NVARC
Nashoba Valley
Amateur Radio Club

SIGNAL

A club since 1992
Since 1993
Since 1996

de N1NC August 2021 Volume 30 Number 8

In this Issue

NVARC Monthly Meetings

NVARC general meetings are scheduled for the third Thursday of the month at 2430 UTC (7:30pm, Eastern Time).

Note that NVARC does not meet formally in July or August, due to vacations, and other Summertime activities, however, informal Zoom sessions are being held.

Non-members who are interested in attending may send an email to meetings@n1nc.org requesting the teleconference details.

NVARC thanks **Medtronic, Inc** for providing the teleconferencing services under their employee volunteer support program for non-profit organizations.

The President's Corner

***de* Bruce, K1BG**

August is upon us, and we are in what I call the "summer doldrums" of Amateur Radio.

People in general and hams in particular enjoy being outdoors during the summer. Amateur radio is traditionally enjoyed in one's radio shack, and so it's logical that with longer days and more outside activity, less time is spent actually on-the-air. The activity seen on the air generally reflects this.

Having said that, I'd like members reading this to share their summer activities with our membership in the Signal. My story will appear elsewhere in this issue, but I'd like to see the September pages full of other members experiences. If you did something interesting, please share it with the membership!

As you know, NVARC does not have formal meetings in the summer, however, we will have an informal Zoom session on the third Thursday of this month. Please join us if you can. See meetings@n1nc.org for info on how to join the Zoom session/

Additionally, we are back to our weekly in-person breakfasts at Tiny's Restaurant in Ayer (8AM, every Saturday). Here's a shot of last Saturday's group:

Everyone is welcome, so feel free to bring friends and family.

Jessica, WU3C, has kindly and generously offered to host this year's summer picnic on Saturday, August 30th. More details can be found elsewhere in this issue of Signal.

The ARRL New England Convention, re-branded "HamXpostion", will take place on September 10, 11, and 12 at a new location in Marlborough, MA. NVARC is planning on having a table in the exhibition area, which will be a place for members to congregate AND for the club to promote who we are and what we do.

I'd like club members to spend a little time helping out at the booth to make sure that someone from the club is there during all the hours the convention hall is open.

John, KK1X, has kindly stepped forward to help coordinate this. More info on HamXposition can be found at https://hamxposition.org/

While speaking about HamXpostion, I'm pleased to announce that NVARC's Vice President, Phil, W1PJE, will be the guest speaker at the Grand Banquet on Saturday night. This is quite an honor, which is well deserved. I'm sure many club members will be in attendance. For more information on Phil and the Banquet, go to https://hamxposition.org/grand-banquet.

As of today, and assuming that there are no new Covid lockdowns, it looks like NVARC will resume in person meetings in September at the Pepperell Community Center! Look for more details on this in the September issue of the Signal.

Finally, for all American Radio Relay League (ARRL) members out there, elections for elected positions will be taking place this Fall. One local position that looks like it will be heavily contested is that of New England Division Director.

Three candidates have announced their intention to run as of today:

- Incumbent Fred Hopengarten, K1VR,
- Past Division Director Tom Frenaye, K1KI, and
- Nashua Area Radio Society president Fred Kemmerer, AB1OC.

It's still early, and perhaps more people will decide to run for this position. It will be an interesting Fall to say the least! Updates will be coming in the September edition of the Signal. If you are an ARRL member, please take the time to look at the candidates and decide on which one is best for you.

-*de* Bruce, K1BG

2012 NVARC Picnic

Once again, Jessica, WU3C, has offered to host a summer picnic at her place: 86 Squannacook Road, Shirley, MA. Jessica writes:

> "1400 until whenever.
>
> BYOE – "E" as in "everything", haha. Bring something to grill, bring a dish to share, bring some booze, whatever you like!
>
> I will get corn and salt potatoes and some other odds and ends.
>
> We will have a propane and a charcoal grill hot and ready!
>
> BUT **Please** RSVP to me at:
> jessica@kedzig.com
> by 21 August
>
> Everyone and their friends are invited. C U There!"

