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GENERAL NOTICE

NOTICE 1064 OF 2012

INDEPENDENT COMMUNICATIONS AUTHORITY OF SOUTH AFRICA

PURSUANT TO SECTION 4 (1) OF THE ELECTRONIC COMMUNICATIONS ACT 2005, (ACT NO. 36 OF 2005)

HEREBY ISSUES A NOTICE INVITING COMMENTS REGARDING THE 2ND DRAFT FREQUENCY MIGRATION REGULATION AND RADIO FREQUENCY MIGRATION PLAN

1. The Independent Communications Authority of South Africa ("the Authority'), in terms of section 4, read with sections 31(4), 34(7)(c)(iii), 34(8) and 34(16) of the Electronic Communications Act (Act No. 36 of 2005), hereby gives notice and invites comments on the *2nd Draft Radio Frequency Migration Regulations and Radio Frequency Migration Plan*.

2. Interested persons are hereby invited to submit written representations, including an electronic version of the representation in Microsoft Word, of their views on the Draft Frequency Migration Regulations and Radio Frequency Migration Plan by no later than 16h00 on the 8th of February 2013.

3. Written representations or enquiries may be directed to:

The Independent Communications Authority of South Africa
Pinmill Farm Block A
164 *Katherine Street*
South Africa

Private Bag XI0002
Sandton
2146
Attention:
Mr Manyaapelo Richard Makgotlho
e-mail: rmakgotlho@icasa.org.za

4. All written representations submitted to the Authority pursuant to this notice shall be made available for inspection by interested persons from the 11th of February 2013 at the ICASA Library or website and copies of such representations and documents will be obtainable on payment of a fee.

5. Where persons making representations require that their representation or part thereof be treated as confidential, then an application in terms of section 4D of the ICASA Act, 2000 (Act No. 13 of 2000) must be lodged with the Authority. Such an application must be submitted simultaneously with the representation on the draft regulations and plan. All confidential material must be pasted onto a separate annexure which is clearly marked as "Confidential". If, however, the request for confidentiality is not granted, the person making the request will be allowed to withdraw the representation or document in question.

Dr SS MNCUBE
CHAIRPERSON

PART 1

2nd Draft Frequency Migration Regulations

DRAFT REGULATION
Radio Frequency Migration Regulations

SCHEDULE

1. Definitions

In these Regulations, terms used shall have the same meaning as in the Electronic Communications Act 2005 (no. 36 of 2005); unless the context indicates otherwise:

"Act" means the Electronic Communications Act, 2005 (Act No. 36 of 2005) as amended;

"ITU" means the International Telecommunication Union;

"SADC FAP" means the Southern African Development Community Frequency Allocation Plan;

"User" means a licensed or licence exempt user of the radio frequency spectrum; and

"**WRC"** means the World Radio communication Conference.

2. Purpose

The purpose of these regulations is to establish the framework by which the Authority may migrate users of the radio frequency spectrum under the National Radio Frequency Plan of South Africa.

3. Principles

(1) Radio frequency spectrum migration must be in accordance with the Radio Frequency Migration Plan.

(2) Radio frequency spectrum migration must be consistent with the National Radio Frequency plan.

(3) The National Radio Frequency Plan itself must be consistent with the International Telecommunication Union (ITU) Radio-regulations as updated by WRC, and with the SADC FAP.

(4) Allocations and assignments of radio frequency spectrum that are no longer in line and accordance with the National Radio Frequency Plan will be migrated.

(5) The users to be migrated shall not be entitled to be compensated by the Authority for the costs of the migration.

(6) To the extent that it is possible, the cost of migration should be minimised by considering, amongst other things, the duration of the licence and the economic life time of the equipment.

(7) Frequency migration may be required in core and central astronomy advantage areas in terms of section 22(2) (c) of the Astronomy Geographic Advantage Act (Act No. 21 of 2007).

4. Process for Radio Frequency Migration

The Authority shall initiate a process of radio frequency migration in the following circumstances:

(a) As specified in the Frequency Migration Plan;

(b) Where a change in the use of a radio frequency band is required to bring the South African National Frequency Plan into line with the ITU's Radio-regulations or the final acts of the latest WRC;

(c) Where a change in the use of a radio frequency band is required to ensure harmonisation of the South African National Radio Frequency Plan with the SADC FAP;

(d) Where the Authority has determined that a change in use of the frequency is necessary for efficient utilisation of the radio frequency spectrum and to otherwise meet the objectives of the Act;

(e) Where the Authority has determined that a change in a radio frequency spectrum licence holder's assignment within a radio frequency band is required to enable more efficient use of the radio frequency spectrum (in-band migration) or

(f) Where a South Africa specific requirement must be accommodated, such as that arising from protecting radio frequency spectrum for radio astronomy purposes in core and central astronomy advantage areas in terms of the Astronomy Geographic Advantage Act (Act No.21 of 2007).

5. Preparation of a Radio Frequency Spectrum Assignment Plan

(1) A change in the use of a radio frequency band(s) must be initiated through a Radio Frequency Spectrum Assignment Plan for the radio frequency spectrum bands in the manner specified in the latest Radio Frequency Spectrum Regulations.

(2) With respect to the radio frequency migration process, a Radio Frequency Assignment Plan may include:

(a) The process for migrating existing users and uses from their existing spectrum location, specifying the bands to which the users and uses will be migrated - including in-band migration where applicable.

(b) The period for the reallocation of the radio frequency band in question, specifying the date at which the users to be migrated should cease transmission.

(3) A Radio Frequency Spectrum Assignment Plan shall be subject to public consultation:

(a) The Authority shall publish the Radio Frequency Spectrum Assignment Plan in the Government Gazette, and invite interested persons to submit written representations as specified.

(b) The Authority may, after any defined period for lodging comments by interested persons has passed, hold a public hearing in respect of the application.

6. Amendment of a Radio Frequency Spectrum Licence

(1) Upon completion of the Radio Frequency Spectrum Assignment Plan, the Authority must issue a notice to users to be migrated.

(2) The notice of amendment may include the following:

(a) The date at which the licensee must cease transmitting within the frequency range of his existing assignment;

(b) The date at which the licensee may commence transmitting within the new assignment or

(c) The date within which the licensee must collect their updated radio frequency spectrum licence which contains the new terms and conditions of the new assignment, including technical parameters and whether the assignment is exclusive or shared.

7. Short title and commencement

These Regulations are called the Radio Frequency Migration Regulations 2012 and shall come into effect upon publication in a Government Gazette.

PART 2

2nd Draft Radio Frequency Migration Plan

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1 Introduction

1.1 Purpose

To develop a Radio Frequency Migration Plan with the aim of managing spectrum efficiently for the benefit of all South Africans in terms of section 2(e) of the Electronic Communications Act, 2005 (Act No. 36 of 2005) as amended ("the Act").

The plan provides for:

- Background and basis of the Radio Frequency Migration Plan;
- How the Radio Frequency Migration Plan was developed;
- Identification of the radio frequency bands where migration may be required and makes proposals regarding such frequency migration as may be required;
- The impact of the Frequency Migration Plan; and
- International benchmark study on the experience of other countries with respect to matters relevant to spectrum migration.

1.2 Definitions

1.2.1 ITU Definitions

The standard definitions for spectrum management in the International Telecommunications Union (ITU) Radio regulations (Article 1) are as follows:

> ***allocation*** (of a frequency band): Entry in the Table of Frequency Allocations of a given frequency band for the purpose of its use by one or more terrestrial or space *radiocommunication services* or the *radio astronomy service* under specified conditions. This term shall also be applied to the frequency band concerned. (1.16)
>
> ***allotment*** (of a radio frequency or radio frequency channel): Entry of a designated frequency channel in an agreed plan, adopted by a competent conference, for use by one or more administrations for a terrestrial or space *radiocommunication service* in one or more identified countries or geographical areas and under specified conditions. (1.17)
>
> ***assignment*** (of a radio frequency or radio frequency channel): Authorization given by an administration for a radio station to use a radio frequency or radio frequency channel under specified conditions. (1.18).

The ITU does not define spectrum migration as such.

In the Act, the reference to spectrum migration is clearly the migration of users of radio frequency spectrum to other radio frequency bands in accordance with the radio frequency plan. The main focus of the FMP is on migrating existing users.

Since certain issues of spectrum migration involve usage as opposed to users, it is useful to expand the definition of migration to include not just users but also uses

"Radio Frequency Spectrum Migration" *means the movement of users or uses of radio frequency spectrum from their existing radio frequency spectrum location to another.*

1.2.2 Spectrum re-farming

The term spectrum re-farming is widely used, but like spectrum migration does not have a universal definition and can mean slightly different things in different countries.

The ICT Regulation Toolkit[1] describes spectrum re-farming:

as a process constituting any basic change in conditions of frequency usage in a given part of radio spectrum (see The ICT Regulation Toolkit[2].

Such basic changes might be:

1. *Change of technical conditions for frequency assignments;*
2. *Change of application (particular radiocommunication system using the band);*
3. *Change of allocation to a different radiocommunication service.*

The term re-farming is used to describe:

- The process where a GSM operator changes the use of all or part of the spectrum used for GSM to UMTS / LTE; especially where the spectrum licence has specified the technology (as GSM) and the operator licence has to be changed[3] .
- The situation where the individual assignments within a band are changed to allow more efficient use to be made of the frequency band (usually due to a change in technology).

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[1]This allows spectrum migration to encompass re-farming of spectrum within assigned bands other technologies and in-band migration such as the digitalisation of TV broadcast.[2] The ICT Regulation Toolkit is a joint production of infoDev and the International Telecommunication Union

[2] The ICT Regulation Toolkit is a joint production of infoDev and the International Telecommunication Union

[3] Even where the licences are not technologically specific and it could be argued that the change in use from GSM to LTE does not require a regulator to get involved; in order to make efficient use of the spectrum it may be necessary to modify the individual assignments within the band.

- The process of reallocating and reassigning frequency bands where the licence period has expired, this is happening in Europe where the orial GSM licences are expiring[4].For the purposes of the plan therefore, radio frequency spectrum re-farming may be defined as follows:

  "Radio Frequency Spectrum Re-farming" means the process by which the use of a Radio Frequency Spectrum band is changed following a change in allocation, this may include change in the specified technology and does not necessarily mean that the licensed user has to vacate the frequency.

1.2.3 Other definitions

Where the user of a radio frequency has a change of assignment within the same band, usually to allow greater efficiency in the use of the spectrum, this may be termed **in-band migration**.

In some cases, a radio spectrum user may not only have his assignment changed in the same band, but have a new spectrum allocated in a different band. This has occurred with respect to the balancing of spectrum assignments in the GSM 900 MHz and 1800 MHz bands (refer to Appendix B **Error! Reference source not found.**) and may well become a feature of mobile broadband assignments in the future.

1.3 Spectrum use in the Karoo Central Astronomy Advantage Areas

The radio frequency spectrum use in the Karoo Central Astronomy Advantage Areas to be declared in the Northern Cape Province must be protected for radio astronomy purposes in terms of the Astronomy Geographic Advantage Act (Act No.21 of 2007). Section 22 of the AGA Act provides specifically for Restrictions on use of radio frequency spectrum in astronomy advantage areas.

[4] A good example is in Ireland ref: "Multi-band Spectrum Release: Release of the 800 MHz, 900 MHz and 1800 MHz Radio Spectrum Bands' – various consultations by ComReg 2012.

2 Applicable Legislation and Regulations

2.1 Electronic Communications Act

2.1.1 Section 34 - Radio Frequency Plan

Section 34 of the Act deals with the National Radio Frequency Plan and as part of this, radio frequency migration.

Subsection (2) essentially contains the key statement:

.....national radio frequency plan developed by the Authority, which must set out the specific frequency bands designated for use by particular types of services.....

Referring specifically to matter of migration:

- Section 34 (7) (c) (iii), states that the Authority must:

  Co-ordinate a plan for migration of existing users, as applicable, to make available radio frequency spectrum to satisfy the requirements of subsection (2) and the objects of this Act and of the related legislation.

- Section 34 (16) states that:

  The Authority may, where the national radio frequency plan identifies radio frequency spectrum that is occupied and requires the migration of the users of such radio frequency spectrum to other radio frequency bands, migrate the users to such other radio frequency bands in accordance with the national radio frequency plan, except where such migration involves governmental entities or organisations, in which case the Authority—

  (a) must refer the matter to the Minister; and

  (b) may migrate the users after consultation with the Minister

It is clear that ICASA has the obligation and authority to plan and implement the migration of users, subject to the approval of the Minister with respect to government entities[5].

2.1.2 Section 31 - Radio Frequency Spectrum Licence

Section 31 of the Electronic Communication Act (2005) deals with the radio frequency spectrum licences.

- Section 31 (4) states that:

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[5] Section 34 (16) of the Act

(4) The Authority may amend a radio frequency spectrum licence—

(a) to implement a change in the radio frequency plan;

(b) in the interest of orderly radio frequency spectrum management;

(c) to effect the migration of licensees in accordance with a revised radio frequency plan or the transition from analogue to digital broadcasting;

(d) if requested by the licensee concerned to the extent that the request is fair and does not prejudice other licensees; or

(e) with the agreement of the licensee.

It is the Authority's view that the latter legislation empowers it to amend a radio frequency licence/s to cater for instances listed in section 31(4) (a)-(e) of the Act.

2.1.3 Chapter 3 – Licensing Framework

Section 31(1) and (2) of the Act dealing with the radio frequency spectrum licence interlinks with Chapter 3 of the Act which in principle deals with the award of licences for individual and class licences for the provision of services, and clarifies that a person cannot provide services which require the use of the radio frequency spectrum without a radio frequency spectrum licence. Spectrum Licence Duration

The process of migrating users will not have an impact on the duration of their radio frequency spectrum licences. The radio frequency spectrum licences in South Africa are in principle granted for a period of 12 months or one year. In the case of multi-year licences, migration will not fall within the period of the multi-year licence.

2.1.4 Astronomy Geographic Advantage Act (Act No.21 of 2007)

The proceedings of ICASA are also subject to the Astronomy Geographic Advantage Act. This act contains the following provisions that affect the Draft Radio Frequency Migration Plan. Certain subsections in section 22 (Restrictions on use of radio frequency spectrum in astronomy advantage areas) and section 23 (Declared activities in core or central astronomy advantage area) that are relevant, state the following:

Section 22(1) - the Minister has the authority subject to subsection (2) within a core or central astronomy advantage area to protect the use of the radio frequency spectrum for astronomy observations.

Section 22(2) - Pursuant to the authority granted in subsection (1) and with the concurrence of ICASA, in so far as the Minister's action is likely to affect broadcasting service license or broadcasting service, the Minister may, by notice in the Gazette –

a) prohibit completely or restrict in any way the use of specific frequencies within the radio frequency spectrum or the radio frequency spectrum in general within a core or central astronomy advantage area;

b) require the conversion, within a reasonable time period, of analogue transmissions in the radio frequency spectrum within a core or central astronomy advantage area, to digital transmissions;
c) require any user of the radio frequency spectrum which transmits or broadcasts into a core or central astronomy advantage area to migrate onto a radio frequency or utilise alternative technology that more effectively protects radio astronomy observations; or
d) exempt from the provisions of such notice any person or organ of state who has entered into an agreement with the management authority of the core or central astronomy advantage area to mitigate their impact on the radio frequency spectrum within the relevant astronomy advantage area.

Section 22(6) - Notwithstanding anything contained in any other law, ICASA must not issue a broadcasting service license or a radio frequency spectrum license after the coming into force of this Act where the service to be licensed would cause radio frequency interference in a core or central astronomy advantage area, unless the conditions set out in the license make provision for the protection of such areas.

Section 23(1) - the Minister may, with the concurrence of ICASA where his or her action is likely to affect broadcasting service license or broadcasting service, declare that no person may, in a core or central astronomy advantage area, and conduct any activity in any of the following categories (only the items relating to radio frequency spectrum are listed below):

a) the construction, expansion or operation of any fixed radio frequency interference source;
b) activities capable of causing radio frequency interference, including bringing into the area or operating any interference source, mobile radio frequency interference source or short range device;
c) any other activity which may detrimentally impact on astronomy and related scientific endeavours, or the astronomy advantage of any core or central astronomy advantage area or may direct that such activities may only be conducted in a core or central astronomy advantage area in accordance with standards or conditions prescribed by the Minister.

Section 23(2) - Following publication of a declaration under subsection (1), the Minister must review all declared activities which were lawfully conducted in any affected core or central astronomy advantage area immediately before a declaration in terms of subsection (1) was published.

2.2 Review of Regulations

2.2.1 Radio Frequency Spectrum Regulations

The Final Radio Frequency Spectrum Regulations (Notice 184 0f 2011 in Government Gazette 34172) do not elaborate further (than the Act) on the issue of migration or the

related issue of the amendment of a radio frequency spectrum licence initiated by the authority.

