Thesis Outline
and
DRDC Dielectric powder Imaging

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March 3rd 2018

Thesis Outline(1)

Abstract (0%)

I. Introduction (90%)

II. Theory (70%)

III. Experiment Methods (20%)

IV. Experiment Results (20%)

V. Conclusion (0%)

VI. Future Work (0%)

Thesis Outline(2)

1. Introduction

   Light-matter interaction

   Active resonator & magnetic material

   1.1 Ferromagnetic Resonance and Magnon

   1.2 Microwave cavity and Cavity Photon

   1.3 Emergence of Cavity Magnon Polaritons

Thesis Outline(3)

2. Theory

2.1 Cavity mode

2.1.1 RLC circuit model

2.1.2 Classical Oscillator

2.1.3 Quantum Harmonic Oscillator

2.2 Magnon

2.2.1 Ferromagnetic Resonance

2.2.2 Collective Spin Hamiltonian

2.2.3 Heisenberg model for magnon

2.3 Cavity Magnon Polaritons

2.3.1 Coupled Oscillator

2.3.2 Quantum Hamiltonian

2.3.3 Magnon Quintuplet

Thesis Outline(4)

3. Experiment Methods

3.1 Cavity Design

3.1.1 Microstrip cavity

3.1.2 Feedback cavity

3.2 Experiment Setup

Overall setup

3.2.1 Electromagnet

3.2.2 Vector Network Analyser

3.2.3 Power supply

3.2.4 3-D stage

Thesis Outline(5)

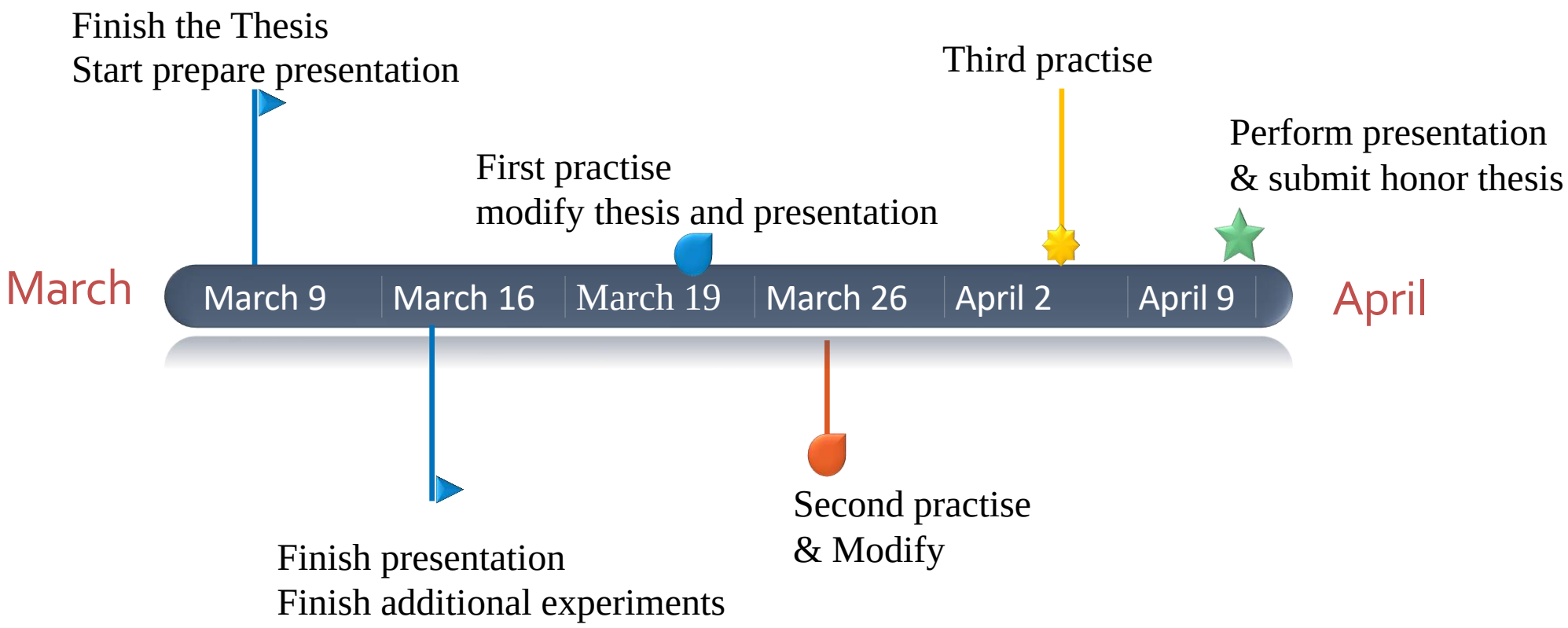
4. Experiment Results
   - 4.1 Magnetically Induced Transparency
     - 4.1.1
     - 4.1.2
     - 4.1.3
   - 4.2 Strong coupling
     - 4.2.1
     - 4.2.2
     - 4.2.3
   - 4.3 Magnon quintuplet
     - 4.3.1
     - 4.3.2
     - 4.3.3
   - 4.4 TBD

