Abstracts

Noise model of InP-InGaAs SHBTs for RF circuit design

A. Huber, D. Huber, C. Bergamaschi, T. Morf and H. Jackel. "Noise model of InP-InGaAs SHBTs for RF circuit design." 2002 Transactions on Microwave Theory and Techniques 50.7 (Jul. 2002 [T-MTT]): 1675-1682.

A scalable small-signal and noise model of InP-InGaAs single heterojunction bipolar transistors was developed. Effects which become important at higher frequencies such as the correlation between base and collector current noise and frequency-dependent base current noise are taken into account. We will show that these effects are significant at frequencies higher than 40 GHz and can no longer be neglected. Our model also includes the effects of the different emission coefficients of the base and collector currents. Using this improved model, a direct-coupled, lumped broad-band amplifier was designed. We completely characterized the fabricated circuit with respect to small-signal, noise, and linearity behavior. A -3-dB bandwidth of 50 GHz with a dc gain of 9.8 dB and a gain-peaking of only 1.2 dB were achieved. All these values agree very well with the simulation results. The noise figure is 7.5 dB over a large frequency range. In the frequency range from 2 to 50 GHz, the third-order intercept point IP/sub 3/ and 1-dB compression point at the output have values from 17 to 10 dBm and 3 to 0 dBm, respectively.

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