

# Electric field control of standing spin waves in PMN-PT/NiFe heterostructure

Marek Frankowski,<sup>1</sup> Jakub Chęciński,<sup>1</sup> Sławomir Ziętek,<sup>1</sup>  
Witold Skowroński,<sup>1</sup> and Tomasz Stobiecki<sup>1</sup>

<sup>1</sup>*AGH University, Department of Electronics,  
al. Mickiewicza 30, 30-059 Kraków, Poland*

We present experimental results on spin-diode effect in a PMN-PT/NiFe heterostructure tuned by electric field [1]. By utilizing micromagnetic simulations we are able to get an insight into parameters and details of dynamics that are hard or impossible to obtain experimentally, namely standing spin-waves (SSW) spatial distribution, phase and length. Experimental results are compared with micromagnetic simulations, showing good quantitative agreement. In this manner we verify which experimentally observed modes are SSW modes. We apply an electric field to change SSW modes frequencies and reproduce this effect by micromagnetic simulations to find the anisotropy change amplitude in an external electric field.

## References:

[1] S. Ziętek, J. Chęciński, M. Frankowski et al. Electric-field tunable spin waves in PMN-PT/NiFe heterostructure: Experiment and micromagnetic simulations, *Journal of Magnetism and Magnetic Materials* 428 (2017) 64–69 .

*This work was supported by grant Preludium 2015/17/N/ST3/02276 from National Science Center, Poland. Numerical calculations were supported by PL-GRID infrastructure. TS. acknowledges the statutory Grant 11.11.230.017.*