SOUND3 AMPLITUDE

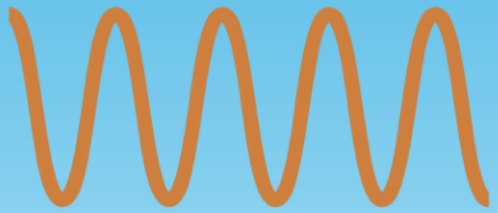
TOMMASO ROSATI

SOUND ART

SOURCE

WAVE

AUDITORY SYSTEM



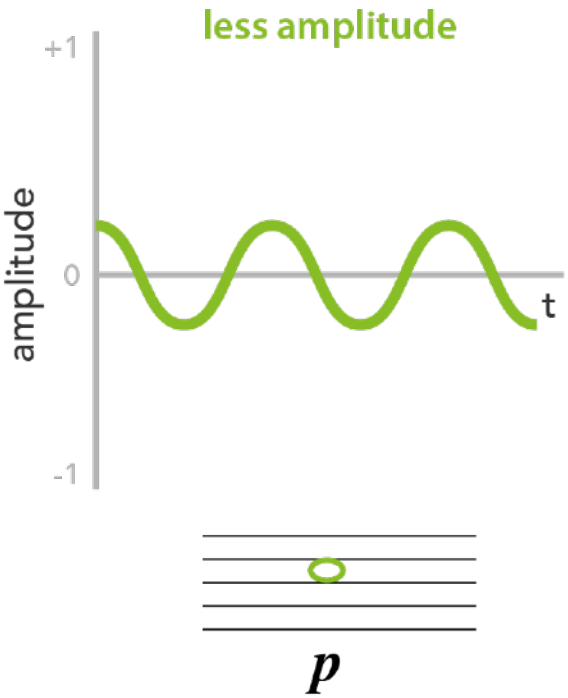
ELASTIC MEDIUM

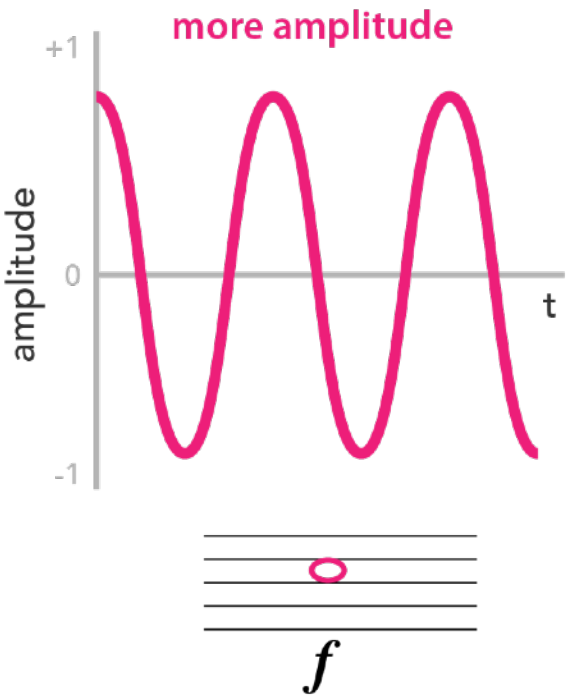
Amplitude - Dynamics - Volume

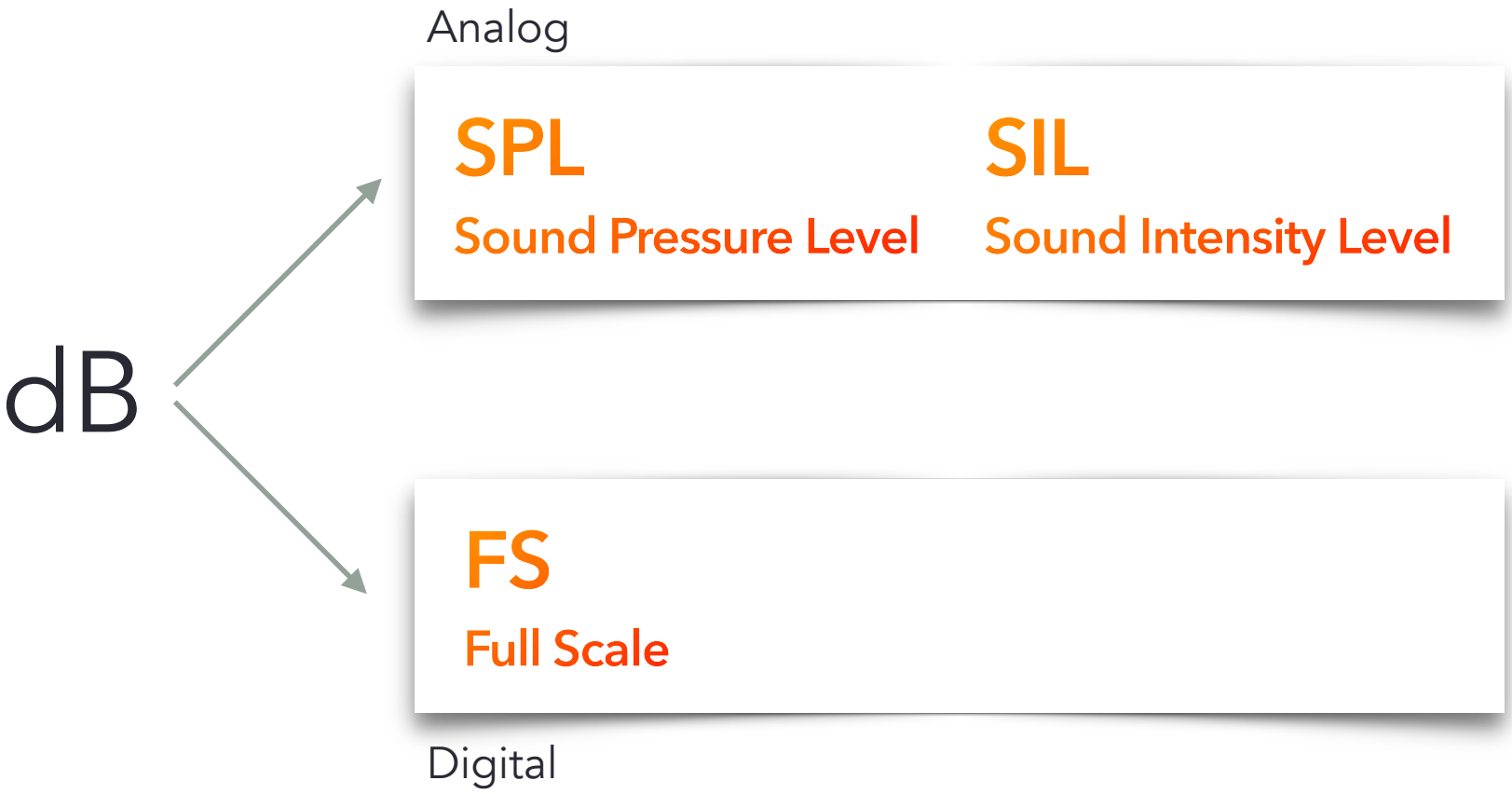
Amplitude is the acoustic physics term for measuring the maximum deviation of the wave from the zero line, thus indicating the magnitude of the compression-rarefaction of the elastic medium that my vibrating body is producing.

Dynamics is the musical term for how loudly we should play a particular part, is expressed in a scale ranging from pianissimo to fortissimo, and, unlike amplitude, is relative to context.

