

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C AND INDUSTRY CANADA RSS 247 REQUIREMENT

OF

Applicant: Montblanc-Simplo GmbH.
 Hellgrundweg 100 22525 Hamburg Germany
Product Name: Montblanc SUMMIT
Brand Name: Montblanc
Model No.: S2T18
Model Difference: N/A
FCC ID: 2AENP-S2T18
IC: 20163-S2T18
Report Number: ER/2018/50067
FCC Rule Part: §15.247, Cat: DTS
IC Rule Part: RSS-247 issue 2 Feb 2017
Issue Date: Jun. 15, 2018
Date of Test: May 19, 2018 ~ May 29, 2018
Date of EUT Received: May 19, 2018

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.

Tested By:

Louis Chen

Louis Chen / Engineer

Approved By:

Jim Chang

Jim Chang / Manager



Testing Laboratory
0513

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t (886-2) 2299-3279

f (886-2) 2298-0488

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Revision History

Report Number	Revision	Description	Effected Page	Issue Date	Revised By
ER/2018/50067	Rev.00	Initial creation of document	All	Jun. 15, 2018	Tiffany Kao

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1 GENERAL INFORMATION

1.1 Product description

General:

Product Name:	Montblanc SUMMIT	
Brand Name:	Montblanc	
Model No.:	S2T18	
Model difference:	N/A	
Hardware Version:	1000	
Software Version:	N/A	
USB Cable:	Model No.: K45 + E56 Cable, Supplier: LUCENT	
Cradle:	Model No.: 104CD, Supplier: Montblanc	
Power Supply:	3.8Vdc from Rechargeable Li-ion Battery or 5Vdc from USB port	
	Battery:	Model No.: APP00278, Supplier: APACK TECHNOLOGY CO LTD

WLAN 2.4GHz:

Wi-Fi	Frequency Range	Channels	Rated Power in dBm (Peak)	Rated Power in dBm (EIRP)	Type of Emission	Modulation Technology
802.11b	2412-2462	11	17.93	8.85	13M2G1D	DSSS,
802.11g			19.44	3.70	17M2D1D	OFDM
802.11n HT20			19.54	3.82	18M1D1D	
Antenna Designation:	Loop Antenna, Antenna Gain: -6.13 dBi					
Modulation type:	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM					
Transition 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_20MHz: 6.5 – 144.4Mbps					

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1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247

FCC KDB 558074 D01 DTS Meas. Guidance v04

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

RSS-247 issue 2 Feb. 2017

RSS-Gen. issue 5 Apr. 2018

ANSI C63.10:2013

Note: All test items have been performed and record as per the above standards.

1.3 Test Facility

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

FCC Registration Number and Designation are: 509634 / TW0001

Canada Registration Number: 4620A

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 placed on a turn table which is 0.8 m above ground plane. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz. The CISPR Quasi-Peak and Average detector mode is employed according to §15.207 & RSS-Gen §8.8. The two LISNs provide 50 ohm/ 50uH 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 Radiated Emissions

The EUT is 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

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.

Note:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor. Following shows an offset computation example with cable loss and attenuator.

Offset:

= RF cable loss (dB)+ attenuation factor(dB) dB =11 (dB)

2.5 Configuration of Tested System

Fig. 2-1 Radiated Emission Configuration



Fig.2-3 Conducted Emission (Antenna Port) Configuration

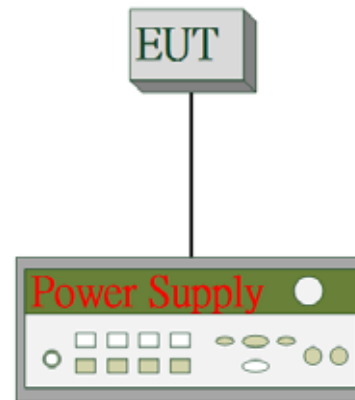


Fig. 2-2 Conducted Emission (AC Power Line) Configuration



Table 2-1 Equipment Used in Tested System

Item	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.	Notebook	Lenovo	L440	R9-007LAZ	Shielded	Unshielded
3.	DC Power Supply	Agilent	E3634A	MY53180030	N/A	Unshielded

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3 SUMMARY OF TEST RESULTS

FCC Rules	IC Rules	Description Of Test	Result
§15.207(a)	RSS-Gen §8.8	AC Power Line Conducted Emission	Compliant
§15.247(b) (3)	RSS-247 §5.4(4)	Peak Output Power	Compliant
§15.247(a)(2)	RSS-247 §5.2 (1) RSS-Gen §6.6	6dB & 99% Emission Bandwidth	Compliant
§15.247(d)	RSS-247 §5.5	Conducted Band Edge and Spurious Emission	Compliant
§15.247(d)	RSS-247 §5.5	Radiated Band Edge and Spurious Emission	Compliant
§15.247(e)	RSS-247 §5.2(2)	Power Spectral Density	Compliant
§15.203 §15.247(b)	RSS- Gen §6.8	Antenna Requirement	Compliant

4 DESCRIPTION OF TEST MODES

4.1 Operated in 2400 ~ 2483.5MHz Band

11 channels are provided for 802.11b, 802.11g and 802.11n_HT20

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

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4.2 The Worst Test Modes and Channel Details

1. The EUT has been tested under operating condition.
2. Test 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.

RADIATED EMISSION TEST:

RADIATED EMISSION TEST (BELOW 1 GHz)					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11g	1 to 11	6	OFDM	6	Main

RADIATED EMISSION TEST (ABOVE 1 GHz)					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11b	1 to 11	1, 6, 11	DSSS	1	Main
802.11g	1 to 11	1, 6, 11	OFDM	6	Main
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	MCS 0	Main

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 H position was reported.

ANTENNA PORT CONDUCTED MEASUREMENT:

CONDUCTED TEST					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11b	1 to 11	1, 6, 11	DSSS	11	Main
802.11g	1 to 11	1, 6, 11	OFDM	54	Main
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	MCS 0	Main

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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 Edge	+/- 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: +/-2.87dB
	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB

Measurement uncertainty (Polarization : Horizontal)	9kHz-30MHz: +/-2.87dB
	30MHz - 167MHz: +/- 4.22dB
	167MHz -500MHz: +/- 3.44dB
	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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6 CONDUCTED EMISSION TEST

6.1 Standard Applicable

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

Frequency range MHz	Limits dB(μV)	
	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 TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESC17	100760	06/06/2017	06/05/2018
Coaxial Cables	N/A	WK CE Cable	N/A	01/02/2018	01/01/2019
Notebook	DELL	E5400	3704625136	N/A	N/A
LISN	SCHWARZ-BECK	NSLK 8127	8127-649	05/18/2018	05/17/2019

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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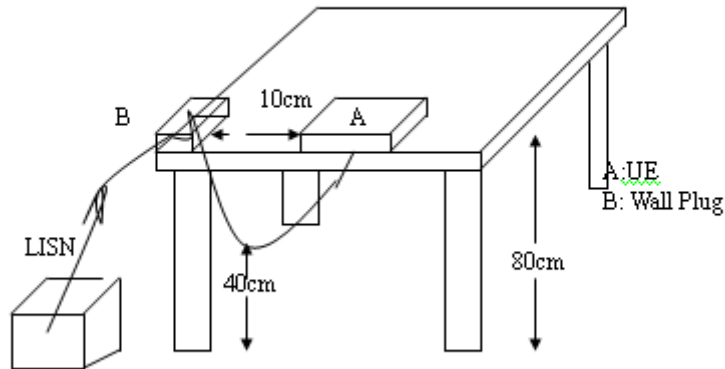
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6.4 Test SET-UP (Block Diagram of Configuration)



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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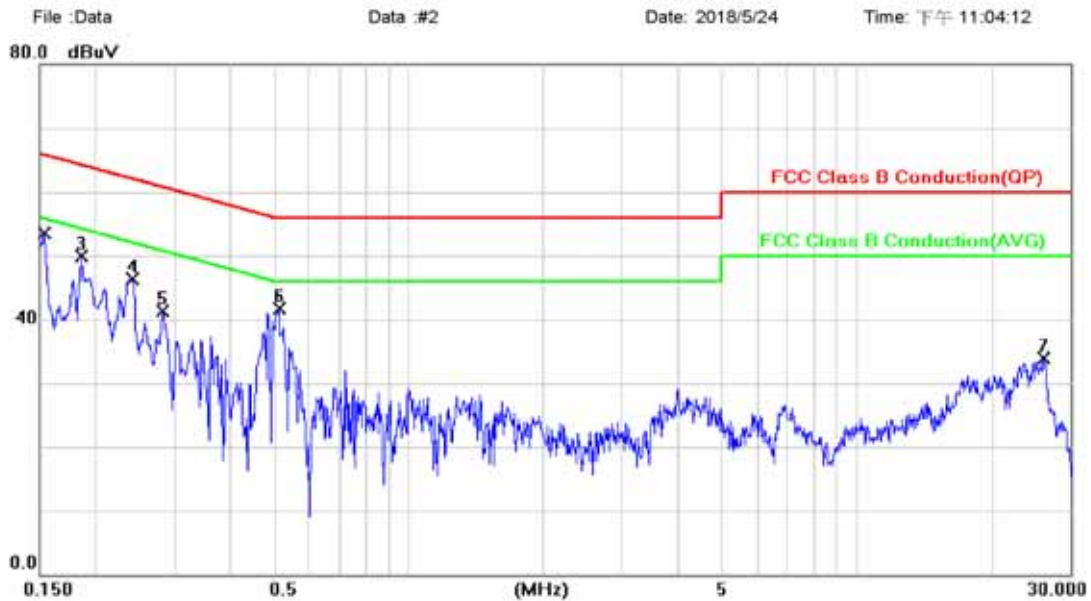
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Operation Mode:	operation mode	Test By:	Louis
-----------------	----------------	----------	-------

Site Conduction Room	Phase: L1	Temperature: 20 °C
Limit: FCC Class B Conduction(QP)	Power: AC 120V/60Hz	Humidity: 58 %
Mode: Operation		
Note:		

Conducted Emission



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1	*	0.1540	57.00	0.07	57.07	65.78	-8.71	QP	
2		0.1540	42.30	0.07	42.37	55.78	-13.41	AVG	
3		0.1860	49.87	0.07	49.94	64.21	-14.27	peak	
4		0.2420	46.25	0.07	46.32	62.03	-15.71	peak	
5		0.2820	41.27	0.07	41.34	60.76	-19.42	peak	
6		0.5140	41.57	0.08	41.65	56.00	-14.35	peak	
7		26.2540	33.29	0.60	33.89	60.00	-26.11	peak	

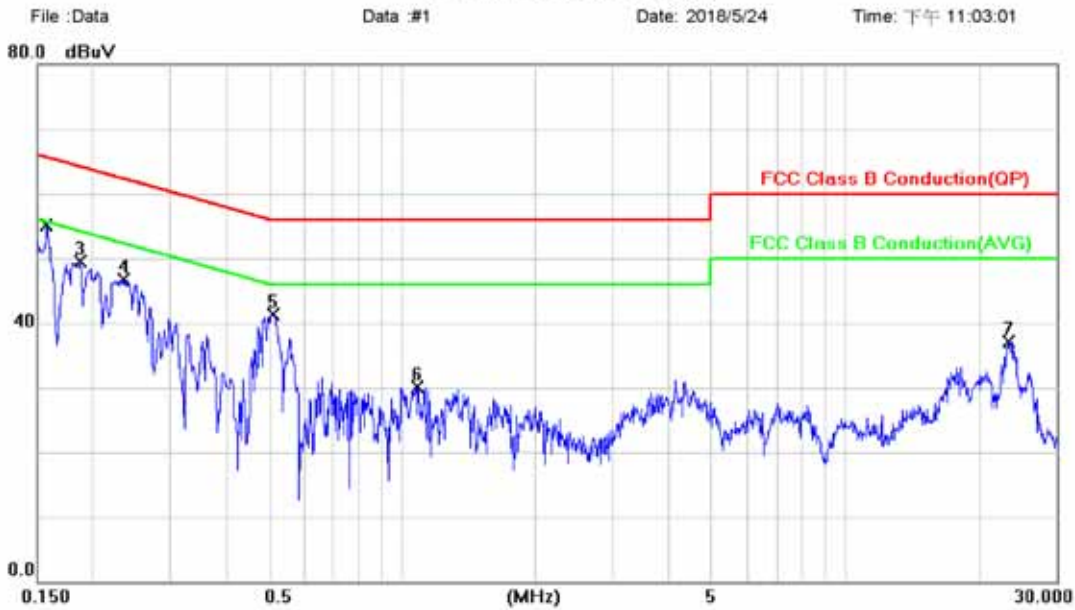
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Site Conduction Room	Phase: N	Temperature: 20 ℃
Limit: FCC Class B Conduction(QP)	Power: AC 120V/60Hz	Humidity: 58 %
Mode: Operation		
Note:		

Conducted Emission



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1	*	0.1580	53.10	0.07	53.17	65.57	-12.40	QP	
2		0.1580	38.00	0.07	38.07	55.57	-17.50	AVG	
3		0.1874	49.38	0.07	49.45	64.15	-14.70	peak	
4		0.2353	46.54	0.07	46.61	62.26	-15.65	peak	
5		0.5100	41.23	0.08	41.31	56.00	-14.69	peak	
6		1.0780	29.97	0.09	30.06	56.00	-25.94	peak	
7		23.3980	36.52	0.55	37.07	60.00	-22.93	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.

Formula:

$$\text{Duty Cycle} = \text{Ton} / (\text{Ton} + \text{Toff})$$

Measurement Procedure:

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

Duty Cycle:

	Duty Cycle (%)	Duty Factor (dB)	1/T (kHz)	VBW setting (kHz)
802.11b	97.75	0.10	0.12	1.00
802.11g	87.24	0.59	0.73	1.00
802.11n_20	86.46	0.63	0.78	1.00

$$b = 97.75\%, g = 87.24\%, n_ht_20 = 86.46\%$$

$$\text{Duty Cycle Factor: } 10 * \log(1/0.9775) = 0.1$$

$$\text{Duty Cycle Factor: } 10 * \log(1/0.8724) = 0.59$$

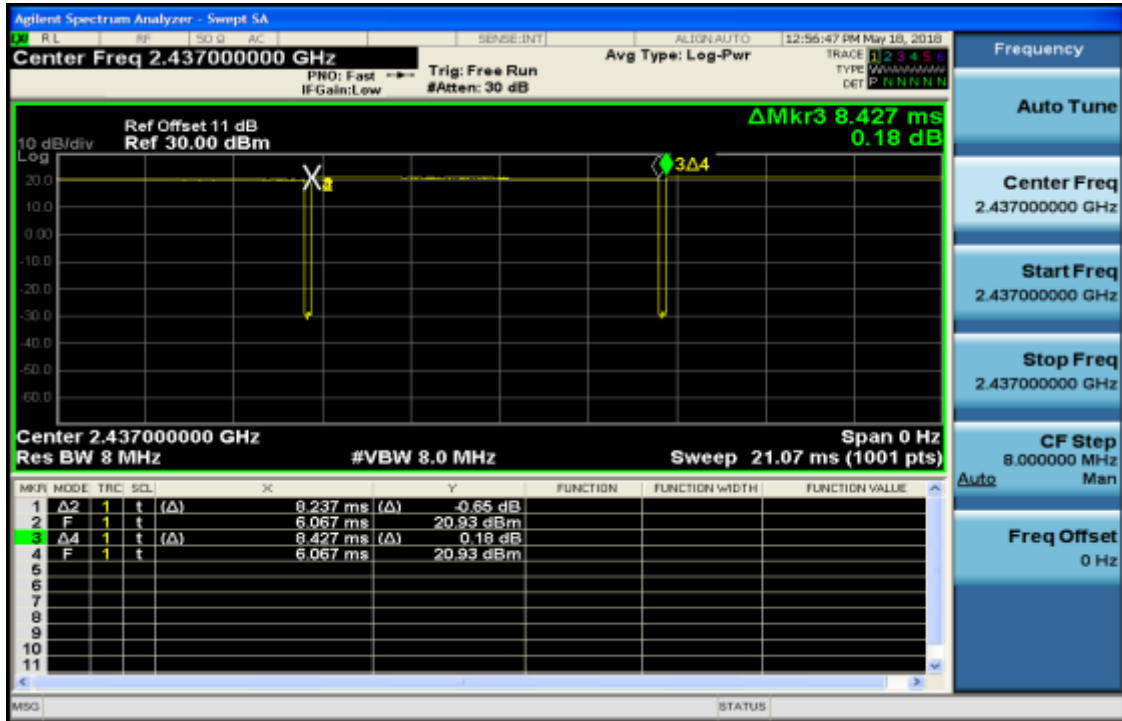
$$\text{Duty Cycle Factor: } 10 * \log(1/0.8646) = 0.63$$

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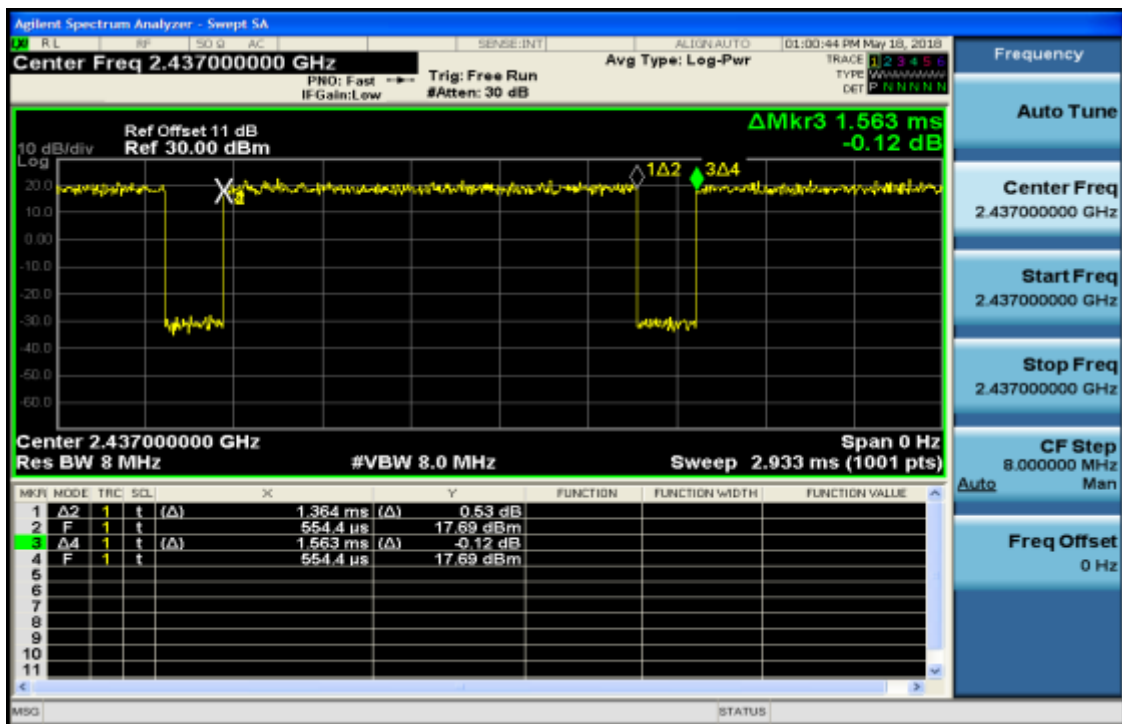
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7.1 DUTY CYCLE TEST SIGNAL Measurement Result 802.11 b



802.11 g

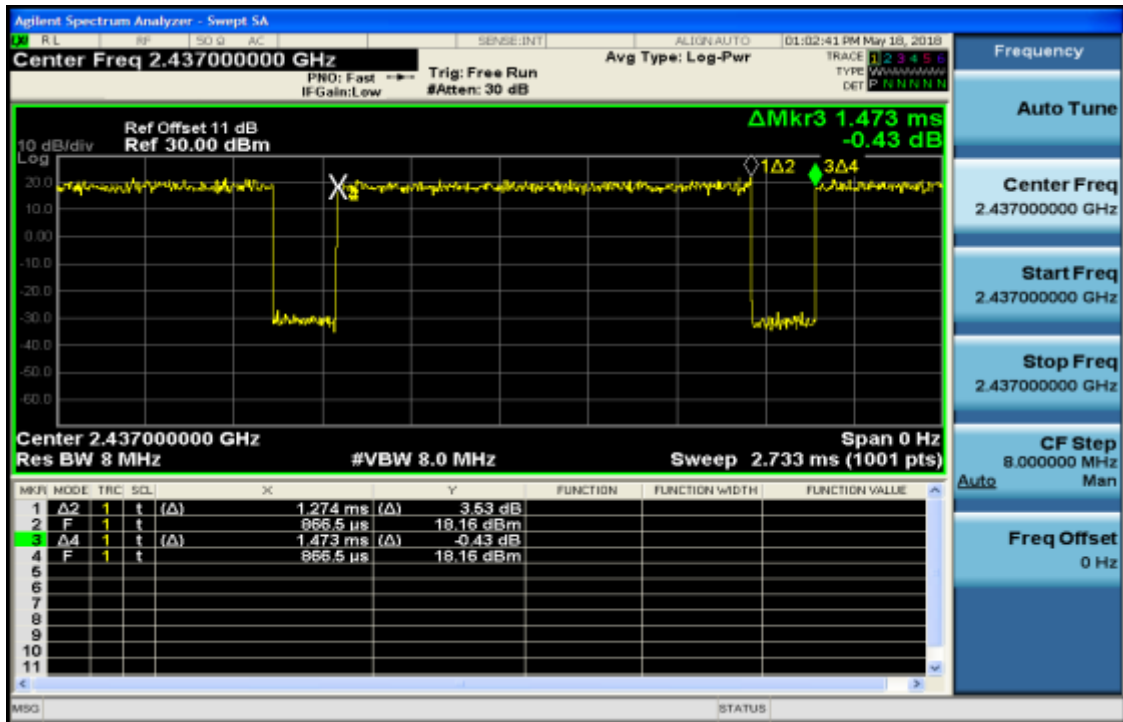


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802.11 n_20 MHz



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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.

