After masking data we are left with roughly 1 month of data. In total there are roughly 3000 frame and cadence during these acquisitions was set to 10 min. (Mention number of cables and reference cable). Currently, data that I'm working on is in broken pieces. It is very very clear in figure 1 of Appendix.

The Flowchart mentioned in figure 1 describes the steps used to model Linear Gain at 600 MHz. There are multiple variations of the model which are explained in the following plots. The purpose behind this experiment is to come up with a thermal model for the gain variations of 50m coaxial cables. Raw Gain is calculated using:

The gain calculated is in linear scale, for each frame and in frequency domain. The gain for 1 cable, 1 frame is mentioned in figure 2. The ripples in the plot represents multiple reflections in single channel. These reflections are due to multiple cables/connections in single channel. To begin with, we fitted linear line on gain plot and subtracted raw gain from fit. The residual represents the reflections in the cable at that instance, figure 3. These reflections can be temperature dependent. We tried different models to see how much these reflections are time (temperature) dependent. After that we took Fourier transformation of residual to understand reflections in cable, figure 5. Peaks in the plot represents the different reflections, the peak in lower side (left) are due to reflections in shorter cable and peaks in the upper side (right) are due to long cables. From this plot, we selected few reflections by setting threshold value and modeled all the reflections above that threshold. We were still not sure if the reflections were time dependent, cable dependent or there is some other dominant factor which we are ignoring. To see how much reflections are varying for single cable, we plotted the residual for 1000 different time frames, figure 6.

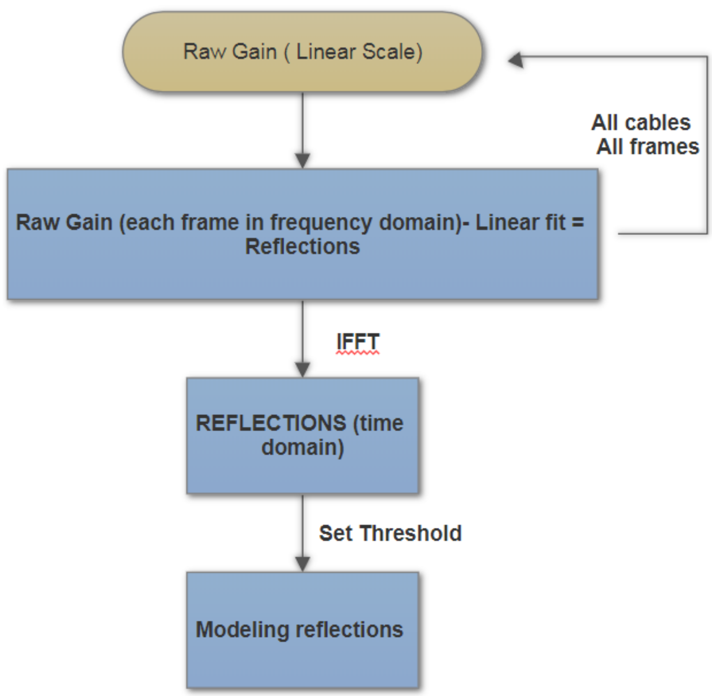

Figure 1: Flow chart presenting how we are finding reflections. Note, the threshold value is set to 4 times the mean value of IFFT (Raw_Gain – Linear fit). This threshold value can play important role, over fitting or underfitting of data.

Important point to note here is that, for this model, the linear fit mentioned in step 2 is time dependent and cable dependent. We are just using reflections from past but we will be doing step 2 for each frame at real time.

