

A Panadapter for the FT-817

Mike Seguin, N1JEZ

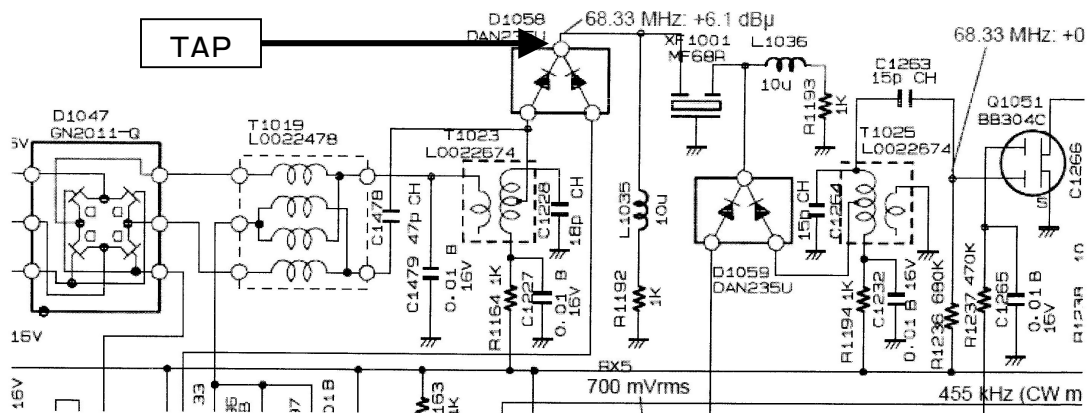
An interesting new SDR receiver called the FUNCube Dongle^{1,2,3} recently went on sale in support of AMSAT-UK's FUNCube satellite project. The unit is a self contained SDR receiver that can cover 64 MHz – 1700 MHz. It is USB based. Under Windows, it shows up as a sound card. No special drivers are needed. It works with most SDR software that supports I & Q. It includes an LNA, tuner and audio card built into a small package. The RF input is SMA. 96kHz is the quadrature sampling rate. Once the ADC's decimation filter skirts have been taken into account, you have about 80kHz.

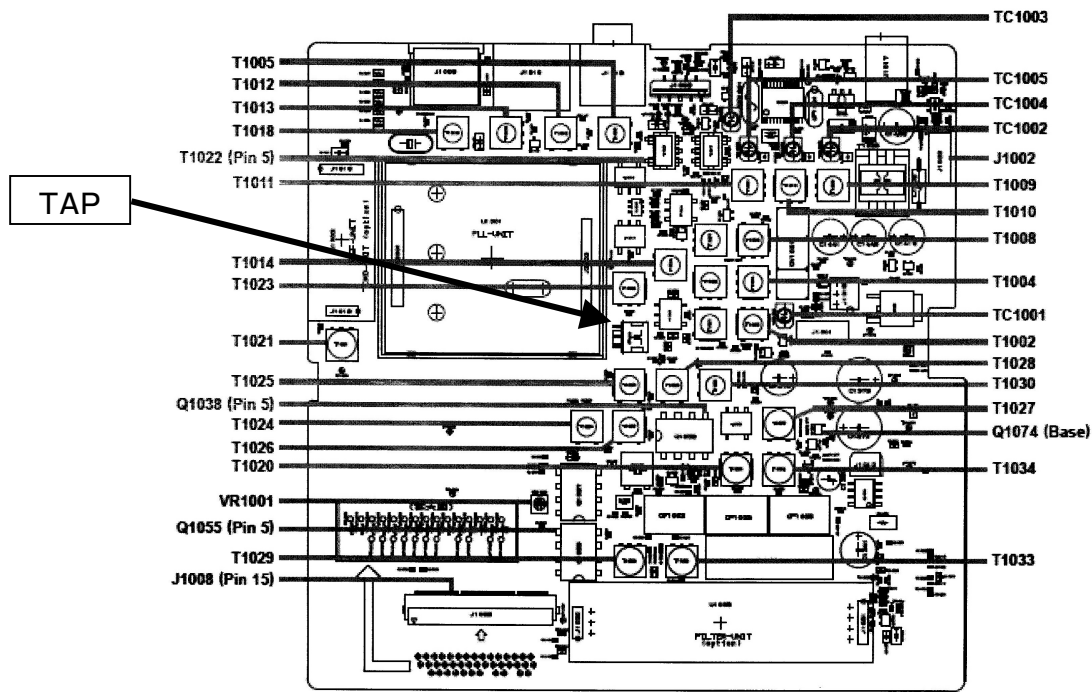


When I first saw the receiver, I thought of using it as a Panadapter for weak signal work with my 10 GHz and up gear. It would tune 144 MHz and 432 MHz which are the two IF's I use with my transverters. One issue is that I would have to unhook my IF and connect the Dongle in its place. To transmit, I'd have to reconnect my IF. I could hook up RF switching but it was not the ideal situation. When the FUNCube was first shown at a N.E.W.S. meeting it was suggested that possibly it could be used by tapping the common IF in the rig used with a transverter. This intrigued me.

