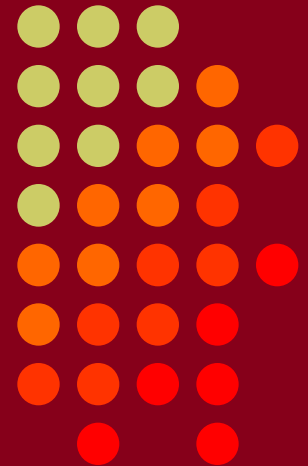


# The Advantages of Waterfall Displays for Contesting and DXing

Presented by N6TV

[n6tv@arrl.net](mailto:n6tv@arrl.net)



• CTU •  
CONTEST  
UNIVERSITY

# Presentation Overview

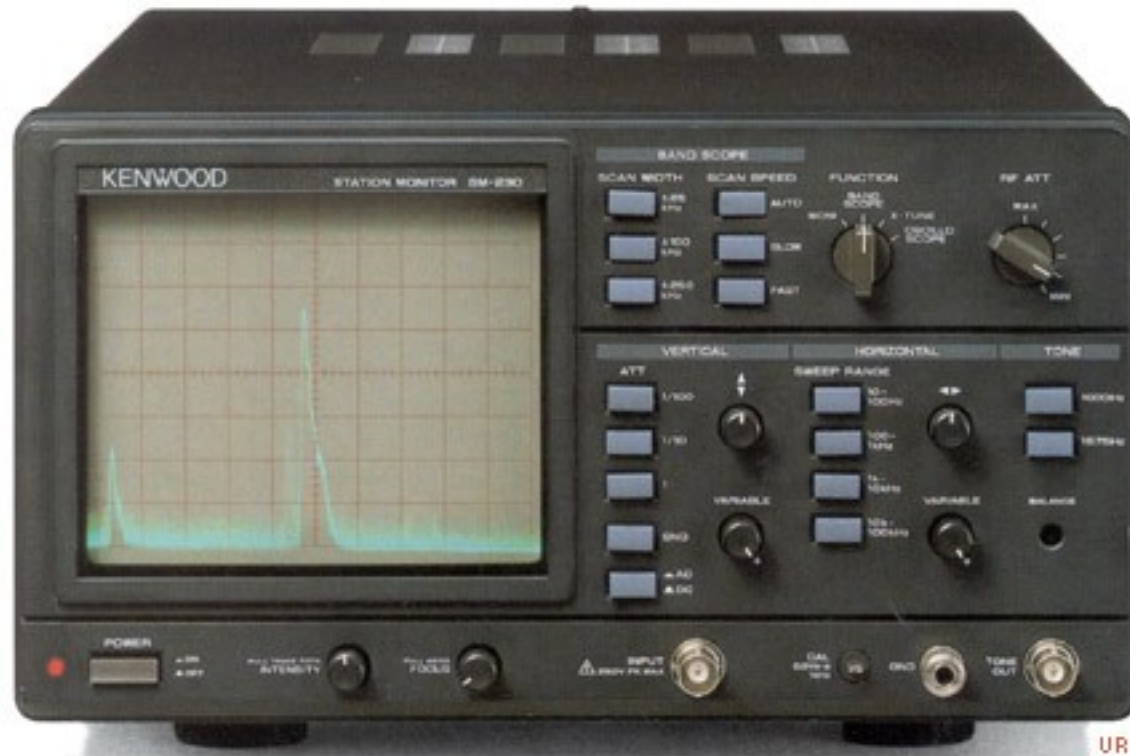


- Legacy “Panadapters”
- Waterfall scope in CW Skimmer
- Latest radios with waterfall displays
- Waterfall display advantages & disadvantages
- How to use waterfall displays while contesting or DXing
- Q & A

