FREQUENCY ASSIGNMENT PROCEDURES FOR LOW CAPACITY TWO FREQUENCY FIXED SERVICES IN THE 820 - 960 MHz BAND

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CONTENTS PAGE

1.0 INTRODUCTION 2
2.0 CHANNELLING ARRANGEMENTS 2
3.0 FREQUENCY ASSIGNMENT RULES 3
3.1 Channel Assignment Strategy 3
3.2 Spatial and Frequency Cull Ranges 3
3.3 Protection Ratios 3
3.4 Adjacent Services 4
4.0 ANTENNAS 5
5.0 REFERENCES 5

ATTACHMENT: A Figure 1 of the 900 MHz Band Plan

ATTACHMENT: B Channelling arrangements and frequency assignment notes

1.0 INTRODUCTION

The introduction of new services such as the digital Cellular Mobile Telephone Service (CMTS) and Cordless Telephone Service (CTS) has necessitated the restructuring of the 900 MHz band. The 900 MHz Band Plan [1] issued in February 1992 details the new spectrum arrangements, including the allocation of two segments, 854 MHz to 857 MHz and 930 MHz to 933 MHz, for use by Low Capacity Two Frequency (LCTF) fixed services. These services previously occupied two six MHz segments, 847.5 MHz to 853.5 MHz and 932 MHz to 938 MHz. For more detailed information of the overall spectrum arrangements in the 900 MHz band, a copy of the Band Plan Diagram is given at Attachment A.

The LCTF Fixed Service is used mainly for 6 voice channel frequency division multiplex (FDM) point-to-point links by utility and telecommunications organisations. Digital modulation systems are also accommodated.

The purpose of this document is to provide frequency assignment procedures for services in the new LCTF Fixed Service segments of the 900 MHz band.

2.0 CHANNELLING ARRANGEMENTS

Three channelling patterns for LCTF fixed services are provided as shown in Attachment B. Suitable channels appropriate to the new service may be selected from any of these patterns when frequencies are being assigned.

1. Pattern A provides 15 go and return channels spaced at 200 kHz intervals. The centre frequencies of the first channel pair are at 854.1 and 930.1 MHz. This pattern is used for services with emission bandwidths greater than 100 kHz, ie, 6 channel FDM/FM systems, with a typical bandwidth of 150 kHz.

2. Pattern B provides 30 go and return channels spaced at 100 kHz intervals. The centre frequencies of the first channel pair are at 854.05 and 930.05 MHz. This pattern may be used for services with emission bandwidths of 50 kHz to 100 kHz, such as those used by some electricity supply authority links.

3. Pattern C provides 59 go and return channels spaced at 50 kHz intervals. The centre frequencies of the first channel pair are at 854.05 and 930.05 MHz. This pattern may be used for services with emission bandwidths between 25 kHz and 50 kHz and allows for the use of equipment providing a minimum of two (multiplexed) voice channels.

3.0 FREQUENCY ASSIGNMENT RULES

The frequency assignment process involves the standard calculation for the wanted to unwanted (W/U) signal level ratio for the proposed and each existing service in the coordination area, and a comparison of the W/U ratio with the required protection ratios for the services involved.

3.1 Channel Assignment Strategy

In areas of high spectrum demand, channels already used by LCTFs should be reused until a clear channel is necessary (this is known as vertical loading). Where there is a choice of frequencies, the frequency which provides minimum isolation, while still providing the appropriate level of protection, between the proposed and existing service should be chosen. It is acknowledged that other factors, such as the anticipated expansion of large networks or specific user requirements , may influence the selection of frequencies. In these cases other assignment strategies may be adopted. Where practicable, selection of frequencies should tend toward the low numbered (low frequency) channels to minimise potential interference problems with CTS systems in the 857-861 MHz segment of the 900 MHz band.