Thesis Outline(3)

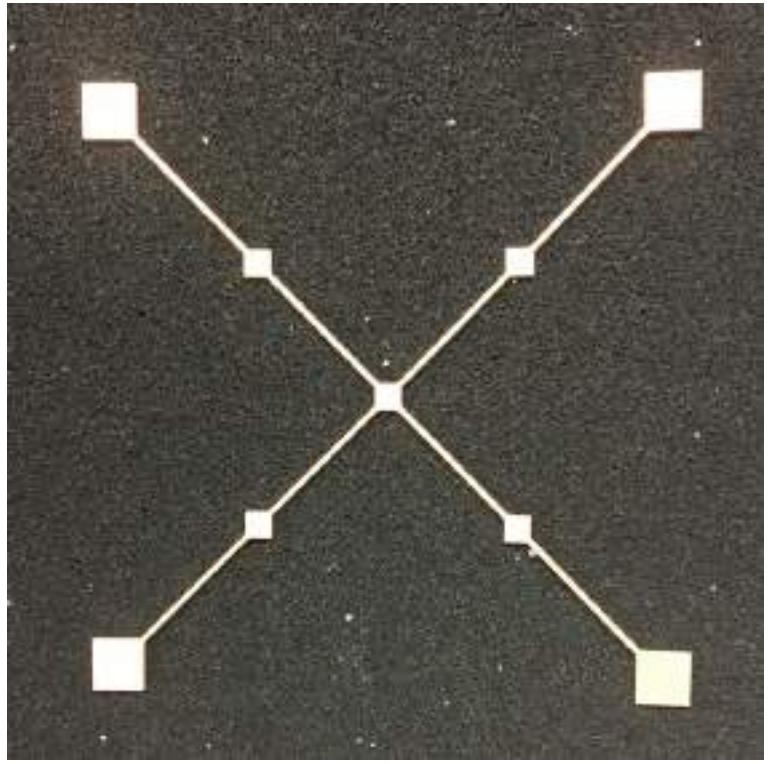
5. Conclusion

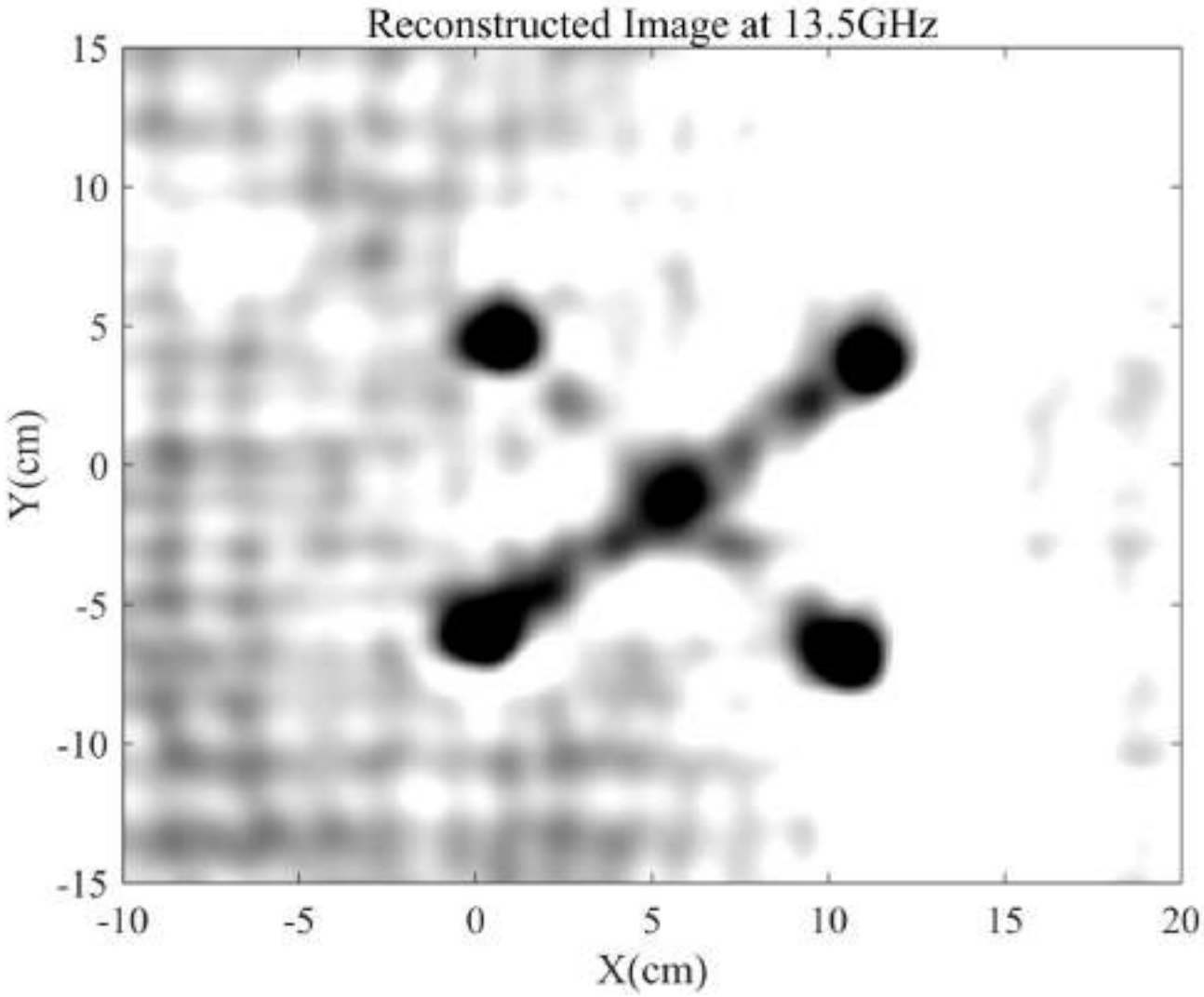
6. Future Work

Timeline


Finish the Thesis
Start prepare presentation
First practise
modify thesis and presentation
Third practise
Perform presentation
& submit honor thesis
March
March 9
March 16
March 19
March 26
April 2
April 9
April
Finish presentation
Finish additional experiments
Second practise
& Modify

Imaging Results(1)



