Abstract Submitted
for the SES20 Meeting of
The American Physical Society

Experimental and Numerical Studies of the Mechanical Damped Driven Duffing Oscillator[1] LARS HEBENSTIEL, DOUG HARPER, IVAN NOVIKOV, Western Kentucky University — The Duffing Oscillator (DO) is a bistable, nonlinear oscillator derived from a double well potential which exhibits various phenomena such resonance and stochastic resonance (SR). SR occurs when a system experiences resonance due to some amount of noise being added to the system, with some optimal amount of noise for the most resonance. These phenomena have been observed in ring lasers, electron paramagnetic resonance and various other models. In this talk, we present the experimental results obtained with a magnetically driven mechanical model of the DO recently proposed. The system consists of high-power magnet attached to a spring and placed inside a solenoid. The potential energy of this system is described through use of binomial expansion as a fourth order potential. The current through the second coil placed underneath the experimental setup is varied to provide external periodic and white noise forces. The oscillator's position is measured with a force probe, and with a grayscale transparency, photo-resistor/LED system which measures the intensity of light passing through the semitransparent sheet. LabVIEW control systems are used to vary the current through the coils and acquire data from the position sensors.

[1]Kentucky Academy of Science Research Grant, Project ID 23270225.

Lars Hebenstiel
Western Kentucky University

Date submitted: 19 Oct 2020 Electronic form version 1.4