Vodacom's written submission in response to ICASA's draft IMT roadmap

[Government Gazette Number: 42021, Notice Number 683 of 9 November 2018]

1 INTRODUCTION

Vodacom (Pty) Ltd ("Vodacom") welcomes the opportunity to make a written representation on the "Notice Regarding the Draft IMT Roadmap for Consultation" (the draft IMT Roadmap"), as published by ICASA ("the Authority") in Government Gazette No. 42021, Notice Number 683 of 9 November 2018.

Vodacom commends the Authority on facilitating a number of pre-commercial 5G trials and demonstrations during the course of 2018. These trials demonstrated the promise of IMT2020 as well the urgent need to assign sufficient spectrum to realise the IMT2020 vision in South Africa.

It remains important that the spectrum allocations for IMT2020 be globally harmonised as far as possible to bring down the cost of the 5G equipment ecosystem through economies of scale and to facilitate roaming and cross-border coordination. Therefore, the outcomes of ITU WRC-19 in Egypt, where IMT2020 spectrum bands are expected to be allocated, are ultimately going to shape the future development of 5G.

While recognising the studies being done in ITU-R WP 5D as well as the work done in the National Preparatory Working Group ("NPWG"), Vodacom commends the Authority's initiative in consulting industry on South Africa's IMT Roadmap in the run up to WRC-19.

Vodacom notes that the draft IMT Roadmap references the draft Frequency Migration Plan[1] ("FMP") as well as the 2013[2] and 2018[3] National Radio Frequency Spectrum Plans ("NRFP"). Vodacom understands that:

- the 2018 draft version of the FMP has no legal standing;
- that 2013 NRFP has been repealed and replaced by the 2018 NRFP; and
- that 2018 NRFP will have to be repealed and replaced with a new NRFP that reflects the outcomes of WRC-19 after the conclusion of the treaty.

Furthermore, future South African IMT Spectrum assignments will have to be consistent with the WRC-19 treaty as well as the subsequent update of the NRFP.

[1] Independent Communications Authority of South Africa, notice number 494 of 2018, Government Gazette No. 41854 published on24 August 2018

[2] Independent Communication Authority of South Africa, notice number 352 of 2013, Government Gazette Number 36334 published on 3 April 2013

[3] Independent Communication Authority of South Africa, notice number 266 of 2018, Government Gazette Number 41650 published on 25 May 2018

Bearing in mind the ITU and National processes, Vodacom accepts that the consultation on the draft IMT Roadmap is exploratory, and that the positions taken by the Authority and respondents are provisional and subject to change based on the outcomes of WRC-19.

Vodacom trusts that the Authority will find its input a helpful contribution to the development of South Africa's vision for IMT2020.

Vodacom confirms its willingness to participate in any further consultative process, which the Authority may undertake in regard to the draft IMT Roadmap.

Vodacom's submission is comprised of two parts:

- Part A: Vodacom's response in principle on matters raised in the Draft Roadmap;
- Part B: Vodacom's specific comments on IMT and potential IMT frequency bands.

2 Part A: In Principle Comments

The draft IMT Roadmap contains some inaccuracies and references that are out of date. Errors can creep in when a document of the scope and the complexity of this draft IMT Roadmap is compiled. For the most part these errors do not result in misunderstandings. Vodacom has attempted to limit its comments on apparent errors to those that have the potential to create material misunderstanding or ambiguity.

Vodacom's in principle comments on the draft IMT Roadmap address the following themes:

- South Africa's broadband policy;
- FDD and TDD trends;
- Demand forecasts for South Africa;
- Universal service and coverage obligations; and
- Guard bands.

2.1 South Africa's Broadband Policy (Draft IMT Roadmap 2018, Section 5.3)

Vodacom supports the SA Connect Broadband Policy, and commends the Authority on recognizing the pivotal role that the assignment of High Demand Spectrum plays in enabling the extension of broadband access. South African subscribers are already experiencing the adverse consequences of delays in assigning IMT spectrum in the form of Quality of Service degradation due to spectrum related congestion. Subscribers have also missed out on the benefits that additional spectrum and investment in new technology bring.

Vodacom recognizes that the assignment of spectrum is a process that involves multiple stakeholders. Vodacom assures the Authority of its constructive participation in any process that the Authority may undertake to facilitate the expedited assignment of spectrum.

> *"If required, as part of the strategy to meet national broadband requirements, sufficient spectrum will be set aside for the creation of a national Wireless Open Access Network (WOAN). "*
>
> - SA Connect quoted in the Draft IMT Roadmap 2018, section 5.3 page 44

Vodacom notes that a national wireless-broadband open access network may be required to achieve South Africa's broadband objectives. Vodacom has expressed its support for a competitive Wireless Open Access Network ("WOAN") in its recent submissions on the Policy Direction[4] and Electronic Communications

[4] Policy Direction to the Authority on licensing of unassigned High Demand Spectrum ("HDS"), as published in the Gazette 41935 on 27 September 2018.

Amendment Bill[5]. Vodacom will not repeat its WOAN proposals in this submission. Vodacom is willing to share its submissions on the Policy Direction and Electronic Communications Amendment Bill at the Authority's request.

In addition to licensing IMT spectrum with urgency and setting aside spectrum for a WOAN, Vodacom proposes that the Authority consider the potential of commercial spectrum pooling, leasing and trading as mechanisms to facilitate spectrum sharing and, more generally the efficient use of spectrum.

2.2 FDD and TDD trends (Draft IMT Roadmap 2018, Section 5.7)

Vodacom commends the Authority for engaging stakeholders on FDD and TDD trends in the draft IMT roadmap.

While FDD channel arrangements made a lot of sense in a world where the majority of traffic was generated by largely symmetrical voice services, TDD channelling plans provide flexibility to carry data traffic characterised by uplink and downlink asymmetry more efficiently. The case for TDD band plans will become increasingly compelling as inherently asymmetric broadband traffic continues to grow.

TDD offers advantages over FDD with respect to spectrum efficiency, network performance and capacity. Furthermore, TDD facilitates the transition from 4G towards 5G networks and services. The following are some of the advantages of TDD:

- Unlike FDD, TDD supports traffic asymmetry efficiently and flexibly. Depending on the uplink and downlink resource allocation, TDD can be optimised to support applications ranging from video streaming that require lots of downlink resources, to video surveillance that requires substantial uplink resources. This is because TDD makes it possible to adjust downlink and uplink resource ratios to match actual uplink and downlink traffic requirements
- TDD uses the same spectrum for both uplink and downlink communication. The channel reciprocity inherent in TDD facilitates advanced antenna solutions. Channel reciprocity simplifies MIMO, distributed MIMO and beamforming. Similar antenna solutions for FDD would be more complicated an require high signalling overhead to obtain and use the downlink channel state information.

