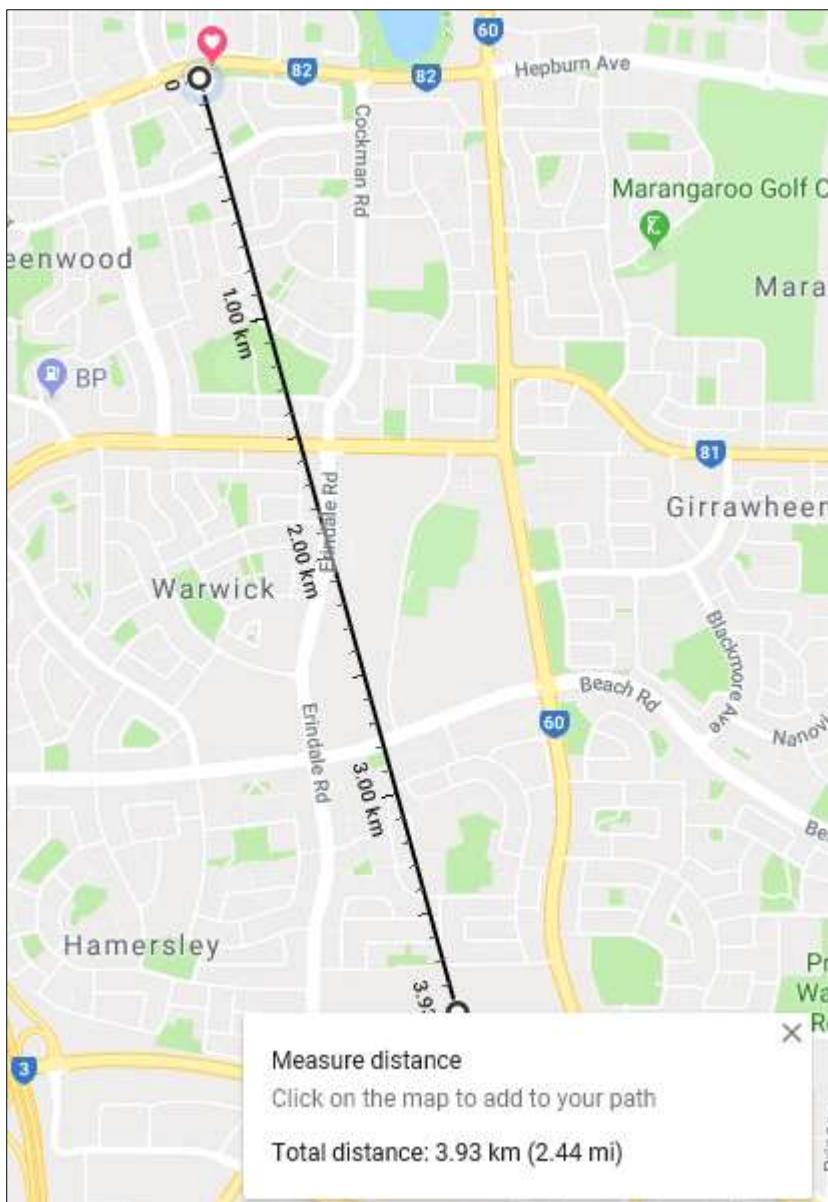


## Objective

As can be seen from the map below, my QTH is approx. 3.93km away from the ABC MW transmitter 6WF which operates on 720kHz at 50Kw. The 5<sup>th</sup> harmonic of 720kHz is 3.6MHz which I can detect normally at about the -80/85 dbm. When operating on 3.6Mhz LSB I normally only hear a little bit of voice from it's LSB portion of the AM signal, the stronger carrier being suppressed by my LSB filter. In short, it does not worry me and this level of 6WF's 5<sup>th</sup> harmonic is well within specification, I only hear it as I am so close to the 50Kw transmitter, 3.93km or 9.4 wavelengths away.



the small amount of 5<sup>th</sup> harmonic I was experiencing...

However, the 5<sup>th</sup> harmonic went from its usual 75db down from the 720Khz primary to 40db down for a period, in other words it increased by 35db. So, I then decided to record the good and bad conditions, so I had a reference for future use.

In order to prove to myself that none of this 5<sup>th</sup> harmonic was being generated in my transceivers front end from overload from the 6WF's output on 720Khz, I decided to construct the Mini Kits 1.8Mhz HP filter.

