EARTH OBSERVATION SYMPOSIUM (B1)
Interactive Presentations (IP)

Author: Dr. Fan Feng
China Academy of Space Technology (Xi'an), China, sailingvon@126.com

Mr. Xiaomin Tan
China Academy of Space Technology (Xi'an), China, tanxm2008@163.com
Mrs. Hongxing Dang
China Academy of Space Technology (Xi'an), China, danghongxx@163.com

A NOVEL DESIGN APPROACH TO TIMING SEQUENCE FOR ULTRA-HIGH RESOLUTION SPACEBORNE SAR

Abstract

For ultra-high resolution spaceborne SAR,the high range resolution is always achieved by large transmit bandwidth. Andthe antenna with high gain, entailing a small azimuth antenna angle, should be used for SAR payload to ensure that the signal-to-noise ratio (SNR) meets the requirement. Under this condition, it has to employ sliding spotlight operational mode with large azimuth squint angles to guarantee high resolution in azimuth. Thus, the scene echoes will experience large range cell migration during the whole datatake period, thereby invalidating the conventional timing sequence scheme with a single pulse repetition interval(PRI), as the echoes will not be constrained within the receive window for the whole period any longer. To solve this problem, we propose a new approach that will adjust the PRI for different azimuth sections.

This new approach firstly divides the whole azimuth time into a number of intervals, within each of which the range migration of echoes will become much limited. Then, for each interval, one specific PRI, with which the associated receive window can accommodate the echoes, can be chosen from the timing diagram of spaceborne SAR. From interval to interval, the corresponding PRIs can be set to make sure that echoes can be effectively received with no interference by transmit events or nadir echoes. Moreover, the SAR system performance should also be assessed for different intervals separately, since echoes will experience different operation ranges, different squint angles,as well as different antenna patterns.

In this paper, we introduce the above-mentioned azimuth time partition method and the corresponding PRI selection rationale. The system performance evaluation method is also given for this mode. Simulation results are provided at last to show the necessity and effectiveness of this new timing sequence approach to receive the echoes of ultra-high resolution spaceborne SAR, and to prove that system performance are actually varied with azimuth intervals.