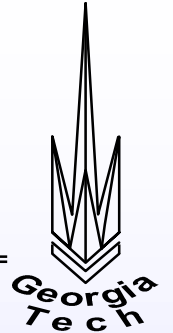


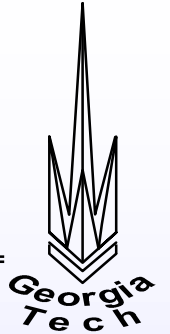
Contact Potential Difference Probe A Non-Contact Lubricant Film Sensor



Precision Machining Research Consortium
Industrial Advisory Board
Georgia Institute of Technology
29 October 1997

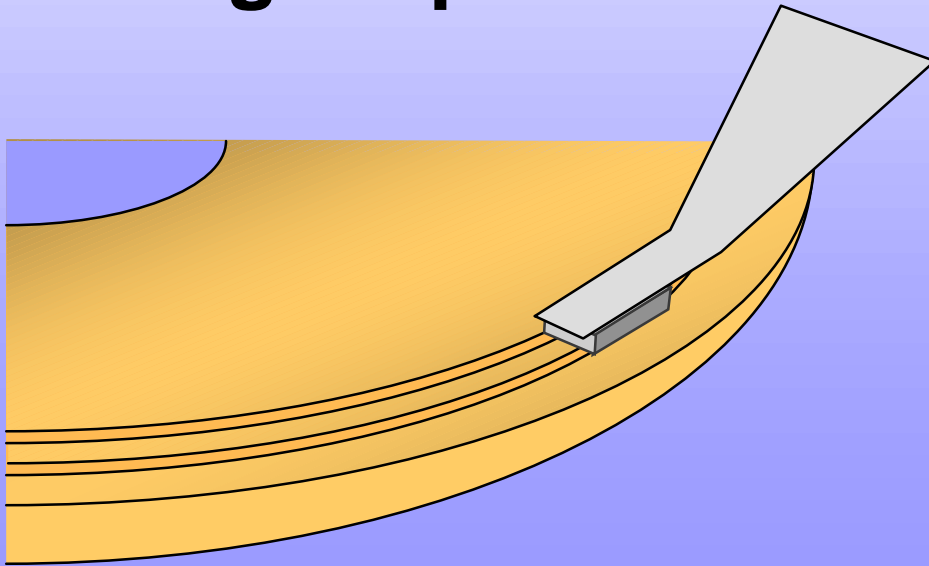
Daisuke Yano
Terry H. Thomas
Advisor: Dr. Steven Danyluk

Objective



**Development of a non-contact sensor
for wear, corrosion, and lubrication
monitoring.**

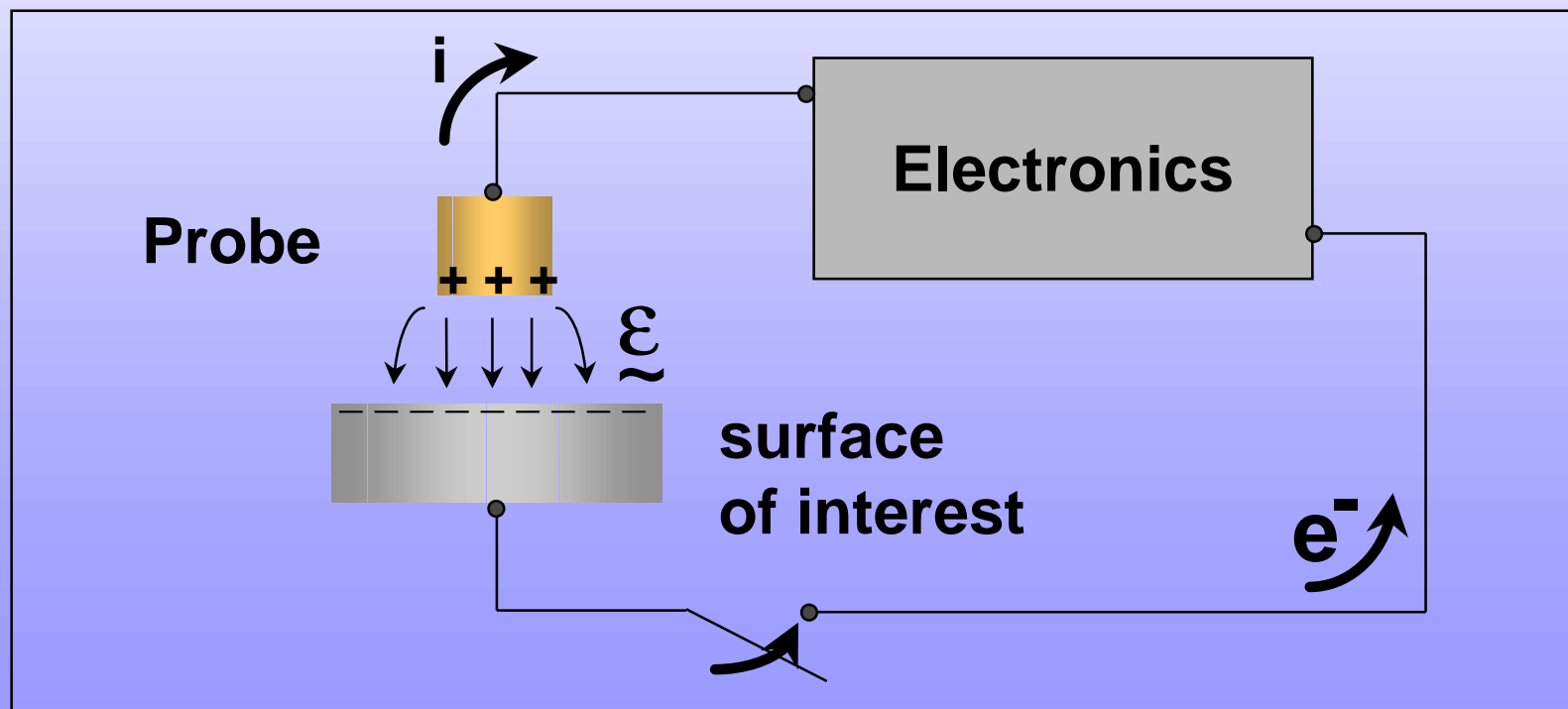
(building on prior work of Danyluk group)



