

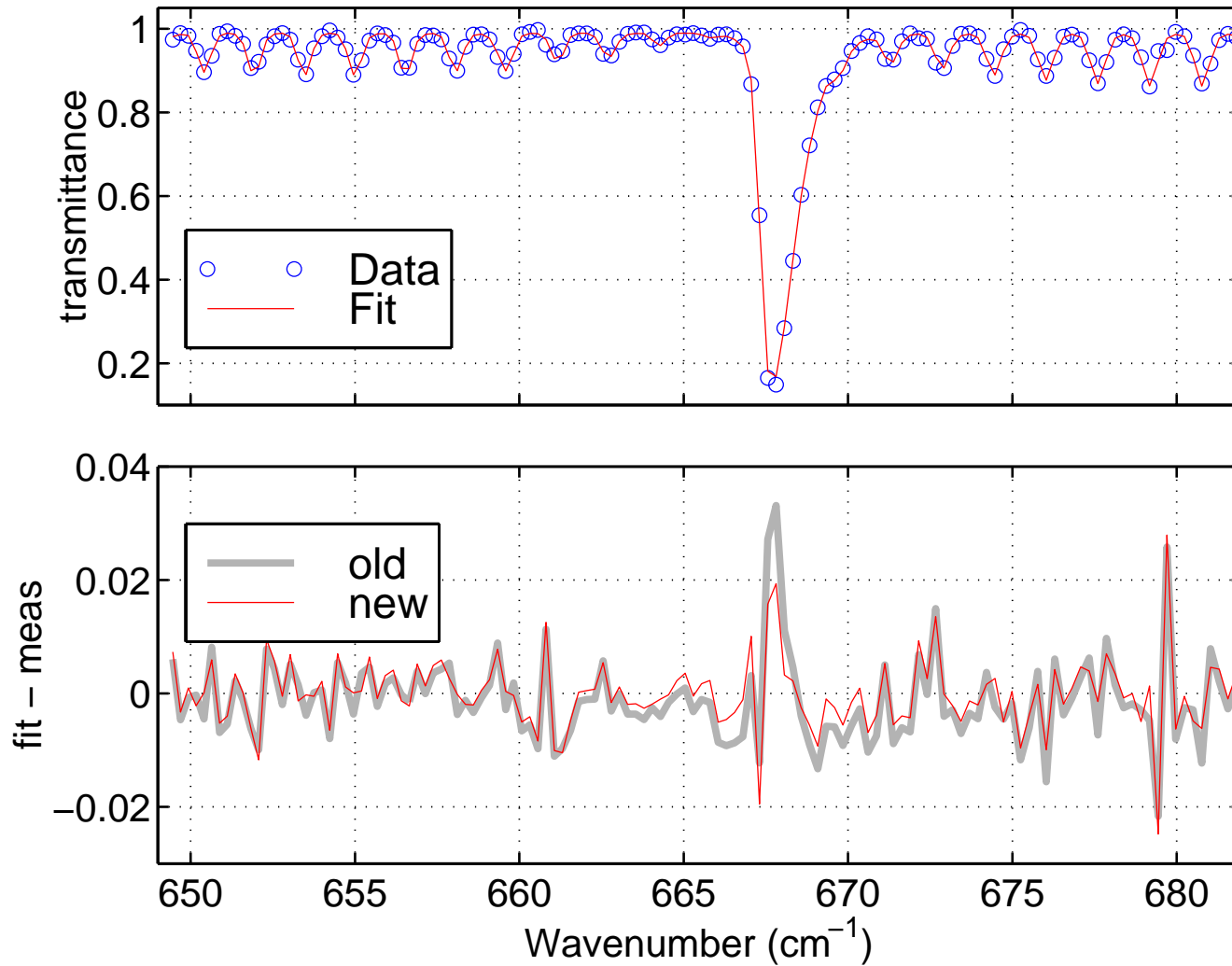
Overview

- Spectral Response Function Measurements
- Forward Model Progress
- CAMEX-III

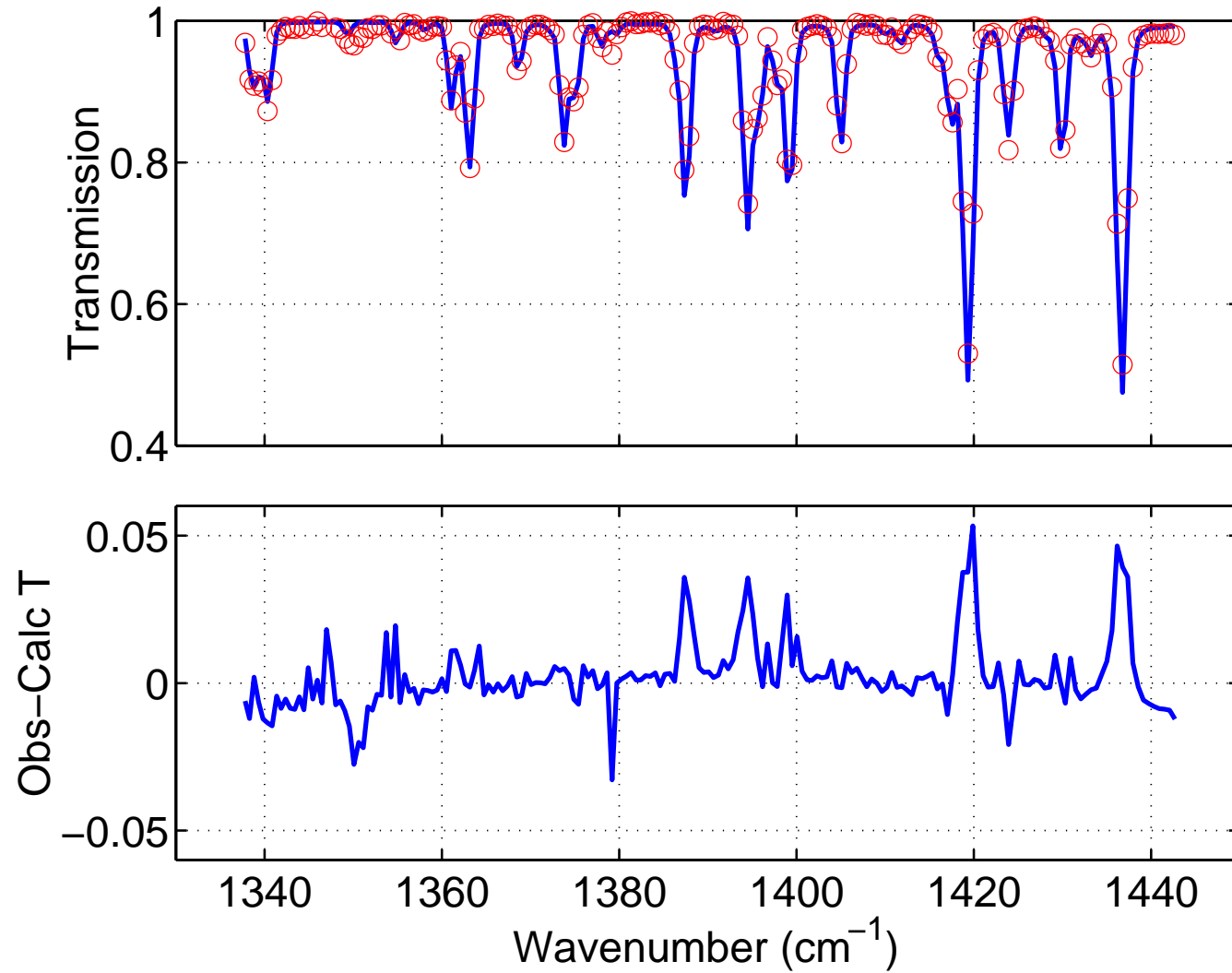
Spectral Response Function

- Lab air path transmittances measured (both CO₂ and H₂O) using two different lab air path distances
- Gas cell spectra used to test Bruker
- Preliminary testing of HHA's SRF model
- AIRS SRF's very sharp, can make SRF characterization difficult
- Wide variety of problems, *probably not inherent to AIRS??*.
- “Lost” CO Channels!
- We developed our own interferogram → SRF code for this, and code for visualization of SRF's.

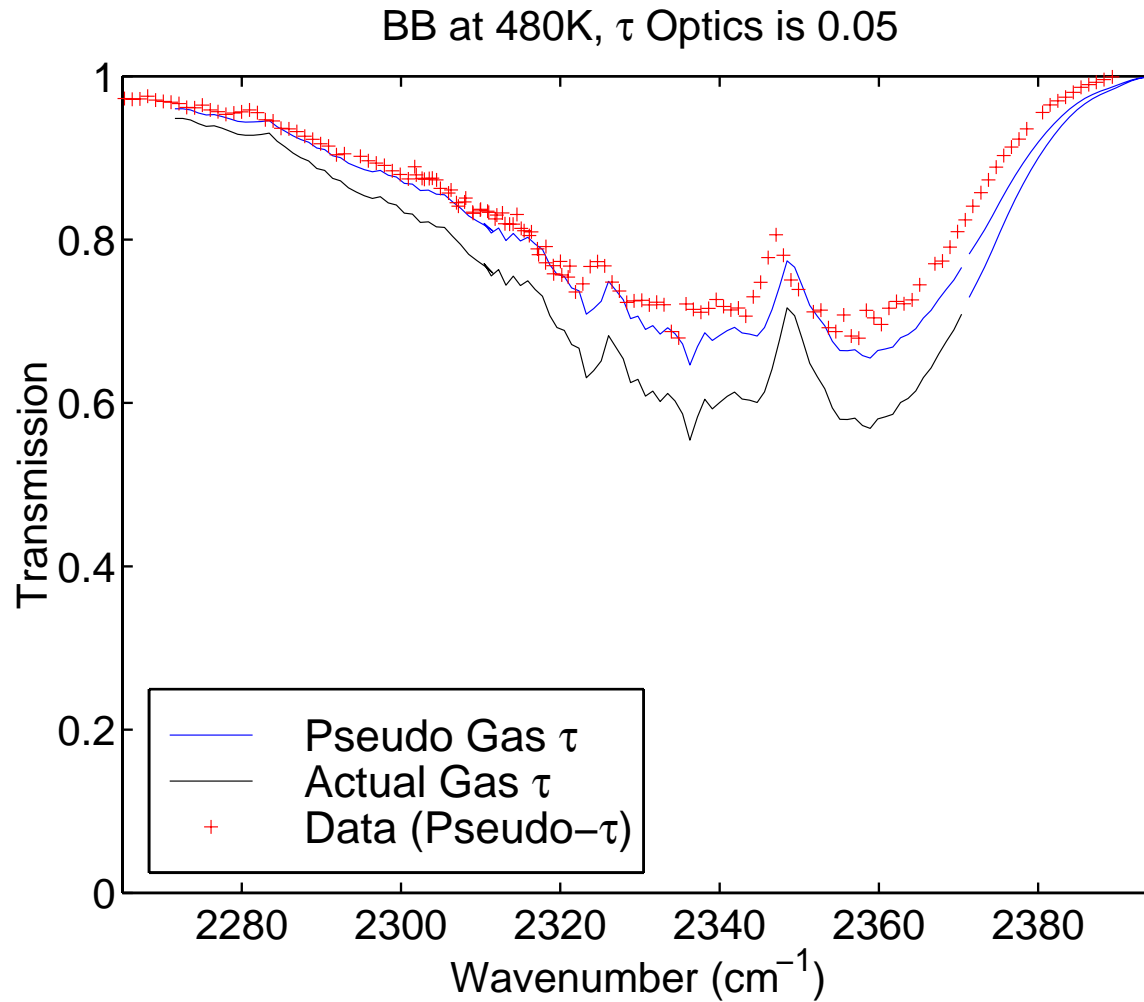
Lab Air Path CO₂ Fits



Lab Air Path H₂O Fits



4.3 μm CO_2 - not recorded for transmission



Test Descriptions

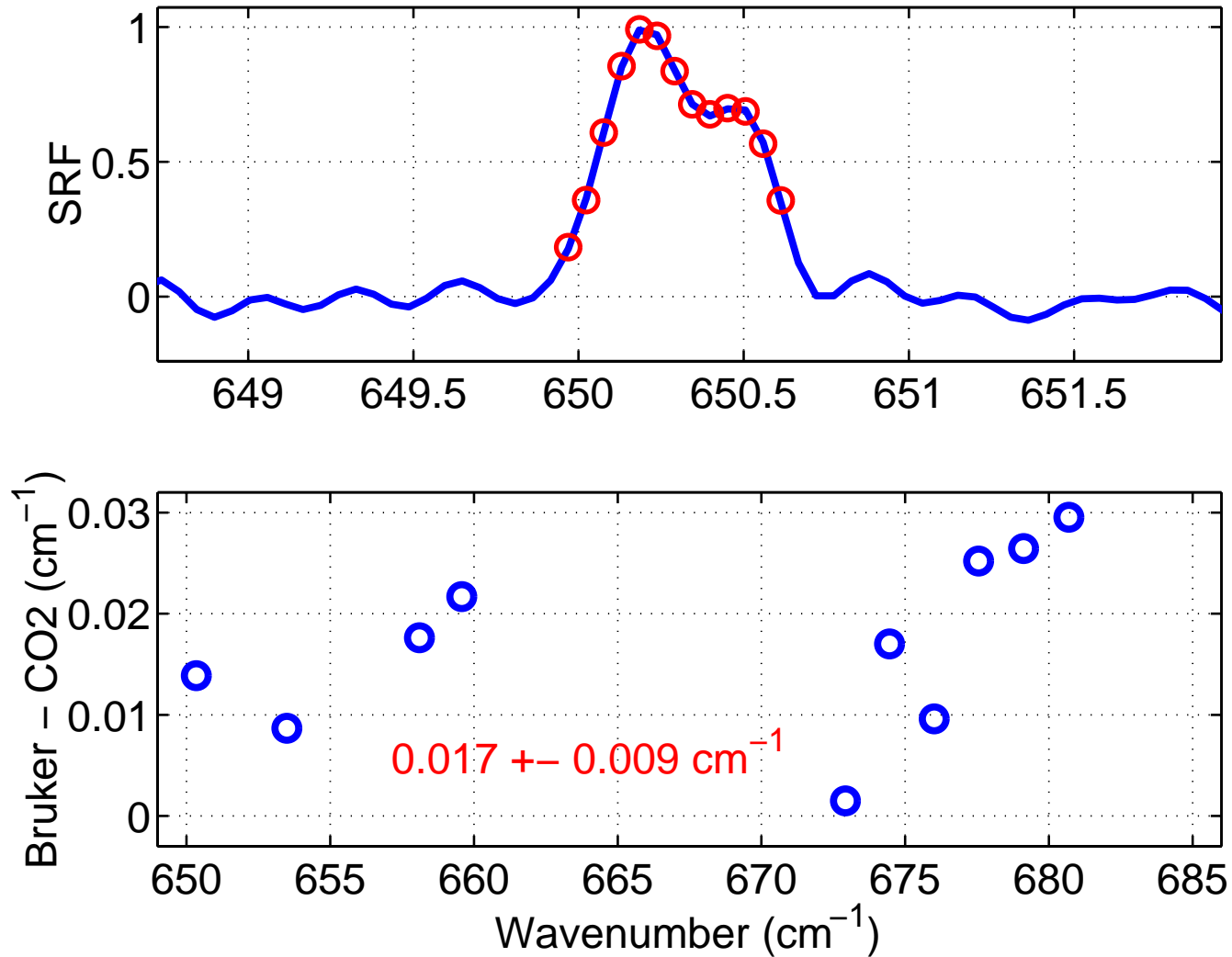
Test 386: No integrating sphere, A-side only detectors?

Test 387: No integrating sphere, B-side only detectors?

