

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

Applicant:	FUJITSU CONNECTED TECHNOLOGIES Ltd. Chuorinkan 7-10-1 Yamato, Kanagawa 242-0007, Japan
Product Name:	Smart Phone
Brand Name:	FUJITSU
Model No.:	F-42A
Model Difference:	N/A
Report Number:	ER/2020/40013
FCC ID:	2AQYEFMP178
FCC Rule Part:	§15.247, Cat: DTS
Issue Date:	May 8th, 2020
Date of Test:	Apr. 14th, 2020 ~ May 4th, 2020
Date of EUT Re- ceived:	Mar. 31st, 2020

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits. The test results of this report relate only to the tested sample identified in this report.

Approved By: _____CHUN; CHIZEH, CHIEN

Chun Chieh Chen / Supervisor



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Revision History						
Report Number	Report Number Revision Description Issue Date Remark					
ER/2020/40013	Rev.00	Original.	May 8th, 2020	Revised By: Yuri Tsai		

Note:

1 · Disclaimer

Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.

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1 GENERAL INFORMATION

1.1 Product description

Product Name:	Smart Phone			
Brand Name:	FUJITSU			
Model No.:	F-42A			
Model Difference:	N/A			
Hardware Version:	V1.2.0			
Software Version:	V00R016Ve			
	3.8Vdc from Rechargeable Li-ion Battery			
Power Supply:	Battery: Model No.:CA54310-0075 Battery: Supplier: FUJITSU CONNECTED TECHNOLOGIES LIMITED			

Wi-Fi 802.11	Frequency Range	Channels	Rated Power (dBm)	Modulation Technology
b			17.93	DSSS,
g	2412-2462	11	23.68	
n_HT20			23.74	- OFDM
Modulation	type:		PSK, DBPSK for DSSS 16QAM, QPSK, BPSK for OFDM	
Antenna De	esignation:	λ/4 Monopole Antenna, Peak Gain: -3.7dBi		
Transistion Rate 802.11 b: 1/2/5.5/11 Mbps 802.11 g: 6/9/12/18/24/36/48/54 Mbps 802.11 n_HT20MHz: 6.5 – 72.2 Mbps				

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1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247 FCC KDB 558074 D01 15.247 Meas Guidance v05r02 ANSI C63.10:2013

1.3 Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory (TAF code 0513) No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803

FCC Designation number: TW0001

1.4 Special Accessories

There are no special accessories used while test was conducted.

1.5 Equipment Modifications

There was no modification incorporated into the EUT.

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2 SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on a table which is 0.8 m above ground plane. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz. The CISPR Quasi-Peak and Average detector mode is employed. The two LISNs provide 50uH/50 ohm of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

2.3.2 Conducted Test (RF)

The active antenna port of the unlicensed wireless device is connected to the spectrum analyzer with attenuator to protect the instrumentation. If a second antenna port is available, it is tested at one operating frequency, with other port(s) appropriately terminated, to verify it has similar output characteristics as the fully tested port.

2.3.3 Radiated Emissions

The EUT is a placed on a turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.

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2.4 Measurement Results Explanation Example

2.4.1 Radiated Emission Test Sites For Measurements From 9 kHz To 30 MHz

Radiated emission below 30MHz is measured in a 9m*9m*6m semi-anechoic chamber, the measurements correspond to those obtained at an open-field test site. There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

2.4.2 For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

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2.5 Configuration of Tested System

Fig. 2-1 Radiated Emission configuration



Fig. 2-2 Conducted (Antenna Port) Configuration Emission

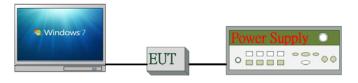
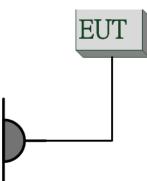


Fig 2-3 Conduction (AC Power Line) Radiated Emission



ltem	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1	WLAN Test Software	N/A	N/A	N/A	N/A	N/A
2	DC Power Supply	Agilent	E3640A	MY40000811	N/A	N/A
3	Notebook	Lenovo	L430	R9-XFG0X	Shielded	Unshielded

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3 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207(a)	AC Power Line Conducted Emission	Compliant
§15.247(b) (3)	Peak Output Power	Compliant
§15.247(a)(2)	6dB Emission Bandwidth	Compliant
§15.205 §15.209 §15.247(d)	Conducted Band Edge and Spurious Emission	Compliant
§15.205 §15.209 §15.247(d)	Radiated Band Edge and Spurious Emission	Compliant
§15.247(e)	Power Spectral Density	Compliant
§15.203 §15.247(b)	Antenna Requirement	Compliant

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4 DESCRIPTION OF TEST MODES

4.1 Operated in 2400 ~ 2483.5MHz Band

11 channels are provided for 802.11b/g/n 20M.

CHANNEL	FREQUENCY (MHz)
1	2412
2	2417
3	2422
4	2427
5	2432
6	2437
7	2442
8	2447
9	2452
10	2457
11	2462

4.2 The Worst Test Modes and Channel Details

- 1. The EUT has been tested under operating condition.
- 2. aTest program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.
- 3. Investigation has been done on all the possible configurations for searching the worst case.

The gevin UE is pre-scanned among below modes.

			Multiple
Modulation	Transmis	sion Chain	Transmission
			Spatial
🛛 802.11 b	🛛 Ch0 🗆 Ch	1 🗆 Ch2 🗆 Ch3	□ 2TX
⊠ 802.11 g	🛛 Ch0 🗆 Ch	1 🗆 Ch2 🗆 Ch3	□ 2TX
🛛 802.11 n	🛛 Ch0 🗆 Ch	1 🗆 Ch2 🗆 Ch3	
□ 802.11 ax	🗆 Ch0 🗆 Ch	1 🗆 Ch2 🗆 Ch3	

4. Therefore, below summary is the modes of test configuration that yield the highest reading and generate the highest emission chosen to carry out the relevantly mandatory test items.

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4.3 Radiated Emission Test:

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT		
RADIATED EMISSION TEST (BELOW 1 GHz)							
802.11g	1 to 11	6	OFDM	6	Ch0		
RADIATED EMISSION TEST (ABOVE 1 GHz)							
802.11b	1 to 11	1, 6, 11	DSSS	1	Ch0		
802.11g	1 to 11	1, 6, 11	OFDM	6	Ch0		
802.11n20M	1 to 11	1, 6, 11	OFDM	MCS 0	Ch0		

Note:

The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for 802.11b/g/n WLAN Transmitter for channel Low, Mid and High, the worst case E2 position was reported.

4.4 Antenna Port Conducted Mesurement:

CONDUCTED TEST							
MODEAVAILABLE CHANNELTESTED CHANNELMODULATIONDATA RATE (Mbps)ANTENN PORT							
802.11b	1 to 11	1, 6, 11	DSSS	1	Ch0		
802.11g	1 to 11	1, 6, 11	OFDM	6	Ch0		
802.11n 20M	1 to 11	1, 6, 11	OFDM	MCS 0	Ch0		

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5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
Peak Output Power	+/- 0.84 dB
6dB Bandwidth	+/- 51.33 Hz
100 KHz Bandwidth Of Frequency Band Edges	+/- 0.84 dB
Peak Power Density	+/- 1.3 dB
Temperature	+/- 0.65 °C
Humidity	+/- 4.6 %
DC / AC Power Source	DC= +/- 0.13%, AC= +/- 0.2%

Radiated Spurious Emission Measurement Uncertainty					
Polarization: Vertical	9kHz~30MHz: +-2.3dB				
	30MHz - 180MHz: +/- 3.37dB				
	180MHz -417MHz: +/- 3.19dB				
	0.417GHz-1GHz: +/- 3.19dB				
	1GHz - 18GHz: +/- 4.04dB				
	18GHz - 40GHz: +/- 4.04dB				
	9kHz~30MHz: +-2.3dB				
	30MHz - 167MHz: +/- 4.22dB				
	167MHz -500MHz: +/- 3.44dB				
Polarization: Horizontal	0.5GHz-1GHz: +/- 3.39dB				
	1GHz - 18GHz: +/- 4.08dB				
	18GHz - 40GHz: +/- 4.08dB				

Note:

- 1. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
- 2. The conformity assessment statement in this report is based solely on the test results, measurement uncertainty is excluded.

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CONDUCTED EMISSION TEST 6

6.1 Standard Applicable

Frequency range within 150kHz to 30MHz shall not exceed the Limit table as below.

Frequency range	Limits dB(uV)					
MHz	Quasi-peak Average					
0.15 to 0.50	66 to 56	56 to 46				
0.50 to 5	56	46				
5 to 30	60	50				
Note						
1. The lower limit shall apply at the transition frequencies						
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50						
MHz.						

6.2 Measurement Equipment Used

	Conducted Emission Test Site								
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.				
ТҮРЕ		NUMBER	NUMBER	CAL.					
EMI Test Receiver	R&S	ESCI 7	1166.5950.07	Jul. 4th, 2019	Jul. 3rd, 2020				
LISN	SCHWARZBECK	NSLK 8127	8127-649	Jun. 3rd, 2020	Jun. 2nd, 2020				
Test Software	Farad	EZ-EMC	Ver. SGS-03A2	N.C.R	N.C.R				
Coaxial Cables	N/A	WK CE Cable	N/A	Jan. 2nd, 2020	Jan. 1st, 2021				

6.3 EUT Setup

- 1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI 63.10:2013.
- 2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
- 3. The LISN was connected with 120Vac/60Hz power source.

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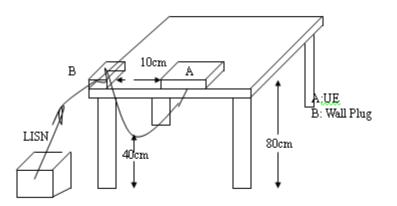
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6.4 Test SET-UP (Block Diagram of Configuration)



6.5 Measurement Procedure

- 1. The EUT was placed on a table which is 0.8m above ground plane.
- 2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 3. Repeat above procedures until all phases of power being supplied by given UE are completed

6.6 Measurement Result

Note: Refer to next page for measurement data and plots.

Note2: The * reveals the worst-case results that closet to the limit.

