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
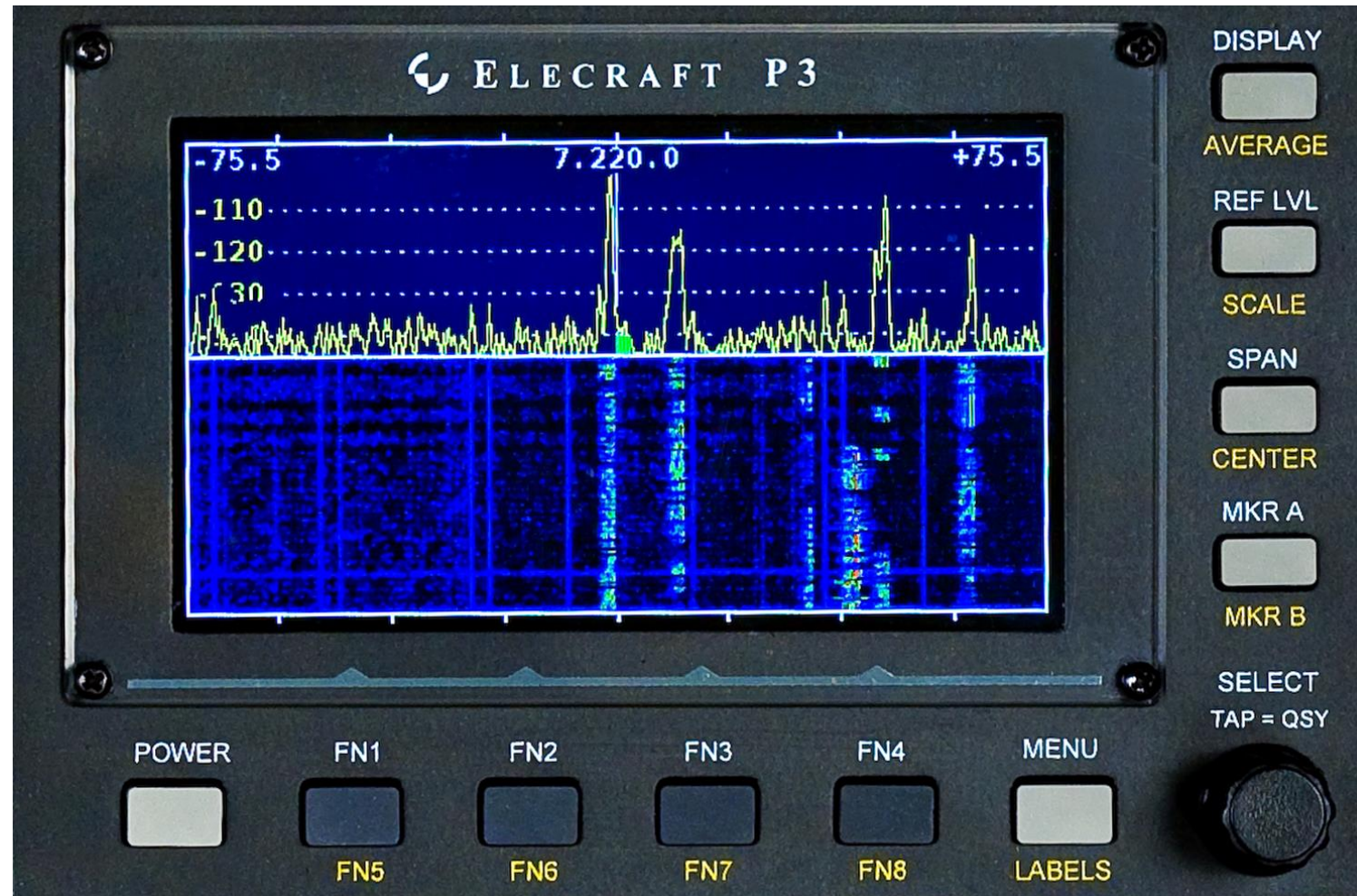
Analog

