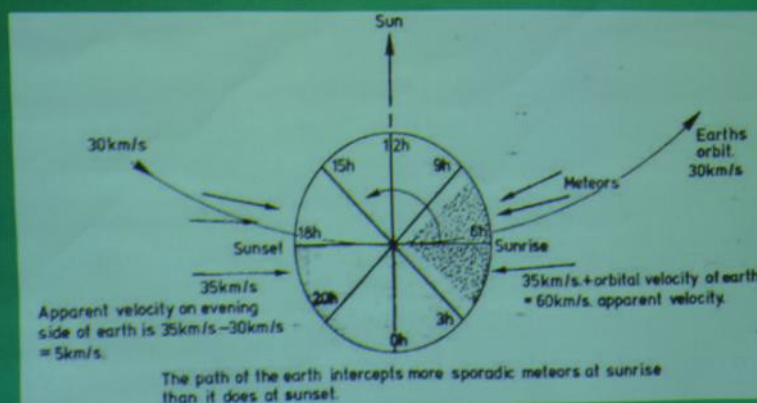


The Official Newsletter of the Auckland VHF Group Inc. Spectrum

Introduction

- The rate at which meteors the Earth's atmosphere peaks at around 6:00 AM local time
- Between midnight and 6:00 AM the Earth is turning into the path of oncoming meteors
- Meteors strike with higher velocity during this time.



From the presentation by James Smith ZL2ET
For details of his talk see page 6

Maintenance getting under way at the Clubrooms
See page 8



Auckland VHF Group Inc.

Branch 66 NZART

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

Office	Name	Call sign	Home	Work / Mobile	E-mail
President	Vacant				
Vice President	Dave Dingley	ZL1TIA	828 9394		marday@ihug.co.nz
Secretary	Marlene Matthews	ZL1MYL	634 5130		perma@xtra.co.nz
Treasurer	Vacant				
Committee	George Raffles	ZL1TUX	626 6944	021 735 361	graffles@xtra.co.nz
	Brendon Reid				brendon@aa.net.nz
	Peter Loveridge	ZL1UKG	377 3398		peterlov@ihug.co.nz
	Greg Storz	ZL1GSG	849 2878		
	Darryl Grange	ZL1TCI	817 4553		
AREC Section Leader	Laurie Mathews	ZL1ICU	634 5130	0274 817 463	perma@xtra.co.nz
Deputy Section	George Raffles	ZL1TUX	626 6944	021 735 361	graffles@xtra.co.nz
ZL1BQ Trustee	Vaughan Henderson	ZL1VH	418 1071	021 844 804	vaughanh@vodafone.co.nz
Repeater Trustee	Vaughan Henderson	ZL1VH	418 1071	021 844 804	vaughanh@vodafone.co.nz
Klondyke Managers	ZL1VH / ZL1BK				
690 Manager	Dennis Seymour	ZL1UET	278 0381		
850/670 Manager	Vaughan Henderson	ZL1VH	418 1071	021 844 804	vaughanh@vodafone.co.nz
ATV/Beacons					
Spectrum Editor	Peter Loveridge	ZL1UKG	09-4276362		peterlov@ihug.co.nz
Trading Table	Vaughan Henderson	ZL1VH			tradingtable@aucklandvhfgroup.org.nz
Hon Auditor	Raequel Probine		630 8044		
Webmaster	Terry Corin ZL1BPA				zl1bq.webmaster@gmail.com
Club Web Page					http://www.qsl.net/zl1bq
ATV Interest Group					http://www.qsl.net/zl1qf/atvug/ATVusers.html
ZL1VHD Dstar gateway administrator; Laurie ZL1ICU			634 5130	0274 817463	perma@xtra.co.nz
ZL1VHD Dstar gateway registration URL :					http://zl1vhd.dstar.org.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 peterlov@ihug.co.nz

Auckland VHF Group (Inc) Branch 66

General Meeting notice

11th September 2017 7.30pm, Hazel Avenue Club Rooms

(Located on left at the end of Hazel Avenue)

The Evenings Subject:

The Annual “Show & Tell”

Tonight you are the presenters. Your winter projects can see the light of day and inspire your colleagues to learn from and copy your ideas. There will be a prize for best project awarded by acclamation.

