Abstracts

Synchronization of oscillators coupled through narrow-band networks

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The ability of two coupled oscillators to synchronize depends critically on the coupling network. Previous analyses have accurately predicted the performance of quasi-optical microwave oscillator arrays for both weak and strong coupling, but have been limited to coupling networks with bandwidths considerably larger than the locking bandwidths of the oscillators. In this paper, the authors develop a method for deriving a suitable system of nonlinear differential equations describing the oscillator amplitude and phase dynamics using a generalization of Kurokawa's method. The method is applied to the case of two Van der Pol oscillators coupled through a resonant network for a wide range of coupling strengths and bandwidths. Simple approximate formulas are developed for the size of the frequency locking region as functions of the basic circuit parameters.

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