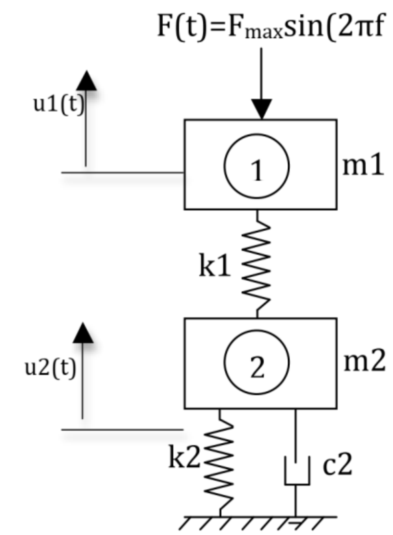


FEM MODELISATION WITH NASTRAN

DYNAMIC ANALYSIS OF STRUCTURES

Practical Work 4: Report

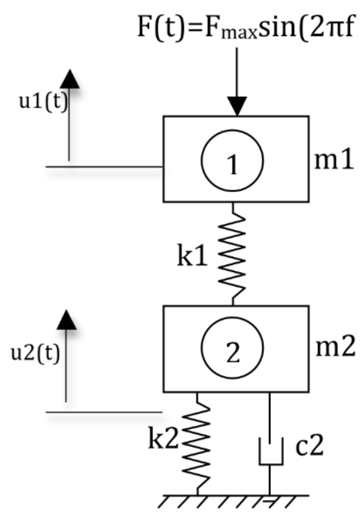
RESUME

In this practical session, we conducted dynamic analyses of a mass-spring-damper system, a clamped plate, and a thick beam fixed at one end. The objective was to understand the critical aspects of dynamic analysis for these elements, highlighting the importance of evaluating their response under different loading conditions. Dynamic analysis is essential in predicting the behavior of mechanical structures, particularly in determining stability, resonance, and material stress under various operational conditions

Khady sarah Sall

Aero-05, Walid Larbi

I. mass-spring-damper system

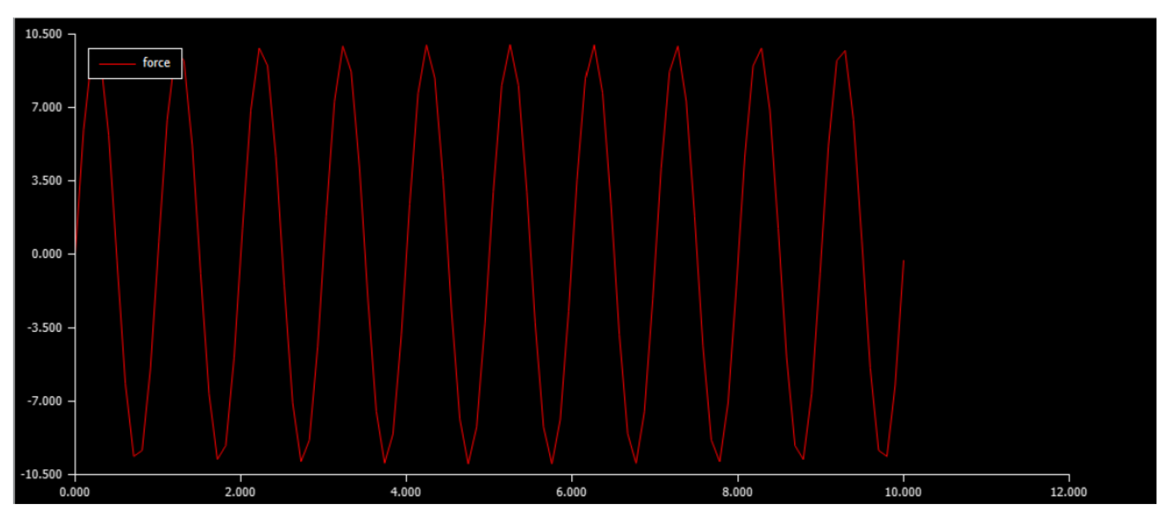


m1	525 kg
m2	262 kg
k1	8755 N/m
k2	2188 Nm
c2	5250 Ns/m
F(t)	10sin((2π/T)t)N avec T=1s

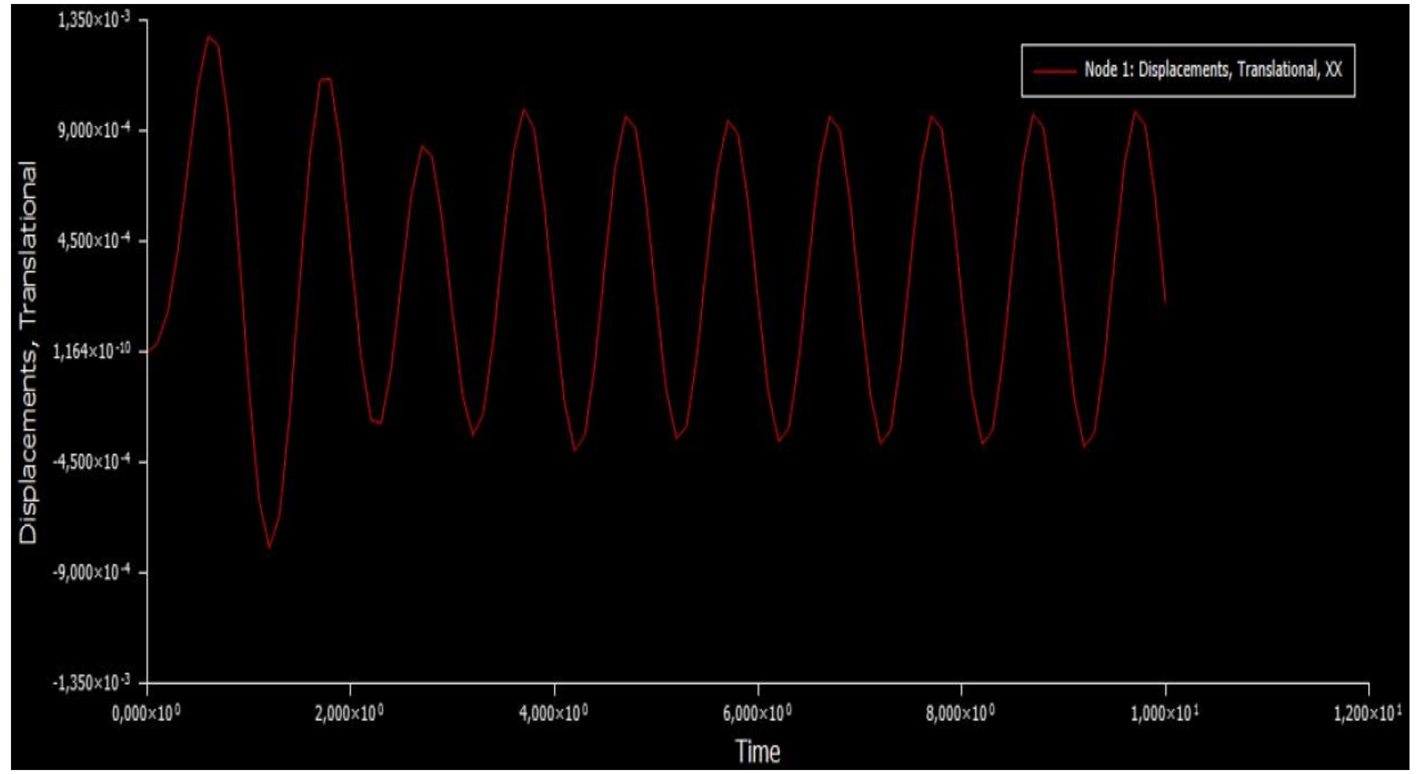
Our objective for this study is to solve this dynamic problem using the Patran/Nastran software to find the unknown displacements u1(t) and u2(t)).

