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Mr Manyapelolo Richard Makgotlho
Independent Communications Authority of South Africa (ICASA)
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Per mail: rmakgotlho@icasa.org.za

Dear Mr Makgotlho

RE: MTN Supplementary submission: Base Station Transmit Power Limit relaxation for AAS deployments

Mobile Telephone Network ("MTN") thanks the Authority for the opportunity to make a supplementary submission relating to power limitations for Active Antenna Systems (AAS) deployments. This is part of our further written representation on the Long-term spectrum outlook as outlined in Notice 738 of Government Gazette No. 45690 published on 24 December 2021 and the subsequent public hearings held on the 13 and 14 April 2022 on the matter.

1. Introduction

The Authority has prescribed in the 2015 Radio Frequency Spectrum Assignment Plan (RFSAP) for IMT services on 2.600MHz and 3500MHz bands that "*Base Station transmissions should not exceed 61dBm/5MHz EIRP*". This is repeated in section 5.6 of the Draft Radio Frequency Spectrum Assignment Plan for the frequency band 3400MHz to 3600MHz for public consultation, Notice 1970 of Government Gazette No 46160 published on 31 March 2022. It is MTN's understanding that globally the industry is moving towards using Total Radiated Power (TRP) as the metric to specify power limitations for Active Antenna Systems (AAS) deployments. It is critical that the Authority take into account the applications to be used for a specific band and have regard to the appropriate technical recommendations for those applications/services. Thus, MTN would like to request that the Authority revisit this power emission limit when updating RFSAP regulation as it is very restrictive for

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AAS's that are now commonly used for 5G deployments in bands such as IMT2600 and IMT3500.

2. TRP versus EIRP Power Limits for AAS

The AAS that are deployed utilize dynamic beamforming where the amplitude and/or phase between antenna elements is continually adjusted to alter the antenna pattern in response to changes in the radio environment. The EIRP¹ in a dynamic radio beam can be significantly higher in AAS deployments than for non-AAS deployments where the antenna pattern and/or antenna gain is fixed. While an EIRP limit is suitable for non-AAS passive antenna systems, the industry globally is moving towards using TRP² as the metric to specify power limitations for AAS deployments, because TRP is seen as more accurate in assessing interference between AAS systems and other mobile systems (for network level co-existence interference analysis) and has been adopted by OFCOM to specify radiated conformance requirements for AAS systems.

MTN submits as a reference within Region 1, the national regulator of the United Kingdom, OFCOM³ that has applied a **65dBm/5MHz EIRP limit for non-AAS base stations** and a **TRP limit of 44dBm/5MHz for AAS base stations** in the IMT3500 band. It is MTN's understanding that OFCOM had applied the power emission changes after four license holders (Vodafone, Telefonica, Hutchison and EE) requested OFCOM to vary the technical conditions in C-band radio licenses awarded. By comparison, in Region 2, it should be noted that the Canadian⁴ guidelines for TRP limits on C-band are even more relaxed and set at 68dBm/5MHz (for non-AAS) and 47dBm/5MHz (for non-AAS). MTN believes the OFCOM power emission guidelines for non-AAS and AAS base stations are more appropriate considering current technology being deployed for bands such as IMT2600 and IMT3500 in South Africa.

3. Comparison of EIRP power emission limit versus TRP limit for AAS

Regulatory Authority	ICASA	OFCOM	OFCOM
AAS Category	AAS & Non-AAS	Non-AAS	AAS
ICASA Emission limit (5MHz channel)	61dBm/5MHz EIRP	65dBm/5MHz EIRP	44dBm/5MHz TRP
ICASA Emission limit (40MHz channel) ⁵	70dBm/40MHz EIRP	74dBm/40MHz EIRP	53dBm/40MHz TRP
Transmitted Power (40 MHz channel) ⁵	EIRP – Antenna Gain ⁶ = 70 – 25 = 45 dBm = 31.6 W	EIRP – Antenna Gain ⁶ = 74 – 25 = 45 dBm = 79.4 W	53 dBm = 200 W
Transmitted Power (5 MHz channel)	~4W	~10W	25W
Transmit Power Difference (TRP versus EIRP)	~6 times	~2.5 times	n.a.

