

低功率射頻電機(LP0002) DFS測試報告

案 號：	1801T089A
報告編號：	BTL-NCC-5-1801T089A
受理日期	106 年 12 月 27 日
完成日期	108 年 03 月 11 日
發行日期	108 年 03 月 25 日

產 品 名 稱：	UC Phone
型 號：	CP-8865
商 標 / 廠 牌：	CISCO
申 請 廠 商：	(名稱) 台灣思科系統股份有限公司
	(地址) 臺北市信義區信義路4段460號12樓

東研信超股份有限公司

台北市內湖區舊宗路二段171巷18號

電話：(02) 2657-3299 傳真：(02) 2657-3331

TAF實驗室認可編號：0659



報告發行歷史紀錄

報告版本	內容	發行日期
R00	初始報告。	108年03月25日

測試證明書

本實驗室特此證明：

本測試報告內所記載之測試數據，數據之觀測評估、分析及選取，測試程式以及待測試設備系統之組成，符合國家通訊傳播委員會低功率射頻電機技術規範/低功率0002 (LP0002) (107-01-10)所規定之量測方法、量測程式之相關規定。

本測試報告內所記載之受測試件（或稱待測樣品），經本實驗室實施測試以後所得之射頻干擾特性，符合國家通訊傳播委員會低功率射頻電機技術規範/低功率0002 (LP0002) (107-01-10)所規定設備動態頻率選擇(DFS)之限制值。

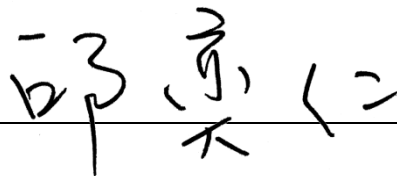
本實驗室聲明

除非本實驗室與客戶間有書面同意特定之量測不準確度，否則本實驗室依適用的測試標準、程式所完成之測試報告，係以一般商用範圍可接受之不準確度來表示測試結果之正確性。

本測試報告所記載之測試結果僅對客戶所指定之待測樣品，在本測試報告所述及之測試條件下所實施之量測有效。製造商有責任確保爾後製造之量產品，其所使用之電氣、機構的零件與本待測樣品所使用的相同。本實驗室沒有義務對客戶或其他者，以本實驗室所出具之測試報告做其它增加或減少之推斷。

本測試報告屬客戶之機密文件。居於客戶、本實驗室間之相互保護，未經本實驗室簽署之局部影印或複製均屬無效。

實驗室報告簽署人：



發行日期：

108 年 03 月 25 日

東研信超股份有限公司

台北市內湖區舊宗路二段171巷18號

電話：(02) 2657-3299 傳真：(02) 2657-3331

Table of Contents	Page
1 . APPLIED STANDARDS	6
1.1 OTHER RELEVANT STATEMENT	6
2 . EUT INFORMATION	7
2.1 EUT SPECIFICATION TABLE	7
2.2 DESCRIPTION OF AVAILABLE ANTENNAS TO THE EUT	7
2.3 CONDUCTED OUTPUT POWER AND EIRP	8
3 . U-NII DFS RULE REQUIREMENTS	9
3.1 WORKING MODES AND REQUIRED TEST ITEMS	9
3.2 TEST LIMITS AND RADAR SIGNAL PARAMETERS	10
4 . TEST INSTRUMENTS	15
5 . TEST SETUP	16
5.1 DFS MEASUREMENT SYSTEM	16
5.2 CALIBRATION OF DFS DETECTION THRESHOLD LEVEL:	19
5.3 DEVIATION FROM TEST STANDARD	19
6 . TEST RESULTS	20
6.1 SUMMARY OF TEST RESULT	20
6.2 TEST MODE: DEVICE OPERATING IN SLAVE MODE	20
6.3 DFS DETECTION THRESHOLD	20
6.4 CHANNEL CLOSING TRANSMISSION AND CHANNEL MOVE TIME WLAN TRAFFIC	21
6.5 NON- OCCUPANCY PERIOD	24

低功率射頻電機測試紀錄表

測試單位名稱：東研信超股份有限公司

測試單位電話：(02) 2641-8198

測試單位地址：新北市汐止區大同路二段 169 巷 68-1 號

器材名稱：UC Phone

申請廠商：台灣思科系統股份有限公司

廠牌：CISCO

製造廠商：Cisco Systems, Inc.

