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The Republic
of Vanuatu



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Radiocommunication
Regulator

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A Consultation Paper on **Planning for the 700 MHz band in Vanuatu**

INVITING PUBLIC COMMENT AND INPUT
30th April 2014

Planning for the 700 MHz band in Vanuatu

Executive summary

In this paper the Telecommunications and Radiocommunications Regulator of Vanuatu (TRR) is seeking comment on its proposals to plan the 700 MHz band (694MHz to 803MHz) in Vanuatu for 4th Generation Mobile Broadband using the Asia Pacific Telecommunity's (APT) 700 MHz Plan.¹

Mobile broadband is a recognized economic enabler capable of providing internet access and facilitating improved education and healthcare facilities. Because the 700 MHz band is capable of supporting cells with a radius exceeding 10 km the cost of infrastructure is much lower than higher LTE bands like 1800 MHz. This reduced cost of infrastructure combined with the ability to reuse most existing 900 MHz towers means the cost to provide the new services is reduced which should result in a saving to both the operator and the consumer.

There are a number of international arrangements to choose from when planning the 700 MHz band. The paper presents all currently available options for the planning of this band and discusses the advantages and disadvantages of each.

The paper concludes that TRR believes the APT 700 MHz plan is the best option for Vanuatu because it is now almost a globally harmonised band. In addition, the APT Frequency Division Duplex (FDD) arrangements have been almost universally adopted in Region 3 where Vanuatu is categorized under, with only China opting for the Time Division Duplex (TDD) plan.

The smallest viable FDD pair is 5 MHz. The most technically efficient block of spectrum for LTE services is a 20 MHz pair. TRR therefore proposes to offer the spectrum as lots of 2 by 5 MHz (up to a maximum per carrier of two 20 MHz paired licenses made up of four 5 MHz pairs). To ensure maximum technical efficiency is obtained, the blocks for each carrier will be aggregated into contiguous blocks. This arrangement provides flexibility to reorder the band in the future if technology changes warrant this.

TRR believes that there may be a strong case for broadband spectrum for emergency services in the future. The paper seeks views on this possible future need and how it may best be met.

Taking these proposals into account the paper sets out the TRR proposed structure of the band and using 3rd Generation Partnership Project (3GPP) standards for the band (3GPP Band 28) as guidance presents a set of technical parameters for the allocation of the spectrum

Throughout the paper TRR seeks and requests input from industry and the community. Specific questions are summarized in Section 16.

¹ APT Report on "Implementation Issues Associated with Use of the Band 698-806 MHz by Mobile Services". APT/AWG-REP-24, September 2011

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2 CONSULTATION FEEDBACK INFORMATION

- TRR welcomes and invites comments and feedback to this consultation document from all interested parties;
- We would appreciate your provision of information to be clear by quoting the corresponding main sections and sub sections when providing your comments;
- More general comments on the consultation document should be indicated accordingly;
- In the interests of transparency, TRR will make public all or parts of any submissions made in response to this Consultation Document unless there is a specific request to treat all or part of a response in confidence. If no such request is made, TRR will assume that the response is not intended to be confidential. TRR will evaluate requests for confidentiality according to relevant legal principles;
- Respondents are required to clearly mark any information included in their submission that they consider confidential. They shall provide reasons why that information should be treated as such. Where information claimed to be confidential is included in a submission, respondents are required to provide both a confidential and a non-confidential version of their submission. TRR will determine, whether the information claimed to be confidential is to be treated as such, and, if so, will not publish that information. In respect of the information that is determined to be non-confidential, TRR may publish or refrain from publishing such information at its sole discretion.
- TRR has set out a number of questions throughout this consultation paper. These are summarised in Section 16. Wherever possible, please refer to these questions if you have specific questions to provide us with your queries;
- TRR will accept comments in English, French or Bislama;
- If comments are submitted in printed format, they must be submitted on A4 paper accompanied, wherever possible, by a disk containing the comments, in electronic format;
- Comments on this consultation document should be provided to TRR via the following means:

Email address consultation@trr.vu

Faxed to (678) 24470

Posted or hand delivered to:

Public Input – Planning for the 700 MHz band in Vanuatu

Telecommunications and Radiocommunications Regulator

P O Box 3547, Port Vila, Vanuatu

- The deadline for public Comments is **4pm, 13 June 2014**; please note that TRR's consultation timeframe in accordance with TRR's Consultation Guidelines is normally 28 days. For this plan, TRR considers a 6 week review period is necessary.
- For any phone enquiries regarding this Consultation document, please call the following numbers:

(678) 27621 or (678) 27487
- TRR will consider every comment submitted when finalizing its report or decision. For transparency, a record of every comment received will be made available for public

information, unless comments are labeled 'In Confidence' (see also dot points 4 and 5 above);

- For more information about TRR's Consultation Guidelines, please visit the following website <http://www.trr.vu/index.php/en/public-register/consultations>
- You are welcome to visit our website <http://www.trr.vu> for more details on the latest developments in the telecommunication services industry and other related matters.

3 GLOSSARY

3GPP	3rd Generation Partnership Project
APT	Asia Pacific Telecommunity
AWG	APT Wireless Group
CDMA	Code Division Multiple Access
CEPT	Conférence Européenne des administrations des Postes et des Télécommunications
EIRP	Effective Isotropic Radiated Power
E-UTRA	Evolved Universal Terrestrial Radio Access
FDD	Frequency Division Duplex
GSM	Global System for Mobile Communications
GSMA	GSM Association
ITU	International Telecommunications Union
JTG	Joint Task Group
LTE	Long Term Evolution
LTE-A	LTE Advanced
PPDR	Public Protection and Disaster Relief
PS BB	Public Sector Broadband
PS NB	Public Sector Narrowband
TDD	Time Division Duplex
TRR	Telecommunications and Radiocommunications Regulator of Vanuatu
TVL	Telecom Vanuatu Limited
UHF	Ultra High Frequency
VHF	Very High Frequency
WRC	World Radio Conference

4 INTRODUCTION AND PURPOSE

Vanuatu currently enjoys mobile telephone coverage provided by 2 carriers, Digicel and Telecom Vanuatu Limited (TVL), in the 900 MHz and 1800 MHz bands. The technology used is based on the 2nd Generation (2G) Global System for Mobile Communications (GSM) standard and more recently on the CDMA based 3rd Generation Universal Mobile Telecommunications System (UMTS) standard.

3rd Generation (3G+) services are offered using UMTS technology in the same 900 MHz bands used for GSM.

While the 1800 MHz band is suited to 4th Generation services, it is understood that it is currently being used for 2.5G services in Vanuatu.

Access to reliable high capacity mobile broadband is a recognized economic enabler. To ensure the people of Vanuatu and visitors have access to the most modern technology, 4th Generation Long Term Evolution (LTE) services, TRR proposes to plan the 700 MHz band (694 MHz to 803 MHz) for LTE using the regional APT 700 MHz plan. This consultation paper sets out the main options for planning this band, and seeks input from interested parties as to which of the options best meets their needs and the needs of Vanuatu.

This consultation is being conducted against the background of increasingly widespread adoption of the 700 MHz band for mobile broadband around the world and across the Asia Pacific region. In Vanuatu, the 700 MHz has not yet been allocated for radiocommunications services. TRR has, however, received some requests from industry for the use of the 700 MHz band. TRR believes that it is now an appropriate time to consider how best to allocate this band in Vanuatu.

While the band is increasingly being allocated around the world, different countries have adopted different band plans to accommodate mobile broadband in this spectrum. One of the major approaches has been that of the APT which has proposed a comprehensive band plan for the Asia Pacific Region (ITU Region 3). TRR believes that the APT plan has some definite advantages for Vanuatu, and given that Vanuatu is in Region 3, TRR proposes to link its plan to the APT band plan.

It is also worth noting that the arrival of the submarine cable in Vanuatu has already begun to stimulate the demand for, and deployment of, broadband. This trend is likely to continue and strengthen, and this will be likely to intensify the need for spectrum to roll-out broadband services into rural areas.

TRR believes that the 700 MHz band therefore has a vital role to play in bringing broadband services to Vanuatu, and especially in the implementation of the Government's Universal Access Policy.

