A Panadapter for the FT-2000 on 6 using the Funcube Dongle

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Introduction

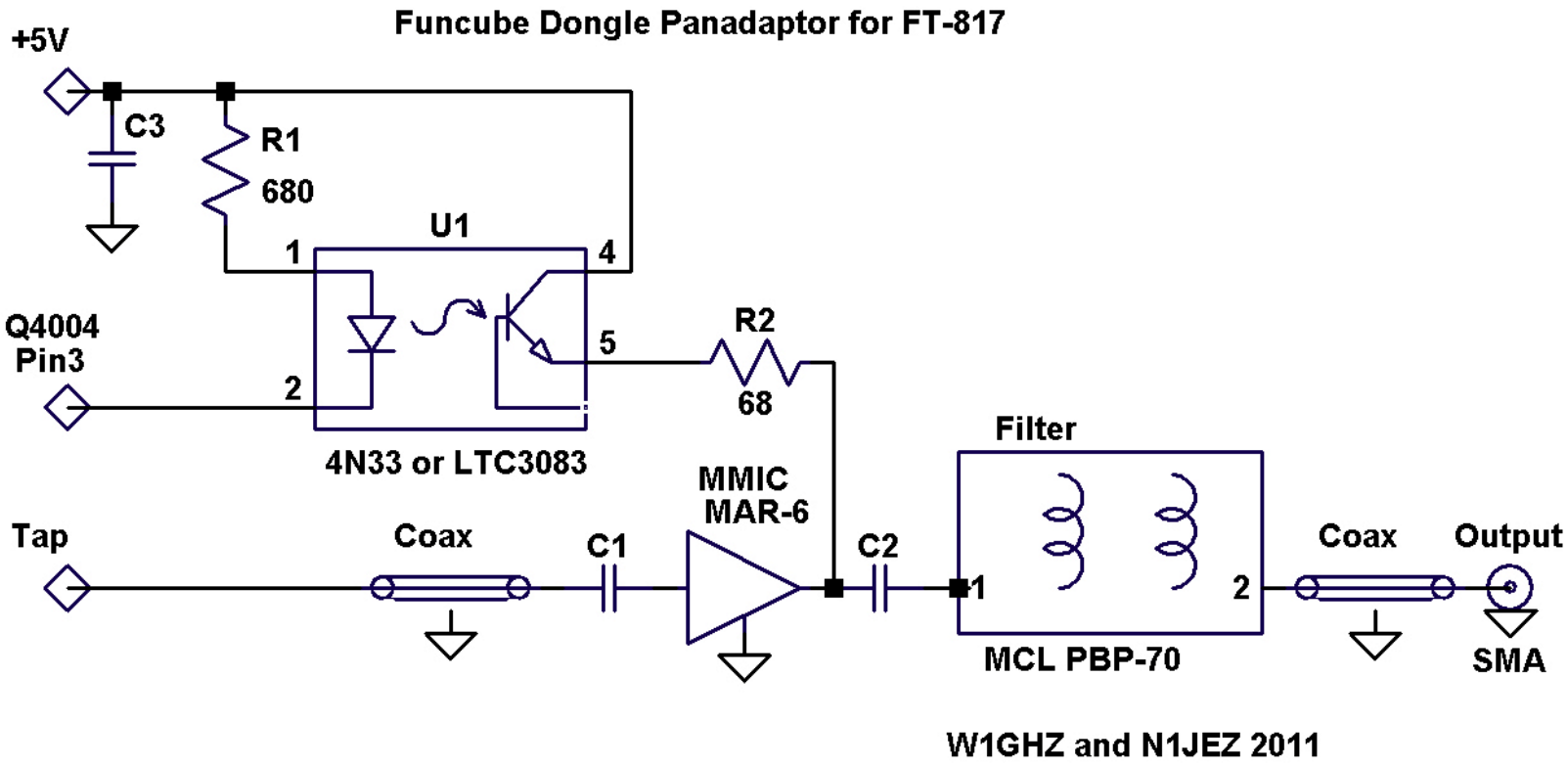
- We have been looking for a way to add a spectrum/waterfall display to an FT-2000 to use on 6 during contests.
- Options Explored
  - Yaesu DMU-2000: Expensive ($1180) and not very capable.
  - SDR-IQ & IF2000: Very nice but more than I wanted to spend ($715).
  - TelePost LP-PAN & IF2000 & E-MU Soundcard: Also very nice but again pricey ($600) and complex.