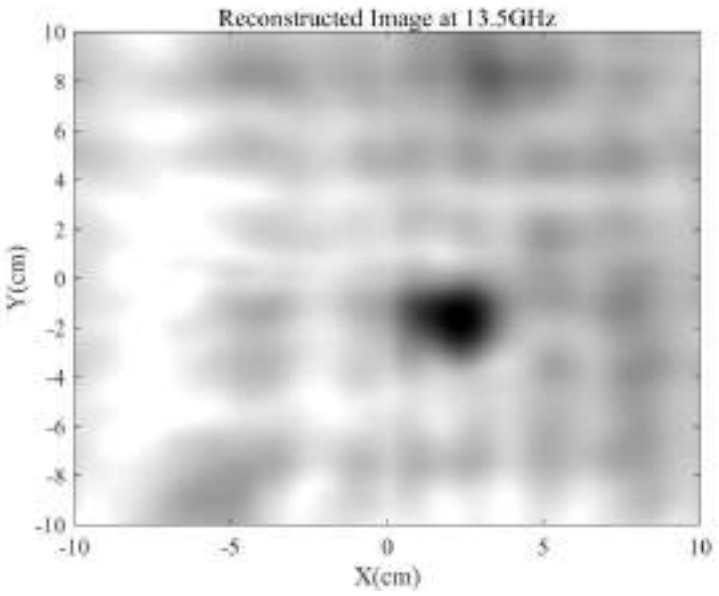


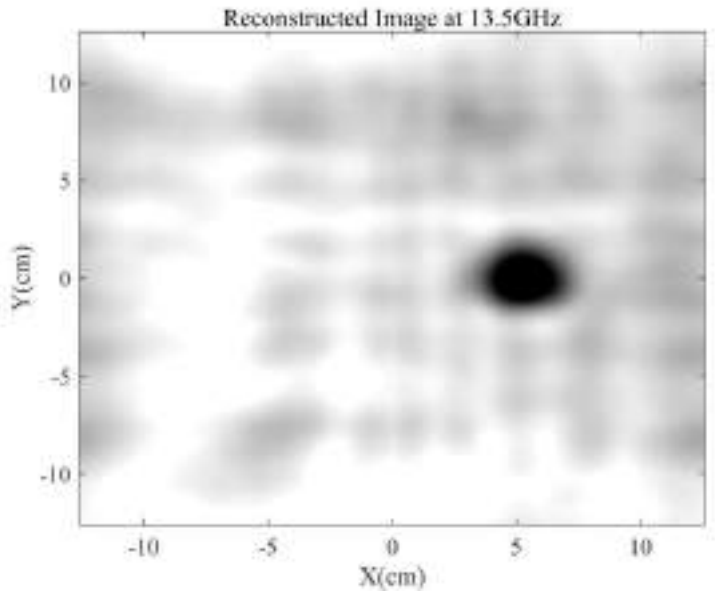
Imaging Results(2)

