

传感器与信号处理

机载脉冲多普勒雷达湍流信号的仿真分析

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摘要:

为了分析湍流特性和有效地对湍流信号进行检测以及研究地杂波对湍流检测的影响,采用快速傅里叶变换(fast Fourier transform, FFT)对湍流回波信号的风速与谱宽进行了计算,建立了相应的湍流模型,在湍流风速和谱宽的检测中引入了地杂波因素。提出了湍流信号处理的FFT方法,重新定义了湍流的风速和谱宽和最小信号检测门限以及相关变量。仿真结果表明,湍流的风速具有脉动特征,该方法能够很好地估计出湍流风场里的风速分布,无地杂波情况下的湍流回波信号的风速与谱宽要优于有地杂波情况。

关键词: 风速 谱宽 快速傅里叶变换 多普勒频移

Simulation and analysis of turbulence signals in airborne pulse Doppler radar

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Abstract:

In order to analyze the characteristic of turbulence, detect the signal of turbulence efficiently and further research the influence of the ground clutter on detecting turbulence, the corresponding turbulence model is established. The wind speed and spectral width of the turbulence echo signal are computed and simulated by using the fast Fourier transform (FFT) algorithm. A new FFT algorithm used for turbulence signal processing is proposed, where the wind velocity and spectrum width of the turbulence, the minimum signal detection threshold and relevant variables are newly defined. The simulation results show that the wind speed of turbulence has a pulsative feature, and the FFT algorithm can perfectly estimate the distribution of wind speed in the wind field of turbulence. The wind speed and spectral width of the echo signal of turbulence under a non ground clutter condition are superior to that with ground clutter conditions.

Keywords: wind velocity spectrum width fast Fourier transform (FFT) Doppler spectrum shift

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