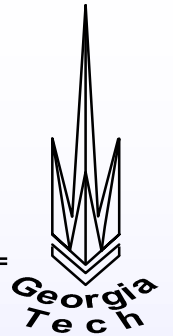
Contact Potential Difference (CPD) Sensor

New application of a Kelvin Probe

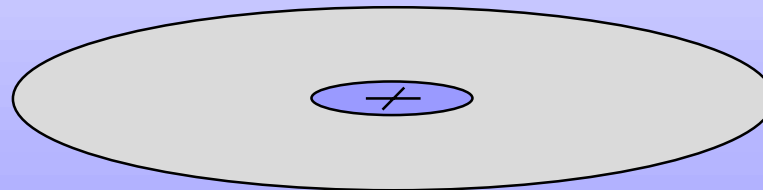
Measures electrical field between surfaces



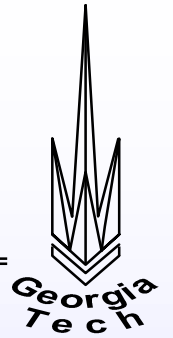
Experiment



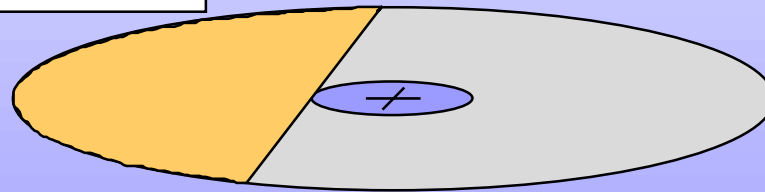
Non-Lubricated Hard Disk



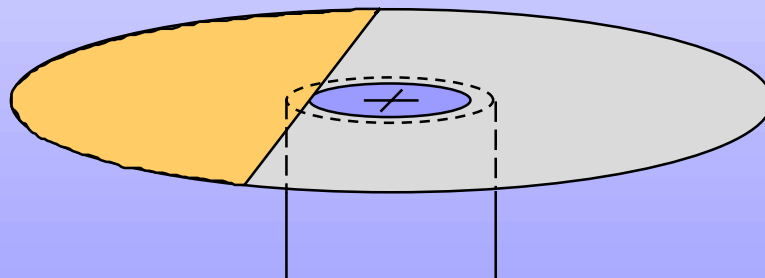
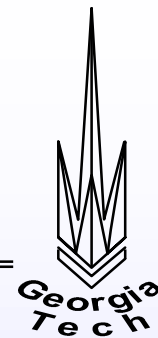
Experiment