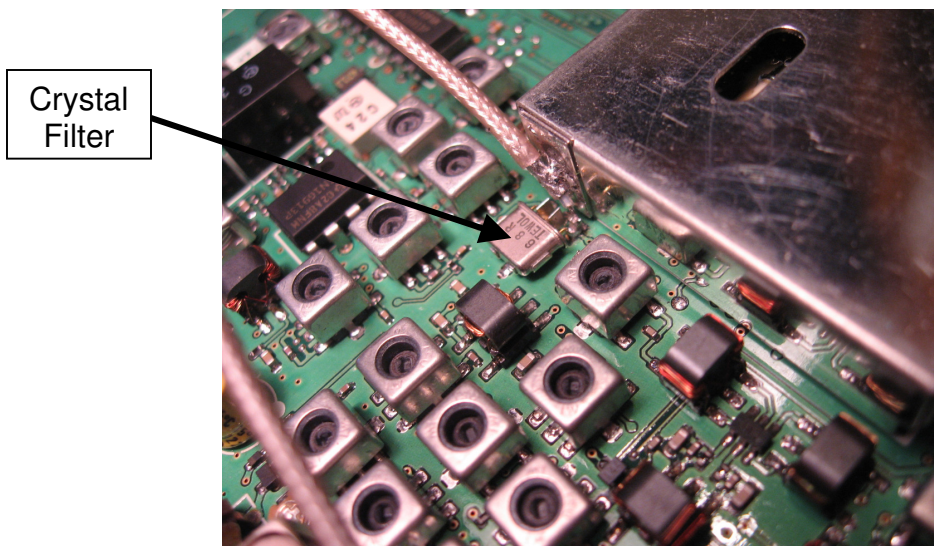
I looked into my FT-817 and saw that it used a common 68.33 MHz IF. This looked perfect as the FUNCube could tune that easily. Also being a common IF, it would be the same regardless of whether I used 144 or 432 MHz with the FT-817.

The first step was to identify a location to tap the common IF. In looking at the schematic, there is a point just before the first crystal filter (XF1001) that looked like a good candidate.

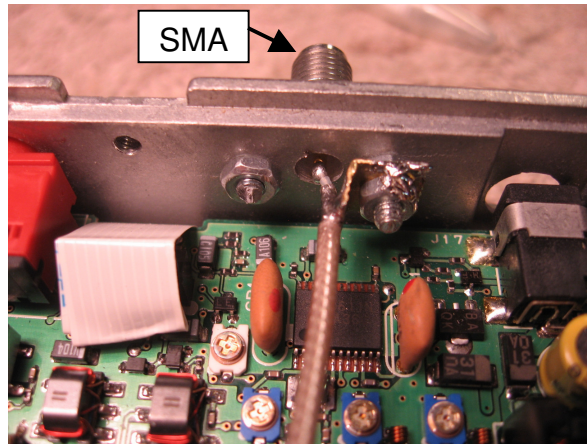
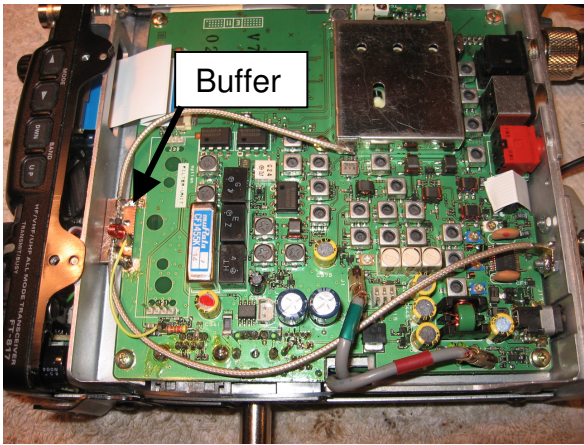




