



**TRIAL OF WHITE SPACE TECHNOLOGY  
ACCESSING VHF AND UHF BANDS IN SINGAPORE**

Information Pack

## **CONTENTS**

EXECUTIVE SUMMARY (3)

1. PROJECT OVERVIEW (4)

2. AVAILABLE CHANNELS AND PERMITTED POWER LEVELS (5)

3. LOCATION OF TRIALS (6)

4. TYPES OF TRIALS (7)

5. TRIAL DURATION AND PERIOD (7)

6. EQUIPMENT APPROVAL (7)

7. COMPLIANCE (7)

8. APPLICATION PROCEDURE (8)

9. ENQUIRIES (8)

## EXECUTIVE SUMMARY

The Info-communications Development Authority (“IDA”) welcomes the conducting of white space technology trials in Singapore by any interested party to explore the various spectrum environments and regimes that white space technology could operate in.

To ensure continued protection of licensed services in Singapore from possible interferences that may occur during the trial period, this document provides the framework for conducting trials of white space technology in Singapore by specifying various trial conditions and limits.

More details on the methodology for the trials are available in the **Test Plan**<sup>1</sup>.

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<sup>1</sup>[http://www.ida.gov.sg/doc/Policies\\_and\\_Regulation/Policies\\_and\\_Regulation\\_Level2/WST/WhiteSpaceTP.pdf](http://www.ida.gov.sg/doc/Policies_and_Regulation/Policies_and_Regulation_Level2/WST/WhiteSpaceTP.pdf)

## 1 FRAMEWORK OVERVIEW

1.1 In Singapore, the spectrum of radio frequencies currently allocated for use, on a primary basis, for the provision of terrestrial broadcast services in the Very High Frequency (“VHF”), between 174 to 230 MHz, and the Ultra High Frequency (“UHF”) bands, between 494 to 790 MHz, are not all in use at any given time. The spectrum not in use for the provision of broadcast services in Singapore consists of both interleaved and contiguous spectrum blocks. The unused spectrum is known as ‘white spaces’. These white spaces are situated below 1 GHz, and the propagation characteristics at these frequencies allow radio signals to travel long distances and penetrate buildings easily.

1.2 IDA welcomes the conducting of trials for white space technology in Singapore, by any interested party, to explore the various spectrum environments and regimes that white space technology could operate in. To facilitate the investigation and testing of white space devices and systems in Singapore, and to ensure continued protection of licensed services in Singapore from possible interferences that may occur during the trial period, IDA has developed a set of terms and conditions and the application procedures for interested parties who wish to conduct white space trials. These sets of terms, conditions and procedures are in addition to the general terms and conditions for telecommunication trials, which can be found in the ***‘Terms and Conditions for Telecommunication Technical Trials’<sup>2</sup>***.

1.3 In this trial phase, IDA will:

- (a) examine and consider the spectrum requirements and the need for harmonised spectrum allocation or dedicated channels/frequency bands for the use of white space technology;
- (b) evaluate and identify the specific spectrum to be allocated for white space technology use;
- (c) examine the regulatory aspects and consider the measures that will be required to put in place for the use of white space devices;
- (d) examine any concerns regarding the use of white space devices in the VHF and UHF bands and the likelihood of radio interference to existing licensed services; and
- (e) examine how best to make use of the block of white space spectrum identified for the benefit of consumers and businesses in Singapore.

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<sup>2</sup>[http://www.ida.gov.sg/doc/Policies%20andnd%20Regulation/Policies\\_and\\_Regulation\\_Level2/Guidelines%20on%20Licensing%20Scheme/TechTrialLic.pdf](http://www.ida.gov.sg/doc/Policies%20andnd%20Regulation/Policies_and_Regulation_Level2/Guidelines%20on%20Licensing%20Scheme/TechTrialLic.pdf)

## 2 AVAILABLE CHANNELS AND PERMITTED POWER LEVELS

2.1 The white space devices used for the trials must be capable of detecting broadcast services. However, there are also secondary users, namely wireless microphones services in the VHF and UHF bands.

