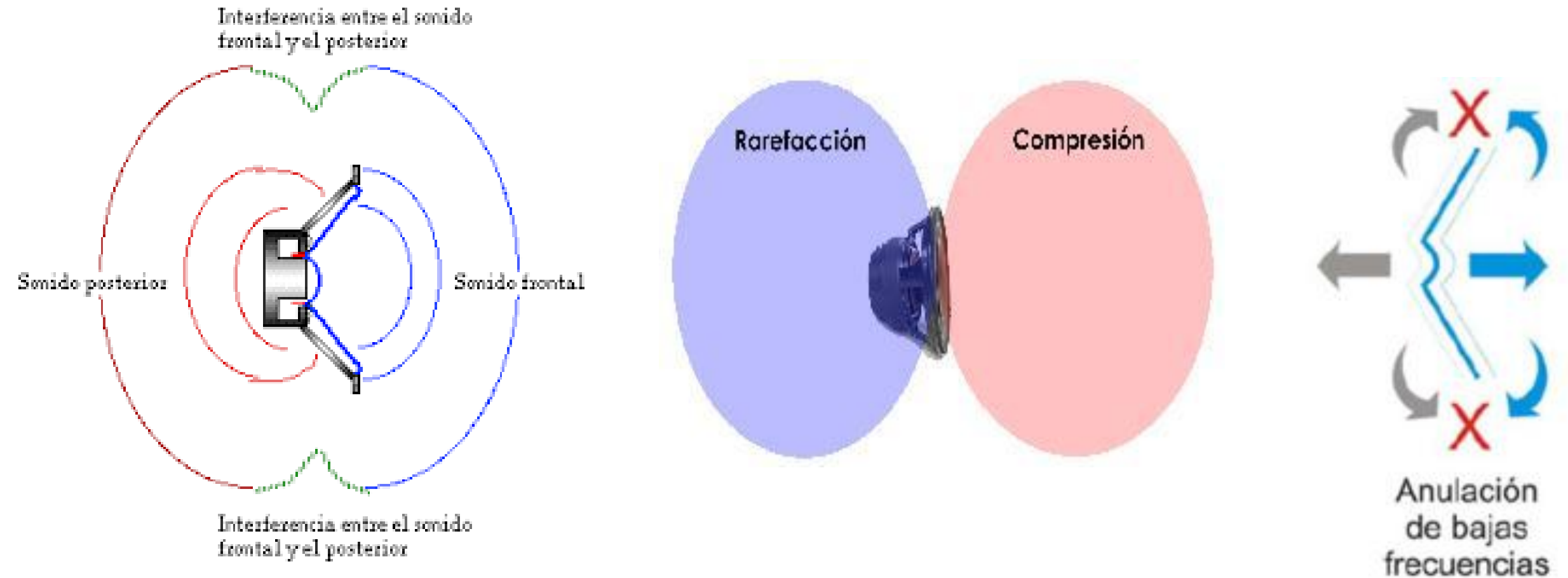
$5 W_{RMS}$

$$1W \rightarrow 97dB \quad L_{[SPL]} = 10 \log \frac{5W}{1W} = 7dB$$

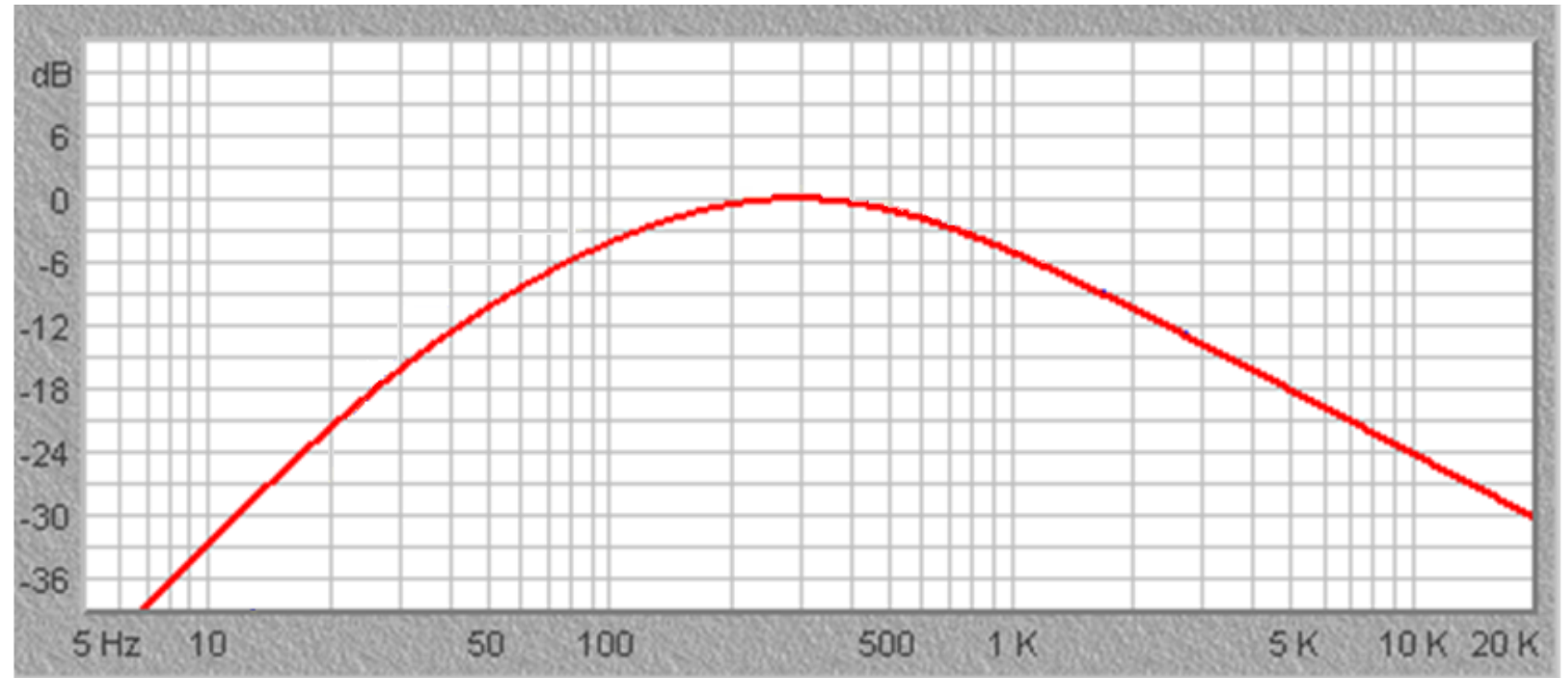
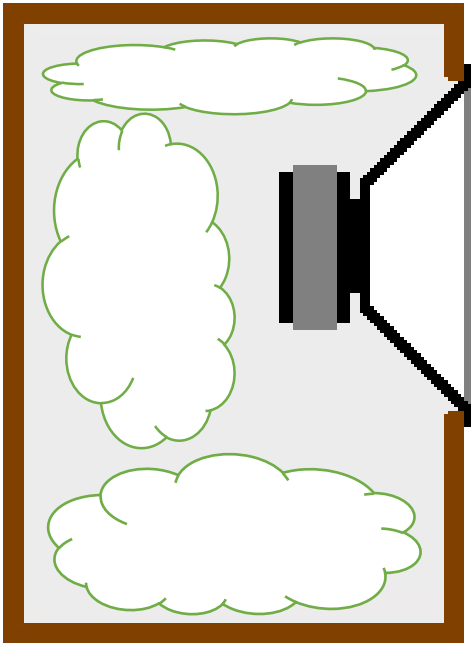
$$\boxed{\text{Máximo Volumen}} \rightarrow 97dB + 7dB = \boxed{104dB}$$

