

Nondestructive Imaging of Surface and Sub-Surface Defects in Thin-Films with Super Spatial Resolution Using Evanescent Microwave Fields

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With the current spatial resolution of $4\ \mu\text{m}$ at 1 GHz or $0.4\ \mu\text{m}$ at 10 GHz, the evanescent microwave probe (EMP) is capable of mapping non-uniformities and defects in a variety of materials including insulators, semiconductors, metals, biological, and botanical samples. Due to its large center frequency of operation, EMP can be operated with very fast scan rates approaching 10 cm/s. Since the method does not require physical contact with the sample, it can also be used to study "sticky", as well as, hot and cold surfaces. According to our recent studies, the spatial resolution of EMP can be improved by a factor of 40 in certain materials. Its principle of operation is based on producing decaying electromagnetic fields near a discontinuity in a micro-strip-line waveguide. EMP is a two-dimensional planar structure and it is possible to design and fabricate many parallel EMPs operating at different frequencies on silicon cantilever beams. Such an integrated parallel probe assembly will enable efficient, fast and hyper-spectral mapping of moving samples. There are manufacturing problems that can be addressed and solved by using fast scanning probes in an assembly or manufacturing environment to provide real-time information and feedback regarding the quality of deposited films. In this paper, we will discuss some recent experimental results and probe characteristics.

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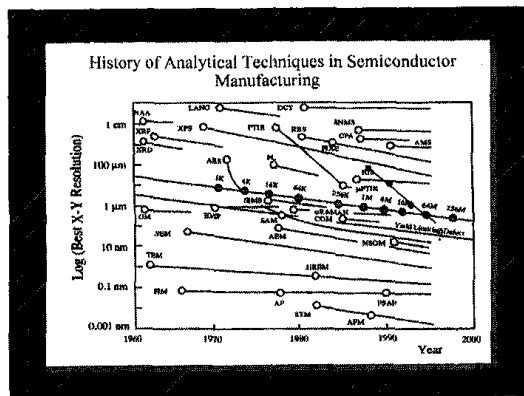
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Outline

