Abstracts

Continuum modeling of the dynamics of externally injection-locked coupled oscillator arrays

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Mutually injection-locked arrays of electronic oscillators provide a novel means of controlling the aperture phase of a phased-array antenna, thus achieving the advantages of spatial power combining while retaining the ability to steer the radiated beam. In a number of design concepts, one or more of the oscillators are injection locked to a signal from an external master oscillator. The behavior of such a system has been analyzed by numerical solution of a system of nonlinear differential equations which, due to its complexity, yields limited insight into the relationship between the injection signals and the aperture phase. In this paper, we develop a continuum model, which results in a single partial differential equation for the aperture phase as a function of time. Solution of the equation is effected by means of the Laplace transform and yields detailed information concerning the dynamics of the array under the influence of the external injection signals.

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