



Sistemas de Sonido

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Ingeniero en Electrónica

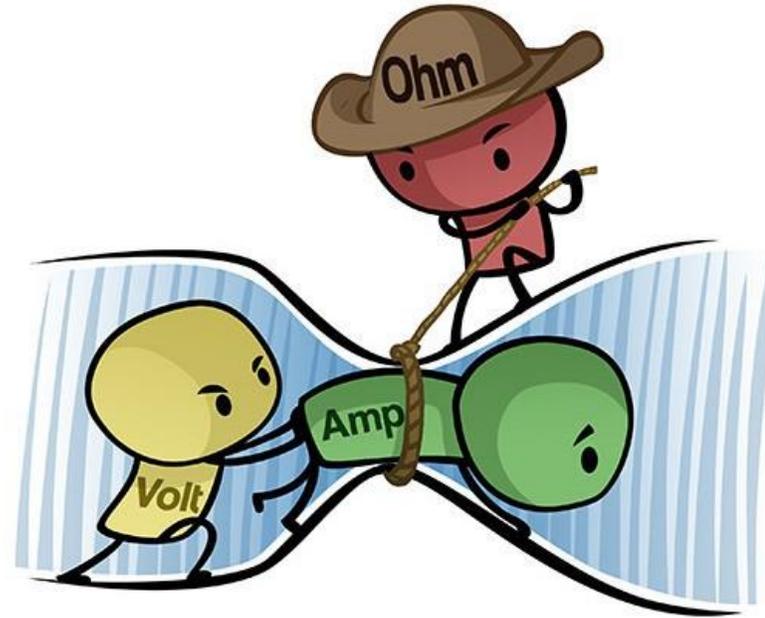
Especialista en Audio y Sonido

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Ingeniero en Acústica

Mg. en Acústica Arquitectónica y Medioambiental

Principios de Electricidad, Electrónica y Magnetismo



Tensión

Volt

Corriente

Ampere

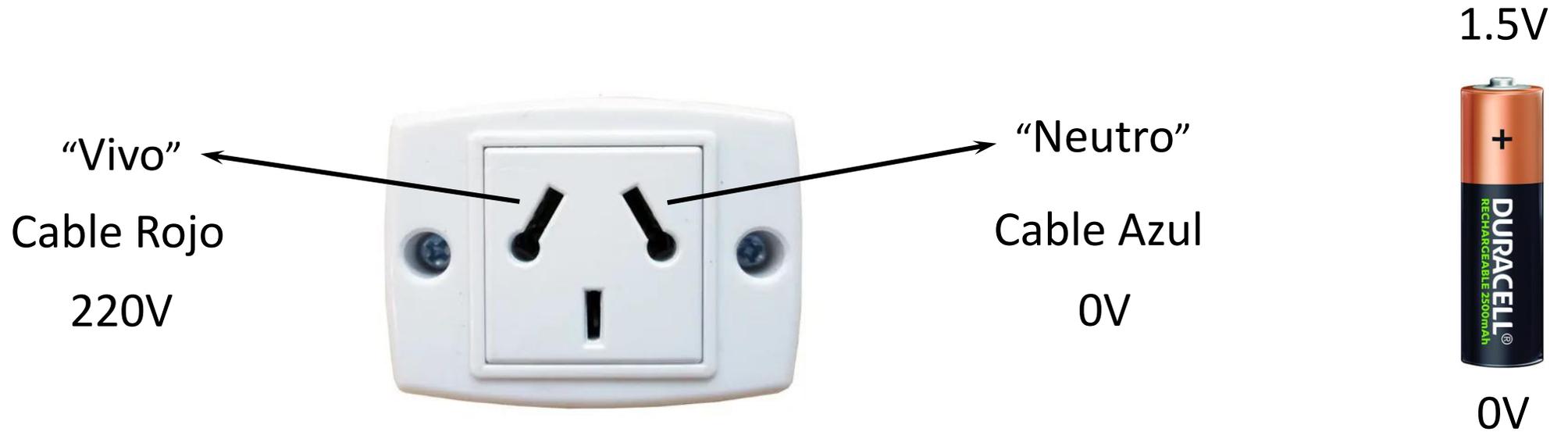
Resistencia

Ohm

Tensión



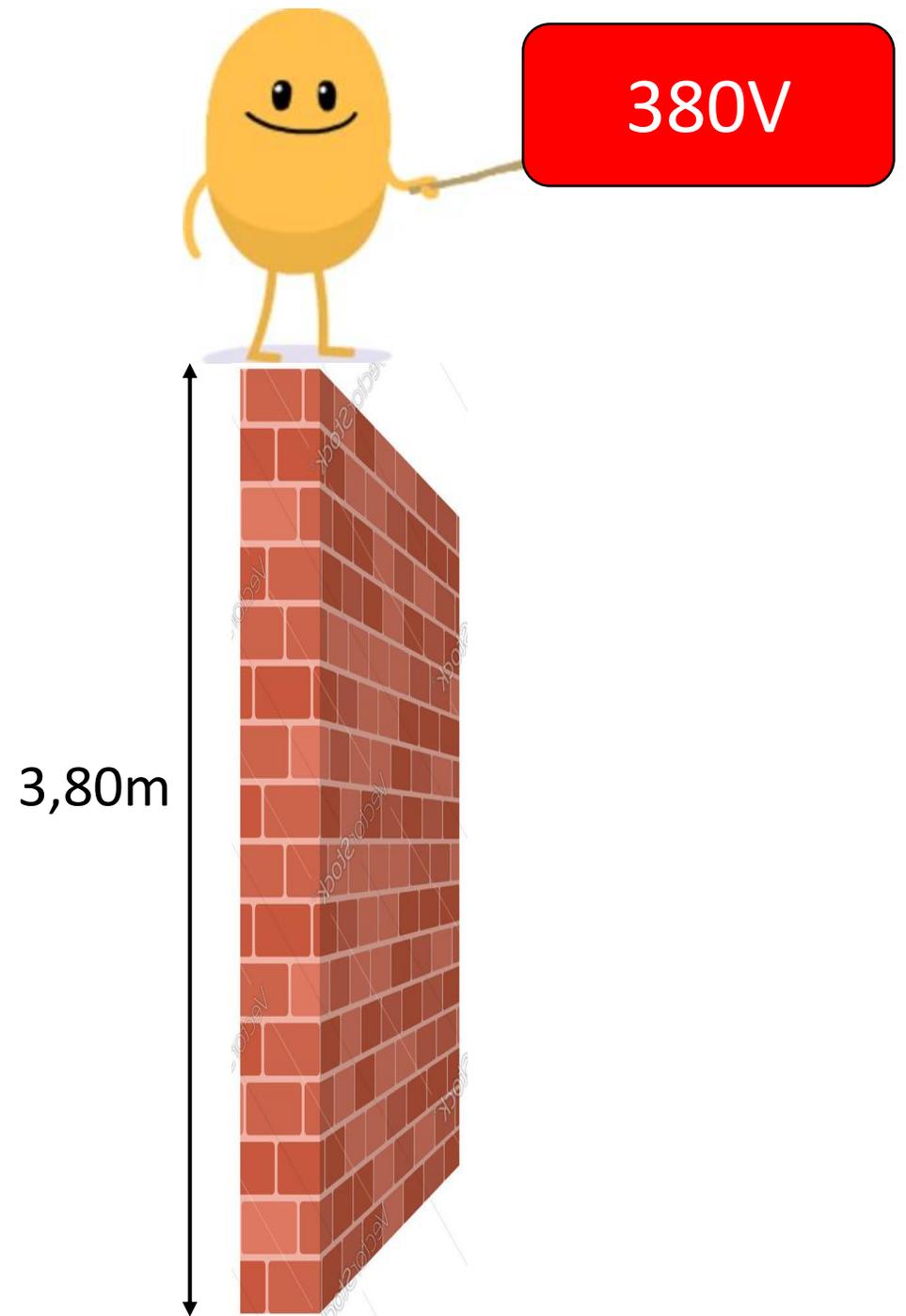
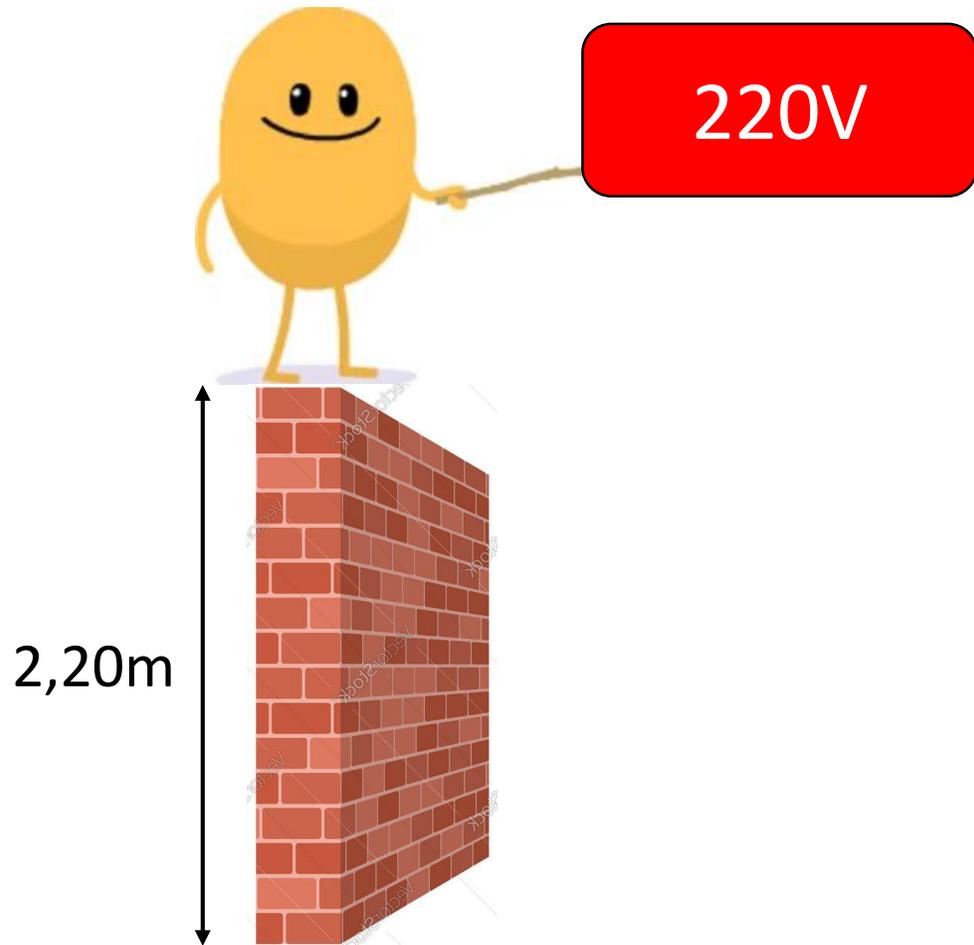
Diferencia de potencial eléctrico entre dos puntos



Diferencia de potencial o diferencia de tensión =

220V

Diferencia de potencial



Corriente

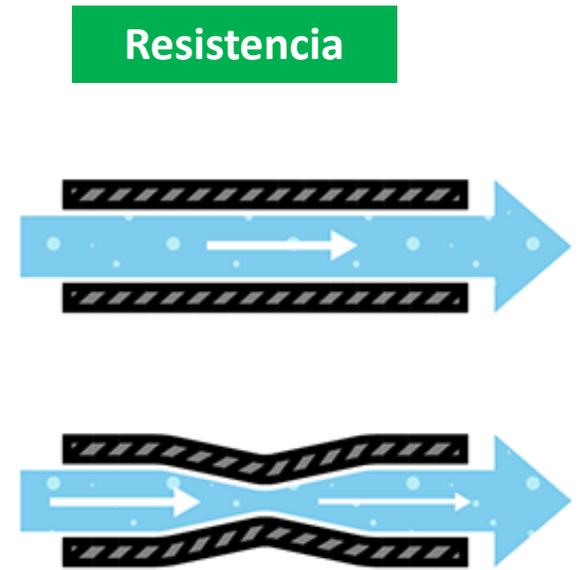
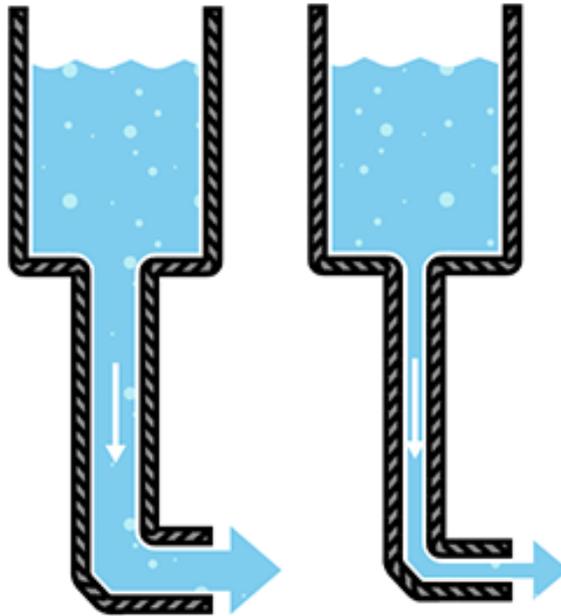
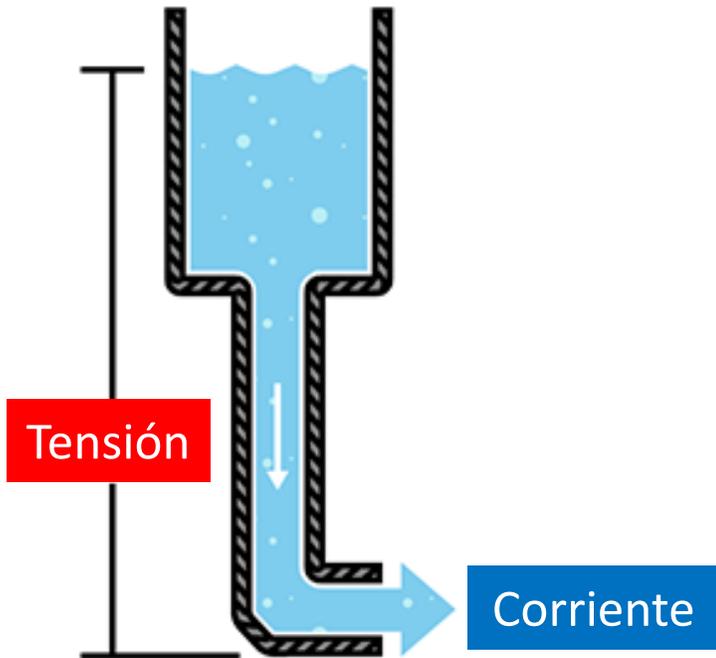


