

Ohio State University
Acoustics and Dynamics Laboratory
Subject: Experimental Results on QC-118 Damped Rectangular Plates
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The following document contains data from vibro-acoustic experiments conducted on two rectangular plates. Both plates are 1.5 mm thick by 152.4 mm wide by 304.8 mm long and are made of galvanized steel. The damped plate has a 0.6 mm spray of QC-118 (damping material) fully applied to one side. All measurements were made at room temperature, on Dec. 19 and 20, 2002.

The first two frequency response functions (FRF) included were created from vibration data measured using a scanning laser vibrometer. The experiment was performed with free boundary conditions. The excitation was created using an impact hammer in which the impact force (F) location was at a free boundary of the plate. The first plot displays the acceleration (A/F type FRF where A is the acceleration), up to 2000 Hz. The second accompanying plot displays the insertion loss (in dB) obtained between the damped and undamped plate. Also included is a table listing the relevant mode shapes and natural frequencies of the damped and undamped plates. Loss factors will be calculated and reported later.

The second two FRF plots were created from experimental data taken from microphone (P) measurements in an acoustic chamber (free field). The experiment was performed in the same fashion with free boundary conditions and using an impact hammer force (F) for the input. The measurement was taken with the plate hung the long direction (see figure below), and the microphone placed at the same height and pointing directly at, the center of the plate. The first plot displays the P/F type acoustic response function up to 1600 Hz, while the second plot displays the insertion loss (in dB) obtained between the damped and undamped plate.