5 BENEFITS OF MOBILE BROADBAND

The 700 MHz band offers a 'sweet spot' for mobile services, with an ideal combination of range and data capacity. At 700 MHz the signal covers a reception radius of over 10 km, compared to around six kilometers for an 1800 MHz system. This is particularly important when providing broadband services to rural areas.

The costs associated with building a 700 MHz broadband system are correspondingly lower, with the 700 MHz band requiring only one third of the infrastructure expenditure needed for deployments in the 1800 MHz band. (It has been estimated that halving capital costs is conservatively expected to

reduce service costs by at least 5 to 10 per cent). By helping to reduce prices, this would particularly benefit low income groups.

In addition, the 700 MHz band has similar, but slightly better, propagation characteristics to the current 900 MHz band in use in Vanuatu. This means much infrastructure such as towers, access roads and power systems will be able to be reused which should also reduce the cost of providing new services.

These advantages underpin the benefits that come from allocating the spectrum to mobile broadband and in particular LTE and LTE-A systems. Rural areas in particular would benefit, while entrepreneurs and small companies everywhere would be given access to a much wider range of customers.

A substantial economic increment would come from increased productivity in all sectors including agriculture and tourism. Social benefits would be seen particularly in rural and other less developed areas – better access to education and healthcare, more effective rural development and improved access to information, financial services and entertainment.²

Adding LTE via the 700 MHz band in addition to the GSM and UMTS services already available in the 900 MHz band will therefore benefit the people of Vanuatu, visitors to the country, and potentially contribute to an overall increase in GDP.

6 SPECTRUM AVAILABLE FOR MOBILE BROADBAND

There is a large amount of spectrum allocated to mobile and suited to mobile broadband services in International Telecommunication Union (ITU) Region 3. Table 1 below gives an indicative overview of this spectrum.

Many Administrations, carriers and vendors continue to argue for more spectrum to be allocated at the ITU's World Radio Conference 2015 (WRC-15) via the ITU's Joint Task Group JTG-4-5-6-7 (the numbers representing interested services).

This additional spectrum is sought for high density, high population high demand areas such as the centres of developed cities. Sydney Australia or Auckland New Zealand are two regional examples.

Vanuatu's largest city, Port Vila, is not developed to this extent and so some bands have been reserved for purposes of more importance to Vanuatu. Two examples are the 1.5 GHz band (1452 – 1492 MHz) which is under consideration in the JTG for mobile broadband but which is currently being used in Vanuatu for fixed links. This is because interconnectivity between islands is critical to the development of Vanuatu and TRR does not believe there will be demand for this spectrum for mobile services in Vanuatu in the foreseeable future.

Another band under consideration is the 3400 to 3800 MHz band. In Vanuatu this is used for the fixed satellite service and is vital for international connectivity or for those operators already on the cable, redundancy international links. This band therefore is also not likely to be considered for mobile services in Vanuatu in the foreseeable future.

² Source. Socio-economic impact of allocating the 700 MHz band to mobile in Asia Pacific. Boston Consulting for GSMA, October 2010.

The APT's 700 MHz plan offer 2 x 45 MHz of spectrum for 4th Generation (4G) services, also known as LTE and LTE Advanced (LTE-A). Because the band is in the UHF portion of the radiofrequency spectrum it is capable of supporting large cells. In the proper configuration it is also capable of supporting high data rates. This spectrum is currently unencumbered in Vanuatu and TRR believes that it should be planned as soon as possible for LTE services so that access to true mobile broadband can play its part in Vanuatu's economic development.

Band	Allocation	Spectrum	Existing or potential usage
806 – 825 851 – 870 MHz	2 x 19 MHz depending on planning.	38 MHz	Under consideration in the APT and in Australia for mobile broadband. Potential allocation to PPDR mobile broadband. Currently parts are allocated to PPDR land mobile in some Region 3 Administrations.
825–845 870–890 MHz	2 x 20 MHz	40 MHz	Mobile telephony (CDMA and GSM850).
890 – 915 935 – 960 MHz	2 x 25 MHz	50 MHz	GSM band and 3G services.
1710–1785 1805–1880 MHz	2 x 75 MHz	150 MHz	Mobile telephony (GSM1800). Mobile broadband (4G LTE).
1900–1920 MHz	20 MHz	20 MHz	3G or 4G services.
			Broadband.
1920–1980 2110–2170 MHz	2 x 60 MHz	120 MHz	3G mobile telephony and broadband.
2300–2400 MHz	100 MHz	100 MHz	Broadband. TDD LTE
3425–3575 MHz	2 x 50 MHz used in some countries	Up to 100MHz	Fixed wireless access, Broadband. Set aside for satellite services in Vanuatu.

Table 1 Bands available for mobile broadband in ITU Region 3

Questions

1. Should the TRR allocate the 700 MHz spectrum?
2. If so, when will industry need this spectrum for mobile broadband?
3. If so, should this be configured for 4th Generation (LTE) services?

7 CHARACTERISTICS AND LIKELY USE OF THE 700 MHz BAND

The most likely uses of the 700 MHz spectrum flow from the characteristics of the band, which affect its suitability for various purposes.

The 700 MHz spectrum is located in the ultra-high frequency (UHF) band of the radiofrequency spectrum. UHF spectrum, especially below 1 GHz, has signal propagation characteristics that make it highly valued for deploying a wide range of communications services.

These propagation characteristics make the 700 MHz band useful for delivering a range of mobile and fixed services such as mobile telecommunications networks (telephony and broadband). The growing demand for communications capacity of mobile networks has led to a number of Administrations allocating the band for such purposes.

The wide signal coverage of the 700 MHz band could enable these mobile services to be delivered much more cost-effectively, particularly to rural and remote locations within Vanuatu. The wider signal coverage available would mean that fewer base stations are needed to support a network, significantly reducing the implementation costs for operators and consequently the flow on costs for consumers.

8 AVAILABLE CONFIGURATIONS OF THE 700 MHz BAND

There are a number of configurations available in the 700 MHz band. In brief these are:

- The US arrangements.
- The APT 700 MHz FDD arrangements, known as 3GPP Band 28.
- The APT 700 MHz TDD arrangements, known as 3GPP Band 44.
- Part of a potential European band arrangement which is the same as the lower part of the APT 700 MHz FDD arrangements.

8.1 AN EXPLANATION OF LTE DATA CAPACITY PER CHANNEL

In the following sections there is a discussion of how the 700 MHz band might be planned for use. There are a number of ways the available spectrum might be divided for assignment. For example, one option might be to have contiguous 20 MHz paired blocks of spectrum. The major telecommunications equipment manufacturer, Ericsson, has estimated that a 20 MHz pair is able to carry up to six times more data capacity (for bursty traffic) than four 5 MHz individual pairs³.

This means that the greatest spectrum efficiency, or technical efficiency, is achieved if the spectrum is planned to ensure carriers have access to 20 MHz contiguous pairs.

This also means that a carrier having access to a 20 MHz pair will have an advantage over another carrier who does not have access to the same contiguous amount of spectrum.

On the other hand, dividing the spectrum into contiguous 20 MHz blocks effectively means that there will be a limit of two carriers that will have access to the spectrum. This may have implications for competition in telecommunications markets in Vanuatu. Dividing the available spectrum into smaller blocks may allow the scope for more than two operators to get spectrum.

³ "Multi-Carrier HSPA Evolution", Klas Johansson and others, Ericsson AB, Stockholm, 2009.

Regardless of the size of the blocks allocated TRR will ensure they are aggregated into contiguous lots to ensure maximum technical efficiency.

8.2 THE APT 700 MHz PLAN

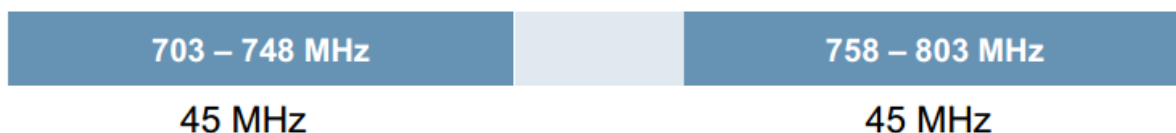
The APT plan allows for 2 x 45 MHz of FDD spectrum or a contiguous 100 MHz of TDD spectrum. The FDD arrangements have been adopted in all countries using the APT plan except China.

