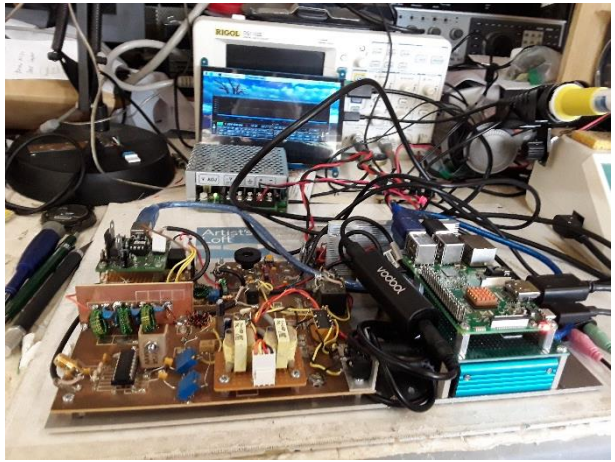
Homebrew SDR ~ Why do It?

Pete Juliano, N6QW

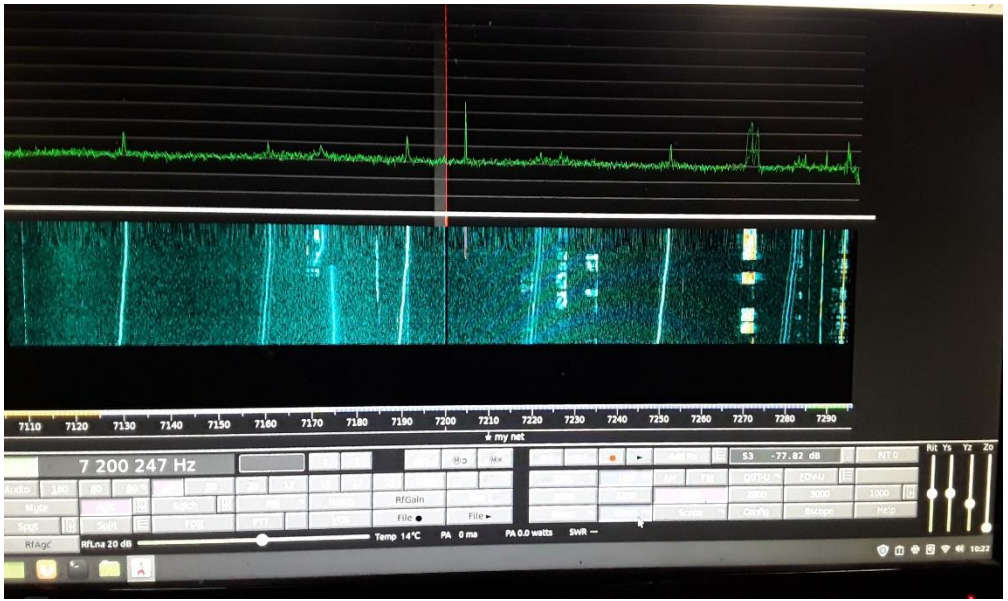
Homebrew SDR – Why do it?

- A Pile of Junk or Working SDR?



Homebrew SDR– Why Do It?

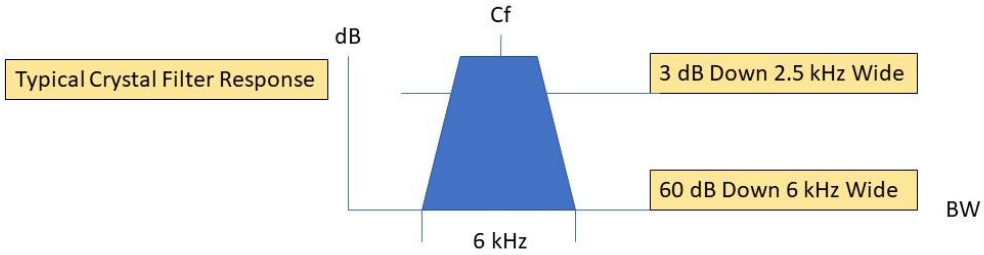
- That Pile of Junk Can do This ~ 192 kHz of 40M



Homebrew SDR – Why do it?