Flujo de electrones por un conductor por unidad de tiempo

Oposición al flujo de corriente eléctrica a través de un conductor

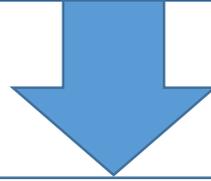


Resistencia



Ley de Ohm

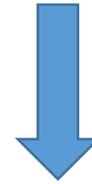
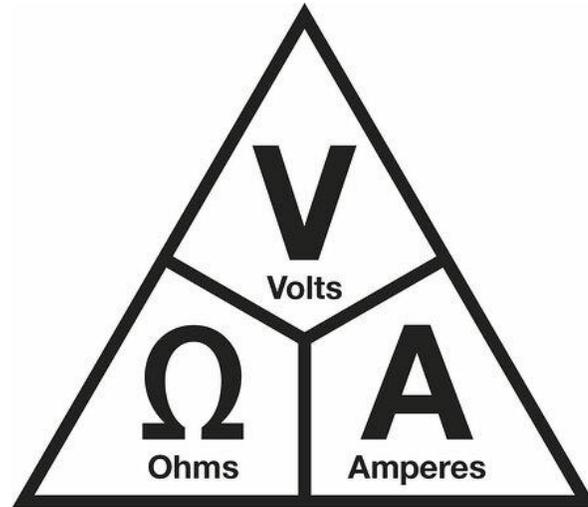
$$\text{Caudal de Agua} = \frac{\text{Altura del Agua}}{\text{Rugosidad de la Tuberia}}$$



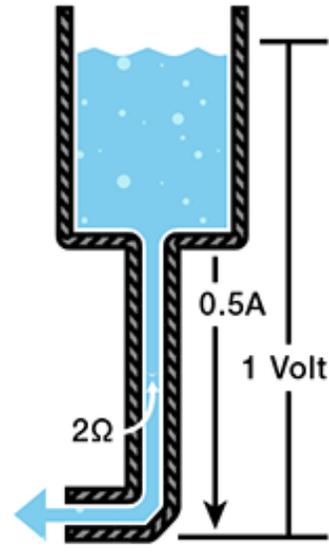
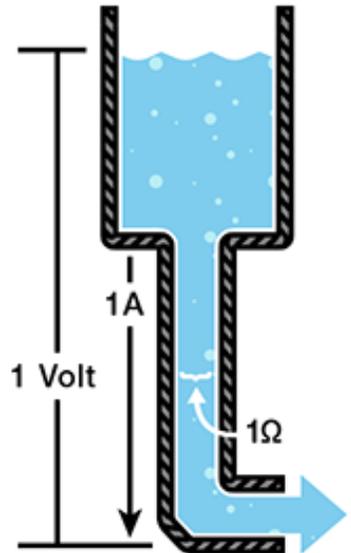
$$\text{Corriente} = \frac{\text{Diferencia de Tensión}}{\text{Resistencia}}$$



$$V = I \cdot R$$



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



Ley de Ohm

$$V = I \cdot R$$

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

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

$$P = I \cdot V$$

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

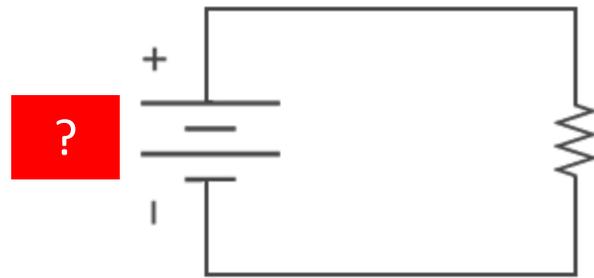
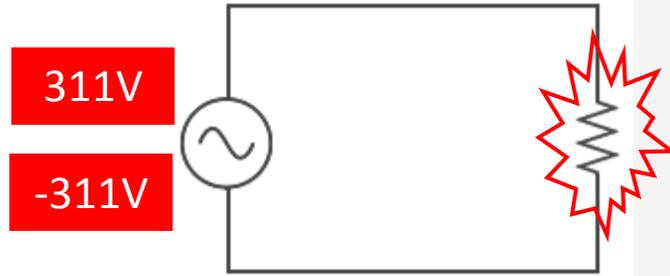
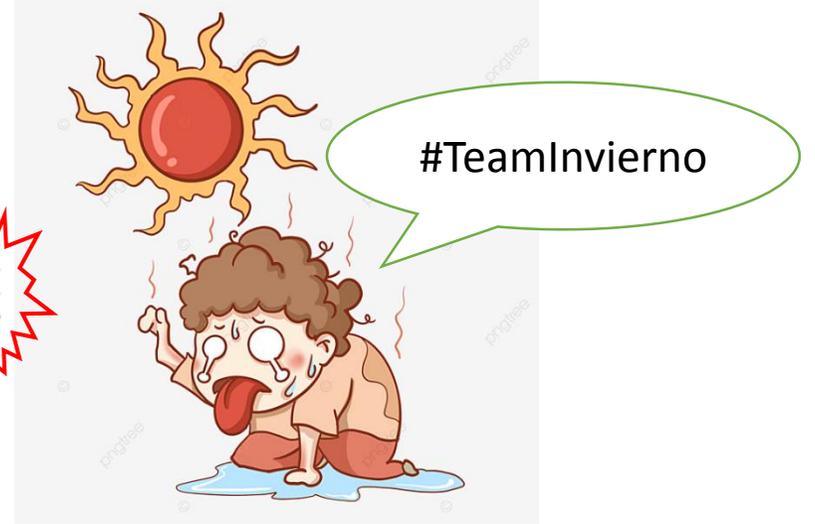
$$P = I^2 \cdot R$$

Tensión Alternada o Diferencia de potencial alterno



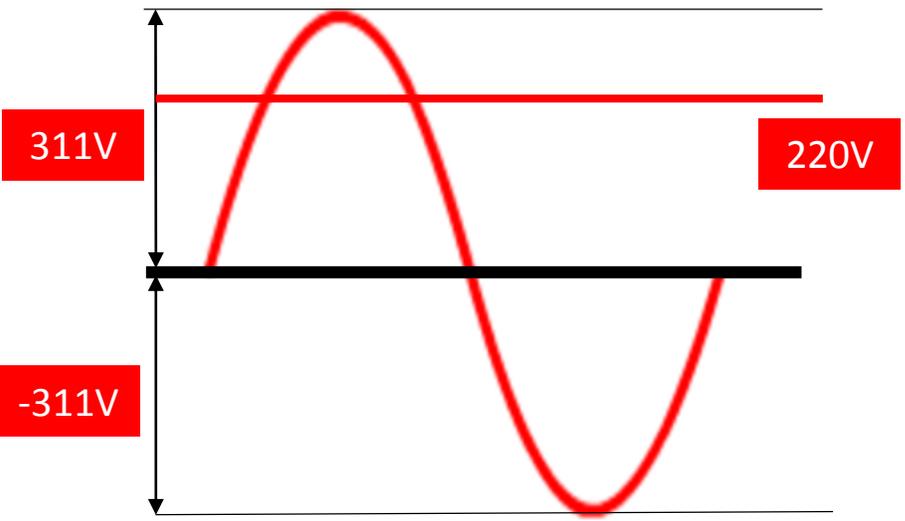
¿Qué son los 220v entonces?

Tensión R.M.S o “Tensión Eficaz”

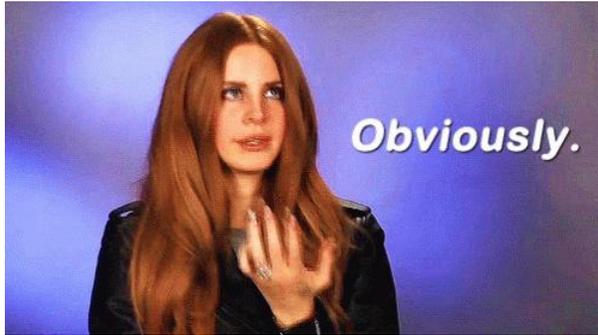


$$V_{equivalente} = \frac{V_{pico}}{\sqrt{2}} = V_{RMS}$$

R.M.S = *Root Mean Square*



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



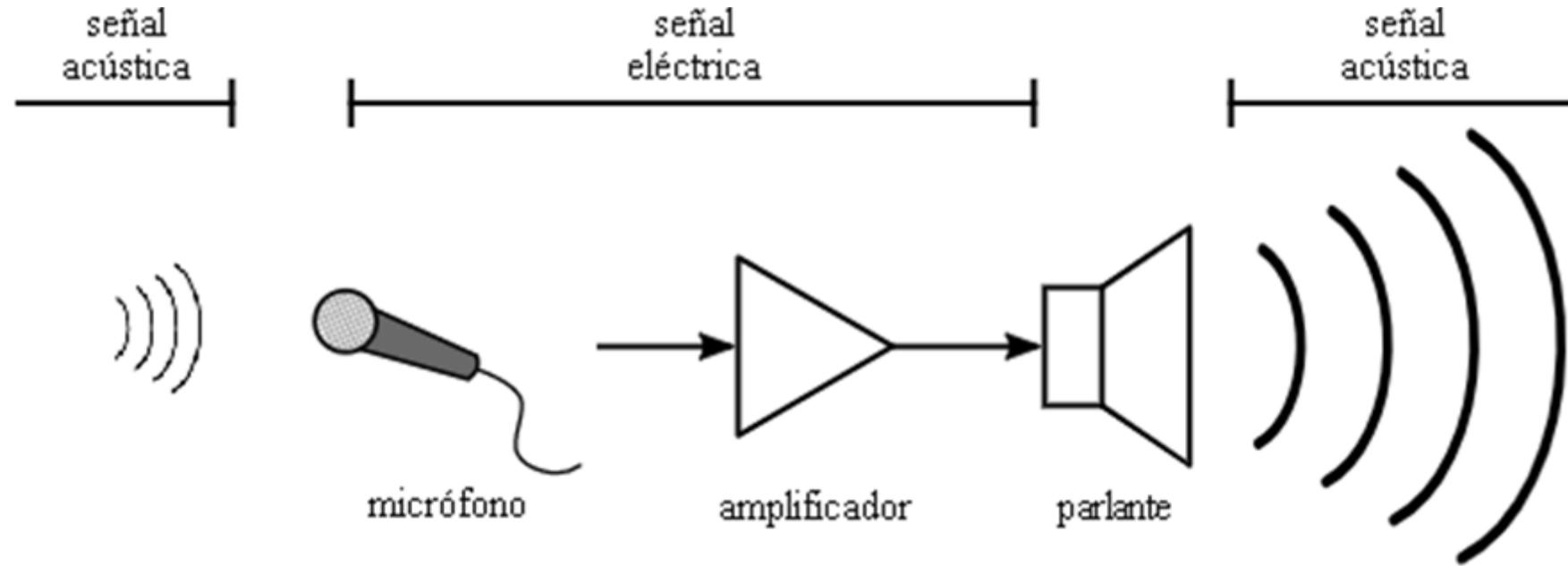
¿Quién se encarga del sonido?

Probabilidad 1 Especialista 3-5%

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

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

Cadena Electroacústica

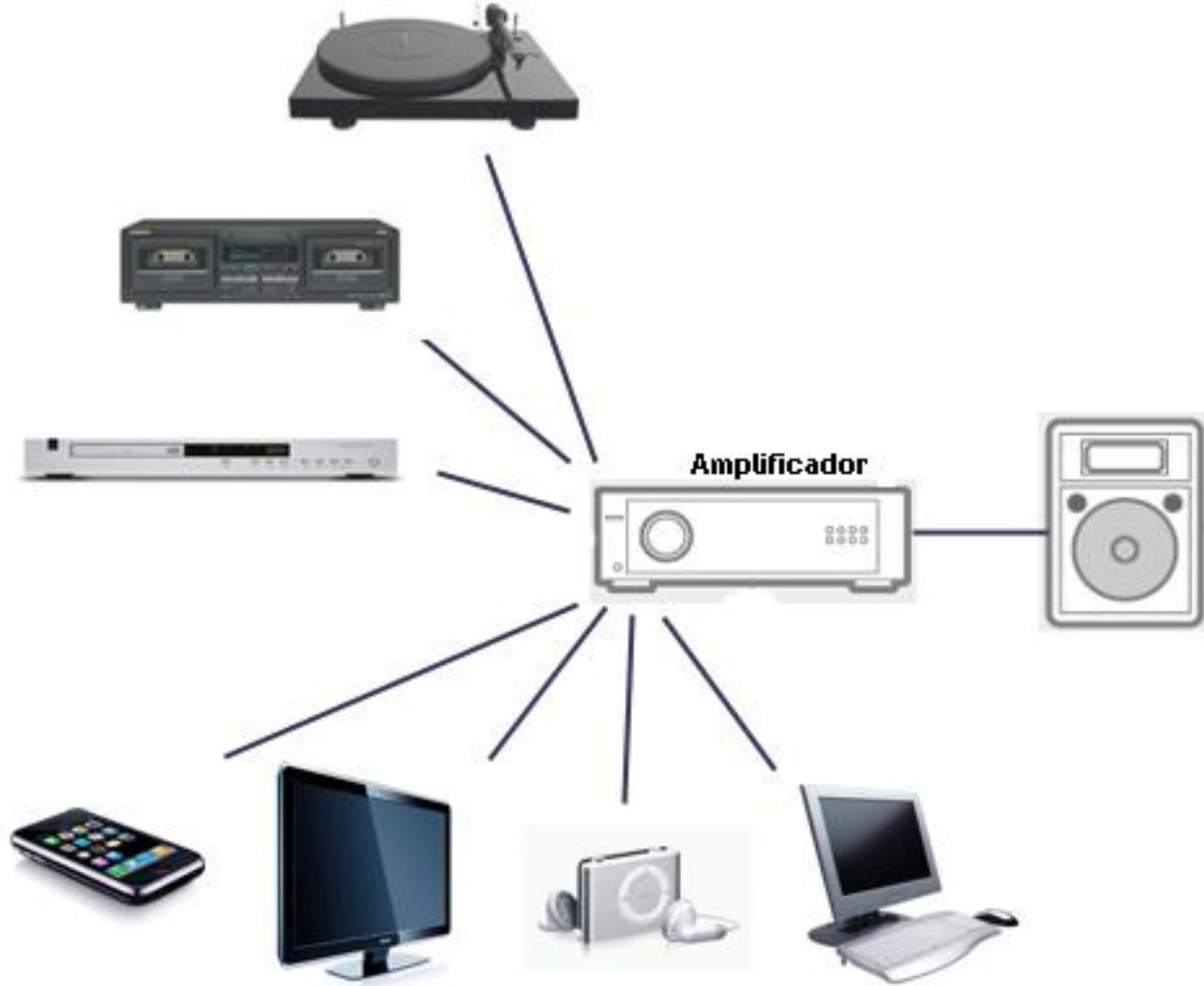
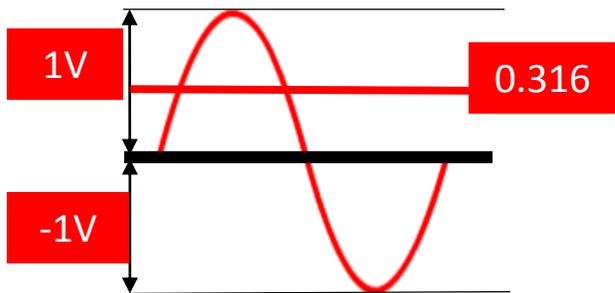


Señales de Entrada

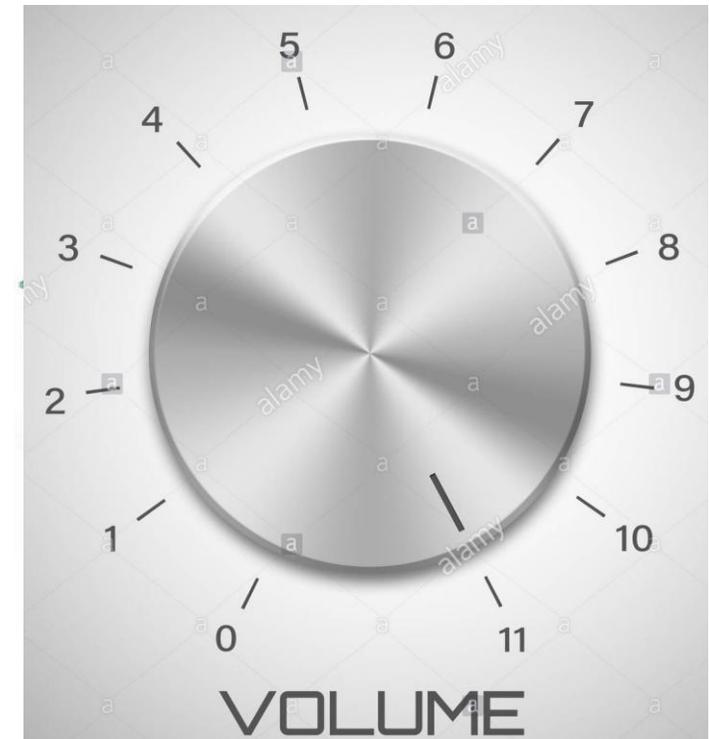
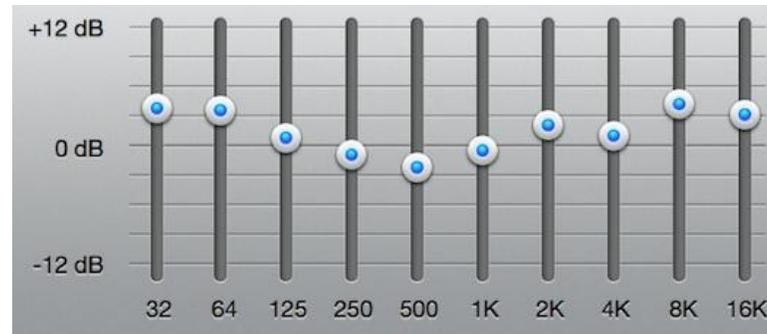
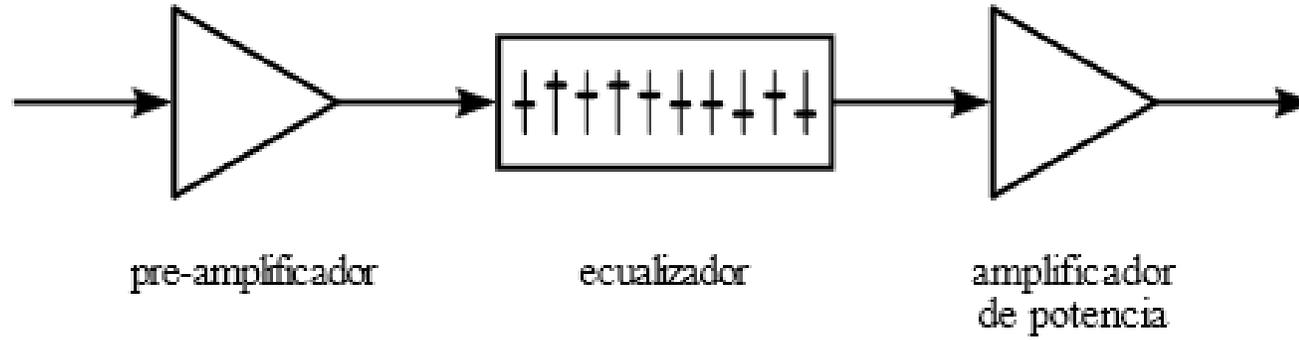


Señales
sonoras
muy
pequeñas

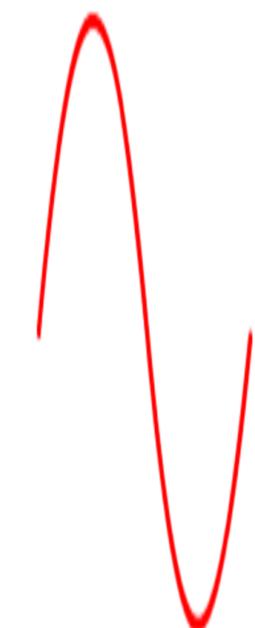
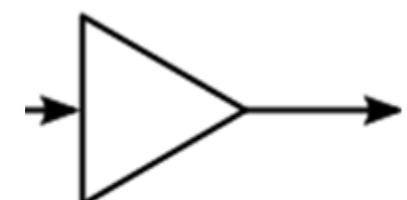
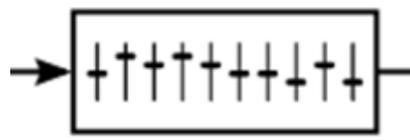
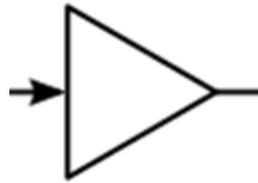
$$V_{RMS} = 0.316 V_{RMS}$$



