We summarize the modal frequencies, wavelengths, and the locations of nodes and anti-nodes for the first nine harmonics associated with a vibrating rod of length, *L* in the table below.

Harmonic Mode #, n	**Frequency f (Hz)**	**Wavelength λ (m)**	**Node Locations, (m)**	**Anti-Node Locations, (m)**
1	f_1	$\lambda_1 = 2L$	0	$\pm{}^1/_2L$
2	$f_2 = 2f_1$	$\lambda_2 = {}^1/_2\lambda_1 = L$	$\pm{}^1/_4L$	$0, \pm{}^2/_4L = \pm{}^1/_2L$
3	$f_3 = 3f_1$	$\lambda_3 = {}^1/_3\lambda_1 = {}^2/_3L$	$0, \pm{}^2/_6L = \pm{}^1/_3L$	$\pm{}^1/_6L, \pm{}^3/_6L = \pm{}^1/_2L$
4	$f_4 = 4f_1$	$\lambda_4 = {}^1/_4\lambda_1 = {}^1/_2L$	$\pm{}^1/_8L, \pm{}^3/_8L$	$0, \pm{}^2/_8L = \pm{}^1/_4L, \pm{}^4/_8L = \pm{}^1/_2L$
5	$f_5 = 5f_1$	$\lambda_5 = {}^1/_5\lambda_1 = {}^2/_5L$	$0, \pm{}^2/_{10}L = \pm{}^1/_5L, \pm{}^4/_{10}L = \pm{}^2/_5L$	$\pm{}^1/_{10}L, \pm{}^3/_{10}L, \pm{}^5/_{10}L = \pm{}^1/_2L$
6	$f_6 = 6f_1$	$\lambda_6 = {}^1/_6\lambda_1 = {}^1/_3L$	$\pm{}^1/_{12}L, \pm{}^3/_{12}L = \pm{}^1/_4L, \pm{}^5/_{12}L$	$0, \pm{}^2/_{12}L = \pm{}^1/_6L, \pm{}^4/_{12}L = \pm{}^1/_3L, \pm{}^6/_{12}L = \pm{}^1/_2L$
7	$f_7 = 7f_1$	$\lambda_7 = {}^1/_7\lambda_1 = {}^2/_7L$	$0, \pm{}^2/_{14}L = \pm{}^1/_7L, \pm{}^4/_{14}L = \pm{}^2/_7L, \pm{}^6/_{14}L = \pm{}^3/_7L$	$\pm{}^1/_{14}L, \pm{}^3/_{14}L, \pm{}^5/_{14}L, \pm{}^7/_{14}L = \pm{}^1/_2L$
8	$f_8 = 8f_1$	$\lambda_8 = {}^1/_8\lambda_1 = {}^1/_4L$	$\pm{}^1/_{16}L, \pm{}^3/_{16}L, \pm{}^5/_{16}L, \pm{}^7/_{16}L$	$0, \pm{}^2/_{16}L = \pm{}^1/_8L, \pm{}^4/_{16}L = \pm{}^1/_4L, \pm{}^6/_{16}L = \pm{}^3/_8L$
9	$f_9 = 9f_1$	$\lambda_9 = {}^1/_9\lambda_1 = {}^2/_9L$	$0, \pm{}^2/_{18}L = \pm{}^1/_9L, \pm{}^4/_{18}L = \pm{}^2/_9L, \pm{}^6/_{18}L = \pm{}^3/_9L = \pm{}^1/_3L, \pm{}^8/_{18}L = \pm{}^4/_9L$	$\pm{}^1/_{18}L, \pm{}^3/_{18}L, \pm{}^5/_{18}L, \pm{}^7/_{18}L, \pm{}^9/_{18}L = \pm{}^1/_2L$

We used a Hewlett-Packard HP-3652A Dynamic Signal Analyzer (another piece of electronic measurement equipment in our lab) to carry out real-time Fast-Fourier Transform/Harmonic Analysis, in order to measure the harmonic content of the modal vibrations of our $L = 1.52$ m long aluminum rod. When the aluminum rod was held at its mid-point and excited, as expected, we observed the first three of the odd-harmonic ($n = 1, 3, 5$) modes of vibration of the rod, which we measured to be at $f_1 = 1672$ Hz, $f_3 = 5012$ Hz (~ 3 f_1) and $f_5 = 8350$ Hz (~ 5 f_1), respectively. Nearly all of the vibrational energy of the aluminum rod (> 99%) is in the fundamental – very little energy is contained in the higher ($n = 3$, $n = 5$) harmonics. Most of this is in the 3rd harmonic, with even less in the 5th harmonic. Higher order ($n = 7, 9, \ldots$) harmonics were not observable with our setup.

When the rod was held at $x = ¼$ L in order to excite (only) the 2nd harmonic, we observed (only) the second ($n = 2$) harmonic at $f_2 = 3338$ Hz (~ 2 f_1).

When the rod was held at $x = {}^1/_3$ L, in order to excite (only) the 3rd harmonic odd harmonic, we observed (only) the third ($n = 3$) harmonic at $f_3 = 5012$ Hz (~ 3 f_1).