Regulation 15 deals with the duration of a radio frequency spectrum licence

- Regulation 15 (1) stipulates that *The grant of a Radio Frequency Spectrum Licence and assignment*[6] *must not be construed as conferring upon the holder a monopoly of the use of the frequency or a right of continued tenure with respect of the frequency;*
- Regulation 15 (2) stipulates that, *unless otherwise specified, a Radio Frequency Spectrum Licence remains valid for one year and thereafter is renewable upon payment of the annual licence fee.*
- Regulation 15 (3) stipulates that where an assignment is issued in the Amateur Radio, Aeronautical, Maritime, Citizen Band frequency bands or for Ski Boats, the radio frequency spectrum licence can be renewed for a maximum period of 5 years.

2.2.2 Terrestrial Broadcasting Frequency Plan

The Final Terrestrial Broadcasting Frequency Plan (Notice 1538 of 2009 in Government Gazette 32728) deals with the planning of the broadcast bands in South Africa including the digitalisation programme and the vacation of broadcast channels from the 800 MHz frequency band following the 2006 regional radio conference in Geneva (GE06), which in turn was derived from resolutions made in WRC 07.

This plan is being currently updated and will reflect the WRC12 resolutions on the 700 MHz band.

This plan essentially deals with the conversion of analogue to digital Television and the subsequent migration of the existing TV channels to a new spectrum location. The key issues of interest are that there is a period during which broadcasts continue simultaneously in analogue and digital until the analogue channels are switched off.

2.3 Overview of rights

2.3.1 Radio frequency spectrum rights

Neither in the Act, nor in the regulations are there any rights on the parts of users to retain spectrum. The spectrum licence is currently valid for one year only and a spectrum assignment can be revoked at any time. As the International benchmark study (refer to Appendix B (**Error! Reference source not found.**) indicates, this is not unique to South Africa and many administrations retain the ultimate right to decide on the use of the

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[6] There is a semantic difference between licence and assignment. The assignment is the right of use of a specific frequency or frequency band, the licence is the document giving the assignment. Where a user is migrated from one spectrum location to another, his licence may be amended to give a new assignment and change other terms and conditions.

spectrum at any time, notwithstanding the procedures for withdrawal, amendment or suspension of a licence.

The process for spectrum migration shall include the following:

- a consultation process,
- consideration of the economic lifetime of the equipment,
- the identification of alternative frequencies for users who have to be migrated out of a frequency band,
- advance planning along with an adequate time frame,
- consideration of the duration of the radio frequency spectrum licence,
- consideration of the duration of a broadcast licence.

3 Principles Governing Frequency Migration

3.1 Identification of Bands which are subject to Frequency Migration

Bands are identified for radio frequency migration according to the following hierarchy:

- First Level – where the ITU radio regulations / decision of a World Radio Conference (WRC) require a change in national allocation that will require existing users to be migrated;
- Second Level - where a Regional Radio Conference require a change in national allocation that will require existing users to be migrated;
- Third Level – where the SADC Frequency Allocation Plan (FAP) requires a change in a change in national allocation that will require existing users to be migrated and
- Fourth Level – a decision is taken to change the use of a frequency band at national level and this requires the migration of existing users.

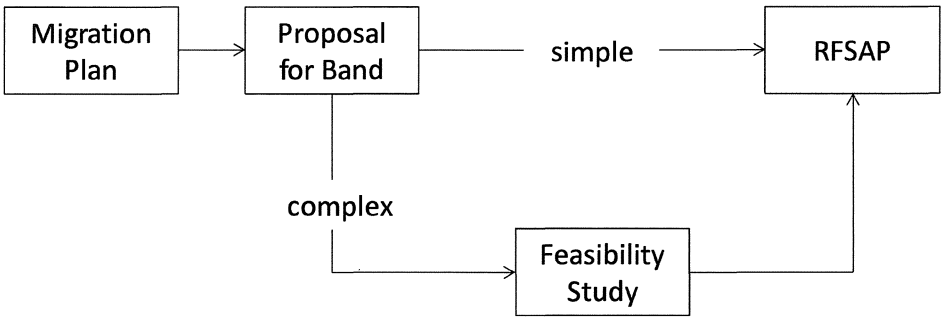
3.2 Process

The process of frequency migration is carried out in a manner consistent with the radio frequency spectrum regulations and the generic process is described in the draft frequency migration regulation that is attached to this draft plan. The key processes are:

- Preparation of a Radio Frequency Spectrum Assignment Plan (RFSAP)
- Amendment of a Radio Frequency Spectrum Licence

When it has been established that migration is required, then the critical issue is to determine the time frame in a manner consistent with sound radio frequency spectrum management.

The first consultation highlighted the need in some cases to carry out a feasibility study on the band in question. This is illustrated in the process flow indicated below.



The RFSAP will be subject to a consultation process, but it is desirable that a feasibility study be carried out first where there are contentious issues and alternative options.

Submissions in the first consultation touched on the issue of specifying the destination bands for services migrating out. It cannot be a requirement of the Frequency Migration Plan that destination bands for out-migrating users or uses be identified because the appropriate destination band will vary from user to user depending on their specific requirements of the user. The spectrum pricing regime is intended to facilitate this process and guide users to the 'optimum' choice.

3.3 Time Frame for Migration

In principle, ICASA can migrate a user to another location as part of sound radio frequency spectrum management as required. However, an appropriate time frame should be applied as a matter of standard practice.

In determining the time frame, the following factors will be taken into account:

- the duration of the spectrum licence,
- the time frame to migrate existing customers (end users),
- the economic life of the equipment installed and
- adequate forward planning.

3.3.1 Time Frame to migrate existing end users

The issue of the migration of existing users is a key determinant of a spectrum migration time frame. The issue arose in the past with cessation of the analogue mobile phone systems and the migration to GSM and is currently an issue with respect to broadcasting. In Europe, the main controversy is with regard to proposed plans to terminate VHF FM and possibly Medium Wave broadcasting and as a result of this opposition, the termination of FM does not seem likely in the short term. There has been less opposition to the cessation of analogue television broadcasts.

The critical area in South Africa is the digitalisation of TV where end users have to obtain a digital-to-analogue box to accommodate digital signals to their existing televisions before analogue switch off in 2015.

Potential areas that may arise in the future include:

- Conversion of existing cellular frequencies to HSPA/ LTE.
    - Because of the large number of GSM customers with voice / text only phones in South Africa and the availability of other bands for mobile broadband, it is unlikely that GSM bands will be shut off any time soon.
    - A switch over from 3G / HSPA to LTE – if this ever occurs would involve a time frame of 3-5 years to accommodate the life cycle of the end-terminal equipment.
- Switch off of an analogue radio: This is unlikely to occur within the time frame envisaged by this spectrum migration strategy.

3.3.2 Economic life of the equipment installed

It should not be automatically assumed that a change in frequencies will require new transmission equipment; it is possible that the equipment can be retuned at relatively low cost.

In terms of the economic lifetime of the equipment, SABRE 2 which was gazetted in August 2001, planned for switchover deadline of December 2005 for the services subject to migration which was a time frame of just under 5 years. This was at a time when the technological life-cycle was longer than it is today.

3.3.3 Adequate Forward Planning

Probably the most important factor for a frequency migration is the allowance of sufficient time for adequate forward planning. In terms of the overall process this may include:

- Proper time for consultation,
- Band planning,
- Adequate time for existing users of the spectrum to migrate out, and
- Adequate time required for dual illumination during a switchover period subject to no interference.

In terms of the time frame, the critical determinant is the earliest time in which new users can begin transmitting as this will be the final date at which existing users cease transmitting. In principle, there is little to be achieved by shutting down existing transmission before new licensees are ready to start transmitting.

3.3.4 Conclusions regarding time frame.

It is proposed that the forward looking time frame for a process of spectrum migration should be 3-5 years from the moment of announcement, unless otherwise specified.

To ensure that there is no confusion, where there are multi-year radio frequency spectrum licences; these should generally not exceed 5 years. Where there is a spectrum migration planned for a particular frequency band, there is nothing to stop a licence being issued for the period up to the date at which transmission should cease if the licensee is able to 'live with' this.

3.4 Frequency Migration in the Karoo Central Astronomy Advantage Areas

The need for frequency migration in the Karoo Central Astronomy Advantage Areas will be determined by the South Africa specific requirements for protecting the use of the radio frequency spectrum for astronomy observations. The following principles will be applied:

- The protected spectrum within a core or central astronomy advantage area will be determined in the declaration of the area in terms of the Astronomy Geographic Advantage Act;
- The frequency bands in the protected spectrum to be exempted from the restriction of its use will constitute a frequency allocation plan for the Karoo Central Astronomy Advantage Areas;
- The frequency band exemptions will be determined by the relevant management authority designated for the declared areas in terms of the Astronomy Geographic Advantage Act, and will be subject to a public consultation process after advance consultation with ICASA;
- The frequency band exemptions will be published in the Gazette after the public consultation had been concluded; and
- Frequency use outside the exempted frequency bands must migrate to frequencies inside the exempted frequency bands. The procedures to determine the frequency spectrum bands to be exempted are detailed in the draft Regulations on Procedural Matters for the Central Astronomy Advantage Areas. As preliminary information, the radio frequency bands and the services that need to be considered for exemption for radio communications purposes are set out in the following sub items. Only spectrum from 100 to 960 MHz is addressed in the comments below. No exemptions are contemplated above 960 MHz, however, a possible need for exemptions will be considered as required.

4 Development of the Radio Frequency Migration Plan

4.1 Background

The First Draft of the Draft Frequency Migration Regulation and Frequency Migration Plan was issued for consultation in August 2012. The industry submitted comments and public hearings were held in November 2012.

The table below illustrates the time line of documents and conferences that informed the creation of First Draft of the Draft Frequency Migration Regulation and Frequency Migration Plan

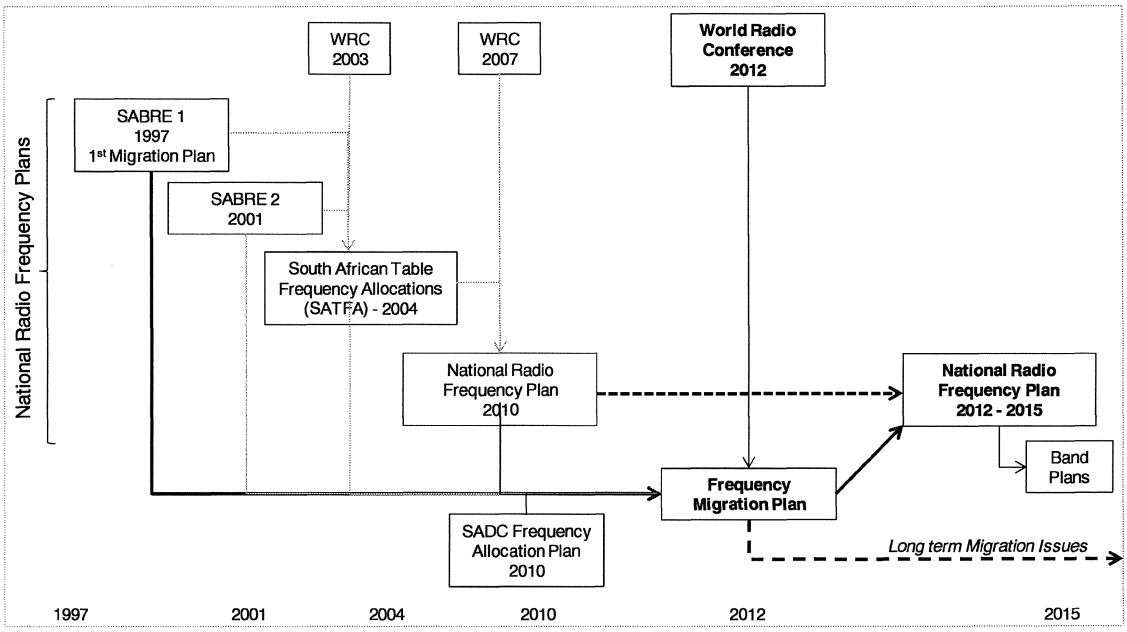


Figure 1 Time Frame and events informing Frequency Migration Plan

This Second Draft Frequency Migration Regulation and Frequency Migration Plan have taken account of the industry submissions insofar as they relate to Frequency Migration. This second draft also takes cognizance of the draft update of the National Radio Frequency Plan and both reflect the Final Acts of WRC-12 World Radiocommunication Conference (Geneva 2012) and the subsequent update of the ITU Radio Regulations in November 2012.

4.2 International Context

The use of the Radio Frequency Spectrum is fundamentally determined through the ITU Radio Regulations which are established by treaty and modified by treaty in the form of the Resolutions of the World Radio Conferences in which South Africa has participated

since 1994. The primary driver for a change in use is a change in allocation stemming from a World Radio Conference Resolution.

South Africa has to harmonise uses and management of frequency bands with other countries in Africa and elsewhere in Region 1 on the grounds that this facilitates coordination and allows South Africa to benefit from potential economies of scale with regard to equipment as well being able to capitalize on existing development work.

South Africa has actively participated in the preparation of the SADC Frequency Allocation Plan (SADC FAP) and to keep the National Radio Frequency Plan as harmonised as possible with the latest version of the SADC FAP as is necessary to maintain international co-ordination with neighbouring countries.

4.3 Approach to development of FMP

The Radio Frequency Migration Plan is drawn up using the latest National Radio Frequency Plan (NRFP 2010) as a baseline.

As a first step, a confirmation is made with regards to the frequency migrations proposed in SABRE[7] (see below) with respect to the following:

- Whether the migration as proposed (both from and to other bands) has been carried out and
- If identified service/s continue to occupy the original band, whether these services should still be migrated or if the migration has now become irrelevant in the present context. This is carried out by:
    - Evaluating the current utilization of these bands by the incumbent
    - Determining whether these bands could be put to better use

In the next step, the proposals in the SADC Frequency Allocation Plan 2010 (SADC FAP 2010) are considered for relevancy in the Republic of South Africa. In terms of relevancy, points under consideration are:

- Whether the bands proposed for alternate use by SADC are being currently utilized (by whom and to what extent) and
- If there is a global trend and perceived economic benefit in migrating the current users to accommodate new services.

The third step involves looking at the resolutions adopted at the World Radiocommunication Conference (WRC) 7 and 12 etc., applicable to Region 1 and determines applicability for South Africa. Similar criteria as used to evaluate SADC proposals would be applied here.

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[7] The Revision of South African Frequency Allocation Plans (Band Plans) and Migration Strategies – Notice 759 of 1997 – which covered 20MHz to 3 GHz (SABRE-1) and 3.4GHz to 3.6 GHz.

The fourth step involves identifying South Africa specific migration issues.

In this manner, all matters of significance from global, regional and national context along with the historical activities around migration are awarded due consideration in drafting the frequency migration plan.

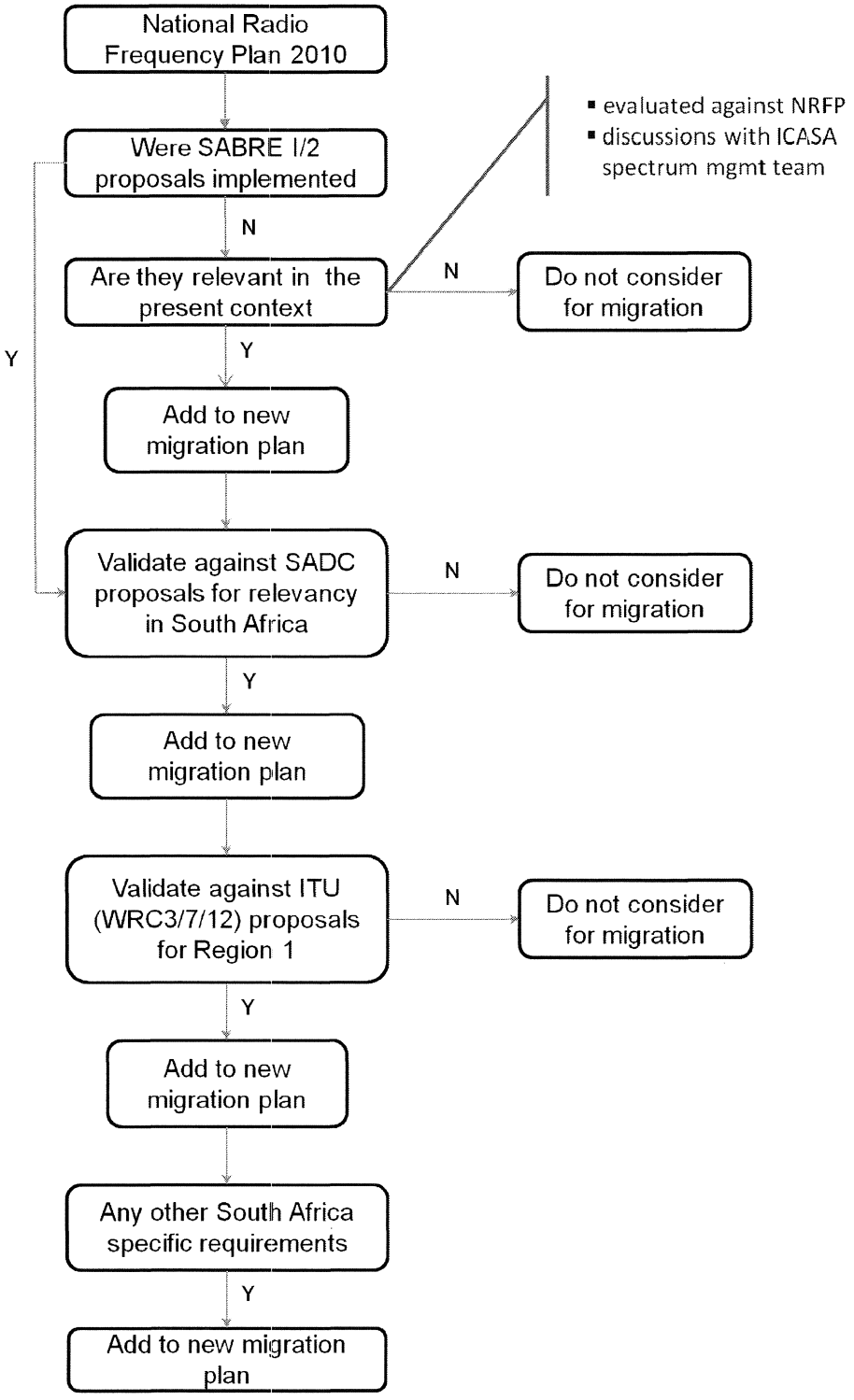

Figure 2 Process for Development of Frequency Migration Plan

4.4 SABRE 1 and SABRE 2

There were two South African Bands Re-planning Exercises (SABRE) carried out in 1997 and 2001. SABRE 1 has been the most comprehensive spectrum migration exercise to date.

