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Compatibility Test Second Part MARSIS Active / SC X-Band On

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1 INTRODUCTION

The aim of this document is a brief description of the impact on the MARSIS science performances during the X-Transmitter On of the SC. This study was carried out both on the Ionosphere and Sub Surface Science analysis.

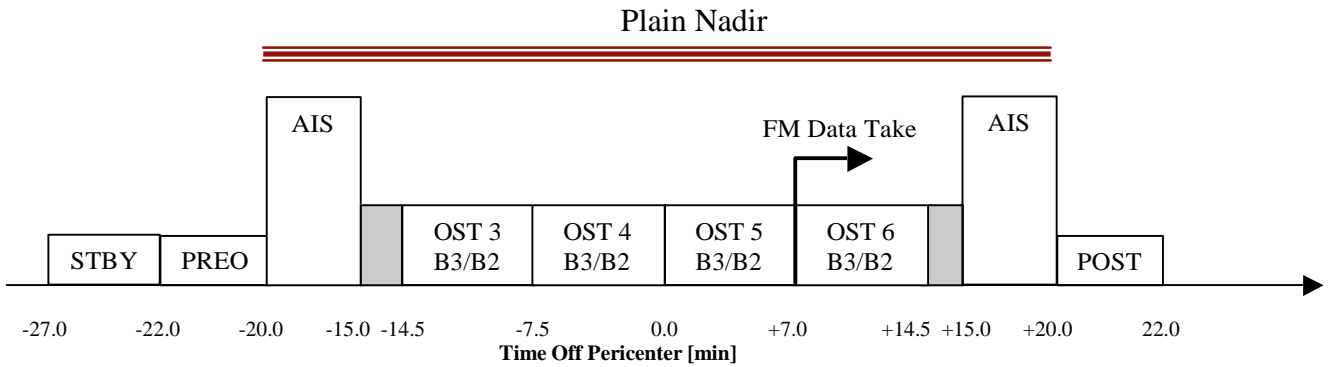
In order to study and understand the possible anomalies of the X-Band On of the SC during the MARSIS operations we have analyzed one adjacent observations in the same area, 11 orbits after the compatibility test.



2 ORBIT ENVIRONMENTAL CONFIGURATION

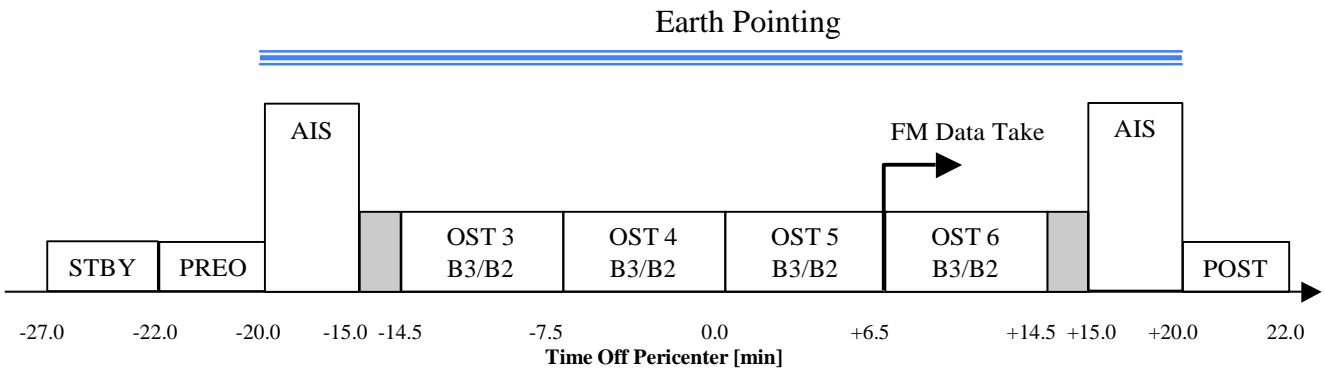
2.1 Orbit 4002 (Adjacent Observation, 11 Orbits after the test)

Pericenter data: 17 – February -07, T 07:25:04 [UTC]



2.2 Orbit 3991 (Compatibility Test)

Pericenter data: 14 – February -07, T 05:31:14 [UTC]