# Legacy Panadapters



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



UR

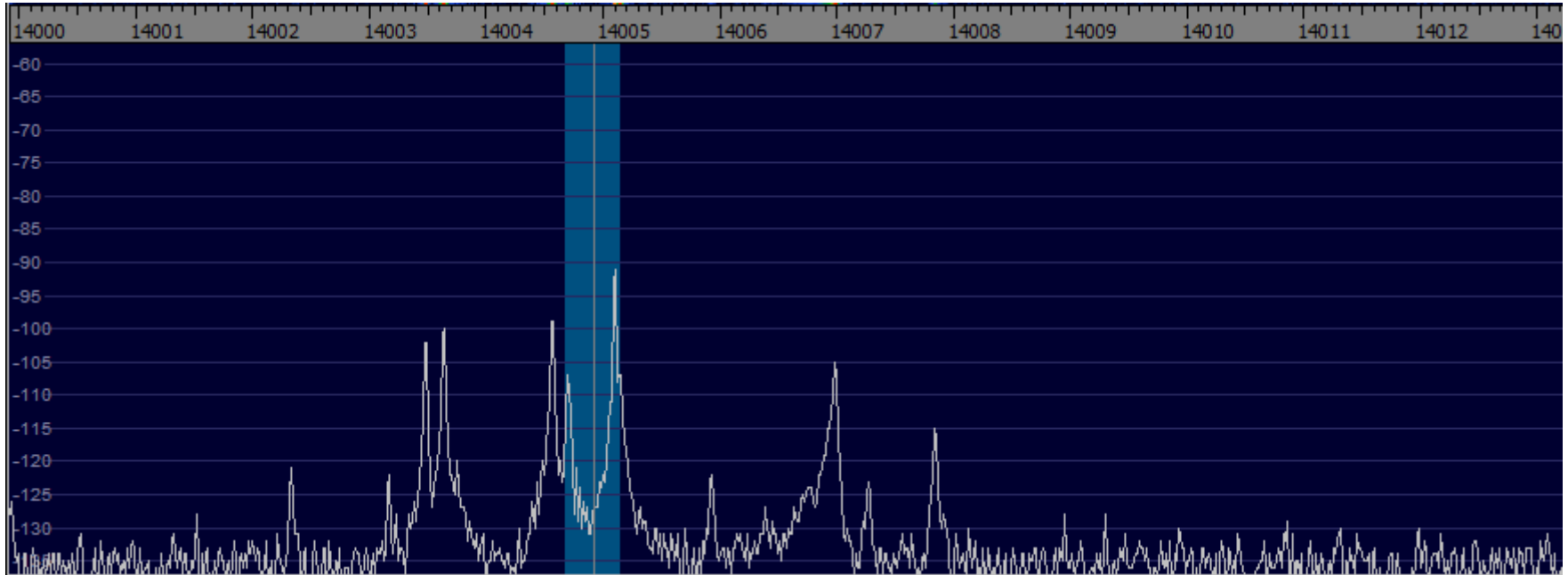


# Legacy Panadapters

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



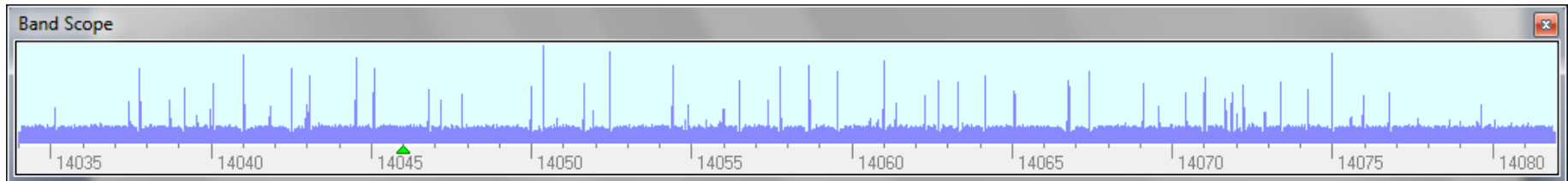
# Spectrum Displays Hide Weak Signals





# CW Skimmer's Band Scope

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



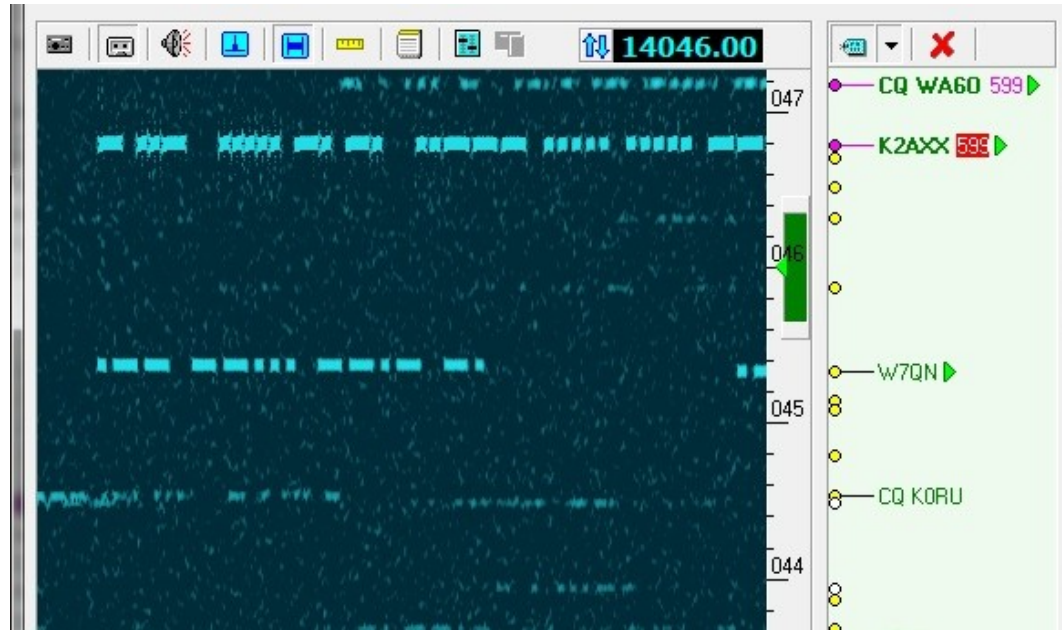
- Much better resolution, but display is very jumpy
- No “peak signal” memory
- Not useful on SSB

