SETT. MA PLUGINS SDRuno MAIN V1.41.1	SETT. RDSW EXW SDRuno RX CONTROL RSY		SETT. F FMAF	SDRuno AUX SP	8-88 - 1
OPT SCAN SCHEDULER Final SR: 800000 0 SP1 SP2 RX Gain: 65.0dB ADD VRX ANTC ANTA NOTCHES MW/FM DAB COULD COCK	VF0 - QM FM MODE CW 0P FLTER N   VF0 A A > B NFM MFM CWPK 6000 8000 NI   VF0 B B > A WFM SWFM ZAP 11K 20K N	ISB DEGITAL NOTCH 2200 530 160	300 -5000 -4000 -3000 -2000		57 Pts RBW 9.13 Hz Marks 100 H
STOP	MUTE -84 dBm AGC	NCH4 1 2 3 17			
Sdy: 21% Sys: 29% SAVE WS Default Workspace		ow 15 Clear Enter		< 200M >	
Police.s1b 124250000 Y AM -90	Ann Intro	ducti efine			90.00   0000 L0:109000   000
Airband.s1b 126550000 Y AM 126725000 Y AM AM	986500 1087000 1087500 1088000 108	A0628F S 8500 1 ABE79D S 1720 A004C9 S AC18FE S 0640	SDRumo ADSB FLUGIN   Flight Alt Spd Hdg Lat   8000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 5000 500	Long RSSI Maga 74	BW 976.56 Hz Marks 50 kH 900 1093500 10 8
AudioRecorder DADSB DXCluster MRXCutput MRXCutput ADSB BlackCatystems CloudMarkers ContourShuttle Fran LionECI Tens LionECI	Resenter: Steve Brightman KI5E	A8BC13 5 2214	16225 331 35	SDR DIAU	нини 1/24/2022 10:58:59 А
STORE PROFILE SP W	IF SP+WF COMBO	< 200M >	VFO < RBW >		SQLC THR. i
				53°F Partly sunny	9⊒ ₽ 4» 10:58 AM

# Agenda

- The Basics
- Applications
- Hardware
- Software
- Panadapters
- Support & Information Sources
- Q&A



# What is an SDR?

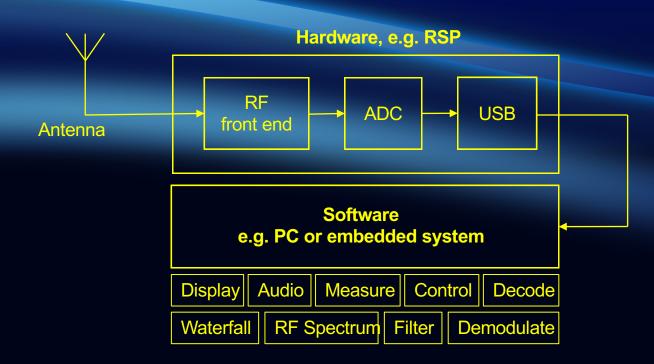
 A radio communication system where many components that have been traditionally implemented in *hardware*...

(e.g. mixers, filters, amplifiers, modulators/ demodulators, detectors, etc.) ...are implemented by *software* on a PC or embedded system.

- The hardware portion consists of pre-selection filters, possibly some IF filtering and a Analog-to-Digital Converter
- SDR is a technique, the actual implementation will vary by application:
  - e.g. Receivers tend to concentrate on wide bandwidth, Transceivers on narrower bandwidth at a specific frequency



### Simplified SDR Receiver Block Diagram





Example implementation



# Why do I want an SDR Receiver?

#### <u>Top Ten List</u>

- 1. True general coverage
- 2. Work one frequency and still monitor the entire band (or another band!)
  - Panadapter (suddenly your eyes can do 1000X what only your ears could do previously, one signal at a time!)
- 3. Audio and IF Digital Signal Processing (DSP)
- 4. Filters! (brick-wall envelopes... improving all the time with s/w upgrades)
- 5. Harness the power of your existing Computer
- 6. Multiple VFOs and/or virtual receivers
- 7. Schedule and Record large bandwidths of the spectrum and tune later!
- 8. Record/playback of audio from a specific signal
- 9. Allows you to explore new applications:
  - Digital modes, WX satellites, radio astronomy, aircraft monitoring, digital stations, TV, DAB, Ionosondes etc etc