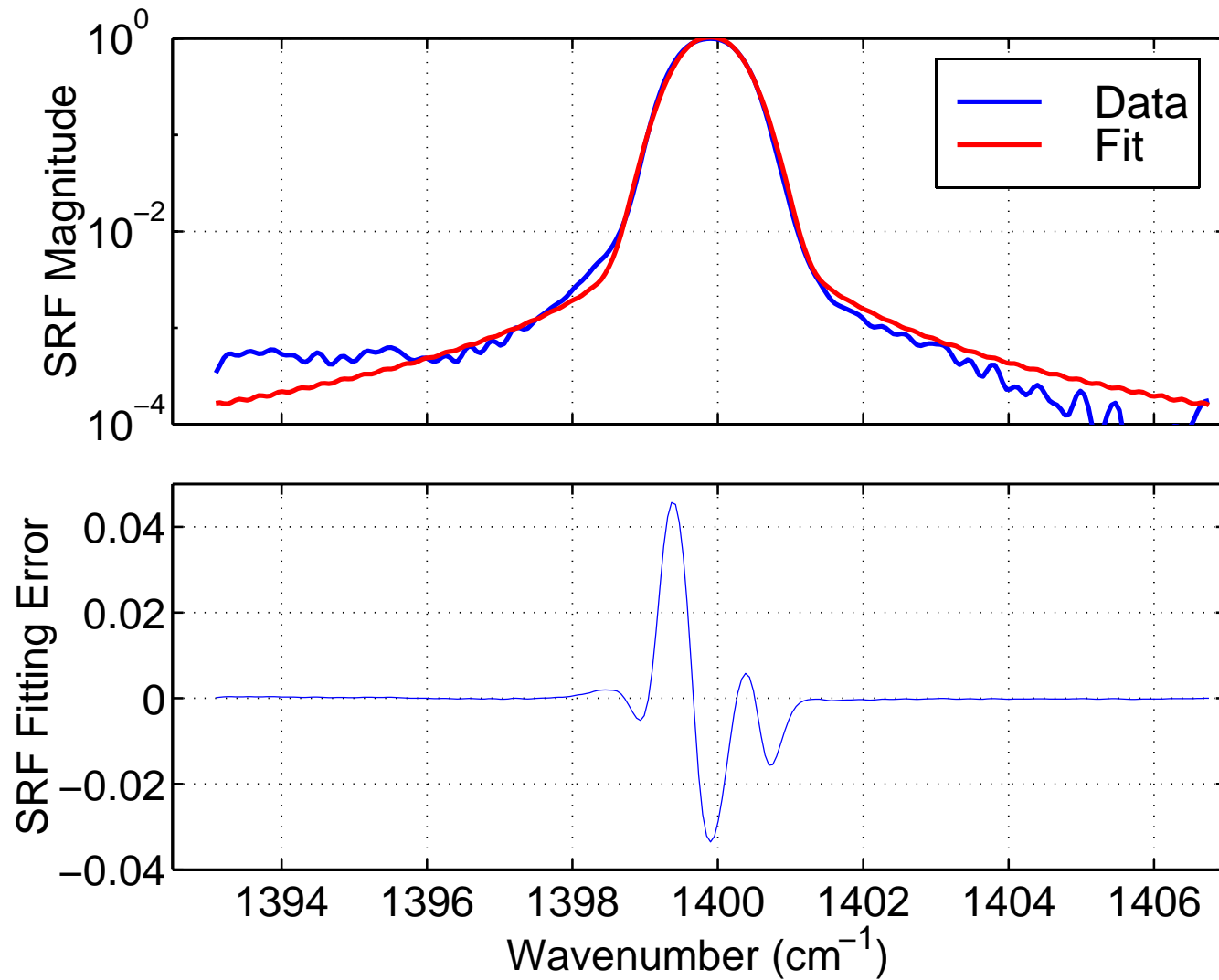
Test 543: Integrating sphere in

Test 549: Integrating sphere in, CO₂ in transfer optics

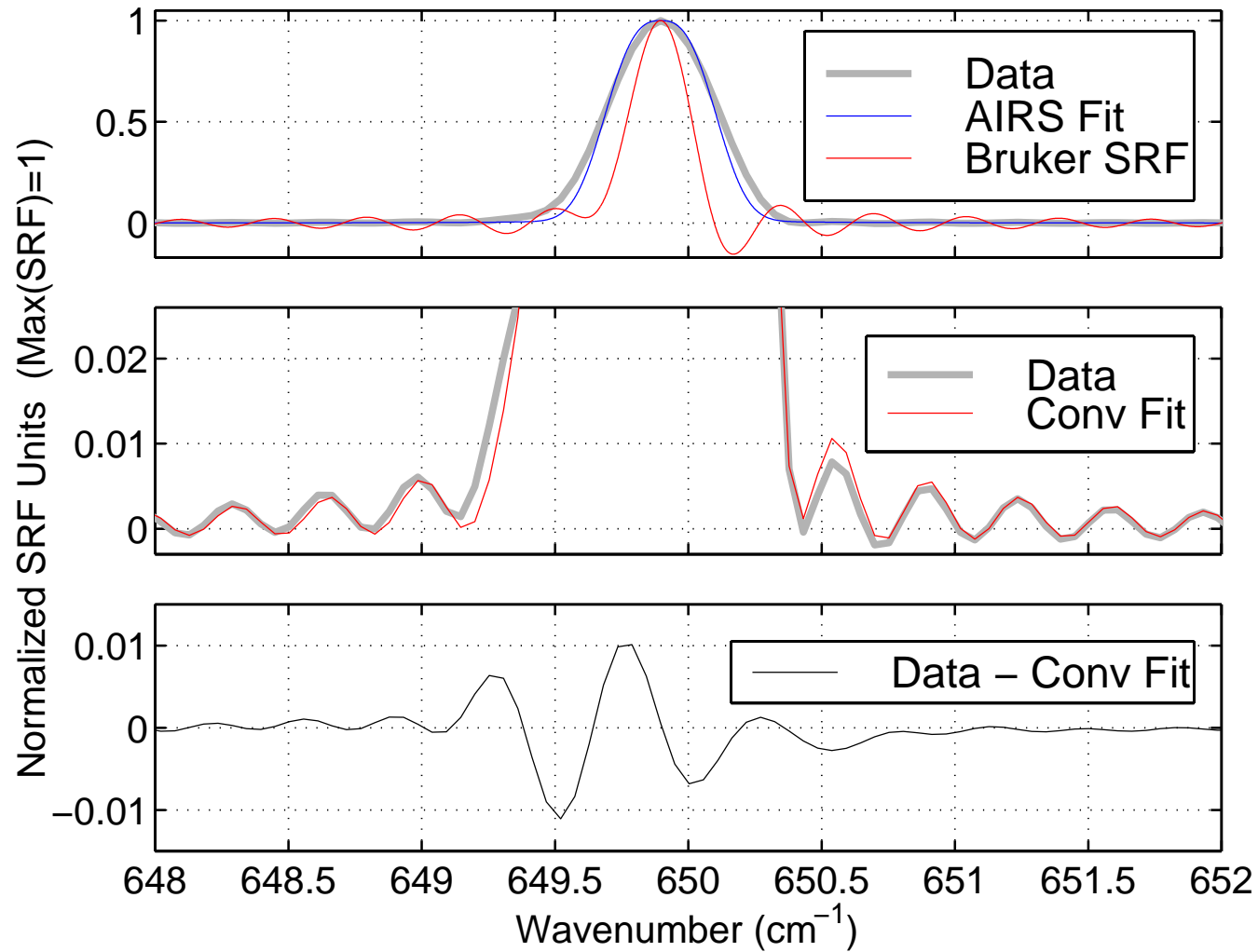
Bruker Plus Gas Cell, FTIR ν Accuracy



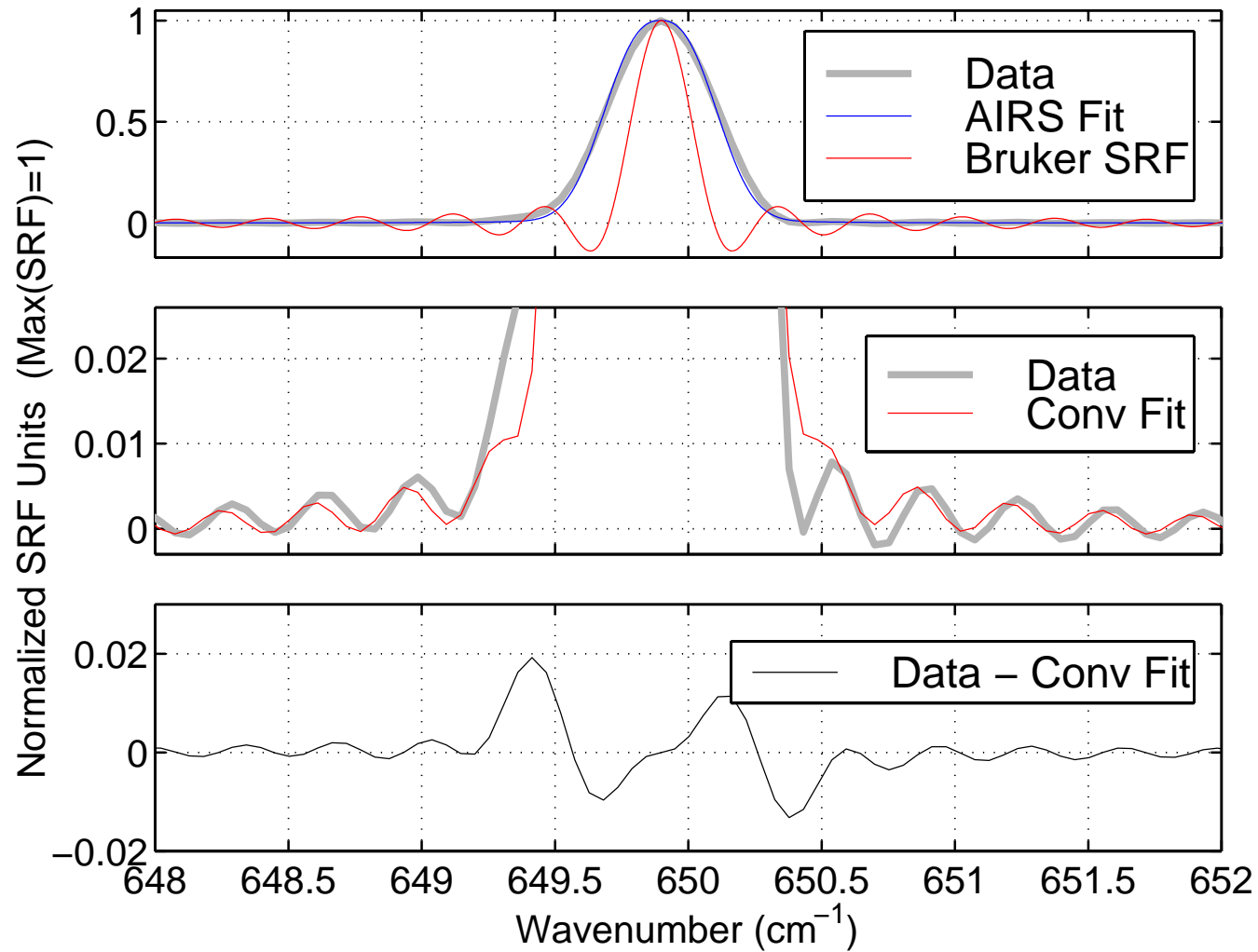
M3 Fit for SRF - HHA's Lorentz/Gaussian



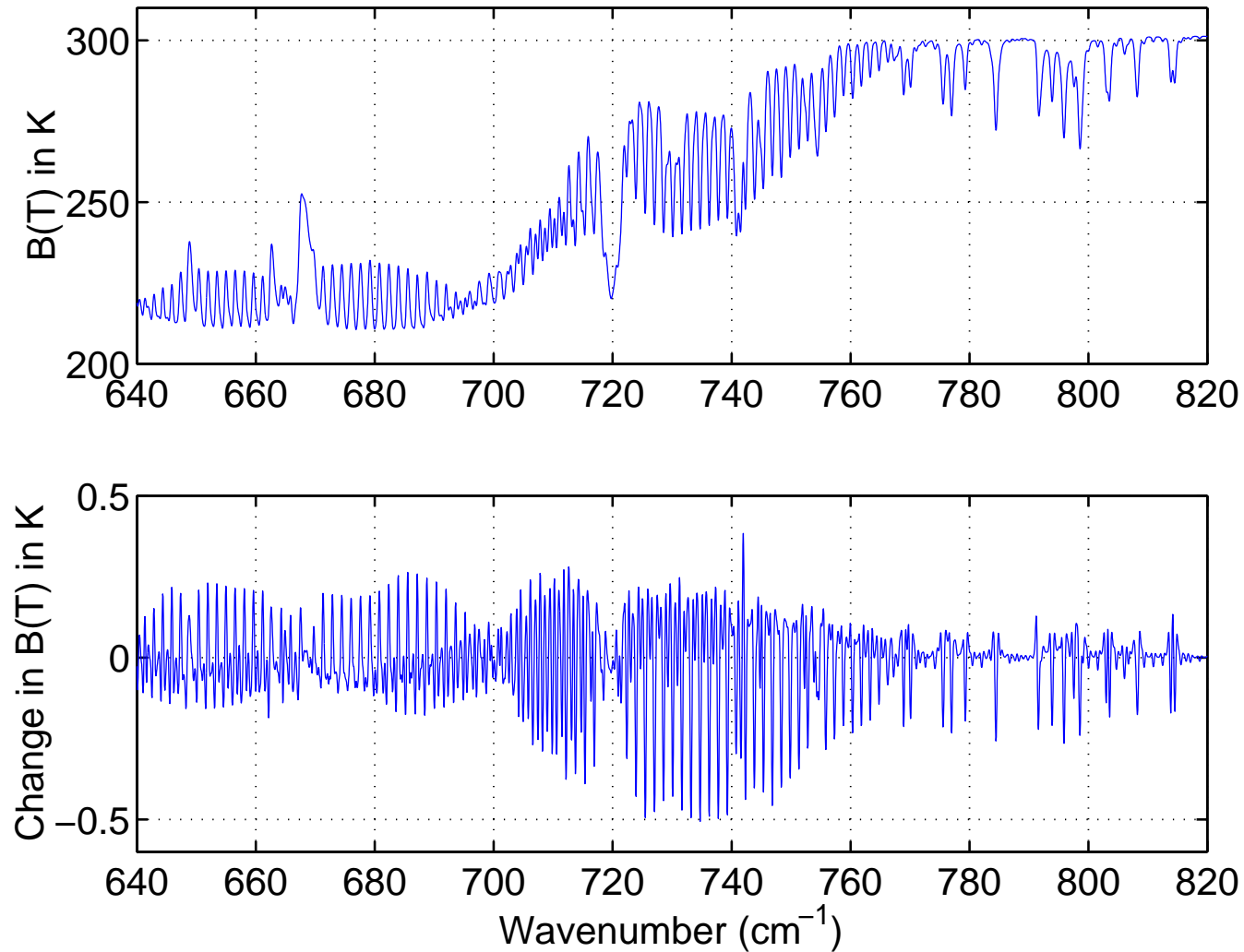
M12 Fit for SRF, Bruker Calc. On-Axis



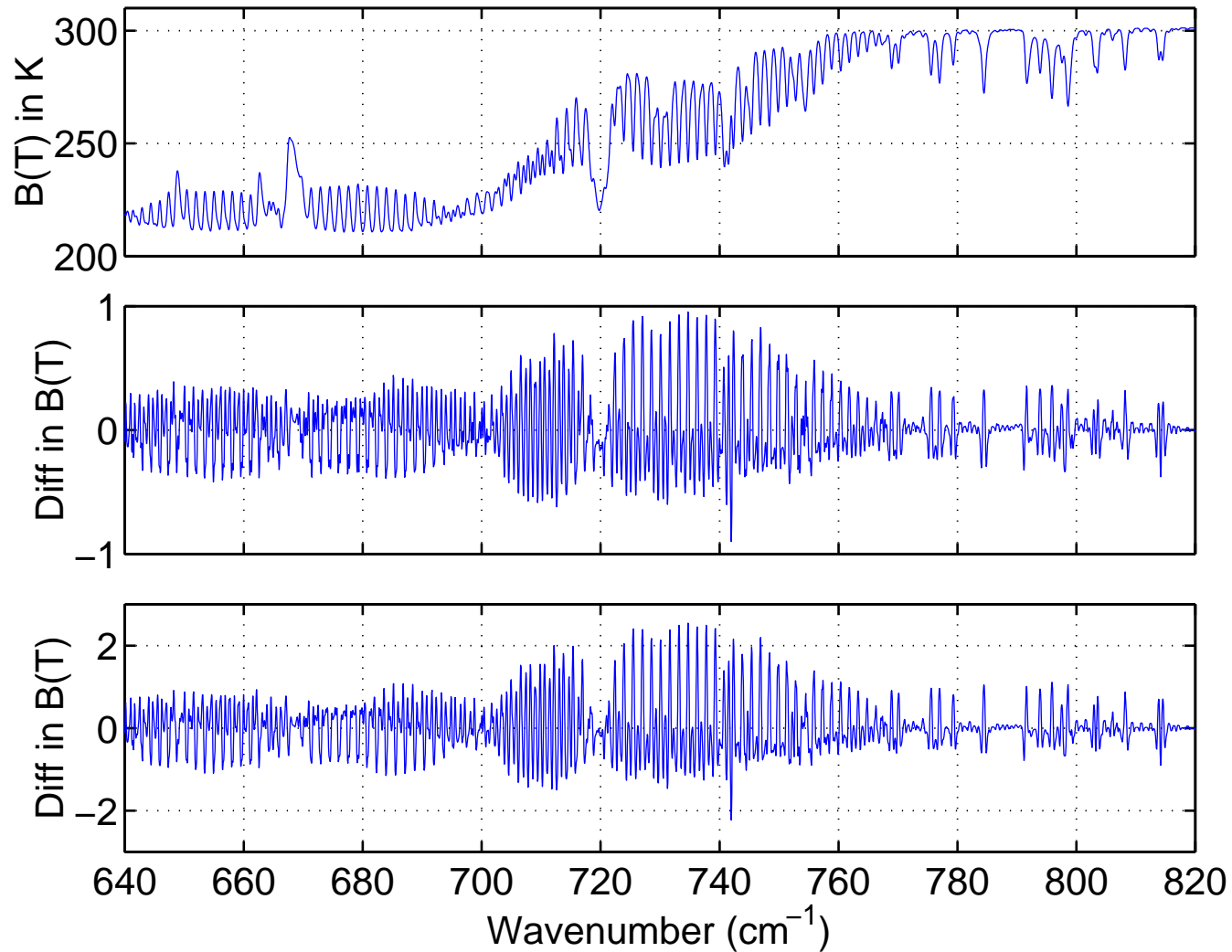
