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.4 April 2016

UPCOMING EVENTS

Regular Meetings

5/9 & 5/23
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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Contributing Editors:
WB2QOQ Rick Anderson
WB2EDO Jim Brown
K2UI Jim Stekas

Climatological Data for New Providence
for March 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 March, 80 deg. F (March 10)
Last March(2015) maximum was 59 deg. F.
Average Maximum temperature this March, 58.1 deg. F
Minimum temperature for this March, 21 deg. F (March 3)
Last March(2015) minimum was 5 deg. F.
Average Minimum temperature this March, 35.2 deg. F
Minimum diurnal temperature range, 10 deg. (49-39 deg.) 3/14
Maximum diurnal temperature range, 36 deg. (75-39 deg.) 3/31

Average temperature this March, 46.7 deg. F
Average temperature last March, 35.6 deg. F

PRECIPITATION -
Total precipitation this March – 1.4” snow; 1.55” rain/melted snow.
Total precipitation last March – 15.1” snow; 4.73” rain/melted snow.

Maximum one day precip. event this March - March 4, 1.0” snow
Measurable rain fell on 7 days this March, 8 days last March.
Measurable snow fell on 3 days this March.

==========
Rick Anderson
4/7/16
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
CoCoRaHS Network Station #NJ-UN-10
==========
Rick Anderson
12/27/15

New Providence Memorial Day Parade

NPARC members are invited to participate in this years Memorial Day Parade, taking place on Monday, May 30. Our club has annually participated in this town event, for as long as I can recall; and a decent attendance in this club activity is requested. This is the one public event where hundreds of town's people get to see the club members, and a good attendance is most welcomed. Last year there was a small participation in our parade unit. As in past years, we request members to initially meet in the New Providence Memorial Library parking lot at 9:25 a.m., and we will truck pool over to our starting position on Central Avenue.
Suggested dress code is white shirt, blue slacks, NPARC yellow cap, and of course your 2 meter HT, tuned to club frequency.
Our unit will walk the parade route, down Springfield Ave., between Central Ave. and Academy St. Please consider taking part in this community event.

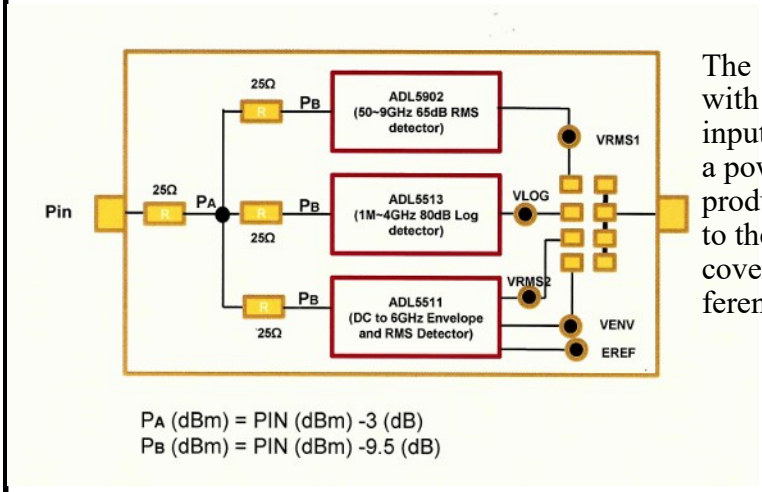
Please contact Rick, WB2QOQ, if you will be participating in the parade or have questions. rick243@comcast.net; (908) 464-8911.

2015 Parade

RF Detector Surf Board Kit

Jim Stekas - K2UI

The Analog Devices RF Detector Surf Board Kit is an evaluation board with three power measurement chips that operate from DC to 9GHz. This article will give an overview of the board, the capabilities of the chips, and outline some ideas towards putting it to work in the shack.



The board has a single SMA input (P_{in}) with a resistor network that fans out the input to the three power detector chips at a power level of P_{in} – 9.5 dB. Each chip produces an output voltage proportional to the RMS input power in dB. The chips cover different frequency bands with different dynamic ranges.

