MOUNTAIN SPARK GAPS

NPARC—The Radio Club for the Watchung Mountain Area

Website: http://www.nparc.org
Club Calls: N2XJ, W2FMI
Facebook: New Providence Amateur Radio Club (NPARC)

November 2023

Volume 56 No. 11

Regular Meetings

Second & Fourth Mondays

Nov 13 - Business Meeting at SBS & Zoom
Nov 20 - Technical Meeting at SBS & Zoom

Upcoming Events

Check Reflector & www.nparc.org for details.

Digital Net Mondays at 9 PM – 28.086 MHz (+/-)
CW Net, Thursdays at 9 PM – 28.050+QRM

Meeting Schedule

Regular Meeting: 7:30—9:00 PM
2nd & 4th Monday
of each month
Watch for Emails

Everyone is Welcome
If a normal meeting night is a holiday, we usually meet the following night.
Call one of the contacts below or check the web site

Club Officers for 2023

President: K2UI, Jim Stekas
908-868-4970
Vice President:W2EMC Brian DeLuca
973-543-2454
Secretary: K2AL: Al Hanzl
908-872-5021
Treasurer: K2YG Dave Barr
908-277-4283
Activities: KC2OSR, Sam Sealy
973-635-8966

On the Air Activities

Club Operating Frequency
145.750 MHz FM Simplex

Sunday Night Phone Net
Murray Hill Repeater (W2LI) at 9:00 PM
Transmit on 147.855 MHz
With PL tone of 141.3 Hz
Receive on 147.255 MHz
Net Control K2AL

Digital Net
Mondays 9 PM
28,084 — 28,086
Will be using PSK and RTTY
Net control K2YG

Club Internet Address

Website: http://www.nparc.org
Webmaster KC2WUF David Bean
Reflector: nparc@mailman.qth.net
Contact K2AL, Al

MOUNTAIN SPARK GAPS

Published Monthly by NPARC, Inc.
The Watchung Mountain Area Radio Club
P.O. Box 813
New Providence, NJ 07974

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Editor Emeritus: K2EZR Frank McAneny
Acting Editor: K2UI Jim Stekas
Contributing Editors:
WB2QOQ Rick Anderson

Climatological Data for New Providence - Sept 2023

The following information is provided by Rick, WB2QOQ, who has been recording daily weather events at his station for the past 43 years.

TEMPERATURE -

Maximum temp this September, 89 F (Sept 7)
Last September(2022) maximum was 87 F.
Average Maximum temp this September, 72.8 F

Minimum temp this September, 48 F (Sept 27)
Last September(2022) minimum was 45 F.
Average Minimum temp this September, 59.7 F

Minimum diurnal temp range, 3 F (58 - 55 F) 9/26
Maximum diurnal temp range, 30 F(89 - 69 F) 9/7

Average temp this September, 66.3 F
Average temp last September, 66.7 F

PRECIPITATION -

Total precipitation this September– 8.38" rain
Total precipitation last September– 5.19" rain

Maximum one day precip. event Sept 29, 1.50" rain.
Measurable rain fell on 16 days this September
9 days last September.

YTD Precipitation – 43.29"

==========

Rick Anderson 10/29/2023
243 Mountain Ave.
New Providence, NJ
(908)464-8911
rick243@comcast.net

Lat = 40 degrees, 41.7 minutes North
Long = 74 degrees, 23.4 minutes West
Elevation: 380 ft.
CoCoRaHS Network Station #NJ-UN-10

President's Column

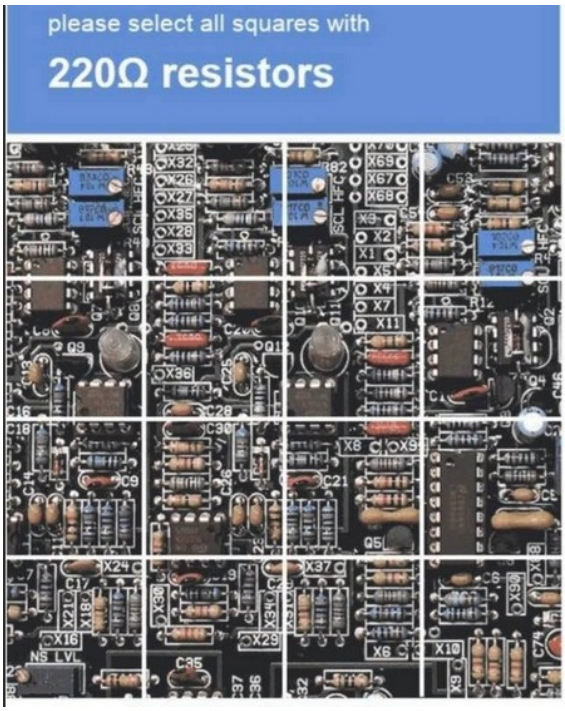
Last year we were invited by by the Tri-County Radio Club (TCRA) to join them in a walking fox hunt in Echo Lake Park. On Saturday, October 28, we resumed a long tradition of NPARC fox hunts and returned the favor by inviting TCRA to join us. James, KB2FCV, chose the location for the hidden fox and built the automated transmitter that sat inconspicuously in the weeds at Kitchel Lake park. Sam, KC2OSR, was stuck with handling the site permits and ancillary paperwork in his role as Activities Chairman. (More fox hunt details follow.)

GNU Radio provides an environment of SDR processing algorithms and support for a wide range of SDR hardware platforms. The GNU Radio Companion (GRC) allows SDR hardware and algorithms to be configured and interconnected using a graphical interface. (Think Viseo or Matlab's Simulink.) Once you have a working SDR block diagram, you can save it as an application that can be run from the command line or a desktop icon. Even without SDR hardware, GRC gives you a sandbox for playing around with various signal processing algorithms.

For the November issue, Jay Morreale, KD2ZRO, has contributed an extensive article on running GNU Radio on the Raspberry Pi4, and building SDR applications with GRC.

Thanks to all the contributors to this month's Spark Gaps: WB2QOQ, W2IOC, AC2GL, K2AL, K2YG and KD2ZRO.

