

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







Example implementation



Why do I want one?

Top Ten List

- 1. True general coverage
- 2. Work one frequency and still monitor the 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. 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			
Eile Op Mode Configure View Log	book <u>H</u> elp	Spot RxID TxID TUNE	
140.0	On Off 0706	In Out	
140.8	50 [5] call Op	Az	
FM 3000 🔫	😒 📑 🖭 Qth 🛛 🛛 St	Pr Loc	
CQ 3.0 Clear	H][WRAP:fn K8JTK_Test_Tornado_Funnel_Cloud_Storm_ 1348	Report.fstm2s] <fimsg>2.0.8</fimsg>	
CQ 🕅 🛛 ANS 🕅 QSO 🕨 🛛 KI	III SK II Me/Qth Brag	Т/К Тх ₩ Кх Ш ТХ И 1	1
500	1000 1500 2000	2500	
WF 4 -20 4 70 1 x1	4 • • NORM 4 4 1499 • • • QSY	Store FLK FRV FT/R	
MT63-2KL s/n 19 dB	f/o +0.0 Hz Extracting WRAP/FLM 4 -3	.0 . 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







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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

SDRølau

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





www.sdrplay.com

Price 5DRpla

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

RSPdx – new!

10 MHz visibility









RSPduo - Dual independent tuners!

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

• Two independent "slices" anywhere in the coverage range



"...the biggest change to SDR since the RSP1!"



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 3rd party Windows software e.g. HDSDR, SDR-Console)
- Runs on a Raspberry Pi3 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

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RSPduo - Mix and match applications simultaneously!





ATC





RSPduo - Diversity Tuning!!!



- 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 software, SDRuno, for the RSP family:

- Software upgradeable for future standards
- API provided to allow demodulator or application development
- Windows only for now!
- SDRplay also offers Multi-platform support for Windows, Mac, Linux, Android, Raspberry Pi 2/3 via 3rd party software including: SDRConsole, HDSR and CubicSDR
- All the above software packages are available free of charge!
- Supports 3rd party software e,g, loggers, Decoders, Rig Control etc



SDRuno



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SDRConsole



HDSDR

CubicSDR

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
- > 3rd party Interface
- Recorders
- SDRplay or 3rd party development



Scheduler





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	SDRur	10 MEM. PANEL		- X	SETT. P	WR & SNR T	O CSV	SCREEN	SHOT				
air2.s1b		Frequency	s	Mode I	-20 dPm								
air3.s1b		119950000	Y	AM	-30								
Airband.s1b		120050000	Y	AM	-40 S	1 2 3 4 5	6789	+10 +20 +30	+40 +50 +6	0			
airtest.s1b		120075000	Y	AM	-50								
AMBC eth		120150000	v	AM	c0 -10	17.6 dBm S							
AMbcOrlando.s1b		120300000	v	AM	-60								
FirstScan.s1b		120300000	v	AM	-70								
HamcationAM.s1b	>	120475000		AM	-80								
HiZtest.s1b		120373000		0.04	-90								
Police.s1b		120700000	1	AM	-100								
SB_EIBLSID		121650000	Y	AM	-110								
test2.s1b		122500000	Y	AM	110								
Testtest.s1b		123775000	Y	AM	-120								
WEFAX.s1b		125000000	N	AM	-130								
WX.s1b		127900000	Y	AM	-140								
WX2.s1b		128000000	N	AM	12800	12900	12000	12100	12200	12200	12400	12500	12600
air? c1h		128225000	Y	AM	12800	12900	13000	13100	13200	13300	13400	13300	13600
1386 cfa		130300000	Y	AM									
1390lock.cfg	- î	130325000	Y	AM									
1427.cfg		132975000	Y	AM									
20mVoice.cfg		133400000	Y	AM .									
40mCW.cfg													
40mDigital.cfg													
AirScan.crg													
AMforScan cfa													
AMtuner2.cfa													
Diversioty20m.cf	a												
DualMaster.cfg													
FMBC.cfg													
MCTRoff.cfg													
MCTRtest.cfg				4									
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1390lock.cfg					Profile (1390	ock) loade	a a						- 1. C. S. S
STORE PROFILE				•	SP WF	SP+WF	сомво						< 200
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SDRuno Software Roadmap

1.42

- Memory Panel updates (if blank use current value)
 - RF Gain
 - IF Gain/AGC enable
 - Scanner Threshold
- Scanner updates
 - · Lockouts in a separate file
 - Statistics logging
 - Use memory panel threshold
 - Improved/faster memory panel scanning
- Custom controls
 - SP2 Filter bandwidth (up to max available SP2 bandwidth for RX mode)
 - User defined Band framing buttons
- Start-up tips

2.0

- Cross Platform (Windows, MacOS, Linux)
 - This will support both x86 and the new Mac M1 architecture if practicable
- New Remote Server (cross platform)
- Built-in SDRuno TCP client
- Add Hamlib support for non-Windows platforms
- GUI update ability to lock panels together

All versions also include bug fixes and user feedback (where possible)

All SDRuno software enhancements, (except those for specific hardware) are applicable to all RSP models!





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

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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

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• Literally hundreds of documents and videos!

	Description click for more details		Created
ID562	SDRuno v1.40.2 Profiles		02-Dec-2020
ID556	SDRuno basics Virtual audio cable		28-Oct-2020
OC610	Installing the SDRplay RSP API on an M1 Mac	1	09-Oct-2021
ID599	SDRuno V1.41 ADSB plugin guide	- <u>-</u>	30-Jul-2021
ID597	SDRuno v1.41 Introduction		29-Jul-2021
ID600	ADSB plugin preview		28-Jul-2021
ID555	Using Virtual Audio Cables		28-Oct-2020
ID546	SDRuno FAQ Installation		14-Sep-2020
ID542	Loading 3rd Party Plugins		04-Sep-2020
ID539	SDRuno DAB plugin		20-Aug-2020
ID538	SDRuno Audio Recorder Plugin		17-Aug-2020
ID537	SDRuno DX Cluster plugin demo	1	14-Aug-2020
ID535	SDRuno Improved Squelch		09-Aug-2020
IV049	Setting up the Recording Scheduler in SDRuno		03-Mar-2020
IV050	Making a wav or mp3 file from SDRuno	7	03-Mar-2020
V038	SDRplay RSPduo HF diversity demo (22m)	1	25-Oct-2019
G006	Workflow for running GNU-radio with SDRplay RSPs	1	11-Oct-2019
V036	Diversity setup and demo for 3 HF antennas		14-Aug-2019
V034	Diversity for noise cancelling demo (RSPduo)		22-Jul-2019

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

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& Resolution bandwidth

measurement & ham band

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www.youtube.com/c/SDRplayRSP

Facebook Groups



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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: https://groups.io/g/SDRPlayUsers
- Email: <u>support-usa@sdrplay.com</u>
- Facebook: SDRplay and SDRuno specifically
 - Independent groups run by enthusiastic users!
- Where to purchase?
 - Ham Radio Outlet (US): <u>https://www.hamradio.com</u>



See our demo at the HRO booth!

