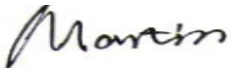
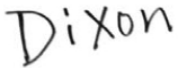
FCC PART 15 SUBPART C TEST REPORT

FCC PART 15.247

Report Reference No.....:	**MWR150600405**	
FCC ID.....:	**2AFAUTIS001**	
Compiled by (position+printed name+signature)..:	File administrators Martin Ao	
Supervised by (position+printed name+signature)..:	Test Engineer Martin Ao	
Approved by (position+printed name+signature)..:	Manager Dixon Hao	
Date of issue.....:	Jul 09,2015	
Representative Laboratory Name.:	**Maxwell International Co., Ltd.**	
Address.....:	Room 509,Hongfacenter building, Baoan District, Shenzhen, Guangdong, China	
Testing Laboratory Name.....:	**Shenzhen CTL Testing Technology Co., Ltd.**	
Address.....:	Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan,Shenzhen,China	
Applicant's name.....:	**HGR HERMANOS GARCIA ROMERO S.A.S**	
Address.....:	CARRERA 20 No. 13 - 39 off. 212 BOGOTA, COLOMBIA DC 110111	
Test specification.....:		
Standard.....:	**FCC Part 15.247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz**	
TRF Originator.....:	SHENZHEN JIETONG INFORMATION TECHNOLOGY CO., LTD	

Test item description.....:	Mobile Phone
Trade Mark.....:	Tigers
Manufacturer.....:	**WASAM TECHNOLOGY (SHEN ZHEN) CO.,LTD.**
Model/Type reference.....:	TIS001
Listed Models .....:	N/A
Modulation Type.....:	DSSS(CCK,DQPSK,DBPSK),OFDM(64QAM,16QAM,QPSK, BPSK)
Operation Frequency.....:	From 2412MHz to 2462MHz
Rating.....:	DC 3.7V
Hardware version.....:	F1H-V1.1
Software version .....:	bestsonny.f1h.w500c.V1.0.20140910
Result.....:	**PASS**

TEST REPORT

Test Report No. :	MWR150600405	Jul 09, 2015 Date of issue

Equipment under Test	:	Mobile Phone
Model /Type	:	TIS001
Listed Models	:	N/A
Applicant	:	**HGR HERMANOS GARCIA ROMERO S.A.S**
Address	:	CARRERA 20 No. 13 - 39 off. 212 BOGOTA, COLOMBIA DC 110111
Manufacturer		**WASAM TECHNOLOGY (SHEN ZHEN) CO.,LTD.**
Address	:	B, F Building, (Hengqiang Industrial Park), Bogang Taifeng Industrial Zone, Shajing Town, Bao'an 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.

Contents

1. TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15.247: 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.

ANSI C63.4-2009: American National Standard for Methods of Measurement of Radio- Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

558074 D01 DTS Meas Guidance v03r03: GUIDANCE FOR PERFORMING COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEMS (DTS) OPERATING UNDER §15.247

2. SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	May 20, 2015
Testing commenced on	:	May 21, 2015
Testing concluded on	:	Jul 09, 2015

2.2. Product Description

The **HGR HERMANOS GARCIA ROMERO S.A.S** 's Model: TIS001 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	TIS001
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 and FDD Band V
WLAN FCC Operation frequency	IEEE 802.11b:2412-2462MHz IEEE 802.11g:2412-2462MHz IEEE 802.11n HT20:2412-2462MHz IEEE 802.11n HT40:2422-2452MHz
BT FCC Operation frequency	2402MHz-2480MHz
HSDPA Release Version	Release 7
HSUPA Release Version	Release 6
DC-HSUPA Release Version	Not Supported
WCDMA Release Version	R99
WLAN FCC Modulation Type	IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK,BPSK) IEEE 802.11n HT40: OFDM (64QAM, 16QAM, QPSK,BPSK)
BT Modulation Type	GFSK (BT4.0 BLE)/GFSK,8DPSK,π/4DQPSK(BT 3.0+EDR)
Hardware version	F1H-V1.1
Software version	bestsonny.f1h.w500c.V1.0.20140910
GPS function	Supported
WLAN	Supported 802.11b/802.11g/802.11n
Bluetooth	Supported BT4.0 BLE /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 Frequency	GSM850 :824.2MHz-848.8MHz/PCS1900:1852.4MHz-1907.6MHz
GSM/EDGE/GPRS Operation Frequency Band	GSM850/PCS1900/GPRS850/ GPRS 1900/EDGE850/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 4.20 VDC (nominal: 3.70 VDC)
GPRS operation mode	Class B
Ant Gain	GSM850:-2.92dBi,GSM1900:-0.07dBi WCDMA Band 850: -2.92dBi WCDMA1900: GSM1900:-0.07dBi WIFI/BT:-0.58 dBi

Note:
1..The EUT is Dual SIM,But The two SIMs cannot use synchronization and only one can use for each time.
2. 3D and ALS+PS sensor used by this device and ,no power reduction during use.

2.3. Equipment Under Test

Power supply system utilised

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

DC 3.70V

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

TIS001 is subscriber equipment in the WCDMA/GSM system. The HSPA/UMTS frequency band is Band II, Band V; The GSM/GPRS/EDGE frequency and 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, AGPS 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.

2.5.2 Test Modes

Test Case	Test Conditions	
	Configuration	Description
DTS (6 dB) Bandwidth	Measurement Method	FCC KDB 558074 §8.2 Option 2
	Test Environment	NTNV
	EUT Configuration	11b_L,11b_M,11b_H 11g_L,11g_M,11g_H 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
	EUT Configuration	11b_L,11b_M,11b_H 11g_L,11g_M,11g_H 11n HT20_L, 11n HT20_M, 11n HT20_H 11n HT40_L, 11n HT40_M, 11n HT40_H
Maximum Power Spectral Density Level	Measurement Method	FCC KDB 558074 §10.2 (peak PSD).
	Test Environment	NTNV
	EUT Configuration	11b_L,11b_M,11b_H 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 Non-Restricted Frequency Bands	Measurement Method	FCC KDB 558074§11.0.
	Test Environment	NTNV
	Test Setup	Test Setup 1
	EUT Configuration	11b_L,11b_M,11b_H 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 Restricted Frequency Bands (Conducted)	Measurement Method	FCC KDB 558074§12.2, Conducted (antenna-port).
	Test Environment	NTNV
	EUT Configuration	11b_L,11b_M,11b_H 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 Restricted	Measurement Method	FCC KDB 558074§12.1,Radiated(cabinet/case emissions with Impedance matching for antenna-port).
	Test Environment	NTNV
	EUT Configuration	11b_L,11b_M,11b_H 11g_L,11g_M,11g_H 11n HT20_L, 11n HT20_M, 11n HT20_H 11n HT40_L, 11n HT40_M, 11n HT40_H

Test Case	Test Conditions	
	Configuration	Description
AC Power Line Conducted Emissions	Measurement Method	AC mains conducted.
	Test Environment	NTNV
	EUT Configuration	11b_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 “Y 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(MTK 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，power setting（23dBm）
11g	IEEE 802.11g with data rate of 6 Mbps using SISO mode, power setting（22dBm）
11n HT20	IEEE 802.11n with data date of MCS0 and bandwidth of 20MHz using SISO mode, power setting（21dBm）
11n HT40	IEEE 802.11n with data date of MCS7 and bandwidth of 40MHz using SISO mode, power setting（20dBm）

2.6. EUT operation mode

Test Mode	RF Ch.	TX Freq. [MHz]	RX Freq. [MHz]	Ch. BW [MHz]
11b	L	Ch No. 1 / 2412MHz	---	20
			---	20
	M	Ch No. 6 / 2437 MHz	---	20
			---	20
	H	Ch No. 11/ 2462MHz	---	20
			---	20
11g	L	Ch No. 1 / 2412MHz	---	20
			---	20
	M	Ch No. 6 / 2437 MHz	---	20
			---	20
	H	Ch No. 11/ 2462MHz	---	20
			---	20

11n HT20	L	Ch No. 1 / 2412MHz	---	20
			---	20
	M	Ch No. 6 / 2437 MHz	---	20
			---	20
	H	Ch No. 11/ 2462MHz	---	20
			---	20
11n HT40	L	Ch No. 3/ 2422MHz	---	40
			---	40
	M	Ch No. 6 / 2437 MHz	---	40
			---	40
	H	Ch No. 9/ 2452 MHz	---	40
			---	40

2.7. EUT configuration

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

● - supplied by the manufacturer

○ - supplied by the lab

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

2.8. Internal Identification of AE used during the test

AE ID*	Description
AE1	Charger

Adapter:
Trademark: Tigers
INPUT:AC 100-240V 50/60Hz 0.15A
OUTPUT: DC 5.0V,1A

*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: 2AFAUTIS001** filing to comply with Section 15.247 of the FCC Part 15, Subpart C 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 During Tests		
NTNV	Temperature	Voltage	Relative Humidity
	Ambient	3.70VDC	Ambient

2.12. NOTE

1. The EUT is a Mobile Phone with WCDMA/GSM/GPRS/EDGE, WiFi and Bluetooth function, The functions of the EUT listed as below:

	Test Standards	Reference Report
GSM/GPRS/EDGE	FCC Part 22/FCC Part 24	MWR150600401
WCDMA	FCC Part 22/FCC Part 24	MWR150600402
Bluetooth	FCC Part 15 C 15.247	MWR150600403
BLE	FCC Part 15 C 15.247	MWR150600404
WiFi	FCC Part 15 C 15.247	MWR150600405
USB Port	FCC Part 15 B	MWR150600406
SAR	FCC Part 2 §2.1093	MWR150600407

2. 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	√	—	—	—
802.11g	√	—	—	—
802.11n HT20	√	—	—	—
802.11n HT40	√	—	—	—

3. 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. TEST ENVIRONMENT

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,China
The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 (2009) and CISPR Publication 22.

3.2. Test Facility

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

FCC-Registration No.: 970318

Shenzhen CTL Testing Technology Co., Ltd. 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, Dec 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. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen CTL Testing Technology Co., Ltd. National Digital Electronic Product Testing Center quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen CTL Testing Technology Co., Ltd. National Digital Electronic Product Testing Center
is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.24 dB	(1)
Radiated Emission	1~18GHz	5.16 dB	(1)
Radiated Emission	18-40GHz	5.54 dB	(1)
Conducted Disturbance	0.15~30MHz	3.39 dB	(1)

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

3.5. 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.