4. MTN coverage predictions using ASSET tool (from Aircom) utilizing 2.5D VOLCANO topographical model

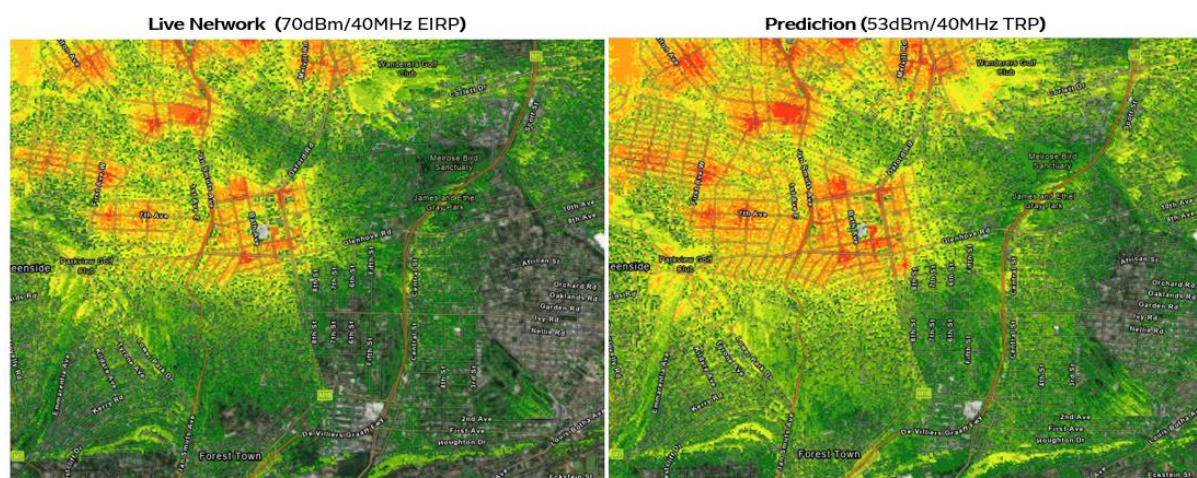


Figure 1 – Coverage prediction comparison for the current MTN 5G live network (70dBm/40MHz EIRP limit per cell) versus the 53 dBm/40MHz TRP limit on NR 3500 MHz band

5G NR SS-RSRP (dBm)	Current % POPULATION COVERAGE (at 70dBm/40MHz EIRP)	% POPULATION COVERAGE (at 53dBm/40MHz TRP)
-60	0.0%	0.2%
-70	0.3%	0.8%
-80	1.2%	2.5%
-85	2.1%	4.0%
-90	3.5%	5.8%
-95	5.1%	8.0%
-100	7.2%	10.6%
-105	9.7%	13.5%
-110	12.5%	16.6%
-115*	15.6%	19.5%

***Note:** MTN reports 5G population coverage statistics at -115dBm SS-RSRP threshold level

Note that it is unknown to MTN what transmission limits, if any, are in place on the 3.7GHz band (3600MHz – 3800MHz) where licenses have been issued for FWA on a secondary usage basis (with the satellite service having primary use of this band).

5G FWA services are being deployed in the 3.7GHz band using the same AAS technology as is being deployed in the IMT3500 band. MTN is not aware of any RFSAP published governing the operator's deploying FWA services in this band, but

it would be expected that the base station transmission limits should be no more than those specified for the IMT3500 band considering that the satellite services in this band have primary use and are expected to be protected from FWA interference. For transparency and clarity, it is recommended that the Authority publish an RFSAP for the 3600MHz – 3800MHz that clearly outlines the transmission limits allowed within this band.

Recommendation

MTN would like to request that the Authority review and reconsider this power emission limit when updating RFSAP regulation as it is very restrictive for AAS's that are now commonly used for 5G deployments in bands such as IMT2600 and IMT3500. Radio coverage is significantly impacted at present for AAS deployments using the 61dBm/5MHz EIRP emission limit.

Yours Sincerely



Geoff Blake
Senior Manager: Technical Regulations
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List of References

¹EIRP is Effective Isotropic Radiated Power, also called the Equivalent Isotropic Radiated Power. In antenna measurements, the measured radiated power in a single direction is known as the EIRP.

²TRP is an active measurement, in that a powered transmitter is used to transmit through the antenna. The total received power is calculated and summed up over all possible angles (hence, it is a spherical or 3D measurement) and the result is Total Radiated Power.

³OFCOM notice on "Variation of Spectrum Access licenses in the 3400 to 3680 MHz band". The Maximum power within the Permitted Frequency Blocks is specified in Table 2 (page 6) of the following document; <https://www.ofcom.org.uk/consultations-and-statements/category-3/proposal-vary-3.4ghz-radio-spectrum-licences>

⁴Canadian gazette notice on "Flexible Use Broadband Equipment Operating in the Band 3450-3650 MHz – RSS-192". The Maximum TRP within the Permitted Frequency Blocks is specified in Table 1 (page 4, Section 8.7) of the following document: [https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/RSS-192i42020-05EN.pdf/\\$file/RSS-192i42020-05EN.pdf](https://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/RSS-192i42020-05EN.pdf/$file/RSS-192i42020-05EN.pdf)

⁵MTN has been awarded 40MHz of spectrum on IMT2600 and IMT3500 bands in spectrum auction concluded in March 2022.

⁶Typical antenna gain of AAS product deployed on MTN 5G live network during National Disaster period using ICASA provisional radio license on IMT3500 is: 25 dBi. Example of AAU deployed: Huawei AAU5639w (3.4-3.6GHz; 200MHz IBW).