

The Official Newsletter of the
Auckland VHF Group Inc.
Spectrum



The PCB layout of the Kerberos “Coherent” receivers

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Auckland VHF Group Inc.

Branch 66 NZART

PO Box 10138, Dominion Rd, Auckland 1446
Clubrooms: 30 Hazel Ave, Mt Roskill

Office	Name	Call sign	Work / Mobile	E-mail
President	Matthew King	ZL1YOT	022 649 3310	president@aucklandvhf.org
Vice President	Not filled			
Secretary (Acting)	Vaughan Henderson	ZL1VH	021 844 804	secretary@aucklandvhf.org
Treasurer	George Raffles	ZL1TUX	021 735 361	treasurer@aucklandvhf.org
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	Greg Storz	ZL1GSG	09 849 2878	greg.storz@orcon.net.nz
	Darryl Grange	ZL1TCI	021 123 7733	dgrange@ecohousing.co.nz
	Vaughan Henderson	ZL1VH	021 844 804	zl1vh1@gmail.com
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Deputy Group Ldr.	Not filled			
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Account Reviewer	Basil Orr	ZL1TOW	021 867 367	
Webmaster	Terry Corin	ZL1BPA	027 697 4686	webmaster@aucklandvhf.org
Club Web Page:	http://www.qsl.net/zl1bq			
ZL1VHD Dstar gateway administrator: Laurie ZL1ICU 634 5130 0274 817463 perma@xtra.co.nz				

Club News and Net:

The combined Auckland VHF Group and Auckland Regional Branch News and Net are held on 146.625 MHz and 439.875 MHz at 8.15 pm each Sunday or after the ZL6A National Broadcast on the last Sunday of the month.

Club meetings are held at the Clubrooms at Hazel Avenue, on the second Monday of each month at 7.30 pm. For other details, listen to the News and Net each Sunday evening.

SPECTRUM is the official journal of the Auckland VHF Group Inc. Opinions expressed are those of the authors and do not necessarily reflect club points of view. The closing date for SPECTRUM articles is by the 1st of each month. Articles to be submitted to the editor Peter ZL1UKG
spectrum@aucklandvhf.org

Auckland VHF Group (Inc) Branch 66

General Meeting Notice

Monday 09th December 2019 7.30pm,

At the Hazel Avenue Club Rooms
(Located on left at the end of Hazel Avenue)

The Evening's Topic:

December Meeting: VHF Group Xmas Party

To farewell the 2019 year our December meeting will be the usual Christmas party at the clubrooms on Monday December 9th. We will have a very short business meeting to seek approval to pay the ten year licence to occupy for the Klondyke site.

Please BYO, the VHF Group will be supplying non-alcoholic drinks and a small selection of "nibbles".

You are welcome to bring a plate to contribute to the supper.

EVERYBODY WELCOME

We look forward to seeing you there

Coming Events:

- Field Day Contest Sat 07-Sun 08 December. All bands 6m and up.

Contest starts on Saturday 7 December at 1700 hours and ends at 2300 hours – 6 x 1 hour periods.

The contest resumes on Sunday 8 December at 0700 hours and finishes at 1300 hours – another 6 x 1 hour periods. Look for operation on 6m around 50.15 MHz, 2m around 144.2 MHz, on 70cm at 432.2 MHz. Most operation will be on SSB but do give a call using FM mode if you don't have SSB available.

Auckland VHF Group Presidents Report December 2019

In the absence of our President, away on a power catamaran heading for Picton, I have put together some notes on recent Group activity:

Klondyke Licence to Occupy –after several years of unsatisfactory negotiations with the then land owner, early in 2019 we found out that the land had changed hands and was now owned by a company called Fortlane Ltd. A letter to their registered company address did not get any response, so a little more investigation found the legal firm that had handled the land transfer and through them, was able to make contact with the new owner’s representative, Eric Zhao. Following the initial contact, our “Licence to Occupy” document was emailed in late June and shortly afterwards in mid-July, and acknowledgement and request that we wait while the new landowner entered into negotiation with all the other tenants on the land.



Finally, on Monday 29 October, a follow up inquiry brought about the response that the owner was able to enter into an agreement with us and the annual rental would be \$1400 per year. This was followed by a request to meet and on Monday 18 November, Brendon ZL1XXX and I met with the owner’s representative, Eric Zhao. A very friendly meeting ensued and we were able to explain in some detail what we did as a VHF Group and why we had the Klondyke Repeater site. The owner requested some small changes to the Licence to Occupy which the committee worked through. A new clause enabling the owner to cancel the Licence to Occupy on 6 months’ notice in writing; and an addition to the clause about vacating the site with a requirement that we leave the site tidy and in a safe and clean condition.