[5] Electronic Communications Amendment Bill as tabled in Parliament on 19 September 2018 [B 31 -2018]

- It is often easier to repurpose a single unpaired TDD spectrum block than to repurpose paired FDD spectrum blocks.

Vodacom recommends that TDD spectrum be assigned as soon as possible to enable deployment of advanced networks that use spectrum more efficiently. TDD Radio Frequency Spectrum Assignment plans should prescribe mandatory synchronisation between networks in TDD bands to reduce the guard-bands required.

Vodacom would welcome further consultation to determine what benefit there may be to changing the channelling plans of some South Africa's IMT bands from FDD to TDD. Such a consultation may consider the following factors, among others:

- **The nature of the services provided on the band.** For example, IMT900 and IMT1800 are the only IMT bands that support GSM voice. The GSM capacity requirements will dictate how long these bands will have to remain FDD.
- **The capabilities of the active mobile devices relying on an IMT band in South Africa**. When the channelling plan of a band changes, some mobile devices may no longer be able to connect to the band. Consideration should be given to minimising the impact on users in the event that a channelling plan is changed from FDD to TDD.
- **The harmonisation of the band plan for Region 1.** This is important to maintain Region 1 interoperability and to benefit from Region 1 standardised devices.
- **The availability of Region 1 devices that support the TDD channel plan under consideration.** Many FDD band plans have larger device ecosystems than their TDD counterparts. That may change in the future.
- **The level of certainty required to make significant investments in network infrastructure**.
- **The requirement to recover investments in FDD equipment.**

Vodacom notes the Authority's observations about the capabilities of current radio equipment. The state of the art in technology will continue to evolve to enable ever more efficient use of spectrum. Ideally the regulatory framework should provide the flexibility required to derive full benefit from the latest technology.

> *"The current LTE bandwidth limit is 20 MHz and most equipment could spread power of ~80 W over ~40 MHz bandwidth depending on the frequency range. Therefore, 40 MHz assignments per operator might be cost-efficient, but this would be hard to assign in multi-operator environments. Therefore, it might be advantageous to have one wholesale operator or active Radio Access Network (RAN) sharing involving a number of mobile network operators in TDD spectrum. "*
>
> -Draft IMT Roadmap 2018, section 5.7.2 page 48

Currently, most radio power is consumed when RAN signals are radiated at the prescribed EIRP limit. Calculation shows that using 20 MHz bandwidth at the EIRP limit of 61dBm/5 MHz would require 160W radios. Similarly using 10 MHz bandwidth at the prescribed EIRP limit requires 80W radios.

In the case of Distributed Antenna Systems ("DAS") where there is surplus power, active RAN sharing does allow for the more efficient use of equipment. Active RAN sharing also reduces the amount of radio equipment needed on a mast. Reducing radio equipment is very important because mast space at sites is becoming more constrained.

Therefore, Vodacom agrees with the Authority that active RAN sharing would allow for the more efficient use of equipment and spectrum. Vodacom would welcome further consultation by the Authority to clarify the regulatory framework for active RAN sharing as soon as possible.

2.3 Forecasts for South Africa (Draft IMT Roadmap 2018, Section 6.2)

Vodacom cautions that historic and current actual usage statistics in South Africa are likely to understate the demand for IMT services in South Africa, as it stands to reason that there is IMT demand in South Africa as a result of spectrum congestion.

In principle demand forecasts are a reasonable basis to estimate the country's IMT spectrum requirements and it is appropriate that the IMT Roadmap includes demand forecasts for South Africa.

However, the studies and forecasts cited in the Roadmap are old and out of date. Vodacom recommends that the Authority updates the forecasts with the latest available information.

2.4 IMT Spectrum and Universal Service Obligations (Draft IMT Roadmap 2018, Section 9)

Universal Service Obligations attached to IMT spectrum licenses are a credible mechanism to meet South Africa's Broadband targets.

Considering that the cost of meeting license obligations can exceed the cost of obtaining a spectrum license, Universal Service Obligations must be clear upfront during the licensing process and investors must have reassurance that the obligations will not be changed at a later date. Changing license obligations midstream would undermine investor confidence.

Vodacom supports obligations that are clear, practically and objectively measurable and that facilitate unambiguous interpretation. Vodacom anticipates that license clear license obligations will be prescribed in the Invitation to Apply ("ITA") processes for IMT spectrum. Vodacom reserves its right to comment on specific Universal Service Obligations in the context of ITA processes to license spectrum.

2.5 The priority of underserved areas (Draft IMT Roadmap 2018, Section 9.2)

It is important to prioritize underserviced areas to give more South Africans the opportunity to benefit from broadband services.

Vodacom agrees with the Authority that the assignment of IMT800, IMT700 and IMT450 spectrum is required to meet South Africa's universal service targets. Vodacom supports the assignment of these bands as soon as possible. Vodacom is willing to take on coverage obligations as part of the license conditions for new spectrum assignments in these bands.

Coverage obligations should allow operators to roll-out coverage concurrently in served and underserved areas to coverage spectrum most effectively to the benefit of South Africans in urban, sub-urban and rural areas.

2.6 Considerations for assignment (Draft IMT Roadmap 2018, Section 9.3.1)

Vodacom notes the Authority's deliberations about linking coverage and capacity bands in a spectrum assignment process. It is important to also consider the advantages of not linking the assignment of coverage and capacity bands.

Vodacom is of the opinion that the Authority could have assigned lots composed spectrum in the IMT700, IMT800, and IMT2600 bands, before the Digital Terrestrial Television ("DTT") migration was completed, as the Authority endeavored to do in the 2016 ITA[6]. Nevertheless, unlinking the assignment of IMT2600 from IMT800 and IMT700 spectrum would have enabled the Authority to assign the IMT2600 without being affected by the delays in DTT migration. Considering the extent to which some operators are currently acutely capacity constrained, South Africa has foregone the opportunity to benefit from increased mobile broadband capacity by not licensing IMT2600 at the earliest possible date.

Furthermore, the Authority should bear in mind that some operators may have insufficient IMT spectrum in coverage bands and a surfeit of IMT spectrum in capacity bands. Such operators, may only be interested in acquiring spectrum in coverage bands. Operators with a surfeit of spectrum in capacity bands may what to trade this spectrum to others who are capacity constrained.

