



Headquarters - Info - Line

... a service from ...

The New Zealand Association of
Radio Transmitters Incorporated



15 February 2004

Issue # 68

Greetings Everyone,

Welcome to **Headquarters-Info-Line** a fortnightly bulletin of news from NZART Headquarters E-mailed directly to Branches.

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NZART Business Manager Debby ZL2TDM Says:

Break In - Many of you will appreciate that at this time of year the number of Break In's ordered are comparative to the number of members listed, with a few left for late payers. As I only have a small number left of the Jan/February issue of Break In, for those of you who have yet to pay, please be aware that unless your payment is received soon, I may run out.

Call book on CD Rom - For those interested in ordering the free Call Book on CD which is in addition to the hard copy version, I will extend the closure for ordering until February 23rd **at the latest**. I am still receiving several orders, however I do have to apply a cut off to ensure stock availability.

Council and Remits - This weekend Council met in Porirua to discuss many activities and issues within the Association. A more formal report will be made available in the next issue of HQ Info-line. There will only be two remits submitted at Conference this year, one of them being the proposed updated NZART Constitution. Printing of this document will be in the March/April issue of Break In.

IARU Region 3 Conference in Taiwan - Four NZART delegates are now in attendance at the triennial IARU Conference being held in Taiwan. A report will be made available to all members on their return.

See you later – Debby ZL2TDM

Amateur Licence Statistics from the Ministry of Economic Development's web site with Tony Case ZL1UD:

Category	Date Oct. 23, 03	Date Nov. 25, 03	Date Dec. 19, 03	Date Jan.23, 04	Date Feb.13, 04
General Grade	3198	3155	3162	3168	3170
Limited Grade	1546	1516	1525	1534	1540
Novice Grade	12	12	12	12	12
Total Licensed	4756	4683	4699	4714	4722
Amateurs					
Beacons	42	42	42	42	42
Digi-peaters	28	28	28	29	29
Fixed	2	2	2	2	2
Repeaters	211	211	211	211	211
TV Repeaters	19	19	19	19	19
Total Licenses	5058	4985	5001	5017	5025

Experience Marlborough 2004 NZART Conference:

When - Queens Birthday weekend, 5th & 6th June 2004.

Where - Marlborough Girls College, McLaughlan Street, Blenheim.

The 78th annual NZART conference in Marlborough the gourmet province is easily accessible by road, air and sea; there is no excuse not to come!

Forum topics are virtually finalised and include something for everyone. Home brew Test Equipment, Kiwi Sat, Medical Equipment (to follow on from imaging two years ago), IRLP and Echo Link, New Amateur Radio Equipment with Mainland Radio & Com-Centre, A forum on the National System, FMTAG with procedures and advice on repeater problems, DX, also Marine electronics. In Sunday's lineup expect SPAM, AREC, WARO, OTC and AMSAT-ZL.

The registration cost for the Marlborough 2004 Conference will be the same as for the Wairarapa Conference last year. Look for the Conference registration form in your March/April edition of Break-In. It will also be available on-line early in March.

Accommodation remains at a premium in Blenheim for this holiday weekend so book early and avoid disappointment. For information see our website: www.zl2ks.com

Contact: Conference Secretary: Helen Harris ZL2TPT

Telephone or Fax: 03 575 7181

Or e-mail: mt.adde@xtra.co.nz

FMTAG NEWS:

FMTAG Notes Approved At The February 2004 Council Meeting

NZART Council, at its meeting on Saturday the 14th of February 2004, approved publication of the discussion document ***“A NEW FREQUENCY PLAN FOR THE NATIONAL SYSTEM”*** A copy of this document is attached to this issue of HQIL.

Comments should be sent by post to FMTAG, c/o NZART, P.O. Box 40-525, Upper Hutt, or by email to: fmtag@nzart.org.nz

APRS ON THE HF BANDS

In a previous issue, we advised that several members were keen to try APRS on the HF bands and had enquired about suitable frequencies.

Different frequencies appear to be in use, by groups in different areas. It would appear that a unified set of frequencies, as on VHF, UHF and SHF, would be desirable.

So far, FMTAG has received one set of comments on this subject.

This is a second call for comments on suitable frequencies for HF APRS, preferably with supporting evidence. Comments can be sent by post to NZART Headquarters, or by email to the address at the end of this report.

PAPAKURA BRANCH 65 VOICE-OVER-INTERNET SYSTEM

Papakura Branch 65, in association with Branch 86, the Suburban Amateur Radio Club, has applied for coordination of a Voice-Over-Internet system.