As a result of the meeting with Eric Zhao, we are able to get the annual rental reduced to \$1300 per year, and payment was to be made in a lump sum for the 10 year renewal period. Your committee has agreed to the altered terms and conditions in the Licence to Occupy and a signed copy has been sent to the Landowner. The new Licence to Occupy takes effect from 1 December and there are no back rentals or any other encumbrances, nor are we liable of any legal fees for the settlement.

At our December meeting approval will be sought to make the lump sum payment of \$13,000 (no GST at the landowners request). The signing of a new Licence to Occupy for the Klondyke site is a major step forward and will now allow us to apply for a resource consent for the next stage of the tower maintenance – the repainting. I am sure that some of you will have questions about the new licence or want more detail. We will be happy to answer those questions at our December General Meeting on Monday

Change of Night for Committee Meeting - effective from the end of November 2019, the Auckland VHF Group Committee meetings will be held on the 4th Tuesday of each month except December.

Changing the date means a fixed day each month, rather than the current “last Monday in the month” and can be locked in to digital calendars and diaries.

Clubrooms Carpark re metalled – Late November Auckland Council’s Customer and Community Services directorate made good on a long standing request and the carpark in front of the clubrooms has had the overlay of soil and weeds removed and a layer of fine gravel laid. This has improved the appearance immensely and we now have a clean, dry surface to park on. The asphalt sealing of the carpark and alterations to the car park area will not be done until the Puketepapa Community Board provides the funding.

Notes compiled by ZL1VH

Auckland VHF Group Inc.

Minutes for the General Meeting held on 11th November 2019

Following the AGM

Meeting Start 8:16

Correspondence In

Insurance information from Warren Harris, to be tabled in committee
Member application from Australian prospect, discussed he can be a member.
Email from Council with details on the remedial carpark metalling

Correspondence Out

No Correspondence out

General Business

Question from Marlene ZL1MYL, do we have a health and safety plan for Klondyke – will be tabled in next committee meeting.

Presentation –

Dr Carl Laufer spoke on SDR Radio Development & took us thru his Kerberos SDR project. This is a technique for using RTL-SDR in direction finding, passive radar & radio astronomy.

Next Meeting

Committee Meeting Tue? 26th November
Club Meeting Monday 9th December - Xmas Party?

Meeting Closed 9:45pm

The investigation and development of RTL-SDR potential

Dr Carl Laufer outlines his work and results

Following the research for his PhD work he saw the need for a computer controlled receiver. The RTL-SDR was the cheapest available at the time but after finding how to command it, it turned out to have faults that made it unreliable for his work. He determined what the faults where and in collaboration with a Chinese supplier the design was changed to overcome them.

The uses for the RTL-SDR now include :

- Can receive satellite signals with a 1.5 m diameter dish
- Can receive Radio Astronomy type signals eg Hydrogen lines and galactic elements
- Can receive switching information from PC screens

Kiwi-SDR receivers around the world have been used for TDoA determine distance and direction over very long baselines. His current project is to use multiple “coherent” local receivers to analyse the direction of arrival of signals. A PCB has been developed to support 4 x RTL-SDR receivers driven by the same clock signal. The links to the PC introduce another problem as USB links

have different time delays in polling and delivering data packets to the PC. Calibration is required by the PC for change of frequency and to provide time delay corrections for USB before analysis can begin.

Initially the project was called Hydra but this name had already been registered so the next choice was Kerberos (a mythical 3 headed dog that guarded the entrance of Hades). Now that hardware was available writing the required software was going to be too time consuming when the end result was research results. Carl found Tamás Peto a PhD student at Budapest University of Technology and Economics who was writing such software for his PhD. They have combined their skills on this project. A Raspberry Pi-3 has the processing power to do this over a short baseline. To make the analysis more efficient filters such as processing bandwidth, frequency and decimation reduce the processing load. A bandwidth of 2 – 4 MHz is possible with the Raspberry Pi-3. Commercial equipment can probably handle much more.

