Differential Opto-mechanical Accelerometer

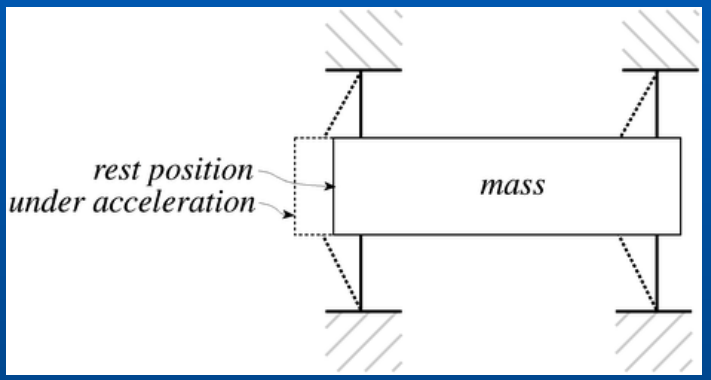
Ekalak Chaowicharat

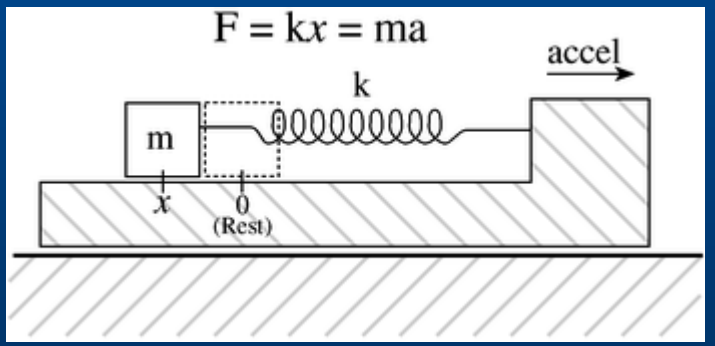
Differential Opto-mechanical Accelerometer

- Theory of Accelerometer
- Differential Opto-mechanical Accelerometer
- Fabrication Process
- Result
- Conclusion

Differential Opto-mechanical Accelerometer

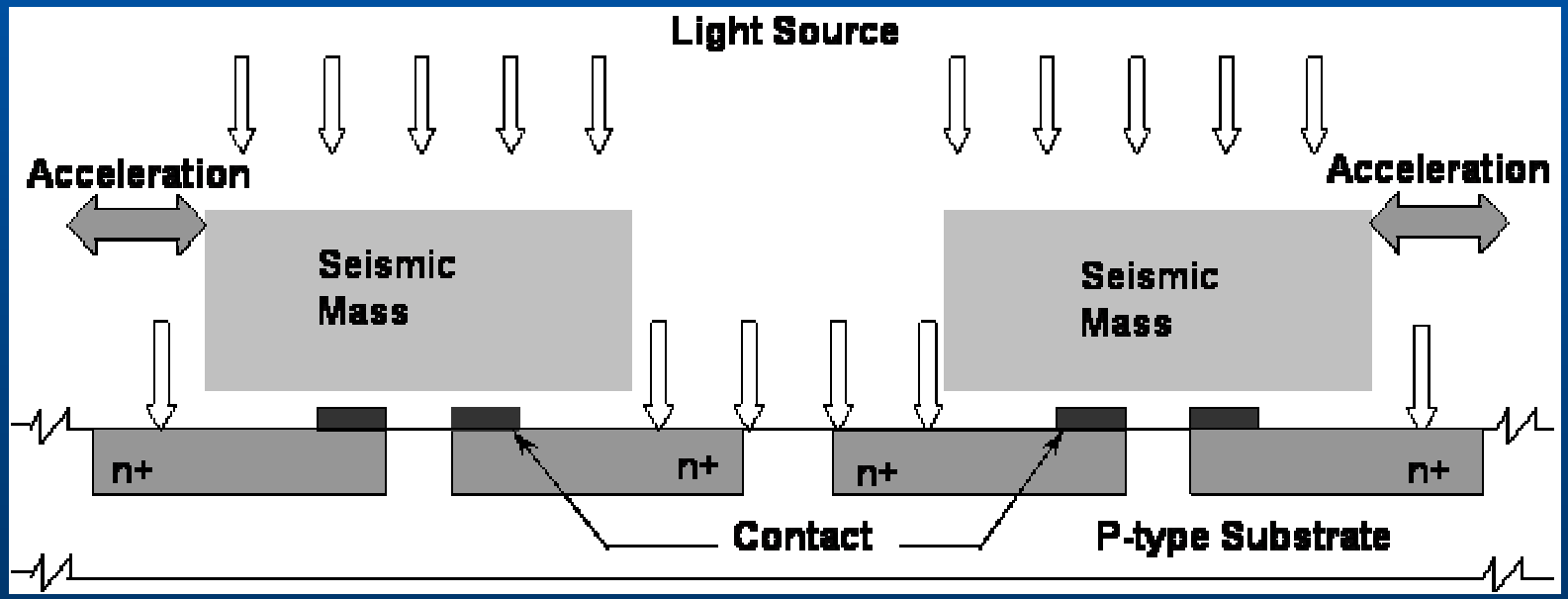
- Theoretical Background
  - Newton's Second Law
    - F = ma
  - Spring
    - F = kx





