

## 基于CORDIC算法的微小卫星发射机设计与实现

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摘要:

针对微小卫星测控应答机体积小、重量轻及其功能灵活的特点, 研究了全数字调制发射机的实现方法。全数字调制加两次上变频的发射机结构, 可以灵活的实现多种码速率、不同带宽、不同调制方式的调制信号。在全数字调制部分利用NCO和CORDIC算法实现数字频率合成器, 不仅可以满足副载波、载波调制的频率精度要求, 而且与传统的数字式频率合成技术相比占用了较少的硬件逻辑资源。在一块FPGA上实现了几种常用调制方式的VHDL代码, 验证了该方案的可行性。基于CORDIC算法的全数字调制设计方案可以应用到其他可重构的软件无线电设计中。

关键词: 全数字调制; CORDIC算法; 数字频率合成器

## Design and implementation of micro-satellite transmitter using CORDIC algorithm

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**Abstract:**

The implementation method of fully digital modulation transmitter of micro-satellite affects volume, weight and function reconfigurability of the transponder. The transmitter composed by fully digital modulator and two up-converter stages is able to cope with multiple symbol rates, signal bandwidths, and modulation schemes. Using NCO and CORDIC algorithm to implement the Digital Frequency Synthesizer (DFS) of fully digital modulator, not only satisfies the requirement of frequency resolution, but also needs less logic resources than traditional frequency synthesizer solutions. The very high speed integrated circuit hardware description language (VHDL) code of several modulation schemes was synthesized on a specific field programmable gate array (FPGA), and the results showed this methodology was feasible. The fully digital modulation scheme using CORDIC algorithm can be applied to the design of other reconfigurable transmitters.

**Keywords:** fully digital modulation ; coordinate rotation digital computer (CORDIC) algorithm; digital frequency synthesizer

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