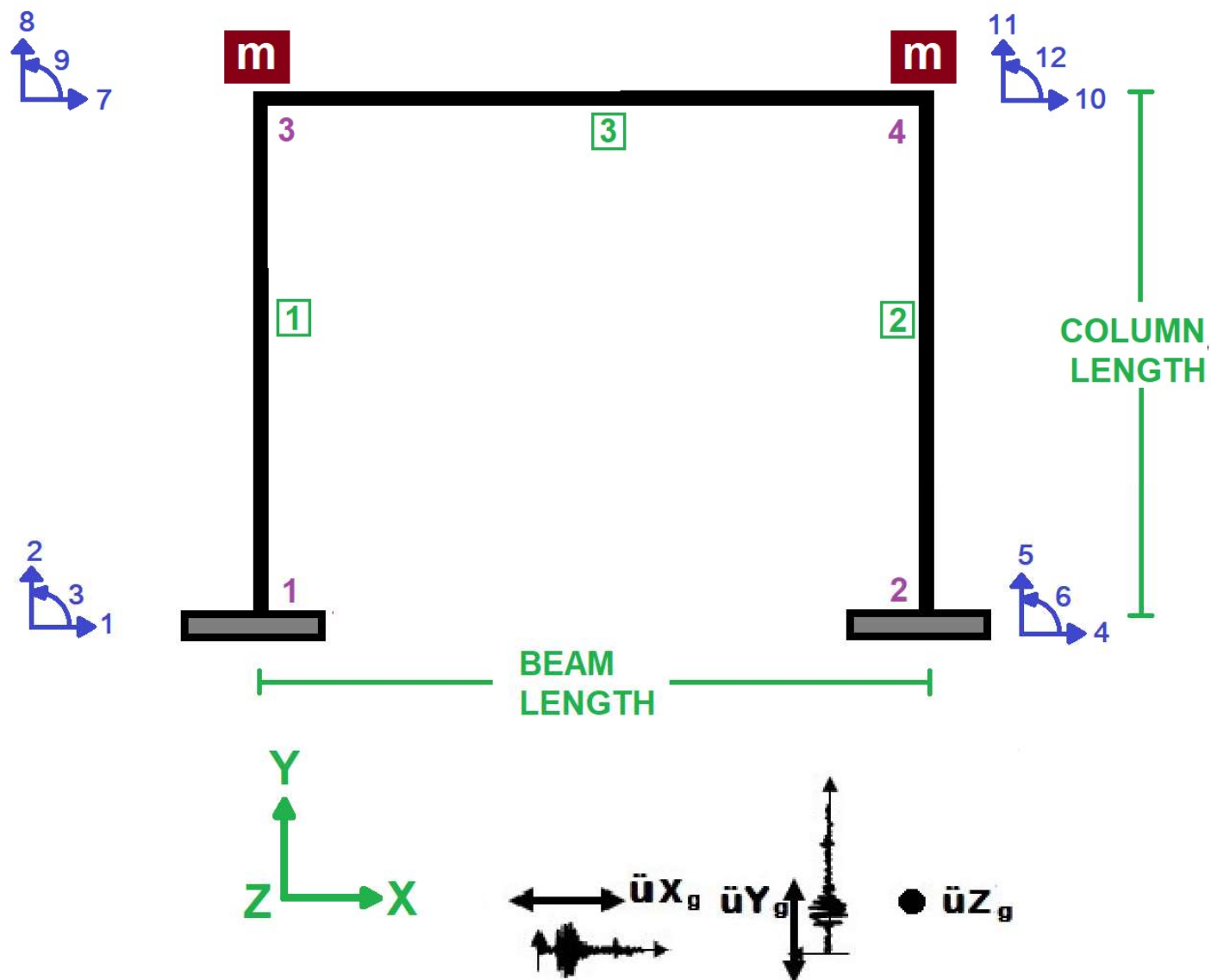
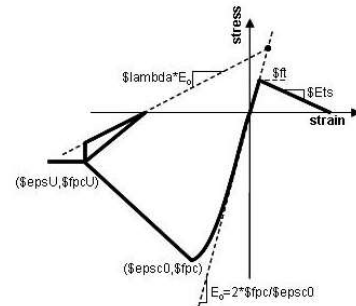


IN THE NAME OF ALLAH

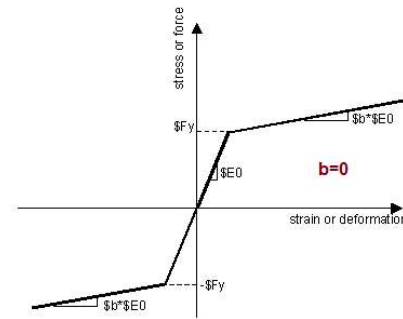
ASSESSMENTS OF THE STRUCTURAL DUCTILITY DAMAGE INDEX OF ULTRA-HIGH STRENGTH CONCRETE (UHSC) FRAME USING OPENSEES.

WRITTEN BY SALAR DELAVAR GHASHGHAEI (QASHQAI)

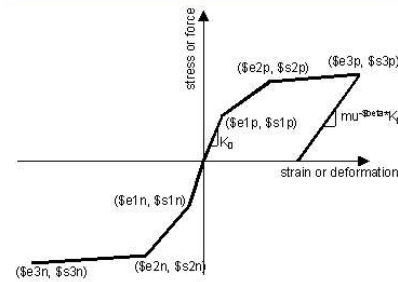




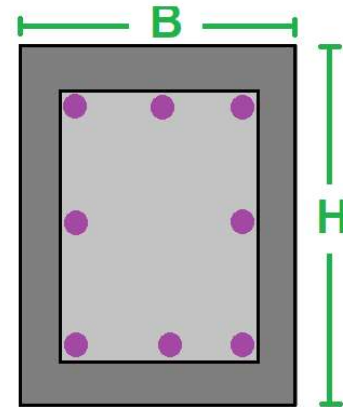
CORE AND COVER CONCRETE REALTION



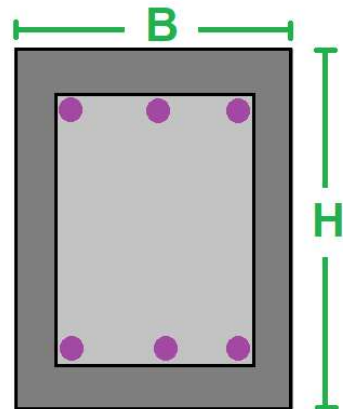
WITHOUT HARDENING AND ULTIMATE STRAIN



WITH HARDENING AND ULTIMATE STRAIN



COLUMN SECTION



BEAM SECTION

$$\text{Structure Ductility Damage Index} = \frac{\Delta_d - \Delta_y}{\Delta_u - \Delta_y}$$

