INDEPENDENT COMMUNICATIONS AUTHORITY OF SOUTH AFRICA

NOTICE 285 OF 2020

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

NOTICE OF THE RADIO FREQUENCY SPECTRUM ASSIGNMENT PLAN FOR THE FREQUENCY BAND 2500 TO 2690 MHz (IMT2600)

1. The Independent Communications Authority of South Africa ("the Authority"), hereby publishes the Radio Frequency Spectrum Assignment Plan for the frequency band 2500 to 2690 MHz in terms of section 30, 31(4), and 33 of the Electronic Communications Act (Act No. 36 of 2005), as amended, read with regulation 3 of the Radio Frequency Spectrum Regulations, 2015 and the International Mobile Telecommunications (IMT) Roadmap 2014 and the IMT Roadmap 2019.

2. This Radio Frequency Spectrum Assignment Plan supersedes any previous spectrum assignment arrangements for the same spectrum location.

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ACTING CHAIRPERSON

Radio Frequency Spectrum Assignment Plan

Rules for Services operating in the Frequency Band
2500 to 2690 MHz

(IMT2600)

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1 Definitions

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

"3GPP"	means the 3rd Generation Partnership Project (3GPP) which consists of six telecommunications standard development organisations;
"Act"	means the Electronic Communications Act, 2005 (Act No. 36 of 2005) as amended;
ECC/REC (11) 05	Means the Electronic Communications Committee within the European Conference of Postal and Telecommunications Administrations Recommendation (11) (05);
ECC/DEC 05)05	Means the Electronic Communications Committee Decision within the European Conference of Postal and Telecommunications Administrations on the harmonised utilisation of spectrum for IMT-2000/UMTS systems operating within the band 2500 - 2690 MHz
ECC REPORT 216	Means the Electronic Communications Committee Decision within the European Conference of Postal and Telecommunications Administrations report on practical guidance for TDD networks synchronisation. *Means* the
ECC Report 296	Electronic Communications Committee Decision within the European Conference of Postal and Telecommunications Administrations report on synchronization regulatory framework options in 3400-3800 MHz: a toolbox for coexistence of MFCNs in synchronised, unsynchronised and semi-synchronised operation in 3400-3800 MHz.

"FDD"	means Frequency Division Duplex;
"HCM"	means harmonised calculation method;
"IMT"	means International Mobile Telecommunications;
"IMT2600"	means IMT in the 2600MHz frequency band;
"ITU"	means the International Telecommunication Union;
"ITU-R"	means the International Telecommunication Union Radiocommunication Sector;
ITU-R M	Mean the International Telecommunication Union Radiocommunication Sector Recommendation for the Mobile Radiocommunications;
ITU-R M.1822	Means Recommendation for the Framework for services supported by IMT;
ITU-R M.2023	Means Report on Spectrum requirements for International Mobile Telecomunications-2000 (IMT-2000);
ITU-R M.2072	Means Report on World mobile telecommunication market forecast;
ITU-R M.2078	Means Report on Estimated spectrum bandwidth requirements for the future development of IMT-2000 and IMT-Advanced;
"LTE"	Means Long Term Evolution which 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;
MFCN	Means Mobile and or Fixed Communications Networks;
"NRFP"	means the National Radio Frequency Plan 2018 for South Africa;
"OFDMA"	

Means Orthogonal frequency-division multiple access, a multiuser access technique in which the subsets of subcarriers are assigned to individual users.

"PCI"	means Physical-Layer Cell Identities;
"SADC"	means the Southern African Development Community;
"TCA"	means terrain clearance angle correction factor;
"TDD"	means Time Division Duplex;
"TRP"	Total Radiated Power.
"WiMAX"	means a Worldwide Interoperability for Microwave Access, a wireless industry coalition dedicated to the advancement of IEEE 802.16 standards for broadband wireless access (BWA) networks.
"WMAN"	Means a Wireless Metropolitan Area Network: A wireless network intended to provide a signal over an area approximately the size of a metropolitan City.

2 Purpose

2.1 The purpose of this RFSAP is to state the requirements for the utilisation of the frequency band 2500 to 2690 MHz for IMT2600 in South Africa.

