Department of Communications

Project SABRE
(South African Band Re-planning Exercise)

Band plan for the frequencies
20 MHz to 3 GHz

Version 2.0

24 April 1997

Contents

1 Introduction

1.1 General

This document presents the band plan for the future use of the radio spectrum in South Africa between the frequencies 20 MHz and 3 GHz. The document has been produced by the Department of Communications (hereinafter referred to as the Department) in South Africa, with the assistance of Smith System Engineering and the CSIR, as part of Project SABRE (South African Band Re-planning Exercise).

1.2 Project SABRE

The need for Project SABRE emerged over a period of time, in response to factors such as the increased demand for radio spectrum and developments elsewhere in the world that could potentially benefit South Africa. The project was established by the former Department of Posts and Telecommunications in 1995 in order to re-plan the radio frequency spectrum between 20 MHz and 3 GHz. The project has been conducted by the Department, together with an international team of consultants, led by Smith System Engineering from the UK and including the CSIR in South Africa, the UK Radiocommunications Agency and the economic consultants NERA.

The principal aims of the project are as follows:

- to review the usage of the radio spectrum between the frequencies 20 MHz and 3 GHz;

- to produce a band plan for the future use of the spectrum, which is both agreed nationally in South Africa and consistent with international trends.

In order to achieve these aims, the project is divided into four phases:

- Phase 1 - 'Current spectrum usage', has reviewed the current spectrum usage in South Africa.

- Phase 2 - 'Requirements capture', has identified the requirements for the future use of the spectrum in South Africa.

- Phase 3 - 'International trends', has examined relevant international trends, both in technology and services and in the usage of the spectrum in other countries.

- Phase 4 - 'Band plan', has taken as input the results of the previous three phases, and has balanced these in order to produce the band plan which is presented in this document. The production of this final version follows the distribution of a draft version and the subsequent consultation process.

1.3 Methodology

The development of this future band plan has taken account of inputs from a wide variety of sources. In particular, the process has involved achieving an appropriate balance between the following three (sometimes contradictory) forces:

- the current usage of the radio spectrum in South Africa, and other related aspects of the current situation (any move from the current situation will inevitably create problems for those required to change);

- the future requirements and aspirations of spectrum users, industry and other interested parties in South Africa (it would be impossible for any future band plan to satisfy everyone's wishes);

- developments and trends elsewhere in the world (these are important in order to be able to source equipment economically and to be able to take advantage of emerging systems, technologies and services).

The capture of the current situation and future requirements has involved an extensive consultation and information gathering process conducted in South Africa. This has included the following activities:

- A series of interviews with major users of the radio spectrum, and manufacturers and suppliers of systems which utilise the spectrum. Over 50 interviews have taken place with representatives from, among others, the military, the police, the parastatals, local and regional authorities, other big radio users, telecommunications operators, broadcasters and signal distributors, dealers and manufacturers of radio equipment, groups representing disadvantaged communities, and other representative groups such as SARL, LMRA, BEAPS, etc. Each interview took place in South Africa, with typical attendees including senior executives and personnel responsible for communications and spectrum management. The interviews took place in the period January to March 1996.

- The distribution of a questionnaire to a larger set of stakeholders and other interested parties. The questionnaire was initially sent out in January 1996 to a list of around 200 organisations, the majority of which were big users of the radio spectrum. At the same time, advertisements were placed in the national press, the Government Gazette and trade publications inviting input from the general public. The questionnaire was sent out to respondents to these advertisements. The questionnaire was also distributed by the LMRA to its members, and a separate mailing was made to paging operators. In excess of 300 questionnaires were sent in total, and over 100 completed questionnaires were received by the Project SABRE team.

- The Project SABRE team has also drawn on previous exercises which have invited input concerning the radio spectrum in South Africa. In particular, extensive use has been made of submissions to previous Department spectrum review exercises, in particular the review of the spectrum between 30 and 470 MHz in 1994, and the request in February 1995 for proposals for technologies to be implemented in the 440-470 MHz band. Submissions in response to the recent telecommunications Green Paper have also been consulted, especially the answers to the questions regarding radio frequency spectrum management.

The above consultation and information gathering process formed the basis of Phases 1 and 2 of Project SABRE. Phase 3 of the project, which was performed in parallel with

Phases 1 and 2, was aimed at ensuring that South Africa is able to make full use of emerging opportunities from elsewhere in the world, and that the band plan is as far as possible future-proof to anticipated advances internationally. This phase included a wide ranging information gathering process concerning international trends relating to technologies, services, growth rates, spectrum plans, spectrum pricing, neighbouring countries, etc. This included discussions with a range of organisations around the globe, including regulatory and standardisation bodies, major international manufacturers, and experienced industry analysts.

Following the completion of Phases 1 to 3, a draft version of the future band plan was produced. This draft was distributed to industry at a launch conference on 12 June 1996, at which time written comments on the draft band plan were requested. These comments were evaluated and formed an input into the production of the band plan (Government Gazette No. 17701, 27 December 1996). A revised version of this plan follows.

1.4 Importance of the exercise

Project SABRE has resulted in a frequency band plan which indicates how the radio spectrum between 20 MHz and 3 GHz is to be used in South Africa in the future. This radio spectrum is utilised by a wide range of systems and services, which are either already being used or will in future be used by almost every person in South Africa.

Many different types of systems and services utilise this section of the radio spectrum. The following is only a small selection of these:

- telephone services to rural areas and disadvantaged communities;
- television and radio broadcasts;
- mobile radio systems used by commercial organisations;
- emergency communications by the police, fire and ambulance services, etc;
- cellular, cordless telephones and pagers;
- satellites (for telecommunication and broadcasting);
- alarm systems, remote control devices, etc.

The radio spectrum is not currently being utilised as efficiently and effectively as it could be. This has a number of implications:

- there is congestion and interference in some frequency bands;
- opportunities for the introduction of new technologies and services are restricted;
- users are not able to obtain as many frequencies as they would like;

- there are costs to business in terms of operational efficiency and equipment costs.

The aim of Project SABRE has been to produce a frequency band plan for the future that will make effective use of the scarce resource that is the radio frequency spectrum. This has been done in a way that will benefit all South Africans and will aid the social and economic development of the country.

There are thus a wide range of benefits that should result from Project SABRE and the frequency band plan that is produced. The following are some examples:

- helping to enable the provision of telephone services to communities that do not at present have any telecommunications;

- making more efficient use of the spectrum so that more users are able to benefit from it;

- providing opportunities for the use of advanced broadcasting technologies which will enable higher quality and wider ranging broadcasts;

- improving the quality of service for existing users;

- helping to enable businesses to operate more effectively, and to generate additional revenue for the country.

1.5 Structure of this document

This document is divided into the following sections:

- Section 2 presents, in tabular format, the proposed future band plan for the use of the radio spectrum in South Africa between 20 MHz and 3 GHz.

- Section 3 provides supporting notes to explain and give more information about the future band plan.

- Section 4 presents the future band plan in diagrammatic form, in order to aid comprehension.

- Appendix A provides a list of abbreviations used in the document.

2 Future band plan

The following table presents the band plan for the future use of the radio spectrum in South Africa between 20 MHz and 3 GHz. The plan represents a target that the country should strive to achieve.

The table is divided into the following columns:

- Frequency Band. The range of frequencies associated with the main allocations (in MHz). The frequency indicated as the start of the band is the centre frequency of the first channel included within the band. The frequency used to denote the end of the band is not included in the band.

- Main Allocations. This column indicates the main services to which each band is to be allocated. The service types are as defined by the ITU, and the allocations are in most cases consistent with the ITU Radio Regulations for Region 1 (as modified as a result of the World Radio Conference WRC-95). The allocations are all primary unless otherwise indicated, with different services delimited by oblique strokes. The service that will have most widespread use in the future is generally listed first.

- Sub-Allocations. This column gives details of any sub-allocations within a band, including proposed usage of the sub-band and range of frequencies in MHz. Where no sub-bands are indicated, the column may in some cases provide further details of the proposed usage of the band.

- Notes and comments. The comments in the right hand column give further information concerning the band, in particular when changes to its usage are proposed. This may include details such as major utilisations, the nature of the usage, and implications for migration. Where additional explanation is required a reference is made to the supporting notes in section 3, which might, for example, explain the rationale behind the proposed changes or give an outline of the proposed migration strategy.

- For some bands, the last column is divided into two, with the right-most column indicating significant geographic variations. Within certain bands different uses may be authorised based on geographical separation (coastal and inland, or urban and rural, for example). Such instances are noted in this manner.

The table and supporting notes make reference to a number of sources of information, including the following:

- The frequency allocation tables within the ITU Radio Regulations, as modified following WRC-95. Notes within these Radio Regulations are referred to by references of the form "RR S5.XYZ".

- The results of the ERC's Detailed Spectrum Investigation into the band 29.7 - 960 MHz (referred to as the "European DSI").

- ITU Recommendations (eg ITU-R F1098)

- CEPT Recommendations (eg T/R 13-01) and ERC Decisions.

- Declaration regarding radio apparatus published in the Government Gazette on 17 November 1995.

Throughout the band plan and the supporting notes in section 3, reference is made to broad timescales for the realisation of objectives. These timescales are being addressed in more detail in separate migration planning documentation, but in this document the terms immediate short, short, medium and long term are broadly used to indicate the following:

- immediate short term: 1 - 2 years (ie before 1999);
- short term: 2 - 5 years (ie 1999 - 2002);
- medium term: 5 - 10 years (ie 2002 - 2006);
- long term: 10 - 15 years (ie beyond 2006).

Frequency Band (MHz)	Main Allocations	Sub-Allocations (MHz)	Notes and comments
19.995 - 20.01	Standard Frequency and Time Signal		No change
20.01 - 21	Fixed		No change
21 - 21.45	Amateur / Amateur-Satellite		No change
21.45 - 21.85	Broadcasting		No change
21.85 - 21.924	Fixed		No change
21.924 - 22	Aeronautical Mobile		No change
22 - 22.855	Maritime Mobile		No change
22.855 - 23.2	Fixed		No change
23.2 - 23.35	Aeronautical Mobile / Fixed		No change
23.35 - 24.89	Mobile / Fixed		No change
24.89 - 24.99	Amateur / Amateur-Satellite		No change
24.99 - 25.01	Standard Frequency and Time Signal		No change
25.01 - 25.07	Mobile / Fixed		No change
25.07 - 25.21	Maritime Mobile		No change
25.21 - 25.55	Mobile / Fixed		No change
25.55 - 25.67	Radio Astronomy		No change
25.67 - 26.1	Broadcasting		No change
26.1 - 26.175	Maritime Mobile		No change
26.175 - 27.5	Mobile / Fixed	Single Frequency Mobile 26.175 - 27.5 ISM 26.957 - 27.283	No change Includes existing assignments for low power paging in 26.995 - 27.195 MHz and CB radio in 27.185 - 27.275 MHz International ISM band (RR S5.150 refers) See also Govt Gazette of 17 Nov 1995
27.5 - 28	Mobile / Fixed / Meteorological Aids		No change
28 - 29.7	Amateur / Amateur-Satellite		No change
29.7 - 30.005	Mobile / Fixed	Single Frequency Mobile 29.7 - 29.99	

