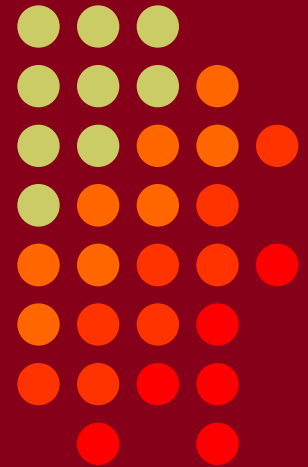


The Advantages of Waterfall Displays for Contesting and DXing

Presented by N6TV

n6tv@arrl.net



• CTU •
CONTEST
UNIVERSITY



Presentation Overview

- Legacy “Panadapters”
- Waterfall scope in CW Skimmer
- Latest radios with waterfall displays
- Waterfall display advantages & disadvantages
- How to use waterfall displays while contesting or DXing
- Q & A

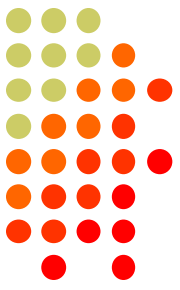
Legacy Panadapters



- Kenwood SM-230 Station Monitor (25, 100, or 250 KHz):



UR

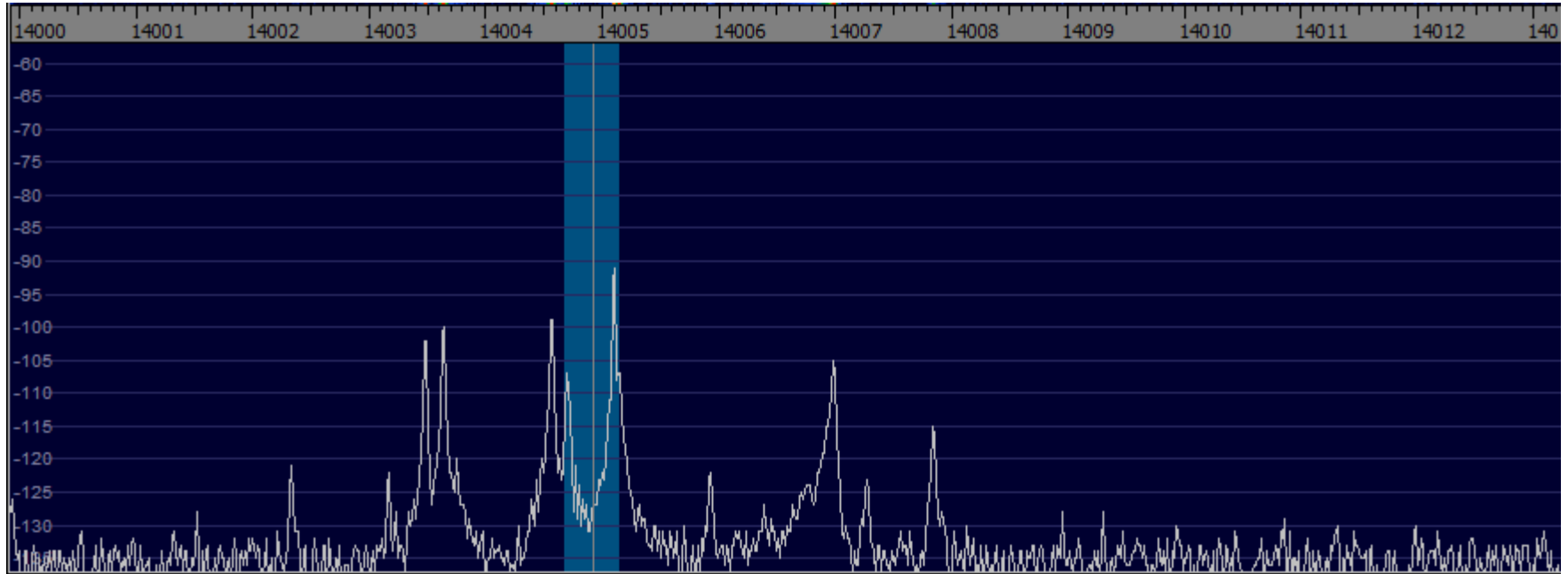


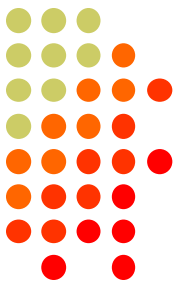
Legacy Panadapters

- “Band Scopes” in Icom IC-781, IC-756ProIII, IC-7600, IC-7800, IC-7700 (before new firmware)



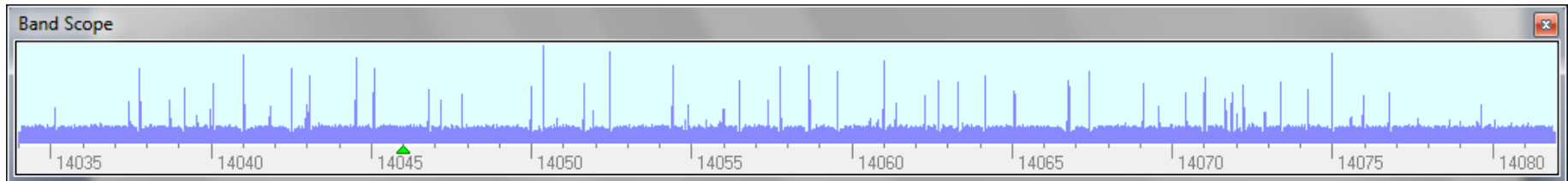
Spectrum Displays Hide Weak Signals





CW Skimmer's Band Scope

- From the CW Skimmer menu, select View → Band Scope



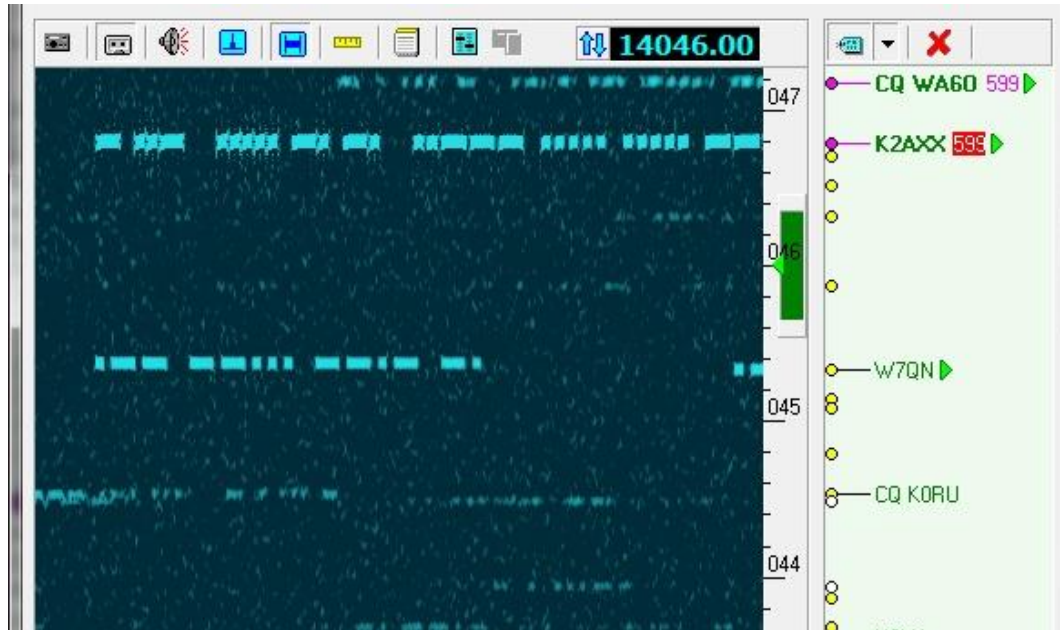
- Much better resolution, but display is very jumpy
- No “peak signal” memory
- Not useful on SSB

Legacy Panadapter Limitations



- Big signals dominate the display
- Weak signals very difficult to spot
- Signal peaks disappear, no history
- Difficult to find “clear spots” on a crowded band
- Limited zoom in or out
- Display jumpy, distracting
 - Signal averaging helps, but it also hides things

CW Skimmer Waterfall Limitations



- You only see 10 - 15 kHz of the band at most
- Scale is **fixed**, cannot “zoom” in or out, or tune smoothly
- Narrow 500 Hz CW filter – *not* usable on phone