10. Can you ever have too many receivers?



Application Examples



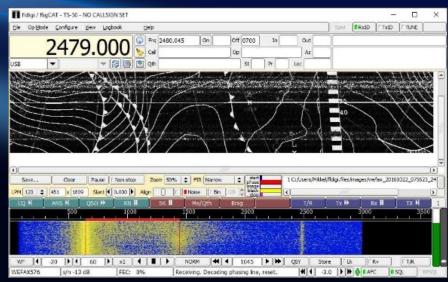
### Fldigi Digital Decoding

#### Eldigi NBEMS (Narrow Band Emergency Messaging System)

🚺 fldigi - K8JTK		
Ele Op Mode Configure View Log	pook <u>H</u> elp	Spot RxID TxID TUNE
146.00	C S Frq 148.379 On Off 0706	In Out
146.88	<b>30</b> S call 00	Az
FM 3000 -	🔁 📑 🖭 Qth 🛛 St	Pr Loc
CQ 3.0 Cear	F][WRAP:fn K8JTK_Test_Tornado_Funnel_Cloud_Storm_Re	port.fstm2s] <fimsp>2.0.8</fimsp>
CQ H ANS H QSO 🕨 KI	III SK II Me/Qth Brag T,	/R Tx 🕨 Rx 🛚 TX 🕅 1
500	1000 1500 2000	2500
WF 4 -20 4 70 x1	▲ ■ ▶ NORM ◀ ▲ 1499 ▶ ₩ QSY	Store FLk FRV FT/R
MT63-2KL s/n 19 dB	f/o +0.0 Hz Extracting WRAP/FLN 4 -3.0	🕨 🕪 🎸 l' AFC 📲 SQL 🛛 l' KPSQL

Credit: Jeff Kopcak, k8jtk

#### ...and WEFAX Decoding



Credit: Erik Mikkel Wied



Fldigi: http://www.w1hkj.com

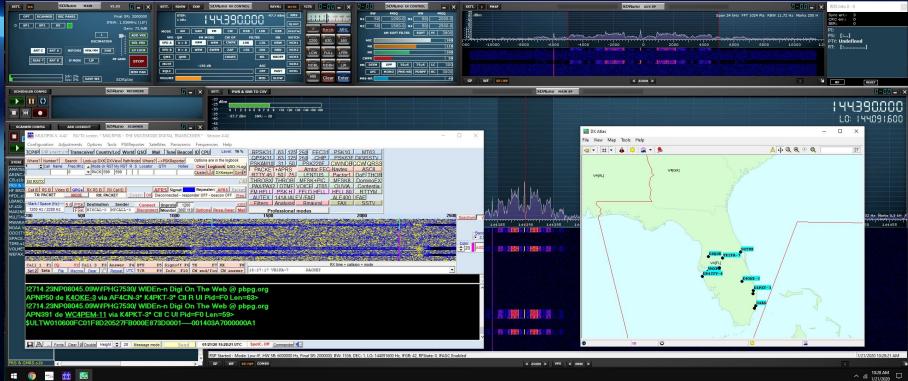
#### HF Weather Fax



Black Cat Systems: https://www.blackcatsystems.com Credit: Mike Ladd, KD2KOG







# 🌖 🔤 🔂 👪

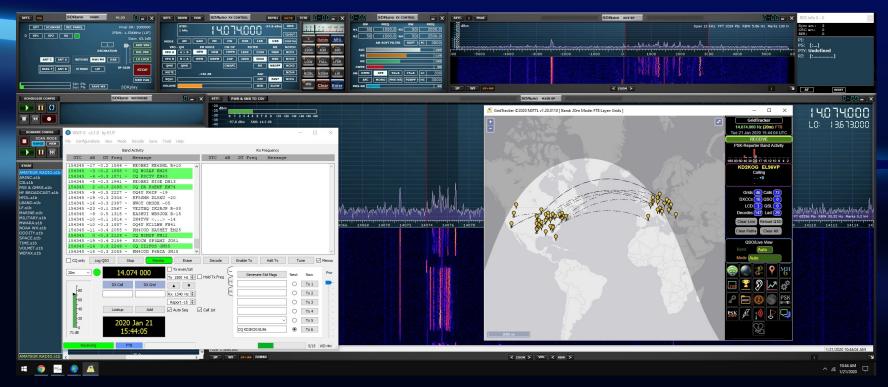
#### MultiPSK: http://f6cte.free.fr/index anglais.htm

www.sdrplay.com

Credit: Mike Ladd, KD2KOG

\_\_\_\_





WSJT-X: https://physics.princeton.edu/pulsar/K1JT/wsjtx.html

GridTracker: https://tagloomis.com/grid-tracker/

www.sdrplay.com

#### Credit: Mike Ladd, KD2KOG



#### CSV Userlist Browser

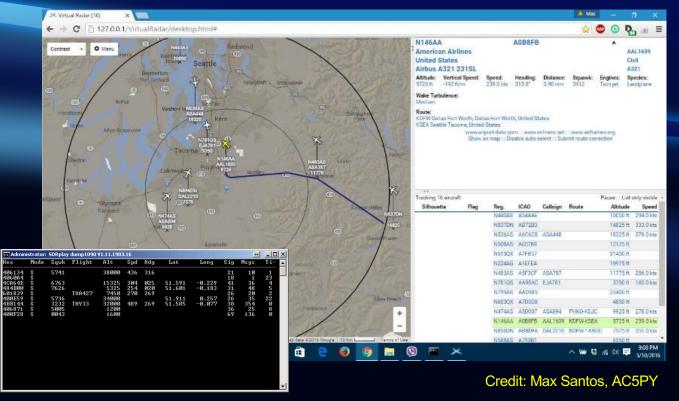


CSV User List Browser: https://www.df8ry.de/htmlen/home/@welcome.htm

Credit: Mike Ladd, KD2KOG

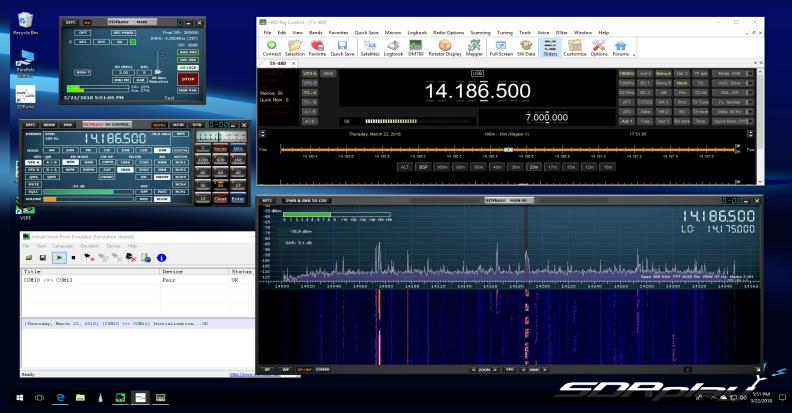


# ADS-B decoding example using Dump1090 and VRS





### Ham Radio Deluxe (including DM-780 and Logbook)



Credit: Steve Brightman, KI5ENW



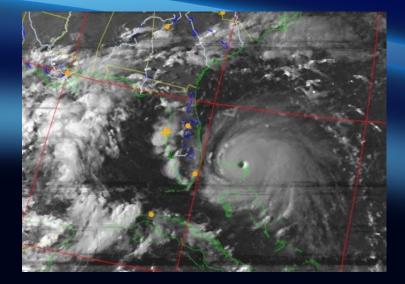
Ham Radio Deluxe: https://www.hamradiodeluxe.com/

# Satellite working





## NOAA Weather satellite (137 MHz) - Wxtoimg (RSP1)



User pictures from the facebook group: www.facebook.com/groups/sdrplay/

Wxtoimg: http://www.wxtoimg.com

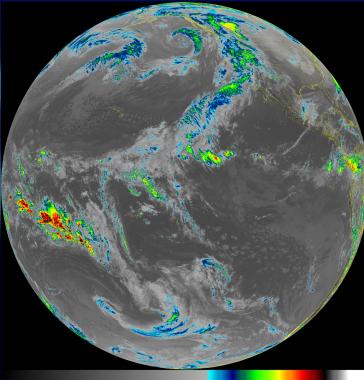


Credit: Hurricane Dorian by Bill Otten, KC9CS

SDRolau

# High Resolution imagery received from the NOAA GOES 16 and GOES 17 satellites (1.7GHz)





-30C -40C -50C -60C -70C -80C



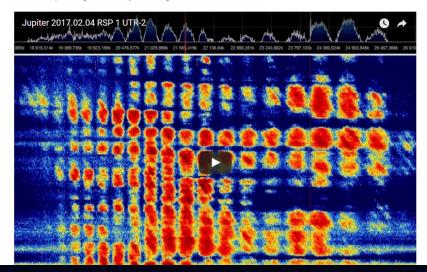
Credit: Bern Bareis

## Tune in to Jupiter!

#### **RECEIVING JUPITER NOISE BURSTS WITH AN SDRPLAY RSP1**

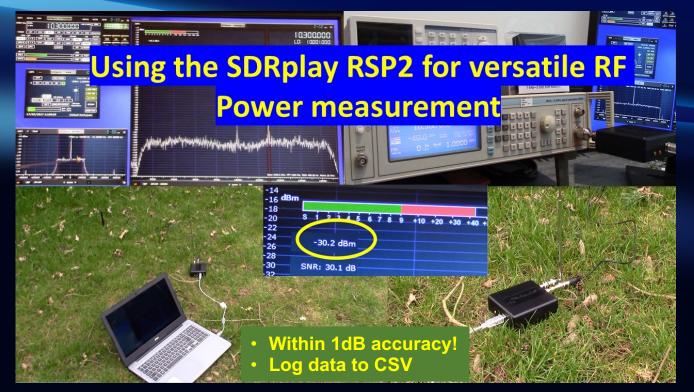
Over on YouTube user <u>MaskitolSAE</u> has uploaded a video showing him receiving some noise bursts from Jupiter with his SDRplay RSP1. The planet Jupiter is known to emit bursts of noise via natural 'radio lasers' powered partly by the planets interaction with the electrically conductive gases emitted by Io, one of the the planets moons. When Jupiter is high in the sky and the Earth passes through one of these radio lasers the noise bursts can be received on Earth quite easily with an appropriate antenna

In his video <u>MaskitolSAE</u> shows the 10 MHz of waterfall and audio from some Jupiter noise bursts received with his SDRplay RSP1 at 22119 kHz. According to the YouTube description, it appears that he is using the <u>UTR-2 radio telescope</u> which is a large Ukrainian radio telescope installation that consists of an array of 2040 dipoles. A professional radio telescope installation is not required to receive the Jupiter bursts (a backyard dipole tuned to ~20 MHz will work), but the professional radio telescope does get some really nice strong bursts as seen in the video.



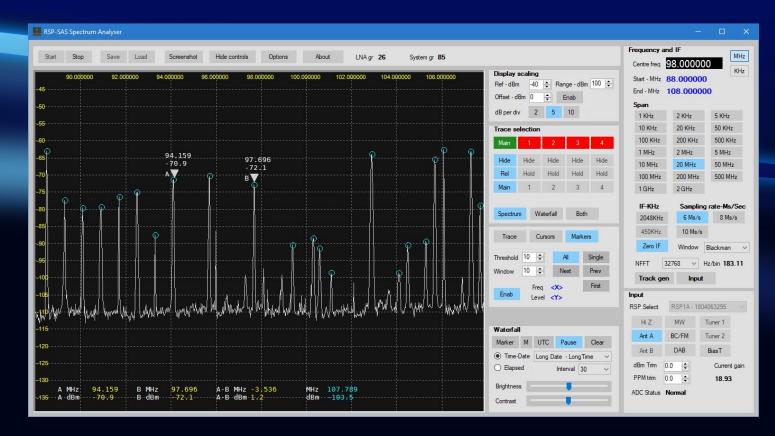


# Doubles as a new piece of RF lab kit: an RF Power meter – get one for work or play!



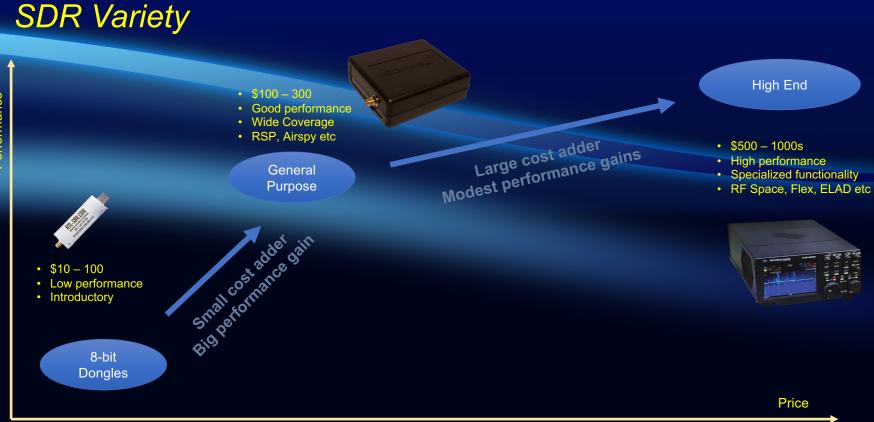


#### SAS Spectrum Analyser – Make your RSP into a Spectrum Analyser!



SDR hardware







13

# Review of SDR receivers – what to consider:

- Frequency Range: The range of frequencies the SDR can tune.
- ADC Resolution: Higher is better. More resolution means more dynamic range, less signal imaging, a lower noise floor, more sensitivity when strong signals are present and better ability to discern weak signals.
- Instantaneous Bandwidth: The size of the real time RF chunk available.
- RX/TX: Can the radio receive and/or transmit?
- **Preselectors:** Analogue filters on the front end to help reduce out of band interference and imaging.
- **Software:** Is your favourite package supported? Does manufacturer provide?
- Price



## Instantaneous bandwidth illustration

#### RSP1a

#### 10 MHz visibility







RSPdx

## RSPduo - Dual independent tuners!

Single 10MHz slice, like the other RSPs, or....

un manager and when

• Two independent "slices" anywhere in the coverage range







# SDRplay Receivers – RSP Family

- Continuous SDR receiver coverage from VLF to 2 GHz
- All the amateur radio bands from VLF to 23cm
- High performance ADC technology (not another compromise SDR!)
- Built-in high performance front-end filters
- Use as a stand-alone general coverage receiver, or as a high resolution panadapter
- Visualize all the signals in multiple bands simultaneously
- SDRuno Windows SDR software provided free-of-charge
- Works on other platforms (Mac, Linux etc) using 3rd party SDR Software
- Works with 3<sup>rd</sup> party Windows software e.g. HDSDR, SDR-Console)
- Runs on a Raspberry Pi download our SD Card image
- Ideal for portable operation (powered via USB)
- Can be used as a Spectrum Analyzer or an RF Power Meter
- Backed by the world's biggest and best SDR support community!



