ANALYSIS OF THE EFFECT OF RADIO FREQUENCY INTERFERENCE ON INTERFEROMETRIC PHASE

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INTRODUCTION

The P-band ultra wideband synthetic aperture radar shares the band with other services, as for example TV broadcast and telecommunications transmitter stations, means distortion by radio frequency interference (RFI) to the SAR. It's well known the performance of UWB-SAR is degraded due to the existence of radio frequency interference. This paper describes the problems of RFI in InSAR, and analyses the effect of RFI to interferometric phase based on simulation.

THE EFFECT OF RFI ON POINT-TARGET IMAGING

In order to analyze the effect of RFI on interferometric phase, we first analyze the effect of RFI on point-target imaging process. Simulation Parameters as follows: P-band InSAR sensors that operate in 620MHz, the system bandwidth is 200MHz, the length of baseline is twenty meters, the RFI signals whose frequency locates in 686 MHz are received. The radio frequency interference signal power received from emitters exceeds the power of the simulated target echoes by 41.8717dB.The received RFI signal and simulated point targets echoes are mixed and imaged in order to analyze the effect of RFI on imaging process. The point target imaging quality is shown in Table I and the imaging result of point target echo with RFI and without RFI are respectively shown in Fig. 1 and Fig. 2.

Table I Point target imaging quality between RFI and without RFI

Target echo	Range			Azimuth		
	Resolution(m)	PSLR(dB)	ISLR(dB)	Resolution(m)	PSLR(dB)	ISLR(dB)
Without RFI	2	-13.3061	-10.0606	3	-14.0661	-12.3854
With RFI	2	-12.1708	-5.1844	3	-10.5191	-5.9986

From the result above, we can readily observe the degradation in PSLR and ISLR. The degradation of ISLR is more serious than PSLR. The deterioration of imaging quality due to the amplitude of RFI is much larger than point target echo's. The ratio of signal to interference is -41.8717dB, so the high side lobe levels appear.

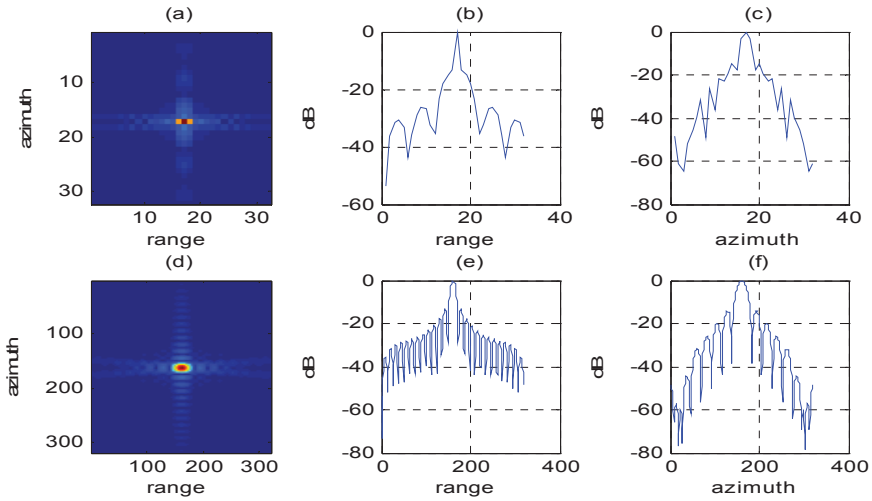

Figure 1 Image of point target echo without RFI

(a) The image of point target echo without RFI before interpolation. (b) Matched filtering result in range before 10 times interpolation. (c) Matched filtering result in azimuth before interpolation. (d) The image of point target echo with RFI after interpolation. (e) Matched filtering result in range after 10 times interpolation. (f) Matched filtering result in azimuth after interpolation.

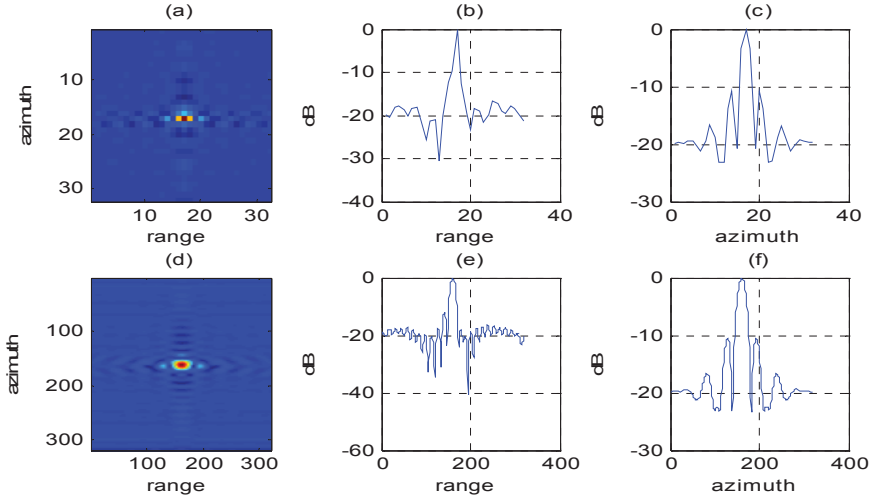

Figure 2 Result of point target echo with RFI

(a) The image of point target echo with RFI before interpolation. (b) Matched filtering result in range before interpolation. (c) Matched filtering result in azimuth before interpolation. (d) The image of point target echo with RFI after interpolation. (e) Matched filtering result in range after interpolation. (f) Matched filtering result in azimuth after interpolation.

THE EFFECT OF RFI ON INTERFEROMETRIC PHASE

Despite the interference signal can be the same as the target signal are located in dual channel radar images anywhere, but in the dual-channel image of the corresponding pixel in the target signal phase changes with the target location, while the jamming signal phase difference is only azimuth displacement slowly varying function. As an average of 41.8717dB of interferences to echoes ratio, the phase of dual-channel complex image is guided primarily by interferences phase, while has nothing to do with the distance.

REFERENCES

[1] Rosen, P .A, Hensley, S. Le. C. "Observation and Mitigation of RFI in ALOS PALSAR SAR data: Implications for the Desdyni Mission," *2008 IEEE Radar Conference* , pp. 1-6, 2008.
[2] G. Cazzaniga,, A. Monti Guarnieri, "Removing RF interferencecs from P-Band airplane SAR data ." , IGARSS'96,proc. IEEE Cat. No. 96CH35875,Lincoln, Nebraska USA, pp. 1845-1847, 27-31 May 1996.