Unlinking coverage and capacity bands when new spectrum is assigned coupled with provision for the trading of assigned IMT spectrum can be expected to result in:

[6] Government Gazette No 40145 Notice 438 of 2016, Invitation to Apply for a Radio Frequency Spectrum License to provide mobile broadband wireless access services for urban and rural areas using the complementary bands, 700MHz, 800MHz and 2.6GHz

- more efficient distribution of IMT spectrum between operators, and therefore more efficient utilization of IMT spectrum in South Africa;
- earlier deployment of spectrum in capacity bands leading to consumer benefit in the form of increased capacity and improved network performance; and
- the lowering of regulatory barriers to introducing 5G services in South Africa.

Individual Assignment or Wholesale assignment of spectrum (Draft IMT Roadmap 2018, Section 9.3.2)

As stated earlier, Vodacom has expressed its support for a competitive Wireless Open Access Network ("WOAN") in its recent submissions on the Policy Direction and Electronic Communications Amendment Bill. A competitive WOAN should coexist with sufficient individually assigned spectrum to mobile network operators to maintain healthy infrastructure competition and the sustained investment that will ensure that South Africa remains at the frontier of new IMT technology.

2.7 Guard -bands (Draft IMT Roadmap 2018, Section 7.2)

Vodacom commends the Authority on using compatibility studies to inform its conclusions about guard bands and the Authority's willingness to conduct studies into collocation/co-existence between IMT800 and IMT850.

With respect to the investigation of guard bands in the draft IMT roadmap, Vodacom is concerned that the links between the findings of the studies cited and the Authority's conclusions are in many cases not clear or compelling.

With reference to CEPT Report 41[7]

It is not clear why the Authority quotes findings with respect to:

- WIMAX,
- PAMR,
- CDMA,
- TETRA,
- DECT, or
- IMT450 coexistence studies.

The most relevant result from Report 41 appears to be:

> *"Introducing LTE and WiMAX to the 900 and 1800 MHz bands should not cause any additional impact on adjacent services. In general, there is no need of an additional guard band between LTE/WiMAX 900 and GSM-R whatever the channelisation or bandwidth considered for LTE/ WiMAX 900. ECC Report 096 concludes that a carrier separation of 2.8 MHz or more between the UMTS carrier and the nearest GSM-*

[7] CEPT Electronic Communications Committee, CEPT Report 41, Final Report 12 November 2010

> *R carrier is sufficient. For LTE/ WiMAX 900, the frequency separation between the nearest GSM-R channel centre frequency and LTE/WiMAX channel edge should be at least 300 kHz."*
> -Draft IMT Roadmap 2018, section 7.2 page 69

This result does not support the Authority's finding that:

> *"Based on the results above, general guard band values can be applied to other bands, which should be considered in the IMT roadmap channelling exercise:*
> - *Guard band between GSM and LTE or UMTS: >300 kHz; and "*
>
> -Draft IMT Roadmap 2018, section 7.2 page 71

While Vodacom agrees that the quoted study indicates that a guard band of >300 kHz (with reference to the channel edge), suffices between adjacent GSM-R and LTE carriers[8] the study does not say that a carrier separation of less than 2.8 MHz between UMTS and GSM-R will suffice.

The Authority should qualify its conclusion about the sufficiency of > 300kHz separation between LTE and GSM-R carriers appropriately. 300 kHz carrier separation will most likely not be sufficient to prevent receiver desensitization where uplinks adjacent to downlinks without sufficient geographical separation.

Comments on the proposed band plan for IMT800, IMT850, IMT900

The introduction of an IMT850 uplink in the centre gap between the IMT800 uplink and downlink, reduces the guard band between the strong IMT800 downlink signal and the closest IMT uplink from 11 MHz to 4 MHz. This raises concerns that the out of band spurious signals from the IMT850 downlink might desensitize the IMT850 receivers, and even cause receiver blocking. The draft Roadmap does not cite ECC/ITU studies that address this concern or indicate that co-existence between IMT800 and IMT850 is possible. Vodacom advises the Authority to consider a more thorough investigation into the interference risk.

Furthermore the IMT850 downlink is located only 8 MHz away from the sensitive IMT800 uplink base station receivers. 8 MHz guard band between the IMT850 downlink and the IMT800 uplink could be sufficient to be able to protect IMT800 base station receivers from desensitisation, but it is 3 MHz less than the centre gap of 11 MHz for IMT800. Therefore Vodacom advises the Authority to consider a more thorough investigation into the interference risk and the co-existence measures and interference mitigation measures that IMT850 licensees will need to implement.

[8] Vodacom interprets the Authority's statement to mean that the minimum value of the guard band is 300 kHz. An alternative interpretation is that the minimum value of the guard band must by any value larger than 300 kHz. The alternative interpretation is logically safe in the sense that it is unlikely to be wrong, but not very helpful guidance for band planning. For example, minimum guard band of 350 kHz, 5MHz, 50 MHz would all meet the test of being larger than 300 kHz.

3 Part B: Specific Comments

A number of factors were considered in Vodacom's comments on specific bands. These include:

- The current band allocation for ITU Region 1 and South Africa in the 2018 NRFP;
- The status of 4G and 5G Third Generation Partnership Project ("3GPP") standards for a band; and
- The current device ecosystem for the band.

Vodacom notes the guidance from the SADC FAP quoted below.

> *"Whereas harmonisation is important, this could however take place on various levels namely allocation level, (e.g. mobile service), application level (e.g. cellular mobile) or on technology level (e.g. LTE or mobile WiMAX). Although the ITU spectrum harmonisation is generally limited to the first level, (i.e. radio communication services) it does occasionally also endeavour to harmonise certain applications. A noteworthy example is where a band is 'identified' for a specific application such as IMT. Although such identification does not establish any priority in the Radio Regulations, nor does it exclude the use of the particular frequency band for any other application within the same or other allocations, it does signal to the market the potential of harmonising the particular frequency band for the specified application. Within this application various technologies could then be deployed."*
>
> -Draft IMT Roadmap 2018, section 4 page 33

Based on this guidance, Vodacom considers references to IMT as a typical application in the NRFP as a signal of the market potential of harmonising the particular frequency band for IMT. By this reasoning, all bands where IMT is listed as a typical application in the NRFP should be included in the IMT Roadmap.

Vodacom supports the Authority's approach of including both current IMT bands from the NRFP and WRC-19 IMT2020 candidate bands in the draft IMT Roadmap. In addition to comments on the IMT candidate bands in the draft roadmap, Vodacom has taken the liberty of proposing current and possible future IMT bands that is considered prudent to include in South Africa's IMT Roadmap.

