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ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

	OF
Product Name:	USB module
Brand Name:	REALTEK
Model No.:	RTL8812BU
Model Difference:	N/A
FCC ID:	TX2-RTL8812BU
Report No.:	ER/2017/70015
Issue Date:	Jul. 21, 2017
FCC Rule Part:	§15.247, Cat: DTS
Prepared for:	REALTEK SEMICONDUCTOR CORP. NO. 2, INNOVATION ROAD II, SCIENCE PARK, HSINCHU 300, TAIWAN SGS Taiwan Ltd.
Prepared by:	Electronics & Communication Laboratory No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803
BIC MRA Desting Laboratory 0513	Note: This report shall not be reproduced except in full, without the written approval of SGS Taiwan Ltd. This document may be altered or revised by SGS Taiwan Ltd. personnel only, and shall be noted in the revision section of the document.

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VERIFICATION OF COMPLIANCE

Applicant for:	REALTEK SEMICONDUCTOR CORP. NO. 2, INNOVATION ROAD II, SCIENCE PARK, HSINCHU 300, TAIWAN
Product Name:	USB module
Brand Name:	REALTEK
Model No.:	RTL8812BU
Model Difference:	N/A
FCC ID:	TX2-RTL8812BU
Report Number:	ER/2017/70015
Date of Test:	Jul. 03, 2017 ~ Jul. 17, 2017
Date of EUT Received:	Jul. 03, 2017

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.

Test By:	Ton Lis	Date:	Jul. 21, 2017
Prepared By:	Tin Lin / Engineer Vroletta Tang	Date:	Jul. 21, 2017
Approved By:	Violetta Tang / Clerk Jim Chang Jim Chang / Asst. Manager	Date:	Jul. 21, 2017

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Revision History

Report Number	Revision	Description	Issue Date
ER/2017/70015	Rev.00	Initial creation of document	Jul. 21, 2017

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1 **GENERAL INFORMATION**

1.1 Product description

General:

Product Name:	USB module
Brand Name:	REALTEK
FCC Model No.:	RTL8812BU
Model Difference:	N/A
Software Version:	V0.6
Hardware Version:	0V8
Power Supply:	5V from USB Port

WLAN 2.4GHz:

Wi-Fi	Frequency Range	Channels	Rated Power	Modulation Technology		
11b/g	2412-2462	11	b: 25.18dBm g: 27.45dBm (MIMO)	DSSS, OFDM		
11n	HT20 2412-2462	11	27.69dBm (MIMO)	OFDM		
11n	HT40 2422-2452	7	7 29.34dBm (MIMO) OFDM			
Antenna	Designation:	Printed Antenna, Main Antenna Gain: -1.5dBi, Part No.: RTK-ANT-0002, Supplier: REALTEK Aux Antenna Gain: -0.1dBi, Part No.: RTK-ANT-0002, Supplier: REALTEK				
Modulati	on type:	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM				
Transitio	n Rate:	802.11 b: up to 11 Mbps; 802.11 g: up to 54 Mbps 802.11 n_20MHz: up to 144Mbps 802.11 n_40MHz: up to 300Mbps				

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Host Information:

MB/NB/add-in card model name	OS	USB Host
Acer-Aspire VN7 719G-55MB(NB)	WIN8.1	Intel USB3.0
ASUS-(P7H55-M/USB3)	WIN7	NEC USB3.0
ASUS-(M5A87) (PC)	WIN7	Asmedia USB3.0
ASUS(NB)-(U36J)	WIN7	Fresco USB3.0
ASUS-(P8Z77-V LX)	WIN7	Intel USB3.0
DELL Vostro 270S (PC)	WIN7	Intel USB3.0
GIGABYTE-(GA-880GMA-UD2H)	WIN7	NEC USB3.0
GIGABYTE-(GA-F2A85X-UP4)	WIN7	AMD USB3.0
GIGABYTE-(GA-H61M-USB3(B3))	WIN7	ETRON USB3.0
HP 14-R017TU(NB)	WIN8	Intel USB3.0
Lenovo T430(NB)	WIN7	Intel USB3.0
MSI-(H67MA-E35(B3))	WIN7	NEC USB3.0
TOSHIBA(NB)-(R830)	WIN7	Renesas USB3.0
TOSHIBA(NB)-(R930)	WIN7	Intel USB3.0
UTB222	WIN7	Renesas USB3.0
UTB242	WIN7	TI USB3.0
UTB245	WIN7	Fresco USB3.0
VLI-805 add-in card	WIN7	VLI USB3.0

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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

FCC KDB 662911 D01 Multiple Transmitter Output

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 Numbers are: 509634

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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SYSTEM TEST CONFIGURATION 2

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 as 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 30MHz, The CISPR Quasi-Peak and Average detector mode is employed according to \$15,207. 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 a placed on as 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 hand-held transmitter (EUT) was rotated through one orthogonal axe 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.

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 1.8dB, and 10dB attenuator (SISO) and cable loss 4.8dB, and 10dB attenuator (MIMO). Offset:

SISO mode offset = RF cable loss (dB)+ attenuation factor(dB) =11.8(dB) MIMO mode offset = RF cable loss (dB)+ attenuation factor(dB)+ 10 log(NANT) dB =14.8(dB)

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2.5 Configuration of Tested System

Fig. 2-1 Radiated & AC Power Line & Conducted (Antenna Port) Emission



Table 2-1 Equipment Used in Tested System

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.	Notebook	Lenovo	L420	LR-7HXZA	Shielded	Un-shielded

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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
§15.247(d)	Conducted Band Edge and Spurious Emission	Compliant
§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, 802.11g and 802.11n HT20

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

7 channels are provided for 802.11n HT40

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
3	2422 MHz	8	2447 MHz
4	2427 MHz	9	2452 MHz
5	2432 MHz		
6	2437 MHz		
7	2442 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 (BELOW 1 GHz)								
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT			
802.11g	1 to 11	1, 6, 11	OFDM	6	MIMO			
	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	AUX			
802.11g	1 to 11	1, 6, 11	OFDM	6	MIMO			
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	MCS 8	MIMO			
802.11n (HT40)	3 to 9	3, 6, 9	OFDM	MCS 8	MIMO			

RADIATED EMISSION TEST

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.

Pre-scanned was done on Main antenna and Aux antenna. The Aux antenna results higher emission at 2.4GHz. Therefore, the completed set of radiated measurement was done on Aux antenna to be presented on this test report.

ANTENNA PORT CONDUCTED MEASUREMENT:

		001010755	TEAT		1			
	CONDUCTED TEST							
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT			
802.11b	1 to 11	1, 6, 11	DSSS	1	AUX			
802.11g	1 to 11	1, 6, 11	OFDM	6	MIMO			
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	MCS 8	MIMO			
802.11n (HT40)	3 to 9	3, 6, 9	OFDM	MCS 8	MIMO			

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Directional gain (MIMO)

The Tx transmission to construct MIMO operation is cyclic delay diversity, and the following deduction to obtain the array gain of MIMO operation is based on the approach given by KDB 662911 D01.

Array gain = 3.01dBi (peak spectral density, conducted spurious emission)

Gain that is combined with different magnitude of two antennas:

- If antenna gains are not equal, the user may use either of the following methods to calculate (ii) directional gain, provided that each transmit antenna is driven by only one spatial stream:
 - Directional gain may be calculated by using the formulas applicable to equal gain antennas with G_{ANT} set equal to the gain of the antenna having the highest gain; or,

$$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$$

where

Each antenna is driven by no more than one spatial stream; N_{55} = the number of independent spatial streams of data;

 $N_{,DM}$ = the total number of antennas

 $g_{j,k} = 10^{G_k/20}$ if the kth antenna is being fed by spatial stream j, or zero if it is not; G_k is the gain in dBi of the kth antenna.

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MEASUREMENT UNCERTAINTY 5

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:

	9kHz-30MHz: +/-2.87dB
	30MHz - 180MHz: +/- 3.37dB
Measurement uncertainty	180MHz -417MHz: +/- 3.19dB
(Polarization : Vertical)	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB

	9kHz-30MHz: +/-2.87dB
	30MHz - 167MHz: +/- 4.22dB
Measurement uncertainty	167MHz -500MHz: +/- 3.44dB
(Polarization : Horizontal)	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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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	ESCI7	100760	05/11/2017	05/10/2018				
LISN	SCHWARZBECK	NSLK 8127	8127-649	05/22/2017	05/21/2018				
LISN	MESS TEC	FCC-LISN-50/250 -25-2-01	4034	03/19/2017	03/18/2018				
Coaxial Cables	N/A	WK CE Cable	N/A	11/26/2016	11/25/2017				

6.3 EUT Setup

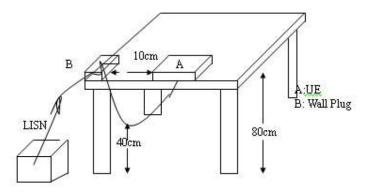
- 1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI 63.10:2013.
- 2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
- 3. The LISN was connected with 120Vac/60Hz power source.

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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.

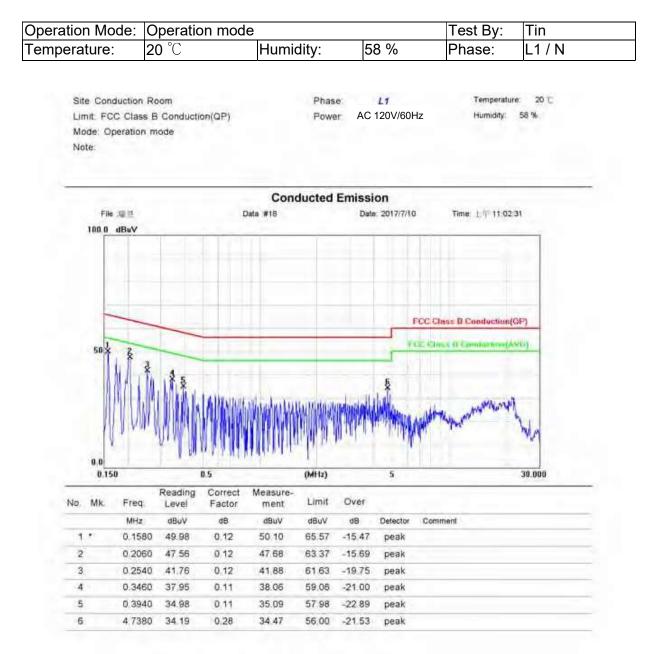
Note2: The * reveals the worst-case results that closet to the limit.

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AC POWER LINE CONDUCTED EMISSION TEST DATA



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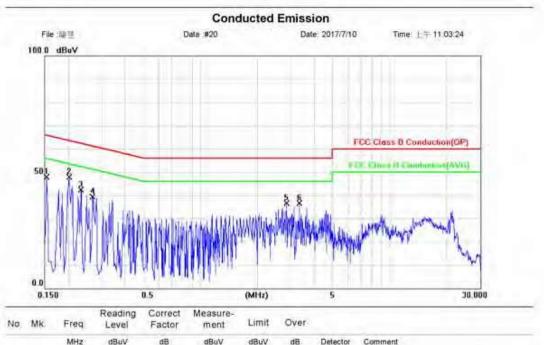
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Site Conduction Room Phase. N Temperature: 20 C Limit: FCC Class B Conduction(QP) Power AC 120V/60Hz Humidity: 58 % Mode: Operation mode Note:



	MHZ	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	0.1540	47.87	0.07	47.94	65.78	-17.84	peak	
2 •	0.2020	47 70	0.07	47 77	63.53	-15.76	peak	
3	0.2340	42.29	0.07	42.36	62.31	-19.95	peak	
4	0.2700	39.33	0.07	39.40	61.12	-21.72	peak	
5	2 8500	36.57	0 15	36.72	56.00	-19.28	peak	
6	3.3140	36.41	0 17	36.58	56.00	-19.42	peak	

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DUTY CYCLE OF TEST SIGNAL 7

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:

Duty Cycle = Ton / (Ton+Toff)

Measurement Procedure:

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

Duty Cycle:

	Duty Cycle (%)	Duty Factor (dB)
802.11b	99.63	0.02
802.11g	96.24	0.17
802.11n_20	92.84	0.32
802.11n_40	86.51	0.63

b = 99.63%, *g* = 96.24%,*n_ht_*20 = 92.84%*n_ht_*40 = 86.51%

Duty Cycle Factor: $10 * \log(1/0.9963) = 0.02$ Duty Cycle Factor: $10 * \log(1/0.9624) = 0.17$ Duty Cycle Factor: $10 * \log(1/0.9284) = 0.32$ Duty Cycle Factor: 10 * log(1/0.8651) = 0.63

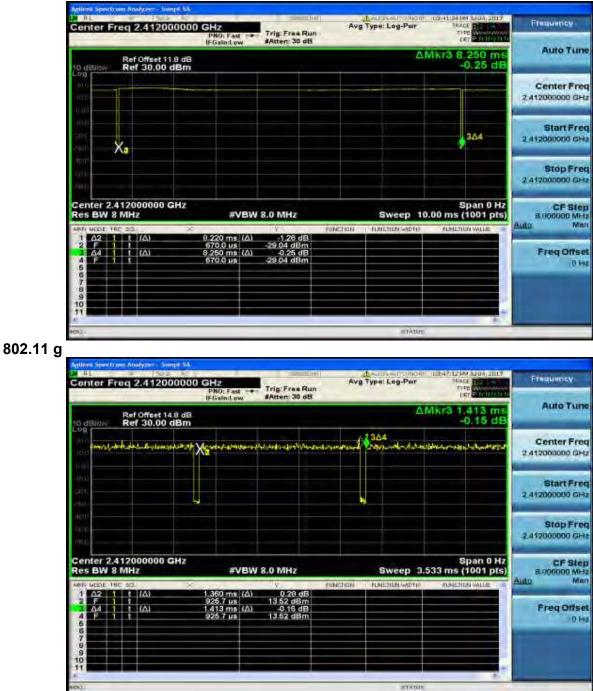
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7.1 DUTY CYCLE TEST SIGNAL Measurement Result

802.11 b



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802.11 n_20 MHz

	IFGain:Low	#Atten: 30 dB		DET PINHTITITE	
ffset 14.8 dB 30.00 dBm	W.Mashie and		۵	Mkr3 713.0 µs -1.53 dB	Auto Tun
at we flight the	alian deve fara	เหลือเอตาสู่เสียงกฎษาสา	of for the product of the second		Center Fre 2.412000000 GH
<.				Δ2 3Δ4	Start Fre 2.412000000 CH
					Stop Fre 2.412000000 GM
0000 GHz	#VBW	14	and the second data was a long to a long of the second data being the se		CF Str 8.000000 Mi Auto Mi
51	662.0 μs (Δ) 131.0 μs 713.0 μs (Δ) 131.0 μs	0,14 dB -26,93 dBm -153 dB -26,93 dBm			Freq Offs 01
	60.00 dBm 4 ⁴ 17 (1)12 - 1 (3) 50000 GHz	10.00 dBm	00.00 dBm 	10.00 dBm ««чыйы» тикинанийскат фалартану сортоности (з 11 12 10000 GHz #VBW 8.0 MHz 12 10 014 dB 13 10 014 dB 13 10 014 dB	1.53 dB a* with the first of the firs

802.11 n_40 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.