FT-817

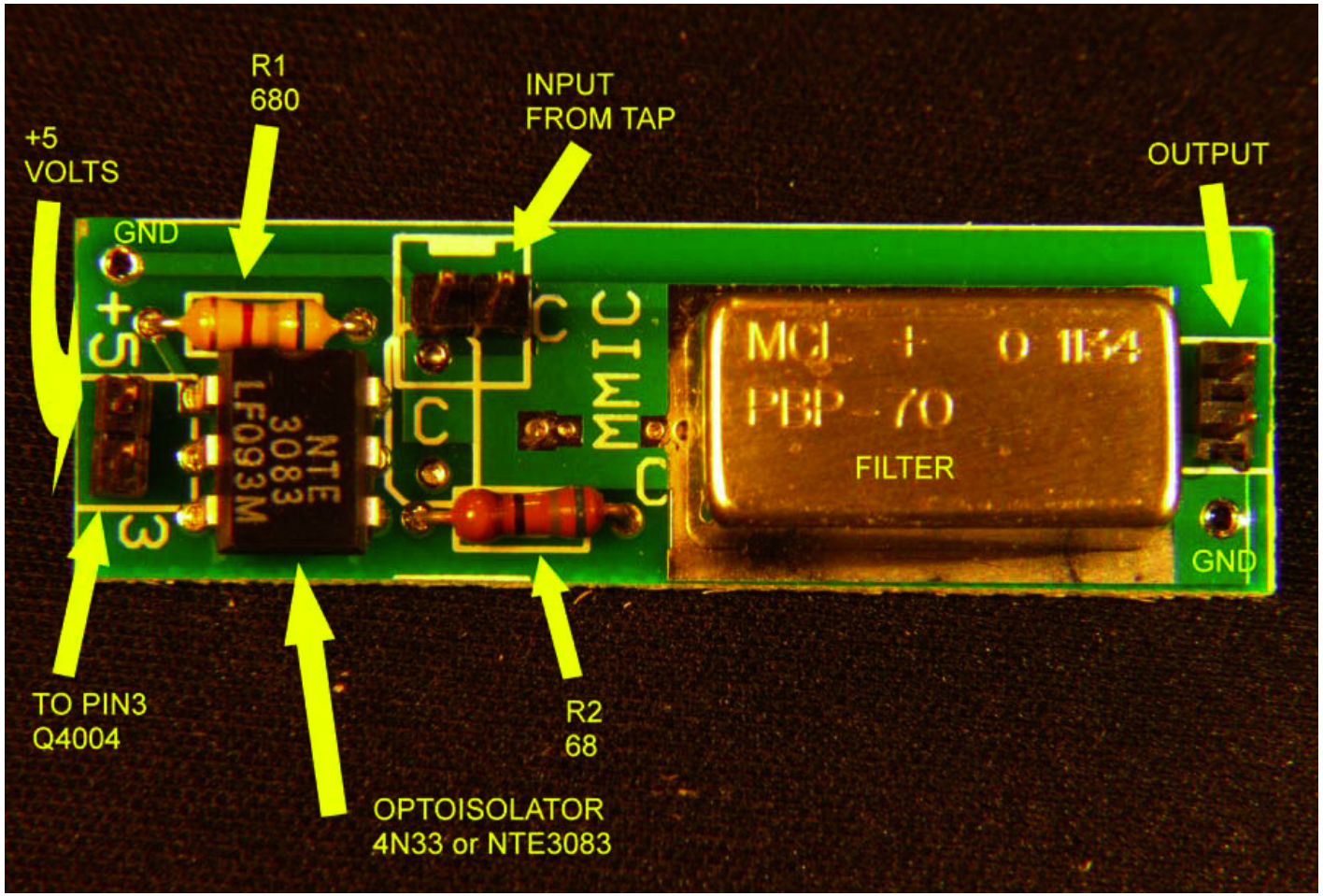
- A Panadapter for the FT-817 by Paul Seguin, N1JEZ
- Printed-Circuit Board for the FT-817 Panadapter by Paul Wade, W1GHZ
- Connected a Funcube Dongle to the FT-817 1st IF (68.33 MHz).
- What is a Funcube Dongle?
  - 64 to 1700 MHz SDR receiver
  - No special drivers needed
  - Looks like a sound card in Windows
  - I&Q 96 kHz sampling rate

