IDA consultation Proposed Regulatory Framework for TV White Space Operations in the VHF/UHF Bands. Comments from Neul.

1. Context and contact details

This document collects Neul comments to [IDA](#) public consultation on "[the Proposed Regulatory Framework for TV White Space Operations in the VHF/UHF Bands](#)".

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2. Answers

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 welcome that approach. Also see response to question 3.

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 are favourable to this idea. More than the certainty of spectrum access it is the viability of using whitespace for the Internet of Things (IoT) that would be improved in allocating channels for those applications. IoT applications will require low cost and small size modules. The small antenna size implies a small instantaneous bandwidth which is in contradiction with the possible use of 168MHz of spectrum.

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 prioritized WSDs

The idea of giving certainty of spectrum access is not unrelated to the development of the Licensed Shared Access (LSA) proposals seen in Europe. This means that a set of channels could be allocated to a limited number of right holders that want to operate an IoT network by sharing the spectrum with a primary or secondary license holder. The LSA incumbent in this case would be the licensed private mobile radio.

Question 4

IDA invites views on allowing operation of WSD in the 695-806 band until IDA allocates these frequencies for IMT deployment

We are in favour of that option. The IDA should consider whether the duplex gap could still be used for low power unlicensed service if the E-UTRA band 28 is adopted by the IDA for IMT deployment. As shown in Figure 1
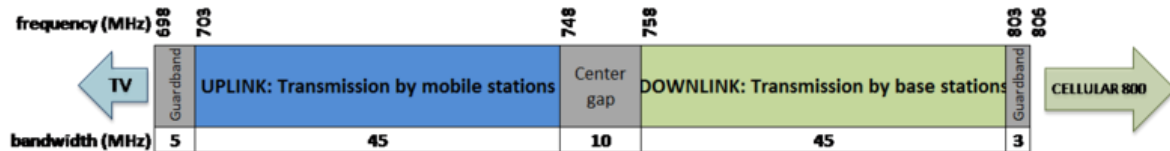

Figure 1: APAC E-UTRA FDD band

Question 5

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

We are supportive of that approach

Question 6

No comment

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 geo-location database

See Question 20

Question 8,9,10,11

No comment

Question 12

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

The limit of -56.8 dBm should be specified in 100 kHz with an RMS detector. It should also be noted that it only applies to personal portable devices and not to fixed devices which have a limit at -42.8 dBm conducted. It would also make sense that for personal portable mode II devices that are not operating adjacent to a TV channel the -56.8 dBm limit does not apply and only the -42.8 dBm applies.

Question 15

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

Given the urbanized nature of Singapore and that the distance between the transmitter and the victim would be less than 1km in a lot of cases it would be appropriate to follow the recommendation ITU-R P.1411-6 which includes models to be used for distances below 1km. This includes the COST231 Walfish-Ikegami model which takes into account roof height supports distances of less than 1km. In addition the base station height can be less 30m which is a limitation of the Hata model. Figure 2 show the difference between Hata and COST231 under the specified conditions.
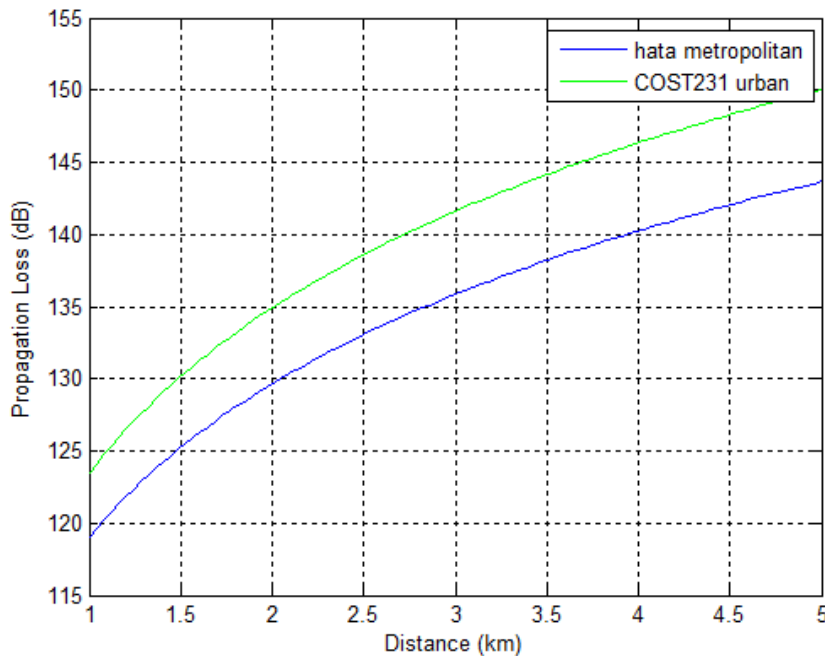

Figure 2: Propagation model compared. (building separation=15m, Road width=5m, Roof height=20, Road angle = 0 deg)

In the consultation document it is not clear how the WSD power is going to be calculated. Setting the requirement that the co-channel interference is below noise floor is too conservative. The WSD power should be set such that the private mobile radio (PMR) devices are not desensitized more than x dB (x TBD). This should take into account the average power spectral density of the WSD device and the receive bandwidth of the PMR device. As described in [1] the PMR device uses between 6.25 and 25 kHz channels. Not taking into account the relative bandwidth between the WSD device and the PMR device would result in significant under estimation of the WSD allowed power.

