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Quantum Dynamics of Spin-torqued Nanomagnet YONG WANG, YAOJUN ZHANG, L.J. SHAM, Department of Physics, University of California, San Diego — Nanomagnet is the key ingredient of many spintronics devices, such as hard disk read head, magnetoresistive random access memory(MRAM),etc. The underlying mechanisms in these structures are due to the interplay between the nanomagnet and spin-polarized electrons. Usually, the nanomagnet is characterized by the classical magnetization vector with its intrinsic quantum fluctuation neglected. By treating the nanomagnet as a huge atom with millions of energy levels, we are able to take account into the magnetization fluctuation, and study the interactions between nanomagnet and spin-polarized electrons on the same footing as quantum objects. We will show that the well-known giant magnetoresistance(GMR) effect and spin transfer torque(STT) effect are the consequences of continuous quantum measurements on the nanomagnet by spin-polarized electrons. We found that the quantum dynamics of nanomagnet is governed by a Fokker-Planck(FP) type equation in the atomic coherent state representation(P- representation). We will also discuss the correlation between the magnetization fluctuation and the electric current fluctuation.

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