

Dynamic Analysis

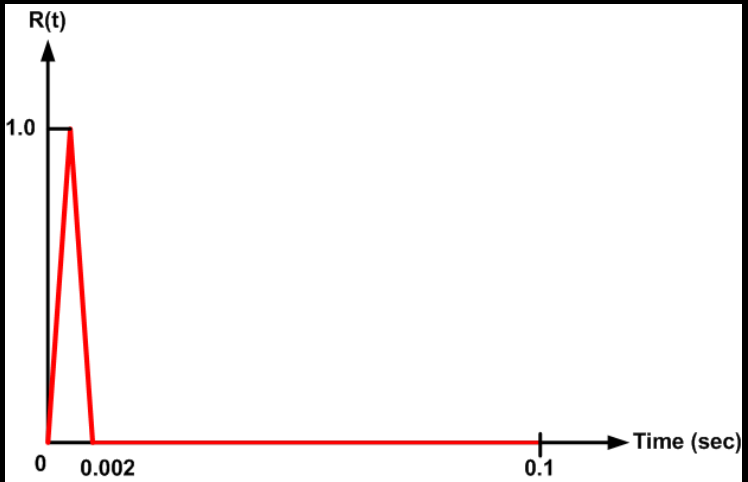
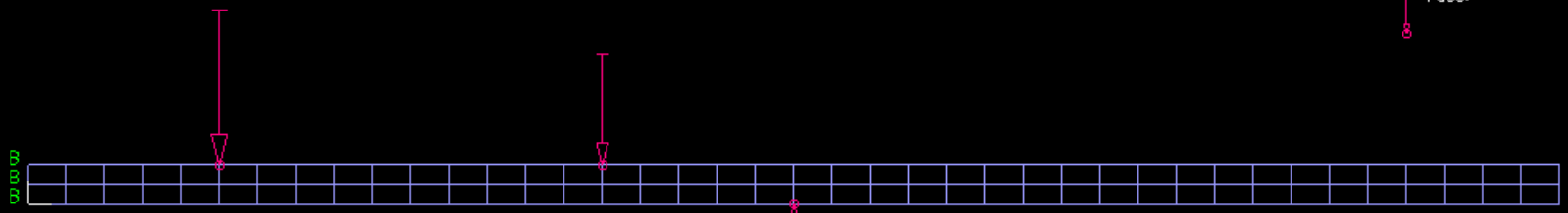
A
D
I
N
A

TIME 0.0003000



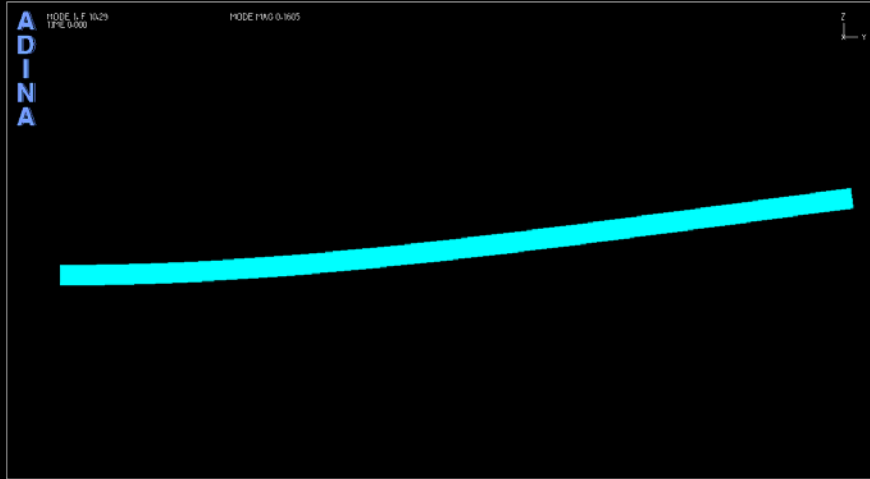
PRESCRIBED
FORCE
TIME 0.0003000

7000.

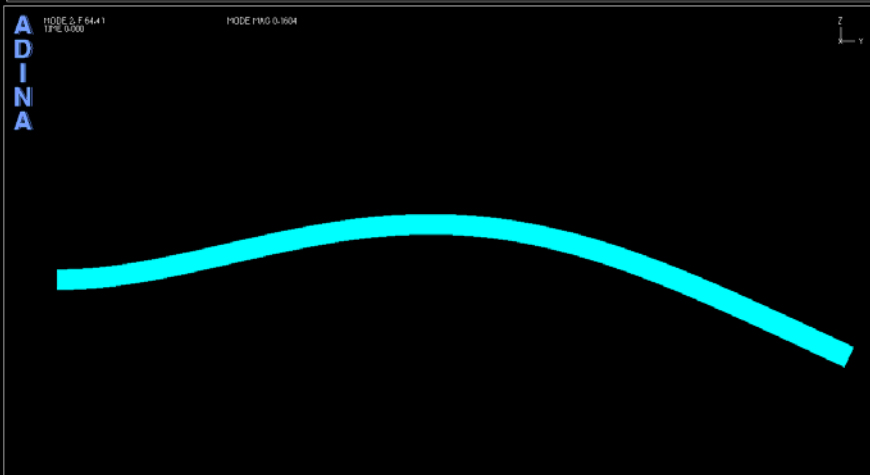


U_2 U_3
B

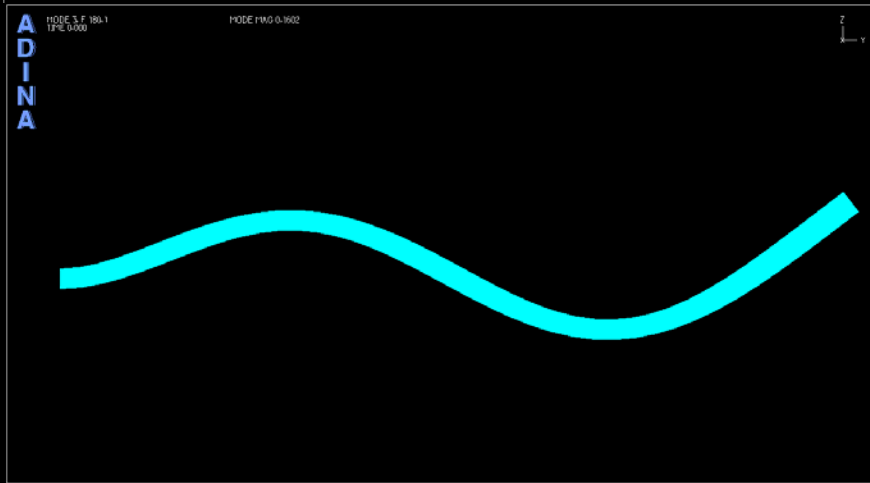
Use time step = 0.0001 sec



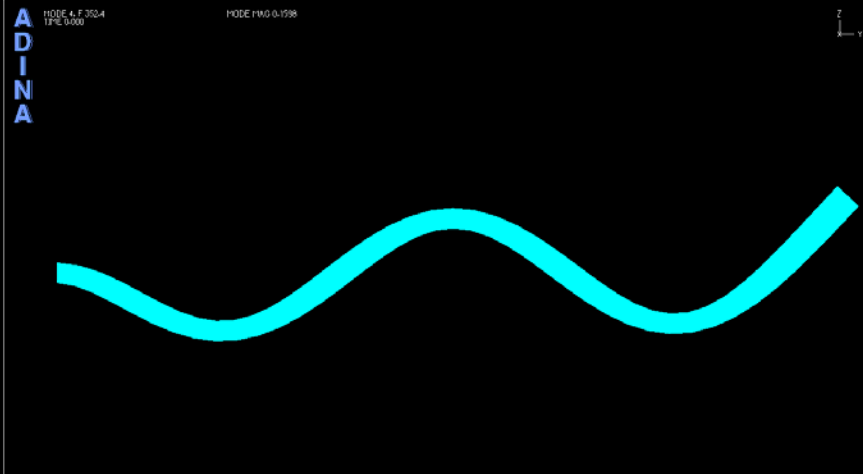
Mode 1
(10.29 Hz)



