

TEST REPORT

On behalf of

Savant Technologies LLC, dba GE Lighting, a Savant company

Product Name: RTL8721DM Module

Model No.: JXC8721-65

FCC ID: PUU-KEYPADSG2A

Prepared For: Savant Technologies LLC, dba GE Lighting, a Savant company
1975 Noble Road, Cleveland, OH 44112

Prepared By: Audix Technology (Shanghai) Co., Ltd.
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File No. : C1D2206038
Report No. : ACI-F22107
Date of Test : 2022.06.29
Date of Report : 2022.07.13

The statement is based on a single evaluation of one sample of the above-mentioned products. It does not imply an assessment of the whole production and does not permit the use of the test lab logo. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

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TEST REPORT

Applicant : Savant Technologies LLC, dba GE Lighting, a Savant company
EUT Description : RTL8721DM Module
(A) Model No. : JXC8721-65
(B) Power Supply : DC3.3V
(C) Test Voltage : DC3.3V

Test Procedure Used:

FCC RULES AND REGULATIONS PART 15 SUBPART E AND KDB 905462 D02

The device described above is tested by Audix Technology (Shanghai) Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart E limits.

The test results are contained in this test report and Audix Technology (Shanghai) Co., Ltd. is assumed full responsibility for the accuracy and completeness of these measurements. This report also shows that the EUT (M/N: Refer to Sec2.1), which was tested is technically compliance with the FCC limits.

This report applies to above tested Sample only. This report shall not be reproduced in part without written approval of Audix Technology (Shanghai) Co., Ltd.

The test results for EUT's BLE/ WIFI (2.4G)/ WIFI (5G) function are contained in No.ACI-F22104, ACI-F22105, ACI-F22106 report.

Date of Test : 2022.06.29 Date of Report : 2022.07.13

Producer :

HUIMIN YAN

HUIMIN YAN / Assistant

Reviewer :

Byron Wu

BYRON WU/ Deputy Assistant Manager



For and on behalf of
Audix Technology (Shanghai) Co., Ltd.

KAMP CHEN

Signatory :

Authorized Signature(s)

KAMP CHEN/ Manager

1 SUMMARY OF STANDARDS AND RESULTS

1.1 Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below:

Description / Test Item		Test Standard	Results	Meets Limit
EMISSION				
DFS	Non-Occupancy Period	FCC RULES AND REGULATIONS PART 15 SUBPART E AND KDB 905462 D02	N/A	15.407(h)(2)
	DFS Detection Threshold		N/A	
	Channel Availability Check Time		N/A	
	U-NII Detection Bandwidth		N/A	
	DFS Detection Threshold		N/A	
	Channel Closing Transmission Time		Pass	
	Channel Move Time		Pass	
	U-NII Detection Bandwidth		N/A	
	N/A is an abbreviation for Not Applicable.			

2 GENERAL INFORMATION

2.1 Description of Equipment Under Test

Description : RTL8721DM Module

Type of EUT : ☒ Production ☐ Pre-product ☐ Pro-type

Model Number : JXC8721-65

Radio Tech : BLE 5.0;
IEEE 802.11 a/b/g/n.

Note : Bluetooth LE1M only.

Channel Freq. : BLE: 2402MHz-2480MHz;
IEEE 802.11a:
5180MHz—5240MHz; 5260MHz—5320MHz
5500MHz—5700MHz; 5745MHz—5825MHz
IEEE 802.11b: 2412MHz—2462MHz
IEEE 802.11g: 2412MHz—2462MHz
IEEE802.11nHT20:
2412MHz—2462MHz;
5180MHz—5240MHz; 5260MHz—5320MHz
5500MHz—5700MHz; 5745MHz—5825MHz
IEEE802.11nHT40:
2422MHz—2452MHz;
5190MHz—5230MHz; 5270MHz—5310MHz
5510MHz—5670MHz; 5755MHz—5795MHz

Modulation : BLE: GFSK;
802.11b: DSSS (CCK, DQPSK, DBPSK);
802.11a/g/n: OFDM (64QAM, 16QAM, QPSK, BPSK).

