

INDEPENDENT COMMUNICATIONS AUTHORITY OF SOUTH AFRICA
NOTICE 636 OF 2019



THE ELECTRONIC COMMUNICATIONS ACT 2005, (ACT NO. 36 OF 2005)

NOTICE INVITING COMMENTS REGARDING THE DRAFT RADIO FREQUENCY SPECTRUM ASSIGNMENT PLAN FOR THE FREQUENCY BAND 470 TO 694 MHz FOR DIRECT MIGRATION FROM ANALOGUE TELEVISION AND THE RELEASE OF THE BAND 694 TO 862 MHz

1. The Independent Communications Authority of South Africa ("the Authority"), hereby publishes the **Draft Radio Frequency Spectrum Assignment Plan for the frequency band 470 to 694 MHz for public consultation** in terms of sections 30, read with sections 2 (d), 2 (e), 4, 30, 31(4), and 33 of the Electronic Communications Act (Act No. 36 of 2005), read with the Terrestrial Broadcasting Frequency Plan 2013, published in Government Gazette number 36321 (Notice 298 of 2013), the Update to the Terrestrial Broadcasting Frequency Plan, published in Government Gazette Number 38005 (Notice 801 of 2014), Regulation 3 of the Radio Frequency Spectrum Regulations 2015 and the IMT Roadmap 2019.

2. The goal of RFSAP is to implement the provisions as detailed in regulation 9 of the Radio Frequency Spectrum Assignment Plan published in Government Gazette 38640 (Notices 271, 272, 273 and 274 of 2015).
3. This Draft Radio Frequency Spectrum Assignment Plan will supersede any previous radio spectrum assignment arrangements for the same spectrum location once finalised.
4. 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 Radio Frequency Spectrum Assignment Plan for the frequency band 470 to 694 MHz for public consultation** by no later than 16h00 on Friday 31 January 2020. The Authority may conduct public hearings.
5. Written representations or enquiries may be directed to:

The Independent Communications Authority of South Africa (ICASA)

350 Witch-Hazel Avenue

Eco Point Business Park

Eco Park

Centurion

or

Private Bag X10

Highveld Park

0169

Attention:

Mr Manyapelo Richard Makgotlho

e-mail: rmakgotlho@icasa.org.za

6. All written representations submitted to the Authority pursuant to this notice shall be made available for inspection by interested persons from 04 February 2020 at the ICASA Library or website and copies of such representations and documents will be obtainable on payment of a fee.

7. Where persons making representations require that their representation, or part thereof, be treated confidentially, then an application in terms of section 4D of the Independent Communications Authority of South Africa Act, 2000 (Act No. 13 of 2000) must be lodged with the Authority outlining reasons why such information should be treated as confidential in line with the provisions of section 4D (4) (a) to (e). Such an application must be submitted simultaneously with the representation on the draft regulations and plan. Respondents are requested to separate any confidential material into a clearly marked confidential annexure. If, however, the request for confidentiality is refused, the person making the request will be allowed to withdraw the representation or document in question.

8. The guidelines for confidentiality request are contained in Government Gazette Number 41839 (Notice 849 of 2018).



DR. KEABETSWE MODIMOENG

ACTING CHAIRPERSON



Draft Radio Frequency Spectrum Assignment Plan

Rules for Services operating in the Frequency Band
from 470 to 694 MHz

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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
Administration	means Members States of the International Telecommunications Union.
“DTT”	means Digital Terrestrial Television
“DVB-T2”	means Digital Video Broadcasting – Second Generation Terrestrial
“IMT”	means International Mobile Telecommunications
“ITA”	means Invitation to Apply
“ITU”	means the International Telecommunication Union
“ITU-R”	means the International Telecommunication Union Radiocommunication Sector
“NRFPP”	means the National Radio Frequency Plan 2013 for South Africa
“PCI”	means Physical-Layer Cell Identities
“RFSAP”	means Radio Frequency Spectrum Assignment Plan
“SFN”	means Single Frequency Networks
“WRC-12”	means World Radio Conference 2012 held in Geneva
“WRC-15”	means the World Radio Conference 2015 held in Geneva

2. About

2.1 The Authority published the Terrestrial Broadcasting Frequency Plan 2013, in Government Gazette number 36321 (Notice 298 of 2013) on 02 April 2013 in terms of Sections 4(2) (b) and 30(1).

2.2 This draft Radio Frequency Spectrum Assignment Plan is to be read in conjunction with the National Radio Frequency Plan 2018 and the Radio Frequency Migration Plan 2019.

- 2.3 The Authority on 16 September 2014, further published the update to the Terrestrial Broadcasting Frequency Plan in Government Gazette 38005 (Notice 801 of 2014).
- 2.4 This Draft Radio Frequency Spectrum Assignment Plan (“RFSAP”) is published for the purposes of adding further detail to the assignment of broadcasting frequencies, with a specific emphasis on frequencies that have been coordinated within the Southern Development Community (“SADC”) and notified to the International Telecommunications Union Radiocommunications (“ITU-R”). The Digital Terrestrial Television assignments have met the conformance Requirements of the Geneva Agreement of 2006 (“GE-06”) and have been notified to the ITU-R Master International Frequency Register (“MIFR”).
- 2.5 The aim of Draft RFSAP is to enable the implementation of the Single Frequency Network (“SFN”) Assignments in Annexure J of the update to the Terrestrial Broadcasting Frequency Plan in the Government Gazette Number 38005 (Notice 801 of 2014) for the Digital Terrestrial Television (“DTT”) Multiplexes one (1) and two (2) to ensure an expedited television analogue switch off in order to enable the early release of the IMT700 and IMT800.

3. Purpose

3.1 The purpose of this Draft RFSAP is:

3.1.1 to provide a plan for the phased approach in implementing the analogue television switch-off onto Digital Terrestrial Television through an SFN;

3.1.2 to implement the Transitional arrangements provisions set out in regulation 9 of the Radio Frequency Spectrum Assignment Plan published in Government Gazette 38640 (Notices 271, 272, 273 and 274 of 2015);

3.1.3 to provide information on the requirements attached to the use of a frequency band in line with the allocation and other information in the latest version of the National Radio Frequency Plan ("NRF");

3.1.4 to provide information on 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;

3.1.5 to provide the requirements necessary for the utilisation of the frequency band between 470 to 694 MHz for DTT in order to release frequencies in the band 694 to 860 MHz for IMT immediately after analogue television switch-off in the affected areas;

3.1.6 to ensure that alignment of Annexure J of the Terrestrial Broadcasting Plan 2013, as with the notified frequencies of the ITU-R MIFR. The aim being to emphasise the ITU's recognition that stated that MT systems which are mobile systems that provide access to a wide range of telecommunication services including advanced mobile services, supported by mobile and fixed networks, which are increasingly packet-based; and

3.1.7 to speed-up the process to release 694 to 854 MHz for IMT as the Authority has decided on the early availability of the IMT700 and IMT800. The RFSAP is being consulted on to enable for immediate availability of the band 470 to 694 MHz at the time of analogue switch-off.

3.2 The key features of this RFSAP are:

3.2.1 a high degree of commonality of functionality worldwide while retaining the flexibility to support a wide range of services and applications in a cost-efficient manner;

3.2.2 compatibility of services within IMT and with fixed broadcast networks;

3.2.3 capability of interworking with other radio access systems;

- 3.2.4 high quality DTT services;
- 3.2.5 user equipment suitable for worldwide use;
- 3.2.6 user-friendly applications, services and equipment; and
- 3.2.7 allow for the most efficient use of the spectrum using the DVB-T2 technology together with SFN networks.