- SABRE I – in 1997 addressing the radio frequency spectrum between 20MHz and 3 GHz, and between 3.4 – 3.6 GHz
- SABRE II – in 2001 addressing radio frequency spectrum above 3 GHz with the exception of those bands already addressed in SABRE I

4.4.1 SABRE 1 – 1997

SABRE 1[8] was a significant programme to re-plan the radio frequency in line with the ITU Region 1 frequency allocation plan from 20 MHz to 3GHz and to migrate users that either did not accord with the existing allocation plan or prevented efficient use of the spectrum. A prime example of this was the drive to migrate fixed links to over 3 GHz. SABRE 1 was extended to cover 3.4 – 3.6 GHz

The primary services which were targeted for this exercise were

- Fixed links – plan to migrating the fixed links (wherever possible) to higher frequencies above 3 GHz. The primary rationale was that the frequency below 3 GHz was prime estate for mobile communications and should be reserved for that purpose
- Mobile services in VHF High Band – plan for migrating out existing services such as paging, alarms, municipal and governmental authorities into bands reserved for their use and migrate in mobile services into the cleared band
- Paging services – consolidate paging services into bands specifically allocated for that purpose. This would include low power paging, amateur, regional and other paging system
- Alarms – consolidate alarm systems into specific bands

4.4.2 SABRE 2 – 2001

SABRE 2[9] was a programme to re-plan the radio frequency spectrum from 3GHz to 70 GHz (with the exception of 3.4 – 3.6 GHz which was part of SABRE 1), partly driven by the need to in-migrate fixed-links from below 3Gz.

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[8] The Revision of South African Frequency Allocation Plans (Band Plans) and Migration Strategies – Notice 759 of 1997 – which covered 20MHz to 3 GHz (SABRE-1) and 3.4GHz to 3.6 GHz.

[9] Radio frequency spectrum band plan covering the range 3 GHz to 70 GHz – (SABRE-2) Notice 1920 of 2001

4.4.3 Analysis of SABRE

The analysis conducted shows that the following migration of services out of specified bands as proposed under SABRE (1 and 2) did not take place.

Table 1 SABRE planned allocations that have not been implemented

Frequency Band (MHz)	Planned allocation under SABRE	Current allocation in NRFP 2010
53.025 – 53.225	Low power paging	Wireless Microphones (53 -54 MHz)
(81 – 81.625 BTX) paired with (86.375 - 87 MTX)	Dual frequency alarms/ Mobile	Mobile 7 BTX only
141 – 142	None	Remote controlled industrial apparatus (should be in the ISM band)
150.05 – 151	Wide area paging	Wildlife telemetry tracking 148-152 MHz
(165.55 – 167.4875) paired with (172.05 – 173.9875)	BTX-DF (165.55 – 167.4875 MHz) MTX-DF(172.05 – 173.9875 MHz)	MTX-DF (165.55 – 167.4875 MHz) BTX-DF(172.05 – 173.9875 MHz)
240 – 246	DAB	International distress (239 MHz)
278 – 286	FLEX outbound paging services	SF Mobile
406.1 – 410	SF links only	Fixed links (406.1 – 407.625 MHz) paired with (416.1 – 417.625 MHz) Fixed links (407.625 – 410 MHz) paired with (417.625 – 420 MHz)
426.1 – 427.625	Public trunking	SF links (426.1 – 430 MHz)
427.625 – 430	urban–government and public safety rural – SF links	SF links (426.1 – 430 MHz) only
(454.425 – 460) paired with (464.425 – 470)	Mobile trunking MTX (454.425 – 460 MHZ) BTX (464.425 – 470 MHz)	Mobile trunking BTX (454.425 – 460 MHZ) MTX (464.425 – 470 MHz)
463 – 463.975	SF Mobile out of the band	SF Mobile
876 – 880	Digital trunking	Mobile Wireless Access (824 – 849 MHz paired with 869 - 894 MHz)
925 – 925.4	Two-way paging (FLEX inbound)	No allocation
1885 – 1980	FPLMTS (satellite)	No allocation

Frequency Band (MHz)	Planned allocation under SABRE	Current allocation in NRFP 2010
1980 – 2010/ 2170 – 2200	Mobile – Satellite (earth – to – space)	Fixed links 1980 – 2010 MHz paired with 2170 – 2200 MHz
21400 – 22000	Broadcasting satellite service	Fixed links

4.5 National Radio Frequency Plans

After SABRE, there have been two national radio frequency plans, SATFA and the NRFP 2010.

4.5.1 The South African Table of Frequency Allocations 2004

SATFA: The South African Table of Frequency Allocations 2004[10] consolidated SABRE 1 and SABRE 2 in one plan covering the range 20MHz to 70 GHz.

4.5.2 National Radio Frequency Plan 2010

The National Radio Frequency Plan 2010[11] updated SATFA 2004[12] and extended the frequency range covered (now 9 kHz – 3000 GHz). Its stated aim was to incorporate the decisions taken by WRC and include updates on the Table of Frequency Allocations extending up to 3000GHz.

4.6 SADC Frequency Allocation Plan (FAP)

The SADC Frequency Allocation Plan was drawn up in 2010 and guides the use of frequency in the SADC countries as spectrum coordination is required between SADC members. The allocations of the SADC FAP are largely consistent with those for South Africa and the SADC FAP is used as a reference in the preparation of the FMP.

4.7 ITU World Radio Conference resolutions

The following resolutions from the World Radio Conferences have been taken into consideration. The primary focus is on WRC12, however 4 resolutions from WRC07 have also been analysed.

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[10] The South African Table of Frequency Allocations (SATFA) – Notice 1442 of 2004.

[11] The National Radio Frequency Plan – Notice 727 of 2010

[12] The main reason for the name change is that the term 'National Radio Frequency Plan' is used in the ECA.

Table 2 WRC resolutions

Frequency Band (MHz)	WRC	Res. No.	Resolution
108 - 117.975	12	413	Use by aeronautical mobile (R) service without interfering with existing ARNS systems
450 – 470	7	224	Frequency bands for the terrestrial component of International Mobile Telecommunications below 1 GHz
690 – 794	12	232	Use of the frequency band 694-790 MHz by the mobile, except aeronautical mobile, service in Region 1 and related studies
790 – 862	12	224	Frequency bands for the terrestrial component of International Mobile Telecommunications below 1 GHz
960 – 1164	12	417	Use of 960 – 1164 MHz by aeronautical mobile (R) service meeting standard and recommended practice
1518 - 1544 1545 - 1559 1610 - 1626.5 1626.5 - 1645.5 1646.5 - 1660.5 1668 - 1675 2483.5 - 2500	12	225	Use of additional frequency bands for the satellite component of IMT
1525 – 1559/ 1626.5 – 1660.5	12	222	Use of 1525-1559 MHz and 1626.5-1660.5 MHz by the mobile-satellite service, and procedures to ensure long-term spectrum access for the aeronautical mobile-satellite (R) service
1885 – 2025/ 2100 - 2200	7	212	Implementation of International Mobile Telecommunications in the bands 1885-2025 MHz and 2110-2200 MHz
2300 – 2400	12	223	Additional frequency bands identified for IMT
5150 – 5250/ 5250 – 5350/ 5470 – 5725	12	229	Use of the bands 5150-5250 MHz, 5250-5350 MHz and 5470-5725 MHz by the mobile service for the implementation of wireless access systems including radio local area networks
15400 – 15700	7	614	Use of the band 15.4-15.7 GHz by the radiolocation service
22550 – 23150	7	753	Use of the band 22.55-23.15 GHz by the space research service

4.8 Key issues with respect to migration

The following explains the approach to key issues regarding the frequency migration plan:

Broadcasting Service

- Digital Terrestrial Television (DTT): The process of migrating TV services from analogue to digital (and corresponding in-band migration) is in progress. The plans need to be updated following the WRC 12 along with the allocation of the 700 MHz band to MOBILE (which includes IMT) on a co-primary basis and the corresponding consideration to consolidate UHF TV broadcasting to the 470-694 MHz UHF band in line with the original Draft Broadcasting Digital Migration Framework (Government Gazette number 31490). The potential spectrum for IMT in the 800 MHz (WRC07) and 700 MHz band will be the major spectrum resource for mobile broadband.
- Studio Links: These are point-to-point links connecting broadcast studios to transmitters that have been part of the broadcast frequency bands, especially the 800MHz band. With the reallocation of the 700MHz and 800 MHz band to IMT, these studio links also need to be migrated out. They should be given assignments in the bands allocated for Fixed Point to Point links.
- Self Help Stations – These are repeater stations rebroadcasting television channels to limited areas on a low power basis[13]. These must be migrated into the broadcast bands below 694 MHz.

Mobile Service

- Mobile broadband: 'Mobile' broadband is an important use of radio frequency spectrum at the current time and there is a large demand for spectrum in several bands for this purpose. As such, mobile broadband is the service that is most likely to require the migration of other services to accommodate its spectrum needs. The allocation of spectrum for mobile broadband / IMT has already been the subject of WRC resolutions for ITU region 1 as well as per SADC proposed common sub-allocation/ utilization. This ensures that equipment is readily available and a harmonized service can be provided both across the Southern African region as well as other countries in Region 1
- Paging – Paging was still considered to be a major service at the time of SABRE, however (due mainly to GSM) the use of paging services is declining to the point where it will only be used in certain niche areas such as hospitals. SABRE aimed to consolidate paging channels and planned specific migration to achieve this; however this is probably no longer relevant. It is expected that the remaining principle use will

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[13] Refer to 'Review of Self-Help Stations' – ICASA Position Paper February 2006 and 'Inquiry into Self Help Stations' – ICASA Discussion document of December 2004.

continue to be in medical environments where current allocations for low-power paging services would be more than adequate to meet the demand. Accordingly, the SABRE plans for paging can be discounted.

- Alarms – There are a large number of assignments in the bands allocated for alarms and the bands are generally highly utilised. If the present trend of demand for new assignments continues, there are two options:
    - Direct users to convert to a newer technology that is more spectrally efficient and can be accommodated in the existing spectrum allocation.
    - Allocate more spectrum for Alarms in adjacent bands.
- Public Safety: It is proposed that:
    - All public safety services should be consolidated in the same radio frequency band (380 – 400 MHz)
    - It is recommended that where possible public safety users should adopt a common standard. This would have multiple benefits including economic benefits borne out of infrastructure sharing as well as increased effectiveness due to interoperability between users using a common equipment base.

4.9 Proposed Migration Plan

The following table deals with all bands where there is a potential frequency migration issue. The motivation for a migration is either that it is an original SABRE proposal, stems from WRC resolutions and the SADC FAP or is a 'New ICASA' proposal for migration.

This 2nd draft of the frequency migration plan has been adjusted following the consultations on the First Draft of the Draft Frequency Migration Regulation and Frequency Migration Plan and has been aligned with the update of the National Radio Frequency Plan

Column 1 indicates the frequency range.

Column 2 states the allocation in the National Radio Frequency Plan 2012 and also any applications that are mentioned in the NRFP. As is the standard practice for frequency plans, primary allocations are in UPPER CASE, secondary allocations are in Lower Case. Applications are (within brackets).

Column 3 indicates the proposals for new allocations and utilization. The proposed allocation is indicated along with the source of the proposal (SABRE, WRC, SADC FAP, New ICASA proposals).

Column 4 contains notes on any migration issues.

This table only includes those bands where frequency migration is under consideration, some bands have been removed following the consultation process for the First Draft of the Draft Frequency Migration Regulation and Frequency Migration Plan.

Table 3 Proposed migration plan

Frequency Band (MHz)	Existing Allocation in NRFP 2010 (Applications)	Proposed Utilization/ Applications	Notes on migration/ usage
75.2 – 87.5	MOBILE except aeronautical mobile (Private and communal repeaters)	Allocate (81 – 81.625 MHz) BTX paired with (86.375 – 87 MHz) MTX for dual frequency (DF) alarms as per SABRE DF and SF links remain as-is	Migrate in DF alarms in line with original SABRE 1 proposed allocation (SABRE proposal, refer 4.4) Other SF / DF links can be maintained for use in private/ communal repeaters (refer to 4.10.1)
138 – 143.6	MOBILE Fixed (SF alarms, SF Mobile, MTX-BTX paired links, Remote controlled industrial apparatus)	Expand allocation for SF Alarms to (140.5 – 141.5 MHz) Mobile 1 MTX-BTX pairing remain as-is	Migrate SF Mobile (141 – 141.5 MHz) out of this band and allocate for SF alarms (New ICASA Proposal)[14] Migrate remote controlled industrial apparatus from 141 – 142 MHz to ISM Band (New ICASA Proposal) (refer to 4.10.2)
150.05 – 153	FIXED MOBILE except aeronautical mobile (Alarms, telemetry, SF Mobile and paging[15])	Single frequency alarms (152.05 – 152.55 MHz) Alarms, Single Frequency Alarms & load shedding (148.950-151 MHz)	152.05 – 152.55 MHz should be exclusively allocated to SF alarms. All other users must migrate out of this band (refer to 4.10.3)

[14] Proposal only if alarm systems cannot be migrated to more spectrally efficient technologies

[15] Alarms, SF Mobile. In-house paging and load shedding (148.95 – 151 MHz); SF Alarms (152.05 – 152.55 MHz); Government Service Wildlife Telemetry Tracking (148 – 152 MHz); SF Mobile (152.55 – 153.05 MHz)

Frequency Band (MHz)	Existing Allocation in NRFP 2010 (Applications)	Proposed Utilization/ Applications	Notes on migration/ usage
156.4875 – 156.5625	MARITIME MOBILE (distress and calling via DSC) FIXED MOBILE (Maritime Radio-navigation and location (radar), SF mobile in inland areas)	Maritime Distress (distress and calling via DSC) SF Mobile (in in-land areas)	Migrate any SF mobile (156.375 – 156.7625 MHz) operating inland in the vicinity of water-bodies out of this band (in accordance with ITU Appendix 18) (refer to 4.10.4)
156.8375 – 174	MOBILE except aeronautical mobile (R) Mobile Satellite Services (Earth-to-space)	Migrate BTX-DF (165.55 – 167.4875 MHz) to (172.05 – 173.9875 MHz) swap with the MTX-DF band	(1) ensure that the appropriate nesting of the spectrum is carried out by swapping the MTX and BTX allocations as proposed (2)- Conduct technical feasibility study into simplex frequencies (FDMA or TDMA) with different channel spacing – including coexistence of multiple technologies, bandwidth etc. (refer to 4.10.5)
174 – 223	BROADCASTING (TV)	TV Broadcasting (174 – 214 MHz) T-DAB (214 – 230 MHz) As per SADC FAP proposed common sub-allocation/ utilization	TV Band III (GE-06 applies) Migration from analogue to digital in accordance with planned SADC timelines T-DAB would be the new service introduced in this band (refer to 4.10.6)
223 – 230	BROADCASTING (TV)	T-DAB (214 – 230 MHz)	TV Band III (GE-06

Frequency Band (MHz)	Existing Allocation in NRFP 2010 (Applications)	Proposed Utilization/ Applications	Notes on migration/ usage
		As per SADC FAP proposed common sub-allocation/ utilization	applies) Migration from analogue to digital in accordance with planned SADC timelines T-DAB would be the new service introduced in this band (refer to 4.10.7)
230 – 267	BROADCASTING (TV) MOBILE	230 – 238 MHz TV Broadcasting (DTT) 238 – 242.95 MHz PMR 242.95 – 243.05 MHz International Distress 243.05 – 246 MHz Low power devices 246– 254 MHz TV Broadcast (DTT) (Channel 13) 254 – 267 MHz PMR as per SADC FAP proposed common sub-allocation/ utilization and modified according to submission comments.	TV Band III (GE-06 applies) Migration from analogue to digital in accordance with planned SADC FAP timelines Migration as per SADC FAP proposed common sub-allocation/ utilization (refer to 4.10.8)
335.4 - 387	FIXED MOBILE	335.4-336 MHz/ 346.0-356.0 MHz/ 366.0-380.0 MHz PMR and/or PAMR 336-346 MHz paired with 356-366 MHz Fixed Wireless Access/ PTP/PTMP rural system	Migrate existing fixed links to above 3 GHz – subject to study (refer to 4.10.9)