3.6. Summary of measurement results

Test Specification clause	Test case	Test Mode	Test Channel	Recorded In Report		Pass	Fail	NA	NP	Remark
§15.247(b)(4)	Antenna gain	802.11b	☒ Lowest ☒ Middle ☒ Highest	802.11b	☒ Lowest ☒ Middle ☒ Highest	☒	☐	☐	☐	complies
§15.247(e)	Power spectral density	802.11b 802.11g 802.11n HT20 802.11n HT40	☒ Lowest ☒ Middle ☒ Highest	802.11b 802.11g 802.11n HT20 802.11n HT40	☒ Lowest ☒ Middle ☒ Highest	☒	☐	☐	☐	complies
§15.247(a)(1)	Spectrum bandwidth – 6 dB bandwidth	802.11b 802.11g 802.11n HT20 802.11n HT40	☒ Lowest ☒ Middle ☒ Highest	802.11b 802.11g 802.11n HT20 802.11n HT40	☒ Lowest ☒ Middle ☒ Highest	☒ ☒	☐	☐	☐	complies
§15.247(b)(1)	Maximum output power	802.11b 802.11g 802.11n HT20 802.11n HT40	☒ Lowest ☒ Middle ☒ Highest	802.11b 802.11g 802.11n HT20 802.11n HT40	☒ Lowest ☒ Middle ☒ Highest	☒ ☒ ☒	☐	☐	☐	complies
§15.247(d)	Band edge compliance conducted	802.11b 802.11g 802.11n HT20 802.11n HT40	☒ Lowest ☒ Highest	802.11b 802.11g 802.11n HT20 802.11n HT40	☒ Lowest ☒ Highest	☒ ☒	☐	☐	☐	complies
§15.205	Band edge compliance radiated	802.11b 802.11g 802.11n HT20 802.11n HT40	☒ Lowest ☒ Highest	802.11b 802.11g 802.11n HT20 802.11n HT40	☒ Lowest ☒ Highest	☒	☐	☐	☐	complies
§15.247(d)	TX spurious emissions conducted	802.11b 802.11g 802.11n HT20 802.11n HT40	☒ Lowest ☒ Middle ☒ Highest	802.11b 802.11g 802.11n HT20 802.11n HT40	☒ Lowest ☒ Middle ☒ Highest	☒ ☒	☐	☐	☐	complies
§15.247(d)	TX spurious emissions radiated	802.11b 802.11g 802.11n HT20 802.11n HT40	☒ Lowest ☒ Middle ☒ Highest	802.11b	☒ Lowest ☒ Middle ☒ Highest	☒	☐	☐	☐	complies
§15.109	RX spurious emissions radiated	-/-	-/-	-/-	-/-	☒	☐	☐	☐	complies
§15.209(a)	TX spurious Emissions	802.11b	-/-	802.11b	-/-	☒	☐	☐	☐	complies

	radiated < 30 MHz									
§15.107(a) §15.207	Conducted Emissions < 30 MHz	802.11b	-/-	802.11b	-/-	☒	☐	☐	☐	complies

Remark:
1. The measurement uncertainty is not included in the test result.
2. NA = Not Applicable; NP = Not Performed

3.7. Equipments Used during the Test

AC Power Conducted Emission						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal.Due
1	Artificial Mains	Rohde&Schwarz	ENV216	101316	2014/07/02	2015/07/01
					2015/06/02	2016/06/01
2	EMI Test Receiver	Rohde&Schwarz	ESCI3	103710	2014/07/02	2015/07/01
					2015/06/02	2016/06/01
3	Pulse Limiter	Com-Power	LIT-153	53226	2014/07/01	2015/06/30
					2015/06/02	2016/06/01
4	EMI Test Software	Rohde&Schwarz	ES-K1 V1.71	N/A	N/A	N/A
5	Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-3M (9KHz-26.5G)	3m	2014/10/19	2015/10/18

Radiated Emission						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal.Due
1	Bilog Antenna	Sunol Sciences Corp.	JB1	A061713	2015/05/19	2016/05/18
2	EMI TEST Receivcer	Rohde&Schwarz	ESCI3	103710	2014/07/02	2015/07/01
					2015/06/02	2016/06/01
3	EMI TEST Software	Audix	E3	N/A	N/A	N/A
4	EMI TEST Software	Rohde&Schwarz	ESK1	N/A	N/A	N/A
5	HORN ANTENNA	Sunol Sciences Corp.	DRH-118	A062013	2015/05/19	2016/05/18
6	Amplifer	HP	8447D	3113A07663	2015/05/19	2016/05/18
7	Preamplifier	HP	8349B	3155A00882	2015/05/19	2016/05/18
8	Amplifer	Compliance Direction systems	PAP1-4060	129	2015/05/19	2016/05/18
9	Active Loop Antenna	Daze	ZN30900A	N/A	2015/05/19	2016/05/18
10	TURNTABLE	MATURO	TT2.0	----	N/A	N/A
11	ANTENNA MAST	MATURO	TAM-4.0-P	----	N/A	N/A
12	Horn Antenna	SCHWARZBECK	BBHA9170	25849	2015/05/19	2016/05/18
13	Spectrum Analyzer	Rohde&Schwarz	FSU26	201148	2015/05/20	2016/05/19
14	Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-10M (9KHz-26.5G)	10m	2014/10/19	2015/10/18
15	Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-3M (9KHz-26.5G)	3m	2014/10/19	2015/10/18

Maximum Peak Output Power / Power Spectral Density / 20dB Bandwidth / Band Edge Compliance of RF Emission / Spurious RF Conducted Emission						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal.Due
1	Spectrum Analyzer	Rohde&Schwarz	FSU26	201148	2015/05/20	2016/05/19
2	Spectrum Analyzer	Agilent	E4407B	MY45108355	2015/05/21	2016/05/20
3	Power meter	Rohde & Schwarz	NRVD	260540	2015/05/21	2016/05/20
4	Power Sensor	Rohde&Schwarz	NRR-Z81	256697	2015/05/21	2016/05/20
6	Coaxial Cables	WK CE Cable	N/A (9KHz-26.5G)	N/A	2014/10/19	2015/10/18
7	The temporary antenna connector	MMCX - SMA	1547	23657478	2014/10/19	2015/10/18
8	Cable	MURATA	MM8430 - 2610	11548	2014/10/19	2015/10/18

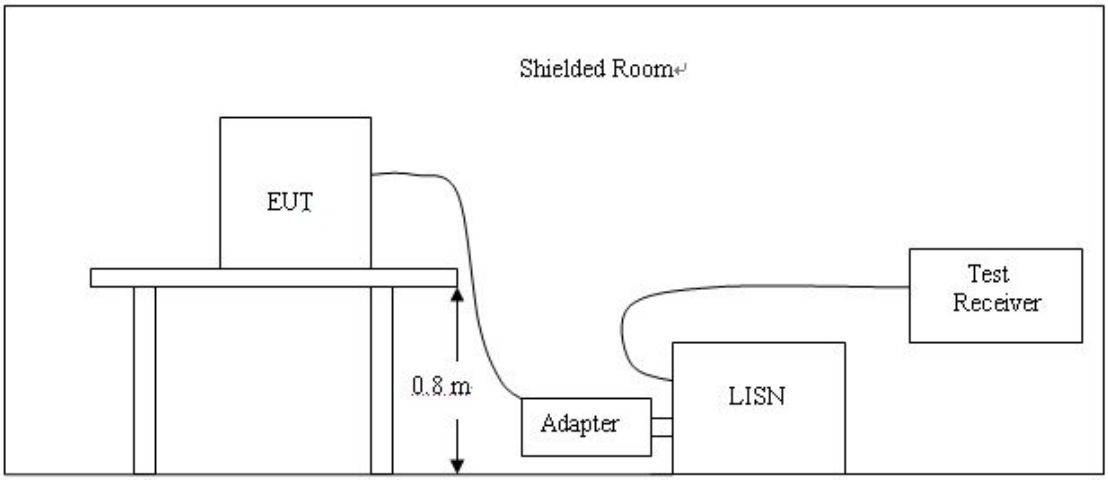
Note:The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

The Cal.Interval was one year

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 C63.4-2009.
2. Support equipment, if needed, was placed as per ANSI C63.4-2009
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4-2009
4. 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:

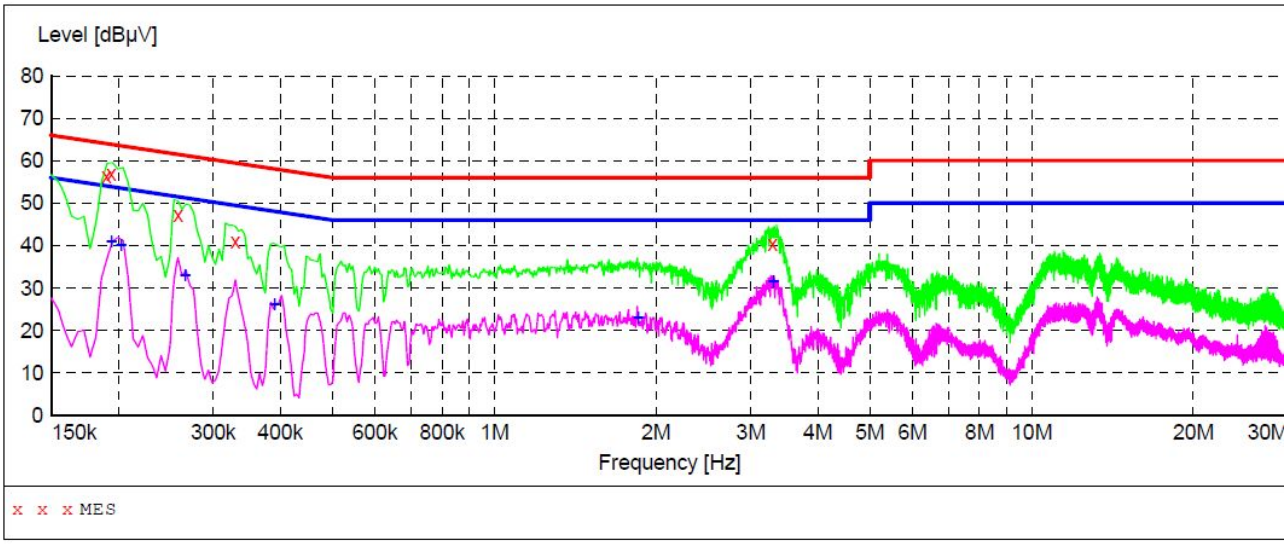
Frequency (MHz)	Maximum RF Line Voltage (dBμV)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15 - 0.50	79	66	66-56*	56-46*
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

* 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.

SCAN TABLE: "Voltage (9K-30M)FIN"
Short Description: 150K-30M Voltage



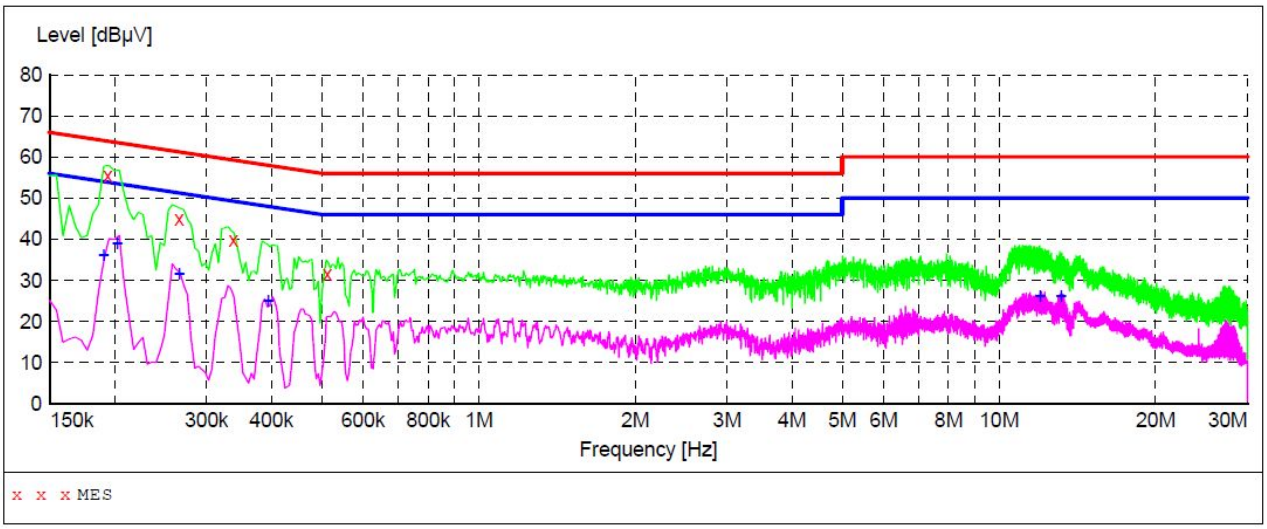
MEASUREMENT RESULT:

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.190000	56.30	9.9	64	7.7	QP	N	GND
0.194000	56.90	9.9	64	7.0	QP	N	GND
0.258000	47.30	9.9	62	14.2	QP	N	GND
0.330000	40.90	9.9	60	18.6	QP	N	GND
3.296000	40.40	10.5	56	15.6	QP	N	GND

