Magnetic field modulated microwave spectroscopy of thin films and nanostructures

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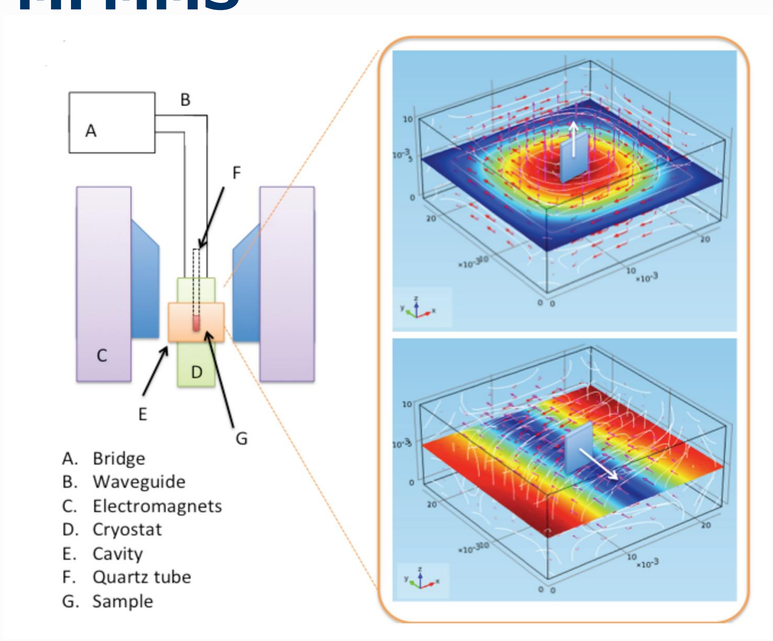
AFOSR MURI "SEARCH FOR NEW SUPERCONDUCTORS FOR ENERGY AND POWER APPLICATIONS"

Introduction

- Nanostructure fabrication
- MFMMS sensitivity
- Comparison of different techniques
- Comparison between Nb films and Nb films on nanostructures

