PAPUA NEW GUINEA TELECOMMUNICATION AUTHORITY

PNG Radiocommunications & Telecommunications Technical Authority

THE 148 – 174 MHz BAND PLAN

Papua New Guinea Telecommunication Authority September 2008

THE 148 174 MHz BAND PLAN

Table of Contents

Appendices :

THE 148 - 174 MHz BAND PLAN

1.0 INTRODUCTION

Papua New Guinea as a developing country is experiencing a growing demand for all types of communications. As technology advances and overall communication costs decrease the radiocommunication services become affordable by a larger number of potential users. The public in general and business in particular become more aware of and dependent on the benefits of radiocommunications which are now regarded as a necessity rather than a luxury. All these factors ultimately increase the demand for spectrum which is a valuable and limited resource.

This is especially true for the Land Mobile Radio (LMR) service in the 148 - 174 MHz band which is traditionally referred to as the VHF High Band. There has been a spectacular growth in utilisation in this band over the recent years with no signs of diminishing in the near future.

The growth in the number of annual licences for the last few years exceeds 10%, to the point where in Port Moresby and the Highlands area it is now becoming difficult to allocate vacant frequencies to new services and to expand existing services. Fear of vandalism has lead to the use of high altitude repeater installations which significantly increases the frequency re-use distance and further aggravates the frequency assigners task.

The availability of affordable mature radio communication equipment and the good propagation characteristics of the VHF bands make these bands very popular for LMR users, especially in rural and suburban areas. It is certain that the demand for frequencies in this band is likely to increase even more in the near future.

Spectrum Management in Papua New Guinea is a responsibility of the the Papua New Telecommunication Authority (PANGTEL). The role of PANGTEL is to manage the RF spectrum in accordance with international agreements. This is achieved in practice through the adoption of a National Table of Frequency Allocations and the implementation of band plans and planning guidelines. The ultimate aim is to ensure equitable and efficient use of the RF spectrum for the benefit of all users in PNG.

2.0 BACKGROUND

In order to get some insight into the VHF High Band usage in PNG and to identify the areas where the Auhtority is experiencing difficulties in satisfying the demand for channels for new services and for expansion of existing services, the Spectrum Engineering Section investigated the existing departmental records on frequency usage in the VHF High Band.

This investigation revealed that there was an unbalanced distribution of assignments for the various segments. While in some segments almost all of the available frequencies had been assigned, in general, the band was not being efficiently utilised.

To inform the major radiocommunication users, service providers, dealers and other concerned organisations and industry in PNG, and to invite submissions of inputs and expressions of interest regarding the replanning of the VHF High Band, the then Spectrum Management Department circulated a letter in December 1991 stating our intention to review the existing spectrum arrangements in the VHF High Band.

Following supportive written and verbal responses from a number of organisations the First Draft Band Plan was released and distributed for comments in February 1992. Subsequently, in response to the comments and questions raised by the then PTC Telecom Planning Department and the Telecommunication Industry Association of PNG two separate meetings were held with representatives from both organisations. Agreements reached at these meetings have been taken into account in the preparation of the draft band plan.

1.0 EXISTING VHF HIGH BAND PLAN

The current VHF High Band Plan in PNG was originated in 1980 by the then Radio Branch of the Postal and Telecommunication Services, in the Department of Public Utilities.

This Band Plan sets the VHF High Band between 148 and 174 MHz. Excluding the 156.000 - 157.425 MHz and 160.600 - 162.050 MHz International Maritime bands and the 149.9 - 150.050 MHz Radio Navigation Satellite band the total spectrum available for Land Mobile allocations is 23 MHz.

Three important user groups with spectrum requirements in the VHF High Band are: Government, Telikom and Private. Based on projections for spectrum requirements for each user over a period of time the existing Band Plan apportions the available spectrum to the major users for their exclusive use and currently supports a variety of radiocommunications services, as shown in the table below:

User		Service	Type of radio systems	Frequency system
PTC	10 MHz (43.5%)	Fixed	Single Channel Links	Two Frequency
		Fixed	RTSS	Two Frequency
		Fixed	Multi Channel Links	Two Frequency
		L Mobile	Two Way Mobile Radio	Two Frequency
Government	6 MHz (26%)	L Mobile	Two Way Mobile Radio	Two Frequency
		L Mobile	Two Way Mobile Radio	Single Frequency
Private	5 Mhz (22%)	L Mobile	Two Way Mobile Radio	Two Frequency
		L Mobile	Two Way Mobile Radio	Single Frequency
Shared	2 MHz (8.5%)	L Mobile	Two Way Mobile Radio	Single Frequency

Except for the channelling arrangements for the Multi Channel Links, which are based on a 200 kHz channel spacing and a transmit/receive frequency split of 6 MHz, all other radio systems are based on 25 kHz frequency spacing and a frequency split of 4.6 MHz.

4.0 MAIN OBJECTIVES OF THE BAND PLAN

There being a need for major changes it is proposed that the new spectrum arrangements in the VHF High Band will:

- Increase the number of available channels in general, particularly for the land mobile service. This will alleviate difficulties presently experienced in the frequency assignment process, when suitable frequencies for new applicants are needed. It will also facilitate the expansion of existing systems;
- Improve overall band productivity and avoid long term congestion in the assignment of frequencies. By allowing all users equal access to a greater portion of the band the present imbalance in segment occupancy will gradually become insignificant.
- Provide opportunities for the implementation in Papua New Guinea of field proven spectrum efficient and cost effective technologies;
- Provide for minimum disruption and orderly continuation of existing services likely to be affected by changes in the band plan; and,
- Reserve some spectrum in order to facilitate future frequency planning for new radiocommunication services and systems that may evolve.

5.0 DISTRIBUTION OF SPECTRUM TO USER CATEGORIES

There are many advantages in adopting a planned approach initially for provision of exclusive spectrum for each user category; for example users can easily make nation-wide plans for their long term communication requirements. The frequency assignment process is also simplified for spectrum management authorities. However it is impossible to predict with sufficient accuracy what the long term demand for each user category will be. Some users will experience a higher demand, while others a lower demand, than what may have been originally assumed for those users.

This in the long run will inevitably cause a demand/resource imbalance between user categories. Some users will face a higher deficiency in the number of available channels to satisfy their demand while other users may have a surplus of channels for which there is no immediate demand. This is evident for example when the occupancy of segment D is compared to segments A and H in the existing band plan.

While a dynamic approach in the distribution of the available spectrum may require greater effort on the frequency assigner side, it will surely achieve greater spectrum efficiency and equitable access to the spectrum for all users.

Therefore, a dynamic spectrum distribution is given preference to the exclusive spectrum distribution in most of the proposed VHF High Band Plan. This means that most of the spectrum will be made available to all users on a first come first serve basis.

For example segment A which had previously been reserved for government services will now be made available for general use. Some channels however will remain allocated nation wide for exclusive use by government services, for example Telikom and ELCOM.

On the other hand, segment H, which had been reserved for exclusive use by the Telecom mobile telephone service, will now be relinquished for general use.

6.0 BAND STRUCTURE

The existing band has been predominantly engineered for two frequency systems with a minimum transmit/receive frequency split of 4.6MHz with higher splits where required. Channels from the two frequency segments have been grouped in lots of 6 channels per group with 325kHz frequency separation between channels from the same group. This arrangement provides for practicable site engineering solutions in transmitter and receiver multi- coupling. System expansion with additional channels is straight forward.

The transmit/receive frequency separation has been offset by 12.5kHz in order to prevent the intermodulation products generated by repeater transmit frequencies from falling on repeater receive frequencies. Intermodulation products will therefore always be a minimum of 12.5kHz from the receive channel. Thus the interference potential is much lower than when the intermodulation product falls exactly on the receive frequency.

Equipment which will accommodate a transmit/receive frequency separation of less than 4.6MHz is readily available. Lower transmit/receive frequency separation would allow greater flexibility in the planning of the band by reducing the size of the "guardbands" which are required between transmit and receive segments to meet isolation requirements and to avoid intersegment third order intermodulation. These guardbands are allocated to single frequency services as they are spectrum inefficient and are not in high demand.

However a change in transmit/receive separation would require readjustment of all affected radiocommunication equipment and cause great inconvenience and disruption in service to existing users which would by far exceed the benefits obtained by higher spectrum efficiency.

For the above reasons, the basic structure of the band has been retained. However, with 12.5kHz channels the 12.5kHz offset of the transmit/receive separation no longer prevents the odd number intermodulation products generated by repeater transmit frequencies from falling on repeater receiver frequencies.

To avoid the interference that could otherwise occur all channels from a segment are divided into two groups of odd and even channels. Because the transmit/receive frequency separation is an odd multiple of 12.5kHz all intermodulation products generated by repeater transmit frequencies from one group fall on repeater receiver frequencies of the other group. If channels from the two groups are not used within a given area this type of intermodulation will always be avoided even if all channels from one group are used at the same site.