DFS Info. : Operational Mode:
☐ Master
☒ Client without Radar Detection
☐ Client with Radar Detection

Antenna Info. : Antenna Type: IPEX Antenna
Antenna Gain:
2400MHz~2483.5MHz: -2.72 dBi;
5GHz bands:
Band1: 2.15 dBi;
Band2: 2.43 dBi;
Band3: 4.1 dBi;
Band4: 2.41 dBi.
The Antenna uses an antenna that use a unique coupling to the intentional radiator that is comply with 15.203 requirement.

Applicant : Savant Technologies LLC, dba GE Lighting, a Savant company
1975 Noble Road, Cleveland, OH 44112

Manufacturer : same as Applicant

Factory : Shenzhen Jingxun Technology Co., Ltd.
3/F,A5 building Zhiyuan Community No.1001,
Xueyuan Road Nanshan District, Shenzhen City, China

2.2 Test Information

The EUT was operation at client mode, the modulation and channel was selected by a Wi-Fi Router.

Modulation	Test Channel	Frequency (MHz)
802.11n-HT40	54	5270
	102	5510

2.3 Sample Description

Test Item	Model Number	Sample Number	Date of receipted
DFS	JXC8721-65	E2206269a-01/05	2022.06.09

2.4 Supported Equipment

Brand : Acer
Product Name: : Notebook PC
Model Name : TravelMate P238 series
Model Number : N15W8

Brand : ASUS
Product Name: : AX6000 Dual-band Wi-Fi Router
Model Name : RT-AX88U
Model Number : K8ITHP000036
FCC ID : MSQ-RTAXHP00
IC: : 3568A-RTAXHP00

2.5 Description of Test Facility

Name of Firm : Audix Technology (Shanghai) Co., Ltd.

Site Location : 3F and 4F, 34Bldg, 680 Guiping Rd.,
Caohejing Hi-Tech Park,
Shanghai 200233, China.

Accredited by NVLAP, Lab Code : 200371-0

FCC Designation Number : CN5027

Test Firm Registration Number : 954668

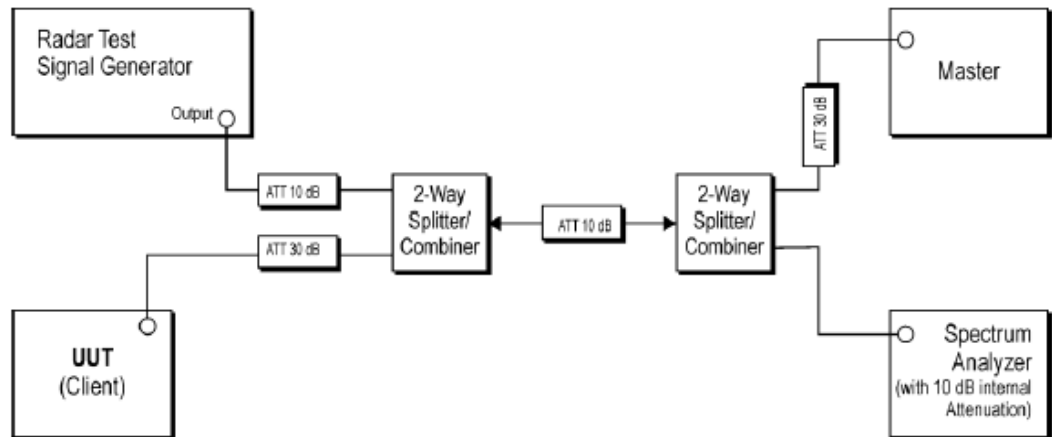
3 DFS MEASUREMENT

3.1 Test Equipment

The following test equipment was used during the Emission Bandwidth measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Agilent	N9010A	MY52221182	2021.09.16	1 Year
2.	MXG Vector Signal Generator	KEYSIGHT	N5182B	MY53051937	2022.06.06	1 Year
3.	DFS Radar Profiles	KEYSIGHT	N7607B Signal Studio	V3.2.0.0	--	--
4.	AX6000 Dual-band Wi-Fi Router	ASUS	RT-AX88U	K8ITHP000036	--	--

3.2 Block Diagram of Test Setup



3.3 Specification Limits

§15.407(h)(2)(iii):

Channel Move Time. After a radar's presence is detected, all transmissions shall cease on the operating channel within 10 seconds. Transmissions during this period shall consist of normal traffic for a maximum of 200 ms after detection of the radar signal. In addition, intermittent management and control signals can be sent during the remaining time to facilitate vacating the operating channel.