EVERYBODY WELCOME

Coming Events:

Sunday September 17 - Working Bee at VHF Group Clubrooms from 9.30 am onwards.

Saturday October 7 and Sunday October 8 - Weekend Ham Radio Class at 400 East Coast Road, Mairangi Bay. Contact Julian Dukes ZL1ABX (jules_d@xtra.co.nz) for more information.

Saturday October 14 - Come and help celebrate 45 years since our clubrooms opened. From 1pm at the Clubrooms, Hazel Avenue.

Saturday 4 November - Western Suburbs Branch Used Equipment Sale at Rosebank School Hall. Further details to come.

VHF Group General Meeting

Monday 14th August 2017 at the clubrooms

Attendance: As per attendance book plus a couple

ZL1VH, ZL1TUX, ZL2ET, ZL1TOF, Brendon Reid, ZL1TUJ, ZL1TCI, ZL1GYM, ZL1GSG,
ZL1EME, ZL1KG, ZL1AYV, ZL1ICU, ZL1TND, ZL1DRB, ZL1TDG

Apologies: ZL1TIA, ZL1TAY, ZL1SK

Moved: ZL1TDG **Seconded:** ZL1TUX

Start of Meeting: 07:45 pm **Meeting**

Chaired By: Vaughan, ZL1VH **Minute Taker:** George ,

ZL1TUX

Minutes of Last Meeting: The General Meeting Minutes of 10th July 2017, as published in the August 2017 club newsletter (Spectrum) is taken as Circulated,

Any Changes to the Minutes: None

Minutes taken as correct.

Moved: ZL1TUJ **Seconded:** ZL1UKG

Matters Arising: None.

Moved: **Seconded:**

Correspondence IN:

- 1) North Shore Newsletter
- 2) Amsat Journal
- 3) Invoice M&J Dingley, Doors and Hardware, for Clubrooms
- 4) Power Accounts
- 5) Break-In

Correspondence OUT:

None

Correspondence In, Received and Out Endorsed.

Moved: **Seconded:**

Accounts:

Accounts IN:

Club Maintenance D&M Dingley, Account for Door & Hardware \$164.94

Accounts OUT: No Accounts out.

Accounts, Received and Payments made on receipts of invoices.

Moved: ZL1TUX

Seconded: ZL1TUJ

PASSED

General Business:

- 1) Clubrooms update.
Borer in Door's have been replaced,
- 2) Discussions on stairs & ramp.
George Marr will help with documentation for ramp and grant application.
- 3) Club Open day 45 years at Hazel Ave, 14th October 2017. Clubrooms cleanup, maintenance.
Require Photo's and information on the Club building.
- 4) **Hamilton Market Day, 26th August.**
Peter, Vaughan

Business Meeting Closed. 8:07 pm

Meeting guest speaker James Smith, ZL2ET, gave an interesting talk on Meteor Scatter Communications.

Vaughan thanked James for his talk and presentation.

Meeting closed at 9:00pm

Supper was then served.

NOTE: A Subscription was received from George Marr, ZL1TUJ, (Deposited in inter- net account). \$45.00 sub, \$50.00 repeater (690?), D-Star \$5.00.

Operating Meteor Scatter with James Smith ZL2ET

What do you need and the PC software that helps you

The Earth is continually bombarded by small meteors arriving from a variety of directions with random velocities reaching up to 70 km / sec. Meteor showers give the best opportunity to make contacts with the short lived ionisation trails left by meteors entering the atmosphere. The best time to take advantage of meteors is between midnight and 6 am local time. This is when the rotation of the Earth around the sun and the rotation of the Earth add to the velocity of the incoming meteors to provide stronger ionisation hence stronger reflection of radio signals. A common source of meteors is the debris left in the tail of passing comets as they orbit the sun. The showers are named by the constellation they appear to come from in the sky. The Perseids is one of the strongest, originating from the tail of Halley's Comet. You can find out more about showers at the web site www.livemeteors.com. The sound you hear on opening this site is short pings amidst the roar of radio noise. Most meteors are tiny and don't take long to burn up. The ionisation they produce does not last for long.

To make use of the short bursts the current most popular software is MSK144 written by Joe Taylor K1JT. There are Forums where people talk about MSK144. MSK144 transmits 250 characters / sec using Forward Error Correction (FEC). The benefit is that it will only inform you of frames that decode without errors.