Per RSS-247 §5.4(4)

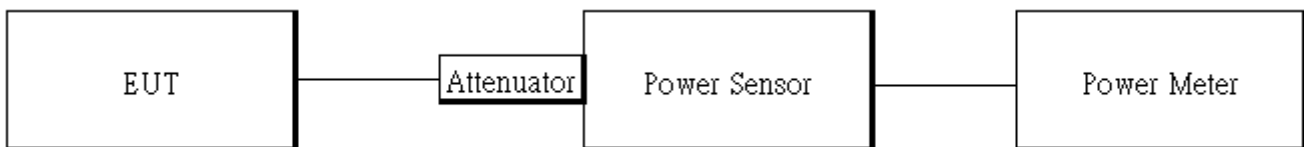
For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. Except as provided in Section 5.4(5), the e.i.r.p. shall not exceed 4 W.

8.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Meter	Anritsu	ML2496A	1242004	2017/10/16	2018/10/15
DC Power Supply	Anritsu	E3640A	MY52410006	2017/11/28	2018/11/27
EXA Spectrum Analyzer	Agilent	N9010A	MY50420195	2018/05/03	2019/05/02
DC Power Supply	Anritsu	E3640A	MY52410006	2017/11/28	2018/11/27

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.

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8.5 Measurement Result

802.11b Main					
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit	RESULT
1	2412	1	17.87	1 Watt = 30.00 dBm	PASS
6	2437	1	17.93	1 Watt = 30.00 dBm	PASS
11	2462	1	17.14	1 Watt = 30.00 dBm	PASS
802.11b Main					
CH	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Limit	RESULT
1	2412	1	14.98	1 Watt = 30.00 dBm	PASS
6	2437	1	14.95	1 Watt = 30.00 dBm	PASS
11	2462	1	14.57	1 Watt = 30.00 dBm	PASS
802.11g Main					
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit	RESULT
1	2412	6	18.88	1 Watt = 30.00 dBm	PASS
6	2437	6	19.04	1 Watt = 30.00 dBm	PASS
11	2462	6	19.44	1 Watt = 30.00 dBm	PASS
802.11g Main					
CH	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Limit	RESULT
1	2412	6	9.75	1 Watt = 30.00 dBm	PASS
6	2437	6	9.68	1 Watt = 30.00 dBm	PASS
11	2462	6	9.83	1 Watt = 30.00 dBm	PASS

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802.11n_HT20M Main					
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit	RESULT
1	2412	MCS0	19.09	1 Watt = 30.00 dBm	PASS
6	2437	MCS0	19.11	1 Watt = 30.00 dBm	PASS
11	2462	MCS0	19.54	1 Watt = 30.00 dBm	PASS
802.11n_HT20M Main					
CH	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Limit	RESULT
1	2412	MCS0	9.67	1 Watt = 30.00 dBm	PASS
6	2437	MCS0	9.75	1 Watt = 30.00 dBm	PASS
11	2462	MCS0	9.95	1 Watt = 30.00 dBm	PASS

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

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EIRP

802.11b Main								
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit		RESULT
1	2412	1	14.98	-6.13	8.85	4W=	36 dBm	PASS
6	2437	1	14.95	-6.13	8.82	4W=	36 dBm	PASS
11	2462	1	14.57	-6.13	8.44	4W=	36 dBm	PASS

802.11g Main								
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit		RESULT
1	2412	6	9.75	-6.13	3.62	4W=	36 dBm	PASS
6	2437	6	9.68	-6.13	3.55	4W=	36 dBm	PASS
11	2462	6	9.83	-6.13	3.70	4W=	36 dBm	PASS

802.11n_HT20M Main								
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit		RESULT
1	2412	MCS0	9.67	-6.13	3.54	4W=	36 dBm	PASS
6	2437	MCS0	9.75	-6.13	3.62	4W=	36 dBm	PASS
11	2462	MCS0	9.95	-6.13	3.82	4W=	36 dBm	PASS

* **Note:** EIRP = Average Power + Gain

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9 6DB & 99% BANDWIDTH MEASUREMENT

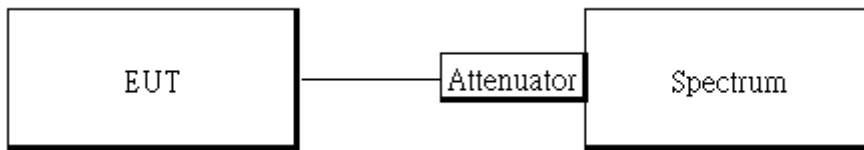
9.1 Standard Applicable

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

9.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Meter	Anritsu	ML2496A	1242004	2017/10/16	2018/10/15
DC Power Supply	Anritsu	E3640A	MY52410006	2017/11/28	2018/11/27
EXA Spectrum Analyzer	Agilent	N9010A	MY50420195	2018/05/03	2019/05/02
DC Power Supply	Anritsu	E3640A	MY52410006	2017/11/28	2018/11/27

9.3 Test Set-up



9.4 Measurement Procedure

- Place the EUT on the table and set it in transmitting mode.
- The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
- Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- For 6dB Bandwidth:
Set the spectrum analyzer as RBW = 100 kHz, VBW = 3*RBW, Span = 30M/50MHz, Detector=peak, Sweep=auto.
- Mark the peak frequency and -6dB (upper and lower) frequency.
- For 99% Bandwidth:
Set the spectrum analyzer as RBW=1%, VBW = 3*RBW, Span = 30M/50MHz, Detector=Sample, Sweep=auto.
- Turn on the 99% bandwidth function, max reading.
- Repeat above procedures until all frequency of interest measured was complete.

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9.5 Measurement Result

6dB Bandwidth

802.11b Main

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	8564	> 500	PASS
2437	8096	> 500	PASS
2462	8099	> 500	PASS

802.11g Main

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	16511	> 500	PASS
2437	16437	> 500	PASS
2462	16439	> 500	PASS

802.11_n_HT20 Main

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	17642	> 500	PASS
2437	17649	> 500	PASS
2462	17634	> 500	PASS

99% Bandwidth

802.11b Main		802.11g Main		802.11n_HT20M Main	
Freq. (MHz)	99% BW (MHz)	Freq. (MHz)	99% BW (MHz)	Freq. (MHz)	99% BW (MHz)
2412	13.151	2412	17.075	2412	18.112
2437	13.081	2437	17.194	2437	18.108
2462	13.055	2462	17.075	2462	18.113

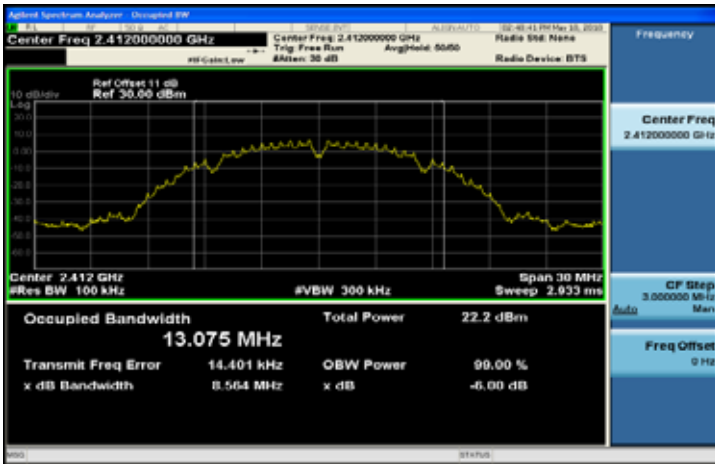
**Refer to next page for plots*

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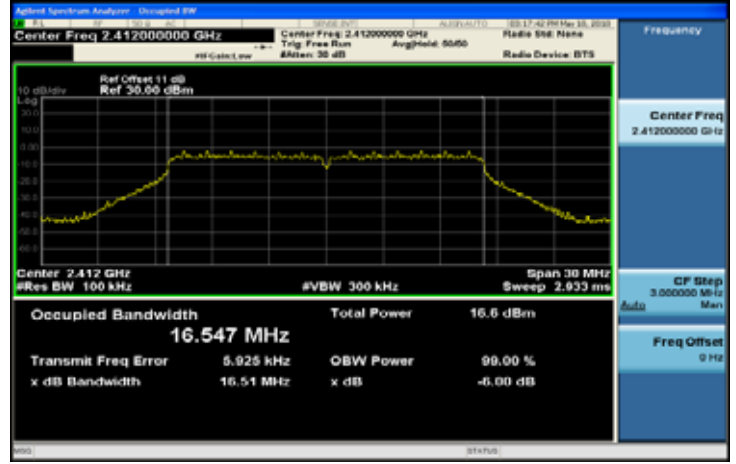
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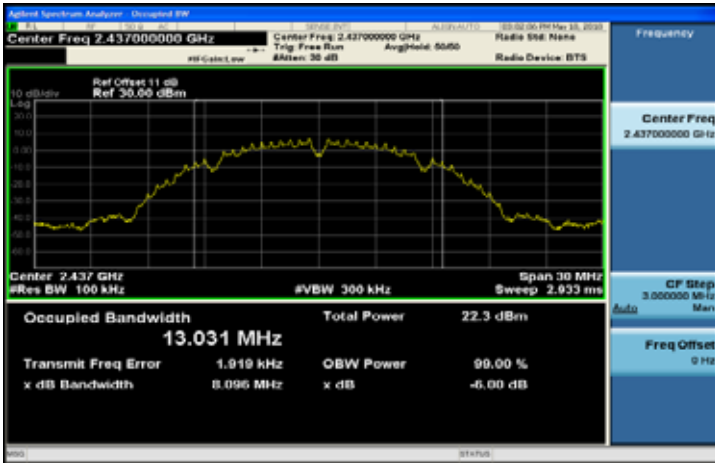
802.11b (Main)
6dB Band Width Test Data CH-Low



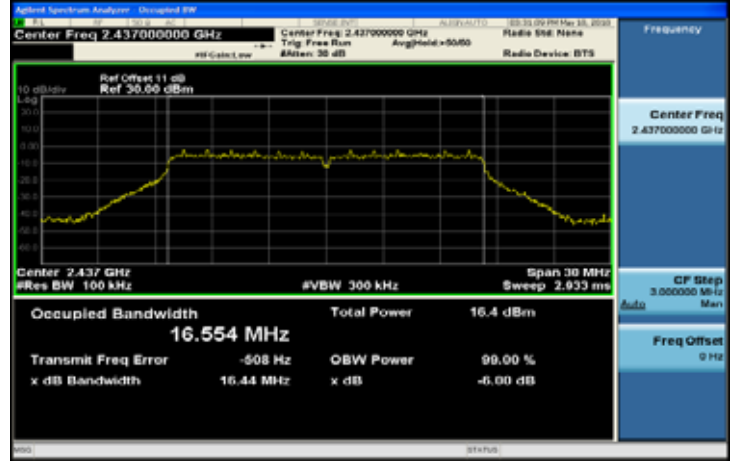
802.11g (Main)
6dB Band Width Test Data CH-Low



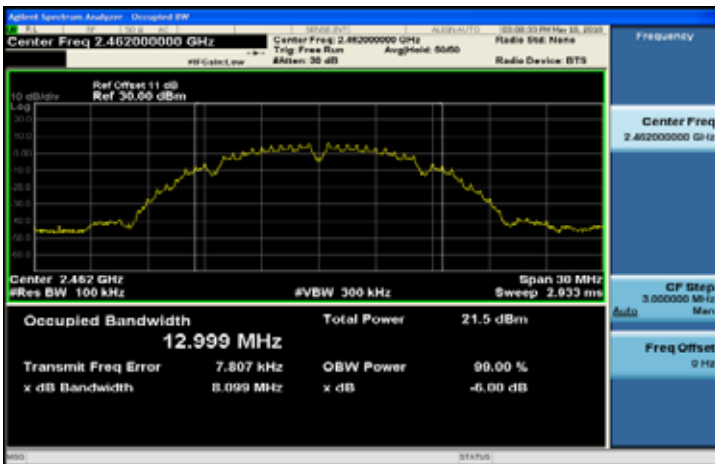
6dB Band Width Test Data CH-Mid



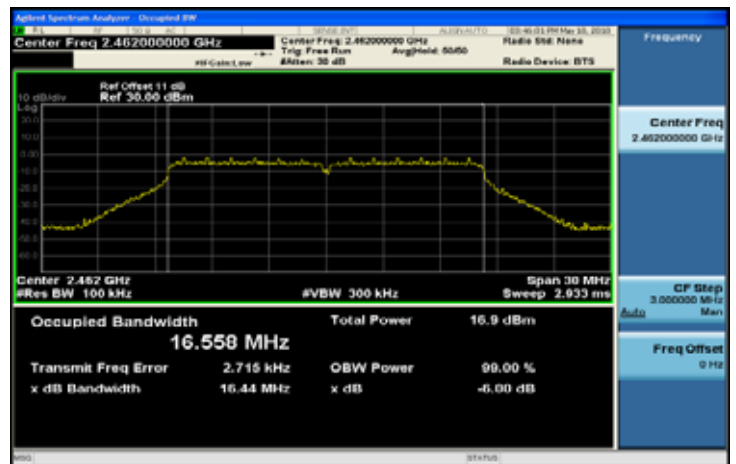
6dB Band Width Test Data CH-Mid



6dB Band Width Test Data CH-High



6dB Band Width Test Data CH-High



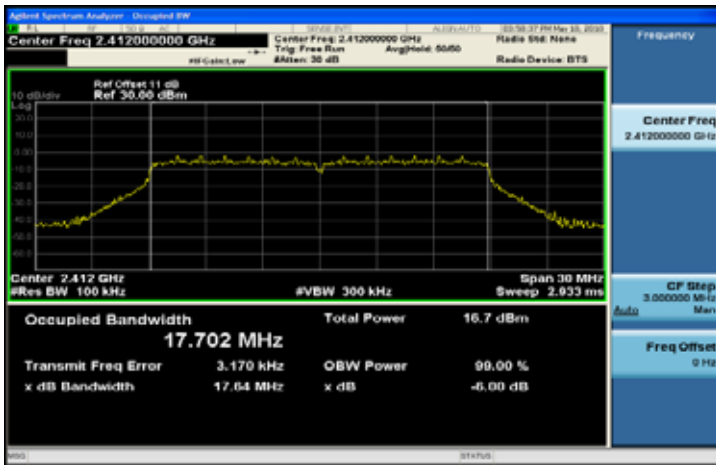
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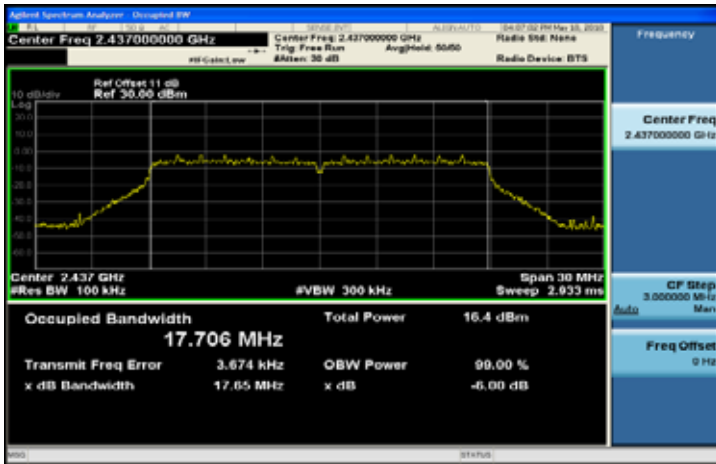
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802.11n_20M (Main)

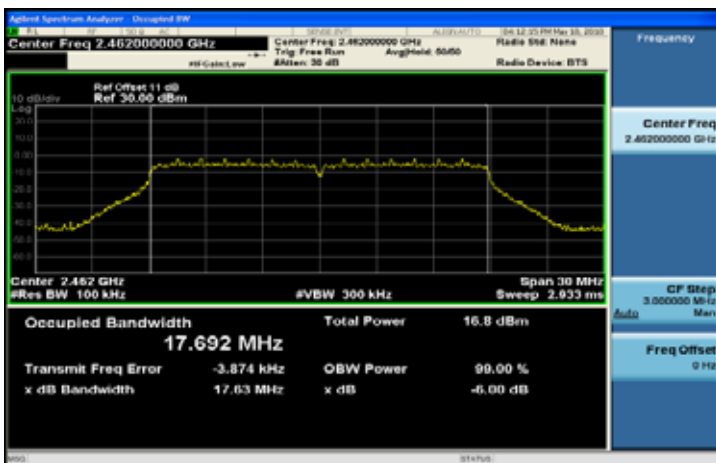
6dB Band Width Test Data CH-Low



6dB Band Width Test Data CH-Mid



6dB Band Width Test Data CH-High



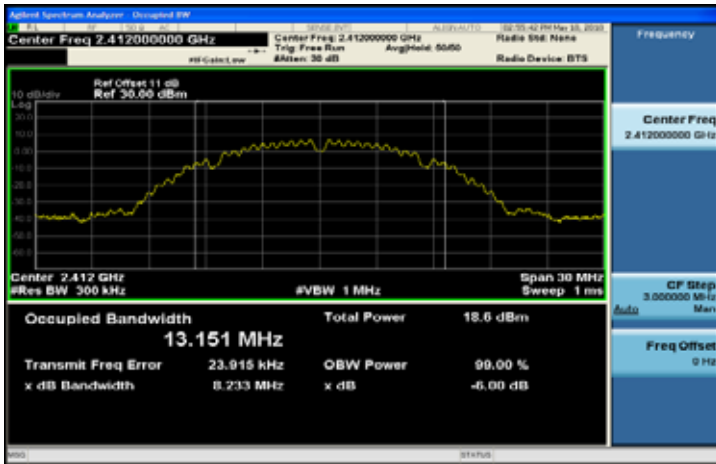
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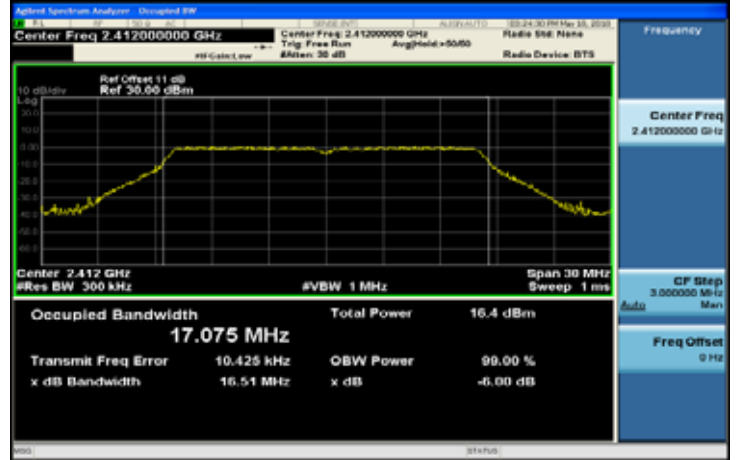
802.11b (Main)

99% Band Width Test Data CH-Low

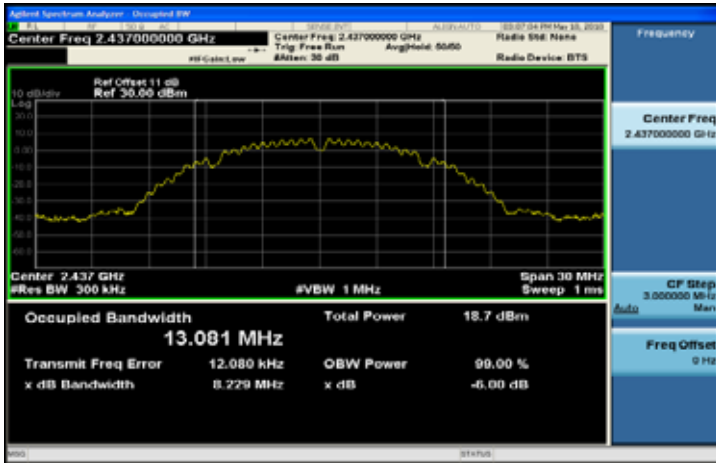


802.11g (Main)