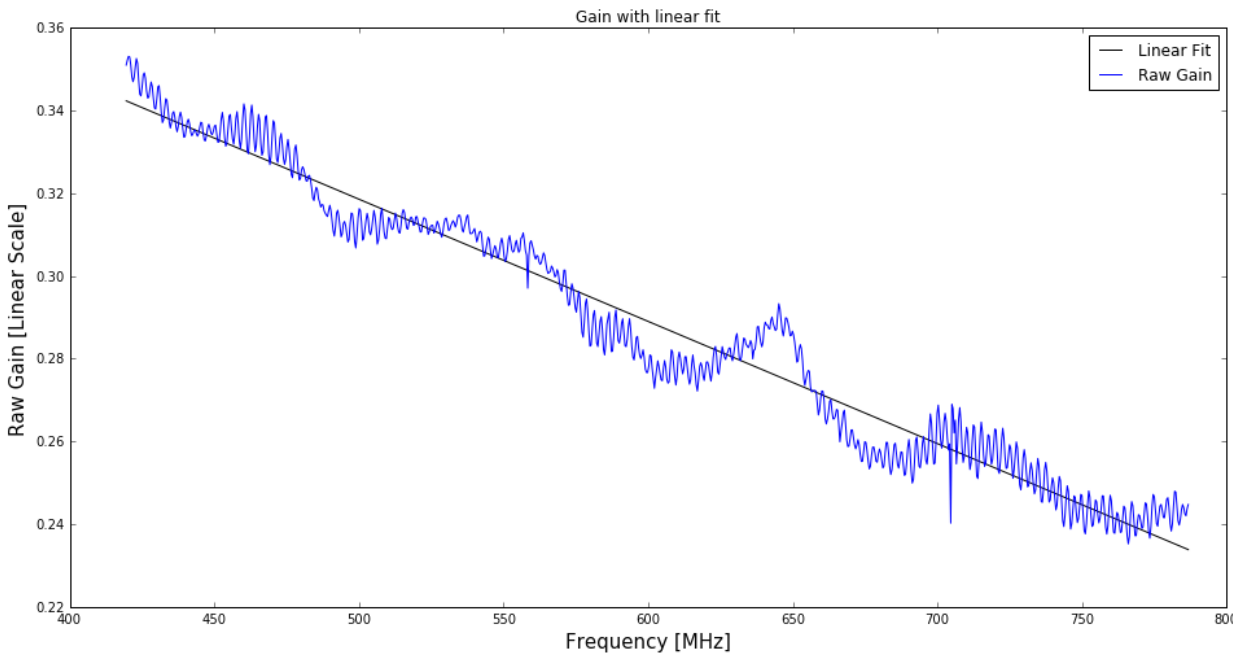

Figure 2: Raw gain as function of frequency for single channel and single time frame

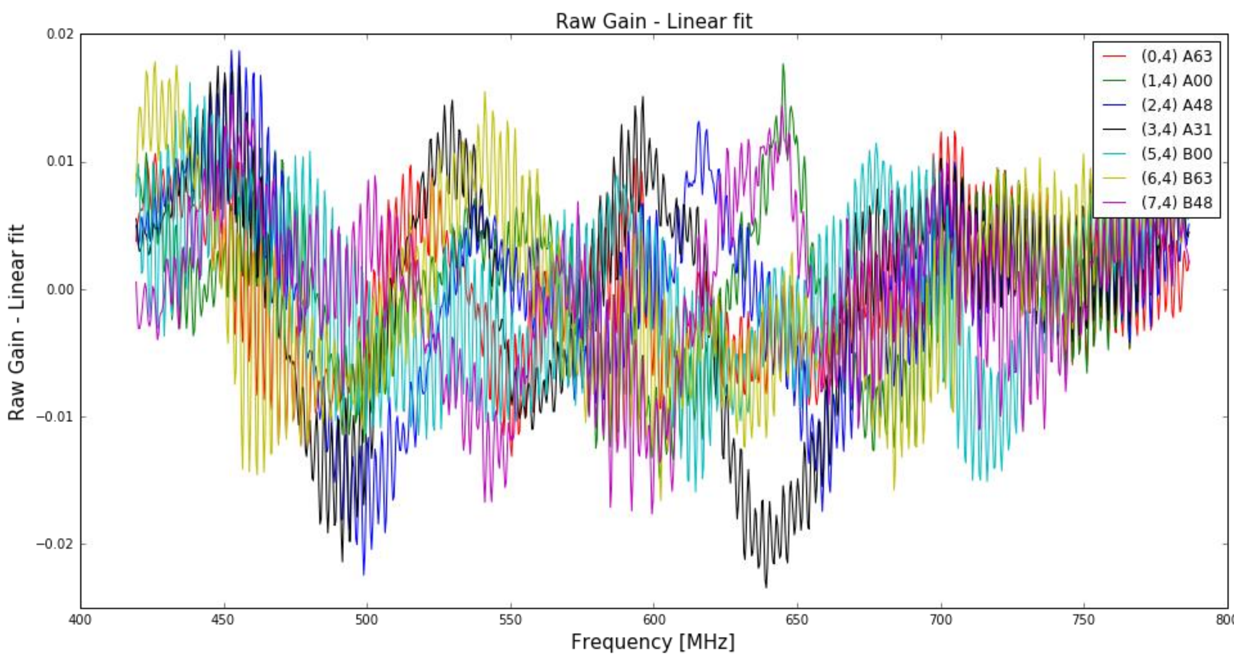

Figure 3: Residual of Raw Gain and Linear fit as function of frequency for 7 channels and single time frame