3.1 IMT bands below 6 GHz

3.1.1 450 MHz

The 2018 NRFP allocates 450 MHz to 470 MHz to MOBILE and FIXED on a co-primary basis. The 2018 NRFP earmarks IMT450 as a typical application in the frequency range from 450 MHz to 470 MHz. The Radio Frequency Assignment Plan for IMT450[9] prescribes a 2 x 5 MHz FDD channel plan for band.

According to the Global Mobile Suppliers Association ("GSA") database[10] there are currently 110 devices on the market that support LTE band 31 (452.5 MHz to 457.5 MHz // 462.5 to 467.5 MHz). The device ecosystem is comprised of 93 routers, 11 modules, and 6 USB modems.

Vodacom agrees that IMT450 may prove essential for cost effective rural coverage and that a TDD channelization plan may a good fit for uplink oriented M2M applications.

Vodacom notes that the Authority is also contemplating the use of IMT450 for PPDR supporting services. In this regard Vodacom notes that LTE broadcast features show promise in their ability to support push-to-talk public safety use cases.

This suggests a tantalising possibility that one LTE450 network could support rural broadband, uplink oriented M2M applications, and PPDR services. Clearly such a solution would require appropriate application and traffic management.

Vodacom supports further consultation and the potential revision of the RFSAP for IMT450.

Irrespective of the ultimate band channelization for IMT450, Vodacom requests that the Authority make available a progress report of the migration activities identified in the IMT roadmap (2014) for IMT450. Should there be any delays in the original timetable Vodacom further requests that the Authority make available a revised timetable for IMT450 migration.

3.1.2 600 MHz ("Digital Dividend 3")

Vodacom appreciates that the 614 MHz – 698 MHz has not been allocated to MOBILE for ITU Region 1, and that the band is also not allocated to MOBILE in the 2018 NRFP. Because of the limited amount of sub-1GHz IMT spectrum, South Africa's dispersed population, and growing demand for Mobile Broadband, the 600 MHz band is important for long-term planning.

[9] Government Gazette No 38640 Notice 270 of 2015 – 450 to 470 MHz

[10] https://gsacom.com/gambod/

While South Africa has fallen behind the rest of the world due to delays in completing DTT migration for Digital Dividend 1 and 2, world-wide support for IMT in the 600 MHz band (Digital Dividend 3) is increasing.

In 2017, the Federal Communications Commission ("FCC") held a successful incentive-based auction to repurpose the 614 MHz – 698 MHz band for cellular and cable use[11]. This auction was done in a two-part process in which the incumbent broadcasters in the band bid to voluntarily relinquished their spectrum rights and mobile wireless and cable companies then placed bids on the available spectrum. The remaining broadcasters were granted extensions until the end of April 2018 at which time the regulator relocated their licenses to a broadcasting band.

Vodacom requests that Authority investigate the feasibility of allocating 614 MHz – 698 MHz band to MOBILE in South Africa, and advocating this position in the appropriate international fora.

Vodacom further proposes that the Authority explore the scope for using incentive-based auctions to incentivise the migration of the incumbent users to make IMT bands available for assignment.

Vodacom recommends that the Authority monitor developments in this band and include the 600 MHz frequency range in South Africa's IMT roadmap.

3.1.3 700 MHz (Digital Dividend 2)

The 2018 NRFP allocates 694 MHz to 790 MHz to MOBILE and BROADCASTING on a co-primary basis. Vodacom appreciates that the co-primary allocation to BROADCASTING is a consequence of the delays in DTT Migration. Vodacom trusts that South Africa will be in a position to revoke the co-primary allocation to BROADCASTING when the NRFP is updated to reflect the outcomes of WRC-19.

The 2018 NRFP earmarks IMT700 as a typical application in the frequency range from 694 MHz to 790 MHz. and the Radio Frequency Assignment Plan for IMT700[12] prescribes a 2 x 30 MHz FDD channelling plan for band.

According to the GSA database there are currently 1450 devices on the market that support LTE band 28 (703 MHz to 733 MHz // 758 to 788 MHz). The device ecosystem is comprised of 972 phones, 223 routers, 129 modules, 72 tablets, 17 asset trackers, 16 USB modems and 21 devices in a variety of other categories. This indicates that the device ecosystem is mature and that many South African's will be able to use this band as soon as they have IMT700 coverage.

[11] https://www.fcc.gov/about-fcc/fcc-initiatives/incentive-auctions/how-it-works

[12] Government Gazette No 38640 Notice 271 of 2015 – 703 to 733 MHz and 758 to 788 MHz

Vodacom requests that Authority provide an update on the progress of DTT migration and a revised timetable. Vodacom further expresses its willingness to work with the Authority and other stakeholders to facilitate the acceleration and completion of the DTT migration.

Vodacom further request that the Authority provide an update on the timeline for assigning spectrum in IMT700 band.

3.1.4 750 MHz

The 2018 NRFP allocates 694 MHz to 790 MHz, which includes the IMT750 band, to MOBILE and BROADCASTING on a co-primary basis. Vodacom appreciates that the co-primary allocation to BROADCASTING is a consequence of the delays in DTT migration. Vodacom trusts that South Africa will be in a position to revoke the co-primary allocation to BROADCASTING when the NRFP is updated to reflect the outcomes of WRC-19.

The 2018 NRFP does not explicitly earmark IMT750 as a typical application in the frequency range from 733 MHz to 758 MHz. and the Radio Frequency Assignment Plan for IMT750[13] prescribes a 15 MHz TDD channelling plan from 738 MHz to 753 MHz with 5MHz guard bands.

The only LTE TDD band covering the frequency range from 733 MHz to 758 MHz in the GSA database is band 44. The device ecosystem for band 44 is limited to one router. Therefore, the value South Africa can derive for this band in the near future is limited.

Vodacom requests that the Authority provide an update on the work in progress on the band plan contemplated for IMT750 in South Africa.

3.1.5 800 MHz (Digital Dividend 1)

The 2018 NRFP allocates 790 MHz to 862 MHz to MOBILE, BROADCASTING and FIXED on a co-primary basis. Vodacom appreciates that the co-primary allocation to BROADCASTING is a consequence of the delays in DTT migration. Vodacom trusts that South Africa will be in a position to revoke the co-primary allocation to BROADCASTING when the NRFP is updated to reflect the outcomes of WRC-19.

The 2018 NRFP earmarks IMT800 as a typical application in the frequency range from 790 MHz to 862 MHz. and the Radio Frequency Assignment Plan for IMT800[14] prescribes a 2 x 30 MHz FDD channelling plan for band.

