

## ***Interactive comment on “Improved instrumental line shape monitoring for the ground-based, high-resolution FTIR spectrometers of the NDACC” by F. Hase***

**Anonymous Referee #1**

Received and published: 11 February 2012

### General Comments

This paper describes a new approach for the accurate determination of the instrumental lineshape of FTIR spectrometers using three cells filled with varying concentrations of N<sub>2</sub>O. It makes a good case for why this method is an improvement on the use of a single cell to derive the ILS, as is currently the approach used in NDACC and TCCON. Good knowledge of the ILS is useful for the diagnosis of FTIR spectrometer misalignment, and can be incorporated into the analysis of atmospheric spectra to retrieve trace gas abundances. As the desire for greater accuracy and precision of trace gas mea-

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surements grows, driven by scientific needs, improved ILS determination such as that proposed here, becomes increasingly important.

The paper is well written and the content is of interest to the FTIR community, particularly NDACC and TCCON. It is suitable for publication in AMT after the minor comments below are addressed.

### Specific Comments

Page 7705, line 15, and page 7709, line 14: Why is 180 cm used here, rather than 250 cm, which is the OPD required by the NDACC? See the NDACC FTIR measurement protocol at <http://www.ndsc.ncep.noaa.gov/organize/protocols/appendix2/>

Page 7706, line 15: Why is the transmission of the HBr lines referred to as “residual transmission”?

Page 7709, para 2: Even though there are different configurations of the Bruker 125HR FTIR, it could be useful to its users to add a schematic diagram illustrating the experimental set-up used here. Possibly two versions could be included, one for instruments with a sample chamber, and one for those without.

Page 7711, para 1: The proposed procedure for adapting the three-cell method for ILS determination across NDACC is reasonable, but it should be recognized that there may be logistical challenges for remote sites even for the simplified approach of shipping cells C2 and C3 between reference sites and other sites.

Page 7711, para 2: Regarding the issue of adding similar results for TCCON NIR ILS determination, I suggest at least including a brief discussion of some of the challenges and considerations, as outlined in the response to Referee #2.

### Technical Corrections

Page 7700, line 3: change Infra Red to Infrared or InfraRed here and elsewhere

Page 7700, lines 3 and 13: change applied to used

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Page 7701, lines 2 and 3: The direct result . . . atmosphere. The desired . . .  
Page 7701, line 6: define SNR  
Page 7701, line 6: allows the recording of solar . . .  
Page 7701, line 7: permits the monitoring of many . . .  
Page 7701, lines 9 and 10: allows the shapes of individual spectral lines to be resolved.  
Page 770, line 10: determined; in addition . . .  
Page 7701, line 16: affiliated with networks . . .  
Page 7701, line 19: Kurylo, 1991;  
Page 7701, lines 26 and 27: to regularly use . . . to derive the ILS . . .  
Page 7702, line 20: change applied to used  
Page 7702, line 24: sapphire  
Page 7702, line 25: define NCAR  
Page 7702, line 27: 200-250 hPa ?  
Page 7703, line 10: spectra,  
Page 7703, line 21: nominal FTS,  
Page 7704, line 10: change apply to use  
Page 7704, line 13: mirrors,  
Page 7704, line 27: change In to As a  
Page 7705, line 6: change insertion to clarification  
Page 7705, line 13: change applied to used  
Page 7705, line 18: superimposed on it.

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Page 7705, line 21: which is not critical . . .  
Page 7705, line 24: The difficulty in reconstructing the . . .  
Page 7705, line 26: broadband  
Page 7706, line 2: height, . . .  
Page 7706, line 3: line, . . .  
Page 7706, line 9: above, . . . network, provides unsaturated spectral lines to, and . . .  
Page 7706, line 22: path length (also elsewhere, both length and path length are used  
in describing the cells - use one consistently)  
Page 7706, line 24: superimposed on it.  
Page 7707, line 3: State explicitly that this mass ratio of 1.8 refers to the ratio of the  
molecular mass of HBr to that of N<sub>2</sub>O.  
Page 7707, line 4: change applied to used  
Page 7707, line 5: band; for . . .  
Page 7707, line 16: HCl, N<sub>2</sub>O . . .  
Page 7708, line 17: 20 mrad; the . . .  
Page 7708, line 27: change discriminable to distinguishable  
Page 7709, lines 7-9: Revise the sentence "The total cell pressure . . . in October." as it  
is unclear. The original C2 cell pressure should have been 216 (200 + 16) hPa. It has  
increased to 220 hPa. The sentence implies that this small increase has moved it out  
of pure Doppler-broadening regime, which is probably not what is meant.  
Page 7710, line 19: network-wide  
Page 7710, line 21: pressure-monitored

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Page 7710, line 22: HBr cells to which we have access. Because the HBr cells have a ...

Page 7710, line 25: line-broadening

Page 7711, line 7: will be required

Page 7711, line 25: This paper has now been published: Geophys. Res. Lett., 38, L24810, doi:10.1029/2011GL049899, 2011

Page 7714, Figure 1 caption: superimposed on it ...

Page 7715, Figure 2 caption: The normalized modulation efficiency and phase error derived ...

Page 7717, Figure 4 caption: change plate to panel. Also, the open circles are hard to see - can they be enlarged or made a different colour?

Page 7718, Figure 5 caption: effective path length ... imposed on it

Page 7719, Figure 6 caption: The (normalized) retrieved modulation efficiency and phase error for ... the three-month ...

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Interactive comment on Atmos. Meas. Tech. Discuss., 4, 7699, 2011.