



低功率射頻器材測試報告

申請廠商	: 惠州高盛達科技有限公司
地址	: 惠州市惠澳大道惠南高新科技產業園金達路 2 號
工廠	: 惠州高盛達科技有限公司
地址	: 惠州市惠澳大道惠南高新科技產業園金達路 2 號
產品名稱	: WIFI+BT Module
產品型號	: DCT2CM2101
廠牌	: GSD
受理日期	: 110 年 09 月 08 日
完成日期	: 110 年 09 月 30 日

實驗室名稱：世騰電子科技股份有限公司測試實驗室

實驗室地址：桃園市蘆竹區聯福街 2 巷 10 號

實驗室認可證書有效期限：112 年 07 月 08 日

實驗室認可編號及範圍：1439 (9 kHz to 40 GHz)

實驗室認證資格





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修訂記錄

報告號碼.	發行日期	描述
21090057-TRNCC04	Sept. 30, 2021	Original



證 明 書

申請廠商 : 惠州高盛達科技有限公司

地址 : 惠州市惠澳大道惠南高新科技產業園金達路 2 號

工廠 : 惠州高盛達科技有限公司

地址 : 惠州市惠澳大道惠南高新科技產業園金達路 2 號

產品名稱 : WIFI+BT Module

產品型號 : DCT2CM2101

廠牌 : GSD

該產品樣品試驗 : 國家通訊傳播委員會低功率射頻器材技術規範(LP0002)。
依據之試驗標準 : 規範修訂日期 109 年 07 月 01 日。
FCC Part 15E, 15.407
LP0002 5.7 章節及 FCC KDB 789033 D02 General UNII Test
Procedures New Rules

茲在此鄭重聲明：

本試驗報告所列之待測設備樣品已於民國 110 年 09 月 27 日在本公司的標準測試場地完成詳細及完整之量測。本試驗報告所列之量測皆依據低功率射頻器材技術規範及 FCC Part 15E 之規定來執行。並判斷此待測設備樣品確實符合低功率射頻器材技術規範規定。備註：本測試報告僅對受測之樣品負責。非經本公司同意，測試報告不得摘錄複印使用。(全部複製除外)。

項次	測試項目	低功率射頻器材技術規範	FCC Rule	量測設備	測試結果	結果判定
9	動態頻率選擇	5.7.7.2 節	15.407(h)(2)	請參閱 2 章	請參閱 3.1-3.9 節	合格

本實驗室已依據合約內的標準，降低儀器、環境、人員等不確定因素。因此測試結果將直接依照標準要求判定之。

報告簽署人：



1. 一般描述

1.1. 產品規格

Main Chip	MT7663BUN
IEEE Standards	IEEE 802.11a/b/g/n/ac+ BT
Operating Frequencies	2.4GHz~2.4835GHz /5.150~5.825GHz
Modulation	BT: GFSK, $\pi/4$ -DQPSK, 8DPSK BLE: GFSK 802.11b: CCK, DQPSK, DBPSK 802.11a/g: 64-QAM,16-QAM, QPSK, BPSK 802.11n: 64-QAM,16-QAM, QPSK, BPSK (註：802.11n 可以支持 1TX,2TX 兩種模式) 802.11ac: 256-QAM,64-QAM,16-QAM, QPSK, BPSK (註：802.11ac 可以支持 1TX,2TX 兩種模式)
Wireless Data Rate	BT: GFSK:1Mbps, $\pi/4$ -DQPSK: 2Mbps, 8DPSK:3Mbps BLE: GFSK: 1Mbps, 2Mbps WIFI 2.4G: 802.11b: 1, 2 ,5.5,11Mbps 802.11g: 6,9,12,18,24,36,48,54Mbps 802.11n: HT20 reach up to144.4Mbps, HT40 reach up to300Mbps WIFI 5G: 802.11a: 6,9,12,18,24,36,48,54Mbps 802.11n: HT20 reach up to144.4Mbps, HT40 reach up to300Mbps 802.11ac: VHT20 reach up to173.3Mbps, VHT40 reach up to400Mbps, VHT80 reach up to 866.7Mbps
Working Temperature	-10℃ to +70℃
Storage Temperature	-40℃ to +80℃
Power Supply	3.3V +/-10%

