Design and Construction of a Laser Interferometer to Study Thin Metal Films

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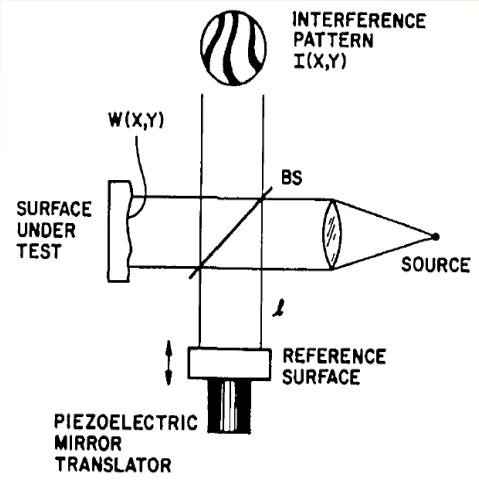
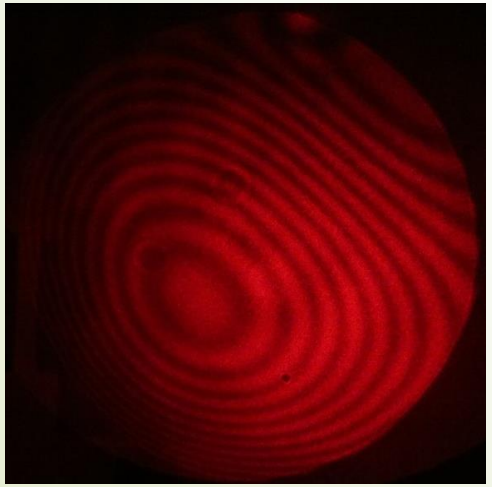
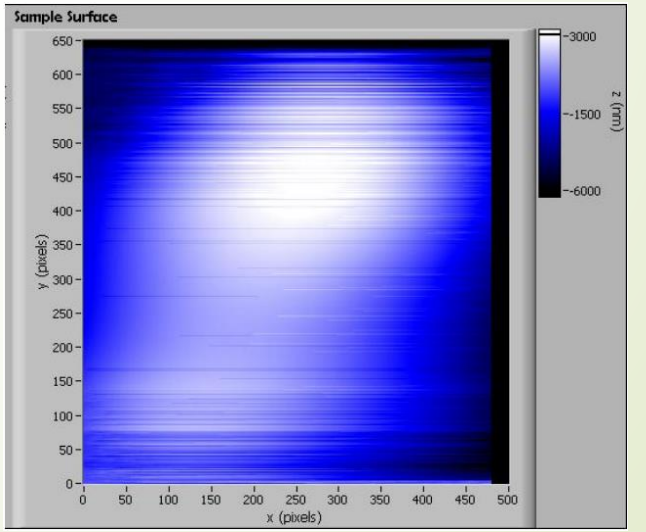
Outline