Volume means the perceived sensation of a given amount of air compression-rarefaction.





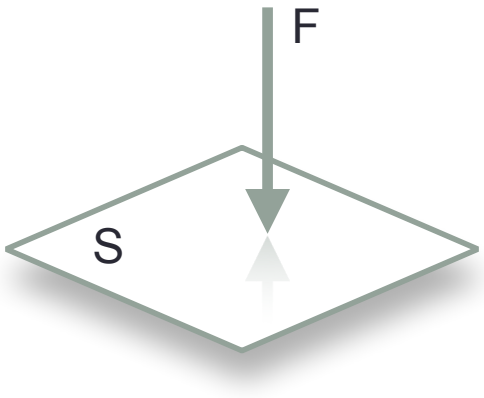

Analog
SPL
Sound Pressure Level
SIL
Sound Intensity Level
dB
FS
Full Scale
Digital

ANALOG

SPL Sound Pressure Level

Measure the air **pressure** due to the air molecules' compression-rarefaction.

pressure = the force applied to a surface = **F/S** = Newton/m^2



one of the weakest audible sounds: 0,000025 N/m^2 →

one of the loudest sounds: 30 N/m^2 →

This huge distance becomes a bit complex to handle in everyday measurements:

$$\frac{30\ N/m^2}{0{,}000025\ N/m^2}$$

A logarithm allows us to “squash” these values and make them easier to use.

