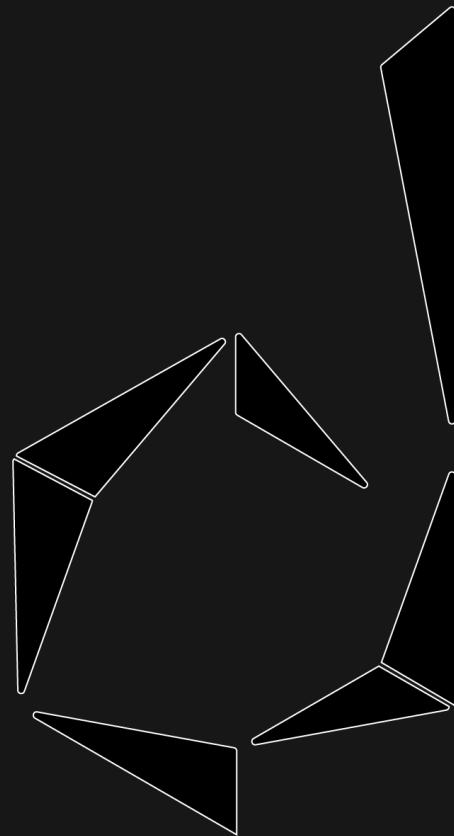


# INGENIERÍA MECATRÓNICA



## DI\_CERO

DIEGO CERVANTES RODRÍGUEZ

INGENIERÍA ASISTIDA POR COMPUTADORA

COMSOL MULTIPHYSICS 5.6

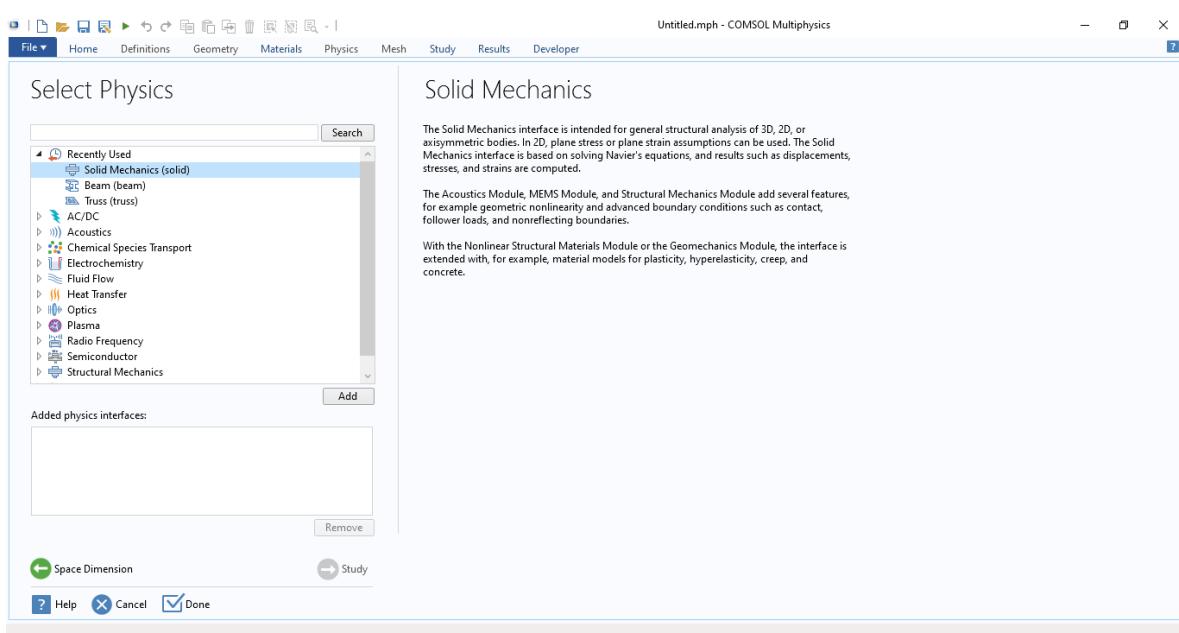
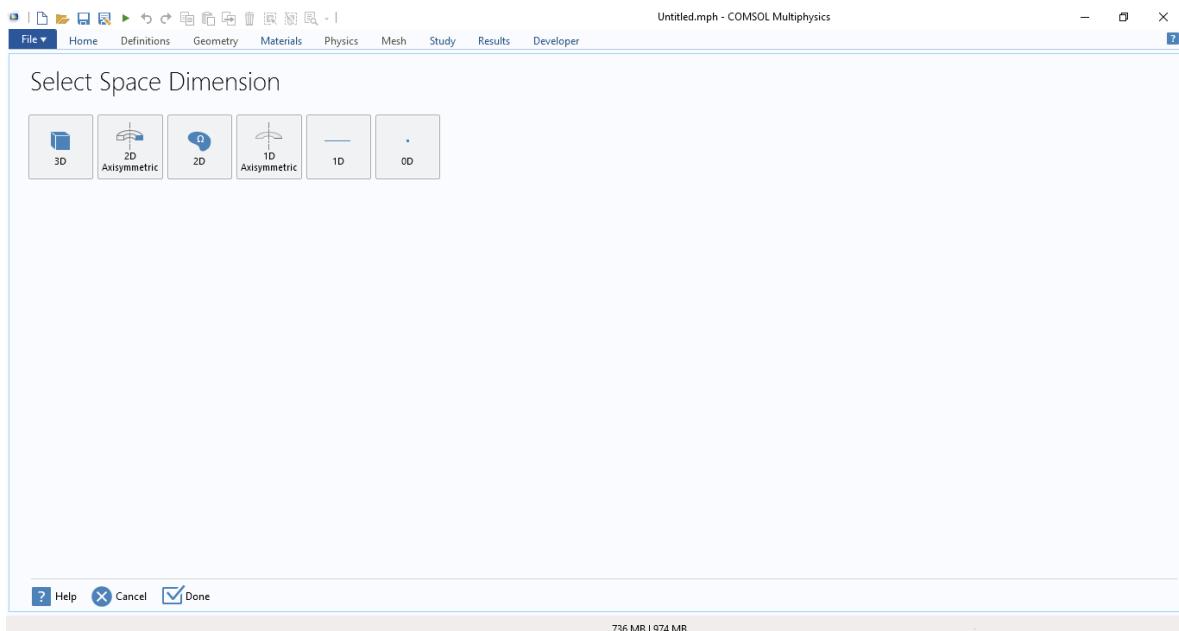
II: Vibración en Vigas -  
Frecuencias Armónicas

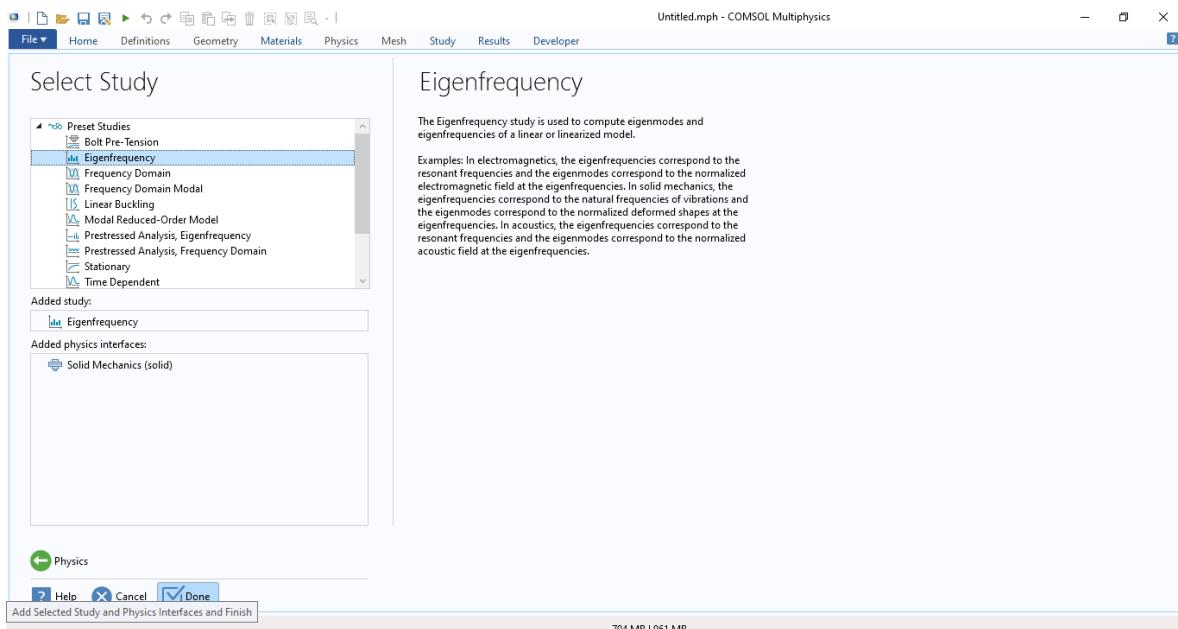
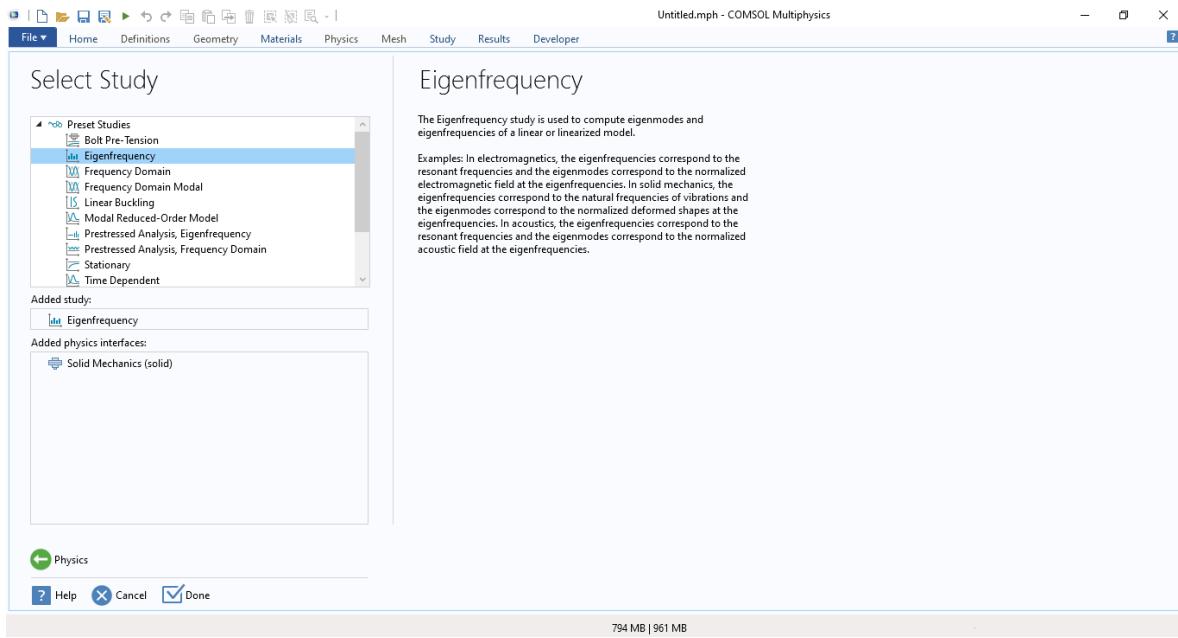
## Contenido

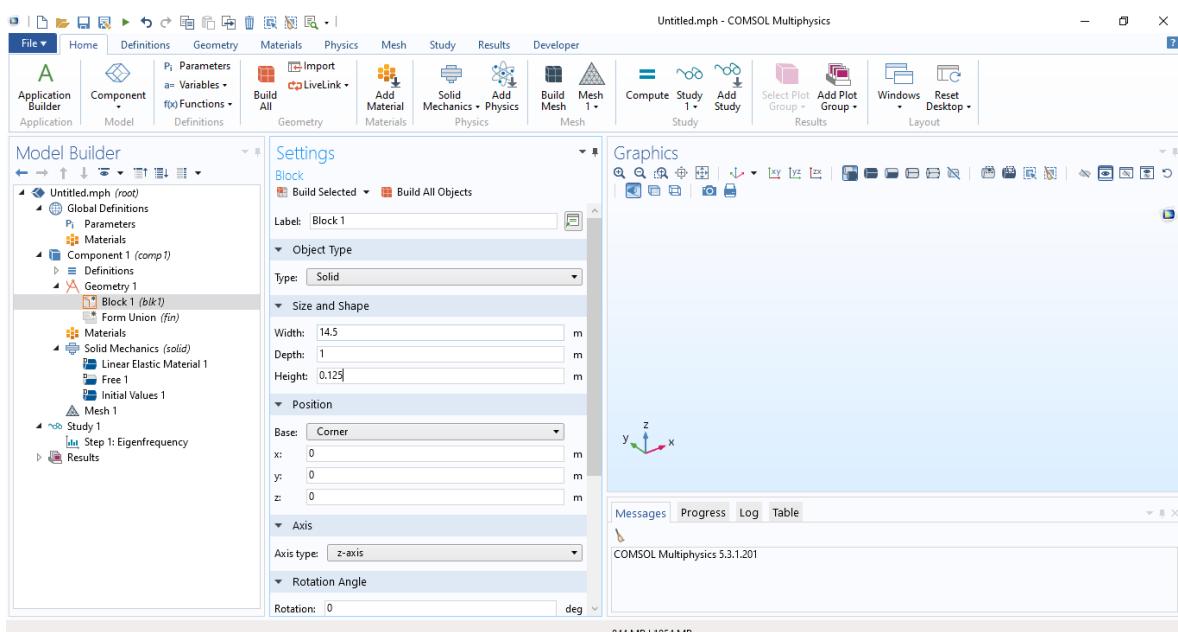
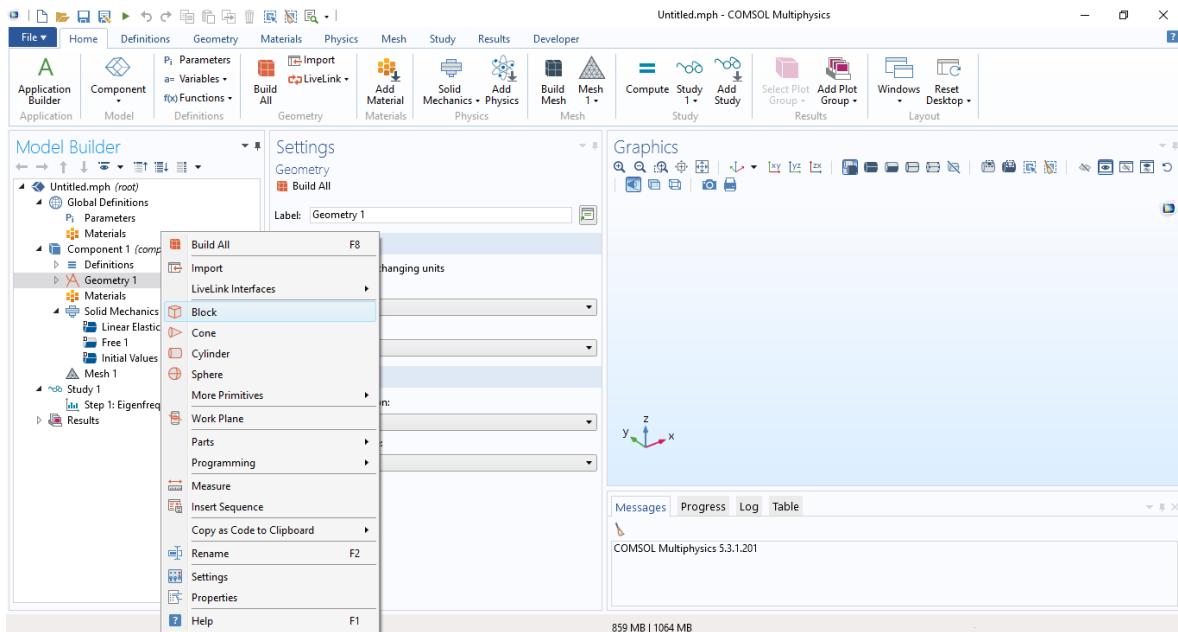
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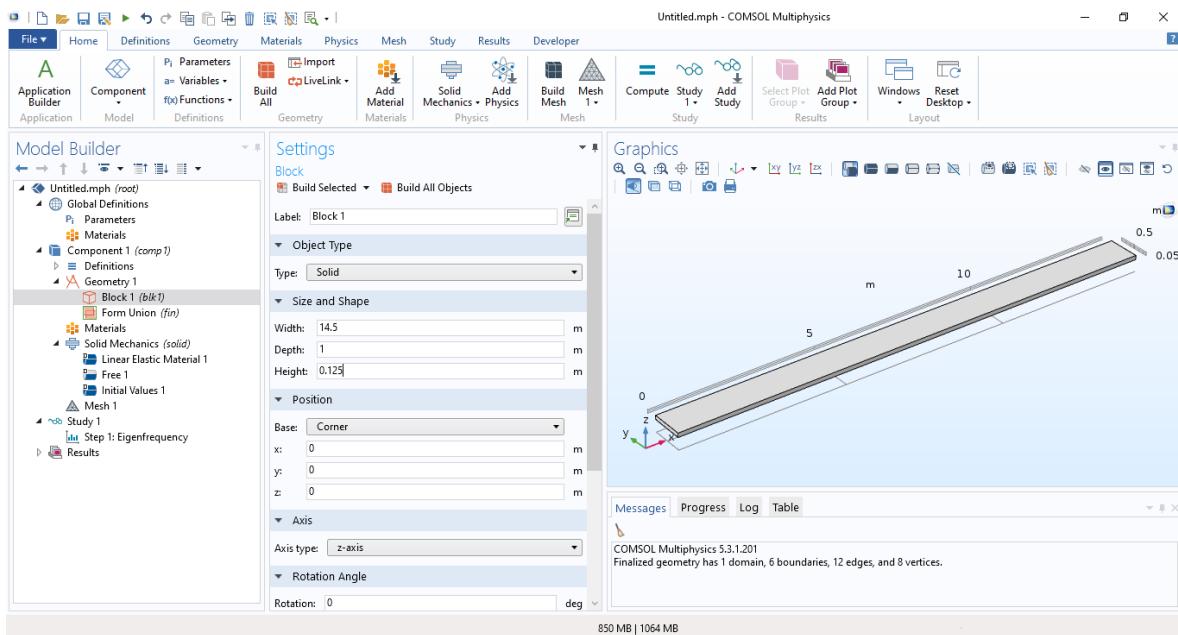
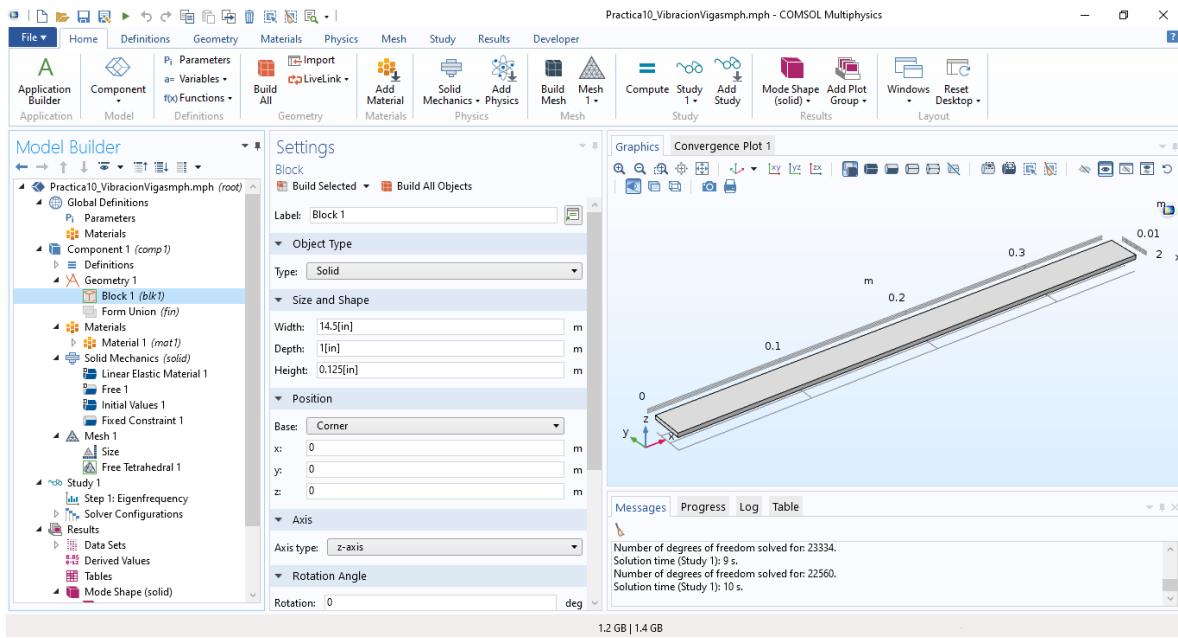