Frequency Band (MHz)	Main Allocations	Sub-Allocations (MHz)	Notes and comments
		Amateur 29.7 - 30	29.7 - 30 MHz to be allocated to Amateur on a secondary basis (see note 3.3.1)
30.005 - 30.01	Mobile / Fixed / Space Operation	Government 29.99 - 32	
30.01 - 50	Mobile / Fixed		
		Single Frequency Mobile 32 - 32.325	No change
		Mobile 1 MTX 32.325 - 33.675	No change Paired with 41.65 - 43 MHz
		Single Frequency Mobile 33.675 - 34.175	No change
		Mobile 2 MTX 34.175 - 35	No change Paired with 40.625 - 41.45 MHz Demonstration frequency at 34.7 MHz unchanged (paired with 41.15 MHz)
		Model Aircraft Control 35 - 35.25	New allocation for control of model aircraft (see note 3.3.2) Current DF assignments in 35 - 35.15 MHz and SF assignments in 35.2 - 35.25 MHz to be migrated
		Single Frequency Mobile 35.25 - 35.5	No change
		Mobile 3 BTX 35.5 - 36.825	No change Paired with 38.5 - 39.825 MHz
		Single Frequency Mobile 36.825 - 38.5	No change 36.85 - 38.45 MHz currently assigned to Government Radio Astronomy at 38.45 MHz
		Mobile 3 MTX 38.5 - 39.825	No change Paired with 35.5 - 36.825 MHz
		Single Frequency Mobile 39.825 - 40.625	No change

Frequency Band (MHz)	Main Allocations	Sub-Allocations (MHz)	Notes and comments
	Mobile / Fixed (continued)	Mobile 2 BTX 40.625 - 41.45	No change Paired with 34.175 - 35 MHz 40.675 - 40.685 MHz to be allocated to Amateur for propagation study (max ERP 10W) Current low power paging at 40.68 MHz to be migrated Wireless microphones in 40.65 - 40.7 MHz (Govt Gazette of 17 Nov 1995 refers) 40.66 - 40.7 MHz is international ISM band (RR S5.150 refers) Demonstration frequency at 41.15 MHz unchanged (paired with 34.7 MHz)
		Single Frequency Mobile 41.45 - 41.65	SF assignments due to model control at 35 - 35.25 MHz Current DF assignments in 41.45 - 41.6 MHz to be migrated
		Mobile 1 BTX 41.65 - 43	No change Paired with 32.325 - 33.675 MHz
			ITU footnote regarding use of 41 - 44 MHz for Aeronautical no longer required (see note 3.3.3)
		Government 43 - 50	
		Meteor Burst 45.3 - 46.9 and 47.5 - 49.1	New allocation for meteor burst communications
		CT0 Cordless Telephones BTX 46.61 - 46.97 MTX 49.67 - 49.97	7 frequency pairs assigned to CT0 (see note 3.3.4)
50 - 54	Amateur		No change Wireless microphone and model control assignments in 53 - 54 MHz (Govt Gazette of 17 Nov 1995 refers) and low power paging in 53.025 - 53.225 MHz remain unchanged

Frequency Band (MHz)	Main Allocations	Sub-Allocations (MHz)	Notes and comments
54 - 66	Mobile / Fixed	Single Frequency Mobile 54 - 54.325	No change
		Mobile 1 BTX 54.325 - 54.45	No change Paired with 59.9 - 60.025 MHz Demonstration frequency at 54.35 MHz to be removed
		Government 54.45 - 55.45	Model control still required at 54.45 - 54.55 MHz
		Mobile 2 BTX 55.45 - 56.85	No change Paired with 58.5 - 59.9 MHz
		Single Frequency Mobile 56.85 - 58.5	No change
		Mobile 2 MTX 58.5 - 59.9	No change Paired with 55.45 - 56.85 MHz
		Mobile 1 MTX 59.9 - 60.025	No change Paired with 54.325 - 54.45 MHz Demonstration frequency at 59.925 MHz to be removed
		Government 60.025 - 66	Current assignments for model aircraft control in 60.1375 - 60.375 MHz to be phased out in medium term (see note 3.3.2)
66 - 68	Mobile / Fixed	National Emergency Alarm Radio (NEAR)	Block allocation for NEAR (see note 3.4.1)
68 - 74.8	Mobile / Fixed	Single Frequency Mobile 68 - 69.25	No change
		Mobile 1 BTX 69.25 - 70	No change Paired with 76.175 - 76.925 MHz
		Mobile 2 BTX 70 - 70.975	No change to Mobile usage Paired with 75.2 - 76.175 MHz
		Amateur 70 - 70.3	Allocation to Amateur is on a secondary basis (see note 3.4.3)
		Single Frequency Mobile 70.975 - 71.475	No change Current assignments to fire fighting
		Mobile 3 BTX 71.475 - 72.525	No change Paired with 76.925 - 77.975 MHz
		Single Frequency Mobile 72.525 - 73.425	No change
		Mobile 4 BTX 73.425 - 74.8	No change Paired with 78.625 - 80 MHz

Frequency Band (MHz)	Main Allocations	Sub-Allocations (MHz)	Notes and comments
74.8 - 75.2	Aeronautical Radionavigation	Instrument Landing System markers	No change
75.2 - 87.5	Mobile / Fixed	Mobile 2 MTX 75.2 - 76.175	No change Paired with 70 - 70.975 MHz
		Mobile 1 MTX 76.175 - 76.925	No change Paired with 69.25 - 70 MHz
		Mobile 3 MTX 76.925 - 77.975	No change Paired with 71.475 - 72.525 MHz
		Mobile 5 BTX 77.975 - 78.625	No change Paired with 82.975 - 83.625 MHz
		Mobile 4 MTX 78.625 - 80	No change Paired with 73.425 - 74.8 MHz
		Mobile 6 BTX 80 - 80.5	No change Paired with 87 - 87.5 MHz Demonstration frequency at 80.15 MHz unchanged (paired with 87.15 MHz)
		Single Frequency Mobile 80.5 - 81	No change
		Mobile 7 BTX 81 - 81.625	No change Paired with 86.375 - 87 MHz To include assignments for dual frequency alarms (see note 3.6.2)
		Mobile 8 BTX 81.625 - 82.975 MHz	No change Paired with 85.025 - 86.375 MHz
		Mobile 5 MTX 82.975 - 83.625	No change Paired with 77.975 - 78.625 MHz
		Single Frequency Mobile 83.625 - 85.025	No change
		Mobile 8 MTX 85.025 - 86.375	No change Paired with 81.625 - 82.975 MHz
		Mobile 7 MTX 86.375 - 87	No change Paired with 81 - 81.625 MHz To include assignments for 2-way alarms (see note 3.6.2)
		Mobile 6 MTX 87 - 87.5	No change Paired with 80 - 80.5 MHz Demonstration frequency at 80.15 MHz unchanged (paired with 80.15 MHz)
87.5 - 108	Broadcasting	FM Sound Broadcasting	No change

Frequency Band (MHz)	Main Allocations	Sub-Allocations (MHz)	Notes and comments
108 - 117.975	Aeronautical Radionavigation	ILS localiser 108-112 VOR (VHF Omni-directional Range) 112-117.975	No change
117.975 - 137	Aeronautical Mobile		No change
137 - 138	Mobile-Satellite / Meteorological-Satellite / Mobile / Space Operation / Space Research	MSS 137 - 138 NOAA meteorological satellite 137.5 - 137.62	All except mobile are space-to-Earth MTX assignments at 137.775 - 138 MHz to be migrated
138 - 144	Mobile / Fixed	Mobile 1 MTX 138 - 140.5	Paired with 141.5 - 144 MHz New allocation includes current MTX assignments at 138 - 138.425 and 138.475 - 138.95 MHz (pairings to change) Current SF assignments at 138.975 - 140.5 MHz to be migrated or changed to DF
		Alarms 140.5 - 141	See note 3.6.2 Current SF assignments to be migrated
		Single Frequency Mobile 141 - 141.5	Primary status of current users will be rescinded. Plan to migrate towards MTX leg of duplex pair with 152.55 - 153.05 MHz as use of SF reduces
		Mobile 1 BTX 141.5 - 144	Paired with 138 - 140.5 MHz New allocation includes current BTX assignments at 142.8 - 143.275 and 143.325 - 143.975 MHz (pairings to change) Current SF assignments at 141.5 - 142.775 MHz to be migrated or changed to DF Demonstration frequency at 143.9 MHz to be removed
144 - 146	Amateur / Amateur-Satellite		No change
146 - 148	Mobile / Fixed	Mobile 2 MTX 146 - 148	Paired with 153.05 - 155.05 MHz New allocation includes existing MTX assignments at 146.05 - 148.9 MHz

Frequency Band (MHz)	Main Allocations	Sub-Allocations (MHz)	Notes and comments	
148 - 149.9	Mobile-Satellite (E-to-s) / Mobile / Fixed	MSS 148 - 149.9 Mobile 2 MTX 148 - 148.95 Single Frequency Mobile 148.95 - 149.8	See note 3.6.3 Band allocated at WARC-92 to MSS (Little LEOs) Current MTX and SF assignments can remain in short-medium term	
149.9 - 150.05	Radionavigation-Satellite / Land Mobile-Satellite (E-to-s)	MSS 149.9 - 150.05 Single Frequency Mobile 149.9 - 150.05	See note 3.6.3 Current SF assignments can remain in short-medium term	
150.05 - 156.7625	Mobile / Fixed	Paging 150.05 - 151	Block allocation for paging (see note 3.6.4) Current SF assignments at 150.05 - 150.5 MHz to be migrated	
		Government 151 - 152.05	No change	
		Alarms 152.05 - 152.55	See note 3.6.2 Current SF assignments to be migrated	
		Single Frequency Mobile 152.55 - 153.05	Plan to migrate towards BTX leg of duplex pair with 141 - 141.5 MHz as use of SF reduces	
		Mobile 2 BTX 153.05 - 156	Unchanged Paired with 146 - 148.95 MHz	
		Mobile 3 MTX 156 - 156.7625	International maritime MTX (ship station) at 156 - 156.375 MHz paired with 160.6 - 160.975 MHz unchanged Single frequency maritime at 156.375 - 156.7625 MHz unchanged International distress call (digital) at 156.525 MHz unchanged	156 - 156.375 MHz allocated to land mobile MTX in inland areas (paired with 160.6 - 160.975 MHz) 156.375 - 156.7625 MHz allocated to SF mobile in inland areas
156.7625 - 156.8375	Maritime Mobile		International distress, safety and call frequency at 156.8 MHz unchanged	

