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 53 NO. 2 February 2020

Regular Meetings

Monday 7:30 3/9 & 3/23
N P Borough Hall
Third Floor Conference Room

Upcoming Events

Field Day

Meeting Schedule

Regular Meeting: 7:30—9:00 PM
2nd & 4th Monday
of each month at the
New Providence Hall
Elkwood Ave. NP
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 2018

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
973-635-8966

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
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 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
W2PTP Paul Wolfmeyer
K2UI Jim Stekas

Climatological Data for New Providence for January 2020

The following information is provided by Rick, WB2QOQ, who has been recording daily weather events at his station for the past 38 years.

TEMPERATURE -
Maximum temperature this January, 65 deg. F (January 11)
Last January(2019) maximum was 57 deg. F.
Average Maximum temperature this January, 42.2 deg. F
Minimum temperature this January, 17 deg. F (January 21)
Last January(2018) minimum was +1 deg. F.
Average Minimum temperature this January, 28.9 deg. F
Minimum diurnal temperature range, 6 deg. (46-40 deg.)1/3
Maximum diurnal temperature range, 22 deg. (49-27 deg.)1/10;(64-42 deg.)1/12

Average temperature this January, 35.6 deg. F
Average temperature last January, 30.5 deg. F

PRECIPITATION -
Total precipitation this January - 2.37" rain/snow melt; 2.2" snow.
Total precipitation last January - 3.93" rain; 2.1" snow.

Maximum one day precip. event this January -

January 25, 1.34" rain; January 18, 1.7" snow.
Measurable rain fell on 7 days this January, 6 days last January.
Measurable snow fell on 2 day this January.

YTD Precipitation - 2.37"

==========

Rick Anderson
2/12/2020
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 February 2020

It has been a busy start to the year. After our second meeting of January, I was "down for the count" with a virus so I didn't get a column done in January. Sorry.

On January 4. Kevin, N2TO, managed a great Kids Day at DeCorso. Kevin and I kid about it taking seven of us to get the HF dipole up—but it worked although contacts were low. VHF was the higher activity. Thanks Kevin and all participants.
Our second meeting of January had a great speaker-- Ron Bosco WB2GAI--talking about operating from Crete SP9. The talk was interesting and varied--about his personal DX-peditions to Crete. Very nice.

And then the problems with locations came!
We were advised that our requests for use of the DeCorso Center for our meetings in 2020 were not to be approved. We tried to pursue what was going on—bottom line: we don't really know, but it's not US. We will continue to pursue that location. But New Providence has given us space for our meetings in Borough Hall. Most meetings will be in the third floor conference room. Our first February meeting seemed to work OK. Our second February meeting was in the Lincoln Room and that worked ok, too, but it is smaller**. As of now future meetings are scheduled in the third floor conference room at New Providence Borough Hall**.

And the New Providence High School told us they were rescinding our approved use of the cafeteria for our February auction! This was due to a large fundraiser event that was to take place on the same date. The high school space administrator was very helpful in giving us some alternatives—some with a changed date, others with a changed location. We held an "emergency" executive meeting and decided to follow a "same date, same time" philosophy to minimize the impact since publicity was already out and, hopefully, "distance travelers" would only have to go to a different place—Salt Brook School. We worked with the Salt Brook administrator and custodial staff—who we found very responsive to our needs. And Al K2AL"republicized" everything—thanks much.

So the auction took place on February 22 but at Salt Brook School! The attendance was terrific—over one hundred ten registered. The weather was great. Parking was good. And the custodial staff was great, doing lots of our setup and teardown for us. Over 100 "lots" were auctioned—typical for us is 60—and the equipment mix was good—almost all true ham-related items. Joe K2JAO did an outstanding job--three hours straight!! Thanks, Joe! The handlers transported some really heavy items—ugh!! And the treasurer was "super busy" the whole time!!

The food was good—sandwiches essentially sold out. We are grateful for Marilyn's donation of a number of non-sandwich items.
So we are "declaring" the auction very successful! Finances look good at this point. Thanks to everyone for pitching in—which is what is so pleasing about working with NPARC members. They get things done!

Sam has Gordon W2TTT lined up for our program on March 9th—be there!! 73 for now,
Wolf W2PTP 201-404-6914 or W2PTP@arrl.net

The Radiation Paradox

Jim Stekas - K2UI

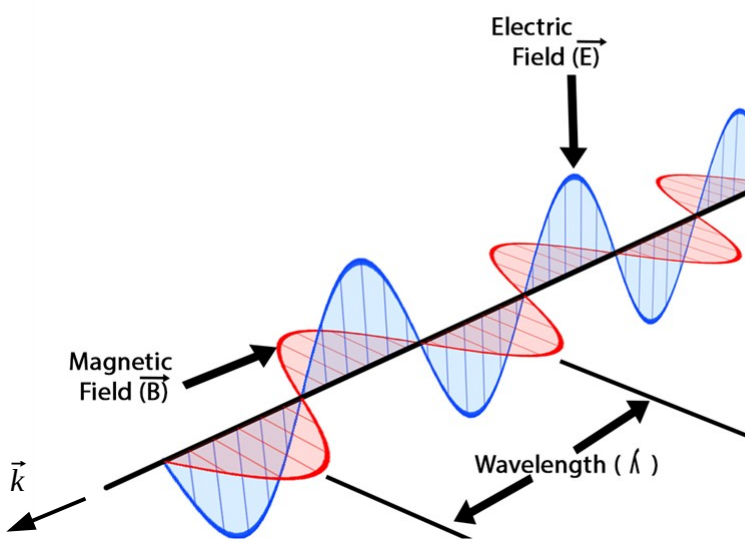
The most important component of any ham station is the antenna. Start with a 4-element, 20m Yagi on a 60ft tower and you'll be successful no matter what rig you've got in the shack. But if your antenna is a short attic mounted affair, a shack filled with $20k of Elecraft and Flex gear won't make up for a poor antenna.

