

Software-Defined Radio (SDR)

PART ONE
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Part One Agenda

SDR Definition

What is SDR?

SDRs in Amateur Radio

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WebSDR

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SDR Definition

Software-Defined Radio (SDR) is a radio communication system where components that conventionally have been implemented in analog hardware (e.g. mixers, filters, amplifiers, modulators/demodulators, detectors) are instead implemented by means of software on a computer or embedded system.

-Wikipedia

What is SDR?

Components traditionally implemented with analog are instead done by software on a dedicated or standard piece of computer hardware (e.g., PC)

Made possible by faster and faster microchips that allow signals to be captured in analog and then converted the digital domain (1s and 0s)

Digital Signal Processing (DSP) is done in the digital domain which consists of the filtering and demodulation of the desired signal

SDRs in Amateur Radio

Transceiver Examples

Integrated (no PC required)

Elecraft, Icom, Yaesu

Component

Apache Labs, FlexRadio, Hermes Lite 2, SunSDR



Receiver Examples

Component

Airspy, SDRPlay, RTL-SDR Dongles

Online SDR - Networks

Airspy.com (40 sites)

Global Tuners (28 sites)

WebSDRs (141 sites)

OpenWebRX (244 sites)

KiwiSDRs (914 sites)



User SDR Software (Component)

SDR# (SDR-Sharp) from Airspy: 3rd party plug-ins - Windows

SDR Console: supports multiple hardware

SDR++: - Windows, Linux, OSX, BSD, Android

SDRUno: best with SDRPlay hardware - Windows

PowerSDR: supports FlexRadio - Windows

HPSDR/Thetis: supports ANAN/Hermes Lite - Windows, Linux

HDSDR: Windows

Online SDRs...

are receivers connected to the internet, allowing many listeners to listen and tune in simultaneously. SDR technology makes it possible that all listeners tune independently, and thus listen to *different* frequencies and signals. Depending on type of Online SDR, four, eight, or up to a hundred (WebSDR) listeners can use the same site simultaneously.

typically consist of a PC server and SDR server software, a fast internet connection, and some radio hardware to feed antenna signals into the PC.

many times are deployed by radio amateurs. We appreciate and benefit greatly from a global network of Online SDRs made possible thanks to time, effort, and expense others make to install and maintain equipment and connectivity. Access to nearly every Online SDR is made available to all without cost or subscriptions.

Why use an online SDR?

Listening to hear other signals better

Shortwave listening

Commercial broadcasting

Amateur radio

Overcome bad propagation/receiver location diversity

Facilitate net/roundtable sessions to hear everyone

Solution for local antenna restrictions or RFI

Assess HF propagation conditions

Listening to hear your own signal better

A/B testing of antennas, audio, other settings

Real time antenna pattern mapping

Online SDR Use Case

17 Meter Propagation Group

more info at <http://hams.live/prop17/>

Informal round table group that meets daily near 18.162 MHz

Group led by control operator who directs round table communications and manages list of check-in stations

Many in the Group access Online SDRs to improve the ability to hear stations that otherwise cannot be directly copied

A livestreamed list is also maintained to help keep track of check-ins, sequence, and signal reports

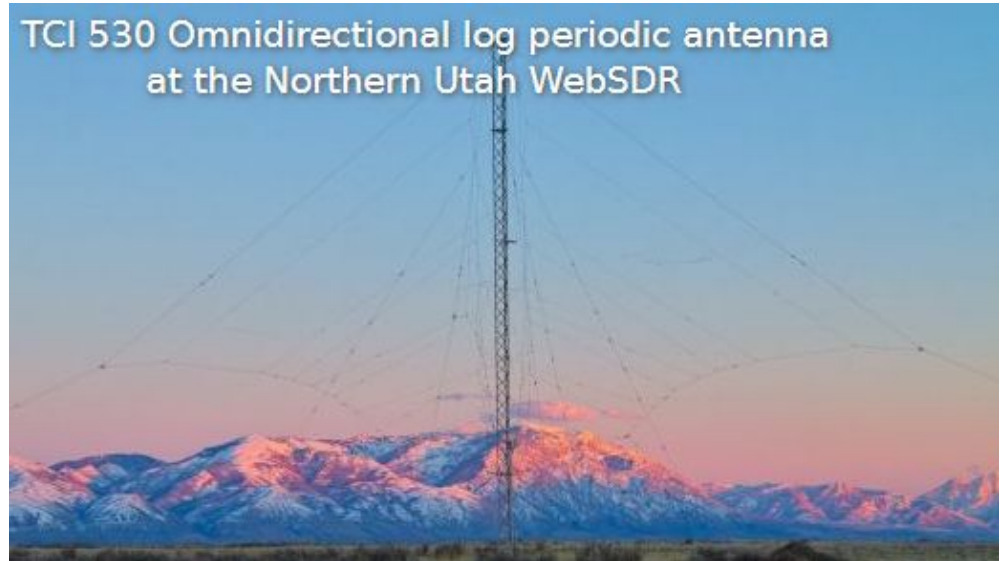
Online SDRs help eliminate listening to dead air and instead hear stations that cannot be copied directly

Online SDRs are different

Like all other radio stations, Online SDRs vary widely in terms of quality and performance.