Funcube Dongle

W1GHZ Printed-Circuit Board



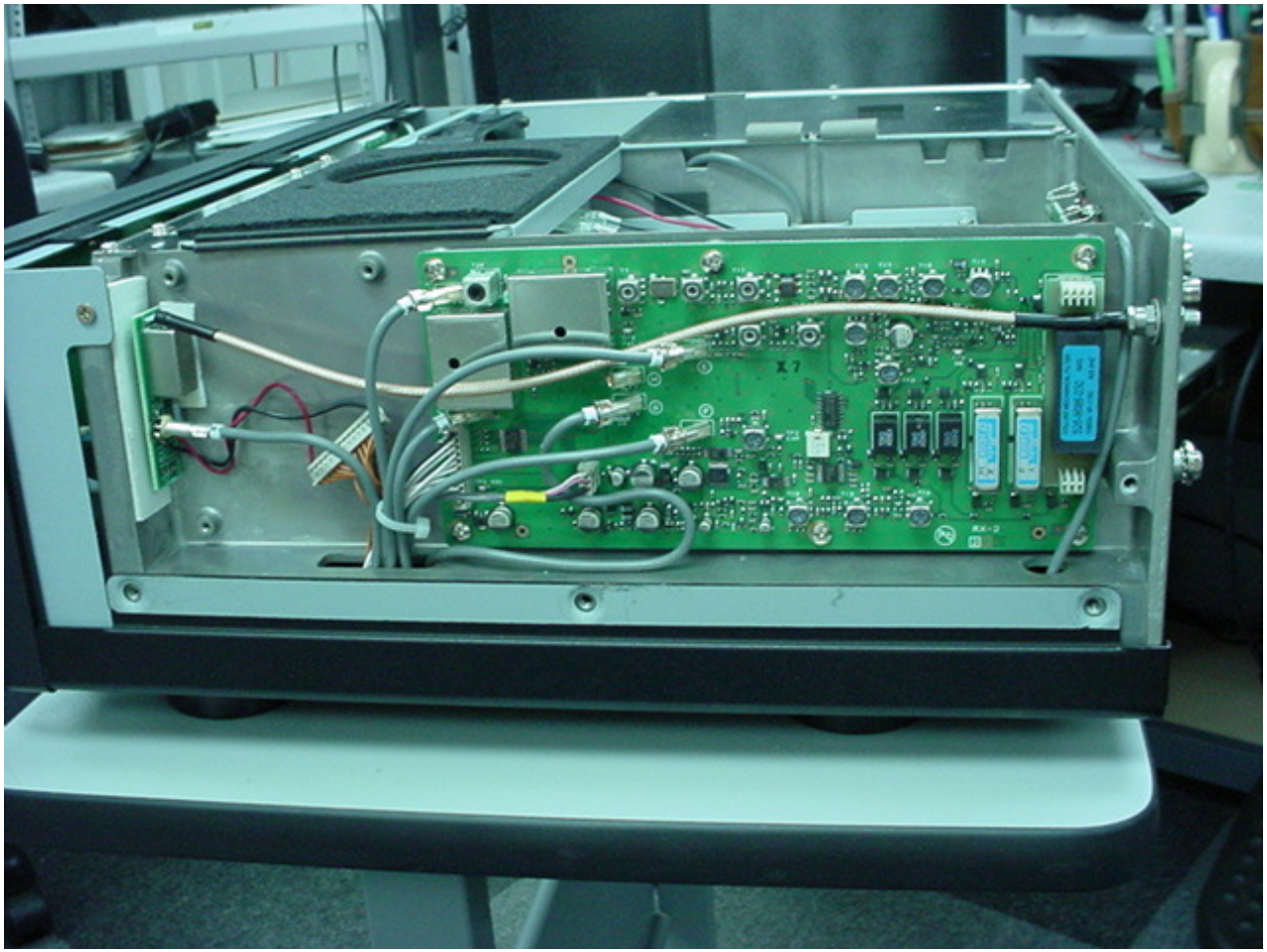
W1GHZ Printed-Circuit Board



FT-2000

- Would this also work with my FT-2000?
  - FT-2000 1st IF is 69.45 MHz
  - 1st IF is easily available internally