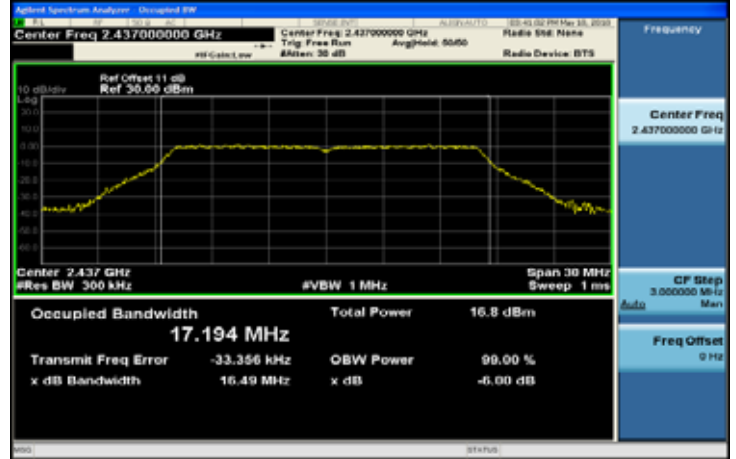
99% Band Width Test Data CH-Low



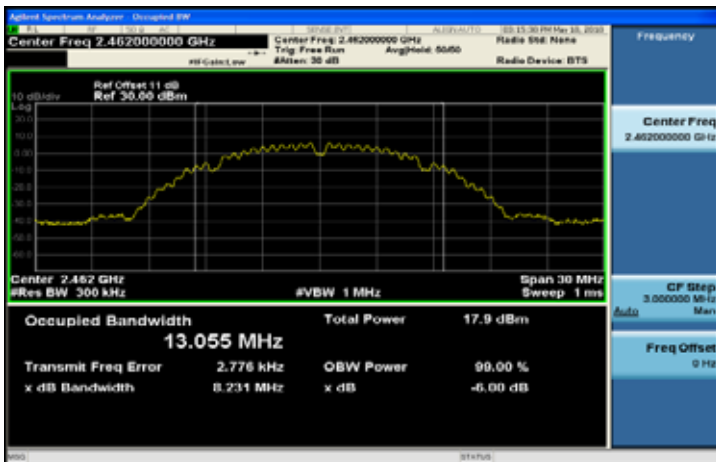
99% Band Width Test Data CH-Mid



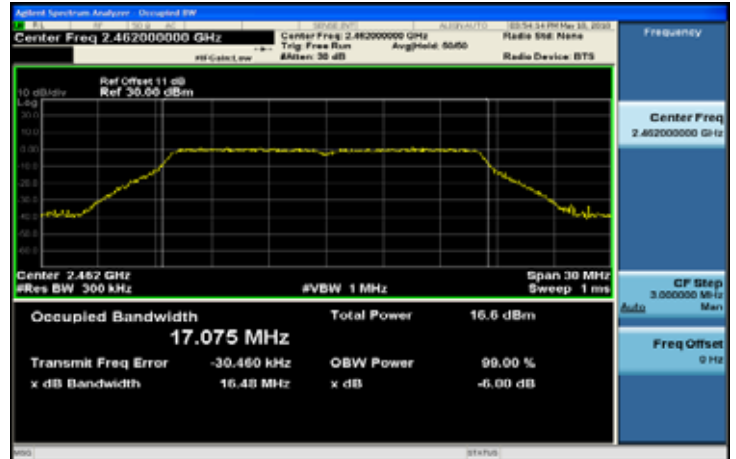
99% Band Width Test Data CH-Mid



99% Band Width Test Data CH-High



99% Band Width Test Data CH-High

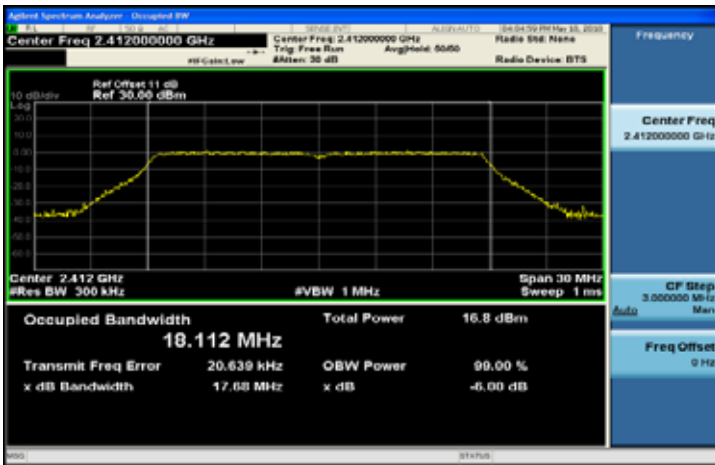


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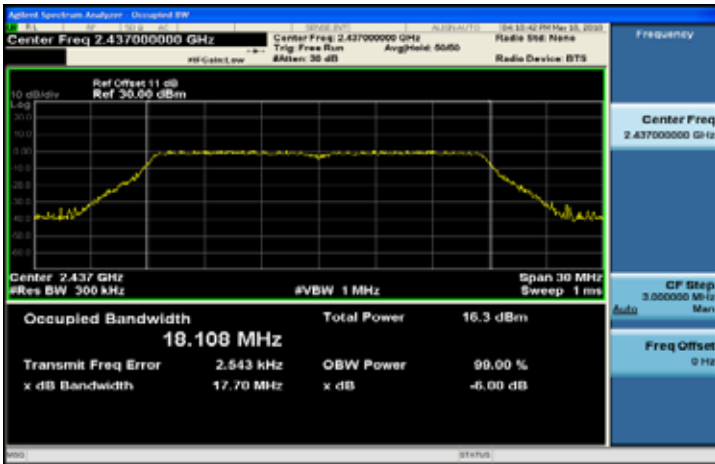
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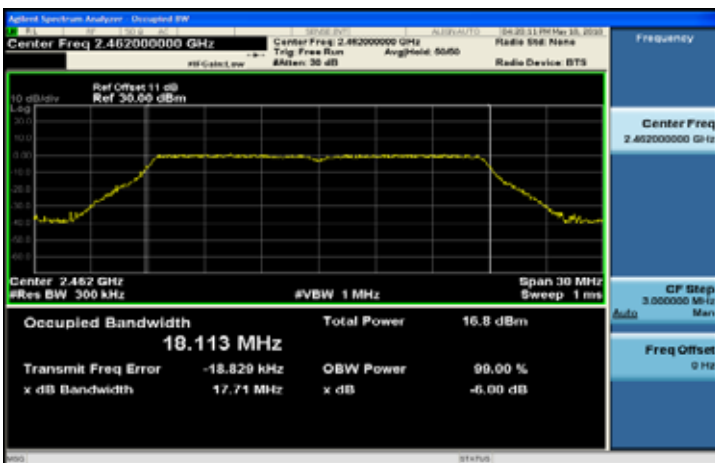
802.11n_20M (Main)
99% Band Width Test Data CH-Low



99% Band Width Test Data CH-Mid



99% Band Width Test Data CH-High



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10 CONDUCTED BAND EDGE 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.

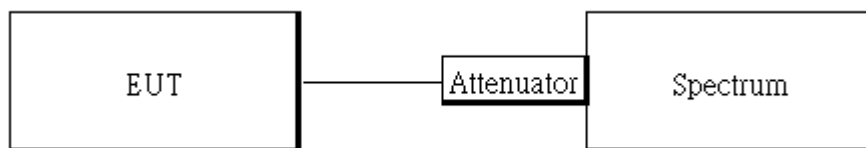
In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a) & RSS-Gen §8.10, must also comply with the radiated emission limits specified in §15.209(a) & RSS-Gen §8.8.

If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

10.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Meter	Anritsu	ML2496A	1242004	2017/10/16	2018/10/15
DC Power Supply	Anritsu	E3640A	MY52410006	2017/11/28	2018/11/27
EXA Spectrum Analyzer	Agilent	N9010A	MY50420195	2018/05/03	2019/05/02
DC Power Supply	Anritsu	E3640A	MY52410006	2017/11/28	2018/11/27

10.3 Test SET-UP



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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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10.4 Measurement Procedure

Conducted Band Edge Limt

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 & ANSI C63.10.
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 & ANSI C63.10.
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.

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 & ANSI C63.10.
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.

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10.5 Measurement Result

Reference Level of Limit 802.11b mode			Reference Level of Limit 802.11g mode		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)	Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	6.49	-13.51	2412	-2.15	-22.15
2437	6.78	-13.22	2437	-4.38	-24.38
2462	5.90	-14.10	2462	-1.77	-21.77

Reference Level of Limit 802.11n20 mode		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	-2.11	-22.11
2437	-4.36	-24.36
2462	-1.86	-21.86

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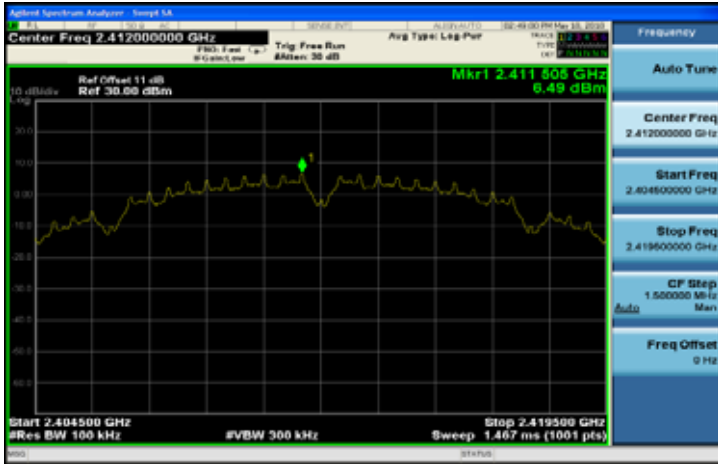
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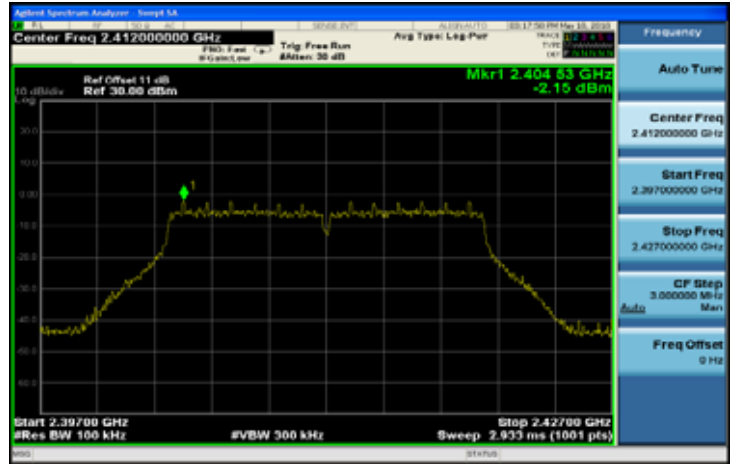
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802.11b Band Edge Limit Test Data CH-Low



802.11g Band Edge Limit Test Data CH-Low



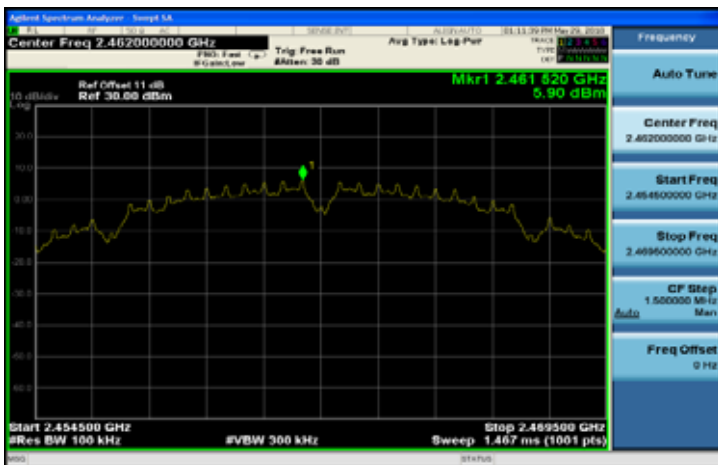
802.11b Band Edge Limit Test Data CH-Mid



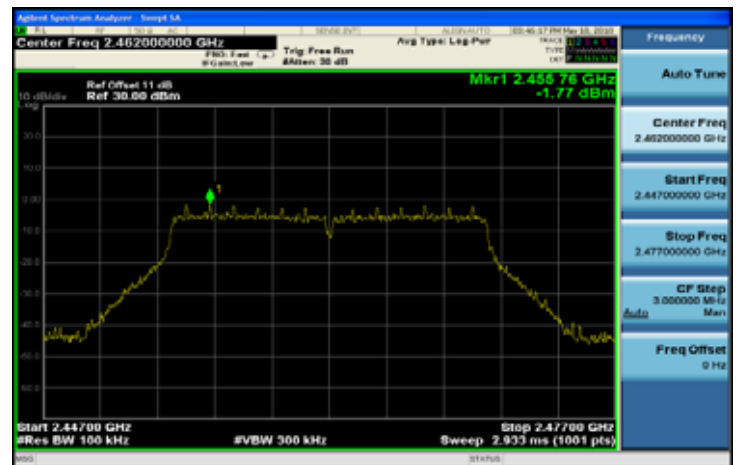
802.11g Band Edge Limit Test Data CH-Mid



802.11b Band Edge Limit Test Data CH-High



802.11g Band Edge Limit Test Data CH-High

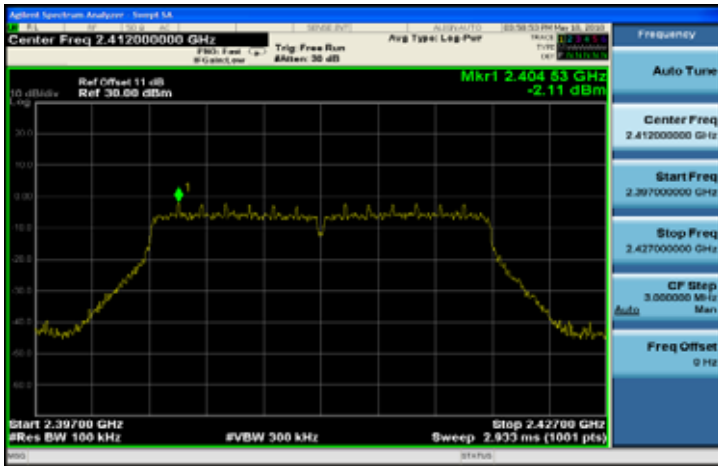


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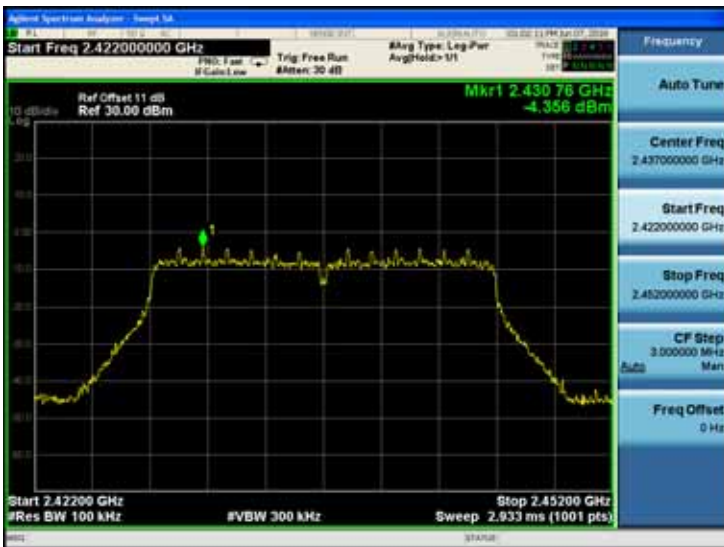
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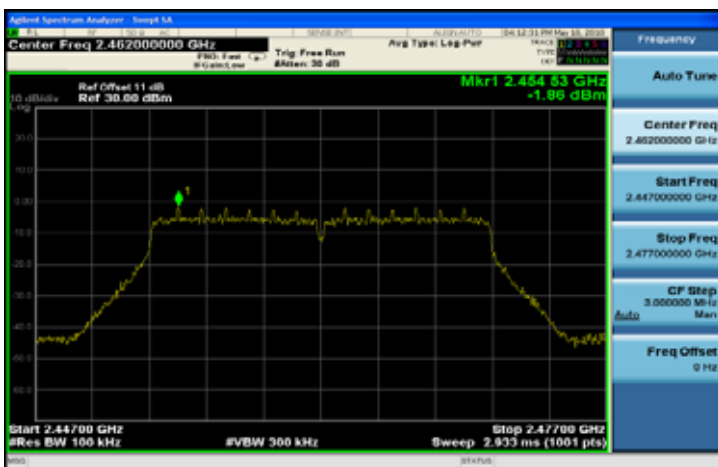
802.11n_HT20 Band Edge Limit Test Data CH-Low



802.11n_HT20 Band Edge Limit Test Data CH-Mid



802.11n_HT20 Band Edge Limit Test Data CH-High

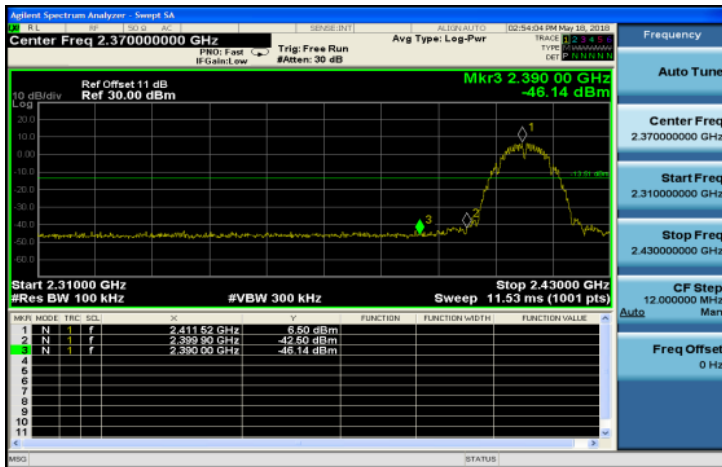


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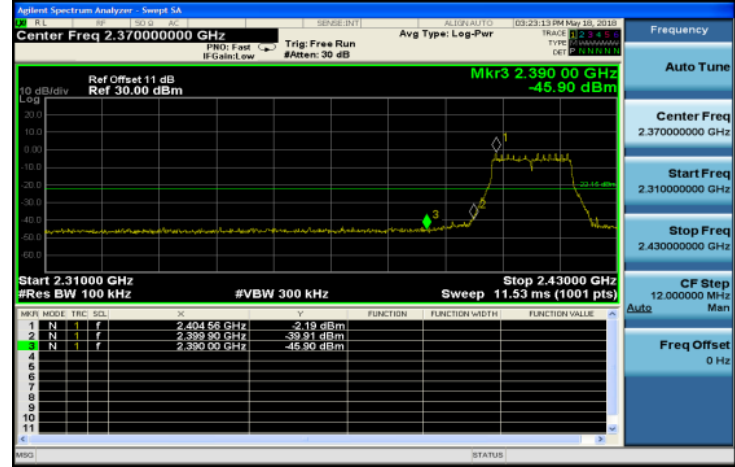
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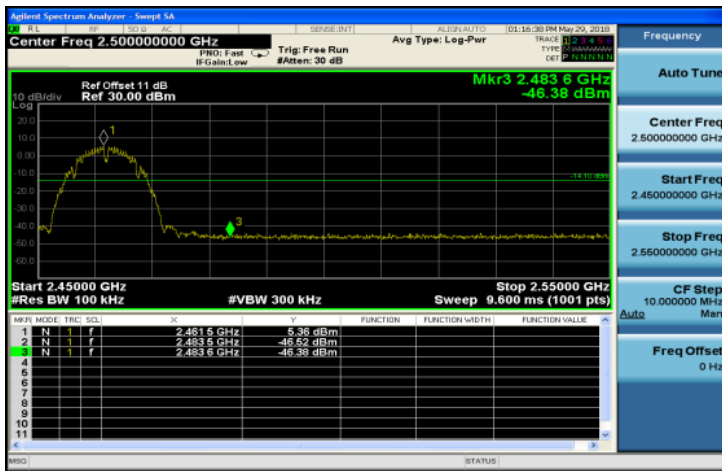
802.11b
Band Edge Test Data CH-Low



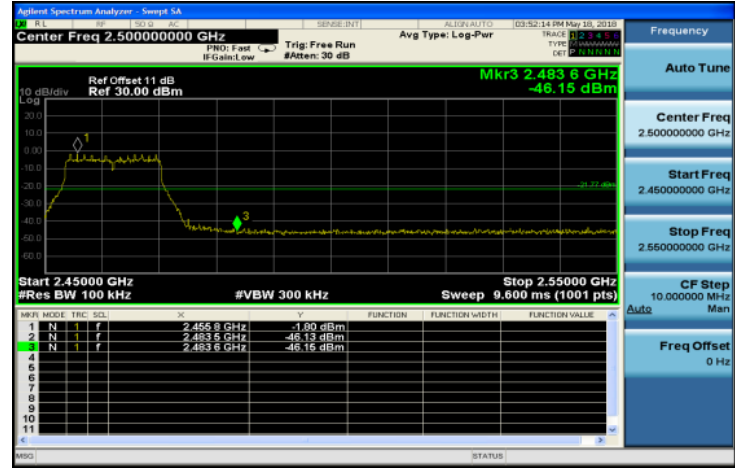
802.11g
Band Edge Test Data CH-Low



Band Edge Test Data CH-High



Band Edge Test Data CH-High



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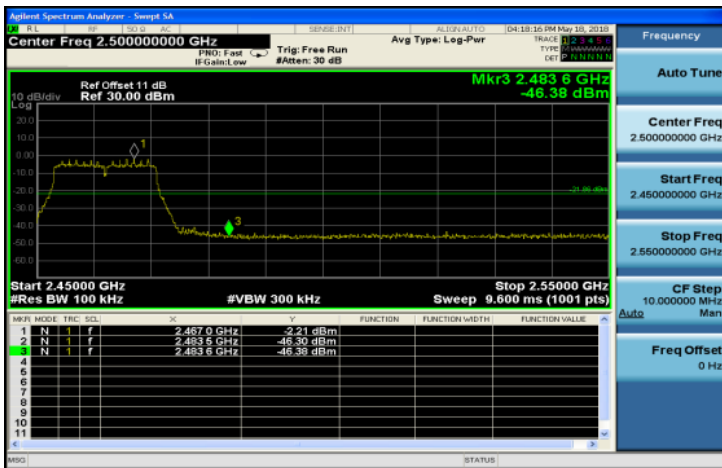
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802.11n_HT20

Band Edge Test Data CH-Low



Band Edge Test Data CH-High



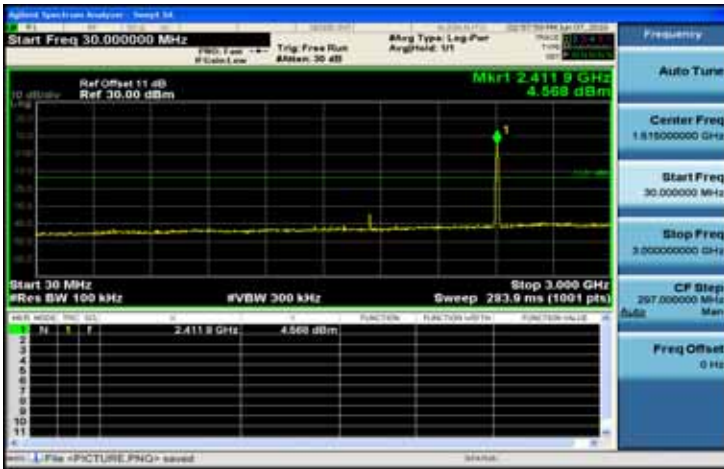
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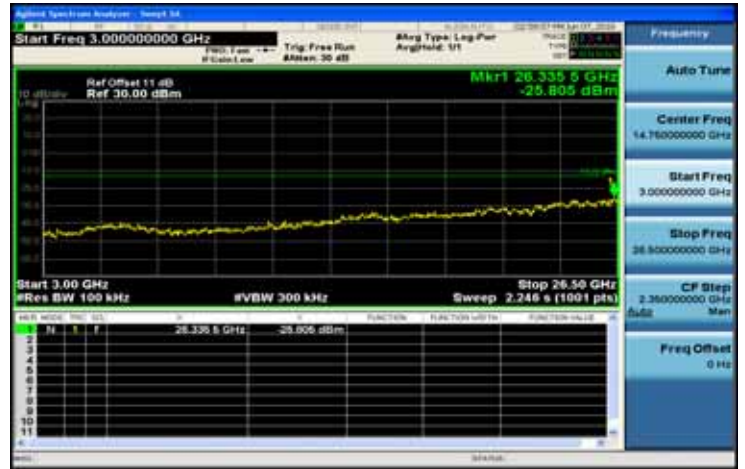
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802.11b