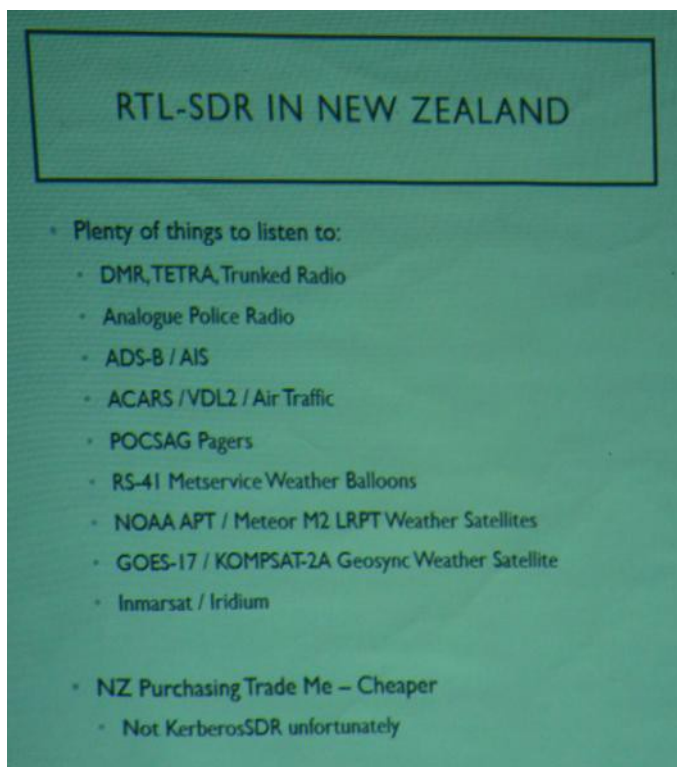
The analysis of statistical information can be displayed as a “Heat Map” where the density of signals is required. It can be used for position analysing Passive Radar signals where a strong signal from a local transmitter of convenient power, bandwidth, duty cycle and frequency is reflected from the target in question. The TDoA data at different antennas at least $\lambda/2$ apart can be used for direction finding provided the target is at least 5λ wide. Positions out to 50 km have been achieved with sufficient power.

A future application could be Astronomical long baseline interferometry.

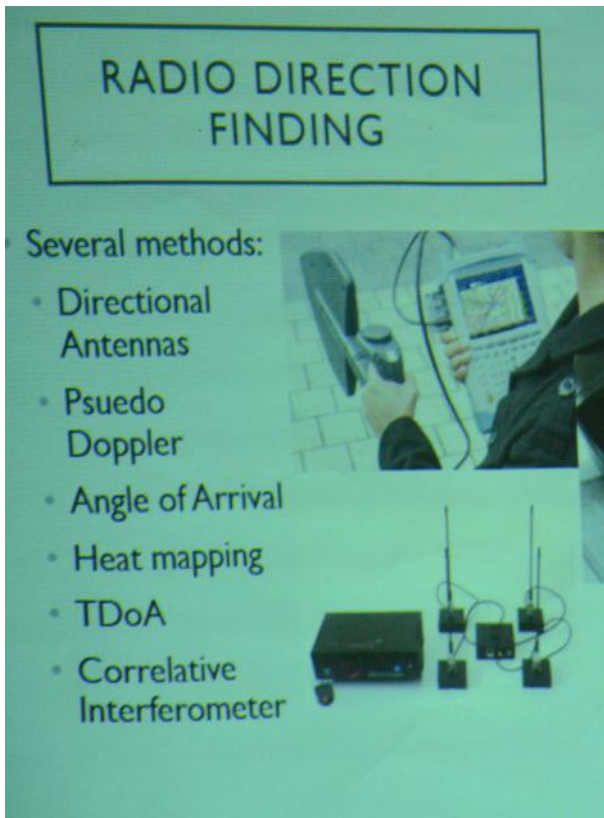
Peter Loveridge From notes made during the presentation



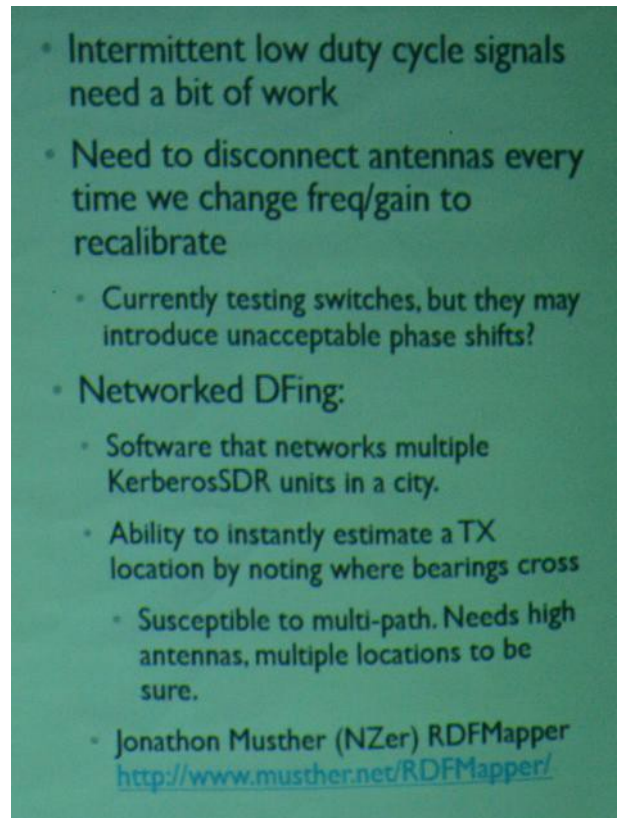
Dr Carl Laufer



Applications to receive in New Zealand



Methods of locating targets



Areas still to be investigated

Auckland VHF Group, Treasurer's Report 2018-2019

I have been doing the accounts for the last couple of years, but the present End of Year (End of September) to AGM (November Meeting) is not a realistic timeframe to prepare accounts, and get them reviewed. The 2017-2018 accounts were reviewed, and presented to the Club at the May 2019 Meeting, and reported in the May Spectrum, these have been uploaded to the incorporated societies site.