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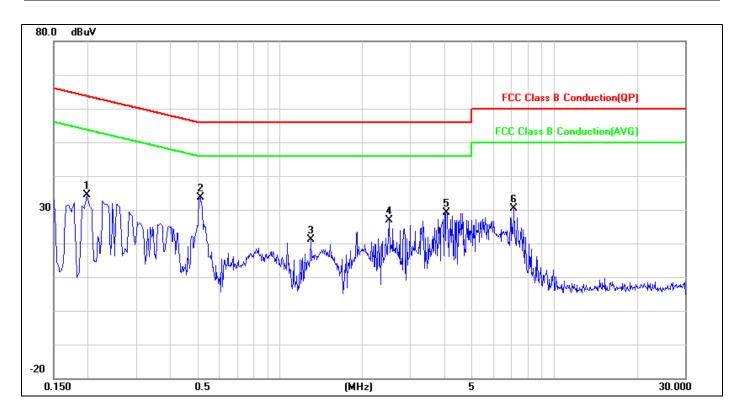
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AC POWER LINE CONDUCTED EMISSION TEST DATA

Description:	Operation	Date:	2020/04/29
Line:	L1	Temp.(°C)/Hum.(%):	23 (°C)/55%
Test Voltage:	AC 120V/60Hz	Test By:	Neo
Report Num-	ER/2020/40013		
ber	ER/2020/40013		



		Freq.	Reading	Factor	Measurement	Limit	Over	
No.	Mk.	(MHz)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dB)	Detector
1		0.1980	34.45	0.01	34.46	63.69	-29.23	peak
2	*	0.5140	33.59	0.01	33.60	56.00	-22.40	peak
3		1.3020	21.17	0.03	21.20	56.00	-34.80	peak
4		2.5020	26.86	0.07	26.93	56.00	-29.07	peak
5		4.0660	29.06	0.14	29.20	56.00	-26.80	peak
6		7.1620	30.24	0.23	30.47	60.00	-29.53	peak

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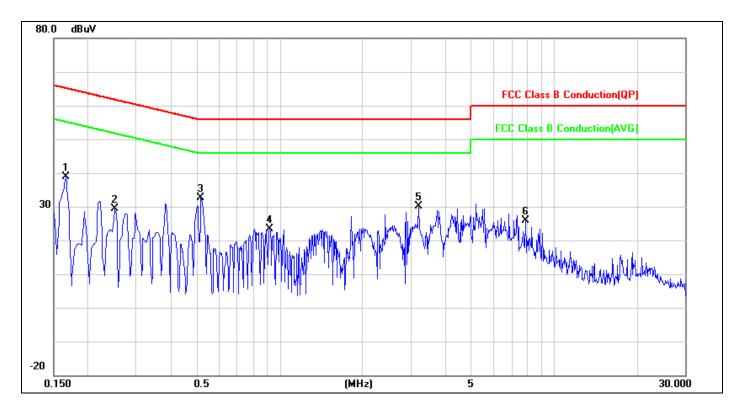
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Description: Line:	Operation N	Date: Temp.(°C)/Hum.(%):	2020/04/29 23(°C)/55%
Test Voltage:	AC 120V/60Hz	Test By:	Neo
Report Num- ber	ER/2020/40013		



		Freq.	Reading	Factor	Measurement	Limit	Over	
No.	Mk.	(MHz)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dB)	Detector
1		0.1660	38.88	0.00	38.88	65.16	-26.28	peak
2		0.2500	29.33	0.01	29.34	61.76	-32.42	peak
3	*	0.5180	32.60	0.01	32.61	56.00	-23.39	peak
4		0.9220	23.47	0.02	23.49	56.00	-32.51	peak
5		3.2100	30.15	0.10	30.25	56.00	-25.75	peak
6		7.8540	25.65	0.24	25.89	60.00	-34.11	peak

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7 DUTY CYCLE OF TEST SIGNAL

Pre-analysis Check: While conducting average power measurement, duty cycle of each mode shall be checked to ensure its duty cycle in order to compensate for the loss due to insufficient ratio of duty cycle. All duty cycle is pre-scanned, and result as obtained below shows only the most representative ones where duty cycle is conducted as the given transmission with given virtual operation that expresses the percentage.

7.1 Measurement Procedure:

- 1. Set span = Zero
- 2. RBW = 8MHz
- 3. VBW = 8MHz,
- 4. Detector = Peak

7.2 Duty Cycle:

	Duty Cycle (%) = Ton / (Ton+Toff)	Duty Factor (dB) =10*log (1/Duty Cycle)	1/T (kHz)	VBW setting (kHz)
802.11b	100.00	0.00	0.00	0.01
802.11g	99.85	0.01	0.18	0.01
802.11n_20	99.82	0.01	0.20	0.01

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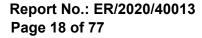
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7.3 Duty Cycle test plots 802.11b 20MHz

n Analyzer - Swept SA	
2.412000000 GHz Avg Type: Voltage TRACE	Frequency
IFGain:Low #Atten: 30 dB or AMKr3 5.1	000 ms Auto Tun
ef 20.00 dBm).47 dB
304	Center Fre 2.41200000 GH
	2.41200000 31
	Start Fre
	2.412000000 GH
	Stop Fre
	2.412000000 GH
20000000 GHz Hz #VBW 8.0 MHz Sweep 20.00 ms (5	pan 0 Hz CF Ste 5001 pts) 8.000000 MH
CL X Y FUNCTION FUNCTION WOTH FUNCTION	Auto Ma
(Δ) 5.000 ms (Δ) -0.47 dB t 1.000 ms 12.97 dBm (Δ) 5.000 ms (Δ) -0.47 dB t 1.000 ms 12.97 dBm	Freq Offse
	Scale Typ
	Log
T	- · · ·

802.11g_20MHz

				Analyzer - Swept SA	
	ALIGN AUTO Avg Type: Voltage	SENSE:INT		50 Ω DC	RL
Type www.www	Avg Type: Voltage	Trig: Free Run	GHZ PNO: Fast	2.412000000	nter Fre
DET P N N N N N		#Atten: 30 dB	IFGain:Low	NFC	
Auto Auto					
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			1.6.6		
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					0
Star					0
2,4120000					
2.41200000					
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					0
Stop			_		
2.41200000					
					~
Span 0 Hz CF				00000 GHz	nter 2.41
veep 10.00 ms (10001 pts) 8.00000	Sweep 10	8.0 MHz	#VBW		s BW 81
Auto				-	
HON WIDTH FUNCTION WALLE	ICTION FUNCTION WIDTH	1.17 dB	5,480 ms (Δ)	(Δ)	MODE THC
		11.17 dBm	2.682 ms	(4)	F 1
Freq		0.27 dB	5.488 ms (Δ)	(Δ)	Δ4 1
		11.17 dBm	2.682 ms		F 1
1					
Scale					
Scale					
Log					
,,					1
STATUS	STATU				

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802.11n_20MHz

Keysight Spectrum Analyzer - Swept SA					
RL RF 50 Q DC	00 GHz		ALIGN AUTO Type: Voltage	05:12:27 PM Apr 17, 2020 TRACE 1 2 3 4 5 TYPE	Frequency
Ref Offset 10.3 dE	IFGain:Low #Atten	ree Run : 30 dB	ΔN	1kr3 5.084 ms -0.08 dE	Auto Tun
				3∆4 من معرفينية	Center Fre
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					Start Fre 2.412000000 GH
0.0					Stop Fre 2.412000000 GH
enter 2.412000000 GHz es BW 8 MHz	#VBW 8.0 Mi			Span 0 Hz 0 ms (10001 pts	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	4.323 ms 12.75	23 dB dBm 08 dB	FUNCTION WIDTH	FUNCTION VALUE	Freq Offse
6 7 8 9					Scale Typ
10 11					Log Li
ia			STATUS		





8 PEAK OUTPUT POWER MEASUREMENT

8.1 Standard Applicable

For systems using digital modulation in the 2400-2483.5 MHz bands, the limit for peak output power is 1Watt.

If the transmitting antenna of directional gain greater than 6dBi are used the peak output power form the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the Antenna exceeds 6dBi.

In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of Antenna exceeds 6dBi.

The antenna gain is not grater than 6 dBi. Therefore, reduction of power is not required.

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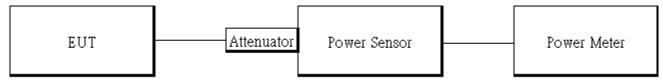


8.2 Measurement Equipment Used

Conducted Emission Test Site							
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.		
Power Meter	Anritsu	ML2496A	1804001	Feb. 20th, 2020	Feb. 19th, 2021		
Power Sensor	Anritsu	MA2411B	1726104	Feb. 20th, 2020	Feb. 19th, 2021		
Power Sensor	Anritsu	MA2411B	1726107	Feb. 20th, 2020	Feb. 19th, 2021		
DC Power Supply	Agilent	E3640A	MY40000811	Dec. 23th, 2019	Dec. 22th, 2020		
DC Block	Mini-Circuits	BLK-18-S+	1	Jan. 2nd, 2020	Jan. 1st, 2021		
Attenuator	Mini-Circuit	BW-S10W2+	2	Jan. 2nd, 2020	Jan. 1st, 2021		

8.3 Test Set-up

Power Meter:



8.4 Measurement Procedure

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter.

Power Meter:

It is used as the auxiliary test equipment to conduct the output power measurement.

4. Record the max. Reading as observed from Spectrum or Power Meter.

* Note: The duty cycle factor is compensated to obtain the maximum value of measurement in average.