I relate the measured pressure to the minimum audible pressure:

why 10log
instead of 20log?
because intensity and pressure are in ratio
$i \times p^2$
and $\log a^b = b * \log a$

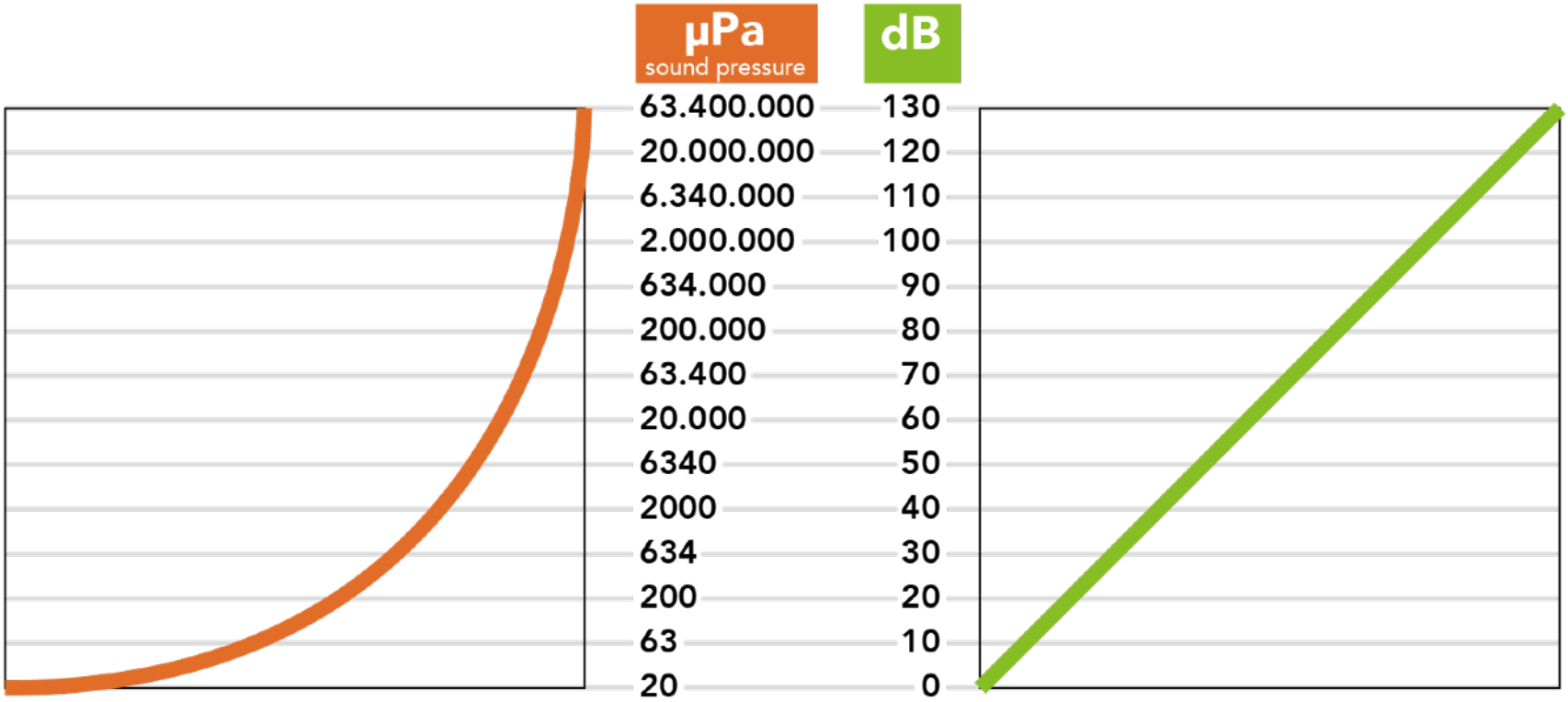
$$SPL = 20\log\left(\frac{p}{p_0}\right) dB$$