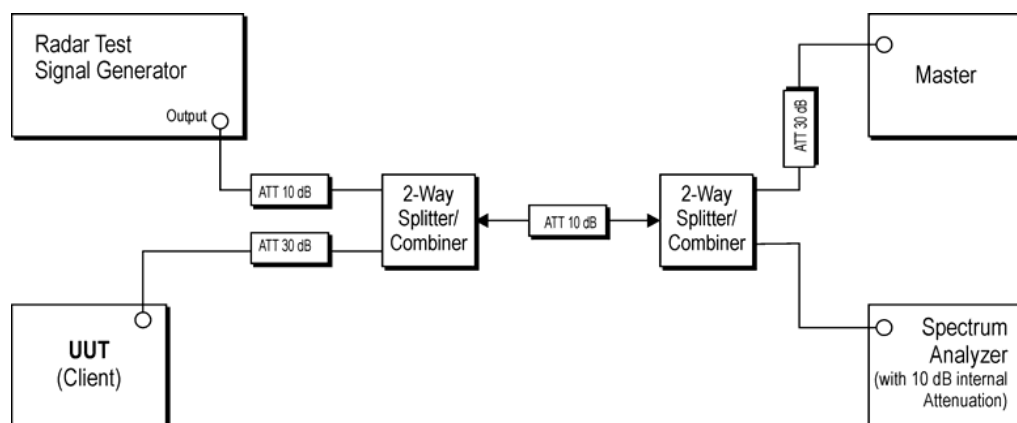
Note: For more details, please refer to the User's manual of the EUT.

1.2. 差異說明

無。



1.3. 受測裝置之系統說明



「本案經申請者切結器材不提供隨貨配件，配件由實驗室提供併同檢驗」，及其廠牌型號資訊如下：

DFS				
Equipment	Brand	Model	Length/Type	Power cord/Length/Type
筆記型電腦	Sony	PCG-71811P	N/A	非隔離/1.8m
治具板	GSD	N/A	隔離/1.2m	N/A
AP	D-Link	DIR-868L	N/A	Adapter / 1.5m / NS



1.4. 測試場地

測試場地：	世騰電子科技股份有限公司測試實驗室 338 桃園市蘆竹區聯福街 2 巷 10 號
測試電壓：	AC 110V / 60Hz
適用規範：	本測試報告之所有項目皆依據國家通訊傳播委員會低功率射頻器材技術規範以及參考 ANSI、FCC/47CFR/2.1046、2.1047、2.1049、2.1051、2.1053 及 2.1055 之檢驗法。
測試頻率：	電源傳導：從 150 kHz 到 30 MHz。 場強輻射：從 30 MHz 到 25000 MHz。
測試天線的距離：	場強輻射之測試距離為 3 M。

Test Item	Test Site	Test Period	Environmental Conditions	Tested By
DFS	RFDFS01-NK	2021/09/09~2021/09/27	22~25°C / 50~60%	Nick Guan

1.5. 量測不確定度

Measurement Item	Uncertainty
Channel Move Time	±2.64%
Channel Closing Transmission Time	±5.36%
Threshold	±1.121dB



2. 測試儀器

Test Item	DFS				
Test Site	RFDFS01-NK				
Instrument	Manufacturer	Model No	Serial No	Calibration Date	Valid Date
Horn Antenna	EMCO	3115	31589	2021/04/09	2022/04/08
Horn Antenna	EMCO	3115	31601	2020/10/16	2021/10/15
EXA Signal Analyzer	KEYSIGHT	N9010A	MY54200207	2021/04/21	2022/04/20
CAX Signal Analyzer	KEYSIGHT	N9000B	MY57100291	2020/11/10	2021/11/09
MXG Vector Signal Generator	KEYSIGHT	N5182A	MY50141551	2020/10/15	2021/10/14
N7607B Signal Studio	KEYSIGHT	v3.2.0.0	NA	NA	NA
InServiceMonitorUtility	Theda	v10.0.0.0	NA	NA	NA



2.1. 天線型式及其增益

ANT 1

- 1.1 Brand : GSD
- 1.2 Model : G.5.13.WC0DXXDAXX
- 1.3 Antenna type : FPC Antenna
- 1.4 Frequency Rang : 5150-5850MHz
- 1.5 Gain(peak) :
 - 5150MHz - 5250MHz: 3dBi;
 - 5250MHz - 5350MHz: 3dBi;
 - 5470MHz - 5725MHz: 3dBi;
 - 5725MHz - 5850MHz: 3dBi;

