

13-Sep-2013

Ms Aileen Chia
Deputy Director General (Telecoms and Post)
Infocomm Development Authority of Singapore
10 Pasir Panjang Road
#10-01 Mapletree Business City
Singapore 117438

Dear Ms.Chia,

PUBLIC CONSULTATION PAPER ON PROPOSED REGULATORY FRAMEWORK FOR
TV WHITE SPACE OPERATIONS IN THE VHF/UHF BANDS.

IDA TSAC Work Group WG6 welcomes the opportunity to comment on the above that was released on 17 June 2013. We support the use of TVWS technology to enable opportunistic sharing of 'White Space' spectrum in the VHF and UHF broadcast bands that is unassigned to in Singapore.

In general, we propose that any regulations for use by WSDs should be harmonized on a regional/global basis so as not to have unique products and geolocation databases.

With respect to questions posed in the public consultation paper, we are pleased to provide comments in the following pages.

The responses were contributed by our Work Group members as follows:

Motorola Solutions, I2R (Institute for Infocom Research), NICT, Starhub, Huawei and Lock Spectrum. The response to each question represents the majority views of our members, if not consensus.

Following this white paper, our WG6 is tasked by IDA TSAC to work on the technical specifications or standards for TV White Space Operations in Singapore. As our standards work depend on the regulatory framework imposed by IDA, we will take initial reference from the White paper. We hope that IDA will inform or advise our Work Group as soon as there are changes in the regulatory framework, so that our standards work will be aligned with the updated regulatory framework.

If you have any clarifications. please do not hesitate to contact us.

Yours Sincerely,

Yip Yew Seng

Chairman, IDA TSAC Work Group 6 (Wireless Centric Mobility Enabled)

Email: yip@motorolasolutions.com

CC:

Khoo Teng Lock, Lock Spectrum

Liew Wong Huat, Starhub

Dr Oh Ser Wah, I2R

Dr Ma Yugang, I2R

Dr Sum Chin Sean, NICT

Dr Zhou Ming Tuo, NICT

Dr Xu Changqing, Huawei

**RESPONSE TO
CONSULTATION PAPER ISSUED BY THE INFO-COMMUNICATIONS DEVELOPMENT AUTHORITY OF
SINGAPORE ON
PROPOSED REGULATORY FRAMEWORK FOR TV WHITE SPACE OPERATIONS IN THE VHF/UHF BANDS
17 June 2013**

Question 1:

IDA invites views on adopting a licence-exempt approach for WSDs in Singapore, subject to the devices meeting the conditions set by IDA.

We support the license-exempt approach for WSDs in Singapore.

Question 2:

IDA invites views on designating a restricted number of TVWS channels to support the deployment of services that require certainty of spectrum access.

We support prioritizing some channels for this on a dynamic & temporary basis, provided that there will still be sufficient channels available for the other WSDs.

Question 3:

In the event where IDA designates channels to support such services, IDA invites views on the appropriate regulatory approach in designating and managing these TVWS channels and the regulatory framework for the operations of prioritised WSDs.

Certain emergency services (eg Police, Civil defense etc), large scale events & commercial applications may require urgency and certainty of services. We suggest such spectrum to be assigned on a dynamic & temporary basis, and moderated by database.

Question 4:

IDA invites views on allowing operation of WSDs in the 694 MHz – 806 MHz band until IDA allocates these frequencies for IMT deployment.

We support use of this band for WSD, and understand that such use will end when the band is allocated for IMT deployment. Plan for allocation of spectrum for WS, IMT and others within this band should be made known to the public with sufficient notice.

Question 5:

IDA invites views on adopting a database approach as the mandated method to access white space spectrum.

The Database approach shall be the primary and mandated method. Sensing approach can be a complementary, but not mandated approach.

Question 6:

IDA invites views on the proposed general requirements for the database query and Registration

We support the approach described in paragraphs 16-18 of the paper, subject to the resolution of the issue raised in our response to Question 7.

Priority levels could be incorporated, and this shall be managed by the database, not the device.