New Zealand and Australia recently allocated the band to domestic carriers. In Australia Telstra won 2 x 20 MHz of spectrum and Optus 2 x 10 MHz. Because Telstra won a licence in the band 713 – 733 MHz paired with 768 – 788 MHz the Australian band is ‘split’ and unless there is a spectrum trade no other carrier can acquire a 20 MHz pair. 15 MHz of paired spectrum remains unallocated in Australia.

Elsewhere in the region, Papua New Guinea and Fiji have both announced that they are adopting the APT plan. Fiji conducted a spectrum auction in late 2013 to assign frequencies in the 700 MHz band. Tonga has also confirmed that it will adopt the APT plan.

The APT 700 MHz FDD and TDD arrangements are shown below.

FDD Mode – 3GPP Band 28



TDD Mode – 3GPP Band 44

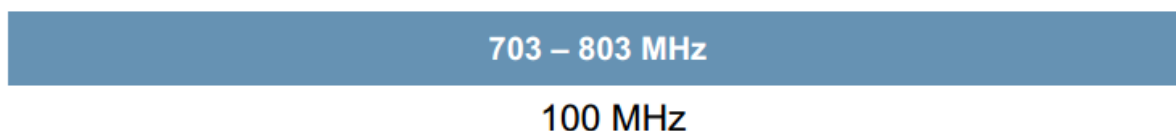


Figure 1 The FDD and TDD APT 700 MHz plans

8.3 THE US ARRANGEMENTS

The US arrangements have not been popular globally. Despite early attempts from regional carriers within the APT Wireless Group (AWG), the group that designed the APT 700 MHz plan, only Canada, the US and Bolivia have adopted the US plan.

The US plan has numerous disparate blocks of spectrum and does not make available a single contiguous 20 MHz pair. It also makes roaming between networks very difficult. The US plan's spectrum allocation is made even more complex by the inclusion of blocks of spectrum for both narrow band and broadband public safety purposes (PS NB and PS BB blocks in the diagram below).

This plan is shown in Figure 2.

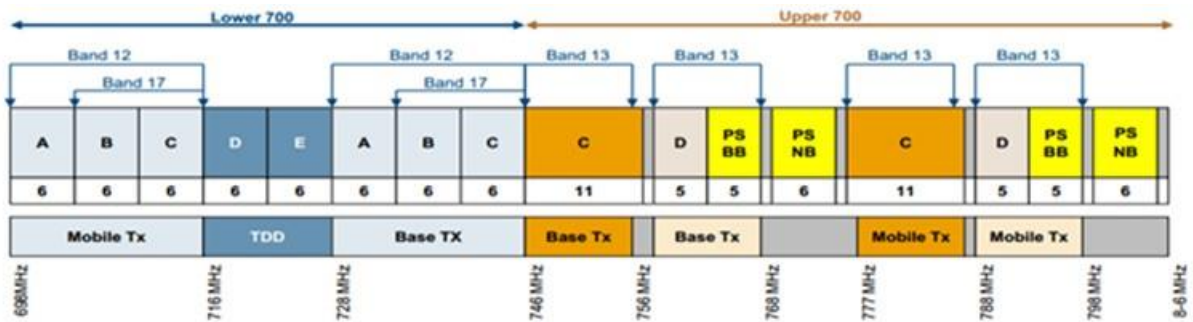


Figure 2 The US 700 MHz band plan.

8.4 THE CEPT BAND 20 ARRANGEMENTS.

During the ITU World Radio Conference 2012 (WRC-12) the band 694 – 790 MHz was allocated to mobile on a co-primary basis with broadcasting. This allows the lower duplex of the APT plan (the duplex arrangements will be explained in a later section) or 2 x 30 MHz to be planned which will harmonize with the same portion of the APT FDD plan.

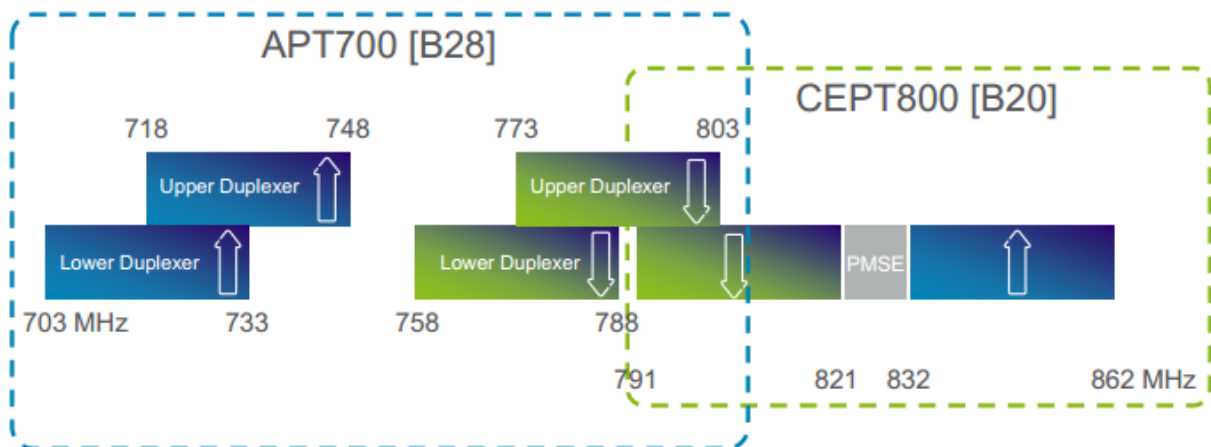


Figure 3 APT 700 MHz (Band 28) overlapping the CEPT 800 MHz (Band 20)

The advantages of almost global harmonization are obvious should this plan be adopted. However this arrangement uses only about half of the APT 700 MHz plan and does not allow more than one contiguous 20 MHz pair.

Adoption of the APT 700 MHz plan would also allow roaming onto the CEPT band 20 plan.

8.5 EXPLANATION OF THE APT DUAL DUPLEX ARRANGEMENTS

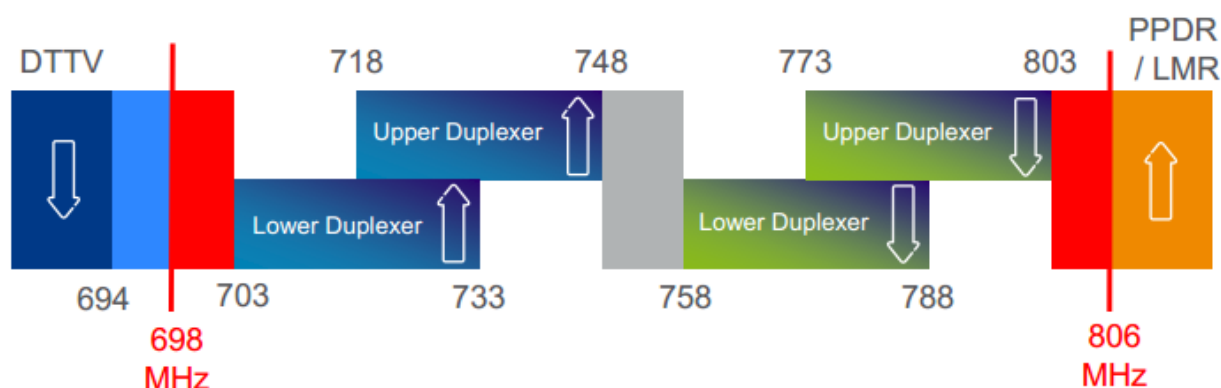


Figure 4 The APT 700 MHz Dual Duplex Arrangements (Ericsson)

The figure above shows both the dual duplex arrangements in the APT 700 MHz FDD plan and the services in ITU Region 3 that adjoin it.

The dual duplex arrangements were considered necessary so that equipment vendors could implement filters and duplexers within the mobile handsets. To cover the full 45 MHz band, user handsets will need two 30 MHz duplex filters. While this adds complexity to equipment, it is necessary to allow out of band emissions to be below standard limits. It also enables handset manufacturers to maximize market volumes across different countries, and therefore will help reduce equipment costs.

The arrangement also facilitates spectrum planning as it allows some spectrum blocks to overlap both duplexers. This makes the centre block of spectrum most attractive for carriers, but this can also have disadvantages if a carrier is allowed to have access to the centre of the band as it prevents more than one 20 MHz pair being allocated.