- Here are the results we get

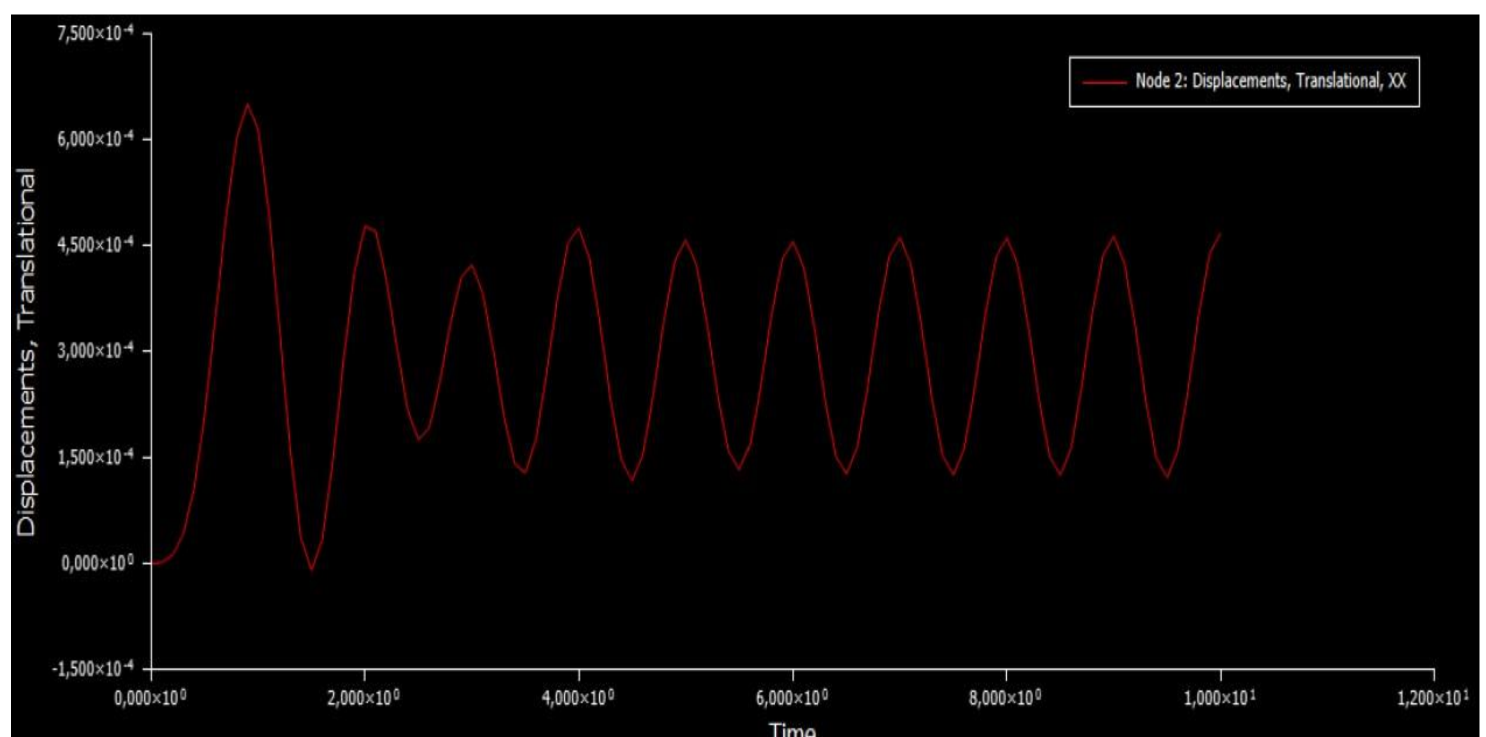
➢ Plot of the Force variation



- **Displacement u1(t) for mass1**



- **Displacement u2(t) for mass 2**

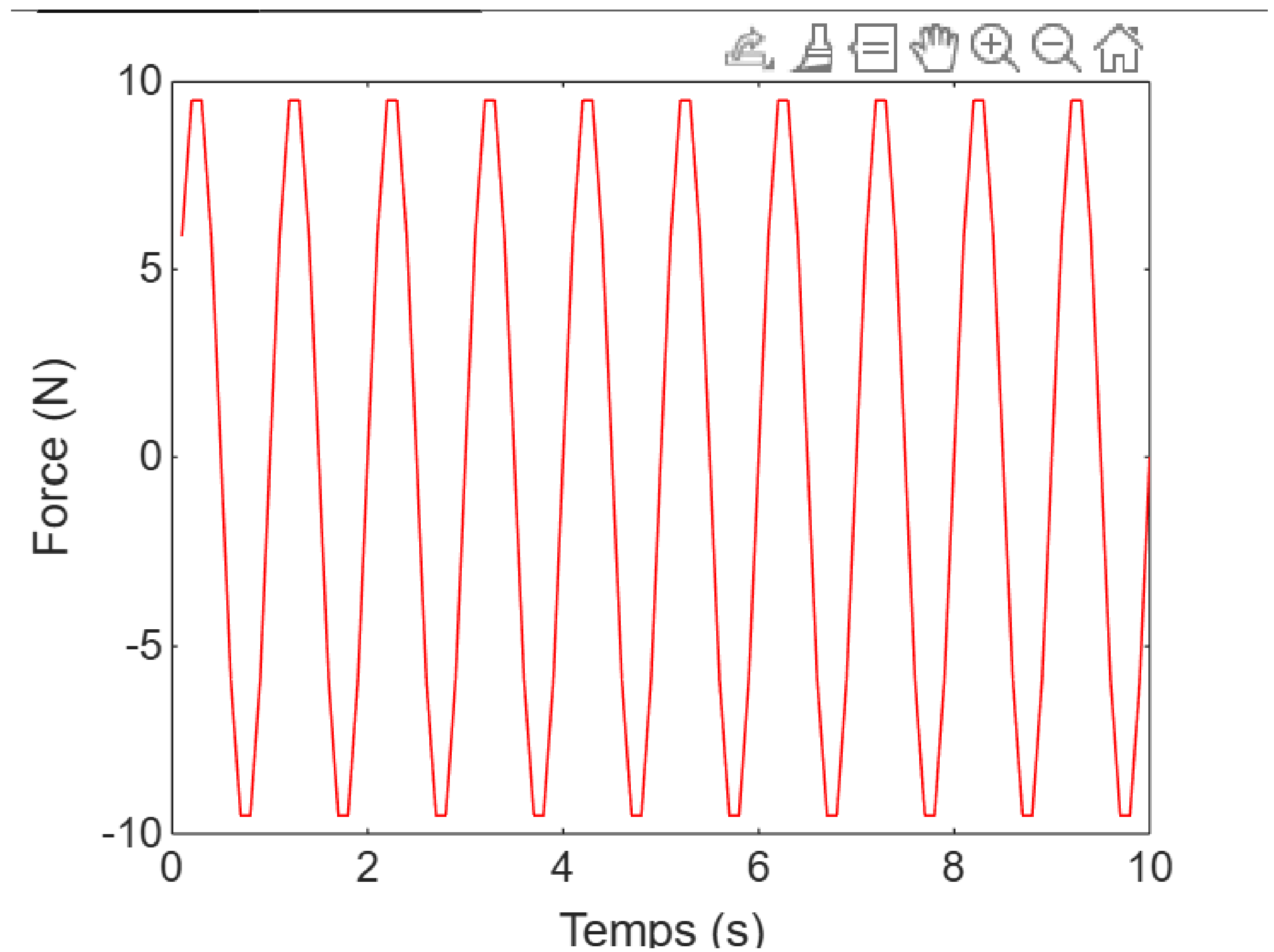


- **Interpretation :**

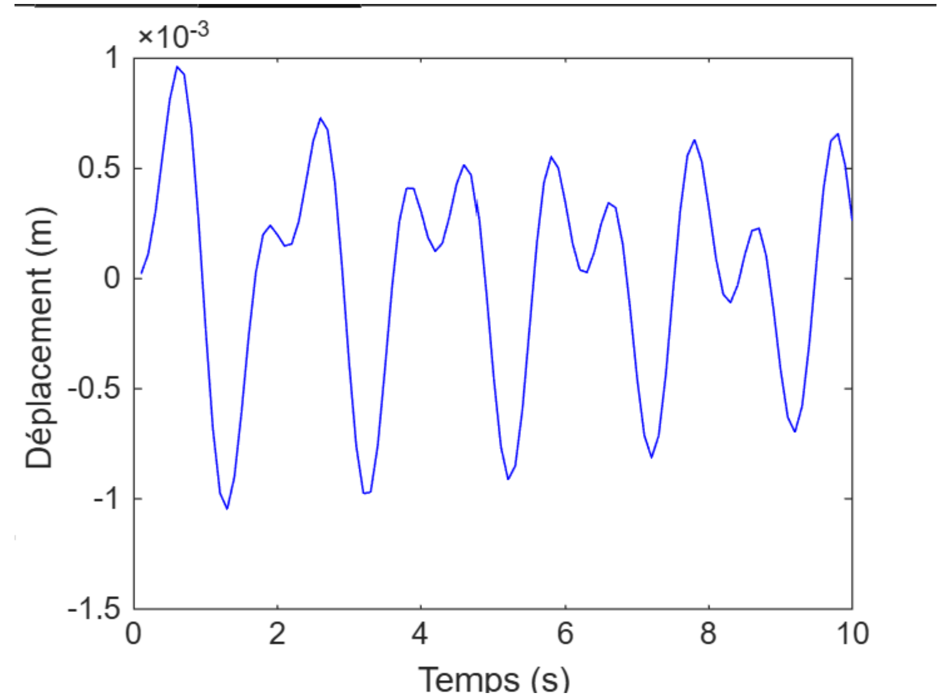
The resukts are correct we can see that the amplitude of displacement of mass is superior to mass2 this is due to the damper attached to mass2 with high viscuous coeeficient. Our transient time response and plot are all correct.

- **Matlab Computation**

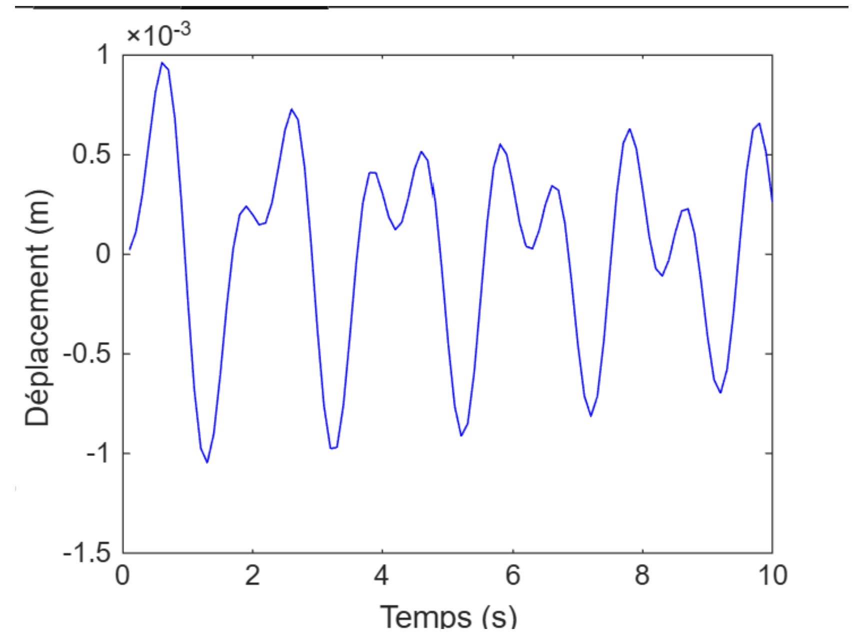
➢ Force Plot



- Displacement u1(t) for mass1



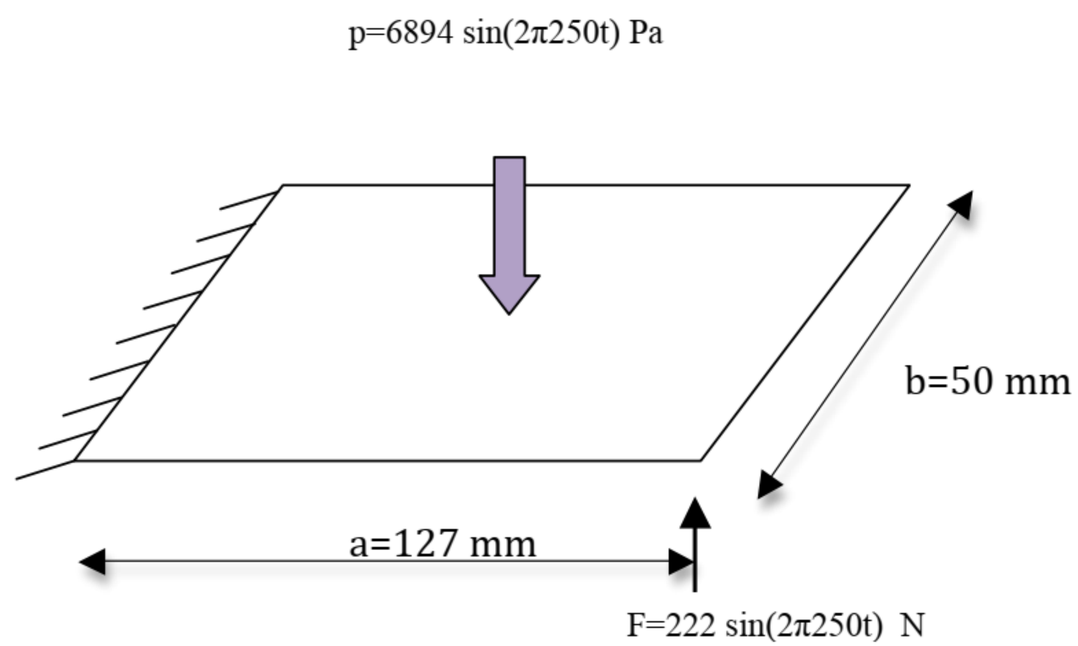
- Displacement u2(t) for mass2



➢ Problem

We don’t get the same displacement for mass2 when we compare the numerical method and the computioned with matlab. Unfortunately I couldn’t find what the error.

II. Rectangular Shell Dynamic Analysis



- **Characteristics of the Shell:**

$E = 210\ GPa$

$\rho = 7800\ kg/m3$

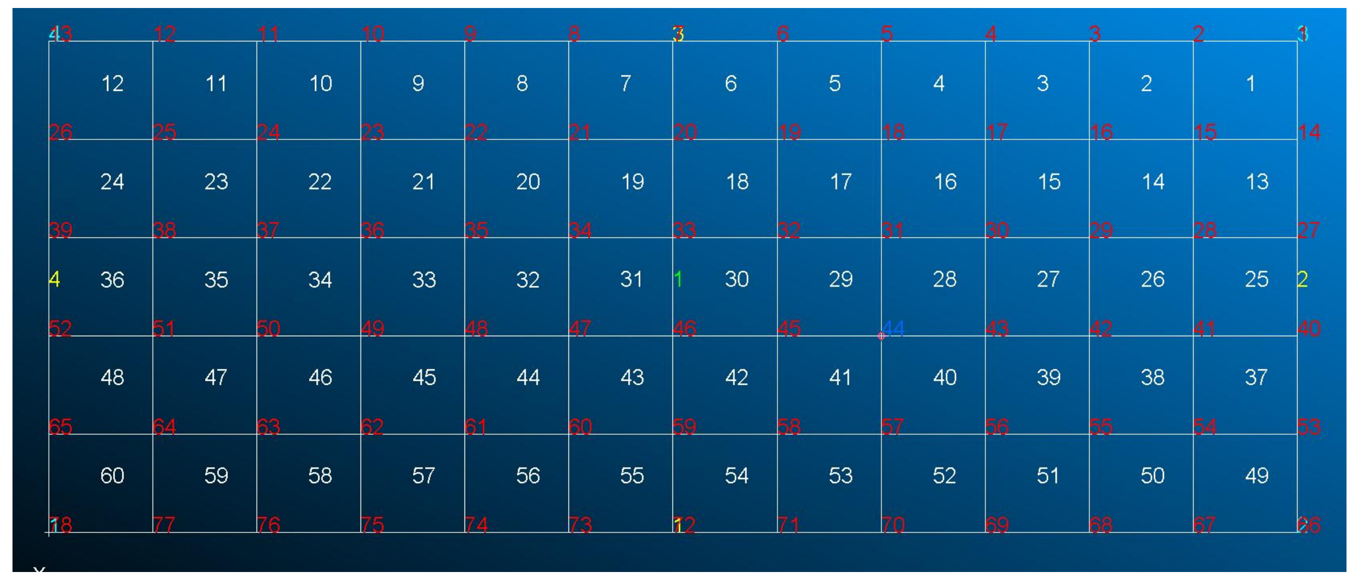
$\upsilon = 0.3$

$h = 2.5\ mm$

$a = 127\ mm$

$b = 50\ mm$

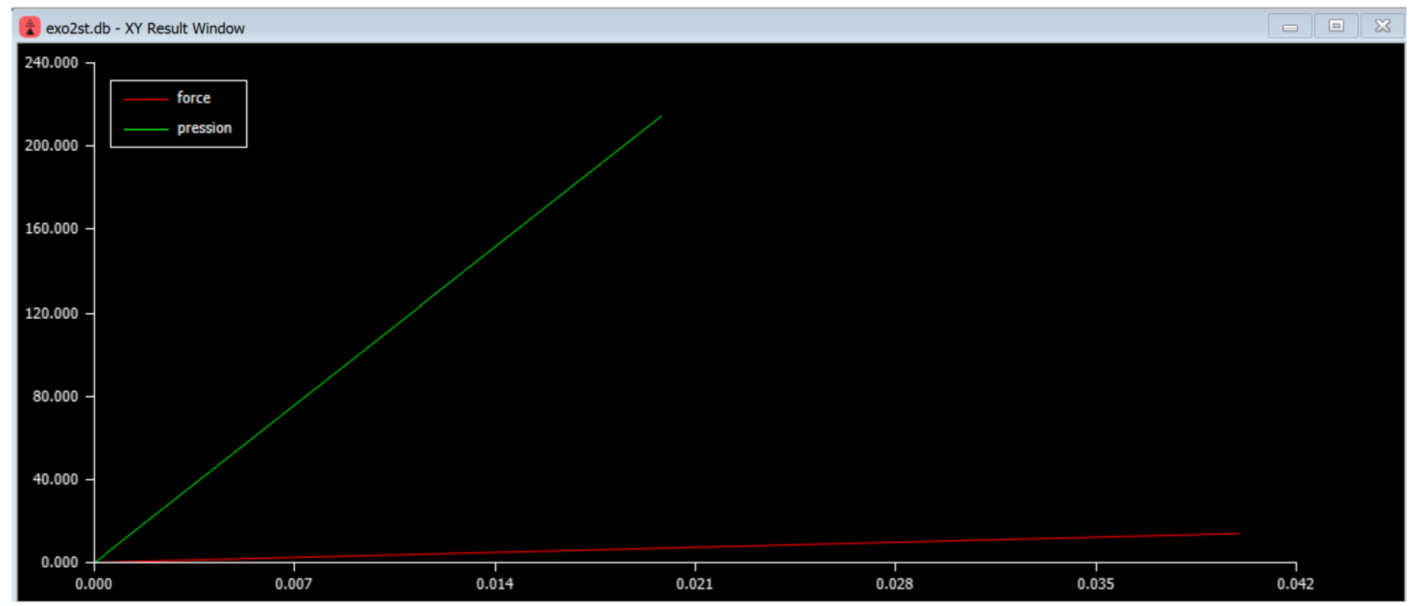
➢ Geometry, Surface, Mesh Elements and Nodes