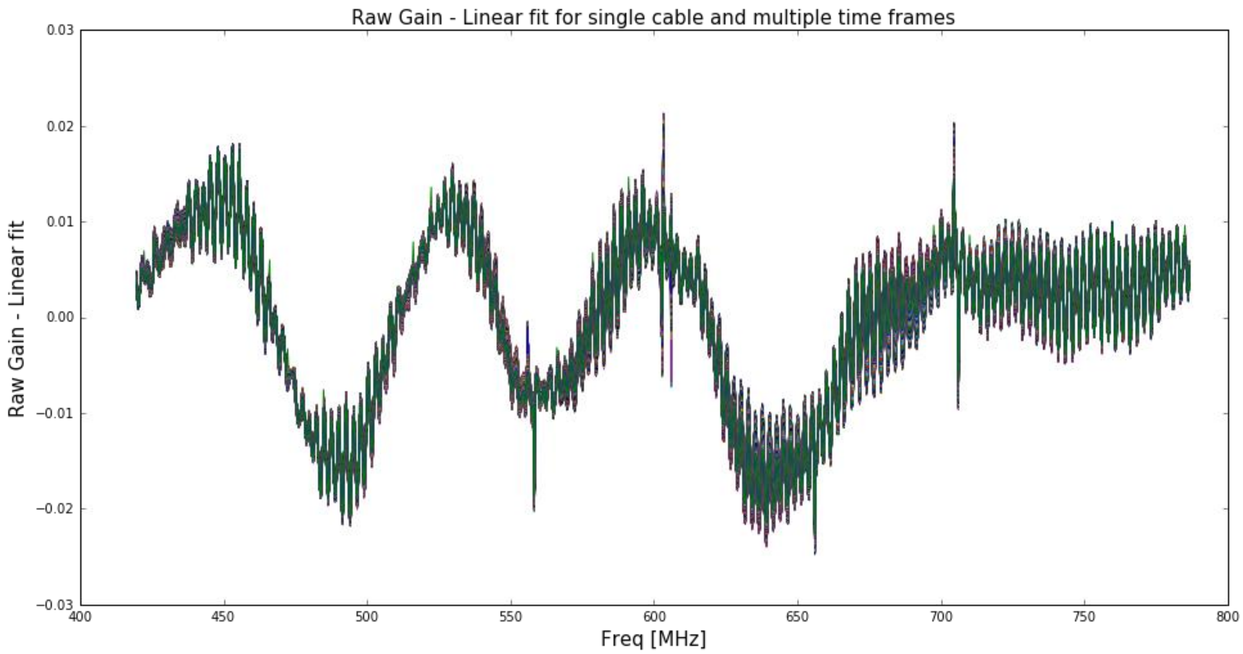

Figure 4: Reflections for single cable and 800 time frames

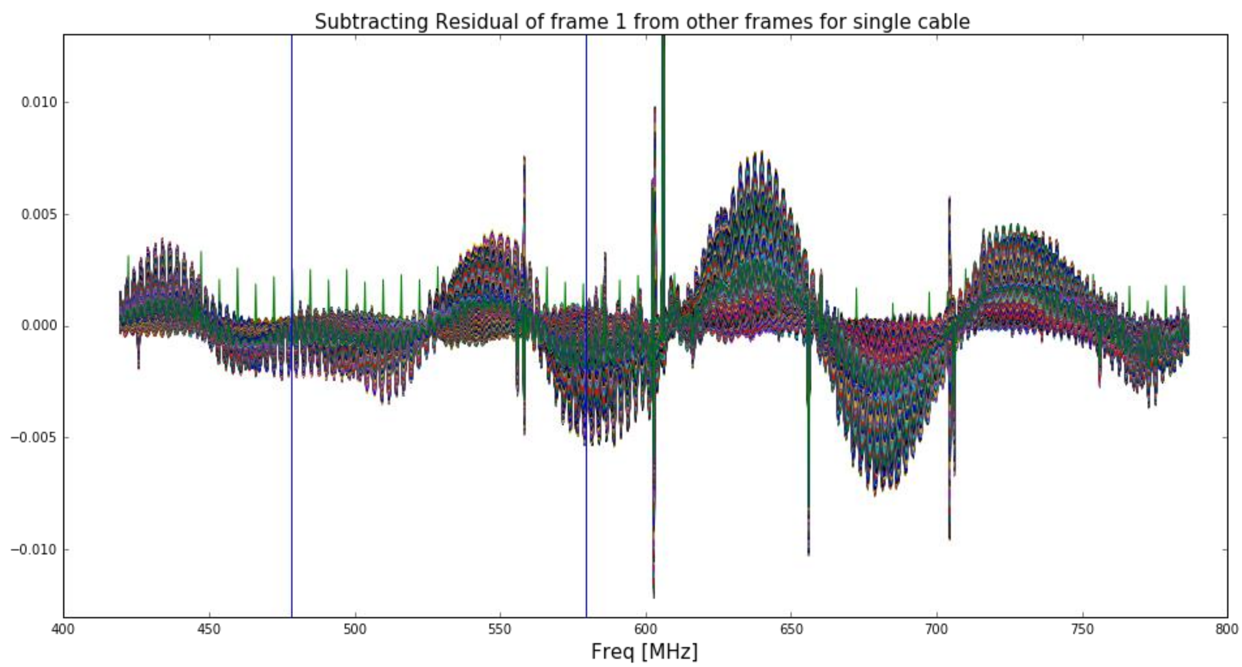

Figure 5: Subtracting one time frame from above plot to other time frames

