

# Tunable MEMS Capacitor for mm and $\mu\text{M}$ Wave Generation

Arpita Das<sup>1</sup>, Amrita Nandy<sup>1</sup>, Sakuntala Mahapatra<sup>1</sup>, Sk. Mohammed Ali<sup>1</sup>, Minu samantary<sup>1</sup>

<sup>1</sup>National MEMS design centre, Department of Electronics and Telecommunication, Trident Academy of Technology, Biju Pattnaik University of Technology, India  
Email: alimohammed4@gmail.com

## Introduction:

The prime intention is the generation of mM and  $\mu\text{M}$  waves by employing a mems tunable capacitor and a tunable mems inductor. These days devices based on mems technology are being concocted due to their ability of accomplishing complicated functions by performing simple tasks. The principium involved is the generation of frequency by using a LC oscillator circuit.

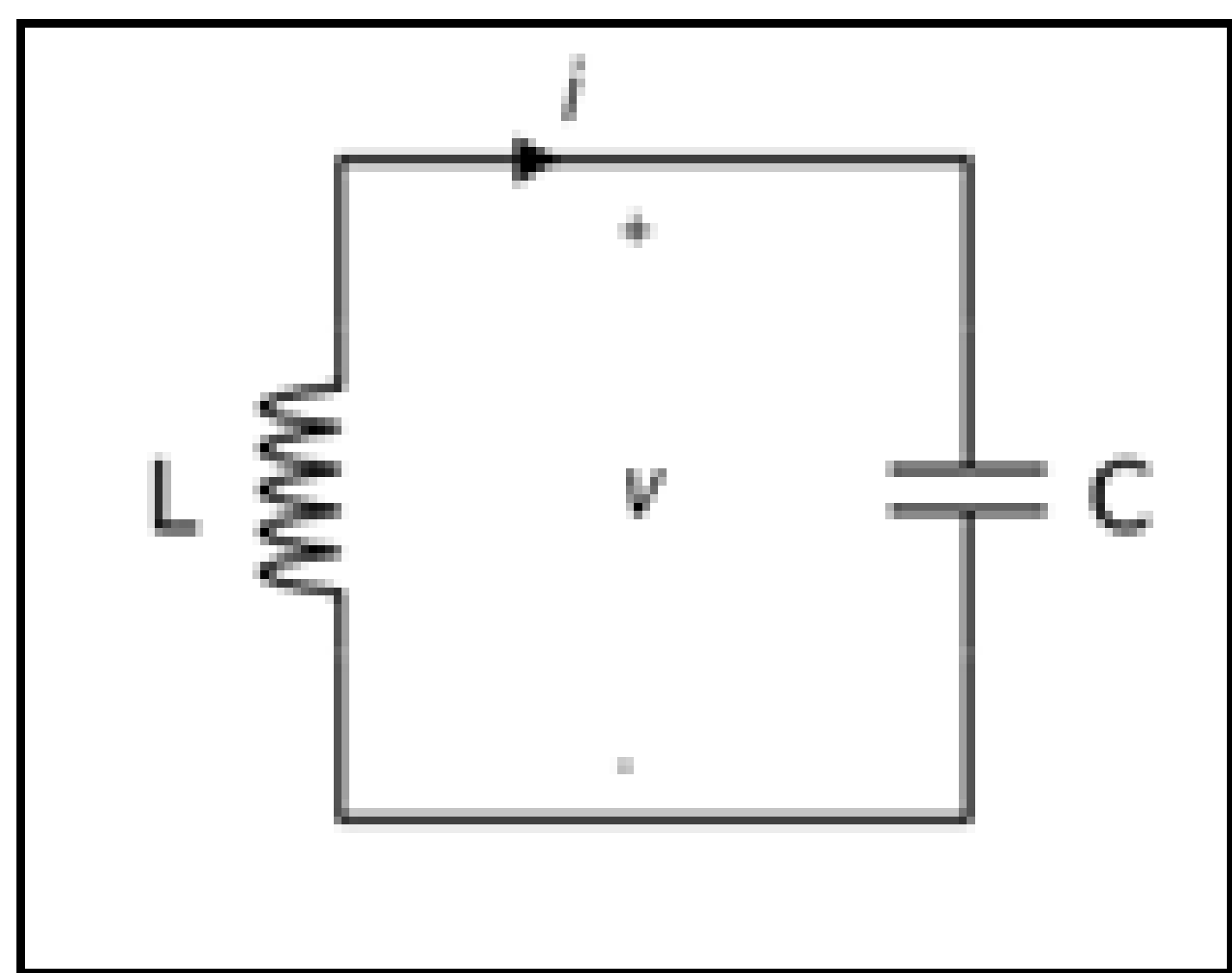


Figure 1. LC oscillator

## Computational Methods:

Electrostatic simulation of a tunable mems capacitor is carried out for a given distance. Potential boundary conditions are applied to the capacitor plates and bars. In order to have zero surface charge at the boundary, the condition  $n \cdot D = 0$  was applied. Hereafter a tunable mems inductor was designed by utilizing the model equations:

$$-\nabla \cdot (\sigma \nabla V - \mathbf{J}^e) = 0$$

$$\nabla \times (\mu_0^{-1} \mu_r^{-1} \nabla \times \mathbf{A}) + \sigma \nabla V = \mathbf{J}^e$$

