



## **THEORETICAL STUDY OF FERROMAGNETIC RESONANCE IN EXCHANGE-COUPLED MAGNETIC/NONMAGNETIC/MAGNETIC MULTILAYER STRUCTURES**

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The dispersion relation on ferromagnetic films was calculation by using torque equation of motion with a damping term. The total energy including zeeman, demagnetizing and anisotropy energy terms was used to get ferromagnetic resonance frequency for both uniform and higher order spin wave modes. In antiferromagnetic films, the torque equation of motion for each sub-lattice were written to derive an expression for the dispersion relation.

The magnetic trilayer system under investigation consist of two ferromagnetic layers separated by a nonmagnetic layer. The dispersion relation of magnetic/nonmagnetic/magnetic three layers is calculated by using Landau-Lifshitz dynamic equation of motion for the magnetization with interlayer exchange energy. As for the exchange-coupled resonance of ferromagnetic resonance (FMR), the theoretical study has been calculated for both symmetrical and asymmetrical structures. In this systems, the exchange-coupling parameter  $A_{12}$  between neighboring layers was used to get resonance fields as a function of the angle between the magnetization vectors of each magnetic layers.