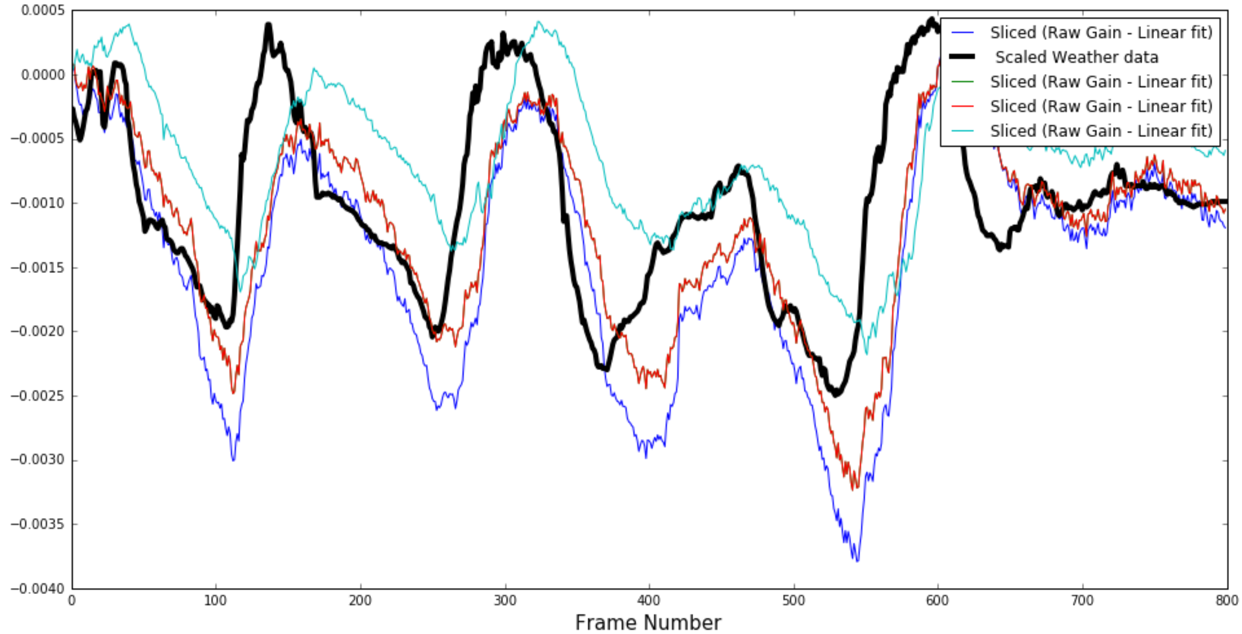

Figure 6: We are slicing the above plot at 4 different frequencies f= 478 MHz and 578 MHz and 2 adjacent frequencies. This is to check how much is reflection varying due to temperature.