Frequency Band (MHz)	Main Allocations	Sub-Allocations (MHz)	Notes and comments	
156.8375 - 174	Mobile / Fixed	Mobile 3 MTX 156.8375 - 157.95	Single frequency maritime at 156.8375 - 156.875 MHz unchanged	156.8375 - 156.875 MHz allocated to SF mobile in inland areas
			International maritime MTX (ship station) at 156.875 - 157.45 MHz paired with 161.475 - 162.05 MHz unchanged	156.875 - 157.95 MHz allocated to land mobile MTX in inland areas (paired with 161.475 - 162.55 MHz)
			Private maritime MTX at 157.45 - 157.95 MHz paired with 162.05 - 162.55 MHz	
		Mobile 4 BTX 157.95 - 160.6	Paired with 162.55 - 165.2 MHz	
			Tx/Rx separation to be altered	
		Mobile 3 BTX 160.6 - 162.55	International maritime BTX (coast station) at 160.6 - 160.975 MHz paired with 156 - 156.375 MHz unchanged	160.6 - 160.975 MHz allocated to land mobile BTX in inland areas (paired with 156 - 156.375 MHz)
			Single frequency mobile at 160.975 - 161.475 MHz unchanged	160.975 - 161.475 MHz allocated to SF mobile
			International maritime BTX (coast station) at 161.475 - 162.05 MHz paired with 156.875 - 157.45 MHz unchanged	161.475 - 162.55 MHz allocated to land mobile BTX in inland areas (paired with 156.875 - 157.95 MHz)
			Private maritime BTX at 162.05 - 162.55 MHz paired with 157.45 - 157.95 MHz	

Frequency Band (MHz)	Main Allocations	Sub-Allocations (MHz)	Notes and comments	
	Mobile / Fixed (continued)	Mobile 4 MTX 162.55 -165.2	Paired with 157.95 - 160.6 MHz Tx/Rx separation to be altered	Restrictions on civilian use of 161.875 - 173.875 MHz (Sonobuoy frequencies) in coastal areas to be relaxed (see note 3.6.5)
		Mobile 5 MTX 165.2 - 169.4	Paired with 169.8 - 174 MHz	
		Paging 169.4 - 169.8	New allocation of national paging band for ERMES (see note 3.6.6)	
		Mobile 5 BTX 169.8 - 174	Paired with 165.2 - 169.4 MHz	
174 - 238	Broadcasting	Band III TV Broadcast Channels 4 to 11	No change Current wireless microphone assignments throughout this band unchanged	
238 - 246	Mobile / Fixed	International Distress Frequency 242.95 - 243.05	This band is currently kept clear for the International Distress frequency Spillover from NICAM transmissions on Channel 11 affects low end of this band Current wireless microphone and other low power device assignments unchanged	
		Digital Audio Broadcasting (T-DAB) 238.4 - 239.9	Allocation of initial T-DAB channel at 238.432 - 239.968 MHz. Possibility of further T-DAB channels either above or below this (see note 3.7.1)	
246 - 254	Broadcasting	Band III TV Broadcast Channel 13	Problems with use of NICAM on Channel 13 (see note 3.7.2)	
254 - 272	Mobile / Fixed	Public Trunking (MPT 1327) BTX 254 - 259.4	No change See note 3.7.3	
		Government 259.4 - 262	No change	
		Public Trunking (MPT 1327) MTX 262 - 267.4	No change See note 3.7.3	

Frequency Band (MHz)	Main Allocations	Sub-Allocations (MHz)	Notes and comments
	Mobile / Fixed (continued)	Government 267.45 - 400	
272 - 273	Mobile / Fixed / Space Operation		
273 - 328.6	Mobile / Fixed	Paging 700 kHz from 278 - 286	Proposed new band for 2-way paging (700 kHz from within 278 - 286 MHz, paired with 925 - 925.4 MHz) See note 3.7.4
328.6 - 335.4	Aeronautical Radionavigation	ILS Glide Path 328.6 - 335.4	
335.4 - 399.9	Mobile / Fixed	WLL 336-346	See note 3.7.5 paired with 356-366 MHz
		Trunked Mobile MTX 380 - 390 BTX 390 - 400	To be used for digital trunking in the long term (see note 3.7.6)
399.9 - 400.05	Radionavigation-Satellite / Land Mobile-Satellite		No change
400.05 - 400.15	Standard Frequency and Time Signal		No change
400.15 - 401	Mobile-Satellite / Meteorological-Satellite / Meteorological Aids / Space Research		No change All except Meteorological Aids are space-to-Earth
401 - 402	Meteorological Aids / Space Operation (s-to-E)		No change
402 - 406	Meteorological Aids	Low Power Devices 402 - 406	No change Govt Gazette of 17 Nov 1995 refers
406 - 406.1	Mobile-Satellite (E-to-s)	Emergency Position Indicating Radio Beacon (EPIRB)	No change

Frequency Band (MHz)	Main Allocations	Sub-Allocations (MHz)	Notes and comments	
406.1 - 420	Mobile / Fixed	Single Frequency Mobile 406.1 - 407.625	See note 3.8.2 Migration of fixed links to higher frequencies as far as possible	
		Mobile MTX 407.625 - 413	See note 3.8.3 Allocation for Government / public safety usage (mainly trunked) Migration of fixed links to higher frequencies as far as possible Paired with 417.625 - 423 MHz MHz	
		Mobile Data MTX 413 - 413.7625	New band for public mobile data, paired with 423 - 423.7625 MHz (see note 3.8.4)	
		Public Trunking MTX 413.7625 - 417.625	See notes 3.8.2 & 3.8.4 New band for public trunking using digital mobile radio Migration of fixed links to higher frequencies as far as possible Paired with 423.7625 - 427.625 MHz	415 - 417.2 MHz (paired with 425 - 427.2 MHz) to be allocated to WLL in rural areas (see note 3.8.4)
		Mobile BTX 417.625 - 420 Trunked Mobile MTX (Urban) 417.625 - 420	See notes 3.8.3 & 3.8.5 Paired with 407.625 - 410 MHz Trunked Mobile MTX paired with 427.625 - 430 MHz Allocation for Government / public safety usage Possibility to introduce other trunked mobile radio in urban areas in medium term	

Frequency Band (MHz)	Main Allocations	Sub-Allocations (MHz)	Notes and comments	
420 - 430	Mobile / Fixed	Trunked Mobile BTX 420 - 423	Trunked mobile radio for Government / public safety, paired with 410 - 413 MHz (see note 3.8.3) Current single frequency links to be migrated	
		Mobile Data BTX 423 - 423.7625	New band for public mobile data, paired with 413 - 413.7625 MHz (see note 3.8.4) Current single frequency links to be migrated	
		Public Trunking BTX 423.7625 - 427.625	New band for public trunking using digital mobile radio (see note 3.8.4) Paired with 413.7626 - 417.625 MHz Current single frequency links to be migrated (see note 3.8.1)	425 - 427.2 MHz (paired with 415 - 417.2 MHz) to be allocated to WLL in rural areas (see note 3.8.4)
		Trunked Mobile BTX (Urban) 427.625 - 430 Single Frequency Fixed (Rural) 427.625 - 430	See note 3.8.5 Use for trunked mobile radio in urban areas in medium term (paired with 417.625 - 420 MHz) Frequencies will only be assigned for SF links where migration above 1 GHz would be impractical	
430 - 440	Amateur / Radiolocation	Amateur 430 - 440 ISM / Low Power Devices 433.05 - 434.79 Amateur-Satellite 435 - 438	See note 3.8.6 Used for low power applications such as remote control. Centre frequency 433.92 MHz. Govt Gazette of 17 Nov 1995 refers Subject to conditions in RR S5.282	

Frequency Band (MHz)	Main Allocations	Sub-Allocations (MHz)	Notes and comments	
440 - 450	Mobile / Fixed	Telemetry / Data BTX 440 - 441	Scanning telemetry, dual frequency alarms, and other fixed point-to-multipoint data services that require to use mobile technology (see note 3.8.7) Paired with 445 - 446 MHz Existing links to be migrated	
		Mobile BTX 441 - 445	Paired with 446 - 450 MHz (see note 3.8.7) Existing links to be migrated	
		Telemetry / Data MTX 445 - 446	Scanning telemetry, dual frequency alarms, and other fixed point-to-multipoint data services that require to use mobile technology (see note 3.8.7) Paired with 440 - 441 MHz Existing links to be migrated	
		Mobile MTX 446 - 450	Paired with 441 - 441 MHz (see note 3.8.7) Existing links to be migrated	
450 - 470	Mobile / Fixed	Fixed Links 450 - 453	Paired with 460 - 463 MHz (see note 3.8.8) Existing links will be migrated in accordance with fixed link strategy (see notes 3.2.1 & 3.8.1). Dual frequency links that have to remain in UHF will be migrated to this band Assignments to data in 451.5 - 452.675 MHz will migrate to 440 - 441 MHz	
		Single Frequency Mobile 453.025 - 453.975	No change	
		Paging 453.975 - 454.425	New regional paging band, including 4 channels for on-site paging (see note 3.8.8) Current MTX assignments at 454.025 - 454.125 MHz and SF assignments at 454.275 - 454.725 MHz to be migrated	
		Trunked Mobile MTX 454.425 - 460	Paired with 464.425 - 470 MHz (see note 3.8.8) Current BTX assignments at 454.875 - 454.975 and 459 - 459.975 MHz will be affected. C450 license (BTX at 455.5 - 459.48 MHz) expires in 1999	455 - 460 MHz (paired with 465 - 470 MHz) to be allocated to WLL in rural areas (see note 3.8.8)

Frequency Band (MHz)	Main Allocations	Sub-Allocations (MHz)	Notes and comments	
	Mobile / Fixed (continued)	Fixed Links 460 - 463	Paired with 450 - 453 MHz (see note 3.8.8) Existing links will be migrated in accordance with fixed link strategy (see notes 3.2.1 & 3.8.1). Dual frequency links that have to remain in UHF will be migrated to this band Assignments to data in 461.5 - 462.675 MHz will migrate to 445 - 446 MHz	
		Single Frequency Mobile 463.025 - 463.975	No change	
		Low Power Mobile Radio 463.975 - 464.425	Includes short range business radios 464.375 - 464.425 MHz to be dedicated for control of hazardous equipment (see note 3.8.6)	
		Trunked Mobile BTX 464.425 - 470	Paired with 454.425 - 460 MHz (see note 3.8.8) Current single frequency assignments at 464.525 - 464.975 MHz will be affected Current C450 license (MTX at 465.5 - 469.48 MHz) expires in 1999	465 - 470 MHz (paired with 455 - 460) allocated to WLL in rural areas (see note 3.8.8)
470 - 854	Broadcasting	TV Broadcasting Channels 21 - 68	No change to basic allocation One 8 MHz channel should be reserved for digital TV experiments (see note 3.9.1)	Sharing of broadcasting spectrum with WLL and links in 790 - 854 MHz (see note 3.9.2)
854 - 862	Fixed	Fixed links 856 - 864.1	Current links in this band can remain unchanged in the short term (see note 3.9.3)	
862 - 890	Mobile / Fixed			
		CT2 Cordless Telephones 864.1 - 868.1	No change See note 3.9.4	
		Fixed links 868.1 - 876	Link frequencies will be assigned or retained in this band only where migration would be impractical (see note 3.9.3)	Part of 869 - 894 MHz (paired with 824 - 849 MHz) to be allocated to WLL in rural areas (see note 3.9.2)