# RSPduo - Monitor two widely spaced bands simultaneously!

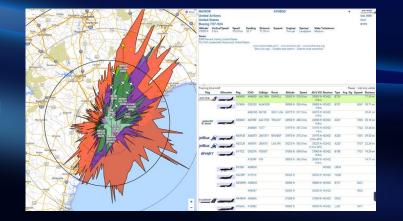


SDRolau

1

# RSPduo - Mix and match applications simultaneously!





ATC





# RSPduo - Diversity Tuning!!!



1

- RSPduo only
- MRC (Maximum Ratio Combination) for noise reduction (AUTO mode)
- Interference Rejection (Manual mode)

# RSPdx – Multiple Inputs & HDR



- Improved replacement for RSP2/pro
- 3 Software selectable inputs
- Additional 500kHz LPF for LF/VLF
- HDR mode for enhanced performance under 2MHz
  - Great for Dxers!
- Notch filters on all inputs
- BNC input for reception up to 200MHz
- Rugged steel case







# **Software**

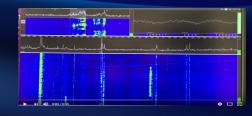
- SDRplay owns and develops our own SDR software, optimised for the RSP family:
  - Software upgradeable for future standards
  - API provided to allow demodulator or application development
- SDRplay also provides Multi-platform API enabling Windows, Mac, Linux, Android, Raspberry Pi 3<sup>rd</sup> party software including: SDRConsole, HDSR and CubicSDR
- All the above software packages are available *free of charge!*
- Supports 3<sup>rd</sup> party software e,g, loggers, Decoders, Rig Control etc



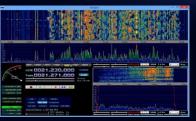
**SDRuno** 



SDRConsole



CubicSDR



HDSDR



#### Multiple VFOs & different decode modes - simultaneously!





#### RF power level + SNR measurement & logging



SDRølau

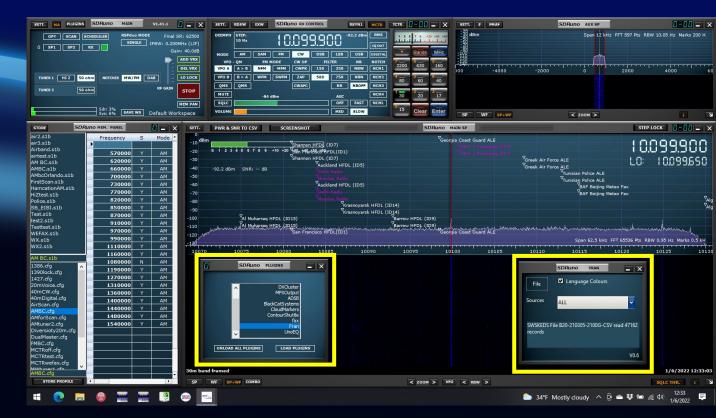
#### Scanning – scan a range of frequencies or your own preset frequencies



# Plugins

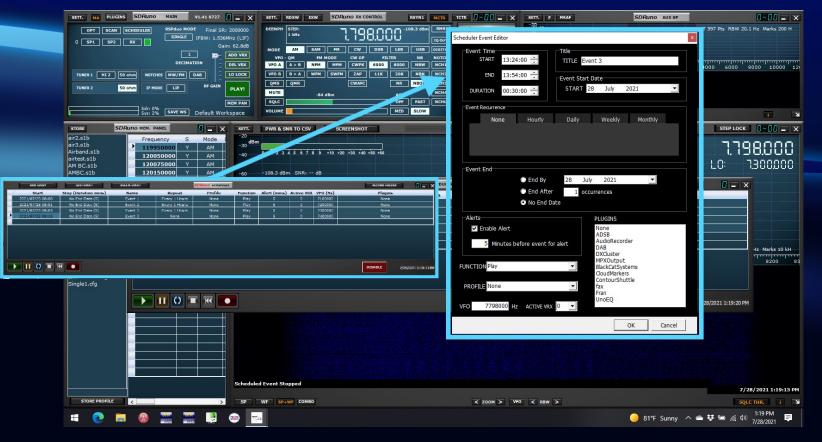
Enhance receiver capabilities:

- Annotation
- Decoders
- Controllers
- > 3<sup>rd</sup> party Interface
- Recorders
- SDRplay or 3<sup>rd</sup> party development



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## Scheduler





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#### **Profiles**

- Ensure receiver is set up correctly for:
  - Scheduled events
  - Specific user scenarios
- Store a complete set of radio parameters including:
  - ➢ LO and VFO
  - Sample rate (SR and DEC)
  - Gain
  - Input selection
  - Notch filters
  - VRX settings
- Examples:
  - AM broadcast
  - ➢ HF CW or FT8
  - FM Broadcast