Gabinete Acústico o "Baffle"

Cortocircuito Acústico

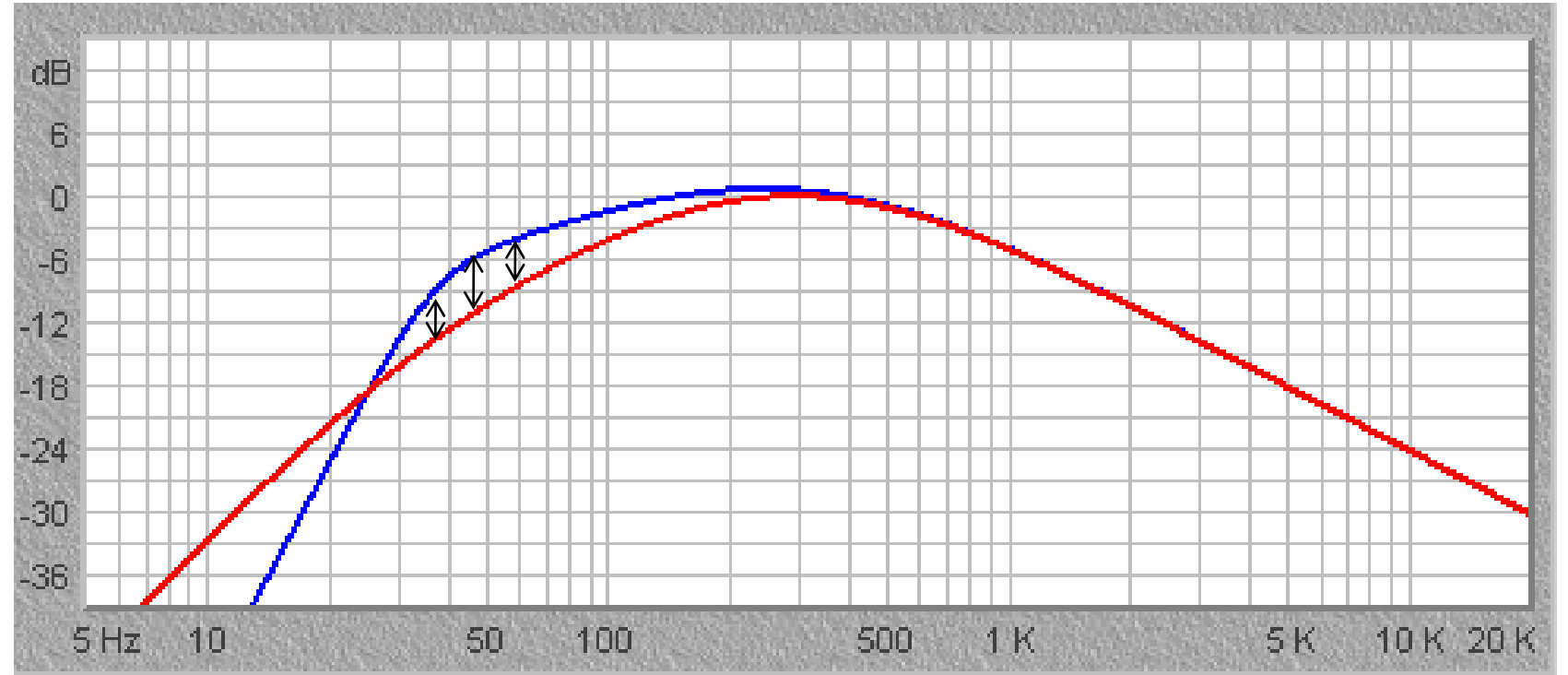
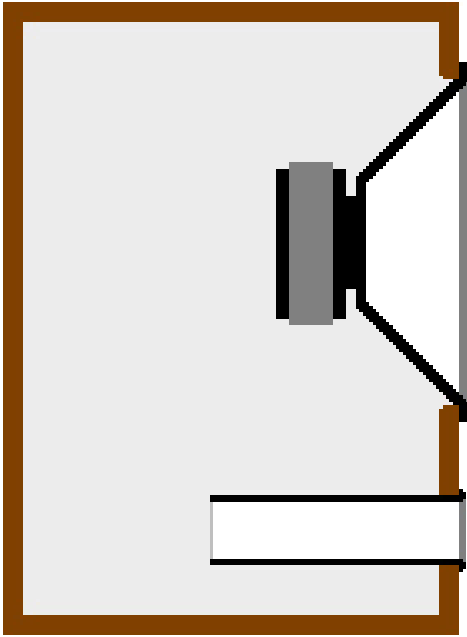


