NARROW BAND NOISE ATTENUATION FOR FMCW SOUNDING,

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Abstract:

The processing of a LFM signal of the chirpsounder by a method of compression in frequency area consists in multiplication of the received signal to a heterodyne signal, complex-conjugated to a radiated signal. As a result of demodulation the noise concentrated in frequency area becomes pulse noise, allowing to use specific methods of reduction of pulse noise.Work the system of reduction of the noise concentrated in frequency area will be effective at significant excess of energy of noise over energy of a signal. Therefore the signal on an output of the receiver can be considered within the framework of model of a mix of two distributions with different dispersions.Identification of the form of distribution has been realized on the basis of use of estimations of the kurtosis and factor of entropy If samples of a signal had two-modal distribution was considered, that they contains noise.Attribute of the sample belonging to the noise is the big distance of this sample from centre value of distribution. The importance of difference between samples is estimated on base of the use criterion finding the blunders in experimental measurements.Efficiency of procedure of a rejection was estimated on value of size n=10lg (P1/P2) (P1 – the attitude signal / noise after rejection, P2 – the initial attitude signal / noise). For the analysis the data were used received in experiments, carried out on radiolines Cyprus - Nizhny Novgorod and Irkutsk - Nizhny Novgorod. From 1500 spectra of a signal processed in carried out experiments the noise concentrated in frequency area has been found out in 60 % spectra. Thus average value of the cut out band of frequencies has made 14 êÃö at a band of frequencies of a signal in 100 êÃö. The average gain was equal 4.1 dB, maximal - 13 dB. It is experimentally established, that the value n depends on the attitude P2. If for values 5dB <P2 <20dB average gain is equal 4.7 dB (maximal - 13 dB), for 20dB <P2 <40dB - 3 dB (maximal 9 dB). Thus application of the offered technique is especially effective at a small signal on a background of significant noise. Application of estimations of the kurtosis and factor of entropy for identification of the form of distribution has increased probability of correct detection of the noise from 76 % up to 95 %.
The factor of correlation between n and the entropy factor in the carried out experiments is equal -0,8, i.e. the increase in energy of noise conducts to reduction of the entropy factor.