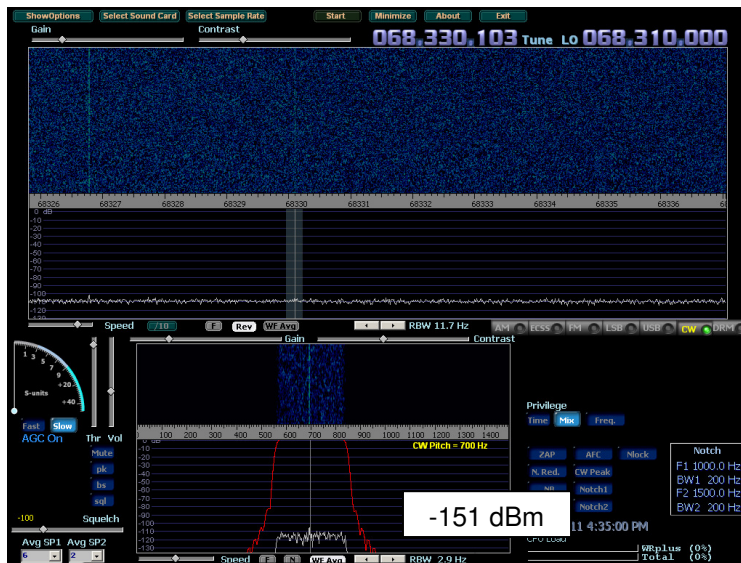
Above are excerpts of the schematic and top board of my FT-817 that show the tap point. I mounted a small ATC capacitor off the input leg of the crystal filter and attached some small coax. Picture below.



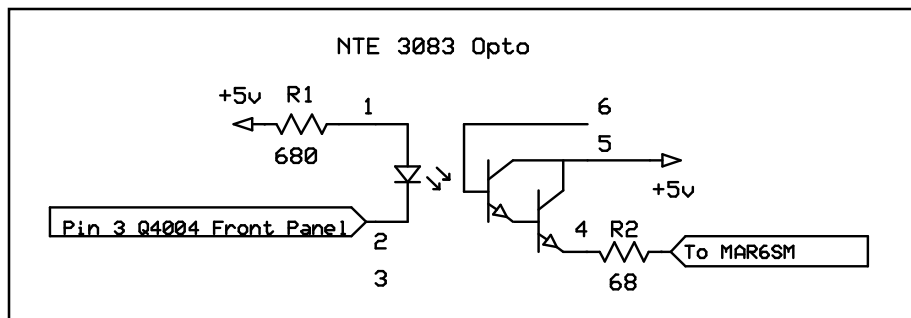
I decided to use an active buffer/isolation amp so as to minimize any interaction with the FT-817 IF. I rummaged through my junk box and found a bunch of MAR6-SM's that we all got at various conferences over the years. I kludged together a small board to mount the MMIC and soldered it to the front lip of the top board near where the optional CW filter would normally go. I then ran another piece of coax to an SMA connector I mounted on the rear panel for the output. To power the MAR6-SM, I tapped +5volts off the mic connector RJ-45.

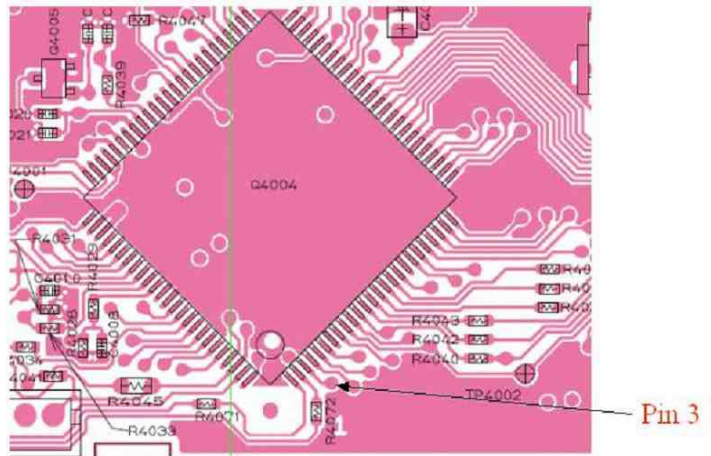
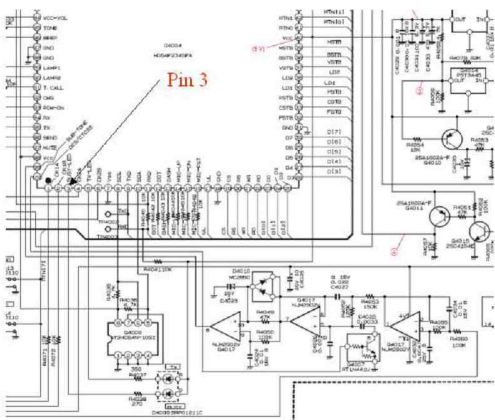


Initial testing showed that I could easily see a signal at least 10 dB below what I could hear. Below is a screen shot from WRPlus showing a signal at -151 dBm.