MEASUREMENT RESULT:

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.194000	41.00	9.9	54	12.9	AV	N	GND
0.202000	40.00	9.9	54	13.5	AV	N	GND
0.266000	33.10	9.9	51	18.1	AV	N	GND
0.390000	26.20	9.9	48	21.9	AV	N	GND
1.850000	23.10	10.4	46	22.9	AV	N	GND
3.302000	31.50	10.5	46	14.5	AV	N	GND

SCAN TABLE: "Voltage (9K-30M)FIN"
Short Description: 150K-30M Voltage



MEASUREMENT RESULT:

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.194000	55.50	9.9	64	8.4	QP	L1	GND
0.266000	44.90	9.9	61	16.3	QP	L1	GND
0.338000	39.80	9.9	59	19.5	QP	L1	GND
0.512000	31.50	9.9	56	24.5	QP	L1	GND

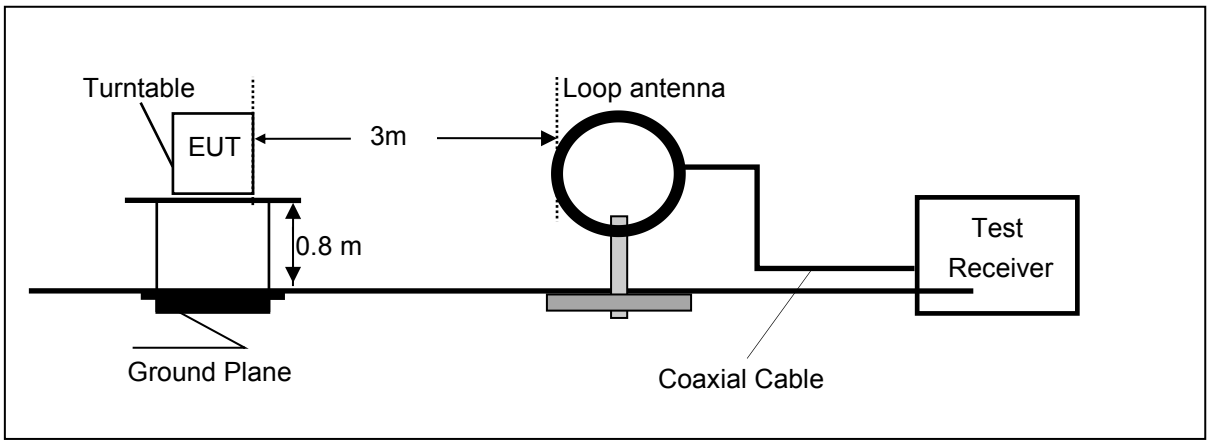
MEASUREMENT RESULT:

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.190000	36.20	9.9	54	17.8	AV	L1	GND
0.202000	38.90	9.9	54	14.6	AV	L1	GND
0.266000	31.50	9.9	51	19.7	AV	L1	GND
0.394000	25.00	9.9	48	23.0	AV	L1	GND
11.984000	26.10	10.7	50	23.9	AV	L1	GND
13.142000	26.30	10.7	50	23.7	AV	L1	GND

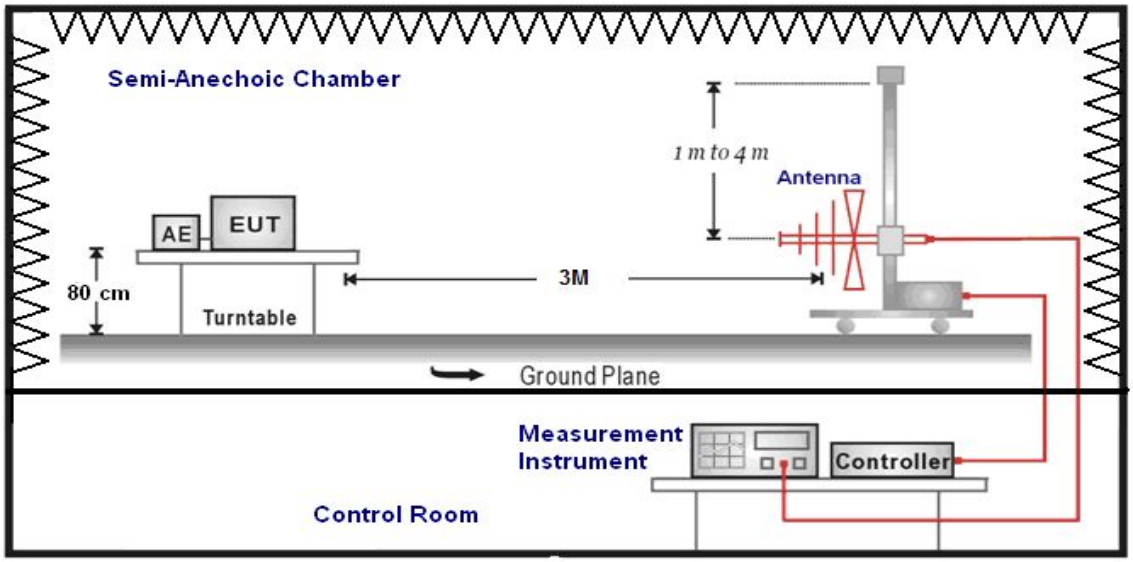
4.2. Radiated Emission

TEST CONFIGURATION

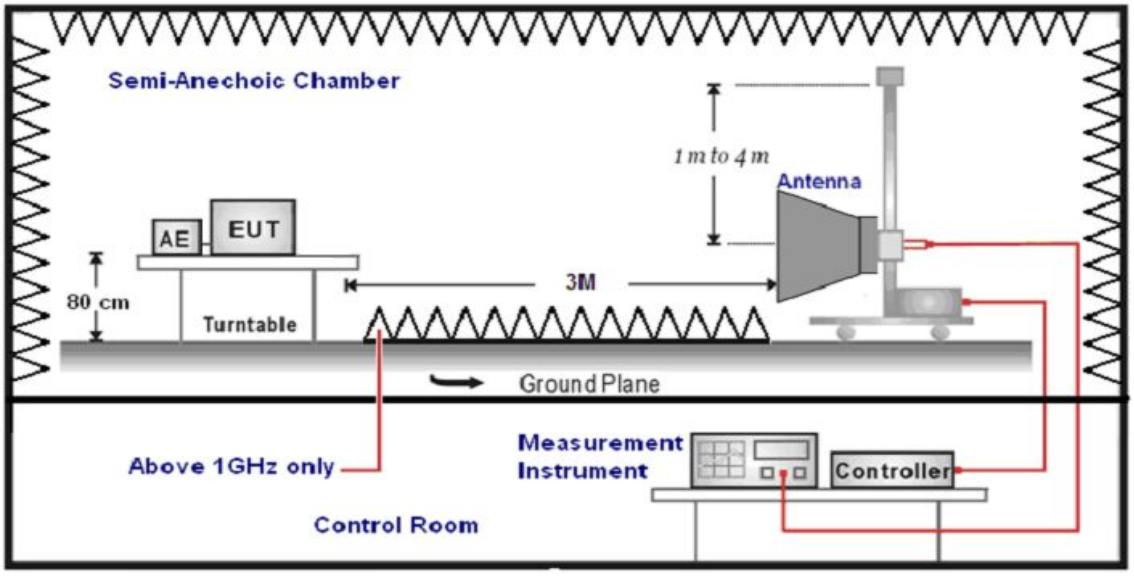
Frequency range 9 KHz – 30MHz



Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz



TEST PROCEDURE

1. 1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT.
3. For the radiated emission test above 1GHz:
   Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
4. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
5. Repeat above procedures until all frequency measurements have been completed.
6. The EUT minimum operation frequency was 32.768 KHz and maximum operation frequency was 2462MHz.so radiated emission test frequency band from 9 KHz to 25GHz.
7. 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	3

8. 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
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto	Peak (Receiver)
	Average Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto	Average (Receiver)

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	

RADIATION LIMIT

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table. According to § 15.247(d), in any 100kHz bandwidth outside the frequency band in which the EUT is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the100kHz bandwidth within the band that contains the highest level of desired power.

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),
2. ULTRA-BROADBAND ANTENNA for the radiation emission test below 1G.
3. HORN ANTENNA for the radiation emission test above 1G.
4 "---" means not recorded as emission levels lower than limit.
5 Margin= Limit - Level

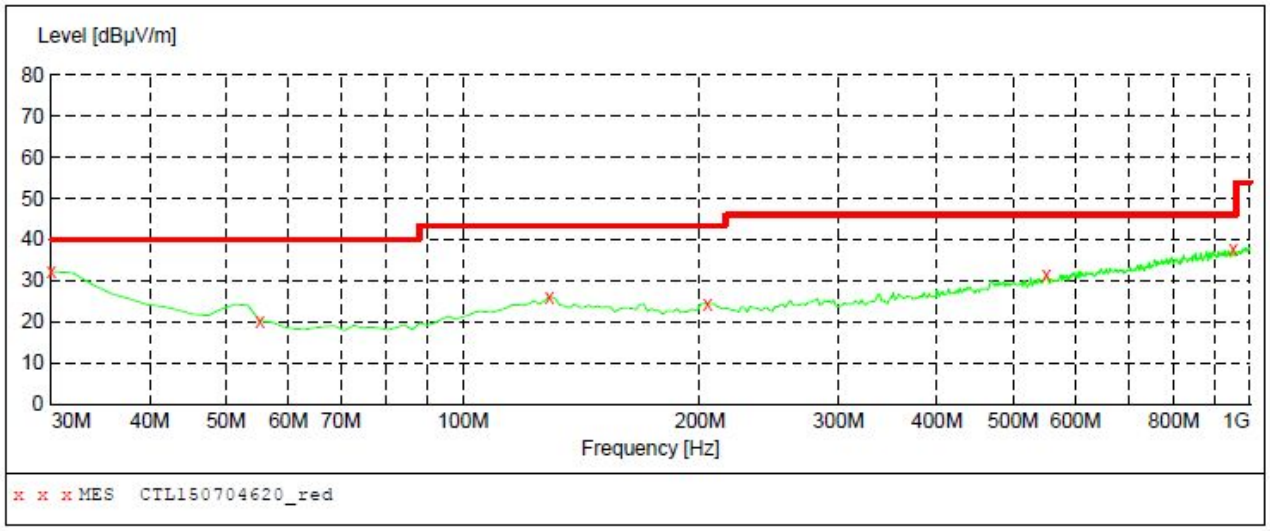
For 9KHz to 30MHz

Frequency (MHz)	Corrected Reading (dBμV/m)@3m	FCC Limit (dBμV/m) @3m	Margin (dB)	Detector	Result
12.00	42.60	69.54	26.94	QP	PASS
24.00	45.37	69.54	24.17	QP	PASS

For 30MHz to 1000MHz

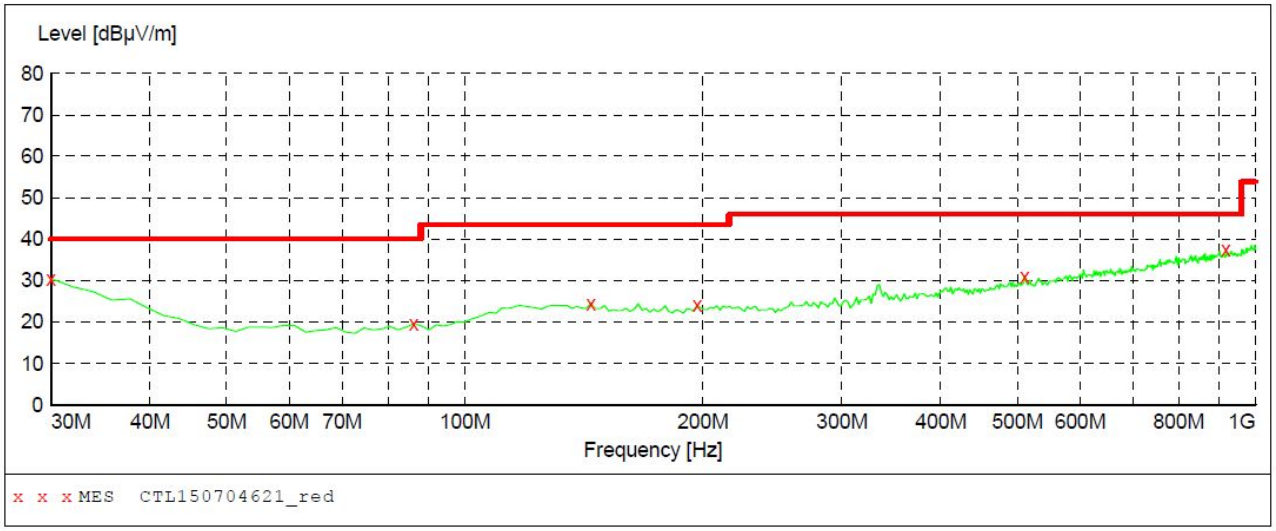
Note:We tested each test mode (b/g/n) and channel (low/mid/high and recorded the worst case at the 11b(the Middle channel).