## Results :

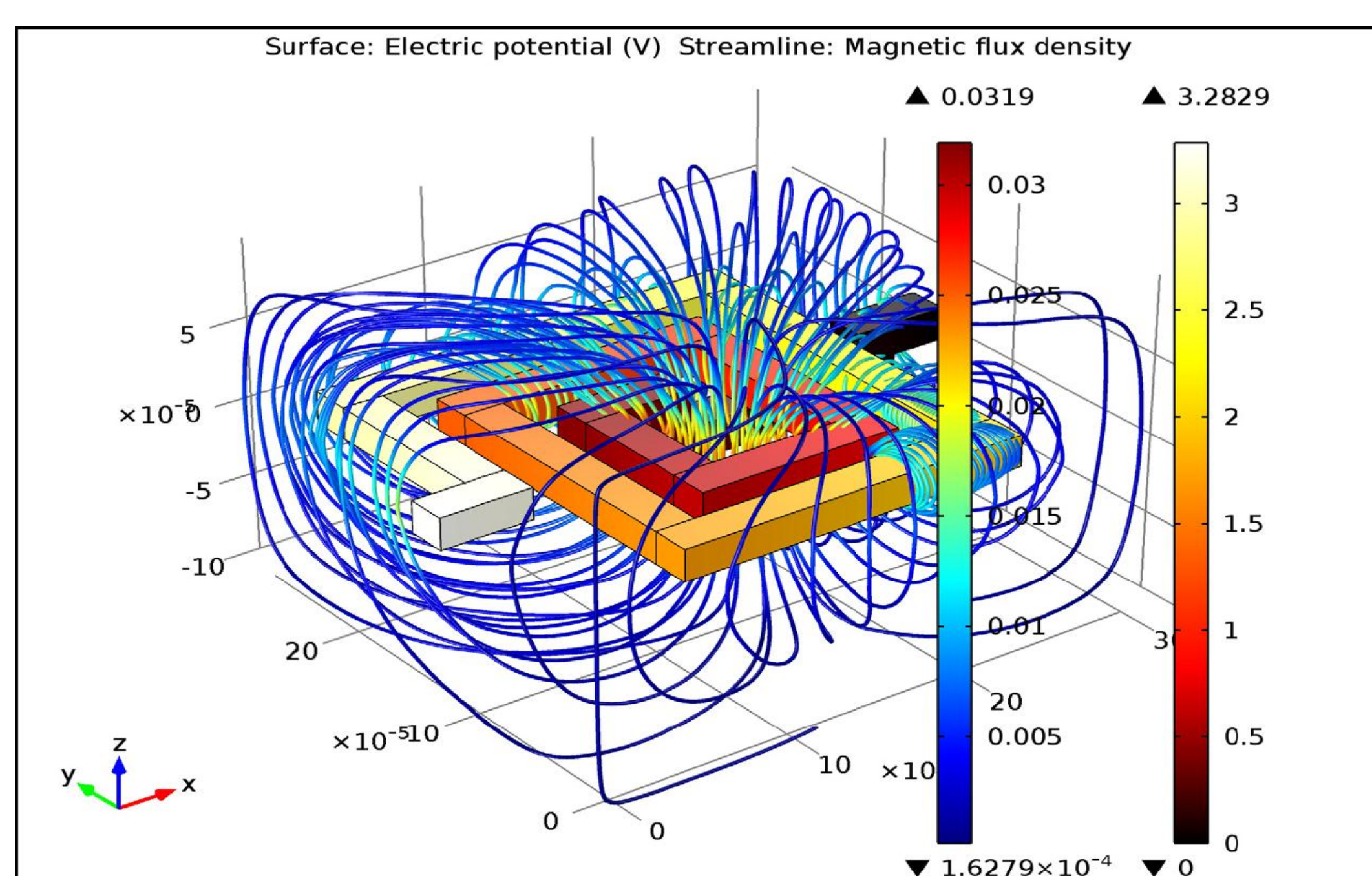


Figure 2. Tunable mems inductor

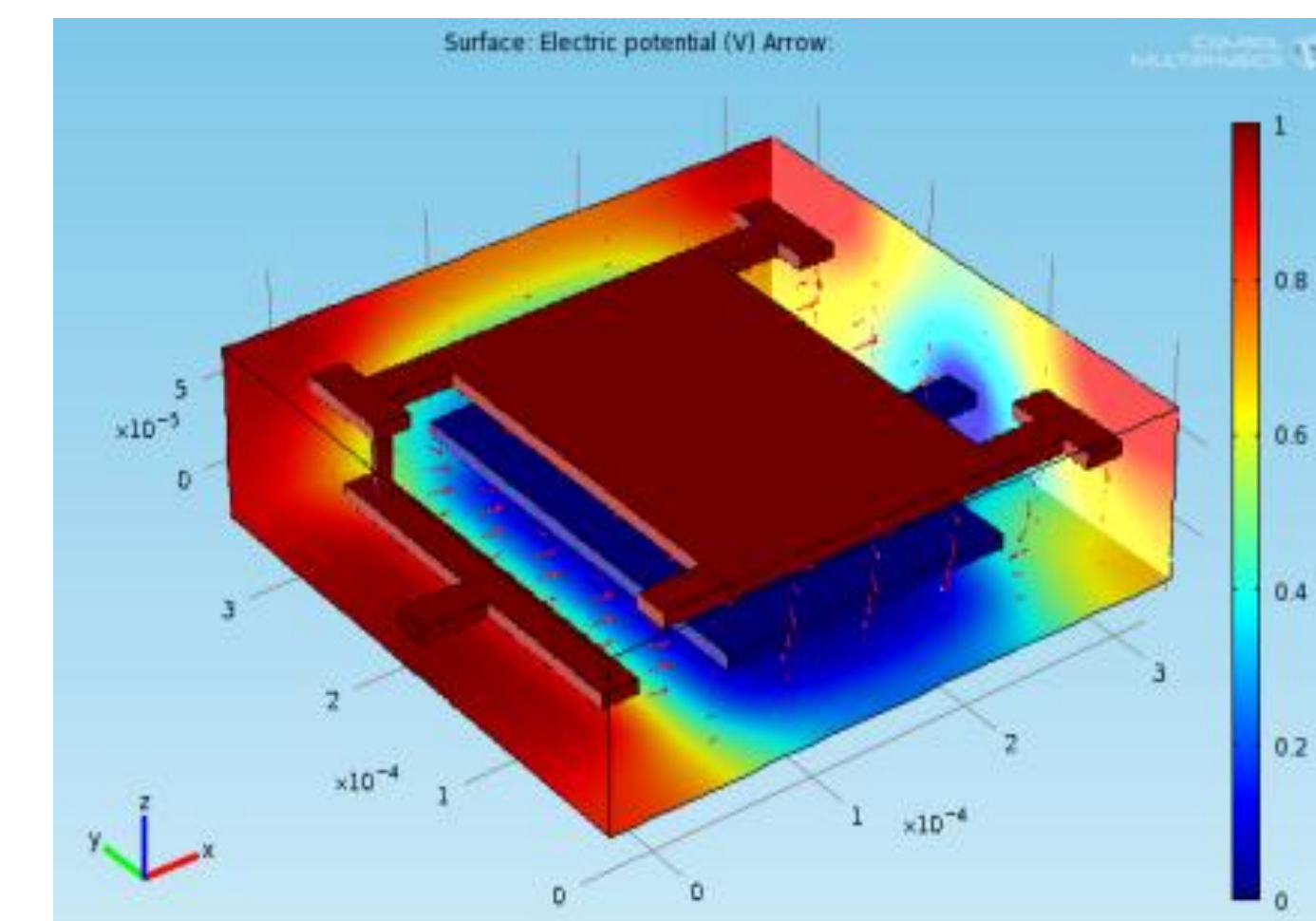


Figure 3. Tunable mems capacitor

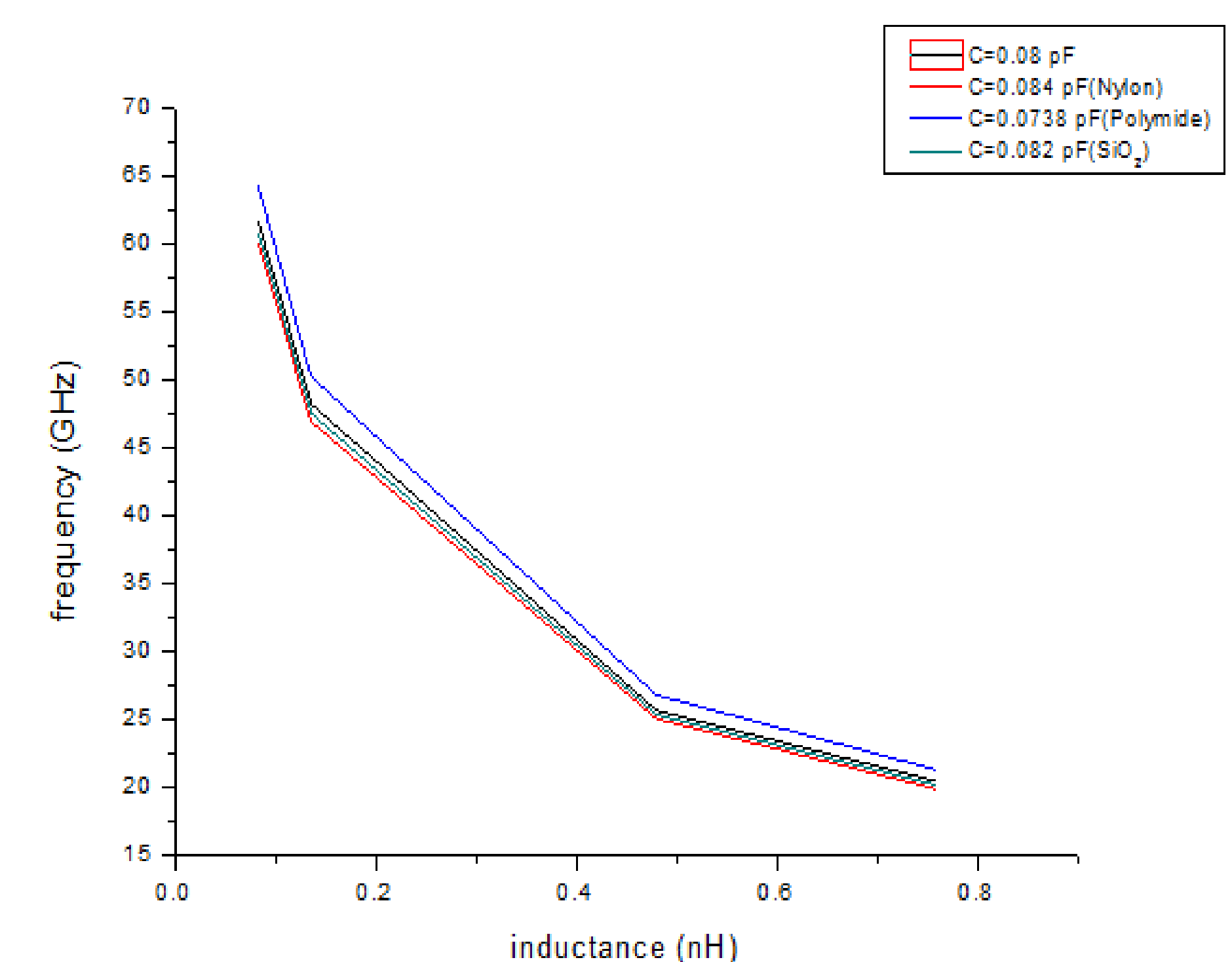