ANT 2

- 1.1 Brand : GSD
- 1.2 Model : G.5.13.WC0DXXDAXX
- 1.3 Antenna type : FPC Antenna
- 1.4 Frequency Rang : 5150-5850MHz
- 1.5 Gain(peak) :
 - 5150MHz - 5250MHz: 3dBi;
 - 5250MHz - 5350MHz: 3dBi;
 - 5470MHz - 5725MHz: 3dBi;
 - 5725MHz - 5850MHz: 3dBi;

(參照天線規格資料)



3. 動態頻率選擇

3.1. List of Measurement and Examinations

EUT Applicability of DFS requirements and Frequency Range

Operation Mode		Operating Frequency Range	
		5250-5350MHz	5470-5725MHz (Don't support 5600MHz-5650MHz)
Master	--	--	--
Client without radar detection	√	√	√
Client with radar detection	--	--	--

DEVICES WITH RADAR DETECTION

MAXIMUM TRANSMIT POWER	VALUE (SEE Note 1 and 2)
≥ 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	

Table1: Applicability of DFS requirements prior to use of a channel

REQUIREMENT RADAR	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	√

**Table2: Applicability of DFS requirements during normal operation**

REQUIREMENT RADAR	OPERATIONAL MODE		
	MASTER	CLIENT WITHOUT RADAR DETECTION	CLIENT WITH RADAR DETECTION
DFS Detection Threshold	V	Not required	V
Channel Closing Transmission Time	V	V	V
Channel Move Time	V	V	V
U-NII Detection Bandwidth	V	Not required	V

Additional requirements for devices with multiple bandwidth modes	Master or Client with radar detection	Client without radar detection
U-NII Detection Bandwidth and Statistical Performance Check	All BW modes must be tested	Not required
Channel Move Time and Channel Closing Transmission Time	Test using widest BW mode available	Test using the widest BW mode available for the link
All other	Any single BW mode	Not required
Note: Frequencies selected for statistical performance check (Section 7.8.4) should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 MHz channels and the channel center frequency.		

3.2. Test Setup

Setup for Master with injection at the Master

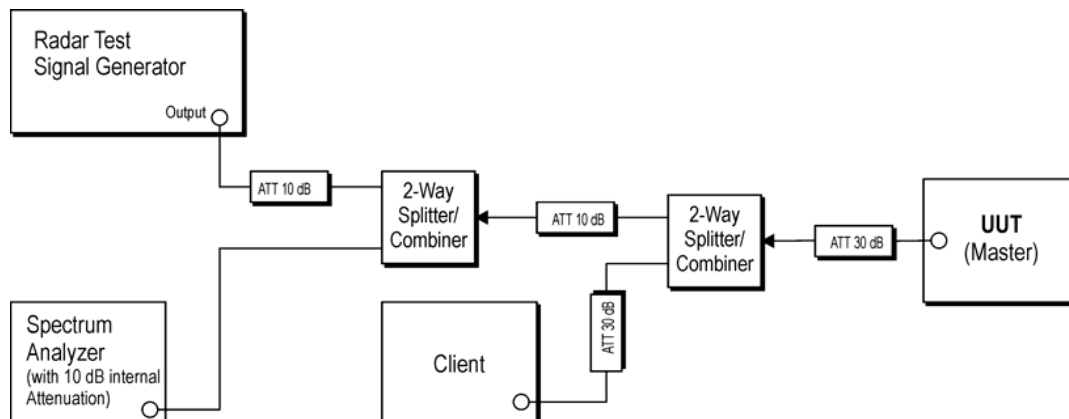


Figure 1: Example Conducted Setup where UUT is a Master and Radar Test Waveforms are injected into the Master

Setup for Client with injection at the Master

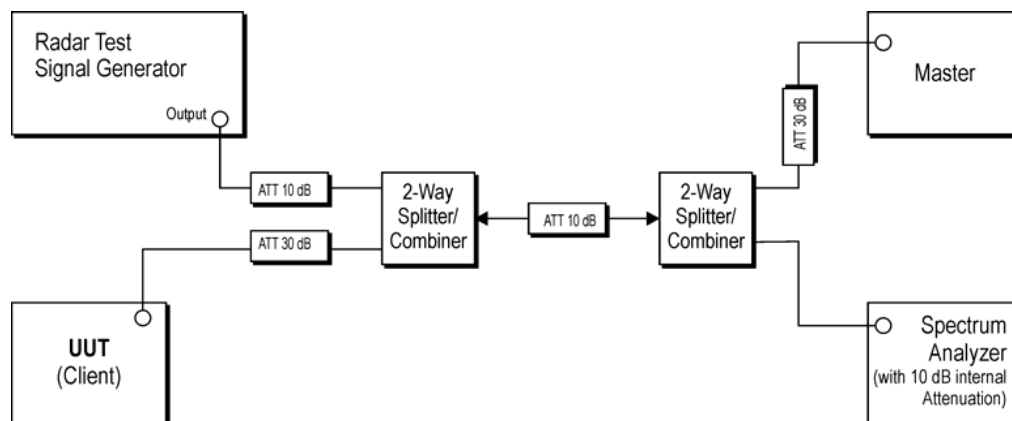


Figure 2: Example Conducted Setup where UUT is a Client and Radar Test Waveforms are injected into the Master