- Simple Answer~ Features and Benefits
- Signal Handling, Filters, Multi-Mode
- The Digital Experience (FT-8, WSPR)
- Change the Software not Hardware
- Availability of Low Cost Technology
- The Important “Learning Journey”

Homebrew SDR – Features & Benefits



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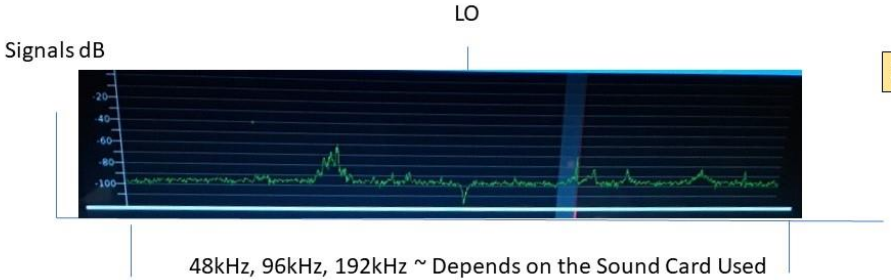

SDR Spectrum

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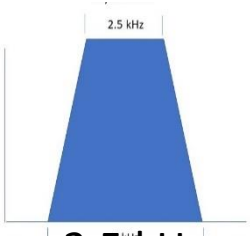
Zero IF and the Band Width covered depends on the LO Placement and the Sound Card

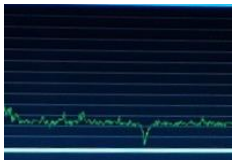
N6QW 1/2021

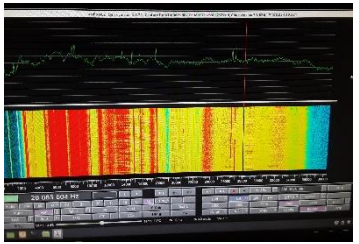
Homebrew SDR -- Bandwidth

- WYSIWYG – The ability to look at a slice of the band is unparalleled!
- Is the band open or is it “dead”?



2.5 kHz


96 kHz

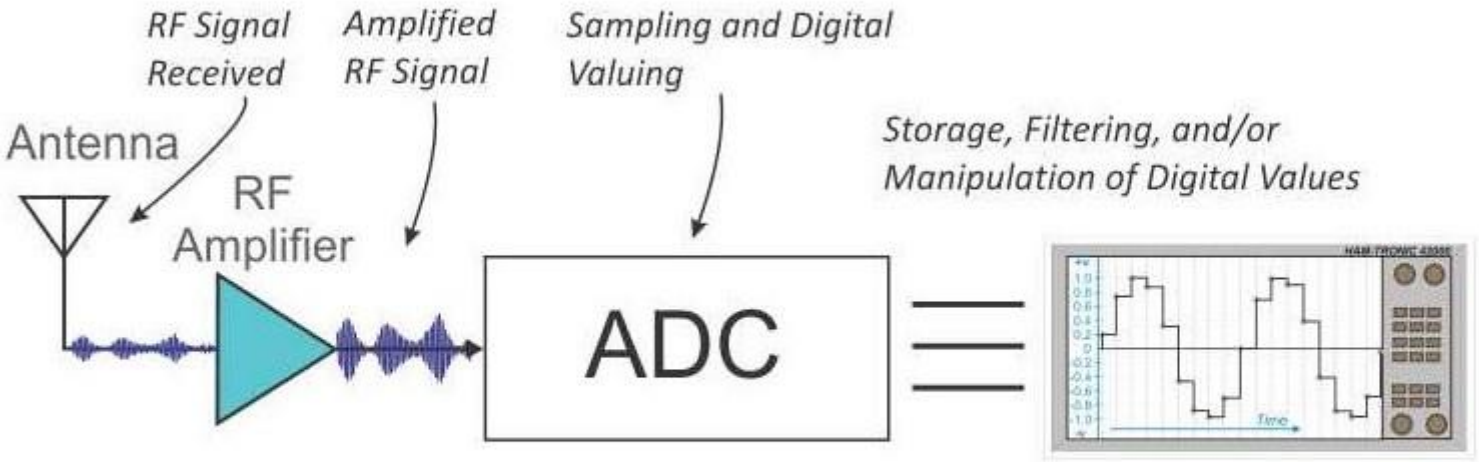

38 MHz*

* Hermes Lite 2.0 DDC

Homebrew SDR – Why Do it?

- SDR, My Definition: Bytes and Bits replace Nuts and Bolts! (The shift from HDR to SDR!)
- “Free” Software ~ Free is Good! Minimal Hardware.
- Variants: I & Q (Zero IF Sound Card), DDC, Hybrid
- I & Q: Computer, Rig, Software, Sound Card
- DDC ~ Direct to Digital
- Answer: Control of the Received and Transmitted signals to improve signal quality and information exchange. A Tailoring of Parameters and Wider View of the Band Signals.