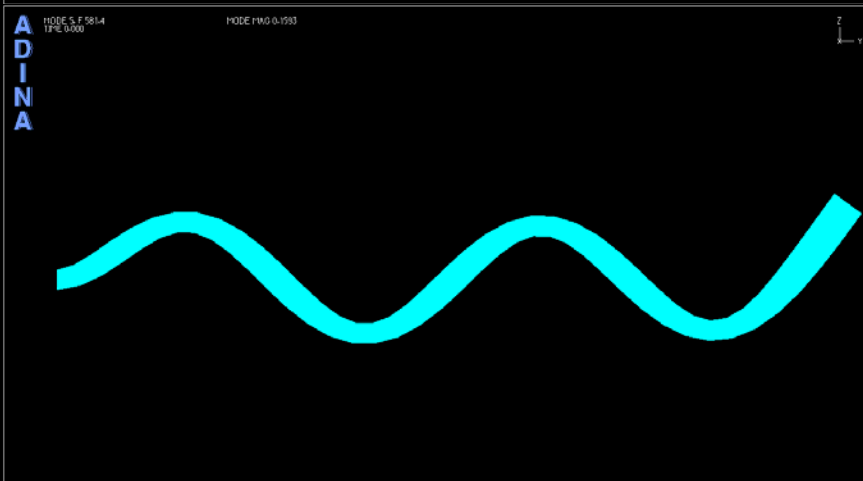
Mode 2
(64.41 Hz)



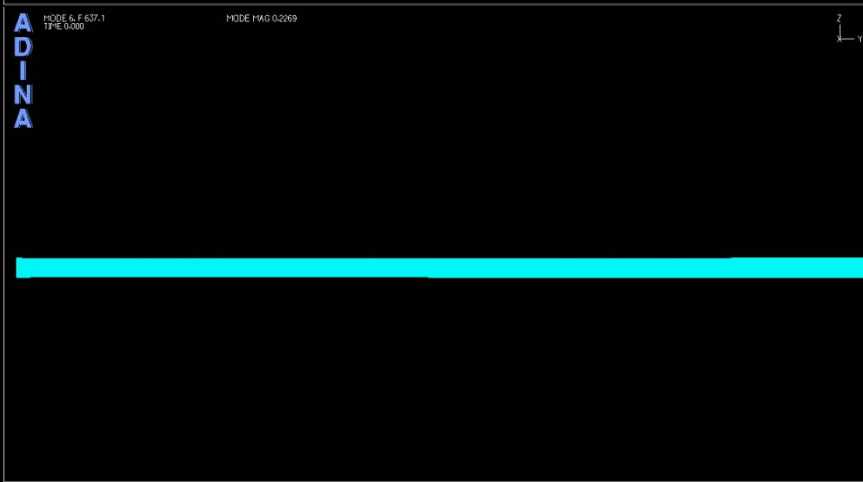
Mode 3
(180.1 Hz)



Mode 4
(352.4 Hz)



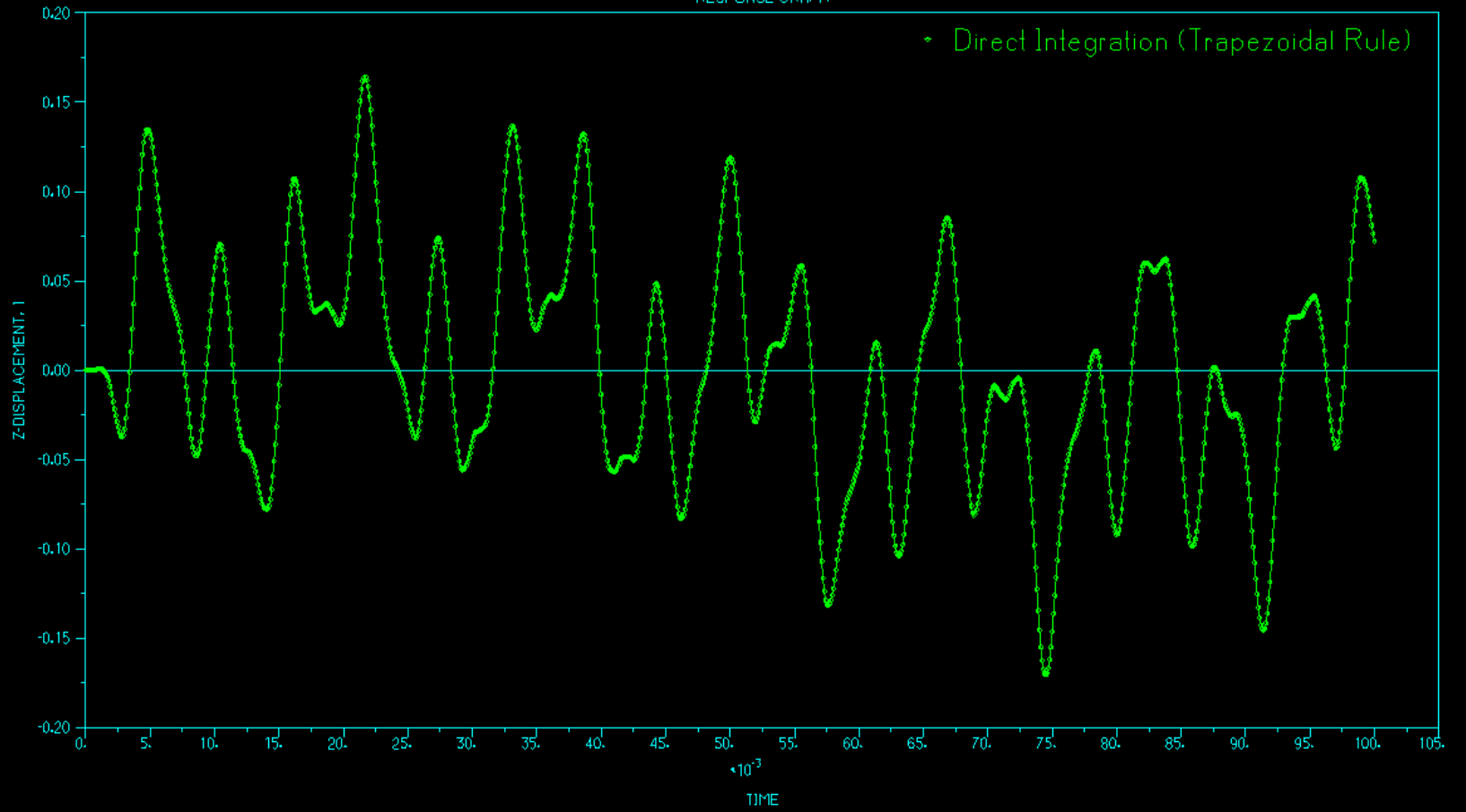
Mode 5
(581.4 Hz)



Mode 6
(637.1 Hz)

