

Panoramic Spectrum Displays for Amateur Transceivers

VE3KI

West Carleton Amateur Radio Club

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Technological Basis

- Panoramic spectrum display: special-purpose spectrum analyzer, more or less closely integrated with a transceiver
- Analog: add a simple separate receiver swept-tuned across the band of interest, output displayed on a CRT or equivalent
- Digital:
 - Swept-tuned narrow-band detector within a conventional transceiver
 - Broad band direct-sampled SDR
 - Can be integrated with logging software

Some Platform-Dependent Displays

Analog



Heathkit SB-620



Kenwood SM-230

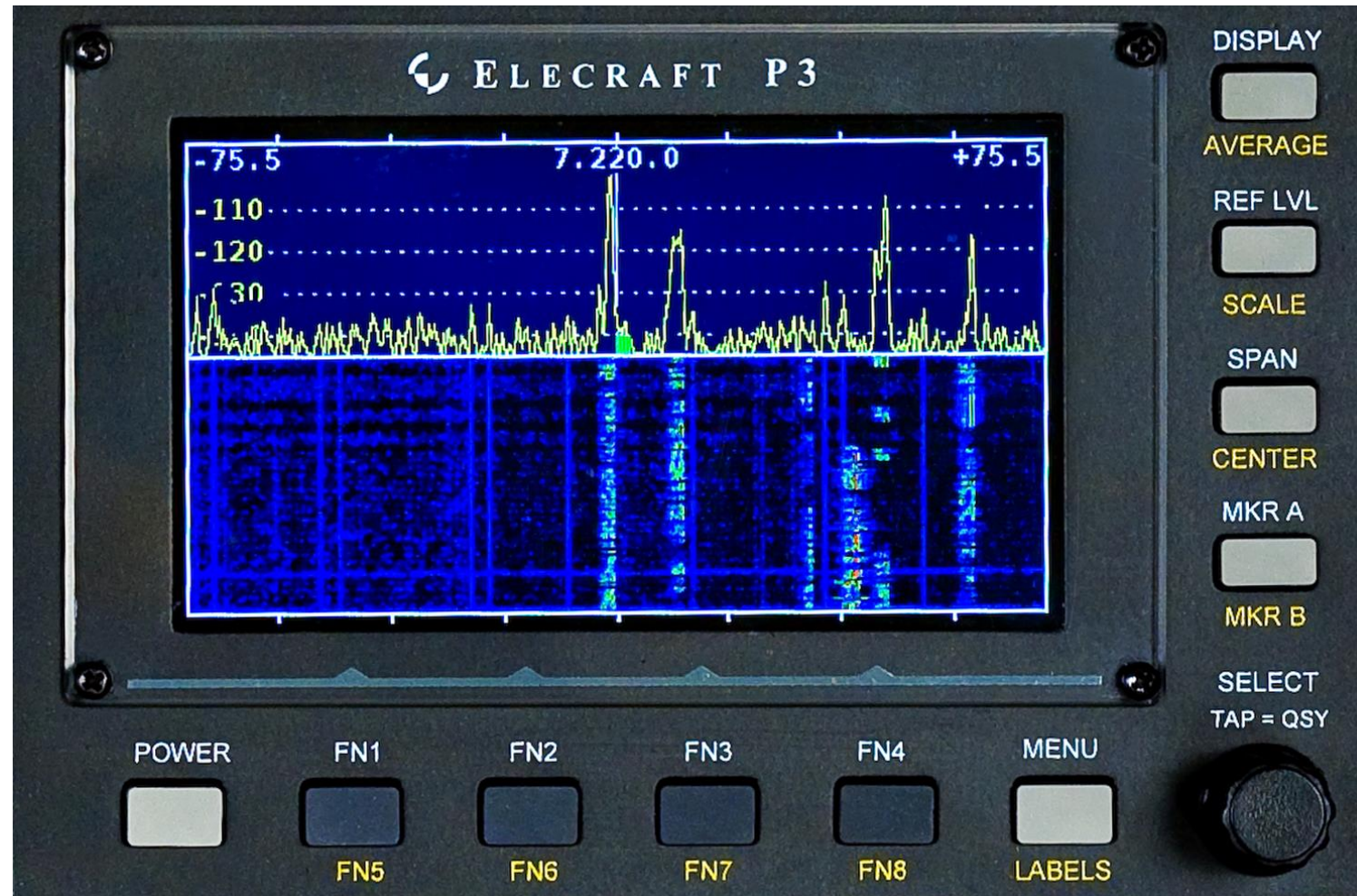
Icom IC-7600



Yaesu FTDX-1200



Elecraft P3



FlexRadio PowerSDR Software



FlexRadio Maestro



Icom IC-7300



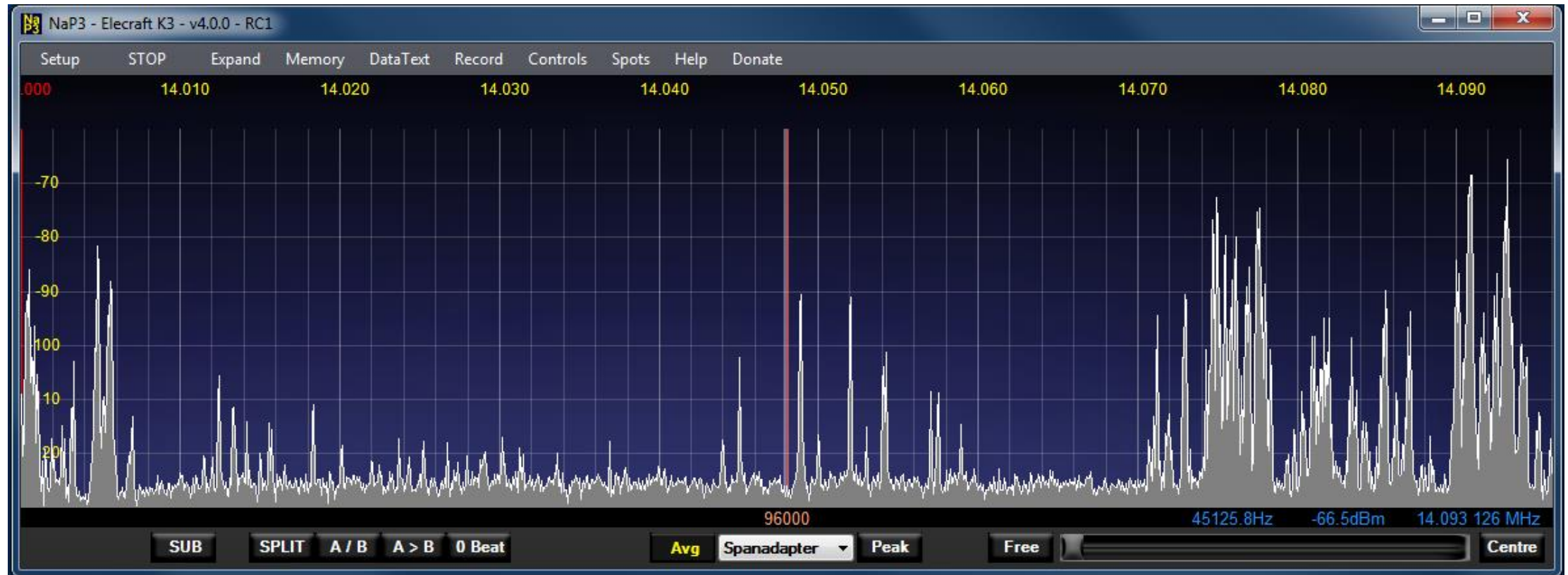
Platform-independent solutions

- Do you need to buy a particular Icom/Elecraft/Yaesu/FlexRadio transceiver in order to get a panoramic spectrum display?
- The answer is no. You can add a spectrum display to any amateur transceiver with the help of an HF-capable SDR (e.g. Airspy-HF+, SDRPlay RSP, SoftRock/LP-PAN + sound card), some free software, and depending on the transceiver, possibly some additional hardware for T/R sequencing
- The spectrum source can be either your transceiver's IF, or RF directly from the antenna

IF-based

- If your transceiver has an IF output, or if you can modify it to provide one (after the first mixer but ahead of roofing filters or other selectivity-determining circuits), you can feed this into an SDR tuned to the IF
- Use SDR panadapter software that uses CAT control from the transceiver to label the display with the transceiver's RF instead of the SDR's frequency (transceiver's IF)
 - If you are already using CAT control with a logging program, you may need some kind of port-sharing software (com0com, VSPE, LP-Bridge, ...)

