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## Development of a Cylindrical Waveguide Antenna Array with a High Isolation Between Receive - Transmit Sub arrays: Theory and Experiment

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**Abstract:** The possibility of developing an antenna system consisting of transmit and receive arrays and being able to work simultaneously in full duplex mode at the same frequency is a very attractive task. This could only be achieved if the isolation between the transmit and receive arrays is sufficiently high not to cause a parasitic oscillation which will ruin the proper operation of a transponder system to which the arrays will be connected. Specifically, in this paper the operation of two peripheral open waveguide arrays placed on a cylindrical surface and being isolated with a radial line operating as a space filter, is studied. In analyzing the radiation properties of this rather complicated array antenna which has a conformal structure, an integral equation technique is used, while the solution of the derived set of equations is obtained by using a Galerkin approach. The accuracy of the developed solution is verified by several tests such as energy conservation theorem, convergence patterns and comparison with results obtained by applying the physical theory of diffraction technique. In addition to the theoretical analysis, an experimental antenna system has been developed and measured. Comparison of theoretical and experimental results is carried out and the validity of the solution is verified.

**Key Words:** cylindrical waveguide, aperture antenna, Galerkin method, antenna array, transmit and receive sub-arrays, space filters, loaded radial line, boundary value problem, Dyadic Green's function

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