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.

Main Antenna Gain: Aux1 Antenna Gain:	-1.50 -0.10	dBi dBi
Number Antenna:	2	pcs
Limit: The antenna gain is grater than 6dBi in MIMO mode the limit reduce as below Directional gain = gain of antenna element + 10 log (# of TX antenna elemen	/:	dBm

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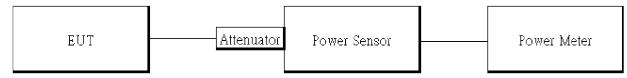
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SGS Conducted Room								
EQUIPMENT	MFR	MFR MODEL SERIAL		LAST	CAL DUE.			
TYPE		NUMBER	NUMBER	CAL.				
Power Meter	Anritsu	ML2495A	1005007	12/15/2016	12/14/2017			
Power Sensor	Anritsu	MA2411B	917032	12/15/2016	12/14/2017			
EXA Spectrum Analyzer	Agilent	N9030A	MY53120760	03/21/2017	03/20/2018			
DC Block	Mini-Circuits	BLK-18-S+	1	01/05/2017	01/04/2018			
Coaxial Cable	HUBER+SUH NER	SUCOFLEX 102	23670/2	01/05/2017	01/04/2018			
Attenuator	Mini-Circuit	BW-S10W2+	2	01/05/2017	01/04/2018			
Splitter	Agilent	11636B	N/A	01/05/2017	01/04/2018			
DC Power Supply	Agilent	E3640A	MY52410006	11/21/2016	11/20/2017			
Temperature Chamber	TERCHY	MHG-120LF	911009	05/19/2017	05/18/2018			

8.3 Test Set-up

Power Meter:



8.4 Measurement Procedure

- 1. 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.
- 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.	802.11b Aux1								
СН	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit RESULT			RESULT		
1	2412	1	24.92	1 Watt	30.00	dBm	PASS		
6	2437	1	25.18	1 Watt	30.00	dBm	PASS		
11	2462	1	24.94	1 Watt	30.00	dBm	PASS		
802.	11b Au	x1							
СН	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Limit		RESULT			
1	2412	1	22.76	1 Watt	30.00	dBm	PASS		
6	2437	1	23.06	1 Watt	30.00	dBm	PASS		
11	2462	1	22.81	1 Watt	30.00	dBm	PASS		

802.	11g_MI	MO						
СН	Freq. (MHz)	Data Rate	ata Power ate (dBm) Total Peak Total Output Power Output		Total Peak Output Power (mW)	Limit	RESULT	
			CH 0	CH 1	(abili)	(11144)		
1	2412	6	24.26	24.61	27.45	555.75	1 Watt = 30.00 dBm	PASS
6	2437	6	24.25	24.53	27.40	549.86	1 Watt = 30.00 dBm	PASS
11	2462	6	23.78	24.41	27.12	514.84	1 Watt = 30.00 dBm	PASS
802.	11g_MI	MO						
СН	Freq. (MHz)	Data Rate	Po	Dutput wer Bm)	Avg. Output Power (dBm)	Avg. Output Power (mW)	Limit	RESULT
			CH 0	CH 1	(abili)	(1111)		
1	2412	6	16.94	17.45	20.38	105.02	1 Watt = 30.00 dBm	PASS
6	2437	6	16.75	17.36	20.24	101.77	1 Watt = 30.00 dBm	PASS
11	2462	6	16.39	17.14	19.96	95.31	1 Watt = 30.00 dBm	PASS

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802.	802.11n_HT20M MIMO								
сн	Freq. (MHz)	Data Rate	Po	Output wer <u>3m)</u> CH 1	Total Peak Output Power (dBm)	Total Peak Output Power (mW)	Limit	RESULT	
1	2412	MCS8	24.03	24.18	27.12	514.75	1 Watt = 30.00 dBm	PASS	
6	2437	MCS8	24.64	24.72	27.69	587.55	1 Watt = 30.00 dBm	PASS	
11	2462	MCS8	23.56	23.96	26.77	475.87	1 Watt = 30.00 dBm	PASS	
802.	11n_H1	Г20M М	IMO						
сн	Freq. (MHz)	Data Rate	Po	Dutput wer Bm)	Avg. Output Power (dBm)	Avg. Output Power (mW)	Limit	RESULT	
			CH 0	CH 1	(,	()			
1	2412	MCS8	14.76	15.09	18.26	62.21	1 Watt = 30.00 dBm	PASS	
6	2437	MCS8	17.32	17.91	20.96	115.75	1 Watt = 30.00 dBm	PASS	
11	2462	MCS8	14.58	15.36	18.32	63.06	1 Watt = 30.00 dBm	PASS	

802.	802.11n_HT40M MIMO								
сн	Freq. (MHz)	Data Rate	Po	Output wer 3m) CH 1	Total Peak Output Power (dBm)	Total Peak Output Power (mW)	Limit	RESULT	
3	2422	MCS8		23.94	26.75	473.69	1 Watt = 30.00 dBm	PASS	
6	2437	MCS8	24.29	27.71	29.34	858.74	1 Watt = 30.00 dBm	PASS	
9	2452	MCS8	22.75	23.23	26.01	398.74	1 Watt = 30.00 dBm	PASS	
802.	11n_H1	F40M M	IMO						
сн	Freq. (MHz)	Data Rate	Po	Dutput wer Bm)	Avg. Output Power (dBm)	Avg. Output Power (mW)	Limit	RESULT	
			CH 0	CH 1	(abiii)	()			
3	2422	MCS8	13.71	14.34	17.68	50.66	1 Watt = 30.00 dBm	PASS	
6	2437	MCS8	16.73	17.36	20.70	101.55	1 Watt = 30.00 dBm	PASS	
9	2452	MCS8	13.19	13.96	17.23	45.73	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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9 **6DB BANDWIDTH MEASUREMENT**

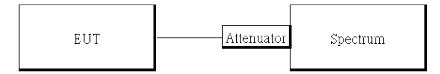
9.1 Standard Applicable

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

9.2 Measurement Equipment Used

	SGS Conducted Room							
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.			
Power Meter	Anritsu	ML2495A	1005007	12/15/2016	12/14/2017			
Power Sensor	Anritsu	MA2411B	917032	12/15/2016	12/14/2017			
EXA Spectrum Analyzer	Agilent	N9030A	MY53120760	03/21/2017	03/20/2018			
DC Block	Mini-Circuits	BLK-18-S+	1	01/05/2017	01/04/2018			
Coaxial Cable	HUBER+SUH NER	SUCOFLEX 102	23670/2	01/05/2017	01/04/2018			
Attenuator	Mini-Circuit	BW-S10W2+	2	01/05/2017	01/04/2018			
Splitter	Agilent	11636B	N/A	01/05/2017	01/04/2018			
DC Power Supply	Agilent	E3640A	MY52410006	11/21/2016	11/20/2017			
Temperature Chamber	TERCHY	MHG-120LF	911009	05/19/2017	05/18/2018			

9.3 Test Set-up



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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.
- 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 = 30M/50MHz, Detector=peak, Sweep=auto.

- 5. Mark the peak frequency and –6dB (upper and lower) frequency.
- 6. For 99% Bandwidth:

Set the spectrum analyzer as RBW=1%, VBW = 3*RBW, Span = 30M/50MHz, Detector=Sample, Sweep=auto.

- 7. Turn on the 99% bandwidth function, max reading.
- 8. Repeat above procedures until all frequency of interest measured was complete.

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Result

9.5 Measurement Result

6dB Bandwidth

802.11b Aux1

Freq.	6dB BW	Limit	Result	
(MHz)	(kHz)	(kHz)	Result	
2412	10063	> 500	PASS	
2437	10068	> 500	PASS	
2462	10057	> 500	PASS	

802.11g Main

Freq.	6dB BW	Limit	Result
(MHz)	(kHz)	(kHz)	Result
2412	16360	> 500	PASS
2437	16370	> 500	PASS
2462	16330	> 500	PASS

802.11g Aux1 Freq. 6dB BW Limit (247)

2412	16360	> 500	PASS
2437	16370	> 500	PASS
2462	16370	> 500	PASS

802.11 n HT20 Main

Freq.	6dB BW	Limit	Result
(MHz)	(kHz)	(kHz)	
2412	17580	> 500	PASS
2437	17560	> 500	PASS
2462	17590	> 500	PASS

802.11_n_HT20 Aux1

Freq.	6dB BW	Limit	Result	
(MHz)	(kHz)	(kHz)	Result	
2412	17600	> 500	PASS	
2437	17590	> 500	PASS	
2462	17580	> 500	PASS	

802.11_n_HT40 Main

Freq.	6dB BW	Limit	Result
(MHz)	(kHz)	(kHz)	Result
2422	36380	> 500	PASS
2437	36520	> 500	PASS
2452	36350	> 500	PASS

802.11_n_HT40 Aux1

Freq.	6dB BW	Limit	Result
(MHz)	(kHz)	(kHz)	Result
2422	36330	> 500	PASS
2437	36420	> 500	PASS
2452	36390	> 500	PASS

*Refer to next page for plots

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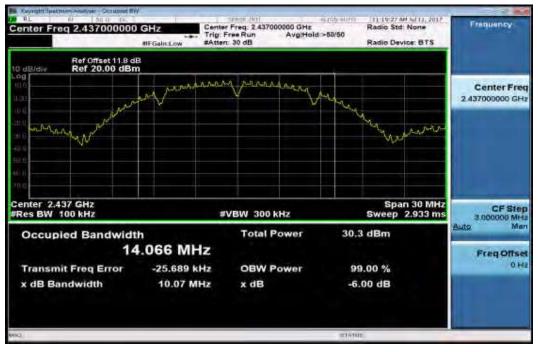
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802.11b (Aux) 6dB Band Width Test Data CH-Low



6dB Band Width Test Data CH-Mid



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6dB Band Width Test Data CH-High



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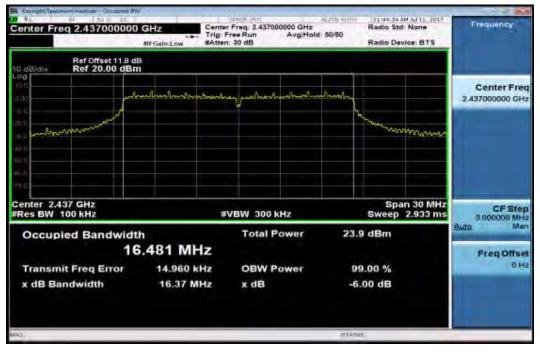
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802.11g (Main) 6dB Band Width Test Data CH-Low



6dB Band Width Test Data CH-Mid



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6dB Band Width Test Data CH-High

Center Freq 2.462000000 GHz					Center Freq. 2.482000000 GHz Radio : Trig: Free Run Avg/Hold: 50/50					Radio Str	Minul 11, 2017 d: None wice: BTS	Frequency
10 dB/div	Ref Offset 11.8 dB Ref 20.00 dBm											
40 C 10 0 10 0	water	ŗ	aryan A			Vendensele	مين مين مريد المريد			North Contraction	nengaga saga	Center Freq 2.462000000 GHz
Center 2,40 #Res BW 1		#V	#VBW 300 kHz			Span 30 MHz Sweep 2.933 ms			CF Step 3.00000 MHz			
Occupied Bandwidth 16.472 MHz					Hz	Total Power			22.1 dBm			Auto Man Freg Offset
Transmit Freq Error x dB Bandwidth			-3.888 kHz 16.33 MHz		OBW Power x dB		99.00 % -6.00 dB				0 Hz	
80	_	-		_				=1/	This.			

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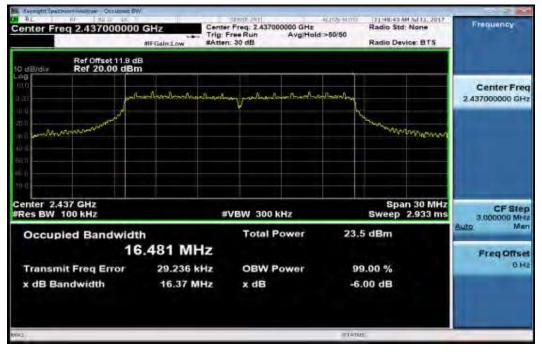
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802.11g (Aux) 6dB Band Width Test Data CH-Low



6dB Band Width Test Data CH-Mid



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6dB Band Width Test Data CH-High

Center Fre	q 2.462000			Center Freq. 2.482000000 GHz Trig: Free Run AvgiHold: 50/50 w #Atten: 30 dB				Radio Str	None t: None vice: BTS	Frequency
10 dB/div										
100 100		and monthing	und and	ordony	parteral	بمالعمهامير	-balla			Center Freq 2.462000000 GHz
and martine	woodwood and the							w www.	manual	
40 4 52 ()										
10.0										
	Center 2.452 GHz Span 30 MHz Spae 30 MHz Spae 2.933 ms									CF Step 3.000000 MH
Occupied Bandwidth 16.491 MHz				,	Total Power			.6 dBm		Auto Mer
Transmit Freq Error x dB Bandwidth		-	-5.487 kHz 16.36 MHz		OBW Power x dB		99.00 % -6.00 dB			FreqOffset 0 Hz
						TANE				

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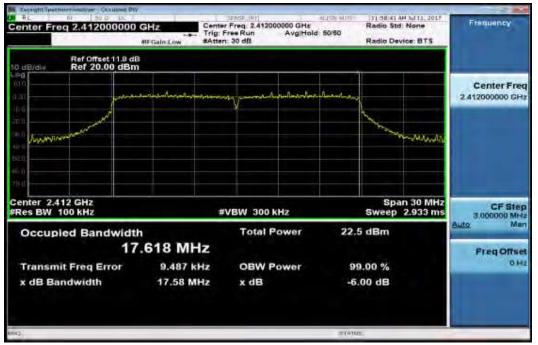
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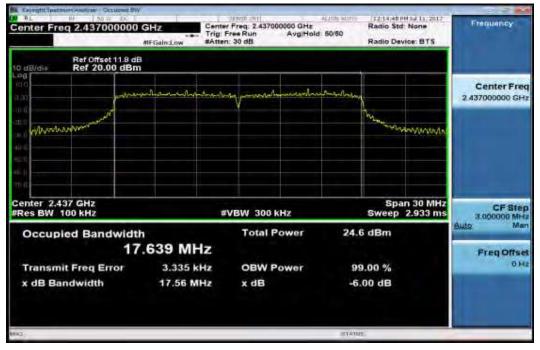


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802.11n_20M (Main) 6dB Band Width Test Data CH-Low



6dB Band Width Test Data CH-Mid



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6dB Band Width Test Data CH-High