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
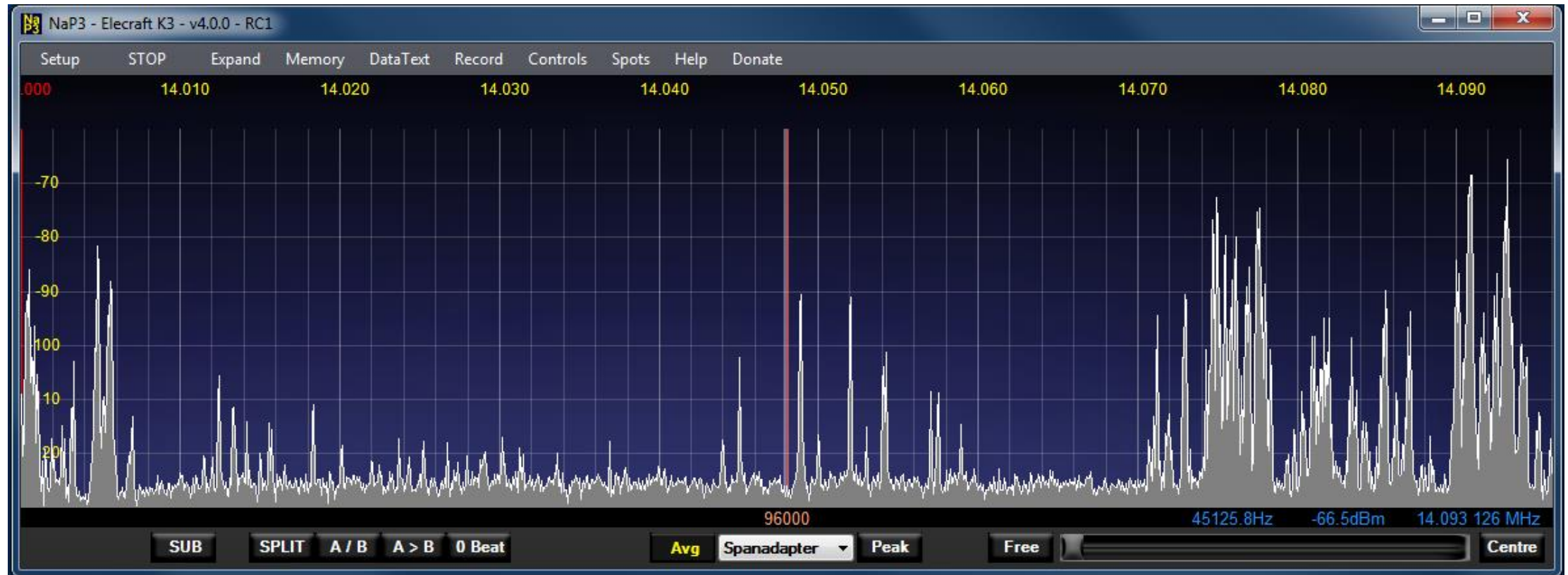
NaP3 with DX Cluster spots

CW Skimmer
