

MTN'S SUBMISSION ON THE DISCUSSION DOCUMENT REGARDING "THE USE AND LICENSING OF THE BAND 57-66GHZ (V BAND) AND THE BAND 71-76GHZ PAIRED WITH THE BAND 81-86GHZ (E BAND)" FOR CONSULTATION.

November 2015

1. INTRODUCTION

On the 8 September 2015, (by way of Notice Number 895 of 2015) in Government Gazette No: 39180, ICASA ("the Authority") published a Discussion Document regarding "the use and licensing of the band 57-66Ghz (V Band) and the band 71-76 GHz paired with the band 81-86GHz (E Band)" for Consultation.

MTN welcomes the publication of the Discussion Document in that we believe that the regulatory framework for licencing of E-Band and V-Band is of such significance and if regulated in an effective manner will provide alternative solutions for fibre deployment where the acquisitions of the appropriate wayleaves proves to be problematic.

MTN's submission is structured as follows:

- Section 2 sets out general commentary to the Discussion Document; and
- Section 3 provides specific comments to the Discussion Document.

MTN confirms its willingness to participate in any oral hearings which may be scheduled in regard to the Discussion Document.

2. GENERAL COMMENTS

The demand for cost-effective solutions to high capacity connectivity is constantly on the rise. Both service providers and enterprises are looking for cost effective, reliable solutions that are quick to deploy. Fixed point-to point wireless systems are ideal because of their flexibility, speed of deployment, and lower overall life-cycle costs compared to leased-line services. This accounts for the wide deployment and popularity of traditional microwave point-to-point system (6 - 38 GHz).

2.1. E-Band

The significance of the E-band spectrum cannot be overstated. The 10 GHz of spectrum available in the 70 and 80 GHz bands represents 50-times the bandwidth of the entire cellular spectrum. With 1 -5 GHz of bandwidth available, gigabit and greater data rates can easily be accommodated with reasonably simple radio architectures. Propagation

characteristics are comparable to those at the widely used microwave bands, and link distances of up to 3km can confidently be realised.

E-Band has a profound advantage when used as a last mile technology substituting fibre in cases where way leaves cannot be obtained. It furthermore has the advantage of “time to market” and can also easily be recovered when enterprise customers move premises or relinquish their service.

There are a number of additional physical and regulatory-enabled technical characteristics that add to the attractiveness of E-band as a useful spectrum for wireless communications.

- Firstly, the gain of an antenna increases with frequency (11dB more at e-Band compared to 18GHz), in other words because of the small aperture/beam widths of these antennas (pencil width), all the gain of the antenna is focused in this small beam, resulting in an increase in gain in that direction
- The 5 GHz wide E-band channels enable the radio to pass high data rate signals with only low level modulation schemes. This together with adaptive rate modulation AMR can result in 1.2 Gbps throughput over a 1GHz channel only utilizing QPSK (Quadrature Phase Shift Keying)..

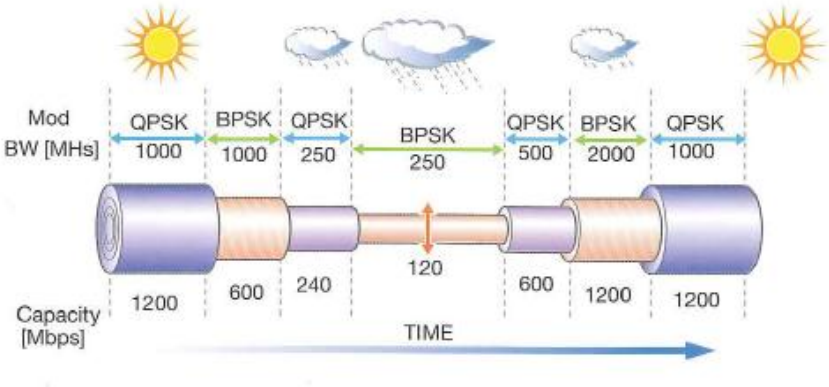

Fig 1: AMR enabling 1Gbps on low modulation schemes such as QPSK

These simple modulation schemes hold the following advantages:

- The transmit amplifiers can be driven to their maximum power ratings, providing additional power compared to high-QAM modulations.
- The receiver sensitivity is improved with a low-level modulation.
- The hardware is simpler, more cost effective, and has a smaller footprint.

The current ETSI standard governing the use of E-band is intended for self-coordination, and as such does not stipulate a full set of receiver parameters. It recognises that due to the excellent spectral reuse characteristics of the band, minimal frequency coordination is required. However current feedback from carriers throughout Europe has indicated that they would prefer a more centrally coordinated/licensed approach in order to safeguard their mission-critical services.

