

Harmonic Nulling in Time-Modulated Linear Arrays

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Abstract

Nulling techniques in adaptive arrays aim to the maximization of the power received associated at the desired signal despite a minimization of the power associated at the interferences signals, placing nulls in the direction of arrivals (DoAs) of interferences in the synthesis process of the power pattern. Many techniques has been proposed in literature to determine the optimal configuration of the element's excitations based on the maximization of the Signal-to-Noise-plus-Interference-Ratio (SINR), or on the minimization of the total power received. In this scenario has been recently proposed an adaptive nulling technique adopting time-modulated linear array: this type of array introduces an additional degree of freedom (time) in the process synthesis increasing flexibility in the antenna design and in the power pattern shaping problem. The major inconvenient of time-modulated arrays is the generation of unwanted harmonics, the so called sideband radiation that represent a loss in term of radiated power. Moreover, to suppress the unwanted harmonics, it is necessary to use a selective filter that in the case of high power interferences could be too expensive: then, it will be necessary minimize the power associated at the harmonic signals.

This project proposes a technique based on the particle swarm algorithm to determine the optimal dynamic configuration of the array excitations in order to receive correctly the desired signal minimizing the interferences contributes and in the same time limiting the drawbacks of time-modulated array (stated before) considering a time-varying scenario: particle swarm algorithm has been already showed its effectiveness in electromagnetics problems solution, in particular on the problem of synthesis of adaptive arrays in time-varying scenarios and on the problem time modulated array synthesis with low SR.

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