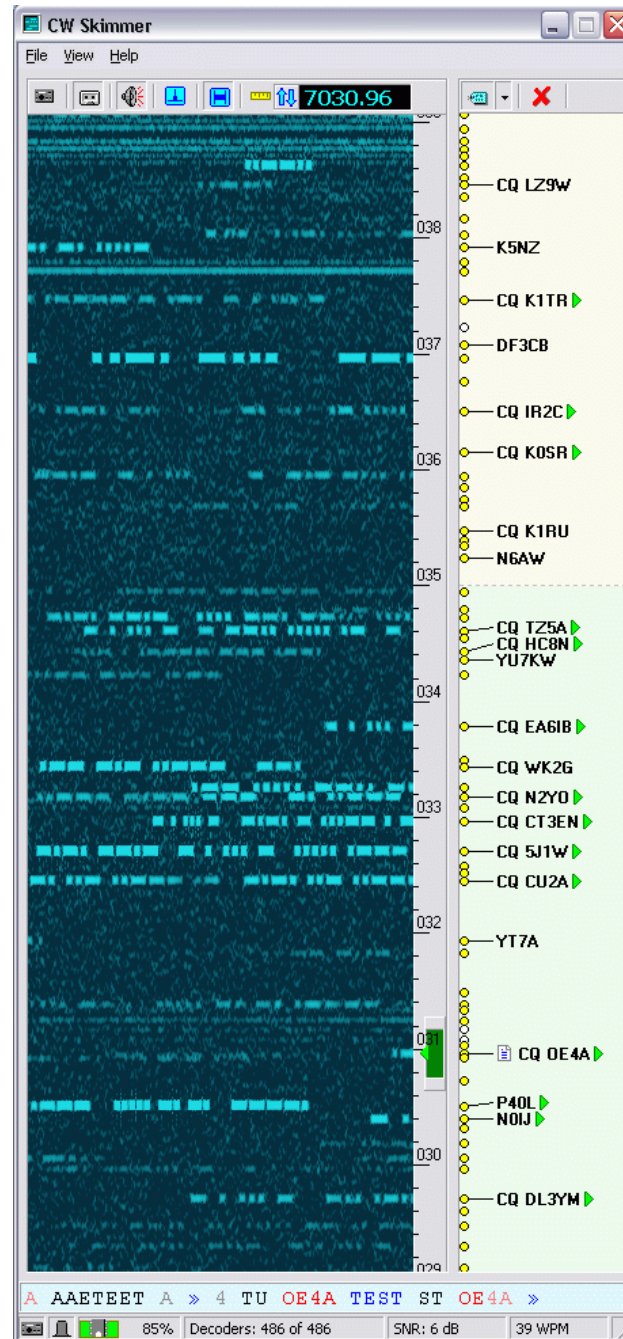
RF-based

- 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
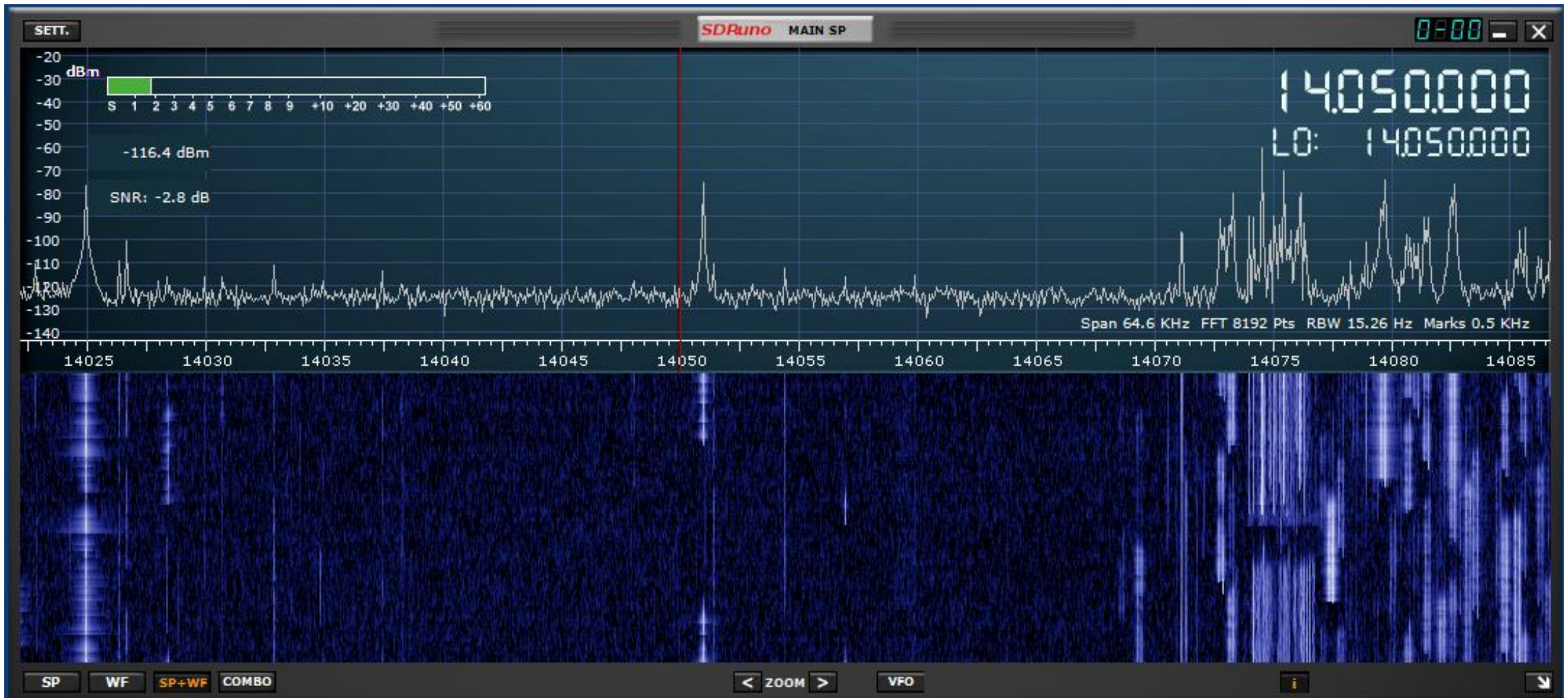
