



An Introduction to Software Defined Radio

What is an SDR?

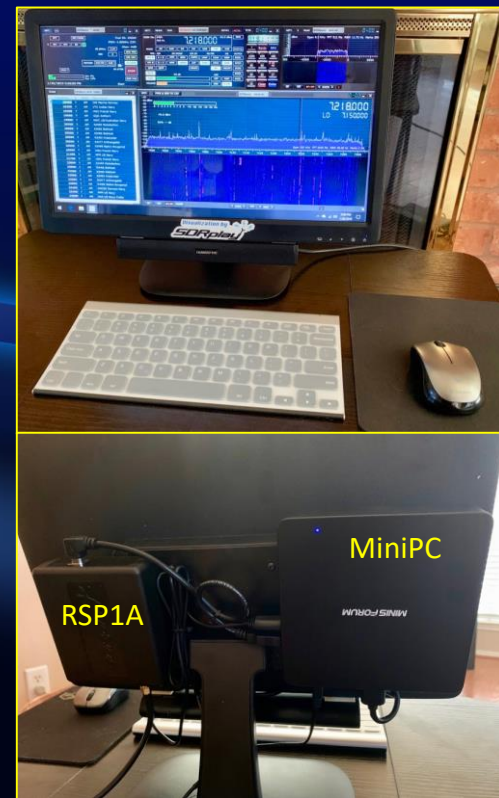
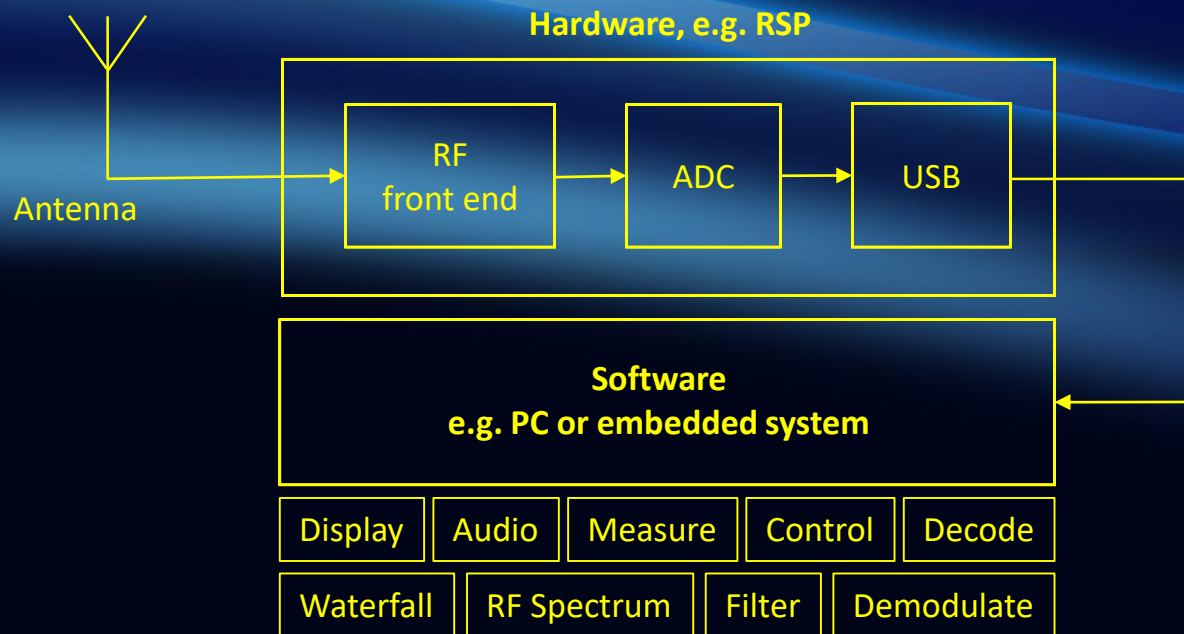
- A radio communication system where many components that have been traditionally implemented in hardware...

(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

Simplified SDR Block Diagram



Example implementation

Why do I want one?

Top Ten List

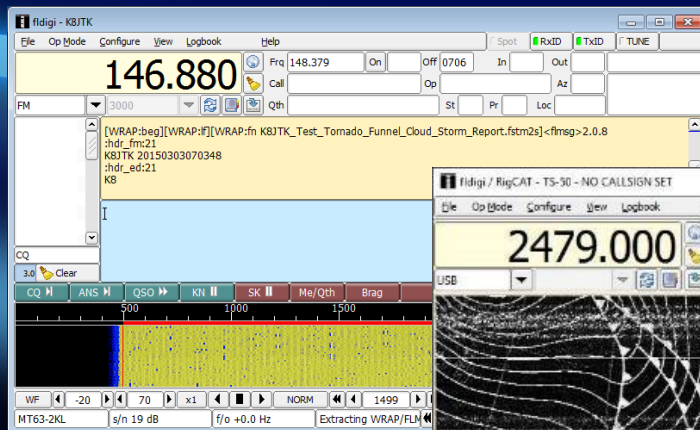
1. True general coverage
2. Work one frequency and still monitor the band (or another band!)
 - Panadapter (suddenly your eyes can do 1000X what only your ears could do previously, one signal at a time!)
3. Filters! (brick-wall envelopes... improving all the time with s/w upgrades)
4. Audio and IF Digital Signal Processing (DSP)
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



Digital Decoding

Fldigi NBEMS (Narrow Band Emergency Messaging System)

