Comment on "Mobility spectrum computational analysis using a maximum entropy approach"

J. Antoszewski,[1] D. Redfern,[1] L. Faraone,[1] J. R. Meyer,[2] I. Vurgaftman,[2] and J. Lindemuth[3]
[1]*School of Electrical, Electronic and Computer Engineering, The University of Western Australia, 35 Stirling Highway, Crawley WA 6009, Australia*
[2]*Code 5613, Naval Research Laboratory, Washington D.C. 20375, USA*
[3]*Lake Shore Cryotronics Inc., 64 E Walnut Street, Westerville, Ohio 43081-2399, USA*
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We point out that the comparison in Fig. 1 of the recent publication by S. Kiatgamolchai *et al.* [Phys. Rev. E **66**, 036705 (2002)] of the proposed maximum entropy–mobility spectrum analysis (ME-MSA) with our quantitative mobility spectrum analysis (QMSA) is misleading. Rather than comparing with the more recent "improved" version of QMSA [Vurgaftman *et al.*, J. Appl. Phys. **84**, 4966 (1998)], a preliminary version that was three years older and demonstrably inferior was employed. We show that ME-MSA and the improved QMSA give quite similar results.

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COMMENT

The article "Mobility spectrum computational analysis using a maximum entropy approach" [1] presents a new technique called maximum entropy-mobility spectrum analysis (ME-MSA) for transforming magnetic-field-dependent resistivity and Hall coefficient data into a mobility spectrum. The method is interesting, and appears to be promising based on the results presented.

However, it should be pointed out that the comparison in Ref. [1] to our quantitative mobility spectrum analysis (QMSA) approach [2,3] is misleading. The discussion of earlier work in Section II mentions that a newer "improved" version of QMSA (sometimes referred to as *i*-QMSA) is now available [3] (it is sold as a software package by Lake Shore Cryotronics). However, rather than using this more advanced algorithm, Fig. 1 in Section IV of Ref. [1] plots ME-MSA results next to spectra generated by the first published form of QMSA, without explicitly mentioning that the comparison is to a preliminary algorithm that was three years older and considerably less sophisticated. The impression left by Fig. 1 is that ME-MSA is clearly superior to QMSA, whose distinctness from *i*-QMSA made two sections earlier can be missed by the reader.

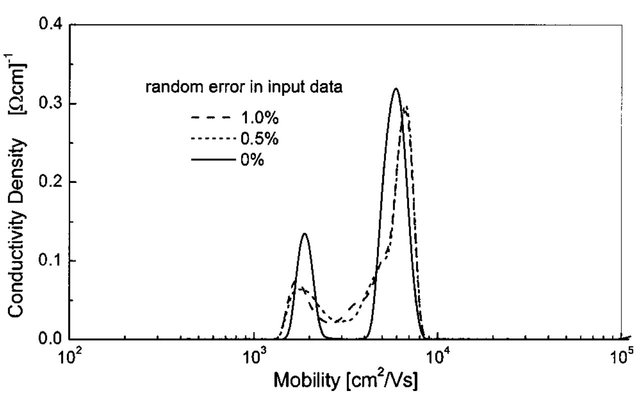

FIG. 1. Mobility spectra obtained from *i*-QMSA. Synthetic input data were generated assuming two carriers: $n_1=1\times10^{11}$ cm^{-2}, $n_2=1\times10^{11}$ cm^{-2} with mobilities $\mu_1=2000$ cm^2/V s, $\mu_2=6000$ cm^2/V s, respectively, and also introducing synthetic random errors ranging from 0%, 0.5% and 1%. The two carriers are easily identified in all of the spectra.

TABLE I. Sheet carrier densities from *i*QMSA:

Input data error %	1st carrier cm^{-2}	2nd carrier cm^{-2}
0	9.2e10	1.0e11
0.5	7.0e10	9.6e10
1.0	9.4e10	1.1e11

We now show that *i*-QMSA gives quite similar results to ME-MSA when the data sets used in Ref. [1] are input. The synthetic input conductivity tensor was generated assuming two carriers with sheet densities $n_1=1\times10^{11}$ cm^{-2}, $n_2=1\times10^{11}$ cm^{-2} and mobilities $\mu_1=2000$ cm^2/V s, $\mu_2=6000$ cm^2/V s, respectively. Figure 1 of the present *Comment* shows that for any simulated error $\leqslant 1\%$, *i*-QMSA correctly yields two distinct peaks. The *i*-QMSA densities and mobilities presented in Tables I and II are seen to reliably reproduce the main features of the input data for all of the conditions tested. While a definitive comparison is not possible because no quantitative data were presented in Ref. [1], the statement in that work's final paragraph that ME-MSA gives "a reduced level of errors compared to other MSA techniques" was unsupported, since no attempt was made to compare with the most advanced previous method.

TABLE II. Carrier mobilities from *i*-QMSA:

Input data error %	1st carrier cm^2/Vs	2nd carrier cm^2/Vs
0	1995	5916
0.5	2073	5936
1.0	1902	5883

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