

Possible Swedish contribution to the FIRE instrument

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Abstract—Currently, a new Mars exploration program for the 2020's, named Mars Exploration with Lander-Orbiter Synergy (MELOS), is being discussed in Japan. One of the orbiters of MELOS is proposed to explore the Martian meteorology and climate system; more specifically, the dust meteorology, water cycle, atmospheric circulation, atmospheric chemistry, and mechanisms of dust storm development.

A submillimetre wave atmospheric mission sounding instrument with a passive heterodyne spectrometer called Far-InfraRed Experiment (FIRE) for MELOS has been proposed. It consists of a dual polarization 610 GHz channel (H₂O, H₂O₂ and HDO), a 560 GHz channel (12CO and 13CO) as well as a 340 GHz channel (TBC). The front-ends are based on subharmonic mixers coupled to cascaded schottky doublers and active x6 multipliers with power amplification at 70 and 75 GHz for the 560&610 GHz channels. For the 350 GHz channel, only one schottky doubler is needed. A 400 mm antenna is currently presumed with an estimated mass of 0.7 kg.

The back-end consist of high resolution FFT spectrometers with 200 MHz bandwidth and 4096 channels and autocorrelation spectrometers with 2 GHz bandwidth and 1024 channels. The complete radiometer package will have an estimated power consumption of < 40 W with possibility to perform science with less than 20 W in a time multiplexed fashion. Much of the receiver system development will be based on current activities at Omnisys, including the STEAMR instrument development, TERACOMP (557 GHz receiver under FP7 contract) and 500+ GHz activities in collaboration with Chalmers/MC2.

The design of the instrument and test results of different subsystems will be presented at the conference.