Better Waterfall Displays



- The Elecraft P3 Panadapter



- Major improvement over legacy designs

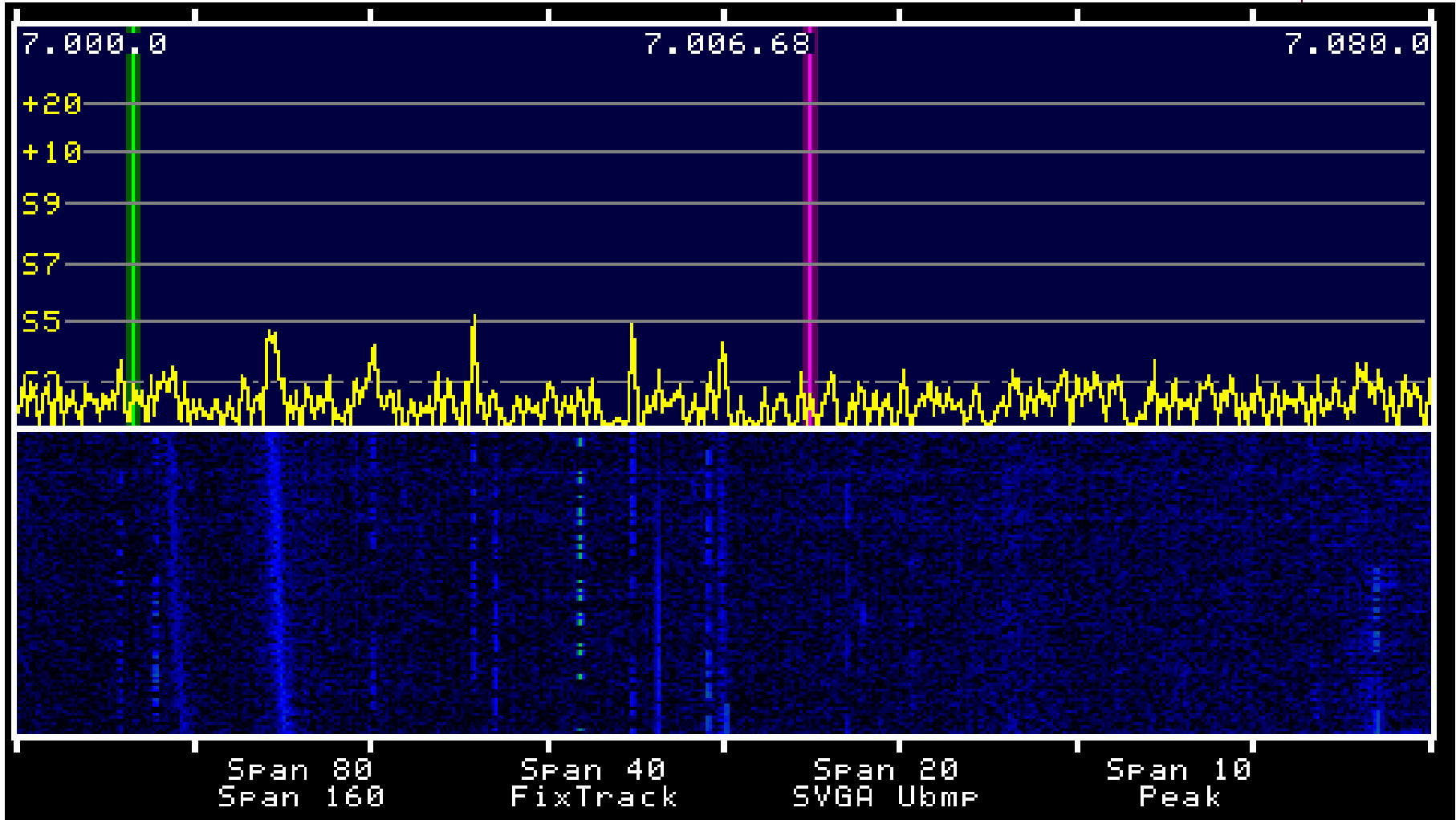
Elecraft P3 + P3SVGA Option



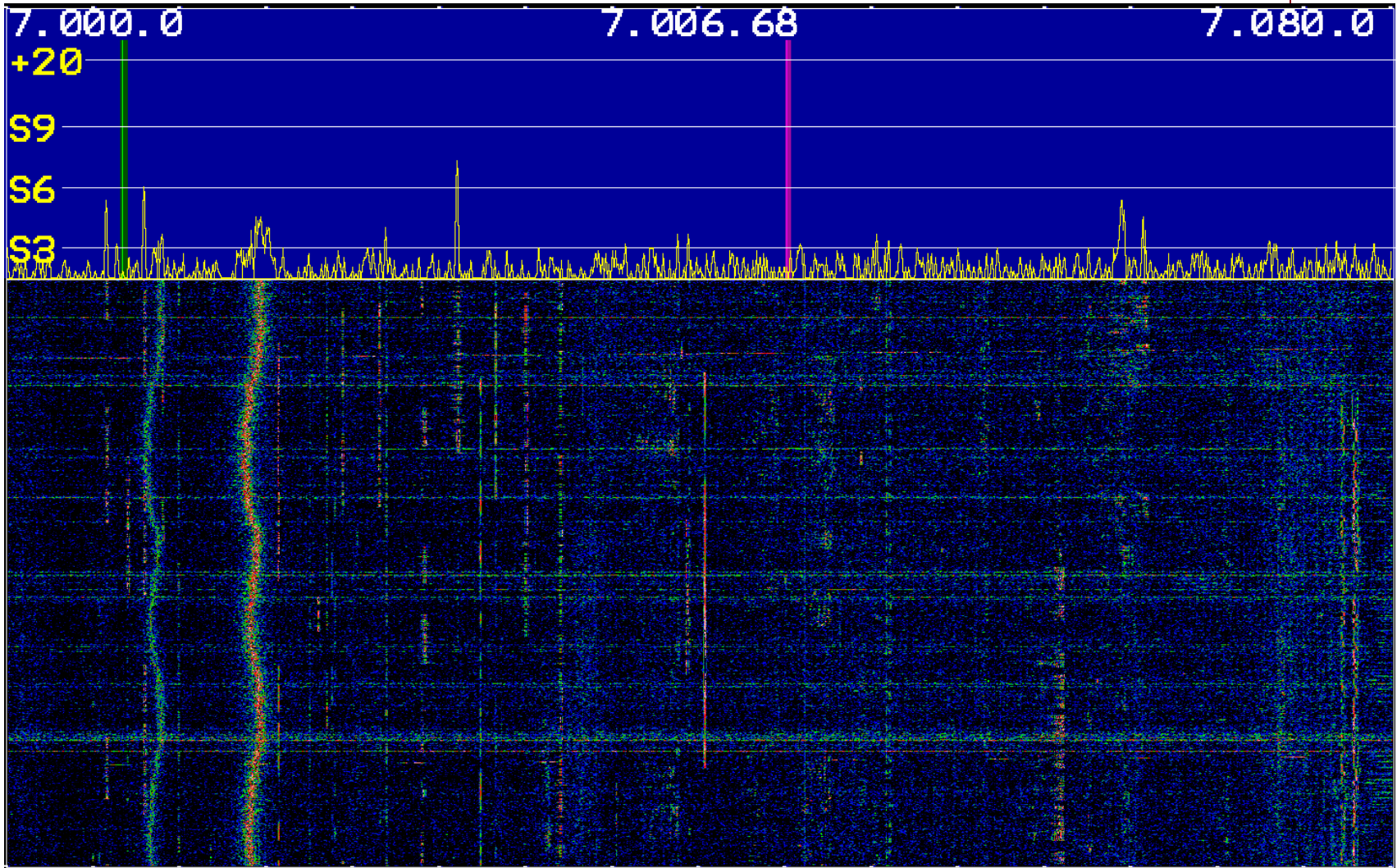
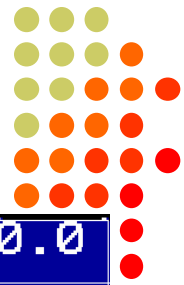
- P3 resolution only 480 x 272 pixels
- P3SVGA: internal SVGA Large Screen Adapter
 - 1024 x 768
 - 1280 x 1024
 - 1440 x 900
 - 1920 x 1080
- Displays far more signals