2.2 Therefore, **for the purpose of this trial**, white space devices must be able to detect both analogue and digital broadcast services in the following range:

- VHF Band - channels 2 to 12; and
- UHF Band - channels 21 to 62.

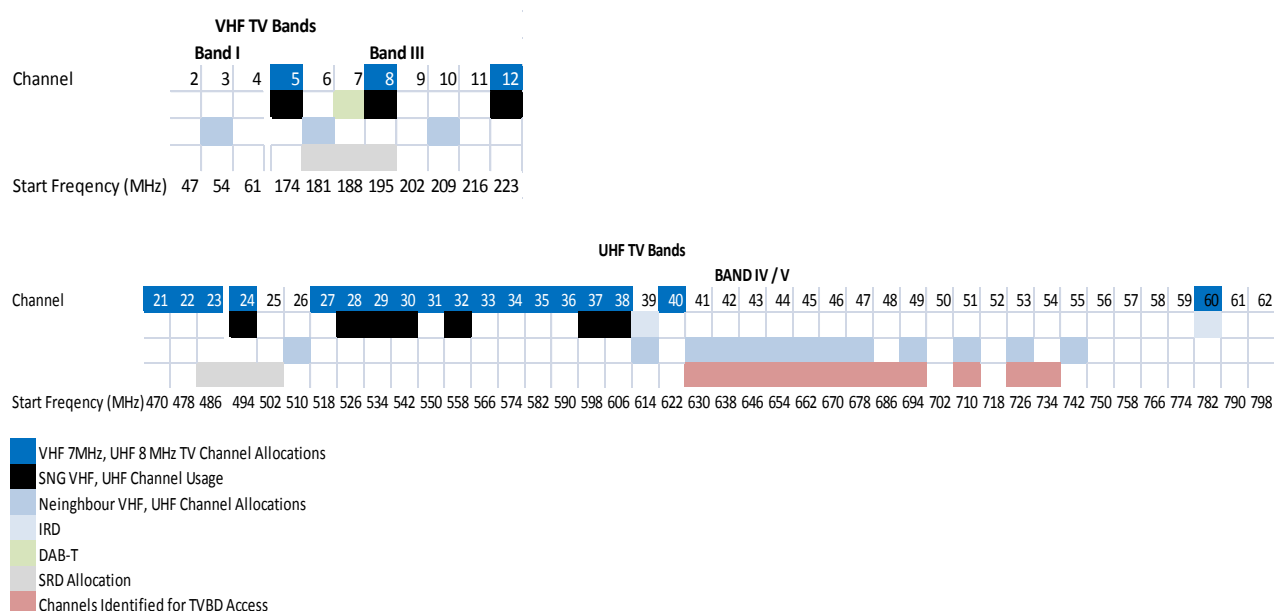
TV Broadcast Devices (“TVBDs”) should also have the ability to detect both analogue and digital wireless microphones services in the above range as an optional sensing capability.

2.3 **For the purposes of the trial**, white space devices must only transmit in:

- UHF Band – channels 41 - 49, 51 and 53 - 54.

2.4 Figure 1 provides an overview of the broadcast spectrum environment in Singapore.

**Figure 1: Broadcast Spectrum in Singapore**



2.5 For the purposes of the trial, trial participants providing white space devices to be tested will be required to state the operational performance of their devices before the trial commences. These parameters should be confirmed during the controlled laboratory testing phase of the trial, and where a device is shown to cause interference in a controlled environment, it will not be allowed to participate in the field trials. The maximum transmission power of a white space device should also be restricted to those proposed within the technical parameters defined below.

