GTI Comment on the Draft IMT Roadmap

October 2014

1. Cover sheet

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1.1. Confidentiality

See page 2 above

1.2. Declaration

I confirm that the information supplied on the cover sheet may be incorporated into a formal consultation response: it can be published by ICASA, unless otherwise specified on this cover sheet, and I authorize ICASA to make use of the information in this response to meet its legal requirements.
Signed .....at.....Beijing.....
Date .....Oct. 7th, 2014.....

2. Invitation to Comment

Global TD-LTE Initiative

Oct. 7th, 2014

Comments on the Draft IMT Roadmap

COMMENTS OF GTI

The Global TD-LTE Initiative (GTI) is pleased to be able to respond to South Africa's consultation "Consultation on draft IMT roadmap". This response has been prepared by the Spectrum Working Group of GTI[1].

GTI (Global TD-LTE Initiative) is an open platform in 2011, advocating cooperation among global operators and vendors to energize the creation of a world-class and a growth-focused business environment. GTI aims to build a robust ecosystem of converged TD-LTE/LTE FDD, and speed up its commercialization. With 3 years' development, GTI has become one of the most important cooperation platforms with 112 operator members and 90 vendors.

Accordingly we welcome the initiative by the South Africa to review the IMT roadmap, which would maximize future flexibility for a review of planning issues. GTI hereby submits its comments in response to the South Africa's consultation on the IMT roadmap and the general views and future opportunity on some certain bands in your consultation paper.

[1] Individual members of GTI may respond separately and their views may be different to those in this document.

2.1. IMT 700/750

2.1.1 General view on IMT 700 and 750

APT700 has been widely recognized as a “Digital Dividend” LTE spectrum. Many countries around the world have decided or have an intention to adopt it as an LTE spectrum. The potential markets for APT700 cover more than 3 billion people. APT 700MHz is a low band introduced in 3GPP Release11 for LTE. 3GPP has defined two band plans on APT 700, namely Band 28 (FDD) and Band 44 (TDD).

Band 28

9 countries already auctioned APT700 including Japan, Philippines, Australia, Taiwan, New Zealand, Chile, Ecuador, Papua New Guinea and Fiji by Band 28, while more than 20 countries will be auctioned soon. According to GSA, as of Jul 2014, 6 operators from 4 countries, including Papua New Guinea, Taiwan, New Zealand and Australia have already commercial launched APT700. All the major RAN infrastructure vendors have announced support for Band 28, the radio units supporting APT700 and the corresponding solution of those vendors will be ready for commercial launch from 2013Q4. The main stream chipset manufacturers have already supported Band28 or will support Band 28 in the near future.

Band 44

Despite Band 28 has an earlier industry start, the unpaired nature gives Band 44 the flexibility to become a potential alternative to partially release any spectrum (at least 20MHz recommended) available within 700MHz. This can speed up early release of LTE spectrum, especially since in many cases broadcasting services have occupied the 700MHz band and difficult to re-farm. In China, all operators have started to deploy 700MHz trial with B44 solutions in many regions such as the sub-urban and rural market in Guizhou and Zhejiang provinces.

2.2. IMT2300 unpaired spectrum TDD

2.2.1 General view on IMT 2300

The standardization organizations, operators and manufacturers have promoted TDD network developed quickly in some countries, especially in the 2.3GHz band. Due to

large bandwidths are available with medium propagation loss and penetration loss, this band has been highly appreciated by industry. 11 countries have utilized 15 commercial LTE TDD networks in 2.3GHz band, such as China, Russia, India, South Africa, etc. In addition, others 17 TDD commercial networks are in deployment or firmly planned in band 40.

Commercially of launched LTE TDD networks in 2.3GHz band

Country	Operator	TDD frequency	TDD band(s)
Australia	NBN Co.	2.3GHz	40
Australia	Optus	2.3GHz	40
Hong Kong	China Mobile Hong Kong	2.3GHz	40
India	Aircel	2.3GHz	40
India	Bharti Airtel	2.3GHz	40
Indonesia	PT Internux	2.3GHz	40
Nigeria	Spectranet	2.3GHz	40
Nigeria	Swift Networks	2.3GHz	40
Oman	Omantel	2.3GHz	40
Russia	Vainakh Telecom	2.3GHz	40
Saudi Arabia	STC	2.3GHz	40
South Africa	Telkom Mobile(8ta)	2.3GHz	40
Sri Lanka	Dialog Axiata	2.3GHz	40
Sri Lanka	Lanka Bell	2.3GHz	40
Vanuatu	WanTok	2.3GHz	40

Until July 14, 2014 1,889 LTE user devices (including operator & frequency variants) announced by 168 suppliers. 530 of LTE devices (28%), which is 330 more than a year ago, can operate in LTE TDD mode (TD-LTE), supporting the growing number of LTE operators using unpaired spectrum. Bands 40 (2.3 GHz) has the largest choice of terminals: 361 devices (68%). 85 LTE TDD device manufacturers supports the development of TDD industry.

Regional progress and standardization progress are introduced as follow.

