Detected Resonant Frequencies (0-200 Hz):
10
16
52
78
88
120
148
188

Estimated Damping Ratios:
Mode near 10.00 Hz → ζ = 0.2000
Mode near 16.00 Hz → ζ = 0.1875
Mode near 52.00 Hz → ζ = 0.0577
Mode near 78.00 Hz → ζ = 0.0385
Mode near 88.00 Hz → ζ = 0.0227
Mode near 120.00 Hz → ζ = 0.0333
Mode near 148.00 Hz → ζ = 0.0338
Mode near 188.00 Hz → ζ = 0.0266

Normalized Mode Shapes (0-200 Hz):

Mode at 10.00 Hz:
X: 0.030∠-125.1°
Y: 0.118∠-155.8°
Z: 1.000∠28.2°

Mode at 16.00 Hz:
X: 0.135∠-5.4°
Y: 0.173∠20.0°
Z: 1.000∠172.7°

Mode at 52.00 Hz:
X: 0.066∠-146.8°
Y: 0.078∠-146.7°
Z: 1.000∠27.8°

Mode at 78.00 Hz:
X: 0.032∠-41.2°

Y: 0.087∠154.7°
Z: 1.000∠-48.4°

Mode at 88.00 Hz:
X: 0.082∠173.2°
Y: 1.000∠165.2°
Z: 0.187∠-174.6°

Mode at 120.00 Hz:
X: 0.099∠-75.8°
Y: 0.200∠114.3°
Z: 1.000∠-73.7°

Mode at 148.00 Hz:
X: 0.123∠-171.2°
Y: 1.000∠-86.0°
Z: 0.855∠-134.1°

Mode at 188.00 Hz:
X: 0.955∠175.3°
Y: 1.000∠97.3°
Z: 0.965∠145.6°
=== Modal Parameter Summary (0-200 Hz) ===

Freq_Hz	**Damping**	**Phi_X**	**Phi_Y**	**Phi_Z**
10	0.2	-0.017384-0.024736i	-0.10779-0.048502i	0.88099+0.47314i
16	0.1875	0.13448-0.012623i	0.16289+0.05921i	-0.99179+0.12784i
52	0.057692	-0.054994-0.035959i	-0.064958-0.042688i	0.88448+0.46658i
78	0.038462	0.024037-0.021061i	-0.078816+0.037187i	0.66394-0.74778i
88	0.022727	-0.081133+0.0097038i	-0.96679+0.25557i	-0.18585-0.017428i
120	0.033333	0.024245-0.095909i	-0.082255+0.18181i	0.28127-0.95963i
148	0.033784	-0.12192-0.018833i	0.070108-0.99754i	-0.59496-0.61449i
188	0.026596	-0.95155+0.078595i	-0.12792+0.99178i	-0.79638+0.54563i

Detected Resonant Frequencies (0-200 Hz):
10
16
52
78

88
120
148
188

Estimated Damping Ratios:
0.2000
0.1875
0.0577
0.0385
0.0227
0.0333
0.0338
0.0266

=== Modal Summary (0-200 Hz) ===
Mode 1: f=10.00 Hz, Damping=0.2000, k_dyn_X=13538800.48 N/m, k_dyn_Y=3462927.47 N/m, k_dyn_Z=409331.09 N/m
Mode Shape (X,Y,Z): 0.030∠-125.1°, 0.118∠-155.8°, 1.000∠28.2°
Mode 2: f=16.00 Hz, Damping=0.1875, k_dyn_X=5673990.40 N/m, k_dyn_Y=4421814.22 N/m, k_dyn_Z=766370.80 N/m
Mode Shape (X,Y,Z): 0.135∠-5.4°, 0.173∠20.0°, 1.000∠172.7°
Mode 3: f=52.00 Hz, Damping=0.0577, k_dyn_X=42499952.06 N/m, k_dyn_Y=35926877.15 N/m, k_dyn_Z=2792552.36 N/m
Mode Shape (X,Y,Z): 0.066∠-146.8°, 0.078∠-146.7°, 1.000∠27.8°
Mode 4: f=78.00 Hz, Damping=0.0385, k_dyn_X=145153956.43 N/m, k_dyn_Y=53228894.54 N/m, k_dyn_Z=4638825.76 N/m
Mode Shape (X,Y,Z): 0.032∠-41.2°, 0.087∠154.7°, 1.000∠-48.4°
Mode 5: f=88.00 Hz, Damping=0.0227, k_dyn_X=272348140.89 N/m, k_dyn_Y=22254004.84 N/m, k_dyn_Z=119221518.46 N/m
Mode Shape (X,Y,Z): 0.082∠173.2°, 1.000∠165.2°, 0.187∠-174.6°
Mode 6: f=120.00 Hz, Damping=0.0333, k_dyn_X=92984282.08 N/m, k_dyn_Y=46096791.21 N/m, k_dyn_Z=9198602.29 N/m
Mode Shape (X,Y,Z): 0.099∠-75.8°, 0.200∠114.3°, 1.000∠-73.7°
Mode 7: f=148.00 Hz, Damping=0.0338, k_dyn_X=566594160.08 N/m, k_dyn_Y=69900853.45 N/m, k_dyn_Z=81724974.36 N/m
Mode Shape (X,Y,Z): 0.123∠-171.2°, 1.000∠-86.0°, 0.855∠-134.1°
Mode 8: f=188.00 Hz, Damping=0.0266, k_dyn_X=599137349.47 N/m, k_dyn_Y=572052835.45 N/m, k_dyn_Z=592574321.37 N/m

Mode Shape (X,Y,Z): 0.955∠175.3°, 1.000∠97.3°, 0.965∠145.6°