The data sheets for these chips can be downloaded from www.analog.com. These contain detailed specifications and schematics of their evaluation boards. No specs are available for the Surf Board Kit, but I assume the board replicates the individual eval boards. Here are short descriptions of the chips.

ADL5902 - This chip makes very accurate (error < 1dB) RMS power measurements over the range of -62 dBm to 3 dBm (~ 1 nano to 2 milli watts). This measurement is delivered as a voltage proportional to the RMS power in dBm, VRMS1. VRMS1 changes by 53mv/dB.

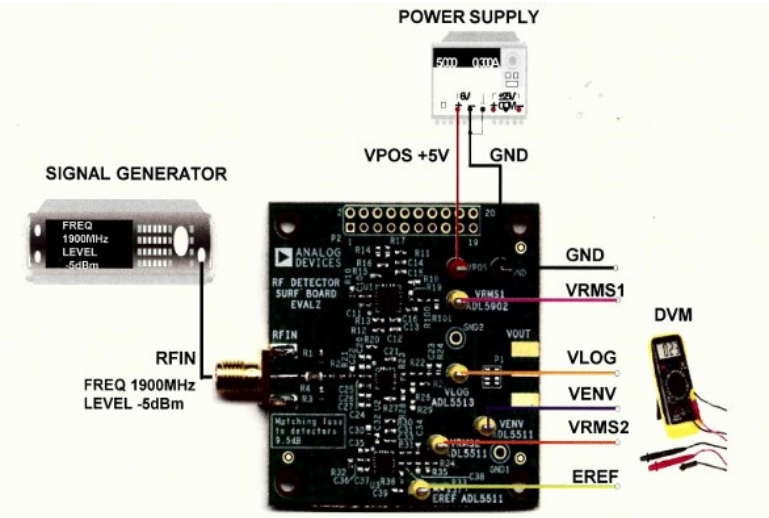
ADL5513 – A chip that covers all the ham bands below 4GHz and has a wide dynamic range of 80 dB. Output voltage, VLOG, varies 21mv/dB from -65 dB to 5 dB. This can be pushed +/-5 dB with some additional error.

ADL5511 – This device goes down to DC and has a dynamic range of 47dB. It produces not only RSM power measurements, but envelope power as well. (Do QRP SSB-ers quote PEP or RMS power?!)

All of these chips include circuitry to compensate for temperature and chip fabrication variation to minimize measurement error. Maximum input levels are about 20 dBm (100mw) for these devices. This translates to 30 dBm (1W) at P_{in} given the 9.5dB loss in the fanout network at the input.

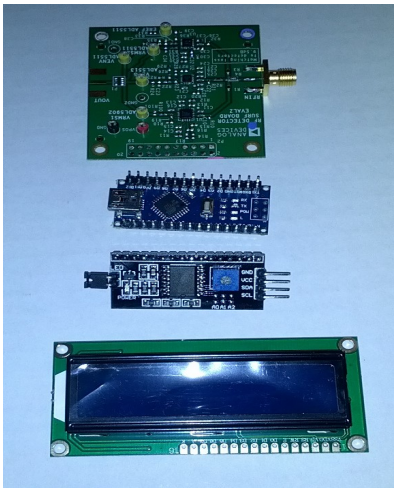
One of the nice things about the Surf Board Kit is that it isn't a kit at all. It is a completely assembled board that only needs a 5V at 125ma supply to work. All measurement voltages are brought out to test points that are easily accessed with alligator clips. There is also provision for adding a output SMA connector for bringing out the signal of your choice.

The simplest way to use the Surf Board would be to hook up a power supply and use your DVM to measure voltages as shown in the figure below. Of course, you will need to use the your calculator or the graphs in the data sheets to translate voltages into dBm.



