

NARA Newsletter



President's Message – Randy VE7FAA

Ham Happenings at the Cedar Hall in September capped off a great summer season for NARA.

While we don't yet have official numbers, if you were there you know the venue was packed. More than that, everyone had a great time. Heartfelt thanks go to all who made it so successful.

Now that summer is at an end, we have more time to work on the new club station at the Collishaw Air Cadet site on Nanaimo Lakes Road. The station will include a remote HF base, allowing HF operation by those lacking equipment or an antenna.

Unfortunately, operating a remote HF station is limited to those with Advanced certification. NARA intends to address this issue with RAC and ISED, suggesting that remote HF operation should be opened to those who have a Basic with Honours certification.

We hope you had a great summer. Now get ready to join us for winter club events!

New APRS Digipeater

Thanks to Mason VE7PMD/VE7GC a new low power APRS digipeater was set up in Nanaimo on Sunday, Sept. 24. David VA7DXX donated the TNC and radio to NARA for this digipeater and Mason has set it up at a temporary location north of Westwood Lake in central Nanaimo. The digipeater will identify as WESTWO and VE7NA. After soak testing at this location the plan is to move the equipment to Mt. Benson, with a primary purpose of providing APRS coverage in the back country to the west of Mt. Benson.



Fall Basic Course

This year's trainers are David VA7DXX, Devan VE7LSE, Katherine VA7HN and Mike VA7WPM. Full details appear below. If you want to enroll please contact Mike VA7WPM at keelcove@shaw.ca.

NARA Training Schedule – Basic Course – Fall 2023

Notes:

- Course organizer and student liaison is Mike VA7WPM
- Contact Mike at keelcove@shaw.ca if you want to join the course
- The course will be delivered by Zoom
- There are 10 courses in all, plus an introduction
- Each course session will contain many example questions from the Basic Question Bank
- Students require the study manual, available on loan or \$30 to purchase
- Course slides will be supplied to all students after each training session
- Trainers will emphasize the need for self-study between the training sessions

Nanaimo Amateur Radio Association

Date	Day	Start Time	Topic	Duration (Hours)	By
October 7	Saturday	2 PM	Introduction and Course Info Introduction to Regulations & Policies	1.5	Mike VA7WPM David VA7DXX
October 11	Wednesday	7 PM	Regulations & Policies – Part 2	2.0	David VA7DXX *
October 18	Wednesday	7 PM	Basic Electronics & Theory	2.0	David VA7DXX
October 25	Wednesday	7 PM	Circuit Components	2.0	Mike VA7WPM
November 3	Friday	7 PM	Station Assembly, Practice and Safety	2.0	Mike VA7WPM
November 7	Tuesday	7 PM	Operating Procedures	2.0	Mike VA7WPM
November 15	Wednesday	7 PM	Feedlines	2.0	David VA7DXX
November 22	Wednesday	7 PM	Antenna Systems	2.0	David VA7DXX
November 29	Wednesday	7 PM	Radio Wave Propagation	2.0	David VA7DXX
December 6	Wednesday	7 PM	Interference & Suppression	2.0	Devan VE7LSE/Katherine VA7HN *
December 9	Saturday	2 PM	Exam	Approx. 2.0	David/Mike

Ham Happenings 2023

It was a slightly cooler day for NARA's Ham Happenings on Sept. 17 but that did not deter the crowds. The Cedar Hall was filled with traders and buyers with seemingly well over 100 attending the event. As an added extra, some great food and drink was available thanks to VE7SUM and his team. The top door prize, an ICOM V86 hand-held, was won by Darryl VA7DDU.



Near Vertical Incident Skywave (NVIS) Testing by NARA

NARA's club call sign, VE7NA, was on the air on Saturday, Aug. 26, for NVIS (Near Vertical Incident Skywave) tests on 3.745 MHz. The concept was to establish, in a practical way, what ranges might be achievable using 100 watts in daylight with typical 80m antennas; that is antennas not specifically designed for NVIS work.