30M-3GHz Spurious Emission Test Data CH-Low



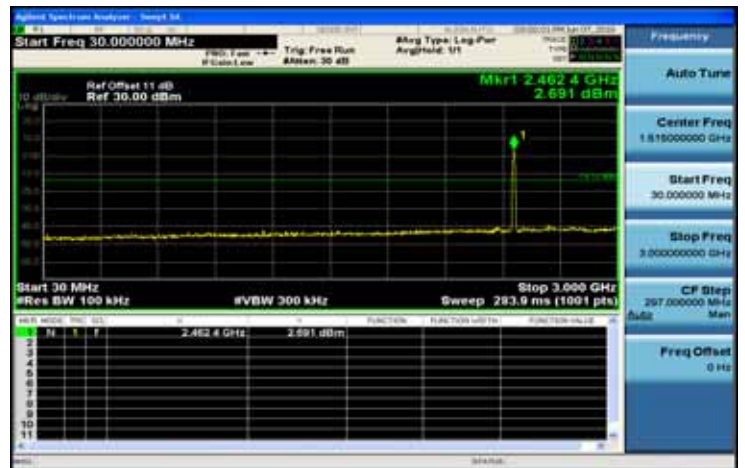
3G-26.5GHz Spurious Emission Test Data CH-Mid



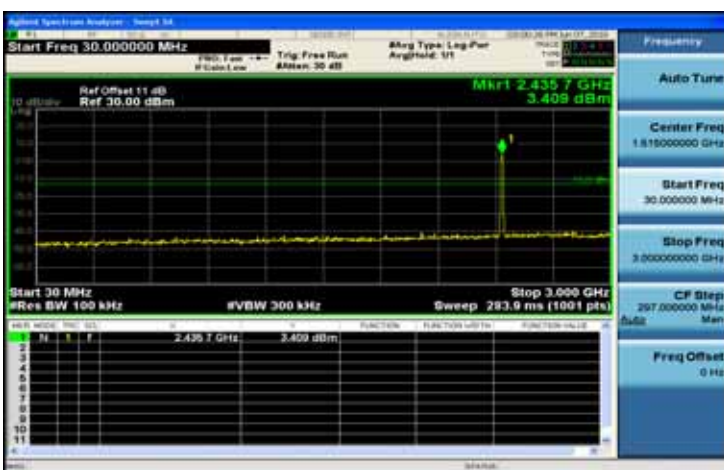
3G-26.5GHz Spurious Emission Test Data CH-Low



30M-3GHz Spurious Emission Test Data CH-High



30M-3GHz Spurious Emission Test Data CH-Mid



3G-26.5GHz Spurious Emission Test Data CH-High



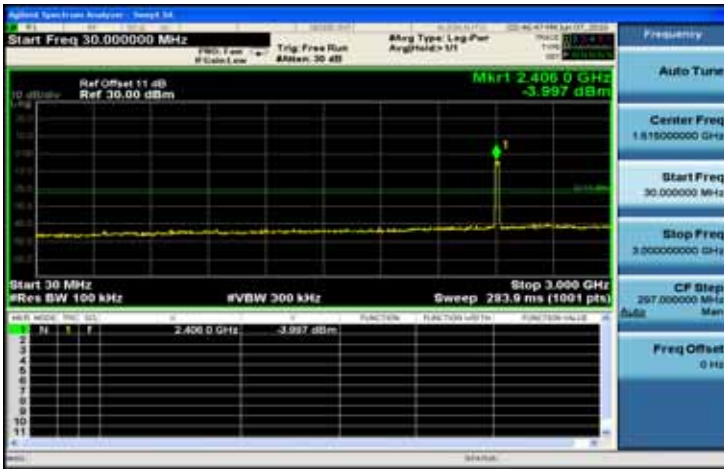
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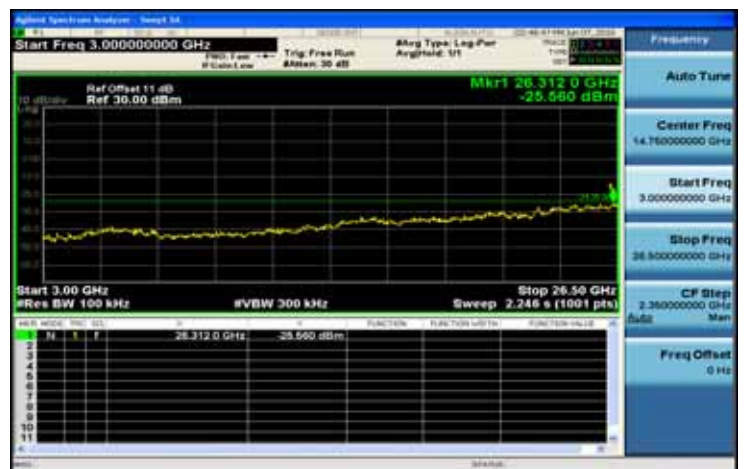
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802.11g

30M-3GHz Spurious Emission Test Data CH-Low



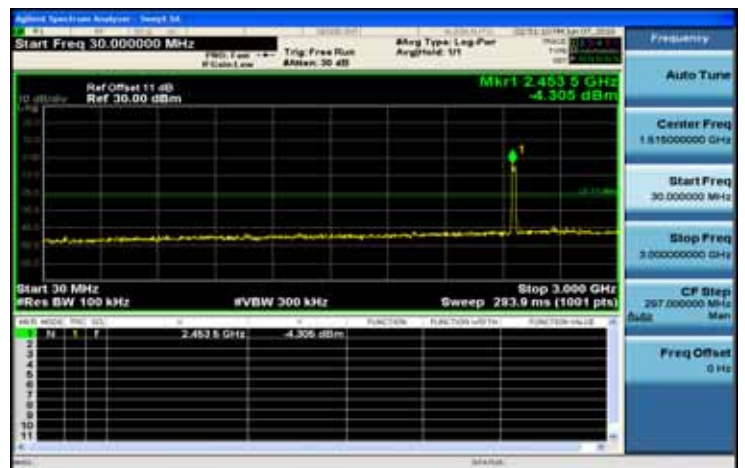
3G-26.5GHz Spurious Emission Test Data CH-Mid



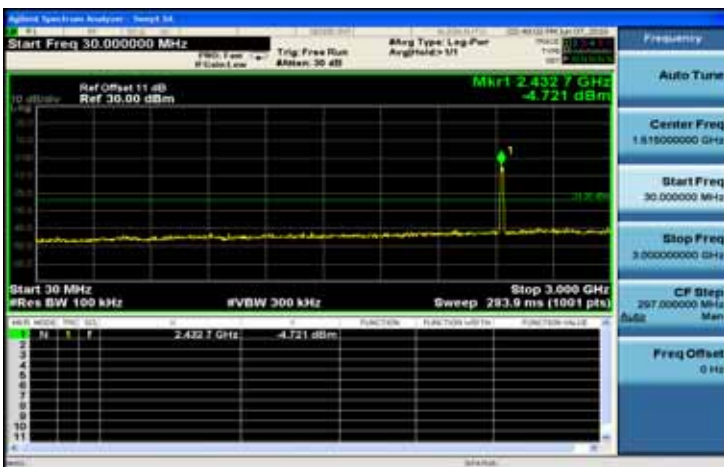
3G-26.5GHz Spurious Emission Test Data CH-Low



30M-3GHz Spurious Emission Test Data CH-High



30M-3GHz Spurious Emission Test Data CH-Mid



3G-26.5GHz Spurious Emission Test Data CH-High



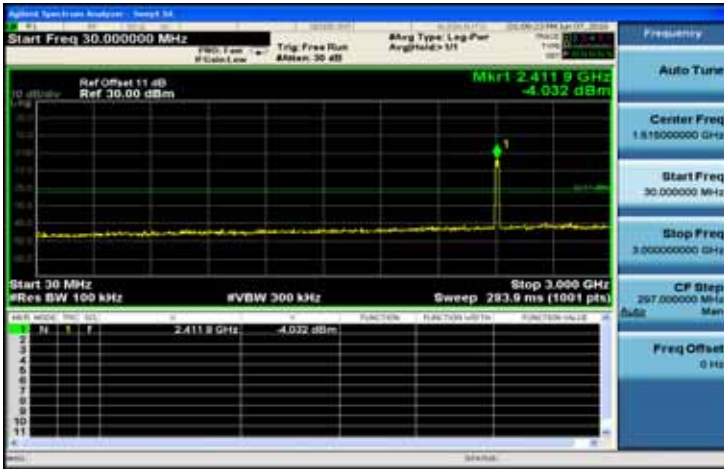
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802.11n_HT20

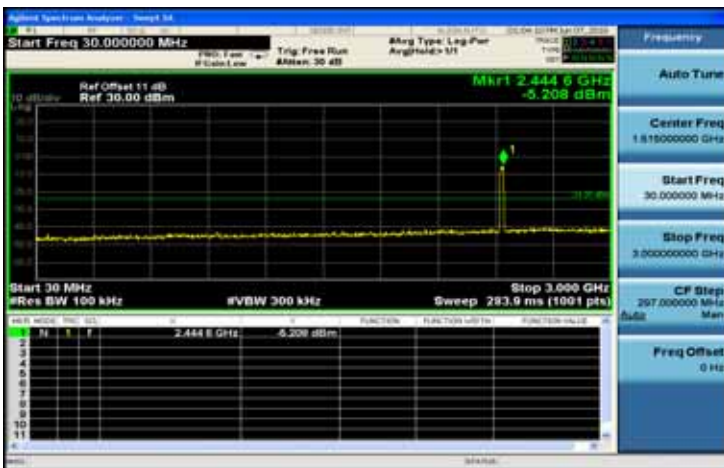
30M-3GHz Spurious Emission Test Data CH-Low



3G-26.5GHz Spurious Emission Test Data CH-Low



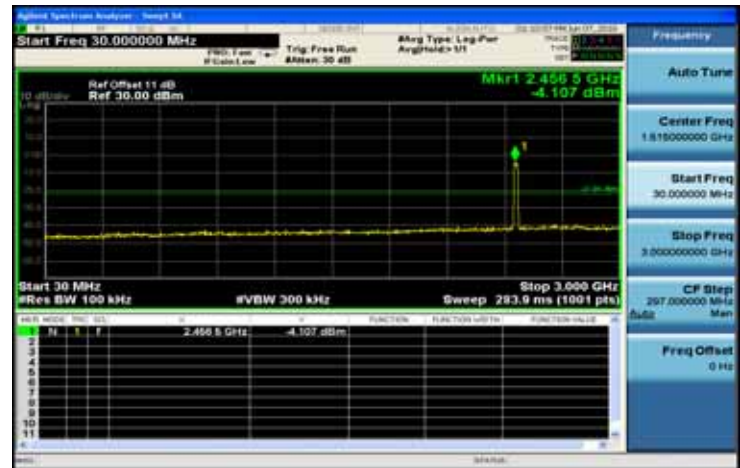
30M-3GHz Spurious Emission Test Data CH-Mid



3G-26.5GHz Spurious Emission Test Data CH-Mid



30M-3GHz Spurious Emission Test Data CH-High



3G-26.5GHz Spurious Emission Test Data CH-High



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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 & RSS-Gen §8.8, 8.9 limit as below.

And according to §15.33(a) (1) & RSS-Gen §6.13(a), 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 (dBµV/m) = 20 log Emission level (dBµV/m)

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11.2 Measurement Equipment Used:

966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Bi-log Antenna	SCHWAZBECK	VULB9168	378	2017/12/29	2018/12/28
Horn Antenna	Schwarzbeck	BBHA9120D	1441	2017/08/04	2018/08/03
Horn Antenna	Schwarzbeck	BBHA9170	184	2017/12/12	2018/12/11
Loop Antenna	ETS.LINDGREN	6502	148045	2017/09/26	2018/09/25
Spectrum Analyzer	Agilent	E4446A	MY51100003	2018/05/15	2019/05/14
EMI Test Receiver	R&S	ESCI7	100335	2018/02/02	2019/02/01
Pre-Amplifier	HP	8449B	3008A00578	2018/01/02	2019/01/01
Pre-Amplifier	HP	8447D	2944A07676	2018/01/02	2019/01/01
Pre-Amplifier	EMC Instruments Corp.	EMC0126530	980038	2018/01/02	2019/01/01
Attenuator	Mini-Circuit	BW-S10W2+	3	2018/01/02	2019/01/01
Filter 2400-2483.5 MHz	EWT	EWT-14-0166	M1	2018/01/02	2019/01/01
Low Loss Cable	Huber Suhner	966_RX	9	2018/01/02	2019/01/01

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

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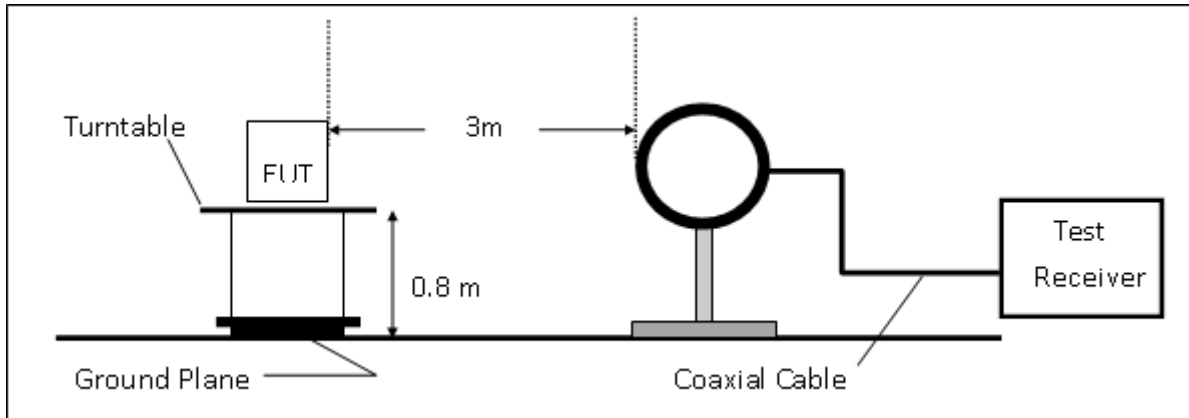
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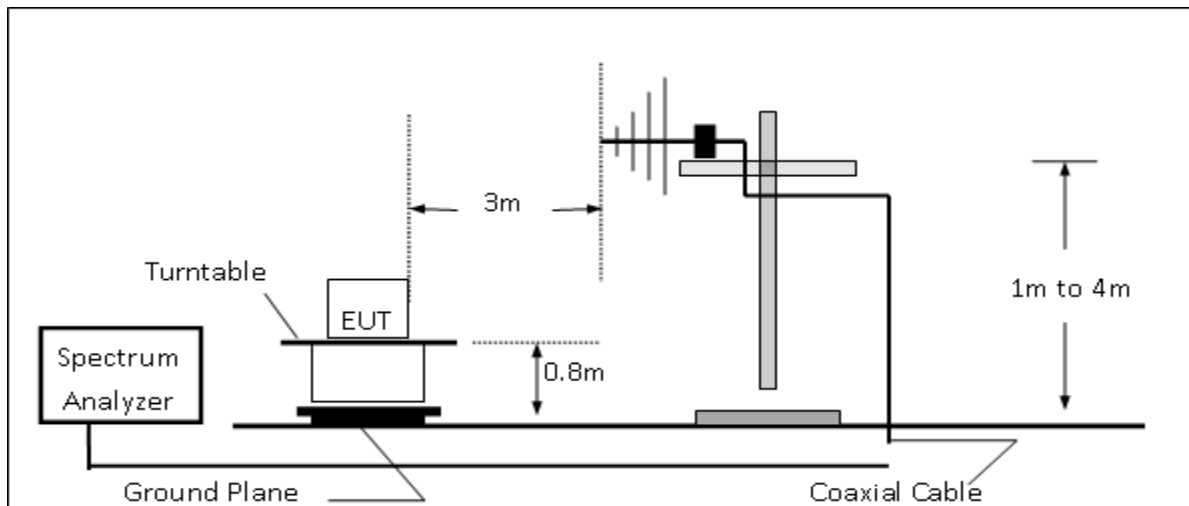
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11.3 Test SET-UP

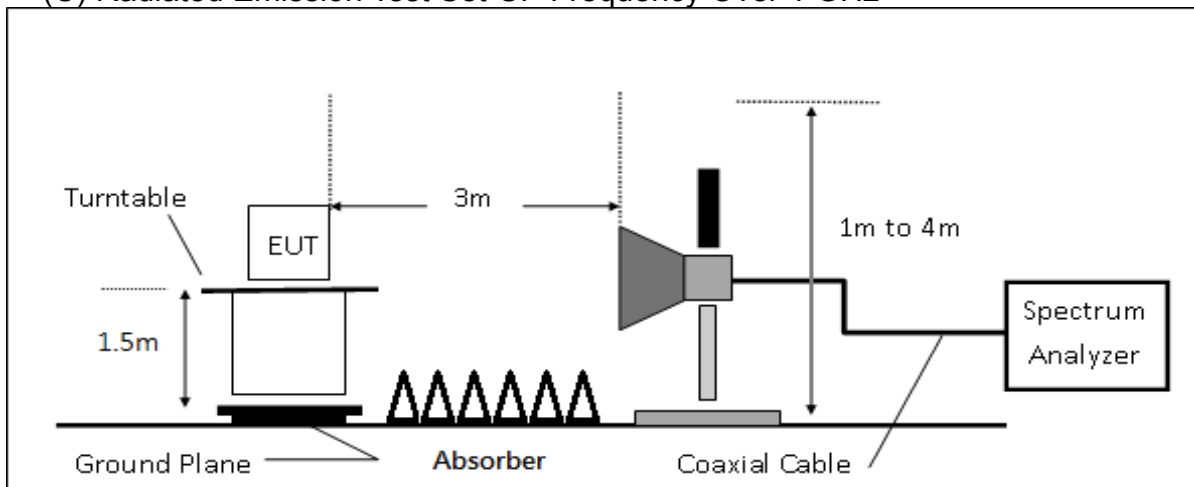
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



(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 & ANSI C63.10.
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	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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: Refer to next page spectrum analyzer data chart and tabular data sheets.

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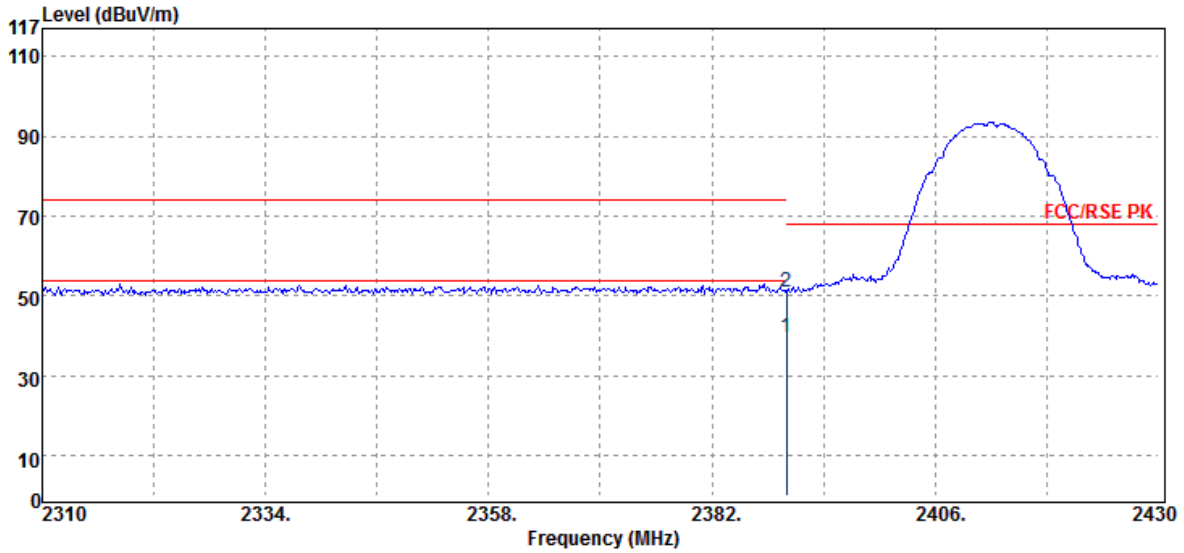
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Radiated Band Edge Measurement Result (802.11b)

Operation Band	:802.11b	Test Date	:2018-05-23
Fundamental Frequency	:2412 MHz	Temp./Humi.	:23 deg_C / 61 RH
Operation Mode	:Bandedge CH LOW	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2390.00	Average	39.39	0.20	39.59	54.00	-14.41
2390.00	Peak	50.67	0.20	50.87	74.00	-23.13

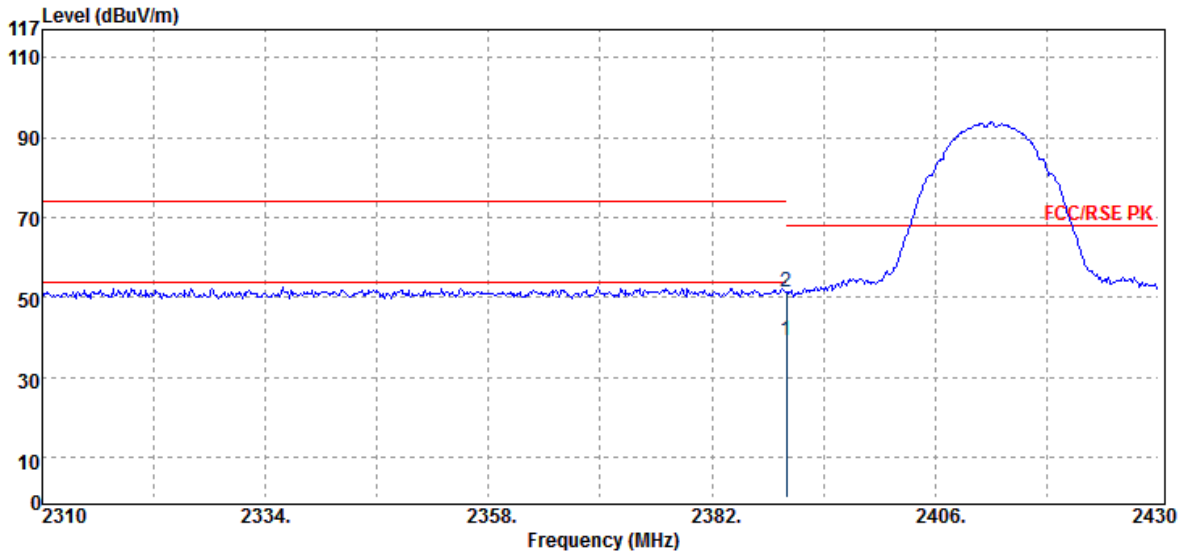
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Operation Band :802.11b
 Fundamental Frequency :2412 MHz
 Operation Mode :Bandedge CH LOW
 EUT Pol. :H Plane