STORE	SDRuno MEM. PANEL		SETT. PWR & SNR TO CSV SCREENSHOT	
air2.s1b	Frequency	S Mode I	-20 dBm	
ir3.s1b irband.s1b	119950000	Y AM	-30	
irtest.s1b	120050000	Y AM	-40 \$ 1 2 3 4 5 6 7 8 9 +10 +20 +30 +40 +50 +60	
M BC.s1b	120075000	Y AM	-50	
MBC.s1b	120150000	Y AM	-60 -107.6 dBm SNR: 8.7 dB	
MbcOrlando.s1	120300000	Y AM	-70	
irstScan.s1b amcationAM.s1	120475000	Y AM	-80	
amcationAM.s1 iZtest.s1b	120575000	Y AM		
plice.s1b	120700000	Y AM	-90	
B EIBLs1b	121650000	Y AM	-100	
est.s1b	122500000	Y AM	-110	
st2.s1b	123775000	Y AM	-120	
esttest.s1b /EFAX.s1b	125000000	N AM	-130	
X.s1h	127900000	Y AM	-140	
X2.s1b	128000000	N AM	-140	
	128225000	Y AM	12800 12900 13000 13100 13200 13300 13400 13500	13600
ir2.s1b	130300000	Y AM		
386.cfg	^ 130325000	Y AM		
390lock.cfg 427.cfg	132975000	Y AM		
mVoice.cfa	133400000			
mCW.cfg	100100000			
mDigital.cfg				
rScan.cfg				
MBC.cfg				
MforScan.cfg		H		
Mtuner2.cfg iversioty20m.c				
ualMaster.cfg	9			
MBC.cfq				
ICTRoff.cfa				
CTRtest.cfg				
ICTRwefax.cfg				
Whuper1 cfa	<b>↓</b>		Profile (1390lock) loaded	
390lock.cfg				10 Yr 11
STORE PROFIL		•	SP WE SP+WE COMBO	< 200



#### SDRuno Software Roadmap

v1.42

- Final Version of SDRuno
  - Will continue to be supported for bug fixes etc
  - No new major enhancements will be added
- Nomenclature: V1.42 build xxxx
  - where xxxx is a unique 4 digit number typically based on MMDD
- All SDRuno software enhancements (except those for specific hardware) are applicable to all RSP models!
- The update notifications (if they are turned on) will make you aware of when a release is ready. If you do not want these notifications, the update notifier can be disabled in the main panel OPT menu.
- For more info: <u>https://www.sdrplay.com/sdruno-roadmap/</u>

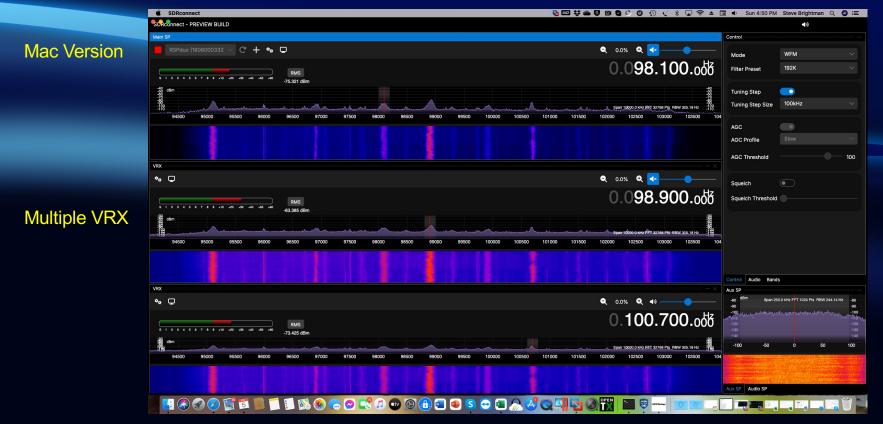


#### Introducing SDRconnect

- Complete rewrite of SDRuno
  - Both SDRuno and SDRconnect can be installed on the same machine
  - SDRuno v1.42 will continue to be supported (bug fixes etc only)
- Cross Platform (x86, ARM, MacOS, Linux, Windows, Android)
- New Remote Server and Client (cross platform)
  - Access your RSP from anywhere home LAN or across the internet!
- Complete GUI rewrite and update
  - More intuitive / easy to use interface
  - Ability to lock panels together
- Modular architecture
  - Easily add additional functionality
- Compatible with all current RSPs (RSP1A, RSPdx, RSPduo)
  - Compatible with RSP2 & RSP2pro discontinued products
  - Due to hardware limitations the RSP1 is not supported, but SDRuno 1.42 can still be used
- Preview release is imminent! (see https://www.sdrplay.com/sdrconnect/ for updates)



