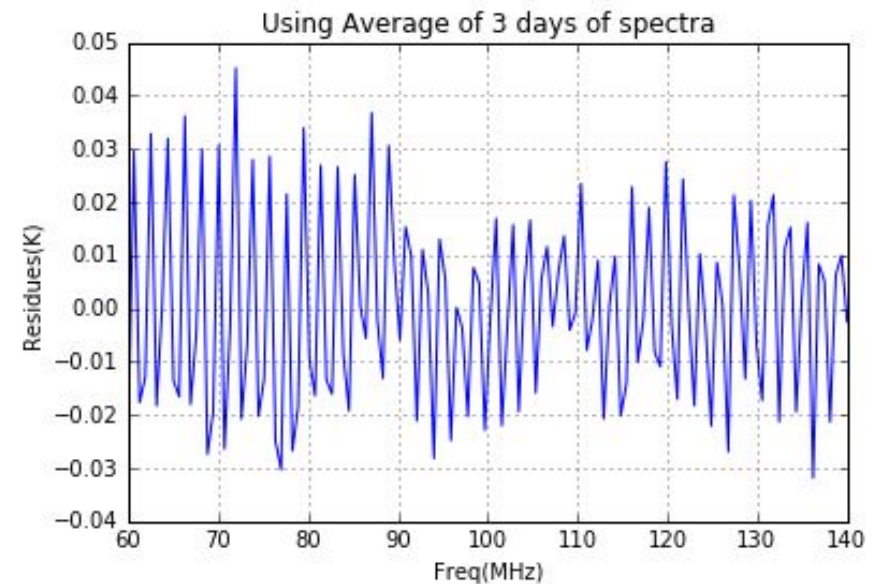


# Receiver 03 - Ripple analysis

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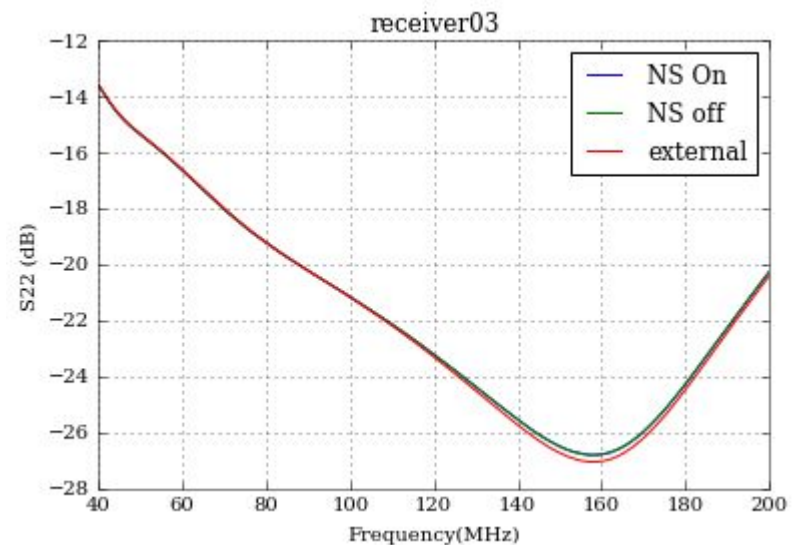
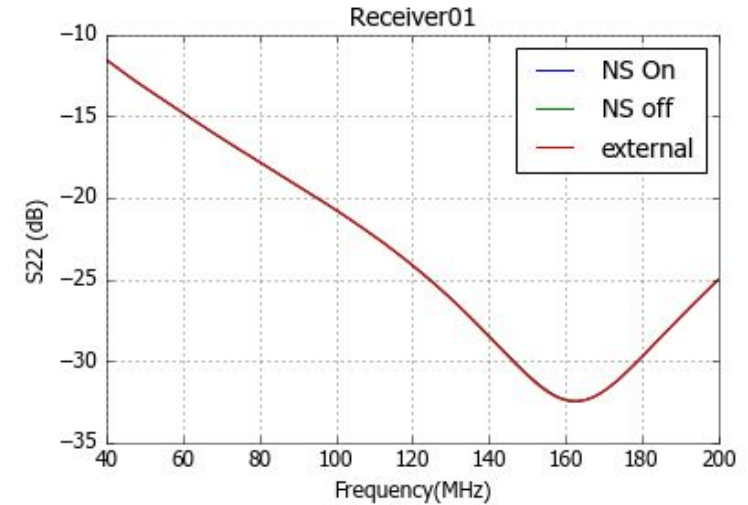
# Ripple problem?