4. General

- 4.1 South Africa adopted the DVB-T2 broadcast transmission standard for implementation. This said standard is a DVB European-based Consortium standard adopted by the ITU and its radio Regulations.
- 4.2 All installations to be used for purposes of transmission with the said standard must comply with safety rules as specified in applicable standards.
- 4.3 A further requirement will be that any equipment that will be used for purposes of transmission with the said standard shall be required to obtain certification under South African laws and Regulations.
- 4.4 The assignment of the frequency band 470 to 694 MHz and the channel arrangement as outlined in the Terrestrial Broadcasting Frequency Plan, 2013 Annexure J as updated in 2014, provides that the Terrestrial Broadcast Frequency Plan, 2013 does not allow for a direct migration from analogue to digital television but rather for a two-stage process which will first allow analogue television to be transmitted in parallel with DTT and thereafter there will be a restacking process of frequencies to release the digital dividend (694 to 854 MHz);
- 4.5 The said plan has however been overtaken by events since the deadline for analogue switch-off passed on 17 June 2015, furthermore, the analogue and digital assignments above 694 MHz are no longer protected and have been suppressed from the ITU-R MIFR.
- 4.6 In order to eliminate interference to existing analogue transmissions during the dual illumination period there will be frequency changes required to DTT frequencies within the band 470 to 694 MHz before analogue switch-off.
- 4.7 Analogue switch-off also applies to Analogue Terrestrial Broadcast Self-Help stations (“Self-Help stations”) which, in most cases, will have to migrate to Direct To Home (DTH) as there will not be DTT available in these areas including the provisions for Self-Help stations. Analogue switch-off for Self-Help stations shall be implemented in accordance with the provisions in section 2.4 on Self-Help stations in the Terrestrial Broadcasting Frequency Plan, 2013.
- 4.8 The requirement for the migration of Studio Transmitter Links within the 800 MHz band need to migrate immediately out of the band as per Terrestrial Broadcast Frequency Plan, 2013 and the NFRP 2018.

- 4.9 The Authority has managed the Liquid Telecom assignments in the bands 827.775 – 832.695 MHz paired with 872.775 – 877.695 MHz in order to ensure migration destination band through the publication on 29 March 2019, in Government Gazette: 42337 (Notice Number 165 of 2019). This guard band might not be adequate to resolve all interferences and additional filtering might be required depending on the deployment situation.
- 4.10 The Authority has studied SFN's which are registered with the ITU in the Radiocommunications Bureau (BR) International Frequency Information Circular (BRIFIC) database and noticed that numerous of them similar to the size of SFN's in the South African BRIFIC entries such as for instance:
- 4.11 The United Kingdom
- In the United Kingdom, there are several SFN assignments that exceed 200 km.
- 4.12 Spain
- In Spain, there are numerous SFN assignments that exceed 300 km in size.
- 4.13 France
- In France, there are several SFN assignments that exceed the Gauteng SFN size.
- 4.14 Italy
- In Italy, there are numerous SFN assignments that exceed 300 km.
- 4.15 Portugal
- In Portugal, there is one national SFN for the whole country.
- 4.16 *The Authority extracted and analysed the SFN's which are registered with the ITU in the BRIFIC database and noticed that many of them are similar to the size of SFN's in the South African BRIFIC entries. An example of these entries is attached as **Appendix E**.*

- 4.17 The benchmark revealed that there are much larger SFN entries in the ITU-R MIFR as compared to the South African entries, such as those of Italy, United Kingdom, Spain, Portugal and numerous other countries that have implemented SFNs. The RFSAP allows for a guard band of 9 MHz above 694 MHz to limit possible interference between IMT 700 and the DTT services in accordance with footnote 5.296 and Resolution 235 (WRC-15) of the ITU Radio Regulations edition 2016.

5. ITU Recommendations, Resolutions and Reports

The ITU-R Recommendations constitute a set of international technical standards developed by the Radiocommunication Sector (formerly CCIR) of the ITU. They are the result of studies undertaken by Radiocommunication Study Groups on:

- 5.1 the use of a vast range of wireless services, including popular new mobile communication technologies;
- 5.2 the management of the radio-frequency spectrum and satellite orbits;
- 5.3 the efficient use of the radio-frequency spectrum by all radiocommunication services;
- 5.4 terrestrial and satellite radiocommunication broadcasting;
- 5.5 radio wave propagation;
- 5.6 systems and networks for the fixed-satellite service, for the fixed service and the mobile service;
- 5.7 space operation, Earth exploration-satellite, meteorological-satellite and radio astronomy services.
- 5.8 The ITU has provided Recommendations, Resolutions and Reports with respect to the utilisation of band 470 – 690 for purposes of advising Administrations the planning criteria, including protection ratios, for various methods of providing second generation digital terrestrial television broadcasting (DTTB) systems in the VHF/UHF bands as follows:
- 5.8.1 Recommendation ITU-R M.2012-1 (02/2014): Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications-Advanced (IMT Advanced);
- 5.8.2 Report ITU-R2241-0 Compatibility studies in relation to Resolution 224 in the bands 698-806 MHz and 790-862 MHz;

- 5.8.3 Report ITU-R M.2074: Report on Radio Aspects for the terrestrial component of IMT-2000 and systems beyond IMT-2000;
- 5.8.4 Recommendation ITU-R M.1645 Framework and overall objectives of the future development of IMT-2000 and systems beyond IMT-2000;
- 5.8.5 Resolution 235 (WRC-15);
- 5.8.6 Resolution 5.549 (WRC-15);
- 5.8.7 The ITU Radio Regulations (RR), Provision Number 5.1.2 of the Geneva 2006 (GE06) Agreement, and the World Radiocommunications Conference (WRC) Resolution 224-4, Resolution 232 (WRC-12) and the results of activities undertaken by the within ITU Region 1 (African Region);
- 5.8.8 Recommendation ITU-R M.2090-0 incorporated by reference into the ITU Radio Regulations by WRC 15 with key emphasis on specific unwanted emission limit of International Mobile Telecommunication (IMT) mobile stations operating in the frequency band 694-790 MHz to facilitate the protection of existing services in the ITU Region 1 in the frequency band 470-694 MHz;
- 5.8.9 Recommendation ITU R M.1036-5 incorporated by reference into the ITU Radio Regulations by WRC 15 dealing with the lower duplexer of the Frequency arrangement A5 in Recommendation ITU R M.1036 (i.e. uplink in 703-733 MHz) and a maximum output power of 23 dBm, to provide for a nine (9) MHz guard band between Broadcasting and IMT; and
- 5.8.10 ITU Report ITU-R BT.2339-0, incorporated by reference into the ITU Radio Regulations by WRC 15, with respect to co-channel sharing and compatibility studies between digital terrestrial television broadcasting and IMT in the frequency band 694-790 MHz in the GE06 planning area were studied and ITU-R Reports was developed in this respect.

6. Transmit Configuration for DVB-T2

6.1 The DTT Frequency Plan in Annexure J of the Terrestrial Broadcasting Plan 2013, is designed with the Transmit Configuration for DVB-T2 (Fixed Reception). The Terrestrial DTT Frequency Plan which was developed for South Africa is based on the following transmit configuration:

Technology:	DVB-T2
Constellation:	256 QAM
FEC/Code Rate:	3/5
Guard Interval	1/8
Location Probability:	95%
FFT size	32Ke
Block length	64800
Effective minimum usable field strength (CH21):	49.873 dBuV/m
Capacity	30.01Mb/s
Pilot Pattern	PP2

6.2 This transmit configuration is the most optimum transition configuration preferred. However, if the guard interval is smaller than the specified GI, this will lead to self-interference in the network. The Authority therefore emphasise that the transmission parameters should comply to the specified transmission configuration above even though 3 Mbit/s may be compromised.

6.3 The following transmit configuration or similar is possible, however, caution should apply as self-interference may result on the network thus making the SFN(s) unimplementable. See below said transmit configuration:

Constellation:	256 QAM
FEC/Code Rate:	3/5
Guard Interval	1/16
Location Probability:	95%
FFT size	32Ke
Block length	64800

Effective minimum usable field strength (CH21):	49.375 dBuV/m
Capacity	33.27 Mb/s
Pilot Pattern	PP4

7. Radio Frequency Spectrum Assignment Plan to clear the IMT 700 and IMT 800 spectrum of the Broadcasting Services after analogue television switch-off.

7.1 The Terrestrial Television Broadcasting Frequencies as registered and Coordinated with ITU and South Africa's six (6) neighbouring countries in accordance with the GE-06 Agreement. Further, South Africa's current DTT frequency plan is also registered with the ITU in accordance with the Geneva 06 and coordinated with South Africa's six (6) neighbouring countries.

7.2 The Terrestrial Television Plan contains 1257 frequencies for DTT implementation in the band 470 MHz to 694 MHz. This plan is commonly known as the seven (7) MUX plan since it provides for the deployment of seven multiplexes per transmission point in an 8 MHz channels per province as per the diagram below. The Figures and maps below summarise the construction of the 7 MUX plan and the multiplex group combinations in the respective provinces.