The main station will be a 2 metre repeater at Ponga Hill, Papakura, at NZ260 map reference R12 886529. We have selected 545 as being the most appropriate, corresponding to a repeater transmit frequency of 145.450 MHz and a repeater receive frequency of 144.850 MHz.

The Ponga Hill station will be linked to the existing 5775 (2 metre) repeater at Musick Point, at NZ260 map reference R11 800818, by means of a bi-directional UHF link. We have selected 438.125 MHz for the Ponga Hill transmit frequency, and 433.125 MHz for the Musick Point transmit frequency, as being the most appropriate.

The corresponding Internet access station will be located at the Branch 65 clubrooms, at NZ260 map reference R12 812590.

The Ponga Hill station will be linked to the Internet access station by means of a bi-directional UHF link. We have selected 438.000 MHz for the Ponga Hill transmit frequency, and 433.000 MHz for the Branch 65 clubrooms transmit frequency, as being the most appropriate.

INTERIM RECOMMENDATIONS TO COUNCIL

National System frequency plan, as mentioned above.

Mercury Bay Branch 85 has applied to move the 7075 repeater, by a distance of less than 3 km, to Kakaratahei, at NZ260 map reference T11 385754. Engineering analysis confirms that this repeater can continue to operate on the existing channel 7075, corresponding to a repeater transmit frequency of 147.075 MHz and a repeater receive frequency of 147.675 MHz.

Papakura Branch 65 Voice-Over-Internet system, in association with Branch 86, the Suburban Amateur Radio Club, as mentioned above.

FINAL RECOMMENDATIONS TO COUNCIL

Tararua Branch 06 has applied for co-ordination for a 2 metre linking transceiver to be located at Wharite, NZ260 map reference T23 528015, for the purposes of linking the 9225 Wharite (70 cm) repeater to the 5625 (2 metre) repeater at Butters, NZ260 map reference T25 672674.

Whangarei Branch 28 has requested a site change for the 725 repeater to Horokaka, NZ260 map reference Q07 132917, and the addition of a 70 cm repeater at Horokaka. We have selected 9575 for the 70 cm repeater, corresponding to a repeater transmit frequency of 439.575 MHz and a repeater receive frequency of 434.575 MHz, as being the most appropriate.

Hastings Branch 13 and Napier Branch 25 have jointly applied for co-ordination for a stand-alone 70 cm Voice and Data repeater to be located at Threave, NZ260 map reference V22 341547. We have selected 9675, corresponding to a repeater transmit frequency of 439.675 MHz and a repeater receive frequency of 434.675 MHz, as being the most appropriate.

North Otago Branch 64 has applied to relocate the 865 repeater to a site on Cape Wanbrow, Oamaru, at NZ260 map reference J41 505639. An engineering analysis confirms that this repeater can continue to operate on the existing channel 865, corresponding to a repeater transmit frequency of 438.650 MHz and a repeater receive frequency of 433.650 MHz.

The Auckland VHF Group Branch 66 has applied to relocate the North Shore 190 (23 cm) repeater to a site in Glenfield, at NZ260 map reference R11 642880. An engineering analysis confirms that this repeater can continue to operate on the existing channel 190, corresponding to a repeater transmit frequency of 1291.900 MHz and a repeater receive frequency of 1271.900 MHz.

Christchurch Branch 05 has applied for co-ordination of a 2 metre APRS Digi, to be located at Marleys Hill, NZ260 map reference M36 801332. The APRS Digi will operate on 144.575 MHz, in accordance with the bandplan shown on page 3-12 of the current Call Book.

Christchurch Branch 05 has applied for co-ordination of a 2 metre propagation beacon, to be located at the Branch Clubrooms, NZ260 map reference M35 831434. The beacon will operate on 144.285 MHz, in accordance with the geographic bandplan.

Christchurch Branch 05 has applied for co-ordination of a 70 cm propagation beacon, to be located at the Branch Clubrooms, NZ260 map reference M35 831434. The beacon will operate on 432.285 MHz, in accordance with the geographic bandplan.

COMMENTS

As always, we value your comments and suggestions on the above matters and recommendations, and on any other FMTAG matters.

Please send your comments by mail to **FMTAG, NZART Headquarters, PO Box 40-525, Upper Hutt**, or by e-mail to fmtag@nzart.org.nz

APPLICATIONS

Applications for repeaters, beacons, digipeaters, point-to-point links, and so on, should be made on the latest version of FMTAG Form 10, which may be obtained from the above address, in paper or electronic versions. Completed forms should be sent to NZART Headquarters or by e-mail to fmtag@nzart.org.nz

Stolen Equipment Register Info with Roy Symon ZL2KH:

Please contact the Police, the owner or Roy Symon ZL2KH if you know the whereabouts of this FM Transceiver.

