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.5 May 2016

UPCOMING EVENTS

Regular Meetings

6/13 & 6/27
Monday 7:30
NP Community Center

Field Day

6/25 and 6/26.

THINK GOOD WEATHER

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

Club Officers for 2015

President: KC2WUF David Bean
973-747-6116
Vice President:K2UI Jim Stekas
973-377-4180
Secretary: KD2EKN Tim Farrell
908-244-6202
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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The Watchung Mountain Area Radio Club
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WB2QOQ Rick Anderson
WB2EDO Jim Brown
K2UI Jim Stekas

Climatological Data for New Providence for April 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 April, 80 deg. F (April 18)
Last April(2015) maximum was 80 deg. F.
Average Maximum temperature this April, 63.8 deg. F
Minimum temperature this April, 22 deg. F (April 5)
Last April(2015) minimum was 27 deg. F.
Average Minimum temperature this April, 39.3 deg. F
Minimum diurnal temperature range, 13 deg. (59-46 deg.) 4/2
Maximum diurnal temperature range, 39 deg. (74-35 deg.) 4/17

Average temperature this April, 51.6 deg. F
Average temperature last April, 52.3 deg. F

PRECIPITATION -
Total precipitation this April - 1.99" rain.
Total precipitation last April - 2.35" rain.

Maximum one day precip. event this April - April 4, 0.46" rain
Measurable rain fell on 13 days this April, 9 days last April.

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Rick Anderson
5/11/16
243 Mountain Ave.
New Providence, NJ
(908)464-8912
rick243@comcast.net
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
-10

New Providence Memorial Day Parade

Marchers 2016

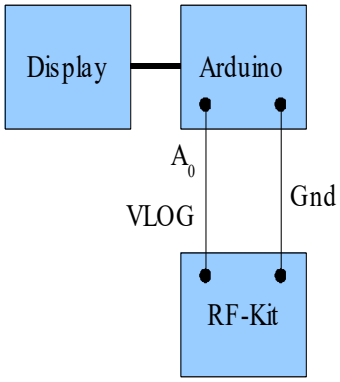
K2AL assisted by K2JV & K2EZR (not pictured) provided communications.

Arduino / RF-Kit Power Meter

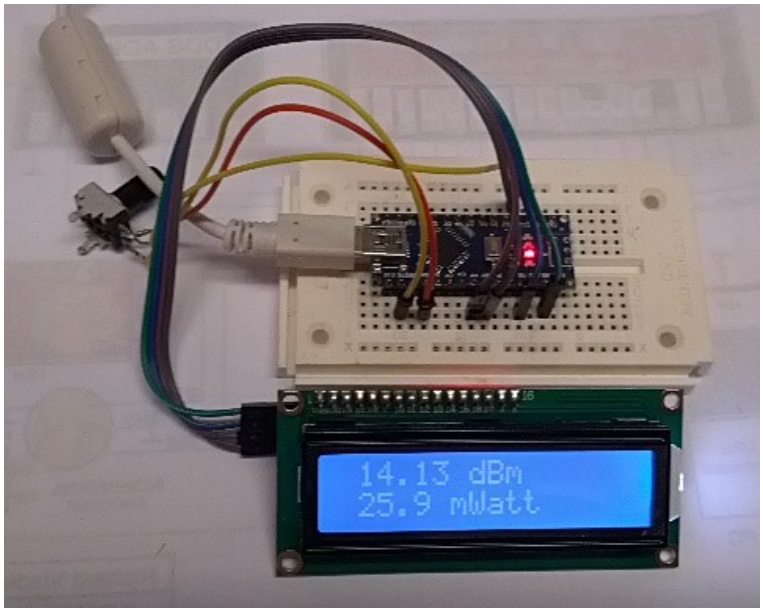
Jim Stekas - K2UI

Last month we presented an overview of the Analog Devices RF-Kit and provided a list of parts for using it in an Arduino-based power meter. This month we link the components together into a minimal system using an Arduino board, an LCD display and the RF-Kit.