No.	Group 1	Group 2	Group 3	Group 4
1	CH21	CH22	CH23	CH24
2	CH25	CH26	CH27	CH28
3	CH29	CH30	CH31	CH32
4	CH33	CH34	CH35	CH36
5	CH37	CH38	CH39	CH40
6	CH41	CH42	CH43	CH44
7	CH45	CH46	CH47	CH48

Figure 1

MUX	NC1	NC2	NW	LP1	LP2	MP	KZN	GP	WC	EC	FS
MX1	3 (CH23)	4 (CH24)	2 (CH22)	1 (CH21)	2 (CH22)	3 (CH23)	2 (CH22)	4 (CH24)	1 (CH21)	3 (CH23)	1 (CH21)
MX2	3 (CH27)	4 (CH28)	2 (CH26)	1 (CH25)	2 (CH26)	3 (CH27)	2 (CH26)	4 (CH28)	1 (CH25)	3 (CH27)	1 (CH25)
MX3	3 (CH31)	4 (CH32)	2 (CH30)	1 (CH29)	2 (CH30)	3 (CH31)	2 (CH30)	4 (CH32)	1 (CH29)	3 (CH31)	1 (CH29)
MX4	3 (CH35)	4 (CH36)	2 (CH34)	1 (CH33)	2 (CH34)	3 (CH35)	2 (CH34)	4 (CH36)	1 (CH33)	3 (CH35)	1 (CH33)
MX5	3 (CH39)	4 (CH40)	2 (CH38)	3 (CH39)	1 (CH37)	2 (CH38)	4 (CH40)	4 (CH40)	1 (CH37)	2 (CH38)	1 (CH37)
MX6	3 (CH43)	4 (CH44)	2 (CH42)	3 (CH43)	1 (CH41)	2 (CH42)	3 (CH43)	4 (CH44)	1 (CH41)	2 (CH42)	1 (CH41)
MX7	3 (CH47)	4 (CH48)	2 (CH46)	3 (CH47)	1 (CH45)	2 (CH46)	3 (CH47)	4 (CH48)	1 (CH45)	2 (CH46)	1 (CH45)

Figure 2

- 7.3 It should be noted that the frequency assignments were slightly distorted to reduce interference to broadcasting service licensees in other countries.
- 7.4 The Terrestrial Television Plan also allowed for eSwatini (Kingdom of) and Lesotho (Kingdom of) to be included in the Digital Frequency Network (DFN) structure. In contrast, the conventional Multi Frequency Network (MFN) frequency plan approach would have provided only a maximum of four (4) national multiplexes for South Africa.
- 7.5 The maps below indicate the respective SFN's per province on a national basis and the channels that will be used per province. Theoretically it is also possible to create a national country wide SFN which would have created 28 national SFN's each offering an 8 MHz channel. The plan as it currently stands can be further expanded to include localised MFN services per site as and where required.