Δ_d = Lateral Displaement from Dynamic Analysis

Δ_y = Lateral Yield Displaement from Pushover Analysis

Δ_u = Lateral Ultimate Displaement from Pushover Analysis

Spyder (Python 3.12)

File Edit Search Source Run Debug Consoles Projects Tools View Help

C:\Users\Del\Desktop\OPENSEES_FILES\CONCRETE_FRAME_EXAMPLES\ULTRA_HIGH_STRENGTH_CONCRETE.py

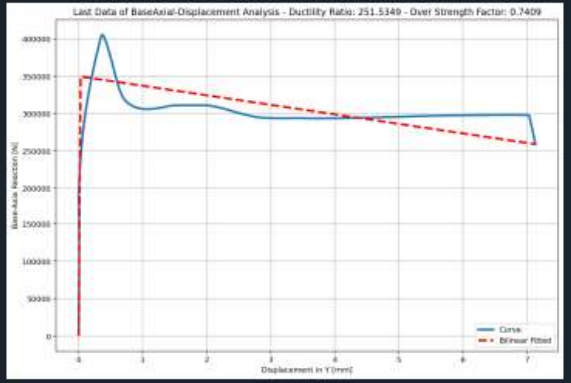
CONCRETE_FRAME_ULTRA_HIGH_STRENGTH_CONCRETE.py

```
1 #####
2 #                               IN THE NAME OF ALLAH
3 #   ASSESSMENTS OF THE STRUCTURAL DUCTILITY DAMAGE INDEX OF ULTRA-HIGH STRENGTH CONCRETE (UHSC) FRAME U
4 #-----
5 #                               THIS PROGRAM WRITTEN BY SALAR DELAVAR GHASHGHAEI (QASHQAI)
6 #                               EMAIL: salar.d.ghashghaei@gmail.com
7 #####
8
9 # Ultra-High Strength Concrete (UHSC) is concrete with compressive strength over 100 MPa.
10 # It is used in advanced structures like tall buildings, bridges, tunnels, and military facilities.
11
12 # Main Properties of UHSC:
13 # -----
14 # - Compressive strength: >100 MPa (often up to 150 MPa or more)
15 # - High tensile and flexural strength (due to steel or polymer fibers)
16 # - High density: 2400-2600 kg/m³
17 # - Very low permeability (resistant to water, chloride, and sulfate)
18 # - High elastic modulus (Low deformation under load)
19 # - Excellent durability
20
21 # Main Components:
22 # -----
23 # 1. High-quality Portland cement
24 # 2. Silica fume (to reduce pores and improve strength)
25 # 3. Steel or polypropylene fibers (for crack control and toughness)
26 # 4. Superplasticizer (to reduce water/cement ratio, typically W/C ≤ 0.25)
27 # 5. Well-graded sand and aggregates
28 # 6. Mineral powders (e.g., quartz powder in some mixes)
29
30 # Advantages:
31 # -----
32 # - High strength in compression, tension, and bending
33 # - Very durable in harsh environments (marine, chemical, etc.)
34 # - Allows smaller sections and lighter structures
```

...ILES\CONCRETE_FRAME_EXAMPLES\ULTRA_HIGH_STRENGTH_CONCRETE

24 %

Last Data of BaseArea-Displacement Analysis - Ductility Ratio: 251.5349 - Over Strength Factor: 0.7409



Help Variable Explorer Debugger Plots Files

Console 1/A

Lobatto

End 1 Forces (P V M): 0.227544 1.75728 4330.36

End 2 Forces (P V M): -0.227544 -1.75728 941.468

Element: 3 Type: ForceBeamColumn2d Connected Nodes: 3 4

Number of Sections: 5 Mass density: 3.75

Lobatto

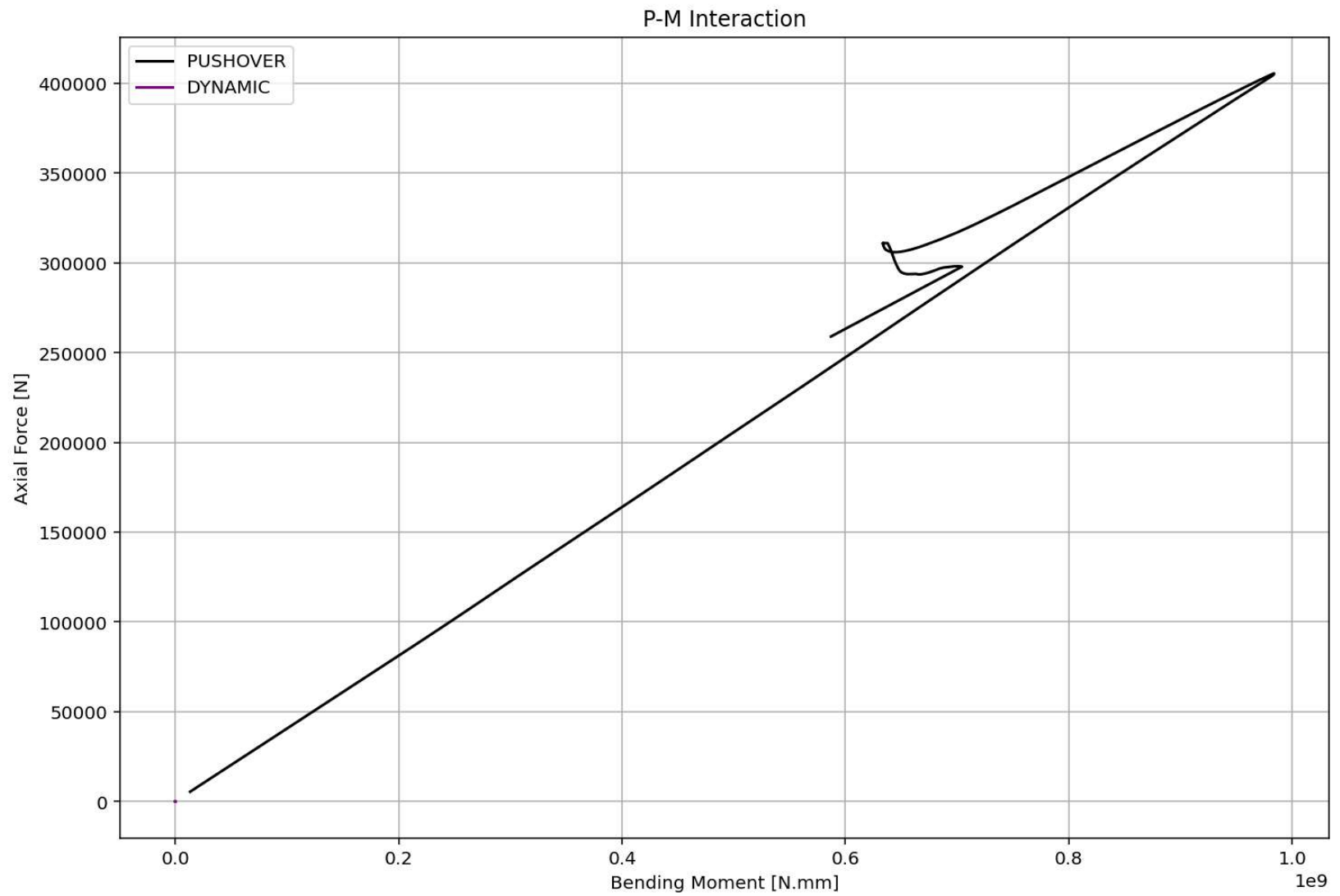
End 1 Forces (P V M): -7.14309e-06 -0.268992 -941.477