➢ Numerical Simulation and Results:

Study time= 0.04s Time of excitation is equal to 0.008s

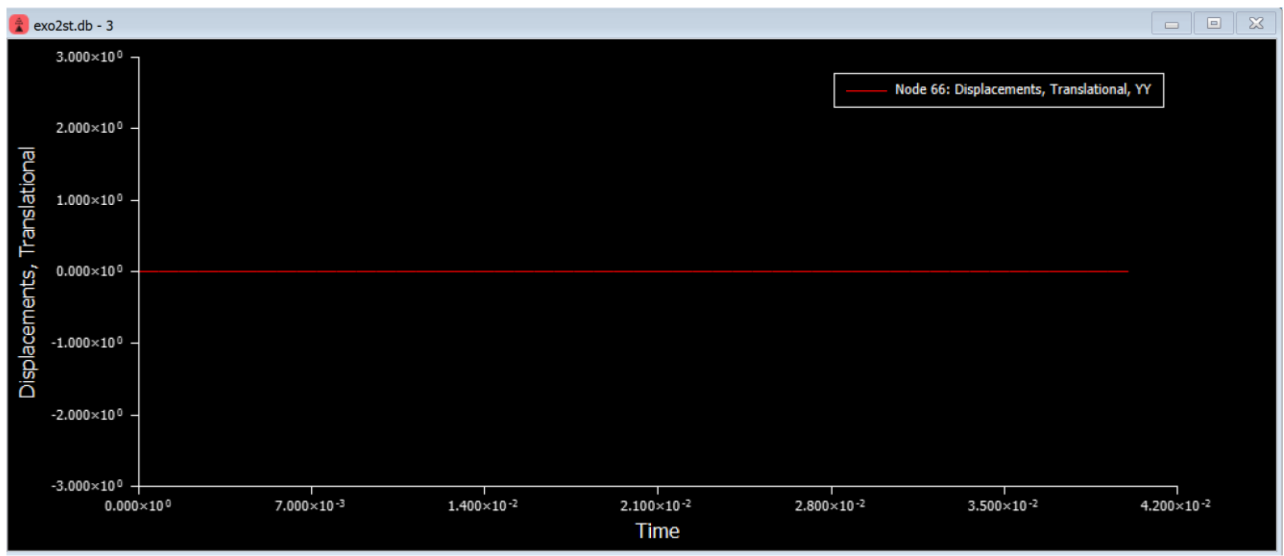
- **Force and pressure plot**

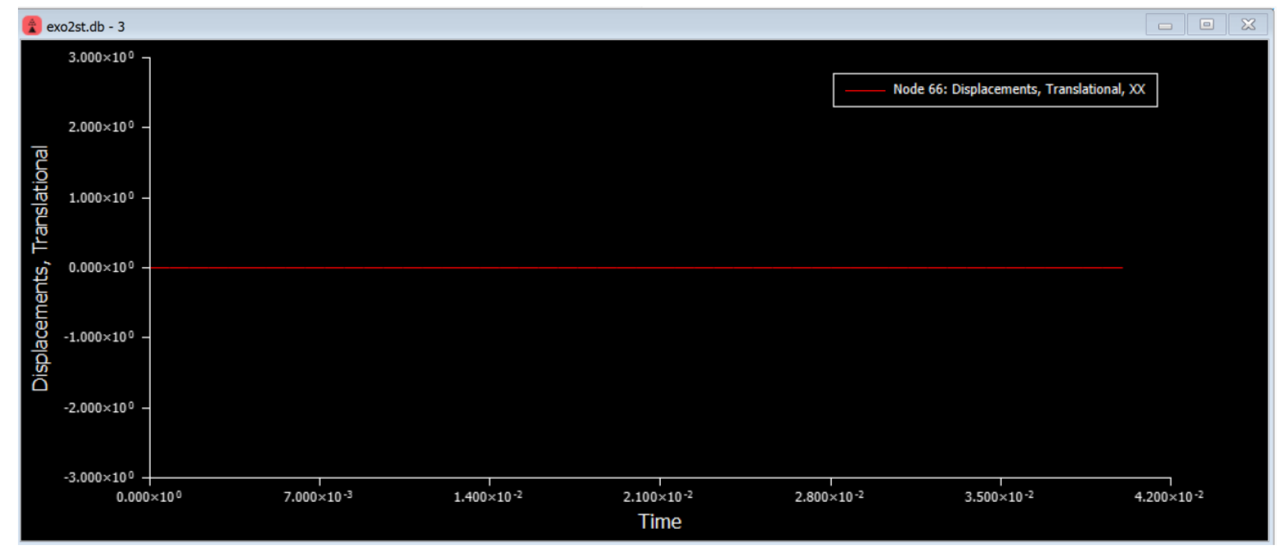


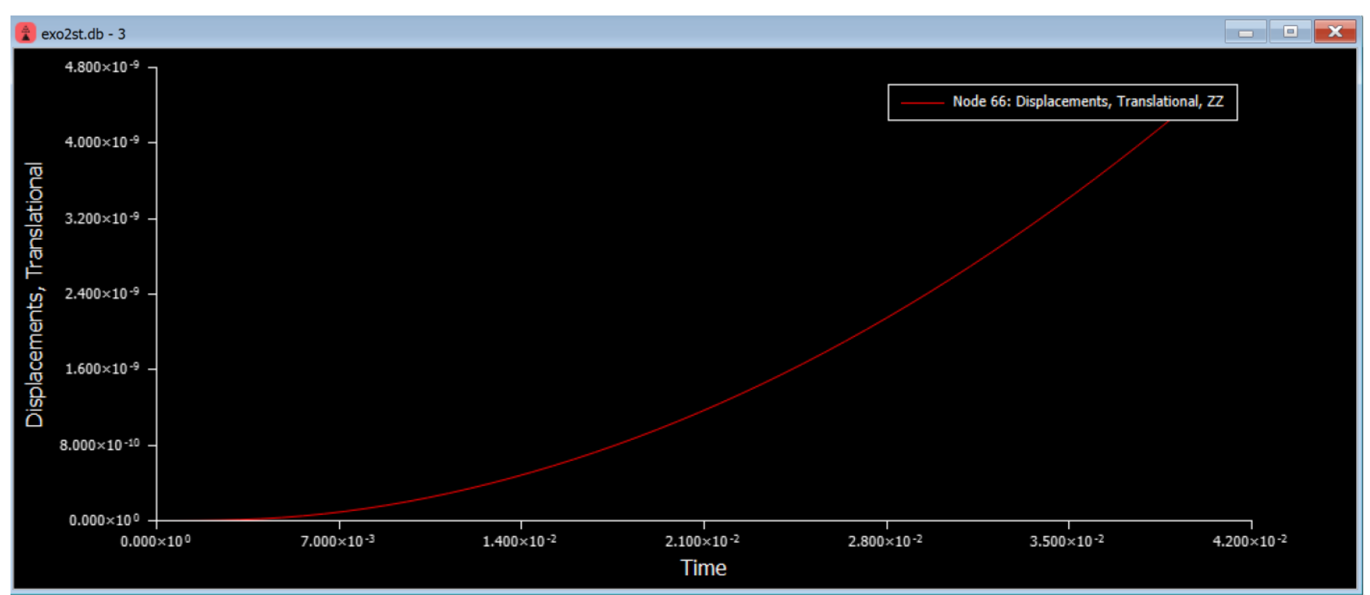
➢ Constraints and Deformation at some Nodes