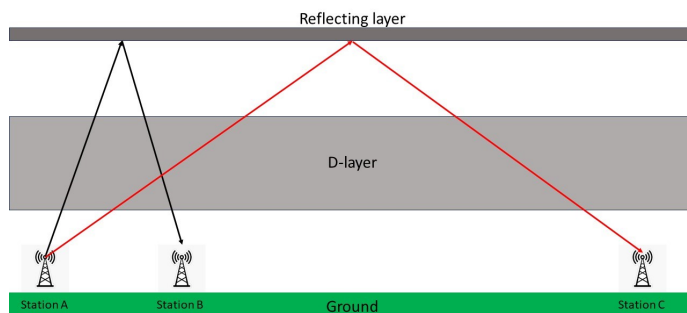
From the ISED Basic exam we know that the D-layer, the lowest of the ionospheric layers, is activated by the Sun during daylight. The D-layer attenuates low frequency MF/HF signals. For example, distant medium-wave AM broadcast stations cannot be heard during the day. At night, when the D-layer is not present, AM broadcast stations from distant locations can be heard.

Using the 160m band for the proposed NVIS tests was considered but rejected on the grounds that not many stations had suitable 160m antennas; a half-wave dipole on the 160m band is about 80 metres (just over 260 feet) long. In addition, most EOCs or other stations set up for emergency situations, when NVIS propagation might be used, are set up on the 80m band, again because of antenna considerations.

Antennas specifically designed for NVIS would typically be horizontally polarized, low to the ground, and preferably a half-wave dipole. The idea, of course, is to push the RF upwards for NVIS propagation rather than towards the horizon as with a traditional antenna intended for longer distances. A better NVIS antenna would be a beam designed to push the RF straight up to the ionosphere.

The geometry of NVIS is that if signals go straight up to the ionosphere through the D-layer and down, then the distance through the attenuating D-layer is at a minimum. As the distance between the NVIS transmitter and receiver increases, and as the angle of the signal through the D-layer changes, there is more attenuation through the D-layer. At some distance the attenuation through the D-layer is so high that signals are blocked.

Although NARA contacted many clubs in BC prior to the actual tests, setting up a four-hour window between 11 am to 3 pm Pacific time, the club was not expecting many calls, perhaps 20. Much to our surprise we had 110 contacts and operating was more like a contest than the leisurely propagation testing we anticipated!



As you can see from the diagram, signals on 80m between Station A and B pass through the D-layer but with attenuation. The path length through the D-layer between stations A and C is longer, more attenuation with distance.

The VE7NA station was set up in a cabin at VA7DXX's property, just east of the Nanaimo Airport high on Woodley Range between Nanaimo and Ladysmith. It was decided to use 100 watts again because this will be a typical power from an emergency station. The antenna — not ideal for NVIS work — was one of the available dipoles orientated north to south at a height of about 16 metres (just over 50 feet). At this height the normal radiated pattern of a half-wave dipole is somewhat distorted because it is too close to the ground. The pattern at this height is typically less directional than would be expected at say a height 40 metres (130 feet). The NARA operator on the day was David VA7DXX, assisted by Paul VE7XQL.

Given that the main purpose of these tests was to establish what ranges were achievable in daylight on 80m LSB using 100 watts and non-specialist NVIS antennas, the question became how best to analyze the results. Table 1 breaks down the number of stations worked by distance. While the actual numbers of stations in each distance band was not significant, the ranges achieved are certainly noteworthy.

Table 1 - Contacts by distance

Distance Band	% of contacts
Under 50 km	19%
50-100 Km	35%
100-150 Km	12%
150-200 Km	9%
200-250 Km	6%
250-300 Km	7%
Over 300 Km	7%

The highlights of these NVIS tests include:

- 45% of contacts achieved were over 100 Km
- 20% of contacts exceeded 200 Km
- 25% of contacts were with the US, despite no publicity direct to Washington State clubs
- Signals via NVIS typically get weaker as distance is increased
- NVIS conditions, as expected, change over time as witnessed by stations who called in several times
- Ranges to around 300 km can be expected with modest equipment
- Given the mountainous terrain around VE7NA it is evident that NVIS propagation will pop over mountains into nearby valleys screened for groundwave propagation

NARA looked at the top five contacts based on range. We were interested in the antennas which were in use. See Table 2.