omicron-lab.com



Twyman-Green Interferometer



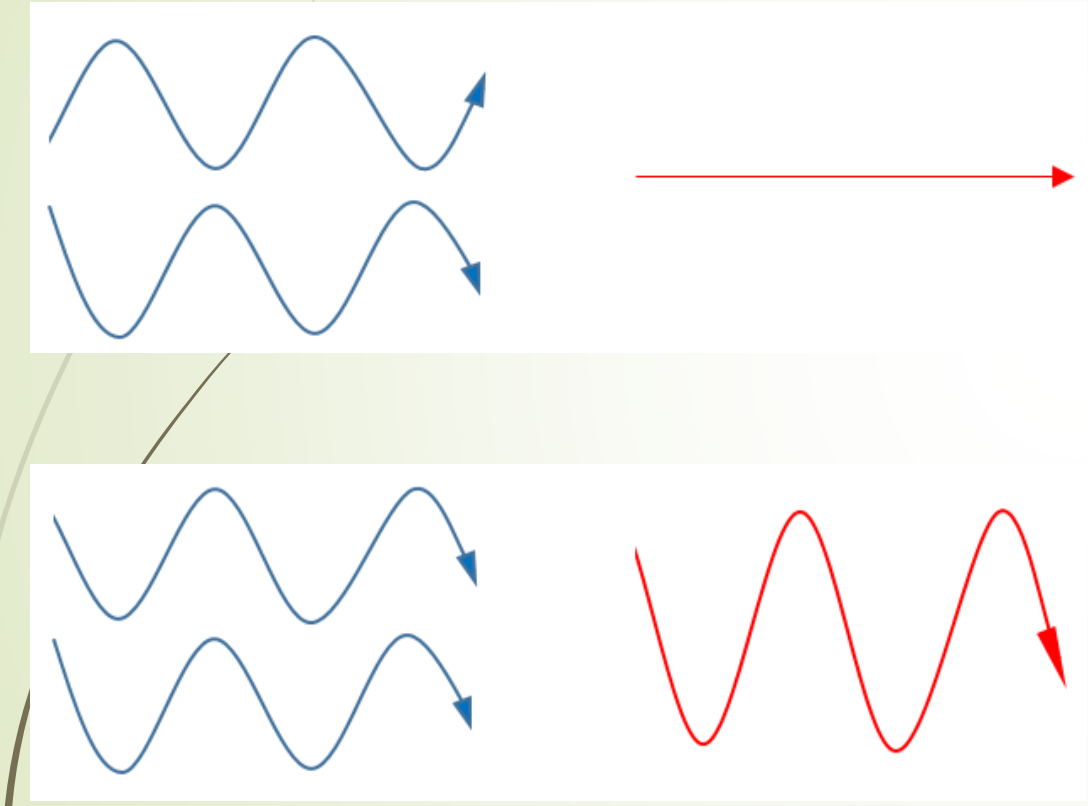


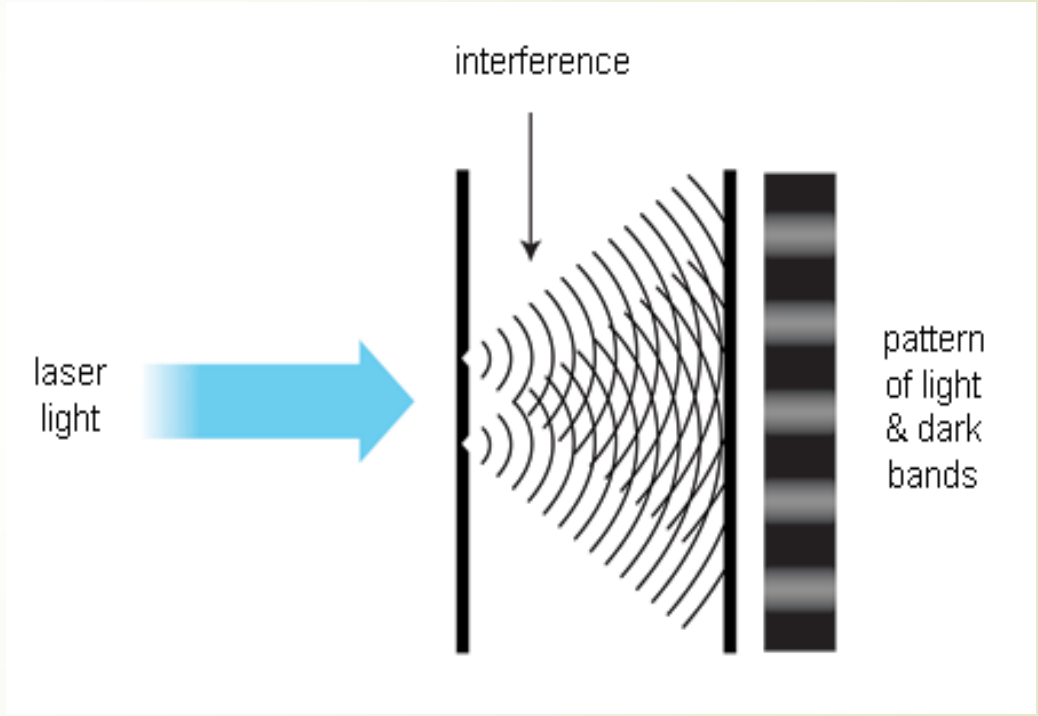
Thin Film Applications

Computer-builder.com

pngimg.com

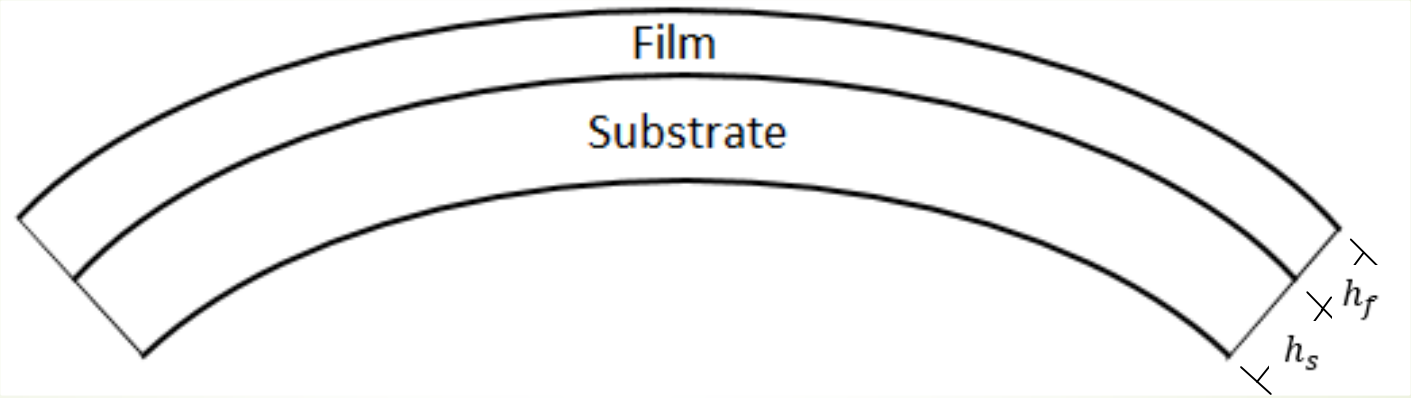
