

# **ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT**

# INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT AND INDUSTRY CANADA RSS 210 CLASS II PC REPORT

	OF			
Product Name:	802.11ac/a/b/g/n + BT Wireless Module			
Brand Name:	UG			
Model No.:	NFA-BAC-MR-02			
Model Difference:	N/A			
FCC ID:	COFNFABACMR02			
IC:	10293A- NFABACMR02			
Report No.:	ER/2014/40011			
Issue Date:	May. 06, 2014			
FCC Rule Part:	§15.247, Cat: DTS			
IC Rule Part:	RSS-210 issue 8 :2010, Annex 8			
Prepared for:	UNIVERSAL GLOBAL SCIENTIFIC INDUS- TRIAL CO., LTD. 141, Lane 351, Sec. 1, Taiping Road, Tsaotuen, Nantou 54261, Taiwan			
Prepared by:	SGS Taiwan Ltd. Electronics & Communication Laboratory No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803			
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台灣檢驗科技股份有限公司	t (886-2) 2299-3279



Report No.: ER/2014/40011 Issue Date: May. 06, 2014 Page: 2 of 129

# **VERIFICATION OF COMPLIANCE**

Applicant:	UNIVERSAL GLOBAL SCIENTIFIC INDUSTRIAL CO., LTD.
	141, Lane 351, Sec. 1, Taiping Road, Tsaotuen, Nantou 54261, Taiwan
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Brand Name:	UG
Model No.:	NFA-BAC-MR-02
Model Difference:	N/A
FCC ID:	COFNFABACMR02
IC:	10293A- NFABACMR02
File Number:	ER/2014/40011
Date of test:	Apr. 03, 2014 ~ Apr. 25, 2014
Date of EUT Received:	Apr. 03, 2014

# 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 C63.4:2009 and RSS-Gen. issue 3 the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.247 and IC RSS 210 issue 8: 2010 Annex 8. The test results of this report relate only to the tested sample identified in this report.

Test By:	Marcus Tseng	Date	May. 06, 2014
Prepared By:	Marcus Tseng / Engineer Uroletta Tang	Date	May. 06, 2014
Approved By:	Violetta Tang / Clerk	Date	May. 06, 2014

Jim Chang / Supervisor

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# Version

Version No.	Date	Description
00	May. 06, 2014	Initial creation of document

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#### 1 **GENERAL INFORMATION**

#### **Product description** 1.1

General Information of Notebook:

Product Name:	Notebook Computer					
Brand Name:	Lenovo					
Model No.:	Lenovo N 20425	20 Chrome, 80G1, 20419, Lenovo N20p Chrome, 80G2,				
Model Difference:	Market Se	gmentation				
Hardware Version:	N/A					
Software Version:	N/A					
Model No. for BT Module:	NFA-BAC	2-MR-02				
Module FCC ID:	COFNFA	3ACMR02				
Module IC:	10293A- NFABACMR02					
Scope:	The test report covers the radiated emissions requirements of the stand- ards referenced in the report to allow system level approval of the mod- ule in this specific host.					
Class II Permissive change:	802.11ac/a/b/g/n + BT Wireless Module (NFA-BAC-MR-02) card In- stalled in an Notebook Computer					
	11.1Vdc Rechargeable Li-polymer battery pack or 20Vdc from AC/DC adapter					
	Battery:	1. Model No.: L13M6P61, Supplier: Simplo				
Power Supply:	Dattery.	2. Model No.: L13L3P61, Supplier: LG				
117		1. Model No.: ADLX45NCC3A, Supplier: Chicony				
	Adapter:	2. Model No.: ADLX45NDC3A, Supplier: Delta				
		3. Model No.: ADLX45NLC3A, Supplier: Liteon				

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# WLAN 2.4GHz+5.7GHz:

Wi-Fi	Frequency Range	Channels	Rated Power (Peak)	Modulation Technology	Type of Emission Listed in Test Report/Original Grant:
11b/g	2412-2462	11	b: 19.76dBm g: 25.28dBm	DSSS OFDM	b: 17M7D1D g: 17M7D1D
11n (2.4GHz)	HT20 2412-2462	11	n: 25.08dBm n: 24.70dBm (MIMO Chain0) n: 26.22dBm (MIMO Chain 1) n: 28.54dBm (MIMO Chain 0+1)	OFDM	17M7D1D
11n (2.4GHz)	HT40 2422-2452	7	n: 24.98dBm n: 24.44dBm (MIMO Chain0) n: 24.01dBm (MIMO Chain 1) n: 27.24dBm (MIMO Chain 0+1)	OFDM	36M6D1D
11a	5725-5850	5	a: 22.81dBm		28M3D1D
11n (5GHz)	HT20 5725-5850	5	n: 22.64dBm n: 21.38dBm (MIMO Chain0) n: 21.93dBm (MIMO Chain 1) n: 24.60dBm (MIMO Chain 0+1)	OFDM	28M3D1D
11n (5GHz)	HT40 5725-5850	2	n: 23.44dBm n: 20.70dBm (MIMO Chain0) n: 21.28dBm (MIMO Chain 1) n: 24.10dBm (MIMO Chain 0+1)		51M6D1D
11ac (20M)	5725-5850	5	ac 20M: 23.15dBm ac 20M: 21.90dBm (MIMO Chain0) ac 20M: 21.98dBm (MIMO Chain 1) ac 20M: 24.74dBm (MIMO Chain 0+1)		28M3D1D
11ac (40M)	5725-5850	2	ac 40M: 23.41dBm ac 40M: 20.75dBm (MIMO Chain0) ac 40M: 21.60dBm (MIMO Chain 1) ac 40M: 24.14dBm (MIMO Chain 0+1)	OFDM	51M6D1D
11ac (80M)	5725-5850	1	ac 80M: 14.82dBm ac 80M: 13.46dBm (MIMO Chain0) ac 80M: 14.76dBm (MIMO Chain 1) ac 80M: 17.17dBm (MIMO Chain 0+1)		76M4D1D

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Antenna Designation:	<ul> <li>PIFA Antenna, Supplier: High-Tek Electronics Co., Ltd</li> <li>2.4G: TX1 Antenna (P/N: 0ACCN013045N, Peak gain: 1.5dBi) TX2 Antenna (P/N: 0ACCN013046N, Peak gain: -1.55dBi)</li> <li>5.7G: TX1 Antenna (P/N: 0ACCN013045N, Peak gain: 2.72dBi) TX2 Antenna (P/N: 0ACCN013046N, Peak gain: 1.70dBi)</li> </ul>
Modulation type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Transition Rate:	802.11 a: 6/9/12/18/24/36/48/54Mbps; 802.11 b: 1/2/5.5/11 Mbps; 802.11 g: 6/9/12/18/24/36/48/54Mbps; 802.11 n_20MHz: 6.5 – 144Mbps; 802.11 n_40MHz: 13.5 – 300Mbps; 802.11 ac (20M): 6.5 – 144Mbps; 802.11 ac (40M): 13.5 – 300Mbps; 802.11 ac (80M): 29.3 - 866.7Mbps

The 2.4G max antenna gain is 1.5dBi which was choosing for Radiated Spurious Emission test. The 5.7G max antenna gain is 2.72dBi which was choosing for Radiated Spurious Emission test. The EUT is in compliance with FCC §15.247 at which the frequency band of 2400~2483.5, and 5725~5850MHz has been tested.

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# IEEE 802.11n Spec:

MCS Index					NG	nna	ND	nna		Datarat	e(Mbps)	
	Nss	Modulation	R	NBPSC	NCBPS		NDBPS		800	nsGI	400nsGI	
					20MHz	40MHz	20MHz	40MHz	20MHz	40MHz	20MHz	40MHz
0	1	BPSK	1/2	1	52	108	26	54	6.5	13.5	7.200	15
1	1	QPSK	1/2	2	104	216	52	108	13.0	27.0	14.400	30
2	1	QPSK	3/4	2	104	216	78	162	19.5	40.5	21.700	45
3	1	16-QAM	1/2	4	208	432	104	216	26.0	54.0	28.900	60
4	1	16-QAM	3/4	4	208	432	156	324	39.0	81.0	43.300	90
5	1	64-QAM	2/3	6	312	648	208	432	52.0	108.0	57.800	120
6	1	64-QAM	3/4	6	312	648	234	486	58.5	121.5	65.000	135
7	1	64-QAM	5/6	6	312	648	260	540	65.0	135.0	72.200	150

Symbol	Explanation
NSS	Number of spatial streams
R	Code rate
NBPSC	Number of coded bite per single carrier
NCBPS	Number of coded bite per symbol
NDBPS	Number of data bite per symbol
GI	Guard interval

# 802.11n\_HT20 MCS8 -15

MCG	Modulation	R	N <sub>BPSCS</sub> (i <sub>SS</sub> )	N <sub>SD</sub>	N <sub>SP</sub>	N <sub>CBPS</sub>	N <sub>DBPS</sub>	Data rate (Mb/s)	
MCS Index								800 ns GI	400 ns GI (see NOTE)
8	BPSK	1/2	1	52	4	104	52	13.0	14.4
9	QPSK	1/2	2	52	4	208	104	26.0	28.9
10	QPSK	3/4	2	52	4	208	156	39.0	43.3
11	16-QAM	1/2	4	52	4	416	208	52.0	57.8
12	16-QAM	3/4	4	52	4	416	312	78.0	86.7
13	64-QAM	2/3	6	52	4	624	416	104.0	115.6
14	64-QAM	3/4	6	52	4	624	468	117.0	130.0
15	64-QAM	5/6	6	52	4	624	520	130.0	144.4
NOTE-T	he 400 ns GI rate	values	are rounded to 1	decima	l place.				

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# 802.11n HT40 MCS8 -15

MCS	Modulation	Modulation R	N G )	N <sub>SD</sub>	N <sub>SP</sub>	N	N	Data rate (Mb/s)	
Index			N <sub>BPSCS</sub> (i <sub>SS</sub> )			N <sub>CBPS</sub>	N <sub>DBPS</sub>	800 ns GI	400 ns GI
8	BPSK	1/2	1	108	6	216	108	27.0	30.0
9	QPSK	1/2	2	108	6	432	216	54.0	60.0
10	QPSK	3/4	2	108	6	432	324	81.0	90.0
11	16-QAM	1/2	4	108	6	864	432	108.0	120.0
12	16-QAM	3/4	4	108	6	864	648	162.0	180.0
13	64-QAM	2/3	6	108	6	1296	864	216.0	240.0
14	64-QAM	3/4	6	108	6	1296	972	243.0	270.0
15	64-QAM	5/6	6	108	6	1296	1080	270.0	300.0

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# **1.2** Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: <u>COFNFABACMR02</u> filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules. And IC: <u>10293A- NFABACMR02</u> filing to comply with Industry Canada RSS-210 issue 8: 2010 Annex 8. The composite system (digital device) is compliance with Subpart B under the DoC procedure.

# 1.3 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.4:2009 and RSS-Gen: 2010. Radiated testing was performed at an antenna to EUT distance 3 meters.

Tested in accordance with Apr 2013 KDB558074 D01 V03 for compliance to FCC 47CFR 15.247 requirements.

# **1.4 Test Facility**

The measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd., Guishan Township, Taoyuan County, Taiwan 333 which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4:2009. FCC Registration Number is: 990257. Canada Registration Number: 4620A-4.

The 10 m Open Area Test Sites located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No. 29, Pau-Tou-Tsuo Valley Chia-Pau Tsuen, Linkou Hsiang, Taipei county, which is constructed and calibrated to meet the CISPR 22/EN 55022 requirements. SGS Site No. 1(3 &10 meters) and FCC Registration Number: 94644.

# **1.5** Special Accessories

There are no special accessories used while test was conducted.

# **1.6 Equipment Modifications**

There was no modification incorporated into the EUT.

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#### 2 SYSTEM TEST CONFIGURATION

#### 2.1 **EUT Configuration**

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

#### 2.2 **EUT Exercise**

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

#### 2.3 **Test Procedure**

# 2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the general criterion in Section 7.1 of ANSI C63.4:2009.Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz, and the measurement procedure 7.3 in ANSI 63.4:2009 is followed to carry out the test. The CISPR Quasi-Peak and Average detector mode is employed according to §15.107

# 2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. 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 three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna. according to the requirements in Section 8 and 13 and of ANSI C63.4:2009,

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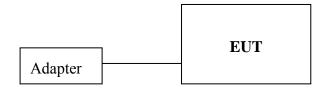
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#### 2.4 **Configuration of Tested System**

# Fig. 2-1 Radiated Emission & Conducted (Antenna Port) Configuration



# **Table 2-1 Equipment Used in Tested System**

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	WLAN Test Software	N/A	N/A	N/A	N/A	N/A

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#### SUMMARY OF TEST RESULTS 3

FCC / IC Rules	Description Of Test	Result
§15.207(a) RSS-Gen §7.2.4	AC Power Line Conducted Emission	N/A
§15.247(b) (3) RSS-210 §A8.4(4)	Peak Output Power	Compliant
§15.247(a)(2) RSS-210 §A8.2 (a)	6dB Bandwidth	N/A
§15.247(d) RSS-210 §A8.5	100 KHz Bandwidth Of Frequency Band Edges	N/A
§15.247(d) RSS-210 §A8.5	Spurious Emission	Compliant
§15.247(e) RSS-210 §A8.2(b)	Peak Power Density	N/A
§15.203 RSS-GEN §7.1.2,	Antenna Requirement	Compliant
RSS-Gen §4.6.1	99% Power Bandwidth	N/A

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# **4 DESCRIPTION OF TEST MODES**

The EUT has been tested under operating condition. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

802.11 b mode: Channel low (2412MHz), mid (2437MHz) and high (2462MHz) with 1Mbps lowest data rate are chosen for full testing.

802.11 g mode: Channel low (2412MHz), mid (2437MHz) and high (2462MHz) with 6Mbps lowest data rate are chosen for full testing.

802.11 n\_20MHz mode: Channel low (2412MHz), mid (2437MHz) and high (2462MHz) with 6.5Mbps lowest data rate are chosen for full testing.

802.11 n\_40MHz mode: Channel low (2422MHz), mid (2437MHz) and high (2452MHz) with 13.5Mbps lowest data rate are chosen for full testing.

802.11 a mode: Channel low (5745MHz), mid (5785MHz) and high (5825MHz) with 6Mbps lowest data rate are chosen for full testing.

802.11 n (5GHz) \_20MHz: Lowest (5745MHz), Mid (5785MHz) and high (5825MHz) with 6.5Mbps lowest data rate are chosen for full testing.

802.11 n (5GHz) \_40MHz: Lowest (5755MHz) and high (5795MHz) with 13.5Mbps lowest data rate are chosen for full testing.

802.11 ac (20M) mode: Channel low (5745MHz), mid (5785MHz) and high (5825MHz) with 6.5Mbps lowest data rate are chosen for full testing.

802.11 ac (40M): Lowest (5755MHz) and high (5795MHz) with 13.5Mbps lowest data rate are chosen for full testing.

802.11 ac (80M): 5775MHz with 29.3Mbps lowest data rate are chosen for full testing.

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The worst case is determined by the output power that generates the highest emission. As examined in the section of output power measurement, the section 7.5, the lowest data rate at a/b/g/n HT20/n HT40/ac (20M)/ac (40M)/ac (80M) resulted the highest level of fundamental emission, and therefore, the lowest data rate is chosen as the worst-case to conduct the remaining of other mandatory test cases.

The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for 802.11a/b/g/n/ac WLAN Transmitter for channel Low, Mid and High, the worst case E2 position was tested as resulted in pre-scanned measurement with respect to 2.4GHz 802.11b/g/n and 5.7GHz 802.11a/n HT20/n HT40/ac (20M)/ac (40M)/ac (80M).

Pre-scanned was done on TX1 Antenna and TX2 Antenna, and TX1 Antenna results higher emission at 2.4GHz and 5.7GHz. Therefore, the completed set of measurement was done on TX1 Antenna to be presented on this test report.

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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.

Gain with 5.7G is combined with the identical gain:

- (i) If all antennas have the same gain,  $G_{ANT}$ , Directional gain =  $G_{ANT}$  + Array Gain, where Array Gain is as follows.
  - For power spectral density (PSD) measurements on all devices, *Array Gain = 10 log(N<sub>ANT</sub>/N<sub>SS</sub>) dB*.
  - For power measurements on IEEE 802.11 devices, <sup>1,2</sup>

Array Gain = 0 dB (i.e., no array gain) for  $N_{ANT} \le 4$ ; Array Gain = 0 dB (i.e., no array gain) for channel widths  $\ge 40$  MHz for any  $N_{ANT}$ ; Array Gain = 5 log( $N_{ANT}/N_{SS}$ ) dB or 3 dB, whichever is less, for 20-MHz channel widths with  $N_{ANT} \ge 5$ .

Array gain = 0dBi (ERP/EIRP related measurement) Array gain = 3.01dBi (peak spectral density)

MIMO gain = gain (nominal gain) + array gain = (2.04 + 0)dBi = 2.04dBi

Gain with 2.4G is combined with different magnitude of two antennas:

- (ii) If antenna gains are not equal, the user may use either of the following methods to calculate 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,

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

where

Each antenna is driven by no more than one spatial stream;  $N_{SS}$  = the number of independent spatial streams of data;  $N_{ANT}$  = the total number of antennas

 $g_{j,k} = 10^{G_k/20}$  if the *k*th 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.

