REDUCING MULTIPATH IN ANTENNA MEASUREMENTS

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Many ranges are limited by the effects of multipath propagation due to reflection from adjacent structures. Such structures may include buildings, range walls, floors, ceilings. The classic methods of reducing these effects use diffraction fences and absorber. With modern processing capabilities, new methods can be incorporated to reduce the multipath effects. Actually the method of reduction is not new, but is the implementation of the older techniques of the singularity expansion method [Baum, Interaction Note 88, 1971] and the matrix pencil method [Hua and Sarkar, 1989].

This paper presents the results that push the limits of an outdoor range due to ground bounce. A 400MHz Uda-Yagi antenna was simulated in both free space and over a ground plane with a dipole transmit antenna. The configurations were swept in frequency from 50MHz to 2050 MHz, typical of an 801 point sweep on a network analyzer. The results are then inverse Fourier transformed (IFFT) to the time domain. Similar results may be obtained for direct time-domain measurements. The processing is basically done in the time-domain. Based on the range limits, the transient response is truncated to eliminate multipath. At higher frequencies, the truncation is sufficient to obtain the needed data and a forward FFT may be used to obtain the frequency response. Such a process would be repeated for each angle of interest.

In the case of interest, the truncation is well before the antenna response has settled. The matrix pencil method is then applied to the response to obtain a pole-residue model for the response. Care must be taken in the choice of the window, starting after the equivalent incident waveform has passed and ending before the multipath appears. The matrix pencil method can be enhanced by observing poles additional poles that have little contribution to the basic response, but represent noise in the system. From the pole structure, both the transient and frequency responses may be computed without the interference of multipath. The results for the boresight response of the 400MHz Yagi will be presented along with measured boresight responses of several antennas, including frequency-independent antennas, UWB antennas, and a monopole.

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3. (a)

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