Amplificador de potencia



Repaso de lo visto hasta ahora



pre-amplificador

ecualizador

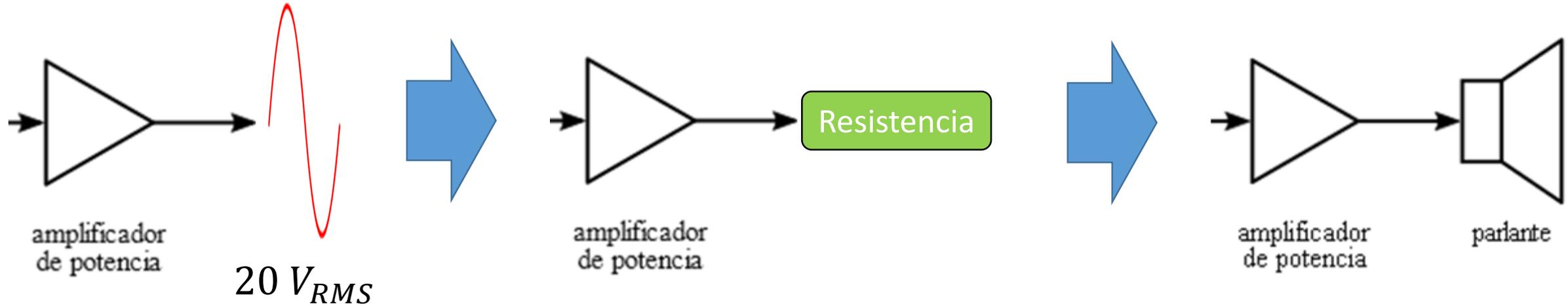
amplificador de potencia

$0.316 V_{RMS}$

$0.353 V_{RMS}$

$20 V_{RMS}$

Potencia de un Amplificador

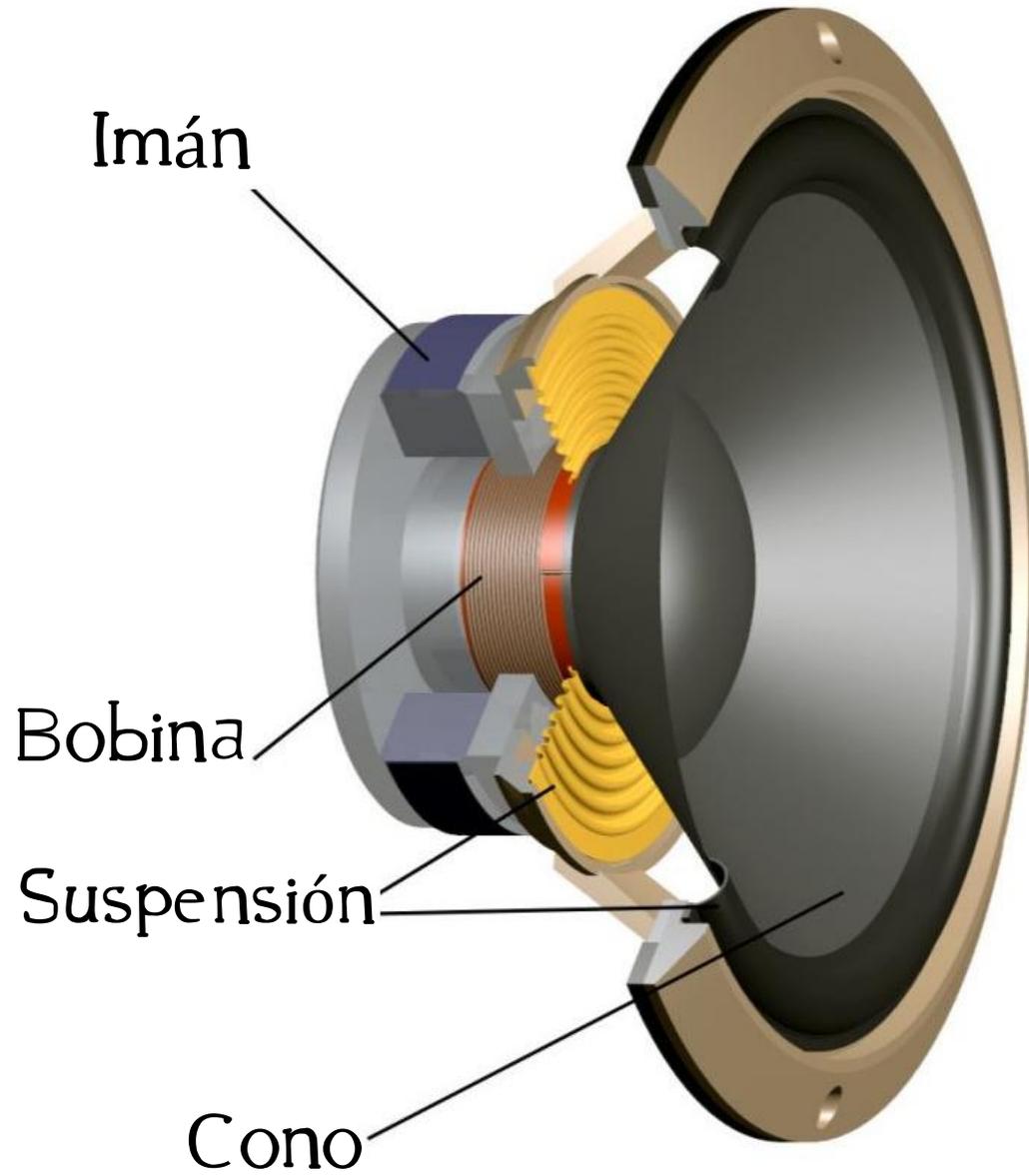


$$Potencia = \frac{(V_{RMS})^2}{R} [W]$$

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



Parlantes



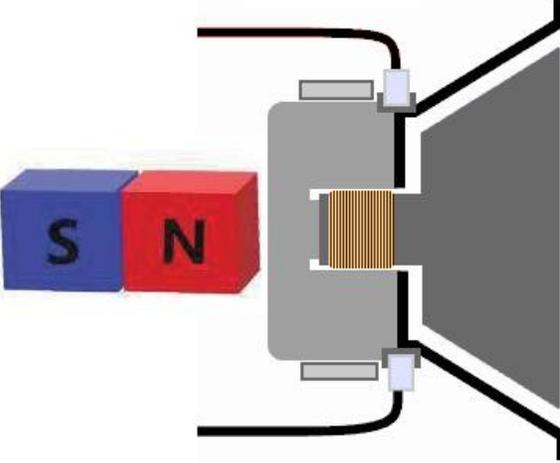
Imán



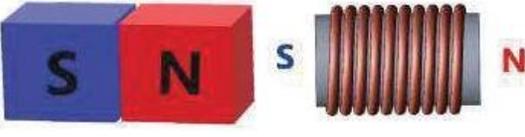
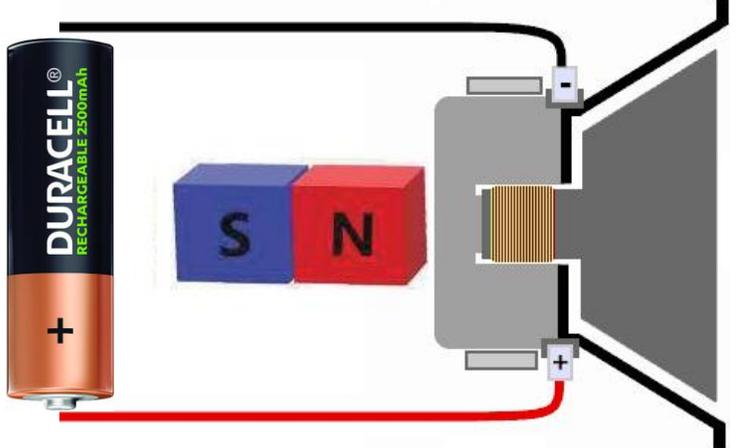
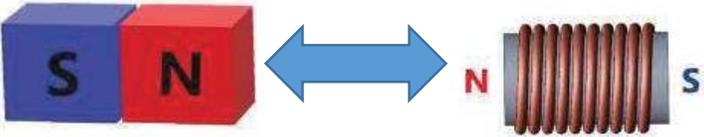
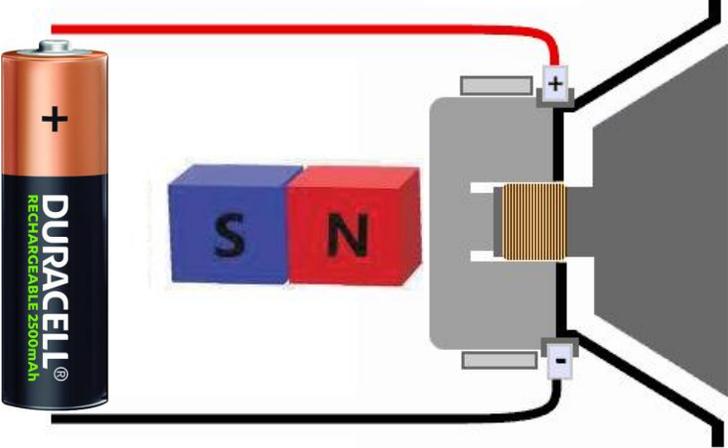
Bobina

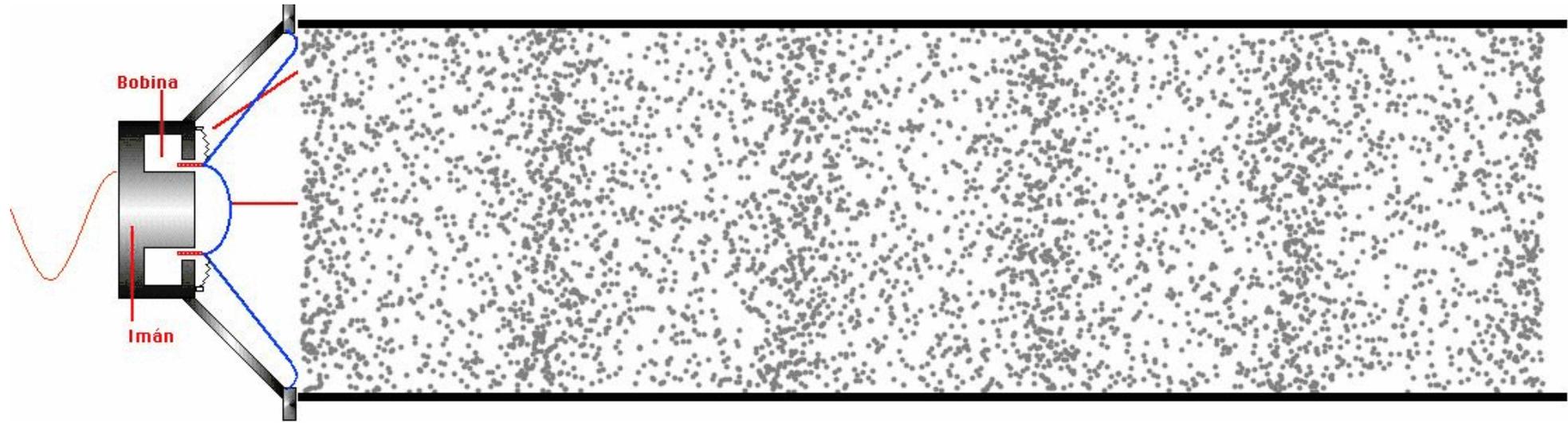


Funcionamiento

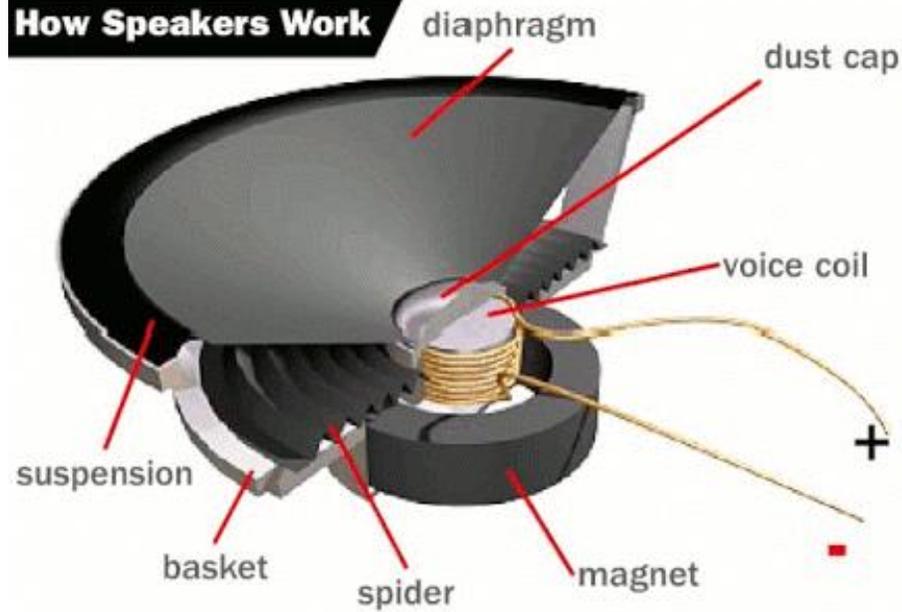


Sin Señal

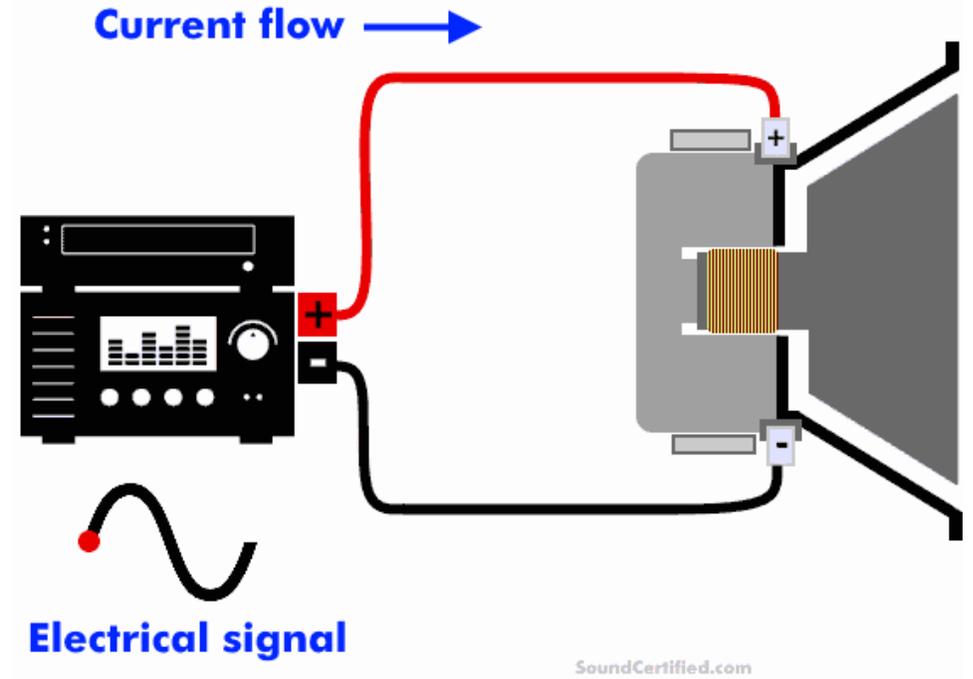




How Speakers Work



©2001 How Stuff Works



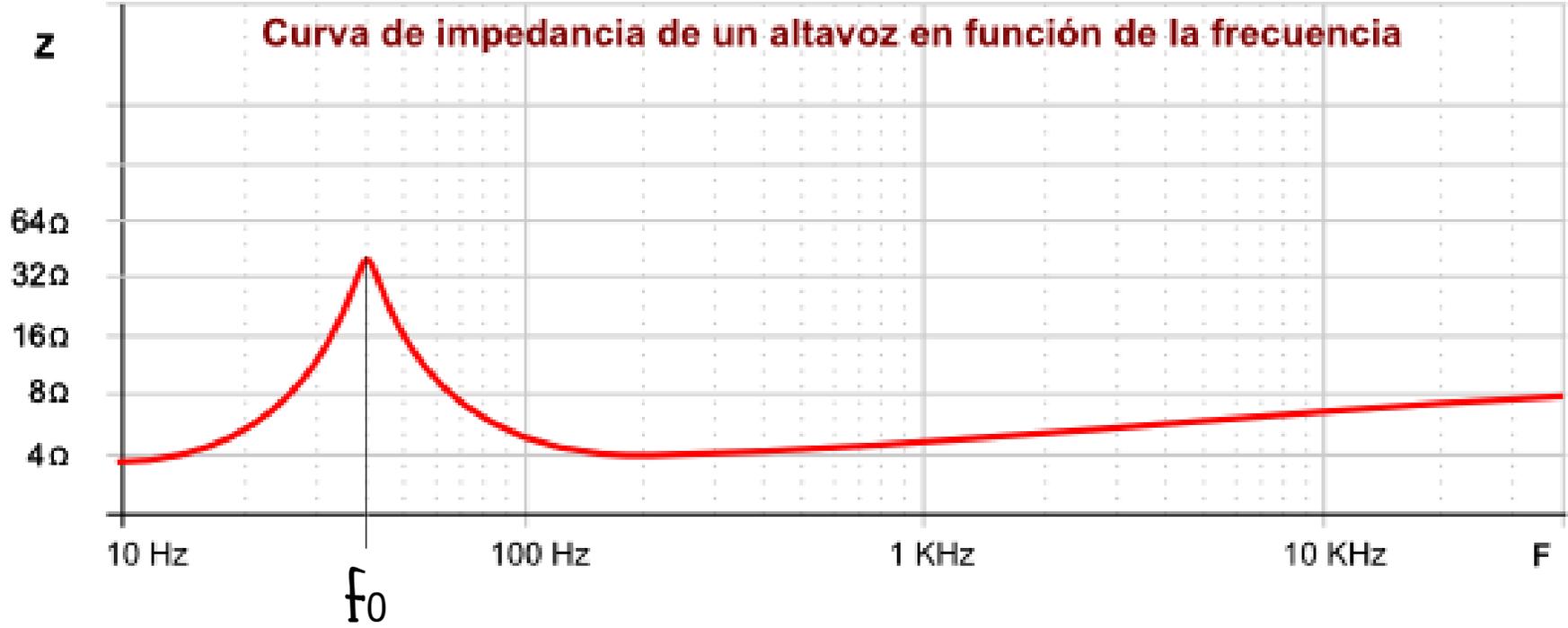
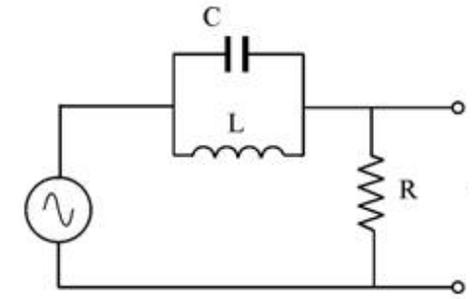
Características

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



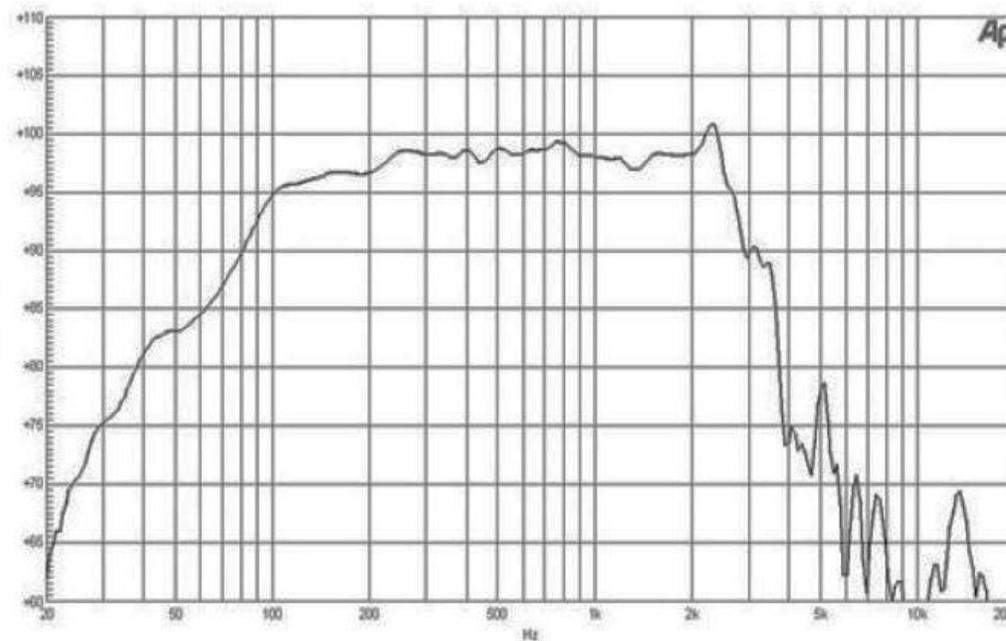
Capacidad de un parlante de transformar
POTENCIA ELECTRICA
en
INTENSIDAD SONORA