New this month is enhanced security for the Spark Gaps. To unlock the rest of the newsletter please solve the captcha at right ⇒



73,

Jim – K2UI

W2UDT Inducted Into VFW

Ken Hanzl - W2IOC

Ken Hanzl, W2IOC, and fellow Veteran of Foreign Wars (VFW) member Tom Mazzaccaro recently went to visit Bill Hudzik, W2UDT, at Lyons VA Medical Center. Ken, who is Commander of VFW Post 5481, recently became aware that Bill had done a tour in Vietnam, 1969-1970. Bill served for four years in the United States Air Force from 1966 to 1970. After contacting Bill's wife, Maryann Nergaard, Ken was able to obtain the required documentation to have Bill become a member of the VFW. During the visit Bill was welcomed into the Organization and was presented with a VFW membership pin. The VFW will keep in contact with Bill as he is a comrade-in-arms in need.
Bill communicated by writing on a white board and we had a pleasant visit. As an aside, it so happens that Tom Mazzaccaro knew Maryann when she served as a Morris County Judge. Tom was part of Montville Township's Administration when certain cases came before Maryann. So the visit became enjoyable on two fronts.

Since Bill's issues are physical and Bill is 100% aware, Maryann encourages visitors. He is in long-term care, Unit 2B Room 126 although he is often in the day room. To coordinate a visit you can email Maryann at mzhdz@comcast.net or call her at 908-392-6542.

The facility address is:

Lyons VA Medical Center
151 Knollcroft Rd.
Lyons, NJ 07939

NPARC Fox Hunt "Soapbox"

from various sources

Thank you to those who participated today [Sat, Oct 29]! The weather turned out to be a beautiful day today for a fox hunt. The fox was located at Loantaka Park nearby the pond. As an added bonus, all participants got to enjoy the lovely fall colors in peak season! I hope that everyone enjoyed the hunt!

Participants included …

Teams:	**Solo (lone wolves):**
Heather K4DH, Chris W3CJD	Rich KD2CQ
Paul KD2DRM & Rich W2KOT	Don K2DAM
Al K2AL, Eric K2ESH, Dave K2YG	Walter W2EE
Bill W2WZ & Cindi	Jim K2UI

Paul KD2DRM and Rich W2KOT (Team) were the first to arrive at the site and first to find the fox. Walter W2EE was the first lone wolf to find the fox.

Thank you to Sam KC2OSR & Marilyn for handling the starting point, helping secure the site and arranging an eating location after as well as range testing with the fox a few weeks before. Thanks to Jim K2UI and Dave K2YG for their assistance as well. Thank you to Tri-County as well for the use of the W2LI repeater.

We will plan for a walking fox hunt sometime in the spring and will probably do some training or building sessions between now and then during club meetings.

------- James KB2FCV

I hunted solo and spent 1.5 hrs in the Loantaka Brook Reservation stumbling through the woods about a half mile from Kitchel Lake. I was giving up around 11:30 and ran into Heather and Chris in the (wrong) parking and we made out way to Kitchel Lake thanks to some help from KB2FCV.

------- Jim K2UI

I had fun, although i didn't find the fox. Strangely, I was in BOTH Loantaka Brook parks at one time or another. I got strong signals, but very little directional bias. I need some schoolin' about the antenna I made, I guess. Nice to see a decent crowd, and thanks James, Sam, and Marilyn for their efforts!

------- Don K2DAM

Eric, K2ESH, Dave, K2YG and I formed a team for the Foxhunt. We used a 3-element 2 meter Yagi built by Dave, an Alinco HT and a Byonics attenuator. We found the transmitter at approximately 10:15 am after traveling approximately 8 miles.

------- Al K2AL

Here is the winning TCRA team W2EE, KD2DRM, W2KOT with K2AL.

The top NPARC team: K2AL, K2ESH and K2YG.

Here is the dreaded fox, housed in an ammo case and easily overlooked from 3 feet away.

November 2023 Contest Calendar

A selection of the more popular of the 150 contests held during the month of September, 2023.
The QSO Parties, especially the individual state ones, are the most "friendly".

Contest Name	Modes	Date/Time	Exchange
ARRL Sweepstakes	CW	Sat 11/4 5pm – Sun 11/5 10pm	Serial No. + Precedence + [your call] + Check + Section [1]
	SSB	Sat 11/18 5pm-Sun 11/19 10pm	
WAE DX Contest RTTY	RTTY only	Fri 11/10 7pm – Sun 11/12 7pm	RST + Serial #. (See WA8BNM website for QTC details) [2]
CQ-WE (Western Electric)	CW/Digital	Sat 11/11 3-6pm	Name + Location Code + Years of Service
	Phone	Sat 11/11 8-12m	
	Phone	Sun 11/12 2-6pm Phone	
	CW/Digital	Sun 11/12 8-12m	
CQ Worldwide DX CW	CW	Fri 11/24 7pm-Sun 11-26 7pm	RST + CQ Zone [3]

Notes:

1. ARRL Sweepstakes exchange is: Serial Number; Precedence (entry category: Q = QRP; A = <100w; B = >100w; U = unlimited; M = Multi Op; Your Call Sign; Check (first year you were licensed); and ARRL/RAC Section. For example, my first exchange running qrp would be: 001 Q K2YG 56 NNJ. See www.arrl.org/sweepstakes for details.
2. The WAE contest is simple, if you like, with only RST and serial number exchanged. However, scores can be increased by a factor of 2 to 10 if you participate in the exchange of QTCs, which are lists of contact time, call and serial number for previous contest contacts. QTCs should only be attempted by those understanding the process and who are using logging software that makes the QTC process fairly easy, such as N1MM+. You can avoid sending or receiving QTCs when requested by simply sending "no". Most participants do not exchange QTCs.
3. The CQ WW Contests are excellent opportunities to increase your DXCC totals. More than 100 countries will be on the air in them. Once or twice I have worked more than 100 different countries in the 2 days of the CQ WW DX CW contest running qrp, so the opportunity is there.

Check the WA7BNM Contest Calendar at: https://www.contestcalendar.com/contestcal.html for entry classes, power, and more important information about these and other interesting competitions.

Good Luck -- Dave, K2YG

A Resistor Is Just A Resistor Right?

Dave Hartman - AC2GL

Sometimes, but not always. For Direct Current the answer is usually yes, but … it's also a noise source.

