

Testing Results



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Design Requirements Summary

- CR1 - Compact Design
- CR2 - Dampen Vibration
- CR3 - Space for Electrical Components on Structure
- CR4 - Adjustable Height Between Scanning Tip and Sample
- CR5 - Cost-effective
- CR6 - No Magnetic Field present within STM
- CR7 - Precise Adjustment of Structure
- ER1 - Minimize dimensions of structure less than 2.5" in length and width
- ER2 - Isolate Structure from surface > 4dB difference
- ER3 - Integrate 3 Fine Thread Thumb Screws
- ER4 - Affordable material selection under \$500
- ER5 - No magnets are used within the structure

Top Level Testing Summary

Experiment / Test	Relevant DRs
Ex1 - Vibration Test	CR2, ER2
Ex2 - Measurement Test	CR1, CR3, CR4, ER1
Ex3 - Magnetism test	CR6, ER5
Ex4 - Budget Analysis	CR5, ER4
Ex5 - Fine Threaded Screw Test	CR7, ER3

Detailed Testing Plan

- Vibration Testing
 - Dampen Vibrations (CR2), Isolate structure from Surface (ER2)
 - Use ADXL355 accelerometer
 - Perform active, semi-active, non-active tests
 - Use four set ups
 - Full Design
 - No Acoustic Box
 - No Cement Block
 - No Steel Discs

Detailed Testing Plan

- Measurement Test
 - Tests for compact design under 2.5” in length and width (CR1), Space for Electrical Components (CR3), Adjustable height between sample and tip (CR4), and Minimize Dimensions for structure (ER1).
 - Use calipers and tape measure

Design Testing Plan

- Magnetism Test
 - Test that not magnetic field is present in the structure (CR6) and no magnets are used in design of structure (ER5).
 - Use ferrous metal rod
 - Test for resistance when pulling away from the structure

Design Testing Plan

- Budget Analysis
 - Tests being cost-effective (CR5) and having affordable material selection (ER4)
 - Compare Bill of Materials cost to the budget of \$500

Design Testing Plan

- Fine Threaded Screw Test
 - Test Customer Requirement of precise adjustment of the structure (CR7) and integrating fine threaded screws (ER3).
 - This is a pass/fail test by making sure the screws are incorporated in the design

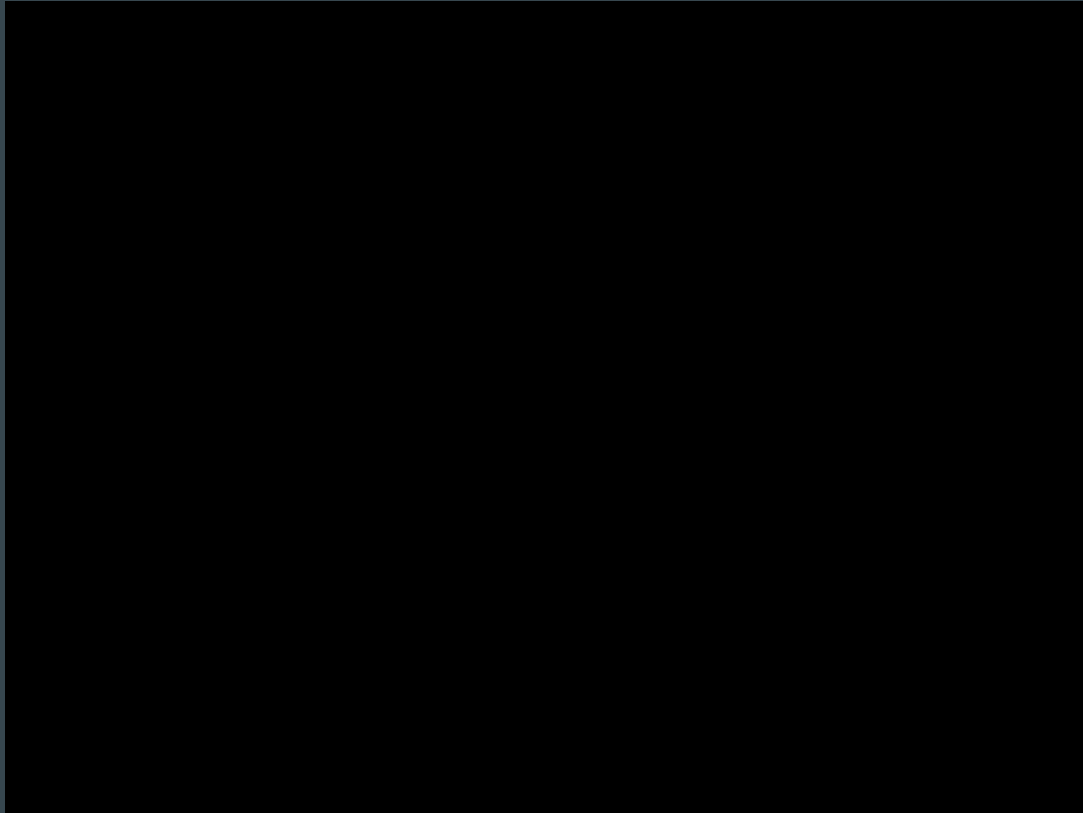
Specification Sheet

Customer Requirement	CR met? (Yes or No)	Client Acceptable (Yes or No)
CR1 - Compact Design	Yes(<2.5in)	Yes(<2.5in)
CR2 - Dampen Vibration	Yes (~4dB)	Yes
CR3 - Space for Electrical Components	Yes	Yes
CR4 - Adjustable Height	Yes	Yes
CR5 - Cost-effective	Yes (<\$500)	Yes(<\$500)
CR6 - No Magnetic field present in STM	Yes	Yes
CR7 - Precise adjustment of structure	Yes (80tpi)	Yes (80tpi)

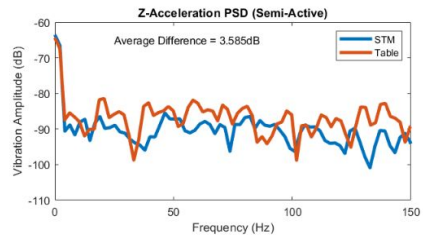
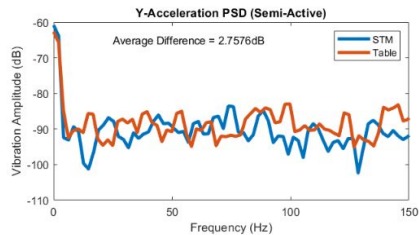
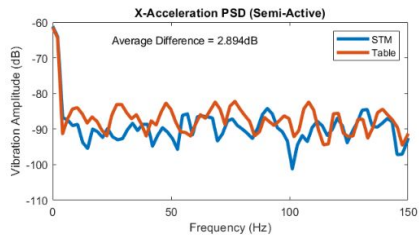
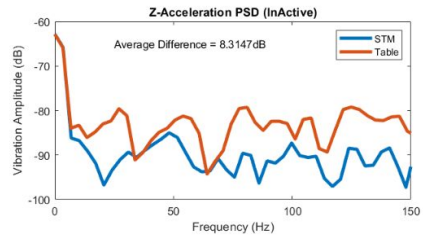
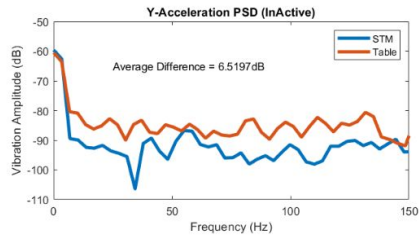
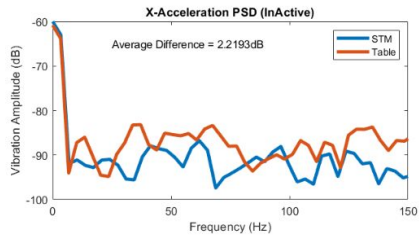
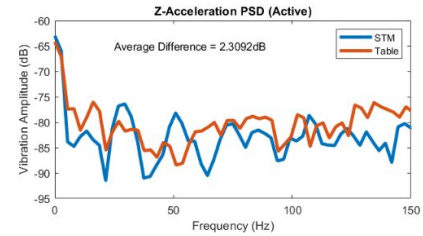
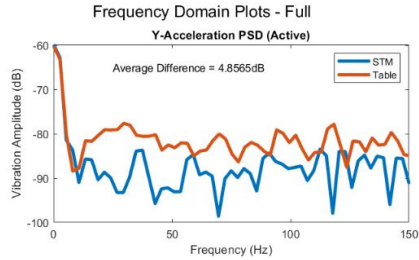
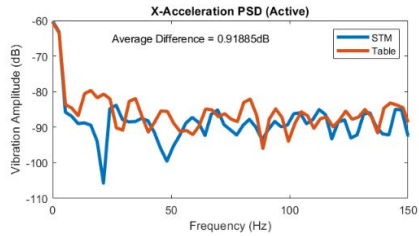
Specification Sheet

Engineering Requirement	Target	Tolerance	Measured Value	ER met? (Yes or No)	Client Acceptable (Yes or No)
ER1 - Minimize dimensions of structure	<2.5 inches in length and width	± 0.005 in	2.25 inches	Yes	Yes
ER2 - Isolate structure from surface	>4dB difference	-2dB	2.2dB 6.52dB 8.31dB	Yes	Yes
ER3 - Integrate fine threaded screws	>50 TPI	N/A	80 TPI	Yes	Yes
ER4 - Affordable material selection	< \$500	\$100	\$295.62	Yes	Yes
ER5 - No magnets used within structure	0	N/A	0	Yes	Yes

Testing Video

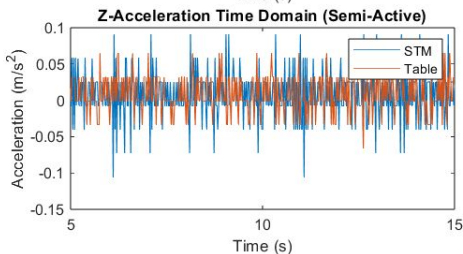
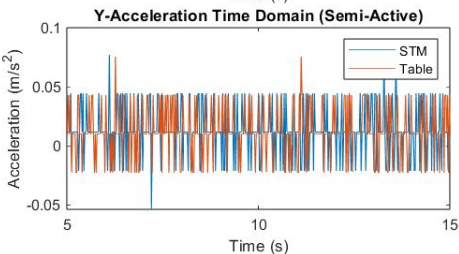
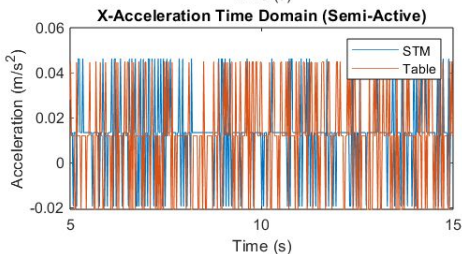
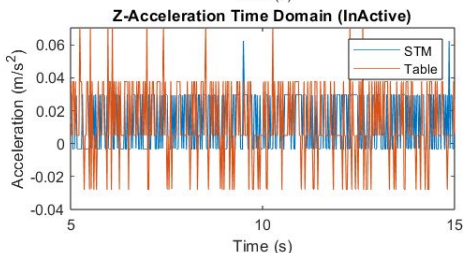
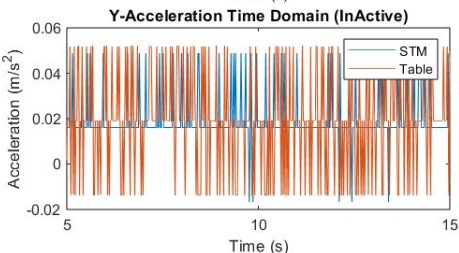
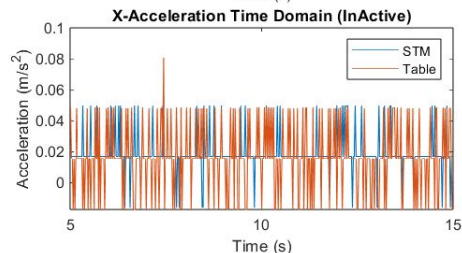
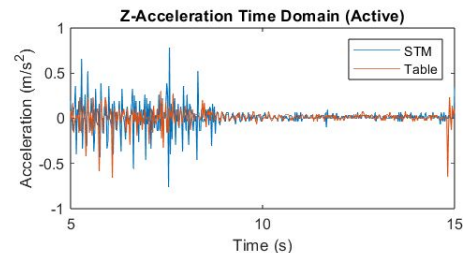
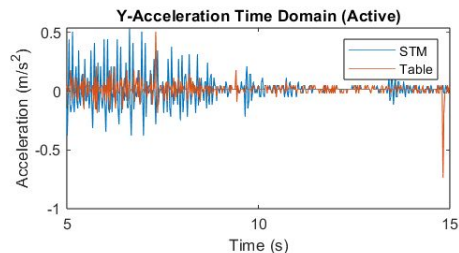
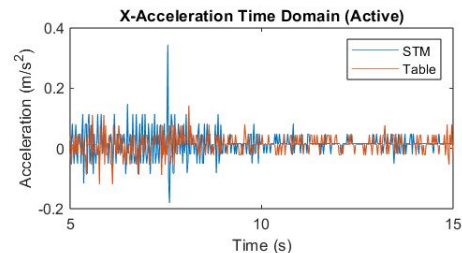


Vibration Testing Results



Vibration Testing Results

Time Domain Plots - Full



QFD

System QFD

Project: QFD STM ME CAPSTONE

Date: 10/22/23

Legend

- A NaioSTM [NaioSTM](#)
- B SNE Alpha [SNE Alpha](#)
- C VHX-7000 Series [Adopted by](#)

1	Minimize dimensions of structure				
2	Isolate the structure from surroundings/surface	3			
4	Integrate Fine Thread thumb screw	3	0		
5	Affordable material selection	9	-3	-3	
6	No magnets used within structure	0	-3	0	3

		Technical Requirements					Customer Opinion Survey					
		Customer Weights	Minimize dimensions of structure	Isolate the structure from surroundings/surface	Integrate Fine Thread thumb screw	Affordable material selection	No magnets used within structure	1 Poor	2	3 Acceptable	4	5 Excellent
1	Compact Design	5	9	3	3	9	0	C				AB
2	Dampen Vibrations	5	3	9	3	0	3		AB			C
3	Space for Electrical Components on Structure	5	9	3	0	0	0					ABC
4	Adjustable Height Between Scanning Tip and Sample	4	3	3	9	0	0		AB			C
5	Cost-effective	4	3	0	0	9	0	C	AB			
6	No Magnetic Field present within STM	4	0	3	0	3	9					ABC
7	Precise Adjustment of the Structure	4	3	0	9	0	0		AB			C
Technical Requirement Units			in ²	dB	pitch (in)	\$	NA					
Technical Requirement Targets			<25in ²	>4	.25 80	500	None					
Absolute Technical Importance			141	99	102	99	51					
Relative Technical Importance			2	5	4	6	7					

END