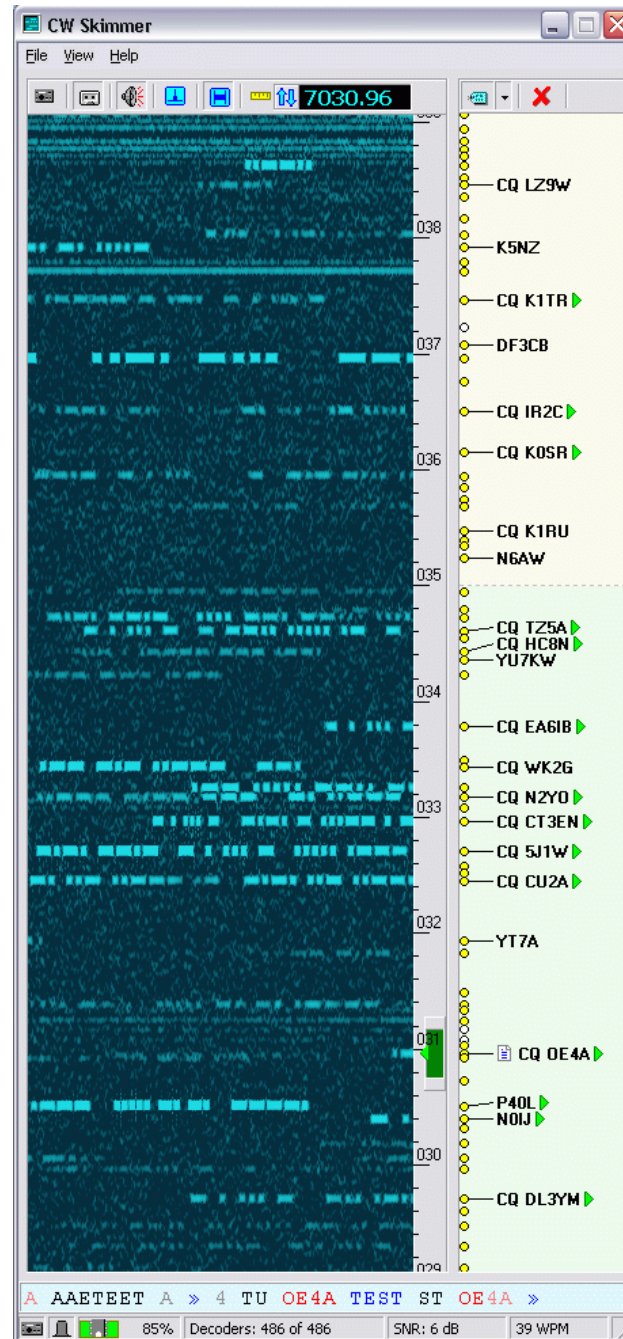
NaP3 Example



NaP3 with DX Cluster spots



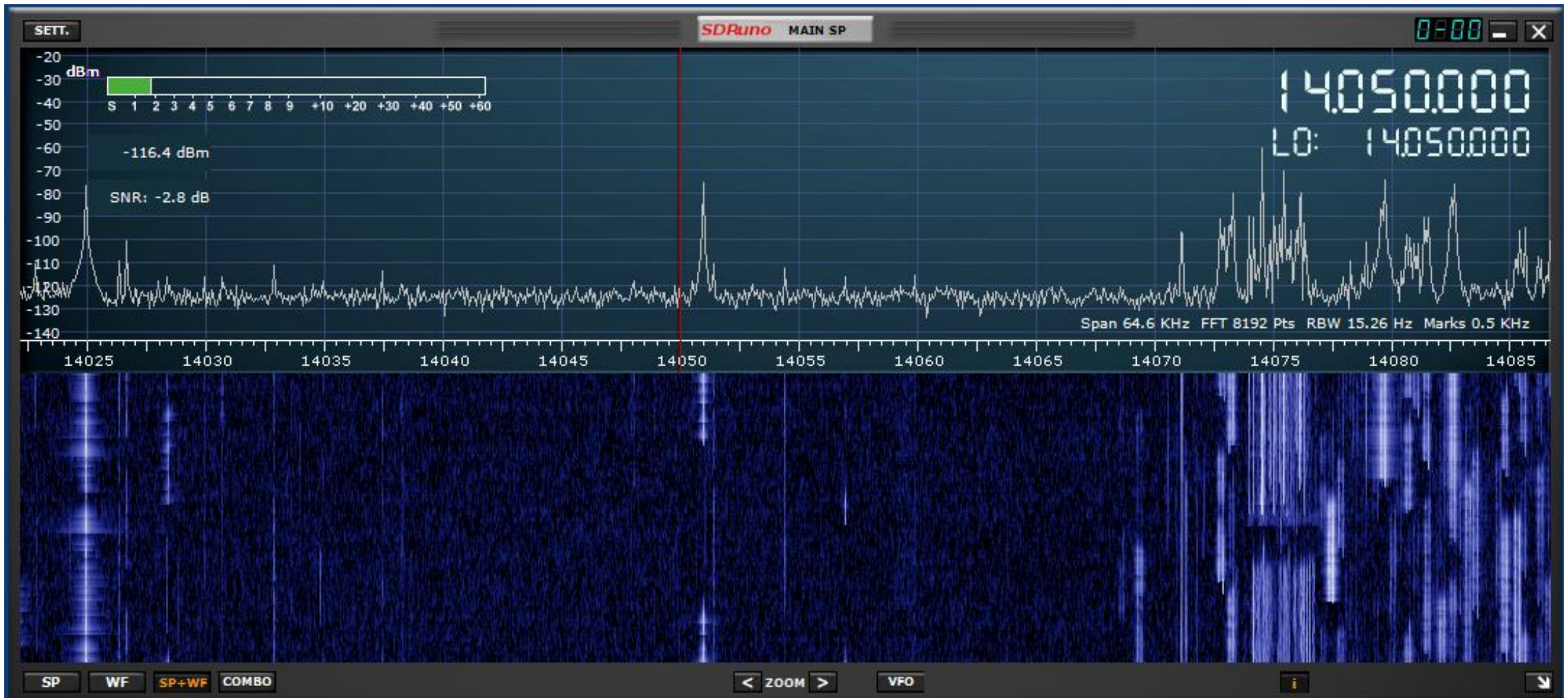
CW Skimmer



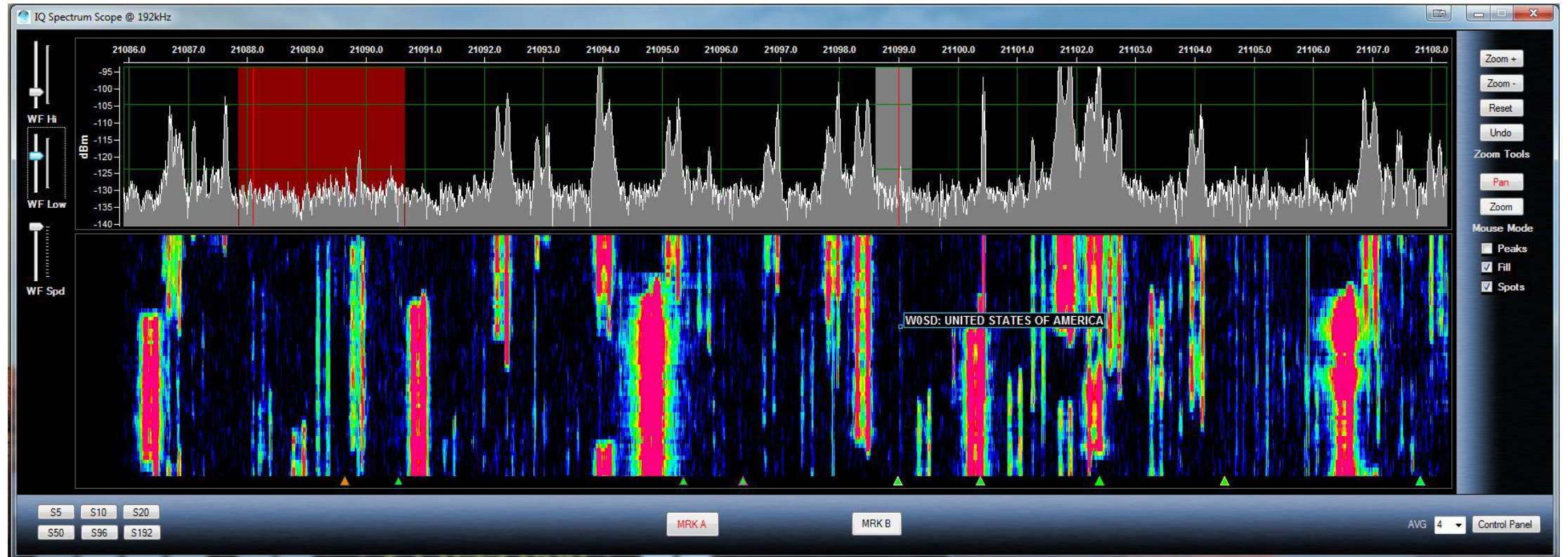
RF-based

- Some transceivers provide a pair of jacks for RX Antenna output and input (originally intended for accessories like filters, noise-cancellers, etc.)
 - The output is behind the T/R switch but ahead of the first mixer
 - Connect a jumper between the RX Ant output and input with a splitter to tap off a signal to the SDR
 - Use radio control software to tune the SDR to the transceiver's frequency
- If your transceiver does not have an RX Ant Output/Input pair, use a T/R sequencer plus a splitter to route received signals to both receivers while isolating the SDR from the transmitter's output

SDRuno/SDRPlay



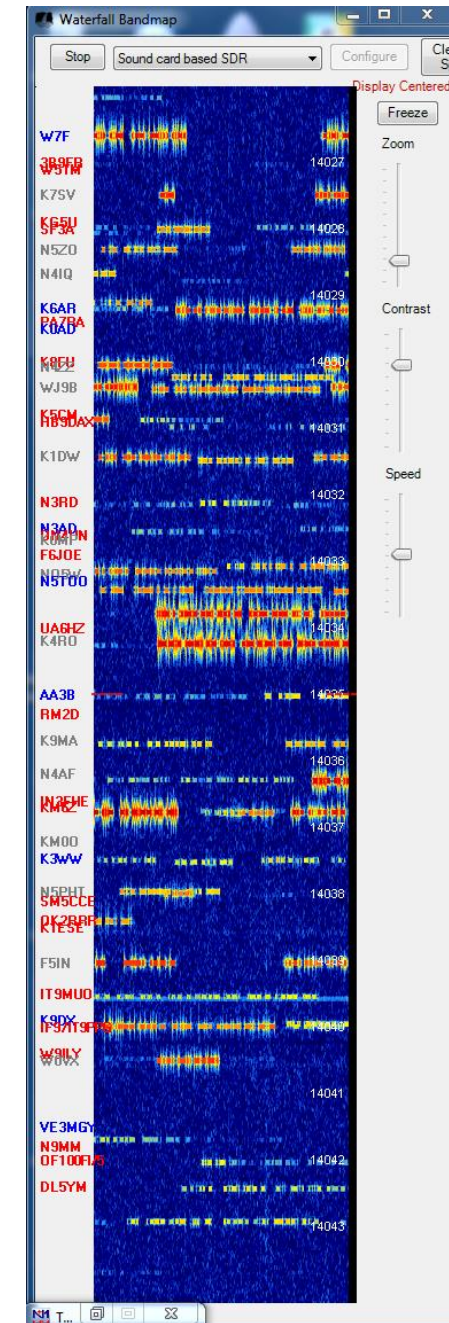
Win4K3Suite



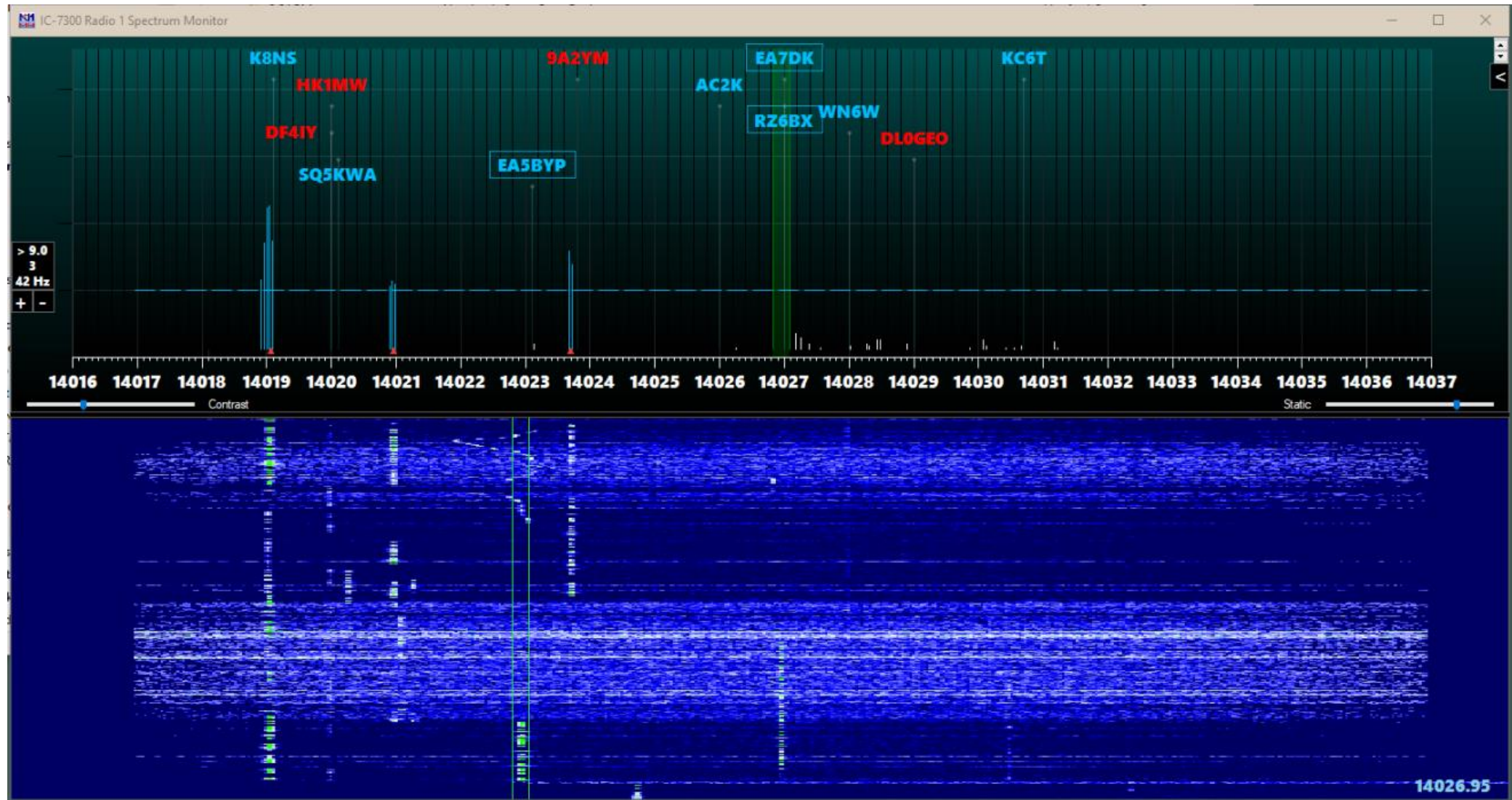
Integration with Logging Software

- The examples so far are integrated with the radio, but not with the logging software
- Next step is to integrate with logging software
 - Provides instant dupe vs. new contact vs. new multiplier status display for contests, or DXCC needed status and LotW/eQSL info for DXers
 - Replaces the logging software's bandmap display with a spectrum display
 - Can integrate with some transceivers directly (IC-7300, FlexRadio), or with external SDR-based displays

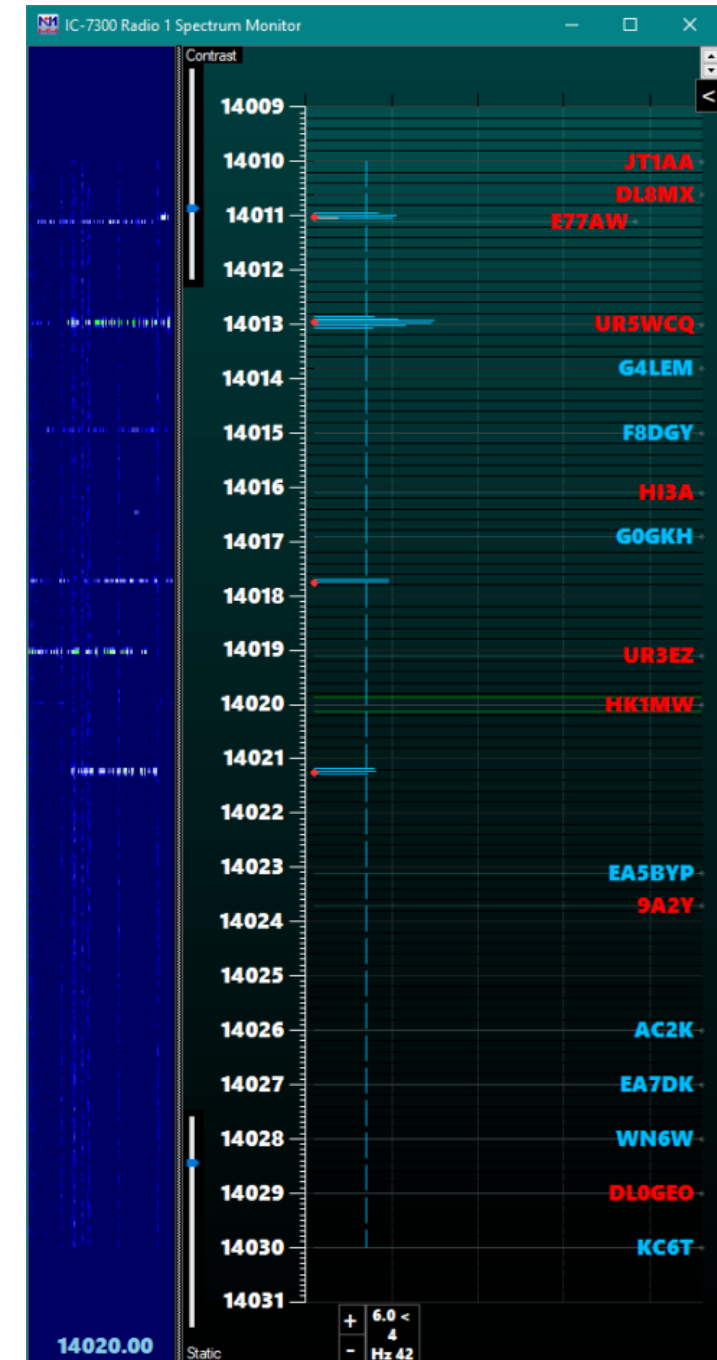
N2IC's Waterfall Bandmap



N1MM+ with IC-7300



N1MM+ Vertical Orientation



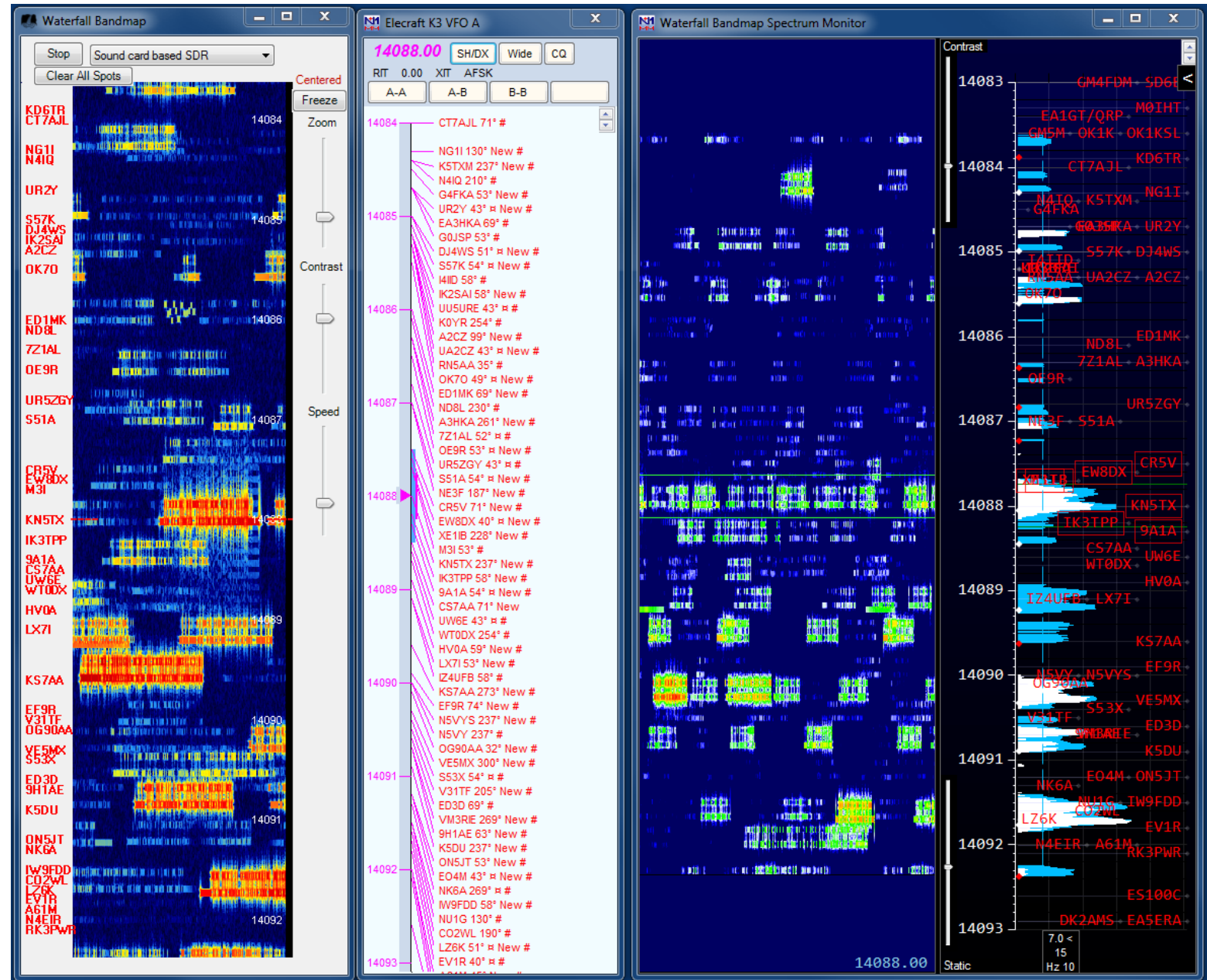
3 Bandmaps

Centre = traditional bandmap
(call signs from Cluster)