Directive Gain = -0.06dBi (Wifi 2.4G),

2.22dBi (802.11ac 20M 5.8G), 2.20dBi (802.11ac 40M 5.8G), 2.09dBi (802.11ac 80M 5.8G)

MIMO Gain = 1.17dBi (Wifi 2.4G),

4.94dBi (802.11n\_HT 20/ ac 20M 5.8G), 4.92dBi (802.11n\_HT 40/ ac 40M 5.8G), 4.81dBi (802.11ac 80M 5.8G)

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# **5 MEASUREMENT UNCERTAINTY**

Test Items	Uncertainty			
AC Power Line Conducted Emission	+/- 2.586 dB			
Peak Output Power	+/- 1.55dB (for Spectrum) +/- 1.42 dB (for Power Meter)			
6dB Bandwidth	+/- 123.36 Hz			
100 KHz Bandwidth Of Frequency Band Edges	+/- 1.55 dB			
Peak Power Density	+/- 1.55 dB			
99% Power Bandwidth	+/- 123.36 Hz			
Temperature	+/- 0.8 °C			
Humidity	+/- 4.7 %			
DC / AC Power Source	DC= +/- 1%, AC=+/- 0.2%			

Radiated Spurious Emission:

Measurement uncertainty (Polarization : <b>Vertical</b> )	30MHz - 180MHz: +/- 3.37dB			
	180MHz -417MHz: +/- 3.19dB			
	0.417GHz-1GHz: +/- 3.19dB			
	1GHz - 18GHz: +/- 4.04dB			
	18GHz - 40GHz: +/- 4.04dB			

	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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# **6 CONDUCTED EMISSION TEST**

# 6.1 Standard Applicable:

According to §15.207 and RSS-Gen §7.2.4, frequency range within 150KHz to 30MHz shall not exceed the Limit table as below.

Frequency range		.imits B(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 t	ransition 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	05/27/2013	05/26/2014			
LISN	Rolf-Heine	NNB-2/16Z	99012	03/26/2014	03/25/2015			
LISN	FCC	FCC-LISN-50/250-25-2-01	04034	03/19/2014	03/18/2015			
Coaxial Cables	N/A	WK CE Cable	N/A	11/26/2013	11/25/2014			

# 6.3 EUT Setup:

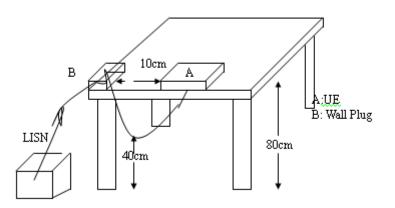
- 1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.4:2009.
- 2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
- 3. The LISN was connected with 120Vac/60Hz power source.

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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:

Please refer to FCC Part15B Test Report for the plots.

Report No.: T140306L10-D, Test Lab: Compliance Certification Services Inc. Linkuo Laboratory

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#### 7 PEAK OUTPUT POWER MEASUREMENT

#### 7.1 **Standard Applicable:**

According to §15.247 (b)

(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

According to RSS-210 issue 8, §A8.4(4), for systems employing digital modulation techniques operating in the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz, the maximum peak conducted output power shall not exceed 1 W. Except as provided in Section A8.4 (5), the e.i.r.p. shall not exceed 4 W.

As an alternative to a peak power measurement, compliance can be based on a measurement of the maximum conducted output power. The maximum conducted output power is the total transmitted power delivered to all antennas and antenna elements, averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or transmitting at a reduced power level. If multiple modes of operation are implemented, the maximum conducted output power is the highest total transmit power occurring in any mode.

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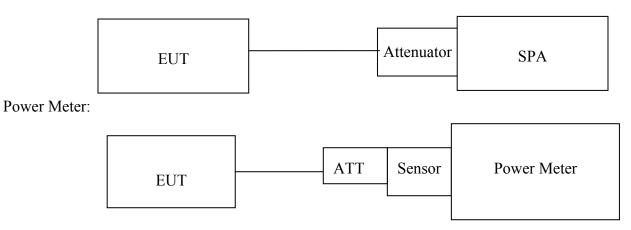


#### 7.2 **Measurement Equipment Used:**

Conducted Emission Test Site							
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.		
ТҮРЕ		NUMBER	NUMBER	CAL.			
Power Meter	Anritsu	ML2495A	1005007	01/13/2014	01/12/2015		
Power Sensor	Anritsu	MA2411B	917032	01/13/2014	01/12/2015		
Spectrum Analyzer	Agilent	E4446A	MY51100003	05/30/2013	05/29/2014		
Spectrum Analyzer	Agilent	E4440A	MY45304525	03/08/2014	03/07/2015		
DC Block	Mini-Circuits	BLK-18-S+	1	02/27/2014	02/26/2015		
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/03/2014	01/02/2015		
Attenuator	Mini-Circuit	BW-S10W2+	002	02/27/2014	02/26/2015		
Splitter	Agilent	11636B	N/A	02/27/2014	02/26/2015		

# 7.3 Test Set-up:

Spectrum:



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# 7.4 Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.

2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter or spectrum. (**Peak power setting on Spectrum:** Channel power function, RBW = 1MHz, VBW = 3MHz, Span: 30/60MHz, Detector =peak, Sweep = Auto. Setting on spectrum is adjusted based on the mandatory procedure in 9.1.2 of the KDB558074). Power Meter is used as the auxiliary test equipment to conduct the output power measurement. 9.1.3 in KDB558074 is followed.

(Avg. power setting on Spectrum: Channel power function, RBW = 1MHz, VBW = 3MHz, Span: 30/60MHz, Detector =Avg., Trace avg =100, Sweep = Auto, Setting on spectrum is adjusted based on the mandatory procedure in 9.2.2.4 of the KDB558074). Power Meter is used as the auxiliary test equipment to conduct the output power measurement. 9.2.3, option 3 in KDB558074 is followed.

- 3. Record the max. Reading as observed from Spectrum or Power Meter.
- 4. Repeat above procedures until all frequency of interest measured was complete.
- 5. For MIMO operation, measurement is done per chain basis, and then sum the simultaneous transmitting output in linear.

Pre-anaysis Check: While conducting average power measurement, duty cycle of each mode (a/n\_ht20/n\_ht40) 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, resulted as obtained below, and showed only the most representative ones

Tabular results as indicates below entails the results of duty factor for all supported modes. *Formula:* 

*Duty Cycle = Ton / (Ton+Toff)* 

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# **Test Procedure:**

Set span = 0, RBW = 8MHz, VBW = 8MHz, Detector = Peak Duty Cycle:

	Antenna	Duty Cycle	Duty Factor (dBm)
802.11b	Single	0.99	0.04
802.11g	Single	0.99	0.04
802.11n_20	SISO	0.99	0.04
(2.4G)	MIMO	0.99	0.04
802.11n_40	SISO	0.99	0.04
(2.4G)	MIMO	0.99	0.04
802.11a	Single	0.99	0.04
802 11n 20 (5C)	SISO	0.99	0.04
802.11n_20 (5G)	MIMO	0.99	0.04
802 11n 40 (5C)	SISO	0.99	0.04
802.11n_40 (5G)	MIMO	0.99	0.04
802.11ac (20M)	Single	0.99	0.04
802 11aa (40M)	SISO	0.99	0.04
802.11ac (40M)	MIMO	0.99	0.04
802 11aa (80MC)	SISO	0.99	0.04
802.11ac (80MG)	MIMO	0.99	0.04

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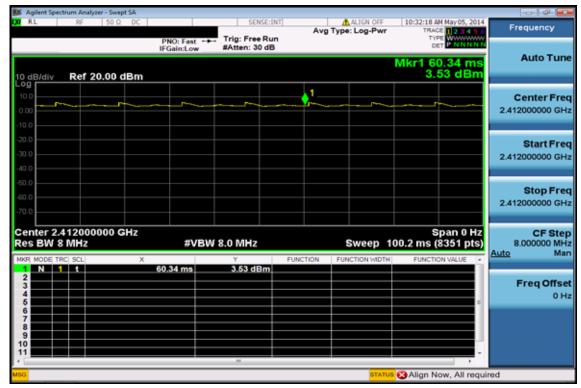
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S Taiwan Ltd.



# **Duty Factor:**

### 802.11 b



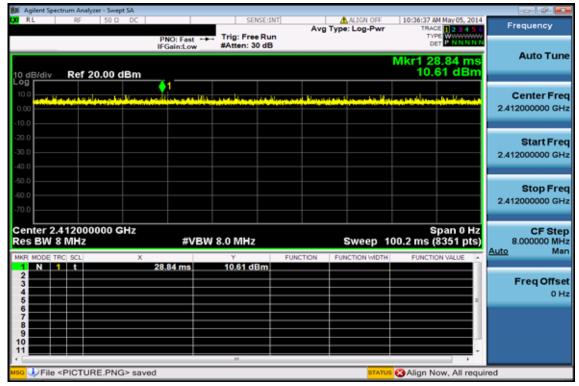
### 802.11 g

📕 Agilent Spectrum Analyzer - Swept SA						- # ×
LX0 RL RF 50 Ω DC		SENSE:	Avg	ALIGN OFF Type: Log-Pwr	10:34:10 AM May 05, 201 TRACE 1 2 3 4 5	Frequency
	PNO: Fast ++ IFGain:Low	#Atten: 30 di			Mkr1 41.11 ms	Auto Tuno
10 dB/div Ref 20.00 dBm					6.97 dBm	
10.0		<b>♦</b> <sup>1</sup>				Center Freq
0.00						2.412000000 GHz
-10.0						
-20.0						Start Freq
-40.0						2.412000000 GHz
-50.0						Stop From
-60.0						Stop Freq 2.412000000 GHz
-70.0						
Center 2.412000000 GHz Res BW 8 MHz	#VBV	/ 8.0 MHz		Sweep 1	Span 0 Hz 00.2 ms (8351 pts)	CF Step 8.000000 MHz Auto Man
MKR MODE TRC SCL X	41.11 ms	Y 6.97 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	Auto Man
2 3		0.07 0.011				Freq Offset
4 5						0 Hz
6 7						
8						
10					-	
MSG				STATU	s 🕄 Align Now, All requ	uired

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# 802.11 n 20 MHz - SISO



### 802.11 n 20 MHz - MIMO

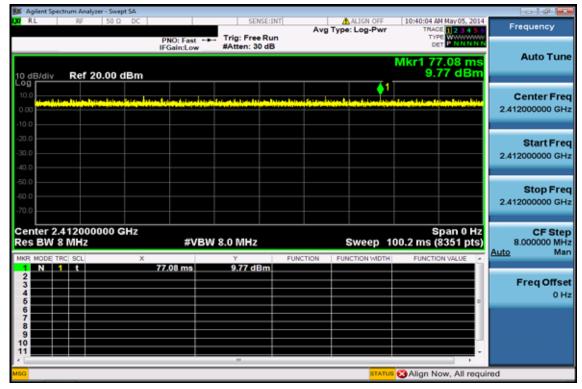
Agilent Spectrum Analyzer - Swept SA							
LX0 RL RF 50Ω DC		SENSE:INT		ALIGN OFF Type: Log-Pwr	10:38:27 AM TRACE	May 05, 2014	Frequency
10 dB/div Ref 20.00 dBm	PNO: Fast ++ IFGain:Low	#Atten: 30 dB			DET	PNNNNN	Auto Tune
10.0 0.00 -10.0	autoli di Londona d	lat pratecial deservation in the	iiten an tear the	lan ti da <mark>kanan sila</mark>	1 Sumanyuling	a de la calendaria de la c	Center Freq 2.412000000 GHz
-20.0							Start Freq 2.412000000 GHz
-50.0 -60.0 -70.0							Stop Freq 2.412000000 GHz
Center 2.412000000 GHz Res BW 8 MHz MKR MODE TRC SCL X	#VBW	Y 8.0 MHz	FUNCTION	Sweep 1	Sp 00.2 ms (8 FUNCTION		CF Step 8.000000 MHz <u>Auto</u> Man
2 3 4 5 6							Freq Offset 0 Hz
7 8 9 10 11						-	
MSG				STATUS	🕄 Align No	w, All requir	red

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# 802.11 n\_40 MHz - SISO



# 802.11 n\_40 MHz - MIMO

	ctrum Analyzer - S									- Ø - X
Center F		0 0 DC	a D:Fast ↔		SE:INT	Avg T	ALIGN OFF	TRAC	M May 05, 2014	Frequency
10 dB/div	Ref 20.0	IFG	D: Fast ↔	#Atten: 30				Mkr1 5	8.33 ms 84 dBm	Auto Tune
10.0 0.00	i je k ja sostajni									Center Freq 2.412000000 GHz
-20.0 -30.0 -40.0										Start Freq 2.412000000 GHz
-50.0 -60.0 -70.0										Stop Freq 2.412000000 GHz
Center 2. Res BW 1		0 GHz	#VB\	N 8.0 MHz	FUNC	TION	Sweep 1	00.2 ms (	pan 0 Hz 8351 pts)	CF Step 8.000000 MHz <u>Auto</u> Man
1 N 2 3 4 5	1 t		3 ms	8.84 dB						Freq Offset 0 Hz
6 7 8 9 10										
<							STATIS	Alian N	ow, All requi	rad
							o inite	- Cargin R	on, raitequi	100

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

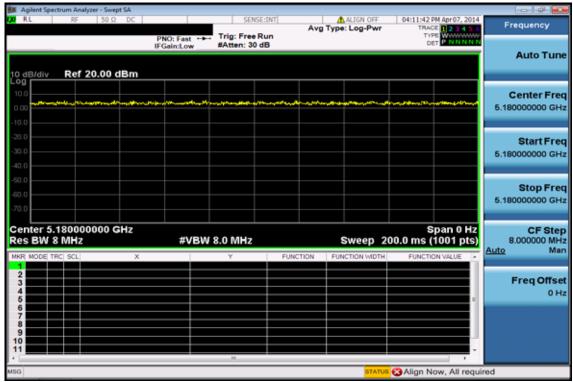
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802.11a



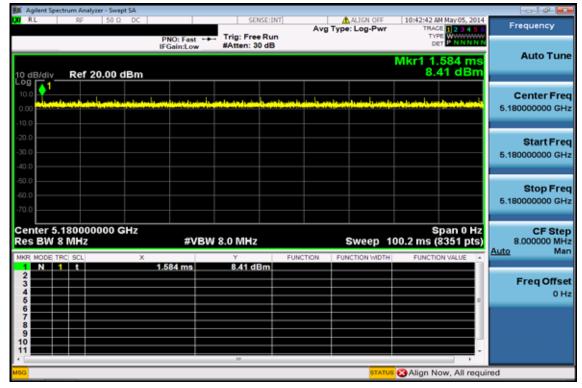
# 802.11 n (5GHz)\_20M - SISO



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# 802.11 n (5GHz) 20M - MIMO



# 802.11 n (5GHz)\_40M - SISO

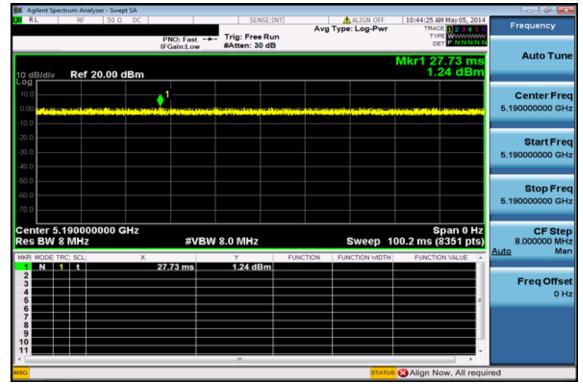
🛤 Agilent Spectrum Analyzer - Swept SA							
(X) RL RF 50Ω DC		Trig: Free Run		ALIGN OFF	04:18:41 PM Apr TRACE	23456	Frequency
10 dB/div Ref 20.00 dBm	PNO: Fast ↔ IFGain:Low	#Atten: 30 dB			DET		Auto Tune
10.0 0.00 -10.0	n an		and an an air	Mar Wahar Methodan di	ntan ann an	ula apr	Center Freq 5.180000000 GHz
-30.0							<b>Start Freq</b> 5.180000000 GHz
-50.0 -80.0 -70.0							Stop Freq 5.180000000 GHz
Center 5.180000000 GHz Res BW 8 MHz		V 8.0 MHz	FUNCTION FU	Sweep 2	Span 00.0 ms (100 FUNCTION VA		CF Step 8.000000 MHz <u>Auto</u> Man
1         2           3         4           5         6           6         7           8         9           9         10           11         11							Freq Offset 0 Hz
( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )		HI			C Allen Mr	,	
MSG				STATUS	Align Now, J	All requir	ea

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

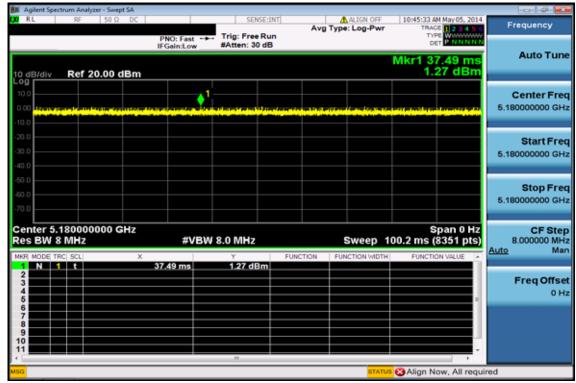
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# 802.11 n (5GHz) 40M – MIMO



### 802.11 ac (20M) - SISO



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# 802.11 ac (20M) - MIMO



# 802.11 ac (40M) - SISO

	Analyzer - Swept SA						- ¢ ×
UM RL	RF 50 Ω DC		Trig: Free R	Avg	ALIGN OFF Type: Log-Pwr	10:46:47 AM May 05, 2 TRACE 1 2 3 4 TYPE	5 6 Frequency
10 dB/div R	ef 20.00 dBm	PNO: Fast ↔ IFGain:Low	#Atten: 30 d			Mkr1 31.97 m 0.05 dB	Auto Tune
10.0		<b>1</b>					Center Freq 5.190000000 GHz
-20.0 -30.0 -40.0							Start Freq 5.190000000 GHz
-50.0 -60.0 -70.0							Stop Freq 5.190000000 GHz
Center 5.190 Res BW 8 M	CL X	#VBV	V 8.0 MHz Y 0.05 dBm	FUNCTION	Sweep 1	Span 0 H 00.2 ms (8351 pt FUNCTION VALUE	HZ CF Step (S) 8.000000 MHz Auto Man
2 3 4 5 6		51.57 ma	0.00 0.01				Freq Offset
7 8 9 10 11							
<					CTATUR.	Align Now, All re	a surviva d
and a					SIATUS	Aligh Now, All re	squired