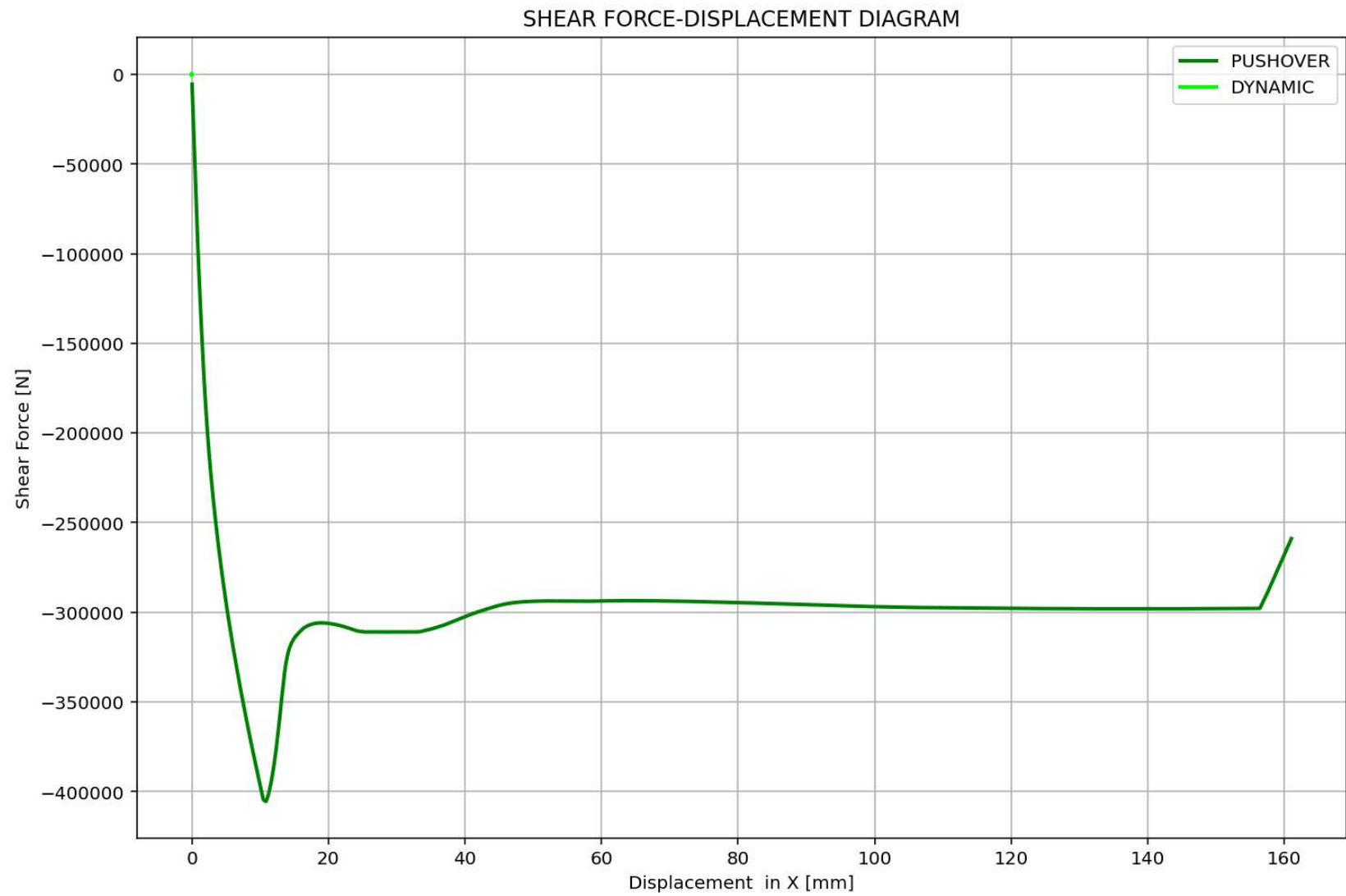
End 2 Forces (P V M): 7.14309e-06 0.268992 -941.468

