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Consultative Document

on the

**Authorisation Framework for the
Accommodation of White Space
Radiocommunications Devices**

(First round)

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1 Introduction

1.1 Rationale

There is a high demand for spectrum for fixed and mobile broadband, fuelled by the rapidly expanding demand for broadband connectivity and the need for ubiquitous mobility. As a result, there is a growing search for more spectrum to facilitate broadband development. Additionally, there is a growing interest in innovative ways to use available spectrum. One such way is the use of unassigned or underutilised spectrum (hereafter called, “white spaces”) and has led to the development of related emerging technologies and devices. In particular, White Space Devices (WSDs) operate on unassigned or underutilised spectrum, not commonly allocated for use by mainstream fixed and mobile broadband technologies. WSDs may be used to provide broadband connectivity as well as support other emerging technologies such as machine to machine (M2M) communication. WSDs are authorised to operate in a manner that does not cause harmful interference to incumbent radiocommunications services within the same frequency band. Consequently, WSDs present operators with an alternative to mainstream technologies used to provide broadband services and associated spectrum bands which may be heavily utilised.

The Telecommunications Authority of Trinidad and Tobago (the Authority) has received expressions of interest for the use of WSDs. Trinidad and Tobago can benefit from WSD technology to provide broadband and other innovative services to underserved markets.

1.2 Purpose

This document sets out the Authority’s Authorisation Framework for the Accommodation of White Space Devices. This framework intends to establish the technical and operational rules and guidelines for the deployment of WSDs in Trinidad and Tobago. The framework:

- i. Provides the Terms of Reference for the Authority’s regulatory oversight;
- ii. Protects existing incumbent services operating in bands that will be made available for WSD operations; and
- iii. Reassures potential users that a carefully planned and regulated environment has been created for the deployment of WSDs.

1.3 Background

Traditionally spectrum has been carefully managed by regulators through a national frequency allocation table, guided by Article 5 of the International Telecommunications Union Radiocommunications Sector (ITU-R) Radio Regulations (2016). The national frequency allocation table divides radio frequency spectrum into bands, which are allocated for radiocommunications services that are identified as either primary or secondary services. Thereafter, assignment plans are developed based on these allocations and outline how spectrum will be assigned to stations of a particular radiocommunications service.

The Authority currently employs two processes for assigning spectrum—a general application process where spectrum is assigned on a first come, first served basis; and a selective process using competitive mechanisms such as auctions or beauty contests. With both processes, assignments are made to stations of primary services and secondary services.

The traditional approach to spectrum management limits interference to users of spectrum. Frequency bands are allocated to specific radiocommunications services, and sharing mechanisms are implemented when multiple services are allocated to the same band. WSDs typically access spectrum in a manner that differs from the traditional approach to spectrum management. WSDs utilise an approach known as dynamic spectrum access (DSA). DSA is a body of spectrum access approaches that allow for spectrum sharing (Min Song 2002). Using DSA approaches, WSDs opportunistically access spectrum that may be available at a particular location or at a particular time, in bands currently allocated to other radiocommunications services.

The non-traditional spectrum access of WSD technology is the main driver for the development of this framework. This framework ensures that the operations of incumbent services are not disrupted by harmful interference from WSDs and reassures both incumbent operators and potential users of WSDs that a regulated environment has been created for the deployment of WSDs.

1.4 Framework Objectives

The Authorisation Framework for the Accommodation of White Space Devices:

- i. Identifies the frequency bands that can accommodate WSDs;
- ii. Establishes rules and guidelines for the operation of WSDs in Trinidad and Tobago;

- iii. Establishes rules for the approval of Database Administrators to operate in Trinidad and Tobago; and
- iv. Establishes a regulatory framework for licensing WSDs.

1.5 Relevant Legislation

The sections of the Telecommunications Act Chap. 47:31 which inform this framework are:

Section (18)(1)(i):

“Subject to the provisions of this Act, the Authority may exercise such functions and powers as are imposed on it by this Act and in particular –

Plan, supervise, regulate and manage the use of the radio frequency spectrum, including –

- (i) the licensing and registration of radio frequencies and call signs to be used by all stations operating in Trinidad and Tobago or on any ship, aircraft, or other vessel or satellite registered in Trinidad and Tobago;
- (ii) the allocation, assignment and reallocation or reassignment of frequency bands where necessary.”