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

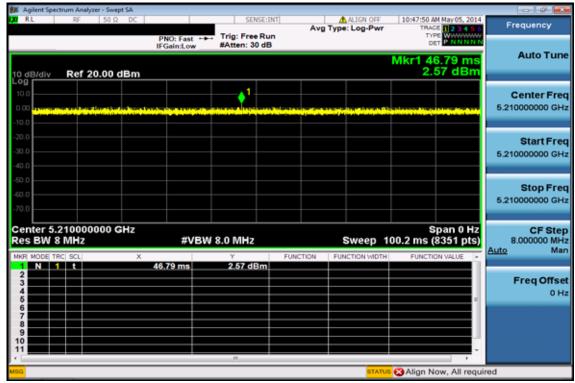
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# 802.11 ac (40M) - MIMO



### 802.11 ac (80M) - SISO



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# 802.11 ac (80M) - MIMO



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#### 7.5 Measurement Result (Worst Case Data Rate):

### 802.11b (Antenna Main)

		Peak Power Output (dBm)					
СН	Frequency	Data Rate	Dequined Limit				
Сп	(MHz)	1	Required Limit				
1	2412	19.72	1 Watt = 30 dBm				
6	2437	19.74	1 Watt = 30 dBm				
11	2462	19.74	1 Watt = 30 dBm				

		Average Power Output (dBm)					
СН	Frequency	Data Rate	D				
Сн	(MHz)	1	<b>Required Limit</b>				
1	2412	16.88	1 Watt = 30 dBm				
6	2437	16.77	1 Watt = 30 dBm				
11	2462	16.86	1 Watt = 30 dBm				

### 802.11g (Antenna Main)

		Peak Power Output (dBm)				
СН	Frequency	Data Rate	Dequined Limit			
Сп	CH Frequency (MHz)	6	Required Limit			
1	2412	23.28	1 Watt = 30 dBm			
6	2437	25.16	1 Watt = 30 dBm			
11	2462	23.74	1 Watt = 30 dBm			

		Average Power Output (dBm)					
СН	Frequency	Data Rate	Dequined Limit				
Сп	(MHz)	6	Required Limit				
1	2412	14.35	1 Watt = 30 dBm				
6	2437	15.29	1 Watt = 30 dBm				
11	2462	13.30	1 Watt = 30 dBm				

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# 802.11n 20M (Antenna Main)

		Peak Power Output (dBm)					
СН	Frequency	Data Rate	Dequined Limit				
Сп	(MHz)	MCS0	<b>Required Limit</b>				
1	2412	23.22	1 Watt = 30 dBm				
6	2437	24.89	1 Watt = 30 dBm				
11	2462	22.94	1 Watt = 30 dBm				

		Average Power Output (dBm)					
СП	Frequency	Data Rate	Deguined Limit				
СН	Frequency (MHz)	MCS0	Required Limit				
1	2412	12.69	1 Watt = 30 dBm				
6	2437	15.32	1 Watt = 30 dBm				
11	2462	13.50	1 Watt = 30 dBm				

# 802.11n\_40M (Antenna Main)

		Peak Power Output (dBm)	
СН	Frequency (MHz)	Data Rate	Required Limit
		MCS1	
3	2422	21.70	1 Watt = 30 dBm
6	2437	24.19	1 Watt = 30 dBm
9	2452	22.70	1 Watt = 30 dBm

		Average Power Output (dBm)	
СН	Frequency (MHz)	Data Rate	Required Limit
		MCS1	
3	2422	12.08	1 Watt = 30 dBm
6	2437	14.51	1 Watt = 30 dBm
9	2452	12.96	1 Watt = 30 dBm

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#### 802.11b (Antenna Aux)

		Peak Power Out	put (dBm)
СП	Frequency (MHz)	Data Rate	De guine d Lineit
СН		1	<b>Required Limit</b>
1	2412	19.55	1 Watt = 30 dBm
6	2437	19.66	1 Watt = 30 dBm
11	2462	19.76	1 Watt = 30 dBm

		<b>Average Power Ot</b>	ıtput (dBm)
CII	Frequency (MHz)	Data Rate	Degratized Lineit
СН		1	<b>Required Limit</b>
1	2412	16.89	1 Watt = 30 dBm
6	2437	16.78	1 Watt = 30 dBm
11	2462	16.87	1 Watt = 30 dBm

#### 802.11g (Antenna Aux)

		Peak Power Out	put (dBm)
СН	Frequency (MHz)	Data Rate	Degrating d Limit
Сп		6	Required Limit
1	2412	23.39	1 Watt = 30 dBm
6	2437	25.28	1 Watt = 30 dBm
11	2462	23.82	1 Watt = 30 dBm

		Peak Power Out	put (dBm)
СН	Frequency (MHz)	Data Rate	Dequined Limit
		6	Required Limit
1	2412	14.36	1 Watt = 30 dBm
6	2437	16.08	1 Watt = 30 dBm
11	2462	13.76	1 Watt = 30 dBm

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#### 802.11n\_20M (Antenna Aux)

		Peak Power Out	put (dBm)
СН	Frequency (MHz)	Data Rate	Dequined Limit
Сп		MCS0	Required Limit
1	2412	22.56	1 Watt = 30 dBm
6	2437	25.08	1 Watt = 30 dBm
11	2462	23.95	1 Watt = 30 dBm

		Average Power Ou	itput (dBm)
CII	Frequency (MHz)	Data Rate	Degrafied Lineit
СН		MCS0	<b>Required Limit</b>
1	2412	12.74	1 Watt = 30 dBm
6	2437	15.63	1 Watt = 30 dBm
11	2462	14.20	1 Watt = 30 dBm

#### 802.11n\_40M (Antenna Aux)

		Peak Power Out	put (dBm)
СН	Frequency (MHz)	Data Rate	Dequined Limit
Сн		MCS0	Required Limit
3	2422	22.26	1 Watt = 30 dBm
6	2437	24.98	1 Watt = 30 dBm
9	2452	23.22	1 Watt = 30 dBm

		Average Power Ou	ıtput (dBm)
СН	Frequency (MHz)	Data Rate	Dequined Limit
		MCS0	Required Limit
3	2422	12.09	1 Watt = 30 dBm
6	2437	15.37	1 Watt = 30 dBm
9	2452	13.27	1 Watt = 30 dBm

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### 802.11n\_20M (2.4G) MIMO Chain 0

		Peak Power Out	put (dBm)
СН	Frequency (MHz)	Data Rate	Dequined Limit
Сп		MCS0	Required Limit
1	2412	23.85	1 Watt = 30 dBm
6	2437	24.70	1 Watt = 30 dBm
11	2462	23.69	1 Watt = 30 dBm

		Average Power Ou	itput (dBm)
CII	Frequency (MHz)	Data Rate	Degrad Lineit
СН		MCS0	<b>Required Limit</b>
1	2412	13.01	1 Watt = 30 dBm
6	2437	14.97	1 Watt = 30 dBm
11	2462	13.61	1 Watt = 30 dBm

# 802.11n\_20M (2.4G) MIMO Chain 1

		Peak Power Out	put (dBm)
СН	Frequency (MHz)	Data Rate	Deguined Limit
Сн		MCS0	Required Limit
1	2412	23.61	1 Watt = 30 dBm
6	2437	26.22	1 Watt = 30 dBm
11	2462	23.58	1 Watt = 30 dBm

		Average Power Ou	ıtput (dBm)
СН	Frequency (MHz)	Data Rate	Deguined Lineit
		MCS0	Required Limit
1	2412	13.23	1 Watt = 30 dBm
6	2437	15.10	1 Watt = 30 dBm
11	2462	14.26	1 Watt = 30 dBm

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802.11n_20M (2	2.4G) MIMO Chain 0+Chain 1
----------------	----------------------------

		Peak Power Output (dBm)	
<b>Frequency</b>	Data Rate	Degrad Lineit	
СН	(MHz)	MCS0	<b>Required Limit</b>
1	2412	26.74	1 Watt = 30 dBm
6	2437	28.54	1 Watt = 30 dBm
11	2462	26.65	1 Watt = 30 dBm

		Average Power Output (dBm)	
	Frequency	Data Rate	
СН	Frequency (MHz)	MCS0	Required Limit
1	2412	16.13	1 Watt = 30 dBm
6	2437	18.05	1 Watt = 30 dBm
11	2462	16.96	1 Watt = 30 dBm

# 802.11n\_40M (2.4G) MIMO Chain 0

		Peak Power Output (dBm)	
СН	Frequency	Data Rate	Deguined Limit
Сн	(MHz)	MCS0	Required Limit
3	2422	21.60	1 Watt = 30 dBm
6	2437	24.44	1 Watt = 30 dBm
9	2452	23.09	1 Watt = 30 dBm

		Average Power Output (dBm)	
CII	Frequency	Data Rate	Dequined Limit
СН	(MHz)	MCS0	Required Limit
3	2422	12.24	1 Watt = 30 dBm
6	2437	14.41	1 Watt = 30 dBm
9	2452	13.02	1 Watt = 30 dBm

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### 802.11n\_40M (2.4G) MIMO Chain 1

		Peak Power Output (dBm)	
СН	Frequency	Data Rate	Descrived Limit
Сн	(MHz)	MCS0	Required Limit
3	2422	22.20	1 Watt = 30 dBm
6	2437	24.01	1 Watt = 30 dBm
9	2452	22.94	1 Watt = 30 dBm

		Average Power Output (dBm)	
CII	Frequency (MHz)	Data Rate	Degrad Lineit
СН		MCS0	<b>Required Limit</b>
3	2422	12.36	1 Watt = 30 dBm
6	2437	14.62	1 Watt = 30 dBm
9	2452	13.56	1 Watt = 30 dBm

802.11n\_40M (2.4G) MIMO Chain 0+Chain 1

		Peak Power Output (dBm)	
СН	<b>Frequency</b>	Data Rate	Deguined Lineit
Сп	Frequency (MHz)	MCS0	Required Limit
3	2422	24.92	1 Watt = 30 dBm
6	2437	27.24	1 Watt = 30 dBm
9	2452	26.03	1 Watt = 30 dBm

		Average Power Output (dBm)	
	Frequency	Data Rate	Degrad Lineit
СН	(MHz)	MCS0	<b>Required Limit</b>
3	2422	15.31	1 Watt = 30 dBm
6	2437	17.53	1 Watt = 30 dBm
9	2452	16.31	1 Watt = 30 dBm

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## 802.11a (Antenna Main)

		Peak Power Output (dBm)	
CII	Frequency	Data Rate	Descrived Limit
CH	(MHz)	6	Required Limit
149	5745	22.81	1 Watt = 30 dBm
157	5785	22.65	1 Watt = 30 dBm
165	5825	22.64	1 Watt = 30 dBm

		Average Power Output (dBm)	
Fred Fred	Frequency	Data Rate	Degrad Lineit
CH	(MHz) 6	6	<b>Required Limit</b>
149	5745	15.32	1 Watt = 30 dBm
157	5785	14.72	1 Watt = 30 dBm
165	5825	15.13	1 Watt = 30 dBm

# 802.11n (5GHz)\_20M (Antenna Main)

		Peak Power Output (dBm)	
СН	Frequency	Data Rate	Dequined Limit
Сп	(MHz)	MCS0 Required I	<b>Required Limit</b>
149	5745	22.64	1 Watt = 30 dBm
157	5785	22.61	1 Watt = 30 dBm
165	5825	22.48	1 Watt = 30 dBm

		Average Power Ou	ıtput (dBm)
CII	Frequency (MHz)	Data Rate	Dequined Limit
СН		MCS0	<b>Required Limit</b>
149	5745	15.73	1 Watt = 30 dBm
157	5785	16.54	1 Watt = 30 dBm
165	5825	16.05	1 Watt = 30 dBm

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### 802.11n (5GHz)\_40M (Antenna Main)

		Peak Power Out	put (dBm)
СН	Frequency (MHz)	Data Rate	Dequined Limit
Сп		MCS0	Required Limit
151	5755	23.44	1 Watt = 30 dBm
159	5795	23.32	1 Watt = 30 dBm

		Average Power Ou	ıtput (dBm)
CII	Frequency (MHz)	Data Rate	Deguined Lineit
СН		MCS0	<b>Required Limit</b>
151	5755	15.70	1 Watt = 30 dBm
159	5795	15.99	1 Watt = 30 dBm

#### 802.11ac (20M) (Antenna Main)

		Peak Power Out	put (dBm)
СП	Frequency (MHz)	Data Rate	Deguined Lineit
СН		MCS0	<b>Required Limit</b>
149	5745	23.02	1 Watt = 30 dBm
157	5785	23.15	1 Watt = 30 dBm
165	5825	22.73	1 Watt = 30 dBm

		Average Power O	utput (dBm)
	Frequency (MHz)	Data Rate	Degrating d Limit
СН		MCS0	Required Limit
149	5745	16.19	1 Watt = 30 dBm
157	5785	16.64	1 Watt = 30 dBm
165	5825	16.22	1 Watt = 30 dBm

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#### 802.11ac (40M) (Antenna Main)

		Peak Power Out	put (dBm)
СН	Frequency (MHz)	Data Rate	D
Сп		MCS0	Required Limit
151	5755	23.41	1 Watt = 30 dBm
159	5795	23.33	1 Watt = 30 dBm

		Average Power Ou	ıtput (dBm)
CII	Frequency (MHz)	Data Rate	Deguined Lineit
СН		MCS0	Required Limit
151	5755	15.84	1 Watt = 30 dBm
159	5795	16.02	1 Watt = 30 dBm

#### 802.11ac (80M) (Antenna Main)

		Peak Power Out	put (dBm)
СН	Frequency (MHz)	Data Rate	Dequined Limit
Сп		MCS0	<b>Required Limit</b>
155	5775	14.82	1 Watt = 30 dBm

		Average Power Ou	ıtput (dBm)
CII	Frequency	Data Rate	D
CH	Frequency (MHz)	MCS0	<b>Required Limit</b>
155	5775	8.84	1 Watt = 30 dBm

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.



### 802.11a (Antenna Aux)

		Peak Power Ou	tput (dBm)
СН	Frequency (MHz)	Data Rate	Degrating d Limit
Сп		6	- Required Limit
149	5745	22.38	1 Watt = 30 dBm
157	5785	22.31	1 Watt = 30 dBm
165	5825	22.09	1 Watt = 30 dBm

		Average Power Ou	itput (dBm)
CII	Frequency (MHz)	Data Rate	Degratized Lineit
CH		6	<b>Required Limit</b>
149	5745	15.68	1 Watt = 30 dBm
157	5785	14.99	1 Watt = 30 dBm
165	5825	15.05	1 Watt = 30 dBm

# 802.11n (5GHz)\_20M (Antenna Aux)

		Peak Power Out	put (dBm)
СН	Frequency (MHz)	Data Rate	Dequined Limit
Сп		MCS0	<b>Required Limit</b>
149	5745	22.31	1 Watt = 30 dBm
157	5785	22.08	1 Watt = 30 dBm
165	5825	22.03	1 Watt = 30 dBm

		Average Power Ou	ıtput (dBm)
СН	Frequency (MHz)	Data Rate	Dequined Limit
СН		MCS0	Required Limit
149	5745	15.07	1 Watt = 30 dBm
157	5785	15.06	1 Watt = 30 dBm
165	5825	15.08	1 Watt = 30 dBm

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### 802.11n (5GHz) 40M (Antenna Aux)

		Peak Power Out	put (dBm)
СН	Frequency (MHz)	Data Rate	Describer d Line
Сп		MCS0	Required Limit
151	5755	22.63	1 Watt = 30 dBm
159	5795	22.52	1 Watt = 30 dBm

		Average Power Ou	utput (dBm)
CII	Frequency (MHz)	Data Rate	Dequined Limit
СН		MCS0	Required Limit
151	5755	14.19	1 Watt = 30 dBm
159	5795	14.16	1 Watt = 30 dBm

#### 802.11ac (20M) (Antenna Aux)

		Peak Power Out	put (dBm)
СП	Frequency (MHz)	Data Rate	Degrad Lineit
СН		MCS0	<b>Required Limit</b>
149	5745	22.62	1 Watt = 30 dBm
157	5785	22.57	1 Watt = 30 dBm
165	5825	22.12	1 Watt = 30 dBm

		Average Power Or	utput (dBm)
	Frequency (MHz)	Data Rate	Degrating d Lineit
СН		MCS0	Required Limit
149	5745	14.72	1 Watt = 30 dBm
157	5785	14.93	1 Watt = 30 dBm
165	5825	14.72	1 Watt = 30 dBm

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#### 802.11ac (40M) (Antenna Aux)

		Peak Power Out	put (dBm)
СН	Frequency (MHz)	Data Rate	Dequined Limit
Сн		MCS0	Required Limit
151	5755	22.54	1 Watt = 30 dBm
159	5795	22.62	1 Watt = 30 dBm

		Average Power Ou	ıtput (dBm)
	Frequency (MHz)	Data Rate	Dequined Limit
СН		MCS0	Required Limit
151	5755	14.02	1 Watt = 30 dBm
159	5795	13.90	1 Watt = 30 dBm