After initial testing, I decided to shut the buffer amp off during transmit. I searched around inside the FT-817 for a convenient source to control the buffer regardless of band/mode. While there are all sorts of control signals, finding a common one wasn't so easy! I finally decided to use a trick I utilized on my FT-736R. I used the front panel "buzy" (receive) LED. I paralleled an Opto-Isolator across the LED and used the Darlington output to switch the buffer.

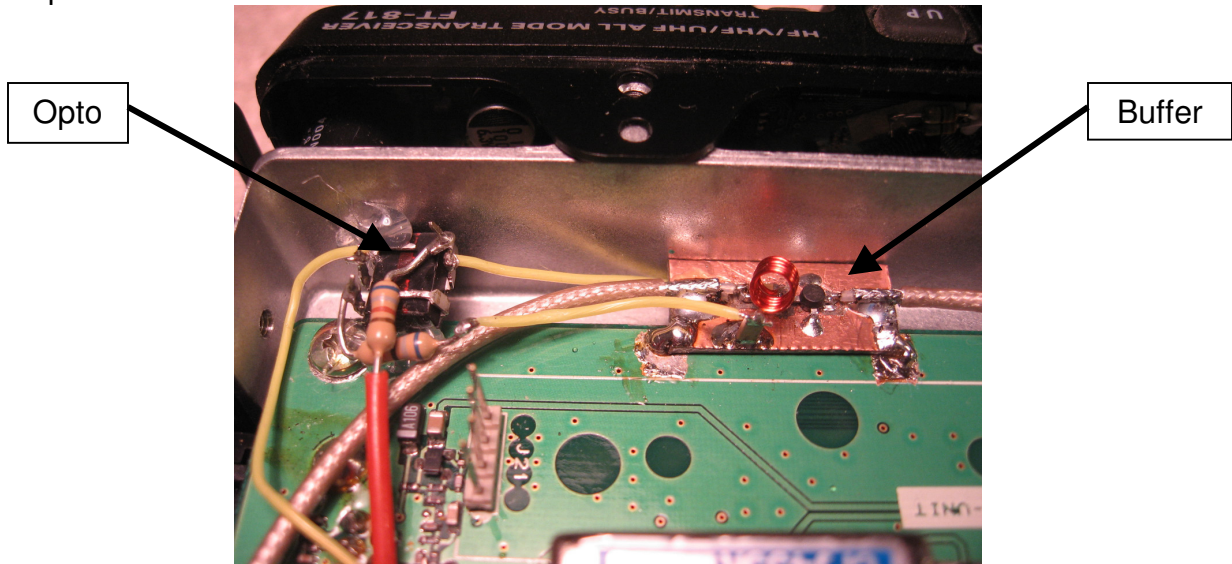




Front panel connection – Pin 3 Q4004

Above is the connection point I used for the Opto. There is a thru-hole off pin 3 of Q4004 on the front panel that will accept a #26 wire easily. Resistor value R2 was chosen to bias the MMIC at ~ 16ma. I used an NTE-3083 Opto because I had it.