Frequency Band (MHz)	Main Allocations	Sub-Allocations (MHz)	Notes and comments	
		Trunked Mobile MTX 876 - 880	Reserved for use for digital trunked mobile radio services, eg using GSM-R or TETRA (see note 3.9.6) Paired with 921 - 925 MHz Links in this band to be migrated in accordance with fixed link strategy (see note 3.2.3)	872- 905 MHz (paired with 917 - 950 MHz) to be allocated to WLL in rural areas (see note 3.9.5)
		E-GSM Cellular MTX 880.4 - 890	Reserved for Extended GSM (see note 3.9.7) Paired with 925.4 - 935 MHz Links in this band to be migrated in accordance with fixed link strategy (see note 3.2.3) Lower 400 kHz unavailable due to paging at 925 - 925.4 MHz	

Frequency Band (MHz)	Main Allocations	Sub-Allocations (MHz)	Notes and comments	
890 - 960	Mobile / Fixed	GSM Cellular MTX 890 - 914	No change Paired with 935 - 959 MHz	
		CT1 Cordless Telephones 914 - 915	No change (see note 3.9.8) Paired with 959 - 960 MHz	
		Reserved 915.4 - 921 Low Power Devices 915 MHz ± 0.0015% Vehicle location systems 915.025 - 915.2 Radio tagging systems 915.2 - 915.4	Part of Region 2 ISM band at 902 - 928 MHz (see note 3.9.9) Govt Gazette of 17 Nov 1995 refers	917- 950 MHz (paired with 872- 905 MHz) to be allocated to WLL in rural areas (see note 3.9.5)
		Trunked Mobile BTX 921 - 925	Reserved for use for digital trunked mobile radio services, eg using GSM-R or TETRA (see note 3.9.6) Paired with 876 - 880 MHz	
		Paging 925 - 925.4	See note 3.9.10 Inbound leg of national paging band (including guard bands), paired with 700 kHz in 276 - 282 MHz	
		E-GSM Cellular BTX 925.4 - 935	Reserved for Extended GSM (see note 3.9.7) Paired with 880.4 - 890 MHz	
		GSM Cellular BTX 935 - 959	No change Paired with 890 - 914 MHz	
		CT1 959 - 960	No change (see note 3.9.8) Paired with 914 - 915 MHz	
960 - 1215	Aeronautical Radionavigation	Distance Measuring Equipment / Secondary Surveillance Radar	No change	

Frequency Band (MHz)	Main Allocations	Sub-Allocations (MHz)	Notes and comments	
1215 - 1240	Radiolocation / Radionavigation-Satellite (s-to-E)	Low Power Devices 1215 - 1225 GPS L2 1215 - 1260	Govt Gazette of 17 Nov 1995 refers	
1240 - 1260	Radiolocation / Radionavigation-Satellite (s-to-E) / Amateur	Amateur 1240 - 1300	Amateur at 1240 - 1300 MHz on secondary basis	
1260 - 1300	Radiolocation / Amateur	Air Traffic Control Radar 1240 - 1350		
1300 - 1350	Aeronautical Radionavigation			
1350 - 1400	Fixed / Mobile / Radiolocation	Fixed links (Go) 1350 - 1375	Allocation for dual frequency links migrated from other bands. Paired with 1492 - 1517 MHz. CEPT T/R 13-01 refers. (see note 3.10.1)	
		Fixed links (Return) 1375 - 1400	New allocation for dual frequency links migrated from other bands. Paired with 1427 - 1452 MHz. CEPT T/R 13-01 refers. (see note 3.10.1) The band 1395-1400 /1447-1452 MHz will be used only for Fixed services pertaining to the provision of WLL, for a period of 5 years.	
1400 - 1427	Earth Exploration-Satellite / Radio Astronomy / Space Research		No change Earth Exploration-Satellite and Space Research are passive	
1427 - 1429	Fixed / Mobile / Space Operation (E-to-s)	Fixed links (Go)	Allocation for dual frequency links migrated from other bands. Paired with 1375 - 1400 MHz. CEPT T/R 13-01 refers. (see also notes 3.10.1 and 3.10.3)	1429 - 1465 MHz paired with 1477 - 1513 MHz (excl. 1447-1452 MHz) to be allocated to WLL on shared basis (see note 3.10.2)
1429 - 1452	Fixed / Mobile			

Frequency Band (MHz)	Main Allocations	Sub-Allocations (MHz)	Notes and comments	
1452 - 1492	Broadcasting / Broadcasting-Satellite / Fixed / Mobile	Terrestrial Digital Audio Broadcasting (T-DAB) 1452 - 1467	See note 3.10.4 Current fixed link allocations at 1449 - 1464 MHz will need to be migrated. The band 1395-1400 /1447-1452 MHz will be used only for Fixed services pertaining to the provision of WLL, for a period of 5 years	1477 - 1513 MHz paired with 1429 - 1465 MHz (excl. 1447-1452 MHz) to be allocated to WLL on shared basis (see note 3.10.2)
		Satellite Digital Audio Broadcasting (S-DAB) 1467 - 1492	See note 3.10.4 No fixed links to be migrated	
1492 - 1525	Fixed / Mobile	Fixed Links (Return) 1492 - 1517	Allocation for DF links migrated from other bands. Paired with 1350 - 1375 MHz. CEPT T/R 13-01 refers. (see also notes 3.10.1 & 3.10.3)	
		Single Frequency Fixed Links 1517 - 1525	New allocation for SF links migrated from other bands	
1525 - 1535	Maritime Mobile-Satellite (s-to-E)/ Fixed / Space Operation (s-to-E) /		Some current fixed links to be migrated in line with fixed links strategy in long term (see note 3.2.3)	
1535 - 1544	Maritime Mobile-Satellite (s-to-E)	Inmarsat	No change	
1544 - 1545	Mobile-Satellite (s-to-E)		No change	
1545 - 1555	Aeronautical Mobile-Satellite (s-to-E)		No change. Paired with 1646.5 - 1656.5 MHz	
1555 - 1559	Land Mobile-Satellite (s-to-E)		No change	

Frequency Band (MHz)	Main Allocations	Sub-Allocations (MHz)	Notes and comments
1559 - 1610	Aeronautical Radionavigation / Radionavigation-Satellite (s-to-E)	GPS L1	No change for GPS in 1559 - 1610 MHz APC (Aeronautical Public Correspondence) BTX in 1593 - 1594 MHz, paired with MTX in 1625.5 - 1626.5 MHz. Situation may need reviewing in long term
1610 - 1626.5	Mobile-Satellite (E-to-s)		1610 -1626.5 MHz designated worldwide for emerging MSS systems. Paired with 2483.5 - 2500 MHz for some systems. (see note 3.10.5)
1626.5 - 1645.5	Maritime Mobile-Satellite (E-to-s)	Inmarsat	No change
1645.5 - 1646.5	Mobile-Satellite (E-to-s)		No change
1646.5 - 1656.5	Aeronautical Mobile-Satellite (E-to-s)		No change. Paired with 1545 - 1555 MHz
1656.5 - 1660.5	Land Mobile-Satellite (E-to-s)		No change
1660.5 - 1668.4	Radio Astronomy / Space Research		No change
1668.4 - 1670	Meteorological Aids / Radio Astronomy / Mobile/ Fixed		No change
1670 - 1700	Meteorological Aids / Meteorological-Satellite (s-to-E) / Mobile / Fixed	Terrestrial Flight Telephone System (TFTS) 1670 - 1675	Possible allocation for TFTS ground stations (paired with 1800 - 1805 MHz) (see note 3.10.6)
1700 - 1710	Fixed / Mobile / Meteorological-Satellite (s-to-E)	Fixed Links	Current fixed links to be migrated in long term according to fixed links strategy (see note 3.2.3)

Frequency Band (MHz)	Main Allocations	Sub-Allocations (MHz)	Notes and comments	
1710 - 1980	Mobile / Fixed	Personal Communication Networks (PCN) MTX 1710 - 1785	See note 3.10.7 Paired with 1805 - 1880 MHz. CEPT T/R 22-07 refers Current fixed link assignments to be migrated according to fixed link strategy (see note 3.2.3)	PCN band also to be used for WLL (see note 3.10.2)
		Reserved 1785 - 1800	Migration of fixed links out of this band in long term	
		Terrestrial Flight Telephone System (TFTS) 1800 - 1805	Possible allocation for TFTS aircraft stations (paired with 1670 - 1675 MHz) (see note 3.10.6) No immediate plans to migrate fixed links out of this band	
		Personal Communication Networks (PCN) BTX 1805 - 1880	See note 3.10.7 Paired with 1710 - 1785 MHz. CEPT T/R 22-07 refers Current fixed link assignments in this band to be migrated according to fixed link strategy	PCN band to be used also for WLL (see note 3.10.2) 1850 - 1900 MHz (paired with 1930 - 1980 MHz) to be used for WLL on shared basis (see note 3.10.2)
		DECT 1880 - 1900	DECT band to be used for short range cordless telephones, wireless PABX, local loop provision, radio LANs, etc Migration of fixed links out of this band an immediate requirement (see note 3.10.8)	DECT band to be used also for WLL (see note 3.10.2)
		WLL 1900 - 1920	See note 3.10.10	

Frequency Band (MHz)	Main Allocations	Sub-Allocations (MHz)	Notes and comments	
	Fixed / Mobile (continued)	Terrestrial component of FPLMTS/UMTS 1885 - 1980	See note 3.10.9 Terrestrial component of FPLMTS to be introduced from the top of this band (ie just below 1980 and 2170 MHz) Migration of fixed links out of this band in the long term	1930 - 1980 MHz (paired with 1850 - 1900 MHz) to be used for WLL on shared basis (see note 3.10.2)
1980 - 2010	Mobile-Satellite (E-to-s) / Fixed / Mobile	Satellite component of FPLMTS/UMTS	See note 3.10.9 Paired with 2170 - 2200 MHz Satellite component of FPLMTS/UMTS expected to be introduced from top of band Band also to be used for MSS system	1920 - 2300 MHz to be used for WLL on a shared basis (see note 3.10.2)
2010 - 2025	Mobile / Fixed	Terrestrial component of FPLMTS/UMTS	See note 3.10.9	
2025 - 2110	Fixed / Mobile / Space Operation / Earth-Exploration-Satellite / Space Research	Fixed Links 2025 - 2075 Fixed Services pertaining to the provision of WLL 2075 - 2110	See note 3.10.11 Paired with 2200 - 2285 MHz. ITU-R F1098 and CEPT 13-01 refer All except Fixed and Mobile are Earth-to-space and space-to-space	
2110 - 2170	Mobile / Fixed	Terrestrial component of FPLMTS / UMTS	See note 3.10.9 Terrestrial component of FPLMTS to be introduced from top of band (ie just below 1980 and 2170 MHz) Migration of fixed links out of this band in long term	
2170 - 2200	Mobile-Satellite (s-to-E) / Fixed / Mobile	Satellite component of FPLMTS/UMTS	See note 3.10.9 Paired with 1980 - 2010 MHz Satellite component of FPLMTS/UMTS expected to be introduced from top of band Band also to be used for MSS system	