Section 36(1):

“No person shall –

- (a) establish, operate or use a radio-communication service;
- (b) install, operate or use any radio transmitting equipment; or
- (c) establish, operate or use any radio-communication service on board any ship, aircraft, or other vessel in the territorial waters or territorial airspace of Trinidad and Tobago, other than a ship of war or a military aircraft or satellite registered in Trinidad and Tobago

without a licence granted by the Authority”

1.6 Review Cycle

This document will be revised periodically to meet changing needs, taking account of technological advancements. The Authority will review this framework as necessary, and in consultation with stakeholders to ensure that the framework is guided by relevant policy guidelines and objectives.

Questions or concerns regarding the maintenance of this framework may be directed to the Authority via e-mail to info@tatt.org.tt.

1.7 Consultation Process

The Authority will seek the views of the general public and other stakeholders regarding this document and in accordance with its [Procedures for Consultation in the Telecommunications Sector of Trinidad and Tobago](#). The document will be revised taking account of the comments and recommendations made during the consultation process.

The framework will be made available for a first round of public consultation for a four week period, as prescribed by the Authority's procedures. After reviewing public and stakeholder comments, the Authority will issue a revised framework for a second round of public consultation for another four-week period. Comments received from the second round of consultation shall be reviewed and the final framework shall be published thereafter.

1.8 Other Relevant Documents

Other relevant policies, plans and regulations to be read along with the Authorisation Framework for the Accommodation of White Space Radiocommunications Devices include:

- i. [Authorization Framework for the Telecommunications and Broadcasting Sectors of Trinidad and Tobago](#) (ver. 0.5, 2005)
- ii. [Recommendations for Spectrum Management Policy](#) (ver. 0.5, 2005)
- iii. [Trinidad and Tobago Frequency Allocation Table](#) (9 kHz – 1000 GHz) (ver. 2, 2010)
- iv. [Class Licensing Regime](#) (ver. 1 2008)
- v. [Equipment Standardisation and Certification Framework for the Telecommunications and Broadcasting Sectors of Trinidad and Tobago](#) (ver. 1, 2008).

1.9 Definitions

Equivalent Isotropic Radiated Power (EIRP) - The product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna (absolute or isotropic gain) (ITU-R 2016).

Fixed White Space Device - A WSD that transmits and/or receives radiocommunications signals at a specified fixed location (CFR 2016).

Geo-location Database - A database system approved by the Authority that provides white space devices with operational parameters, such as available channels and permitted power (ETSI 2014).

Harmful Interference - Interference which endangers the functioning of telecommunications so as to impede, degrade, obstruct or interrupt a telecommunications service (TATT 2004).

Mobile White Space Device - A WSD that transmits and/or receives radiocommunications signal at an unspecified location that changes during or between operations (CFR 2016).

Primary Service - A radiocommunications service for which stations can claim protection from harmful interference from stations of a secondary service (ITU-R 2016).

Secondary Service - A radiocommunications service for which stations shall cause harmful interference to stations of primary services and cannot claim protection from interference from stations of primary services (ITU-R 2016).

Spectrum Sensing - The process by which a WSD monitors a channel to detect whether the channel is occupied by a radio signal of an incumbent radiocommunications service (CFR 2016).

Station - One or more transmitters or receivers or a combination of transmitters and receivers, including the accessory equipment, necessary at one location for carrying on a radiocommunication service, or the radio astronomy service (ITU-R 2016).

Television White Space (TVWS) - The portion of the television broadcasting band, 54-72 MHz, 76-88 MHz and 470-698 MHz in ITU-R Region 2, that is made available for the operation of WSDs (DSA 2016).

White Space - unassigned or unutilised spectrum at a particular location or at a particular time (DSA 2016).

White Space Devices - Cognitive radio devices that operate on white spaces (ETSI 2014).

2 Overview of White Space Devices

In formulating this framework, existing WSD regulations and operations from several jurisdictions were investigated, as follows:

- i. Canada (IC 2016)
- ii. The United Kingdom (Ofcom 2015)
- iii. The United States of America (CFR 2016)
- iv. New Zealand (RSM 2014)
- v. Singapore (IMDA 2016).