This noise, often referred to as "Johnson" noise, is generated in a resistor independent of any current flow and has a mean-square voltage value of 4*k*T*R*(BW). In this expression "k" is Boltzman's constant, "T" is temperature in degrees Kelvin, "R" is resistance in ohms, and "BW" is bandwidth, in Hz.

OK, so what is Boltzman's constant?

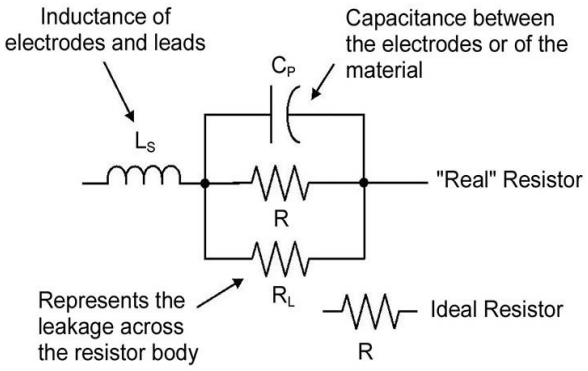
Boltzmann's constant, k, has dimensions of energy per degree of temperature, the Boltzmann constant has a defined value of 1.380649×10^{-23} joule per kelvin (K). At a room temperature of 72 Degrees F the Kelvin Temperature would be a balmy 295.3722 Degrees K.

Let's pick a 10 Meg Ohm resistor for R, just because it's a high impedance and won't conduct very much current in a battery powered device. And let's say the bandwidth (BW) of interest is 20KHz, approximately what the human ear is capable of hearing, theoretically.[1] So, the noise voltage V = 4 * 1.380649×10^{-23} * 295.3722 * 10 x 10^{6} * 20 x 10^{3} or 0.326244 microvolts.

According to Monitoring Times, "A typical specification might be that a receiver has a sensitivity of 0.25 uV [microvolts] for a 12 dB SINAD. Obviously the lower the input voltage needed to achieve the given level of SINAD, the better the receiver performance."

Therefore, if you have a static bleeding resistor in your antenna system you won't want to use a 10 MOhm resistor, but something much lower, but not so low that it shunts the desired signal to ground.

But Wait! There's more! That's just the DC case. When used in an RF circuit the resistor isn't just a resistor, it's a rather complex little component. It needs to be modeled as a handful of pieces as shown at right.



The lead inductance can be reduced, but not eliminated, by using those little surface mount chip resistors. But there will also be the inductance of the circuit board traces. However, making the device smaller will increase the inter-electrode capacitance.

So, the bottom line, according to Walter Morrow[2] is "There ain't no such thing as a free lunch"

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1 For most of use seniors, 10 Khz is a better estimate for the maximum frequency we can hear.

2 Reference for the quote.

Raspberry PI 4 GNU Software Defined Radio Prototype

Jay Morreale - KD2ZRO

I took a workshop that provided an introduction to Software Defined Radio (SDR) that used the Analog Devices PLUTO SDR active learning model. It contains an AD9363 RF Agile transceiver. It has a tuning range of 325 MHz to 3.8 GHz, a channel bandwidth of 200 KHz to 20 MHz, and a sample rate of 2.4 MS/s. The transceiver can tune from 70 MHz to 6 GHz with a hack but has reduced performance specs over this range.

I was studying the for the technician class amateur radio license on my own for a while and found the M.O.R.E Project course through the IEEE and took it. It helped tremendously and I passed my exam last year. As part of the course we received a Yaesu FT-65R transceiver and the RTL-SDR V3 Software Defined Radio USB Module. It came with a telescoping antenna and tunes from 500 kHz to 28.8 MHz using direct sampling and 24 MHz to 1.7 GHz using the Local Oscillator (LO). It has 3.2 MHz of bandwidth.

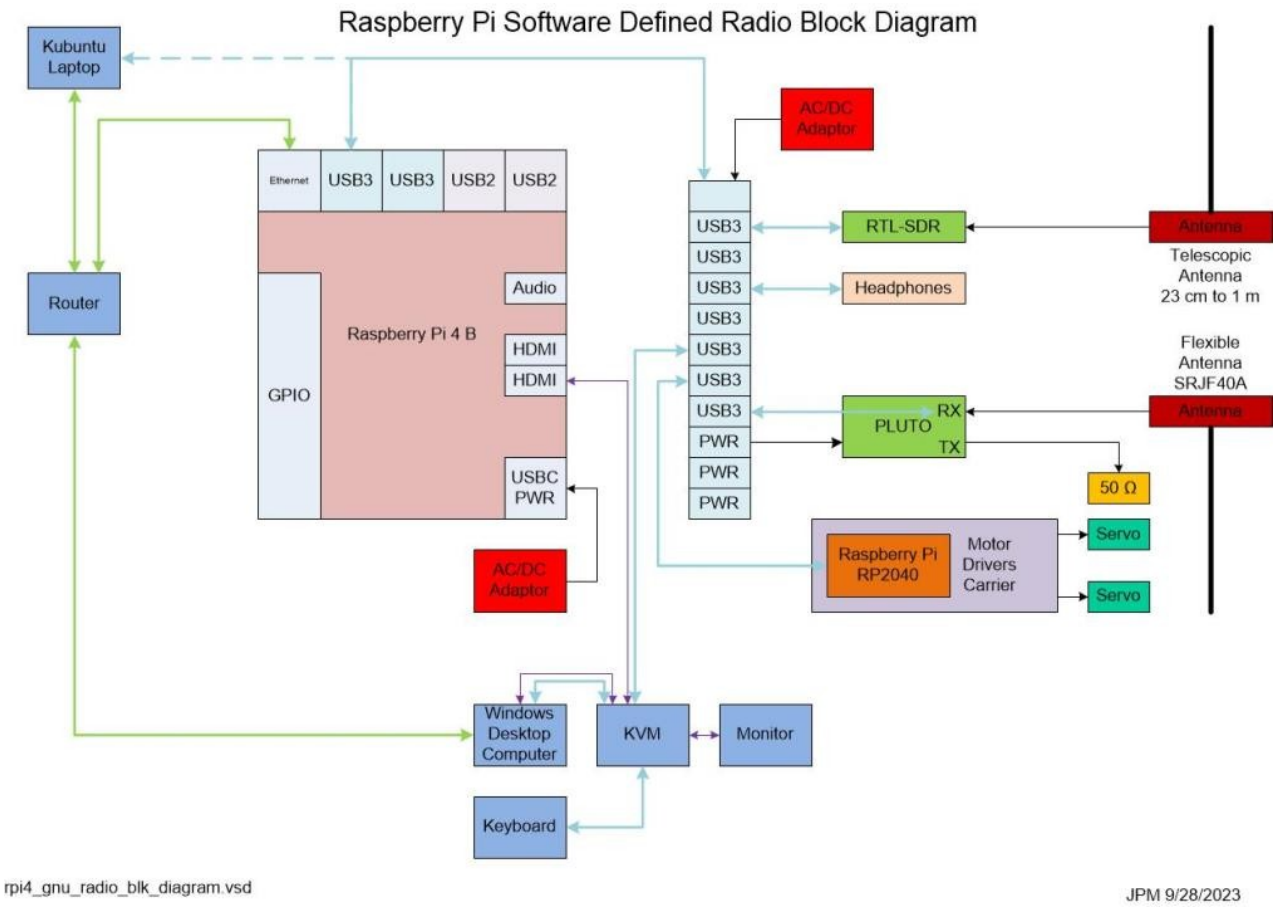
Both these SDR modules are compatible many radio programs like SDR#, and SRDangel, and with GNU Radio. GNU Radio is an open source graphical signal processing language use to create RF hardware and SDRs. GNU radio programs are called flowgraphs. I was looking to learn how to write flowgraphs to demodulate FM radio, NOAA broadcasts, scan aviation and emergency bands, and decode some of the digital modes. GNU radio has some great tutorials on getting started writing flowgraphs.

I connected these SDRs to a Raspberry Pi 4 B single board computer running Raspbian 64 bit Linux and to a Laptop running Kubuntu 22.04 Linux. Getting GNU Radio run on the raspberry pi 4 B has been problematic so I did a lot of troubleshooting the Kubuntu Laptop. It works great on the laptop and drops audio on the Pi 4 so there is a buffer issue somewhere.

I added a Raspberry Pi Pico on a motor driver carrier to control servos and motors and to learn to program these types of devices using C++ using Microsoft's Visual Studio Code (VSC) and the PlatformIO plugin for future projects.

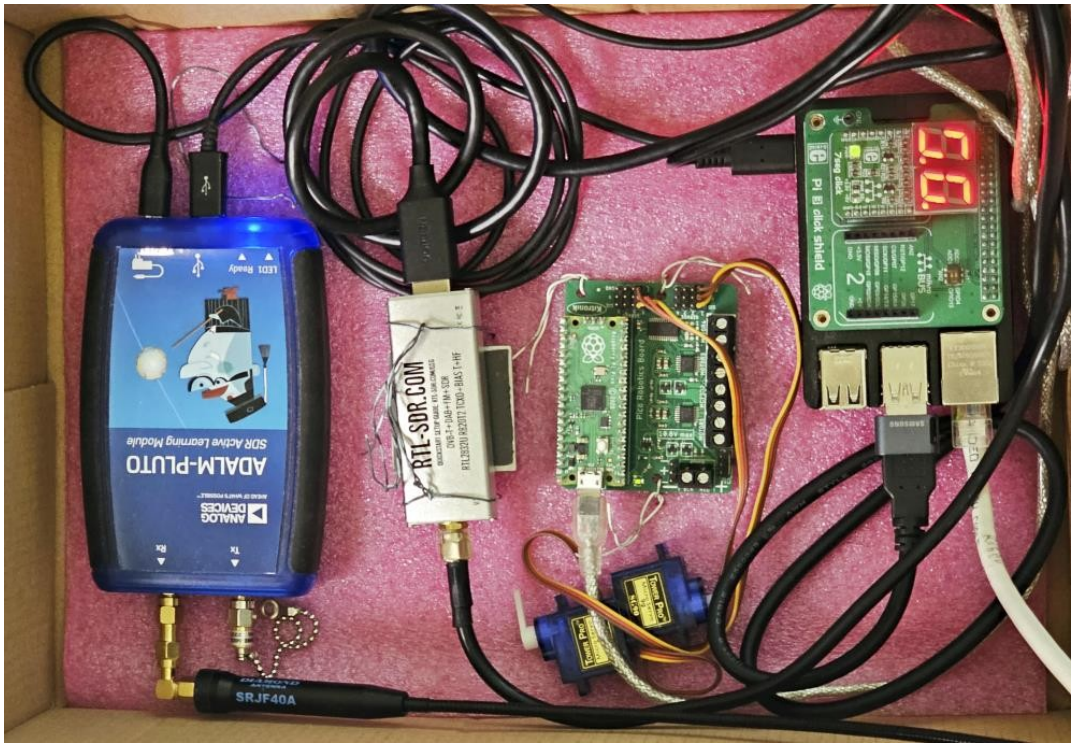
Block Diagram

The block diagram of the radio is shown below. The Pi 4 USB ports are limited to 1.1 A total and can't power all the devices so a USB hub was added. I worried for a while that I had overloaded the Pi 4.



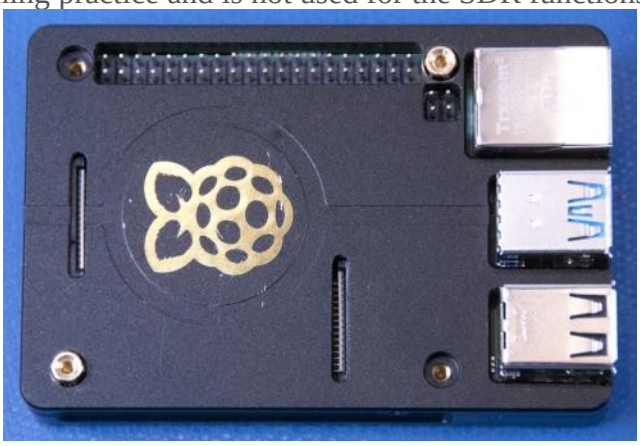
The Build

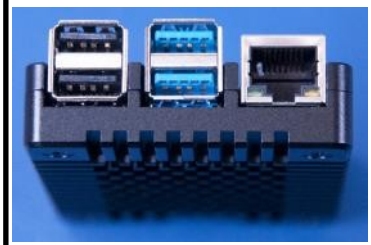
Originally the components were assembled on my work table. I had to travel and wanted work on it while away so re-assembled it into a shoe box. The pink foam is ESD foam and acts to cushion the parts. I used telephone wire to hold parts to box by punching hole the box and twisting the wires around the parts. The RTL-SDR gets a little warm so I mounted on a small heatsink to keep it off the foam.