7.0 INTRODUCTION OF NEW TECHNOLOGIES

As new radio communication systems proliferate and the technology for production of existing systems continues to improve making existing equipment affordable to a greater number of users, the demand for spectrum increases even further. In order to keep abreast of technological innovation and demand, spectrum arrangements must be frequently reviewed to allow for the introduction of new services and more spectrum efficient radio communication systems.

Even though it is unlikely that the demand for spectrum in PNG will in the near future increase beyond availability, it will be wise to introduce more spectrum efficient technologies thus making more spectrum available for future expansion and for the introduction of new radio systems.

7.1 Narrow Band (12.5 kHz) versus Wide Band (25 kHz)

By virtue of the lower occupied bandwidth, at least in theory, the number of available channels can be doubled by converting from wide band to narrow band channelling. Practically, the introduction of narrow band channelling will substantially increase the number of available channels in those segments which are relatively under used.

Narrow band equipment is produced on a large scale and has been successfully used in many countries for a number of years. In practice it has proved to be slightly inferior to wide band (25 kHz) equipment in terms of quality of reception and adjacent channel interference. However, the substantial gains in spectrum efficiency by far outweigh this small disadvantage. It also offers the advantage of better readability of the received signal in high ambient noise conditions.

In view of the above the new VHF High Band has been planned to accommodate narrow band channelling arrangement.

Existing users operating wideband equipment, who wish to expand their systems, may experience poorer quality of service when mixed operation with narrow bandwidth equipment is introduced. This may result in reduction of the coverage area, the extent of which will depend on the particular type of equipment. Generally, the potential inconvenience from mixed operation can be accepted as a necessary short term solution to their long term needs.

7.2 Conversion to Narrow Band (12.5kHz) Operation

To minimise the cost associated with equipment conversion, the deadline set for replacement of all wide band equipment will be December 31, 1999. This period gives adequate time for amortisation of costs associated with obsolete equipment. Note that after the cut off date for narrow band operation, wide band equipment may be permitted but users of this equipment will be required to conform with deviation and bandwidths specified for narrow band equipment. Tuning and frequency tolerances must also conform with narrow band equipment performance. In the meantime it will be left to users to decide which option to choose when they expand their existing systems, which may depend on the number of old versus new mobile radios, the life expectancy of the old radios etc.

In some segments of the band the availability of channels to a particular user may be subject to their changeover from WB to NB operation. Whenever possible and if the inconvenience caused to users of existing equipment is insignificant, it is proposed to use narrow band (12.5 kHz) channels for the land mobile services in the VHF High Band.

However, unless technically impracticable, especially in the newly released segments, all new LM assignments in the VHF High Band will be based on the narrow band channelling arrangements. After 31 December 1999, only narrow band systems will be in operation.

7.3 ACSSB

Amplitude Compandored Single Side Band (ACSSB) is a variation of the popular Single Side Band (SSB) amplitude modulation technique. This modulation scheme requires only 5 kHz frequency spacing and yet exhibits an effect similar to the FM capture effect. Reports on experiments with ACSSB maintain its equivalence in performance with or superiority over narrow and wide band FM.

Except for the non-linearities in the transmitter output stage which may cause adjacent channel intermodulation interference (ACI), thus increasing the requirements for rejection of ACI, technological advances have managed to eliminate all of the drawbacks associated with conventional SSB, such as transmitter and receiver frequency stability.

ACSSB equipment is already being assembled by a few manufacturers but not on a large scale and the cost of ACSSB radio is 50 to 100 % higher than the cost for a similar FM radio. However as popularity of ACSSB increases its price will significantly be reduced and undoubtedly, it will eventually become a long term solution to congestion problems associated with voice communications.

The VHF High Band Plan provides for the introduction of ACSSB technology in Papua New Guinea in view of its spectrum efficiency and performance.

7.4 Trunking

While some technological advances increase the information throughput for a given channel bandwidth the idea in trunking is to use the available channels more efficiently in terms of the number of users per channel for a given period of time.

In conventional systems a channel is assigned to a number of users but the channel is available to only one user at a time. In other words if another user wishes to make use of the channel in the same time his call must be delayed until the first user has finished his conversation. This inability to place a call instantly can be very annoying, or in some cases unacceptable, especially if the waiting time is too long.

The probability that the waiting time exceeds a given amount of time is defined as a grade of service. The grade of service depends on the number of users per channel, the average message length and the channel occupancy in the busy hour. What grade of service is acceptable depends on the type of user in particular, but generally all users prefer short waiting times.

In trunking, a number of channels is assigned to a large number of users. Any of the common channels can be made available to any user. For equal number of users per channel the probability that all channels from a trunking group are occupied at the same is lower than the probability of only one conventional channel being occupied at that same time. Therefore, users are less aware of the congestion that may occur on any one channel.

Consequently, trunking systems offer significant improvements in spectrum efficiency over conventional systems in the sense that fewer channels are needed to accommodate the same number of users with the same grade of service. Or, a higher grade of service is achieved with the same number of users per channel.

There are other advantages that users may have from trunking such as:

(a) Reliability

Trunked systems have inherent reliability stemming from their multi-channel aspect. Since no channel is exclusively assigned to any particular user and all channels are made available to all users, the failure of any one channel that renders that channel unusable such as equipment failure or the presence of harmful interference, would have a negligible effect except for a possible reduction in the grade of service in the busiest hour. Should a channel failure occur in a conventional two frequency system all communication is lost.

(b) Privacy

Conversations between users or groups are not overheard by third parties in the group.

(c) Possibility for expansion

The increase in the number of users of a trunked system can easily be achieved and the degradation of service the same increment would cause to nearly full conventional systems will hardly be noticed in trunked systems. In addition to that, a trunking system may be allocated additional channels, without the need for modifications to existing mobile or portable equipment.

(d) A user group can place more than one call at a time

Unlike in conventional systems, where only one call can be placed at a time, in trunked systems one user group can simultaneously place several calls, depending on the number of unoccupied channels at that instant.

(e) Common equipment

Though the radio communication equipment employed at trunking transmitter sites may be slightly more expensive than a comparable conventional two frequency equipment, the overall cost per customer will be reduced as less equipment per customer is required and consequently fewer licensing fees will be paid.

(f) Other advantages

Trunked systems offer other advantages such as connection to the PSTN, queuing of calls, extended area coverage, etc.

The main disadvantages are the high initial capital investments associated with setting up of a large trunking system.

7.5 Miscellaneous Services and Systems

This classification is used to describe the diversity of services and systems that are permitted to operate. For example segment X is nominally allocated to 6.25kHz two frequency systems of the land mobile service however there are existing wide band two frequency systems (ELCOM) and single frequency systems (Telikom Paging) operating in this segment.

The single frequency segments are allocated to both the land mobile and fixed services and although the channel spacing is set nominally to 12.5kHz for voice communications there may be other arrangements for data transmission and exterior and interior paging systems.

Segment pair Z/Z1, which has been created from the available land mobile frequencies between maritime segments and unused portion of segment J may be reserved for future use by services and systems not foreseen at present and thus described as miscellaneous.

The existence of this loosely defined category allows greater flexibility for the accommodation of unforeseen future developments and temporary allocation for some services not provided for in the band plan.

8.0 MOBILE VERSUS FIXED SERVICE

The VHF and UHF bands are attractive to both the Fixed Service (FS) and Land Mobile Service (LMS) due to the good propagation characteristics and the availability of relatively inexpensive radio communication equipment.

The spectacular growth of mobile radio communications in the developed countries during the last quarter of this century has invariably put heavy pressure on the fixed services in these contested bands.

The main arguments in favour of the mobile service being given priority over the fixed service in the VHF bands are:

1. Because of the greater number of users per channel in the mobile service than in the fixed service the use of lower frequencies permitting wide area coverage is preferred for the LMS to minimise cost.

2. In fixed service operation propagation can be predicted with a greater degree of accuracy than for LMS. Therefore these bands with predictable propagation characteristics are better suited for LMS.

Presently the demand for LMS is not so high and the new arrangements will provide for sufficient number of channels to accommodate near future demands. However, it is very likely that in 10 years time the demand may outgrow the availability of LMS channels in the VHF High Band.

It appears that in those areas where the demand for channels for the land mobile service in the VHF High Band will eventually increase beyond availability the only way such channels can be provided is by restricting the fixed services from using the contested spectrum (segments B and G) in those areas. Given that, it is only a matter of time when the FS will have to be reallocated from the VHF High Band it seems reasonable to start the process of fixed links clearance from high demand areas as soon as possible.

However the use of VHF fixed links appears at present to be the only viable solution for providing the essential telephone service to rural areas where other means of connection to the Telikom PSTN are unjustifiable. Presently there are a great number of such links throughout Papua New Guinea and Telikom rely on their continuous usage for the provision and expansion of their telephone service to rural areas. In these areas therefore fixed links in segments B and G will be permitted to remain indefinitely.