- I. Evanescent Sensing Methods?
- II. Resolution
- III. Results
- IV. Future Work

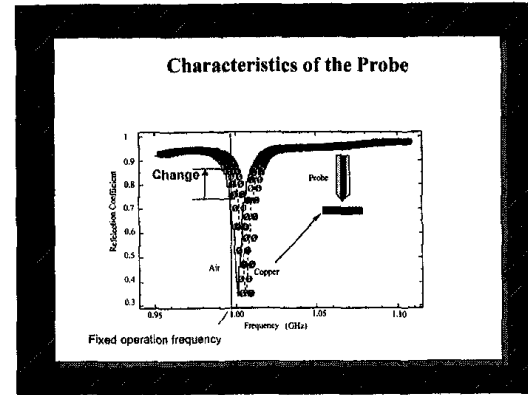
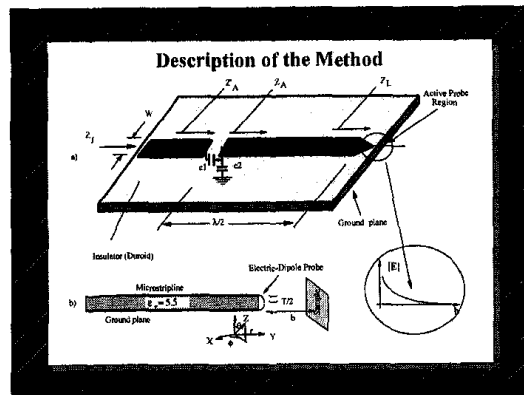


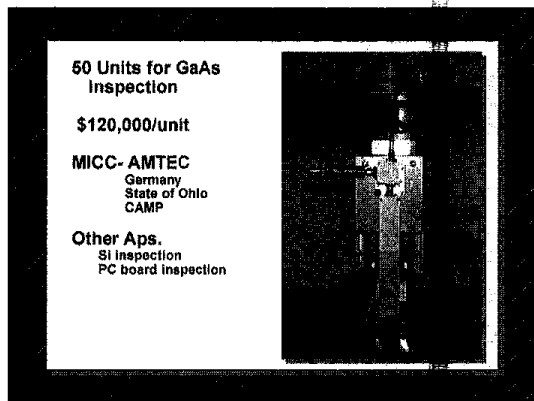
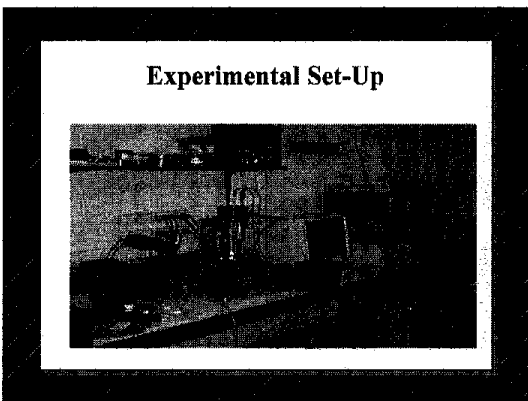
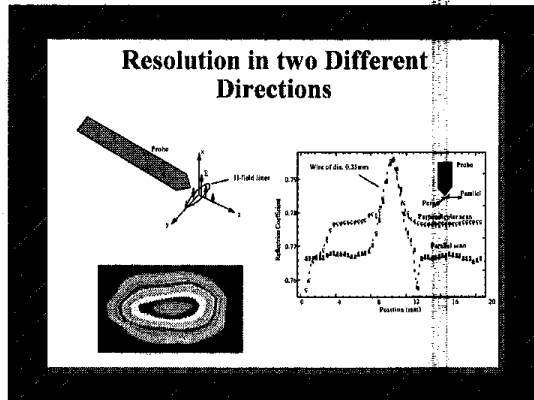
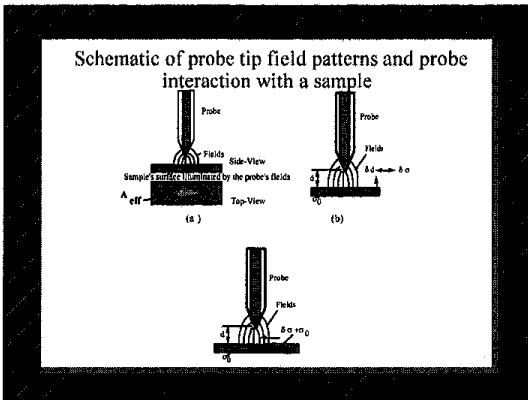
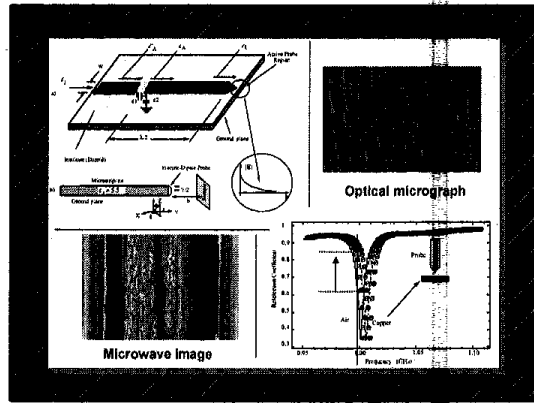
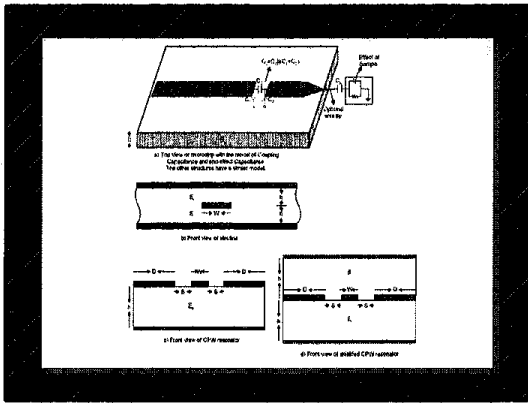
Super-Resolution Non-Destructive Imaging of Defects, and Non-uniformities in Metals, Composites, Semiconductors, and Dielectrics Using Evanescent Microwave Probes

