

基于子带合成的超宽带雷达杂波建模与仿真

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Ultra-wideband Radar Clutter Modeling and Simulation Based on Sub-band Synthesis

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摘要

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摘要 该文利用子带合成和广义平板模型, 分别在不同的入射角和相对带宽条件下进行超宽带雷达地杂波建模、仿真, 并对杂波统计特性进行分析。首先根据地形将地面划分成若干个小区域(称为广义平板); 把超宽带信号划分成一系列子带(窄带); 然后得出各子带信号在平板模型下的杂波反射系数(σ^0), 最后通过子带合成的方法获得超宽带雷达地杂波模型。通过仿真发现, 超宽带雷达地杂波随着入射角或相对带宽变化时, 杂波的统计分布也跟随变化; 但超宽带雷达杂波的概率密度函数曲线具有“低重心和重拖尾”的共性, 且随着相对带宽的增加, 拖尾加重。仿真结果证明了“频率分割子带合成”法的可行性。

关键词: 超宽带雷达 子带合成 广义平板模型 杂波反射系数

Abstract: In this paper, an approach, based on sub-band synthesis and general facet model, is proposed for Ultra-WideBand (UWB) radar ground clutter modeling, simulation and analysis of clutter statistics in the case of different incident angle and relative bandwidth is respectively proposed. Firstly, the facet is divided into a series of small segments (called general facet) according to ground shape; UWB radar work bandwidth is splitted into a bank of sub-bands (narrow-bands). The second step is to obtain the individual facet clutter backscattering coefficient (σ^0) from the sub-bands. Finally, the method of sub-band synthesis is utilized to get UWB radar ground clutter model. According to clutter simulation, it is found that the UWB radar ground clutter Probability Density Function (PDF) curve varies with the fluctuation of incident angle or relative bandwidth. However, UWB radar PDF curve is characteristic of “low barycenter and fat tail”, furthermore, the tail become more heavy when the relative bandwidth of UWB radar increase. Simulation results show that the method of “frequency splitting and sub-bands synthesis” is feasible.

Keywords: UWB radar Sub-band synthesis General facet model Clutter backscattering coefficient

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