P3 Built-in Display at 480 x 272



P3SVGA at 1440 x 900



Old Icom IC-7800 firmware



Icom IC-7800 with V3.0 firmware

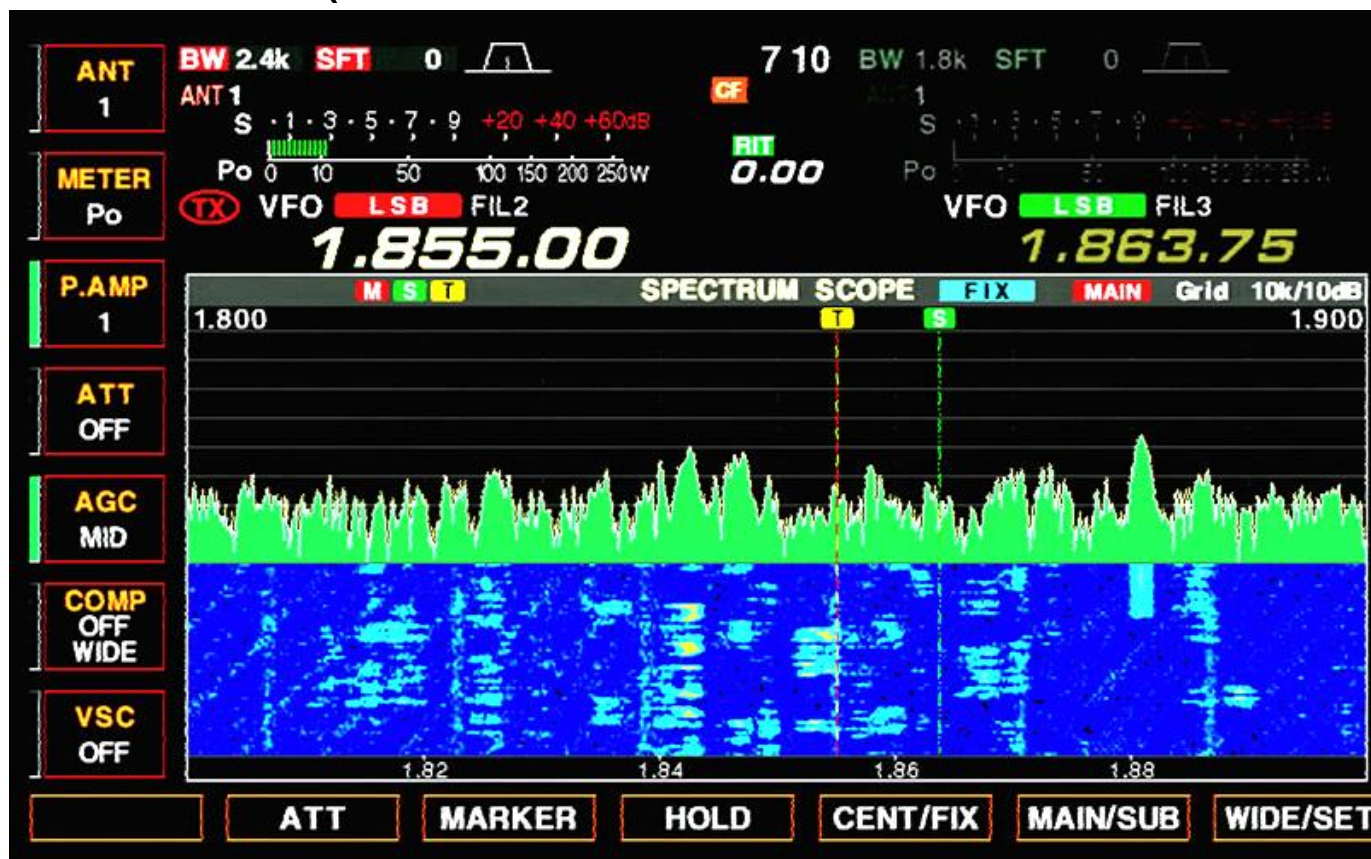




IC-7800 V3.0 Screen Shot

IC-7600, IC-7700 V2.0 Also Supports Waterfall

- 800 x 480 (with or without external monitor)



IC-7850 / 7851 – Huge Improvement



- Fast, 800 x 600, MAIN only, or MAIN + SUB
- “Click to tune” with USB mouse



New IC-7300 has fast waterfall too!