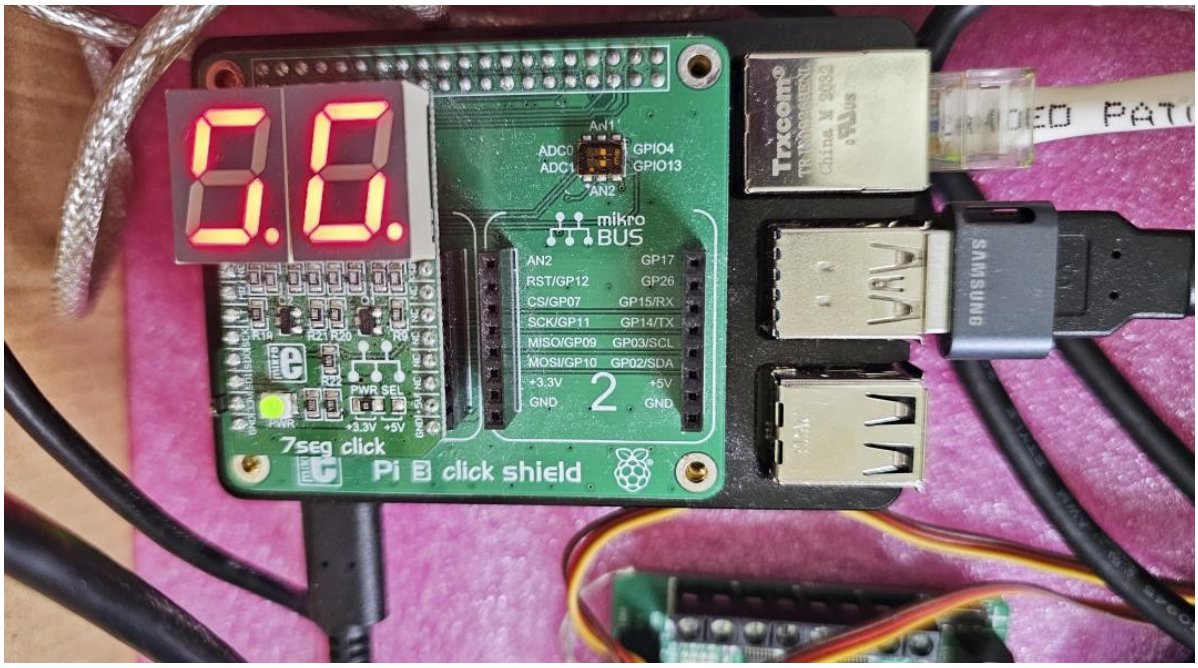


Raspberry Pi 4 B

The pI 4 is housed in a [Geekworm Raspberry Pi 4 N300] enclosure to provide heatsinking and some physical protection. I have a Pi 3 Click shield with a 7seg click board plugged into the Pi 4 GPIO connector. It is for was added for C++ programming practice and is not used for the SDR functions.





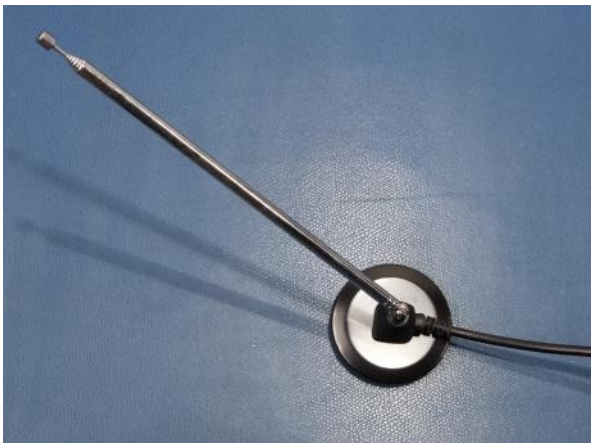


I can access the Pi directly using my monitor and keyboard through a Keyboard Video Monitor (KVM) switch, Secure Shell Protocol (SSH) using Putty on my host computers, and using the Virtual Networking Computing (VNC) graphical desktop sharing program TightVNC.

Software Defined Radios (SDRs)

RTL-SDR V3

The RTL-SDR V3 dongle tunes from 500 kHz to 28.8 MHz using direct sampling and 24 MHz to 1.7 GHz using the Local Oscillator (LO). It has 3.2 MHz of bandwidth, and a sample rate of 1.92 MS/s. I'm able to listen to 105.5 MHz radio station and 162.55 MHz WX radio using a flowgraphs on the Kubuntu laptop. On the Pi 4, GNU Radio is dropping packets so the sound is choppy and not useful.



