



Acoustical Analysis Report

for

Sample Mode Analysis

Quest Acoustical Interiors

(877) 900-6849

The Dimensions of Your Room

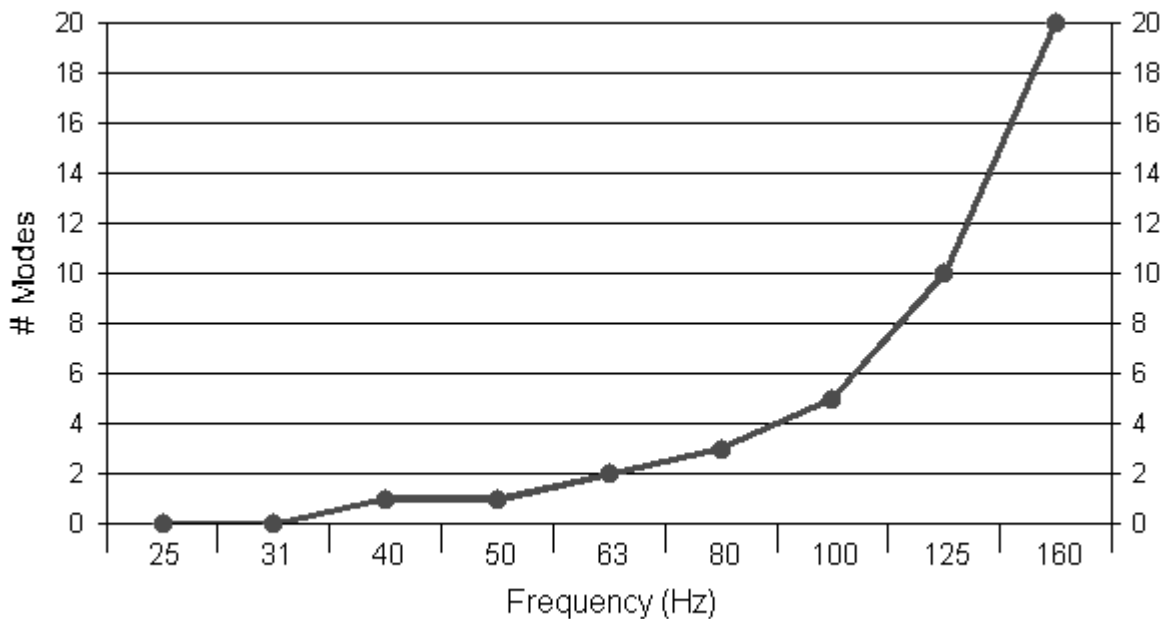
MODE ANALYSIS REPORT



Understanding the acoustical nature of your listening room begins by analyzing the dimensions. While room dimensions should not be used solely to determine the suitability of a room for quality sound reproduction, room dimensions can reveal some potential problems. Good sound is possible in any room, even a room displaying poor modal distribution. Achieving good sound becomes a more challenging task though when the room dimensions do not evenly support all bass 1/3 octaves. In this analysis we focus on discovering which bass frequencies resonate in the room.

Resonant frequencies, called modes, are present in every room. Our first goal is to find out what modes are at work, we then begin learning if we can expect a neutral sounding room or a room injecting its own imprint on all of our music. Achieving uniform modal distribution means that the spacing between modes is relatively even with each 1/3 octave band occupied by a mode. Uneven modal distribution means that there are either too many or not enough modes in some of the 1/3 octave bass bands. This "mode analysis" uses the "Modes per 1/3 Octave" chart combined with a detailed modal calculation to analyse predicted bass smoothness. Use both to gain an idea of your rooms true modal character.