- With touch screen



IC-7610 with dual band waterfall



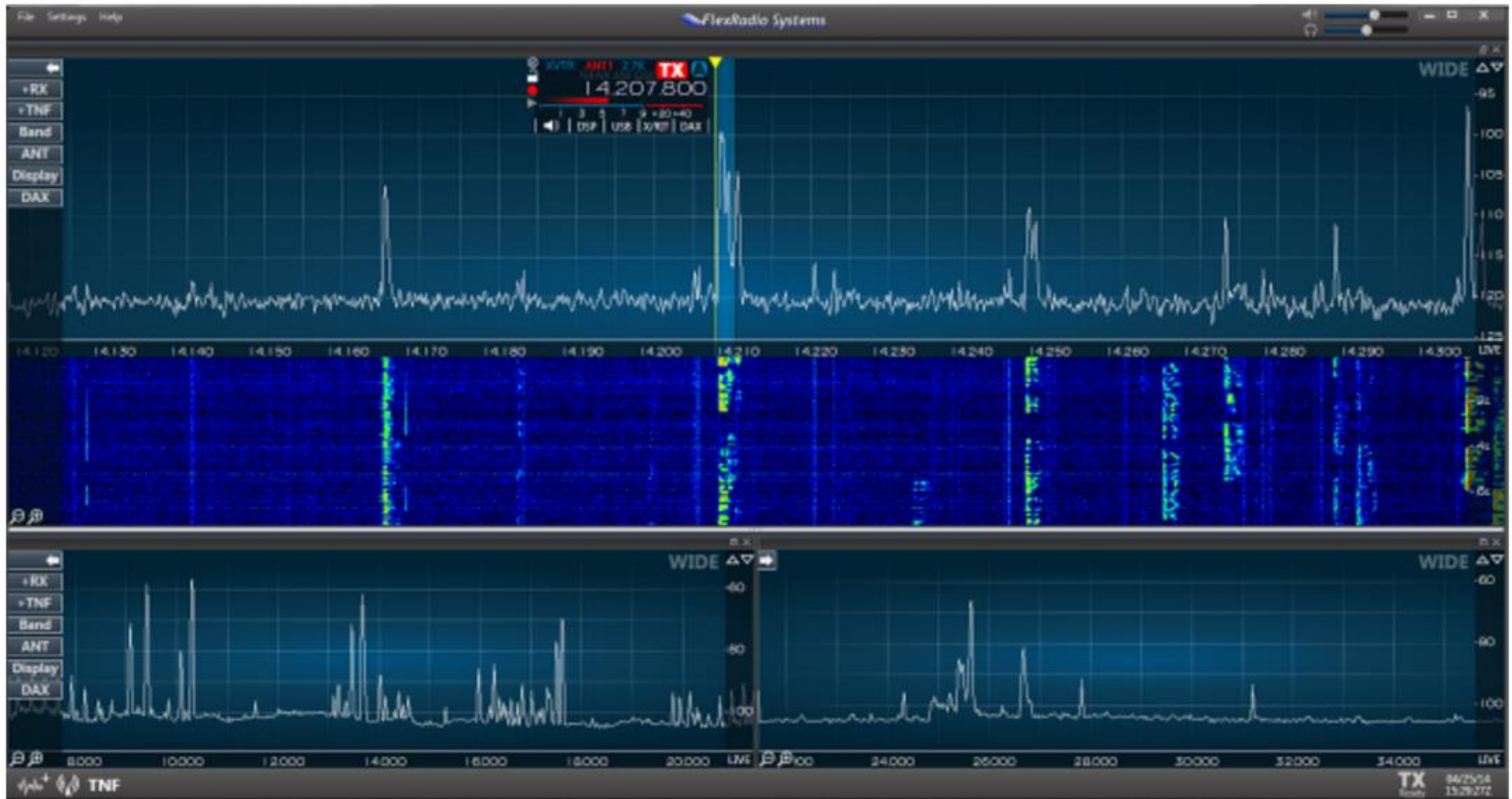
Kenwood TS-990S



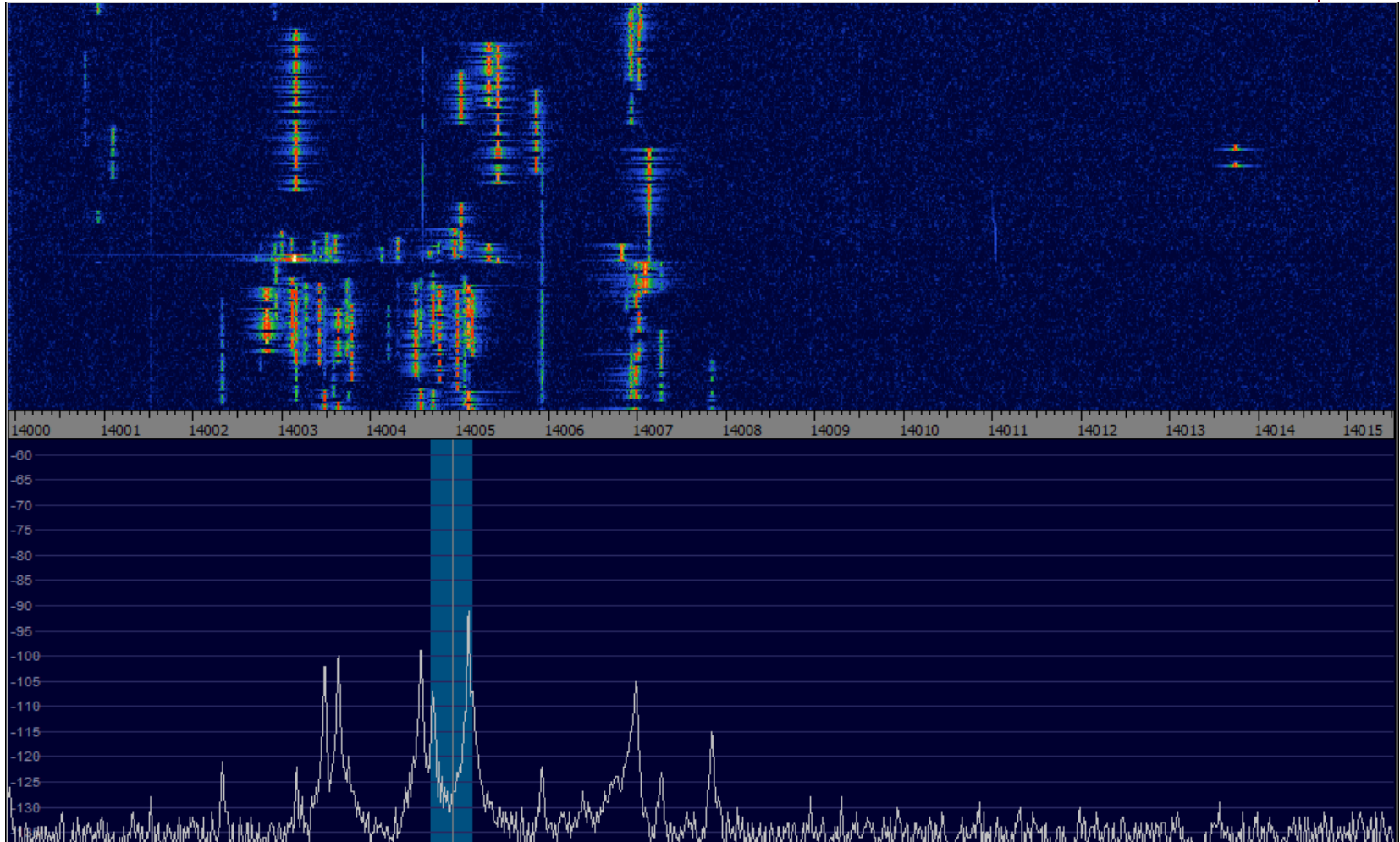
FlexRadio FLEX-5000™, FLEX-6700™



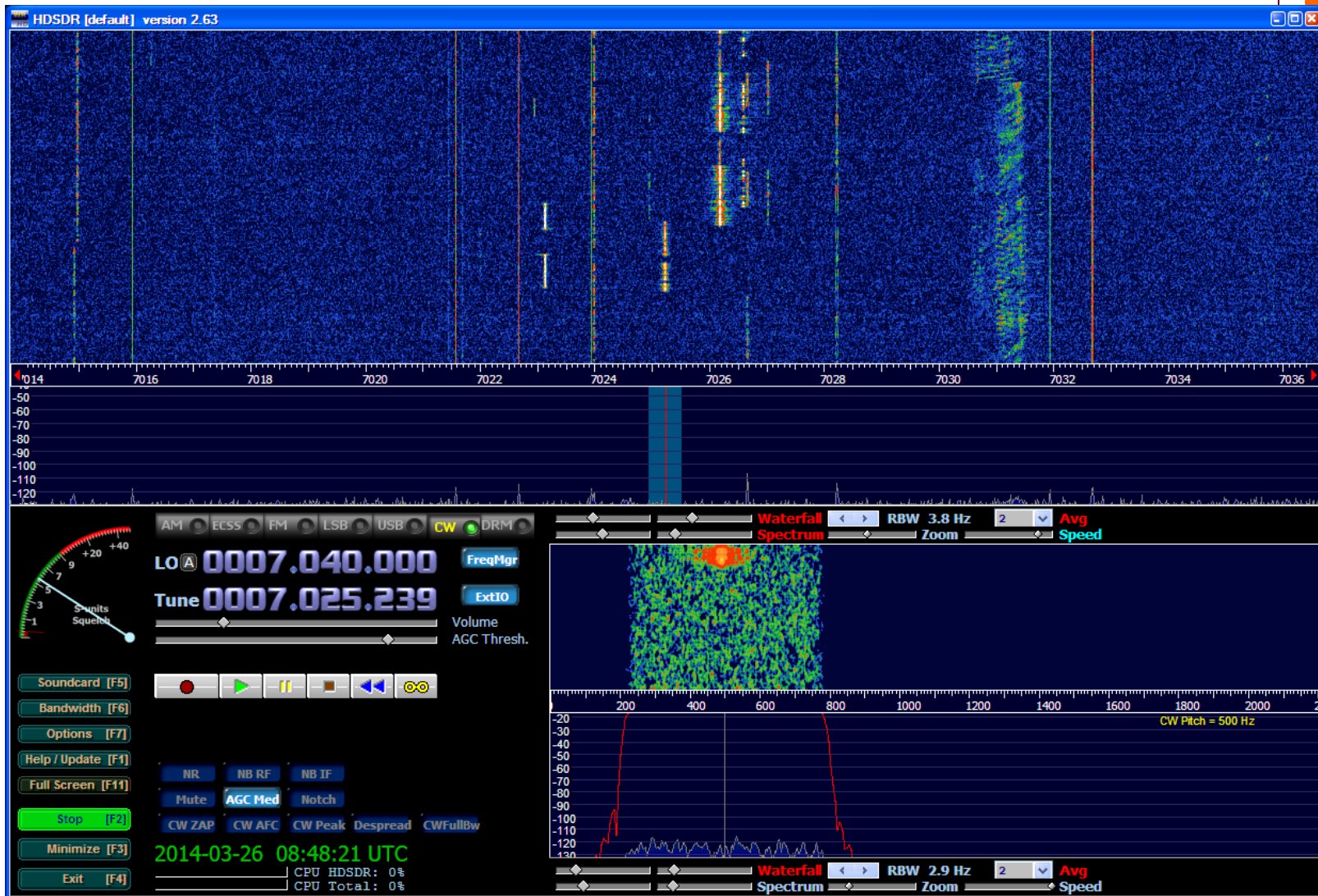
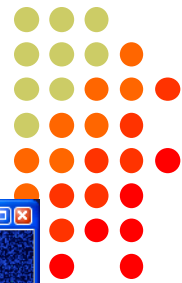
FlexRadio Systems® SmartSDR