### Introducing SDRconnect - Example screenshot



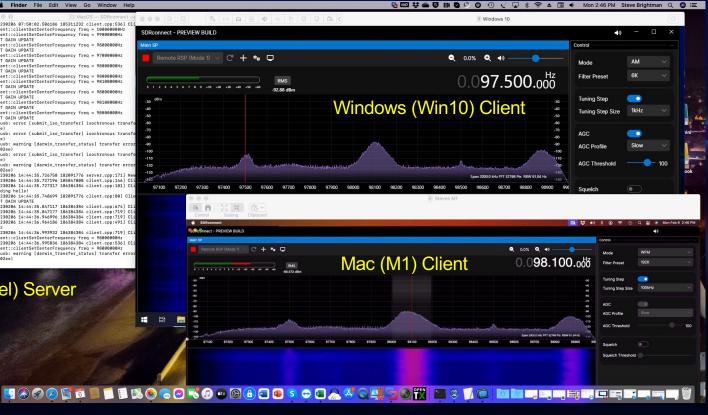
Note: GUI not yet finalized!

#### SDRølau

#### Introducing SDRconnect - Example screenshot

🗯 Finder File Edit View Go Window Help

I20230206 07:50:02.506186 185311232 client.cpp:536] Cl: lient::clientSetCenterFrequency freg = 100000000Hz Client::clientSetCenterFrequency freq = 99000000Hz SENT GAIN UPDATE Client::clientSetCenterFrequency freq = 9800000Hz Main SP SENT GATN UPDATE Client::clientSetCenterFrequency freq = 97000000Hz SENT GAIN UPDATE Client::clientSetCenterFrequency freq = 9800000Hz SENT GATN UPDATE Client::clientSetCenterFrequency freq = 98000000Hz Client::clientSetCenterFrequency freq = 98100000Hz SENT GAIN UPDATE Client::clientSetCenterFrequency freq = 9800000Hz SENT GAIN UPDATE dB Client::clientSetCenterFrequency freq = 98100000Hz SENT GAIN UPDATE -40 Client::clientSetCenterFrequency freq = 9800000Hz SENT GAIN UPDATE libusb: error [submit\_iso\_transfer] isochronous transfe -60 02ee) libusb: error [submit\_iso\_transfer] isochronous transfe 02ee) libusb: warning [darwin\_transfer\_status] transfer error 88882ee) libusb: error [submit iso transfer] isochronous transfe -116 02ee) libusb: warning [darwin\_transfer\_status] transfer error -120 80002ee -130 I20230206 14:44:35.726758 182091776 server.cpp:171] New I20230206 14:44:35.727196 185847808 client.cpp:146] Cli I20230206 14:44:35.727317 186384384 client.cpp:181] Cli ending hello! I20230206 14:44:35.748699 182091776 client.cpp:80] Clie SENT GATN LIPDATE 120230206 14:44:35.847117 186384384 client.cop:674] Cl: I20230206 14:44:35.847177 186384384 client.cpp:719] Cl 20230206 14:44:36.946996 186384384 client.cpp:719] C I20230206 14:44:36.964186 186384384 client.cpp:491] Cli 6Hz I20230206 14:44:36.993932 186384384 client.cpp:719] Cli lient::clientSetCenterFrequency freq = 98000000Hz 128238286 14:44:36.995836 186386386 client.con:5361 Cl Client::clientSetCenterFrequency freg = 98000000Hz libusb: warning [darwin transfer status] transfer erro: 30002ee) Mac (Intel) Server

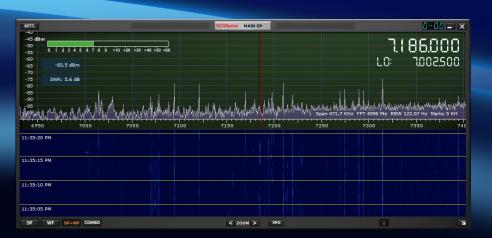








#### What is a Panadapter?



"Go-to" choice for Kenwood, Yaesu, Icom, Elecraft etc!

- "Panadapter is short for Panoramic Adapter. The simple answer is that it allows us to see a panoramic display of the band our radio is tuned to. We can see every signal"\*.
- Early implementations used a PC soundcard to achieve this function but were therefore limited to 200 kHz of bandwidth because they rely on the sound card.
- The advent of affordable SDR hardware such as the RSP1A has allowed implementations with much greater bandwidth, and hence much more usefulness.
- Combined with readily available, and capable, SDR software Panadapters are now an affordable and easy to implement reality!