Homebrew SDR -- DDC



SDR Direct Digital Conversion Receiver Signal Processing

(The Hermes Lite 2.0 is this Form Factor)

Homebrew SDR -- DDC

Hermes Lite 2.0 DDC – A Network Based SDR Transceiver
Not Homebrew as such; but homebrew units are on the air!

Homebrew SDR – An I/Q Primer

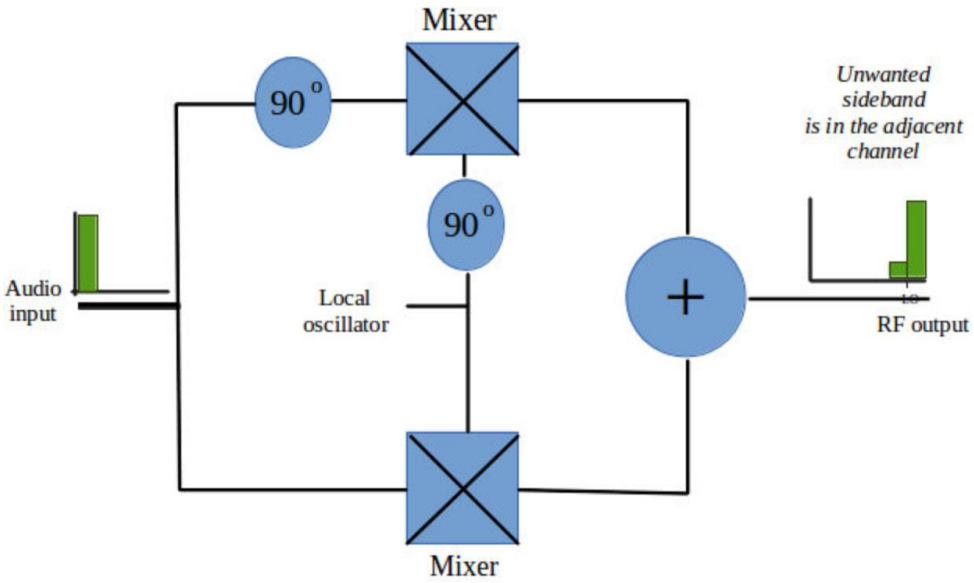
- Back to the Future: The Phasing Approach
- The I/Q SDR Transceiver: RF Signals are converted to an Audio Base Band ~ Often Called a Zero IF (Like DCR) ~ 2 Channels
- I / Q BW set by Sound Card
- Our Focus: Because it is “doable”!

Homebrew SDR _ I/Q Primer

The phasing method of SSB generation uses a phase-shift technique that causes one of the sidebands to be canceled out.

