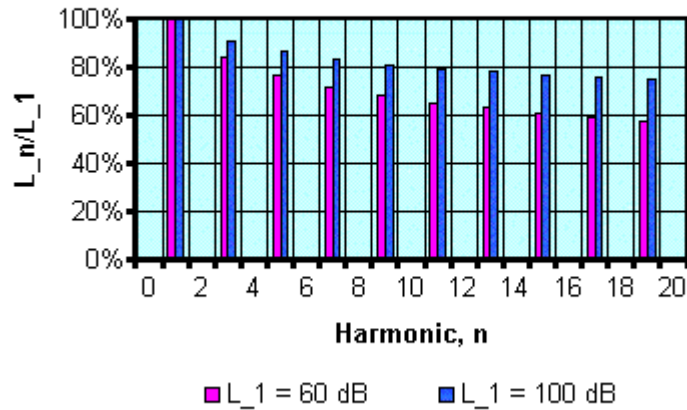


Harmonic Content of a Bipolar Square Wave (50% Duty Cycle)



The following two figures show the “Fourier construction” of a periodic, bipolar, 50% duty-cycle unit-amplitude square wave. The waveforms in these figures were generated using truncated, finite-term version(s) of the Fourier series expansion for this waveform:

$$f(\theta) \Big|_{\text{square-wave}} = \frac{4}{\pi} \sum_{m=1}^{m=\infty} \frac{\sin[(2m-1)\theta]}{(2m-1)} = \frac{4}{\pi} \left\{ \sin \theta + \frac{1}{3} \sin 3\theta + \frac{1}{5} \sin 5\theta + \frac{1}{7} \sin 7\theta + \dots \right\}$$

The first figure shows the bipolar square wave (labelled as “Waveform”) overlaid with three other waveforms: that associated with just the fundamental (“ $n = 1$ ”), then the waveform associated with fundamental + 3rd harmonic (“ $n = 1:3$ ”), then the waveform associated with fundamental + 3rd + 5th harmonic (“ $n = 1:5$ ”).

Fourier Construction of a Bipolar Square Wave