The 2018-2019 actual accounts are still in the process of being prepared to be reviewed.

I am hoping to get the accounts to the Honorary Reviewer, in November, possibly for the December Meeting, but I have limited amount of time to complete the update in time. As advised in last year's report, to complete and have the accounts reviewed within a month as I am working full time and workload is extremely busy.

Club membership is up on last year from 50 to 51 at the end of the year. This includes 3 life members, 2 Honorary Life Members, 3 family members, and 3 associate members. There are some new members who have joined the club in the last month, and these members have been granted 2018-2019 membership.

The Trading Table income for 2018-2019 looks to be about the same as 2017-2018, but it may be harder to get updated stock in the future at reasonable prices.

Club Assets

The Auckland VHF Group had many assets around the place, and a record of these have not been kept up to date, any assets that belong to the club would be greatly appreciated if they are returned, so inventory can be made. This includes all facilities the group encounters, Beacon and Repeater sites, equipment in them, belonging to the group, belonging to third parties, leases and agreements with third parties. These are needed so we can look at the future and make sure the sites the club has are adequately covered.

Information on these sites is required: Nihotupu Beacon Hut, Brynderwyn's and agreement between the VHF Group and Whangarei, Klondyke, Ruatowhena, and other places, like people's homes etc.

Klondyke Repeater and system

This is going to affect the group and its finance to cover this and other club debts that may come up. The club has put aside \$40,000 for repairs to the aerial tower, but this is only a proportion of the work required. Donations so far have been around \$6,000 from users and members. There will also be additional work in replacing the cable tray and mountings that will need to be paid for.

The club would like to hear from anyone who can help and assist the club with obtaining grants and other activities. The club needs to get the lease of the land updated, and this could also include back dated rental, resource consent for the work. Any quote mentioned are only for the tower, but the aerials need to come down and repaired and rust removed from them, galvanized and re-installed.

For some of the repeater sites we do have some income from third parties, but we need to look at the agreements closely, when they come up for renewal. Power must be an addition to usage as that is taking a high percentage of the fee received, and maintenance of the tower is not covered.

I wish to thank Laurie ZL1ICU and Marlene ZL1MYL for their continued donation towards the costs of the internet connection installed at Klondyke and operation / use and costs associated with the D/Star repeater also located at Klondyke.

I am expecting considerable costs to be incurred in the future including legal fees at Klondyke, and the possibility of high annual rents. We need to keep our reserves intact because there is also the possibility of either having to pay back-rents covering a number of years and other expenses. At present there may be a major cost for a License to occupy the Klondyke Site but will keep members informed when more information is available.

Brynderwyn lost the services of the Auckland Region Helicopter Trust which covers some of the ongoing power usage in return for housing their repeater. We may need to find alternative funding to cover the power usage if this site is to continue to operate. Power at present to operate this site is approximately \$85.00 per month.

The Auckland VHF Group pays license fees for each Repeater, Beacon and link frequencies. Donations are being received for sponsorship of licenses which is assisting to pay the fees. A list of sponsors is published in Spectrum. These fees are likely to increase as result of RSM's review of

the radio spectrum fees framework. Present fees are around \$800.00 per year. We thank those clubs and individuals who have been able to assist with donations towards running costs and license costs over the past year. Without this financial support, the club would not be able to continue those services.

The Club has added the new web site this year, which is still being worked on. The cost of the site is not covered by the increase in this year's increase in subs.

I would expect that the Clubs Subs be kept at the same level as this year provided that membership remains the similar to last year, and Klondyke donations and grants can be obtained. Setting of the subscription at the AGM is the correct place to do it, but to be fair, the to all members, the subscriptions we be held at the present value, until the end of the financial year, which is just under ten months away. 2020- 2021 sub's year.

Finally, I would like to thank Basil Orr for his work acting as honorary reviewer for the accounts.

George Raffles, ZL1TUX

Treasurer Auckland VHF Group Inc

11th November 2019

Subscription Increase

In accordance with the motion passed at the AGM held on the 12th November 2018, subscriptions to the Auckland VHF Group will increase effective 1 October 2019, the start of our new financial year.