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

Respuesta en Frecuencia



B&C 15HPL76w



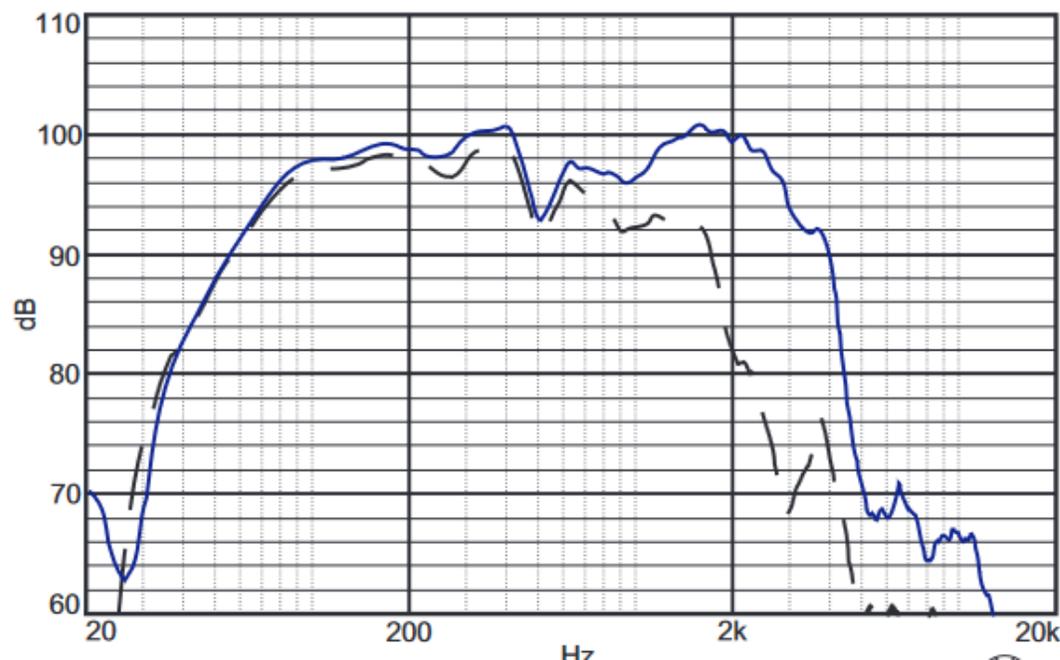
4 Ohm

350W

99dB



Selenium 15PW6



8 Ohm

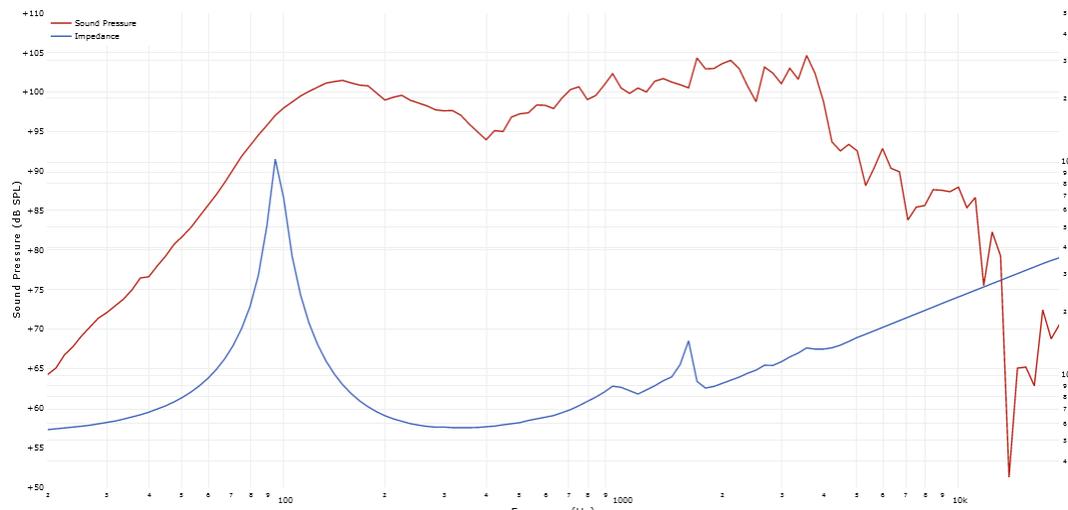
400W

97dB

Respuesta en Frecuencia



Jensen 12-70



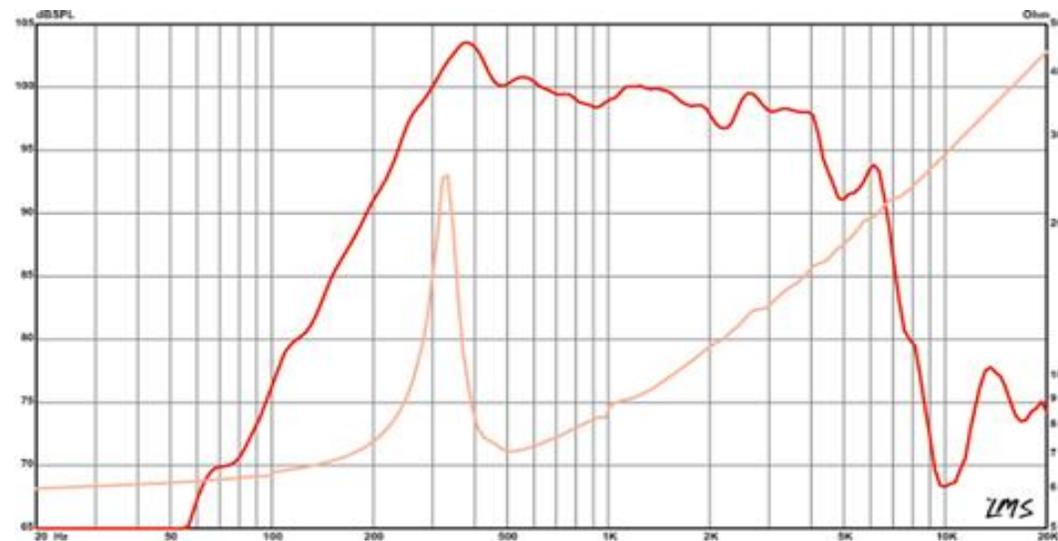
8 Ohm

70W

97dB



Eminence Beta 10 CBMRA



8 Ohm

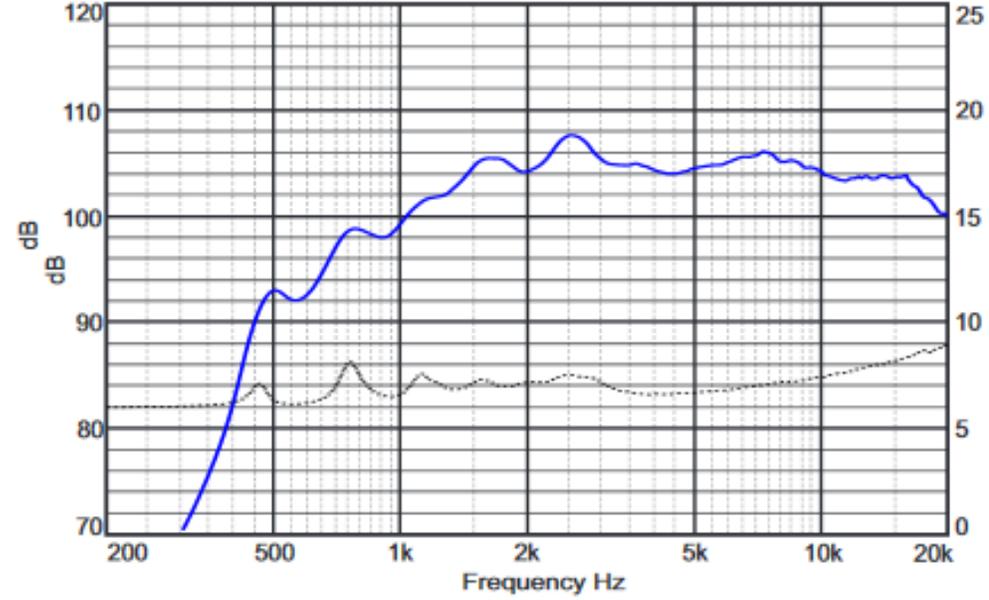
200W

99.6dB

Respuesta en Frecuencia



JBL D202TI



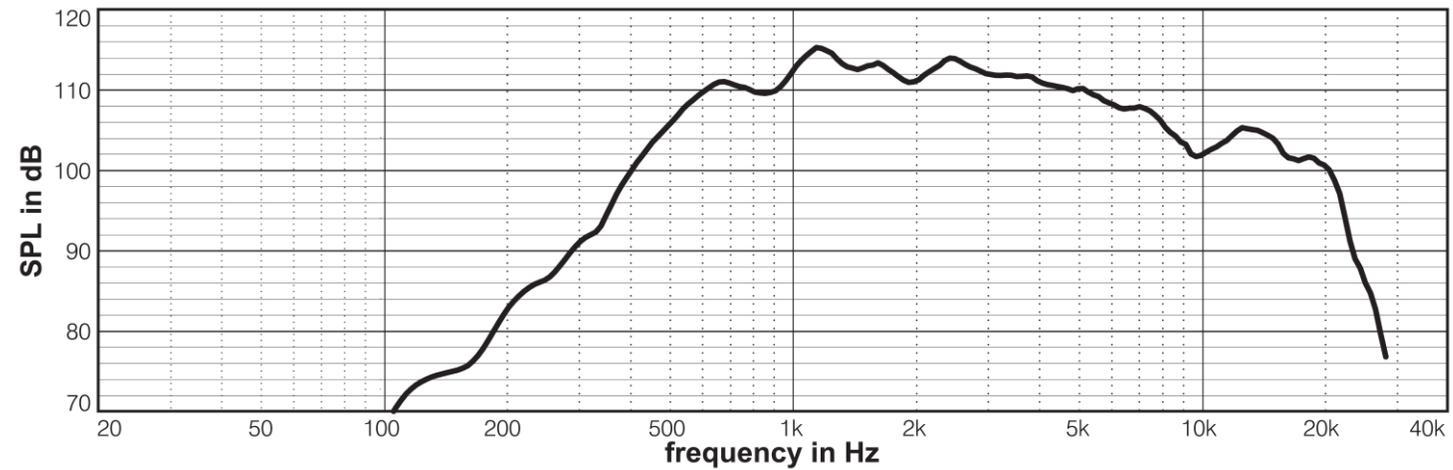
8 Ohm

60W

106dB



D.A.S K-8



16 Ohm

125W

110dB

Cornetas para Drivers



¿Cuánto sonará un parlante?



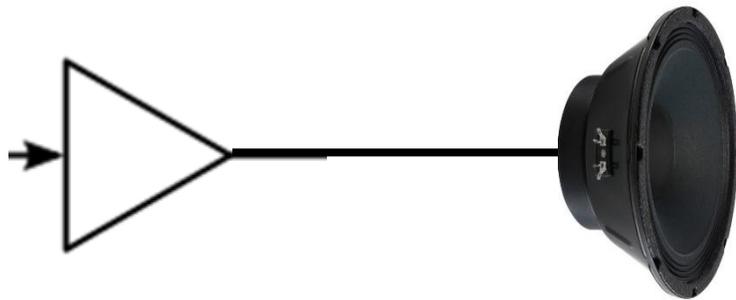
amplificador de potencia

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



$5 W_{RMS}$

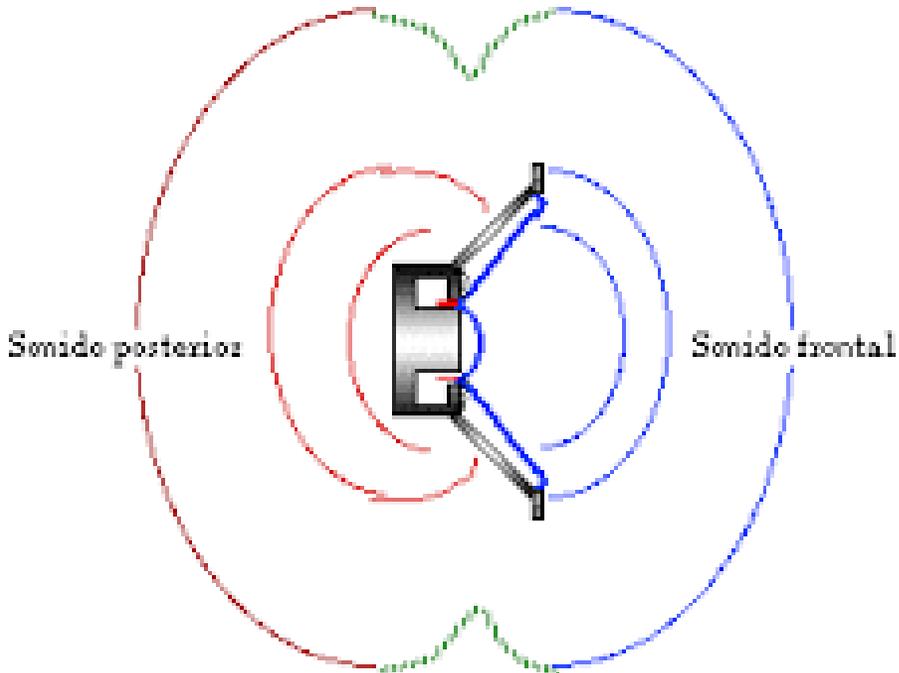
$$1W \rightarrow 97dB \quad L_{[SPL]} = 10 \log \frac{5W}{1W} = 7dB$$

