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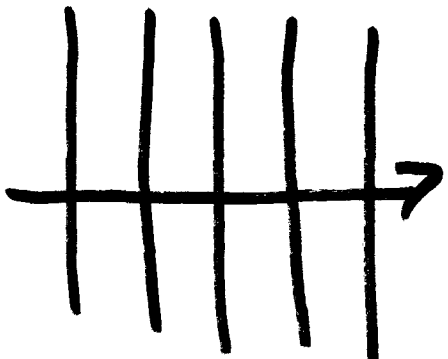
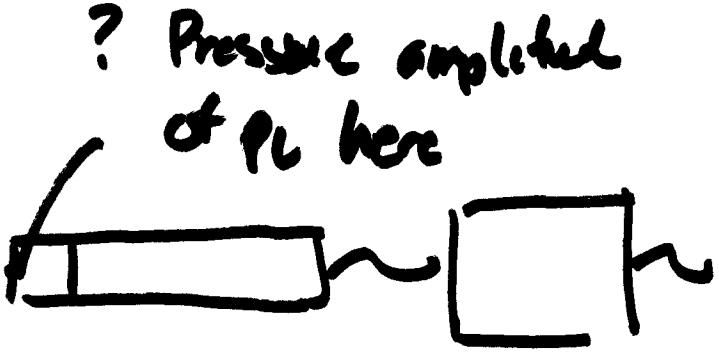
# Examples Uses of the 4133

## Microphone



$p_i$ = PW at 0° incidence, f = 10 kHz




V = Voltage amplitude

= 24.2 mV

$$S_f = S_0 + \Delta_f(10\ kHz) \qquad \Delta_f = 0.25\ dB$$

$$S_f = -38.6 + 0.25 = -38.35\ dB$$

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$M_f = 10^{-38.35/20} = 0.0121\ V/Pa$

$= 12.1\ mV/Pa$

$M_f = \frac{V}{p} \qquad p = \frac{V}{M_f} = \frac{24.2\ mV}{12.1\ mV/Pa} = 2\ Pa$

Everything the same, except $f = 1\ kHz$

$\Delta_f(1\ kHz) = 0 \Rightarrow S_f = S_0 = -38.6\ dB\ re\ 1\ V/Pa$

$M_f = 11.7\ mV/Pa \Rightarrow p = \frac{24.2\ mV}{11.7\ mV/Pa} = 2.07\ Pa$

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# Free-Field Correction Factor

$$M_f = \frac{V}{p_i(x,y,z)} \qquad M_p = \frac{V}{\langle p_i + p_s \rangle}$$

$$\frac{M_f}{M_p} = \frac{\frac{V}{p_i}}{\frac{V}{\langle p_i + p_s \rangle}} = \frac{\langle p_i + p_s \rangle}{p_i}$$

Could be computed with FEM

$$20\log\left[\frac{M_f}{M_p}\right] = 20\log\left[\frac{\langle p_i + p_s \rangle}{p_i}\right] = 20\log[M_f] - 20\log[M_p]$$

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$S_f - S_p = K_f \equiv$ free-field correction factor.

↑ "Should" be provided by the manufacturer.

Example calculations using free-field correction factor.

Frequency 10 kHz, $M_p$ = ?? 4133 mcc

Cal chart: $S_0 = -38.6$, $\Delta_f = 0.25$, $S_f = -38.35$, $M_p = 12.1 \frac{mV}{Pa}$

Cal Chart + FF corr. Factor. $S_p = S_0 + \Delta_p (f = 10\ kHz)$

$\Delta_p \approx 4\ dB$

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$S_f = S_p + K_f$ ; $K_f = 4$ dB ; $S_f = -42.6 + 4$ dB

$= -38.6$ dB re 1 V/Pa

$= 11.7$ mV/Pa

Say the field is the same, except random incidence.

$K_f = 0.7$ ; ~~$S_f = -2$~~ $S_p = -42.6$ dB re 1 V/Pa

$S_f = -42.6 + 0.7 = -41.9$ dB re 1 V/Pa

$\Rightarrow M_f = 8.035$ mV/Pa