Setup for Client with injection at the Client

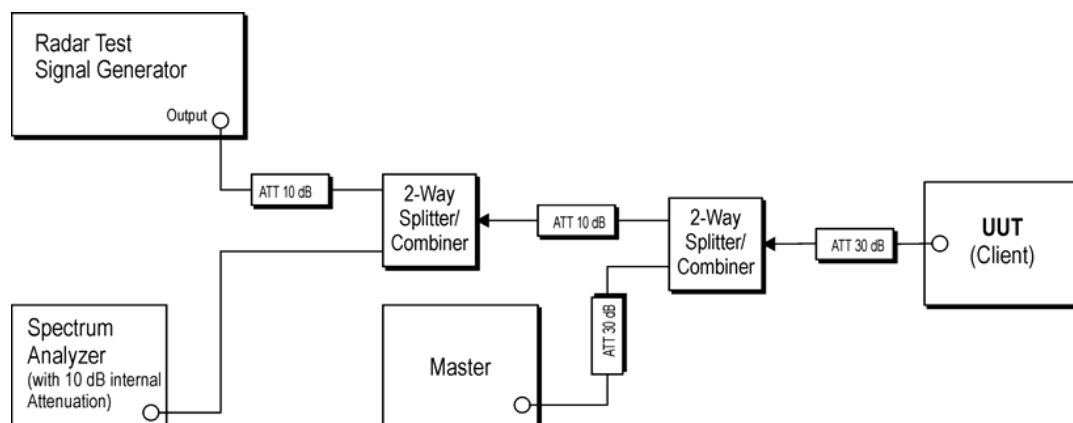


Figure 3: Example Conducted Setup where UUT is a Client and Radar Test Waveforms are injected into the Client



3.3. DFS Detection Threshold

DFS Detection Threshold is the level used by the DFS mechanism to detect radar interference.

3.3.1. Test Limit

Limits Clause 5.7.2.1.2

DFS Detection Thresholds for Master Devices and Client Devices with Radar Detection

MAXIMUM TRANSMIT POWER	VALUE (SEE Note 1 and 2)
≥ 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

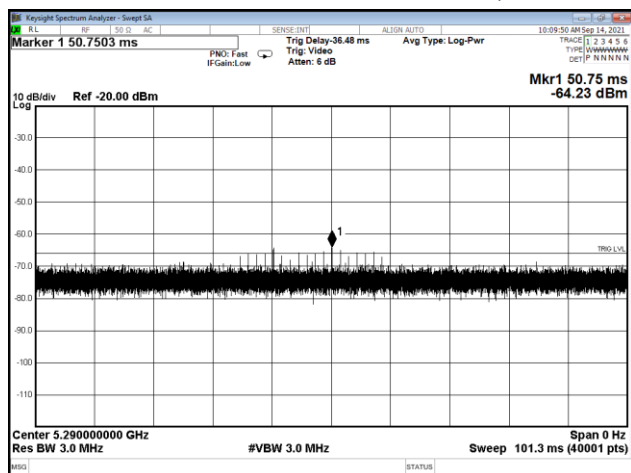
Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna.
Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal 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

Max. output power	Band: 5250MHz ~ 5350MHz For 1TX 802.11a: 13.40dBm 802.11n HT20: 13.22dBm 802.11n HT40: 13.16dBm 802.11ac VHT20: 13.24dBm 802.11ac VHT40: 13.20dBm 802.11ac VHT80: 11.56dBm For 2TX 802.11n HT20: 16.54dBm 802.11n HT40: 16.66dBm 802.11ac VHT20: 16.57dBm 802.11ac VHT40: 16.70dBm 802.11ac VHT80: 15.02dBm Band: 5470MHz ~ 5725MHz For 1TX 802.11a: 13.81dBm 802.11n HT20: 13.63dBm 802.11n HT40: 13.41dBm 802.11ac VHT20: 13.70dBm 802.11ac VHT40: 13.44dBm 802.11ac VHT80: 11.67dBm For 2TX 802.11n HT20: 17.00dBm 802.11n HT40: 17.14dBm 802.11ac VHT20: 17.05dBm 802.11ac VHT40: 17.17dBm 802.11ac VHT80: 15.37dBm
Antenna gain (Max)	5250MHz - 5350MHz: ANT A: 3dBi; ANT B: 3dBi 5470MHz - 5725MHz: ANT A: 3dBi; ANT B: 3dBi