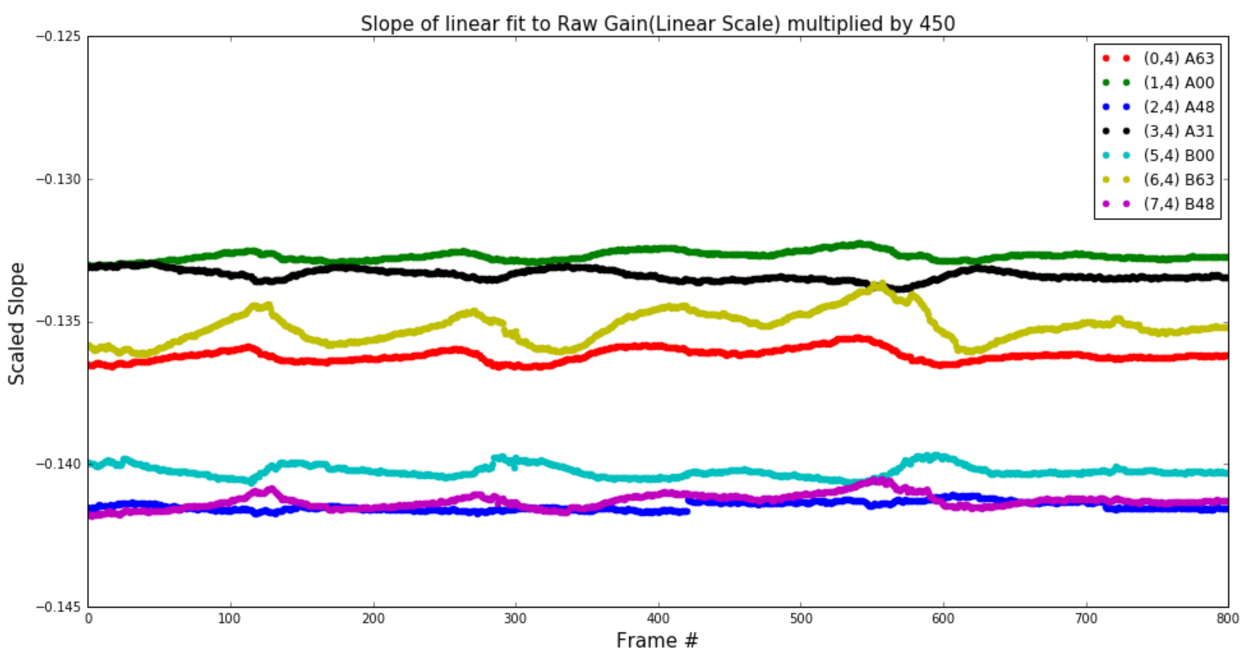

Figure 7: Scaled slope of the linear fit to raw gain for first 800 frames

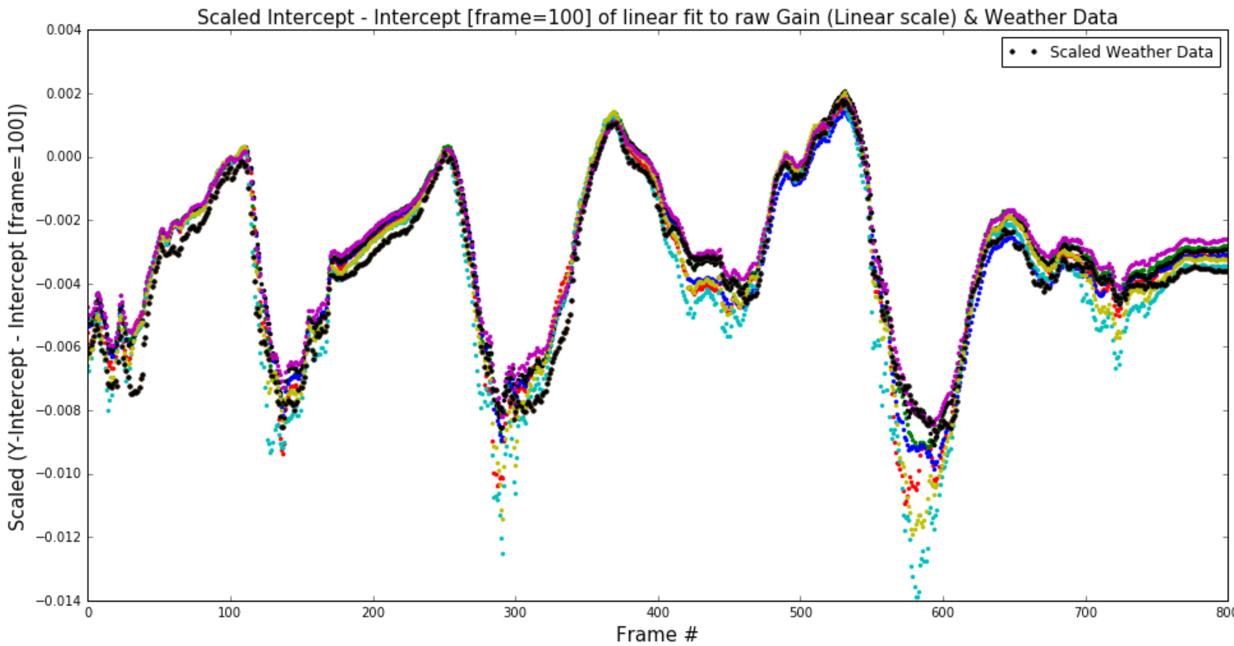

Figure 8: Scaled y-intercept of the linear fit to raw gain for first 800 frames

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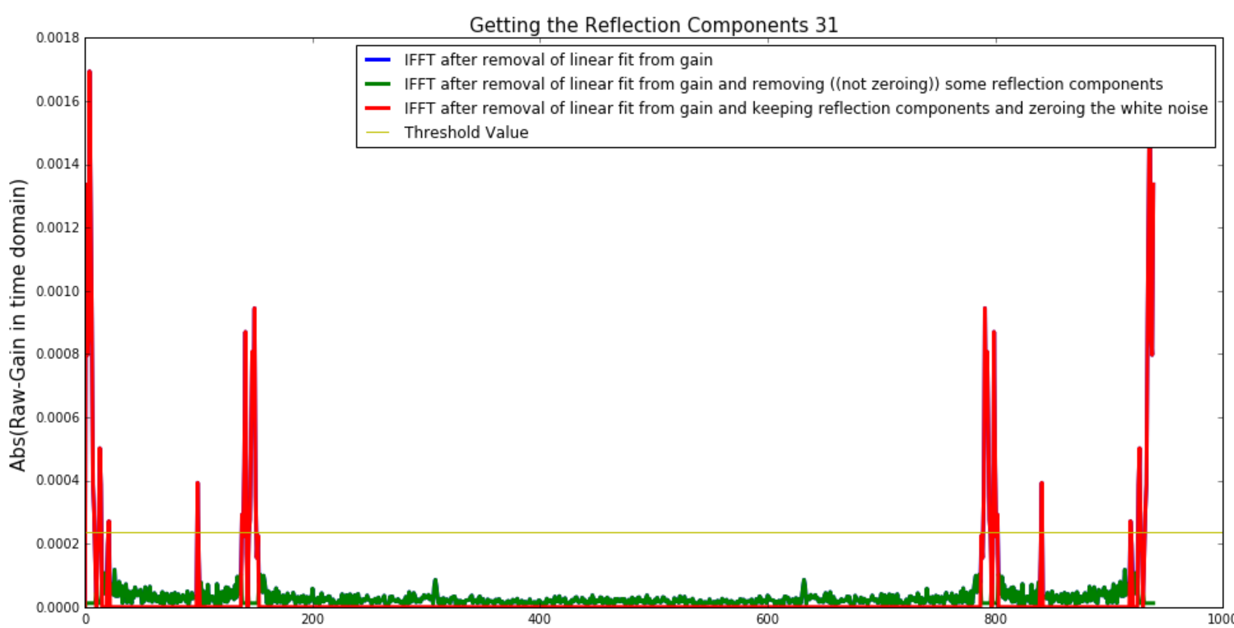


Figure 9: IFFT of raw gain along with the threshold for selecting different reflections.