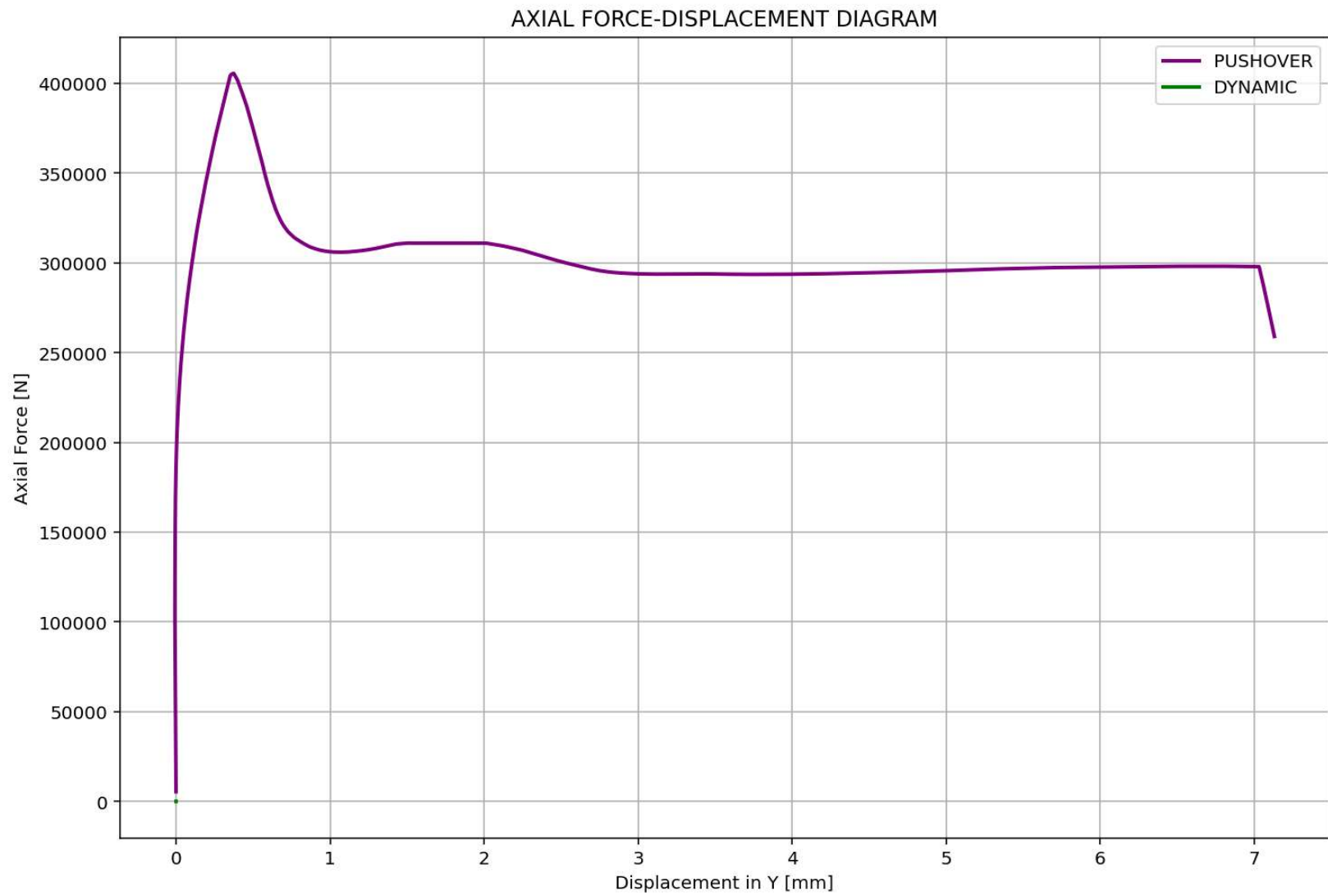
In [3]:

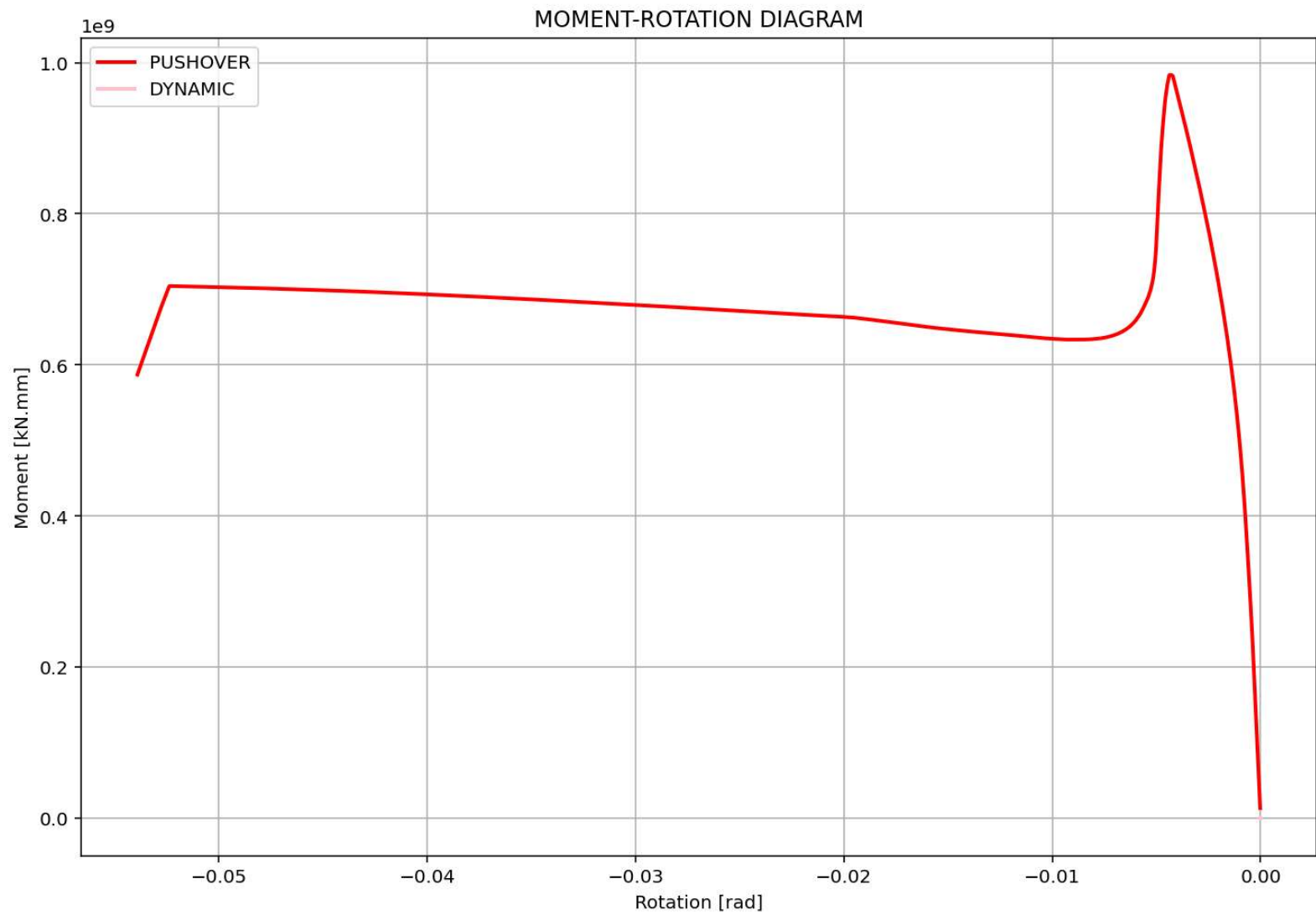
IPython Console History

Inline Conda: anaconda3 (Python 3.12.7) ✓ LSP: Python Line 27, Col 16 UTF-8 CRLF RW Mem 48%