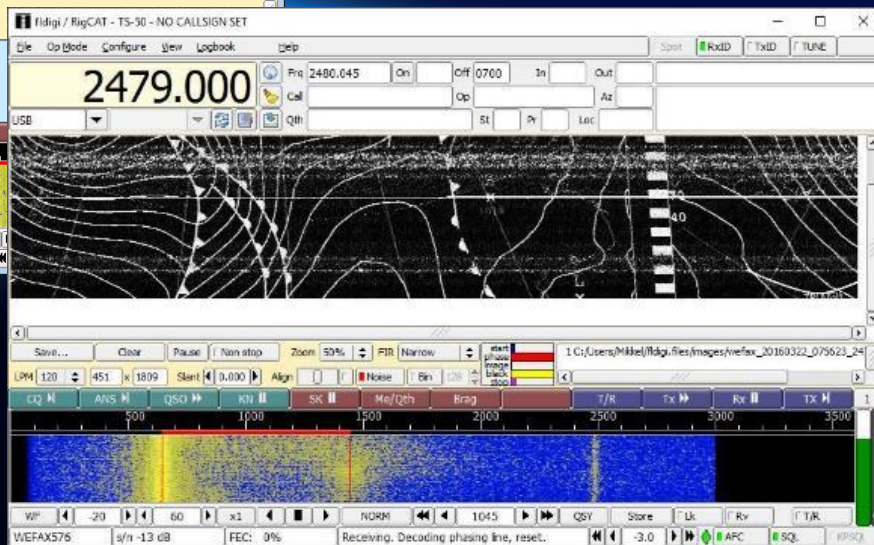


Credit: Jeff Kopcak, k8jtk

Fldigi: <http://www.w1hkj.com>

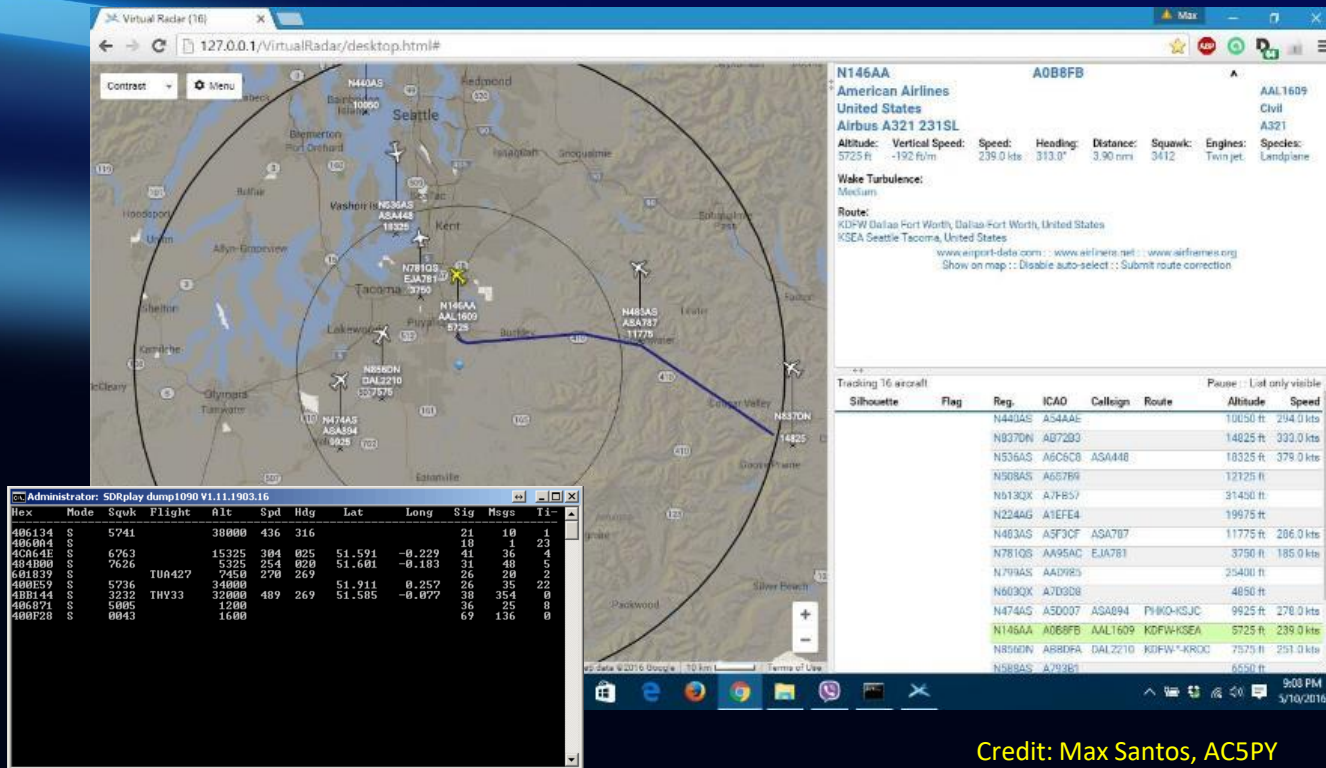
Also supports DSD, DSD+, MultiPSK, DM780 and more via VAC and CAT control

...and WEFAX Decoding



Credit: Erik Mikkell Wied

ADS-B decoding example using Dump1090 and VRS



Credit: Max Santos, AC5PY

Satellite working



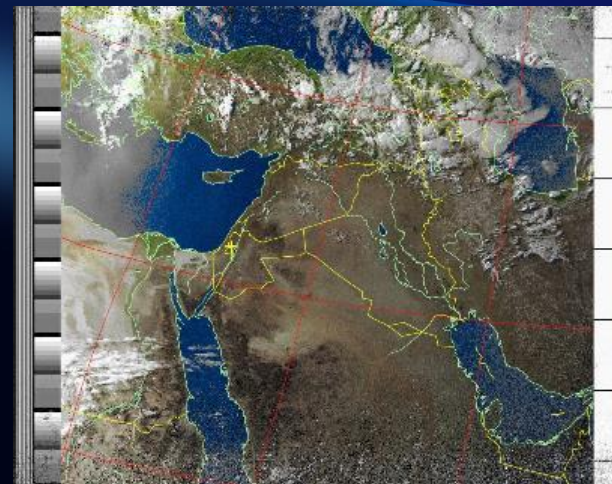
NOAA Weather satellite (137 MHz) - Wxtoimg (RSP1)