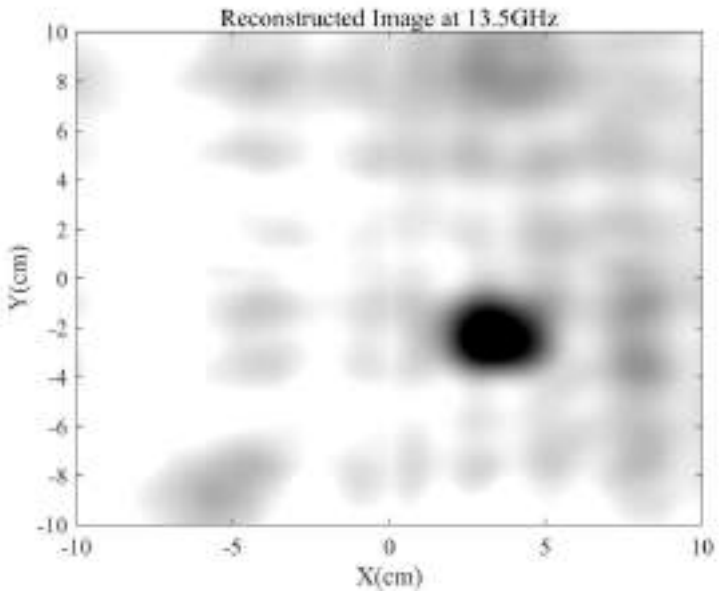
Icing sugar

NH_4NO_3

$KClO_3$

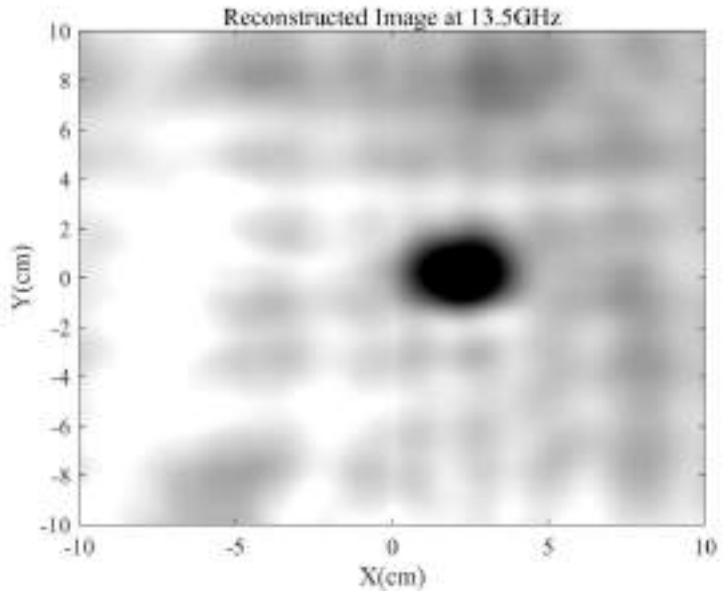




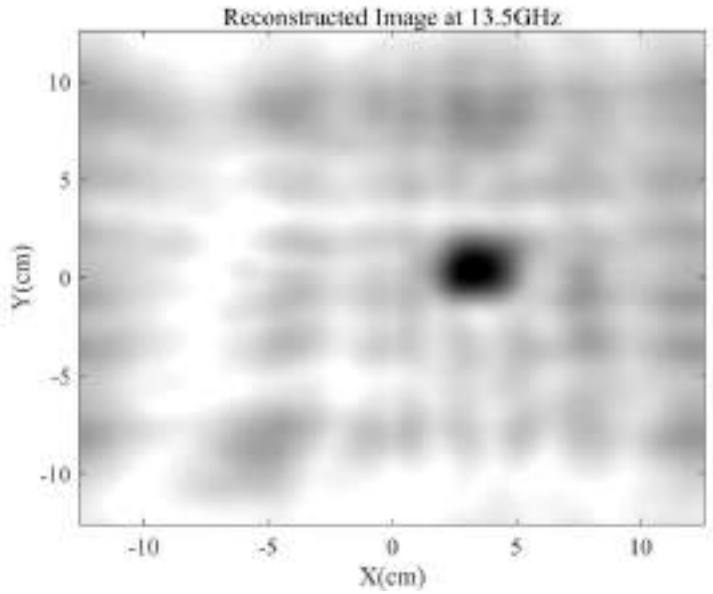


Imaging Results(3)