Frequency Band (MHz)	Main Allocations	Sub-Allocations (MHz)	Notes and comments	
2200 - 2290	Fixed / Mobile / Space Operation / Earth-Exploration-Satellite / Space Research	Fixed Links 2200 - 2250 Fixed Services pertaining to the provision of WLL 2250 - 2285 WLL 2285 - 2290	See note 3.10.11 Paired with 2025 - 2110. ITU-R F.1098 and CEPT T/R 13-01 refer All except Fixed and Mobile are space-to-Earth and space-to-space	
2290 - 2483.5	Fixed / Mobile	Fixed links Fixed Services pertaining to the provision of WLL 2300 -2360 ISM 2400 - 2500	Some migration of fixed links will be required (see note 3.10.12) Existing frequencies for 28 MHz OB links to remain (ie 2377 and 2471 MHz on primary basis plus 4 others on secondary basis) International ISM band, including for spread spectrum links. RR S5.150 and Govt Gazette of 17 Nov 1995 refer	2360 - 2483.5 MHz allocated to WLL in rural areas (see note 3.10.2)
2483.5 - 2500	Mobile-Satellite (s-to-E) / Fixed / Mobile	MSS 2483.5 - 2500	MSS allocation for emerging systems (paired with 1610 - 1626.5 MHz). (see also note 3.10.5)	
2500 - 2520	Fixed / Mobile / Mobile-Satellite (s-to-E)	MMDS band 2500 - 2690 Fixed links	Need for re-planning of MMDS band to use more effectively (see note 3.10.13) CEPT 13-01 refers to use of 2520 - 2593 / 2597 - 2670 MHz for fixed links	
2520 - 2670	Fixed / Mobile / Broadcasting-Satellite			
2670 - 2690	Fixed / Mobile / Mobile-Satellite (E-to-s)			
2690 - 2700	Earth Exploration-Satellite / Radio Astronomy / Space Research		Earth Exploration-Satellite and Space Research are passive	
2700 - 3000	Aeronautical Radionavigation		No change	

3 Supporting notes

3.1 General

This section provides notes to support and explain the future band plan presented in section 2 of this document. The notes relate in particular to those frequency bands where changes in the usage are proposed. In most cases the notes are concerned with the rationale behind the proposed changes, or the strategy for migrating from the current to the proposed future position.

For convenience the notes are divided according to frequency bands as follows. This is the same division as has been used in previous phases of Project SABRE:

- 20 - 50 MHz;
- 50 - 87.5 MHz;
- 87.5 - 137 MHz;
- 137 - 174 MHz;
- 174 - 400 MHz;
- 400 - 470 MHz;
- 470 - 960 MHz;
- 960 - 3000 MHz.

The notes relating to these bands are presented in sections 3.3 to 3.10 respectively. In addition, section 3.2 describes fundamental principles that have been used in the construction of the band plan, and which relate to the band plan as a whole rather than to particular bands of spectrum within it.

3.2 Fundamental principles

3.2.1 General

This section describes some of the most important principles that have driven the development of the future band plan presented in this document.

The following are fundamental long term aims that are encompassed within the future band plan:

- Migrating of fixed links to higher frequencies, in particular from bands below 1 GHz, and to frequencies above 3 GHz where possible.

- More efficient use of military spectrum, and hence release or sharing of spectrum for non-military applications.

- Making spectrum available for new technologies and services, such as wireless local loop, digital trunked radio, mobile satellite systems, etc.

- Increasing the amount of spectrum available for land mobile radio.

These objectives reflect international trends in spectrum management.

3.2.2 Alignment with ITU Region 1

South Africa is part of ITU Region 1 (as is Europe), and thus the country has an obligation to base its frequency allocations on those specified for Region 1 in the ITU Radio Regulations. Further, the future band plan presented in this document has in many areas been based around band plans adopted by European countries, in order to make it easier to introduce new technologies and source equipment from Europe.

However, South Africa is different from Europe in many ways, and any decisions to follow Europe have not been taken without careful consideration. Where there may be benefits to South Africa in the use of technologies and equipment from outside Region 1, efforts have been taken to try to incorporate these within the band plan, or at least to avoid taking decisions that would prevent their use in the future.

3.2.3 Strategy for migration of fixed links

The overall strategy for migrating fixed link frequencies to higher in the spectrum has a number of strands:

- UHF (400 - 470 MHz) links should be moved above 3 GHz where possible. However, spectrum will be allocated in the UHF band for cases where a sound case can be made why a link should remain at UHF.

- Links in the 800 MHz band (854 - 900 MHz) should in general also be moved above 3 GHz where possible, although in some cases it may be possible for these to remain where this can be justified.

- Links in the range 1.3 - 2.7 GHz should be moved above 3 GHz where possible. However, in some cases the links can remain unchanged, or be moved to new spectrum in 1.3 - 2.7 GHz, if a case can be made why they should not move to higher frequencies.

- New allocations for fixed links will be made in the bands 1350 - 1525 MHz and 2025 - 2290 MHz in accordance with the plans agreed in CEPT Recommendation T/R 13-01. These frequencies will be used in cases where a user is migrating links from the UHF band, or from other frequencies around 1.5 GHz, but for some well-justified reasons it is unreasonable to insist that the links are moved above 3 GHz.

The decision as to whether a particular link may remain below 3 GHz will be judged on a case-by-case basis, and will depend upon a sound justification being made as to why the link cannot be moved higher. The decision will be based upon a number of parameters, including the capacity required, distance to be covered, geographical location, and the cost of alternative means of providing the link. As a general rule, for example, the Department will discourage the use of radio for low capacity links over short distances.

3.2.4 Wireless Local Loop

An important aim in the band re-planning exercise has been to make spectrum available for a variety of different wireless local loop technologies in different areas of

the spectrum (eg for the Telkom Million Line Project). Spectrum has been made available in a number of different bands, in some cases on an exclusive basis but in many cases on a shared basis, and between them it is believed that the allocations should provide the possibility for a wide variety of WLL systems to be used which are available from a range of suppliers and are suitable for use in the range of scenarios required for South Africa.

The basis for sharing between WLL and other services will depend upon the case in question. Factors will include the locations where the other services (and the WLL) are required to be used, and technical characteristics of the systems. For example, where the split is between 'urban' and 'rural' and the other service is already used in 'urban' areas (eg for cellular), then the 'rural' areas where WLL can be used will generally be those where it can be used without interfering with the other service (eg a suitable distance away from major population centres and major roads). The precise details of the sharing criteria will need to be established on a case-by-case basis.

3.2.5 Single frequency assignments

Spectrum can often be used more efficiently if assigned in frequency pairs, especially where the frequencies are used at high sites. This has been one of the major reasons for the move in the future band plan towards more dual frequency and less single frequency spectrum for mobile radio (in particular in VHF High band). In certain cases, single frequency assignments may be allowed for non high site use within dual frequency bands.

3.3 20 - 50 MHz

3.3.1 29.7 - 30 MHz (extension of amateur band)

It is proposed that this segment of spectrum should be allocated to the amateur service on a secondary basis for use during disaster exercises and emergency situations. This is in addition to the existing exclusive amateur band 28 - 29.7 MHz, which is to retain its primary status. The additional spectrum is currently used for single frequency mobile applications.

3.3.2 35 - 35.25 MHz (model aircraft control)

South Africa currently uses the frequency band 60.1375 - 60.375 MHz for the control of model aircraft, which differs from bands used elsewhere in the world. In order to allow the model aircraft community to benefit from international economies of scale, to facilitate international competitions, etc, it is proposed that the model aircraft control band will be moved to be in line with the European band at 35 - 35.25 MHz. The existing model aircraft control band could be released in the medium term. It should be noted that the new band will not be available immediately for use for model aircraft control, as existing users will need to be migrated out.

3.3.3 41 - 44 MHz (removal of ITU footnote regarding aeronautical use)

A footnote in the ITU tables (RR S5.160) provides for the additional allocation in Southern Africa of the band 41 - 44 MHz to the aeronautical radionavigation service on a primary basis. These frequencies are not currently used for this purpose in South Africa, and it is recommended that South Africa should be removed from this footnote.

3.3.4 46.61 - 46.97 / 49.67 - 49.97 MHz (CT0 cordless telephones)

CT0 cordless telephones are widely used in South Africa, and their use on the nominated frequencies within these ranges (as specified in the Government Gazette dated 17 November 1995) should continue.

3.4 50 - 87.5 MHz

3.4.1 66 - 68 MHz (block allocation for NEAR)

The band 66 - 68 MHz currently contains several sub-allocations, eg for the MARNET system. It is proposed that the band should be treated as a single block allocation, to be known as National Emergency Alarm Radio (NEAR). It is also proposed that the channel spacing should be reduced from 25 kHz to 12.5 kHz, in order to address the congestion problems that have been reported.

3.4.2 68 - 87.5 MHz (VHF Mid band)

It was proposed in the draft band plan that the land mobile sub-bands of the VHF Mid band should be re-organised, with the new plan for this part of the spectrum to be based on the European DSI. Following inputs in response to the draft band plan and further consideration of the associated migration process, which would inevitably be long, complex and costly, it has been concluded that the long term benefits that such a re-farming exercise would bring cannot currently be justified.

Hence it is now proposed that this part of the spectrum should, at least in the short term, remain largely unchanged. This does not rule out the possibility of smaller scale changes to particular sub-bands in order to address specific local problems (eg interference from broadcasting). The overall situation will also be periodically reviewed, since it is likely that at some time in the future a major re-planning may be more appropriate than at present, for example due to changing patterns of usage in the band or developments elsewhere in the world.

3.4.3 70 - 70.3 MHz (use for amateur service)

It is proposed that this sub-band should be allocated to the amateur service on a secondary basis in order to undertake experimental work on propagation. The change is in line with recommendations made in the European DSI.

3.5 87.5 - 137 MHz

The use of this band is to remain as at present:

- 87.5 - 108 MHz: FM audio broadcasting;
- 108 - 137 MHz: Aeronautical services.

3.6 137 - 174 MHz

3.6.1 138 - 174 MHz (VHF High band re-planning)

It is proposed that the land mobile sub-bands within the VHF High band will be re-planned in order to bring them more in line with the rest of ITU Region 1. The sub-band boundaries and Tx/Rx separations in the proposed future band plan are based on those in the European DSI, and are illustrated in the relevant figure in Appendix B of this document.

The refarming of this band will be done in a phased and effective manner. The migration will be effected largely by making use of the recently created 12.5 kHz "interleaved channels". As far as possible, users will be moved only when they would normally upgrade their equipment, although some forced migration will inevitably be required at some stages in the process.

3.6.2 140.5 - 141 and 152.05 - 152.5 MHz (alarms)

It is proposed that these two blocks of spectrum are allocated for use for alarm systems (both single and dual frequency). Demand in the short term is expected to be primarily for single frequency systems, although a small number of frequency pairs will be reserved for early dual frequency systems. It is anticipated that in the long term the industry will move towards more extensive use of dual frequency systems, and hence it is planned that the frequencies in the two blocks will increasingly be used as duplex pairs. Some frequencies may also be assigned for dual frequency alarms in other parts of the spectrum, namely VHF Mid band (81 - 81.625 / 86.375 - 87 MHz) and UHF (440 - 441 / 445 - 446 MHz).

3.6.3 148 - 149.9 MHz (little LEOs)

This band was allocated internationally at WARC 92 for the mobile satellite systems known as little LEOs. The band is allocated for the space-to-Earth direction, and is extended up to 150.05 MHz for some little LEO systems. The space-to-Earth link is generally provided at either 137 - 138 MHz or 400.15 - 401 MHz, depending on the system.

