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Interactive comment on "Mars sub-millimeter sensor on micro-satellite: sensor feasibility study" *by* Richard Larsson et al.

Anonymous Referee #2

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The manuscript is about using sub-millimeter radiometry to measure Martian atmosphere. In my opinion this idea is a solid one and combining the sub-millimeter instrument with a micro satellite platform follows the current trend.

However, I find some problems with this feasibility study. I do see that the main emphasis of the manuscript is on the radiometer instrument and the measurements made with it. I would still like to see the space technology details discussed more.

For example, the authors state that putting the satellite into Martian orbit has never been attempted before using atmospheric drag. The authors just assume that this can be done and assume a couple of potential orbits. But doesn't this mean that using micro satellite platform makes the mission harder to accomplish? Why not just put the instrument to a bigger platform and put it into orbit by more conventional means?

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Discussion paper

I also think that the description of the radiometer instrument is lacking. I did read the Kasai et al. 2012 paper and they describe the FIRE radiometer in detail. In what way the FIRE-mini differs from the FIRE instrument? Is it only size as the authors mention or the usage of two channels with different circular polarization? How about weight and power budget? Kasai et al. 2012 gives two options of FIRE radiometer; Limited science: 5 kg, 10 W & Full science: 16 kg, 40 W. If the micro satellite platform has max. weight of 100 kg then fitting in even the full science option of FIRE might do the job. So what is the advantage of FIRE-mini over FIRE?

Solar power is available less in the Martian orbit than in Earth orbit. Is the 40W power feasible using solar panels? In my opinion the small satellite size could be a limitation in this case. How about the attitude control? A probable choice would be magnetic control which also uses electric power. So what is the actual advantage of using micro satellite platform? Is it the reduced costs?

I think the Reviewer #1 has good comments about the trade offs in accuracy, resolution and precision. The Reviewer #1 also points out that making the radiometer more sensitive reduces the errors in parameter retrieval. This could be difficult since the receiver is heterodyne receiver (because of sub-millimeter wavelengths) or at least depends much on the calibration of the instrument. I suppose the calibration of the FIRE-mini will be done using 2.7K background microwave radiation as with FIRE? Even though the orbit selection might no have a big effect on those the attitude control probably will have. Magnetic attitude control, however, is not that precise.

The authors describe the forward model in chapter 2.3 and then I suppose chapter 2.4 describes how the inversion of forward model is done. I think the description is more on the conceptual level and it is not that easy to see what is actually done in the paper.

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