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 54 NO. 9 September 2021

Regular Meetings

Second & Fourth Mondays
"ZOOM" until we can all
get together again

Upcoming Events

Digital Net Mondays at 9:00 PM
PSK on 80 or10 meters
CW training Net, Thursday at 9:00 PM
Watch for Email announcements.

Meeting Schedule

Regular Meeting: 7:30—9:00 PM
2nd & 4th Monday
of each month

ZOOM until further notice

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 2021

President: W2PTP Paul Wolfmeyer
201-406-6914
Vice President:K2GLS Bob Willis
973-543-2454
Secretary: K2AL: Al Hanzl
908-872-5021
Treasurer: K2YG Dave Barr
908-277-4283
Activities: KC2OSR: Sam Sealy
973-462-2014

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
Mondays 9 PM
28,084 — 28,086
Will be using PSK and RTTY
Net control K2YG

Club Internet Address

Website: http://www.nparc.org
Webmaster KC2WUF David Bean
Reflector: nparc@mailman.qth.net
Contact K2JV, Barry

MOUNTAIN SPARK GAPS

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WB2QOQ Rick Anderson
W2PTP Paul Wolfmeyer
K2UI Jim Stekas

Climatological Data for New Providence for August 2021

The following information is provided by Rick, WB2QOQ, who has been recording daily weather events at his station for the past 40 years.

TEMPERATURE -
Maximum temperature this August, 90 deg. F (August 13)
Last August(2020) maximum was 90 deg. F.
Average Maximum temperature this August, 82.4 deg. F
Minimum temperature this August, 59 deg. F (August 2)
Last August(2020) minimum was 59 deg. F.
Average Minimum temperature this August, 68.5 deg. F
Minimum diurnal temperature range, 3 deg. (73 - 70 deg.)8/22
Maximum diurnal temperature range, 19 deg. (78 - 59 deg.)8/2

Average temperature this August, 75.5 deg. F
Average temperature last August, 74.8 deg. F

PRECIPITATION -
Total precipitation this August- 6.46" rain.
Total precipitation last August- 4.62" rain.

Maximum one day precip. event this August-

August 22, 2.47" rain.
Measurable rain fell on 11 days this August,15 days last August.

YTD Precipitation - 36.15"

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Rick Anderson
9/29/2021
243 Mountain Ave.
New Providence, NJ
(908)464-8911
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

President's Column September 2021

We had our monthly business meeting on September 13. The Dissolution bylaw was introduced and seconded and discussed. It will be voted on at our October business meeting, October 11. For reference that proposed bylaw is:

Section 9

Dissolution: On dissolution of this organization, remaining funds would be distributed to a 501 (c)(3) Amateur Radio organization or organizations as determined by the Executive Committee.

The purpose of the bylaw is to have a simple bylaw to handle any remaining funds so that the state doesn't make a distribution for us if a time for dissolution of the club ever comes. The state's distribution might not be consistent with our mission as an amateur radio club.

The Executive Committee's budget for FY 2022 (begun August 2021) was also presented with comparison's to non-normal fiscal years of 2020 and 2021 and to our last "normal" FY of 2019. Our 2022 FY budget is a "deficit budget" with plans for both an auction and Field Day. Due to the current financial health (good) of the club and continued uncertainty caused by the pandemic, there will be no increase in dues at this time.

We also discussed plans for a holiday luncheon on December 4 at Chimney Rock. We plan greater spacing for attendees than in the past, probably minimum three feet. Attendees at the ZOOM meeting favored a luncheon. Individuals will need to make a personal choice of risk versus seeing each other. At our second meeting, we shared that the cost per meal would likely increase to the $36 range from the previous $30 range, as prices of many items have increased and restaurants were particularly hard hit by the pandemic. A poll indicated the group still wanted to proceed.

Relative to meeting space, New Providence has not yet made space available. This could also impact potential auction plans.

Our second meeting of the month featured our Hudson Division Director Ria N2RJ who updated us on current FCC and ARRL issues affecting the hobby. I was particularly interested to hear about the ARRL Volunteer Monitoring program overseen by Riley Hollingsworth K4ZDH and how it differs from the OOs. We are pleased Ria is headed to a second term as Hudson Division Director!

Tim Farrell KD2EKN will be running the Nominating Committee again—yes, it's that time! You will need a new President and Vice-President for sure—so if you are interested, communicate that to Tim. And respond to him if he calls on you!! If you have questions about the officer roles, feel free to call me too.

Dates to mark down: October 11 (business meeting), October 25 (program meeting), November 8 (annual meeting with elections), November 22 (program meeting), December 4 (holiday luncheon).

Don't forget the news!! 73, Wolf W2PTP, 201-404-6914, W2ptp@arrl.net

SWR … Yet Again

Jim Stekas - K2UI

I am unable to identify any technical topic that has received more attention in the ham radio press than SWR. Few things are more comforting to a typical ham than seeing the cross-needle SWR meter reading close to 1.0. Even though the transceiver manual says anything less the 1.5 is good enough, an SWR of 1.4 will cause more unease than it merits.