2.2 The Radio Frequency Spectrum Assignment Plan provides information on the requirements attached to the use of a frequency band in line

with the allocation and other information in the National Radio Frequency Plan.

2.3 This information includes 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.

2.4 The Authority has opted for a TDD channel arrangement C3 from the Recommendation ITU-R M.1034-6 to increase the usable bandwidth of IMT2600 to 190 MHz.

2.5 Moreover, the increased bandwidth will allow the prospective incumbents to realise the capabilities of IMT2020 systems which require the bandwidth ranges of 80 to 100 MHz.

2.6 The ITU states that IMT systems 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. The ITU is the internationally recognised entity that has sole responsibility to define and to recommend the standards and frequency arrangements for IMT systems.

3 General

3.1 The naming for IMT was developed by the ITU in ITU-R Resolution 56-1. IMT is the root name that encompasses all IMT 2000 (including enhancement) and IMT Advanced (including enhancement)[1] and IMT 2020 collectively.

3.2 Key features of IMT are:

- 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;
- compatibility of services within IMT and with fixed networks;
- capability of interworking with other radio access systems;
- high quality mobile services;
- user equipment suitable for worldwide use;
- user-friendly applications, services and equipment;
- worldwide roaming capability; and
- enhanced peak data rates to support advanced services and applications.

3.3 Key capabilities of IMT2020:

(a) Peak data rate: Maximum achievable data rate under ideal conditions per user/device (in Gbit/s);

[1] IMT 2000 and IMT Advance are generations of IMT progressively leading to IMT2020. The relevance is to ensure that the document complies with the ITU Radio Regulations in force in accordance to ITU-R Resolution 56-1.

(b) User experienced data rate: Achievable data rate that is available ubiquitously[2] across the coverage area to a mobile user/device (in Mbit/s or Gbit/s);

(c) Latency: The contribution by the radio network to the time from when the source sends a packet to when the destination receives the packet (in ms);

(d) Mobility: Maximum speed at which a defined QoS and seamless transfer between radio nodes which may belong to different layers and/or radio access technologies (multi-layer/-RAT) can be achieved (in km/h);

(e) Connection density: Total number of connected and/or accessible devices per unit area (per km^2).

(f) Energy efficiency: Energy efficiency has two aspects-

(i) on the network side, energy efficiency refers to the quantity of information bits transmitted to/ received from users, per unit of energy consumption of the radio access network (RAN) (in bit/Joule);

(ii) on the device side, energy efficiency refers to quantity of information bits per unit of energy consumption of the communication module (in bit/Joule).

(g) Spectrum efficiency: Average data throughput per unit of spectrum resource and per cell[3] (bit/s/Hz); and

[2] The term "ubiquitous" is related to the considered target coverage area and is not intended to relate to an entire region or country.

[3] The radio coverage area over which a mobile terminal can maintain a connection with one or more units of radio equipment located within that area. For an individual base station, this is the radio coverage area of the base station or of a subsystem (e.g. sector antenna).

(h) Area traffic capacity: Total traffic throughput served per geographic area (in Mbit/s/m^2).

3.4 Technical characteristics of equipment used in IMT2600 systems must conform to all applicable South African standards, international standards, the ITU and its radio regulations as agreed and adopted by South Africa.

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

3.6 The equipment used must be certified under South African law and regulations.

3.7 The allocation of this frequency band and the information in this RFSAP are subject to review.

3.8 Frequency band assigned for IMT2600 include frequency range from 2500-2690 MHz.

3.9 The use of this band will be for IMT-TDD to align with the Final Radio Frequency Migration Plan 2019 published in Government Gazette 42337 (Notice 166 of 2019).

(7) The technologies which can provide IMT2600 services include, but are not limited to:

- LTE,
- LTE Advanced,
- HSPA+, and
- WiMAX.

3.10 Typical technical and operational characteristics of IMT systems as identified as by the ITU including reports and recommendations from the CEPT ECC are described in the following documents:

3.10.1. Recommendation ITU-R M.2012-1 (02/2014): Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications-Advanced (IMT Advanced).