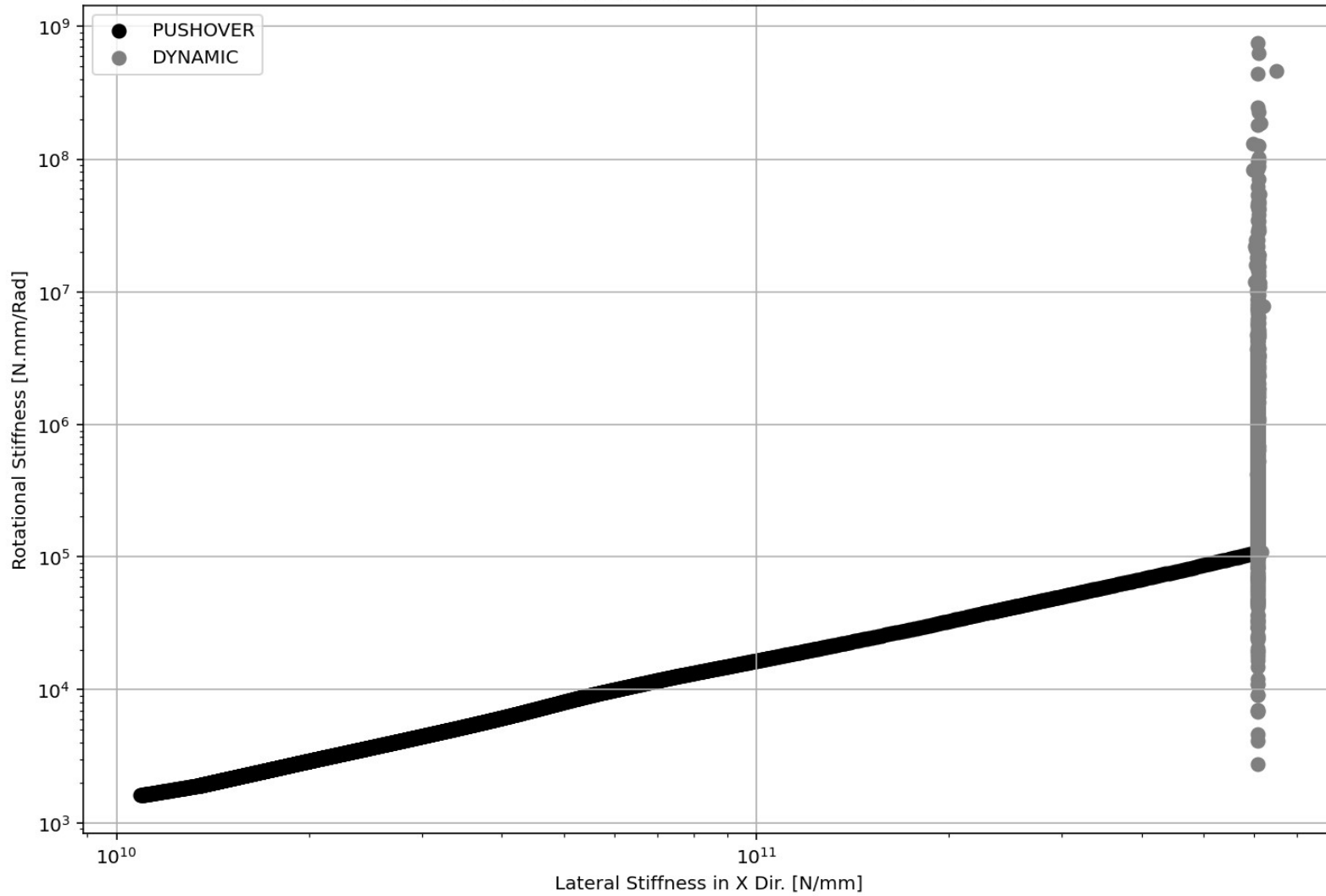


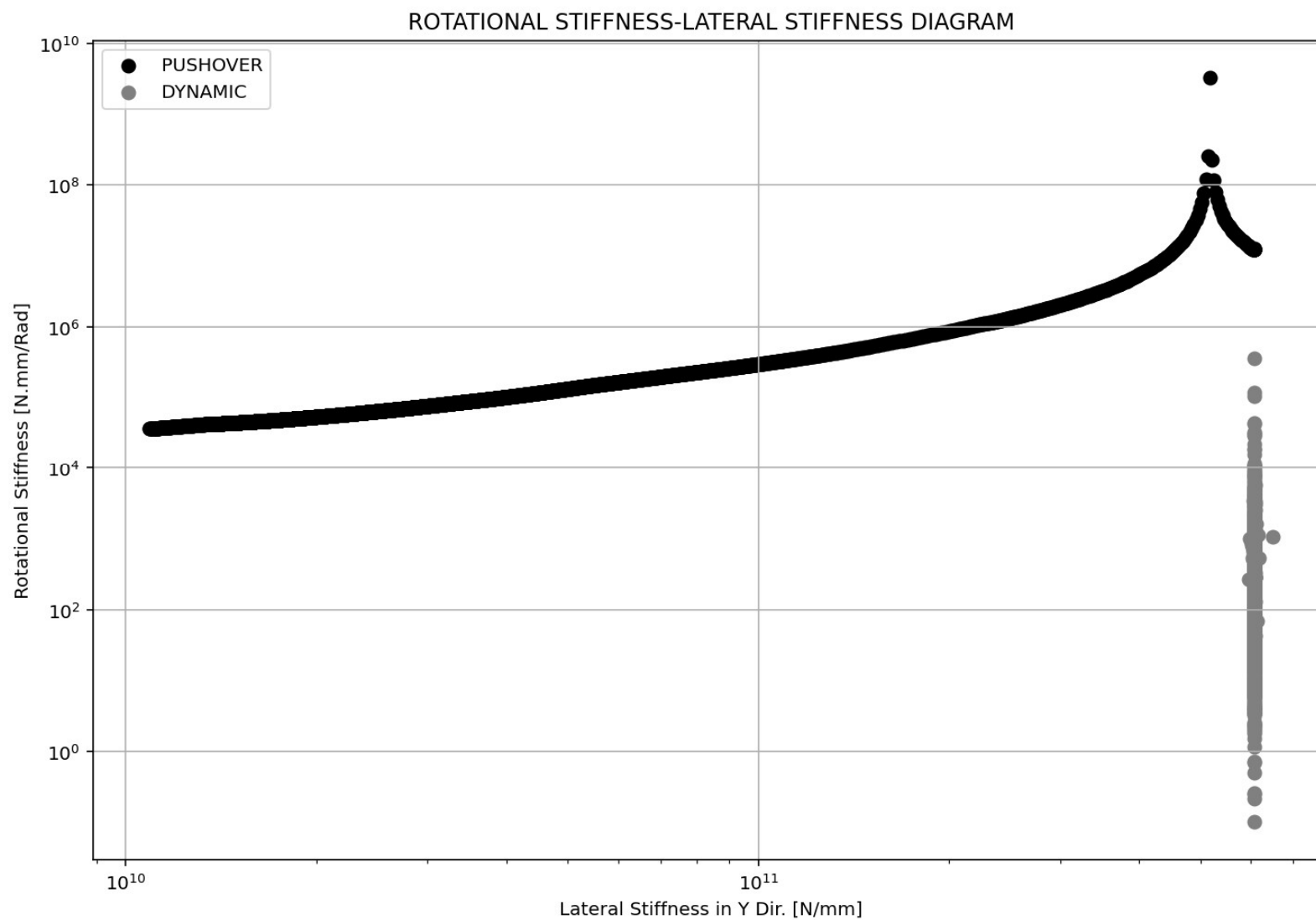




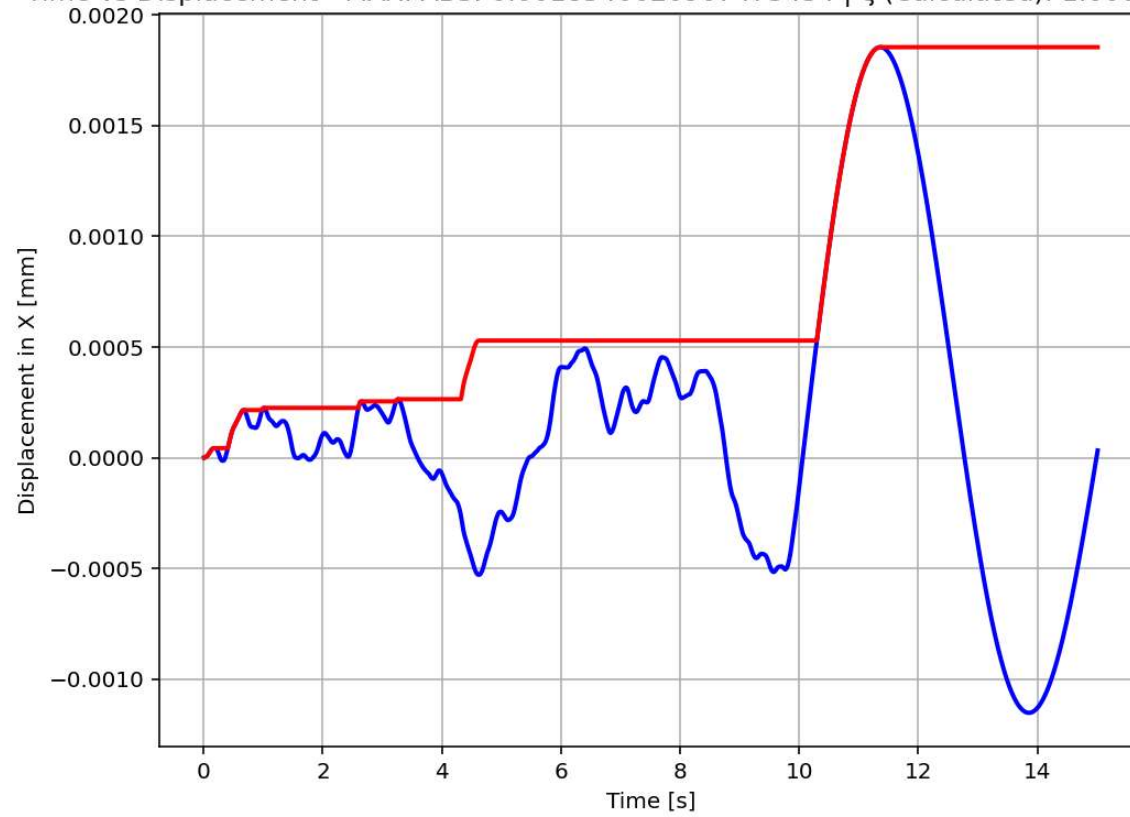