Gabinete Acústico Cerrado o “Bafle infinito”



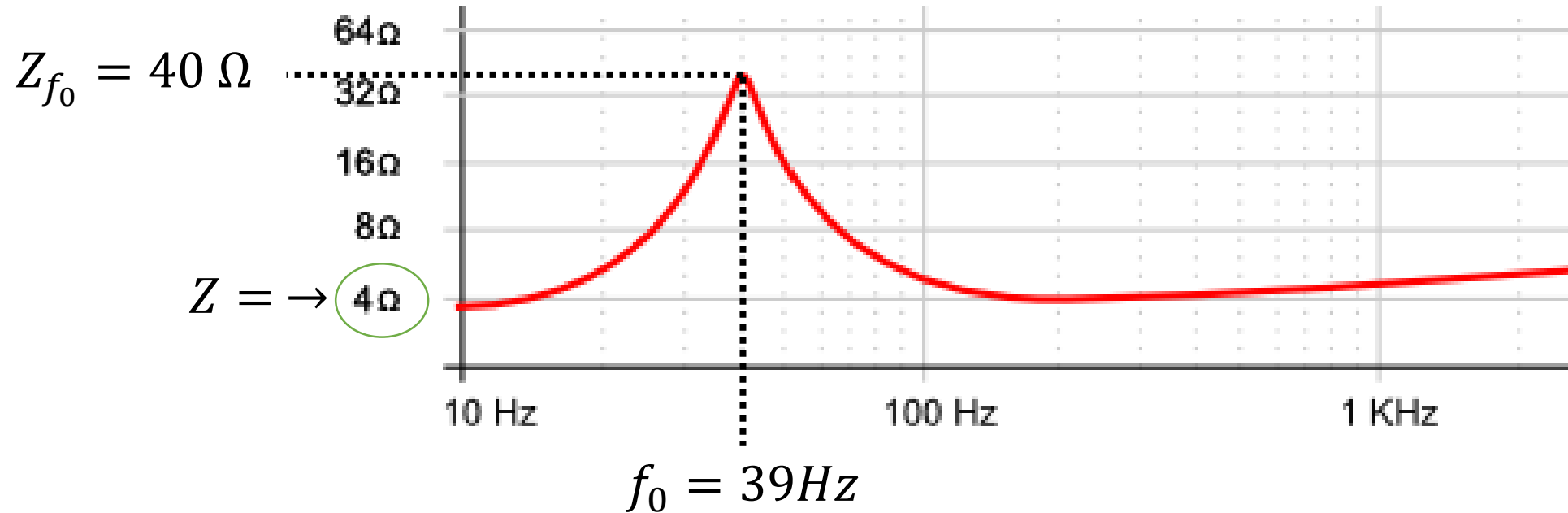
- Caja hermética
- Rellena o no con material absorbente
- Parlantes con suspensión muy blanda

Gabinete Acústico ventilado o “Bass Reflex”



- Ganancia de 6db en bajas frecuencias
- Sin material absorbente
- Mejora el Rendimiento del parlante

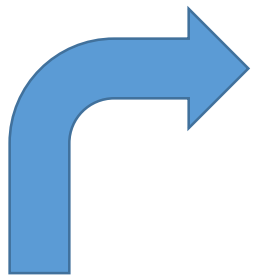
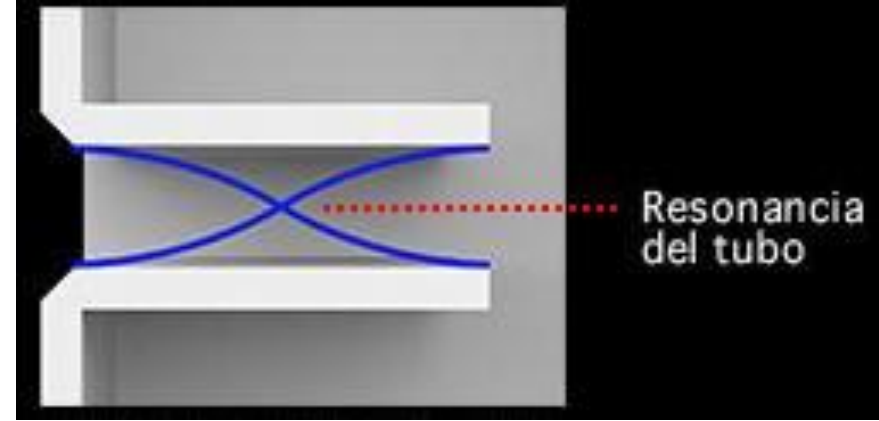
¿Cómo funciona un Gabinete Bass Réflex?