3.10.2. Report ITU-R M.2146 Coexistence between IMT-2000 CDMA-DS and IMT-2000 OFDMA TDD WMAN in the 2 500-2 690 MHz band operating in adjacent bands in the same area.

3.10.3. Report ITU-R 2113-1: Sharing studies in the 2 500-2 690 MHz band between IMT-2000 and fixed broadband wireless access systems including nomadic applications in the same geographical area.

3.10.4. Report ITU-R M.2045-0: Mitigating techniques to address coexistence between IMT-2000-time division duplex and frequency division duplex radio interface technologies within the frequency range 2 500-2 690 MHz operating in adjacent bands and in the same geographical area.

3.10.5. Report ITU-R M.2074: Report on Radio Aspects for the terrestrial component of IMT-2000 and systems beyond IMT-2000.

3.10.6. Report ITU-R M.2041: Sharing and adjacent band compatibility in the 2.5 GHz band between the terrestrial and satellite components of IMT-2000.

3.10.7. Recommendation ITU-R M.1645 Framework and overall objectives of the future development of IMT-2000 and systems beyond IMT-2000.

3.10.8. Recommendation ITU-R M.1036-6: Frequency arrangements for implementation of the terrestrial component of International Mobile Telecommunications (IMT) in the bands identified for IMT in the Radio Regulations (RR).

3.10.9. Recommendation ECC/REC (11) 05: The Electronic Communications Committee Decision within the European Conference of Postal and Telecommunications Administrations on the harmonised utilisation of spectrum for IMT-2000/UMTS systems operating within the band 2500 - 2690 MHz;

3.10.10. Report ECC/DEC 05)05: The Electronic Communications Committee Decision within the European Conference of Postal and Telecommunications Administrations on the harmonised utilisation

of spectrum for IMT-2000/UMTS systems operating within the band 2500 - 2690 MHz; and

3.10.11. Report ECC REPORT 216: The Electronic Communications Committee Decision within the European Conference of Postal and Telecommunications Administrations report on synchronization regulatory framework options in 3400-3800 MHz: a toolbox for coexistence of MFCNs in synchronised, unsynchronised and semi-synchronised operation in 3400-3800 MHz.

4 Channelling Plan

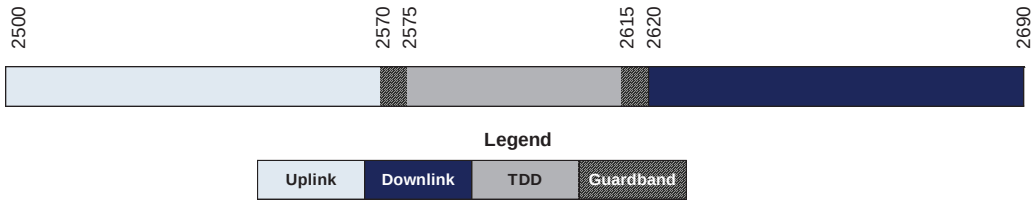
4.1 The frequency band 2500-2690MHz provides a total bandwidth of 190 MHz for the IMT service.

4.2 Channel arrangements are indicated in ITU Recommendations: Rec. ITU-R M.1036-6.

4.3 The ITU has recommended a list of channel arrangements shown below:

Frequency arrangements	Paired arrangements					Un-paired arrangements (e.g. for TDD) (MHz)
	Mobile station transmitter (MHz)	Centre gap (MHz)	Base station transmitter (MHz)	Duplex separation (MHz)	Centre gap usage	
C1	2 500-2 570	50	2 620-2 690	120	TDD	2 570-2 620
C2	2 500-2 570	50	2 620-2 690	120	FDD	2 570-2 620 FDD DL external
C3	Flexible FDD/TDD					

Option C1 is the current channel arrangement as depicted in the figure below:



Option C3 shall apply in respect to South Africa. This IMT-TDD aligns with the Final Radio Frequency Migration Plan 2019 published in Government Gazette 42829 (Notice 600 of 2019) and to increase the usable bandwidth of IMT2600.

South Africa is to implement the channel arrangement as illustrated below;

5 Requirements for usage of radio frequency spectrum

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

5.2 The use of the band is limited to IMT services.

5.3 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.