Question 7:

IDA invites views on the three situations in which a WSD must query the database. In particular, IDA invites views on defining 50m as the maximum distance that WSDs are allowed to move from its original location, without contacting the geolocation database

For paragraph 17b), considerations should be made for portable WSD moving on vehicular speeds, as contacting the database every 50m may not be feasible. Other alternatives should be explored, such as

- a) A longer distance should be allowed. We propose 100m which is the distance allowed under Ofcom of the UK, or longer range. This is because the difference in power levels between 50m and 100m is small, as described in Annex A.
- b) Another mechanism such as querying the database/s for the region within which the portable WSD is operating, so that as long as the WSD operates within this region, it is not considered to have moved considerably as defined by paragraph 17b).
- c) Instead of fixing a distance such as 50m or 100m, a given value set by database for different locations should be explored.

We recommend that in the same time interval, the WSDs should be allowed to move from its original location without contacting the database under the above conditions (whichever higher).

Question 8:

IDA invites views on the output power transmission of WSDs as shown in Table 2

We recommend that another category (ie a new column in table 2) be added that includes Fixed Device with no capability to access database, but still allowed to transmit 4W. We opine that Fixed Devices shall have the maximum power level of 4W, regardless of whether it has the ability to query the database or not.

Question 9:

IDA invites views on allowing the Fixed Devices to have tunable output power that is capped at a maximum of 4Watts EIRP.

We recommend that power >4W be explored especially for point-to-point wireless applications, where directional antennas can be used so as to reduce interference to others in the vicinity.

Question 10:

IDA invites views on the requirement of a Unique WSD Identifier and for this identifier to be based on standards developed by recognised standards organisations.

We support the use of unique identifier to facilitate tracking of devices that transmit radio signals, so as to facilitate IDA to enforce its regulations.

Question 11:

IDA invites views on the proposed maximum transmission level of 100mW EIRP for WSDs operating in channels adjacent to a local broadcast channel.

Paragraph 24 mentioned only Mode I and II Devices. We suggest that if transmission power level is limited to 100mW, Fixed Device should be included as well to operate in channels adjacent to a local broadcast channel. In fact, Fixed Device has less uncertainty (with its fixed location) compared to Mode I and II Devices which are Portable Devices and have no fixed location. Furthermore, with this lesser uncertainty, Fixed Device and nomadic (ie relatively stationary) devices should be able to transmit higher power compared to Portable Devices.

Question 12:

IDA invites views on the proposed OOB emission limit of -56.8dBm, which will be imposed on WSDs operating in channels that are directly adjacent to a local broadcast service.

We suggest that this limit should be raised as the proposed limit is too stringent and many WSDs cannot meet this.

In fact, -56.8dBm is lower than the current FCC Part 15 unintentional radiation limit of -49.2dBm for this range of frequency. If -56.8dBm OOB protection is really required, the current legal unintentional radiators such as switching regulators, laptops, desktops and so on would have long interfered with TV receivers. But, this does not seem to be the case now. Thus, the strict protection limit of -56.8dBm may not be needed. In addition, typically spurious requirements (unintentional radiation) are more stringent than OOB. Therefore, a reasonable figure for OOB should not be lower than -49.2 dBm.

We also presented some typical OOB requirements for LTE and other systems in Annex B. As one could see, typical N+1 adjacent channel OOB ranges around -30 dBm.

With the above, we urge IDA to reconsider this OOB emission limit and reduce the requirement to -30 dBm.

Also, we would like to clarify with IDA the bandwidth for this limit. We are assuming it is 100kHz.

Question 13:

IDA invites views on defining the OOB emission limits for WSD to WSD operations.

A limit shall be imposed to prevent lower quality WSD transmitter to be used. Our workgroup TSAC WG6 will be tasked to work on it.

Question 14:

IDA invites views on the proposed approach to manage coexistence between a WSD and the other secondary services within the TVWS channels.

We support the proposed approach described in clauses 29-31. Since location of Mode I WSD is not known, its location can be estimated via its possible range from Fixed or Mode II Master devices. Safe harbor methods should be used for unlicensed wireless microphones.

Question 15:

IDA invites views on the proposed propagation model and parameters used to determine the maximum transmission power level of a WSD.

We opine that Hata is a possible model at this moment.

Question 16:

IDA invites views on its proposal for the protection of licence-exempt and licensed wireless microphones. IDA also invites views and comments on the optimal number of safe harbour channels required to ensure that licence-exempt wireless microphones can continue to be used once WSDs are deployed.

We support IDA's view on protecting wireless microphone via safe harbour so that they will be contained within known frequency channels. As we do not have the data for usage patterns and frequency of such usage, IDA would be in a better position to decide on the number of channels for safe harbor, but we suggest that this be minimized.