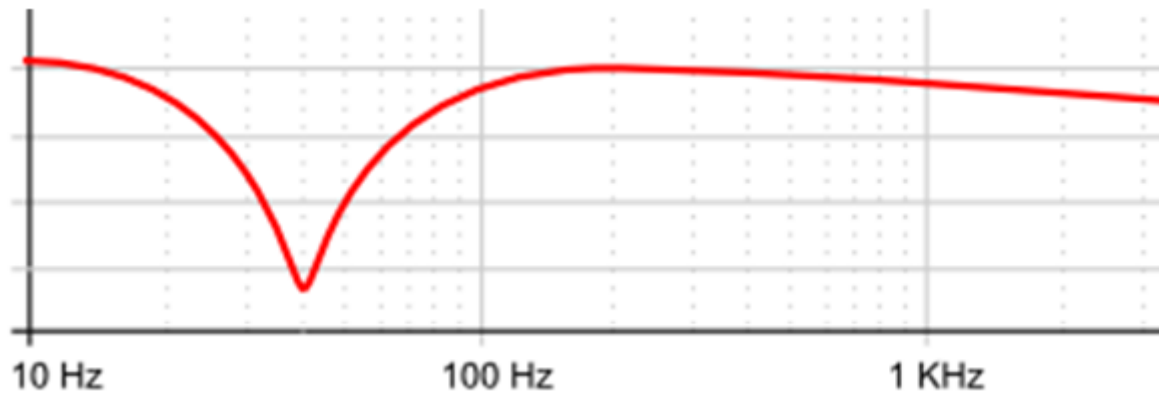
$$P = \frac{(V_{RMS})^2}{40 \Omega} = W_{RMS}$$