It is important to note that the issue of the dual duplex arrangements is primarily of interest to potential operators; for example it may affect the attractiveness of particular parts of the spectrum band to an operator. *TRR does not believe, however, that the duplex issue will impact on its decision on how to allocate and assign the 700 MHz spectrum.*

9 DETERMINING FREQUENCY ARRANGEMENTS FOR THE 700 MHz BAND

9.1 FREQUENCY BOUNDARIES

Three main issues are relevant in configuring the frequency boundaries of the 700 MHz band:

- the requirement for any necessary guard bands or a mid-band duplex gap on the frequency boundaries
- the desirability of aligning the frequency boundaries with international arrangements
- the possible accommodation of low interference potential devices in some parts of the 700 MHz band under other licensing arrangements.

9.1.1 Guard bands and mid-band gap

As discussed above, it is considered that the most likely use for the 700 MHz band will be the delivery of mobile telecommunications services. If this is so, these services will require guard bands in order to avoid harmful interference to services in neighboring bands. Similarly if an FDD arrangement is chosen, duplex arrangements dictate that it is necessary to set aside a mid-band gap.

9.1.2 International harmonisation

In determining the frequency boundaries of the 700 MHz band, the potential for alignment with international arrangements is an important consideration.

TRR's preferred approach is to commence domestic planning work in line with the harmonised ITU Region 3 plan and to implement the APT 700 MHz FDD arrangements.

There are substantial advantages to Vanuatu's carriers and users in arrangements that are internationally harmonised. The major advantage is the economies of scale that make manufacturing equipment for both users and providers cheaper. Harmonisation may also facilitate user features such as global roaming. TRR is therefore looking to international 700 MHz band developments in determining its configuration for the 700 MHz band.

The major 700 MHz band plans currently in existence are the European and US plans as previously outlined. Due to the original arrangements for European broadcasting services, the European 700 MHz band (790–862 MHz) is in a substantially different frequency range to Vanuatu, meaning there is only a limited overlap (790–820 MHz) between the European and APT 700 MHz bands. The ITU's WRC-12 agreements mean there will be (after 2015) a duplex block of 2 x 30 MHz that harmonises with the APT 700 MHz plan. There are some advantages to this plan, but it would effectively waste some of the spectrum in the APT plan, and is not harmonised with most neighboring countries.

The US 700 MHz band (698–806 MHz) aligns more closely with the frequency range that is available in Vanuatu. However, TRR considers that the plan implemented in the US is not an efficient use of spectrum because it contains interleaved small blocks of spectrum, requiring more guard bands than a single contiguous block and making handset design more complex. It would also be undesirable to implement a modified version of the US plan unilaterally, since this would effectively constitute a unique 700 MHz band plan, contrary to the objective of harmonising arrangements.

TRR has therefore focused its efforts for international harmonisation on countries within ITU Region 3 (Asia–Pacific and parts of the Middle East. It should be noted, however, that some Latin American countries and even the CEPT and Arab block of countries have recently announced the adoption of some or all of the APT Plan).

Questions

4. Should TRR align its configuration of the 700 MHz band with the harmonised ITU Region 3 arrangements or those from another Region?

9.2 GLOBAL TAKE-UP OF THE APT 700 MHz FDD PLAN (BAND 28)

The APT 700 MHz FDD plan (Band 28) has proven to be the most popular band for the adoption of mobile broadband globally.

This popularity has numerous benefits, economies of scale in manufacture and the ability for users to roam almost globally using the same technology.

In Region 3 the following countries have adopted or have signaled they will adopt the band:

- Afghanistan; pop 30 Million
- Australia; pop 23 Million
- Bangladesh; pop 161 Million
- Bhutan; pop 0.7 Million
- Brunei; pop 0.4 Million
- India; pop 1.2 Billion
- Indonesia; pop 249 Million
- Japan; pop 127 Million
- Malaysia; pop 29 Million
- Maldives; pop 0.4 Million
- Nepal; pop 30 Million
- Pakistan; pop 190 Million
- Papua New Guinea; pop 7 Million
- Singapore; pop 5 Million
- Sri Lanka; pop 21 Million
- Tonga; pop 0.1 Million
- Taiwan; pop 23 Million
- New Zealand; pop 4 Million

Thus countries with a population of approximately 2 billion people in ITU Region 3 to date have adopted the APT plan. Thailand and the Philippines have not yet allocated the band to mobile and China prefers the TDD arrangements. Other south East Asian countries are showing 'slow progress' towards the implementation of the band. (Source GSMA).

In Region 2, the Americas, only the US, Canada, Bolivia and Nicaragua have announced they will use the US band plan. The following South American countries have adopted or signaled they will adopt the APT plan:

- Brazil; pop 195 Million
- Mexico; pop 117 Million
- Colombia; pop 47 Million
- Argentina; pop 41 Million
- Peru; pop 30 Million
- Venezuela; pop 30 Million
- Chile; pop 17 Million
- Ecuador; pop 16 Million
- Dominican Rep.; pop 10 Million
- Costa Rica; pop 5 Million
- Panama; pop 3 Million
- Uruguay; pop 3 Million

Thus in addition to those countries in ITU Region 3, countries with an additional total population in the Americas of 514 million (Source GSMA) propose to adopt the APT Plan.

With the European countries taking up the ITU WRC-12 allocation in 2015 almost the entire world will be able to use a single handset that can roam anywhere (except (to date) China, US, Canada, Bolivia and Nicaragua).

Table 2 summarises the various approaches to planning for the 700 MHz across countries and regions.

Area	Range of 700 MHz band	Advantages/disadvantages
Australia	694–803 MHz	Adopted the APT Plan in 2012.
Europe	790–862 MHz	Little overlap with Vanuatu frequency range.
Europe WRC-12 Band	703 – 788 MHz	One 2 x 30 MHz duplex is harmonised.
United States	698–806 MHz	Overlapping frequency range but inefficient arrangements.
Asia, Pacific and part of the Middle East	Likely 698–806 MHz	Similar frequency range and decision made by AWF on harmonised arrangements.
The Americas	694 – 803 MHz	12 Latin American Administration have signaled they will adopt APT Plan.

Table 2: Summary of 700 MHz band arrangements

9.3 THE ADVANTAGES OF HARMONISATION

The advantages to be found in near global harmonisation fall into two broad categories.

9.3.1 Global trade and tourism

The ability of people to move freely between countries for travel of business is an enabler of greater activity in the business and tourism sectors.

9.3.2 Equipment standardization

With a single band (or duplex arrangement) to manufacture to vendors of both base stations and handsets are able to achieve economies of scale that will eventually flow to the consumer.

For example Mozilla, a global internet access organisation has recently announced a prototype US\$25 smartphone running the FireFox operating system. The full feature handset, aimed and bridging the digital divide in the developing world is manufactured by Huawei and is called the Y300.

10 PROPOSAL TO ADOPT THE APT 700 MHz FDD PLAN

TRR proposes to adopt the APT 700 MHz FDD plan in its entirety.

This plan is shown below along with duplex arrangements guard bands and potential neighboring services.

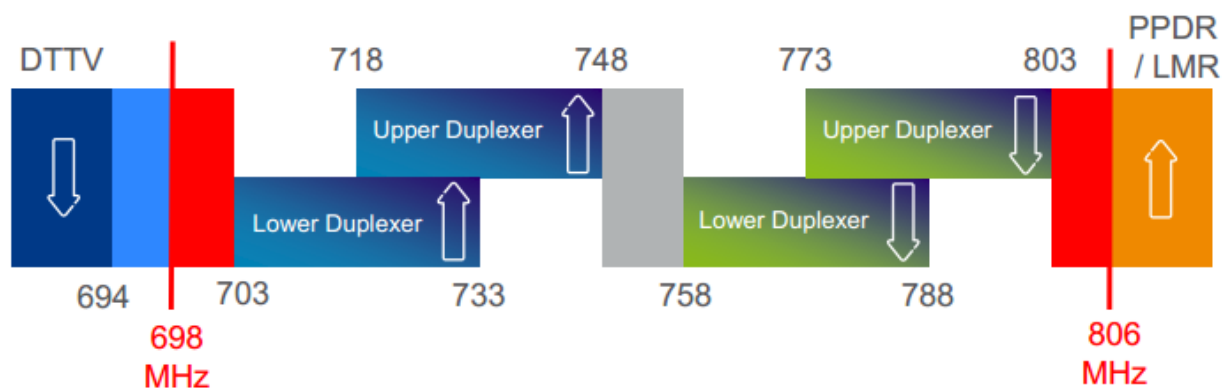


Figure 5 The APT 700 MHz FDD Plan.