I ended up making both the 1.8Mhz HP and 500Khz LP filters, the later possibly being useful for operation on the 630 meter band.

Figures 1, 1a, 2 & 2a show the performance of these filters.

As expected, the insertion of the 1.8Mhz HP did not affect the small amount of 5<sup>th</sup> harmonic signal I was receiving from 6WF, so I concluded my receiver front end was not contributing to

The following is the frequency response of my MiniKits 500Khz low pass filter kit (EME164-LP9-0M5).

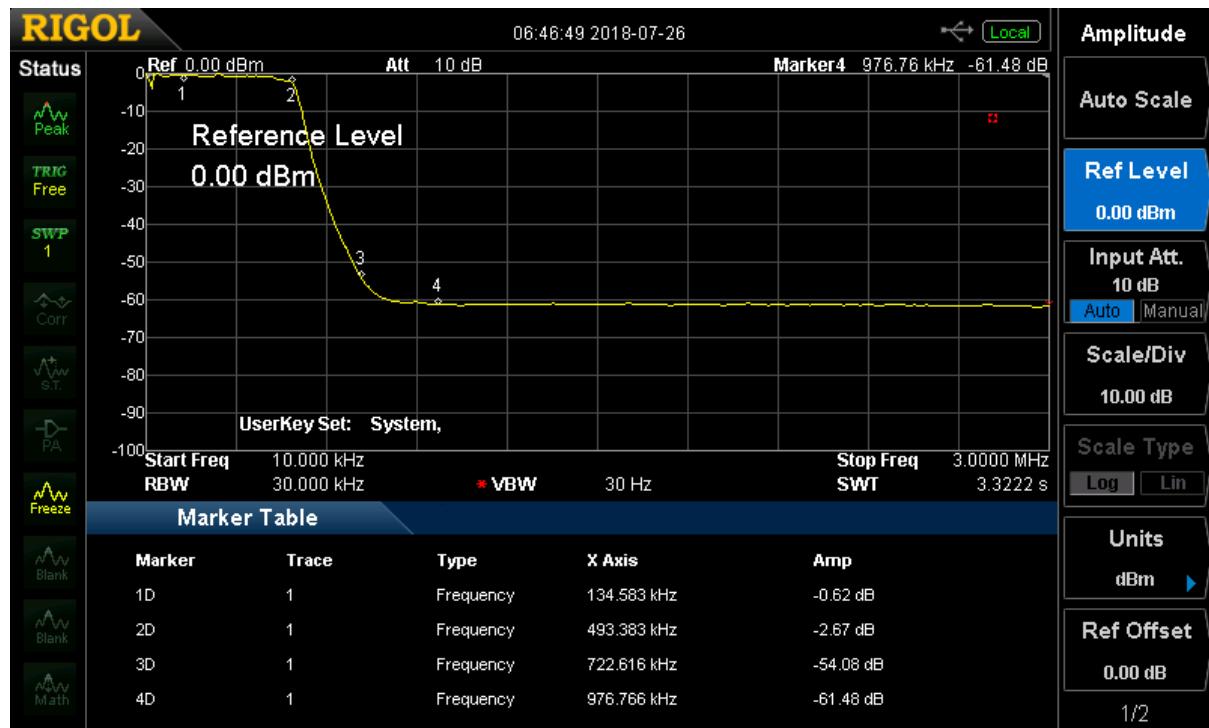


Figure - 1

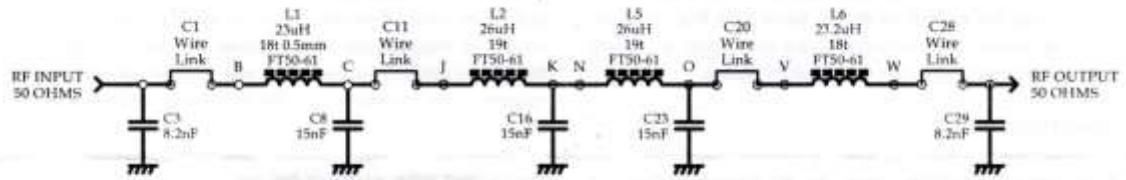


Figure – 1a

The following is the frequency response of my MiniKits 1.8Mhz high pass filter kit (EME164-HP11-1M8).



