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)

VOLUME 51 NO.6   June 2016

UPCOMING EVENTS

Regular Meetings

7/11 & 7/25
Monday 7:30
NP Community Center

Meeting Schedule

Regular Meeting: 7:30—9:00 PM
2nd Monday of each month at the
NP Senior & Adult Center
15 East Forth Street
New Providence

Informal Project Meeting: 7:30—9:00 PM
4th Monday of each month
Same location
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

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Club Officers for 2015

President: KC2WUF David Bean
973-747-6116
Vice President:K2UI Jim Stekas
973-377-4180
Secretary: KD2EKN Tim Farrell
973-921-1175
Treasurer: K2YG Dave Barr
908-277-4283
Activities: W2PTP Paul Wolfmeyer
201-404-6914

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
First & Third Mondays 9 PM
Details as announced.

Club Internet Address

Website:http://www.nparc.org
Webmaster K2MUN David Berkley
Reflector: nparc@mailman.qth.net
Contact K2UI, Jim

MOUNTAIN SPARK GAPS

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WB2QOQ Rick Anderson
WB2EDO Jim Brown
K2UI Jim Stekas

Climatological Data for New Providence for May 2016

The following information is provided by Rick, WB2QOQ, who has been recording daily weather events at his station for the past 34 years.

TEMPERATURE -
Maximum temperature this May, 93 deg. F (May 27, 28)
Last May(2015) maximum was 89 deg. F.
Average Maximum temperature this May, 71.9 deg. F
Minimum temperature this May, 36 deg. F (May 16)
Last May(2015) minimum was 41 deg. F.
Average Minimum temperature this May, 51.2 deg. F
Minimum diurnal temperature range, 4 deg.(49-45 deg.) 5/1
Maximum diurnal temperature range, 33 deg. (75-42 deg.) 5/9;(78-45 deg.) 5/11;

(87-54 deg.) 5/25.

Average temperature this May, 61.6 deg. F
Average temperature last May, 67.3 deg. F

PRECIPITATION -
Total precipitation this May - 3.89" rain.
Total precipitation last May - 4.11" rain.

Maximum one day precip. event this May - May 30, 0.61" rain
Measurable rain fell on 15 days this May, 4 days last May.

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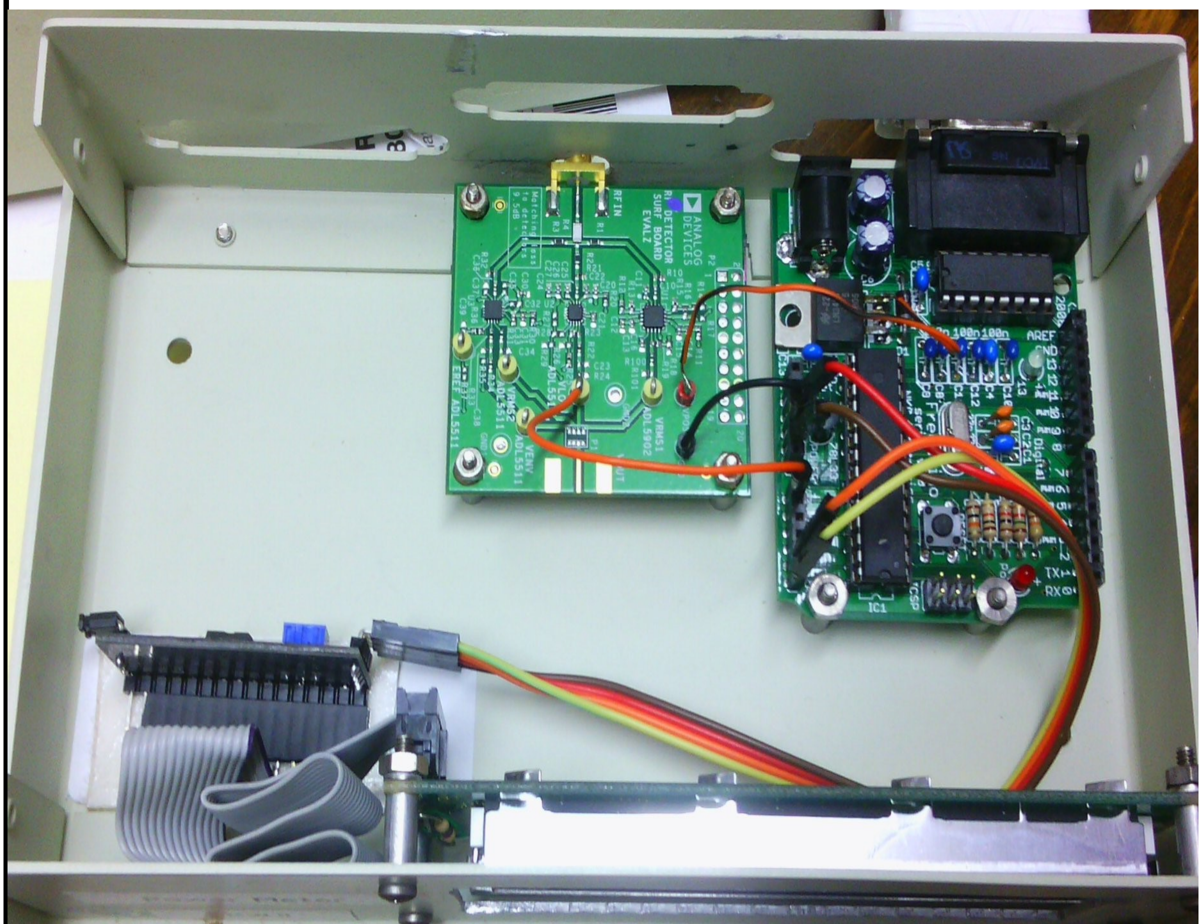
Rick Anderson
6/9/16
243 Mountain Ave.
New Providence, NJ
(908)464-8912
rick243@comcast.net