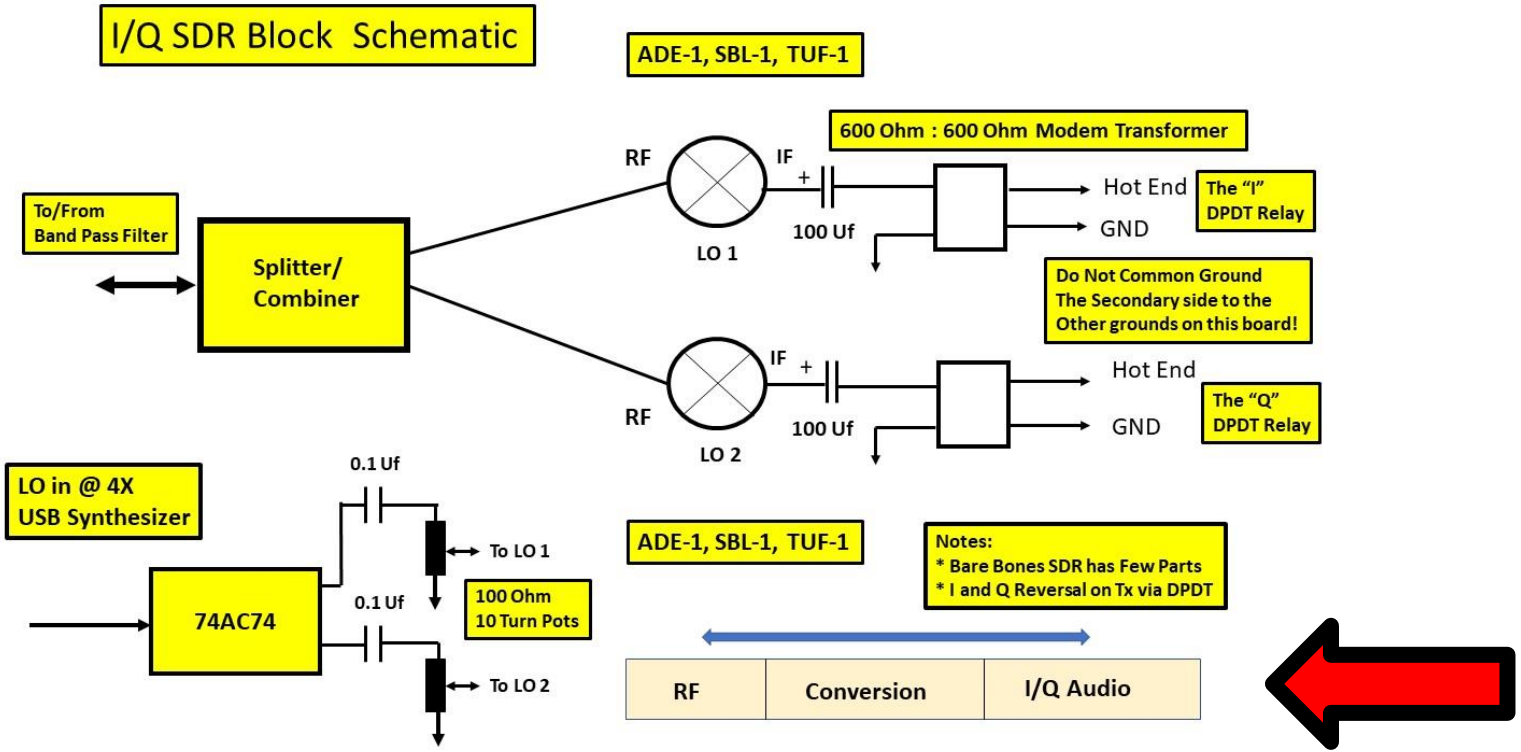
- The phasing method uses two balanced modulators which eliminate the carrier.
- The carrier oscillator is applied to the upper balanced modulator along with the modulating signal.
- The carrier and modulating signals are both shifted in phase by 90 degrees and applied to another balanced modulator.
- Phase-shifting causes one sideband to be canceled out when the two modulator outputs are added together.