Make: Yaesu

Model: FT-1500M

Serial Number: OGO82979

Type: Dual band FM transceiver

Stolen From: It was in a car that was stolen from the Wellington Railway Station.

Date: February 2004

Owner: S. McFadyen, ZL2VSS - Call Book address

Police: Wellington Central

Contests with Stan White ZL2ST:

Next Saturday February 21 the first NZART Boat Anchor Contest will be held between 0730-0900 UTC on 80 metres. There are two operating periods 0730-0815 and 0815-0900 UTC - phone and CW on 80 metres with valve equipment.

See the November/December SPAM column in Break In or the NZART contest website for full details. The ARRL International CW contest is also on this weekend (21/22).

The Jock White Memorial Field Day is on 28/29 February between 3 pm and Midnight Saturday and 6 am and 3 pm on Sunday. Home stations have been included this year. Phone and CW on 80 and 40 metres. See the 2002/3 callbook for all details except for Home stations, details of which are given in the November December Break In contests column and on the NZART website. All phone stations are encouraged to have at least 50 phone contacts on the band(s) that they are on. In the case of CW 25 contacts are encouraged (and essential for Field Stations to qualify as a multiplier).

Dates To Remember:

- **Next NZART Official Broadcast 8pm & 9pm on Sunday 29th February.**
- **Next HQ-Info-Line e-mailed on Sunday 7th March.**
- **Closing Date for copy for Next Break-In 10th March.**
- **NZART Conference 5th and 6th June 2004 at Marlborough Girls College, Blenheim.**

73

Jim Meachen ZLZBH

Editor

NZART Council, at its meeting on Saturday the 14th of February, 2004, approved publication of the following discussion document.

Comments should be sent by post to **FMTAG, c/o NZART, P.O. Box 40-525, Upper Hutt**, or by email to: **fmtag@nzart.org.nz**

A NEW FREQUENCY PLAN FOR THE NATIONAL SYSTEM

The NZART Bandplan reserves 433 MHz to 435 MHz for the inputs of non-inverted local and National System repeaters, and for the outputs of inverted National System repeaters. Similarly, 438 MHz to 440 MHz is reserved for the other half of the frequency pairs.

In 2003, the Ministry of Economic Development (MED) created a General User Radio Licence (GURL) for Short Range Devices (SRD), on frequencies between 433.05 MHz and 434.79 MHz, occupying almost all of the 433 to 435 MHz repeater frequency range. As a consequence many repeaters (and the National System) are suffering increasing interference from these devices.

Interference to the National System is particularly annoying, since all of the National System repeaters turn on when any one of them is triggered by a SRD. Therefore, any remedial action should give priority to the National System.

FMTAG proposes a two-pronged approach:

1. National System 70 cm Repeaters. A new frequency plan is proposed, using frequencies above 434.79 MHz.
2. Local 70 cm Repeaters. On-demand re-location to lesser-used SRD frequencies is proposed. Several Branches have already completed frequency co-ordination for new 70 cm frequencies for their existing repeaters.

The remainder of this document considers a new plan for the National System.

NATIONAL SYSTEM PLAN

On first inspection, 434.800 MHz to 435.000 MHz (200 kHz) appears to be free of SRD interference. This allows eight frequency pairs at 25 kHz spacing:

Non-inverted repeater inputs in the range 434.800 to 434.975 MHz
Non-inverted repeater outputs in the range 439.800 to 439.975 MHz

Depending on the out-of-band radiation characteristics of the SRDs, it is advisable to minimise use of the lowest frequency pair, 434.800 MHz/439.000 MHz.

FACTORS CONSIDERED

1. That the existing network layout is to continue, as far as possible, featuring three types of station:

a. Non-inverted repeaters, on frequencies such as 9xyz. These repeaters use directional or omni-directional antennas, as required, and are associated with one, or more, ULS for in-band linking, described next, and priority logic controllers.

b. UHF linking Stations (ULS), on frequencies such as 9abc. These repeaters use highly-directional antennas and are associated with non-inverted repeaters, described above, and priority logic controllers.

c. Inverted repeaters, on frequencies such as 4abc. These are stand-alone repeaters with ordinary controllers, and use directional or omni-directional antennas, as required.

Several non-inverted National System repeaters are co-located with non-inverted Local repeaters. Both repeaters need to have the same input/output frequency split sense, to avoid massive on-site de-sensing.