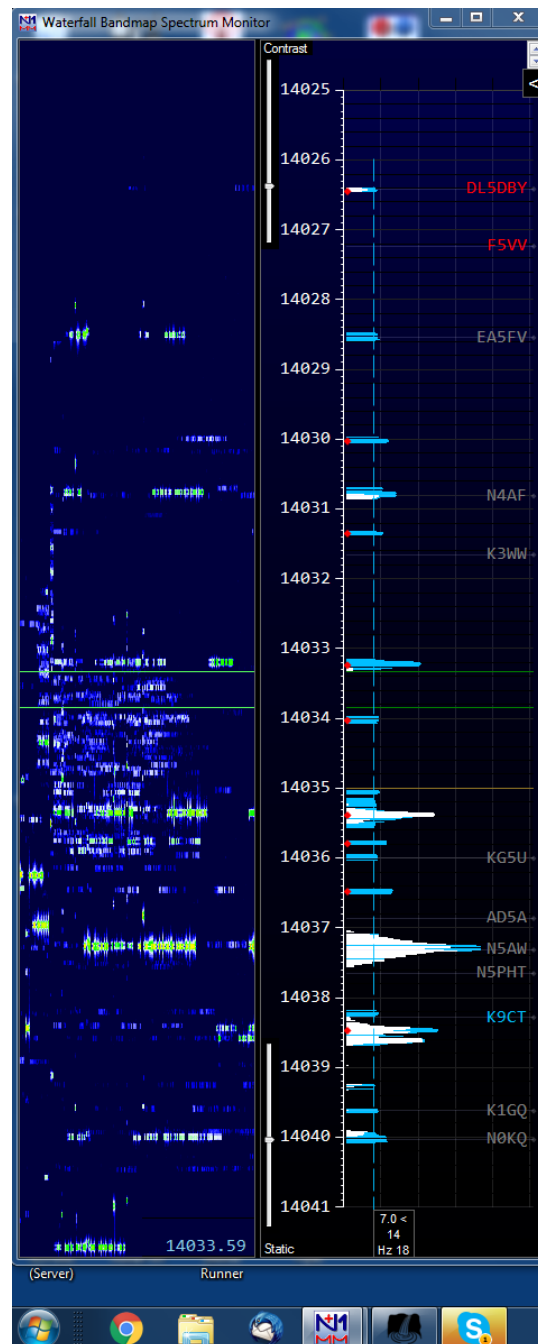
Left = N2IC's Waterfall Bandmap
(spectrum data from an external SDR)

Right = N1MM+ spectrum display
(fed by Waterfall Bandmap program)

In addition to point and click with a mouse, you can also use keyboard hotkeys to jump to the next currently-active trace on the waterfall.



In action



MM-DD HH:MM	Call	Freq	Mode	Name	Exch	M1	Pts
02-28 13:53	EA5FV	14028.54	CW	DANI	EA	✓	1
02-28 13:53	N5PHT	14037.65	CW	GARY	1489		1
02-28 13:54	K1GQ	14039.62	CW	BILL	NH		1
02-28 13:55	N8KQ	14040.03	CW	BILL	1463		1
02-28 13:55	HB9ARF	14041.61	CW	PHIL	1354	✓	1
02-28 13:55	N5AW	14037.31	CW	MARV	157	✓	1
02-28 13:56	AD5A	14036.86	CW	MIKE	1415	✓	1
02-28 13:56	K65U	14036.00	CW	DALE	1241	✓	1
02-28 13:58	N4AF	14030.81	CW	HOWIE	132		1
02-28 13:43	K9CT	7031.20	CW	CRAIG	276	✓	1

Check Log/Master/Call history/Reverse lookup					
K9CT	K9CT	K8CT	K8CT	K9CT	
K9T	K9T	K9T	K9S	K9T	K9H
K90T	K9T	K9T	K9T	K9C	
K9ZT	K9C	K9G			
K9CU	K9COT	K9C			
K9CS	K9U	K9CW			
K9TC					

N1 14033.59 CW Elecraft K3 VFO A

File Edit View Tools Config Window Help

CW Name Exch

160
80
40
20
15
10

Run S&P 29

F1 CQ F2 Exch F3 TU F4 VE3KI F5 His Call F6 B4
F7 Rpt Exch F8 Agn F9 NAME F10 NAME? F11 NR? F12 NR
Esc: Stop Wipe Log It Edit Mark Store Spot It QRZ