VE7NA's top 5 contacts by distance

Station	Location	Km	Antenna
KJ6EI	Vancouver, WA	387	Awaiting information
VA7RYL	Williams Lake	366	G5RV, center 40 ft, ends 60 ft
VE7ENP	Kelowna	333	Inverted V dipole, center at 26 ft
VE7VZ	Kelowna	315	Awaiting information
K6BRR	Packwood, WA	314	80m doublet, apex at 32 ft

As with all tests, emergency or propagation, there are always lessons to learn:

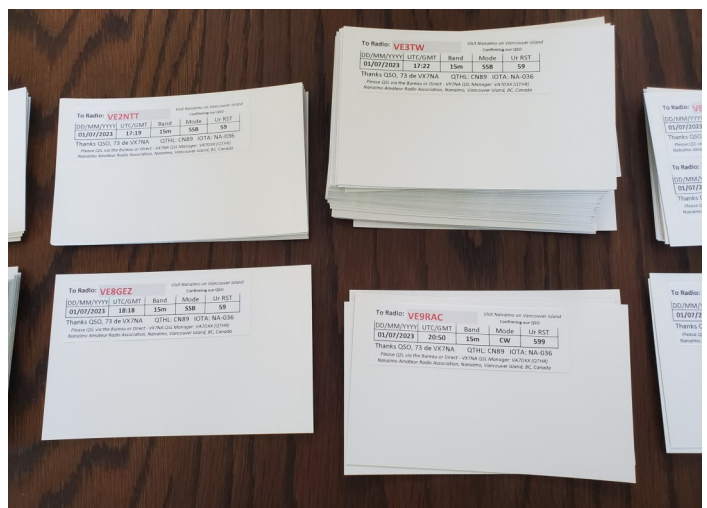
- NARA intends to do further tests to explore NVIS ranges, but next time we will primarily use an antenna specially designed for NVIS use.
- While NARA did email many clubs in BC, we did not give the tests any publicity in the US. This will be addressed when NARA next conducts these NVIS daylight tests
- Next time NARA will be better prepared to make contacts with far more stations than expected
- In future we will also choose an SSB frequency in the 80m band which can be used by more licensees in the United States

Exploring NVIS 80m ranges in daylight with the D-layer present certainly settles one question: it is possible to use the 80m band during daylight hours to achieve good ranges with modest equipment. Ranges of over 300 km on VHF/UHF bands are normally only achievable with power and higher gain antennas from good locations. These NARA tests demonstrated that ranges of over 300 km are possible with 100 watts and ordinary 80m antennas.

VX7NA – NARA’s Special Call Sign

By early September all 1,500 VX7NA Special NARA 75th anniversary QSL cards had been labeled, sorted, packaged and mailed to the RAC QSL bureau.

The process took about eight hours. Thanks David VA7DXX for the work! Some QSL cards for NARA members were handed out at Ham Happenings, but for those members who did not attend their cards have been mailed individually.



VX7NA QSL cards, for Canada, being sorted by call area

How is DX – David VA7DXX

In a recent NARA Newsletter I mentioned in this column the RIB (Radio In a Box). The RIB was used by the VP6D DXpedition to Ducie Island in the South Pacific earlier this year and was more recently used by the group which activated the Penrhyn Atoll in the North Cooks islands operating as E51D.

The basic idea behind the RIB is minimum impact on an island. So no tents, toilets, showers, operators, etc. All the RIB requires is an external generator and antennas. Once the RIB is on the island and the antennas set up, the system just requires the generator to be refueled say once a day. The operators, are situated on a boat

anchored off the island, remotely controlling the stations on the RIB. There is thus minimum human impact, and these days more and more islands require this type of approach.

The main person behind the RIB is George Wallner AA7JV who developed it in conjunction with the Northern California DX Club, who have also provided some financial assistance. Until recently my own perception of the RIB was of a large box full of equipment, including an amplifier. However, a recent closer view of the RIB gave a rather different impression. As you can see from the picture, the RIB and its amphibious transport system is rather more complex than I imagined.