#### 802.11ac (80M) (Antenna Aux)

		Peak Power Out	put (dBm)
СН	Frequency (MHz)	Data Rate	Dequined Limit
Сп		MCS0	Required Limit
155	5775	13.82	1 Watt = 30 dBm

		Average Power Ou	ıtput (dBm)
CII	Frequency	Data Rate	D
CH	Frequency (MHz)	MCS0	<b>Required Limit</b>
155	5775	8.03	1 Watt = 30 dBm

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### 802.11n (5GHz) 20M MIMO Chain 0

		Peak Power Out	put (dBm)
СН	Frequency (MHz)	Data Rate	Deguined Limit
Сн		MCS0	Required Limit
149	5745	21.38	1 Watt = 30 dBm
157	5785	21.22	1 Watt = 30 dBm
165	5825	21.30	1 Watt = 30 dBm

		Average Power Ou	ıtput (dBm)
	Frequency (MHz)	Data Rate	Degrad Lineit
СН		MCS0	<b>Required Limit</b>
149	5745	15.00	1 Watt = 30 dBm
157	5785	15.00	1 Watt = 30 dBm
165	5825	14.62	1 Watt = 30 dBm

### 802.11n (5GHz)\_20M MIMO Chain 1

		Peak Power Out	put (dBm)
СН	Frequency (MHz)	Data Rate	Dequined Limit
Сн		MCS0	Required Limit
149	5745	21.78	1 Watt = 30 dBm
157	5785	21.93	1 Watt = 30 dBm
165	5825	21.83	1 Watt = 30 dBm

		Average Power Ou	ıtput (dBm)
CII	Frequency (MHz)	Data Rate	Dequined Limit
СН		MCS0	Required Limit
149	5745	15.54	1 Watt = 30 dBm
157	5785	15.01	1 Watt = 30 dBm
165	5825	15.40	1 Watt = 30 dBm

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# 802.11n (5GHz) 20M MIMO Chain 0+ Chain1

		Peak Power Out	put (dBm)
CII	Frequency (MHz)	Data Rate	Deguined Limit
CH		MCS0	Required Limit
149	5745	24.59	1 Watt = 30 dBm
157	5785	24.60	1 Watt = 30 dBm
165	5825	24.58	1 Watt = 30 dBm

		Average Power Output (dBm)	
	Frequency (MHz)	Data Rate	Degratized Lineit
CH		MCS0	<b>Required Limit</b>
149	5745	18.29	1 Watt = 30 dBm
157	5785	18.06	1 Watt = 30 dBm
165	5825	18.04	1 Watt = 30 dBm

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## 802.11n (5GHz)\_40M MIMO Chain 0

		Peak Power Out	put (dBm)
СН	Frequency (MHz)	Data Rate	Dequined Limit
Сп		MCS0	Required Limit
151	5755	20.70	1 Watt = 30 dBm
159	5795	20.53	1 Watt = 30 dBm

		Average Power Ou	ıtput (dBm)
СН	Frequency (MHz)	Data Rate	Dequined Limit
СН		MCS0	<b>Required Limit</b>
151	5755	14.70	1 Watt = 30 dBm
159	5795	14.83	1 Watt = 30 dBm

#### 802.11n (5GHz)\_40M MIMO Chain 1

		Peak Power Out	put (dBm)
СН	Frequency (MHz)	Data Rate	Dequined Limit
Сп		MCS0	Required Limit
151	5755	21.28	1 Watt = 30 dBm
159	5795	21.59	1 Watt = 30 dBm

		Average Power Output (dBm)	
CII	Frequency (MHz)	Data Rate	Degrad Lineit
CH		MCS0	<b>Required Limit</b>
151	5755	15.32	1 Watt = 30 dBm
159	5795	15.23	1 Watt = 30 dBm

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## 802.11n (5GHz)\_40M MIMO Chain 0+Chain 1

		Peak Power Ou	tput (dBm)
СН	Frequency (MHz)	Data Rate	Dequined Limit
Сн		MCS0	- Required Limit
151	5755	24.01	1 Watt = 30 dBm
159	5795	24.10	1 Watt = 30 dBm

		Average Power Ou	ıtput (dBm)
CII	Frequency (MHz)	Data Rate	Dequined Limit
СН		MCS0	<b>Required Limit</b>
151	5755	18.03	1 Watt = 30 dBm
159	5795	18.04	1 Watt = 30 dBm

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#### 802.11ac (20M) MIMO Chain 0

		Peak Power Out	put (dBm)
СН	Frequency (MHz)	Data Rate	Deguined Limit
Сп		MCS0	Required Limit
149	5745	21.90	1 Watt = 30 dBm
157	5785	21.23	1 Watt = 30 dBm
165	5825	21.31	1 Watt = 30 dBm

		Average Power Ou	ıtput (dBm)
	Frequency (MHz)	Data Rate	Degrad Lineit
СН		MCS0	Required Limit
149	5745	15.65	1 Watt = 30 dBm
157	5785	15.65	1 Watt = 30 dBm
165	5825	14.82	1 Watt = 30 dBm

#### 802.11ac (20M) MIMO Chain 1

		Peak Power Out	put (dBm)
СН	Frequency (MHz)	Data Rate	De guine d Lineit
Сн		MCS0	<b>Required Limit</b>
149	5745	21.55	1 Watt = 30 dBm
157	5785	21.98	1 Watt = 30 dBm
165	5825	21.82	1 Watt = 30 dBm

		Average Power Ou	ıtput (dBm)
CII	Frequency (MHz)	Data Rate	Dequined Limit
СН		MCS0	Required Limit
149	5745	15.84	1 Watt = 30 dBm
157	5785	15.74	1 Watt = 30 dBm
165	5825	15.62	1 Watt = 30 dBm

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#### 802.11ac (20M) MIMO Chain 0+ Chain 1

		Peak Power Out	put (dBm)
СН	Frequency (MHz)	Data Rate	Descrived Limit
Сн		MCS0	Required Limit
149	5745	24.74	1 Watt = 30 dBm
157	5785	24.63	1 Watt = 30 dBm
165	5825	24.58	1 Watt = 30 dBm

		Average Power Output (dBm)	
CII	Frequency (MHz)	Data Rate	Degrad Lineit
СН		MCS0	<b>Required Limit</b>
149	5745	18.76	1 Watt = 30 dBm
157	5785	18.71	1 Watt = 30 dBm
165	5825	18.65	1 Watt = 30 dBm

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### 802.11ac (40M) MIMO Chain 0

		Peak Power Out	tput (dBm)
СН	Frequency (MHz)	Data Rate	Dequined Limit
Сп		MCS0	- Required Limit
151	5755	20.75	1 Watt = 30 dBm
159	5795	20.61	1 Watt = 30 dBm

		Average Power Ou	ıtput (dBm)
	Frequency (MHz)	Data Rate	Dequined Limit
СН		MCS0	Required Limit
151	5755	14.95	1 Watt = 30 dBm
159	5795	14.93	1 Watt = 30 dBm

#### 802.11ac (40M) MIMO Chain 1

		Peak Power Out	put (dBm)
СН	Frequency (MHz)	Data Rate	Dequined Limit
Сн		MCS0	Required Limit
151	5755	21.32	1 Watt = 30 dBm
159	5795	21.60	1 Watt = 30 dBm

		Average Power Ou	ıtput (dBm)
CII	Frequency (MHz)	Data Rate	Degrad Lineit
СН		MCS0	<b>Required Limit</b>
151	5755	15.51	1 Watt = 30 dBm
159	5795	15.55	1 Watt = 30 dBm

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## 802.11ac (40M) MIMO Chain 0+ Chain 1

		Peak Power Out	put (dBm)
СН	Frequency (MHz)	Data Rate	D
Сн		MCS0	Required Limit
151	5755	24.05	1 Watt = 30 dBm
159	5795	24.14	1 Watt = 30 dBm

		Average Power Ou	ıtput (dBm)
	Frequency (MHz)	Data Rate	Degrad Lineit
СН		MCS0	<b>Required Limit</b>
151	5755	18.25	1 Watt = 30 dBm
159	5795	18.26	1 Watt = 30 dBm

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## 802.11ac (80M) MIMO Chain 0

		Peak Power Out	put (dBm)
СН	Frequency	Data Rate	Degrad Lineit
Сн	Frequency (MHz)	MCS0	<b>Required Limit</b>
155	5775	13.46	1 Watt = 30 dBm

		Average Power Output (dBm)	
СН	Frequency	Data Rate	Dequined Limit
Сп	Frequency (MHz)	MCS0	<b>Required Limit</b>
155	5775	7.49	1 Watt = 30 dBm

#### 802.11ac (80M) MIMO Chain 1

		Peak Power Out	put (dBm)
СН	Frequency	Data Rate	Dequined Limit
Сп	Frequency (MHz)	MCS0	<b>Required Limit</b>
155	5775	14.76	1 Watt = 30 dBm

		<b>Average Power Ot</b>	ıtput (dBm)
СП	Frequency	Data Rate	Degrad Lineit
СН	Frequency (MHz)	MCS0	<b>Required Limit</b>
155	5775	9.76	1 Watt = 30 dBm

### 802.11ac (80M) MIMO Chain 0+ Chain 1

台

		Peak Power Out	put (dBm)
СН	Frequency (MHz)	Data Rate	Dequined Limit
Сн		MCS0	<b>Required Limit</b>
155	5775	17.17	1 Watt = 30 dBm

		<b>Average Power Ot</b>	itput (dBm)
СН	Frequency	Data Rate	Degrad Lineit
	Frequency (MHz)	MCS0	<b>Required Limit</b>
155	5775	11.78	1 Watt = 30 dBm

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

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### 802.11b (Antenna Main)

		EIRP (dBm)	
СП	Frequency (MHz)	Data Rate	Degrad Lineit
CH		1	<b>Required Limit</b>
1	2412	18.38	1 Watt = 30 dBm
6	2437	18.27	1 Watt = 30 dBm
11	2462	18.36	1 Watt = 30 dBm

### 802.11g (Antenna Main)

EIRP (dBm)			Sm)
СН	Frequency	Data Rate	Dequined Limit
СН	(MHz)	6	Required Limit
1	2412	15.85	1 Watt = 30 dBm
6	2437	16.79	1 Watt = 30 dBm
11	2462	14.80	1 Watt = 30 dBm

#### 802.11n\_20M (Antenna Main)

		EIRP (dBm)		
СН	Frequency (MHz)	Data Rate	Dequined Limit	
Сп		MCS0	- Required Limit	
1	2412	14.19	1 Watt = 30 dBm	
6	2437	16.82	1 Watt = 30 dBm	
11	2462	15.00	1 Watt = 30 dBm	

#### 802.11n\_40M (Antenna Main)

		EIRP (dBm)		
СН	Frequency (MHz)	Data Rate	Dequined Limit	
Сп		MCS1	Required Limit	
3	2422	13.58	1 Watt = 30 dBm	
6	2437	16.01	1 Watt = 30 dBm	
9	2452	14.46	1 Watt = 30 dBm	

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### 802.11b (Antenna Aux)

		EIRP (dBm)		
CII	Frequency (MHz)	Data Rate	Degrafie d Lineit	
CH		1	<b>Required Limit</b>	
1	2412	15.34	1 Watt = 30 dBm	
6	2437	15.23	1 Watt = 30 dBm	
11	2462	15.32	1 Watt = 30 dBm	

### 802.11g (Antenna Aux)

		EIRP (dBm)		
СН	Frequency (MHz)	Data Rate	Dequined Limit	
Сп		6	Required Limit	
1	2412	12.81	1 Watt = 30 dBm	
6	2437	14.53	1 Watt = 30 dBm	
11	2462	12.21	1 Watt = 30 dBm	

#### 802.11n\_20M (Antenna Aux)

		EIRP (dB	Sm)
СН	Frequency (MHz)	Data Rate	Dequined Limit
Сп		MCS0	Required Limit
1	2412	11.19	1 Watt = 30 dBm
6	2437	14.08	1 Watt = 30 dBm
11	2462	12.65	1 Watt = 30 dBm

#### 802.11n\_40M (Antenna Aux)

		EIRP (dB	m)
СП	Frequency (MHz)	Data Rate	Degrad Lineit
СН		MCS0	<b>Required Limit</b>
3	2422	10.54	1 Watt = 30 dBm
6	2437	13.82	1 Watt = 30 dBm
9	2452	11.72	1 Watt = 30 dBm

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# 802.11n 20M (2.4G) MIMO Chain 0+Chain 1

		EIRP (dB	Sm)
СН	Frequency (MHz)	Data Rate	Dequined Limit
Сп		MCS0	Required Limit
1	2412	17.30	1 Watt = 30 dBm
6	2437	19.22	1 Watt = 30 dBm
11	2462	18.13	1 Watt = 30 dBm

### 802.11n\_40M (2.4G) MIMO Chain 0+Chain 1

		EIRP (dBm)		
СН	Frequency (MHz)	Data Rate	Deguined Lineit	
Сн		MCS0	Required Limit	
3	2422	16.48	1 Watt = 30 dBm	
6	2437	18.70	1 Watt = 30 dBm	
9	2452	17.48	1 Watt = 30 dBm	

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## 802.11a (Antenna Main)

		EIRP (dB	<b>m</b> )
СН	Frequency (MHz)	Data Rate	Dequined Limit
Сн		6	<b>Required Limit</b>
149	5745	18.04	1 Watt = 30 dBm
157	5785	17.44	1 Watt = 30 dBm
165	5825	17.85	1 Watt = 30 dBm

# 802.11n (5GHz)\_20M (Antenna Main)

		EIRP (dBm)		
СН	Frequency (MHz)	Data Rate	Dequined Limit	
СП		MCS0	Required Limit	
149	5745	18.45	1 Watt = 30 dBm	
157	5785	19.26	1 Watt = 30 dBm	
165	5825	18.77	1 Watt = 30 dBm	

#### 802.11n (5GHz)\_40M (Antenna Main)

		EIRP (dB	Sm)
СН	Frequency (MHz)	Data Rate	Dequined Limit
Сн		MCS0	Required Limit
151	5755	18.42	1 Watt = 30 dBm
159	5795	18.71	1 Watt = 30 dBm

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#### 802.11a (Antenna Aux)

		EIRP (dB	m)
CII	Frequency (MHz)	Data Rate	Degrad Lineit
CH		6	<b>Required Limit</b>
149	5745	17.38	1 Watt = 30 dBm
157	5785	16.69	1 Watt = 30 dBm
165	5825	16.75	1 Watt = 30 dBm

### 802.11n (5GHz)\_20M (Antenna Aux)

		EIRP (dBm)		
СН	Frequency (MHz)	Data Rate	Deguined Limit	
Сн		MCS0	<b>Required</b> Limit	
149	5745	16.77	1 Watt = 30 dBm	
157	5785	16.76	1 Watt = 30 dBm	
165	5825	16.78	1 Watt = 30 dBm	

# 802.11n (5GHz)\_40M (Antenna Aux)

		EIRP (dE	Sm)
СН	Frequency	Data Rate	Dequined Limit
Сп	(MHz)	MCS0	Required Limit
151	5755	15.89	1 Watt = 30 dBm
159	5795	15.86	1 Watt = 30 dBm

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# 802.11n (5GHz) 20M MIMO Chain 0+ Chain1

EIRP (dBm)		m)	
СН	Frequency (MHz)	Data Rate	Degrafie d Lineit
Сн		MCS0	<b>Required Limit</b>
149	5745	23.22	1 Watt = 30 dBm
157	5785	23.00	1 Watt = 30 dBm
165	5825	22.97	1 Watt = 30 dBm

# 802.11n (5GHz)\_40M MIMO Chain 0+Chain 1

		EIRP (dB	Sm)
СН	Frequency	Data Rate	Dequined Limit
Сп	Frequency (MHz)	MCS0	Required Limit
151	5755	22.95	1 Watt = 30 dBm
159	5795	18.04	1 Watt = 30 dBm

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## 802.11ac (20M) (Antenna Main)

		EIRP (dB	Sm)
СН	Frequency	Data Rate	Dequined Limit
Сп	(MHz)	MCS0	Required Limit
149	5745	18.91	1 Watt = 30 dBm
157	5785	19.36	1 Watt = 30 dBm
165	5825	18.94	1 Watt = 30 dBm

### 802.11ac (40M) (Antenna Main)

		EIRP (dB	Sm)
CII	Frequency	Data Rate	Deguined Limit
СН	Frequency (MHz)	MCS0	Required Limit
151	5755	18.56	1 Watt = 30 dBm
159	5795	18.74	1 Watt = 30 dBm

#### 802.11ac (80M) (Antenna Main)

		EIRP (dB	m)
СН	Frequency	Data Rate	Dequined Limit
Сн	Frequency (MHz)	MCS0	<b>Required Limit</b>
155	5775	11.56	1 Watt = 30 dBm

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#### 802.11ac (20M) (Antenna Aux)

		EIRP (dBm)				
СН	Frequency	Data Rate	Dequined Limit			
Сп	(MHz)	MCS0	<b>Required Limit</b>			
149	5745	16.42	1 Watt = 30 dBm			
157	5785	16.63	1 Watt = 30 dBm			
165	5825	16.42	1 Watt = 30 dBm			

#### 802.11ac (40M) (Antenna Aux)

		EIRP (dB	Sm)
СН	Frequency	Data Rate	Dequined Limit
Сп	Frequency (MHz)	MCS0	<b>Required Limit</b>
151	5755	15.72	1 Watt = 30 dBm
159	5795	15.60	1 Watt = 30 dBm

#### 802.11ac (80M) (Antenna Aux)

		EIRP (dB	Sm)
СН	Frequency	Data Rate	Deguined Lineit
Сн	Frequency (MHz)	MCS0	Required Limit
155	5775	9.73	1 Watt = 30 dBm

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# 802.11ac (20M) MIMO Chain 0+ Chain 1

		EIRP (dBm)			
СН	Frequency	Data Rate	Dequined Limit		
Сп	(MHz)	MCS0	Required Limit		
149	5745	23.69	1 Watt = 30 dBm		
157	5785	23.64	1 Watt = 30 dBm		
165	5825	23.18	1 Watt = 30 dBm		

# 802.11ac (40M) MIMO Chain 0+ Chain 1

		EIRP (dBm)		
СН	Frequency	Data Rate	Dequined Limit	
Сн	Frequency (MHz)	MCS0	<b>Required Limit</b>	
151	5755	23.17	1 Watt = 30 dBm	
159	5795	23.18	1 Watt = 30 dBm	

### 802.11ac (80M) MIMO Chain 0+ Chain 1

		EIRP (dBm)	
СН	Frequency	Data Rate	Dequined Limit
	Frequency (MHz)	MCS0	<b>Required Limit</b>
155	5775	16.59	1 Watt = 30 dBm

\* Note: EIRP = Average Power + Gain, where the nominal gain of the antenna (1.5dBi for 2.4GHz Antenna Main, -1.55dBi for 2.4GHz Antenna Aux, and 2.72dBi for 5GHz Antenna Main, 1.70dBi for 5GHz Antenna Aux, 1.17dBi for 2.4GHz (MIMO) and 4.94dBi (802.11n\_HT 20/ ac 20M 5.8G), 4.92dBi (802.11n\_HT 40/ ac 40M 5.8G), 4.81dBi (802.11ac 80M 5.8G) (MIMO)), where MIMO gain = directive gain + nominal gain.