Polarization	*Vertical*



Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Polarization
30.000000	32.20	21.1	40.0	7.8	VERTICAL
55.220000	20.20	8.3	40.0	19.8	VERTICAL
128.940000	26.10	14.9	43.5	17.4	VERTICAL
204.600000	24.50	14.4	43.5	19.0	VERTICAL
551.860000	31.20	21.1	46.0	14.8	VERTICAL
953.440000	37.60	26.7	46.0	8.4	VERTICAL

Polarization	Horizontal



Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Polarization
30.000000	30.50	21.1	40.0	9.5	HORIZONTAL
86.260000	19.60	9.3	40.0	20.4	HORIZONTAL
144.460000	24.50	14.4	43.5	19.0	HORIZONTAL
196.840000	24.00	13.8	43.5	19.5	HORIZONTAL
511.120000	31.10	20.4	46.0	14.9	HORIZONTAL
918.520000	37.40	26.3	46.0	8.6	HORIZONTAL

For 1GHz to 25GHz

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

802.11b Mode(above 1GHz)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (802.11b--2412MHz)										
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4824.00	58.23	PK	74.00	15.77	53.68	33.52	6.92	35.89	4.55
1	4824.00	44.76	AV	54.00	9.24	40.21	33.52	6.92	35.89	4.55
2	7236.00	60.14	PK	74.00	13.86	48.87	37.10	9.19	35.02	11.27
2	7236.00	43.91	AV	54.00	10.09	32.64	37.10	9.19	35.02	11.27

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (802.11b--2412MHz)										
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4824.00	55.08	PK	74.00	18.92	50.53	33.52	6.92	35.89	4.55
1	4824.00	42.81	AV	54.00	11.19	38.26	33.52	6.92	35.89	4.55
2	7236.00	57.71	PK	74.00	16.29	46.44	37.10	9.19	35.02	11.27
2	7236.00	42.62	AV	54.00	11.38	31.35	37.10	9.19	35.02	11.27

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (802.11b--2437MHz)										
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4874.00	58.76	PK	74.00	15.24	52.52	33.59	6.95	34.30	6.24
1	4874.00	44.08	AV	54.00	9.92	37.84	33.59	6.95	34.30	6.24
2	7311.00	59.89	PK	74.00	14.11	48.23	37.44	9.22	35.00	11.66
2	7311.00	43.03	AV	54.00	10.97	31.37	37.44	9.22	35.00	11.66

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (802.11b--2437MHz)										
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4874.00	56.08	PK	74.00	17.92	49.84	33.59	6.95	34.30	6.24
1	4874.00	42.56	AV	54.00	11.44	36.32	33.59	6.95	34.30	6.24
2	7311.00	58.01	PK	74.00	15.99	46.35	37.44	9.22	35.00	11.66
2	7311.00	41.25	AV	54.00	12.75	29.59	37.44	9.22	35.00	11.66

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (802.11b--2462MHz)										
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4924.00	57.91	PK	74.00	16.09	51.49	33.71	6.98	34.27	6.42
1	4924.00	42.85	AV	54.00	11.15	36.43	33.71	6.98	34.27	6.42
2	7386.00	58.84	PK	74.00	15.16	46.96	37.61	9.25	34.98	11.88
2	7386.00	42.67	AV	54.00	11.33	30.79	37.61	9.25	34.98	11.88

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (802.11b--2462MHz)										
No.	Frequency (MHz)	Emssion Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1	4924.00	55.12	PK	74.00	18.88	48.70	33.71	6.98	34.27	6.42
1	4924.00	41.94	AV	54.00	12.06	35.52	33.71	6.98	34.27	6.42
2	7386.00	56.87	PK	74.00	17.13	44.99	37.61	9.25	34.98	11.88
2	7386.00	40.30	AV	54.00	13.70	28.42	37.61	9.25	34.98	11.88

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. The other emission levels were very low against the limit.
4. Margin value = Limit value- Emission level.
5. For Wireless 802.11b mode at 1Mbps.

4.3. Maximum Peak 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 10log (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	22.65	30	PASS
6	2437	22.67	30	PASS
11	2462	22.41	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	21.54	30	PASS
6	2437	21.49	30	PASS
11	2462	21.06	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	20.71	30	PASS
6	2437	20.29	30	PASS
11	2462	19.99	30	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.

4.3.4 802.11n HT40 Test Mode

A. Test Verdict

Channel	Frequency (MHz)	Measured Output Peak Power (dBm)	Limits (dBm)	Verdict
3	2422	19.52	30	PASS
6	2437	19.91	30	PASS
9	2452	20.05	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 ≤ RBW ≤ 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.

LIMIT

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

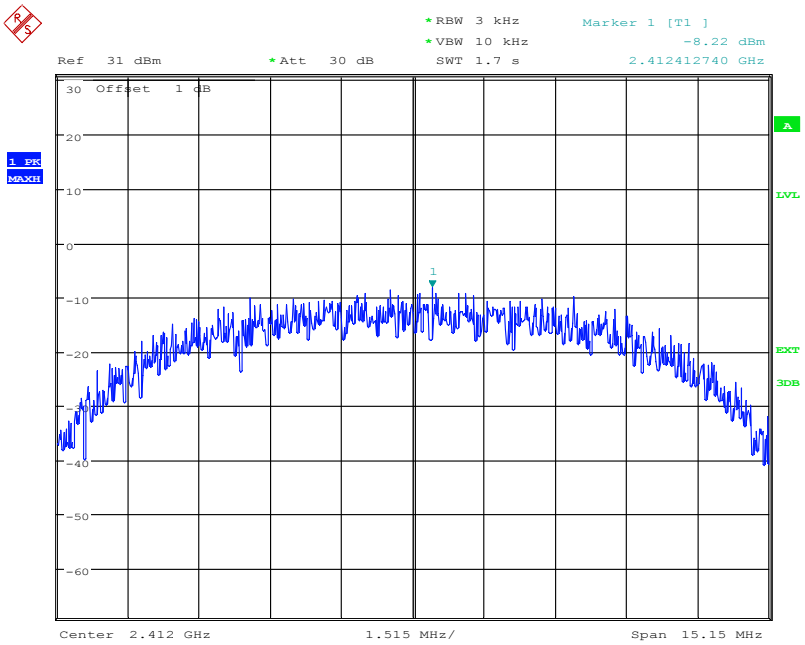
4.4.1 802.11b Test Mode

A. Test Verdict

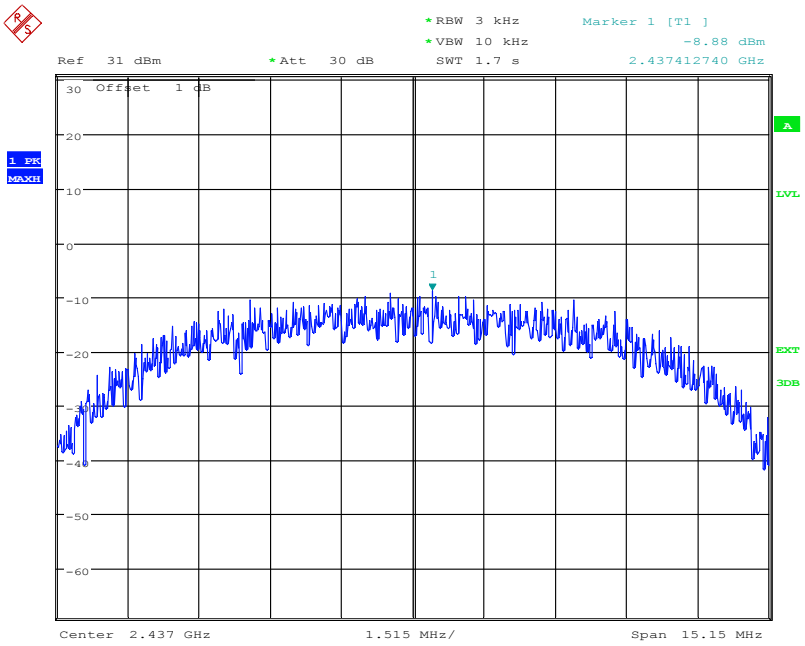
Channel	Frequency (MHz)	Report PSD (dBm/3KHz)	Refer to Plot	Limits (dBm/3KHz)	Verdict
1	2412	-8.22	Plot 4.4.1 A	8	PASS
6	2437	-8.88	Plot 4.4.1 B	8	PASS
11	2462	-9.09	Plot 4.4.1 C	8	PASS

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.

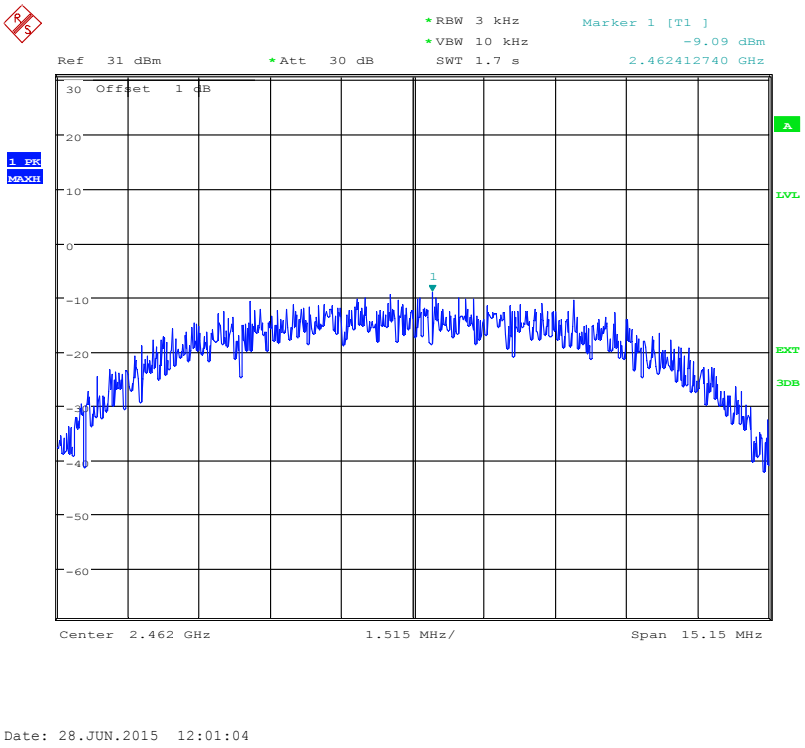
B. Test Plots



(Plot 4.4.1 A: Channel 1: 2412MHz @ 802.11b)



