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The shot noise like feature of the magnetic 1/f noise in CoFeB/MgO/CoFeB magnetic tunnel junctions. LIANG LIU, JIASEN NIU, HUIQIANG GUO, JIAN WEI, International Center for Quantum Materials, School of Physics, Peking University, Beijing 100871, China and Collaborative Innovation Center of Quantum, D. L. LI, J. F. FENG, X. F. HAN, Beijing National Laboratory of Condensed Matter Physics, Institute of Physics, Chinese Academy of Sciences, Beijing 100190, China, X.-G. ZHANG, Center for Nanophase Materials Sciences, and Computer Science and Mathematics Division, Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831-6493, J. M. D. COEY, CRANN and School of Physics, Trinity College, Dublin 2, Ireland — The magnetic field dependent 1/f noise in magnetic multilayers and magnetic tunnel junctions (MTJs) is conventionally considered as resistance fluctuations (S_R), for which an applied current (I) is merely used to convert S_R to measurable voltage fluctuations ($S_V = I^2 S_R$). From S_R and magnetoresistance, magnetization fluctuations can be inferred obeying the fluctuation-dissipation relation (FDR), thus comes the name magnetoresistive noise. However, we find that 1/f noise in CoFeB/MgO/CoFeB MTJs is better described by S_I/I, instead of S_V/I^2, particularly near the magnetic reversal fields of the reference layer and the free layer, the latter of which has not been previously investigated in detail. More surprisingly, the bias dependence resembles that of shot noise. These findings call for further investigation on FDR for magnetic noise in MTJs, especially in the far from equilibrium state with high bias and possible contribution from collective magnon excitations.

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