9.0 PROPOSALS TO INCREASE SPECTRUM AVAILABILITY FOR LMS

Apart from applying more spectrum efficient assignment strategies and technologies the availability of VHF channels for the land mobile service can be increased by promoting the use of the 400 MHz band to those users in high demand urban areas where the advantages of the VHF band over the UHF band become insignificant. In these areas UHF channels should be assigned to those users who do not have real justification for the use of VHF channels.

10.0 GRAPHIC REPRESENTATION OF THE BAND PLAN

The proposed plan for the VHF High Band is graphically outlined in Appendix A. Each transmit segment is designated with a unique code under the column heading "S". The corresponding receive segment has the same code with the number "1" added. For reasons of continuity and to make it easier for those who are familiar with the existing plan to make comparison between the two plans, where possible, segments have been labelled with their original designations.

The segment limits, "SL", define the frequency width of each segment. Depending on the channel spacing in various segments the segment limits may overlap the lower edge of the first channel or the upper edge of the last channel in a segment. For the two frequency systems the paired segment is presented in the column with a "PS" heading.

Transmit segments, receive segments and single frequency segments are displayed in separate columns with different graphic symbols for easy identification of the basic segment description. The radiocommunication services and systems for the purpose for which the segments may be used and the nominal channelling arrangements for each segment of the VHF High Band are given in Appendix B.

11.0 CHANNELLING ARRANGEMENTS IN THE VHF HIGH BAND

The transmit and receive channel frequencies for each particular segment are listed in Appendix C.

The structure of the existing Wide Band channelling arrangements has been retained with new Narrow Band channels being placed between existing WB channels. This means that existing users can continue to operate on their assigned frequencies in accordance with the new frequency plan.

Channel frequencies may be odd (odd channels) and even (even channels) multiples of the channel spacing. It can be proven that odd number (for example, third, fifth etc) intermodulation products generated by odd channels are odd multiples of the channel spacing and, likewise, odd number intermodulation products generated by even channels are even multiples of the channel spacing.

The transmit receive frequency separations, T/R Sep, are odd multiples of the channel bandwidth (for example 4.6125 MHz = 369 x 12.5 kHz). This means that even receive channels are paired with odd transmit channels and vice versa. Therefore the potential for the intermodulation products, generated by repeater transmit frequencies, to cause interference to their corresponding repeater receive frequencies will significantly be reduced if at one site operation of only odd or even transmit frequencies is allowed, but not both.

To diminish the likelihood of interference caused by odd number intermodulation products, frequencies in all of the two frequency segments are divided into one odd and one even group. Half of the channels will be made available to one or more major sites and the other half will be allocated to the other sites.

The channelling arrangements of the existing plan fit perfectly in the new arrangements to satisfy the conditions explained above. Once converted to Narrow Band operation, all existing assignments will be free of intra-group odd number intermodulation, provided that new assignments to those sites are consistent with the odd or even grouping arrangement.

148.0 - 149.9 MHz Tx / Rx SEPARATION 4.6125 MHz SEGMENT A

Service :	Two Frequency System :	Bandwidth :	Channels :
LAND MOBILE	TRUNKED AND CONVENTIONAL	12.5 (25 kHz)	151 at 12.5 kHz

Ch	Tx	Rx	Ch	Tx	Rx	Ch	Tx	Rx
A1	148.0125	152.6250	A27	148.6625	153.2750	A53	149.3125	153.9250
iA1	148.0250	152.6375	iA27	148.6750	153.2875	iA53	149.3250	153.9375
A2	148.0375	152.6500	A28	148.6875	153.3000	A54	149.3375	153.9500
iA2	148.0500	152.6625	iA28	148.7000	153.3125	iA54	149.3500	153.9625
A3	148.0625	152.6750	A29	148.7125	153.3250	.A55	149.3625	153.9750
iA3	148.0750	152.6875	iA29	148.7250	153.3375	iA55	149.3750	153.9875
A4	148.0875	152.7000	A30	148.7375	153.3500	A56	149.3875	154.0000
iA4	148.1000	152.7125	iA30	148.7500	153.3625	iA56	149.4000	154.0125
A5	148.1125	152.7250	A31	148.7625	153.3750	A57	149.4125	154.0250
iA5	148.1250	152.7375	iA31	148.7750	153.3875	iA57	149.4250	154.0375
A6	148.1375	152.7500	A32	148.7875	153.4000	A58	149.4375	154.0500
iA6	148.1500	152.7625	iA32	148.8000	153.4125	iA58	149.4500	154.0625
A7	148.1625	152.7750	A33	148.8125	153.4250	A59	149.4625	154.0750
iA7	148.1750	152.7875	iA33	148.8250	153.4375	iA59	149.4750	154.0875
A8	148.1875	152.8000	A34	148.8375	153.4500	A60	149.4875	154.1000
iA8	148.2000	152.8125	iA34	148.8500	153.4625	iA60	149.5000	154.1125
A9	148.2125	152.8250	A35	148.8625	153.4750	A61	149.5125	154.1250
iA9	148.2250	152.8375	iA35	148.8750	153.4875	iA61	149.5250	154.1375
A10	148.2375	152.8500	A36	148.8875	153.5000	A62	149.5375	154.1500
iA10	148.2500	152.8625	iA36	148.9000	153.5125	iA62	149.5500	154.1625
A11	148.2625	152.8750	A37	148.9125	153.5250	A63	149.5625	154.1750
iA11	148.2750	152.8875	iA37	148.9250	153.5375	iA63	149.5750	154.1875
A12	148.2875	152.9000	A38	148.9375	153.5500	A64	149.5875	154.2000
iA12	148.3000	152.9125	iA38	148.9500	153.5625	iA64	149.6000	154.2125
A13	148.3125	152.9250	A39	148.9625	153.5750	A65	149.6125	154.2250
iA13	148.3250	152.9375	iA39	148.9750	153.5875	iA65	149.6250	154.2375
A14	148.3375	152.9500	A40	148.9875	153.6000	A66	149.6375	154.2500
iA14	148.3500	152.9625	iA40	149.0000	153.6125	iA66	149.6500	154.2625
A15	148.3625	152.9750	A41	149.0125	153.6250	A67	149.6625	154.2750
iA15	148.3750	152.9875	iA41	149.0250	153.6375	iA67	149.6750	154.2875
A16	148.3875	153.0000	A42	149.0375	153.6500	A68	149.6875	154.3000
iA16	148.4000	153.0125	iA42	149.0500	153.6625	iA68	149.7000	154.3125
A17	148.4125	153.0250	A43	149.0625	153.6750	A69	149.7125	154.3250
iA17	148.4250	153.0375	iA43	149.0750	153.6875	iA69	149.7250	154.3375
A18	148.4375	153.0500	A44	149.0875	153.7000	A70	149.7375	154.3500
iA18	148.4500	153.0625	iA44	149.1000	153.7125	iA70	149.7500	154.3625
A19	148.4625	153.0750	A45	149.1125	153.7250	A71	149.7625	154.3750
iA19	148.4750	153.0875	iA45	149.1250	153.7375	iA71	149.7750	154.3875
A20	148.4875	153.1000	A46	149.1375	153.7500	A72	149.7875	154.4000
iA20	148.5000	153.1125	iA46	149.1500	153.7625	iA72	149.8000	154.4125
A21	148.5125	153.1250	A47	149.1625	153.7750	A73	149.8125	154.4250
iA21	148.5250	153.1375	iA47	149.1750	153.7875	iA73	149.8250	154.4375
A22	148.5375	153.1500	A48	149.1875	153.8000	A74	149.8375	154.4500
iA22	148.5500	153.1625	iA48	149.2000	153.8125	iA74	149.8500	154.4625
A23	148.5625	153.1750	A49	149.2125	153 8250	A75	149.8625	154.4750
iA23	148.5750	153.1875	iA49	149.2250	153.8375	iA75	149.8750	154.4875
A24	148.5875	153.2000	A50	149.2375	153.8500	A76	149.8875	154.5000
iA24	148.6000	153.2125	iA50	149.2500	153.8625			
A25	148.6125	153.2250	A51	149.2625	153.8750			
iA25	148.6250	153.2375	iA51	149.2750	153.8875			
A26	148.6375	153.2500	A52	149.2875	153.9000			
iA26	148.6500	153.2625	iA52	149.3000	153.9125			

Channels are grouped in lots of six with 325 kHz frequency separation.

Narrowband channels can be assigned subject to the adjacent wideband channels not beeing used in the same area.
Wideband channels may be used untill 31.12.1999.