*En f_0 el parlante recibirá
10 veces menos potencia
del amplificador*

Tubos de Sintonía



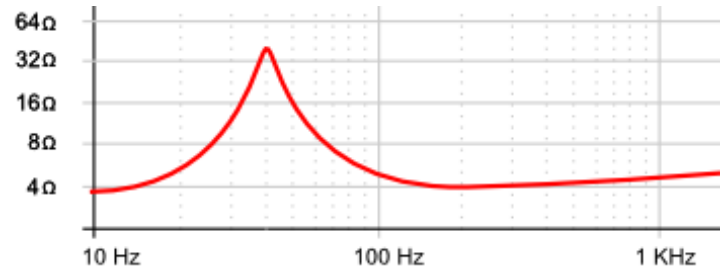
BAFLE



Sintonizamos el gabinete para que resuene a la misma frecuencia que el parlante

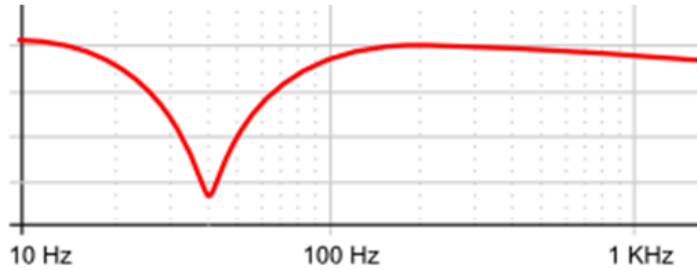
Parlante dentro de Gabinete Sintonizado

Impedancia del parlante



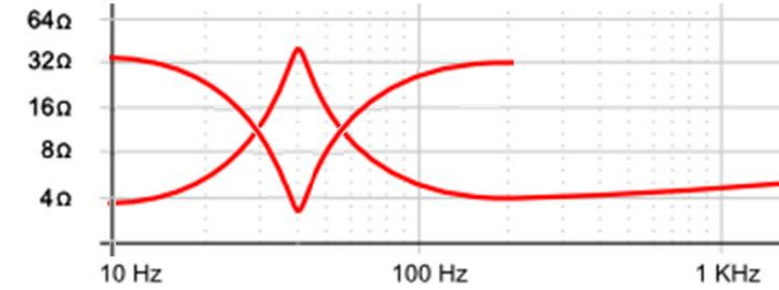
+

Impedancia del gabinete

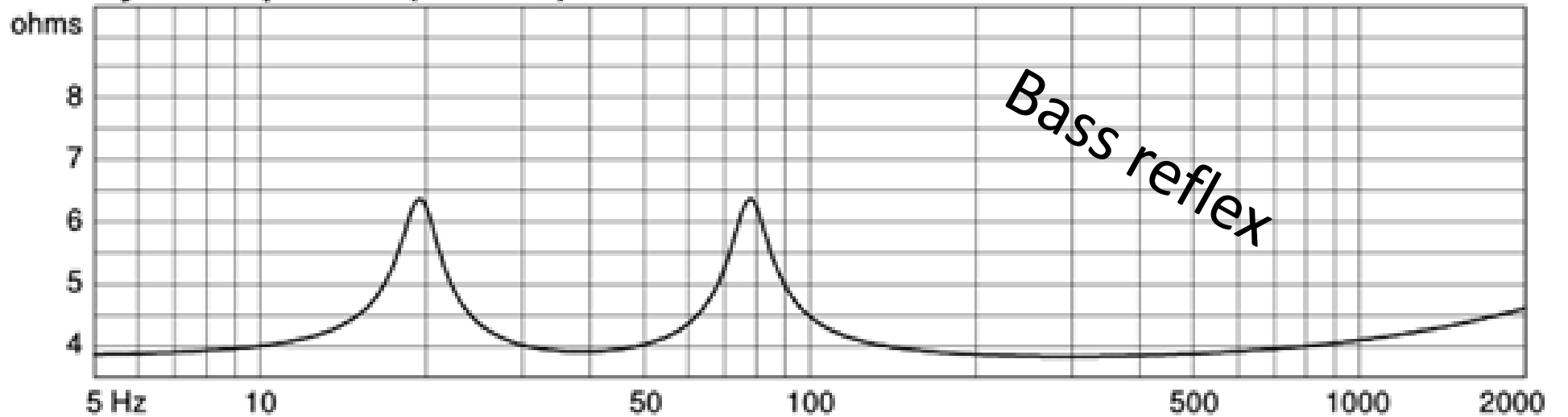


=

Impedancia del sistema

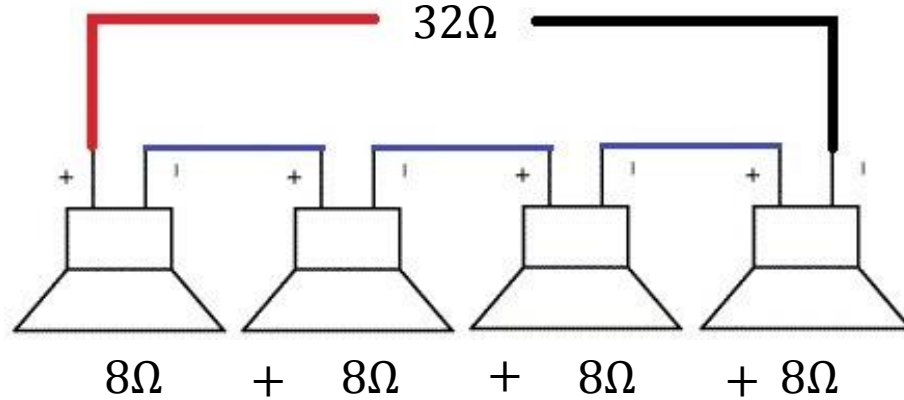


System Impedance (ohms/Hz)