型號：CP-8865

項次	測試項目	適用規範	測試結果	測試設備	結果判定
1	動態頻率選擇(DFS)	低功率射頻電機技術規範 4.7.7.2 節	Page 16	Page 14	合格

技術主管：邵俊哲 直接主管：許嘉超 測試員：吳承書

1. APPLIED STANDARDS

國家通訊傳播委員會低功率射頻電機技術規範/低功率 0002 (LP0002) (107-01-10)
 FCC Part 15, Subpart E (Section 15.407)
 FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r02
 FCC KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02

1.1 OTHER RELEVANT STATEMENT

1. 本測試報告屬新設計之機型，申請新的型式認證。
2. 此產品具有Bluetooth(EDR+LE)、WLAN 2.4 GHz、RLAN 5 GHz及DFS Slave功能。

功能	報告編號	備註
Bluetooth	BTL-NCC-1-1801T089A	
Bluetooth Low Energy	BTL-NCC-2-1801T089A	
WLAN 2412~2462MHz	BTL-NCC-3-1801T089A	
RLAN 5150~5250 MHz, 5260~5320 MHz, 5500~5700 MHz, 5745~5825MHz	BTL-NCC-4-1801T089A	
DFS	BTL-NCC-5-1801T089A	本報告

2. EUT INFORMATION

2.1 EUT SPECIFICATION TABLE

Table 1: Specification of EUT

Product name	UC Phone
Brand Name	CISCO
Model	CP-8865
Operational Mode	Slave
Operating Frequency Range	5250 MHz 至 5350 MHz & 5470 MHz 至 5725 MHz
Modulation	OFDM
Max Conducted Power	12.88dBm
Max EIRP Power	14.96dBm (31.3329mW<500mW)

Note: This device was functioned as a

☐ Master ☒ Slave device without radar detection ☐ Slave device with radar detection

2.2 DESCRIPTION OF AVAILABLE ANTENNAS TO THE EUT

Antenna Specification:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	Note
1	INPAQ	WA-P-LB-02-206	PCB	I-PEX MHF	1.85	Band 2
					2.03	Band 3

2.3 CONDUCTED OUTPUT POWER AND EIRP

Table 2: The Conducted Output Power and EIRP List

Mode: TX (11ac VHT20)				
Frequency Band (MHz)	Max Couducted Output Power (dBm)	Antenna Gain	Max EIRP (dBm)	Max EIRP (mW)
5250~5350	12.49	2.08	14.57	28.6418
5470~5725	12.84	2.08	14.92	31.0456

Mode: TX (11ac VHT40)				
Frequency Band (MHz)	Max Couducted Output Power (dBm)	Antenna Gain	Max EIRP (dBm)	Max EIRP (mW)
5250~5350	12.69	2.08	14.77	29.9916
5470~5725	12.88	2.08	14.96	31.3329

Mode: TX (11ac VHT80)				
Frequency Band (MHz)	Max Couducted Output Power (dBm)	Antenna Gain	Max EIRP (dBm)	Max EIRP (mW)
5250~5350	11.92	2.08	14.00	25.1189
5470~5725	11.61	2.08	13.69	23.3884

3. U-NII DFS RULE REQUIREMENTS

3.1 WORKING MODES AND REQUIRED TEST ITEMS

The manufacturer shall state whether the UUT is capable of operating as a Master and/or a Client. If the UUT is capable of operating in more than one operating mode then each operating mode shall be tested separately. See tables 1 and 2 for the applicability of DFS requirements for each of the operational modes.

Table 2: Applicability of DFS requirements prior to use a channel

Requirement	Operational Mode		
	Master	Client without radar detection	Client with radar detection
Non-Occupancy Period	√	Not required	√
DFS Detection Threshold	√	Not required	√
Channel Availability Check Time	√	Not required	Not required
U-NII Detection Bandwidth	√	Not required	√

Table 3: Applicability of DFS requirements during normal operation.

Requirement	Operational Mode		
	Master	Client without radar detection	Client with radar detection
DFS Detection Threshold	√	Not required	√
Channel Closing Transmission Time	√	√	√
Channel Move Time	√	√	√
U-NII Detection Bandwidth	√	Not required	√

3.2 TEST LIMITS AND RADAR SIGNAL PARAMETERS

DETECTION THRESHOLD VALUES

Table 4: DFS Detection Thresholds for Master Devices and Client Devices With Radar Detection.

Maximum Transmit Power	Value (See Notes 1,2 and 3)
EIRP $\geq$ 200 milliwatt	-64 dBm
EIRP < 200 milliwatt and power spectral density < 10 dBm/MHz	-62 dBm
EIRP < 200 milliwatt that do not meet the power spectral density requirement	-64 dBm

Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna.

Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.

Note3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.

Table 5: DFS Response Requirement Values

Parameter	Value
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds See Note 1.
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.
U-NII Detection Bandwidth	Minimum 80% of the UNII 99% transmission power bandwidth. See Note 3.

Note 1: Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.

Note 2: The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.

Note 3: During the U-NII Detection Bandwidth detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.

PARAMETERS OF DFS TEST SIGNALS

Step intervals of 0.1 microsecond for Pulse Width, 1 microsecond for PRI, 1 MHz for chirp width and 1 for the number of pulses will be utilized for the random determination of specific test waveforms.

Table 6: Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (μsec)	PRI (μsec)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Number of Trials
0	1	1428	18	See Note 1	See Note 1
1	1	Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a Test B: 15 unique PRI values randomly selected within the range of 518-3066μ sec, with a minimum increment of 1μ sec, excluding PRI values selected in Test A	$\text{Roundup} \left\{ \begin{array}{l} \left(\frac{1}{360} \right) \cdot \\ \left(\frac{19 \cdot 10^6}{\text{PRI}_{\mu \text{ sec}}} \right) \end{array} \right\}$	60%	30
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120
Note 1: Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests.					

Table 7: Long Pulse Radar Test Waveform

Radar Type	Pulse Width (μsec)	Chirp Width (MHz)	PRI (μsec)	Number of Pulses per Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Number of Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

Table 8: Frequency Hopping Radar Test Waveform

Radar Type	Pulse Width (μsec)	Chirp Width (MHz)	PRI (μsec)	Number of Pulses per Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Number of Trials
6	1	333	9	0.333	300	70%	30

Note:

Table 5a - Pulse Repetition Intervals Values for Test A

Pulse Repetition Frequency Number	Pulse Repetition Frequency (Pulses Per Second)	Pulse Repetition Interval (Microseconds)
1	1930.5	518
2	1858.7	538
3	1792.1	558
4	1730.1	578
5	1672.2	598
6	1618.1	618
7	1567.4	638
8	1519.8	658
9	1474.9	678
10	1432.7	698
11	1392.8	718
12	1355	738
13	1319.3	758
14	1285.3	778
15	1253.1	798
16	1222.5	818
17	1193.3	838
18	1165.6	858
19	1139	878
20	1113.6	898
21	1089.3	918
22	1066.1	938
23	326.2	3066

4. TEST INSTRUMENTS

DESCRIPTION	MANUFACTURER	MODEL NO.	Serial No	Calibration Until
Spectrum Analyzer	Keysight	N9010A	MY54200240	Aug. 27, 2018
MXG Vector Signal Generator	Agilent	N5182B	MY51350711	May 29, 2018
10dB Attenuators	Mini-Circuits	VAT-10+	N/A	May 15, 2018
10dB Attenuators	Mini-Circuits	VAT-10+	N/A	May 15, 2018
30dB Attenuators	Mini-Circuits	VAT-30+	N/A	May 15, 2018
30dB Attenuators	Mini-Circuits	VAT-30+	N/A	May 15, 2018
POWER SPLITTER	Mini-Circuits	ZFRSC-123-S+	N/A	May 15, 2018
POWER SPLITTER	Mini-Circuits	ZFRSC-123-S+	N/A	May 15, 2018

Remark "N/A" denotes no model name, no serial no. or no calibration specified.
: All calibration period of equipment list is one year.