M12 Fit for SRF, Bruker Calc. On-Axis



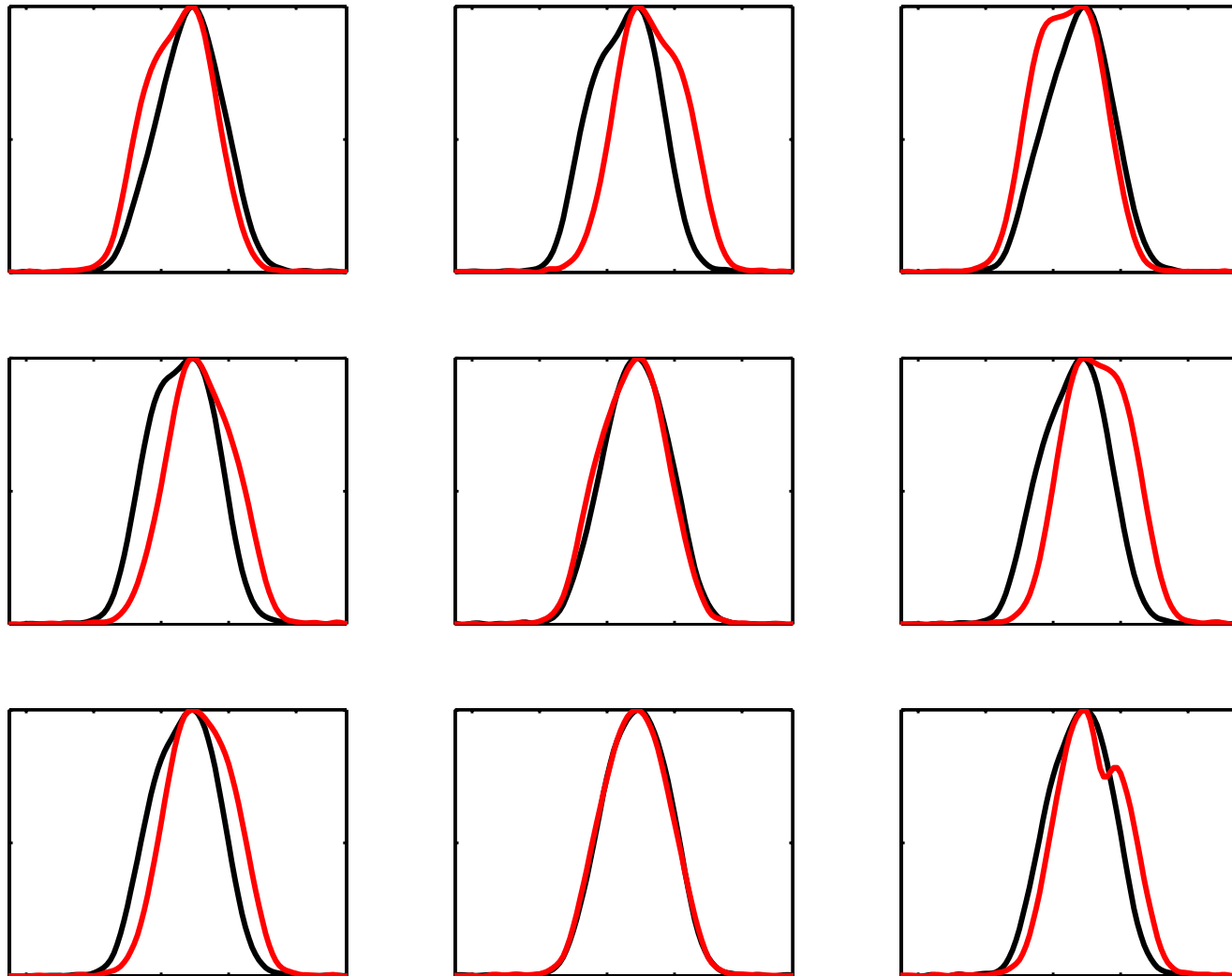
B(T) Errors if Ignore Bruker Width



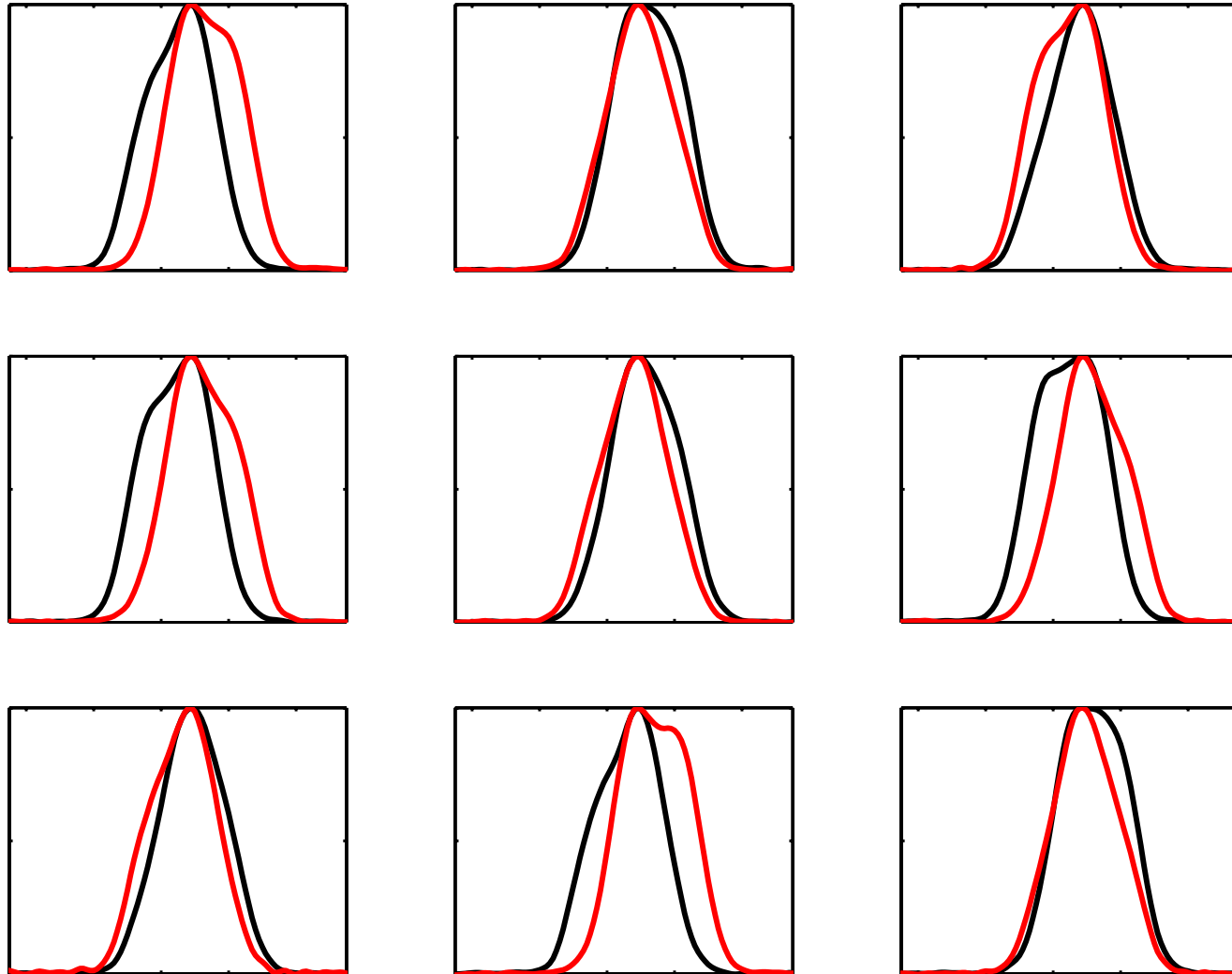
B(T) Errors if Ignore Bruker Sinc



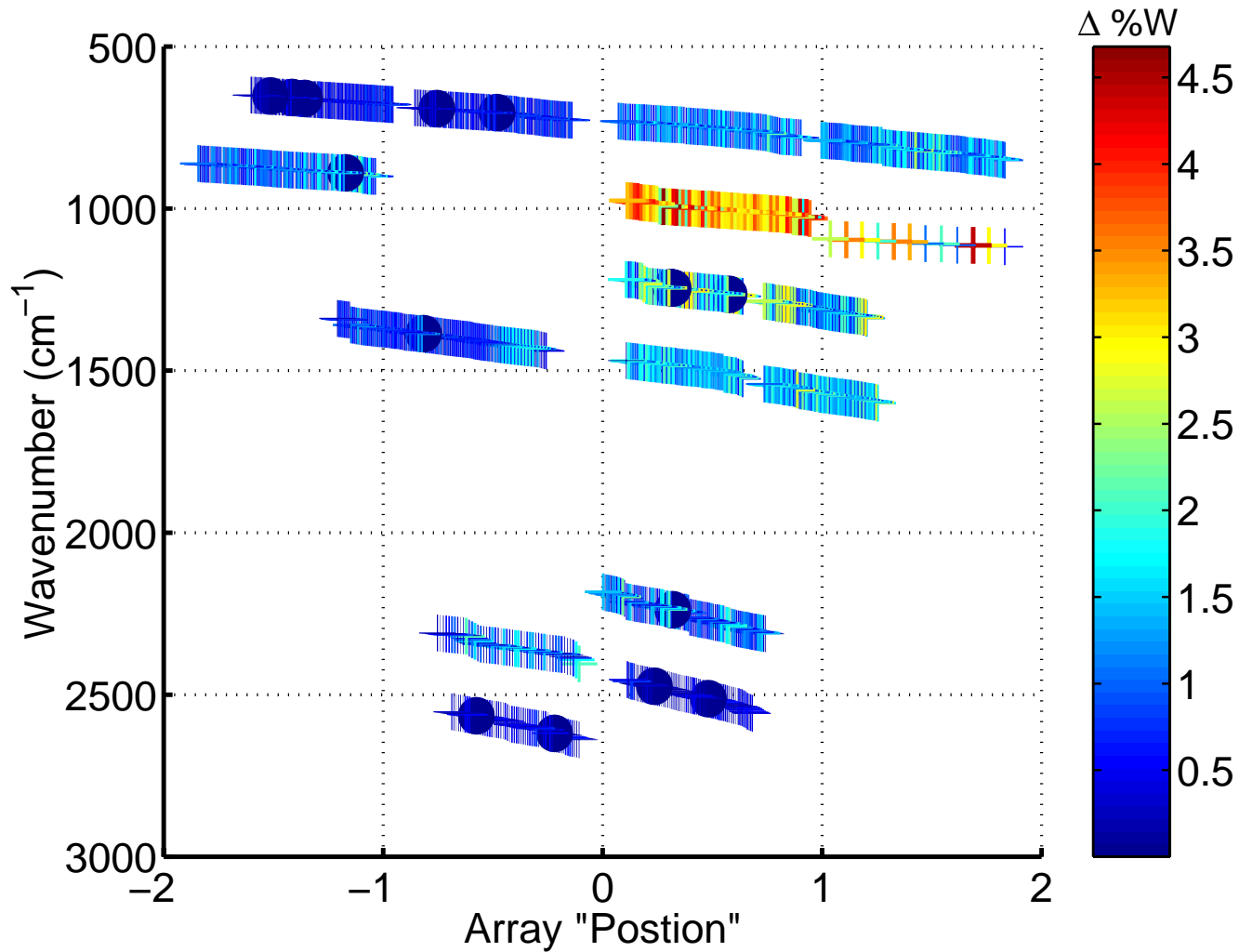
Test 386, M4a Sample SRFs

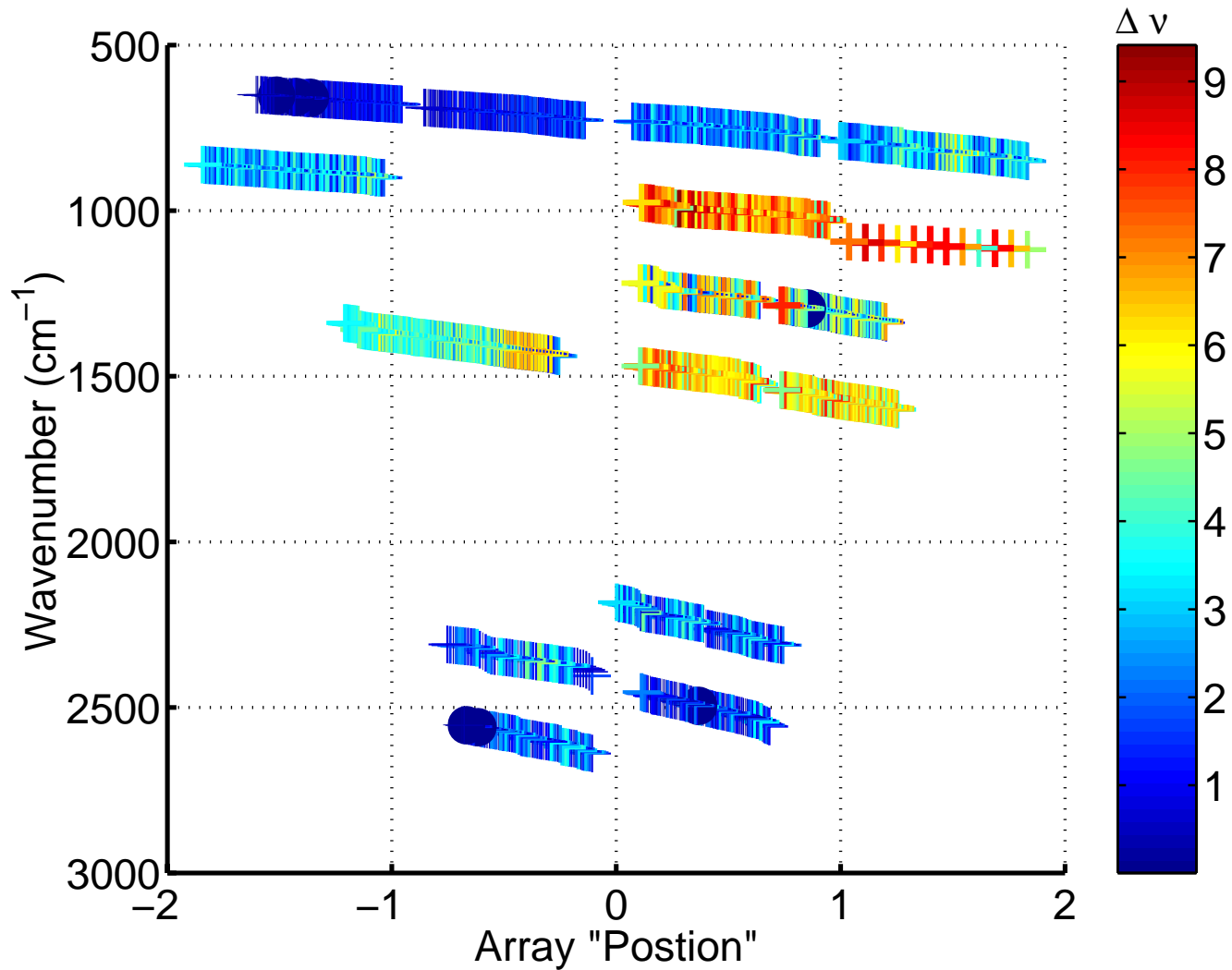


Test 386, M4a Sample SRFs, con't

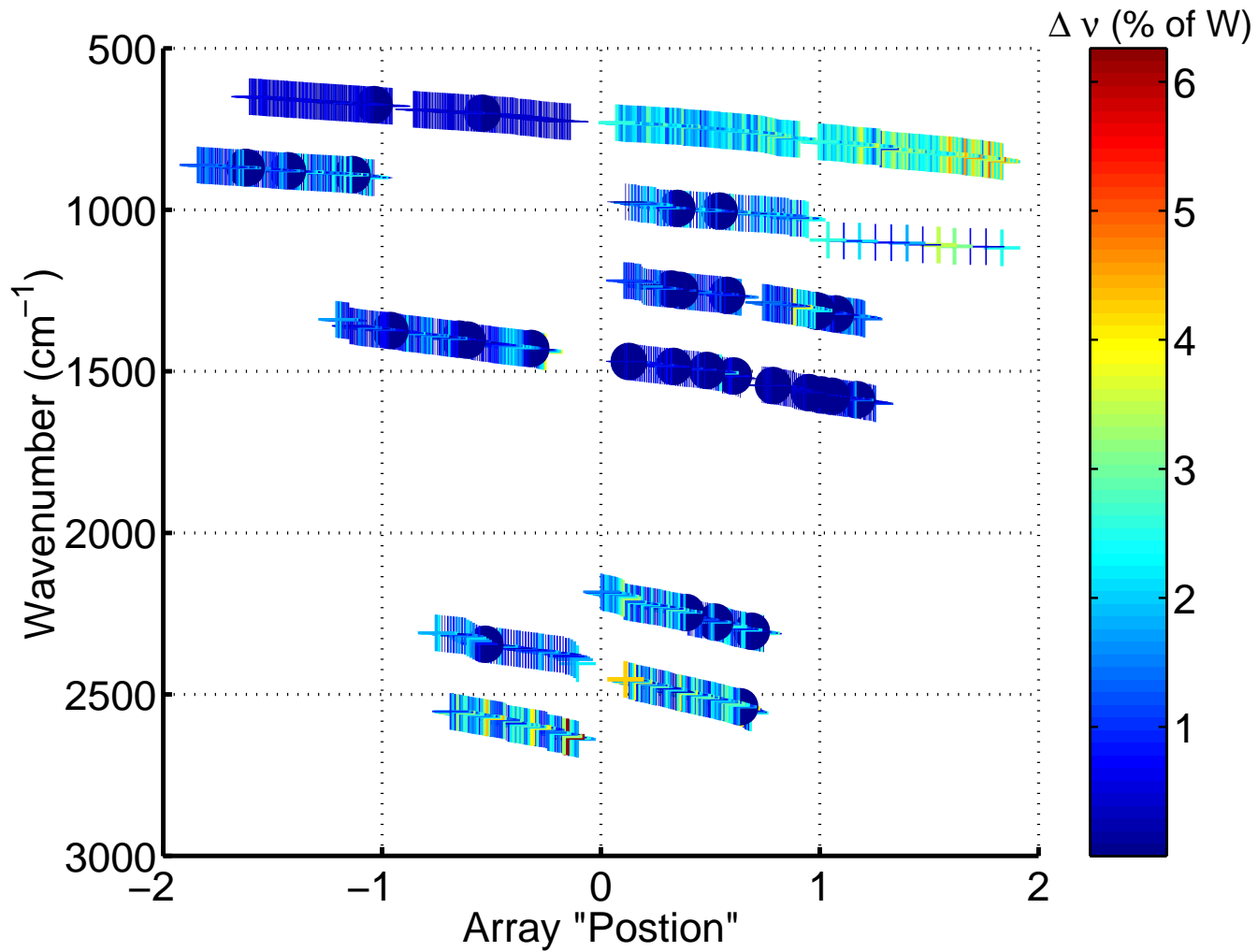


ν_i Diffs, 50% vs 80% Chord, T386