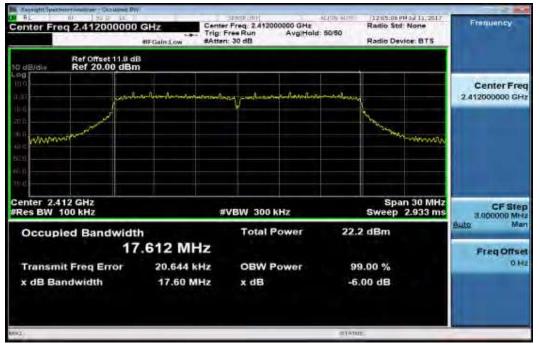
Center Fre	Center Freq. 2.462000000 GHz Trig: Free Run AvgiHold: 50/50 #Atten: 30 dB				Radio Device: BTS		Frequency			
10 dB/div	Ref Offset									
Log 100 101 101 101 101 101 100 100 100 10	and the second	and a strategy of the strategy	lan mining in the	- Internet	par de santre	den Bentres De La	- Anton Andrea	and the second s	mathaness)	Center Freq 2 462000000 GHz
Center 2.40 #Res BW 1	00 kHz	#VE	SW 300 K			Sweep	an 30 MHz 2.933 ms	CF Step 3.00000 MH		
Occupied Bandwidth 17.1 Transmit Freq Error x dB Bandwidth		609 MHz 314 Hz 17.59 MHz		Total Power OBW Power x dB		99) dBm).00 % 00 dB	Freq Offset 0 H2		
							TAN	_		

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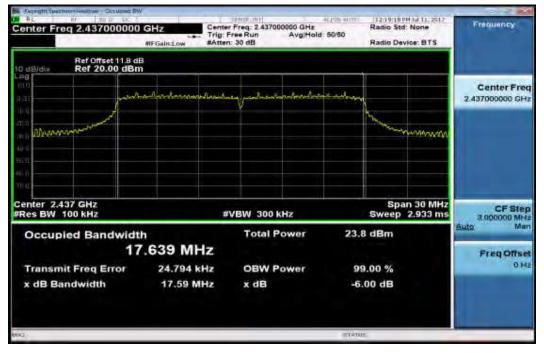
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802.11n_20M (Aux) 6dB Band Width Test Data CH-Low



6dB Band Width Test Data CH-Mid



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6dB Band Width Test Data CH-High

Center Fre	q 2.46200	0000 GI	lz Gala Low		eq. 2.46200	0000 GH± AvgiHold	and the second	Radio St	Mad 11, 2017 d: None wice: BTS	Frequency
10 dB/div	Ref Offset Ref 20.00									
Log 0.00 0.01 0		anger Annormal		-www.w.cuy	joutorah	and to see	romen den capaz	and a second	~~mm	Center Freq 2.462000000 GHz
Center 2.40 #Res BW 1	00 kHz			#VE	300 k		12	Sweep	an 30 MHz 2.933 ms	CF Step 3 000000 MHz Auto Man
		22.959 I 17.58 M	kHz	Total Power OBW Power x dB		22.2 dBm 99.00 % -6.00 dB			Freq Offset 0 Hz	
							TAN	-		

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802.11n 40M (Main) 6dB Band Width Test Data CH-Low



6dB Band Width Test Data CH-Mid



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6dB Band Width Test Data CH-High

Center Freq 2.45200000	GHz Cente	r Freq. 2.452000000 GHz Free Run AvgiHolo 1: 30 dB	Radio d: 50/50	Std: None Device: BTS	Frequency
10 dB/div Ref 20.00 dBr					
	Arrest and a second	~~~~~~.	anahasharpaha,	here	Center Free 2.452000000 GH
Center 2.452 GHz #Res BW 100 kHz		#VBW 300 kHz		Span 50 MHz veep 4.8 ms	CF Step 5.00000 MHz
Occupied Bandwidt	th 6.217 MHz	Total Power 21.3 dBm		1	Buto Men
Transmit Freq Error x dB Bandwidth	1.227 kHz 36.35 MHz	OBW Power x dB	99.00 % -6.00 de	31	0 Ha
90			TANK		

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Case 6:22-cv-01162-ADA Document 56-4 Filed 06/22/23 Page 41 of 129 Report No.:ER/2017/70015



Page 41 of 129

802.11n_40M (Aux) 6dB Band Width Test Data CH-Low



6dB Band Width Test Data CH-Mid



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6dB Band Width Test Data CH-High

Center Fre	q 2.45200	0000 G	Hz FGals:Low	Center F	reg: 2.45200 e Run	0000 GHz AvgiHold	Neg Auro	Radio S	iopilad 11, 2617 Std: None Device: BTS	Frequency
Ref Offset 11.8 dB 10 dB/div Ref 20.00 dBm										
Log U.a. U.a. U.a. U.a. U.a. U.a. U.a. U.a				and a drawny	jaan ka	havenishe				Center Freq 2.452000000 GHz
Center 2.4 #Res BW 1				#VI	300 k	Hz			pan 50 MHz eep 4.8 ms	CF Step
Occupi	Occupied Bandwidth 36.257 N		257 MI	Ηz	Total Power		20.	20.7 dBm		Auto Men
	it Freq Em ndwidth	or	22.140 k 36.39 M		OBW P x dB	ower		9.00 % 00 dB		0.44
60							TAN	£.		

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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).

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.

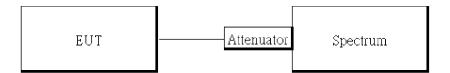
	S	GS Conducted R	loom			
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.	
TYPE		NUMBER	NUMBER	CAL.		
Power Meter	Anritsu	ML2495A	1005007	12/15/2016	12/14/2017	
Power Sensor	Anritsu	MA2411B	917032	12/15/2016	12/14/2017	
EXA Spectrum	Agilant	N0020A	MY53120760	03/21/2017	03/20/2018	
Analyzer	Agilent	N9030A	WIT55120760	03/21/2017	03/20/2010	
DC Block	Mini-Circuits	BLK-18-S+	1	01/05/2017	01/04/2018	
Coaxial Cable	HUBER+SUH	SUCOFLEX 102	23670/2	01/05/2017	01/04/2018	
	NER					
Attenuator	Mini-Circuit	BW-S10W2+	2	01/05/2017	01/04/2018	
Splitter	Agilent	11636B	N/A	01/05/2017	01/04/2018	
DC Power Supply	Agilent	E3640A	MY52410006	11/21/2016	11/20/2017	
Temperature	TEDOUV		011000	05/10/2017	05/10/2010	
Chamber	TERCHY	MHG-120LF	911009	05/19/2017	05/18/2018	

10.2 Measurement Equipment Used

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.



10.3 Test SET-UP



10.4 Measurement Procedure

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.

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

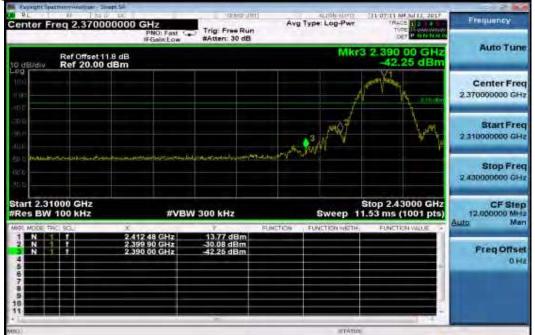
- 1. Refer to next page spectrum analyzer data chart and tabular data sheets.
- 2. For restricted Band Edge Limit, please refer to section 12.5 of this report for measurement result.

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802.11b **Band Edges Test Data CH-Low**



Band Edges Test Data CH-High

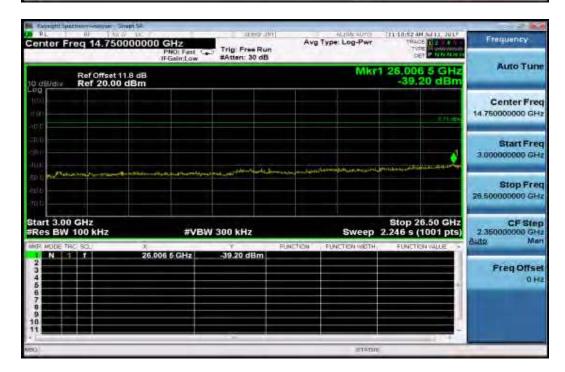


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802.11b **Spurious Emission Test Data CH-Low**

enter Freq 1.515000			Avg Type: Log-Pw		Frequency
Ref Offset 11.8 Ref 20.00 dB	dB Im		N	lkr1 2.411 9 GHz 13.29 dBm	Auto Tune
90 (00) min				271.5EM	Center Free 1.515000000 GH
79(0) 1940					Start Free 30 000000 MHz
10 10 No 10 10 To	مەرىپ ئىرىمە بەر بىر بىر بىر بىر بىر بىر بىر بىر بىر بى	مەيدىلەتتىرىك مەت سىزىيە مەيدىلەتتىرىك مەت سىزىيە	and and an and a second second second		Stop Free 3.000000000 GH
start 30 MHz Res BW 100 kHz	#VB)	V 300 kHz	Sweep	Stop 3.000 GHz 283.9 ms (1001 pts)	CF Step 297.000000 MH
MR MODE TRC SO.	x 2.411 9.GHz	13,29 dBm	UNCTION FUNCTION WE	TH FUNCTION VALUE -	Auto Mer
2 3 3 4 4 5 6 6 6 7 7 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9					Freq Offset 0 H
so).			=TA:	tive:	



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Spurious Emission Test Data CH-Mid

inter Fr	reg 1.515000	0000 GHz PN0: Fast G IFGain:Low	Trig: Free Run #Atten: 30 dB	Avg Type: Log-Pwr	TRACE 12 4 1 F	Frequency Auto Tun			
dB/d/v	Ref Offset 11.8 dB Mkr1 2.438 7 GHz Evdiv Ref 20.00 dBm 12.72 dBm								
0)					rants	Center Fre 1.515000000 Gr			
						Start Fr 30 000000 M			
10 10 10		م بالانداد بار با مطالع است از او به استنباس	an an an an an taining an trid (an sha	مان و او ا		Stop Fr 3.000000000 G			
and a second second second	100 kHz	#VB	W 300 kHz		Stop 3.000 GHz 83.9 ms (1001 pts)	CF SI 297.000000 M Auto M			
P: MODE TR	ici soli T	2.438 7 GHz	FL 12.72 dBm	INCTION FUNCTION WETH.	FUNCTION VALUE				
						Freq Off 0			
-				TABA		-			

PL II sca PL II sca enter Freq 14.7500	The former of	Trig: Free Run #Atten: 30 dB	Avg Type: Log-Pwr	11.32:30 AM MILLI, 2017 TRACE TI 2 AM MILLI TYPE OCT P MANDA	Frequency
Ref Offset 11 Ref 20.00 c			Micr	1 26,500 0 GHz -38,73 dBm	Auto Tune
90 00 00				-100/101	Center Free 14.750000000 GH
				1	Start Free 3.00000000 GH
e esta antiquer antiquer	alterhandrigen houses	errege et de la constitute	an a		Stop Fre 26 50000000 GH
art 3.00 GHz es BW 100 kHz		300 kHz		Stop 26.50 GHz 2.246 s (1001 pts)	CF Ster 2.35000000 GH Auto Ma
P. MDDE TRC: SOL	26.500 0 GHz	-38.73 dBm	NETION , FUNCTION WRITH,	FUNCTEN VALUE	Freq Offse 0 H
alter de de de			státia	() () () () () () () () () ()	

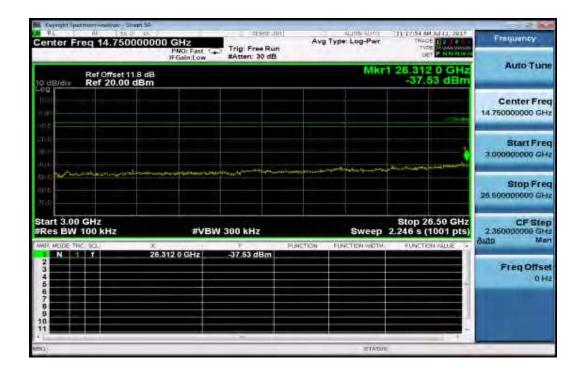
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Spurious Emission Test Data CH-High

Center Freq 1.515000000	GHz PN0: Fast	Trig: Free Run #Atten: 30 dB	Avg Type: Log-Pwr	THE READE THE AMAGINE AND A THE READE THE READE THE READE THE READER AND A	Frequency
Ref Offset 11.8 dB	Auto Tun				
100 (101) (100)				-rows	Center Fre 1,516000000 GH
2011 2017					Start Fre 30.000000 MH
ED 13 <mark>manifest en statum d'apper en s</mark> EC 10 70 D		and in incorrected that in	and the second	/ Tiple-Whet do-managementation	Stop Fre 3.000000000 GH
Start 30 MHz Res BW 100 kHz	#VBW :		and the second	Stop 3.000 GHz 33.9 ms (1001 pts)	CF Ste 297,000000 Mi- Auto Ma
	462 4 GHz	12.63 dBm	אבדנסא - דשאבדנסא אפדרא,	FORCEDIVADE	Freq Offse 0 H
				-	



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802.11g **Band Edges Test Data CH-Low**



Band Edges Test Data CH-High

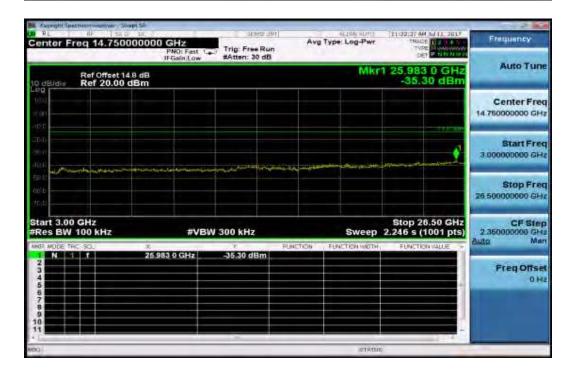


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802.11g **Spurious Emission Test Data CH-Low**

Record to The Table Terrer	server abril	ALISK AUTO	111-12-15 AM 3ul 11, 2017	
enter Freq 1.515000000		Avg Type: Log-Pwr	THACE THE REPORT	Frequency
Ref Offset 14.8 dB		Mki	1 2.420 9 GHz 6.03 dBm	Auto Tune
				Center Fre 1.515000000 GH
				Start Fre 30.00000 MH
ty it was an and a part of the second s	na da Santa Al Santa di Antonio (na mini da santa di A			Stop Fre 3.00000000 GH
itart 30 MHz Res BW 100 kHz	#VBW 300 kHz	And its summaries and a comparison of the Company of the	Stop 3.000 GHz 3.9 ms (1001 pts)	CF Ste 297.000000 Mi Auto Ma
1 1 f 2.	420 9 GHz 6.03 dBm	FUNCTION FUNCTION WETH	FUNCTION VALUE	Freq Offsi 0 H
		STADA		



