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ICASA's E-Band and V-Band Proposals (September 2015)

Recognising demand for these bands, ICASA intends to regulate the E band and V band in a manner which is effective and also spectrum-efficient, keeping licensing delays to the bare minimum, by proposing that the V-Band be licence exempt and the E-Band be split into licensed and light-licensed portions.

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E-BAND

- 71-76 GHz and 81-86 GHz
- Suitable for radio transmission as occurs in atmospheric attenuation window
- Allocated to the Fixed Service on an international basis across all ITU Regions
- Allows PtP links of up to 4km
- Allows extremely large data transmission rates (up to several gigabits per second) normally used in a paired fashion on the same link, for FDD-based transmission
- May meet demand for high data transmission rates over short ranges through deployment of 4G/LTE networks (link between smart device and base station under a small cell strategy)
- Requires Line of Sight (LoS)
- "Pencil-beam" characteristics of the transmission, i.e. extremely narrow beamwidth of dish antennas, means highly focussed, directional transmission, making chance of mutual interference with random, uncoordinated deployment, to be highly unlikely.

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

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

E-Band deployment scenarios

- Mobile backhaul and aggregation
- 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
- Interestingly ICASA sees the potential for this band to be used for last mile connections:
  With the increasing availability of low-cost user devices, data usage has hit the mainstream and traffic volume growth in townships is higher than the average growth rate countrywide. We are seeing the high growth rate of WI-FI access points in the townships and new innovations from operators where non-traditional ("shipping container") base stations covering approximately 1.5 km are rolled out. The proliferation of these "small cells" increases demand for short high capacity links. Where fiber is not cost -effective and traditional microwave links bands are not fast enough the solution becomes the E-band. This approach free up traditional microwave radio links that can then be used for longer hops. Often a wireless connection for last mile connection is far more easy to deploy and less costly than an environmentally destructive trenching of a conduit underground. Internet service providers in townships and informal settlements can benefit from wirelessly connecting to fiber nodes.

E-Band channel arrangements

- ITU Recommendation ITU-R F.2006 defines the arrangement of specific radio-frequency (RF) channels for channel size ranging from 250 MHz to 4500 MHz, permitting time-division duplex (TDD) and frequency-division duplex (FDD) applications with 10 GHz as well as 2.5 GHz duplex separation. The Recommendation specifies the channel/block arrangement as multiples of 250 MHz with 125 MHz of

guard band on each side. That makes 2 × 19 basic 250 MHz channels within the bands 71-76 GHz and 81-86 GHz available.

The Authority understands that there is a range of different demands for the spectrum, with some users demanding carrier-grade, quality (i.e. very high availability) links (e.g. for microcells). These users are concerned about the risks of the self-coordinated approach from the point of view of link availability. Government security agencies also require exclusive channels to cater for their safety-of-life operations. To cater for all these requirements, the Authority may consider band segmentation, similar to what has been implemented by Ofcom in the United Kingdom.

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?

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

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

V-BAND

- 57-64 GHz
- Very wide RF bandwidth, so very desirable for high-capacity uses, both for networking equipment indoors and for short-range, outside links. Applications include:
  - streaming lag-free high-definition (HD) video from a Blu-ray video player or tablet to a television set;
  - peer-to-peer (P2P) fixed operations outdoors;
  - providing broadband access to adjacent structures in commercial facilities; and
  - extending the reach of fibre-optic networks.
- Typical link ranges of a few hundred metres
- Narrow beamwidth so suitable for uncoordinated use allowing high number of short-range digital fixed links in a relatively small area

  To illustrate the difference between systems using V band, as compared with those using the much lower 5.8-GHz band: At 60 GHz a 25-cm dish antenna can achieve 40 dBi of gain with a half-power beamwidth of 1.4 degrees. At 5.8 GHz, an antenna of the same size would have a beamwidth ten times that – therefore at least 10 degrees. The narrow beamwidth at 60 GHz allows multiple radios to be installed on the same roof-top or mast, even if they are all operating at the same frequency. All that is required to avoid mutual interference is that the radios must be spaced apart on the roof and/or should be aimed respectively in slightly different directions.

