

## 电子技术

### X波段瞬态极化雷达射频前端关键技术研究

赵菲, 叶良丰, 肖科, 柴舜连, 毛钧杰

国防科学技术大学电子科学与工程学院, 湖南 长沙 410073

#### 摘要:

瞬态极化新体制雷达, 通过单脉冲获得瞬时极化散射矩阵来提取目标特征信息, 提高了雷达系统在复杂电磁环境中的探测、抗干扰和反隐身等方面能力。基于该雷达工作原理, 提出“同时正交双极化”的射频前端设计方案, 完成了国内首部瞬态极化雷达试验系统射频前端的研发。采用正交双通道和幅相一致性技术保证了雷达实现瞬态极化的功能, 采用滤波技术保证了射频系统的频谱纯度; 采用低噪声放大技术有效降低了接收机噪声系数; 采用直接频率综合技术提高了射频系统频率稳定性和相参性能; 结构集成一体化设计保证了射频收发前端的电磁兼容性能和便携性。射频前端测试结果均优于指标要求, 并支持试验系统初步解决了目标极化散射特征提取与识别领域的基础性和共性难题。

关键词: 瞬态极化雷达 极化散射矩阵 射频前端 雷达接收机 雷达发射机 幅相一致性

### Key technologies of X-band front end RF for instantaneous polarization radar

ZHAO Fei, YE Liang-feng, XIAO Ke, CHAI Shun-lian, MAO Jun-jie

Coll. of Electronic Science and Engineering, National Univ. of Defense Technology, Changsha 410073, China

#### Abstract:

The instantaneous polarization new system radar extracts the characteristic information of the target by achieving the polarization scattering matrix instantaneously, and improves the ability of detecting, anti-interference and anti stealth in complex electromagnetic environment. Based on the operation principle of this radar, the RF front end design scheme “simultaneous orthogonal double polarization” is proposed, and the first RF front for instantaneous polarization radar experiment system is manufactured in China. The technology of amplitude phase coherence for orthogonal channels is adopted to satisfy the function of the system. The low noise amplify technology is adopted to decrease the noise coefficient of the receiver efficiently. The filter technology improves the pureness of frequency spectrum. The technology of indirect frequency synthesis improves the frequency stabilization and the coherent performance of the system. The structure integration design improves the EMC and the portable performance of the RF front end. The measured results of the system are better than the predetermined targets. And this RF front end helps the experiment system resolve extracting the polarization scattering characteristic of the targets and the basic difficult problem in identifying field.

Keywords: instantaneous polarization radar polarization scattering matrix front end RF radar receiver radar transmitter magnitude-phase coherence

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通讯作者:

作者简介:

作者Email:

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