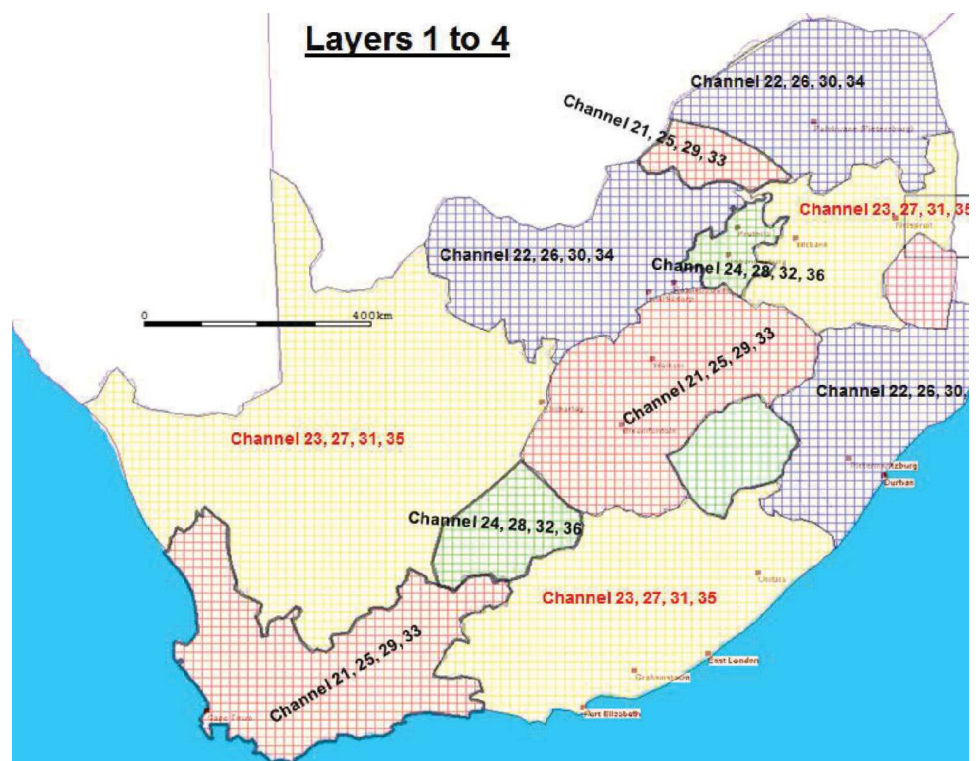


Figure 3

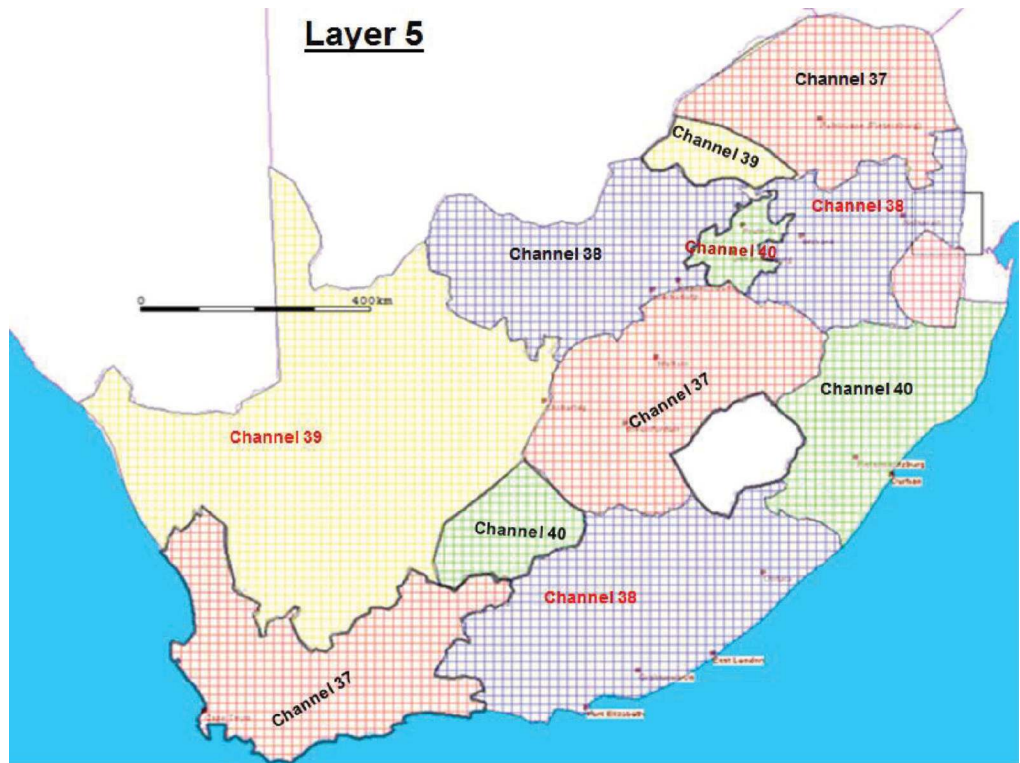


Figure 4

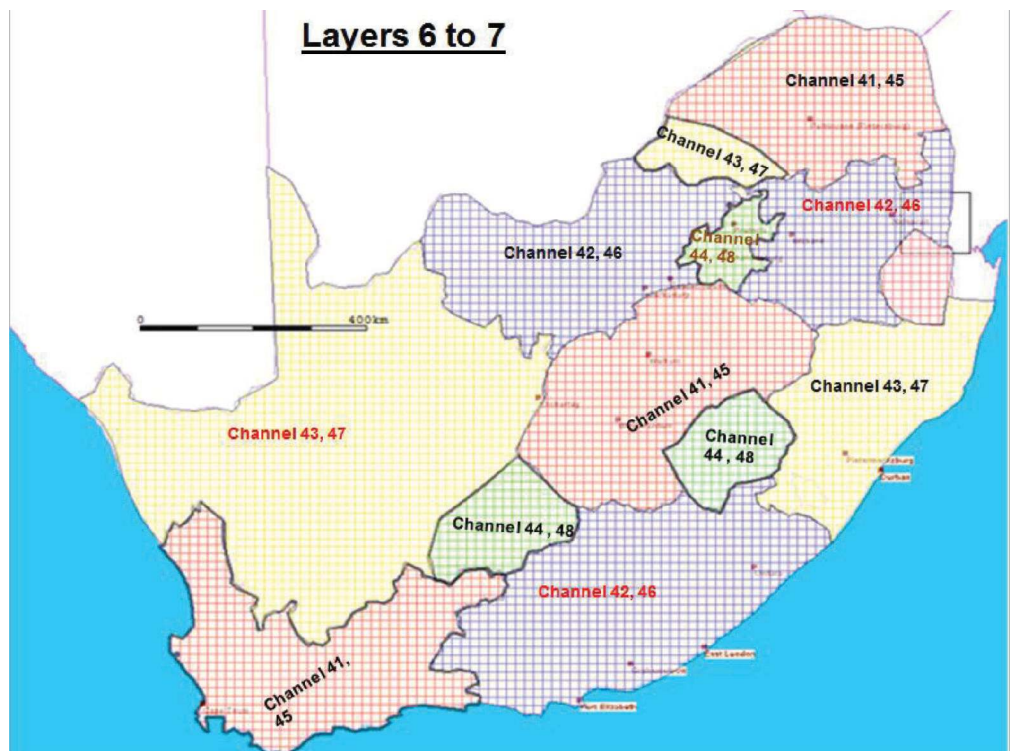


Figure 5

- 7.6 The current plan for Analogue Switch Off (ASO) is to launch DTT on a MFN thus compelling a second migration phase before being able to release IMT700 and IMT800 spectrum. This approach also implies an extended dual illumination phase (where analogue and digital television operational in the band 470 MHz to 860 MHz) before releasing the IMT spectrum after the second migration phase and ASO.
- 7.7 It is currently envisaged that all analogue services will be switched off by 2020 after which the restacking process (anticipated to require an additional two (2) years) will start to fully release IMT700 and IMT800 spectrum by around 2022.
- 7.8 Whereas the Authority initially developed the coordinated 7MUX frequency plan for South Africa it now intends to develop an implementation strategy for this plan whereby the ASO process can be accelerated to ensure the earliest possible release of Dividend 1 and Dividend 2 spectrum for IMT use.
- 7.9 The purpose of this approach is to describe and offer the compilation of this accelerated digital deployment and ASO plan. The scenario where the Guard Interval is smaller than the specified Guard Interval will lead to self-interference in the network. This RFSAP therefore emphasise that the transmission parameters must comply with the above specified transmission configuration. This is to ensure the envisaged optimised implementation of the DTT Plan in Annexure A and Annexure B is realised within the envisage immediate implementation.

8. Re-Alignment of DTT Multiplexes

- 8.1 After analogue switch-off the operational frequencies will be re-aligned in accordance with Annexure J of the Terrestrial Broadcasting Plan 2013, as amended. In order to ensure re-alignment from analogue television switch to SFN, Annexure J of the Terrestrial Broadcasting Plan 2013, as amended, has been revised into **Annexure A** and **Annexure B** of this RFSAP.
- 8.2 To create a plan with the least possible interference the large SFN's were broken up into smaller SFN's in some provinces. In **Annexure A** and **Annexure B**.
- 8.3 The Freq (MHz) and CH are the frequency and associated channel number at which the service shall be implemented in transitional phase to ensure that the IMT 700 and IMT 800 frequencies

can immediately be released after analogue switch-off. The Transitional Phase is the time period taken to Switch Analogue Frequencies directly to the Digital Single Frequency Network (SFN).

- 8.4 In the transitional phase there are no DTT assignments above 694 MHz. The final phase includes the frequencies and its associated final channel numbers which the station will operate in the provincial SFN network. The envisaged analogue switch-off dates per province to ensure the release IMT700 and IMT 800 frequencies are as follows:

Item	Province	Frequency Migration to channel below 694 MHz	Analogue Switch-off Date
1	Free State	Phase 1 Starts (0 Month)	Phase 1 Ends (4 Months)
2	Northern Cape	Phase 2 starts (2 Months)	Phase 2 Ends (4 Months)
3	Limpopo Province	Phase 3 Starts (2 Months)	Phase 3 Ends (4 Months)
4	North West	Phase 4 Starts (2 Months)	Phase 4 Ends (4 Months)
5	Mpumalanga	Phase 5 Starts (2 Months)	Phase 5 Ends (4 Months)
6	Gauteng	Phase 6 Starts (2 Months)	Phase 6 Ends (4 Months)
7	Western Cape	Phase 7 Starts (2 Months)	Phase 7 Ends (4 Months)
8	Kwa-Zulu Natal	Phase 8 Starts (2 Months)	Phase 8 Ends (4 Months)
9	Eastern Cape	Phase 9 Starts (2 Months)	Phase 9 Ends (4 Months)

NB: The timelines are to be adjusted in accordance with the Policy imperatives and the representations from Industry based on a workable plan.

- 8.5 The Authority aim that the IMT700 and IMT800 shall be clear from the broadcaster by end of the first semester of 2021.

- 8.6 The main advantages of changing all Multi- Frequency Network (MFN) DTT assignments below CH49 Single Frequency Network (SFN) before starting the analogue switch-off are as following:

- 8.6.1 the first migration of all analogue stations interfered with by DTT stations can be initiated – These transmitter stations affected is included in Appendix E;
- 8.6.2 South Africa can then initiate the migration of all Digital Dividend 1 (“DD1”) analogue transmitters to Digital in order to clear the DD1 dividend (790 to 860 MHz);
- 8.6.3 South Africa can then initiate the migration all Digital Dividend 2 (“DD2”) analogue transmitters to Digital in order to clear the DD2 dividend (694 to 790 MHz); and
- 8.6.4 broadcasting service licensees can then migrate all analogue TV services in the band (470 to 694 MHz) at a pace that will not impact negatively on the broadcasters.

9. Requirements for usage of Radio Frequency Spectrum

- 9.1 This section covers the minimum key characteristics considered necessary to make the best use of the available frequencies.
- 9.2 The use of the 470 TO 694 MHz Frequency band is limited for DTT services and only systems using digital technologies that promote spectral efficiency will be issued with an assignment. Capacity enhancing digital techniques are being rapidly developed and such techniques that promote efficient use of spectrum, without reducing quality of service are encouraged. In some cases, a radio system conforming to the requirements of this RFSAP may require modifications if harmful interference is caused to other radio stations or systems.
- 9.3 The allocation of spectrum and shared services within these bands are found in the NRFP and an extract of NRFP 2018 is shown in **Appendix A**.
- 9.4 While the maximum radiated power to be allowed is contained in Annexure A and Annexure B of this RFSAP.
- 9.5 In some cases, a radio system conforming to the requirements of this RFSAP may require modifications if harmful interference occurs.
- 9.6 The interference analysis results for digital on analogue transmission during the transitional phase are shown in Annexure C.
- 9.7 Lastly, Criteria and guidelines for interference mitigation are dealt by Joint Spectrum Advisory Group, established in terms of the Digital Migration Regulations, 2012.

10. Implementation

- 10.1 This RFSAP will come into effect upon publication in the Government Gazette
- 10.2 No new assignment in the frequency range 470 to 694 MHz shall be approved unless they comply with this RFSAP.
- 10.3 The propagation model for use in contained in ITU-R Recommendation P.1546.

11. Co-ordination Requirements

All the frequencies used in this RFSAP have been coordinated and the assignment which have been included in the ITU-R BRIFIC database. All the frequencies used in this RFSAP are either coordinated or fall outside the coordination contour of the assignment which is registered in the BRIFIC ITU database. All coordination has been performed in line with the Geneva 2006 Agreement (GE06).

12. Assignment

The assignments in this frequency band are made in accordance with the procedure for Standard Applications in line with regulation 5 of the Radio Frequency Spectrum Regulations 2015, as amended.

13. Amendment

- 13.1 Existing Radio Frequency Spectrum Licences must be amended within the timelines in section 9 of this RFSAP, in accordance with regulation 9 of the Radio Frequency Spectrum Regulations 2015, as amended, read with regulation 12 (3) of the Digital Migration Regulations published in the Government Gazette Number 36000 (Notice 1070 of 2012).