The motion was to update Full Membership to \$50.00 and all other memberships by 10%.

As a result:

The Full subscription will increase from \$45.00 to \$50.00.

The Associate Subscription will increase from \$40.00 to \$44.00.

Family members were \$10.00, possibly stay there.

George ZL1TUX our Treasurer is looking at trying to get invoices sent out to all members.

Notes from Here and There

Amsat-Oscar 7 45th Birthday

The world's longest-lived satellite, AO-7, turned 45 years old last month. It was launched on November 15, 1974, from Vandenberg Air Force Base in California aboard a Delta-2310 rocket. After nearly 7 years of service, AO-7 was thought to have reached the end of its life when in June 1981 transmissions ceased due to battery failure, and a premature obituary appeared in the *AMSAT Satellite Report*.

In an interesting footnote, although AO-7 was thought to be non-functional after 1981, it's been reported that the Polish Solidarity movement used AO-7 to pass messages in 1982, while Poland was under martial law.

An article, in Polish, with the details is available at <https://tinyurl.com/AO-7-Poland> .

Twenty years later, on June 21, 2002, G3IOR reported hearing "an old-style CW beacon" from an unknown OSCAR near 145.970 MHz. It didn't take long to identify the satellite as AO-7. Despite some pre-launch predictions that the CMOS logic circuits on-board "wouldn't last 3 weeks," AO-7 remains operational and well-used while in sunlight. AMSAT's analysis of the failure, attributed to a battery short-circuit and return to active use after 20 years, the battery going open circuit, allowing the solar panels to again power the spacecraft.

It is the oldest operational satellite, in any service, in orbit. <https://www.amsat.org/two-way-satellites/ao-7/>

Thanks AMSAT for use of this report.

Kordia National System Award 2020

The Wellington VHF Group is running the 2020 Kordia National System Award and this time it is actually a National Systems award – i.e. the UHF National System and the DMR National System.

More details to come but the theme of the award is Telephone Exchanges. The award will run from Saturday 21 December to Friday 31 January 2020.

Contacts on the DMR system must be on the ZL talkgroup, and these contacts are worth 1.5 compared to the analogue contacts.

Points are awarded for working a station at an exchange and points from activation of an exchange, as well as for the number of contacts made while activating an exchange. So start thinking about where telephone exchanges are and we'd love to hear any questions you come up with before we publish the award rules. Questions can be sent to info@vhf.nz

From Q-Bit November 2019



**Amateur Radio Emergency Communication.
Volunteers in radio communications.
Using our resources to help the community.**

INFORMATION

The Auckland VHF Group has an AREC Group that works closely with Auckland Council Emergency Management. They provide advice, resources and manpower to assist in times of need.

The AREC section is headed by Group Leader David Dingley ZL1TIA.

From time to time the VHF Group has training sessions and exercises. Members also assist with sports events, parades and other community activities. For further information about AREC please see the NZART web site: <http://www.nzart.org.nz/arec/>

JOIN BRANCH 66 AREC

All members of the Auckland VHF Group are encouraged to join the AREC section. Your contribution, large or small is appreciated by all involved. For further information about joining Branch 66 AREC contact the Group Leader:

David Dingley ZL1TIA

828 9394 Email: mardayak@gmail.com

AREC News:



AUCKLAND VHF GROUP (INC)

SUPPORT THE EFFORTS OF THE VHF GROUP THROUGH YOUR
SUBSCRIPTION

SUBSCRIPTIONS FOR 2020

THE SUBS GO TOWARDS;

- Maintenance and on-going improvements to beacons, repeaters and linking systems for the national system, including the Klondyke repeater site.
- Providing on-time and free access to spectrum magazine as soon as it is available.
- Providing facilities for good speakers and lecturers at our general meetings.
- Discounted access to our trading table goodies.
- Access to test equipment and technical help when needed.

FULL MEMBERSHIP **\$50.00**

ASSOCIATE MEMBERSHIP **\$44.00**

FAMILY MEMBERSHIP ADDITIONAL **\$10:00**

SEE ATTACHED MEMBERSHIP RENEWAL FORM (next page)

**REMEMBER TO KEEP US INFORMED OF YOUR EMAIL
ADDRESS!**

OTHERWISE WE CANNOT SEND YOU SPECTRUM!



Thought for the month:

When I find it, I don't need it. When I need it, I can't find it.