pressione misurata

pressione di riferimento

1° Advantage on using logarithms

A smaller numerical scale and thus more agile to use

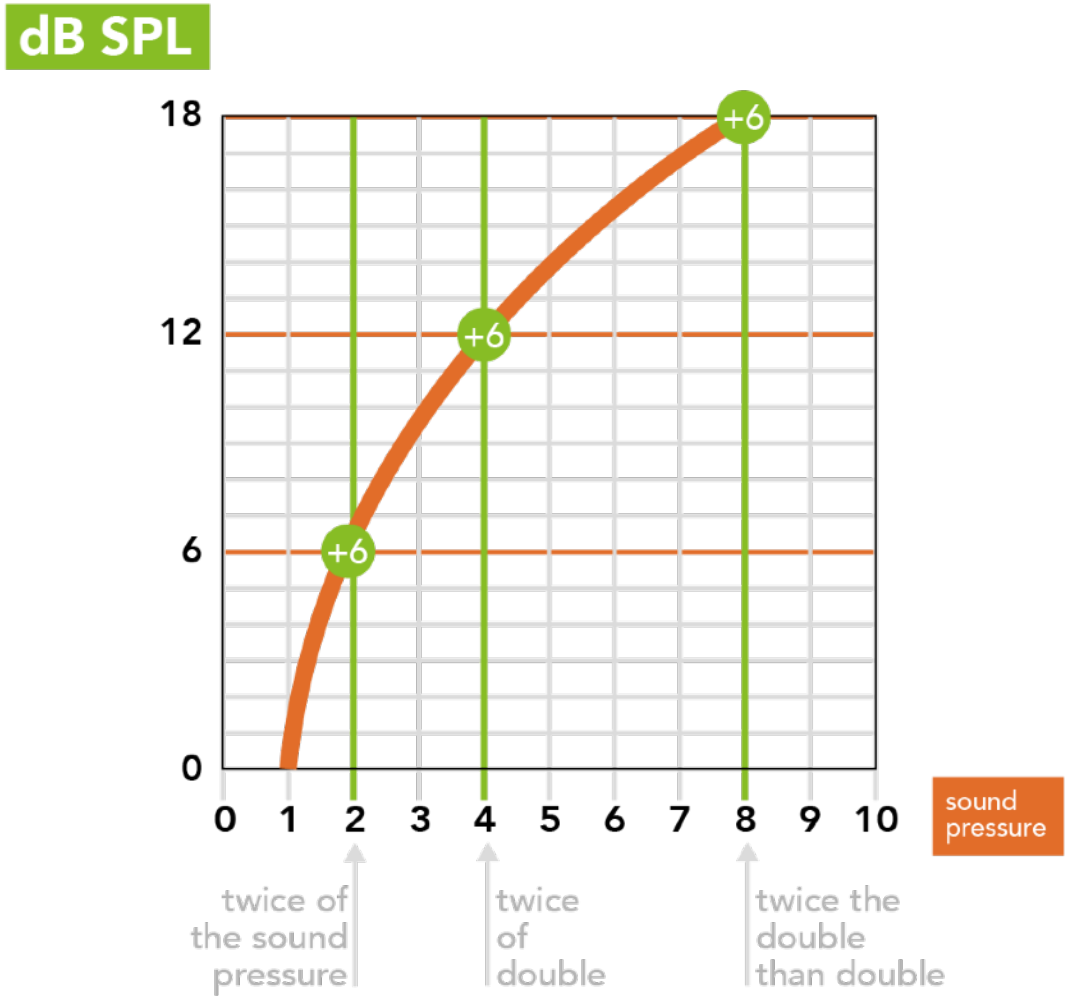


2° Advantage on using logarithms

A compensation for the functioning of our auditory system, which, as with frequencies, does not respond in a linear but logarithmic way.