14. Radio Frequency Migration

14.1 Specific Procedure

14.2 Radio Frequency Spectrum Licensees in this band shall migrate in accordance with phases in Annexure A and Annexure B in line with timelines indicated in Section 9 of this RFSAP.

14.3 Affected licensees are to apply for an amendment of their spectrum licences where applicable.

Appendix A National Radio Frequency Plan

ITU Region 1 allocations and footnotes	South African allocations and footnotes	Typical Applications	Notes and Comments
<p>470-694 MHz</p> <p>BROADCASTING</p> <p>5.149 5.291A 5.294 5.296 5.300 5.304 5.306 5.311A 5.312</p>	<p>470-694 MHz</p> <p>BROADCASTING</p> <p>RADIO ASTRONOMY 5.304</p> <p>5.149 5.311A</p>	<p>DTT Broadcasting (470-694 MHz)</p> <p>Radio Astronomy (606 – 614 MHz)</p> <p>SAP/SAB Applications</p>	<p>Broadcasting Allotments in accordance with GE89 and GE06. Broadcast assignments in accordance with the latest version of the Terrestrial Broadcasting Frequency Plan as amended (GG No.36321) 02 April 2013. Band IV/V Analogue television is to be migrated to digital television and ensure harmonisation with SADC. The use of 'White Spaces' in this band is under consideration (subject to Non Interference Non Protection basis to users under a primary allocation).470 - 606 MHz, max. 50 mW ERP 606 - 614 MHz, max. 50 mW ERP</p>

Appendix B Interference Resolution Process

When requesting coordination, the relevant characteristics of the base station and the code or PCI group number should be forwarded to the Administration that is members States of the ITU affected. All of the following characteristics should be Included:

- a) carrier frequency [MHz];
- b) name of transmitter station;
- c) country of location of transmitter station;
- d) geographical coordinates [latitude, longitude];

- e) effective antenna height [m];
- f) antenna polarisation;
- g) antenna azimuth [deg];
- h) antenna gain [dBd];
- i) effective radiated power [dBW];
- j) expected coverage zone or radius [km];
- k) date of entry into service [month, year];
- l) code group number used; and
- m) antenna tilt [deg].

The Administration affected shall evaluate the request for coordination and shall within 30 days notify the result of the evaluation to the Administration requesting coordination. If in the course of the coordination procedure the Administration affected requires additional information, it may request such information.

If in the course of the coordination procedure, an Administration may request additional information.

If no reply is received by the Administration requesting coordination within 30 days, it may send a reminder to the Administration affected. An Administration not having responded within 30 days following communication of the reminder shall be deemed to have given its consent and the code co-ordination may be put into use with the characteristics given in the request for coordination.

The periods mentioned above may be extended by common consent.

Appendix C Interference cases per province

DTT frequencies selected from 7 Mux plan to minimize interference on existing analogue. See sections on frequency assignments/allotments.

Easter Cape CH 46 - MUX 1

Interference Herschel CH46 SBC3 - Confirm "on air" Consider Herschel as priority area for Analogue Switch-off

Sterkspruit - Large power difference on adjacent channel 47 - ensure same TX power levels - This will resolve the interference

Aliwal North Goedemoed - Co-Channel on CH46 - switch over to satellite reception

Eastern Cape CH 35- MUX2

Despatch Adjacent Channel with Despatch CH34 - slight interference - ensure same transmission power - This will resolve the interference

Barkley East co-channel CH 35 - slight interference - Increase the power on SBC1 Transmitter with 6 dB to overcome interference

Northern Cape CH31 - MUX 2

No interference predicted

Northern Cape CH24 & CH27 MUX 1

No interference predicted

Western Cape CH33 & CH38 MUX1

No Interference predicted

Western Cape CH29 MUX2

Graafwater interfered by Piketberg - Graafwater Self-help viewers to migrate to satellite immediately

Northern Province Mux 1 & 2 Area A

No interference CH21 & CH33

Northern Province Mux 1 Area B CH26

No Interference

Northern Province Mux 2 Area B CH30

No Interference

Mpumalanga Mux1 CH35

Slight Interference Davel etv CH34 on outskirts (complementary coverage available) and Steelpoort Legobo SBC3 Self-Help

Mpumalanga Mux 2 CH31

Light interference in Davel CH30 Coverage (SABC1)

North West Mux 1 CH34

No interference problems

North West Mux 2 CH46

No interference problems - Mux2 split not required

Gauteng Mux 1 CH 36

No interference predicted

Gauteng Mux 2 CH 44

There is some interference on the Potgietersrus etv transmission on CH44 near Nylstroom. Pretoria etv CH29 offer Complementary Coverage. Prioritize analogue switch-off in Potgietersrus coverage area near Nylstroom

KwaZulu-Natal Mux 1 CH 30

Interference on Maqabaqabeni SBC3 CH30 - Confirm "on air" If "On Air" treat as priority area for Analogue "switch off"

KwaZulu-Natal Mux 2 CH 40

No Interference

Free State Mux 1 CH21

Koffiefontein (CH21) SBC1, Phillipolis (CH21) SBC2, Marquard (CH21) SBC1, Manguzi (CH21) SBC1.

Free State Mux 2 CH25

Grootvlei Eskom (CH25) SBC2, Marquard (CH25) SBC1, Manguzi (CH25) SBC1.

Population in areas where interference is possible

Item	Program	People located in area	Percentage people located in area
1	etv	56 724	0.10%
2	SABC1	260921	0.45%
3	SABC2	58305	0.10%
4	SABC3	96122	0.17%

Important remarks

Figures above reflects the maximum number of people located in the areas where interference is possible. Population figures do not include households that already migrated to DTT or DTH (indication is that 60%

of television viewers already migrated to DTH or DTT). Most viewers affected will experience slight interference on analogue TV program. As such, Special efforts should be made to migrate affected viewers and others to DTT & DTH as soon as possible to avoid interference. Emphasis should be placed on migration of analogue television viewers who experience interference and where the frequency is transmitted above the 694 MHz to release the spectrum for IMT.

Appendix F Example of SFN Frequencies included in the ITU BRIFIC for Italy: Channel 26 with 230 SFN Transmitter Stations



ANNEXURE A

Note 1: Freq (MHz) and CH are the frequency and associated channel number at which the service shall be implemented in order to ensure that the IMT 700 and IMT 800 frequencies in order to clear the Frequency Band after analogue switch-off.

Note 2: No DTT assignments are above 694 MHz.

Note 3: Final Frequency and the associated final channel number is the frequency at which the station will operate in the provincial SFN network.

Note 4: In order to create a plan with the least possible interference the large SFN's were broken up into smaller SFN's in some provinces.