Questions

5. Should TRR align its configuration of the 700 MHz band with the harmonised ITU Region 3 arrangements, the APT 700 MHz FDD plan?
6. If not, what configuration arrangements should TRR put into place for the 700 MHz band?
7. What are the benefits and risks of TRR's preferred approach? Is there sufficient evidence to support the proposal?

11 DETERMINING GEOGRAPHIC AND TECHNICAL SPECIFICATIONS FOR THE 700 MHz BAND

11.1 GEOGRAPHIC BOUNDARIES

As Vanuatu is an archipelago of 82 islands (65 inhabited) spanning some 1300 km north to south, and because the 700 MHz band is a 'coverage band'; one capable of large cell diameters in excess of 10 kilometers radius, splitting any 700 MHz plan into geographic blocks does not seem to deliver any advantages.

However, if the band were split each geographic block would need to be coordinated; a difficult task on over-water paths. In addition, people travelling from one island to another may cross over a boundary into another service area and thus lose connectivity or require roaming agreements negotiated between carriers.

A single geographic lot for each proposed licence also ensures that all island communities are covered by both licensees.

Leaving the lots which cover the entirety of Vanuatu also potentially offers services at sea between the islands which would enhance safety for people travelling by boat.

For these reasons TRR proposes to have a single geographic boundary encompassing the entire Republic of Vanuatu.

Questions

8. Should TRR configure each lot to cover the entire Republic of Vanuatu?
9. Are there other preferred geographic configurations?

11.2700 MHz TECHNICAL FRAMEWORK

In addition to the spectrum arrangements, it is necessary to consider the development of technical arrangements within the established boundaries. TRR will propose a technical framework for the spectrum. These limits are the out of licence emissions which allow multiple systems to coordinate. Operators are encouraged to refer to the 3GPP band 28 technical parameters for more information.

TRR will also define out of band limits; that is emissions below the boundary at 694 MHz and above the boundary at 806 MHz.

These limits are based on 3GPP and ITU standards and should accommodate any equipment which complies with these standards. The technical parameters are comprehensively explained in Section 14.

The smallest viable increment of spectrum for LTE is a paired block of 5 MHz. The most efficient, from a technical point of view is a paired block of 20 MHz as discussed in Section 8.1. Using the most technically efficient block has a number of advantages in bringing the benefits of mobile broadband to Vanuatu, rural areas in particular, as outlined in Section 5.

The APT plan offers 2 x 45 MHz of spectrum. This amount of spectrum along with a minimum realistic allocation of 2 x 5 MHz suggests the band be divided into basic lots of 2 x 5 MHz. If it was decided to license paired blocks of 20 MHz, then four of these basic building blocks would be aggregated to form each licence giving 2 x 20 MHz to each licensee.

By breaking the band into 5 MHz pairs the band could be reshaped in the future should changes in technology dictate. For example, in the future a 15 MHz or a 25 MHz pair may be the most efficient. By dividing the band into 5 MHz pairs TRR hopes to allow for any future changes with minimal disruption.

This arrangement is shown in Figure 6 below.

If TRR were to not set aside spectrum for PPDR there would be other options available. In brief these are:

- Three allocations of 2 x 15 MHz
- Four allocations of 2 x 10 MHz and one of 2 x 5 MHz.
- One allocation of 2 x 20 MHz, one of 2 x 15 MHz and one allocation of 2 x 10 MHz.
- Nine allocations of 5 MHz.
- Or any combination of the above using 5 MHz lots as the basic building block.

These options would allow the potential for more than two carriers to gain access to the spectrum, and could thus offer significant benefits in terms of increased competition into mobile and broadband markets in Vanuatu.

Questions

10. Which of the above options for allocating the 700 MHz band do you prefer, and why?

11.3 Spectrum for PPDR mobile broadband

Within the APT and in many Administrations, a spectrum allocation for Public Protection and Disaster Relief (PPDR) is being considered.

Access to modern broadband services can provide emergency services and defence with a number of benefits. These range from the ability to download maps, to number plate and face recognition services. A number of vendors provide systems that use LTE as the backbone for integrated emergency services communication systems.

The 700 MHz band is well suited to this purpose as it represents an economically viable band for providing wide area coverage for emergency services and defence.

Within the APT one vendor has argued for an allocation of 10 MHz of paired spectrum. Many Administrations argued that this was excessive and that a system could be built using commercial infrastructure without any spectrum allocation. Emergency services argued that commercial networks are not robust enough to rely upon during natural disasters such as cyclones and floods.

Australia recently conducted an in depth study into the needs of emergency services. This study determined that one 5 MHz pair of spectrum from the 800 MHz band (the band immediately above the 700 MHz band) would be sufficient for PPDR. Were there an event that required greater bandwidth the Australian study determined that using an adjacent carrier band would provide the most economically and technically efficient solution.

While the Australian study recommended the spectrum be set aside in the 800 MHz band there is continuing momentum in Australia for that spectrum to be within the 700 MHz band.

In Vanuatu is not yet clear whether there will be a demand for broadband PPDR spectrum. Nor is it clear whether any such demand would be best by the allocation in the 700 MHz band, the 800 MHz band, or through the use of commercial infrastructure. TRR considers that there may be a strong case for a broadband emergency service network in Vanuatu in the future.

TRR believes that the 700 MHz band may be an appropriate band (although not the only one) for such a network, if there is some 700 MHz spectrum in Vanuatu. This would be the case, for example, if TRR opted for 20 MHz contiguous blocks as outlined earlier or if spectrum is left unallocated at the completion of the allocation process. TRR welcomes views on whether there is a demand for a broadband PPDR network in Vanuatu, and if so whether this would be best met by an allocation of spectrum in the 700 MHz band, the 800 MHz band, or through the use of commercial infrastructure.

Question

11. Should TRR set aside one 5 MHz pair in the 700 MHz plan for future emergency services use, or make spectrum available in the 800 MHz band for this purpose?

11.4 Proposed Vanuatu 700 MHz band arrangements

TRR has proposed to adopt the APT 700 MHz FDD arrangements.

Within this overall plan, TRR proposes several main options for responders to consider.

Option A: Two 20 MHz paired blocks

Under this option, TRR would propose to license two lots of 2 x 20 MHz built from a 5 MHz basic block; that is four 5 MHz pairs aggregated as shown in blue in Figure 6. This would allow the setting

aside of one 5 MHz pair for Emergency Services and Defence use within Vanuatu as shown in green in Figure 6.

The guard bands outlined in the APT plan and proposed by TRR are shown in red.

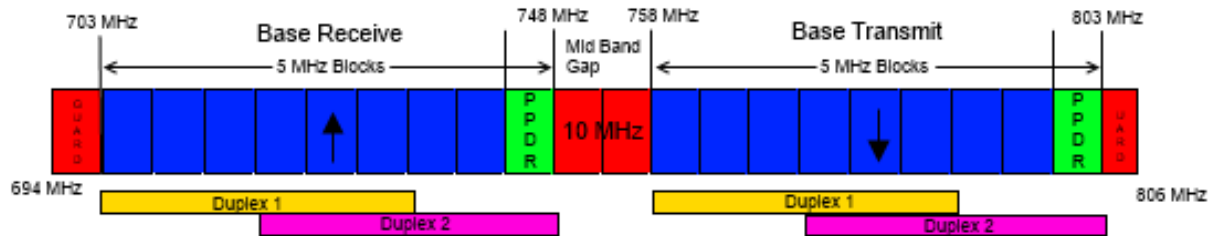


Figure 6 Proposed 700 MHz arrangements with a PPDR allocation

The overlap of the duplexes is shown below the proposed arrangements. Each of the proposed allocations has at least 15 MHz of spectrum common to both duplexes. This means that should Europe adopt the lower duplex handsets from that region will be able to roam onto any Vanuatu network.

Depending on the outcome of the allocation process, and keeping the lots as aggregated 2 x 20 MHz blocks, there are three proposed ways the band could be designed. The first is as shown in Figure 6 with the PPDR reservation at the 'high' end of the band. The second way places the PPDR segment in the centre, that is where the arrows indicate the transmit direction in the band. The third way is to place the PPDR segment at the low end of the band.