The E51D RIB operating from Penrhyn Atoll in the North Cooks islands. Quite a set up for a remote station.

As you will read on page 6 of this newsletter there is a partial solar eclipse taking place on Oct. 14. The eclipse will be visible over much of North America. Just how the absence of the Sun on the ionosphere will affect radio propagation during this eclipse will be studied in great detail by professionals and radio amateurs alike.

Many radio amateurs, including myself, are taking part as observers in an experiment from the University of

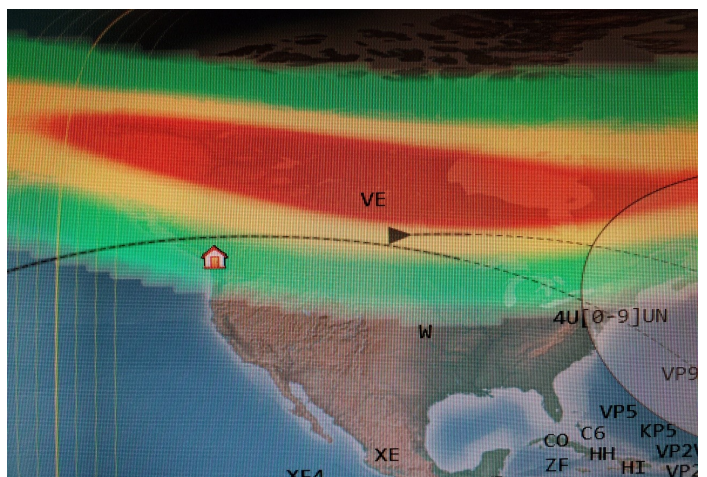
Scranton in Pennsylvania. As an observer I measure the Doppler shift on the moving ionosphere based on the 10 MHz WWV standard frequency transmission from Boulder, Colo. I use a GPS locked frequency standard to compare against the frequency of the received WWV signal. By measuring the Doppler shift on the 10 MHz WWV signal from many accurately known locations it is possible to calculate how the ionosphere is moving. My own measurements can typically show a short term Doppler shift of some 1.5 Hz during a typical day. My 24/7 measurements are stored and once a day are sent to the University of Scranton via the web for analysis. Next month I will reproduce some of the graphs which are produced on a daily basis.

Solar-cycle-wise, multiple newer forecasts predict increases in sunspot activity for solar cycle 25 over the original forecast, as can be seen in the diagram below



Some of the latest forecasts predict a higher peak in Solar cycle 25 than previously expected

As if to confirm the increased solar activity, on the evening of Sept. 18 a fast moving coronal mass ejection (CME) struck Earth's magnetic field. During the resulting G3-class geomagnetic storm, auroras spread from France to the West coast of the USA. I did listen on the 6m band to see if there was any activity. I heard two VE7 stations only via aurora exchanging signal reports and locators. The aurora dissipated from its peak late evening Pacific time.



Auroral simulation for the evening of Sept. 18

There are lots of DXpeditions coming up in October, with most of them operating from the Pacific. Any radio communication into the Pacific from Nanaimo is relatively easy. The DXpeditions include: Samoa (5W0LM), Vanuatu (YJ0TT), St Vincent (J88PI), French Polynesia (TX6D), Marshall Islands (V7), East Kiribati (T32AN), Swains Island (W8S – see below), Mayotte (TO8FH), Niue (E6Am), North Cook Islands (E51J), Micronesia (V6AH, V63CB and V6SZ), Chatham Islands (ZL7), Saba & St Eustatius (PJ5) and Temotu (H40WA).

The DXpedition signing T22T to the Pacific Islands of Tuvalu has been going strong in late September. Tuvalu is a constitutional monarchy which became independent of the UK in 1978. The country consists of three reef islands and six atolls, all low lying and being eroded by rising sea levels. The T22T DXpedition is by the Rebel DX Group and runs until Oct. 9.