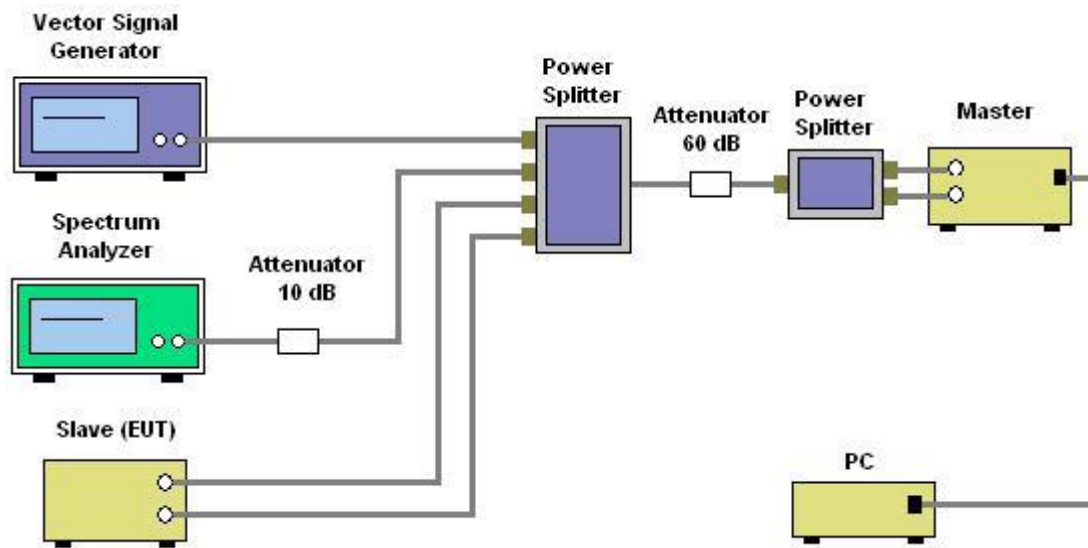
5. TEST SETUP

5.1 DFS MEASUREMENT SYSTEM

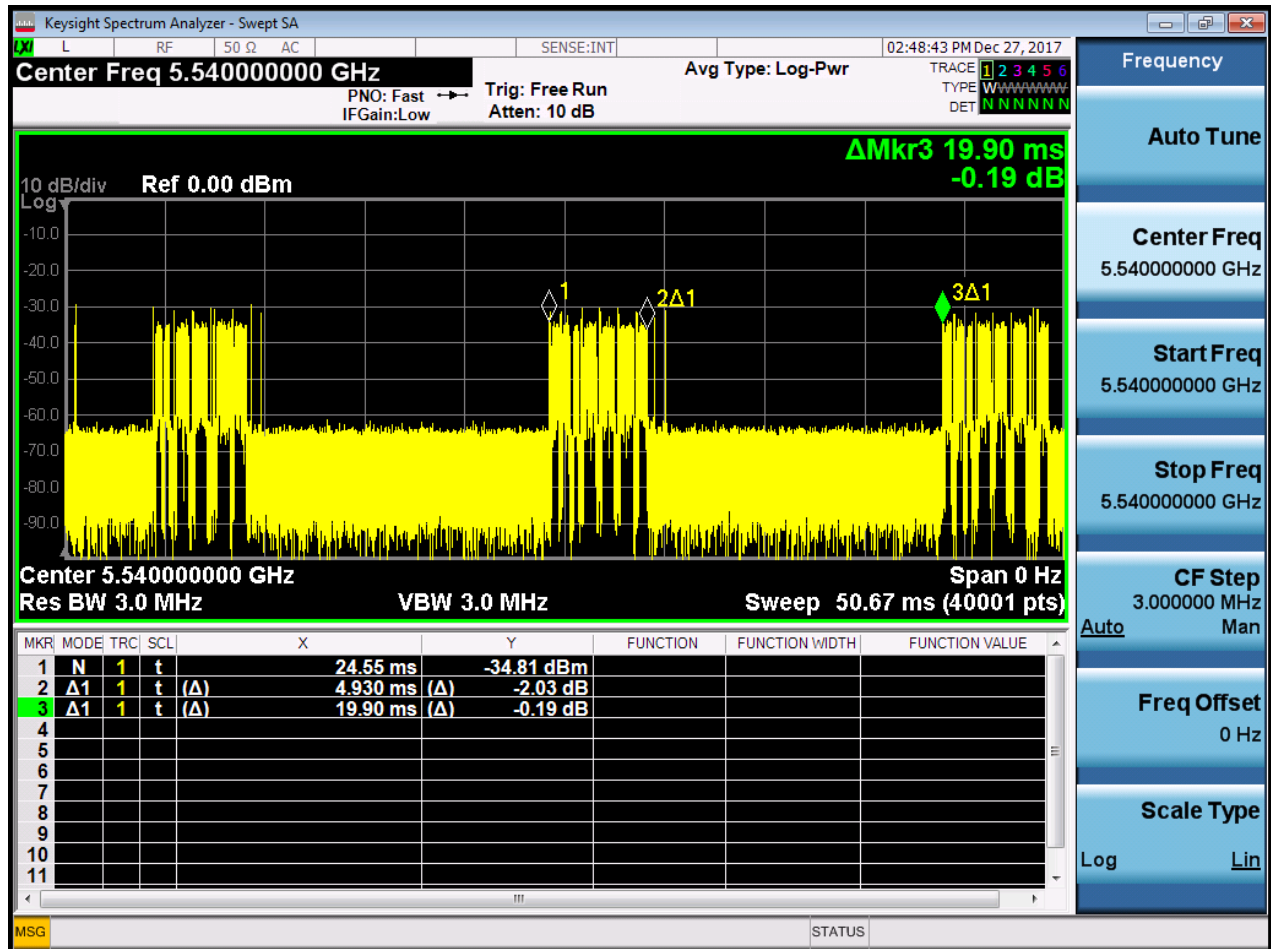
Test Precedure

1. Master device and client device are set up by conduction method as the following configuration.
2. The client device is connected to notebook and to access a IP address on wireless connection with the master device.
3. Then the master device is connected to another notebook to access a IP address.
4. Finally, let the two IP addresses run traffic with each other through the Run flow software “Lan test” to reach 17% channel loading as below

Setup



Channel Loading



Time on (ms)	Time on+Time off (ms)	Percentage= Time on / (Time on+Time off) (%)
4.93	19.90	24.77

The hopping type 6 pulse parameters are fixed while the hopping sequence is based on the August 2005 NTIA Hopping Frequency List. The initial starting point randomized at run-time and each subsequent starting point is incremented by 475. Each frequency in the 100-length segment is compared to the boundaries of the EUT Detection Bandwidth and the software creates a hopping burst pattern in accordance with Section 7.4.1.3 Method #2 Simulated Frequency Hopping Radar Waveform Generating Subsystem of FCC 06-96. The frequency