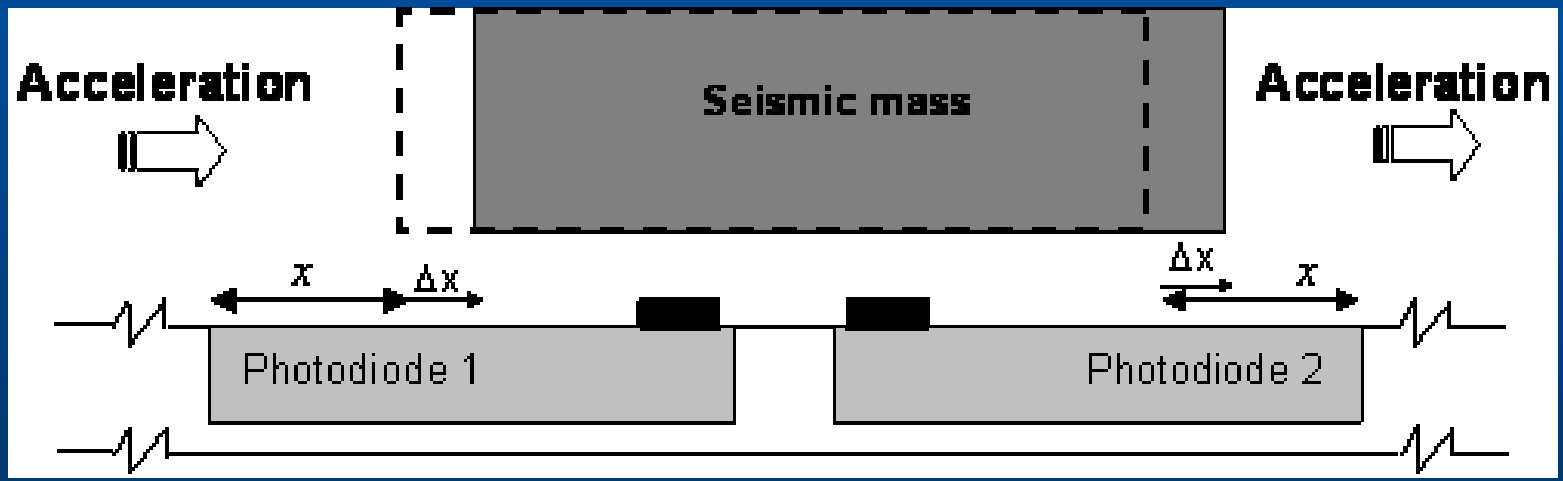
Differential Opto-mechanical Accelerometer

- Operating Principle



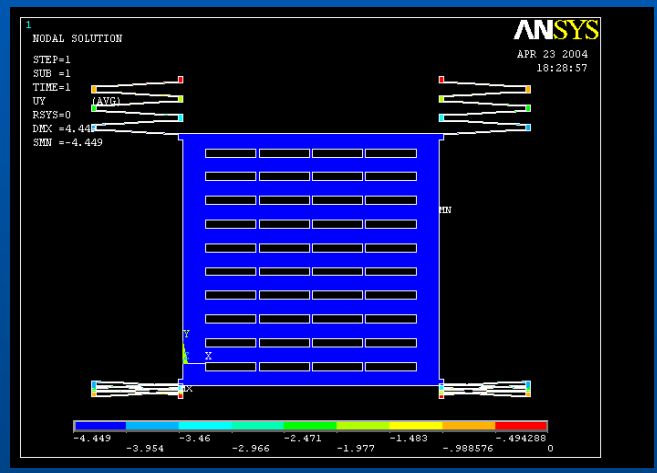
Differential Opto-mechanical Accelerometer