Interconexión de Parlantes

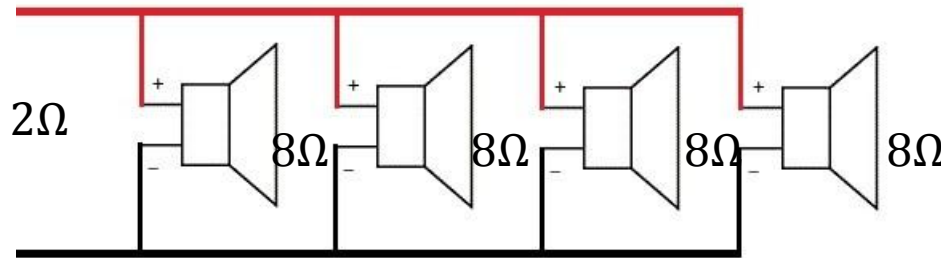
Conexión Serie



$$Z = Z1 + Z2 + Z3 + Z4$$

$$Z = 8 + 8 + 8 + 8 = 32$$

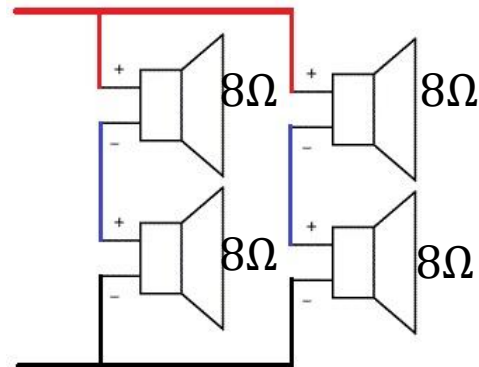
Conexión Paralelo



$$Z = \frac{1}{\frac{1}{Z1} + \frac{1}{Z2} + \frac{1}{Z3} + \frac{1}{Z4}}$$

$$Z = \frac{1}{\frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8}} = 2$$

Conexión Mixta

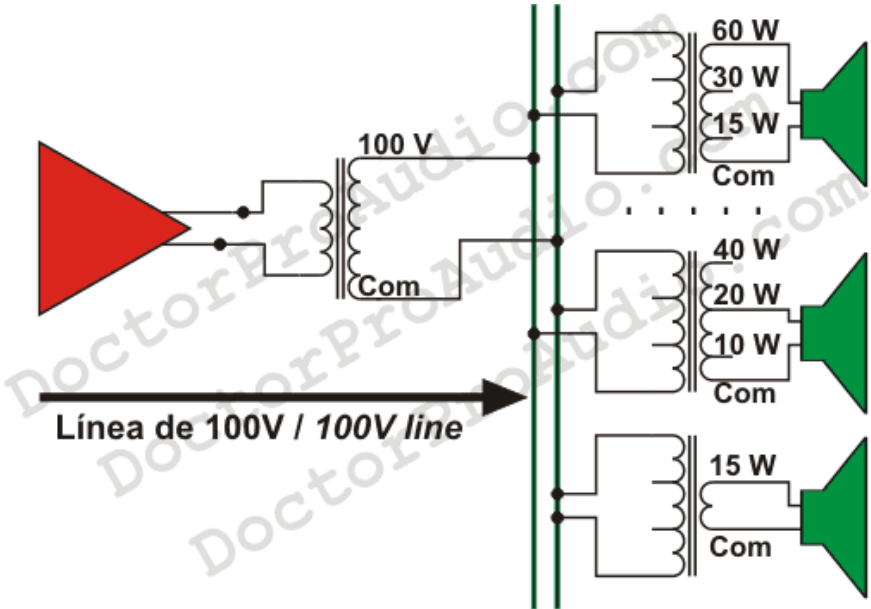
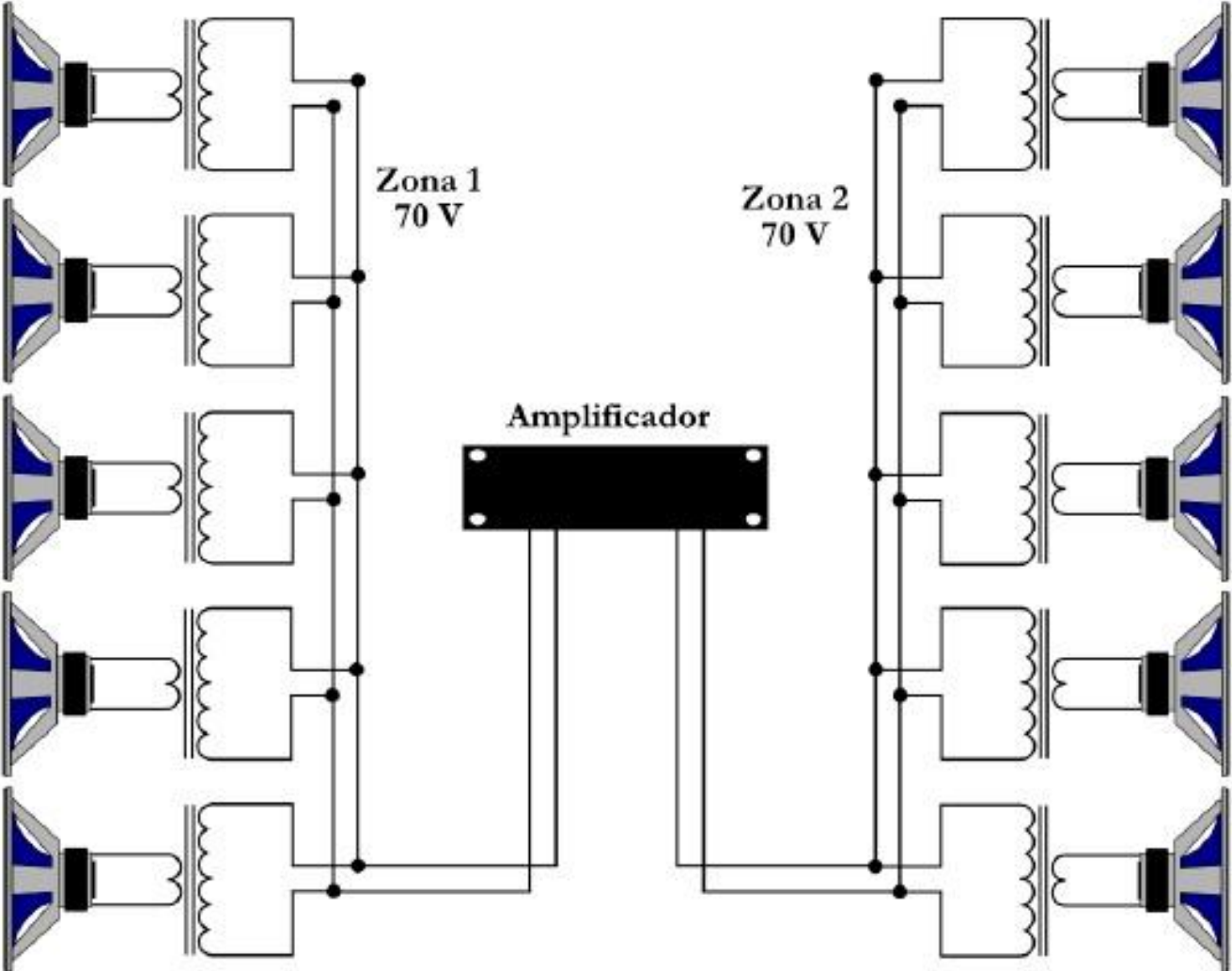


$$Z_{serie} = 8 + 8 = 16$$

$$Z_{paralelo} = \frac{1}{\frac{1}{16} + \frac{1}{16}} = 8$$

$$Z = 8$$

Conexión de parlantes con transformador



Parlantes para diseño arquitectónico

Parlantes para embutir en muros

Modelo abierto



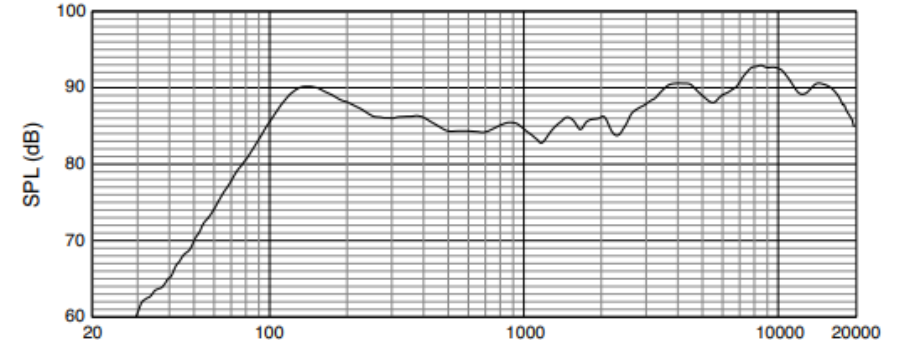
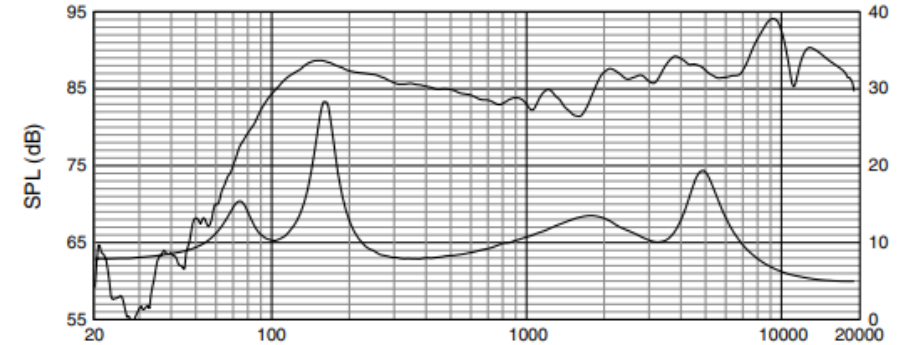
Parlantes para embutir en techos