1) Region 1

As we know, there has been several 2.3GHz TDD networks developed or in deployment

in region 1.Such as, Vainakh Telecom has launched the 2.3GHz TDD network in Russia. Besides Europe the 2.3GHz TDD networks are progressing well in Middle East. The 2.3GHz TDD network has been deployed by STC to ensure users experience of the smartphone and data card in Saudi Arabia.

In Europe the band 2300 – 2400 MHz (2.3 GHz) is allocated to the Fixed and Mobile services on a co-primary basis, and to the Radiolocation and Amateur services on a secondary basis.

In some countries in Europe the band is extensively used for defense or security purposes including aeronautical telemetry in accordance with ERC Recommendation 62-02 and Closed-Circuit Television (CCTV). The band is still a core band for wireless cameras as part of SAP or SAB applications. SAP/SAB operates on a non-interference, non-protected basis and assignments of these services tend to be temporary in nature.

The Frequency Management Working Group, via project team FM 52, has been tasked with developing a draft ECC Decision, aimed at harmonizing implementation measures for MFCN (including broadband wireless access systems) in the frequency band 2300-2400 MHz including:

- least restrictive technical conditions (LRTC), taking into account the existing standardization framework and activities at the worldwide level, and an appropriate frequency arrangement;
- Regulatory provisions based on Licensed Shared Access (LSA) to facilitate the long term incumbent use of the band in the territory of those administrations that wish to maintain such use.

FM52 is also developing a recommendation on cross-border coordination between MFCN, and, between MFCN network & other systems in the 2300-2400 MHz band.

In September 2013, the Ministry of Defence (MoD) announced that Ofcom would be made responsible for the award of 40MHz of spectrum across the 2.3GHz bands. The Ofcom plan to award licenses for use of the released 2.3GHz frequencies as soon as is practical. They plan to do this during the 2015-16 financial year. In Europe there is an ongoing harmonization process for the 2.3 GHz band. The CEPT, working through the ECC has established a project team under its WGFM to look into harmonization of the 2.3GHz band for mobile/fixed communications networks (e.g. mobile and fixed broadband), whilst ensuring current users are appropriately protected. Only an unpaired band plan has been proposed as part of the ongoing CEPT work: CEPT has decided not to consider a paired band plan. Given that the 3GPP standard only contains an unpaired band plan and CEPT are only considering an unpaired band plan, the Ofcom are proposing to be consistent with these.

As for the standardization, the band has already been standardized in 3GPP (Band 40).

2) Region 3

In region 3, a good number of countries have utilized TDD network in 2.3GHz. For

examples, CMHK has achieved 2.3GHz TDD first-stage project with 1500 base stations in December 2012. Bharti Airtel has built a 2.3GHz TDD network with 6000 base stations in India. Malaysia, India, Indonesia are also in deployment or firmly planned in 2.3GHz. Furthermore, lots of operators has voiced intention on TDD network in 2.3GHz.

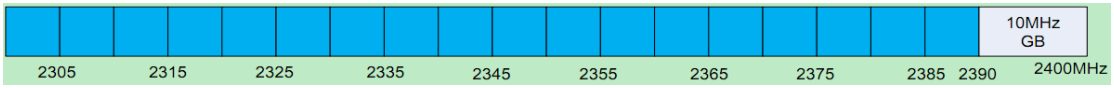
Considering the responses of 2300-2400 MHz Questionnaire from APT member countries, following frequency arrangement are recognized in the band 2300-2400MHz in APT region:

- Full TDD arrangement is preferred. However, flexible FDD/TDD arrangement is also considered for administrations that are required to meet local conditions.
- Channel raster of 5MHz and 9 MHz are used.
- 10MHz or wider/narrower guard band to 2.4GHz ISM band is considered.

Illustrations for band plan options based on the views are as follows:

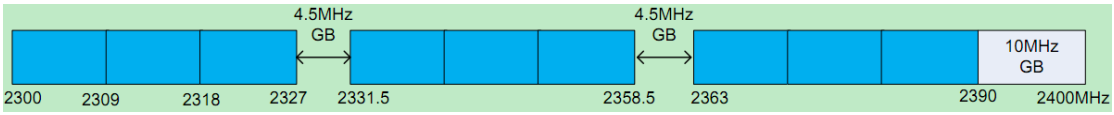
- Option 1: Full TDD without specific arrangement

- Option 2 : implementation of 5MHz channel raster



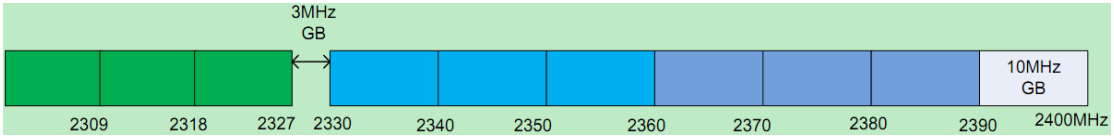
- Option 3: implementation of 9 MHz channel raster

- Case A: 9 MHz only



- Case B: 9 MHz and 10MHz

· Technical condition for coexistence between 9 MHz and 10MHz is being considered.



Option 4: Flexible FDD/TDD

<u>2300-2400MHz---Now and for the Future</u>

It is of utmost importance to serve the growth in mobile broadband services in the 2300 – 2400 MHz frequency band, which is allocated to the Mobile Service and identified for IMT globally in the ITU Radio Regulations. The band is targeted for utilizing TDD technology by 3GPP as LTE Band 40. Driven by the growing developments in the Asia Pacific region, multi band devices are already available supporting this band.