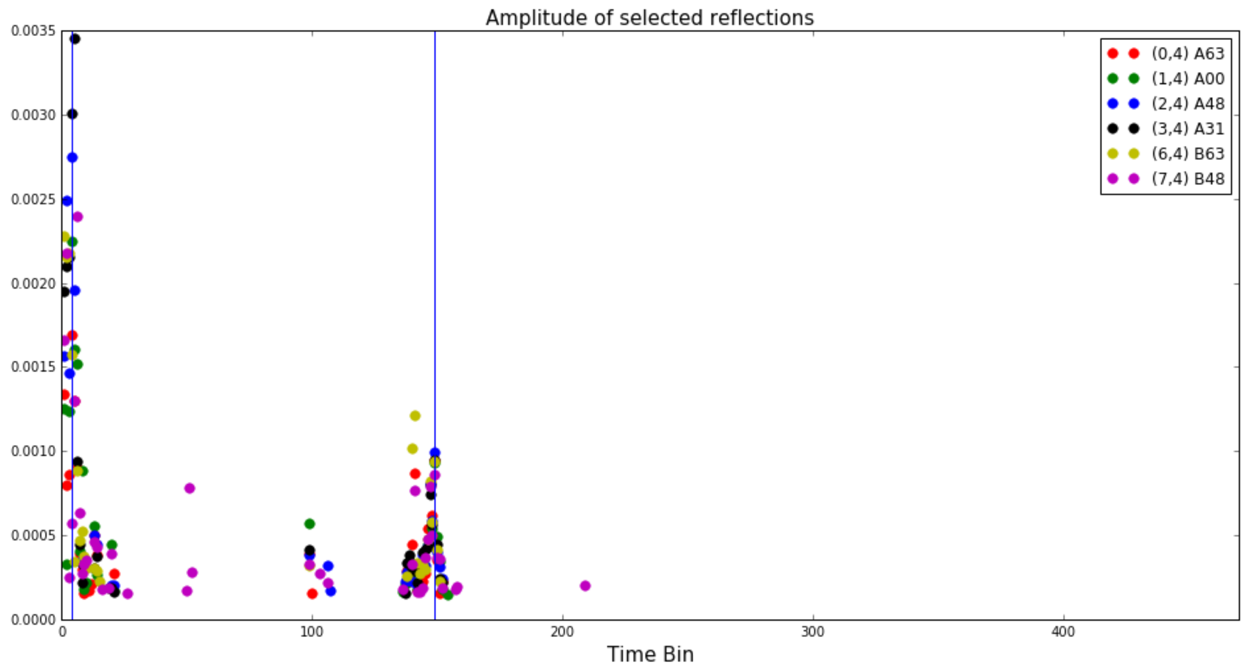
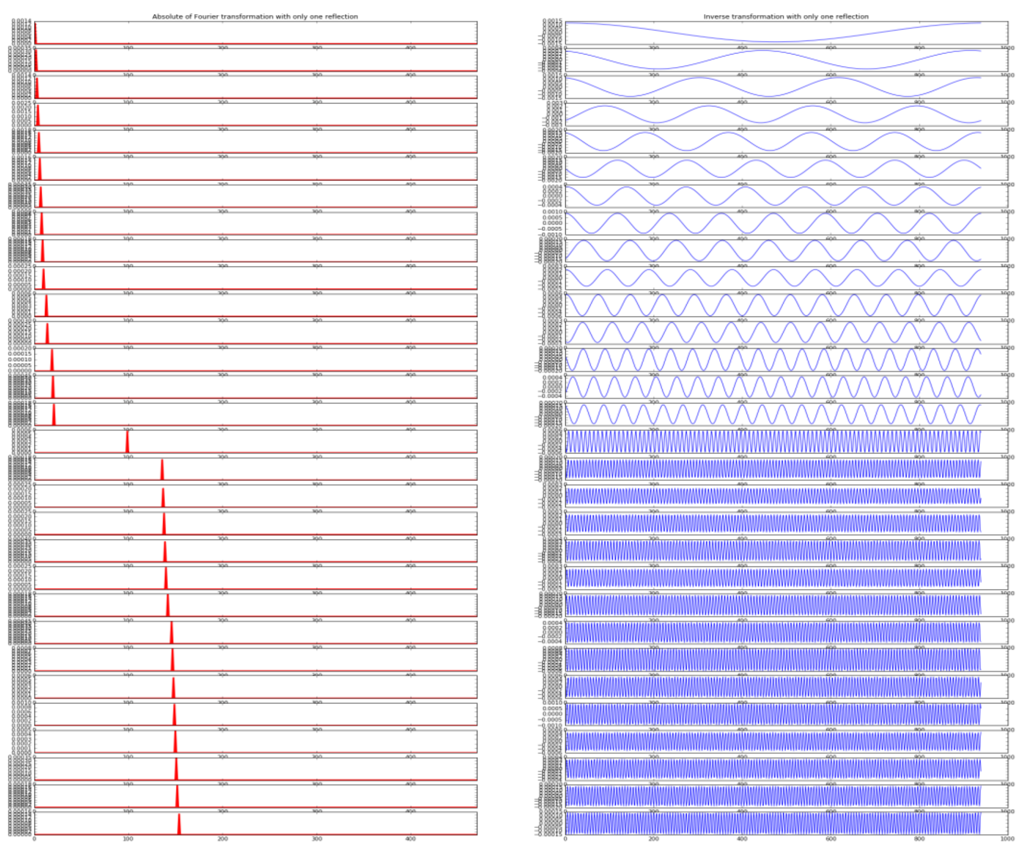
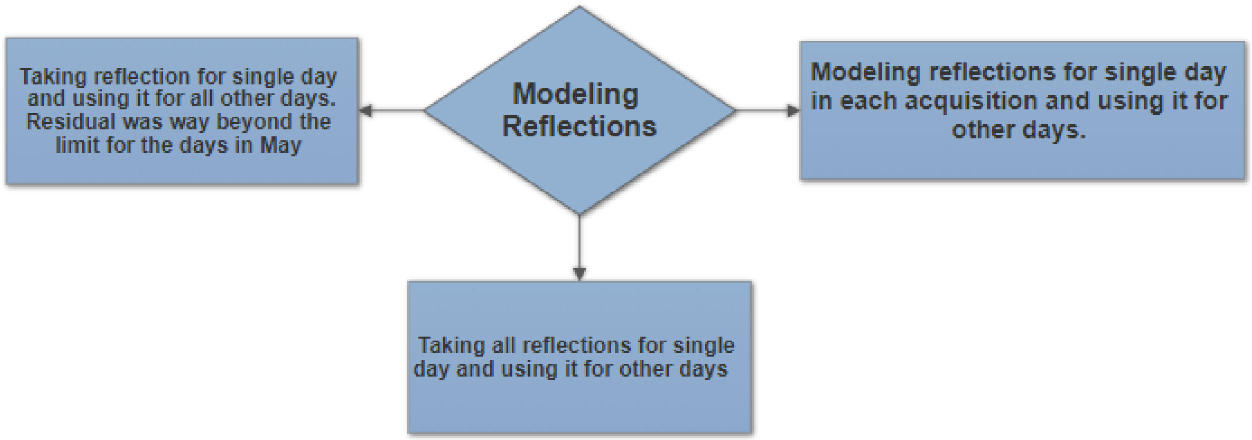