In low spectrum demand areas a horizontal loading/maximum isolation assignment strategy may be considered. Using this strategy the next clear channel is selected until reuse is required. Where there is a choice of frequencies the one that maximises the isolation between the proposed and existing services should be chosen. (A discussion of vertical and horizontal assignment strategies is given in reference [2]).

3.2 Spatial and Frequency Cull Ranges

Preliminary culls are used to determine site sense. They should cover a 2 km radius at each end of the proposed new link and should include at least all services within the 900 MHz band.

The main spatial cull is used to identify existing services within the coordination area. The cull should cover a 200 km radius, centred at the midpoint of the proposed new link and should include all services within the LCTF segment. Adjacent band services also need to be considered in this process (see section 3.4).

3.3 Protection Ratios

LCTF fixed services are generally assigned in the same manner as 900 MHz fixed service wideband links (WBL) and so require similar levels of protection. Previously values of 65 dB for co-channel and 45 dB for adjacent channel operation were used for the assignment of WBLs. Tests conducted by users of

WBLs indicate that a protection ratio of 50 dB is sufficient for co-channel operation and this figure has been adopted for the assignment of WBLs [3].

Discussions with LCTF fixed users indicate that values determined for wideband links are appropriate for LCTF fixed services. Thus a protection ratio of 50 dB is recommended for co-channel and 30 dB for adjacent channel use. The adjacent channel figure is consistent with protection ratios used in the lower microwave bands, and is confirmed by frequency dependant rejection (FDR)[1] calculations.

Protection ratios to be used for LCTF fixed services, both analogue and digital systems are:

Co-channel	50 dB
Adjacent channel	30 dB

Table 1. LCTF Protection Ratios

Note 1. Adjacent channel protection ratio figures apply to all receivers used in 200 kHz channels, regardless of adjacent channel transmitter bandwidth.

Note 2. Receivers used on narrow channels (100/50 kHz) would normally require less protection, tending towards those ratios used for single channel links. See [4].

3.4 Adjacent Services

The LCTF fixed service allocation in the 900 MHz band is adjacent to the Single Channel Single Frequency Fixed / CTS (shared band), Single Channel Two Frequency Fixed, and Digital Short Range Radio (DSRR) services. A guard band between LCTF and the single channel services is not considered necessary as these fixed services will be considered in the assignment process. (See reference [4] for appropriate protection ratios for the single channel services). Coordination arrangements between LCTF, CTS, and DSRR services are yet to be determined, and additional guide-lines will be provided as these services develop.

[1] FDR in accordance with CCIR Report 654-3 "Methods for Calculating Interference Power in Adjacent Bands and Channels".

4.0 ANTENNAS

A survey of the antennas currently used for LCTF services in high spectrum demand areas shows that the majority of systems are recorded as using an antenna with the characteristics of a 2 m gridpak or better. Thus, it is recommended that an antenna with characteristics similar to a 2 m gridpak be specified as the minimum requirement for LCTF, ie, the notional antenna.

It would normally be expected that new assignments employ the notional antenna as a minimum requirement. However, assigners may attach Special Conditions which allow for the use of other antennas where circumstances require.

Operators that have been displaced by the restructuring of the 900 MHz band may be permitted to retain existing antenna systems for a reasonable amortisation period after the changeover, providing overall coordination of services in these bands is not unduly restricted.