5.4 The allocation of spectrum and shared services within these bands are found in the NRFP and an extract of NRFP is shown in Appendix A

5.5 5.1 Maximum radiated power

5.5.1 Base Station transmissions should not exceed 61dBm/5MHz EIRP.

5.5.2 Mobile Station transmissions should not exceed 35 dBm/5 MHz (e.i.r.p.) and 31 dBm/5 MHz (TRP[4])

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

5.5.4 Where appropriate subscriber terminal station should comply with the technical specification outlined under "3GPP TS 36.521-1" or latest version.

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

5.7 Criteria and guidelines for interference mitigation are described in Appendix D.

6 Implementation

6.1 No new assignments for IMT2600 in the band 2500 – 2690 MHz shall be approved unless they comply with this RFSAP.

7 Co-ordination Requirements

7.1 Use of these frequency bands require coordination with the neighbouring countries within the coordination zones of 0 kilometres in case of LTE-

[4] TRP is defined as the integral of the power radiated by an antenna array system in different directions over the entire radiation sphere. TRP is equal to the total conducted power input into the antenna array system less any losses in the antenna array system.

to-LTE and 6 kilometres in case of Synchronised TDD operations with respect to other technologies in other neighbouring country.

7.2 The Trigger values at a height of 3 m above ground between TDD systems shall be 65 dBµV/m/5 MHz@0 km and 49 dBµV/m/5 MHz@6 km

7.3 The coordination distance is continuously being reviewed and may be updated from time to time.

7.4 The following field strength thresholds have to be assured based on ECC/REC 11(05) for 2500-2690 MHz frequency band. Operator-to-operator coordination may be necessary to avoid interference.

7.4.1 In general stations and systems may be used without coordination with a neighbouring country if the mean field strength produced by the cell (all transmitters within the sector) does not exceed the value of 30 dBµV/m/5 MHz at an antenna height of 3m above ground at the borderline between countries, and does not exceed a value of 49 dBµV/m/5 MHz@6 km at an antenna height of 3m above ground at a distance of 6 km inside the neighbouring country.

7.4.2 In the case that LTE is deployed both sides of the border the field strength levels can be increased to 59 dBµV/m/5MHz and 41 dBµV/m/5MHz at 6 km.

7.4.3 Synchronisation should be achieved including that of the field strength levels if TDD is in operation across both sides of a border.

7.5 For field strength, calculations should be made according to Appendix B. In cases of other frequency block sizes 10*log (frequency block size/5MHz) should be added to the field strength values e.g.:

BW (MHz)	Field strength level at 3 m height (general case)	Field strength level at 3 m height (LTE case)
5 MHz	55.0 dBμV/m/5MHz @0km	59.0 dBμV/m/5MHz @0km
	29.0 dBμV/m/5MHz @9km	41.0 dBμV/m/5MHz @6km
10 MHz	58.0 dBμV/m/10MHz @0km	62.0 dBμV/m/10MHz @0km
	32.0 dBμV/m/10MHz @9km	44.0 dBμV/m/10MHz @6km
15 MHz	59.8 dBμV/m/15MHz @0km	63.8 dBμV/m/15MHz @0km
	33.8 dBμV/m/15MHz @9km	45.8 dBμV/m/15MHz @6km
20 MHz	61.0 dBμV/m/20MHz @0km	65.0 dBμV/m/20MHz @0km
	35.0 dBμV/m/20MHz @9km	47.0 dBμV/m/20MHz @6km

7.6 If neighbouring administrations wish to agree on frequency coordination based on preferential frequencies, while ensuring a fair treatment of different operators within a country the Authority will add the following within mutual agreements:

7.6.1 Stations of IMT systems may be operated without coordination if the mean field strength produced by the cell (all transmitters within the sector) does not exceed the value of 65 dBmV/m/5 MHz at 10% time, 50% of locations at 3 metres above ground level at the borderline

7.6.2 Technical analysis must be conducted by the Licensees before an assignment is made to individual base stations according to Appendix B taken from ECC/REC (11) 05 and must be notified to the Authority on a quarterly basis.