Frequency Band (MHz)	Existing Allocation in NRFP 2010 (Applications)	Proposed Utilization/ Applications	Notes on migration/ usage
380 – 400	FIXED (380 – 387 MHz) MOBILE (380 – 400 MHz) (Public safety, SAPS, DOD, Army etc.)	380.0-387.0 MHz paired with 390.0-397.0 MHz for digital systems to be used for PPDR 387.0-390.0 MHz paired with 397.0-399.9 MHz. To be used mainly for digital systems (PMR and/or PAMR) (SADC FAP proposed common sub-allocation/ utilization)	Consolidate all public safety services into this band, migrating all users falling into this category into this band (New ICASA proposal) Other links to be migrated out as per SADC FAP proposed common sub-allocation/ utilization (refer to 4.10.10)
405 – 430	FIXED Mobile except aeronautical mobile (Government services, Mobile Data and public trunking)	PMR and/ or PPDR (SADC FAP proposed common sub-allocation/ utilization) Public digital trunking only (New ICASA proposal)	Migrate government services (especially SAPS) to public safety band 380 – 400 MHz, Mobile Data - Migrate Mobile Data users out of this band Band reserved for Public Digital Trunking (New ICASA proposal) (refer to 4.10.11)
440 – 450	FIXED Mobile except aeronautical mobile (Short range business radio and PMR)	Short range business radio and PMR (New ICASA proposal) Other allocations stay as-is	Other users to be migrated out of the sub-band for Short-range business radio (440 – 440.1/ 445 – 445.1 MHz) (New ICASA proposal) (refer to 4.10.12)
450 – 470	FIXED MOBILE (Trunked Mobile Railways, Mines etc.)	Mobile (IMT) as per WRC-07 (Res. 224)	Carry out feasibility on this band. (refer to 4.10.13)
470 – 790	BROADCASTING	Co-primary allocation to	Digital Dividend 2; 694-

Frequency Band (MHz)	Existing Allocation in NRFP 2010 (Applications)	Proposed Utilization/ Applications	Notes on migration/ usage
	RADIO ASTRONOMY	MOBILE excluding aeronautical mobile (i.e. IMT at WRC-12)	790 Plan migration of broadcast to below 694 in 2015 aligned with on-going studies within ITU-R Migrate studio links out to PTP bands. Migrate self-help stations below 694 MHz (refer to 4.10.14)
790 – 862	FIXED BROADCASTING MOBILE except aeronautical mobile (TV Broadcast including fixed links (Secondary transmitter links))	IMT (Terrestrial) (WRC-07)	Digital Dividend 1; Broadcast to be migrated out by 2015. Align with the on-going efforts within the 800 MHz band as defined in Notice 911 of 2011 Government Gazette 34872 as amended / replaced Migrate studio links out. Migrate self-help stations below 692 MHz (refer to 4.10.15)
862 – 890	FIXED MOBILE except aeronautical mobile (Wireless audio (863-865 MHz), Fixed links (868.1–876 MHz), RFID (865 – 868 MHz), RFID (869.4- 869.65 MHz) Alarms (868.6 – 868.7 MHz, 860.25 –	Mobile (IMT) (as per SADC FAP proposed common sub-allocation/ utilization)	Migrate to IMT as per SADC FAP proposed common sub-allocation/ utilization to facilitate development of harmonized channelling arrangement. Align with the on-going efforts within the 800 MHz band as defined in Notice 911 of 2011 Government Gazette

Frequency Band (MHz)	Existing Allocation in NRFP 2010 (Applications)	Proposed Utilization/ Applications	Notes on migration/ usage
	869.3 MHz, 869.65 – 869.7 MHz) Wireless Access Services (824-849 MHz paired with 869-894 MHz) Mobile (880-890 MHz paired with 925-935 MHz))		34872 as amended / replaced. Align with ITU-R WP5D agreement on the appropriate channel plan for the 700 MHz/800 MHz frequency bands for Region 1. (refer to 4.10.16)
890 – 942	MOBILE except aeronautical mobile (Mobile (890-915 MHz paired with 925-935 MHz) Several RFID systems (915.1 – 921 MHz), (GSM900 band)	Allocations maintained as-is	(refer to 4.10.17) Spectrum re-farming when deemed required may be carried out based upon defined process (refer to **Error! Reference source not found.**)
942 – 960	MOBILE except aeronautical mobile (GSM 900)		No migration planned Spectrum re-farming when deemed required may be carried out based upon defined process (refer to **Error! Reference source not found.**)
1350 – 1375 paired with 1492 – 1517 1375 – 1400 MHz paired with 1427 – 1452	FIXED (Fixed low capacity PTP DF links)	Rural BWA both fixed and mobile (Modified ICASA proposal)	Allocate to rural BWA; maintain existing links where required. Potential band for IMT under WRC-15 Agenda Item 1.1. Migration planning after decision at WRC-15 (enabling

Frequency Band (MHz)	Existing Allocation in NRFP 2010 (Applications)	Proposed Utilization/ Applications	Notes on migration/ usage
			harmonization, equipment availability etc.) (refer to 4.10.19)
1452 – 1492	BROADCASTING BROADCASTING-SATELLITE (T-DAB and S-DAB (L-band))	FIXED MOBILE (except aeronautical mobile) BROADCASTING BROADCASTING-SATELLITE (T-DAB and S-DAB (L-band))FWBA/ PTP/ PMP/ LMR (New ICASA proposal)	Currently allocated to T-DAB (1452 – 1479.5 MHz) and S-DAB (1479.5 – 1492) Propose to align allocation with ITU Region 1 (New ICASA proposal) (refer to 4.10.20) Feasibility study on the various options.
1518 – 1525	FIXED MOBILE-SATELLITE (space-to-earth)	Band is currently not occupied; potential application for LMR repeaters (New ICASA proposal)	No change in allocation and no migration at this stage (refer to 4.10.21)
1525 – 1559	(1525 – 1530 MHz) SPACE OPERATION (space-to-earth) FIXED MOBILE-SATELLITE (space-to-earth) Earth exploration satellite Mobile except aeronautical mobile (Mobile satellite services)	potential application for LMR repeaters (New ICASA proposal)	Migrate in fixed links for LMR repeaters, band could also be used for outside-broadcasting links currently operating in 2300 – 2450 MHz (New ICASA proposal) (refer to 4.10.22)
	(1530 – 1535 MHz) SPACE OPERATION (space-to-earth)		No migration planned (refer to 4.10.22)

Frequency Band (MHz)	Existing Allocation in NRFP 2010 (Applications)	Proposed Utilization/ Applications	Notes on migration/ usage
	MOBILE-SATELLITE (space-to-earth) Earth exploration satellite Mobile except aeronautical mobile Fixed (Mobile satellite services)		
	(1535 – 1559 MHz) MOBILE-SATELLITE (space-to-earth)		No migration planned (refer to 4.10.22)
1668 – 1675	(1668 – 1668.4 MHz) MOBILE SATELLITE (earth-to-space) RADIO ASTRONOMY SPACE RESEARCH (passive)	(refer to 4.10.23)	No change (refer to 4.10.23)
	(1668.4 – 1670 MHz) METEOROLOGICAL AIDS MOBILE SATELLITE (earth-to-space) RADIO ASTRONOMY	(refer to 4.10.23)	No change (refer to 4.10.23)
	(1670 – 1675 MHz) METEOROLOGICAL AIDS MOBILE MOBILE SATELLITE (earth-to-space)	(refer to 4.10.23)	No Change (refer to 4.10.23)
1710 – 1785 paired with 1805-1880	FIXED MOBILE		No out-migration planned Spectrum re-farming

Frequency Band (MHz)	Existing Allocation in NRFP 2010 (Applications)	Proposed Utilization/ Applications	Notes on migration/ usage
	(GSM1800 band)		when deemed required may be carried out based upon defined process (refer to **Error! Reference source not found.**)
1880 – 1900	FIXED MOBILE (Cordless DECT phone)	FWA (SADC FAP proposed common sub-allocation/ utilization) Alternate allocation to BWA (fixed and mobile)	Currently under use by Telkom in a WLL configuration. Can be allocated for FWA Alternate allocation to BWA (fixed and mobile) (refer to 4.10.24)
1920 – 1980 paired with 2110 – 2170	FIXED MOBILE (Current 3G band)		No migration planned Spectrum re-farming when deemed required may be carried out based upon defined process (refer to **Error! Reference source not found.**)
1980 – 2010 paired with 2170-2200	FIXED MOBILE-SATELLITE (Earth-to-space) (Fixed Links (DF), IMT (Satellite))	Fixed Links (DF), BFWA (OR Reserve for MSS	Migrate in Fixed links (DF) from other bands; consider for BFWA (Submission proposal to reserve for MSS and migrate out terrestrial links) (refer to 4.10.25)
2025 – 2110 paired with 2200 – 2285	FIXED (Fixed links)	Fixed Links (DF) BFWA (New ICASA proposal)	Fixed links – currently under-utilized. Migrate in Fixed links (DF) from other bands Potential to allocate for BFWA – but only where there is no interference problem with PTP links.

Frequency Band (MHz)	Existing Allocation in NRFP 2010 (Applications)	Proposed Utilization/ Applications	Notes on migration/ usage
			(refer to 4.10.26)
2110 – 2170	FIXED MOBILE (Current 3G band)		No migration planned Spectrum re-farming when deemed required may be carried out based upon defined process (refer to **Error! Reference source not found.**)
2290 – 2300	FIXED MOBILE	BFWA (as per SADC FAP proposed common sub-allocation/ utilization) Alternative – change allocation to BWA (applies to 2285-2300 MHz)	Band currently unused; can be allocated for BFWA as per SADC FAP proposed common sub-allocation/ utilization (refer to 4.10.27)
2300 – 2450	FIXED MOBILE Amateur (Fixed links (2307 – 2387 MHz) paired with (2401 – 2481 MHz) Several outside broadcasting links ISM band (2400 – 2483.5 MHz))	IMT (Terrestrial) 2300 – 2400 MHz as per SADC FAP proposed common sub-allocation/ utilization	Migrate existing fixed links above 3 GHz Potential migration of outside-broadcasting links in line with the Broadcast Plan. Otherwise no change (refer to 4.10.28)
2500 – 2690	2500-2520 MHz FIXED MOBILE except aeronautical mobile		Currently being used by Sentech (2500 – 2550 MHz) and WBS (2550 – 2565 MHz). 125 MHz available for assignment Align with the on-going
	2520-2655 MHz FIXED	BFWA	

Frequency Band (MHz)	Existing Allocation in NRFP 2010 (Applications)	Proposed Utilization/ Applications	Notes on migration/ usage
	MOBILE except aeronautical mobile Radio astronomy 2655-2690 MHz FIXED MOBILE except aeronautical mobile Radio astronomy	Mobile IMT (as per SADC FAP proposed common sub-allocation/ utilization)	efforts within the 800 MHz band as defined in Notice 911 of 2011 Government Gazette 34872 as amended or replaced (refer to 4.10.29)
3400 – 3600	FIXED MOBILE except aeronautical mobile	BFWA Mobile IMT (as per SADC FAP proposed common sub-allocation/ utilization)	Band needs harmonizing in SADC for IMT; channelling plan to be developed Study on potential issues including sharing and the allocation to amateur (refer to 4.10.30)
3600 – 4200	FIXED FIXED-SATELLITE (space-to-earth) (Satellite (VSAT, downlink), Terrestrial backhaul)	(3600-4200 MHz) Fixed services (PTP) (3600-4200 MHz) Fixed-satellite (space-to-Earth) (PTP/VSAT/SNG) as per SADC FAP proposed common sub-allocation/ utilization	No change. (refer to 4.10.31)
5150 – 5350	(5150 – 5250 MHz) AERONAUTICAL RADIONAVIGATION FIXED-SATELLITE-SERVICE (Earth-to-space) Mobile except	Wireless Access Systems / RLAN As per SADC FAP proposed common sub-allocation/ utilization	License exempt; Wireless Access Systems / Radio Local Access Network (WAS & RLAN) indoor use only. as per Notice 184 of 2011 Government Gazette 34172

Frequency Band (MHz)	Existing Allocation in NRFP 2010 (Applications)	Proposed Utilization/ Applications	Notes on migration/ usage
	aeronautical mobile (Wireless Access (short range))		*(previously Notice number 944 of 2008 in Government Gazette 31321)* No change
	(5250 – 5255 MHz) SPACE RESEARCH Mobile except aeronautical mobile		
	(5255 – 5350 MHz) EARTH EXPLORATION SATELLITE (active)		
5470 – 5725	(5470 – 5570 MHz) MARITME RADIONAVIGATION Mobile except aeronautical mobile EARTH EXPLORATION SATELLITE (active) SPACE RESEARCH (active) RADIOLOCATION (Maritime radio navigation (radar) and Wireless Access (short range))	Wireless Access Systems / RLAN As per SADC FAP proposed common sub-allocation/ utilization	No migration planned; as per as per Notice 184 of 2011 Government Gazette 34172 *(previously Notice number 944 of 2008 in Government Gazette 31321)* No Change (refer to 4.10.32)
	(5570 – 5650 MHz) MARITME RADIONAVIGATION Mobile except aeronautical mobile RADIOLOCATION		
	(5650 – 5725 MHz) RADIOLOCATION		

Frequency Band (MHz)	Existing Allocation in NRFP 2010 (Applications)	Proposed Utilization/ Applications	Notes on migration/ usage
	Mobile except aeronautical mobile Amateur Space Research (deep space)		
5725 – 5830	FIXED-SATELLITE (earth-to-space) RADIOLOCATION Amateur (ISM, Amateur, SRD)		No migration for South Africa; maintain for ISM as per Notice 184 of 2011 Government Gazette 34172 *(previously Notice number 926 of 2008 in Government Gazette 31290).* *No Change*
5850 -5925	FIXED FIXED-SATELLITE (earth-to-space) Mobile (Upper C-band (VSAT, Satellite PTP links), ISM (5725 – 5875 MHz))	(5850-6425 MHz) Fixed-satellite uplinks (PTP/VSAT/SNG)/ temporary Outside broadcast links (5850-5925 MHz) FIXED links (5725-5875 MHz) ISM as per SADC FAP proposed common sub-allocation/ utilization	No Change (refer to 4.10.34)
5925 – 6700	FIXED FIXED-SATELLITE (earth-to-space) (Fixed links/ VSAT, FSS, SNG feeder links)	5925 – 6425 MHz Fixed links 6425 – 7110 MHz Fixed links as per SADC FAP proposed common sub-allocation/ utilization	No Change (refer to 4.10.35)
10700 – 11700	FIXED FIXED-SATELLITE	as-is	No change Migrate VSAT links into

Frequency Band (MHz)	Existing Allocation in NRFP 2010 (Applications)	Proposed Utilization/ Applications	Notes on migration/ usage
	(space-to-earth)/(earth-to-space) (Ku-band satellite)		this band as per SADC FAP proposed common sub-allocation/ utilization Other allocation remains as-is (refer to 4.10.36)
12290, 16420		Reserved for safety related calling as per WRC-03 Res. 352	No Change
15400 – 15700		Radio location service as per WRC-07 Res. 614	No Change
40000 – above		Allocate for high capacity PTP links	(refer to 4.10.37)

4.10 Reasons on proposed migration plan following 1st consultation

4.10.1 75.2 – 87.5 MHz

The band is primarily used by Repeaters (Private, Communal) in several applications such as mining, farming and other small businesses. SABRE 1 had proposed migration of the dual-frequency alarms into this band. It is proposed to:

- Keep the DF/ SF radio links as-is.
- Allocate (81 – 81.625 MHz) BTX paired with (86.375 – 87 MHz) MTX for dual frequency (DF) alarms, and migrate-in DF alarms that may be operating in other bands.

Outcome of 1st Consultation

No objection to proposal

4.10.2 138 – 144 MHz

The band is primarily used by Repeaters (Private, Communal) in several applications such as mining, farming and other small businesses along with SF alarms. In addition there is an allocation for remote controlled industrial apparatus (ISM Licence exempt band 141 – 142)[16].

Within South Africa there has been a significant usage of alarms and this is forecast to continue to grow over the next decade. In this case the current band allocations for SF alarms at 140.5 – 141 MHz as well as at 152.05 – 152.55 MHz will be insufficient to meet this demand. At the same time modern alarm systems are more spectrally efficient, and if users migrate to such systems then it is probable that the current allocation is sufficient to meet South Africa's current and future needs. In order to meet this future need it is proposed to:

- Request proposals to determine whether new / current technologies can provide a mechanism for the users to use the current allocation in a more spectrally efficient manner.
- If this is not possible, consider migrating SF Mobile at 141 – 141.5 MHz out of this band. Timeline for this migration would be Year 5 – Year 7.
- Migrate in SF alarms into the band 141 – 141.5 vacated by SF mobile – allocating a total of 1 MHz for this application in the 140 MHz band. This would be the second step in a two stage process of allocating an SF alarm band. In the first stage all other users who are operating within the 152.05 – 152.55 MHz band allocated for SF alarms would be migrated out to free up spectrum for additional SF alarm assignments (Year 0 – Year 3).