Theory





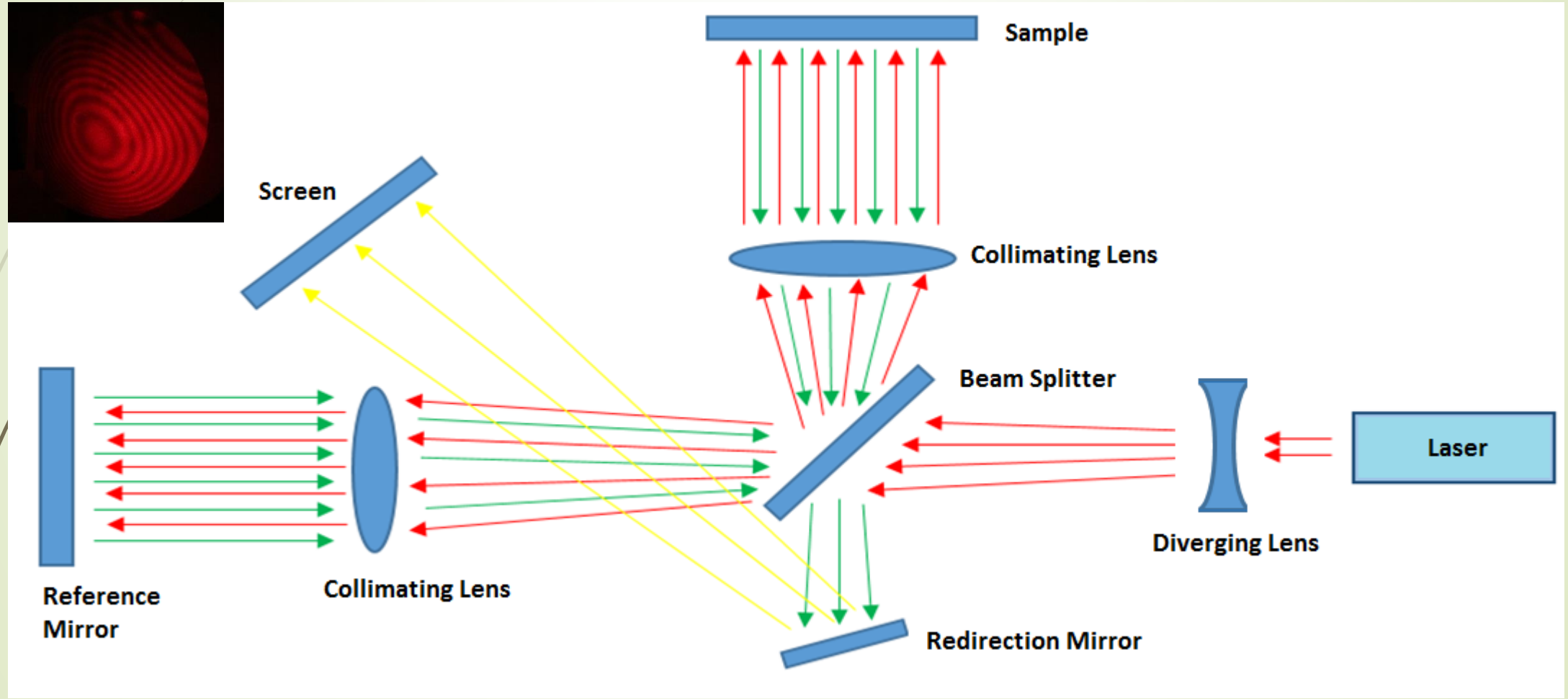
www.bbc.co.uk

Stoney Formula

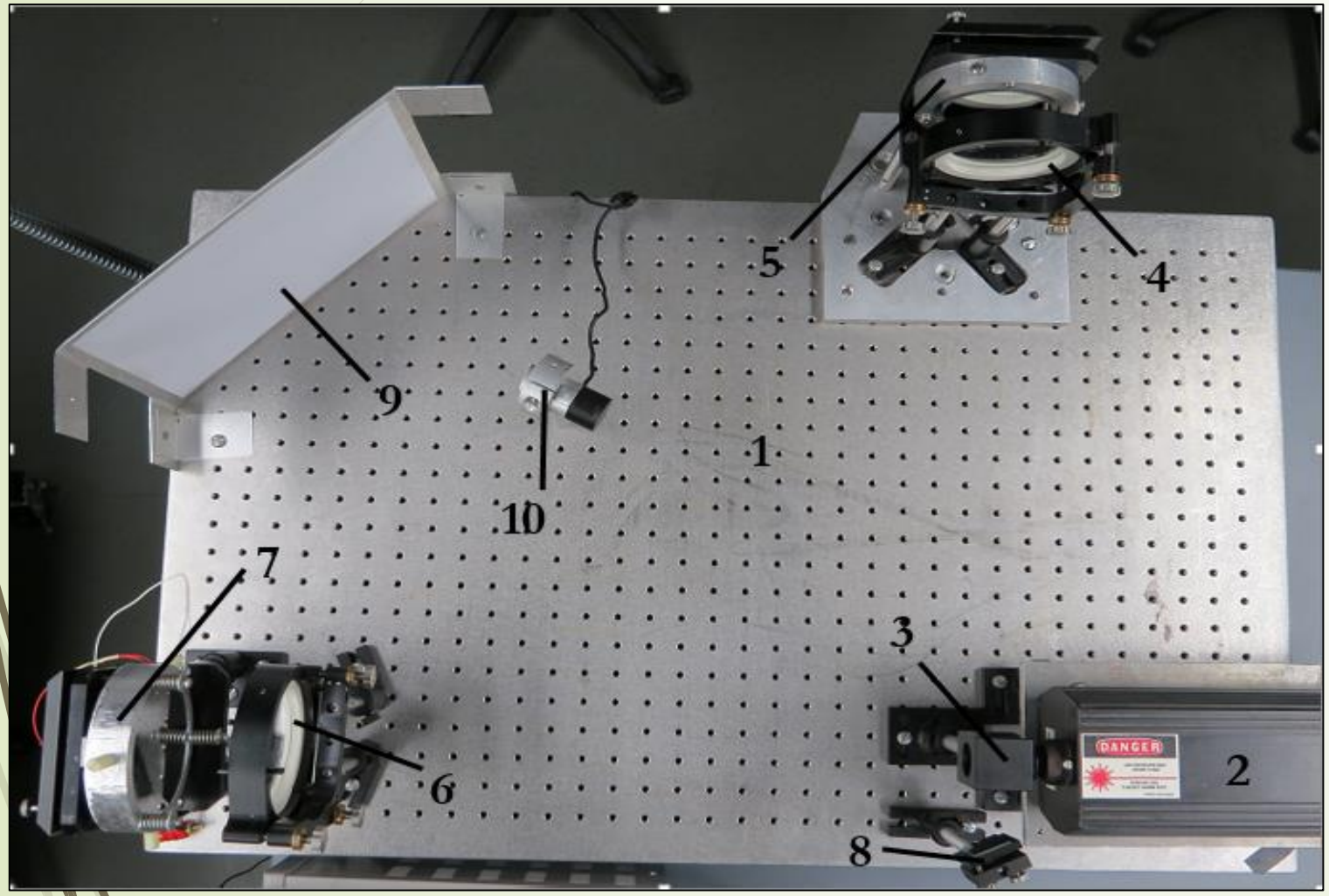


$$\sigma_{avg} = \frac{\kappa M_s {h_s}^2}{6h_f}$$

Interferometer



Houghton Interferometer



