Abstracts

Small-signal modeling of HBTs using a hybrid optimization/statistical technique

H. Ghaddab, F.M. Ghannouchi, F. Choubani and A. Bouallegue. "Small-signal modeling of HBTs using a hybrid optimization/statistical technique." 1998 Transactions on Microwave Theory and Techniques 46.3 (Mar. 1998 [T-MTT]): 292-298.

A new formulation for extracting the elements of the small-signal equivalent-circuit model of heterojunction bipolar transistors (HBTs) is proposed in this paper. This approach avoids the main problem of the conventional extraction methods which, in most cases, is the use of brute-force optimization techniques to extract a large number of parameters. At the beginning, this technique first uses the extraction procedure of a low-frequency HBT model. An analytical formulation that allows the reduction of the number of the unknowns of the low-frequency model to only two, which have to be calculated using a suitable optimization technique, is described. This makes the optimization problem much easier to handle and increases the probability for converging to the actual elements of the model, thus avoiding the converging to spurious solutions. Secondly, in order to extend the model to higher frequencies, a statistical approach is proposed to extract parasitic extrinsic elements. An experimental validation is carried out on three HBT devices and satisfactory results are obtained up to 30 GHz.

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