Question 17:

IDA invites views on the need to develop a registration process for users of licence-exempt wireless microphones that require additional channels beyond the safe harbour channels.

We propose that only safe harbor channels be allowed for licence-exempt wireless microphones. Refer to our responses to Questions 2 & 3 if certainty of spectrum is needed.

Question 18:

IDA invites views on whether the proposed demarcation zone approach is sufficient in terms of managing cross border interference issue and if there are any other factors IDA should consider.

We would like to clarify with IDA that the demarcation zone is from the country border.

The -120 dBm specified as the limit for the maximum power at the border is quite stringent. It is suggested to use -115 dBm as shown in Table 3. This is because the noise floor in Singapore or our neighbors should be reciprocal. Also, the noise floor shown is at locations not near the border. It is expected that these numbers could be higher at the border. Please also indicate the bandwidth used for

measurement of the noise floor levels in Table 3. From the numbers presented, it is unlikely to be the noise floor over a TV channel of 8 MHz as the measured numbers are lower than theoretical noise floor for 8 MHz.

We agree that an authorized database should be used to calculate the demarcation zone dynamically based on this noise floor guideline with an appropriate propagation model.

Question 19:

IDA invites views on the aggregate interference effect of WSD and whether any adjustment in terms of technical requirement is needed.

We support IDA's proposal not to limit on the number of WSDs that can operate at any one location.

Question 20:

IDA invites views on using GPS as the method to determine location accuracy, and on whether 50m is a sufficient location accuracy requirement for the operation of WSDs.

We prefer that the method to determine location is not mandated as long as the accuracy requirements are met (eg 50m for FCC or 100m for UK Ofcom). Industry should be able to decide what technologies to use to achieve the requirements.

Question 21:

IDA invites views on allowing the manual input and internal storage of geographic coordinates for indoor Fixed Devices.

We support IDA's view, and further propose that these manual methods are allowed for

- a) Fixed devices which are outdoors as well, not only indoors. This saves cost as the device will not need a built-in GPS capability.
- b) "Nomadic" devices: The Mode II device may be transferred to another location, but once in the new location, it is fixed in position, and WSD operation starts only when it is stationary at the new location, and not in transit from one location to another.

Question 22:

IDA invites views on the requirement of an approval process for the installer of indoor Fixed Devices and the necessary conditions for approval.

We support the requirement of an approval process, but this process should be simple enough to implement. We recommend that the installer shall provide contact information to IDA to facilitate tracking of issues. We have some doubts on mandating the requirement for professional installers, for fear of its higher cost especially for simple home-use applications.

Question 23:

IDA invites views on the possible types of TVWS network topologies and use case

Scenarios.

We opine that in order to promote innovation, topologies should not be mandated. Therefore, besides master & slave, other topologies/ methods such as multiple-hops, mesh, etc should be allowed as long as the geo-location requirements are met.

For avoidance of doubt, we assume indirect internet connection is allowed to implement the topologies, and would recommend IDA to clearly state so.

Question 24:

IDA invites views on the payment of fees for the use of database services.

If the database is industry-managed, the database operators will need to operate on revenue-generating basis. We recommend that IDA provides incentive to industry to generate revenues from spin-off services such as data analytics etc. To jumpstart the industry, we recommend the government to subsidize the fees initially, to allow industry some time to find its own revenue generating model.

Question 25:

IDA invites views on both approaches in managing the database (i.e. industry-managed or government-managed database).

Industry-managed approach database should be attempted first, to facilitate innovation and competitiveness. If there is no keen participation from the industry in the beginning, government-managed database should be initiated to jumpstart the industry and to gather experience.

Question 26:

To better gauge the level of interest from the industry, IDA invites companies that are interested in developing and managing the database for Singapore to register its interest with us and share the following details:

- i) Funding for database development and management (i.e. self-funded, cost recovery, etc)**
- ii) Business models considered when providing database services**
- iii) Possible fees involved for TVWS users**

We recommend that feedback from potential database operators be sought.

Question 27:

IDA invites views on the proposed preliminary conditions for the operation and administration of the databases

We recommend that feedback from potential database operators be sought.

