

FCC PART 15 SUBPART C TEST REPORT

FCC PART 15.247

Report Reference No	MWR160100405	
FCC ID	RQQHLT-E50UTM	
Compiled by		h a si
(position+printed name+signature):	File administrators Martin Ao	Mortin
Supervised by	-	uchas was a
(position+printed name+signature):	Test Engineer Yuchao Wang	yacaao.wang
Approved by	Managan Divan Llas	Montin yuchao.wang DiXon
(position+printed name+signature):	Manager Dixon Hao	V^{*}
Date of issue	Jan. 24, 2016	
Representative Laboratory Name .:	Maxwell International Co., Ltd.	
Address:	Room 509, Hongfa center building Guangdong, China	, Baoan District, Shenzhen,
Testing Laboratory Name	Shenzhen CTL Testing Technolo	ogy Co., Ltd.
Address	Floor 1-A, Baisha Technology Nanshan District, Shenzhen, China	
Applicant's name	HYUNDAI CORPORATION	
Address	140-2, Kye-dong, Chongro-ku, Seo	oul, South Korea
Test specification:		
Standard:	FCC Part 15.247: Operation witl 2400-2483.5 MHz and 5725-5850	
TRF Originator	Maxwell International Co., Ltd.	
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Test item description	Mobile Phone	
Trade Mark	HYUNDAI	
Manufacturer	Shenzhen Rainbow Time Techn	ology Co.,Ltd
Model/Type reference:	E545	
Listed Models	1	
Modulation Type	DSSS(CCK,DQPSK,DBPSK),OFD BPSK)	DM(64QAM,16QAM,QPSK,
Operation Frequency	From 2412MHz to 2462MHz	
operation Frequency		
Rating	DC 3.80V	
Rating	DC 3.80V	22

TEST REPORT

Test Report No. :	MWR160100405		Jan. 24, 2016 Date of issue
Equipment under Test	:	Mobile Phone	
Model /Type	:	E545	
Listed Models	:	1	
	·		
Applicant	:	HYUNDAI CORPORAT	ION
Address	:	140-2, Kye-dong, Chong	gro-ku, Seoul, South Korea
Manufacturer	:	Shenzhen Rainbow Tir	ne Technology Co.,Ltd
Address	:		Technology Building, Science and nan District, Shenzhen, China

Test Result: PASS

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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1 <u>TEST STANDARDS</u>

The tests were performed according to following standards:

<u>FCC Rules Part 15.247:</u> Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz. <u>ANSI C63.10:2013</u>: American National Standard for Testing Unlicensed Wireless Devices <u>KDB558074 D01 V03</u>: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

2 <u>SUMMARY</u>

2.1 General Remarks

Date of receipt of test sample	:	Jan. 01, 2016
Testing commenced on	:	Jan. 12, 2016
Testing concluded on	:	Jan. 24, 2016

2.2 Product Description

The **HYUNDAI CORPORATION**'s Model: E545 or the "EUT" as referred to in this report; more general information as follows, for more details, refer to the user's manual of the EUT.

Name of EUT	Mobile Phone
Model Number	E545
Modilation Type	GMSK for GSM/GPRS, 8-PSK for EDGE,QPSK for UMTS
Antenna Type	Internal
UMTS Operation Frequency Band	Device supported UMTS FDD Band II/V
	IEEE 802.11b:2412-2462MHz
WLAN FCC Operation frequency	IEEE 802.11g:2412-2462MHz
WE with do operation nequency	IEEE 802.11n HT20:2412-2462MHz
	IEEE 802.11n HT40:2422-2452MHz
BT FCC Operation frequency	2402MHz-2480MHz
HSDPA Release Version	Release 10
HSUPA Release Version	Release 6
DC-HSUPA Release Version	Not Supported
WCDMA Release Version	R99
	IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK)
WLAN FCC Modulation Type	IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK)
WEAR TOO WOOddation Type	IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK, BPSK)
	IEEE 802.11n HT40: OFDM (64QAM, 16QAM, QPSK,BPSK)
BT Modulation Type	GFSK,8DPSK,π/4DQPSK(BT 3.0+EDR)
Hardware version	14900_MM1_V03
Software version	HYUNDAI_E545_V5.1.1_20160122
Android version	Android 4.4.2
GPS function	Supported
WLAN	Supported 802.11b/802.11g/802.11n
Bluetooth	Supported BT 4.0/BT 3.0+EDR
GSM/EDGE/GPRS	Supported GSM/GPRS/EDGE
GSM/EDGE/GPRS Power Class	GSM850:Power Class 4/ PCS1900:Power Class 1
GSM/EDGE/GPRS Operation	GSM850 :824.2MHz-848.8MHz/PCS1900:1850.2MHz-1909.8MHz
Frequency	G310050 .024.210172-040.010172/PC31900.1050.210172-1909.010172
GSM/EDGE/GPRS Operation	GSM850/PCS1900/GPRS850/GPRS1900/EDGE850/EDGE1900
Frequency Band	G310050/PC31900/GPR3050/GPR31900/EDGE050/EDGE1900
GSM Release Version	R99
GPRS/EDGE Multislot Class	GPRS/EDGE: Multi-slot Class 12
Extreme temp. Tolerance	-30°C to +50°C
Extreme vol. Limits	3.40VDC to 4.20VDC (nominal: 3.80VDC)
GPRS operation mode	Class B

2.3 Equipment Under Test

Power supply system utilised

Power supply voltage	:	0	120V / 60 Hz	0	115V / 60Hz
		0	12 V DC	0	24 V DC
			Other (specified in blank below)		

DC 3.80V

2.4 Description of the test mode

IEEE 802.11b/g/n: The product support Third channels but only use Eleventh channels in USA.

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

2.5 Short description of the Equipment under Test (EUT)

2.5.1 General Description

E545 is subscriber equipment in the WCDMA/GSM system. The HSPA/UMTS frequency band is Band I,Band II, Band Vand Band VIII; The GSM/GPRS/EDGE frequency band includes GSM850 and GSM900 and DCS1800 and PCS1900, but only Band II and Band V and GSM850 and PCS1900 bands test data included in this report. The Mobile Phone implements such functions as RF signal receiving/transmitting, HSPA/UMTS and GSM/GPRS/EDGE protocol processing, voice, video MMS service, GPS and WIFI etc. Externally it provides micro SD card interface, earphone port (to provide voice service) and SIM card interface. It also provides Bluetooth module to synchronize data between a PC and the phone, or to use the built-in modem of the phone to access the Internet with a PC, or to exchange data with other Bluetooth devices.

NOTE: Unless otherwise noted in the report, the functional boards installed in the units shall be selected from the below list, but not means all the functional boards listed below shall be installed in one unit.

Test Case	Test Conditions			
Test Case	Configuration	Description		
DTS (6 dB) Bandwidth	Measurement Method	FCC KDB 558074 §8.2 Option 2		
	Test Environment	NTNV		
		11b_L,11b_M,11b_H		
	EUT Configuration	11g_L,11g_M,11g_H		
	EOT Configuration	11n HT20_L, 11n HT20_M, 11n HT20_H		
		11n HT40_L, 11n HT40_M, 11n HT40_H		
Maximum Peak Conducted Output Power	Measurement Method	FCC KDB 558074§9.1.2		
	Test Environment	NTNV		
	Test Setup	Test Setup 1		
		11b_L,11b_M,11b_H		
	EUT Configuration	11g_L,11g_M,11g_H		
	Lot coniguration	11n HT20_L, 11n HT20_M, 11n HT20_H		
		11n HT40_L, 11n HT40_M, 11n HT40_H		
	Measurement Method	FCC KDB 558074 §10.2 (peak PSD).		
Maximum Power Spectral Density	Test Environment	NTNV		
Level		11b_L,11b_M,11b_H		
	EUT Configuration	11g_L,11g_M,11g_H		
		11n HT20_L, 11n HT20_M, 11n HT20_H		

2.5.2 Test Modes

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		11n HT40 L, 11n HT40 M, 11n HT40 H	
	Measurement Method		
		FCC KDB 558074§11.0.	
	Test Environment	NTNV	
Unwanted Emissions into Non-	Test Setup	Test Setup 1	
Restricted Frequency Bands		11b_L,11b_M,11b_H	
receiled a requericy Barrac	EUT Configuration	11g_L,11g_M,11g_H	
	LOT Configuration	11n HT20_L, 11n HT20_M, 11n HT20_H	
		11n HT40_L, 11n HT40_M, 11n HT40_H	
	Measurement Method	FCC KDB 558074§12.2, Conducted	
	Measurement Method	(antenna-port).	
Unwanted Emissions into Restricted Frequency Bands (Conducted)	Test Environment	NTNV	
		11b_L,11b_M,11b_H	
	EUT Configuration	11g_L,11g_M,11g_H	
		11n HT20_L, 11n HT20_M, 11n HT20_H	
		11n HT40_L, 11n HT40_M, 11n HT40_H	
Unwanted Emissions into	Measurement Method	FCC KDB	
Restricted		558074§12.1,Radiated(cabinet/case	
		emissions with	
		Impedance matching for antenna-port).	
	Test Environment	NTNV	
		11b_L,11b_M,11b_H	
		11g_L,11g_M,11g_H	
	EUT Configuration	11n HT20 L, 11n HT20 M, 11n HT20 H	
		11n HT40_L, 11n HT40_M, 11n HT40_H	

Test Case	Test Conditions			
Test Case	Configuration	Description		
AC Power Line Conducted	Measurement Method	AC mains conducted.		
Emissions	Test Environment	NTNV		
	EUT Configuration	11g_M (Worst Conf.).		

Note: 1. For Radiated Emissions, By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that "Z axis" position was the worst, then the final test was executed the worst condition and test data were recorded in this report.

2. Typical working modes for each IEEE 802.11mode are selected to perform tests. The manufacturer provide special test software to control TX duty cycle >98% for TX test; recorded worst case at difference data rate as follows:

Test Mode	Test Modes Description
11b	IEEE 802.11b with data rate of 1 Mbps using SISO mode.
11g	IEEE 802.11g with data rate of 6 Mbps using SISO mode.
11n HT20	IEEE 802.11n with data date of MCS0 and bandwidth of 20MHz using SISO mode.
11n HT40	IEEE 802.11n with data date of MCS7 and bandwidth of 40MHz using SISO mode.

2.6 EUT operation mode

Test Mode	RF Ch.	TX Freq. [MHz]	RX Freq. [MHz]	Ch. BW [MHz]
	L	Ch No. 1 / 2412MHz		20
11b	М	Ch No. 6 / 2437 MHz		20
	Н	Ch No. 11/ 2462MHz		20
	L	Ch No. 1 / 2412MHz		20
11g	М	Ch No. 6 / 2437 MHz		20
	L C M C H C L C M C H C L C M C H C L C M C H C C M C C M C	Ch No. 11/ 2462MHz		20
	L	Ch No. 1 / 2412MHz		20
11n HT20	М	Ch No. 6 / 2437 MHz		20
	Н	Ch No. 11/ 2462MHz		20
	L	Ch No. 3/ 2422MHz		40
11n HT40	М	Ch No. 6 / 2437 MHz		40
	Н	Ch No. 9/ 2452 MHz		40

2.7 EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

• - supplied by the manufacturer

 \bigcirc - supplied by the lab

0	Power Cable	Length (m) :	/
		Shield :	1
		Detachable :	1
0	Multimeter	Manufacturer :	/
		Model No. :	1

2.8 Internal Identification of AE used during the test

AE ID*	Description
AE1	Charger

AE1 Model: 811B INPUT: AC100-240V~ 50/60Hz 0.15A OUTPUT: DC 5.0V 1500mA

*AE ID: is used to identify the test sample in the lab internally.

2.9 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: FCC ID: RQQHLT-E50UTM filing to comply with FCC Part 15.247 Rules

2.10 Modifications

No modifications were implemented to meet testing criteria.

2.11 Test Environments

NOTE: The values used in the test report maybe stringent than the declared.

