

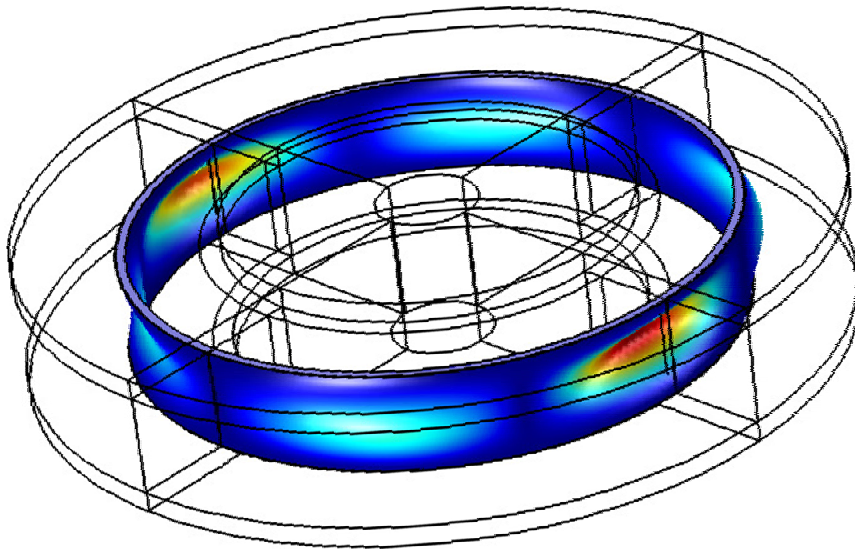
PIEZOTYRES

COMSOL
CONFERENCE
BANGALORE2013



LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
(AUTONOMOUS)

Design and simulation of Piezotires **Using Comsol multiphysics 4.3b software**



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Out lines :-

- ✓ **Introduction.**
- ✓ **Working principle.**
- ✓ **Designing procedure.**
- ✓ **Results and Simulation.**
- ✓ **Conclusion.**

Introduction

Access to electricity has become a major problem. In the process of solving this problem we should consider every small source of electrical energy.

There are different sources of renewable energy such as solar, wind, tidal... for energy generation. Apart from these **piezoelectric devices** are those which provide electric potential naturally on applying stress.