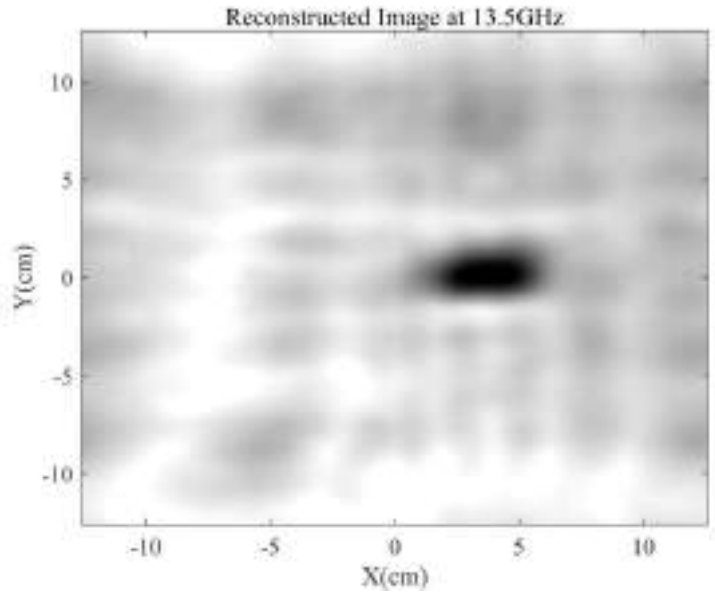
NaCl



KNO_3



$NaNO_3$



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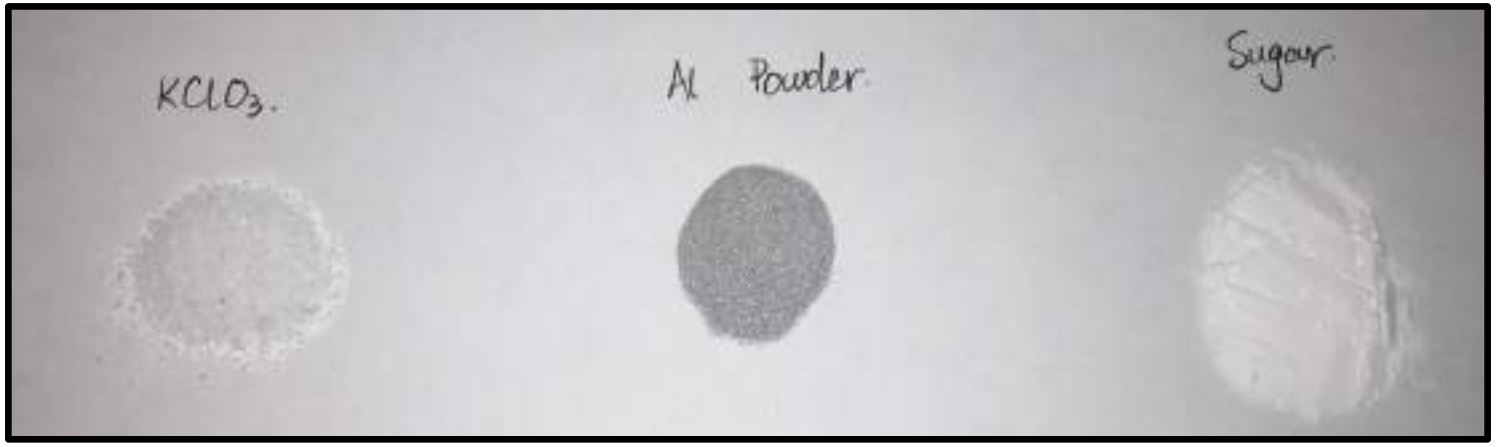
