

应用

实时频谱分析技术在雷达信号侦察中的应用

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摘要:

复杂电磁环境下, 信号侦察系统需要宽带的信号采集和处理能力、高截获概率和快速准确的分析能力。数字化雷达侦察宽带接收机中采用实时频谱分析技术可以提高设备对信号的捕获能力和观察能力, 是一种非常有应用前景的新技术。本文首先研究了实时频谱分析技术的基本原理及其两个关键技术——频率模板匹配技术和数字荧光技术, 然后提出了经过频率模板匹配处理后基于数字荧光技术生成的频谱积累图进行信号检测的处理方法, 并定性分析了在接收频段上存在单信号、双信号及多信号等不同情况下该方法的处理性能。对双信号和多信号情况, 根据信号位置按照分离、交叉和包含三种情况进行了分析。最后给出了相应的仿真验证, 假定频段上存在三个宽带信号, 其中一个信号在频率模板的模板区, 另外两个信号不在, 对3种能分离的情况在5dB、10dB、15dB、20dB的不同信噪比下各作了100次试验, 并对试验结果进行了分析。仿真结果表明, 采用文中提出的处理方法, 能够有效的分析处理在同一时间段内存在的多个不同信号, 从而提高了雷达侦察接收机的性能。

关键词: 雷达侦察 实时频谱分析 频率模板匹配; 数字荧光技术

Application of Real-time Spectrum Analysis Technology in Radar Reconnaissance

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Abstract:

In the complex electromagnetic environment, the system for signal detection of radar reconnaissance receiver needs the abilities of wideband signal acquisition and processing, high probability of intercept and capture, and fast and accurate analysis. The digital radar reconnaissance system that applies the real-time spectrum analysis technology can highly enhance the capability of capturing and observing signals, and it is a new technology which has a very nice foreground in the application. First of all, the basic theory of real-time spectrum analysis technology and the two key techniques— frequency mask matching (FMM) and Digital phosphor technology (DPX) have been worked over. Then the method for signal detection based on cumulative spectrum which was made from DPX after FMM was put forward. Beside this, the performance in different conditions including single signal, double or multiple signals existing in the same receiver band was qualitatively analyzed. When there is more than one signal, the relationship of frequency position is divided into the separation, cross and containing, all the resolvent for every situation are particularly explained. Eventually the corresponding simulation tests were presented. There are three broadband signals in the frequency band, one signal not match the frequency mask and the other two signals do. Every 100 tests were done under the SNR of 5dB, 10dB, 15dB and 20dB. The analysis for the results and the conclusion was discussed followed. The simulating results has demonstrated that the multiple signals existing in the same time period can be analyzed effectively using the method proposed in this paper, which improves the performance of radar reconnaissance receiver.

Keywords: Radar Reconnaissance Real-time Spectrum Analysis Frequency mask matching; Digital phosphor technology

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