Parameter for Detection	Value
Sensitivity	-120dBm
Transmit Power	4dBm adjacent channel 17dBm (,N+2,...)
Transmit-power per channel	100Mw
Bandwidth	$N^3 \times 8\text{MHz}$
Out-of-band-performance	< -48dBm
Time between sensing	< 1 second
Maximum Continuous transmission	400 milliseconds
Minimum pause after transmission	100 milliseconds

Parameter for geo-location	Value
Location accuracy	< 50m
Transmit Power	As specified in database (up to 100mW)
Bandwidth	$N^4 \times 8\text{MHz}$
Out-of-band-performance	< -48dBm
TVBD Refresh rate	1 second
Database refresh rate	24 hours
Maximum Continuous transmission	400 milliseconds
Minimum pause after transmission	100 milliseconds

### 3 LOCATION OF TRIALS

3.1 All white space technology trials are to be conducted strictly within the premises of the CRAVE (“Cognitive Radio Venue”) zones, which are given in the table below. This is to ensure that the trials are conducted in a controlled environment for monitoring of any possible radio interference.

Test Site	Coordinates	Site Description
Kranji Carpark	1°26'16.14"N, 103°44'07.08"E	Singapore / Malaysian Coast
Marina South Pier	1°16'15.4"N, 103°51'47.6"E	Singapore / Indonesia Coast
Opposite Beauty World	1°20'38.79"N, 103°46'28.8"E	Mitigation near broadcast tower
Cairnhill Carpark	1°18'13.08"N, 103°50'12.0"E	Dense urban environment
Science Park II	1°17'14.39"N, 103°46'53.0"E	In-building environment

<sup>3</sup> N being the maximum number of contiguous channels that is identify by the white space devices.

<sup>4</sup> N being the maximum number of contiguous channels that is identify by the white space devices.

## 4 TYPES OF TRIALS

4.1 As part of this phase for conducting white space technology trials, IDA would like to invite interested parties to conduct trials together with IDA. For trials jointly conducted with IDA, IDA will provide the laboratory facilities for the testing and measurement of participants' TVBDs and no radio spectrum frequency fees will be payable during the trial period. However, the test results shall be shared with IDA and IDA shall have the full right to use the test results in whichever manner it deems fit. The "Terms and Conditions for Telecommunication Technical Trials" will continue to apply.

4.2 Notwithstanding the above, parties who intend to conduct white space technology trials on their own without the involvement of IDA are also welcome to do so. For such cases, radio frequency fees for conducting white space technology trials will apply (please see **Chapter 8 – Temporary Use of Radio Spectrum** of the '**Spectrum Management Handbook**')<sup>5</sup>, and the "Terms and Conditions for Telecommunication Technical Trials" will also apply.

## 5 TRIAL DURATION AND PERIOD

5.1 The white space technology trial will be conducted over a period of 6 months. The exact period of the trial will be announced by IDA on **30 July 2010**.

## 6 EQUIPMENT APPROVAL

6.1 No type approval of equipment is required for the purpose of conducting the trials. However, the approval for use of equipment for trials does not mean approval from IDA for the use and sale of the white space equipment in the future after the trial period.

## 7 COMPLIANCE

7.1 All trial participants must comply with all the terms and conditions set out in this document for the entire duration of their trials. IDA reserves the right to terminate the trials should there be any issue of non-compliance.

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<sup>5</sup>[http://www.ida.gov.sg/doc/Policies%20and%20Regulation/Policies\\_and\\_Regulation\\_Level2/20060421164253/SpectrumMgmtHB140207.pdf](http://www.ida.gov.sg/doc/Policies%20and%20Regulation/Policies_and_Regulation_Level2/20060421164253/SpectrumMgmtHB140207.pdf)

## **8 APPLICATION PROCEDURE**

8.1 Interested parties who wish to conduct white space trials jointly with IDA should submit the online application form for technical trial at <https://tls.ida.gov.sg/tls/login.do> before the closing date, **6 July 2010**.

8.2 Interested parties who wish to conduct their own white space trials, without IDA's participation, should submit the above mentioned online application form to IDA at least two weeks before the intended date of the commencement of their trials.

## **9 ENQUIRY**

9.1 For enquiries on conducting white space technology trials, please contact the following officers:

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