# MOUNTAIN SPARK GAPS

NPARC—The Radio Club for the Watchung Mountain Area

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

VOLUME 48 NO. 8 August 2013

# UPCOMING EVENTS

**Regular Meetings**

**Mon. 9/9 & 9/23 7:30 PM**
**Salt Brook School Cafeteria**
***NOTE CHANGE***

**Sept. 14**
**ARRL September VHF Contest**
**(see www.arrl.org/contests)**

**Holiday Luncheon**
**Saturday 12/9**
**Keep the Date Open**

## Meeting Schedule

**Regular Meeting:** 7:30—9:00 PM
**2nd Monday of each month** at the
Salt Brook School Cafeteria
Springfield Ave. and Maple St.
New Providence

**Informal Project Meeting:** 7:30—9:00 PM
**4th Monday of each month** at the
Salt Brook School Cafeteria
Springfield Ave. and Maple St.
New Providence

**Everyone is Welcome**
If a normal meeting night is a holiday,
we usually meet the following night.
Call the contacts below.
When Schools are closed,
Meetings are held in the Recreation
Department Meeting Room in Borough Hall

---

## Club Officers for 2013

President: K2MUN David Berkley
908-500-9740
Vice President:KC2WUF David Bean
973-747-6116
Secretary: KC2HLA Hillary Zaenchik
908-244-6202
Treasure: 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

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



Editor: K2EZR Frank McAneny
Contributing Editors:
WB2QOQ Rick Anderson
WB2EDO Jim Brown


Climatological Data for New Providence for July 2013

The following information is provided by Rick, WB2QOQ, who has been recording daily weather events at his station for the past 33 years.

**TEMPERATURE -**
Maximum temperature this July, 98 deg. F (July 19)
Last July(2012) maximum was 102 deg. F.
Average Maximum temperature this July, 87.9 deg. F
Minimum temperature for this July, 58 deg. F (July 30)
Last July(2012) minimum was 61 deg. F.
Average Minimum temperature this July, 69.6 deg. F
Minimum diurnal temperature range, 7 deg. (68-61 deg.) 7/25
Maximum diurnal temperature range, 24 deg. (86-62 deg.) 7/27; (82-58 deg.) 7/30;

(83-59 deg.) 7/31.

Average temperature this July, 78.8 deg. F
Average temperature last July, 78.0 deg. F

**PRECIPITATION -**
Total precipitation this July - 3.69" rain
Total precipitation last July - 2.29" rain

Maximum one day precip. event this July; July 1, 1.09" rain.
Measurable rain fell on 13 days this July, 13 days last July.
This July there were 13 days of 90 degree or higher temperatures.
There were two official heat waves; July 5-9(5 days), 14-21(8 days).

======================


Rick Anderson
8/1/13
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

# PRESIDENTS COLUMN
## By K2MUN

I have a new ham radio obsession: JT65 and JT9. I won't talk about the modes themselves since David, KC2WUF, provided an excellent column on them for last month's Spark Gaps (http://nparc.org/newsletters/July13MSG.pdf). However, given the minimal communications provided by these very structured QSO's, why do they obsess me? Because they force attention on what lies behind them -- pure propagation. Laid out in front of you is a band of hams from many exotic locations and each time I click on one, I get a sense of wonder that, somehow, I don't experience on other modes. I'm continuously conscious of the amazing distances these meager signals travel and each complete QSO validates the miracle.

Last month I talked about space weather. In this column, I want to try to demystify, or at least discuss, the jargon associated with the forecasts. From a broad perspective there are a number of parameters that are used to describe the effect of the Sun on propagation. The grandmother of them all is Sun Spot Number (SSN). A sun spot is a disturbance in the Sun's atmosphere -- think of it as a storm. However, when solar scientists count sun spots they don't just count the number of storms. Instead they use a measure, called Sun Spot Number, which tries to account for the size of the storms, the number of actual events and the effects of specific observatories. Alternatively SSN is called International Sun Spot Number, relative Sun Spot Number, Zūrich number or Wolf number after Rudolf Wolf who first counted sunspots in around 1850.

SSN is correlated to a direct measure, the '10 cm radio flux' (measured at 10.7 cm). Other numeric parameters are the A-index and its logarithmic average over each day, the K-index. These are the first measures that directly relate to what we hear on our (especially) HF radios. Let's take a look at one simple report of propagation conditions (from DX Toolbox, Black Cat Systems). The first screenshot is a listing of the conditions on August 12, 2013 while the second shows many of the same parameters over the July 13 - August 11, 2013 period. You can see another simple tool on many of our NPARC website pages (http://nparc.org/). Look at the bottom of the left hand column and you will see a current propagation snapshot. If you click anywhere on the information you will be taken to http://www.hamqsl.com/solar.html which has an overwhelming wealth of ionospheric and solar data. I use both of these tools regularly to try to guess where to listen for the most interesting DX and what to expect over the day.