GTI think that with the adoption of more mobile devices under license-exempt (top priority), 2300 – 2400 MHz is a global harmonized TDD frequency band.

2.2.2 Comments on the consultant

Question 1: The Authority invites industry views on usage of 2380-2400 MHz

GTI think the band from 2380-2400 MHz should be a TDD band for industry in South Africa.

There are two reasons accounting for this recommendation.

First of all, according to the IMT Roadmap, this sub-band is not used in South Africa currently, and the lower band of 2.3GHz had already been used by TDD by some operators. From system coexistence perspective, the adoption of TDD technology can inherently save more guard band against interference and reduce the RF filter cost, which not only improve spectrum usage efficiency, but also save device cost.

Secondly, from industry chain point of view, 2300-2400MHz is a global IMT band identified by ITU, 3GPP had already standardized this band as Band 40. In some region, such as APT countries, TDD license had been issued and infrastructure and terminal equipment had already possessed tremendous market scale. Thus enabling 2380-2400 MHz as a TDD band in South Africa meets the trend of globally unification and is also benefit of terminal roaming.

Question 2: The Authority invites industry views on usage of 2290-2300 MHz for IMT

As we know, the 2290-2300 MHz band is currently unused in South Africa. Land mobile and space research applications are referred to this band in ECA Table. If TDD equipment developed to extend IMT-2300 starting from 2290-2300MHz, it should contribute significantly to the increasing scale of the TDD industry. In addition, there is no difficulty in technology at present. Actually the frequency band 2290-2300 MHz in a few CEPT countries is used by deep space applications and three deep space communications facilities were placed around the world by U.S. According to the current utilization of this band, co-existence between IMT-TDD and other services may be feasible.

2.3. IMT2600 spectrum

2.3.1 General view on IMT 2600

It is very wise to consider the 2.6GHz band for mobile and fixed wireless access system as it has become one of the key bands for LTE deployment globally. As the latest advanced mobile network technology, Long-Term Evolution (LTE) will contribute to maximize the social and economic value of 2.6GHz spectrum.

1) 2.6GHz spectrum status

The following 3 frequency arrangements were recommended and captured in ITU Recommendation M.1036 [1] in the year around 2004. And in the following years, the band plan and frequency arrangement have been determined by the administrations in different countries/regions.

Frequency arrangements	Paired arrangements					Unpaired arrangements (e.g. for TDD) (MHz)
	Mobile station transmitter (MHz)	Centre gap (MHz)	Base station transmitter (MHz)	Duplex separation (MHz)	Centre gap usage	
C1	2 500-2 570	50	2 620-2 690	120	TDD	2 570-2 620 TDD
C2	2 500-2 570	50	2 620-2 690	120	FDD	2 570-2 620 FDD DL external
C3	Flexible FDD/TDD					

Figure 2.1 ITU Frequency arrangement in 2500-2690MHz

Follow-up to the ECC Decision of 18 March 2005 (ECC/DEC/(05)05) [2], most of the EU countries which released 2.6GHz band, such as France, Germany, Sweden, Finland，Holland and etc., have allocated this band according to the following arrangement.

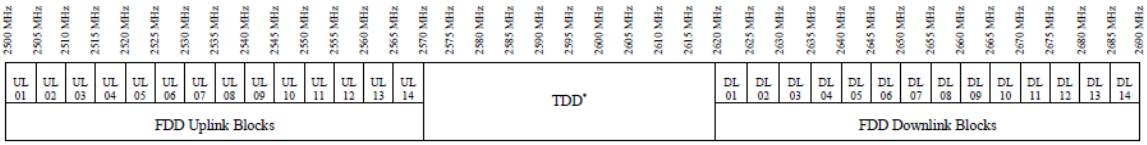


Figure 2.2 EU Frequency arrangement in 2500-2690MHz

Except for Europe, countries in other parts of the world, representatively US, China and Japan, have planned this band for IMT system with TDD mode which aligns with ITU frequency arrangement C3.

In the United States the 2.6GHz band is designated by Part 27 of the FCC rules and regulations, as specified in Title 47 of the Code of Federal Regulations [3]. The

arrangement of the 2496 – 2690MHz band is shown below in Figure 2.3.