Figure 4. Frequency v/s inductance

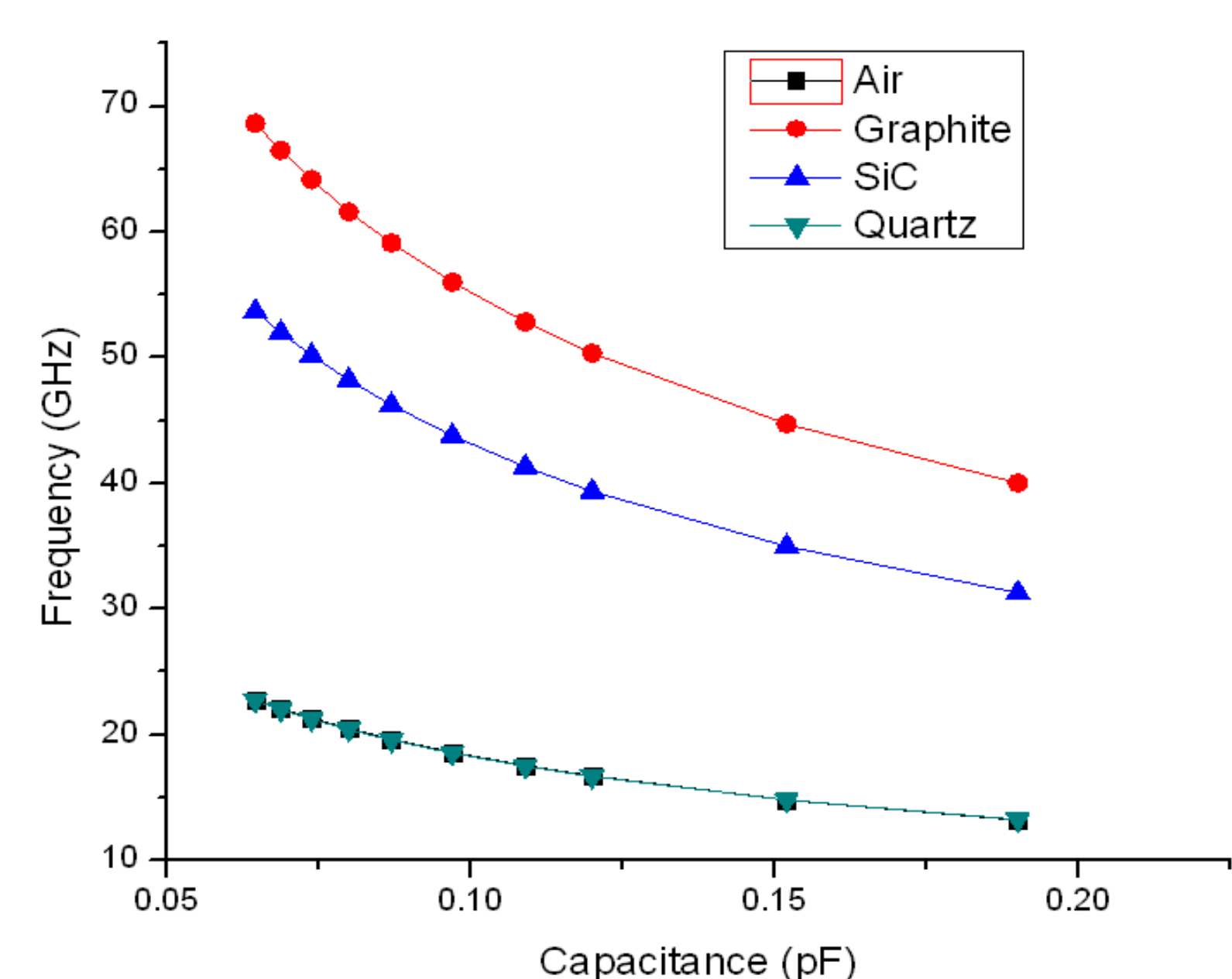


Figure 5. Frequency v/s capacitance

**Conclusion:** The experiment is carried out by varying the capacitance and inductance value and hence we are obtaining high frequency range, which can be useful in mM and  $\mu\text{M}$  wave generation.

## References:

1. Z. Xiao, W. Peng, R.F. Wolffenbuttel, and K.R. Farmer, "Micromachined variable capacitors with wide tuning range," Sensors and Actuators A 104 (2003).
2. K.F. Harsh, B. Su, W.Zhang, V.M. Bright, and Y.C. Lee, "The realization and design considerations of a flip-chip integrated MEMS tunable capacitor," Sensors and Actuators 80 2000.