KDB 905462 D02:

Table 1: Applicability of DFS Requirements Prior to Use of a Channel

Requirement	Operational Mode		
	Master	Client Without Radar Detection	Client With Radar Detection
<i>Non-Occupancy Period</i>	Yes	Not required	Yes
<i>DFS Detection Threshold</i>	Yes	Not required	Yes
<i>Channel Availability Check Time</i>	Yes	Not required	Not required
<i>U-NII Detection Bandwidth</i>	Yes	Not required	Yes

Table 2: Applicability of DFS requirements during normal operation

Requirement	Operational Mode	
	Master Device or Client with Radar Detection	Client Without Radar Detection
<i>DFS Detection Threshold</i>	Yes	Not required
<i>Channel Closing Transmission Time</i>	Yes	Yes
<i>Channel Move Time</i>	Yes	Yes
<i>U-NII Detection Bandwidth</i>	Yes	Not required

Additional requirements for devices with multiple bandwidth modes	Master Device or Client with Radar Detection	Client Without Radar Detection
<i>U-NII Detection Bandwidth and Statistical Performance Check</i>	All BW modes must be tested	Not required
<i>Channel Move Time and Channel Closing Transmission Time</i>	Test using widest BW mode available	Test using the widest BW mode available for the link
<i>All other tests</i>	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.

Table 3: 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.
Note 3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.

Table 4: DFS Response Requirement Values

Parameter	Value
<i>Non-occupancy period</i>	Minimum 30 minutes
<i>Channel Availability Check Time</i>	60 seconds
<i>Channel Move Time</i>	10 seconds See Note 1.
<i>Channel Closing Transmission Time</i>	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.
<i>U-NII Detection Bandwidth</i>	Minimum 100% of the U-NII 99% transmission power bandwidth. See Note 3.
<p>Note 1: <i>Channel Move Time</i> and the <i>Channel Closing Transmission Time</i> should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.</p> <p>Note 2: The <i>Channel Closing Transmission Time</i> is comprised of 200 milliseconds starting at the beginning of the <i>Channel Move Time</i> plus any additional intermittent control signals required to facilitate a <i>Channel</i> 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.</p> <p>Note 3: During the <i>U-NII Detection Bandwidth</i> 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.</p>	

3.4 Operating Condition of EUT

The EUT operate as client, connect to the Wi-Fi Router.

3.5 Test Procedure

The conducted setup shown on Section 3.2 was used to measure the Channel Closing Transmission Time and Channel Move Time.

For a Client Device without DFS, the Channel Move Time and Channel Closing Transmission Time requirements will be verified with one Short Pulse Radar Type defined in Table 5 of KDB 905462 D02.

The Client Device (EUT) is associated with the Master Device (Wi-Fi Router). The Data Traffic is streamed from the Master Device to the Client Device. Radar waveforms generated with the Vector Signal Generator are injected into the Master Device on the operating channel.

Observe the transmissions of the EUT at the end of the radar burst on the operating channel for duration greater than 10 seconds. Measure and record the transmissions from the UUT during the observation time (Channel Move Time). Measure and record the Channel Move Time and Channel Closing Transmission Time if radar detection occurs.

3.6 Threshold Level

Threshold Level = -62dBm + Antenna Gain.

3.7 Test Results

PASSED.

All the test results are attached in next pages.

(Test Date: 2022.06.29 Temperature: 23°C Humidity: 51 %)