Test Date :2018-05-23
 Temp./Humi. :23 deg_C / 61 RH
 Engineer :Tin
 Measurement Antenna Pol. :HORIZONTAL



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2390.00	Average	39.14	0.20	39.34	54.00	-14.66
2390.00	Peak	51.11	0.20	51.31	74.00	-22.69

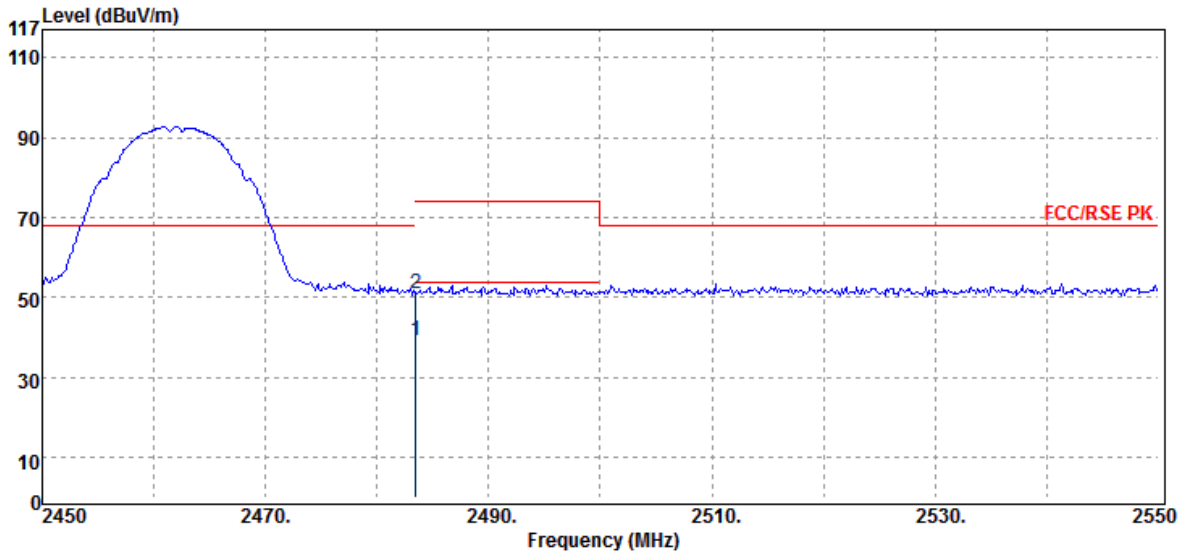
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Operation Band :802.11b
 Fundamental Frequency :2462 MHz
 Operation Mode :Bandedge CH HIGH
 EUT Pol. :H Plane

Test Date :2018-05-23
 Temp./Humi. :23 deg_C / 61 RH
 Engineer :Tin
 Measurement Antenna Pol. :VERTICAL



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2483.50	Average	38.77	0.53	39.30	54.00	-14.70
2483.50	Peak	50.41	0.53	50.94	74.00	-23.06

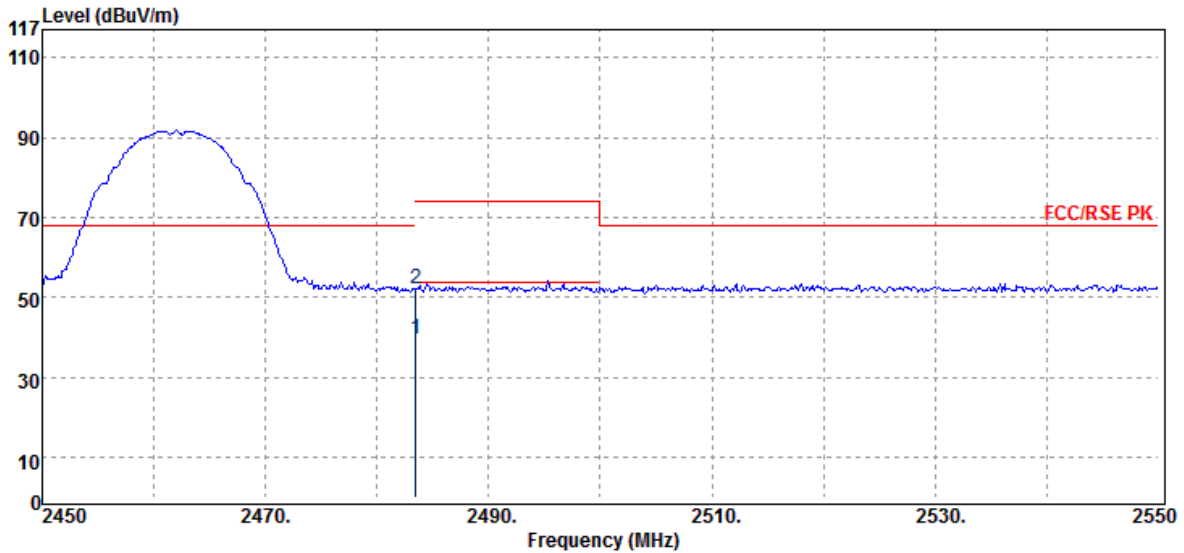
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Operation Band :802.11b
 Fundamental Frequency :2462 MHz
 Operation Mode :Bandedge CH HIGH
 EUT Pol. :H Plane

Test Date :2018-05-23
 Temp./Humi. :23 deg_C / 61 RH
 Engineer :Tin
 Measurement Antenna Pol. :HORIZONTAL



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2483.50	Average	39.11	0.53	39.64	54.00	-14.36
2483.50	Peak	51.65	0.53	52.18	74.00	-21.82

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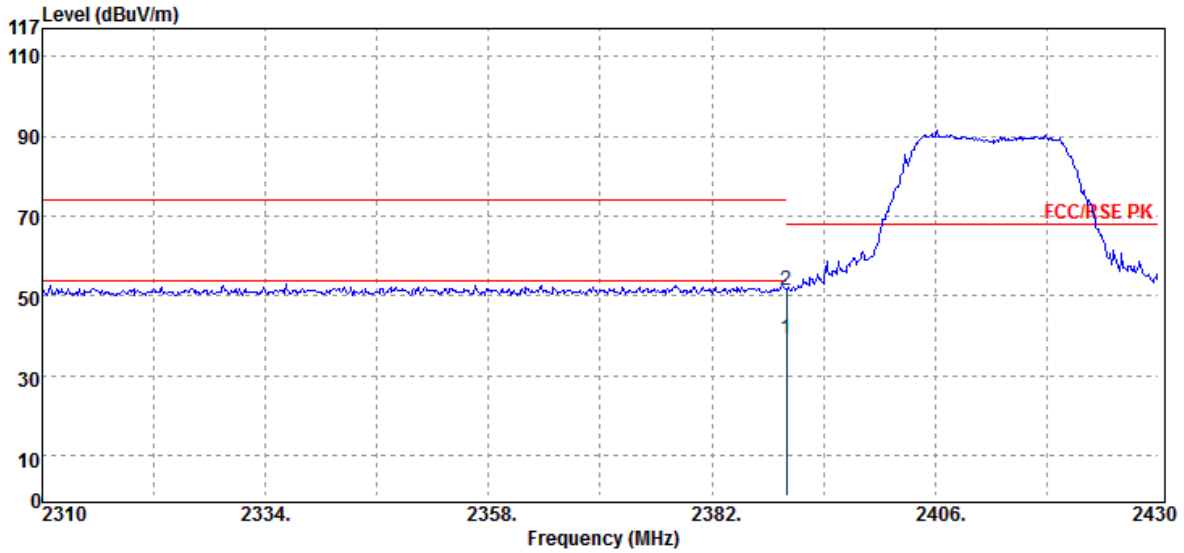
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Radiated Band Edge Measurement Result (802.11g)

Operation Band	:802.11g	Test Date	:2018-05-23
Fundamental Frequency	:2412 MHz	Temp./Humi.	:23 deg_C / 61 RH
Operation Mode	:Bandedge CH LOW	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2390.00	Average	39.12	0.20	39.32	54.00	-14.68
2390.00	Peak	51.29	0.20	51.49	74.00	-22.51

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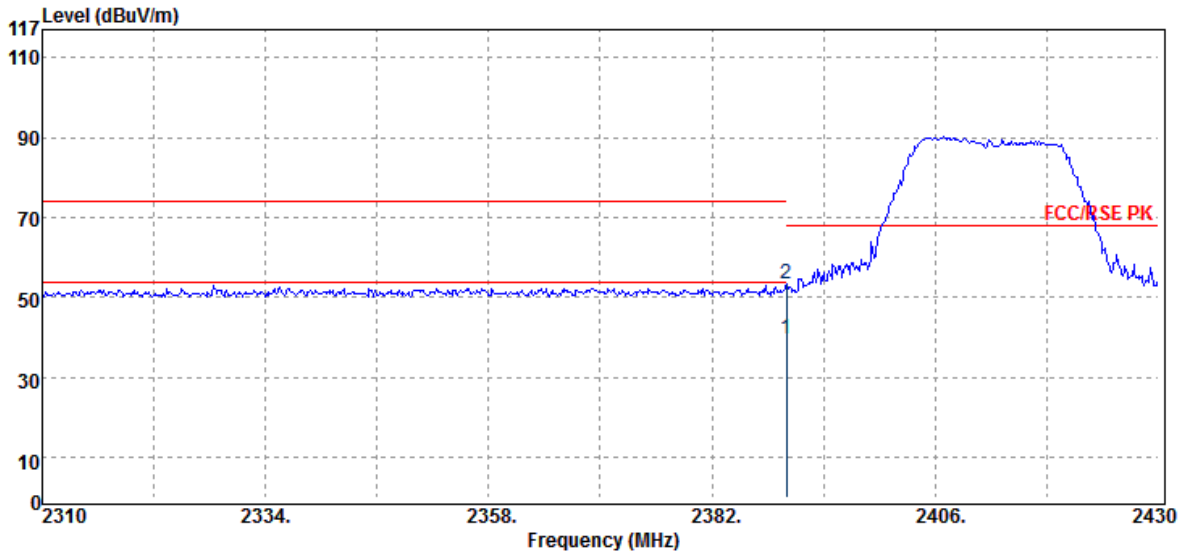
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Operation Band :802.11g
 Fundamental Frequency :2412 MHz
 Operation Mode :Bandedge CH LOW
 EUT Pol. :H Plane

Test Date :2018-05-23
 Temp./Humi. :23 deg_C / 61 RH
 Engineer :Tin
 Measurement Antenna Pol. :HORIZONTAL



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2390.00	Average	39.29	0.20	39.49	54.00	-14.51
2390.00	Peak	53.14	0.20	53.34	74.00	-20.66

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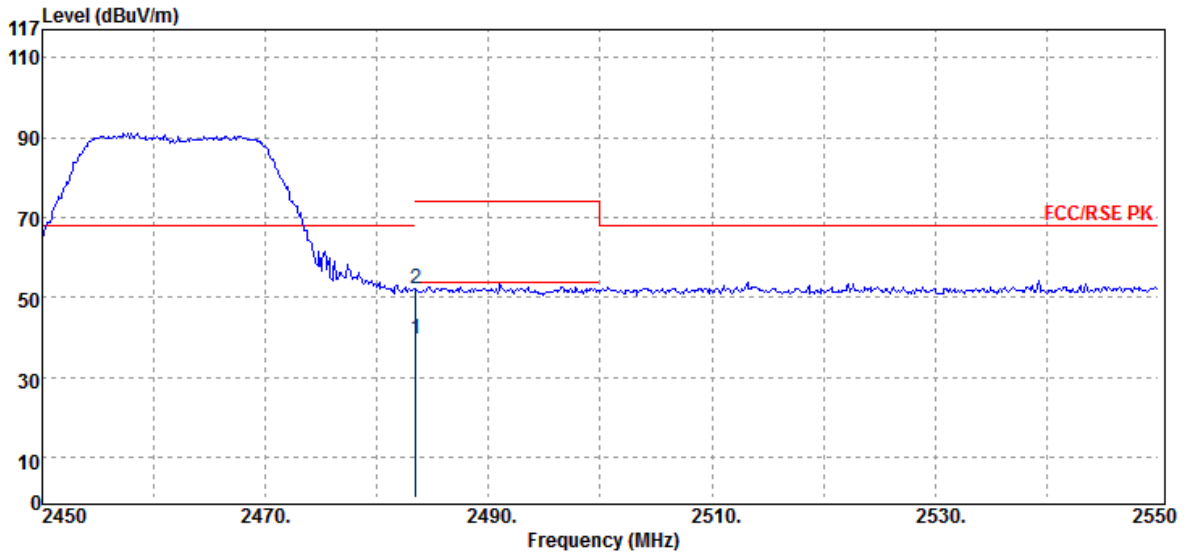
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Operation Band :802.11g
 Fundamental Frequency :2462 MHz
 Operation Mode :Bandedge CH HIGH
 EUT Pol. :H Plane

Test Date :2018-05-23
 Temp./Humi. :23 deg_C / 61 RH
 Engineer :Tin
 Measurement Antenna Pol. :VERTICAL



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2483.50	Average	39.08	0.53	39.61	54.00	-14.39
2483.50	Peak	51.53	0.53	52.06	74.00	-21.94

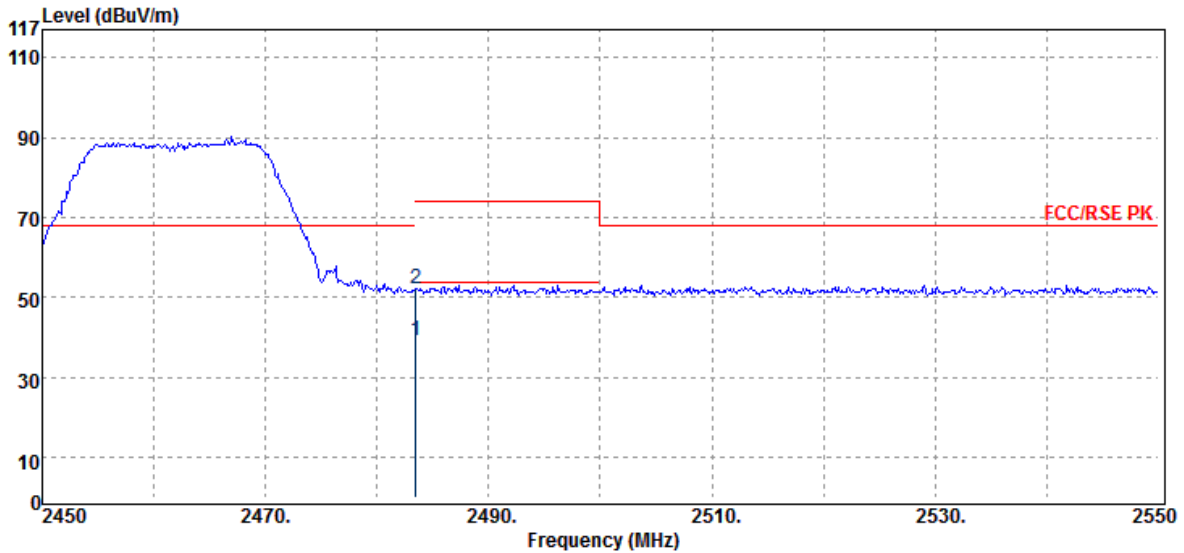
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Operation Band :802.11g
 Fundamental Frequency :2462 MHz
 Operation Mode :Bandedge CH HIGH
 EUT Pol. :H Plane

Test Date :2018-05-23
 Temp./Humi. :23 deg_C / 61 RH
 Engineer :Tin
 Measurement Antenna Pol. :HORIZONTAL



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2483.50	Average	38.85	0.53	39.38	54.00	-14.62
2483.50	Peak	51.55	0.53	52.08	74.00	-21.92

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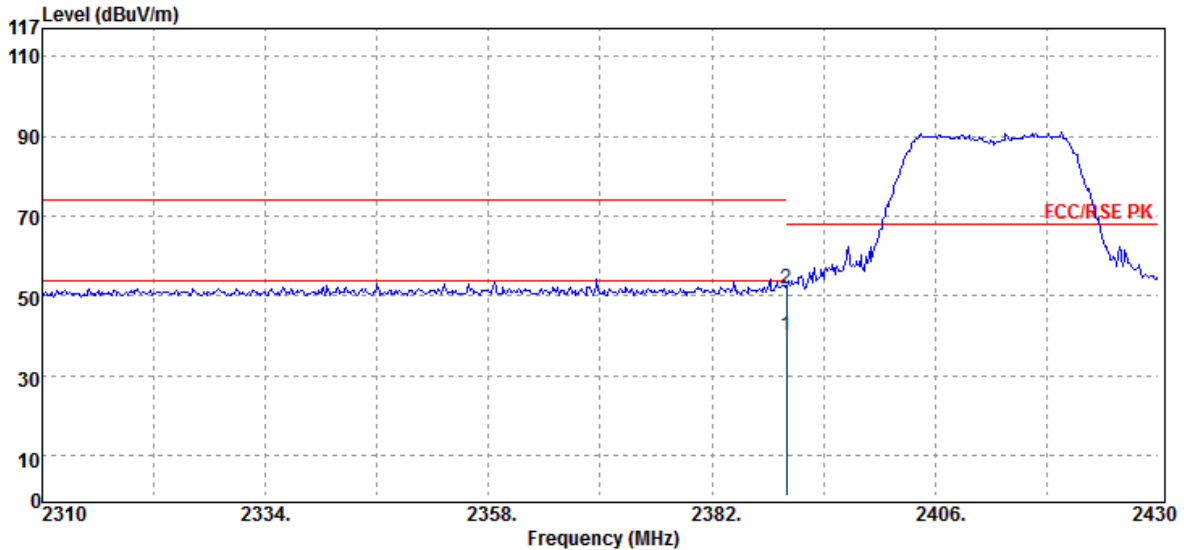
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Radiated Band Edge Measurement Result (802.11_HT20)

Operation Band	:802.11n20	Test Date	:2018-05-23
Fundamental Frequency	:2412 MHz	Temp./Humi.	:23 deg_C / 61 RH
Operation Mode	:Bandedge CH LOW	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2390.00	Average	39.74	0.20	39.94	54.00	-14.06
2390.00	Peak	51.64	0.20	51.84	74.00	-22.16

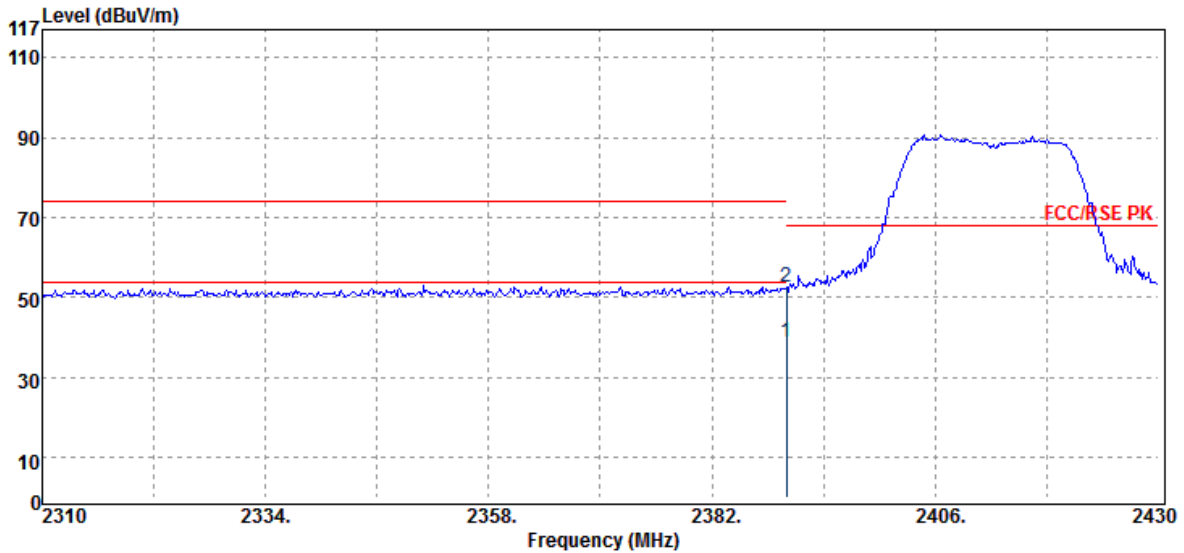
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Operation Band :802.11n20
Fundamental Frequency :2412 MHz
Operation Mode :Bandedge CH LOW
EUT Pol. :H Plane

Test Date :2018-05-23
Temp./Humi. :23 deg_C / 61 RH
Engineer :Tin
Measurement Antenna Pol. :HORIZONTAL



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2390.00	Average	38.69	0.20	38.89	54.00	-15.11
2390.00	Peak	52.49	0.20	52.69	74.00	-21.31