- **Nodes 66**

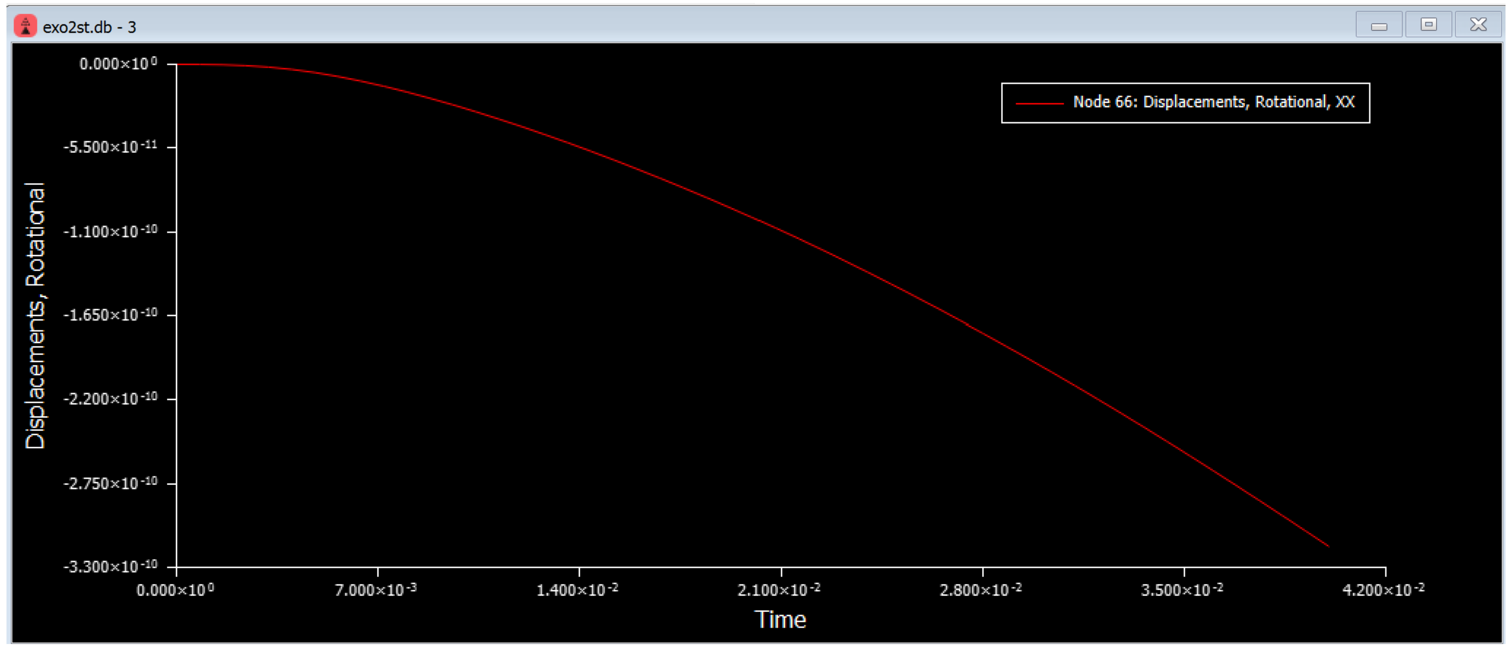
➢ Translational Displacement

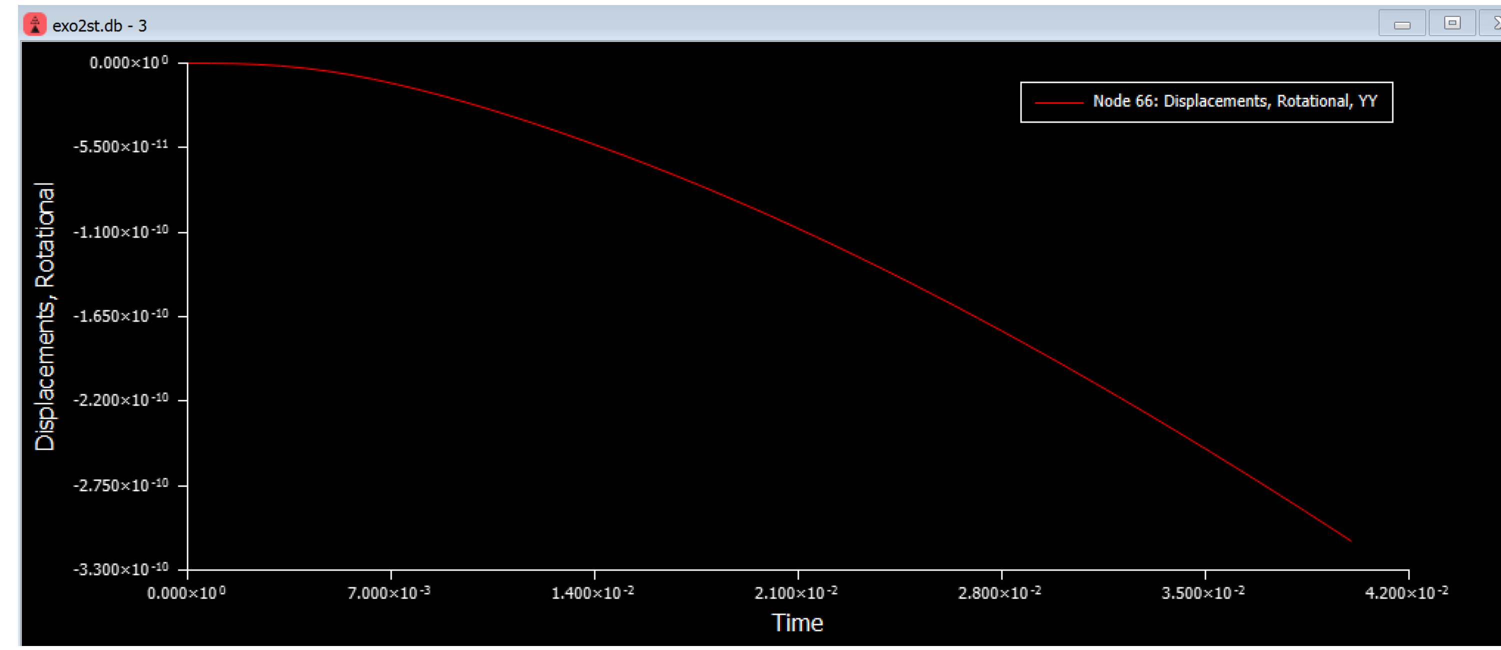


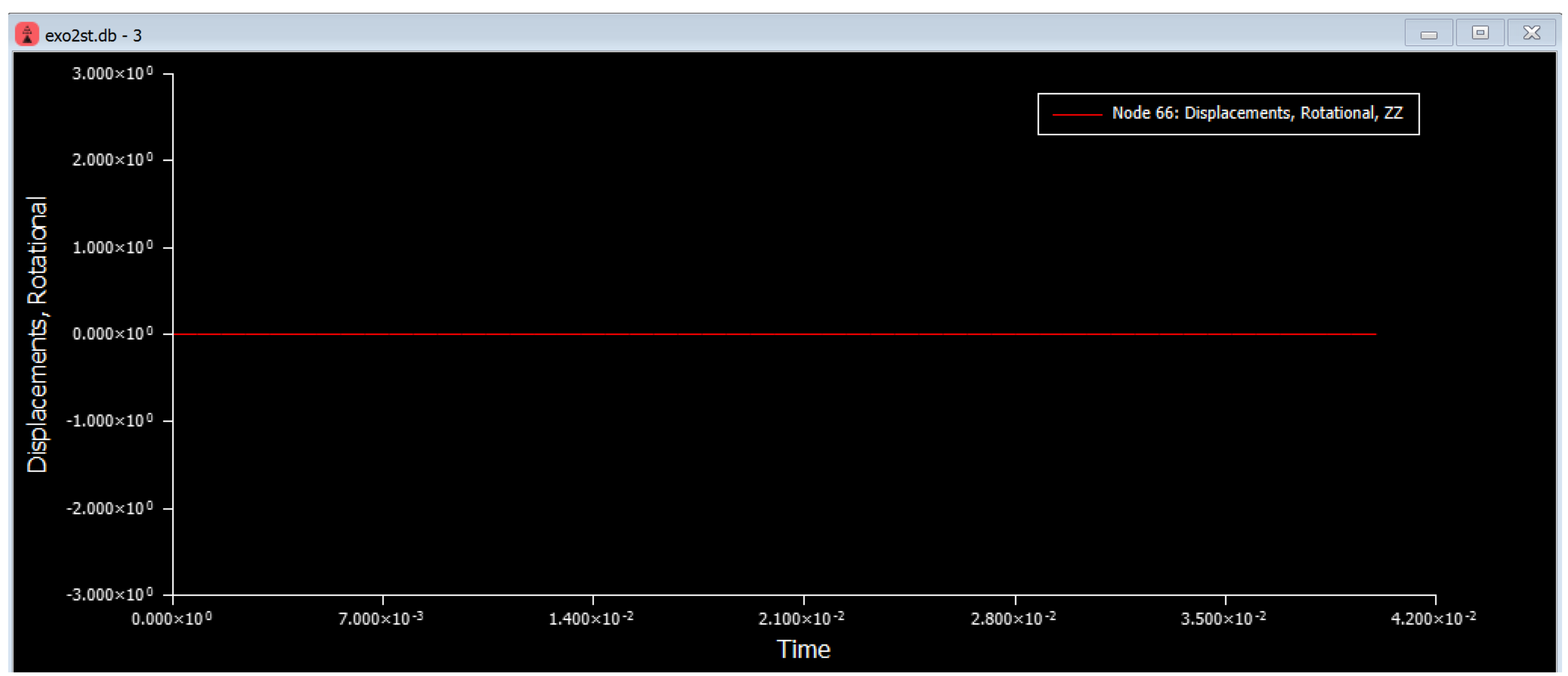




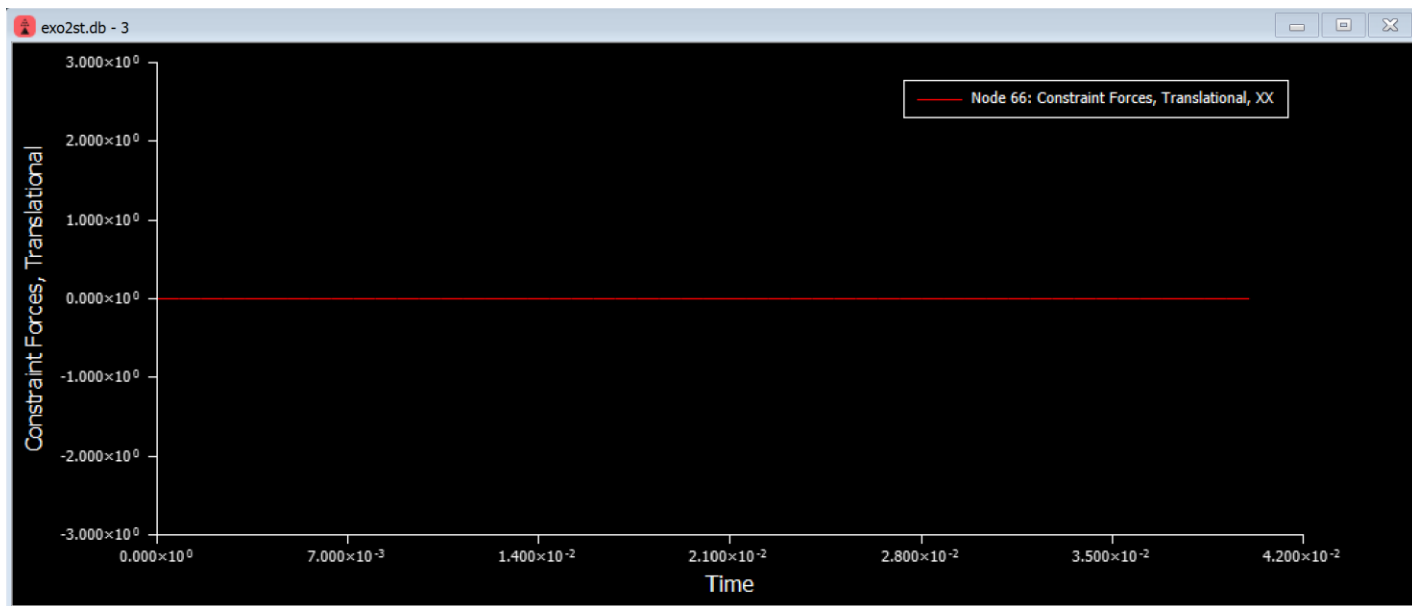
➢ Rotational Displacement