Bass-Reflex



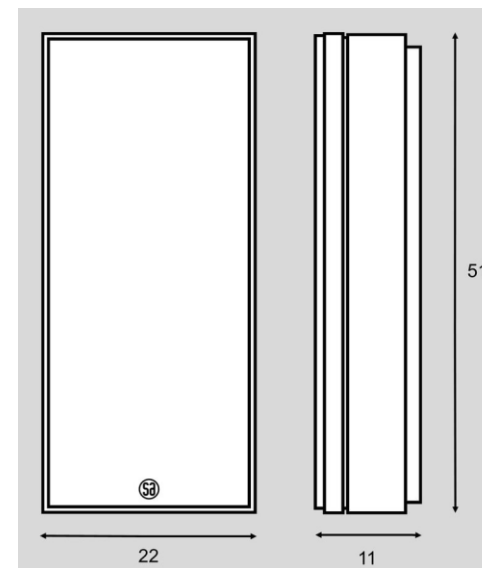
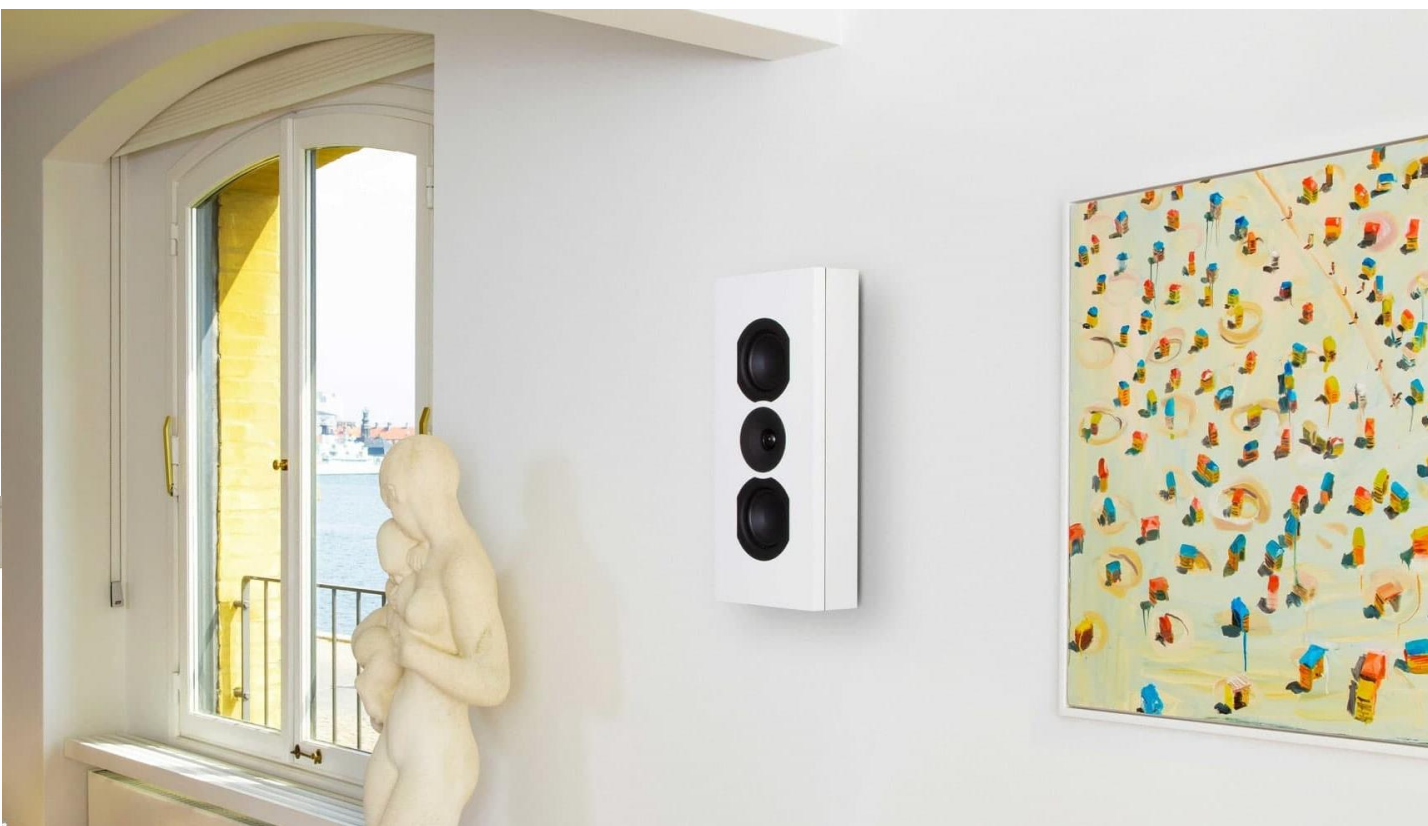
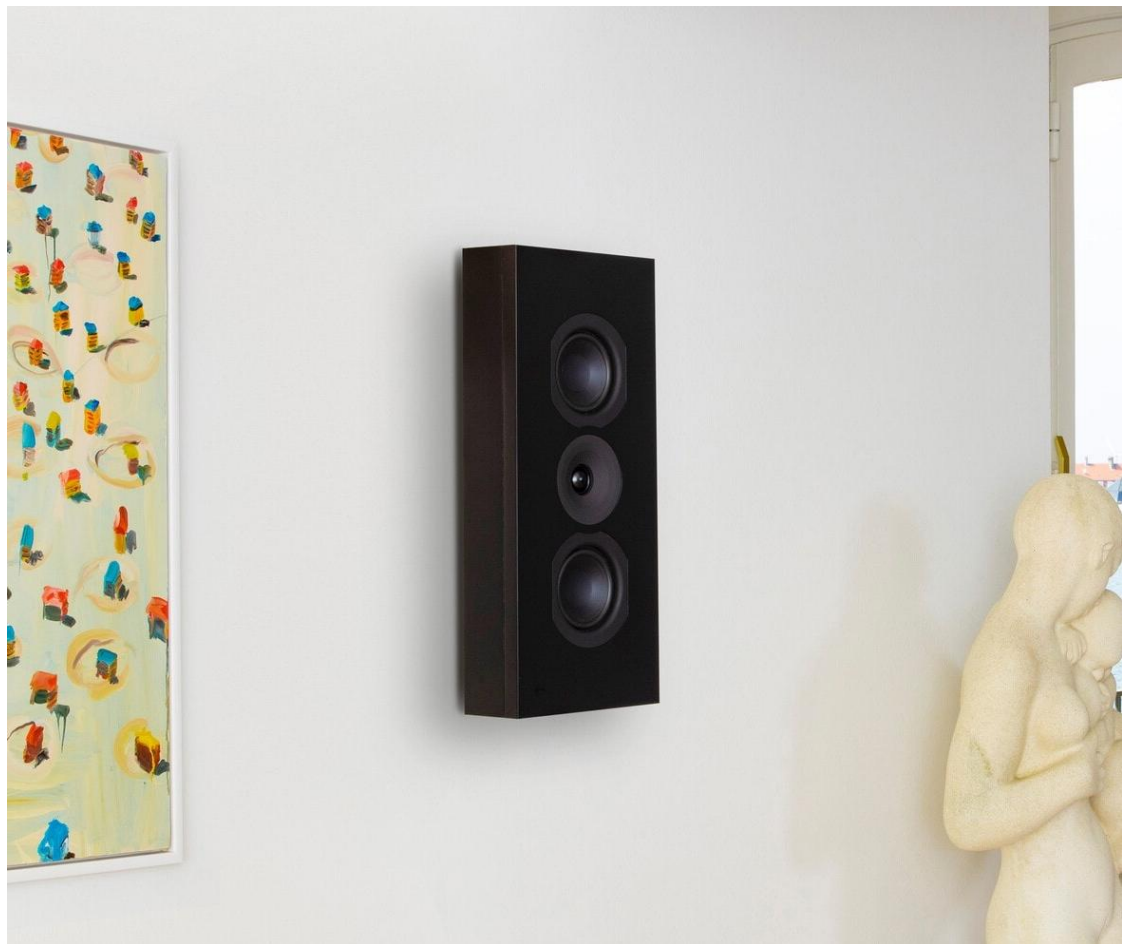
Control Series