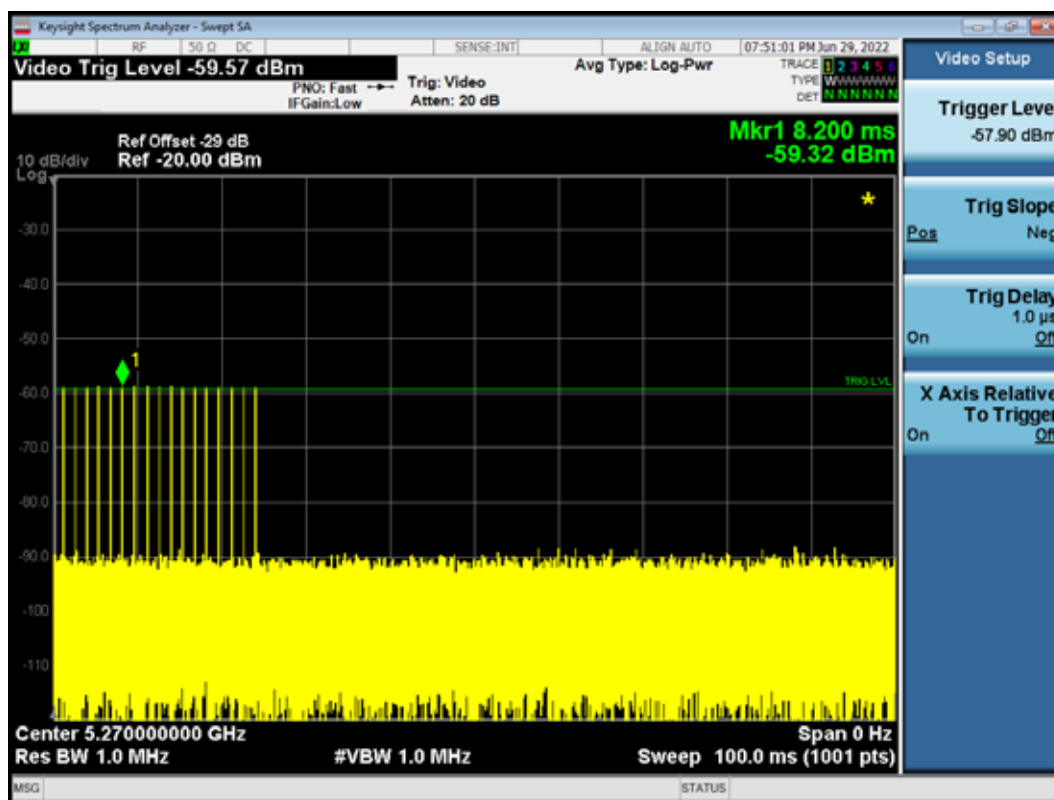
Modulation	Channel	Frequency (MHz)	Antenna Gain (dBi)	Threshold Level (dBm)
802.11n-HT40	54	5270	2.43	-59.57
	102	5510	4.1	-57.9

Modulation	Channel	Frequency (MHz)	Channel Move Time (s)	Limit (s)