- ITU Radio Regulations (RR) No. 5.547 identifies the 55.78-59 GHz band, as well as the 64-66 GHz band, as being available for high-density applications in the fixed service (FS).
- ITU Recommendation ITU-R F.1497 sets out the radio-frequency channel and block arrangements of V-Band for Fixed Services are defined in.

V-Band deployment scenarios

- Intelligent Transport Systems (ITS)
- Multi-Gigabit Wireless Systems (MGWS): encompasses applications for wireless digital video, audio and control applications, as well as multiple gigabit WLANs operating in the 57-66 GHz band on a licence-exempt ('unlicensed') basis.

Interference considerations

- ECC REPORT 113 Compatibility Study: not necessary to try and frequency-coordinate systems in this band. For this reason, the band can be used licence-exempt, as long as certain technical criteria are adhered to.
- The V-Band is regulated as licence-exempt ("unlicensed") in the majority of regulatory jurisdictions across the globe.
- Acknowledge demands for licensed spectrum but suggest E-Band is a better solution

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

V-Band channel arrangements

- The CEPT Recommendation ECC/REC/(09)01 provides a number of flexible options for high-power, point-to-point, fixed wireless services in this band, including the options of either not having a specific channel plan or adopting a channel plan. Figure 7 shows plans for channelisation in FDD and TDD mode.

7 What technical sharing criteria should apply in a licence-exempt environment?

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

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.

SUGGESTIONS FOR REGULATORY FRAMEWORKS FOR E-BAND AND V-BAND

- There is a clear need for a regulatory framework.
- In view of practices followed elsewhere, there are four possible approaches that the Authority has been considering for regulating the E-Band and V-Band. These are:
  - a self-coordination approach (coordination done by the user);
  - a regulator-coordinated approach;
  - an approach of regulator-coordinated with fixed channel assignments; and
  - A licence-exempt approach.

The proposed E-Band framework

- Conventional licensing unsuitable, delays and expense will impede rollout
- Band segmentation: proposal to have a conventionally licensed and a light-licensed portion:

  The Authority proposes that the E band should be segmented into two parts, one for a conventional,

regulator-coordinated approach and the other for a self-coordination, light-licensing approach. It is proposed that the band is segmented as indicated in figure 8. This means that the band 73.375–75.875 GHz, paired with 83.375-85.875 GHz, is set aside for self-coordination and the band 71.125-73.125 GHz, paired with 81.125-83.125 GHz, is set aside for conventional frequency coordination, frequency assignment and spectrum licensing. We term the former approach a light-licensing approach and the latter approach a full-licensing approach.



Figure 8. Diagrammatic representation of E-band segmentation

Segment	Block Size	Frequency range	Maximum channel bandwidth	Channel Plan	Transmit Power	
Self-coordination block	2.5 GHz	73.375–75.875 GHz paired with 83.375-85.875 GHz	2.5 GHz	CEPT band plan [ECC REC/(05)07]	Maximum e.i.r.p.	55 dBW
					Maximum transmitter output power	30 dBm
					Minimum antenna gain	38 dBi
Frequency band pair coordinated by the Authority	2 GHz (limited to 1 GHz in the first instance)	71.125-73.125 GHz paired with 81.125-83.125 GHz	1000 MHz	CEPT band plan [ECC REC/(05)07]	Maximum e.i.r.p.	55 dBW
					Maximum transmitter output power	30 dBm
					Minimum antenna gain	38 dBi
Frequency band pairs separating the self-coordination blocks from the blocks coordinated by the Authority	250 MHz	73.125-73.375 GHz paired with 83.125-83.375 GHz	-	-		

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

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

- The light-licensing (self-coordination) portion of the band: propose use of an automated, online database maintained by the Authority on which links are to be registered. Users must plan their own links taking cognisance of existing, registered links in the band.
  - Narrow beamwidths will be primary interference protection. Users must resolve interference complaints from existing users: priority is given to the link with the earliest registration date.
  - Licence fees payable
  - Propose must register on database at least 14 days before deploying link.
  - Propose model that will allow registration in 15 minutes through web interface
  - Benefits: very rapid deployment of links, including temporary links & no increased requirement on ICASA due to frequency coordination and the rest of the licensing process

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.