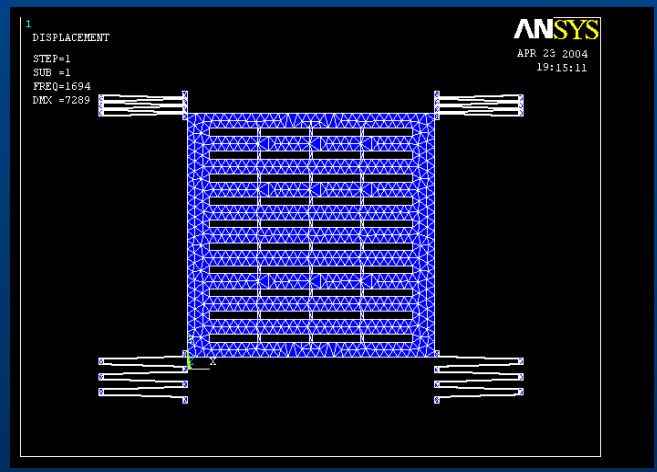
- Operating principle



Differential Opto-mechanical Accelerometer

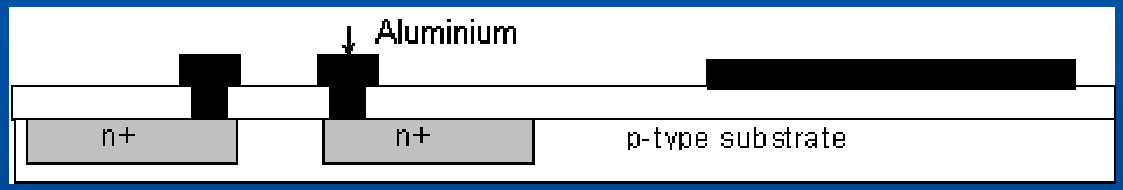
- Simulation
  - ANSYS
    - Static Analysis
      - Sensitivity
      - Linearity
    - Modal Analysis
      - Natural Frequency