Credit: Jeff Broughton, WB8RIY

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

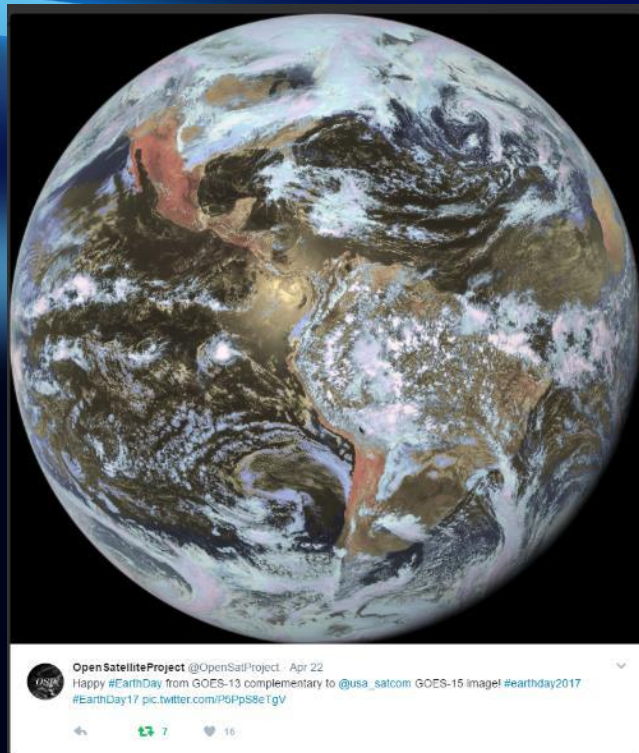
Wxtoimg:
<http://www.wxtoimg.com>



Credit: Sefi Merkel

High Resolution satellite images (1.7GHz) RSP2

..including latest GOES-16




SDRplay forum on Sat imaging

SDRPLAY


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UNCATEGORIZED

How to get some very impressive GOES High Resolution Satellite images using the RSP2 and SDRuno



JON

 NOVEMBER 20, 2017

"Geostationary weather satellite image reception is more challenging than APT weather satellite image reception, but can be achieved well using an SDRplay RSP2" as described in this new post on our forum.

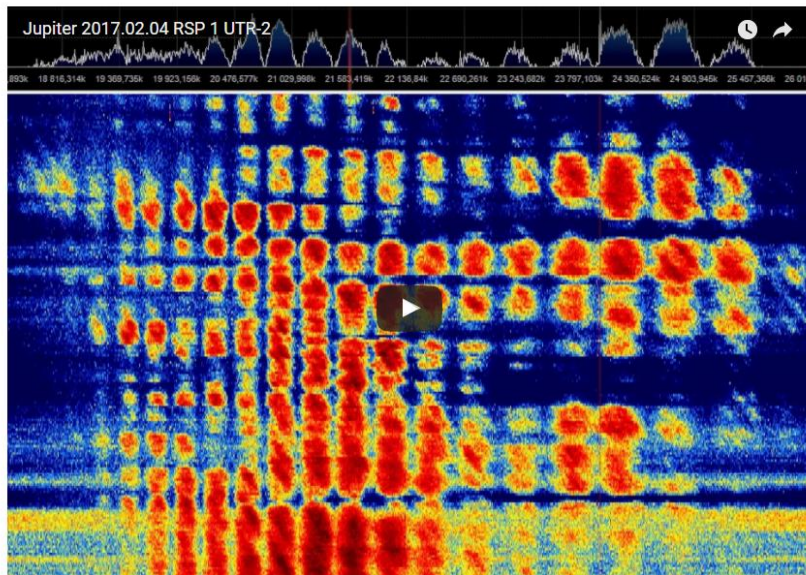
The author writes "Before getting started in putting together a receiving system for HRIT and LRIT images, it is a good idea to [...]"

Tune in to Jupiter!

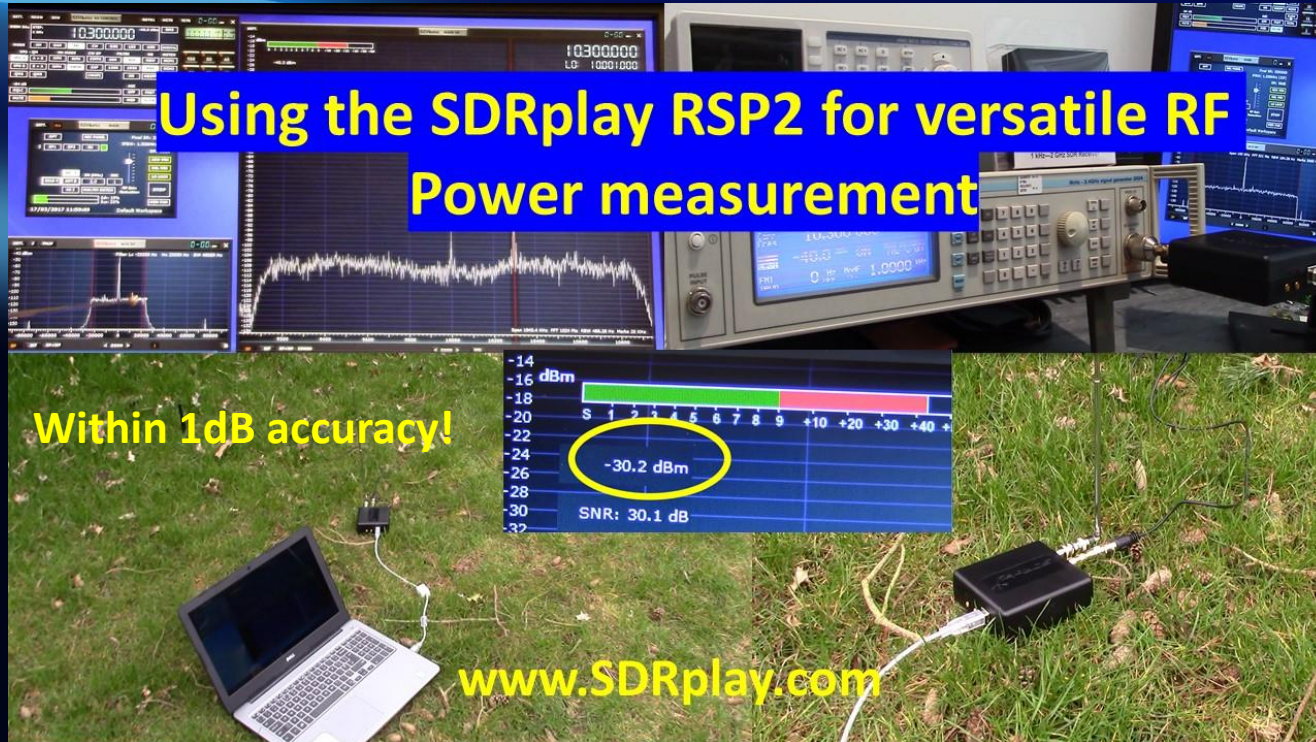
RECEIVING JUPITER NOISE BURSTS WITH AN SDRPLAY RSP1

Over on YouTube user [MaskitoSAE](#) 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 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 [MaskitoSAE](#) 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 [UTR-2 radio telescope](#) 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.



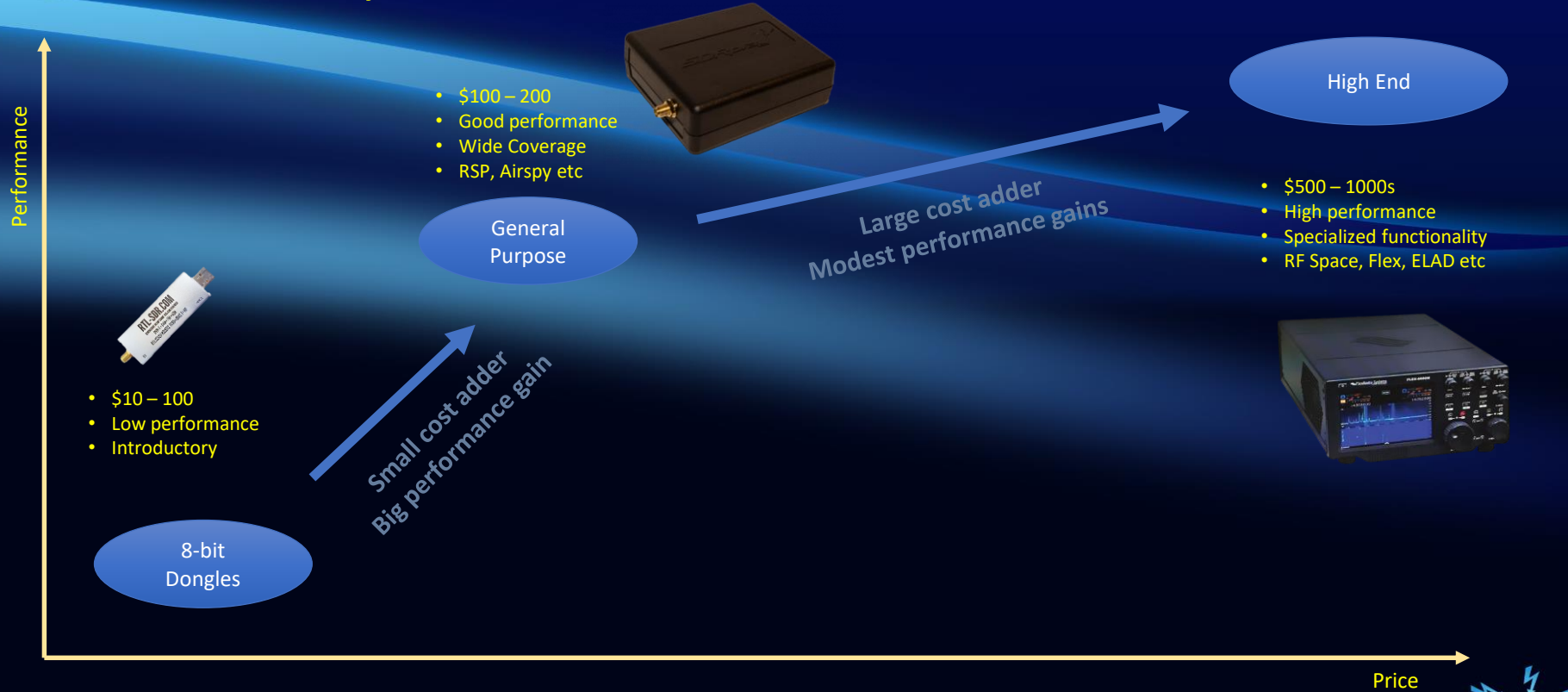
*Doubles as a new piece of RF lab kit:
an RF Power meter – get one for work or play!*



SDR hardware



SDR Variety



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**

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
- Also works with other platforms (Mac, Linux etc) and popular SDR Software (e.g. HDSDR, SDR-Console & Cubic SDR)
- Run 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!

Instantaneous bandwidth illustration



10 MHz visibility

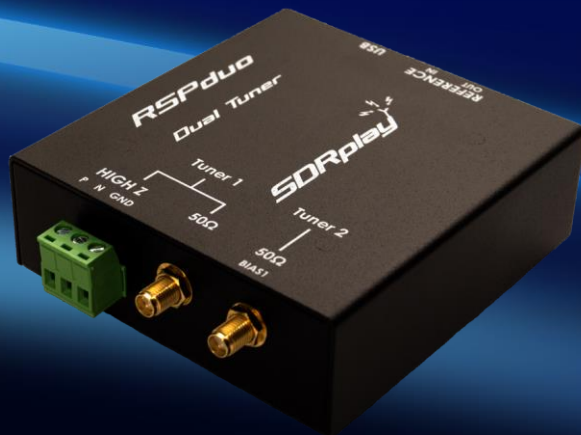
1kHz



2GHz

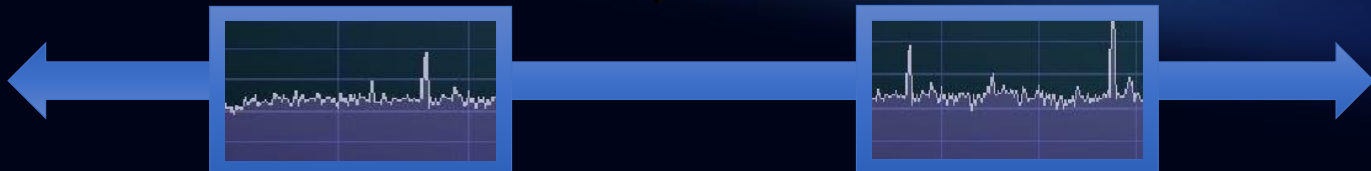
Introducing the RSPduo

- Dual independent tuners!



“...the biggest change to SDR since the RSP1!”

1kHz

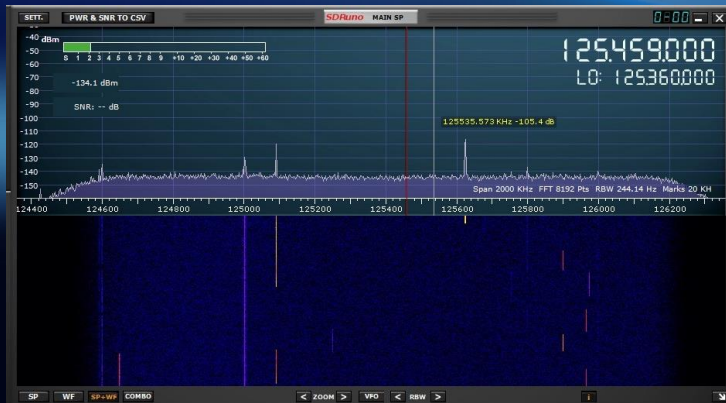


2GHz

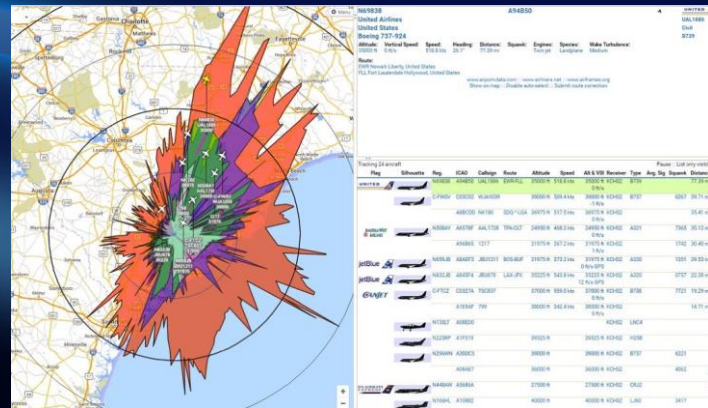
Two independent “slices” anywhere in the coverage range

Monitor two widely spaced bands





ATC



ADSB

Software



Software

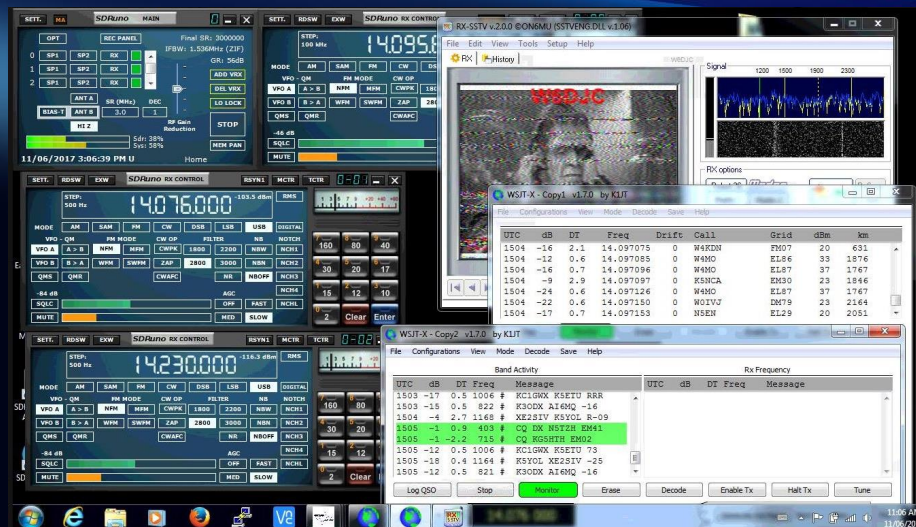
- SDRplay offers Multi-platform support for Windows, Mac, Linux, Android, Raspberry Pi 2/3 via 3rd party software including:



- In addition SDRplay owns and develops our own software, SDRUno (Windows only) for the RSP family:

- Based on Studio1 which cost \$179
- Software upgradeable for future standards
- API provided to allow demodulator or application development

- All the above software packages are available **free of charge!**



Ham Band Framing + RF power level + SNR measurement & logging



SDRuno 1.3 – Scanning and IQ out!

The screenshot displays the SDRUno 1.3 software interface with several panels and callouts:

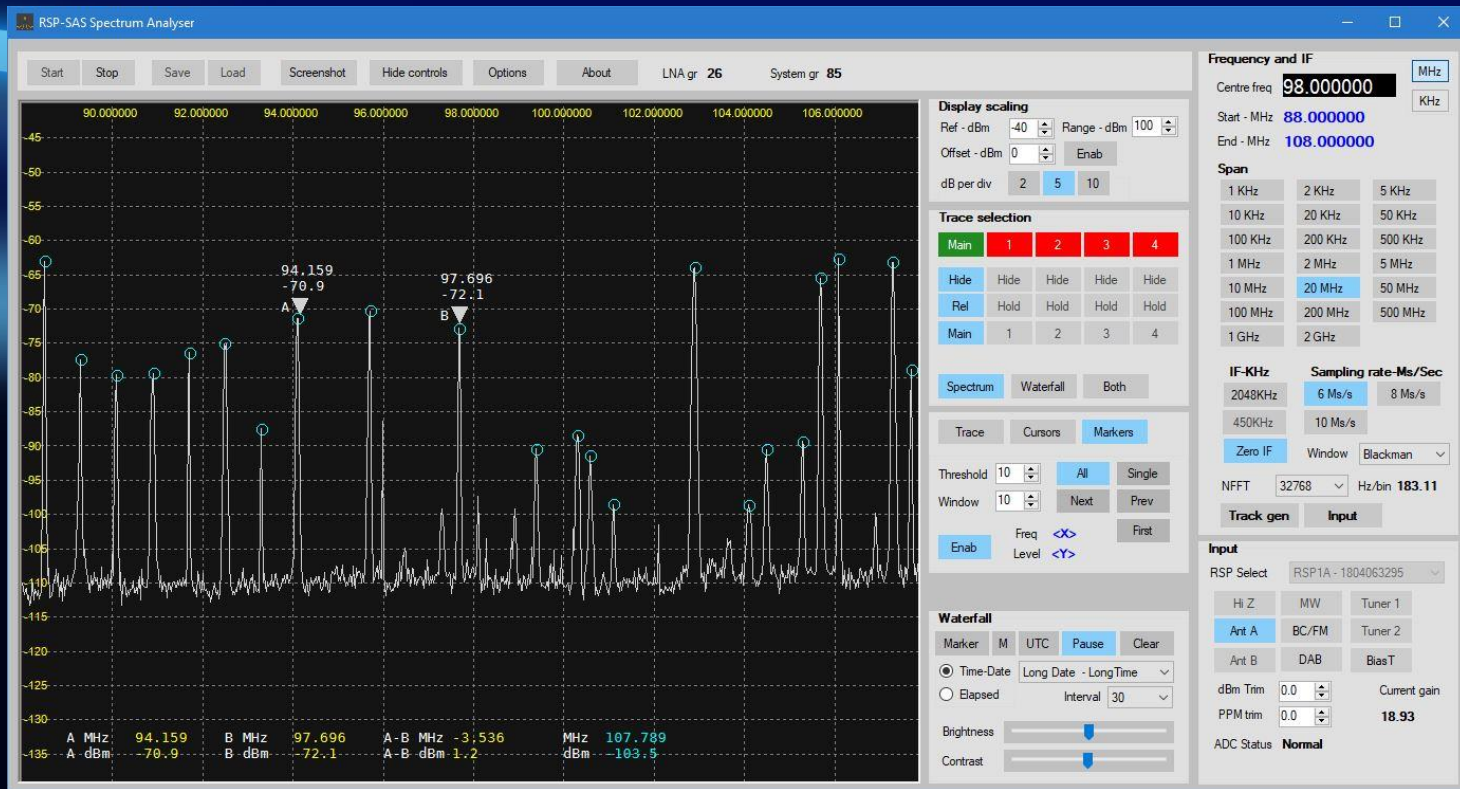
- Top Left Panel (MAIN):** Shows settings for Final SR: 2000000, IPBW: 1.536MHz (LIP), Gain: 53.2dB, and a list of memory banks (SP1, SP2, RX).
- Top Middle Panel (RX CONTROL):** Displays the current frequency 12300000 and various modulation modes (AM, SAM, PM, CW, DSB, LSB, USB, DIGITAL).
- Top Right Panel (AUX SP):** Shows a spectrum plot with a span of 18.7 KHz, FFT 512 Pts, RBW 23.44 Hz, and Marks 500 H.
- Bottom Left Panel (STORE):** A list of memory banks (air2.s1b, air.s1b, Airband.s1b, etc.) and a table of frequencies and modes.
- Bottom Middle Panel (MAIN SP):** A large spectrum plot showing a span of 2000 KHz, FFT 8192 Pts, RBW 244.14 Hz, and Marks 20 KH.
- Bottom Right Panel (Scanner Config 0):** A dialog box for configuring scan ranges, showing preset ranges (AIRBAND (NA)) and fields for Start Freq, Stop Freq, Step Freq, Hold Time, and Threshold.