7.6.3 Specific information regarding coordination may be found in Appendix C, taken from Cross-Border Frequency Coordination: Harmonised Calculation Method for Africa (HCM4A) Agreement.

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

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

8 Assignment

8.1 Extended Approach

8.1.1 The assignment of frequencies will take place in accordance with the Extended Application Procedures prescribed in terms of the Radio Frequency Spectrum Regulations of 2015, as amended.

8.1.2 The radio frequency spectrum licence of the incumbent has been amended for its re-assignment in the 2575-2595 MHz frequency band.

8.1.3 An Invitation to Apply will be published for assignments in the 2500 to 2690 MHz frequency band in terms of regulation 6 and 7 of the Radio Frequency Spectrum Regulations, 2015.

9 Revocation

9.1 Existing radio frequency spectrum licences for the use of the band are to be amended or revoked as per the frequency migration timetable published in the Radio Frequency Migration Plan.

10 Radio Frequency Migration

10.1 There is currently a single incumbent in the band between 2575 MHz to 2595 MHz.

10.2 Given the fact that TDD mode does not require a guard band, and in order to avoid interference between TDD networks operating in adjacent frequency carriers, radio transmissions of adjacent TDD networks should be synchronised and with the uplink and downlink frames aligned in time.

10.3 The incumbent may retain the assignment in the frequency band and must perform synchronisation with other licensees operating in TDD mode in order to avoid interference between TDD networks operating in adjacent frequency carriers, and accordance with the Network

synchronization for the frequency band 2500 to 2690 MHz as defined in Appendix E.

11 Radio Frequency Licence Amendment

The incumbent's Radio Frequency Spectrum Licence shall be amended in this Radio Frequency Spectrum Assignment Plan in order to implement TDD Synchronisation between and amongst when future licensees are licensed.

12 Commencement

12.1 This Radio Frequency Assignment Plan will come into effect upon publication in the Government Gazette.

Appendix A National Radio Frequency Plan

ITU Region 1 allocations and footnotes	South African allocations and footnotes	Typical Applications	Notes and Comments
5.150 5.399 5.401 5.402	5.150 5.399 5.402		
2 500-2 520 MHz FIXED 5.410 MOBILE except aeronautical mobile 5.384A 5.412	**2 500-2 520 MHz** MOBILE except aeronautical mobile 5.384A NF9	IMT2600 MTX (2500 – 2570 MHz)	Paired with 2620 – 2690 MHz International Mobile Telecommunication Roadmap (GG No.38213) 14 November 2014. Radio Frequency Assignment Plan (GG N. 38640) as amended 30 March 2015 Recommendation ITU-R M.1036
2 520-2 655 MHz FIXED 5.410 MOBILE except aeronautical mobile 5.384A BROADCASTING-SATELLITE 5.413 5.416 5.339 5.412 5.418B 5.418C	**2 520-2 655 MHz** MOBILE except aeronautical mobile 5.384A NF9 5.339	IMT2600 MTX (2500 – 2570 MHz) IMT2600 TDD (2570 – 2620 MHz) IMT2600 BTX (2620 – 2690 MHz) IMT (2500-2690 MHz)	Paired with 2620 – 2690 MHz Paired with 2500 – 2570 MHz International Mobile Telecommunication Roadmap (GG No.38213) 14 November 2014. Radio Frequency Assignment Plan (GG N. 38640) as amended 30 March 2015 Recommendation ITU-R M.1036 The band 2 500-2 690 MHz is also used for BFWA in some SADC countries