No Heading

101/96 9,696

14035.0 CW Elecraft K3 VFO B

File Edit View Tools Config Window Help

CW Name Exch

160
80
40
20
15
10

☐ Run ☒ S&P 29

F1 QRL F2 Exch F3 TU F4 Call Him F5 His Call F6 empty

F7 State? F8 Agn F9 NAME F10 NAME? F11 NR? F12 NR

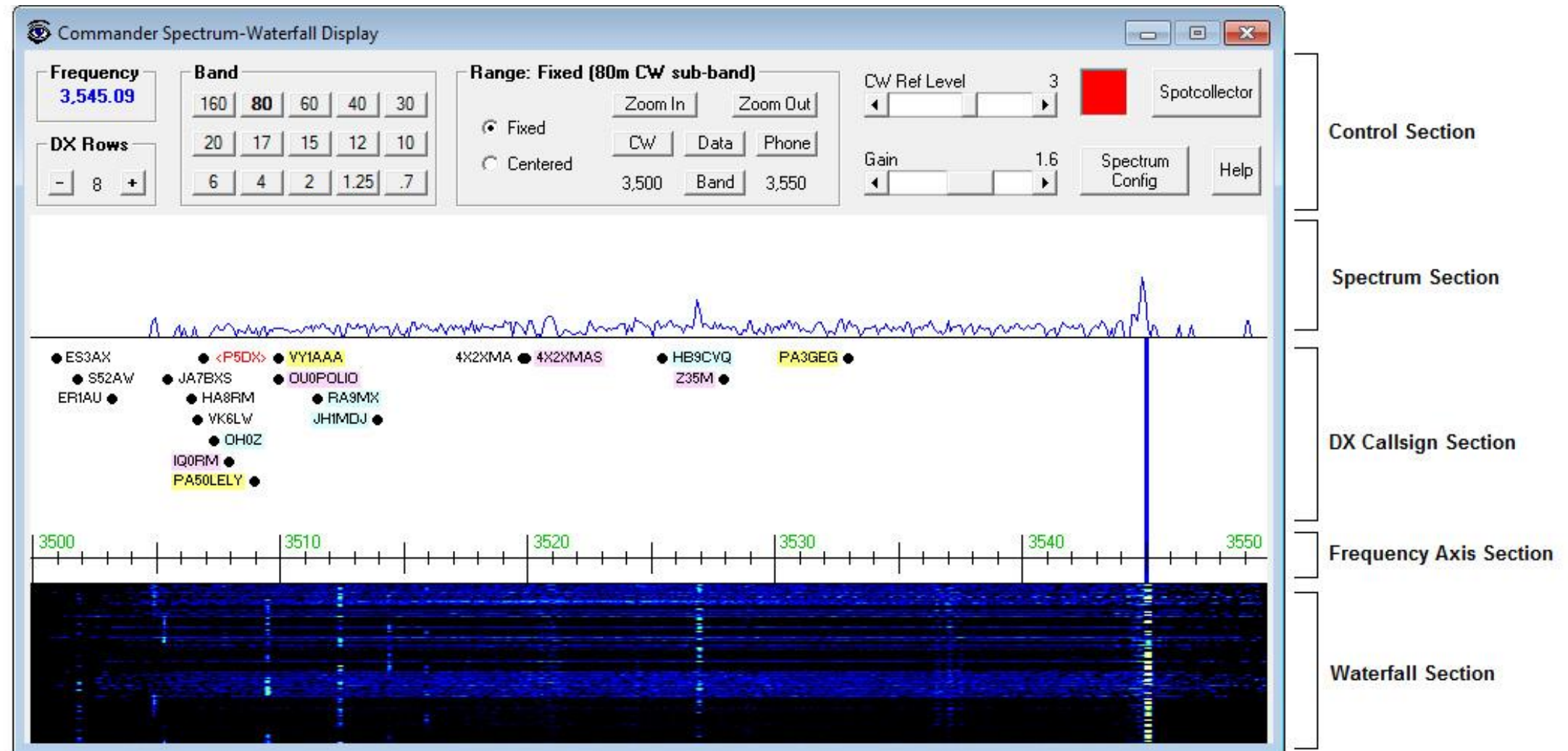
Esc: Stop Wipe Log It Edit Mark Store Spot It QRZ

Heading appears here when enabled.

Call history UserText appears here when enabled.

Tribander 101/96 9,696

DXLab Suite – IC7300/7610/7851



Software Resources

- N1MM+ Spectrum Display:
<https://n1mm.hamdocs.com/tiki-index.php?page=Spectrum+Display+Window&structure=N1MM+Logger+Documentation>
(go to the N1MM+ on-line manual and search for Spectrum Display)
- N2IC's Waterfall Bandmap:
<https://groups.io/g/waterfallbandmap>
- DXLab Suite - Interoperation with SDRs:
<http://www.dxlabsuite.com/dxlabwiki/SDRInteroperation>
- Icom Spectrum Display:
<http://www.dxlabsuite.com/dxlabwiki/SpectrumWaterfallIcom>
- Win4K3Suite, Win4Yaesu Suite:
<https://va2fsq.com/>, <http://yaesu.va2fsq.com/>
- NaP3:
<http://www.telepostinc.com/NaP3.html>
- CW Skimmer:
<http://www.dxatlas.com/cwskimmer/>