



Planned measurements of electromagnetic signals on the surface of Mars: ExoMars 2020

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Recent observations of the Mars Atmosphere and Volatile Evolution (MAVEN) mission on the Mars orbit have shown plasma waves similar to those observed in the Earth's magnetosphere. Previous models indicate that some of these waves might be able to penetrate to the surface of Mars. The ExoMars 2020 Surface Platform will conduct environmental and geophysical measurements with the aim to study the Martian surface and subsurface environment at the landing location. The Surface Platform instrumentation will include the wave analyzer module as a part of the Martian ground electromagnetic tool instrument. The wave analyzer module will be dedicated to measurements of electromagnetic waves in the frequency range up to 20 kHz. Two sets of scientific questions which we plan to address have never been answered by direct observations on the surface of the planet:

1. Can we observe electromagnetic radiation propagating from the interplanetary space down to the surface of the planet? Which frequencies and plasma wave modes can penetrate down to the surface of Mars? What are the conditions under which we observe the penetrating waves? What state of the Martian ionosphere is the most favorable?
2. Can we observe electromagnetic radiation from hypothetical electric discharges in the Martian dust storms? If yes, are the waveforms of this electromagnetic radiation similar to the waveforms radiated from the terrestrial lightning? Which possible processes might lead to initial breakdown of Martian discharges and how are these processes reflected in the detectable electromagnetic radiation? Which special meteorological conditions might lead to initiation of Martian discharges?