The Authority also considered similar works undertaken within the Caribbean, such as the Caribbean Telecommunications Union report entitled, “TV White Space Management and Regulation Report” (CTU 2015).

2.1 Operation of White Space Devices

This section provides a brief overview of the operation of WSDs that were considered in developing this framework.

2.1.1 Category of Devices

Two categories of WSDs have been authorised in other jurisdictions—fixed WSDs and mobile WSDs. In these jurisdictions, different WSD categories required different rules to ensure interference free operations.

2.1.2 White Space Access Mechanisms

White space access mechanisms may only be required where WSDs utilise white spaces within bands with a significant number of assignments. White space access mechanisms determine:

- i. Frequency channels that are available for use by a WSD at its geographic location; and
- ii. Other operational parameters, such as validity period and maximum permitted transmit power, at which the WSD can operate in a manner that will not cause harmful interference to incumbent services.

A white space access mechanism may not be required where white spaces are in a band that is largely unassigned, and where contiguous spectrum is made available for WSD operations. In such a situation, WSDs may operate using traditional approaches to spectrum management, such as the assignment of individual channels either for exclusive use or for location based operations, where frequency reuse is applied. New Zealand uses this approach in its interim arrangements for the licensing of WSDs (RSM 2014).

There are two (2) white space access mechanisms that allow access to white space:

- i. **Spectrum sensing** is the mechanism in which the WSDs determine available channels by scanning a band to check for signals from incumbent services. Spectrum sensing WSDs use algorithms to detect signals based on specific characteristics of the expected signals in the band. Therefore the sensing capabilities of WSDs are based on algorithms designed to detect signals given the standards implemented in the jurisdiction.

Spectrum sensing WSDs also determine operating parameters in order to avoid causing harmful interference to the incumbent services. The operating parameters of the spectrum sensing WSDs are built-in at the time of manufacture and are certified to meet minimum sensing detection thresholds and operation criteria, based on the standards of the signals used in the jurisdiction (DSA 2016; Kocks et al 2012).

The spectrum sensing mechanism is still being developed, and has not been used in any pilot to date. However, there are countries that have made provisions for the operation of devices that rely on this spectrum access mechanism in their regulations (FCC 2016; DSA 2016).

- ii. **Geo-location Database** is the mechanism in which WSDs must query an authorised database to obtain information on available channels and other operating parameters relevant to the location of the WSDs. This access mechanism has been implemented in the TV bands in the US, the UK and Singapore (DSA 2016).

Both fixed and mobile WSDs can operate with the Geo-location Database access mechanism and WSD deployments can be either standalone or networked. Standalone WSDs, whether fixed or mobile, are required to have the capability to query Geo-location Databases. For networked deployments, at least one mobile or fixed WSD is required to communicate with Geo-location

Databases. This WSD is called the master WSD. It acts as a base station or access point to control other fixed or mobile WSDs, referred to as slave WSDs.

WSDs communicate with a Geo-location Database using the internet over a medium other than the spectrum they are attempting to access, for example a cellular mobile data connection (Webb 2013).

2.1.3 Geo-location Databases and Exchanges with White Space Devices

Once a WSD establishes communication with a Geo-location Database, it must report its device parameters to the database. The database then determines the operational parameters for the WSD using coexistence rules. The operational parameters, communicated to the WSD, are usually valid for a specific period.

Device parameters that are reported to the database vary across jurisdictions. The following are the three (3) device parameters that, at a minimum, are reported:

- i. Location;
- ii. Location uncertainty; and
- iii. Antenna height (Fixed WSDs Only).

The three (3) operational parameters that, at a minimum, are reported to the querying WSD are:

- i. Available channels;
- ii. Maximum permitted power; and
- iii. Channel validity period.