- Ripples in the data from receiver 03 was noted in the field itself.
  - Period - 1.7MHz
- We tested the receiver in the lab by connecting a 6dB attenuator and looking at the spectra.
- Average of 3 days of spectra was used.
- The period of ripples that I calculated from the residues is 1.88MHz.
- Given the velocity of propagation of LMR 400 to be 85%.  $\Rightarrow$  cable length =  $135\text{m}/2 \sim 67\text{m}$ .
- In the lab we used a "50m" cable.



# S22 Testing

- A 6dB attenuator was connected to the input of the receiver.
  - VNA was connected to the LNA output.
  - The S11 was measured for all three LNA switch positions
  - A bias-tee was used between the receiver and the VNA to provide a voltage to the receiver to change the switch state.
  - The same was done for Receiver01 to understand the differences.
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- S22 of the three switch positions are shown for both the receivers.

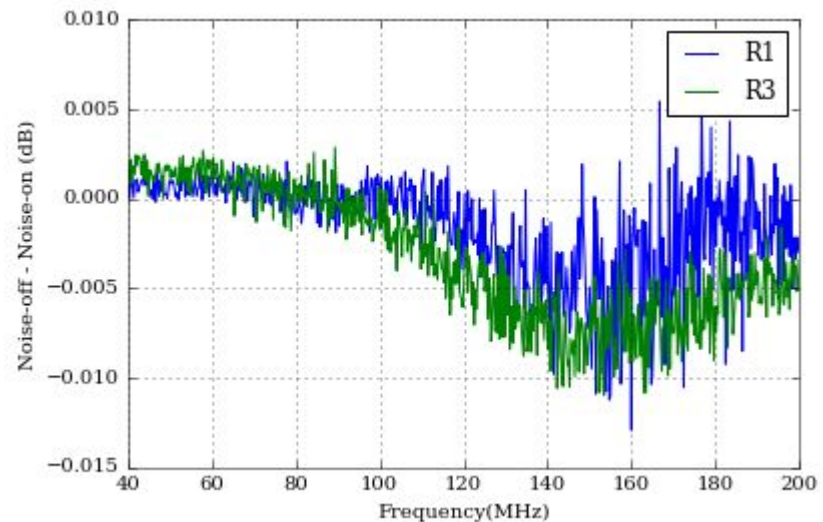
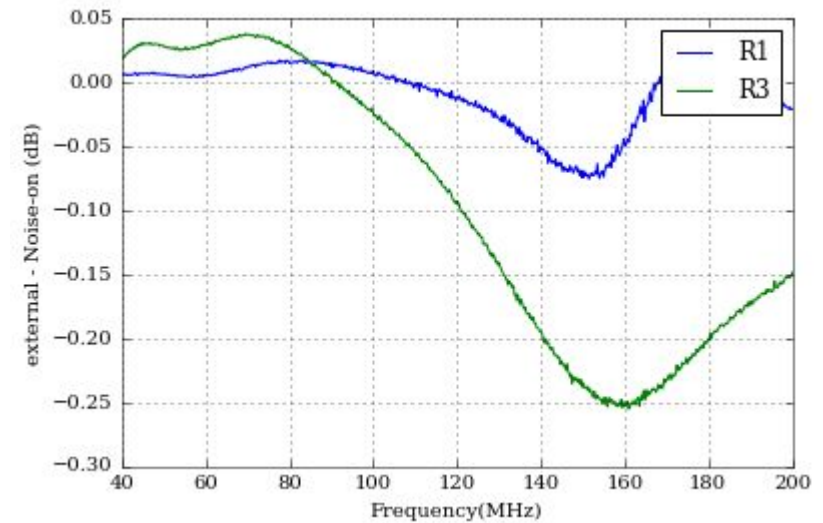


# S22 Testing

- Difference in the S22 between the Switch position 1 & 2 for both receiver 01 & receiver03
- Difference in the S22 between the Switch position 2 & 3 for both receiver 01 & receiver03

Note from Judd:

The second plot does suggest the difference in S22 between antenna input and internal noise could be a possible issue. The large-ish difference between switch states would either be: a) an issue with the LNA itself, 2) there isn't enough isolation between the LNA and the output of the receiver (so we could add attenuation somewhere after the LNA) or 3) the bias-tee is having troubles still.



# Fixing the problem

Leroy noticed the issue that when trying to switch to the external position; it would not engage. The SPDT switch pertaining to the noise source was shorting to ground

- A new regulator for the external noise source was installed Lm7812ct (old part number Lm7815ct).
- A capacitor was placed on the bias-Tee.
- S22 was measured again and shown in the top right plot is the difference between the external antenna position and Noise position.
- The difference reduced and is now similar to that of receiver 01.
- Spectra with 6dB connected to the receiver taken again.
- Average of 4 days of spectra was used.
- A fourier series of 7 terms was fitted to the data between 50 - 100 MHz and the residues are shown in the bottom plot.

