Review of AMT-2020-316: "Characterization…optical resonance…" by Blumenstock et al.

General Comments.
Good paper. Channel fringes are probably a major source of station-to-station bias within the NDACC-IRWG network, especially for weakly-absorbing gases. This is because the amplitude and phase of channel fringes can vary considerably from site to site, even for nominally-identical instruments. So the fringes must either be suppressed, or somehow accounted for in the spectral analysis, or both.

The main deficiency of this manuscript is that the authors provide no explanation of why increasing the wedge angle of the air-gap reduces the amplitude of channel fringes. The central conclusion of the paper is that an 0.8 deg angle for the air-wedge substantially reduces the channeling, as compared with the standard 0.5 deg. But the authors don't tell us why. Ideally, there would be an equation that relates the channel fringe amplitude to the relevant physical properties (reflectivity, flatness, wavenumber, wedge angle). This equation would also explain why the channel fringe amplitudes are so much larger in HgCd than in InSb. Alternatively, there should be a figure (fringe amplitude versus wedge angle for different wavenumbers) showing the results of computer modelling of the channeling.

In line 95 the authors further state (correctly) that a large tilt suppresses channel fringes, but don't offer any explanation why.

Wouldn't anti-reflection coating of the BS and Compensator also decrease the channeling? Explain why this isn't a feasible option?

Finally, the authors should discuss potential disadvantages of the larger wedge. For example, might an increased wedge angle between the BS and Compensator cause alignment problems for instruments that are aligned at 1 atm and then operated under vacuum? Or is the air-gap sealed such that the air pressure between the BS and Compensator never changes? Or is there another reason why this doesn't matter?

Paper should be publishable once these issues (above) are addressed. The authors should also address the more technical problems discussed below.

Specific Comments.
Line 40: "0.9 and 0.11 or 0.23" is ambiguous. I suggest two sentences, one describing air gap periods, and the second discussing the substrate periods.

Line 45: quantify "significantly"

Line 62: Here you use % as the unit of channel fringe amplitude. Is this a typo? In other places you use ‰. Choose a unit and be consistent.

Line 98: "design" → "build". It is easy to **design** an FTS free from channeling; just specify everything to be wedged.

Line 117: Explain why NDACC uses a set of filters (improve SNR and avoid saturation). This won't be apparent to a non-NDACC reader.

Line 117: here you use "arc-min" as the wedge angle unit, whereas previously you used degrees. Choose one and use consistently. Or explain why wedge angle requires two different units.

Line 121: I think that a table would be useful here (or a link to a table) that shows the spectral coverage of each NDACC filter. Also, add a column to Table 2 showing which filters were used at each site.

Line 130: "…spectral resolution of 0.05 cm-1" is ambiguous. Add the OPD parenthetically.

Line 148: Figure 2 caption inadequate.

Line 170: Move fig.3 earlier, before discussion of fig.4 begins.

Line 175: I don't think that the colors add much value to fig.3 since you've already told us the correspondence between the three optical cavities and their fringe periods. Perhaps add the HgCd information to fig. 3 and then use colors to denote the detector or the wavenumber of the fitted window.

Line 185: What about the fringes from the BS substrate? Are these never the largest?

Line 188: Site labels should be identical between figs.4 & 5 (IZ-18 vs IZ-2018)

Line 197: "The amplitude is even larger as compared to the InSb domain" → "The HgCd amplitudes are larger than those in the InSb domain". Explain why amplitude is larger in HdCd than in InSb domain?

Lines 200-203: Here you discuss the InSb domain in section 4.2 (HgCdTe Domain). Shouldn't these sentences be in section 4.1?

Line 204: Figure 6 doesn't explain what the three curves are. Are these spectra from different instruments? If so, which ones? Labelling the curves as weak/medium/strong isn't helpful. I can already see with my eyes which one has the strong fringes.

Line 208: Mixed units for wedge angles.

Line 211: "…with far-infrared pellicle…" →"…with unwedged far-infrared pellicle…"

Line 216: Fig.7 caption. What is the difference between upper and lower panels? Different instruments? If so, which ones? Are the left panels from the same instrument as the right panels? In the lower left panel increasing the wedge from 0.5 to 0.8 deg. caused a factor 3 reduction in the channel fringe amp. But in the lower-right panel, the reduction was much less, perhaps only a factor 1.5. Please discuss.

Line 218: "To avoid the need for strongly wedged substrates…". This is confusing since the surrounding discussion is about the air-gap fringes. A strongly wedged substrate won't change the air-gap wedge, unless there is an unspoken linkage between the two.

Line 232-233: As in line 218, here you mix the air-gap fringes and the substrate fringes. In my mind these are separate things, with different periods, controlled by different factors. So why would "a larger wedge of the beam slitter substrate" help reduce the air-gap channel fringes?

Line 234: Perhaps change "incompatibility" to "non-interchangeability"

Line 248: "Finally, we found that most spectrometers show two dominant channeling frequencies with about 0.1 or 0.2 cm^{-1} and 0.9 cm^{-1} corresponding to beam splitter substrate and beam splitter air gap. In most cases, the channeling caused by the gap of the beam splitter is the leading one. " → "Finally, we found that most spectrometers show two dominant channeling frequencies with about 0.1 or 0.2 cm^{-1} and 0.9 cm^{-1} corresponding to beam splitter substrate and beam splitter air gap, respectively, the latter usually dominant."