Impulse Radio Signal Processing Considering the Internal Phase-Frequency Instability

Oleg Shynkaruk, Ivan Chesanovskiy

Abstract – **The impulse radio signal processing method is considered with taking into account their internal phase-frequency instability.**

Keywords – **Impulse radio signal, internal modulation, phase instability, optimal receiver, matched filter.**

I. INTRODUCTION

The impulse radar system operation algorithm is proposed in which the optimal receiver (matched filter) model is formed (corrected) as a result of analysis for full complex waveform envelope, which is radiated.

II. OPERATION ALGORITHM

In real systems as a result of physical restriction for accurate synthesis signal reproduction in the microwave band and high power the efficiency is lost of the optimal receiver. In the simple impulse signal location process the signal correlation properties are changed as a result of the complex waveform envelope deformation [2]. It is reduces to the energy losses and deterioration of the resolving capacity. In the complicated signal location process, for example discrete-coded phase signals [1], as a result of the phase destabilization of the microwave oscillations the ambiguity function sides overshoot level is increased. It is also reduces to the energy and information losses.

In the report the radar means operation algorithm is considered. This algorithm is defined with using of the maximum enable information parameter quantities of the radiated radio signal, its useful (modulated) features and bad features (amplitude, frequency-phase instabilities).

In this approach the additional element should be inserted in the radar system, which coordinates the receiver and transmitter operations fig. 1.
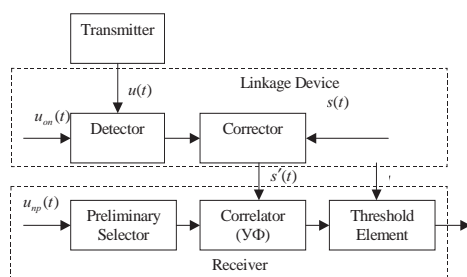

Fig. 1. The radar system with correction of the receiver parameters block diagram.

By analyzing of the system operation for example of the radar station in which the simple impulse signal use it is determined next features. By using of the additional parameter its internal phase and frequency instability it can be reached the signal/noise ratio increasing. Moreover the potential resolving capacity can be increased in several times.

If only instability is considered by means of the electronic frequency decreasing the correlation function is specialized as a result of the modulated impulse rectangle shape fig.2 (impulse duration 1mcs).
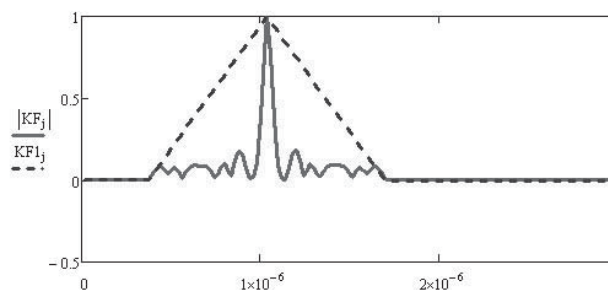

Fig. 2. The modulus diagram of the bang signal normalized correlation function with consideration of the instability (-), without consideration of the instability (--) (KF – Correlation function level)

III. CONCLUSION

The obtained results show that analysis of the internal impulse phase and frequency structure instability allows to achieve its "narrowing" on the output of the matched filter in 5 – 6 times with the sides overshoot level 15 – 26 dB depending on the instability swing. In the energy case it means the increasing of the signal level with respect to noise level because of energy stays a constant value and duration is decreased.

REFERENCES

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