Each method has advantages and disadvantages to each licensee and each user group (emergency services and carriers).

Option B: Three 15 MHz paired blocks

Under this option, TRR would propose to license 3 lots of 2 x 15 MHz built from a 5 MHz basic block; that is three 5 MHz pairs.

This option would have the advantage of providing scope for three operators to deliver broadband services to Vanuatu in this band. It would not, however, deliver the same technical efficiency benefits as Option A. It should also be noted that under this option, there would not be sufficient spectrum to set aside one 5 MHz pair for Emergency Services and Defence use within Vanuatu.

Option C: Four 10 MHz paired blocks

Under this option, TRR would propose to license 4 lots of 2 x 10 MHz built from a 5 MHz basic block; that is two 5 MHz pairs. This option would allow the setting aside of one 5 MHz pair for Emergency Services and Defence use within Vanuatu as shown in green in Figure 6.

This option would have the advantage of providing scope for four operators to deliver broadband services to Vanuatu in this band. Once again, it would not, however, deliver the same technical efficiency benefits as Option A.

Option D: Any combination of $n \times 2 \times 5\text{MHz}$ blocks

This option would allow carriers to bid for aggregated lots of spectrum under a market based allocation. This would allow the carrier that placed a higher value on the spectrum to acquire up to the maximum of a $2 \times 20\text{ MHz}$ allocation yet still allow three entrants, one with $2 \times 15\text{ MHz}$ and one with $2 \times 10\text{ MHz}$. To ensure maximum technical efficiency the spectrum would be aggregated.

In addition to aggregation, allocated blocks would be stacked in the band such that any unallocated blocks were also aggregated and remained adjacent to the smallest allocated lot. This would allow a carrier without the most efficient $2 \times 20\text{ MHz}$ allocation to later acquire more spectrum or would make a block available for a possible PPDR allocation.

Figure 7 shows the flexible arrangements based on paired 5 MHz blocks without a pre-determined PPDR allocation. From this plan any number of 5 MHz pairs shown in blue could be aggregated and allocated to a carrier in any combination as outlined above.

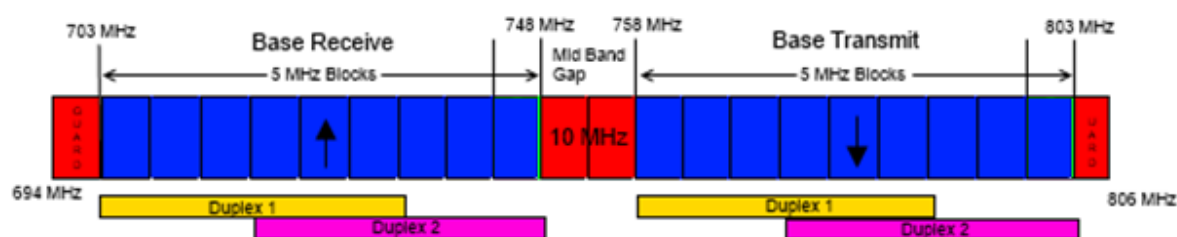


Figure 7 Proposed 700 MHz arrangements with no pre-determined PPDR allocation

Questions

12. Which of the proposed options do you consider best meets the needs of Vanuatu? If none of these options is suitable, can you propose a different configuration to meet the needs of industry?
13. If you prefer Option A (20 MHz blocks), which of the three possible arrangements would you prefer?

12 OTHER SERVICES

12.1 BROADCASTING

Vanuatu does not currently have any operational UHF TV broadcasting services above TV Channel 40 (centre frequency 626 MHz). However, TRR is aware of proposals to use spectrum in the 600 MHz band.

TRR proposes to limit any future broadcasting assignments to Channel 44 (centre frequency 658 MHz) and below and to allocate services from the lowest usable frequency. The reasons for this are given below.

12.2 WIRELESS MICROPHONES

TRR is aware that wireless microphones operate throughout the UHF broadcasting band and the band proposed for new mobile broadband services.

Unacceptable levels of interference to both mobile broadband services and wireless microphones may result if wireless microphones continue to operate in the band 694 MHz to 803 MHz. TRR therefore proposes to prohibit the operation of wireless microphones in this band.

To prevent interference into TV receivers, TRR proposed in Section 12.1 to restrict any future TV Transmitter assignments to Channel 44 and below. This leaves a guard band between services of 32 MHz. TRR proposes to continue to allow wireless microphones to operate on a no interference (secondary) basis on all unused broadcasting channels below the proposed mobile broadband band, but recommends wireless microphone users and vendors consider operation in the range 662 MHz to 694 MHz where no interference to either new mobile broadband services or future television services will be likely. TRR believes this will give wireless microphone users some certainty into the future.

Questions

14. Are the proposed limits on wireless microphones sufficient to protect other services and users without placing an overly stringent requirement on wireless microphone users?
15. Is the proposed guard band suitable for continued wireless microphone users?

13 SPECTRUM ALLOCATION

TRR will allocate this spectrum according to the provisions of the Telecommunications and Radiocommunications Regulation Act No 30 of 2009, and in particular the Radio Apparatus Licence and Spectrum Licence (Fees) Regulation, Order No 153 of 2012.

The Regulation states that in relation to a spectrum licence, the “Regulator is to charge the assignment of a spectrum using the administrative incentive pricing or spectrum auctions whichever is appropriate under the circumstance.”

Administrative incentive pricing (AIP) and spectrum auctions are market based methods of allocating and pricing spectrum. TRR believes that market based methods should be used wherever there may be more demand for a particular spectrum band than the available supply.

While TRR is open to considering either method to allocate this spectrum, in this case our preference is to hold a spectrum auction. Spectrum auctions are a fair and transparent means of allocating spectrum between competing users. Importantly, they do not require the regulator to make a judgment as to what is the appropriate price in the market. Instead, the price is determined by the bidders at the auction. It can be difficult for regulators to determine the market price for spectrum under AIP without detailed access to financial information held by operators. Indeed, auction price information is often used as an input when calculating administered incentive prices.

The type of auction best suited to the allocation of 700 MHz spectrum may depend upon which of the possible allocation options was chosen. For example, with just two nation-wide licences of 2 x 20 MHz being available, a simple ‘open outcry’ auction would be adequate (that is, an auction conducted by an auctioneer in a room, with bidders able to call out their bids. The lots would be sold one after the other).

This open outcry auction may also be suitable for Options B and C involving 3 lots of 2x15 MHz and four lots of 2x10 MHz. However, for an option such as Option D which allowed bidders to choose the aggregation which best meets their needs, a more complex style of auction conducted electronically would be preferable. Such an auction could be conducted, for example, using the Simultaneous Ascending Round Auction commonly used in the USA for spectrum auctions. Under the SMRA, all lots are on offer at the same time, and bidders can choose to bid on the particular lots that best suit their needs.

Question

16. How should TRR allocate and assign a price for access to the 700 MHz band?

14 TECHNICAL PARAMETERS

14.1 BASIS OF PARAMETERS

The proposed limits for the technical framework for the terminal stations are based on 3GPP values for a 5 MHz E-UTRA (LTE) channel.

The proposed limits for base stations are based on a combination of the European values and the values currently being used in the 800 MHz band in Australia. In order to help preserve options for future planning of the frequencies above 803 MHz, an additional requirement is proposed for out-of-band emissions above 806 MHz. Since there is not yet any decision on what will eventually occupy this spectrum, these values have been determined based on both the values given in 3GPP TS36.104 v10.3.0 and the European values, with an additional 10-15dB of filtering. It is also in line with the out-of-band values currently proposed for the 890 MHz boundary in the 800 MHz band.

In simple terms, any system which meets the 3GPP standards for Band 28 will be able to operate in Vanuatu.

The proposed powers are expressed as radiated powers, these are the powers transmitted from the antenna of the system.

Some Administrations, notably Australia, have proposed more stringent out of band limits at the lower edge to protect broadcasting services. TRR has not applied these for two reasons.

- Vanuatu does not have any licensed TV broadcasting on the three channels immediately below the 700 MHz band.
- The statistical nature of interference from mobile devices means any potential interference, should TRR decide later to license a broadcast TV channel would be minimal and occur only for a short duration in a limited area.

14.2 PROPOSED OUT OF BAND LIMITS

The proposed out of band and out of licence limits are shown in Table 3 below.