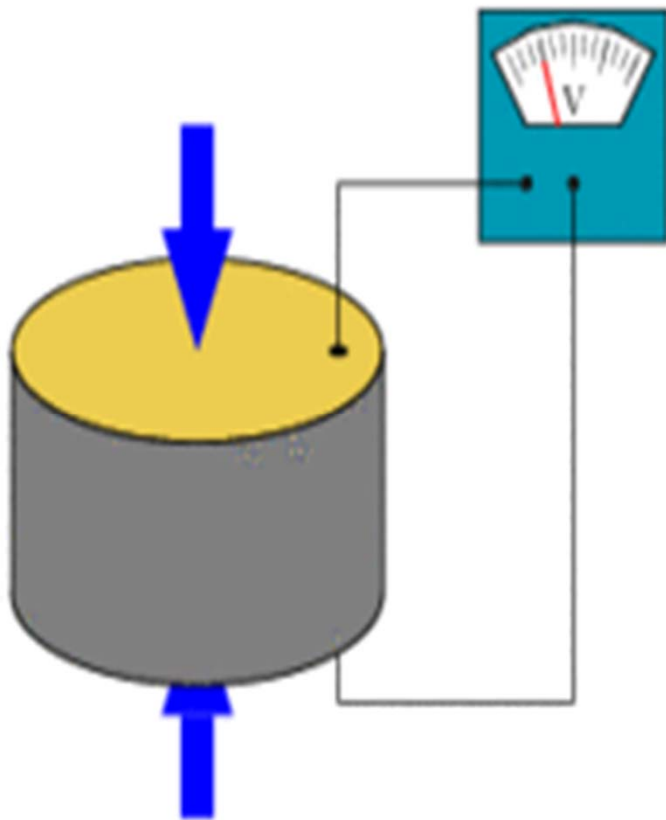
Piezotyres

Piezoelectric
effect + Tyres



Piezoelectric effect

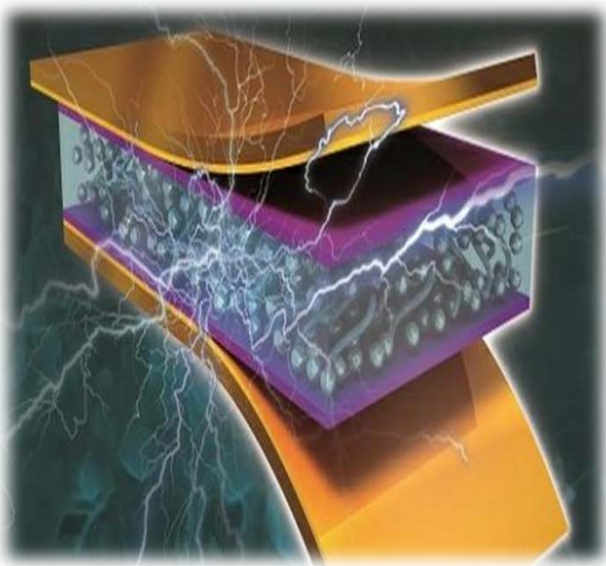
Natural Wonder



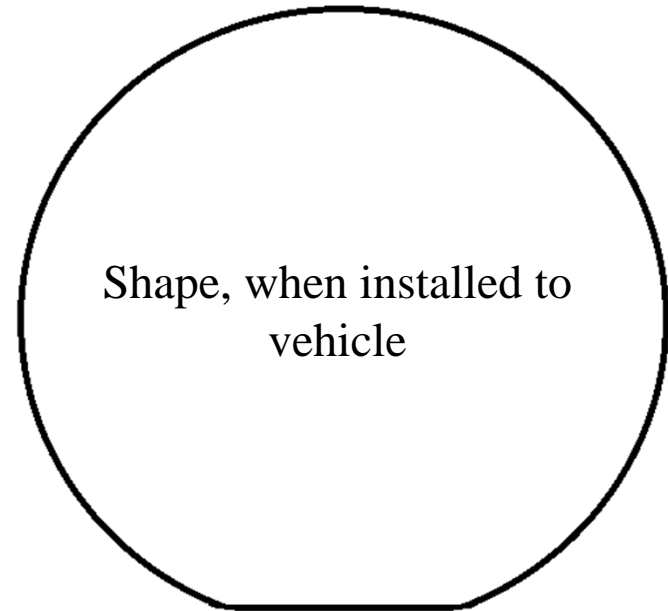
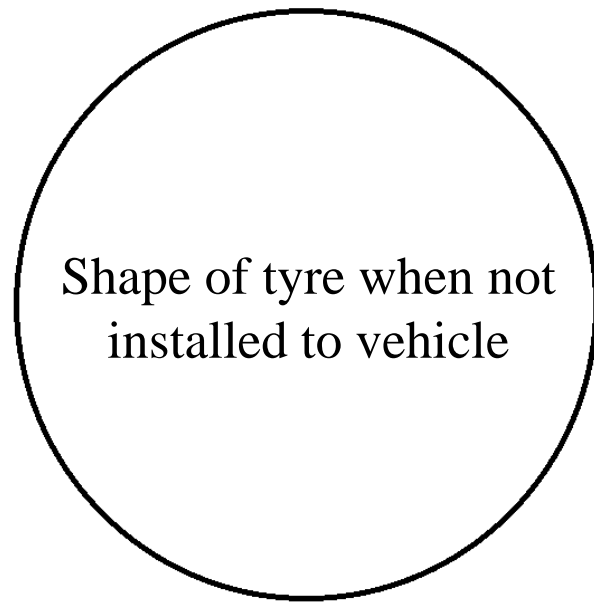
- ✓ Mechanical stress causes the charge separation in the individual atoms of the material
- ✓ Any spatially separated charge will result in an electric field, and therefore an electric potential.