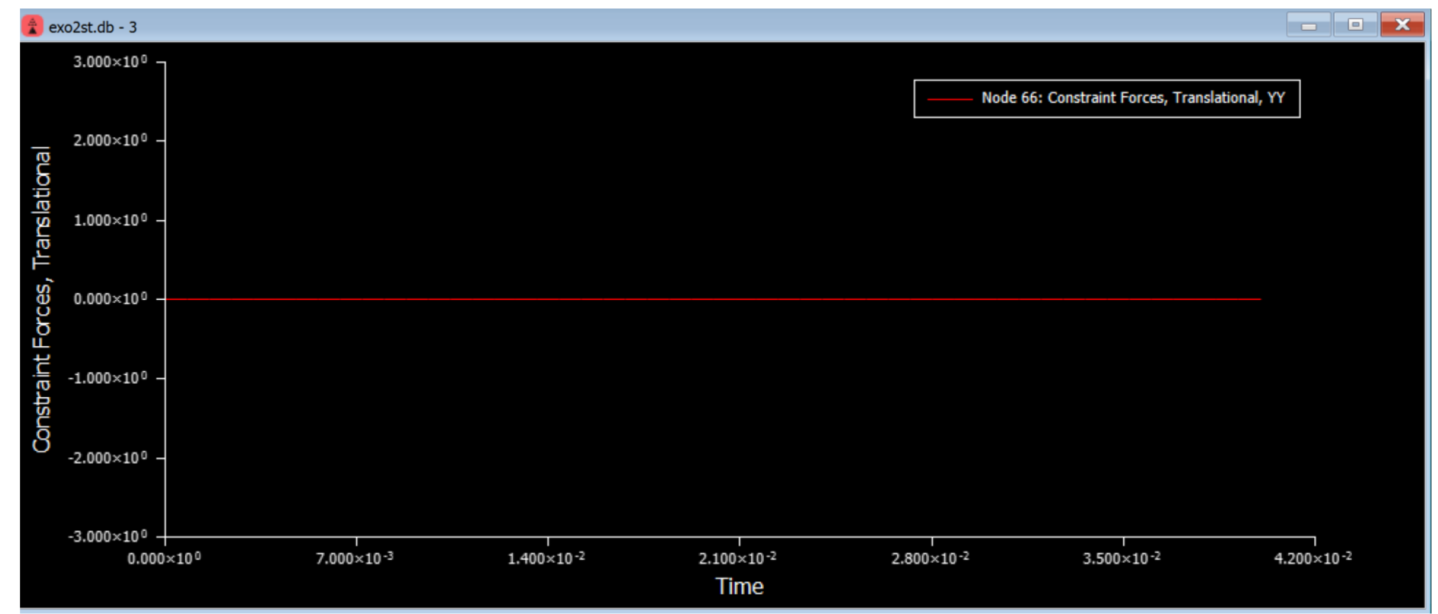


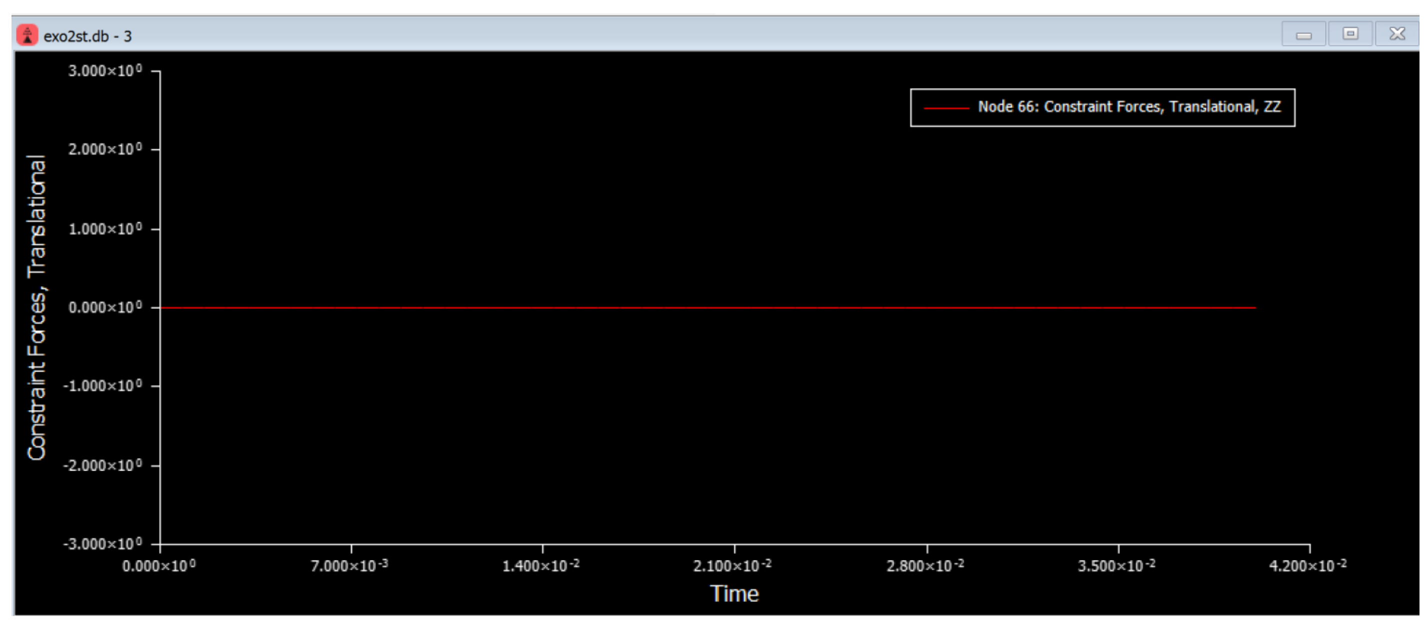




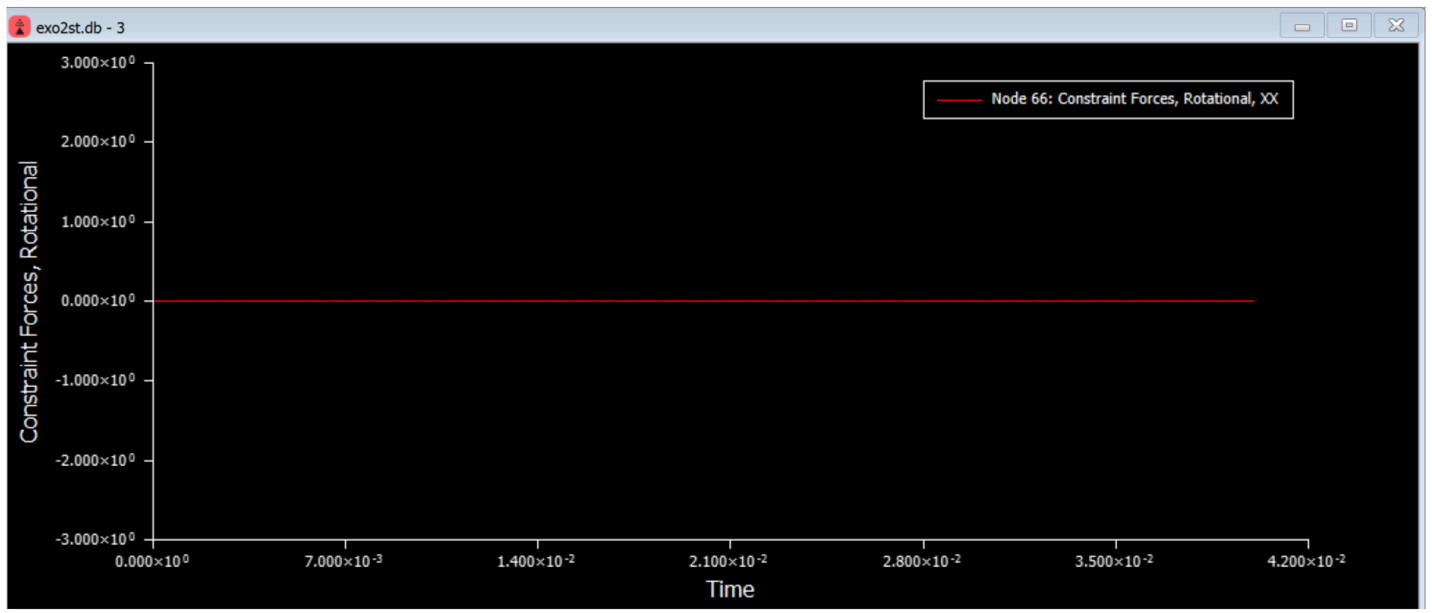
➢ Translational Constrainst

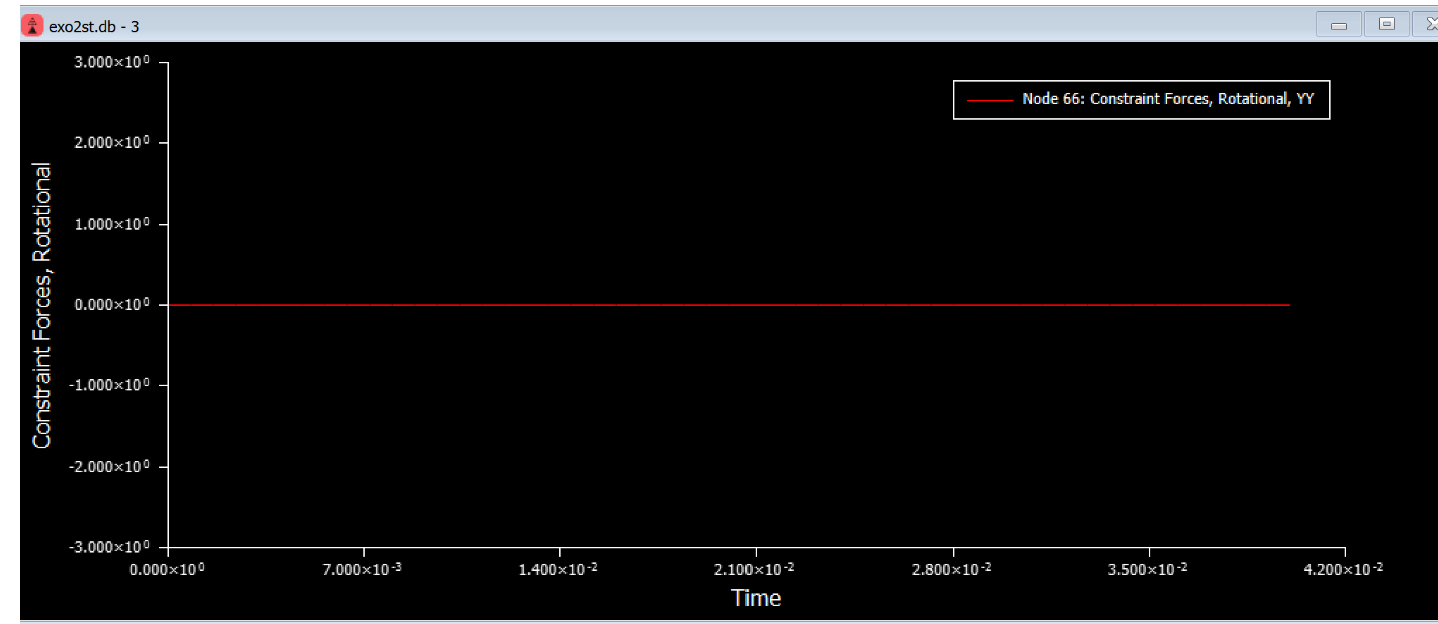


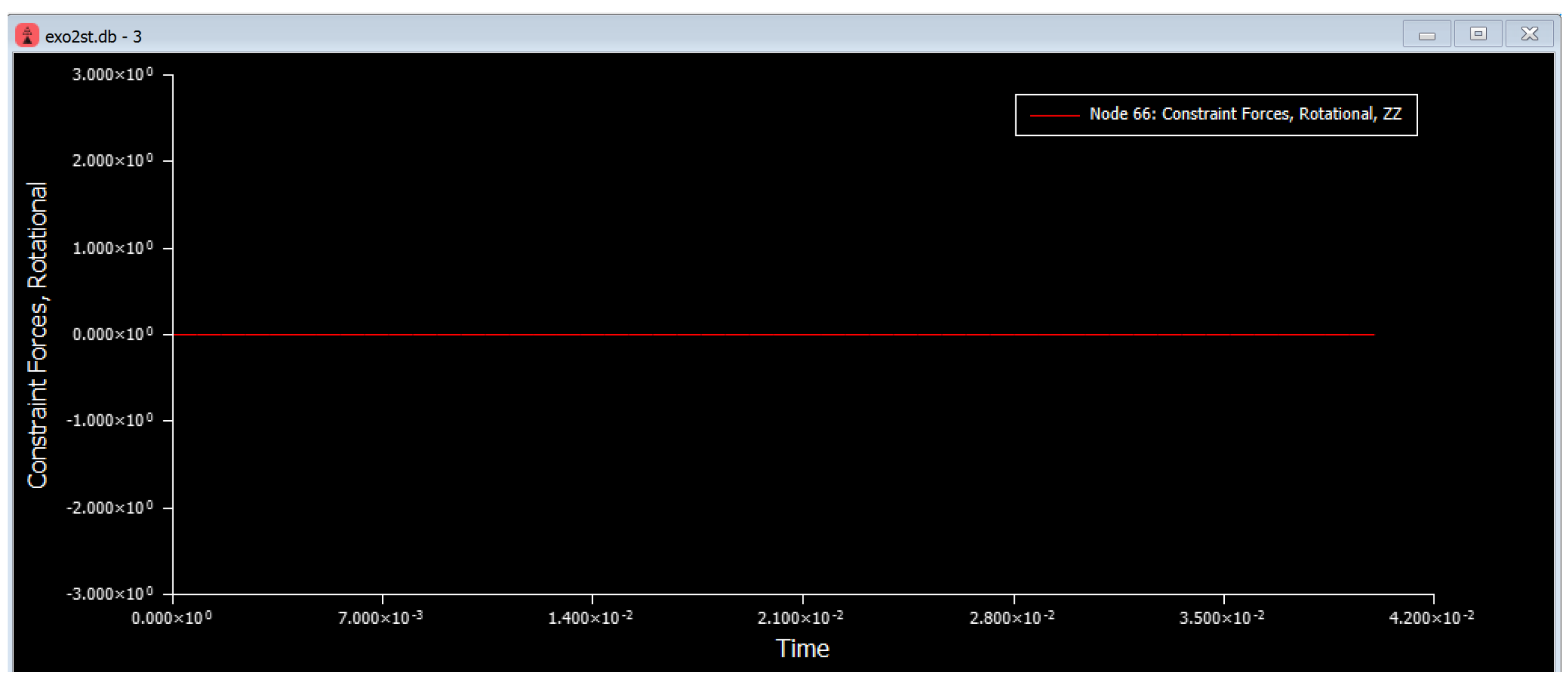




➤ Rotational Constrainst