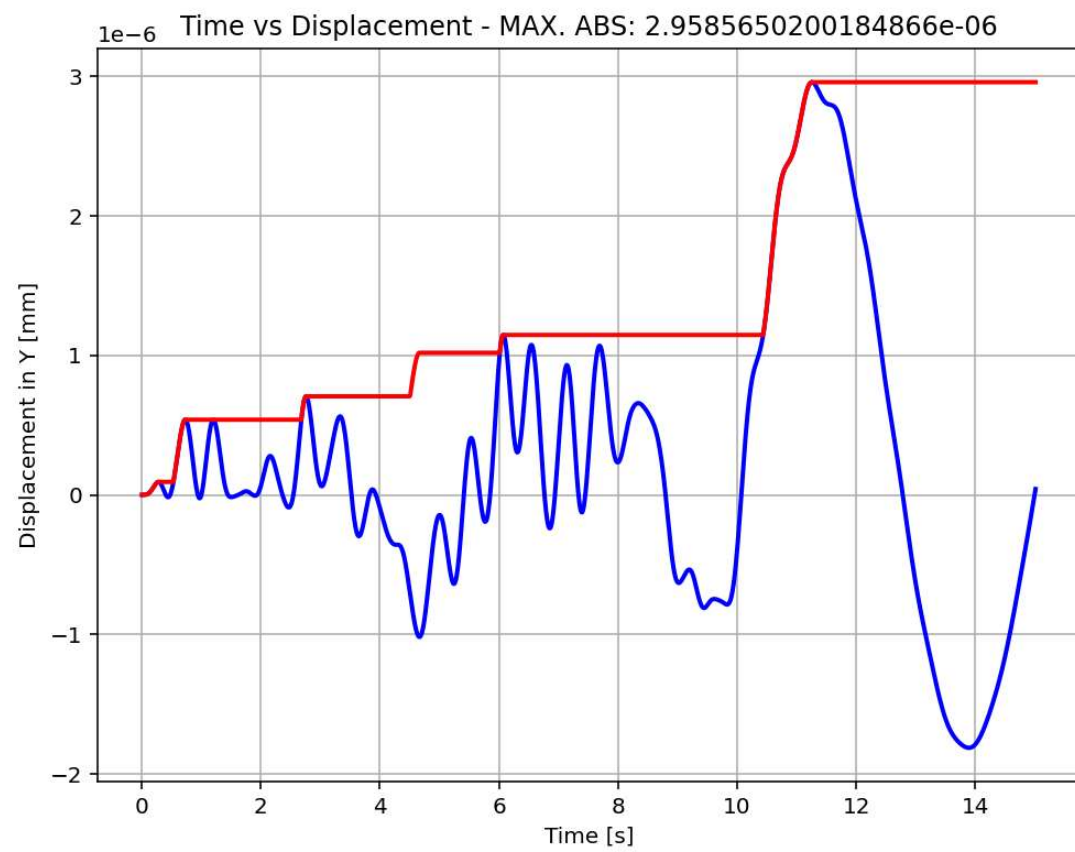
ROTATIONAL STIFFNESS-LATERAL STIFFNESS DIAGRAM