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Spurious Emission Test Data CH-Mid

enter Freq 1.51500000	D GHZ PNQ: Fast G	Trig: Free Run #Atten: 30 dB	Avg Type: Log-Pwr	THERE IN A THE AND A THE A	di successione
Ref Offset 14.8 dB Ref 20.00 dBm	Auto Tuni				
				• ¹	Center Fre 1.515000000 GH
90 fa					Start Fre 30.00000 MH
	1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -				Stop Fre 3.00000000 GH
tart 30 MHz Res BW 100 kHz	#VBV	/ 300 kHz	Sweep 2	Stop 3.000 GHz 83.9 ms (1001 pts)	CF Ste 297.000000 Mi Auto Ma
NP MODE TRO SCL X	2.441 5 GHz	r FL 5.62 dBm	INCTION FUNCTION WETH	FUNCTION VALUE	
3 4 5 6 7					Freq Offse 0 H
Q)			TAU	K.	-

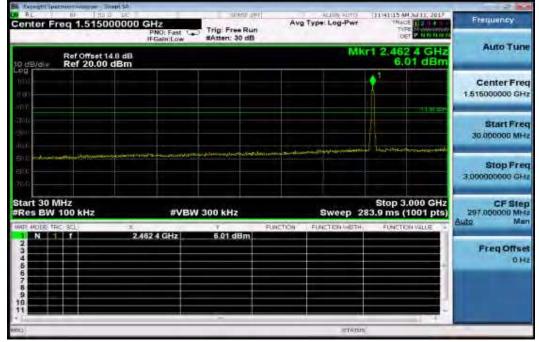
Frequency	11147148 AM Jul 33, 2017 TR405 TI 2, 2, 4, 5 TREP Providence OFT Providence	Avg Type: Log-Pwr	Trig: Free Run #Atten: 30 dB	DOOOOO GHZ PNO: Fast IFGain:Low		nter Fr
Auto Tur	26.100 5 GHz -36.29 dBm	Mkr		l8 dB dBm	Ref Offset Ref 20.00	fB/div
Center Fre 14.75000000 GF						
-						
Start Fre 3.00000000 Gi	and the second second	والمحر والمراجع والمحاوم والمحاول والمروج والمحاول والمروج والمحاول والمحاوم والمحاوم والمحاوم والمحاوم والمحاو		ورياد محاجي المحموم معالي		-
Stop Freq 26 50000000 GHz						44760
CF Ste 2.35000000 GH	Stop 26.50 GHz 2.246 s (1001 pts)	Sweep	300 kHz	#VB1	GHz 100 kHz	rt 3.00 IS BW
Auto Ma	FUNCTION VALUE	H FUNCTION WIDTH.	FUI	26.100 5 GHz	c 90.)	MODE TR
Freq Offse						
	-					
		TAUN				

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Spurious Emission Test Data CH-High



BL.		0000000 GHz PN0: Fast IFGein:Low	Trig: Free Run #Atten: 30 dB	Avg Type: Log-Pwr	THAT STAN AND STANDARD	Frequency
dB/div	Ref Offset Ref 20.0	14.8 dB 10 dBm		Micr	1 25.936 0 GHz -35,97 dBm	Auto Tuni
0) (/)						Center Fre 14.75000000 GH
						Carrie Free
1				مى بىرى بىرى بىرى بىرى بىرى بىرى بىرى بى	- l	Start Fre 3.00000000 GH
						Stop Fre 26 50000000 GH
es BW	GHz 100 kHz	#VE	W 300 kHz	Sweep	Stop 26.50 GHz 2.246 s (1001 pts)	CF Ste 2 35000000 GH
MDDE TR		× 25.936 0 GHz	-35.97 dBm	UNCTION FUNCTION WIGTH.	FUNCTION VALLE	Auto Ma
						Freq Offse
				TAUA	6	

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802.11n HT20 **Band Edges Test Data CH-Low**

Keynight Spatterer Seamon - Seam 32		AND DO NOT THE OWNER		2.2 2
enter Freq 2.37000000	GHZ PNO: Fest (Trig: Free Run #Atten: 30 dB	Avg Type: Log-Pwr	13:53 PM 34 13, 2017 TRACE 112 24 4 11 TIPE Measurement OFF P IN N N I 4	Frequency
Ref Offset 14.8 dB Ref 20.00 dBm	390 00 GHz -41.52 dBm	Auto Tune		
		<u></u>	2.3	Center Free 70000000 GH
		And and the		Start Freq 10000000 GH
2013 2013 2014 2014 2014 2014 2014 2014 2014 2014	alarman fi ta "separt an Radon galarma ananan "sina ta " ji 1998 mili në fa		24	Stop Free 3000000 GH
tart 2.31000 GHz Res BW 100 kHz KR MODE TRO SOL X		Sweep 11.53	0 2.43000 GHz ms (1001 pts) Auto	CF Step 12.000000 MH Mar
2 N 1 f 2.3	108 28 GHz 6.05 dBm 199 90 GHz -28 53 dBm 190 00 GHz -41.52 dBm			Freq Offset 0 Hz
8 9 10 11 11		TATU		

Band Edges Test Data CH-High



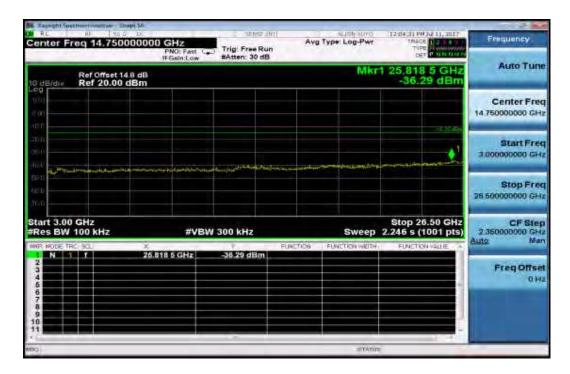
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802.11n HT20 Spurious Emission Test Data CH-Low

Keynght Spathum					
enter Freq 1.51500	0000 GHz	Trig: Free Run #Atten: 30 dB	Avg Type: Log-Pwr	TRACE 12 MAN 11, 2017	Frequency
Ref Offset 14 Ref 20.00 c		EAtten: 30 ab	Mk	r1 2.417 9 GHz 4.75 dBm	Auto Tuni
90 (m) (m)					Center Free 1.515000000 GH
					Start Fre 30 000000 MH
		Alexandra di A	had an		Stop Fre 3.000000000 GH
tart 30 MHz Res BW 100 kHz	#VBV	V 300 kHz	Sweep 2	Stop 3.000 GHz 33.9 ms (1001 pts)	CF Ste 297.000000 MH
NP. MODE THC: SO,	×	* FU 4.75 dBm	NCTION FUNCTION WETH	FUNCTION VALUE -	Auto Me
2 3 4 5 6					Freq Offse 0 H
7 8 9 10					
50			TÁUA		-

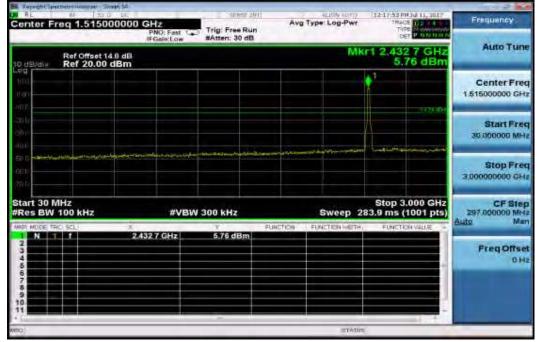


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Spurious Emission Test Data CH-Mid



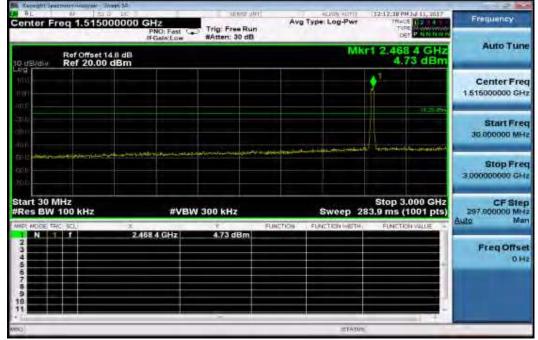
anter Freq 1	4.750000000 GH PN0 MFGe	I East (_)	Trig: Free Run #Atten: 30 dB		Log-Pwr	112-18:22 PM TRACI TVR OE	34 13, 2017 DE 24 0 Provinsion	Frequency
	Offset 14.8 dB 20.00 dBm				Mkr	-35.2	0 GHz 5 dBm	Auto Tune
								Center Free 14.75000000 GH
8								
	Martin Martin			the the same			- never the	Start Frec 3.000000000 GH
								Stop Free 26 50000000 GH
art 3.00 GHz es BW 100 k	iHz	#VBW 3	00 kHz		Sweep	Stop 20 2.246 s (1	5.50 GHz 001 pts)	CF Step 2.35000000 GH
	191		-35.25 dBm	FUNCTION FUN	стериотн.	FUNCTIO	IVALLE .	Auto Mar
N MODE TRC SQ.	26.077.0	GHZ	-35.25 0 8 11					
N T T	26,077 0 (GHZ	-39.29 dBm					Freq Offse 0 H
NET	26.077 0	GHZ	39 29 dBM					117. YOUR DOLLARS SHOW

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Spurious Emission Test Data CH-High



AL.		0000000 GHz PN0: Fast IFGein:Low	Trig: Free Run #Atten: 30 dB	Avg Type: Log-Pwr	12:12:56 PH34 13, 2017 TREOS 112 4 1 TREO AND AND AND OUT PLOT DUAL	Frequency
) dEvolv	Ref Offset Ref 20.0	14.8 dB 0 dBm		Mkr	1 25,912 5 GHz -35,08 dBm	Auto Tune
						Center Free 14.750900000 GH
						Start Free 3.000000000 GH
	ATT AT A A A A A A A A A A A A A A A A					Stop Fre 26 50000000 GH
art 3.00 Res BW	GHz 100 kHz	#VB	W 300 kHz	Sweep	Stop 26.50 GHz 2.246 s (1001 pts)	CF Step 2.350000000 GH
P MODE TH	(C. 90.)	X 25.912 5 GHz	-35.08 dBm	NETION . FUNCTION WIGTH.	FUNCTION VALUE -	Auto Mar
						Freq Offse 0 H
12	and a second as			TAUA		

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802.11n HT40 **Band Edges Test Data CH-Low**



Band Edges Test Data CH-High



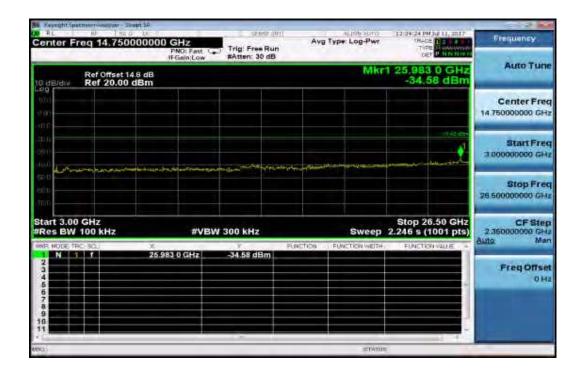
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802.11n_HT40 **Spurious Emission Test Data CH-Low**

			ini i	31 102			ni Tan	
Frequency	12-34:06 PM 34 13, 2017 TRACE 112 34 4 10 Type Phone and the second	Type: Log-Pwr	n f	Trig: Free R	PNO: Fast	000000 G		
Auto Tun	1 2.414 9 GHz 1.58 dBm	Mk		antien. se u	H-Ghin Low	14.8 dB	Ref Offset	0 dB/div
Center Free 1.515000000 GH								90 (0)
Start Free 30,00000 MH	- 10 K2 H2+							nto F
Stop Free 3.000000000 GH		Alexandric grant and	Hei	48.444 Mp. 7. 19. 2 April	P zywiat i wany ten	مازدان سوری در به	and and the lower	to is <mark>a sinte</mark> No la Tala
CF Ster 297.000000 MH Auto Me	Stop 3.000 GHz 3.9 ms (1001 pts)	Charles and the second s		300 kHz			100 kHz	
Freq Offse 0 H	FUNCTION VALUE	FUNCTION WETH	FUNCTION	1,58 dBm	4 9 GHz	and the second sec		4 5 6
								7 8 9 10
-		TADA						90)



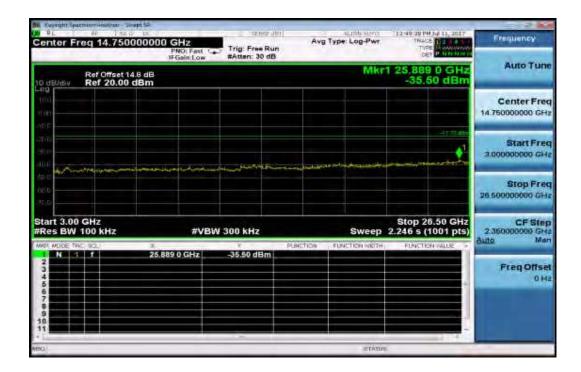
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Spurious Emission Test Data CH-Mid

Represent Spaceson and Spaceson SP		uner 191	ALTEN ADTO	12-49-16 PM 34 13, 2017	
enter Freq 1.515000000	PNO: Fast	and a second second	Avg Type: Log-Pwr	THE REAL PROPERTY AND A STATE	Frequency
Ref Offset 14.8 dB Ref 20.00 dBm			MK	r1 2,423 8 GHz 2,25 dBm	Auto Tun
				21	Center Fre 1.515000000 GH
nn					Start Fre 30 d00000 MH
			an - 1977 - 19 - 19 - 19 - 19 - 19 - 19 -		Stop Fre 3.000000000 GH
tart 30 MHz Res BW 100 kHz	#VBW	300 kHz	Sweep 2	Stop 3.000 GHz 83.9 ms (1001 pts)	CF Ste 297.000000 Mi Auto Mi
NR MODE TRO SOL X	423 8 GHZ	7 FU 2.25 dBm	HETICH FUNCTION WETH.	FUNCTION VALUE	Chelly Inte
234					Freq Offs 01
502		and the second se			



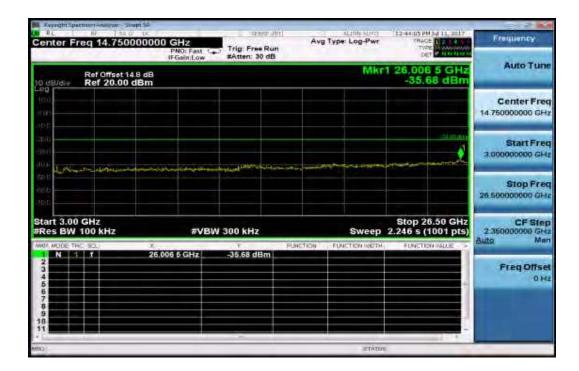
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Spurious Emission Test Data CH-High

GHz	-dates 761	Avg Type: Log-Pwr	12-41:46 PM 3d 13, 2617 TRACE 115	Frequency				
PNO: Fast G	#Atten: 30 dB		OFT P UT NUM					
Ref Offset 14.8 dB Mkr1 2,438 7 GHz dB/dw Ref 20.00 dBm -0.95 dBm								
			¢!	Center Fre 1.515000000 GH				
				Start Fre 30.000000 Mi				
netti etani erante		a ya ang ng n	lan oldaya Marina adada da	Stop Fre 3.000000000 GH				
#VBV	V 300 kHz	Sweep 2	Stop 3.000 GHz 83.9 ms (1001 pts)	CF Ste 297.000000 M				
438 7 GHz	-0.95 dBm	NCTION FUNCTION WETH,	FUNCTION VALUE >	Auto Mi				
				Freq Offs 01				
		#VBW 300 kHz	#VBW 300 KHz Sweep 2:	Mkr1 2.438 7 GHz -0.95 dBm				