A WSD may receive one or more set of operational parameters from the Geo-location Database. If the WSD has multiple options from which to choose, it selects a channel and associated maximum power permitted and operates. Depending on the jurisdiction, WSDs are required to report channel usage parameters to the Geo-location Database. Channel usage parameters to be reported may include:

- i. Channels to be used by the WSD; and
- ii. Maximum expected transmit power

In the various jurisdictions WSDs are required to poll the Geo-location Database to verify if their operational parameters are still valid. This maximum time between polls varies significantly between the jurisdictions. For fixed WSDs, in the US the polling period is at least once every 24 hours. In Singapore it is at a maximum every six hours and in the UK, Ofcom initially intended to set the polling intervals to 15 minutes.

2.1.4 Administration of Geo-location Database

The Database Administrator can either be the regulator, another public sector entity or one or more private sector entities. All existing regulations, in jurisdictions that have implemented the Geo-location Database access mechanism, designate database administration to one or multiple private sector entities.

The role of the Database Administrator is to oversee and manage operations of the database with respect to:

- i. Determining and providing upon request accurate operational parameters in a non-discriminatory manner, in accordance with established coexistence rules;
- ii. Registering WSDs;
- iii. Establishing processes for the exchange of information with the regulator;
- iv. Ensuring all communications with WSDs are secure; and
- v. Ensuring all information stored in the database is secure.

There are two approaches to authorising Database Administrators in jurisdictions with regulations. With the first approach, the administrators are simply designated by the regulator, without a licence: the authorisation instrument may take the form of an agreement. This approach also does not require administrators to pay a fee to operate the Geo-location Database. The alternative is licenced Database Administrators who pay a licence fee to administer a Geo-location Database (DSA 2016).

In some of the jurisdictions researched, Database Administrators may charge fees for providing operational parameters as well as for value added services, such as priority access and access to clearer channels.

2.2 Frequency Bands and Coexistence Planning

This section provides an overview of the frequency bands in which WSDs are authorised to operate in the jurisdictions that were investigated.

2.2.1 Television White Space Band

The Television White Space (TVWS) band refers to the portions in the band allocated to television broadcasting services (TV) that are available for WSD operations. The TVWS band is preferred because:

- i. Its propagation characteristics can support WSD applications;
- ii. The location of TV broadcast transmitters are fixed, with usually fixed operational parameters, making coverage relatively predictable; and
- iii. The TV broadcast band is underutilised in many countries.

This band has been used to pilot WSDs applications throughout the world, mainly using the Geo-location Database access mechanism.

The TV band in ITU-R Region 2 is split into two ranges—Very High Frequency (VHF) and Ultra High Frequency (UHF). The VHF ranges extend from 54 to 88 MHz and from 174 to 216 MHz. The UHF range extends from 470 to 698 MHz. The channel plan for the TV band in ITU-R Region 2 (See Table 1), which is applicable to Trinidad and Tobago, is based on a 6 MHz channel bandwidth.

Table 1 - ITU-R Region 2 Television Broadcasting Services Channel Plan

Channel	Frequency Range (MHz)
2	54 - 60
4	66 - 72
5 - 6	76 - 88
7 - 13	174 - 216
14 - 20	470 - 512
21 - 51	512 - 698

When WSD operations are accommodated in the TVWS band, incumbent services are protected by coexistence rules developed by the regulator. Typical services that require protection in this band are:

- i. Analogue and digital terrestrial TV broadcasting services
- ii. Fixed broadcast auxiliary service links services
- iii. Wireless microphones
- iv. Land mobile services
- v. Radio astronomy services.

Coexistence rules are used to determine the operational parameters of WSDs and are developed based on the incumbent services using the band. Therefore rules and approaches vary between jurisdictions.

2.2.2 The 3.6 GHz Band

The 3.6 GHz band, 3550-3700 MHz, is the other band where white spaces have been made available to WSDs. The Federal Communications Commission (FCC) has identified this band for the operation of Citizens Broadband Radio Service (CBRS) in Code of Federal Regulations (CFR) Title 47 Part 96, with a three-tiered licensing approach (FCC 2016). The three tiers are:

- i. Incumbent Access – Military radar, FSS and other grandfather wireless broadband licensees to continue operations in the 3650-3700 MHz band.
- ii. Priority Access – Operators will be assigned a non-renewable licence for use of 10 MHz within the 3550-3650 MHz portion of the band.
- iii. General Authorised Access – Flexible access to the band permitted for any portion of the band not assigned to higher-tier users.