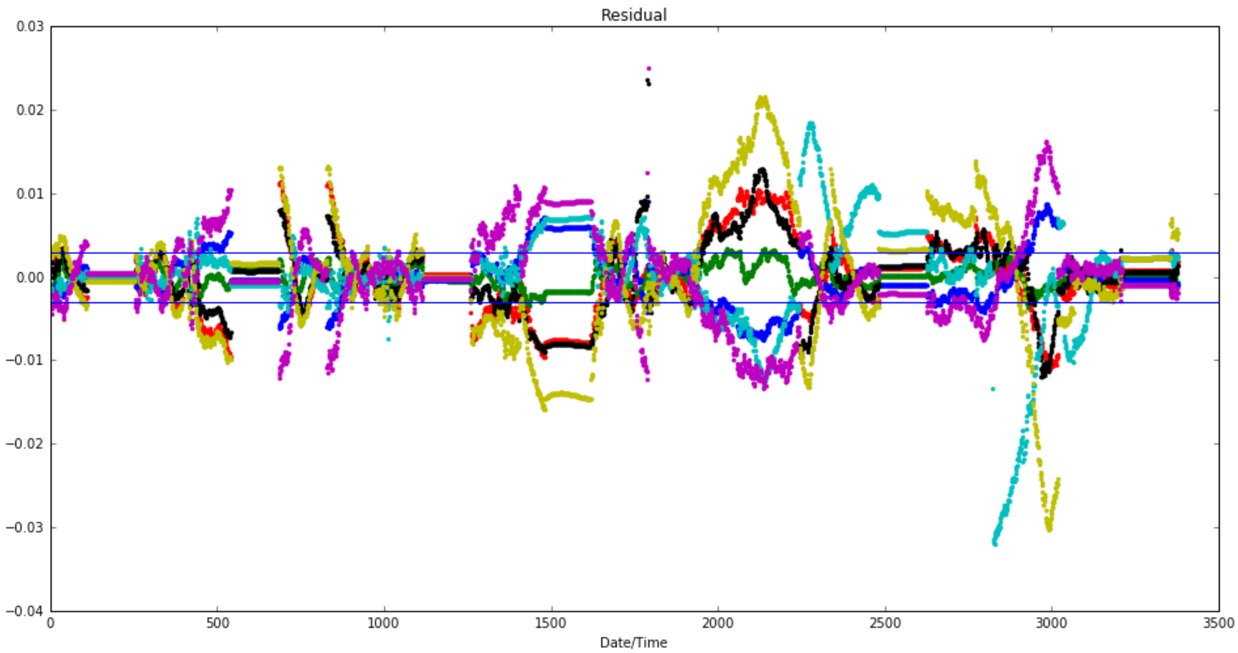
Figure 10: Amplitude (Absolute value of IFFT(Raw Gain – Linear fit)) for selected reflections for single time frame and 7 channels.