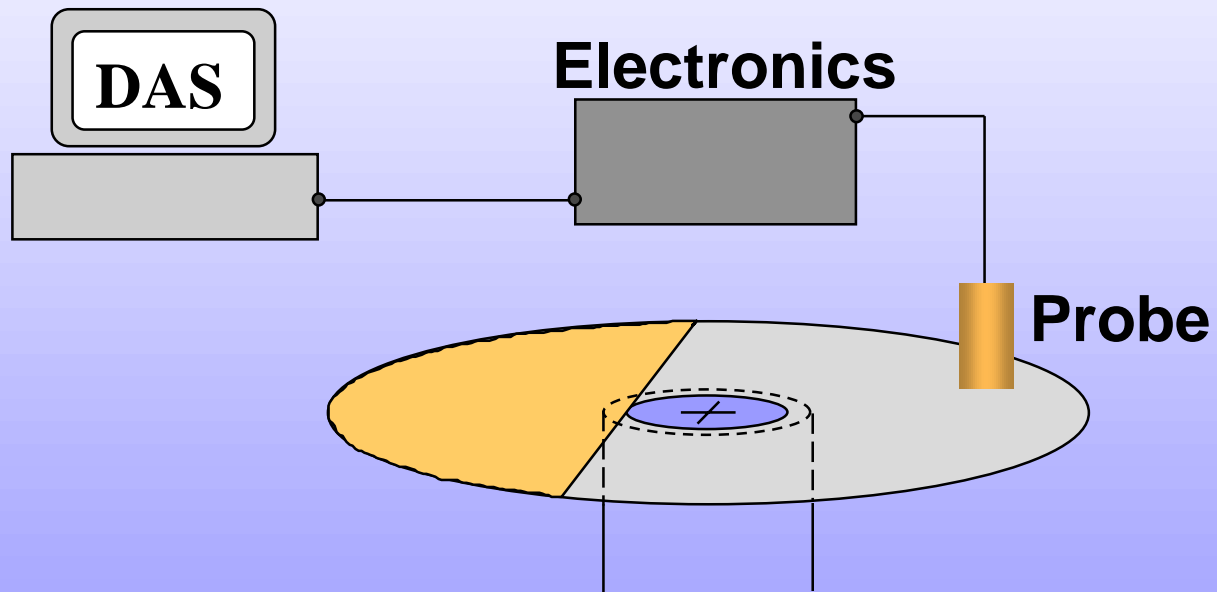
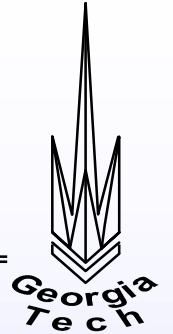
Partial Lubrication



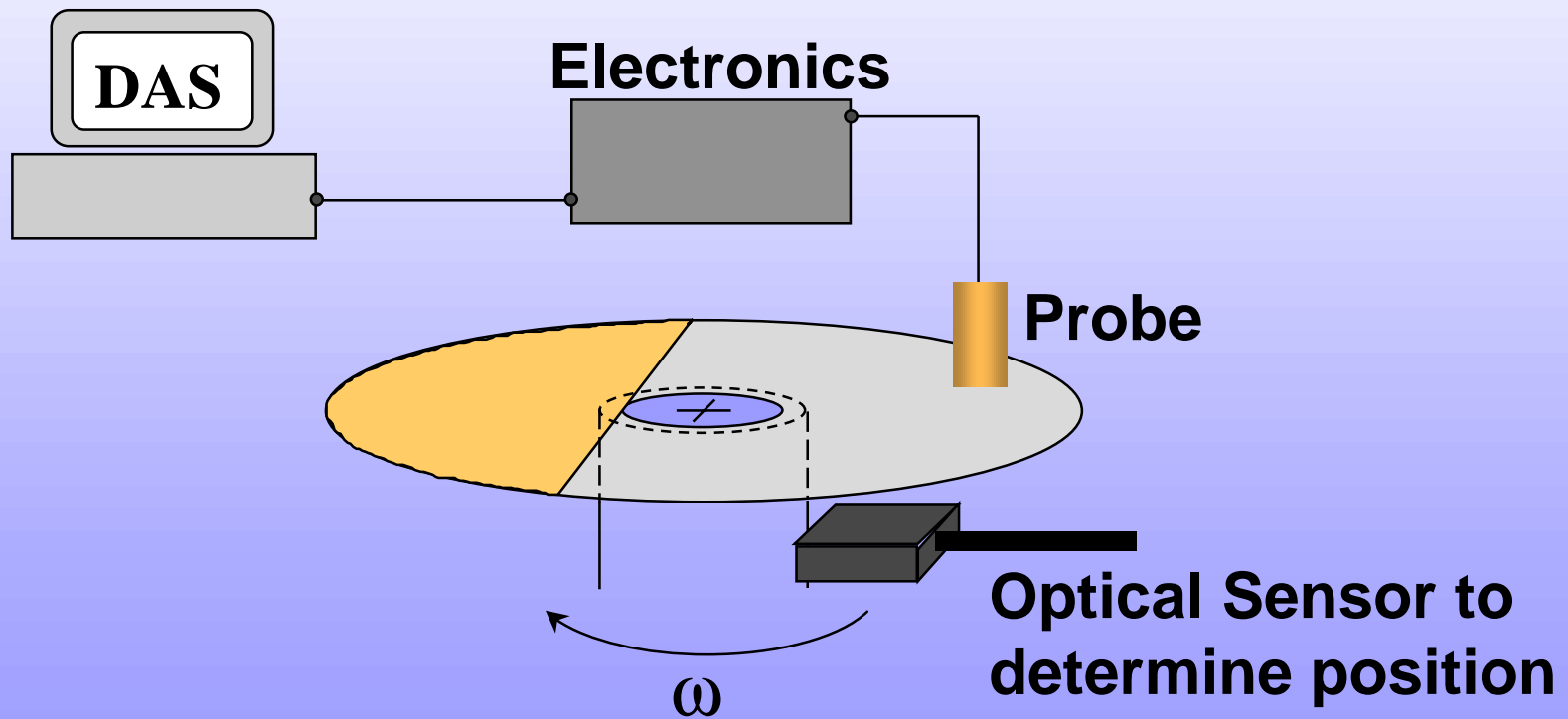
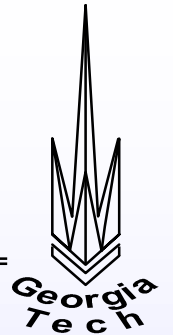
Experiment



