ANS #2 on Receiver 02 - Lab & Field Data

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Here we compare the data obtained from ANS#2 when it was connected to receiver02 in the field to the data obtained from the same setup in the lab.

1.) **Lab Data**

The lab data was taken in October 2018. The Receiver calibration coefficients and the LNA S11 used are shown in Memo 128. These were applied to the ANS#2 spectra obtained in the lab and calibrated as shown below:

![Figure 1: Spectra obtained from ANS#2 when connected to receiver2. The dotted line corresponds to uncalibrated spectra and the solid line is calibrated with the Lab measurements shown in memo128](image)

The obtained calibrated spectra was then fitted with different foreground models (N=5terms) and the residues were plotted:
Figure 2: The residues obtained on fitting different foreground models to the calibrated lab spectra. a.) EXPLOG foreground model with 5 terms. b.) PhysicalLin (Nature paper) with 5 terms c.) LinLog (5 terms) d.) LogLog (5 terms)
Figure 3: The residues obtained on fitting different foreground models to the calibrated data of ANS#2 connected to receiver 2 in the lab.

2.) Field Data

The field data that was used corresponds to the following days:
2018_149 to 2018_177.acq
*File 2018_149* has RFI hence eliminated in the integration

The ANS#2 was still connected to the receiver beyond day 177 but on day 178 data acquisition was switched from PXSPEC to FASTSPEC
The s11 used is the data in: low2_alans_noise_source_20180601

Figure 4: The magnitude and phase of the corrected S11 of ANS#2 when it was connected to the Rcv2 in the field.

The data was calibrated with coefficients and LNA s11 from Report 128 (same as above) and the S11 from the field.
Figure 5: Spectra obtained from ANS#2 when connected to receiver2 in the field. The dotted line corresponds to uncalibrated spectra and the solid line is calibrated with the Lab measurements shown in memo128.

Similar to the lab data, the obtained calibrated spectra was then fitted with different foreground models (N=5 terms) and the residues were plotted:
Figure 6: The residues obtained on fitting different foreground models to the calibrated field spectra. 

a.) EXPLOG foreground model with 5 terms. 
b.) PhysicalLin (Nature paper) with 5 terms 
c.) LinLog(5 terms) 
d.) LogLog (5 terms)

Day 150-154

Day 150-159

Day 160-169

Day 170-176
Figure 7: The residues obtained on fitting different foreground models to the calibrated data of ANS#2 connected to receiver2 in the figure. The different figures correspond to different days processed.

To investigate the 60 MHz dip, we did the fitting over a narrower range - 50 -100 MHz.
Notes:
- On comparing the Calibrated ANS#2 spectra from the lab and field, it is seen that the noise temperature obtained from the setup in the lab is higher. This indicates we aren't using the same value of attenuation.
- For the lab data, tall the fits gave similar residues.
- PhysicalLin (or the equation from the Nature paper) gives the highest value of residues.
- In the residues obtained from the field data, one can see a dip at 60 MHz. (with EXPLOG and LogLog fit)

Replacing the backend to the one that was used in the field:

Similar to what was done before, the lab data was fit with different foreground models (N=5) and the residues are shown below:

Still no 60 MHz dip is seen in residues from the lab measurement.

Further investigation will be carried using by loosening the attenuator in the old back end.