New England Grape: NVARC Studies Ionospheric Variations… Again

***de* Phil, W1PJE**

In the past, NVARC members have used amateur radio to participate in more than one scientific investigation of the ionosphere through the HamSCI collective (https://hamsci.org).

For example, a 2018 Field Day experiment, still under analysis, had people like Bob W1XP transmitting CW signals to HF receivers on the overflying CASSIOPE/ePOP low Earth orbiting satellite[1].

To study trans ionospheric propagation[2] NVARC also participated in a crowdsourced Solar Eclipse QSO Party, organized around the August 2017 total solar eclipse that tracked across the continental US from Washington State to South Carolina[3], and results were written up[4].

As I am on the scientific steering board of the HamSCI collective, I continue to monitor activity

[1] Previously operated by Canada, now by the European Space Agency as SWARM-E: https://epop.phys.ucalgary.ca

[2] https://hamsci.org/article/cassiope-spacecraft-monitors-2018-arrl-field-day

[3] http://www.n1nc.org/Events/2017/HamSCI/NVARC_and_the_Eclipse.pdf

[4] https://hamsci.org/seqp

and upcoming projects with an eye towards NVARC participation.

The focus of much technical effort right now in HamSCI is an ongoing project to construct and deploy a Personal Space Weather Station[5] under NSF and NASA support.

The Personal Space Weather Station (PSWS) project ultimately aims to create a small, multi-instrument system that can make distributed ground-based measurements of the space environment in ways complementary to professional observing networks.

The observations from this project will not only be useful to the (amateur) owner of an individual system, but also will be aggregated into a central database for space science and space weather research purposes. Initial work is focusing on the development of a scientific-grade HF radio receiver, as well as the necessary software and network infrastructure.

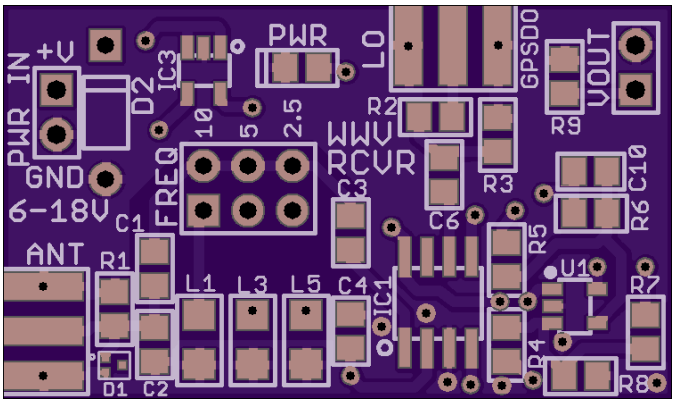
Development of the core PSWS system, known as the TangerineSDR[6], is extensive and is being led by the TAPR collective, arguably the most active and comprehensive hardware and software development group in amateur radio, with luminaries such as Scotty Cowling WA2DFI, Tom McDermott N5EG, and John Ackermann N8UR.

Meanwhile, pilot PSWS projects are now going on parallel to the main TangerineSDR effort - including a simple proof of concept Doppler time standards receiver known as the Grape version 1 or Grape V1[7].

This project, led by Case Western Reserve University, is intended as an early adopter/'bleeding edge' version of a standalone, continuous monitoring system that targets monitoring of frequency shifts in AM carriers from national time standard stations using a GPS disciplined oscillator as a stable reference.

For those of us in W1 land, this means targeting the well known WWV time stations in Fort Collins, CO on 2.5 / 5 / 10 / 15 / 20 / 25 MHz operated by the US National Institute of Standards and Technology (NIST)[8], as well as the CHU stations on 3.330 / 7.850 / 14.670 MHz operated by the Canadian National Research Council (NRC) in Ottawa, Ontario[9].

You perhaps heard one of these powerful stations as your first shortwave listening experience; I certainly did, using a random wire and a Hallicrafters SX-110.



Unpopulated top view of PC board for Grape V1 receiver (design: John Gibbons N8OBJ, Case Western Reserve University; see https://hamsci.org/grape1)

Recently, I issued a call to assemble a small and manageable group of NVARC participants with the right set of prerequisites, including hardware and software build experience.

The goal: construct Grape V1 receivers and deploy them, adding data to the emerging Grape collective along with practical lessons learned.

