Abstracts

Analysis of an experimental technique for determining Van der Pol parameters of a transistor oscillator

Kuang Yi Chen, P.D. Biernacki, A. Lahrichi and A. Mickelson. "Analysis of an experimental technique for determining Van der Pol parameters of a transistor oscillator." 1998 Transactions on Microwave Theory and Techniques 46.7 (Jul. 1998 [T-MTT]): 914-922.

The Van der Pol (VDP) model of a transistor oscillator describes the behaviour of the oscillator with three parameters. When operating in steady state, only two parameters can be determined by spectrum analysis, these being the oscillation frequency and amplitude of oscillation. In this paper, a technique for measuring the other VDP parameter is examined. In this approach, a periodically modulated voltage is added to the bias of the oscillator to perturb the operational state. A theoretical derivation shows that the power spectrum of the perturbed oscillator contains additional information for determination of the other VDP parameter. A simple analytical perturbation formula predicts the oscillator's response to the ramped bias. Our experimental results agree with the analytical perturbation solution and therefore, this allows one to read off the other VDP parameter from the experimental data. The VDP model allows one to predict the behaviour of coupled transistor oscillators more accurately and simply than does the traditional large-signal model of the transistor. This VDP model will simplify oscillator array design since the number of parameters needed to describe each oscillator is reduced from that which would be required using a large-signal circuit model.

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