At a high level, what do all these numbers tell us. First, Solar Flux is the 10 cm radio direct measure of the sun's radiation falling on the Earth's atmosphere, or more particularly, the layers that contribute to radio propagation as discussed last month. SSN and Solar Flux are directly correlated although the relationship is not linear. Solar Flux hits a minimum of about 70 even when the SSN falls to zero. However, by the time the Sun is active the numbers are very roughly similar. E.g. at an SSN or 200 (a very active Sun) Solar Flux has been measured as around 225 (with a range from about 200 - 230). Unfortunately, this is still only an indirect measure of the major drivers of Ionospheric ionization which, as mentioned last month, is the main determinant of our HF radio propagation. However, these various measures correlate well to what we actually experience although are accurate only in the average.

There are many other direct measurements, these include x-ray flux which causes radio black-outs, magnetic storms that can also degrade HF radio and, Solar particle radiation which can be dangerous to orbiting satellites and even people. This information is provided by the sites I've mentioned and by NOAA (the **N**ational **O**ceanic and **A**tmospheric **A**dministration). The observed data provides measures ranging from various radiation disturbances to the sun throwing highly ionized material at the earth (a CME or **C**oronal **M**ass **E**jection). These events can cause anything from minor disruption in communications to, in the extreme, potentially destructive events up to destroying satellites and harming people. They can also lead to exciting displays of Northern (and Southern) lights -- Aurora, something we rarely experience this far south in the U.S. Sometimes events that can disrupt HF communications can even be a boon for those who fish for DX at higher bands.

How about these more direct satellite measurements? The various NOAA satellites measures X-ray flux, magnetic fields and ionizing particles flux as well as observing the sun directly. To interpret the intensity of various types of disturbances (magnetic, particle radiation and x-ray) NOAA provides a colorful chart at: http://www.swpc.noaa.gov/NOAAscales/NOAAscales.pdf.

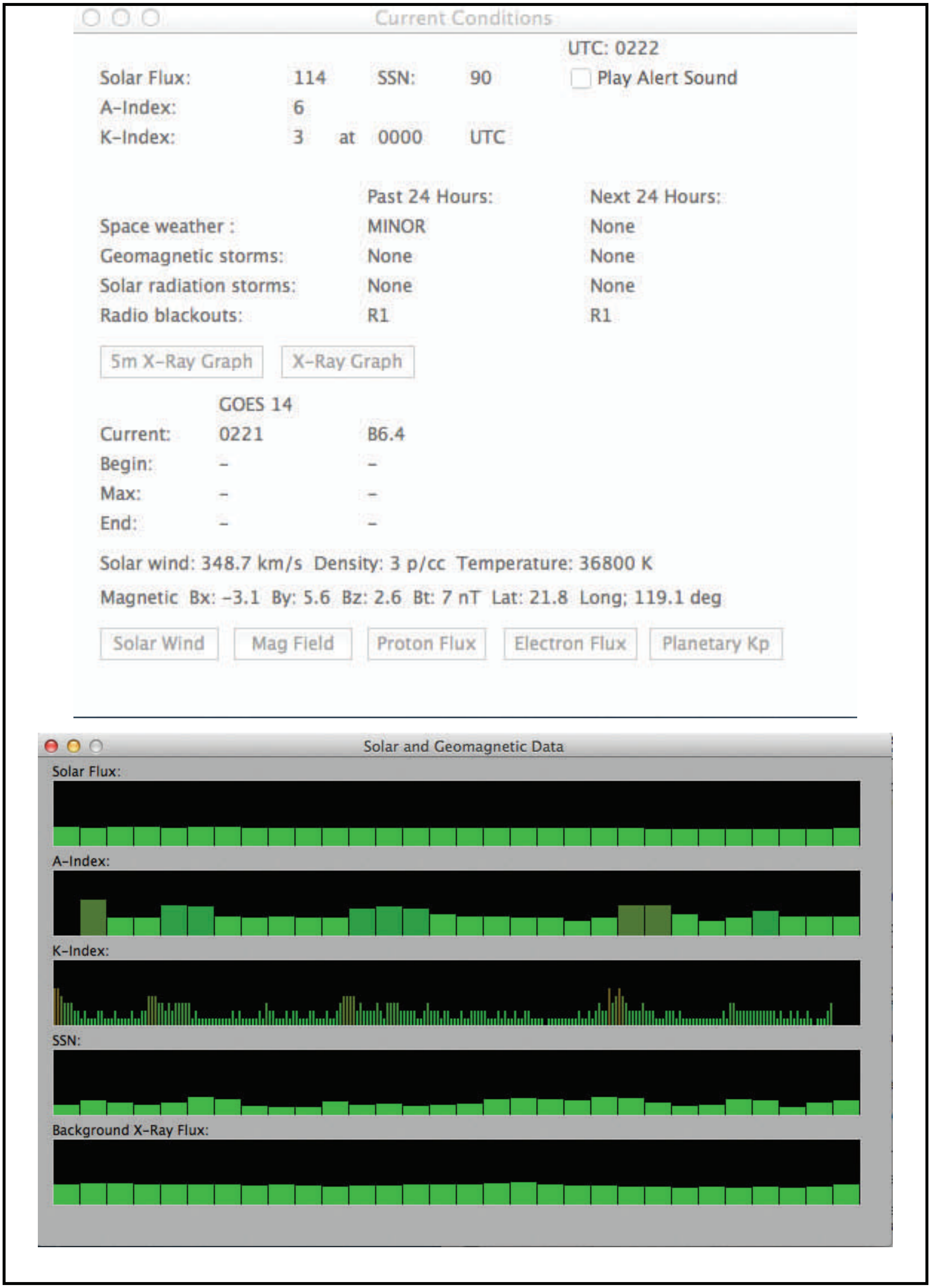
How to read these numbers in a qualitative way? First SSN and its correlate Solar Flux, indicate how good our overall propagation is going to be. High values indicate good strong reflections from the ionosphere, at the proper time of day. Remember that the sun has to shine on the ionosphere for ionization to take place. However, the K-index (and A-index) measures the disturbance caused by various factors resulting in noise (what we perceive as 'minimum S-units' on a band). The higher the numbers the worst the noise levels. The baseline is a quiet day in Boulder, CO. The K-index is measured every three hours (8 times per day) and the number range from 0 to 9. Up to K=3 is pretty quite and above that some degree of 'storm' activity is indicated. The A-index is calculated from the K-index over the previous day. An A-index from 0-7 is quiet; from 8-15 is unsettled while above 15 is active, noisy, propagation conditions.