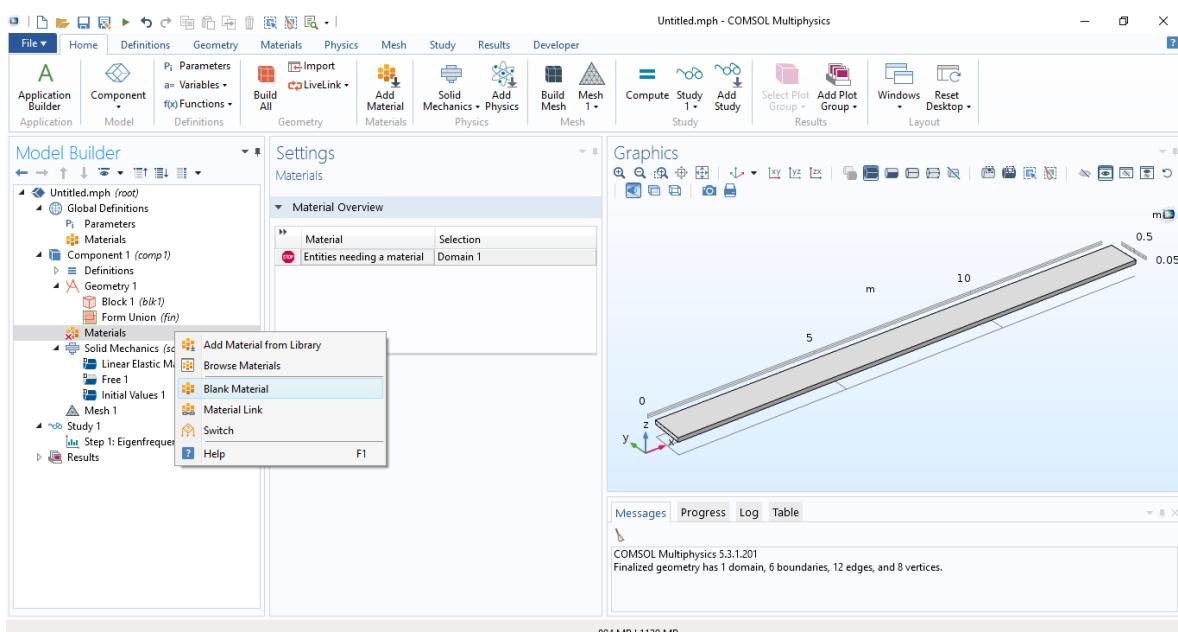
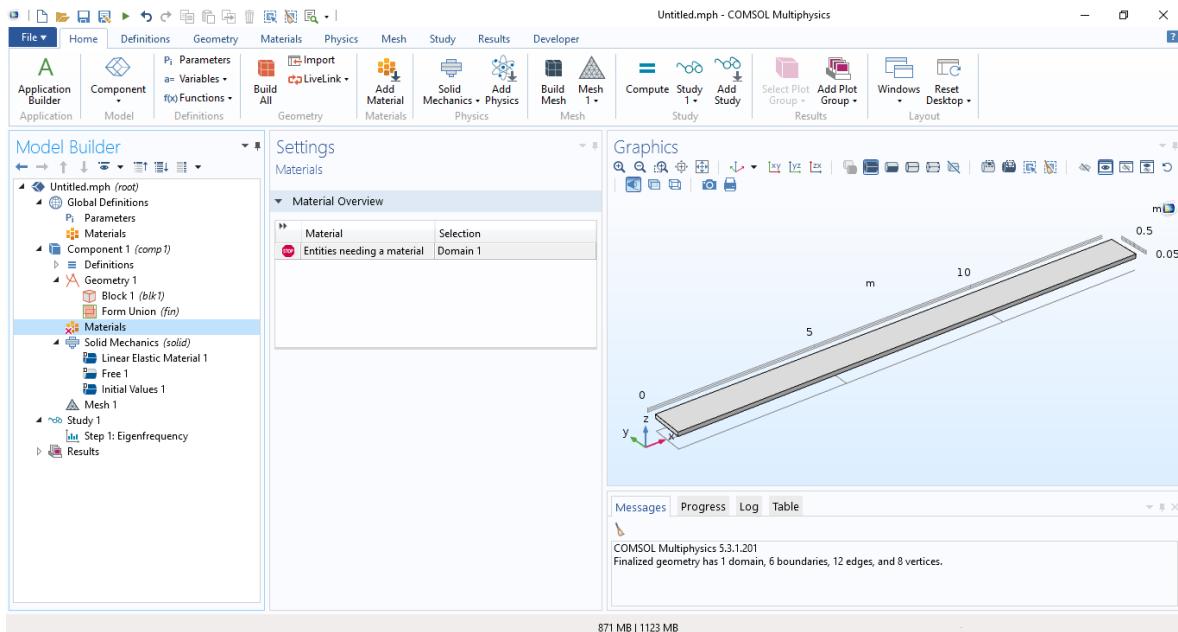
# CREACIÓN DE LA PIEZA EN COMSOL:

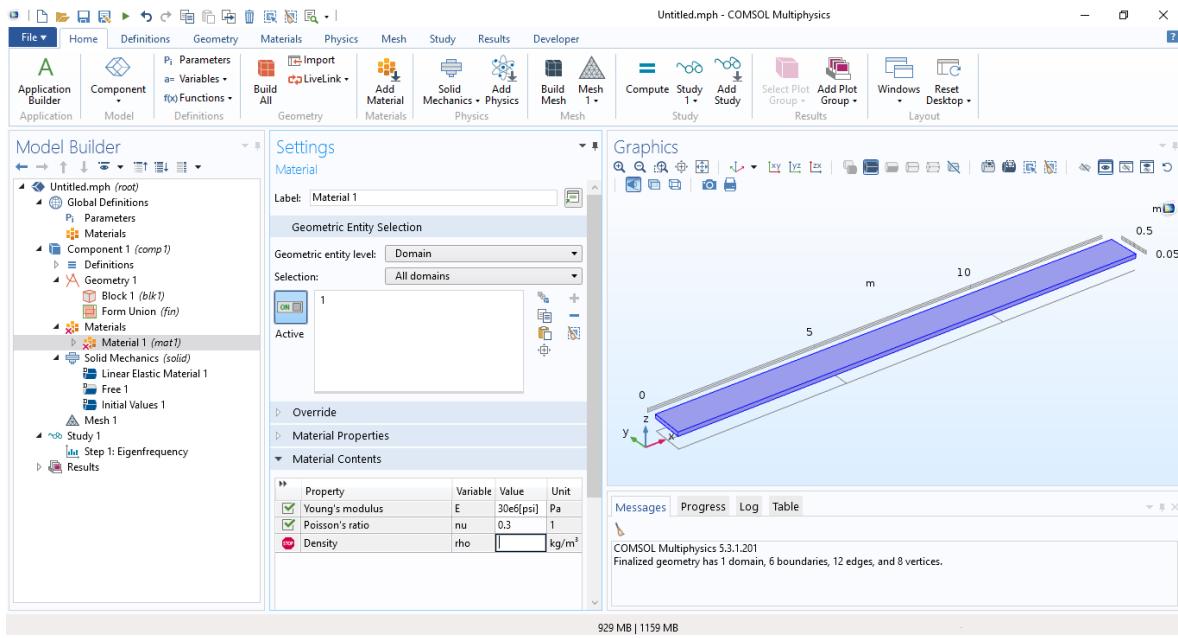




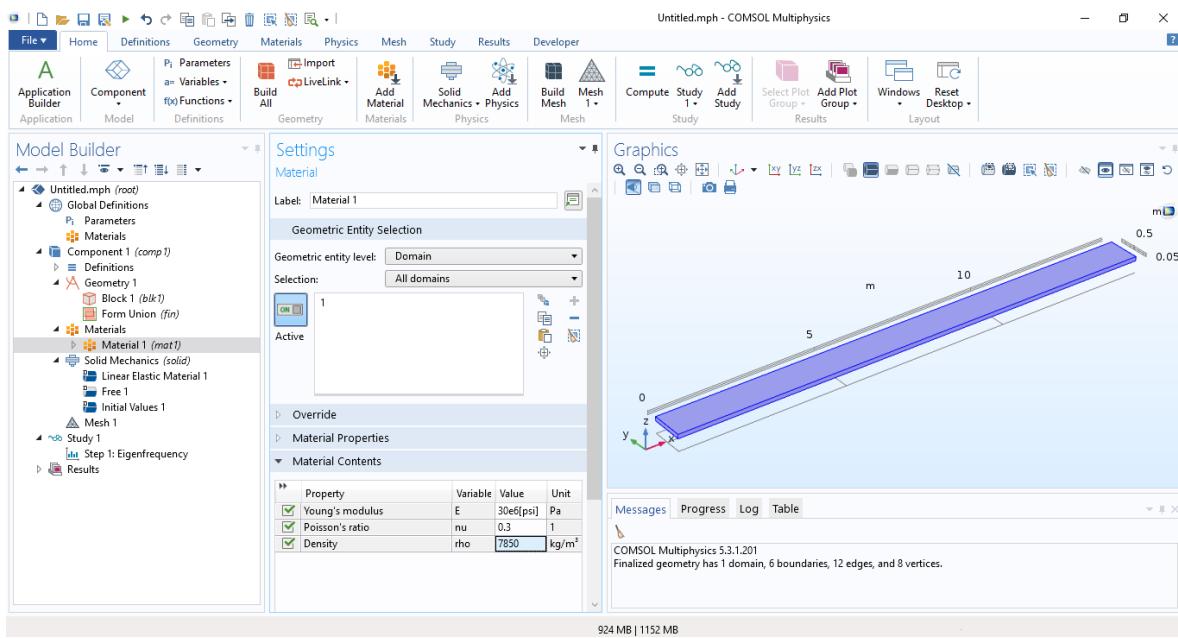




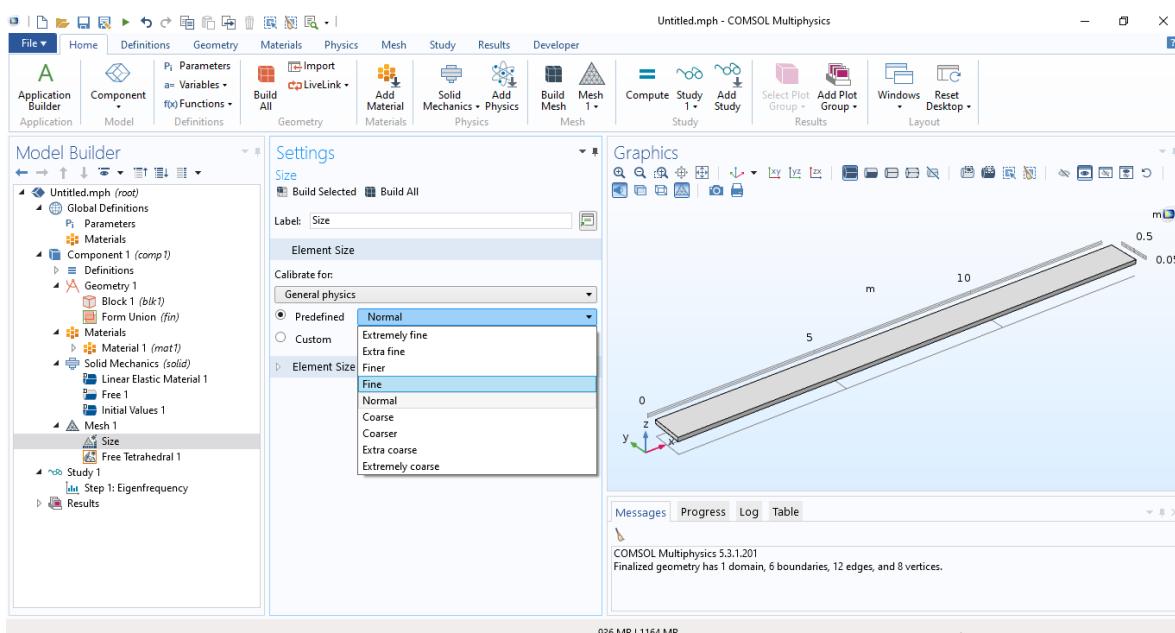
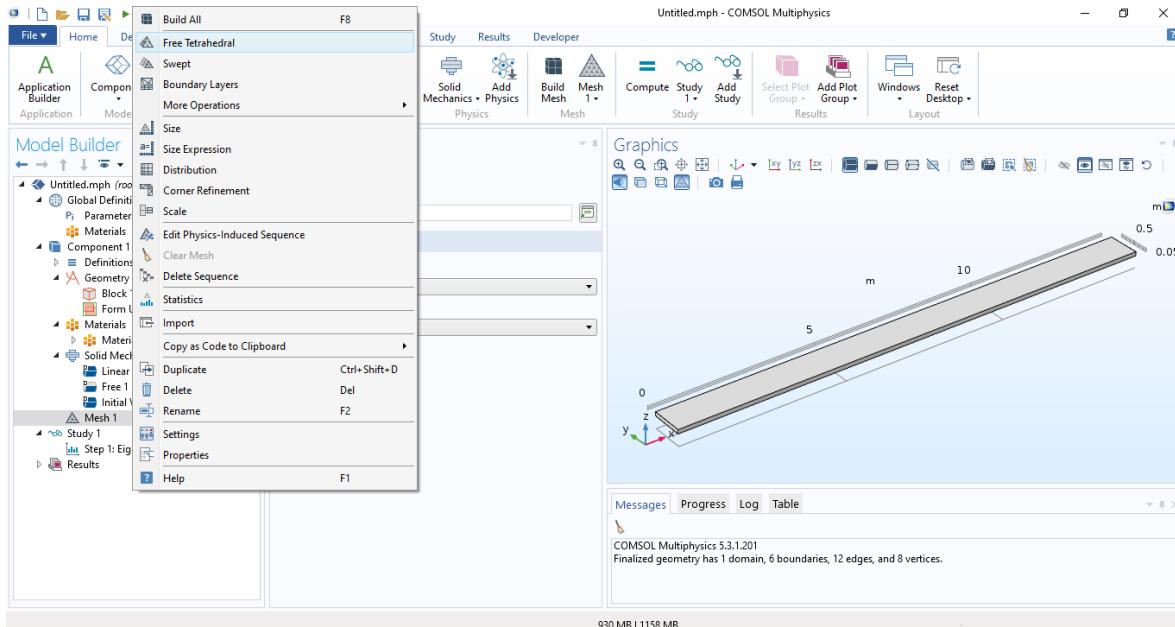


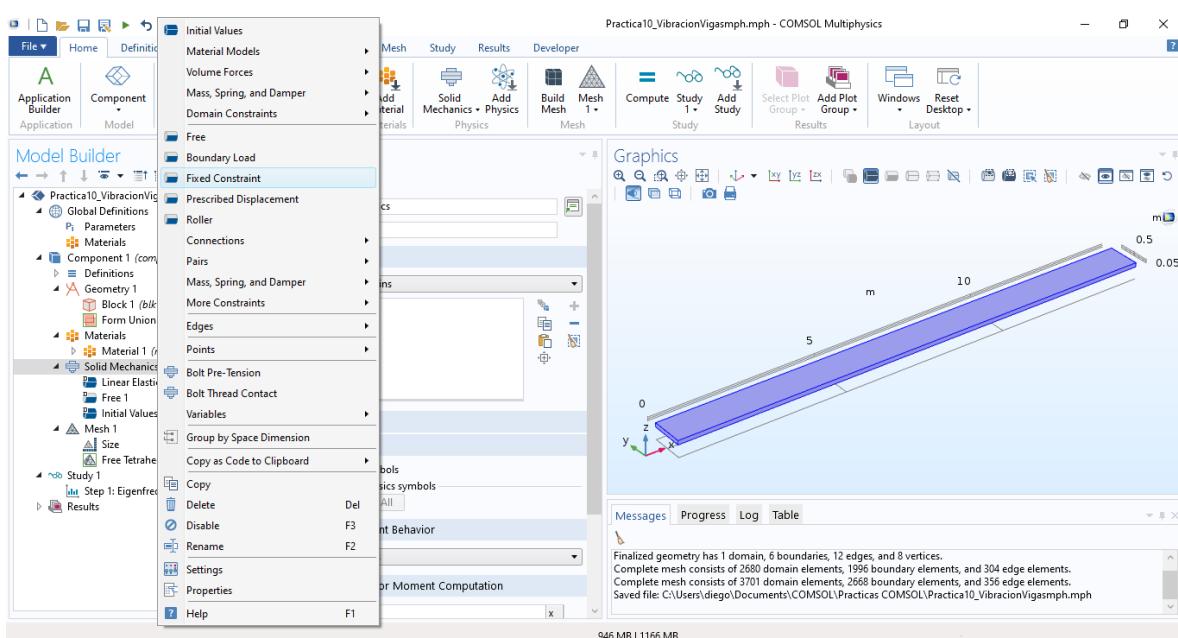
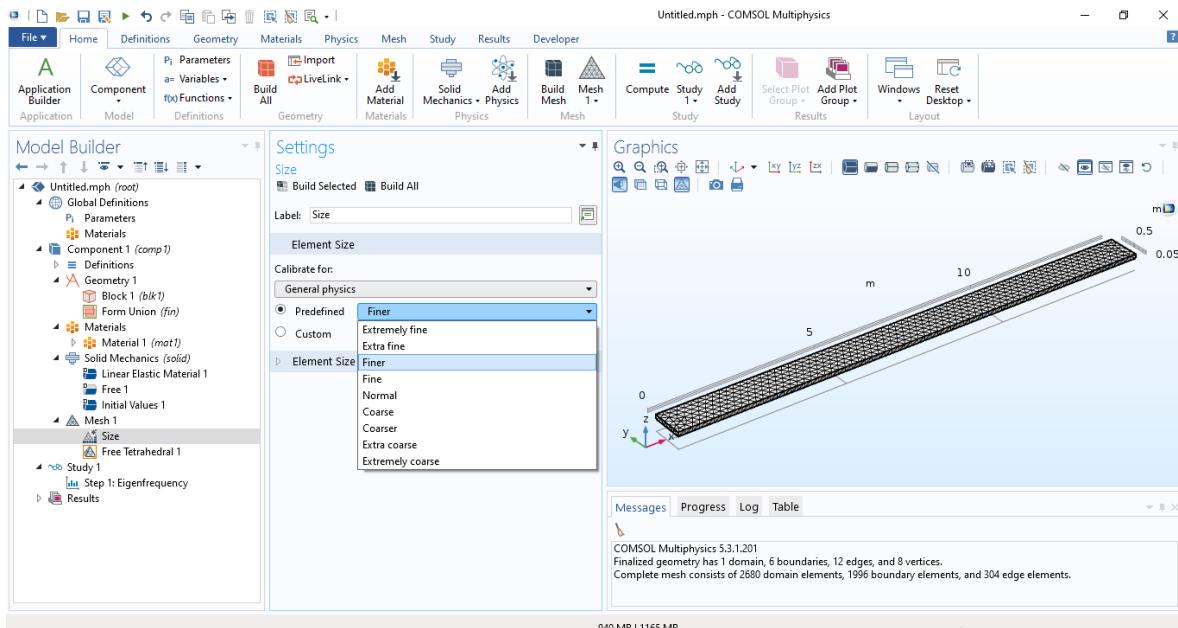


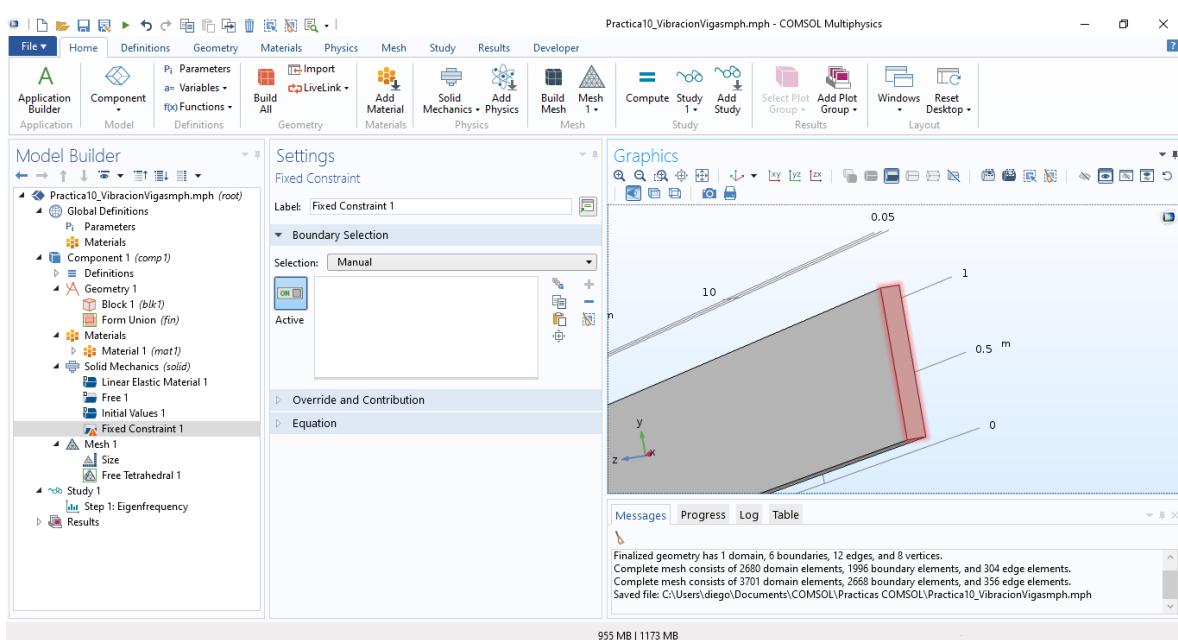
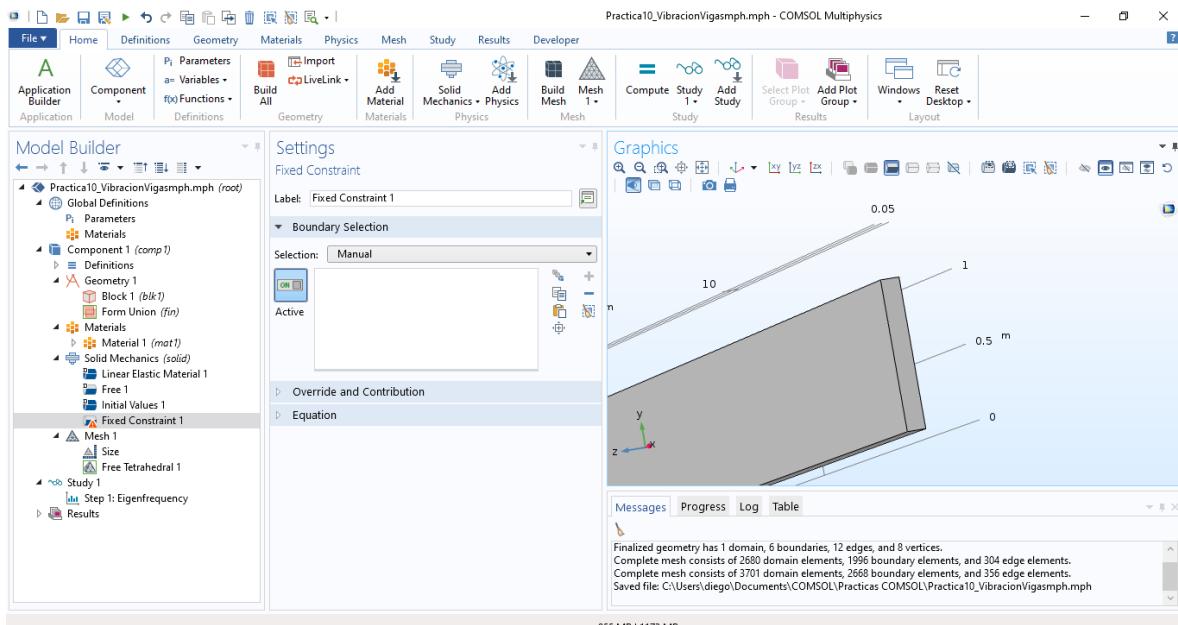
La densidad se puede ingresar con su unidad en el sistema internacional y el programa lo tomará en cuenta para convertirlo en el cálculo.

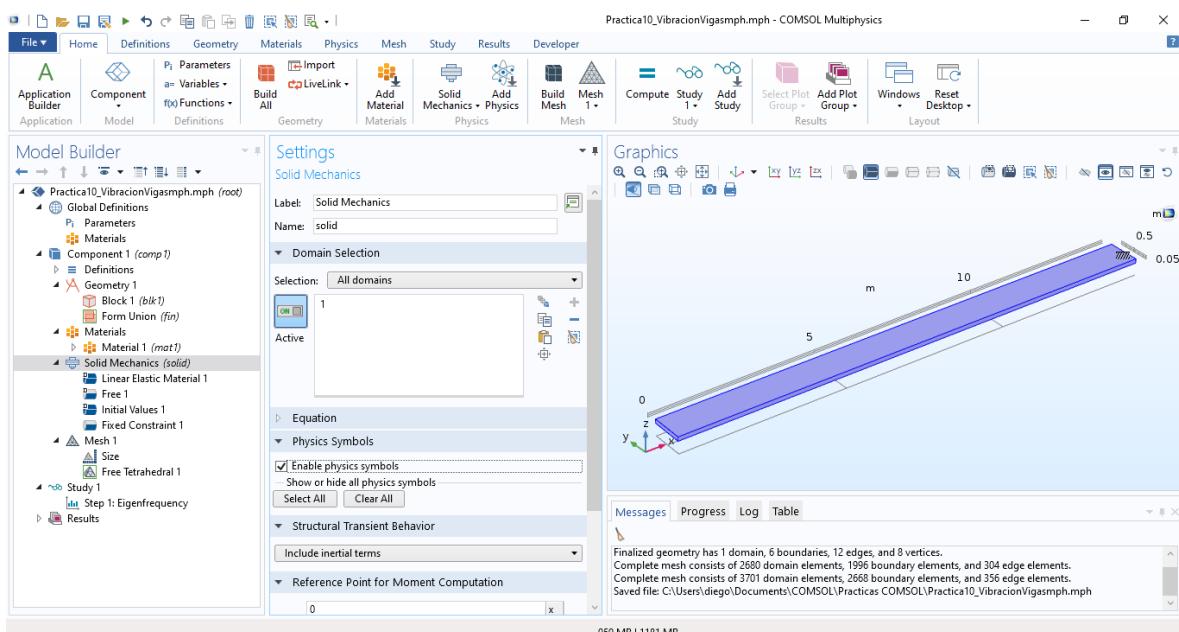
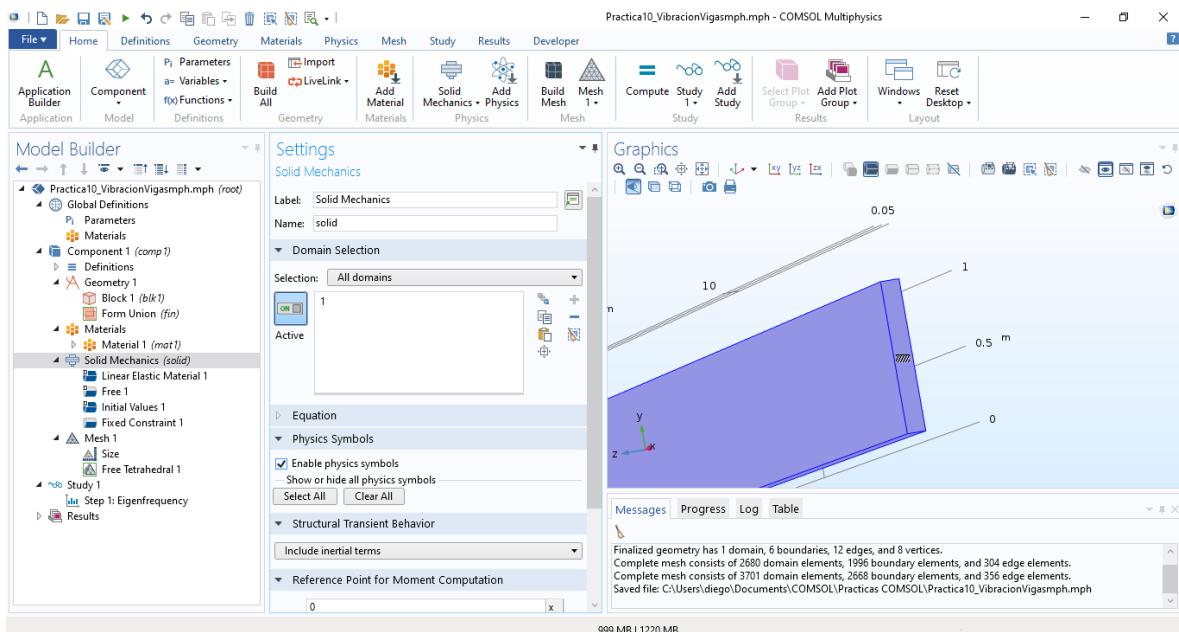