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

Arduino / RF-Kit Power Meter
Jim Stekas - K2UI

In the April and May issues of Spark Gaps we described how to build a QRP power meter using an Analog Devices RF-Kit and an Arduino. This month we finish up with a description of the Arduino software and how to calibrate your meter.

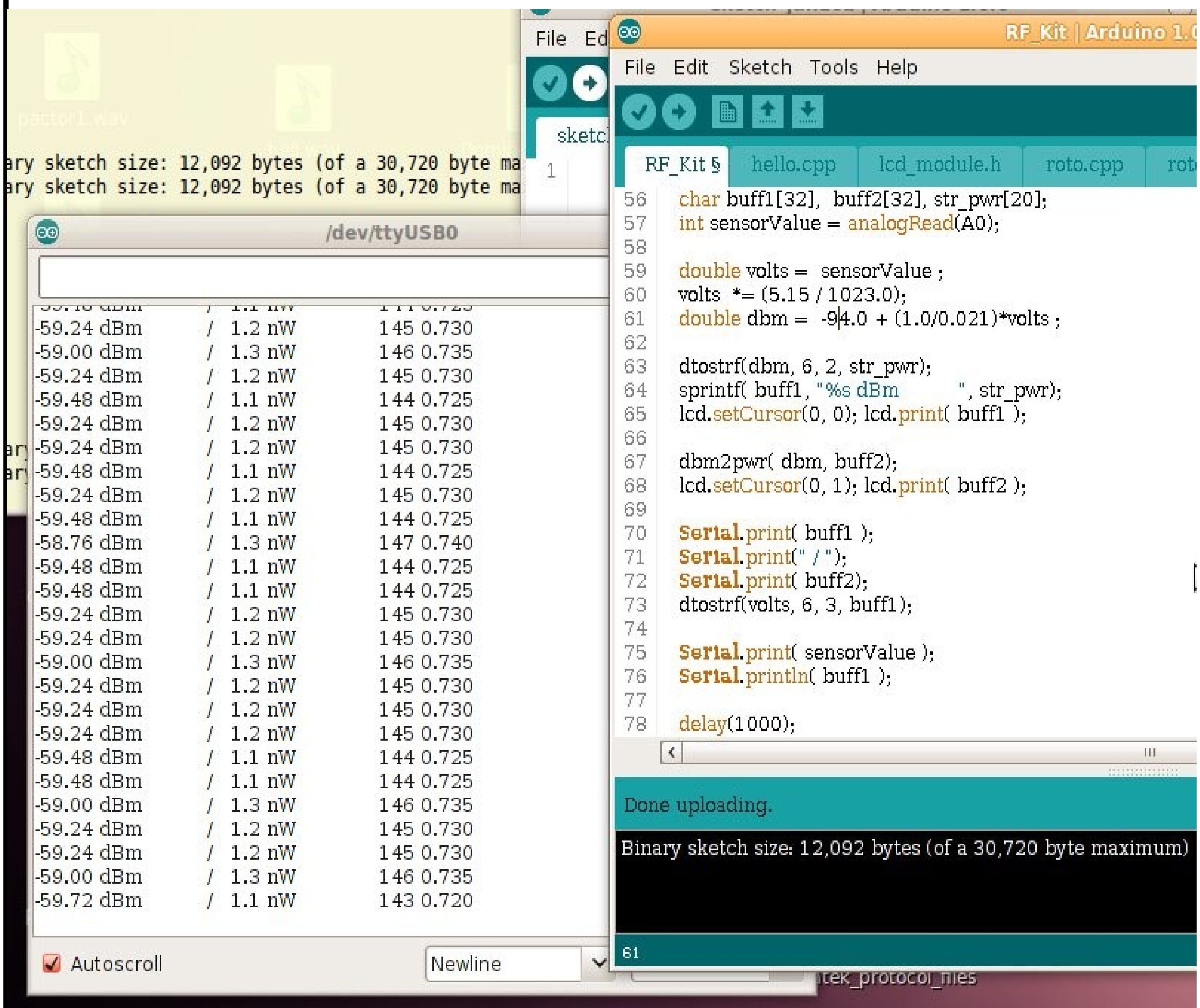


At this point, I assume you either have an Arduino with an LCD display or plan to acquire one. For my power meter I used an old Freeduino board and a 24x2 character LCD display. This combination won't fit in an Altoids tin, but it results in an uncrowded project with easy access to everything.

This picture above shows the inside of my power meter. The LCD display is at the bottom of the picture. It interfaces to the Freeduino (upper right) using a I2C board (lower left) that handles display intensity and back-lighting. (Well worth the $1 price.) The ADI RF-Kit is mounted next to the Arduino and interfaces with only 3 wires:

+5V power is taken from the on-board voltage regulator by soldering directly to the output pin
the GND connection plugs right into the Freeduino header
VREF is the measurement voltage output and connects to A0, an analog port with ADC capability.

My first tests of the power meter were discouraging. The power readings bounced around +/- 2dB and my first thought was that the cause was noise picked up by the unshielded VREF wire. Turns out the added current draw of the RF Kit (125ma) caused the voltage from my wall wart to sag, and the 5V bus dropped to 4.5V sixty times a second. A power supply with a higher current rating solved the problem and gave rock steady readings.



The figure above shows the critical code in the RF_Kit Arduino sketch (see ref. 4) opened in the standard Arduino development environment (IDE). The snippet shown is the heart of the function called *loop()*, which runs endlessly to read VREF and display the power. Here is how it works:

- Line 57: reads the value of the ADC into the variable *sensorValue*
- Lines 59+60: converts *sensorValue* into a floating point *voltage*.
