

MUTUAL COUPLING BETWEEN ANTENNAS IN PERIODIC NETWORK USING THE ADVANCED TRANSVERSE WAVE APPROACH FOR WIRELESS APPLICATIONS

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Abstract:

Radio frequency (RF), microwave and millimetre-wave integrated circuits have advanced quickly in the last two decades. This progress would not have been possibly achieved without the increased demand for RF and microwave consumer devices (cellular telephony and wireless data systems), the increasing speed of digital devices, the advance of solid-state devices, and the progression of planar transmission lines at an astonishing rate.

For most applications in communication systems when the scheme of twin antennas is used, the transmitting and receiving antenna array will be closely placed side by side. If the mutual coupling is too strong, the transmitting energy will blockade the receiver; therefore, the reduction of mutual coupling between two arrays is very important.

This research sets out to present a new technique based on the advanced Transverse Wave Approach (TWA) so as to depress the mutual coupling between antenna elements. TWA has several features that set it apart from other numerical EM methods. Indeed, no matrix inversion is required by the TWA, no limitations on the shape of the components are imposed, no numerical instabilities often stemmed from the matrices with large condition number and the convergence are insured independently of the interfaces of analysed structure. Besides, the TWA is based on transverse waves instead of the tangential EM fields that allow us to handle scattering operators rather than manipulate unbounded impedance or admittance operators.

Many studies have been carried out on the reduction of the mutual coupling factor between antennas but with high computation effort. This research offers the possibility to investigate the mutual coupling between antennas in periodic network for wireless applications by introducing a very efficient technique working without any mathematical computation effort.

Index terms: Advanced TWA, Mutual coupling, Antennas, Wireless applications.