148.0 - 149.9 MHz Tx / Rx SEPARATION 4.6125 MHz : USERS / CHANNEL GROUPS SEGMENT A

Service :	Two Frequency System :	Bandwidth :	Channels :
LAND MOBILE	TRUNKED AND CONVENTIONAL	12.5 (25 kHz)	151 at 12.5 kHz

GROUP	CHANNEL						USER CATEGORY
1	A	1	14	27	40	53	66	GOVERNMENT
i1	iA	1	14	27	40	53	66	
2	A	2	15	28	41	54	67	GOVERNMENT (Telikom)
i2	iA	2	15	28	41	54	67	
3	A	3	16	29	42	55	68	
i3	iA	3	16	29	42	54	68	GENERAL
4	A	4	17	30	43	56	69	
i4	iA	4	17	30	43	56	69	
5	A	5	18	31	44	57	70	GOVERNMENT (ELCOM)
i5	iA	5	18	31	44	57	70	
6	A	6	19	32	45	58	71	GENERAL
i6	iA	6	19	32	45	58	71	
7	A	7	20	33	46	59	72	GOVERNMENT (Telikom)
i7	iA	7	20	33	46	59	72	
8	A	8	21	34	47	60	73	
i8	iA	8	21	34	47	60	73	GENERAL
9	A	9	22	35	48	61	74	
i9	iA	9	22	35	48	61	74	
10	A	10	23	36	49	62	75	GOVERNMENT (Telikom)
i10	iA	10	23	36	49	62	75	
11	A	11	24	37	50	63	76	
i11	iA	11	24	37	50	63		
12	A	12	25	38	51	64		GENERAL
i12	iA	12	25	38	51	64		
13	A	13	26	39	52	65		
i13	iA	13	26	39	52	65		

A1 . . . A76 — Regular narrowband (12.5 kHz) channels whose center frequencies overlap existing wideband (25 kHz) channels centre frequencies.

iA1 . . . iA75 — Interleaved narrowband channels whose centre frequencies fall between regular channels centre frequencies.

Unless technically or economically justified, all new assignments of regular channels will be narrowband. Interleaved narrowband channels can be assigned only when the adjacent regular channels are narrowband or not used in thesame area. Regular and interleaved channels will not be assigned at the same site. Two sites are considered as one if the geographical separation between them is less than 2 km. When new assignments are made, priority will be given to those applicants who are intending to develop trunked radio systems.

Channels designated as GOVERNMENT are available to government users only. Channels designated as GENERAL may be used by all users.

150.05 - 150.4 MHz Tx / Rx SEPARATION 4.60625 SEGMENT X

Service :	Two Frequency System :	Bandwidth :	Channels :
MISCELLANEOUS	MISCELLANEOUS	6.25 (25 kHz)	54 at 6.25 kHz

Ch	Tx	Rx	Used By
eX1	150.06250	154.66875	A83
oX1	150.06875	154.67500	ELCOM
eX2	150.07500	154.68125	
oX2	150.08125	154.68750	
eX3	150.08750	154.69375	
oX3	150.09375	154.70000	
eX4	150.10000	154.70625	
oX4	150.10625	154.71250	
eX5	150.11250	154.71875	A85
oX5	150.11875	154.72500	Telikom
eX6	150.12500	154.73125	
oX6	150.13125	154.73750	
eX7	150.13750	154.74375	
oX7	150.14375	154.75000	
eX8	150.15000	154.75625	
oX8	150.15625	154.76250	
eX9	150.16250	154.76875	
oX9	150.16875	154.77500	
eX10	150.17500	154.78125	
oX10	150.18125	154.78750	
eX11	150.18750	154.79375	
oX11	150.19375	154.80000	
eX12	150.20000	154.80625	
oX12	150.20625	154.81250	
eX13	150.21250	154.81875	
oX13	150.21875	154.82500	
eX14	150.22500	154.83125	
oX14	150.23125	154.83750	
eX15	150.23750	154.84375	
oX15	150.24375	154.85000	
eX16	150.25000	154.85625	
oX16	150.25625	154.86250	
eX17	150.26250	154.86875	A91
oX17	150.26875	154.87500	Telikom
eX18	150.27500	154.88125	Paging
oX18	150.28125	154.88750	
eX19	150.28750	154.89375	
oX19	150.29375	154.90000	
eX20	150.30000	154.90625	
oX20	150.30625	154.91250	
eX21	150.31250	154.91875	
oX21	150.31875	154.92500	
eX22	150.32500	154.93125	
oX22	150.33125	154.93750	
eX23	150.33750	154.94375	A94
oX23	150.34375	154.95000	Vulcan
eX24	150.35000	154.95625	Observ
oX24	150.35625	154.96250	
eX25	150.36250	154.96875	
oX25	150.36875	154.97500	
eX26	150.37500	154.98125	
oX26	150.38125	154.98750	
eX27	150.38750	154.99375	A96
oX27	150.39375	155.00000	ELCOM

Segment X is nominally planned for Land Mobile two frequency systems using Amplitude Compandored Single Sideband Modulation.

Channels may be odd (oX) or even (eX). Even and odd channels may not be used at the same repeater site. Two sites are considered as one if the distance separation between them is less than 2 km.

Channels from segment X, for example, eX1, oX1 and eX2, which are overlapped with a used channel (A83) from the old segment A may not be assigned.

140.40 - 151.40 MHz Tx / Rx SEPARATION 4.6125 MHz SEGMENT B

Service :	Two Frequency System :	Bandwidth :	Channels :
FIXED	SINGLE CHANNEL LINKS	25 kHz	40

Ch	Tx	Rx	Ch	Tx	Rx
B1	150.4125	155.0250	B21	150.9125	155.5250
B2	150.4375	155.0500	B22	150.9375	155.5500
B3	150.4625	155.0750	B23	150.9625	155.5750
B4	150.4875	155.1000	B24	150.9875	155.6000
B5	150.5125	155.1250	B25	151.0125	155.6250
B6	150.5375	155.1500	B26	151.0375	155.6500
B7	150.5625	155.1750	B27	151.0625	155.6750
B8	150.5875	155.2000	B28	151.0875	155.7000
B9	150.6125	155.2250	B29	151.1125	155.7250
B10	150.6375	155.2500	B30	151.1375	155.7500
B11	150.6625	155.2750	B31	151.1625	155.7750
B12	150.6875	155.3000	B32	151.1875	155.8000
B13	150.7125	155.3250	B33	151.2125	155.8250
B14	150.7375	155.3500	B34	151.2375	155.8500
B15	150.7625	155.3750	B35	151.2625	155.8750
B16	150.7875	155.4000	B36	151.2875	155.9000
B17	150.8125	155.4250	B37	151.3125	155.9250
B18	150.8375	155.4500	B38	151.3375	155.9500
B19	150.8625	155.4750	B39	151.3625	155.9750
B20	150.8875	155.5000	B40	151.3875	156.0000

This segment is an exclusive Telikom allocation for the provision of the Rural Telephone Subscriber Service.

151.40 - 152.61875 Mhz — SEGMENT C

Service :	Single Frequency System :	Bandwidth :	Channels :
MISCELLANEOUS	MISCELLANEOUS	12.5 (25 kHz) kHz	97 at 12.5 kHz

Ch	Tx = Rx	Ch	Tx = Rx	Ch	Tx = Rx
.C1	151.4125	.C17	151.8125	.C33	152.2125
iC1	151.4250	iC17	151.8250	iC33	152.2250
.C2	151.4375	.C18	151.8375	.C34	152.2375
iC2	151.4500	iC18	151.8500	iC34	152.2500
.C3	151.4625	.C19	151.8625	.C35	152.2625
iC3	151.4750	iC19	151.8750	iC35	152.2750
.C4	151.4875	.C20	151.8875	.C36	152.2875
iC4	151.5000	iC20	151.9000	iC36	152.3000
.C5	151.5125	.C21	151.9125	.C37	152.3125
iC5	151.5250	iC21	151.9250	iC37	152.3250
.C6	151.5375	.C22	151.9375	.C38	152.3375
iC6	151.5500	iC22	151.9500	iC38	152.3500
.C7	151.5625	.C23	151.9625	.C39	152.3625
iC7	151.5750	iC23	151.9750	iC39	152.3750
.C8	151.5875	.C24	151.9875	.C40	152.3875
iC8	151.6000	iC24	152.0000	iC40	152.4000
.C9	151.6125	.C25	152.0125	.C41	152.4125
iC9	151.6250	iC25	152.0250	iC41	152.4250
.C10	151.6375	.C26	152.0375	.C42	152.4375
iC10	151.6500	iC26	152.0500	iC42	152.4500
.C11	151,6625	.C27	152.0625	.C43	152.4625
iC11	151.6750	iC27	152.0750	iC43	152.4750
.C12	151.6875	.C28	152.0875	.C44	152.4875
iC12	151.7000	iC28	152.1000	iC44	152.5000
.C13	151.7125	.C29	152.1125	.C45	152.5125
iC13	151.7250	iC29	152.1250	iC45	152.5250
.C14	151.7375	.C30	152.1375	.C46	152.5375
iC14	151.7500	iC30	152.1500	iC46	152.5500
.C15	151.7625	.C31	152.1625	.C47	152.5625
iC15	151.7750	iC31	152.1750	iC47	152.5750
.C16	151.7875	.C32	152.1875	.C48	152.5875
iC16	151.8000	iC32	152.2000	iC48	152.6000
				C49	152.6125

This segment can be used for Land mobile and Fixed Services by single frequency systems for transmission of voice, messages and data.

