Detected Resonant Frequencies (0-200 Hz):

16
52
88
122
148
176
190

Estimated Damping Ratios:

Mode near 16.00 Hz → ζ = 0.1875
Mode near 52.00 Hz → ζ = 0.0385
Mode near 88.00 Hz → ζ = 0.0341
Mode near 122.00 Hz → ζ = 0.0328
Mode near 148.00 Hz → ζ = 0.0203
Mode near 176.00 Hz → ζ = 0.0341
Mode near 190.00 Hz → ζ = 0.0211

Normalized Mode Shapes (0-200 Hz):

Mode at 16.00 Hz:
X: 0.128∠138.1°
Y: 0.064∠-14.7°
Z: 1.000∠137.7°

Mode at 52.00 Hz:
X: 0.123∠-118.0°
Y: 0.058∠65.4°
Z: 1.000∠-116.7°

Mode at 88.00 Hz:
X: 0.087∠55.2°
Y: 1.000∠-17.1°
Z: 0.571∠-169.6°

Mode at 122.00 Hz:
X: 0.632∠90.7°
Y: 0.098∠177.3°
Z: 1.000∠-72.0°

Mode at 148.00 Hz:
X: 1.000∠18.9°
Y: 0.289∠-170.7°
Z: 0.484∠-101.6°

Mode at 176.00 Hz:
X: 1.000∠-29.9°
Y: 0.326∠139.0°
Z: 0.620∠-88.7°

Mode at 190.00 Hz:
X: 0.805∠-34.0°
Y: 0.424∠48.9°
Z: 1.000∠-92.0°
=== Modal Parameter Summary (0-200 Hz) ===

Freq_Hz	Damping	Phi_X	Phi_Y	Phi_Z
16	0.1875	-0.095407+0.085605i	0.061604-0.016181i	-0.73927+0.67341i
52	0.038462	-0.057678-0.1083i	0.023976+0.052339i	-0.44999-0.89303i
88	0.034091	0.049717+0.071571i	0.95604-0.29324i	-0.56177-0.1035i
122	0.032787	-0.0078278+0.63181i	-0.09808+0.0045918i	0.30929-0.95097i
148	0.02027	0.94601+0.32413i	-0.2856-0.046953i	-0.097164-0.47415i
176	0.034091	0.86652-0.49915i	-0.2458+0.21339i	0.014158-0.62004i
190	0.021053	0.66722-0.45089i	0.27869+0.31919i	-0.034572-0.9994i

Detected Resonant Frequencies (0-200 Hz):
16
52
88
122
148
176
190

Estimated Damping Ratios:
0.1875

0.0385
0.0341
0.0328
0.0203
0.0341
0.0211

=== Modal Summary (0-200 Hz) ===
Mode 1: f=16.00 Hz, Damping=0.1875, k_dyn_X=4088315.69 N/m, k_dyn_Y=8227747.53 N/m, k_dyn_Z=524051.69 N/m
  Mode Shape (X,Y,Z): 0.128∠138.1°, 0.064∠-14.7°, 1.000∠137.7°
Mode 2: f=52.00 Hz, Damping=0.0385, k_dyn_X=29091340.11 N/m, k_dyn_Y=62006044.84 N/m, k_dyn_Z=3569607.47 N/m
  Mode Shape (X,Y,Z): 0.123∠-118.0°, 0.058∠65.4°, 1.000∠-116.7°
Mode 3: f=88.00 Hz, Damping=0.0341, k_dyn_X=734342782.72 N/m, k_dyn_Y=63993573.24 N/m, k_dyn_Z=112028677.51 N/m
  Mode Shape (X,Y,Z): 0.087∠55.2°, 1.000∠-17.1°, 0.571∠-169.6°
Mode 4: f=122.00 Hz, Damping=0.0328, k_dyn_X=96843770.75 N/m, k_dyn_Y=623212277.50 N/m, k_dyn_Z=61191721.75 N/m
  Mode Shape (X,Y,Z): 0.632∠90.7°, 0.098∠177.3°, 1.000∠-72.0°
Mode 5: f=148.00 Hz, Damping=0.0203, k_dyn_X=401658743.51 N/m, k_dyn_Y=1387744971.18 N/m, k_dyn_Z=829866945.30 N/m
  Mode Shape (X,Y,Z): 1.000∠18.9°, 0.289∠-170.7°, 0.484∠-101.6°
Mode 6: f=176.00 Hz, Damping=0.0341, k_dyn_X=623928369.75 N/m, k_dyn_Y=1916804837.27 N/m, k_dyn_Z=1006012982.61 N/m
  Mode Shape (X,Y,Z): 1.000∠-29.9°, 0.326∠139.0°, 0.620∠-88.7°
Mode 7: f=190.00 Hz, Damping=0.0211, k_dyn_X=948266577.00 N/m, k_dyn_Y=1802132933.77 N/m, k_dyn_Z=763621048.69 N/m
  Mode Shape (X,Y,Z): 0.805∠-34.0°, 0.424∠48.9°, 1.000∠-92.0°