- Line 61: converts the *voltage* into *dBm*.
- Lines 63-68: displays the power in dBm and watts on the front panel LCD.
- Lines 70-76: displays all the program variables in the "Serial Monitor" (the window on the left) for debugging.

The Serial Monitor display lets you calibrate your meter. The first step in calibrating your meter is getting an accurate voltage reading from A0. Put a known voltage (e.g. AA battery) into A0 and check the rightmost two columns in the monitor display for *sensorValue* and *voltage*. You should change 5.15 in line 60 to get a voltage reading equal to the known input voltage. ADI designed their chip to have a very linear voltage to dBm behavior, so if you get the voltage calculation right, you shouldn't need to touch line 61 (see note 5).

The ADC inside the AVR chip uses a reference voltage that defines what the maximum ADC count (1023) corresponds to. By default, the 5V supply is the reference for the ADC and a 5% change in the 5V bus voltage will give a 5% shift in ADC value. If you intend to run off batteries, I suggest using a Zener diode to provide the reference voltage to the AREF header pin. (This will require a small SW mod to enable the external reference.)

The power meter operates over a range of -55 dBm (3 picoWatts) to 15dBm (30mW) for frequencies from 1-4000MHz. (My calibration was done at 850 MHz). If you want to measure transmit power you will need a 40 dB attenuator capable of handling you transmitter power. Alternatively, if you have a dummy load, you could build a 40 dB attenuator tap into a small utility box. To minimize stray coupling, use multiple resistors in series and minimize the length of the resistor lead to the output connector (to the power meter).

References and Notes:

1. "A Modular 40m CW Transeiver with VFO", QST , March 2016. Describes an Ardino project with LCD that will give you info on parts and how to hook them up as well as useful web links. Also see www.arrl.org/qst-in-depth for this article.

2. http"www7zoi.net/Power%20meter%20updates.pdf– Gives plans for a T-tap that works up to 500 MHz.