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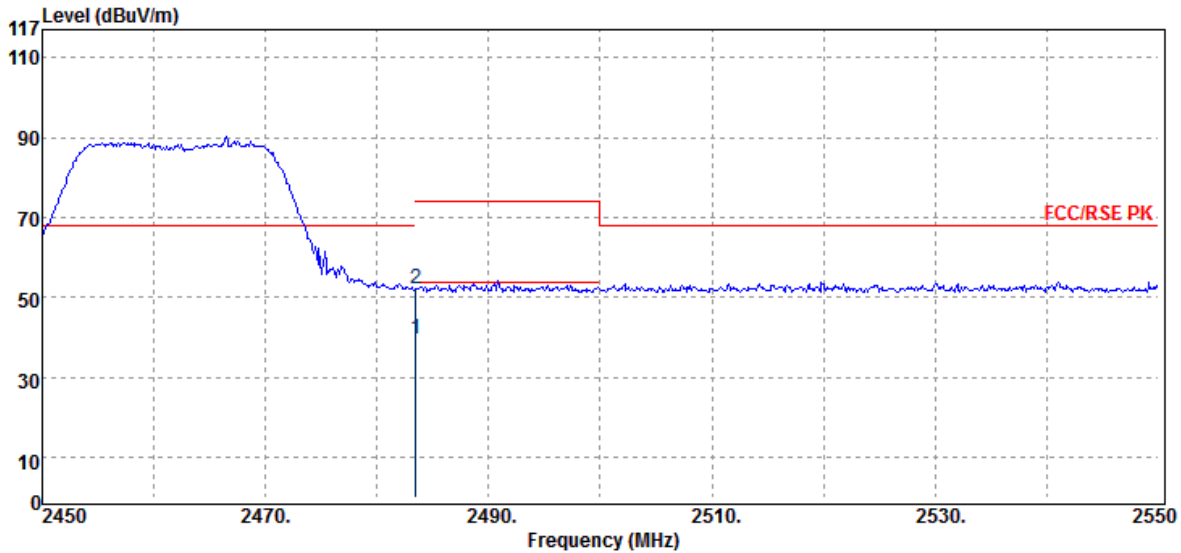
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Operation Band :802.11n20
Fundamental Frequency :2462 MHz
Operation Mode :Bandedge CH HIGH
EUT Pol. :H Plane

Test Date :2018-05-23
Temp./Humi. :23 deg_C / 61 RH
Engineer :Tin
Measurement Antenna Pol. :VERTICAL



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2483.50	Average	39.20	0.53	39.73	54.00	-14.27
2483.50	Peak	51.70	0.53	52.23	74.00	-21.77

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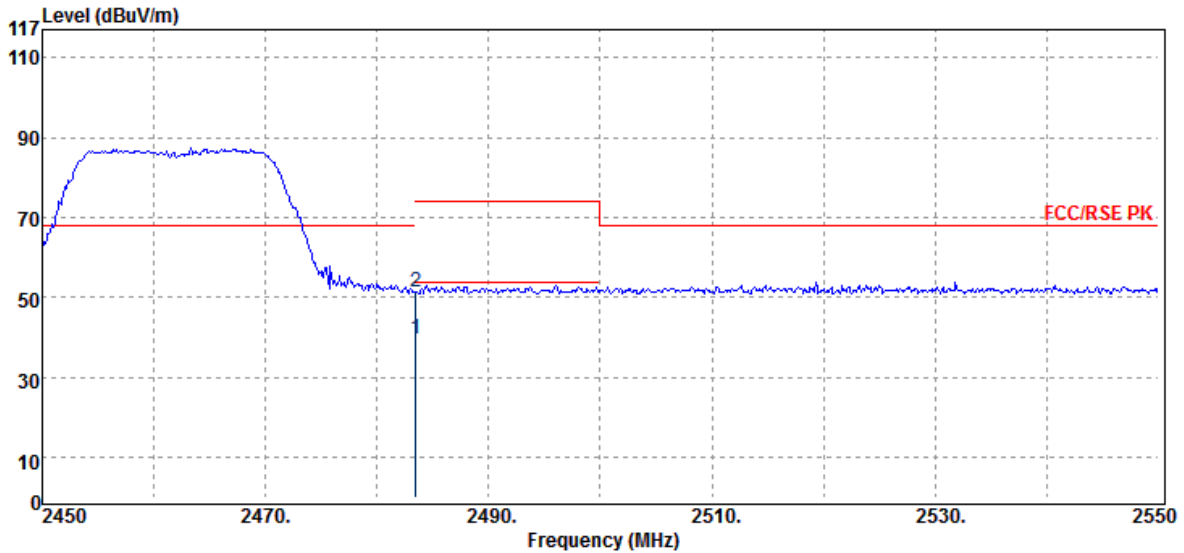
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Operation Band :802.11n20
Fundamental Frequency :2462 MHz
Operation Mode :Bandedge CH HIGH
EUT Pol. :H Plane

Test Date :2018-05-23
Temp./Humi. :23 deg_C / 61 RH
Engineer :Tin
Measurement Antenna Pol. :HORIZONTAL



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2483.50	Average	39.15	0.53	39.68	54.00	-14.32
2483.50	Peak	50.90	0.53	51.43	74.00	-22.57

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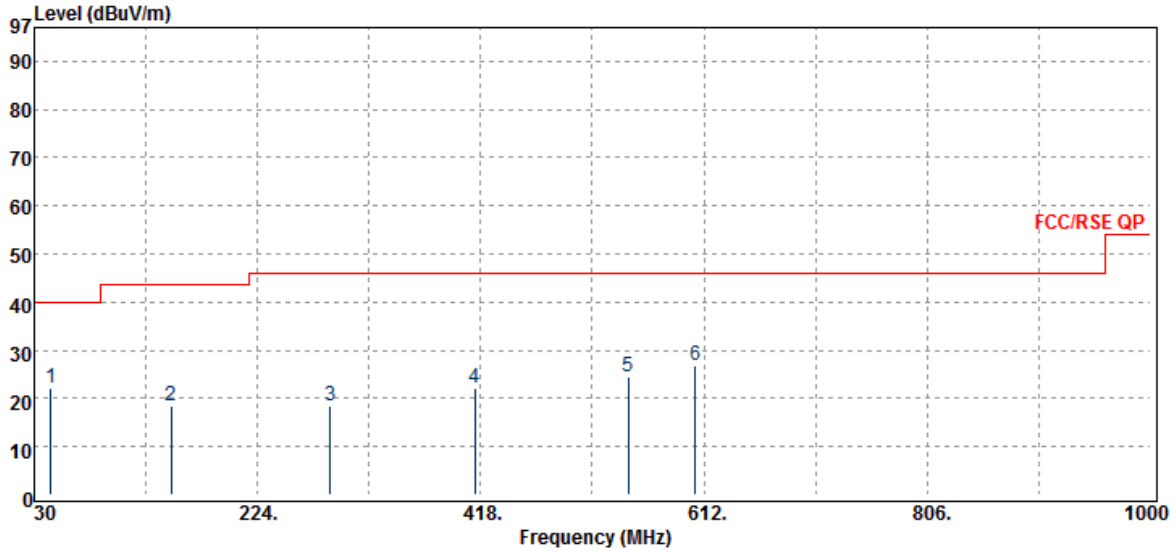
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Below 1GHz Worst-Case Data:

Radiated Spurious Emission Measurement Result (802.11 g)

Operation Band	:802.11g	Test Date	:2018-05-24
Fundamental Frequency	:2437 MHz	Temp./Humi.	:23 deg_C / 61 RH
Operation Mode	:Tx CH MID	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
44.55	Peak	30.50	-8.51	21.99	40.00	-18.01
149.31	Peak	27.19	-8.67	18.52	43.50	-24.98
287.05	Peak	26.24	-7.66	18.58	46.00	-27.42
413.15	Peak	27.25	-5.18	22.07	46.00	-23.93
546.04	Peak	28.18	-3.66	24.52	46.00	-21.48
604.24	Peak	29.38	-2.40	26.98	46.00	-19.02

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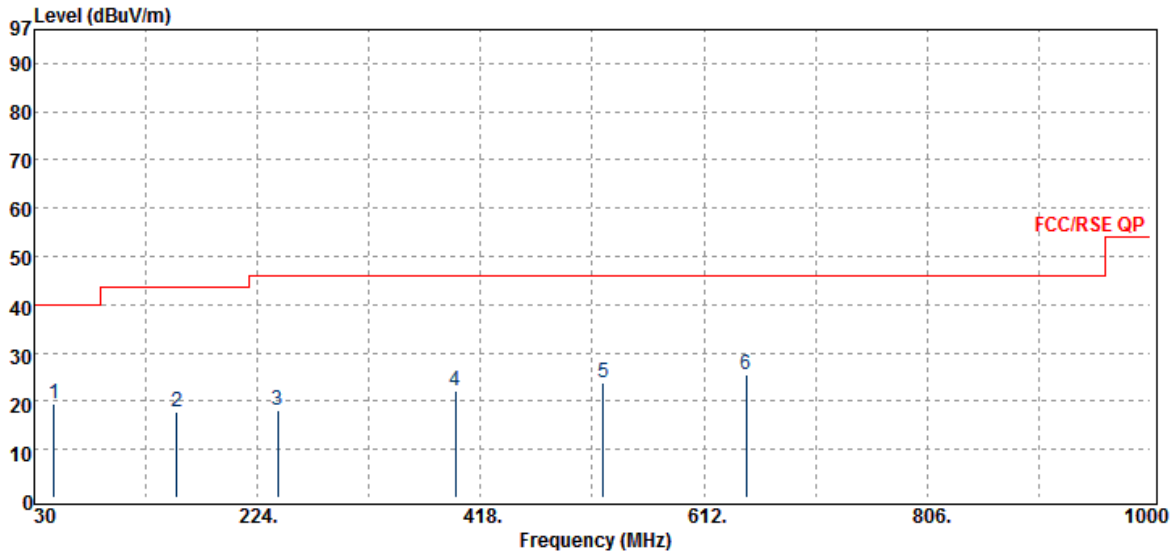
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Operation Band	:802.11g	Test Date	:2018-05-24
Fundamental Frequency	:2437 MHz	Temp./Humi.	:23 deg_C / 61 RH
Operation Mode	:Tx CH MID	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBUV	Factor dB	Actual FS dBUV/m	Limit @3m dBUV/m	Margin dB
47.46	Peak	27.68	-8.31	19.37	40.00	-20.63
154.16	Peak	26.22	-8.57	17.65	43.50	-25.85
241.46	Peak	27.51	-9.32	18.19	46.00	-27.81
395.69	Peak	27.48	-5.43	22.05	46.00	-23.95
524.70	Peak	27.75	-4.01	23.74	46.00	-22.26
648.86	Peak	27.70	-2.14	25.56	46.00	-20.44

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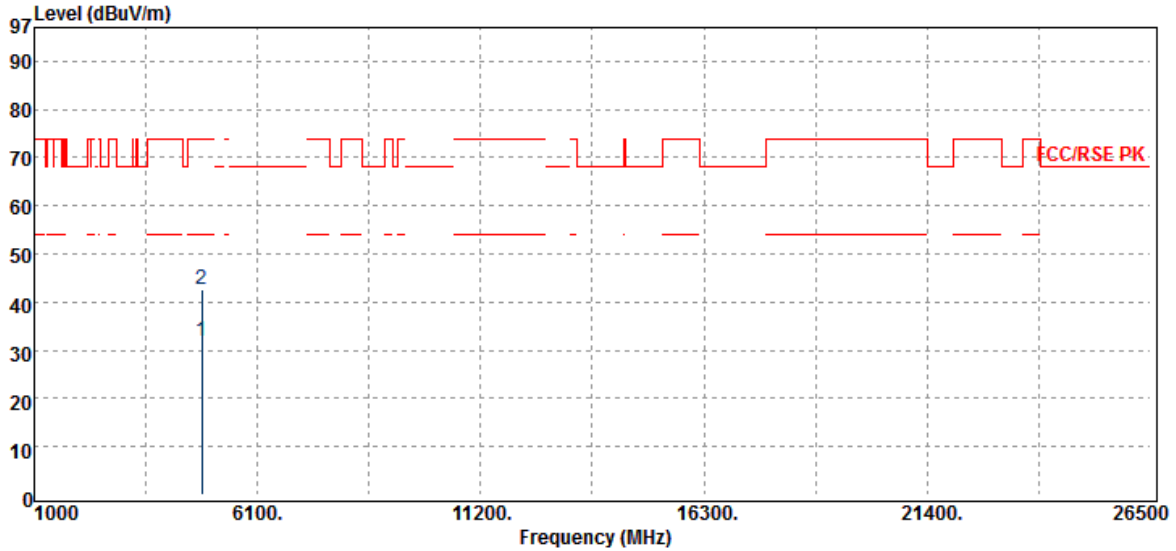
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Above 1GHz Data:

Radiated Spurious Emission Measurement Result (802.11 b)

Operation Band	:802.11b	Test Date	:2018-05-23
Fundamental Frequency	:2412 MHz	Temp./Humi.	:23 deg_C / 61 RH
Operation Mode	:Tx CH LOW	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4824.00	Average	24.70	7.35	32.05	54.00	-21.95
4824.00	Peak	35.28	7.35	42.63	74.00	-31.37

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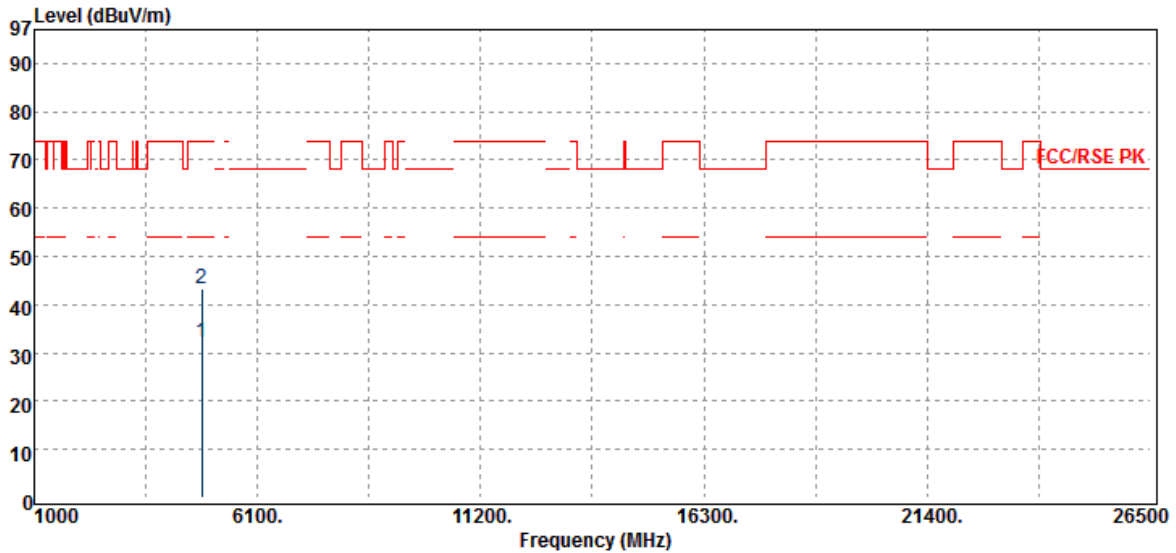
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Operation Band	:802.11b	Test Date	:2018-05-23
Fundamental Frequency	:2412 MHz	Temp./Humi.	:23 deg_C / 61 RH
Operation Mode	:Tx CH LOW	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level d μ V	Factor dB	Actual FS d μ V/m	Limit @3m d μ V/m	Margin dB
4824.00	Average	24.91	7.35	32.26	54.00	-21.74
4824.00	Peak	35.85	7.35	43.20	74.00	-30.80

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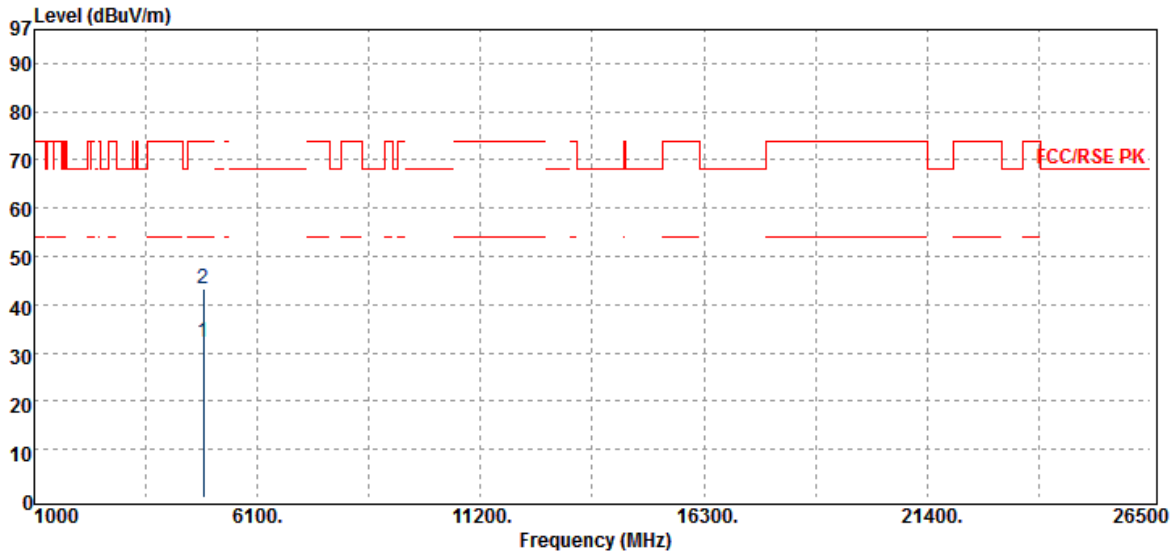
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Operation Band :802.11b
 Fundamental Frequency :2437 MHz
 Operation Mode :Tx CH MID
 EUT Pol. :H Plane

Test Date :2018-05-23
 Temp./Humi. :23 deg_C / 61 RH
 Engineer :Tin
 Measurement Antenna Pol. :VERTICAL



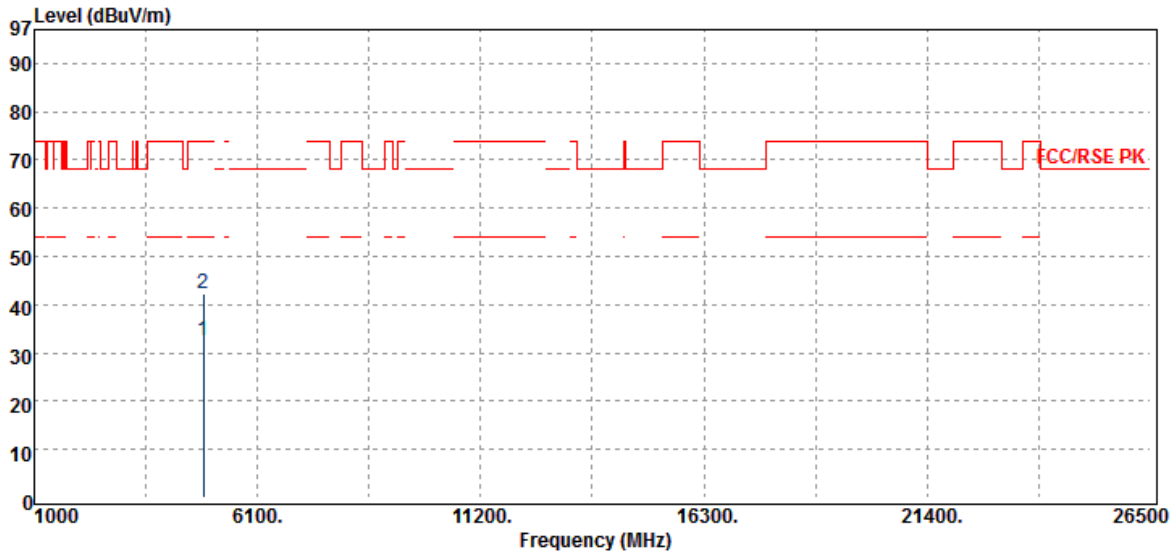
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level d μ V	Factor dB	Actual FS d μ V/m	Limit @3m d μ V/m	Margin dB
4874.00	Average	24.66	7.62	32.28	54.00	-21.72
4874.00	Peak	35.81	7.62	43.43	74.00	-30.57

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Operation Band	:802.11b	Test Date	:2018-05-23
Fundamental Frequency	:2437 MHz	Temp./Humi.	:23 deg_C / 61 RH
Operation Mode	:Tx CH MID	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level d μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
4874.00	Average	25.02	7.62	32.64	54.00	-21.36
4874.00	Peak	34.56	7.62	42.18	74.00	-31.82

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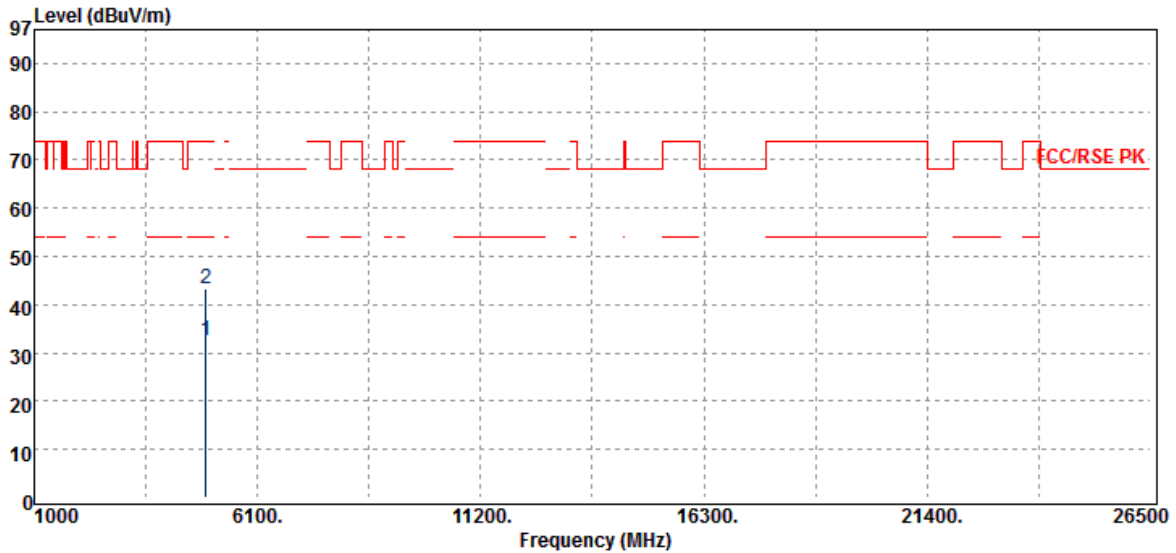
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Operation Band	:802.11b	Test Date	:2018-05-23
Fundamental Frequency	:2462 MHz	Temp./Humi.	:23 deg_C / 61 RH
Operation Mode	:Tx CH HIGH	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