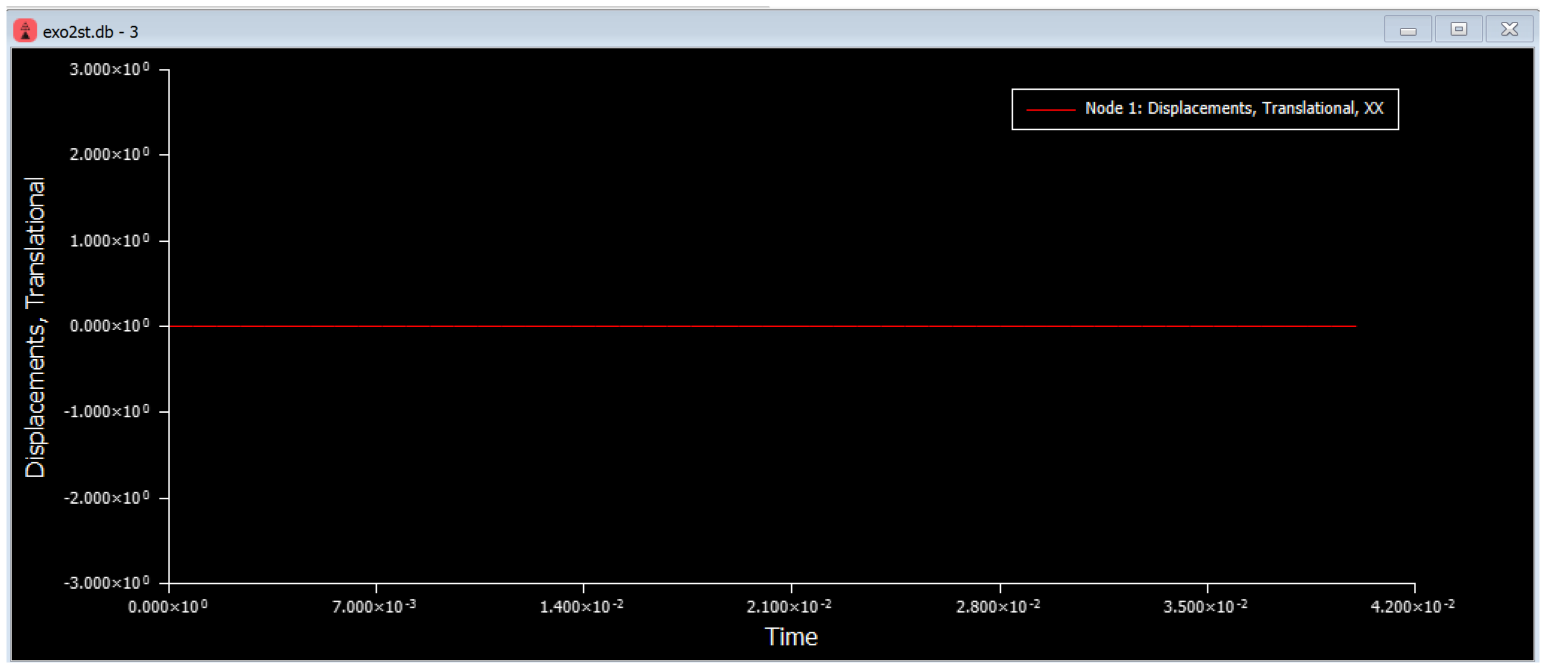


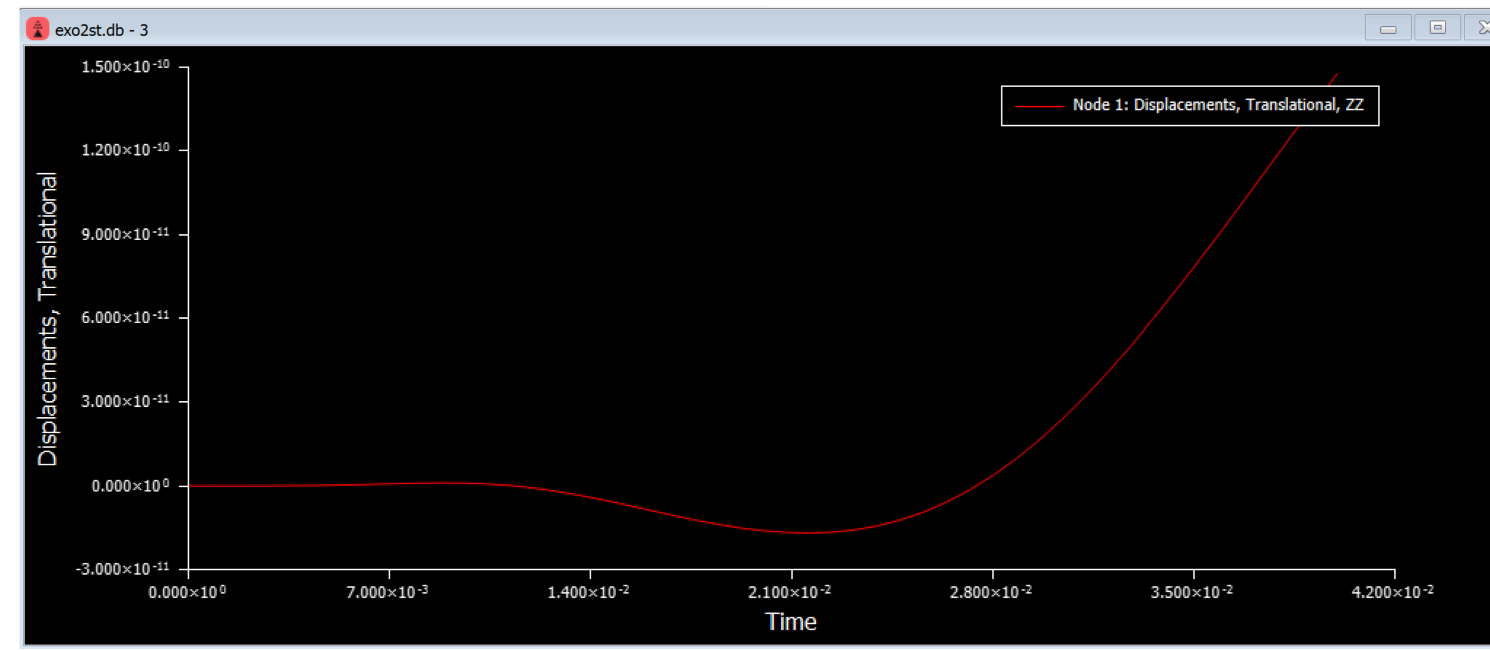


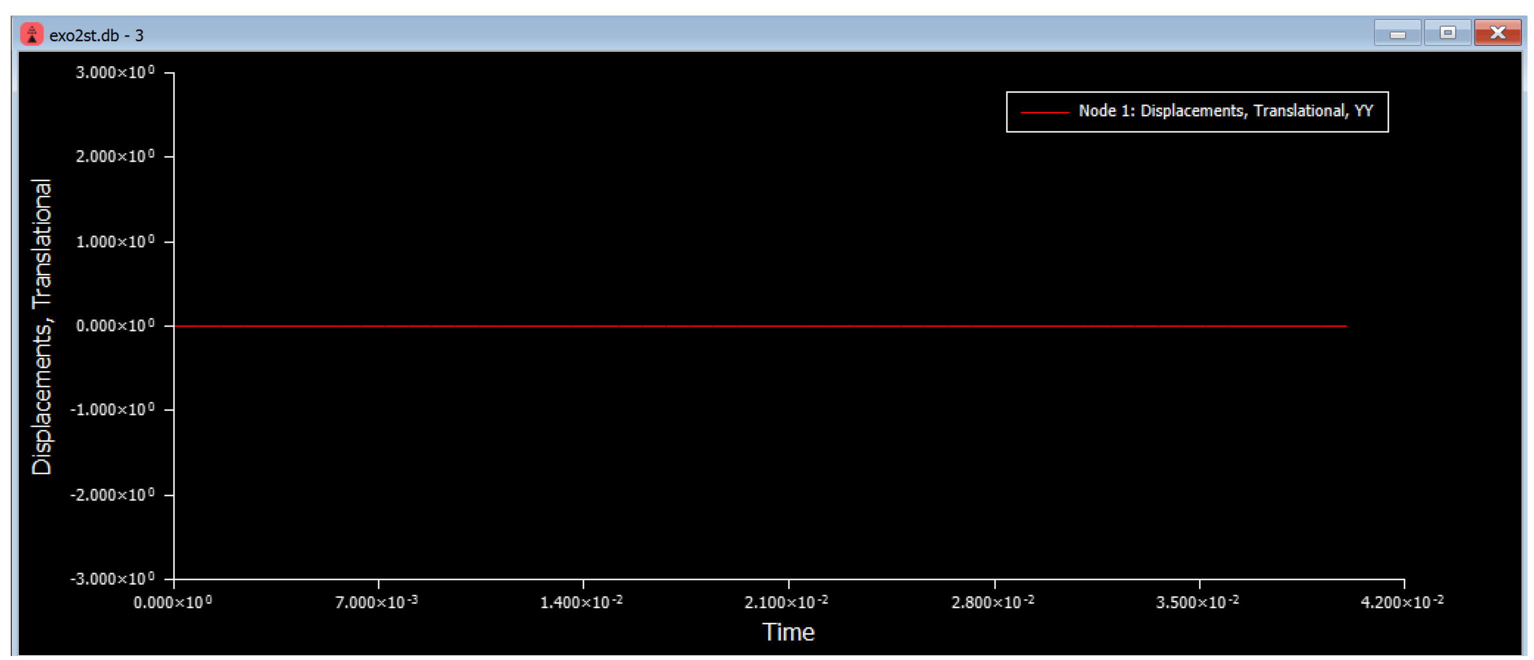


- **Node 1**

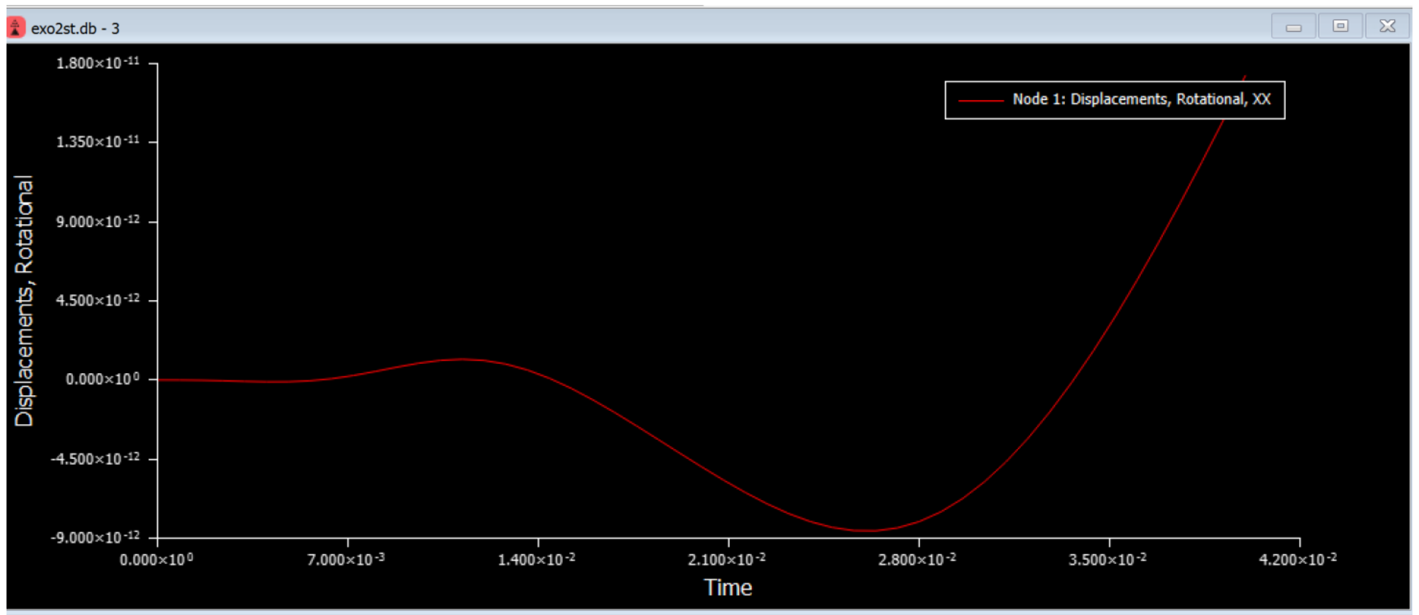
➤ Translational Displacement

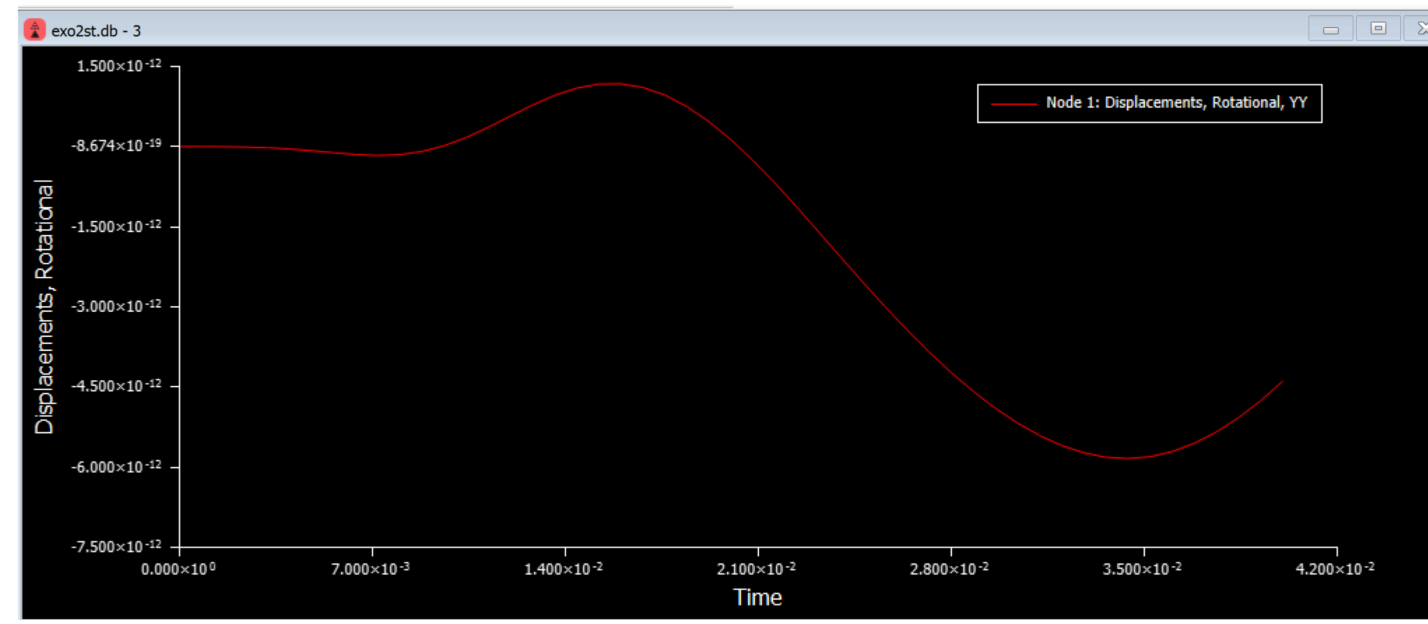