of the signal generator is incremented in 1 MHz steps from FL to FH for each successive trial. This incremental sequence is repeated as required to generate a minimum of 30 total trials and to maintain a uniform frequency distribution over the entire Detection Bandwidth.

The signal monitoring equipment consists of a spectrum analyzer set to display 8001 bins on the horizontal axis. The time-domain resolution is 2 msec / bin with a 16 second sweep time, meeting the 10 second short pulse reporting criteria. The aggregate ON time is calculated by multiplying the number of bins above a threshold during a particular observation period by the dwell time per bin, with the analyzer set to peak detection and max hold.

Should multiple RF ports be utilized for the Master and/or Slave devices (for example, for diversity or MIMO implementations), additional combiner/dividers are inserted between the Master Combiner/Divider and the pad connected to the Master Device (and/or between the Slave Combiner/Divider and the pad connected to the Slave Device). Additional pads are utilized such that there is one pad at each RF port on each EUT.

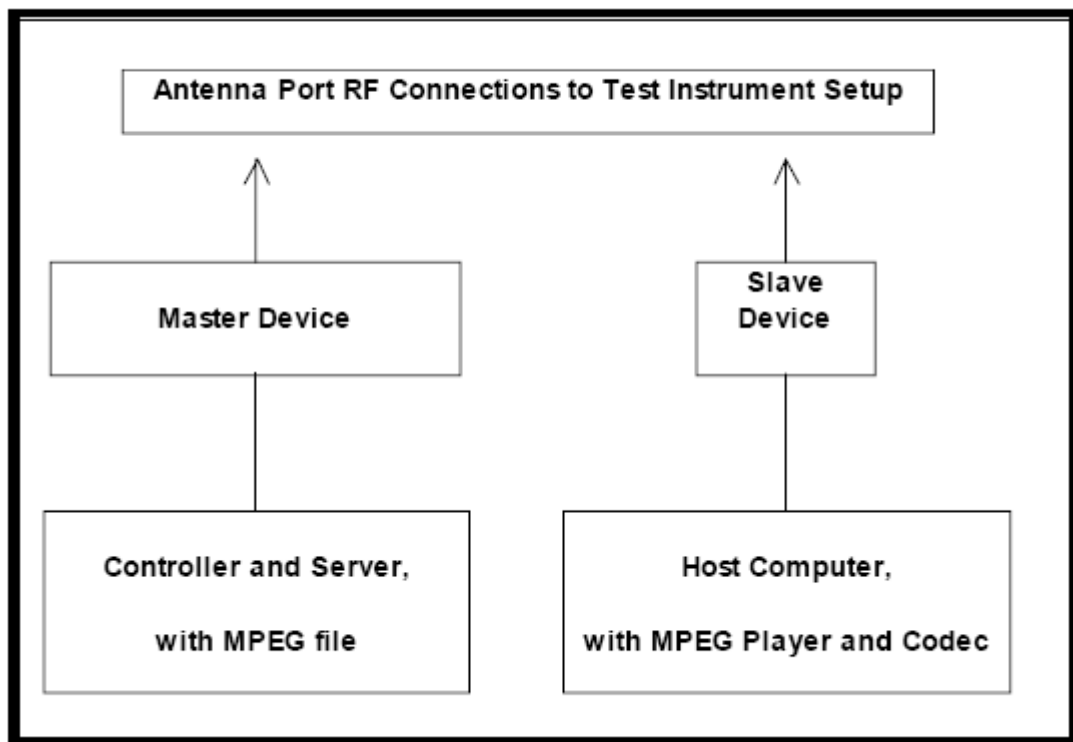
5.2 CALIBRATION OF DFS DETECTION THRESHOLD LEVEL:

A 50 ohm load is connected in place of the spectrum analyzer, and the spectrum analyzer is connected in place of the master device and the signal generator is set to CW mode. The amplitude of the signal generator is adjusted to yield a level of -62 dBm as measured on the spectrum analyzer.

Without changing any of the instrument settings, the spectrum analyzer is reconnected to the Common port of the Spectrum Analyzer Combiner/Divider. Measure the amplitude and calculate the difference from -62 dBm. Adjust the Reference Level Offset of the spectrum analyzer to this difference.

The spectrum analyzer displays the level of the signal generator as received at the antenna ports of the Master Device. The interference detection threshold may be varied from the calibrated value of -62 dBm and the spectrum analyzer will still indicate the level as received by the Master Device.

Set the signal generator to produce a radar waveform, trigger a burst manually and measure the level on the spectrum analyzer. Readjust the amplitude of the signal generator as required so that the peak level of the waveform is at a displayed level equal to the required or desired interference detection threshold. Separate signal generator amplitude settings are determined as required for each radar type.



5.3 DEVIATION FROM TEST STANDARD

No deviation.

6. TEST RESULTS

6.1 SUMMARY OF TEST RESULT

Clause	Test Parameter	Remarks	Pass/Fail
4.7.7.2	DFS Detection Threshold	No Applicable	N/A
4.7.7.2	Channel Availability Check Time	Not Applicable	N/A
4.7.7.2	Channel Move Time	Applicable	Pass
4.7.7.2	Channel Closing Transmission Time	Applicable	Pass
4.7.7.2	Non- Occupancy Period	Applicable	Pass
4.7.7.2	Uniform Spreading	Not Applicable	N/A
4.7.7.2	U-NII Detection Bandwidth	Not Applicable	N/A

6.2 TEST MODE: DEVICE OPERATING IN SLAVE MODE

The EUT is slave equipment, it need a master device when testing.

Slave with injection at the Master. (Radar Test Waveforms are injected into the Master)

6.3 DFS DETECTION THRESHOLD

Calibration:

The EUT is a Slave Device without Radar Detection and with a max gain is 2.08 dBi.

The rated output power of the Master Device (Brand: Check Point, Model: L-71W, FCC ID:

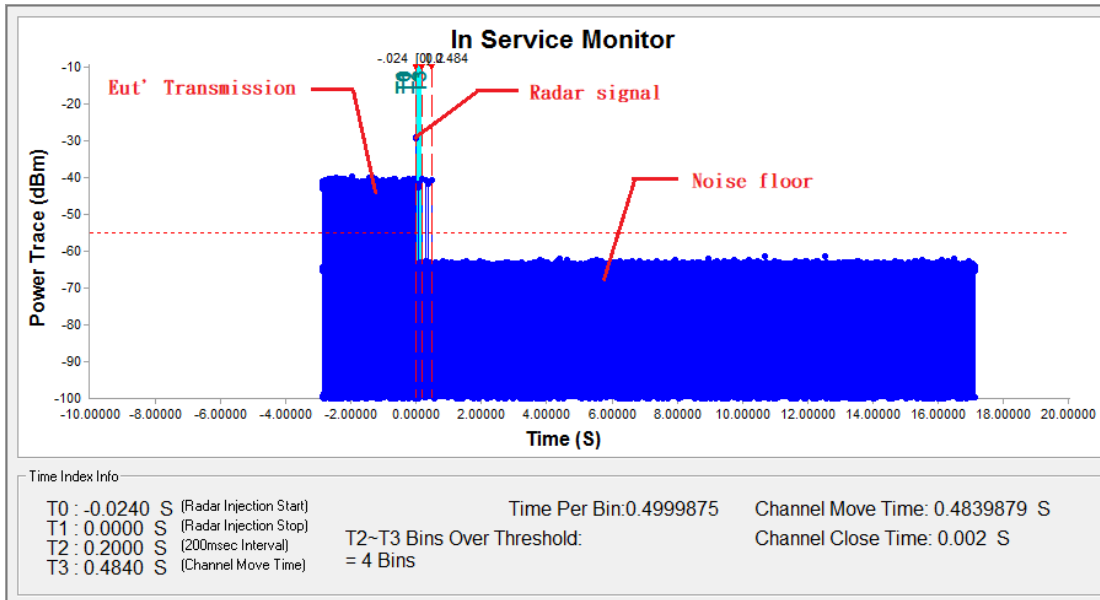
YHI-NW121) is > 23dBm (EIRP). Therefore the required interference threshold level is -64 dBm.

