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硕 士 学 位 论 文

无线自组网络应急通信异频转发器的研制

Development of Wireless Ad Hoc Network Pilot Frequency

Repeater for Emergency Communication

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摘要

在信息化高度发达的今天，人们对信息的需求和获取也提出了更高的要求，尤其是在突发事件发生后，相关信息的及时获取和传递就显得极为重要。近年来国家将应急通信领域的发展建设提上了新的高度，这也使相关的研究工作具有很强的针对性和现实意义。

本文从我国国情和应急通信领域发展的实际出发，以 900 MHz 无中心多信道选址移动通信系统为设计蓝本，论证开发了一款实用、稳定、便携的转发器样机，提供了一套射频部分的解决方案，使在突发事件后能够快速组网做出响应。

本文的主要工作是在理论指导的基础上运用 HFSS、ADS 等射频仿真软件对组成系统的微波滤波器、放大器、混频器、耦合器和相关辅助电路进行设计和仿真，在完成加工制作后进行了相关测试改进工作，最后将电路级联成转发器系统进行测试并配合无中心系统手持设备开展组网应用试验。

主要创新点在于：在有限的 2 MHz 频带内通过合理巧妙的规划设计和技术应用，实现对射频信号的处理；运用超窄带滤波和移频技术、超微细化微带平面电路工艺对系统射频电路进行了小型化研究；采用新颖性挤压式立体电路工艺及结构一体化思想完成了滤波器等电路模块与机箱外壳的一体化结构设计和模具化生产方式的探索。

最终制作的转发器样机体积小巧、性能稳定，实测指标符合预期效果。该转发器非常适用于应急通信的需求，具有很强的推广应用价值，希望能对当今应急通信领域的发展提供应用参考。

关键词： 转发器；无中心系统；应急通信

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Abstract

Nowadays, with the highly developed information technology, people have higher requirements to the demands and obtainment of information, especially when something emergent occurs, timely accessing and transferring to related information has become extremely important. In recent years, the country has taken the development and construction of emergency communications to a new level, which makes related research become more pertinent and have practical significance.

This paper was based on the reality of China's national conditions and the development of emergency communications, it took the 900 MHz land mobile communication system using multi-channel access techniques without a center controller as the original designing version, developed a practical, stable and portable transponder prototype and provided a set of solutions to the radio frequency, so that when the unexpected events occur it can make a network and respond quickly.

Based on the theoretical guidance, the major work of this paper is to use the simulation software, such as HFSS and ADS, to design and simulate microwave filters, amplifiers, mixers, couplers, and related auxiliary circuits, which are components of the system. After completing the processing and manufacturing, the improvement of the relevant testing was carried out, and finally the final circuits were cascaded into repeater system for testing and in coordination with handheld devices with no center controller system to carry out Ad hoc network application testing.

The main innovation is: in the limited frequency band of 2 MHz, it achieves the RF signal processing by rational planning and design and clever technology; applying the ultra-narrow-band filter and frequency shifter technology, ultra-refined system of microstrip planar circuit technology to study the miniaturization of RF circuits; using novel extrusion process three-dimensional circuit and structure of integrated ideas to complete the integrated design of filter and other circuit modules with the chassis shell and the exploration of mold production methods.

The final production of transponder prototype has small volume and the performance is stable, the measured indicators are consistent with the expected results. It is extremely suitable for the requirements of emergency communication, and has very strong promotional value. Hope it will provide some application reference for the present development of emergency communications.

key words: repeater;no center controller system;emergency communication

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