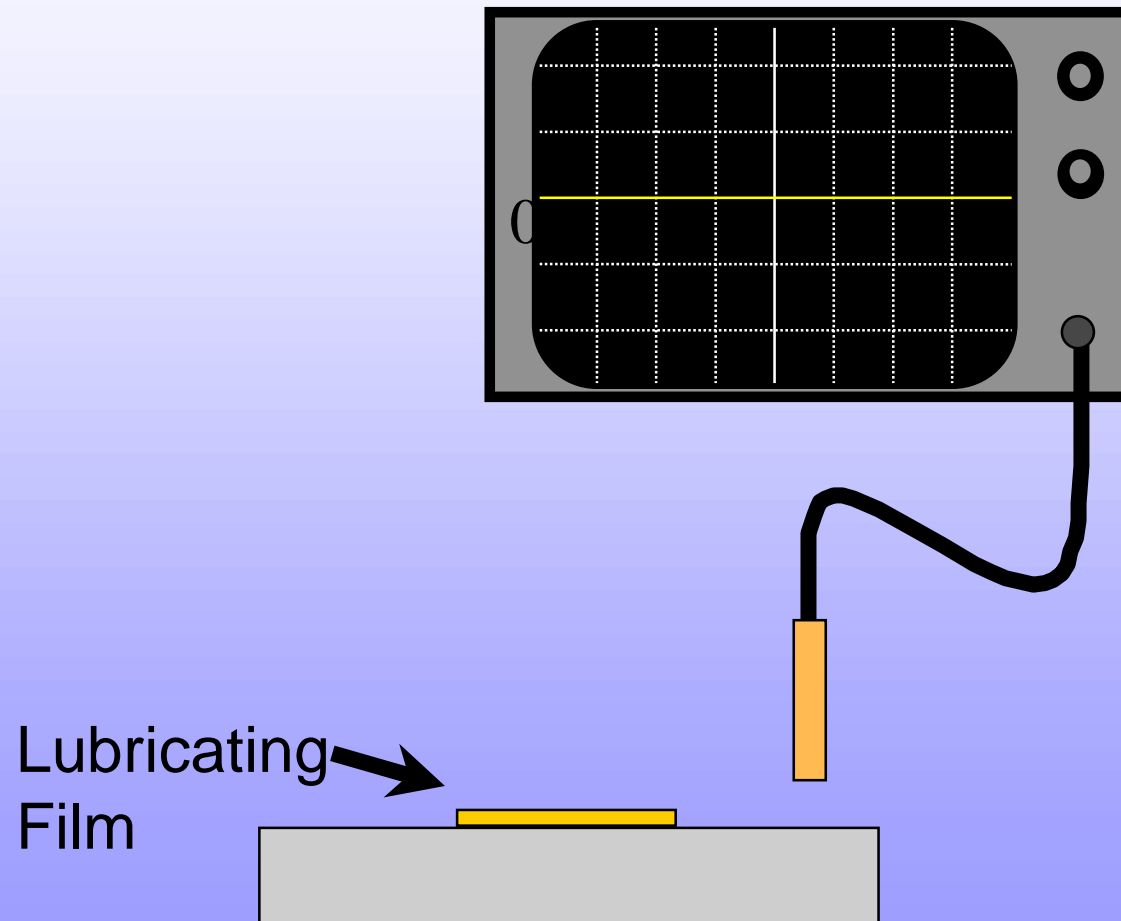
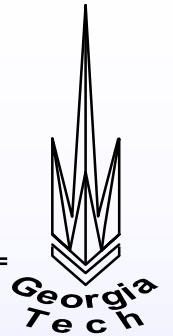
Experiment