Unless there is justification, all new channels for voice communications will be 12.5 kHz. Existing 25 kHz voice communication channels may be used until 31.12.1999.

Except for voice communication systems, the 12,5 kHz channel separation is nominal. Other channel spacings may be used as required by the communication system (for example paging) . In such cases, protection from adjacent channel interference will determine the frequency separation between the channels involved.

154.50625 - 154.65625 MHz SEGMENT Y

Service :	Single Frequency System :	Bandwidth :	Channels :
MISCELLANEOUS	**MISCELLANEOUS**	**6.25 kHz**	**27 at 6.25 kHz**

Ch	Tx = Rx	Ch	Tx = Rx
Y1	154.51250	Y8	154.60000
iY1	154.51875	iY8	154.60625
Y2	154.52500	Y9	154.61250
iY2	154.53125	iY9	154.61875
Y3	154.53750	Y10	154.62500
iY3	154.54375	iY10	154.63125
Y4	154.55000	Y11	154.63750
iY4	154.55625	iY11	154.64375
Y5	154.56250	Y12	154.65000
iY5	154.56875	iY12	154.65625
Y6	154.57500	Y13	154.66250
iY6	154.58125	iY13	154.66875
Y7	154.58750	Y14	154.67500
iY7	154.59375		

Segment Y can be used for land mobile and fixed services single frequency systems with Amplitude Compandored Single Sideband technology.

162.05 - 164.0 MHz Tx / Rx SEPARATION 4.6125 MHz SEGMENT D

Service :	Two Frequency System :	Bandwidth :	Channels :
LAND MOBILE	CONVENTIONAL	12.5 (25 kHz)	151 at 12.5 kHz

Ch	Tx	Rx	Ch	Tx	Rx	Ch	Tx	Rx
D1	162.0625	157.4500	D27	162.7125	158.1000	D53	163.3625	158.7500
iD1	162.0750	157.4625	iD27	162.7250	158.1125	iD53	163.3750	158.7625
D2	162.0875	157.4750	D28	162.7375	158.1250	D54	163.3875	158.7700
iD2	162.1000	157.4875	iD28	162.7500	158.1375	iD54	163.4000	158.7875
D3	162.1125	157.5000	D29	162.7625	158.1500	.D55	163.4125	158.8000
iD3	162.1250	157.5125	iD29	162.7750	158.1625	iD55	163.4250	158.8125
D4	162.1375	157.5250	D30	162.7875	158.1750	D56	163.4375	158.8250
iD4	162.1500	157.5375	iD30	162.8000	158.1875	iD56	163.4500	158.8375
D5	162.1625	157.5500	D31	162.8125	158.2000	D57	163.4625	158.8500
iD5	162.1750	157.5625	iD31	162.8250	158.2125	iD57	163.4750	158.8625
D6	162.1875	157.5750	D32	162.8375	158.2250	D58	163.4875	158.8750
iD6	162.2000	157.5875	iD32	162.8500	158.2375	iD58	163.4000	158.8875
D7	162.2125	157.6000	D33	162.8625	158.2500	D59	163.5125	158.9000
iD7	162.2250	157.6125	iD33	162.8750	158.2625	iD59	163.5250	158.9125
D8	162.2375	157.6250	D34	162.8875	158.2750	D60	163.5375	158.9250
iD8	162.2500	157.6375	iD34	162.9000	158.2875	iD60	163.5500	158.9375
D9	162.2625	157.6500	D35	162.9125	158.3000	D61	163.5625	158.9500
iD9	162.2750	157.6625	iD35	162.9250	158.3125	iD61	163.5750	158.9625
D10	162.2875	157.6750	D36	162.9375	158.3250	D62	163.5875	158.9750
iD10	162.3000	157.6875	iD36	162.9500	158.3375	iD62	163.6000	158.9875
D11	162.3125	157.7000	D37	162.9625	158.3500	D63	163.6125	159.0000
iD11	162.3250	157.7125	iD37	162.9750	158.3625	iD63	163.6250	159.0125
D12	162.3375	157.7250	D38	162.9875	158.3750	D64	163.6375	159.0250
iD12	162.3500	157.7375	iD38	163.0000	158.3875	iD64	163.6500	159.0375
D13	162.3625	157.7500	D39	163.0125	158.4000	D65	163.6625	159.0500
iD13	162.3750	157.7625	iD39	163.0250	158.4125	iD65	163.6750	159.0625
D14	162.3875	157.7750	D40	163.0375	158.4250	D66	163.6875	159.0750
iD14	162.4000	157.7875	iD40	163.0500	158.4375	iD66	163.7000	159.0875
D15	162.4125	157.8000	D41	163.0625	158.4500	D67	163.7125	159.1000
iD15	162.4250	157.8125	iD41	163.0750	158.4625	iD67	163.7250	159.1125
D16	162.4375	157.8250	D42	163.0875	158.4750	D68	163.7375	159.1250
iD16	162.4500	157.8375	iD42	163.1000	158.4875	iD68	163.7500	159.1375
D17	162.4625	157.8500	D43	163.1125	158.5000	D69	163.7625	159.1500
iD17	162.4750	157.8625	iD43	163.1250	158.5125	iD69	163.7750	159.1625
D18	162.4875	157.8750	D44	163.1375	158.5250	D70	163.7875	159.1750
iD18	162.5000	157.8875	iD44	163.1500	158.5375	iD70	163.8000	159.1875
D19	162.5125	157.9000	D45	163.1625	158.5500	D71	163.8125	159.2000
iD19	162.5250	157.9125	iD45	163.1750	158.5625	iD71	163.8250	159.2125
D20	162.5375	157.9250	D46	163.1875	158.5750	D72	163.8375	159.2250
iD20	162.5500	157.9375	iD46	163.2000	158.5875	iD72	163.8500	159.2375
D21	162.5625	157.9500	D47	163.2125	158.6000	D73	163.8625	159.2500
iD21	162.5750	157.9625	iD47	163.2250	158.6125	iD73	163.8750	159.2625
D22	162.5875	157.9750	D48	163.2375	158.6250	D74	163.8875	159.2750
iD22	162.6000	157.9875	iD48	163.2500	158.6375	iD74	163.9000	159.2875
D23	162.6125	158.0000	D49	163.2625	158 6500	D75	163.9125	159.3000
iD23	162.6250	158.0125	iD49	163.2750	158.6625	iD75	163.9250	159.3125
D24	162.6375	158.0250	D50	163.2875	158.6750	D76	163.9375	159.3250
iD24	162.6500	158.0375	iD50	163.3000	158.6875	iD76	163.9500	159.3375
D25	162.6625	158.0500	D51	163.3125	158.7000	D77	163.9625	159.3500
iD25	162.6750	158.0625	iD51	163.3250	158.7125	iD77	163.9750	159.3625
D26	162.6875	158.0750	D52	163.3375	158.7250	D78	163.9875	159.3750
iD26	162.7000	158.0875	iD52	163.3500	158.7375	iD78		159.3875

Channels are grouped in lots of six with 325 kHz frequency separation
Narrowband channels can be assigned subject to the adjacent wideband channels not beeing used in the same area.
Wideband channels may be used untill 31.12.1999.

162.05 - 164.0 MHz Tx / Rx SEPARATION 4.6125 MHz : USERS / CHANNEL GROUP SEGMENT D

Service :	Two Frequency System :	Bandwidth :	Channels :
LAND MOBILE	CONVENTIONAL	12.5 (25 kHz)	155 at 12.5 kHz

GROUP	CHANNEL												
1	D	1	14	27	40	53	66						
i1	iD	1	14	27	40	53	66						
2	D	2	15	28	41	54	67						
i2	iD	2	15	28	41	54	67						
3	D	3	16	29	42	55	68						
i3	iD	3	16	29	42	54	68						
4	D	4	17	30	43	56	69						
i4	iD	4	17	30	43	56	69						
5	D	5	18	31	44	57	70						
i5	iD	5	18	31	44	57	70						
6	D	6	19	32	45	58	71						
i6	iD	6	19	32	45	58	71						
7	D	7	20	33	46	59	72						
i7	iD	7	20	33	46	59	72						
8	D	8	21	34	47	60	73						
i8	iD	8	21	34	47	60	73						
9	D	9	22	35	48	61	74						
i9	iD	9	22	35	48	61	74						
10	D	10	23	36	49	62	75						
i10	iD	10	23	36	49	62	75						
11	D	11	24	37	50	63	76						
i11	iD	11	24	37	50	63	76						
12	D	12	25	38	51	64	77						
i12	iD	12	25	38	51	64	77						
13	D	13	26	39	52	65	78						
i13	iD	13	26	39	52	65							

D1 . . . D78 Regular narrowband (12.5 kHz) channels whose center frequencies overlap existing wideband (25 kHz) channels centre frequencies.

iD1 . . . iD77 Interleaved narrowband channels whose centre frequencies fall between regular channels centre

frequencies.

