Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Mode coupling in a two-mode spin-torque oscillator: coexistence, mode-hopping and linewidth broadening OLLE HEINONEN, Argonne Natl Lab, EZIO IACOCCA, University of Gothenburg, PRANABA MUDULI, Indian Institute of Technology, Delhi, JOHAN AKERMAN, Royal Institute of Technology, Kista — Spin-torque oscillators (STOs) are microwave frequency and spin-wave generators with potential technological applications. Single-mode oscillators have been described previously[1]. However, recent experiments have shown STO multi-mode generation [2,3]. By extending the single-mode auto-oscillator theory [1] taking into account mode coupling, we show that single-mode generation, coexistence, and periodic energy transfer are possible to describe analytically. Furthermore, the generation linewidth in a mode-hopping regime exhibits broadening due to the autocorrelation loss, similar to a thermally-driven particle in a double potential well obeying Arrhenius' equation. Our results provide the physical mechanism behind the linewidth broadening at current and temperature driven mode transitions. Argonne National Laboratory is a US DOE Science Laboratory operated under Contract No. DE-AC02-06CH11357 by UChicago Argonne, LLC. Supported by grants from the Swedish Research Council (VR), the Swedish Foundation for Strategic Research (SSF), and the Knut and Alice Wallenberg Foundation. References: [1] Slavin and Tiberkevich, IEEE Trans. Magn. **45**, 1875 (2009). [2] Muduli et al., Phys. Rev. B **86**, 174408 (2012); Dumas et al., Phys. Rev. Lett. **110**, 257202 (2013). [3] Muduli et al., Phys. Rev. Lett. **108**, 207203 (2012).

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Date submitted: 15 Nov 2013 Electronic form version 1.4