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8.5 Measurement Result

802.1	802.11b Ch0							
СН	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit (dBm)	RESULT			
1	2412	1	17.80	30.00	PASS			
6	2437	1	17.64	30.00	PASS			
11	2462	1	17.93	30.00	PASS			
802.1	1b Ch0							
СН	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT			
1	2412	1	15.04	30.00	PASS			
6	2437	1	14.91	30.00	PASS			
11	2462	1	15.19	30.00	PASS			

802.1	1g Ch0				
СН	Freq. (MHz)	Data Rate	Peak Output Power (dBm)		RESULT
1	2412	6	23.51	30.00	PASS
6	2437	6	22.61	30.00	PASS
11	2462	6	23.68	30.00	PASS
802.1	1g Ch0				
СН	Freq. (MHz)	Data Rate			RESULT
1	2412	6	14.89	30.00	PASS
6	2437	6	14.73	30.00	PASS
11	2462	6	15.11	30.00	PASS

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802.11n_HT20M Ch0						
СН	Freq. (MHz)	Data Rate	Peak Output Power (dBm)		RESULT	
1	2412	MCS0	23.74	30.00	PASS	
6	2437	MCS0	22.83	30.00	PASS	
11	2462	MCS0	23.68	30.00	PASS	
802.1	1n_HT20	M Ch0				
СН	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT	
1	2412	MCS0	14.75	30.00	PASS	
6	2437	MCS0	14.77	30.00	PASS	
11	2462	MCS0	15.24	30.00	PASS	

* Note: The duty cycle factor is compensated to obtain the maximum value of measurement in average.

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9 6DB BANDWIDTH MEASUREMENT

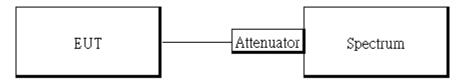
9.1 Standard Applicable

The minimum 6 dB bandwidth shall be at least 500 kHz.

9.2 Measurement Equipment Used

Conducted Emission Test Site								
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.			
TYPE		NUMBER	NUMBER	CAL.				
DC Power Supply	Agilent	E3640A	MY40000811	Dec. 23th, 2019	Dec. 22th, 2020			
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY57120290	Feb. 20th, 2020	Feb. 19th, 2021			
DC Block	Mini-Circuits	BLK-18-S+	1	Jan. 2nd, 2020	Jan. 1st, 2021			
Attenuator	Mini-Circuit	BW-S10W2+	2	Jan. 2nd, 2020	Jan. 1st, 2021			

9.3 Test Set-up



9.4 Measurement Procedure

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 4. For 6dB Bandwidth:

Set the spectrum analyzer as RBW = 100 kHz, VBW = 3*RBW, Span = large enough to capture all products of the modulation process, Detector=peak, Sweep=auto.

5. Mark the peak frequency and –6dB (upper and lower) frequency.

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9.5 6dB Bandwidth

802.11b Ch0

Freq.	6dB BW	Limit	Result
(MHz)	(kHz)	(kHz)	Result
2412	8107	> 500	PASS
2437	8545	> 500	PASS
2462	8600	> 500	PASS

802.11g Ch0

Freq.	6dB BW	Limit	Result
(MHz)	(kHz)	(kHz)	Result
2412	16420	> 500	PASS
2437	16410	> 500	PASS
2462	16380	> 500	PASS

802.11 n HT20 Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	17620	> 500	PASS
2437	17630	> 500	PASS
2462	17590	> 500	PASS

*Refer to next page for plots

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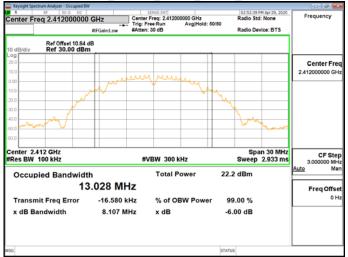
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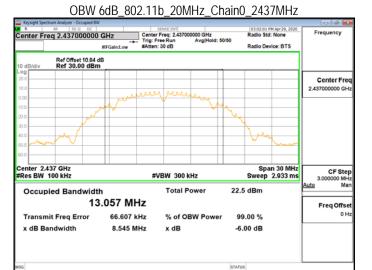
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Report No.: ER/2020/40013 Page 25 of 77

OBW 6dB_802.11b_20MHz_Chain0_2412MHz





] Ø 📕 03:10:54 PM Apr 29, Radio Std: None Center Freq: 2.462000000 GHz Trig: Free Run Avg Hol Frequency enter Freq 2.462000000 GHz Radio Device: BT Ref Offset 10.84 dB Ref 30.00 dBm Center Fre enter 2.462 GHz Res BW 100 kHz Span 30 MH CF Step #VBW 300 kHz Sweep 2.933 ms 3.0000 Occupied Bandwidth Total Power 22.6 dBm 13.153 MHz Freq Offse οн Transmit Freg Error -92.027 kHz % of OBW Power 99.00 % x dB Bandwidth 8.600 MHz x dB -6.00 dB

OBW 6dB_802.11b_20MHz_Chain0_2462MHz

OBW 6dB_802.11g_20MHz_Chain0_2412MHz

rum Analyzer - Occupied BW				
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ndwidth	16.42 MHz	x dB	-6.00 dB	
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OBW 6dB_802.11g_20MHz_Chain0_2437MHz



OBW 6dB_802.11g_20MHz_Chain0_2462MHz



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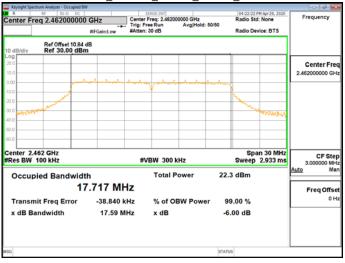
OBW 6dB_802.11n_20MHz_Chain0_2412MHz

	m Analyzer - Occupied BW				
Center Freq 2.412000000 GHz		Trig	sense :nrt ter Freq: 2.412000000 GHz ;: Free Run Avg Hold: t ten: 30 dB	04:05:49 PM Apr 29, Radio Std: None S0/50 Radio Device: BT	Frequency
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x dB Ban	dwidth	17.62 MHz	x dB	-6.00 dB	
SG				STATUS	

OBW 6dB_802.11n_20MHz_Chain0_2437MHz

Keysight Spectrum Analyzer - Occupied BW		serves well		
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enter 2.437 GHz Res BW 100 kHz	#	VBW 300 kHz	Span 30 MH Sweep 2.933 m	
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17	.720 MHz			Freq Offse
Transmit Freq Error	35.483 kHz	% of OBW Power	99.00 %	он
x dB Bandwidth	17.63 MHz	x dB	-6.00 dB	
a			STATUS	

OBW 6dB_802.11n_20MHz_Chain0_2462MHz



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10 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

10.1 Standard Applicable

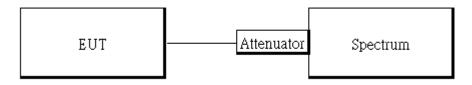
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

10.2 Measurement Equipment Used

Conducted Emission Test Site								
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.			
TYPE		NUMBER	NUMBER	CAL.				
DC Power Supply	Agilent	E3640A	MY40000811	Dec. 23th, 2019	Dec. 22th, 2020			
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY57120290	Feb. 20th, 2020	Feb. 19th, 2021			
DC Block	Mini-Circuits	BLK-18-S+	1	Jan. 2nd, 2020	Jan. 1st, 2021			
Attenuator	Mini-Circuit	BW-S10W2+	2	Jan. 2nd, 2020	Jan. 1st, 2021			

10.3 Test SET-UP



10.4 Measurement Procedure

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Reference Level of Emission Limit:

- 1. Set analyzer center frequency to DTS channel center frequency.
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
- 3. Set the span to 1.5 times the DTS channel bandwidth.
- 4. Set the RBW = 100kHz & VBW = 300 kHz.
- 5. Detector = peak.
- 6. Sweep time = auto couple.
- 7. Trace mode = max hold.
- 8. Allow trace to fully stabilize.
- 9. Use the peak marker function to determine the maximum amplitude level.

Conducted Band Edge:

- 1. To connect Antenna Port of EUT to Spectrum.
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 4. Set start to edge frequency, and stop frequency of spectrum analyzer so as to encompass the spectrum to be examined.
- 5. Set the spectrum analyzer as RBW=100 kHz, VBW=300 kHz, Detector = Peak, Sweep = auto
- 6. Mark the highest reading of the emission as the reference level measurement.
- 7. Set DL as the limit = reading on marker 1 20dBm
- 8. Marker on frequency, 2.3999GHz and 2.4836GHz, and examine shall 100 kHz immediately outside the authorized (2400~2483.5) be attenuated by 20dB at least relative to the maximum emission of power.
- 9. Repeat above procedures until all default test channel (low, middle, and high) was complete.

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Conducted Spurious Emission:

- 1. To connect Antenna Port of EUT to Spectrum
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
- 3. Set RBW = 100 kHz & VBW= 300 kHz, Detector =Peak, Sweep = Auto.
- 4. Allow trace to fully stabilize.
- 5. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
- 6. Repeat above procedures until all default test channel measured were complete.

10.5 Measurement Result

Reference Level of Limit 802.11b mode				
Freq.				
(MHz) (dBm)		(dBm)		
2412 6.51		-13.49		
2437	6.83	-13.17		
2462	6.88	-13.12		

Reference Level of Limit 802.11g mode				
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)		
2412	3.44	-16.56		
2437	3.78	-16.22		
2462	4.29	-15.71		

Reference Level of Limit 802.11n20 mode				
Freq.	PSD	Reference Level of Limit		
(MHz) (dBm)		(dBm)		
2412	3.50	-16.50		
2437	3.65	-16.35		
2462	4.11	-15.89		

Note Cable Loss

10.84 dB

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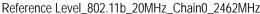


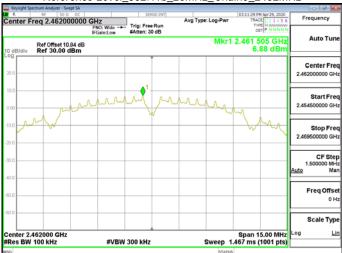
Reference Level_802.11b_20MHz_Chain0_2412MHz



Reference Level_802.11b_20MHz_Chain0_2437MHz







Reference Level_802.11g_20MHz_Chain0_2412MHz



Reference Level_802.11g_20MHz_Chain0_2437MHz



Reference Level_802.11g_20MHz_Chain0_2462MHz



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Reference Level_802.11n_20MHz_Chain0_2412MHz