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[16] Government Gazette No. 31290, Notice No. 926 of 2008 as amended.

- Migrate the remote controlled industrial apparatus out of the 141 -142 MHz band into a band dedicated for ISM. This is important since the alarms are sensitive and the remote controlled industrial apparatus devices may cause interference with the operation of these alarm systems.

It is therefore proposed to allocate this band in the following manner:

- Mobile 1 MTX 138 – 140.5 MHz paired with 141.5 – 144 MHz.
- SF alarms 140.5 – 141.5 MHz.

Outcome of 1st Consultation

No objection to proposal

4.10.3 150.05 – 153 MHz

The current users may continue to operate in this band with the following exceptions:

- Channels 150.625, 150.650, 150.675 MHz are reserved for in-house paging. The demand for paging has shown a sharp decrease over the past decade and may only occupy a very niche segment (e.g. hospitals etc.). If there are no current assignments for paging it is proposed to de-allocate these channels for this purpose.
- SF Alarms are supposed to operate within the 152.05 – 152.55 MHz band on an exclusive basis. However, there are other users (SF Mobile etc.) operating in this band. Given the growing demand from alarms (refer 4.10.2) it is proposed to migrate these users out of this band (Year 0 – Year 3) and allocate it on an exclusive basis to SF alarms.

Outcome of 1st Consultation

No objection to proposal

4.10.4 156.4875 – 156.5625 MHz

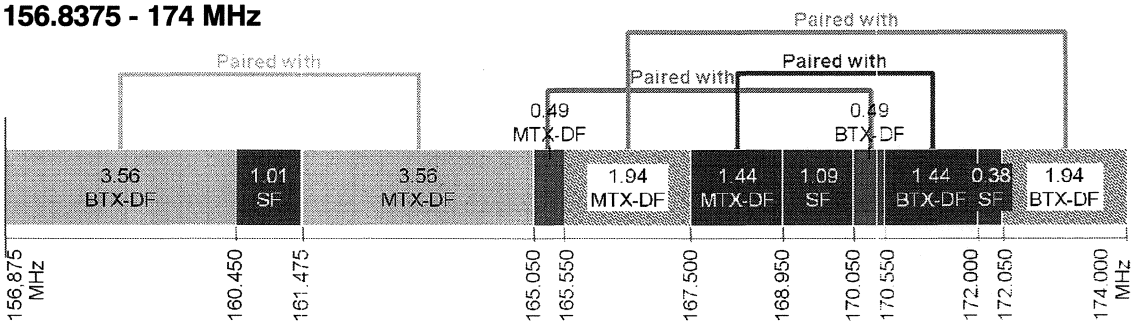
Although SF Mobile may continue to operate within 156.375 – 156.7625 MHz on a non-interference basis and non-protection basis to Maritime mobile services in inland areas, there are many occasions where these are situated in proximity (50km or less to water-bodies). This is as per ITU RR Article 31 and Appendix 18. It is therefore proposed to:

- Identify and migrate all SF Mobile users within close proximity (50 km or less) to water-bodies out of this band and/ or relocate the same.

Outcome of 1st Consultation

No objection to proposal

4.10.5 156.8375 - 174 MHz



The planned frequency allocation as per the NFRP in this band is as shown in Figure 3

Figure 3 Proposed Allocation 156.875MHz – 174MHz

However at present the MTX-DF (165.55 – 167.5 MHz) and BTX-DF (172.05 – 174 MHz) are interchanged as indicated in Figure 4.

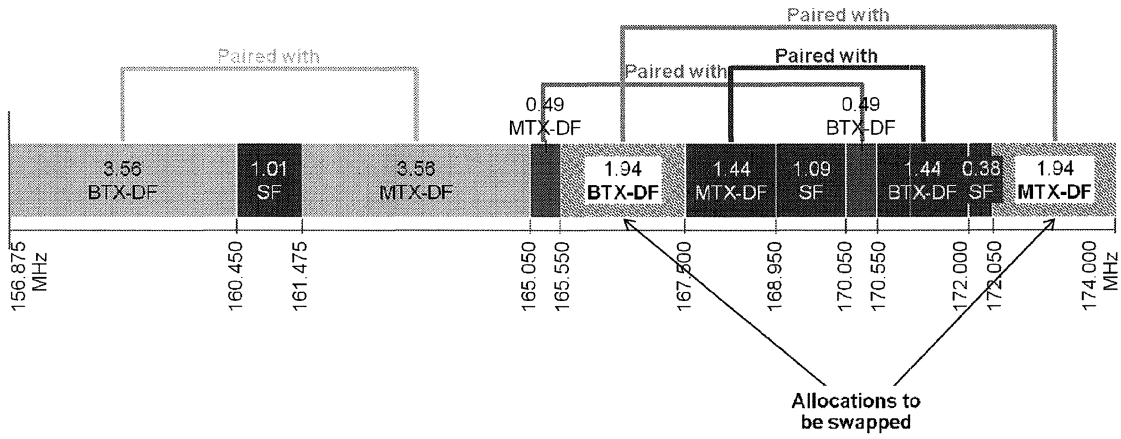


Figure 4 Current situation 156.875MHz – 174MHz

This has resulted in the situation that the BTX lies within the MTX allocation and vice-versa, leading to interference and other challenges during assignment.

It is therefore proposed to:

- Restore the allocation as proposed with immediate effect by swapping the MTX and BTX.

Outcome of 1st Consultation

Consultation submissions lead to the following modified proposal.

- First step, ensure that the appropriate nesting of the spectrum is carried out by swapping the MTX and BTX allocations as indicated in the ICASA proposal (as proposed)
- Second step - Conduct technical feasibility study into simplex frequencies (FDMA or TDMA) with different channel spacing – including coexistence of multiple technologies, bandwidth etc. Depending upon the outcome, the band would need to

be re-planned (year 2 + after studies have been completed) – need for studies stemming from the submissions.

4.10.6 174 – 223 MHz

The VHF TV service currently operating in this band will be migrated to DTT by 2015 in line with GE-06 guidelines. The new allocation could be carried out in line with SADC FAP proposed common sub-allocation / utilization.

There are a few important points to consider here:

- T-DAB: in line with SADC proposed common sub-allocation/ utilization, this service has been allocated to two bands (214 – 230 MHz) as well as (1452 – 1492 MHz). Depending upon the utilization of the service related to this band, the allocation of two frequency bands would be re-evaluated. It may be sufficient to restrict allocation of T-DAB to 214-230 MHz and allocate the 1452 – 1492 MHz band for other uses.
- It is also recognized that although DAB is the standard proposed by SADC for sub-allocation/ utilization there are other alternatives being proposed such as DMB, DVB-H etc.
- It is recognized that apart from selecting the technology based upon spectral efficiency itself, it is also important to be harmonized with the SADC region as well as to consider the wide-spread availability and costs associated in using alternative standards.

It is therefore proposed that the allocation for this band be as follows:

- 174- 214 MHz TV Broadcasting.
- 214 - 230 MHz Terrestrial – Digital Audio broadcasting and comments and considerations for the technology standard(s) to be specifies for this purpose are invited.

Outcome of 1st Consultation

- Consultation submissions concern alignment with the Broadcast plan regarding VHF. Where this is not explicitly covered, then ICASA will determine if the future needs of audio broadcasters are covered by the current allocation and evaluate with respect to the entire broadcasting plan.

4.10.7 223 – 230 MHz

The band is proposed to be allocated for T-DAB (refer to 4.10.6):

- 214 - 230 MHz T-DAB.

4.10.8 235 – 267 MHz

This band is currently being occupied by Analogue TV. Consequent to the planned migration in line with GE-06, the band can be used for the following purposes as per SADC proposed sub-allocation / utilization:

- 235 – 238 MHz TV Broadcasting.
- 238 – 242.95 MHz PMR including public trunking.
- 242.95 – 243.05 MHz International Distress.
- 243.05 – 246 MHz Low power devices ancillary to broadcasting services.
- 246.18 – 254.18 MHz TV Broadcast (Channel 13).
- 254 – 267 MHz PMR and/ or PAMR including public trunking.

Outcome of 1st Consultation

Based upon the submissions received the allocation for this band is modified:

- 230 – 238 MHz TV Broadcasting as per submission (to form a complete 8MHz DVB-T2 Channel)
- 238 – 242.95 MHz PMR including public trunking (national trunking)
- 242.95 – 243.05 MHz International Distress
- 243.05 – 246 MHz Low power devices ancillary to broadcasting services.
- 246– 254 MHz TV Broadcast (Channel 13) modified as per submission254 – 267 MHz PMR and/ or PAMR including public trunking (national trunking)

4.10.9 335.4 - 387 MHz

Spectrum in this band could be freed up for rural broadband if equipment for FBWA in this band is available in the market. The current players have shown indications that they may relinquish this spectrum due to spectrum fees imposed.

It is proposed that the band be allocated for one or more of the following uses as per SADC FAP proposed sub-allocation/ utilization:

- 335.4-336 MHz PMR and / or PAMR.
- 346.0-356.0 MHz PMR and / or PAMR.
- 366.0-380.0 MHz PMR and / or PAMR.
- 336-346 MHz paired with 356-366 MHz for Fixed Wireless Access/ PTP/PTMP rural system.

Outcome of 1st Consultation

- Based upon the submissions received, the migration of fixed links out of this band should be subject to feasibility studies.

4.10.10 380 – 400 MHz

This band will be allocated as a contiguous block for public protection and disaster relief (PPDR) as well as public safety with users including SAPS, SANDF, the ambulance service, metro police and Fire-fighting services. All other users will migrate out of this band. This allocation recognizes the importance of having a band dedicated for public safety and free of any other potential sources of interference. In ideal circumstances, these users could make use of a common digital public trunking network which could also promote interoperability between such users in periods of emergency.

It is also recommended that private establishments who work alongside and are responsible for public safety also operate within this band. This would allow interoperability with other public safety/ emergency services users.

The proposed allocation of this band would be as per SADC proposed sub-allocation/ utilization

- 380.0-387.0 MHz paired with 390.0-397.0 MHz for digital systems to be used for PPDR.
- 387.0-390.0 MHz paired with 397.0-399.9 MHz. To be used mainly for digital systems (PMR and/or PAMR).
- It is the new ICASA proposal that this band be exclusively reserved for public safety and all users (e.g. SAPS etc.) migrate into this band.
- Considerations be made to adopt a common digital trunking technology standard which would allow:
    - Economic savings by operating and sharing a single network infrastructure
    - Improving effectiveness and promoting interoperability

Outcome of 1st Consultation

- Need for a dedicated PPDR system in this band, and there is support for the use of TETRA as the technology of choice. The use of a single PPDR system infrastructure which facilitates communications between different groups involved in public safety has its benefits.
- Concerns arose about the cost to roll out such a system – leading to a long migration time as indicated by SAPS.
- Suggestions pointed to the need to consult the Department of Communications on this matter along with all parties involved.

4.10.11 406.1 - 430 MHz

This band is currently used for public trunking services. In addition there is a Mobile Data Service (WBS) operating in this band as well the SADC proposed sub-allocation/ utilization indicates use for PMR and/ or PAMR as well as PPDR. Given the NRFP

allocation for Digital Trunked Mobile there is the possibility of other services (including those using FDMA) and other TDMA systems, including DMR, may be introduced in this band. ICASA proposes that:

- 410 – 430 MHz reserved for digital public trunking only.
- All other services apart from public trunking to be migrated out of the band.

It is important to note that although this band is allocated to Digital Trunking there are several different technologies which could suit this purpose, not all of which are interoperable with each other. In the present assignments there are several who are using TETRA, while other Digital Trunking technologies are also being proposed. Proposals are invited to determine the best way forward which would allow technology neutrality but however would ensure that interference between users using different technology standards (FDMA versus TDMA etc.) is minimized.

Outcome of 1st Consultation

- The band changed to 406.1 – 430 MHz
- Submitting company studies (IMS and others as referred to in their submission) regarding the advantages of TDMA systems over FDMA
  - ICASA is to examine this, taking into cognizance the preference for a technology neutral approach (unless deemed detrimental) and the concerns of Transnet, in order to determine cost effective solutions for this band
- This exercise has also to be synchronized with the migration into the PPDR band (380 – 400 MHz)
- The planned time period would be determined after the 380 – 400 MHz migration plan (above) is finalized

4.10.12 440 - 450 MHz

This band is allocated for Short Range Business Radio (441 – 441.1 MHz) while the remaining portion is allocated for PMR (both UHF repeaters and DMR). The Short Range Business Radio has wide application in South Africa and is type approved (unlicensed). It is important to ensure that this sub-band is maintained for Short Range Business Radio purposes. There is no migration planned in the PMR sub-band.

It is hence proposed by ICASA that:

- 440 – 440.1 MHz is allocated to Short-range Business radio,
- 446 – 446.1 MHz is used for temporary assignments within PMR band,
- All other users migrate out of the band, and
- The rest of the users in this band can remain as-is.

Outcome of 1st Consultation

As per submissions – the migration of users only reflects to 440 – 440.1 MHz, and 446 – 446.1 MHz. All users who are not either Short Range Business Radio or PMR should migrate.

4.10.13 450 - 470 MHz

This band is currently used for Trunked Mobile with several users including the Railways (Transnet) and mines (Figure 5). The SADC FAP proposed common sub-allocation/ utilization seeks to allocate this spectrum for Mobile IMT. This is important to note that several adjacent countries (e.g. Mozambique) are moving to implement this proposal. Although the band has a large number of assignments, a recently concluded spectrum audit indicates that the spectrum usage is quite low – indicating inefficient spectrum use.

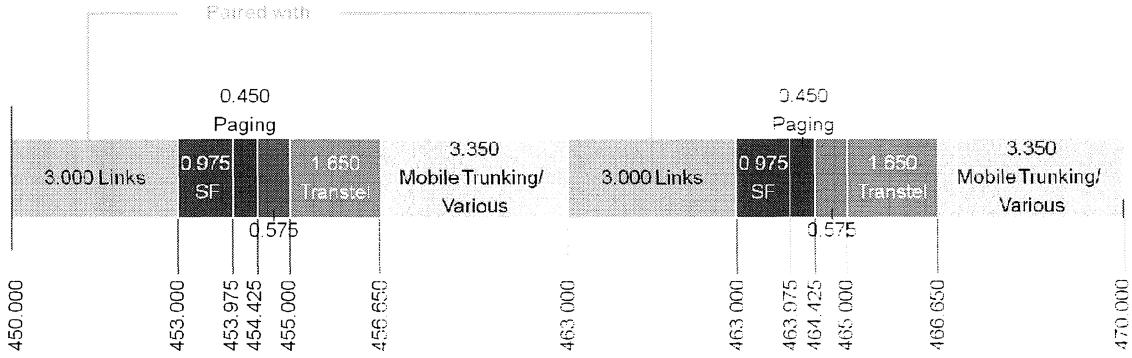


Figure 5 Current assignment 450 – 470 MHz

In view of the other spectrum that has been identified for IMT, it is proposed therefore:

- To migrate the current users out of this band into the radio frequency 3 GHz and above space.
- To allocate this band to Mobile (IMT) as per Res. 224 of WRC-07.

In view however of the large number of assignments in this band, additional comments on this suggestion are particularly welcome

Outcome of 1st Consultation

As expected there was considerable response on the use of the band:

- This band is deemed advantageous by multiple parties for rural coverage,
- There are requests to assign this band for public safety using LTE – however, there is no elaborated approach on how such a network would be financed or operated,

- Both Telkom and Transnet have indicated that the band is currently being used for different services – this would have to be validated via the spectrum audit and

  ESKOM –has also indicated need of spectrum for smart grid applications

  It is therefore proposed to

  - Subject this band to a feasibility study including
    - Evaluate the ITU-R M.1036 recommendations in light of current usage
    - Determine current levels of utilization (especially for Transnet and Telkom) via validated methodology
    - Determine harmonization potential with neighbouring states
  - Based upon the results of the feasibility study determine band allocation

4.10.14 470 - 790 MHz

This band has been assigned for (Terrestrial) Broadcasting and Mobile on a co-primary basis for Region 1 countries at the WRC-12 (Table 2).

Given that there is a current planned migration underway in the 790 – 862 MHz band (due to be completed after analogue switch off in by 2015), a proposal would be to concurrently define and implement a migration plan for the 694 – 790 MHz band as well. The time-line to complete the migration could be staggered as compared to the 794 – 862 MHz band. This would ensure that no new services are allocated for this band and the existing users have a finite and defined period to migrate.

It is proposed that:

- The migration plan is aligned with the on-going efforts within the 800 MHz band as defined in Government Gazette 34872[17].
- With respect to the small number of Studio Links in this band; these must be migrated out and given point to point fixed assignments.
- Self Help Stations must be migrated out into the broadcast bands below 694 MHz.

Outcome of 1st Consultation

As expected there was considerable response on the use of the band – comments that are of relevance to the band allocation include:

- Submissions requested that a study should evaluate the needs of broadcasters.