Local site limits what kind of antenna system(s) are chosen. Everything from a simple small loop antenna in the attic to elaborate antenna arrays on tall towers with the ability to switch between different antennas.

The local site also determines what noise levels are encountered.



OpenWebRX

PROs

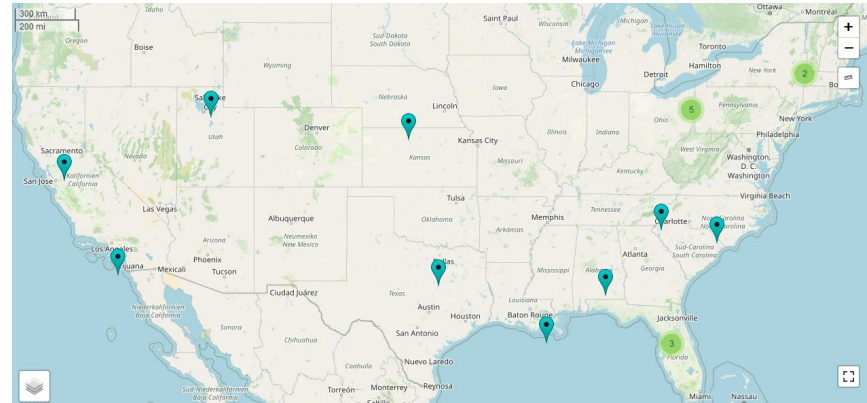
Works with inexpensive RTL-SDR or SDRPlay hardware

Sites support up to 15-20 users

CONs

Much fewer sites available versus KiwiSDR,
only 19 US sites supporting HF

No longer in development



WebSDR

PROs

Sites support up to 100 users at once

CONs

Much fewer sites available versus KiwiSDR,
only 25 US Sites with HF

Only works on certain amateur
bands - site specific



KiwiSDR

PROs

**Best selection of sites,
221 US, Over 900 worldwide**

Sites provide full HF coverage 1-30MHz

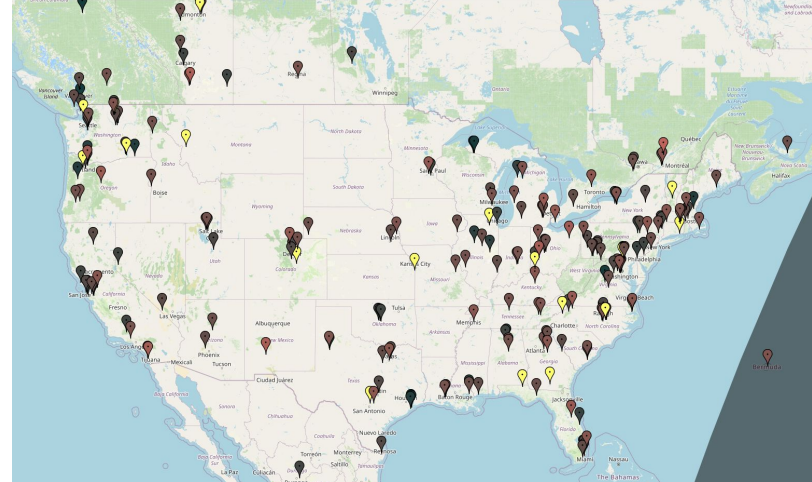
Wide selection of built-in extensions

Spectral Noise Filtering

Camp-on feature/share audio stream

CONS

**Sites only support 4 users, or
8 users with limited functionality**



KiwiSDR SNR

KiwiSDRs are ranked based on Signal to Noise Ratio (SNR).

Currently, best one in North America ranks at #61, located in Half Moon Bay, California.