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

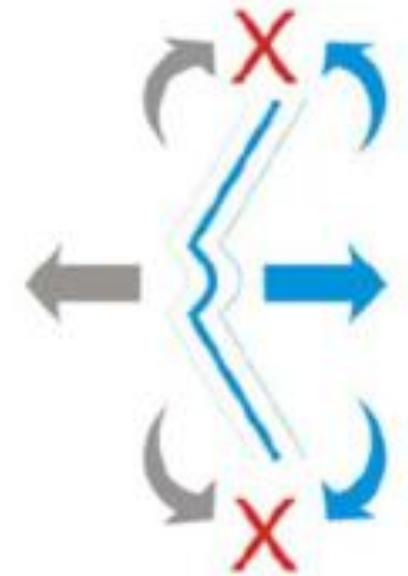
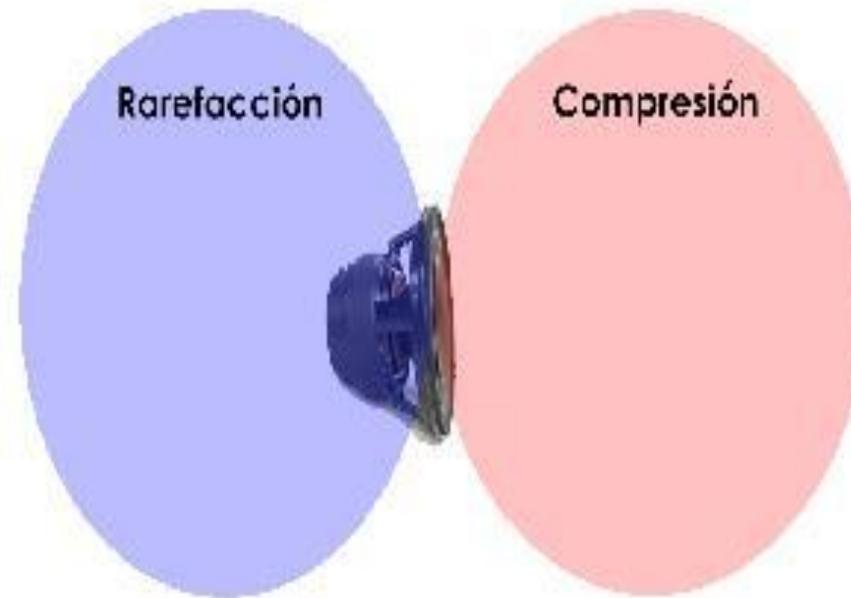
Gabinete Acústico o “Baffle”

Cortocircuito Acústico

Interferencia entre el sonido frontal y el posterior

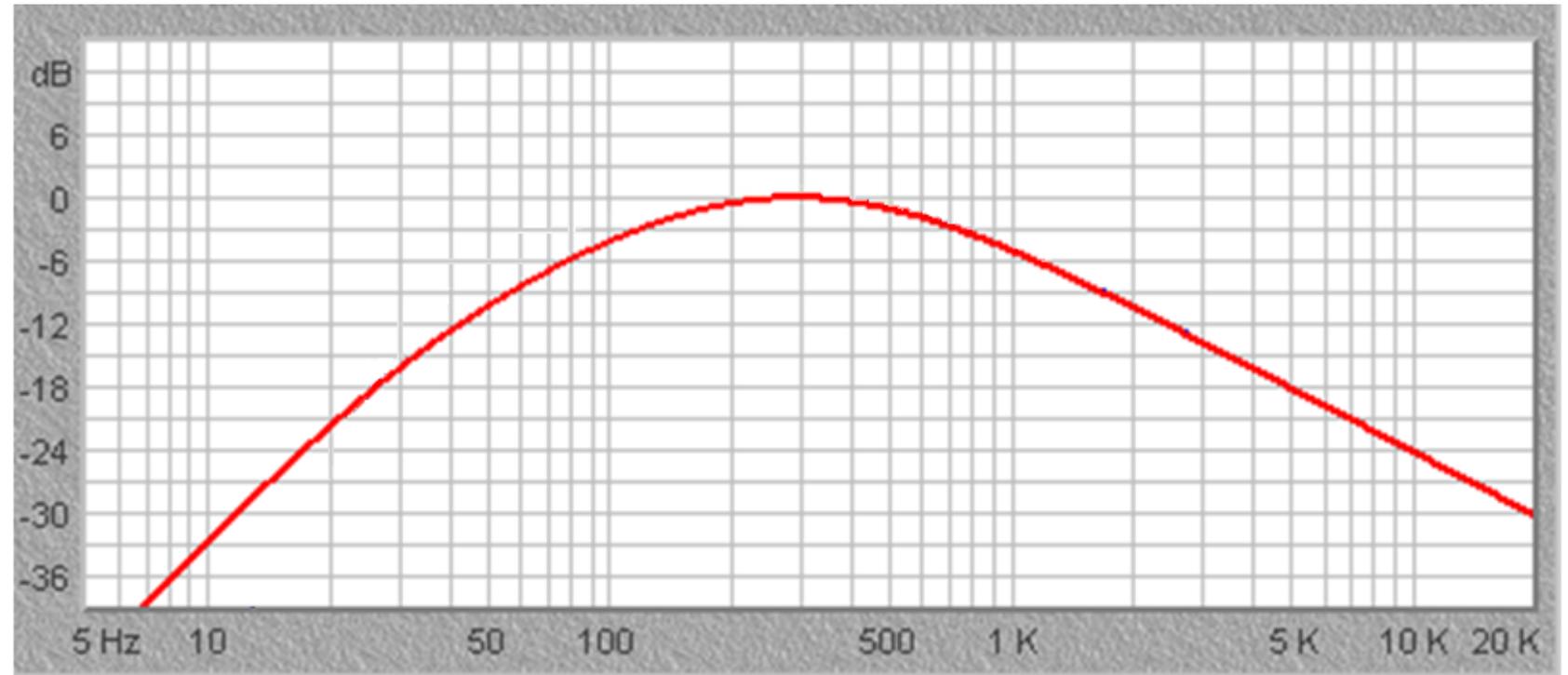
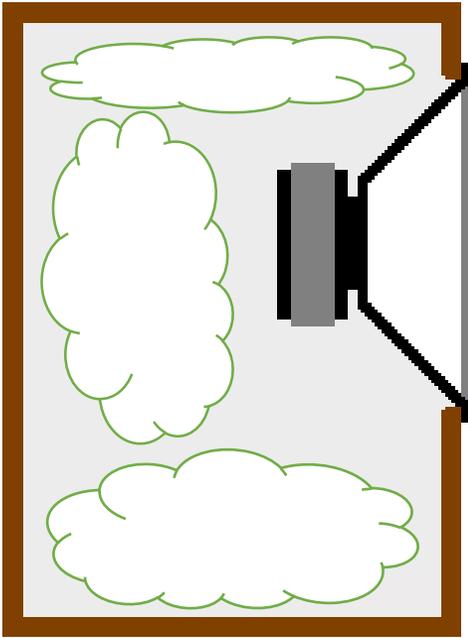


Interferencia entre el sonido frontal y el posterior



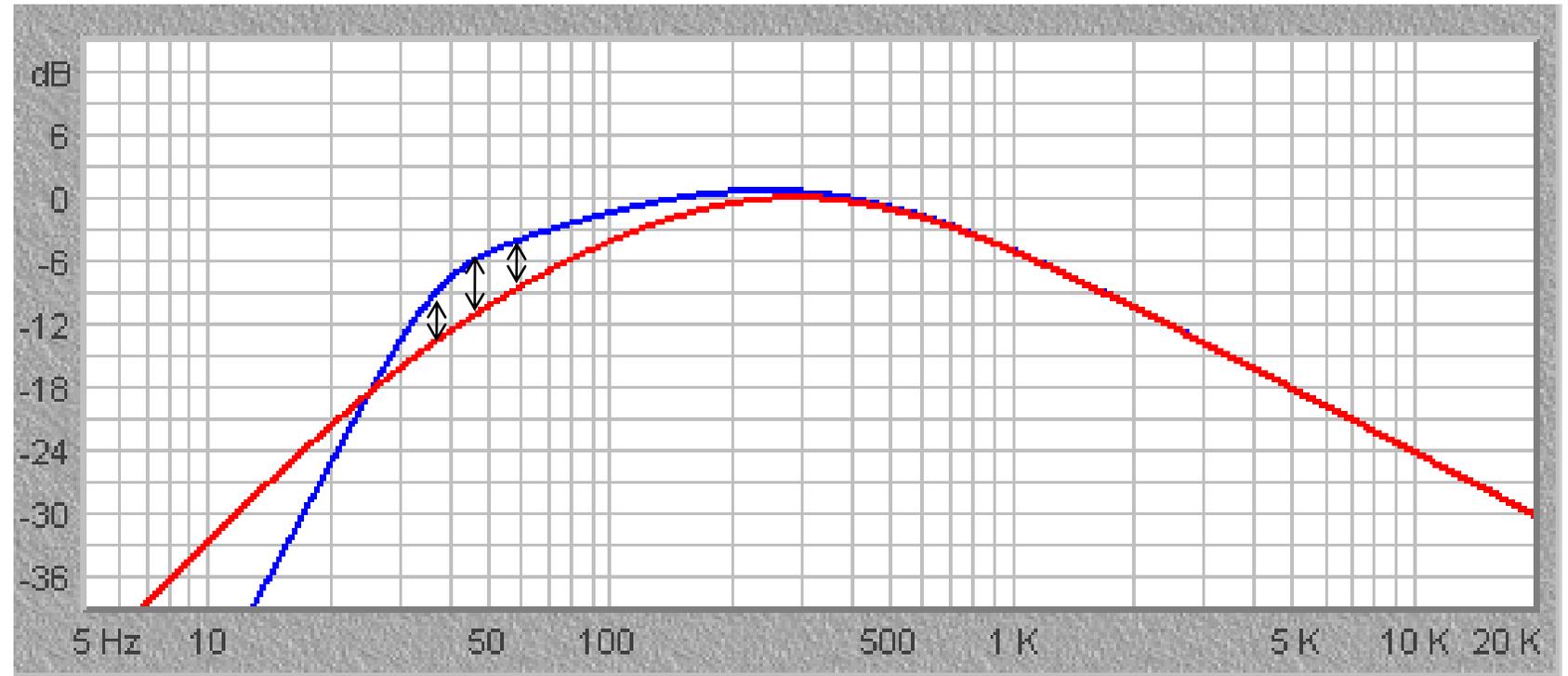
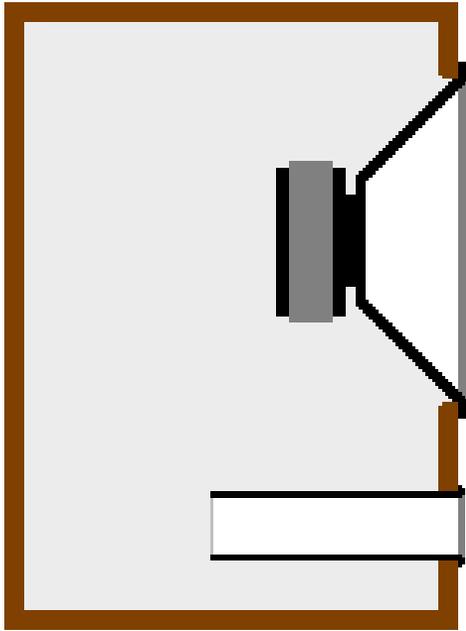
Anulación de bajas frecuencias

Gabinete Acústico Cerrado o “Bafle infinito”



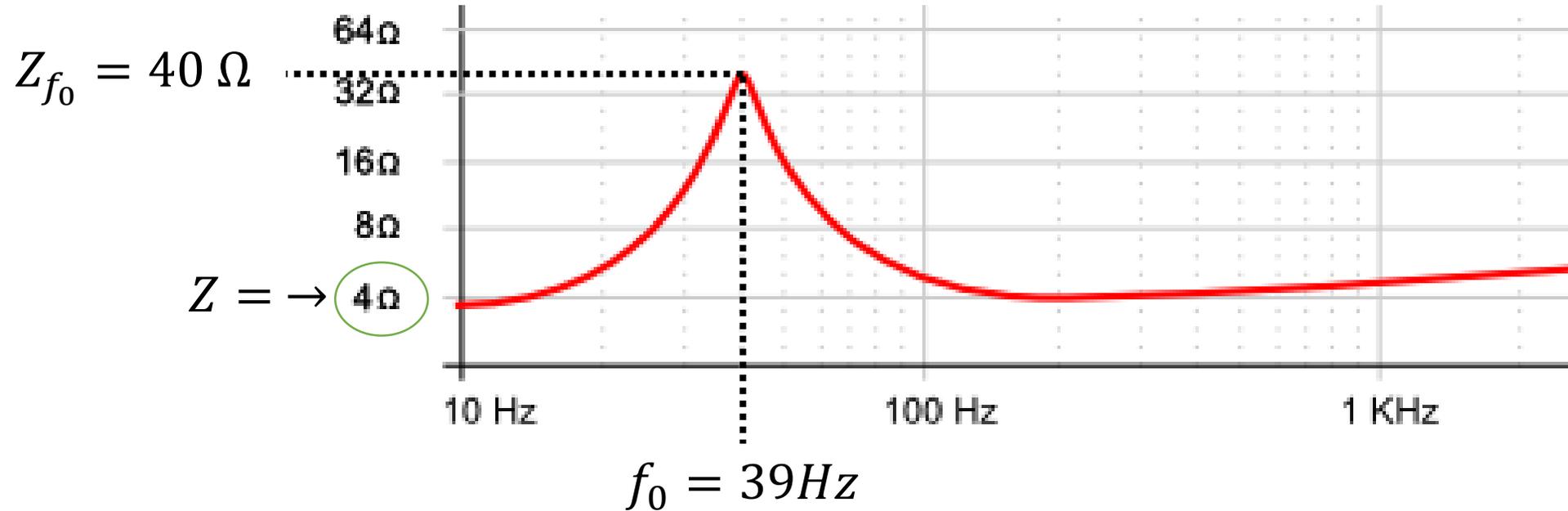
- Caja hermética
- Rellena o no con material absorbente
- Parlantes con suspensión muy blanda

Gabinete Acústico ventilado o “Bass Reflex”



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

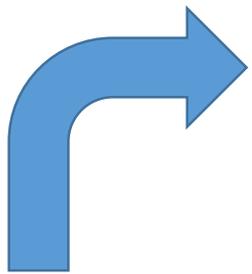
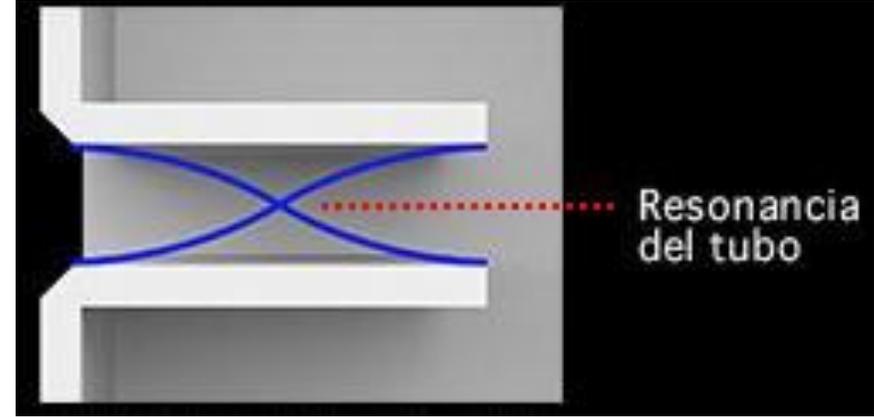
¿Cómo funciona un Gabinete Bass Réflex?