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[17] Government Gazette 34872: Draft invitation to apply for Radio Frequency Spectrum Licence to provide mobile broadband wireless access service for urban and rural areas using the Complimentary Bands, 800 MHz and 2.6 GHz

- Propose to consider both the digital dividend bands concurrently as well as a staggered approach (i.e. assign together with 790 - 862 MHz band.
- Migration plan should be following release of updated NRFP 12 indicating the new proposed allocations (ITU – RR Footnote 5.312A).
- Consideration is being given to using the 1.6 GHz band for the STL links.
- New assignment / licensing to be run in parallel with the migration process and commence as soon as ITU-R studies have resulted in the appropriate channel plan for the 700 MHz/800 MHz frequency bands for Region 1.

4.10.15 790 - 862 MHz

This band has been allocated for IMT (Terrestrial) for Region 1 countries at WRC-07 (Table 2) and is often termed as Digital Dividend 1. Currently this band is occupied by UHF TV. Migration is planned to be initiated and phased in through to 2015.

It is proposed that:

- The migration plan is aligned with the on-going efforts within the 800 MHz band as defined in Government Gazette 34872[18].
- With respect to the small number of Studio Links in this band; these must be migrated out and given point to point fixed assignments.
- Self Help stations must be migrated out into the broadcast bands below 692 MHz.

Outcome of 1st Consultation

Comments that are of relevance to the band allocation include:

- Propose to consider both the digital dividend bands concurrently as well as a staggered approach (i.e. assign together with 694 - 790 MHz band.
- Migration plan should be following release of updated NRFP 12 indicating the new proposed allocations (ITU – RR Footnote 5.312A).
- The Broadcast Plan should incorporate Self Help and Studio Transmitter Links. Self Help stations need to be part of the DTT band plan.

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[18] Government Gazette 34872: Draft invitation to apply for Radio Frequency Spectrum Licence to provide mobile broadband wireless access service for urban and rural areas using the Complimentary Bands, 800 MHz and 2.6 GHz

- New assignment / licensing to be run in parallel with the migration process and commence as soon as ITU-R studies have resulted in the appropriate channel plan for the 700 MHz/800 MHz frequency bands for Region 1.

4.10.16 862 - 890 MHz

This band currently has several users including:

- Wireless audio (863-865 MHz).
- Fixed links (868.1–876 MHz).
- RFID (865 – 868 MHz), RFID (869.4- 869.65 MHz).
- Alarms (868.6 – 868.7 MHz, 860.25 – 869.3 MHz, 869.65 – 869.7 MHz).
- Wireless Access Services (824-849 MHz paired with 869-894 MHz).
- Mobile (880-890 MHz paired with 925-935 MHz) – currently assigned to Cell C.

It is essential to note that alarms were not part of the SABRE proposed allocations and may need to be consolidated within designated alarm bands. Additionally there is some level of confusion with regards to the Wireless Access Service (824-849 MHz paired with 869-894 MHz) as part of the NRFP – given that such an assignment would interfere with the Mobile band assigned to Neotel. It is proposed to:

- Align re-planning efforts within the 800 MHz band as defined in Government Gazette 34872[19] as amended / replaced.
- Remove the assignment for Wireless Access Services in this band.
- Re-plan the entire band to accommodate IMT (terrestrial) as per SADC FAP proposed common sub-allocation/ utilization.
- Migrate existing users out of this band.

Outcome of 1st Consultation

- Migration of other users to be considered when the use of 862 – 876 MHz for IMT in the future to has been investigated as part of the development of harmonised IMT channelling arrangements (i.e. when ITU-R WP5D has agreement on the appropriate channel plan for the 700 MHz/800 MHz frequency bands for Region 1).
- There was no support for GSM-R (876-880) MHz paired with 921-925 MHz) by Transnet.

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[19] Government Gazette 34872: Draft invitation to apply for Radio Frequency Spectrum Licence to provide mobile broadband wireless access service for urban and rural areas using the Complimentary Bands, 800 MHz and 2.6 GHz.

4.10.17 890 - 942 MHz

This band currently has several users including:

- Mobile (890 – 915 MHz paired with 925 – 935 MHz) currently assigned to Vodacom, MTN and Cell C.
- Several RFID (short range applications) from 915.1 – 919.2 MHz.
- GSM-R (921-925 MHz) - However, it is important to note that GSM-R is not mentioned as an explicit service in the NRFP, while SABRE recommended that this band be allocated for digital trunking.

It is proposed that:

- 921-925 MHz is allocated for the purposes of GSM-R.
- The remaining allocations remain as-is.
- Spectrum re-farming, when deemed necessary is carried out based upon the principles and policies defined in section **Error! Reference source not found.**.

Outcome of 1st Consultation

Submissions that are of relevance to the band allocation / migration:

- There was no support for GSM-R (876-880) MHz paired with 921-925 MHz) by Transnet
- No migration at this stage.

4.10.18 942 - 960 MHz

This band currently is allocated for GSM900 (Vodacom, MTN). There is currently no spare capacity left in this band.

It is proposed that:

- No migration is planned for the band, the allocations remain as-is.
- Spectrum re-farming, when deemed necessary is carried out based upon the principles and policies defined in section **Error! Reference source not found.**.

Outcome of 1st Consultation

Submissions made regarding potential refarming.

- No out- migration planned for this band.
- Harmonization of the 900 MHz band to be carried out.

4.10.19 1350 – 1375 paired with 1492 – 1517 AND 1375 – 1400 MHz paired with 1427 – 1452

This band is currently allocated to low capacity PTP / DF links. Spectrum is available on a radio coordinated basis. Based upon availability of equipment as well as user demand, ICASA proposes that:

- Maintain existing links where required (too expensive to migrate etc.).
- Allocation to rural broadband (BFWA) due to good propagation characteristics.

Outcome of 1st Consultation

- As proposed by submissions, the proposed allocation is adjusted to BWA (both fixed and mobile)
- As indicated by submissions, potential band is best for IMT as per WRC-15 Agenda Item 1.1.
- Migration planning postponed until decision at WRC-15 (enabling harmonization, equipment availability etc.)

4.10.20 1452 - 1492 MHz

This band is currently allocated to T-DAB and S-DAB due to the current South African allocations of BROADCASTING and BROADCASTING-SATELLITE. Given the allocation of DAB in the VHF band (from 214 – 230 MHz) it is important to determine whether the frequency allocation is sufficient or additional spectrum in the L-band needs to be allocated for the purpose. Consideration of this depends upon:

- Whether there is sufficient and adequate demand for DAB services to require assignment in two bands.
- Whether equipment is readily available encompassing both bands.

Under the present and forecasted situation, it is believed that the DAB allocation in the VHF band is sufficient to meet the requirements of T-DAB. This would also result in lower equipment costs since any receiver would have to be designed to cover only a single band rather than two distinct bands. In addition, S-DAB may have only very limited potential within South Africa and this spectrum may be better utilized for other purposes. It is there proposed by ICASA to:

- Modify the allocation in this band and align it with the ITU Region 1 to include FIXED, MOBILE except aeronautical mobile, BROADCASTING and BROADCASTING-SATELLITE.
- Allocate this band to PTP/ PMP/ BFWA depending upon the availability of equipment. Communal/ private repeaters could also operate in this band.

Outcome of 1st Consultation

- FIXED will be inserted as an allocation as submitted by Cell C – so that the allocation in this band is aligned with the ITU Region 1 to include FIXED, MOBILE except aeronautical mobile, BROADCASTING and BROADCASTING-SATELLITE.
- As submitted by Telkom, this frequency band has been mentioned in WP5D as a possible candidate band for IMT under WRC-15 Agenda Item 1.1. If WRC-15 decides to identify this band (and adjacent bands) for IMT, a re-planning of the band could be performed. In such cases, a common profile (channelling plan) will be developed, which will drive the availability of equipment.
- Therefore, a decision pertaining to this band should be postponed until after WRC-15.
- Consideration to be given at that point for 1452-1492 MHz to be designated for 'mobile supplemental downlink' use (as submitted by Qualcomm).
- A feasibility study to be conducted on various options.

4.10.21 1518 - 1525 MHz

The band was allocated for both SF links as well as the IMT satellite component. However, this band remains unoccupied and there are views that the IMT (satellite) will have limited usage within South Africa.

Due to these factors, ICASA proposes to:

- Allocate this band for repeater links for land-mobile radio (LMR) and migrate such links into this band.
- This band could also be allocated for outside-broadcasting links currently operating in 2300 – 2450 MHz.

Outcome of 1st Consultation

- In view of the submissions from industry regarding the importance of maintaining the band for MSS (mobile satellite service), the existing allocations will be maintained and no migration is planned.
- The submissions will be taken into account in formulating South Africa's position at global forums.

4.10.22 1525 - 1559 MHz

The band has been identified for IMT (satellite); and Res. 225 (WRC applies). In the band 1530 – 1544 MHz priority for maritime mobile distress is given, urgency and safety communication (GMDSS); Res. 222 applies. The band is currently being used by INMARSAT.

Due to these factors, ICASA proposes to:

- Consider using the 1525 – 1530 MHz band for Fixed links (e.g. repeater links) and migrate such links into this band.

- This band could also be allocated for outside-broadcasting links currently operating in 2300 – 2450 MHz.
- Keep the remaining allocation (1535 – 1559 MHz) of the band as-is.

Outcome of 1st Consultation

- Current usage by INMARSAT needs to be further evaluated. The proposal for no change would be based upon the current levels of usage. If deemed low utilization then 1525 – 1530 MHz will be used for simplex fixed links only.
- For 1530 – 1559 MHz – it is confirmed no changes will occur.

4.10.23 1668 – 1675/ 2483.5 - 2500 MHz

The band has been identified for the satellite component of IMT; and Res 225 applies. However, the use of IMT (Satellite) within South Africa is limited and it is unclear whether this application would ever become significant for broadband with the strong growth of IMT (Terrestrial).

It is therefore proposed by ICASA to:

- Change the current allocation to be in line with ITU Region 1 allocations of:
    - 1668 – 1668.4 MHz:
        - MOBILE-SATELLITE (earth-to-space)
        - RADIO ASTRONOMY
        - SPACE RESEARCH (passive)
        - Fixed
        - Mobile except aeronautical mobile
    - 1668.4 – 1670 MHz:
        - METEOROLOGICAL AIDS
        - FIXED
        - MOBILE except aeronautical mobile
        - MOBILE-SATELLITE (earth-to-space)
        - RADIO ASTRONOMY
    - 1670 – 1675 MHz:
        - METEOROLOGICAL AIDS
        - FIXED
        - METEOROLOGICAL SATELLITE (space-to-earth)
        - MOBILE

- MOBILE-SATELLITE (earth-to-space)

- This change in allocation is in line with ITU region 1 and will open up the possibilities of introducing Fixed links (PTP, PMP) into this band.

Outcome of 1st Consultation

- In view of the submissions from industry regarding the importance of maintaining the band for MSS (mobile satellite service), the existing allocations will be maintained.
- No migration is planned.
- The submissions will be taken into account in South Africa's position at global forums.

4.10.24 1880 - 1900 MHz

The band was allocated for cordless DECT by SABRE proposed allocation. This is currently used by Telkom to provide WLL services. Depending upon the current utilization of this band and as per SADC FAP, it is proposed that a common sub-allocation/ utilization be proposed as follows:

- Allocate this band to BFWA.

Outcome of 1st Consultation

- Evaluate DECT FWA migration proposal from Telkom
- Note taken of interference concerns between DECT cordless and BWA in submissions[20]
- Future allocation (with measures in place to allow sharing and minimize interference) for BWA (fixed and mobile) rather than BFWA will be considered.

4.10.25 1980-2010/ 2170-2200 MHz

The band has been identified for the satellite component of IMT; and Res 225 applies. However, the use of IMT (Satellite) within South Africa is limited and it is unclear whether this application would ever become significant for broadband with the strong growth of IMT (Terrestrial). The band is also allocated for Fixed Links, but is currently not used in the lower band; it is utilized by SANDF, Transnet and others in the upper band; but is under-utilized. It is therefore proposed to:

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[20] ERC Report 100; 'Compatibility between certain Radiocommunication system operating in adjacent bands – evaluation of DECT/ GSM1800 compatibility, 2000'

- Allocate for Fixed links and migrate in Fixed links (DF) from other bands.
- Allocate for BFWA depending upon availability of equipment in these bands (New ICASA proposal).
-

Outcome of 1st Consultation

- Submissions from satellite organisations propose to reserve the band for MSS and migrate terrestrial links out.
- Submissions did not favour migrating fixed links into this band.
- Submissions request study on the availability of BFWA equipment before making allocation.
- ICASA conclusion is to maintain status quo for the moment.

4.10.26 2025 – 2110 paired with 2200 - 2285 MHz

The band is currently allocated for fixed links – but is under-utilized. SABRE proposed use of 2075 - 2110 MHz for WLL was never implemented.

It is proposed to:

- Keep allocation for Fixed links and migrate in Fixed links (DF) from other bands.
- Allocate for BFWA if band continues to remain under-utilized and depending upon demand and availability of equipment, (New ICASA proposal).

Outcome of 1st Consultation

- Some submissions support BFWA being allocated but point out difficulties of frequency sharing with PTP links.
- Arguments for the band to allow Rural Broadband (BFWA), albeit conditions must be put in place to allow co-existence of BWA and PTP.
- In case co-existence is not possible, then BFWA could be implemented in areas where PTP links are absent.

4.10.27 2290 - 2300 MHz

The band is currently unused; In line with SADC proposed common sub-allocation/ utilization, ICASA proposes to

- Allocate this band to BFWA.

Outcome of 1st Consultation

- Submission proposed extending band to 2285-2300MHz and allocating it to BWA (fixed and mobile) rather than just BFWA.

- This will require MOBILE to be included in the South African allocations in the NRFP (MOBILE is already a Region 1 allocation).
- Submissions alerted that 2285-2290 MHz is unused.

4.10.28 2300 - 2450 MHz

The band is currently in use for several services including:

- Fixed links – 2307 – 2387 MHz paired with 2401 – 2481 MHz.
- Outside broadcasting links (28 MHz) – primary basis at (2377, 2471 MHz), secondary basis at (2321, 2349 MHz, 2415, 2443 MHz).
- ISM – 2400 – 2483.5 MHz.

As per SADC FAP proposed common sub-allocation/ utilization, it is proposed to:

- Allocate 2300 – 2400 MHz for IMT (Terrestrial).
- Continue to retain allocation of 2400 – 2483.5 MHz for ISM.
- Existing Fixed links could be migrated above 3 GHz.
- Migrate outside-broadcasting links in line with the DTT migration (potentially to 1518 – 1559 MHz band).

Outcome of 1st Consultation

- The band is to be allocated for IMT as proposed and supported by submissions
- A detailed study of the current users and uses may be carried out (based upon MTN, Telkom submissions)
- Migration will commence once the results of the study are available.

4.10.29 2500 - 2690 MHz

This band is being used by Sentech (50 MHz) and WBS (15 MHz); 125 MHz is currently available for assignment. As per SADC FAP proposed common sub-allocation/ utilization this band has been allocated for Mobile IMT.

It is proposed to:

- Align re-planning efforts within the 2.6 MHz band as defined in Government Gazette 34872[21].
- Allocate the band to Mobile IMT.

Outcome of 1st Consultation

- Submissions support the allocation of the band for IMT as proposed
- Re-planning efforts within the 2.6 MHz band should be as defined in Government Gazette 34872 as amended or replaced.

4.10.30 3400 - 3600 MHz

This band is currently being utilized by:

- Sentech (national).
- Neotel (national).
- Telkom (national).
- USAL (regional).

In terms of WRC 07 decisions and as per SADC FAP proposed common sub-allocation/ utilization it is proposed to:

- Allocate for mobile service on a primary basis and use for Mobile IMT. This would also result in a harmonized Mobile IMT band across the entire SADC region.
- Migrate existing users out of the band.

Outcome of 1st Consultation

- Submissions support the allocation of the band for IMT
- Inmarsat submission was concerned with BFWA interference with earth stations

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[21] Government Gazette 34872: Draft invitation to apply for Radio Frequency Spectrum Licence to provide mobile broadband wireless access service for urban and rural areas using the Complimentary Bands, 800 MHz and 2.6 GHz

4.10.31 3600 - 4200 MHz

This band (C-band) is currently being utilized for PTP links (terrestrial backhaul) and Satellite links including VSAT, Satellite downlink and tracking. The proposed allocation as per SADC proposed common sub-allocation/ utilization is:

- (3600-4200 MHz) Fixed services (PTP).
- (3600-4200 MHz) Fixed-satellite (space-to-Earth) (PTP/VSAT/SNG).
- (3600-3800 MHz) Broadband Fixed Wireless Access (BFWA).

The sub-band 3600-3800 MHz could be used for BFWA where frequency sharing with FS PTP and/or FSS is feasible. The channelling arrangement for PTP links in this band is based on ITU-R Recommendation F.635. The sub-band 3600-4200 is used for medium and high capacity PTP links and FSS. In the band 3600-3800 MHz, BFWA, FS PTP and FSS applications will have to operate on coordinated basis. However, considering the difficulty in coordinating ubiquitous user terminals used for BFWA and VSAT, it is proposed that:

- VSAT systems should be migrated to the Ku-band (ref: 4.10.36).