Question 28:

IDA invites views on the proposed approach and communications protocols between the following:

- i) WSD and IDA website containing the list of authorised database administrators**

ii) WSD and the database

We recommend that such protocols should be harmonized on a regional/global basis so as not to have unique solutions. Our workgroup TSAC WG6 will be tasked to work on it.

Question 29:

IDA invites views on the proposed frequency of update for Time A validity and Time B Validity.

A shorter time-frame will allow more dynamic services to be established, possibly increasing overall spectrum utilization. Our workgroup TSAC WG6 will be tasked to work on it.

Question 30:

IDA invites views on requiring the adjustment of the value for Time A validity and Time B validity, and for this to be within the range of 6 to 24 hours.

Shorter time frames for time validity will allow more services to utilize the bands. The database structure can readily accommodate shorter time frames as well. Required update rates in the range of shorter than 6-24 hours can be accommodated to improve spectrum utilization. Our workgroup TSAC WG6 will be tasked to work on the appropriate Time validity.

Question 31:

IDA invites views on the benefits and costs of a requirement for WSD to report its operational parameters to the database

We opine that, as an option, these parameters are ~~necessary~~ recommended to better understand the operating environment and to optimise resources to maximise benefits for all. However, additional resources from database may be required to process the report. TSAC WG to work on tech specs considering these parameters and trade-offs. Also, not all WSDs in the same locality/applications are required to report (since some parameters may be the same), only polling of some of these WSDs.

Question 32:

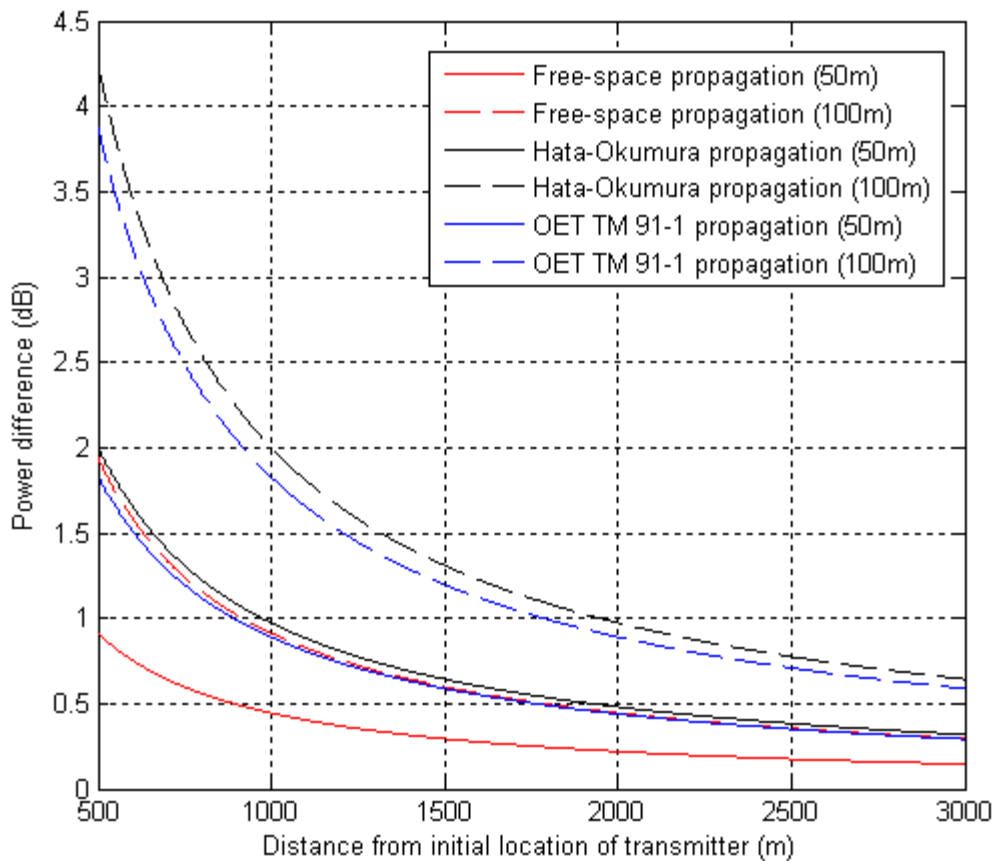
IDA invites views on the benefits of including within the TVWS regulations a requirement for WSD to register its contact parameters to the database.

We recommend that the contact parameters (eg name of user, tel number, email etc) will be registered during initial configuration, maintained by database, once until there is a change.

