

# **MOUNTAIN SPARK GAPS**

**NPARC—The Radio Club for the  
Watchung Mountain Area**



**Website: <http://www.nparc.org>  
Club Calls: N2XJ, W2FMI**

**VOLUME 50 NO.8 August 2015**

## **UPCOMING EVENTS**

### **Regular Meetings**

**9/14 & 9/28  
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

## 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](mailto:nparc@mailman.qth.net)  
Contact K2UI, Jim

## MOUNTAIN SPARK GAPS

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WB2QOQ Rick Anderson  
WB2EDO Jim Brown

## Climatological Data for New Providence for July 2015

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 July, 97 deg. F  
(July 29)

Last July(2014) maximum was 95 deg. F.  
Average Maximum temperature this July, 86.7  
deg. F

Minimum temperature for this July, 59 deg. F  
(July 16,17,23)

Last July(2014) minimum was 55 deg. F.  
Average Minimum temperature this July, 66.1  
deg. F

Minimum diurnal temperature range, 9 deg. (75  
-66 deg.) 7/4

Maximum diurnal temperature range, 28 deg.  
(89-61 deg.) 7/25

Average temperature this July, 76.4 deg. F

Average temperature last July, 74.8 deg. F

### PRECIPITATION -

Total precipitation this July - 2.1" rain  
Total precipitation last July - 6.23"

Maximum one day precip. event this July; Ju-  
ly 30, 0.47" rain.

Measurable rain fell on 11 days this July,  
14 days last July.

=====  
Rick Anderson

8/10/15

243 Mountain Ave.

New Providence, NJ

(908) 464-8912

[rick243@comcast.net](mailto: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

Elevation: 380 ft.

CoCoRaHS Network Station #NJ-UN-10

## Some additional weather data from WB2QOQ

### RAINFALL RECEIVED 8/19 IN THUNDERSTORM - NEW PROVIDENCE

After weeks of not receiving more than a tenth of an inch of rainfall, yesterdays localized significant rain storm was really something !  
Below are rain gauge reports for yesterday from fellow volunteers who, like me, take daily precipitation observations in the area:

Chatham	1.04"
Long Hill twp.	0.18"
Morris twp.	0.48"
Bedminster	0.33"
Cranford	0.46"
Union	0.47"
New Providence	4.02"

A bit of August weather look-back:

Tropical Storm (originally a Hurricane) Irene hit New Jersey on Aug. 27,28, 2011

Maximum one day precip. event on August 28; 6.25" rain.  
Irene dumped 8.72" of rain on Aug. 27, 28 at my station.

I lost AC power, as many of you did, for 5 days, 9 hrs.

At the time we figured, WOW; THAT was some Storm !

Little did we know that in the following year Hurricane Sandy would pay NJ a visit;

with a lot Worse consequences!

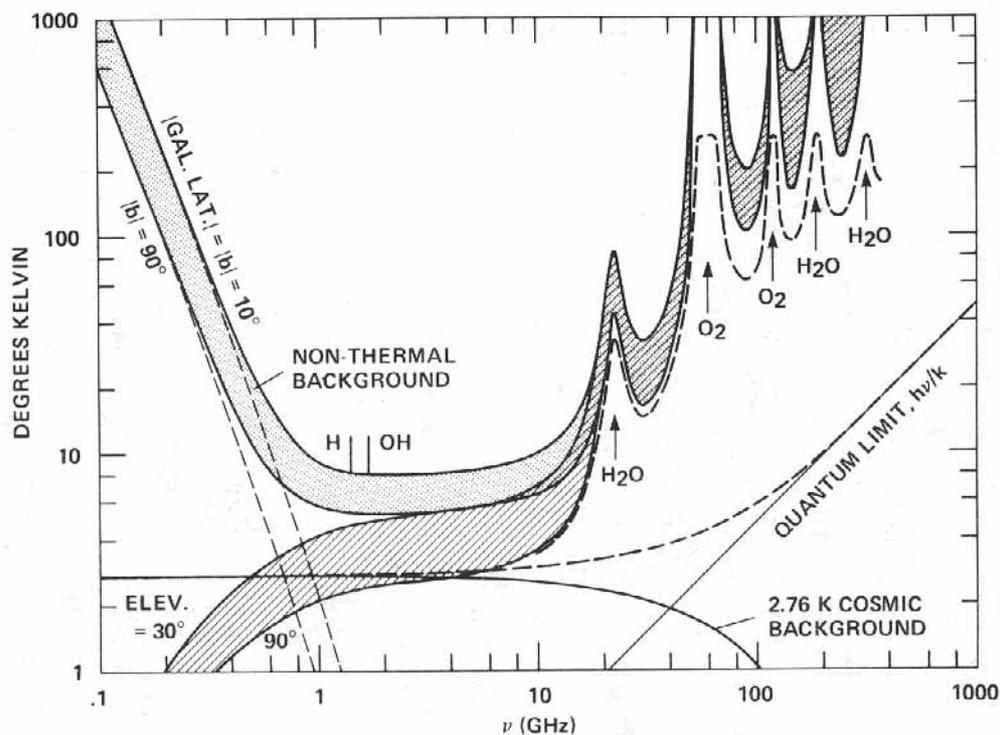
## Working Extreme DX

Jim Stekas - K2UI

I am not a DX-chaser. My last envelope from the Bureau arrived more than 20+ years ago. But I am always gratified by how well I can “get out” with a K1 and a simple wire antenna. By “extreme DX” I don't mean “swinging the beam”, cranking up the Alpha, and breaking a pile-up to “get a new one”. I mean *extreme*, as in could I work a station on Mars? On Pluto? In a different stellar system? In another galaxy?!