In South Africa the band 148 - 149.9 MHz (and the other relevant MSS bands also) is proposed to be allocated for possible use in the medium term for little LEOs, which could potentially provide useful store-and-forward data communications to remote areas of the country. The future of little LEOs on a global scale is uncertain at this stage, however, and no immediate clearing of the band is proposed. Even if little LEO systems are used in South Africa, it is possible that they will be able to co-exist with

existing services in the band, although it has yet to be shown conclusively that this will be possible.

3.6.4 150.05 - 151 MHz (block allocation for paging)

It is proposed that this band should be used to provide a block allocation for paging. The situation regarding assignments for paging systems should gradually be rationalised by moving paging assignments to frequencies within this band (and also to 169.4 - 169.8 MHz (ERMES) and other paging bands).

3.6.5 161.875 - 173.875 MHz (sharing of Sonobuoy frequencies)

There are currently severe restrictions on the civilian use of these frequencies used for Sonobuoy operations, which lie in prime VHF mobile spectrum. The Sonobuoy frequencies between 161.875 and 173.875 MHz are currently unavailable for other uses to a distance of 200 km inland from the coast. This appears to be unnecessarily restrictive. Restrictions elsewhere in the world are generally less severe; in the UK, for example, there is no exclusive allocation to sonobuoys, and they are forced to share with other users in coastal areas. It is believed that there should be scope for increased sharing of Sonobuoy frequencies compared with what is allowed at present, and it is proposed that further study should be undertaken to investigate the possibilities, with a view to relaxing any protection criteria that are found to be excessive.

3.6.6 169.4 - 169.8 MHz (ERMES)

This band is allocated to the digital paging system ERMES. The progress of this technology will be monitored and should there be no requirement in South Africa, this band will be re-allocated to paging in general.

In order to use the band for paging it will be necessary to move existing single frequency radio users elsewhere. It is proposed that interleaved channels elsewhere in VHF High band should be used for this purpose.

3.7 174 - 400 MHz

3.7.1 216 - 246 MHz (frequencies for T-DAB)

The introduction of T-DAB (Terrestrial Digital Audio Broadcasting) is in Europe most likely to occur in the band 216 - 240 MHz. (The plan for this introduction is detailed in the so-called Wiesbaden plan.) In South Africa, the frequencies in this band up to 238 MHz are currently used for TV broadcasting (TV channels 9 to 11), while 238 - 246 MHz is allocated to fixed and mobile services and is lightly used, except for the international distress frequency at 243 MHz.

It is proposed that in South Africa the initial introduction of T-DAB in the VHF spectrum is in the band 238.432 - 239.968 MHz, in accordance with the Wiesbaden plan. The allocation of up to 4 further T-DAB channels might be possible within the band 238 - 246 MHz, but further technical study would be required to establish the feasibility of this, in particular regarding possible interference to the international

distress frequency, and the future availability of equipment to operate above 240 MHz is also uncertain. An alternative in the event that T-DAB is not feasible above 240 MHz is to share T-DAB with existing TV channels in 216 - 238 MHz. The possibility also exists to introduce T-DAB in South Africa in the band 1452 - 1467 MHz (see note 3.10.4).

3.7.2 246 - 254 MHz (TV channel 13)

This channel is used for TV broadcasting in Southern Africa, unlike all other regions of the world. However, it is not possible to use the so-called 'channel 12' (238 - 246 MHz) for TV broadcasts, due to the need to keep the international distress frequency at 243 MHz free from interference. This, combined with the significant guard bands that are generally required between spectrum used for broadcasting and telecommunications, effectively makes it impossible to use the radio spectrum around these frequencies efficiently. A long term solution to address this situation would be to use channel 13 for a different purpose (eg mobile radio, as is the case in other parts of the world), but in the short term it is not practical for channel 13 to cease being used for TV broadcasting.

A further problem is that the broadcasters wish to use NICAM on channel 13 in metropolitan areas, but this results in spillage into the public trunking channels immediately above 254 MHz, thus making a substantial portion of the trunking band unusable. The problem is accentuated by the fact that channel 13 is used with a slightly offset vision and sound carrier (the vision carrier is at 247.43 rather than the standard 247.25 MHz), thus causing interference further into the trunking band than would otherwise be the case.

Discussions should continue between the Department and the IBA on how best to minimise the problems. Attempts should continue to find a technical solution, but until the matter has been resolved it will be necessary to prohibit the use of NICAM on channel 13. The longer term solution to avoid spillover from NICAM into the public trunking band is likely to involve some combination of (a) moving the vision down to 247.25 MHz from 247.43 MHz, (b) tighter filtering of the NICAM transmitters, and/or (c) reducing the width of the NICAM sound carrier.

3.7.3 254 - 259.4 / 262 - 267.4 MHz (public trunking)

This band is currently used by public trunking network operators. The licenses of these operators are due to expire in 2008, after which the spectrum will revert to mobile use. It is anticipated that the public trunking will by this date have migrated to digital trunking networks.

3.7.4 278 - 286 MHz (2-way paging)

It is proposed that 700 kHz from within this band should be allocated to 2-way paging (ie 600 kHz + 2 x 50 kHz guard bands). This is for the outbound leg, paired with 925 - 925.4 MHz for inbound (ie 300 kHz + 2 x 50 kHz guard bands). This is consistent with expected future availability of equipment for the FLEX system, especially for the large Asian market. The band is currently allocated to Government, and the exact location of the 700 kHz used will follow further discussion (278 - 278.7 MHz is a likely option).

3.7.5 300 - 380 MHz (20 MHz for wireless local loop)

This spectrum is potentially very useful for providing telecommunications to rural areas. The band 336 - 346 / 356 - 366 MHz is allocated to WLL on an exclusive basis, as from 1 May 1997.

3.7.6 380 - 400 MHz (use of government spectrum for digital trunked radio)

This military band has been designated in Europe for use for digital trunked mobile radio (CEPT T/R 22-05), in particular TETRA systems for use by the emergency services. In South Africa the band is currently used by government, and it is believed that the short term needs for digital trunking can be satisfied in spectrum above 400 MHz. Hence it is proposed that the current usage remain in the short term, but that the spectrum should be used for trunked mobile radio in the long term.

3.8 400 - 470 MHz

3.8.1 406 - 470 MHz (migration of fixed links)

Much of this band is currently used for fixed links. Throughout the world there is a strong trend for fixed links to be migrated to higher bands (above 3 GHz where possible), and the band is increasingly being used for mobile services, a purpose to which it is very well suited. For these reasons, a general transition away from fixed links and towards mobile radio is proposed for the band. Further details regarding specific sub-bands are given in the following paragraphs. The overall plan for the band is illustrated in the relevant figure in Appendix B of this document.

It is very difficult at this time to predict accurately what the take-up of trunked mobile radio in South Africa will be, and what the possibility of migrating fixed links to higher frequencies is. For this reason the plan is intended to incorporate some flexibility to allow adjustments to be made as the demand for different types of systems and services becomes clearer.

3.8.2 406.1 - 407.625 / 416.1 - 417.625 MHz (current ESKOM frequencies)

This spectrum is currently used by ESKOM for both mobile and fixed applications. The use of these frequencies for fixed links should be minimised as far as possible, by migration of links to higher frequencies where practical. Mobile usage of the band by ESKOM may continue in the short term where necessary, but mobile users should also be migrated if possible, for example to a trunked system elsewhere in the UHF band.

As ESKOM move out of the band, other (single frequency) users can be introduced in 406.1 - 407.625 MHz. The other half of the band (416.1 - 417.625 MHz) is part of the band which is to be used for future public digital trunking networks, and hence any residual usage of the band by ESKOM will limit the spectrum available when such networks are introduced.

3.8.3 407.625 - 413 / 417.625 - 423 MHz (Government and Public Safety)

407.625 - 410 / 417.625 - 420 MHz is currently used by Government for a variety of fixed and mobile applications. The 2 x 3 MHz immediately above this (ie 410 - 413 / 420 - 423 MHz) is currently used for single frequency fixed links.

It is proposed that the band should be treated as a single block allocation to be used primarily for public safety and local/regional authorities. This should provide for more effective frequency planning, site management, co-ordination, etc, and would also give more flexibility regarding how the frequencies are used. The use of the band for fixed links should be minimised as far as possible, thus releasing additional spectrum for mobile use.

The band 407.625 - 413 / 417.625 - 423 MHz will provide spectrum for local and regional authorities for mobile radio (primarily trunked). It is envisaged that the band 410 - 413 / 420 - 423 MHz (together with 417.625 - 420 / 427.625 - 430 MHz) will be used primarily for digital trunked radio (the frequencies are within one of the bands designated for TETRA in Europe). Priority in migration of fixed links should be given to clearing the frequencies immediately above 410 / 420 MHz, in order to allow a rapid transition and provide the municipalities with frequencies in this block, which will be useful when co-operation with Government is required.

3.8.4 413 - 417.625 / 423 - 427.625 MHz

These frequencies are primarily used for fixed links at present, with the exception of the ESKOM frequencies 416.1 - 417.625 MHz (see note 3.8.2). It is proposed that these fixed links are migrated elsewhere, with the frequencies released to be used as follows:

- 413 - 413.7625 / 423 - 423.7625 MHz. Public mobile data network(s). This spectrum would enable the setting up of a number of public data networks in South Africa. The band would provide a total of 60 2x12.5 kHz frequency channels.

- 413.7625 - 417.625 / 423.7625 - 427.625 MHz. Public trunking network using digital trunked radio. It is proposed that in the longer term this band could be freed for use for digital trunking. The band is part of the spectrum which is designated for TETRA in Europe. It is envisaged that the band would most likely be used for public digital trunking networks, although other applications such as private radio systems could also be implemented in the band.

- 415 - 417.2 / 425 - 427.2 MHz. Wireless local loop sharing. In addition to the above mobile and fixed services, this band will also be shared with WLL in rural areas. There are a number of different WLL systems available from suppliers which are able to operate in this band.

3.8.5 427.625 - 430 MHz (trunked mobile radio and single frequency links)

The band 420 - 430 MHz is currently used primarily for single frequency links. Although these will where possible be moved to higher bands or changed to dual frequency, it is recognised that in practice it will be necessary to retain some single

frequency links in UHF. It is proposed that the band 427.625 - 430 MHz should be used for single frequency links in rural areas.

It should also be possible in the long term for the band 417.625 - 420 / 427.625 - 430 MHz to be used for trunked mobile radio in urban areas. This application would need to share with usage of the band 417.625 - 420 MHz by Government, local and regional authorities (which should be concentrated in rural areas in the long term), as well as with the single frequency links in 427.625 - 430 MHz.

3.8.6 430 - 440 MHz (amateur band and low power applications)

This band is allocated to the amateur service in South Africa, as elsewhere in ITU Region 1. The sub-band 433.05 - 434.79 MHz, however, is also designated as an ISM band in Region 1, subject to the special authorisation of the administration concerned (see RR S5.138), and it has effectively been treated as an ISM band in South Africa for a number of years. Further, the Government Gazette of 17 November 1995 specifies the use of the band for low power devices on an unlicensed basis, subject to obligatory type approval. The consequence of this is that the amateur service may not claim protection from (in-band) emissions from ISM equipment operating in the band, nor can ISM equipment and low power devices claim protection from amateur users in the band. (Note that dedicated spectrum has been assigned at 464.375 - 464.425 MHz for the control of cranes and other hazardous equipment.)