# ANÁLISIS MECÁNICO EN COMSOL:

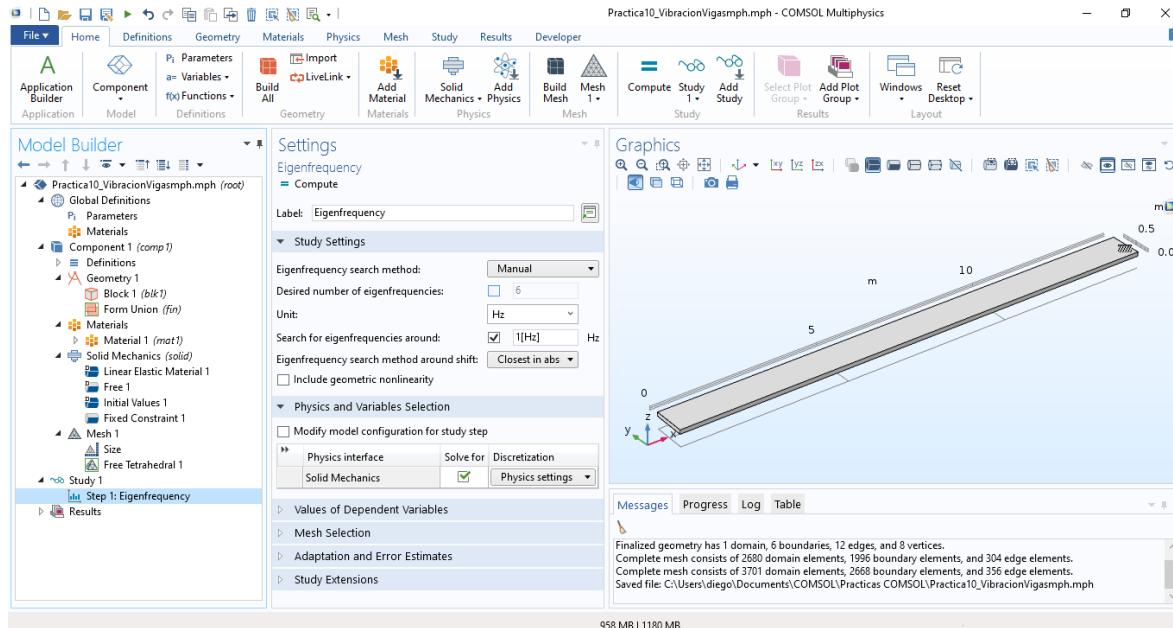




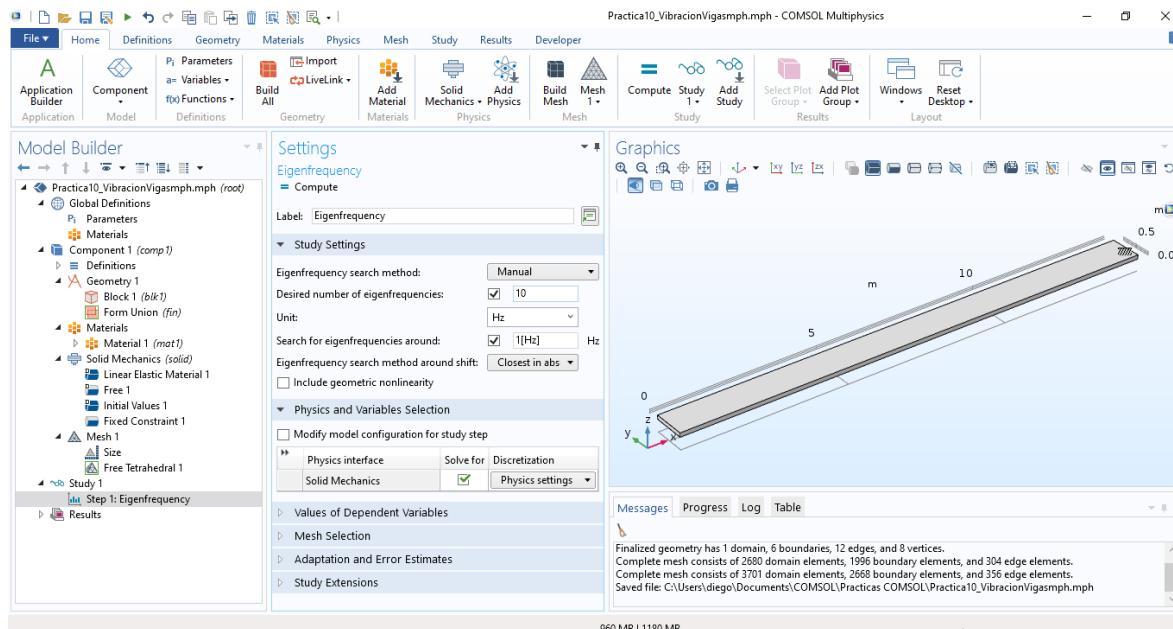




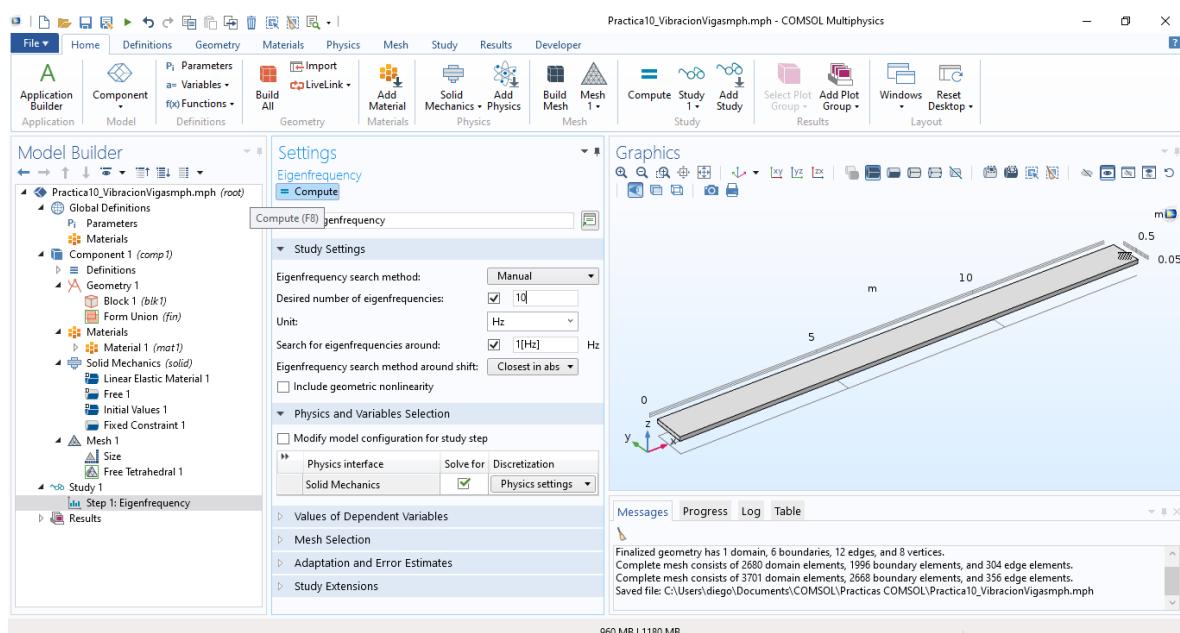
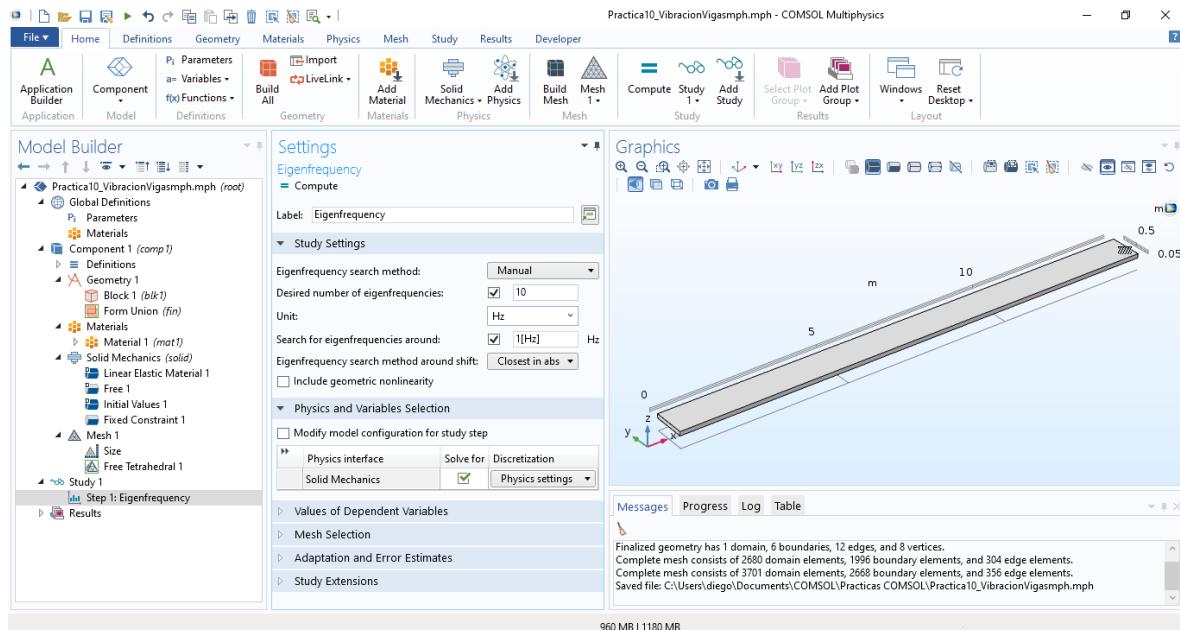
# RESULTADO DEL ELEMENTO FINITO EN COMSOL:



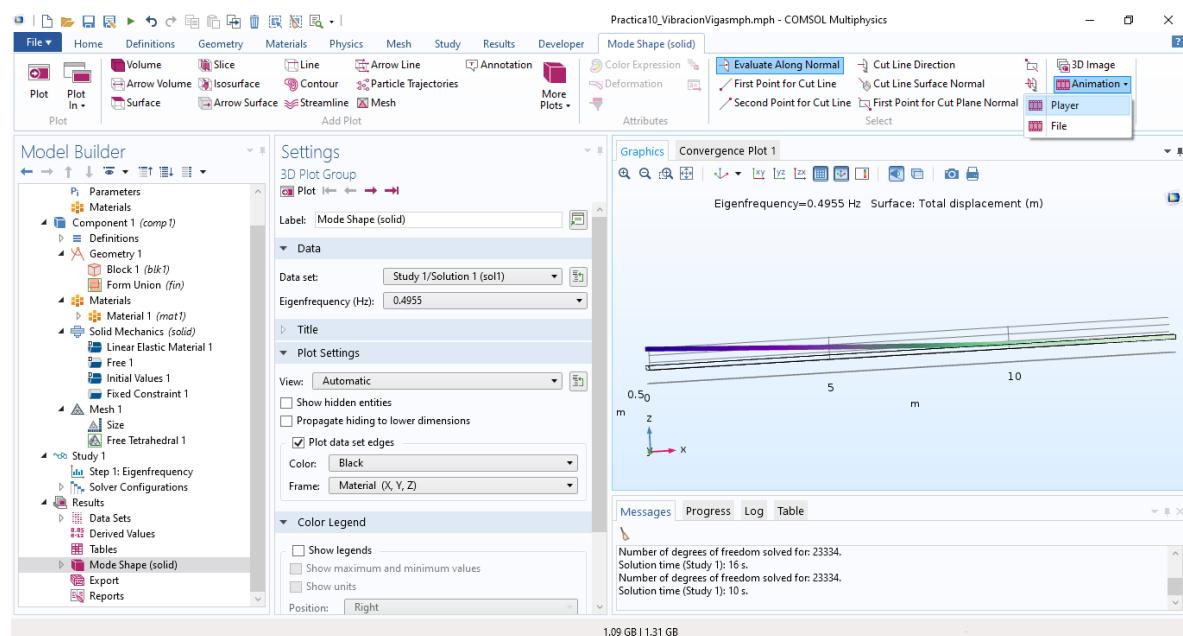
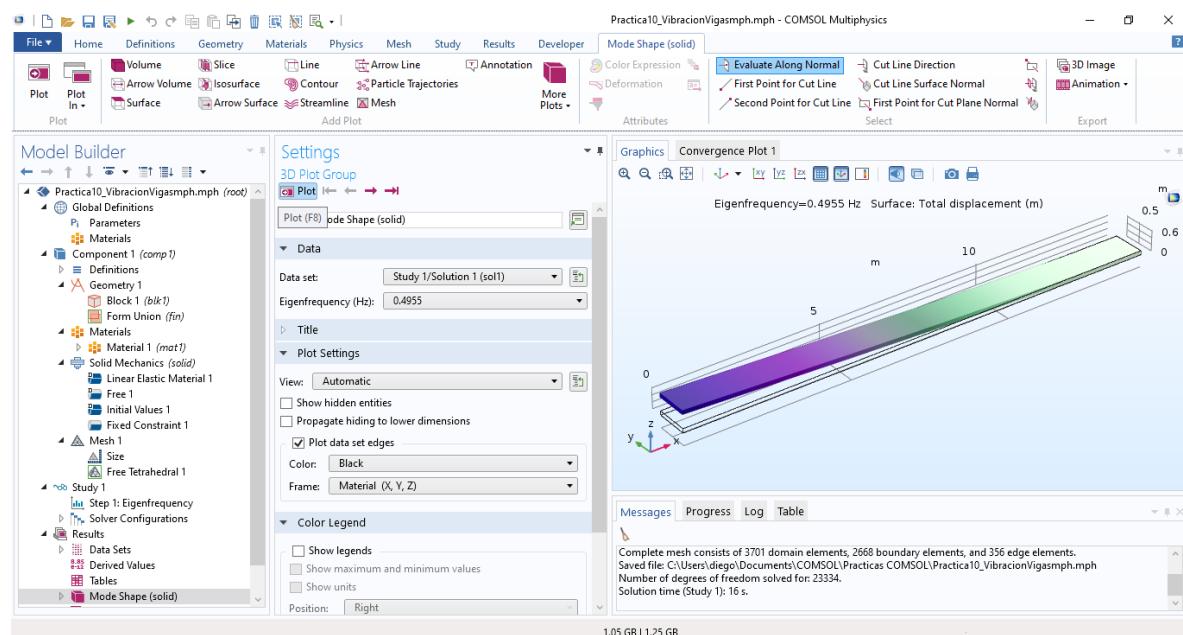
En la parte de Settings perteneciente a la pestaña de Step1: Eigenfrequency donde se encuentra el checkbox que dice *desired number of eigenfrequencies*: al seleccionarla puedo indicar las frecuencias armónicas que quiero que encuentre de mi pieza, ya sea 1, 2, 10, etc.