Reference Level_802.11n_20MHz_Chain0_2437MHz



Reference Level_802.11n_20MHz_Chain0_2462MHz



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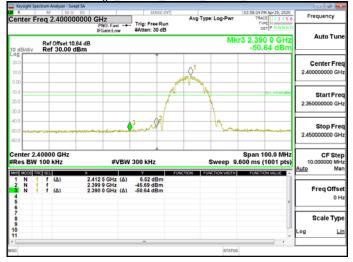
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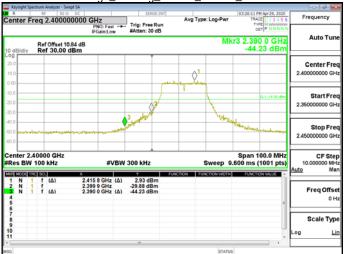
Band Edge_802.11b_20MHz_Chain0_2412MHz

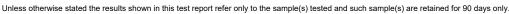












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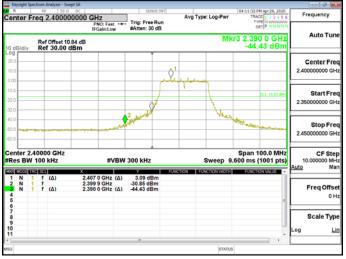
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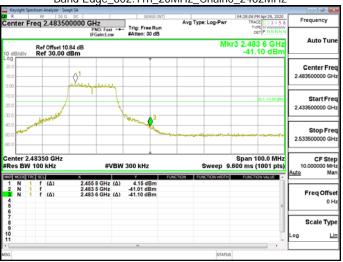
Band Edge_802.11g_20MHz_Chain0_2462MHz



Band Edge_802.11n_20MHz_Chain0_2412MHz

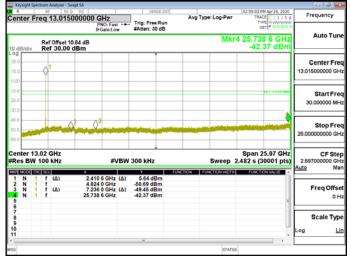


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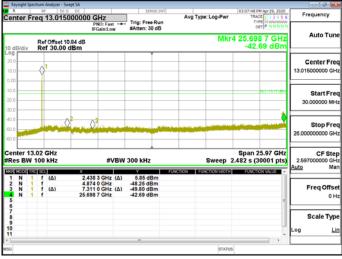




Spurious Emission_802.11b_20MHz_Chain0_2412MHz



Spurious Emission_802.11b_20MHz_Chain0_2437MHz

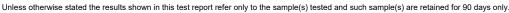


Spurious Emission_802.11b_20MHz_Chain0_2462MHz

 R
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03:17:15 PM Apr 29, 203 Frequency Ave Type: Log-Pwr Auto Tu Mkr4 25.568 0 GHz -42.67 dBm Ref Offset 10.84 dB Ref 30.00 dBm Center Fre Start Fre 30.0000 Stop Fre Span 25.97 GHz Sweep 2.482 s (30001 pts) er 13.02 GH CF Ster 2.5970 Res BW 100 kHz #VBW 300 kH; (Δ) 4.24 dBm -49.52 dBm -51.76 dBm -42.67 dBm NNN 1 f (Δ) (Δ) Freq Offse он Scale Typ



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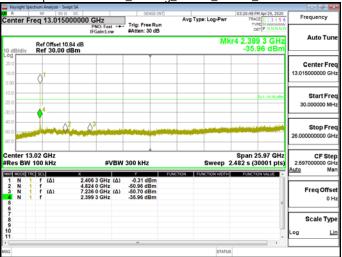
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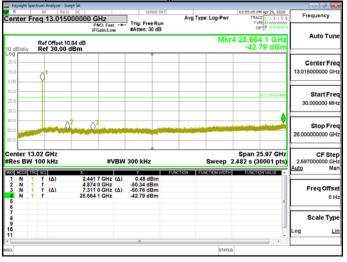
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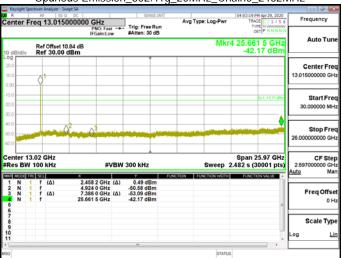
Spurious Emission_802.11g_20MHz_Chain0_2412MHz



Spurious Emission_802.11g_20MHz_Chain0_2437MHz



Spurious Emission_802.11g_20MHz_Chain0_2462MHz





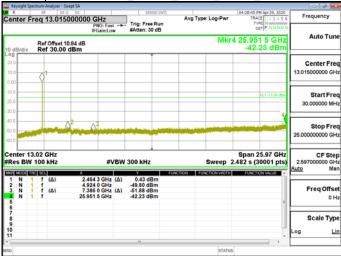
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Spurious Emission_802.11n_20MHz_Chain0_2437MHz

Keysight Sp	ectrum Analyzer - Swe					
Center F	req 13.0150	00000 GHz	Trig: Free Run	Avg Type: Log-Pwr	04:19:45 PM Apr 29, 2020 TRACE 1 2 3 4 5 6 TYPE M WWWWW DET P NNNNN	Frequency
10 dB/div	Ref Offset 10. Ref 30.00 d	IFGain:Low 84 dB IBM	#Atten: 30 dB	Mkr	4 25.276 3 GHz -42.56 dBm	Auto Tun
20.0	01					Center Fre 13.015000000 GH
20.0					0,1 -16.35 dDn	Start Fre 30.000000 MH
40.0 50.0 60.0		0				Stop Fre 26.00000000 GH
Res BW	3.02 GHz 100 kHz	#VB	W 300 kHz		Span 25.97 GHz 2.482 s (30001 pts)	CF Ste 2.597000000 GH Auto Ma
1 N 2 N 3 N 4 N 5	RC SCL 1 f (Δ) 1 f (Δ) 1 f (Δ)	2.434 0 GHz (Δ 4.874 0 GHz 7.311 0 GHz (Δ 25.276 3 GHz) -0.52 dBm -50.41 dBm	FUNCTION WOTH	FUNCTION VALUE	Freq Offse
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Spurious Emission_802.11n_20MHz_Chain0_2462MHz



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11 RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT

11.1 Standard Applicable

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands must also comply with the §15.209 limit as below.

And according to §15.33(a) (1), for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

Frequency (MHz)	Field strength (microvolts/meter)	Distance (meters)	
0.009-0.490	2400/F(kHz)	300	
0.490-1.705	24000/F(kHz)	30	
1.705-30	30	30	
30-88	100	3	
88-216	150	3	
216-960	200	3	
Above 960	500	3	

Note:

- 1. The lower limit shall apply at the transition frequencies.
- 2. Emission level (dB μ V/m) = 20 log Emission level (μ V/m)

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11.2 Measurement Equipment Used:

966 Chamber						
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.	
Horn Antenna	Schwarzbeck	BBHA9170	184	Dec. 25th, 2019	Dec. 24th, 2020	
Horn Antenna	Schwarzbeck	BBHA9120D	D803	Dec. 20th, 2019	Dec. 19th, 2020	
Bi-log Antenna	TESEO	CBL 6112D	35242 & AT-N0555	Jan. 13th, 2020	Jan. 12th, 2021	
Loop Antenna	ETS.LINDGREN	6502	148045	Oct. 15th, 2019	Oct. 14th, 2020	
Spectrum Analyzer	Agilent	E4446A	MY51100003	Oct. 23th, 2019	Oct. 22nd, 2020	
EMI Test Receiver	R&S	ESCI 7	1166.5950.07	Jul. 4th, 2019	Jul. 3rd, 2020	
Pre-Amplifier	EMC Instruments	EMC184045B	980135	Jan. 2nd, 2020	Jan. 1st, 2021	
Pre-Amplifier	EMC Instruments	EMC051825	980152	Jan. 2nd, 2020	Jan. 1st, 2021	
Pre-Amplifier	HP	8447D	2944A09469	Jan. 2nd, 2020	Jan. 1st, 2021	
Attenuator	Mini-Circuit	BW-S10W2+	4	Jan. 2nd, 2020	Jan. 1st, 2021	
Filter 2400-2483.5 MHz	EWT	EWT-14-0166	M1	Jan. 2nd, 2020	Jan. 1st, 2021	
High Pass Filter	WI	WHKX4.0/18G-10S S	22	Jan. 2nd, 2020	Jan. 1st, 2021	
Coaxial Cable	Huber Suhner	succoflex 102	MY2622/2	Jan. 2nd, 2020	Jan. 1st, 2021	
Coaxial Cable	Huber Suhner	succoflex 104A	800086/4a	Jan. 2nd, 2020	Jan. 1st, 2021	

NOTE: N.C.R refers to Not Calibrated Required.

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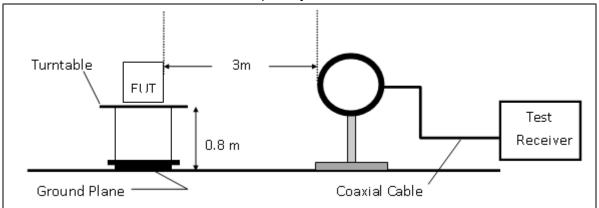
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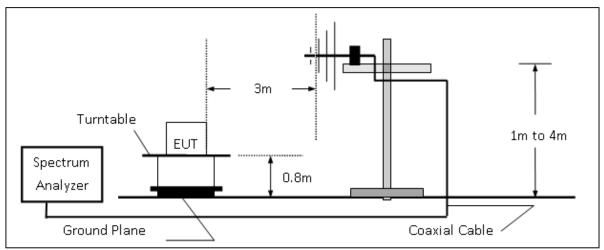


11.3 Test SET-UP

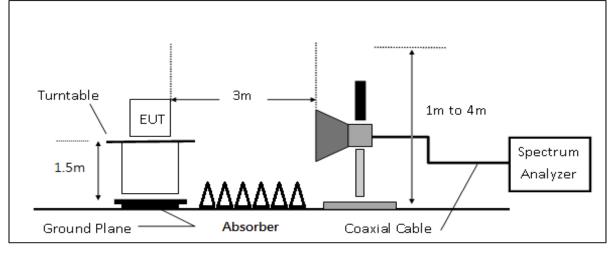
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



(B) Radiated Emission Test Set-Up, Frequency form 30MHz to 1000MHz



(C) Radiated Emission Test Set-UP Frequency Over 1 GHz



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11.4 Measurement Procedure

- 1. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
- 2. The EUT was placed on a turn table with 0.8m for frequency< 1GHz and 1.5m for frequency> 1GHz above ground plane.
- 3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
- 4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
- 5. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.
- 6. Set the spectrum analyzer as RBW=120 kHz and VBW=300 kHz for Peak Detector (PK) and Quasi-peak (QP) at frequency below 1 GHz.
- 7. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Peak Detector at frequency above 1 GHz.
- 8. Set the spectrum analyzer as RBW=1 MHz, VBW=10 Hz (Duty cycle > 98%) or VBW ≥ 1/T (Duty cycle < 98%) for Average Detector at frequency above 1 GHz.
- 9. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- 10. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 11. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. On spectrum, change spectrum mode in linear display mode, and reduce VBW = 10Hz if average reading is measured.
- 12. Repeat above procedures until all default test channel measured were complete.