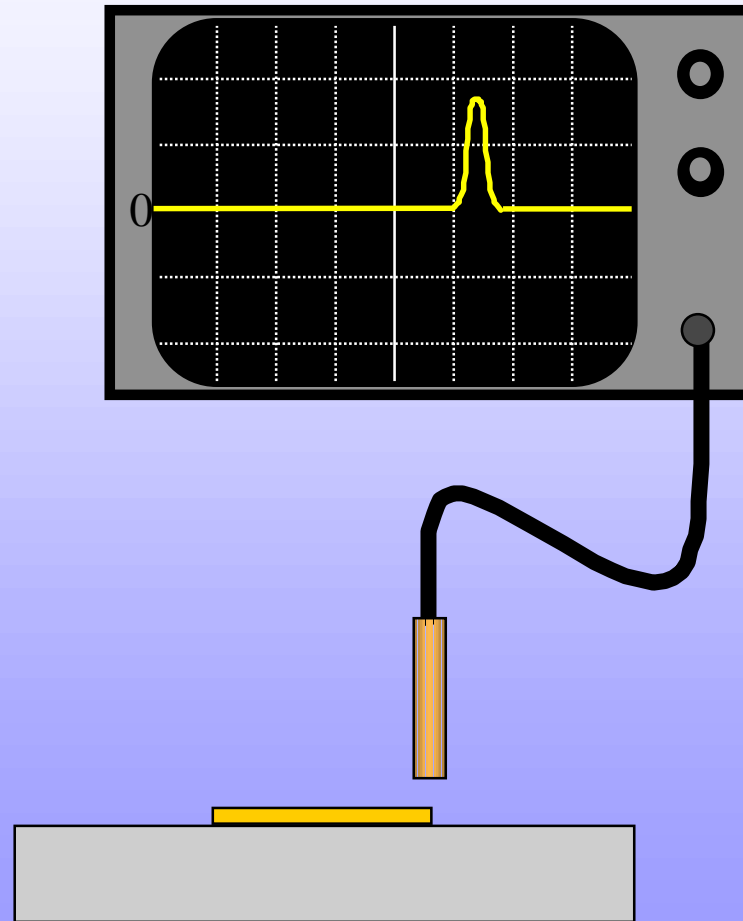
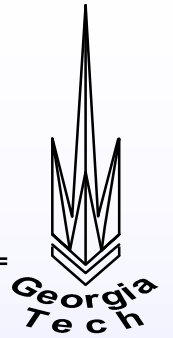
Experiment