All results found at:
rx.linkfanel.net/snr.html

59.	34 dB	34 dB		EI6IZ SDR #1 KiwiSDR V2 Castlebar, Co Mayo, Ireland
60.	34 dB	36 dB	25.88 dB	10 kHz-30 MHz SDR, SM2BYC, Sweden
61.	34 dB	34 dB	31.30 dB	KFS Omni KiwiSDR Half Moon Bay, California
62.	34 dB	29 dB	22.83 dB	linkz - kiwi 1 French Alps
63.	34 dB	31 dB		OE5SLN Web-SDR Mehrnbach, Upper Austria, Austria
64.	33 dB	33 dB		DC1EHG Haselunne, Germany
65.	33 dB	30 dB	34.65 dB	0-30 MHz SDR, ZL1ROT, Rotorua, New Zealand
66.	33 dB	33 dB	25.43 dB	0-30 MHz SDR Westerlee, Groningen, The Netherlands
67.	33 dB	31 dB		F1VAM 0-30 MHz Brinckheim Alsace France
68.	33 dB	31 dB		DL8LAS Trent, 0-30 MHz SDR
69.	33 dB	35 dB	15.90 dB	0-30 MHz KiwiSDR-F6ABJ-France
70.	33 dB	31 dB		EA1FPS - SDR Moreda, Asturias - Spain
71.	33 dB	28 dB	13.60 dB	0-32 MHz SDR near Lublin, POLAND
72.	33 dB	29 dB		0-30 MHz SDR, GB0SNB, Kelvedon Hatch Secret Nuclear Bunker Brentwood, Es
73.	33 dB	33 dB		0-30 MHz SDR, DL1BAJ Hooksiel, Germany
74.	33 dB	31 dB	23.59 dB	G3SDH, 0-30 MHz KiwiSDR, Wellbrook Loop. Near Bristol, UK
75.	33 dB	29 dB	19.56 dB	0-30 MHz SDR DL3ZID Schwerin
76.	33 dB	32 dB		0-30 MHz SDR @ DB0HX Höxter, Germany
77.	33 dB	31 dB	29.31 dB	0-30 MHz SDR, Pingtung taiwan-2(BV7AU)屏東 臺灣
78.	33 dB	34 dB		KiwiSDR-1 PA8AD De Kiel, Netherlands
79.	33 dB	24 dB		Leicester MF, 42m high vertical
80.	33 dB	33 dB	27.59 dB	EI6IZ SDR #2 KiwiSDR V1 Castlebar, Co Mayo, Ireland
81.	33 dB	25 dB		LA6LU KiwiSDR - Cha-Am, Thailand (0-30 MHz SDR)
82.	32 dB	30 dB	40.41 dB	2-30MHZ SDR #1, VK5ARG Remote Receiver Site Near Tarlee, South Australia
83.	32 dB	27 dB	11.86 dB	0-30 MHz SDR KiwiSDR IW2KPL Franco Antenna : Windom 7-band OFC dipol
84.	32 dB	31 dB	24.54 dB	0-30 MHz SDR, Svenljunga, Sweden
85.	32 dB	11 dB		0-30 MHz SDR Northwest Seattle WA
86.	32 dB	32 dB	28.07 dB	Willem Toerink Westerlee, Groningen, The Netherlands
87.	32 dB	33 dB	18.51 dB	0-30 MHz SDR, HB9BXE Adligenswil Lucerne
88.	32 dB	24 dB	27.50 dB	10kHz-20 MHz SDR - F1JEK/P - France - DX-500 active antenna.
89.	32 dB	32 dB		SM7IUN 0-30 MHz SDR Bjärred, Sweden
90.	32 dB	30 dB	40.90 dB	2-30MHZ SDR #2, VK5ARG Remote Receiver Site Near Tarlee, South Australia
..

KiwiSDR URL Parameters

[Pennsylvania SDR 40 Meters](#)

<http://kiwisdr.k3fef.com:8073/?f=7168lsbz10&keys=xyxySo&sqrt=4&wfm=-100&cmmap=5>