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11.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where FS = Field Strength

RA = Reading Amplitude AF = Antenna Factor CL = Cable Attenuation Factor (Cable Loss) AG = Amplifier Gain

The limit of the emission level is expressed in dBuV/m, which converts 20*log(uV/m)

Actual FS($dB\mu V/m$) = SPA. Reading level($dB\mu V$) + Factor(dB) Factor(dB) = Antenna Factor($dB\mu V/m$) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

11.6 Test Results of Radiated Spurious Emissions form 9 kHz to 30 MHz

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit per 15.31(o) was not reported.

11.7 Measurement Result

Note:

- 1. Refer to next page spectrum analyzer data chart and tabular data sheets.
- 2. Measurements are completed at peak and average level, the mark of average is the highest emission in restricted bands

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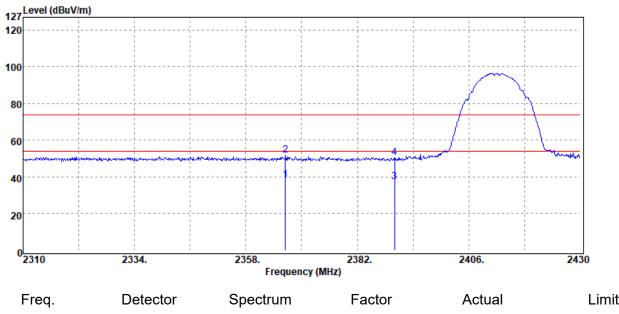
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11.7.1 Radiated Band Edge Measurement Result

Report Number	:ER/2020/40013	Test Date	:2020-04-23
Operation Mode	:802.11b	Temp./Humi.	:22.5/67
Test Frequency	:2412 MHz	Antenna Pol.	:VERTICAL
Test Mode	:Bandedge CH Low	Engineer	:Neo
EUT Pol	:E2 Plane		



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2366.52	Average	30.67	7.53	38.20	54.00	-15.80
2366.52	Peak	44.11	7.53	51.64	74.00	-22.36
2390.00	Average	30.05	7.46	37.51	54.00	-16.49
2390.00	Peak	42.87	7.46	50.33	74.00	-23.67

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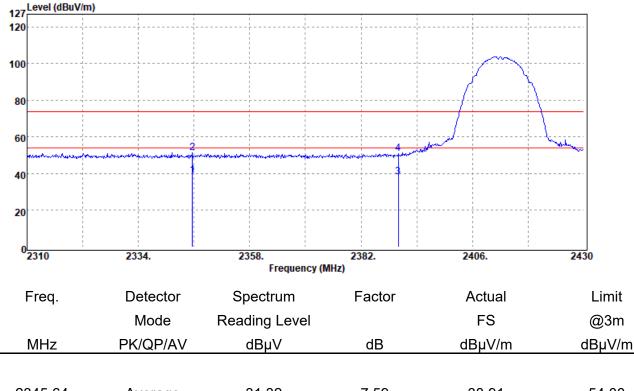
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Margin

dB



Report Number	:ER/2020/40013	Test Date	:2020-04-23
Operation Mode	:802.11b	Temp./Humi.	:22.5/67
Test Frequency	:2412 MHz	Antenna Pol.	:HORIZONTAL
Test Mode	:Bandedge CH Low	Engineer	:Neo
EUT Pol	:E2 Plane		



2345.64	Average	31.32	7.59	38.91	54.00	-15.09
2345.64	Peak	43.71	7.59	51.30	74.00	-22.70
2390.00	Average	30.95	7.46	38.41	54.00	-15.59
2390.00	Peak	43.39	7.46	50.85	74.00	-23.15

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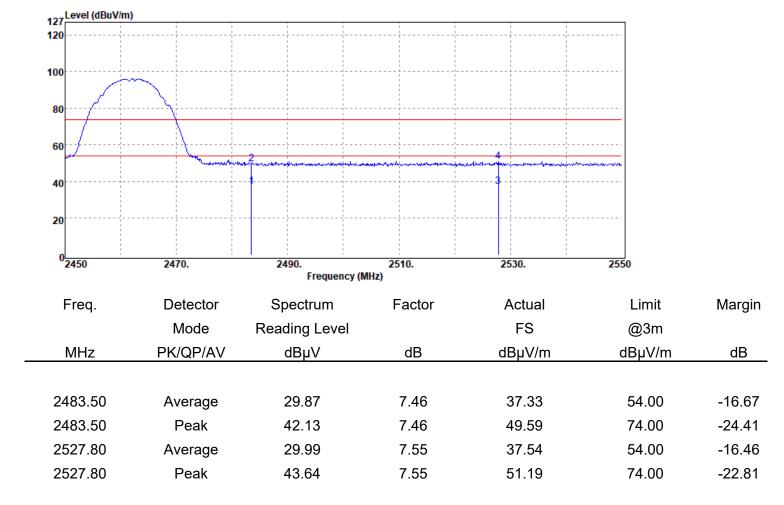
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Report Number	:ER/2020/40013	Test Date	:2020-04-23
Operation Mode	:802.11b	Temp./Humi.	:22.5/67
Test Frequency	:2462 MHz	Antenna Pol.	:VERTICAL
Test Mode	:Bandedge CH High	Engineer	:Neo
EUT Pol	:E2 Plane		



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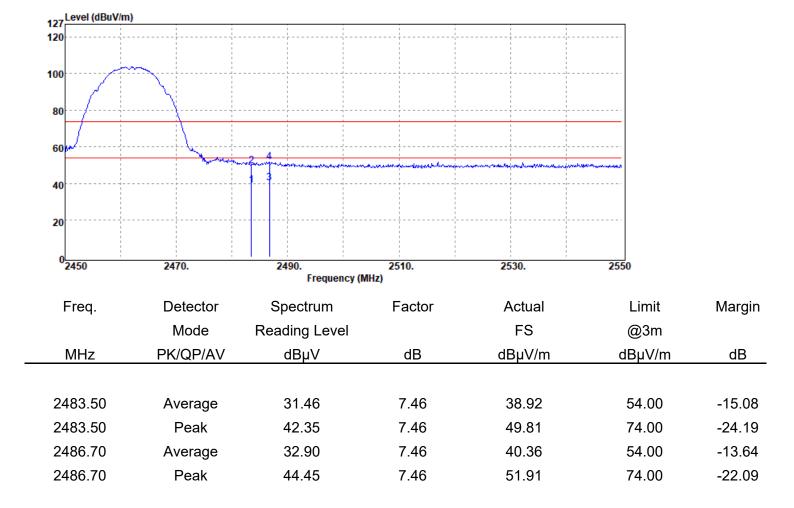
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Report Number	:ER/2020/40013	Test Date	:2020-04-23
Operation Mode	:802.11b	Temp./Humi.	:22.5/67
Test Frequency	:2462 MHz	Antenna Pol.	:HORIZONTAL
Test Mode	:Bandedge CH High	Engineer	:Neo
EUT Pol	:E2 Plane		



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2430

Limit

@3m

dBµV/m

54.00

74.00

Margin

dB

-14.78

-15.99

ANTH

2406.

Actual

FS

dBµV/m

39.22

58.01

2382.

Factor

dB

7.46

7.46

Frequency (MHz)



80

60

40

20

0 2310

Freq.

MHz

2390.00

2390.00

2334.

Detector

Mode

PK/QP/AV

Average

Peak

Report Number	:ER/2020/40013	Test Date	:2020-04-23
Operation Mode	:802.11g	Temp./Humi.	:22.5/67
Test Frequency	:2412 MHz	Antenna Pol.	:VERTICAL
Test Mode	:Bandedge CH Low	Engineer	:Neo
EUT Pol	:E2 Plane		
127 Level (dBuV/m)			
120		· · · · · · · · · · · · · · · · · · ·	
100			
100		a martine marken and	

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2358.