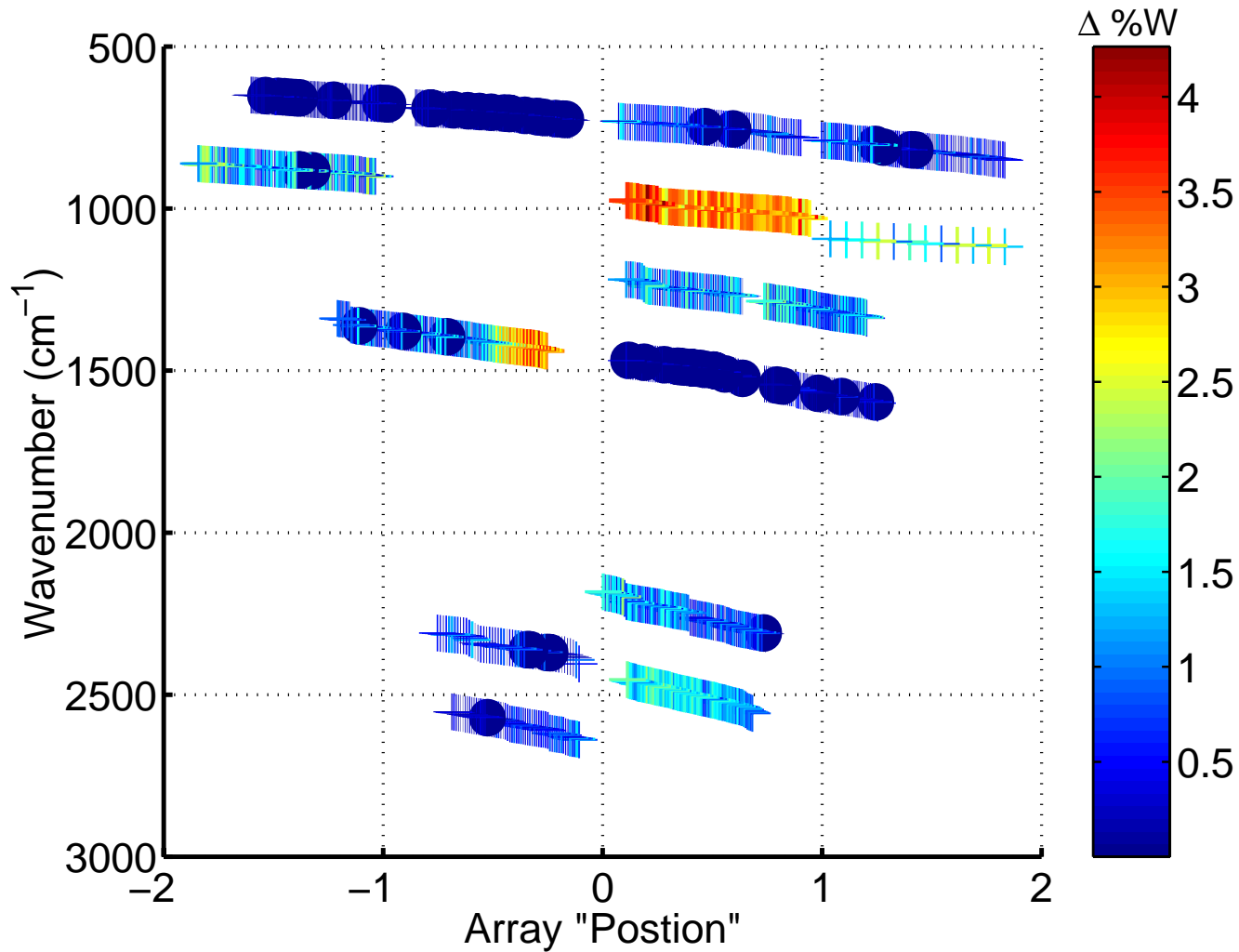


ν_i Diffs, 50% Chord vs Max, T386

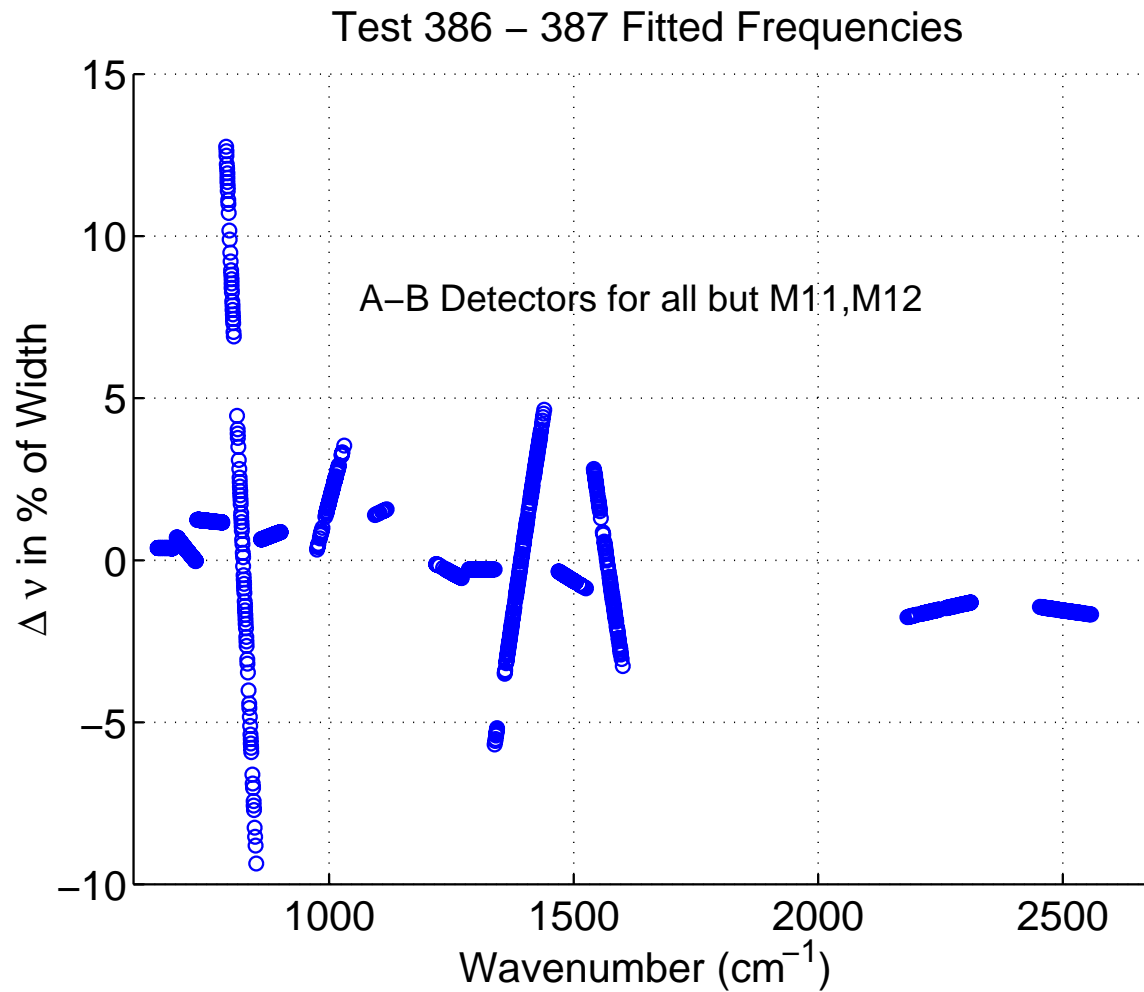
Obs. Freq Diff, T386 and T387



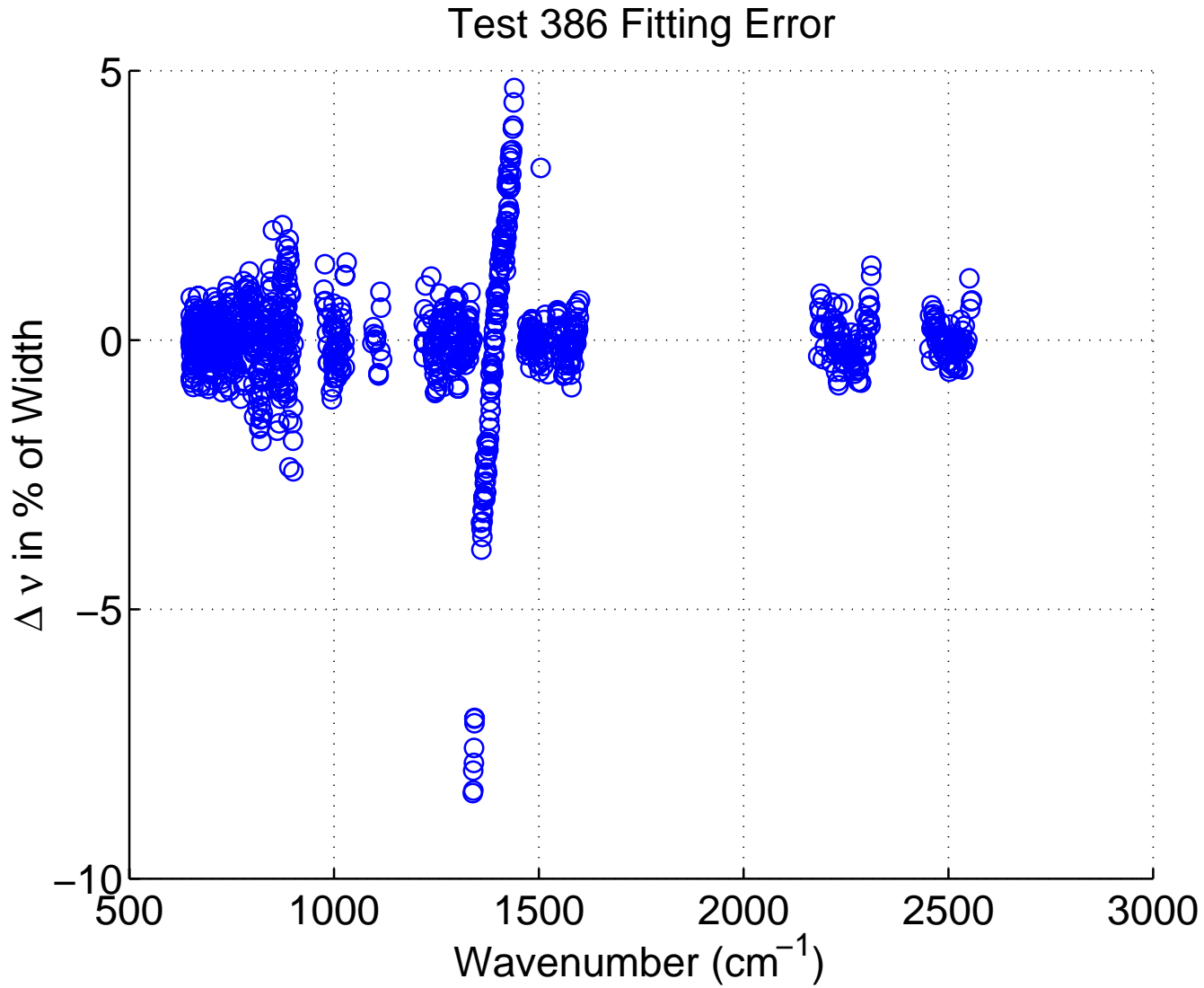
Obs. Width Diff, T386 and T387



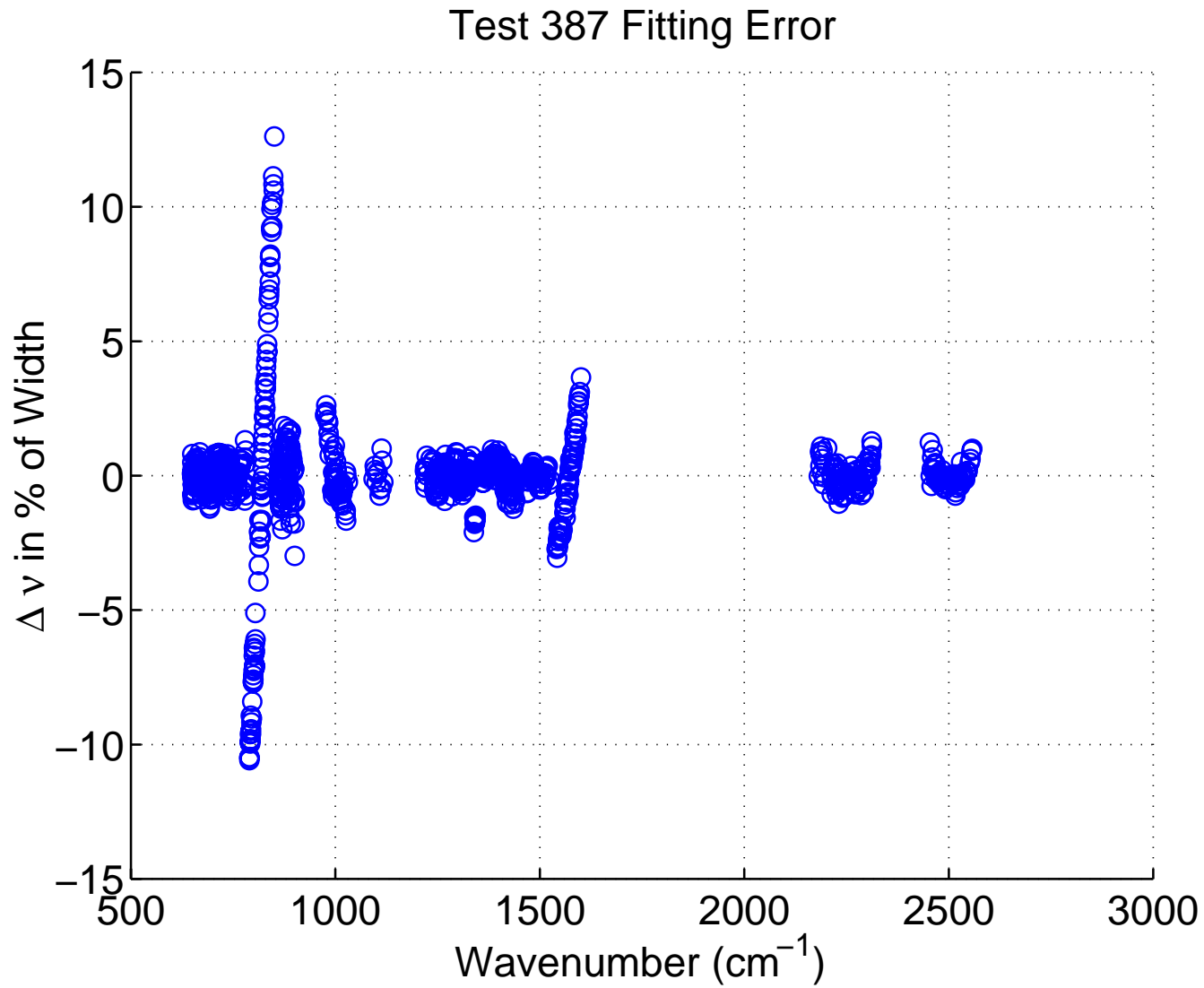
Fitted Freq. Diffs, T386,387



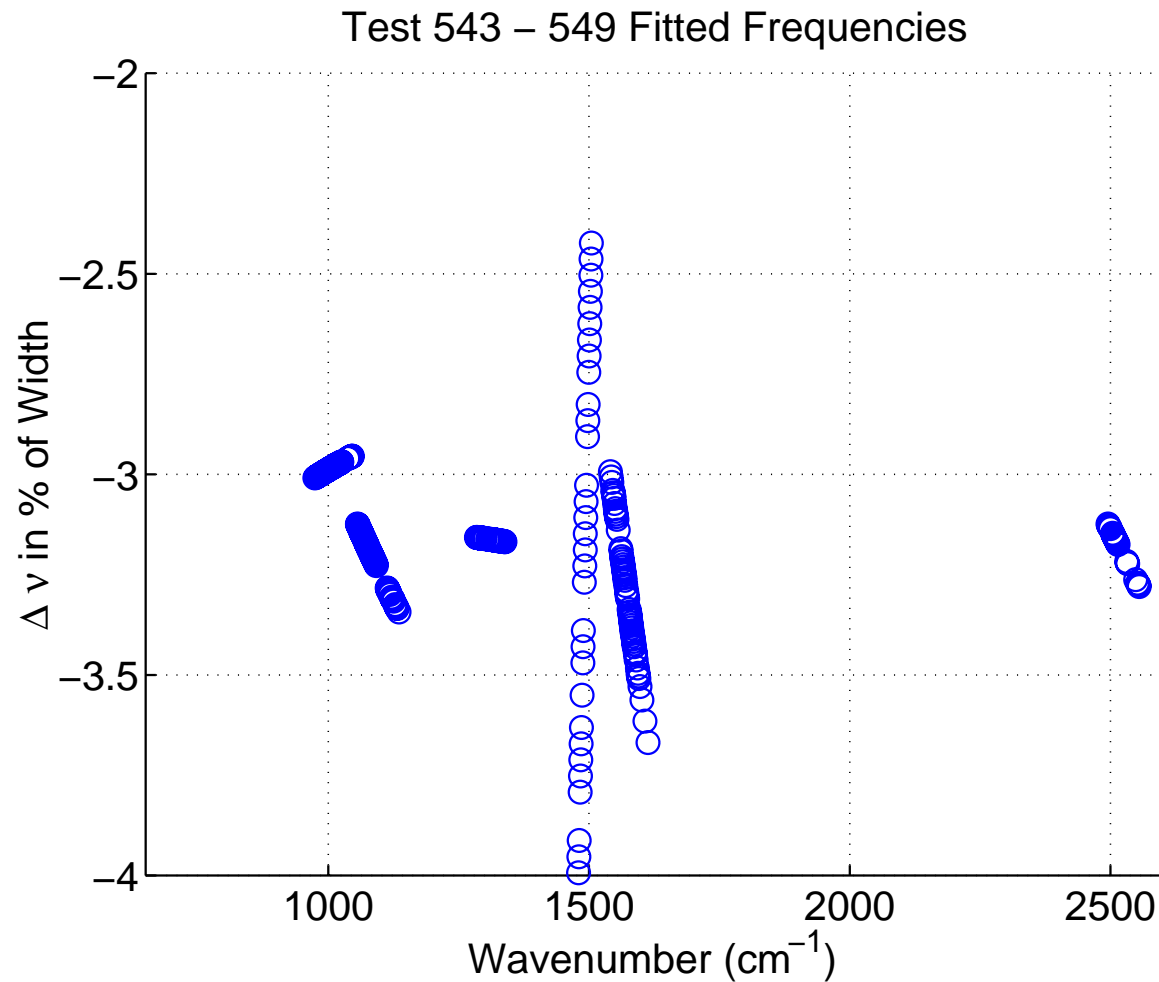
Test 386 Frequency Fitting Errors



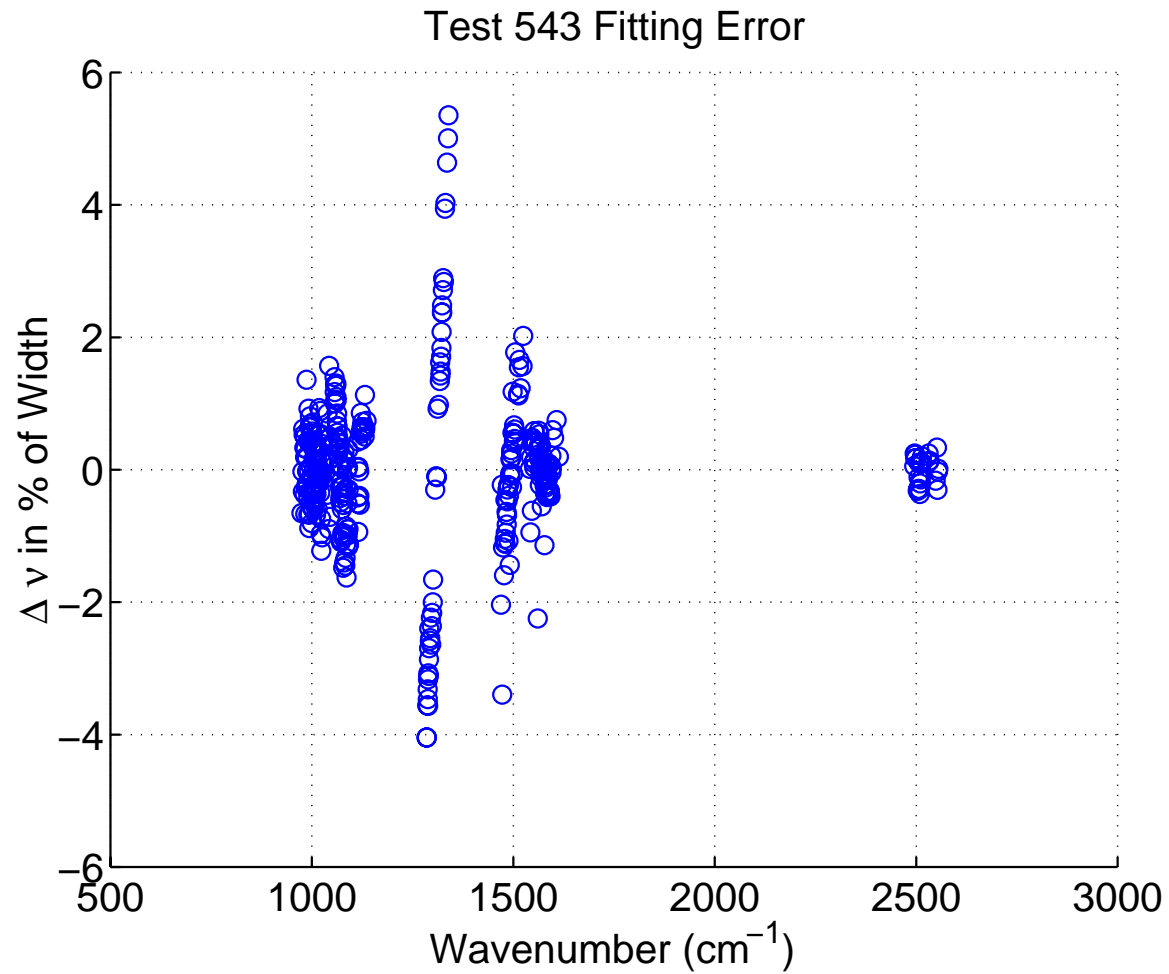