The main Tuvalu atoll

Also, look out for W8S operating from Swains Island, in the Tokelau chain in the South Pacific, from Oct. 4 -17. This is a sizable DXpedition with ten operators and a relatively easy path from Nanaimo.



Swains island in the South Pacific

Late October also hosts the popular CQ Worldwide SSB DX Contest, a 48-hour contest on Oct. 28-29. If you are looking for new countries or islands on SSB, this contest should prove to be helpful.

QSL Matters

Your own QSL cards

As a reminder, if you want to collect QSL cards sent to you via the BC Incoming QSL bureau check with Ken VE7BC to see if there are any cards waiting for you. You can email Ken at ve7bc27@gmail.com. If there are cards waiting for you, send some money, say \$10, to Ken Clarke VE7BC, PO Box 1109, 100 Mile House, BC V0K 2E0. It is also worth noting that if you are not interested in collecting QSL cards sent to you as a VE7/VA7 station, RAC recommends that you advise Ken at the above email address. This helps to save space at the volunteer incoming BC QSL bureau.

Another tip if you are ordering your own QSL cards. The Islands on the Air (IOTA) program is probably the second most popular award scheme in amateur radio after DXCC. For your QSL card to be credited for this award, the accurate name of the island must be printed somewhere on your QSL card. It is not an IOTA requirement that the IOTA designator (NA-036 for Vancouver Island) is printed on the card, but the exact island name is essential.

At the Pacific NW DX convention in Vancouver in August one of the companies exhibiting was a company called 'QSL Concept.' Pick your favorite picture for the front of your own QSL card, include your callsign on the front and you have the makings of a full colour two-sided personal QSL card. On the back leave space for the normal QSO type of information such as date, time, band, mode and report. You can sketch out what you want and QSL Concept will help you to create your own design, and when complete the company will send you a proof of both sides of the card for you to approve. The design work is done by a local radio amateur in Vancouver. The cost of the cards is probably a lot less than you might imagine. Once ordered you can expect your cards to arrive within about two weeks.

Exchanging QSL cards remains very popular despite the fact that the confirmation of contacts can be done electronically these days. For the DX Century Club (DXCC), the most popular award for radio amateurs, you can join the ARRL's Log Book of the World electronic QSL program. However, you can also have physical QSL cards checked for DXCC as well. Next month we will look at both the Log Book of the World and later the OQRS system of obtaining QSL cards from major DXpeditions.

AREDN Additions

On Saturday, Sept. 23, a group of amateurs from the Nanaimo area installed some AREDN antennas at the VE7KU repeater site at Mt. Cokely, which is 1,220 metres above sea level. Unfortunately, the weather did not cooperate and only one 5 GHz antenna, pointing towards Port Alberni, was installed. The remaining equipment is safely inside the VE7KU hut awaiting the next attempt to install additional 5 GHz antennas on the tower.



Kevin VE7KGV & Devan VE7LSE on the VE7KU tower. Others helping at the VE7KU site were: VA7ODR, VE7PMD and VE7TFM. In Parksville, assisting with coverage testing, were VE7RQX, VE7TOM and VE7TOP.

October 14 Events

On Oct. 14 the Moon will pass in front of the Sun, producing what is called an annular solar eclipse visible from North and South America. This should not be confused with a total eclipse, where the Moon completely covers the Sun.

During an annular eclipse, the Moon is a little too small for complete coverage, a result of the Moon's elliptical orbit. When the Moon passes in front of the Sun, an annulus remains visible, creating a "ring of fire" in the sky. It is still very cool. Indeed, you will literally feel cool as the diffuse shadow of the Moon passes overhead

dimming the landscape and lowering the air temperature by a few degrees.

The "path of annularity" is about 100 miles wide. Along its centerline, the Sun will be ring-shaped for more than four minutes, with as much as 95% coverage of the solar disk. But be careful! Even a 5% sliver of the Sun can be blindingly bright enough to cause eye damage. Only watch the event using ISO-approved eclipse glasses, and never ever look directly at the Sun.



The eclipse path over N. & S. America on Oct. 14.