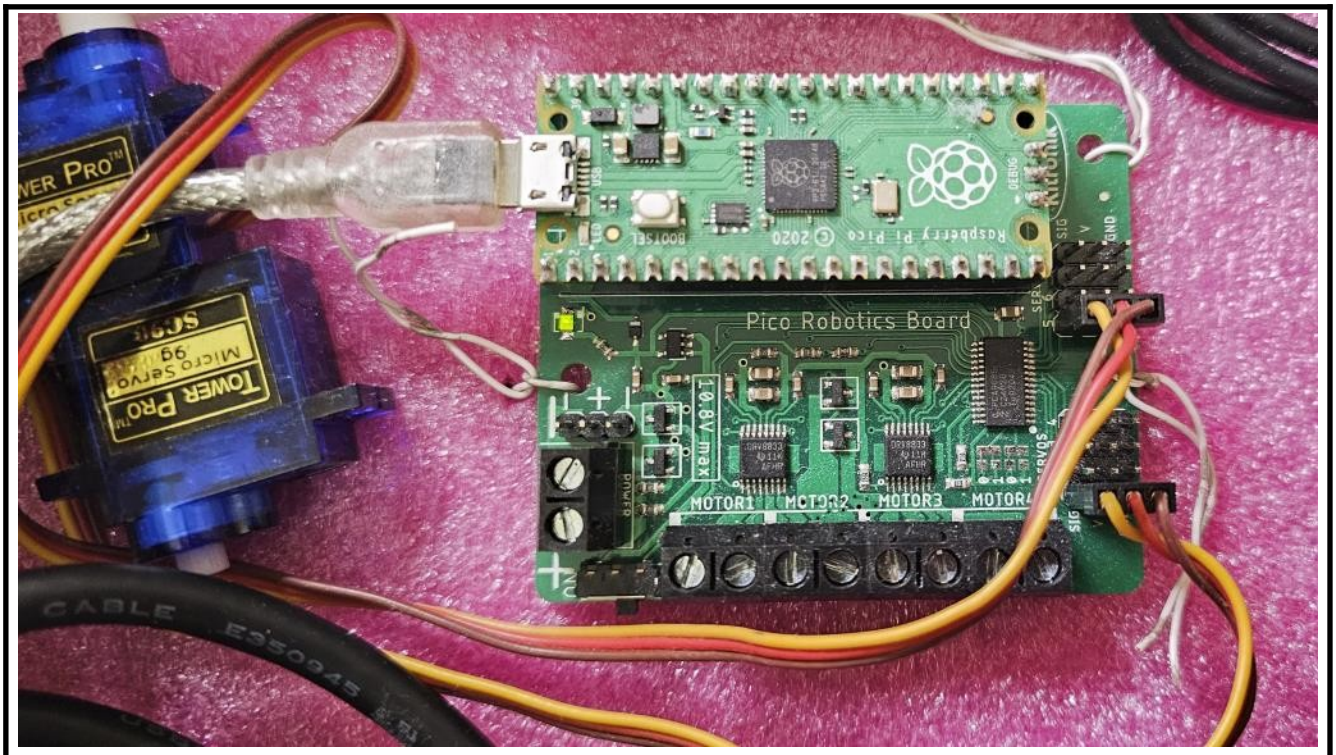
PLUTO

The ADALM-PLUTO SDR has a tuning range of 325 MHz to 3.8 GHz, a channel bandwidth of 200 KHz to 20 MHz, and a sample rate of 2.4 MS/s. The transceiver can tune from 70 MHz to 6 GHz with a hack but has reduced performance specs over this range. I haven't used the transmitter.

The PLUTO runs an embedded Linux and can run as an Internet Protocol (IP) device with a USB to Ethernet adapter. It requires 5 V at 1A which is more than the USB 0.5 A limit so the power port is connected to a charging power port of the USB Hub.

Raspberry Pi Pico & Motor Driver

The Raspberry PI Pico and motor driver carrier isn't being used yet. It could be used for antenna control or mechanical tuning at some point.



USB Hub

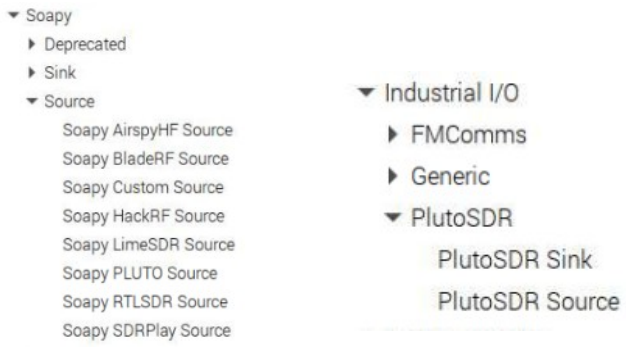
The Anker USB Hub is used to power the SDRs and other devices due to the limitations of the Pi 4 USB power outputs. The [Anker USB Hub] has 7 USB 3 ports (0.9 A) and 3 charging ports. The charging ports provide 5V at 2.1 A. The hub can provide up to 60 W of power to devices.

Flowgraphs

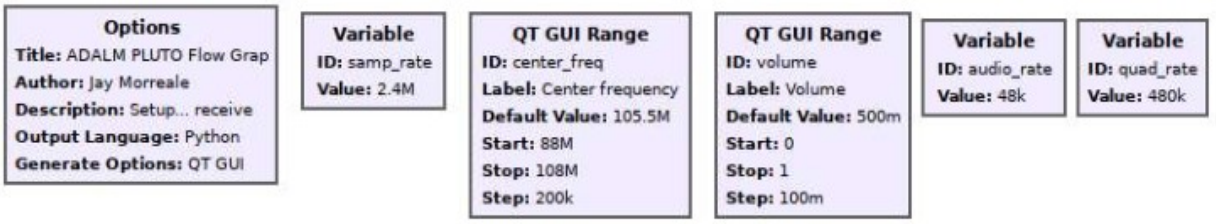
GNU Radio flowgraphs were developed from tutorial examples to create a wideband demodulator for detecting FM radio and a narrowband FM demodulator for detecting NOAA Weather radio broadcasts.

GNU Radio contains a library of signal process blocks used to create a flowgraph. The list of functions is shown below.

The library comes with source and sink modules for the SDRs. The SOAPY SDR Sink modules for many devices are available and are shown below. The Source blocks for the RTL-SDR and PLUTO devices were used in the flowgraphs that follow. The PLUTO source came from the Industrial IO library and the RTL-SDR came from the SOAPY library.