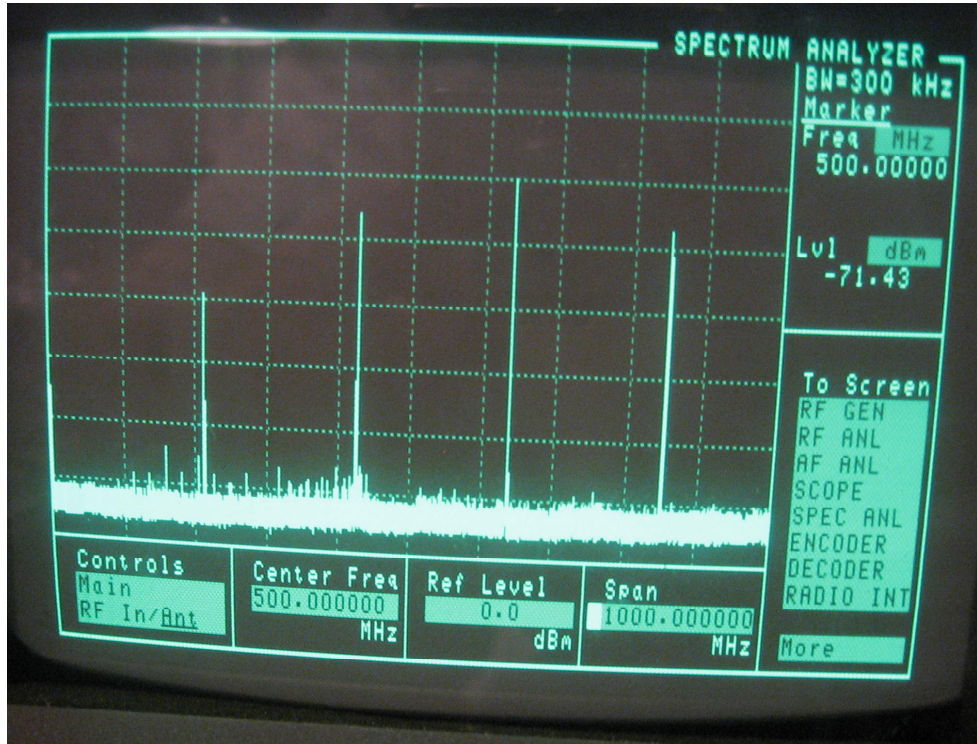
Below is a picture of the MMIC buffer and Opto mounted along the front lip of the top board. In true Ham fashion, I had to use hot melt glue somewhere in this project, so it is holding the Opto in place.



Don, W1FKF suggested I looked at the IF output on a spectrum analyzer. He discovered there were some significant carriers present. On 2 meters, the approximate frequency and levels I measured are:

- 212.57 MHz @ -39
- 425.78 MHz @ -28
- 637.72 MHz @ -21
- 849.65 MHz @ -28

On 432:
500.9 MHz @ -12.5
1 GHz @ -13.7



Before adding the band pass filter.

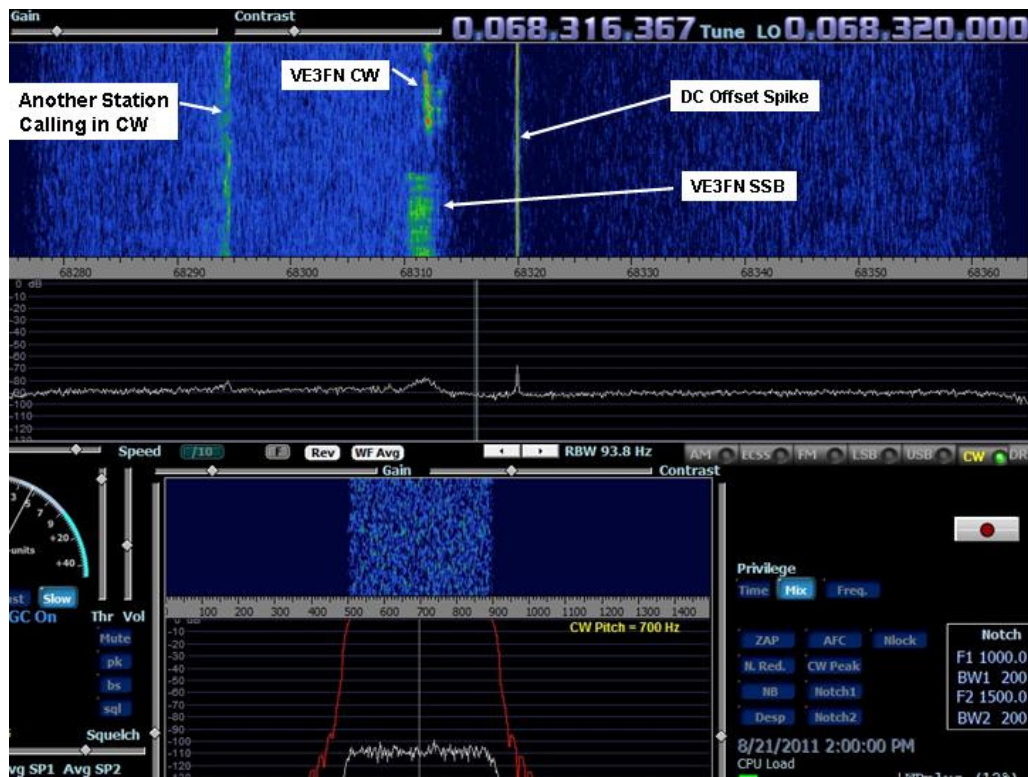
I inserted a Minicircuits SBP-70+⁴ between the FT-817 and FUNCube. It cleaned up the spectrum and increased sensitivity an additional 3 dB.