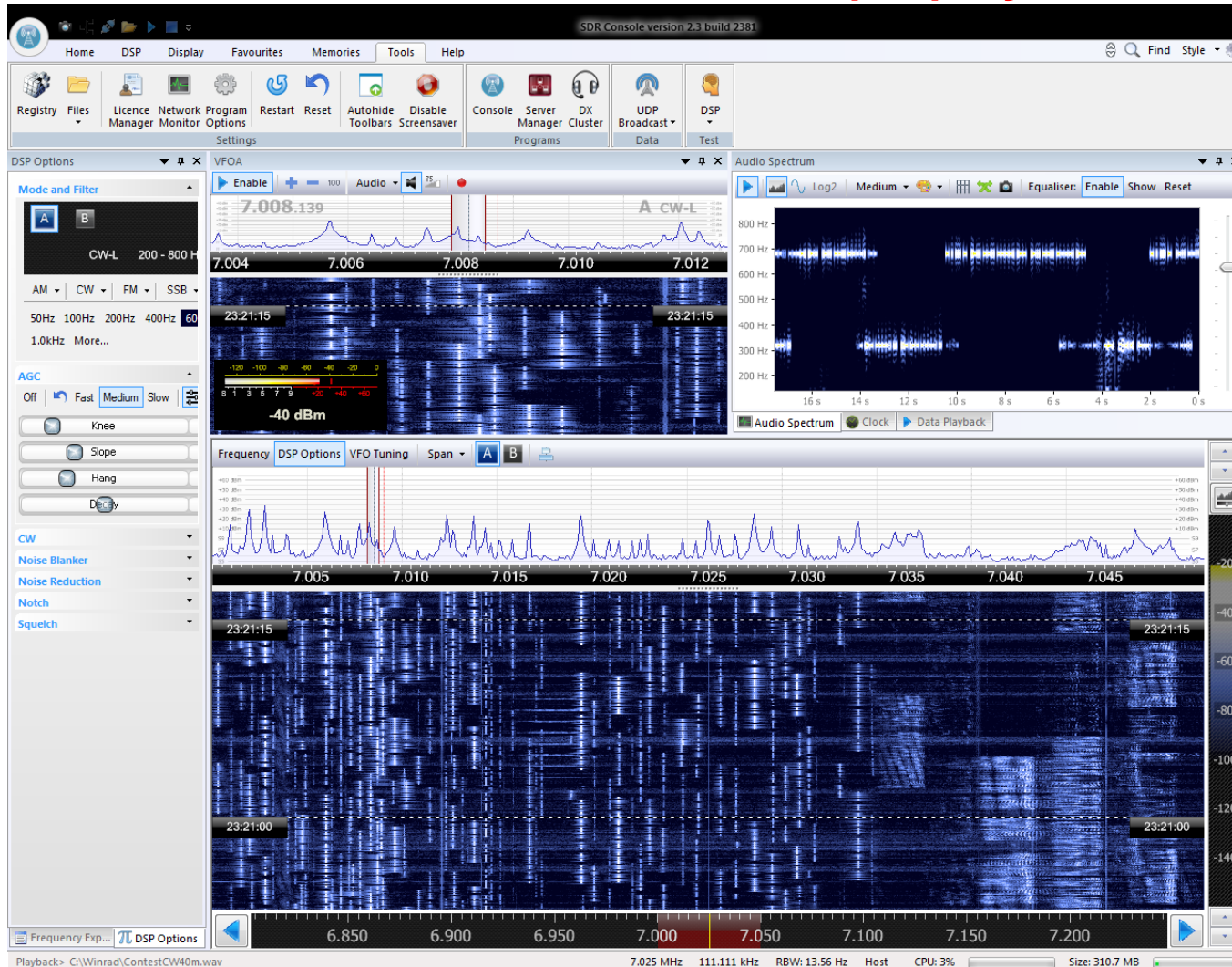
Winrad Software



HSDR Software



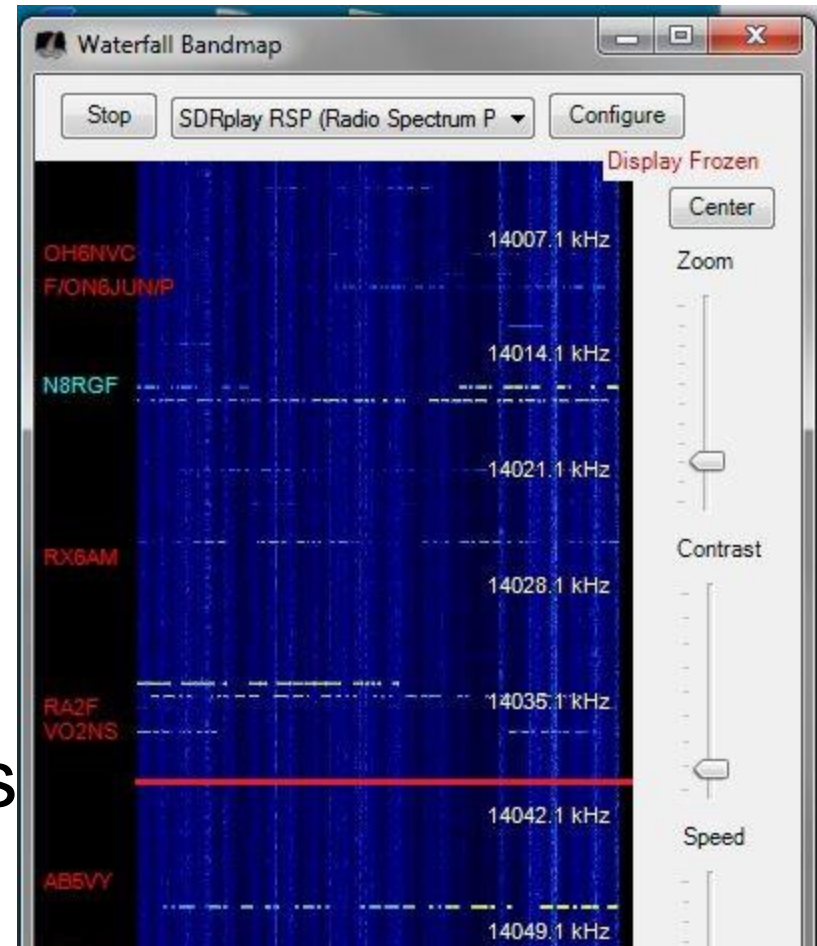
SDR-Radio.com SDRConsole (V2) by HB9DRV



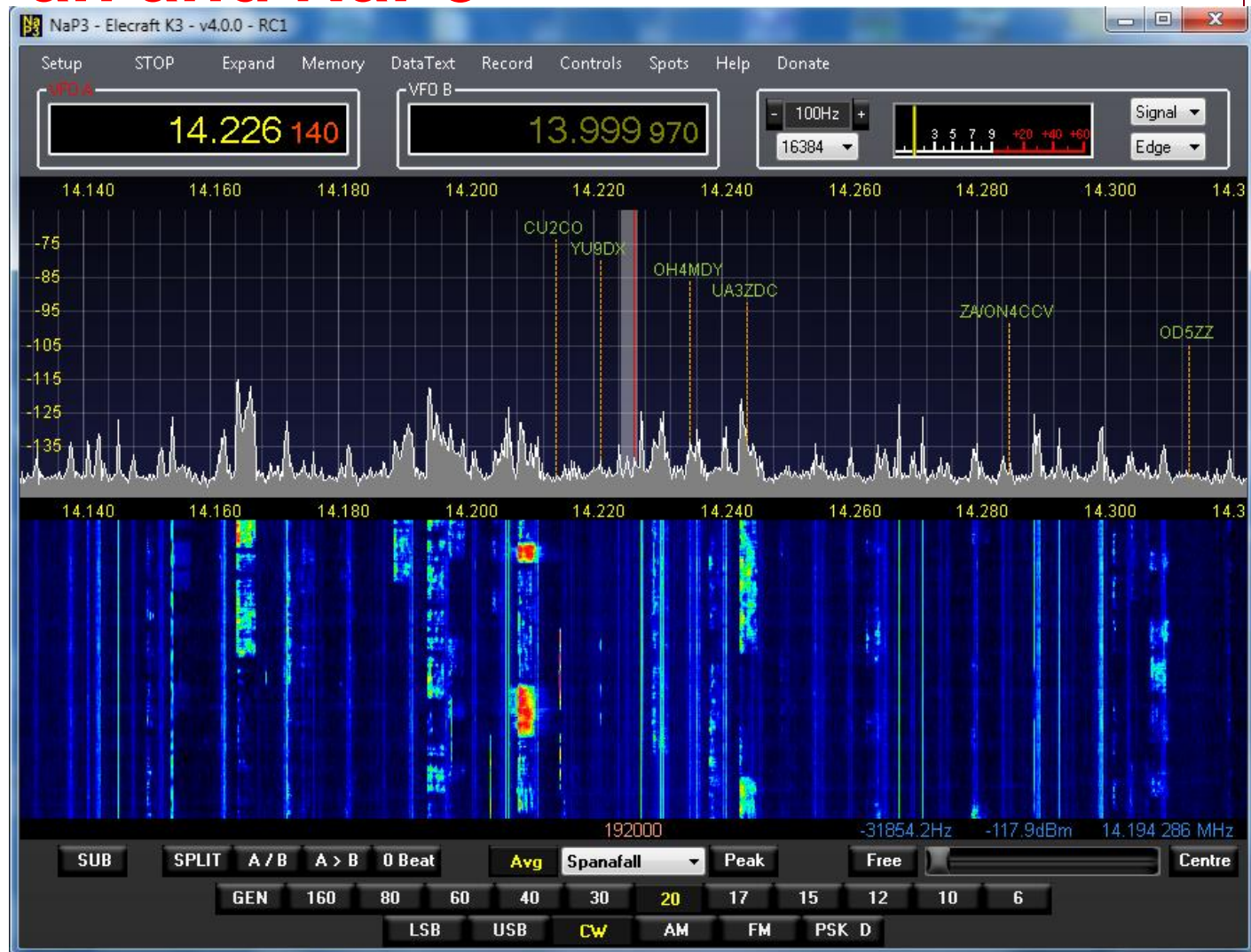
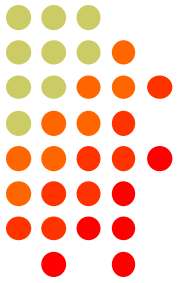
Waterfall Bandmap by N2IC (for N1MM+)

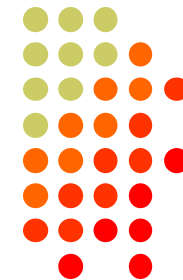


- Combines **cluster spots** from Internet or Skimmer with waterfall from local SDR
- Zoom Feature
- Click to tune feature
- Potential to support other logging programs

