Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Inertia and chiral edge modes of a skyrmion magnetic bubble[1]
IMAM MAKHFUDZ, Johns Hopkins University, BENJAMIN KRUEGER, University of Hamburg, OLEG TCHERNYSHYOV, Johns Hopkins University — Dynamics of topological defects is a topic of longstanding interest in magnetism. The attention to it stems from rich basic physics as well as from its connection to technological applications. The dynamics of a vortex in a thin-film ferromagnet resembles the motion of a charged massless particle in a uniform magnetic field. Similar dynamics is expected for other magnetic textures with a nonzero skyrmion number. However, recent numerical simulations revealed that skyrmion magnetic bubbles show significant deviations from this model. In this talk we present the derivation of the correct dynamical model of a skyrmion magnetic bubble. We first introduce our model phenomenologically and then derive it from the standard theory of a thin-film ferromagnet. This allows us to characterize not only the center-of-mass motion of the bubble but also the dynamics of its shape within the same framework.We show that a skyrmion bubble possesses inertia and derive its mass from the standard theory of a thin-film ferromagnet. Besides center-of-mass motion, other low energy modes are waves on the edge of the bubble traveling with different speeds in opposite directions.

[1]US National Science Foundation under Award No. DMR-1104753 (Imam Makhfudz and Oleg Tchernyshyov),

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Date submitted: 09 Nov 2012 Electronic form version 1.4