



Design of Shaped Beam Linear Aarray of Aperture Coupled Microstrip Antenna by Orthogonal Method with Far Field Mutual Coupling

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ABSTRACT— Orthogonal method has been used to synthesis of linear array antenna with Aperture Coupled Microstrip Antenna (ACMA) elements to obtain a shaped beam radiation pattern. The ACMA has been used as the array element because of its wide bandwidth return loss. Also, to achieve the correct excitation for the array elements, mutual coupling between them has been considered in the synthesis procedure. The mutual coupling effect has been shown by comparing the simulation results with and without of this effect in the orthogonal synthesis procedure. Finally, based on the optimum results of the orthogonal synthesis method a suitable feeding network has been designed for the array.

KEYWORDS: orthogonal method; mutual coupling; aperture coupled microstrip antenna; array antenna

I. INTRODUCTION

Because of the advantages of array antennas these configurations are used for beam forming problems in communication systems [1]. Different methods have been used for synthesis and optimization of the array antennas. Many parameters should be considered in the synthesis of the array antennas. One of the most important of these parameters is mutual coupling between the

array elements [2]. Different methods have been applied to compensate the mutual coupling by calculating the coupling coefficients such as Fourier decomposition and so on. In the synthesis of the array antennas the processing time and accurate results are so important. The orthogonal method that is extended and generalized for the synthesis of the array antennas can be used to obtain the excitation of the array elements with considering the mutual coupling to achieve the desired radiation pattern [3]. In the present work, to consider the mutual coupling the E-Field radiation pattern of each element in the presence of the other elements (Active Pattern) has been obtained from HFSS Ansoft. Then the active radiation patterns are used to synthesis the array by the orthogonal method to obtain the desired radiation pattern.

II. ORTHOGONAL METHOD

Orthogonal method is the technique that use the orthogonally between functions and obtain the excitation of array elements. If the mutual coupling between the elements will not be considered, derivation of the excitation is a simple procedure [3]. To this end, the array factor has the following form: