

ADAPTIVE INTERFERENCE REJECTION FILTERS FOR SPREAD SPECTRUM COMMUNICATION SYSTEMS



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ABSTRACT

Use of spread spectrum techniques for communication systems has proven an effective technique for increasing the ECCM capability. This technique has, however, increased the systems susceptibility to narrow band interference because of the larger bandwidth occupied by spread spectrum waveform. This vulnerability is further compounded by the interferers often being in close proximity to the receiver and the dynamic nature of the interference environment.

The adaptive filter is a technique for suppressing interferers whose spectral characteristics are different from those of the signal of interest while passing the data with a minimum of phase and amplitude distortion. The adaptive filter can be realized as a steerable notch filter or a fully adaptive transversal filter following the development by Widrow.

Use of the adaptive filter as a pre-filter or whitening filter prior to the demodulator is discussed. The advantage of suppressing high level narrowband interference prior to the demodulator, especially when the demodulators are implemented digitally is the main motivation. An important consideration is the ability of spread spectrum systems to tolerate a substantial loss of spectral energy while still maintaining the desired performance. This feature allows use of steerable filters with relatively wide notches or correspondingly transversal filters without a large number of coefficients. Finally, implementation of adaptive transversal filters with surface acoustic wave (SAW) and charge coupled devices (CCD) is discussed.