Electrical synchronization of two spin-torque nano oscillators

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Spintronics is being developed to overcome the limitation of conventional technology. One of the key applications of Spintronics is the spin-torque nano-oscillator (STNO) based on the transfer of spin angular momentum from spin-polarized current to the local magnetization of nano-magnetic structures. The spin-transfer torque can be used to generate a microwave signal under certain condition of external magnetic field and DC current [1, 2]. The STNOs have a great potential for a microwave generator [3], but have critical disadvantages such as lower power and broad linewidth which hinder the realization of STNO-based wireless communication [4].

In order to overcome these disadvantages, we have studied the synchronization of serially-connected STNOs consisting of two nano-scale magnetic tunnel junctions with elliptical shape. The samples are deposited using both DC and RF sputtering on the oxidized Si substrate. The samples are thereafter annealed at a temperature of 350 in a magnetic field of 4 kOe. A microwave signal was measured using spectrum analyzer. We observe two distinguished peaks with a small power (1.2 nW) at a low bias current (I_{DC}) which implies the microwave peaks originate from two individual junctions. As the current increases, the two distinguished peaks are merged at I_{DC} 1.6 mA, and the microwave power is increased to 4.8 nW. The broad linewidth of the merged peak indicates the frequency fulling or partial synchronization of two oscillation peaks with power enhancement.

References

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