5.0 REFERENCES

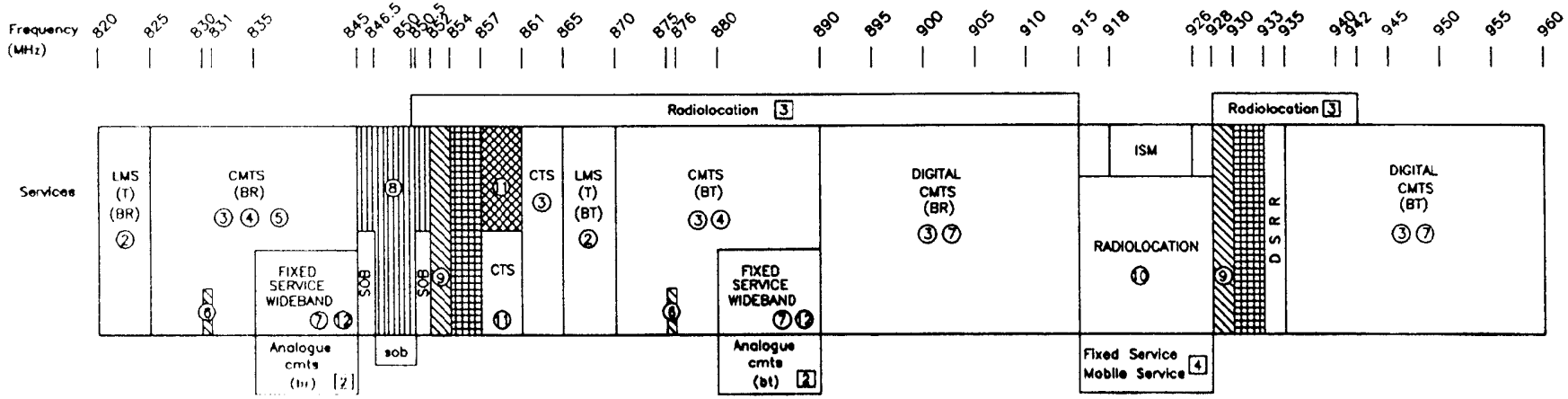
[1] 900 MHz Band Plan, Statutory Rules 1992 No.47

[2] Whittaker M.J. "Frequency Assignment Strategies in Australia", Journal of Electrical and Electronics Engineering Australia, September 1991

[3] "Frequency Assignment Rules for Fixed Service Wideband Links Operating in the Segments 835-845 MHz and 880-890 MHz", SPD 5/93, March 1993, Spectrum Planning Section, DOTAC

[4] "Lynx Version 3-Computer Assisted Frequency Assignment for Two Frequency Single Channel Fixed Services in the 150, 400 and 900 MHz Bands", (SP11/92), June 1992, Spectrum Planning Section, DOTAC

FIGURE 1: 900 MHz BAND PLAN DIAGRAM



ABBREVIATIONS:

BR	Base Receive
BT	Base Transmit
CMTS	Cellular Mobile Telephone Service
CTS	Cordless Telephone Service
DSRR	Digital Short Range Radio
ISM	Industrial, Scientific and Medical Applications
LMS(T)	Land Mobile Service (Trunked)
SOB	Sound Outside Broadcast Link

FIXED SERVICE SINGLE CHANNEL SINGLE FREQUENCY

FIXED SERVICE SINGLE CHANNEL TWO FREQUENCY

FIXED SERVICE LOW CAPACITY SINGLE FREQUENCY

FIXED SERVICE LOW CAPACITY TWO FREQUENCY

LEGEND

Services, the names of which are printed in 'CAPITALS' are called 'primary' services. See Table 1.

Services, the names of which are printed in 'normal characters' are called 'secondary' services. See Table 2.

(N) = see note N in Table 1.

[N] = see note N in Table 2.

Attachment A

Attachment B

CHANNELLING ARRANGEMENTS FOR LOW CAPACITY, TWO FREQUENCY FIXED SERVICES

854-857 MHz SEGMENT

PATTERN A

200 kHz Channels

Channel Centre Frequencies (MHz)
853.9+(n x (0.2))