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#### 8 **6dB BANDWIDTH**

#### 8.1 **Standard Applicable:**

According to §15.247(a)(2), Systems using digital modulation techniques may operate in the 902 - 928 MHz,2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500kHz.

According to RSS 210 issue 8: 2010Annex 8.2. Systems employing digital modulation techniques (which includes direct sequence) can now be certified under RSS-210 provided they comply with the following requirements: The minimum 6 dB bandwidth shall be at least 500 kHz.

Conducted Emission Test Site							
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.		
ТҮРЕ		NUMBER	NUMBER	CAL.			
Power Meter	Anritsu	ML2495A	1005007	01/13/2014	01/12/2015		
Power Sensor	Anritsu	MA2411B	917032	01/13/2014	01/12/2015		
Spectrum Analyzer	Agilent	E4446A	MY51100003	05/30/2013	05/29/2014		
Spectrum Analyzer	Agilent	E4440A	MY45304525	03/08/2014	03/07/2015		
DC Block	Mini-Circuits	BLK-18-S+	1	02/27/2014	02/26/2015		
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/03/2014	01/02/2015		
Attenuator	Mini-Circuit	BW-S10W2+	002	02/27/2014	02/26/2015		
Splitter	Agilent	11636B	N/A	02/27/2014	02/26/2015		

# 8.2 Measurement Equipment Used:

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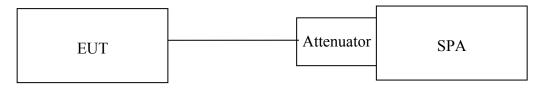
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#### 8.3 **Test Set-up:**



#### **Measurement Procedure:** 8.4

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 3. Set the spectrum analyzer as RBW = 100 kHz, VBW = 3\*RBW, Span = 30M/50MHz, Detector=Peak, Sweep=auto, the setting on spectrum is adjusted based on the procedure as guide in 8.1 option 1 of KDB558074.
- 4. Mark the peak frequency and –6dB (upper and lower) frequency.
- 5. Repeat above procedures until all frequency of interest measured was complete.

#### Measurement Result: N/A 8.5

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# 9 BAND EDGES MEASUREMENT

# 9.1 Standard Applicable:

According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, 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 in15.209(a).

According to RSS-Gen §7.2.5 and RSS-210 issue 8,§A8.5, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced 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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 5 and 6 is not required. In addition, radiated emissions which fall in the restricted bands of Table 3 must also comply with the radiated emission limits specified in Tables 5 and 6.

# 9.2 Measurement Equipment Used:

# 9.2.1 Conducted Emission at antenna port:

Refer to section 7.2 for details.

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#### 9.2.2 **Radiated emission:**

966 Chamber							
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.		
ТҮРЕ		NUMBER	NUMBER	CAL.			
EMI Test Receiver	R&S	ESCI7	100760	05/27/2013	05/26/2014		
Spectrum Analyzer	Agilent	E4446A	MY51100003	05/30/2013	05/29/2014		
EXA Spectrum Analyzer	Agilent	N9010A	MY50420195	01/20/2014	01/19/2015		
Spectrum Analyzer	R&S	FSV-30	101398	10/22/2013	10/21/2014		
Loop Antenna	ETS.LINDGREN	6502	00148045	07/05/2013	07/04/2014		
Bilog Antenna	SCHWAZBECK	VULB9168	378	01/02/2014	01/01/2015		
Horn antenna	ETS.LINDGREN	3117	123995	05/31/2013	05/30/2014		
Horn Antenna	Schwarzbeck	BBHA9170	184	01/23/2014	01/22/2015		
Pre-Amplifier	Agilent	8447D	2944A07676	01/03/2014	01/02/2015		
Pre-Amplifier	Agilent	8449B	3008A00578	01/03/2014	01/02/2015		
Pre-Amplifier	EMC Instruments Corp.	EMC184045	980135	01/24/2014	01/23/2015		
Filter 2400-2483.5 MHz	EWT	EWT-14-0166	M2	02/27/2014	02/26/2015		
Attenuator	Mini-Circuit	BW-S10W2+	004	02/27/2014	02/26/2015		
Turn Table	HD	DT420	N/A	N.C.R	N.C.R		
Antenna Tower	HD	MA240-N	240/657	N.C.R	N.C.R		
Controller	HD	HD100	N/A	N.C.R	N.C.R		
Low Loss Cable	Huber Suhner	966_Rx	9	01/03/2014	01/02/2015		
3m Site NSA	SGS	966 chamber	N/A	07/15/2013	07/14/2014		

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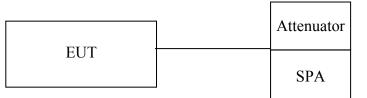
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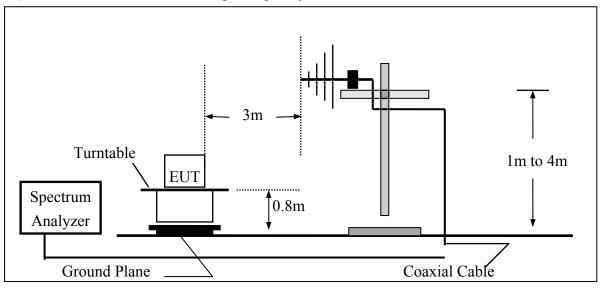
# 9.3 Test SET-UP:

# 9.3.1 Conducted Emission at antenna port:

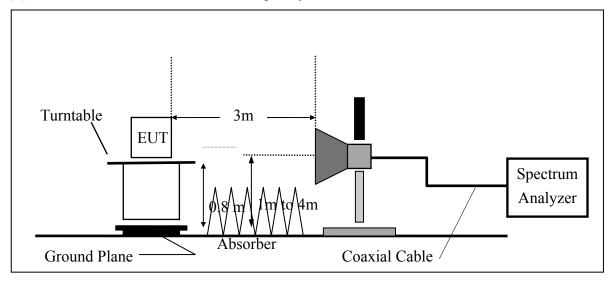


### 9.3.2 Radiated emission:

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



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



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# 9.4 Measurement Procedure:

Unwanted Emissions into Non-Restricted Frequency Bands, Measurement Procedure followed by 11.1 of KDB558074 D01

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 3. Set start to edge frequency, and stop frequency of spectrum analyzer so as to encompass the spectrum to be examined.
- 4. Set the spectrum analyzer as RBW, VBW=300KHz, Detector = Peak, Sweep = auto
- 5. Mark the highest reading of the emission as the reference level measurement.
- 6. Set DL as the limit = reading on marker 1 20dBm
- 7. 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.
- 8. Repeat above procedures until all default test channel (low, middle, and high) was complete.

Unwanted Emission falling into Restricted Frequency Bands, Measurement Procedure followed by 12.1 of KDB558074 D01

- 1. The EUT was placed on a turn table which is 0.8m above ground plane.
- 2. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
- 3.EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
- 4. 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.
- 5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 6. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 7.On spectrum, following 8.1.2, and RBW = 1MHz, VBW = 3MHz, & Marker 2390MHz, and 2483.5MHz (Peak Measurement). Average Measurement: following 8.2 with the modification span to 1MHz, &RBW = 1MHz, VBW = 3MHz and peak marker function to obtain the highest reading on 2390, and 2483.5MHz.
- 8. Repeat above procedures until all default test channel (low, middle, and high) was complete

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*Note: For MIMO operation, directional gain is not subjected to offset back as prescribe in KDB 662911 D01 for relative out-of-band measurement, including conducted bandedge falling into non-restricted frequency band.* 

# 9.5 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:

$$\mathbf{FS} = \mathbf{RA} + \mathbf{AF} + \mathbf{CL} - \mathbf{AG}$$

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

# 9.6 Measurement Result:

Note: Refer to next page tabular data sheets.

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#### **Radiated Emission:**

(Unwanted Emissions into Restricted Frequency Bands): 802.11 b mode							
Operation Band	:802.11 b	Test Date	:2014-04-23				
Fundamental Frequency	:2412 MHz	Temp./Humi.	:21 deg_C /59 RH				
Operation Mode	:Band Edge LOW	Engineer	:Tin				
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL				

Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor(dB)

Factor(dB) = Antenna Factor( $dB\mu V/m$ ) + Cable Loss(dB) – Pre\_Amplifier Gain(dB)

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

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

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

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
2386.08	S	Average	49.02	2.40	51.42	54.00	-2.58
2386.08	S	Peak	55.61	2.40	58.01	74.00	-15.99
2390.00	Е	Average	44.47	2.42	46.89	54.00	-7.11
2390.00	Е	Peak	52.59	2.42	55.01	74.00	-18.99

Operation Band	:802.11 b	Test Date	:2014-04-23
Fundamental Frequency	:2412 MHz	Temp./Humi.	:21 deg_C /59 RH
Operation Mode	:Band Edge LOW	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor(dB)

 $Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$ 

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

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

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

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
2386.20	S	Average	45.11	2.40	47.51	54.00	-6.49
2386.20	S	Peak	53.17	2.40	55.57	74.00	-18.43
2390.00	Е	Average	42.01	2.42	44.43	54.00	-9.57
2390.00	Е	Peak	51.36	2.42	53.78	74.00	-20.22

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Operation Band	:802.11 b	Test Date	:2014-04-23
Fundamental Frequency	:2462 MHz	Temp./Humi.	:21 deg_C /59 RH
Operation Mode	:Band Edge HIGH	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor(dB)

 $Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$ 

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

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

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

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	45.41	2.74	48.15	54.00	-5.85
2483.50	Е	Peak	51.88	2.74	54.62	74.00	-19.38

Operation Band	:802.11 b	Test Date	:2014-04-23
Fundamental Frequency	:2462 MHz	Temp./Humi.	:21 deg_C /59 RH
Operation Mode	:Band Edge HIGH	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor(dB)

 $Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$ 

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

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

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

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	E	Average	43.16	2.74	45.90	54.00	-8.10
2483.50	Е	Peak	49.96	2.74	52.70	74.00	-21.30

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### **Radiated Emission:**

(Unwanted Emissions into Restricted Frequency Bands): 802.11 g mode							
Operation Band	:802.11 g	Test Date	:2014-04-23				
Fundamental Frequency	:2412 MHz	Temp./Humi.	:21 deg_C /59 RH				
Operation Mode	:Band Edge LOW	Engineer	:Tin				
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL				

Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor(dB)

Factor(dB) = Antenna Factor( $dB\mu V/m$ ) + Cable Loss(dB) – Pre\_Amplifier Gain(dB)

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

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

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

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	49.96	2.42	52.38	54.00	-1.62
2390.00	Е	Peak	69.66	2.42	72.08	74.00	-1.92

Operation Band	:802.11 g	Test Date	:2014-04-23
Fundamental Frequency	:2412 MHz	Temp./Humi.	:21 deg_C /59 RH
Operation Mode	:Band Edge LOW	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor(dB)

Factor(dB) = Antenna Factor( $dB\mu V/m$ ) + Cable Loss(dB) – Pre\_Amplifier Gain(dB)

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

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

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

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	46.26	2.42	48.68	54.00	-5.32
2390.00	E	Peak	65.76	2.42	68.18	74.00	-5.82

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Operation Band	:802.11 g	Test Date	:2014-04-23
Fundamental Frequency	:2462 MHz	Temp./Humi.	:21 deg_C /59 RH
Operation Mode	:Band Edge HIGH	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor(dB)

 $Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$ 

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

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

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

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	43.12	2.74	45.86	54.00	-8.14
2483.50	Е	Peak	63.84	2.74	66.58	74.00	-7.42
2496.50	S	Average	34.13	2.78	36.91	54.00	-17.09
2496.50	S	Peak	56.54	2.78	59.32	74.00	-14.68

Operation Band	:802.11 g	Test Date	:2014-04-23
Fundamental Frequency	:2462 MHz	Temp./Humi.	:21 deg_C /59 RH
Operation Mode	:Band Edge HIGH	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor(dB)

 $Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$ 

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

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

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

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	41.61	2.74	44.35	54.00	-9.65
2483.50	Е	Peak	61.71	2.74	64.45	74.00	-9.55
2496.00	S	Average	32.34	2.78	35.12	54.00	-18.88
2496.00	S	Peak	53.80	2.78	56.58	74.00	-17.42

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### **Radiated Emission:**

(Unwanted Emissions into Restricted Frequency Bands): 802.11 n\_20M modeOperation Band:802.11 n20MTest Date:2014-04-23

Operation Dalid	.002.11 II20IVI	Test Date	.2014-04-23
Fundamental Frequency	:2412 MHz	Temp./Humi.	:20.3deg_C /58 RH
Operation Mode	:Band Edge LOW	Engineer	:Curry
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor(dB)

 $Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$ 

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

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

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

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	E	Average	49.53	2.42	51.95	54.00	-2.05
2390.00	Е	Peak	69.69	2.42	72.11	74.00	-1.89

Operation Band	:802.11 n20M	Test Date	:2014-04-23
Fundamental Frequency	:2412 MHz	Temp./Humi.	:20.3deg_C /58 RH
Operation Mode	:Band Edge LOW	Engineer	:Curry
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor(dB)

 $Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$ 

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

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

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

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	48.75	2.42	51.17	54.00	-2.83
2390.00	Е	Peak	68.50	2.42	70.92	74.00	-3.08

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Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor(dB)

 $Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$ 

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

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

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

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	44.70	2.74	47.44	54.00	-6.56
2483.50	Е	Peak	69.92	2.74	72.66	74.00	-1.34

802.11 n20M	Test Date	:2014-04-23
2462 MHz	Temp./Humi.	:20.3deg_C /58 RH
Band Edge HIGH	Engineer	:Curry
E2 Plane	Measurement Antenna Pol.	:HORIZONTAL
2 E	462 MHz Band Edge HIGH	462 MHzTemp./Humi.Band Edge HIGHEngineer

Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor(dB)

 $Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$ 

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

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

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

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	E	Average	44.62	2.74	47.36	54.00	-6.64
2483.50	Е	Peak	70.04	2.74	72.78	74.00	-1.22

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### **Radiated Emission:**

(Unwanted Emissions into Restricted Frequency Bands): 802.11 n\_40M mode

Operation Band	:802.11 n40M	Test Date	:2014-04-23
Fundamental Frequency	:2422 MHz	Temp./Humi.	:20.3deg_C /58 RH
Operation Mode	:Band Edge LOW	Engineer	:Curry
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor(dB)

Factor(dB) = Antenna Factor( $dB\mu V/m$ ) + Cable Loss(dB) – Pre\_Amplifier Gain(dB)

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

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

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

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
2388.48	S	Average	50.22	2.41	52.63	54.00	-1.37
2388.48	S	Peak	67.51	2.41	69.92	74.00	-4.08
2390.00	E	Average	50.91	2.42	53.33	54.00	-0.67
2390.00	E	Peak	64.87	2.42	67.29	74.00	-6.71

Operation Band	:802.11 n40M	Test Date	:2014-04-23
Fundamental Frequency	:2422 MHz	Temp./Humi.	:20.3deg_C /58 RH
Operation Mode	:Band Edge LOW	Engineer	:Curry
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor(dB)

 $Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$ 

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

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

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

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
2388.00	S	Average	49.57	2.40	51.97	54.00	-2.03
2388.00	S	Peak	65.42	2.40	67.82	74.00	-6.18
2390.00	Е	Average	49.21	2.42	51.63	54.00	-2.37
2390.00	Е	Peak	62.88	2.42	65.30	74.00	-8.70

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Fundamental Frequency	:2452 MHz	Temp./Humi.	:20.3deg_C /58 RH
Operation Mode	:Band Edge HIGH	Engineer	:Curry
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL
Operation Mode	:Band Edge HIGH	Engineer	:Curry

Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor(dB)

 $Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$ 

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

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

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

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	46.06	2.74	48.80	54.00	-5.20
2483.50	Е	Peak	67.27	2.74	70.01	74.00	-3.99

:802.11 n40M	Test Date	:2014-04-23
:2452 MHz	Temp./Humi.	:20.3deg_C /58 RH
:Band Edge HIGH	Engineer	:Curry
:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL
	:2452 MHz :Band Edge HIGH	:2452 MHz Temp./Humi. :Band Edge HIGH Engineer

Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor(dB)

 $Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$ 

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

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

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

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	46.48	2.74	49.22	54.00	-4.78
2483.50	Е	Peak	68.31	2.74	71.05	74.00	-2.95

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# **10 SPURIOUS EMISSION TEST 10.1 Standard Applicable**

According to §15.247(d),

Emission at antenna port:

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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

# **Radiated Spurious Emission**

Attenuation below the general limits specified in § 15.209(a) is not required. 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) (see § 15.205(c)).