Therefore, ETSI TM4 are currently redrafting EN 302 217-2 to include 80 GHz, allowing regulators the choice of self-coordinated or fully-coordinated deployments in the future.

Currently, most licensing schemes in traditional microwave frequencies use the occupied bandwidth as a linear component at determining the license cost. For example, a license for a 56 MHz channel will cost twice as much as a license for a 28 MHz channel, as is the case in South Africa with administrative incentive pricing.

In E-band, however, the European Radio Communication Committee recommendations are written around low level modulation schemes and very wide bandwidths. Therefore, using the existing "formulas" for licensing costs can grossly overprice an 80 GHz 1 GHz wide channel in relation to a 23 GHz 56 MHz channel. Such algorithms have been adopted in some countries, but have resulted in the de-facto sterilisation of the 80 GHz band, due to the exorbitant license costs. As a consequence, most countries have taken a more attractive approach of sensibly pricing licenses in E-band, thus leading to a large utilisation of this still spectrum.

Below is an extract from a publication on Licensing and License Fee Considerations for E-band 71-76 GHz and 81-86 GHz Wireless Systems by Jonathan Wells, PhD, in which he highlights the salient points:

> *Many countries have chosen to open the 71-76 and 81-86 GHz ITU "e-band" frequencies for ultra high capacity point-to-point communications. Most of these countries' regulators have recognized two unique aspects of high frequency propagation physics and high data rate e-band radio systems:*
>
> • *The unique transmission properties of very high frequency mm-waves enable much simpler frequency coordination, interference mitigation and path planning than lower frequency bands*
>
> • *Licensing fees based on amount of data transmission or bandwidth usage will result in tariffs that can be extraordinarily high for high data rate systems;*

so high that gigabit per second wireless systems are penalized and both adoption and competition is discouraged

For these reasons, several regulators manage e-band using "light licensing" techniques that reflect the ease of coordinating, registering and licensing, and set license fees that cover administrative costs, but do not penalize the high data rates and bandwidths that are required for ultra-broadband services.

MTN would support that a similar approach is adopted by ICASA

2.2. V-Band

A 60GHz communications system must overcome the effects of oxygen absorption, which is at a rate of 16dB/km. In order to operate reliably at even short ranges, a very focused, narrow-beam antenna must also be employed to increase the level of signal available to the target receiver. This combination of oxygen absorption and narrow beam transmission enhances the security of the 60GHz radio link, minimizing the probability of unauthorized intercept.

The benefit of Oxygen absorption relative to frequency re-use is detailed in figure 2. It illustrates the distance relationship between the 60GHz frequency reuse range, the green region, and the traditional range, the blue region. Oxygen absorption makes possible the same-frequency reuse within a very localized region of air space. Operation within the 60GHz millimeter wave spectrum enables very dense interference free deployment of same frequency radio terminals.

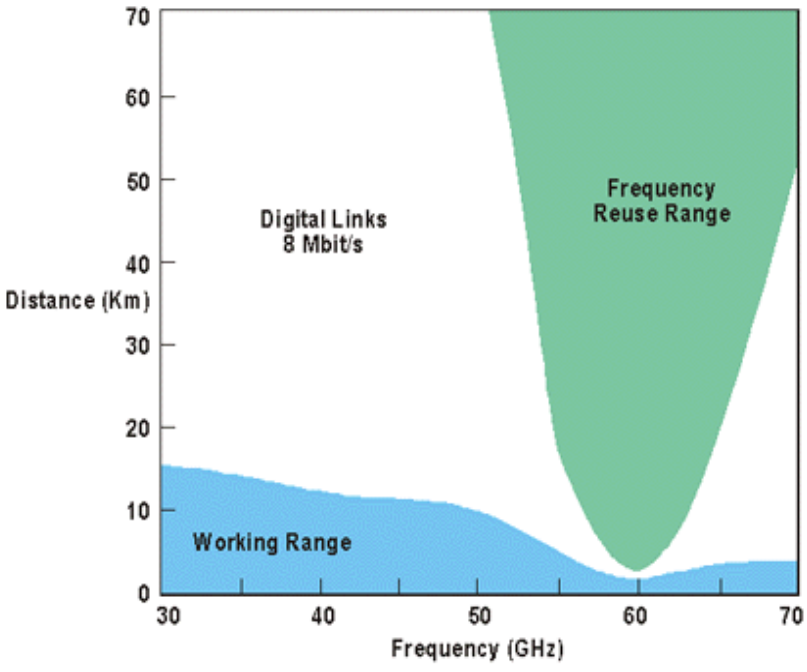

Fig 2: Frequency Reuse

Due to the unique characteristics of the 60GHz millimeter wave region and the raw bandwidth available, wireless communication at 60GHz offers a reliable "last mile" alternative to installing physical fiber. 60GHz communications systems can be used for a variety of applications, including metropolitan area networks, campus networks, network backbones, network branch links, temporary emergency restoration and local access.