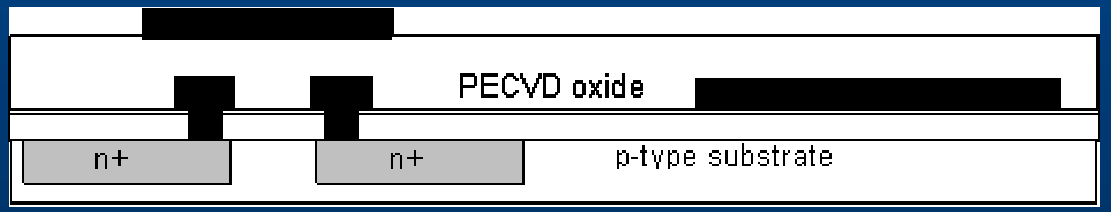


Differential Opto-mechanical Accelerometer

- Fabrication Process
  - Photodiodes
    - n+ on p-type substrate

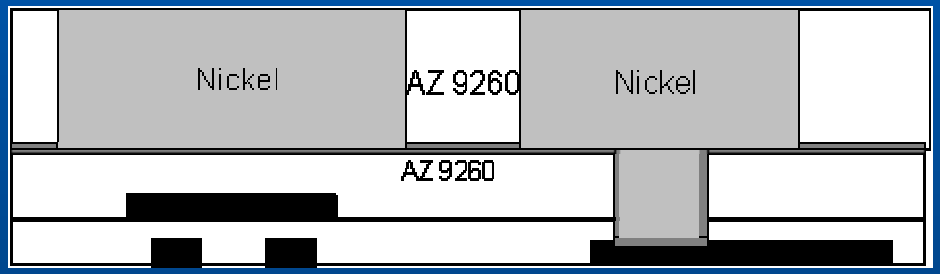


  - Antireflection Coating
    - λ/4

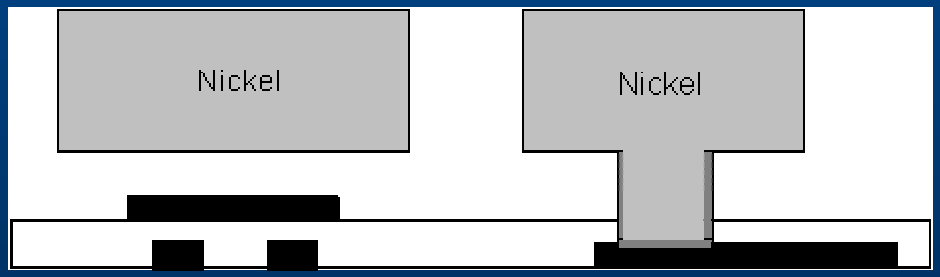


Differential Opto-mechanical Accelerometer

- Fabrication Process
  - Nickel electroplate to form seismic mass

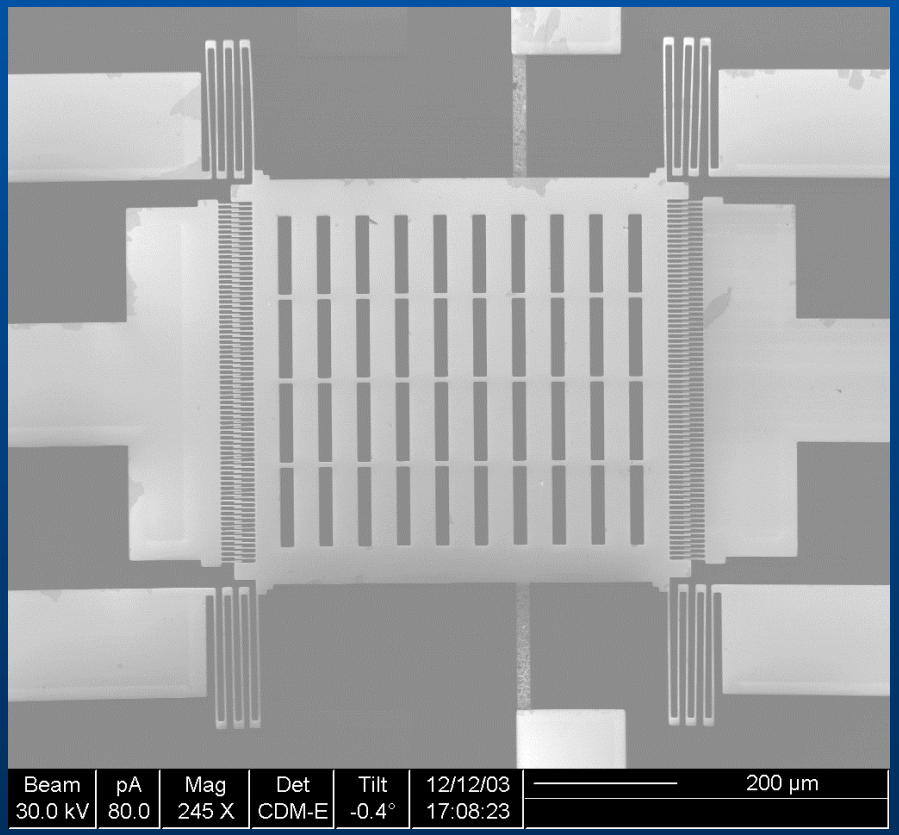


  - Removing the sacrificial layer



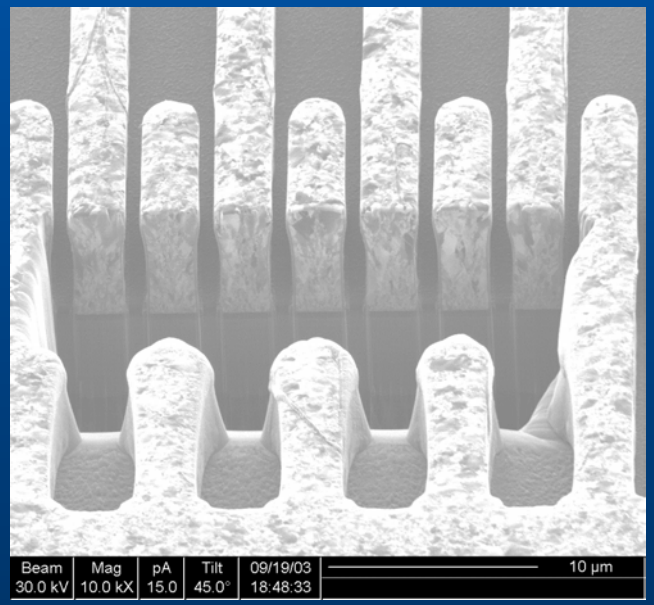
Differential Opto-mechanical Accelerometer