General authorised access citizen broadband radio devices (CBRDs) use an access mechanism similar to Geo-location Databases called the Spectrum Access System (SAS). The SAS provides CBRDs with operational parameters based on channel usage by higher-tiered licensees. White space operations in this band have only been adopted in the US (FCC 2016).

2.3 Licensing of White Space Devices

There are three approaches to the licensing of WSDs— licence exempt, licence shared access and traditional individual licence.

2.3.1 Licence Exempt

The licence exempt approach is a traditional approach to licensing devices considered to be mass market and low interference causing. These devices are allowed to operate without an individual licence, once they conform to established general operating parameters. In Trinidad and Tobago this approach to authorisation is referred to as a class licence.

The licence exempt approach has been adopted by the US, the UK and Singapore (FCC 2016).

2.3.2 Licence Shared Access

Licence shared access (LSA) is a spectrum authorising approach that allows spectrum sharing between incumbent service providers and new service providers within a frequency band. Spectrum that is already assigned, or is expected to be assigned to incumbent users, is made available for licensing to new service providers. LSA relies on spectrum sharing rules, which guarantee access to spectrum and protection from harmful interference for both incumbent and new services. With this approach, secondary use and opportunistic access no longer apply to WSDs (Faussurier 2014).

2.3.3 Individual Licence

Individual licence is the traditional approach for authorising spectrum use exclusively, either within a specified area or nationwide. This approach also excludes secondary use and opportunistic access to licensing operation of WSDs. It is most appropriate in jurisdictions where spectrum will be available exclusively for WSD operations: Minimal coexistence planning is needed to protect incumbent operators in the band. New Zealand adopted this approach in its interim arrangements for the licensing of WSDs (RSM 2014).

3 Framework for Authorisation of White Space Radiocommunications Devices

3.1 Frequency Bands

WSD operations will be allowed in the bands allocated for the provision of television broadcasting services (TV) in Trinidad and Tobago. WSD operations will be limited to selected channels in the Ultra High Frequency (UHF) TV band, 470 – 698 MHz, because of the high utilisation of the channels in the Very High Frequency (VHF) TV band. Channels will be made available to WSDs in accordance with the existing TV assignment channel plan, which is based on a 6 MHz channel bandwidth.

Rules:

1. *WSD operations shall only be allowed on selected channels, prescribed by the Authority, in the UHF television broadcasting band—470-698 MHz.*
2. *WSDs shall operate on 6 MHz channel bandwidth in accordance with the Authority's television broadcasting service channel assignment plan.*

3.2 White Space Access Mechanism

The Geo-location Database approach is implemented in all deployments, including trials and pilots, to date and is considered to be the more viable option for managing access to white spaces. Therefore this is the approach to be adopted in Trinidad and Tobago.

The Authority recognises the potential of spectrum sensing as an access mechanism and will monitor its deployment in other jurisdictions. The Authority may, in the future, include spectrum sensing as an alternative access mechanism.

Rule:

3. *The Geo-location Database approach shall be adopted as the white space access mechanism in Trinidad and Tobago.*

3.3 White Space Devices

3.3.1 Categories of Devices

Both fixed and mobile devices can operate using a Geo-location Database as the access mechanism for white space spectrum. However, considering the current device ecosystem, the expected applications of WSDs in Trinidad and Tobago and the need to protect incumbent service providers, only fixed WSDs will be allowed at this time.

WSDs must have the ability to query Geo-location Databases over the internet, using a medium other than the white space spectrum to which it is attempting to gain access.

The Authority recognises that mobile WSDs can operate with this access mechanism and that there is potential for applications using mobile devices. The Authority may consider allowing mobile WSDs in Trinidad and Tobago in the future.

Rules:

4. *Only fixed WSDs shall be allowed to operate in Trinidad and Tobago.*
5. *Fixed WSDs shall have the following capabilities:*
 - i. *The ability to query Geo-Location Databases; and*
 - ii. *The ability to connect to the internet using a medium, other than the white space it is trying to access, to communicate with Geo-location Databases.*

3.3.2 Geo-location Database Access Requirements

WSDs will transmit using white spaces only after it has received operational parameters from a Geo-location Database. WSDs are only permitted to operate in accordance with operational parameters provided by a Geo-location Database. WSDs query a Geo-location Database for operational parameters, by sending their device parameters. Device parameters will include at a minimum, a WSD's:

- i. Location and location accuracy;
- ii. Antenna height above ground level; and
- iii. Serial number.

