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飞行器目标频率响应散射特性

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Frequency Response Scattering Characteristic of Aircraft

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摘要 为研究飞行器目标散射频率响应特性和隐身、反隐身原理，对两种飞行器平板缩比模型进行了系列测试和计算研究，推导和验证了简单目标（金属球）的频率响应特性在飞行器目标上的适用性，并推广到如飞行器复杂散射体的分析。提出了划分瑞利区、谐振区、高频区的新方法，指出飞行器具有隐身能力极限的概念；研究了目标多频散射的极化特性，发现频率降低时，水平极化下全向雷达散射截面（RCS)均值逐渐增大，垂直极化时减小。得到了两种飞行器目标处于瑞利区、谐振区时依靠外形隐身所能达到的RCS极限值。结果分析表明，在瑞利区和谐振区，目前的外形隐身措施存在不能超越的极限，在这两个区域的雷达隐身需结合外形和材料隐身技术。

关键词： 飞行器 电磁散射 频率 雷达散射截面 极化

Abstract： The radar cross section (RCS) of multi-scale models for two different aircraft is tested and computed to analyze the frequency response characteristics of aircraft scattering and study the stealth and antistealth theory. The frequency response characteristics of scattering from a simple target such as a metal sphere is deduced and validated to be applicable for complex objects such as an aircraft. A new method is presented to divide the Reighlay region, resonance region and high frequency region of an aircraft, and a concept of stealth performance limit is discovered. The polarization characteristics of target scattering under multi waves were investigated. It is found that when testing frequency decreases the whole range of RCS average increases in horizontal polarization and decreases in vertical polarization. The stealth performance limit attained by modifying aircraft shape was gained from these two aircraft in Reighlay and resonance regions. Results show that the stealth performance achieved through the present shape modifying measures has an unsurmountable limit in Reighlay and resonance regions; therefore, radar stealth needs to integrate shape and radar absorbing material techniques in both frequency regions.

Keywords： aircraft electromagnetic scattering frequency radar cross section (RCS) polarization

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