

电子技术

基于STFT的宽带数字ESM接收技术

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摘要:

提出了一种新的基于瞬时测频的宽带数字电子支援 (electronic support measure, ESM) 接收技术。首先对输入信号进行短时傅里叶变换, 通过对变换结果进行快速插值, 实现瞬时测频; 然后利用多门限完成瞬时频域检测, 并根据检测带宽进行抽取。这种新的接收技术能够有效解决ESM系统对宽带同时到达信号的侦收难题, 且算法结构规整, 易于用现场可编程逻辑门阵列 (field programmable gate array, FPGA) 芯片进行硬件实现。计算机仿真结果表明, 系统单信号检测灵敏度可达-5 dB, 当输入信噪比为-5 dB~15 dB时, 单信号正确检测概率可达90%以上, 动态范围达20 dB, 双信号瞬时动态范围可达18 dB。

关键词: 电子支援 同时到达信号 短时傅里叶变换 瞬时测频

Wideband digital ESM receiving technique based on STFT

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Abstract:

A novel wideband digital electronic support measure (ESM) receiving technique based on instantaneous frequency measurement (IFM) is proposed. Firstly, a short time Fourier transform (STFT) is put on the input signal. The IFM is realized by fast insertion to the STFT results. Secondly, an instantaneous frequency detection technique is implemented by using multi threshold. Lastly, the output is down sampled according to the detective bandwidth. The difficulty of capturing wideband simultaneous signals in ESM system can be conquered according to this novel receiving technique. Furthermore, the scheme can be expediently implemented in field programmable gate array (FPGA) device due to its regular fabric. Computer simulation results indicate that the detection sensitivity of one signal can reach -5 dB. The right detection rate can overcome 90 percent so as the input signal to noise ratio (SNR) is in the range of -5 dB to 15 dB. That is 20 dB dynamic range can be got. The simulation results also show that 18 dB double signal simultaneous dynamic range can be achieved by using this scheme.

Keywords: electronic support measure (ESM) simultaneous signal short time Fourier transform (STFT) instantaneous frequency measurement (IFM)

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