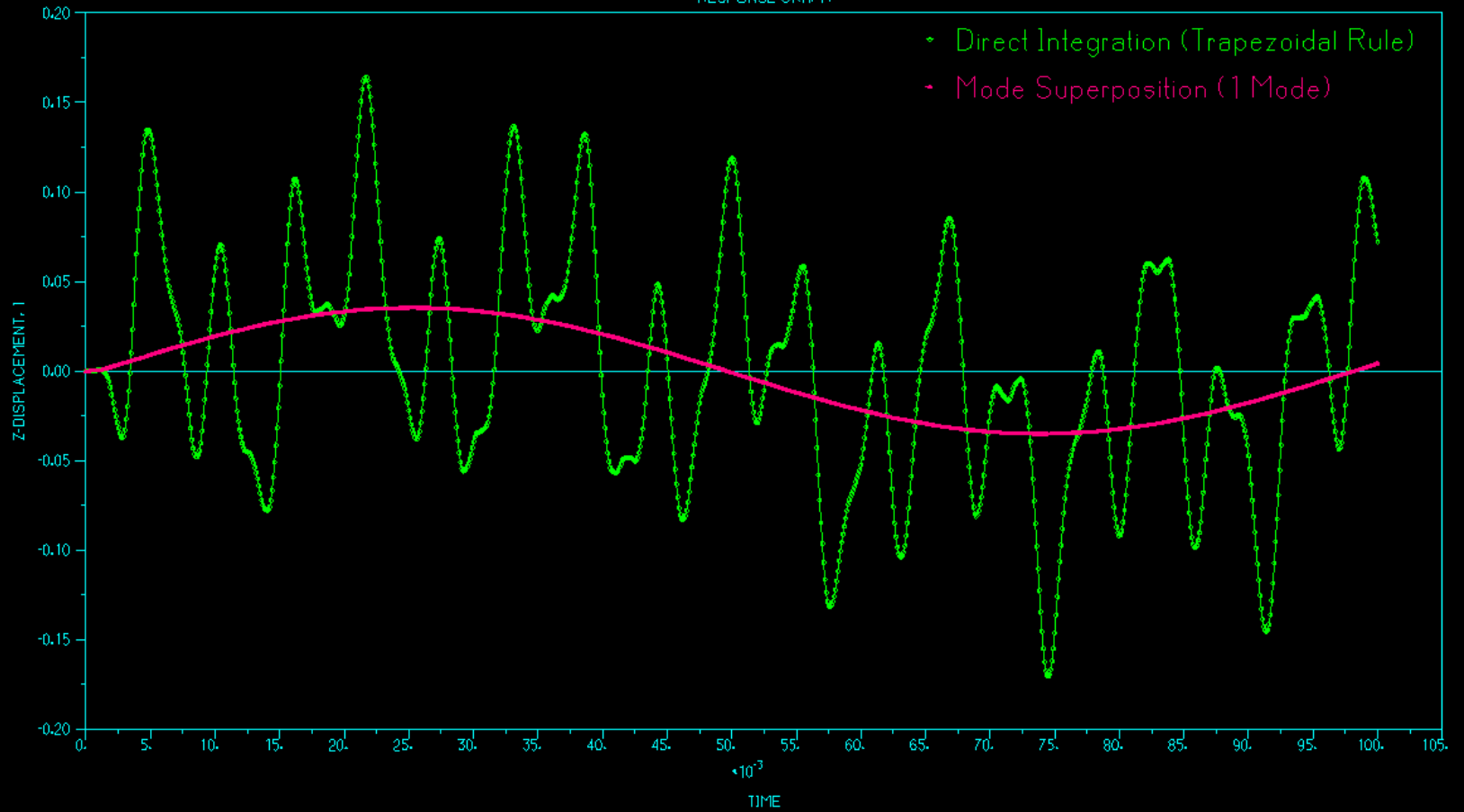
**A
D
I
N
A**

RESPONSE GRAPH



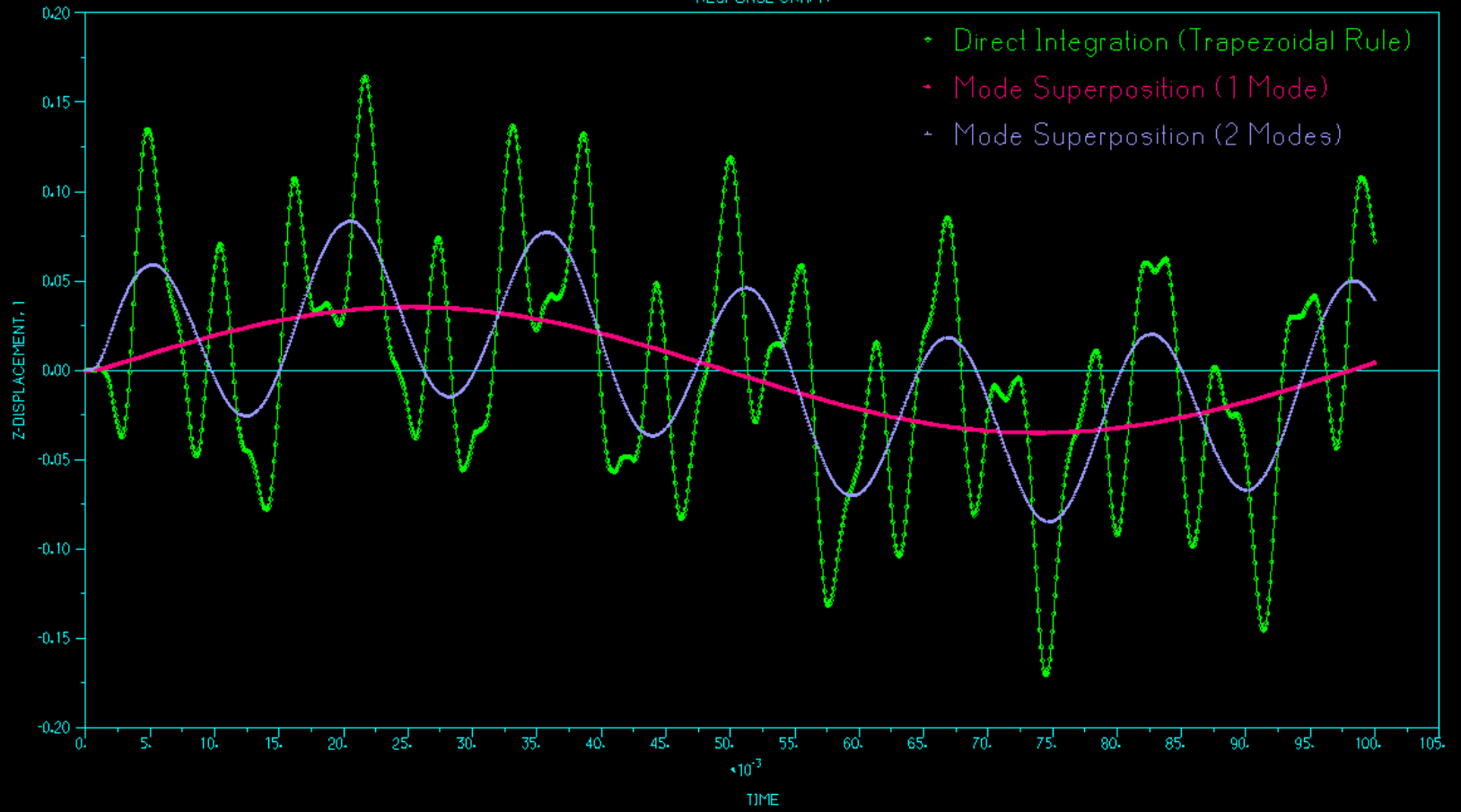
**A
D
I
N
A**

RESPONSE GRAPH



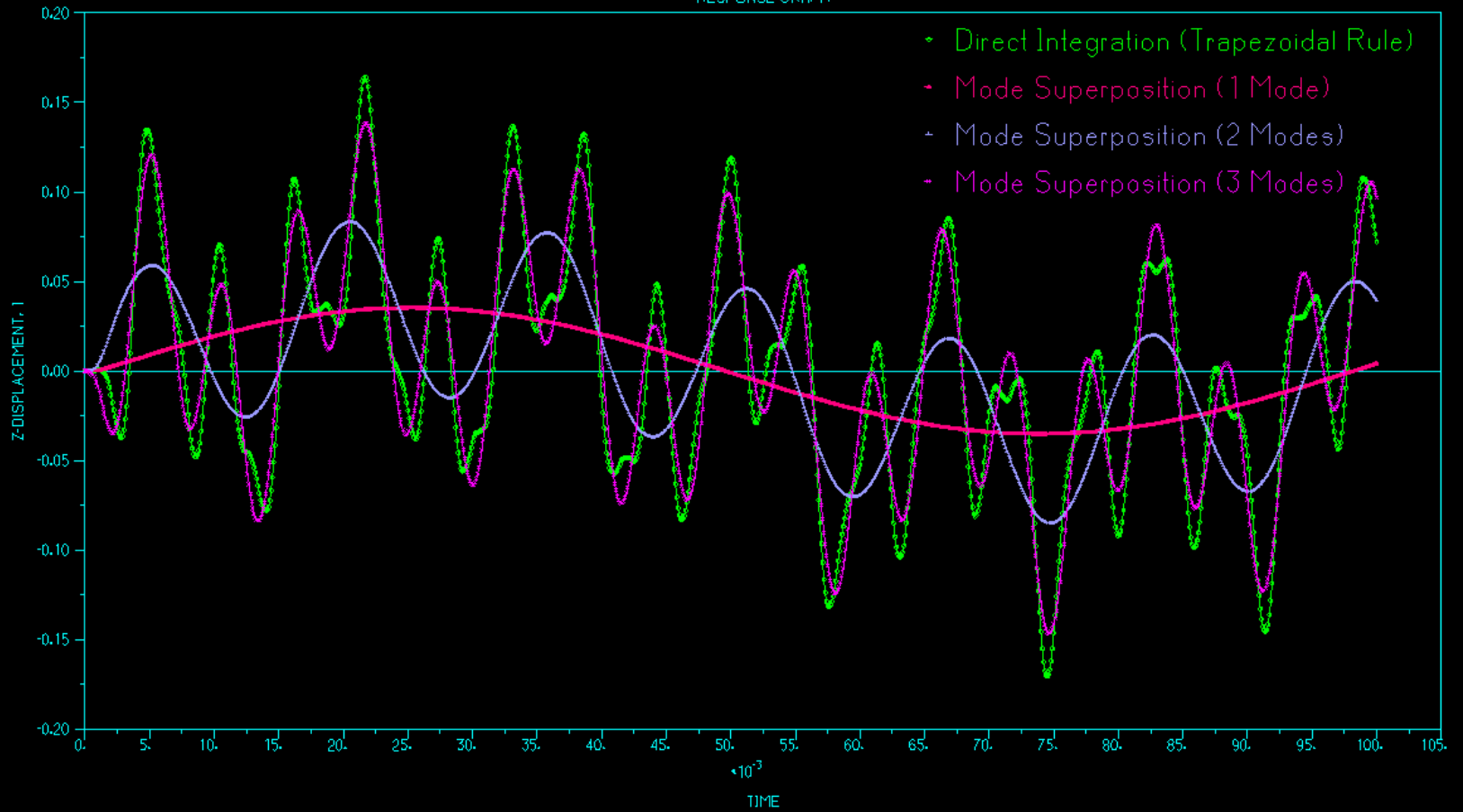
**A
D
I
N
A**

RESPONSE GRAPH