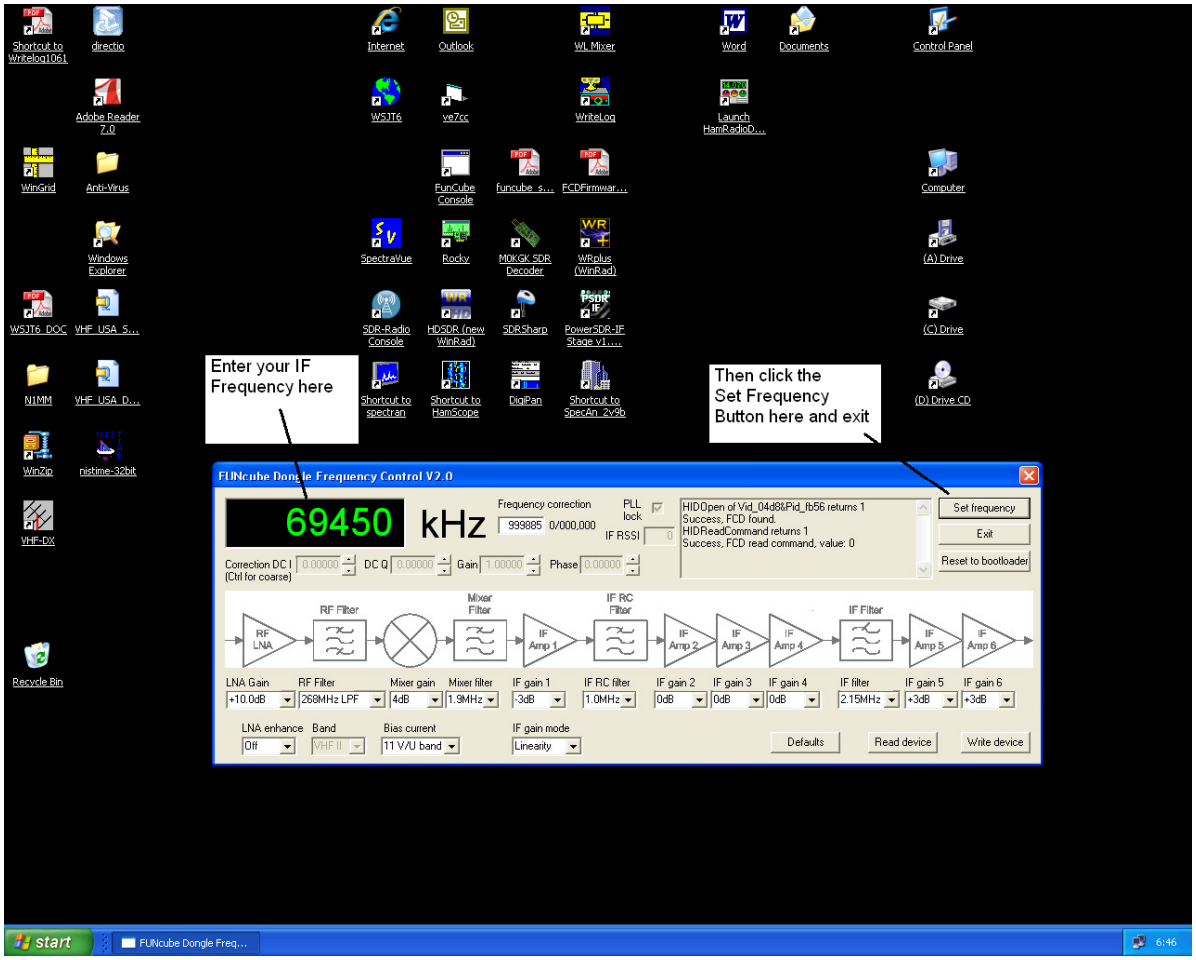
FT-2000 Hardware Mod



FT-2000 & W1GHZ PCB

FT-2000 & Funcube Dongle

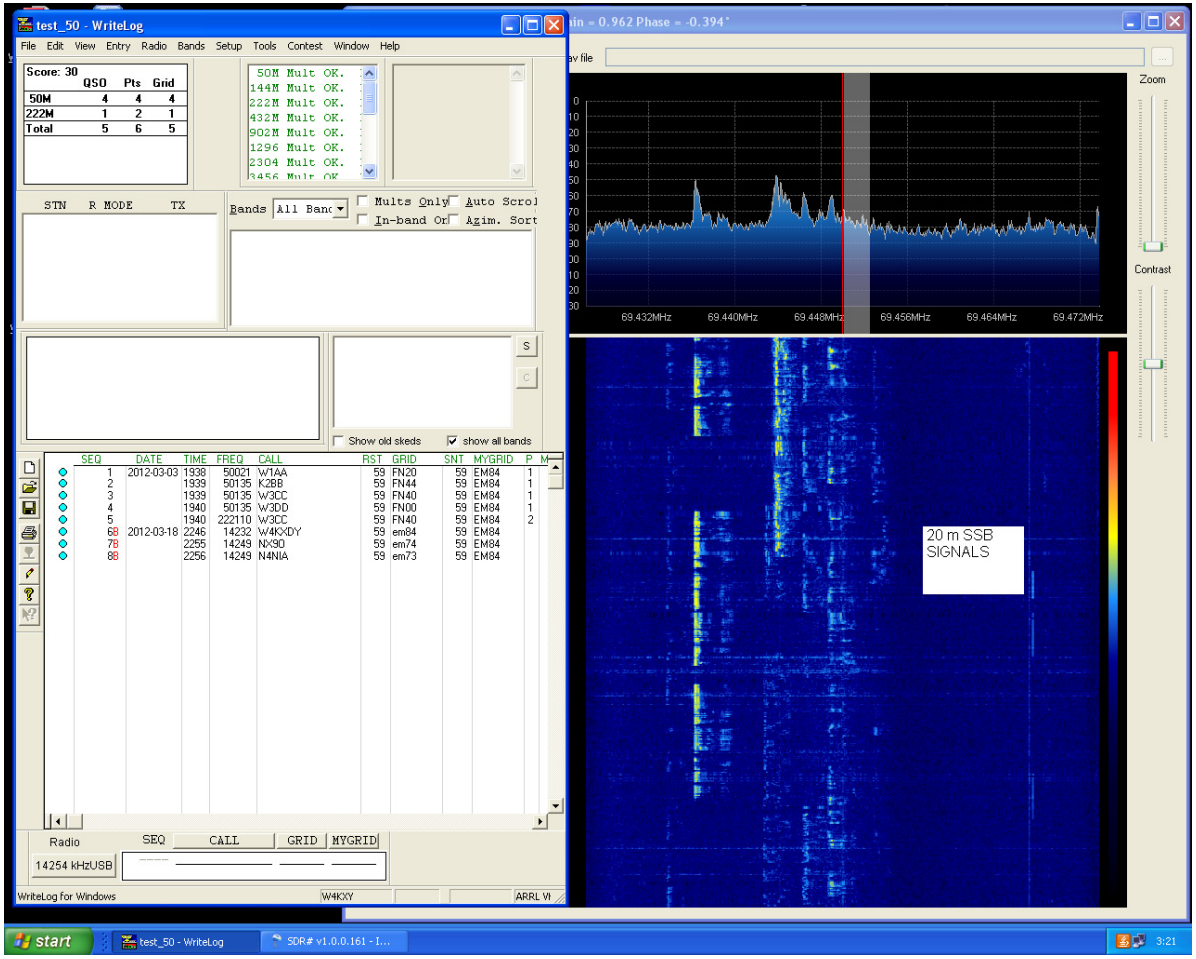
Funcube Dongle Control Panel



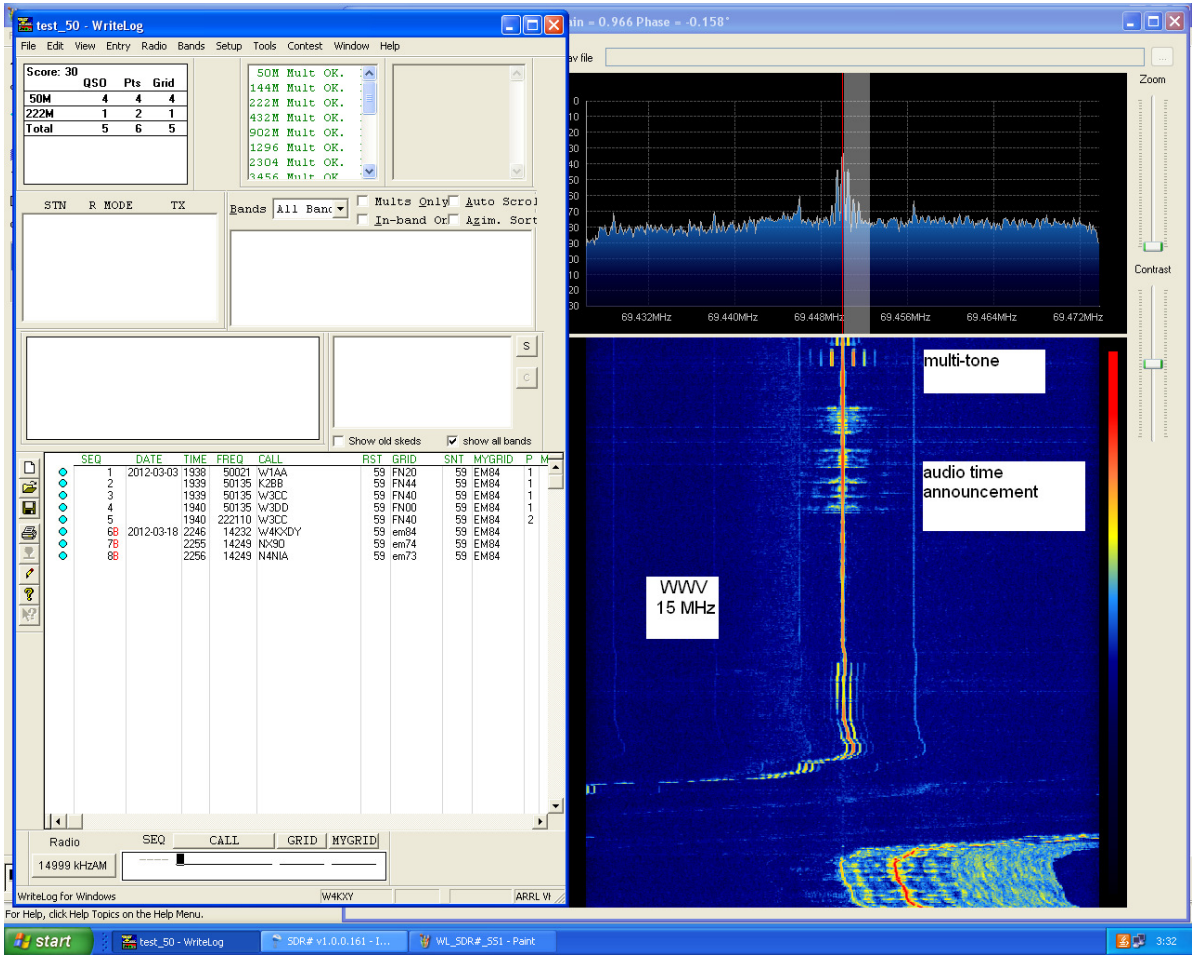
SDR Software Evaluation

- Rocky 3.7: consistent crashing problem, fixed HF frequency displayed
- M0KGK 1.0: fixed HF frequency displayed, no waterfall
- SDR-Radio Console V1.4: Simon Brown's latest endeavor after Ham Radio Deluxe, extremely full featured
- HDSDR: this is the latest WinRad
- WinRad: original edition
- SpectraVue: works quite well and interfaces to the radio to give correct frequency readout on spectral display, but is of course more CPU intensive. Lots of Bells and Whistles.
- WU2X PowerSDR IF edition: limited display capability for 6m but it works with FCD and demodulates too, consistently crashes in CW mode
- SDR# (SDRsharp) Probably the latest SDR program out. It is written in C#, hence the name. Seems to meet our needs for the present, but could use some upgrades to make it more user friendly, at least for our uses.