Annex A (refer to Question 7)

Refer to the graph below on calculation of the difference in power for moving 50m or 100m towards the transmitter. The x-axis depicts the distance of WSD from the transmitter and the y-axis depicts the difference in the power received by the WSD when it is moved either 50m or 100m towards the transmitter. As an example, let’s take the case when WSD is initially at 1km distance from the transmitter. When it moves 50m or 100m, the difference in the received power is 1dB or 2dB, respectively, using Hata-Okumura propagation calculations. This means that the difference in power level between 50m and 100m is only 1dB. This number is even lower when the WSD is further away from the transmitter, which is typically the case.

Given the incumbents are typically far from WSDs and sufficient protection has been catered in calculation of database, there is no need to restrict 50m as the maximum distance that WSDs are allowed to move before contacting the geo-location database. Instead, 100m or above is sufficient. By having larger positioning tolerance will also allow the potential use of other cheaper technologies for positioning rather than relying on GPS.



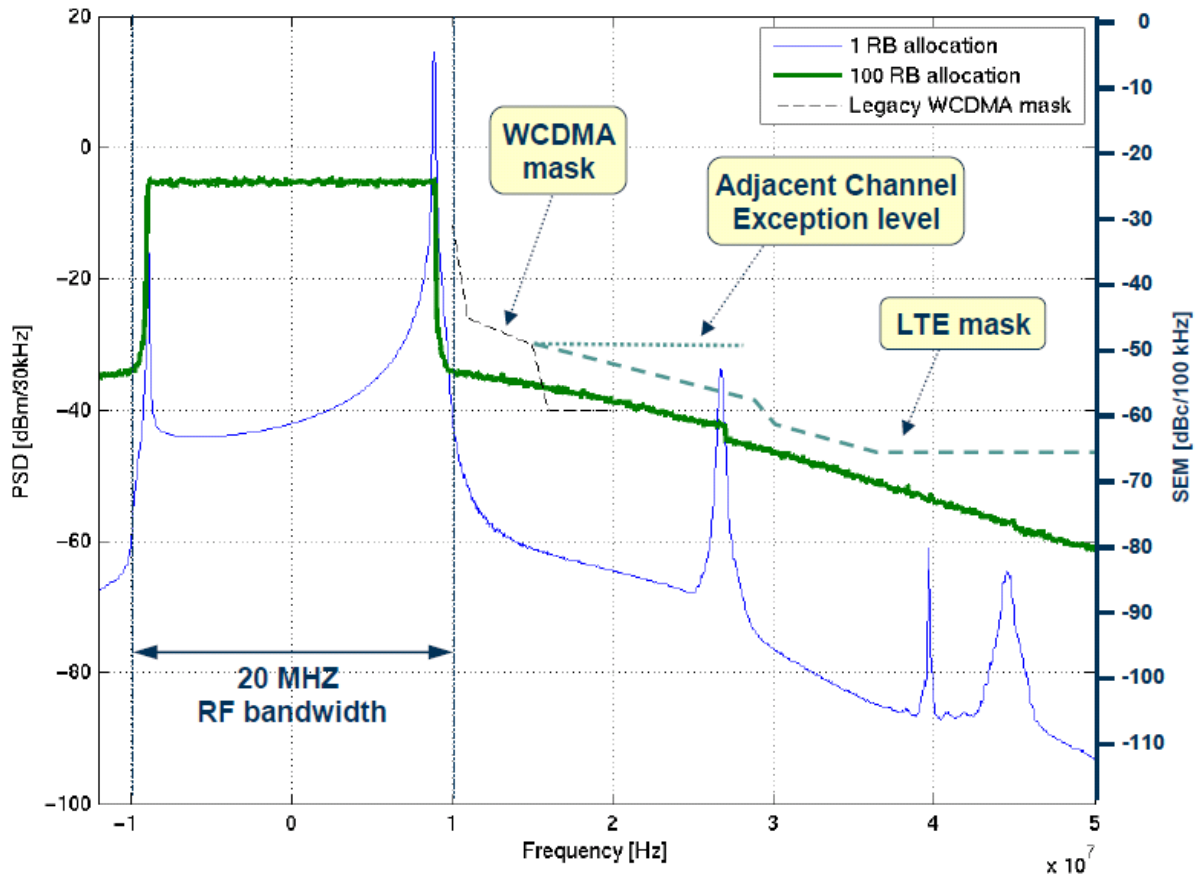
Annex B (refer to Question 12)