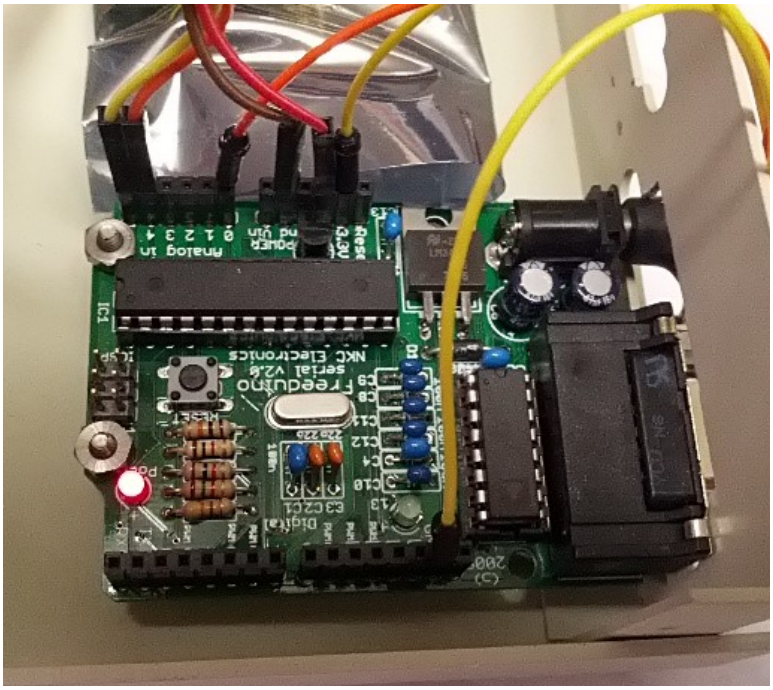
There are many LCD display options for the Arduino. The 16x2 (characters x lines) LCD displays are cheap and widely available and can be connected directly using an 8-wire parallel interface or a 4-wire serial interface using an I2C adapter board. You can also find display "shields" that plug right into an Arduino board. Or you can forgo an LCD display and print to a window on your computer to start. The RF-Kit has 4 different output options. The figure shows VLOG connected to analog port A_0 which is used to convert the voltage into a 10-bit number.



The picture below shows a breadboard prototype using an Arduino Nano. The LCD display has an I2C board attached to the back. The RF-Kit VLOG signal is simulated by a potentiometer connected between ground and the 3.3v pin on the Nano. The orange wire is the wiper of the potentiometer and is connected to A_0. The SW (called a "sketch" in Arduino-speak) reads the A_0 voltage every 100msec and scales it to a dBm value that is written to the top line of the display. The power in watts is written to the second line of the display.



The picture below shows a more finished prototype using a Freeduino and a 24x2 LCD display. The RF-Kit is in the static bag and its role is simulated with a potentiometer. The Freeduino uses 12v power and has a built-in regulated 5v supply that will be used to power the RF-Kit.



The figure on the left is a closeup of the Freeduino showing the "VLOG" connection to A_0 (orange wire). The yellow wire at the bottom of the picture is the analog ground connection.

Of course none of this works without software. I will post my "sketch" for this project on nparc.org. It is based on code I lifted from the 40m transceiver project in the March 2016 QST. The article describes how to wire up the LCD/I2C to the Arduino and where to get the Arduino development kit and SW libraries. www.arrl.org/qst-in-depth gives more detailed project info.

If you have never programmed before, don't fret. You shouldn't have to write a line of code. Just build the project sketch and load it onto your Arduino. Or easier still, bring it to a meeting and I'll burn it for you.

There is a mountain Arduino information available on-line, not to mention countless books and articles. So it makes no sense to create yet another Arduino tutorial here. My suggestion is to get and Arduino load the development environment (IDE) on your computer a build a few example sketches. When you want to do something you don't know how to do, use Google to find articles related to a specific task or problem at hand, e.g. interfacing an LCD. Don't try to "learn all about the Arduino" by reading a big fat book because you will just be wasting your time on pointless details. If you have an RF-Kit (or a 10K potentiometer!) and an Arduino you are ready to start experimenting.

SCIENTIFIC TIDBITS

Growing Human Liver

Japanese researchers have grown tiny functioning livers from human skin cells, which is a major step toward the goal of bioengineering human organs for transplants. The researchers began by transforming the skin cells back to their earlier stem cell state and reprogramming them to become liver cells. They then put those cells in petri dishes along with cells taken from umbilical cords and bone marrow, mimicking the mix of cells that naturally produce a fetal liver in utero. Within days, the cells spontaneously formed "liver buds," the same early-stage liver tissue found in fetuses. When transplanted into mice, the liver buds connected to the rodents' blood vessels and began to work as human livers would, metabolizing drugs and making proteins. Scientists have previously built windpipes and arteries for transplant by growing stem cells on plastic scaffolds, but that method has failed for solid organs like livers. Researchers hope that growing tens of thousands of liver buds could yield enough tissue to patch up and one day even replace failing organs. If this does come to pass, which there is every reason to believe it will, it would certainly eliminate the need to organ donors and solve the problem of organ rejection.

Arctic Methane Leaks

The rapid retreat of Arctic ice is uncorking ancient reserves of methane gas, speeding up the process of global warming. Scientists from the University of Alaska traveled on foot and by plane to survey that state and Greenland for spots where methane was bubbling up through the thinning ice of lakes. In Alaska alone, they found 150,000 such methane leaks near receding glaciers or melting permafrost: in Greenland, the gas was rising along the edges of shrinking ice caps. Previous studies have shown that melting permafrost allows recently frozen plant matter to decay, causing some methane to be released. But tests of the new gas seeps showed that much of the methane came from underground stores that had been sealed with ice for millennia. Methane is 25 times more powerful as a heat-trapping gas than carbon dioxide, and emissions of it have increased in recent years, partly because of higher populations of livestock. Arctic melting could be a really big source of methane as well, as the estimate is that 50 to 70 percent more methane than previously thought is escaping the ground in Alaska. This is not great news.