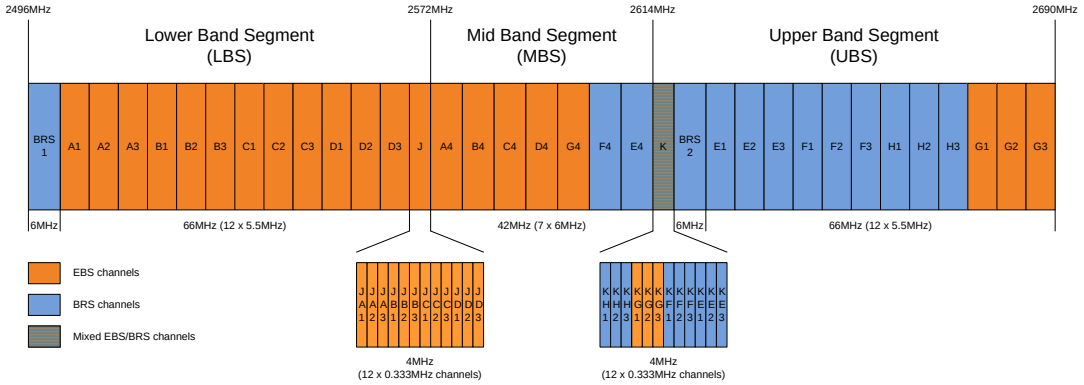


Figure 2.3 BRS/EBS channel plan and LBS/MBS/UBS band segmentation

Commercial operators can own the BRS blocks or lease EBS blocks (commercial operators cannot own EBS blocks, only non-commercial operators such as churches or educational institutions can) across various markets in order to make up their spectrum holding. Due to the fragmented nature of ownership, each block can potentially have a different owner within a specific geographic area and, in certain areas, the availability of EBS blocks (mainly in the LBS) is limited. The consequence of this ownership structure is that operators in the US preferring to operate TDD based systems in order to make best use of the spectrum available. Then the 2.6GHz spectrum is standardized as TDD band 41 (shown in figure 2.4) in 3GPP [4, 5] in 2010.

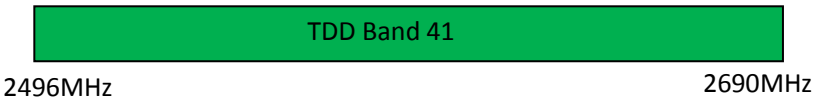


Figure 2.4 TDD Band 41

In China, the whole frequency band 2500-2690MHz has been planned for IMT system with TDD mode in Oct 2012 and manually required synchronization in 2013. Three Chinese operators China Mobile, China Telecom and China Unicom have got spectrum in this band and all of them have provided services in Band 41 based on LTE TDD technology.

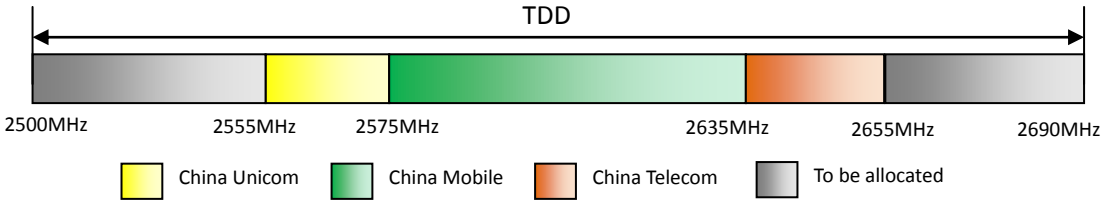


Figure 2.5 2500-2690MHz frequency arrangements in China

Japan also followed TDD band 41 subsequently and Soft Bank has launched LTE TDD commercial network in this band in 2012.

Many other countries in Asia and other regions, have allocated this band for WiMax technology years ago and a lot of legacy spectrum in this band is owned by WiMax operators. As for the re-farming, LTE TDD is an ideal choice for WiMax operators in 2.6GHz spectrum growing their business. It is expected that LTE TDD will continue to exploit and expand global economies of scales in 2.6GHz band in these regions/countries.

2) LTE Industry and Ecosystem at 2.6GHz

LTE FDD Network Status at 2.6GHz

Band 7 is already widely deployed being used in 26% of LTE-FDD networks worldwide in 86 networks. And is the second most used band for LTE-FDD behind 1800MHz (Band 3).

LTE TDD Network Status at 2.6GHz

LTE TDD is one of the mainstream technology delivering capacity, data throughput enhancements and low latency to support existing and new services and features requiring high level of capability and performance. Interest in LTE TDD is global and strengthening. GSA confirms that around 1 in 8 commercial LTE networks incorporate the TDD mode. 39 LTE TDD systems are commercially launched in 26 countries, including 13 operators who have deployed both FDD and TDD modes in their mobile operations.