ANNEXURE B

No.	MUX	DTT	TX-Name	Freq. (MHz)	CH	ERP (kW)	Longitude	Latitude	Province	Pol.	SFN Id	CH	Freq. (MHz)
1	2	DVB-T2	QUEENSTOWN	586	35	58	026°47'05.000"	-31°43'56.000"	EC	H	EC2	35	586
2	2	DVB-T2	GRAHAMSTOWN	586	35	65	026°42'31.000"	-33°17'15.000"	EC	H	EC2	35	586
3	2	DVB-T2	UMIATA	658	44	10	028°44'36.000"	-31°35'48.000"	EC	H	EC2	35	586
4	2	DVB-T2	KING WILLIAMS TOWN	658	44	18.02	027°15'36.000"	-32°40'44.000"	EC	H	EC2	35	586
5	2	DVB-T2	BUTTERWORTH	658	44	10	028°12'25.000"	-32°16'35.000"	EC	H	EC2	35	586
6	2	DVB-T2	PORTST JOHNS	586	35	10	029°31'39.000"	-31°56'39.000"	EC	H	EC2	35	586
7	2	DVB-T2	ALIWAL NORTH	586	35	50	026°34'00.000"	-30°47'05.000"	EC	H	EC2	35	586
8	2	DVB-T2	SOURBERG	586	35	40	025°34'29.000"	-33°14'55.000"	EC	H	EC2	35	586
9	2	DVB-T2	MOUNT AYLIFE	490	23	50	029°23'41.000"	-30°50'11.000"	EC	H	EC2	35	586
10	2	DVB-T2	NGANGELIZWE	586	35	0.2	028°48'31.000"	-31°37'15.000"	EC	H	EC2	35	586
11	2	DVB-T2	SIERKSPRUIT	586	35	20	027°16'14.000"	-30°41'44.000"	EC	V	EC2	35	586
12	2	DVB-T2	EAST LONDON	658	44	63	027°48'58.000"	-32°56'20.000"	EC	H	EC2	35	586
13	2	DVB-T2	PORT ELIZABETH	586	35	72	025°26'29.000"	-33°56'10.000"	EC	H	EC2	35	586
14	2	DVB-T2	PORT ELIZABETH CITY	586	35	2	025°35'29.630"	-33°55'28.000"	EC	V	EC2	35	586
15	2	DVB-T2	DESPATCH	586	35	2	025°25'29.000"	-33°45'53.000"	EC	V	EC2	35	586
16	2	DVB-T2	THEUNISEN	682	47	34	026°34'50.000"	-28°11'55.000"	FS	H	FS2	25	506
17	2	DVB-T2	SUID-AND (KROONSTAD)	506	25	0.25	027°11'10.000"	-27°41'18.000"	FS	V	FS2	25	506
18	2	DVB-T2	BETHLEHEM	506	25	50	028°29'58.000"	-28°14'10.000"	FS	H	FS2	25	506
19	2	DVB-T2	SENEKAL	506	25	10	027°30'26.000"	-28°15'19.000"	FS	H	FS2	25	506
20	2	DVB-T2	LADYBRAND	506	25	10	027°22'42.000"	-29°10'18.000"	FS	H	FS2	25	506
21	2	DVB-T2	BOESMANSKOP	506	25	10	027°12'55.000"	-30°00'28.000"	FS	H	FS2	25	506
22	2	DVB-T2	KROONSTAD	506	25	50	027°11'10.000"	-27°25'16.000"	FS	H	FS2	25	506
23	2	DVB-T2	PE TRUS STEYN	506	25	0.5	028°19'06.000"	-27°30'51.000"	FS	H	FS2	25	506
24	2	DVB-T2	WITSIESHOEK	506	25	0.5	028°50'49.000"	-28°31'04.000"	FS	V	FS2	25	506
25	2	DVB-T2	BLOEMFONTEIN	506	25	100	026°13'50.000"	-29°06'13.000"	FS	H	FS2	25	506
26	2	DVB-T2	WELVERDIEND	658	44	90	027°14'55.000"	-26°26'47.000"	GP	H	GP2	44	658
27	2	DVB-T2	BEZ V ALLEY	658	44	0.5	028°05'04.000"	-26°11'41.000"	GP	V	GP2	44	658
28	2	DVB-T2	HELDERKRUIJN	658	44	20	027°51'32.000"	-26°06'05.000"	GP	V	GP2	44	658
29	2	DVB-T2	JOHANNESBURG	658	44	50	028°00'26.000"	-26°11'31.000"	GP	H	GP2	44	658
30	2	DVB-T2	MENLO PARK	658	44	0.04	028°16'09.000"	-25°46'15.000"	GP	V	GP2	44	658
31	2	DVB-T2	MONDEOR	658	44	0.5	027°59'37.000"	-26°16'54.000"	GP	V	GP2	44	658
32	2	DVB-T2	MULBARTON	658	44	0.03	028°03'56.000"	-26°17'36.000"	GP	V	GP2	44	658
33	2	DVB-T2	PRETORIA	658	44	70	027°59'03.000"	-25°41'20.000"	GP	H	GP2	44	658
34	2	DVB-T2	PRETORIA NORTH	658	44	0.25	028°10'07.000"	-25°41'25.000"	GP	V	GP2	44	658
35	2	DVB-T2	SUNNYSIDE	658	44	20	028°12'24.000"	-25°45'53.000"	GP	V	GP2	44	658
36	2	DVB-T2	LINMEYER	658	44	0.1	028°04'16.000"	-26°16'08.000"	GP	V	GP2	44	658
37	2	DVB-T2	HEIDELBERG	658	44	0.1	028°20'53.000"	-26°29'19.000"	GP	V	GP2	44	658
38	2	DVB-T2	PORT SHEPSTONE	626	40	74	030°17'17.000"	-30°44'07.000"	KN	H	KZ2	40	626
39	2	DVB-T2	DONNYBROOK	626	40	60	029°51'19.000"	-29°54'56.000"	KN	H	KZ2	40	626
40	2	DVB-T2	NEWCASTLE	626	40	1	029°57'12.000"	-27°43'07.000"	KN	V	KZ2	40	626
41	2	DVB-T2	VRYHEID	626	40	10	030°47'38.000"	-27°44'27.000"	KN	H	KZ2	40	626
42	2	DVB-T2	GLENCOE	626	40	50	029°56'51.000"	-28°09'04.000"	KN	H	KZ2	40	626
43	2	DVB-T2	LADYSMITH	626	40	1	029°47'18.600"	-28°35'23.000"	KN	V	KZ2	40	626
44	2	DVB-T2	ESHOWE	626	40	63	031°17'57.000"	-28°51'29.000"	KN	H	KZ2	40	626
45	2	DVB-T2	UBONBO	626	40	50	032°04'52.000"	-27°33'42.000"	KN	H	KZ2	40	626
46	2	DVB-T2	KOKSTAD	626	40	0.4	029°29'24.000"	-30°56'42.000"	KN	V	KZ2	40	626
47	2	DVB-T2	PONGOLA	626	40	1.5	031°39'00.000"	-27°31'34.000"	KN	V	KZ2	40	626
48	2	DVB-T2	EMPANGENI	626	40	0.25	031°55'31.000"	-28°44'38.000"	KN	V	KZ2	40	626
49	2	DVB-T2	GREY TOWN	626	40	10	030°32'10.000"	-29°00'46.000"	KN	H	KZ2	40	626
50	2	DVB-T2	MATAPIELE	682	47	10	028°49'19.000"	-30°23'45.000"	KN	H	KZ2	40	626