[13] Government Gazette No 38640 Notice 272 of 2015 – 733 to 758 MHz

[14] Government Gazette No 38640 Notice 273 of 2015 – 791 to 821 MHz and 832 to 862 MHz

According to the GSA database there are currently 5211 devices on the market that support LTE band 20 (791 MHz to 821 MHz // 832 MHz to 862 MHz). The device ecosystem is comprised of 3490 phones, 880 routers, 383 tablets, 257 modules, 22 asset trackers, 19 notebooks and 54 devices in a variety of other categories. This indicates the device ecosystem is mature and that many South African's will be able to use this band as soon as they have IMT800 coverage.

Vodacom requests that the Authority provide an update on the progress of DTT migration and a revised timetable. Vodacom further expresses its willingness to work with the Authority and other stakeholders to facilitate the acceleration and completion of the DTT migration program.

Vodacom further requests that the Authority provide an update on the timeline for assigning spectrum in IMT800 band.

3.1.6 850 MHz

The 2018 NRFP allocates 790 MHz to 862 MHz, which includes the contemplated IMT850 band, to MOBILE, BROADCASTING and FIXED on a co-primary basis. Vodacom appreciates that the co-primary allocation to BROADCASTING is a consequence of the delays in the DTT migration. Vodacom trusts that South Africa will be in a position to revoke the co-primary allocation to BROADCASTING when the NRFP is updated to reflect the outcomes of WRC-19.

The 2018 NRFP does not explicitly earmark IMT850 as a typical application in the frequency range from 825 MHz to 830 MHz paired with 870 MHz and 875 MHz. The second draft Radio Frequency Assignment Plan for IMT850[15] prescribes a 2 x 5 MHz FDD channelling plan for the band.

The proposed channel plan could accommodate LTE band 5 or LTE band 18 equipment.

According to the GSA database there are currently 4597 devices on the market that support LTE band 5. The device ecosystem is comprised of 3048 phones, 684 routers, 402 modules, 275 tablets, 47 USB modems, 41 asset trackers, 31 notebooks and 69 devices in a variety of other categories. Most of these devices are intended for the Region 2 market. Given that South Africa is part of ITU Region 1, it is to be expected that comparatively few South African's own devices that support band 5. Furthermore, South Africans who do purchase Region 2 devices may not be able to use these devices on networks that use Region 1 harmonised standards.

According to the GSA database there are currently 372 devices on the market that support LTE band 18. The device ecosystem is comprised of 216 phones, 59 modules, 57 routers, 20 tablet PCs and 20 devices in a variety of other categories. Given that South Africa is part of ITU Region 1, it is to be expected that

[15] Government Gazette No 41082 Notice 684 of 2017 – 825 to 830 MHz and 870 to 870 MHz

comparatively few South Africans own devices that support band 18. Furthermore, South Africans who do purchase Region 3 devices may not be able to use these devices on networks that use Region 1 harmonised standards.

Vodacom's position is that IMT850 is not a feasible band in a harmonized Region 1 IMT800 band planning environment. Vodacom appreciates that, by the same reasoning, Liquid Telecom's current CDMA850 is also not feasible in a harmonized Region 1 band planning environment. Although Vodacom regards the migration from CDMA850 to LTE850 as an improvement to the status quo, significant questions remain about how best to move towards a more harmonized sub-1GHz Region 1 band plan without prejudicing Liquid Telecom's established spectrum rights.

Vodacom and particularly Cell-C have experienced interference from the CDMA850 downlink to the IMT900 uplink. Vodacom accepts the Authority's argument that migration to LTE in both the 850 MHz band and the 900 MHz is likely to reduce this interference.

The downlink of the proposed LTE850 band will also be vulnerable to receiver desensitisation as a result of interference from the LTE800 downlink. Further studies may be required to determine if the 4 MHz separation between the LTE800 band uplink and the LTE850 band downlink is sufficient and what coordination measures will be required to protect the LTE850 uplink from interference from the LTE800 downlink.

Vodacom is hopeful that IMT800 spectrum will be assigned in the near future. If Liquid Telcom's CDMA850 assignment is migrated as proposed in the second draft RFSAP for IMT850, the industry will require clarity about the extent to which assignments in the IMT850 band will be able to claim protection from interference from assignments in the IMT800 band. Given that South Africa has adopted a harmonised Region 1 band plan, Vodacom is of the opinion that non-harmonized IMT850 assignments ought not to be able to claim protection from Region 1 harmonised assignments in the IMT800 band.

Vodacom proposes that the Authority and Liquid Telecom explore the options available to migrate Liquid Telecom out of the 850 MHz band to an alternative assignment in a harmonised IMT capacity band.

3.1.7 900 MHz

Regarding considerations arising from the IMT Roadmap 2014 and 2018, Vodacom cautions that while the migration from GSM to LTE in 2 x 5MHz steps may be technically feasible in the short-term, it would have adverse consequences on the substantial numbers of subscribers who rely on 2G devices for access to mobile communications.

The Final Radio Frequency Spectrum Assignment Plan (RFSAP) for IMT900 of 2015[16] changes the band's channel plan to create contiguous 10 MHz FDD assignments for Vodacom, MTN, and Cell-C. The new channel plan and in-band migration frees up 5 MHz FDD for future assignment.

Vodacom's 11 MHz FDD assignment in the 900 MHz-band is currently the only IMT spectrum it can use in a sub-1GHz band. The IMT900 RFSAP reduces Vodacom's spectrum assignment in the 900 MHz band from 11 MHz FDD to 10 MHz FDD.

Vodacom has optimized the use of its limited IMT900 spectrum to provide 2G, 3G and LTE coverage to subscribers. It plans the radio network very carefully as it strives to maintain sufficient 2G capacity and quality of services while increasing mobile broadband coverage.

In 2015 the Authority signalled its intention to assign IMT spectrum in the IMT700 and IMT800 bands near future. Had the Authority's 2016 ITA[17] and DTT migration been executed as planned, Vodacom would have been able to sacrifice 1MHz FDD in the 900 MHz-band without inflicting significant harm on the mobile subscribers who have come to rely on both 2G voice coverage and 3G and LTE mobile data services.

Unfortunately, IMT700 and IMT800 spectrum has not yet been assigned. Furthermore, significant uncertainty remains about when DTT migration will progress to the extent that the digital dividend spectrum can be used to provide LTE coverage country-wide.

Given the status quo, the return on 1 MHz FDD in the 900 MHz-band, by the deadline of 31 March 2020 prescribed in the IMT900 RFSAP, will have substantial adverse impact on the 2G quality of service and mobile broadband coverage available to South African subscribers.

Furthermore, over the years many people have installed cell-extenders tuned to operate at specific frequencies. After in-band migration the installed base of cell extenders will be incorrectly tuned. This will result in degraded service to customers reliant on cell-extenders. This multitude of incorrectly tuned cell-extenders is likely to increase the harmful interference experienced by operators dramatically.

Given that the IMT900 RFSAP has been overtaken by the lack of progress on DTT Migration and the withdrawal of the 2016 ITA, Vodacom requests that the Authority consult on the revision of the IMT900 RFSAP deadline for the completion of in-band migration.

[16] Government Gazette No 38640 Notice 275 of 2015 – 880 to 915 MHz and 925 to 960 MHz

[17] Government Gazette No. 40145 notice number 438 of 2016

3.1.8 1400 MHz

The 2018 NRFP allocates 1427 MHz to 1518 MHz to MOBILE on a co-primary basis, although IMT is not earmarked as a typical application. Vodacom appreciates that WRC-19 will consider sharing and compatibility studies in accordance with resolution 761 and 223 adopted by WRC-15.

Vodacom supports the Authority's proposal to undertake a study to determine if changes are required to rearrange the band usage. Vodacom proposes the Authority investigate the possibility of migrating current applications to newer technologies, in the IMT1400 band. In this regard the Authority may find the GSA's Recent Market Update on LTE Broadcast[18] informative. Of interest is the maturing capability of LTE to support digital broadcast and public safety use cases.

A large number of IMT band plans have been standardised by the 3GPP for the frequency range from 1427MHz to 1514 MHz, and some of the band plans are standardised for both LTE and 5G. 3GPP has standardised the following bands for IMT1400.

Operating Band[19]	Uplink Operating Band	Downlink Operating Band	Duplex Mode	Bandwidth (MHz)
Band 11	1427.9 MHz – 1447.9 MHz	1475.9 MHz – 1495.9 MHz	FDD	40MHz
Band 21	1447.9 MHz – 1462.9 MHz	1495.9 MHz – 1510.9 MHz	FDD	30MHz
Band 32	N/A	1452 MHz – 1496 MHz	SDL	44MHz
Band 45	1447 MHz – 1467 MHz	1447 MHz – 1467 MHz	TDD	20MHz
Band 50 / n50	1432 MHz - 1517 MHz	1432 MHz - 1517 MHz	TDD	85MHz
Band 51 / n51	1427 MHz - 1432 MHz	1427 MHz - 1432 MHz	TDD	5MHz
Band 74 / n74	1427 MHz – 1470 MHz	1475 MHz – 1518 MHz	FDD	86MHz
Band 75 / n75	N/A	1432 MHz – 1517 MHz	SDL	85MHz
Band 76 / n76	N/A	1427 MHz – 1432 MHz	SDL	5MHz

[18] GSA LTE Broadcast (eMBMS) Market Update, January 2019, https://gsacom.com

[19] 'Band' denotes operating bands for 4G, 'n' denotes operating bands for 5G. Example: Band 50/ n50 is both 4G and 5G capable while Band 21 is only 4G capable.

Vodacom supports the principle that South Africa should adhere to the globally harmonised framework to benefit from economies of scale for standardised products, to facilitate easy roaming and cross-border coordination, and to maintain predictability and stability in the communications industry. Therefore, Vodacom supports the principle that band plans harmonised for Region 1 should be given preference when a RFSAP is developed.

Vodacom proposes the following principles in selecting a band plan for the most efficient use of the 1427 MHz to 1518 MHz frequency range for IMT:

- Align with band plans harmonised for Region 1;
- Endeavour to assign as much spectrum as possible to IMT;
- Maximise the flexibility of the band plan to allow for efficient use of spectrum;
- Give preference to band plans that support both LTE and 5G.

Based on the principles above, Vodacom considers the following band plans to be promising:

- Band 50 / n50 – This band assigns 85MHz of the 91MHz to IMT and provides the flexibility of TDD, while supporting 5G in addition to LTE.

- Band 74 / n74 – This band assigns 86MHz of the 91MHz. Although the band uses FDD it supports 5G in addition to LTE.

- Band 75 / n75- This band assigns 85MHz of the 91MHz. The band supports SDL and supports 5G in addition to LTE.

Given that the band is currently used in an SDL configuration America and Europe, Vodacom is of the opinion that Band 75/ n75 is likely to be the optimal band plan for South Africa.

3.1.9 1800 MHz

According to a January 2019 report by the GSA[20], LTE band 3 (1710 MHz to 1785 MHz // 1805 MHz to 1880 MHz) is the most popular band for LTE networks worldwide, with 327 LTE networks deployed across all regions. Furthermore, the GSA device database indicates that there are currently 8877 devices that support band 3.

However, in South Africa the 1800MHz band remains crucial to provide services to a substantial portion of subscribers who do not have access to LTE capable handsets. Vodacom notes that the technology neutral

[20] GSA Band 3 (1800 MHz): The most popular global band for LTE, January 2019, https://gsacom.com

legal framework in the Electronic Communications Act affords the flexibility required by licensees to optimise their use of spectrum according to the capacity required in each Radio Access Technology layer. Vodacom therefore supports the Authority's proposal that migrations from GSM1800 to IMT1800 should be allowed based on operator's needs.

3.1.10 2100 MHz

The 2018 NRFP allocates 1980 MHz to 2010 MHz and 2170 MHz to 2200 MHz to MOBILE, MOBILE-SATELLITE, and FIXED on a co-primary basis. IMT-satellite is earmarked as a typical application.

Vodacom supports the Authority's proposal to extend the terrestrial IMT allocation by 2 x 30 MHz. The band is very promising and the 3GPP have standardised band 65 with and uplink from 1920 to 2010 MHz and a downlink from to support the proposed extension of IMT.

LTE band 1 (1920 MHz to 1980 MHz // 2110 MHz to 2170 MHz) currently supports 7285 devices. According to the GSA database there is already one module that supports band 65. Vodacom anticipates that the band 65 device ecosystem will expand rapidly in the event that the band is identified for terrestrial IMT at WRC-19.

However, in South Africa the 2100MHz band remains crucial to provide service to the substantial portion of subscribers who do not have access to LTE capable handsets. Vodacom notes that the technology neutral legal framework in the Electronic Communications Act affords the flexibility required by licensees to optimise their use of spectrum according to the capacity required in each Radio Access Technology layer. Vodacom therefore supports the Authority's proposal that migrations from UMTS2100 to IMT2100 should be allowed based on operator's needs.

3.1.11 2300 MHz

The 2018 NRFP allocates 2300 MHz to 2450 MHz to MOBILE and FIXED on a co-primary basis. The 2018 NRFP earmarks IMT2300 TDD as a typical application in the frequency range from 2300 MHz to 2400 MHz. and the Radio Frequency Assignment Plan for IMT2300[21] prescribes a 100 MHz TDD channelling plan for band.

Regarding considerations arising from the IMT Roadmap 2014 and 2018:

> *"The IMT2300 band is almost fully used. The only free spectrum of 20 MHz could be assigned to WBS to facilitate the clearance of 2550-2565 MHz, which would require new equipment and antennas. There might be a temporary solution for WBS to move their services to 2585-2600 MHz until the new IMT-TDD licensee would need the new spectrum.*

[21] Government Gazette No 38640 Notice 276 of 2015 –2300 MHz to 2400 MHz

> • *The 2400-2500 MHz band should be used for ISM applications and DECT- services; In case of interference with 2380-2400 MHz assignments, the ISM- band operator needs to establish a sufficient guard band.*"
>
> -Draft IMT Roadmap 2018, section 10 page 123

Vodacom understands that WBS/Rain has been migrated from the FDD portion of the 2600 MHz band to the TDD portion of the 2600 MHz band. Rain has been operating an IMT network in the 2600 MHz band for some time. Therefore, this Authority's statement quoted above appears to be incorrect.

According to the GSA database there are currently 4449 devices on the market that support LTE band 40 (2300 MHz to 2400 MHz). The device ecosystem is comprised of 3159 phones, 727 routers, 214 modules, 211 tablets, 80 USB modems and 58 devices in a variety of other categories. The substantial current device ecosystem suggests that a significant opportunity to provide more broadband LTE capacity to South African subscribers in the short term is foregone while the industry is waiting for the remaining 40 MHz spectrum in the band to be licensed.

Vodacom's understanding is that Telkom is the only licensee in the IMT2300 band and that Telkom's assignment is 60 MHz TDD. Vodacom requests that the Authority updates the industry of the actual occupation of the IMT2300 band.

Vodacom would like to highlight that the spectrum in the 2300 MHz band has been concentrated, limiting the deployment of services in this band. With this in mind, Vodacom request the Authority to consider options to make the 1x 100 MHz in the 2300 MHz band available to licensees in a more equitable manner.

3.1.12 2600 MHz

The 2018 NRFP allocates 2500 MHz to 2690 MHz to MOBILE on a primary basis. The 2018 NRFP earmarks IMT2600 as a typical application in the frequency range from 2500 MHz to 2690 MHz. The Radio Frequency Assignment Plan for IMT2600[22] prescribes a 2 x 70 MHz FDD in combination with 1 x 50 MHz TDD channelling plan for band.

According to the GSA database there are currently 7938 devices on the market that support LTE band 7 (2500 MHz to 2570 MHz // 2620 to 2690 MHz). The device ecosystem is comprised of 5588 phones, 1156 routers, 615 tablets, 299 modules, 23 asset trackers, 157 USB modems and 123 devices in a variety of other categories. This indicates the device ecosystem is mature and that many South African's will be able to use this band as soon as they have IMT2600 FDD coverage.

[22] Government Gazette No 38640 Notice 277 of 2015 – 2500 to 2570 MHz and 2620 to 2690 MHz

According to the GSA database there are currently 3434 devices on the market that support LTE band 38 (2570 MHz to 2620 MHz). The device ecosystem is comprised of 2292 phones, 660 routers, 192 modules, 157 tablets, 87 USB modems and 46 devices in a variety of other categories. This indicates the device ecosystem is mature and that many South African's will be able to use this band as soon as they have IMT2600 TDD coverage.

Vodacom is hopeful that IMT2600 spectrum will be assigned in the near future as this band is critical for LTE capacity growth of existing mobile network licensees. Further delays in assigning the band will exacerbate the negative impact of capacity constraints on quality of service, as well as potentially prices.

In order to cater for future evolution, Vodacom recommends that the Authority considers re-planning the IMT2600 band for TDD as soon as possible to provide an efficient migration path to 5G.

3.1.13 3300 MHz, 3500 MHz, 3800 MHz

The greater 3.5 GHz band (3300 MHz - 3800 MHz) will be critical for IMT2020 capacity growth of existing mobile network licensees. 3GPP band plans have already been developed for 3300 MHz to 4200 MHz (n77) and 3300 MHz to 3800 MHz (n78). Should this band not be made available to mobile operators in the near future the deployment of IMT2020 infrastructure may be delayed.

Several 3.5 GHz auctions have been completed across the globe with the most recent the Spanish and Italian auctions. Therefore, Vodacom would like to recommend that the 3.5 GHz, which is underutilised today be made available to existing licensees through an auction with appropriate urgency.

Vodacom supports the Authority's proposal adopt IMT with a TDD channelization plan for the whole 3300 MHz to 3600 MHz frequency range.

Vodacom requests the Authority to reconsider the use of Managed Spectrum Parks ("MSP") in the band plan for (3300 MHz – 3800 MHz). While MSP may have appeared as an attractive option in the past, a better solution may be the mandating of synchronised operation in this band. This will likely provide the best long-term investment and performance outcome.

3300 to 3400 MHz

The 2018 NRFP allocates 3300 MHz to 3400 MHz to RADIOLOCATION on a primary basis. There is no allocation to MOBILE. The device ecosystem for this band is currently limited with one device on the market that supports LTE band 55 (3300 MHz to 3400 MHz). Vodacom supports the proposal to allocate 3300 MHz to 3400 MHz to MOBILE in South Africa subject to the findings of the compatibility studies called for by WRC-15 Resolution 223.

3400 to 3600 MHz

The 2018 NRFP allocates 3400 MHz to 3600 MHz to FIXED and MOBLE on a co-primary basis. IMT3500 TDD is earmarked as a typical application for the band. The Radio Frequency Assignment Plan for IMT3500[23] prescribes a 1 x 200 MHz TDD channelling plan for the band.

Vodacom informs the Authority of an inconsistency in note 8 on page 27 of the Roadmap where an FDD band plan is proposed for 3400 to 3600 MHz. It is Vodacom's understanding that the Authority does not intend to revisit the TDD band channelization.

The device ecosystem for the band is promising a there are currently 236 devices on the market that support LTE band 42 (3400 MHz to 3600 MHz). Considering this band's importance for 5G Vodacom requests that:

- The Authority to publish a detailed migration plan showing how the existing operators will be migrated to TDD within the 3400 MHz and 3600 MHz bands;
- The Authority clarify when the spectrum within this band (3300 MHz - 3600 MHz) will be made available for assignment.