Environment Parameter	Selected Values Du	ring Tests				
NTNV	Temperature	Voltage	Rela	Relative Humidity		
	Ambient 3.8VDC		Amb	ient		
 The frequency bands used in this EUT are listed as follows: 						
Frequency Band(MHz)	2400-2483.5	5150-5350	5470-5725	5725-5850		
802.11b	\checkmark	—	_	-		
802.11g	\checkmark	—	—	-		
802.11n HT20	\checkmark	—	—	_		
802.11n HT40	\checkmark	—		—		

2. The EUT incorporates a SISO function, Physically, the EUT provides one completed transmitter and one completed receiver.

Modulation Mode	TX Function
802.11b	1TX
802.11g	1TX
802.11n HT20	1TX
802.11n HT40	1TX

3 <u>TEST ENVIRONMENT</u>

3.1 Address of the test laboratory

Shenzhen CTL Testing Technology Co., Ltd.

Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan, Shenzhen 518055 China

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.4, CISPR 22/EN 55022 and CISPR16-4-1 SVSWR requirements.

3.2 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

IC Registration No.: 9618B

The 3m alternate test site of Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration No.: 9618B on November 13, 2013.

FCC-Registration No.: 970318

Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 970318, December 19, 2013.

3.3 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

3.4 Test Description

Test Item	FCC Part No.	Requirements	Verdict
DTS (6 dB) Bandwidth	15.247(a)(2)	≥ 500 kHz.	PASS
Maximum Peak Conducted Output Power	15.247(b)(3)	For directional gain:< 30dBm – (G[dBi] –6 [dB]),peak; Otherwise :< 30dBm, peak.	PASS
Maximum Power Spectral Density Level	15.247(e)	For directional gain :< 8dBm/3 kHz – (G[dBi] –6[dB]), peak. Otherwise :< 8dBm/3 kHz, peak.	PASS
Band Edges Compliance	15.247(d)	< -20dBr/100 kHz if total peak power ≤power limit.	PASS
Unwanted Emissions into Non- Restricted Frequency Bands	15.247(d)	< -20dBr/100 kHz if total peak power ≤power limit.	PASS
Unwanted Emissions into Restricted Frequency Bands (Conducted)	15.247(d) 15.209	< -20dBr/100 kHz if total peak power ≤power limit.	PASS
Unwanted Emissions into Restricted Frequency Bands (Radiated)	15.247(d) 15.209	FCC Part 15.209 field strength limit;	PASS
AC Power Line Conducted Emissions	15.207	FCC Part 15.207 conducted limit;	PASS

Remark: The measurement uncertainty is not included in the test result.

Test Test Test Recorded NP Specification Test case Pass Fail NA Remark Mode Channel In Report clause 🛛 Lowest 🛛 Lowest Antenna §15.247(b)(4) 802.11b 🛛 Middle 802.11b Middle Middle \boxtimes complies gain Highest Highest 802.11b 802.11b **Lowest** ⊠ Lowest Power 802.11g 802.11g Middle Middle \boxtimes §15.247(e) spectral complies 802.11n HT20 802.11n HT20 Highest Highest density 802.11n HT40 802.11n HT40 Spectrum 802.11b 802.11b ⊠ Lowest 🛛 Lowest \boxtimes bandwidth 802.11g 802.11g Middle Middle §15.247(a)(1) complies 802.11n HT20 – 6 dB 802.11n HT20 🛛 Highest Highest bandwidth 802.11n HT40 802.11n HT40 802.11b 802.11b \boxtimes Lowest ⊠ Lowest Maximum 802.11g 802.11g Middle Middle §15.247(b)(1) complies output 802.11n HT20 802.11n HT20 power Highest Highest 802.11n HT40 802.11n HT40 802.11b 802.11b Band edge 802.11g 🛛 Lowest \boxtimes 802.11g Lowest §15.247(d) compliance complies 802.11n HT20 Highest 802.11n HT20 Highest conducted 802.11n HT40 802.11n HT40 802.11b 802.11b Band edge 802.11g ⊠ Lowest 802.11g ⊠ Lowest compliance \boxtimes §15.205 complies 802.11n HT20 Highest 802.11n HT20 Highest radiated 802.11n HT40 802.11n HT40 ТΧ 802.11b 802.11b 🛛 Lowest 🛛 Lowest 802.11g \boxtimes spurious 802.11g §15.247(d) Middle Middle Middle complies emissions 802.11n HT20 802.11n HT20 Highest Highest conducted 802.11n HT40 802.11n HT40 802.11b ТΧ 🛛 Lowest Lowest spurious 802.11g §15.247(d) X Middle 802.11b Middle \boxtimes complies emissions 802.11n HT20 Highest Highest radiated 802.11n HT40 RX spurious §15.109 -/--/--/--/- \boxtimes complies emissions radiated ТΧ spurious §15.209(a) Emissions 802.11b -/-802.11b -/- \boxtimes complies radiated < 30 MHz Conducted §15.107(a) 802.11b \boxtimes Emissions -/-802.11b -/complies §15.207 < 30 MHz

3.5 Summary of measurement results

Remark:

1. The measurement uncertainty is not included in the test result.

2. NA = Not Applicable; NP = Not Performed

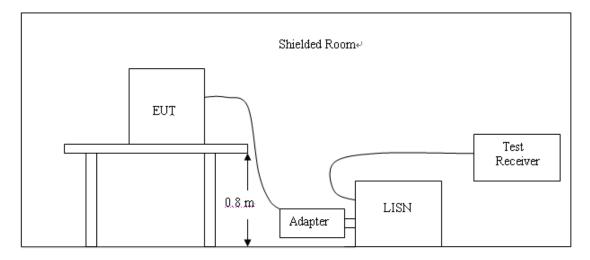
Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
LISN	R&S	ENV216	3560.6550.12	2015/06/02	2016/06/01
LISN	R&S	ESH2-Z5	860014/010	2015/06/02	2016/06/01
Bilog Antenna	Sunol Sciences Corp.	JB1	A061713	2015/06/02	2016/06/01
EMI Test Receiver	R&S	ESCI	103710	2015/06/02	2016/06/01
Spectrum Analyzer	Agilent	N9030A	MY49430428	2015/05/21	2016/05/20
Controller	EM Electronics	Controller EM 1000	N/A	2015/05/21	2016/05/20
Horn Antenna	Sunol Sciences Corp.	DRH-118	A062013	2015/05/19	2016/05/18
Active Loop Antenna	SCHWARZBECK	FMZB1519	1519-037	2015/05/19	2016/05/18
Amplifier	Agilent	8349B	3008A02306	2015/05/19	2016/05/18
Amplifier	Agilent	8447D	2944A10176	2015/05/19	2016/05/18
Temperature/ Humidity Meter	Gangxing	CTH-608	02	2015/05/20	2016/05/19
High-Pass Filter	K&L	9SH10- 2700/X12750-O/O	N/A	2015/05/20	2016/05/19
High-Pass Filter	K&L	41H10- 1375/U12750-O/O	N/A	2015/05/20	2016/05/19
Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-10M	10m	2015/06/02	2016/06/01
Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	2015/06/02	2016/06/01
Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	2015/06/02	2016/06/01
RF Cable	Megalon	RF-A303	N/A	2015/06/02	2016/06/01
Power Sensor	R&S	NRP-Z4	823.3618.03	2015.06.02	2016.06.01
Power Meter	R&S	NRVS	1020.1809.02	2015.06.02	2016.06.01

3.6 Equipments Used during the Test

4 TEST CONDITIONS AND RESULTS

4.1 AC Power Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

- 1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2013.
- 2. Support equipment, if needed, was placed as per ANSI C63.10-2013
- 3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2013
- The EUT received DC5V power from the adapter, the adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5. All support equipments received AC power from a second LISN, if any.
- 6. The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7. Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
- 8. During the above scans, the emissions were maximized by cable manipulation.

AC Power Conducted Emission Limit

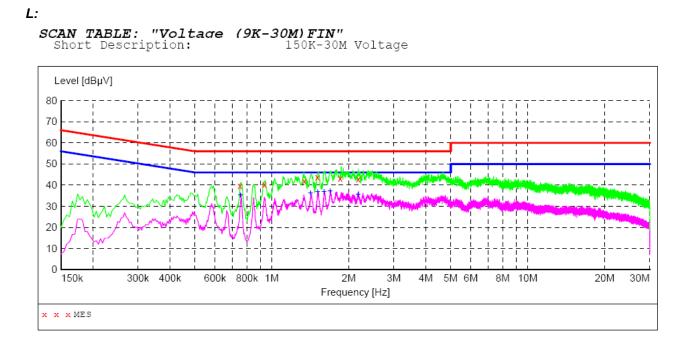
For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following:

Frequency (MHz)	Maximum RF Line Voltage (dBµV)						
	CLA	SS A	CLASS B				
	Q.P.	Ave.	Q.P.	Ave.			
0.15 - 0.50	79	66	66-56*	56-46*			
0.50 - 5.00	73	60	56	46			
5.00 - 30.0	73	60	60	50			

* Decreasing linearly with the logarithm of the frequency

TEST RESULTS

The AC Power Conducted Emission measurement is performed the each test mode (b/g/n) and channel (low/mid/high), the datum recorded below (802.11b mode, the middle channel) is the worst case for all the test modes and channels.

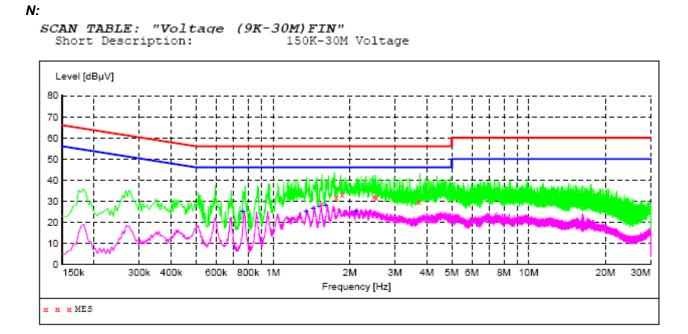


MEASUREMENT RESULT:

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.750000 0.934000 1.338000 1.506000 1.850000 2.178000	39.70 40.40 41.80 43.80 43.30 42.80	10.4 10.5 10.5 10.5 10.5 10.5	56 56 56 56 56	16.3 15.6 14.2 12.2 12.7 13.2	QP QP QP QP QP QP	L1 L1 L1 L1 L1 L1	GND GND GND GND GND GND

MEASUREMENT RESULT:

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.754000 1.418000 1.510000 1.602000 1.690000 2.174000	35.10 36.10 36.70 36.90 37.20 35.50	10.4 10.5 10.5 10.5 10.5 10.5	46 46 46 46 46	10.9 9.9 9.3 9.1 8.8 10.5		L1 L1 L1 L1 L1 L1	GND GND GND GND GND GND



MEASUREMENT RESULT:

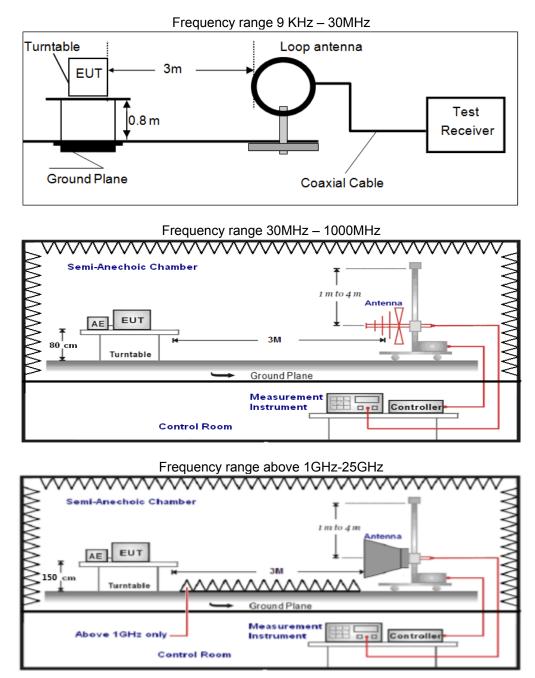
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
1.550000 1.766000 2.478000 2.534000 3.714000	29.10 31.90 33.10 32.20 31.80 29.80	10.5 10.5 10.5 10.5 10.5 10.5	56 56 56 56 56	26.9 24.1 22.9 23.8 24.2 26.2	QP QP QP QP QP QP	N N N N N	GND GND GND GND GND GND