# 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

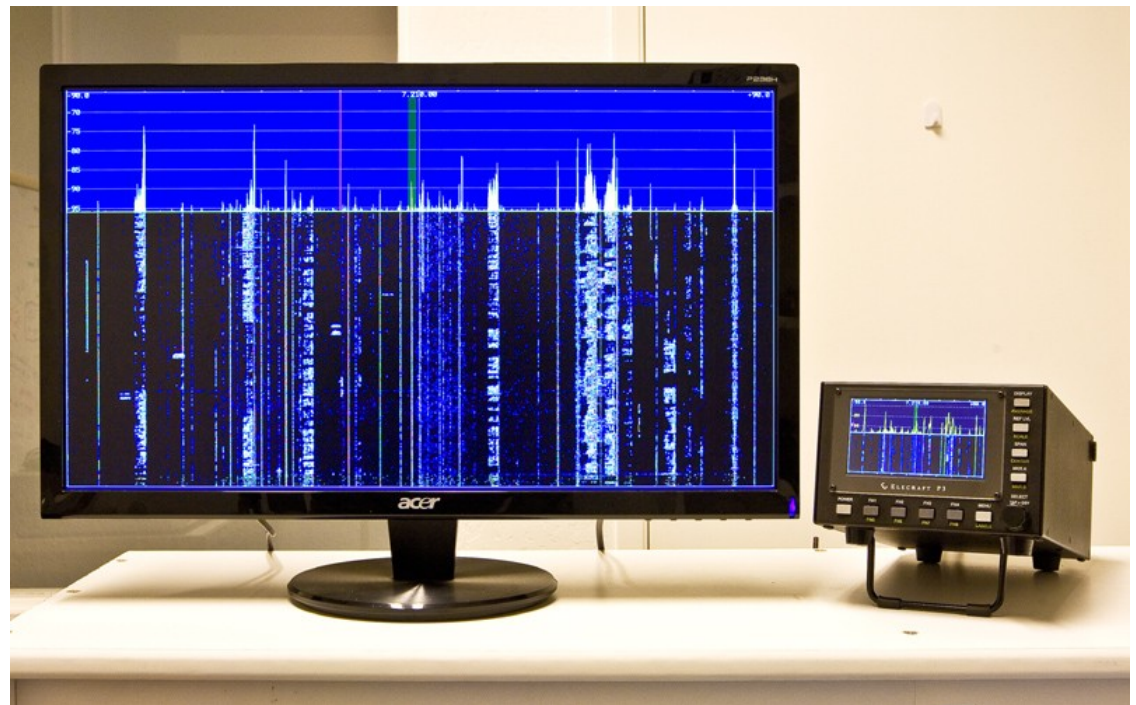


- Major improvement over legacy designs

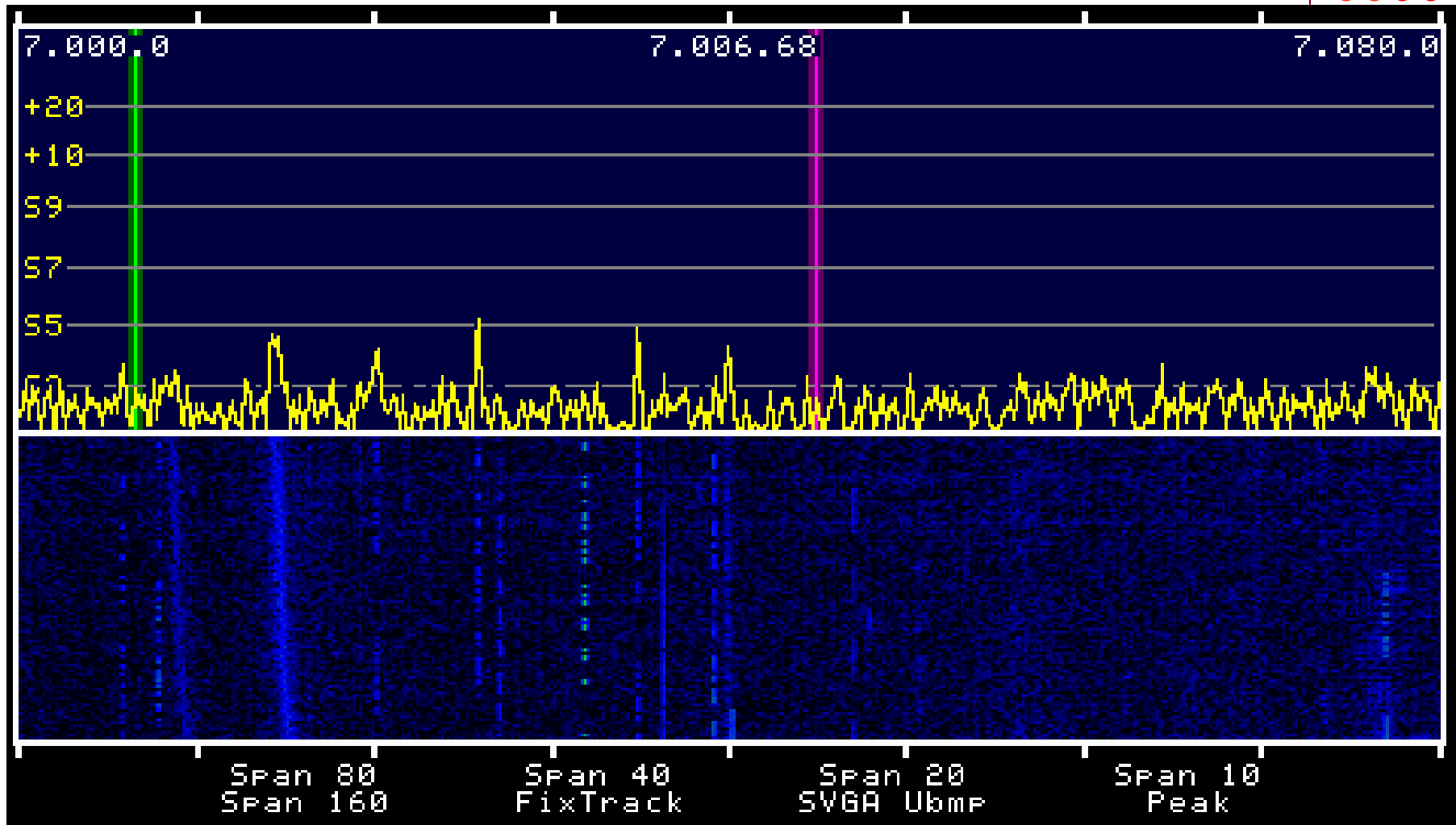
# Elecraft P3 + P3SVGA Option



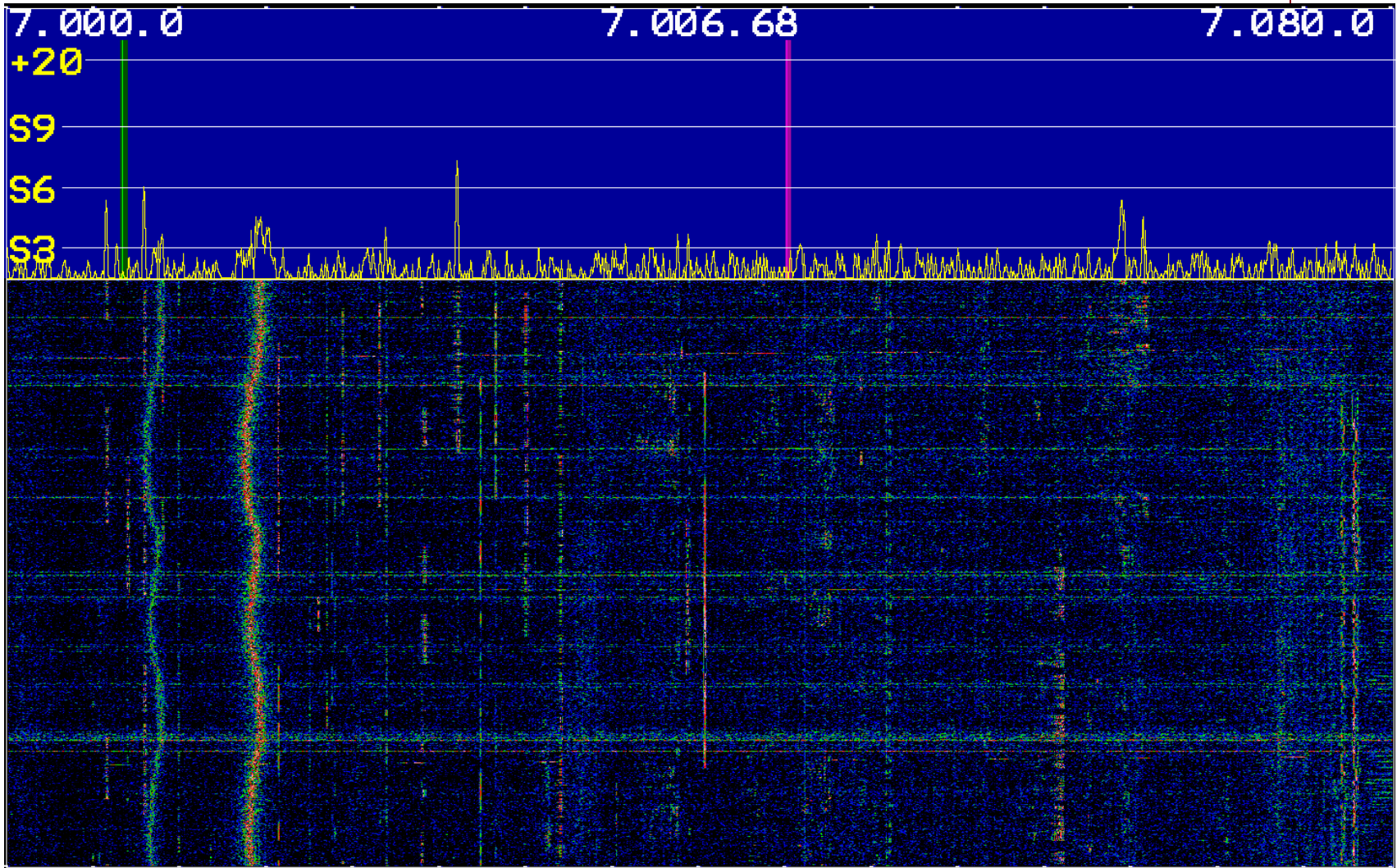
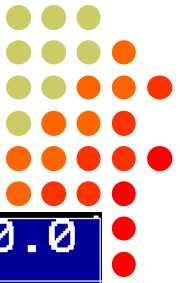
- P3 resolution only 480 x 272 pixels
- P3SVGA: internal SVGA Large Screen Adapter
  - 1024 x 768
  - 1280 x 1024
  - 1440 x 900
  - 1920 x 1080
- Displays far more signals