ITU Region 1 allocations and footnotes	South African allocations and footnotes	Typical Applications	Notes and Comments
2 655-2 670 MHz FIXED 5.410 MOBILE except aeronautical mobile 5.384A BROADCASTING-SATELLITE 5.208B 5.413 5.416 Earth exploration-satellite (passive) Radio astronomy Space research (passive) 5.149 5.412	**2 655-2 670 MHz** MOBILE except aeronautical mobile 5.384A NF9 Radio astronomy 5.149	IMT2600 BTX (2620 – 2690 MHz). IMT (2500-2690 MHz)	Paired with MTX 2500 – 2570 MHz International Mobile Telecommunication Roadmap (GG No.38213) 14 November 2014. Radio Frequency Assignment Plan (GG N. 38640) as amended 30 March 2015. Recommendation ITU-R M.1036
2 670-2 690 MHz FIXED 5.410 MOBILE except aeronautical mobile 5.384A Earth exploration-satellite (passive) Radio astronomy Space research (passive) 5.149 5.412	**2 670-2 690 MHz** MOBILE except aeronautical mobile 5.384A Radio astronomy 5.149	IMT2600 MTX (2620 – 2690 MHz)	Paired with 2500 – 2570 MHz International Mobile Telecommunication Roadmap (GG No.38213) 14 November 2014. Radio Frequency Assignment Plan (GG N. 38640) as amended 30 March 2015. Recommendation ITU-R M.1036
2 690-2 700 MHz	**2 690-2 700 MHz** RADIO ASTRONOMY		

Appendix B Propagation model

PROPAGATION MODEL

The following methods are proposed for assessment of anticipated interference inside neighbouring country based on established trigger values. Due to the complexity of radiowave propagation nature, different methods are proposed to be considered by administrations and are included here for guidance purposes only.

It should be noted that the following methods provide theoretical predictions based on available terrain knowledge. It is practically impossible to recreate these methods with measurement procedures in the field. Therefore, only some approximation of measurements could be used to check compliance with those methods based on practical measurement procedures. The details of such approximation are not included in this recommendation and should be negotiated between countries based on their radio monitoring practices.

1. PATH SPECIFIC MODEL

Where appropriate detailed terrain data is available, the propagation model for interference field strength prediction is the latest version of Recommendation ITU-R P.452, For the relevant transmitting terminal, predictions of path loss would be made at x km steps along radials of y km at z degree intervals. The values for those receiver locations within the neighbouring country would be used to construct a histogram of path loss – and if more than 10% of predicted values exceed the threshold the station should be required to be coordinated.

Values for x, y, z and path specific field strength levels are to be agreed between the administrations concerned.

2. SITE GENERAL MODEL

If it is not desirable to utilise detailed terrain height data for the propagation modelling in the border area, the basic model to be used to trigger coordination between administrations and to decide, if co-ordination is necessary, is Recommendation ITU-R P.1546, “Method for point to area predictions for terrestrial services in the frequency range 30 to 3000 MHz”. This model is to be employed for 50% locations, 10% time and using a receiver height of 3m.

For specific reception areas where terrain roughness adjustments for improved accuracy of field strength prediction are needed, administrations may use correction factors according to terrain irregularity and/or an averaged value of the TCA parameter in order to describe the roughness of the area on and around the coordination line.

Administrations and/or operators concerned may agree to deviate from the model by mutual consent[5].

3e.g. as used by members of the HCM-Agreement

3. AREA CALCULATIONS

In the case where greater accuracy is required, administrations and operators may use the area calculation below.

For calculations, all the pixels of a given geographical area to be agreed between the administrations concerned in a neighbouring country are taken into consideration.

For the relevant base station, predictions of path loss should be made for all the pixels of a given geographical area from a base station and at a receiver antenna height of 3m above ground.

For evaluation,

[5] Such as in use by members of the HCM4A - Agreement

only 10 percent of the number of geographical areas between the borderline (including also the borderline) and the 6 km line itself inside the neighbouring country may be interfered by higher field strength than the trigger field strength value given for the borderline at a height of 3 m above ground;

only 10 percent of the number of geographical areas between the 6 km (including also 6km line) and 12 km line inside the neighbouring country may be interfered by higher field strength than the trigger field strength value given for the 6 km line at a height of 3 m above ground. It is recommended that during area calculations not only detailed terrain data but also clutter data be considered. Use of correction factors for clutter is crucial where the border area is 'open' or 'quasi-open' from the point of view of clutter or where the interfering base station is just a few kilometres from a borderline.

If the distance between a base station and a terrain point of a borderline is closer than or equal to 1 km, free space propagation model needs to be applied. Furthermore, if there is no terrain obstacle within the 1st Fresnel zone, also the free space propagation model should be applied.