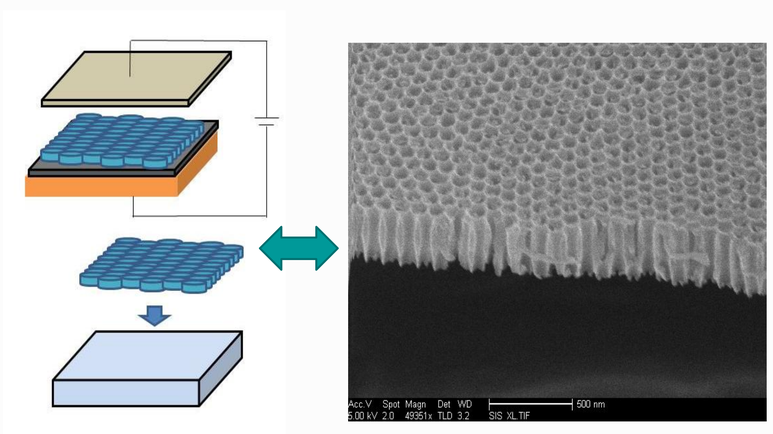
MFMMS



$$S = \frac{\partial P_{abs}}{\partial H}$$

P_{abs}: Microwave power absorbed

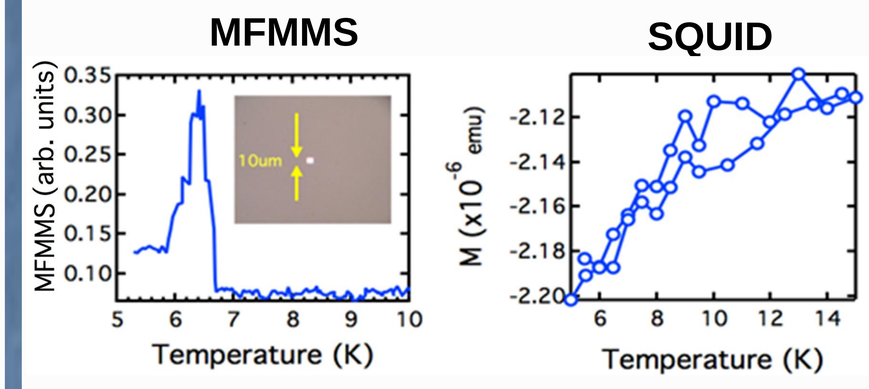
Nanostructures



- Free standing AAO membranes
- Membrane transfer
- Nano dot structures

Sensitivity

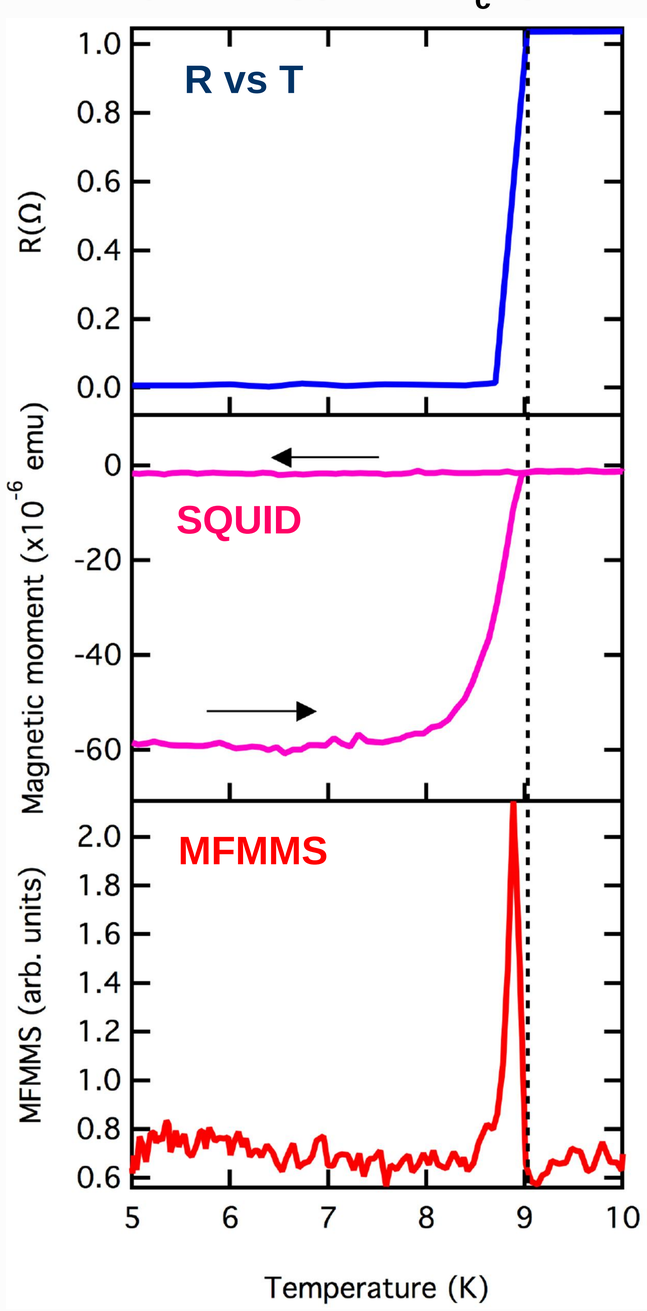
1



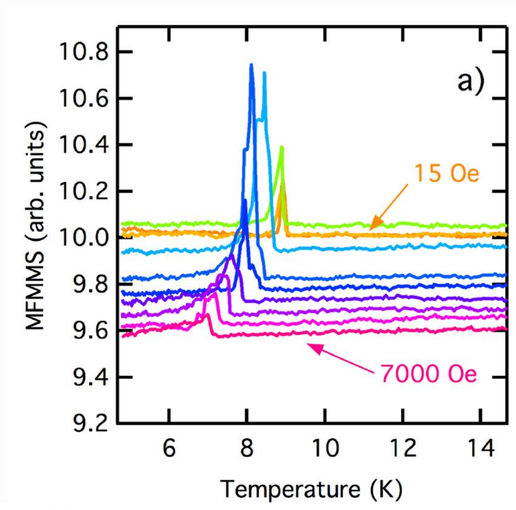
Sensitivity ~10^{-11} cm^3.