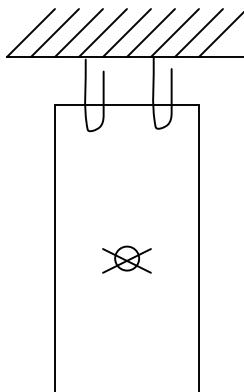
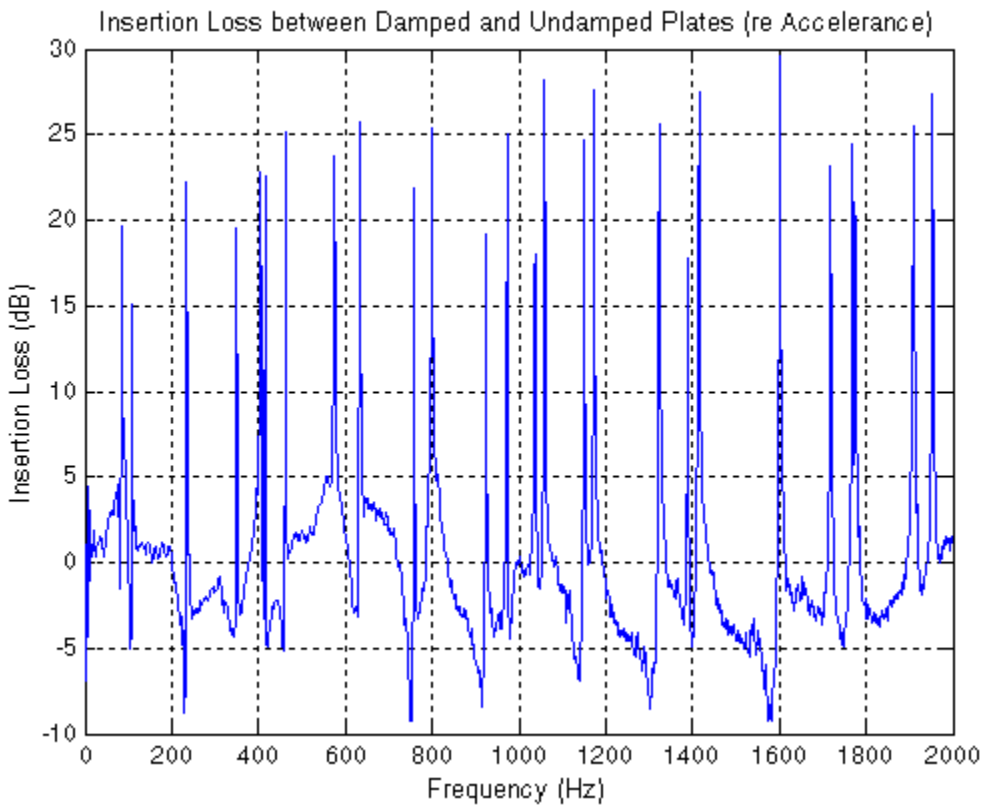
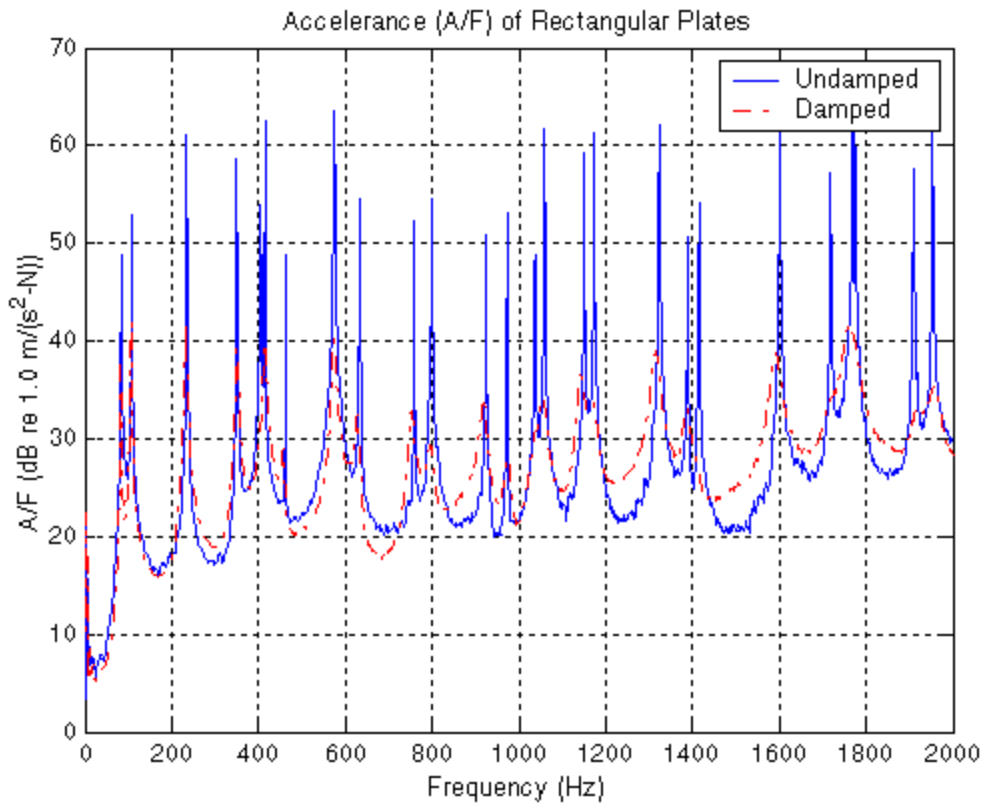
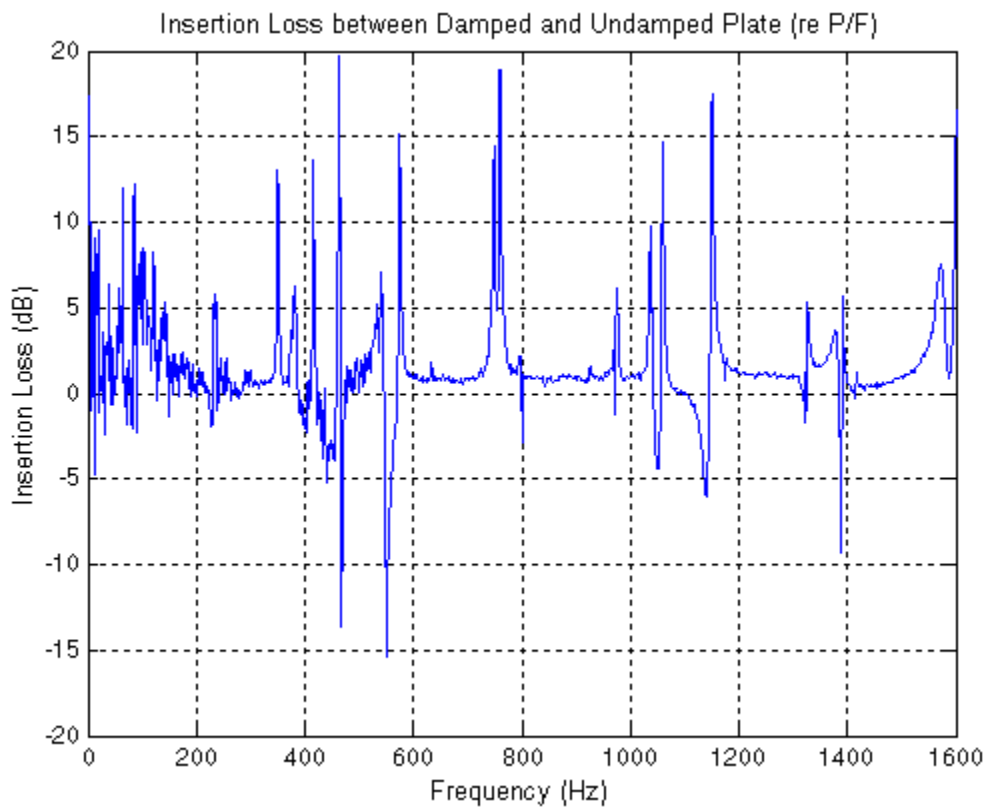
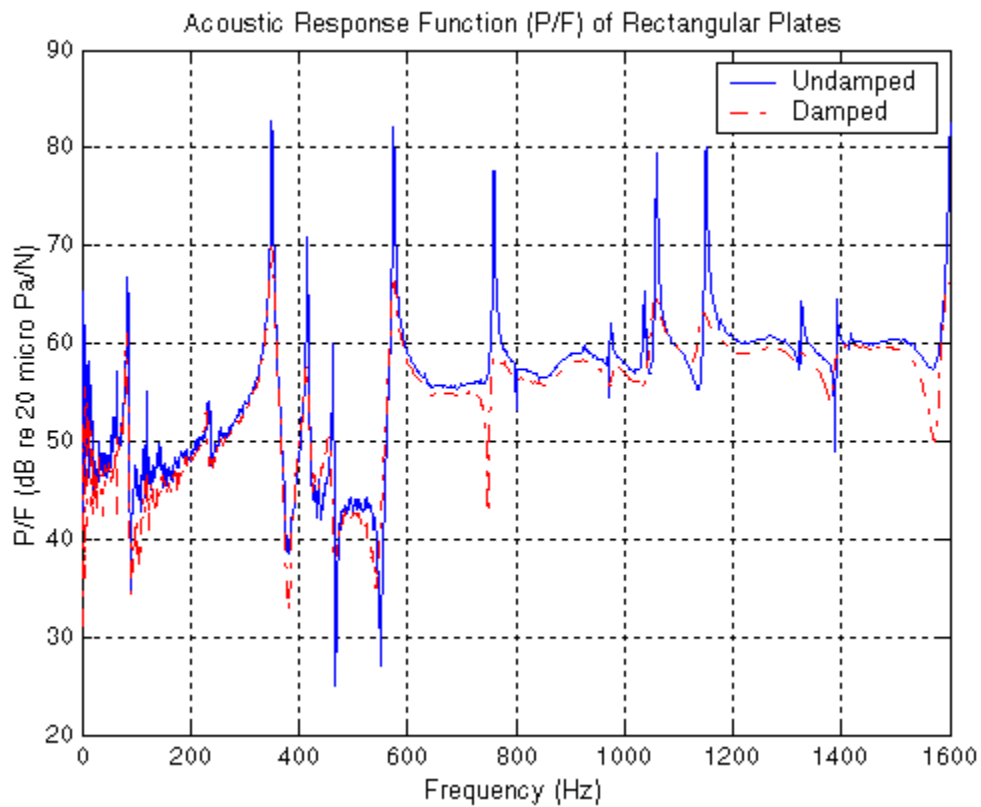