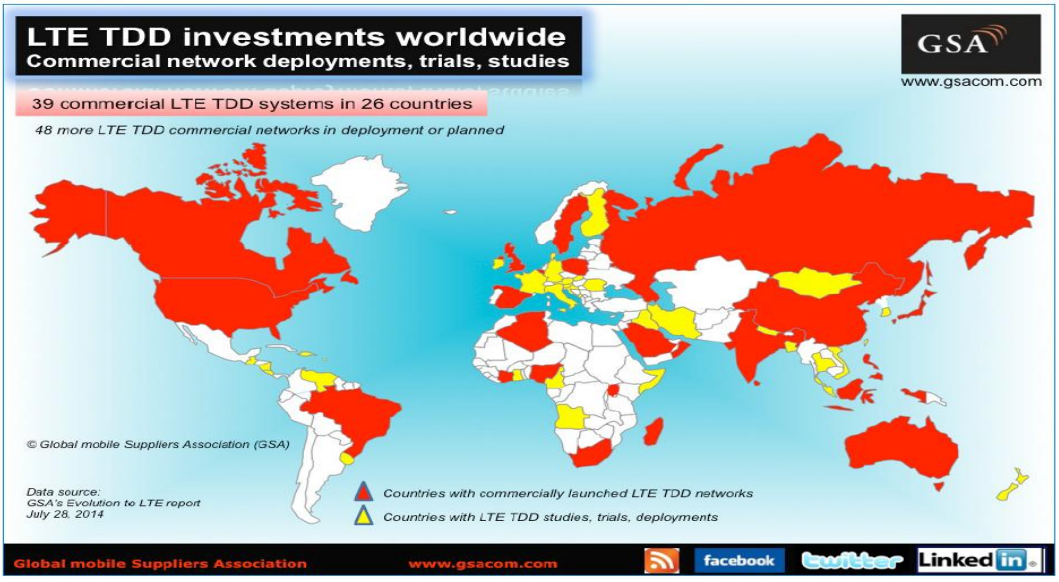


Figure 2.6 LTE TDD investments worldwide

As mentioned above, 2.6GHz band is one of the key bands for LTE development. Up to now operators from China, the United State, Japan and so on, have launched commercial LTE TDD network in Band 41. Also some operators launched LTE TDD network in Band 38 which have overlapping frequency (2570-2620MHz) as Band 41. It means that LTE TDD has formed the basis of global roaming in 2.6GHz band.

The decision by operators in China to deploy LTE TDD ensures that a large-scale market and robust ecosystem will be established in 2.6GHz, benefitting all TDD markets.

MII issued LTE TDD licenses to China Mobile, China Telecom and China Unicom on December, 2013.

- China Mobile commercially launched LTE TDD on December 18, 2013 in Band 39, 40 and 41. 320,000 base stations were activated by June 2014. The announced target in 2014 includes 500,000 base stations deployed across 340 major cities and 100 million LTE TDD user terminal sales.
- China Telecom commercially launched LTE TDD service in Band 41 on February 14, 2014, initially offering service in almost 100 cities.
- China Unicom commercially launched LTE TDD services in Band 40 and Band 41 on March 18, 2014 in 25 cities and plans to cover 100 cities in 2014.

According to MIIT, the number of LTE subscribers in China has reached 20 million at end June, 2014.

SoftBank commercially launched LTE TDD (AXGP) in Feb, 2012. The AXGP subscribers have approximated 4000,000 by the end of July, 2014.

Following its buyout of Clearwire who owns all 2.6GHz TDD spectrum in US, Sprint stopped selling WiMax service after 2012 and commercially launched LTE TDD in Band 41.

The total number of LTE TDD subscribers is forecast to increase to 70.4 million by the end of 2014, according to Digitimes Research.

Availability of devices[6]

FDD Band 7 is strongly supported in devices, again ranking 2nd in LTE-FDD network behind Band 3.

The ecosystems for TDD bands 38 and 41 (2.6GHz) dominate the LTE TDD devices and are almost identical, supported in almost half of TDD devices. Availability of devices that can support TD-LTE remains growing. According to GSA statistics, there are 543 devices in the market in mid-July 2014.

2.3.2 Comments on the consultant

With regard to the consultation questions of the technical issues for the 2.6GHz, we would like to explain the views and comments on several aspects as below. It should be noted that the answer is given in a generic way rather than in one-to-one manner.

Question 1: The Authority invites industry views on demand in the IMT2600 Band (FDD/TDD)

As mentioned above, IMT 2600MHz band is one of the most important key bands for LTE global development. There are two essential frequency plans as below.

One is FDD/TDD, which is mentioned above as ITU frequency arrangement C1. We note that the 2.6GHz roadmap by the Authority prefers to use ITU frequency arrangement C1 and this would align with many deployments and has strong industry support. However, to our understanding, C1 may not an efficient band plan as guard band would be needed between FDD/TDD and there will be some constrains/difficulties in equipment implementation to ensure FDD/TDD deployment in the same geographic area.

The other is all TDD planning, mentioned above as ITU frequency arrangement C3. Now, the economy of scale for LTE TDD has been formed globally and is to be enlarged. All TDD planning aligns ITU frequency arrangement C3 and can maximize the spectrum utilization without any spectrum waste. While we noticed that there may be inter-operator interference in all TDD network if there are non- synchronize operators. The regulatory can mandates multiple IMT operators to synchronize their network to avoid interference and spectrum waste, which has already been a practice in e.g. China.

Hence we would recommend that the Authority consider either above two frequency plannings for IMT 2600 band.

Question 2: The Authority invites industry views on the migration of WBS

As for the 2-phase migration approach for WBS proposed by the Authority, we think some technical issue as well as the migration cost need to be evaluated carefully, e.g. interference between WBS and IMT in the first phase, migration cost of WBS in the second phase etc…Even through the IMT 2600 band can be cleared off in the future, further study is still needed on how to use the central TDD spectrum.

As mentioned above, LTE TDD is also one of the mainstream technologies of 3GPP and can provide equal level services as FDD. The TDD ecosystem in IMT 2600 band has been well established. We think the most straight forward way for WBS is to migrate to LTE TDD mode rather than migrate to other frequencies/bands. The same situation exists in US and Japan which have adopted LTE TDD mode for the legacy migration in IMT 2600 band.