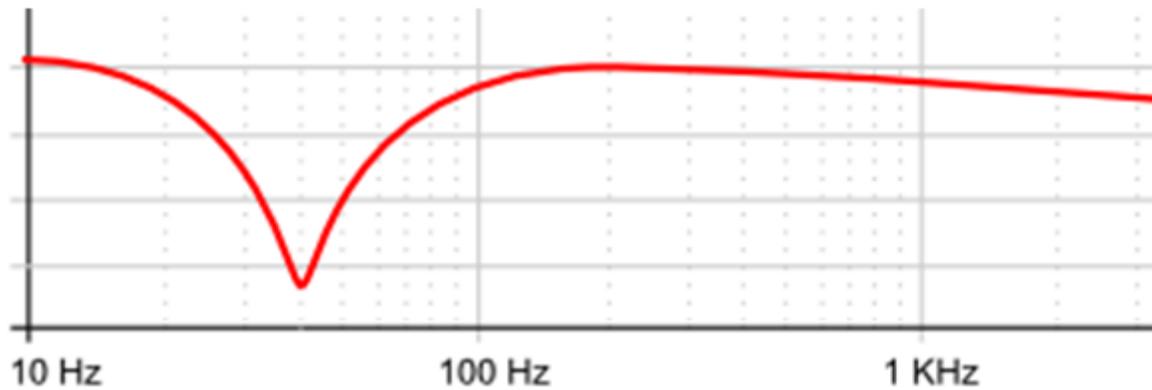
$$P = \frac{(V_{RMS})^2}{40 \Omega} = W_{RMS}$$

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

Tubos de Sintonía



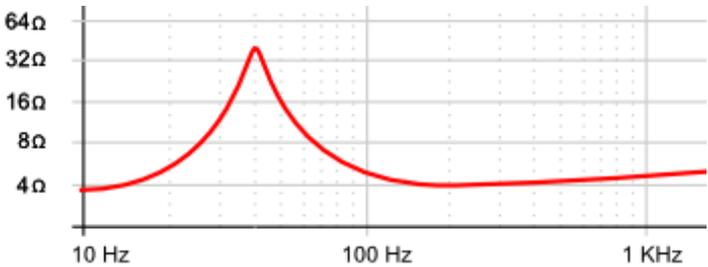
BAFLE



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

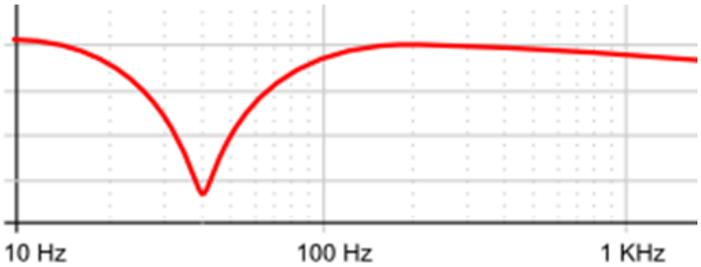
Parlante dentro de Gabinete Sintonizado

Impedancia del parlante



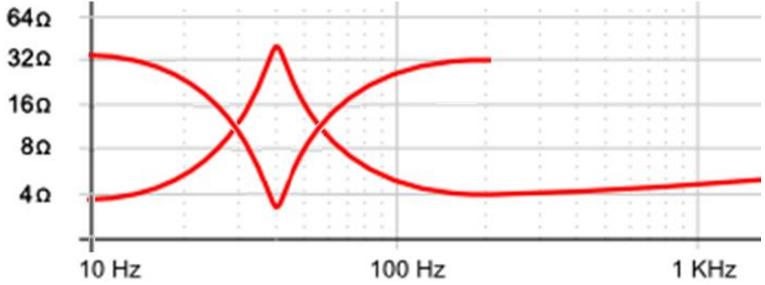
+

Impedancia del gabinete

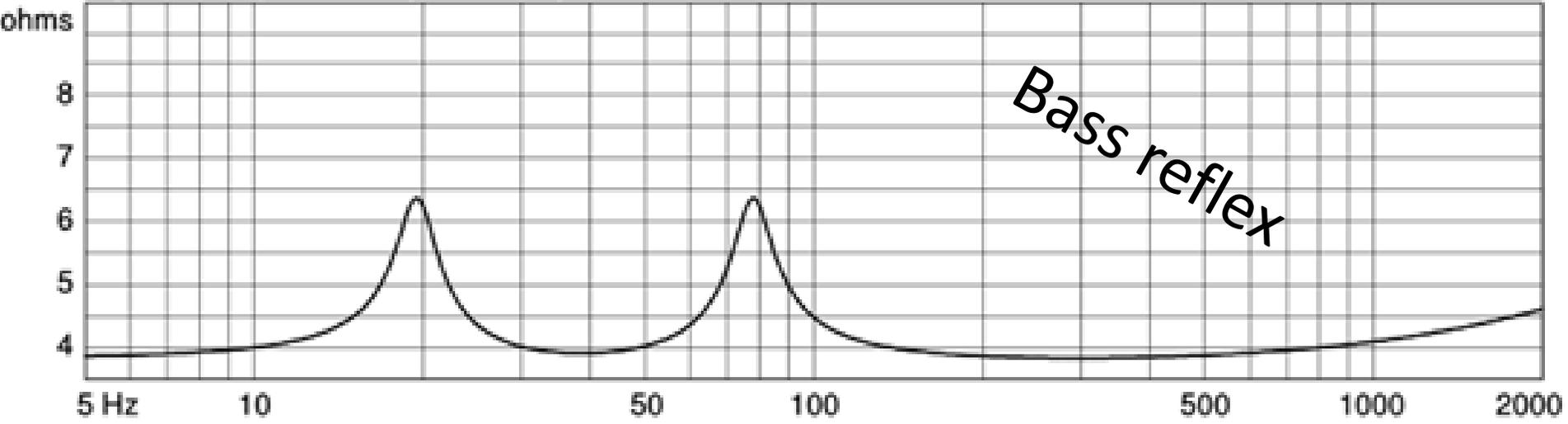


=

Impedancia del sistema

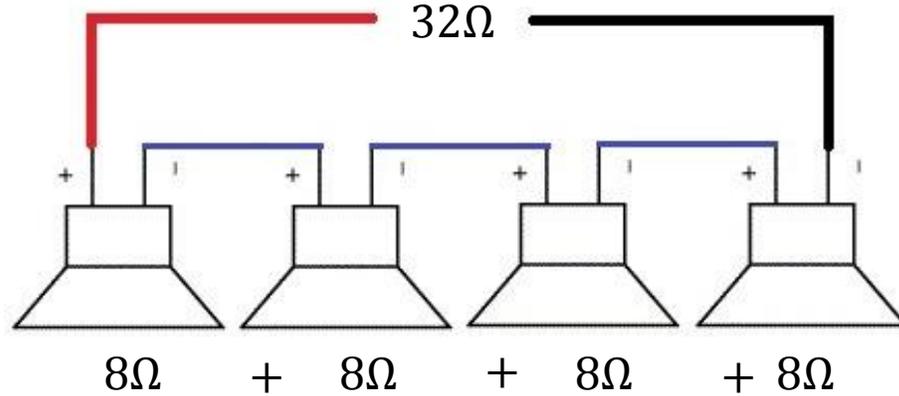


System Impedance (ohms/Hz)



Interconexión de Parlantes

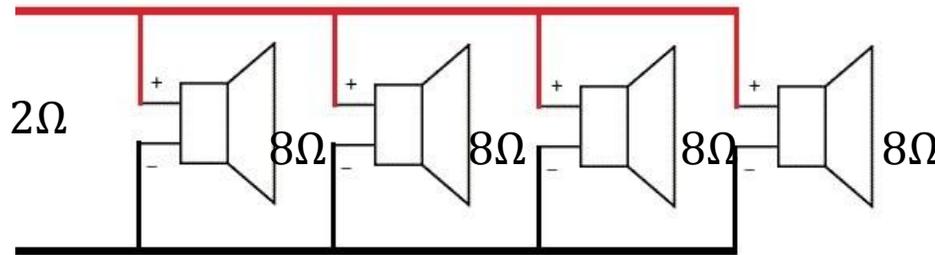
Conexión Serie



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

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

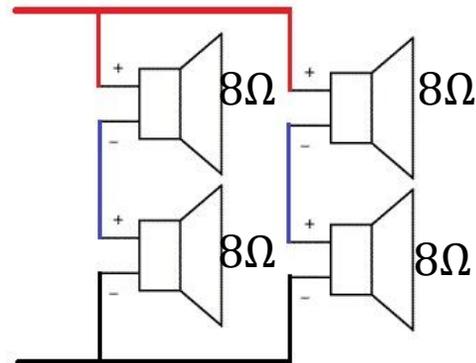
Conexión Paralelo



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

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

Conexión Mixta

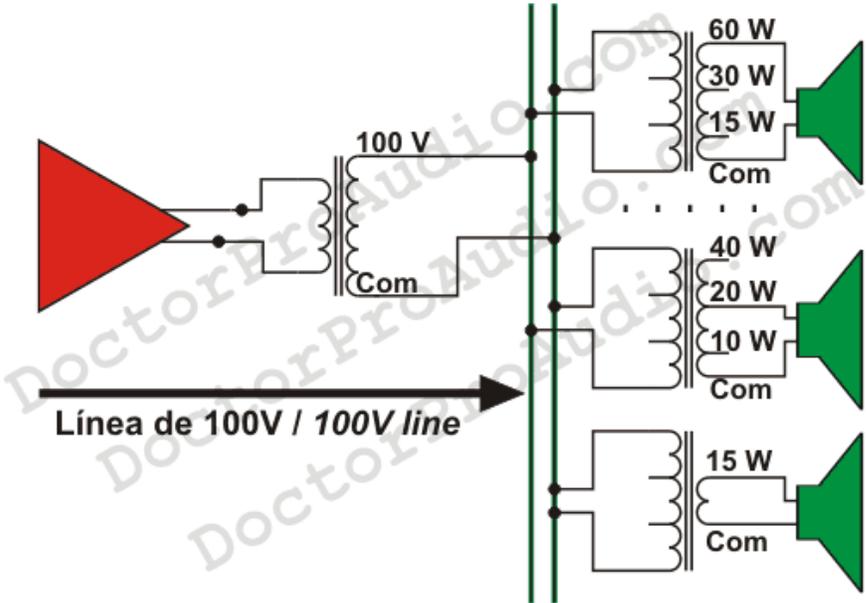
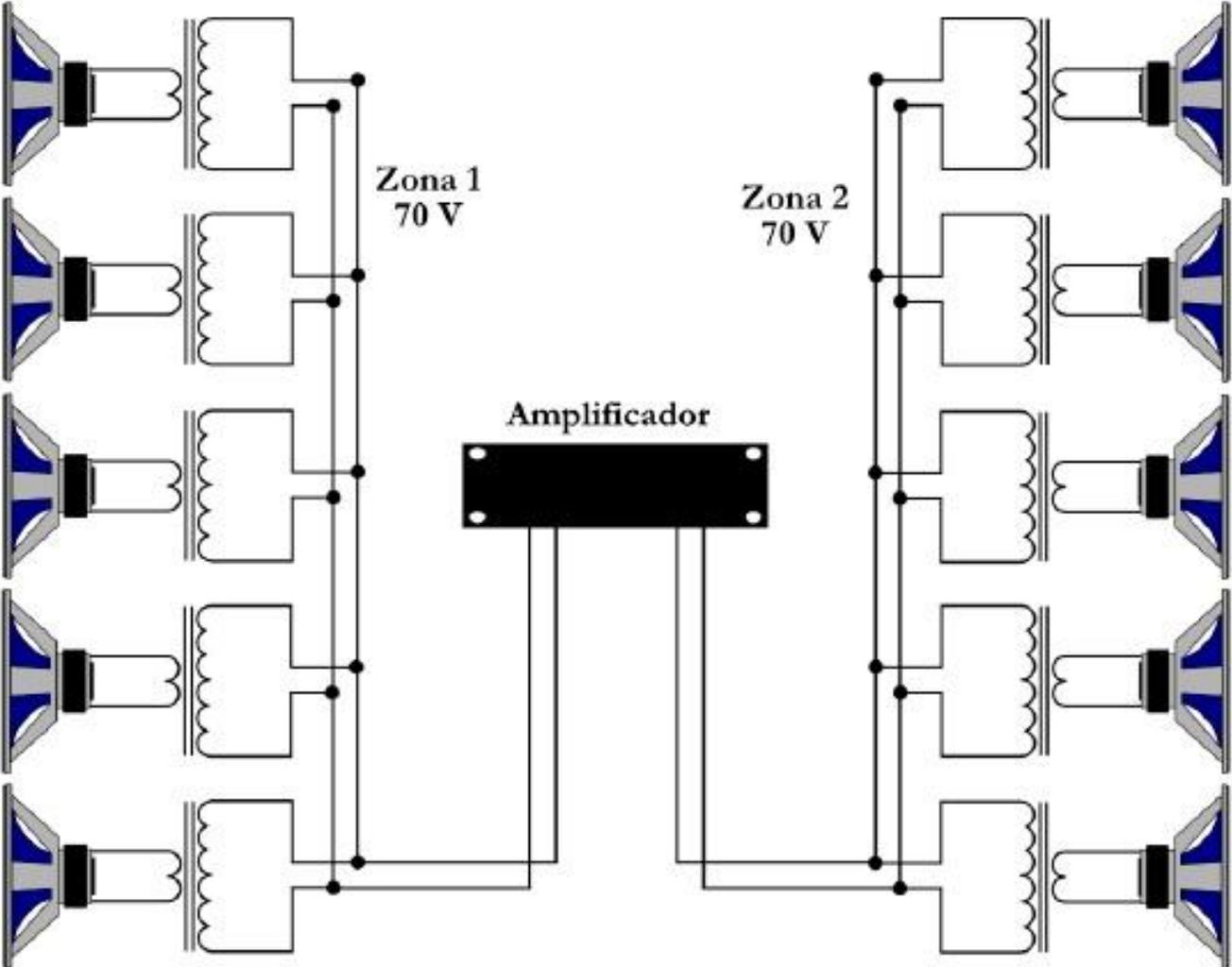