The Geo-location Database will respond to the WSD with operational parameters, which will include, at a minimum:

- i. The available channels;
- ii. The maximum permitted power; and
- iii. The channel validity period.

A WSD is required to notify its Geo-location Database of its channel usage parameters, which will include at a minimum:

- i. Channels to be used by the WSD; and
- ii. Maximum expected transmit power.

WSDs are required to query a Geo-location Database for operational parameters when:

- i. Activating from a power off state; or
- ii. The channel validity period expires.

WSDs are required to poll a Geo-location Database at least once every 24 hours to verify that their operational parameters continue to be valid. WSD must adjust their operating power to a permissible level if the Geo-location Database indicates that its operating channel is no longer available at the current operating level.

WSD must also cease transmission if the Geo-location Database indicates its operating channel is no longer available or if the Geo-location Database becomes unavailable.

If a WSD does not have a direct connection to the internet, it can only operate as a slave WSD. It will query a Geo-location Database for operational parameters via a master WSD, by transmitting to the master WSD on either the channel the master WSD is transmitting on, or on a channel the master WSD indicates is available for use. On receiving operational parameters from the Geo-location Database, the slave WSD will only use the channels that the database indicates are available for it to use.

Rules:

6. *WSDs shall only transmit using white spaces after it has received operational parameters from a Geo-location Database.*
7. *WSDs shall only operate in accordance with operational parameters received from a Geo-location Database.*
8. *WSDs shall query a Geo-Location Database with the following device parameters:*
 - i. *Location and location accuracy;*
 - ii. *Antenna height above ground level; and*
 - iii. *Serial number.*
9. *WSDs shall query a Geo-location Database for the following operational parameters:*
 - i. *Available channels;*
 - ii. *Maximum permitted power; and*
 - iii. *Channel validity period*
10. *A WSDs shall notify its Geo-location Database of its channel usage parameters, which will include at a minimum;*
 - i. *Channels to be used by the WSD; and*
 - ii. *Maximum expected transmit power*
11. *WSDs shall query the database for operational parameters when:*
 - i. *Activating from a power off state; or*
 - ii. *When the channel validity period expires.*
12. *WSDs shall poll a Geo-location Database once every 24 hours to verify their operational parameters continue to be valid and make adjustments as indicated by the Geo-location Database.*
13. *WSDs shall cease operation in any of the following situations:*
 - i. *The database indicates the channel is no longer available; or*
 - ii. *When the database becomes unavailable*
14. *When a WSD does not have a direct connection to the internet, it shall operate as a slave WSD and a master WSD will query the Geo-location Database on its behalf.*

3.3.3 Security Requirements

WSDs shall utilise mechanisms to ensure that the WSDs communicate only with authorised Geo-location Databases, when querying available channels and identifying other operational parameters. Also, WSDs are to employ mechanisms which secure communication with authorised Geo-location Databases and

with other WSDs, preventing unauthorised interception of data. Mechanisms shall also be implemented to prevent operational parameters from being manually modified.

Rules:

15. WSDs shall utilise adequate mechanisms to ensure:

- i. Communication for the purpose of obtaining available channels and other operational parameters takes place with only approved Geo-location Databases;*
- ii. Communications with Geo-location Databases or other WSDs are secure; and*
- iii. Prevention of any unauthorised modification of operational parameters provided by a Geo-location Database.*

3.4 Coexistence of Services

In Trinidad and Tobago, digital and analogue ‘Free-to-Air’ TV broadcasting services (TV broadcasting services) operate within the band 470-698 MHz. These are the services for which coexistence rules are needed. WSDs will be required to operate in a manner that does not cause harmful interference to TV broadcasting services, while WSDs shall not claim protection from harmful interference.