An antenna compromise is about 10 dBi of gain. A wider pattern will see a greater amount of sky which should contain more meteors. High gain will receive fewer weaker signals. Reflection at 6 m is stronger than 2 m and 70 cm is difficult to use because of the degree of ionisation required. A preamp will be required at 2 m. The height of HF ionisation is lower than the height where meteor ionisation occurs but during times of low sunspot counts 10 m may also be usable.

Peter Loveridge 07 September 2017 taken from James Smith's presentation



Southern Hemisphere

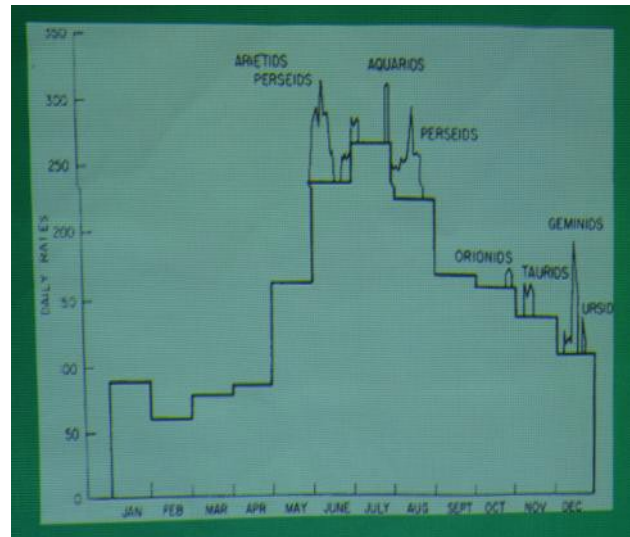
- January 3 or 4, 2017 Quadrantids
- April 21 or 22, 2017 Lyrids
- May 5 or 6, 2017 Eta Aquariids
- July 27-28, 2017 Delta Aquariids
- August 12 or 13, 2017 Perseids
- October 7 or 8, 2017 Draconids
- October 21, 2017 Orionids
- November 4-5, 2017 South Taurids
- November 11-12, 2017 North Taurids
- November 17 or 18, 2017 Leonids
- December 13-14, 2017 Geminids

Calendar

Photos Peter Loveridge from the presentation

Station Requirements

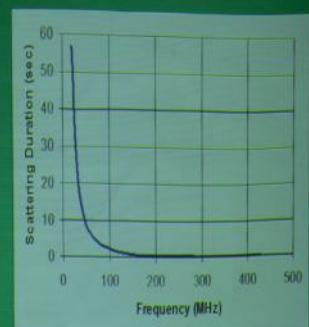
- RF output at least 100 W
- Good VHF transceiver or transverter with MDS of -125 dBm (3 KHz BW)
- Mast-mounted pre-amp, gain > 10 dB
- Horizontally polarized beam antenna, gain > 10 dB
- Signalink or other sound card interface
- Computer running WS-JTX or MSHV software



Intensity

Meteor Trails and RF

- After the trail has been created, electrons and ions slowly recombine, reducing the ionization and scattering ability of the trail
- The length of time over which a trail can scatter RF decreases rapidly with increasing frequency.



Ionisation

VHF Group News Round Up for September 2017

Maintenance Working Bee at Clubrooms Rewarding the building for 45 years of service

The date of **Sunday 17 September 2017 from 9:30 am** has been chosen to begin the work that will sustain the building into the future. The topics to be covered are :

- Clean the spouting and repair the break in the spouting on the tennis club side.
- Remove the borer ridden plywood panel.
- Fit Gib Board in its place.
- Install a hand rail on the inside of the front door (to be an extension of a rail on the stairs).
- Plastering the Gib if time and materials permit.

A suitable ladder is available to get onto the roof for cleaning. The new doors have given a lift to the appearance of the interior. There has been some purging of the collection of now ancient data books on the rear wall of the clubroom which is ongoing. Some of the Trading Stock is stored under the benches on the south side of the building. A few years of lack of interest at markets will see this being purged as well. Less is more !

The paint on the north side of the clubrooms is starting to become powdery. If the building is not painted over the coming summer the surface preparation will become much more extensive. It is likely that a contractor will be employed to do the work if able bodied volunteers are not available.