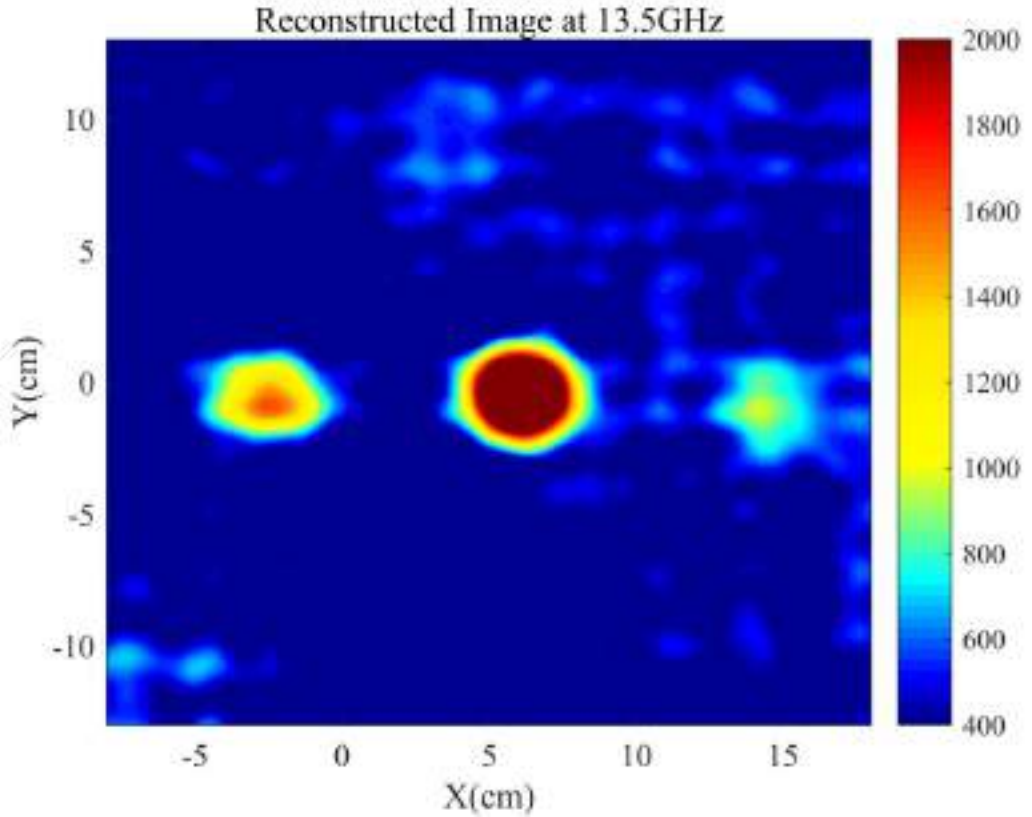
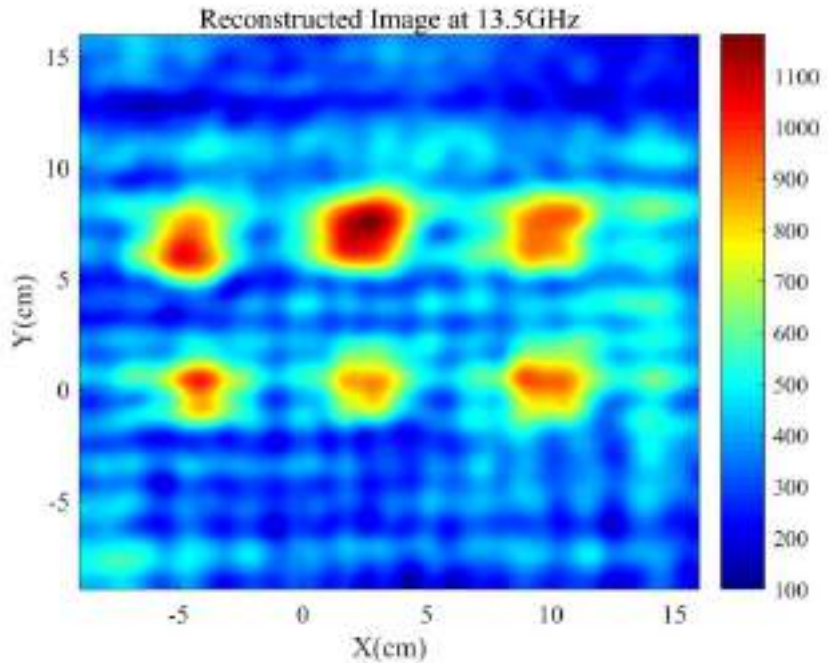
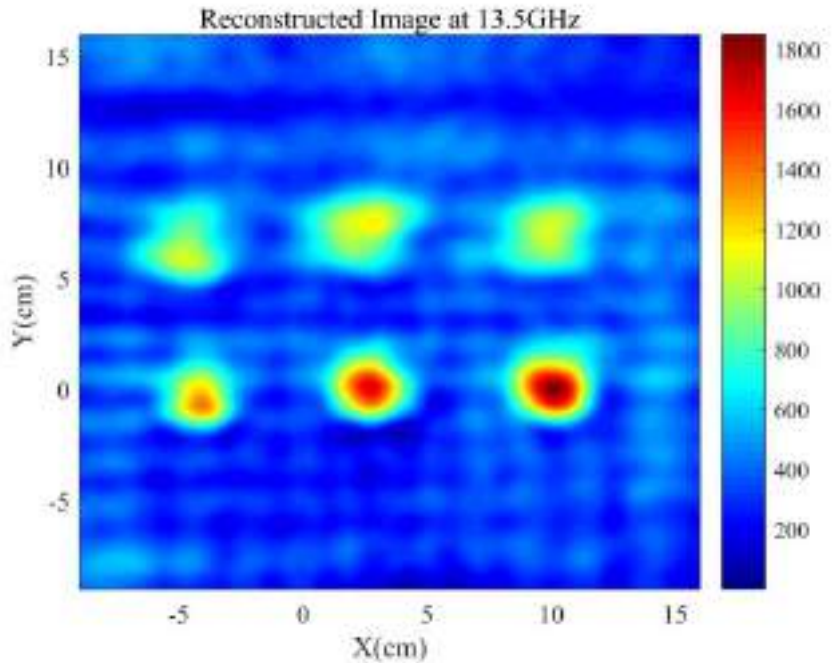




Imaging Results(5)

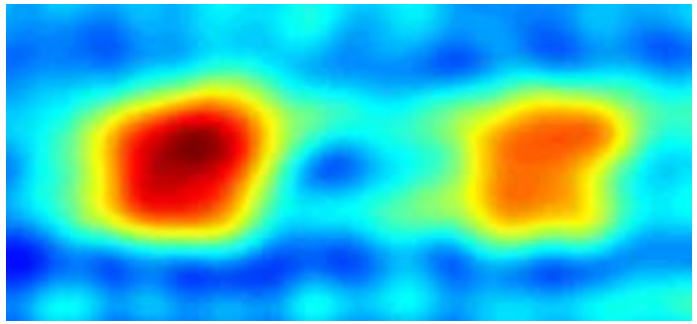




Next step

- Preform imaging experiment at different height of chemical powders.

Some concerns:



Same amount, different setup