PATTERN B

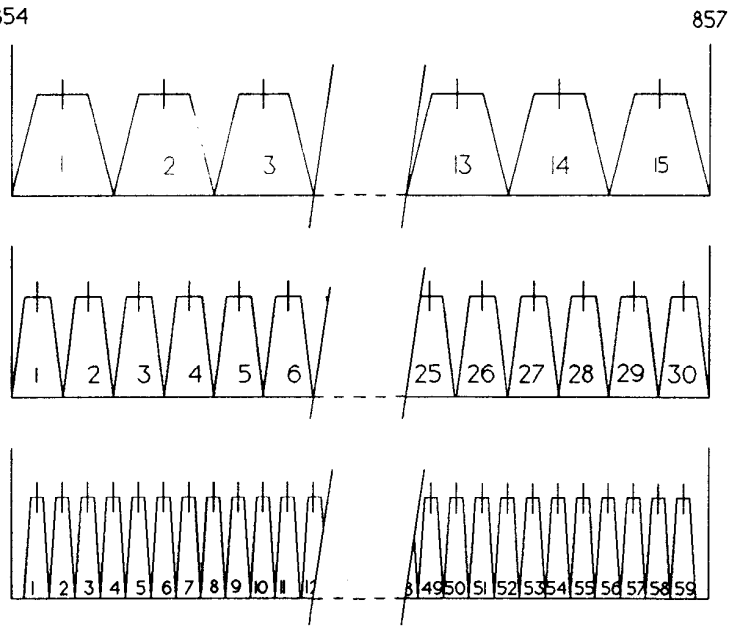
100 kHz Channels

Channel Centre Frequencies (MHz)
853.95+(n x (0.1))

PATTERN C

50 kHz Channels

Channel Centre Frequencies (MHz)
854+(n x (0.05))



930-933 MHz SEGMENT

PATTERN A

200 kHz Channels

Channel Centre Frequencies (MHz)
929.9+(n x (0.2))

PATTERN B

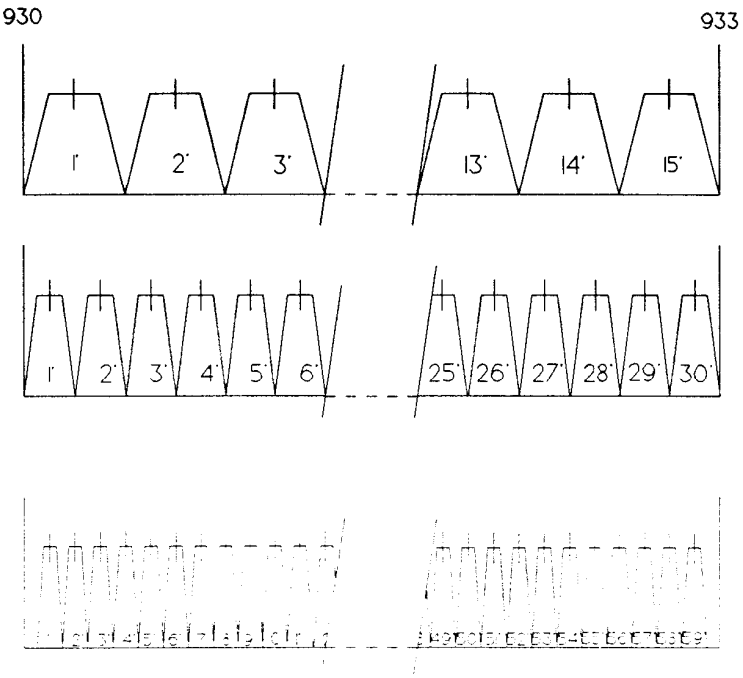
100 kHz Channels

Channel Centre Frequencies (MHz)
929.95+(n x (0.1))

PATTERN C

50 kHz Channels

Channel Centre Frequencies (MHz)
930+(n x (0.05))



See page 2 for Frequency Assignment Notes

Attachment B

FREQUENCY ASSIGNMENT NOTES:

1.	Notional Antenna	:2m gridpak
2.	Minimum Transmission Capacity	:analogue- 2 voice channels :digital - not specified, but minimum expected is 1 bit/s/Hz
3.	Minimum Path Length	:None specified
4.	Typical Use	:6 channel FDM links