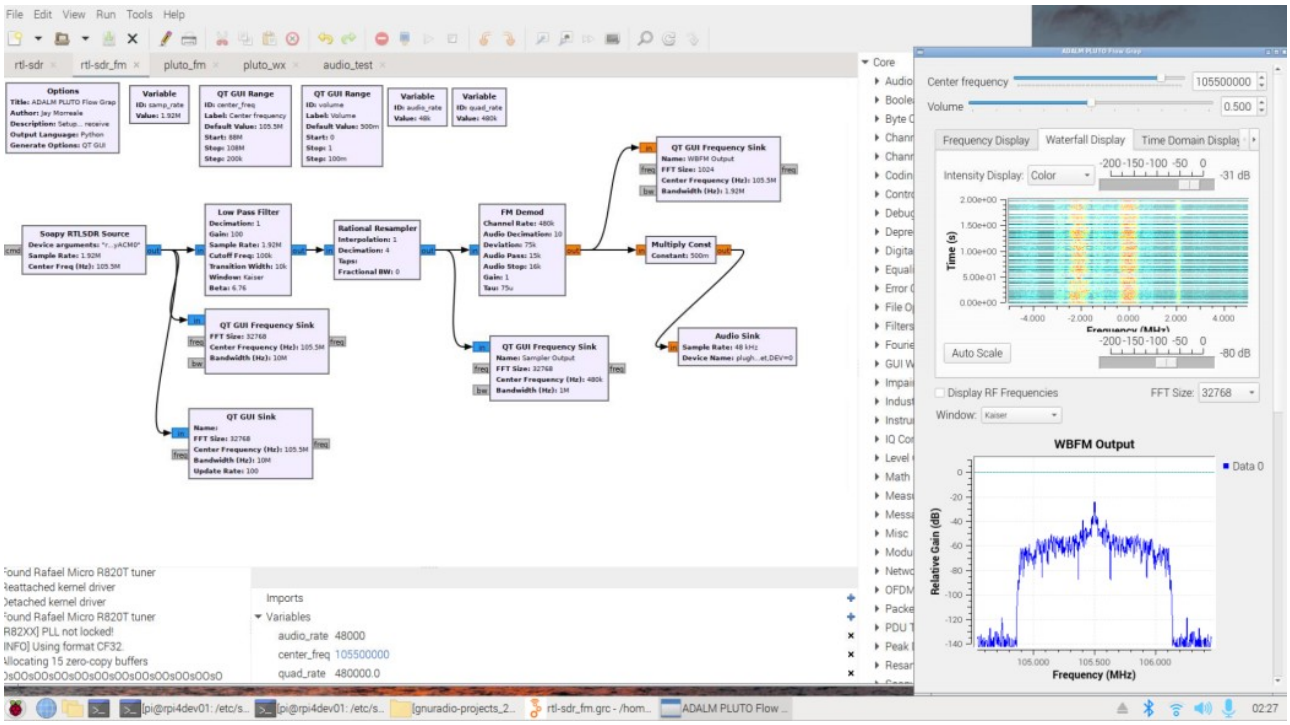


The flowgraph starts with the Options block that describes the flowgraph. Variable and range blocks are added to set common values for the various signal processing functions. This includes the sample rate, tuning ranges, and audio sample rates, for example.



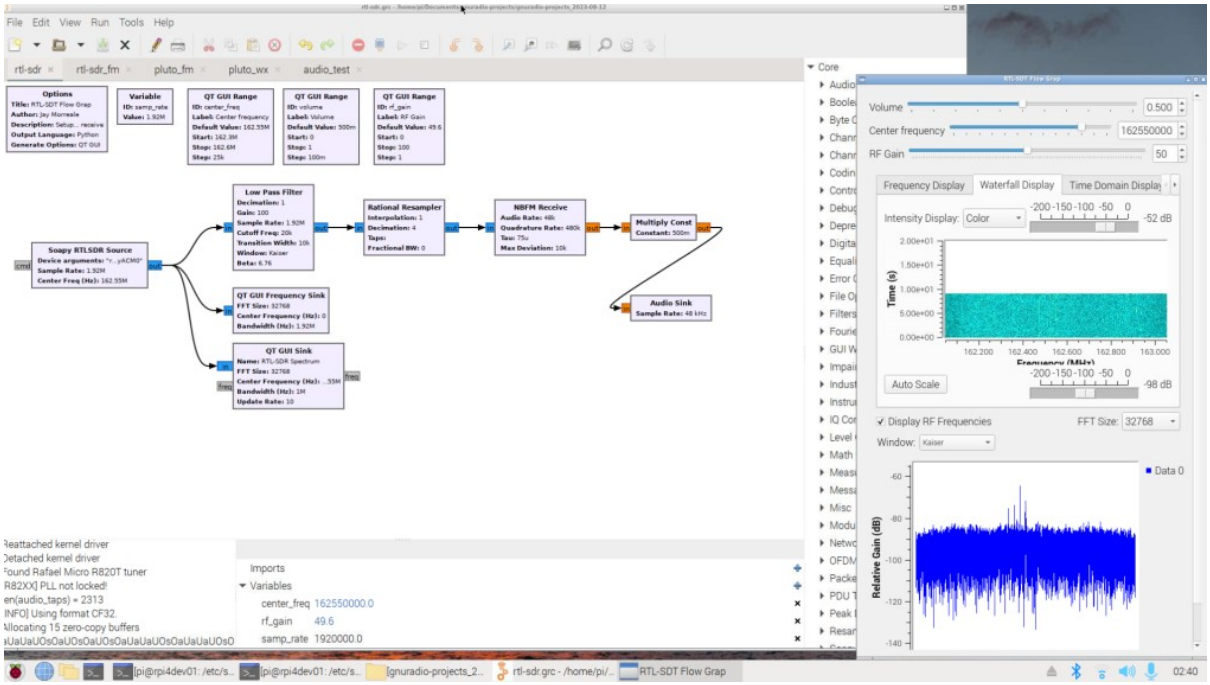
RTL-SDR FM

The RTL-SRM FM flowgraph is shown below.