After correction for procedural adjustments, the required radiated threshold at the antenna port is $-64 + 1.99 = -62.01$ dBm.

The calibrated radiated DFS Detection Threshold level is set to -64 dBm. The tested level is lower than the required level hence it provides a margin to the limit.

6.4 CHANNEL CLOSING TRANSMISSION AND CHANNEL MOVE TIME WLAN TRAFFIC

TX (11ac VHT20 Mode)



Note:

T0 denotes the start of the Radar burst.

T1 denotes the start of Channel Move Time upon the end of the last Radar burst.

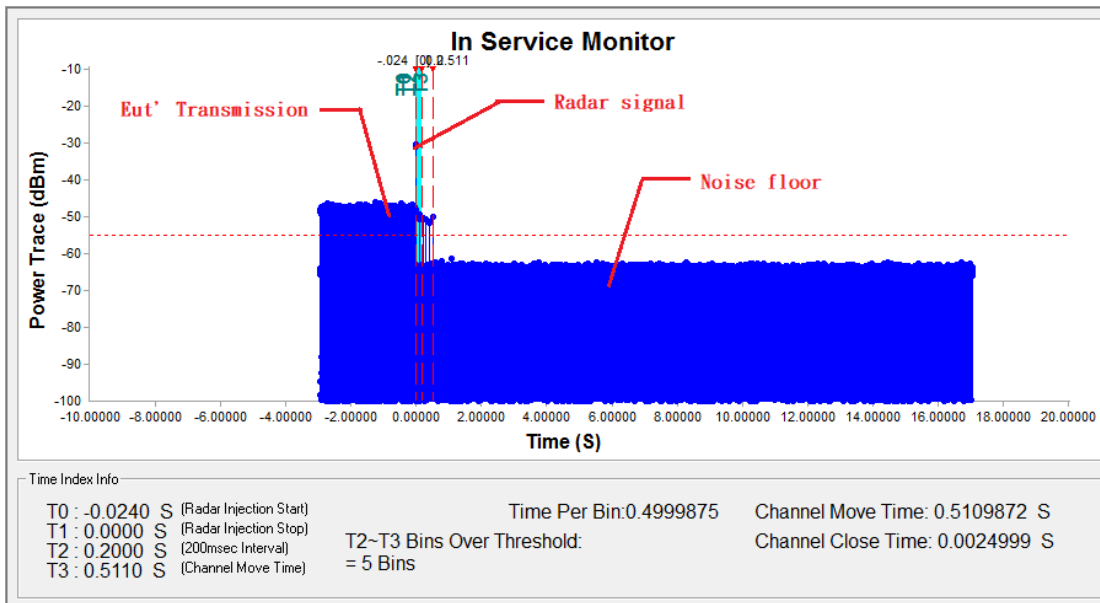
T2 denotes the data transmission time of 200ms(from T1 to T2).

T3 denotes the end of Channel Move Time(from T1 to T3).



Note: An expanded plot for the device vacates the channel in the required 500ms

TX (11ac VHT40 Mode)