Win4K3Suite
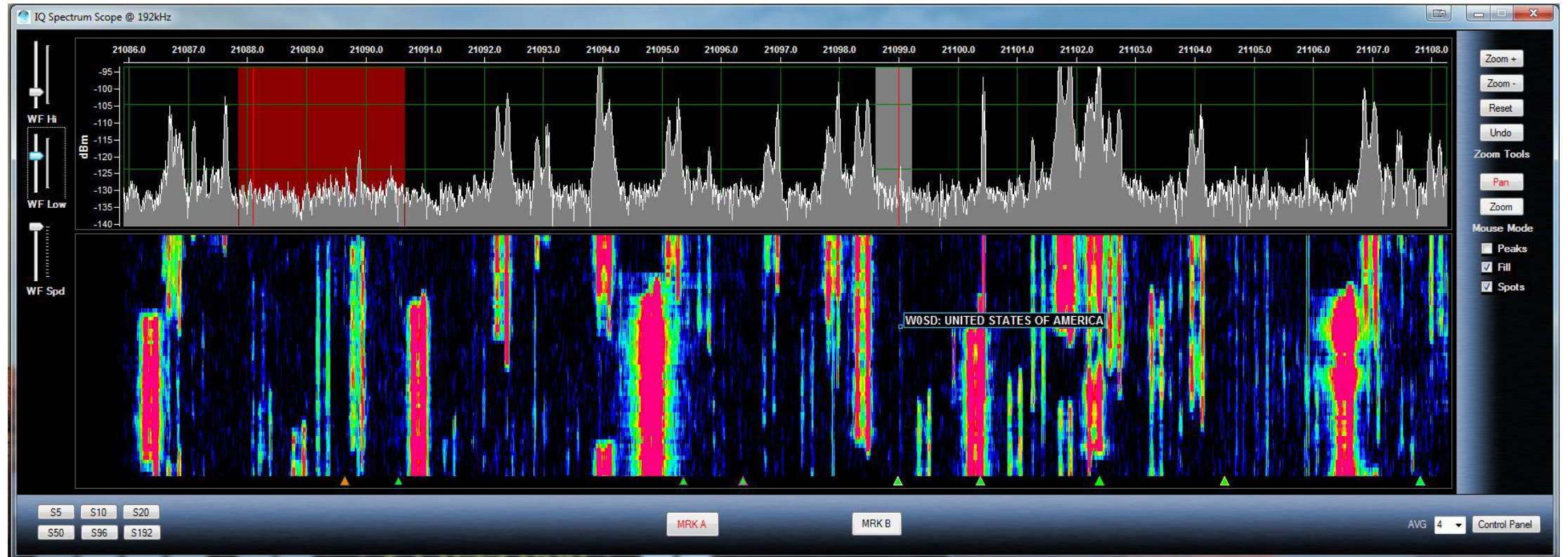
Integration with Logging Software

- 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