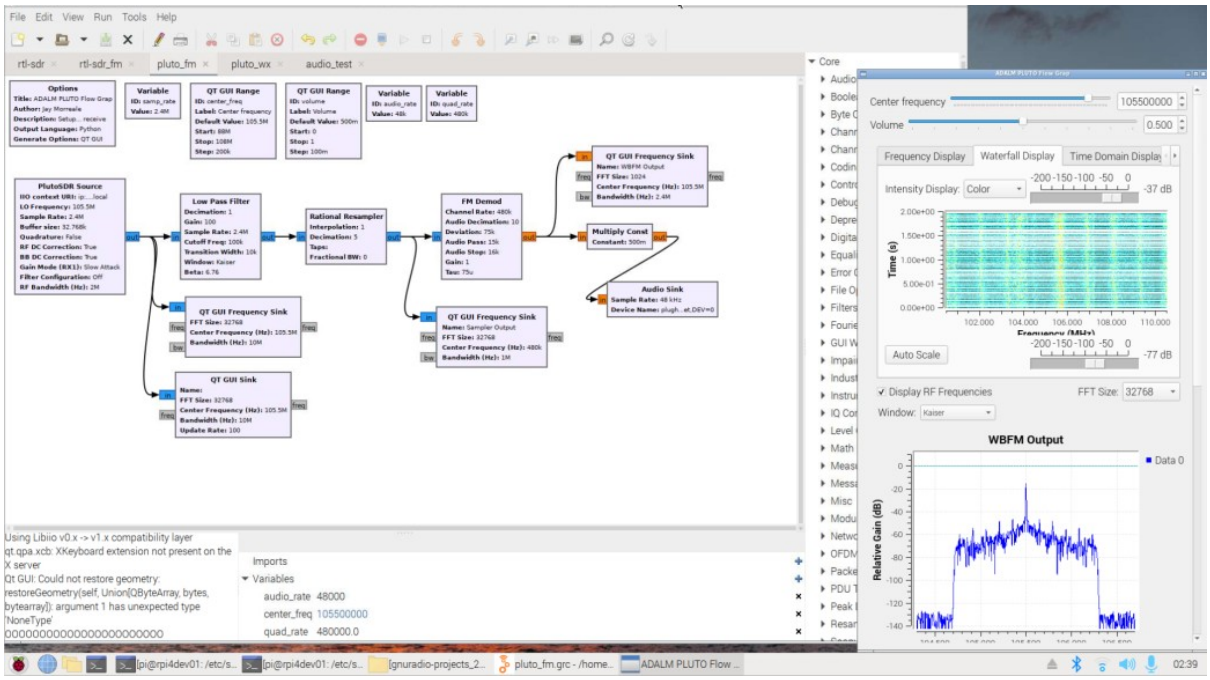
RTL-SDR WX

The RTL-SRM narrowband FM weather flowgraph is shown below.



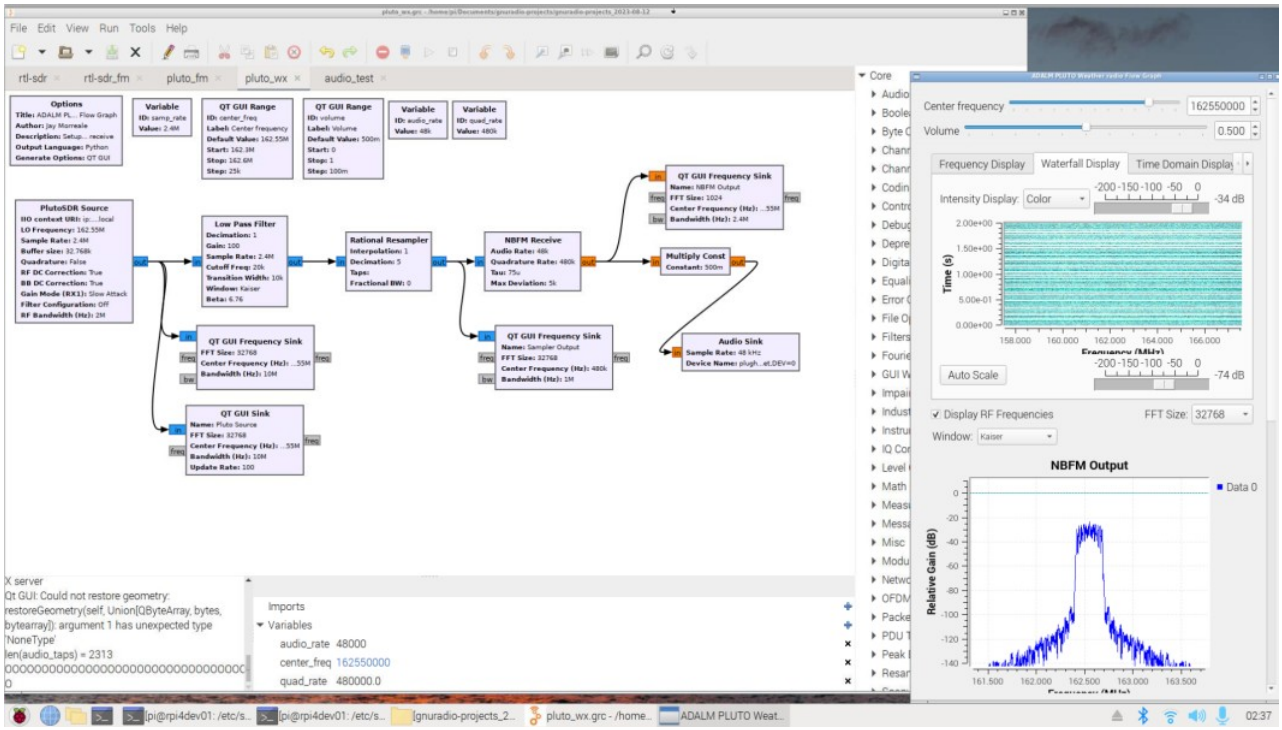
PLUTO FM

The PLUTO FM flowgraph is shown below.



PLUTO WX

The PLUTO narrowband FM weather flowgraph is shown below.



Future Activities

GNU Radio works well on the Kubuntu laptop but isn't working well enough to be useful on the Pi 4. More troubleshooting required. The latest version of the IIO_info tool was compiled and installed. So I'll re-compile the latest version of GNU ratio that see if that fixes the audio buffering problem. This is to be followed by writing flowgraphs that detect and decode PSK31 and perhaps detect and decode CW. There are also IQ demodulator functions to experiment with.

European Radio Days 2021 Tutorials

I learned a lot about RF radio signal processing from the European GNU Radio Days tutorials and working to view tutorials 3 and 4.

- European GNU Radio Days Introductory Tutorial 1 (JM Friedt)
- European GNU Radio Days Intro 2: Receiving a Real Transmission from A to (almost) Z (L. Cardoso)
- European GNU Radio Days Introductory tutorial 3: FIT/CorteXlab with GNU Radio using Docker (L. Cardoso)
- European GNU Radio Days Intro tutorial 4 "Tips and tricks on "efficiently" using SDR and GNU Radio"

References

- ADALM-PLUTO Overview
- M.O.R.E Project course
  GNU Radio
- GNU Radio Tutorials
- Raspberry Pi 4 B
- Raspbian 64 bit Linux
- Raspberry Pi Pico
- Visual Studio Code (VSC)
- PlatformIO
  Geekworm Raspberry Pi 4 N300
- TightVNC
- Anker USB Hub