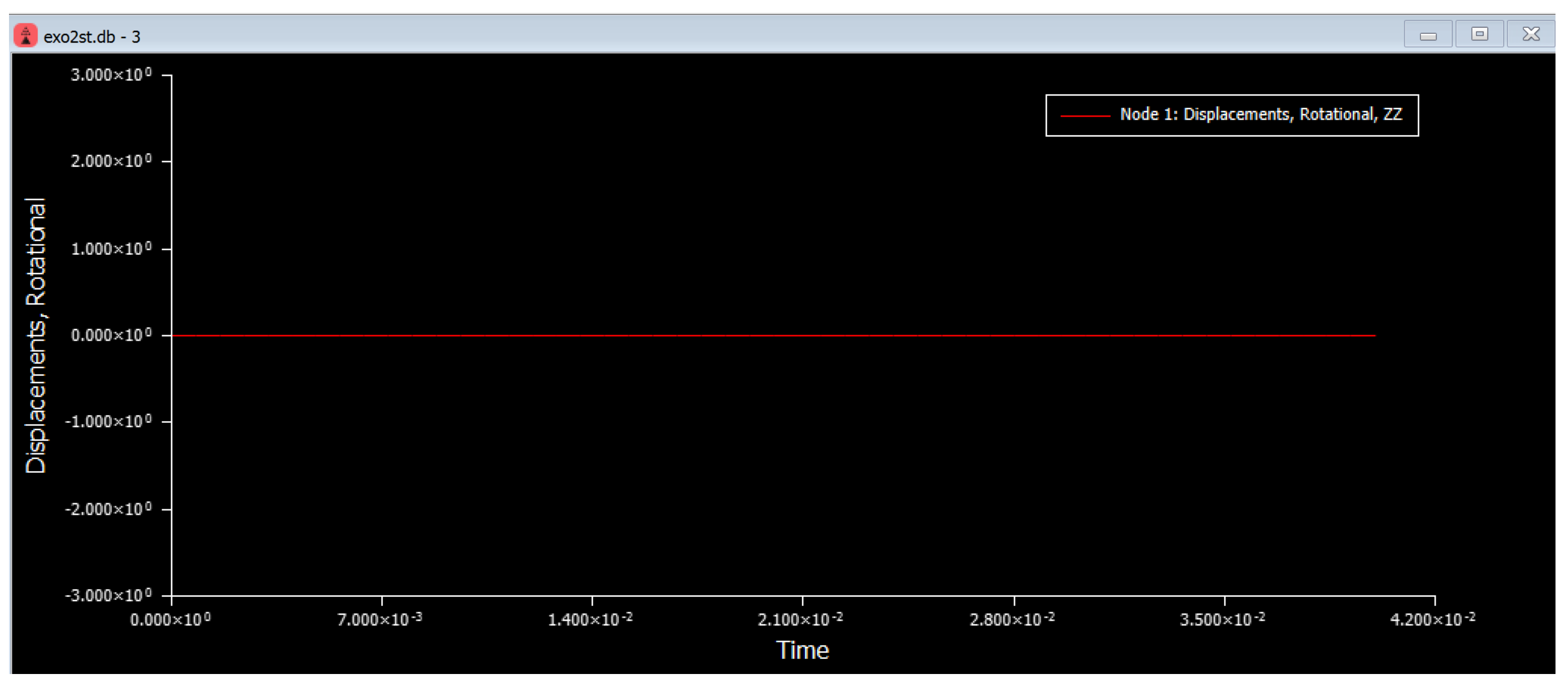




➢ Rotational Displacement



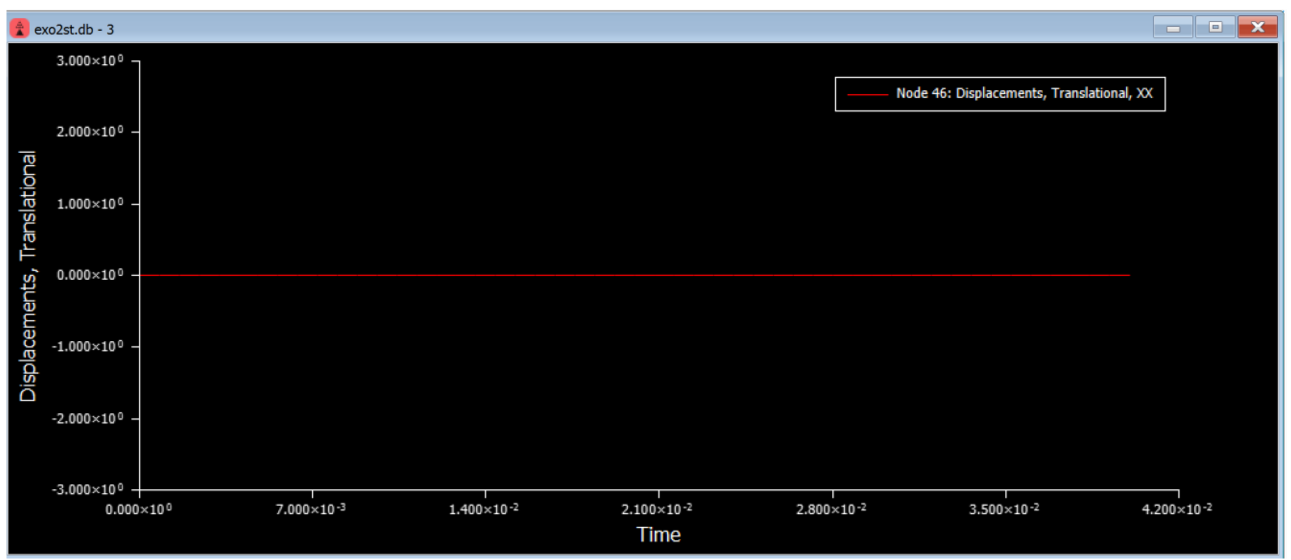


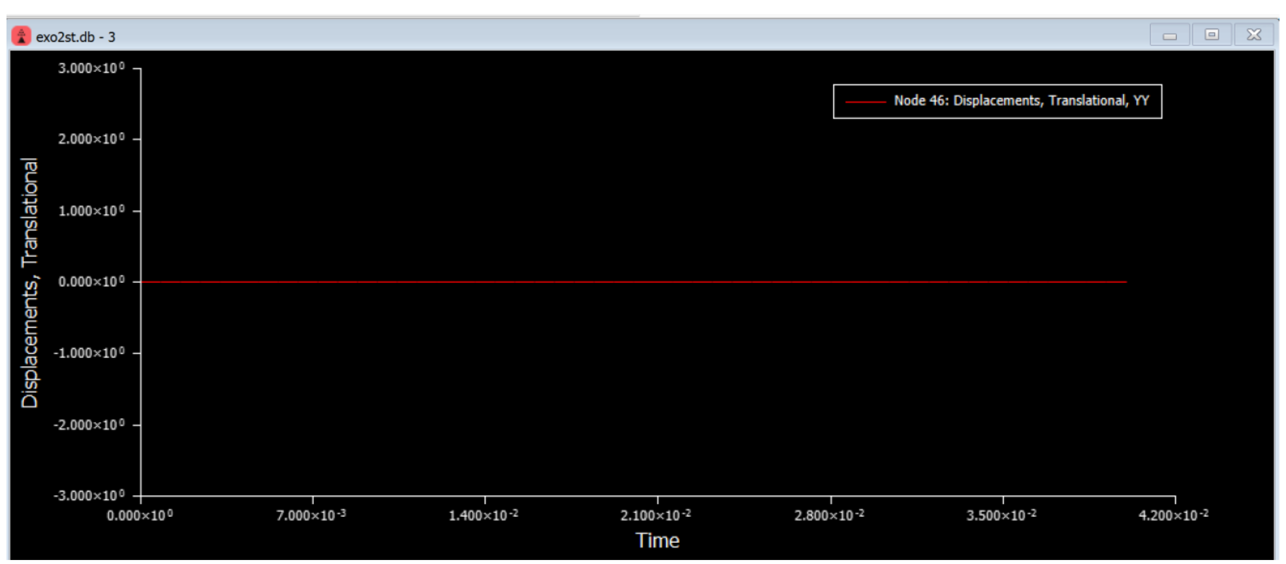


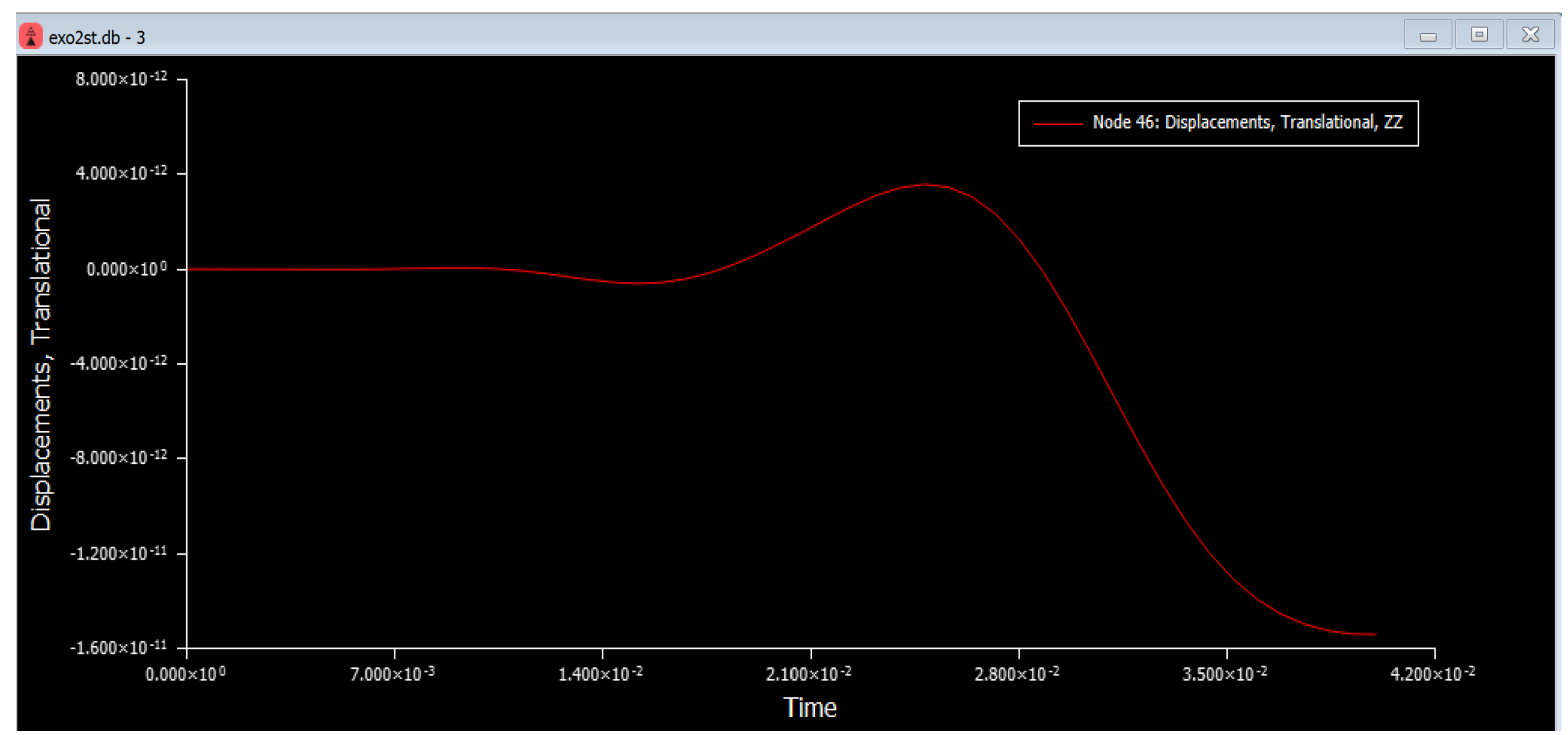
At Node 1 We Have no Constraints. They All are Null.