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2.4. IMT3500 unpaired TDD spectrum

2.4.1 General view on IMT 3500

We think it is very wise for South Africa to consider the 3.5GHz band for mobile service. As the latest advanced mobile network technology, Long-Term Evolution (LTE) will contribute to maximize the social and economic value of spectrum, especially in the case of wide area deployment.

3.5GHz is being increasingly recognized as the most probable global harmonized TDD band and will play a key role in meeting the explosive mobile data demands. Regional band planning or re-farming considerations for this band have made significant progress in the world in recent years. The progress of 3.5GHz band is introduced as below.

1) Progress in Region 1

In Europe, there has been a transition from a framework designed for BWA/rural access to a new framework designed for IMT-Advanced purposes. The initial BWA framework (reflected in EC decision 2008/411/EC) assumed paired spectrum allocations could be used either as TDD or FDD, together with a proper block-edge-mask. This was fine as rural deployment usually exhibit few inter-operator coexistence issues, and ensuring flexibility was more important in this context. However, for IMT-Advanced purposes, those assumptions were no longer true, i.e. sites are often shared among operators, and FDD/TDD or unsynchronized TDD/TDD coexistence issues were expected. Besides, the flexible arrangement did not provide enough guidance to the industry to know where to invest (which is illustrated by WiMAX failure to properly address the mobile market in this frequency band). Yet, most countries and operators recognized the 3.4-3.8 GHz bands as the main suitable contiguous block of spectrum to enable IMT-Advanced data rates, and it was desirable to get a new proper harmonized regulatory framework to help those deployments happen.

The new ECC decision (11)06 removes flexibility and mandates a homogeneous band plan within a country to avoid TDD/FDD coexistence issues. For the 3.6-3.8 GHz sub-band, TDD is the only duplex mode allowed (corresponding to 3GPP band 43). One of the main reasons has been related to coexistence with satellites in this upper band (in FDD, voiding one duplex for coexistence would also mean losing the other corresponding duplex). For the 3.4-3.6 GHz sub-band, two band plans are defined (TDD i.e. 3GPP band 42, and FDD i.e. 3GPP band 22. See fig.2.7 and fig.2.8). There has been an intense debate related to which band plan should be preferred — if any — as both duplex schemes have pros and cons. The European Commission decided to mandate

ECC to define a preferred band plan, which has been finally defined as TDD. The main reasons were to enable economies of scale with other parts of the world, and ease terminal implementation (while B22 was technically more challenging due to its very small duplex gap).

There has been some additional work

- on new block edge masks, assuming HetNet deployments (macro/micro/pico/femtocells), in FDD, TDD-synchronized and TDD-unsynchronized modes. This is reflected in ECC report 203
- on synchronization for TDD networks, assessing technical and non-technical topics in a multi-operator context with HetNets and indoor cells (i.e. without GNSS). This work is reflected in the ECC report 216.

All this work is reflected in CEPT report 49 (November 2013), in ECC decision (11)06 (march 2014), and in the new EC decision 2014/276/EU (may 2014, updates previous EC decision 2008/411/EC).

And as a follow-up to this decision, some European countries, such as UK and Spanish have already deployed network on this band. In UK, 3.5GHz and 3.7GHz bands have been licensed. The operator UK Broadband is rolling out TD-LTE network on both Band 42 and 43 to provide mobile and fixed services. WiMAX™ operator Neo-Sky commercially launched LTE TDD service in 3.5 GHz (band 42) in June 2013.

In addition to the Europe, In Belgium, b•lite Telecom BVBA (ex- Clearwire Belgium) has launched a 3.5 GHz TD-LTE system (band 42) in April, 2014.

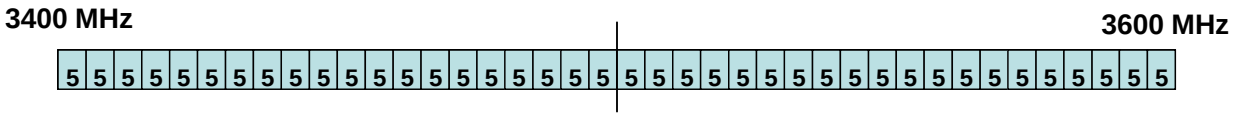

Figure 2.7 Preferred Frequency arrangement for the 3400-3600 MHz band based on TDD

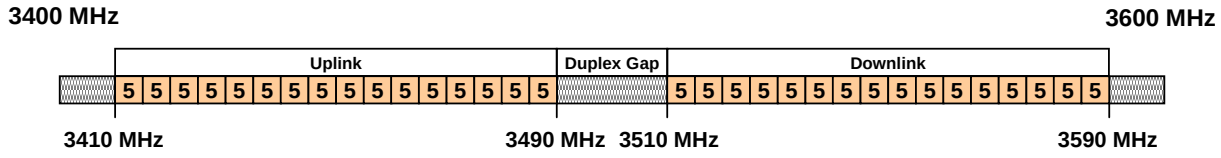

Figure 2.8 Alternative Frequency arrangement for the 3400-3600MHz band based on FDD

2) Progress in Region 3

Regulators in Region 3 have also speed up the planning of this band and it is expected to finish the planning soon in some representative countries, e.g. in Japan and China

In China, co-existence study and field test have been carried out to evaluate the compatibility between TD-LTE and fixed satellite services. It is thought that current sharing study between TD-LTE and satellite is enough. It is feasible for TD-LTE to operate and coexist with satellite within band 42. Co-existence issue in very limited cases will be handled by the approach of geographic separation. It is anticipated that the planning for this band will be speed up in 2014.