Figure - 2

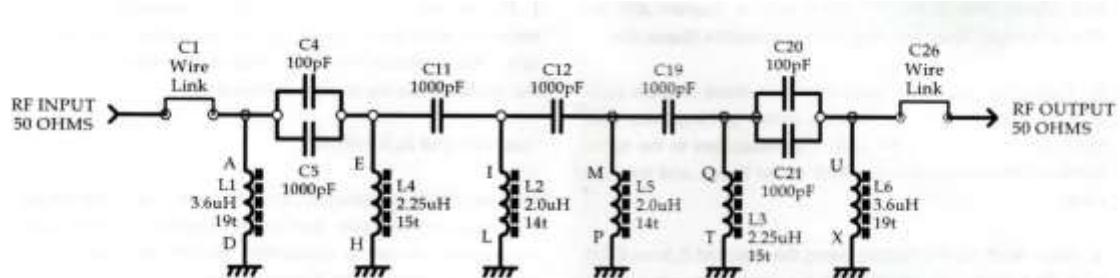


Figure – 2a

On Friday the 13<sup>th</sup> of July, I noticed the 5<sup>th</sup> harmonic from 6WF was stronger than normal at my QTH having increased in level by approx. 35db from what I call its normal level. The spectrum below shows the 5<sup>th</sup> harmonic being approx 39.75db down from the fundamental at 720Khz (-60db – (-20.25)).

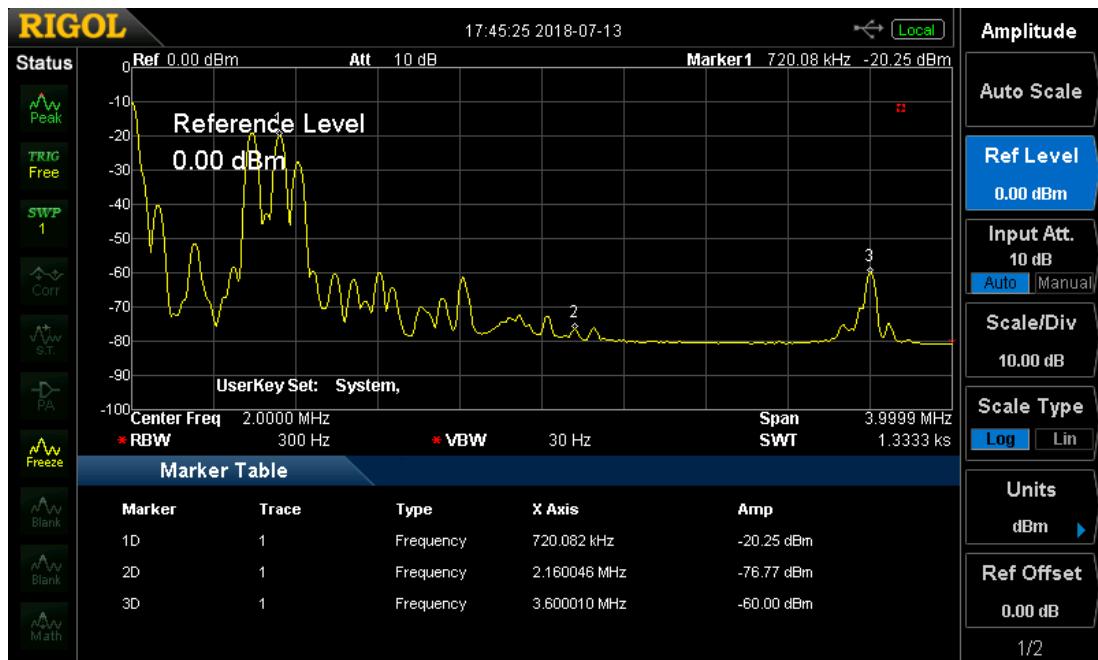


Figure – 3

Figure 3a below is taken from my PX3 pan adaptor and you can see both sidebands of the AM signal, the carrier being suppressed by my receiver's filter. I was now hearing the splatter from the harmonic even when I moved 5kHz away, not the normal conditions I would expect. The green highlighted section indicates the current receiver filter settings on the KX3.