Outside the path, observers will see the Sun turn into a crescent, fat or thin depending on how far they are from the centerline. This is called a "partial eclipse," also best seen using eclipse glasses. Almost all of North and South America is in the partial eclipse zone. (Thanks Space Weather). Also Search for 'Solar Eclipse QSO Party.'

Operation Dark Skies also takes place, part 1, on Oct. 14 with part 2 on Oct. 16. Dark Skies, organized by the Radio Amateurs of Canada (RAC), is a Canada-wide simulated emergency test which will coincide with the solar eclipse. If you want to take part you will need to register, full information is at <https://www.rac.ca/simulated-emergency-test-2023-operation-dark-skies/>.

**NARA's 2023 Christmas meal
is being planned to be held at the
Air Cadets 205 Collishaw Squadron**

The Satellite Downlink: The Greencube (IO-117) Satellite Part 1 - Bruce VE7PTN

This month's article is a return to satellite operating how-to format. Over the few installments I will cover how to get set up and work the Greencube (IO-117) packet satellite. First, a bit about the satellite and what makes it special. The satellite is operated by Sapienza Space Systems and Space Surveillance Laboratory (S5Lab) team at Sapienza University of Rome, Italy. Its primary mission is to test plant cultivation in microgravity. (That's where the "green" bit in the name comes from.) Its telecommunication subsystem has a UHF simplex packet digipeater (digital repeater) functionality available to the amateur radio community. More technical information can be found on the S5Lab website: <https://www.s5lab.space/index.php/greencube-home/>.

Greencube was launched in July 2022 and the digipeater was activated in October 2022, so it is a relatively new satellite. But what makes it special is its huge "footprint". A satellite's footprint is that portion of the Earth's surface that "sees" the satellite above the horizon at any given moment. The footprint size is related to the altitude of the satellite. Most amateur radio satellites are Low Earth Orbit (LEO), with altitudes from 300 km to 1,500 km and have a footprint about the size of a continent. But Greencube orbits at about 5,800 km; it is considered a Medium Earth Orbit (MEO) satellite and its footprint is almost an entire hemisphere of the Earth. This means that from western Canada, one can easily work stations in South America, Asia, Europe, Africa and Australia. No other amateur satellite has such a large footprint.

The equipment needed to work this satellite is not much different than other satellites. You do need a Windows computer interfaced with your radio to track the satellite frequencies and to send and receive the packet audio. Also, your radio will need to support Upper Sideband Data (USB-D) modulation. Since that satellite is so far away, a high-gain antenna is best. Most operators are using a Yagi with 10 or more UHF elements. But I have had success with just a handheld Arrow II antenna with seven elements. And technically you don't need a lot of power; despite a range of 10,000 km to the satellite when it is on the horizon, it can be reached with less than 10 watts. However, since the satellite has become

so popular, many operators are hitting it at any instant, and the loudest station will win the pile-up to get digipeated. Most operators are running at the full power their UHF provides.



GreenCube
Microgreens cultivation
in a CubeSat

Greencube logo from Sapienza Space Systems and Space Surveillance Laboratory (S5Lab) website.

What you will need to work this satellite is some specific software. There are three software components required: tracking software, to adjust the radio's uplink and downlink for the Doppler effect; Terminal Node Controller (TNC) software, to input and output the audio between computer and radio; user terminal software to provide an interface where the user can send and receive QSO information. Note that the specific TNC and terminal required software for Greencube are only available for Windows at this time.

The tracking software may be any one that can support the UHF USB-D simplex mode. Not all software can do this as most amateur satellites are crossband duplex modes. I use SatPC32ISS for this; this program is included with SatPC32 and is the version that supports simplex. As I have said in earlier articles, it is not great software but it is cost-effective and well supported.

For the TNC software, you will need to use SoundModem written by Andrey UZ7HO (<http://uz7.ho.ua/packetradio.htm>). There is a specific version of this software for Greencube, see the file "greentnc.zip" on his website for a copy. (He also provides user terminal software called GreenCubeDigi, but it has limited features and I don't recommend it.)

