Development of the Submillimeter Wave Sounder for the Japanese Mars Orbiter

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The Submillimeter wave sounder (SMM sounder) is a model payload on the Japanese Mars orbiter, MELOS-1. The SMM sounder observes the thermal radiation emitted from the Martian atmosphere. A large number of rotational transitions of many photochemically important species, including H2O, can be found in the submillimeter domain. The vertical profiles of the atmospheric state (e.g., temperature, chemical compositions) can be retrieved by using the pressure dependency of the spectral line shape of those rotational transitions. Furthermore, owing to high frequency resolution of the heterodyne technique, direct measurements of wind speed are realized through observing the Doppler shift of the molecular spectrum. All these characteristics makes the SMM sounder unique, and will provide a substantial progress on the Martian meteorological understanding.

The draft design of the instrument is observing at the frequency band of 500 and 600 or 800 GHz. Such a dual band system enables us to observe multiple water vapor lines with different line strengths. Combination of the observations of weak and strong opacity lines improves the vertical sensitivity to the water vapor abundance: from the surface to ~100 km. The polarization receiver system will be equipped in order to observe the thermal property of the surface.

This paper reports the latest status of the instrumental development, and discusses the possible scientific performance of the MELOS SMM sounder by performing the observational simulations.

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