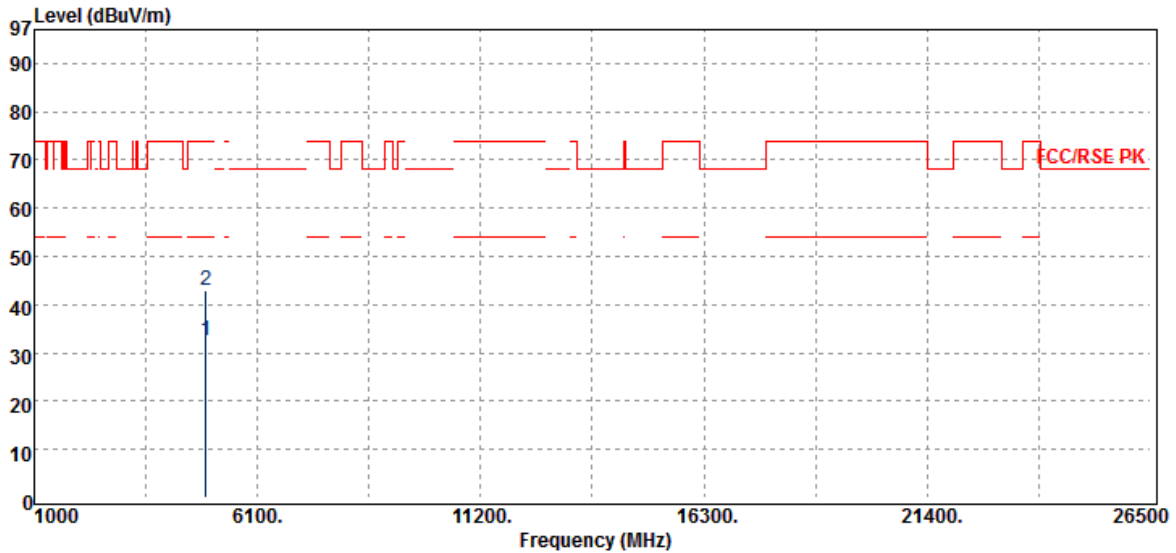
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level d μ V	Factor dB	Actual FS d μ V/m	Limit @3m d μ V/m	Margin dB
4924.00	Average	25.09	7.59	32.68	54.00	-21.32
4924.00	Peak	35.82	7.59	43.41	74.00	-30.59

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Operation Band	:802.11b	Test Date	:2018-05-23
Fundamental Frequency	:2462 MHz	Temp./Humi.	:23 deg_C / 61 RH
Operation Mode	:Tx CH HIGH	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level d μ V	Factor dB	Actual FS d μ V/m	Limit @3m d μ V/m	Margin dB
4924.00	Average	25.12	7.59	32.71	54.00	-21.29
4924.00	Peak	35.52	7.59	43.11	74.00	-30.89

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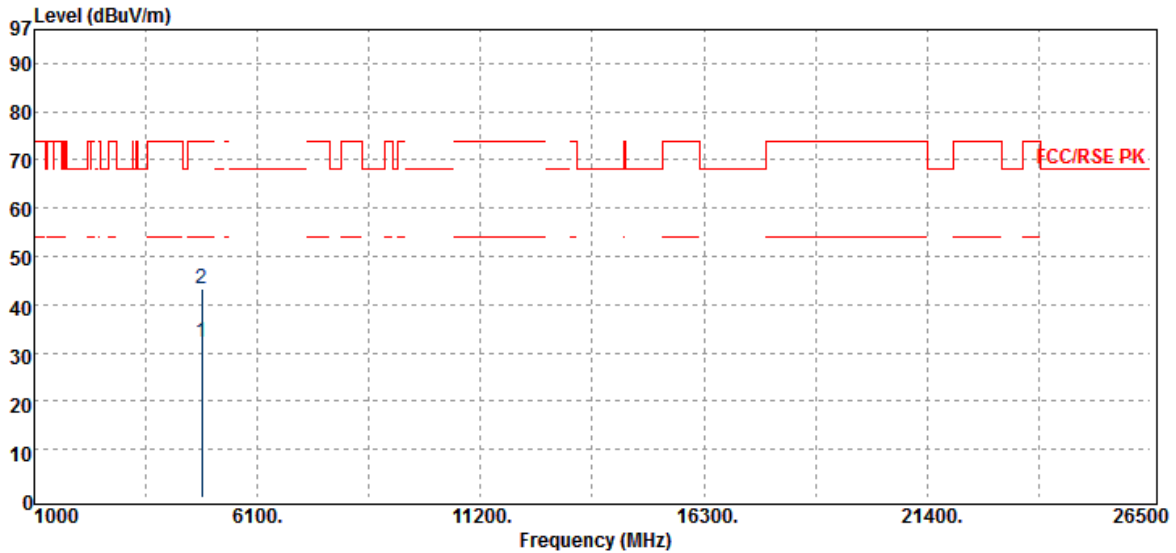
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Radiated Spurious Emission Measurement Result (802.11 g)

Operation Band	:802.11g	Test Date	:2018-05-23
Fundamental Frequency	:2412 MHz	Temp./Humi.	:23 deg_C / 61 RH
Operation Mode	:Tx CH LOW	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level d μ V	Factor dB	Actual FS d μ V/m	Limit @3m d μ V/m	Margin dB
4824.00	Average	24.99	7.35	32.34	54.00	-21.66
4824.00	Peak	35.80	7.35	43.15	74.00	-30.85

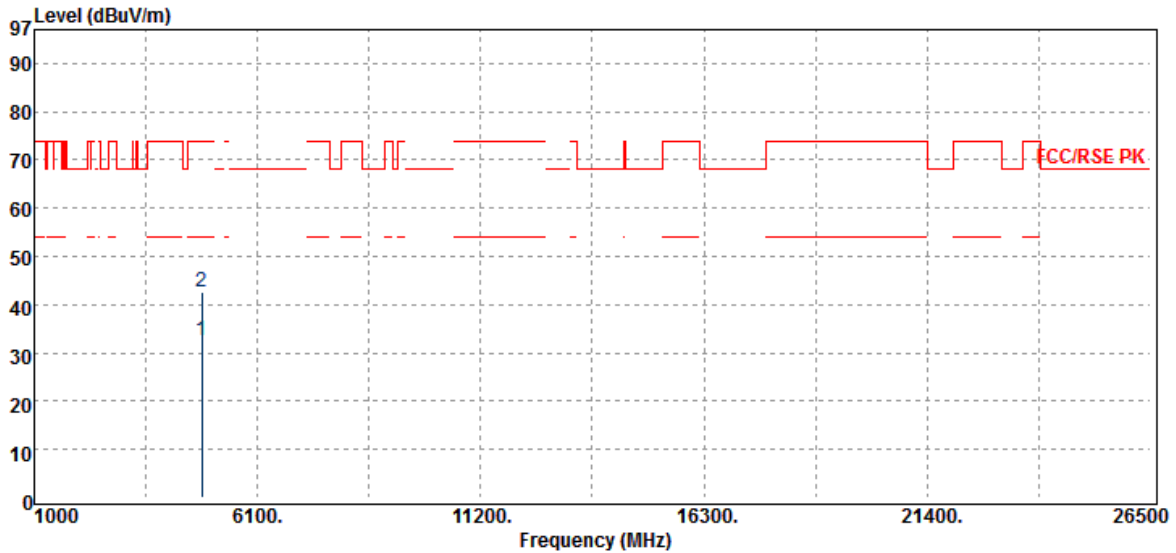
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Operation Band :802.11g
 Fundamental Frequency :2412 MHz
 Operation Mode :Tx CH LOW
 EUT Pol. :H Plane

Test Date :2018-05-23
 Temp./Humi. :23 deg_C / 61 RH
 Engineer :Tin
 Measurement Antenna Pol. :HORIZONTAL



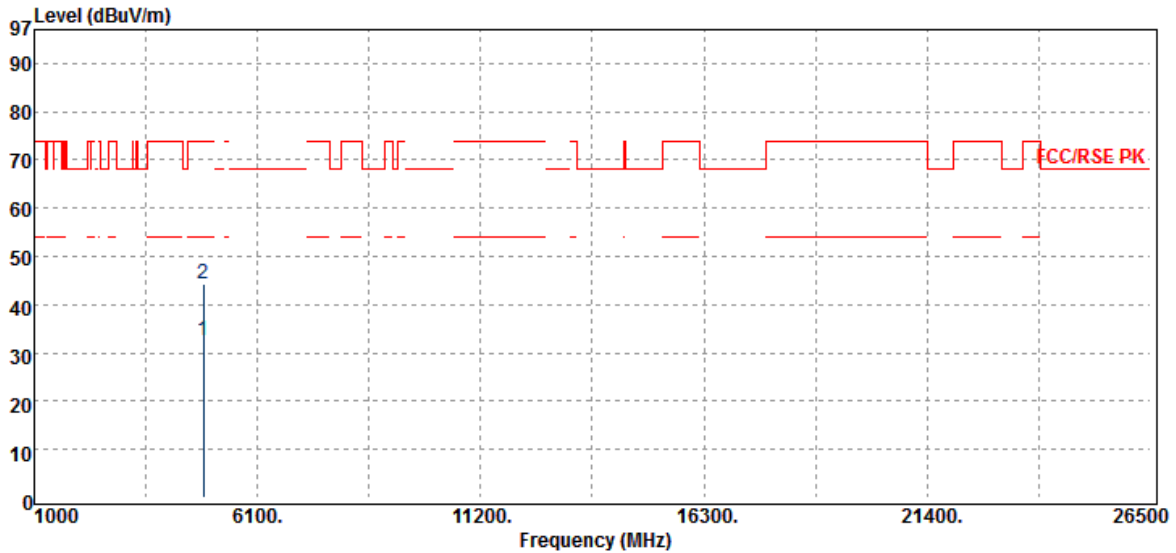
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level d μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
4824.00	Average	25.13	7.35	32.48	54.00	-21.52
4824.00	Peak	35.42	7.35	42.77	74.00	-31.23

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Operation Band	:802.11g	Test Date	:2018-05-23
Fundamental Frequency	:2437 MHz	Temp./Humi.	:23 deg_C / 61 RH
Operation Mode	:Tx CH MID	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level d μ V	Factor dB	Actual FS d μ V/m	Limit @3m d μ V/m	Margin dB
4874.00	Average	24.85	7.62	32.47	54.00	-21.53
4874.00	Peak	36.75	7.62	44.37	74.00	-29.63

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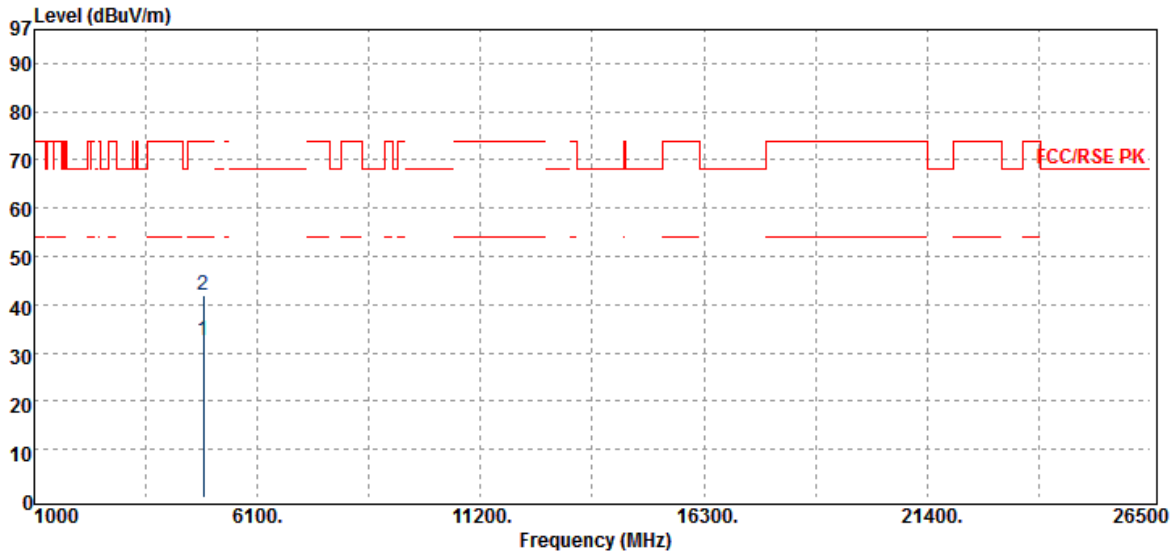
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Operation Band	:802.11g	Test Date	:2018-05-23
Fundamental Frequency	:2437 MHz	Temp./Humi.	:23 deg_C / 61 RH
Operation Mode	:Tx CH MID	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level d μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
4874.00	Average	25.07	7.62	32.69	54.00	-21.31
4874.00	Peak	34.41	7.62	42.03	74.00	-31.97

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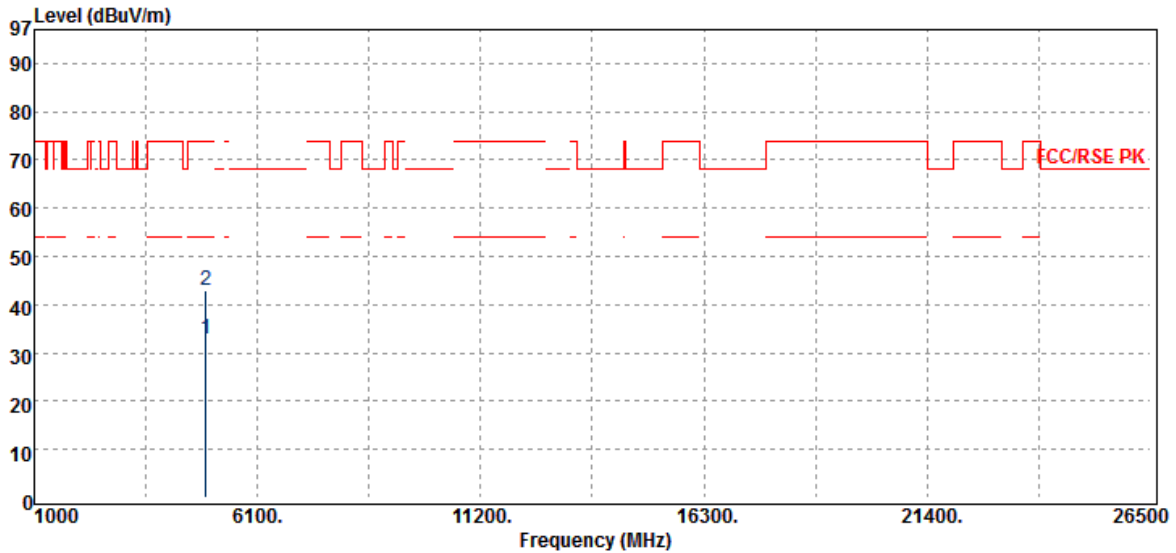
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Operation Band	:802.11g	Test Date	:2018-05-23
Fundamental Frequency	:2462 MHz	Temp./Humi.	:23 deg_C / 61 RH
Operation Mode	:Tx CH HIGH	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level d μ V	Factor dB	Actual FS d μ V/m	Limit @3m d μ V/m	Margin dB
4924.00	Average	25.20	7.59	32.79	54.00	-21.21
4924.00	Peak	35.28	7.59	42.87	74.00	-31.13

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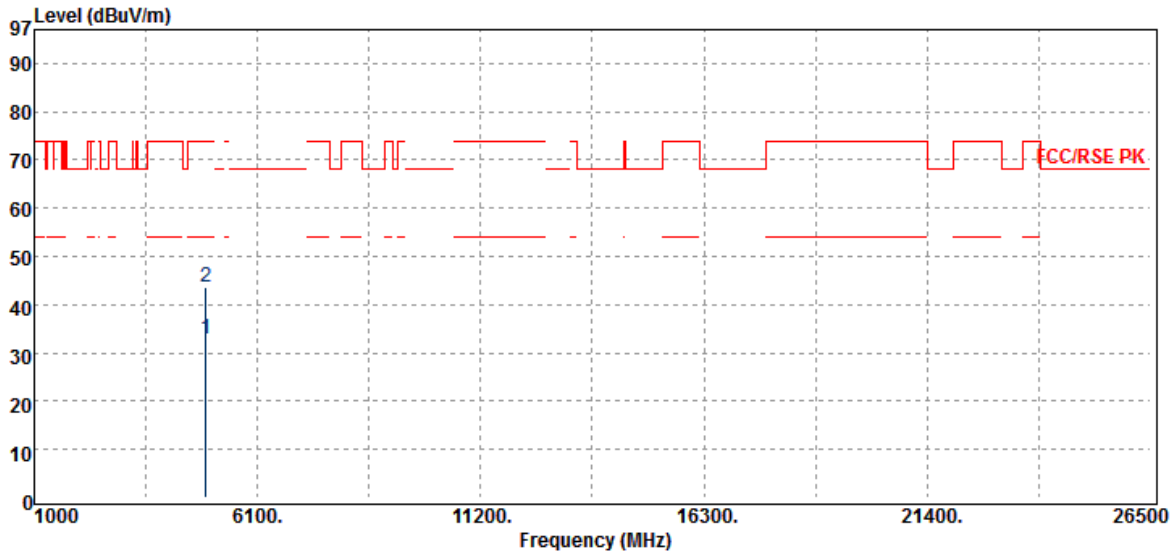
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Operation Band	:802.11g	Test Date	:2018-05-23
Fundamental Frequency	:2462 MHz	Temp./Humi.	:23 deg_C / 61 RH
Operation Mode	:Tx CH HIGH	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:HORIZONTAL



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level d μ V	Factor dB	Actual FS d μ V/m	Limit @3m d μ V/m	Margin dB
4924.00	Average	25.24	7.59	32.83	54.00	-21.17
4924.00	Peak	36.12	7.59	43.71	74.00	-30.29

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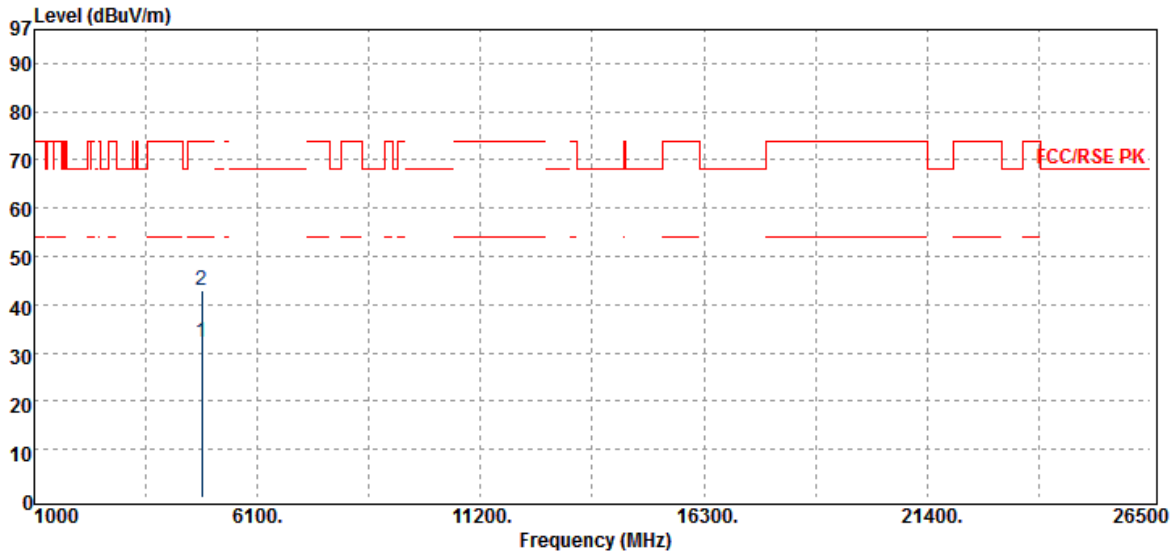
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Radiated Spurious Emission Measurement Result (802.11n_HT20)

Operation Band	:802.11n20	Test Date	:2018-05-23
Fundamental Frequency	:2412 MHz	Temp./Humi.	:23 deg_C / 61 RH
Operation Mode	:Tx CH LOW	Engineer	:Tin
EUT Pol.	:H Plane	Measurement Antenna Pol.	:VERTICAL



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level d μ V	Factor dB	Actual FS d μ V/m	Limit @3m d μ V/m	Margin dB
4824.00	Average	24.98	7.35	32.33	54.00	-21.67
4824.00	Peak	35.62	7.35	42.97	74.00	-31.03

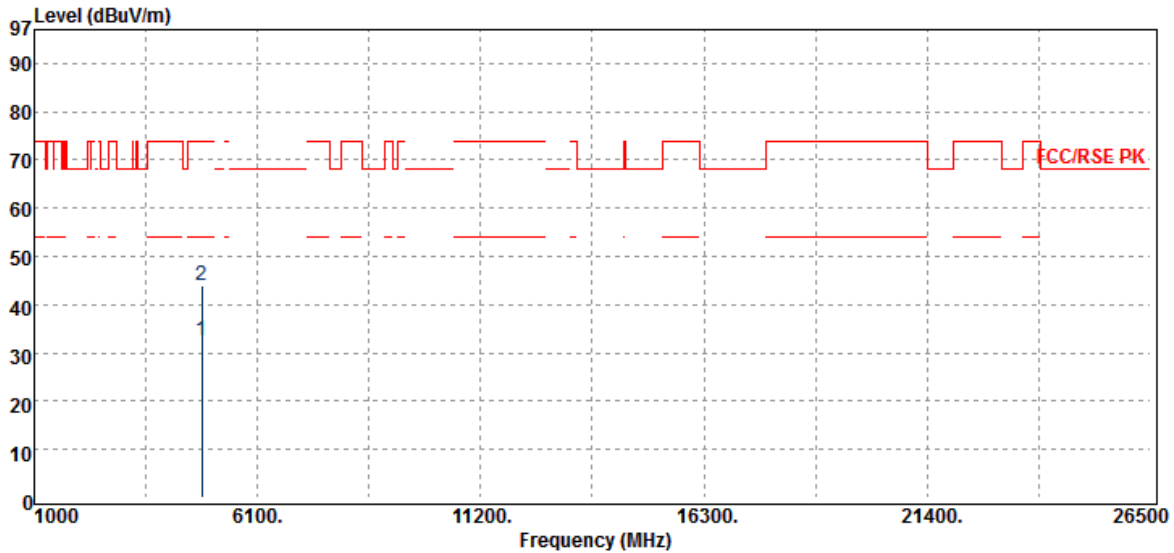
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Operation Band :802.11n20
Fundamental Frequency :2412 MHz
Operation Mode :Tx CH LOW
EUT Pol. :H Plane