Given the small geographic area of Trinidad and Tobago, channels currently assigned to digital and analogue TV broadcasters in the TV broadcasting band will not be made available for the operation of WSDs. WSDs will be allowed to operate on channels adjacent to those assigned to digital and analogue TV broadcasters, for which operational parameters are listed in Tables 2 and Table 3 respectively.

When a WSD operates on a channel that is adjacent to both analogue and digital services it must comply with the operational limits for coexistence with digital service.

Table 2 - Parameter limits for WSD operations on channels adjacent to digital television broadcasting services

Operational Parameters	1st Adjacent	2nd Adjacent	3rd Adjacent and greater
Maximum EIRP	16 dBm	20 dBm	36 dBm
Maximum RF output	10 dBm	14 dBm	30 dBm
Maximum Antenna Gain	6 dBi (For every dBi gain above the maximum value, the maximum conducted output power shall be reduced by 1 dB)		
Out of band emission limit (100 kHz)	-62.8 dBm	-58.8 dBm	-42.8 dBm

Table 3 - Parameter limits for WSD operations on channels adjacent to analogue television broadcasting services

Operational Parameters	1st Adjacent	2nd Adjacent and greater
Maximum EIRP	20 dBm	36 dBm
Maximum RF output	14 dBm	30 dBm
Maximum Antenna Gain	6 dBi (For every dBi gain above the maximum value, the maximum conducted output power shall be reduced by 1 dB)	
Out of band emission limit (100 kHz)	-58.8 dBm	-42.8 dBm

The values in Table 2 and Table 3 are maximum values. Where the maximum permissible operating power is not necessary to achieve successful communication, WSDs shall implement transmit power control to limit operating power to the minimum necessary to achieve successful communication.

Rules:

16. *WSDs shall not be allowed to operate on channels assigned to authorised digital and analogue 'Free-to-Air' TV broadcasters.*
17. *WSDs shall not operate in a manner that causes harmful interference to authorised digital and analogue 'Free-to-Air' TV broadcasting services, and shall not claim protection from harmful interference from other authorised users.*
18. *WSD operations shall be allowed on channels adjacent to channels assigned to digital TV broadcasters, with the following technical limits:*
 - i. *For 1st adjacent channel:*
 - a. *Maximum EIRP 16 dBm*
 - b. *Maximum Antenna Gain: 6 dBi*
 - c. *Out of band Emission Limit: -62.8 dBm*
 - ii. *For 2nd adjacent channel:*
 - a. *Maximum EIRP 20 dBm*
 - b. *Maximum Antenna Gain: 6 dBi*
 - c. *Out of band Emission Limit: -58.8 dBm*
 - iii. *For 3rd adjacent channel and greater:*
 - a. *Maximum EIRP: 36 dBm*
 - b. *Maximum Antenna Gain: 6 dBi*
 - c. *Out of band Emission Limit: -42.8 dBm*
19. *WSD operations shall be allowed on channels adjacent to channels assigned to analogue TV broadcaster, with the following technical limits:*
 - i. *For 1st adjacent channel:*
 - a. *Maximum EIRP 20 dBm*
 - b. *Maximum Antenna Gain: 6 dBi*
 - c. *Out of band Emission Limit: -58.8 dBm*

- ii. *For 2nd adjacent channel and greater:*
 - a. *Maximum EIRP: 36 dBm*
 - b. *Maximum Antenna Gain: 6 dBi*
 - c. *Out of band Emission Limit: -42.8 dBm*

20. WSDs shall implement transmit power control to limit operating power to the minimum level necessary to achieve successful communication

3.5 Geo-location Database

3.5.1 Functions of Geo-location Database

Geo-Location Databases will make available to registered WSDs, operational parameters in accordance with the technical rules set out in this framework and as prescribed by the Authority.

In making operational parameters available to a WSD, the Geo-location Database shall ensure that all communications and interactions between the WSD and itself include adequate security measures such that unauthorised parties cannot access or alter the Geo-location Database or the operational parameters sent to WSDs or otherwise affect the database system or WSDs in performing their intending functions or in providing adequate interference protection to authorised services in the TV broadcasting band.

The Authority will make available to Database Administrators a list of registered WSDs and list the channels available for WSD operations and the maximum permissible power for each available channel, in the Schedule B of the Scheduled of Class Licensed Devices.