FREQUENCY/MODE



WATERFALL ZOOM



DISPLAY OPTIONS



WATERFALL CONTRAST



WATERFALL SIZING



WATERFALL COLORMAP

LIST OF KIWISDR URL PARAMETERS AT: <http://kiwisdr.com/quickstart/#id-user-tune>

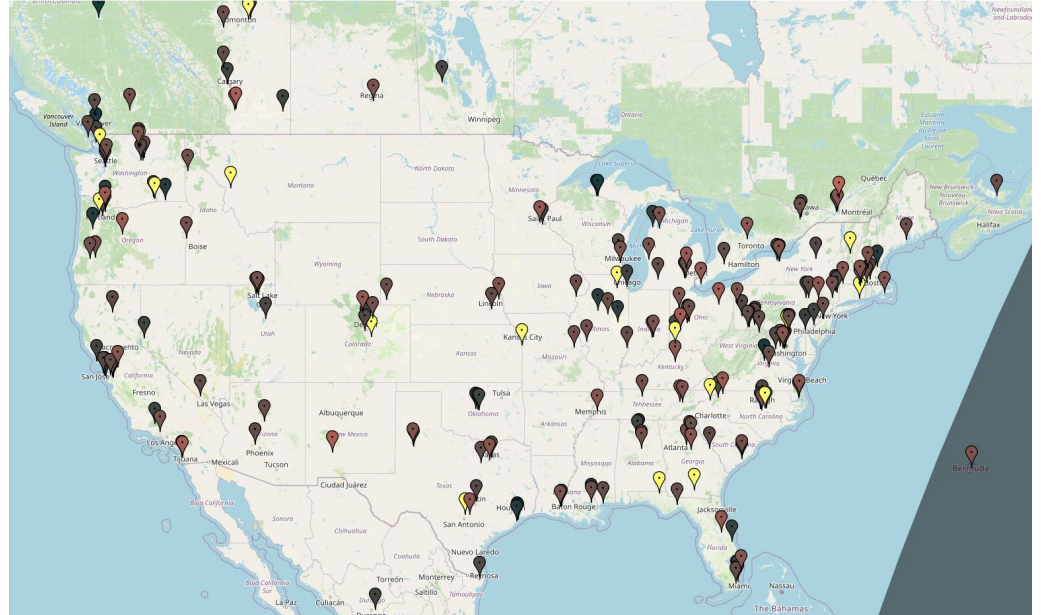
KiwiSDR Settings Demo

[Pennsylvania SDR 40 Meters](#)

[Utah SDR 40 Meters](#)

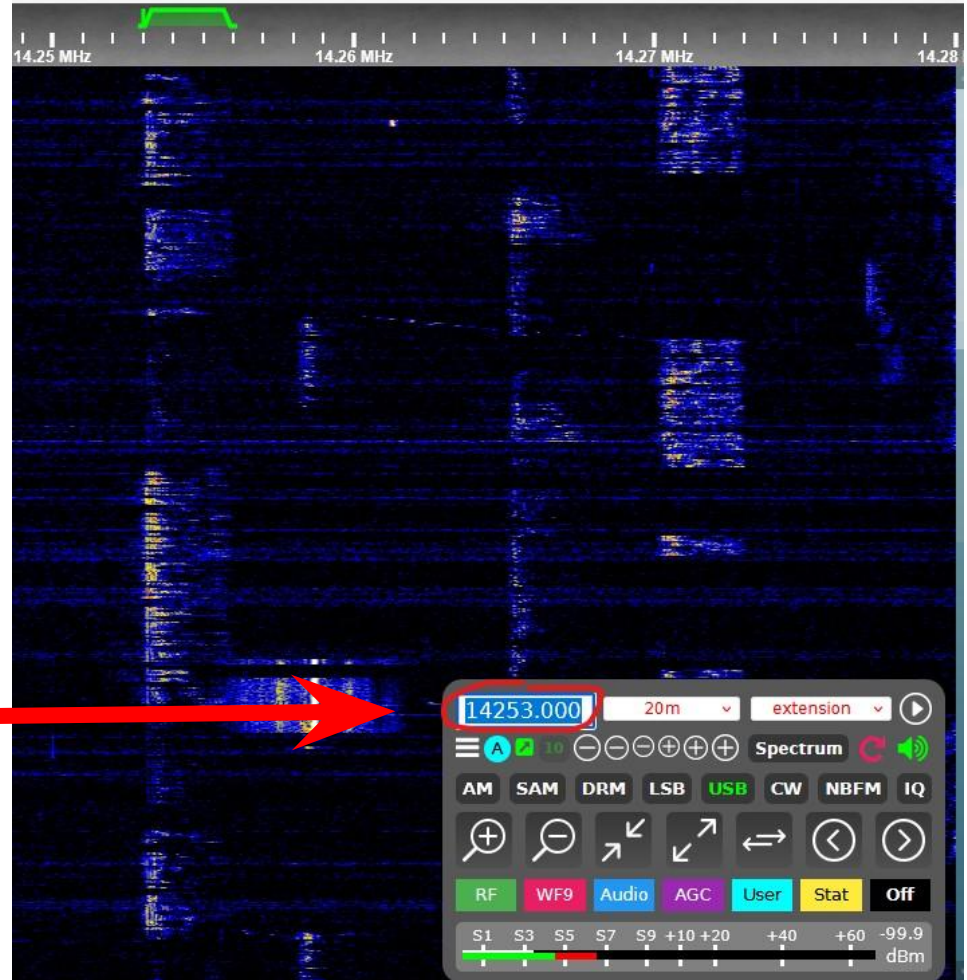
[Half Moon Bay, CA 40 Meters](#)

[Lamont, Alberta, 40 Meters](#)



