Measuring Angle-Of-Arrival in Over Ocean Propagation Experiments

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Abstract

Radio propagation experiments are a useful tool when verifying propagation models and identifying anomalies in a practical link. This paper details a method to measurement amplitude profiles and angle-of-arrival in an over-ocean propagation experiment. A new technique for measuring the phase of radio signals received by incoherent detectors is described. Frequency drift and offsets, arising because the different receivers are incoherent, are compensated for by way of a common reference signal injected into each channel. The phase of the unknown signals are obtained by processing the down-converted and digitised waveforms. A novel technique based on an adaptive, discrete-time quadrature delay estimator (QDE) algorithm is used for this purpose. This algorithm is insensitive to variations in the amplitudes of the input signals, and does not require an accurate prior estimate of the frequency of the input sinusoids. This approach is shown to be an accurate, low cost alternative to conventional vector measurement techniques when used with large antenna arrays and is therefore well suited to fixed link, angle-of-arrival measurements.