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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 $(dB\mu V/m) = 20 \log Emission level (dB\mu V/m)$

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11.2 Measurement Equipment Used:

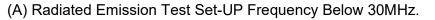
SGS SAC-III										
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.					
TYPE		NUMBER	NUMBER	CAL.						
EMI Test Receiver	R&S	ESCI7	100760	05/11/2017	05/10/2018					
Spectrum Analyzer	Agilent	E4446A	MY51100003	04/25/2017	04/24/2018					
Loop Antenna	ETS-Lindgren	6502	148045	09/20/2016	09/19/2017					
Bilog Antenna	SCHWAZBECK	VULB9168	378	12/19/2016	12/18/2017					
Horn Antenna	Schwarzbeck	BBHA9120D	1441	08/01/2016	07/31/2017					
Pre-Amplifier	Agilent	8447D	2944A07676	01/05/2017	01/04/2018					
Pre-Amplifier	EMC Instruments Corp.	EMC0126530	980038	01/05/2017	01/04/2018					
Turn Table	HD	DT420	N/A	N.C.R	N.C.R					
Antenna Tower	ChamPro	AM-BS-4500-B	060776-ABS	N.C.R	N.C.R					
Controller	ChamPro	EM1000	60776	N.C.R	N.C.R					
Low Loss Cable	Huber Suhner	966_RX	9	01/05/2017	01/04/2018					
3m Site NSA	SGS	966 chamber	N/A	07/01/2017	06/30/2018					
Low Loss Cable	Huber Suhner	966 TX	1	01/05/2017	01/04/2018					
Horn Antenna	Schwarzbeck	BBHA9170	184	12/12/2016	12/11/2017					
Pre-Amplifier	EMC Instruments Corp.	EMC184045	980135	01/05/2017	01/04/2018					

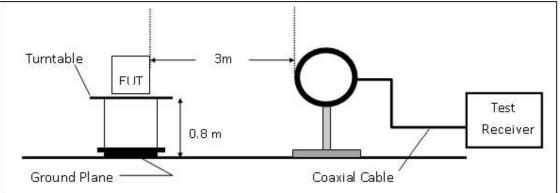
NOTE: N.C.R refers to Not Calibrated Required.

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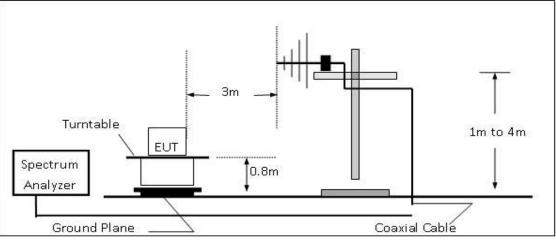


11.3 Test SET-UP

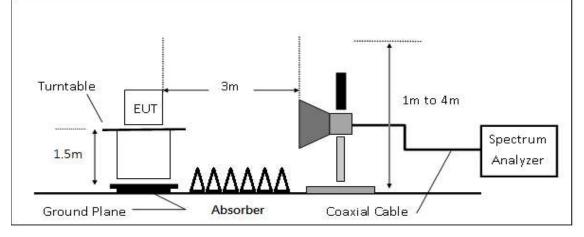




(B) Radiated Emission Test Set-Up, Frequency form 30MHz to 1000MHz



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

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

Factor(dB) = Antenna Factor(dBµV/m) + Cable Loss(dB) – Pre Amplifier Gain(dB)

Note :

"F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency.; "S" : denotes Spurious Frequency.

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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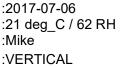


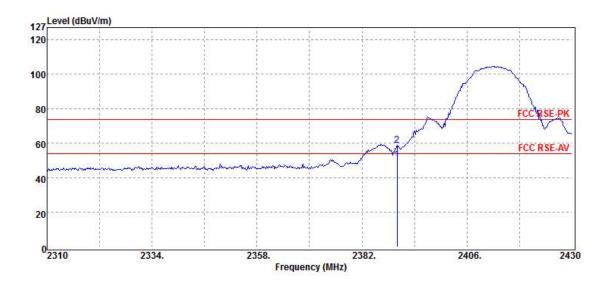
Radiated Band Edge Measurement Result (802.11b)

Operation Band Fundamental Frequency Operation Mode EUT Pol.

:802.11b :2412 MHz :Bandedge CH LOW :H Plane

Test Date Temp./Humi. Engineer :Mike Measurement Antenna Pol.





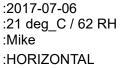
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	Е	Average	52.23	-1.74	50.49	54.00	-3.51
2390.00	Е	Peak	60.46	-1.74	58.72	74.00	-15.28

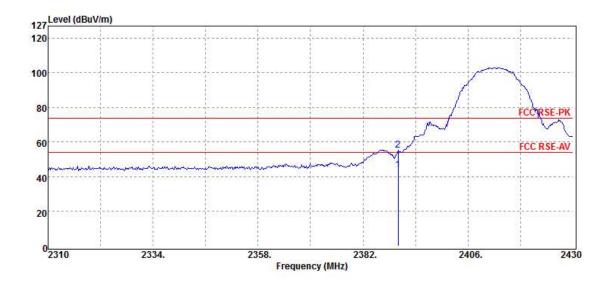
Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.



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

Test Date Temp./Humi. Engineer :Mike Measurement Antenna Pol.





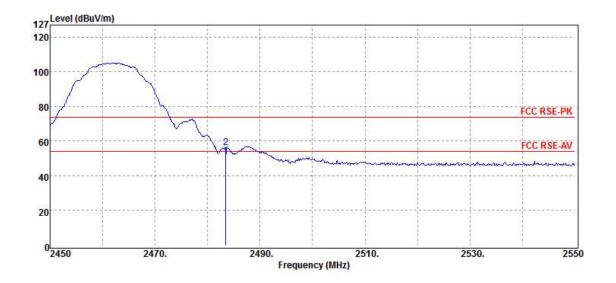
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	Е	Average	45.59	-1.74	43.85	54.00	-10.15
2390.00	Е	Peak	57.07	-1.74	55.33	74.00	-18.67

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

:2017-07-06 Test Date Temp./Humi. :21 deg C / 62 RH Engineer :Mike :VERTICAL Measurement Antenna Pol.



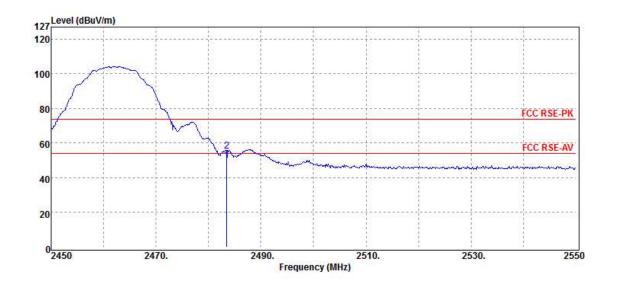
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	Е	Average	52.62	-1.62	51.00	54.00	-3.00
2483.50	Е	Peak	57.86	-1.62	56.24	74.00	-17.76

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

:2017-07-06 Test Date Temp./Humi. :21 deg C / 62 RH Engineer :Mike :HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	Е	Average	51.72	-1.62	50.10	54.00	-3.90
2483.50	Е	Peak	57.15	-1.62	55.53	74.00	-18.47

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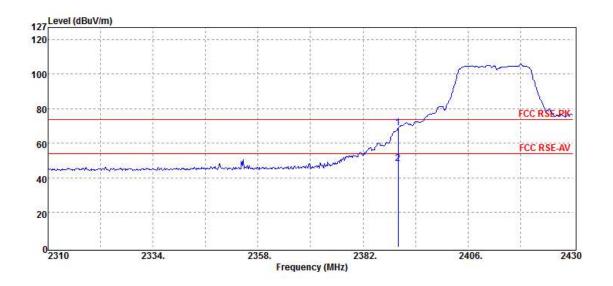
Radiated Band Edge Measurement Result (802.11g)

Operation Band Fundamental Frequency Operation Mode EUT Pol.

:802.11g :2412 MHz :Bandedge CH LOW :H Plane

Test Date Temp./Humi. Engineer :Mike Measurement Antenna Pol.

:2017-07-06 :21 deg_C / 62 RH :VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	Е	Peak	70.67	-1.74	68.93	74.00	-5.07
2390.00	Е	Peak	49.96	-1.74	48.22	74.00	-25.78

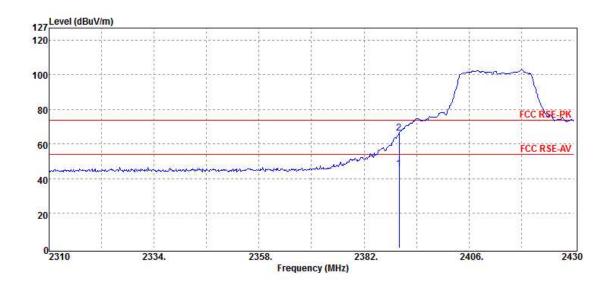
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Operation Band :802.11g Fundamental Frequency :2412 MHz **Operation Mode** :Bandedge CH LOW EUT Pol. :H Plane

Test Date Temp./Humi. Engineer :Mike Measurement Antenna Pol.

:2017-07-06 :21 deg C / 62 RH :HORIZONTAL



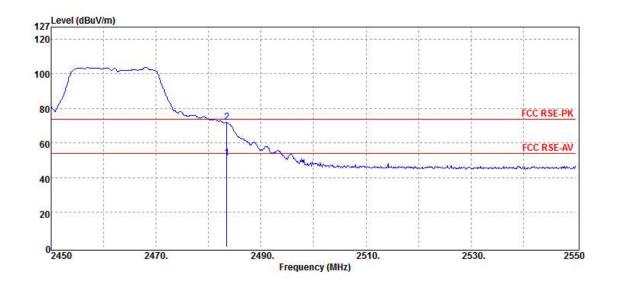
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	Е	Average	47.32	-1.74	45.58	54.00	-8.42
2390.00	Е	Peak	68.08	-1.74	66.34	74.00	-7.66

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

:2017-07-06 Test Date Temp./Humi. :21 deg C / 62 RH Engineer :Mike :VERTICAL Measurement Antenna Pol.



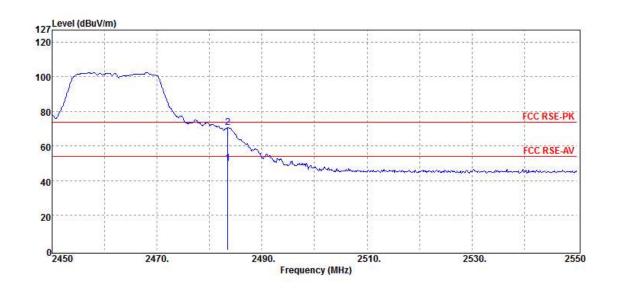
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	Е	Average	53.04	-1.62	51.42	54.00	-2.58
2483.50	Е	Peak	73.51	-1.62	71.89	74.00	-2.11

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

:2017-07-06 Test Date Temp./Humi. :21 deg C / 62 RH Engineer :Mike :HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	Е	Average	51.52	-1.62	49.90	54.00	-4.10
2483.50	Е	Peak	72.25	-1.62	70.63	74.00	-3.37

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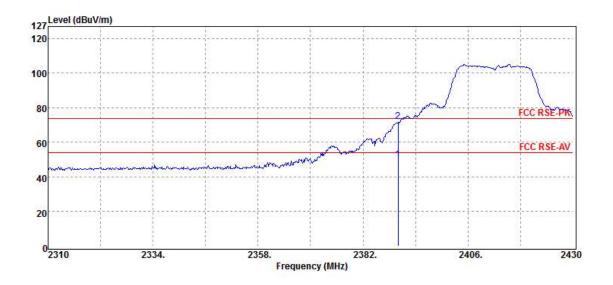
Radiated Band Edge Measurement Result (802.11_HT20)

Operation Band Fundamental Frequency Operation Mode EUT Pol.

:802.11n20 :2412 MHz :Bandedge CH LOW :H Plane

Test Date Temp./Humi. Engineer :Mike Measurement Antenna Pol.

:2017-07-06 :21 deg_C / 62 RH :VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	Е	Average	52.03	-1.74	50.29	54.00	-3.71
2390.00	Е	Peak	73.69	-1.74	71.95	74.00	-2.05

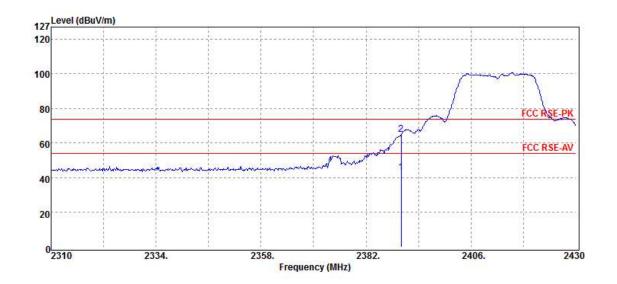
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Operation Band :802.11n20 Fundamental Frequency :2412 MHz **Operation Mode** :Bandedge CH LOW EUT Pol. :H Plane

:2017-07-06 Test Date Temp./Humi. :21 deg C / 62 RH Engineer :Mike :HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	Е	Average	44.60	-1.74	42.86	54.00	-11.14
2390.00	Е	Peak	66.98	-1.74	65.24	74.00	-8.76

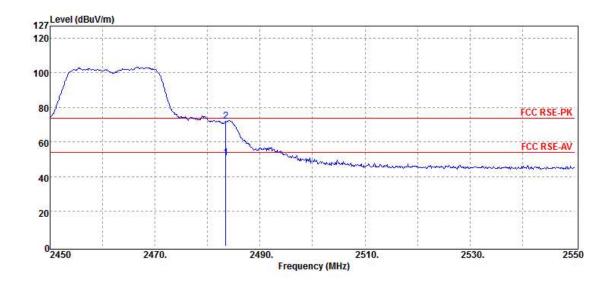
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Operation Band :802.11n20 Fundamental Frequency :2462 MHz **Operation Mode** :Bandedge CH HIGH EUT Pol. :H Plane

:2017-07-06 Test Date Temp./Humi. :21 deg C / 62 RH Engineer :Mike :VERTICAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	Е	Average	52.48	-1.62	50.86	54.00	-3.14
2483.50	Е	Peak	73.73	-1.62	72.11	74.00	-1.89

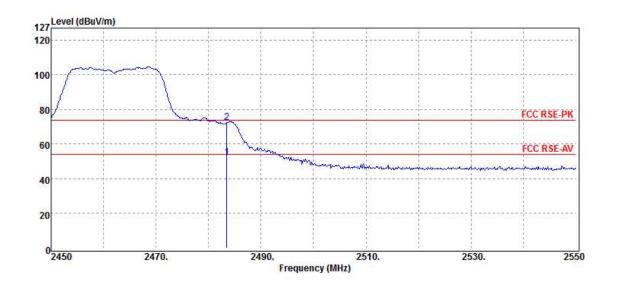
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Operation Band :802.11n20 Fundamental Frequency :2462 MHz **Operation Mode** :Bandedge CH HIGH EUT Pol. :H Plane

:2017-07-06 Test Date Temp./Humi. :21 deg C / 62 RH Engineer :Mike :HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	Е	Average	54.10	-1.62	52.48	54.00	-1.52
2483.50	Е	Peak	74.12	-1.62	72.50	74.00	-1.50

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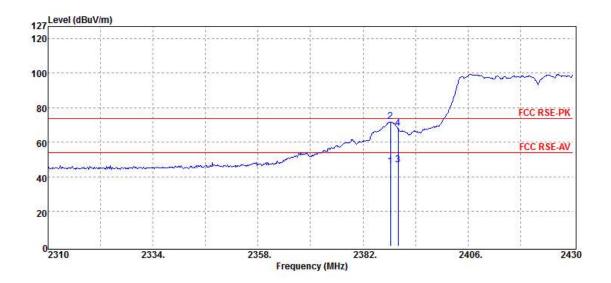
Radiated Band Edge Measurement Result (802.11_HT40)

Operation Band Fundamental Frequency Operation Mode EUT Pol.