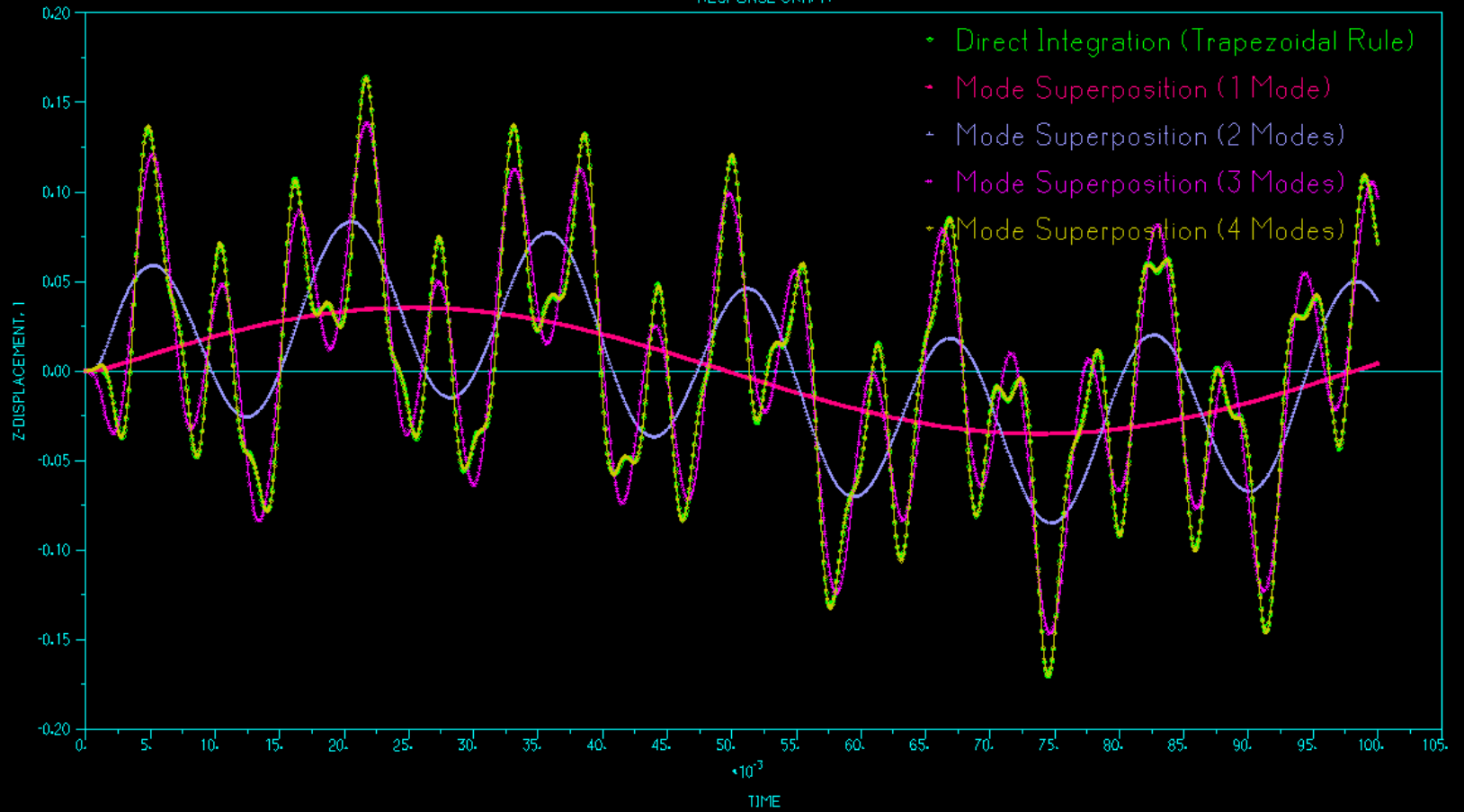
**A
D
I
N
A**

RESPONSE GRAPH

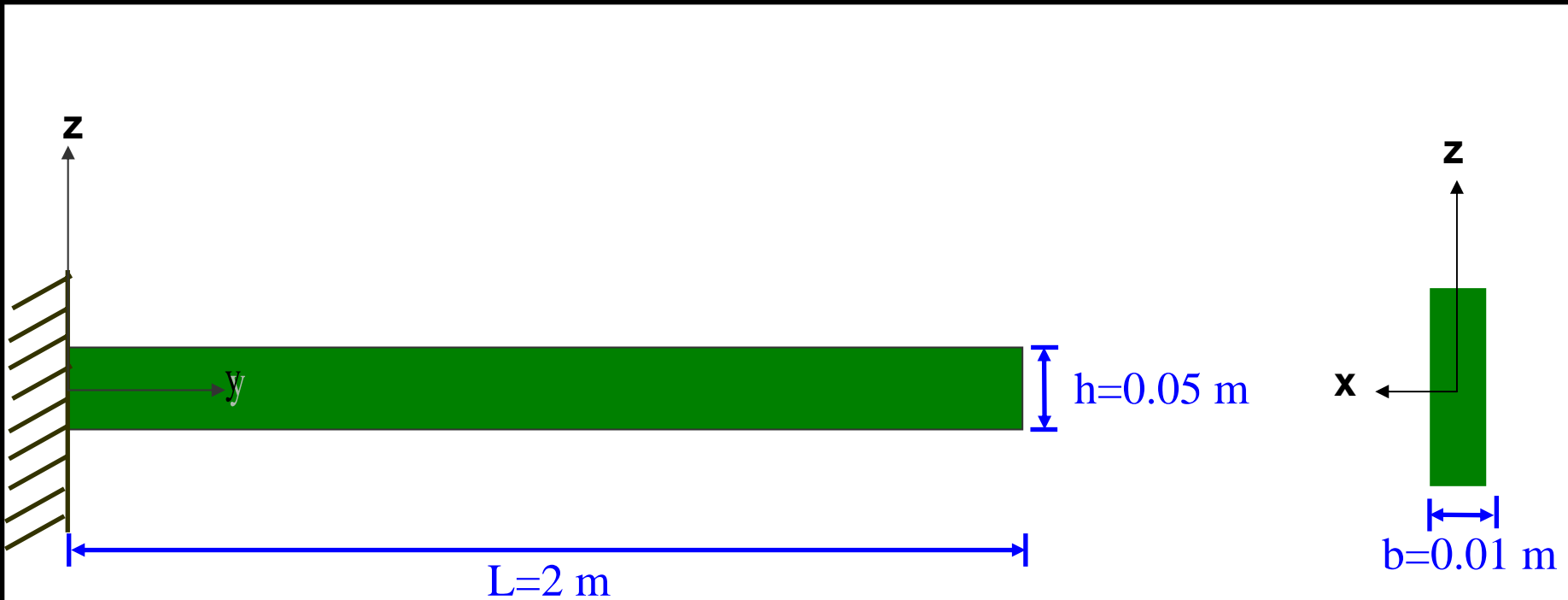


ADINA

RESPONSE GRAPH

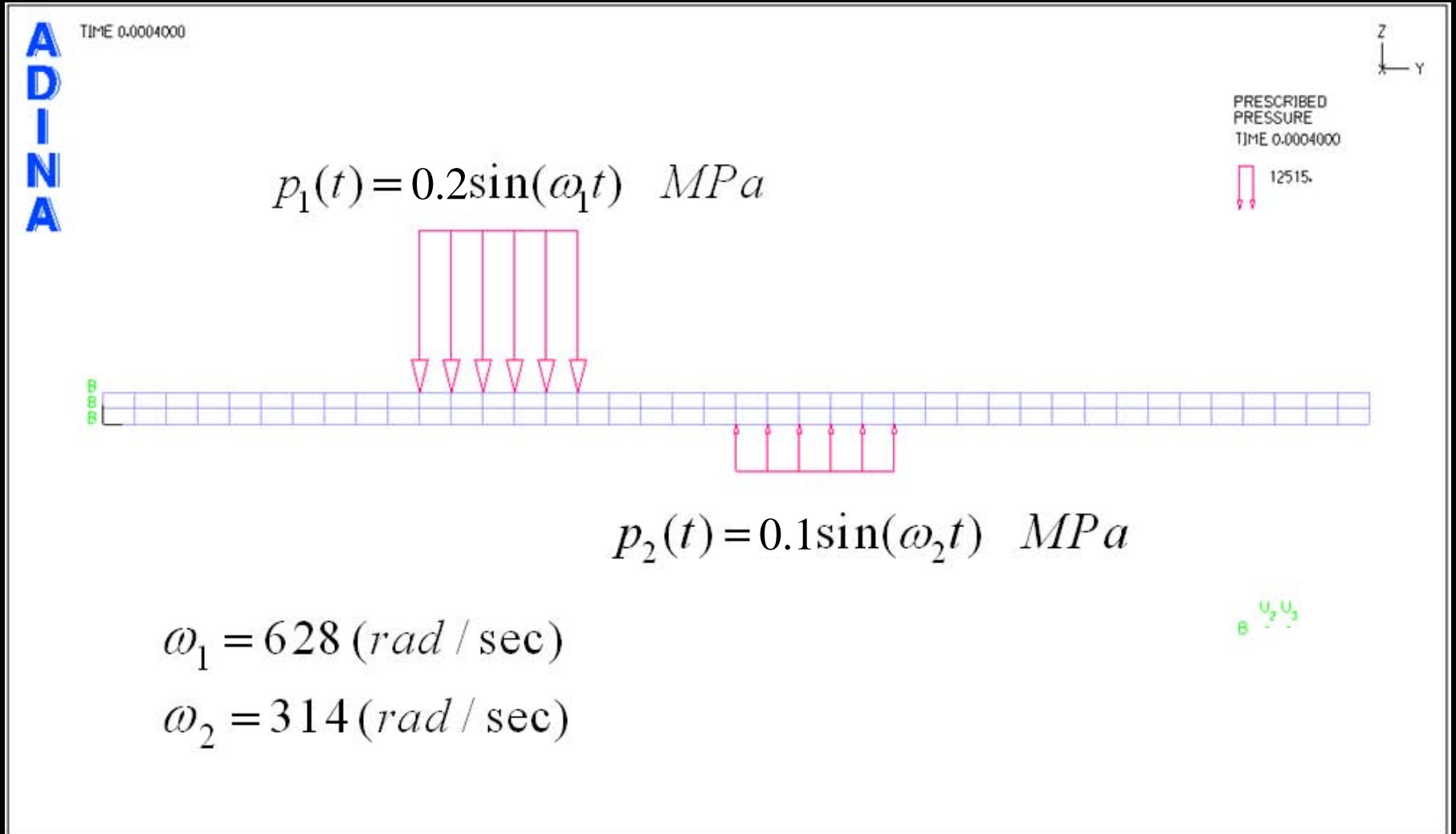


Dynamic Analysis of the cantilever beam



- An aluminum cantilever beam
- $E=70\text{ GPa}$, Poisson ratio=0.33, density= 2700 kg/m^3
- plane stress in y - z plane

Dynamic Analysis of the cantilever beam



All responses are scaled by the factor of 100.