This call to action ended up with several participants in what we are now calling the "New England Grape" group.

They include NVARC members George, KB1HFT, Bill, AB1XB, and Vlad, W1MTI, with Jessica, WU3C, offering soldering capability if needed.

Added to this group is the very active Willie Smith, N1JBJ, of the Billerica Amateur Radio Society, who found out about the opportunity through a forwarded email.

Finally, I am fielding questions and acting as an organizer.

The group is making great progress despite not having ever met in person!

Already, email discussions have covered a wide range of topics including:

[5] https://hamsci.org/basic-project/personal-space-weather-station

[6] https://tangerinesdr.com

[7] https://hamsci.org/grape1

[8] https://www.nist.gov/time-distribution/radio-station-wwv

[9] https://nrc.canada.ca/en/certifications-evaluations-standards/canadas-official-time/nrc-shortwave-station-broadcasts-chu

- Are SMD parts really possible for humans to deal with, including small medium-pitch components (0805, 1206, SOT-23 packages) and a really, really small fine pitch (0.80mm) SOT-723 device? [Answer: yes.].

- How bad is the global parts shortage and what must be substituted? [Answer: substitutes were made and were successful.].

- What kind of dedicated antennas are useful for this application, and how do you deal with a RX-only antenna in the near field of a normal transmitting dipole? [Answer: N1JBJ experimentation is going on with a passive small loop.]

Although the group is closed now to keep it small and flexible, information on New England Grape build and operating experiences will be featured in an upcoming HamXpostion keynote talk given in mid-September at the ARRL New England Division convention in Marlboro.

Beyond that, stay tuned for future developments, summaries of activity, and ways to participate in future efforts, both here in the Signal and at NVARC club meetings.

Sidebar: What is the Grape measuring anyhow, and what does it mean?

As amateurs know from long experience, HF skywave signals do not travel line of sight but are heavily refracted due to properties of the ionospheric plasma.

When a signal leaves its originating station, it transits through the ionospheric medium along a given path that is defined by (magnetoionic) propagation equations studied for almost a century now[10].

In particular, these can predict the resulting wave trajectory here on Earth, where the ionosphere is a weakly ionized and heavily magnetized plasma. On other planets such as Mars with a weak and highly variable magnetic field, it would be a much trickier task. But subjects like Mars ionospheres, and strange associated items like the Elser-Mathes Cup[11], are a tale for another time.

Coming back to Earth's case, as the time signal's propagation path changes as a function of time, the apparent frequency of the AM carrier, defined fundamentally as d(Path)/dt, will shift. This offset is what the Grape measures.

The challenge for scientific interpretation is that more than one factor can cause that path length to change:

1. Bulk motion of the ionosphere in some direction (vertical and/or horizontal), changing the F region peak electron density height and therefore the path the signal takes. This is understood through a simple case: pretend that the signal goes straight to a point in the F region ionosphere, hard reflects there, and then comes back down. (That's the "Martyn equivalent" path.) If I move the reflection point up, it lengthens the path.

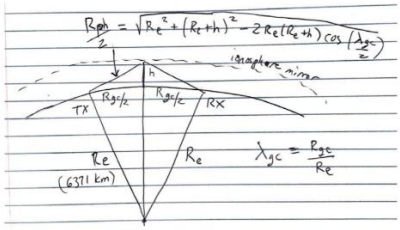
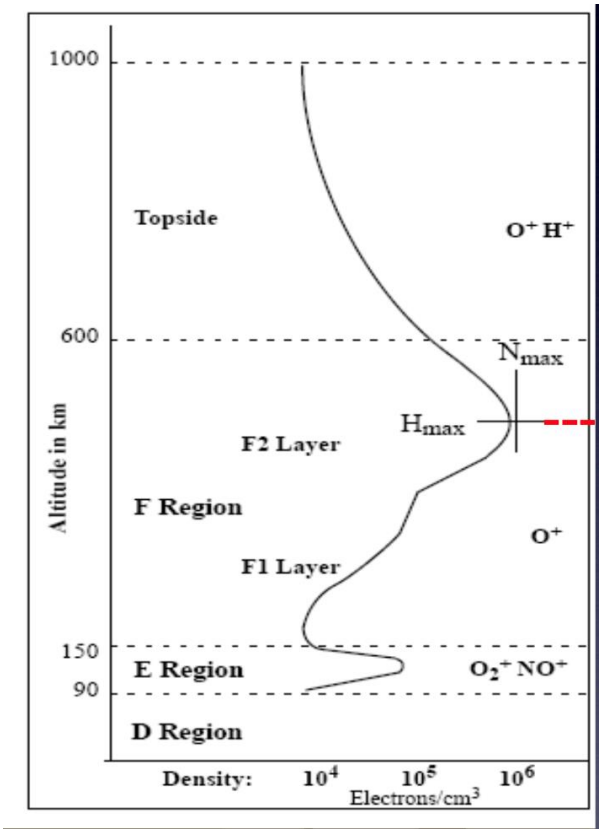