Callouts highlight specific features:

- Scan to or from Memory Banks:** Points to the RX CONTROL panel.
- Lock out unwanted freqs:** Points to the STORE panel.
- Preset or user-defined scan ranges:** Points to the Scanner Config 0 dialog box.

The interface also shows a status bar at the bottom with the date and time (3/26/2019 10:47 AM) and the SDRplay logo.

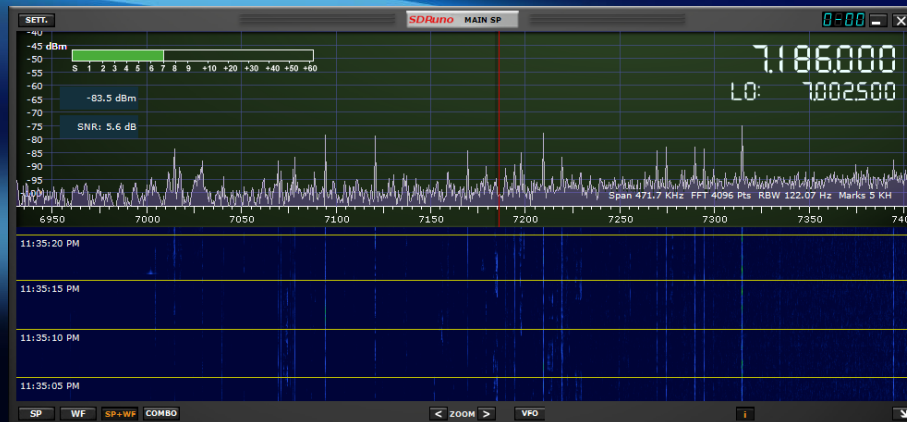
SAS Spectrum Analyser – Make your RSP into a Spectrum Analyser!



Panadapters



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!




- RSP protected by rig's internal T/R
- Splitter if required (e.g. Yaesu)
- RX BW limited by IF

- RSP protected by T/R
- T/R shares signal
- Widest RX bandwidth
- *Always connect PTT!*

Support and further information



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SOFTWARE

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[ARM64](#)

SDRUNO – V1.22 (13TH JAN 2018)
(**RSP1/RSP1A/RSP2**) Includes hardware driver

SDRUNO – V1.24 (24TH AUGUST 2018)
(**RSPduo**) Includes hardware driver

SAS SPECTRUM ANALYSER – V0.9A
(**12th June 2018**) (**RSP1/RSP1A/RSP2**) Includes hardware driver

HDSDR – V2.76A (13TH JULY 2018)

DOCUMENTATION

[Software](#) [App Notes](#) [Community Guides](#) [How To Guides](#)

[Video guides & Media](#) [Links](#) [Datasheets](#)


SDRUNO USER MANUAL
(version 1.22 / 13th January 2018)






SDRUNO (RSPDUO) USER MANUAL
(version 1.23 / 18th May 2018)

SDRUNO MANUEL UTILISATEUR (FRANCAIS)
(version 1.23 / 18th May 2018 – merci a André Meunier)

SDRUNO RELEASE NOTES

Software and documentation – Applications and Support Catalog

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
APPLICATIONS AND SUPPORT CATALOGUE

The SDRplay Applications and Support Catalogue is your reference point for numerous Application Notes, Application Notes, Application Notes and much more! You can scroll through the entire list, or use the category drop-down to home in on your area of interest. Or you can just look for keywords in the search box. For each entry, click on the corresponding icon for the YouTube Video or the PDF document. For more detailed information on each item, click or tap on the description (PC users can also hover over the icons)

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Description		Created
AISUPP Link to more support options		24-Jan-2019
AV001 Basic Introduction to SDR & RSP1A		05-Jun-2018
AV004 Introducing the RSPduo		18-May-2018
3PV001 Seventyone unboxes the RSPduo		18-May-2018
AV003 Starthere Video Guide for RSP1A		02-Feb-2018
3PV003 Seventyone unboxes the RSP1A		08-Dec-2017
AV016 Getting started with RSP2 or RSP2pro		25-Nov-2016
AB006 Basic Troubleshooting the RSP		20-Jul-2018
3PV002 Tech Minds unboxes the RSPduo		18-May-2018
AV007 New features in SDRuno v1.22		18-Jan-2018
UG001 SDRuno Cookbook		15-Jan-2018
AN005 Setting up a panadapter		11-Oct-2017

How-to videos: SDRplay YouTube Channel

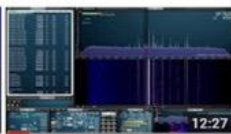
SDRuno Video Guides - Part 2 (V 1.2 onwards) [PLAY ALL](#)

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



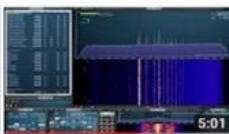
SDRuno v1.2- What changed in Version 1.2

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



Introducing RSP1A and SDRuno v1.21

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



#1 SDRuno v1.2- Workspaces & Resolution bandwidth

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



#2 SDRuno v1.2- PWR & SNR measurement & ham band

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

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

These are "How to" Video guides to setting up SDRuno for the RSP1A. Part 1 were made using earlier versions of SDRuno than was used



#1 SDRuno Basic layout and settings (version 1.2 and earlier)