Dynamic Analysis of the cantilever beam

$$\omega_u = \omega_1 = 628 \text{ (rad/sec)}$$

$$\omega_{co} = 4\omega_u = 2512 \text{ (rad/sec)}$$

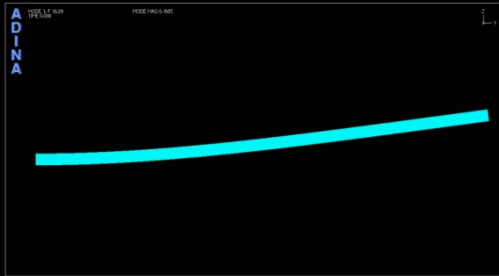
$$\Delta t = \frac{1}{20} T_{co} = \frac{\pi}{10\omega_{co}} = \frac{1}{8000} \cong 0.0001 \text{ (sec)}$$

We want to use a reasonable mesh
which gives accurate frequencies for $\omega \leq \omega_{co}$

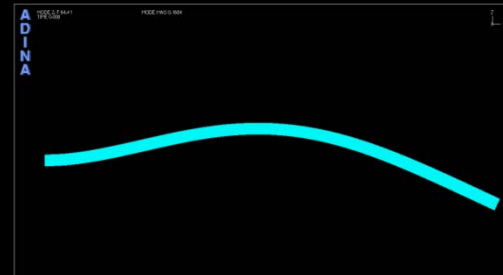
Natural Frequencies (rad/sec)

Out of cut-off frequency

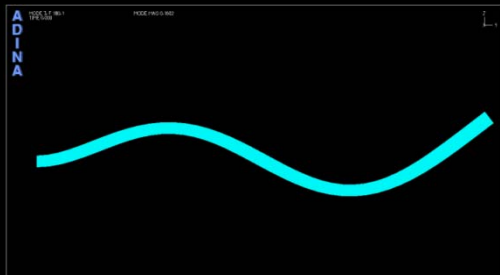
FE Mesh (9-node el.)	Mode 1	Mode 2	Mode 3	Mode 4	Mode 5
2 x 1	68.24	675.4	4029	4236	12334
4 x 1	65.60	438.4	1382	3548	4013
8 x 1	64.91	410.4	1167	2342	3997
16 x 1	64.72	405.0	1132	2212	3645
100 x 4	64.59	403.6	1125	2190	3588