Homebrew SDR – I/Q Primer

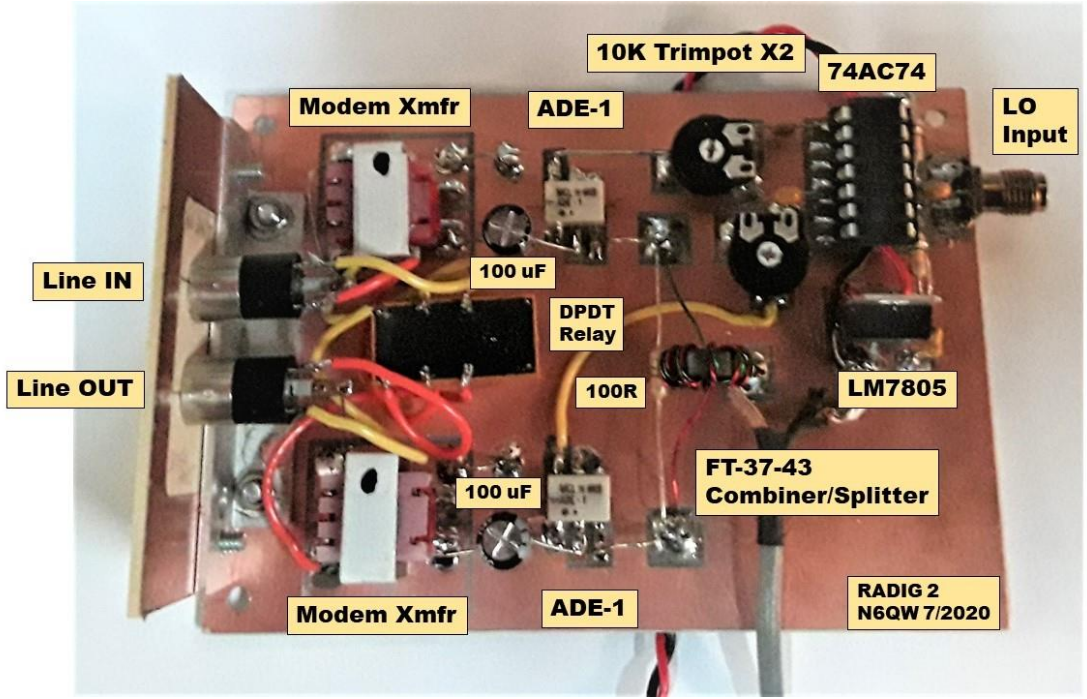


Think ~ Bi-Directional

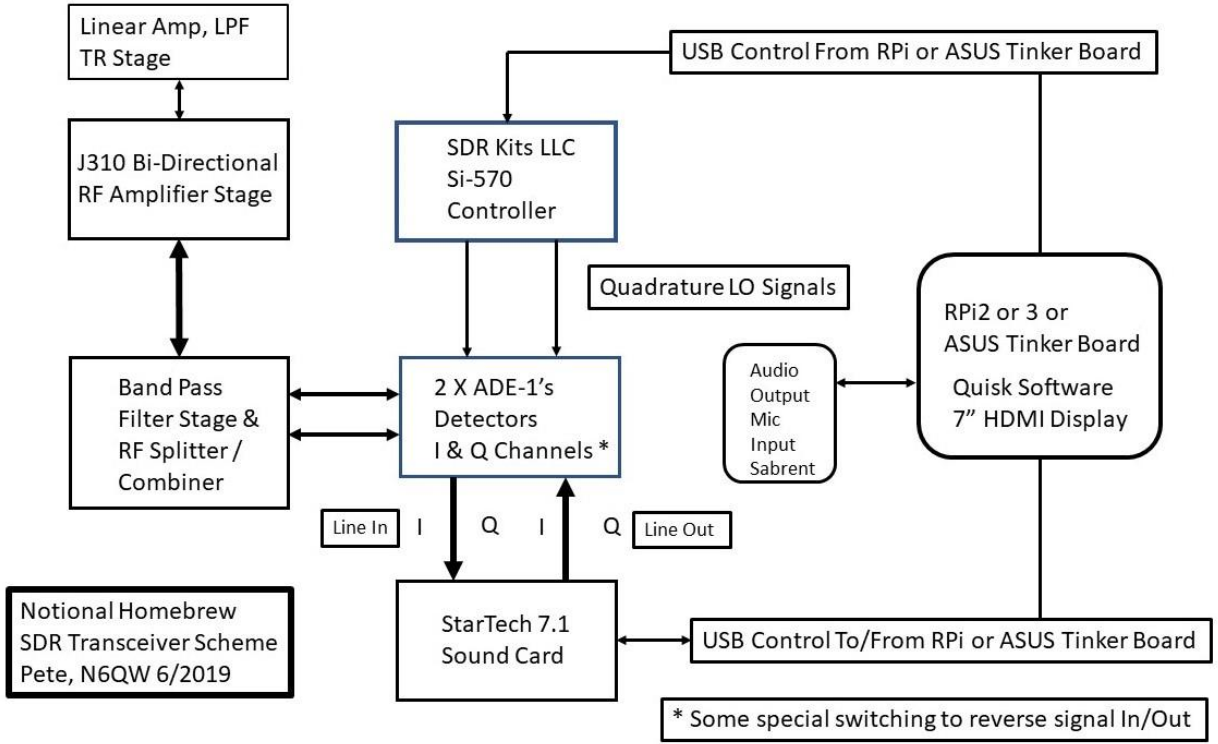
Homebrew SDR ~ First Look ~ Block!