No.	MUX	DTT	TX-Name	Freq. (MHz)	CH	ERP (kW)	Longitude	Latitude	Province	Pol	SFN Id	CH	Freq. (MHz)
51	2	DVB-T2	MOOI RIVIER	626	40	10	029°52'04.000"	-29°11'07.000"	KN	H	KZ2	40	626
52	2	DVB-T2	NONGOMA	626	40	10	031°39'27.000"	-27°54'18.000"	KN	H	KZ2	40	626
53	2	DVB-T2	PIETERMARITZBURG	626	40	20	030°19'49.000"	-29°34'47.000"	KN	V	KZ2	40	626
54	2	DVB-T2	DURBAN	626	40	100	030°43'00.000"	-29°46'11.000"	KN	H	KZ2	40	626
55	2	DVB-T2	VERULAM	626	40	0.01	031°02'19.000"	-29°38'25.000"	KN	V	KZ2	40	626
56	2	DVB-T2	OVERPORT	626	40	26	030°59'44.000"	-29°50'12.000"	KN	V	KZ2	40	626
57	2	DVB-T2	IHE BLUFF	626	40	2.5	031°00'44.060"	-29°54'40.880"	KN	V	KZ2	40	626
58	2	DVB-T2	THABAZIMBI	570	33	67	027°36'51.000"	-24°27'59.000"	L	H	LP2A	33	570
59	2	DVB-T2	LOUIS TRICHARDI	546	30	23	029°45'26.000"	-23°00'02.000"	L	V	LP2B	30	546
60	2	DVB-T2	TZANEEN	546	30	80	030°00'17.000"	-23°47'08.000"	L	H	LP2B	30	546
61	2	DVB-T2	SIBASA	546	30	16	030°26'54.000"	-22°56'57.000"	L	V	LP2B	30	546
62	2	DVB-T2	POTGIETSRUS	546	30	62	029°14'10.000"	-24°09'24.000"	L	H	LP2B	30	546
63	2	DVB-T2	HOEDSPRUIT	554	31	10	030°52'08.000"	-24°32'30.000"	L	H	MP2	554	31
64	2	DVB-T2	VOLKSRUST	642	42	15	029°52'14.630"	-27°18'36.000"	MP	H	MP2	554	31
65	2	DVB-T2	PIET RETIEF	554	31	76	030°41'03.000"	-27°01'11.000"	MP	H	MP2	554	31
66	2	DVB-T2	DAVEL	522	27	50	029°37'26.000"	-26°27'30.000"	MP	H	MP2	554	31
67	2	DVB-T2	SABIE	554	31	0.1	030°45'34.000"	-25°07'44.000"	MP	V	MP2	554	31
68	2	DVB-T2	STANDERTON	554	31	0.25	029°12'51.000"	-26°57'37.000"	MP	V	MP2	554	31
69	2	DVB-T2	CAROLINA	554	31	10	030°37'57.000"	-26°10'37.000"	MP	H	MP2	554	31
70	2	DVB-T2	NELSPRUIT	554	31	76	030°46'35.000"	-25°30'55.000"	MP	H	MP2	554	31
71	2	DVB-T2	MIDDELBURG	554	31	50	029°23'24.000"	-25°49'04.000"	MP	H	MP2	554	31
72	2	DVB-T2	KURUMAN HILLS	554	31	80	023°33'38.000"	-27°53'13.000"	NC	H	NC2A	554	31
73	2	DVB-T2	ALEXANDER BAY	554	31	0.1	016°29'49.000"	-28°36'32.000"	NC	V	NC2A	554	31
74	2	DVB-T2	KIMBERLEY	506	25	68	024°54'19.000"	-28°51'14.000"	NC	H	F82	506	25
75	2	DVB-T2	CHRISTIANA	674	46	10	024°55'50.000"	-27°53'03.000"	NW	H	NW2	674	46
76	2	DVB-T2	ZEERUST	674	46	63	026°02'51.000"	-25°51'37.000"	NW	H	NW2	674	46
77	2	DVB-T2	SCHWEIZER RENEKE	674	46	100	025°13'07.000"	-27°08'13.000"	NW	H	NW2	674	46
78	2	DVB-T2	PIET PLESSIS	674	46	10	024°49'55.000"	-26°14'56.000"	NW	H	NW2	674	46
79	2	DVB-T2	RUSTENBURG	674	46	32	027°07'06.000"	-25°56'56.000"	NW	H	NW2	674	46
80	2	DVB-T2	PIKETBERG	610	38	56.1	018°44'19.000"	-32°49'09.000"	WC	H	WC2	538	29
81	2	DVB-T2	ODTSHOORN	634	41	100	022°10'02.000"	-33°40'16.000"	WC	H	WC2	538	29
82	2	DVB-T2	VILLIERSDORP	634	41	60	019°30'25.000"	-33°58'09.000"	WC	H	WC2	538	29
83	2	DVB-T2	BEAUFORT WEST	538	29	60	022°30'25.000"	-32°15'29.000"	WC	H	WC2	538	29
84	2	DVB-T2	GEORGE	538	29	34	022°27'04.000"	-33°55'38.000"	WC	H	WC2	538	29
85	2	DVB-T2	PLETTENBERG BAY	538	29	0.125	023°22'25.000"	-34°03'34.000"	WC	V	WC2	538	29
86	2	DVB-T2	HERMANUS	538	29	0.603	019°13'18.000"	-34°24'47.000"	WC	V	WC2	538	29
87	2	DVB-T2	KNYSNA	538	29	0.501	023°02'31.000"	-34°04'17.000"	WC	V	WC2	538	29
88	2	DVB-T2	FRANSHOEK	538	29	2	019°04'26.000"	-33°54'26.000"	WC	V	WC2	538	29
89	2	DVB-T2	TYGERBERG	538	29	50	018°55'46.000"	-33°52'29.000"	WC	V	WC2	538	29
90	2	DVB-T2	AURORA	538	29	0.25	018°38'29.000"	-33°49'39.000"	WC	V	WC2	538	29
91	2	DVB-T2	CAPE TOWN	538	29	50	018°23'15.000"	-34°03'15.000"	WC	H	WC2	538	29
92	2	DVB-T2	CLIFTON	538	29	0.1	018°22'37.000"	-33°56'30.000"	WC	H	WC2	538	29
93	2	DVB-T2	FISHOEK	538	29	0.1	018°26'12.000"	-34°08'59.000"	WC	V	WC2	538	29
94	2	DVB-T2	GRABOUW	538	29	1	018°58'03.000"	-34°06'05.000"	WC	V	WC2	538	29
95	2	DVB-T2	HOUT BAY	538	29	4	018°20'56.000"	-34°00'44.000"	WC	V	WC2	538	29
96	2	DVB-T2	PAARL	538	29	20	018°56'23.000"	-33°42'51.000"	WC	V	WC2	538	29
97	2	DVB-T2	SEA POINT	538	29	0.4	018°23'51.000"	-33°54'33.000"	WC	V	WC2	538	29
98	2	DVB-T2	SIMONSTOWN	538	29	2	018°23'37.000"	-34°11'54.000"	WC	V	WC2	538	29
99	2	DVB-T2	STELLENBOSCH	538	29	0.8	018°52'10.000"	-33°54'59.000"	WC	V	WC2	538	29
100	2	DVB-T2	TABLE MOUNTAIN	538	29	0.6	018°24'13.000"	-33°57'25.000"	WC	V	WC2	538	29

Note 1: Freq (MHz) and CH are the frequency and associated channel number at which the service shall be implemented in order to ensure that the IMT 700 and IMT 800 frequencies in order to clear the Frequency Band after analogue switch-off.

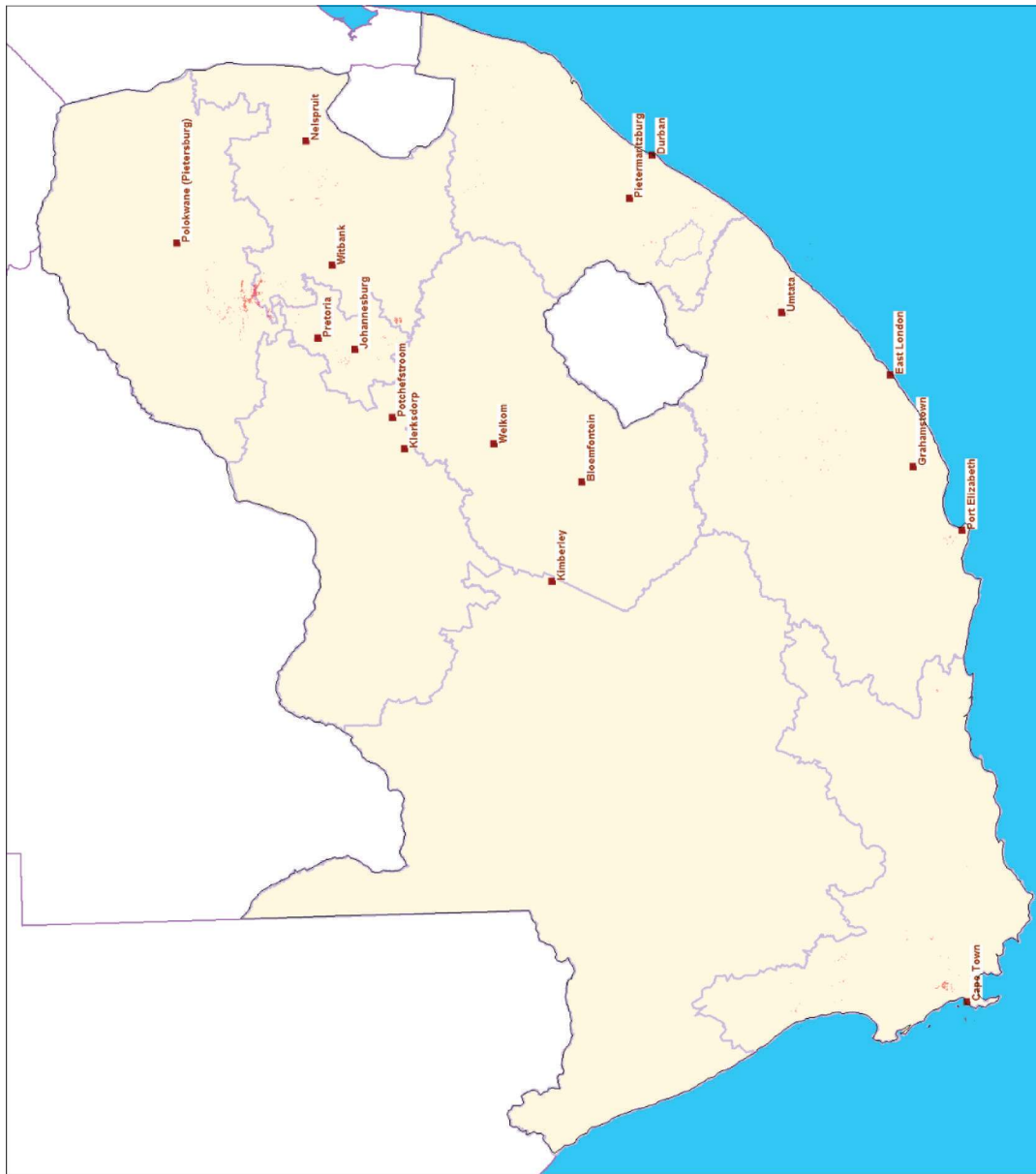
Note 2: No DTT assignments are above 694 MHz.