3 SUB SURFACE SCIENCE RESULTS

3.1 Orbit 4002 (Adjacent Orbit, 11 Orbits after the test)

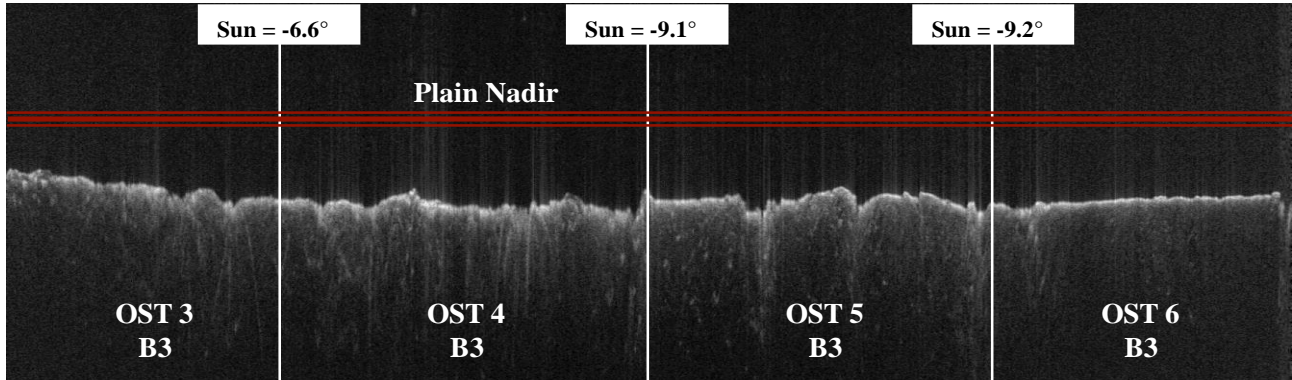


Fig. 3.1.1 (MARSIS Radargram, first Tx Bands)

The performances of MARSIS are standard within all the passage. The SNR and the spatial resolution are also within the expected working ranges.

3.2 Orbit 3991 (Compatibility Test)

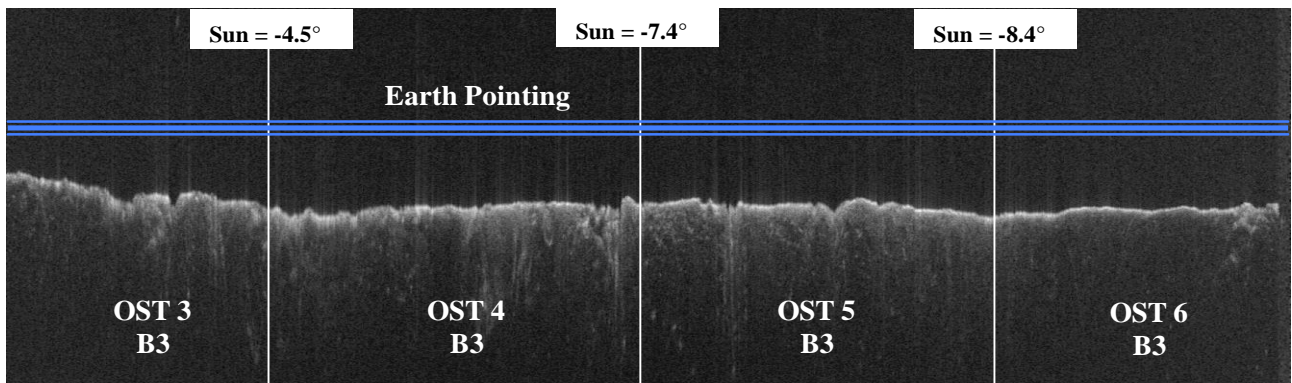


Fig. 3.2.1 (MARSIS Radargram, first Tx Bands)

In this observation it is evident a small degradation of the radar performances in term of SNR and spatial resolution.

The loss of performances have been probably caused by a combination of the sun ionization of the upper ionosphere layer, the unfavourable SC pointing and the X-Band On of the SC's transmitter.



4 ACTIVE IONOSPHERIC SCIENCE ANALYSIS

Not any interferences have been detected in both the following cases.