Table 6.6.2.1.1-1: General E-UTRA spectrum emission mask

Spectrum emission limit (dBm)/ Channel bandwidth							
Δf_{OoB} (MHz)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Measurement bandwidth
$\pm 0-1$	-10	-13	-15	-18	-20	-21	30 kHz
$\pm 1-2.5$	-10	-10	-10	-10	-10	-10	1 MHz
$\pm 2.5-2.8$	-25	-10	-10	-10	-10	-10	1 MHz
$\pm 2.8-5$		-10	-10	-10	-10	-10	1 MHz
$\pm 5-6$		-25	-13	-13	-13	-13	1 MHz
$\pm 6-10$			-25	-13	-13	-13	1 MHz
$\pm 10-15$				-25	-13	-13	1 MHz
$\pm 15-20$					-25	-13	1 MHz
$\pm 20-25$						-25	1 MHz

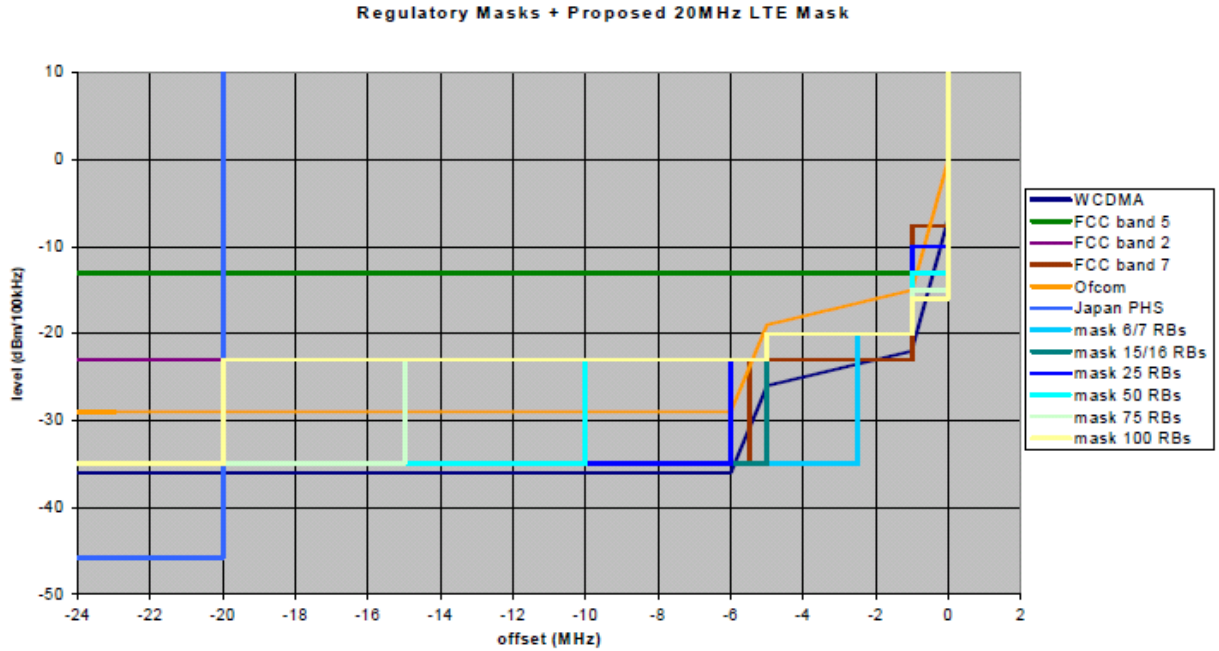
Source: Table 6.6.2.1.1-1 of

http://www.etsi.org/deliver/etsi_ts/136100_136199/136101/08.10.00_60/ts_136101v081000p.pdf



Source: Figure 4 of

<http://stakeholders.ofcom.org.uk/binaries/consultations/949731/annexes/Dynamics-of-3GPP-LTE-uplink.pdf>



TR 36.803 v1.0.0 Figure 6.6.2.1 -1: Regulatory mask and proposed E-UTRA masks

Source: Slide 24 of http://www.home.agilent.com/upload/cmc_upload/All/4-B_Track_1-Paper_2.pdf?&cc=SG&lc=eng