

一种快速最优自适应频率校准电路

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摘要: 提出一种快速最优自适应频率校准电路, 应用于卫星导航接收机的宽带频率合成器中. 该自适应频率校准电路通过共用频率合成器中多模分频器的分频码, 快速定位到多频带压控振荡器的理想目标频带, 并进行反馈校准, 搜索出目标频点的上下两条实际目标频带, 并分别与之比较偏差, 选择距离最近的目标频带. 该自适应频率校准电路采用数模混合电路设计, 模拟部分以减小搜索步长, 数字部分以提高校准算法的准确性和减少搜索步数. 基于 $0.18\ \mu\text{m}$ CMOS 工艺的混合信号仿真验证表明, 相对于传统的频率校准电路, 提出的快速最优自适应频率校准电路可以实现更短的锁定时间, 并选取最优频带, 从而有利于频率合成器的环路稳定和相位噪声优化.

关键词: 自适应; 频率校准; 快速; 数模混合; 最优算法

A Fast and Optimal Adaptive Frequency Calibration Circuit

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Abstract: A fast and optimal adaptive frequency calibration circuit is proposed for wideband frequency synthesizer of satellite navigation receiver applications. The adaptive frequency calibration circuit can quickly find ideal target frequency band of the multi-band VCO by the division ratio of the multimode divider of the frequency synthesizer. The feedback calibration is performed to search the actual upper and lower target frequency band of the target frequency, and compared with the deviation, selected the nearest target frequency band. The adaptive frequency calibration circuit is designed using mixed signal circuit to reduce the step size of search by analog circuit and to improve the accuracy of the calibration algorithm and reduce the number of search steps by digital circuit. Simulation results based on $0.18\ \mu\text{m}$ CMOS process show that compared with the traditional frequency calibration circuit, the proposed method can achieve shorter locking time and select the optimal frequency band, which is beneficial to the loop stability and phase noise optimization of frequency synthesizer.

Key words: adaptive; frequency calibration; fast; mixed signal; optimal algorithm

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