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Tunable Magnetic Resonance via Interlayer Exchange Interaction YUNPENG CHEN, University of Delaware, XIN FAN, University of Denver, YUNSONG XIE, University of Delaware, JEFFREY WILSON, RAINEE SIMONS, Electron and Opto-Electronic Devices Branch, NASA Glenn Research Center, SUI-TAT CHUI, JOHN XIAO, University of Delaware — Magnetic resonance is a critical property of magnetic materials for the applications in microwave devices and novel spintronics devices. The resonance frequency is commonly controlled with an external magnetic field generated by an energy-inefficient and bulky electromagnet. The search for tuning the resonance frequency without electromagnets has attracted tremendous attention. The voltage control of resonance frequency has been demonstrated in multiferroic heterostructures through magnetoelastic effect. However, the frequency tunable range is limited. We propose a paradigm to tune the magnetic resonance frequency by recognizing the huge interlayer exchange field and the existence of the high-frequency modes in coupled oscillators. We demonstrate the optical mode in exchange coupled magnetic layers which occurred at much higher frequencies than coherent ferromagnetic resonance. We further demonstrated a large resonance frequency tunable range from 11GHz to 21 GHz in a spin valve device by in-situ manipulating of the exchange interaction. The technique developed here is far more efficient than the conventional methods of using electromagnets and multiferroics. This new scheme will have an immediate impact on applications based on magnetic resonance.

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