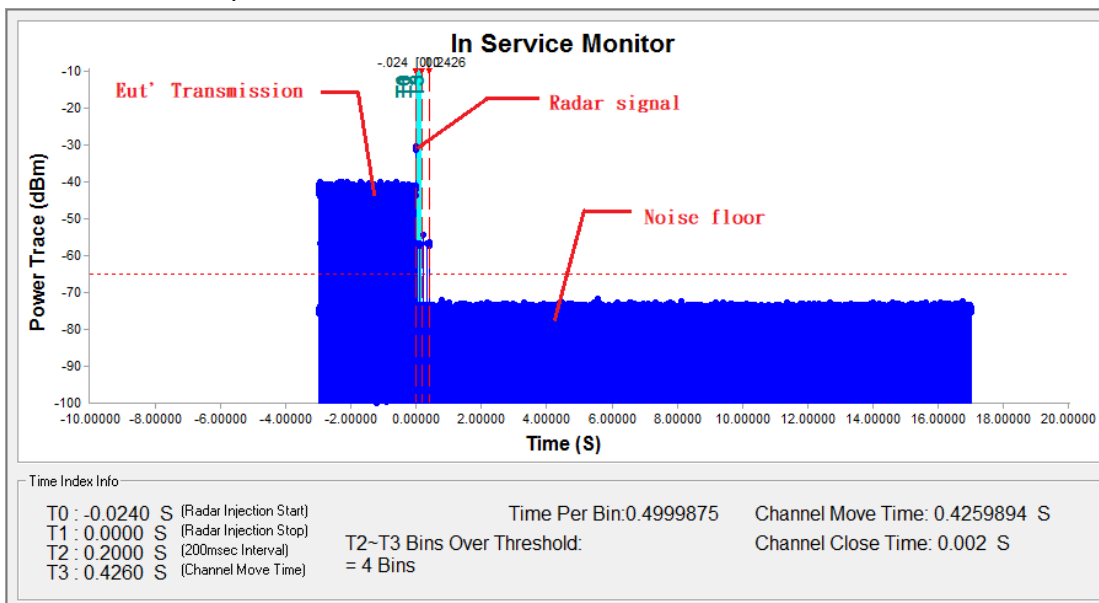
Note:

T0 denotes the start of the Radar burst.
T1 denotes the start of Channel Move Time upon the end of the last Radar burst.
T2 denotes the data transmission time of 200ms(from T1 to T2).
T3 denotes the end of Channel Move Time(from T1 to T3).



Note: An expanded plot for the device vacates the channel in the required 500ms

TX (11ac VHT80 Mode)



Note:

- T0 denotes the start of the Radar burst.
- T1 denotes the start of Channel Move Time upon the end of the last Radar burst.
- T2 denotes the data transmission time of 200ms(from T1 to T2).
- T3 denotes the end of Channel Move Time(from T1 to T3).



Note: An expanded plot for the device vacates the channel in the required 500ms

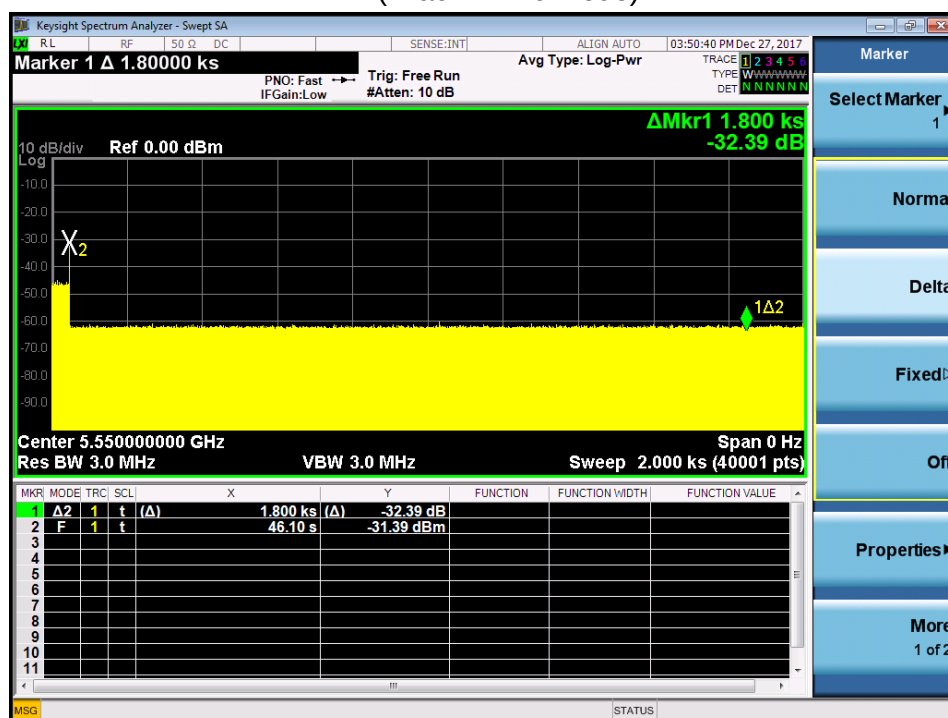
6.5 NON- OCCUPANCY PERIOD

During the 30 minutes observation time, UUT did not make any transmissions on a channel after a radar signal was detected on that channel by either the Channel Availability Check or the In-Service Monitoring.

TX (11ac VHT20 Mode)



TX (11ac VHT40 Mode)



TX (11ac VHT80 Mode)



結束