Natural wonder

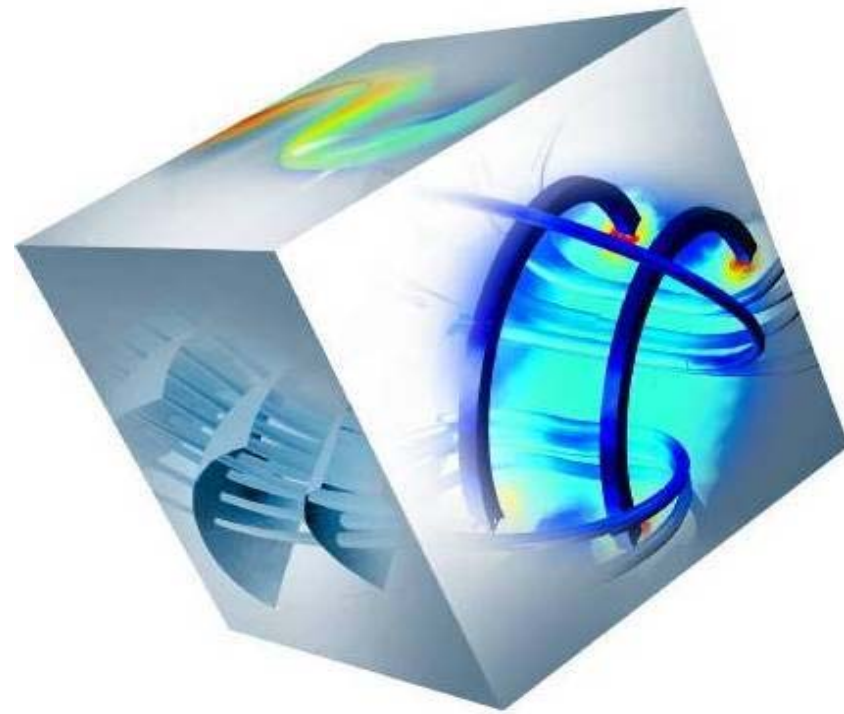
Man Made Wonder



WORKING



*This Idea is implemented in
Comsol multiphysics software*



Physical Interface :-

Solid Mechanics (solid)

And

Piezoelectric Devices (pzd)

Parameters :-

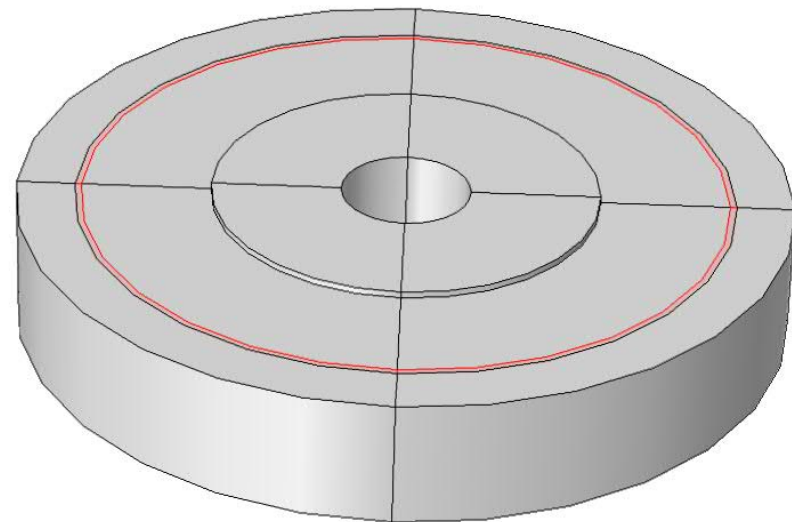
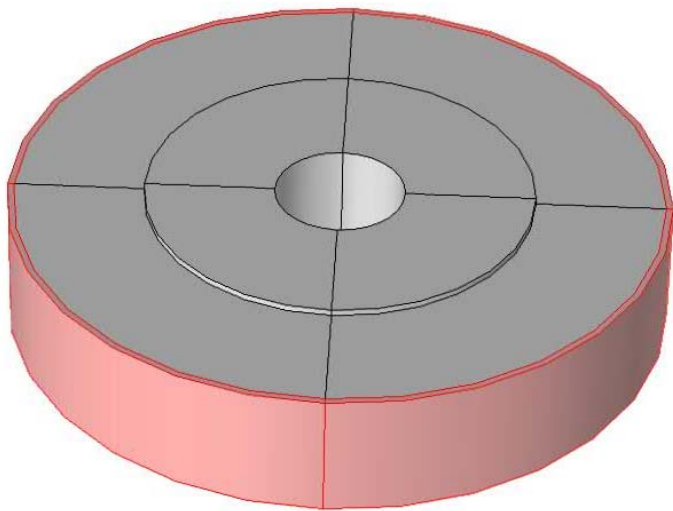
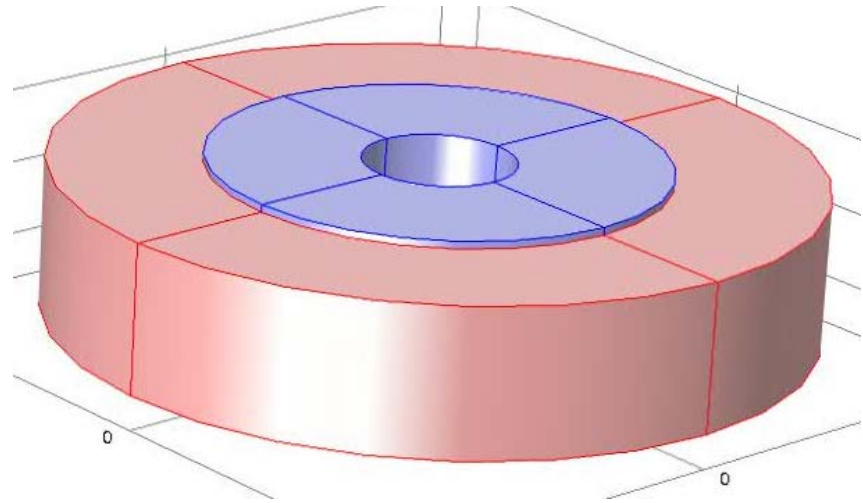
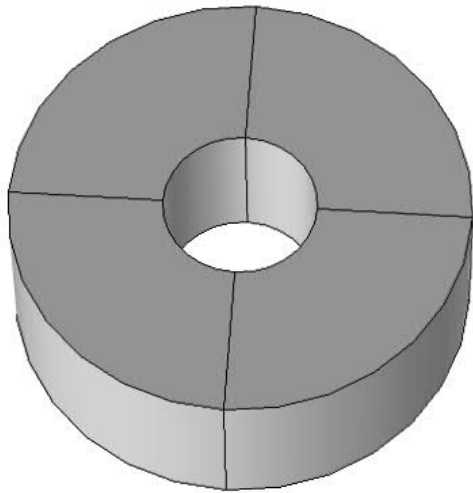
Name	Expression	Value	Description
s0	6[Pa]	6.0000Pa	Stress