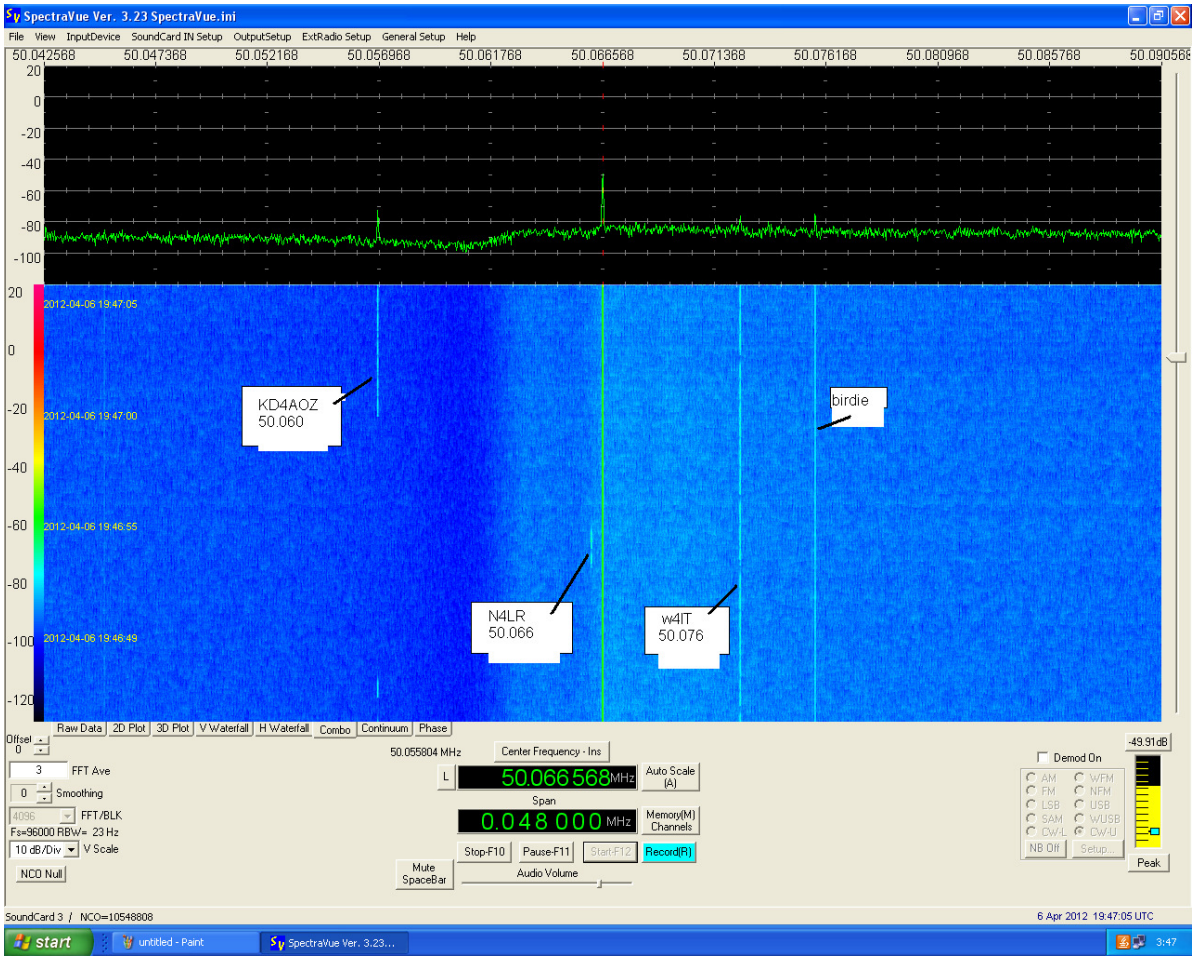
SDR#


test_50 - WriteLog
File Edit View Entry Radio Bands Setup Tools Contest Window Help
Score: 30
QSO Pts Grid
50M 4 4 4
222M 1 2 1
Total 5 6 5
50M Mult OK.
144M Mult OK.
222M Mult OK.
432M Mult OK.
902M Mult OK.
1296 Mult OK.
2304 Mult OK.
STN R MODE TX
Bands All Banc
Mults Only
Auto Scrol
In-band Or
Azim. Sort
Show old skeds
show all bands
SEQ DATE TIME FREQ CALL RST GRID SNT MYGRID P
1 2012-03-03 1938 50021 W1AA 59 FN20 59 EM84 1
2 1939 50135 K2BB 59 FN44 59 EM84 1
3 1939 50135 W3CC 59 FN40 59 EM84 1
4 1940 50135 W3DD 59 FN00 59 EM84 1
5 1940 222110 W3CC 59 FN40 59 EM84 2
6B 2012-03-18 2246 14232 W4KXDY 59 em84 59 EM84
7B 2255 14249 NX90 59 em74 59 EM84
8B 2256 14249 N4NIA 59 em73 59 EM84
Radio
SEQ CALL GRID MYGRID
14254 kHzUSB
WriteLog for Windows
W4KXY
ARRL VI
Zoom
Contrast
69.432MHz 69.440MHz 69.448MHz 69.456MHz 69.464MHz 69.472MHz
20 m SSB
SIGNALS
start
test_50 - WriteLog
SDR# v1.0.0.161 - I...
3:21