2. That the system inherently has more non-inverted than inverted repeaters.

3. That there are only seven interference-free frequencies available at the top of the band.

4. That interference to/from other modes on 70 cm should be minimised.

For example, the 433 to 435 MHz band is shared between FM repeaters and ATV. One condition of this frequency sharing is that ATV operators are required to use one of five precise frequencies, offset from the nominal TV frequencies in accordance with a geographic plan. If possible, the new National System plan should continue to be compatible with this frequency offset plan, to avoid yet another re-crystalling of ATV transmitters.

The ATV interference pattern repeats at multiples of 125 kHz. Therefore, a frequency shift of a multiple of 125 kHz, from the existing FM repeater frequency plan, minimises the two-way interaction between narrow band modes and ATV.

5. That “propagation overshoot lock-up”, caused by the indiscriminate mixing of inverted and non-inverted repeaters on the same frequency, must be avoided, especially during periods of enhanced tropospheric ducting. The lock-up problem would be avoided if other bands were used for all, or most, of the linking.

Therefore, in consideration of these factors, the following frequency usage is recommended.

LOW FREQUENCY HIGH FREQUENCY SUGGESTED USAGE

434.800 MHz	439.800 MHz	minimise or avoid use of this frequency
434.825 MHz	439.825 MHz	non-inverted repeaters
434.850 MHz	439.850 MHz	inverted repeaters and ULS
434.875 MHz	439.875 MHz	non-inverted repeaters
434.900 MHz	439.900 MHz	inverted repeaters and ULS
434.925 MHz	439.925 MHz	non-inverted repeaters
434.950 MHz	439.950 MHz	inverted repeaters and ULS
434.975 MHz	439.975 MHz	non-inverted repeaters

IMPLEMENTATION

Individual linking segments, consisting of an inverted repeater in the middle and a ULS at each end, can be changed when convenient. The only impact on the rest of the National System is the unavailability of that segment during the on-site frequency changes, involving filter/duplexer/transmitter/receiver re-tuning.

PROPOSED FREQUENCY ALLOCATION METHODOLOGY

The existing National System frequency plan (first created in 1987) made provision for 72 stations (36 repeaters and 36 ULS), on 15 frequency pairs. Therefore, co-channel interference is likely to increase when all of these stations have to be accommodated on seven (or eight) frequency pairs.

The new plan requires:

1. Maximum frequency re-use. For example, the existing plan features six stations on 900, while some other frequencies have only one station each.
2. Appropriate antennas. Mobiles should use roof-centre-mounted omni-directional antennas and home stations should use directional antennas. Complaints of interference should not be accepted from users having inappropriate antennas. Similarly, users causing interference by the use of excessive power, and inappropriate antennas, should be counselled.
3. Designated exclusive frequencies for non-inverted repeaters (four frequencies) and inverted repeaters (three or four frequencies), to avoid propagation overshoot lock-up.
4. Interleaved frequencies for non-inverted repeaters and inverted repeaters. This minimises the frequency spacing at non-inverted repeater/ULS sites, maximises the achievable notch depths in the repeater duplexers and minimises on-site intermodulation.

SPECTRUM EFFICIENCY

The frequency scarcity problem is particularly acute in the centre of the North Island. Many instances of “double coverage”, or of “multiple coverage”, have been noted or reported. This represents an inefficient use of radio spectrum, and can prevent the re-use of frequencies at other locations.

Undesirable double coverage occurs when stations are located at less-than-optimum sites, and additional stations are required to fill-in the coverage deficiencies of the first station. However, in doing so, there are significant areas where both stations provide coverage.

Solutions to this problem include:

- a. re-locate stations to better sites.
- b. reduce antenna gain and/or introduce directional antennas; reduce transmitter power and receiver sensitivity of the repeaters.

DOUBLE (OR MULTIPLE) COVERAGE

Most of the existing stations can be accommodated in the seven or eight available frequency pairs of the plan, by eliminating double (or multiple) coverage. Several examples of double coverage will now be discussed, to illustrate the problem.

1. Te Mata and Mount Erin.

The better coverage by Mount Erin, when compared with Te Mata, was revealed when the linking antenna polarisation at Mount Erin and Wharite was corrected, from horizontal to vertical. Te Mata has generally inferior coverage and poor linking potential, owing to its much lower altitude. There is a shortage of frequencies in this area, partly caused by the problems mentioned below, in example 6.

Te Mata occupies a frequency that could be better used at Whakapunake to extend the National System to Gisborne. Whakapunake, inland from Wairoa, also back-fills those northern parts of Napier obstructed from/to Te Mata and Mount Erin.

Recommendation. That the Te Mata National System station be deleted from the plan, to release a frequency for Gisborne.