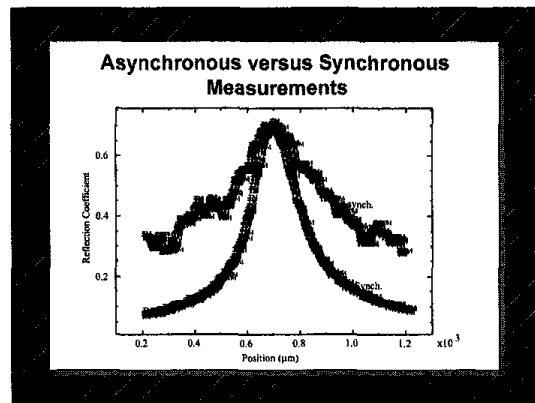
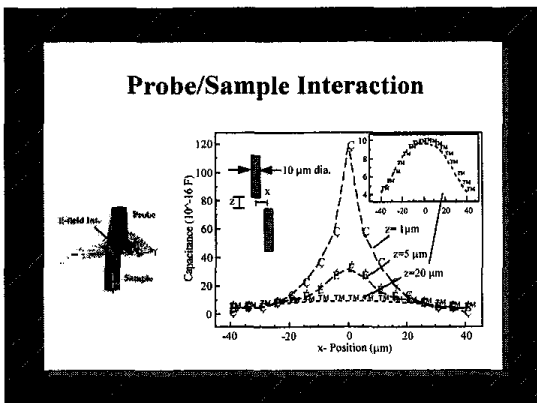
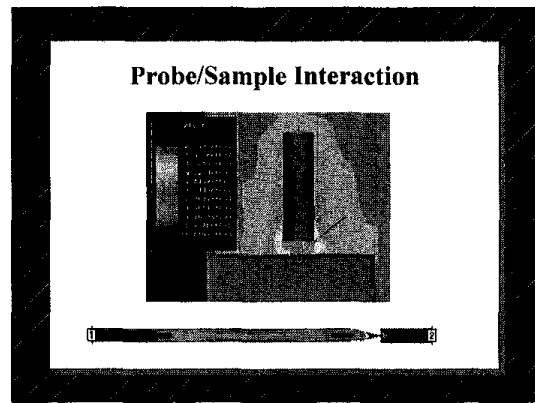
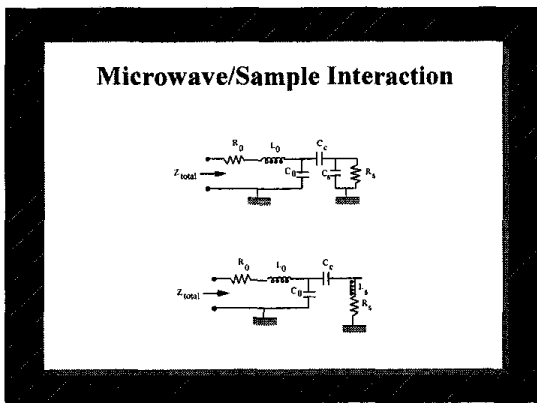
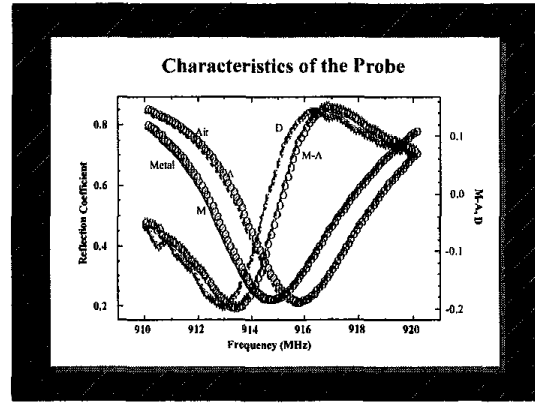
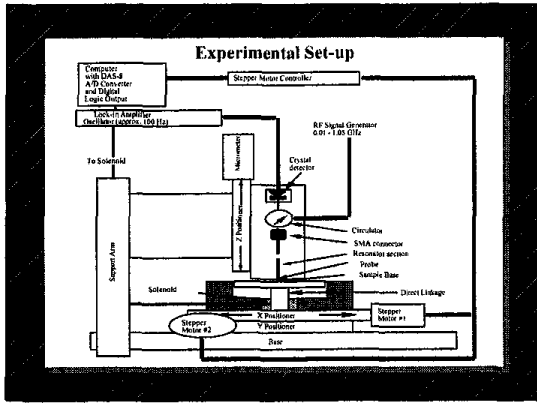
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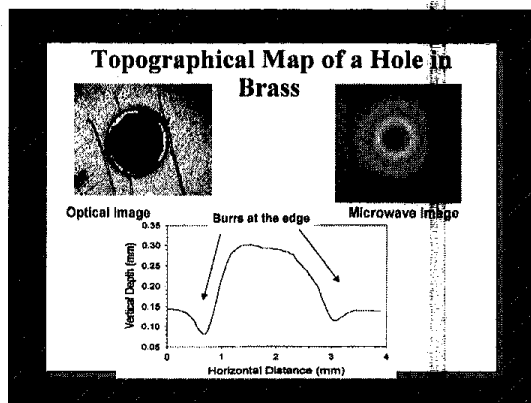
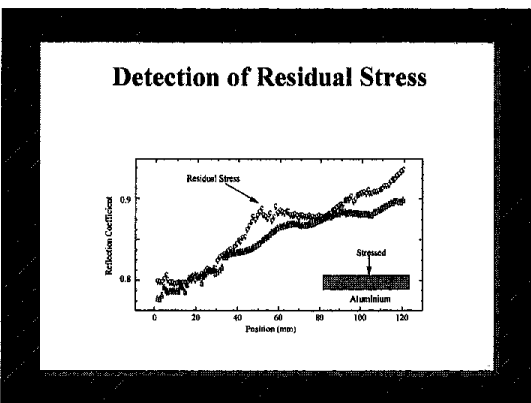
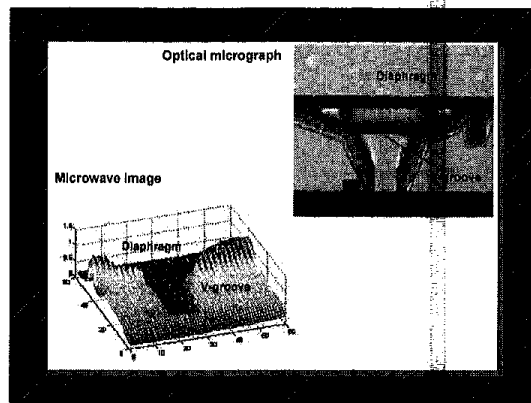
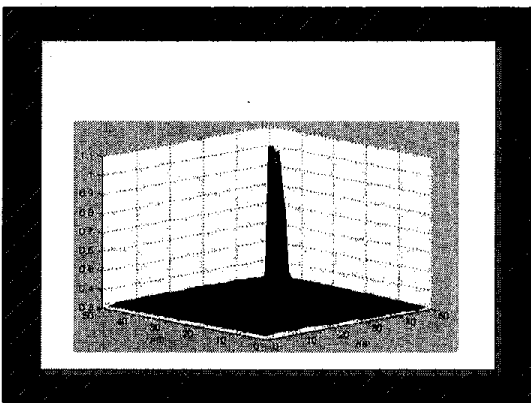
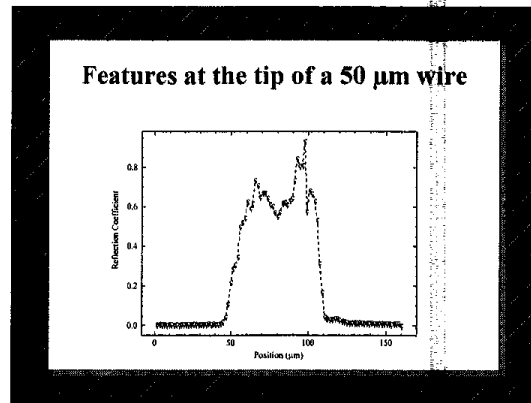
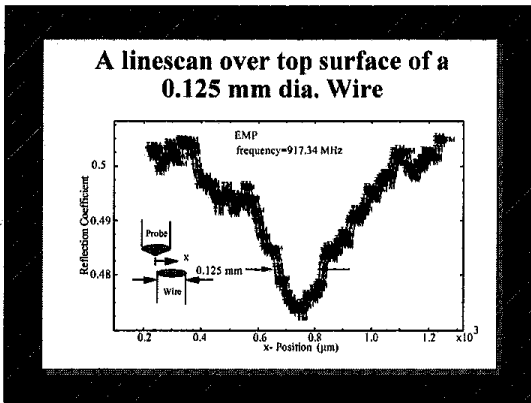