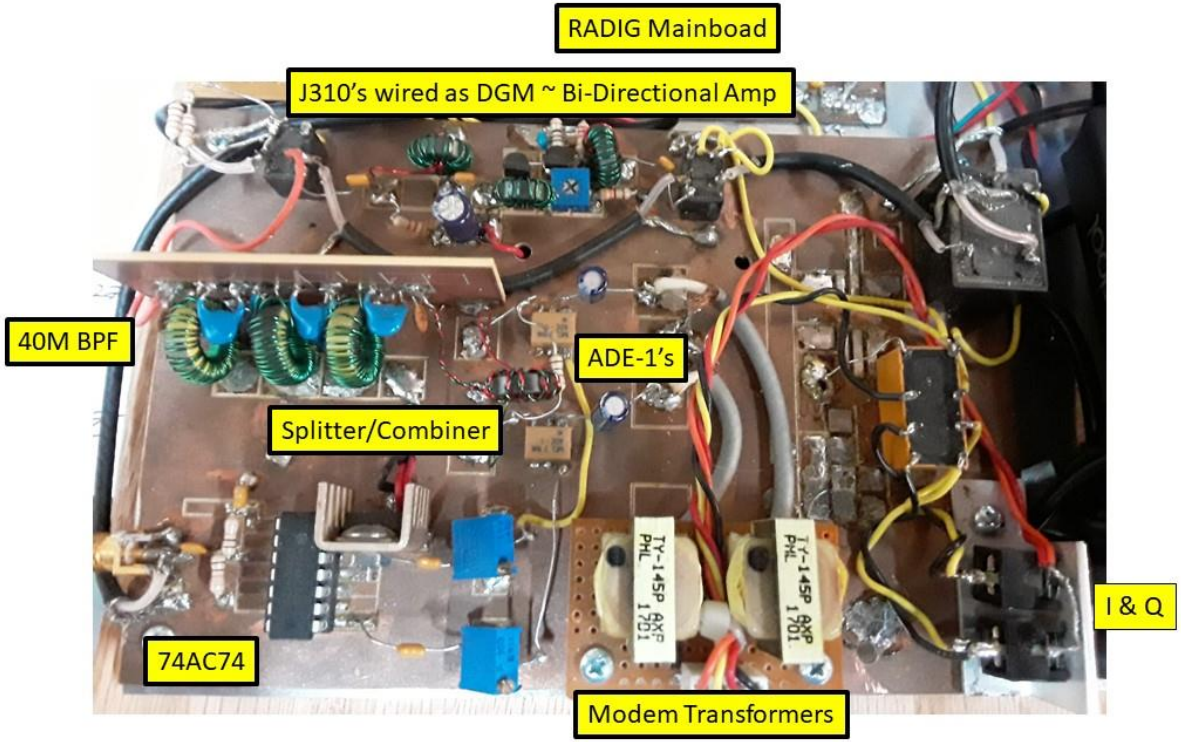
Homebrew SDR – First Look ~ Hardware



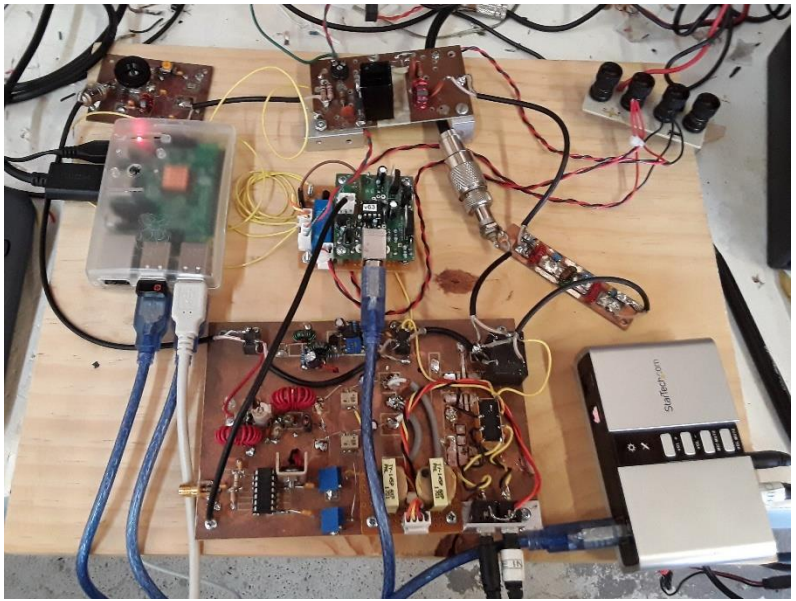
Homebrew SDR – Notional XCVR Design



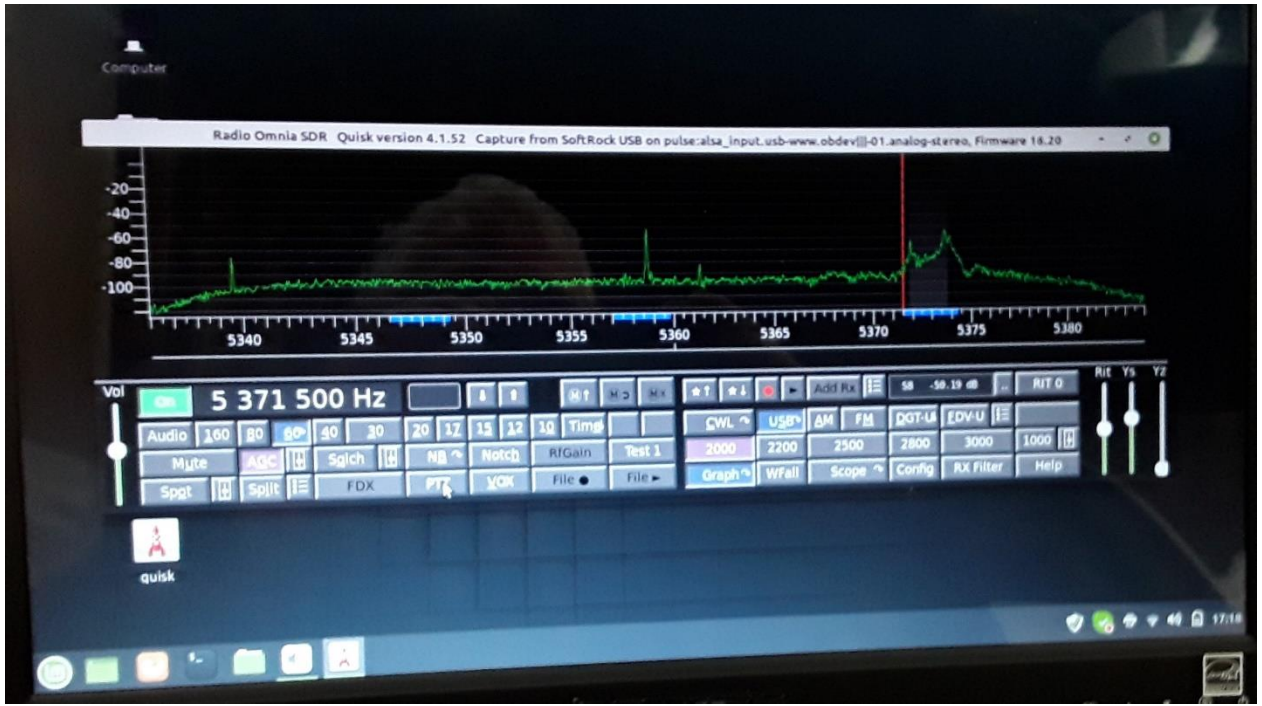