Illustration of Martyn equivalent path. Rph = total path length.

[10] For details, see Budden, K. G. (1988), The propagation of radio waves: The theory of radio waves of low power in the ionosphere and magnetosphere, Cambridge University Press. Also: Ratcliffe, J. A. (1959), The magneto-ionic theory and its applications to the ionosphere, Cambridge University Press.

[11] The Cup's story is told most recently in: http://www.arrl.org/files/file/QST/This%20Month%20in%20QST/June2016/Schoenfeld.pdf



Example daytime ionosphere electron density profile. Shape changes and/or overall increases in electron density can cause effective propagation path length changes, producing apparent frequency shifts.

2. Change in the shape of the ionosphere's vertical profile (say, its vertical altitude extent) as the signal transits a particular region, so that the refraction maximum altitude is now different and the path again changes. This could for example occur in the hours after sunset, when recombination is eating away the electron density at the bottom side of the profile and changing its shape.

3. Increase in the electron density at a given altitude itself. This once again changes the refractive equations that govern where the signal goes, and hence changes the path. Such a change might occur for example during geomagnetically disturbed conditions, when neutral composition changes increase the effective ionization production rate (from solar extreme ultraviolet photons) over non-storm times.

Tangling apart which of (1)-(3) (or all of them) is causing the measured relative frequency shift is the observation challenge.

However, we can apply other analysis tools in conjunction with Grape measurements to help - e.g. ray tracing, ionospheric modeling, and other instruments like ionosondes - and in the process extract ionospheric information.

Putting all information together in a “fusion analysis mode” gets you much more than any one individual technique.

Ultimately, science targets for this measurement include geomagnetic storm changes in the ionosphere and natural ionospheric variability / wave activity caused by traveling ionospheric disturbances (TIDs). These features make electron density vary by 1-10% on the geomagnetically quietest of days, with much larger values during big storms. Understanding this variability, and what drives it, is a key goal of the research community and those involved in understanding space weather.

-*de* Phil, W1PJE

What I did on my Summer Vacation

***de* Bruce, K1BG**

I have a number of ham radio related activities that take place during the summer months. Summer activities seem to be book ended between Field Day at the end of June and HamXpostion at the beginning of September. My ham activities all took place in the month of July.

Early July regularly has me attending **Lobstercon** in Brunswick, ME, the weekend after the 4th of July (some campers do arrive early, throughout the week leading up to the event).

Lobstercon is a gathering of New England QRP afficionados who enjoy camping, operating, socializing, and eating during the weekend.

It usually draws perhaps 100 attendees (with a few NVARC members typically there). Last year, only 5 socially distant people attended, and this year the number was closer to 50.

Many attendees set up QRP (and some 100 watt) stations and either rag chew or participate in the IARU World Championships that is held over that weekend.

I usually arrive on Thursday or Friday, but due to the tropical storm that came up the coast, I didn't arrive until very early Saturday morning.

The highlight of the weekend are the Saturday activities organized by Rex, W1QRP, of QRPme fame: http://www.grp.me.

Besides a mini flea market in the afternoon and a raffle (with a lot of free giveaways) in the evening, 50 bucks buys you a continental breakfast, all you can eat BBQ at lunch, and a spectacular lobster clambake at dinnertime (if you aren't into seafood, there are other alternatives).