802.11n-HT40	54	5270	0.9749708	10
	102	5510	0.789739	10

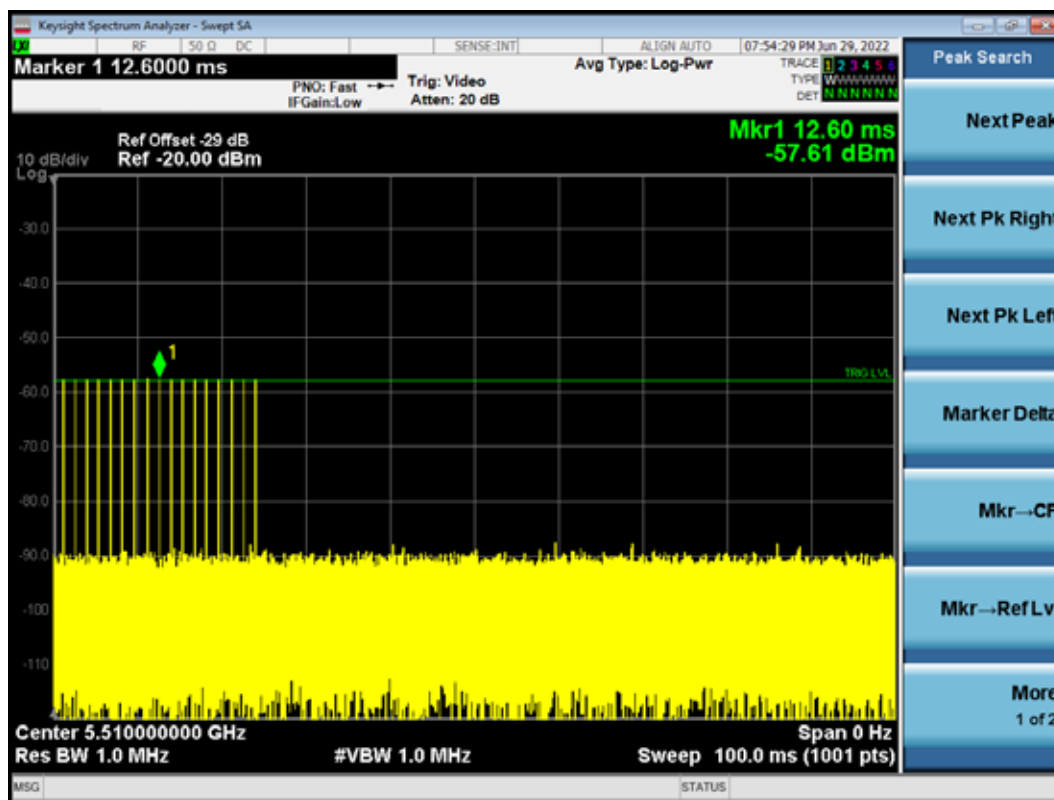
Modulation	Channel	Frequency (MHz)	Channel Closing Transmission Time (s)	Limit (s)
802.11n-HT40	54	5270	0.0049998	0.2
	102	5510	0.0029999	0.2