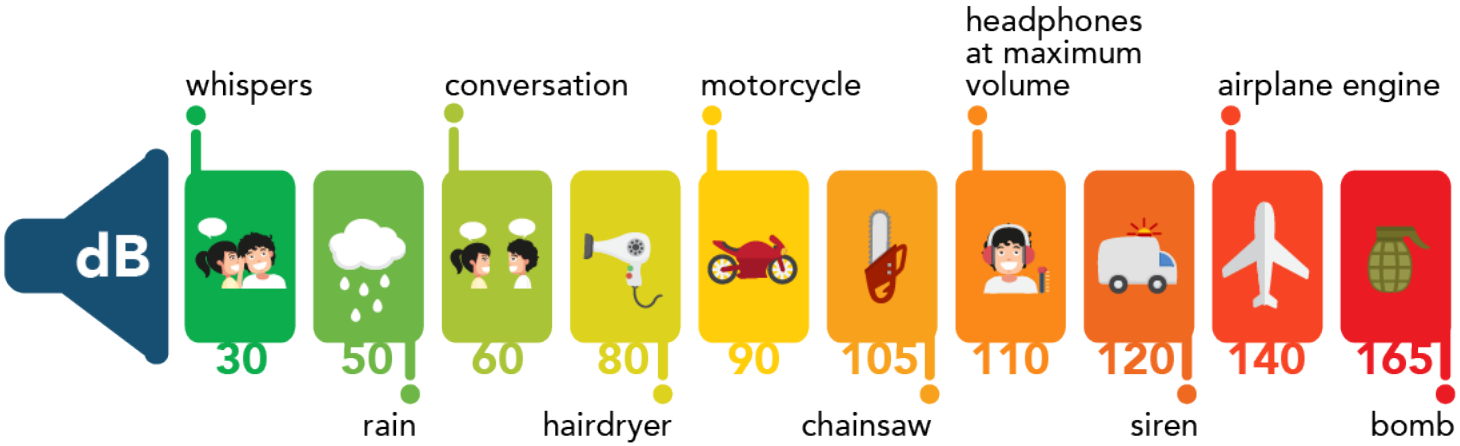
ANALOG

A significant practical consequence of using a logarithmic scale is that to double the perceived volume, I do NOT have to multiply by 2 but add a value: **+6 dB** in the dB SPL or FS and **+3 dB** in the dB SIL (because in creating the dB SIL we multiply the logarithm by 10 and not by 20). To half, I will do a subtraction (-6 dB or - 3 dB)