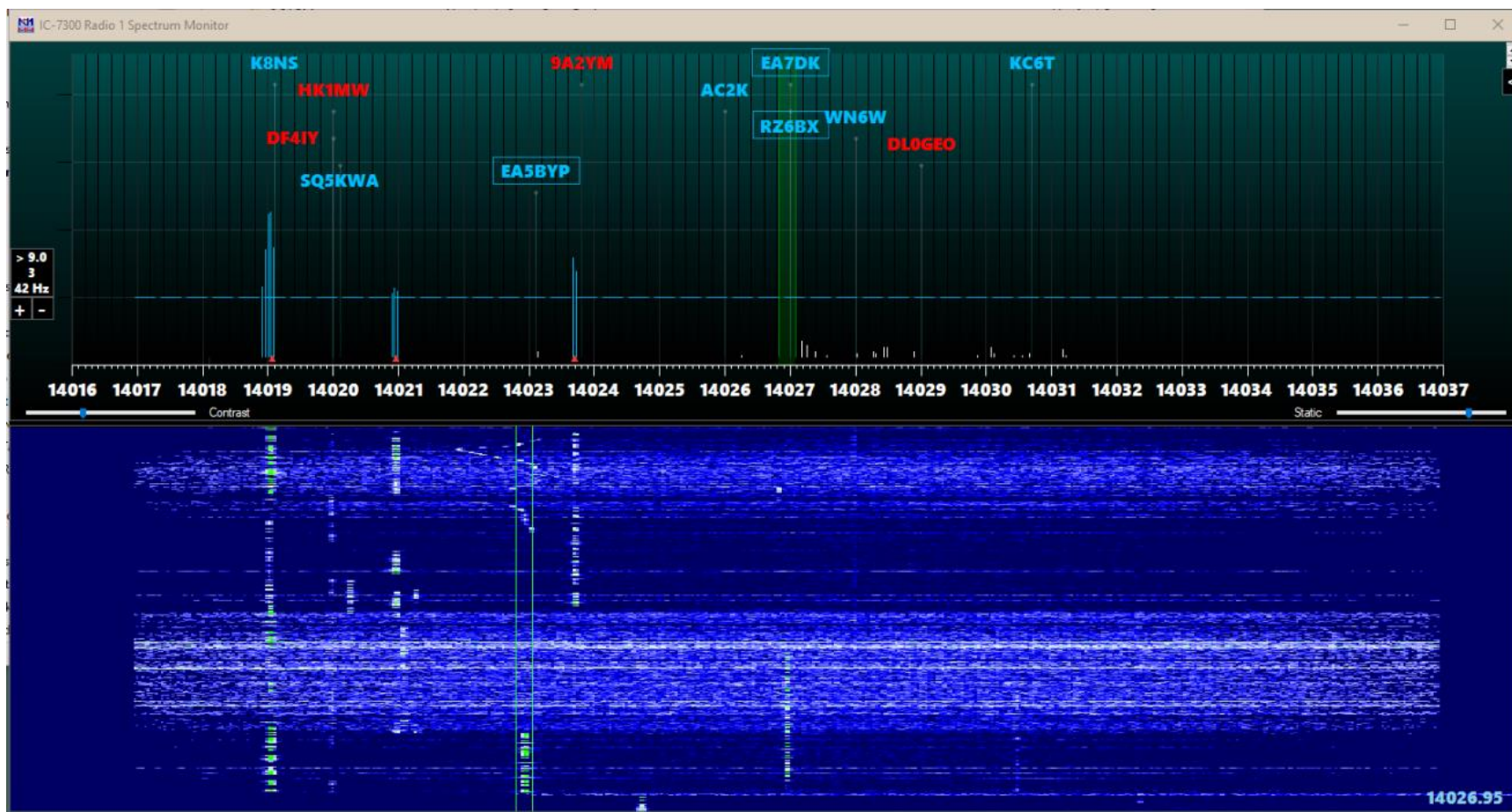


LP-Pan and NaP3

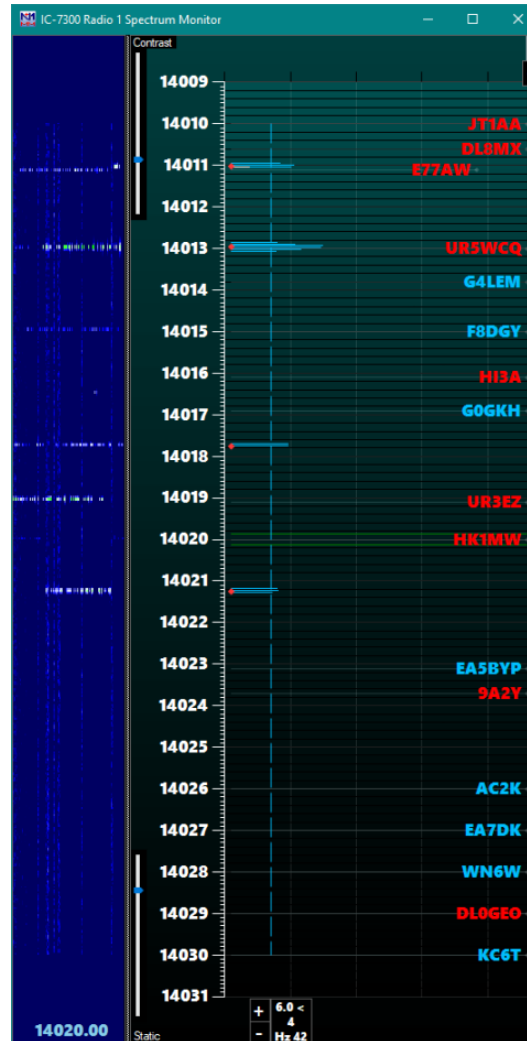




N1MM+ Spectrum Display Window



N1MM+ Vertical Spectrum Display Window



N1MM+ with Spectrum Display



The screenshot displays the N1MM+ software interface. The top window is the 'Airsy Spectrum Monitor' showing a spectrum plot with various call signs labeled, including SP9RV, CN2WW, K83VQU, SQ9MDK, K4SXT, EA1FCL, XX9D, DL5YAD, DK8VD, N4QR, N3FL, K1YAN, N8MD, W8OZ, K3LGH, HAGFQ, VE2JYY, JE3BUD, F5NZY, DL6UKW, K4GMH, KE7L, DLGUKW, K4GMH, KE7L, KK4GFR, N5XE, N8BC, M8SVC, N1IX, DF9ZY, SP2HKA, and K13HL. The plot shows signal strength in dBm (0 to 15) versus frequency in kHz (3500 to 3580). Below the plot are controls for contrast and a 'Spectrum' settings panel with options like 'Show These Spots at Top', 'Non-Dupes', 'Dupes', 'Only spots you can hear', 'Show Red Signal Markers at the Base of Traces', 'Show These Red Markers', 'Non-Dupes', 'Dupes', 'Only Unknown Signals', and 'Self Spot Signals Above Threshold'.

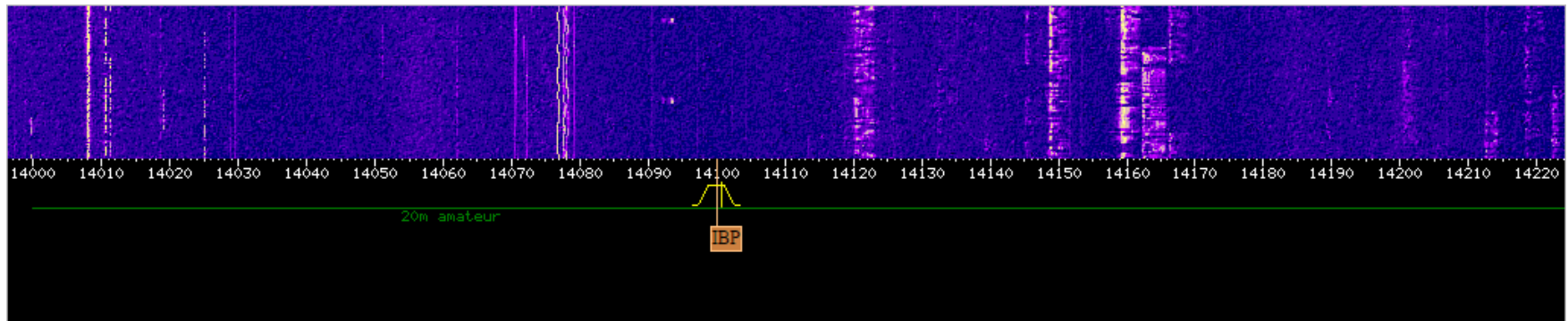
Other windows include: 'Check Log/Master/Telnet/Call history/Reverse lookup' with columns for Log #, Master, Telnet, and Call hist; 'Dupesheet - IC-7800 Radio 13.5 MHz' showing a table of call signs; 'Score - 0 Points' showing 'Band Mode QSOs Pts Mlt Pt/Q' and '1 Mult = 1.0 Q's'; 'Manual Radio 2' showing a list of call signs like VU2MV 28*, JA7BSF 334*, K1G 49*, K1GHL 49*, E71A 52*, K8T 280*, VE2VA 71*, YV5DRN 165*, YV5DRN 165*, SS1KD 52*, UJUFZ 56*, UA0CKD 341*, UJUFZ 346*, EA80M 85*, EF80 85*, and PY2LOG 154*.

The bottom windows show the 'CW Manual Radio 1' and 'CW Manual Radio 2' interfaces, both displaying 'F5NZY' and 'K19T' respectively, with various controls for frequency, power, and mode.