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



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

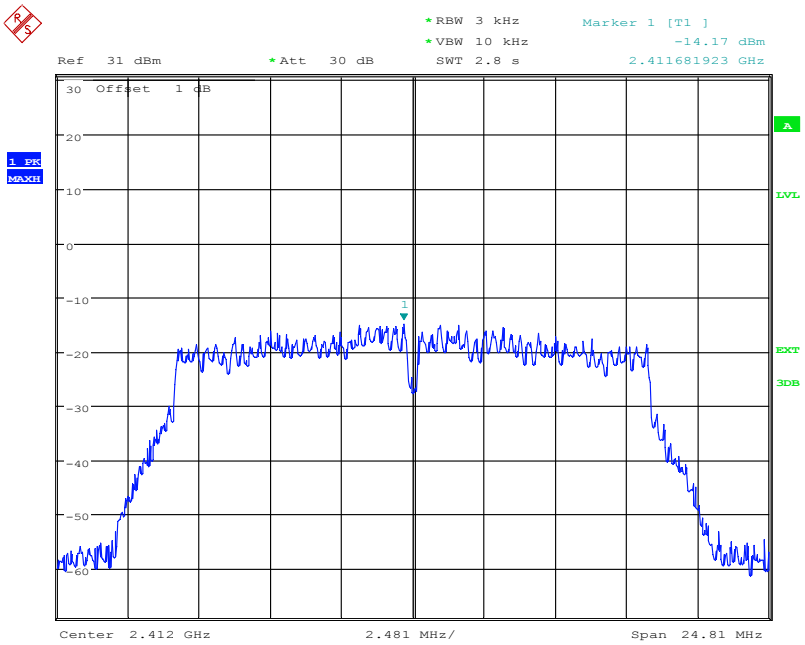
4.4.2 802.11g Test Mode

A. Test Verdict

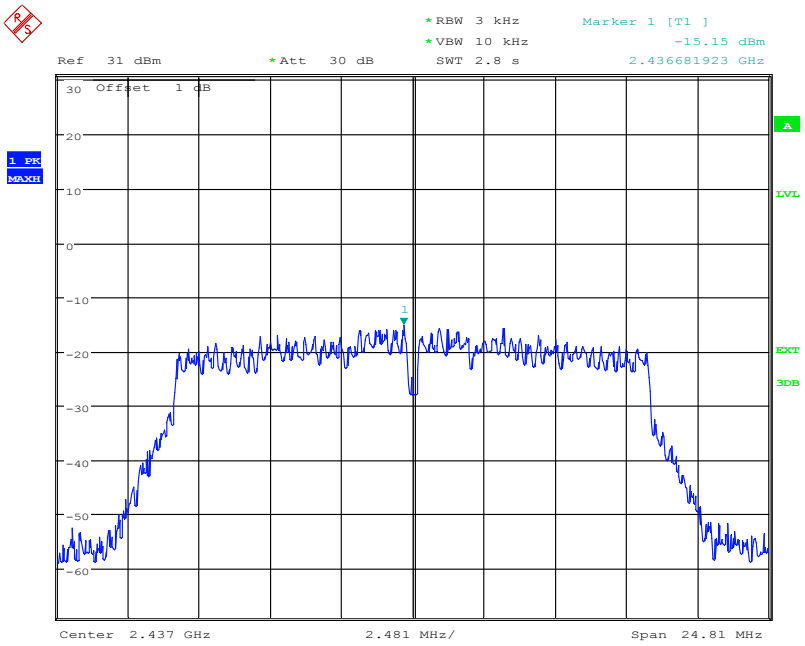
Channel	Frequency (MHz)	Report PSD (dBm/3KHz)	Refer to Plot	Limits (dBm/3KHz)	Verdict
1	2412	-14.17	Plot 4.4.2 A	8	PASS
6	2437	-15.15	Plot 4.4.2 B	8	PASS
11	2462	-15.68	Plot 4.4.2 C	8	PASS

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.

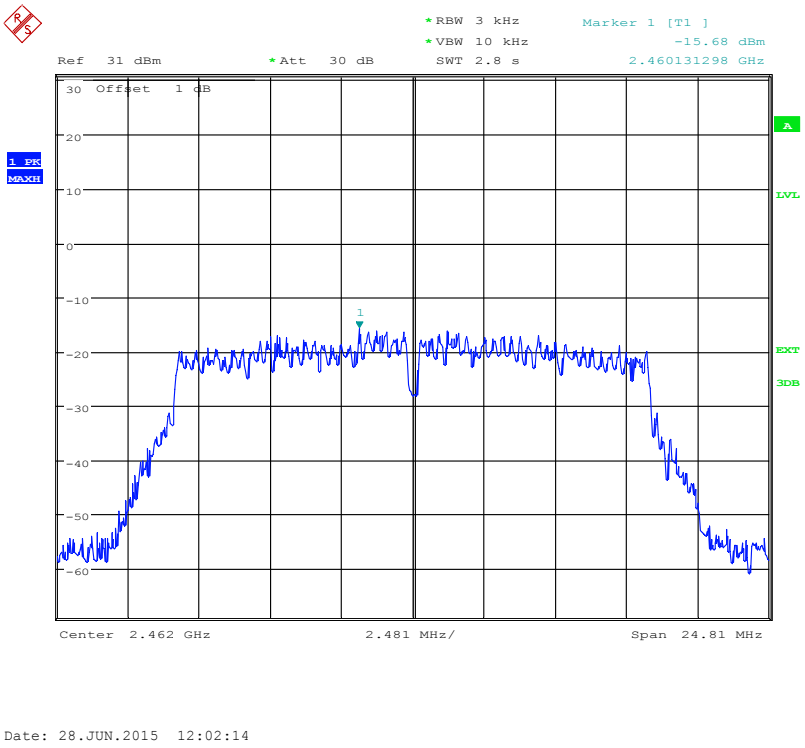
B. Test Plots



(Plot 4.4.2 A: Channel 1: 2412MHz @ 802.11g)



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



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

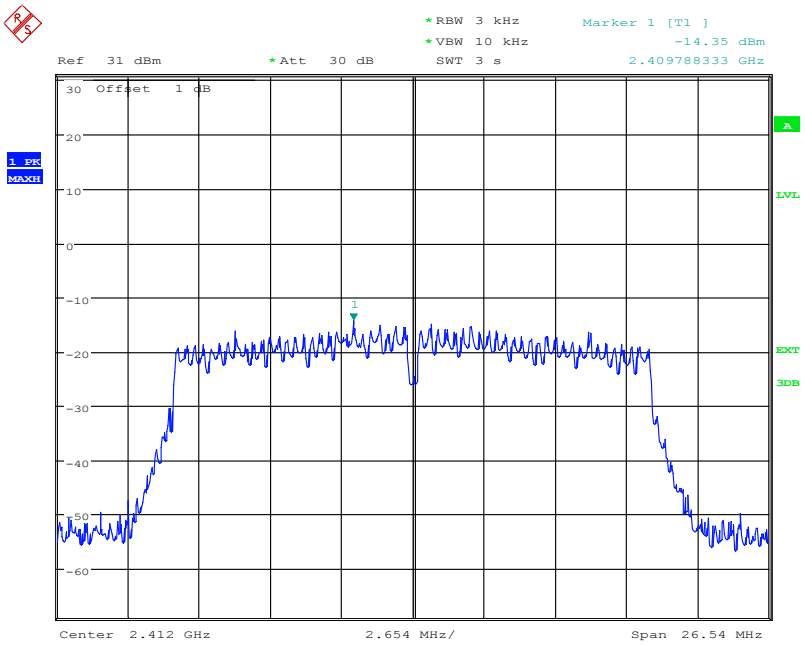
4.4.3 802.11n HT20 Test Mode

A. Test Verdict

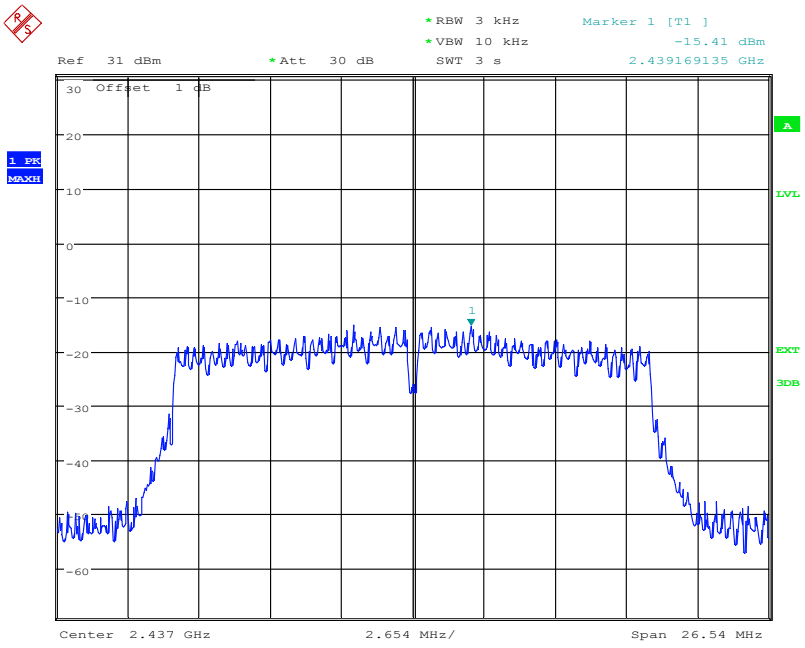
Channel	Frequency (MHz)	Report PSD (dBm/3KHz)	Refer to Plot	Limits (dBm/3KHz)	Verdict
1	2412	-14.35	Plot 4.4.3 A	8	**PASS**
6	2437	-15.41	Plot 4.4.3 B	8	PASS
11	2462	-15.88	Plot 4.4.3 C	8	PASS

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.

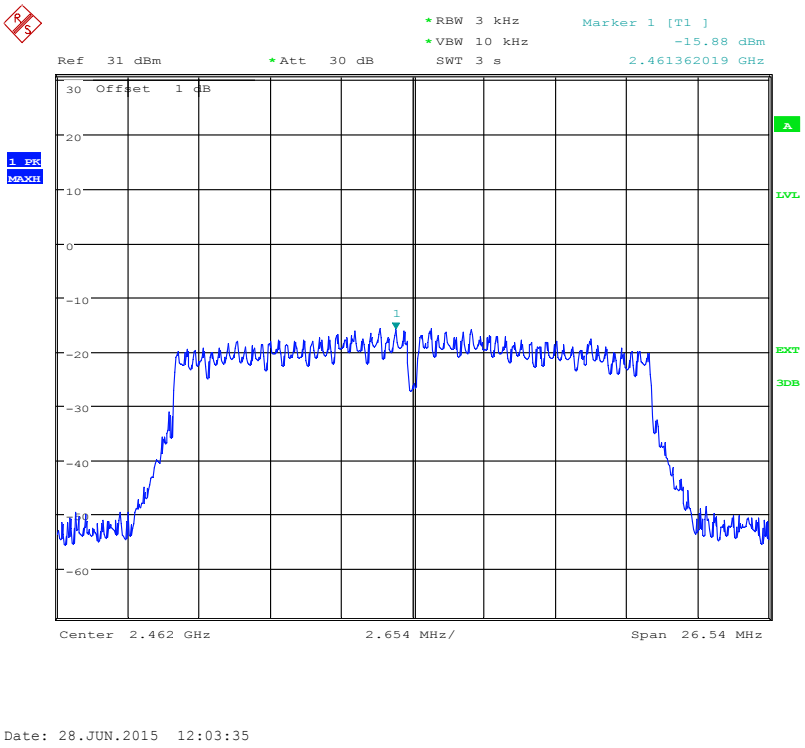
B. Test Plot



(Plot 4.4.3 A: Channel 1: 2412MHz @ 802.11n HT20)



