Anonymous referee #1

This is generally very well-written and appropriately detailed. Therefore, I have relatively few comments, and encourage that it be accepted subject to some minor corrections.

We thank the anonymous referee for his/her careful read and comments. We have addressed all of them and our responses are written below.

Typos/Rephrasing:

Pg.2, line 48: "at two wavelengths" should be "in two wavelength bands"
corrected

Pg. 18, line 397: "calibr@te" should be "calibrate"
corrected

Comments:

I don't see it mentioned, but are users of the observation planning tools notified if there is a possibility that the observations may point near the sun (if not in the solar occultation mode) or a non-target body (i.e. Jupiter will be in the background of a Ganymede scan)?
We have added more details in section 3.3.1 regarding the calculations, not only of geometrical data, but also of events (eclipses, occultations, transits) from the SPICE kernels. These geometrical and event calculations are then cross-checked with the observation definitions and their requirements (source size, phase angle, event, etc.) in the scheduling rules.

Pg. 9, Line 240. I assume this also true for the calibration modes, since you want to make sure your cold sky pointings do not look at a planet or moon.
For this particular point, and because this is very unlikely to happen, we use an external observation geometry visualization tool to check that an OFF position is not contaminated by an unwanted source. This is now explained in section 3.3.1.

Pg. 7 Line 174-176: If I understand this right, what is happening is that the instrument begins a scan across Jupiter, notes at some point a nadir signal (based on pointing, not measurements?), continues a scan until half of that power is reached, and then stops the scan and begins integrating on target? It seems, without further details, like this approach could suffer failures under un-anticipated conditions. If there is further detail on this operation mode (or if this has been done before, etc.), a reference would be sufficient, otherwise, I would appreciate further elaboration on the specifics (including replicating a few details from appendices). Clearly initial tests have worked, as shown in the figures/videos, but strange things can happen in Jupiter's radiation environment.
We have further expanded on the description of this mode as follows:
To achieve such accuracy in the limb pointing determination, each limb integration with the CTS is preceded by a rapid scan across the limb with the CCH. After completing an OFF measurement, the CCH beam will be placed on the Jovian disk near the targeted limb position. This ``nadir'' CCH measurement will be proportional to the temperature of the atmospheric layers producing the continuum. On Jupiter, the continuum observed in the submillimeter is produced at ~500 mbar Cavalié et al. (2008), where the temperature is around 140 K. This is slightly above the cloud deck probed at e.g. longer millimeter

wavelengths de Pater et al. (2019). While there may be some temperature variability over ranges of ~20° in longitude for a given latitude (and it is a goal of SWI to quantify them), the reference ``nadir'' pointing near the limb should have very similar continuum temperature (within ~1 K, i.e. <1% difference) as the longitude of the limb. As soon as the beam will start reaching the limb and cold space, the CCH signal will start to drop toward the OFF measurement value. When the recorded signal reaches 50% of the (nadir+OFF) value, which then corresponds to a beam filling-factor of 50%, the instrument boresight will be at the limb. The scan is thus stopped and the integration with the CTS starts.

Anonymous referee #2

This is a very well written detailed description of the plan for the Juice SWI instrument operations throughout the mission and initial testing of the operational planning and execution during LEGA. I compliment the authors on laying out such a clear and highly detailed paper.

We thank the anonymous referee for his/her careful read and comments. We have addressed all of them and our responses are written below.

General Comments:

- Is there any interaction of the jovian radiation environment and the signal quality of science measurements for SWI? Many other instruments suffer from increased background/noise in their measurements due to Jovian radiation. It may be nice to add a comment about that somewhere just for clarity. If by chance, there is some interaction/increase of noise due to the radiation then a question would be how does SWI plan to deal with that throughout the mission.
  There is no direct known effect of radiation on the signal quality (not more noise) of SWI. We have added a footnote to reflect this point in section 2.3.1 (Calibration modes) that gives details on the spectral noise.

- lines 170 and 185: I don't have any experience with how the brightness maps of Jupiter look in the GHz range, but in just about every other wavelength range there are large fluctuations of the brightness of Jupiter vs latitude (banding) and even longitude (especially in the 5 micron region). If there are brightness variations, how can you trust pointing to the half power point will place you precisely at the limb? In addition, to what flux accuracy (50% +/-???) and what pointing accuracy does your flux accuracy work out to?
  We understand this concern and have changed the text to:
  "To achieve such accuracy in the limb pointing determination, each limb integration with the CTS is preceded by a rapid scan across the limb with the CCH. After completing an OFF measurement, the CCH beam will be placed on the Jovian disk near the targeted limb position. This ``nadir'' CCH measurement will be proportional to the temperature of the atmospheric layers producing the continuum. On Jupiter, the continuum observed in the submillimeter is produced at ~500 mbar Cavalié et al. (2008), where the temperature is around 140 K. This is slightly above the cloud deck probed at e.g. longer millimeter wavelengths de Pater et al. (2019). While there may be some temperature variability over ranges of ~20° in longitude for a given latitude (and it is a goal of SWI to quantify them), the reference ``nadir'' pointing near the limb should have very similar continuum temperature (within ~1 K, i.e. <1% difference) as

the longitude of the limb. As soon as the beam will start reaching the limb and cold space, the CCH signal will start to drop toward the OFF measurement value. When the recorded signal reaches 50% of the (nadir+OFF) value, which then corresponds to a beam filling-factor of 50%, the instrument boresight will be at the limb."
And we have added the following footnote: "The inflight sensitivity of the CCH is still under investigation to confirm the CCH noise is sufficiently low not to compromise the across limb scan concept of this observation mode. The scan is thus stopped and the integration with the CTS starts."

- In Figure 2, how does the spacecraft pointing performance (spice reconstructed kernels) feed into the data analysis? Maybe there is another arrow from spacecraft data which leads to a Naif SPICE box where the actual performance of the spacecraft pointing is captured?
  Good point. SPICE kernel box added to the figure.

- As an addendum, how is the pointing information of the SWI telescope captured in the data? Will there be SWI delivered spice kernels that give the position of the telescope relative to the spacecraft for all times the instrument is on during the mission?
  This is also a good point. Although this is still a work in progress, it is indeed the plan to have instrument pointing kernels reflecting the SWI telescope pointing delivered with the data. The pointing information will nonetheless also be captured in the metadata of the science data files.
  We have added the following sentence in section 3.2: It is planned for the near future that the SWI telescope pointing information, although transcribed in the science metadata will also be retrievable from dedicated instrument attitude SPICE kernels.

- Line 343 begs the question, why did SWI only perform 166 of its 225 planned observations?
  We have added a sentence to refer to section 4.4.3, in which the reason of the safe mode is given: "Some observations were not executed following an instrument safe mode event that is explained in section 4.4.3."
  We have added a couple of sentences explaining the safe mode and the corrections applied to avoid a new one with the same cause. These sentences can be found at the end of section 4.4.3: "This safe mode was triggered by insufficient tuning stabilization time before the start of signal acquisition with the CTS. This has been tested and confirmed during PCW#03 in 2025 and longer tuning stabilization times have been applied ever since."

- Line 348, Maybe it was the first time the Earth was observed at frequencies around 1200 GHz form space, but I would suspect the Earth atmosphere has been probed at these wavelengths from the ground before, no? Maybe just adding "from space" after "Earth was observed"?
  The atmosphere is totally opaque in the SWI 1200GHz band, when observed from the ground. This can be checked with e.g. the Caltech Submillimeter Observatory Tau-plotter (http://www.submm.caltech.edu/cso/weather/atplot.shtml). Nonetheless, we agree to add "from space".

- The mentioned safe mode event on line 408, is this specific instrument safe mode anomaly? I believe so, maybe lead "safe mode event" with "instrument" to be

completely clear.
Indeed, it was not a spacecraft safe mode, so we have added "instrument" as proposed.

- Not sure whether it is worth detailing the cause of the safe mode during ObsID 314, but you sort of leave the reader curious.
  It was indeed missing, but it is added now. See reply above.

Detailed comments:

- Line 29, remove "of" after "will include"
  Removed

- Line 36, maybe "enabling determination of their sources" rather than "enabling to determine their sources"
  Changed as proposed

- Line 53: maybe "The telescope is equipped" rather than "The instrument TRU" which sounds a bit redundant since I think the TRU is the instrument.
  As written two sentences before, the instrument SWI consists of a TRU, an EU and a radiator. Instead of the proposed change, we have replaced "The instrument TRU" simply by "The TRU".

- Line 65: possible change "thereby" to "and"
  Change applied

- You state in line 78 there are "6" basic instrument operational modes but then list 7 modes.
  Indeed. We have replaced 6 by 7.

- Line 170: add "is" after "to know where the instrument"
  Agreed

- Line 173: add space "models(Cavalie…"
  Space added

- Line 235: "almost only SWI…." This bit reads rather oddly and I'm not sure how important the point is. For one, I assume most of the in-situ instruments were happily observing during this period. I suggest removing or maybe trying to be a bit more specific like (SWI was the only remote sensing instrument capable of observing the Earth during the days following closest approach due to spacecraft pointing restrictions) or something like that.
  Agreed. We have replaced the sentence by: "SWI was one of the few remote sensing instrument capable of performing observations of the Earth and the Moon in the days that followed the closest approach to the Earth, by using its pointing mechanisms."

- Remove random @ symbol in line 398
  Removed