2. Egmont.

The present number of stations linked to Egmont (seven), using six frequencies, exceeds the number of available interference-free frequencies (four). Therefore, some rationalisation, or site relocation, and/or frequency sharing, is required. This will be discussed in the next two sections.

3. Kapiti/Horowhenua.

Paekakariki Hill causes a “hole” in the northern coverage of Belmont. Mount Field and Pukehou are intended to provide coverage along the deficient part of Highway 1. However, there is a substantial amount of double coverage. Neither site has entirely satisfactory coverage. The continuing growth of the surrounding pine trees continues to degrade the performance of the present Mount Field site. Mount Field also puts considerable signal levels into Nelson and Marlborough, preventing re-use of the frequency.

Recommendation. That the two stations be replaced by a better, single site, properly designed to cover the deficient part of Highway 1. That the repeater use directional antennas, to match the shape of the coverage hole and to permit frequency re-use in Nelson/Marlborough.

4. Wanganui.

Wanganui Branch desires to fill localised coverage deficiencies, and has chosen to use a low altitude site. This station was previously to be located at a much higher site and, as a consequence, was coordinated on a clear, wide-area coverage, frequency. Frequency sharing with another station is necessary.

Recommendation. That Wanganui reduce transmitter power, use directional antennas, and share the frequency with Belmont.

5. Nelson.

The current network uses two stations in Nelson: an intermediate linking site at Saddle Hill and a nearby coverage site at Fringed Hill.

Murchison also requires a frequency, but finding one, not already in use in Taranaki/Wanganui/Manawatu, is difficult because of Murchison’s altitude and its open outlook to the North/North East. An alternative method of linking Nelson to Belmont would allow the Saddle Hill frequency to be re-located to Murchison.

Recommendation. That an alternative method of linking between Nelson and Belmont be investigated, to release a frequency for Murchison. Alternatively, the non-preferred frequency pair of 434.800 MHz/439.800 MHz could be used at Saddle Hill, on condition of non-interference from SRDs.

6. Waikato.

This area is surrounded by three major coverage stations:

Auckland (Klondyke) to the West, on frequency pair A.

Taupo (Pihanga) to the South, on frequency pair B.

Gisborne (Whakapunake) to the East, re-using frequency pair A.

This leaves two interference-free frequency pairs: C and D.

The present plan shows four local-coverage stations linked to Kaimai, each having its own frequency. Therefore, some rationalisation/site relocation and/or frequency sharing is required. The following allocations are suggested if frequency sharing is to be attempted, instead of rationalisation/site relocation:

Rotorua and Waitomo on C. Also allocated to Whangarei and Kapiti.
Edgecumbe and Hamilton on D. Also allocated to Bay of Islands and Wharite.

7. Obstructed paths.

Many existing paths are obstructed, for a variety of reasons.

High gain antennas, high output power amplifiers, and high gain receive amplifiers have been used, in an attempt to overcome site deficiencies. The use of such “performance enhancements” causes performance and network planning problems.

- a. High gain antennas are less reliable than low gain antennas. Antenna failure, or water ingress, causes on-site intermodulation.
- b. High output power amplifiers have lower reliability. Also, every 1 dB increase in power causes a 3 dB increase in on-site 3rd-order intermodulation. Every 1 dB increase in power requires a corresponding 1 dB increase in duplexer isolation, to maintain on-site self-pollution noise and overload margins.
- c. High gain receiver amplifiers increase the susceptibility to overload of the following receiver, by on-site transmitters.
- d. The combination of high gain antennas and high output power amplifiers causes excessive co-channel interference to distant stations on the same channel. The combination of high gain antennas and high gain receive amplifiers causes excessive co-channel interference from distant stations on the same channel.
- e. Another problem has been noted, particularly on the multiple-obstructed path between Klondyke and Brynderwyn, when the mid paths obstructions effectively disappear during periods of enhanced tropospheric propagation. At these times, the incoming signals, from the other site, are so strong that they cause additional on-site intermodulation in the repeater receivers.

NEW FREQUENCY PLAN AND PATH PROFILES

The first draft of a frequency plan has been created, based on the above principles and on the known performance of existing stations. This plan makes provision for all the existing stations (except as noted above), and recently co-ordinated stations, plus further extensions on the East Coast, West Coast, Otematata, Twizel, Invercargill and Central Otago.

This plan will be published once its theoretical performance has been confirmed. This mainly involves the calculation of path profiles to confirm:

- a. 35 linking paths
- b. 83 coverage area to coverage area paths, to confirm that co-channel interference is acceptable
- c. 139 ULS to distant inverted repeater paths, to confirm that overshoot interference is acceptable (this is different from overshoot lock-up)