Geometry Details :-

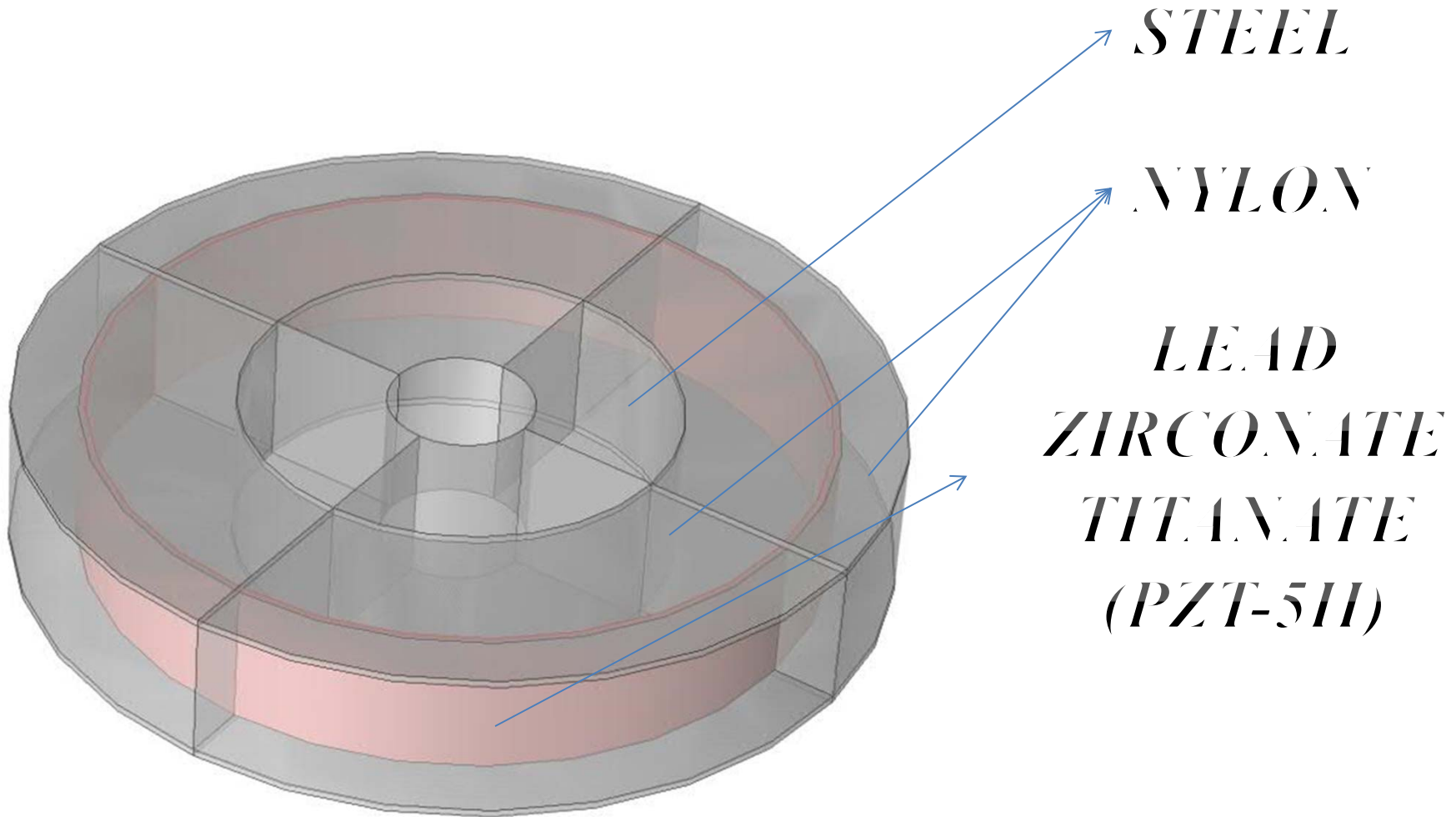
Radius :- 0.5m

Height :- 0.2m

DESIGNING PROCESS