So, how did the information in the August 12 snapshot inform my JT mode operations. Both August 11 and August 12, suffered 'R1', or minor radio blackouts. This rating, as mentioned above, is the result of X-ray flux measured by the GEOS Satellite. There were no storms but the sun was moderately active. A and K indices were also in the mild range so the bands, although not exceptionally quiet, were not screaming with noise. In fact on Sunday, August 11, I had more than a dozen JT mode QSO's, ranging from Germany to Japan. However, it took a modest boost in power from my usual 5 watts to get good signal reports. August 12 was very similar but, being a weekday, the bands were not as well populated.

The gold standard for determining actual detailed, real-time, ionospheric conditions is the vertical sounder or "ionosonde'. This is nothing more than a transmitter, pointed vertically, that is used to see what reflections come back as the frequency of the transmitted probe varies over a wide range of frequencies. The transmitter emits short radio pulses over a range, typically, of 1 MHz to around 20 MHz, which are received at the same site. There are many of these probes running worldwide and, the information can be integrated and interpreted, which is no mean task. I actually had the pleasure of running an ionosonde, under Air Force contract, during the IGY in 1958, as a professional radio operator, not a ham. The results of these probes, tell us the exact structure of the ionospheric layers, their strength and the minimum frequencies that penetrate them (giving MUF, or maximum usable frequency, a valuable indicator of band 'opening'). Combined with the satellite measurements of radiation disturbances, these provide the basis for excellent models of radio propagation worldwide. Next month I intend to explore some of the specific tools available for predicting point-to-point propagation.

So what does all this have to do with my obsession with JT modes? Well, what I am seeing is a result of all the events on the sun reflected in the various numbers. I see distant stations as a direct correlation of the SSN and Solar Flux, the higher the better for those rare DX stations. The signal-to-noise ratios I send and receive (typically negative numbers, between -1 and -25 dB for these very sensitive modes) are affected by the current K index. My pleasure at working rare DX is mediated by those number, reflecting the Sun's activity, right on the screen in front of me. With each contact I feel that I am reaching out from my K2 transceiver across a mysterious void whose properties we are only now beginning to understand.

Next month I'll concentrate on direct propagation calculation, how space weather is forecast and the uses to which we can put this information.