MEASUREMENT RESULT:

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.762000 1.346000 1.434000 1.514000 1.610000 2.102000	25.30 25.20 26.60 27.60 28.00 25.30	10.4 10.5 10.5 10.5 10.5 10.5	46 46 46 46 46	19.4	AV	N N N N N	GND GND GND GND GND GND

4.2 Radiated Emission and Band Edge

TEST CONFIGURATION



TEST PROCEDURE

- 1. The EUT was placed on a turn table which is 0.8m above ground plane for below 1GHz and 1.50m above ground plane for above 1GHz.
- 2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0°C to 360°C to acquire the highest emissions from EUT.
- 3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 4. Repeat above procedures until all frequency measurements have been completed.
- 5. The EUT minimum operation frequency was 32.768 KHz and maximum operation frequency was 2480MHz.so radiated emission test frequency band from 9 KHz to 25GHz.
- 6. The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Ultra-Broadband Antenna	3
1GHz-18GHz	Double Ridged Horn Antenna	3

18GHz-25GHz	Horn Anternna	1
-------------	---------------	---

7. Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector		
9KHz-150KHz	RBW=200Hz/VBW=3KHz,Sweep time=Auto	QP		
150KHz-30MHz	RBW=9KHz/VBW=100KHz,Sweep time=Auto	QP		
30MHz-1GHz	RBW=120KHz/VBW=1000KHz,Sweep time=Auto	QP		
	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto			
1GHz-40GHz	Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak		

More procudre as follows;

1) Sequence of testing 9 kHz to 30 MHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

- --- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.
- --- If the EUT is a floor standing device, it is placed on the ground.
- --- Auxiliary equipment and cables were positioned to simulate normal operation conditions.
- --- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- --- The measurement distance is 3 meter.
- --- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

- --- The antenna height is 1.0 meter.
- --- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement:

--- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QP detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

2) Sequence of testing 30 MHz to 1 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

- --- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- --- The measurement distance is 3 meter.
- --- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

- --- The antenna is polarized vertical and horizontal.
- --- The antenna height changes from 1 to 4 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (\pm 45°) and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

3) Sequence of testing 1 GHz to 18 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

- --- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- --- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- --- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- --- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- --- The measurement distance is 3 meter.
- --- The EUT was set into operation.

Premeasurement:

- --- The turntable rotates from 0° to 315° using 45° steps.
- --- The antenna is polarized vertical and horizontal.
- --- The antenna height scan range is 1 meter to 2.5 meter.

--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.

--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

4) Sequence of testing above 18 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

- --- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- --- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- --- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- --- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- --- The measurement distance is 1 meter.
- --- The EUT was set into operation.

Premeasurement:

--- The antenna is moved spherical over the EUT in different polarizations of the antenna.

Final measurement:

--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

Field Strength Calculation

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

FS = RA + AF + CL - AG

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

For example

Frequency	FS	RA	AF	CL	AG	Transd
(MHz)	(dBµV/m)	(dBµV/m)	(dB)	(dB)	(dB)	(dB)
300.00	40	58.1	12.2	1.6	31.90	

Transd=AF +CL-AG

RADIATION LIMIT

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission out of authorized band shall not exceed the following table at a 3 meters measurement distance. 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)

The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

Frequency (MHz)	Distance (Meters)	Radiated (dBµV/m)	Radiated (µV/m)
0.009-0.49	300	20log(2400/F(KHz))+80	2400/F(KHz)
0.49-1.705	30	20log(24000/F(KHz))+40	24000/F(KHz)
1.705-30	30	20log(30)+40	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

TEST RESULTS

Remark:

1. The radiated measurement are performed the each test mode (b/g/n) and channel (low/mid/high), the datum recorded below (802.11b mode, the middle channel) is the worst case for all the test mode and channel. 2. ULTRA-BROADBAND ANTENNA for the radiation emission test below 1G.

3. HORN ANTENNA for the radiation emission test above 1G.

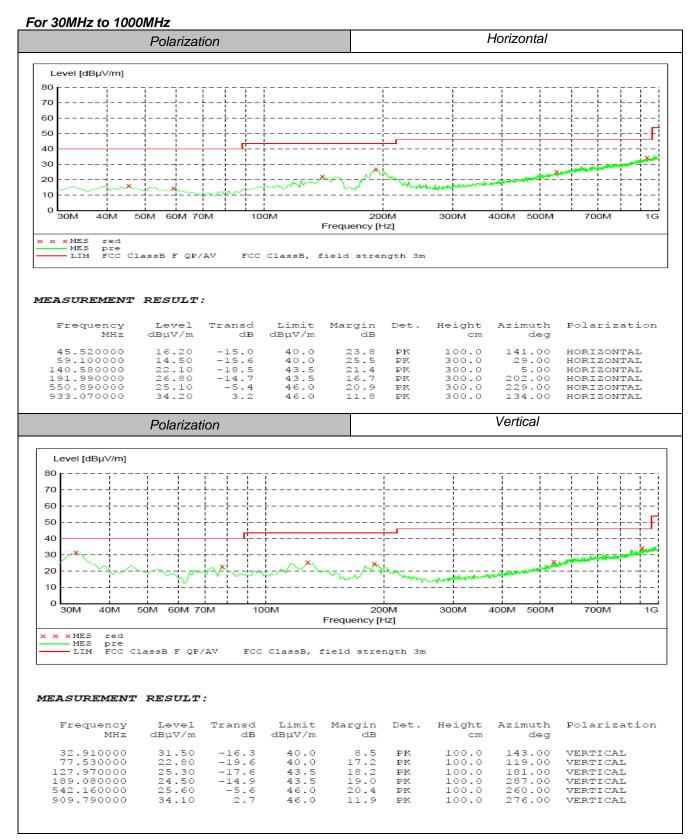
4. We tested both battery powered and powered by adapter charging mode at three orientate ons, recorded worst case at powered by adapter charging mode.

5. "---" means not recorded as emission levels lower than limit.

6. Margin= Limit - Level

For 9KHz to 30MHz

Frequency (MHz)	Corrected Reading (dBµV/m)@3m	FCC Limit (dBµV/m) @3m	Margin (dB)	Detector	Result
11.41	46.69	69.54	22.85	QP	PASS
22.36	43.87	69.54	25.67	QP	PASS



For 1GHz to 25GHz

Note:We tested 11b, 11g, 11n HT20, 11n HT40 and rcorded the worst case at the 11b Mode.

	Frequency	(MHz):		241	2		Polarity:		HORIZONTAL		
No.	Frequency (MHz)	Emissi Leve (dBuV/	I	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)	
1	2402.00	105.55	ΡK			72.15	28.78	4.61	0	33.4	
1	2402.00	95.91	AV			62.51	28.78	4.61	0	33.4	
2	2390.00	41.34	ΡK	74	32.66	8.02	28.72	4.6	0	33.32	
2	2390.00		AV	54							
3	2400.00	45.36	ΡK	74	28.64	11.97	28.78	4.61	0	33.39	
3	2400.00		AV	54							
4	4824.00	64.6	ΡK	74	9.4	60.05	33.52	6.92	35.89	4.55	
4	4824.00	50.02	AV	54	3.98	45.47	33.52	6.92	35.89	4.55	
5	5175.50	50.38	ΡK	74	23.62	43.06	34.49	7.13	34.29	7.32	
5	5175.50		AV	54							
6	7236.00	49.41	ΡK	74	24.59	38.14	37.1	9.19	35.02	11.27	
6	7236.00		AV	54							

802.11b Mode (above 1GHz)

	Frequency((MHz):		241	2		Polarity:		VERTIC	CAL
No.	Frequency (MHz)	Emissi Leve (dBuV/	I	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	2402.00	105.94	ΡK			72.54	28.78	4.61	0	33.4
1	2402.00	96.45	AV			63.05	28.78	4.61	0	33.4
2	2390.00	42.38	ΡK	74	31.62	9.06	28.72	4.6	0	33.32
2	2390.00		AV	54						
3	2400.00	46.1	ΡK	74	27.9	12.71	28.78	4.61	0	33.39
3	2400.00		AV	54						
4	4824.00	65.9	ΡK	74	8.1	61.35	33.52	6.92	35.89	4.55
4	4824.00	50.31	AV	54	3.69	45.76	33.52	6.92	35.89	4.55
5	5233.50	50.63	ΡK	74	23.37	43.21	34.57	7.16	34.31	7.42
5	5233.50		AV	54						
6	7236.00	49.53	ΡK	74	24.47	38.26	37.1	9.19	35.02	11.27
6	7236.00		AV	54						

REMARKS:

1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)

Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
 Margin value = Limit value- Emission level.

- 4. -- Mean the PK detector measured value is below average limit.
- 5. The other emission levels were very low against the limit.

6. RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.

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	Frequency((MHz):		243	7		Polarity:		HORIZO	HORIZONTAL Pre-amplifier (dB) Correction Factor (dB/m) 0 33.5 0 33.5 35.38 1.19 34.2 6.34 34.09 7.67	
No.	Frequency (MHz)	Emissi Leve (dBuV/		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Factor	
1	2437.00	106.06	ΡK			72.56	28.85	4.65	0	33.5	
1	2437.00	96.65	AV			63.15	28.85	4.65	0	33.5	
2	3158.75	47.64	ΡK	74	26.36	46.45	31.14	5.43	35.38	1.19	
2	3158.75		AV	54							
3	4874.00	65.02	ΡK	74	8.98	58.68	33.59	6.95	34.2	6.34	
3	4874.00	50.31	AV	54	3.69	43.97	33.59	6.95	34.2	6.34	
4	5250.75	42.32	ΡK	74	31.68	34.65	34.59	7.17	34.09	7.67	
4	5250.75		AV	54							
5	7311.00	51.33	ΡK	74	22.67	39.67	37.44	9.22	35	11.66	
5	7311.00		AV	54							

	Frequency	(MHz):		243	7		Polarity:		VERTI	CAL
No.	Frequency (MHz)	Emissi Leve (dBuV/	I	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	2437.00	105.24	ΡK			71.74	28.85	4.65	0	33.5
1	2437.00	96.15	AV			62.65	28.85	4.65	0	33.5
2	3678.50	50.77	ΡK	74	23.23	47.25	32.51	6.03	35.02	3.52
2	3678.50	-	AV	54						
3	4874.00	67.9	ΡK	74	6.1	61.56	33.59	6.95	34.2	6.34
3	4874.00	51.08	AV	54	2.92	44.74	33.59	6.95	34.2	6.34
4	5005.15	43.56	ΡK	74	30.44	36.76	34	7.03	34.23	6.8
4	5005.15		AV	54						
5	7311.00	52.31	ΡK	74	21.69	40.65	37.44	9.22	35	11.66
5	7311.00		AV	54						

REMARKS:

- 1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
- 2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor

3. Margin value = Limit value- Emission level.

- 4. -- Mean the PK detector measured value is below average limit.5. The other emission levels were very low against the limit.

6. RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.

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	Frequency(MHz):			246	2	Polarity:		HORIZONTAL		
No.	Frequency (MHz)	Emissi Leve (dBuV/	I	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	2480.00	105.27	ΡK			71.65	28.92	4.7	0	33.62
1	2480.00	95.47	AV			61.85	28.92	4.7	0	33.62
2	2483.50	53.55	ΡK	74	20.45	19.92	28.93	4.7	0	33.63
2	2483.50		AV	54						
3	2500.00	44.74	ΡK	74	29.26	11.06	28.96	4.72	0	33.68
3	2500.00		AV	54						
4	4924.00	65.54	ΡK	74	8.46	60.76	33.71	6.98	35.91	4.78
4	4924.00	51.32	AV	54	2.68	46.54	33.71	6.98	35.91	4.78
5	5215.70	49.86	ΡK	74	24.14	42.46	34.56	7.15	34.31	7.4
5	5215.70		AV	54						
6	7386.00	50.6	ΡK	74	23.4	38.72	37.61	9.25	34.98	11.88
6	7386.00		AV	54						

	Frequency(MHz):			246	2	Polarity:		VERTICAL		
No.	Frequency (MHz)	Emissi Leve (dBuV/	I	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	2480.00	105.27	ΡK			71.65	28.92	4.7	0	33.62
1	2480.00	95.49	AV			61.87	28.92	4.7	0	33.62
2	2483.50	55.11	ΡK	74	18.89	21.48	28.93	4.7	0	33.63
2	2483.50		AV	54						
3	2500.00	43.83	ΡK	74	30.17	10.15	28.96	4.72	0	33.68
3	2500.00		AV	54						
4	4924.00	65.57	ΡK	74	8.43	60.79	33.71	6.98	35.91	4.78
4	4924.00	50.24	AV	54	3.76	45.46	33.71	6.98	35.91	4.78
5	5155.75	48.85	ΡK	74	25.15	41.57	34.45	7.12	34.29	7.28
5	5155.75		AV	54						
6	7386.00	51.52	ΡK	74	22.48	39.64	37.61	9.25	34.98	11.88
6	7386.00		AV	54						

REMARKS:

- 1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
- 2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
- Margin value = Limit value- Emission level.
 -- Mean the PK detector measured value is below average limit.
 The other emission levels were very low against the limit.
- 6. RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.

4.3 Maximum Output Power

TEST CONFIGURATION



TEST PROCEDURE

According to KDB558074 D01 DTS Meas Guidance v03:

PKPM1 Peak power meter method: The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

Maximum conducted (average) output power: As an alternative to spectrum analyzer or EMI receiver measurements, measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied.

1. The EUT is configured to transmit continuously, or to transmit with a constant duty factor.

2. At all times when the EUT is transmitting, it shall be transmitting at its maximum power control level.

3. The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.

If the transmitter does not transmit continuously, measure the duty cycle (x) of the transmitter output signal as described in Section 6.0.

Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.

Adjust the measurement in dBm by adding $10\log(1/x)$, where x is the duty cycle to the measurement result.

LIMIT

The Maximum Peak Output Power Measurement is 30dBm.

TEST RESULTS

Remark: We measured output power at difference data rate for each mode and recorded worst case for each mode.

4.3.1 802.11b Test Mode

A. Test Verdict

Channel	Frequency (MHz)	Measured Output Peak Power (dBm)	Limits (dBm)	Verdict
1	2412	17.58	30	PASS
6	2437	18.09	30	PASS
11	2462	18.02	30	PASS

Note:

1. For 802.11b mode at finial test to get the worst-case emission at 1Mbps.

2. The test results including the cable lose.

4.3.2 802.11g Test Mode

A. Test Verdict

Channel	Frequency (MHz)	Measured Output Peak Power (dBm)	Limits (dBm)	Verdict
1	2412	17.68	30	PASS
6	2437	18.54	30	PASS
11	2462	18.05	30	PASS

Note:

1. For 802.11g mode at finial test to get the worst-case emission at 6Mbps.

2. The test results including the cable lose.

4.3.3 802.11n HT20 Test Mode

A. Test Verdict

Channel	Frequency (MHz)	Measured Output Peak Power (dBm)	Limits (dBm)	Verdict
1	2412	18.06	30	PASS
6	2437	18.85	30	PASS
11	2462	18.14	30	PASS

Note:

For 802.11n HT20 mode at finial test to get the worst-case emission at 6.5Mbps.
 The test results including the cable lose.

4.3.4 802.11n HT40 Test Mode

A. Test Verdict

Channel	Frequency (MHz)			Verdict
1	2412	15.57	30	PASS
6	2437	16.89	30	PASS
11	2462	15.71	30	PASS

Note:

1. For 802.11n HT40 mode at finial test to get the worst-case emission at 13.5Mbps.

2. The test results including the cable lose.

4.4 Power Spectral Density

TEST CONFIGURATION



TEST PROCEDURE

According to KDB 558074 D01 V03 Method PKPSD (peak PSD) this procedure shall be used if maximum peak conducted output power was used to demonstrate compliance, and is optional if the maximum conducted (average) output power was used to demonstrate compliance.

- 1. Set analyzer center frequency to DTS channel center frequency.
- 2. Set the span to 1.5 times the DTS bandwidth.
- 3. Set the RBW to: 3 kHz \leq RBW \leq 100 kHz.
- 4. Set the VBW ≥ 3 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 within the RBW.

10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

<u>LIMIT</u>

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

TEST RESULTS

4.4.1 802.11b Test Mode

A. Test Verdict

Channel	Frequency (MHz)	Report PSD (dBm/100KHz)	Refer to Plot	Limits (dBm/3KHz)	Verdict
1	2412	6.456	Plot 4.4.1 A	8	PASS
6	2437	7.605	Plot 4.4.1 B	8	PASS
11	2462	7.790	Plot 4.4.1 C	8	PASS

Note:

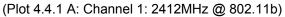
1. For 802.11b mode at finial test to get the worst-case emission at 1Mbps.

2. The test results including the cable lose.

B. Test Plots

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(Plot 4.4.1 B: Channel 6: 2437MHz @ 802.11b)



(Plot 4.4.1 C: Channel 11: 2462MHz @ 802.11b)

4.4.2 802.11g Test Mode

Α.	Test	Verdict

Channel	Frequency (MHz)	Report PSD (dBm/100KHz)	Refer to Plot	Limits (dBm/3KHz)	Verdict
1	2412	1.832	Plot 4.4.2 A	8	PASS
6	2437	3.261	Plot 4.4.2 B	8	PASS
11	2462	2.782	Plot 4.4.2 C	8	PASS

Note:

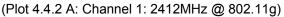
1. For 802.11g mode at finial test to get the worst-case emission at 6Mbps.

2. The test results including the cable lose.

B. Test Plots

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(Plot 4.4.2 B: Channel 6: 2437MHz @ 802.11g)



(Plot 4.4.2 C: Channel 11: 2462MHz @ 802.11g)

4.4.3 802.11n HT20 Test Mode

Α.	Test	Verdict

Channel	Frequency (MHz)	Report PSD (dBm/100KHz)	Refer to Plot	Limits (dBm/3KHz)	Verdict
1	2412	2.619	Plot 4.4.3 A	8	PASS
6	2437	3.819	Plot 4.4.3 B	8	PASS
11	2462	2.802	Plot 4.4.3 C	8	PASS

Note:

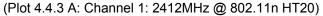
1. For 802.11n HT20 mode at finial test to get the worst-case emission at 6.5Mbps.

2. The test results including the cable lose.

B. Test Plot

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(Plot 4.4.3 B: Channel 6: 2437MHz @ 802.11n HT20)



(Plot 4.4.3 C: Channel 11: 2462MHz @ 802.11n HT20)

4.4.4 802.11n HT40 Test Mode

Channel	Frequency (MHz)	Report PSD (dBm/100kHz)	Refer to Plot	Limits (dBm/3KHz)	Verdict
3	2422	-3.506	Plot 4.4.4 A	8	PASS
6	2437	-0.751	Plot 4.4.4 B	8	PASS
9	2452	-2.919	Plot 4.4.4 C	8	PASS

Note:

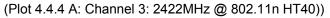
1. For 802.11n HT40 mode at finial test to get the worst-case emission at 13.5Mbps.

2. The test results including the cable lose.

B. Test Plots

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(Plot 4.4.4 B: Channel 6: 2437MHz @ 802.11n HT40)

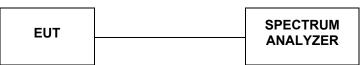
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(Plot 4.4.4 C: Channel 9: 2452MHz @ 802.11n HT40)

4.5 Spurious RF Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2013 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW=100 kHz and VBW= 300 KHz to measure the peak field strength, and measure frequency range from 9 KHz to 26.5GHz.

<u>LIMIT</u>

1. Below -20dB of the highest emission level in operating band.

2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

TEST RESULTS

Remark: The measurement frequency range is from 9 KHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and bandege measurement data.

4.5.1 802.11b Test Mode

Channel	Frequency (MHz)	Frequency Range	Refer to Plot	Limit (dBc)	Verdict	
		2.412 GHz	Plot 4.5.1 A1		PASS	
1	2412	30MHz -3GHz	Plot 4.5.1 A2	-20	PASS	
		3GHz25 GHz	Plot 4.5.1 A3	-20	PASS	
	2437	2.437 GHz	Plot 4.5.1 B1		PASS	
6		30MHz -3GHz	Plot 4.5.1 B2	-20	PASS	
		3GHz-25GHz	Plot 4.5.1 B3	-20	PASS	
11	2462	2.462 GHz	Plot 4.5.1 C1		PASS	
		30MHz -3GHz	Plot 4.5.1 C2	-20	PASS	
		3GHz-25 GHz	Plot 4.5.1 C3	-20	PASS	
Conducted	Left Ban	d edge	Plot 4.5.1 D1	-20	PASS	

Plot 4.5.1 D2

-20

PASS

A. Test Verdict

Note:

bandedge

1. For 802.11b mode at finial test to get the worst-case emission at 1Mbps.

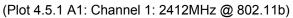
Right Band edge

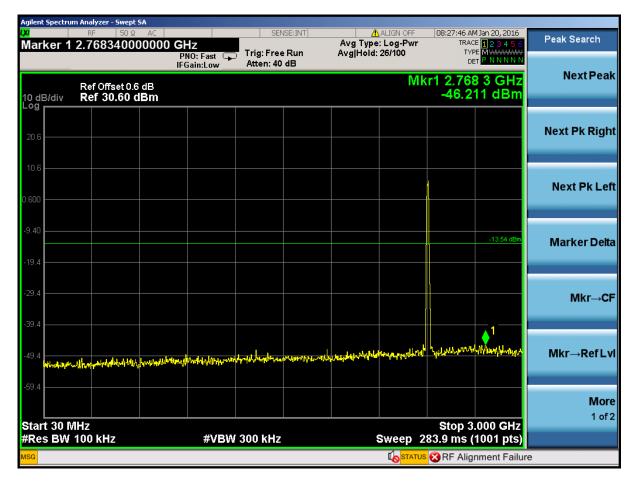
2. The test results including the cable lose.