Note that the European DSI recommended that the sub-band 430 - 432 / 438 - 440 MHz should be allocated to mobile and used for PMR. It is not proposed to adopt this recommendation in South Africa at this stage, but the situation will be reviewed periodically to assess developments elsewhere and the emerging needs in South Africa.

3.8.7 440 - 450 MHz (migration from fixed to mobile)

This band is currently used primarily for fixed links. The aim in the medium term is to use this band primarily for mobile services (PMR in particular). A 5 MHz Tx/Rx separation is to be used, in accordance with the European DSI. Fixed links currently in the band should be moved to higher frequencies (above 3 GHz where possible), although in some cases it may be necessary for the move to be to elsewhere in UHF (eg 427.625 - 430 MHz for single frequency or 450 - 470 MHz for dual frequency).

It is also proposed that part of this band (440 - 441 / 445 - 446 MHz) is used for fixed point-to-multipoint data services such as scanning telemetry and dual frequency alarm systems. The nature of these systems is such that, although they provide communications between fixed stations, they are generally implemented using mobile radio technology to provide wide area coverage, and in many cases it will not be feasible to implement them at higher frequencies.

3.8.8 450 - 470 MHz

This band is currently used for a variety of fixed and mobile applications. The band includes the frequencies used for the C450 analogue cellular system (455.5 - 459.48 / 465.5 - 469.48 MHz), which is due to cease operation in 1999. It is proposed that the

band should retain is current Tx/Rx separation of 10 MHz, and that the future use of the band should be as follows:

- 450 - 453 / 460 - 463 MHz. Fixed links and mobile data. This band should continue to be used for dual frequency fixed links where it is not practical to move to higher frequencies.

- 453 - 453.975 and 463 - 463.975 MHz. Single frequency mobile, as at present.

- 453.975 - 454.425 MHz. Block allocation for paging. Paging assignments from elsewhere in UHF should be migrated to this band. The sub-band 454.325 - 454.425 MHz is allocated specifically for on-site paging.

- 463.975 - 464.425 MHz. Block allocation for low power mobile radios, including short range business radio. The sub-band 464.375 - 464.425 is allocated exclusively for the control of hazardous equipment (eg cranes).

- 454.425 - 460 MHz / 464.425 - 470 MHz. Trunked mobile radio. It is proposed that this band should provide further spectrum for trunked mobile radio systems. This could be for a variety of applications, but it is envisaged that it will primarily be used for private trunked radio systems. The band includes spectrum currently used by Transtel for their trunked radio system (455 - 455.4875 / 465 - 465.4875), for which the BTX and MTX frequencies will need to be swapped in due course.

In addition to the above mobile and fixed services, it is also proposed that sharing with WLL would occur in the band 455 - 460 / 465 - 470 MHz, for rural areas. There are a number of potential WLL systems that can operate in this band.

3.9 470 - 960 MHz

3.9.1 470 - 854 MHz (digital TV experimentation)

The future introduction of digital TV is an important long-term spectrum management issue. In order to plan for this it is suggested that a single 8 MHz analogue TV broadcasting channel should be reserved for digital TV, to allow simultaneous broadcasting of digital signals when the technology becomes available.

3.9.2 790 - 854 MHz (sharing of broadcast channels with WLL and links)

The broadcast channels at the upper end of the UHF broadcasting range (790 - 854 MHz) are primarily used for TV broadcasting at present (they also contain some studio transmitter links). It is believed that there is scope for using these channels more effectively, either by re-planning of the way in which the UHF TV channels are utilised, or by sharing of this part of the spectrum with other services.

A number of WLL systems, in particular those based on US cellular technology such as CDMA and AMPS, are currently available to operate at these frequencies, in particular 824 - 849 MHz (paired with 869 - 894 MHz). Such WLL systems are available from a

range of suppliers, and the ability to use them in South Africa could potentially bring significant social benefit to the country.

It is proposed that, in order to allow the introduction of such WLL systems, sharing of WLL with broadcasting is allowed in at least one of the UHF TV channels, primarily in rural areas. TV channels 65, 66 and 67 (822 - 830, 830 - 838 and 838 - 846 MHz) are the most likely candidates, which would need to be paired with 867 - 875, 875 - 883 and 883 - 891 MHz respectively. Further discussions and study will be required in order to work out the details of the sharing, and in particular sharing criteria will need to be formulated and appropriate protection ratios established in order to ensure that the two services are able to co-exist effectively with each other. The sharing will also need to be co-ordinated with neighbouring countries.

There is also a requirement for certain Government redeployable link equipment to be able to operate in the UHF TV band (and in other dedicated UHF link spectrum) on a shared basis. This equipment is to be migrated into the band in the immediate short term. Appropriate criteria for the sharing will need to be drawn up. In the long term it is intended that that the link equipment will be moved to higher frequencies.

3.9.3 856 - 900 MHz (migration of fixed links to higher frequencies)

There are currently a range of fixed links within these frequencies, including point-to-point links in 856 - 888 MHz and troposcatter links in 862 - 900 MHz. In line with the international trends, the aim should be to migrate these links to higher frequencies at the earliest opportunity. The move should be to frequencies above 3 GHz if possible, with the possibility to move to frequencies around 1.5 GHz in the event that there is a sound case why they cannot be moved to higher frequencies. Such migration will be particularly important in cases where the band is to be used for another purpose and sharing with the new application is not possible. Note, however, that the existing fixed troposcatter systems can remain on their current frequencies in the medium-to-long term.

3.9.4 864.1 - 868.1 MHz (CT2)

The CT2 cordless telephony system has not to date become heavily used in South Africa. Furthermore, CT2 has not been a great success in Europe either, although it is heavily used in some densely populated areas of the Asia-Pacific region (eg Hong Kong and Singapore). However, there is no great pressure in South Africa to use the CT2 spectrum for other purposes, and CT2 does provide a potential technology for short range WLL applications.

It is thus proposed that the allocation of the band to CT2 should be retained, for both cordless telephony and WLL applications. The situation will be reviewed periodically in order to monitor the growth in usage in South Africa, and determine whether any alternative uses would be beneficial. The use of CT2 is likely to be confined almost exclusively to urban areas, and hence sharing with CT2 may be possible in order to allow the use of the frequencies for other purposes in rural areas.

3.9.5 872 - 905 / 917 - 950 MHz (wireless local loop sharing)

It is proposed that spectrum should be allocated on a shared basis in rural areas for sharing of WLL with other services (primarily GSM and private mobile radio). There are a number of different WLL systems that could operate in this band, including systems based on TACS, GSM and CDMA.

3.9.6 876 - 880 / 921 - 925 MHz (possible use for digital PMR)

This band is currently proposed in Europe for digital private mobile radio for the railways using a PMR system based on GSM (GSM-R). In South Africa also, this band offers the possibility for large organisations (such as the railways) to use GSM-based PMR systems. The band might also be one in which TETRA-based equipment is available in the future. There may also be a possibility of WLL sharing these frequencies, particularly in rural areas.

A final decision on this band should not be taken until after the situation in Europe has become clearer, which will probably happen during 1998. It is proposed that the band should remain reserved in South Africa until the international situation clarifies and the local demand has become clear.

3.9.7 880 - 890 / 925 - 935 MHz (reserved for GSM extension)

This band is reserved within Europe for extended GSM. A final decision on the use of the band in South Africa should not be taken until the major European countries have clarified their position, which will probably occur during 1997 and 1998.

The extended GSM band would be required almost exclusively for use in urban areas. In rural areas the band could thus be shared with WLL, and there are a number of WLL technologies available for use in this band (eg based on TACS and CDMA).

3.9.8 914 - 915 / 959 - 960 MHz (CT1)

The system known as CT1 in South Africa (CT1 refers to a different system in other countries) uses frequencies which encroach on the band allocated in Europe to GSM. CT1 is widely used in South Africa, and no change to the usage of the band is proposed in the short term, although it is intended that CT1 will be phased out in the medium term. More immediate action should be taken, however, to stamp out the illegal usage by cordless telephones of GSM frequencies in the band 904 - 905 / 949 - 950 MHz so that these may be used for GSM.

3.9.9 915 - 921 MHz

This is part of Region 2 ISM band 902 - 928 MHz (centre frequency 915 MHz), and there has been some suggestion that at least part of this band (eg 915 - 919.5 MHz) should be adopted in South Africa as a general band for ISM equipment and low power devices. There would be several dangers in doing this, however:

- The fact that the Region 2 band extends outside 915 - 921 MHz will tend to mean that emissions from some of the equipment made for the band will not be well-

confined within the sub-band available in South Africa. This may result in interference to neighbouring services, particularly below 915 MHz (ie existing CT1 and GSM assignments).

- The deregulated nature of ISM will make it difficult to control equipment entering South Africa, eg from the US, and to ensure that emissions from such equipment do not fall into other bands.

- Once an ISM band has been created and equipment has come into use, it is almost impossible to later clear the band of such equipment so that the spectrum can be used for other purposes.

It is thus considered to be inadvisable to allocate the spectrum immediately above 915 MHz as a general ISM / LPD band.

There are some specific low power applications, however, for which a case can be made for an allocation in this area of the spectrum. The Government Gazette of 17 November 1995 already allows for low power devices (eg anti-theft systems) in the band 915 MHz ± 0.0015%, and it is further proposed that spectrum should be allocated to the following specific applications:

- vehicle location systems in 915.025 - 915.2 MHz (on a licensed basis);

- radio tagging systems in 915.2 - 915.4 MHz (with passive tags).

In general, however, further allocations in this band should be minimised as far as possible, since it is likely that in the medium-to-long term the spectrum will become valuable for mobile radio use, eg for further extension of cellular systems or for digital trunked radio.

3.9.10 925 - 925.4 MHz (2-way paging)

This is provisionally allocated to 2-way paging (inbound leg), paired with 700 kHz from 278 - 286 MHz, and is consistent with expected FLEX allocations in other countries (see note 3.7.4).

3.10 960 - 3000 MHz

3.10.1 1350 - 1375 / 1492 - 1517 and 1375 - 1400 / 1427 - 1452 MHz (fixed links)

These bands are allocated in Europe (CEPT Recommendation T/R 13-01) for consolidation of fixed links around 1.5 GHz which cannot move to higher frequencies. The band 1427 - 1452 / 1492.5 - 1517.5 MHz is currently used for fixed links in South Africa, and these would need to migrate to the new plan over a period in order to implement this. The band 1350 - 1400 MHz is currently under-utilised in South Africa.

The use of the bands will be limited to low capacity links. For each of the two bands, the basic channel arrangement proposed in T/R 13-01 provides for 12 2 x 2 MHz channels, with channels with carrier spacings of 1000, 500, 250 and 25 kHz derived

from this by means of subdivision. The precise channel plans to be adopted will follow after further analysis of the requirements for channels in these bands, but it is proposed that they should be primarily at the low capacity end of the range, since they are likely to be required mostly for low capacity links which are moving from UHF.

The sub-band 1395-1400/1447-1452 MHz will be capped for a period of 5 years. During this period only Fixed Services pertaining to the provision of WLL will be allowed in this band.