Spectrum

Reading Level

dBµV

31.76

50.55

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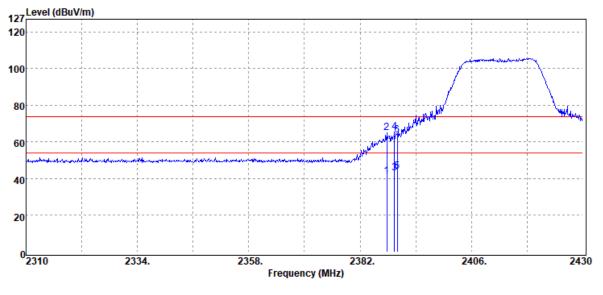
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Report Number	:ER/2020/40013	Test Date	:2020-04-23
Operation Mode	:802.11g	Temp./Humi.	:22.5/67
Test Frequency	:2412 MHz	Antenna Pol.	:HORIZONTAL
Test Mode	:Bandedge CH Low	Engineer	:Neo
EUT Pol	:E2 Plane		



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2387.76	Average	34.06	7.46	41.52	54.00	-12.48
2387.76	Peak	57.36	7.46	64.82	74.00	-9.18
2389.44	Average	35.52	7.46	42.98	54.00	-11.02
2389.44	Peak	58.13	7.46	65.59	74.00	-8.41
2390.00	Average	36.38	7.46	43.84	54.00	-10.16
2390.00	Peak	56.24	7.46	63.70	74.00	-10.30

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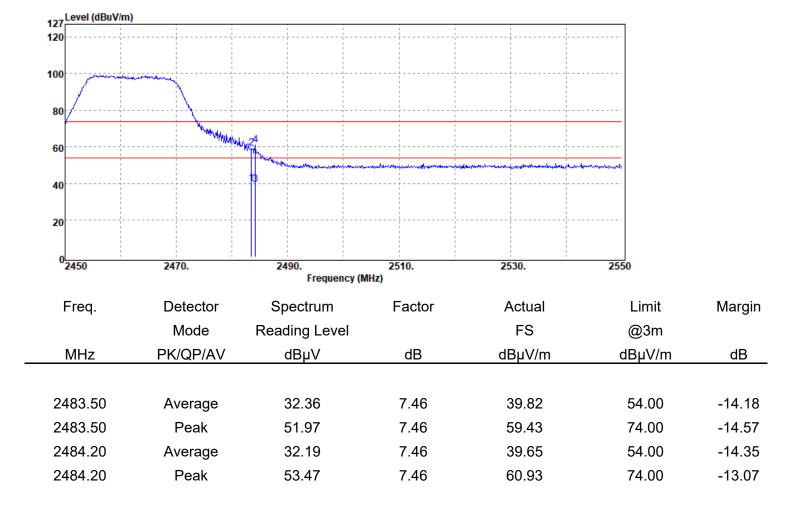
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Report Number	:ER/2020/40013	Test Date	:2020-04-23
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Test Frequency	:2462 MHz	Antenna Pol.	:VERTICAL
Test Mode	:Bandedge CH High	Engineer	:Neo
EUT Pol	:E2 Plane		



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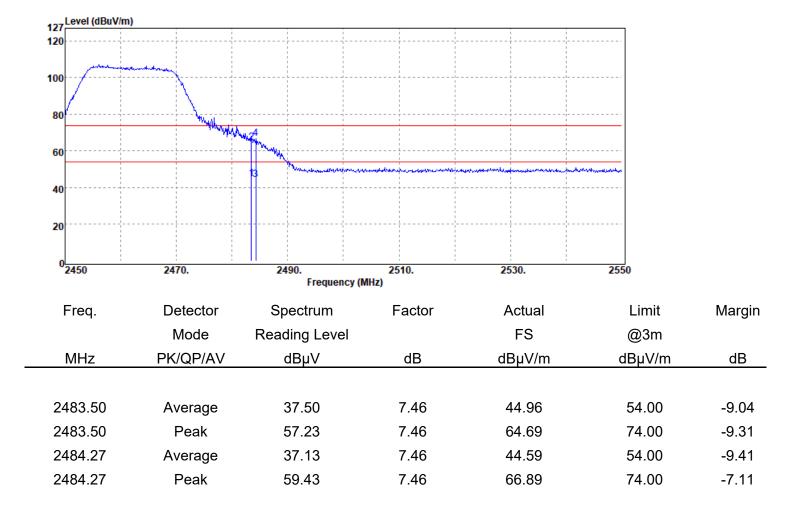
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Report Number	:ER/2020/40013	Test Date	:2020-04-23
Operation Mode	:802.11g	Temp./Humi.	:22.5/67
Test Frequency	:2462 MHz	Antenna Pol.	:HORIZONTAL
Test Mode	:Bandedge CH High	Engineer	:Neo
EUT Pol	:E2 Plane		



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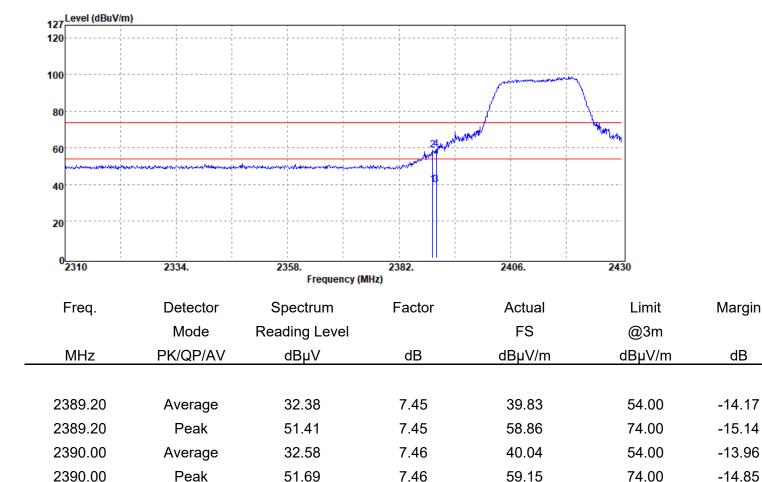
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f (886-2) 2298-0488
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Report Number	:ER/2020/40013	Test Date	:2020-04-23
Operation Mode	:802.11n20	Temp./Humi.	:22.5/67
Test Frequency	:2412 MHz	Antenna Pol.	:VERTICAL
Test Mode	:Bandedge CH Low	Engineer	:Neo
EUT Pol	:E2 Plane		



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54.00

74.00

-8.28

-9.02

Test Date

45.72

64.98



:ER/2020/40013

Report Number

2390.00

2390.00

Operation Mode	:802.11n20			Temp./Humi.	:22.5/67	
Test Frequency	:2412 MHz			Antenna Pol.	:HORIZONTA	L
Test Mode	:Bandedge	CH Low		Engineer	:Neo	
EUT Pol	:E2 Plane					
127 Level (dBuV/m)						
120						
100				mannen		
100				/		
80				I.W	Junger	
			aller and a start and a start and a start a	la.		
60	manus and the states and the second	-	and the state of the			
40						
20						
02310	2334.	2358.	2382.	2406.	2430	
2010	20011	Frequency (N		21001	2100	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB

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38.26

57.52

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Average

Peak

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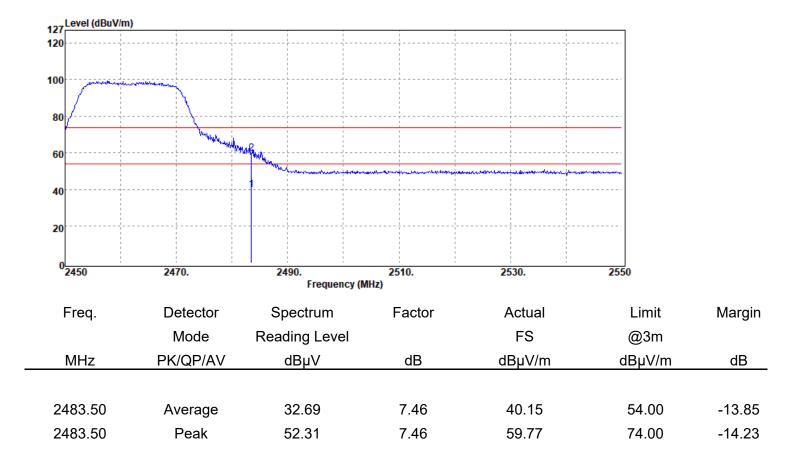
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Report Number	:ER/2020/40013	Test Date	:2020-04-23
Operation Mode	:802.11n20	Temp./Humi.	:22.5/67
Test Frequency	:2462 MHz	Antenna Pol.	:VERTICAL
Test Mode	:Bandedge CH High	Engineer	:Neo
EUT Pol	:E2 Plane		



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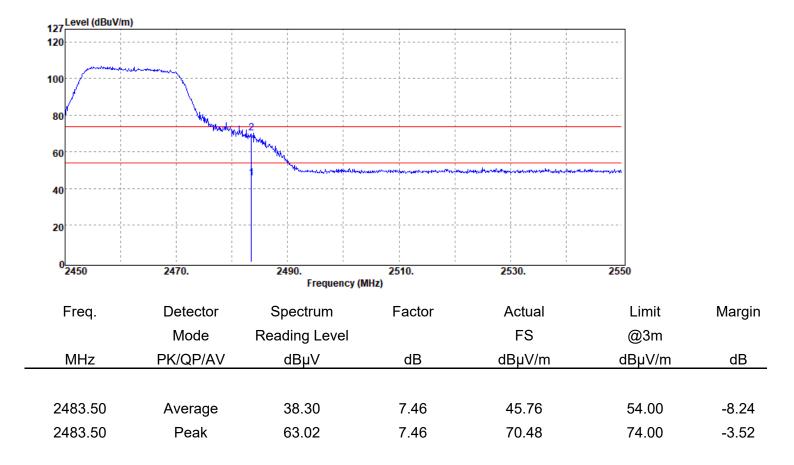
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Report Number	:ER/2020/40013	Test Date	:2020-04-23
Operation Mode	:802.11n20	Temp./Humi.	:22.5/67
Test Frequency	:2462 MHz	Antenna Pol.	:HORIZONTAL
Test Mode	:Bandedge CH High	Engineer	:Neo
EUT Pol	:E2 Plane		



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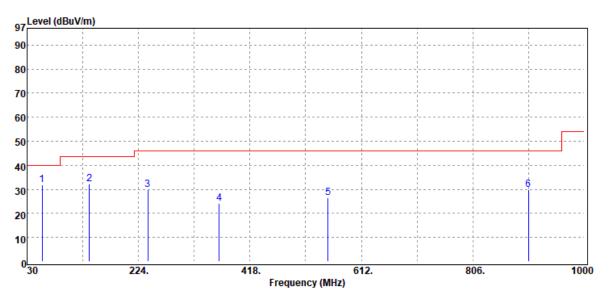
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11.7.2 Below 1GHz Worst-Case Emission:

Report Number	:ER/2020/40013	Test Date	:2020-04-27
Operation Mode	:802.11g	Temp./Humi.	:22.4/70
Test Frequency	:2437 MHz	Antenna Pol.	:VERTICAL
Test Mode	:Tx CH Mid	Engineer	:Neo
EUT Pol	:E2 Plane		



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
56.19	Peak	48.26	-16.52	31.74	40.00	-8.26
138.64	Peak	43.91	-11.58	32.33	43.50	-11.17
240.49	Peak	39.87	-10.12	29.75	46.00	-16.25
364.65	Peak	31.11	-6.80	24.31	46.00	-21.69
553.80	Peak	30.59	-4.19	26.40	46.00	-19.60
903.00	Peak	28.95	1.02	29.97	46.00	-16.03

