

Harmonics versus resonance

A harmonic in relation to the sinusoidal behaviour of a cantilever is related to the frequency of the AC voltage placed on it or by the actions of the actuating piezo. When the cantilever is 'vibrated' by the AC voltage (directly or indirectly) at its fundamental frequency (defined as the reciprocal of the time taken for the cantilever to perform one cycle of its oscillation) this relates to the harmonics of the cantilever. The cantilever harmonics are all periodic of the fundamental frequency. Labelling the fundamental frequency as f , harmonics have frequencies that are multiples of f . The harmonics are $2f$, $3f$, $4f$, etc. Harmonics are equally spaced from the fundamental frequency as periodic multiples.

Resonance, on the other hand, is the change in amplitude of the cantilever oscillation at certain frequencies. Different materials and structures have certain frequencies that the material/structure absorbs and stores more vibrational energy than at other frequencies. This storage of additional energy produces vibrations of the material/structure at larger amplitudes than at other frequencies.