Abstract for an Invited Paper
for the NWS09 Meeting of
The American Physical Society

Optical coupling to spin waves in multiferroic materials[1]

ROGERIO DE SOUSA, University of Victoria, B.C.

The coexistence of ferroelectricity and magnetism in multiferroic materials leads to several interesting effects related to the interplay of light with complex electric and magnetic order. One notable example is bismuth ferrite ($BiFeO_3$), a room temperature multiferroic that exhibits a large ferroelectric moment coexisting with a spiral antiferromagnetic phase in the form of a cycloid. I will describe a theory of bulk $BiFeO_3$, which predicts the appearance of several magnon branches related to magnetic fluctuations at integer multiples of the cycloid wavevector. These magnons get admixed with optical phonons at zero wavevector, giving rise to two series of electromagnon resonances in the far infrared spectrum [1], which were recently observed using Raman spectroscopy [2]. I will show that these results are helpful in designing low loss electronic devices based on spin-wave propagation [3].

[1] R. de Sousa and J.E. Moore, Phys. Rev. B. 77, 012406 (2008).
[2] M. Cazayous, Y. Gallais, A. Sacuto, R. de Sousa, D. Lebeugle, and D. Colson, Phys. Rev. Lett. 101, 037601 (2008).
[3] R. de Sousa and J.E. Moore, Appl. Phys. Lett. 92, 022514 (2008).

[1]We acknowlege support from NSERC-Discovery and the UVic faculty of Sciences.