All the parts used here except the Minicircuits filter were from my junk box. If you rather not “roll your own” MAR6 buffer amp, DEMI has some options⁵.

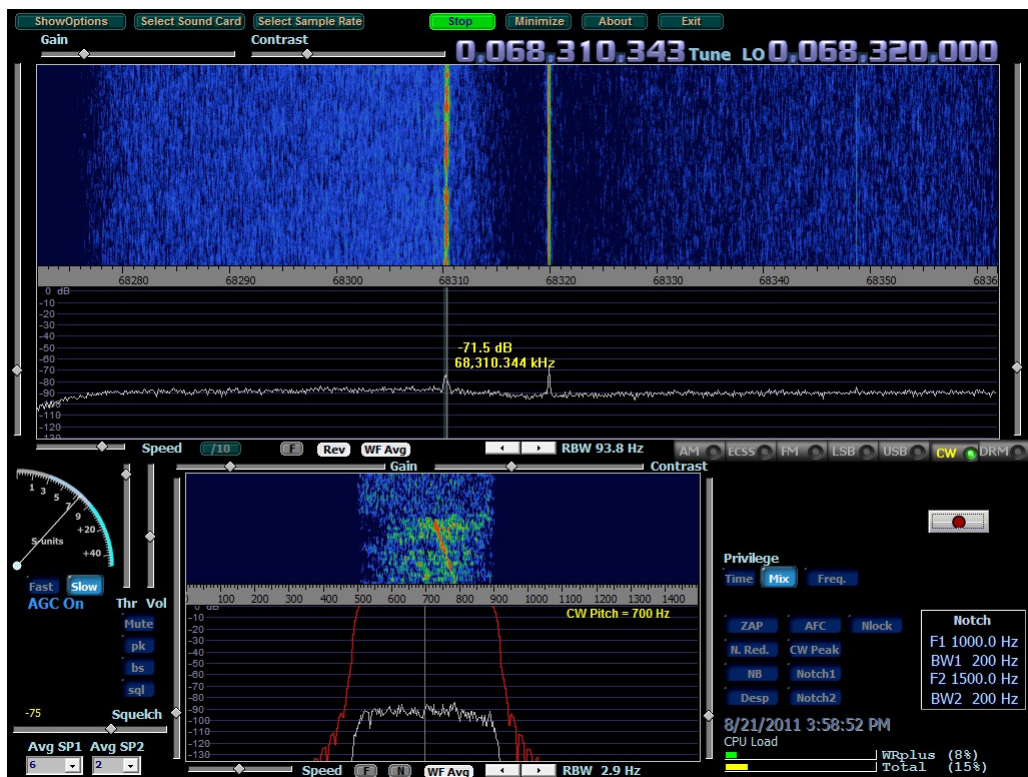
I look forward to using the FUNCube in the field this year especially at 24/47/78/122 GHz!

UPDATE:

Since this original article was written, I’ve had the chance to utilize the FCD on 10 GHz. On Sunday, during the first weekend of the 10 GHz and Up Cumulative, I was on Mt Mansfield, FN34om during some significant rainscatter propagation. Below is a screen shot of VE3FN in the waterfall display on 10 GHz. Ray was in FN26rf, which was 234km at 325° via direct path. I ended up pointing 150° AZ.



It was very easy to peak up on Ray. I immediately spotted his signal in the waterfall and adjusted AZ/EI for max signal. I then tuned my FT-817 to hear his signal.



W1FKF in CW

Above is a shot of W1FKF during the same event at 265km in CW. You can see the spreading and Doppler shift on his signal in the CW window.

Notes:

1. <http://www.funcubedongle.com/>
2. <http://uk.groups.yahoo.com/group/funcube/?yguid=428545443>
3. <http://uk.groups.yahoo.com/group/FCDevelopment/?yguid=428545443>
4. <http://www.minicircuits.com/pdfs/SBP-70+.pdf>
5. <http://www.downeastmicrowave.com/PDF/mmick.PDF>