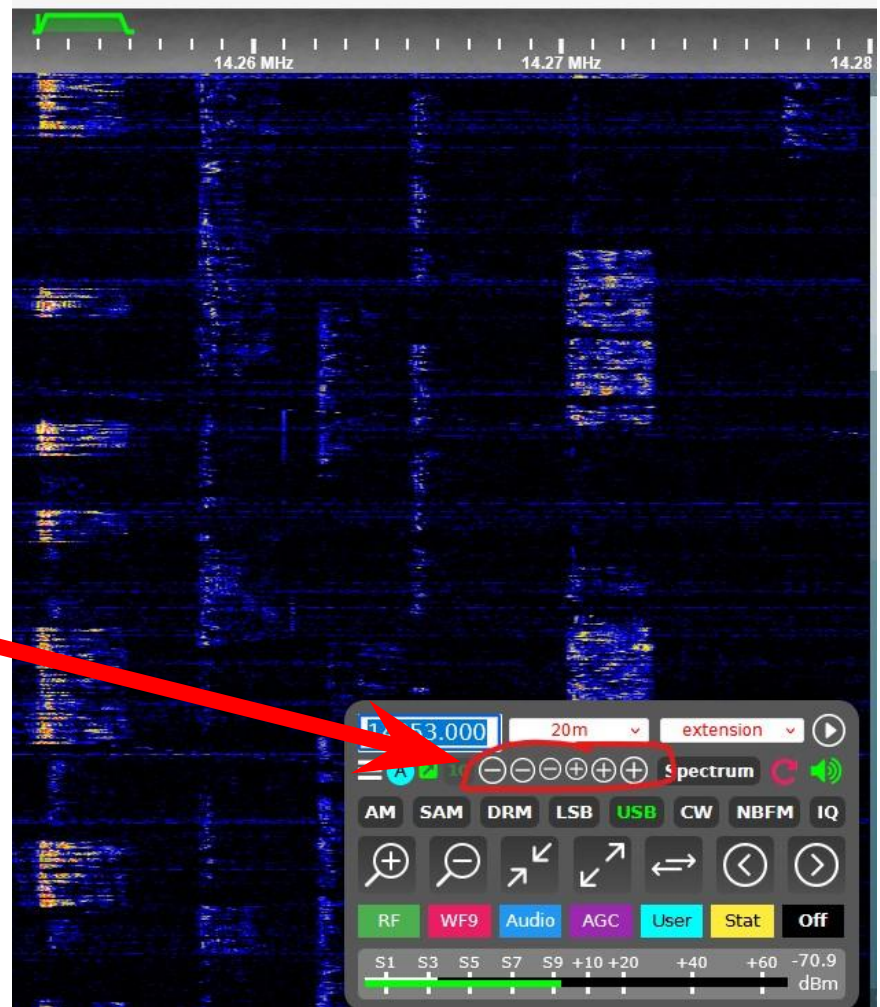
KiwiSDR Settings Demo

Direct frequency input



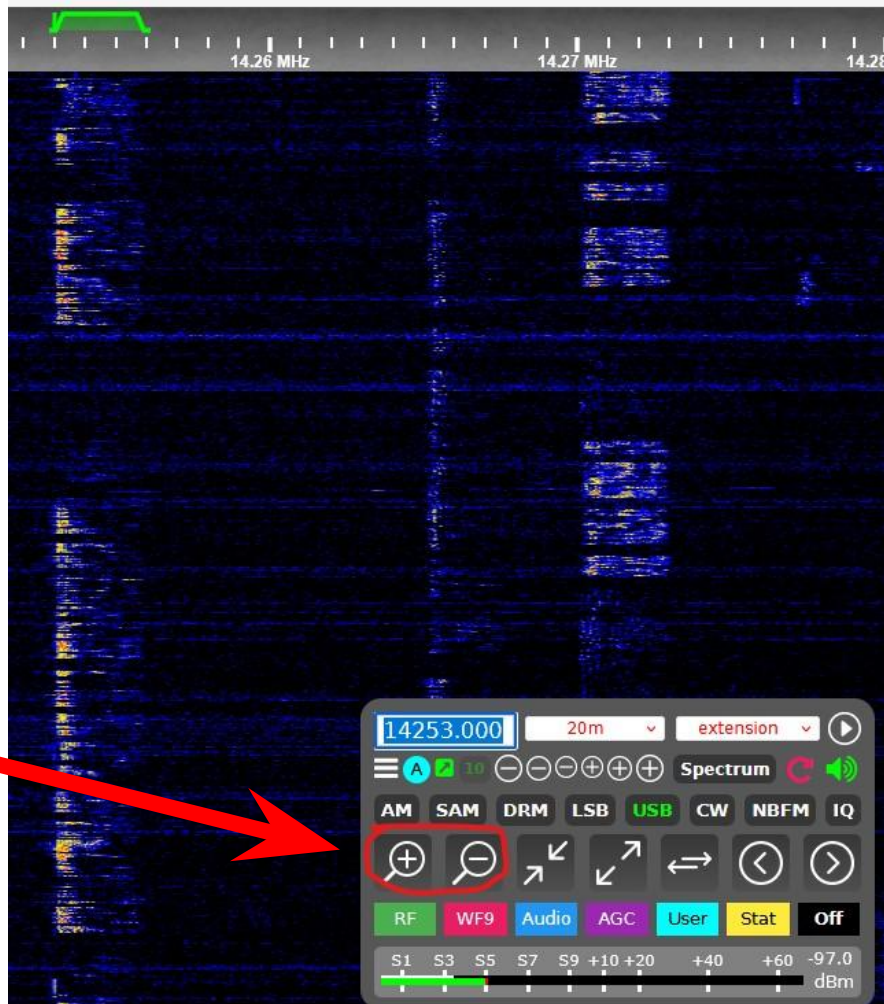
KiwiSDR Settings Demo

Frequency input in steps



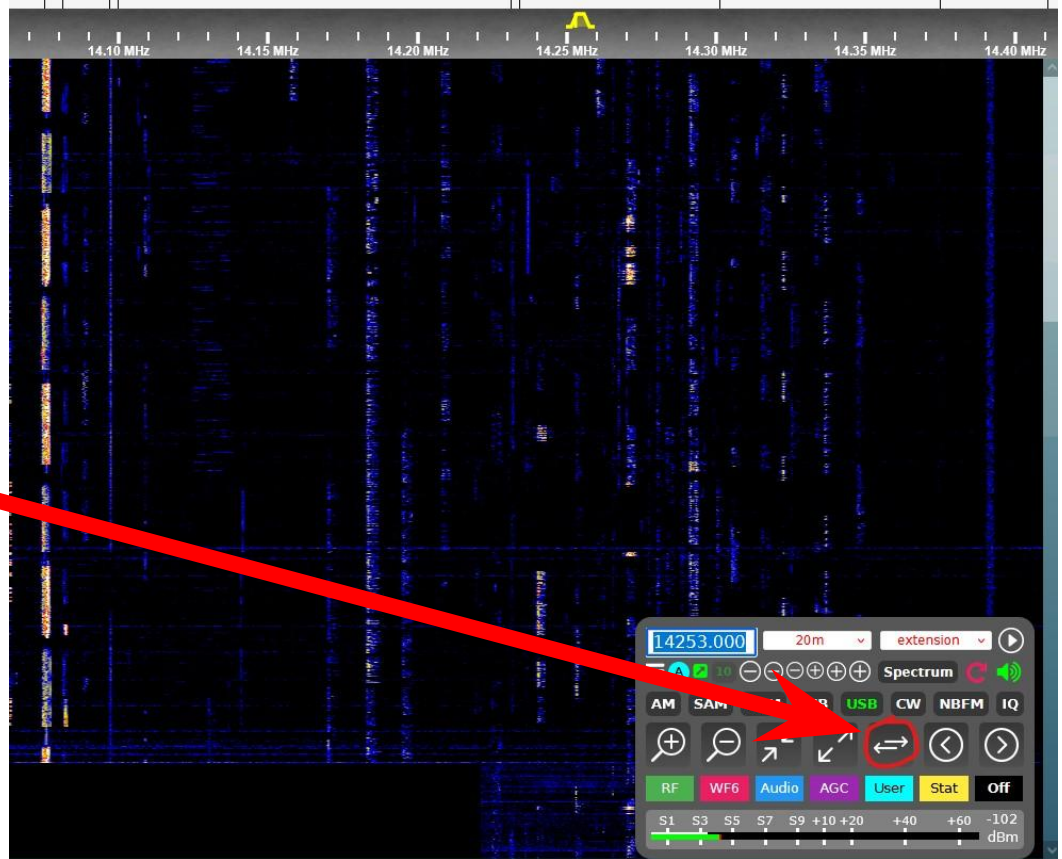
