

Interactive comment on “Atmospheric observations with E-band microwave links – challenges and opportunities” by Martin Fencel et al.

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This paper by Fencel et al. presents for the first time an experimental investigation into the effect of rainfall and water vapour on the attenuation of links at E-Band, with the perspective of measuring rainfall in particular from these attenuations. The paper is well written, easy to follow and well organised. The topic is of high interest and these new experimental data and findings would be important for the growing scientific community working with CMLs as weather sensors. Here are some non-exhaustive general and technical comments on that paper, which I read with interest:

General comments

C1

1. The introduction covers most important aspects but it omits to mention that attenuation by rainfall at these frequencies (E-Band) has already been investigated experimentally, e.g. by Shrestha and Choi (2017) or Norouzian et al. (2020) for instance (and maybe other papers). This literature is often going under the radar of the atmospheric community maybe because it is published in specific engineering and electronics journals (often IEEE). Yes, the objective of these studies was the optimal design of backhaul networks, as to minimise the occurrence of signal fading, instead of opportunistic measurement of rainfall. But nevertheless, experimentally this is the same setup and collected data, and often even formulations and theoretical approaches. I would include a mention of their existence in the introduction, and eventually in the discussion if appropriate.

Sujan Shrestha, Dong-You Choi, Rain attenuation statistics over millimeter wave bands in South Korea, *Journal of Atmospheric and Solar-Terrestrial Physics*, Volumes 152–153, 2017, Pages 1-10, ISSN 1364-6826, <https://doi.org/10.1016/j.jastp.2016.11.004>.

F. Norouzian et al., "Rain Attenuation at Millimeter Wave and Low-THz Frequencies," in *IEEE Transactions on Antennas and Propagation*, vol. 68, no. 1, pp. 421-431, Jan. 2020, doi: 10.1109/TAP.2019.2938735.

2. L105: Which parameters values for the canting angle and temperature, and which model did you use for the T-Matrix calculations? You have to specify it here.

3. Effect of the k-R relation on the retrievals. Those are interesting results but I think the paper abstract does not reflect the actual results of this section. Typically, in Table 5: the performance criteria are actually quite similar between the use of ITU parameters and DSD parameters. Often only 0.01 differs for R2, and RMSE rarely exceeds 0.05 mm h⁻¹. So only based on this, one might think the parameters used are not of real matter. But when looking at Table 4 and the parameters per rain type (stratiform and convective, low and moderate rain rates) one sees the discrepancies. So it is the k-R relations for local DSD and differentiation for specific rain classes/types being used

C2

that has an impact on the retrievals at these frequencies. When lumped all together, ITU or specific DSD actually lead to similar retrievals outcomes. As the authors noted, including larger rain rates in the dataset would increase the differences in retrievals and the importance of the DSD on the retrievals at these rain rates.

4. At these frequencies, longer CML path lengths translates in higher sensitivities to light rainfall – but it also means a coarser spatial resolution for CML rainfall maps – this can be a drawback and can be highlighted.

Specific technical comments

L52 Comma missing before “which”

L115 units of $v(D)$?

L130 units of these variables?

L145 why not calling it the “Liebe model” as you did for the “Leijnse model”?

Table 5: Instead of “Performance”, use “performance metrics”, or “evaluation criteria”?

There are a couple of instances in the paper when the citation format is not suitable, in particular L137 “. . .in (Liebe et al., 1993). . .” should be “in Liebe et al. (1993)”. L166 has the same issue. L226 has the same issue. L263 has the same problem. L197 has the same issue.

“Parsivel” is an acronym and therefore should be written in Upper case letters, e.g. PARSIVEL

L238 Dm is in mm

Figure 4 (b) there is a typo for “convective”. The legend has the same citation format issue (brackets should only be around the date).

L265 and 265, keep a consistent spacing between value and units (%). I think there should be a space.

C3

L277 units of A_w ? (dB km⁻¹)

L290 units of A_{wconst} ?

Figure 7, the word “dry spells” seems cut at the bottom. Abbreviation for the month of November should be “Nov.” if following the correct abbreviation, otherwise writing it in full could be actually better.

L497 chronological order for citations should be preferred

L571 “attention” should be “attenuation”

L 609 “by lower frequencies” “by” should be removed.

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2020-28, 2020.

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