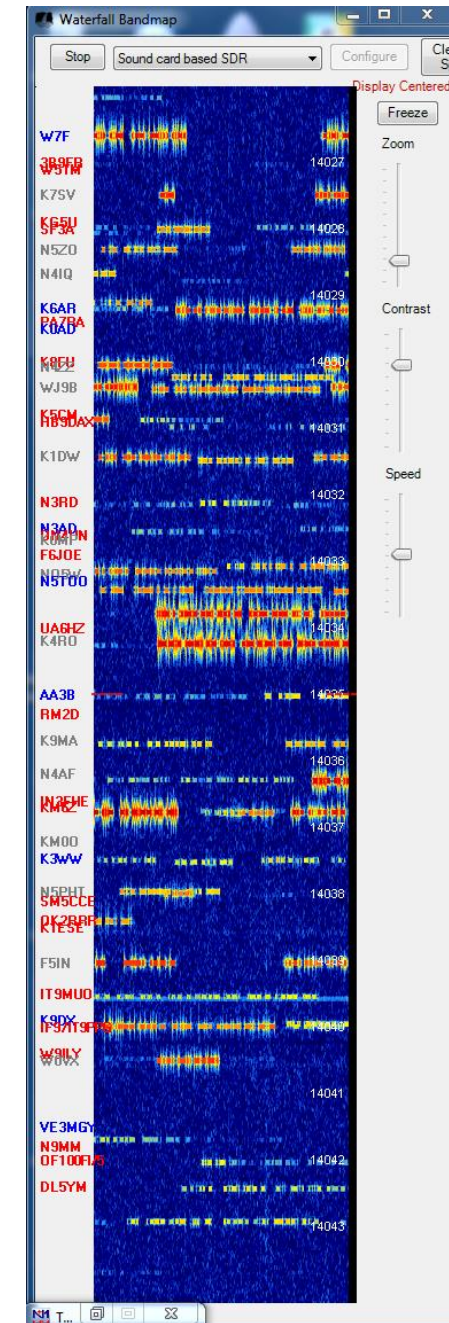
N1MM+ with IC-7300
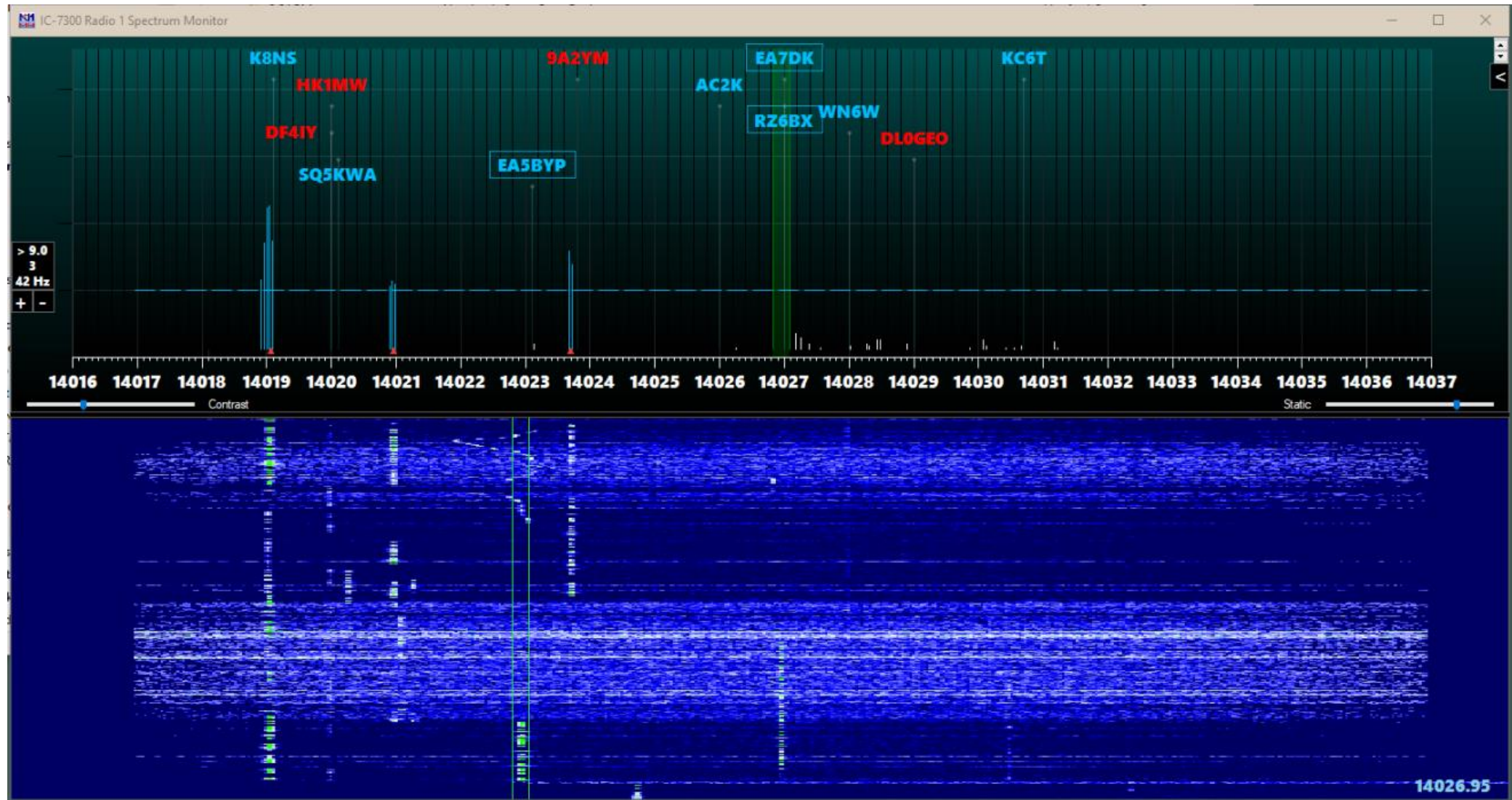