KiwiSDR Settings Demo

Zoom level in or out



KiwiSDR Settings Demo

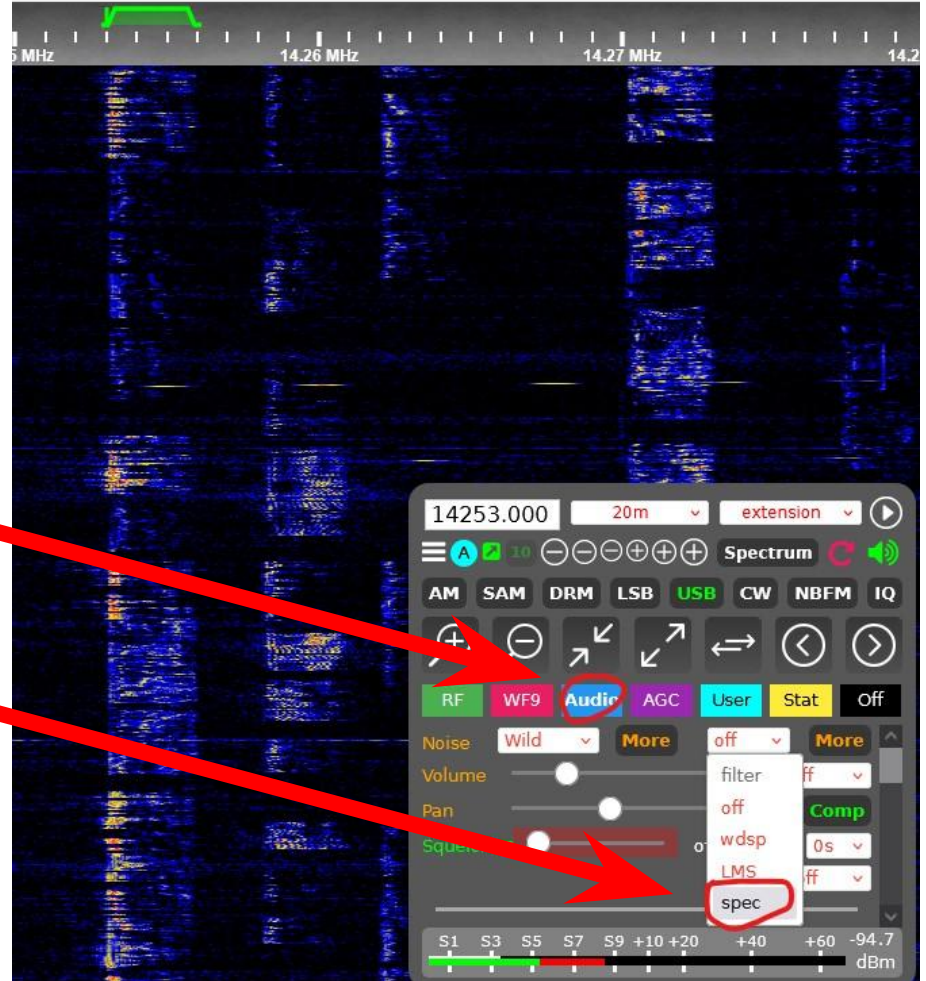
Zoom out band level



KiwiSDR Settings Demo

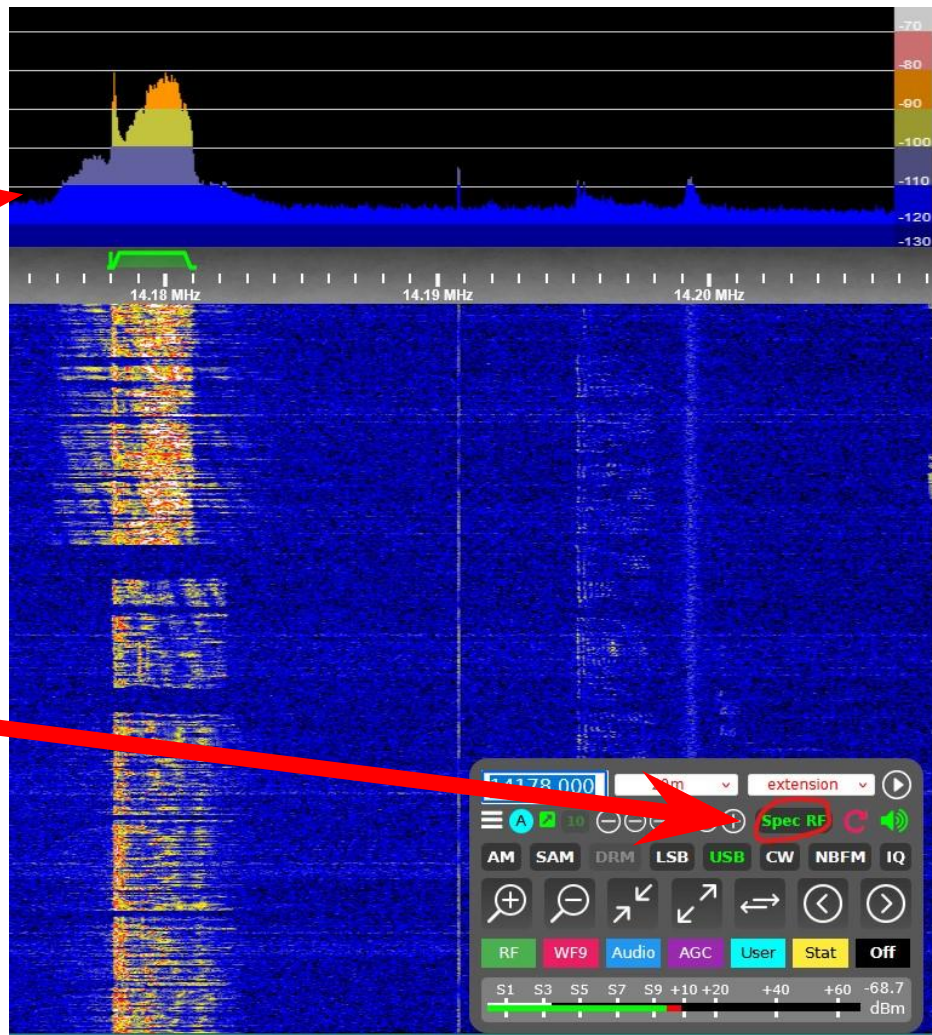
