



# Evaluation of tonality of noise sources

User Guide

## Objective

This document provides a practical method for determining whether a noise source exhibits tonal characteristics suitable for active noise control (ANC) mitigation.

The guideline applies to:

- Rotating machinery
- Fans and blowers
- Compressors
- Pumps
- Electric motors
- Enclosed mechanical systems
- Precision equipment

This document supports both professional acoustic measurement workflows and rapid preliminary screening.

A noise source is considered tonal when:

- One or more narrow frequency peaks dominate the spectrum
- The tonal peak exceeds surrounding broadband energy by a clear margin
- Harmonic structures are visible (integer multiples of a base frequency)
- The tone remains stable across time

Tonal components are typically associated with:

- Rotational frequency (RPM-related tones)
- Blade-pass frequency
- Electrical switching frequencies
- Structural resonances

Broadband noise without dominant peaks is generally not suitable for narrowband ANC.

### Measurement Requirements

- Narrow-band FFT (minimum 1–5 Hz resolution recommended)
- Frequency range covering dominant mechanical components
- Stable operational condition
- Measurement position representative of listener exposure

### What to Look For

- Distinct spectral peaks clearly rising above broadband floor
- Tonal prominence across multiple operating conditions
- Stable frequency behaviour over time

If tonal peaks are present and repeatable, the source may be suitable for ANC evaluation.

## Step-by-step Guide

### 1. Download a Spectroid app onto your Android phone/tablet



(For users of Apple products we recommend [this application](#))

### 2. Go Settings > Audio >

- a. Audio source Default
- b. Sampling rate 48000
- c. FFT size 2048 bins
- d. Decimations 7
- e. Window function Hamming
- f. Desired transform interval 25ms
- g. Exponential smoothing factor 0.3

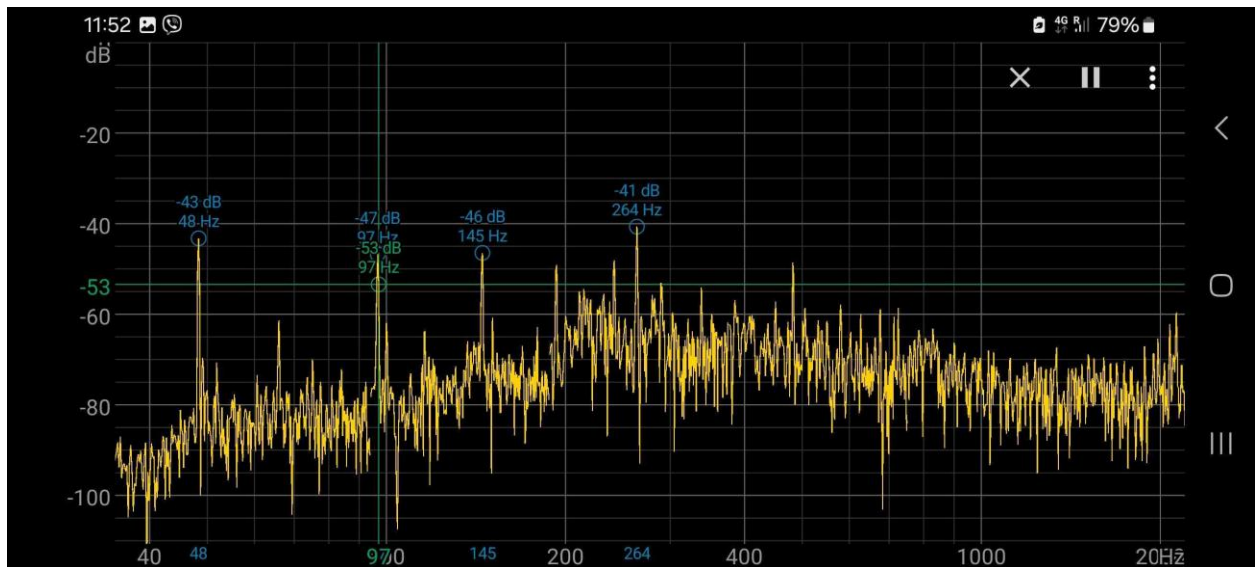
(To the best of your ability, apply the same settings to an alternative application you may be using.)

### 3. Hold your phone/tablet in front of the product under test (horizontally)

### 4. Zoom in on your screen so the frequency axis covers 40-1000Hz range

## 5. Evaluate the narrow-band spectrum

Take a few screenshots of what you see. Your screen should look something like this:



### Indicators of Tonality

- Narrow, sharp spectral spikes
- Clearly visible harmonics
- Consistent dominant frequencies

Diffuse, broadband spectra without defined peaks are typically not suitable for tonal ANC.

Tonal sources that are strong candidates for active noise control are/contain:

- Dominant narrowband peaks
- Stable frequency structure
- Predictable operating conditions

Highly broadband, stochastic, or impulsive sources are typically unsuitable for narrowband ANC approaches.