Homebrew SDR – More Hardware



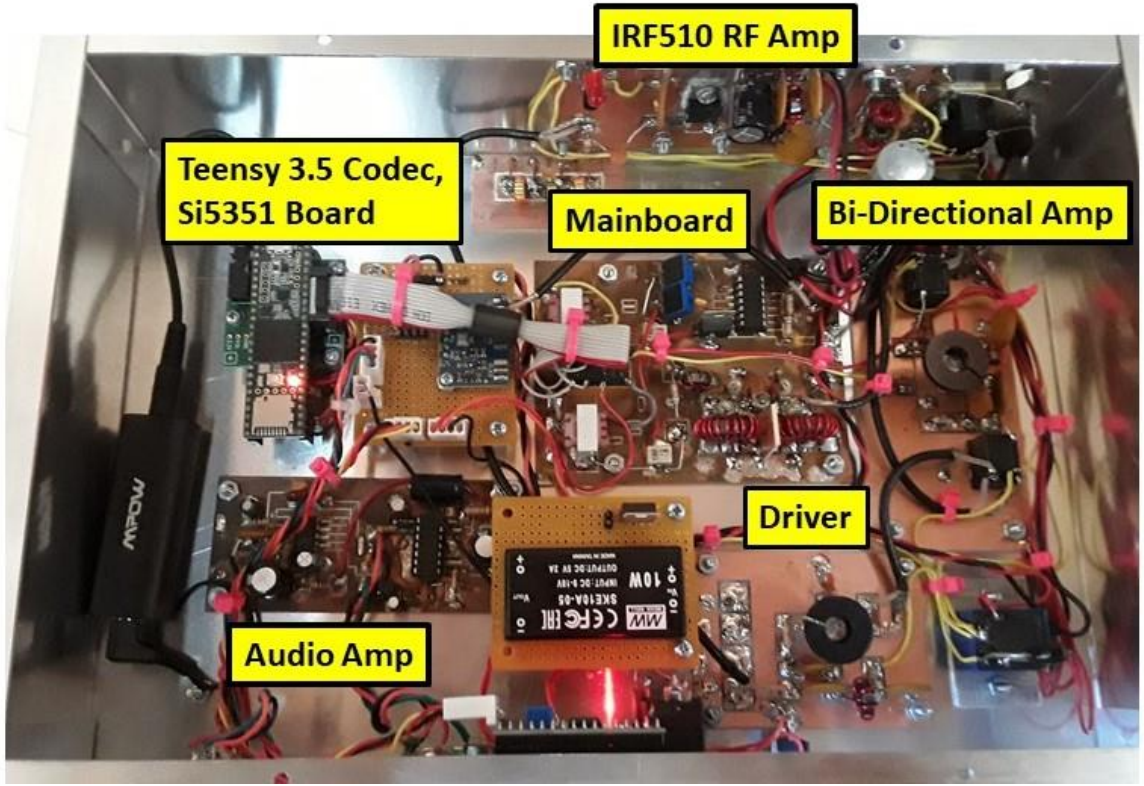
Homebrew SDR – A Bread Board



Homebrew SDR ~ The Dashboard



Homebrew SDR – All in One!