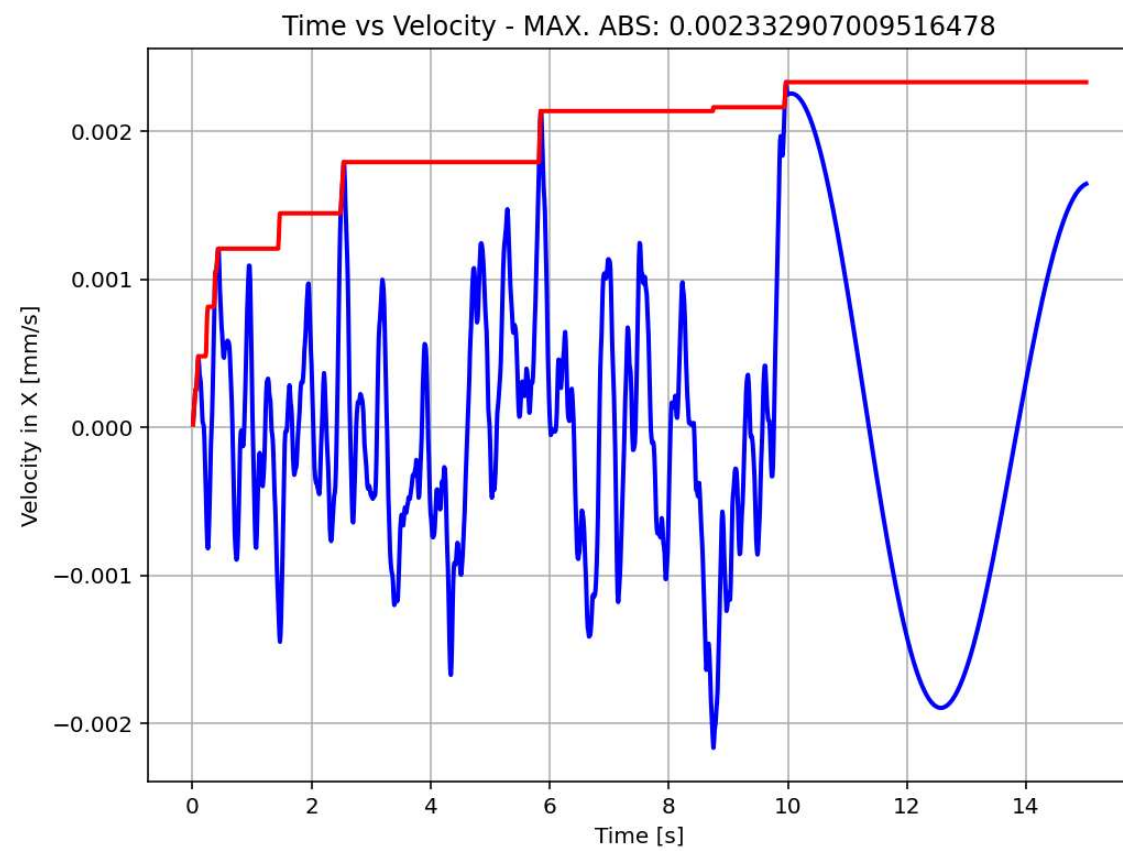


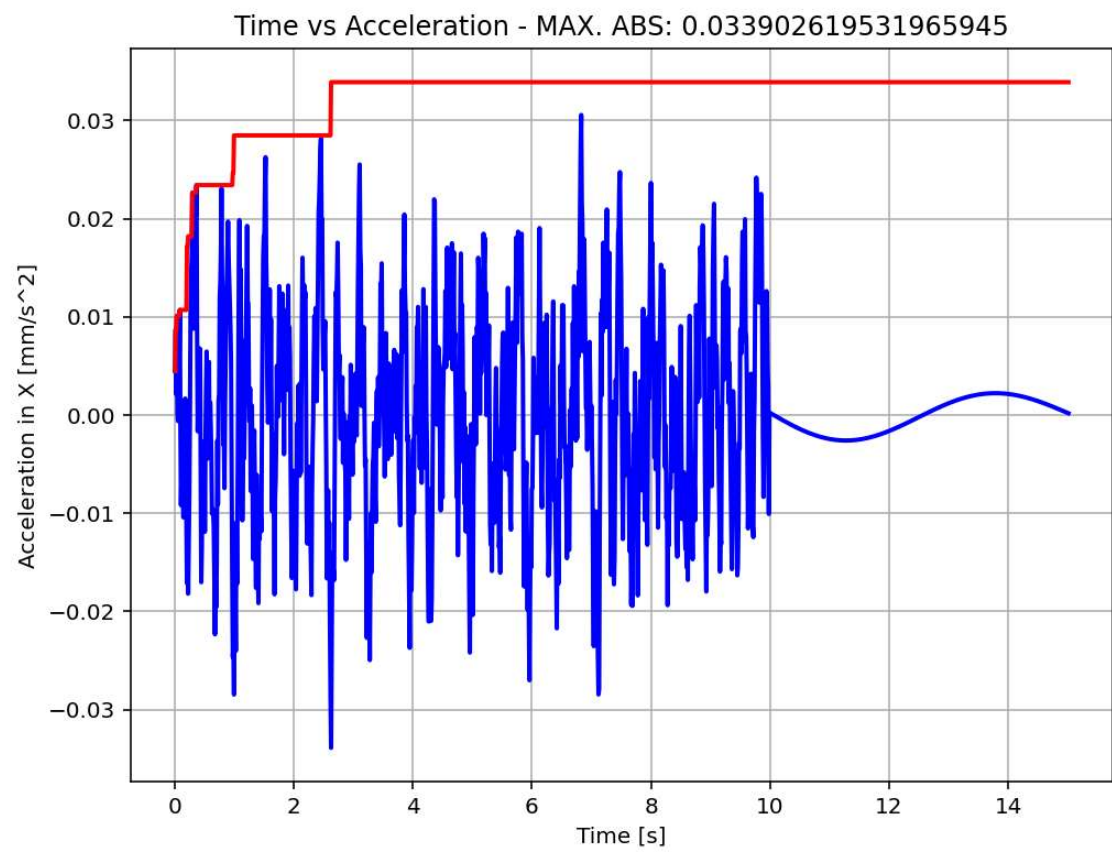


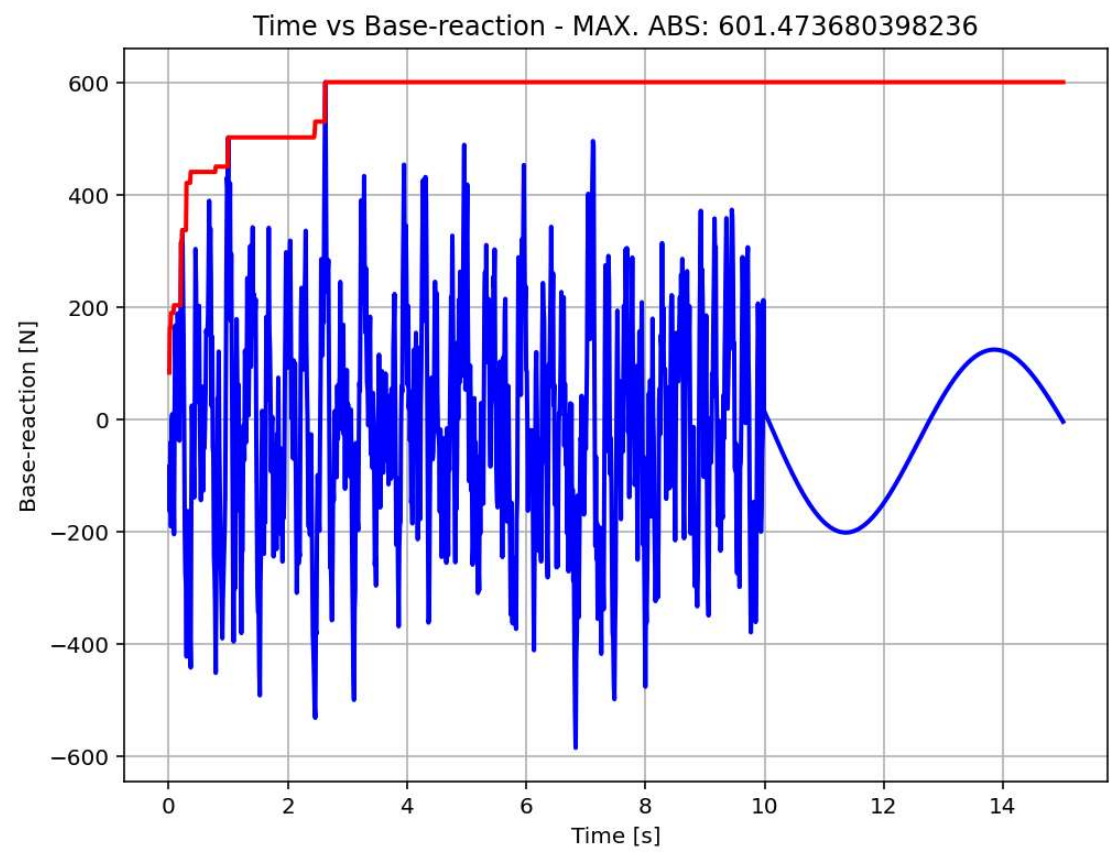
Time vs Displacement - MAX. ABS: 0.0018540020907475434 | ξ (Calculated): 1.00000e+02 %