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.

According to RSS-Gen §7.2.5 and RSS-210 issue 8.§A8.5. In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced 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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 5 and 6 is not required. In addition, radiated emissions which fall in the restricted bands of Table 3 must also comply with the radiated emission limits specified in Tables 5 and 6 of RSS-GEN.

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#### **10.2 Measurement Equipment Used:**

# **10.2.1** Conducted Emission at antenna port:

Refer to section 7.2 for details.

#### 10.2.2 Radiated emission:

Refer to section 9.2.2 for details.

#### 10.3 Test SET-UP:

#### 10.3.1 Conducted Emission at antenna port:

Refer to section 7.3 for details.

#### 10.3.2 Radiated emission:

Refer to section 9.3.2 for details.

### **10.4 Measurement Procedure:**

#### **Radiated Emission:**

- 1. The EUT was placed on a turn table which is 0.8m above ground plane.
- 2. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
- 3. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
- 4. 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.
- 5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 6. 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.
- 7. Repeat above procedures until all default test channel measured were complete.

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# **Conducted Emission:**

- 1. To connect Antenna Port of EUT to Spectrum.
- 2. Set RBW = 100K & VBW = 300K on Spectrum.
- Sweep the frequency to determine spurious emission as seen on spectrum from span of 30 to 3G, 3G to 8G, 8G to 13G, 13G to 18G and 18G to 26.5GHz, 18G to 40GHz (applicable if operation mode is 5GHz)
- 4. Via Software, combine 5 spans of frequency range into one plot
- 5. Repeat above procedures until all default test channel measured were complete.

Note: For MIMO operation, directional gain is not subjected to offset back as prescribe in KDB 662911 D01 for relative out-of-band measurement, including conducted bandedge falling into non-restricted frequency band.

# 10.5 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:

 $\mathbf{FS} = \mathbf{RA} + \mathbf{AF} + \mathbf{CL} - \mathbf{AG}$ 

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

# **10.6 Measurement Result:**

Note: Refer to next page for tabular data sheets.

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#### **Radiated Spurious Emission Measurement Result (802.11b) Operation Band** :802.11 b Test Date :2014-04-23 **Fundamental Frequency** :2412 MHz Temp./Humi. :20.3deg C/58 RH **Operation Mode** :TX LOW Engineer :Curry EUT Pol. :E2 Plane Measurement Antenna Pol. :VERTICAL Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor(dB) Factor(dB) = Antenna Factor( $dB\mu V/m$ ) + Cable Loss(dB) – Pre Amplifier Gain(dB) "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency. Note : "E": denotes Band Edge Frequency.; "S": denotes Spurious Frequency. "---" : denotes Noise Floor. Spectrum Freq. Note Detector Factor Actual Limit Margin Mode Reading Level FS @3m dBµV dBµV/m dBµV/m PK/QP/AV MHz F/H/E/S dB dB 4824.00 Η 42.93 6.89 49.82 54.00 -4.18 Average 4824.00 Η Peak 46.01 6.89 52.90 74.00 -21.10Η 7236.00 ---9648.00 Η ---12060.00 Η 14472.00 Η 16884.00 Η ---19296.00 Η 21708.00 Η ---24120.00 Η

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Fundamental F	Deperation Mode :TX LOW Engineer		Гетр./Humi.	:Curry		_C /58 RH			
Actual FS(dBµV	V/m) = SPA.	Reading level(dE	$B\mu V$ ) + Factor(dE	3)					
$Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$									
Note: "F": denotes Fundamental Frequency.; "H": denotes Harmonic Frequency.									
"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.									
··	' : denotes Noi	se Floor.							
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin		
		Mode	Reading Leve	el	FS	@3m			
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB		
4824.00	Н	Average	39.97	6.89	46.86	54.00	-7.14		
4824.00	Н	Peak	43.84	6.89	50.73	74.00	-23.27		
7236.00	Н								
9648.00	Н								
12060.00	Н								
14472.00	Н								
16884.00	Н								
19296.00	Н								
21708.00	Н								
24120.00	Н								

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Operation Ban Fundamental F Operation Mod EUT Pol.	ntal Frequency :2437 MHz Temp./Humi.		:2014-04-23 :20.3deg_C /58 RH :Curry :VERTICAL						
Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor( $dB$ )									
$Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$									
Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.									
"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.									
··	' : denotes Noi	se Floor.							
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin		
		Mode	Reading Leve	el	FS	@3m			
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB		
4874.00	Н	Average	45.30	6.96	52.26	54.00	-1.74		
4874.00	Н	Peak	47.28	6.96	54.24	74.00	-19.76		
7311.00	Н								
9748.00	Н								
12185.00	Н								
14622.00	Н								
17059.00	Н								
19496.00	Н								
21933.00	Н								
24370.00	Н								

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Operation Ban Fundamental F Operation Mod EUT Pol.	amental Frequency:2437 MHzTemp./Humi.ration Mode:TX MIDEngineer		tenna Pol.	:2014-04-23 :20.3deg_C /58 RH :Curry :HORIZONTAL					
Actual FS(dBµV	V/m) = SPA.	Reading level(dE	$B\mu V$ ) + Factor(dE	3)					
$Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$									
Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.									
"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.									
···	' : denotes Noi	se Floor.							
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin		
		Mode	Reading Leve	el	FS	@3m			
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB		
4874.00	Н	Average	40.81	6.96	47.77	54.00	-6.23		
4874.00	Н	Peak	43.79	6.96	50.75	74.00	-23.25		
7311.00	Н								
9748.00	Н								
12185.00	Н								
14622.00	Н								
17059.00	Н								
19496.00	Н								
21933.00	Н								
24370.00	Н								

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Operation Ban Fundamental F Operation Mod EUT Pol.	nental Frequency :2462 MHz Temp./Humi. on Mode :TX HIGH Engineer		tenna Pol.	:2014-04-23 :20.3deg_C /58 RH :Curry :VERTICAL					
Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor( $dB$ )									
$Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$									
Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.									
"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.									
۰۰۲	' : denotes Noi	se Floor.							
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin		
		Mode	Reading Leve	el	FS	@3m			
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB		
4924.00	Н	Average	43.14	7.01	50.15	54.00	-3.85		
4924.00	Н	Peak	46.24	7.01	53.25	74.00	-20.75		
7386.00	Н								
9848.00	Н								
12310.00	Н								
14772.00	Н								
17234.00	Н								
19696.00	Н								
22158.00	Н								
24620.00	Н								

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Fundamental F	Operation Band:802.111Fundamental Frequency:2462 MOperation Mode:TX HICEUT Pol.:E2 Plan		Test Date Temp./Humi. Engineer Measurement Antenna Pol.			:2014-04-23 :20.3deg_C /58 RH :Curry :HORIZONTAL			
Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor( $dB$ )									
$Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$									
Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.									
"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.									
··	' : denotes Noi	se Floor.							
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin		
		Mode	Reading Leve	el	FS	@3m			
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB		
4924.00	Н	Average	38.98	7.01	45.99	54.00	-8.01		
4924.00	Н	Peak	42.88	7.01	49.89	74.00	-24.11		
7386.00	Н								
9848.00	Н								
12310.00	Н								
14772.00	Н								
17234.00	Н								
19696.00	Н								
22158.00	TT								
	Н								

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Radiated Spurious Emission Measurement Result (802.11g)Operation Band:802.11 gTest Date:2014-04-23Fundamental Frequency:2412 MHzTemp./Humi.:20.3 deg_C /58 RHOperation Mode:TX LOWEngineer:TinEUT Pol.:E2 PlaneMeasurement Antenna Pol.:VERTICALActual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)									
Factor(dB) = Antenna Factor(dB $\mu$ V/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.									
۰ <u> </u>	' : denotes Noi	se Floor.							
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin		
		Mode	Reading Leve	el	FS	@3m			
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB		
4824.00	Н	Average	26.78	6.89	33.67	54.00	-20.33		
4824.00	Н	Peak	38.17	6.89	45.06	74.00	-28.94		
7236.00	Н								
9648.00	Н								
12060.00	Н								
14472.00	Н								
16884.00	Н								
19296.00	Н								
21708.00	Н								
24120.00	Н								

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Fundamental F	Operation Band:Fundamental Frequency:Operation Mode:EUT Pol.:		- ]	Test Date Temp./Humi. Engineer Measurement Antenna Pol.		:2014-04-23 :20.3 deg_C /58 RH :Tin :HORIZONTAL			
Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor( $dB$ )									
$Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$									
Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.									
"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.									
··'	' : denotes Noi	se Floor.							
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin		
		Mode	Reading Leve	el	FS	@3m			
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB		
4824.00	Н	Average	26.98	6.89	33.87	54.00	-20.13		
4824.00	Н	Peak	38.93	6.89	45.82	74.00	-28.18		
7236.00	Н								
9648.00	Н								
12060.00	Н								
14472.00	Н								
16884.00	Н								
19296.00	Н								
21708.00	Н								
24120.00	Н								

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Operation Ban Fundamental F Operation Mod EUT Pol.	requency	:802.11 gTest Date:2437 MHzTemp./Humi.:TX MIDEngineer:E2 PlaneMeasurement Antenna Pol.		:2014-04-23 :20.3 deg_C /58 RH :Tin :VERTICAL					
Actual FS(dBµV	(/m) = SPA.	Reading level(dE	$B\mu V$ ) + Factor(dB	3)					
Factor(dB) = Ar	ntenna Factor(	$dB\mu V/m) + Cab$	le Loss(dB) – Pr	e_Amplifier Gain(	dB)				
Note : "F" : c	lenotes Fundai	mental Frequency	7. ; "H" : denotes	Harmonic Frequency	у.				
"E"	"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.								
در	' : denotes Noi	se Floor.							
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin		
		Mode	Reading Leve	el	FS	@3m			
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB		
4874.00	Н	Average	26.87	6.96	33.83	54.00	-20.17		
4874.00	Н	Peak	38.27	6.96	45.23	74.00	-28.77		
7311.00	Н								
9748.00	Н								
12185.00	Н								
14622.00	Н								
17059.00	Н								
19496.00	Н								
21933.00	Н								
24370.00	Н								

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Operation Ban Fundamental F Operation Mod EUT Pol.	Frequency	:802.11 gTest Date:2437 MHzTemp./Humi.:TX MIDEngineer:E2 PlaneMeasurement Antenna Pol.		:2014-04-23 :20.3 deg_C /58 RH :Tin :HORIZONTAL				
Actual FS(dBµV	$\sqrt{m} = SPA.$	Reading level(dE	$B\mu V$ ) + Factor(dB	3)				
Factor(dB) = Ar	ntenna Factor(	dBµV∕m) + Cab	le Loss(dB) – Pr	e_Amplifier Gain(	dB)			
Note : "F" : c	lenotes Fundai	mental Frequency	7. ; "H" : denotes	Harmonic Frequency	у.			
"E": denotes Band Edge Frequency.; "S": denotes Spurious Frequency.								
۰۰۲	' : denotes Noi	se Floor.						
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin	
		Mode	Reading Leve	el	FS	@3m		
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
4874.00	Н	Average	24.88	6.96	31.84	54.00	-22.16	
4874.00	Н	Peak	36.73	6.96	43.69	74.00	-30.31	
7311.00	Н							
9748.00	Н							
12185.00	Н							
14622.00	Н							
17059.00	Н							
19496.00	Н							
21933.00	Н							
24370.00	Н							

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Operation Ban Fundamental F Operation Mod EUT Pol.	Frequency	:802.11 gTest Date:2462 MHzTemp./Humi.:TX HIGHEngineer:E2 PlaneMeasurement Antenna Pol.		:2014-04-23 :20.3 deg_C /58 RH :Tin :VERTICAL			
Actual FS(dBµV	V/m) = SPA.	Reading level(dE	$(H^{2}) + Factor(dE)$	3)			
Factor(dB) = Ar	ntenna Factor(	$dB\mu V/m) + Cab$	le Loss(dB) – Pr	e_Amplifier Gain(	dB)		
Note : " $\mathbf{F}$ " : $\mathbf{c}$	lenotes Fundai	mental Frequency	y.; "H": denotes ]	Harmonic Frequency	у.		
"Е"	: denotes Band	Edge Frequency.	; "S" : denotes Sp	ourious Frequency.			
دد	' : denotes Noi	se Floor.					
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Leve	el	FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4924.00	Н	Average	26.30	7.01	33.31	54.00	-20.69
4924.00	Н	Peak	37.41	7.01	44.42	74.00	-29.58
7386.00	Н						
9848.00	Н						
12310.00	Н						
14772.00	Н						
17234.00	Н						
19696.00	Н						
22158.00	Н						
24620.00	Н						

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Operation Ban Fundamental F Operation Mod EUT Pol.	Frequency	:802.11 gTest Date:2462 MHzTemp./Humi.:TX HIGHEngineer:E2 PlaneMeasurement Antenna Pol.		:2014-04-23 :20.3 deg_C /58 RH :Tin :HORIZONTAL			
Actual FS(dBµV	V/m) = SPA.	Reading level(dE	(H = Factor) + Factor	3)			
Factor(dB) = Ar	ntenna Factor(	$dB\mu V/m) + Cab$	le Loss(dB) – Pr	e_Amplifier Gain(	dB)		
Note : "F" : c	lenotes Fundai	mental Frequency	y.; "H" : denotes	Harmonic Frequency	/.		
"Е"	: denotes Band	Edge Frequency.	; "S" : denotes S <sub>J</sub>	purious Frequency.			
ددد	' : denotes Noi	se Floor.					
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Leve	el	FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4924.00	Н	Average	26.57	7.01	33.58	54.00	-20.42
4924.00	Н	Peak	37.55	7.01	44.56	74.00	-29.44
7386.00	Н						
9848.00	Н						
12310.00	Н						
14772.00	Н						
17234.00	Н						
19696.00	Н						
22158.00	Н						
24620.00	Н						

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Radiated Spurious Emission Measurement Result (802.11n_20M)										
Operation Ban		:802.11 n20N		Test Date		:2014-04-23				
Fundamental F		:2412 MHz		Temp./Humi.		:20.3 deg_C /58 RH				
Operation Mod	le	:TX LOW		Engineer		:Tin				
EUT Pol.		:E2 Plane	1	Measurement Ar	itenna Pol.	:VERTICAL				
Actual FS(dBµV	(/m) = SPA.	Reading level(dE	$B\mu V$ ) + Factor(dE	3)						
Factor(dB) = Ar	ntenna Factor(	$dB\mu V/m) + Cab$	le Loss(dB) – Pr	e_Amplifier Gain(	(dB)					
Note : " $\mathbf{F}$ " : $\mathbf{c}$	lenotes Funda	mental Frequency	/.; "H" : denotes ]	Harmonic Frequenc	y.					
"E"	: denotes Band	Edge Frequency.	; "S" : denotes Sp	ourious Frequency	•					
دد	' : denotes Noi	se Floor.								
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin			
		Mode	Reading Leve	el	FS	@3m				
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB			
4824.00	Н	Average	27.14	6.89	34.03	54.00	-19.97			
4824.00	Н	Peak	40.47	6.89	47.36	74.00	-26.64			
7236.00	Н									
9648.00	Н									
12060.00	Н									
14472.00	Н									
16884.00	Н									
19296.00	Н									
21708.00	Н									
24120.00	Н									

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Operation Band Fundamental F Operation Mod EUT Pol.	requency	:802.11 n20MTest Date:2412 MHzTemp./Humi.:TX LOWEngineer:E2 PlaneMeasurement Antenna Pol.		:2014-04-23 :20.3 deg_C /58 RH :Tin :HORIZONTAL			
Actual FS(dBµV	V/m) = SPA.	Reading level(dE	$B\mu V$ ) + Factor(dI	3)			
Factor(dB) = An	tenna Factor(	$dB\mu V/m) + Cab$	le Loss(dB) – Pr	e_Amplifier Gain(	dB)		
Note : "F" : d	enotes Fundai	mental Frequency	7. ; "H" : denotes	Harmonic Frequency	у.		
"E":	denotes Band	Edge Frequency.	; "S" : denotes S	purious Frequency.			
ددد	: denotes Noi	se Floor.					
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Leve	el	FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4824.00	Н	Average	26.57	6.89	33.46	54.00	-20.54
4824.00	Н	Peak	37.95	6.89	44.84	74.00	-29.16
7236.00	Н						
9648.00	Н						
12060.00	Н						
14472.00	Н						
16884.00	Н						
19296.00	Н						
21708.00	Н						
24120.00	Н						

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Operation Band	:802.11 n20M	Test Date	:2014-04-23
Fundamental Frequency	:2437 MHz	Temp./Humi.	:22 deg_C /62 RH
Operation Mode	:TX MID	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:VERTICAL

Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor(dB)

Factor(dB) = Antenna Factor( $dB\mu V/m$ ) + Cable Loss(dB) – Pre Amplifier Gain(dB)

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

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

"---": denotes Noise Floor.