Note these limits are expressed in terms of EIRP and the onus is on the operator to ensure the combination of transmitter powers, feeder loss and antenna gain results in an emission within these limits.

Proposed non-spurious out-of-band emission limits

For transmitters operating in the lower band (703-748 MHz) emissions falling:

- (a) above 694 MHz, at frequencies offset from the upper and lower limits of the licence:
 - (i) between 0 MHz and 1 MHz – a radiated maximum true mean power of -15dBm/30kHz;
 - (ii) between 1 MHz and 5 MHz – a radiated maximum true mean power of -10dBm/MHz;
 - (iii) between 5 MHz and 10 MHz – a radiated maximum true mean power of -13dBm/MHz;
 - (iv) greater than 10 MHz – a radiated maximum true mean power -25dBm/MHz;
- (b) between 673-694 MHz:
 - a radiated maximum true mean power of -34dBm/MHz (averaged over a 7 MHz bandwidth)
- (c) below 673 MHz
 - a radiated maximum true mean power of -34dBm/MHz (averaged over a 7 MHz bandwidth).

For transmitters operating in the upper band (758-803 MHz) emissions falling:

- (a) between 748-806 MHz, at frequencies offset from the upper and lower limits of the licence:
 - (i) between 0 MHz and 5 MHz – a radiated maximum true mean power of +15dBm/MHz;
 - (ii) between 5 MHz and 10 MHz – a radiated maximum true mean power of +11dBm/MHz;
 - (iii) greater than 10 MHz – a radiated maximum true mean power of +9dBm/MHz.
- (b) between 806-813 MHz – a radiated maximum true mean power of -6dBm/MHz
- (c) above 813 MHz and below 748 MHz – a radiated maximum true mean power of -15dBm/MHz.

Table 3 Proposed out of band and out of licence limits.

Question

17. Is the – 34 dBm/MHz limit suitable for the mobile and broadcasting services in Vanuatu?

Figures 8 and 9 illustrate these proposed out-of-band emission limits. In both figures, the blue lines indicate emission limits at the edge of the entire lower band block (703-748 MHz), while the red lines illustrate the limits for a hypothetical licence located somewhere within the band.

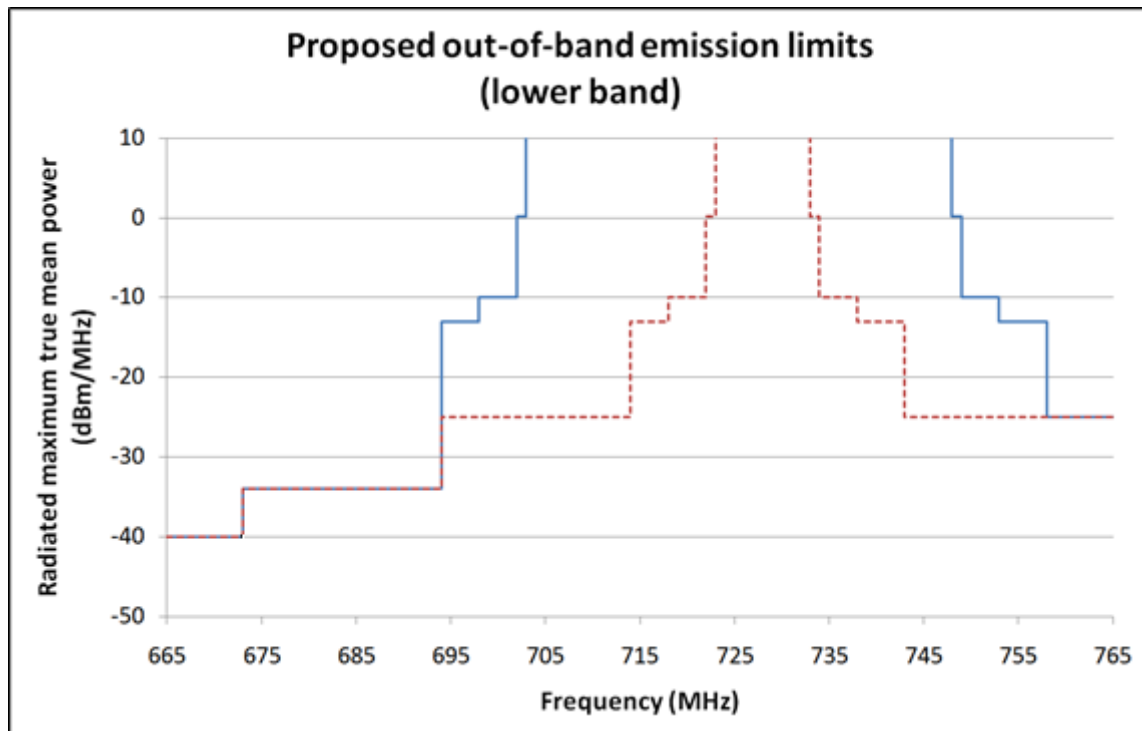


Figure 8 Out of band/licence limits for lower band.

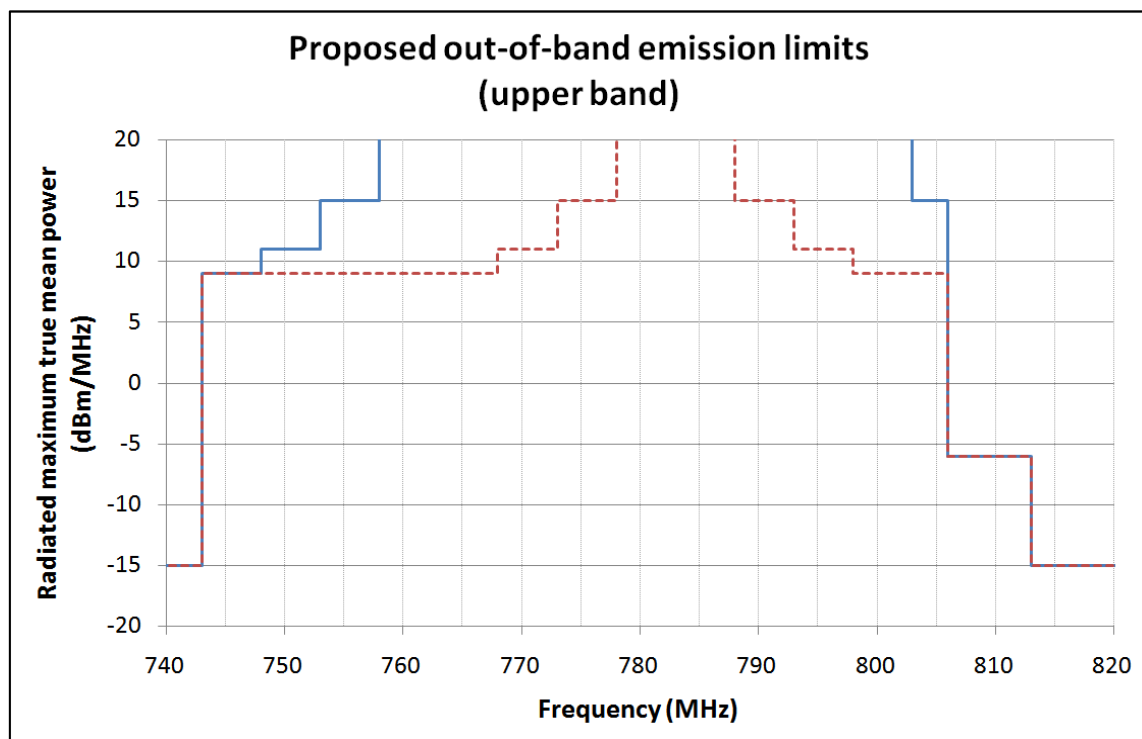


Figure 9 Out of band/licence limits for upper band

Question

18. Are the proposed out of band and out of licence emission limits sufficient to protect other services and users without placing an overly stringent requirement on the licensees?

14.3 PROPOSED OUT OF BAND SPURIOUS EMISSION LIMITS

Limits on spurious emissions protect other services from aggregate out of band noise caused by communications devices. The spurious limits proposed by TRR are common to those accepted by equipment vendors and propose no additional requirements that those contained in standards.