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



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

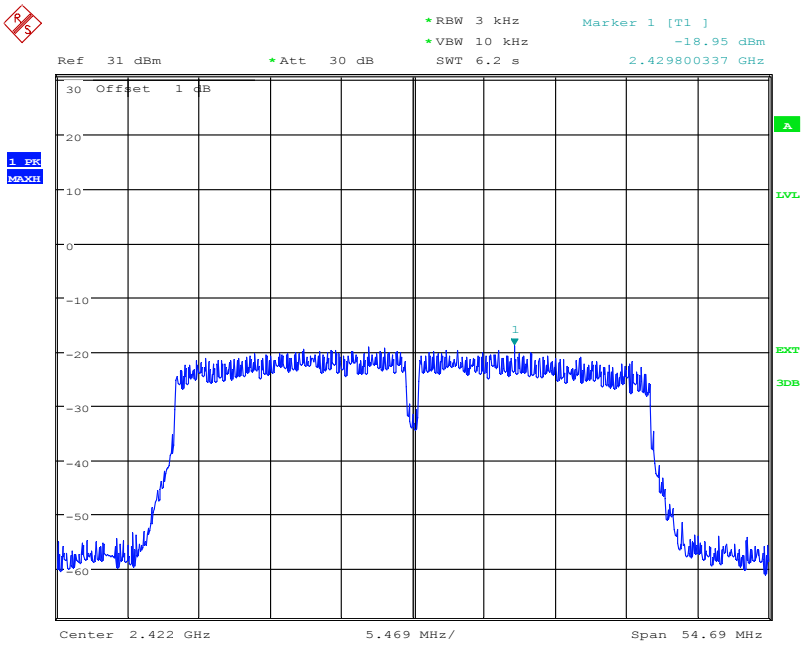
4.4.4 802.11n HT40 Test Mode

A. Test Verdict

Channel	Frequency (MHz)	Report PSD (dBm/3kHz)	Refer to Plot	Limits (dBm/3KHz)	Verdict
3	2422	-18.95	Plot 4.4.4 A	8	PASS
6	2437	-18.75	Plot 4.4.4 B	8	PASS
9	2452	-19.75	Plot 4.4.4 C	8	PASS

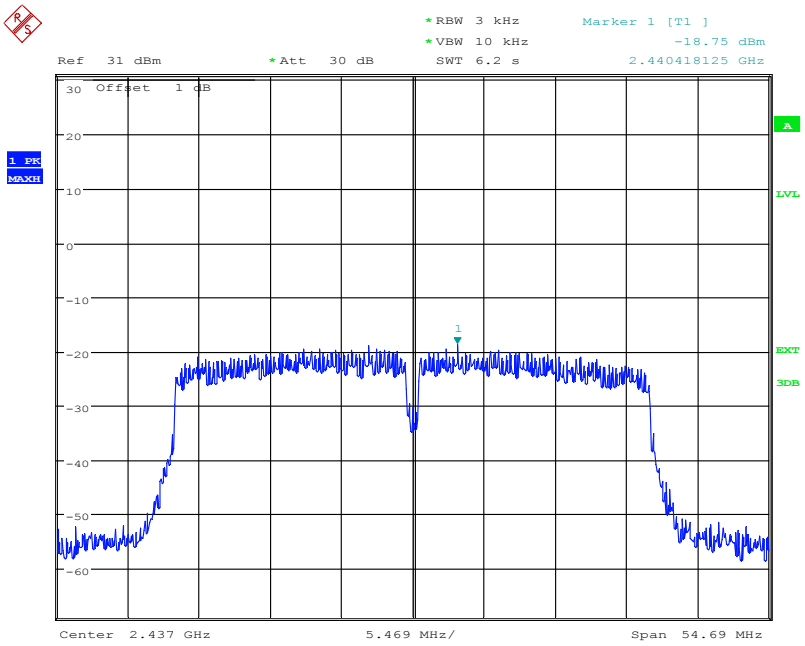
Note:
1. For 802.11n HT40 mode at finial test to get the worst-case emission at 13.5Mbps.
2. The test results including the cable lose.

B. Test Plots



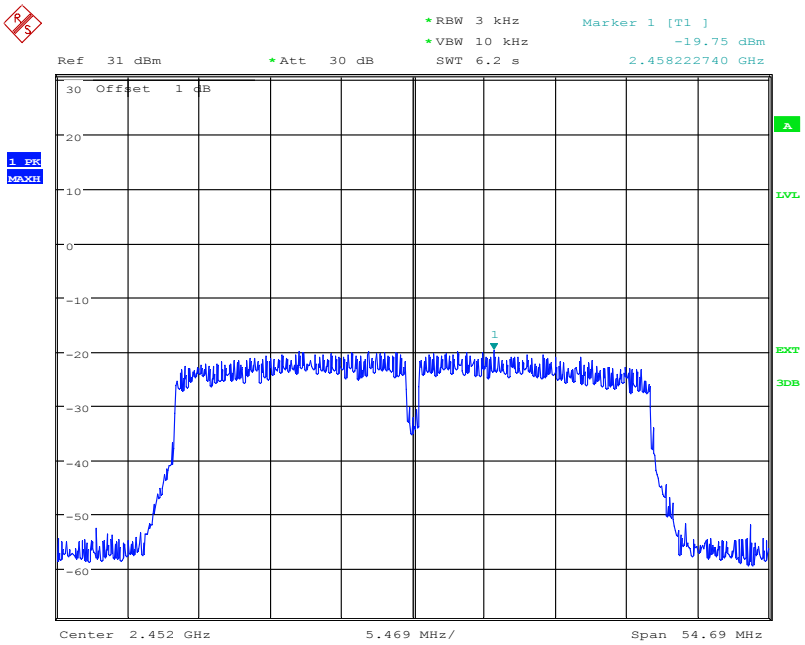
Date: 28.JUN.2015 12:04:40

(Plot 4.4.4 A: Channel 3: 2422MHz @ 802.11n HT40))



Date: 28.JUN.2015 12:04:54

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



(Plot 4.4.4 C: Channel 6: 2452MHz @ 802.11n HT40)

4.5. Band Edge Compliance of RF Emission

TEST REQUIREMENT

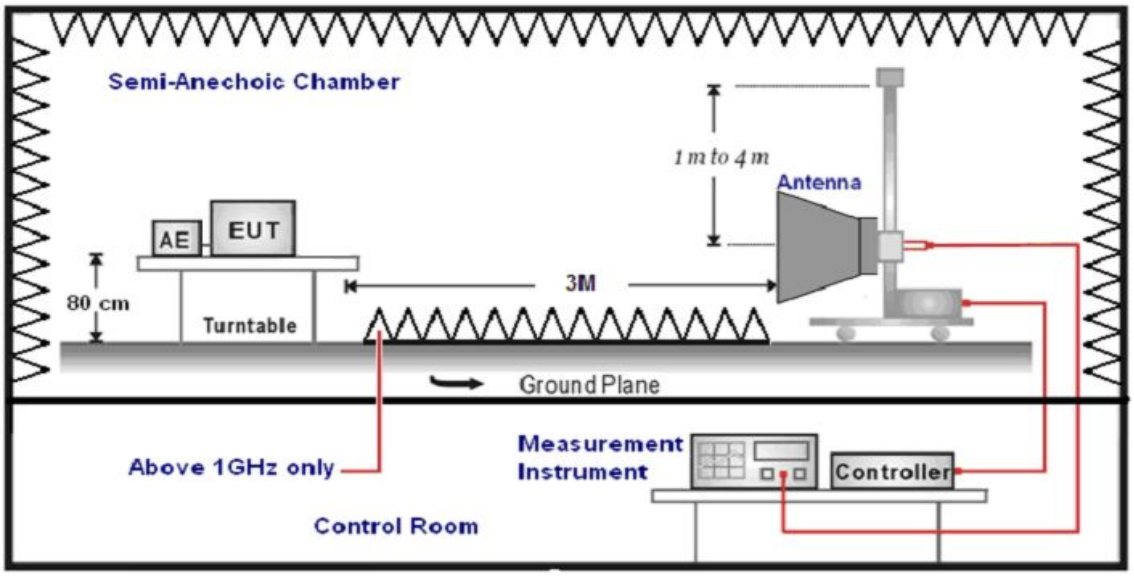
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the 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. 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)).

TEST PROCEDURE

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW of spectrum analyzer to 100 kHz and VBW of spectrum analyzer to 300KHz with a convenient frequency span including 100kHz bandwidth from band edge, for Radiated emissions restricted band RBW=1MHz, VBW=3MHz.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

TEST CONFIGURATION

For Radiated



For Conducted

TEST PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane.

2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ 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 distance between test antenna and EUT was 3 meter:
6. Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto	Peak (Receiver)
1GHz-40GHz	Average Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto	Average (Receiver)

LIMIT

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

TEST RESULTS

4.5.1 For Radiated Bandedge Measurement

Remark:
1. The Bandedge was measured at difference data rate for each mode and recorded worst case for 11b Mode

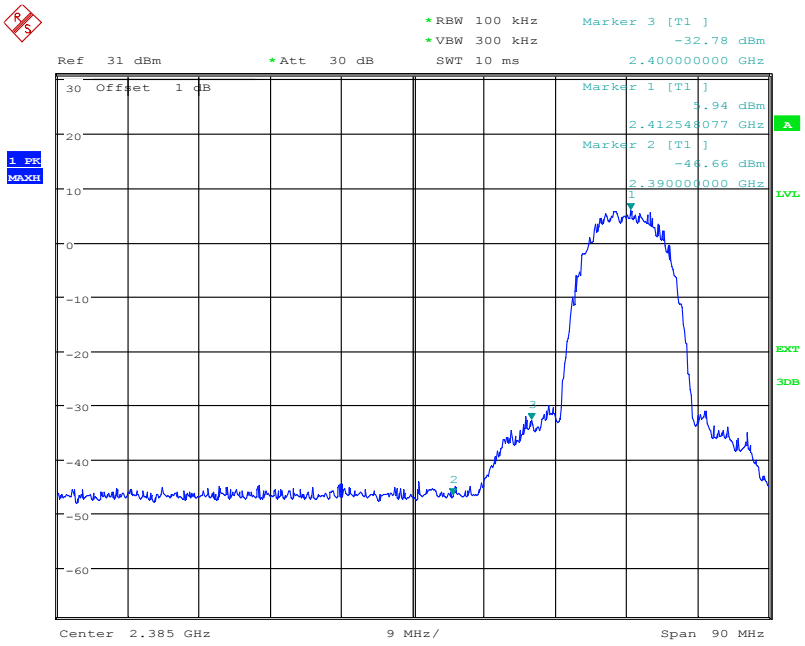
Test Mode:		11b(2412MHz)			Polarization:		Horizontal		
Mark	Frequency (MHz)	Reading Level (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2390.00	23.88	4.60	28.72	0.00	57.20	74.00	16.80	Peak
2	2390.00	15.50	4.60	28.72	0.00	48.82	54.00	5.18	Average
3	2412.82	76.79	4.62	28.80	0.00	110.21	74.00	-36.21	Peak
4	2410.78	74.44	4.62	28.80	0.00	107.86	54.00	-53.86	Average
Test Mode:		**11b(2412MHz)**			**Polarization:**		**Vertical**		
Mark	Frequency (MHz)	Reading Level (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2390.00	23.90	4.60	28.72	0.00	57.22	74.00	16.78	Peak
2	2390.00	13.07	4.60	28.72	0.00	46.39	54.00	7.61	Average
3	2412.75	76.14	4.62	28.80	0.00	109.56	74.00	-35.56	Peak
4	2410.43	73.84	4.62	28.80	0.00	107.26	54.00	-53.26	Average