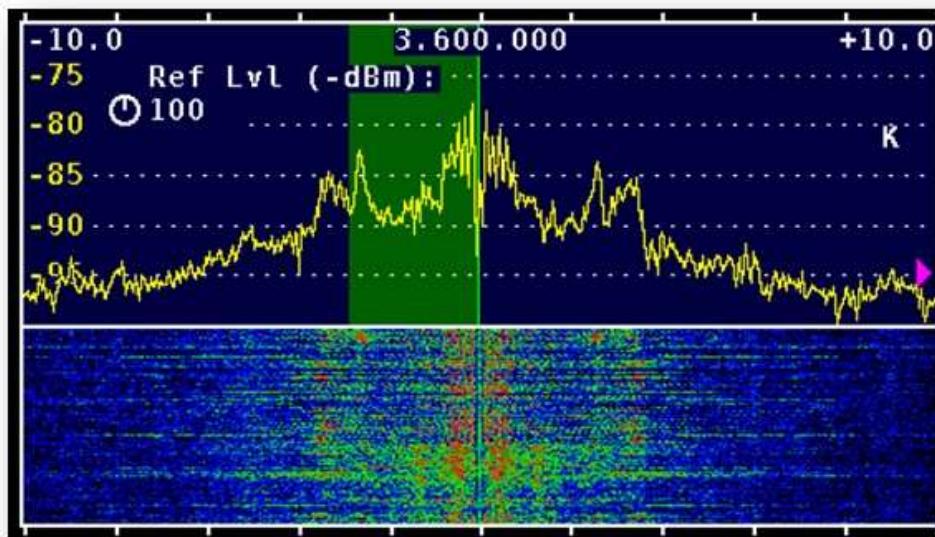


Figure – 3a

The following day, Saturday the 14<sup>th</sup> of July, the 5<sup>th</sup> harmonic from 6WF as heard at my QTH returned to its normal level. That is 61.88db down from the fundamental at 720Khz (-82.09db – (-20.21)).

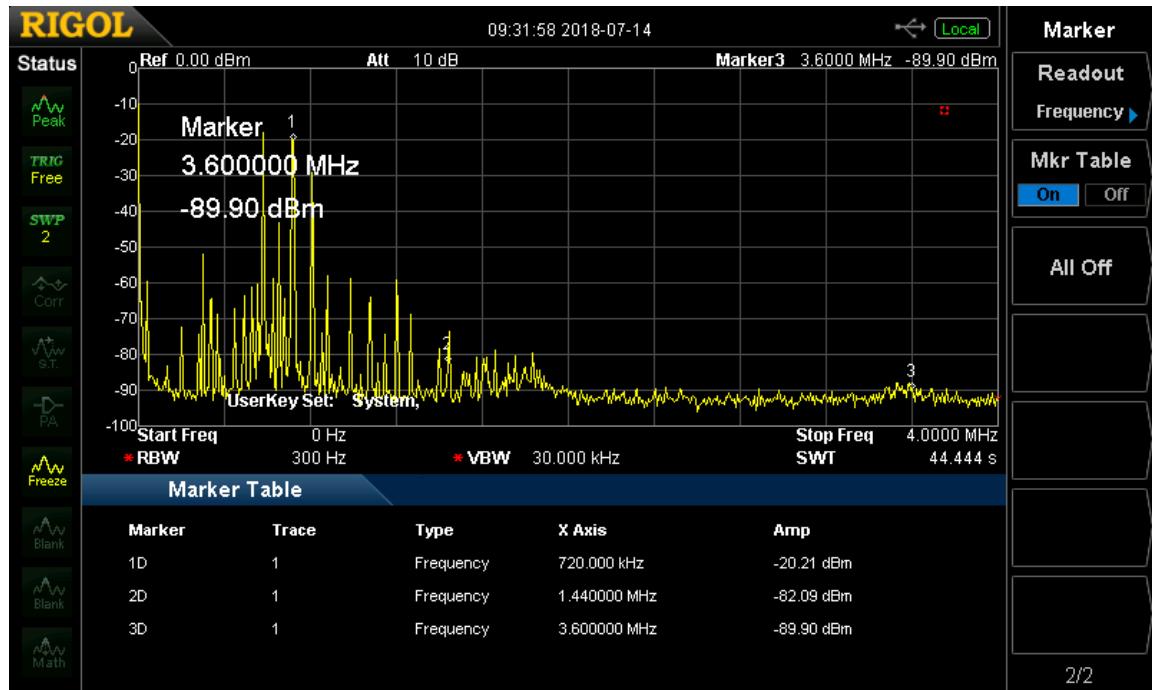


Figure – 4

The spectrum below from my PX3 shows the 5<sup>th</sup> harmonic whilst tune to LSB signal on 3.605Mhz (VK6ATB), you can now see the harmonics strength in relation to a real live signal on the 80 meter band. Note now that we have tuned away from 3.6mhz you can now see the carrier and its strength with is similar to the spectrum analyser graph above.