Test 387 Frequency Fitting Errors



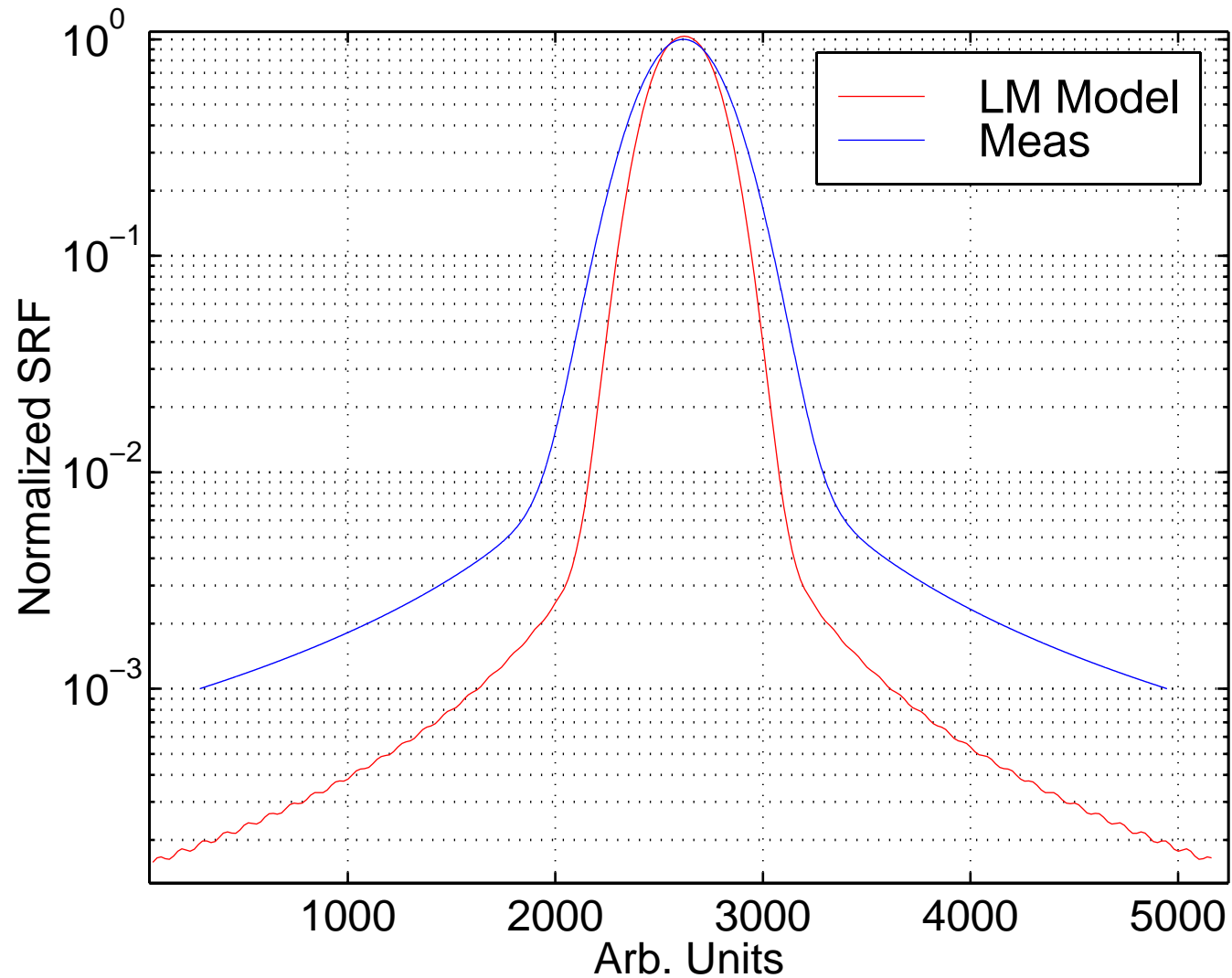
Test 543/549 Fitted Frequency Diffs



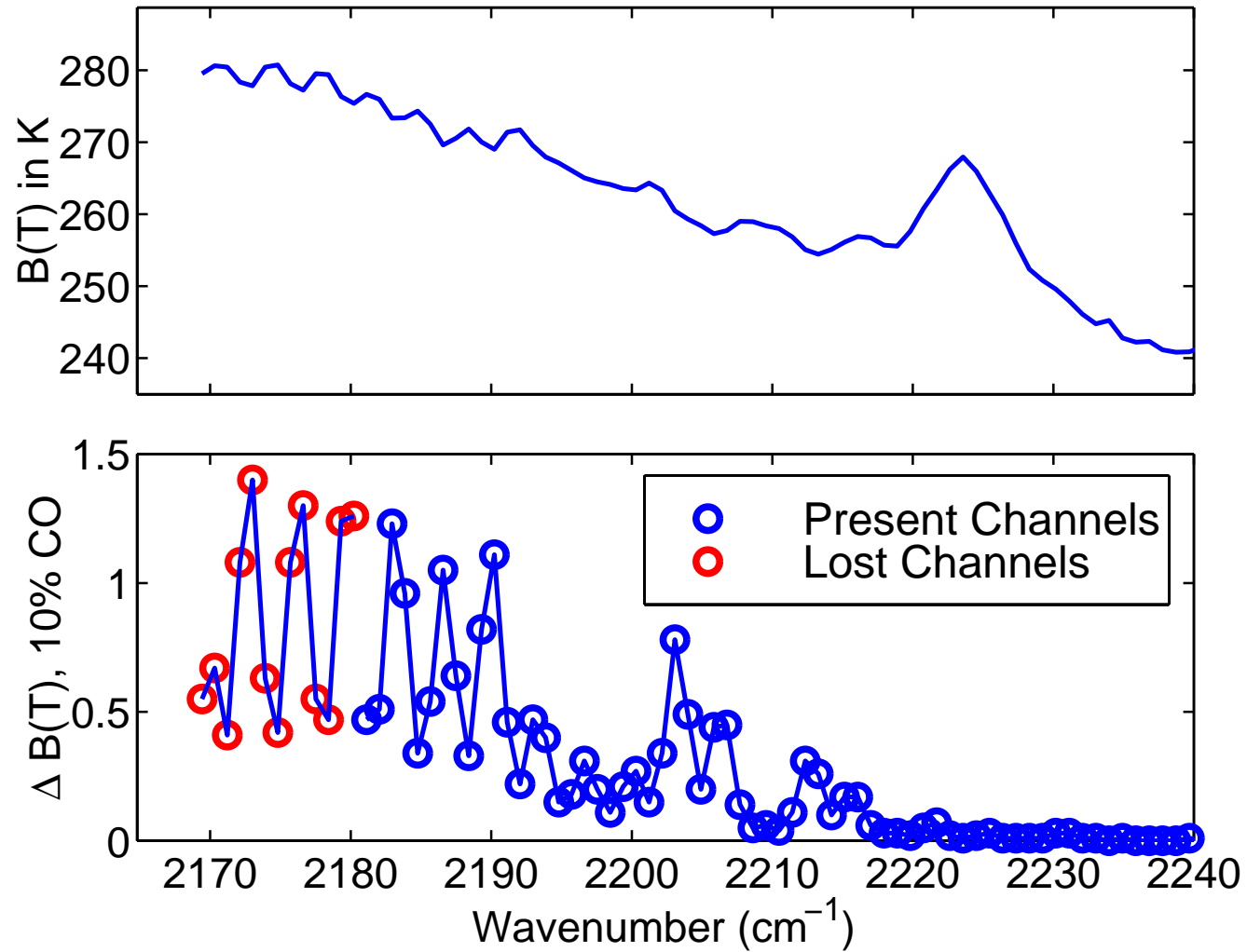
Test 543 Frequency Fitting Errors



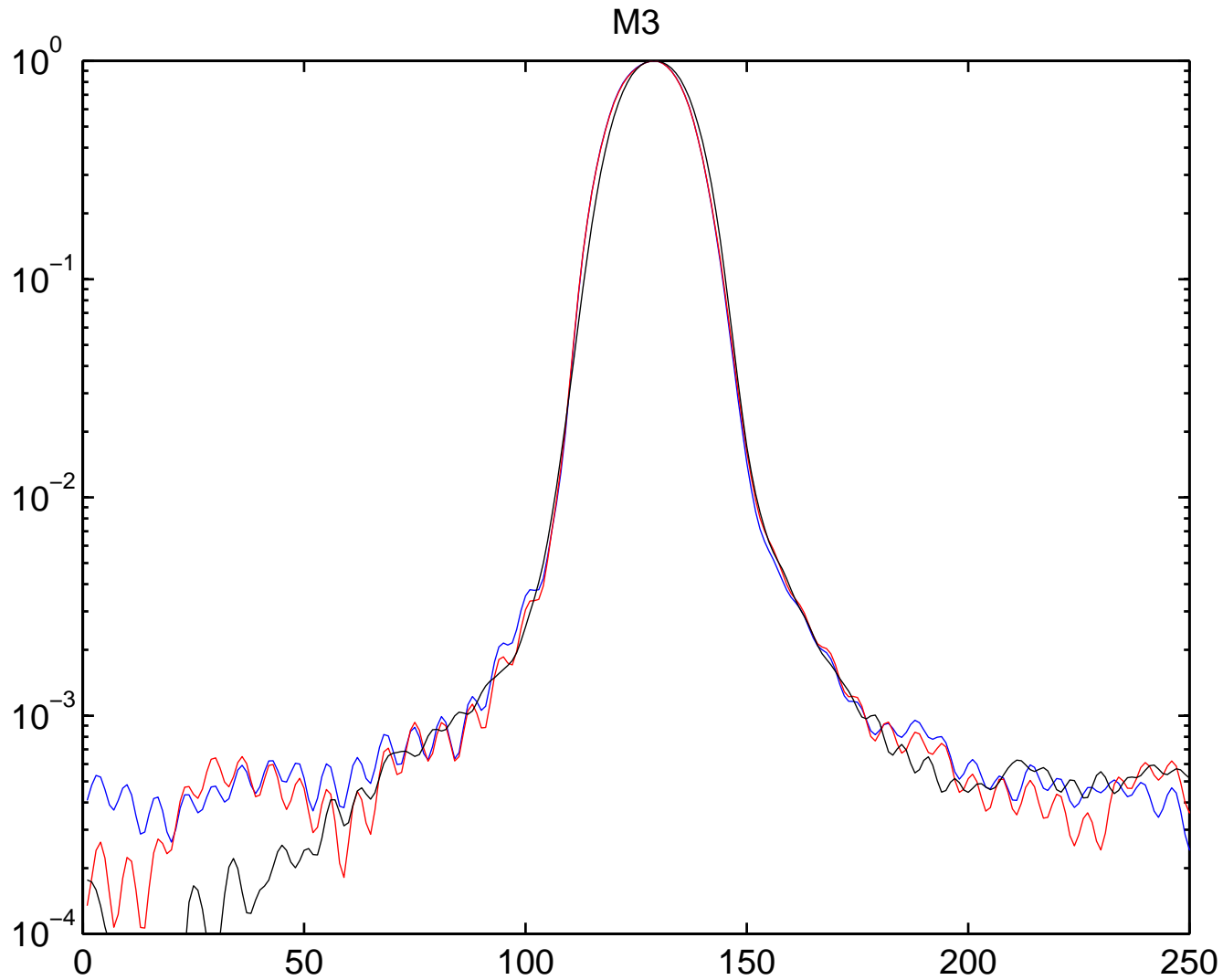
Rough Comparison: LM SRF Model, Data



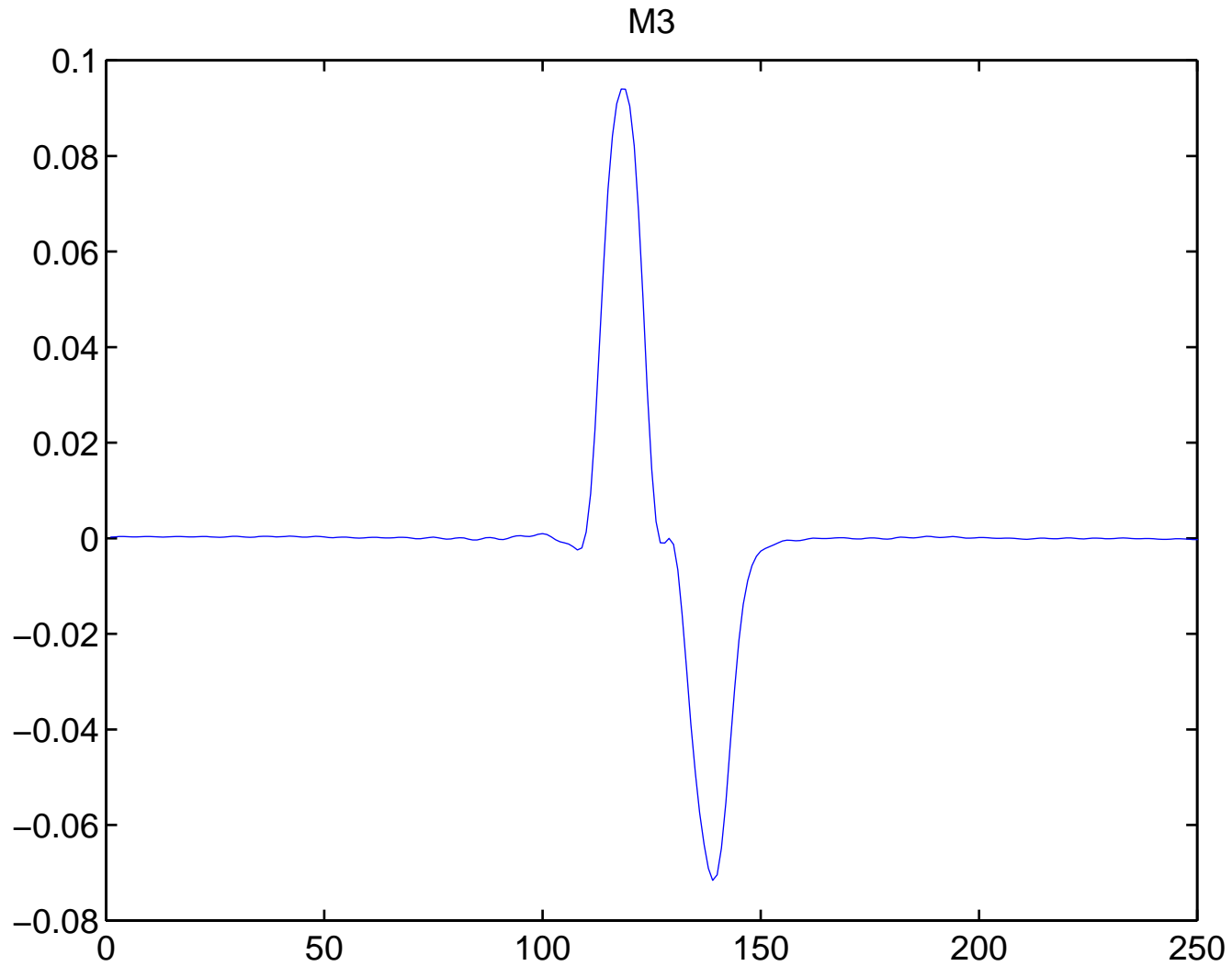
“Lost” CO Channels!



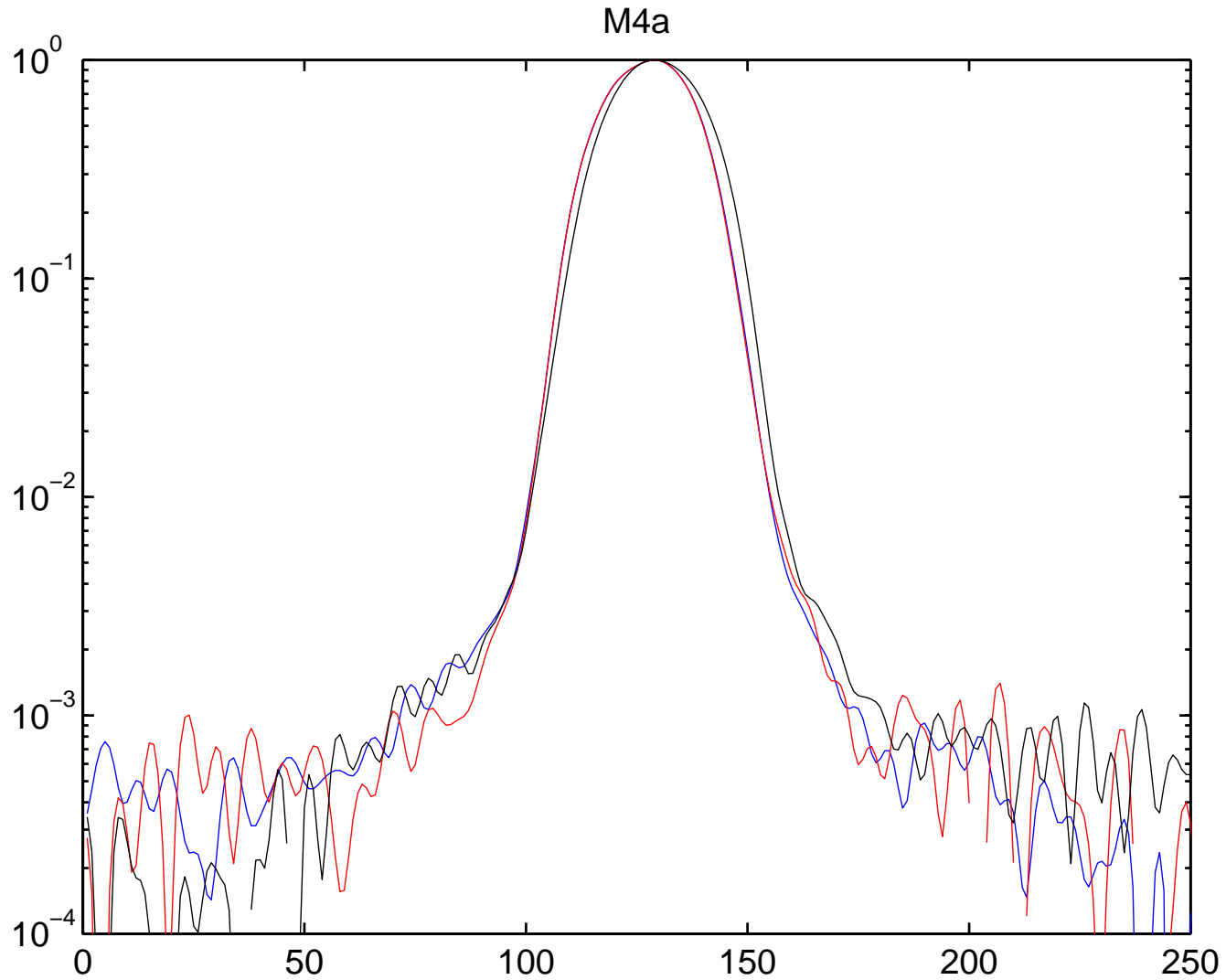
M3 Average SRF, Blue/Red/Black=386,387,543



