Abstracts

A New Phase-Shifterless Beam-Scanning Technique Using Arrays of Coupled Oscillators

P. Liao and R.A. York. "A New Phase-Shifterless Beam-Scanning Technique Using Arrays of Coupled Oscillators." 1993 Transactions on Microwave Theory and Techniques 41.9 (Oct. 1993 [T-MTT] (Special Issue on Quasi-Optical Techniques)): 1810-1815.

A method for electronic beam scanning in linear arrays of antenna-coupled oscillators is introduced which eliminates the need for phase shifters. It is shown that a constant phase progression can be established by slightly detuning the peripheral array elements, while maintaining mutual synchronization. This unusual nonlinear behavior is explained using coupled Van der Pol equations. A stability analysis provides theoretical limitations on the achievable inter-element phase shift. When the phase of the coupling is zero, the theory predicts an inter-element phase shift that can be varied continuously over the range -90° < Delta theta < +90°, and is independent of the number of oscillators in the array. An experimental four-element planar MESFET array was built, operating at 10 GHz with close to zero coupling phase, giving a measured phase progression that was continuously variable over the range -88° < Delta theta < 66°.

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