Bulk And Contact Low Frequency Noise Investigated With Transmission-Line-Model: InAs case

Ł. Ciura [1], J. Wróbel[2], P. Martyniuk[2]
[1]*Rzeszow University of Technology, W. Pola 2, Rzeszow, Poland*
[2]*Institute of Applied Physics, Military University of Technology, 2 Kaliskiego Str.,Warsaw, Poland*

The Transmission-Line-Model (TLM) is a well-known technique that can be used for obtaining parameters of the material or device under consideration, i.e., the sheet resistance, the metal-semiconductor contact parameters, e.g. contact resistance, transfer length, etc. The method relies on resistance measurements between pairs of contacts separated by different distances L. This work reports experimental studies on TLM samples made from n-type InAs doped with Si (N_d=2×10^{16} cm^{-3}, N_d=2×10^{17} cm^{-3}, and N_d=2×10^{18} cm^{-3}) and with various metallization (Au, Ti/Au, Ti/Pt/Au) and contact formation procedure (annealing).

Besides the standard characteristics measured for a TLM, the low frequency noise was also measured. The preliminary results are shown in Fig. 1, where the resistance to TLM (inset) and the normalized low frequency noise S_U (f=1Hz)/U^2 are shown as functions of the spacing of the contacts L. From this characteristic, the origin of observed low frequency noise can be identified by comparing characteristics' slope with a theoretical slope for two different models that assume bulk or contact origin of low frequency noise.

The scientific goal of the work is to investigate the influence of InAs doping, contact metallization, and their formation (annealing) on the total noise and separate bulk and contact noise contributions.

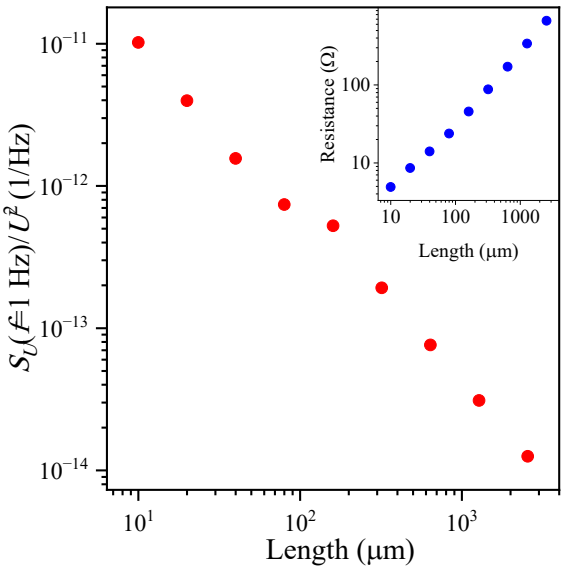

Fig. 1. Resistance and relative low frequency noise as a function of the distance between pairs of contacts for n-type InAs, doped with N_d=2×10^{16} cm^{-3}, transmission-line-model sample with Au contacts.