Test Mode:		11b(2462MHz)			Polarization:		Horizontal		
Mark	Frequency (MHz)	Reading Level (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2461.05	76.59	4.68	28.89	0.00	110.16	74.00	-36.16	Peak
2	2460.25	73.82	4.68	28.89	0.00	107.39	54.00	-53.39	Average
3	2483.50	32.15	4.70	28.93	0.00	65.78	74.00	8.22	Peak
4	2483.50	17.09	4.70	28.93	0.00	50.72	54.00	3.28	Average
Test Mode:		**11b(2462MHz)**			**Polarization:**		**Vertical**		
Mark	Frequency (MHz)	Reading Level (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	2461.09	76.02	4.68	28.89	0.00	109.59	74.00	-35.59	Peak
2	2460.48	73.85	4.68	28.89	0.00	107.42	54.00	-53.42	Average
3	2483.50	25.40	4.70	28.93	0.00	59.03	74.00	14.97	Peak
4	2483.50	16.30	4.70	28.93	0.00	49.93	54.00	4.07	Average

4.5.2 For Conducted Bandedge Measurement

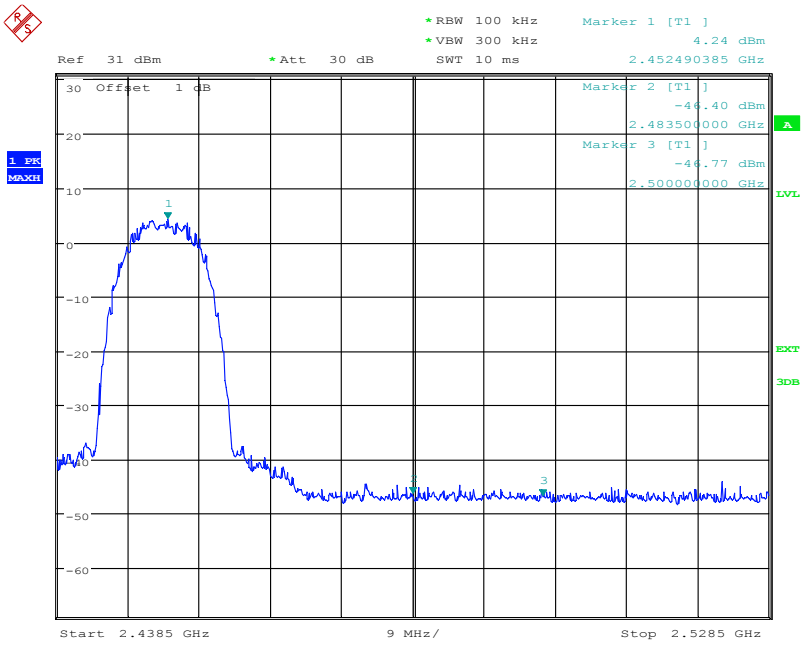
802.11b

A. Test Plots



Date: 28.JUN.2015 12:12:13

(Plot 4.5.2.1 A: Channel 01: 2412MHz @ 802.11 b)

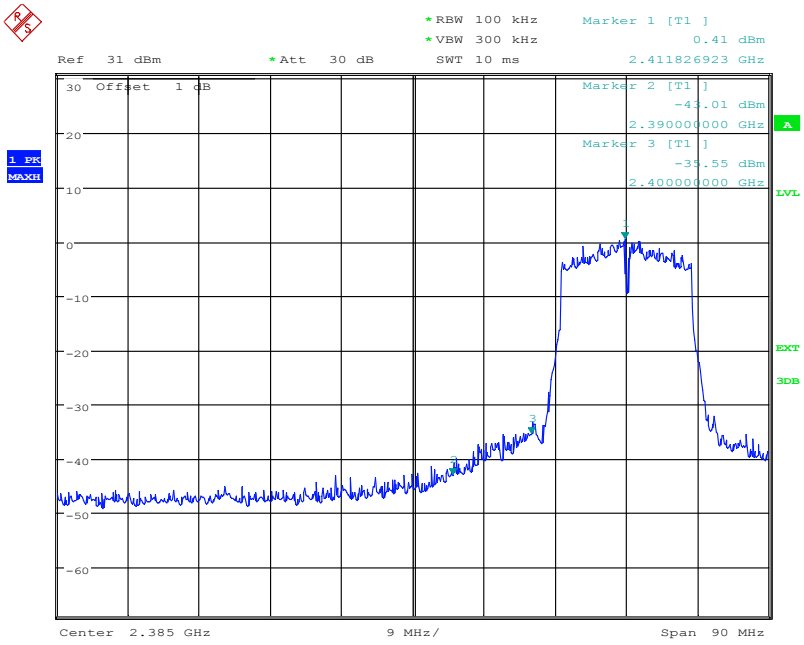


Date: 28.JUN.2015 12:14:26

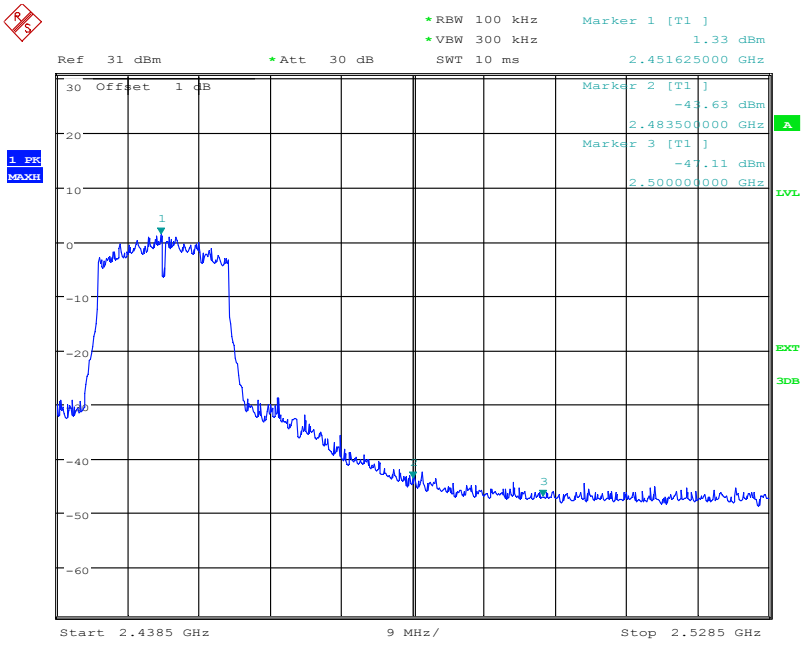
(Plot 4.5.2.1 B: Channel 11: 2462MHz @ 802.11 b)

802.11g

A. Test Plots



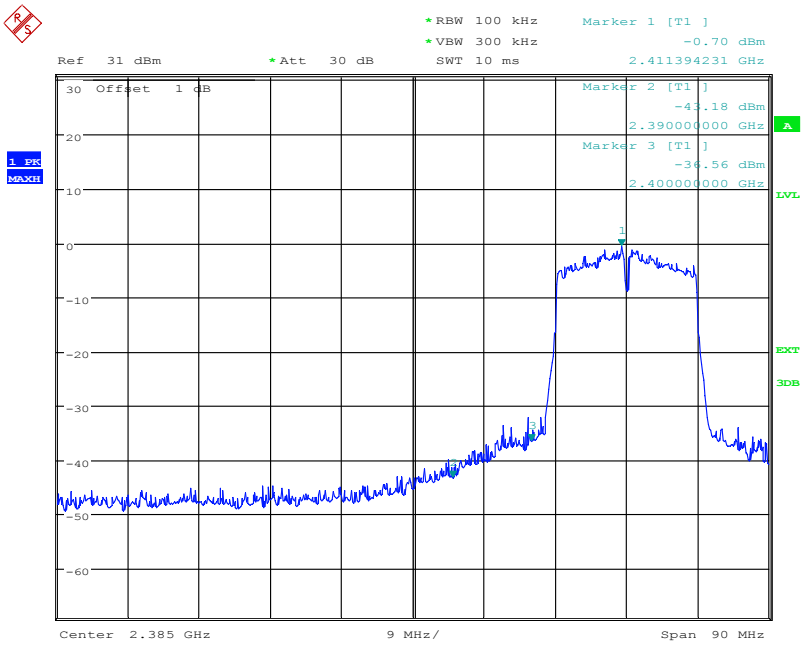
(Plot 4.5.2.2 A: Channel 01: 2412MHz @ 802.11 g)



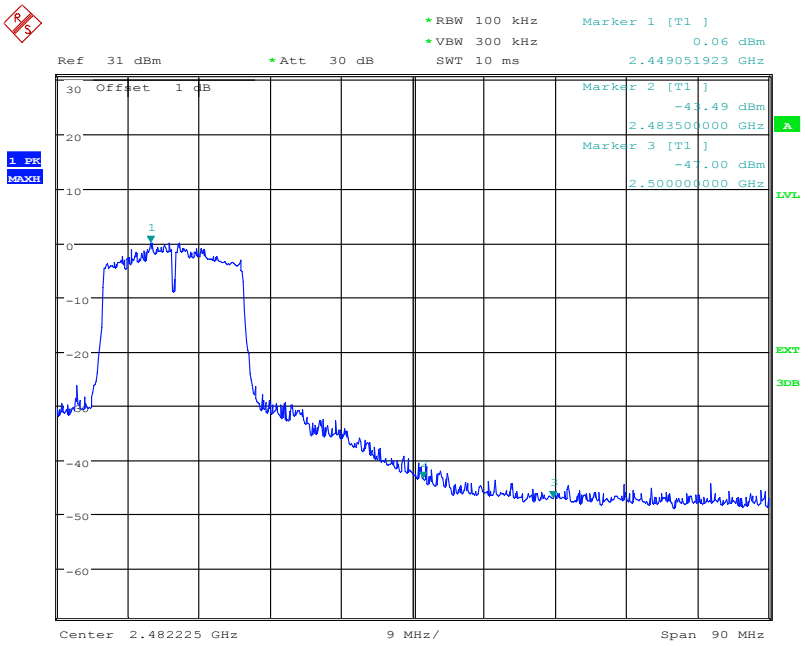
(Plot 4.5.2.2 B: Channel 11: 2462MHz @ 802.11 g)

802.11n HT20

A. Test Plots



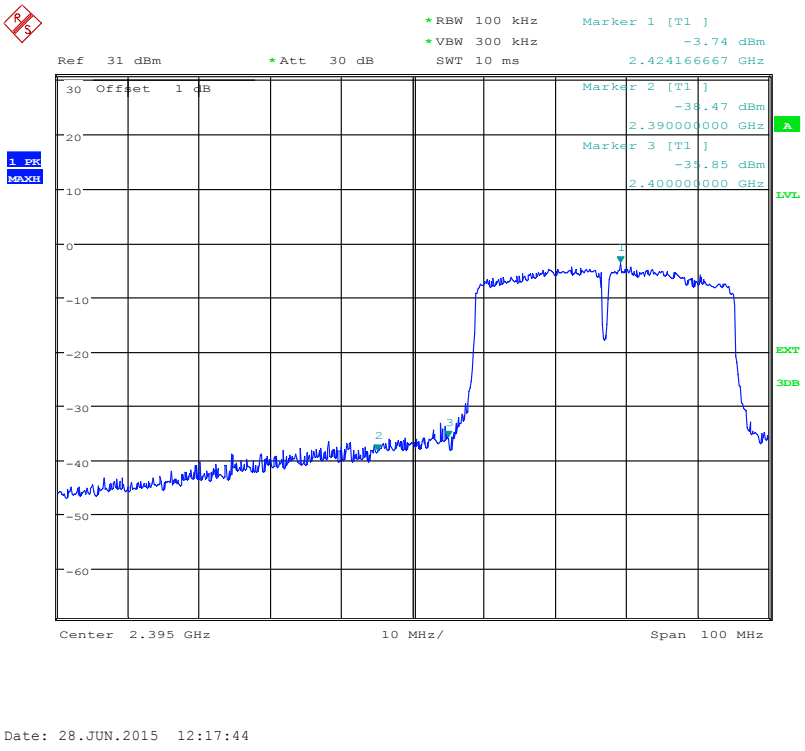
Plot 4.5.2.3 A: Channel 01: 2412MHz @ 802.11n HT20)