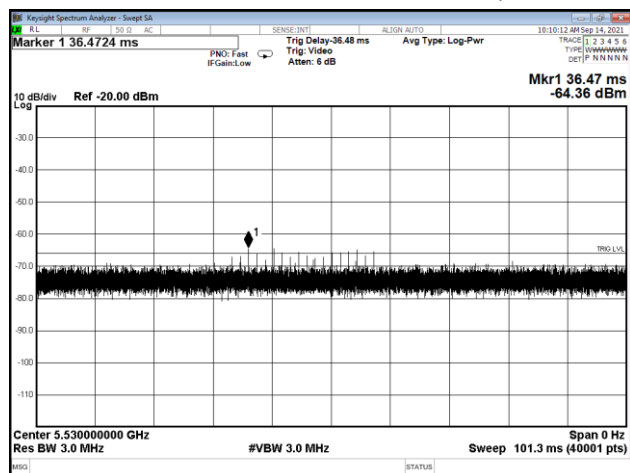


3.3.2. Test Result of DFS Detection Threshold

Modulation Standard: 802.11ac VHT80, 5290MHz



Modulation Standard: 802.11ac VHT80, 5530MHz





3.4. Channel Availability Check Time

The Channel Availability Check is defined as the mechanism by which an RLAN device checks a channel for the presence of radar signals.

There shall be no transmissions by the device within the channel being checked during this process.

If no radars have been detected, the channel becomes an Available Channel valid for a period of time.

The RLAN shall only start transmissions on Available Channels.

At power-up, the RLAN is assumed to have no Available Channels.

3.4.1. Test Limit

Limits Clause 5.7.2.1.2

Table D.2: DFS requirement values

Parameter	Value
Channel Availability Check	> 60s

3.4.2. Test Result of Channel Availability Check

Not required

3.5. Radar Burst at the Beginning of the Channel Availability Check Time

The steps below define the procedure to verify successful radar detection on the test Channel during a period equal to the Channel Availability Check Time and avoidance of operation on that Channel when a radar Burst with a level equal to the DFS Detection Threshold + 1 dB occurs at the beginning of the Channel Availability Check Time. This is illustrated in **Figure 15**.

- The Radar Waveform generator and UUT are connected using the applicable test setup described in the sections on configuration for Conducted Tests or Radiated Tests and the power of the UUT is switched off.
- The UUT is powered on at T_0 . T_1 denotes the instant when the UUT has completed its power-up sequence ($T_{\text{power_up}}$). The Channel Availability Check Time commences on Chr at instant T_1 and will end no sooner than $T_1 + T_{\text{ch_avail_check}}$.
- A single Burst of one of the Short Pulse Radar Types 0-4 will commence within a 6 second window starting at T_1 . An additional 1 dB is added to the radar test signal to ensure it is at or above the DFS Detection Threshold, accounting for equipment variations/errors.
- Visual indication or measured results on the UUT of successful detection of the radar Burst will be recorded and reported. Observation of Chr for UUT emissions will continue for 2.5 minutes after the radar Burst has been generated.
- Verify that during the 2.5 minute measurement window no UUT transmissions occurred on Chr. The Channel Availability Check results will be recorded.

