The Advantages of Waterfall Displays for Contesting and DXing

Presented by N6TV

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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):

http://www.universal-radio.com/
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

http://www.elecraft.com
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

Photo courtesy http://www.elecraft.com
P3 Built-in Display at 480 x 272
Old Icom IC-7800 firmware

http://www.icomamerica.com
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

Photo courtesy http://www.kenwoodusa.com
FlexRadio FLEX-5000™, FLEX-6700™

http://www.flexradio.com
FlexRadio Systems® SmartSDR
Winrad Software
HDSDR Software
SDR-Radio.com SDRCconsole (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

http://www.telepostinc.com
N1MM+ Spectrum Display Window

http://n1mm.hamdocs.com/tiki-index.php?page=Spectrum+Display+Window
N1MM+ Vertical Spectrum Display Window

http://n1mm.hamdocs.com/tiki-index.php?page=Spectrum+Display+Window
N1MM+ with Spectrum Display

http://n1mm.hamdocs.com/tiki-index.php?page=Spectrum+Display+Window
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 \textit{fast}
- Find who the DX just worked, \textit{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\textsuperscript{nd} 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
Winrad on Top, Win-Test on Bottom
Winrad & Win-Test (zoomed)
Click-To-Tune with a “Legacy” Transceiver + SDR

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

Rig 1: FT-1000MP or K3

RX ANT IN OUT

TX ANT

MiniCircuits ZFSC-2-6 Power Splitter

Bandpass Filter

To antenna, coax switch, coax stubs, amp, etc.

Rig 2: FT-1000MP or K3

RX ANT IN OUT

TX ANT

MiniCircuits ZFSC-2-6 Power Splitter

Bandpass Filter

To antenna, coax switch, coax stubs, amp, etc.

ZFSC-2-6

2-position Coax Switch

ANT

SDR (Softrock, Perseus,...)

PC

Drawing by N6TV@arrl.net  31 May 2008
Use Omnipig 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](http://www.kkn.net/~n6tv)
Click-To-Tune, IF OUT to LP-PAN 2, NaP3, LP-Bridge

Rig: K3 shown

Sound card: ASUS Xonar U7 USB shown

Power, 11-15VDC: 120mA

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

IF input 50 ohms 0 dBm max

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

USB to PC on Rear

Mute Input - short to mute Usually not needed

1/8": 3.5mm Mono Plugs

http://www.telepostinc.com
Questions?

- [http://www.winrad.org](http://www.winrad.org) - Winrad software
- [http://www.hdsdr.de/](http://www.hdsdr.de/) - HDSDR software
- [http://sdr-radio.com/Software](http://sdr-radio.com/Software) - SDRConsole
- [http://www.kkn.net/~n6tv](http://www.kkn.net/~n6tv) - Winrad demo file
- [http://www.telepostinc.com/LP-PAN.html](http://www.telepostinc.com/LP-PAN.html)
- [http://www.qrz.com/db/n6tv](http://www.qrz.com/db/n6tv) - Links to this and other presentations