1: Optics Table

2: 632nm Laser

3: Beam Splitter

4: Sample Collimating Lens

5: Sample Mirror

6: Reference Collimating Lens

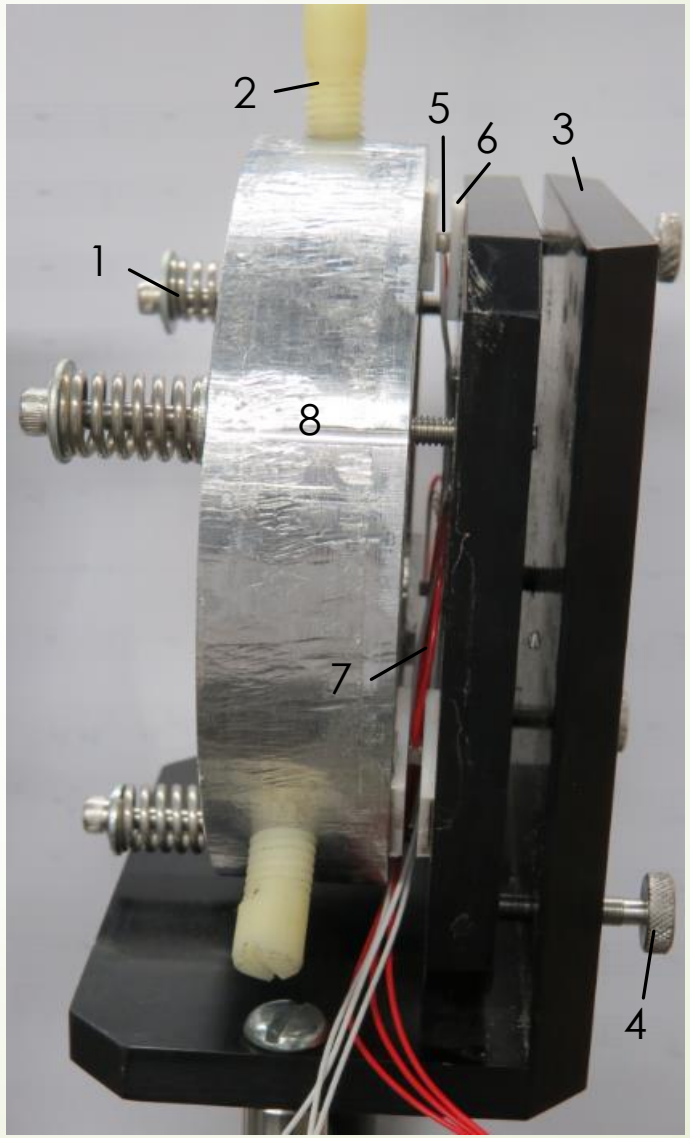
7: Reference Mirror

8: Image Redirection Mirror

9: Screen

10: Webcam