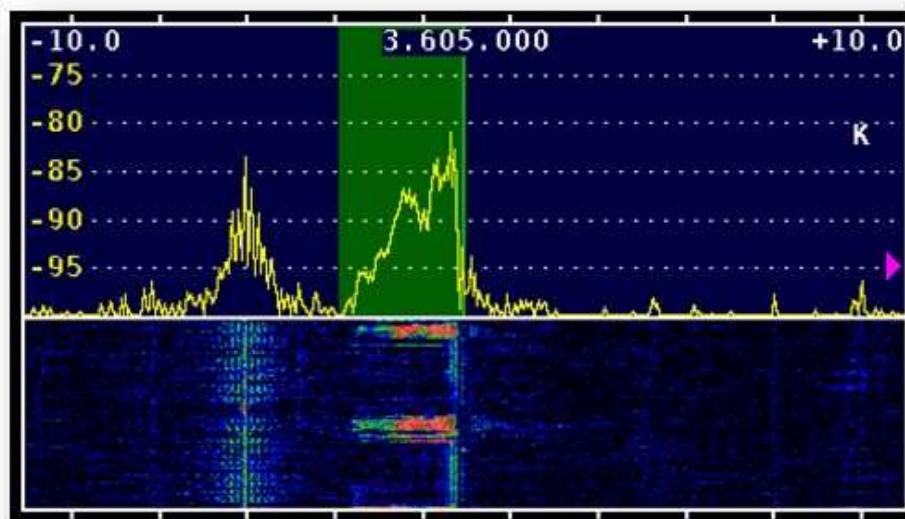
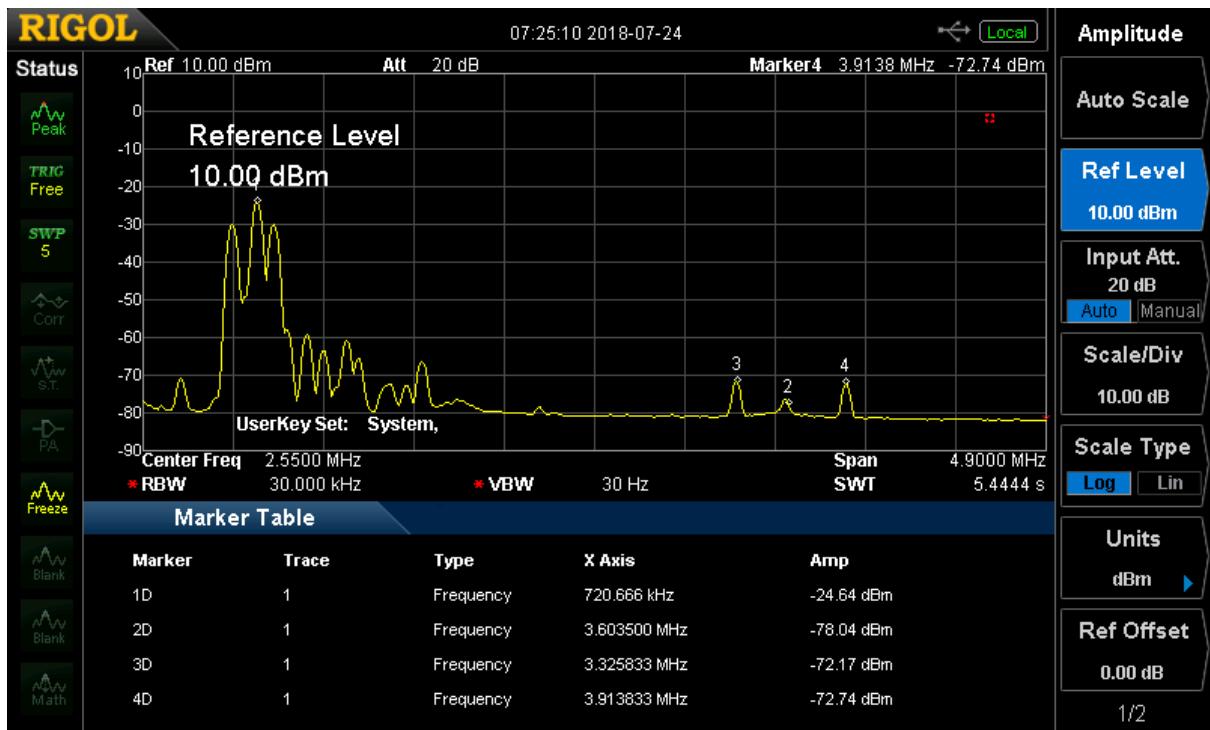


Figure – 4a



## Summary

If you have read this far, I can hear you saying **BUT!** So lets address some of those buts.