Plus, lots of good socializing and operating, if you want to do that.

Thomas Point campgrounds generously provides a deep discount to the attendees. Pictures of the event can be found here: https://app.box.com/s/vna560yggzjoa615k67ojg7xo41snc2d/folder/141180559751

Sometime every summer after Lobstercon, XYL Jayne and I camp on the Cape for a week or so. This summer, we went to Truro, MA, in mid-July. We have a pop-up camper, and we stayed at a campground that is perhaps a half mile from the Atlantic Ocean.

My "portable" station consists of an Icom IC-746pro, tuned down to 30 watts to save battery power, and a dipole antenna thrown up over the outer cape's famous scrub pines. Perhaps 30 ft high.

All logging, keying, etc, are done by hand. No computers are allowed!

Jayne likes to read, and I like to CW rag chew (quietly, with headphones), so it works out well.

I probably averaged 3 or 4 contacts a day. My best DX was old friend Barry, VK2BJ who lives in a suburb or Sidney, Australia. BTW, he gave me a 549, and we talked for maybe 40 minutes. I was pretty happy with that.

My most interesting contact was with Bruce, WB8FMA, in Wheeling, WV.

To make a long story short, I last worked Bruce early in **1970** when he was a Novice and I had just moved up to general class! Ain't this hobby great?

We spent some time conversing and catching up before pulling the plug.

My "worst" DX was Bill, W6KBJ, who was also vacationing in Truro. Needless to say, both signals were 599!

I'm back home now, and not planning another trip this summer. I'm back to the basement shack, QRO, computer logging, and all the comforts of home. But I really enjoy my summer operating activities. Do you have any stories to tell? Please share them here.

de Bruce, K1BG

CW Help is coming!

***de* Bruce, K1BG**

I was approached by Tom Walsh, K1TW, to help with a program that he is putting together for members of the Billerica Amateur Radio Society (BARS), which is designed to help members learn CW or improve their CW abilities.

Tom asked if I would be interested in helping, and I said "YES", as long as NVARC members could

participate. Several members of BARS have stepped forward to help, and I will be asking NVARC members to do the same.

There are many specifics to be worked out, but I envision three types of individuals:

1. Those that have no knowledge of CW but want to learn,
2. Those who want to improve their CW proficiency, and
3. Those who want to mentor others.

BTW, since I am constantly trying to improve my CW proficiency, I consider myself in both of the last two categories!

A zoom meeting will be announced in the coming weeks to kick this off. Feel free to email either me (bruce.blain@charter.net) or Tom Walsh, K1TW (K1TW@arrl.org), if you want more information or want to participate.

You will be forwarded the Zoom invite as soon as this gets scheduled.

No matter which category you are in, I'm looking forward to working with you on your CW skills or with helping others with theirs.

de Bruce, K1BG

From the Shack
***de* George, KB1HFT**

As Phil, W1PJE, mentioned earlier in this issue of Signal, I have volunteered to take part in the HAMSci Grape1 project.

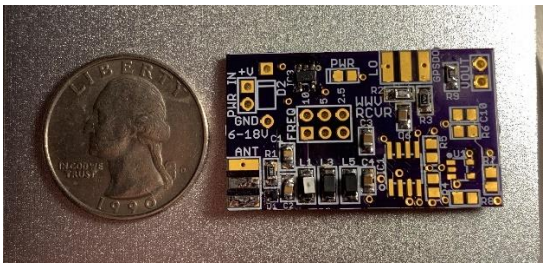
I had initial misgivings, since I had never REALLY done any SMD soldering, nor had never played with a RaspberryPi & Linux.

But I then said to myself, self, I said, let's learn something new! I reasoned that since I have been involved with computers since the late 1960's, (Bendix G20, IBM 1401 & 360, and Digital PDP 8 & 11) and microprocessors since the early 1970's (Intel 4004, 8008, and 8080), and I have recently done several Arduino projects, I figured that I could master The RasPi (which is an awesome piece of technology).