\* Definition courtesy KA9MOT http://mypanadapter.com/



### Why panadapter?

- Add new capabilities / visibility to any rig
- Synchronize the the rig to the software if it has a CAT port
- Work one frequency while monitoring the whole band
- Monitor multiple bands in addition to the one you're working
- Arbitrarily large spectrum scope
- Less cost, more features than factory add-ons,



#### Monitoring 3 bands with SDRuno





### The perfect Panadapter companion for your rig

- Any of the SDR Software programs that support RSP can be used to provide a basic spectrum display.
- SDRuno, HDSDR, SDR Console and CubicSDR have built-in capabilities for CAT and other add-on software, to allow for communication between the SDR software and the transceiver.
- OmniRig is commonly used for synchronization/control between the TRx and SDR Rx, but other control software, e.g. HRD, DXlab etc. can be incorporated using SDRuno's CAT capability
- App notes and videos available from sdrplay.com



# Use a T/R switch if not using protected transceiver IF or RF out!



## Support and further information



#### Software Downloads



www.sdrplay.com

#### **Documentation and Video Catalog**

SDRplau

#### DOCUMENTATION & VIDEO CATALOGUE (PREVIOUSLY CALLED "APPLICATIONS AND SUPPORT CATALOGUE")

The SDRplay Documentation and Video Catalogue is your reference point for documentation, application Notes, how-to videos and much more. You can select by category and sub-category or choose to search "all categories". You can search by keyword and decide whether to include links to third party content. For more detailed information on each

Select Category to search on RSP Hardware SDRplay Software 3rd Party Software Other Hardware Miscellaneous

Select Sub-Category Applications articles Documents Non-Windows platforms Basics SDRuno Webinars Non English

Search selected area for term SEARCH Include Third Party Content? Search ALL Categories?

Searches on full words of more than 2 characters. Returns instances of either term if more than 1. Returns nothing when too many hits (eg SDRuno) Clear Query

•	S	ea	rc	ha	b	e	

• Literally hundreds of documents and videos!

	Description click for more details		Created	
VID562	SDRuno v1.40.2 Profiles		02-Dec-2020	
VID556	SDRuno basics Virtual audio cable		28-Oct-2020	
DOC610	Installing the SDRplay RSP API on an M1 Mac	1	09-Oct-2021	
VID599	SDRuno V1.41 ADSB plugin guide	7	30-Jul-2021	
VID597	SDRuno v1.41 Introduction		29-Jul-2021	
VID600	ADSB plugin preview		28-Jul-2021	
VID555	Using Virtual Audio Cables		28-Oct-2020	
VID546	SDRuno FAQ Installation		14-Sep-2020	
VID542	Loading 3rd Party Plugins		04-Sep-2020	
VID539	SDRuno DAB plugin		20-Aug-2020	
VID538	SDRuno Audio Recorder Plugin		17-Aug-2020	
VID537	SDRuno DX Cluster plugin demo	1	14-Aug-2020	
VID535	SDRuno Improved Squelch		09-Aug-2020	
MV049	Setting up the Recording Scheduler in SDRuno		03-Mar-2020	
4V050	Making a wav or mp3 file from SDRuno	7	03-Mar-2020	
AV038	SDRplay RSPduo HF diversity demo (22m)	7	25-Oct-2019	
JG006	Workflow for running GNU-radio with SDRplay RSPs	-	11-Oct-2019	
W036	Diversity setup and demo for 3 HF antennas		14-Aug-2019	
W034	Diversity for noise cancelling demo (RSPduo)		22-Jul-2019	

1

www.sdrplay.com

#### How-to videos: SDRplay YouTube Channel

#### SDRuno Video Guides - Part 2 (V 1.2 onwards) PLAY ALL

This is Part 2 in our series of SDRuno Video guides for version 1.2 and later. The Video guides in Part 1 were created using earlier versions of SDRuno so you may see some slight differences in the



in Version 1.2

14K views • 7 months ago

SDRuno v1.21

5K views • 2 months ago

& Resolution bandwidth

measurement & ham band

SDRplay Software Defined Rad... 4.2K views • 1 month ago

SDRplay Software Defined Rad... 766 views • 1 day ago

SDRplay Software Defined Rad... 1.4K views • 3 weeks ago

SDRplay Software Defined Rad... 1.2K views • 3 weeks ago

1.8K views + 5 months ago

#### SDRuno Video guides- Part 1 (Click here for Part 1 in our series of over 20 video guides) PLAY ALL



3.4K views • 2 months ago

SDRplay Software Defined Rad... 2.1K views • 5 months ago

#### www.youtube.com/c/SDRplayRSP

www.sdrplay.com

#### Facebook Groups



www.sdrplay.com

### Direct support from SDRplay



www.sdrplay.com

### For more information:

- Company website: <u>www.sdrplay.com</u>
  - Check out the *Applications & Support Catalog* at: <u>https://www.sdrplay.com/apps-catalogue/</u>
- Users Forum: <a href="https://groups.io/g/SDRPlayUsers">https://groups.io/g/SDRPlayUsers</a>
- Email: <u>support-usa@sdrplay.com</u>
- Facebook: <u>SDRplay</u> and <u>SDRuno</u> specifically
  - Independent groups run by enthusiastic users!
- Where to purchase?
  - Ham Radio Outlet (US): https://www.hamradio.com