Unless technically or economically justified, all new assignments of regular channels will be narrowband.

Interleaved narrowband channels can be assigned only when the adjacent regular channels are narrowband or not used in the same area.

Regular and interleaved channels will not be assigned at the same site. Two sites are considered as one if the geographical separation between them is less than 2 km.

159.39375 - 160.6000 MHz SEGMENT E

Service :	Single Frequency System :	Bandwidth :	Channels :
MISCELLANEOUS	MISCELLANEOUS	12.5 (25 kHz)	96 at 12.5 kHz

Ch	Tx = Rx	Ch	Tx = Rx	Ch	Tx = Rx
E1	159.4000	E17	159.8000	E33	160.2000
iE1	159.4125	iE17	159.8125	iE33	160.2125
E2	159.4250	E18	159.8250	E34	160.2250
iE2	159.4375	iE18	159.8375	iE34	160.2375
E3	159.4500	E19	159.8500	E35	160.2500
iE3	159.4625	iE19	159.8625	iE35	160.2625
E4	159.4750	E20	159.8750	E36	160.2750
iE4	159.4875	iE20	159.8875	iE36	160.2875
E5	159.5000	E21	159.9000	E37	160.3000
iE5	159.5125	iE21	159.9125	iE37	160.3125
E6	159.5250	E22	159.9250	E38	160.3250
iE6	159.5375	iE22	159.9375	iE38	160.3375
E7	159.5500	E23	159.9500	E39	160.3500
iE7	159.5625	iE23	159.9625	iE39	160.3625
E8	159.5750	E24	159.9750	E40	160.3750
iE8	159.5875	iE24	159.9875	iE40	160.3875
E9	159.6000	E25	160.0000	E41	160.4000
iE9	159.6125	iE25	160.0125	iE41	160.4125
E10	159.6250	E26	160.0250	E42	160.4250
iE10	159.6375	iE26	160.0375	iE42	160.4375
E11	159.6500	E27	160.0500	E43	160.4500
iE11	159,6625	iE27	160.0625	iE43	160.4625
E12	159.6750	E28	160.0750	E44	160.4750
iE12	159.6875	iE28	160.0875	iE44	160.4875
E13	159.7000	E29	160.1000	E45	160.5000
iE13	159.7125	iE29	160.1125	iE45	160.5125
E14	159.7250	E30	160.1250	E46	160.5250
iE14	159.7375	iE30	160.1375	iE46	160.5375
E15	159.7500	E31	160.1500	E47	160.5500
iE15	159.7625	iE31	160.1625	iE47	160.5625
E16	159.7750	E32	160.1750	E48	160.5750
iE16	159.7875	iE32	160.1875	iE48	160.5875
				E49	152.6000

This segment can be used for Land mobile and Fixed Services by single frequency systems for transmission of voice, messages and data.

Unless there is justification, all new channels for voice communications will be 12.5 kHz. Existing 25 kHz voice communication channels may be used until 31.12.1999.

Except for voice communication systems, the 12,5 kHz channel separation is nominal. Other channel spacings may be used as required by the communication system (for example paging) . In such cases, protection from adjacent channel interference will determine the frequency separation between the channels involved.

160.975 - 161.475 MHz Tx / Rx SEPARATION 8.5125 MHz SEGMENT Z

Service :	Two Frequency System :	Bandwidth :	Channels :
MISCELLANEOUS	MISCELLANEOUS	12.5 kHz	39 at 12.5 kHz

Ch	Tx	Rx	Ch	Tx	Rx
Z1	160.9875	169.5000	Z11	161.2375	169.7500
iZ1	161.0000	169.5125	iZ11	161.2500	169.7625
Z2	161.0125	169.5250	Z12	161.2625	169.7750
iZ2	161.0250	169.5375	iZ12	161.2750	169.7875
Z3	161.0375	169.5500	Z13	161.2875	169.8000
iZ3	161.0500	169.5625	iZ13	161.3000	169.8125
Z4	161.0625	169.5750	Z14	161.3125	169.8250
iZ4	161.0750	169.5875	iZ14	161.3250	169.8375
Z5	161.0875	169.6000	Z15	161.3375	169.8500
iZ5	161.1000	169.6125	iZ15	161.3500	169.8625
Z6	161.1125	169.6250	Z16	161.3625	169.8750
iZ6	161.1250	169.6375	iZ16	161.3750	169.8875
Z7	161.1375	169.6500	Z17	161.3875	169.9000
iZ7	161.1500	169.6625	iZ17	161.4000	169.9125
Z8	161.1625	169.6750	Z18	161.4125	169.9250
iZ8	161.1750	169.6875	iZ18	161.4250	169.9375
Z9	161.1875	169.7000	Z19	161.4375	169.9500
iZ9	161.2000	169.7125	iZ19	161.4500	169.9625
Z10	161.2125	169.7250	Z20	161.4625	169.9750
iZ10	161.2250	169.7375			

This segment is primarily intended for the land mobile service, however, no permanent assignments will be made until 31.12.1995, when the use of this segment will be reviewed against the demand for any services.

164.0 - 165.0 MHz Tx / Rx SEPARATION 5.9875 MHz SEGMENT F

Service :	Two Frequency System :	Bandwidth :	Channels :
FIXED POINT TO POINT	SINGLE CHANNEL LINKS	25 kHz	40

Ch	Tx	Rx	Ch	Tx	Rx
F1	164.0125	170.0000	F21	164.5125	170.5000
F2	164.0375	170.0250	F22	164.5375	170.5250
F3	164.0625	170.0500	F23	164.5625	170.5500
F4	164.0875	170.0750	F24	164.5875	170.5750
F5	164.1125	170.1000	F25	164.6125	170.6000
F6	164.1375	170.1250	F26	164.6375	170.6250
F7	164.1625	170.1500	F27	164.6625	170.6500
F8	164.1875	170.1750	F28	164.6875	170.6750
F9	164.2125	170.2000	F29	164.7125	170.7000
F10	164.2375	170.2250	F30	164.7375	170.7250
F11	164.2625	170.2500	F31	164.7625	170.7500
F12	164.2875	170.2750	F32	164.7875	170.7750
F13	164.3125	170.3000	F33	164.8125	170.8000
F14	164.3375	170.3250	F34	164.8375	170.8250
F15	164.3625	170.3500	F35	164.8625	170.8500
F16	164.3875	170.3750	F36	164.8875	170.8750
F17	164.4125	170.4000	F37	164.9125	170.9000
F18	164.4375	170.4250	F38	164.9375	170.9250
F19	164.4625	170.4500	F39	164.9625	170.9500
F20	164.4875	170.4750	F40	164.9875	170.9750

This segment is an exclusive Telikom allocation for the provision of the Rural Telephone Subscriber Service.

165.0 - 167.0 MHz **Tx / Rx SEPARATION 6.0 MHz** **SEGMENT G**

Service :	Two Frequency System :	Bandwidth :	Channels :
FIXED POINT TO POINT	**MULTI-CHANNEL LINKS**	**200 kHz**	**10**

Ch	Tx	Rx
G1	165.1	171.1
G2	165.3	171.3
G3	165.5	171.5
G4	165.7	171.7
G5	165.9	171.9
G6	166.1	172.1
G7	166.3	172.3
G8	166.5	172.5
G9	166.7	172.7
G10	166.9	172.9

This segment is an exclusive Telikom allocation for the provision of the Rural Telephone Subscriber Service. Channel frequencies and bandwidths are nominal only. Other channel frequencies and bandwidths may be used as required, provided that the emission bandwidths do not exceed the segment limits.

