BINOMIAL ARRAY AS A MULTISTATE PHASE DIVERSITY ANTENNA

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In multipath radio wave propagation environment the way how incident plane waves are summed at a receiving antenna end is determined by the amplitudes and phases of the incoming waves and the amplitude and phase of the receiving antenna radiation pattern, respectively. Array antennas offer possibilities to control variable phase qualities of antennas, which can be used as a resource to optimize signal reception in complex propagation environments.

It is well-known that one cannot determine the element excitation of a linear array uniquely, if the desired radiation pattern is fixed. This non-uniqueness of the array can be considered as a result of several possible choices for a phase pattern. Antenna diversity, where an array antenna is used to create a fixed amplitude pattern and multiple choices for phase patterns, is called multistate phase diversity.

Binomial arrays are one realization of directive beams, which have very different phase patterns compared to each other while the amplitude pattern remains relatively unchanged. Binomial arrays have many benefits if one considers the realization of phase diversity, since excitations are real and symmetric, therefore it is interesting to investigate binomial arrays in sense of phase diversity. A set of different order beams produced by a small binomial array could be effectively used in optimizing received radio signal and system performance.

This concept of using binomial arrays in microcell radio channel environment is demonstrated with an example array configuration consisting of four antenna elements and the technique itself is assessed by the simulated fading reduction performance. Radio channel modeling of the simulations was performed with UTD-based raytracing model made by Nokia Telecommunications.