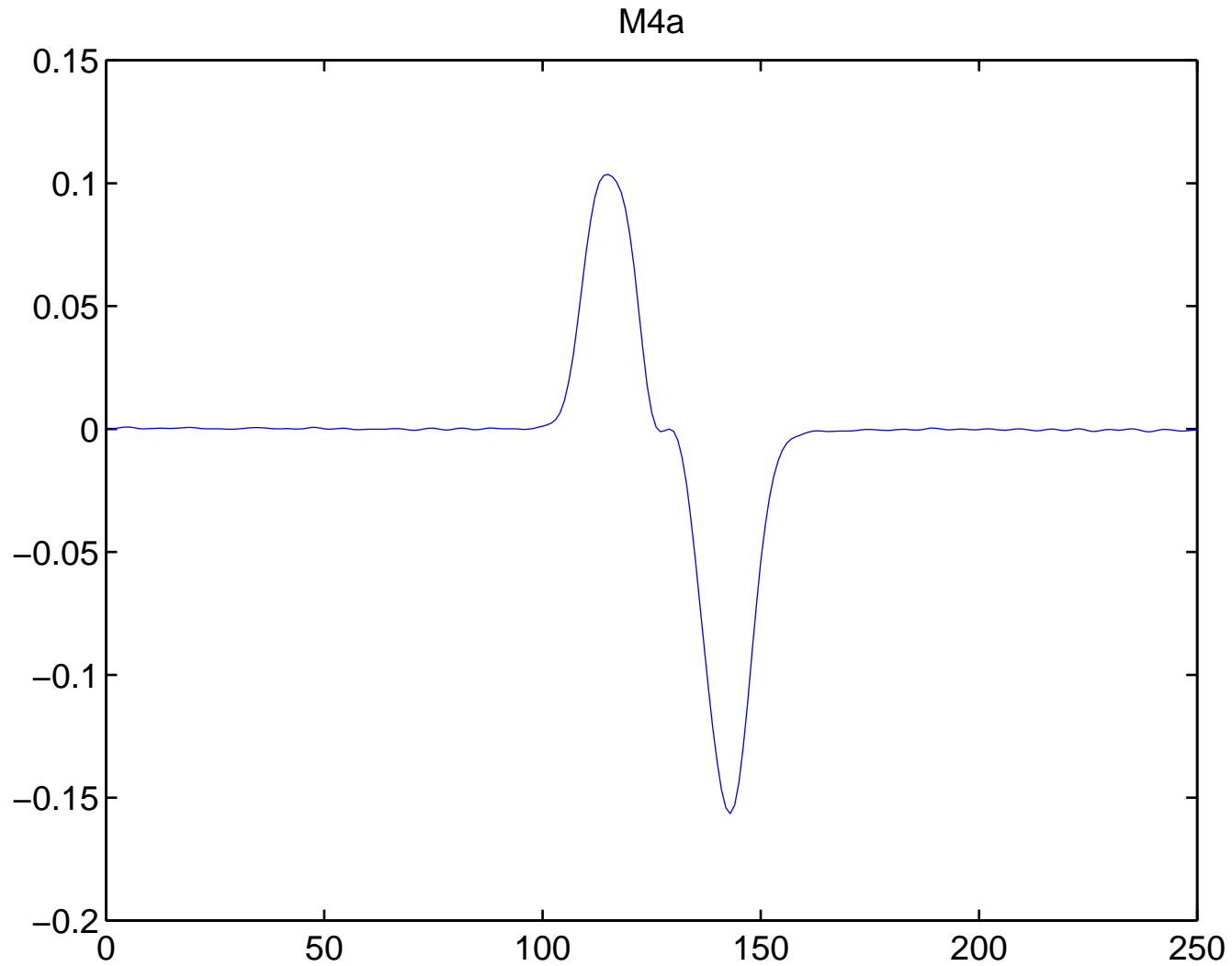
M3 SRF Diff, T386-T543



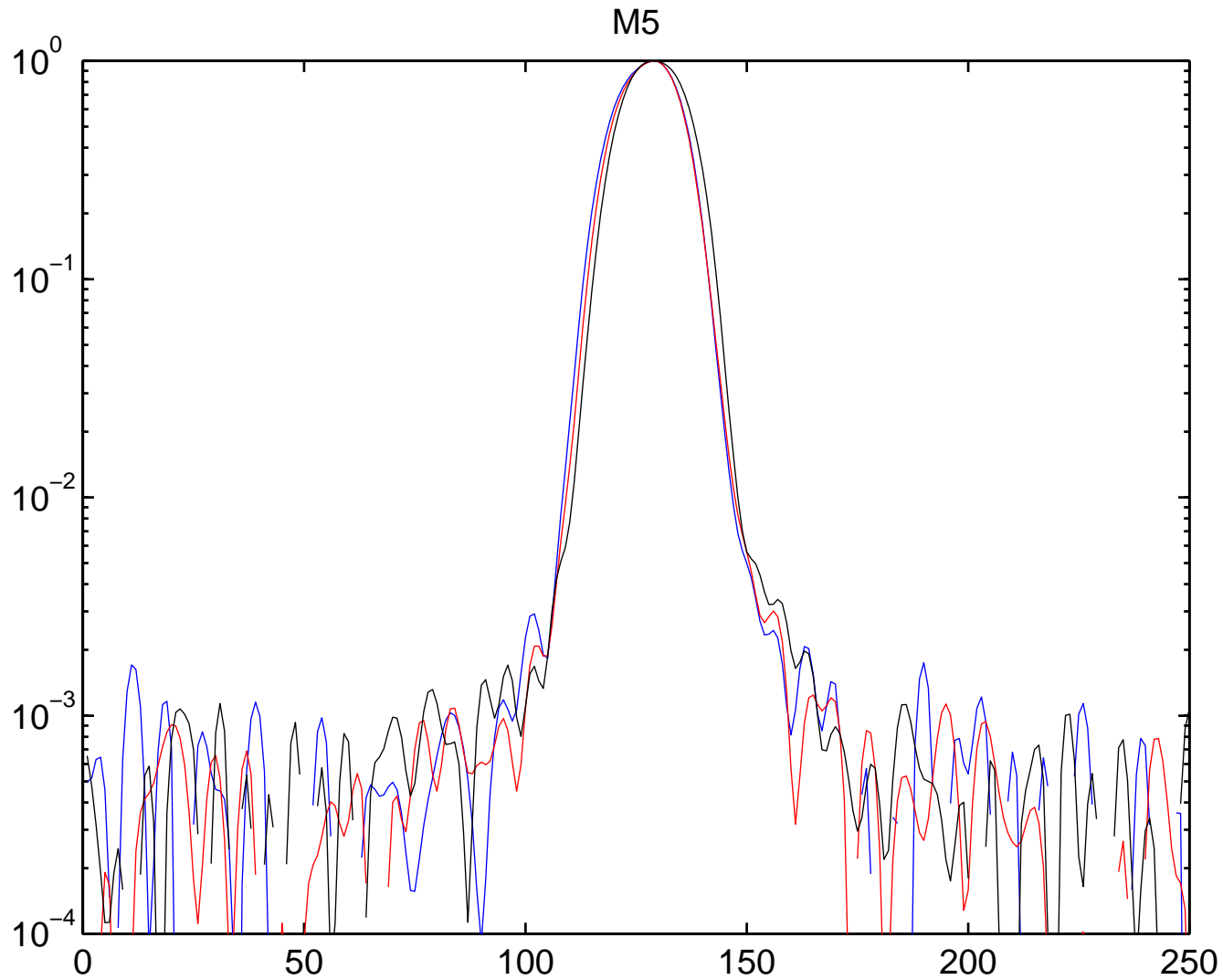
M4 Average SRF, Blue/Red/Black=386,387,543



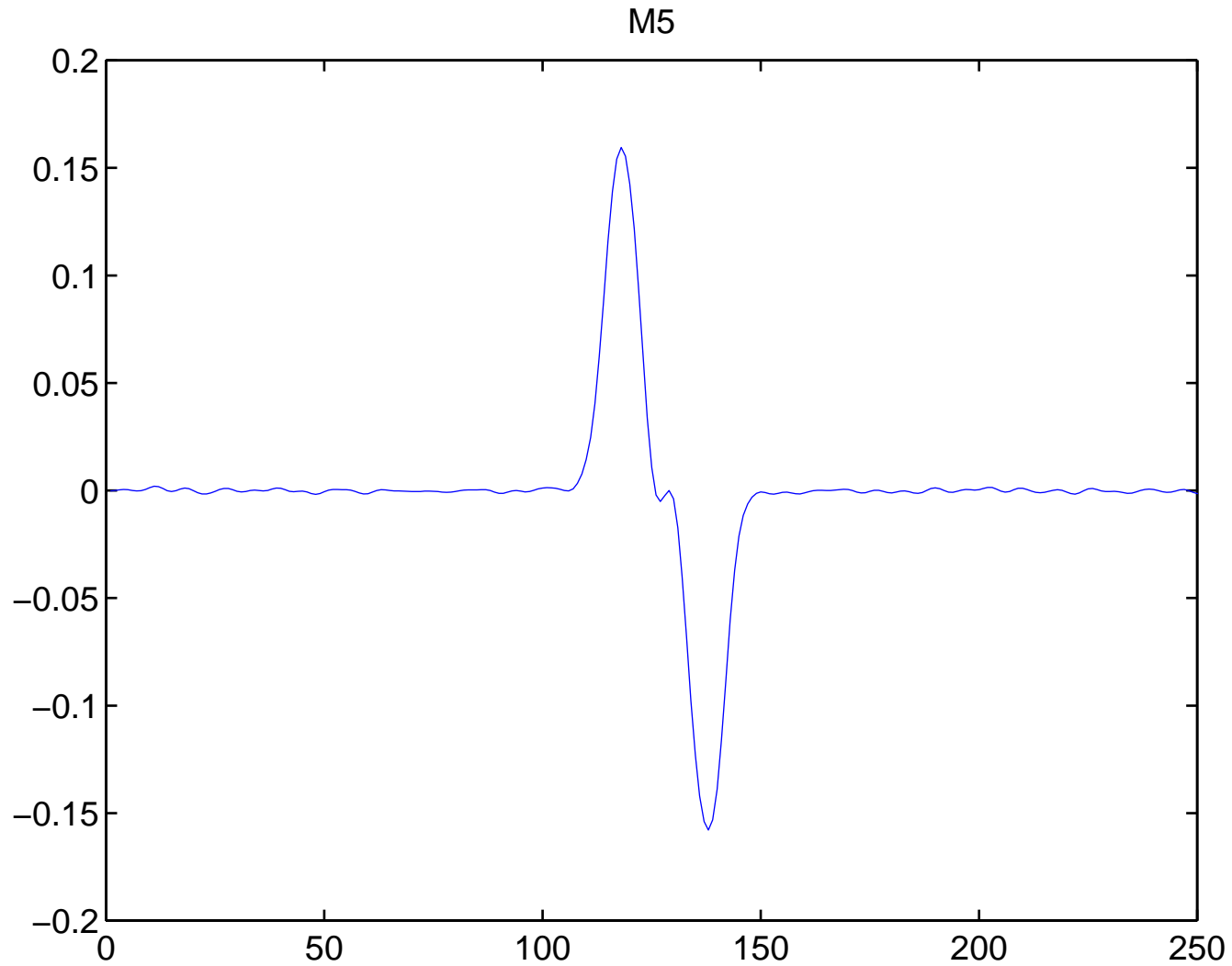
M4 SRF Diff, T386-T543



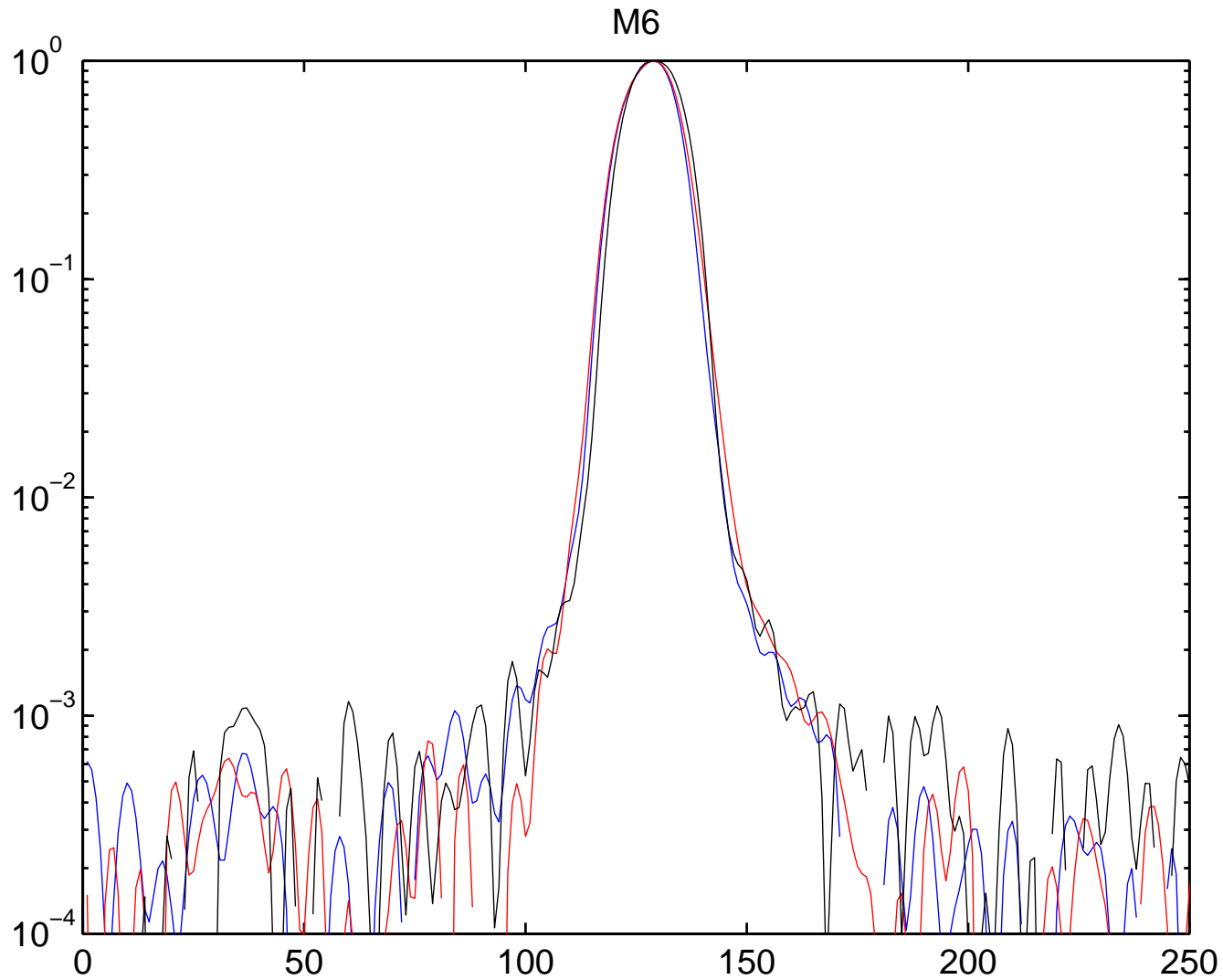
M5 Average SRF, Blue/Red/Black=386,387,543



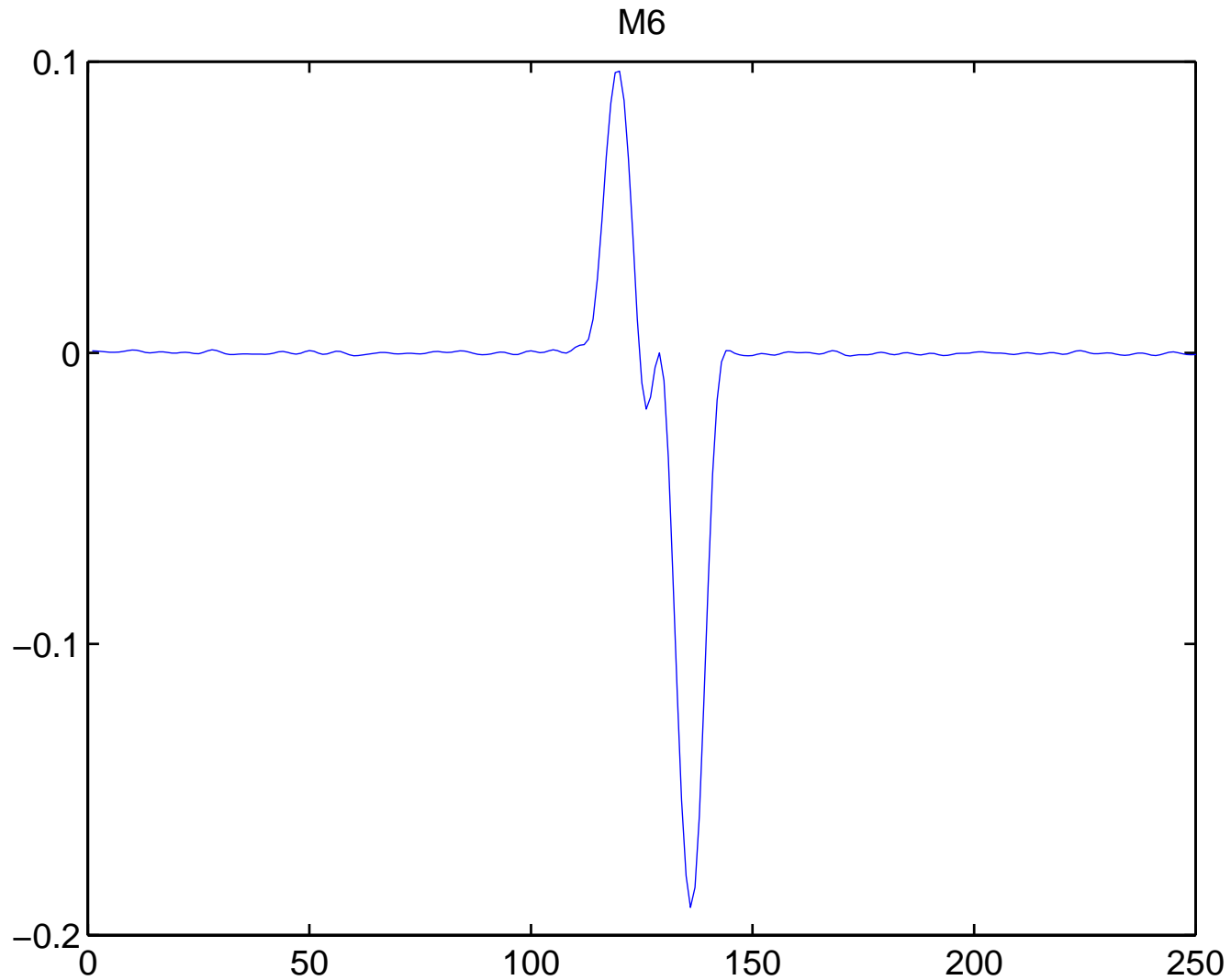
M5 SRF Diff, T386-T543



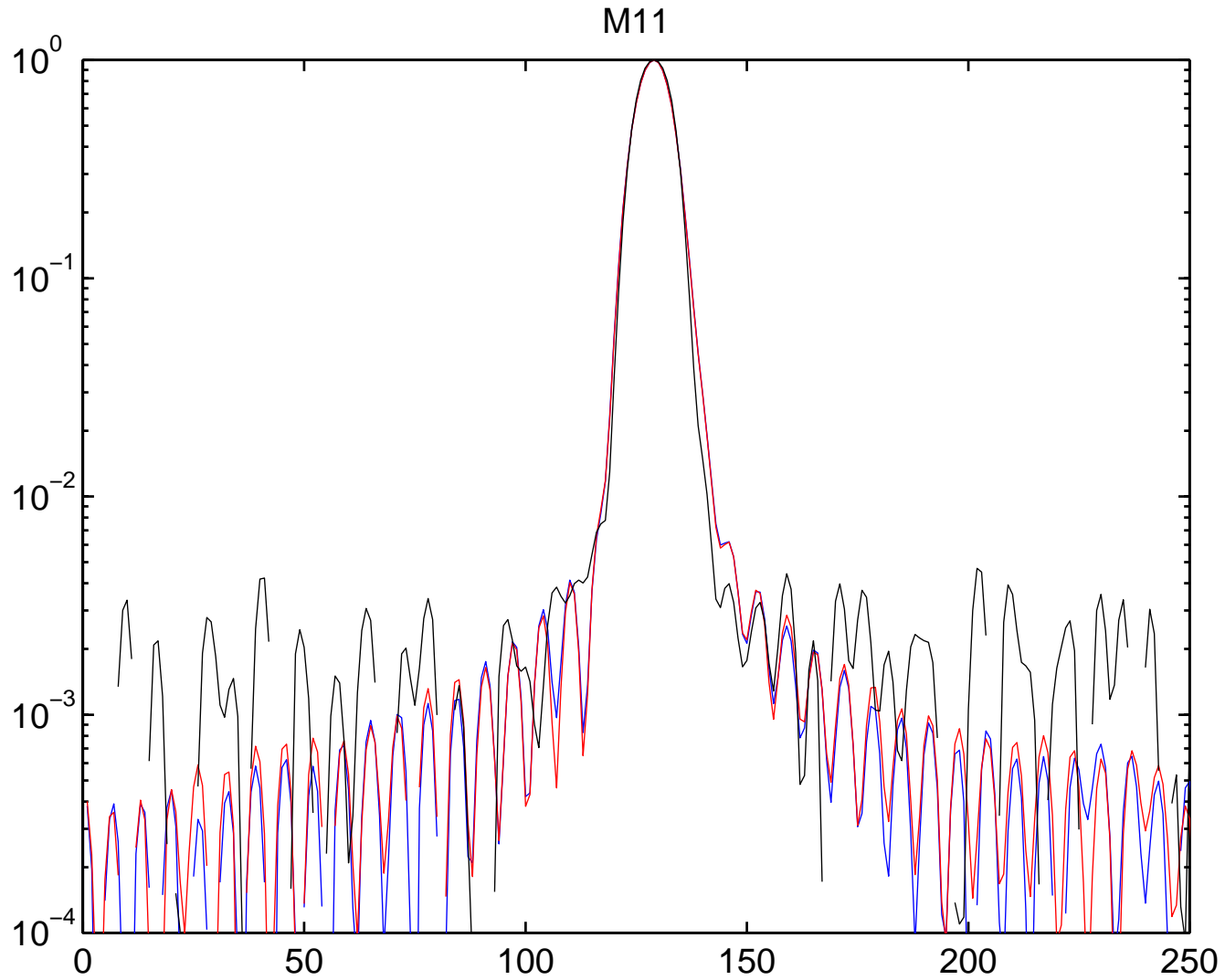
M6 Average SRF, Blue/Red/Black=386,387,543