3.10.2 1400 - 2700 MHz (wireless local loop above 1 GHz)

Allocations are to be made in a number of bands in the range 1.4 - 2.5 GHz to enable sharing of WLL with other services in rural and in some cases urban areas. WLL will also be allowed on an exclusive basis in one area of this spectrum. Sharing will require sharing criteria to be established to ensure that WLL can coexist satisfactorily with the other services in the band. In some cases the WLL technology may be the same as that used for other services in the band (eg DECT, PCN), in which case the sharing will be relatively straightforward.

The spectrum above 1 GHz to be allocated for WLL on an exclusive basis is as follows (see note 3.10.11):

- 2285 - 2290 MHz.
- 1900-1920 MHz

The following bands will be allocated for possible use for WLL on a shared basis:

- 1429 - 1465 / 1477 - 1513 MHz;
- 1710 - 1785 / 1805 - 1880 MHz (PCN);
- 1880 - 1900 MHz (DECT);
- 1850 - 1900 / 1930 - 1980 MHz;
- 1920 - 2300 MHz;
- 2360 - 2400 / 2400 - 2483.5 MHz.

The decision as to whether a particular technology can be used in a shared band in a particular (eg urban) area will generally have to be taken on a per-case basis in order to judge properly whether the required sharing is feasible.

3.10.3 1427 - 1452 / 1492.5 - 1517.5 MHz (fixed links)

In accordance with international trends these links will move to frequencies above 3 GHz where possible, or migrate to the new channel plans specified in CEPT T/R 13-01. Links that fall into the sub-band 1395-1400/1447-1452 MHz, and that are problematical to the new service, will be given a high priority in the migration.

3.10.4 1452 - 1492 MHz (digital audio broadcasting)

This band has been allocated internationally for use for digital broadcasting (S-DAB and T-DAB). In South Africa the band is currently unused above 1464 MHz, but below 1464 MHz it is used for fixed links. The unused section of the band should be reserved

for digital audio broadcasting (in particular S-DAB in 1467 - 1492 MHz), with the long term aim to migrate the fixed link users of the frequencies 1452 - 1464 MHz (paired with 1517.5 - 1529.5 MHz) to other frequencies, if possible above 3 GHz.

3.10.5 1610 - 1626.5 MHz (MSS)

These frequencies have been allocated worldwide for emerging mobile satellite systems (Earth-to-space links), such as Globalstar, Odyssey and Iridium. In the case of Globalstar and Iridium the band is paired with 2483.5 - 2500 MHz, while for Iridium the space-to-Earth links are also in 1610 - 1626.5 MHz. Mobile satellite communications have the potential to provide valuable benefits for South Africa, in particular in providing telecommunications to remote areas. These frequencies are largely unused in South Africa at present, and should be reserved for MSS use.

3.10.6 1670 - 1675 / 1800 - 1805 MHz (TFTS)

These frequencies have been reserved in Europe for the Terrestrial Flight Telephone System (TFTS). ERC decision ERC/DEC/(92)01 refers. Although TFTS may be of use in South Africa in the future, it is far from certain that it will be applicable, given South Africa's geographical location. Hence, no action is required in the immediate future, unless specific demand emerges.

3.10.7 1710 - 1785 / 1805 - 1880 MHz (PCN frequencies)

These are the frequencies at which the European PCN standard DCS1800 operates (CEPT Recommendation T/R 22-07 refers), which are currently used for fixed links in South Africa. The use of PCN in South Africa is likely to be important in order to increase the capacity of the current cellular networks (and to provide for the possibility of competition to the existing cellular operators). These frequencies are being allocated to PCN in countries around the world, although not necessarily the whole band in each country. Sharing of these frequencies by WLL applications is also likely to be possible, especially in rural areas.

No new fixed link assignments should be made in this band in South Africa, and the long term aim should be to move fixed links to frequencies above 3 GHz wherever possible. In the shorter term, the amount of spectrum that needs to be cleared for use by public operators is an important telecommunications policy issue related to the number of PCN licenses to be granted, expansion of capacity for GSM operators, etc. It is unlikely that the whole of the band will be needed for PCN, at least for the medium term, but additional spectrum may also be required from within the band for WLL applications.

3.10.8 1880 - 1900 MHz (DECT)

These frequencies have been allocated to DECT. No new fixed link assignments are being made within the band, and the band will in due course be cleared of fixed links. DECT frequencies may be used for cordless telephony, office wireless PABXs, local telepoint systems, to increase the capacity of the cellular networks and to provide WLL systems in dense areas. For these reasons, the allocation to DECT is seen as important in South Africa.

3.10.9 1885 - 2025 and 2110 - 2200 MHz (FPLMTS/UMTS)

These bands are intended for use on a worldwide basis for the implementation of FPLMTS/UMTS. Within this, the bands 1980 - 2010 and 2170 - 2200 MHz are intended for the satellite component of FPLMTS. This is a long term requirement, and it will be well into the first decade of the next century before the system becomes available, and even then only a small part of the band will initially be needed.

The FPLMTS bands are currently used for fixed links in South Africa. The future of FPLMTS is still uncertain, and it would be premature at this stage to move any fixed links solely in preparation for FPLMTS. However, it would be wise to make as few new fixed link frequency assignments as possible in these bands, and to gradually move links to frequencies above 3 GHz when possible, in accordance with international trends. In this respect, the most immediate need in South Africa is likely to be for frequencies for the satellite components (ie 1980 - 2010 / 2170 - 2200 MHz), which are also the frequencies that have been assigned for the ICO-P system.

3.10.10 1900 - 1920 MHz (WLL)

This band is to be used exclusively for WLL. The DECT and PHS technologies will primarily be used in this band. Other technologies will be considered. Tests conducted on behalf of the Office of the Telecommunications Authority in Hong Kong have established that it is possible for DECT and PHS (1895 - 1918.1 MHz) to co-exist satisfactorily in the overlapping sub-band 1895 - 1900 MHz.

3.10.11 2025 - 2110 and 2200 - 2290 MHz (fixed links and wireless local loop)

Channel arrangements for the use of this band for fixed services are described in both ITU-R Recommendation F.1098 and CEPT Recommendation T/R 13-01. These recommendations describe a channel plan in which the band is divided into dual-frequency channels with carrier spacing 14 MHz and Tx/Rx separation 175 MHz. Carrier spacings of 7, 3.5 and 1.75 MHz are also possible by means of channel subdivision. It is proposed that this arrangement is adopted in the band for fixed services, with a certain portion of the band used for wireless local loop.

The proposed division of the band is as follows:

- 2025 - 2075/ 2200 - 2250 MHz to be used for fixed links;

- 2075 - 2110 / 2250 - 2285 MHz to be used exclusively for Fixed Services pertaining to the provision of WLL;

- 2285 - 2290 MHz to be used exclusively for WLL.

3.10.12 2300 - 2360 MHz

This band was not previously intended for migration, however to the high Government priority given to Universal Service, this band is allocated exclusively to Fixed Services pertaining to WLL.

3.10.13 2500 - 2700 MHz

This band is currently used primarily for MMDS, but it is believed that the current MMDS plan does not utilise the spectrum at all efficiently. Hence it is proposed that the band is re-planned, with the MMDS links concentrated together in a smaller portion of the spectrum. The exact amount of spectrum needed for MMDS should be determined as part of the review. The radio astronomy band 2690 - 2700 MHz should be avoided in the resulting MMDS plan, and the remainder of the band should be allocated for fixed links, in accordance with the plan in CEPT Recommendation T/R 13-01 for the use for the fixed service of the band 2520 - 2593 / 2597 - 2670 MHz.

A List of abbreviations

APC	Aeronautical Public Correspondence
BEAPS	Business Equipment Association Paging Services Division
BTX	Base Transmit
CB	Citizens Band
CDMA	Code Division Multiple Access
CEPT	European Conference of Postal and Telecommunications Administrations
CT	Cordless Telephony
DECT	Digital European Cordless Telecommunications
DF	Dual Frequency
DPT	Department of Posts and Telecommunications
DSI	Detailed Spectrum Investigation
E-GSM	Extended GSM
E-to-s	Earth-to-space
EPIRB	Emergency Position Indicating Radio Beacon
ERC	European Radiocommunications Committee
ERMES	European Radio Messaging System
ERP	Equivalent Radiated Power
FPLMTS	Future Public Land Mobile Telecommunication System
GPS	Global Positioning System
GSM	Global System for Mobile Communications
IBA	Independent Broadcasting Authority
ILS	Instrument Landing System
ISM	Industrial, Scientific and Medical
ITU	International Telecommunication Union
LEO	Low Earth Orbit
LMRA	Land Mobile Radio Association
LPD	Lower Power Device
MMDS	Multipoint Microwave Distribution System
MSS	Mobile Satellite Service
MTX	Mobile Transmit
NEAR	National Emergency Alarm Radio
NERA	National Economics Research Associates

NICAM	Near Instantaneous Compression And Multiplexing
OB	Outside Broadcast
PABX	Private Automatic Branch Exchange
PCN	Personal Communication Network
PHS	Personal Handyphone System
PMR	Private Mobile Radio
RR	Radio Regulation
s-to-E	space-to-Earth
S-DAB	Satellite Digital Audio Broadcasting
SABRE	South African Band Re-planning Exercise
SANDF	South African National Defence Force
SAPS	South African Police Service
SARL	South African Radio League
SF	Single Frequency
STL	Studio Transmitter Link
T-DAB	Terrestrial Digital Audio Broadcasting
TACS	Total Access Communications System
TETRA	Trans European Trunked Radio
TFTS	Terrestrial Flight Telephone System
UHF	Ultra High Frequency
UMTS	Universal Mobile Telecommunications System
VHF	Very High Frequency
WARC	World Administrative Radio Conference
WLL	Wireless Local Loop
WRC	World Radio Conference

B Diagrammatic representation of band plan

The figures presented on the following pages illustrate the proposed future band plan in diagrammatic form, in order to aid comprehension of the plan. The diagrams illustrate the following:

- The first 3 diagrams show the division of the band 20 MHz to 3 GHz between service types, which is in most cases in accordance with ITU Region 1 allocations. For clarity, only a limited number of colour-coded service types are used (ie mobile, fixed, amateur, maritime, aeronautical, broadcasting and 'other'), rather than the full set of services defined by the ITU. The service type shown for each sub-band corresponds to the future use of the band which is expected to be the most widespread in the future. The whole frequency range is divided into the following 3 sections:

  - 20 - 30 MHz;
  - 30 - 470 MHz;
  - 470 - 3000 MHz.

- The next 5 diagrams "zoom in" on the most important and congested areas of the spectrum, in particular those which are allocated to the mobile service. The diagrams show features such as single and dual frequency bands, Tx/Rx pairings, and allocations to particular systems, applications and user groups. The bands shown in the 5 diagrams are as follows:

  - VHF Low and Mid bands (30 - 87.5 MHz);
  - VHF High band (137 - 174 MHz);
  - UHF mobile band (406.1 - 470 MHz);
  - 800 / 900 MHz band (806 - 960 MHz);
  - 1.35 - 2.7 GHz.

- The final diagram indicates the bands that are to be allocated on a shared basis to wireless local loop.