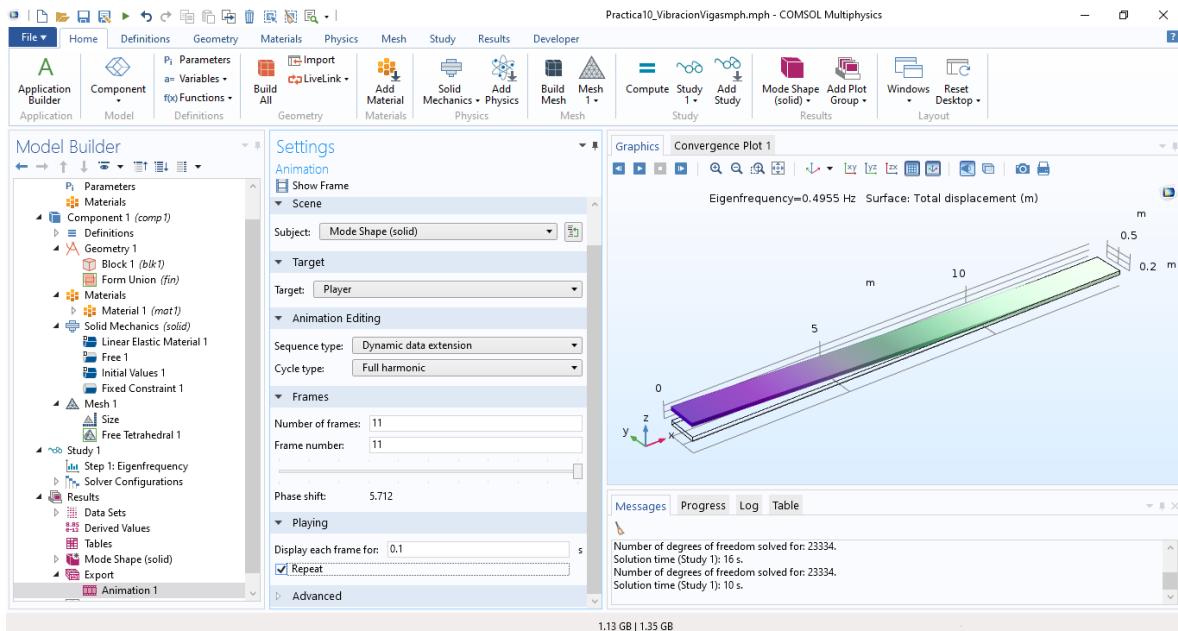
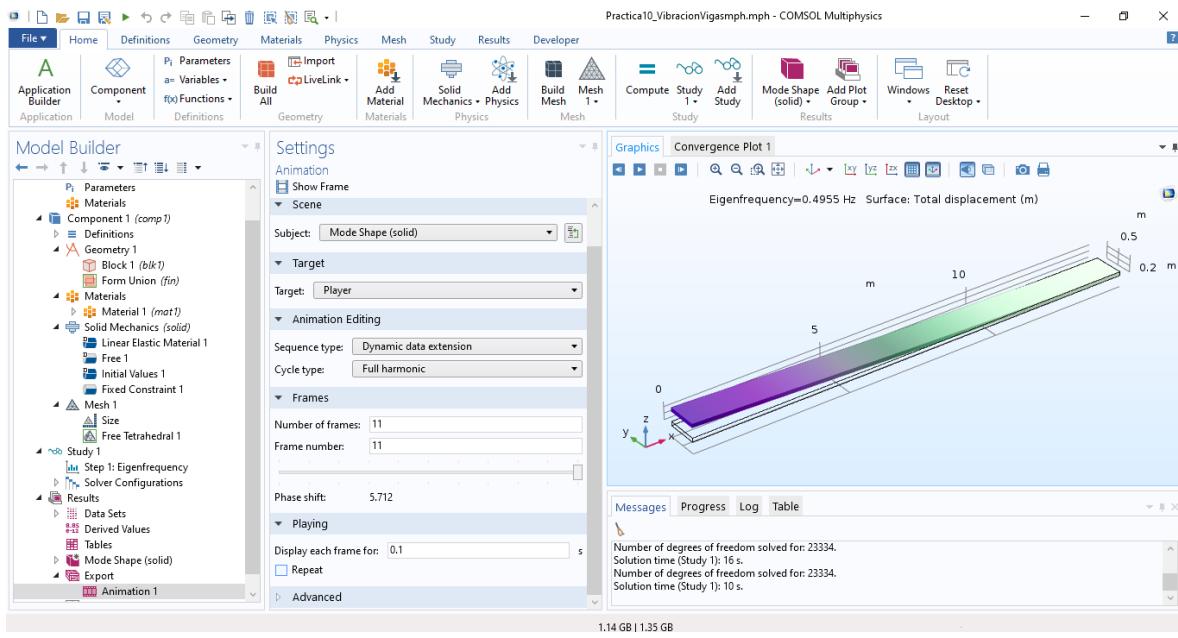


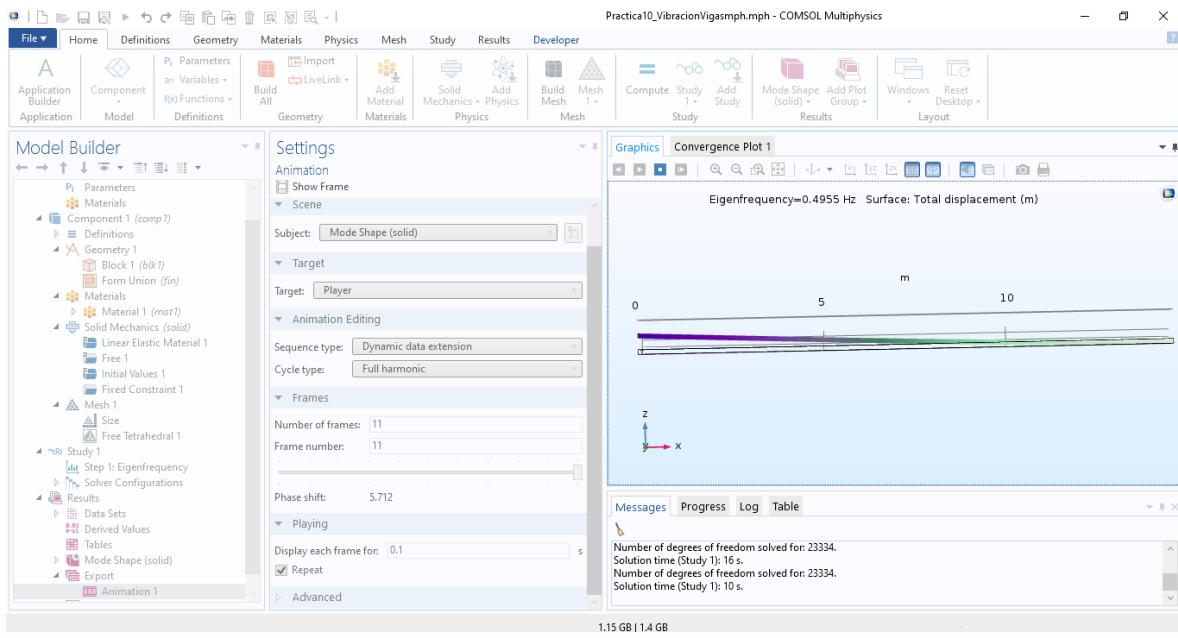
Por default el programa encuentra 6, pero le puedo decir que calcule más.



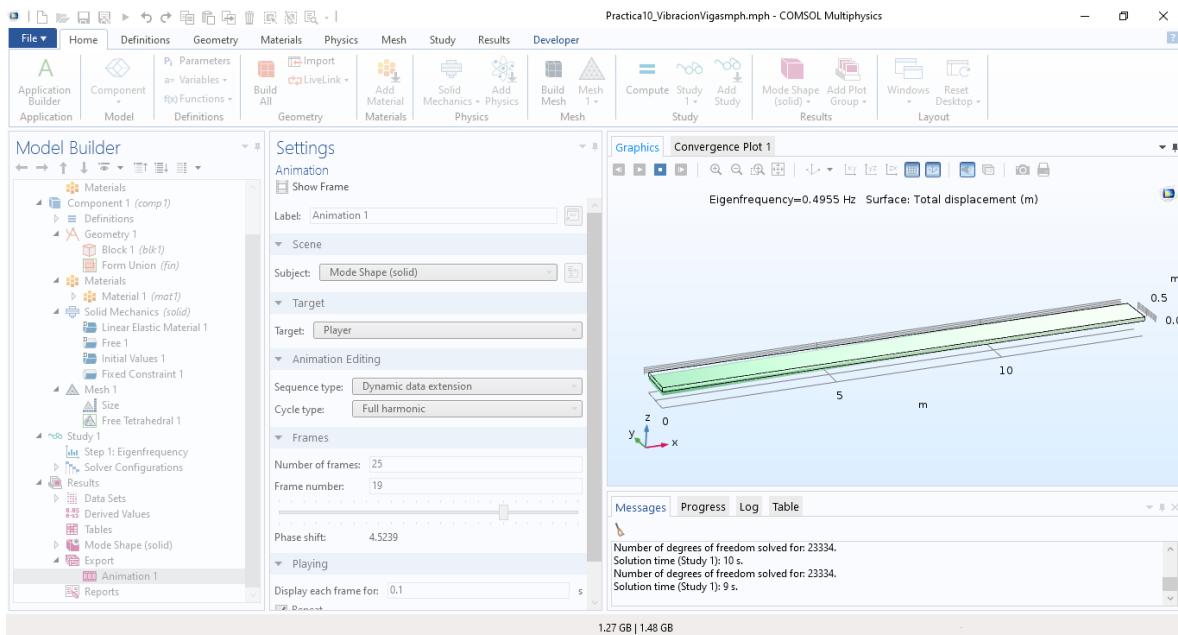
# ANÁLISIS DE VIBRACIONES ARMÓNICAS EN COMSOL:

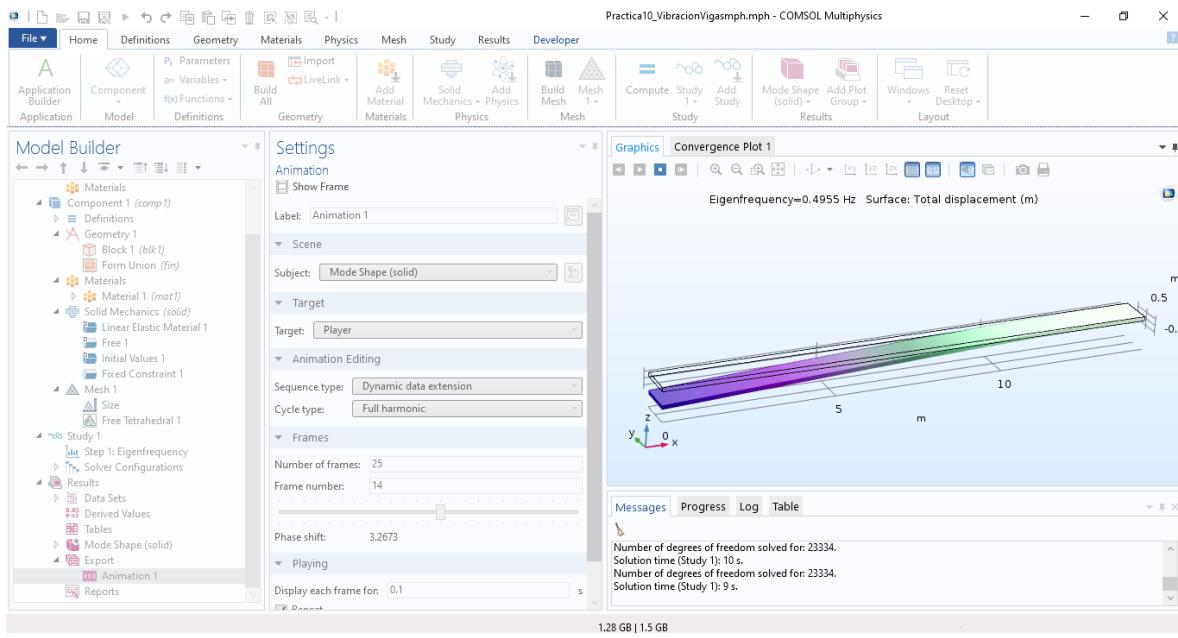




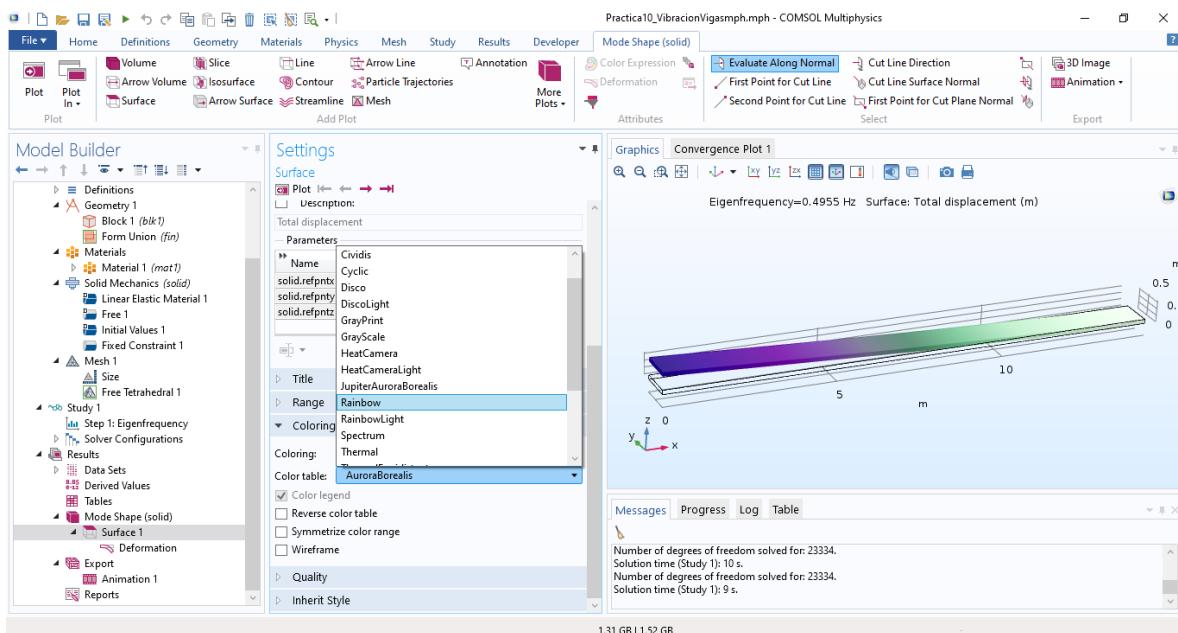


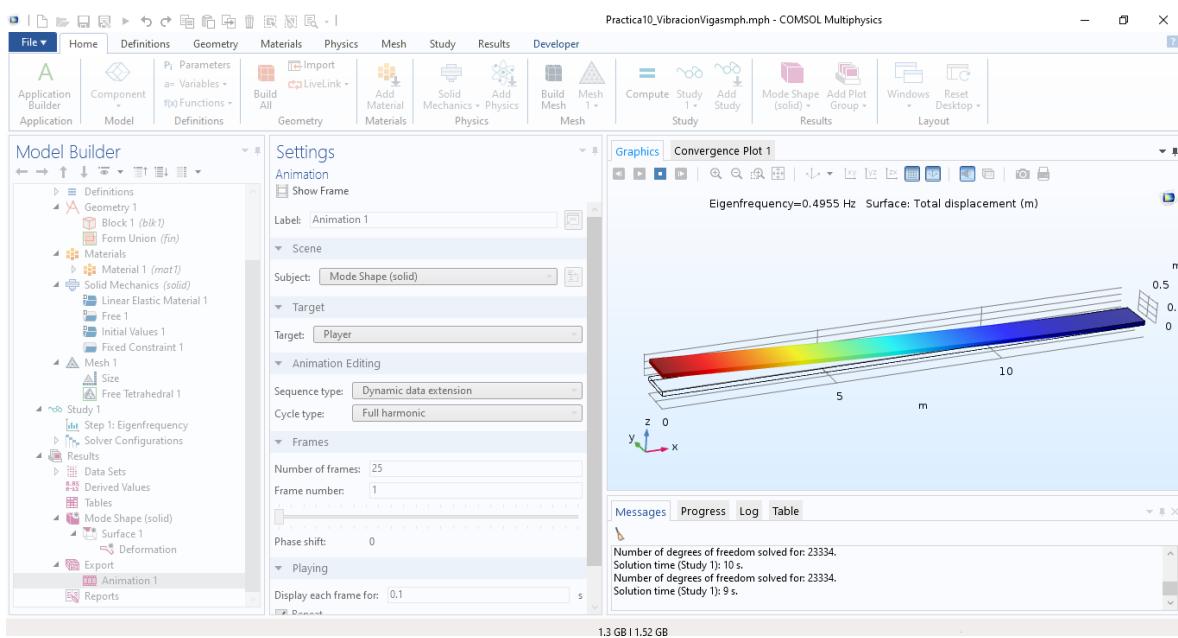
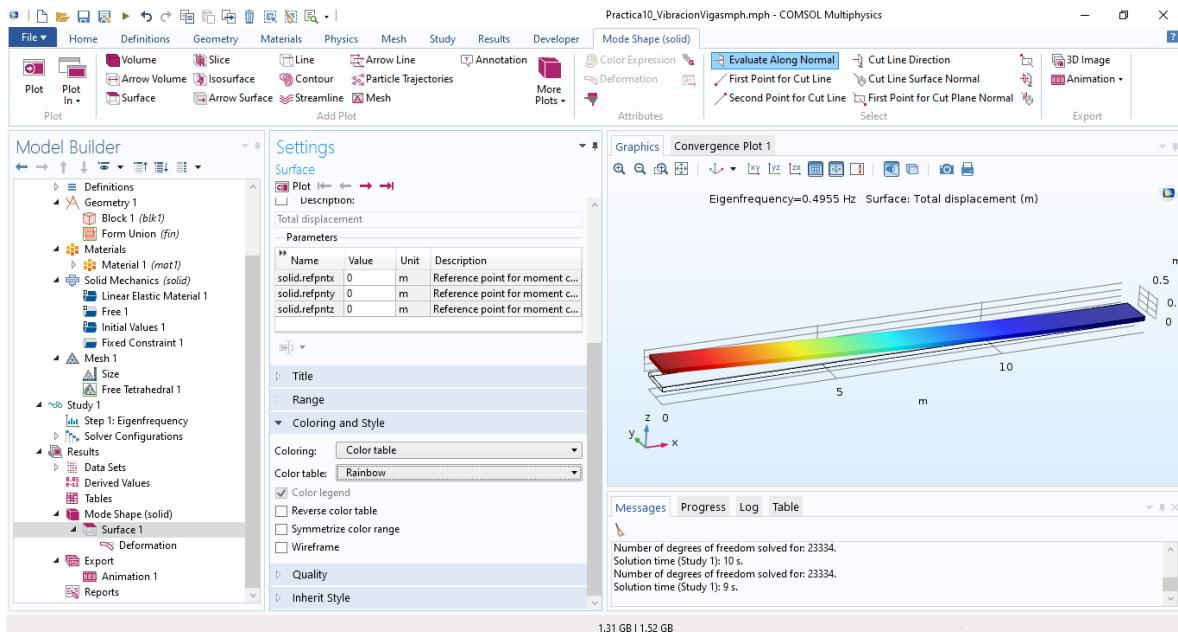
Si aumento el number of frames, se reduce la velocidad en la que se corre la animación.

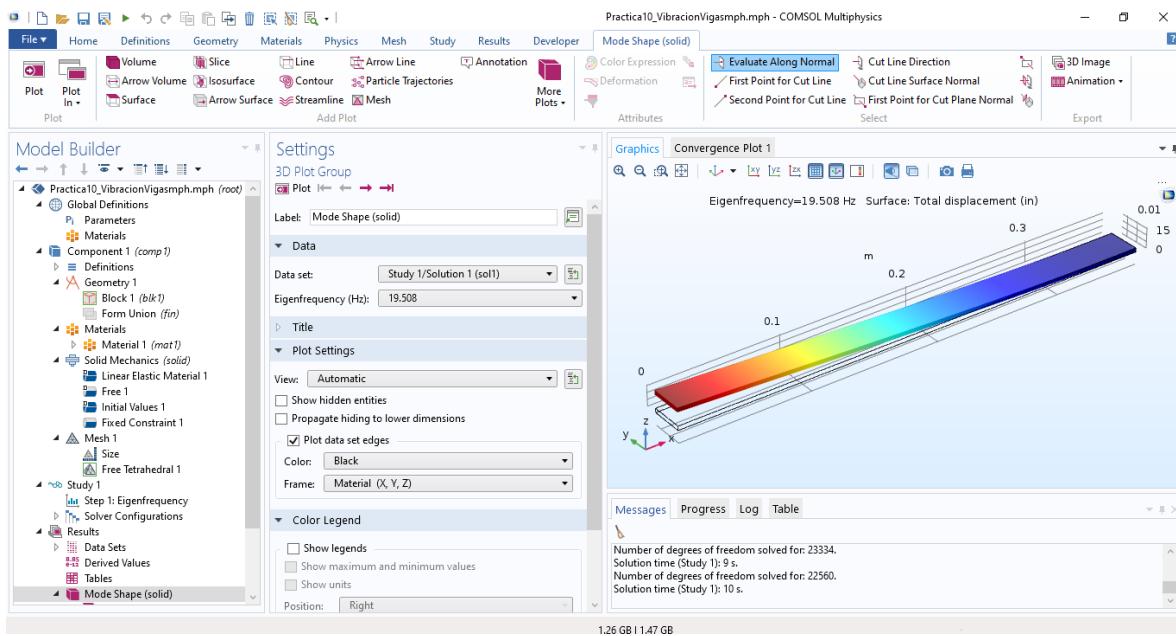




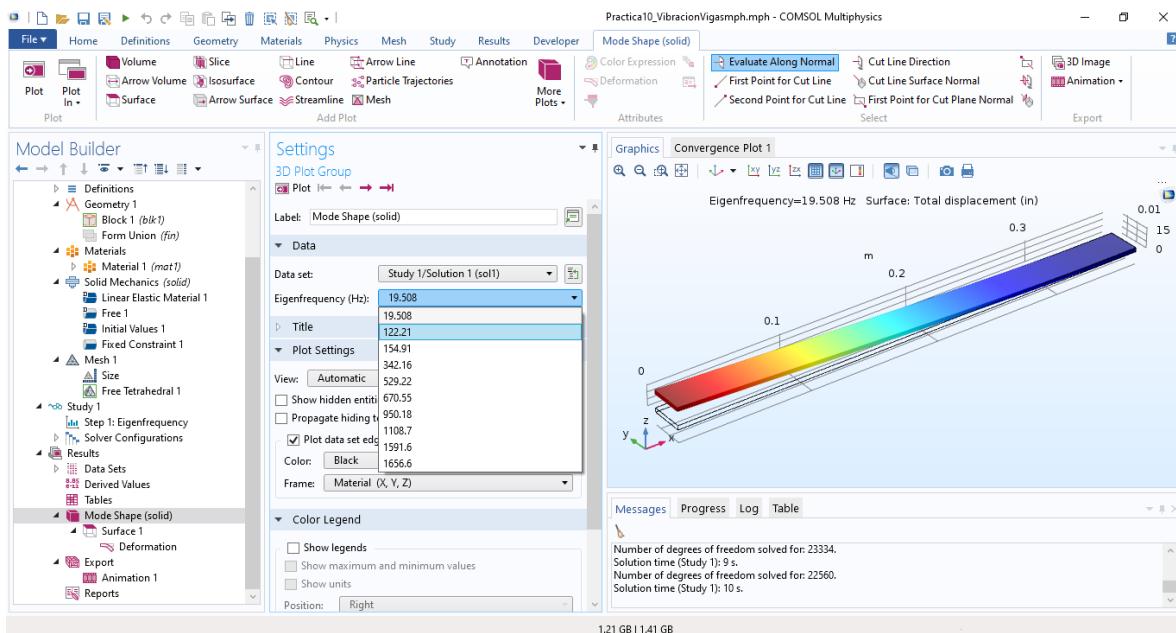
En la opción de *Surface → Coloring → Color table*: le puedo cambiar el color a la pieza cuando se estén mostrando sus frecuencias armónicas.

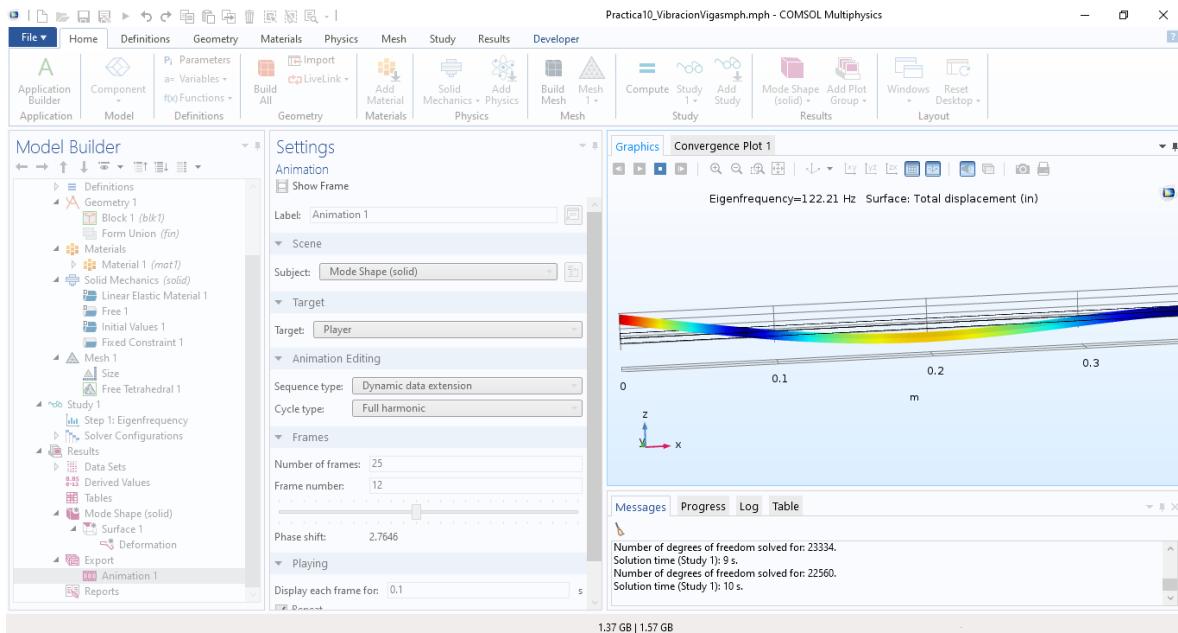
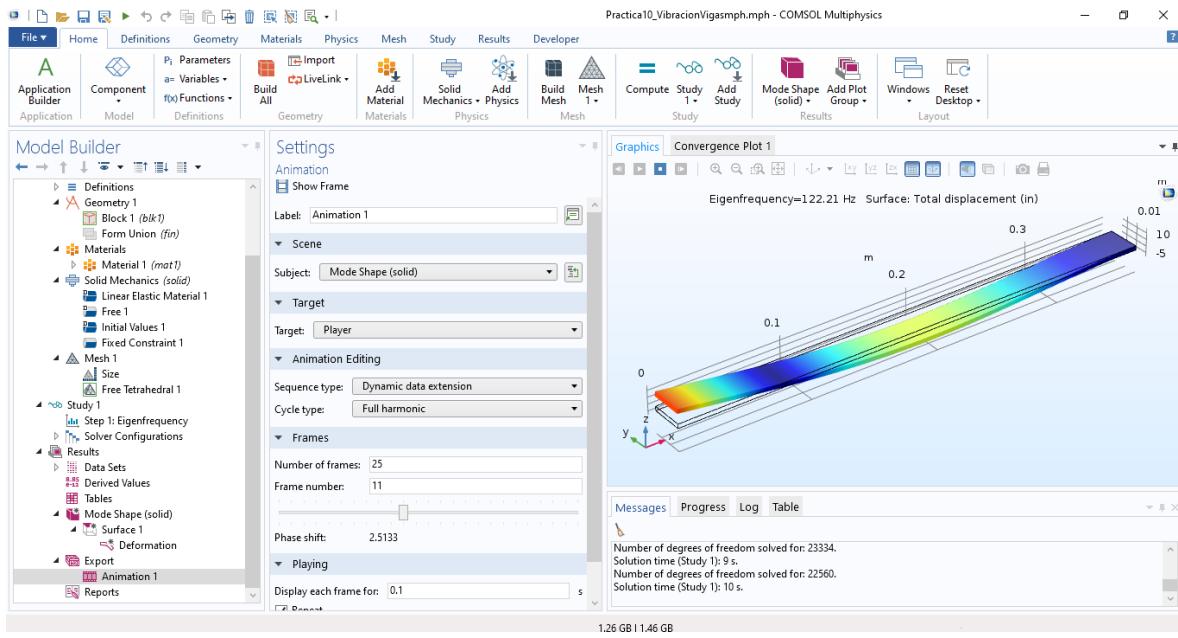


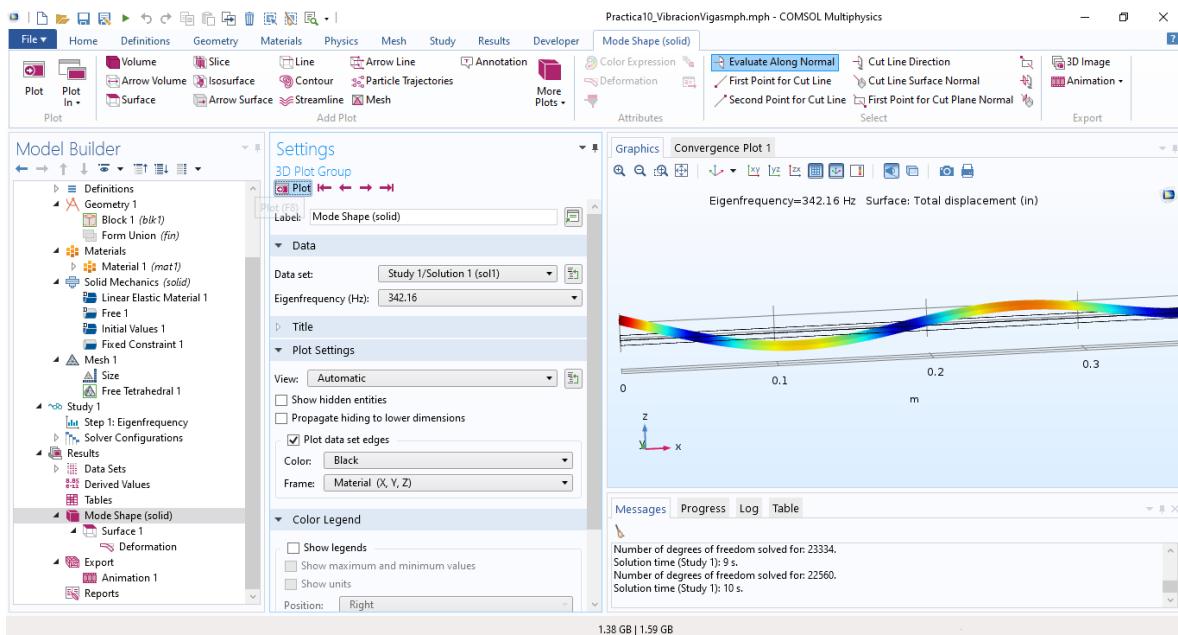
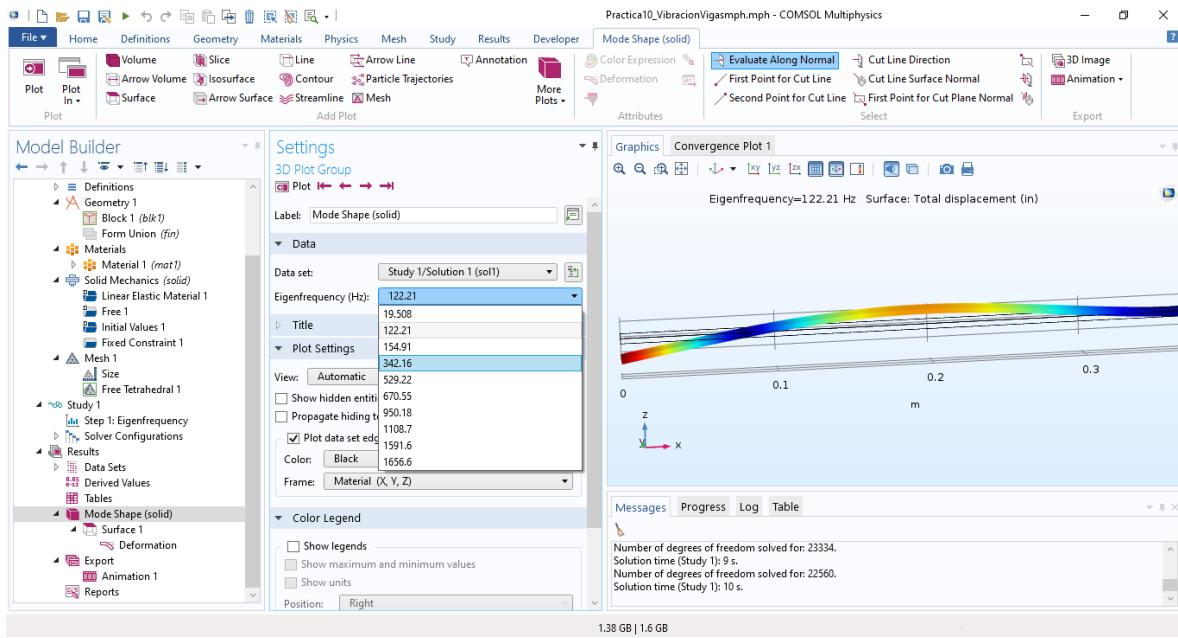