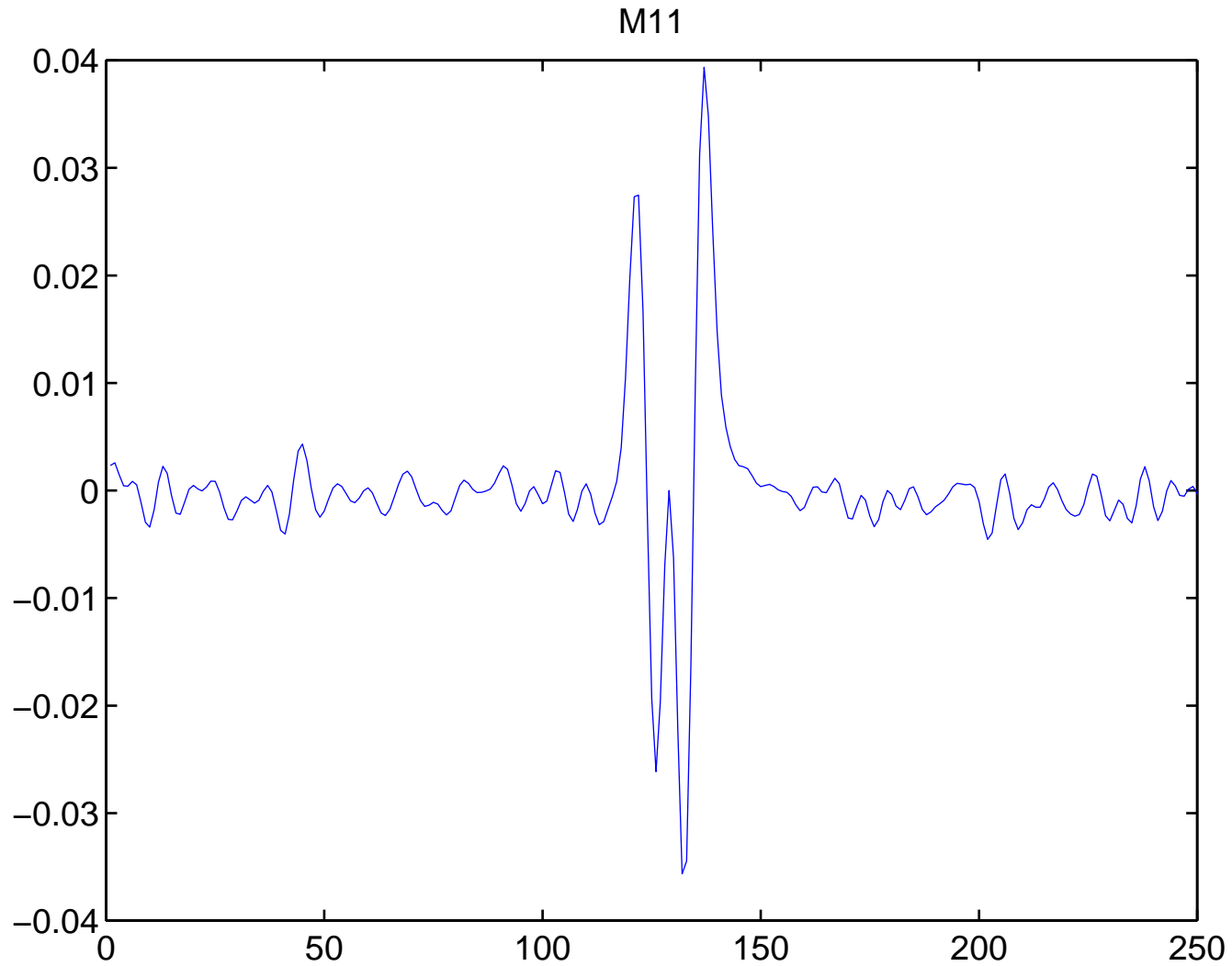
M6 SRF Diff, T386-T543



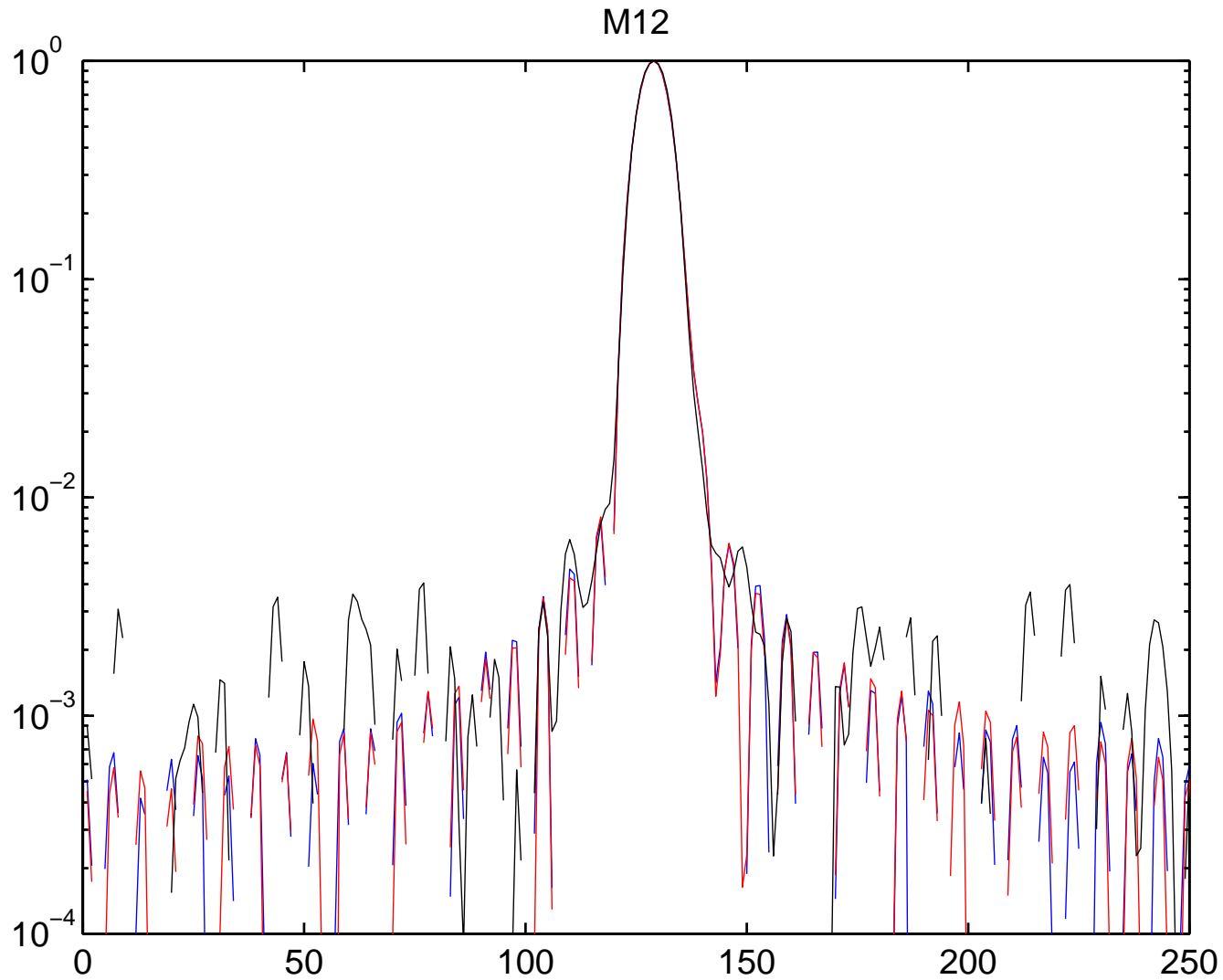
M11 Average SRF, Blue/Red/Black=386,387,543



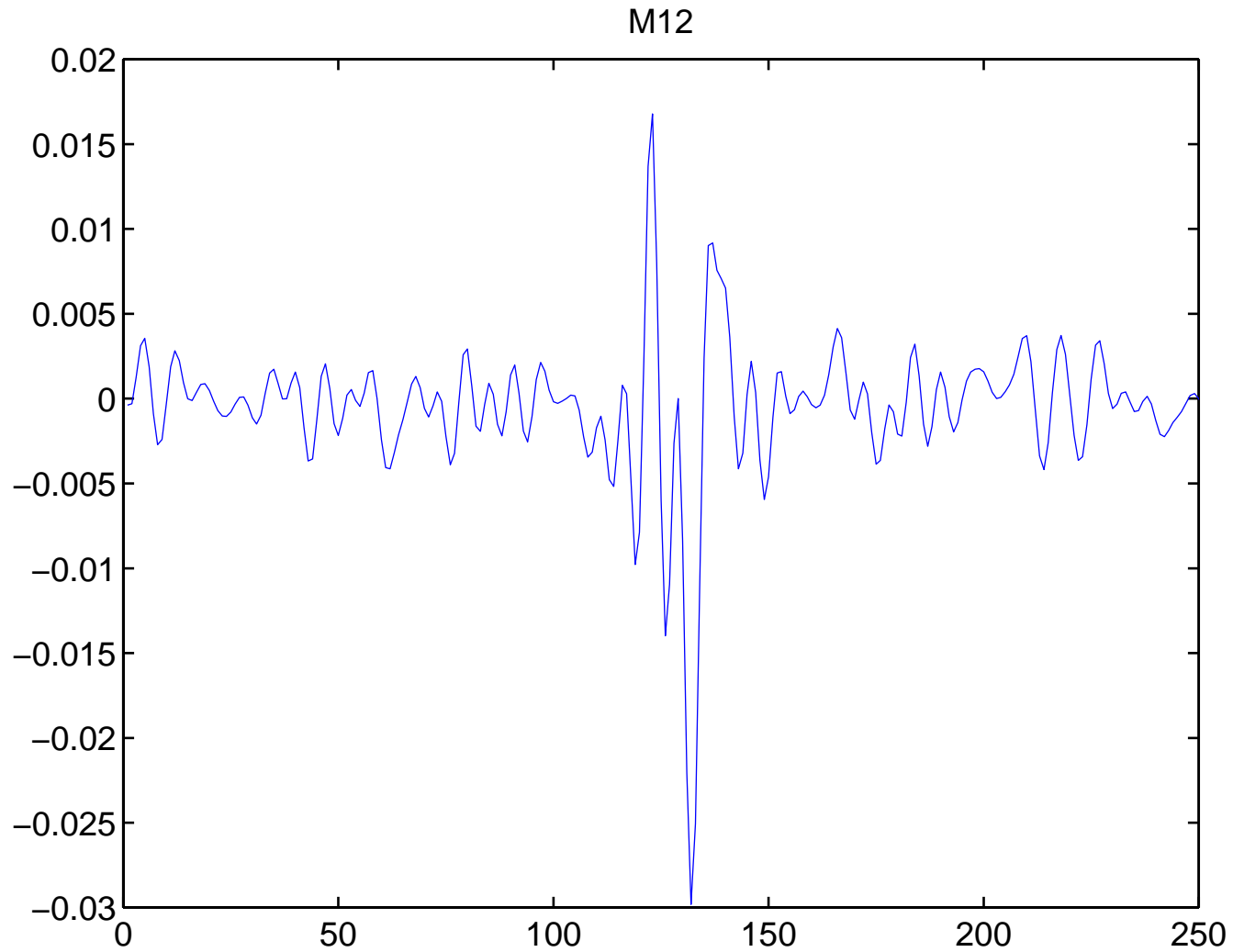
M11 SRF Diff, T386-T543



M12 Average SRF, Blue/Red/Black=386,387,543



M12 SRF Diff, T386-T543



Conclusions on SRFs

- Will need to model Bruker for M11, M12.
- Combination of SRF averaging, removal of integrating sphere should give us good wings.
- Need to determine cause of SRF asymmetries, bumps and correct. Noise pickup problems? Need to see tests with Bruker running, but AIRS optics blocked?
- Why do AIRS center frequencies vary with test?
- **Two-temperature gas cell tests** will give very accurate SRF widths, and will be sensitive to asymmetries we have seen.

Future UMBC Work on SRF's

- With new nominal SRF's, determine SRF measurement accuracy requirements.
- How pick best SRF measurements for model fitting?
- Global focal plane fits?
- Automate analysis to handle more data, more quickly.
- Quick feedback to LM on SRF analysis needed?
- SRF Model: Use channel-to-channel variations vs a model? Probably some combination of the two.
- Would like a sample 2-temperature gas cell test soon to test our understanding of the test and our software.
- We need to visit LM at some point to fully understand the tests and the testing.

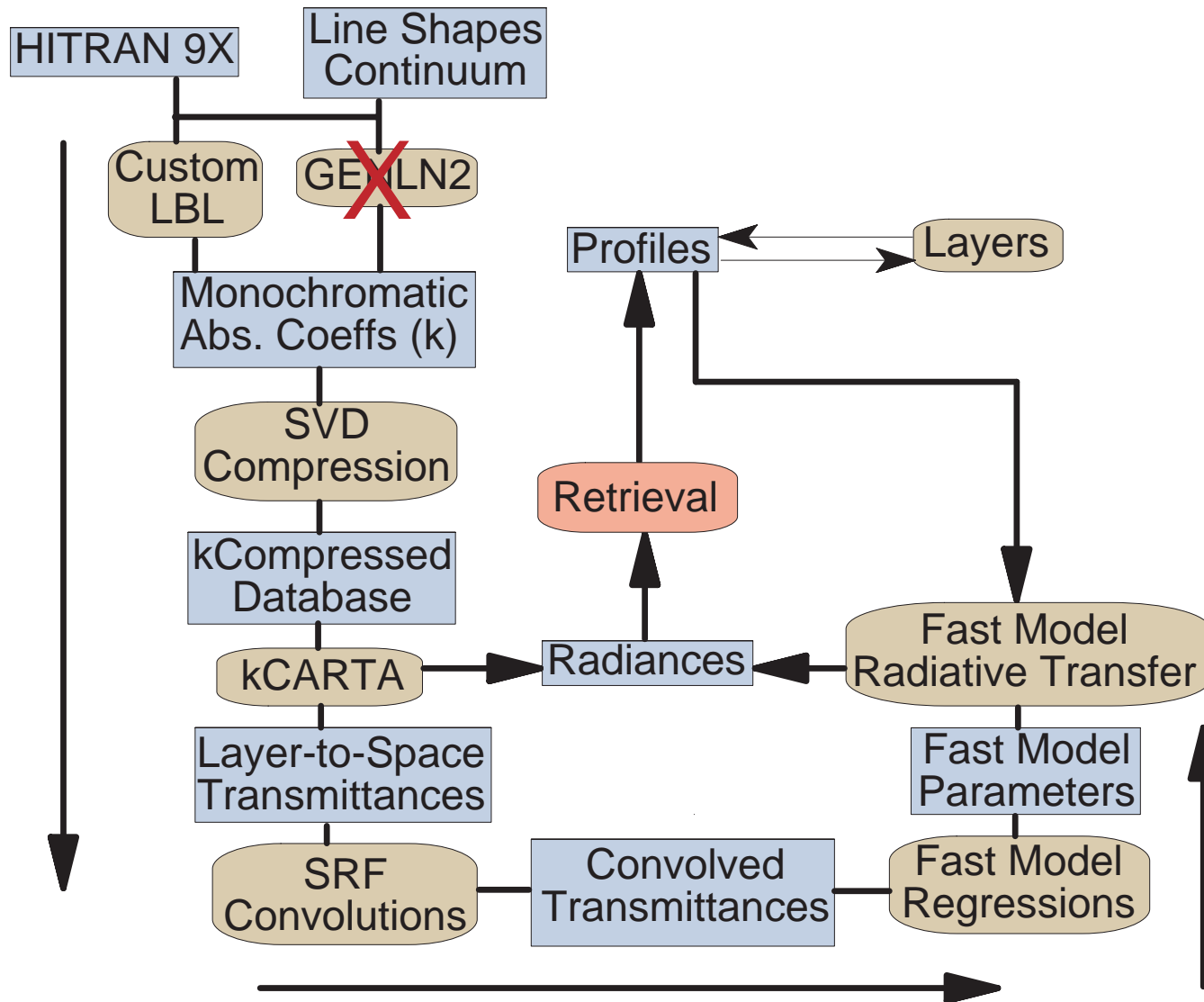
Forward Model Progress

- New line-by-line code *still?* under development. CO₂ P/R branch line mixing at 4.3 and 15 μm . Test with HIS, NAST, AERI, Scanning-HIS, INTESA.
- Developed software for HITRAN96 cross-sections. Can provide to others - was not a trivial exercise.
- HITRAN98 plus Toth H₂O integrated into new line database.
- Presently producing kCARTA compressed databases for all gases but CO₂ and H₂O. Using new compression scheme.
- We should receive new long-path H₂O and CO₂ spectra from RAL soon to help with tropospheric water channels and P/R-branch line mixing.
- Integrating new solar spectrum into forward model

Forward Model: Future Work

- Test new CO₂ line-by-line code
- Analyze RAL lab spectra and finalize CO₂ line-mixing parameters and H₂O near-wing lineshape. Hopefully improve some aspects of H₂O continuum with this lab data.
- Finish production of new kCARTA database. Add CO₂ and H₂O when done. **When are final fast model numbers needed?.**
- Inherit fast model code changes from JPL/GSFC back at UMBC.
- Examine statistical profile set for fast model regressions.
- Production code for kCARTA → AIRS fast model. Quality control and accuracy tests need work.