NAME	Mr/Mrs/Miss/Ms	Christian or given	Surname
Address			
		Phone: (home)	
		Phone: (work)	
		Phone (Cell)	
		Email	
Occupation:		Callsign	
NZART Member		Branch assigned	
AREC Member		Branch assigned	
Category			To pay
Membership	Full	\$50:00	\$
New/Renewal/Change	Associate	\$44:00	\$
Receipt #	Family Add	\$10:00	\$
Donations	Auckland/Klondyke		\$
	Brynderwyn		\$
	Data/D-Star		\$
	IRLP		\$
	Other		
	Beacon / Repeater / Links / Licence donations		\$
		Total	\$
Payment			
Circle one -->	Cash	Cheque	Internet deposit
Invoice/Statement required	Please Advise Treasurer		
Internet	<p>To account ASB 12-3011-0830580-00. Account name is: Auckland VHF Group Inc. Include your Name/Callsign and Sub or RepeatDon etc in particulars field, for us to track. To sponsor a specific repeater, nominate the repeater and a backup repeater for the donation, in case the initial choice has been taken. The sponsorship is a minimum of \$50.00 which covers the licence for a year. Note: Please return the Form to the email or postal address given below to allow us to update our records.</p> <p>(Please Note the Account Number and email may have changed from last year) Email to: treasurer@aucklandvhfgroup.org.nz</p>		
Post	The Treasurer, Auckland VHF Group Inc., PO Box 10138, Dominion Road, Auckland 1446.		
In Person	Bring this form and payment to the next club meeting, 2 nd Monday of the month or to the Committee meeting last Monday of the month.		

The Auckland VHF Group Inc Branch 66 NZART
gratefully acknowledges the sponsorship of Branch 66 Beacons, Repeaters and Fixed Links license fees and the Group's repeater operations by the following radio amateurs and NZART Branches for 2019

<u>Repeater frequency and name</u>	<u>Repeater location</u>	<u>Sponsorship advised for 2019</u>	<u>Amount paid</u>
53.725 Repeater	Klondyke Road	Gwynne Rowe	\$50
144.253 Beacon	Nihotupu	Not operating	
145.625 Data Rptr	Klondyke Road	Not operating	
145.650 Dstar repeater	Klondyke Road		
146.625 Repeater	Klondyke Road		
146.700 Repeater	Ruaotuhenua	Dennis Thorton	\$50
146.900 Repeater	Mt Puketutu Radio	David Wilkins	\$50
432.253 Beacon	Nihotupu	Stability testing	
438.175 Dstar repeater	Klondyke Road		
438.500 Repeater	North Head	Not operating	
439.850 Link Tx to Kaimai	Klondyke Road		
439.875 Ak Nat Sys Rptr	Klondyke Road		
439.900 Link Tx to Egmont	Klondyke Road		
439.950 Link Tx to Brynderwyn	Klondyke Road		
1291.9 Repeater	217 Glenfield Rd	Soren Low	\$50.00
		Total Sponsorship	\$200
NZART Inc: Branch/Personal donations			
Papakura Radio Club		\$500	
	Donations	\$700	
Current as at 26/11/2019			

The Auckland VHF Group, Branch 66, would like to thank all those who came forward to sponsor the licence fee for our Beacons, Repeaters or Fixed Links for the year 2020 or donate towards the Group's repeater Operations.