N1MM+ Vertical Orientation
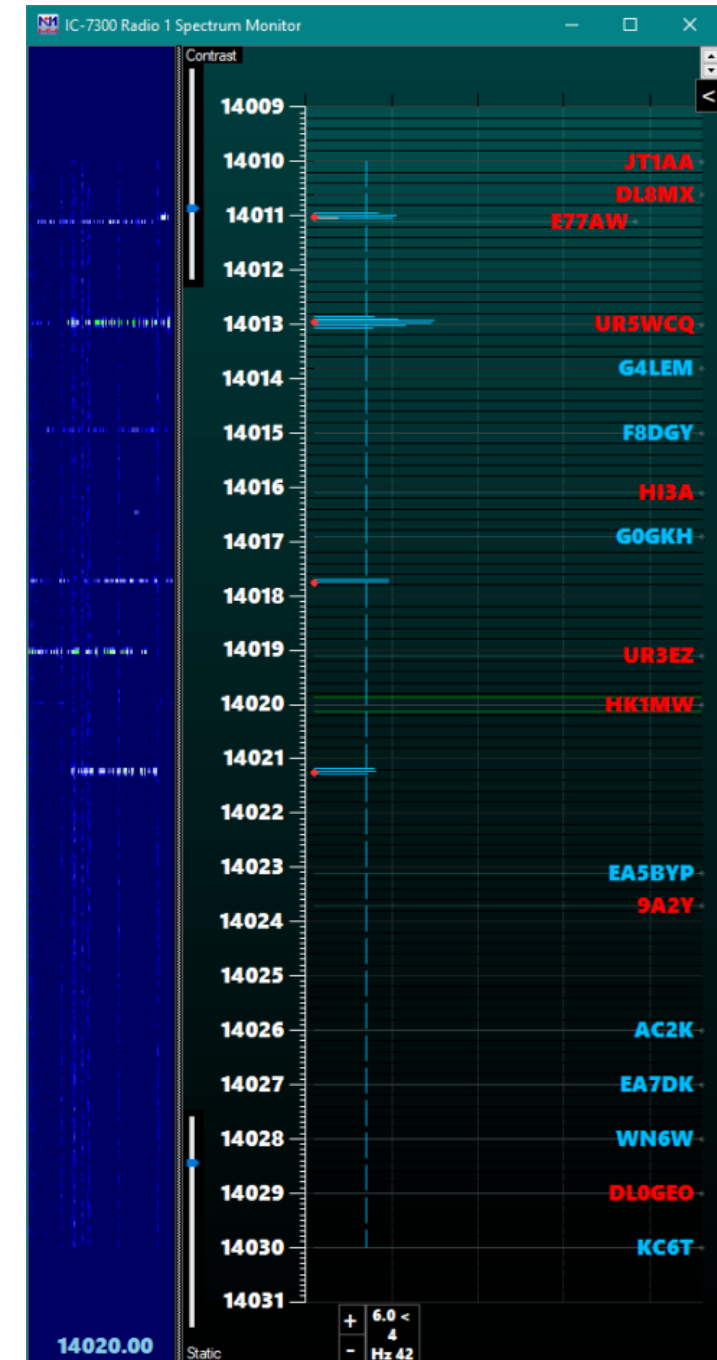
3 Bandmaps

Centre = traditional bandmap