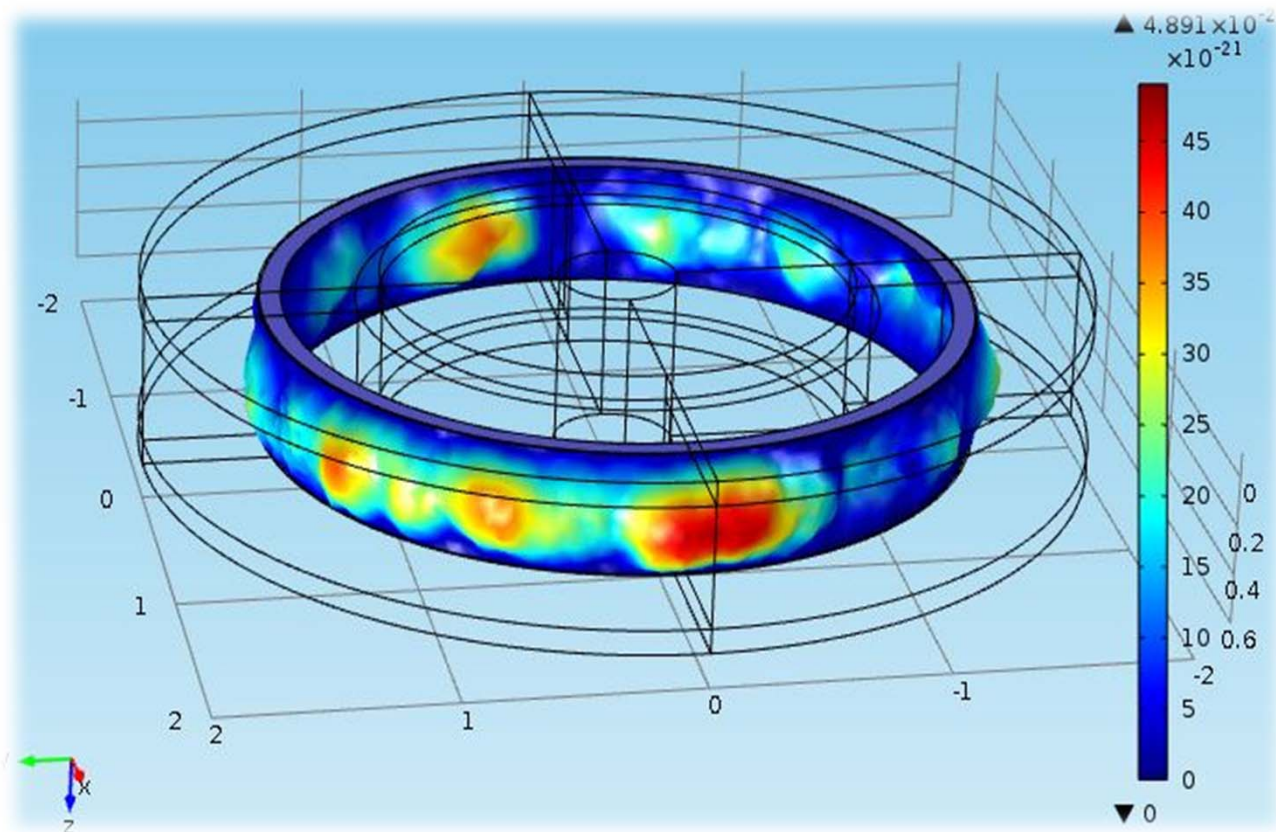
MATERIALS



Results

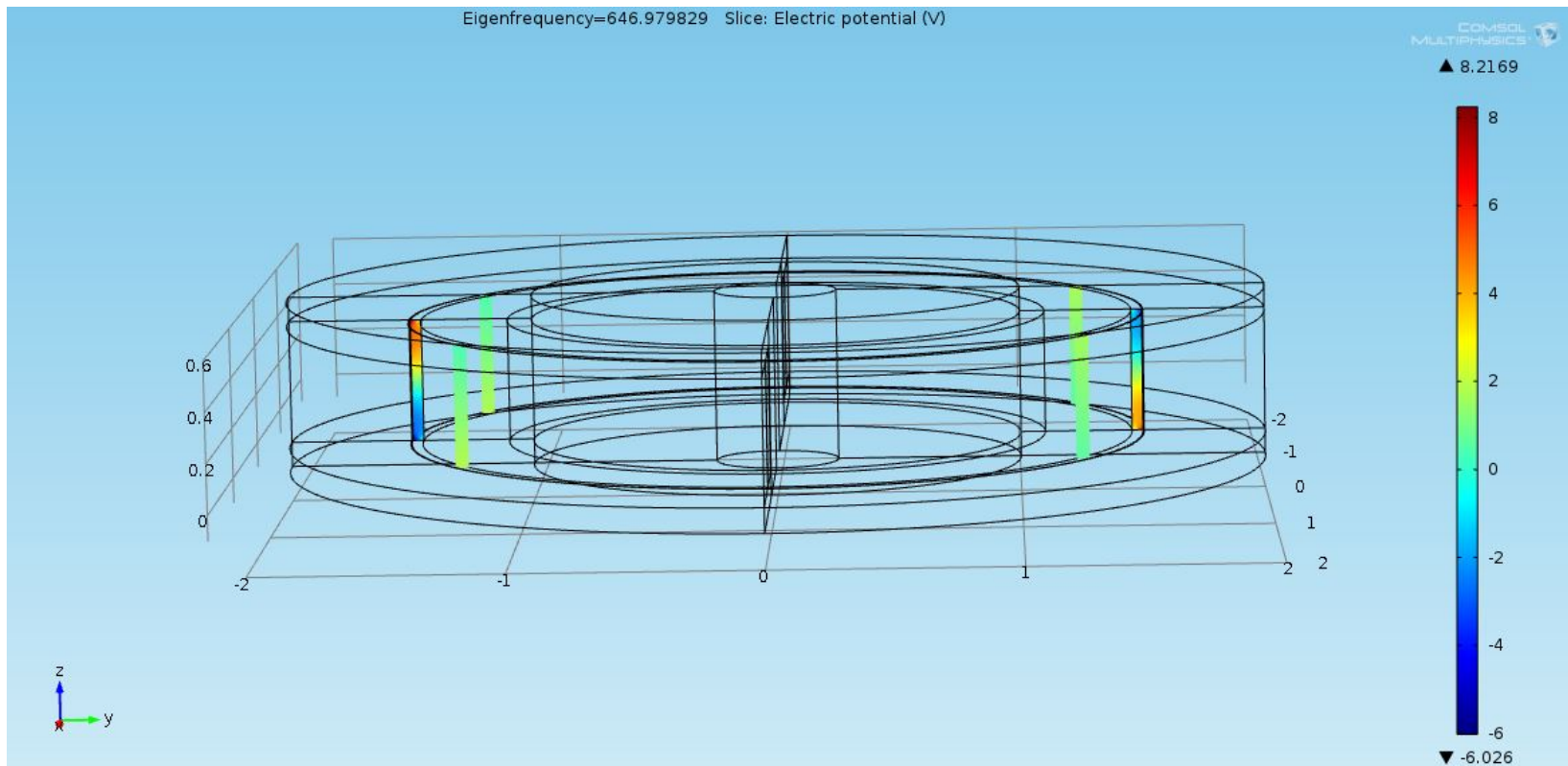
Deformation obtained :-

At the road tyre interface a maximum deformation of 45×10^{-21} m



Electric potential generated.