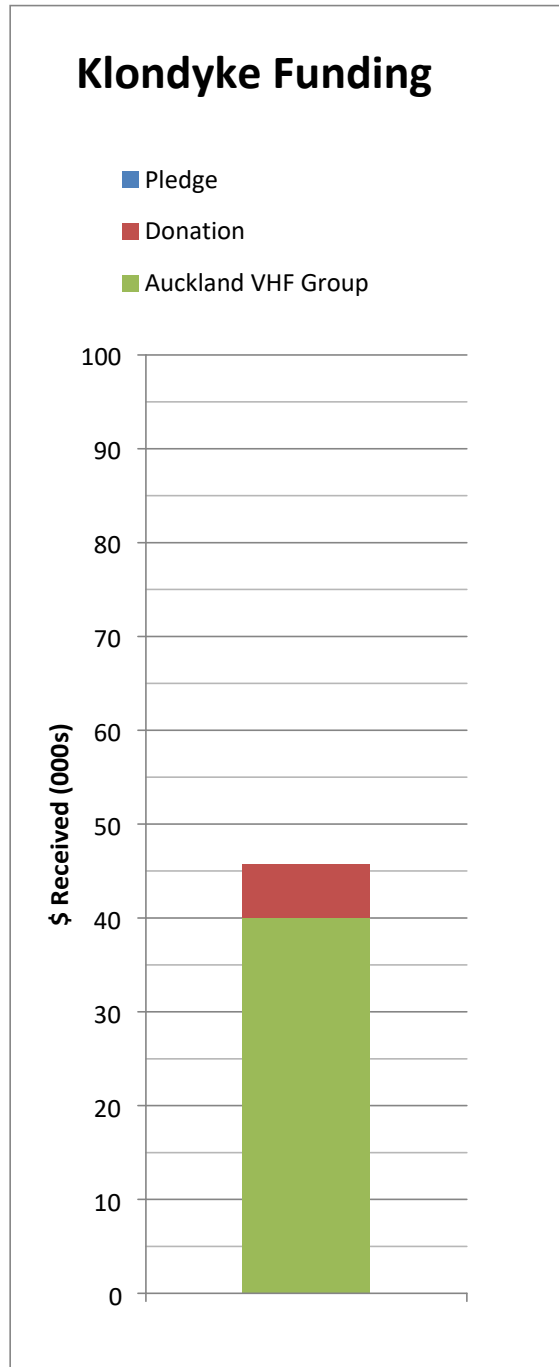
Target 100,000

Name	Donation	Pledge
Donations 2018-2019	6550.00	
Charles Graves	15.00	
Ian Ashley ZL1AOX	500.00	
Keith Dix ZL1BQE	50.00	
Margaret Dingley ZL1AYV	100.00	
David Dingley ZL1TIA	100.00	
Jenny Dingley ZL1TDB	100.00	
Russell King ZL1WITT	20.00	

Tower	63,245.00	Other	27,268.25
GST	9,486.75		
Total	72,731.75	Total	27,268.25

Auckland VHF Group 40,000.00 40.00

Total	7435.00	-
Percent	7.435	0.00



TRADING TABLE

Currently our Trading Table is only open on meeting nights.

Resistors: We are no longer going to stock the standard 1/4W carbon film resistors on the Trading Table. Any members wanting to stock up on resistors before they are otherwise disposed of – come along to the next meeting and help yourselves.

The shelf space currently taken up by resistors will be used to display other Trading Table stock items. Watch this space for details.

We have heaps of parts from dismantled commercial analog TV gear – transmitters, filters, circulators, patch panels, power supplies, cabinets. Too much to list individually, so come along to the clubrooms and have a look.

Back in Stock — SO239 UHF Adaptor:

Just what you need to make up a mobile antenna. SO239 socket and mounting nut. The tube on the side is a screw-in fit for RG58 coax cable. Just strip the outer sheath off and allow about 6 to 7mm of centre conductor, screw the RG58 into the side of the adaptor and solder the center conductor to the centre pin of the fitting.



Coax Adaptors:

Thanks to a recent donation we have a range of assorted coaxial adaptors available at only \$3.00 each, but be in quick!



Capacitors, Transmit:

Capacitors, Metal Clad Mica (Unelco, Semco)

\$2.20 each

Values (in pF):

Or 10 up for \$2.00 each

3.9, 4.7, 6.8, 10, 12, 15, 20, 22, 24, 27, 30, 33, 34, 47, 51, 62, 82,

100, 120, 130, 150, 220, 240, 300, 360, 680pF

Most are rated 350V working $\pm 5\%$ tolerance.

Similar to illustration, tab does not have hole:



Resistors Surface Mount:

Packed in bags of 10 for \$0.50 bag

Most are 1206 size: 2.7 ohm, 4.7 ohm, 22 ohm, 49 ohm, 56 ohm, 68 ohm, 82 ohm, 100 ohm, 180 ohm, 270 ohm, 330 ohm, 390 ohm, 470 ohm, 510 ohm, 680ohm, 820 ohm, 1K ohm, 2k2 ohm, 3k3 ohm, 5k6ohm, 10K ohm, 68K ohm, 100K ohm.

Quartz Crystals:

3.579545 MHz HC18/U wire ended holder

4.194304 MHz HC18/U wire ended holder

[F.4.1]

\$1.00 each

4.1952 MHz HC18/U wire ended holder

[F.4.2]

\$1.00 each

4.33618 MHz HC18/U wire ended holder

\$1.00 each

6.000 MHz HC49/S SMD package 20pF load capacitance

[F.4.3]

\$1.00 each

8.192 MHz HC18/U wire ended holder

\$1.00 each

8.867238 MHz HC18/U wire ended holder

\$1.00 each

13.875 MHz HC18/U wire ended holder

[F.4.5]

\$1.00 each

14.31818 MHz HC18/U wire ended holder. Rakon J30G-4H spec

[F.4.6]

\$2.00 each

14.7456 MHz HC49/S SMD package

[F.4.7]

\$1.00 each

17.472 MHz HC18/U wire ended holder

\$1.00 each

18.432 MHz HC18/U wire ended holder

[F.4.8]

\$1.00 each

20.0000 MHz HC49S SMD package P/No.7D20000183BSAF25Q3

[F.4.9]

\$1.00 each

24.567 MHz HC18/U wire ended holder

\$1.00 each

45.600 MHz HC18/U wire ended holder

\$0.50 each

Miscellaneous:

Battery clip for 9V (PP9) type battery

[F.2.5]

10 for \$1.00

RJ-12 sockets, 6-way PCB mount

[E.6.10]

20c each

TO-3 Mica Washer and insulating bushes

[S.9.9]

50c bag of 20

LED Holder panel mount type

[S.7.10]

50c bag of 10

Test point sockets pcb or chassis mount

[F.2.4]

10c each

Brass rivets, ideal for through-hole connections

[F.2.6]

50c/100

Cable retainer clips black plastic fits 25mm square boom

[F.2.7]

50c each

Plastic standoff mounts for PCB mounting

[F.4.8]

10c each

Handle, Grey Plastic, for equipment enclosures

[F.2.1]

\$1.00 each

Crystal socket PCB mount for HC25/U crystals

[F.2.10]

10c each

Crystal socket chassis mount for HC6/U crystals

[F.2.9]

10c each

Rubber switch boot (waterproof) 15/32"

[F.2.7]

50c each

Radio Frequency Transistors

ATF55143	Low noise E-PHEMT 0.6dB noise figure. Low noise amp for frequencies between 450MHz and 6GHz. SMD package SOT343 (4 lead). [S.case]	\$1.00 each
MGF1302	Low noise GaAs FET $N_f = 1.4\text{dB @ } 4\text{GHz}$, $4\text{dB @ } 12\text{GHz}$. [S.case]	\$5.00 each
BF199	NS 25V 25mA, 500mW $f_t = 550\text{MHz}$ TO92[S.4.14]	\$1.00 for 10
BF494	NS 20V 30mA Low noise mix-osc/IF amp TO-92 [S.4.15]	\$1.50 for 10
BFR91	NS RF Amp. 5GHz 1.9dBn @ 500MHz [S.case]	\$2.00 each
MFE121	Dual gate N-MOSFET 20V 5mA VHF Amp BF352 equiv. [S.case]	\$0.50
MPS5179	NS TO92 12V 50mA 200mW f_t 2000MHz N_f 5.0dB [S.5.13]	\$0.50 each
	RF Transistor. Use in UHF/VHF amplifiers with collector currents in the 100 uA to 30 mA range, and in low frequency drift, high output UHF oscillators.	
BFG67	NS 8GHz 50mA rf amp/preamp SOT143B package [S.case]	\$1.50 each
MPS5172	NS 25V 100mA f_t 120MHz [S.7.5]	\$0.10 each
MPS6507	NS, VHF Mixer, 20V, 100mA, f_t 700MHz [S.5.8]	\$0.20 each
C1-12	NS RF Pwr 400 – 500 MHz 1W 12.5V [S.Case]	\$1.00 each
C3-12	NS RF Pwr 400 – 500 MHz 4W 12.5V [S.Case]	\$2.00 each
MRF237	NS RF Pwr. VHF 4.0W 12V TO39 [S.5.13]	\$3.00 each
MRF449	NS RF Pwr. 2-30MHz 30W 12.5V stud mount [S.Case]	\$10.00 each
MRF559	NS RF Pwr. 806-960MHz 0.5W 12.5V [S.5.13]	\$0.50 each
MRF628	NS RF Pwr 400 – 500 MHz 1W 12.5V [S.Case]	\$2.00 each
MRF904	NS RF Small signal amp. f_t 4GHz 15V TO206 [S.5.13]	\$3.00 each
SD1144	NS RF Pwr 400–550 MHz 2W 12.5V stud mount [S.Case]	\$3.00 each
2N5945	NS RF Pwr 400–700 MHz 2W 12.5V stud mount. [S.Case]	\$3.00 each
2N5946	NS RF Pwr 400–550 MHz 10W 12.5V stud mount [S.Case]	\$4.00 each
2SC908	NS TO39 RF Amp 1W @ 500MHz 13.6V [S.5.13]	\$1.00 each
	Designed as driver and RF power amplifier. 0.5 to 0.8W output at UHF land mobile band. Gain 15dB ($V_{ce}=6.0\text{V}$, $I_c=5\text{mA}$, $f_t=2000\text{MHz}$)	
3SK45	Packaged as ECG221, dual-gate N-channel MOSFET for vhf amp and mixer applications. [S.6.16]	\$0.75 each
3SK192GR	Dual-Gate MOSFET 15V 30mA(max) [S.7.13]	\$1.00 each
2SC5488	NS 30V 70mA low noise rf pre-amp [S.6.4]	\$0.10 each

Recent additions:

BST70A	N-Chan DMOS 80V 0.5A TO92 switch	\$0.20 each
PMBT3904	NPN 40V 200mA switching transistor SMD	\$0.50 for 10
PMBT3906	PNP 40V 200mA switching transistor SMD	\$0.50 for 10