The proposed limits for spurious emissions have been based on arrangements and limits found in CEPT/ERC/REC 74-01 and ITU-R Radio Regulations Appendix 3 and ITU-R Recommendation SM 329. These limits are applicable outside of the band 694-803 MHz.

Note these limits are expressed in terms of EIRP and the onus is on the operator to ensure the combination of transmitter powers, feeder loss and antenna gain results in an emission within these limits.

The proposed maximum permissible level of spurious emissions from a transmitter operated under a 700 MHz band spectrum licence is a radiated mean power of:

- 36dBm per 1 kHz within the band 9 kHz to 150 kHz;
- 36dBm per 10 kHz within the band 150 kHz to 30 MHz;
- 36dBm per 100 kHz within the band 30 MHz to 1 GHz; and
- 30dBm per 1 MHz within the band 1 GHz to 12.5 GHz.

Table 4 Transmitter spurious limits

The proposed maximum permissible level of spurious emissions from a receiver operated under a 700 MHz spectrum licence is a radiated mean power of:

- 57dBm per 100 kHz within the band 30 MHz to 1 GHz; and
- 47dBm per 1 MHz within the band 1 GHz to 12.5 GHz.

Table 5 Receiver spurious limits

Question

19. Are the proposed spurious emission limits sufficient to protect other services and users without placing an overly stringent requirement on the licensees?

14.4 REFERENCE STANDARDS

The following references were used to determine the technical parameters describes above.

Reference technology	Applicable standards and reports
UMTS (UTRA, WCDMA, HSPA, HSPA+)	ITU-R Report M.2039-2, 3GPP TS 25.101, 3GPP TS 25.104, 3GPP TS 24.942, ECC Report 82, ECC Report 96
LTE (E-UTRA, LTE-Advanced)	ITU-R Report M.2039-2, 3GPP TS 36.101, 3GPP TS 36.104, 3GPP TS 36.942

Table 6 Standards Referred to in this Paper.

15 REGULATORY IMPACT ASSESSMENT

This section provides the regulatory impact assessment of the proposed planning arrangements for the 700 MHz broadband spectrum.

15.1 As identified in TRR's 2014 and Onwards Work Program, this consultation addresses the methodology for identifying how the 700 MHz spectrum band might be apportioned between uses, including for broadband delivery. It sets out TRR's preferred approach to setting aside spectrum in the band for broadband, as well as how this spectrum might be configured, and the technical parameters that would govern its use. Under the Work Program, consultation on the 700 MHz band is due to be completed by the fourth quarter 2014.

15.2 The arrangements are in line with the provisions of the Telecommunications and Radiocommunications Regulation Act No.30 of 2009. Section 7 (2) (e) of that Act gives TRR the power to allocate, assign and manage the radio spectrum.

15.3 Implementation of the planning arrangements will support the Telecommunications and Radiocommunications Regulation Act No.30 of 2009 and the Government's National ICT Policy and its Universal Access Policy.

15.4 TRR is undertaking this public consultation, including with existing and possible future users of the spectrum, in order to ensure that the planning arrangements for the 700 MHz band do not impose unnecessary burdens on spectrum users and industry. TRR will take into account the views of responders to this consultation paper in making decisions about the most appropriate regulatory arrangements for the band, and when considering how the band might be allocated to spectrum users. In particular, the paper seeks the views of responders about how best to divide the spectrum into lots or licences for allocation in order to meet the needs of users and of the community generally.

15.5 The planning for the 700 MHz broadband when finally adopted will safeguard and promote the interests of Vanuatu residents and business by:

- Helping to promote the provision of affordable broadband, and particularly mobile broadband services in Vanuatu.
- Helping to lower the costs of providing mobile services, and thus to reduce the costs to users of these services.
- Providing better coverage of broadband and mobile services in Vanuatu than can be achieved with existing spectrum allocations.
- Implementing arrangements consistent with those of a large number of countries, and thus helping to ensure that there is access to consumer equipment at a reasonable price.
- Allowing scope for possible future competition in the mobile telephone and broadband services by providing additional radio spectrum that could be allocated to new players in the mobile telephone and broadband markets.
- Permitting roaming between Vanuatu and other countries. This should allow Vanuatu residents to use their mobile broadband handsets when visiting other countries, as well as allowing visitors to Vanuatu to use their handsets within Vanuatu.

15.6 The proposed planning arrangements will have a positive effect on Vanuatu by allowing radio spectrum that is currently unused to be allocated for the new broadband services. Rural areas in particular would benefit, while entrepreneurs and small companies everywhere would be given

access to a much wider range of customers. A substantial economic increment would come from increased productivity in all sectors including agriculture and tourism. Social benefits would be seen particularly in rural and other less developed areas – better access to education and healthcare, more effective rural development and improved access to information, financial services and entertainment.

15.7 There are likely to be very few negative impacts of the proposed planning arrangements. Allocation of the 700 MHz spectrum to broadband could have an adverse impact on other potential users of the spectrum, for example broadcasters (the 700 MHz band has traditionally been a band used in many countries for UHF television services). However, there is sufficient spectrum in other bands to meet the foreseeable needs of broadcasters and other potential users of this spectrum (for example in the VHF bands and in the 600 MHz UHF band).

15.8 One specific type of user that might be adversely affected are users of wireless microphones that are sometimes deployed in the 700 MHz band. TRR proposes to prohibit the operation of wireless microphones in the 694 MHz to 803 MHz band covered by this consultation paper because of the risk of interference to future broadband services. However, TRR believes that there is sufficient spectrum in other parts of the spectrum, notably in the range 662 MHz to 694 MHz where no interference to either new mobile broadband services or future television services will be likely. TRR believes that this should be more than sufficient to meet the needs of users of wireless microphones, and the proposed arrangements should give wireless microphone users some certainty into the future.

15.9 Under the Radio Apparatus Licence and Spectrum Licence (Fees) Regulation, the Regulator is to charge for spectrum assignment using administrative incentive pricing or spectrum auctions. In this case TRR's preference is to hold a spectrum auction. Spectrum auctions are a fair and transparent means of allocating spectrum between competing users. This would have both positive and negative impacts. They would be likely to result in fairer and more efficient allocations; on the other hand, it is sometimes argued that spectrum auctions can increase the price of spectrum, and thus costs to users. TRR is seeking views as to the appropriate method of allocating spectrum.

15.10 Because very few existing users will be impacted by the proposed measures, TRR believes that the time allowed for consultation on this process should be sufficient to enable smooth implementation. TRR remains of the view that implementation of the new arrangements by the fourth quarter of 2014 are achievable and appropriate.

16 CONSULTATION QUESTIONS

The TRR is seeking the views of responders on the following questions.

1. Should the TRR allocate the 700 MHz spectrum?
2. If so, when will industry need this spectrum for mobile broadband?
3. If so, should this be configured for 4th Generation (LTE) services?
4. Should the TRR align its configuration of the 700 MHz band with the harmonised Region 3 arrangements or those from another Region?
5. Should the TRR align its configuration of the 700 MHz band with the harmonised Region 3 arrangements, the APT 700 MHz FDD plan?
6. If not, what configuration arrangements should the TRR put into place for the 700 MHz band?
7. What are the benefits and risks of the TRR's preferred approach? Is there sufficient evidence to support the proposal?
8. Should the TRR configure each lot to cover the entire Republic of Vanuatu?
9. Are there other preferred geographic configurations?
10. Which of the options for allocating the 700 MHz band do you prefer, and why?
11. Should the set aside one 5 MHz pair in the 700 MHz plan for future emergency services use, or make spectrum available in the 800 MHz band for this purpose?
12. Which of the proposed options do you consider best meets the needs of Vanuatu? If none of these options is suitable, can you propose a different configuration to meet the needs of industry?
13. If you prefer Option A (20 MHz blocks), which of the three possible arrangements would you prefer?
14. Are the proposed limits on wireless microphones sufficient to protect other services and users without placing an overly stringent requirement on wireless microphone users?
15. Is the proposed guard band suitable for continued wireless microphone users?
16. How should TRR allocate and assign a price for access to the 700 MHz band?
17. Is the – 34 dBm/MHz limit suitable for the mobile and broadcasting services in Vanuatu?
18. Are the proposed out of band and out of licence emission limits sufficient to protect other services and users without placing an overly stringent requirement on the licensees?
19. Are the proposed spurious emission limits sufficient to protect other services and users without placing an overly stringent requirement on the licensees?