- This type of harmonic can be caused by many conditions, some of which are:
  - The transmitter
  - Something close to the transmitting environment.
  - Something close to the receivers environment.
  - The receiver overloading.
- The spectrum as recorded on the spectrum analyser was taken on my 160, 80 and 40 meter antenna so it's obviously NOT flat, see figure 6 below. This would result in the recordings at 3.6mhz having more level than those recorded at 720khz, hence the real difference between the fundamental and the 5<sup>th</sup> harmonic will be greater than those indicated here, but as I am only looking for the relative levels between the good and bad conditions this should still indicate when something has gone wrong.

I have made no attempt to isolate where it's occurring but simply recorded what I am hearing at this QTH in the hope that it may prove useful if the bad condition was to become the norm, at least we would have a line in the sand to work from.

Figure 6 below shows the return loss of the antenna I used to take the spectrum analyser measurements. This clearly shows the frequency response of the antenna used to measure the fundamental at 720khz and the 5<sup>th</sup> harmonic at 3.6mhz is NOT flat, hence the db relationship between these two frequencies is NOT the true relationship but an indicator only.

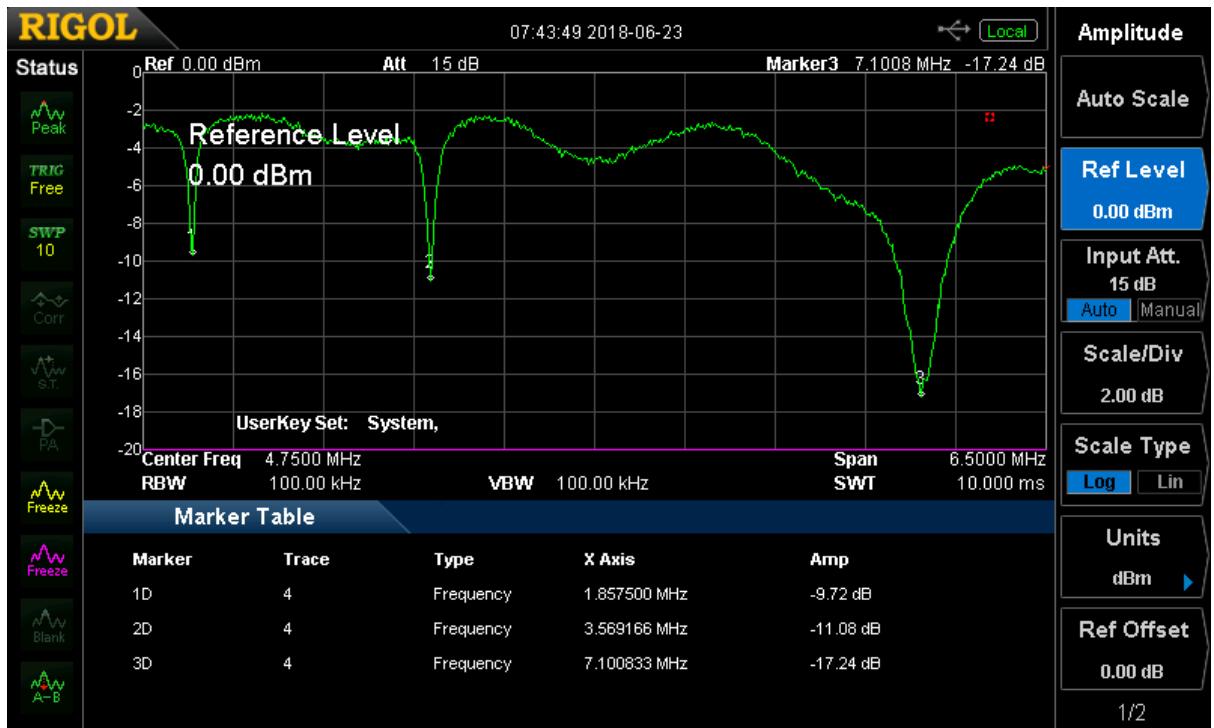


Figure – 6

To be continued....