:802.11n40 :2422 MHz :Bandedge CH LOW :H Plane

Test Date Temp./Humi. Engineer :Mike Measurement Antenna Pol.

:2017-07-06 :21 deg_C / 62 RH :VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2388.24	S	Average	47.68	-1.73	45.95	54.00	-8.05
2388.24	S	Peak	74.00	-1.73	72.27	74.00	-1.73
2390.00	Е	Average	48.63	-1.74	46.89	54.00	-7.11
2390.00	Е	Peak	69.67	-1.74	67.93	74.00	-6.07

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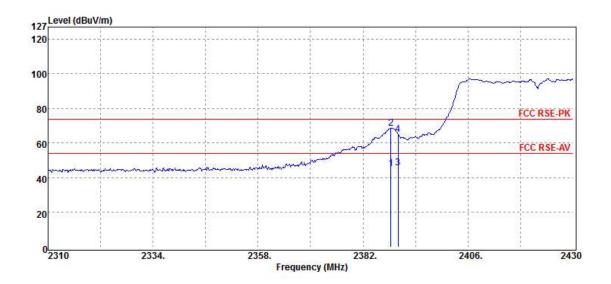
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Operation Band :802.11n40 Fundamental Frequency :2422 MHz **Operation Mode** :Bandedge CH LOW EUT Pol. :H Plane

Test Date Temp./Humi. Engineer :Mike Measurement Antenna Pol.

:2017-07-06 :21 deg C / 62 RH :HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2388.36	S	Average	47.08	-1.73	45.35	54.00	-8.65
2388.36	S	Peak	70.27	-1.73	68.54	74.00	-5.46
2390.00	Е	Average	47.32	-1.74	45.58	54.00	-8.42
2390.00	Е	Peak	66.80	-1.74	65.06	74.00	-8.94

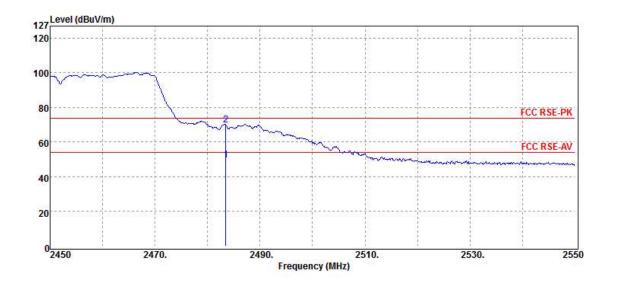
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Operation Band :802.11n40 Fundamental Frequency :2422 MHz **Operation Mode** :Bandedge CH HIGH EUT Pol. :H Plane

:2017-07-06 Test Date Temp./Humi. :21 deg C / 62 RH Engineer :Mike :VERTICAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	Е	Average	51.49	-1.62	49.87	54.00	-4.13
2483.50	Е	Peak	71.54	-1.62	69.92	74.00	-4.08

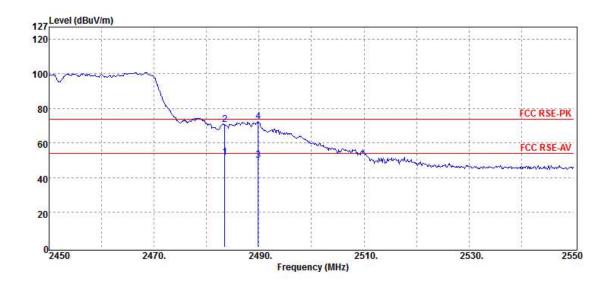
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Operation Band :802.11n40 Fundamental Frequency :2422 MHz **Operation Mode** :Bandedge CH HIGH EUT Pol. :H Plane

:2017-07-06 Test Date Temp./Humi. :21 deg C / 62 RH Engineer :Mike :HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	Е	Average	53.59	-1.62	51.97	54.00	-2.03
2483.50	Е	Peak	72.22	-1.62	70.60	74.00	-3.40
2489.80	S	Average	51.57	-1.62	49.95	54.00	-4.05
2489.80	S	Peak	74.12	-1.62	72.50	74.00	-1.50

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Below 1GHz Worst-Case Data:

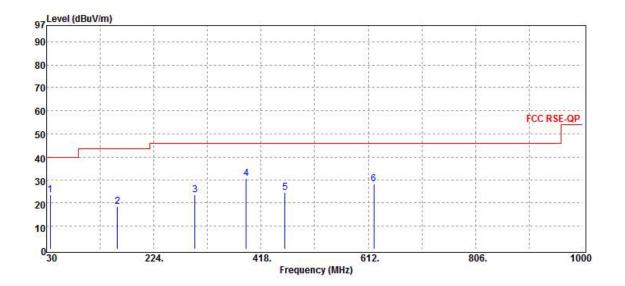
Radiated Spurious Emission Measurement Result (802.11 g)

Operation Band Fundamental Frequency :2412 MHz **Operation Mode** EUT Pol.

:802.11g :Tx CH LOW :H Plane

Test Date Temp./Humi. Engineer Measurement Antenna Pol.

:2017-07-07 :23 deg C / 61 RH :Mike :VERTICAL



	Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
			Mode	Reading Level		FS	@3m	
_	MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
	36.79	S	Peak	32.93	-9.47	23.46	40.00	-16.54
	158.04	S	Peak	27.18	-8.85	18.33	43.50	-25.17
	298.69	S	Peak	31.35	-7.72	23.63	46.00	-22.37
	390.84	S	Peak	36.60	-6.21	30.39	46.00	-15.61
	461.65	S	Peak	29.47	-4.98	24.49	46.00	-21.51
	621.70	S	Peak	30.78	-2.52	28.26	46.00	-17.74

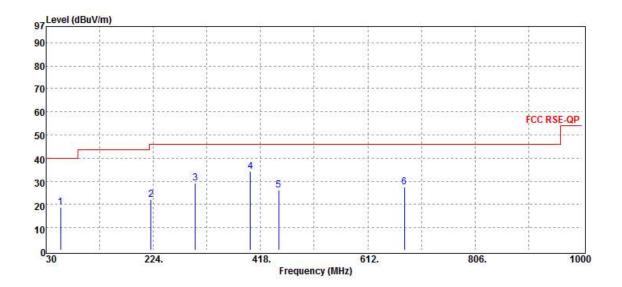
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Operation Band :802.11g Fundamental Frequency :2412 MHz **Operation Mode** :Tx CH LOW EUT Pol. :H Plane

Test Date :2017-07-07 Temp./Humi. :23 deg C / 61 RH Engineer :Mike :HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
56.19	S	Peak	27.46	-8.71	18.75	40.00	-21.25
220.12	S	Peak	32.90	-10.79	22.11	46.00	-23.89
299.66	S	Peak	36.78	-7.71	29.07	46.00	-16.93
399.57	S	Peak	40.37	-6.01	34.36	46.00	-11.64
450.98	S	Peak	31.30	-5.03	26.27	46.00	-19.73
677.96	S	Peak	29.30	-1.84	27.46	46.00	-18.54

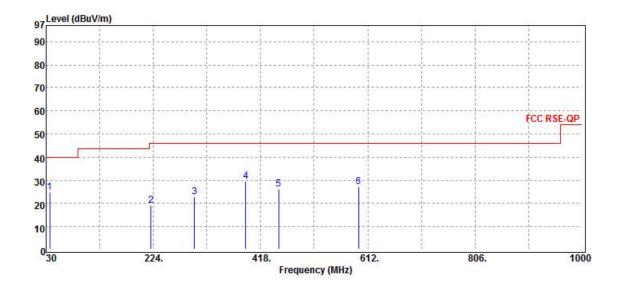
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Operation Band :802.11g Fundamental Frequency :2437 MHz **Operation Mode** :Tx CH MID EUT Pol. :H Plane

Test Date :2017-07-07 Temp./Humi. :23 deg C / 61 RH Engineer :Mike :VERTICAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
36.79	S	Peak	34.15	-9.47	24.68	40.00	-15.32
220.12	S	Peak	29.79	-10.79	19.00	46.00	-27.00
298.69	S	Peak	30.56	-7.72	22.84	46.00	-23.16
390.84	S	Peak	35.63	-6.21	29.42	46.00	-16.58
450.98	S	Peak	31.35	-5.03	26.32	46.00	-19.68
595.51	S	Peak	30.00	-2.70	27.30	46.00	-18.70

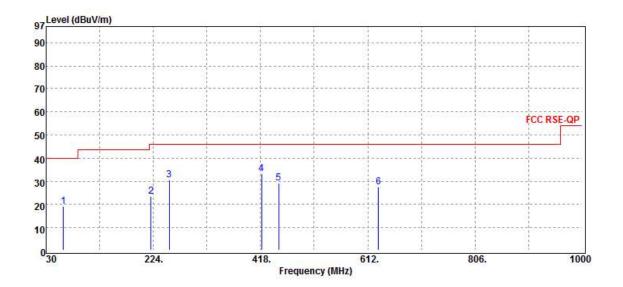
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Operation Band :802.11g Fundamental Frequency :2437 MHz **Operation Mode** :Tx CH MID EUT Pol. :H Plane

Test Date :2017-07-07 Temp./Humi. :23 deg C / 61 RH Engineer :Mike :HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
61.04	S	Peak	28.13	-9.13	19.00	40.00	-21.00
220.12	S	Peak	34.37	-10.79	23.58	46.00	-22.42
253.10	S	Peak	39.78	-9.35	30.43	46.00	-15.57
419.94	S	Peak	39.00	-5.68	33.32	46.00	-12.68
450.98	S	Peak	34.23	-5.03	29.20	46.00	-16.80
631.40	S	Peak	29.97	-2.59	27.38	46.00	-18.62

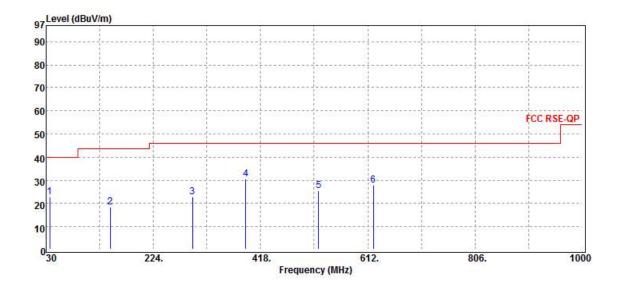
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Operation Band :802.11g Fundamental Frequency :2462 MHz **Operation Mode** :Tx CH HIGH EUT Pol. :H Plane

Test Date :2017-07-07 Temp./Humi. :23 deg C / 61 RH Engineer :Mike :VERTICAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
36.79	S	Peak	32.27	-9.47	22.80	40.00	-17.20
146.40	S	Peak	27.74	-9.18	18.56	43.50	-24.94
294.81	S	Peak	30.75	-7.78	22.97	46.00	-23.03
390.84	S	Peak	36.61	-6.21	30.40	46.00	-15.60
522.76	S	Peak	29.99	-4.34	25.65	46.00	-20.35
621.70	S	Peak	30.52	-2.52	28.00	46.00	-18.00

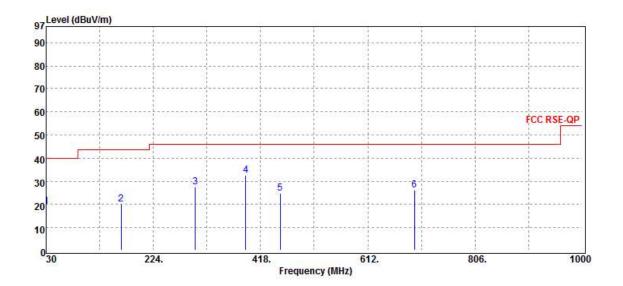
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Operation Band :802.11g Fundamental Frequency :2462 MHz **Operation Mode** :Tx CH HIGH EUT Pol. :H Plane

Test Date :2017-07-07 Temp./Humi. :23 deg C / 61 RH Engineer :Mike :HORIZONTAL Measurement Antenna Pol.



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
30.00	S	Peak	28.88	-9.77	19.11	40.00	-20.89
165.80	S	Peak	28.90	-8.91	19.99	43.50	-23.51
299.66	S	Peak	35.29	-7.71	27.58	46.00	-18.42
390.84	S	Peak	38.83	-6.21	32.62	46.00	-13.38
453.89	S	Peak	29.82	-5.04	24.78	46.00	-21.22
696.39	S	Peak	27.73	-1.58	26.15	46.00	-19.85

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Above 1GHz Data:

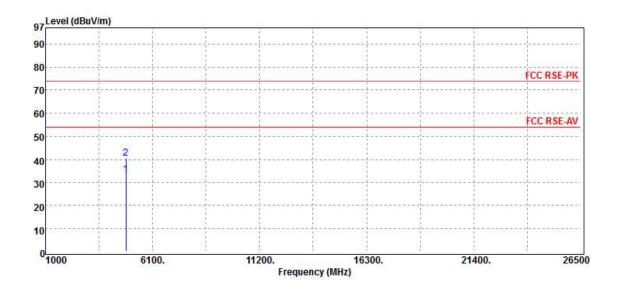
Radiated Spurious Emission Measurement Result (802.11 b)

Operation Band Fundamental Frequency **Operation Mode** EUT Pol.

:802.11b :2412 MHz :Tx CH LOW :H Plane

Test Date Temp./Humi. Engineer Measurement Antenna Pol.