Outcome of 1st Consultation

- Submissions from industry strongly argued against the migration of C band to Ku band because of physical limitations and the extensive use of this band by broadcasters.
- Other submissions proposed deferring any decision on this band until after WRC 15.
- Submissions suggested that there was not strong evidence of demand for this band for BWA.
- In view of the arguments expressed in the submissions, there will be no change.

  The submissions will be taken into account in South Africa's position at global forums.

4.10.32 5470 - 5725 MHz

As per as per SADC proposed common sub-allocation/ utilization, the band can be allocated for:

- Wireless Access Systems (WAS) / RLAN.

Outcome of 1st Consultation

- SARL requested retention for amateur of at least secondary allocations of the band 5650 – 5850 MHz and upgrade to primary status in the bands 5650 – 5670 MHz and 5830 – 5850 MHz.
- The amateur-satellite service seeks to retain access to the band 5650 – 5670 MHz in the Earth-to-space direction and 5830 – 5850 MHz in the space-to-Earth direction.

- Submissions requested that this band be removed from the FMP
- There will be no change for now and the request of the SARL is noted.

4.10.33 5725 - 5850 MHz

This band is currently being used for ISM, amateur and SRD services. As per ITU footnote 5.453 the band can also be allocated for fixed and mobile services on a primary basis. SADC FAP footnote SADC18 allocates this band for similar services in Swaziland and Tanzania. The NRFP can be updated to reflect the assignment if there is an interest within South Africa for this service in the band.

Outcome of 1st Consultation

- Submissions suggested that this band be removed from the FMP and any issues addressed as part of the NRFP
- SARL requested retention for amateur of at least secondary allocations of the band 5650 – 5850 MHz and upgrade to primary status in the bands 5650 – 5670 MHz and 5830 – 5850 MHz.
- The amateur-satellite service seeks to retain access to the band 5650 – 5670 MHz in the Earth-to-space direction and 5830 – 5850 MHz in the space-to-Earth direction.
- There will be no change for now and the request of the SARL is noted.

4.10.34 5850 - 5925 MHz

The upper C-band is currently being used for terrestrial backhaul and satellite (uplink, VSAT). As per the SADC FAP proposed common sub-allocation/ utilization outside broadcasting links could also be potentially migrated into this band with the proposed allocation as follows:

- Fixed-satellite uplinks (PTP/VSAT/SNG) (5850-6425 MHz) – this could also be used for temporary outside-broadcast links.
- FIXED links (5850-5925 MHz).
- ISM (5725-5875 MHz).

Outcome of 1st Consultation

- The OB links as PTP links will be added to the Fixed services allocation
- These will have to be coordinated on a case by case basis with both PTP and FSS systems

4.10.35 5925 - 6700 MHz

As per the SADC proposed common sub-allocation/ utilization the current band could be allocated as follows:

- 5925 – 6425 MHz Fixed links (lower 6 GHz in accordance with ITU-R Rec. F.383).
- 6425 – 7110 MHz Fixed links (upper 6 GHz in accordance with ITU-R Rec. F.384).
- 5850 – 6425 Fixed-satellite uplinks (PTP, VSAT, SNG).

Outcome of 1st Consultation

- Submissions suggested that this band be removed from the FMP.
- There will be no change for now.

4.10.36 10700 - 11700 MHz

This is the defined Ku band. VSAT links should be migrated into this band as per SADC proposed common sub-allocation/ utilization.

Outcome of 1st Consultation

- No out-migration is planned or proposed.
- As the proposal to migrate VSAT links out of the C-Band will no longer be part of the FMP, this band may be removed from the FMP.

4.10.37 12390, 16420 and 154 – 15700

Outcome of 1st Consultation

- No relevant comments received.
- There will be no change

4.10.38 40000 MHz and above

Although out-migration is not an issue above 40GHz, the following comment should be noted:

- Frequency bands above 40 GHz are relatively under-utilized. Equipment is available off the shelf for high bandwidth PTP links over distances of up to 5km. It is proposed that in the spectrum above 40GHz, allocations are made for Fixed Services such as PTP links – which would be useful especially in metropolitan areas for line-of-sight (LoS) high capacity data links.

Outcome of 1st Consultation

- ISPA and WAPA submitted on the desirability of light licensing type regimes above 40 GHz.
- MIMOTECH submitted on the need for the spectrum fees regime to be adjusted to stimulate use of high frequencies.

- Studies will be carried out concerning these issues.

4.11 Summary of New ICASA Proposals

The following table summarises the proposals ICASA is making regarding frequency migration (New ICASA proposals) as extracted from the previous section. These proposals are additional to those proposals made by SABRE and migrations stemming from the WRC and the SADC FAP.

Table 4 Consolidated list of New ICASA proposals for migration

Frequency Band (MHz)	Notes on migration/ usage
141 – 141.5	Migrate SF Mobile out of this band and allocate for SF alarms.
141 – 142	Migrate remote controlled industrial apparatus to ISM Band.
380 – 400	Allocated for public safety/ government services. Migrate all such users into this band.
410 – 430	Allocated for Digital Public Trunking.
440 – 440.1 paired with 445 – 445.1	Allocated for Short-range Business Radio; all other users migrate out of band.
921 – 925	Allocated for GSM-R;
1350 – 1375 paired with 1492-1517 1375 – 1400 paired with 1427 – 1452	Allocate for Rural BFWA; migrate existing fixed duplex links out of this band. – Pending investigation
1452 - 1492	Change allocation to include FIXED, MOBILE except aeronautical mobile. Use for BFWA/ PTP/ PMP depending upon availability of equipment.
1518 – 1559	No change
1668 – 1675	Change allocation in line with ITU Region 1 allocations to include FIXED and Mobile except aeronautical mobile within the allocations.
1980 – 2010 paired with 2170-2200	Migrate in Fixed links (DF) from other bands; allocate for BFWA. OR Reserve for MSS
2025 – 2110 paired with 2200 - 2285	Migrate in Fixed links (DF) from other bands; allocate for BFWA where there are no PTP links to be interfered with

Frequency Band (MHz)	Notes on migration/ usage
2300 – 2450	Migrate outside broadcasting links to the 1518 – 1559 MHz band.

5 Potential Impact of Spectrum Migration

5.1 Bands planned for IMT

One of the critical issues under public debate in South Africa is the availability of spectrum for mobile broadband wireless access.

The potential spectrum that could be made available for IMT following WRC resolutions and SADC FAP proposed common sub-allocation is indicated by the following table.

Table 5 Bands planned for IMT

Frequency Band (MHz)	Bandwidth (MHz)	Current Allocation	Notes
450 – 470	20	Various allocations (Fixed, Mobile)	Enabled for IMT as per WRC-7, Res. 224 applies Subject to feasibility
694 – 792	98	TV Broadcasting	Enabled for IMT as per WRC-12, Res. 232 – Digital Dividend 2
790 – 862	72	TV Broadcasting	Enabled for IMT as per WRC-7, planned for 2015 – Digital Dividend 1
862 – 876	14	Fixed, Alarms, Mobile Wireless Access	Enabled for IMT as per SADC FAP proposed common sub-allocation/ utilization
1880 – 1920	40	DECT/ Extended DECT (Telkom National License)	Enabled for IMT as per SADC FAP proposed common sub-allocation/ utilization
2010 – 2025	15	FIXED / MOBILE	Enabled for IMT as per SADC FAP proposed common sub-allocation/ utilization
2500 – 2690	190	MOBILE	Enabled for IMT as per SADC FAP proposed common sub-

			allocation/ utilization
3400 – 3600	200	BFWA	Enabled for IMT as per WRC-07, effective Nov. 2010

This does not include the frequency already allocated and assigned to GSM / UMTS.

5.2 Other Migration issues

The table below summarises other migration issues that have been highlighted.

Table 6 Summary of migration issues

Frequency Band (MHz)	Current Allocation	Proposed Allocation	Notes
380 – 400	Public Safety (SAPS, DoD etc.)	Public Safety only	Consolidate all public safety related services in this band; move other users out of the band
410 – 430	Government services, Mobile Data and Trunking	Digital Trunking only	Reserve for Digital Trunking use only; migrate mobile data, ESKOM, SAPS out of the band
440 – 450	Short range business radio/ PMR/ other links	Short Range business Radio, PMR only	Should be cleared of all other users; Communal repeaters can be allocated in this band
450 – 470	FIXED, MOBILE	IMT	Should be cleared of all other users
790-862	BROADCAST	IMT	Studio Links need to be migrated out to enable efficient allocation for IMT. Self Help stations need to migrate to below 692 MHz.
921 – 925		GSM-R	Originally allocated by SABRE 1 for digital trunking – currently unused
1350 – 1375 paired with 1492 – 1517	Shared duplex band	BFWA	Could be a consideration for rural BFWA

1375 – 1400 paired with 1427 – 1452	Shared duplex band	BFWA	Could be a consideration for rural BFWA
2025 – 2110 paired with 2200 – 2285	Fixed links (DF)	BFWA	Fixed links currently underutilized
3600 – 4200	Satellite (VSAT, downlink), Terrestrial backhaul	3600 – 3800 MHz BFWA 3600 – 4200 MHz PTP and FSS	No Change
5850 – 6425	Fixed/ Satellite uplinks	Fixed/ Satellite uplink/ Outside Broadcast links	Migrate outside-broadcast from 2300 – 2450 MHz into upper C band
40000 and above		Allocate for PTP links	For local high-speed PTP data links (up to 5 km)

6 Future trends

THIS SECTION IS FOR INFORMATION PURPOSES ONLY – NO COMMENTS ARE INVITED AT THIS STAGE.

This section highlights a few key trends that may have a significant impact to the current allocation in the mid - long term future. Although no immediate measures are recommended as of now it is important to track and carefully monitor these trends in order to be able to take pro-active measures.

6.1 Overall trends in broadband

There is a general movement world-wide to allocate an increasing amount of spectrum in the sub 5 GHz range for IMT. This move is driven by the fact that an increasing number of applications including alarms, mobile radios etc. can be served by IMT. Even typical fixed allocations such as BFWA could be subsumed as a variant of IMT – leaving it to the customer to determine whether he would like to operate the device in a mobile or fixed manner.

Another reason is that new and emerging technologies (e.g. LTE and LTE-Advanced) need an increasing amount of bandwidth in order to be able to achieve high data rate speeds. This can only be possible if spectrum in bands with good propagation characteristics is allocated for this purpose.

The ITU through the WRC's is actively looking into this need and each upcoming WRC may allocate additional spectrum for this purpose. Depending upon current utilization levels in these bands, South Africa would in principle is aligned with allocations made for Region 1. This would extend the spectrum used for mobile broadband and existing services of the type mentioned above could be served by different niche mobile broadband applications rather than being migrated out to dedicated bands.

6.2 Cognitive radios

The ITU (Report ITU R SM.2152) defined cognitive radios as

'a radio system employing technology that allows the system to obtain knowledge of its operational and geographical environment, established policies and its internal state; to dynamically and autonomously adjust its operational parameters and protocols according to its obtained knowledge in order to achieve predefined objectives; and to learn from the results obtained'

The ITU study determined that while Cognitive Radio System (CRS) technologies may yield significant benefits by providing increased spectral efficiency of existing spectrum and mitigate the problem of congestion additional studies needed to be carried out to:

- Ensure the protection of existing services from potential interference originating from the services implementing CRS technology, especially from the dynamic spectrum access capability of CRS.
- Ensure that any system of a specific service using CRS should be operated in accordance with the provisions of the Radio Regulations and administration rules.

The recently concluded WRC-12 conference advised that administrations continue active participation in ITU-R studies conducted under Resolution ITU-R 58 which seeks to:

- *To continue studies for the implementation and use of CRS in Radiocommunication services;*
- *To study operational and technical requirements, characteristics, performance and possible benefits associated with the implementation and use of CRS in relevant Radiocommunication services and related frequency bands;*
- *To give particular attention to enhancing coexistence and sharing among Radiocommunication services;*
- *To develop relevant ITU-R Recommendations and/or Reports based on the aforementioned studies, as appropriate*

ICASA will carefully monitor and participate in these studies. At present cognitive radios have not had any wide-spread commercial success, and is still in the feasibility stage. Once this technology is proven and appropriate ITU resolutions have been passed advocating for the same, South Africa could align itself with the applicable resolutions for Region 1.

6.3 White-space devices

White spaces is defined as

"a label indicating a part of the spectrum, which is available for a Radiocommunication application (service, system) at a given time in a given geographical area on a non-interfering / non-protected basis with regard to other services with a higher priority on a national Basis" [Source: CEPT Report 24]

Terrestrial TV networks have traditionally been planned as Multi-frequency networks (MFN) to support regional TV planning and frequency coordination[22]. This planning leads to locations in the country where particular UHF channels are unused either to avoid interference or simply because there are no broadcasting stations in the area. These channels are known as UHF White-spaces and are currently in used by broadcasters for lower power applications such as wireless-microphones (referred to as Program Making

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[22] Sharing the Broadcasting Spectrum: digital dividend, white spaces, power line telecommunication (PLT) system - (by Mr N. Venkatesh, Counsellor ITU-R Study Group 6)

and Special Events (PMSE) applications). The criteria for the interference-free operation of such equipment are provided by:

- ITU-R BT.1368 - 'Planning criteria for digital terrestrial television services in the VHF/UHF bands'.
- ITU-R BS.1786 - 'Criterion to assess the impact of interference to the terrestrial broadcasting service (BS)'.

These unused channels are now being proposed to be used for mobile broadband using a combination of either spectrum sensing via Cognitive Radios (6.2) or geo-location (via a database of channel usage). The spectrum is being proposed to be allocated on an unlicensed basis. Although the ITU has yet to come up with specific resolutions on the subject, it is currently investigating the use of Cognitive Radios with White Spaces as one of the primary beneficiaries. A few countries in the world have trialled White Space Devices (WSD) including:

- OFCOM (U.K) – The regulator has stated the intention (September 2011) to allow WSD on a license exempt basis on the proviso of no harmful interference to existing services. Rather than use Cognitive Radios the proposition was based up the use of a geo-location database.
- FCC (U.S.A) – The FCC with FCC-10-174 memorandum (September 2010) allowed the use of unlicensed white space spectrum including:
    - Protection criteria for Incumbent Authorised Services
    - Technical rules for TV band devices
    - Database Requirements for TV band devices
    - Channels that can be used by TV band devices (e.g. fixed devices cannot operate on channels adjacent to occupied TV channels)
    - Technical requirements and cognitive capabilities. It is important to note that the FCC, through this order has eliminated the requirement that radios (incorporating geo-location and database access) must first sense TV broadcast signals. This eliminates the mandatory requirement for cognitive radios in this space.
    - Separate channels were allocated for wireless microphones and other devices; in case these devices wanted to use the UHF channels due to unavailability or any other reason they would then need to be registered in the database.
    - The FCC, via (Order DA 11-131) in February 2011 has also registered 9 entities as database administrators.

  It is important to align the approach to WSD with its overall mobile broadband as well as DTT strategy. ICASA will continue to conduct its own feasibility studies in this area as well as follow international activities in this area.

6.4 The 'internet of things' – M2M considerations

Another emerging trend is in the fast growing sector of machine-to-machine communications. Although primarily in the region of low data rate communications, the world-wide market is projected to grow and exceed over 50 billion connected devices[23] by 2020. This would necessitate spectrum allocated for this purpose – either shared via Managed Spectrum Parks or by some other means.

ICASA will study trends to determine the size and opportunity for these services in South Africa.

6.5 Potential alternative licensing models

Various alternative models of licensing which could be termed 'Spectrum Management by Intermediaries' is being assessed on a worldwide basis.

The reason for inclusion here is that the adoption of these models could require the change of existing individual assignments and consequent in-band migration.

6.5.1 Wholesale open access

The principle of Wholesale Open Spectrum Access is where the entity to whom the spectrum is assigned, then sub-leases it to other entities that may then use it for providing services to retail service providers such as Internet Service Providers (ISP's), either individually or collectively.

The wholesale spectrum licensee may also install and operate the network infrastructure which is then used by the retail service. The presumed advantage of this arrangement is that the wholesale spectrum manager is able to operate far more flexibly than the national regulator in ensuring that spectrum is used efficiently by a far larger body of retail service providers.

The wholesale spectrum manager will be able to assign frequency more flexibly in terms of the bands used and coverage. Depending on the model adopted, the retail service providers may also not need to install their own radio equipment.

6.5.2 Managed Spectrum Park

The managed spectrum park approach is an experience learned from New Zealand. It is intended for local and regional broadband services, and seeks to encourage a flexible, cooperative, low cost and self-managed approach to allocation and use of radio spectrum.

Furthermore, it is catering for a situation in which a nationwide spectrum right is not required, but where services require some self-coordination and sharing in a harmonise manner

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[23] Ericsson: The M2M 50B Connected Devices Opportunity, Middle East Telco World Summit 2011

"It is intended for local and regional services, and seeks to encourage a flexible, cooperative, low cost and self-managed approach to allocation and use".