13 Do you agree with the segmentation as proposed?

14 Will online registration be feasible?

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

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

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

- Online link registration: ICASA is considering putting in place a publicly available, web-based registration database, with the parameters on how to be registered given in Annexure 1. The database will be similar to that used by other regulators, for instance, the one used by the FCC in the United States.
- Regulator-coordinated spectrum: done in the normal manner full radio-coordination with a PtP licence fee payable

  To that end, the United Kingdom regulator Ofcom, for instance, is currently reviewing its originally adopted self-coordination approach to make provision for operators who require a guaranteed availability of links. Hence, there is a need to have part of the E-band for licensing for exclusive, dedicated frequency spectrum. Ofcom, as a result, is planning to segment the E band into both a component for self-coordination and a component for coordinating spectrum use in a dedicated, licensed manner.

- Regulator-coordinated spectrum with national pre-assigned channel(s) (“Bulk assignments”): variation on regulator-coordinated approach where a frequency channel or channels is pre-assigned on a countrywide basis. User will be required to inform the Authority, on a regular basis, of all the links deployed (as per Annexure 1).

- The use of the pre-assigned frequency channel will not be exclusive to the user of the channel, especially in the longer term: where congestion in other channels occurs ICASA may co-ordinate use of the pre-assigned channel(s).

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?

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

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

- Technical requirements: as per the CEPT band plan [ECC REC/ (05)07]
  - maximum transmitter output power: 30 dB;
  - maximum e.i.r.p.: 55 dBW; and
  - minimum antenna gain: 38 dBi.

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

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?

- Channel arrangements: *no final view on channel arrangements.*

23 Whether the Authority should specify channels;

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

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

- Protection of the Square Kilometre Array (SKA): need to protect radio astronomy observations from harmful interference when planning the allocation of other services in the 76-86 GHz band. In the case of light-licensing portion ICASA will have to specify an exclusion zone.

The proposed V-Band framework

The Authority's view is: To make the band licence exempt as per 5.8 GHz or 2.4 GHz would best satisfy the needs of users. There would therefore be no need for users to apply to the Authority for a spectrum licence, in this instance.

- Type approval required. No licence fees payable.
- Technical requirements: follow ECC/REC/ (09)01
  - Maximum transmitter output power: 10 dBm;
  - Maximum e.i.r.p.: 55 dBm; and
  - Minimum antenna gain: 30 dBi.

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

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

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

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

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

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

Annexure 1 – E-Band registration database fields

Licensee name	
The Authority's serial reference number	
Date of link registration with a time stamp	
Province	
Path length (km)	
Bandwidth (MHz)	
Bit-rate (Mbps)	
Receiver sensitivity	
Polarisation (H, V or H &V)	
Duplexing method (FDD /TDD)	
Site A	Site B
Geographical coordinates (dd:mm:ss)	Geographical coordinates (dd:mm:ss)
Ground Height (m ASL)	Ground Height (m ASL)
Antenna height (m AGL)	Antenna height (m AGL)
Equipment manufacturer	Equipment Manufacturer
Equipment Model Number	Equipment Model Number
Equipment type approval number (TA number)	Equipment type approval number (TA number)
Antenna manufacturer	Antenna manufacturer
Antenna model number	Antenna model Number
Antenna maximum gain (dBi)	Antenna maximum gain (dBi)
Antenna elevation angle (degrees)	Antenna elevation angle (degrees)
Antenna azimuth angle (degrees)	Antenna azimuth angle (degrees)
EIRP (dBW)	EIRP (dBW)
Transmit frequency (MHz)	Transmit frequency (MHz)