:2017-07-06 :21 deg C / 62 RH :Mike :VERTICAL



	Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe	
			Mode	Reading Level		FS	@3m	Margin	
_	MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	_
	4824.00	Н	Average	28.26	4.93	33.19	54.00	-20.81	
	4824.00	Н	Peak	35.53	4.93	40.46	74.00	-33.54	

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:2017-07-06

Operation Band

:802.11b

Fundamental Operation Mo EUT Pol.		:2412 MHz :Tx CH LOV :H Plane	N	Temp./Hu Engineer Measurer		:Mike	_C / 62 RH ONTAL
97Level	(dBuV/m)						
90							
80							
70						FCC RSE-PI	
60						FCC RSE-AV	
50							
40	2	· · · · · · · · · · · · · · · · · · ·					
30							
20							
10							55
0	6	100.	11200.	16300.	21400.	26	500
1000	Ū	100.	Frequency (I		21400.	20	500
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4824.00	Н	Average	26.90	4.93	31.83	54.00	-22.17
4824.00	Н	Peak	35.37	4.93	40.30	74.00	-33.70



:2017-07-06

Operation Band

:802.11b

Fundamental Operation Mo EUT Pol.		:2437 MHz :Tx CH MID :H Plane		Temp./Hu Engineer Measurer		:Mike	9_C / 62 RH ICAL
97 Level	(dBuV/m)						
90							505
80						FCC RSE-P	ĸ
70							553
60		+				FCC RSE-4	V
50							
40	2						
30							201
20		++					505
10							
0 <mark>1000</mark>	6	100.	11200. Frequency (I	16300. MHz)	21400.	20	\$500
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4874.00	Н	Average	24.01	5.13	29.14	54.00	-24.86
4874.00	н	Peak	35.78	5.13	40.91	74.00	-33.09



:2017-07-06

Operation Band

:802.11b

Fundamental Operation Mo EUT Pol.	Frequency	:2437 MHz :Tx CH MID :H Plane)	Temp./Hu Engineer Measurer		:Mike	2_C / 62 RH
97 Level (dBuV/m)	1	4	6	4		-12
90							555.
80						FCC RSE-F	Ж
70							52.5
60						FCC RSE-4	W
50							
40	2						
30							201
20							575
10							
0 <mark>1000</mark>	6	100.	11200. Frequency (I	16300. MHz)	21400.	20	5500
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4874.00	Н	Average	24.11	5.13	29.24	54.00	-24.76
4874.00	Н	Peak	35.43	5.13	40.56	74.00	-33.44



:2017-07-06

Operation Band

:802.11b

Fundamental Operation Mc EUT Pol.		:2462 MHz :Tx CH HIG :H Plane	Н	Temp./Hu Engineer Measurer		:Mike	_C / 62 RH CAL
97 Level	(dBuV/m)						-10
90							es.
80						FCC RSE-PI	K
70							53
60						FCC RSE-A	v
50	2						
40							80
30							22
20							55.
10							55
0 <mark>1000</mark>	6	100.	11200. Frequency (I	16300. MHz)	21400.	26	500
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4924.00	Н	Average	24.33	5.25	29.58	54.00	-24.42
4924.00	Н	Peak	35.96	5.25	41.21	74.00	-32.79



:2017-07-06

Operation Band

:802.11b

Fundamental Operation Mo EUT Pol.		:2462 MHz :Tx CH HIG :H Plane	Н	Temp./Hu Engineer Measurer		:Mike	2_C / 62 RH
97 Level (dBuV/m)		4	1	4		
90				·····			555
80						FCC RSE-P	ĸ
70							101
60						FCC RSE-A	N
50							
40	2						
30							
20							575
10							
0 <mark>1000</mark>	6	100.	11200. Frequency (I	16300. MHz)	21400.	26	5500
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4924.00	Н	Average	24.47	5.25	29.72	54.00	-24.28
4924.00	Н	Peak	34.86	5.25	40.11	74.00	-33.89



Operation Ba Fundamenta Operation Ma	and I Frequency	nission Mea :802.11g :2412 MHz :Tx CH LOV	surement Resเ ∾	It (802.11 Test Date Temp./Hu Engineer	imi.	-	17-07-06 deg_C / 62 RH ke
EUT Pol.		:H Plane		Measurer	ment Antenna	Pol. :VE	RTICAL
ozLevel	(dBuV/m)						
90				·····			5057551
80							
70						FCC R	SE-PK
60						FCC R	SE-AV
50	2						
40							
30							
20		·····					
10							
0		100	44000	40200		1	20500
°1000	0	100.	11200. Frequency (I	16300. MHz)	21400	5 9 1	26500
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4824.00	Н	Average	24.17	4.93	29.10	54.00	-24.90

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Peak

Н

36.34

4824.00

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4.93

41.27

74.00

-32.73



:2017-07-06

Operation Band

:802.11g

Fundamental F Operation Mod EUT Pol.		:2412 MHz :Tx CH LOV :H Plane	V	Temp./Hu Engineer Measurer		:Mike	2_C / 62 RH
97 Level (d	lBuV/m)						
90							
80						FCC RSE-P	K
70							5.5
60						FCC RSE-A	V
50							
40	2						
30							
20							ees.
10							
0.1000	6	100.	11200. Frequency (16300. MHz)	21400.	26	500
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4824.00	ы	Average	24.24	4.02	29.17	54.00	-24.83
	Н	Average		4.93			
4824.00	Н	Peak	35.16	4.93	40.09	74.00	-33.91



:2017-07-06

Operation Band

:802.11g

Fundamental Operation Mo EUT Pol.		:2437 MHz :Tx CH MID :H Plane		Temp./Hu Engineer Measurer			g_C / 62 R ICAL
97 Level	(dBuV/m)	-					12
90							555
80						FCC RSE-F	ж
70							223
60		++				FCC RSE-	W
50							
40	2						
30							202
20							572
10							7.5 fr
0 <mark></mark> 1000	6	100.	11200. Frequency (I	16300. MHz)	21400.	2	5500
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4874.00	н	Average	24.21	5.13	29.34	54.00	-24.66
4874.00	Н	Peak	35.60	5.13	40.73	74.00	-33.27



:2017-07-06

Operation Band

:802.11g

Fundamental Frequency Operation Mode EUT Pol.	:2437 MHz :Tx CH MID :H Plane)	Temp./Hu Engineer Measurer		:Mike	:21 deg_C / 62 R :Mike :HORIZONTAL	
97 Level (dBuV/m)	1		8	1			
90	+					575	
80					FCC RSE-	PK .	
70							
60					FCC RSE-	AV	
50							
40	· • · · · · · · · · · · · · · · · · · ·					n.h.)	
30						243	
20	++					575	
10						7.7.1)	
0 <mark>1000 6</mark>	100.	11200. Frequency (I	16300. 21400. uency (MHz)		2	26500	
Freq. Note	Detector	Spectrum	Factor	Actual	Limit	Safe	
	Mode	Reading Level		FS	@3m	Margin	
MHz F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
4874.00 H	Average	24.33	5.13	29.46	54.00	-24.54	
	-						



:2017-07-06

Operation Band

:802.11g

:2462 MHz Fundamental Frequency Temp./Humi. :21 deg C / 62 RH **Operation Mode** :Tx CH HIGH Engineer :Mike EUT Pol. :H Plane :VERTICAL Measurement Antenna Pol. Level (dBuV/m) 97 90 80 FCC RSE-PK 70 60 FCC RSE-AV 50 2 40 30 20 10 0^L 1000 6100. 11200. 16300. 21400. 26500 Frequency (MHz) Safe Freq. Note Detector Spectrum Factor Actual Limit Mode **Reading Level** FS @3m Margin PK/QP/AV MHz F/H/E/S dBµV dB dBµV/m dBµV/m dB 4924.00 5.25 29.69 54.00 -24.31н Average 24.44 4924.00 н 5.25 40.54 74.00 -33.46

35.29

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Peak

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Operation Band

:802.11g

Fundamental Frequency :2462 MHz Temp./Humi. :21 deg C / 62 RH **Operation Mode** :Tx CH HIGH Engineer :Mike EUT Pol. :H Plane :HORIZONTAL Measurement Antenna Pol. Level (dBuV/m) 97 90 80 FCC RSE-PK 70 60 FCC RSE-AV 50 2 40 30 20 10 0^L 1000 6100. 11200. 16300. 21400. 26500 Frequency (MHz) Frea. Note Detector Spectrum Factor Actual Limit Safe

		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4924.00	н	Average	24.57	5.25	29.82	54.00	-24.18
4924.00	Н	Peak	35.55	5.25	40.80	74.00	-33.20

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:2017-07-06



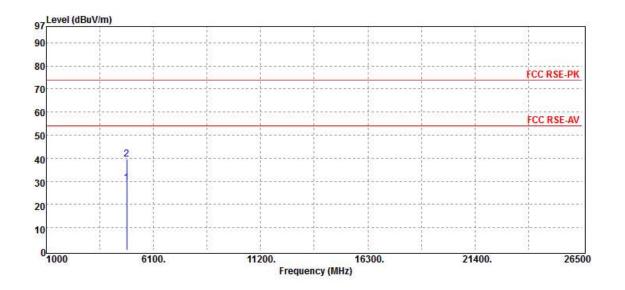
Radiated Spurious Emission Measurement Result (802.11_HT20)

Operation Band	:
Fundamental Frequency	:
Operation Mode	:
EUT Pol.	:

:802.11n20 2412 MHz Tx CH LOW H Plane

Test Date Temp./Humi. Engineer Measurement Antenna Pol.

:2017-07-06 :21 deg C / 62 RH :Mike :VERTICAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe	
		Mode	Reading Level		FS	@3m	Margin	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
4824.00	Н	Average	24.19	4.93	29.12	54.00	-24.88	
4824.00	Н	Peak	34.72	4.93	39.65	74.00	-34.35	

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Operation Ba Fundamental Operation Mo EUT Pol.	Frequency	:802.11n20 :2412 MHz :Tx CH LOV :H Plane	V	Test Date Temp./Hu Engineer Measurer	ımi.	:21 de :Mike	-07-06 eg_C / 62 RH IZONTAL
	(dDa)//m)						
1.44	(dBuV/m)			8			î
90							
80						FCC RSE-	PK
70							
60						FCC RSE	AV
50							
40	2						
30							-211
20							
10							
0 <mark></mark>	6	100.	11200. Frequency (I	16300. MHz)	21400.		26500
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4824.00	Н	Average	24.28	4.93	29.21	54.00	-24.79
4824.00	Н	Peak	35.32	4.93	40.25	74.00	-33.75

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:2017-07-06

:802.11n20

Operation Band

4874.00

4874.00

Н

Н

indamental peration Mo	Frequency	:2437 MHz :Tx CH MID)	Temp./Humi. Engineer			g_C / 62
JT Pol.		:H Plane		Measure	ment Antenna P	ol. :VERT	ICAL
97 Level	(dBuV/m)			6			
90		· [· · · · · · · ·] · · · ·					
80						FCC RSE-	
70						(CC NOL4	
60						FCC RSE-	AV
50							
40	2						
30							242
20							501
10							
0 <mark>1000</mark>	6	100.	11200. Frequency	16300. (MHz)	21400.	2	6500
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB

24.20

34.52

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Average

Peak

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5.13

5.13

29.33

39.65

54.00

74.00

-24.67

-34.35



Operation Ba Fundamental Operation Mo EUT Pol.	Frequency	:802.11n20 :2437 MHz :Tx CH MID :H Plane)	Test Date Temp./Humi. Engineer Measurement Antenna Pol.		:Mike	07-06 g_C / 62 RH ZONTAL
97	(dBuV/m)						
90							
80						FCC RSE-	
70						FUC KSE-	
60						FCC RSE-	AV
50							
40							
30							222
20							
10							17.7 D
0 <mark>1000</mark>	6	100.	11200. Frequency (I	16300. MHz)	21400.	2	6500
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4874.00	н	Average	24.25	5.13	29.38	54.00	-24.62

34.55

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Peak

4874.00

Н

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5.13

39.68

74.00

-34.32



Operation Band Test Date :2017-07-06 :802.11n20 Fundamental Frequency :2462 MHz Temp./Humi. :21 deg C / 62 RH **Operation Mode** :Tx CH HIGH Engineer :Mike EUT Pol. :H Plane :VERTICAL Measurement Antenna Pol. Level (dBuV/m) 97 90 80 FCC RSE-PK 70 60 FCC RSE-AV 50 2 40 30 20 10 0^L 1000 6100. 11200. 16300. 21400.

Fred	uency	(MHz)	

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4924.00	Н	Average	24.44	5.25	29.69	54.00	-24.31
4924.00	Н	Peak	36.08	5.25	41.33	74.00	-32.67

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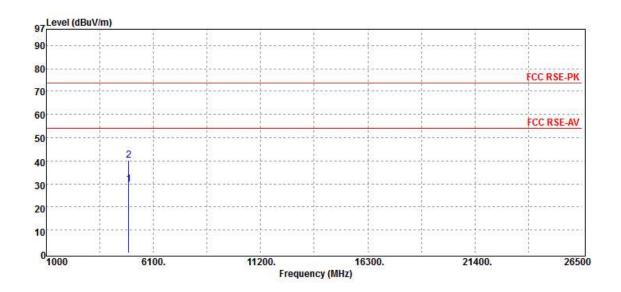
26500



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

Test Date Temp./Humi. Engineer :Mike Measurement Antenna Pol.