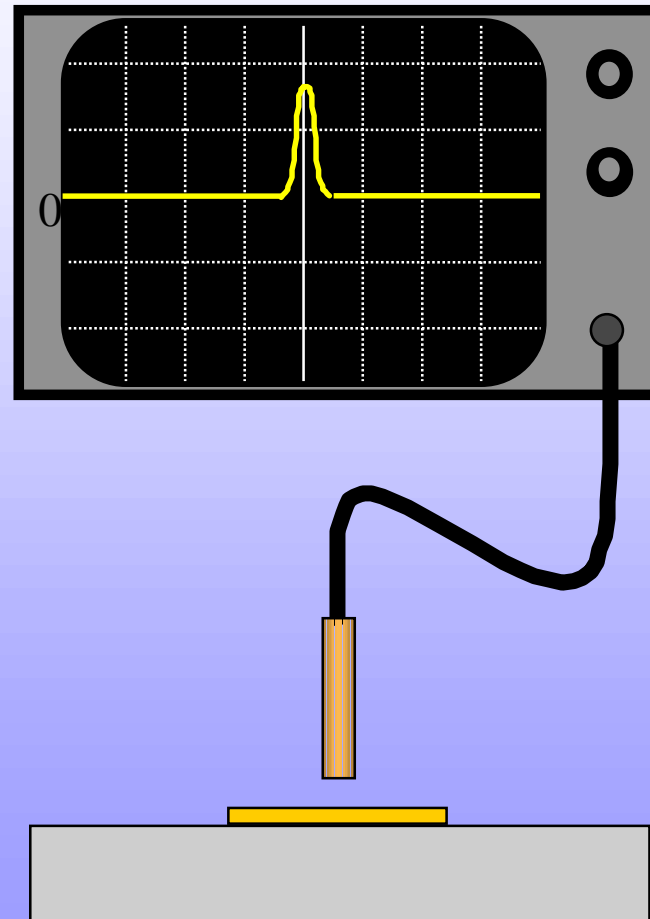
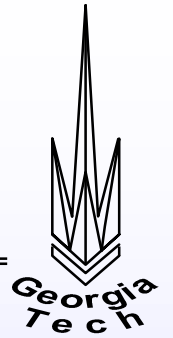
Experiment Procedure



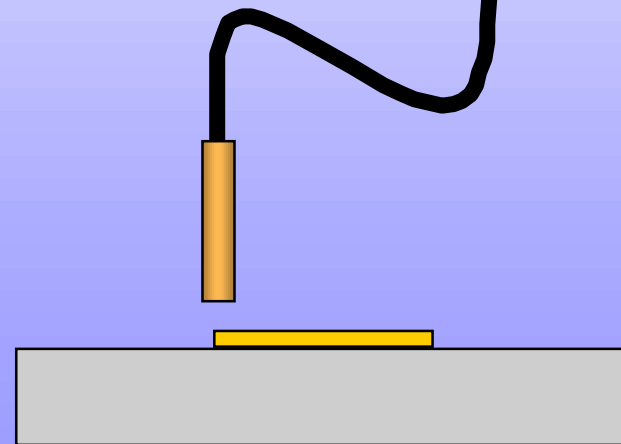
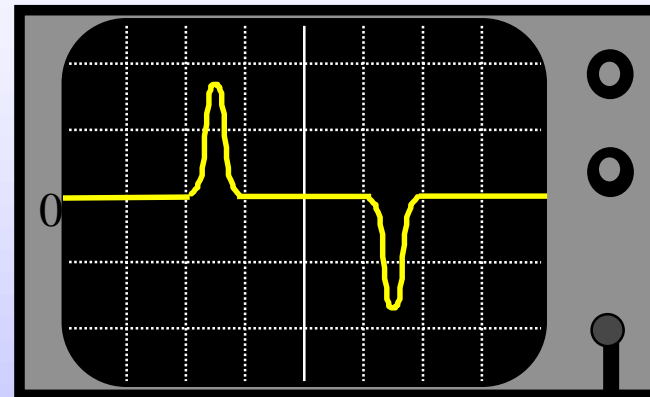
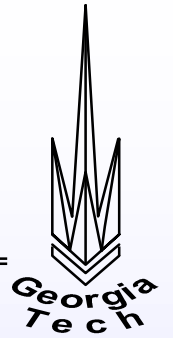
Experiment Procedure



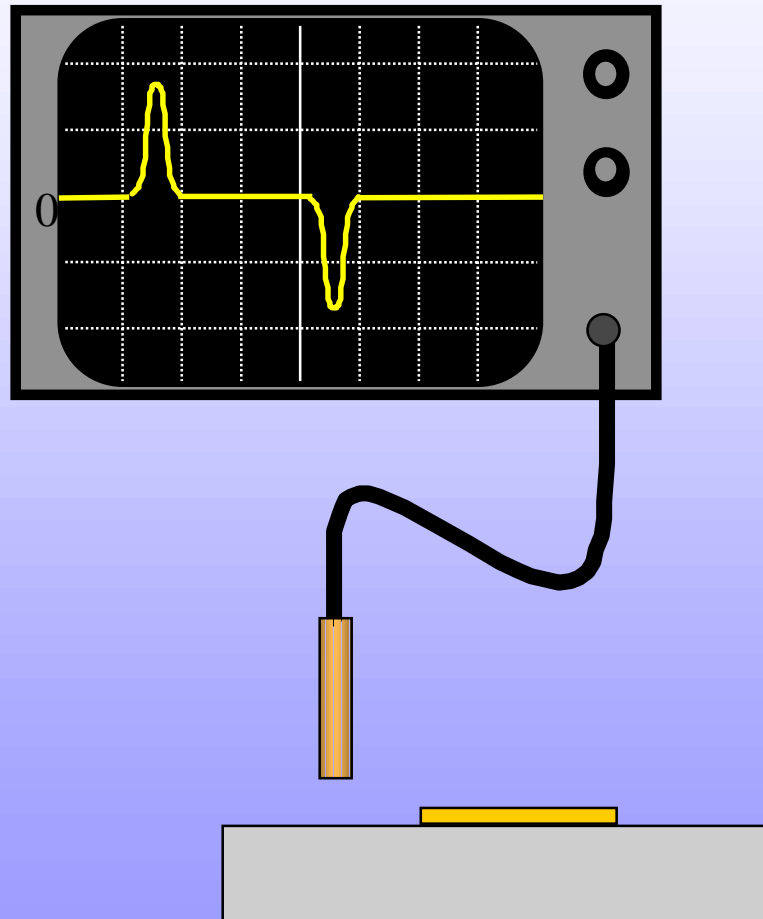
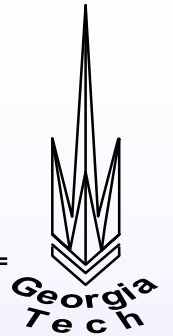
Experiment Procedure