Modes per 1/3 Octave



Scenario: Height: 8.50 ft Width: 12.00 ft Length: 14.50 ft

Bands based upon standard spacing

Dimensional Analysis Plot: This simple looking graph reveals much about the sonic character of your room. Mathematically, it is a graphical representation of the total number of modes which occur in your room per fraction of an octave. This graph illustrates that the room uniformly creates bass modes when each successive fraction of an octave contains an equal or an increasing number of modes as the previous. Translation, a good room has modes in every 1/3 octave. A desirable dimensional analysis curve shows each band level always increasing or at least remaining constant. Any decrease in the number of modes, a retrograde sloped increment, indicates a frequency band without the proper modal support. In most cases, this causes some problems in achieving smooth bass, but depending on the scenario, it can be a significant nuisance. This is the real secret to a good room dimension ratio; Seeing how the height, width, and length effect the modal distribution by displaying this curve and by understanding modal coincidences. Modal Coincidences: A well designed room uses dimensions that do not create multiple modes at or near the same frequencies. While room modes are beneficial by enhancing low frequency energy in a room, coincident modes exaggerate this enhancement at specific frequencies. Our target is to have the enhancement of bass to occur at many frequencies evenly. We therefore want to minimize the number of coincident modes, particularly at the very low frequencies below 100 Hz. Modes that are coincident are marked by an "X" on the Mode charts.

The Dimensions of Your Room

MODE ANALYSIS REPORT

mode analysis continued from previous page

Axial Modes

Freq (Hz)	p	q	r	Type	Wave(ft)	Spacing	Coin	Freq (Hz)	p	q	r	Type	Wave(ft)	Spacing	Coin
38.91	1	0	0	Axial	29.04			188.06	0	4	0	Axial	6.01	0.17	
47.02	0	1	0	Axial	24.03	0.17		194.56	5	0	0	Axial	5.81	0.03	X
66.37	0	0	1	Axial	17.03	0.29		199.12	0	0	3	Axial	5.68	0.02	X
77.83	2	0	0	Axial	14.52	0.15		233.48	6	0	0	Axial	4.84	0.15	
94.03	0	2	0	Axial	12.02	0.17		235.08	0	5	0	Axial	4.81	0.01	X
116.74	3	0	0	Axial	9.68	0.19		265.49	0	0	4	Axial	4.26	0.11	
132.74	0	0	2	Axial	8.51	0.12		272.39	7	0	0	Axial	4.15	0.03	X
141.05	0	3	0	Axial	8.01	0.06		282.09	0	6	0	Axial	4.01	0.03	X
155.65	4	0	0	Axial	7.26	0.09									

All Modes

Freq (Hz)	p	q	r	Type	Wave(ft)	Spacing	Coin	Freq (Hz)	p	q	r	Type	Wave(ft)	Spacing	Coin
38.91	1	0	0	Axial	29.04			153.88	2	0	2	Tangential	7.34	0.03	
47.02	0	1	0	Axial	24.03	0.17		155.65	4	0	0	Axial	7.26	0.01	
61.03	1	1	0	Tangential	18.52	0.23		155.88	0	3	1	Tangential	7.25	0.00	X
66.37	0	0	1	Axial	17.03	0.08		160.67	1	3	1	Oblique	7.03	0.03	
76.94	1	0	1	Tangential	14.69	0.14		160.90	2	1	2	Oblique	7.02	0.00	X
77.83	2	0	0	Axial	14.52	0.01		161.09	2	3	0	Tangential	7.01	0.00	X
81.34	0	1	1	Tangential	13.89	0.04		162.60	4	1	0	Tangential	6.95	0.01	
90.17	1	1	1	Oblique	12.53	0.10		162.67	0	2	2	Tangential	6.95	0.00	X
90.92	2	1	0	Tangential	12.43	0.01		163.94	3	2	1	Oblique	6.89	0.01	
94.03	0	2	0	Axial	12.02	0.03		167.26	1	2	2	Oblique	6.76	0.02	
101.76	1	2	0	Tangential	11.10	0.08		169.21	4	0	1	Tangential	6.68	0.01	
102.28	2	0	1	Tangential	11.05	0.01		174.23	2	3	1	Oblique	6.49	0.03	
112.57	2	1	1	Oblique	10.04	0.09		175.62	4	1	1	Oblique	6.43	0.01	
115.10	0	2	1	Tangential	9.82	0.02		176.77	3	0	2	Tangential	6.39	0.01	
116.74	3	0	0	Axial	9.68	0.01		180.33	2	2	2	Oblique	6.27	0.02	
121.50	1	2	1	Oblique	9.30	0.04		181.85	4	2	0	Tangential	6.21	0.01	
122.06	2	2	0	Tangential	9.26	0.00	X	182.92	3	1	2	Oblique	6.18	0.01	
125.85	3	1	0	Tangential	8.98	0.03		183.09	3	3	0	Tangential	6.17	0.00	X
132.74	0	0	2	Axial	8.51	0.05		188.06	0	4	0	Axial	6.01	0.03	
134.29	3	0	1	Tangential	8.41	0.01		192.05	1	4	0	Tangential	5.88	0.02	
138.33	1	0	2	Tangential	8.17	0.03		193.58	4	2	1	Oblique	5.84	0.01	
138.94	2	2	1	Oblique	8.13	0.00	X	193.69	0	3	2	Tangential	5.83	0.00	X
140.82	0	1	2	Tangential	8.02	0.01		194.56	5	0	0	Axial	5.81	0.00	X
141.05	0	3	0	Axial	8.01	0.00	X	194.75	3	3	1	Oblique	5.80	0.00	X
142.28	3	1	1	Oblique	7.94	0.01		197.56	1	3	2	Oblique	5.72	0.01	
146.10	1	1	2	Oblique	7.73	0.03		199.12	0	0	3	Axial	5.68	0.01	
146.32	1	3	0	Tangential	7.72	0.00	X	199.43	0	4	1	Tangential	5.67	0.00	X
149.90	3	2	0	Tangential	7.54	0.02		200.16	5	1	0	Tangential	5.65	0.00	X