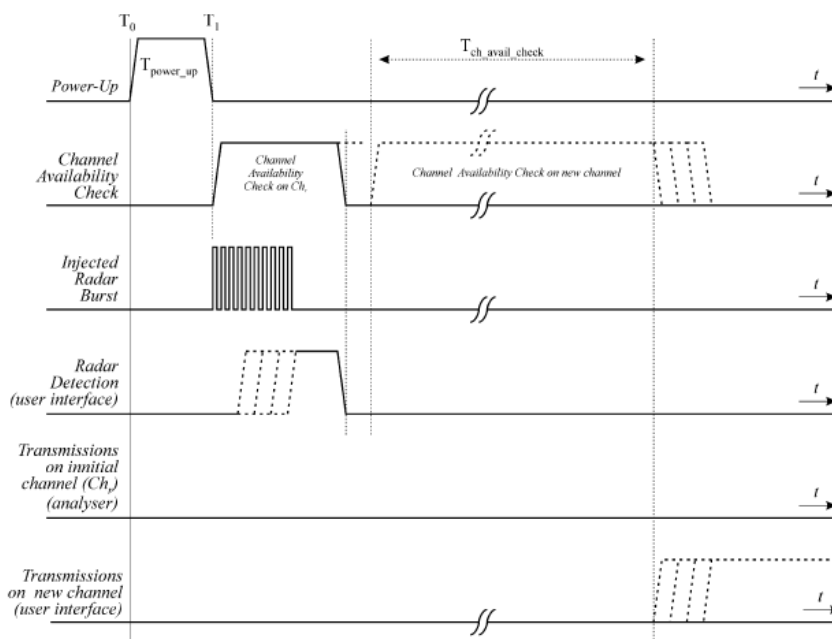


Figure 15: Example of timing for radar testing at the beginning of the Channel Availability Check Time

3.5.1. Test Result of radar burst at the beginning of the Channel Availability Check Time

Not required

3.6. Radar Burst at the End of the Channel Availability Check Time

The steps below define the procedure to verify successful radar detection on the test Channel during a period equal to the Channel Availability Check Time and avoidance of operation on that Channel when a radar Burst with a level equal to the DFS Detection Threshold + 1dB occurs at

the end of the Channel Availability Check Time. This is illustrated in **Figure 16**.

- The Radar Waveform generator and UUT are connected using the applicable test setup described in the sections for Conducted Tests or Radiated Tests and the power of the UUT is switched off.
- The UUT is powered on at T_0 . T_1 denotes the instant when the UUT has completed its power-up sequence ($T_{\text{power_up}}$). The Channel Availability Check commences on Chr at instant T_1 and will end no sooner than $T_1 + T_{\text{ch_avail_check}}$.
- A single Burst of one of the Short Pulse Radar Types 0-4 will commence within a 6 second window starting at $T_1 + 54$ seconds. An additional 1 dB is added to the radar test signal to ensure it is at or above the DFS Detection Threshold, accounting for equipment variations/errors.
- Visual indication or measured results on the UUT of successful detection of the radar Burst will be recorded and reported. Observation of Chr for UUT emissions will continue for 2.5 minutes after the radar Burst has been generated.
- Verify that during the 2.5 minute measurement window no UUT transmissions occurred on Chr. The Channel Availability Check results will be recorded.

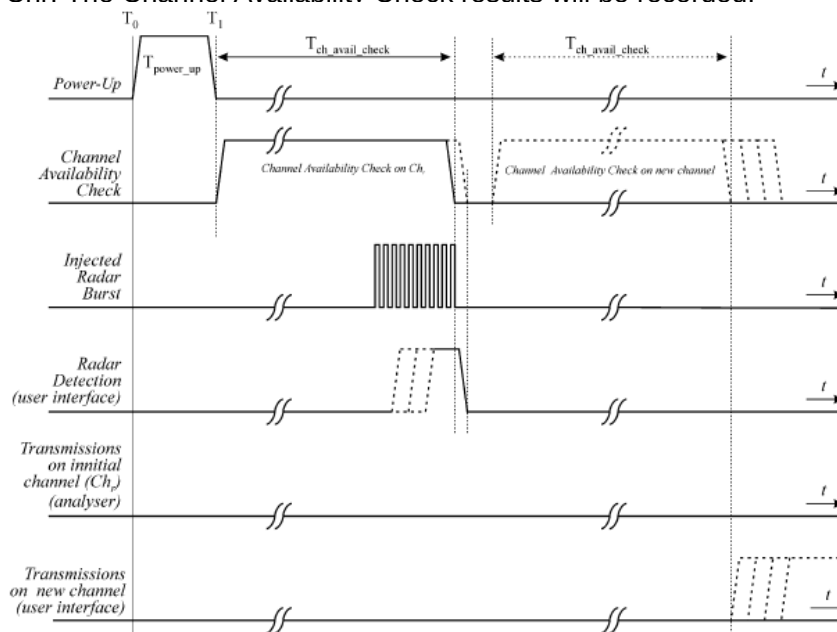


Figure 16: Example of timing for radar testing towards the end of the Channel Availability Check Time

3.6.1. Test Result of radar burst at the end of the Channel Availability Check Time

Not required



3.7. Channel Loading

Timing plots are required with calculations demonstrating a minimum channel loading of approximately 17% or greater. For example, channel loading can be estimated by setting the spectrum analyzer for zero span and approximate the Time On/ (Time On + Off Time).