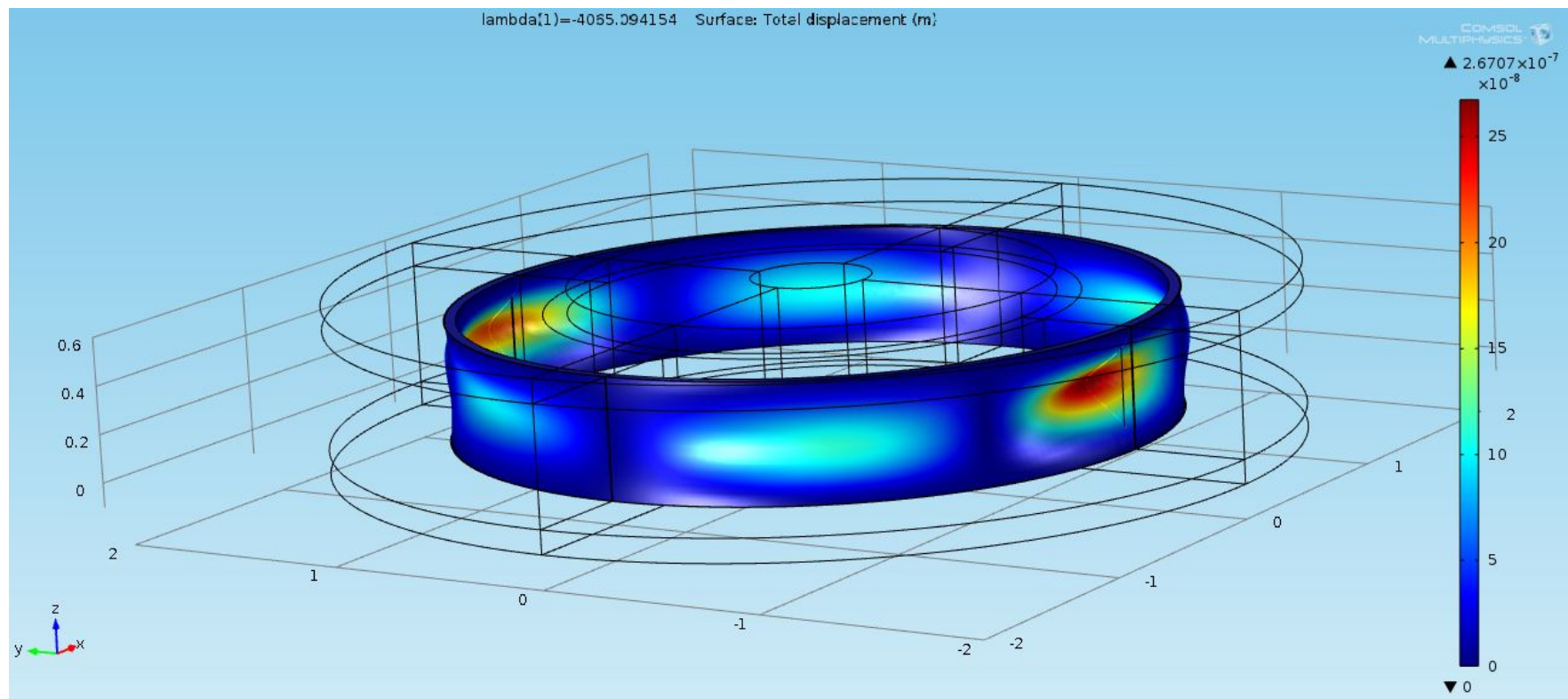
For the resulting deformation the potential obtained is **8.21v**



