Sidelobe Cancellation Method at the Exit of Correlation Processing Sheme

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Abstract - The criterion of sidelobe cancellation in the receiving tract of radar receiver in the case of usage binary phase-shift keying is considered.

I. INTRODUCTION

One of the most significant questions in radar supervision is the question of definition of the mobile target with small level of effective radar cross section (RCS) to targets with big level of RCS. All advantages of wideband technology [1] with simultaneous usage of signal which are able to get the most time compression and the least sidelobe level are used to solve this task.

II. FORMULATION

There is a certain category of code sequences which are called complementary. These sequences differ from others by the feature, that the sum of the correlation sample of this sequence is equal to zero, except the case of the summation the basic (zero shift) components. If there is a sequence \( \{a_n\} \) and \( \{a_n^*\} \) in this case:

\[
R_m + R_m^* = 2 \text{ for } m = 0; \quad (1.)
R_m + R_m^* = 0 \text{ for } m = \pm 1 \ldots \pm (N-1).
\]

This singularity is very useful for definition of the close being targets with different meanings of RCS. The direct usage of this sequence as analog to modulation of carrier frequency results in the loss of the singularity urgency (1), because the signal is very “sensitive” to Doppler’s effect [2].

The corresponding criterion of usage of complementary sequence has been developed in accordance with which it’s possible to get low sidelobe level of correlation function in a very broad band of target speeds. The application of this criterion provides the usage of classic scheme of quadrature processing [3] and recreation filter that in its turn permits radiation and receive signal to represent complementary copy. At the same time recreation filter activity does not depend on the time of broken signal incoming. The signal relief on the exit of this processing scheme is illustrated on the figure 1.

In each concrete case, when there is given signal duration and effective bandwidth it’s necessary to make calculation of signal relief on the exit of the correlation scheme processing in order to determine a range of admissible target speeds at witch sidelobe level do not exceed selected level.

III. CONCLUSION

The considered criterion allows ensuring small sidelobe level of correlation function in an appropriate range of target speed. The criterion can be useful for definition of moving - mobile and slow - moving targets. Due to concrete decrease of sidelobes it’s possible to solve the problem of definition of targets with small RCS value on the background of target with big value of RCS. At the same time there isn’t degradation of target distance resolution at the expense of broadening of the main correlative maximum.

REFERENCES