SELECT AUDIO TAB

Spectral Filter

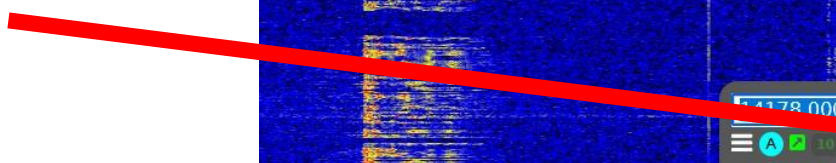


KiwiSDR Settings Demo

RF Spectrum



Spectrum mode - RF

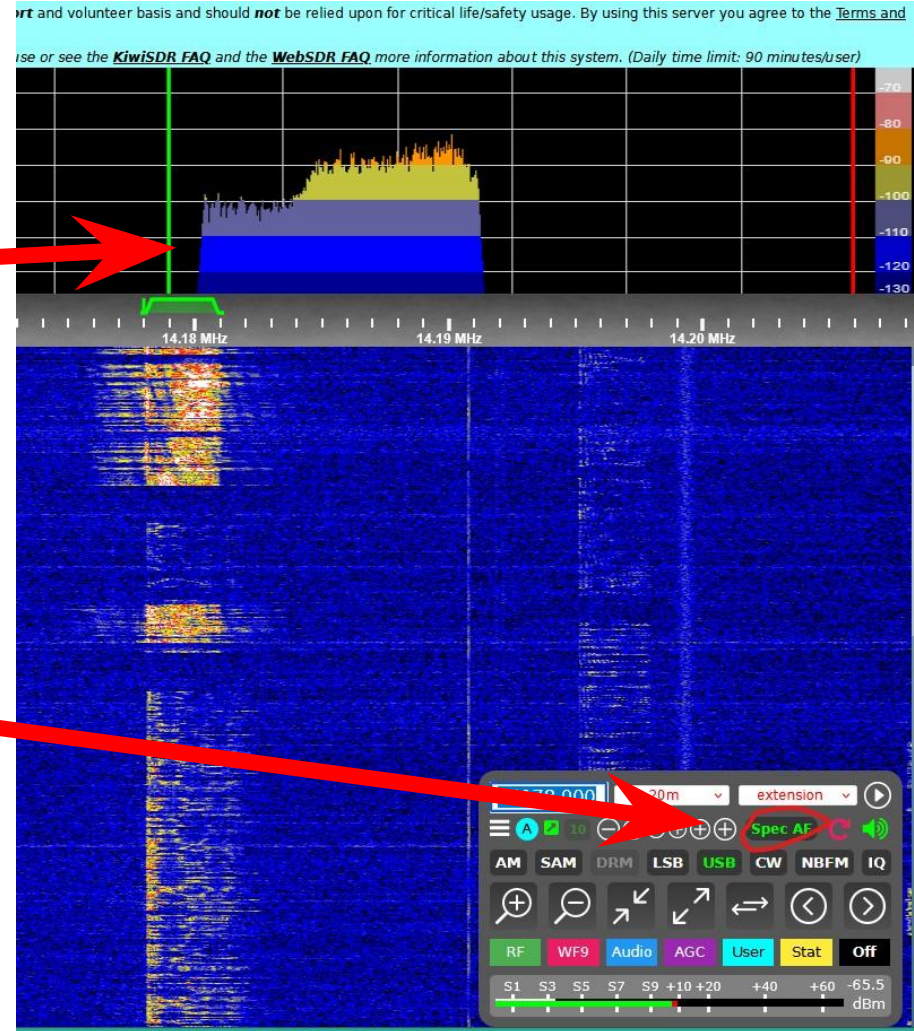
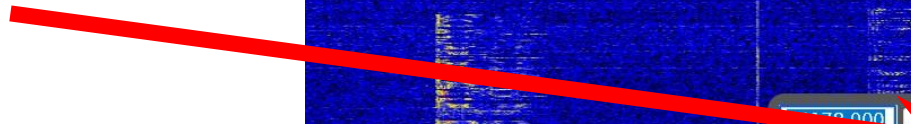


KiwiSDR Settings Demo

AF Spectrum



Spectrum mode - AF



RVARC in July....PART 2



A system to manage using Online SDRs

Today's presentation can be viewed at <http://hams.live/sdr/>