Forward Model Flow Diagram



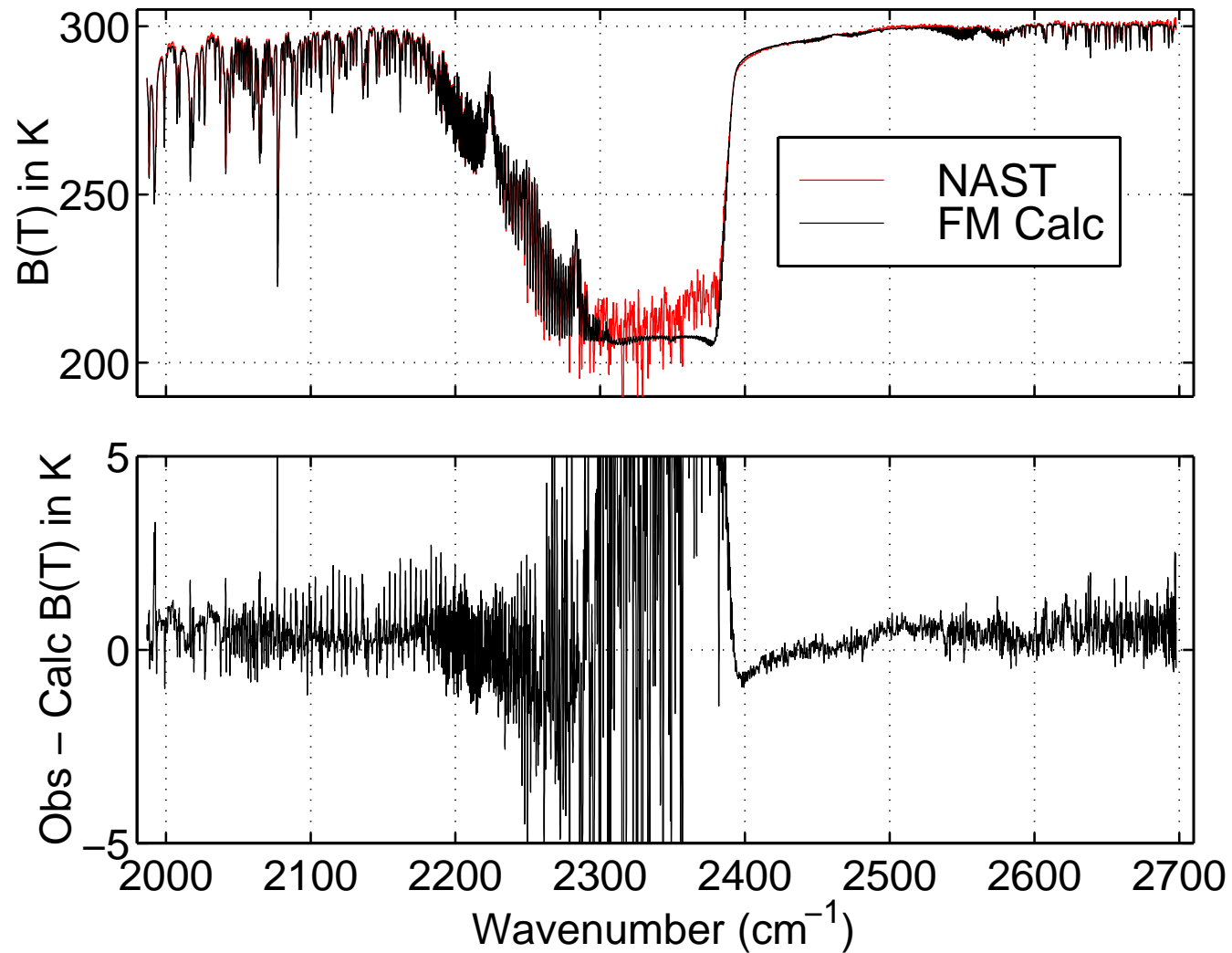
CAMEX-III

- Very little work done since data just recently available
- Plotted up NAST “spectroscopy” set Obs-Calcs recorded near Andros. Calcs done by Langley (Chris Sisko?) using our NAST fast model.
- Our NAST fast model used CDK1.0 (H₂O continuum) and does not have P/R branch line mixing or newer H₂O lineshapes.
- Did some very quick tests of our new CO₂ line-mixing line-by-line code at 4.3 and 15 μm . Promising results. Concerned about problems at 4.3 μm .
- We need to completely understand (1) how the NAST “spectroscopy” data set was produced, and (2) the expected accuracy of the in-situ T and H₂O profile.

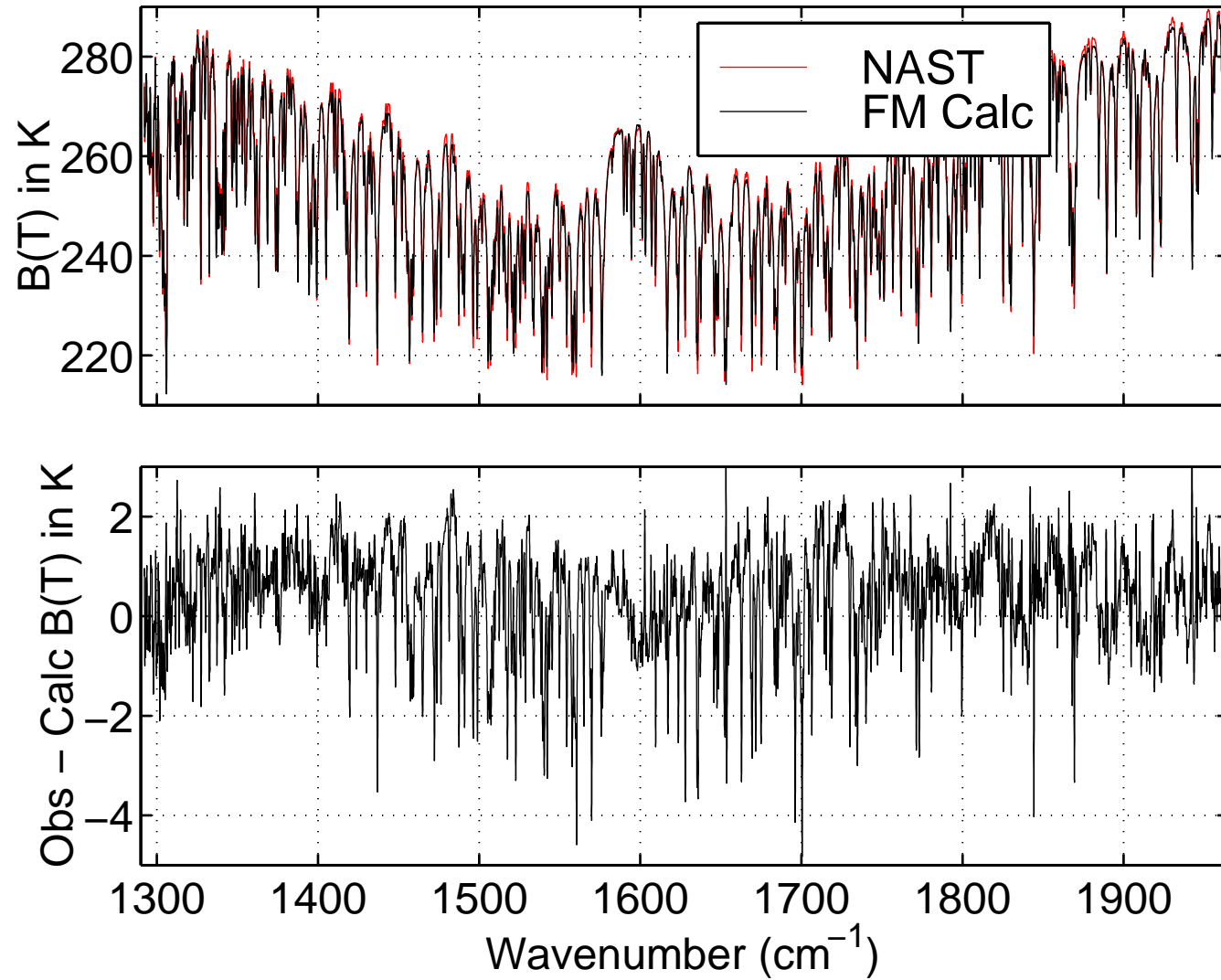
CAMEX-III, cont'd

- Future work may involve more uniform NAST spectra recorded at Wallops Island (Dave Tobin is working on this.)
- Examine utility of variability of radiances with viewing angle to test spectroscopy.

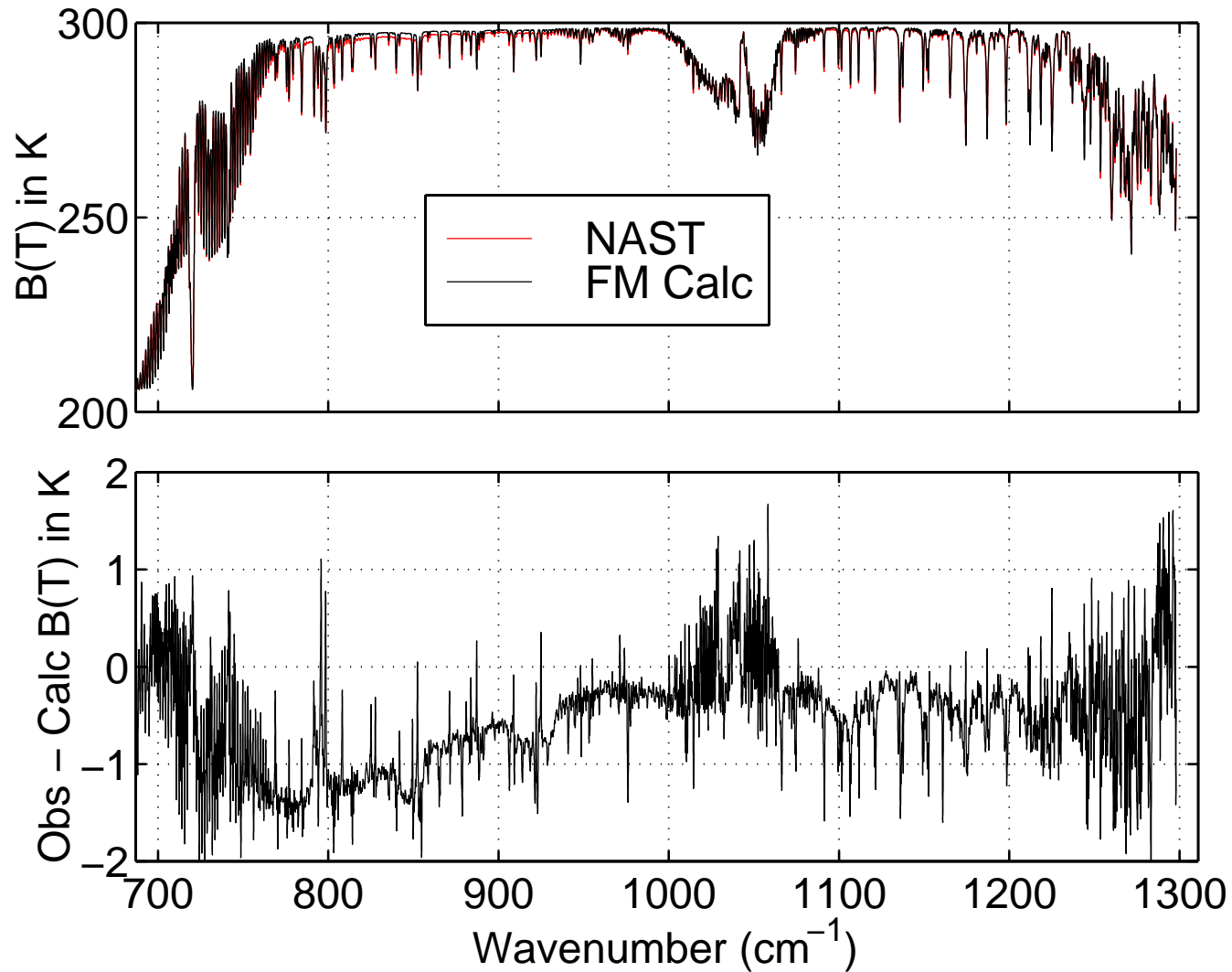
NAST Band 1, Strow FM, (off WWW)



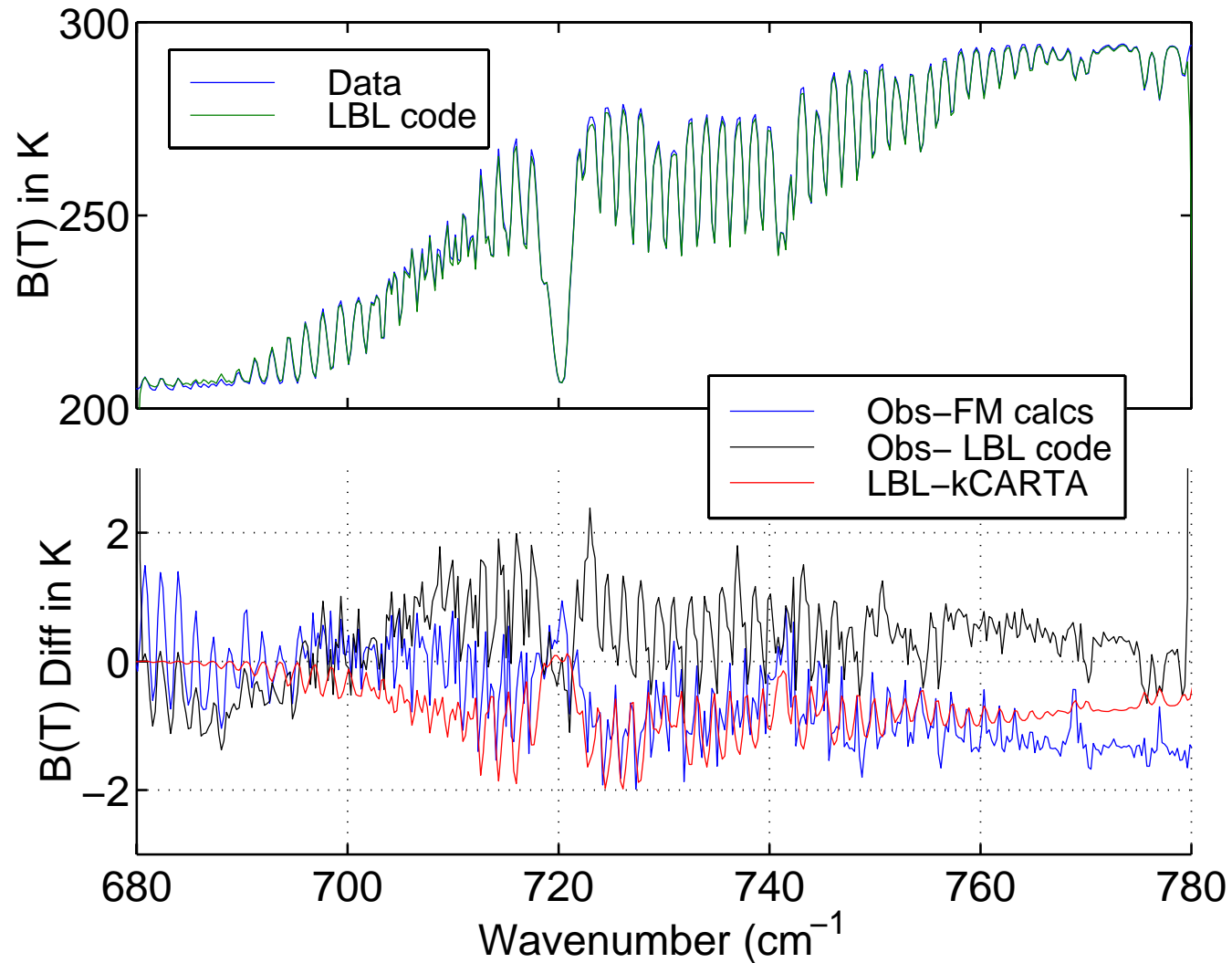
NAST Band2, Strow FM, (off WWW)



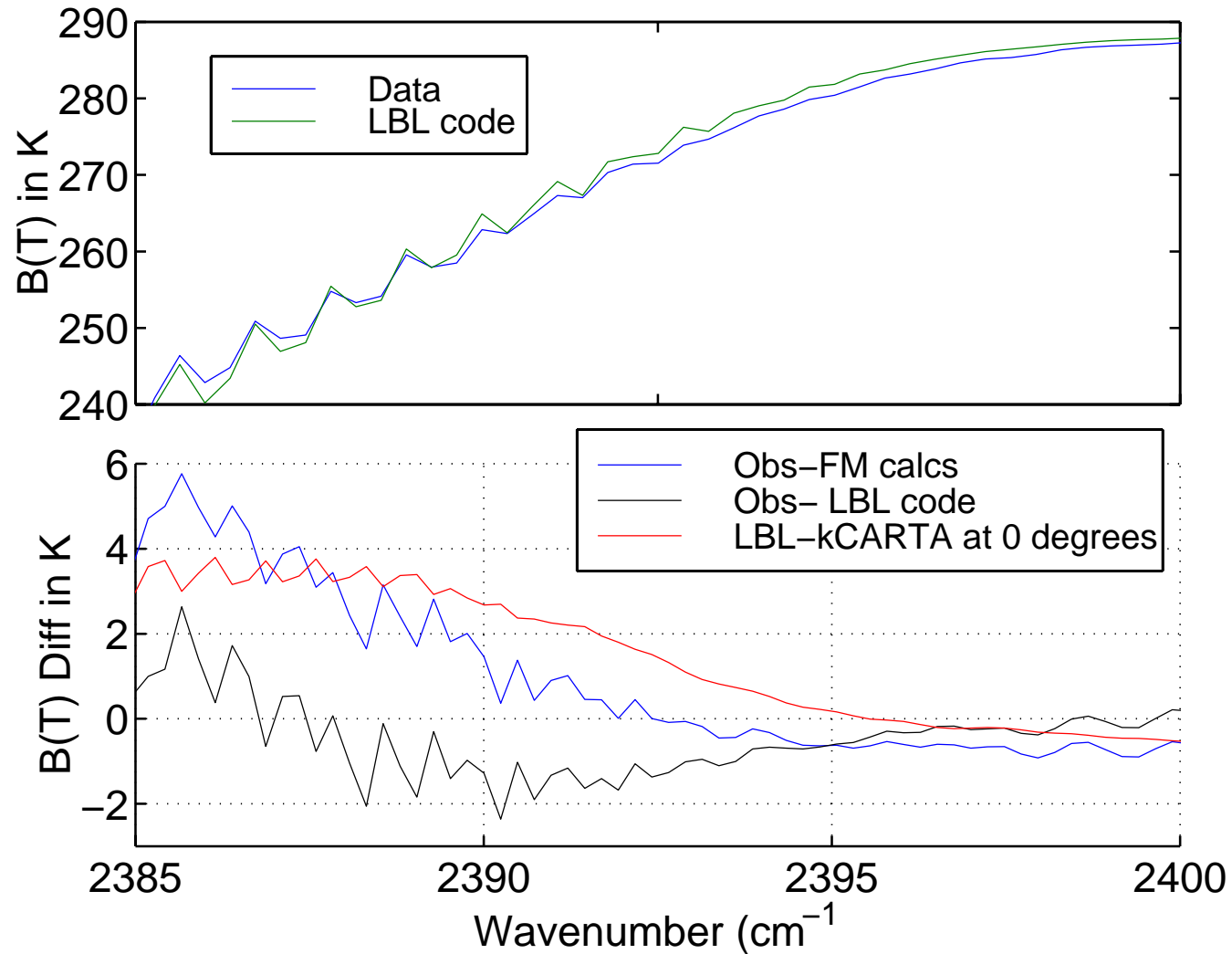
NAST Band3, Strow FM, (off WWW)



New UMBC LBL Calcs for NAST Web Data



New UMBC LBL Calcs for NAST Web Data



New UMBC LBL Calcs for Better? CAMEX-III Scene