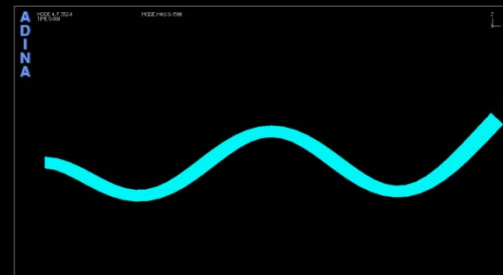
Mode 1



Mode 2

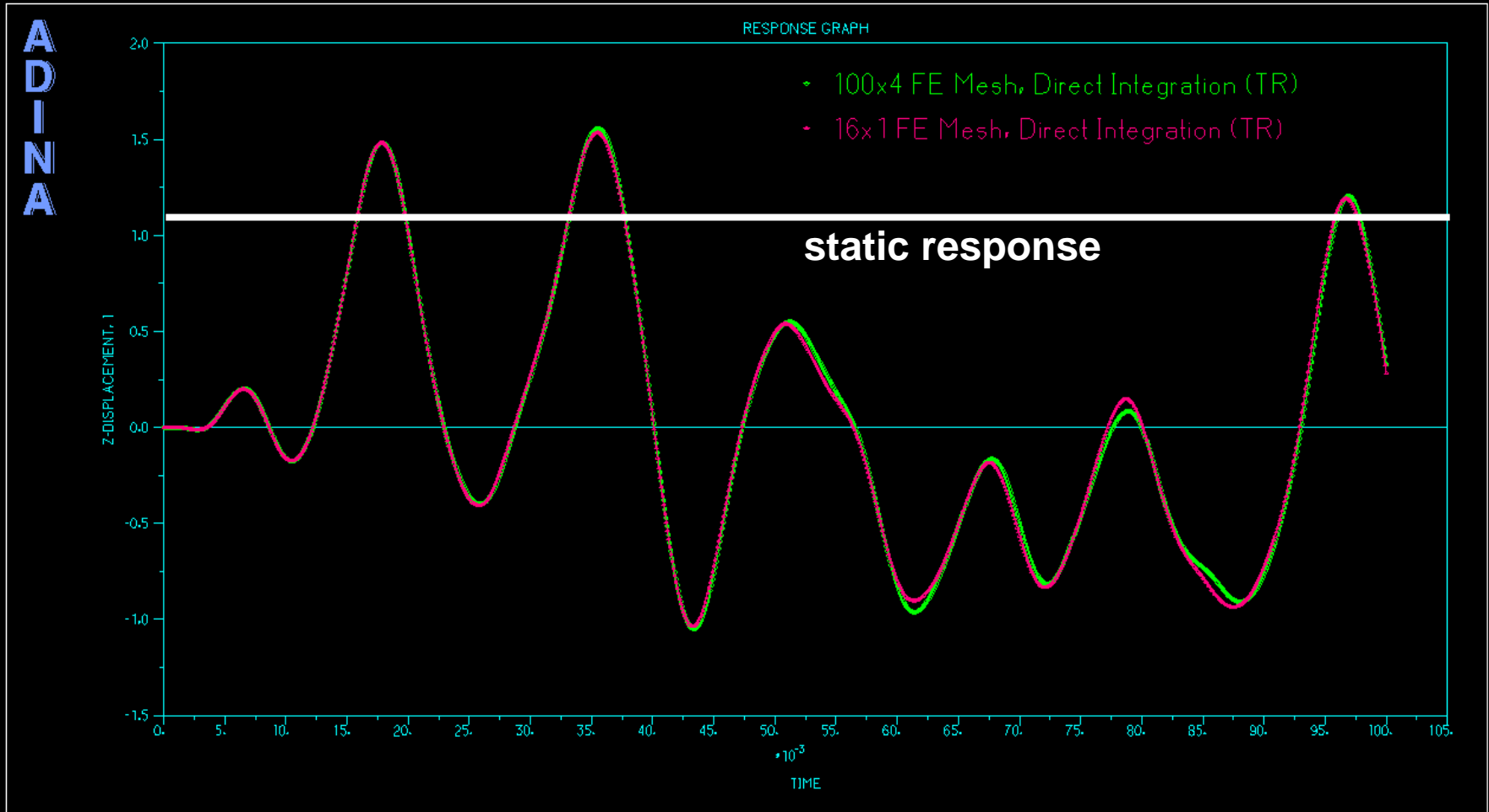


Mode 3

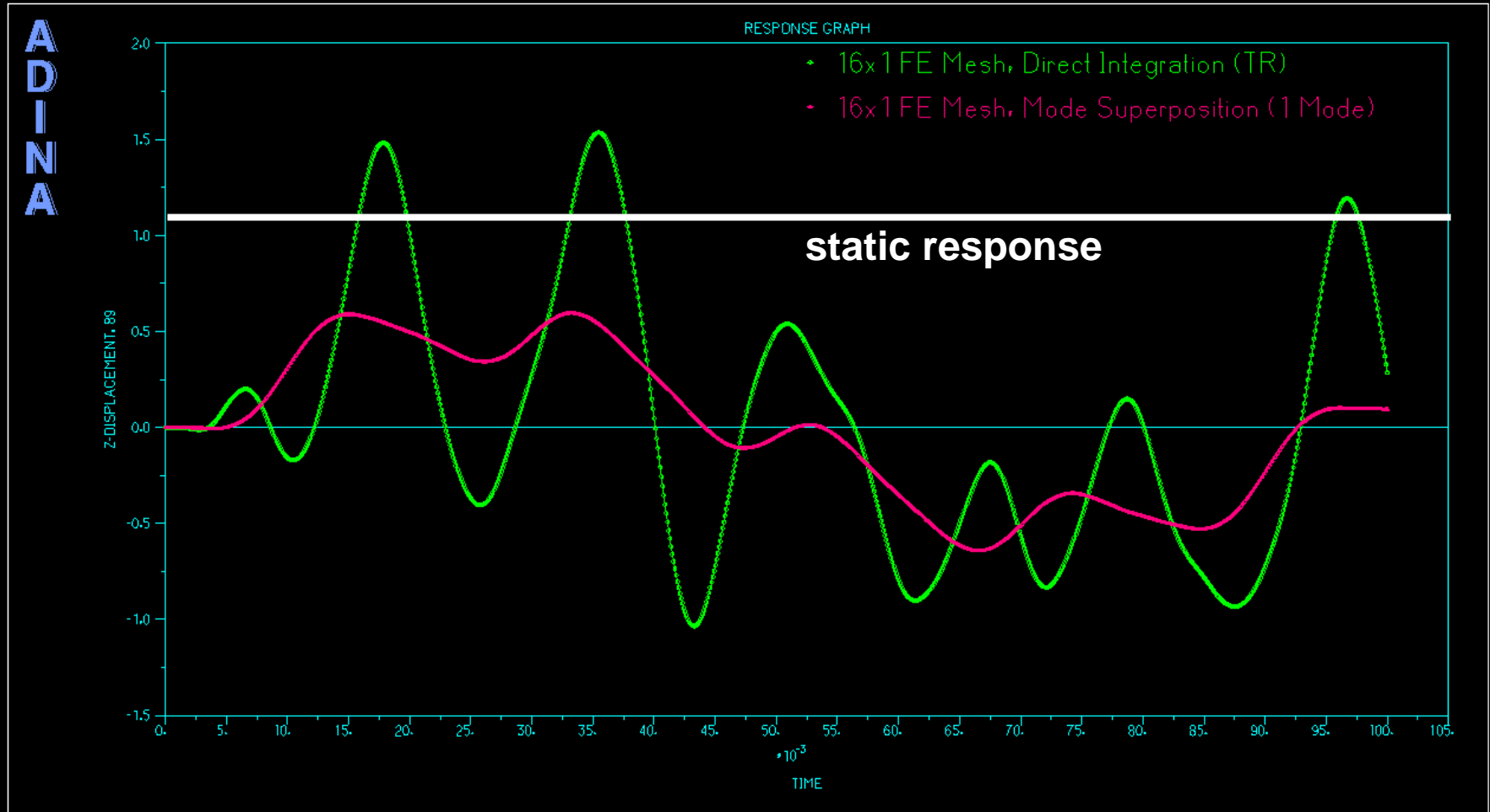


Mode 4

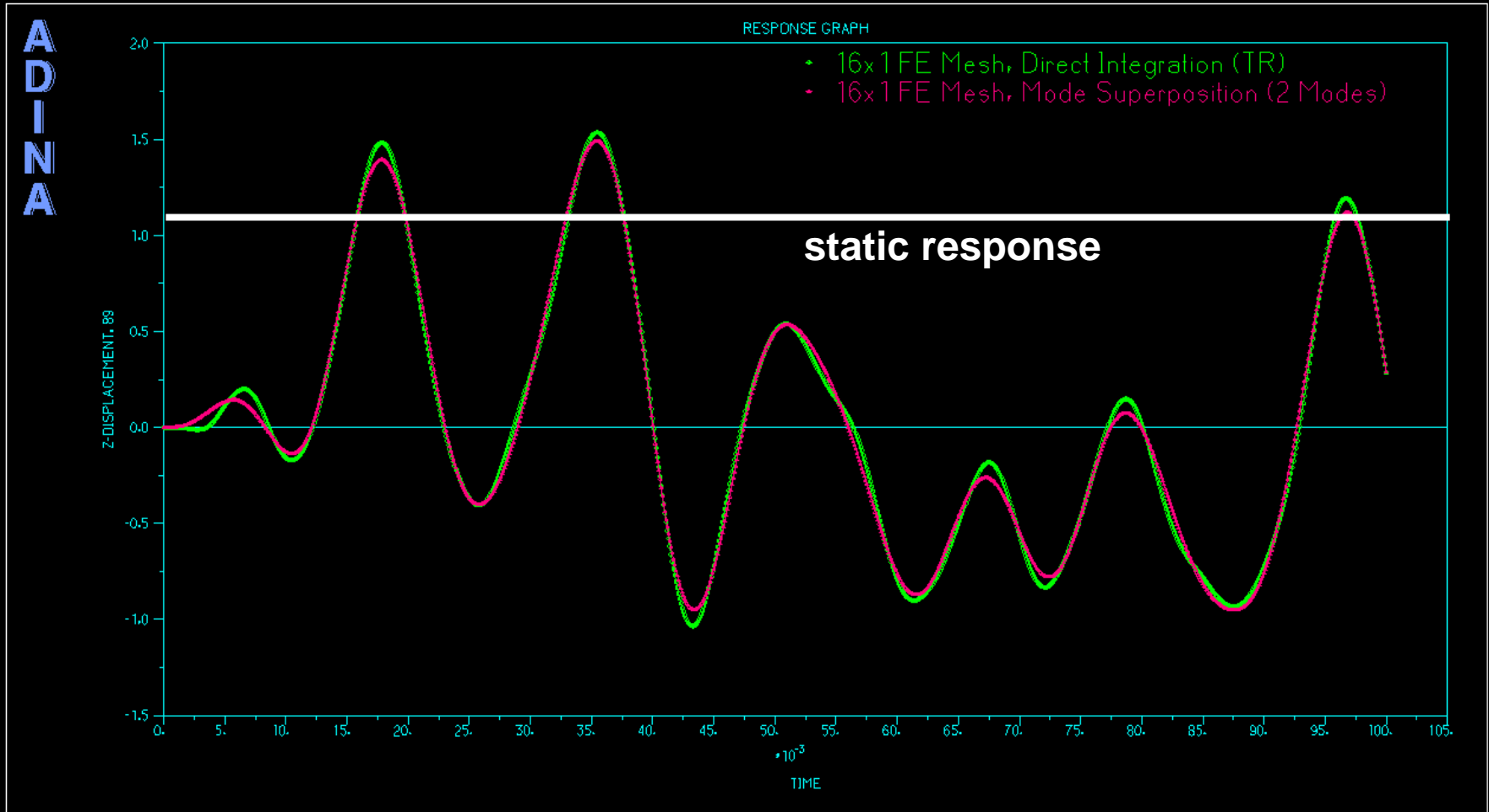
Tip Displacements



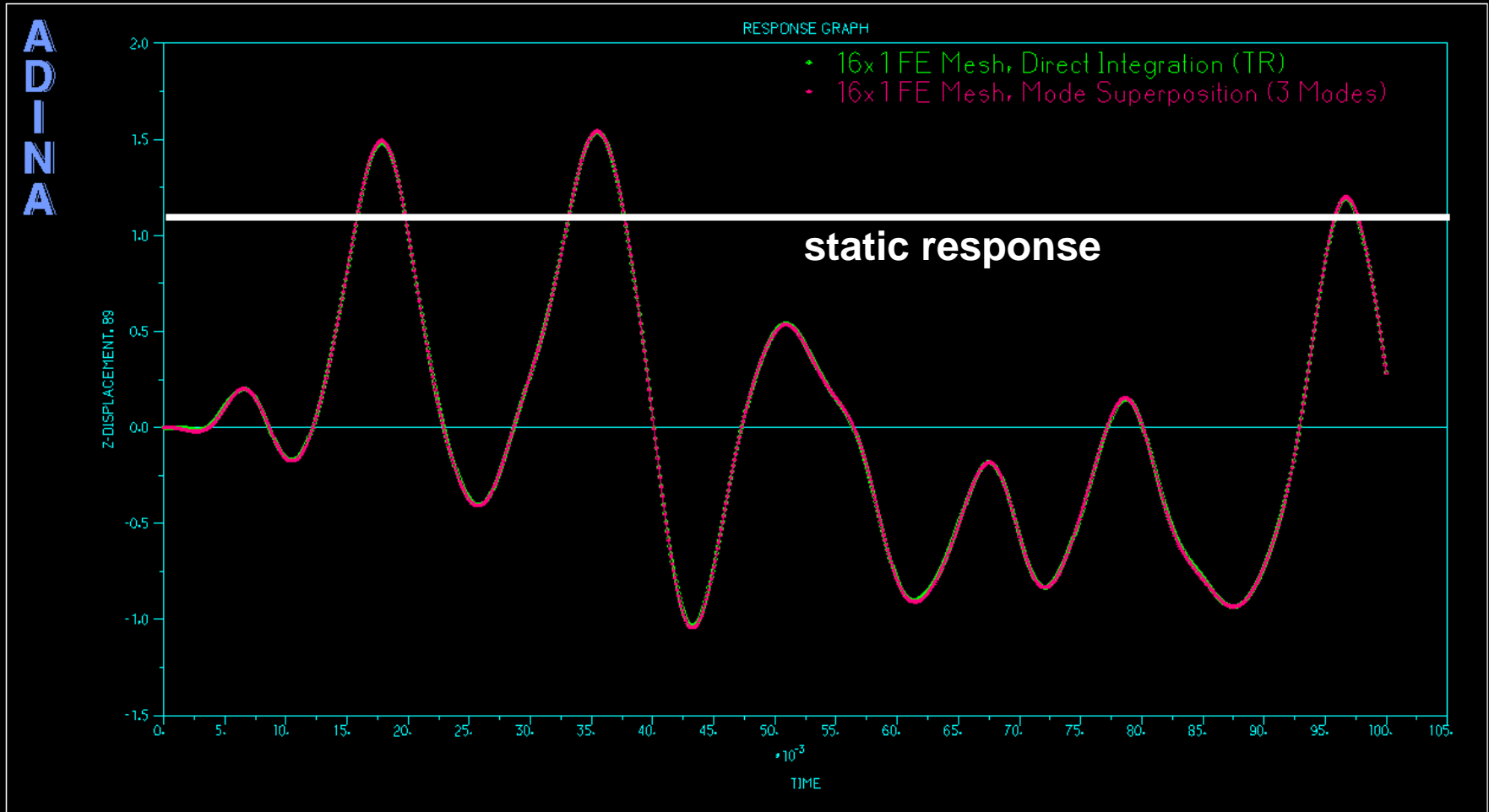
Tip Displacements