3. For 9KHz -30MHz,Because there was only background, So We did not recorded data.

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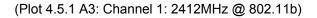






(Plot 4.5.1 A2: Channel 1: 2412MHz @ 802.11b)

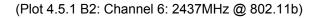
	Spectrum	Analyzer - Swept				-			-		
<mark>IXI</mark> Mar	ker 1 '	RF 50 Ω 23.878000		GHz	SEN	ISE:INT		ALIGN OFF		M Jan 20, 2016	Peak Search
men		20.010000		PNO: Fast 🕞	Trig: Free Atten: 40		Avg Hold:		TY	PE MWWWWW ET P. N.N.N.N.N.	
				IFGain:Low	Atten: 40	ab					NextPeak
	Ref Offset 0.6 dB Mkr1 23.878 GHz dB/div Ref 30.60 dBm -38.806 dBm										
10 dE Log _I	3/div	Ref 30.60	dBm				1	1	-00.0		
20.6											Next Pk Right
10.6											
											Next Pk Left
0.600											
-9.40											
										-13.54 dBm	Marker Delta
-19.4											
-29.4											Mkr→CF
										1	
-39.4										d W. Muh	
						Marken yesh	attantikyat kalih	and the state of the second	M. WARTHAN		
-49.4	the way	1 Harrison May Count	Marily and a second second	Million Burger 10	and the stage of the stage						Mkr→RefLvl
-59.4											
											More
Star	t 3.00 (GHz			I		~		Stop 2	5.00 GHz	1 of 2
#Re	s BW 1	00 kHz		#VBW	300 kHz			Sweep	2.103 s (1001 pts)	
MSG										nment Failur	e





(Plot 4.5.1 B1: Channel 6: 2437MHz @ 802.11b)

	Spectrum	Analyzer - Swept				-					
<mark>IXI</mark> Mar	ker 1 '	RF 50 Ω 2.7505200		47	SEN	ISE:INT		ALIGN OFF		4 Jan 20, 2016 E <mark>1 2 3 4 5 6</mark>	Peak Search
men	NGT T		Р	NO: Fast 🗔	Trig: Free Atten: 40		Avg Hold:		TYF	E M WWWWW T P N N N N N	
			IF0	Gain:Low	Atten: 40	ab		BAL.			Next Peak
10.11		Ref Offset 0.0						IVIK	-45.8) 5 GHz 34 dBm	
10 dE Log	3/alv	Ref 30.60	ивт					1		o-r a Bill	
20.6											Next Pk Right
10.6											
											Next Pk Left
0.600											
									4		
-9.40										-12.40 dBm	Marker Delta
10.1											Marker Dela
-19.4											
-29.4											
-23.4									1		Mkr→CF
-39.4											
										♦ ¹	
-49.4		erlanderer of the states of th				k dada da da	and the second states of the s	hangentered	Laboren and	Monumenter	Mkr→RefLvl
	utter and the	elled of both of both of	and the second second second second	************	ik,∱oslik, a noskutádsi		Mag 1414 Law 1 4				
-59.4											
											More
Otor	+ 20 M								Otan 2		1 of 2
	t 30 M s BW 1	HZ 00 kHz		#VBW	300 kHz			Sweep_2	510p 3 83.9 ms (.000 GHz 1001 pts)	
MSG					000 1112					nment Failur	
Mod										intent allu	0

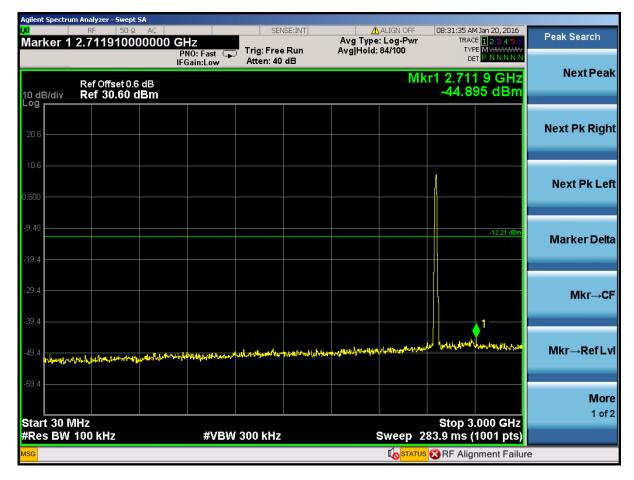




(Plot 4.5.1 B3: Channel 6: 2437MHz @ 802.11b)







(Plot 4.5.1 C2: Channel 11: 2462MHz @ 802.11b)

	: Spectrum	Analyzer - Swept	SA								
<mark>1,XI</mark> Mar	ker 1 2	RF 50 Ω	AC 000000 (P	Hz NO: Fast		Run		ALIGN OFF : Log-Pwr 1/100	TRAC	M Jan 20, 2016 ^{3E} <mark>1 2 3 4 5 6</mark> PE M WWWWW	Peak Search
10 di Log		Ref Offset 0.6 Ref 30.60 (iF(6 dB	Gain:Low	Atten: 40	dB		М	kr1 23.3	06 GHz 72 dBm	Next Peak
20.6											Next Pk Right
10.6 0.600											Next Pk Left
-9.40 -19.4										-12.21 dBm	Marker Delta
-29.4 -39.4									L. at. 1	1 wheth to a	Mkr→CF
-49.4 -59.4	rm lunit, tu	Anter a trading of the last	14-murth-man	uhanaharahanah	yeta affertywane jiwi	Contraction of the contraction of the	halan ang kanangar	han an a	₩ŋ ſ₩₽₩₩₩₩₩₩ ₩	a	Mkr→RefLvl
Star	t 3.00 (s BW 1	GHz 00 kHz		#VBW	' 300 kHz			Sweep	Stop 2 2.103 s (5.00 GHz 1001 pts)	More 1 of 2
MSG									🛿 RF Alig	nment Failur	e

(Plot 4.5.1 C3: Channel 11: 2462MHz @ 802.11b)

Agilent Spectrum Analyzer - S						
Marker 3 2.40000	50 Ω AC	SENSE:II	Avg Type: Lo	og-Pwr TRAG	M Jan 20, 2016 CE <mark>1 2 3 4 5 6</mark>	Marker
	PNO: Fast IFGain:Lov		n Avg Hold:>10		PE MWWWWW ET P N N N N N	Marker Table
Ref Offse				Mkr3 2.400	00 GHz	
10 dB/div Ref 30.	60 dBm			-33.6	25 dBm	_
20.6						Marker Count
10.6					∆ ¹	Marker Count
0.600				^{ىلى} لىرىمى	ny Annung	[ou]
-9.40				V	' \ <u>k</u>	Couple
-19.4				<u>J</u>		Markers
-29.4				31	Ľ	On <u>Off</u>
-39.4				2		
-49.4	م _م ر هر _م ر هار موسواله را معالم مرد مرد مرد هار م	Rimone a grant of the Party of	a montesta protogo man a human	em N ^r		
-59.4						
				6 4 0 1 4		
Start 2.31000 GHz #Res BW 100 kHz		/BW 300 kHz	Sw	stop 2.42 eep 10.73 ms (2200 GHz 1001 pts)	
MKR MODE TRC SCL	×	Y		-	ON VALUE	
1 N 1 f	2.412 48 GHz 2.390 00 GHz					
2 N 1 f 3 N 1 f	2.400 00 GHz	-47.849 dBm -33.625 dBm				All Markers Off
5						
6						
8						More
10						2 of 2
MSG			0	<mark>⊗status</mark> ⊗RF Alig	nment Failur	e

(Plot 4.5.1 D1: Left Band edge @ 802.11b)



(Plot 4.5.1 D2: Right Band edge @ 802.11b)

4.5.2 802.11g Test Mode

A. Test Verdict

Channel	Frequency (MHz)	Frequency Range	Refer to Plot	Limit (dBc)	Verdict
		2.412 GHz	Plot 4.5.2 A1		PASS
1	2412	30MHz -3GHz	z Plot 4.5.2 A2	-20	PASS
		3GHz25 GH:	z Plot 4.5.2 A3	-20	PASS
		2.437 GHz	Plot 4.5.2 B1		PASS
6	2437	30MHz -3GHz	z Plot 4.5.2 B2	-20	PASS
		3GHz-25GHz	Plot 4.5.2 B3	-20	PASS
		2.462 GHz	Plot 4.5.2 C1		PASS
11	2462	30MHz -3GHz	z Plot 4.5.2 C2	-20	PASS
		3GHz-25 GHz	Plot 4.5.2 C3	-20	PASS
Conducted	Left Bar	nd edge	Plot 4.5.2 D1	-20	PASS
bandedge	Right Ba	nd edge	Plot 4.5.2 D2	-20	PASS

Note:

- 1. For 802.11g mode at finial test to get the worst-case emission at 6Mbps.
- 2. The test results including the cable lose.
- 3. For 9KHz -30MHz,Because there was only background, So We did not recorded data.

Agilent Spectrum Analyzer - Swept SA LXI RF 50 Ω AC				M Jan 20, 2016	Peak Search
Marker 1 2.41072908000	PNO: Fast 😱 Trig: Free		-100/100 TY	CE 123456 PE MWWWWW ET P N N N N N	Feak Sealch
Ref Offset 0.6 dB 10 dB/div Ref 30.60 dBm	IFGain:Low Atten: 40	dB	Mkr1 2.410 7		Next Peak
20.6					Next Pk Right
0.600	undervalannaparation	montmanturanting	when have be		Next Pk Left
-9.40 -19.4					Marker Delta
-29.4				N N	Mkr→CF
-49.4					Mkr→RefLvl
-59.4 Center 2.41200 GHz #Res BW 100 kHz	#VBW 300 kHz		Span 2 Sweep 2.200 ms (2.70 MHz	More 1 of 2
MSG	#VBW 300 KHZ		Sweep 2.200 ms (Status SRF Alig		

(Plot 4.5.2 A1: Channel 1: 2412MHz @ 802.11g)

Agilent	Spectrum	Analyzer - Swep							-		
<mark>IXI</mark> Marl	ker 1 1	RF 50 S 2.6495400		3Hz	SEN	ISE:INT		ALIGN OFF		4 Jan 20, 2016 E 1 2 3 4 5 6	Peak Search
ineu				PNO: Fast 😱	Trig: Free Atten: 40		Avg Hold:		TYF	E M MMMM	
_				IFGain:Low	Atten: 40	ab		ML			Next Peak
10.15		Ref Offset 0.						IVIK	r1 2.649	89 dBm	
10 dE Log _I	3/div	Ref 30.60	авт					1	-40.2	oo abiii	
20.6											Next Pk Right
10.6											
											Next Pk Left
0.600									A		
-9.40											Marker Dette
										-18.17 dBm	Marker Delta
-19.4											
-29.4											Mkr→CF
-39.4											
-49.4							alle desta brightabili	When the control of	yman	www.hen.itinter	Mkr→RefLvl
-43.4	rander/https	and hat have	sheet we the	efter Marrison and Marrison	and a local sector of the	a had a should be a loss of the second s	- And - A				
-59.4											
-30.4											More
											1 of 2
	t 30 M			40 (B))A	000 1.11-			0	Stop 3	.000 GHz	
	S BW 1	00 kHz		#VBW	300 kHz				-	1001 pts)	
MSG									🛛 RF Alig	nment Failur	e

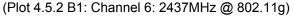
⁽Plot 4.5.2 A2: Channel 1: 2412MHz @ 802.11g)



(Plot 4.5.2 A3: Channel 1: 2412MHz @ 802.11g)

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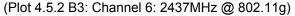






(Plot 4.5.2 B2: Channel 6: 2437MHz @ 802.11g)

Agilent	: Spectrum Analyzer - Swept SA					
<mark>.x</mark> Mar	RF 50 Ω AC ker 1 2.6495400000	00 GHz PN0: Fast C Trig: Free	Avg Type	: Log-Pwr	3:34:31 AM Jan 20, 2016 TRACE 1 2 3 4 5 6 TYPE M WWWWW DET <mark>P N N N N N</mark>	Peak Search
10 dE Log	Ref Offset 0.6 dB B/div Ref 30.60 dBm	IFGain:Low Atten: 40		Mkr1	2.649 5 GHz -45.164 dBm	Next Peak
20.6						Next Pk Right
10.6 0.600						Next Pk Left
-9.40 -19.4					-16.74 dBm	Marker Delta
-29.4 -39.4						Mkr→CF
-49.4	lengthedailymhilymhilwmhilwmhilwmhilwmhilwmhilwmhilwmhilw	galler of your distance beam to get a get and get an adjust of the state of the state of the state of the state	Matternations and a second second second	your Jogward	www.wither.uphere.upher	Mkr→RefLvl
	t 30 MHz s BW 100 kHz	#VBW 300 kHz		sweep 2 <u>83.</u>	Stop 3.000 GHz 9 ms (1001 pts)	More 1 of 2
MSG					RF Alignment Failure)





(Plot 4.5.2 C1: Channel 11: 2462MHz @ 802.11g)

