

MARSIS: Latest Phobos Flyby. Data Processing Results and Advanced Radar Configuration Design

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1. Introduction

The multi-frequency sounding radar MARSIS has successfully observed Phobos during the latest MEX science campaign on 9 January 2011. A new data acquisition technique has been developed and implemented during this fly-by, allowing to obtain an improvement of about 10 dB in Signal to Noise Ratio (SNR) and providing high quality data.

MARSIS has collected two segments of data containing 6000 individual echoes, acquired in 50 sec of operation. The detection range was $180 \div 230$ km between MEX and the Phobos surface, while the employed frequency was 4 MHz. The ground track covered new areas not explored by previous fly-bys.

2. Phobos Data Analysis

Fig.1 shows the radargram of the first segment of acquisition. Two main signatures can be clearly seen. From a first analysis of the topography of interest, considering also similar features observed during previous observations, it appears that the signatures stratification is generated by surface lateral clutters.

Comparing the observation data with the results obtained from the simulator[1] it is possible to identify the top white line in the radargram as the surface echo, while the clutter contribution is represented by the bottom signatures.

Ground processing of the data for one single frame is shown in Fig. 2 with a SNR of about 18 dB. Further and more accurate analysis will be executed in the next future to improve the SNR level and the range resolution, allowing a better scientific interpretation.

3. MARSIS Onboard Configuration

An advanced setting of the on board software was employed in order to boost the signal-to-noise ratio of measurements. Although this procedure pushed the instrument to the limit of its original design capabilities, performance was flawless. There was an improvement of about 10 dB in signal to noise ratio and this allowed to see features that would have been below the noise level.

4. Figures

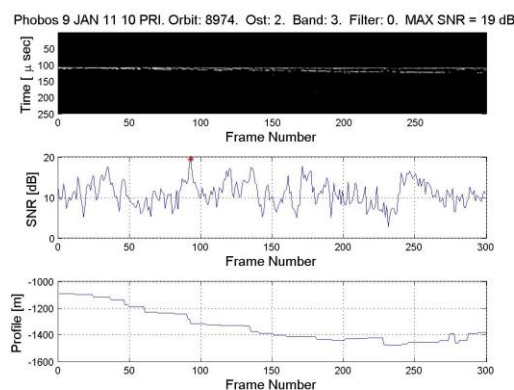


Figure 1: Phobos First Segment Radargram

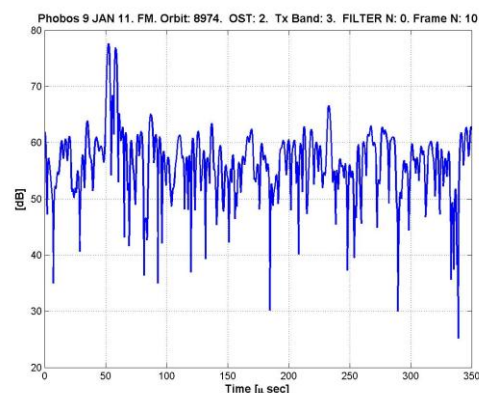


Figure 2: Phobos single frame processed data

Acknowledgements

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References

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[2] Safaeinili, A. et al (2007) First International Conference on the Exploration of Phobos and Deimos, LPI Contribution No. 1.