8 ohm
30 watts RMS
87dB



Parlantes para muros

Con gabinete cerrado



SA Saxo16

SIN DATOS

Parlantes para embutir en muros

Modelo abierto



SONOS

In-Wall Series

SIN DATOS

Parlantes para embutir en muros

Gabinete cerrado Bass Reflex



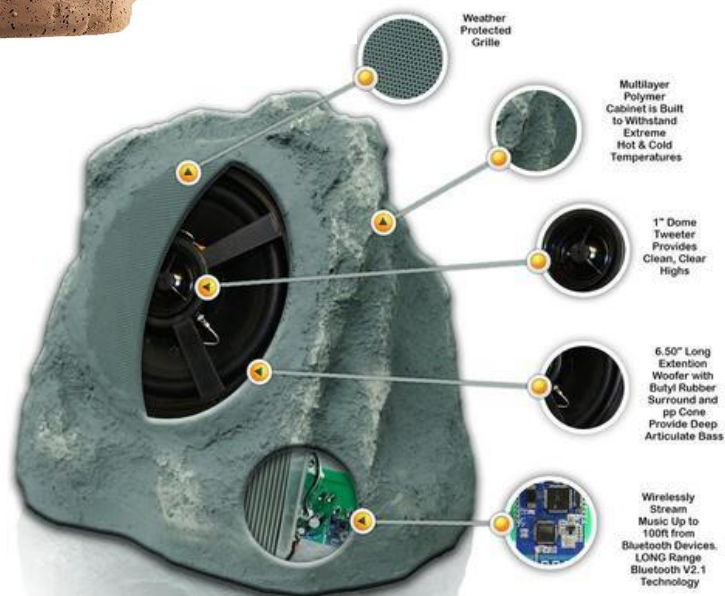
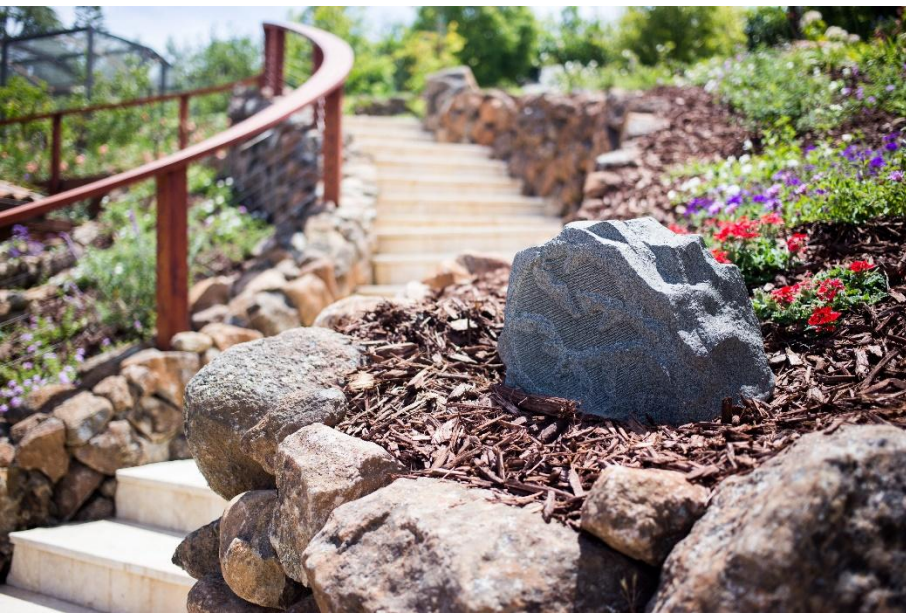
SONANCE
Invisible Series

5 ohm
100 watts RMS
90dB

Parlantes para exteriores “clásicos”



Parlantes para exteriores “modernos”



Parlantes para exteriores “modernos”