	Spectrum Analyzer - Swept SA					
<mark>(x)</mark> Mar	RF 50 Ω AC Ker 1 2.667360000000 AC	GHz PNO: Fast C Trig: Free		ALIGN OFF ype: Log-Pwr old: 22/100	08:35:13 AM Jan 20, 2010 TRACE 1 2 3 4 5 TYPE MWWWW	6 Peak Search
10 dE Log r	Ref Offset 0.6 dB 3/div Ref 30.60 dBm	IFGain:Low Atten: 40		Mk	r1 2.667 4 GH -46.171 dBr	Next Peak
20.6						Next Pk Right
10.6 · 0.600 ·					A	Next Pk Left
-9.40 -19.4					-17.22 dB	Marker Delta
-29.4 ·						Mkr→CF
-49.4	Largeonalization of the souther addition	valtallallerspatklerseterset	ilahoraan ahay haan taalaa	hofterfredbyterreterreter	A Marin Wardson	Mkr→RefLvl
	t 30 MHz \$ BW 100 kHz	#VBW 300 kHz		Sweep 2	Stop 3.000 GH 83.9 ms (1001 pts	More 1 of 2
MSG					🗙 RF Alignment Fai	ure





(Plot 4.5.2 C3: Channel 11: 2462MHz @ 802.11g)

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	: Spect	trum /		zer - Swepl															
r <mark>xı</mark> Mar	ker	12	RF 2.41	50 ຊ 32640			1Z NO: Fast		SEN Trig: Free	NSE:INT		Avg T Avg H	ype: Lo	IGN OFF og-Pwr 00/100		TYPE	an 20, 20 <mark>1</mark>	56	Peak Search
					8 di D		NO: Fast Gain:Low		Atten: 40						1 2.41	DET	PNNNI	N N	Next Peak
10 d Log	B/div			Offset 0. f 30.60											2	.52	dB	m	
20.6	\vdash																1		Next Pk Righ
10.6 0.600															U.) مەلبىر			
-9.40																			Next Pk Lef
-19.4 -29.4														· · · · ·	0 3			1	
-39.4									and the second second		L. J. J. J.	where had not		2 N ^{MARTY}					Marker Delta
-49.4 -59.4		1-771-4 1	of plane	an din ka ya daga daga daga daga daga daga daga	4. Waynersbar	al manager	and a second	Arger (200											
				0 GHz											Spar	<u>ו</u> 112	2.0 MH	Ηz	
	IS BU				×	,	#V	BW :	300 kHz Y		FUNC			veep 1	0.73 m	s (10 ction		s)	Mkr→CF
1 2	N N N	1 1 1	f f		2. 2.	2.413 26 2.390 00	0 GHz		2.520 dE -43.802 dE	3m 📃	PONC	IUN	FUNCTION	UN WIDTH	FUN	UTION	VALUE	Î	
345	Ň		f			2.400 00			-34.527 dE										Mkr→RefLv
5 6 7																			
8 9 10																			More 1 of 2
11																		-	
MSG													1		🛛 🔀 RF A	Alignr	nent Fa	ailure	e





(Plot 4.5.2 D2: Right Band edge @ 802.11g)

-20

PASS

4.5.3 802.11n HT20MHz Test Mode

A. Test Verdict

Channel	Frequency (MHz)	Frequency Range	Refer to Plot	Limit (dBc)	Verdict				
		2.412 GHz	Plot 4.5.3 A1		PASS				
1	2412	30MHz -3GHz	z Plot 4.5.3 A2	-20	PASS				
		3GHz25 GH	z Plot 4.5.3 A3	-20	PASS				
		2.437 GHz	Plot 4.5.3 B1		PASS				
6	2437	30MHz -3GHz	z Plot 4.5.3 B2	-20	PASS				
		3GHz-25GHz	Plot 4.5.3 B3	-20	PASS				
		2.462 GHz	Plot 4.5.3 C1		PASS				
11	2462	30MHz -3GHz	z Plot 4.5.3 C2	-20	PASS				
		3GHz-25 GHz	2 Plot 4.5.3 C3	-20	PASS				
Conducted	Left Ban	id edge	Plot 4.5.3 D1	-20	PASS				

Plot 4.5.3 D2

Note:

1. For 802.11n HT20MHz mode at finial test to get the worst-case emission at 6.5Mbps.

Right Band edge

2. The test results including the cable lose.

3. For 9KHz -30MHz,Because there was only background, So We did not recorded data.

B. Test Plots

bandedge

Agilent Spectrum Analyzer - Swept XI RF 50 Ω Marker 1 2.41325700	AC 00000 GHz	SENSE:INT	ALIGN OFF Avg Type: Log-Pwr Avg Hold:>100/100	07:38:19 AM Jan 20, 2016 TRACE 12 3 4 5 6 TYPE M WWWWWW	Peak Search
Ref Offset 0.6 10 dB/div Ref 30.60 d		Atten: 40 dB		2.413 257 GHz 2.619 dBm	Next Peak
20.6					Next Pk Righ
10.6	And montering	wandhagan jandh lagan	Monal and Marca Journa		Next Pk Lef
-9.40					Marker Delta
-29.4 -39.4				Vv VV	Mkr→CF
-49.4					Mkr→RefLv
-59.4 Center 2.41200 GHz #Res BW 100 kHz	#\/B\M	300 kHz	Swaan-2	Span 25.14 MHz .467 ms (1001 pts)	More 1 of 2
		500 MIZ		RF Alignment Failure	;

(Plot 4.5.3 A1: Channel 1: 2412MHz @ 802.11n HT20)

Agilent Spectrum Analyzer - Swept SA							
Marker 1 2.765370000000		ENSE:INT		ALIGN OFF : Log-Pwr 29/100	TRAC	M Jan 20, 2016 CE <mark>1 2 3 4 5 6</mark> PE M W W W W	Peak Search
Ref Offset 0.6 dB	IFGain:Low Atten:	40 dB		Mk	(r1 2.76	5 4 GHz 47 dBm	Next Peak
20.6							Next Pk Right
0.600							Next Pk Left
-9.40						-17.38 dBm	Marker Delta
-29.4							Mkr→CF
-49.4 maskaliteliers/afletyer.frv.leh.lg/r.egen/v/	Arnovellow the the second s	waren an	ranakimballifula	nt hay was as a land	Baraching Barris	1 walikiyay.h.gli.p	Mkr→RefLvl
-59.4					Stop 3	.000 GHz	More 1 of 2
#Res BW 100 kHz	#VBW 300 kH	Z			83.9 ms (1001 pts) nment Failur	e

(Plot 4.5.3 A2: Channel 1: 2412MHz @ 802.11n HT20)



(Plot 4.5.3 A3: Channel 1: 2412MHz @ 802.11n HT20)

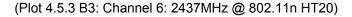






(Plot 4.5.3 B2: Channel 6: 2437MHz @ 802.11n HT20)

Agilent	Spectrum Analyzer - Swept SA					
<mark>ıxı</mark> Mar	RF 50 Ω AC	00 GHz	Avg Typ	ALIGN OFF e: Log-Pwr	08:38:47 AM Jan 20, 2016 TRACE 1 2 3 4 5 6	Peak Search
		PNO: Fast Trig: Free IFGain:Low Atten: 40		1: 23/100	TYPE MWWWWW DET PNNNN	9
10 dE	Ref Offset 0.6 dB B/div Ref 30.60 dBm			Mł	r1 23.196 GHz -37.767 dBm	Next Peak
Log 20.6						Next Pk Right
10.6 0.600						Next Pk Left
-9.40 -19.4					-16.18 dBm	Marker Delta
-29.4 -39.4					1	Mkr→CF
-49.4	Hawaran Maring and the second	Hadalahan walanda walanda waa	سەل ^{لى} لىرا ¹¹ مرىيە ⁴¹ مەمەر بىلىكى ئەمىرى	Ant-it-prosent	relife yeers to be made a second of the seco	Mkr→RefLvl
	t 3.00 GHz				Stop 25.00 GHz	More 1 of 2
#Rea ^{MSG}	s BW 100 kHz	#VBW 300 kHz			2.103 s (1001 pts)	





(Plot 4.5.3 C1: Channel 11: 2462MHz @ 802.11n HT20)

Agilent	Spectrum	Analyzer - Swep									
<mark>.xı</mark> Mar	ker 1	RF 50 S 2.6733000		Hz		ISE:INT	Avg Type	ALIGN OFF	TRAC	4 Jan 20, 2016 E <mark>1 2 3 4 5 6</mark>	Peak Search
			F	NO: Fast 🛛 🖵 Gain:Low	Trig: Free Atten: 40		Avg Hold:	21/100	TYI Di		
		Ref Offset 0.						Mk	r1 2.67	3 3 GHz	Next Peak
10 dE Log	3/div	Ref 30.60							-46.1	29 dBm	
Log											
20.6											Next Pk Right
10.6											
											Next Pk Left
0.600									1		
-9.40											
										-17.20 dBm	Marker Delta
-19.4											
-29.4											Mkr→CF
-39.4											
									∫	1	
-49.4		humuluhamu	. d. marthetad	and and a state of the second	and the state	Mankingerun	WINNIA MARINA	all the provident	y have party	handerstallalise	Mkr→RefLvl
	t type of the	(MMAN) and an and a second	Wate Lotter			· ·					
-59.4											
											More 1 of 2
	t 30 M			40 (1934)				.	Stop 3	.000 GHz	1.012
_	s BW '	00 kHz		#VBW	300 kHz			_		1001 pts)	
MSG									🛛 RF Alig	nment Failur	e

(Plot 4.5.3 C2: Channel 11: 2462MHz @ 802.11n HT20)



(Plot 4.5.3 C3: Channel 11: 2462MHz @ 802.11n HT20)

Agilent	Spectru		yzer - Swe															
I <mark>XI</mark> Marl	cor 1	RF		Ω AC	00 GH	1-7		SEN	ISE:INT		Ava Ti	ALIG				n 20, 2016		Peak Search
Meur		2.4	10000	0000	PN	IO: Fast		ig: Free				ld:>100			TYPE		₩	
					IFG	iain:Low	At	ten: 40	dB									NextPeak
			Offset										Mkr	1 2.4	10 69) GHz		NEXTFOR
10 dE Log j	3/div	Re	f 30.6	0 dBn	n									1	.947	dBm		
20.6																		
10.6															1			Next Pk Right
															• • ',			
0.600														كمكنكم	لمهلك	why have		
-9.40																		Next Pk Left
-19.4														13				NEXL FK LEIL
-29.4												<u>∧ 2</u>	-	\$2]				
-39.4													- Mirta					
-49.4		warden	a dana sebelar dan sebelar	لقافيه بالتدري	han ar	-	non and the	energy and	trenlander	المورمان	ward the state	WIT I						Marker Delta
-59.4																		
			0 GHz									_		Spa	n 112	.0 MHz		
#Re	s BW	100	KHZ			₩VE	3W 30	J KHZ				Swe	ep 1	0.73 m	IS (10	u1 pts;		Mkr→CF
	MODE TP	_			X			Y		FUNC	TION	FUNCTION	I WIDTH	FUI	ICTION V	ALUE 🔺		
1 2	N 1 N 1	f f			2.410 69 2.390 00			<u>.947 dE</u> 531 dE										
3	N 1	f			2.400 00) GHz	-33.	029 dE	3m									Mkr→RefLvl
5																		
6		_																
8																		More
9 10		_																1 of 2
11																•		
													_					
MSG												<u></u>	STATUS	🛛 🔀 RF /	Alignm	ent Fail	ure	

(Plot 4.5.3 D1: Left Band edge @ 802.11n HT20)



(Plot 4.5.3 D2: Right Band edge@ 802.11n HT20)

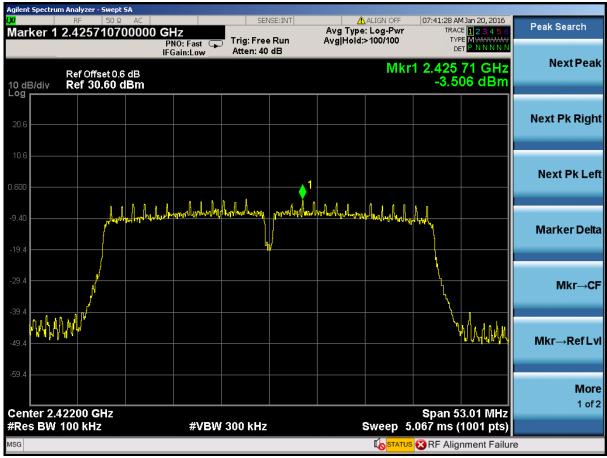
4.5.4 802.11n HT40MHz Test Mode

A. Test Verdict

Channel	Frequency (MHz)	Frequency Range	Refer to Plot	Limit (dBc)	Verdict
		2.422 GHz	Plot 4.5.4 A1		PASS
3	2422	30MHz -3GHz	Plot 4.5.4 A2	-20	PASS
		3GHz25 GHz	Plot 4.5.4 A3	-20	PASS
		2.437 GHz	Plot 4.5.4 B1		PASS
6	2437	30MHz -3GHz	Plot 4.5.4 B2	-20	PASS
		3GHz-25GHz	Plot 4.5.4 B3	-20	PASS
		2.452 GHz	Plot 4.5.4 C1		PASS
9	2452	30MHz -3GHz	Plot 4.5.4 C2	-20	PASS
		3GHz-25 GHz	Plot 4.5.4 C3	-20	PASS

Note:

- 1. For 802.11n HT40MHz mode at finial test to get the worst-case emission at 13.5Mbps.
- 2. The test results including the cable lose.
- 3. For 9KHz -30MHz,Because there was only background, So We did not recorded data.