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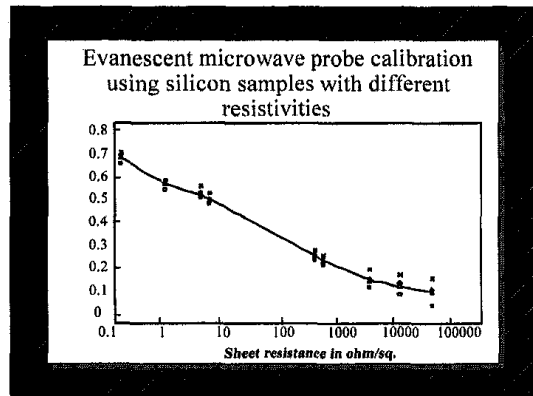
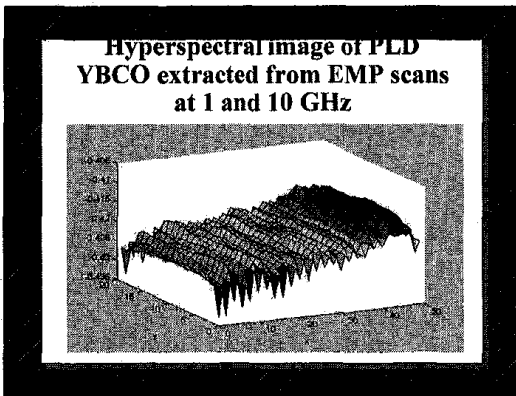
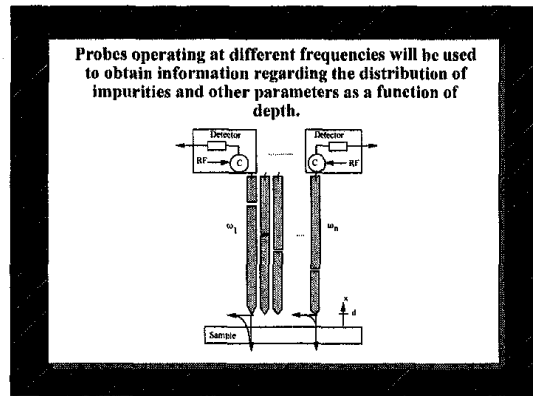
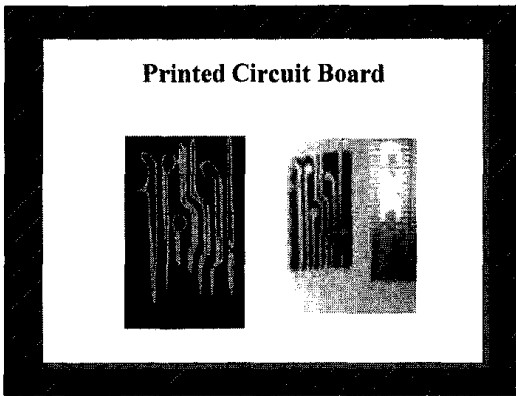
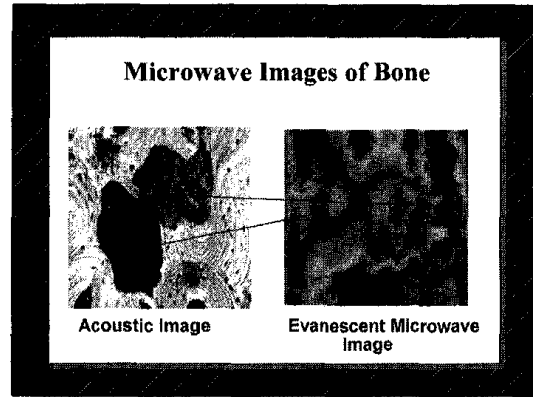
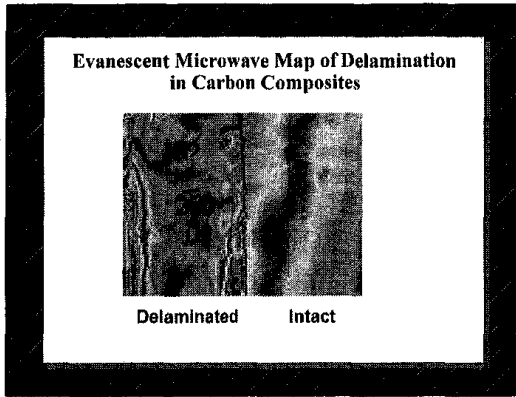
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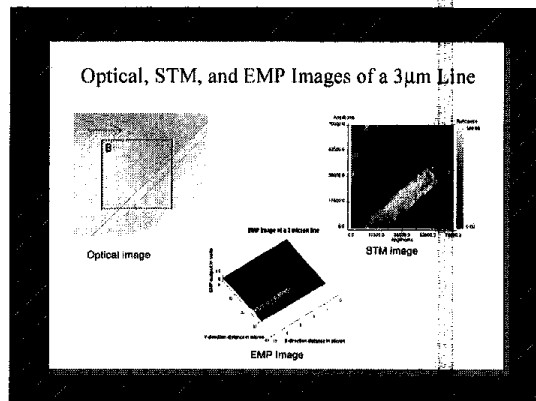
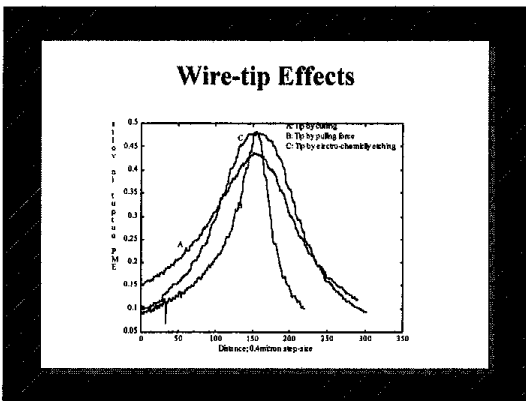
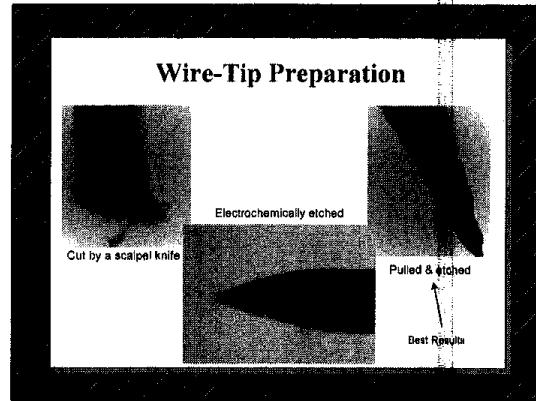
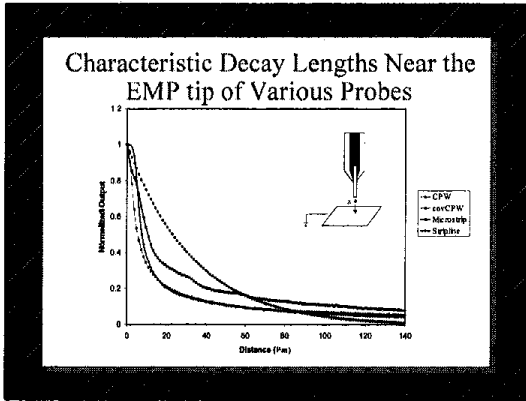












EMP scans of ethylene propylene rubbers with rough and smooth surfaces