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
30.97	S	Peak	39.45	-14.03	25.42	40.00	-14.58
324.88	S	Peak	36.23	-10.92	25.31	46.00	-20.69
402.48	S	Peak	37.88	-9.10	28.78	46.00	-17.22
600.36	S	Peak	42.07	-5.51	36.56	46.00	-9.44
800.18	S	Peak	31.03	-2.29	28.74	46.00	-17.26
916.58	S	Peak	29.99	-0.36	29.63	46.00	-16.37
4874.00	Н	Average	29.02	6.96	35.98	54.00	-18.02
4874.00	Н	Peak	41.65	6.96	48.61	74.00	-25.39
7311.00	Н						
9748.00	Н						
12185.00	Н						
14622.00	Н						
17059.00	Н						
19496.00	Н						
21933.00	Н						

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Operation Band	:802.11 n20M	Test Date	:2014-04-23
Fundamental Frequency	:2437 MHz	Temp./Humi.	:22 deg_C /62 RH
Operation Mode	:TX MID	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor(dB)

Factor(dB) = Antenna Factor( $dB\mu V/m$ ) + Cable Loss(dB) – Pre Amplifier Gain(dB)

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

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

"---": denotes Noise Floor.

Note	Detector	Spectrum	Factor	Actual	Limit	Margin
	Mode	Reading Level		FS	@3m	
F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
S	Peak	43.68	-14.42	29.26	46.00	-16.74
S	Peak	38.96	-10.74	28.22	46.00	-17.78
S	Peak	39.73	-8.92	30.81	46.00	-15.19
S	Peak	35.97	-7.52	28.45	46.00	-17.55
S	Peak	32.67	-2.29	30.38	46.00	-15.62
S	Peak	32.26	-0.36	31.90	46.00	-14.10
Н	Average	26.95	6.96	33.91	54.00	-20.09
Н	Peak	38.35	6.96	45.31	74.00	-28.69
Н						
Н						
Н						
Н						
Н						
Н						
Н						
	F/H/E/S S S S S S H H H H H H H H H H H H H	Mode         F/H/E/S       Mode         S       Peak         S	Mode         Reading Level           F/H/E/S         PK/QP/AV         dBµV           S         Peak         43.68           S         Peak         38.96           S         Peak         39.73           S         Peak         35.97           S         Peak         32.67           S         Peak         32.26           H         Average         26.95           H         Peak         38.35           H             H             H             H             H             H             H             H             H             H             H	Mode         Reading Level           F/H/E/S         PK/QP/AV         dBµV         dB           S         Peak         43.68         -14.42           S         Peak         38.96         -10.74           S         Peak         39.73         -8.92           S         Peak         35.97         -7.52           S         Peak         32.67         -2.29           S         Peak         32.26         -0.36           H         Average         26.95         6.96           H         Peak         38.35         6.96           H                H                H	Mode         Reading Level         FS           F/H/E/S         PK/QP/AV         dBμV         dB         dBμV/m           S         Peak         43.68         -14.42         29.26           S         Peak         38.96         -10.74         28.22           S         Peak         39.73         -8.92         30.81           S         Peak         35.97         -7.52         28.45           S         Peak         32.67         -2.29         30.38           S         Peak         32.26         -0.36         31.90           H         Average         26.95         6.96         33.91           H         Peak         38.35         6.96         45.31           H   <	Mode         Reading Level         FS         @3m           F/H/E/S         PK/QP/AV         dBµV         dB         dBµV/m         dBµV/m           S         Peak         43.68         -14.42         29.26         46.00           S         Peak         38.96         -10.74         28.22         46.00           S         Peak         39.73         -8.92         30.81         46.00           S         Peak         35.97         -7.52         28.45         46.00           S         Peak         32.67         -2.29         30.38         46.00           S         Peak         32.67         -2.29         30.38         46.00           S         Peak         32.26         -0.36         31.90         46.00           H         Average         26.95         6.96         33.91         54.00           H         Peak         38.35         6.96         45.31         74.00           H          H          H          H            H          H          H          H            H

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Operation Ban Fundamental F Operation Moo EUT Pol.	Frequency	:802.11 n20N :2462 MHz :TX HIGH :E2 Plane	Iz Temp./Humi. H Engineer		:2014-04-23 :20.3 deg_C /58 RH :Tin :VERTICAL		
Actual FS(dBµV	V/m) = SPA.	Reading level(dE	$B\mu V$ ) + Factor(dB)	)			
Factor(dB) = Ar	ntenna Factor(	dBµV∕m) + Cab	le Loss(dB) – Pre	_Amplifier Gain(	dB)		
Note : "F" : c	lenotes Fundai	mental Frequency	7. ; "H" : denotes H	Iarmonic Frequency	у.		
"E"	: denotes Band	Edge Frequency.	; "S" : denotes Sp	urious Frequency.			
··	' : denotes Noi	se Floor.					
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level	l	FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4924.00	Н	Average	25.76	7.01	32.77	54.00	-21.23
4924.00	Н	Peak	38.08	7.01	45.09	74.00	-28.91
7386.00	Н						
9848.00	Н						
12310.00	Н						
14772.00	Н						
17234.00	Н						
17234.00 19696.00	H H						

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Actual FS(dBμV/m) = SPA. Reading level(dBμV) + 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. "" : denotes Noise Floor.	Operation Ban Fundamental F Operation Mod EUT Pol.	Frequency	ency :2462 MHz Test Date :TX HIGH Engineer :E2 Plane Measurement Antenna Pol.		:2014-04-23 :20.3 deg_C /58 RH :Tin :HORIZONTAL			
Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency. "E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.	Actual FS(dBµV	V/m) = SPA.	Reading level(dE	$B\mu V$ ) + Factor(dI	3)			
"E": denotes Band Edge Frequency.; "S": denotes Spurious Frequency.	Factor(dB) = Ar	ntenna Factor(	dBµV∕m) + Cab	le Loss(dB) – Pr	e_Amplifier Gain(	lB)		
	Note : "F" : c	lenotes Fundai	mental Frequency	y.; "H": denotes	Harmonic Frequency	Ι.		
"" : denotes Noise Floor.	"Е"	: denotes Band	Edge Frequency.	; "S" : denotes S	purious Frequency.			
	·· <u> </u>	' : denotes Noi	se Floor.					
Freq. Note Detector Spectrum Factor Actual Limit Margin	Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
Mode Reading Level FS @3m			Mode	Reading Leve	el	FS	@3m	
$\label{eq:mhz} MHz \qquad F/H/E/S \qquad PK/QP/AV \qquad dB\mu V \qquad dB \qquad dB\mu V/m \qquad dB\mu V/m \qquad dB$	MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4924.00 H Average 24.91 7.01 31.92 54.00 -22.08	4924.00	Н	Average	24.91	7.01	31.92	54.00	-22.08
4924.00 H Peak 37.46 7.01 44.47 74.00 -29.53	4924.00	Н	Peak	37.46	7.01	44.47	74.00	-29.53
7386.00 Н	7386.00	Н						
9848.00 H	9848.00	Н						
12310.00 Н	12310.00	Н						
14772.00 Н	14772.00	Н						
17234.00 Н	17234.00	Н						
19696.00 Н	19696.00	Н						
22158.00 Н	22158.00	Н						
24620.00 Н	24620.00	н						

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Radiated Spurious Emission Measurement Result (802.11n_40M)									
Operation Band				Test Date		:2014-04-23			
Fundamental F				Temp./Humi.		:20.3 deg_C /58 RH			
Operation Mod	le	:TX LOW		Engineer	towno Dol	:Tin :VERTICAL			
EUT Pol.		:E2 Plane		Measurement An	itenna Pol.	VERTICAL			
Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor( $dB$ )									
$Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$									
Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.									
"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.									
ددد	' : denotes Noi	se Floor.							
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin		
		Mode	Reading Leve	el	FS	@3m			
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB		
4844.00	Н	Average	25.27	6.95	32.22	54.00	-21.78		
4844.00	Н	Peak	36.98	6.95	43.93	74.00	-30.07		
7266.00	Н								
9688.00	Н								
12110.00	Н								
14532.00	Н								
16954.00	Н								
19376.00	Н								
21798.00	Н								
24220.00	Н								

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Operation Band Fundamental Frequency Operation Mode EUT Pol.		:2422 MHz :TX LOW		Test Date Temp./Humi. Engineer Measurement Antenna Pol.		:2014-04-23 :20.3 deg_C /58 RH :Tin :HORIZONTAL			
Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor( $dB$ )									
$Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$									
Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.									
"Е"	denotes Band	Edge Frequency.	; "S" : denotes Sj	purious Frequency.					
درد	' : denotes Noi	se Floor.							
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin		
		Mode	Reading Leve	el	FS	@3m			
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB		
4844.00	Н	Average	25.33	6.95	32.28	54.00	-21.72		
4844.00	Н	Peak	38.23	6.95	45.18	74.00	-28.82		
7266.00	Н								
9688.00	Н								
12110.00	Н								
14532.00	Н								
16954.00	Н								
19376.00	Н								
21798.00	Н								
24220.00	Н								

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Operation Mode:TX MIDEngineer:TinEUT Pol.:E2 PlaneMeasurement Antenna Pol.:VERTICAL									
Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor( $dB$ )									
$Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$									
Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.									
"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.									
"" : denotes Noise Floor.									
Freq. Note Detector Spectrum Factor Actual Limit Margin									
Mode Reading Level FS @3m									
$\begin{tabular}{cccc} MHz & F/H/E/S & PK/QP/AV & dB\mu V & dB & dB\mu V/m & dB \\ \end{tabular}$									
4874.00 H Average 25.69 6.96 32.65 54.00 -21.35									
4874.00 H Peak 37.13 6.96 44.09 74.00 -29.91									
7311.00 Н									
9748.00 H									
12185.00 Н									
14622.00 H									
17059.00 Н									
19496.00 Н									
21933.00 Н									
24370.00 Н									

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Operation Band Fundamental Frequency Operation Mode EUT Pol.		:2437 MHz :TX MID		Test Date Temp./Humi. Engineer Measurement Antenna Pol.		:2014-04-23 :22 deg_C /62 RH :Tin :HORIZONTAL			
Actual FS(dBµV									
$Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$									
Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.									
"E":	denotes Band	Edge Frequency.	; "S" : denotes Sp	purious Frequency.					
··،	' : denotes Noi	se Floor.							
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin		
		Mode	Reading Leve	el	FS	@3m			
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB		
4874.00	Н	Average	25.66	6.96	32.62	54.00	-21.38		
4874.00	Н	Peak	36.98	6.96	43.94	74.00	-30.06		
7311.00	Н								
9748.00	Н								
12185.00	Н								
14622.00	Н								
17059.00	Н								
19496.00	Н								
21933.00	Н								
24370.00	Н								

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Operation Band Fundamental Frequency Operation Mode EUT Pol.		:2452 MHz Te :TX HIGH En		Test Date Temp./Humi. Engineer Measurement Antenna Pol.		:2014-04-23 :20.3 deg_C /58 RH :Tin :VERTICAL			
Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor( $dB$ )									
$Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$									
Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.									
"Е"	: denotes Band	Edge Frequency.	; "S" : denotes S <sub>l</sub>	purious Frequency					
۰۰۲	' : denotes Noi	se Floor.							
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin		
		Mode	Reading Leve	el	FS	@3m			
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB		
4904.00	Н	Average	24.91	6.96	31.87	54.00	-22.13		
4904.00	Н	Peak	38.36	6.96	45.32	74.00	-28.68		
7356.00	Н								
9808.00	Н								
12260.00	Н								
14712.00	Н								
17164.00	Н								
19616.00	Н								
22068.00	Н								
24520.00	Н								

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Operation Band Fundamental Frequency Operation Mode EUT Pol.		:2452 MHz :TX HIGH		Test Date Temp./Humi. Engineer Measurement Antenna Pol.		:2014-04-23 :20.3 deg_C /58 RH :Tin :HORIZONTAL			
Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor( $dB$ )									
$Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$									
Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.									
"E":	denotes Band	Edge Frequency.	; "S" : denotes S	purious Frequency.					
··	: denotes Noi	se Floor.							
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin		
		Mode	Reading Leve	el	FS	@3m			
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB		
4904.00	Н	Average	24.94	6.96	31.90	54.00	-22.10		
4904.00	Н	Peak	37.55	6.96	44.51	74.00	-29.49		
7356.00	Н								
9808.00	Н								
12260.00	Н								
14712.00	Н								
17164.00	Н								
19616.00	Н								
22068.00	Н								
24520.00	Н								

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Radiated Spurious Emission Measurement Result (802.11a)									
Operation Ban				Test Date		:2014-04-23			
Fundamental F		:5745 MHz		Temp./Humi.		:20.3 deg_C /	58 RH		
Operation Mod	le	TX LOW		Engineer	( D 1	:Tin			
EUT Pol.		:E2 Plane		Measurement An	itenna Pol.	:VERTICAL			
Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor( $dB$ )									
$Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$									
Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.									
"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.									
"" : denotes Noise Floor.									
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin		
		Mode	Reading Leve	el	FS	@3m			
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB		
11490.00	Н	Average	32.56	17.78	50.34	54.00	-3.66		
11490.00	Н	Peak	38.89	17.78	56.67	74.00	-17.33		
17235.00	Н								
22980.00	Н								
28725.00	Н								
34470.00	Н								

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Operation Ban Fundamental F Operation Mod EUT Pol.	requency	:802.11 a :5745 MHz :TX LOW :E2 Plane	Te Ei	Test Date Temp./Humi. Engineer Measurement Antenna Pol.		:2014-04-23 :20.3 deg_C /58 RH :Tin :HORIZONTAL	
Actual FS(dBµV	(/m) = SPA.	Reading level(dE	$B\mu V$ ) + Factor(dB)				
Factor(dB) = Ar	ntenna Factor(	dBµV∕m) + Cab	le Loss(dB) – Pre_	Amplifier Gain(	dB)		
Note : " $F$ " : $c$	lenotes Funda	mental Frequency	v. ; "H" : denotes Ha	armonic Frequenc	у.		
"Е"	: denotes Band	Edge Frequency.	; "S" : denotes Spu	rious Frequency			
··	' : denotes Noi	se Floor.					
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
11490.00	Н	Average	30.38	17.78	48.16	54.00	-5.84
11490.00	Н	Peak	37.49	17.78	55.27	74.00	-18.73
17235.00	Н						
17255.00	11						
22980.00	Н						

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Operation Ban Fundamental F Operation Mod EUT Pol.	requency	:802.11 a :5785 MHz :TX MID :E2 Plane	T E	Test Date Temp./Humi. Engineer Measurement Antenna Pol.		:2014-04-23 :20.3 deg_C /: :Tin :VERTICAL	58 RH				
Actual FS(dBµV	Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor( $dB$ )										
Factor(dB) = Ar	tenna Factor(	$dB\mu V/m) + Cab$	le Loss(dB) – Pre	_Amplifier Gain(	dB)						
Note : " $F$ " : $c$	lenotes Funda	mental Frequency	v. ; "H" : denotes H	Iarmonic Frequenc	у.						
"Е"	denotes Band	Edge Frequency.	; "S" : denotes Sp	urious Frequency.							
···	' : denotes Noi	se Floor.									
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin				
		Mode	Reading Level	l	FS	@3m					
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB				
11570.00	Н	Average	22.91	17.66	40.57	54.00	-13.43				
11570.00	Н	Peak	26.59	17.66	44.25	74.00	-29.75				
17355.00	Н										
23140.00	Н										
28925.00	TT										
28925.00	Н										

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Operation Ban Fundamental F Operation Mod EUT Pol.	Frequency	:802.11 a :5785 MHz :TX MID :E2 Plane	Te E	Test Date Temp./Humi. Engineer Measurement Antenna Pol.		:2014-04-23 :20.3 deg_C /58 RH :Tin :HORIZONTAL	
Actual FS(dBµV	V/m) = SPA.	Reading level(dE	(dB) + Factor(dB)	)			
Factor(dB) = Ar	ntenna Factor(	dBµV∕m) + Cab	le Loss(dB) – Pre	_Amplifier Gain(	dB)		
Note : "F" : c	lenotes Fundai	mental Frequency	v. ; "H" : denotes H	armonic Frequenc	у.		
"Е"	: denotes Band	Edge Frequency.	; "S" : denotes Spi	urious Frequency.			
··	' : denotes Noi	se Floor.					
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
11570.00	Н	Average	21.92	17.66	39.58	54.00	-14.42
11570.00	Н	Peak	25.08	17.66	42.74	74.00	-31.26
17355.00	Н						
23140.00	Н						
28925.00	Н						

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Operation Ban Fundamental F Operation Mod EUT Pol.	requency	:802.11 a :5825 MHz :TX HIGH :E2 Plane	]	Test Date Temp./Humi. Engineer Measurement Antenna Pol.		:2014-04-23 :20.3 deg_C /58 RH :Tin :VERTICAL	
Actual FS(dBµV	(/m) = SPA.	Reading level(dB	$(\mu V) + Factor(dE)$	3)			
Factor(dB) = Ar	tenna Factor(	$dB\mu V/m) + Cabl$	le Loss(dB) – Pro	e_Amplifier Gain(	dB)		
Note : "F" : c	lenotes Funda	mental Frequency	v. ; "H" : denotes l	Harmonic Frequency	у.		
"E"	denotes Band	Edge Frequency.;	; "S" : denotes Sp	ourious Frequency.			
ددد	' : denotes Noi	se Floor.					
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Leve	el	FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
11650.00	Н	Average	31.72	17.87	49.59	54.00	-4.41
11650.00	Н	Peak	34.94	17.87	52.81	74.00	-21.19
17475.00	Н						
23300.00	Н						
29125.00	Н						
34950.00	Н						