- **Node 46**

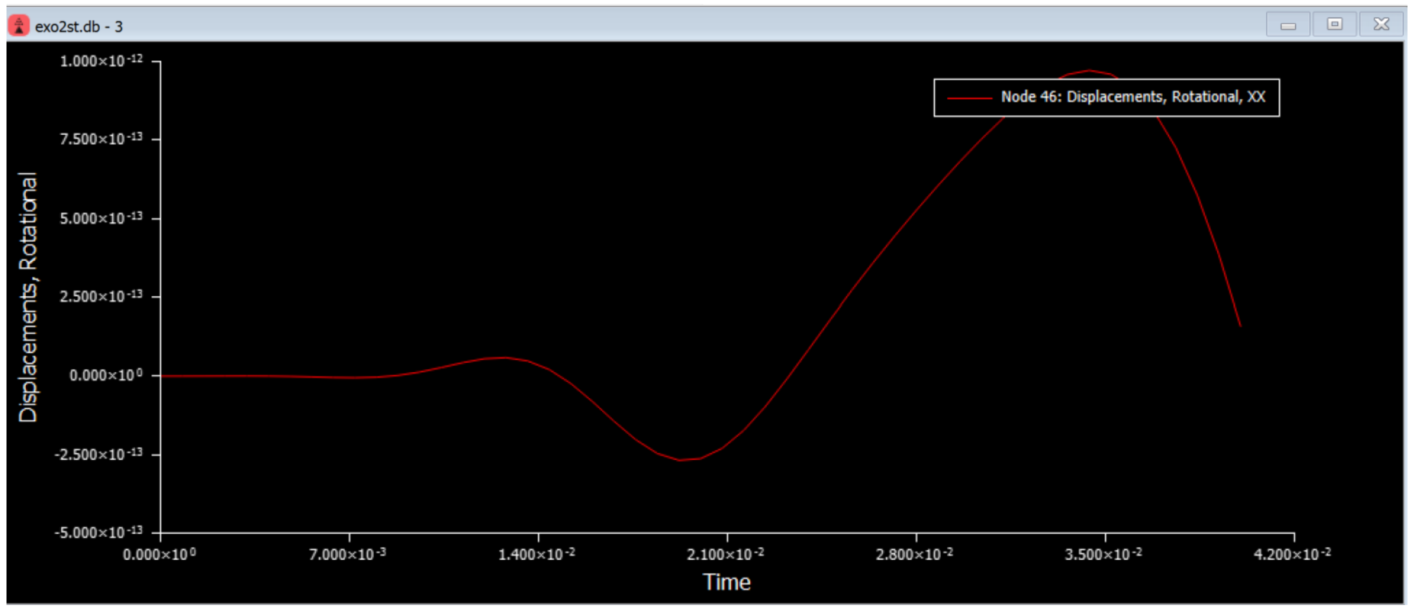
➢ Translational Displacement

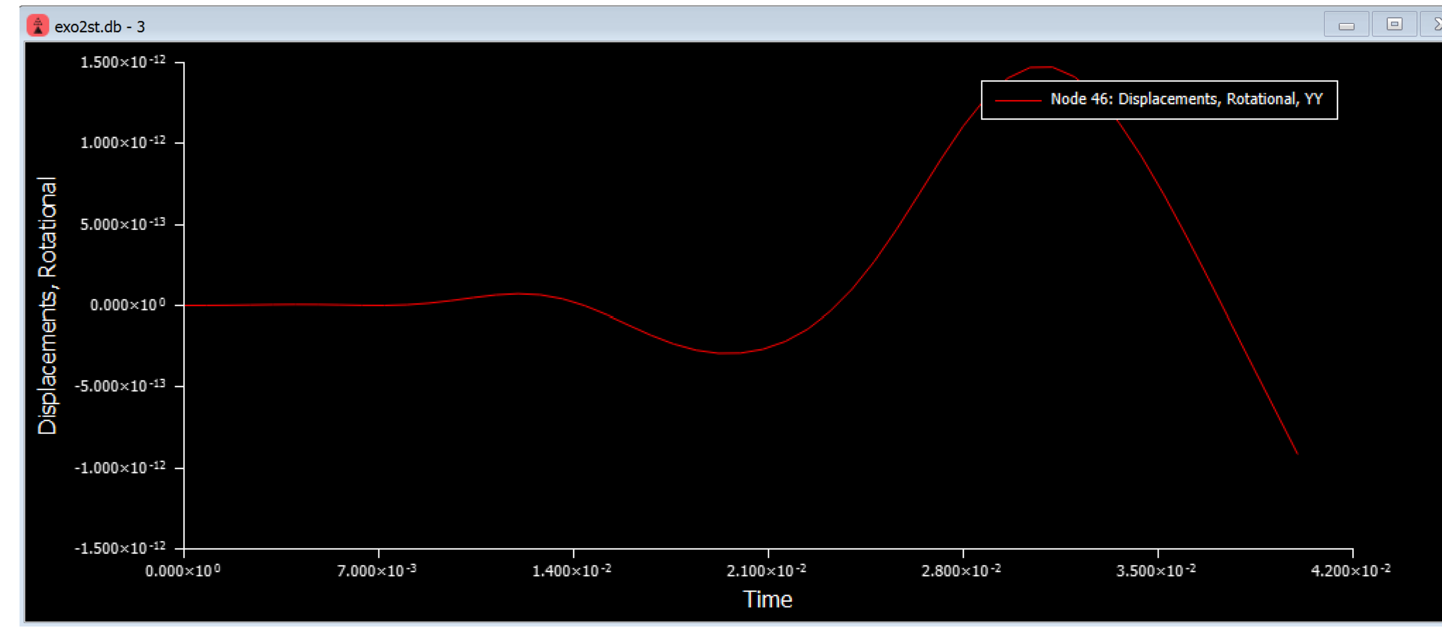


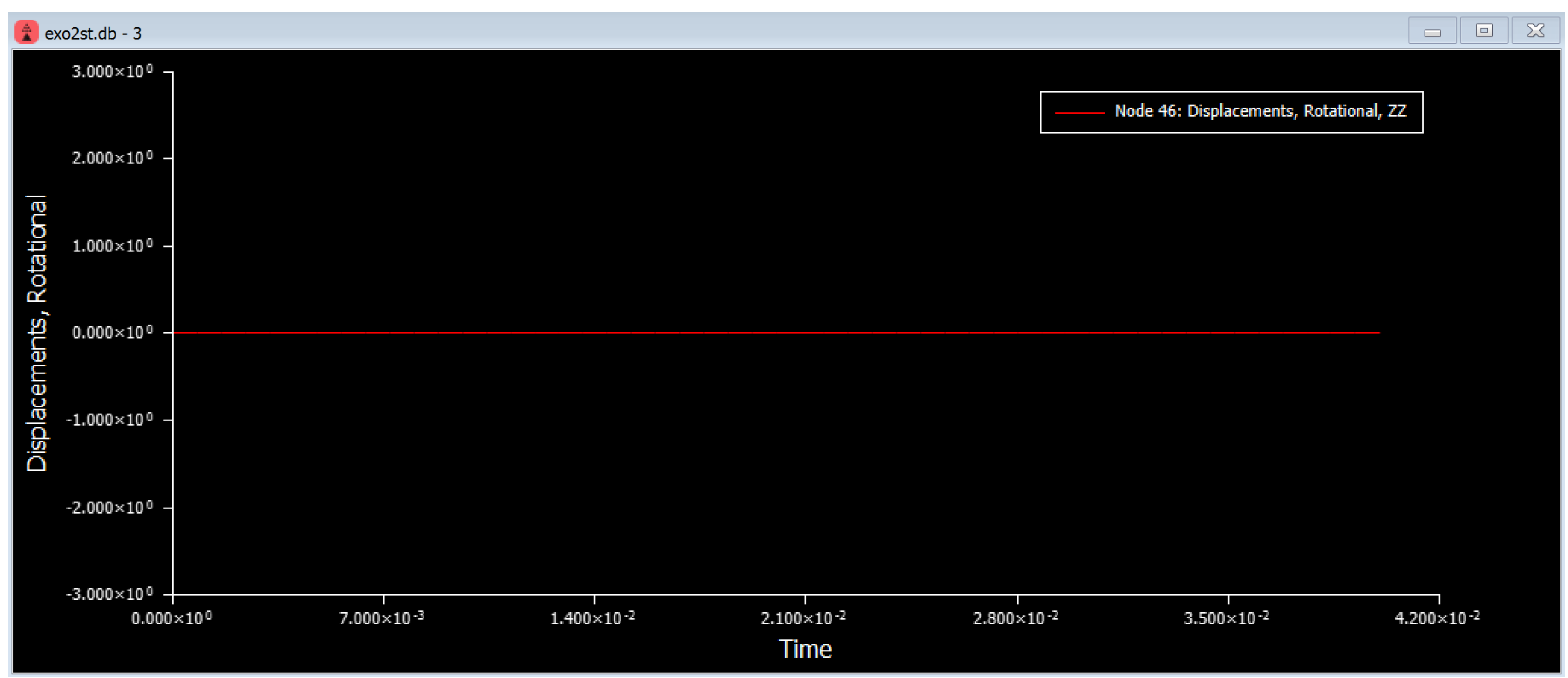




➢ Rotational Displacement

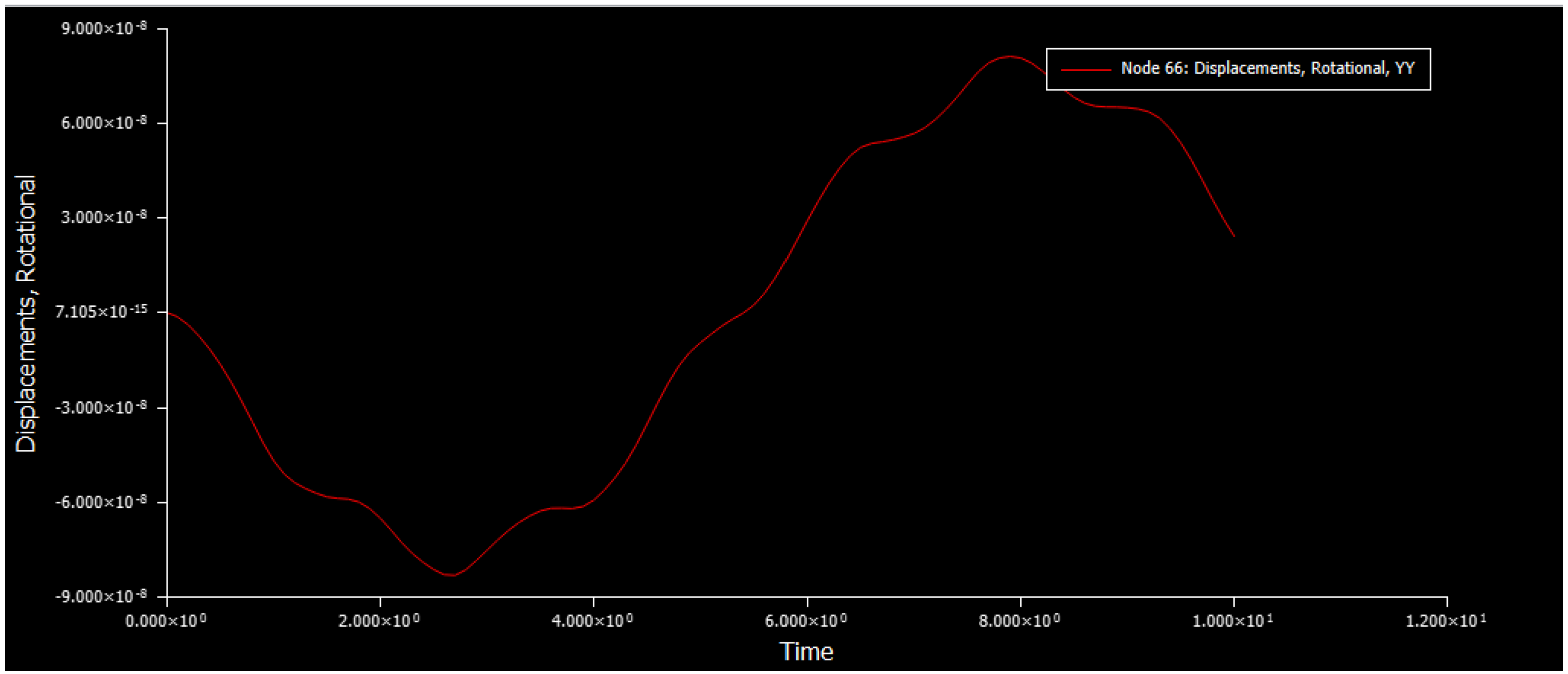






- Verification of Sinusoidal behavioural

While the time of study is small our result might seen not coherent due to the absence of noticeable vibration so we expand the time of study to 10s here is what we got for the Node 66, Rotational displacement along z axis, as expected we have a sinusoidal behavioural. But our study time is small so for the previous result the visual is normal and the plots are correct also.



- **Why this choise of Nodes?**

We choose these 3 Nodes because they are particular and interesting to study dues to force repartitions and boundary conditions. And because of this smart choice we can confirm that our results are true for example For node 1 and 46 the absence of Force constrainst variation both translational and rotational are coherent to their positions.

And Also for the Node 66 due to the presence of the force F we observe displacement along z axix so results are quiet coherent to the case of study .