Question 16,17

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. 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.

Rather than designating two fixed safe harbours in the regulation (as in FCC 15.747) we propose that initially the database has two channels not made available for WSD devices. This would accommodate the licensed wireless microphone not registered in a location database. When the IDA is confident that all licensed wireless microphones are registered with the database it could relax the use of those two channels for whitespace operation.

For unlicensed wireless microphone possible interference mitigation would be to apply a relaxed protection criteria as the one used to protect licensed devices. Unlicensed wireless microphone would then be treated as PMR devices but with relaxed protection requirement.

Question 18

IDE 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

It is not clear from the document in what bandwidth the -120dBm noise limit is measured. We also would like to understand why this limit is 5dB lower than the measurements values shown in Table 3 for the consultation. We propose that this approach is used only for fixed devices which are the ones likely to be installed as base stations and mode II devices. Figure 3 shows the power contour that is allowed to reach a limit of -120dBm at the border (in the same bandwidth). Clearly this is better than requiring an exclusion zone as shown in Figure 4 within which no WSD can operate.
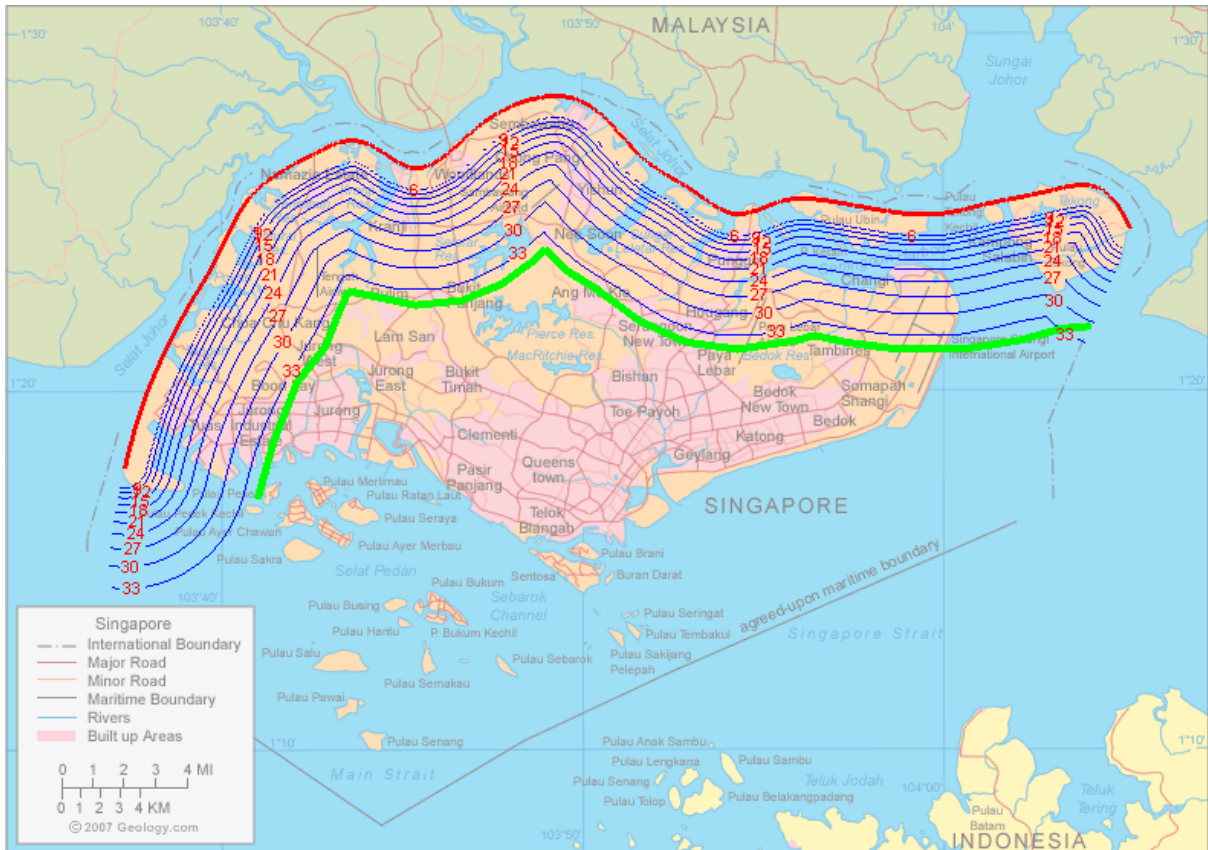
Figure 3: Power contour using HATA propagation model assuming a base station height of 30m and receiver at the border of 1.5m.