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Test Date



:ER/2020/40013

Report Number

Operation Mode	:802.11g			Temp./Humi.	:22.4/70	
Test Frequency	:2437 MHz			Antenna Pol.	:HORIZONTAI	_
Test Mode	:Tx CH Mid			Engineer	:Neo	
EUT Pol	:E2 Plane					
97 Level (dBuV/m) 90 80 70 60 50 40 1 30	3	4		6		
20		•••••				
10						
0 <mark></mark>	224.	418.	612.	806.	1000	
	227.	Frequency (M	AHz)	000.	1000	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
FC 40	Deek	50.40	-16.52	33.60	40.00	6.40
56.19 138.64	Peak Peak	50.12 49.75		33.60	40.00 43.50	-6.40
			-11.58			-5.33
238.55	Peak	52.00	-10.28	41.72	46.00	-4.28
367.56	Peak	38.79	-6.85	31.94	46.00	-14.06
508.21	Peak	30.85	-4.72	26.13	46.00	-19.87
875.84	Peak	29.52	0.49	30.01	46.00	-15.99

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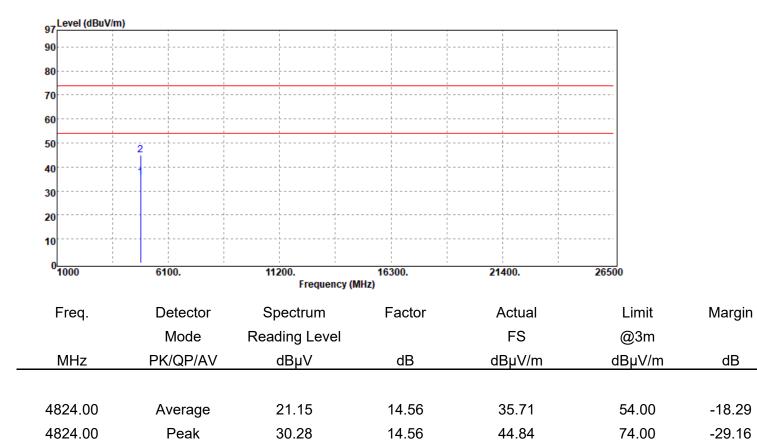
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11.7.3 Above 1GHz Emission:

Report Number	:ER/2020/40013	Test Date	:2020-04-23
Operation Mode	:802.11b	Temp./Humi.	:22.5/67
Test Frequency	:2412 MHz	Antenna Pol.	:VERTICAL
Test Mode	:Tx CH Low	Engineer	:Neo
EUT Pol	:E2 Plane		



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www.sgs.com.tw
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Test Date



:ER/2020/40013

Report Number

-	ion Mode equency ode	:802.11b :2412 MHz :Tx CH Low			Temp./Humi. Antenna Pol. Engineer	:22.5/67 :HORIZONTA :Neo	L
EUT P	ol	:E2 Plane			-		
97 <mark>L0</mark>	evel (dBuV/m)				: :		
90							
80							
70							
60							
50	2						
40							
30							
20							
10							
0_10	000	6100.	11200. Frequency	16300. (MHz)	21400.	26500	
F	req.	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
N	ЛНz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
482	24.00	Average	21.33	14.56	35.89	54.00	-18.11
48	24.00	Peak	31.04	14.56	45.60	74.00	-28.40

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Test Date



:ER/2020/40013

Report Number

Test Fr	tion Mode requency	:802.11b :2437 MHz			Temp./Humi Antenna Pol	. :VERTICAL	
Test M		:Tx CH Mid			Engineer	:Neo	
EUT P	ol	:E2 Plane					
97	evel (dBuV/m)						
90							
80							
70		· · · · · · · · · · · · · · · · · · ·					
60		· · · · · · · · · · · · · · · · · · ·					
50							
40	2	L					
	1						
30							
20							
10							
0 <u> </u> 1	000	6100.	11200. Frequency	16300. (MHz)	21400.	26500	
F	req.	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
N	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
48	74.00	Average	19.37	14.85	34.22	54.00	-19.78
48	74.00	Peak	30.41	14.85	45.26	74.00	-28.74

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t (886-2) 2299-3279

f (886-2) 2298-0488

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:2020-04-23

Test Date



:ER/2020/40013

Report Number

-		:802.11b :2437 MHz :Tx CH Mid :E2 Plane			Temp./Humi. Antenna Pol. Engineer	:22.5/67 :HORIZONTA :Neo	L
97 <mark> </mark>	Level (dBuV/m)	i i	i		i		
90							
80		· · · · · · · · · · · · · · · · · · ·					
70							
60		·····					
50	2	· · · · · · · · · · · · · · · · · · ·					
40		·····					
30		·····					
20							
10							
0	1000	6100.	11200. Frequency (16300. (MHz)	21400.	26500	
F	Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
	MHz I	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
48	374.00	Average	20.96	14.85	35.81	54.00	-18.19
48	374.00	Peak	29.64	14.85	44.49	74.00	-29.51

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t (886-2) 2299-3279

Test Date



:ER/2020/40013

Report Number

	tion Mode requency lode	:802.11b :2462 MHz :Tx CH High	-		Temp./Humi. Antenna Pol. Engineer	:22.5/67 :VERTICAL :Neo	
EUT P	Pol	:E2 Plane					
97[Level (dBuV/m)	i	i i	i i	i i		
90 -							
80							
70							
60		LJ I I I I I I I I					
50	2						
40							
30							
20 10	 						
1	1000	6100.	11200. Frequency	16300. (MHz)	21400.	26500	
F	Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode F	Reading Level		FS	@3m	
I	MHz I	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
49	024.00	Average	19.58	14.87	34.45	54.00	-19.55
49	24.00	Peak	30.08	14.87	44.95	74.00	-29.05

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Test Date



:ER/2020/40013

Report Number

-		:802.11b :2462 MHz :Tx CH High :E2 Plane			Temp./Humi. Antenna Pol. Engineer	:22.5/67 :HORIZONTAL :Neo	
97 90 80 70 60 50 40 30 20 10	Level (dBuV/m)						
	1000	6100.	11200. Frequency (I	16300. ИНz)	21400.	26500	
	Freq.		Spectrum Reading Level	Factor	Actual FS	@3m	Margin
	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
	924.00 924.00	Average Peak	20.36 30.33	14.87 14.87	35.23 45.20		-18.77 -28.80
+3	27.00	reak	00.00	14.07	70.20	17.00	20.00

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Test Date



:ER/2020/40013

Report Number

-		:802.11g :2412 MHz :Tx CH Low :E2 Plane			Temp./Humi. Antenna Pol. Engineer		
97 I	Level (dBuV/m)						
90							
80			·				
70			· · · · · · · · · · · · · · · · · · ·				
60		· · · · · · · · · · · · · · · · · · ·					
50	2		· · · · · · · · · · · · · · · · · · ·				
40							
30							
20							
10							
0	1000	6100.	11200. Frequenc	16300. y (MHz)	21400.	26500	
F	Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
48	324.00	Average	19.35	14.56	33.91	54.00	-20.09
48	324.00	Peak	30.28	14.56	44.84	74.00	-29.16

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:2020-04-23

Test Date



:ER/2020/40013

Report Number

-		:802.11g :2412 MHz :Tx CH Low :E2 Plane			Temp./Humi. Antenna Pol. Engineer	:22.5/67 :HORIZONTA :Neo	L
97	Level (dBuV/m)						
90							
80							
70 60							
50		2					
40							
30							
20							
10							
0	1000	6100.	11200. Frequency (16300. MHz)	21400.	26500	
I	Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
		_					
	324.00	Average	19.12	14.56	33.68	54.00	-20.32
48	324.00	Peak	30.28	14.56	44.84	74.00	-29.16

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Test Date



:ER/2020/40013

Report Number

Operation M Test Freque Test Mode EUT Pol	-	Hz Mid		Temp./Hu Antenna Engineer	Pol. :VERTICA	L
97 Level (df 90 80 70 70 50 50 40 30 20 10	BuV/m)					
0	6100.	11200. Free	16300. juency (MHz)	21400.	26500	
Freq.	Detector	Spectrur	n Factor	Actual	Limit	Margin
	Mode	Reading Le	evel	FS	@3m	
MHz	PK/QP/A	V dBµV	dB	dBµV/m	dBµV/m	dB
4874.00 4874.00	8	19.49 30.40	14.85 14.85	34.34 45.25	54.00 74.00	-19.66 -28.75
-01-1.00		00.40	17.00	70.20	74.00	20.10

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Test Date



:ER/2020/40013

Report Number

-		:802.11g :2437 MHz :Tx CH Mid :E2 Plane			Temp./Humi. Antenna Pol. Engineer	:22.5/67 :HORIZONTAL :Neo	
97 <mark> </mark>	Level (dBuV/m)						
90							
80							
70							
60							
50	2						
40							
30							
20							
10							
0	1000	6100.	11200. Frequency	16300. (MHz)	21400.	26500	
F	Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
I	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
48	374.00	Average	19.30	14.85	34.15	54.00	-19.85
48	374.00	Peak	30.67	14.85	45.52	74.00	-28.48

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Test Date



:ER/2020/40013

Report Number

Operation Mode Test Frequency Test Mode	:802.11g :2462 MHz :Tx CH Higl	n		Temp./Humi. Antenna Pol. Engineer	:22.5/67 :VERTICAL :Neo	
EUT Pol	:E2 Plane					
97 Level (dBuV/m) 90						
80						
70						
60 50						
40	2					
30						
20						
10						
0 <mark></mark>	6100.	11200. Frequency	16300. (MHz)	21400.	26500	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4924.00	Average	19.36	14.87	34.23	54.00	-19.77
4924.00	Peak	30.42	14.87	45.29	74.00	-28.71