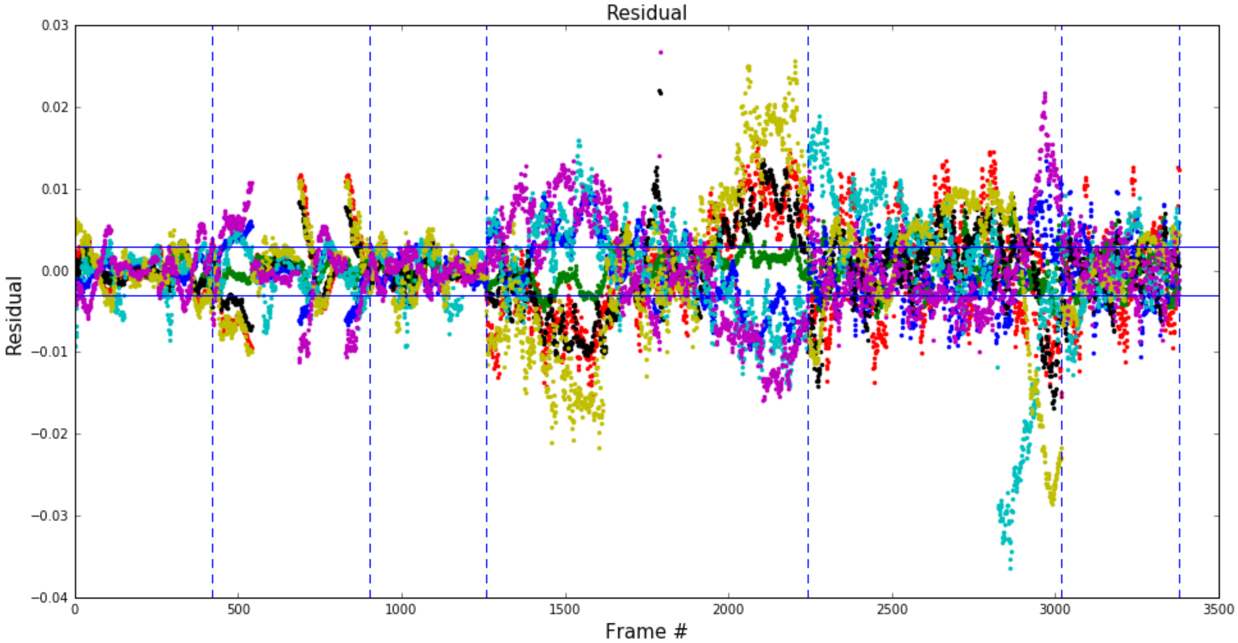
Note: Data collected is varying from April till may. We tried to model reflections in number of ways. At this point we are not sure about perfect way of finding the reflections.



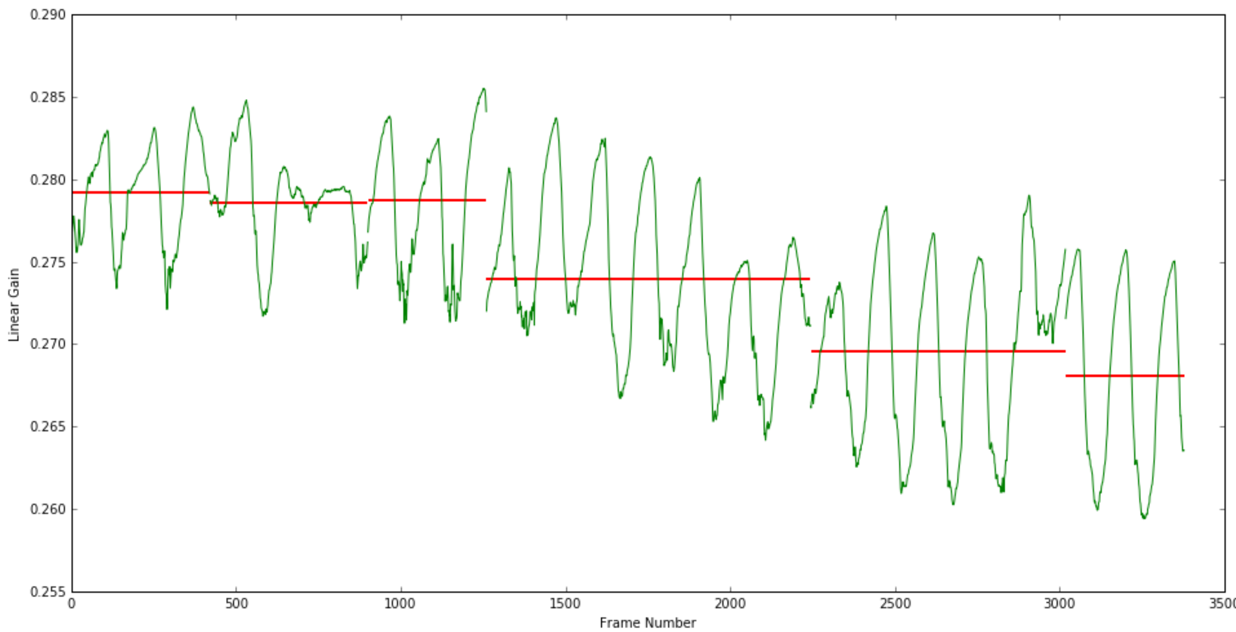
Taking all reflections for single day and using it for other days in that acquisition



Modeling reflections for single day in each acquisition and using it for other days in that acq



Appendix



0.290
0.285
0.280
0.275
0.270
0.265
0.260
0.255
Linear Gain
0
500
1000
1500
2000
2500
3000
3500
Frame Number

Figure 1: