



20 MAY 2022

Vodacom's Submission on Draft Radio Frequency Assignment Plans for the International Mobile Communication (IMT) bands IMT 450, IMT700, IMT750, IMT800, IMT850, IMT900, IMT1500, IMT2300, IMT3300, IMT3500

1. INTRODUCTION

Vodacom Pty Ltd (“Vodacom”) wishes to thank the Authority for the opportunity to make submissions in regard to its public consultation process on the Draft Radio Frequency Assignment Plans for the International Mobile Communication (IMT) bands IMT450, IMT700, IMT750, IMT800, IMT850, IMT900, IMT1500, IMT2300, IMT3300, IMT3500 as published in the Government Gazette No. 46160 (Notices 1961-1970).

Appropriate Radio Frequency Assignment Plans (RFSAPs) are necessary for effective utilisation of spectrum, while maximising consumer benefit. The Vodacom submission is succinct and focussed on the areas that we expect require specific focus.

2. GENERAL COMMENTS

2.1 MAXIMUM RADIATED POWER FOR MID-BANDS (IMT2600¹, IMT3300, IMT3500)

A key element of 5G systems is the use of active antenna systems (AAS). The practical effect of AAS for consumers could be a higher quality of service in busy areas. This is because AAS enable massive multiple-input multiple-output (MIMO) which can increase the capacity of the radio access network in busy areas. This technology has the potential to significantly increase the spectral efficiency and network capacity through the use of beamforming (focusing radio energy in a specific direction), spatial multiplexing (re-using frequencies to send data to different users) and other techniques which take advantage of the location of the user equipment (UE).

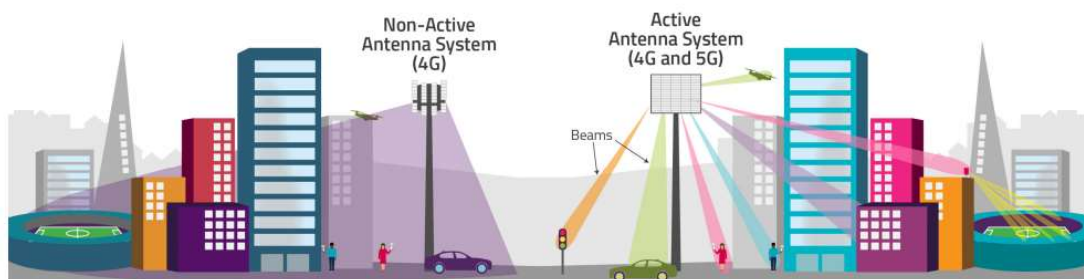


Figure 1: AAS vs. Non-AAS Systems²

Because of the variable transmission pattern that these new technologies employ, there has been a need to change the way radiated power is defined for these systems. The block edge masks (BEMs) for AAS are typically defined in terms of total radiated power (TRP), which is different from the current emissions masks

¹ While not directly the subject of the current consultation, we have included the 2600MHz band to indicate that the principles in respect of TRP relevance also relate to the 2600MHz band.

² https://www.ofcom.org.uk/_data/assets/pdf_file/0025/144880/notice-proposal-vary-3.4-ghz-radio-spectrum-licences.pdf

which are defined in terms of effective isotropic radiated power (EIRP), due to the fact that the radio energy is not evenly spread like a non-AAS system but is focussed within the transmission beams, which themselves are continuously reorganised around customer demands.

Secondly, the majority of 5G equipment to be deployed in these bands will have an integrated radio unit similar to the BS type 1-0 in the section 4.3.3 of the 3GPP 38.104 specification. As can be seen from the figure below, there is no accessible measuring port to measure the output power. It would be impractical to measure the numerous integrated radio array elements contained within the AAS-structured, and then surmise the combined effective thereof. Therefore, the radiated power should be measured in the radiated interface boundary. For this reason, the 3GPP 38.104 specification defines the unwanted emission of this BS type as TRP in section 9.7

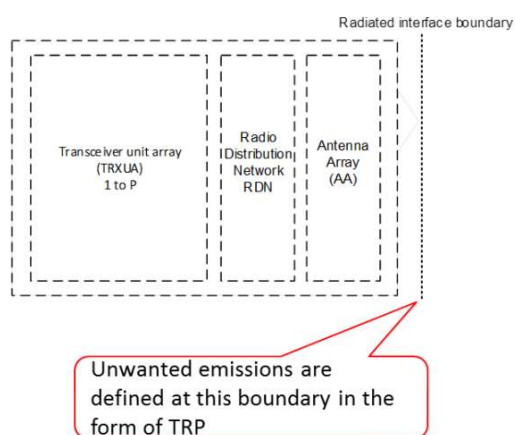


Figure 2: Components of BS type 1-0³

- The following approaches have been adopted globally:
 - WRC 2019 resolution 243 and resolution 750 consider the unwanted emission power level in terms of TRP.
 - CEPT ECC Decision (11)06⁴ which contains the harmonized technical conditions for use of 3400-3800 MHz, specifies all transmitter requirements for AAS in terms of TRP. In addition, it does not include an in-block power limit.
 - ECC Report 281⁵ notes that if administrations wish to introduce an in-block limit, then a value should not exceed 68dBm/5MHz EIRP per antenna for non-AAS and 47dBm/5MHz TRP for AAS may be applied.
 - The New Zealand Regulator undertook a consultation process when investigating the change from EIRP to TRP in the 3.5 GHz band². Both Huawei and Nokia responded stating that they

³ <https://www.rsm.govt.nz/assets/Uploads/documents/consultations/2019-technical-arrangements-of-the-3-5-ghz-band/2babbb72ec/technical-arrangements-of-the-3-5-ghz-band-discussion-document.pdf>

⁴ <https://docdb.cept.org/download/1531>

⁵ <https://docdb.cept.org/download/3419>



recommended TRP for AAS and EIRP for non-AAS⁶ due to the design of their base station equipment.

- In the Authority's own IMT2600 RFSAP, the Authority uses a TRP definition for mobile base stations "Mobile Station transmissions should not exceed 35 dBm/5 MHz (EIRP.) and 31 dBm/5 MHz (TRP)".
- Ofcom released a variation of Spectrum Access licences in the 3400 to 3680 MHz band⁷, whereby they distinguished between power limits for AAS in TRP and non-AAS in EIRP base stations as follows:
 - Non-ASS base station : 65dBm / 5 MHz EIRP per cell
 - AAS base station : 44 dBm / 5 MHz TRP per cell

Ofcom further confirmed these power limits were applied to the 3400 – 3600 MHz band, as well as the 3600 – 3800 MHz band⁷.

In the light of the above, it would be prudent for ICASA to reconsider its position on defining a higher EIRP limit for non-AAS systems, a TRP limit for AAS systems and a higher mobile station EIRP and TRP limit, in line with global trends, such as to keep pace with the quality of service offered to consumers.

2.2 SPECTRUM SHARING

The Authority encourages technology spectrum sharing and quotes the dynamic spectrum sharing (DSS) example of a technology being shared between 4G & 5G, in each of its draft RFSAPs published in 2022. Vodacom supports technology neutrality and therefore supports this type of spectrum sharing in terms of the licensee having flexibility in choosing which technology it can deploy (not to be confused with spectrum sharing between licensees, which we also support if done under mutually agreeable commercial terms). This allows for the MNO to deploy a more efficient network to better serve the changing needs of its customers, and allows for legacy technologies to be re-farmed to more spectrally efficient technologies as they become available.

2.3 HIGHER EIRP MAY BE PERMITTED ON A CASE-TO-CASE BASIS

Vodacom is encouraged by the Authority's approach of allowing for a higher EIRP where justified. The higher EIRP will allow for extended cell ranges and thus will provide better coverage to the inhabitants of rural communities, as well as increase indoor penetration in dense urban, urban and suburban communities. Vodacom recommends that the Authority follow such an approach for TRP limits as well. Vodacom further

⁶ <https://www.rsm.govt.nz/projects-and-auctions/consultations/technical-arrangements-of-the-3-5-ghz-band/?m=785178#search:My41IEdleg==>

⁷ https://www.ofcom.org.uk/_data/assets/pdf_file/0020/192413/statement-award-700mhz-3.6-3.8ghz-spectrum.pdf Par 8.91



recommends that the process to obtain approval for the relaxation of EIRP/TRP limits, be an efficient and expedient one.

3. RFSAP SPECIFIC COMMENTS

3.1 IMT450

Vodacom advocates for exclusive use of this band for IMT as it provides the greatest consumer benefit. The Authority has previously stated that equipment currently being used by incumbents in this band is at the end of its lifespan and the technology is outdated. Therefore, the economic benefits of deploying IMT in this band is likely to outweigh all other potential applications. The Authority's spectrum audit showed that less than 20% of the band is occupied across South Africa despite the large number of licensees⁸.

Vodacom proposes the following steps in order to expedite the assignment of this band. First, the Authority should make available the transmission parameters and locations where legacy services are currently deployed in this band. This will assist MNOs in planning how they could deploy their network, with a better understanding of where their deployment would be limited, based on the expected exclusion zones. Next, as the band is indicated to have low utilization by legacy services, and the Authority has previously stated that all legacy service equipment operating in this band is at the end of its lifecycle, the Authority should make IMT Mobile the primary service in this band, with all other legacy services having secondary allocations only. Thereafter, the Authority should schedule a migration timeline for legacy services to vacate the band.

Vodacom supports Authority's proposal for a D14 (3GPP Band 31) channel arrangement for this frequency range.

3.2 IMT750

The IMT750 band is 44 MHz away from the nearest DTT service (694 MHz) and there will be no DTT services in the 700 MHz band, as stated in the IMT700 RFSAP. Additionally, IMT services already transmit in general at much lower power levels than DTT transmitters. As such, it would be inefficient for the Authority to provide a too conservative lower EIRP limit of 61 dBm/ 5 MHz.

Vodacom therefore recommends that the Authority follow the ECC adoption of 64 dBm/ 5 MHz EIRP for this band.

⁸ Government Gazette Number 38213, NOTICE 1009 OF 2014



3.3 IMT900

Vodacom is encouraged by the Authority's appreciation of the complexity of migrating current 900MHz assignments, and appreciates the extended timeline propose by the Authority, in order for licensees to minimise the negative impacts of migration on consumers. We do, however, expect may still be some residual negative impacts of the migration post-April 2023.

Vodacom recommends that the Authority engage with each of the operators individually, to better understand the challenges that they are currently facing in their migration process.

3.4 IMT1500

Vodacom has previously requested to the Authority to consider the L-band as a contiguous range (1427 – 1518 MHz) for assignment, and not to segment it into parts, as the greatest consumer benefit can be provided by utilizing the full 91 MHz of contiguous spectrum. The National Radio Frequency Plan 2021 currently lists IMT as a typical application for the entire frequency range of 1427 – 1518 MHz. Vodacom is encouraged by the fact that there are currently no incumbents within the entire 1427 – 1518 MHz range, as indicated in the 2021 Inquiry and the Draft Implementation of the Radio Frequency Migration Plan and IMT Roadmap⁹. Therefore, we recommend that the Authority expedite the finalisation of the RFSAP for the full frequency range, and subsequently also expedite assignment of the band.

Vodacom supports the decision of the Authority to consider a TDD band plan for this range.

3.5 IMT3300

Vodacom notes the Authority's statement that Radiolocation (e.g. radar) is protected by ITU Radio Regulations, but that there appears to be no Radiolocation services in the 3300 – 3400 MHz range in South Africa currently⁹. As such, we assume that all transmissions in the band would have already been cleared. With this in mind then, we once again recommend to the Authority that Radiolocation services be changed from having a co-primary allocation with Mobile in the NRFP, to a secondary allocation.

Vodacom also wishes to request clarity from the Authority as to whether the current assignments in the 3400 – 3600 MHz range will be migrated to ensure contiguity of licensee assignments in the broader 3300-4200 MHz range, when the IMT3300 band is licensed. This is particularly relevant to efficiency as contiguous spectrum assignments are a more efficient use of a scarce national resource, and the fact that terminal support in this range is relatively wide, with both bands n77 and n78 start at 3300 MHz and end at 4200 and 3800 MHz, respectively.

⁹ Government Gazette No. 45690, Notice 739 of 2021



3.6 IMT3500

Vodacom would like to bring to the attention of the Authority that Appendix A has the wrong extract from the NRFP as it quotes the 3300 – 3800 **kHz** range and not the 3300 – 3800 **MHz** range. The correct extract is shown below.

ITU Region 1 allocations and footnotes	South African allocations and footnotes	Typical Applications	Notes and Comments
3 400-3 600 MHz FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile 5.430A Radiolocation 5.431	3 400-3 600 MHz FIXED MOBILE except aeronautical mobile 5.430A NF9 Radiolocation	BFWA IMT3500 TDD (3400 – 3600 MHz)	The band 3400 -3600 MHz is also used for BFWA in some SADC countries International Mobile Telecommunication (GG No.42829 Notice 600 of 2019). Radio Frequency Spectrum Assignment Plan (GG N. 38640) as amended 30 March 2015. Recommendation ITU-R M.1036-6 (International Mobile Telecommunications (IMT))
3 600-4 200 MHz FIXED FIXED-SATELLITE (space-to-Earth) Mobile	3 600-4 200 MHz FIXED FIXED-SATELLITE (space-to-Earth) NF14	Fixed links (4 GHz) (3600 – 4200 MHz) C-band downlink (VSAT/SNG/PTP links)(3600 – 4200 MHz) BFWA (3600 – 3800 MHz)	The sub-band 3 600-3 800 MHz could be used for BFWA where frequency sharing with FS PTP and/or FSS is feasible. The channelling arrangement for PTP links in this band is based on ITU-R Recommendation F.635 latest version Annex 1. The sub-band 3 600-4 200 MHz is used for medium and high capacity PTP links and FSS.

3.7 IMT850

Vodacom supports the decision of the Authority to clear the band as per the current regulations in order to protect 3GPP Band 20.