Until a permanent procedure is in place any email sent to the club may now be sent to vaughanh@vodafone.co.nz who will pass it to the people who used to get it from Doug.

These notes have been recorded your editor Peter Loveridge

Clubrooms Working Bee – Tuesday 8 August

A small team met at the clubrooms on Tuesday evening the 8th of August to replace two of the internal doors which had succumbed to damage. The Kitchen door and the door into the radio room both needed replacing. Prior to this, Dave ZL1TIA had measured the size of the old doors and, along with George ZL1TUX, had determined that new internal doors would cost us about \$50 each. Dave went ahead and purchased two suitable doors plus new lock sets and had delivered them to the clubrooms ready for our Tuesday night working bee. The new doors turned out to be the same height and width as the old ones (not bad after 45 + years) and thanks to Brendon's excellent selection of power tools, were soon fitted and the old doors cut up and disposed of.

Report by Vaughan Henderson ZL1VH

See page 9 for photos



Brendon welding power tools



George ZL1TUX fitting locks

Photos Vaughan ZL1VH

Margaret ZL1AVY cleaning up



The Civil Defence Community has a news letter which can be quite specific to locations and situations but there are general items as well such as this promotional item that appeared in the last issue.

Get Ready Week

The week, which starts 9 October this year, is an opportunity for MCDEM, CDEM Groups, partner agencies and other organisations to focus on public education and preparedness activities.

This year the theme for Get Ready Week is **Stay Safe, Stay Informed**. We'll be promoting the different ways people can stay informed during an emergency – which radio stations to listen to, which websites and social media to follow, the importance of getting to know your neighbours and checking if you can receive Emergency Mobile Alerts (see above).

Over the coming weeks, we'll be adding resources for you to share during Get Ready Week 2017. You can find out more at **www.civildefence.govt.nz**. If you want further information about how to get involved or have any questions, email **emergency.management@dpmc.govt.nz**.

Help Wanted:

The North Shore Amateur Radio Club, Branch 29, is looking for amateurs to help out with the annual Jamboree on the Air (JOTA) over the weekend of October 21, 22 and 23. This year JOTA falls on Labour Weekend and the Scouts have indicated that they want to make it a three day event.

JOTA activities will be held at Camp Maynard, 101 Paremoremo Rd, Lucas Heights, Albany. Can you come along and help? There are a number of radio related activities which require some willing radio amateurs to help with. You can be a radio operator on HF, VHF and UHF, operate the D- Star Station, help find contacts with other JOTA stations using IRLP and Echolink.

A radio orienteering activity using UHF PRS radios gets the young people used to using and talking on a hand-held radio. Other activities include a car rally experience using hand held radio to report car numbers and a simulated CD incident reporting activity.

Can you help over this weekend? Two or three hours on one of the days or a half or full day's help would be appreciated. If you can't get to Camp Maynard, you can still help by being on the air and be prepared to talk to the young cubs/scouts/brownies when you hear the ZL1AB JOTA station calling. Please let Vaughan ZL1VH know if you can assist.



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

INFORMATION

The Auckland VHF Group has an active AREC section that works closely with Auckland City Civil Defence. They provide advice, resources and manpower to assist in times of need. The Auckland VHF Group clubrooms provide a backup system to complement the existing systems maintained by Auckland City Council Civil Defence.

The AREC section is headed by Section Leader Laurie Mathews ZL1ICU.

From time to time the VHF Group has training sessions and exercises. Members also assist with sports events, parades and Rally NZ.

For further information about AREC please see the NZART web site.

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 Section Leader or his Deputy.

AREC:

Section Leader; Laurie Mathews ZL1ICU 634 5130 0274 817 463 perma@xtra.co.nz

Deputy Section; George Raffles ZL1TUX 626 6944 021 735 361 zl1tux@xtra.co.nz



AUCKLAND VHF GROUP (INC)

**SUPPORT THE EFFORTS OF THE VHF GROUP THROUGH YOUR
SUBSCRIPTION**

SUBSCRIPTIONS FOR 2017

THE SUBS GO TOWARDS;

- Maintenance and on-going improvements to beacons, repeaters and linking systems for the national system, including the Klondyke repeater site.
- Provides on-time and free access to spectrum magazine as soon as it is available.
- Provides 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 **\$45.00**

ASSOCIATE MEMBERSHIP **\$40.00**

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



SEE ATTACHED MEMBERSHIP RENEWAL FORM (next page)

REMEMBER TO KEEP US INFORMED OF YOUR INTERNET ADDRESS!