3. Download specs for the ADL5513 chip from Www.analog.com. Grab specs for the ADL5902 and ADL5513.

4. RF-Kit sketch for this project will be posted to www.nparc.org

5. According the ADL5513 spec, the voltage/dBm equation should have an intercept of -97.5. Sketch line 61 uses the value -94 which was determined empirically.

6. If you want to go down to audio frequencies, use the VRMS2 output. This comes from the ADL5511 chip path which covers from DC to 6GHz and will give a power range of -30 to 15 dBm.

SCIENTIFIC TIDBITS

The Disintegrating Antarctic Ice Sheet

Warming air and seawater temperatures may melt Antarctica's western ice sheet much faster than previously thought, producing a catastrophic sea-level rise of up to 6 feet by the end of this century. In recent years, the western ice sheet has been losing lots of ice, and scientists have found that warming seawater is carving rivers under ice shelves, causing them to crack off and fall into the sea. Climatologists used computer simulations to project how this process will play out over coming decades if climate change continues at current rates. The models show that much of the western ice sheet will disintegrate into the sea, releasing a vast volume of water that will drown much of the world's coastline during the lifetime of children alive today. With ice melting in other regions, the total sea level rise could be 6 feet by 2100. This situation could literally remap coastlines. Miami, New Orleans, New York, Hong Kong, Shanghai, London and Sydney among the major threatened cities would all be likely inundated as well as thousands of smaller coastal communities. A separate study found that ice at the other end of the globe, in the Arctic Ocean, is also waning, and reached its lowest winter maximum on record this year. Scientists feel the worst-case scenario of sea-level rise could be averted if dramatic efforts to limit carbon dioxide emissions are taken over the next few decades. Government policies regarding this area are going to play a really big role in which future path we go down. Climate change could drive sea levels high enough to force more than 13 million Americans in coastal areas to abandon their homes by 2100. The most vulnerable state is Florida, especially in densely populated areas near Miami. Under a worst-case scenario that would see oceans swell almost 6 feet by century's end, some 6 million of the Sunshine State's residents could be forced to relocate, along with inhabitants of coastal areas in New Jersey, the Carolinas and Virginia. Even if seas rise by only half as much as the direst projections, nearly 5 million people will still become "climate refugees," a mass exodus researchers compare to the 20th century's Great Migration of African-Americans from the South. Currently, coastal communities are some of the most rapidly growing communities in the world. Using current data the likely risk to these populations of the anticipated ocean expansion is greatly underestimated.

There seems to be an emphasis on carbon dioxide emission restraint being the cure for our current climate change dilemma. However, why is nothing much being said regarding methane gas emissions as this substance retains much more heat per volume than carbon dioxide and is being produced naturally in large volumes? Another major question is, could the climate change we are starting to experience be a natural occurrence that is being exacerbated by our production of carbon dioxide and other heat retaining gases, and is going to occur no matter what remedial action we take?

As Spock observes, "Fascinating."

Inflatable Space Habitat

As NASA eyes a future manned mission to Mars, the space agency is poised to begin testing the $17.8 million Bigelow Expandable Activity Module (Beam), a potential home away from home for astronauts on deep-space missions. The 3,000-pound module is among the cargo packed aboard SpaceX's eighth supply mission to the International Space Station (ISS). Once attached to the station, the compressed habitat will inflate like a balloon into a module roughly 13 feet long by 11 feet wide. BEAM is composed of several layers of material, including rubber and Kevlar, and reinforced with an internal metal framework. The inflatable habitat is intended to provide astronauts with more living or work space and to protect them from the dangers lurking in deep space, including radiation and flying debris. The ISS crew will not live inside this prototype habitat, but they will monitor the module and enter it intermittently over the course of two years to assess its viability in space. This is definitely taking camping to its ultimate.

A Really Large Unicorn

Unicorns were real a long time ago. A well-preserved fossilized skull found in Kazakhstan provides evidence that a creature with a single large horn on its head roamed Siberia alongside human ancestors about 29,000 years ago. The real-life version of the fabled unicorn, formally called Elasmotherium sibiricum, was not a beautiful white steed, but a shaggy, hulking cousin of the rhinoceros. The furry herbivore was about 6 feet tall by 15 feet long and weighed in at roughly 9,000 pounds. It used its large horn for defense. New radiocarbon dating techniques reveal the creature may have outlived others of its kind by about 300,000 years by migrating to western Siberia, which had a relatively mild climate at the time. Definitely something you do not want as a house pet!

Jim WB2EDO

Some Field Day 2016 Photos
More to come