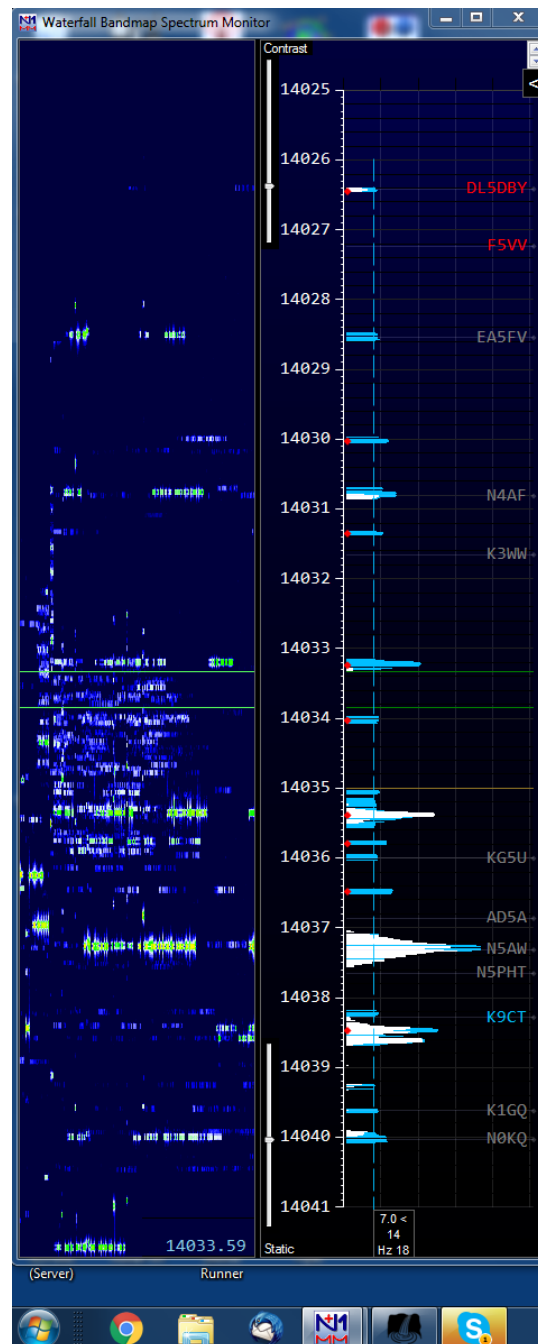(call signs from Cluster)

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

DXLab Suite – IC7300/7610/7851