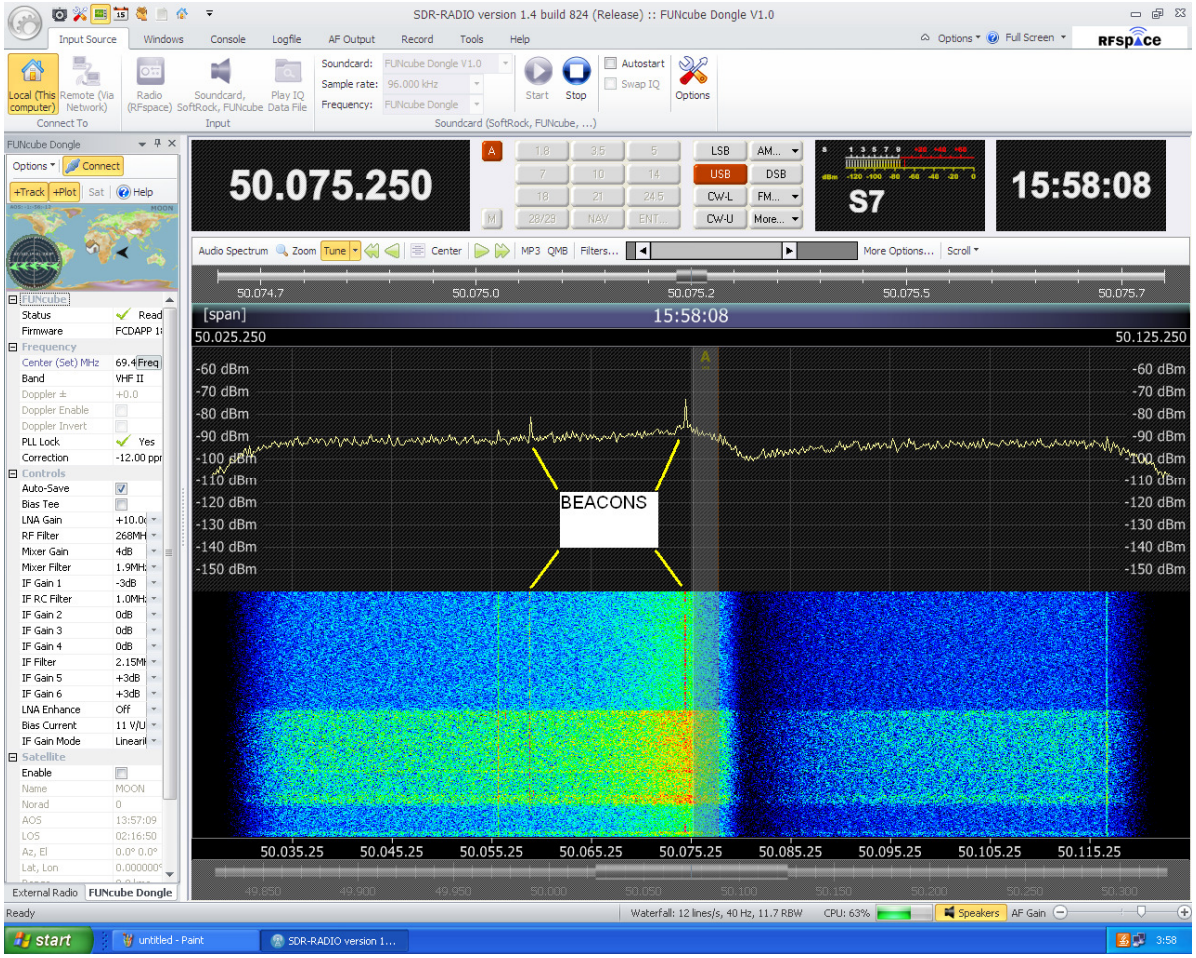
SDR#


test_50 - WriteLog
multi-tone
audio time announcement
WWV
15 MHz

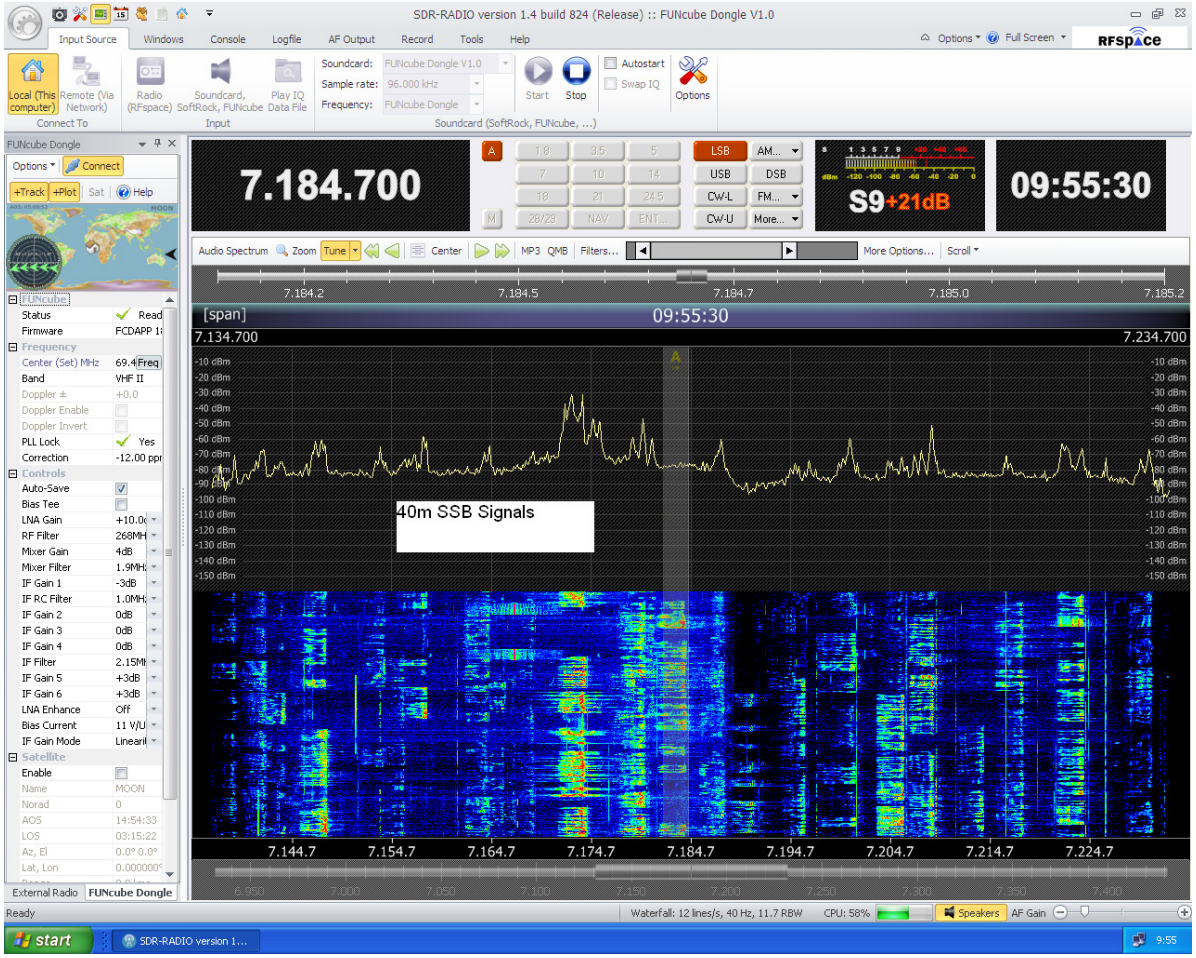
SpectraVue


SpectraVue Ver. 3.23 SpectraVue.ini
File View InputDevice SoundCard IN Setup OutputSetup ExtRadio Setup General Setup Help
50.042568 50.047368 50.052168 50.056968 50.061768 50.066568 50.071368 50.076168 50.080968 50.085768 50.090568
20 0 -20 -40 -60 -80 -100
2012-04-06 19:47:05
2012-04-06 19:47:00
2012-04-06 19:46:55
2012-04-06 19:46:49
KD4AOZ
50.060
N4LR
50.066
w4IT
50.076
birdie
Raw Data 2D Plot 3D Plot V Waterfall H Waterfall Combo Continuum Phase
Offset 0
3 FFT Ave
0 Smoothing
4096 FFT/BLK
Fs=96000 RBW= 23 Hz
10 dB/Div V Scale
NCO Null
50.055804 MHz
Center Frequency - Ins
L 50.066568 MHz
Auto Scale (A)
Span
0.048000 MHz
Memory(M) Channels
Stop-F10 Pause-F11 Start-F12 Record(R)
Mute SpaceBar
Audio Volume
Demod On
AM FM LSB SAM DWL WFM NFM USB WUSB DWU
NB Off Setup...
-49.91dB
Peak
SoundCard 3 / NCO=10548808
6 Apr 2012 19:47:05 UTC
start
untitled - Paint
SpectraVue Ver. 3.23...
3:47