(Plot 4.5.4 A1: Channel 3: 2422MHz @ 802.11n HT40)

Agilent	: Spectrum Analyzer - Swept SA					
<mark>ıxı</mark> Mar	RF 50 Ω AC ker 1 2.685180000000	GHz	Avg Typ	ALIGN OFF e: Log-Pwr	08:42:51 AM Jan 20, 2016 TRACE 1 2 3 4 5 6	Peak Search
		PNO: Fast 😱 Trig: Free IFGain:Low Atten: 40		: 55/100	TYPE MWWWWW DET PNNNNN	
10 dE Log i	Ref Offset 0.6 dB B/div Ref 30.60 dBm			Mkr	1 2.685 2 GHz -45.089 dBm	Next Peak
20.6						Next Pk Right
10.6 0.600						Next Pk Left
-9.40 -19.4						Marker Delta
-29.4 -39.4					-23.51 dBm	Mkr→CF
-39.4 -49.4	hathannah Jawa Airthadina ang prophasing di	ร _{าษต} าใหมด _{ีมา} ปฏิภูณิภูมิใหม่สารได้ไปสายาส	halen pratochin haile ar an an	weeder and large and	annat management	Mkr→RefLvl
-59.4 Star	t 30 MHz				Stop 3.000 GHz	More 1 of 2
	s BW 100 kHz	#VBW 300 kHz			3.9 ms (1001 pts)	
Wag				- NO STATUS		e





(Plot 4.5.4 A3: Channel 3: 2422MHz @ 802.11n HT40)



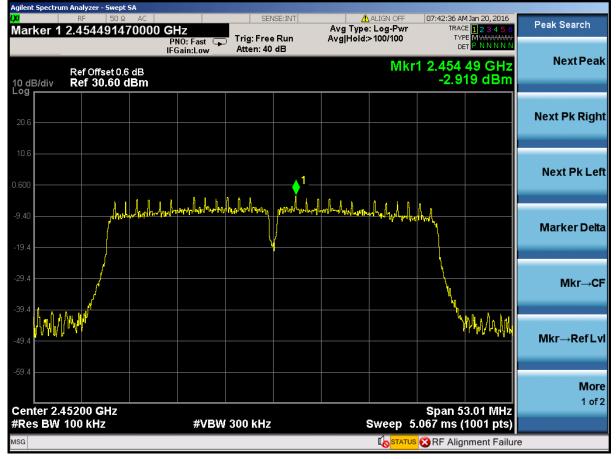
(Plot 4.5.4 B1: Channel 6: 2437MHz @ 802.11n HT40)



	Spectrum	n Analyzer - Swej							1		
<mark>w</mark> Mari	ker 1	RF 50 23.614000	0000000	GHz NO: Fast		Run		ALIGN OFF : Log-Pwr 2/100	TRAC	MJan 20, 2016 25 <mark>1 2 3 4 5 6</mark> 26 M WWWWW	Peak Search
			IF	Gain:Low	Atten: 40	dB	<u>.</u>	M		14 GHz	Next Peak
10 dE Log I	3/div	Ref Offset 0 Ref 30.60							-37.9	46 dBm	
20.6											Next Pk Right
10.6											
0.600											Next Pk Left
-9.40 -19.4										-20.75-dBm	Marker Delta
-29.4										↓ ¹	Mkr→CF
-39.4 -49.4	nhahahaha	manthanth	arthing and an and a star	ale-soft-lik-lytate	yl-anglaydyndo	uthy or shared	wayon yang darah	HA Mallinger	ht. Martin M Martin Martin Martin Martin Martin Martin Martin Martin Martin Martin Martin	rthe head	Mkr→RefLvl
-59.4											More 1 of 2
	t 3.00 s BW 1	GHz 100 kHz		#VBW	300 kHz				2.103 s (5.00 GHz 1001 pts)	
MSG									🗙 RF Alig	nment Failur	e

(Plot 4.5.4 B2: Channel 6: 2437MHz @ 802.11n HT40)

(Plot 4.5.4 B3: Channel 6: 2437MHz @ 802.11n HT40)



(Plot 4.5.4 C1: Channel 9 : 2452MHz @ 802.11n HT40)

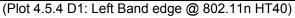
Agilent Sp	ectrum Analyzer - Swept S	5A							
<mark>.x</mark> Marke	RF 50 Ω 51 2.93169000				Avg Type Avg Hold:		TRAC	4 Jan 20, 2016 E <mark>1 2 3 4 5 6</mark> E M International	Peak Search
10 dB/d Log	Ref Offset 0.6 liv Ref 30.60 d		=		Arginola.		(r1 2.93 [•]	1 7 GHz 02 dBm	NextPeak
20.6 —									Next Pk Right
10.6 —							th		Next Pk Left
-9.40								-22.92 dBm	Marker Delta
-29.4									Mkr→CF
	h fundamenta	www.frit.this.Latrian-rups.the	yaukar-Kreinphykilar/nd	Alland Approved	y	bphasily-punceh/tx		hilputra dadala	Mkr→RefLvl
	30 MHz 3W 100 kHz	 	/BW 300 kHz			Sweep_2	Stop 3	.000 GHz 1001 pts)	More 1 of 2
MSG						_		nment Failur	e

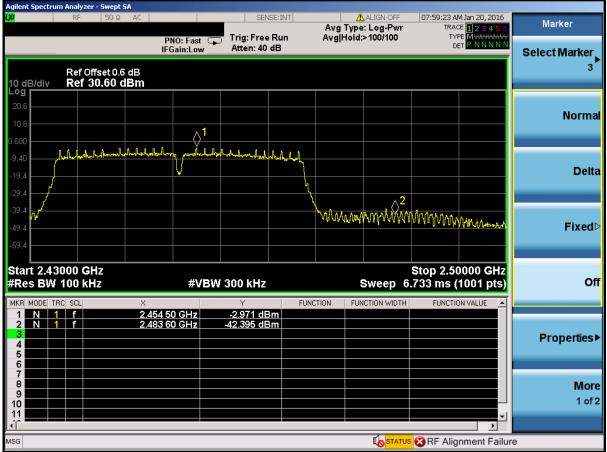
(Plot 4.5.4 C2: Channel 9: 2452MHz @ 802.11n HT40)



(Plot 4.5.4 C3: Channel 9: 2452MHz @ 802.11n HT40)

Agilent Spectrum Analyzer - Swept SA				
<mark>ματκετ 1 2.419480000000</mark>		Avg Type: Log-Pwr	07:57:56 AM Jan 20, 2016 TRACE 1 2 3 4 5 6 TYPE MWWWWW	Peak Search
Ref Offset 0.6 dB 10 dB/div Ref 30.60 dBm	PN0: Fast 😱 Trig: Free Run IFGain:Low Atten: 40 dB	Avg Hold>100/100 Mkr1	1 2.419 48 GHz -2.928 dBm	Next Peak
20.6 10.6 0.600			1	Next Pk Right
-9.40				Next Pk Left
-39.4 -49.4 <mark>utorono-official constitutions of the second </mark>	Managen and Marken M	พิพิมีทุนแกมน์		Marker Delta
Start 2.31000 GHz #Res BW 100 kHz		Sweep 13	Stop 2.44600 GHz 3.00 ms (1001 pts)	Mkr→CF
2 N 1 f 2.3	119 48 GHz -2.928 dBm 190 00 GHz -42.771 dBm 100 00 GHz -41.286 dBm			Mkr→RefLvl
7 8 9 10 11				More 1 of 2
MSG			SRF Alignment Failur	e





(Plot 4.5.4 D2: Right Band edge @ 802.11n HT40)

4.6 6dB Bandwidth

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW=100 KHz and VBW=300KHz. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB. According to KDB558074 D01 V03 for one of the following procedures may be used to determine the modulated DTS device signal bandwidth.

- 1. Set RBW = 100 kHz.
- 2. Set the video bandwidth (VBW) \geq 3 RBW.
- 3. Detector = Peak.

4. Trace mode = max hold.

- 5. Sweep = auto couple.
- 6. Allow the trace to stabilize.

7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

<u>LIMIT</u>

For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

TEST RESULTS

4.6.1 801.11b Test Mode

A. Test Verdict

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Refer to Plot	Limits (kHz)	Verdict
1	2412	10.04	Plot 4.6.1 A	≥500	PASS
6	2437	9.549	Plot 4.6.1 B	≥500	PASS
11	2462	10.04	Plot 4.6.1 C	≥500	PASS

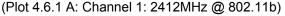
Note:

1. For 802.11b mode at finial test to get the worst-case emission at 1Mbps.

2. The test results including the cable lose.

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(Plot 4.6.1 B: Channel 6: 2437MHz @ 802.11b)

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(Plot 4.6.1 C: Channel 11: 2462MHz @ 802.11b)

4.6.2 801.11g Test Mode

A. Test Verdict

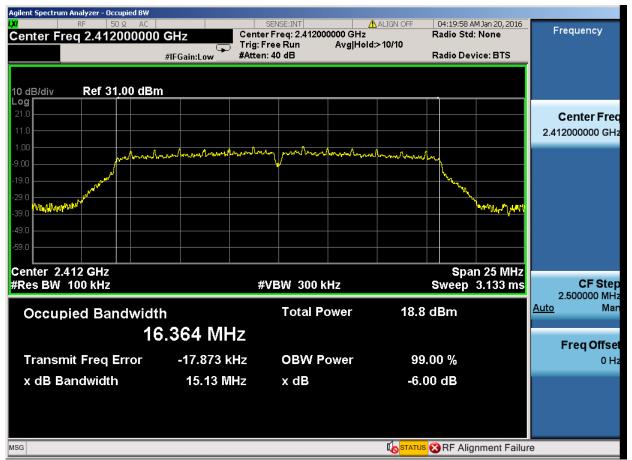
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Refer to Plot	Limits (kHz)	Verdict
1	2412	15.13	Plot 4.6.2 A	≥500	PASS
6	2437	16.01	Plot 4.6.2 B	≥500	PASS
11	2462	15.44	Plot 4.6.2 C	≥500	PASS

Note:

1. For 802.11g mode at finial test to get the worst-case emission at 6Mbps.

2. The test results including the cable lose.

Page 62 of 69



(Plot 4.6.2 A: Channel 1: 2412MHz @ 802.11g)