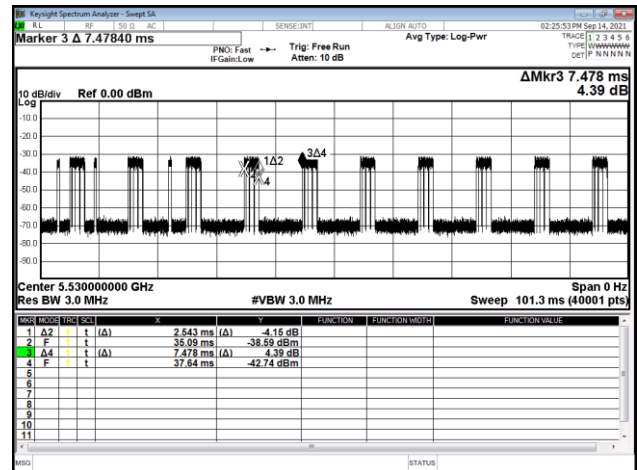
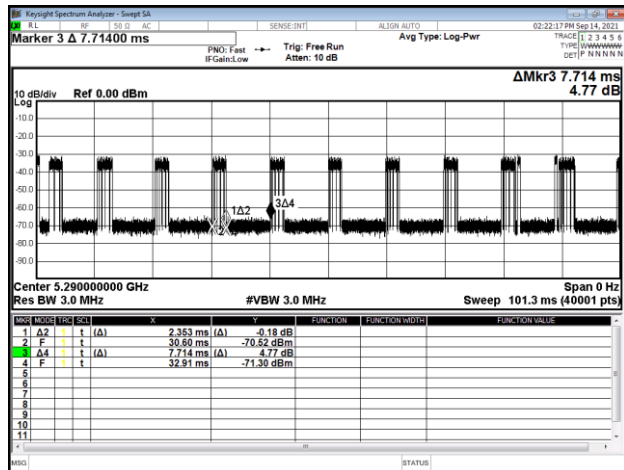
This can be done with any appropriate channel BW and modulation type

5290MHz, 802.11ac VHT80, Band 2

Time On/ (Time On + Off Time) =23.37%

5530MHz, 802.11ac VHT80, Band 3

Time On/ (Time On + Off Time) =25.38%





3.8. U-NII Detection Bandwidth

Additional requirements for devices with multiple bandwidth modes	Master or Client with radar detection	Client without radar detection
U-NII Detection Bandwidth and Statistical Performance Check	All BW modes must be tested	Not required
Note: Frequencies selected for statistical performance check (Section 7.8.4) should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 MHz channels and the channel center frequency.		

3.8.1. Test Limit

Limits Clause 5.7.2.1.2 Table D.2: DFS requirement values

Parameter	Value
U-NII Detection Bandwidth	Minimum 100% of the U-NII 99% transmission
Note : 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.	

3.8.2. Test Result of U-NII Detection Bandwidth

Not required



3.9. Statistical Performance Check

Additional requirements for devices with multiple bandwidth modes	Master or Client with radar detection	Client without radar detection
Note: Frequencies selected for statistical performance check (Section 7.8.4) should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 MHz channels and the channel center frequency.		

3.9.1. Test Result of Uniform Spreading

Not required



3.10.Uniform Spreading

The UUT will select channel by random mode and remember this channel when detect radar signal, so that will select unused channel by random mode.

3.10.1. Test Result of Uniform Spreading

Not required



3.11. In-Service Monitoring

The In-Service Monitoring is defined as the process by which an RLAN monitors the Operating Channel for the presence of radar signals.

Additional requirements for devices with multiple bandwidth modes	Master or Client with radar detection	Client without radar detection
U-NII Detection Bandwidth and Statistical Performance Check	All BW modes must be tested	Not required
Channel Move Time and Channel Closing Transmission Time	Test using widest BW mode available	Test using the widest BW mode available for the link
All other	Any single BW mode	Not required
Note: Frequencies selected for statistical performance check (Section 7.8.4) should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in each of the bonded 20 MHz channels and the channel center frequency.		

3.11.1. Test Limit

Parameter	Value
Channel Move Time	< 10 s (See Note 1)
Channel Closing Transmission Time	< 200 ms+ an aggregate of 60 milliseconds over remaining 10 second period. (See Notes 1 and Notes 2.)
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.	