RF Detector Surf Board Test Setup

A more useful package would be to throw together a few OP amps to produce a voltage that can be read directly in dBm. This will require pots to trim the slope and intercept values as well as a negative voltage supply. Once you've got it all working, you will still need to break out the calculator (or table) to convert dBm to watts assuming you don't think in dBm. ("Running 33 dBm into a dipole here OM."). A better, and easier approach, is to use an Arduino to read the signals and display power in dBm and watts on a small LCD display. The Arduino has multiple analog inputs with A/D converters that can read voltages with 5 mv precision, which equates to 0.25 dB for Surf Board measurements. All slope and intercept calculations can be handled in software as can conversion from dBm to watts. In addition, there are enough analog inputs to allow ***all*** the output voltages to cycled through, measured and displayed. Or you can get fancy and add a rotary shaft encoder to switch between the measurements, or dial in the amount of outboard attenuation you've added.



Here is all you need, in order …

Surf Board Kit, $10 + shipping.

Any Arduino will work A Nano is shown, $6 (or less)

I2C LCD Driver, $1, to minimize wiring.

16x2 LCD Display, $6 (or less)

Next month we will put it all together and do some basic Arduino hacking. (See page 39 of the March 2016 QST to see how to wire up the Arduino and LCD.)

SCIENTIFIC TIDBITS

Really Twisted Radio

For many years, allocation of the increasingly busy frequency spectrum has presented a challenge, and the introduction of mobile smartphones, digital TV, and wireless internet has only added to the problem. However, a group of researchers from the University of Padova, Italy, and the Angstrom Laboratory, Sweden, have come up with a way to ease the congestion by manipulating radio waves so they can hold multiple channels of information in the same band. The technique involves twisting the transmissions. According to the researchers, looked at in three dimensional perspective, this phase twist looks like a fusilli-pasta-shaped beam. Each of these twisted beams can be independently generated, propagated, and detected, even in the very same frequency band, behaving as independent communication channels.

Apparently, it is possible to twist a wave about its own axis a certain number of times– both clockwise and counter clockwise - thus enabling several different configurations. To demonstrate the principle, the researchers transmitted two twisted waves in the 2.4 GHz band from a lighthouse on San Georgio Island to a satellite dish on the Venice mainland 0.27 miles away, where the dish was able to pick up the two separate channels. Within reasonable economic boundaries, one can think about using five orbital angular momentum states, from 5 counter-clockwise up to 5 clockwise, including untwisted waves. In this instance, one can have 11 channels in one frequency band. It is possible to use multiplexing, like digital TV, on each of these to implement even more channels on the same states, which means one could obtain 55 channels in the same frequency band. That is some multiplier effect!

X-Ray Laser

For many years, it has been deemed possible to produce an x-ray laser beam by removing some atom's inner electrons and inducing them to fall to lower energy levels, thus releasing a single color of light. The problem is that no x-ray sources existed that were powerful enough to do it. However, researchers at the Stanford Linear Accelerator Center aimed radiation from their $410 million Linac Coherent Light Source at some neon gas and set off an avalanche of emissions, thereby creating new "atomic x-ray laser." To make it work, they had to use x-ray pulses, each a billion times brighter than any available before, to knock electrons out of the inner shells of the neon atoms. When the remaining atoms fell into the holes, about two percent of them responded by emitting a short-wavelength x-ray. Those, in turn, stimulated neighboring atoms to emit more x-rays, creating a domino effect and amplifying the laser light by 200 million times. It is likely to be a matter of years before the technology finds any kind of general use, but it has many potential applications.

Scary Proposition

The Earth's magnetic field is weakening, and could all but disappear within the next 500 years, exposing our planet to intense solar radiation that would scour its surface of all life. Researchers say the geological record indicates that Earth's magnetic field tends to switch polarity every 250,000 years; it is now about 550,000 years overdue. This swap, which typically begins with the dwindling away of the field's force seems to be in its early stages of development. In the past 150 years, the strength of the magnetic field has lessened by 10 percent, which could be an indication a reversal cycle is beginning. Mars, which scientists believe permanently lost its magnetic field some 3.8 billion years ago, could be a model for what Earth would be like if our magnetic field disappeared. Mars's lack of magnetosphere has allowed solar wind to strip the atmosphere away and upped the amount of cosmic radiation making it to the surface. A similar event on Earth would wipe out all life. Even if the field just continued to weaken, it would scramble electricity and GPS systems, and make it difficult for the many species that navigate using magnetic sensing to migrate. Now that is one beautiful scenario!!

Jim WB2EDO