Current Conditions
UTC: 0222
Solar Flux: 114 SSN: 90
Play Alert Sound
A-Index: 6
K-Index: 3 at 0000 UTC
Past 24 Hours:
Next 24 Hours:
Space weather : MINOR None
Geomagnetic storms: None None
Solar radiation storms: None None
Radio blackouts: R1 R1
5m X-Ray Graph
X-Ray Graph
GOES 14
Current: 0221 B6.4
Begin: – –
Max: – –
End: – –
Solar wind: 348.7 km/s Density: 3 p/cc Temperature: 36800 K
Magnetic Bx: -3.1 By: 5.6 Bz: 2.6 Bt: 7 nT Lat: 21.8 Long; 119.1 deg
Solar Wind
Mag Field
Proton Flux
Electron Flux
Planetary Kp
Solar and Geomagnetic Data
Solar Flux:
A-Index:
K-Index:
SSN:
Background X-Ray Flux:

# SCIENTIFIC TIDBITS

## A Mars Travel Advisory

The idea of sending human beings to Mars has always faced enormous technological challenges. However, it has just become even more challenging. New analyzed data from the Curiosity rover shows that on the trip to the Red Planet, travelers would be bombarded every five or six days with as much radiation as the would get from a full-body CT scan. Despite being tucked under a protective shield during its 253-day trip to Mars last year, the spacecraft's radiation detector was inundated with high-energy protons from the sun, as well as galactic cosmic rays for which there is no effective shield. Mars travelers would see their cancer risk increase by about 3 percent if they made a round trip, and they could also face damaged eyesight and cognitive impairments from the radiation. But proponents of Mars travel are not deterred by these findings. A private mission for a Mars flyby in 2018 is seeking a 50ish married couple, who would have fewer years left to develop radiation-caused cancer, while NASA hopes to devise faster propulsion and better radiation shields before sending humans to Mars in 2030s. The prevailing scientific opinion is the radiation problem can and will be overcome. As one of the scientists associated with this project says, "It's not something that the FDA would recommend that everyone do, but we are talking about a mission to Mars here."

## The Selling of Testosterone

The drug companies tout testosterone therapy as an easy way for men to boost their energy, amp up their sex drive, and build muscle. But a new study suggests that many men are taking testosterone when they don't really need it, risking potentially dangerous side effects. Between 2001 and 2011, testosterone prescriptions for men over 40 tripled, but 25% of them had not first taken a blood test to determine whether they actually had a low testosterone level. Doctors often prescribe the drug for fatigue or a drop in libido, which could be symptoms of other health problems, such as depression, or just the result of normal aging. Testosterone therapy may cause acne and lower men's sperm count, as well as increase their risk of liver damage, heart disease and some cancers. Men in their 40s are the fastest-growing group of testosterone users, and its long-term effects are unclear at this point in time. It is fairly clear, however, that the use of testosterone increases the chances of prostate cancer significantly. The risks entailed in the unnecessary use of testosterone far outweigh any benefit derived from its use therein. Fatigue can usually be overcome by sleep – take a nap!

Jim WB2EDO

Dave Hartman, AC2GL supplied the following article. The full text is too long, 19 pages, to include in this newsletter I can forward it to anyone who wants it..

Some interesting stuff from Cornell University

# Optical detection of radio waves through a nanomechanical transducer

T. Bagci, A. Simonsen, S. Schmid, L. G. Villanueva, E. Zeuthen, J. Appel, J. M. Taylor, A. Sørensen, K. Usami, A. Schliesser, E. S.

(Submitted on 12 Jul 2013 (v1), last revised 2 Aug 2013 (this version, v2))

Low-loss transmission and sensitive recovery of weak radio-frequency (rf) and microwave signals is an ubiquitous technological challenge, crucial in fields as diverse as radio astronomy, medical imaging, navigation and communication, including those of quantum states. Efficient upconversion of rf-signals to an optical carrier would allow transmitting them via optical fibers dramatically reducing losses, and give access to the mature toolbox of quantum optical techniques, routinely enabling quantum-limited signal detection. Research in the field of cavity optomechanics has shown that nanomechanical oscillators can couple very strongly to either microwave or optical fields. An oscillator accommodating both functionalities would bear great promise as the intermediate platform in a radio-to-optical transduction cascade. Here, we demonstrate such an opto-electro-mechanical transducer utilizing a high-Q nanomembrane. A moderate voltage bias (<10V) is sufficient to induce strong coupling between the voltage fluctuations in a rf resonance circuit and the membrane's displacement, which is simultaneously coupled to light reflected off its metallized surface. The circuit acts as an antenna; the voltage signals it induces are detected as an optical phase shift with quantum-limited sensitivity. The half-wave voltage is in the microvolt range, orders of magnitude below that of standard optical modulators. The noise added by the membrane is suppressed by the electro-mechanical cooperativity C~6800 and has a temperature of 40mK, far below 300K where the entire device is operated. This corresponds to a sensitivity limit as low as 5 pV/Hz^1/2, or -210dBm/Hz in a narrow band around 1 MHz. Our work introduces an entirely new approach to all-optical, ultralow-noise detection of classical electronic signals, and sets the stage for coherent upconversion of low-frequency quantum signals to the optical domain.