QPhysics
AT QUEENS COLLEGE

Colloquium Notice

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Magnetic hologram with the optical Artificial Magnetic Lattice for high density recording

The introduction of artificial magnetic structures into magnetic materials can induce novel electromagnetic and spin-wave behavior. Nano- and submicrometer-scale artificial magnetic lattices (AMLs) can control optical (electromagnetic) waves in magnetophotonic crystals [1], volumetric magnetic holograms [2], and labyrinthian magnetic domain structures [3], and can affect spin waves in magnonic crystals [4].

In this talk, the fundamental properties of such AMLs, mainly in magnetic garnet films and alloy thin films, are discussed, followed by demonstrations of their applications in optical and spin-wave micro-devices driven by magnetic phase interference: volumetric magneto-optic (MO) hologram memories [2] and three-dimensional MO holographic displays [5] with magnetophotonic crystals; high-speed MO Q-switch micro-chip lasers with iron-garnet films with labyrinthian magnetic domain structures [3]; and highly sensitive magnetic sensors and spinwave logic circuits with magnonic crystals [6].

Prospective future spin-wave devices with AMLs will be discussed in the context of the new paradigm of magnonics (electron non-transport electronics), where spin waves play an important role as the information carrier.

[1] T. Goto et al., “Magnetophotonic crystal comprising electro-optical layer for controlling helicity of light,” *J. Appl. Phys.*, **111**, 07A913, 2012.
[2] Y. Nakamura et al., “Error-free reconstruction of magnetic hologram via improvement of recording conditions in collinear optical system,” *Optics Exp.*, **25**, 15349-15357, 2017.
[3] R. Morimoto et al., “Magnetic domains driving a Q-switched laser,” *Sci. Rep.*, **6**, 38679, 2016.
[4] N. Kanazawa et al., “Metal thickness dependence on spin wave propagation in magnonic .crystal using yttrium iron garnet,” *J. Appl. Phys.*, **117**, 17E510, 2015.
[5] K. Nakamura et al., “Improvement of diffraction efficiency of three-dimensional magnetooptic spatial light modulator with magnetophotonic crystal,” *Appl. Phys. Lett.*, **108**, 02240, 2016.
[6] N. Kanazawa et al., “Demonstration of a robust magnonic spin wave interferometer,” *Sci. Rep.*, **6**. 30268, 2016.

Notes: Professor Inoue is IEEE Magnetics Society Distinguished Lecturer for 2018

Monday
January 8, 2018
Starts at **3:00 pm**
Coffee at **2:45 pm**
Physics Conference Room, SB B326