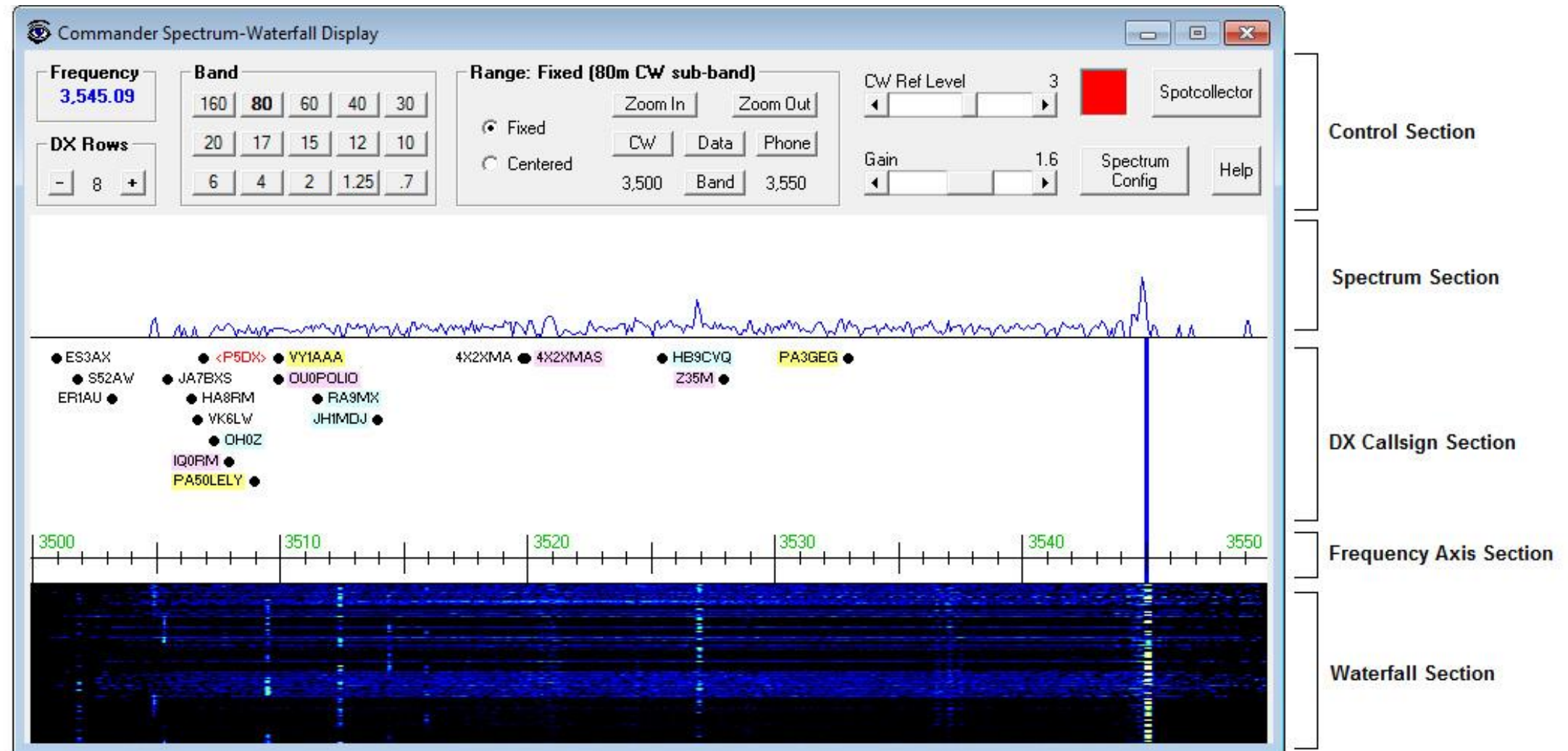
Software Resources

- 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/