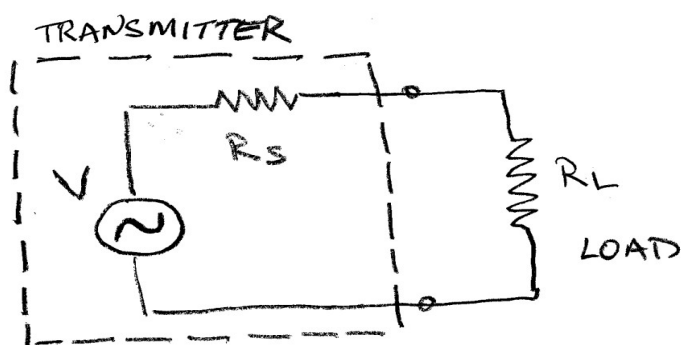
Why do transceiver manufacturers specify a maximum operating SWR of 1.5? Surely it must be all that "reflected power" coming back from the antenna threatening to roast the RF power transistors. I've actually read on-line how the reflected power can add to the forward power resulting in a 100W rig creating 150W of transistor destroying power. Do we really need to fear a tsunami of reflected power bearing down on our rig? (Stay tuned …)

The term SWR (or more properly VSWR) refers to the ratio of maximum to minimum voltage standing wave peaks on a transmission line. They are caused by interference between RF waves headed to the antenna (forward) and reflections coming back toward the transmitter (reverse). Before the advent of SWR meters, measurements were commonly made by inserting voltage probes into a transmission line to measure the standing wave voltages directly.

A typical dipole has a resonant impedance of about 75Ω. If we feed it with 75Ω RG-6 coax, the SWR meter in the shack will measure an SWR of 1.5. But there ***will be no*** standing waves in the coax because it is perfectly matched to the antenna and there is no reflected power. On the other hand, if we feed a 50Ω load with ½ wavelength of 75Ω RG-6 the SWR at the rig will read 1.0 even though there ***will be*** standing waves in the coax because of the mismatch with the load.

So what does it mean if we can have standing waves when the SWR=1.0 and no standing waves when the SWR=1.5? Answer – what we are really concerned about is the "quality of impedance match" but we use the traditional terminology of SWR. Actual standing waves in a transmission line are rarely of practical concern.

Now lets take a look at the dreaded phenomenon of "reflected power" by using a very simple model of a transmitter driving a load. The figure to the right models the transceiver as a voltage source, V, with a source impedance R_S, driving a load R_L.



The total power delivered by V is $P_{TOT}=\frac{1}{2(R_L+R_S)}\frac{V^2}{2}$. When $R_L=R_S$ the power delivered to the load is maximum and $P_L=P_S=P_{MAX}=\frac{V^2}{8R_S}$. For arbitrary values of R_L we have a power delivered to the load of $P_L=\frac{R_L}{(R_L+R_S)^2}\frac{V^2}{2}$.

After a bit of algebra we express the power to the load, P_L, in terms of P_{MAX}:

$$P_L = P_{MAX} - \left(\frac{R_L - R_S}{R_L + R_S}\right)^2 P_{MAX}$$

The expression in parentheses will be recognized as the reflection coefficient, $\Gamma = \frac{R_L - R_S}{R_L + R_S}$, that arises in transmission line theory. It is the parameter that we plot on the Smith chart and will take complex values when the load has reactive components. Carrying the transmission line analog further we identify the "forward" power, $P_{FWD} = P_{MAX}$, and the "reflected" power $P_{REF} = |\Gamma|^2 P_{FWD}$. This is something of an engineering accounting trick where we define P_{FWD} to be independent of load and subtract off a P_{REF} to get the right P_L. Kind of like having an Enron-style lemonade stand that makes $10 and claims $1M in revenue and $999,990 in expenses.

	$R_L = R_S$	$R_L = \frac{R_S}{10}$	$R_L = 10 R_S$
V	100	100	100
R_S	50	50	50
R_L	***50***	***5***	***500***
SWR	1	10	10
Γ	0	-0.82	0.82
P_{FWD}	25	25	25
P_{REF}	0	16.7	16.7
P_S	25	83	0.83
P_L	25	8.3	8.3
P_{TOT}	***50***	***91***	***9.1***
I	***1***	***1.8***	***0.18***

The table at left shows the two possible cases of SWR=10 for a transmitter with a 50Ω output impedance. When load is 5Ω the total power delivered by the voltage source, P_{TOT}, jumps from 50 to 91 W, even though there is only 16.7 W of reflected power, P_{REF}. When the load is 500Ω the reflected power is still 16.7 W which is more than the 9.1 W of total power, P_{TOT} put out by the voltage source!!

The danger to the RF power transistors isn't from reflected power, it is from ***high current*** when the load resistance is too low.

So why do manufacturers spec an SWR < 1.5? The SWR limit is set to prevent damaging high current by ensuring $R_L > R_S/1.5$. Modern rigs have a built in SWR bridge to sense high SWR conditions and "fold over" the power. The model shows that high SWR due to high resistance loads ($R_L > 1.5 R_S$) reduces both power and current and is not damaging, but the "fold over" mechanism gets triggered anyway.

Fifty years ago, vacuum tubes were the only way to get 75W output. Every transmitter had built in manual antenna tuner. Hams "loaded up" their transmitters without benefit of SWR bridge by monitoring a small meter showing plate current. "Tune" and "Load" knobs were tweaked alternately to gradually increase plate current until it reached the maximum rated value. Few hams knew the SWR of their antenna, nor did they care so long it would "load up" and not draw excessive current. Hearing a snap, crackle and pop from inside the transmitter was often the first indication of an antenna issue.

For SWR=1, $R_L = R_S$ and $P_{TOT} = 2P_{MAX}$. When SWR=10, $|\Gamma| = \frac{9}{11}$, and power to the load is $P_L = 0.33\,P_{max}$. There are two possibilities for R_L that give SWR=10:

- $R_L = 10\,R_S$ in which case $P_{TOT} = \frac{4}{11}P_{MAX} = 0.36\,P_{MAX}$
- $R_L = 0.1\,R_S$ for which $P_{TOT} = \frac{4}{1.1}P_{Max} = 3.6\,P_{MAX}$

For both cases of SWR=10 the total power delivered by the transceiver is less than for the SWR=1 case even though they reflect 80% of the forward power back to the rig. In fact, for any SWR>1 the transmitter will deliver less total power than for SWR=1.