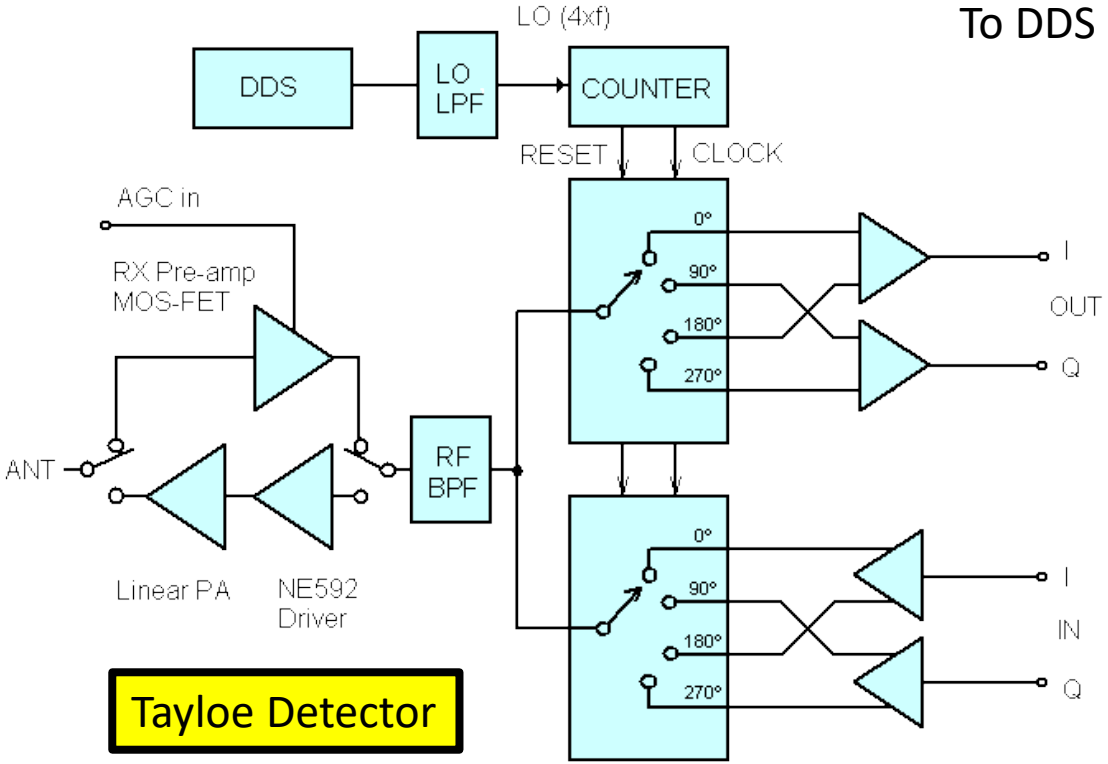
Thank You Charlie, ZL2CTM!

Homebrew SDR – All in One!

- No External Computer ~ 600 MHz Microcontroller
- Programs with the Arduino IDE
- Homebrew your Filter (Filters) using Iowa Hills Software
- LCD Display – No Spectrum or Waterfall*
- But No “fiddling” with 4 pole Marginal Crystal Filters
- High Quality Audio on Transmit and Receive

*In work is the Backpack SDR Group – Will have the Spectrum and Waterfall!

Homebrew SDR – Seen on the Internet



Sound Card

RPi3 or 4
ASUS Tinker Board
Linux Mint
Windows 10
QUISK
Audio Dongle
HDMI
Keybd/Mouse

Homebrew SDR ~ Take it in Small Chunks

- SDR Offers Many Bells and Whistles (Software)
- Hardware not that complex
- Available Technology (Cheap Too!)
- Opportunity for a Learning Journey
- Many Resources and Support Groups
- The “Tilt” of the Hobby

http://www.n6qwradiogenius.us/RSGB.html

Thank You for the Opportunity to speak about Homebrew SDR!

We are at a cross roads as the total integration of the Computer With Ham Radio may be the “hook” to entice new (and younger) Radio Enthusiasts.

My 1st Rig was a 6V6 on a wooden chassis and today we have SDR --- all in the span of 60 years

73’s from the Left Coast
Pete, N6QW

n6qwham@gmail.com

Find out more…

http://www.n6qwradiogenius.us/RSGB.html
SDR site and documentation

http://www.n6qw.com Projects (newer)

http://www.jessystems.com Project (old)

http://www.pastapete.com (Food Stuff)

www.rsgb.org