Threshold Level:

802.11n-HT40 CH5270MHz

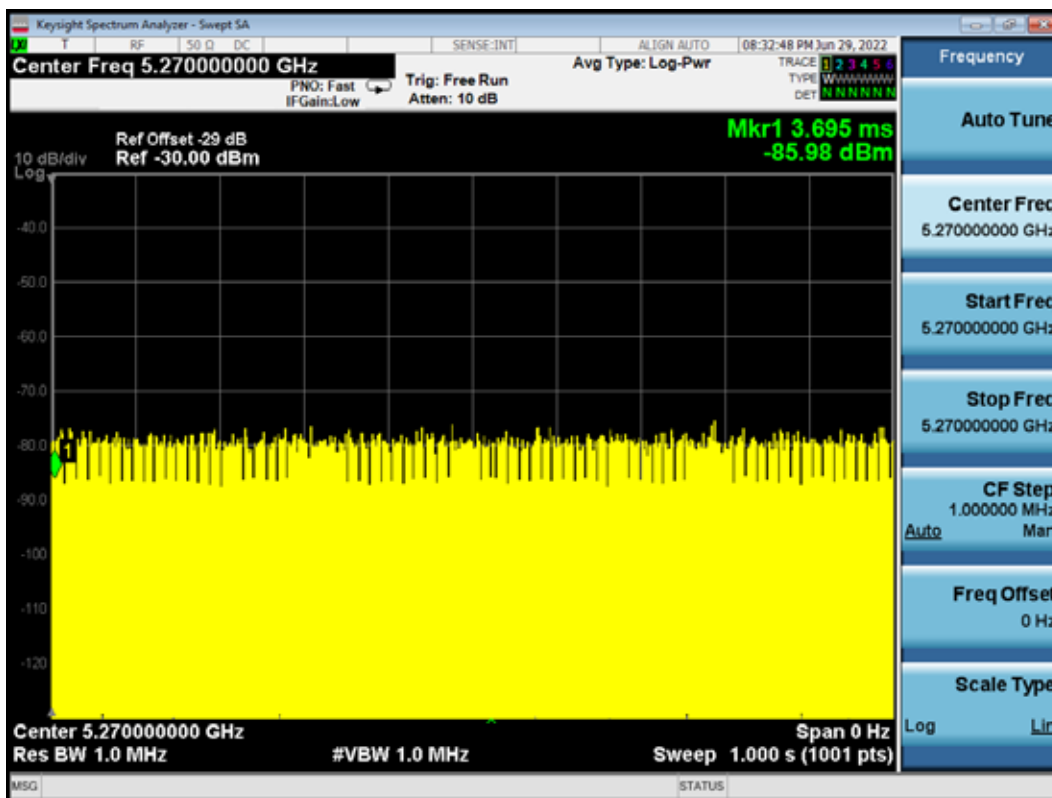


802.11n-HT40 CH5510MHz

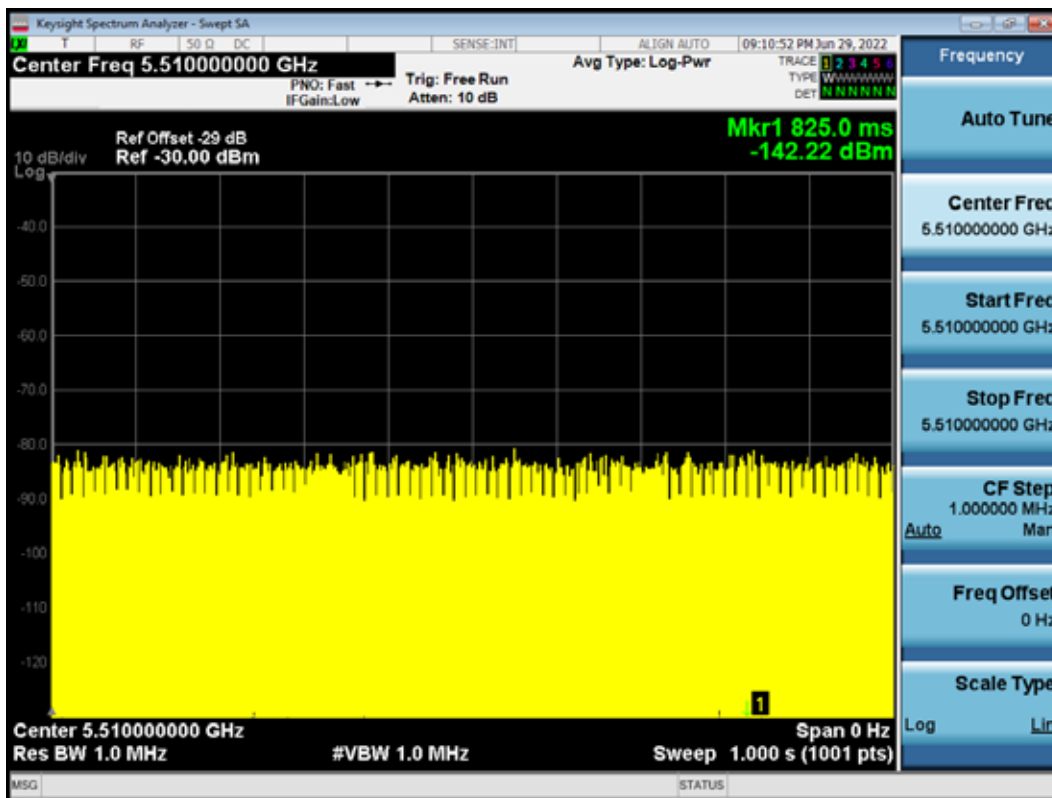


Data Traffic Plot:

802.11n-HT40 CH5270MHz

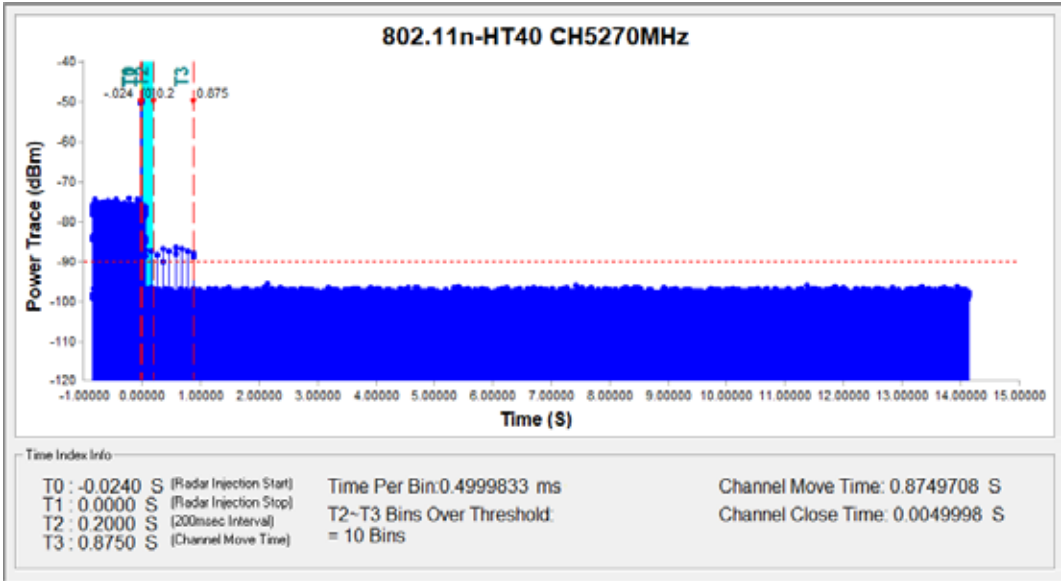


802.11n-HT40 CH5510MHz

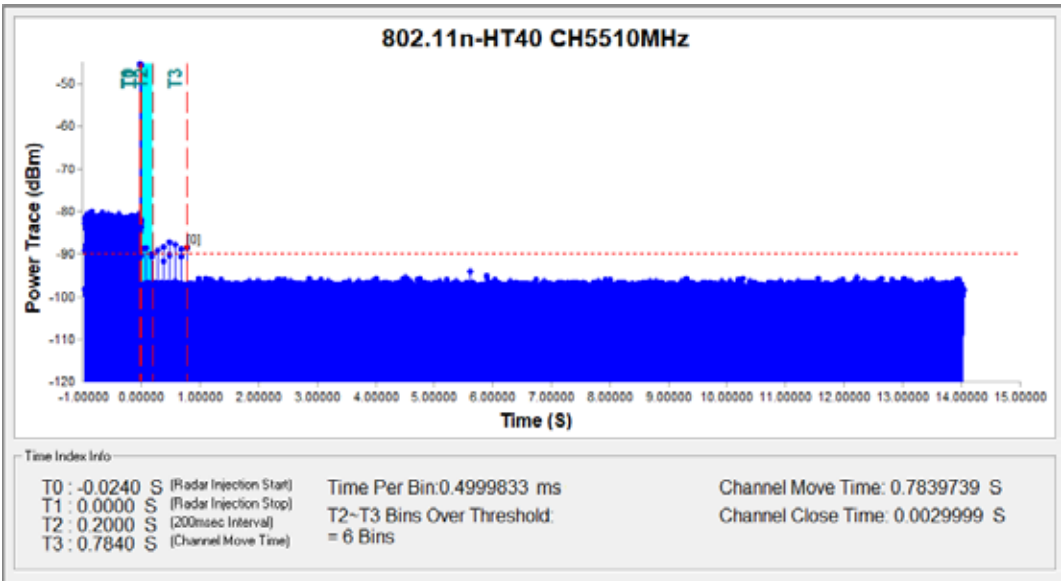


Channel Move Time & Channel Closing Transmission Time:

802.11n-HT40 CH5270MHz



802.11n-HT40 CH5510MHz



4 DEVIATION TO TEST SPECIFICATIONS

None.

5 MEASUREMENT UNCERTAINTY LIST

The measurement uncertainty was estimated for test on the EUT according to CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage of K=2.

The uncertainties value is not used in determining the PASS/FAIL results.

Test Items/Facilities	Frequency/Equipment/Unit	Uncertainty
Conducted Emission No.1 Shielded Room	9kHz~150kHz	±3.1 dB
	150kHz~30MHz	±2.6 dB
Conducted Emission No.3 Shielded Room	9kHz~150kHz	±3.1 dB
	150kHz~30MHz	±2.6 dB
Radiated Emission	30MHz~200MHz, Horizontal	±3.8 dB
	30MHz~200MHz, Vertical	±4.1 dB
	200MHz~1000MHz, Horizontal	±3.6 dB
	200MHz~1000MHz, Vertical	±5.1 dB
	1GHz~6GHz	±5.3 dB
	6GHz~18GHz	±5.3 dB
	18GHz~40GHz	±3.5 dB
Output Power Test	50MHz~18GHz	0.77 dB
Power Density Test	9kHz~6GHz	1.08 dB
RF Frequency Test	9kHz~40GHz	6×10^{-4}
Bandwidth Test	9kHz~6GHz	1.5×10^{-3}
RF Radiated Power Test	30MHz~1000MHz	3.06 dB
Conducted Output Power Test	50MHz~18GHz	0.83 dB
AC Voltage(<10kHz) Test	120V~230V	0.04 %
DC Power Test	0V~30V	0.4 %
Temperature	-40°C~+100°C	0.52 °C
Humidity	30%~95%	2.6 %