Rules:

- 21. Geo-location Databases shall, upon request, supply available channels and other operational parameters to WSDs.*
- 22. Geo-location Databases shall only supply operational parameters to WSDs that are registered with the Authority.*
- 23. Geo-location Databases shall implement adequate security mechanisms to ensure all communications and interactions between itself and WSDs are accurate and secure and that unauthorised parties cannot access or alter the Geo-location Database or the operational parameters sent to WSDs.*

3.5.2 Approval of Geo-location Database

The jurisdictions considered in formulating this framework have adopted the approach of private sector entities to administer Geo-location Databases. Notwithstanding this position, the Authority recognises that a public sector entity may also have an interest in the administration of a Geo-location Database. Therefore, the Authority can authorise one or more public and/or private sector entities to develop and manage Geo-location Databases in Trinidad and Tobago.

Geo-location Databases may be approved as part of the equipment certification process for WSDs. When the user of a WSD applies for the device to be certified, they are required to indicate the Geo-location Database they intend to use to provide operational parameters. If the Geo-location database is not already approved by the Authority, the Database Administrator will be required to apply to the Authority to have its Geo-location Database approved. At a minimum the Database Administrator must be able to demonstrate that the Geo-location Database is capable of providing the services identified in Section 3.5.1.

Where the equipment certification application is approved, the Database Administrator will be required to enter into an agreement with the Authority. The terms and conditions of the agreement shall include, but not be limited, to the following:

- i. The responsibilities of the Database Administrator, in particular its responsibility to provide the database services to all WSD users in a non-discriminatory manner;
- ii. The obligation to provide unencumbered access to WSDs and to inform the Authority where such access will not be available.
- iii. The exchange of information between the Database Administrator and the Authority;
- iv. The Authority's discretion to review draft agreements between Database Administrator and users of WSDs;
- v. The ability of the Authority to prescribe changes to the operational parameters
- vi. The Authority's discretion to review proposed fees to be charged (if any) by the Database Administrator for the provision of Geo-location Database services; and
- vii. The grounds for termination of the agreement and removal of a Geo-location Database from the approved list of Geo-location Databases.

Approved Geo-location Databases will be listed in Schedule B of the Schedule of Devices eligible for use under a Class Licence.

Rules:

- 24. Geo-location Databases shall be administered by one or more private or public sector entities.*
- 25. A Database Administrator shall apply to the Authority to have its Geo-locations Database approved, as part of the equipment certification process for a WSD intending to use its Geo-location Database.*
- 26. Database Administrators shall enter into an agreement with the Authority, on approval of their Geo-location Database.*
- 27. Approved Geo-Location Databases shall be listed in Schedule B of the Schedule of Devices eligible for use under a Class Licence.*

3.6 Licensing of White Space Devices

Considering the administrative and financial implications of the various licensing options for the operation of WSDs, the Authority believes that a light-handed regulatory approach is best suited for the authorisation of WSDs. Therefore, WSDs shall be licensed in accordance with the Class Licensing Regime, as consistent with the jurisdictions researched herein. All WSDs will be required to operate in accordance with the general terms and conditions as prescribed by the Class Licensing Regime. The maximum technical and operating limits prescribed in the class licence for the use of this device shall conform to those limits identified within this framework.

In order for a WSD to be authorised for use in Trinidad and Tobago, it shall be first certified to be in conformance with the technical and operating limits as are prescribed by the class licence. The certification process shall be in accordance with the [Equipment Standardisation and Certification Framework for the Telecommunications and Broadcasting Sectors of Trinidad and Tobago](#).

Furthermore all WSDs will be required to register with the Authority, in accordance with Section 3.4 of the Class Licensing Regime. Registration is required when the WSD is first installed and when the location of the WSD changes.

Rules:

28. All White Space radiocommunications devices shall be authorised in accordance with the Class Licensing Regime.

29. All WSDs shall be certified to conform to the technical and operating limits as are prescribed by the class licence.

30. All WSDs shall be registered with the Authority, in accordance with Section 3.4 of the Class Licensing Regime.

31. WSDs shall be registered:

- i. When first installed; and*
- ii. When their locations change.*

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