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Some Basics

Sound Pressure Level (SPL)

$$L_P = 20\log(\frac{P}{P_0})$$

expressed in units of dB (or more precisely, in units of dB-SPL), where P is a measure of pressure amplitude in units of Pascals[1] and P_0 is the reference pressure amplitude of 20 μPa (or equivalently, 2 x 10^{-5} N/m^2). Expressions similar to the one shown above also apply to A-weighted (L_A) or C-weighted (L_C) measurements, with units notations of dBA and dBC, respectively. These weighted (or filtered) measurements are intended to mimic human hearing. Note that the measurements, P, are instantaneous readings.

Equivalent Continuous Sound Pressure Level (L_{eq})

$$L_{eq} = 10\log\frac{1}{(t_2 - t_1)}\int_{t_1}^{t_2}(\frac{P(t)}{P_0})^2\,dt$$

expressed in units of dB where the measured sound pressure level, P(t), in the numerator is shown here as a function of time. This expression shows a means of averaging over the span of time of interest (from t_1 to t_2.) In addition, the Sound Exposure Level (SEL) is computed the same as L_{eq} as shown above, *but without dividing by time*. Effectively L_{eq} is SEL divided by time. The SEL can be thought of as the cumulative amount of noise. Thus while L_{eq}, the average level can go up and down, SEL can only go up because we are integrating a strictly positive, time-varying quantity – you cannot get "less sound" once it has happened.

Note that there are other ways to quantify and express sound pressure level, like single-shot sound exposure level – those are not discussed here.

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1 Pascals are equivalent to N/m^2