MARSIS Ionospheric Calibration. A. Safaeinili[1], W. Kofman[2], Nouvel[2], Herique[2], R. L. Jordan[1],

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By early 2004, Mars Express will be in Mars orbit and on board it will bring Mars Advanced Radar for Subsurface and Ionospheric Sounding (MARSIS) which is the first of a new generation of radio sounders. MARSIS is the result of an international collaboration between NASA, the Italian Space Agency (ASI), and European Space Agency (ESA), is designed to investigate the Mars subsurface to a depth of up to 5 km as its primary objective. MARSIS also has the capability to study the ionosphere of Mars directly using its passive and active ionospheric sounder.

Probably, the most significant challenge in MARSIS calibration is the compensation for the ionospheric distortions. MARSIS subsurface sounding mode operates in the frequency range of 1.3-5.5 MHz. The ionosphere's plasma frequency varies between 100 kHz to 3.5 MHz depending on the sun elevation angle. As a result, MARSIS is vulnerable to ionospheric attenuation and phase distortion that, if not corrected, can seriously degrade the science performance. Our approach takes advantage of the specular nature of Mars surface at MARSIS operating frequency and uses the "Front-Surface Response" to deconvolve the ionosphere's distortion from the signal. The specularity assumption combined with the physical model of radio wave and plasma interaction makes it possible to even estimate some of the ionospheric parameters. Our results indicate that it is possible to remove the ionospheric distortions with good accuracy and in addition the correction parameters will provide valuable information about the state of ionosphere. This presentation will provide an outline of ionospheric calibration strategy for MARSIS.

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