Reference Mirror



1: Compression Springs

2: Plastic Screws

3: Kinematic Mount

4: Mount Adjustment Screws

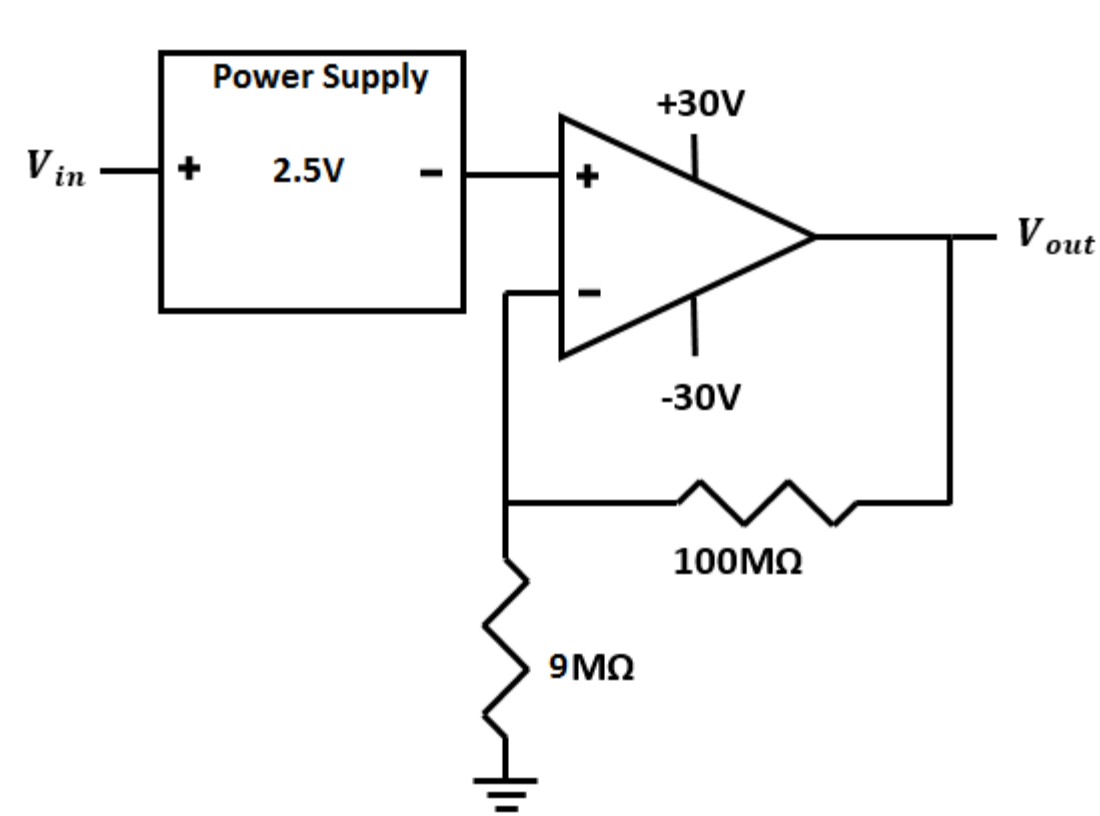
5: Piezoelectric Ceramic Actuator

6: Ceramic Buffers

7: Piezo Leads