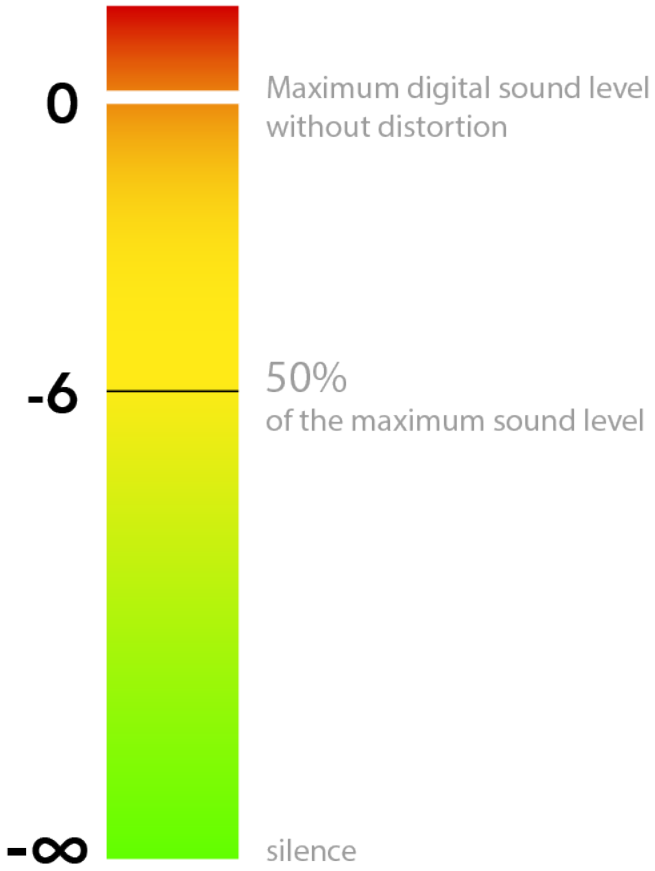
ANALOG

dB SPL



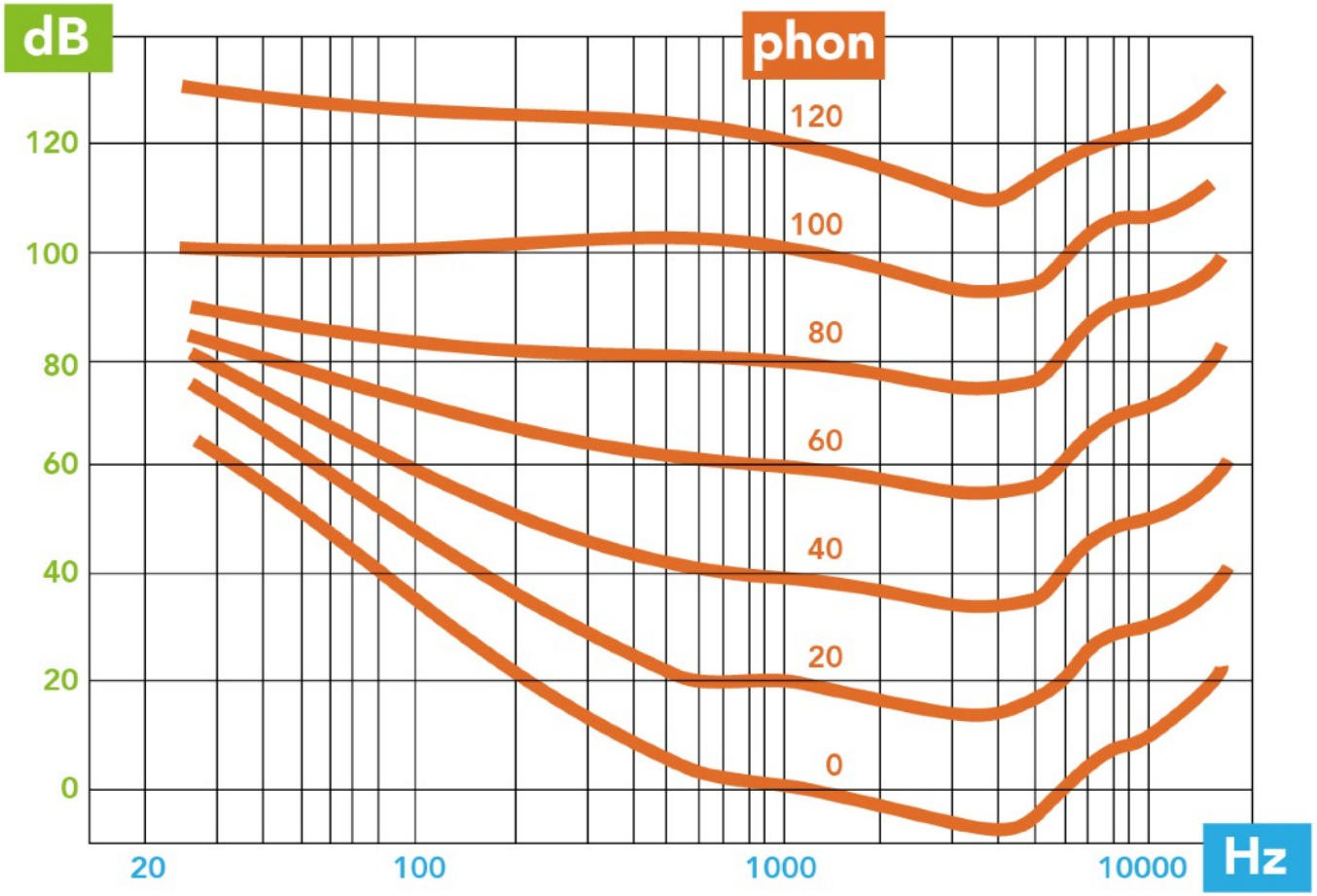
DIGITAL

dB FS (Full Scale)



We are not equally sensitive to all frequencies.

Each orange line is a given perceived amplitude (expressed in Phon). The graph illustrates how many dB I have to exert at a given frequency to perceive that amplitude.



Fletcher-Munson diagram

Dynamics is the musical term for how loudly we should play a particular part, is expressed in a scale ranging from ***pianissimo*** to ***fortissimo***, and, unlike amplitude, is relative to context.

ppp	più piano possibile
pp	pianissimo
p	piano
mp	mezzo piano
mf	mezzo forte
f	forte
ff	fortissimo
fff	più forte possibile
<	crescendo
>	diminuendo

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