As such MTN is in agreement with the Authority on the benefits of V-Band and submit that this band should be licensed exempt.

3. SPECIFIC COMMENTS

3.1 Do you think light licensing would be an appropriate approach for E-band in South Africa?

From a technical point of view, light licensing is a definite option for E- Band as the narrow beam-width at 80 GHz focuses the energy into a "pencil-beam" which creates a very directional transmission, greatly minimizing the potential for interference. However ICASA should be cognizant that mission critical services provided by operators require full protection from interference.

Therefore MTN submits that the E-band should be segmented to allow for full licensing of a portion of E-Band spectrum, in order for operators to acquire the relevant spectrum that is afforded full protection from interference.

3.2 Are there any other licensing approaches that should be considered by the Authority for the E-band?

MTN is of the opinion that the E band should be separated in a light licensing part as well as a fully licensed part. Many operators offer mission critical services as well as high capacity/high availability “fibre like” services to enterprise customers. In such cases, the user of the spectrum requires the full protection afforded by licensed spectrum. In the Netherlands and Ireland, both regulators have adopted fully licensed models, but the fee structure has been amended to remove the cost barriers.

3.3 What other applications for E-Band spectrum should the Authority consider as part of this process, and should such applications impact either the licensing approach?

MTN agrees with the Authority that the following are the main applications for E-Band, and has included one additional application, which is mentioned below:

Mobile backhaul: Backhaul and aggregation for mobile networks including for 2G and 3G, as well as 4G next-generation mobile service;

Fixed Networks: High-capacity business services, including cellular, Wi-Fi and WiMAX backhauling, fibre backbone extensions, redundancy fibre overlays, municipality mesh backbones and temporary connections;

Healthcare: Secure campus connectivity, off-site medical offices and lab network access, real-time connectivity for imaging applications, redundancy fibre overlays and disaster recovery; and

Education: High-performance campus and off-site location connectivity, Wi-Fi hotspot and security camera backhauling and connectivity to service providers' fibre-optic networks.

Mission critical: Services related to safety etc.

3.4 Do you think a self-coordinated approach is appropriate under certain circumstances in the E band?

MTN supports the method adopted by Ofcom in the United Kingdom as it relates to the segmentation of the band to cater for exclusive channels.

Certain operators would require larger E-Band segments to provide carrier grade high availability services to enterprise customers. In such cases the protection that full licensing provides would be required. As such MTN would propose a hybrid licensing approach that allows for full protection from interference that is provided through licensing of spectrum at an acceptable cost and a license exempt portion.

3.5 Are there any other potential approaches apart from band segmentation to accommodate the different spectrum demands in the E band?

MTN submits that band segmentation is an appropriate way to accommodate different spectrum demands.

3.6 What other applications for V-band spectrum should the Authority consider as part of this process?

MTN agrees with the Authority that Intelligent Transport Systems (ITS) and Multi-Gigabit Wireless Systems (MGWS) are two services that utilize this spectrum

However, in addition to this the requirement to meet the growing demand of coverage and capacity of high capacity services (3G,LTE) in dense urban areas result in the increasing numbers of small cells that need to be deployed. This can be in the form of street furniture such as lamp posts etc. Backhaul of these small cells might require connecting various cells in a daisy chain topology back to a macro cell. In such cases high capacity backhaul is required over short distances (typical 50 -100m). V-Band is an excellent medium for such short distance high capacity backhaul application and would not require coordination as a result of the narrow bandwidth and short distance propagation.

3.7 What technical sharing criteria should apply in a license-exempt environment?

As per the ECC report 113, it should not be necessary to impose strict frequency coordination measures as long as emissions from ITS is limited to -29 dBm in the lower 200 MHz of the FS band.

3.8 What principles should guide the allocation of spectrum for V band services?

MTN is of the opinion that V-Band should be treated in the same way as the license exempt 5.8 GHz band where this spectrum is primarily used for “best effort” applications with no formal coordination.