Note 3: Final Frequency and the associated final channel number is the frequency at which the station will operate in the provincial SFN network.

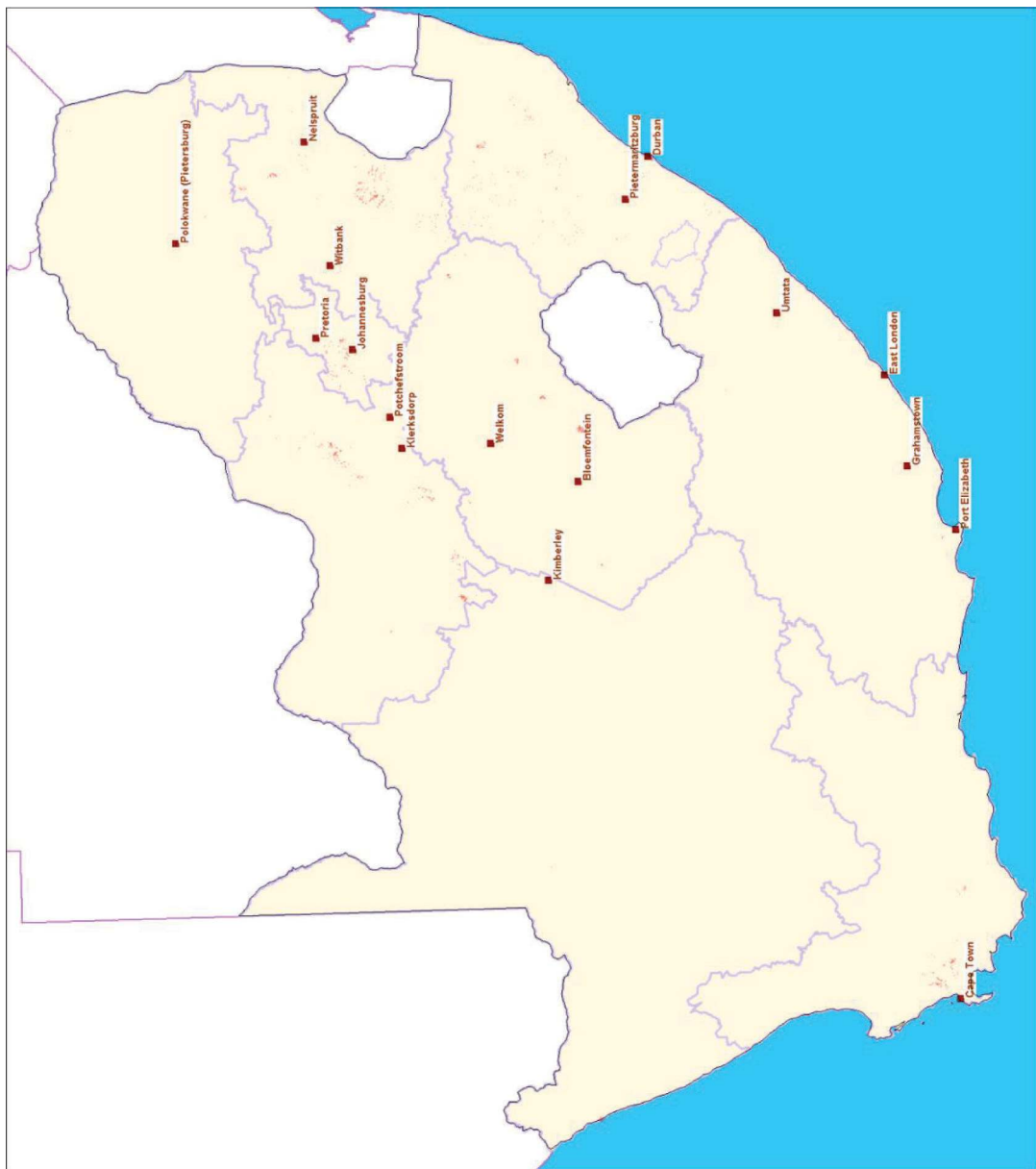
Note 4: In order to create a plan with the least possible interference the large SFN's were broken up into smaller SFN's in some provinces.

ANNEXURE C

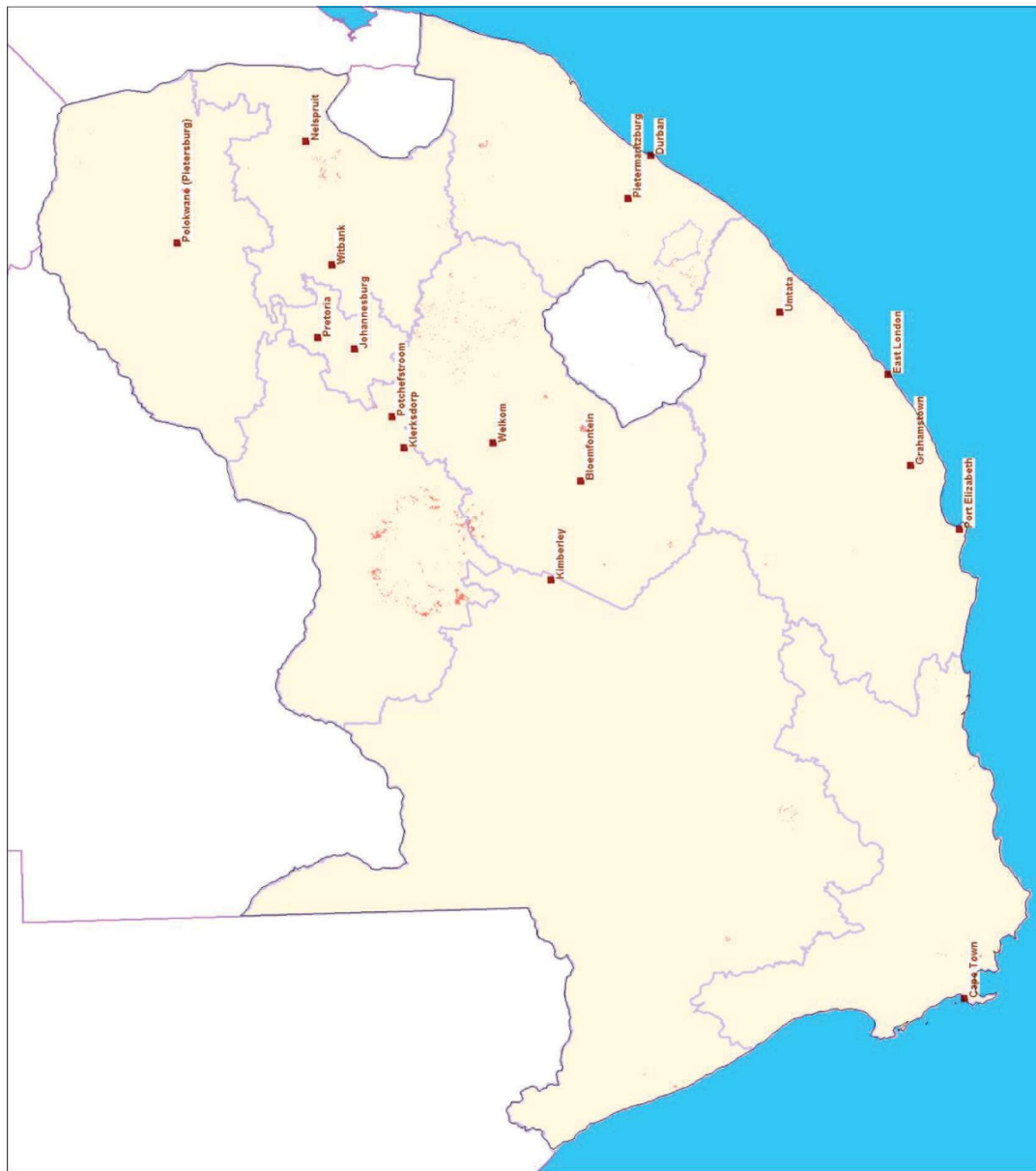
Interference Results for etv (Red areas)



Interference Results for SABC1 (Red areas)



Interference Results for SABC 2 (Red areas)



Interference Results for SABC 3 (Red areas)

