NOTE ON TERMINOLOGY

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TUNE (beginning with version 5.13) computes three output quantities:

- Broadband SPL (Sound Pressure Level)
- Decidecade SPL (“”)
- Broadband PSD (Power Spectral Density)

Names and units used for each quantity are justified as follows.

Broadband SPL

This quantity derives from RMS (Root-Mean-Square) sound pressure computed in the specified time interval (snapshot) of input waveform and a single dB value is obtained. As this operation is not frequency dependent and is done over full frequency spectrum, it is named ‘Broadband’.

TUNE presents broadband SPL in a plot or tabular form as a series of dB values as a function of time.

Definition is given in ISO 18405:2017 standard as follows:

> **3.2.1.1**
> **mean-square sound pressure level**
> **root-mean-square sound pressure level**
> **sound pressure level**
> **SPL**
> $L_{p,\mathrm{rms}}$
> L_p
> DEPRECATED: mean-square SPL
> ten times the logarithm to the base 10 of the ratio of the *mean-square sound pressure* (3.1.3.1) to the specified reference value, p_0^2, in decibels

which in turn derives from:

> **3.1.3.1**
> **mean-square sound pressure**
> $\overline{p^2}$
> integral over a specified time interval of squared *sound pressure* (3.1.2.1), divided by the duration of the time interval, for a specified frequency range

Symbol and unit for **Broadband SPL** are: $\boldsymbol{L_{p,rms}}$, **dB re 1 µPa²**

Note: reference is to 1 µPa² since it is based on mean-square sound pressure which is quadratic.

Decidecade SPL

This quantity is obtained by first taking waveform power spectrum using FFT (Fast Fourier Transform), then selecting frequency components that lie inside a decidecade band, adding them together and dividing by decidecade bandwidth. It is numerically equivalent to taking the average SPL in the same bandwidth within power spectrum. It is also equivalent to filtering the waveform (ideally with infinite frequency rolloff, that is zero transition band), then computing SPL in a similar way as described before for broadband case.

Usually TUNE is set to compute a series of decidecade SPL values and presents them in a plot or tabular form as a function of decidecade center frequency.

Definition is given in ISO 18405:2017 standard as follows, where 'weighted' is meant to be: 'filtered in a decidecade':

> **3.7.1.3**
> **mean-square weighted sound pressure level**
> **weighted sound pressure level**
> **SPL_w**
> $L_{p,w}$
> ten times the logarithm to the base 10 of the ratio of the mean-square *weighted sound pressure* (3.7.1.1) to the specified reference value, p_0^2, in decibels

which in turn derives from:

> **3.7.1.1**
> **weighted sound pressure**
> p_w
> output of a specified linear filter when the input is the *sound pressure* (3.1.2.1), $p(t)$

Symbol and unit for **Decidecade SPL** are: $L_{p,dd}$, **dB re 1 µPa²**

where 'dd' is used as a subscript to refer to a decidecade.

Broadband PSD

This quantity is directly obtained from FFT power spectrum as a series of frequency components starting from zero up to half sampling frequency (Nyqvist limit), thus it is named 'Broadband'.

TUNE presents broadband PSD as a series of values for each frequency bin: each bin has a fixed width which depends on sampling frequency and number of FFT points.

Definition is given in ISO 18405:2017 standard as follows:

> **3.2.1.10**
> **mean-square sound pressure spectral density level**
> $L_{p,f}$
> ten times the logarithm to the base 10 of the ratio of the *mean-square sound pressure spectral density* (3.1.3.13), $\left(\overline{p^2}\right)_f$, to the specified reference value, $\left(\overline{p^2}\right)_{f,0}$, in decibels

which in turn derives from:

> **3.1.3.13**
> **mean-square sound pressure spectral density**
> $\left(\overline{p^2}\right)_f$
> distribution as a function of non-negative frequency of the *mean-square sound pressure* (3.1.3.1) per unit bandwidth of a sound having a continuous spectrum

Symbol and unit for **Broadband PSD** are: $L_{p,f}$, **dB re 1 µPa² / Hz**