Test Date :2018-05-23
Temp./Humi. :23 deg_C / 61 RH
Engineer :Tin
Measurement Antenna Pol. :HORIZONTAL



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level d μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
4824.00	Average	25.14	7.35	32.49	54.00	-21.51
4824.00	Peak	36.51	7.35	43.86	74.00	-30.14

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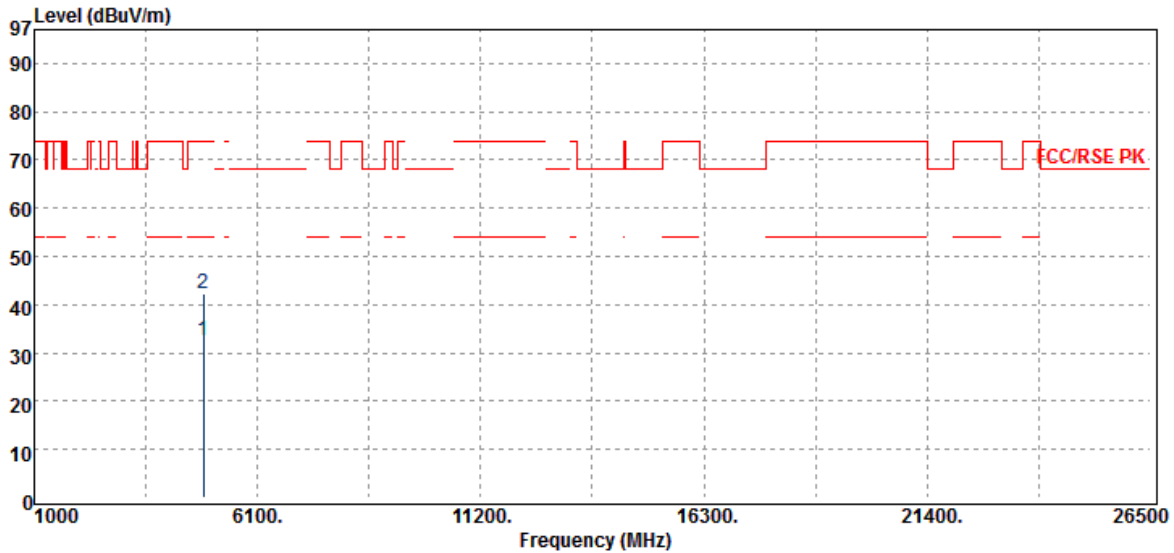
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Operation Band :802.11n20
Fundamental Frequency :2437 MHz
Operation Mode :Tx CH MID
EUT Pol. :H Plane

Test Date :2018-05-23
Temp./Humi. :23 deg_C / 61 RH
Engineer :Tin
Measurement Antenna Pol. :VERTICAL



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level d μ V	Factor dB	Actual FS d μ V/m	Limit @3m d μ V/m	Margin dB
4874.00	Average	24.77	7.62	32.39	54.00	-21.61
4874.00	Peak	34.79	7.62	42.41	74.00	-31.59

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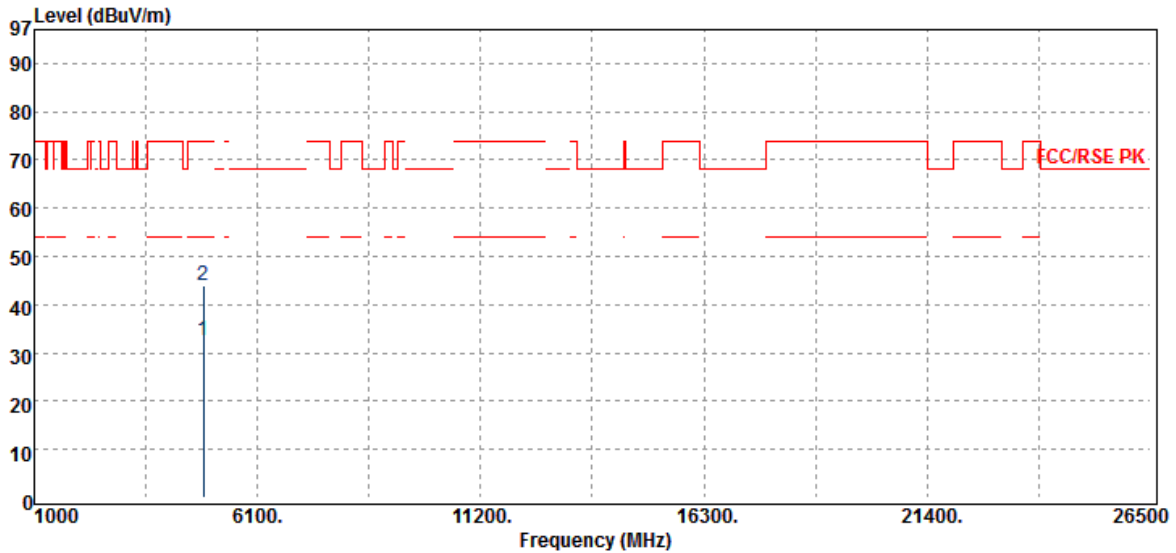
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Operation Band :802.11n20
 Fundamental Frequency :2437 MHz
 Operation Mode :Tx CH MID
 EUT Pol. :H Plane

Test Date :2018-05-23
 Temp./Humi. :23 deg_C / 61 RH
 Engineer :Tin
 Measurement Antenna Pol. :HORIZONTAL



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level d μ V	Factor dB	Actual FS d μ V/m	Limit @3m d μ V/m	Margin dB
4874.00	Average	24.96	7.62	32.58	54.00	-21.42
4874.00	Peak	36.19	7.62	43.81	74.00	-30.19

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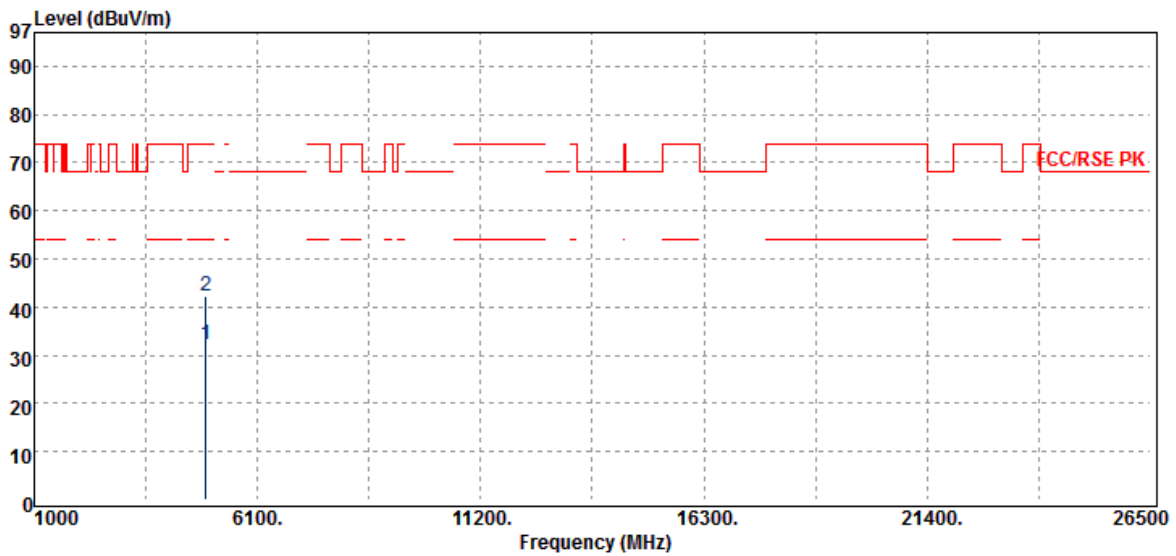
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Operation Band :802.11n20
 Fundamental Frequency :2462MHz
 Operation Mode :Tx CH HIGH
 EUT Pol. :H Plane

Test Date :2018-05-29
 Temp./Humi. :23 deg_C / 61 RH
 Engineer :Tin
 Measurement Antenna Pol. :VERTICAL



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
4924.00	Average	24.75	7.59	32.34	54.00	-21.66
4924.00	Peak	34.82	7.59	42.41	74.00	-31.59

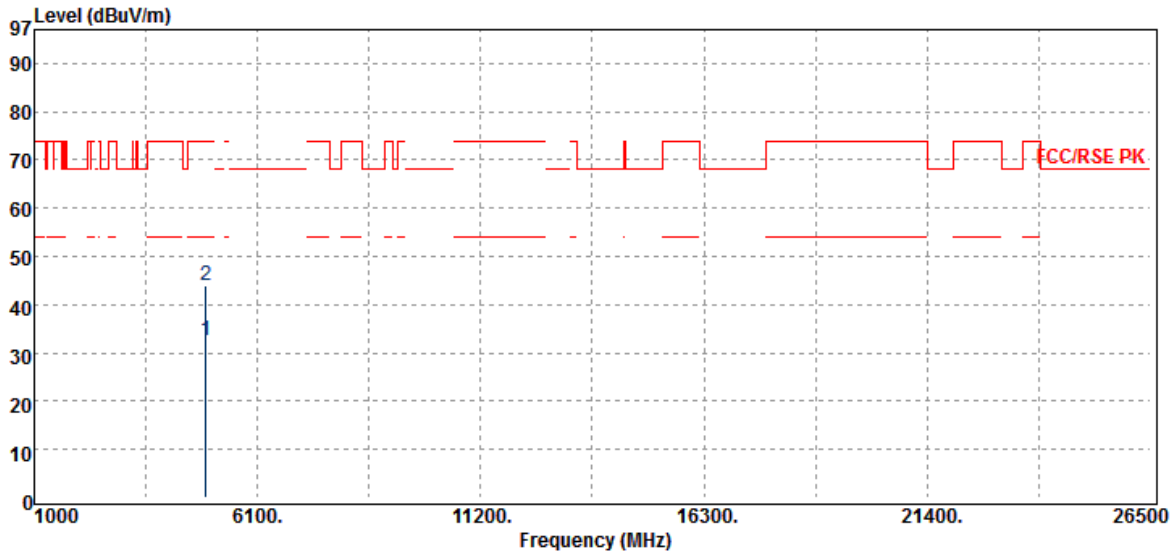
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Operation Band :802.11n20
 Fundamental Frequency :2462 MHz
 Operation Mode :Tx CH HIGH
 EUT Pol. :H Plane

Test Date :2018-05-29
 Temp./Humi. :23 deg_C / 61 RH
 Engineer :Tin
 Measurement Antenna Pol. :HORIZONTAL



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level d μ V	Factor dB	Actual FS d μ V/m	Limit @3m d μ V/m	Margin dB
4924.00	Average	24.89	7.59	32.48	54.00	-21.52
4924.00	Peak	36.36	7.59	43.95	74.00	-30.05

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12 PEAK POWER SPECTRAL DENSITY

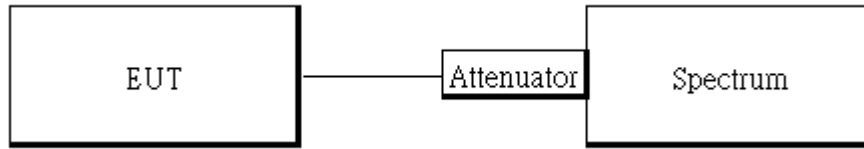
12.1 Standard Applicable

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.

12.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Meter	Anritsu	ML2496A	1242004	2017/10/16	2018/10/15
DC Power Supply	Anritsu	E3640A	MY52410006	2017/11/28	2018/11/27
EXA Spectrum Analyzer	Agilent	N9010A	MY50420195	2018/05/03	2019/05/02
DC Power Supply	Anritsu	E3640A	MY52410006	2017/11/28	2018/11/27

12.3 Test Set-up



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 & ANSI C63.10.
3. Set the span to 1.5 times the DTS channel bandwidth.
4. Set the RBW = 3 kHz. & the 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.

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12.5 Measurement Result

POWER DENSITY 802.11b				POWER DENSITY 802.11g			
Freq. (MHz)	PPSD (dBm)	Limit (dBm)	Result	Freq. (MHz)	PPSD (dBm)	Limit (dBm)	Result
2412	-8.03	8.00	PASS	2412	-17.03	8.00	PASS
2437	-7.66	8.00	PASS	2437	-16.21	8.00	PASS
2462	-7.86	8.00	PASS	2462	-15.82	8.00	PASS

POWER DENSITY 802.11n HT20			
Freq. (MHz)	PPSD (dBm)	Limit (dBm)	Result
2412	-16.37	8.00	PASS
2437	-16.82	8.00	PASS
2462	-15.21	8.00	PASS

offset 11.00 dB for SISO mode

**Refer to next page for plots*

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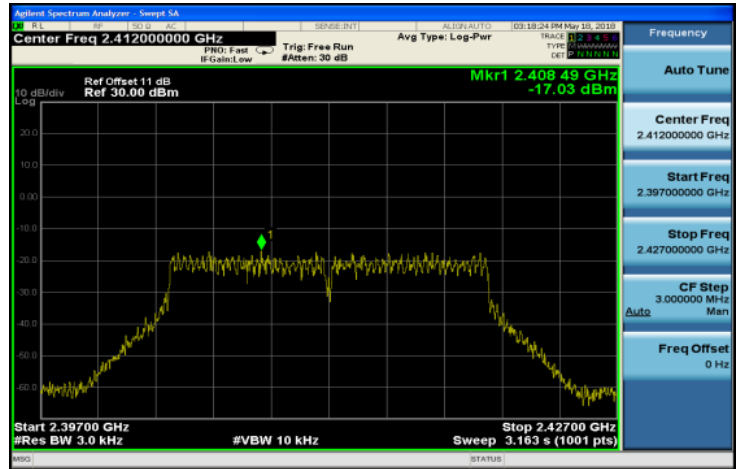
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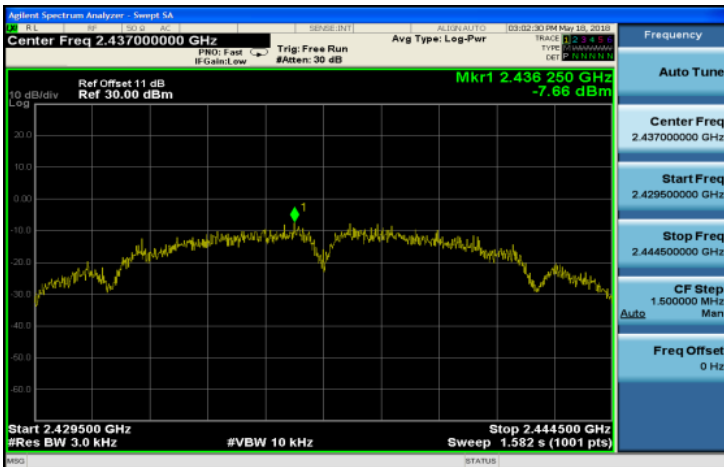
802.11b Power Spectral Density Test Plot (CH-Low)



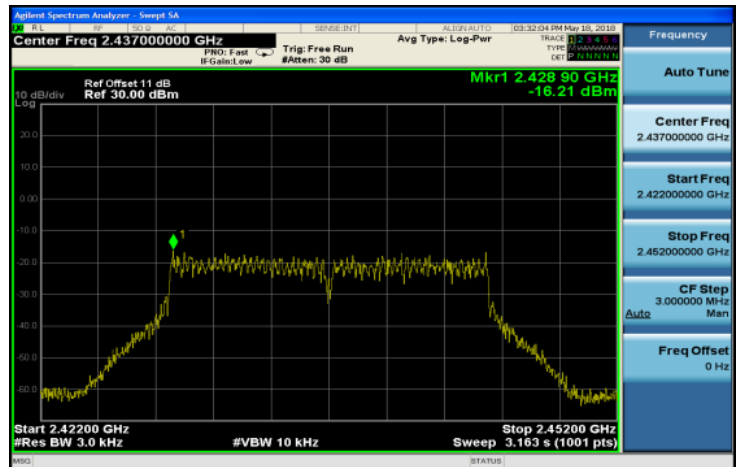
802.11g Power Spectral Density Test Plot (CH-Low)



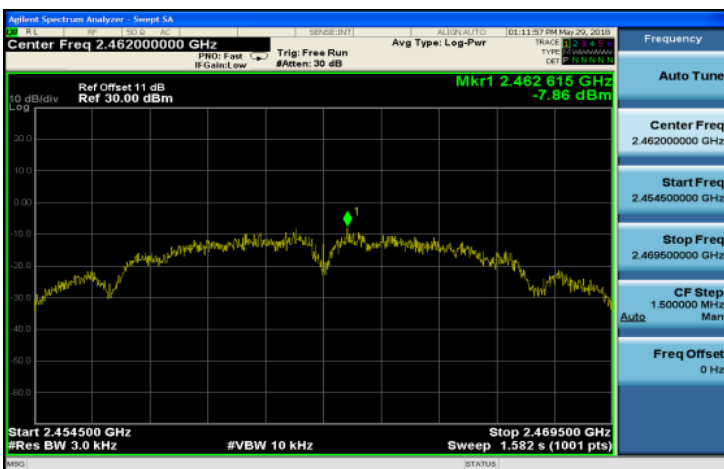
Power Spectral Density Test Plot (CH-Mid)



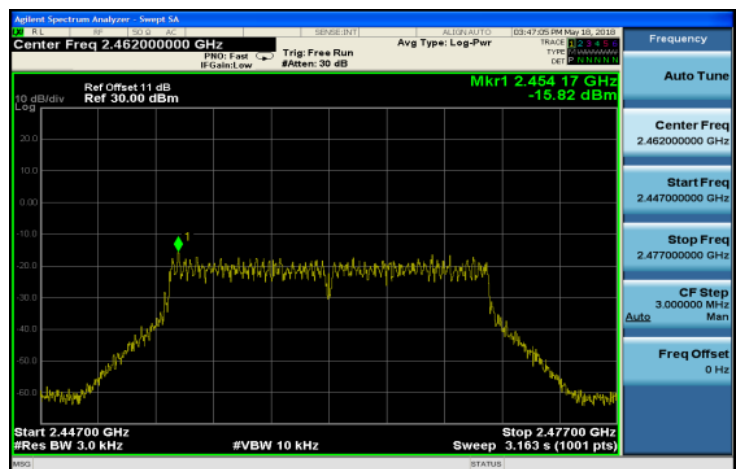
Power Spectral Density Test Plot (CH-Mid)



Power Spectral Density Test Plot (CH-High)



Power Spectral Density Test Plot (CH-High)



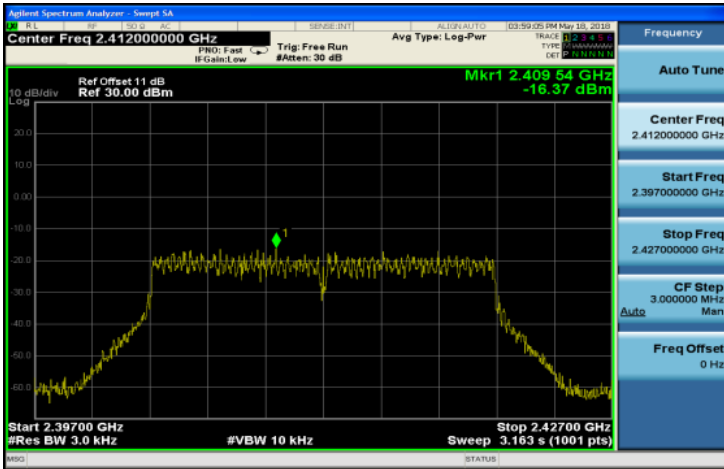
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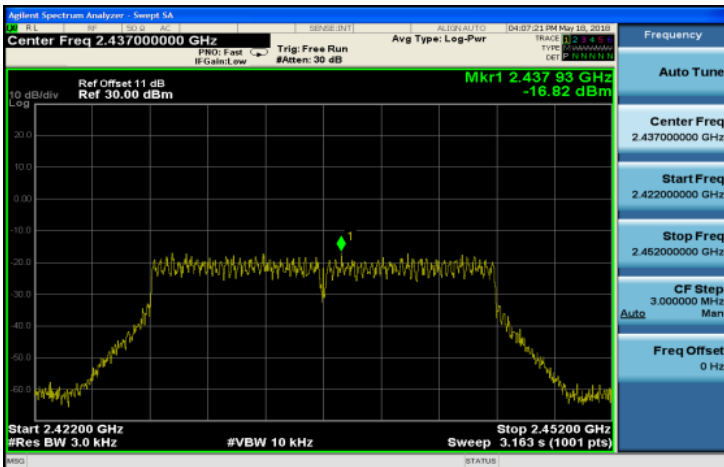
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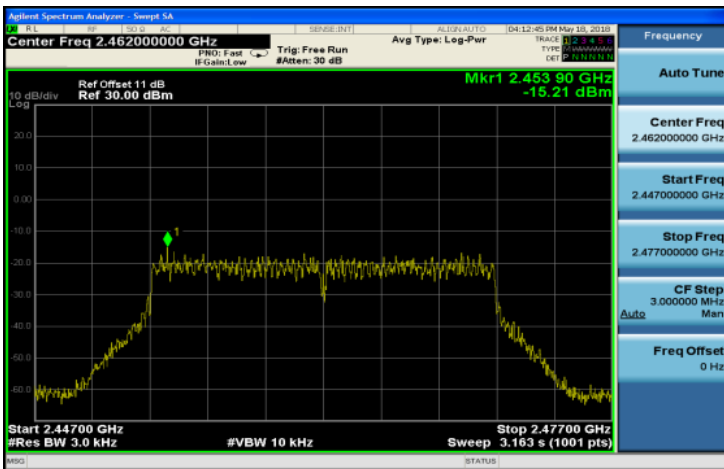
Power Spectral Density Test Plot (CH-Low)



Power Spectral Density Test Plot (CH-Mid)



Power Spectral Density Test Plot (CH-High)



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

An embedded-in antenna design is used.

The antenna connector is designed with unique type RF connector and no consideration of replacement. Please see EUT photo and antenna spec. for details.

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SGS Taiwan Ltd.

台灣檢驗科技股份有限公司

No.134,WuKungRoad,NewTaipeiIndustrialPark,WukuDistrict,NewTaipeiCity,Taiwan24803/新北市五股區新北產業園區五工路134號

t (886-2) 2299-3279

f (886-2) 2298-0488

www.tw.sgs.com

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