QPhysics
AT QUEENS COLLEGE

Colloquium Notice

Mitsuteru Inoue

Toyohashi University of Technology, Japan

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.

Note: 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