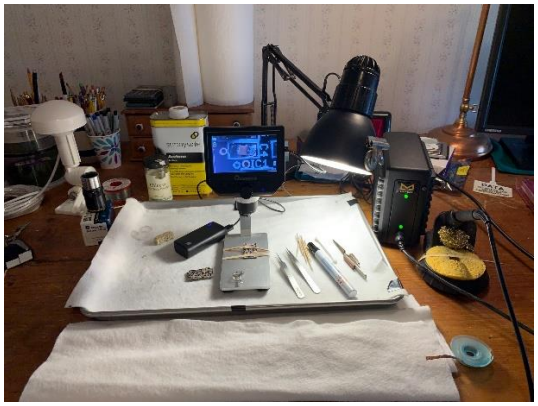
Also, back in the late 1980's I had been involved with administering Sun and Apollo Unix workstations while at Wang Labs, so Linux wouldn't be sooo difficult, right?

So, I signed up.

My SMD soldering is not great, and pales when compared with the published photos of the work of team members Willie, N1JBJ, and Vlad, W1MTI, but it is, IMHO, passable. Here's my partially completed PCB:



I set up a solder station in a white-felt-lined cookie sheet (white so I could see parts that jump out of my tweezers, and felt so they would be less likely to bounce). Even so, I managed to launch several SMDs into orbit, never to be seen again. Good thing I had ordered multiples of each!



I had been using a jeweler's "OptiVisor" magnifying visor, and a Hakko soldering rig, but I was constantly having to adjust the visor, and lean way over the work. Also, I found that I had to set the solder tip temperature significantly above the SMD's recommended soldering temperature to get the solder to flow before my shaky hand would move the part out of alignment.

So, now I'm using a Mustool USB microscope (~$60) that I got from Ali-Express several months ago. Also, many thanks to Peter, N1ZRG, for the loan of his Metical MFR-PS1100 soldering station, which heats up instantly, thus greatly increasing my productivity.

The Metcal and the microscope make soldering SMDs quite straightforward.

Here's a shot of my feeble, but passable, attempt to solder the smallest SMD part, D1 (.8mm wide). Both D1 and C2 were soldered with the Hakko.

Next up is loading the RasPi with an OS image of the Grape1 software, rigging up antennas for WWV and GPS signals, and learning/exploring the "fldigi" software, which is used to transfer data files.

Is this a great hobby, or what?

Have **YOU** paid your NVARC Dues? See:
http://n1nc.org/Members/Roster
for your renewal month.

Treasurer's Report

Income for July was $15 in membership renewals. There were no expenditures in July leaving a net balance increase of $15.

Current balances:

General fund	$2,788.82
Community fund	$5,948.25

As of 5 August we have 41 members who are current with their dues and 33 renewals outstanding.

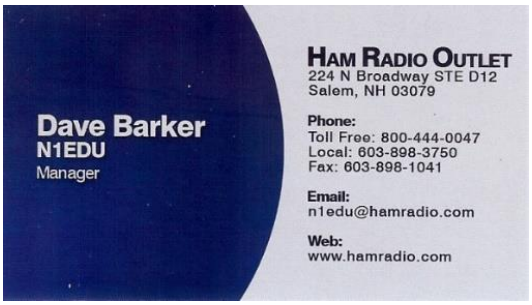
Thank you to those of you who mail your renewals or use PayPal. Renewal months are in the member list on the N1NC.org server at http://n1nc.org/Members/Roster.

To pay membership dues via PayPal see the instructions at http://n1nc.org/Members/dues.

If you are joining ARRL or renewing your membership please consider letting Ralph send in the paperwork for you. The Club will buy the stamp and will get a commission from ARRL. As a Special Service Club, the ARRL expects a majority of Club members to also be ARRL members. Contact Ralph for further information if you need it.

de Ralph, KD1SM

Sponsors



NVARC

Nashoba Valley
Amateur Radio Club
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Vice President: Phil Erickson, W1PJE
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Join NVARC! Annual membership dues are $15; $20 for a family.

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Contact us on the N1MNX repeater.
442.900 (+), 100Hz
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This newsletter is published monthly. Submissions, corrections and inquiries should be directed to the newsletter editor: editor@n1nc.org.
Articles and graphics in most PC-compatible formats are OK.

Editor: George Kavanagh, KB1HFT

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