Figure 4: Proposed demarcation zone (red) and 7km boundary

The question arises as to what would be done for mode I devices (which are not geo-located). What we propose is to calculate the maximum power allowed at the Singapore border assuming a two ray model for the propagation over water and assuming that most TV receivers in Malaysia will point away from the WSD aggressor. Given the TV signal strength at the Malaysian land border, the WSD maximum can be calculated such that the DTV signal to noise ratio is preserved above the required SNR threshold. ITU-R BT.419 recommends the discrimination pattern to assume.

Since mode I devices will obtain the list of channels from a mode II or fixed device we propose that the power level allowed for each channel is transmitted by the fixed/mode II device when it is in the coverage area of the base station.

Another observation is that the location of the demarcation zone is an important factor in calculating the allowed power on the border of the island. Setting the demarcation zone on the Malaysian land border would make more sense than in the middle of the water separation where there is no TV receiver victim.

Question 19

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

We agree with the conclusions set in the consultation.

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 think that mandating GPS geo-location is too restrictive given that new geo location systems are being used like GLONASS and new one are being deployed. We also think that the horizontal position accuracy with 95% confidence level could be used by the database to return the power allocated to a device. If the device moves away from the 95% confidence level circle, it would need to re-contact the database.

Question 21

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

We welcome the possibility to enter the coordinates of indoor fixed devices. We also think that it would be useful to allow outdoor fixed devices to be geo-located by a professional installer, not requiring the fixed device to have automatic geo-location capabilities. We also think that the regulation should allow entering the device location into the database without requiring an input mechanism into the device itself. The device location will be linked with the device ID when the device queries the database.

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.

The installer would be required to provide his/her contacts to the IDA.

Question 23

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

The use case for Neul network is typical of cellular network architecture. Base stations will be fixed outdoor installations and terminals will mainly fall in the mode I device category. Terminals will be cheap devices where the cost of adding a geo-location capability is prohibitive. We don't rule out that some of the terminals will be fixed within a region (for example a harbour, factory).

The use cases we are targeting are the use cases that fall in the Internet of Things (IoT) category.

Question 24

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

No comment

Question 25

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

We support industry managed databases.

Question 26, 27

No comment

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

For the list of qualified database we propose that the same schema as the one used by OFCOM to publish a list of WSDB. It is copied here as a reference

```xml
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:xml="http://www.w3.org/XML/1998/namespace" elementFormDefault="qualified"
attributeFormDefault="unqualified">
        <xs:element name="ws_databases">
                <xs:annotation>
                        <xs:documentation>XML list of currently approved Whitespace Database
providers</xs:documentation>
                </xs:annotation>
                <xs:complexType>
                        <xs:sequence>
                                <xs:element name="last_update" type="xs:dateTime">
                                        <xs:annotation>
                                                <xs:documentation>Date and Time this file was
last updated</xs:documentation>
                                        </xs:annotation>
                                </xs:element>
                                <xs:element name="refresh_rate" type="xs:int">
                                        <xs:annotation>
                                                <xs:documentation>Period in minutes after which
a device needs to read this file again</xs:documentation>
                                        </xs:annotation>
                                </xs:element>
                                <xs:element name="db" type="ws_db" maxOccurs="unbounded"/>
                        </xs:sequence>
                </xs:complexType>
        </xs:element>
        <xs:complexType name="ws_db">
                <xs:sequence>
                        <xs:element name="url" type="xs:string">
                                <xs:annotation>
                                        <xs:documentation>URL for whitespace database
provider</xs:documentation>
                                </xs:annotation>
                        </xs:element>
                        <xs:element name="db_provider_name" type="xs:string">
                                <xs:annotation>
                                        <xs:documentation>Name of the database
provider</xs:documentation>
                                </xs:annotation>
                        </xs:element>
                        <xs:element name="ws_db_id" type="xs:string">
                                <xs:annotation>
                                        <xs:documentation>Unique whitespace database provider
identifier</xs:documentation>
                                </xs:annotation>
                        </xs:element>
                </xs:sequence>
        </xs:complexType>
</xs:schema>
```

Question 29

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

For the time validity B we propose that the time validity is passed to the device as part of the response to the device channel allocation query. This approach is more flexible then having a fixed time validity which is set per database.

Question 30

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

A channel allocation validity between 6 and 24 hours is ok.

Question 31

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

We have no objection to that requirement since it will have to be implemented for devices sold in the UK regulatory regime.

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 suggest that the contact information is not required to be passed by the device itself but can be entered in the database by a third party when it changes. The unique ID should be sufficient for the database to establish the location and contact details of a fixed device.

Bibliography

[1] IDA, "IDA Spectrum Management Handbook," IDA, 2012. [Online]. Available: http://goo.gl/Vndojg.

[2] ITU, "ITU-R P.1411-6," ITU, February 2012. [Online]. Available: http://www.itu.int/rec/R-REC-P.1411-6-201202-I/en.

[3] ITU, "Recommendation BT.419," ITU, June 1990. [Online]. Available: http://www.itu.int/rec/R-REC-BT.419/en.