# P3 Built-in Display at 480 x 272



# P3SVGA at 1440 x 900



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ICOM 12

# Old Icom IC-7800 firmware



# Icom IC-7800 with V3.0 firmware

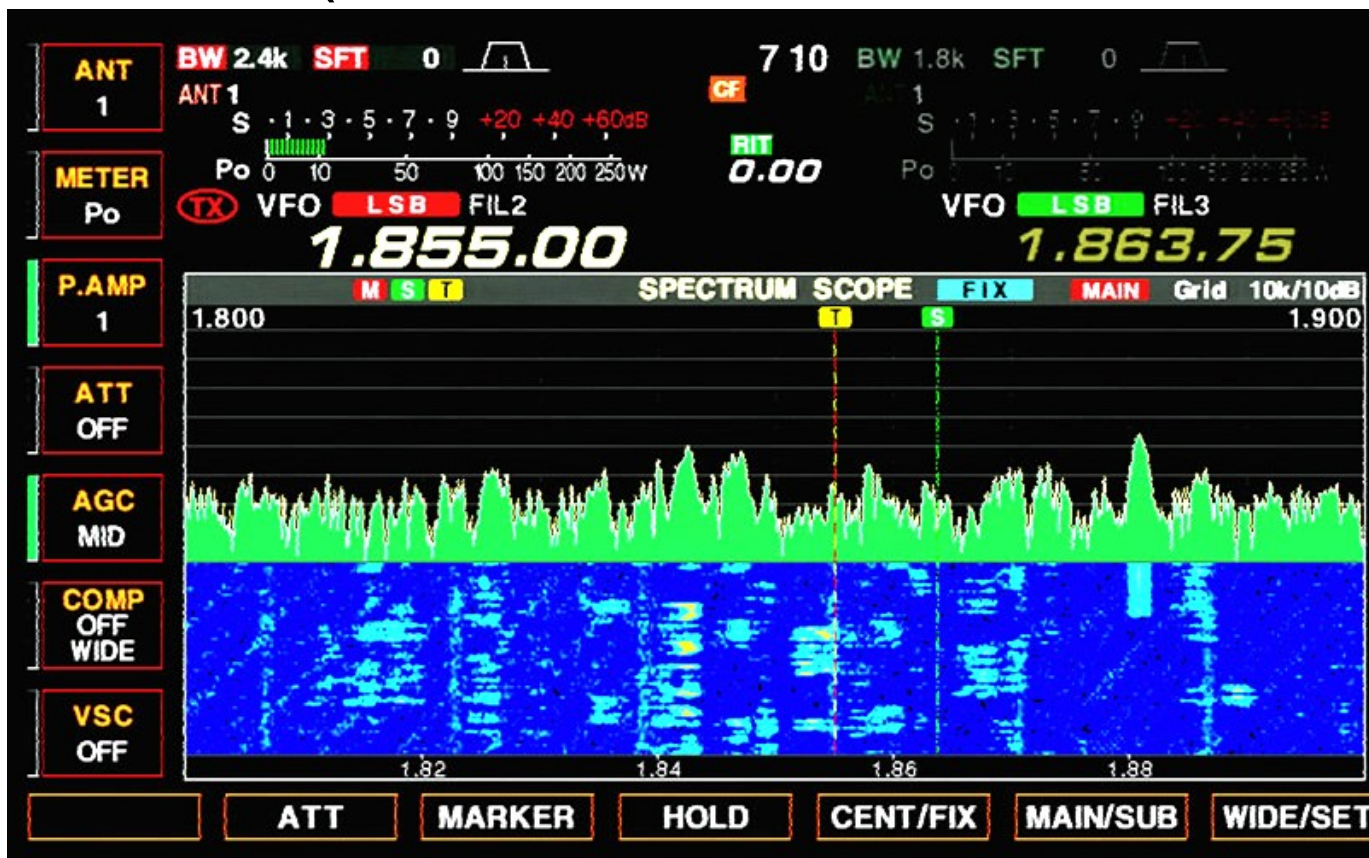




# IC-7800 V3.0 Screen Shot

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



# New IC-7610 with dual band waterfall



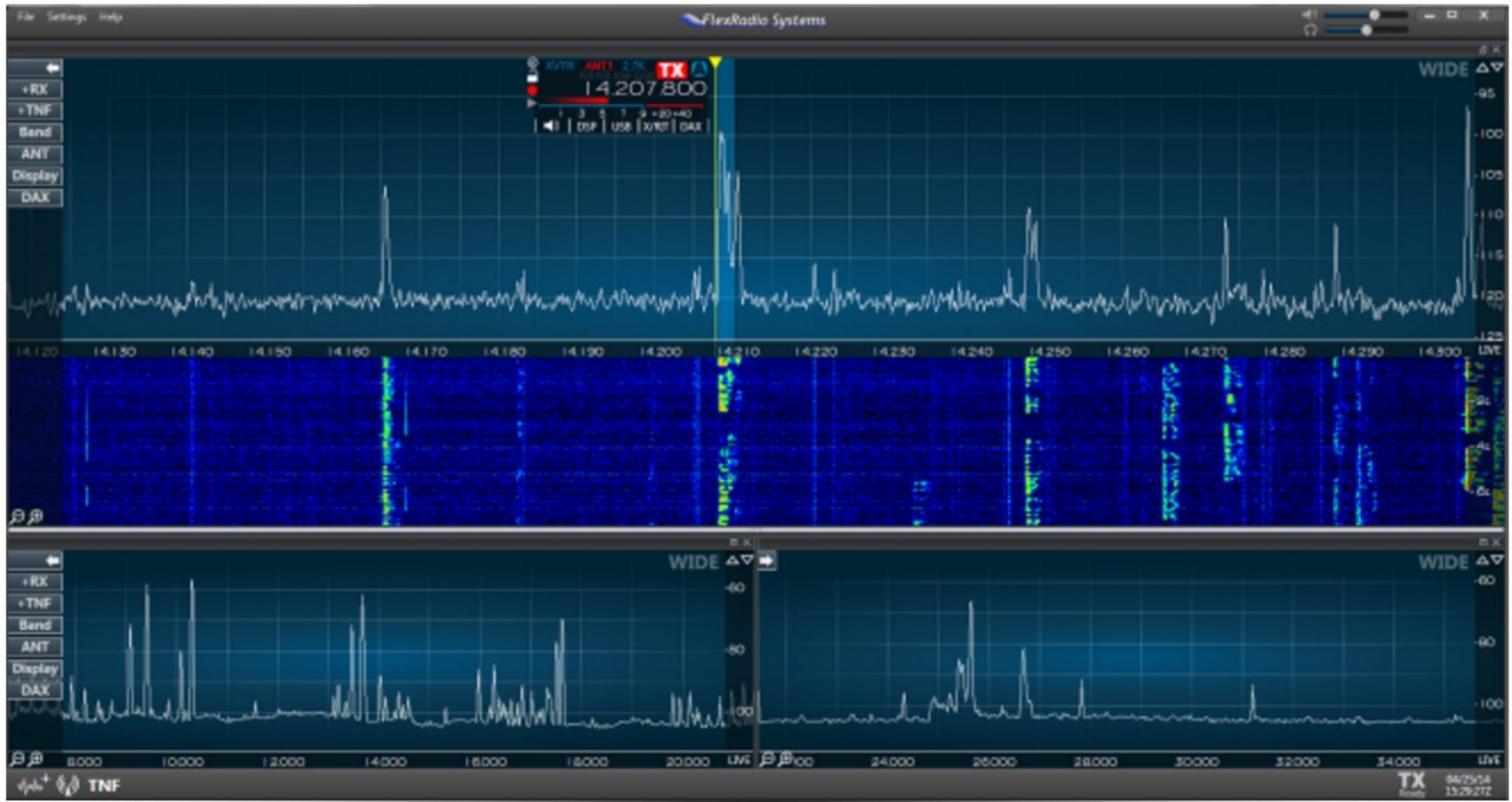
# Kenwood TS-990S



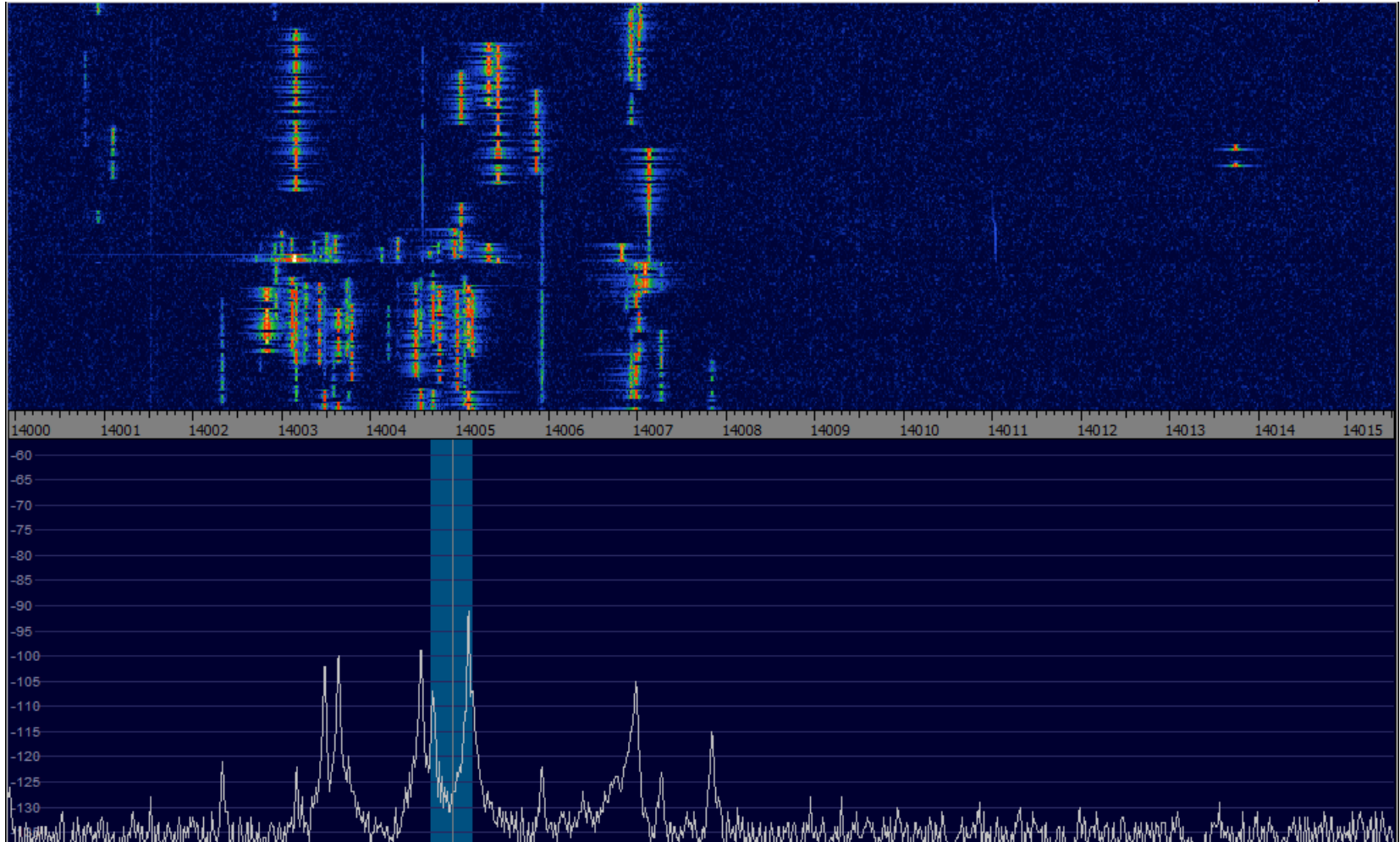
# FlexRadio FLEX-5000™, FLEX-6700™



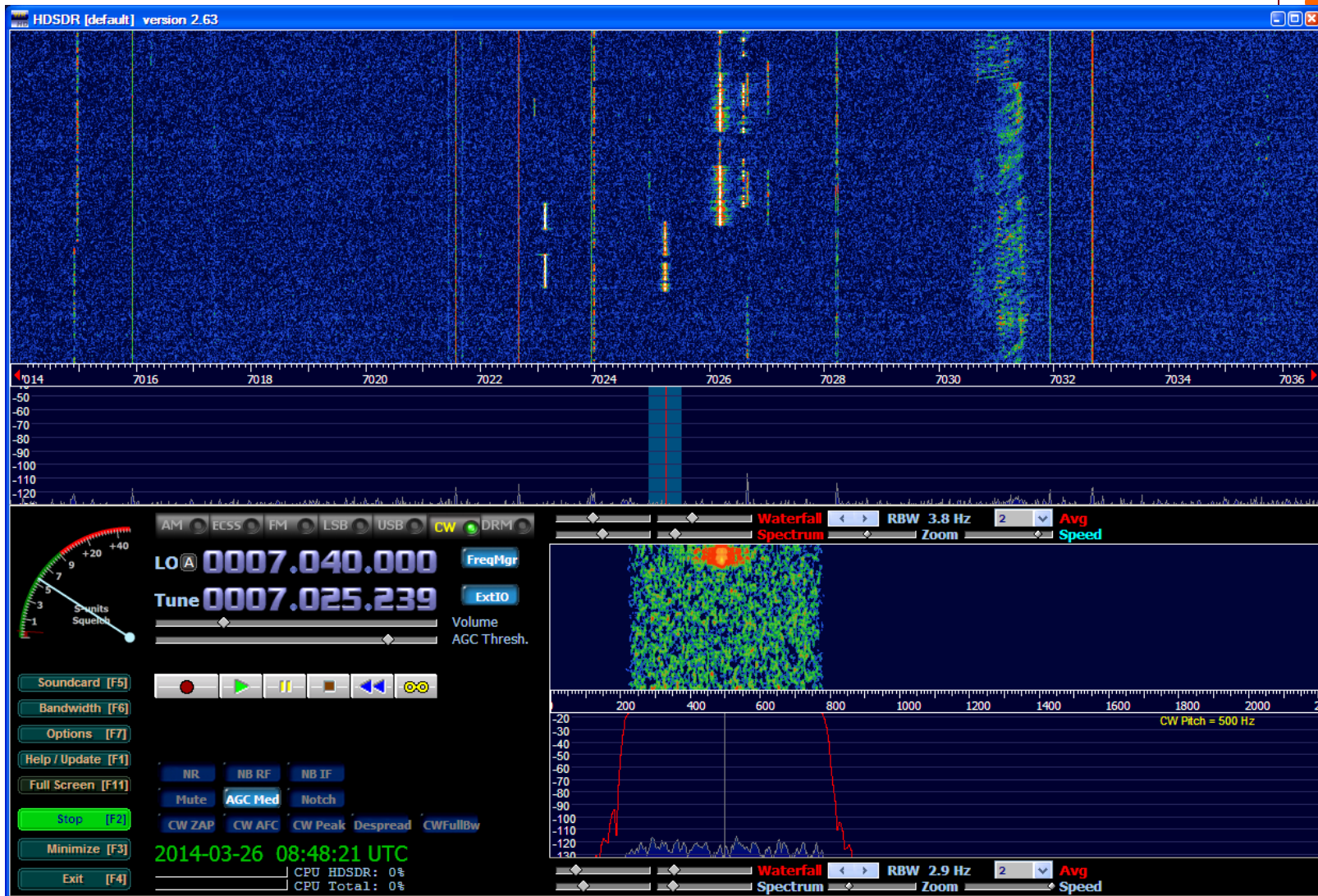
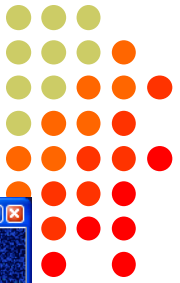
# FlexRadio Systems® SmartSDR



# Winrad Software

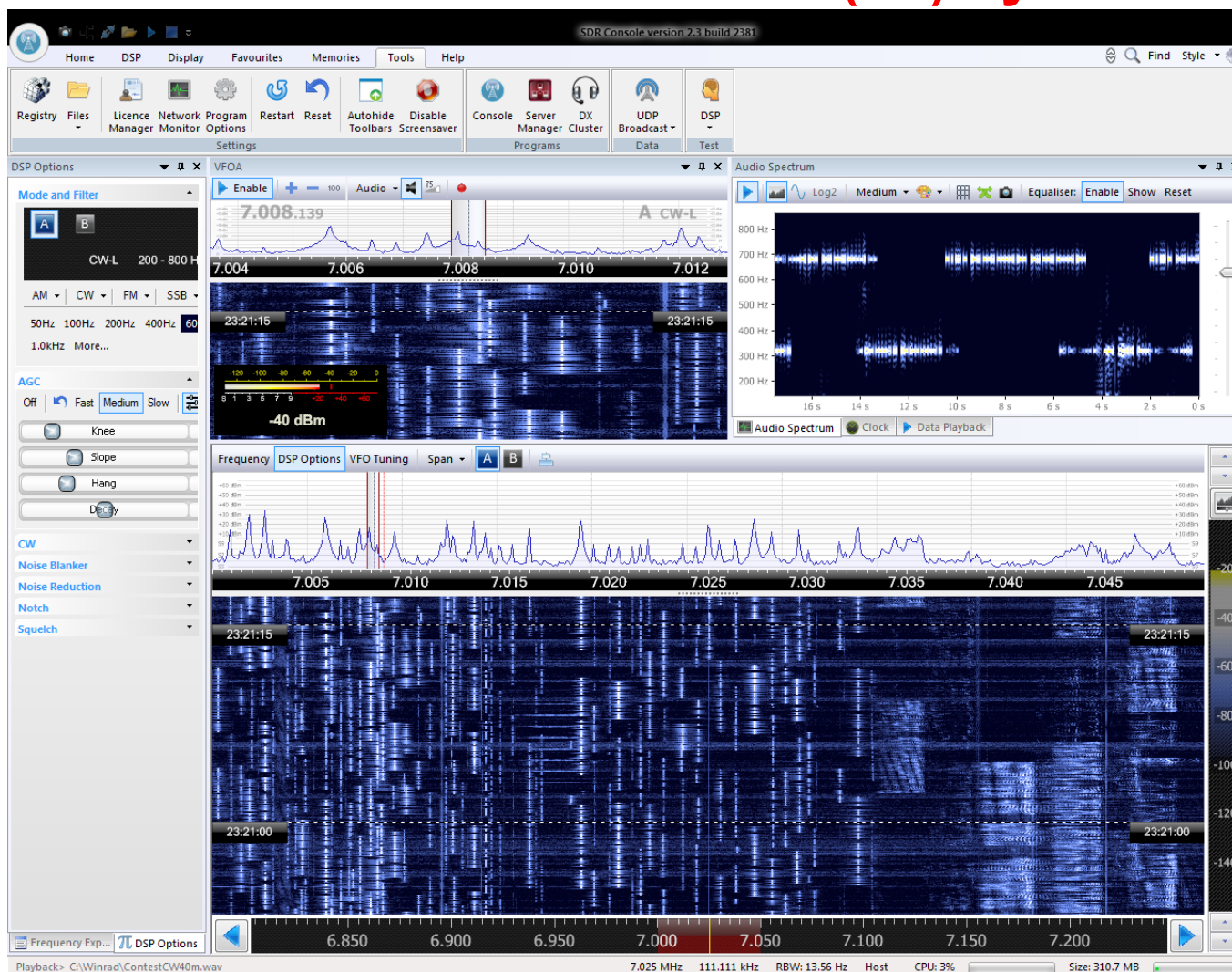


# HSDR Software





# SDR-Radio.com SDRConsole (V2) by HB9DRV

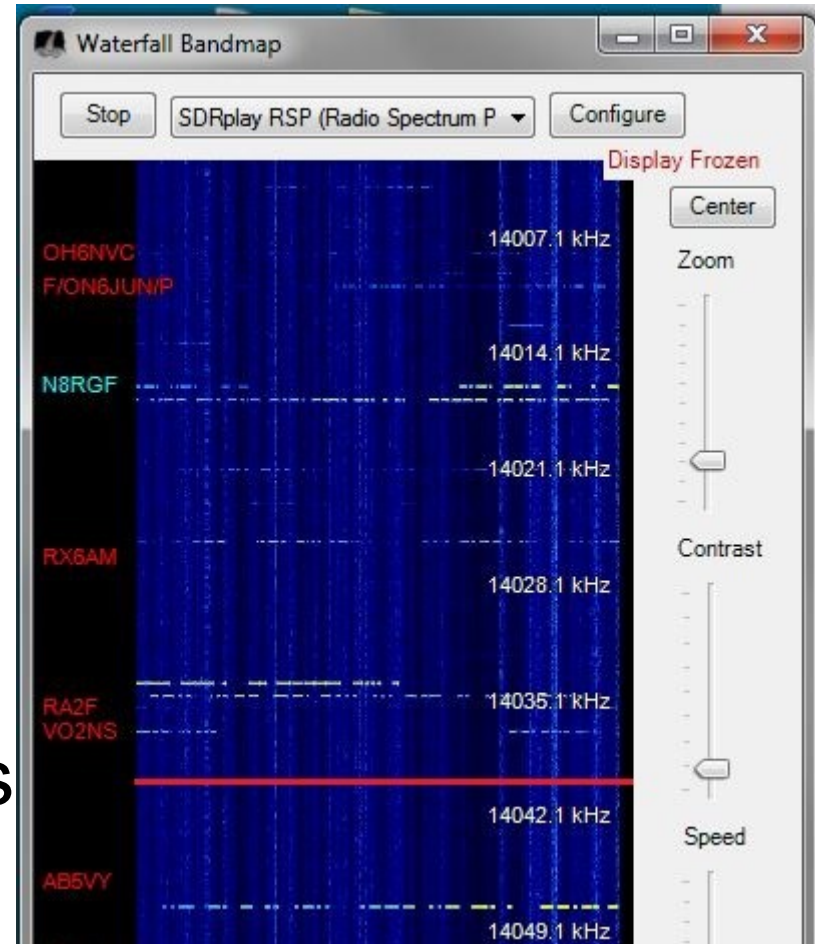




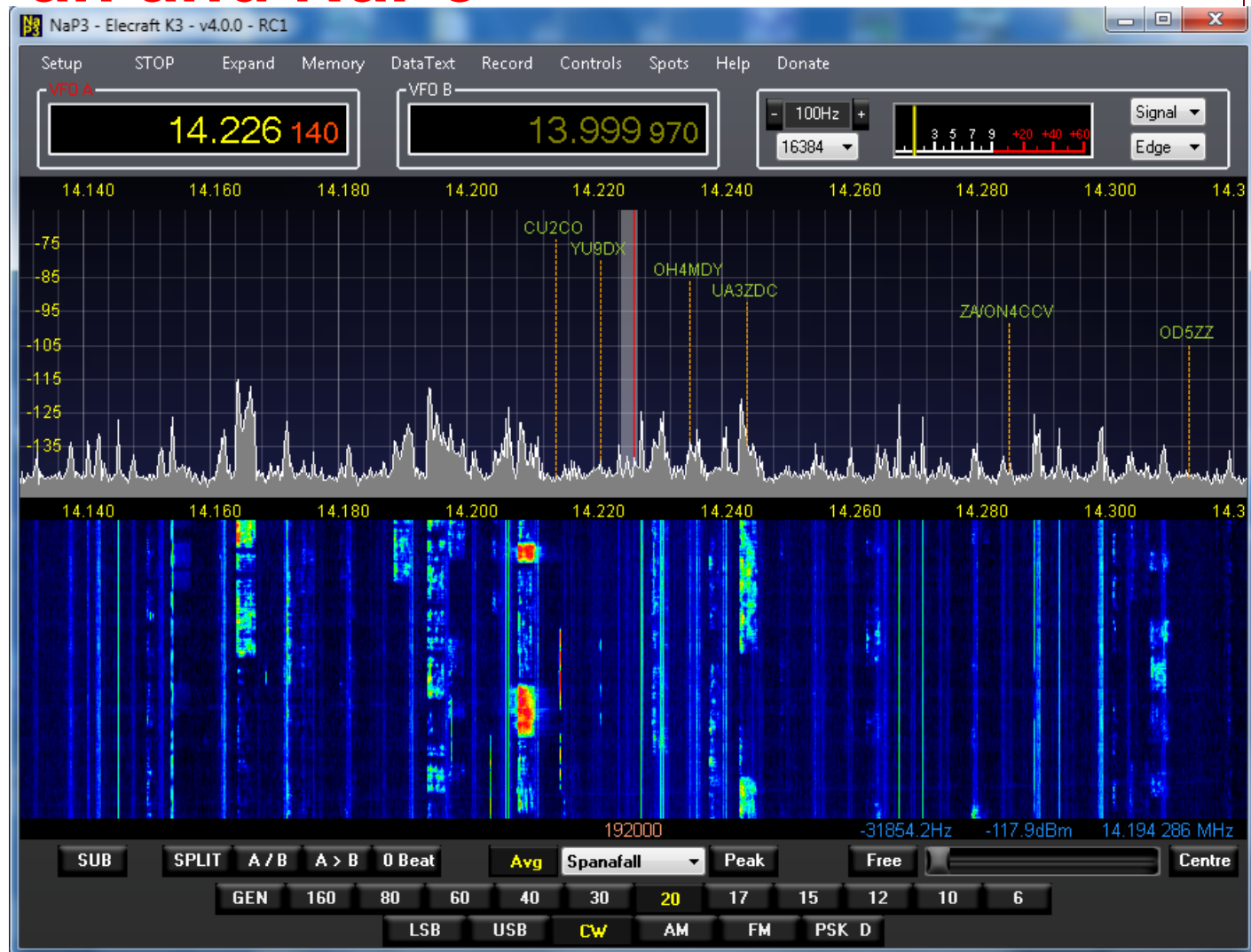
# Waterfall Bandmap by N2IC (new for N1MM+)



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



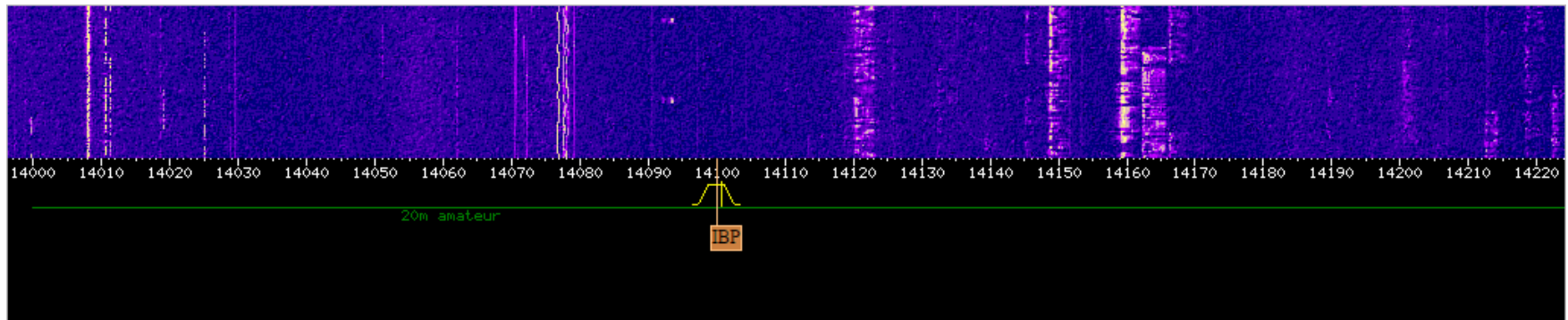
# LP-Pan and NaP3



# WebSDR: Waterfalls on the Web



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

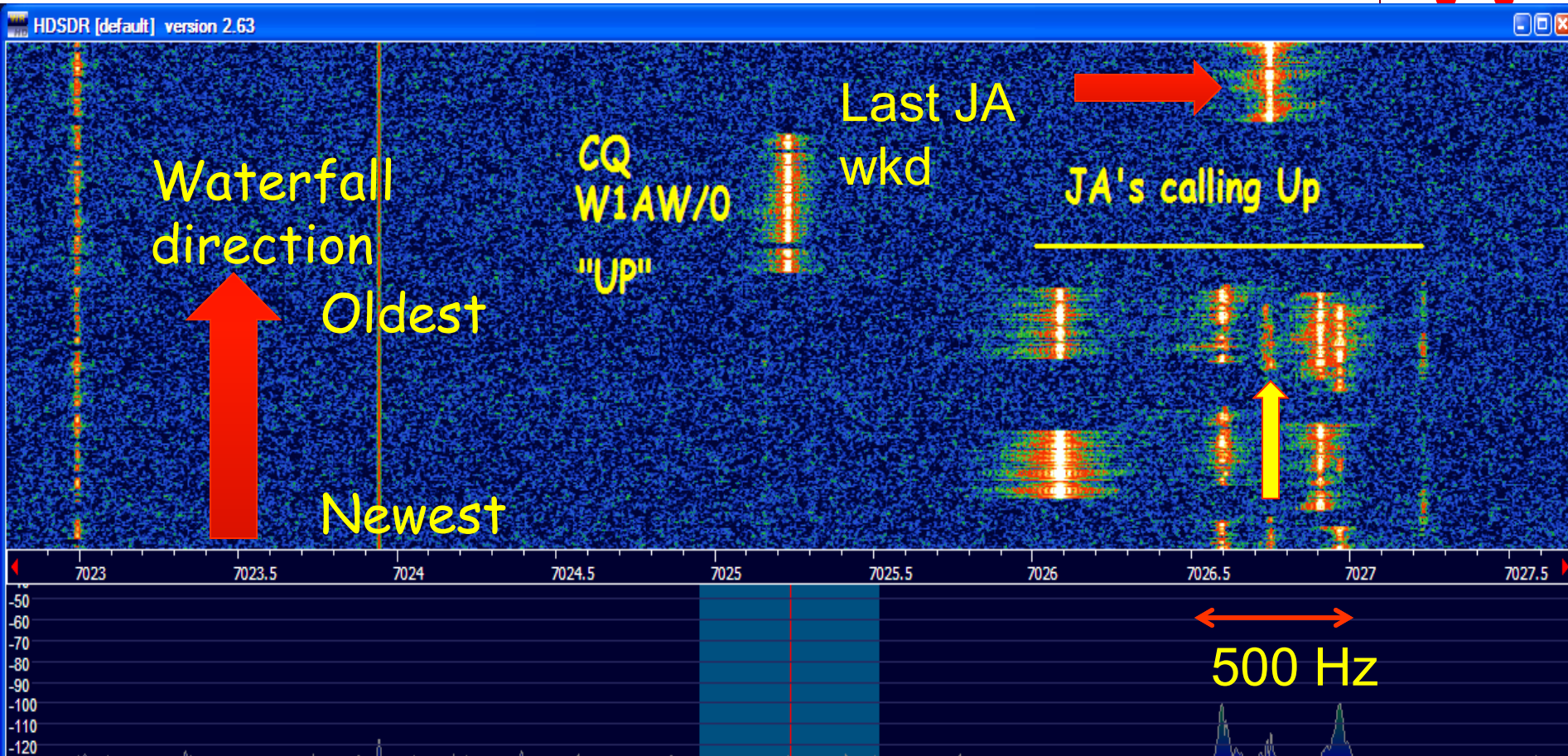


# Waterfall Display Advantages



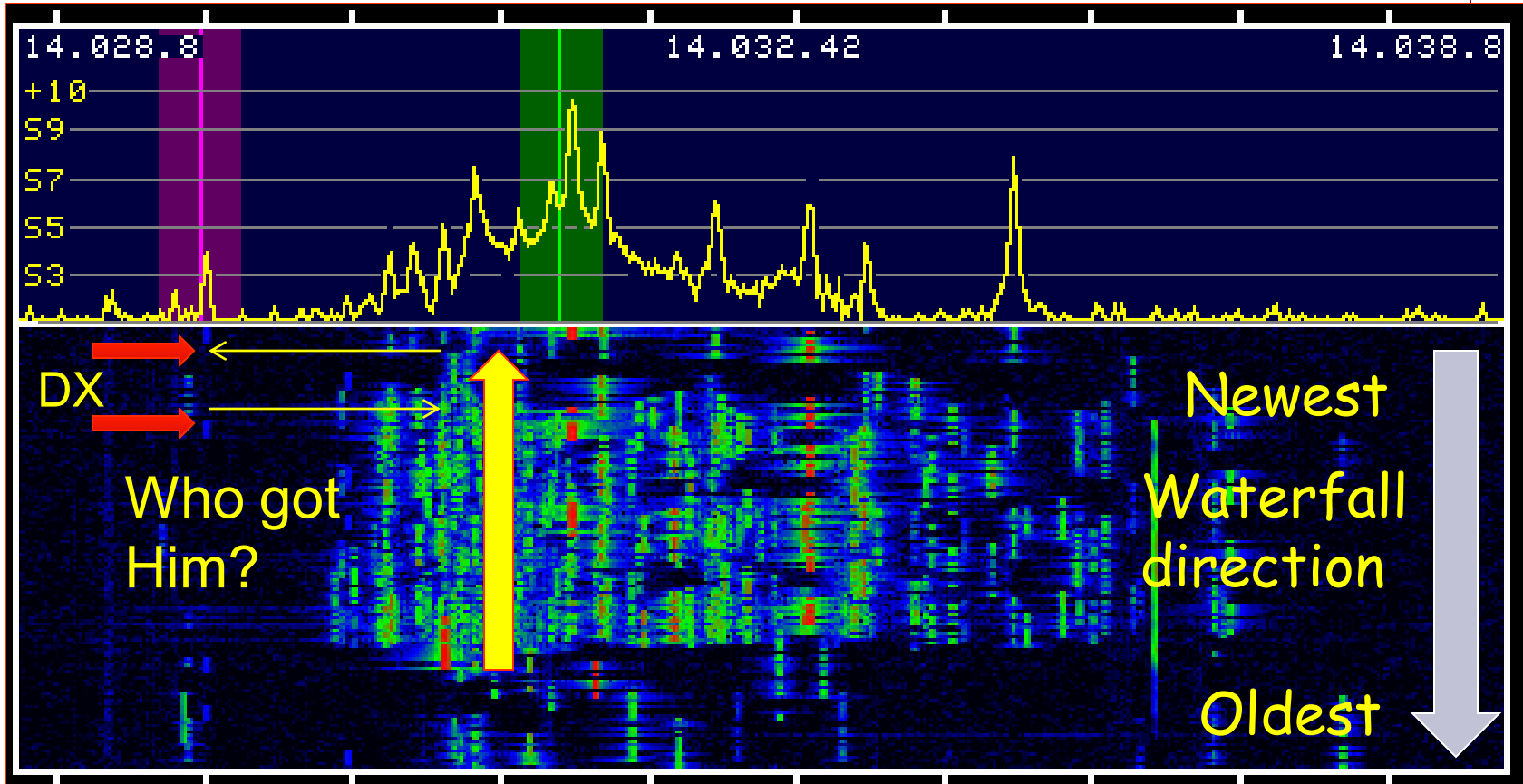
- “Click to Tune” – direct access using a mouse or tap
  - IC-7300, IC-7610, IC-7800 V3.0, IC-7851, Flex/SmartSDR, HDSDR, SDRConsole (but *not* Elecraft P3)
- Weak signals easy to spot (faint traces)
- Many zoom levels: 5, 10, 30, 60, ..., 800 KHz+
  - Watch the whole band at once, or a small slice
- 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 2<sup>nd</sup> 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*



- Radios don't automatically tune from signal-to-signal like CW Skimmer (yet)
- 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 image shows two software windows. The top window is Winrad, displaying a spectrum plot with a red circle around the frequency '7.002 95 MHz'. The bottom window is Win-Test, showing various statistics and a map. A red circle highlights the 'Radio 2' frequency '7.002.9' on the map.