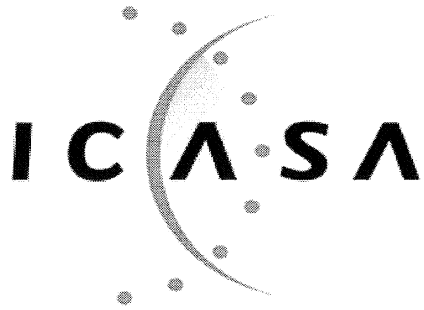
The basic principle is that the licence holders are expected to sort out issues of sub-assignment and interference between themselves and the onus is on the licensees in the spectrum park to behave like responsible and cooperative citizens.

The application of the Managed Spectrum Park model may not necessarily be the same as in New Zealand. A key issue is whether a Managed Spectrum Park should be defined at national level, regional and or local level and the principles on exactly how it should be managed should be established.

Appendix A Model Radio Frequency Spectrum Assignment Plan

Note that the Radio Frequency Spectrum Assignment Plan is also deployed for the planning of radio frequency bands where no migration is contemplated.

The template attached here is to inform stakeholders of the probable process that will be deployed.



Model
Radio Frequency Spectrum Assignment Plan

Rules for XXXXXXXXXXXXXXXXXXXX operating in the Frequency Band XXXXz to XXXXz

Table of Contents

1 Glossary

In this Radio Frequency Spectrum Assignment Plan, terms used shall have the same meaning as in the Electronic Communications Act 2005 (no. 36 of 2005); unless the context indicates otherwise:

"Act" means the Electronic Communications Act, 2005 (Act No. 36 of 2005) as amended;

"ITU" means the International Telecommunication Union;

Other abbreviations as required

2 Purpose

This purpose chapter explains what the FAP is for, details of the frequency band (or bands) involved, explains the type of system / service that is meant to be deployed.

2.1. A Radio Frequency Spectrum Assignment Plan (FAP) provides information regarding the requirements in the use of a frequency band in line with the allocation and other information in the National Radio Frequency Plan. This information includes the technical characteristics of radio systems, frequency channelling, coordination and details on required migration of existing users of the band and the expected method of assignment.

2.2. This Frequency Assignment Plan states the requirements for the utilization of the frequency band between XXXXX XXz to XXX XXz for XXXXXXXXXXXXX in South Africa.

2.3. Explain the system here.

(e.g. 2.2 BWA systems are two way point-to-point, point-to-multipoint or mesh digital radio systems consisting of BWA distribution base stations and their associated subscriber stations (or BWA access devices).

2.4. Explain the service here.

(e.g. BWA services are intended for providing wireless broadband connectivity to subscribers and can include applications such as voice, video, images, interactive multimedia, high-speed data and mobile TV).

3 General

This general chapter gives general information of technical requirements.

3.1. Technical characteristics of equipment used in XXXXXX systems shall conform to all applicable South African standards, international standards, International Telecommunications Union (ITU) and its radio regulations as agreed and adopted by South Africa

3.2. All installations must comply with safety rules as specified in applicable standards.

3.3. The equipment used shall be certified under South African law and regulations.

3.4. The allocation of this frequency band and the information in this Frequency Assignment Plan (FAP) are subject to review.

3.5. Frequency bands assigned for XXXXXXXXXX include bands XXXXXXXX

3.6. Likely use of this band will be for XXXXXXXXX.

3.7. Here may be placed a list of the technologies that which are applicable for the provision of the system and service as and the typical technical and operational characteristics identified as appropriate by the ITU. The relevant ITU-R report may be specified.

4 Channelling Plan

This channelling chapter will vary according to the technology deployed, the example given here is appropriate for Fixed Wireless access.

4.1. The frequency band XXXXX XXz to XXXX XXz provides a total bandwidth of XXX XXz for the XXXXXX service.

4.2. The channel arrangements may be placed here in the text or in the Appendix – depending on the amount of information.

4.3. Here may be placed further information

5 Requirements for usage of radio frequency spectrum

5.1. This FAP covers the minimum key characteristics considered necessary in order to make the best use of the available frequencies.

5.2. Here may be stated that the use of the band is not limited

5.3. Only systems using digital technologies that promote spectral efficiency will be issued with an assignment. Capacity enhancing digital techniques is being rapidly developed and such techniques that promote efficient use of spectrum, without reducing quality of service are encouraged.

5.4. In some cases, a radio system conforming to the requirements of this FAP may require modifications if harmful interference is caused to other radio stations or systems.

5.5. The allocation of spectrum and shared services within these bands are found in the National Radio Frequency Plan (NRFP) and an extract of it is shown in in Appendix A

5.6. Maximum radiated power:

5.6.1. Base Station transmissions should not exceed XXXXX dBm/5MHz EIRP

5.6.2. On a case to case basis, higher EIRP may be permitted if acceptable technical justification is provided

5.6.3. Where appropriate the following may be added. Subscriber terminal station should comply with the technical specification set under XXXXXXX.

5.7. In some cases, a radio system conforming to the requirements of this FAP may require modifications if major interference is caused to other radio stations or systems

5.8. Here may be placed criteria for interference mitigation including guidelines.

6 Implementation

6.1. This FAP shall be effective on the date of issuance of this document

6.2. No new assignment for XXXXXXX in the band XXXXXXXXX shall be approved unless they comply with this FAP.

7 Co-ordination Requirements

7.1. Use of these frequency bands shall require coordination with the neighbouring countries within the coordination zones of XX kilometres from the neighbouring country. The coordination distance is continuously being reviewed and may be updated from time to time.

7.2. Technical analysis is carried out by ICASA before an assignment is issued. Operator-to-operator coordination may be required to avoid interference.

7.3. Specific information regarding coordination may be inserted here.

7.4. In the event of any interference, ICASA will require affected parties to carry out coordination. In the event that the interference continues to be unresolved after 24 hours, the affected parties may refer the matter to ICASA for a resolution. ICASA will decide the necessary modifications and schedule of modifications to resolve the dispute. ICASA will be guided by the interference resolution process as shown in Appendix C.

7.5. Assignment holders shall take full advantage of interference mitigation techniques such as antenna discrimination, tilt, polarization, frequency discrimination, shielding/blocking (introduce diffraction loss), site selection, and/or power control to facilitate the coordination of systems.

8 Assignment

This chapter will make appropriate comments concerning the assignment and issuance of \a licence. In most cases this will refer to the Radio Frequency Spectrum Regulations

Standard Approach

The assignment of frequency will take place according to the Standard Application Procedures in the Radio Frequency Spectrum Regulations 2011.

Extended Approach

The assignment of frequency will take place according to the Extended Application Procedures in the Radio Frequency Spectrum Regulations 2011.

Procedure in an invitation to Apply

The assignment of frequency will take place according to the Procedures in respect of an Invitation to Apply in the Radio Frequency Spectrum Regulations 2011.

In the case of a major strategic spectrum award, i.e. for the 700MHz / 800 MHz / 2.6 GHz etc. – then the ITA may go into some detail regarding the assignment procedure, including the following Table of Contents.

8.1 Assignment Method, Procedures and Timetable
8.1.1 Method
8.1.2 Procedures
- *Eligible Person*
- *Invitation*

8.1.3 Timetable
8.2 Pre-Conditions
8.3 Evaluation Criteria
8.3.1 Service rollout and coverage
8.3.2 Infrastructure Sharing
8.3.3 Financial
8.3.5 Management
8.6 Details and how spectrum is assigned
8.4 Auction (if Applicable)
Explaining how the Auction is intended to be carried out
8.7 Conditions of Assignment
- *Penalties etc.*

8.8 Instructions on Business Plan
8.9 Instructions on Application
8.9.1 Application / Auction Fees
8.9.2 Submission
8.9.3 Date and Time of submission

It is important to note that the definitive document for assignment will be an ITA in this case.

9 Revocation

This chapter will state whether existing licences will be revoked or not extended.

10 Frequency Migration

This chapter will make appropriate comments concerning Frequency Migration. There are two approaches here, either a simple statement that existing users need to move to a different frequency location or a more detailed approach specifying in-band migration and destination bands for affected services.

Standard

Particularly applies to Point to Point links

Current users of this radio frequency spectrum band will be required to cease transmitting in this frequency and, if applicable, obtain a new assignment in an alternative frequency location according to the procedures laid down in the Radio Frequency Spectrum Regulations.

Specific Procedure

This where the FAP specifies in more detail where the existing users of a radio frequency spectrum are likely to migrate to, especially where there is no obvious provision in the National Radio Frequency Plan. In some cases the FAP could also cover the destination frequency bands for users being migrated out; however it is recommended to develop a separate FAP for such destination bands.

11 Other

Appendices to RFSAP

Appendix A - National Radio Frequency Plan

Here shall be placed a copy of the relevant section of the National Radio Frequency Plan.

Appendix B - Band Plan for current frequency bands

Appendix C - Interference Resolution Process

Appendix B Glossary

Act	means the Electronic Communications Act, 2005 (Act No. 36 of 2005);
Authority	means ICASA is the Independent Communications Authority of South Africa;
3G	means 3G or 3rd generation mobile telecommunications is a generation of standards for mobile phones and mobile telecommunication services fulfilling the International Mobile Telecommunications-2000 (IMT-2000) specifications by the ITU
Amateur	means a person who is interested in the radio technique solely for a private reason and not for financial gain and to whom the Authority has granted an amateur radio station licence and shall mean a natural person and shall not include a juristic person or an association: provided that an amateur radio station licence may be issued to a licensed radio amateur acting on behalf of a duly founded amateur radio association;
Assignment	means the authorization given by the authority to use a radio frequency or radio frequency channel under specified conditions;
Base station	means a land radio station in the land mobile service for a service with land mobile stations;
BS	means Broadcast Service
BTX	means Base Transceiver;
Burglar alarm service	means a land mobile service installed, maintained and operated to monitor burglar alarm signals of clients by means of a signal forwarded from a radio transmitter to a central position;
Burglar alarm transmitter	means a transmission radio station in the land mobile service that is intended to transmit automatic alarm signals to a central position;
CDMA	means Code Division Multiplex Access
CEPT	means Conference of European Posts and Telecommunications Authorities;
Citizen-band radio service	means a private, two-way, limited coverage speech communication service in the land mobile service to personal and business operations, which may also be used as a paging system;
Communal radio repeater station service	means a land mobile service installed, maintained and operated via repeater stations that are available for communal use;
Cordless Phone	means a portable telephone with a wireless handset that communicates via radio waves with a base station connected to a fixed telephone line, within a limited range of its base station;
DAB	means Digital Audio Broadcasting is a digital radio technology for broadcasting radio stations
DECT	means Digital Enhanced Cordless Telecommunications 1880 - 1900MHz which is a digital communication standard, which is primarily used for creating cordless phone systems
DF	means Dual Frequency
DTT	means Digital Terrestrial Television
DTT Mobile	means Digital Terrestrial Television for Mobile services
e.i.r.p	means effective isotropically radiated power;
e.r.p	means effective radiated power, is the product of the power supplied to an antenna and its gain relative to a half wave dipole in a given direction;

EBU	means European Broadcasting Union
ECA	means Electronic Communications ACT of South Africa
ECNS	means Electronic Communications Network Services;
ECS	means Electronic Communications Services;
EDGE	means Enhanced Data rates for GSM Evolution is a digital mobile phone technology that allows improved data transmission rates as a backward-compatible extension of GSM
EMC	means Electromagnetic Compatibility;
ETSI	means European Telecommunications Standards Institute
FDMA	means Frequency Division Multiplex Access
FLEX	means paging software originally developed for Motorola;
FMP	means Frequency Migration Plan
FPLMTS	means Future Public Land Mobile Telecommunications System also called IMT-2000
FTBFP 2008	means Final Terrestrial Broadcast Frequency Plan of 2008
FWBA	Fixed Wireless Broadband Access
GHz	means Gigahertz of Radio Frequency Spectrum;
GE06	means Digital Broadcast Conference held in Geneva, Switzerland in 2006.
GMDSS	means the Global Maritime Distress and Safety System is an internationally agreed-upon set of safety procedures, types of equipment, and communication protocols used to increase safety and make it easier to rescue distressed ships, boats and aircraft.
GSM	means Global System for Mobile Communications,(originally Groupe Spécial Mobile), is a standard set developed by the European Telecommunications Standards Institute (ETSI) to describe technologies for second generation (2G) digital cellular networks
GSM-R	means GSM for Railways
HF	means High Frequency;
IMT	means International Mobile Telecommunications
Inductive Loop Systems	means radio apparatus which operates by producing a controlled magnetic field within which a predetermined recognisable signal is formed;
INMARSAT	means International Maritime Satellite
ISM	means Industrial, Scientific and Medical;
ITU	means International Telecommunication Union
ITU RR	means International Telecommunication Union Radio Regulations
KHz	means Kilohertz of Radio Frequency Spectrum;
Land mobile service	means a mobile radio-communication service between fixed stations and mobile land stations, or between land mobile stations;
LEO	means Low Earth Orbit satellites
LMR	means Land Mobile Radio
Low Power Radio	means radio apparatus, normally hand-held radios used for short range two-way voice communications;
LTE	means Long Term Evolution is a standard for wireless communication of high-speed data for mobile phones and data terminals. It is based on the GSM/EDGE and UMTS/HSPA network technologies
M2M	means Machine to Machine
MFN	means Multiple Frequency Networks
MHz	means Megahertz of Radio Frequency Spectrum;
MIMO	means Multiple-Input and Multiple-Output is the use of multiple antennas at both the transmitter and receiver to improve

	communication performance
Mobile station	means a radio station that is intended to be operated while it is in motion or while it is stationary at an unspecified place;
Model Control apparatus	means radio apparatus used to control the movement of the model in the air, on land or over or under the water surface;
MTX	means Mobile Transceiver;
Non-specific Short Range Devices	means radio apparatus used for general telemetry, telecommand, alarms and data applications with a pre-set duty cycle (0.1%: S duty cycle< 100%);
NRFP	means the National Radio Frequency Plan 2010 for South Africa
PAMR	means Public Access Mobile Radio
PMR	means Public Mobile Radio is radio apparatus used for short range two-way voice communications;
PPDR	means Public Protection and Disaster Relief as defined in ITU-R Report M.2033.
PTM	means Point to Multipoint
PTP	means Point to Point
Radio trunking	means a technique by means of which free channels out of a group of radio frequency channels allocated to a base station are automatically made available for the establishment of a connection between the stations of a user;
Radio-beacon station	means a radio station whose radiation is intended to enable a mobile station to fix its position or obtain its bearing with regard to the radio beacon;
Radio-communication	means all electronic communication by means of radio waves;
Relay or repeater station	means a land station in the land mobile service;
RFID	means Radio Frequency identification is a wireless system that uses radio frequency communication to automatically identify, track and manage objects, people or animals. It consist of two main components viz, tag and a reader which are tuned to the same frequency;
RLAN	means Radio Local Access Network is the high data rate two way (duplex) wireless data communications network;
SABRE	means South African Band Re-planning Exercise
SADC	means Southern African Development Community
SADC FAP	means Southern African Development Community Frequency Allocation Plan 2010
SAPS	means South African Police Service
SATFA	means South African Table of Frequency Allocations 2004
Self Helps	means repeater stations rebroadcasting television channels to limited areas on a low power basis
Service licence	means a BS, ECS or ECNS licence;
SF	means Single Frequency
SFN	means Single Frequency Network
Ship station	means a mobile station in the maritime mobile service that has been erected
SNG	means Satellite News Gathering
Spread spectrum	means a form of wireless communications in which the frequency of the transmitted signal is deliberately varied, resulting in a much greater bandwidth than the signal would have if its frequency were not

	varied;
SRD	means Short Range Device is a piece of apparatus which includes a transmitter, and/or a receiver and or parts thereof, used in alarm, telecommand telemetry applications, etc., operating with analogue speech/music or data (analogue and/or digital) or with combined analogue speech/music and data, using any modulation type intended to operate over short distances;
Studio Links	means point to point links in the broadcasting frequency bands used to connect studios to transmitters
STB	means Set Top Box for DVB-T2 reception
T-DAB	means Terrestrial Digital Audio Broadcasting
TDMA	means Time Division Multiplex Access
Telemetry	means the transmission of remotely measured data;
TETRA	means Terrestrial Trunked Radio is a professional mobile radio [2] and two-way transceiver specification. TETRA was specifically designed for use by government agencies, emergency services, (police forces, fire departments, ambulance) for public safety networks, rail transportation staff for train radios, transport services and the military. TETRA is an ETSI standard.
TPC	means Transmitter Power Control is a technical mechanism used within some networking devices in order to prevent unwanted interference between wireless networks;
UHF	means Ultra High Frequency;
UMTS	means Universal Mobile Telecommunications System is a third generation mobile cellular technology for networks based on the GSM standard
VHF	means Very High Frequency;
Video Surveillance Equipment	means radio apparatus used for security camera purposes to replace the cable between a camera and a monitor;
VSAT	means Very Small Aperture Terminal is a two-way satellite ground station that is smaller than 3 meters diameter
WAS	means Wireless Access Systems is end-user radio connections to public or private core networks;
Wideband Wireless Systems	means radio apparatus that uses spread spectrum techniques and has high bit rate;
WRC 2007	means World Radio Conference 2007 held in Geneva
WRC 2012	means World Radio Conference 2012 held in Geneva

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