3.9 As a general principle with, should the Authority relax the transmit power restrictions on case by case basis e.g. rural areas where interference risk is lower than in urban/densely populated areas.

As a general principle, relaxation of the transmit power restriction could be implemented in rural areas where the density and usage of these links are less. However, this might lead to additional regulation required by the Authority; as such areas will have to be monitored for increased activity in the band. With increased growth the relaxed transmit powers will have to be re-assessed by the Authority at a later stage, from time to time i.e. at yearly intervals.

3.10 Is there another approach that should be considered by the Authority?

MTN supports the 4 possible license methods as indicated by the authority:

- self-coordination approach (coordination done by the user);
- regulator-coordinated approach;
- approach of regulator-coordinated with fixed channel assignments;
- License-exempt approach

3.11 Should the Authority consider conventional licensing? If so, please provide reasons.

The following formula is applicable by ICASA in determining the radio frequency spectrum license fees for Point to Point applications:

Fee = (UNIT * FREQ * BW * CG * GEO * SHR * ASTER * HOPMINI * UNIBI)

Making use of this formula, and the factors in the following tables, the exclusive use of a paired 1GHz channel in E- Band (block allocation) for national reuse will result in the following annual fee.

Unit	FREQ	BW	CG	SHR	GEO	ASTER	HOPMINI	UNIBI	Fee
R2000	0.05	1000	1	1	1	600	1	1	**R60m**

Clearly, the above model should not be applied to E-band in the usual fashion, as R60m would deter any operator from utilizing such spectrum.

MTN is of the opinion that conventional licensing (sub 38 GHz) will not be suitable for V/E Band and suggest the following:

- V – Band : License exempt
- E- Band: Combination of Light Licensing and regulator- coordination with fixed channel assignments.

3.12 Do you agree with the concept of segmentation for the purposes of providing both a light-licensing and a full -licensing approach? Please provide reasons for your position.

MTN agrees with the concept of segmentation for providing both light licensing and full licensing. A segment for full licensing will have to be considered for mission critical and high availability services, however as mentioned above existing fee structures would have to be amended in order to achieve a more rational price for licenses in E-band, thus leading to a large utilisation of this spectrum. Excessive fees as explained in 3.11 above may lead to the underutilisation of valuable frequency.

3.13 Do you agree with the segmentation as proposed?

As a result of the fact that E-Band spectrum can be re-used frequently for reasons discussed in 3.2, it will probably not be necessary to reserve half of the spectrum for the full licensing model. MTN suggests that only 3 GHz spectrum be reserved for full licensing.

3.14 Will online registration be feasible?

MTN is of the opinion that online registration is feasible as long as all operators adheres to it.

3.15 Will a 14 day registration requirement be effective and practical?

The registration period should be as short as possible to prevent operators using potentially interfering spectrum without being aware of each other. Fourteen (14) days should be a practical time frame.

3.16 Is there another approach that should be considered by the Authority?

MTN agrees with ICASA's approach, as it facilitates rapid roll-out and diminishes the Authorities burden of coordination between operators.

3.17 Are there any other factors that the Authority should consider?

The Authority has provided a comprehensive document that has considered all factors

3.18 Is this type of regulation (for at least a portion of the E band) really necessary in view of light-licensing looking fairly attractive?

As mentioned in 3.12, certain mission critical and high end availability services require full license protection from the Authority in order to meet SLAs, and hence formal regulation of part of the E-Band will be required.

3.19 Do you have any views as to whether the self-coordination approach or the regulator-coordinated approach is preferable?

Both self-coordinated and Regulator – coordinated approaches should be used in a segmented E Band spectrum.

3.20 Do you think an annual licence fee per point-to-point link is an appropriate approach whereby the licensee has exclusive, protected spectrum?

An annual license fee per PTP link as is currently the case for protected spectrum below 38 GHz would be an appropriate approach to protected E-Band spectrum. The annual license fee should cover administrative costs and not be a cost barrier that may inhibit the utilization of the spectrum band, as such an annual flat fee is recommended.

3.21 Do you think this is a sensible approach? Please provide alternative suggestions if you disagree.

The regulator is currently licensing national block spectrum to large operators on an exclusive basis. Such operators are required to provide to the Regulator a database detailing their current deployment of the block spectrum. This is required for the regulator to do frequency coordination and interference calculations with respect tot infringement of the allocated block spectrum. This seems like a sensible approach.

3.22 Do you think it is a reasonable approach to do away with the exclusivity of a frequency channel to a specific user if there is a need for spectrum by other users who cannot be accommodated in alternative channels, because of congestion? Please provide alternative suggestions if you disagree?