If clutter data is not available, it is proposed to extend the usage of free space propagation model to a few kilometres, depending on the clutter situation in border areas.

For area type interference calculations, propagation models with path specific terrain correction factors are recommended (e.g. Recommendation ITU–R P.1546 with the terrain clearance angle correction factor TCA, HCM4A method with the terrain clearance angle correction factor or Recommendation ITU–R P.1812).

As to correction factors for clutters 'open area' and 'quasi-open area', 20 dB and 15 dB should be used respectively. Recommendation ITU–R P.1406 should be used if a finer selection of clutter is required.

It must be noted that terrain irregularity factor Δh is not recommended to be used in area calculations. Administrations and/or Licensees concerned may agree to deviate from the models by mutual consent.

Appendix C Cross boarder coordination

The following is extracted from ECC/REC (11)05 as an operational example and may be adapted for the SADC-countries.

FIELD STRENGTH LEVELS FOR THE CROSS-BORDER OPERATION BETWEEN FDD MFCN SYSTEMS IN THE FREQUENCY BAND 2500-2690 MHZ

1. Stations of FDD systems with centre frequencies not aligned on both sides of the borderline or with centre frequencies aligned using preferential PCI codes given in Annex 5 may be used without coordination with a neighbouring country if the mean field strength produced by the cell (all transmitters within the sector) does not exceed the value of 65 dBµV/m/5MHz at a height of 3 m above ground at the borderline between countries and does not exceed a value of 49 dBµV/m/5MHz at a height of 3 m above ground at a distance of 6 km inside the neighbouring country.
2. Stations of MFCN FDD systems with centre frequencies aligned on both sides of the borderline using non-preferential PCI codes may be used without coordination with a neighbouring country if the mean field strength produced by the cell (all transmitters within the sector) does not exceed the value of 49 dBµV/m/5 MHz at a height of 3 m above ground at the borderline between countries.
3. It is usually not considered necessary to define preferential frequencies.
4. If administrations wish to agree on frequency coordination based on preferential frequencies, while ensuring a fair treatment of different licensees then they can do so based on mutual agreements. In this case field strength levels in *paragraph 1* above may be applicable.

FIELD STRENGTH LEVELS FOR THE CROSS-BORDER OPERATION BETWEEN TDD MFCN AND BETWEEN TDD AND FDD MFCN SYSTEMS IN THE FREQUENCY BAND 2500-2690 MHZ

1. In general, stations of MFCN systems may be operated without coordination if the mean field strength produced by the cell (all transmitters within the

sector) does not exceed the value of 30 dBµV/m/5 MHz at 3 metres above ground level at the borderline.

2. If administrations wish to agree on frequency coordination based on preferential frequencies, or MFCN TDD systems are in operation across both sides of a border and are synchronised across the border, or MFCN TDD systems are deployed as downlink only on both sides of the border, then field strength levels of 65 dBmV/m/5 MHz@0 km and 49 dBmV/m/5 MHz@6 km are to be applied.

3. If the values in 2 above are not acceptable, field strength levels should be agreed on a bi- or multilateral basis.

4. TDD operation within the bands 2500-2570 MHz and 2620-2690 MHz has not been studied with FDD operation.

5. TDD operation within these bands will only occur if countries do not adopt the channelling arrangement in ECC/DEC/ (05)05. In this case the field strength levels should be agreed on a bi- or multilateral basis.

Appendix D 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 Affected Administration. 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 [dBi]

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

m) antenna tilt [deg]

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

During the course of the coordination procedure an Administration may request additional information from the other Administration. If no reply is received by the Requesting Administration within 30 days, it may send a reminder to the Affected Administration. Failure to respond within 30 days, following communication of the reminder, shall be deemed as 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 mutual consent in writing.

Appendix E - Network synchronization for the frequency band 2500 to 2690 MHz.

The Radio Frequency Spectrum Assignment Plan for the frequency band 2500 to 2690 MHz. The frequency band 2500-2690MHz provides a total bandwidth of 190 MHz for the IMT service. South Africa has decided to implement International Mobile Telecommunications (IMT) Time Division Duplex (TDD) in the Final Radio Frequency Migration Plan 2019 published in Government Gazette 42829 (Notice 600 of 2019) and to increase the usable bandwidth of IMT2600.

