

Mode Analysis and Stabilization of a Spatial Power Combining Array with Strongly Coupled Oscillators

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In order to attain stabilized power-combining operations of a strongly coupled active antenna array, mode analysis for the multi-moding problem of the array is presented, and an effective method for exciting only the in-phase power-combining mode is proposed. In a one-dimensional array of active antennas coupled mutually through microstrip lines, the frequencies and the voltage distributions of the normal modes are obtained. Stable modes of the array are identified using the averaged potential theory. Time evolutions of the mode amplitudes are also calculated. In order for only the desired power-combining mode to oscillate, appropriate resistors are introduced at the midpoints of the coupling lines between the active antennas. An experiment for the arrays with up to eight active antennas has been carried out using Gunn diodes. It has been confirmed that the introduction of the resistors is effective for stable excitation of the in-phase power-combining mode.

 [Return to main document.](#)