As an adjunct to this news, a camera that can film greenhouse gases has been created by a team of Linkoping and Stockholm University researchers. The camera uses advanced infrared to take pictures of methane, used in natural gas and liquid gas fuels. The scientists said the new tool could be used to map and monitor methane sources. At least we will be able to see where the methane is coming from even though we are basically powerless to do anything about it.

World's Lightest Material

It has been reported by scientists from the University of Kiel and Hamburg University of Technology that they have created the "lightest material in the world," consisting of a network of porous carbon tubes that are three-dimensionally interwoven at the nano and micro level. The material, which has a wide range of potential electrical and mechanical applications, weighs in at only 0.2 milligrams per cubic centimeter. That fact makes it about 75 times lighter than Styrofoam. Nevertheless, it is said to be very strong physically. According to the developers, it is jet black, stable, and electrically conductive. It is also ductile (being able to be hammered out thin or drawn out into wire or threads.) and nontransparent. The material, dubbed "aerographite," is four time lighter than the previous record holder, which was made from a similar nickel-based structure. Interestingly, Aerographite can be compressed 95 percent and pulled back to its original form without damage; it actually becomes stronger when exposed to stress. It also absorbs light rays almost completely, making it the blackest of black materials. As far as electronic applications go, Aerographite could fit onto the electrode of Li-Ion batteries. In that case, only a minimal amount of battery electrolyte would be necessary, which then would lead to an important reduction in the battery's weight. This feature could translate into more compact batteries for electric vehicles. In addition, it could be used in the creation of conductive plastics and for vibration damping in avionics and satellites. The material may also prove useful for filtering out water and air pollutants.

Jim WB2EDO

The following was provided by Dave, AGCL

Carbon Nanotubes Make Coaxial Cables Lighter

February 02, 2016
Common coaxial cables could be made 50 percent lighter with a new nanotube-based outer conductor developed by Rice University scientists. The Rice lab of Professor Matteo Pasquali has developed a coating that could replace the tin-coated copper braid that transmits the signal and shields the cable from electromagnetic interference. The metal braid is the heaviest component in modern coaxial data cables.
Replacing the outer conductor with Rice's flexible, high-performance coating would benefit airplanes and spacecraft, in which the weight and strength of data-carrying cables are significant factors in performance. Replacing the braided metal conductor with the nanotube coating eliminated 97 percent of the component's mass.
Research scientist Francesca Mirri, lead author of the paper, made three versions of the new cable by varying the carbon-nanotube thickness of the coating. She found that the thickest, about 90 microns – approximately the width of the average human hair – met military-grade standards for shielding and was also the most robust; it handled 10,000 bending cycles with no detrimental effect on the cable performance.
Current coaxial cables have to use a thick metal braid to meet the mechanical requirements and appropriate conductance. This new cable meets military standards and supplies the strength/flexibility without the bulk.
FMI: http://www.everythingrf.com/News/details/2180-carbon-nanotubes-make-coaxial-cables-lighter

Breakthrough May Pave the Way for GaN to Supplant Silicon in Circuits

Researchers at HRL Laboratories, have achieved the first demonstration of gallium nitride (GaN) complementary metal-oxide-semiconductor (CMOS) field-effect-transistor (FET) technology, and in doing so have established that the semiconductor's superior transistor performance can be harnessed in an integrated circuit. This breakthrough paves the way for GaN to become the technology of choice for power conversion circuits that are made in silicon today.
According to HRL Senior Staff Research Engineer and Principal Investigator Dr. Rongming Chu, GaN transistors have long excelled in both power switching and microwave/millimeter wave applications, but their potential for integrated power conversion has been unrealized. Unless the fast-switching GaN power transistor is intentionally slowed down in power circuits, chip-to-chip parasitic inductance causes voltage instabilities.
Chu and his colleagues in HRL's Microelectronics Laboratory have overcome that limitation, developing a GaN CMOS technology that integrates enhancement-mode GaN NMOS and PMOS on the same wafer. "Integration of power switches and their driving circuitry on the same chip is the ultimate approach to minimizing the parasitic inductance," Chu said.
Today, GaN transistors are being designed into radar systems, cellular base stations, and power converters like those found in computer notebook power adaptors. "In the near term, GaN CMOS IC applications could include power integrated circuits that manage electricity more efficiently while having a significantly smaller form factor and lower cost, and integrated circuits that can operate in harsh environments," he said. "In the long term, GaN CMOS has the potential to replace silicon CMOS in a wide range of products."

Chu concluded, "GaN CMOS IC was considered difficult or impossible, due to the challenge in making P-channel transistor and integrating an N-channel transistor. Our recent work opened up the possibility of making GaN CMOS IC's."

The HRL research team's demonstration was published January 6, 2016, in IEEE Electron Device Letters.

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