OTHERWISE WE CANNOT SEND YOU SPECTRUM!

NAME	Mr/Mrs/Miss/Ms	Christian or given name	Surname
	Mr		
Address			
		Phone: (home)	
		Phone: (work)	
		Phone (Cell)	
		Email	
Occupation:		Callsign	
NZART Member		Branch assigned	
AREC Member		Branch assigned	
Category			To pay
Membership	Full	\$45:00	\$
New/Renewal/Change	Associate	\$40:00	\$
Receipt #	Family Add	\$10:00	\$
Donations	Auckland ATV		\$
	Auckland/Klondyke		\$
	Brynderwyn		\$
	Data/D-Star		\$
	IRLP		\$
	Beacon/Repeater/Links/ATV Licences		\$
	Other		\$
		Total	\$
Payment			
Circle one -->	Cash	Cheque	Internet deposit
Invoice/Statement required	Please Advise Treasurer		
Internet	To account ASB 12-3020-0473626-00. Account name is: Auckland VHF Group Inc. Include your Name/Callsign for us to track. Note: this form needs to be returned to update records. FAX to 028 25544801 or Email		
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 2017

Repeater frequency and name	Repeater location	Sponsorship advised for 2017	Amount paid
53.725 Repeater	Klondyke Road		
144.253 Beacon	Nihotupu	ZL1IU	50.00
145.625 Data Rptr	Klondyke Road	NON-operational	
145.650 Dstar repeater	Klondyke Road	ZL1ICU	50.00
146.625 Repeater	Klondyke Road	ZL1ICU	50.00
146.700 Repeater	Ruaotuhenua	ZL1TUJ	50.00
146.900 Repeater	Mt Puketutu Radio		
432.253 Beacon	Nihotupu	Under repair	
438.175 Dstar repeater	Klondyke Road	ZL1ICU	50.00
438.500 Repeater	North Head		
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	ZL1ABS	50.00
		Total Sponsorship	\$300.00
NZART Inc: Branch/Personal donations			
Franklin Radio Club. Br: 10		\$200.00	
Papakura Radio Club. Br: 65		\$500.00	
Auckland Radio Club. Br: 02		\$100.00	
		\$	
		\$	
	Donations	\$800.00	
Current as at 05/09/2017			

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 2017 or donate towards the Group's repeater Operations.

TRADING TABLE

Currently our Trading Table is only open on meeting nights. Opening on Saturdays may resume later in the year so keep an eye out for announcements in Spectrum.

NEW – NEW - NEW

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



And there's

more....



More from the Trading Table: Surplus filters from analogue TV



Motorola Oncore VP GPS Receivers

The VP Oncore is Motorola's original credit card-sized 8-channel GPS receiver. It measures just 2" x 3 1/4" x 1/2", has very low power requirements, and is well suited for embedded applications. The VP Oncore has the capability of acting as a DGPS reference station for greater position accuracy.

The units on offer have been in storage for some time, and the tinplate screen covers show some signs of corrosion – see photo. Most of the units have a sticker attached saying "Prog NMEA" and are likely to output data in NMEA V2.0 serial format.

Interface is via a 10-pin board header – see reference below for pinout details. Power supply is 5.0v +/-0.25V. Module requires an external active GPS antenna (5V power supplied by receiver module). GPS connector is a snap-on type OSX. Output data includes a 1PPS (one pulse per second) output and TTL level Tx and Rx data lines.

More details can be found at : <ftp://ftp.tapr.org/gps/motorola/oncore.eng.notes.pdf>



\$20.00 each – limited quantity.



N-Type connectors for LMR-400

Crimp-on only. \$5.00 each

Other coaxial connectors available from the Trading Table:

Please note we have sold out of TNC connectors – these are no longer available.