Vodacom proposes that incumbent licensees that are not utilising this band for IMT services be given the option to migrate out of this band.

3600 to 4200 MHz

The 2018 NRFP allocates 3600 MHz to 4200 MHz to FIXED and FIXED-SATELLITE on a co-primary basis. There is currently no allocation to MOBILE in South Africa. However, the frequency range from 3600 MHz to 3800 MHz has already been harmonised for IMT in the European Union. The device ecosystem is promising with the GSA database indicating that there are currently 180 devices on the market that support LTE band 43 (3600 MHz to 3800 MHz). Vodacom anticipates South Africa will be able to benefit from a robust technology ecosystem in the 3600 MHz to 3800 MHz frequency range should it harmonise the band for IMT in the NRFP.

3.1.14 4400 MHz

The 3GPP has developed the n79 5G band plan for the frequency range from 4400 MHz to 5000 MHz. This frequency range has also been allocated to MOBILE on a co-primary basis in the 2018 NRFP.

[23] Government Gazette No 38640 Notice 278 of 2015 – 3400 to 3600 MHz

Vodacom recommends that the Authority monitor developments in this band and include the frequency range from 4400 MHz to 5000 MHz in South Africa's IMT2020 roadmap.

3.1.15 5 GHz

3GPP is currently developing 5G band plans for unlicensed spectrum in the 5GHz band. Hence, Vodacom anticipates that the 5GHz band will be a key band for IMT2020 services.

The 2018 NRFP currently allocates the following portions of the 5G band to MOBILE on a co-primary basis:

- 5150 MHz to 5350 MHz;
- 5470 MHz to 5725 MHz; and
- 5850 MHz to 5925 MHz.

Vodacom recommends that the Authority monitor developments in this band and include the 5GHz frequency range in South Africa's IMT2020 roadmap.

3.2 IMT bands above 6 GHz

Vodacom appreciates that the global and regional harmonisation of IMT2020 spectrum are contingent on the outcomes of WRC-15 Resolution 238 studies and decisions taken at WRC-19. Vodacom's supports the Authority's initiative in investigating the utilisation of IMT2020 bands and proposing the development of RFSAPs.

Nevertheless, much depends on the outcomes of WRC-19. Vodacom proposes that the Authority:

- Prioritises RFSAPs for bands that are globally harmonised for IMT2020 at WRC-19; and
- Prioritises RFSAPs that have industry support in the form of 3GPP band plans.

Given that many of the most promising IMT2020 bands are heavily used in South Africa, Vodacom recommends that the Authority considers sharing and compatibility studies in addition to the feasibility of migration.

3.2.1 24.25 GHz to 27.5 GHz ("the 26 GHz band") and 26.5 GHz to 29.5 GHz ("the 28 GHz band")

The 26 GHz band and the 28 GHz band have emerged as two of the most important bands for 5G. This is because there is significant potential that global harmonisation will be achieved which has led to early deployment.

3GPP band plans exist for both the 26 GHz band (n258 ranging from 24.25 GHz to 27.5 GHz) and the 28 GHz band (n257 ranging from 25.5 GHz to 29.5 GHz). Vodacom proposes that the whole range between 24.25 GHz and 29.5 GHz be set aside for 5G in South Africa.

Vodacom requests that the Authority include both the 26 GHz and 28 GHz bands in the IMT roadmap. Vodacom further requests that the Authority provide information on the current utilisation of 5G band n257 and n258 in the IMT Roadmap.

Vodacom recommends that the Authority investigate the potential coexistence of IMT2020 with the services currently deployed in the band. In the event that this frequency range is harmonised for IMT2020,

3.2.2 31.8 GHz to 33.4 GHz

Vodacom supports the allocation of the band to MOBILE and the harmonisation of this band for IMT2020.

3.2.3 37 GHz to 43.5 GHz ("the 40 GHz band")

Vodacom considers this band to be one of the most important IMT2020 bands. Studies show that unwanted emissions in this band are within acceptable limits and no technical conditions are required to protect other services. Vodacom supports the harmonisation of the whole of 37GHz to 43.5 GHz to set the stage for a globally harmonised tuning range for IMT2020.

37 GHz to 40.5 GHz

The 3GPP has developed band plan n260 for the frequency range from 37 GHz to 40 GHz.

Vodacom supports the Authority's proposal to perform a detailed study into the usage of this band. Vodacom requests that the Authority shares the results of this study with the industry. Vodacom further recommends that the Authority investigate the potential coexistence of IMT2020 with the services currently deployed in the band.

40.5 GHz to 42.5 GHz

Vodacom supports the allocation of the band to MOBILE and the harmonisation of this band for IMT2020.

Vodacom supports the Authority's proposal to perform a detailed study into the usage of this band. Vodacom requests that the Authority shares the results of this study with the industry. Vodacom further recommends that the Authority investigate the potential coexistence of IMT2020 with the services currently deployed in the band.

42.5 GHz to 43.5 GHz

Vodacom supports the harmonisation of this band for IMT2020.

Vodacom requests that the Authority performs a detailed study into the usage of this band. Vodacom requests that the Authority shares the results of this study with the industry. Vodacom further recommends that the Authority investigate the potential coexistence of IMT2020 with the services currently deployed in the band.

3.2.4 47 GHz to 47.2 GHz

Vodacom supports the allocation of the band to MOBILE and the harmonisation of this band for IMT2020.

3.2.5 47.2 GHz to 50.2 GHz

Vodacom supports the harmonisation of this band for IMT2020.

3.2.6 50.4 GHz to 52.6 GHz

Vodacom supports the harmonisation of this band for IMT2020.

3.2.7 57 GHz to 66 GHz

While Vodacom appreciates that it is in South Africa's interest to assign as much spectrum as possible to IMT2020, it is not clear why this band is included in the IMT Roadmap, given that it is not part of WRC-15 Resolution 238. Vodacom requests that the Authority clarifies why it thinks this frequency range should be included in the IMT Roadmap.

3.2.8 66 GHz to 76 GHz

Widespread support is developing for the frequency range from 66 GHz to 71 GHz. Vodacom supports the harmonisation of the whole frequency range from 66 GHz to 76 GHz to IMT2020.

Vodacom recommends that the Authority investigate the potential coexistence of IMT2020 with the services currently deployed in the band.

3.2.9 81 GHz to 86 GHz

Vodacom supports the harmonisation of this band for IMT2020.

Vodacom recommends that the Authority investigate the potential coexistence of IMT2020 with the services currently deployed in the band.

END