T_c measurement

2



Nb films



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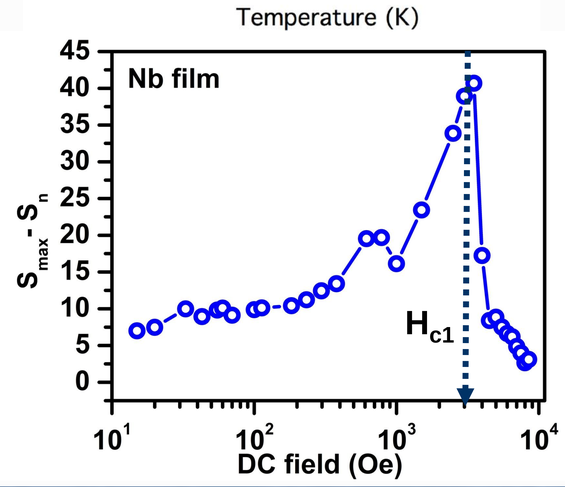
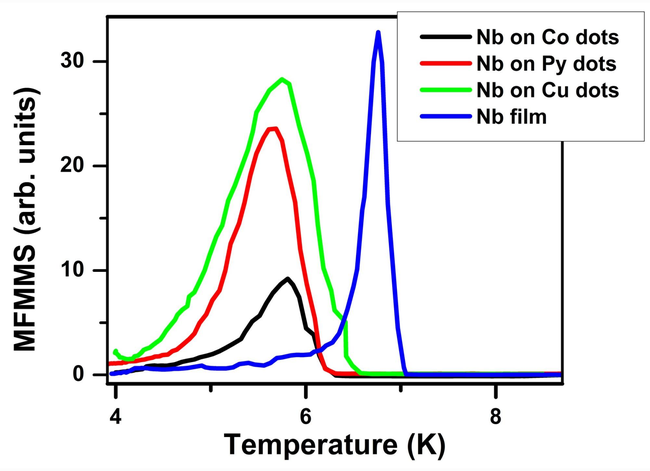


Nb on nanostructures

4



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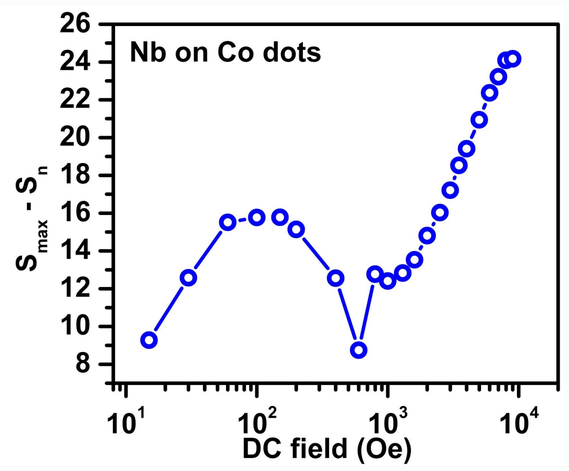

Conclusions

1. MFMMS sensitivity to SC volumes above 10^{-11} cm^3
2. MFMMS results consistent with other techniques
3. Nb films: S_{max}/S_n maximum at ~H_{c1}
4. Suppression of superconductivity by magnetic and metallic nanostructures
5. Different absorption mechanisms in films and "film on nanostructures"?