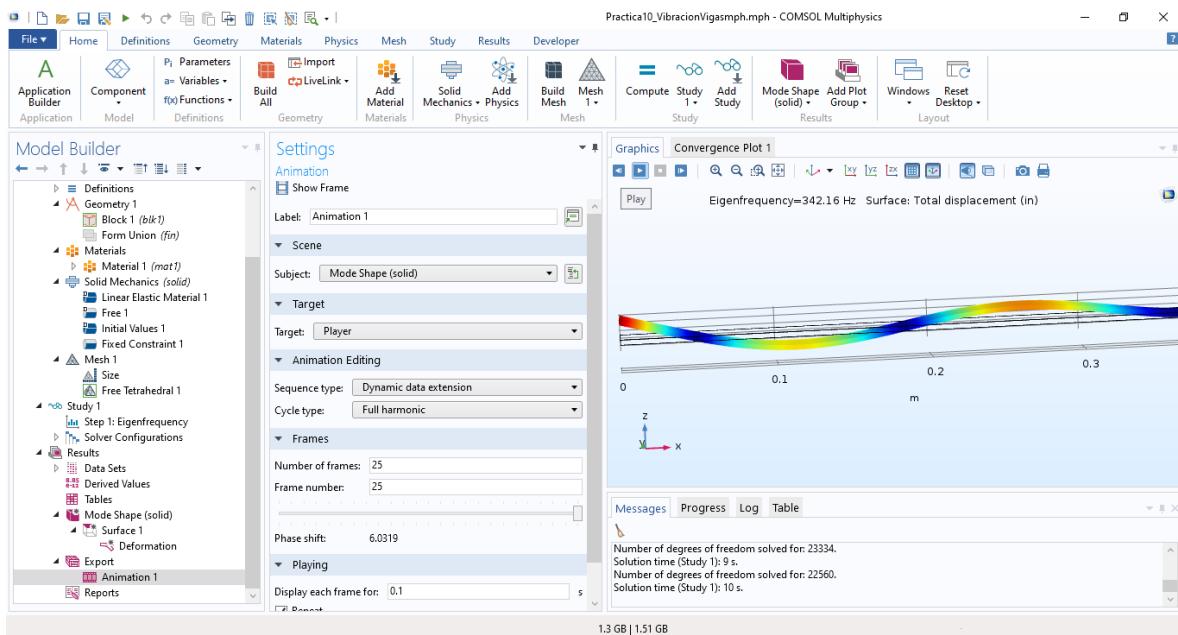
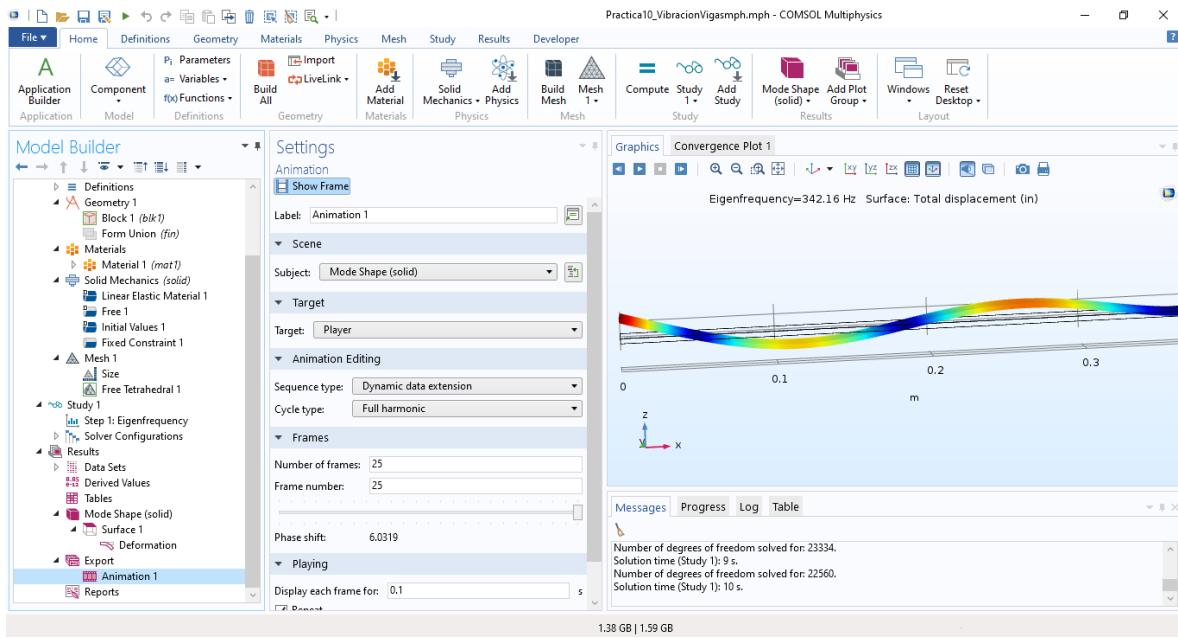


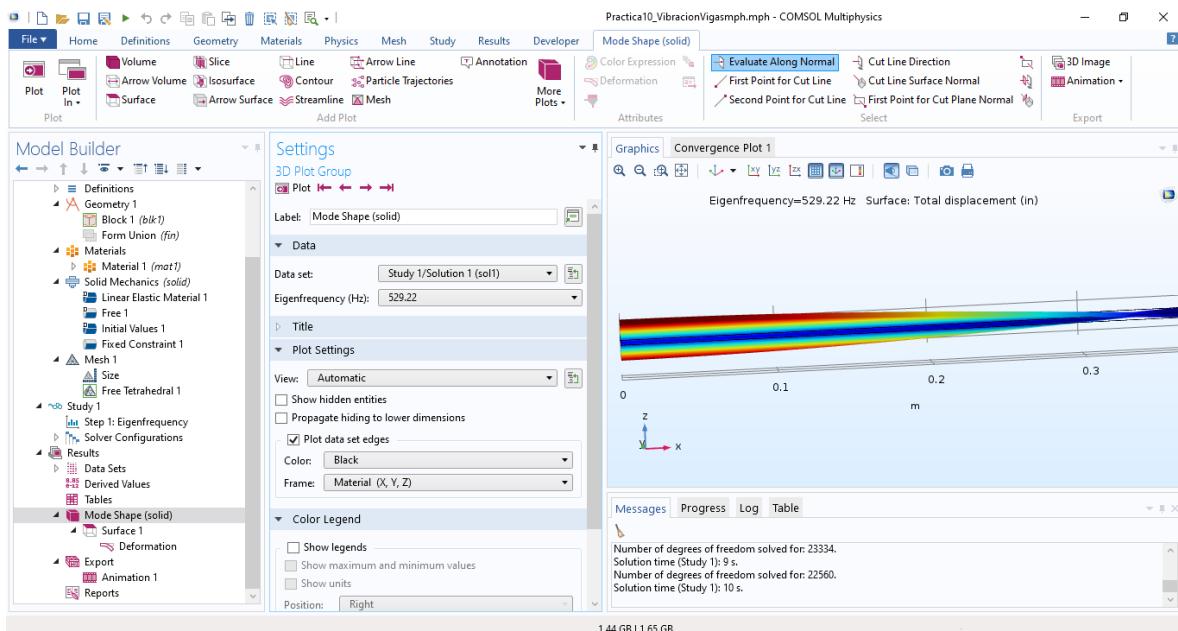
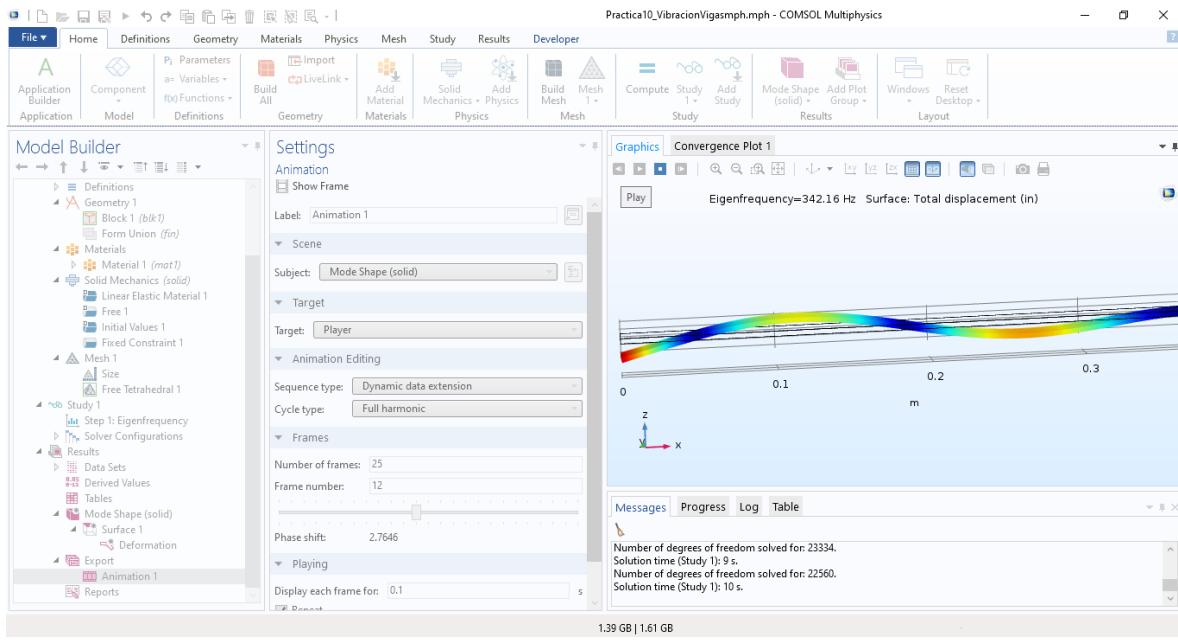
En la opción de *Mode Shape* → *Data* → *Eigenfrequency (Hz)*: elijo la frecuencia que quiero que sea visualizada en la animación y estas se muestran desde la primera frecuencia armónica de la figura en adelante.



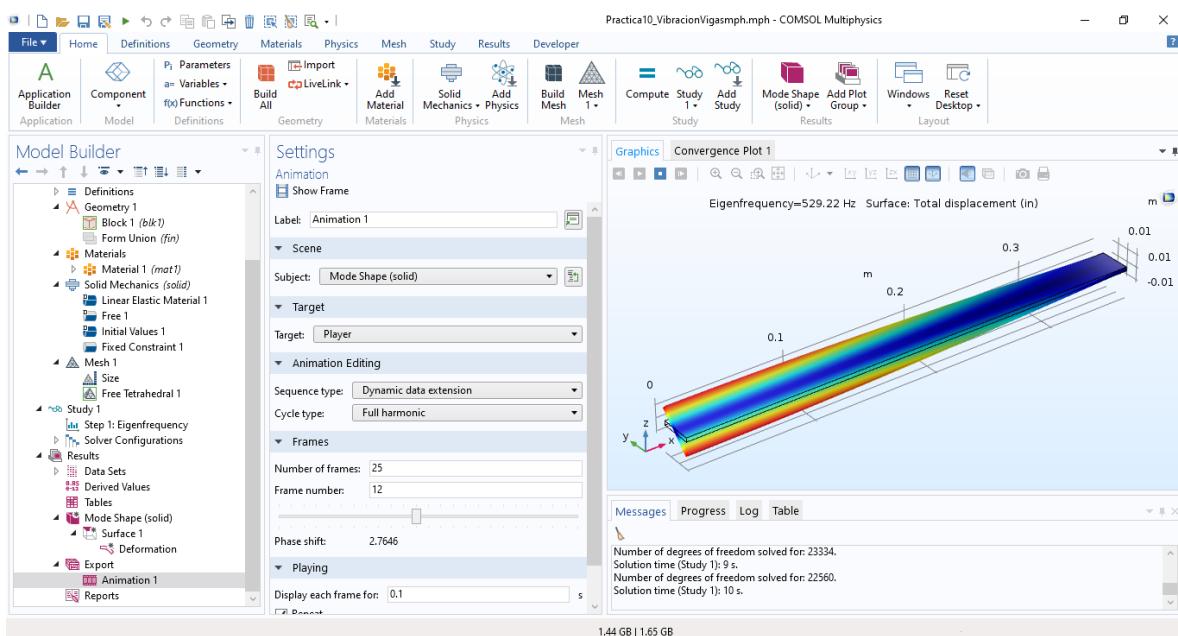
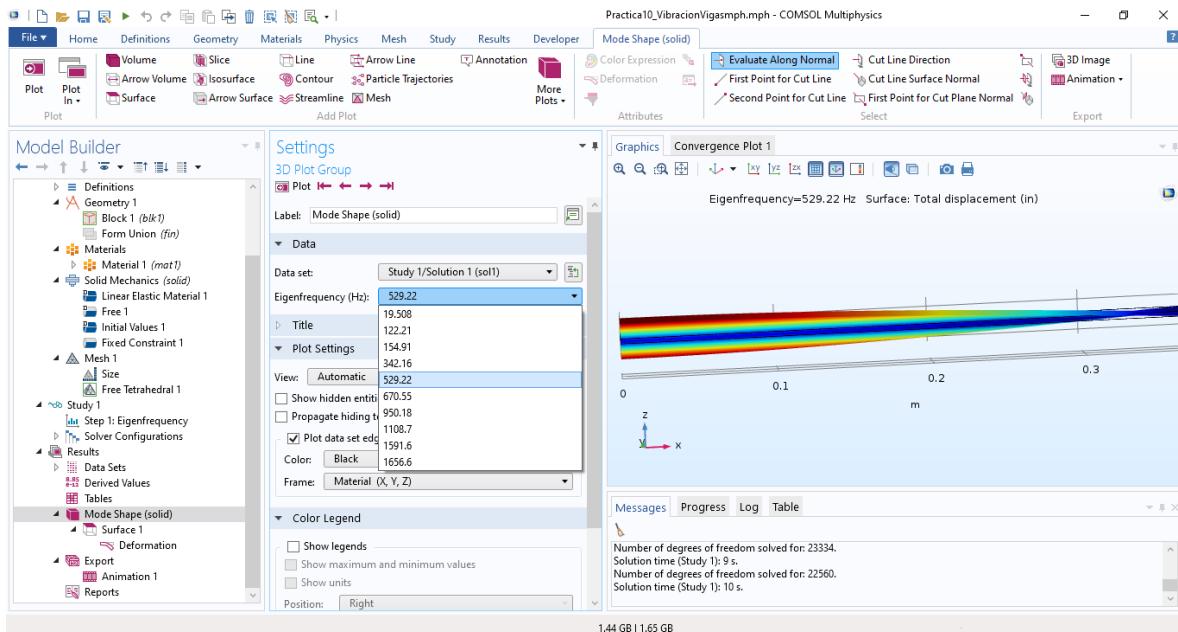