Experiment Procedure



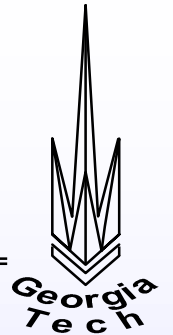
Experiment Procedure



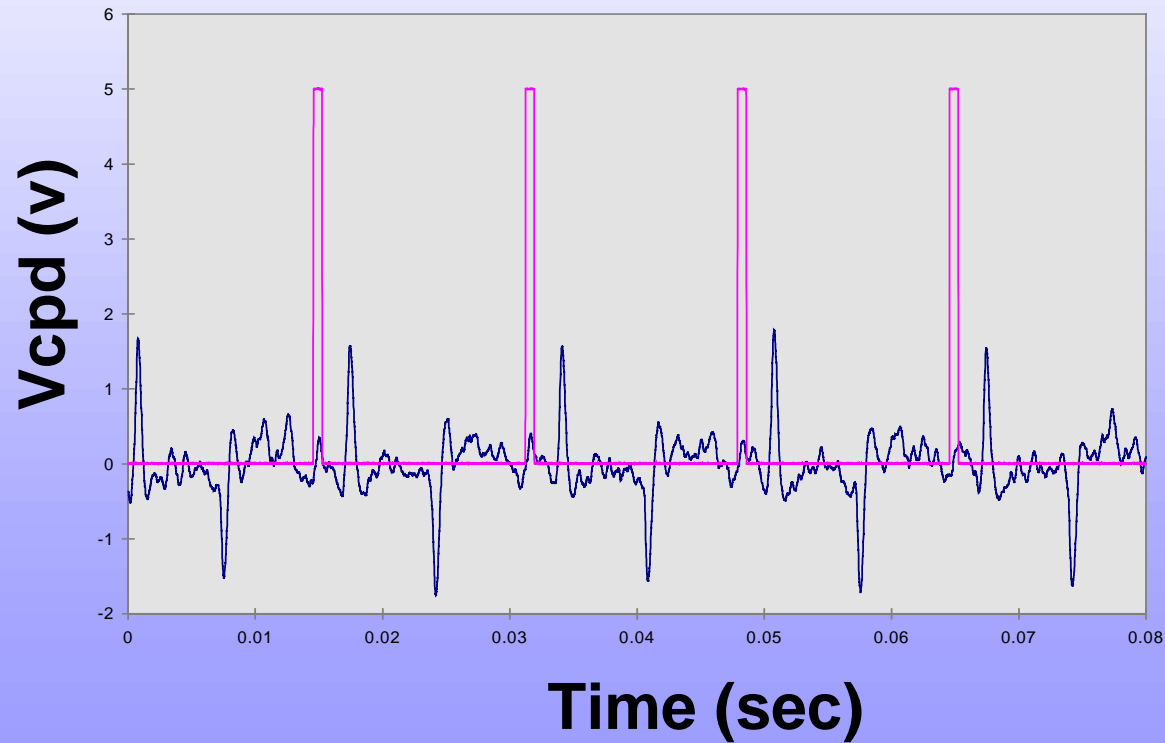
Result - Sample Raw Data

Lubricant Thickness = 20 nm

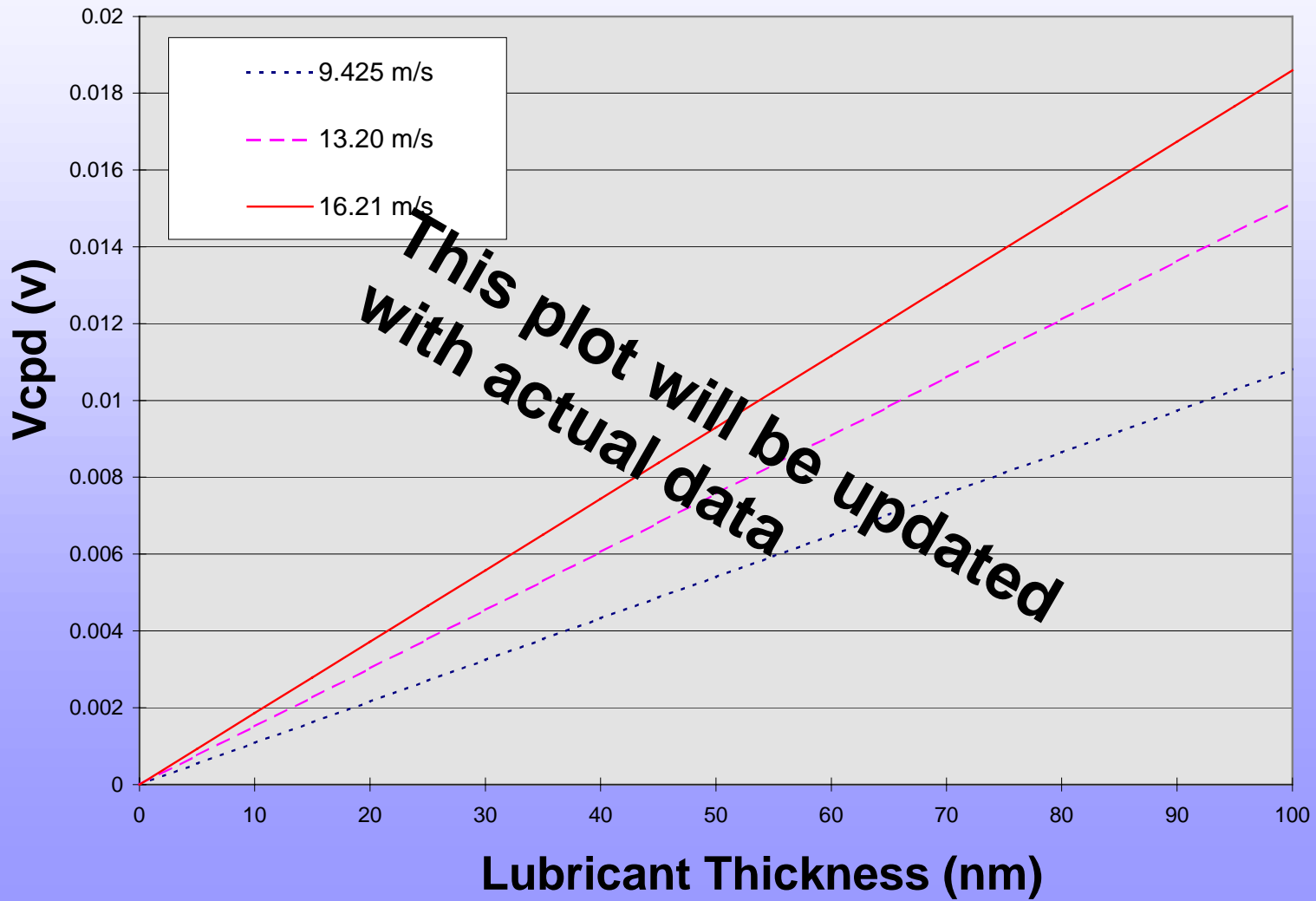
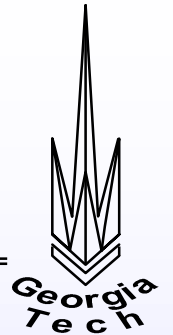
Probe Height = 0.2 mm



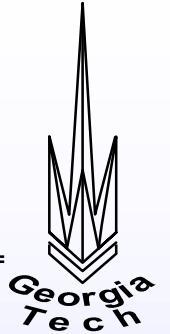
Radial Position: 43 mm



Result



Conclusion/Future Work



CPD probe demonstrated its ability to detect and relate a nano-meter thick lubricant

Future work includes applying this technology to a real-time lubricant condition monitor to a computer hard disk drive