

The Ohio State University ECE Department
IEEE AP/MTT Columbus Chapter Seminar

BEAMFORMING FOR WIDEBAND PHASED ARRAYS:
TIME AND FREQUENCY CONSIDERATIONS

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DREESE LAB ROOM 260

Abstract:

The purpose of this talk is to describe the new theoretical and practical challenges regarding beamforming and elements for phased array with wide (10%-40%) instantaneous bandwidths. The general expression for a monochromatic antenna pattern is now supplanted by a two dimensional function with dependence on both space and time. Expressions for the wideband antenna pattern in space and the impulse response in time will be shown. Both dimensions of time and space must be taken into account by the antenna/radar designer. The effects of random errors in the spatial domain and errors common to all elements with fluctuations in the frequency domain are analyzed as to their effect on the patterns in both domains. Practical examples, based on real life experience, are given, including RF beamformers, phased elements in finite arrays, and a photonic beamformer, which shows improved performance relative to its RF counterparts in both the spatial and time domains. The talk shows the need for interdisciplinary coordination between all the engineering disciplines involved in wideband imaging systems-i.e. the antenna design, the beamformer design and the signal processing analysis, and discusses some unique challenges for the future.

Bio:

Ruth Rotman received the B.Sc. and M.Sc. degrees in electrical engineering from the Massachusetts Institute of Technology, Cambridge, in 1983 and 1985, respectively. She is currently working towards the Ph.D. degree in the area of microwave photonics at Tel Aviv University, Tel Aviv, Israel. Since 1985, she has been with Elta Electronics Industries, Israel, working in the area of phased arrays, photonics, imaging systems and foliage penetration radar.