NARA's website is:

<http://www.ve7na.ca/>

[Nanaimo Amateur Radio
Association](http://www.ve7na.ca/)

The tracking and TNC software are basically set up and forget. The software that you will interact with the most with is the user terminal one. For this I recommend the excellent software written by Carsten OZ9AAR. It is loaded with helpful features that will make your Greencube sessions very productive. He updates the software frequently so new features are being added all the time. You can get the software from his website: <https://moonbounce.dk/hamradio/greencube-terminal-program.html>.

Time (UTC)	From	To	Message
12:21:14	N7AY	KE8FZT	DN13, QSL?
12:21:15	OZ9AAR	WA9WUD	J045
12:21:16	VE7PTN	DF2ET	QSL EN68
12:21:18	RA9DA	CQ	M017
12:21:19	W3AVP	CQ	FN10 (NV/SD?)
12:21:20	VE7PTN	DF2ET	QSL EN68
12:21:24	W3AVP	OZ9AAR	599 FN10 QSL?
12:21:29	VE7PTN	DF2ET	QSL EN68
12:21:32	SP8NR	W3AVP	599 K012
12:21:33	W03T	CQ	de Carm FN00 PA
12:21:34	VE7PTN	DF2ET	QSL EN68
12:21:37	VE7PTN	DF2ET	QSL EN68
12:21:40	EC4TR	KE8FZT	599 IN80 QSL?
12:21:43	N5EKO	EC4TR	EM20 599
12:21:46	OZ9AAR	WA9WUD	R73
12:21:49	GreenCube	ALL	[TLM: eps/obc/radio boot=
12:21:50	K7MT	DL6GBM	599 DN46 MT OP BILL
12:21:51	VE7PTN	KE8RJU	QSL EN68
12:21:54	N9ZTS	WA9WUD	R QSL TU 73
12:21:55	VE7PTN	KE8RJU	QSL EN68
12:22:26	XE2YWH	CQ	DL92
12:22:31	DL6GBM	VE7PTN	599 JN48
12:22:31	N1RCN	CO	EL87 Florida

Screenshot of my traffic window in Greencube Terminal Program during a pass. The dark orange lines are my transmissions. The light orange line in the center of the photo is a successful digipeat of my transmission. The blue line near the bottom is a station (DL6GBM) calling me.

Greencube is great, however, the station configuration can be tricky and frustrating. Everyone seems to go through a challenging period to get all the pieces working for a successful QSO. I know I did – twice! (Once for each radio I use). To hopefully reduce the challenge, I recommend that you checkout some online resources. Your first stop should be to join the Facebook group “GREENCUBE (IO-117) Satellite Users”. In the Files section for this group there are some detailed and radio-specific how-to documents. I will cover the basics in my articles, but you may need to hunt down more information in these documents for your particular setup. There are also some videos on YouTube (search “greencube satellite”). Here is one to get you started: <https://www.youtube.com/watch?v=kZrIU1jC9Fk&t=1s>

Well, that’s all for this month. Next month I will dig into the station setup process. 73.

The VE7NA Radio Room Update

As part of developing the new NARA radio room there will be an AREDN component. This will include installing a medium size dish antenna to connect to the mesh node on Mount Benson. Another small sector antenna will be pointed towards mid Nanaimo. For service continuity the entire radio room facility will be supported by two 300 AH LifePO4 batteries to ensure operation.

Visual Auroras

With the sun so active these days, auroral activity has just been phenomenal of late. If you have a clear view of the sky to the north east, which is where most visual auroras can be seen, you will likely be able to see the Northern Lights. Actually being able to see the visual aurora is, of course, weather related and subject to light pollution. Visual auroras can coincide with radio auroral propagation especially on the 6m and 2m bands. If you are interested in visual and radio auroras, check out aurorafcast.ca.



Visual aurora photographed from Vancouver, thanks to Liron Gertsman Photography

The volunteer group of NARA members producing this newsletter would like to thank all those who provided material for this month’s issue.

The deadline for the November 2023 issue of the NARA Newsletter will be noon on Friday October 27 with an intended publication date of October 30.

News items and comments should be sent to:

news@ve7na.ca