

Low - Frequency Resistance Fluctuations in (Ga,Mn)As

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We present results of transverse resistance fluctuations measurements of (Ga,Mn)As sample in the temperature range 10K-160K and for frequencies 1 Hz - 125 kHz.

The 20 nm - thick (Ga,Mn)As sample with Mn content $x=7\%$ has been grown by MBE method and annealed at 250 °C. The easy axis of magnetization is in the [001] direction and is perpendicular to the sample surface [1].

The current-biased sample has two additional contacts for measuring transverse voltage noise by means of two low-noise preamplifiers working in parallel to get rid of the uncorrelated noise of amplifiers. Data acquisition device and PC computer have been used for further analysis of data and calculation of voltage power spectral density (PSD).

The idea for noise measurements was to detect the resistance fluctuations related to ferromagnetic-paramagnetic phase transition at Curie temperature which is around $T_C \approx 120$ K in our sample [1]. Similarly as in [2] we did not observe any increase in resistance fluctuations at $T \approx T_C$, moreover, we detect there rather a local minimum for normalized resistance noise integrated in the range 1 Hz - 10 kHz. (see Fig.). However, in the integrated noise we observe several maxima at 10 K, 55 K and 100 K where instead of usual $1/f$ noise spectra we see the Lorentzians and Random Telegraph Noise (RTN) in time domain.

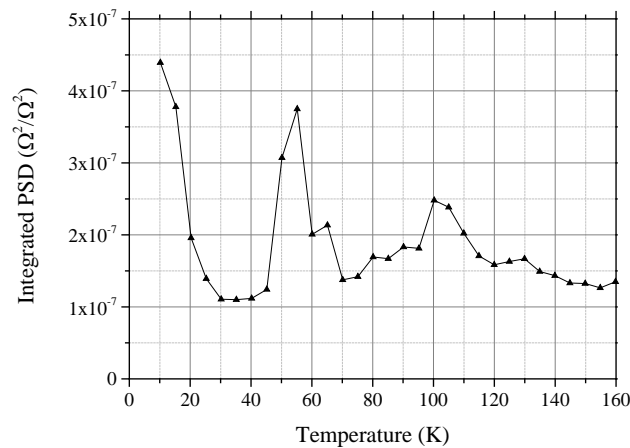


Fig. The temperature dependence of the normalized noise integrated in the frequency range 1 Hz - 10 kHz.

We will discuss possible origins for the features observed in low-frequency integrated noise and for the lack of distinct indications of the ferromagnetic-paramagnetic phase transition.

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[1] P. Juszyński, D. Wasik, M. Gryglas-Borysiewicz, J. Sadowski, *Journal of Applied Physics* **113**, 093708 (2013)

[2] M. Zhu, X. Li, G. Xiang, and N. Samarth, *Physical Review* **B 76**, 201201(R) (2007)