In Japan, introduction of LTE-Advanced systems to 3400-3600MHz band was studied during 2012-2013. The technical requirements such as the coexistence with the incumbent systems (satellite, and microwave links) were concluded. And it is announced that Japan will launch LTE-A TDD in 3.5GHz commercial service around 2016.

In South Korea although some of the capacity in the 3.5-3.7GHz range is used for fixed satellite services, the government plans to release at least 160MHz of capacity at 3.5GHz for mobile broadband services by 2018 as part of its Mobile Gwanggaeto Plan. Both TDD (200MHz) and FDD (2x80MHz) options in 3400-3600MHz are considered to meet the capacity target.

3) Progress in North America

North America envisions 3.5 GHz as an “innovation band,” Three-Tier Spectrum Access is proposed by FCC that the band be structured according to a three-tiered shared access system enforced by a Spectrum Access System (SAS) and the use of geo-location based technology.

The first tier, Incumbent Access, would include authorized federal users. These incumbents would be afforded protection from all other users in the 3.5 GHz Band.

The second tier, Priority Access (PA), would include critical use facilities, such as hospitals, utilities, government facilities, and public safety as well as non-critical entities such as operators that would be afforded a quality-assured access the 3.5 GHz Band. TD-LTE would be a good candidate for this tier.

The third tier, General Authorized Access (GAA), would be authorized to use the 3.5 GHz Band opportunistically. GAA users would be required to accept interference from Incumbent and Priority Access tier users but have to avoid causing any harmful interference to Priority Access Licensees and Incumbent Access tier users.

In addition to the US mentioned above, ABC Communications in Canada has already commercially launched LTE TDD in British Columbia using 3.5 GHz on April 23.

2.4.2 Comments on the consultant

Question 1: The Authority invites industry views on migration out of 3400-3600 MHz from FDD usage to TDD

We think it is very wise for South Africa to consider the 3.5GHz band for mobile service. Considering that 3.5GHz band is the most promising global harmonized TD-LTE band, South Africa's TDD decision will promote this 3.5GHz ecosystem.

As for the spectrum allocation, 3GPP standards are given as blew, which is not the same as your plan in your consultation paper. Considering the industry ecosystem and products cost, standard spectrum allocation is proposed.

In terms of standard on 3.5GHz (3400-3600 MHz), 3GPP specifies two arrangements: unpaired TDD mode (Band 42) and paired FDD mode (Band 22). It has become clear in recent years that TD-LTE at 3.5GHz has a highest possibility to be the dominant IMT technology deployed around the world.

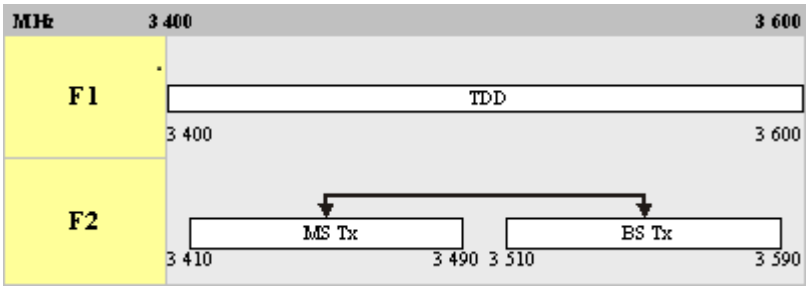

Figure Two 3GPP specified arrangements on 3.5GHz

Besides, TD-LTE at 3600-3800 MHz is the sole technology allocation in the 3GPP: Band43. In the middle or short term, it is expected that C-Band (3800-4200 MHz) will be assigned for IMT use and the technology mode will also be likely to be TD-LTE.

Thus, TD-LTE at 3.5GHz is the widest 3GPP band, giving a total of 400MHz ultra wide bandwidth (even extend to 800MHz). This would enable operators to take the unique advantage of building super speed networks, which is highly desirable among global mobile operators when building a perfect heterogeneous MBB network.

Question 2: The Authority invites industry views on status and time line

Ecosystem around TD-LTE at 3.5GHz band, including availability of chipsets and devices, availability of network equipment, and the future of 3.5GHz band are introduced as follow.

Availability of chipsets and devices

Chipsets that support TD-LTE at 3.5GHz are now available. Chipset vendors that are known to have 3.5GHz capability for their TD-LTE chipsets include Huawei/Hisilicon, Sequans and Altair Semiconductor. Other important chipset providers such as Qualcomm and Intel will have 3.5GHz TD-LTE chipsets ready in 2014/2015.

Availability of devices that can support TD-LTE remains growing. The earliest devices available to operators are indoor and outdoor CPE to support fixed wireless broadband applications. In late 2013, multimode MiFi (GSM/UMTS/TD-LTE) has come into market serving many significant markets. Furthermore, during MWC 2014, Huawei showcased the world's first 3.5GHz TD-LTE smart phone, which was expected to Go-To-Market in 2015.

