

研究论文

多模块中核四极矩共振信号参数估计新方法

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摘要:

针对核四极矩共振技术探测爆炸物中干扰信号的时变性, 基于各信号采样模块包含有固定的核四极矩共振信号与时间干扰信号以及噪声的实际信号模型, 提出改进的多模块HTLSstack算法. 首先采用HTLS的方法确定出共有极点的个数; 其次构造新的筛选准则, 确定所有模块的共有极点; 最后结合核四极矩共振信号的先验信息, 实现核四极矩共振信号参数的有效估计. 该方法充分利用了原始数据的信息, 在低信噪比下, 避免了多模块HTLS方法在第一次奇异值分解时带来的性能损失. 仿真数据和实测数据结果证明了该算法的有效性.

关键词: 核四极矩共振 自由感应衰减 子空间基共有极点估计 奇异值分解 HTLS

New method for estimation of nuclear quadrupole resonance signals parameters in multi-block

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Abstract:

Aiming at the time-variation characteristic of interference signals in the explosive detection using the nuclear quadrupole resonance (NQR) technique, and according to the real world signal model of each signal sample block including the fixed NQR signal, time-variation interference signals and noise, an improved multi-block hankel total least squares stack (HTLSstack) method is presented. Firstly, the number of common poles is determined using the HTLS scheme; secondly, a new selection criterion is constructed to choose the common poles; finally, the prior knowledge is employed to realize the estimation of NQR signals effectively. This method makes full use of the information on original data, and in the case of a low signal-to-noise ratio, it can avoid the performance loss of the multi-block HTLS method in the first singular value decomposition (SVD). The validity of this algorithm is demonstrated with the results of both simulated data and experimental data.

Keywords: nuclear quadrupole resonance (NQR) free induction decay (FID) subspace-based common poles estimation singular value decomposition (SVD) HTLS

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