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Test Date



:ER/2020/40013

Report Number

-		:802.11g :2462 MHz :Tx CH High :E2 Plane			Temp./Humi. Antenna Pol. Engineer	:22.5/67 :HORIZONTA :Neo	L
97 90	.evel (dBuV/m)						
80 [.] 70							
70 60							
50 ⁻ 40 ⁻	2						
30							
20 10							
0	1000	6100.	11200. Frequency	16300. (MHz)	21400.	26500	
F	req.	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
<u> </u>	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
49	24.00	Average	19.23	14.87	34.10	54.00	-19.90
49	24.00	Peak	30.04	14.87	44.91	74.00	-29.09

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Report Number		:ER/2020/4	:ER/2020/40013			:2020-04-23	
Opera	tion Mode	:802.11n20			Temp./Humi.	:22.5/67	
Test F	requency	:2412 MHz			Antenna Pol.	:VERTICAL	
Test M	lode	:Tx CH Low	1		Engineer	:Neo	
EUT F	Pol	:E2 Plane					
97	Level (dBuV/m)						
90							
80							
70							
60							
50							
40							
30							
20			· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·		
10					· · · · · · · · · · · · · · · · · · ·		
0	1000	6100.	11200.	16300.	21400.	26500	
	1000	0100.	Frequency	(MHz)	21400.	26500	
I	Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
48	324.00	Average	19.28	14.56	33.84	54.00	-20.16
48	324.00	Peak	30.26	14.56	44.82	74.00	-29.18

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Test Date



:ER/2020/40013

Report Number

Operation Mode	e :802.11n20			Temp./Humi.	:22.5/67		
Test Frequency	2412 MHz			Antenna Pol.	:HORIZONTAL :Neo		
Test Mode	:Tx CH Low	,		Engineer			
EUT Pol	:E2 Plane						
97	n)						
90							
80							
70							
60							
50	2						
40							
30							
20							
10							
0 <mark></mark>	6100.	11200.	16300.	21400.	26500		
		Frequency (I					
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin	
	Mode	Reading Level		FS	@3m		
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
4824.00	Average	19.61	14.56	34.17	54.00	-19.83	
4824.00	Peak	31.29	14.56	45.85	74.00	-28.15	

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Test Date



:ER/2020/40013

Report Number

Opera	tion Mode	:802.11n20			Temp./Humi.	:22.5/67	
Test F	requency	:2437 MHz			Antenna Pol.	:VERTICAL	
Test N	lode	:Tx CH Mid			Engineer	:Neo	
EUT F	Pol	:E2 Plane					
07	Level (dBuV/m)						
90							
80							
70	· · · · · · · · · · · · · · · · · · ·						
60							
50		2					
40							
30							
20							
10							
0	1000	6100.	11200. Frequency (I	16300. MHz)	21400.	26500	
I	Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
48	374.00	Average	19.07	14.85	33.92	54.00	-20.08
48	374.00	Peak	29.81	14.85	44.66	74.00	-29.34

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Test Date



:ER/2020/40013

Report Number

Operation Mode	:802.11n20			Temp./Humi.	:22.5/67	
Test Frequency	:2437 MHz			Antenna Pol.	:HORIZONTA	L
Test Mode	:Tx CH Mid			Engineer	:Neo	
EUT Pol	:E2 Plane					
97 						
90						
80						
70			· · · · · · · · · · · · · · · · · · ·			
60						
50	2					
40			· · · · · · · · · · · · · · · · · · ·			
30						
20						
10						
0 <mark></mark>	6100.	11200.	16300.	21400.	26500	
		Frequency (N				
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4874.00	Average	19.12	14.85	33.97	54.00	-20.03
4874.00	Peak	30.47	14.85	45.32	74.00	-28.68

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Test Date



:ER/2020/40013

Report Number

Operation Mode Test Frequency Test Mode EUT Pol	:802.11n20 :2462 MHz :Tx CH Higl :E2 Plane	n		Temp./Humi. Antenna Pol. Engineer	:22.5/67 :VERTICAL :Neo	
97 Level (dBuV/m)					
90						
80						
70						
60						
50	2					
40						
30		· · · · · · · · · · · · · · · · · · ·				
20						
10						
0 ^L 1000	6100.	11200. Frequency (16300. MHz)	21400.	26500	
Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4924.00	Average	19.28	14.87	34.15	54.00	-19.85
4924.00	Peak	29.67	14.87	44.54	74.00	-29.46

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:2020-04-23

Test Date



:ER/2020/40013

Report Number

Opera	tion Mode	:802.11n20			Temp./Humi.	:22.5/67	
Test F	requency	:2462 MHz			Antenna Pol.	:HORIZONTA	L
Test N	lode	:Tx CH High			Engineer	:Neo	
EUT F	Pol	:E2 Plane					
07	Level (dBuV/m)						
90							
80							
70				· · · · · · · · · · · · · · · · · · ·			
60							
50							
40	2						
30							
20							
10							
U	1000	6100.	11200. Frequency	16300. (MHz)	21400.	26500	
I	Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
49	924.00	Average	19.16	14.87	34.03	54.00	-19.97
49	924.00	Peak	30.26	14.87	45.13	74.00	-28.87

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12 POWER SPECTRAL DENSITY

12.1 Standard Applicable

Per Part 15.247 (e)

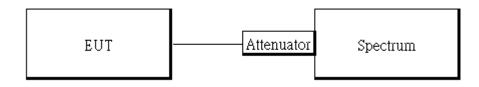
The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

12.2 Measurement Equipment Used

Conducted Emission Test Site						
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.	
TYPE		NUMBER	NUMBER	CAL.		
DC Power Supply	Agilent	E3640A	MY40000811	Dec. 23th, 2019	Dec. 22th, 2020	
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY57120290	Feb. 20th, 2020	Feb. 19th, 2021	
DC Block	Mini-Circuits	BLK-18-S+	1	Jan. 2nd, 2020	Jan. 1st, 2021	
Attenuator	Mini-Circuit	BW-S10W2+	2	Jan. 2nd, 2020	Jan. 1st, 2021	

12.3 Test Set-up



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12.4 Measurement Procedure

- 1. Set analyzer center frequency to DTS channel center frequency.
- 2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
- 3. Set the span to 1.5 times the DTS channel bandwidth.
- 4. Set the RBW = 3 kHz & VBW = 10 kHz.
- 5. For defining Restricted Band Edge Limit: Set the RBW = 100kHz & VBW = 300 kHz
- 6. Detector = peak.
- 7. Sweep time = auto couple.
- 8. Trace mode = max hold.
- 9. Allow trace to fully stabilize.
- 10. Use the peak marker function to determine the maximum amplitude level.

12.5 As per FCC KDB 662911 D01

Unequal antenna gains, with equal transmit powers. For antenna gains given by G1, G2, ..., GN dBi.

(i) If transmit signals are correlated, then Directional gain

= 10 log[(10^{G1/20} + 10^{G2/20} + ... + 10^{GN/20})²/N_{ANT}] dBi

[Note the "20"s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.].

The antenna gain is not grater than 6 dBi. Therefore, reduction of power is not required.

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12.6 Power spectral density

	POWER DENSITY 802.11b					
Freq.	PSD	Offset	Limit	Result		
(MHz)	(dBm/3kHz)		(dBm/3kHz)			
2412	-7.21	10.84	8.00	PASS		
2437	-7.49	10.84	8.00	PASS		
2462	-7.56	10.84	8.00	PASS		

POWER DENSITY 802.11g					
Freq.	PSD	Offset	Limit	Result	
(MHz)	(dBm/3kHz)	Ulisei	(dBm/3kHz)		
2412	-10.53	10.84	8.00	PASS	
2437	-9.90	10.84	8.00	PASS	
2462	-10.43	10.84	8.00	PASS	

POWER DENSITY 802.11n HT20					
Freq.	PSD	Offset	Limit	Result	
(MHz)	(dBm/3kHz)	Ulisel	(dBm/3kHz)		
2412	-10.77	10.84	8.00	PASS	
2437	-10.56	10.84	8.00	PASS	
2462	-10.41	10.84	8.00	PASS	

Note

Cable Loss 10.84 dB

*Refer to next page for plots

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Power Density_802.11b_20MHz_Chain0_2412MHz

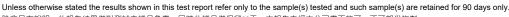


Power Density_802.11b_20MHz_Chain0_2437MHz



Power Density_802.11b_20MHz_Chain0_2462MHz





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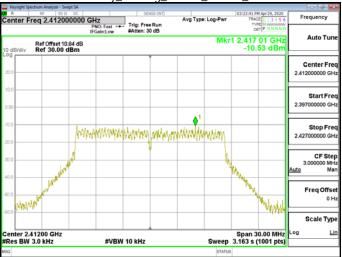
台灣檢驗科技股份有限公司 t (886-2) 2299-3279

f (886-2) 2298-0488

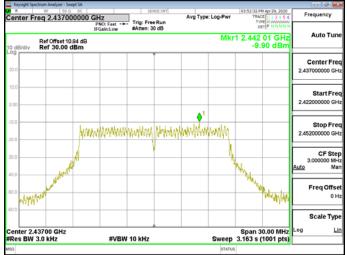
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Power Density_802.11g_20MHz_Chain0_2412MHz



Power Density_802.11g_20MHz_Chain0_2437MHz

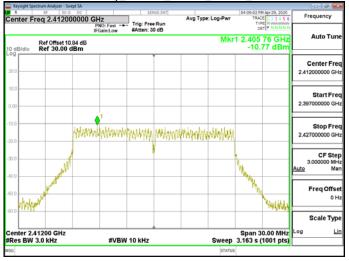


Power Density_802.11g_20MHz_Chain0_2462MHz





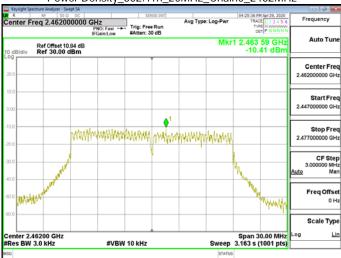
Power Density_802.11n_20MHz_Chain0_2412MHz



Power Density_802.11n_20MHz_Chain0_2437MHz



Power Density_802.11n_20MHz_Chain0_2462MHz



Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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13 ANTENNA REQUIREMENT

13.1 Standard Applicable

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device.

If the transmitting antenna is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi.

13.2 Antenna Connected Construction

The antenna is designed as permanently attached and no consideration of replacement. Please see EUT photo for details.

~ End of Report ~

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