MTN is of the opinion that the E-Band should be segmented into a non-exclusive, as well as an exclusive band (mission critical services). As a result of the short distance a narrow beam widths associated with this spectrum, and hence the possibility of frequent spectrum re-use, there should not be cases where dedicated spectrum will be required to alleviate congestion.

The following three answers relates directly to the Authority's request for comment on channel arrangements.

3.23 Whether the Authority should specify channels;

Yes, the Authority should specify channels in the E-Band.

3.24 If the Authority should specify channels, whether they should be for FDD or TDD or both;

Both frequency-division duplexing (FDD) and time –division duplexing (TDD) has definite advantages and disadvantages:

TDD

Advantages	Disadvantages
• Suited to Asymmetric data payloads (Ethernet IP)	• Lower throughput than FDD
• Cost-effectiveness of equipment (architecture)	
• Ease of frequency planning	
• "Unlicensed" or "Light licensed	

FDD

Advantages	Disadvantages
• Low latency applications	• Lower throughput than FDD
• Throughput higher than TDD (BUT same spectral efficiency).	• Strict freq planning required
• Symmetric data and timing applications (cellular backhaul, framed data)	• "Carrier grade" pricing.

In the United States, E- Band spectrum is available without any sub-channel definition, which allows for frequency-division duplexing (FDD) only.

In Europe, the CEPT has allocated 19 channels of 250-MHz bandwidth each and two 125-MHz guard bands, in each of the 5-GHz-wide E bands. Several channel-pairing scenarios are possible, and time-division duplexing (TDD) is also allowed. In several

countries in Europe, including UK, all of the 19 channels can be paired together, resulting in a 4.75-GHz-wide band.

MTN would therefore suggest that the Authority specify channels for both TDD and FDD applications.

3.25 How the channels should be specified, also considering RF bandwidth.

MTN agrees with the 19 channel band allocation suggested by the Authority (Table 1).

Table 1. RF channels for E-band at various RF channel widths

250 MHz			500 MHz			1000 MHz		CH
81000	71000		81000	71000		81000	71000	GB
81250	71250	1	81375	71375	1	81625	71625	1
81500	71500	2						
81750	71750	3	81875	71875	2			
82000	72000	4						
82250	72250	5	82375	72375	3	82625	72625	2
82500	72500	6						
82750	72750	7	82875	72875	4			
83000	73000	8						
83250	73250	9	83375	73375	5	GB	GB	
83500	73500	10						
83750	73750	11	83875	73875	6	84125	74125	3
84000	74000	12						
84250	74250	13	84375	74375	7			
84500	74500	14						
84750	74750	15	84875	74875	8	85125	75125	4
85000	75000	16						
85250	75250	17	85375	75375	9			
85500	75500	18						
85750	75750	19						
86000	76000		86000	76000		86000	76000	GB

This scenario would make various channel groupings available to make provision for both TDD and FDD.

3.26 Please indicate if you agree with the Authority's view.

MTN agrees with the Authority's view, that the V band should be license exempt and that a similar approach be followed as is currently used for the 2.4-GHz and 5.8-GHz bands.

3.27 What other considerations should guide the Authority's decision in this regard?

Equipment used in the V-Band should meet certain minimum requirements as specified by the Authority and would need to follow a type approval process.

3.28 Do you think there are any risks or other factors that the Authority should consider before making the decision that a license-exempt approach is appropriate for the V band?

MTN does not foresee any risk in making the V Band license exempt, as long as the equipment adhere to the minimum requirements as prescribed and type approved by the Authority.

3.29 Do you think there may be benefits to requiring link registration in this band and that this should be considered?

MTN is of the opinion that maintaining an accurate data base with regards to unlicensed link deployment would be difficult and add to the administrative load of the Authority, with no real benefit.

3.30 If you think that links should be registered, would you consider that to be compatible with MWGS to be licence-exempt?

MTN does not think that license exempt links should be registered.

3.31 Do you agree with the parameters set out above? Please substantiate your response.

MTN agrees with the parameters regarding V Band as recommended by ECC/REC/ (09)01 to be followed by the Authority:

- Maximum transmitter output power: 10 dBm;
- Maximum e.i.r.p.: 55 dBm; and
- Minimum antenna gain: 30 dBi.

Limiting the maximum e.i.r.p to 55 dBm and minimum antenna gain to 30 dBi will ensure narrow bandwidths and subsequent low probability of interference.

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