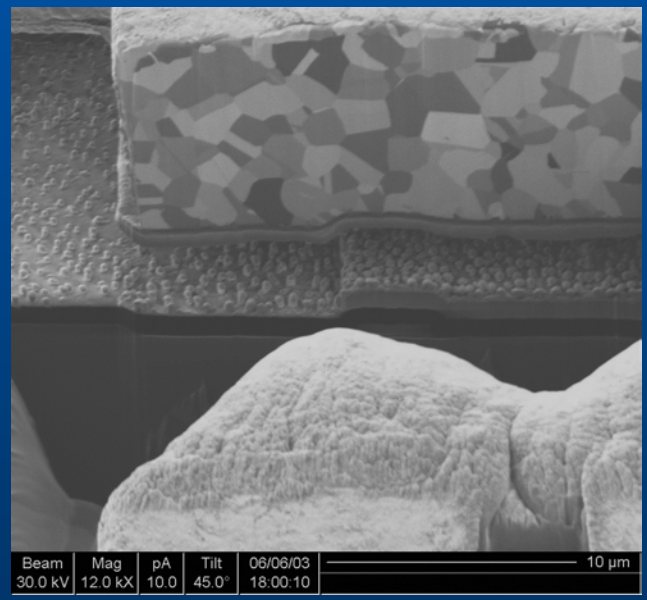
- Overall Picture



Differential Opto-mechanical Accelerometer

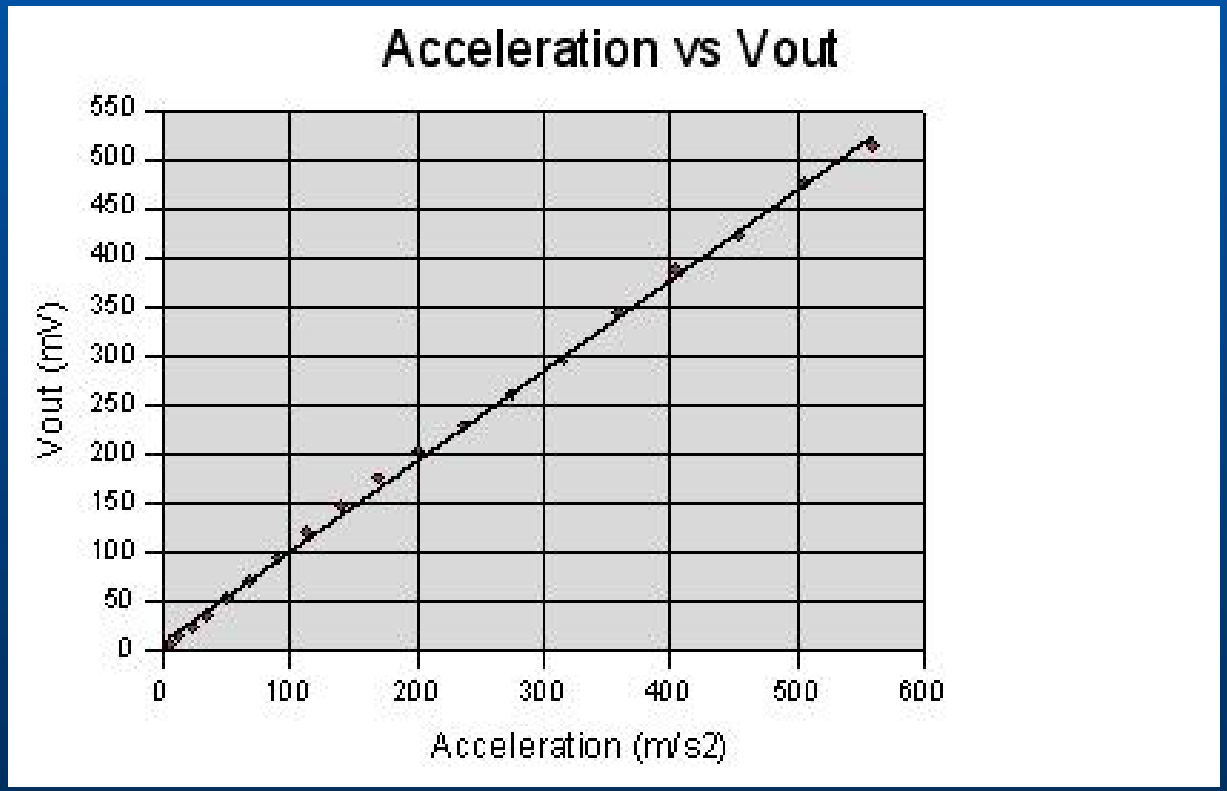
- Cross-section





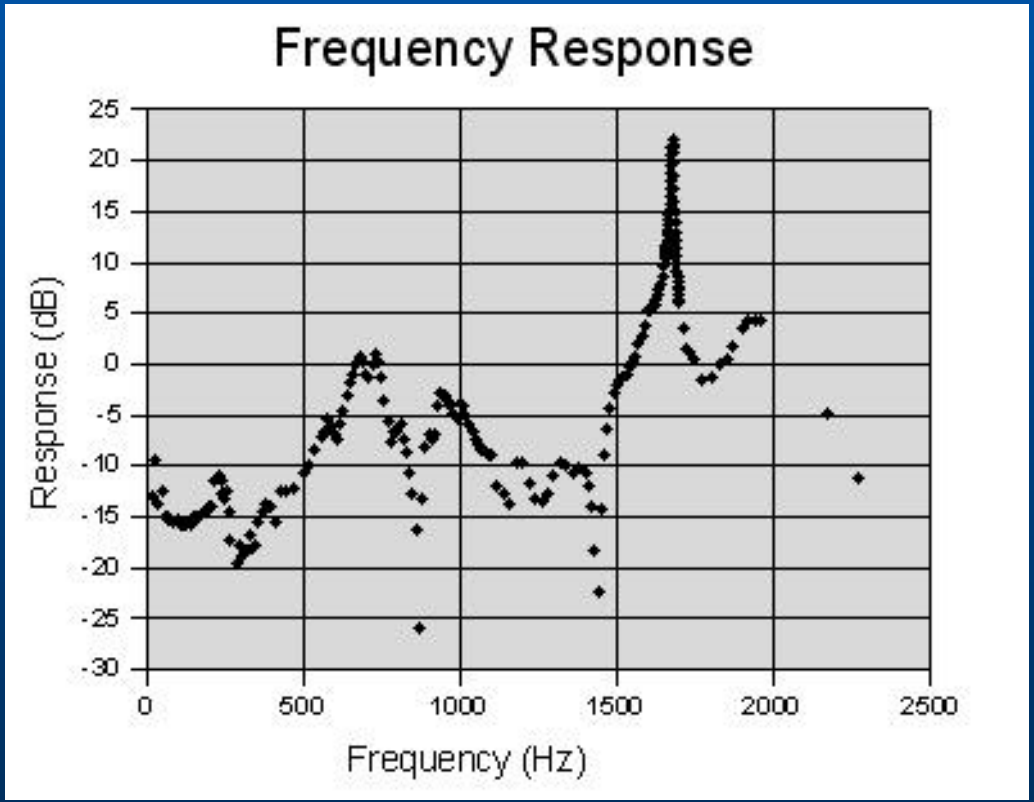
Differential Opto-mechanical Accelerometer

- Static Response



Differential Opto-mechanical Accelerometer

- Dynamic Response



Differential Opto-mechanical Accelerometer

- Summary
  - Opto-mechanical detection
  - Nickel electroplate seismic mass
  - Sensitivity
  - Resonant Frequency