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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Technical Note: REFIR-PAD level 1 data analysis and performance characterization" *by* G. Bianchini and L. Palchetti

Anonymous Referee #2

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General Comment:

This paper is clearly written with good depth of detail describing the instrument and calibration techniques applied to the level 1 processing of the REFIR PAD instrument

The instrument breaks new ground in observational studies of the atmosphere. Studies of the radiative processes of the atmosphere are helped by detailed knowledge of observational data sets, the clear description in this paper will benefit greatly atmospheric studies.

This paper is suitable for publication, there are, however, a few details that need clarification, outlines below.

Page 368 Line 20: Mention is made of of the EU funded REFIR project in which an

FTS is described as capable of resolving the OLR (0.5 cm-1) with a signal-to-noise of greater than 100 in 7s. Later the operative scan time is said to be 30s, how are these times related and what temporal criteria is required for a typical variable scence.

The wording refering to the dual input/output ports is a little confusing. The authors should make clear that one input port is set to a stabilised target while the other cycles through calibration and scence targets. How these target input ports relate to the output ports should also be made clear, as both are seeing a combination of the inputs.

2.1 Detector system characterization:

Page 370 line 24: It is not clear how the non-linearity errors have been calculated. Presumably the linearity is detetermined by looking at the gradient of the detector output Vs input load. Each point on fig.2 will then be a deviation from a straight line fit? Each point will also then be relative to a base load or adjacent load? What precision/accuracy is required of the blackbody temperatures for this measurement.

The power spectrum will have a non-zero off-set (as the authors themselves suggest in section 2.3) which is dependent on the noise level, is this accounted for in the integration of the spectra used in the non-linearity tests. Presumably the detectors are temperature stabilised? Is there a temperature dependence to the gain that has been evaluated.

Page 373 line 10: What do the authors mean by constant resolution in the last paragraph. Is this due to a variability in the resampled interferogram number of points. If so what is the typical variation under laboratory and flight conditions. Could the authors use the laser fringe timings to get a broad understanding of the vibration environment (acoustic and transmitted) in which the instrument is operating, ie perform a fft on these timings.

Page 374 line 21: reference to Fig 6: You say typical results but were similar measurements made across the entire range of the blackbody to determine if any significant

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thermal gradients exist between the monitoring PT sensor and the emitting surface. It is not clear where the sensors is placed relative to the emitting surface, at 287K one might not expect a thermal gradient to be significant, but at higher temperatures this is unlikely to be the case.

Page 375 line 5: The use of the laser source for frequency calibration is a function of the relative optical axis of the laser and FIR interferometers. Are misalignments negligible? if not than this technique is flawed.

Page 376 line 10: I assume that the authors do not mean "if the RBB does not vary sensibly..." but "significantly".

Page 376 line 23: The fact that there is water vapour in the interferometer will cause a path dependent assymetry in the aborption lines, these will cause high frequency phase variation and potentially fill in the measured absorption depth of the lines, will this be taken into account by your calibration process?

Page 379 line 12: The temperature off-sets shown in fig 6 correspond to temperatures close to the CBB and cannot be assumed to be applicable to the HBB. As previously mentioned this also has significance for the overall calibration process.

Page 381 line 25: The measurement points shown are at a higher sampling rate than the 0.5 cm-1 resolution and are presumably points obtained by padding the interferogram with zeros and hence are interpolated points, how much of the shape is instrumental and how much imposed by the interpolation method. Also, can the authors be sure that the chosen line is not saturated (which will broaden the "true line" profile), as under resolving will tend to hide this effect.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 367, 2008.