4.1 Orbit 4002 (Adjacent Observation, 11 orbit after the Test)

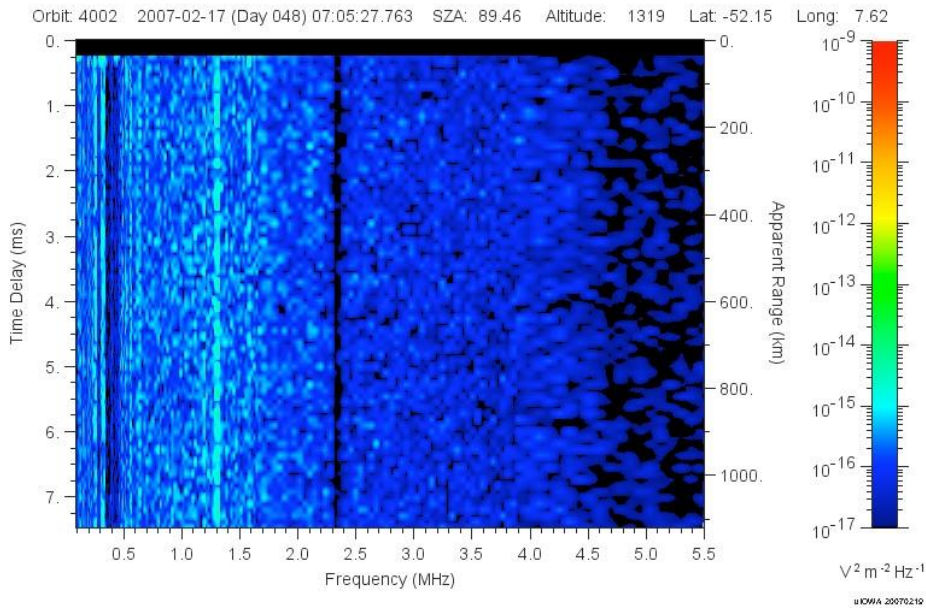


Fig. 4.1.1 (MARSIS AIS Ionogram, Orbit 4002)

4.2 Orbit 3991 (Compatibility Test)

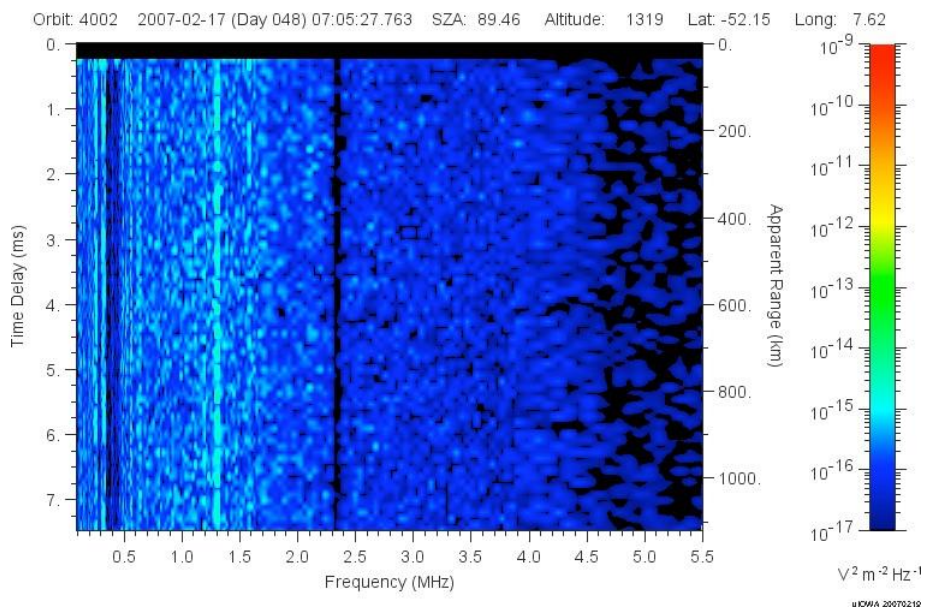


Fig. 4.2.1 (MARSIS AIS Ionogram, Orbit 3991)



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5 CONCLUSIONS

In both the executed tests, MARSIS On during the Space Craft Operations, a certain level of EMI have been detected.

The phenomena has caused a partial degradation of the SNR figure and the Spatial Resolution of the Sub Surface Sounding Modes.

Regarding the Ionosphere Sounding Mode, interference was detected at 2.5MHz during only one of the test intervals, probably indicating that it is from a different source than the X-band transmitter.

In conclusion, the loss of performances that has been analyzed with these two tests, doesn't seem to have a strong impact on the MARSIS Science Campaign."

Anyway, due to the difficulty of the Radar Signal Analysis, it is recommended to minimize as much as possible the unfavourable environmental scenarios, such as the SC pointing different from the Plain Nadir requested by MARIS.