Agilent Spectrum Analyzer - Occupied BW					
XI RF 50 g AC Center Freq 2.437000000 (Trig: I	sense:INT er Freq: 2.437000000 GHz Free Run Avg Hol n: 40 dB	Radio St d:>10/10	AM Jan 20, 2016 d: None avice: BTS	Trace/Detector
10 dB/div Ref 31.00 dBm					
21.0					Clear Write
-9.00	w.l.w.m.m.l.	way paraharan harrow harrow	Monweatherwin Jong		Average
-29.0 -39.0 -39.0				-white you where the	
-49.0					Max Hold
Center 2.437 GHz #Res BW 100 kHz	#	VBW 300 kHz	Sweep	an 25 MHz 3.133 ms	Min Hold
Occupied Bandwidth 16.	381 MHz	Total Power	19.5 dBm		Detector
Transmit Freq Error	-23.203 kHz	OBW Power	99.00 %		Average ► <u>Auto</u> Man
x dB Bandwidth	16.01 MHz	x dB	-6.00 dB		
MSG			🕼 <mark>status</mark> 🐼 RF Ali	gnment Failure	Э

(Plot 4.6.2 B: Channel 6: 2437MHz @ 802.11g)

Agilent Spectrum Analyzer - O	ccupied BW							
	50 Ω AC		SENSE:INT		ALIGN OFF		AM Jan 20, 2016	Frequency
Center Freq 2.462	200000	0 GHz	Center Freq: 2.462			Radio Std	l: None	Frequency
		#IFGain:Low	Trig: Free Run #Atten: 40 dB	Avg Hold	1:>10/10	Radio Dev	vice: BTS	
		#IFGaIn:Low	FAtten. 40 db			Itadio De	vice. B15	
10 dB/div Ref 3	1.00 dB	m						
Log								
21.0								Center Fred
11.0								2.462000000 GHz
1.00								
	mound	mailmenton	multing mindling	mannan	Immendances	lm		
-9.00	£		¥			1		
-19.0								
-29.0						~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	-	
-39.0 4444							"Lat blat years	
00.0								
-49.0								
-59.0								
Center 2.462 GHz						Spa	ın 25 MHz	
#Res BW 100 kHz			#VBW 300	kHz		Sweep	3.133 ms	CF Step
, 								2.500000 MHz
Occupied Ba	ndwid	th	Total	Power	19.0	dBm		<u>Auto</u> Man
	1	6.367 M⊦	-					
			IZ					Freq Offset
Transmit Freq	Error	-27.584 k		Power	00	.00 %		0 Hz
manshiii rieq	EITUI	-27.J04 K		FOwer	55	.00 /0		0 112
x dB Bandwidt	h	15.44 M	Hz xdB		-6.0	00 dB		
MSG						🛛 🔀 RF Alig	nment Failur	e

(Plot 4.6.2 C: Channel 11: 2462MHz @ 802.11g)

4.6.3 801.11n HT20 Test Mode

A. Test Verdict

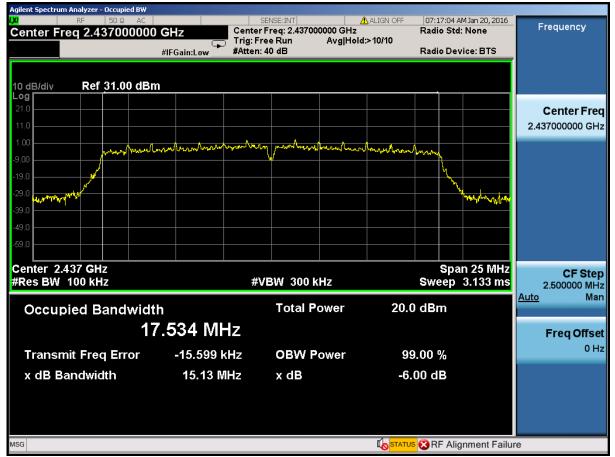
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Refer to Plot	Limits (kHz)	Verdict
1	2412	16.76	Plot 4.6.3 A	≥500	PASS
6	2437	15.13	Plot 4.6.3 B	≥500	PASS
11	2462	15.46	Plot 4.6.3 C	≥500	PASS

Note:

1. For 802.11n HT20 mode at finial test to get the worst-case emission at 6.5Mbps. 2.The test results including the cable lose.

Agilent Spectrum Analyzer - Oc									
	50 Ω AC		SENSE:INT				M Jan 20, 2016	Trac	e/Detector
Ref Value 31.00 d	IBm		Center Freq: 2.41200 Trig: Free Run	Avg Hold:>10000		o Std:	None	1100	0120100101
	#1		#Atten: 40 dB	Cralling and a		o Dev	ice: BTS		
	1.00 dBm								
Log									
21.0									Clear Write
11.0									
1.00									
	monten	Amandana	mound from the	markenenten	montenny				
-9.00						t			_
-19.0						<u> </u>			Average
-29.0						×4			
-29.0 Jun 10 - 29.0							"hugen with		
-39.0									
-49.0									Max Hold
-59.0									
Center 2.412 GHz						Spa	n 25 MHz		
#Res BW 100 kHz			#VBW 300 H	(Hz			3.133 ms		Min Hold
									minnord
Occupied Bar	ndwidth		Total P	ower	19.2 dBn	n			
									D-44
	17.	535 MH:	Z						Detector
T	-	40.047.00			00.00			Auto	Average ► Man
Transmit Freq	Error	-10.317 kH	Iz OBW P	ower	99.00 %	/0		Auto	Ivian
x dB Bandwidth	h	16.76 MH	z xdB		-6.00 dl	в			
MSG							nmont Eailui	· · · · · · · · · · · · · · · · · · ·	
Mod						Aig	milent Fallur	e	

(Plot 4.6.3 A: Channel 1: 2412MHz @ 802.11n HT20)



(Plot 4.6.3 B: Channel 6: 2437MHz @ 802.11n HT20)

Agilent Spectrum Analyze		ed BW										
LXI RF	50 Ω	AC			NSE:INT		ALIGN OFF			M Jan 20, 2016	Fr	equency
Center Freq 2.4	46200	0000 G		Tuine Free	req: 2.46200 e Run	Avg Hold	·> 10/10	Radi	0 Sta:	None		
		#1F	Gain:Low 🖵	#Atten: 4		in ghiere		Radi	o Dev	ice: BTS		
10 dB/div Re Log	f <u>31.00</u>) dBm										
21.0												enter Freg
11.0												2000000 GHz
											2.46	2000000 GHZ
1.00	meml	martin	Annon	www.www.	montin	Amerilan	American	A				
-9.00	1			\\	w/			0.000	\			
-19.0	^								Mr.			
-29.0									م			
A my Marrie										"hall any had		
-39.0												
-49.0												
-59.0												
Center 2.462 G								_	Spa	n 25 MHz		CF Step
#Res BW 100 k	Hz			#VE	3W 300 K	Hz		Swe	eep	3.133 ms	2	.500000 MHz
					T-4-1 D		40.				<u>Auto</u>	Man
Occupied E	Bandy	width			Total P	ower	19.4	dBr	n			
		17.5	533 MI	-z								reg Offset
												0 Hz
Transmit Fre	eq Erre	or	-20.490	<hz< td=""><td>OBW P</td><td>ower</td><td>99</td><td>9.00</td><td>%</td><td></td><td></td><td>0 H2</td></hz<>	OBW P	ower	99	9.00	%			0 H2
x dB Bandwi	idth		15.46 N	147	x dB		-6	00 d	R			
	aun		13.40 1	11 12	X UD		-0.	00 u				
MSG								R	F Alia	nment Failu	e	
								• •••	, ang		-	

(Plot 4.6.3 C: Channel 11: 2462MHz @ 802.11n HT20)

4.6.4 801.11n HT40 Test Mode

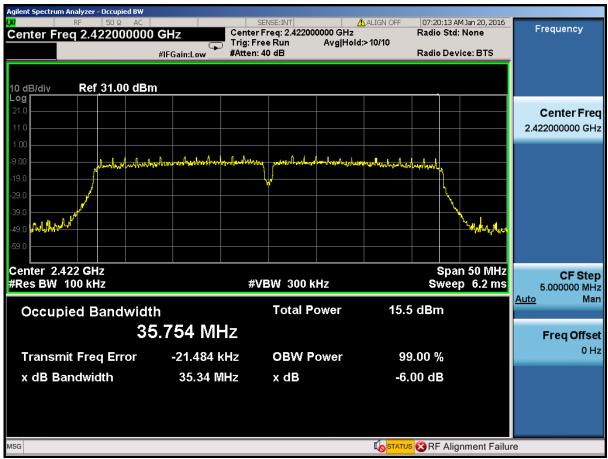
A. Test Verdict

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Refer to Plot	Limits (kHz)	Verdict
3	2422	35.34	Plot 4.6.4 A	≥500	PASS
6	2437	35.17	Plot 4.6.4 B	≥500	PASS
9	2452	35.21	Plot 4.6.4 C	≥500	PASS

Note:

1. For 802.11n HT40 mode at finial test to get the worst-case emission at 13.5Mbps.

2. The test results including the cable lose.



(Plot 4.6.4 A: Channel 3: 2422MHz @ 802.11n HT40)



(Plot 4.6.4 B: Channel 6: 2437MHz @ 802.11n HT40

Agilent Spectrum Analyzer - Occupi		SENSE:INT	ALIGN OFF 07:22:00 AM Jan 20, 2016				
Center Freq 2.45200	00000 GHz Cer	iter Freq: 2.452000000 GHz Free Run Avg Hold	Radio Std: None	Frequency			
		en: 40 dB	Radio Device: BTS				
10 dB/div Ref 31.0	00 dBm						
21.0				Center Freq			
11.0				2.452000000 GHz			
	a h. J. M with a hundred and a strength						
-9.00	N WARDEN CANADAN CANADAN CANADAN CANADAN CANADA		marial hard and have been by				
-29.0							
-39.0							
-49.0 Arddadada			http://www.exec				
-59.0							
Center 2.452 GHz			Span 50 MHz	CF Step			
#Res BW 100 kHz		#VBW 300 kHz	Sweep 6.2 ms	5.000000 MHz			
Occupied Band	lwidth	Total Power	15.8 dBm	<u>Auto</u> Man			
	35.786 MHz			Eron Offect			
				Freq Offset 0 Hz			
Transmit Freq Er		OBW Power	99.00 %				
x dB Bandwidth	35.21 MHz	x dB	-6.00 dB				
MSG			🔣 🕄 RF Alignment Failu	re			

(Plot 4.6.4 C: Channel 9: 2452MHz @ 802.11n HT40)

4.7 Antenna Requirement

Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.247 (c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Refer to statement below for compliance.

The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

Measurement

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module.For normal WLAN devices, the DSSS mode is used.

Conducted power refer ANSI C63.10 :2013 Output power test procedure for DTS devices Radiated power refer to ANSI C63.10 :2013 Radiated emissions tests.

Measurement parameters

Measurement parameter					
Detector:	Peak				
Sweep time:	Auto				
Resolution bandwidth:	1MHz				
Video bandwidth:	3MHz				
Trace-Mode:	Max hold				

Limits

FCC	IC						
Antenna Gain							
6 dBi							

Results

T _{nom}	V _{nom}	Lowest Channel 2412 MHz	Middle Channel 2437 MHz	Highest Channel 2462 MHz
Conducted power [dBm] Measured with DSSS modulation		10.58	11.09	11.02
	Conducted power [dBm] Measured with DSSS modulation		12.04	11.82
Gain [dBi] Calculated		0.79	0.95	0.80
Measuremer	Measurement uncertainty		dB (cond.) / ± 2.56 dB	(rad.)

5 <u>Test Setup Photos of the EUT</u>

Please refer to separated files for Test Setup Photos of the EUT.

6 External Photos of the EUT

Please refer to separated files for External Photos of the EUT.

7 Internal Photos of the EUT

Please refer to separated files for Internal Photos of the EUT.

.....End of Report.....