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一种改进的星载SAR俯仰向DBF处理技术

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An Improved Scheme of Digital Beam-forming on Elevation for Spaceborne SAR

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摘要 在星载SAR系统的高分辨率宽测绘带成像应用中，为了增大接收增益，提高回波的信噪比，可利用数字波束形成(DBF)技术实现俯仰向多通道接收并处理回波信号。该文分析并推导出了俯仰向通道的响应函数。基于这一结果，提出了一种时变加权与FIR滤波相结合的DBF处理方法，并且给出了系统实现框图。与其它DBF方法相比，该方法能在不增加系统实现复杂度的前提下，实现对长脉冲的接收增益最大化与系统性能最优化。仿真结果表明，该方法能够近似达到理论上的系统性能最优值。

关键词： 星载合成孔径雷达 数字波束形成 时变加权 有限冲激响应滤波 接收增益

Abstract： In the high-resolution, wide-swath imaging application of spaceborne SAR, the technique of Digital Beam-Forming (DBF) can be employed to receive and process echo data with multiple channels on elevation, increase the receive gain and Signal-to-Noise Ratio(SNR). According to the geometric relationship among these channels, this paper analyzes the impulse response of the elevation channel, and derives the explicit expression of it. Based on this, this paper proposes a DBF processing scheme which combines the time-variant weighting and Finite Impulse Response (FIR) filtering, and further presents the block diagram of system realization. Compared with other DBF methods, this approach can maximize the receive gain and optimize the system performance for the long pulse, without increasing the complexity of the digital beam-former hardware. Simulation results indicate that it allows the system to achieve the theoretically optimal performance.

Keywords： Spaceborne SAR Digital Beam-Forming (DBF) Time-variant weighting Finite Impulse Response (FIR) filtering Receive gain

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