The Dimensions of Your Room

MODE ANALYSIS REPORT

mode analysis continued from previous page

Dimensional Comparison

This chart shows a comparison of a range of practical room dimension options. It scores each scenario using a relative set of criteria. Point totals shouldn't be used as an absolute judgment of performance but rather strictly as a method of comparison. Low or negative point totals do not necessarily mean poor sound quality. The selection of the optimum room dimensions should primarily reflect the proper employment of other acoustic design elements, and practical design considerations first using this tool to avoid problem dimensions or to select the best from a similarly scored range of choices.

Rated	Scenario	Length(ft)	Width (ft)	Height (ft)	Coin (Ax)	Coin (All)	Retros	# of modes	Points
1	23	14.50	12.00	8.50	0	89	0	163	400
2	22	14.00	12.00	8.50	0	91	0	161	392
3	26	16.00	12.00	8.50	1	103	0	180	312
4	25	15.50	12.00	8.50	1	103	0	177	303
5	31	15.00	12.50	8.50	1	104	0	173	290
6	30	14.50	12.50	8.50	1	95	0	168	284
7	10	15.00	12.50	8.00	1	94	0	167	282
8	29	14.00	12.50	8.50	1	89	0	164	278
9	3	15.00	12.00	8.00	1	85	0	161	273
10	2	14.50	12.00	8.00	1	80	0	158	269
11	9	14.50	12.50	8.00	1	91	0	161	267
12	8	14.00	12.50	8.00	1	93	0	158	256
13	1	14.00	12.00	8.00	1	84	0	154	253
14	21	17.00	13.00	8.00	2	120	0	193	209
15	32	15.50	12.50	8.50	2	103	0	182	193
16	17	15.00	13.00	8.00	0	103	1	173	166
17	24	15.00	12.00	8.50	0	93	1	169	164
18	15	14.00	13.00	8.00	0	92	1	164	150
19	33	16.00	12.50	8.50	3	114	0	187	72
20	7	17.00	12.00	8.00	1	104	1	182	67
21	40	16.00	13.00	8.50	2	128	1	194	-46
22	14	17.00	12.50	8.00	2	109	1	186	-51
23	20	16.50	13.00	8.00	3	121	0	187	-60
24	5	16.00	12.00	8.00	3	110	0	175	-85
25	4	15.50	12.00	8.00	3	103	0	171	-90
26	16	14.50	13.00	8.00	0	103	2	168	-99
27	42	17.00	13.00	8.50	4	134	0	207	-138
28	41	16.50	13.00	8.50	4	125	0	200	-150
29	39	15.50	13.00	8.50	1	113	2	190	-168
30	28	17.00	12.00	8.50	2	116	1	190	-171