MWA Memo
MWA 7m Cable Bandpass Ripple

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Introduction

The MWA active antenna uses a 7 meter cable to connect the LNA of each antenna to the beamformer. The amplitude and spacing of bandpass ripples created by the cable are investigated.

Network Analyzer Plots

The network analyzer is calibrated at -10dBm power level and after calibration 30dB of attenuation is inserted to the input of the LNA since the gain of the LNA + beamformer is on the order of 54dB. The LNA is driven by a balun into the balanced inputs of the LNA. The 50 ohm driving impedance is most similar to the antenna impedance at the lower frequencies, which is where the plots shown below are most representative of the actual situation.

Figure 1.

Figure 1 shows S21, the insertion gain, for the LNA+7m cable+Beamformer set to no delay. Ripples are clearly seen starting at the low end of the band extending up to about 140MHz. The ripple amplitude is roughly 1dB pk-pk, and the ripple spacing is slightly variable at 9.6MHz, 11.5MHz, 11.4MHz, and 9.1MHz for the first several ripples. It is presumed that the ripple spacing difference from the nominal 14MHz due to the cable alone is from the rapidly changing impedance of the HPF in the LNA.

Figure 2.

All the delays are inserted in the beamformer and the gain is plotted in Figure 2. The amplitude of the ripples change but the position is approximately the same. The expected gain variation due to changes in delayline length are also approximately 1dB pk-pk and is clearly seen across the spectrum.

To verify that the ripples are due to the 7m cable, it is removed and replaced with a 2ft cable and is shown in Figure 3. The beamformer is set to No Delay and the ripple characteristic is completely different.

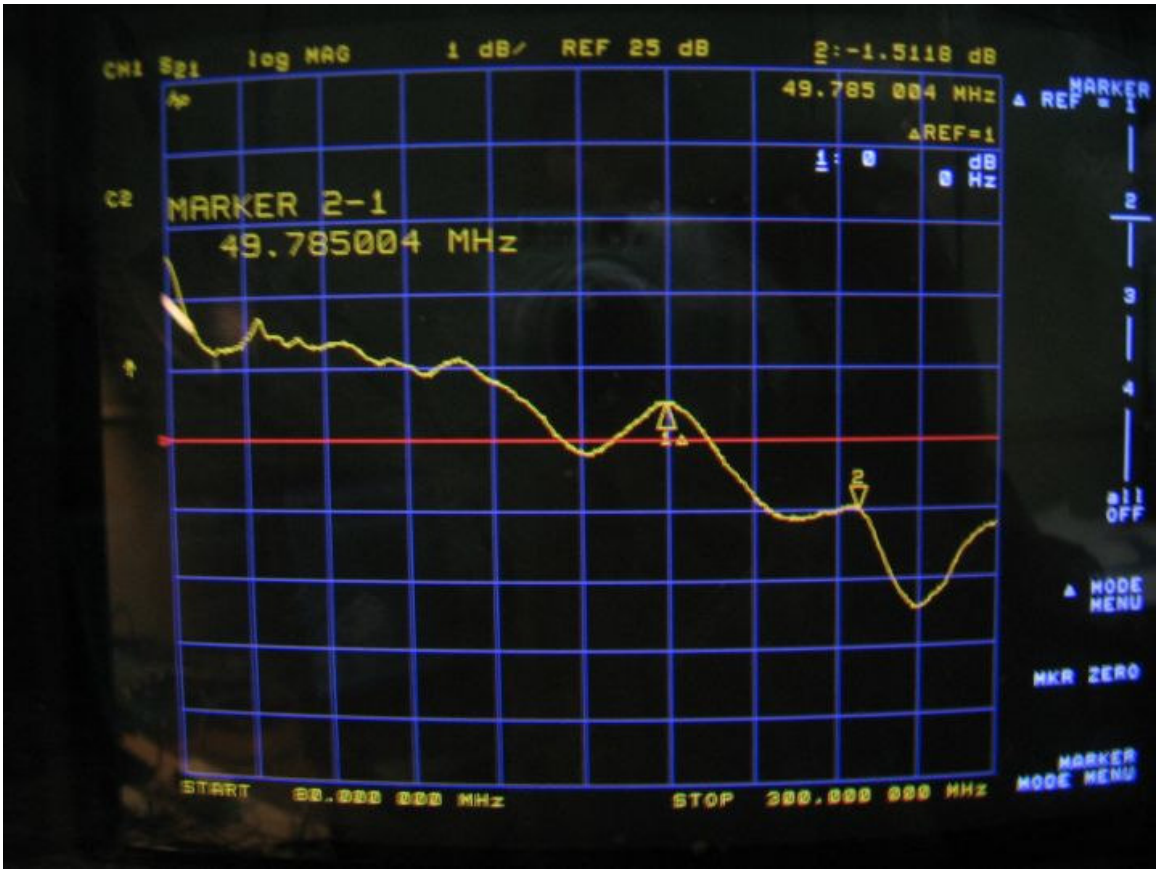

Figure 3.

Conclusion

It is expected that the MWA 32T will exhibit 1dB pk-pk ripples in the bandpass spectrum due to the 7m cable used to connect the LNA to the beamformer. The frequency spacing is slightly different than that expected for the cable alone. These ripples are of approximately the same magnitude as the amplitude errors from the different delay settings in the beamformer.