

Detected Resonant Frequencies (0-200 Hz):

14
124
148
188

Estimated Damping Ratios:

Mode near 14.00 Hz $\rightarrow \zeta = 0.2857$
Mode near 124.00 Hz $\rightarrow \zeta = 0.0323$
Mode near 148.00 Hz $\rightarrow \zeta = 0.0135$

Normalized Mode Shapes (0-200 Hz):

Mode at 14.00 Hz:
X: $0.067\angle 167.1^\circ$
Y: $0.200\angle 152.1^\circ$
Z: $1.000\angle 160.2^\circ$

Mode at 124.00 Hz:
X: $0.300\angle 44.4^\circ$
Y: $0.051\angle -14.8^\circ$
Z: $1.000\angle 53.2^\circ$

Mode at 148.00 Hz:
X: $0.337\angle -15.1^\circ$
Y: $0.830\angle -80.4^\circ$
Z: $1.000\angle 24.8^\circ$

Mode at 188.00 Hz:
X: $0.398\angle -22.0^\circ$
Y: $0.656\angle 90.4^\circ$
Z: $1.000\angle 10.7^\circ$

==== Modal Parameter Summary (0-200 Hz) ===

Freq_Hz	Damping	Phi_X	Phi_Y	Phi_Z
14	0.28571	-0.065216+0.014991i	-0.17672+0.093585i	-0.94084+0.33886i

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124	0.032258	0.21444+0.21003i	0.049244-0.012997i	0.59907+0.8007i
148	0.013514	0.32544-0.088063i	0.13866-0.8187i	0.90777+0.41946i
188	NaN	0.36857-0.14918i	-0.0051381+0.65564i	0.98262+0.18561i

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Estimated Damping Ratios:

0.2857
0.0323
0.0135
NaN

==== Modal Summary (0-200 Hz) ====

Mode 1: f=14.00 Hz, Damping=0.2857, k_dyn_X=17406072.62 N/m, k_dyn_Y=5824650.74 N/m, k_dyn_Z=1164756.02 N/m
 Mode Shape (X,Y,Z): 0.067∠167.1°, 0.200∠152.1°, 1.000∠160.2°
 Mode 2: f=124.00 Hz, Damping=0.0323, k_dyn_X=30954753.95 N/m,
 k_dyn_Y=182435830.53 N/m, k_dyn_Z=9291484.64 N/m
 Mode Shape (X,Y,Z): 0.300∠44.4°, 0.051∠-14.8°, 1.000∠53.2°
 Mode 3: f=148.00 Hz, Damping=0.0135, k_dyn_X=152434364.77 N/m,
 k_dyn_Y=61891315.53 N/m, k_dyn_Z=51391810.20 N/m
 Mode Shape (X,Y,Z): 0.337∠-15.1°, 0.830∠-80.4°, 1.000∠24.8°
 Mode 4: f=188.00 Hz, Damping=NaN, k_dyn_X=251960591.41 N/m, k_dyn_Y=152797534.97 N/m, k_dyn_Z=100183182.95 N/m
 Mode Shape (X,Y,Z): 0.398∠-22.0°, 0.656∠90.4°, 1.000∠10.7°