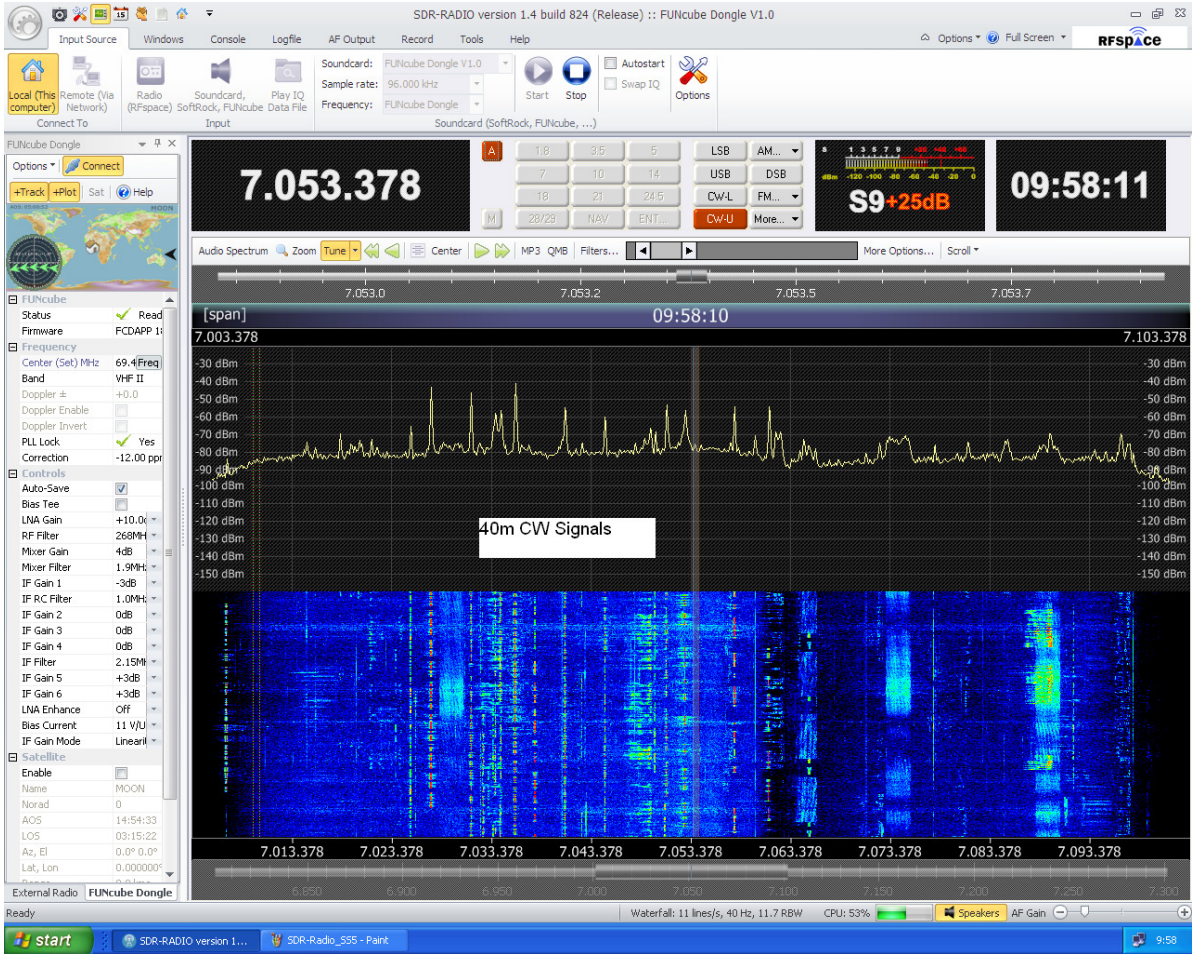
SDR-Radio


SDR-RADIO version 1.4 build 824 (Release) :: FUNcube Dongle V1.0
50.075.250
15:58:08
S7
BEACONS
50.025.250
50.125.250
-60 dBm
-70 dBm
-80 dBm
-90 dBm
-100 dBm
-110 dBm
-120 dBm
-130 dBm
-140 dBm
-150 dBm
50.035.25
50.045.25
50.055.25
50.065.25
50.075.25
50.085.25
50.095.25
50.105.25
50.115.25

SDR-Radio


SDR-RADIO version 1.4 build 824 (Release) :: FUNcube Dongle V1.0
7.184.700
S9+21dB
09:55:30
[span]
09:55:30
7.134.700
7.234.700
40m SSB Signals
7.144.7
7.154.7
7.164.7
7.174.7
7.184.7
7.194.7
7.204.7
7.214.7
7.224.7

SDR-Radio


SDR-RADIO version 1.4 build 824 (Release) :: FUNcube Dongle V1.0
7.053.378
S9+25dB
09:58:11
[span]
09:58:10
7.003.378
7.103.378
40m CW Signals
7.013.378
7.023.378
7.033.378
7.043.378
7.053.378
7.063.378
7.073.378
7.083.378
7.093.378

Conclusion

- Goal was to add a spectrum/waterfall display to an FT-2000 at the lowest possible cost.
- Cost of the Funcube Dongle, W1GHZ PCB and parts was approximately $200.
- So far the best SDR software for our use seems to be SDR#.
  - Low processor and memory overhead
  - Simple which always works best for us
  - Works well running on the same PC with WriteLog
- Of course we will continue experimenting and looking for better and even lower cost hardware and software solutions.