The frequency band 2500 to 2690 is to be assigned to more than one licensee. In order to ensure that more than one licensee is able to operate their networks in TDD mode, in the same geographic area, in a coordinated manner, it is important that these networks are synchronised in order to avoid interference.

In order to avoid interreference where there is co-existence of TDD Networks and to avoid all Base Stations to Base Station as well as User Equipment to User Equipment interferences it is important to synchronise the base stations so that transmit and receive roughly at the same time. This to say that operation is synchronised in such a way that there is no simultaneous uplink and downlink occurring between any pairs of cells which may interfere with each other in the same band.

In order to avoid interference between TDD networks operating in adjacent frequency carriers, the radio transmissions of adjacent TDD networks shall be synchronised with the uplink and downlink frames aligned in time. Such synchronisation of networks is very important due to the fact that this is the best way to avoid interference between networks and ensure efficient use of spectrum resources by avoiding inter-operator guard bands and additional base stations filtering.

Network synchronisation has been successfully implemented in IMT Advance TDD networks ensuring efficient use of the spectrum resource by avoiding the need for guard bands between licensee's assignments. Similarly, inter-licensee's synchronisation and time alignment of uplink and downlink

transmissions (slot and frame synchronisation) are also necessary for efficient deployment of IMT2020 New Radio networks in unpaired band assignments. This RFSAP therefore, is aimed at facilitating synchronised operation among IMT Advance and IMT2020 networks operating in adjacent frequency blocks to make the best use of the valuable spectrum resource.

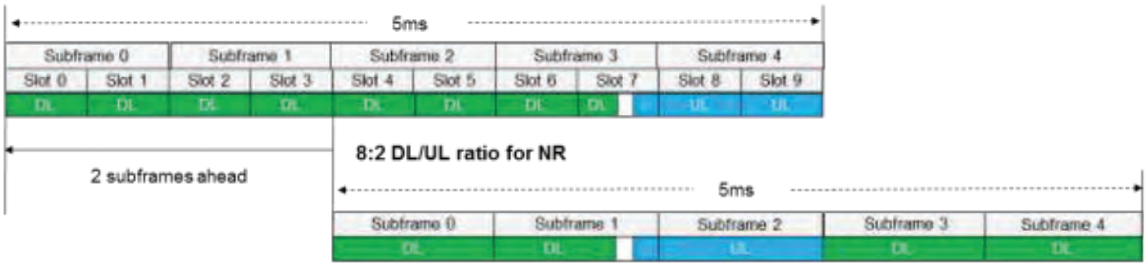
The Authority recommends to licensees that two (2) transmission frame structures for IMT-Advance and IMT2020 macro-cell networks operating in unpaired New Radio Frequency Bands, taking into account technology advances and system design requirements:

1. Scenario 1: IMT2020 only, no legacy IMT Advance TDD networks: 2.5ms periodicity frame structure (DDDSU) for high system capacity and efficiency (Figure 1), and 2.5ms dual periodicity frame structure (DDDSU+DDSUU) for prioritisation of UL transmission (Figure 2).
2. Scenario 2: IMT2020 co-existence with IMT Advance TDD network: 5ms periodicity frame structure compatible with LTE TDD network (DDDDDDDSUU) (Figure 3). However, this is accompanied with twice the latency of Scenario 1.

Figure 1: 2.5ms periodicity frame structure

Figure 2: 2.5ms dual periodicity frame structure

Figure 3: 5ms periodicity frame structure



TD-LTE frame configuration 2

In South Africa, there are legacy IMT Advance TDD networks in the frequency band IMT2600 as illustrated in the Scenario 2. The Authority therefore recommends that licences, in designing their network consider a 5ms periodicity frame structure for IMT2020 network (DDDDDDDSUU,8:2), and 5ms periodicity frame structure for IMT Advance network (DSUDD,3:1).

Licensees are encouraged to agree on the preferred synchronisation method. The Authority will step in, order to mediate in the case where there is no consensus amongst licensee.

End / / /