BNC plugs 50 ohm for RG58 coax (solder/clamp type)	\$2.50 each
BNC plugs 50 ohm for RG58 coax (crimp on type)	\$2.50 each
BNC sockets 75 ohm – single hole mounting	\$1.50 each
N Type male solder on suit RG213 coax	\$4.00 each
N Type male right angle, suit RG213 coax	\$4.00 each
N Type male crimp on suit RG213 coax **	\$3.00 each
N Type socket crimp on suit RG213 coax **	\$3.00 each
N Type male right angle, solder on suit RG213 coax	\$4.00 each
N Type male sliver plated solder/clamp on suit RG58 coax	\$3.00 each
N Type male crimp on suit RG58 coax **	\$2.50 each
N-Type adaptor Male to Male \$3.00 each	Adaptor TNC Male to UHF Female \$3.00 each

**** Crimping service available for these at club meetings.**

Need Crystals for your next project?

3.579545 MHz HC18/U wire ended holder	
4.194304 MHz HC18/U wire ended holder	\$1.00 each
4.1952 MHz HC18/U wire ended holder	\$1.00 each
4.33618 MHz HC18/U wire ended holder	\$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	\$1.00 each
14.31818 MHz HC18/U wire ended holder. Rakon J30G-4H spec	\$2.00 each
14.7456 MHz HC49/S SMD package	\$1.00 each
17.472 MHz HC18/U wire ended holder	\$1.00 each
18.432 MHz HC18/U wire ended holder	\$1.00 each
20.0000 MHz HC49S SMD package P/No.7D20000183BSAF25Q3	\$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

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).	\$1.00 each
MGF1302	Low noise GaAs FET $N_f = 1.4\text{dB @ } 4\text{GHz}$, $4\text{dB @ } 12\text{GHz}$.	\$5.00 each
BFR91	NS RF Amp. $5\text{GHz } 1.9\text{dBnf @ } 500\text{MHz}$	\$2.00 each
BFY90	NS $30\text{V } 50\text{mA } 2.5\text{dBnf @ } 200\text{MHz}$ TO72 VHF/UHF	\$1.50 each
MFE121	Dual gate N-MOSFET $20\text{V } 5\text{mA}$ VHF Amp BF352 equiv.	\$0.50 each
MPS5179	NS TO92 $12\text{V } 50\text{mA } 200\text{mW}$ ft $2000\text{MHz } N_f 5.0\text{dB}$ 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.	\$0.50 each
BFG67	NS $8\text{GHz } 50\text{mA}$ rf amp/preamp SOT143B package	\$1.50 each
MPS5172	NS $25\text{V } 100\text{mA}$ Ft 120MHz	\$0.10 each
MPS6507	NS, VHF Mixer, 20V , 100mA , Ft 700MHz [data]	\$0.20 each
MRF237	NS RF Pwr. VHF $4.0\text{W } 12\text{V}$ TO39	\$3.00 each
MRF559	NS RF Pwr. $806\text{-}960\text{MHz } 0.5\text{W } 12.5\text{V}$	\$0.50 each
MRF904	NS RF Small signal amp. Ft $4\text{GHz } 15\text{V}$ TO206	\$3.00 each
2SC908	NS TO39 RF Amp $1\text{W @ } 500\text{MHz } 13.6\text{V}$ Designed as driver and RF power amplifier. 0.5 to 0.8W output at UHF land mobile band. Gain 15dB ($V_{ce}=6.0\text{V}$, $I_c=5\text{mA}$, ft= 2000MHz)	\$1.00 each
3SK45	Packaged as ECG221, dual-gate N-channel MOSFET for vhf amp and mixer.	\$0.75 each
3SK73GR	Dual-Gate MOSFET N-channel $30\text{V } 7\text{mA}$	\$1.50 each
3SK74L	Dual-Gate MOSFET N-Channel $20\text{V } 25\text{mA}(\text{max})$	\$1.00 each
3SK192GR	Dual-Gate MOSFET $15\text{V } 30\text{mA}(\text{max})$	\$1.00 each
2SC5488	NS $30\text{V } 70\text{mA}$ low noise rf pre-amp	\$0.10 each
BF199	NS $25\text{V } 25\text{mA}$, 500mW ft = 550MHz TO92	\$1.00 for 10
BF494	NS $20\text{V } 30\text{mA}$ Low noise mix-osc/ IF amp TO-92	\$1.50 for 10
40673	Dual-gate N-Mosfet – See MFE121	\$0.50 each