SDRplay Software Defined Rad...
14K views • 7 months ago



#21 SDRuno with the Griffin PowerMate

SDRplay Software Defined Rad...
5K views • 2 months ago



SDRuno EXT/IO Edition for a range of SDRs and dongles

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3.4K views • 2 months ago



#17 SDRuno with the TM-2 USB Controller

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1.8K views • 5 months ago



#16 SDRuno & MultiPSK decoding ACARS

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

Facebook Groups

The screenshot shows the Facebook interface for the 'SDRplay SDRUno' group. The cover image features the text 'SDRplay SDRUno' in large, stylized letters, with 'The Unofficial Chat Group' and 'Software for your RSP1 - RSP1A - RSP2 - RSP2pro &' below it. The left sidebar includes navigation links: About, Discussion, Chats, Announcements, Members, Events, Videos, Photos, and Files. A search bar is present. The main content area shows a post by Jon Hudson from 6 hours ago, discussing dual tuners and antenna comparisons, with a video thumbnail. Below the post, there's a section for 'Synchronised VFOs'. The right sidebar shows 'INVITE MEMBERS' and 'MEMBERS'.

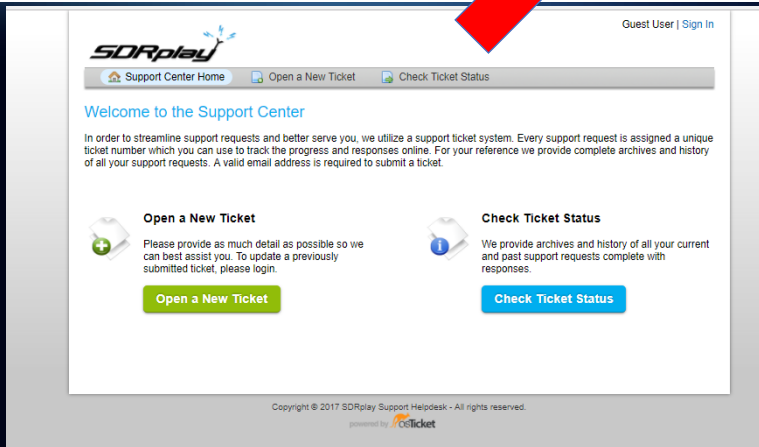
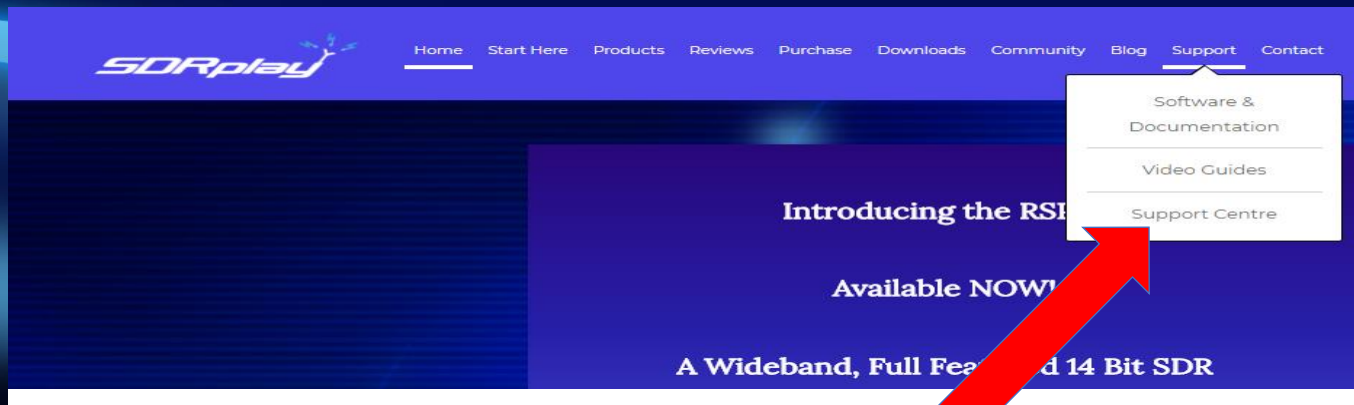
The screenshot shows the Facebook interface for the 'SDRplay' group. The cover image features the text 'SDRplay' in large, stylized letters, with 'THE UNOFFICIAL USER GROUP FOR' above it and 'CONTINUOUS COVERAGE 1KHZ-20KHZ', 'RSP1 - RSP1A - RSP2 - RSP2pro - RSP2uo', '12.44BIT QDR 10MHZ SPECTRUM', and 'WWW.SDRPLAY.COM' below it. The left sidebar includes navigation links: Write Post, Add Photo/Video, Live Video, and More. A search bar is present. The main content area shows a post by Mike Ladd from 6 minutes ago, discussing Radio Romania Int (DRM) 9495. The right sidebar shows 'INVITE MEMBERS' and 'MEMBERS'.

Nearly 10,000 users
helping each other!

www.sdrplay.com



Direct support from SDRplay



Hardware + Software + Community =

So many reasons to get one!



Recommended by authors of both HDSDR and SDR-Console
Backed by the world's biggest & best SDR support community!

www.SDRplay.com

www.sdrplay.com

SDRplay

For more information

- Company website: www.sdrplay.com
 - Check out our new **Applications & Support Catalog** at: <https://www.sdrplay.com/apps-catalogue/>
- Community Forums: www.sdrplay.com/community/
- Email:
 - North America: support-usa@sdrplay.com
 - Rest of World: support@sdrplay.com
- Facebook: [SDRplay](#) and [SDRuno](#) specifically
 - Independent groups run by enthusiastic users!
- Google / YouTube
 - Many videos covering how to use the various software packages, implementing panadapters and much more. Use the Google search function!
 - SDRplay channel: www.youtube.com/c/SDRplayRSP