No antenna is better understood than a half-wave dipole. Over the course of their career almost all hams will build and hang a half-wave dipole in the yard, and make lots of contacts with it. The nerdier ones might model it on the PC using some flavor of NEC to determine the height and slope that give the optimum performance. If you live on a thousand acre farm in Iowa, the numerical models will be pretty good at predicting the field strength (Volts/meter) of your signal far off in the distance. Surely, antenna theory/modeling has been refined to the point that it can answer any question we have about our backyard dipole. Right?

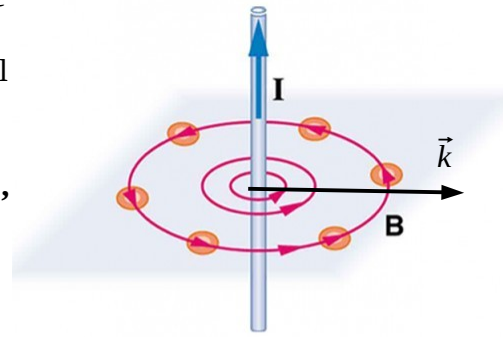
For simple antennas like the half-wave dipole NEC has been validated against experimental measurements to fractions of a dB. But the same theory (Maxwell's equations) that does such a great job at predicting the broadside radiation pattern of a dipole antenna says that the wire cannot radiate any energy in the broadside direction. Welcome to the “Radiation Paradox” that has been kicking around for 100 years.

Maxwell's equations are the theory that describes electricity and magnetism (E&M). The integrate a collection of “independent” laws discovered by Faraday, Ampere, Coulomb, and others into a single unified set of equations that described all the previously known phenomena. But Maxwell's equation also predicted something completely unexpected: the existence of electromagnetic waves that propagate at the same speed as light! Light was an electromagnetic wave.

Electromagnetic waves are composed of oscillating electric ($\vec{E}$) and magnetic ($\vec{B}$) fields that are orthogonal to each other and also to the direction of propagation ($\vec{k}$). The vectors $\vec{k}$, $\vec{E}$, $\vec{B}$ form a right handed set just like the Euclidian vectors $\vec{x}$, $\vec{y}$, $\vec{z}$ we learned about in high school geometry.



By Ampere's law, the current traveling along the antenna wire induces a magnetic field, $\vec{B}$, that encircles the wire (figure right). Broadside waves radiating from the wire would travel in the direction indicated by $\vec{k}$, which is perpendicular to the wire, and to $\vec{B}$. For broadside radiation to occur, their must be a component of $\vec{E}$ that is perpendicular to both $\vec{k}$ and $\vec{B}$, namely along the wire.



But the wire is a conductor, and Maxwell's equations do not allow an electric field to exist inside a conductor[1]. The $\vec{E}$ field at the surface of the conductor ***must be*** perpendicular to the surface, namely pointing broadside. But since radiation can only occur in a direction perpendicular to $\vec{E}$, this would mean a dipole could only radiate toward end-fire with a null toward broadside. This is the "radiation paradox", proof that a dipole can't possibly radiate in the direction we know it does.

Well, the good news is that paradoxically or not the dipole does work, and it radiates maximum power broadside. And the numerical simulation programs predict as much. So, what's the way out of the radiation paradox? Here is my take ...

To solve Maxwell's equations it is often useful to define a vector potential, $\vec{A}$, from which the "real" fields $\vec{E}$ and $\vec{B}$ can be extracted. With the introduction of Einstein's special relativity Maxwell's equations were recast in terms of 4-dimensional space-time vectors. There is a natural way[2] to add a time dimension to $\vec{A}$ to create the space-time vector A^{μ}, but there is no analogous way to make space-time vectors from $\vec{E}$ and $\vec{B}$ and they are replaced by A^{μ} in the relativistic theory.

In an antenna the fields are literally changing at the speed of light, so the antenna problem requires a relativistic treatment. I believe the radiation paradox arises because we have taken rules that apply to $\vec{E}$ and $\vec{B}$ in the non-relativistic stationary environment of the lab and tried to apply them to a relativistic problem. Numerical antenna models solve for $\vec{A}$ in a relativistically correct way and so they never bump into the paradox.

A^{μ} has carried over from special relativity into quantum mechanics as the wave function of a particle of light, the photon. So A^{μ}, which started as a mathematical convenience to solving for $\vec{E}$ and $\vec{B}$ has turned out to be the the fundamental field of E&M.

References

1. K.T. McDonald, *What is the Role of the Arms of a Linear Broadcast Antenna?* http://www.hep.princeton.edu/~mcdonald/examples/arms.pdf
2. S.A. Schelkunoff, *Theory of Antennas of Arbitrary Shape and Size* (1941)

1 This true of perfect conductors, but we expect a dipole constructed with a perfect conductor would be at least as good one using copper.

2 This can be done by applying a "gauge" constraint which allows the time component A^0 to be calculated from $\vec{A}$.