$$Z_{serie} = 8 + 8 = 16$$

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

$$Z = 8$$

Conexión de parlantes con transformador



Parlantes para diseño arquitectónico

Parlantes para embutir en muros

Modelo abierto



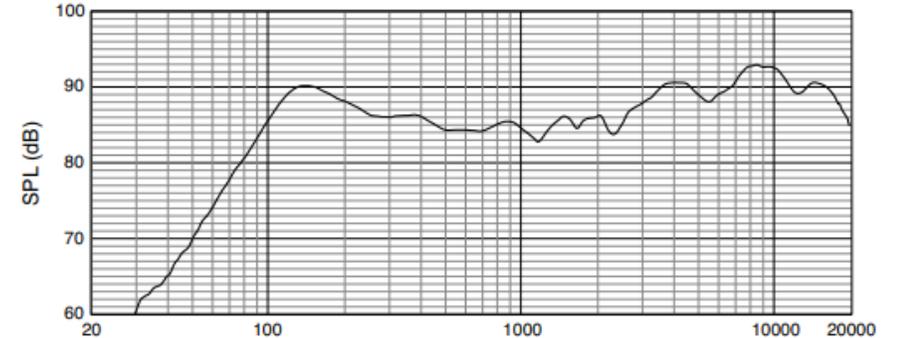
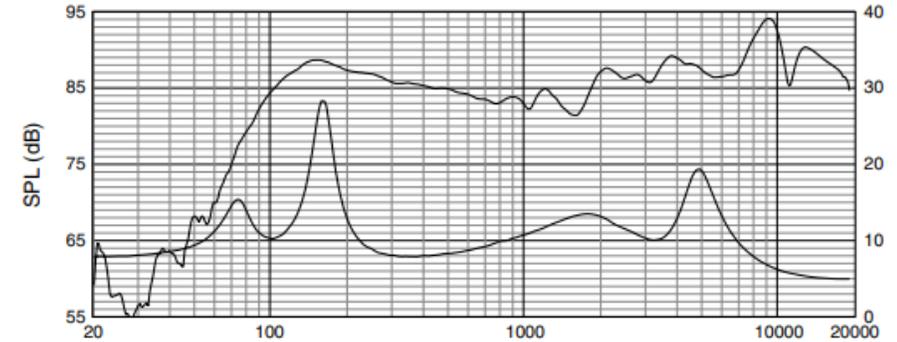
Parlantes para embutir en techos

Bass-Reflex



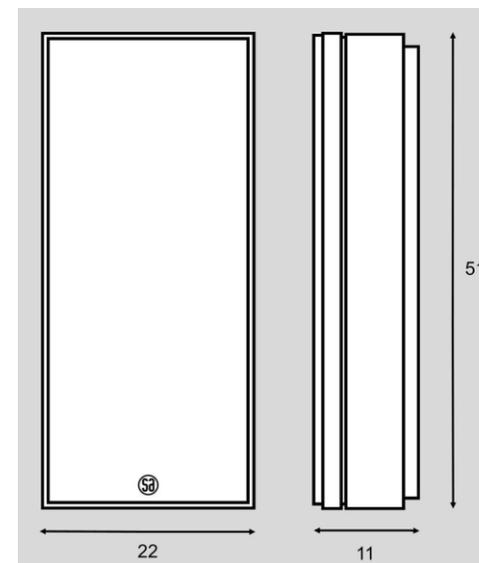
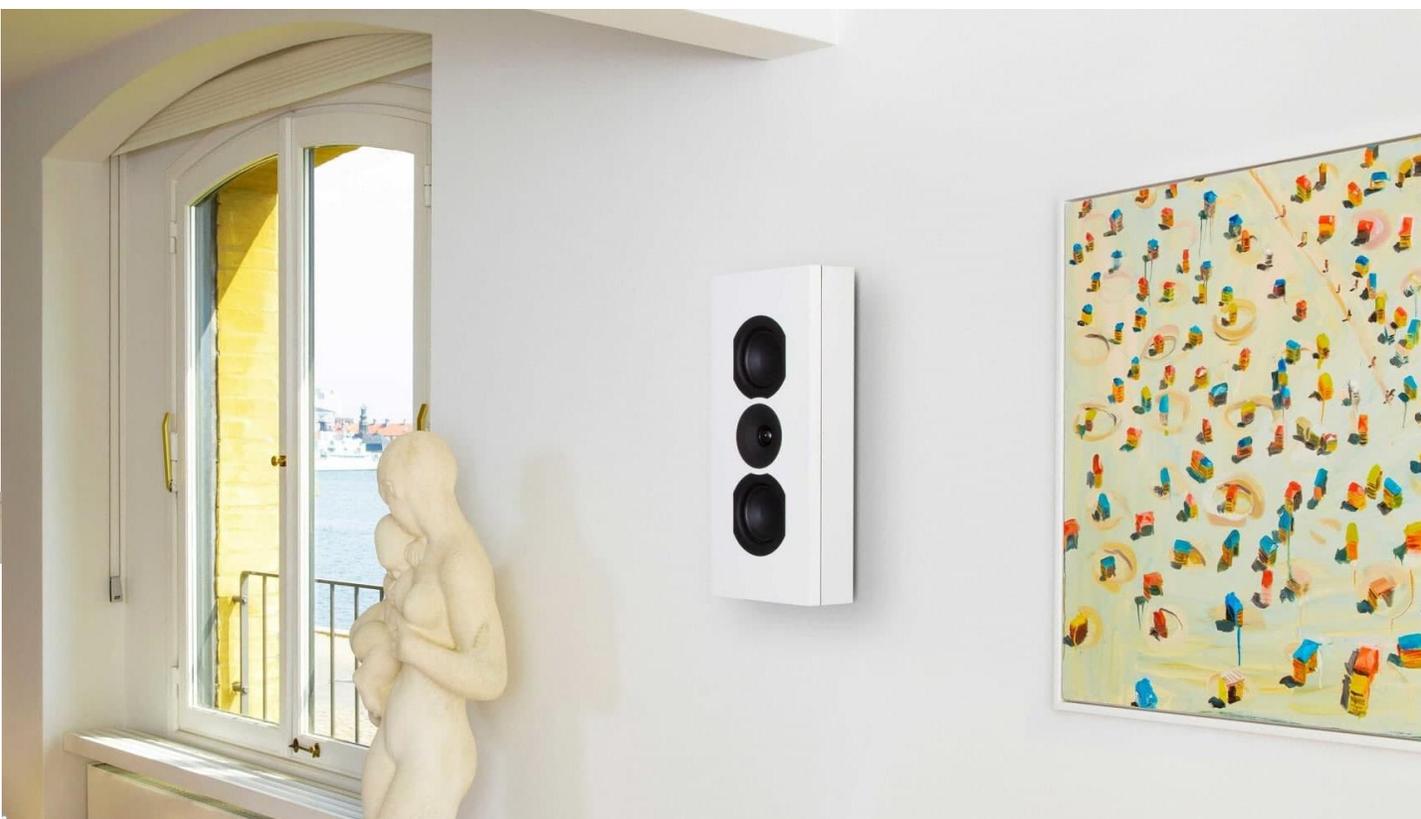
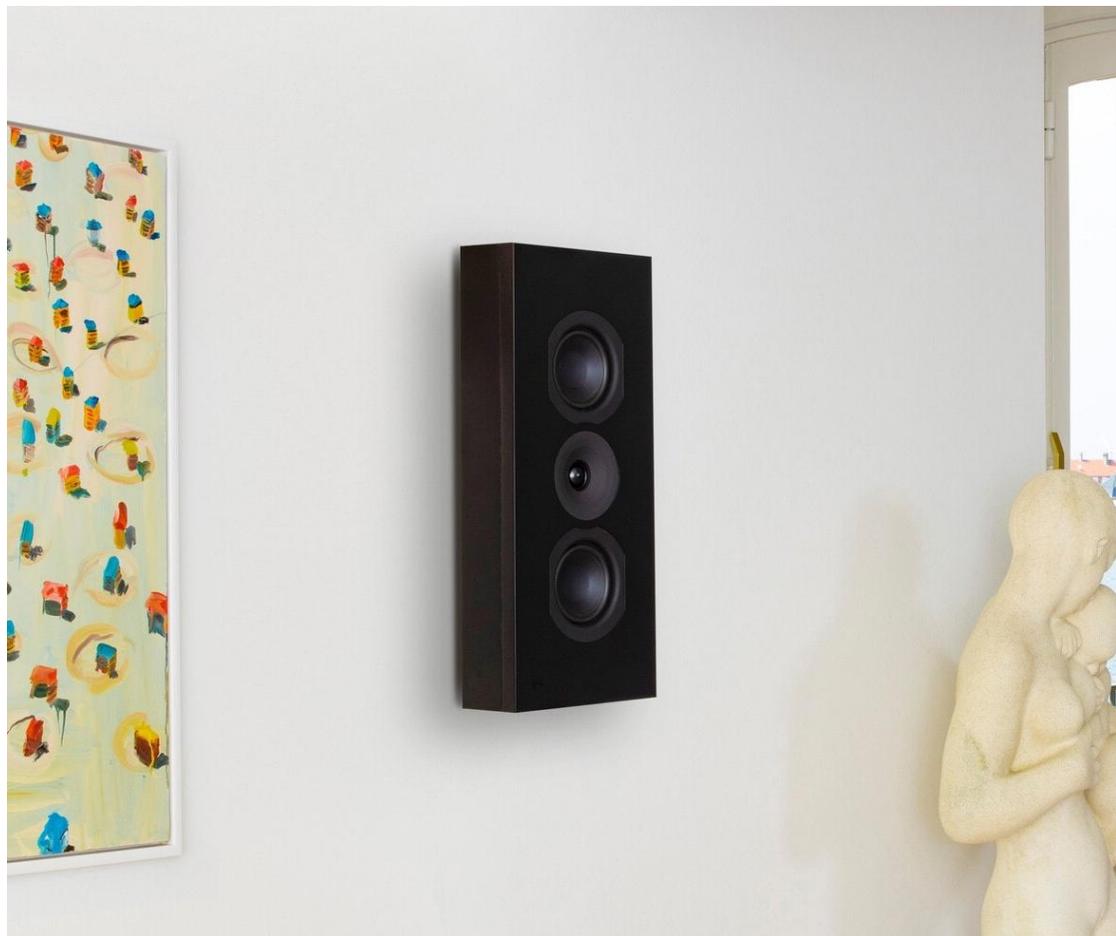
Control Series

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



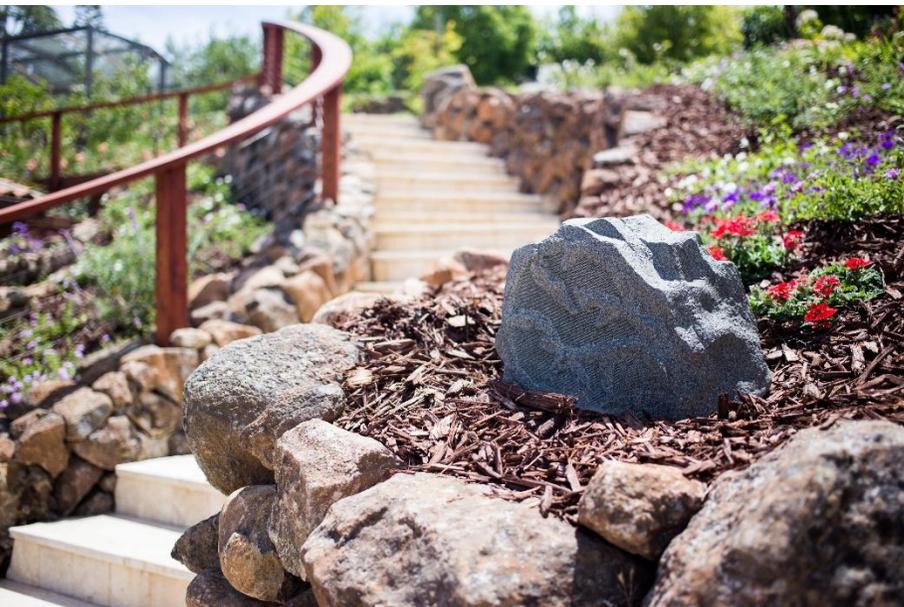
SONANCE
Invisible Series

5 ohm
100 watts RMS
90dB

Parlantes para exteriores “clásicos”



Parlantes para exteriores “modernos”



Parlantes para exteriores “modernos”