(167.0 - 168.0 MHz) Tx/Rx Separation 5.9875MHz — SEGMENT H

Service:	Two Frequency Systems:	Bandwidth:	Channels:
Land Mobile	Trunked and Conventional	**12.5kHz(25)**	**80 at 12.5kHz**

Ch	Tx	Rx	Ch	Tx	Rx	Ch	Tx	Rx
H1	167.0125	173.0000	H17	167.4125	173.4000	H33	167.8125	173.8000
iH1	167.0250	173.0125	iH17	167.4250	173.4125	iH33	167.8250	173.8125
H2	167.0375	173.0250	H18	167.4375	173.4250	H34	167.8375	173.8250
iH2	167.0500	173.0375	iH18	167.4500	173.4375	iH34	167.8500	173.8375
H3	167.0625	173.0500	H19	167.4625	173.4500	H35	167.8625	173.8500
iH3	167.0750	173.0625	iH19	167.4750	173.4625	iH35	167.8750	173.8625
H4	167.0875	173.0750	H20	167.4875	173.4750	H36	167.8875	173.8750
iH4	167.1000	173.0875	iH20	167.5000	173.4875	iH36	167.9000	173.8875
H5	167.1125	173.1000	H21	167.5125	173.5000	H37	167.9125	173.9000
iH5	167.1250	173.1125	iH21	167.5250	173.5125	iH37	167.9250	173.9125
H6	167.1375	173.1250	H22	167.5375	173.5250	H38	167.9375	173.9250
iH6	167.1500	173.1375	iH22	167.5500	173.5375	iH38	167.9500	173.9375
H7	167.1625	173.1500	H23	167.5625	173.5500	H39	167.9625	173.9500
iH7	167.1750	173.1625	iH23	167.5750	173.5625	iH39	167.9750	173.9625
H8	167.1875	173.1750	H24	167.5875	173.5750	H40	167.9875	173.9750
iH8	167.2000	173.1875	iH24	167.6000	173.5875	iH40	168.0000	173.9875
H9	167.2125	173.2000	H25	167.6125	173.6000			
iH9	167.2250	173.2125	iH25	167.6250	173.6125			
H10	167.2375	173.2250	H26	167.6375	173.6250			
iH10	167.2500	173.2375	iH26	167.6500	173.6375			
H11	167.2625	173.2500	H27	167.6625	173.6500			
iH11	167.2750	173.2625	iH27	167.6750	173.6625			
H12	167.2875	173.2750	H28	167.6875	173.6750			
iH12	167.3000	173.2875	iH28	167.7000	173.6875			
H13	167.3125	173.3000	H29	167.7125	173.7000			
iH13	167.3250	173.3125	iH29	167.7250	173.7125			
H14	167.3375	173.3250	H30	167.7375	173.7250			
iH14	167.3500	173.3375	iH30	167.7500	173.7375			
H15	167.3625	173.3500	H31	167.7625	173.7500			
iH15	167.3750	173.3625	iH31	167.7750	173.7625			
H16	167.3875	173.3750	H32	167.7875	173.7750			
iH16	167.4000	173.3875	iH32	167.8000	173.7875			

Channels will be grouped in lots of five at a frequency separation of 200kHz.

Segment H had previously been allocated to the Telecom Mobile Telephone Service. There are few assignments and Telecom do not have plans to expand their service. Pending negotiations with Telecom about the future of their existing assignments, there will be no new assignments in this segment.

This segment is generally planned for the land mobile service. All assignments will be at 12.5kHz channel spacing. Regular and interleaved channels will not be assigned at the same site or at sites which are distance separated by less than 2 km.

Assignment of channels in segment H will be subject to EMC with the TV service on channel 1 (174.25 MHz vision carrier). Transmissions from mobile and fixed radio stations may cause interference to domestic TV receivers tuned to channel 1. Fixed stations have the highest potential to cause interference. Likewise, repeater receivers may be subject to interference from channel 1 transmissions. Both cases of interference can be avoided provided that there is adequate distance/frequency separation between the two services.

(167.0 - 168.0 MHz) Tx/Rx Separation 5.9875MHz SEGMENT H

Service:	Two Frequency Systems:	Bandwidth:	Channels:
Land Mobile	Trunked and Conventional	**12.5kHz(25)**	**80 at 12.5kHz**

GROUP		CHANNEL					
1	**H**	**1**	**9**	**17**	**25**	**33**	
i1	iH	1	9	17	25	33	
2	**H**	**2**	**10**	**18**	**26**	**34**	
i2	iH	2	10	18	26	34	
3	**H**	**3**	**11**	**19**	**27**	**35**	
i3	iH	3	11	19	27	35	
4	**H**	**4**	**12**	**20**	**28**	**36**	
i4	iH	4	12	20	28	36	
5	**H**	**5**	**13**	**21**	**29**	**37**	
i5	iH	5	13	21	29	37	
6	**H**	**6**	**14**	**22**	**30**	**38**	
i6	iH	6	14	22	30	38	
7	**H**	**7**	**15**	**23**	**31**	**39**	
i7	iH	7	15	23	31	39	
8	**H**	**8**	**16**	**24**	**32**	**40**	
i8	iH	8	16	24	32	40	

H1...H40: Regular narrowband (12.5kHz) channels whose centre frequencies overlap existing wideband (25 kHz) channels centre frequencies.

iH1...iH40 Interleaved narrowband channels whose centre frequencies fall between regular channels centre frequencies.

Unless technically or economically justified, all new assignments of regular channels will be narrowband. Interleaved narrowband channels can be assigned only when the adjacent regular channels are narrowband or not used in the same area. Regular and interleaved channels will not be assigned at the same site. Two sites are considered as one if the geographical separation between them is less than 2km. When new assignments are made priority will be given to those applicants who are intending to develop trunked radio systems.

(168.0 - 169.49375MHz) SEGMENT J

Service:	Single Frequency Systems:	Bandwidth:	Channels:
Miscellaneous	Miscellaneous	**12.5(25kHz)**	**119 at 12.5kHz**

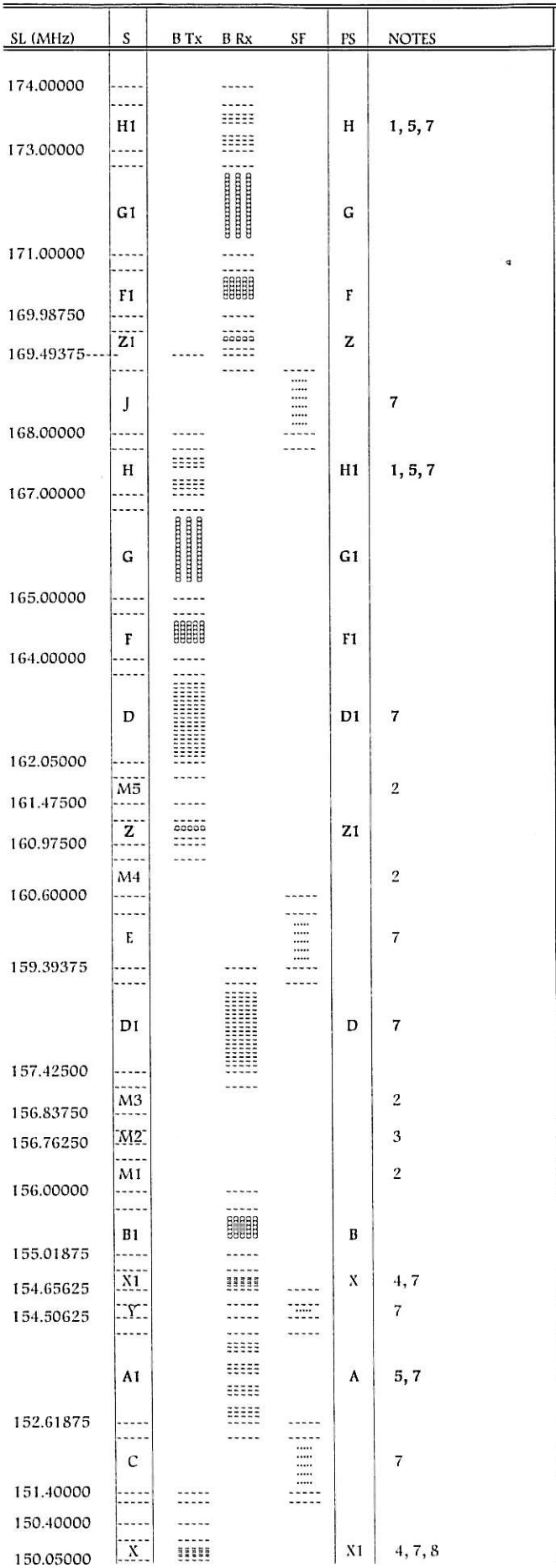
Ch	Tx = Rx	Ch	Tx = Rx		Tx = Rx
J1	168.0125	J21	168.5125	J41	169.0125
iJ1	168.0250	iJ21	168.5250	iJ41	169.0250
J2	168.0375	J22	168.5375	J42	169.0375
iJ2	168.0500	iJ22	168.5500	iJ42	169.0500
J3	168.0625	J23	168.5625	J43	169.0625
iJ3	168.0750	iJ23	168.5750	iJ43	169.0750
J4	168.0875	J24	168.5875	J44	169.0875
iJ4	168.1000	iJ24	168.6000	iJ44	169.1000
J5	168.1125	J25	168.6125	J45	169.1125
iJ5	168.1250	iJ25	168.6250	iJ45	169.1250
J6	168.1375	J26	168.6375	J46	169.1375
iJ6	168.1500	iJ26	168.6500	iJ46	169.1500
J7	168.1625	J27	168.6625	J47	169.1625
iJ7	168.1750	iJ27	168.6750	iJ47	169.1750
J8	168.1875	J28	168.6875	J48	169.1875
iJ8	168.2000	iJ28	168.7000	iJ48	169.2000
J9	168.2125	J29	168.7125	J49	169.2125
iJ9	168.2250	iJ29	168.7250	iJ49	169.2250
J10	168.2375	J30	168.7375	J50	169.2375
iJ10	168.2500	iJ30	168.7500	iJ50	169.2500
J11	168.2625	J31	168.7625	J51	169.2625
iJ11	168.2750	iJ31	168.7750	iJ51	169.2750
J12	168.2875	J32	168.7875	J52	169.2875
iJ12	168.3000	iJ32	168.8000	iJ52	169.3000
J13	168.3125	J33	168.8125	J53	169.3125
iJ13	168.3250	iJ33	168.8250	iJ53	169.3250
J14	168.3375	J34	168.8375	J54	169.3375
iJ14	168.3500	iJ34	168.8500	iJ54	169.3500
J15	168.3625	J35	168.8625	J55	169.3625
iJ15	168.3750	iJ35	168.8750	iJ55	169.3750
J16	168.3875	J36	168.8875	J56	169.3875
iJ16	168.4000	iJ36	168.9000	iJ56	169.4000
J17	168.4125	J37	168.9125	J57	169.4125
iJ17	168.4250	iJ37	168.9250	iJ57	169.4250
J18	168.4375	J38	168.9375	J58	169.4375
iJ18	168.4500	iJ38	168.9500	iJ58	169.4500
J19	168.4625	J39	168.9625	J59	169.4625
iJ19	168.4750	iJ39	168.9750	iJ59	169.4750
J20	168.4875	J40	168.9875	J60	169.4875
iJ20	168.5000	iJ40	169.0000		