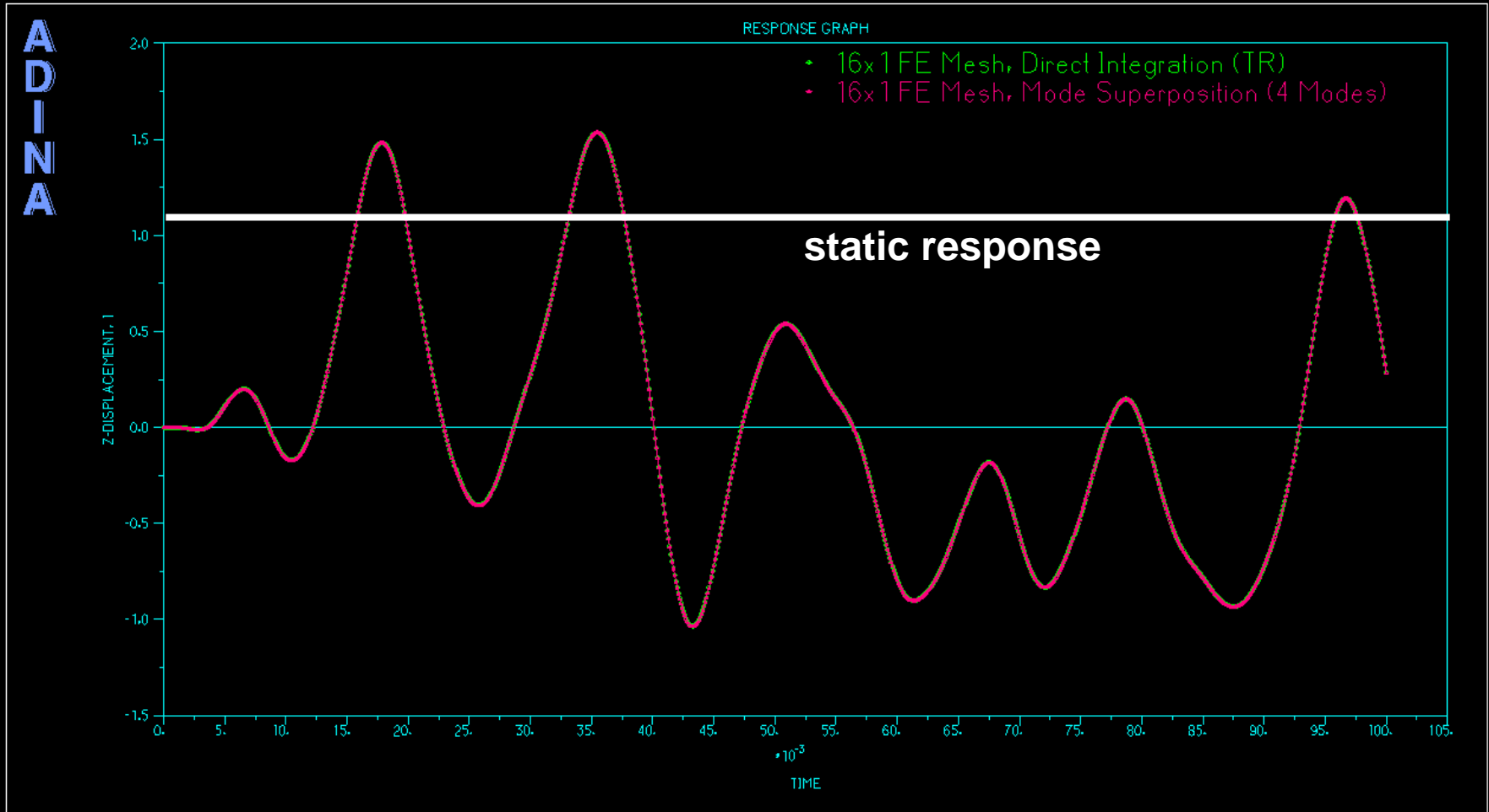
Tip Displacements



Tip Displacements



Tip Displacements



MIT OpenCourseWare
<http://ocw.mit.edu>

2.092 / 2.093 Finite Element Analysis of Solids and Fluids I
Fall 2009

For information about citing these materials or our Terms of Use, visit: <http://ocw.mit.edu/terms>.