Simulation

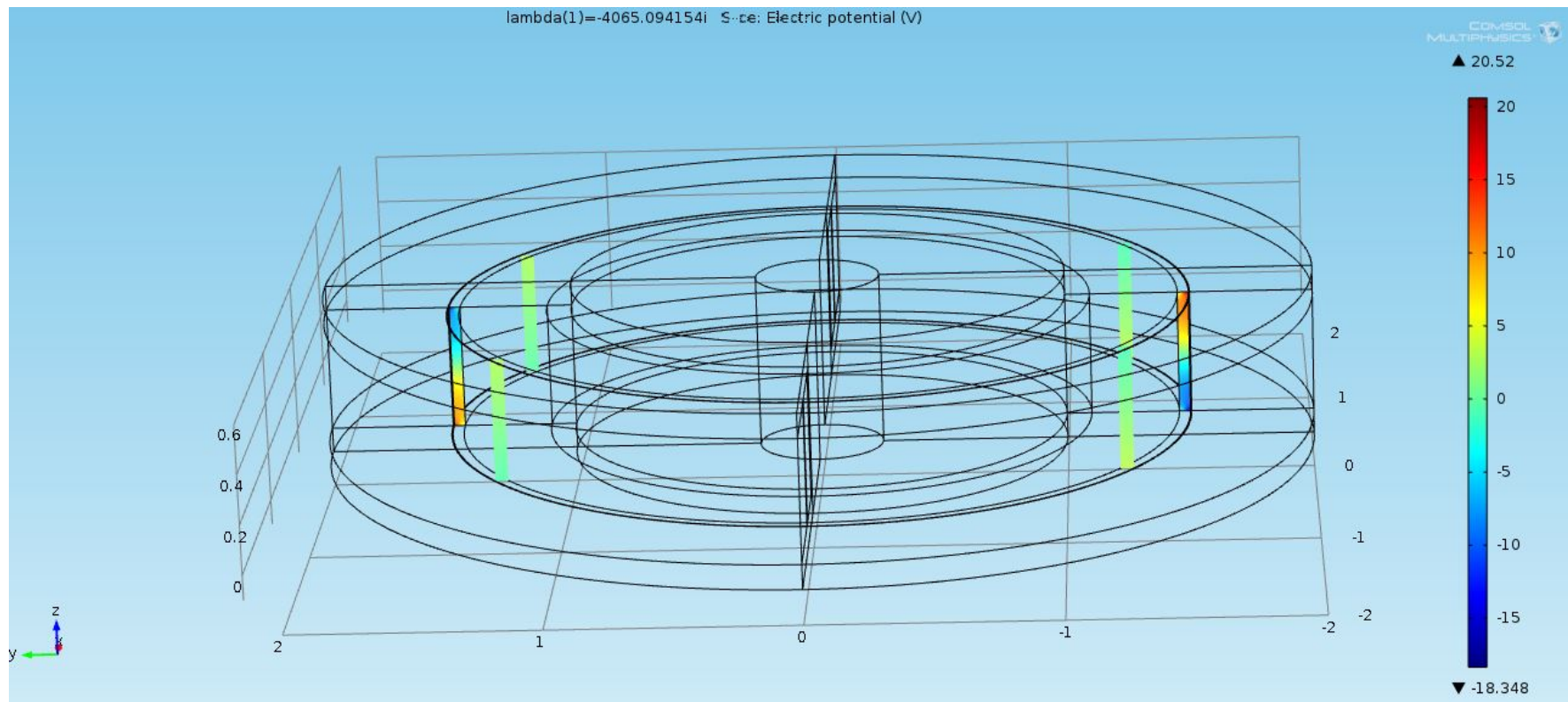
In simulation thickness of piezo electric layer is changed.
The thickness of the layer is **0.01m** reduced to **0.005m**.

Deformation after simulation at road-tyre interface **25×10^{-8}**



Electric potential after simulation

A potential of **20.52v** is developed after changing the thickness of piezo electric layer.



Future scope :-

- ✓ The energy generated from piezotyres can be stored into batteries , this increases upto50% backup capacity of them.
- ✓ MEMS technology can be used in designing of piezoelectric layer in the tyre so that efficiency can be increased a lot.



Conclusion :-

Though we generate small amount of energy. This is very valuable at present Scenario

Piezoelectric effect is an excellent property, we should design devices that make use of this property to generate energy.

ACKNOWLEDGEMENT

***We have done this job in MEMS lab of
LAKIREDDY BALI REDDY COLLEGE OF
ENGINEERING under the guidance of
Dr. k.srinivasa rao***

***We were privileged to experience a sustained
enthusiastic and involved interest from his side.***



Your Queries Please!!!