Figure 1: Orientation of plate for microphone (P) measurements





Mode (x,y)	Modal Index (r)	Undamped	Damped	Calculated Difference in ω_r	
		ω_r (Hz)	ω_r (Hz)	Frequency (Hz)	Epsilon (%)
(2,0)	1	85	82.5	-3	-3
(1,1)	2	108	106.3	-1	-1
(2,1)	3	235	233	-3	-1
(0,2)	5	350	350	0	0
(3,1)	6	405	*	*	*
(1,2)	7	415	415	0	0
(2,1)	8	463	456.3	-6	-1
(2,2)	9	575	573.8	-1	0
(4,1)	10	634	627.5	-6	-1
(3,2)	11	759	753	-6	-1
(5,0)	12	799	796.3	-3	0
(5,1)	13	925	918.8	-6	-1
(0,3)	14	973	975	3	0
(1,3)	15	1038	1045	7	1
(4,2)	16	1059	1055	-4	0
(2,3)	17	1150	1143	-7	-1
(6,0)	18	1174	1173	-1	0
(1,6)	19	1324	1315	-9	-1
(2,5)	20	1389	1386	-3	0
(3,3)	21	1415	*	*	*
*Mode dissipates for the damped case					

Symbols

A Acceleration ((Structural)
F Force (Structural)
P Sound pressure (free field, in anechoic chamber)

A/F Accelerance (Structural)
P/F Acoustic response function
FRF Frequency response function

ω_r natural frequency (in Hz)