:2017-07-06 :21 deg C / 62 RH :HORIZONTAL



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe	
		Mode	Reading Level		FS	@3m	Margin	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	_
4924.00	н	Average	24.61	5.25	29.86	54.00	-24.14	
4924.00	Н	Peak	34.87	5.25	40.12	74.00	-33.88	

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Radiated Spurious Emission Measurement Result (802.11_HT40)

Operation Bai Fundamental Operation Mo	nd Frequency	:Tx CH LOW Engineer		:2017-07-06 :21 deg_C / 6 :Mike			
EUT Pol.		:H Plane		Measurer	ment Antenna	Pol. :VE	RTICAL
97 Level (dBuV/m)						
90							
80						FCC R	SE-PK
70							
60		· · · · · · · · · · · · · · · · · · ·				FCC R	SE-AV
50							
40	2						
30							
20		+					555555
10							0.000.000.000
0	1	1	1 1		1		
⁰ 1000	6	100.	11200. Frequency (I	16300. //Hz)	21400.		26500
				3095.02Y			
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	-
			•		•	•	
4844.00	н	Average	24.23	4.97	29.20	54.00	-24.80

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Peak

4844.00

Н

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4.97

40.85

74.00

-33.15

35.88



Operation Bai Fundamental Operation Mo	Frequency	:802.11n40 :2422 MHz :Tx CH LOV	v	Test Date Temp./Humi. Engineer		:21 de :Mike	-07-06 eg_C / 62 RH
EUT Pol.		:H Plane		Measurer	nent Antenna I	Pol. :HOR	IZONTAL
97 Level ((dBuV/m)		5.4				
90							
80							
1.110						FCC RSE	PK
70							
60						FCC RSE	AV
50							
40	2						
30							
-5224		<u> </u>					
20							
10							
01000	6	100.	11200.	16300.	21400.		26500
			Frequency (I	MHz)			
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
		·	•		•	•	
4844.00	н	Average	24.33	4.97	29.30	54.00	-24.70
		•					
4844.00	Н	Peak	34.17	4.97	39.14	74.00	-34.86

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Operation Band Fundamental Frequency Operation Mode EUT Pol.		:802.11n40 :2437 MHz :Tx CH MID :H Plane		Test Date Temp./Humi. Engineer Measurement Antenna Pol.		:21 de :Mike	:2017-07-06 :21 deg_C / 62 RH :Mike :VERTICAL	
97 Level	(dBuV/m)				18 21			
90								
80						FCC RSE	DK	
70								
60						FCC RSE	AV	
50								
40	2							
30		+						
20							> -	
10							1.1.1.1.1.	
0								
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe	
		Mode	Reading Level		FS	@3m	Margin	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
4874.00	Н	Average	24.26	5.13	29.39	54.00	-24.61	
4874.00	Н	Peak	35.27	5.13	40.40	74.00	-33.60	

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Operation Ba Fundamental Operation Mo EUT Pol.	Frequency	:802.11n40 :2437 MHz :Tx CH MID :H Plane		Test Date Temp./Hur Engineer Measurem	ni. nent Antenna	:21 c :Mik	7-07-06 deg_C / 62 RH e RIZONTAL
97 Level	(dBuV/m)			13	- 12		
90							
80						FCC RS	T DV
70						FLC NO	
60		·				FCC RS	
50						FLC R	SE-AV
40	2						
30							
20							
10							
0							
°1000	6	100.	11200. Frequency (16300. MHz)	21400.		26500
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4874.00	Н	Average	24.37	5.13	29.50	54.00	-24.50
4874.00	Н	Peak	35.40	5.13	40.53	74.00	-33.47

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Test Date

:2017-07-06

:802.11n40

Operation Band

4904.00

4904.00

Н

н

Indamental Fi		:2452 MHz :Tx CH HIG	Н	Temp./Hu Engineer		:21 de :Mike	eg_C / 62 I
JT Pol.		:H Plane		Measure	ment Antenna P	ol. :VERT	TICAL
97 Level (dB	BuV/m)						
90							
80							
70						FCC RSE-	PK
60						tee per	A17
50						FCC RSE	AV
40	2						
30							
20							
10							
01000	6	5100.	11200. Frequency	16300.	21400.	1	26500
			Troquency	(11112)			
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB

24.46

35.82

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Average

Peak

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5.24

5.24

29.70

41.06

54.00

74.00

-24.30

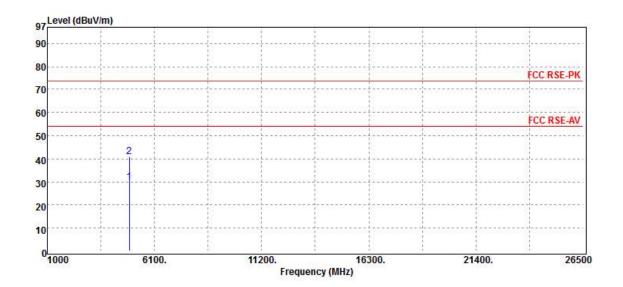
-32.94



Operation Band :802.11n40 Fundamental Frequency :2452 MHz **Operation Mode** :Tx CH HIGH EUT Pol. :H Plane

Test Date Temp./Humi. Engineer :Mike Measurement Antenna Pol.





Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe	
		Mode	Reading Level		FS	@3m	Margin	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	_
4904.00	н	Average	24.57	5.24	29.81	54.00	-24.19	
4904.00	Н	Peak	35.59	5.24	40.83	74.00	-33.17	

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12 PEAK POWER SPECTRAL DENSITY

12.1 Standard Applicable

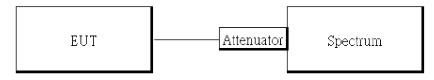
The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

Note:	
Antenna Gain:	<i>-1.50</i> dBi
Aux1 Antenna Gain:	<i>-0.10</i> dBi
Number Antenna:	2 pcs
Limit:	8 dBm
The antenna gain is grater than 6	dBi in MIMO mode the limit reduce as below:
Directional gain = gain of antenna	element + 10 log (# of TX antenna elements)
Effective Legacy Gain (dBi) = 0+3	.01=3.01dBi
Limit: 8dBm – (3.01– 6dBi)=8	

12.2 Measurement Equipment Used

SGS Conducted Room							
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.		
TYPE		NUMBER	NUMBER	CAL.			
Power Meter	Anritsu	ML2495A	1005007	12/15/2016	12/14/2017		
Power Sensor	Anritsu	MA2411B	917032	12/15/2016	12/14/2017		
EXA Spectrum	Agilopt	NOO2OA	MVE2420760	02/24/2047	02/20/2010		
Analyzer	Agilent	N9030A	MY53120760	03/21/2017	03/20/2018		
DC Block	Mini-Circuits	BLK-18-S+	1	01/05/2017	01/04/2018		
Coaxial Cable	HUBER+SUHN ER	SUCOFLEX 102	23670/2	01/05/2017	01/04/2018		
Attenuator	Mini-Circuit	BW-S10W2+	2	01/05/2017	01/04/2018		
Splitter	Agilent	11636B	N/A	01/05/2017	01/04/2018		
DC Power Supply	Agilent	E3640A	MY52410006	11/21/2016	11/20/2017		
Temperature Chamber	TERCHY	MHG-120LF	911009	05/19/2017	05/18/2018		

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.
- 11. 802.11g/n MIMO mode: offset is set following "measure and add 10 Log (N)" on spectrum to measure the PSD for MIMO mode. Offset = cable loss + 10 log (N), where N is number of transmitting antenna. N=2 for this given application

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12.5 Measurement Result

POV	POWER DENSITY 802.11b				VER DEI	NSITY 8	02.11g
Freq. (MHz)	PSD (dBm)	Limit (dBm)	Result	Freq. (MHz)	PSD (dBm)	Limit (dBm)	Result
2412	-1.41	8.00	PASS	2412	-6.48	8.00	PASS
2437	-0.23	8.00	PASS	2437	-6.03	8.00	PASS
2462	-0.55	8.00	PASS	2462	-6.05	8.00	PASS
POWEI	R DENSI	TY 802.	11n HT20	POWE	R DENSI	TY 802.	11n HT40
Freq. (MHz)	PSD (dBm)	Limit (dBm)	Result	Freq. (MHz)	PSD (dBm)	Limit (dBm)	Result
2412	-7.72	8.00	PASS	2422	-11.8	8.00	PASS
2437	-5.71	8.00	PASS	2437	-8.22	8.00	PASS
2462	-7.94	8.00	PASS	2452	-10.9	8.00	PASS

*Refer to next page for plots

Band	ledge Li	imit 802.11b MODE	Bandedge Limit 802.11g MODE			
Freq.	PSD	Ban dedge Limit	Freq.	PSD	Bandedge Limit	
(MHz)	(dBm)	(dBm)	(MHz)	(dBm)	(dBm)	
2412	13.84	-6.16	2412	8.99	-11.01	
2462	13.47	-6.53	2462	8.55	-11.45	
Bande	dge Lin	nit 802.11 n20 MODE	Bande	dge Lir	nit 802.11 n40 MODE	
Bande Freq.	edge Lin PSD	nit 802.11 n20 MODE Bandedge Limit	Bande Freq.	e dge Lir PSD	mit 802.11n40 MODE Bandedge Limit	
				PSD		
Freq.	PSD	Bandedge Limit	Freq.	PSD	Bandedge Limit	

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



Power Spectral Density Test Plot (CH-Mid)



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Power Spectral Density Test Plot (CH-High)



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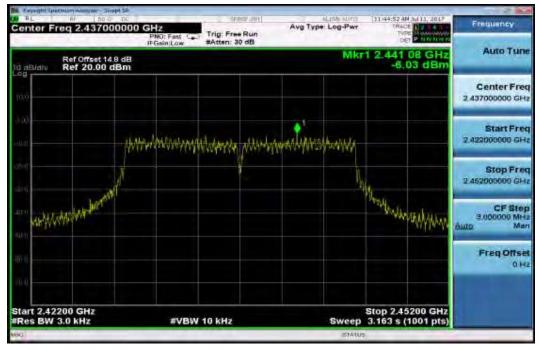
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802.11g Power Spectral Density Test Plot (CH-Low)



Power Spectral Density Test Plot (CH-Mid)

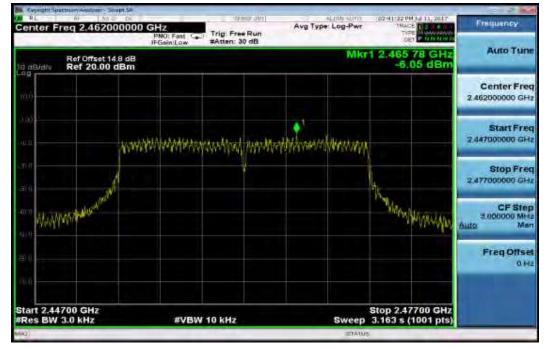


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Power Spectral Density Test Plot (CH-High)



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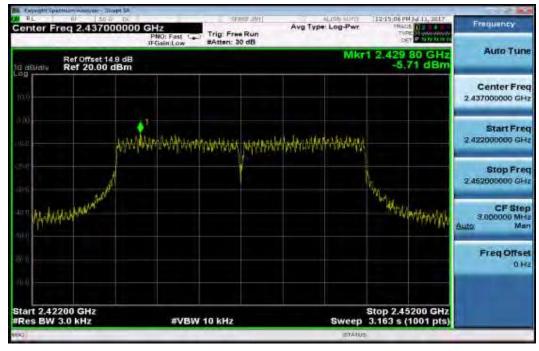


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802.11n HT20 (MIMO) Power Spectral Density Test Plot (CH-Low)







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Power Spectral Density Test Plot (CH-High)



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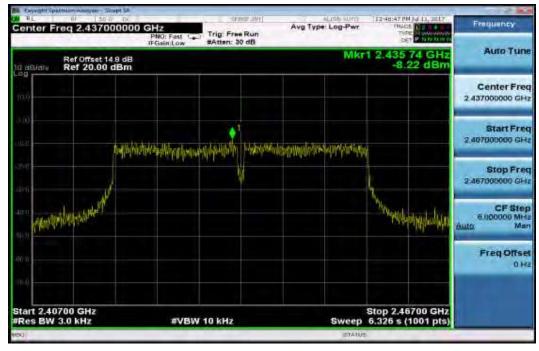


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802.11n HT40 (MIMO) Power Spectral Density Test Plot (CH-Low)



Power Spectral Density Test Plot (CH-Mid)

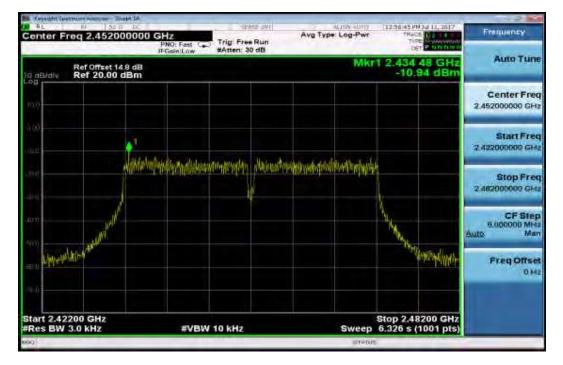


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Power Spectral Density Test Plot (CH-High)



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802.11b PSD for Band edge Limit (CH-Low)



802.11b PSD for Bandedge Limit(CH-High)



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802.11g PSD for Bandedge Limit(CH-Low)



802.11g PSD for Bandedge Limit(CH-High)



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802.11n_HT20 PSD for Bandedge Limit(CH-Low)



802.11n_HT20 PSD for Bandedge Limit(CH-High)



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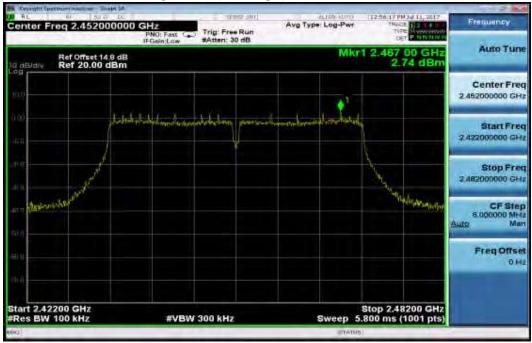
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802.11n_HT40 PSD for Bandedge Limit(CH-Low)



802.11n_HT40 PSD for Bandedge Limit(CH-High)



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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.

Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level.9 When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.

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.

The antenna gain is less than 6dBi. Therefore, it is not necessary to reduce maximum output power limit.

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14 MAXIMUM PERMISSIBLE EXPOSURE (MPE)

14.1 Standard Applicable

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

This is a Mobile device, the MPE is required.

According to §1.1310 and §2.1093 RF exposure is calculated.

Limits for Maximum Permissive Exposure (MPE)

Frequency Range	Electric Field	Magnetic Field	Power Density	Averaging Time	
(MHz)	Strength (V/m)	Strength (A/m)	(mW/cm ²)	(minute)	
Limits for General Population/Uncontrolled Exposure					
0.3-1.34	614	1.63	*(100)	30	
1.34-30	824/f	2.19/f	*(180/f ²)	30	
30-300	27.5	0.073	0.2	30	
300-1500	1	/	F/1500	30	
1500-15000	/	/	1.0	30	

F = frequency in MHz

* = Plane-wave equipment power density

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14.2 Maximum Permissible Exposure (MPE) Evaluation (Worst Case)

802.	11b Au	x1					
СН	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit F			RESULT
1	2412	1	24.92	1 Watt	30.00	dBm	PASS
6	2437	1	25.18	1 Watt	30.00	dBm	PASS
11	2462	1	24.94	1 Watt	30.00	dBm	PASS
802.	11b Au	x1		-			
СН	Freq.	Data	Avg. Output Power	Limit			
СП	(MHz)	Rate	(dBm)		Limit		RESULT
1	(MHz) 2412	Rate		1 Watt	30.00	dBm	PASS
			(dBm)		-	dBm dBm	

MPE Prediction (802.11b)

Prediction of MPE limit at a given distance Equation from page 18 of OET Bulletin 65, Edition 97-01 $S=PG/4\pi R^2$

Where: S = Power density

- P = Power input to antenna
- G = Power gain of the antenna in the direction of interest relative to an isotropic radiator
- R = Distance to the center of radiation of the antenna

Max. output power including tune-up tolerancel:	23.06	(dBm)			
Max. output power including tune-up tolerancel:	202.30192	(mW)			
Duty cycle:	99.63	(%)			
Maximum Pav :	201.5534	(mW)			
Peak Antenna gain (Maximum):	-0.1	(dBi)			
Peak Antenna gain (linear):	0.9772372	(numeric)			
Prediction distance:	20	(cm)			
Prediction frequency:	2437	(MHz)			
MPE limit for uncontrolled exposure at prediction	1	(mW/cm2)			
Power density at predication frequency at 20 (cm)	0.039	(mW/cm2)			
Measurement Result The predicted power density level at 20 cm is 0.039 mW/cm2.					
This is below the uncontrolled exposure limit of 1 mW/cm2 at 2437MHz.					

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