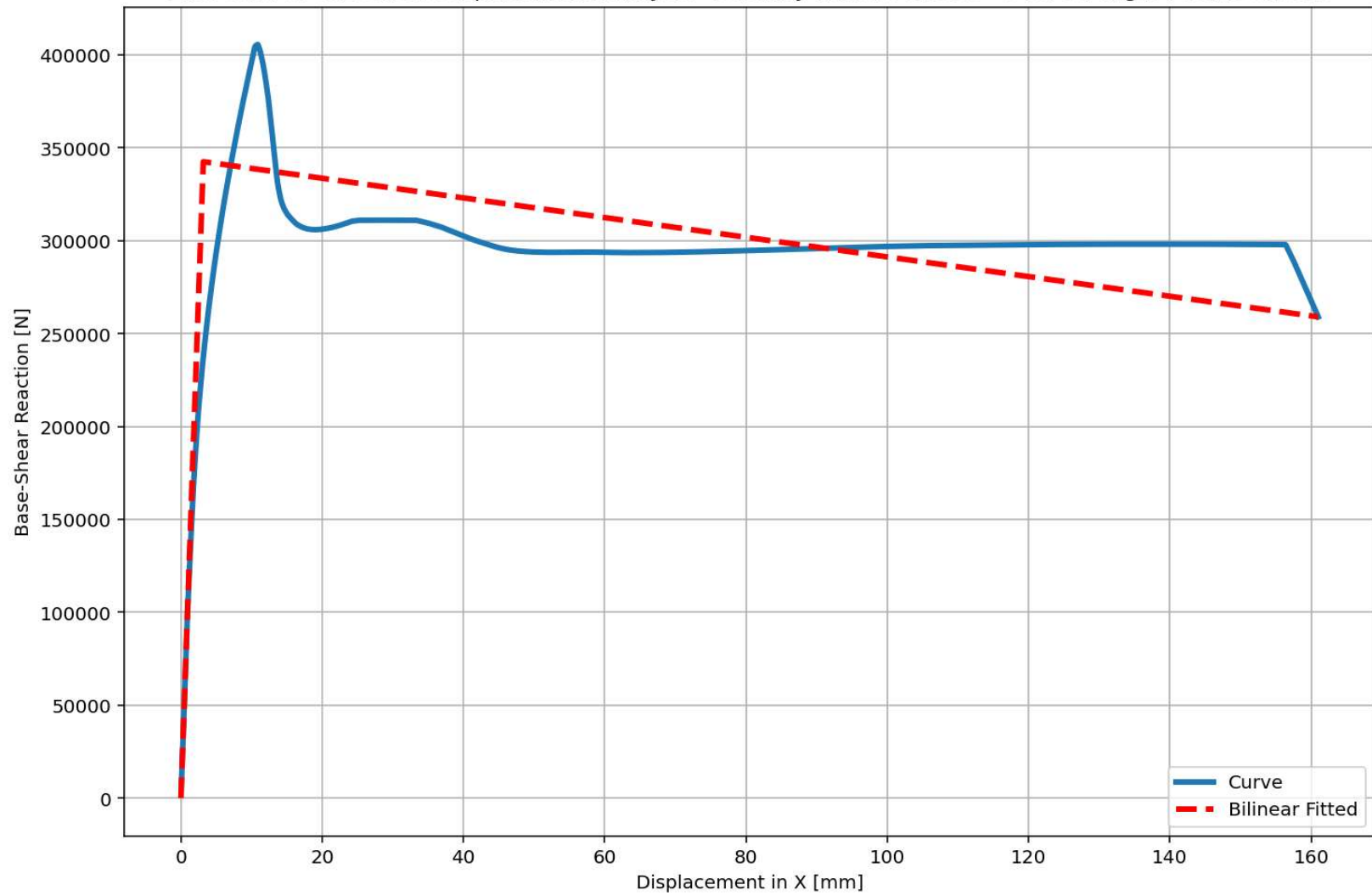








Last Data of BaseShear-Displacement Analysis - Ductility Ratio: 50.8586 - Over Strength Factor: 0.7561



Last Data of BaseAxial-Displacement Analysis - Ductility Ratio: 251.5349 - Over Strength Factor: 0.7409

