SPIN WAVE PROPAGATION IN NON-UNIFORM MAGNETIC FIELDS

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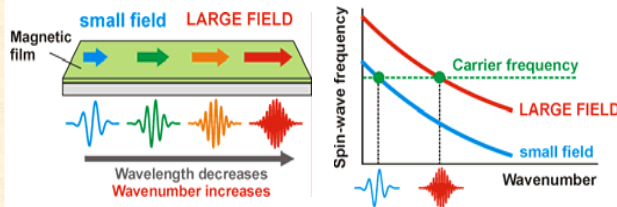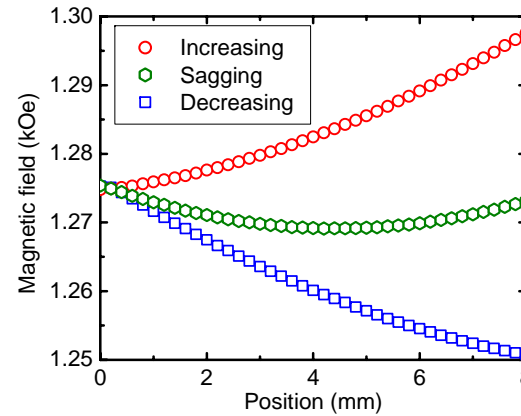*[2] Department of Electrical and Computer Engineering, Colorado State University, Colorado, USA*

1 Introduction

Previous research on spin waves has mainly involved spin wave excitations and propagation in spatially uniform magnetic fields. This work reports high resolution time- and space-resolved imagining of spin wave propagation in spatially non-uniform magnetic fields.

2 Experimental Configuration

Yttrium iron garnet (YIG) film: 7.2 μm thick, 2.2 mm wide, 46 mm long. Carrier frequency of input pulse: 5.515 GHz. Width of input pulse: 35 ns.
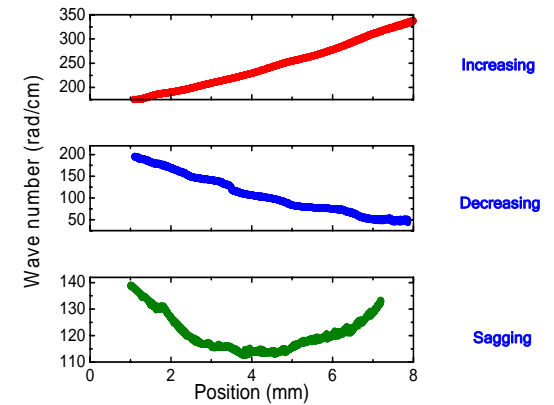
3 Field Configurations

The experiment was preformed with three specific non-uniform field configurations. These consisted of a field that increases with position, decreases with position, and has a decrease followed by an increase.

4 Spatial Evolution

Spin waves undergo a change in wavelength during the propagation through spatially non-uniform magnetic fields.
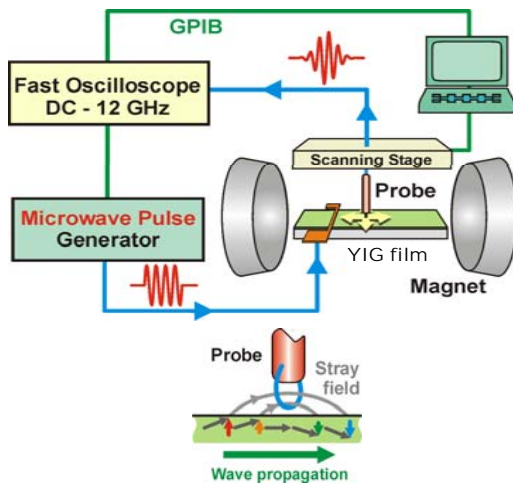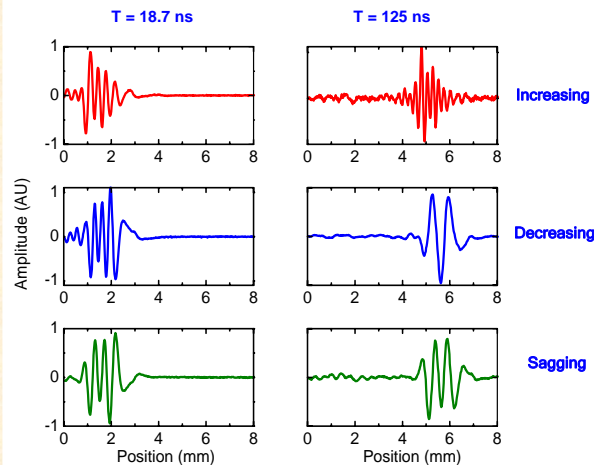
5 Wave Number Characteristics

The wave number increases in a spatially increasing field and decreases in a spatially decreasing field. This change in wave number is also reversible, as shown by the sagging field.

6 Conclusion

❑ The carrier wave number of spin wave pulses increases in a spatially increasing magnetic field and decreases in a spatially decreasing magnetic field.

❑ The wave number change for a general spatially varying static field is reversible.

❑ These field dependent wave number properties present potential microwave signal processing applications.