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Operation Ban Fundamental F Operation Mod EUT Pol.	requency	:802.11 a :5825 MHz :TX HIGH :E2 Plane	J	Test Date Temp./Humi. Engineer Measurement Antenna Pol.		:2014-04-23 :20.3 deg_C /58 RH :Tin :HORIZONTAL	
Actual FS(dBµV	(/m) = SPA.	Reading level(dB	(dE) + Factor(dE)	3)			
Factor(dB) = Ar	tenna Factor(	$dB\mu V/m) + Cab$	le Loss(dB) – Pro	e_Amplifier Gain(	dB)		
Note : "F" : c	lenotes Funda	mental Frequency	v. ; "H" : denotes l	Harmonic Frequency	у.		
"E"	denotes Band	Edge Frequency.	; "S" : denotes Sp	ourious Frequency.			
دد	' : denotes Noi	se Floor.					
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Leve	el	FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
11650.00	Н	Average	25.63	17.87	43.50	54.00	-10.50
11650.00	Н	Peak	28.57	17.87	46.44	74.00	-27.56
17475.00	Н						
23300.00	Н						
29125.00	Н						
34950.00	Н						

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34470.00

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### FCC ID: COFNFABACMR02 **IC: 10293A- NFABACMR02**

#### Radiated Spurious Emission Measurement Result (802.11ac 20M) **Operation Band** :802.11 AC20M Test Date :2014-04-23 **Fundamental Frequency** :5745 MHz Temp./Humi. :22 deg C /62 RH **Operation Mode** :TX LOW Engineer :Tin EUT Pol. :E2 Plane Measurement Antenna Pol. :VERTICAL Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor(dB) Factor(dB) = Antenna Factor( $dB\mu V/m$ ) + Cable Loss(dB) – Pre Amplifier Gain(dB) Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency. "E": denotes Band Edge Frequency.; "S": denotes Spurious Frequency. "---": denotes Noise Floor. Freq. Note Detector Spectrum Factor Actual Limit Margin FS Mode Reading Level @3m dBµV/m dBµV/m PK/QP/AV dBµV dB dB MHz F/H/E/S 30.97 S Peak 39.14 -14.0325.11 40.00 -14.8974.62 S 37.85 40.00 Peak -16.21 21.64 -18.36 417.03 S Peak 38.64 -8.92 29.72 46.00 -16.28S 600.36 Peak 33.43 -5.51 27.92 46.00 -18.08 S 800.18 Peak 29.90 -2.29 27.61 46.00 -18.39 916.58 S Peak 30.16 -0.36 29.80 46.00 -16.20 11490.00 Η 32.45 17.78 50.23 54.00 -3.77 Average 11490.00 Η Peak 35.58 17.78 53.36 74.00 -20.6417235.00 Η \_\_\_ 22980.00 Η 28725.00 Η

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

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Operation Band	:802.11 AC20M	Test Date	:2014-04-23
Fundamental Frequency	:5745 MHz	Temp./Humi.	:22 deg_C /62 RH
Operation Mode	:TX LOW	Engineer	:Tin
EUT Pol.	:E2 Plane	Measurement Antenna Pol.	:HORIZONTAL

Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor(dB)

Factor(dB) = Antenna Factor( $dB\mu V/m$ ) + Cable Loss(dB) – Pre Amplifier Gain(dB)

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

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

"---": denotes Noise Floor.

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Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	rs dBµV∕m	dBµV∕m	dD
MITIZ	Γ/Π/E/S	PK/QP/AV	ασμν	uБ	ασμ ν / Π	ασμν/ Πι	dB
224.97	S	Peak	43.35	-14.42	28.93	46.00	-17.07
417.03	S	Peak	36.96	-8.92	28.04	46.00	-17.96
499.48	S	Peak	35.52	-7.54	27.98	46.00	-18.02
656.62	S	Peak	34.21	-4.41	29.80	46.00	-16.20
697.36	S	Peak	35.03	-3.98	31.05	46.00	-14.95
916.58	S	Peak	31.47	-0.36	31.11	46.00	-14.89
11490.00	Н	Average	25.55	17.78	43.33	54.00	-10.67
11490.00	Н	Peak	28.18	17.78	45.96	74.00	-28.04
17235.00	Н						
22980.00	Н						
28725.00	Н						

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Operation Ban Fundamental F Operation Mod EUT Pol.	requency	:802.11 AC20 :5785 MHz :TX MID :E2 Plane	5 MHz Temp./Humi. MID Engineer		:2014-04-23 :20.3 deg_C /58 RH :Tin :VERTICAL					
Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor( $dB$ )										
Factor(dB) = Ar	ntenna Factor(	$dB\mu V/m) + Cab$	le Loss(dB) – Pre	e_Amplifier Gain(	dB)					
Note : "F" : c	lenotes Fundai	mental Frequency	v.; "H": denotes I	Harmonic Frequency	у.					
"E"	: denotes Band	Edge Frequency.	; "S" : denotes Sp	ourious Frequency.						
دد	' : denotes Noi	se Floor.								
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin			
		Mode	Reading Leve	91	FS	@3m				
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB			
11570.00	Н	Average	25.66	17.66	43.32	54.00	-10.68			
11570.00	Н	Peak	28.28	17.66	45.94	74.00	-28.06			
17355.00	Н									
23140.00	Н									
28925.00	TT									
20725.00	Н									

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Operation Ban Fundamental F Operation Mod EUT Pol.	requency	:802.11 AC20 :5785 MHz :TX MID :E2 Plane	] I	Test Date Temp./Humi. Engineer Measurement Antenna Pol.		:2014-04-23 :20.3 deg_C /58 RH :Tin :HORIZONTAL	
Actual FS(dBµV	T/m) = SPA.	Reading level(dE	$B\mu V$ ) + Factor(dB	3)			
Factor(dB) = An	tenna Factor(	dBµV∕m) + Cab	le Loss(dB) – Pre	e_Amplifier Gain(c	dB)		
Note : " $F$ " : d	lenotes Fundai	mental Frequency	/.; "H": denotes H	Harmonic Frequency	/.		
"E":	denotes Band	Edge Frequency.	; "S" : denotes Sp	ourious Frequency.			
··،	: denotes Noi	se Floor.					
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Leve	1	FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
11570.00	Н	Average	25.78	17.66	43.44	54.00	-10.56
11570.00	Н	Peak	28.88	17.66	46.54	74.00	-27.46
17355.00	Н						
23140.00	Н						
28925.00	Н						

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Operation Ban Fundamental F Operation Moo EUT Pol.	requency	:802.11 AC20 :5825 MHz :TX HIGH :E2 Plane	ך I	Test Date Temp./Humi. Engineer Measurement Antenna Pol.		:2014-04-23 :20.3 deg_C /58 RH :Tin :VERTICAL	
Actual FS(dBµV	(/m) = SPA.	Reading level(dE	$B\mu V$ ) + Factor(dB	3)			
Factor(dB) = Ar	ntenna Factor(	dBµV∕m) + Cab	le Loss(dB) – Pre	e_Amplifier Gain(	dB)		
Note : "F" : c	lenotes Funda	mental Frequency	v.; "H": denotes I	Harmonic Frequency	у.		
"Е"	: denotes Band	Edge Frequency.	; "S" : denotes Sp	ourious Frequency.			
دد	' : denotes Noi	ise Floor.					
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Leve	el	FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
11650.00	Н	Average	31.38	17.87	49.25	54.00	-4.75
11650.00	Н	Peak	34.25	17.87	52.12	74.00	-21.88
17475.00	Н						
23300.00	Н						

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Operation Ban Fundamental F Operation Moc EUT Pol.	amental Frequency:5825 MHzTemp./Humi.tion Mode:TX HIGHEngineer		itenna Pol.	:2014-04-23 :20.3 deg_C /58 RH :Tin :HORIZONTAL			
Actual FS(dBµV	(/m) = SPA.	Reading level(dB	$(\mu V) + Factor(dB)$				
Factor(dB) = Ar	ntenna Factor(	$dB\mu V/m) + Cab$	le Loss(dB) – Pre_	Amplifier Gain(	(dB)		
Note : "F" : c	lenotes Fundai	mental Frequency	y.; "H" : denotes Ha	rmonic Frequenc	y.		
"Е"	: denotes Band	Edge Frequency.	"S" : denotes Spur	rious Frequency	•		
۰۰۲	' : denotes Noi	se Floor.					
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
				-		dD. V/m	dB
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	цD
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	авµv7т	<u>ub</u>
<u>MHz</u> 11650.00	F/H/E/S H	PK/QP/AV Average	dBμV 25.13	dB 17.87	dBμV/m 43.00	<u>авµv/т</u> 54.00	-11.00
			·		•	•	
11650.00	Н	Average	25.13	17.87	43.00	54.00	-11.00
11650.00 11650.00	H H	Average Peak	25.13	17.87	43.00	54.00	-11.00
11650.00 11650.00 17475.00	Н Н Н	Average Peak 	25.13	17.87	43.00	54.00	-11.00

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Radiated Spi	urious Emis	ssion Measure	ement Result	(802.11ac 40M	<b>[</b> )			
Operation Ban		:802.11 AC40		Test Date		:2014-04-23		
Fundamental F		:5755 MHz		Temp./Humi. :20.3 deg_C /58 RH			58 RH	
Operation Mod	le	:TX LOW		Engineer		:Tin		
EUT Pol. :E2 Plane Measurement Antenna Pol. :VERTICAL								
Actual FS(dBµV	(/m) = SPA.	Reading level(dB	$\mu$ V) + Factor(dl	B)				
Factor(dB) = Ar	ntenna Factor(	$dB\mu V/m) + Cabl$	le Loss(dB) – Pr	e_Amplifier Gain	(dB)			
Note : "F" : c	lenotes Fundai	mental Frequency	.; "H": denotes	Harmonic Frequenc	y.			
"E"	: denotes Band	Edge Frequency.;	"S" : denotes S	purious Frequency				
۰۰۲	' : denotes Noi	se Floor.						
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin	
		Mode	Reading Leve	el	FS	@3m		
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB	
11510.00	Н	Average	31.87	17.78	49.65	54.00	-4.35	
11510.00	Н	Peak	33.67	17.78	51.45	74.00	-22.55	
17265.00	Н							
23020.00	Н							
28775.00	Н							
34530.00	Н							

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Operation Band Fundamental Frequency Operation Mode EUT Pol.		:802.11 AC40M :5755 MHz :TX LOW :E2 Plane		Test Date Temp./Humi. Engineer Measurement Antenna Pol.		:2014-04-23 :20.3 deg_C /58 RH :Tin :HORIZONTAL					
Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor( $dB$ )											
$Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$											
Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.											
"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.											
"" : denotes Noise Floor.											
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				
11510.00	Н			1			10 77				
	п	Average	25.45	17.78	43.23	54.00	-10.77				
11510.00	Н	Average Peak	25.45 28.53	17.78 17.78	43.23 46.31	54.00 74.00	-10.77 -27.69				
		C C									
11510.00	Н	Peak									
11510.00 17265.00	H H	Peak									

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Operation Band Fundamental Frequency Operation Mode EUT Pol.		:802.11 AC40M :5795 MHz :TX HIGH :E2 Plane		Test Date Temp./Humi. Engineer Measurement Antenna Pol.		:2014-04-23 :20.3 deg_C /58 RH :Tin :VERTICAL					
Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor( $dB$ )											
$Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$											
Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.											
"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.											
"" : denotes Noise Floor.											
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin				
		Mode	Reading Level	l	FS	@3m					
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB				
11590.00	Н	Average	30.82	17.74	48.56	54.00	-5.44				
11590.00	Н	Peak	33.89	17.74	51.63	74.00	-22.37				
17385.00	Н										
17385.00 23180.00	H H										

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Operation Band Fundamental Frequency Operation Mode EUT Pol.		:802.11 AC40M :5795 MHz :TX HIGH :E2 Plane		Test Date Temp./Humi. Engineer Measurement Antenna Pol.		:2014-04-23 :20.3 deg_C /58 RH :Tin :HORIZONTAL					
Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor( $dB$ )											
$Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$											
Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.											
"E": denotes Band Edge Frequency.; "S": denotes Spurious Frequency.											
"" : denotes Noise Floor.											
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				
11590.00	Н	Average	25.30	17.74	43.04	54.00	-10.96				
11590.00 11590.00	H H	Average Peak	25.30 28.36	17.74 17.74	43.04 46.10	54.00 74.00	-10.96 -27.90				
		e									
11590.00	Н	Peak									
11590.00 17385.00	H H	Peak									

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

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Radiated Spurious Emission Measurement Result (802.11ac 80M)Operation Band:802.11 AC80MTest Date:2014-04-23Fundamental Frequency:5775 MHzTemp./Humi.:20.3 deg_C /58 RHOperation Mode:TXEngineer:TinEUT Pol.:E2 PlaneMeasurement Antenna Pol. <td:vertical< td="">Actual ES(dBul/(m) = SDA_Beading lawal(dBul/) + Factor(dD)</td:vertical<>										
Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor( $dB$ )										
$Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$										
Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.										
"Е"	: denotes Band	Edge Frequency.	; "S" : denotes S	purious Frequency						
"" : denotes Noise Floor.										
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin			
		Mode	Reading Leve	el	FS	@3m				
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB			
11550.00	Н	Average	24.11	17.63	41.74	54.00	-12.26			
11550.00	Н	Peak	27.77	17.63	45.40	74.00	-28.60			
17325.00	Н									
23100.00	Н									
28875.00	Н									
34650.00	Н									

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Fundamental Frequency :57 Operation Mode :T2		:802.11 AC80M :5775 MHz :TX :E2 Plane		Test Date Temp./Humi. Engineer Measurement Antenna Pol.		:2014-04-23 :20.3 deg_C /58 RH :Tin :HORIZONTAL					
Actual FS( $dB\mu V/m$ ) = SPA. Reading level( $dB\mu V$ ) + Factor( $dB$ )											
$Factor(dB) = Antenna Factor(dB\mu V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)$											
Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.											
"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.											
"" : denotes Noise Floor.											
Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin				
		Mode	Reading Level	1	FS	@3m					
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB				
11550.00	Н	Average	24.21	17.63	41.84	54.00	-12.16				
11550.00	Н	Peak	27.98	17.63	45.61	74.00	-28.39				
17325.00	Н										
17325.00 23100.00	H H										

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.



## **11 PEAK POWER SPECTRAL DENSITY**

## **11.1 Standard Applicable:**

According to §15.247(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

According to RSS-210 issue 8, §A8.2(b) The transmitter power spectral density (into the antenna) shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

## 11.2 Measurement Equipment Used:

Refer to section 7.2 for details.

## 11.3 Test Set-up:

Refer to section 7.3 for details. (Spectrum Option)

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## **11.4** Measurement Procedure (following the measurement procedure 10.2 of KDB558074):

- 1. Set analyzer center frequency to DTS channel center frequency.
- 2. Set the span to 1.5 times the DTS channel bandwidth.
- 3. Set the RBW  $\geq$  3 kHz.
- 4. Set the VBW  $\geq$  3 x RBW.
- 5. Detector = peak.
- 6. Sweep time = auto couple.
- 7. Trace mode = max hold.
- 8. Allow trace to fully stabilize.
- 9. Use the peak marker function to determine the maximum amplitude level.
- 10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

11. 802.11n 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.

Note: For the test of PSD at MIMO mode, the highest emission of worst case employing Measure and add 10 log (N) technical is reported on this report after the comparison between Main Antenna at single transmitting mode and Aux that yields the higher value. The single transmitting mode is only reported measurement that produces higher value of outcome.

## 11.5 Measurement Result: N/A

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## **12 ANTENNA REQUIREMENT**

## **12.1 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.

According to RSS-GEN 7.1.2, a transmitter can only be sold or operated with antennas with which it was certified. A transmitter may be certified with multiple antenna types. An antenna type comprises antennas having similar in-band and out-of-band radiation patterns. Testing shall be performed using the highest-gain antenna of each combination of transmitter and antenna type for which certification is being sought, with the transmitter output power set at the maximum level. Any antenna of the same type and having equal or lesser gain as an antenna that had been successfully tested for certification with the transmitter, will also be considered certified with the transmitter, and may be used and marketed with the transmitter. The manufacturer shall include with the application for certification a list of acceptable antenna types to be used with the transmitter.

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 measurement or on data from the antenna manufacturer. Any antenna gain in excess of 6 dBi (6 dB above isotropic gain) shall be added to the measured RF output power before using the power limits specified in RSS-210 or RSS-310 for devices of RF output powers of 10 milliwatts or less. For devices of output powers greater than 10 milliwatts, except devices subject to RSS-210 Annex 8 (Frequency Hopping and Digital Modulation Systems Operating in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz Bands) or RSS-210 Annex 9 (Local Area Network Devices), the total antenna gain shall be added to the measured RF output power before using the specified power limits. For devices subject to RSS-210 Annex 8 or Annex 9, the antenna gain shall not be added.

## 12.2 Antenna Connected Construction:

The directional gains of antenna used for transmitting is 1.5dBi for 2.4GHz, 2.72dBi for 5725-5850 MHz, and 1.17dBi for 2.4GHz MIMO, and 4.94dBi (802.11n\_HT 20/ ac 20M 5.8G), 4.92dBi (802.11n\_HT 40/ ac 40M 5.8G), 4.81dBi (802.11ac 80M 5.8G) MIMO. In addition, the antenna connector is designed with unique type RF connector and no consideration of replacement. Please see EUT photo and antenna spec. for details.

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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.



# 13 99% BANDWIDTH MEASUREMENT

# 13.1 Standard Applicable:

RSS-Gen §4.6.1, the transmitter shall be operated at its maximum carrier power measured under normal test conditions. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual.

The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded.

The span between the two recorded frequencies is the occupied bandwidth.

## **13.2 Measurement Equipment Used:**

Refer to section 7.2 for details.

## 13.3 Test Set-up:

Refer to section 7.3 for details. (Spectrum analyzer)

## **13.4 Measurement Procedure:**

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 3. Set the spectrum analyzer as RBW=1% of the Span, VBW = 3 times RBW, Span= 30 MHz /50MHz.
- 4. Turn on the 99% bandwidth function, max reading..
- 5. Repeat above procedures until all frequency measured were complete.

## 13.5 Measurement Result: N/A

~ End of Report ~

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