8: Mirror Holder

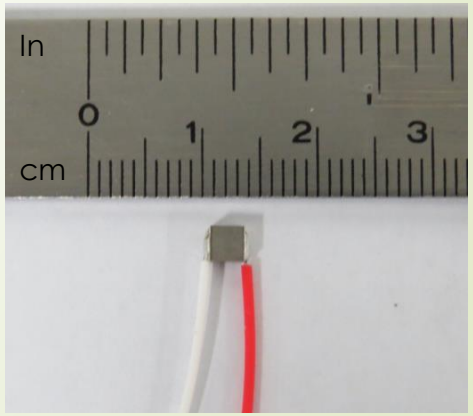
Driving the Reference Mirror



$$V_{out} = (V_{in} - 2.5V)\left(\frac{R_1 + R_2}{R_2}\right)$$

$$V_{out} = (V_{in} - 2.5V)\left(\frac{100M\Omega + 9M\Omega}{9M\Omega}\right)$$

$$V_{out} = 12.1\,(V_{in} - 2.5V)$$



Interference Pattern

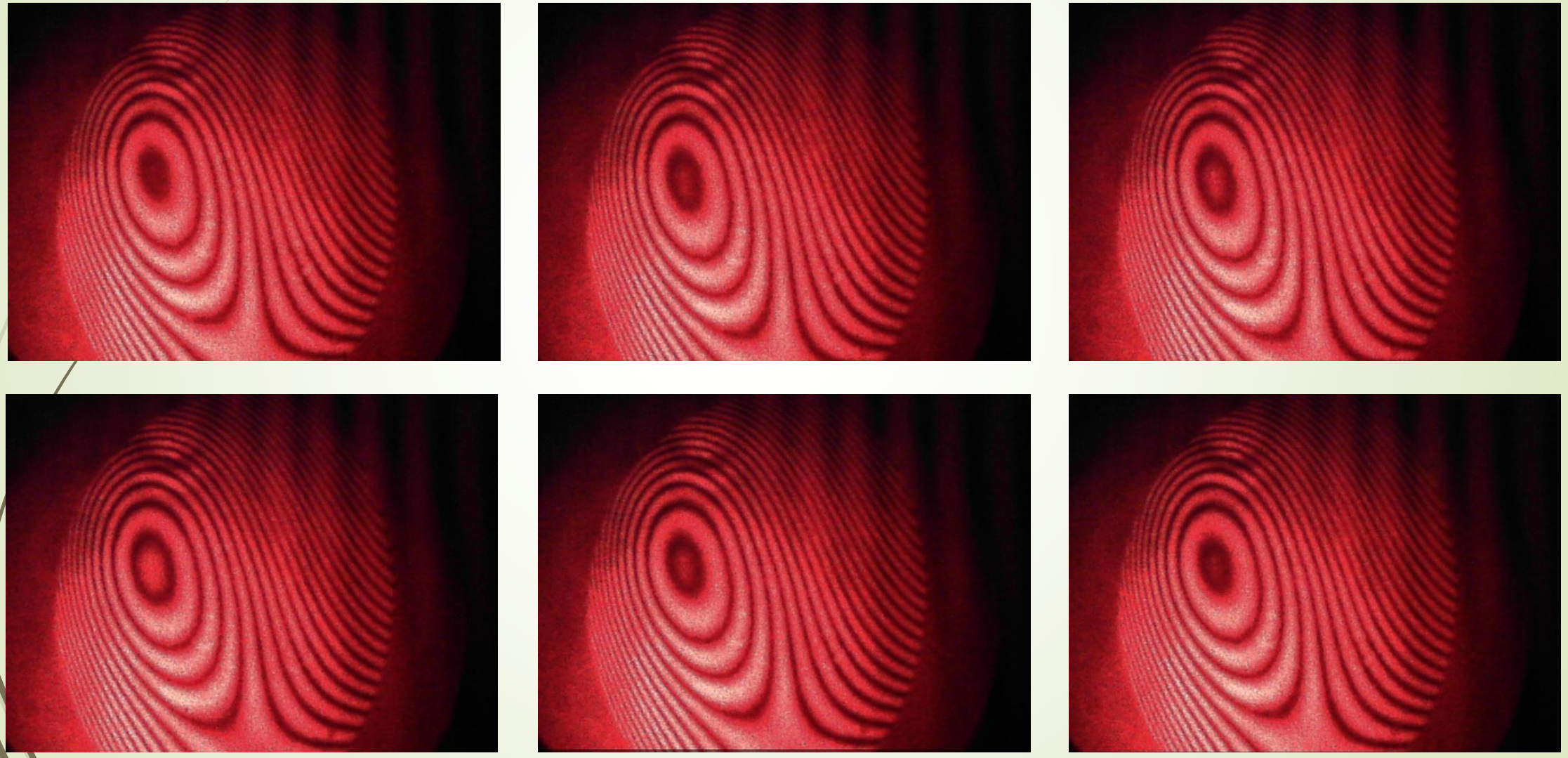
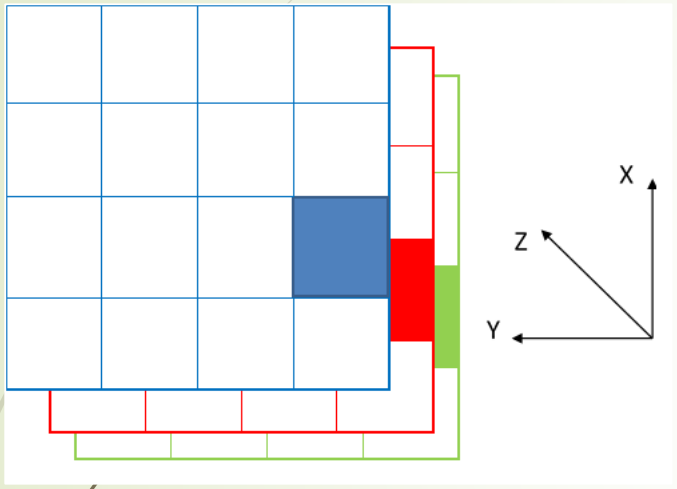
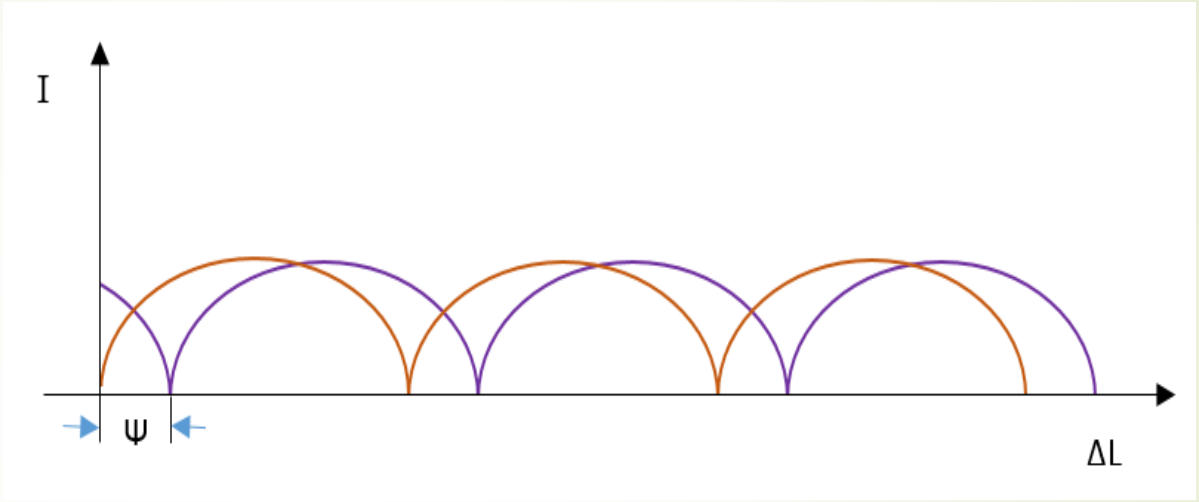
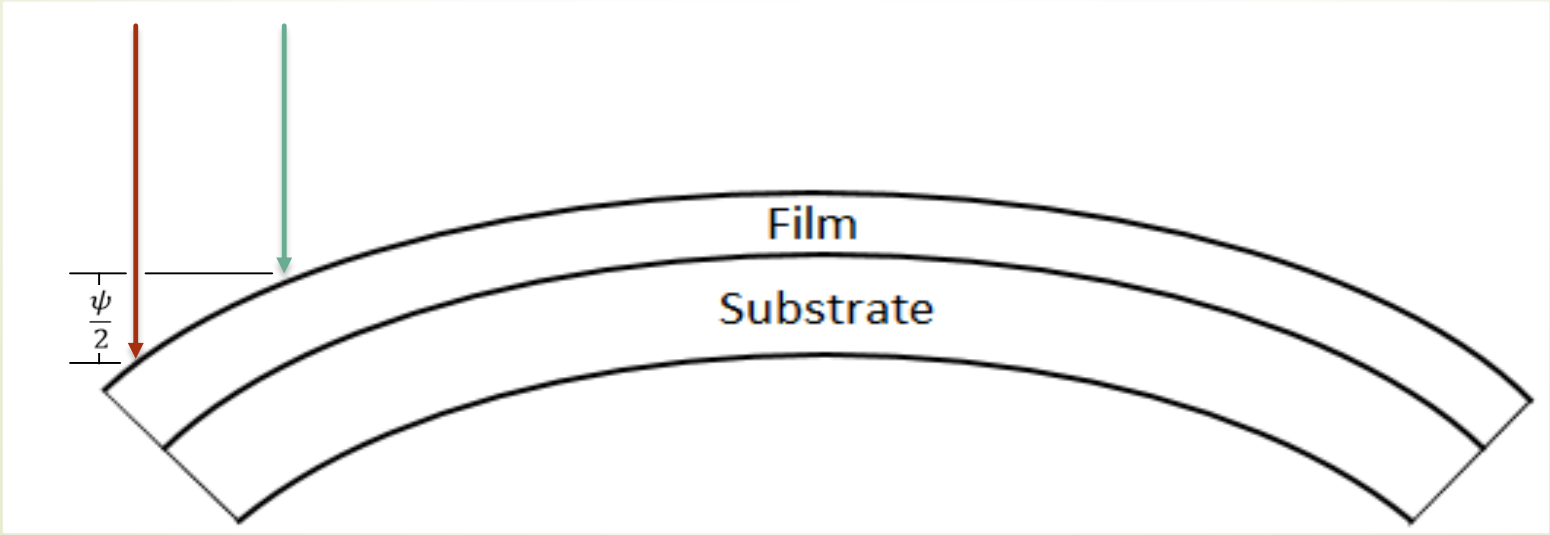