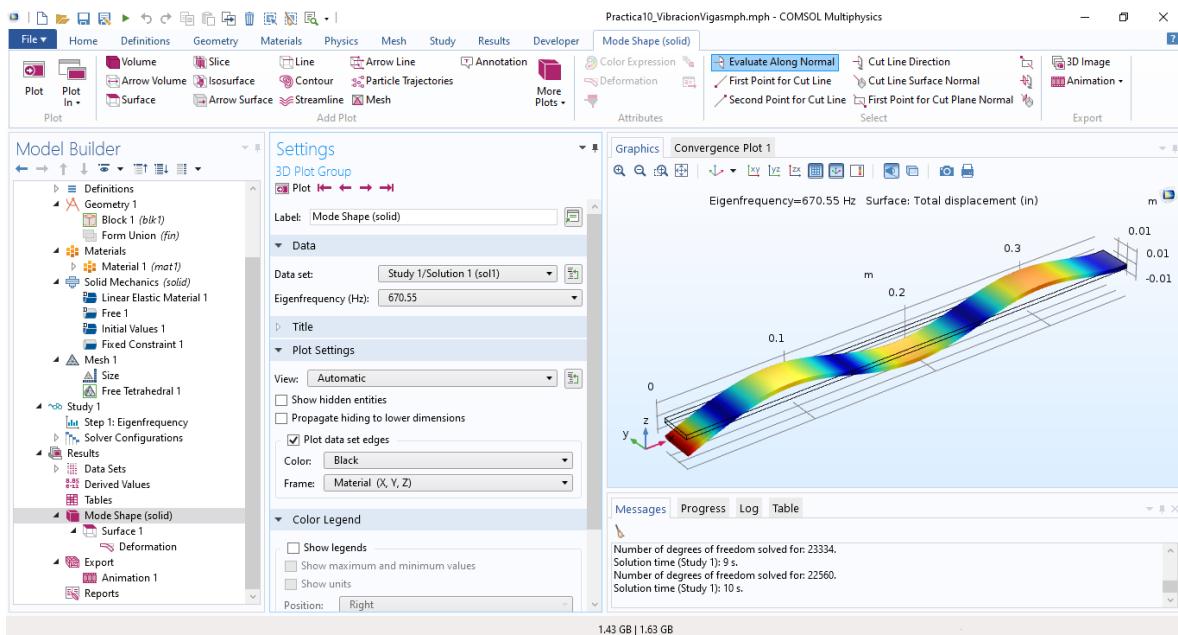
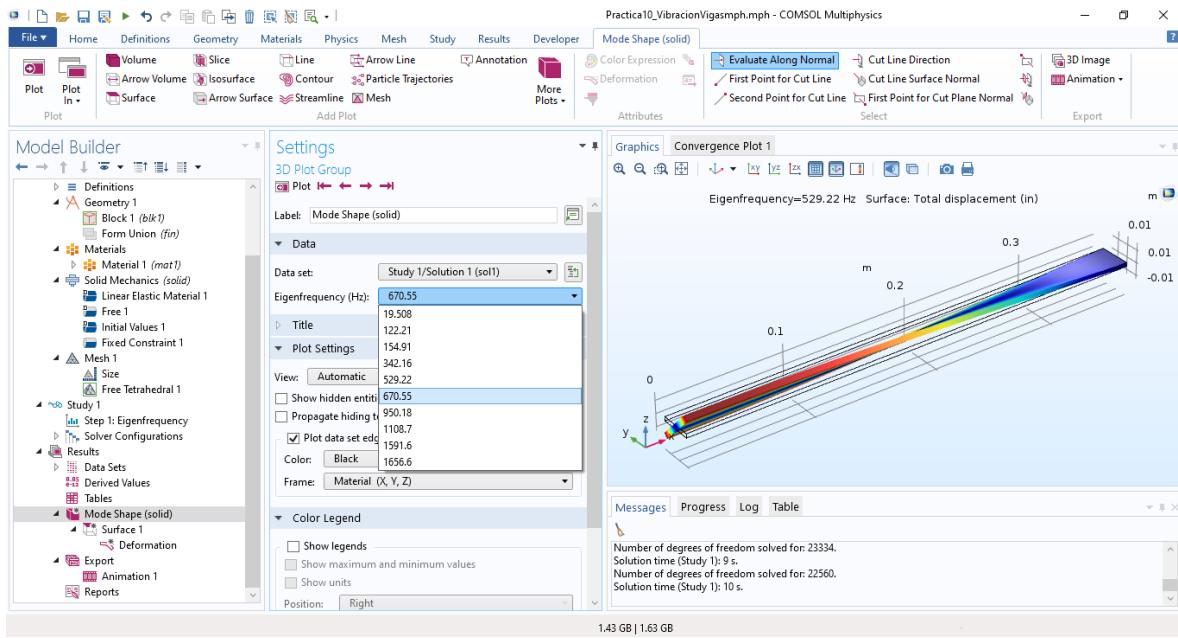




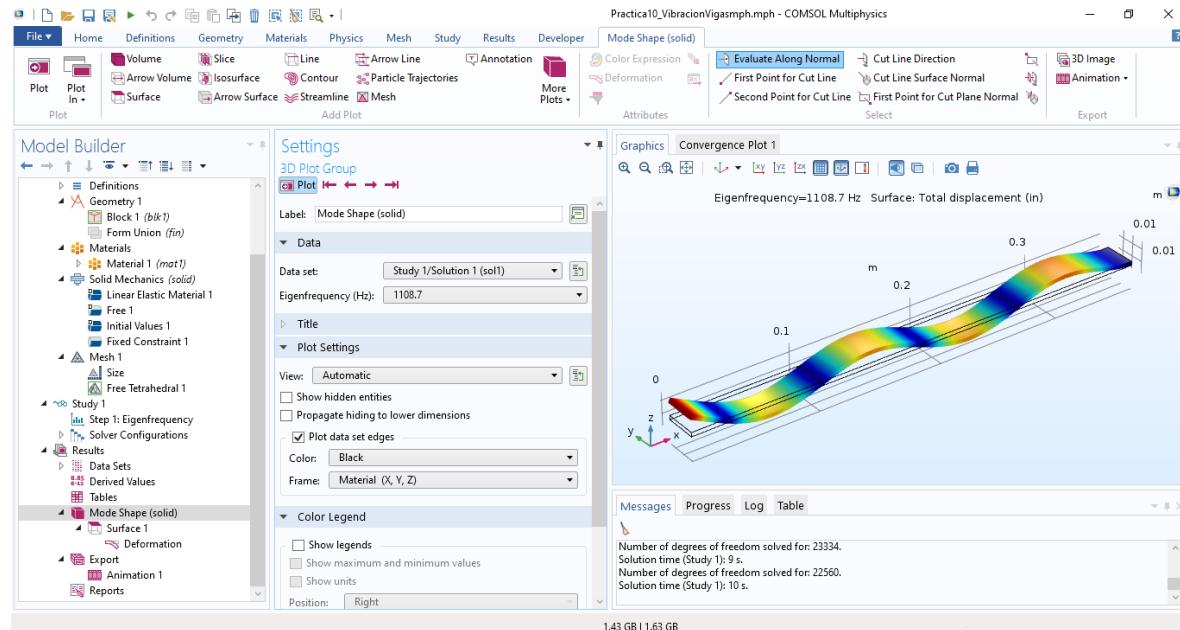
Las diferentes frecuencias me describirán movimientos diferentes, por ejemplo, la quinta frecuencia de esta figura es de un movimiento rotatorio mientras la primera es un movimiento oscilatorio frontal.



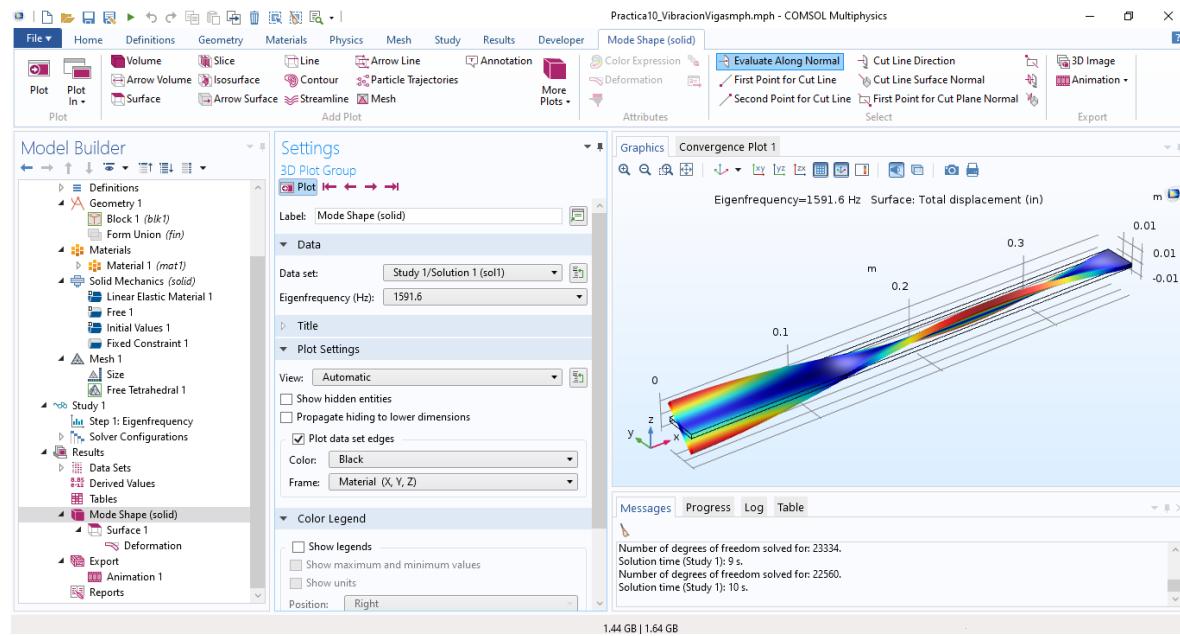
La siguiente frecuencia armónica puede que sea de otro tipo de movimiento, el programa mostrará cuales.

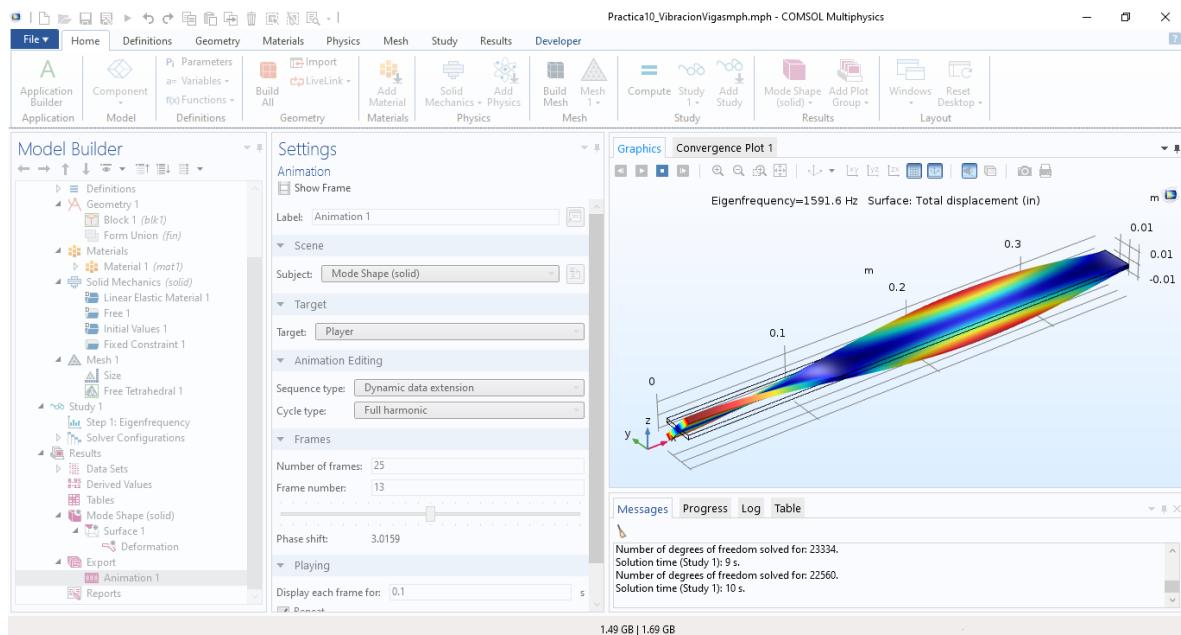
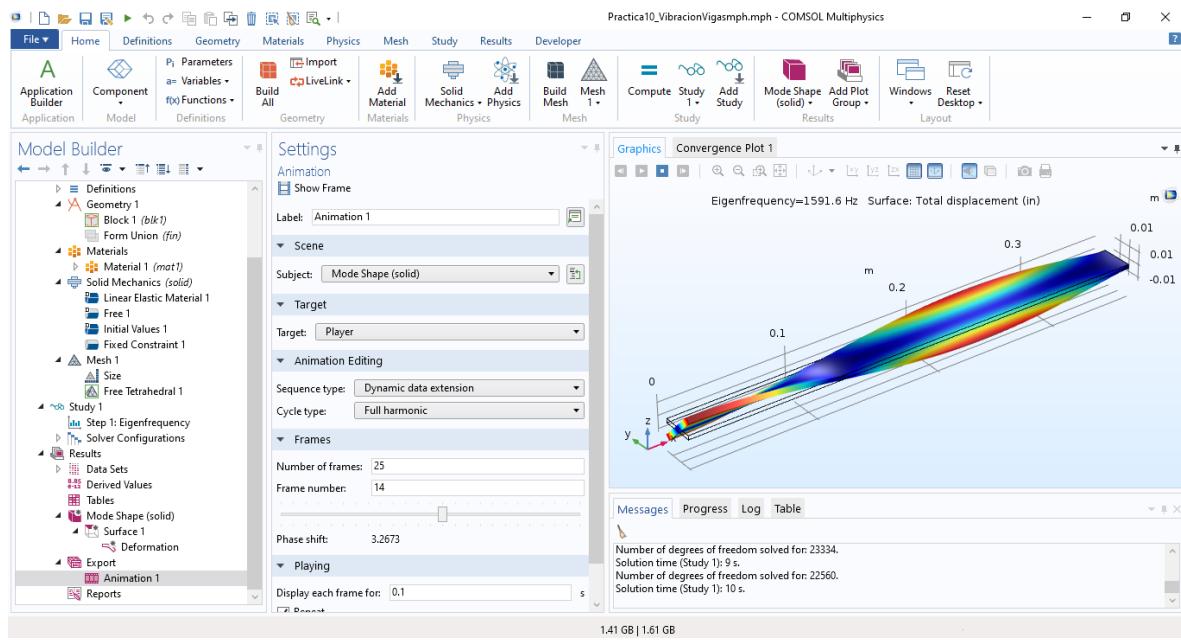


La octava frecuencia armónica de 1108.7 Hz perteneciente a la placa es un movimiento oscilatorio frontal.



La novena frecuencia armónica de 1591.6 Hz perteneciente a la placa es un movimiento oscilatorio que combina dos efectos torsionantes de 2 nodos distintos.





## BIBLIOGRAFÍA:

INGENIERÍA MECÁNICA ESTÁTICA (12VA EDICIÓN) – RUSSELL C. HIBBELER.