Well, we can check off Pluto since the NASA New Horizons mission just sent pictures back from Pluto, a distance of some 4.7 billion miles. This was accomplished over a 1kbps link using a 24 watt X-band transmitter (around 10GHz) and a 42dBi dish antenna. Of course the earth station contributed some very heavy lifting, starting with a 70dBi dish antenna. (NASA clearly doesn't scrimp in the antenna dept.)

The reason for operating around 10GHz can be gleaned from the figure below. The background galactic and atmospheric noise has a minimum between 1-10 GHz. For a fixed size dish antenna there is 20dB more gain at 10GHz than there is at 1GHz, so the higher the frequency the better.



Assuming no losses or impairments, I estimate the downlink receive SNR  $\sim 5$ dB. Here SNR means  $E_b/N_0$ , and although 5dB might seem marginal, modern Turbo-codes operate close to the Shannon limit of  $E_b/N_0 = 0$ dB. In normal operation, roughly 50,000 photons arrive at the earth station antenna for every bit sent.

Now Pluto would be pretty good DX for any ham, but it is on our cosmic doorstep, about 4.5hrs away as light travels. (Don't forget to say “over” when you QSO with Pluto!) The closest star, Alpha Centauri, is 4.5 light years away, over 8000 times farther than Pluto. That translates to an additional 78dB of transmission loss, and an SNR dropping to -73dB. If New Horizons ever got to Alpha Centauri and sent a picture back decoding it would be impossible. Even with zero noise, only 1/400 of a photon would arrive per bit sent. We would need bigger antennas and/or lower bit rates to ensure that we receive at least one photon per bit.

Every time we double the distance we spread the signal (photons) over 4-times the area at the receiver. So doubling the distance requires doubling the antenna size or decreasing the bit rate by 4x. The problem is that the universe is a very big place and we can do a lot of doubling before we are out of the neighborhood.

Here are a few places you want for an ARRL Extreme DX award ....

	Distance (Lt-yr)	Distance / Dist to Pluto	Loss vs Pluto (dB)
Pluto	4.5hr	1	0
Alpha Centauri	4.5	8000	78
Betelgeuse	650	1.15M	121
Across Galaxy	100k	180M	178
Andromeda	2.5M	4.5B	192

If we want to talk with Andromeda at 1kbps, we need to scale up the New Horizon system by 192dB. That means using dish antennas on each end that are roughly the diameter of Mercury's orbit. I suppose that might be feasible for Star Fleet Command, who can deploy the Enterprise with Capt. Kirk and crew. Of course, they didn't have to get into space via Kazakhstan.

If we dropped from 10GHz to 1GHz, we would lose 40dB of antenna gain and we would need to increase antenna sizes 10-fold to maintain the same gain. That might not seem so much when we are throwing around such huge numbers, but 40dB is the difference between \$100 and \$1M.

So what about a 20m DX-pedition to Mars? Assuming stations with 1kW transmitters and 20dBi antennas at both ends, an Earth-Mars CW QSO might just be possible at very slow code speeds.

Bottom line ... don't spend too much time scanning for extraterrestrial signals. And don't even think about it unless you are up in the 10GHz region because aliens aren't going to build antennas a million miles across just so you can log a “new one”.

References:

[www.seti.org](http://www.seti.org) - Search for Extra-Terrestrial Intelligence. Some good technical analysis (including above figure).

[descanso.jpl.nasa.gov/monograph/mono.html](http://descanso.jpl.nasa.gov/monograph/mono.html) - Deep Space Communication “books” by JPL. Detailed descriptions and analysis of radio systems used on various missions, from Voyager on.

## SCIENTIFIC TIDBITS

### **A Breakthrough at the Bottom of the World**

After drilling for two decades through two miles of solid ice, Russian scientists have broken through to a vast lake in the Antarctic that has been cut off from air and light for approximately 20 million years. Lake Vostok, which is about the size of Lake Ontario, may be the last untouched frontier of Earth, and the home to life forms not seen anywhere else. What scientists find there might provide some clue about life on other worlds. This discovery has been compared to the first flight to the moon. Scientists will next begin sampling the pristine waters of Lake Vostok for microbes that may have evolved in near-isolation. If bacteria are found to exist there, the chances increase that micro-organisms could thrive in extraterrestrial sites, such as the ice-covered oceans on Jupiter's moon Europa or Saturn's moon Enceladus. Preliminary ice samples taken from directly above Lake Vostok do show microbial traces, but experts warn that they could be the result of contaminated drilling equipment. The Russians are not alone in researching sub-glacial lakes in Antarctica. Both the United States and Great Britain have teams drilling for samples from other sub-glacial lakes. What they uncover should be very interesting.

### **Why Zebras Got Their Stripes**

Many age old questions have over the recent past been answered; questions such as "how the elephant got its trunk" and now "what is the purpose of the Zebra's stripes?" This question has baffled man for centuries, but now, there may be an answer.

What is the evolutionary point of the Zebra's stripes? A new study suggest a surprising answer: the stripes exist to repel flies. Researchers set out black, white and zebra-patterned horse statues in a field and were startled to discover that the striped models attracted the fewest horseflies. Previous studies have shown that flies are drawn to black surfaces because they reflect steady polarized light, as does the water where flies lay their eggs: white, which reflects polarized light randomly, tends to repel the insects. Researchers expected that stripes would split the difference, but found instead that they produced "a very powerful reduction in attractiveness" compared with either solid color. The skinnier the stripes were, the less flies liked them, suggesting that the juxtaposition of polarized and unpolarized light scrambles their vision. Biting insect can transmit disease, so striped zebras that repelled bloodsuckers would be more likely to survive than those without stripes. I wonder, if we paint narrow black and white stripes on the exposed portions of our bodies we can ward off mosquitos this summer?

Jim WB2EDO