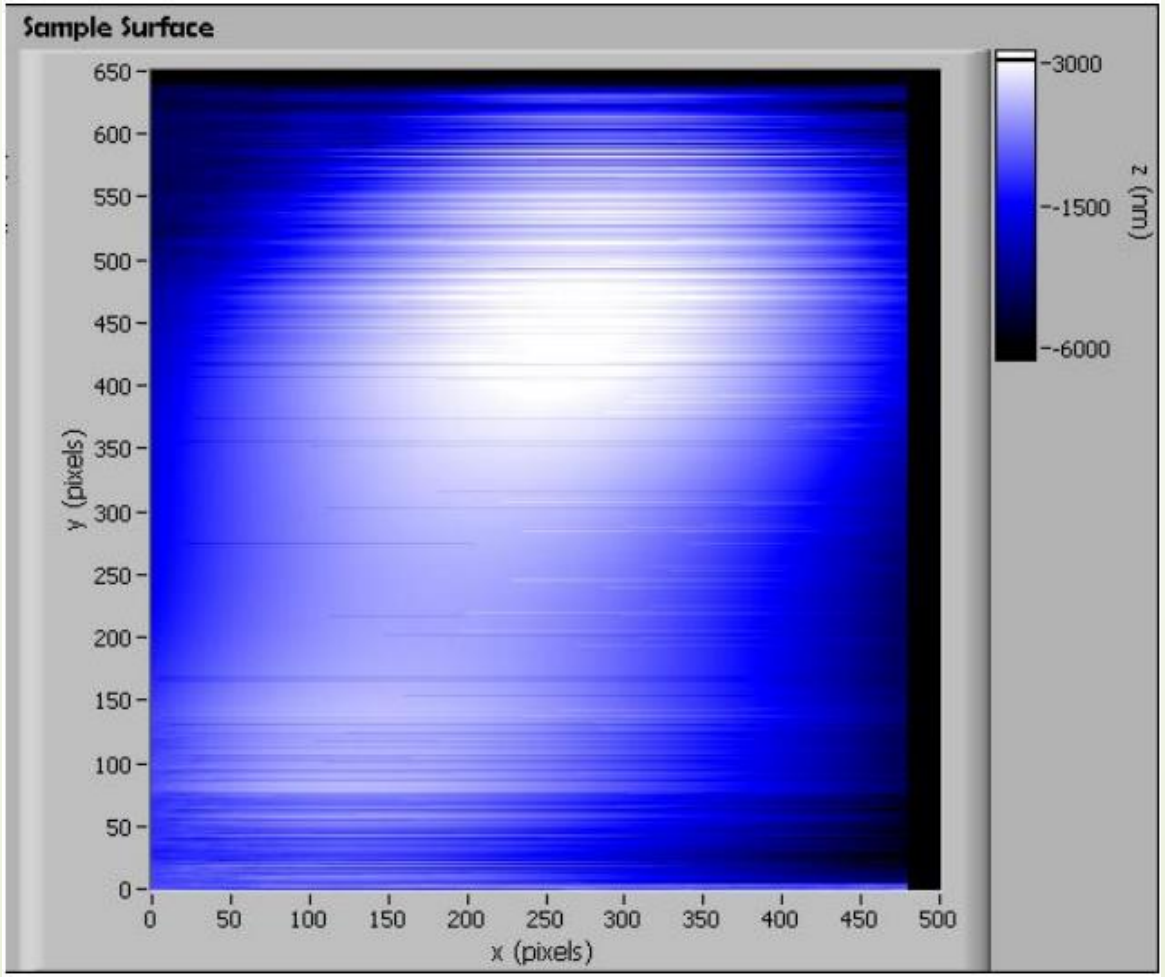
Image Analysis







Topographical Image



Current Status

- Image Stabilization
- Mount beneath Houghton College Deposition Chamber
- In-situ topographical image