This segment may be used by single frequency systems in the Land Mobile and Fixed Services for transmission of voice, messages and data.

Unless there is a justification, all new channels for voice communications will be 12.5kHz. Existing 25kHz voice communication channels may be used until 31.12.1999.

Except for voice communication systems, the 12.5kHz channel separation is nominal. Other channel spacings may be used as required by the communication system (for example paging). In such cases protection from adjacent channel interference will determine the frequency separation between the channels involved.

APPENDIX A
THE 148 - 174 MHz BAND PLAN



LEGEND

S	= Segment	SL	= Segment Limits
PS	= Paired Segment	SF	
B Tx	= Base transmit	B Rx	= Base Receive

Symbol	Spacing	SERVICE	Systems
	12.5 kHz	LAND MOBILE	Conventional
	(25 kHz)	two frequency	
	200 kHz	FIXED	Point To Point
		two frequency	multi-channel
	25 kHz	FIXED	Point To Point
		two frequency	single channel
	12.5 kHz	MISCELLANEOUS	Miscellaneous
	6.25(25)	single frequency	
	6.25 kHz	LAND MOBILE	Conventional
	(25 kHz)	two frequency	Miscellaneous
	12.5 kHz	LAND MOBILE	Trunked
	(25 kHz)	two frequency	Conventional
	12.5 kHz	MISCELLANEOUS	Miscellaneous
		two frequency	

NOTE: Channel bandwidths and spacings as given in the above table are nominal. Should there be a justified requirement other channel spacings and bandwidths may be authorised.

NOTES:

1. Frequencies from segment H1 should be avoided in areas where TV channel 1 is used. In those areas they can only be assigned if the EMC checks have confirmed an acceptable likelihood of interference from TV channel 1 transmissions to repeater receivers and from mobile and fixed transmitters to domestic TV receivers tuned to channel 1.
2. Maritime Mobile Services are subject to the provisions of Appendix 18 of the ITU Radio Regulations.
3. 156.8 MHz is the international distress, safety and calling frequency for the Maritime Mobile Service.
4. ACSB at 6.25kHz spacing will be permitted on channels not overlaping those channels presently used by Telikom and ELCOM.
5. Trunked systems will be given priority over conventional systems.
6. Radionavigation Satelitte EPIRB's
7. Wideband (25kHz) channels can be used until 31.12.1999.

   Unless justified otherwise all new assignments will be narrowband (12.5kHz or 6.25kHz).
8. These segments are world wide primary allocations to Low Earth Orbit Satellite.

APPENDIX B

CHANNEL PLAN FOR THE 148 - 174 MHz BAND

SL (MHz)	S	Purpose for which the segment may be used SERVICES	Systems	Tx/Rx Split (MHz)	Chan Spac (kHz)	No of Chan	First Channel (MHz)	Last Channel (MHz)	Channel Formula (MHz)
174.0000									
	H1	LAND MOBILE	Trunked/Conventional	5.9875	12.5	80	173.0125	173.9875	173.0000+.0125xN
173.0000									
	G1	FIXED (Point To Point)	Multi Channel Links	6.0	200	10	171.1000	172.9000	170.9000+.2xN
171.0000									
	F1	FIXED (Point To Point)	RTSS	5.9875	25	40	170.0000	170.9750	169.9750+.025xN
169.9875									
	Z1	MISCELLANEOUS	Miscellaneous	8.5125	12.5	39	169.5000	169.9750	169.4375+.0125xN
169.49375									
	J	MISCELLANEOUS	Single Frequency	0	12.5	119	168.0125	169.4875	168.0000+.0125xN
168.0000									
	H	LAND MOBILE	Trunked/Conventional	5.9875	12.5	80	167.0125	168.0000	167.0000+.0125xN
167.0000									
	G	FIXED (Point To Point)	Multi Channel Links	6.0	200	10	165.1000	166.9000	164.9000+.2xN
165.0000									
	F	FIXED (Point To Point)	RTSS	5.9875	25	40	164.0125	164.9875	163.9875+.025xN
164.0000									
	D	LAND MOBILE	Conventional	4.6125	12.5	155	162.0625	163.9875	162.0500+.0125xN
162.0500									
161.4750	M5	MARITIME MOBILE							
160.9750	Z	MISCELLANEOUS	Miscellaneous	8.5125	12.5	39	160.9875	161.4625	160.9750+.0125xN
	M4	MARITIME MOBILE							
160.6000									
	E	MISCELLANEOUS	Single Frequency	0	12.5	96	159.4000	160.5875	159.3875+.0125xN
160.6000									
	D1	LAND MOBILE	Conventional	4.6125	12.5	155	157.4500	159.375	157.4375+.0125xN
157.4250									
156.8375	M3	MARITIME MOBILE							
156.7625	M2	MARITIME MOBILE							
	M1	MARITIME MOBILE							
156.0000									
	B1	FIXED	Single Channel Links	4.6125	25	40	155.0250	156.00000	155.0000+.025xN
155.01875									
154.65625	X1	LAND MOBILE	Miscellaneous	4.60625	6.25	54	154.66875	155.00000	154.6625+.00625xN
154.50625	Y	MISCELLANEOUS	Single Frequency	0	6.25	25	154.51250	154.6625	154.50625+.00625xN
	A1	LAND MOBILE	Trunked/Conventional	4.6125	12.5	151	152.6250	154.5000	152.6125+.0125xN
152.61875									
	C	MISCELLANEOUS	Single Frequency	0	12.5	97	151.4125	152.6125	151.4000+.0125xN
151.4000									
	B	FIXED	Single Channel Links	4.6125	25	40	150.4125	151.3875	150.3875+.025xN
150.4000									
150.0500	X	LAND MOBILE	Miscellaneous	4.60625	6.25	54	150.06250	150.39375	150.0000+.00625xN
149.9000	R	RADIO NAVIGATION SATELITTE							
	A	LAND MOBILE	Trunked/Conventional	4.6125	12.5	151	148.0125	149.8875	148.0000+.0125xN
148.000									

APPENDIX C

TRANSMIT AND RECEIVE FREQUENCIES IN THE 148 - 174 MHz BAND

Appendix C contains the nominal transmit and receive frequencies for the various segments in the VHF High Band. Each frequency is designated with a letter corresponding to the particular segment and a number corresponding to the particular channel. The nominal band-aids and number of channels are also given for each segment.

For the Land Mobile two frequency segments the frequencies shown are used by repeaters.

For the Fixed two frequency segments the frequencies shown are used by radiocommunication equipment located at the telephone exchange.

Channels should be assigned in accordance with the channelling arrangements and notes in each segment and any relevant frequency assignment guide-lines and policies.

The allotment of segments to user groups and the channelling arrangements in the VHF High Band as presented in this appendix are nominal. Under some circumstances, for example if it is required to avoid harmful interference or to allow the implementation of a radiocommunication service not provided for in the band plan other arrangements may be permitted.