Limits Clause 5.7.2.2.2

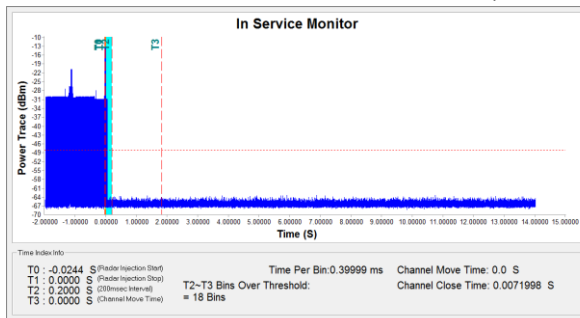
The In-Service Monitoring shall be used to continuously monitor an Operating Channel.

The In-Service-Monitoring shall start immediately after the RLAN has started transmissions on an Operating Channel.

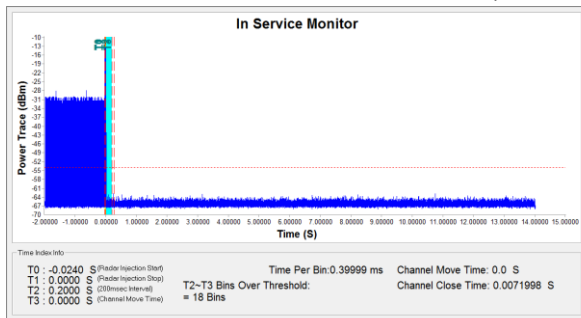


3.11.2. Test Result of In-Service Monitoring

Modulation Standard: 802.11ac VHT80, 5290MHz



Modulation Standard: 802.11ac VHT80, 5530MHz





3.12. Non-Occupancy Period

The Channel Shutdown is defined as the process initiated by the RLAN device immediately after a radar signal has been detected on an Operating Channel.

The master device shall instruct all associated slave devices to stop transmitting on this channel, which they shall do within the Channel Move Time.

Slave devices with a Radar Interference Detection function, shall stop their own transmissions within the Channel Move Time.

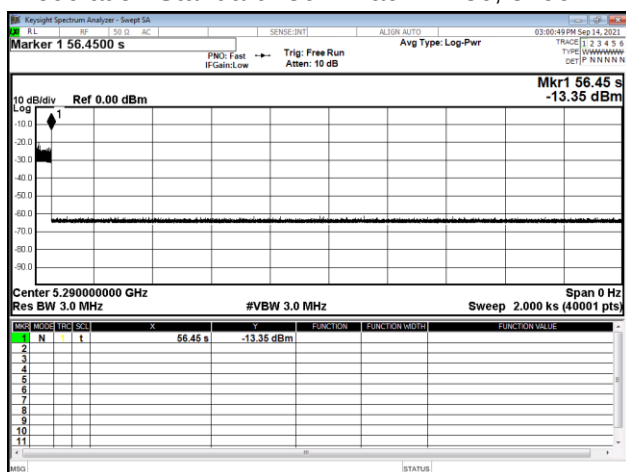
The aggregate duration of all transmissions of the RLAN device on this channel during the Channel Move Time shall be limited to the Channel Closing Transmission Time. The aggregate duration of all transmissions shall not include quiet periods in between transmissions.

3.12.1. Test Limit

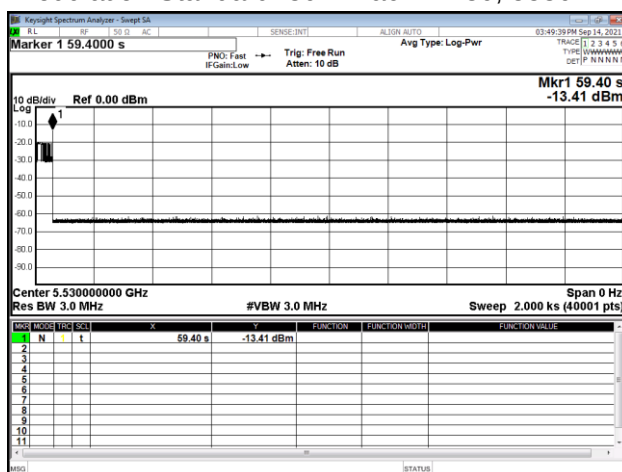
Radar Test Signal	Master (min)	Client (min)
0	> 30	> 30

3.12.2. Test Result of Non-Occupancy Period

Modulation Standard: 802.11ac VHT80, 5290MHz



Modulation Standard: 802.11ac VHT80, 5530MHz



-----THE END OF REPORT-----