WebSDR: Waterfalls on the Web



- <http://websdr.ewi.utwente.nl:8901/>

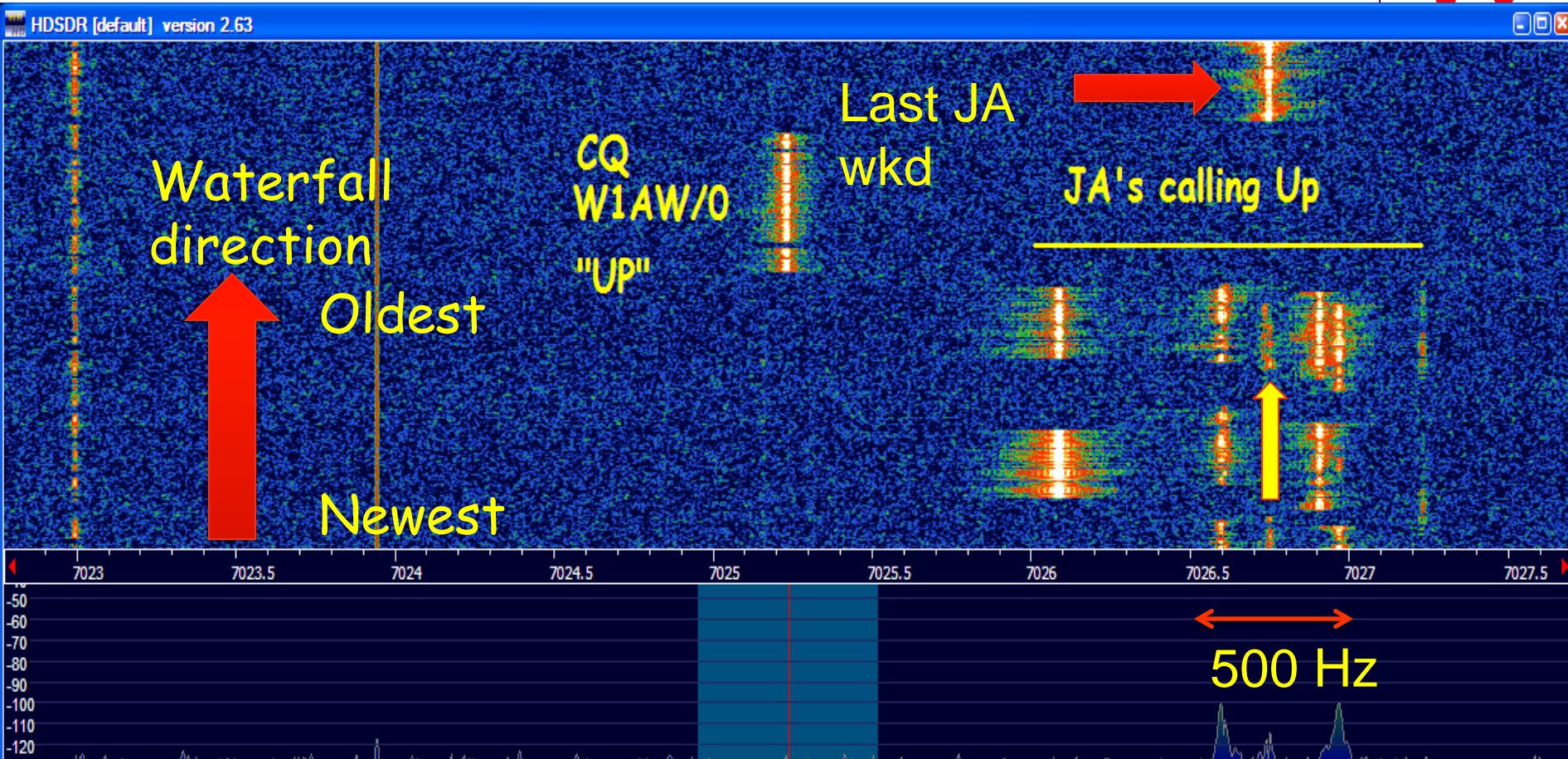


Waterfall Display Advantages



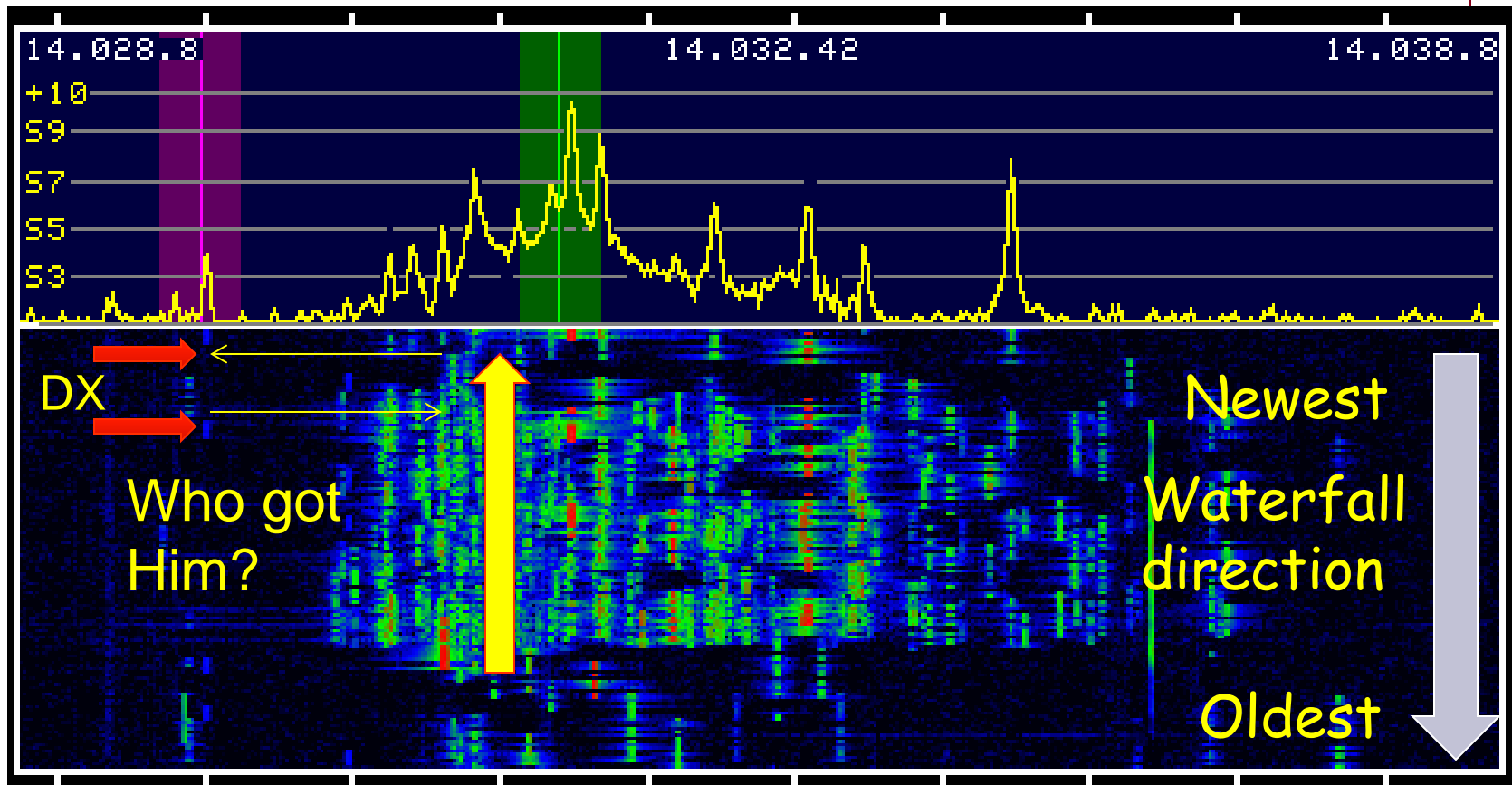
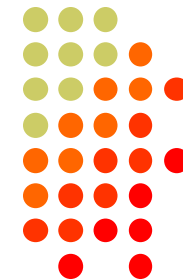
- “Click to Tune” – direct access using a mouse or tap
 - IC-7300, IC-7610, IC-7800 V3.0, IC-7851, Flex/SmartSDR, HDSDR, SDRConsole (but *not* Elecraft P3)
- Jump to Next Signal (N1MM+ Spectrum Display)
- Find “fresh meat” (unidentified signals)
- Weak signals easy to spot (faint traces)
- Many zoom levels: 5, 10, 30, 60, ..., 800 KHz+
 - Watch the whole band at once, or a small slice
- Find clear frequencies *fast*
- Find who the DX just worked, *fast*
- Spot the gaps in a crowded CW pileup

Listening "Up"? Not a problem



Who will W1AW/0 answer next?

E30FB CW Pileup on P3 display



Where will he listen next?

Advantage: Waterfall



- Find “good spots to call” in a CW pileup
- Find clear spots to call CQ
- QRM? You can *see* where to move your VFO to minimize it
- During S&P, find the “next” signal *fast* (no more slow and careful tuning)
- Position VFO B or 2nd receiver without having to *listen* to it
 - S&P while CQing, “SO2V” (single-op, two VFOs)
- Monitor overall band activity
- Keep an eye on the local competition

Waterfall Display *Disadvantages*



- Most radios don't automatically tune from signal-to-signal like CW Skimmer
 - Exception: New N1MM+ Spectrum Display
- Clicking on a signal with the mouse not as precise as tuning with VFO, must still fine tune
- Contest software loses focus when you click on waterfall
- Some find it visually distracting
- Cumbersome to adjust scope width and band edges
- **But, if you're *not* using a waterfall display in a contest, you're really operating "blind"**
- **A waterfall display is really the "killer app"**

Recommendations While Contesting



- Always enable the waterfall
- **Use Fixed Mode** (never “Center” mode)
 - You want the VFO cursor to move, not the scope
- Use narrow 5 - 20 kHz span for CQ, running
- Use wider 40 -100 kHz span for S&P, tuning
- Logging software can and should automate this:
 - In Win-Test, type **SPAN20** [Enter] to set a 20 kHz scope span, limited to band edges
 - See <http://bit.ly/wtscripts> - Win-Test Scripts
P3scripts.zip, IcomScripts.zip, includes source code

Winrad on Top, Win-Test on Bottom



The screenshot displays two software windows. The top window is Winrad, showing a waterfall plot with a frequency marker at 7.00295 MHz. The bottom window is Win-Test, showing various logging and statistics panels.

Winrad Interface:

- Buttons: Show Options, Select Sound Card, Select Sample Rate, Stop, Minimize, About, Exit
- Frequency: 7.00295 MHz
- Waterfall plot showing signal activity across a frequency range from 6.990 to 7.100 MHz.