**Winrad Interface:**

- Buttons: Show Options, Select Sound Card, Select Sample Rate, Stop, Minimize, About, Exit
- Frequency: 7.002 95 MHz
- Plot: Spectrum plot showing signal activity.

**Win-Test Interface:**

- Worked States/Provinces: [0/68]
- Time: 08:46:28, N6TV, SR 1511z, SS 0049z, RUN
- Radio 1: Vfo A: 280300, SPLIT: 280250
- Radio 2: Vfo A: 7.002.9, SPLIT: 7.002.9
- 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
- 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

# Winrad & Win-Test (zoomed)

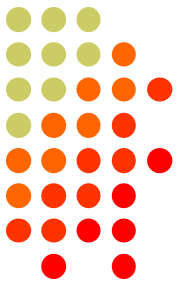


The screenshot shows the Winrad software interface. At the top, there are buttons for 'Show Options', 'Select Sound Card', 'Select Sample Rate', 'Stop', 'Minimize', 'About', and 'Exit'. Below these are sliders for 'Gain' and 'Contrast'. The main display area is a waterfall plot showing a dense blue signal with several vertical dashed lines in yellow and green. The x-axis at the bottom of the plot is labeled with frequencies: 6.990, 7.000, 7.010, 7.020, 7.030, 7.040, 7.050, and 7.060.

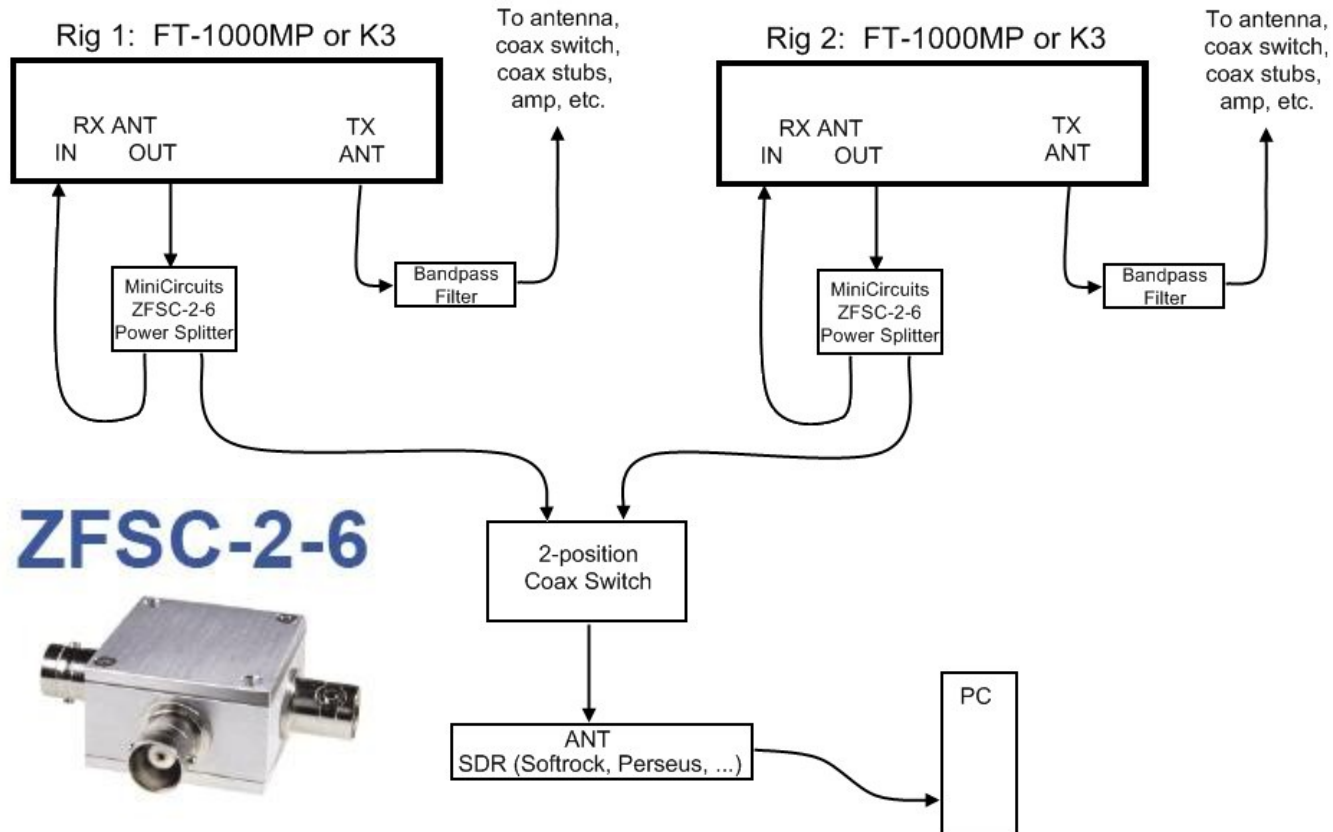
Below the plot is a window titled 'WT - ARRL10m09.wt4 [STN1]' with a menu bar: File, Edit, Operating, Commands, Messages, Tools, Windows, Options, Help. The window contains a 'Worked States/Provinces [0/68]' list and a timer showing '08:46:28'. The list includes the following entries:

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

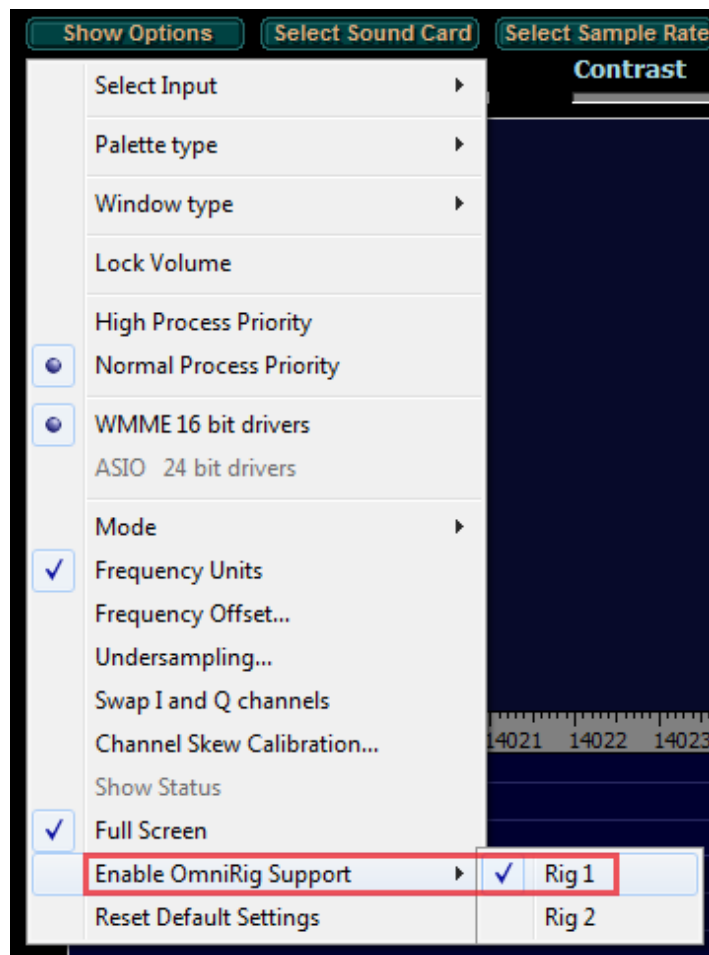


Adding a Software Defined Radio (SDR)  
to an SO2R Station



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://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