According to GSA statistics, there are 24 devices in the market in mid-July 2014. Details for some selected devices are presented in the following table.

Vendor	**Device type**	**Device name**	**Frequency bands supported**
FIC	Mobile tablet	Elija TF9300	TDD 3500 b42, 43
Greenpacket	Router	DA-235 TD-LTE and WiMAX CPE	TDD 2300 b40,TDD 2600 b38,TDD 2600 b41,TDD 3500 b42, 43
Huawei	Router	B2268A Cat 4 device	TDD 1900 b39,TDD 2300 b40,TDD 2600 b38,TDD 3500 b42, 43
Huawei	MiFi	E5776s-420 Cat 4 personal hotspot	TDD 3500 b42, 43, LTE FDD 2600MHz UMTS 850/900/2100MHz
Mitrastar Corporation	Router	Outdoor CPE band 42/43	TDD 3500 b42, 43
Netcomm	Router	WNTD-4243 Outdoor TD-LTE Router	TDD 2300 b40,TDD 2600 b38,TDD 2600 b41,TDD 3500 b42, 43

Availability of network equipment

The status of the network equipment market is similar to the status of the device market: improving. A number of vendors of radio network equipment are making available eNodeB base station equipment to support TD-LTE at 3.5GHz, including Huawei, ZTE, NSN, Datang Mobile, Airspan, Accelleran, etc. Existing products are currently mostly macro cells and microcells, but pico/femtocells are expected in a very short timeframe as chipset vendors such as Qualcomm/Broadcom also have small cells reference-designs that are nearly ready to work on 3.5 GHz.

Operator commitments to invest in TD-LTE at 3.5GHz

Many global operators have signaled their clear desires to use in the 3.5GHz band.

Operator commitments to TD-LTE at 3.5GHz are growing steadily. At the end of June 2014, there were five live commercial TD-LTE networks at 3.5GHz: UK Broadband in UK, PLDT in Philippines, Menatelecom in Bahrain, ABC Communications in Canada, and Neo-Sky in Spain. In addition to these live commercial networks, a number of other operators have announced plans to launch services using TD-LTE in bands 42 and 43. These include players from all parts of the world.

Operator	Country	Details
Xplornet Communications	Canada	Trials from WiMAX migration to TD-LTE
Azqtel	Azerbaijan	Targeting service launch Q3 2014
VipNet	Côte d'Ivoire	Targeting commercial launch in 2H 2014
ITC	Saudi Arabia	In deployment, in deployment
Dedicado	Uruguay	Combined WiMAX / LTE network in deployment
b•lite Telecom	Belgium	Commercial launch is planned in 2014 beginning in the city of Aalst
Imagine Group	Ireland	Currently conducting trials of LTE
Milmex	Poland	Plans to launch 3.5 GHz TD-LTE in 2014
DBD	Germany	Has a licence with 42 to 70 MHz of 3.5 GHz spectrum nationwide and plans to deploy TD-LTE.
Bolloré Telecom	France	Plans to introduce TD-LTE system in band 42 (3.5 GHz), and launch mobile services using MM-MB devices

Except for the operators mentioned above, leading operators from Japan promise to make a great contribution to 3.5GHz TD-LTE. It is said that Japan government will allocate 3.5GHz band in this year. This will drive forward the ecosystem around 3.5GHz TD-LTE more quickly. The following table (cite SoftBankMobile's presentation) illustrates the potential operators' plan in Japan.

	NTT docomo	Designing The Future KDDI	eAccess Broadband services	SoftBa
System and Duplex scheme	LTE-Advanced TDD	LTE-Advanced TDD	LTE-Advanced TDD	LTE-Advanced TDD
Bandwidth	As much as possible	More than 40MHz	More than 40MHz	More than 40M
Use case of 3.5GHz Coverage	Traffic offload with small cell Not nation wide	Traffic offload with Small cell and Street cell	Traffic offload with small cell Not nation wide	Traffic offload w small cell Not nation wide
Guard band between operators	No guard band (synchronization between operators)	No guard band	No guard band	No guard band
Service in	FY2015	1Q FY2016 (2QFY2014 license)	Not mentioned	2016
Target DL peak rate	Not mentioned	1Gbps	1Gbps	1Gbps

Note: eAccess（named Ymobile）is one company of SoftBankMobile.

TD-LTE at 3.5GHz: Now and for the Future

The aforementioned information means that the ecosystem around 3.5GHz TD-LTE is available and mature. As such, ever-increasing operators have a heightened interest in this large block of spectrum that has been available or may become available worldwide.

In contrast, the LTE FDD industry, has not yet announced any plans for the development of 3.5GHz networks or devices.

Global harmonization of the 3.5GHz spectrum band is critical to supporting a single ecosystem, particularly for chipsets and devices. Based on current situation, TD-LTE at 3.5GHz is the preferred choice for South Africa, and it gives a bright future to address the rapid growing data needs. One thing to note is that inter-operator interference issues is suggested to be considered. China has avoided the inter-operator interference issue by making inter-operator mandatory (instead of optional, pending inter-operator agreements) in 2.6GHz. And TDD synchronization has been also mandated in 3.5GHz in Japan. This option may be better to explore to ensure TDD success in an urban environment with multiple operators.

3. Reference

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