Win-Test Interface:

- File Edit Operating Commands Messages Tools Windows Options Help
- Worked States/Provinces [0/68]
- 08:46:28 N6TV SR 1511z SS 0049z RUN
- Radio 1: Vfo A 280300, SPLIT 280250
- Radio 2: Vfo A 70029, SPLIT 70000
- Map: World map showing signal coverage.
- Rate: All bands - All modes, Last hour: 0 Q/h, 10 last QSO: 0 Q/h, 100 last QSO: 0 Q/h, Since 0800z: 0 QSO
- Min: 0 Q/h, Max: 9 Q/h, Moving graph computed on 10 mins, Elapsed time since the last QSO: 0 sec
- All bands - All modes, Time by mult: 0 Pts, 1 QSO counts: 0 Pts, 1 mult counts: 0.0 MULT
- CW 24 WPM
- Extra information: C:\Documents and Settings\All Use
- N6TV data
- Summary: MODE QSO DUP DXC MLTS POINTS AVG, CW 0 0 0 0 0 0.00, SSB 0 0 0 0 0 0.00, TOTAL 0 0 0 0 0 0.00, FINAL SCORE: 0

Winrad & Win-Test (zoomed)



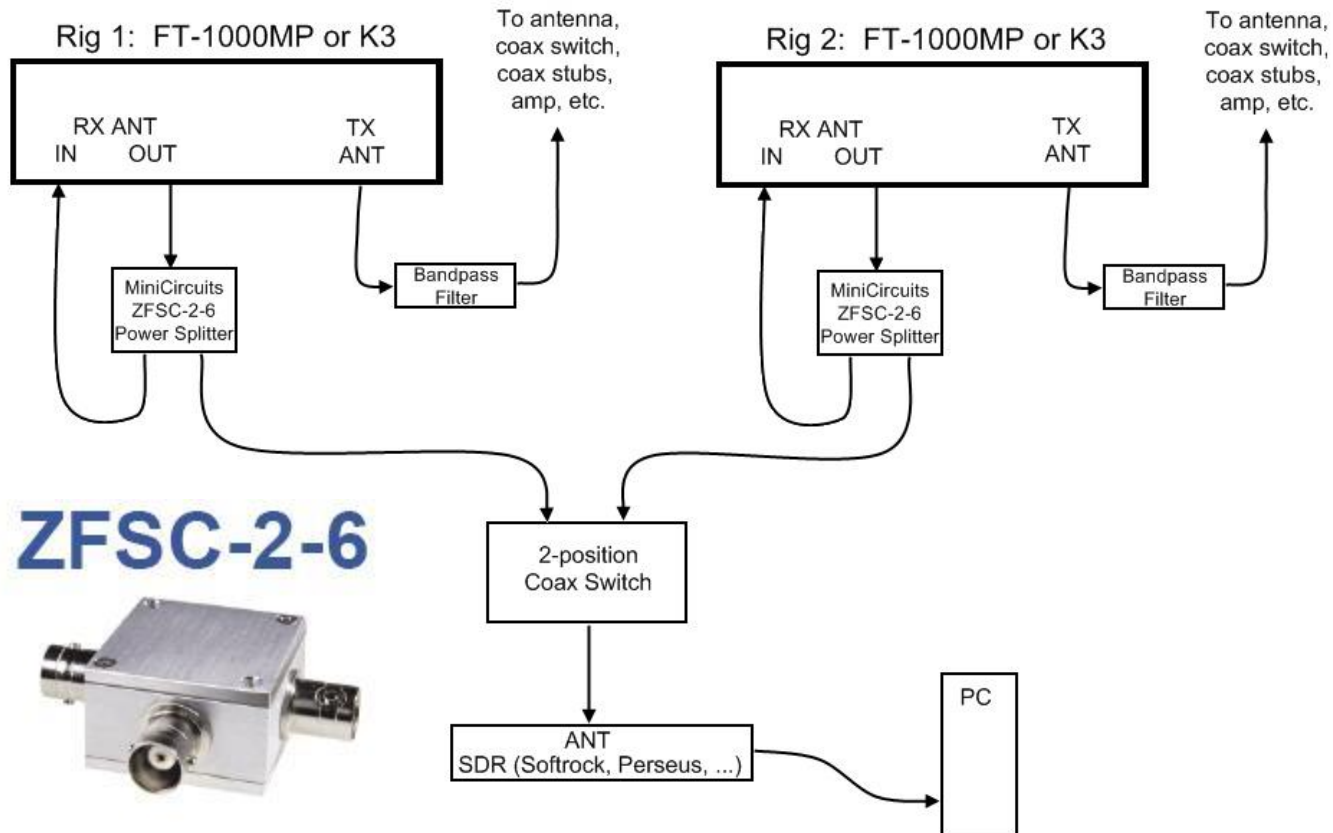
The screenshot shows the Winrad software interface. At the top, there are buttons for 'Show Options', 'Select Sound Card', 'Select Sample Rate', 'Stop', 'Minimize', 'About', and 'Exit'. Below these are sliders for 'Gain' and 'Contrast'. The main display is a waterfall plot showing frequency from 6.990 to 7.060 MHz. The plot shows a dense blue background with several vertical lines of varying colors (yellow, green, blue) indicating signals. Below the plot is a menu bar with 'File', 'Edit', 'Operating', 'Commands', 'Messages', 'Tools', 'Windows', 'Options', and 'Help'. The main window title is 'WT - ARRL10m09.wt4 [STN1]'. Below the menu bar is a table titled 'Worked States/Provinces [0/68]' with a help icon and a close icon. The table has columns for state/province abbreviations and a time column. The time shown is 08:46:28. The table content is as follows:

Worked States/Provinces [0/68]													08:46:28	N6TV	SR 1511z	SS 0049			
K1	CT	MA	ME	NH	RI	VT	K2	NJ	NY										
K3	DE	PA	MD	DC	K4	AL	FL	GA	KY	NC	SC	TN	VA						
K5	AR	LA	MS	NM	OK	TX	K6	CA											
K7	AZ	ID	MT	NV	OR	UT	WA	WY	K8	MI	OH	WV							
K9	IL	IN	WI	K0	CO	IA	KS	MN	MO	ND	NE	SD							
VE9	NB	VE1	NS	VO1	NF	VY2	PEI	VO2	LB	VE2	QC	VE3	ON						
VE4	MB	VE5	SK	VE6	AB	VE7	BC	VE8	NT	VY1	YT	VY0	NU						
KL7	AK	KH6	HI	/MM	R1	R2	R3												

Click-To-Tune with a “Legacy” Transceiver + SDR

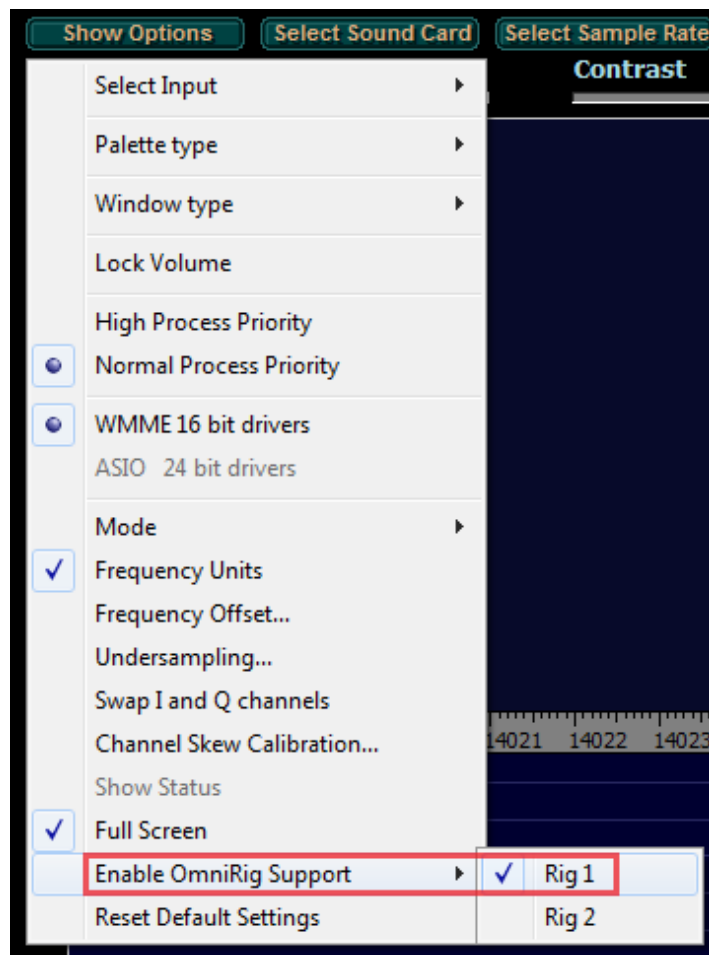


Adding a Software Defined Radio (SDR)
to an SO2R Station



Drawing by N6TV@arrl.net 31 May 2008

Use Omnirig support in Winrad or HDSDR to sync freq. with any transceiver



Try Winrad Waterfall Demo



- Perseus SDR used to make a wideband recording (122 KHz for 10 minutes = **300 MB**)
- Demo will play back that recording and others
- To try the demo yourself, follow instructions at
 - <http://www.kkn.net/~n6tv>

Click-To-Tune, IF OUT to LP-PAN 2, NaP3, LP-Bridge



Rig: K3 shown



RS-232 to PC for NaP3, LP-Bridge, CW Skimmer, etc.

IF input
50 ohms
0 dBm max

Power, 11-16VDC
120mA

Sound card: ASUS Xonar U7
USB shown



Headphone or
Powered
Speaker

Headphone & Line In
jacks are
1/8" / 3.5mm
Stereo

USB to PC
on Rear

Q Output (Right/Red)

I Output (Left/White)

LP-PAN 2



Mute Input-
short to mute
Usually not needed

1/8" : 3.5mm
Mono Plugs

Questions?



- <http://www.winrad.org> - Winrad software
- <http://http://www.hdsdr.de/> - HDSDR software
- <http://sdr-radio.com/Software> - SDRConsole
- <http://n1mm.hamdocs.com/tiki-index.php?page=Spectrum+Display+Window> – N1MM+ Spectrum Display setup
- <http://www.kkn.net/~n6tv> - Winrad demo file
- <http://www.telepostinc.com/LP-PAN.html>
- <http://www.qrz.com/db/n6tv> - Links to this and other presentations