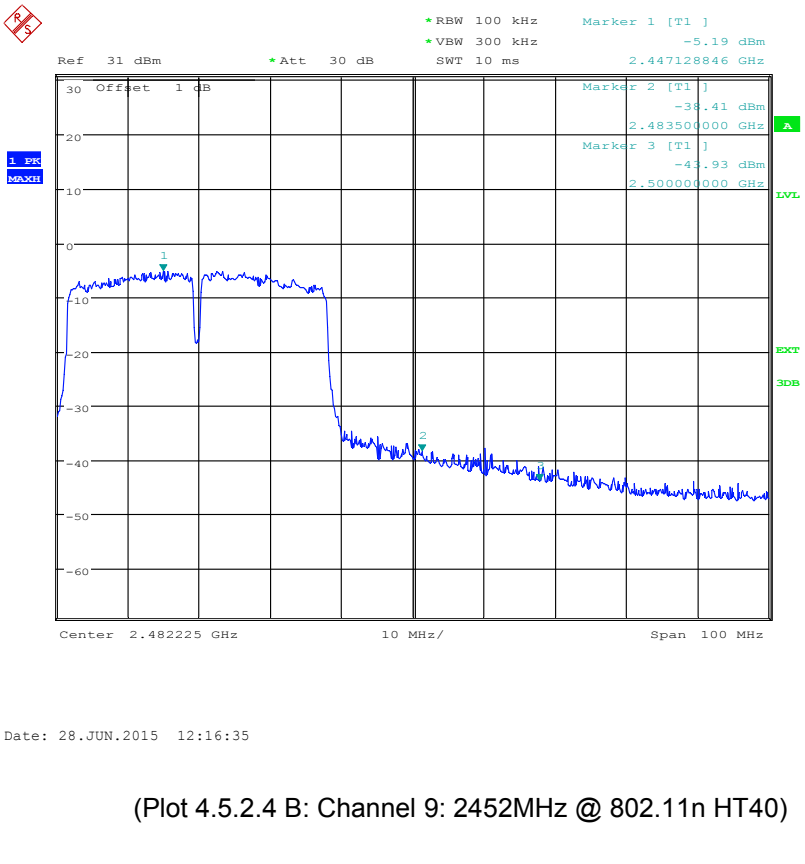
(Plot 4.5.2.3 B: Channel 11: 2462MHz @ 802.11n HT20)

802.11n HT40

A. Test Plots



(Plot 4.5.2.4 A: Channel 3: 2422MHz@ 802.11n HT40)



(Plot 4.5.2.4 B: Channel 9: 2452MHz @ 802.11n HT40)

4.6. 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 C63.4-2009 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.

LIMIT

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

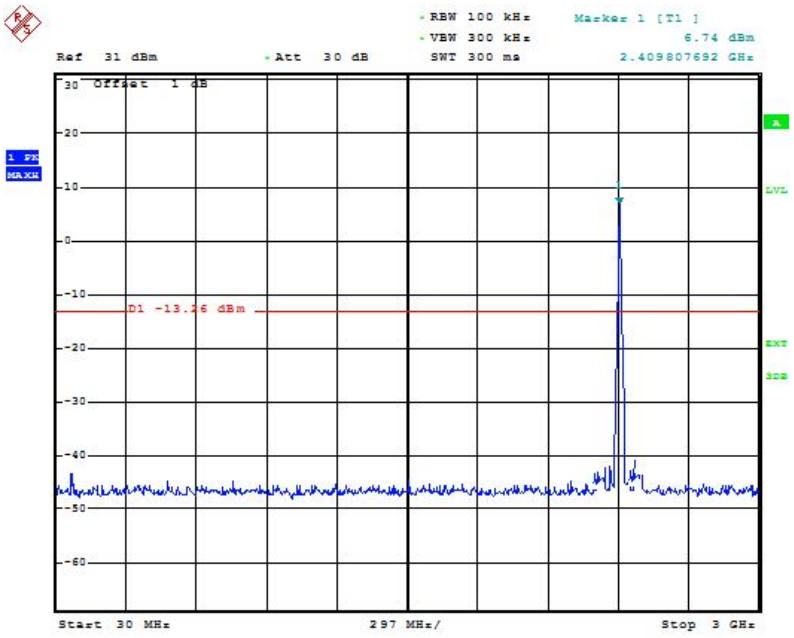
Remark: The measurement frequency range is from 9 KHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and bandege measurement data.

4.6.1 802.11b Test Mode

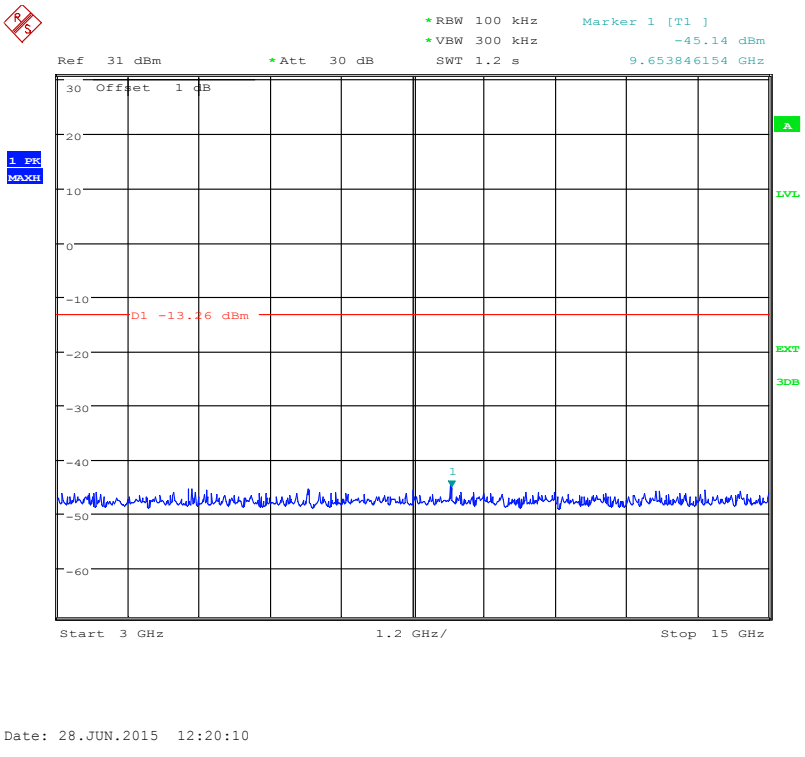
A. Test Verdict

Channel	Frequency (MHz)	Frequency Range	Refer to Plot	Limit (dBc)	Verdict
1	2412	30MHz -3GHz	Plot 4.6.1 A1	---	PASS
		3GHz -15GHz	Plot 4.6.1 A2	-20	PASS
		15GHz -25GHz	Plot 4.6.1 A23	-20	PASS
6	2437	30MHz -3GHz	Plot 4.6.1 B1	---	PASS
		3GHz -15GHz	Plot 4.6.1 B2	-20	PASS
		15GHz -25GHz	Plot 4.6.1 B3	-20	PASS
11	2462	30MHz -3GHz	Plot 4.6.1 C1	---	PASS
		3GHz -15GHz	Plot 4.6.1 C2	-20	PASS
		15GHz -25GHz	Plot 4.6.1 C3	-20	PASS

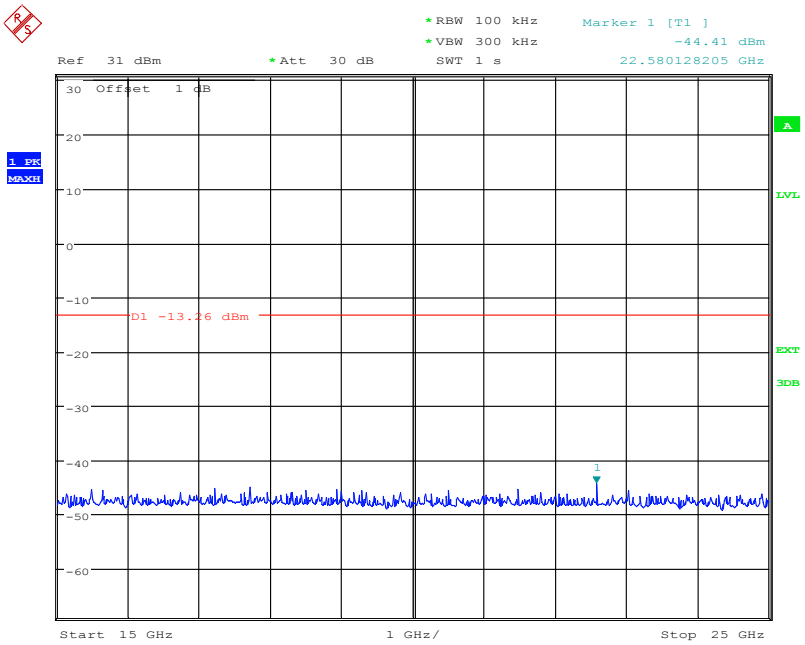
Note:
1. For 802.11b mode at finial test to get the worst-case emission at 1Mbps.
2. The test results including the cable lose.
3. For 9KHz -30MHz,Because there was more 20dB less than limt So We did not recorded data.



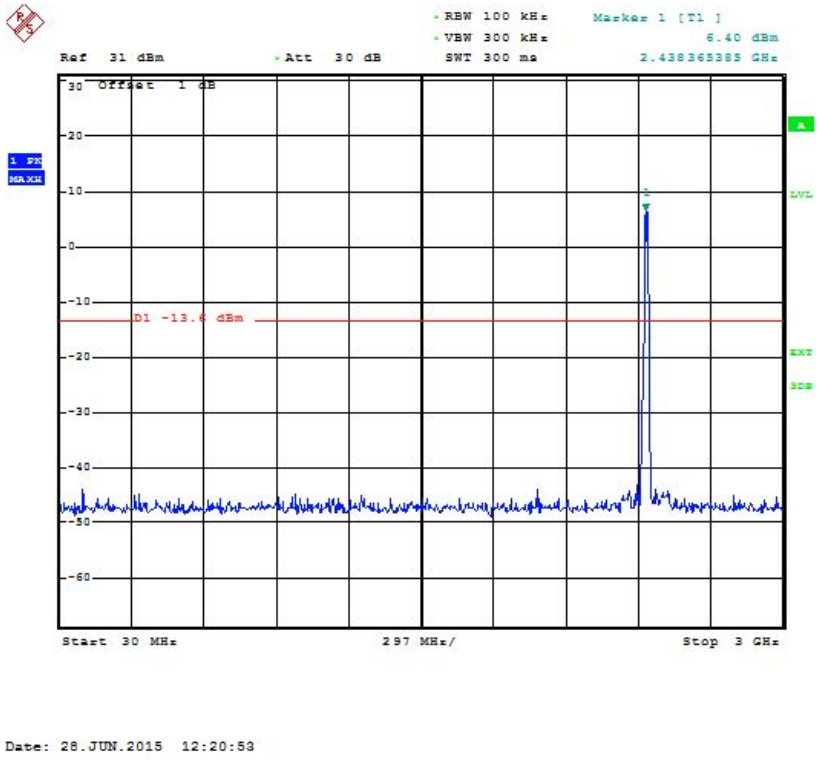
(Plot 4.6.1 A1: Channel 1: 2412MHz @ 802.11b)



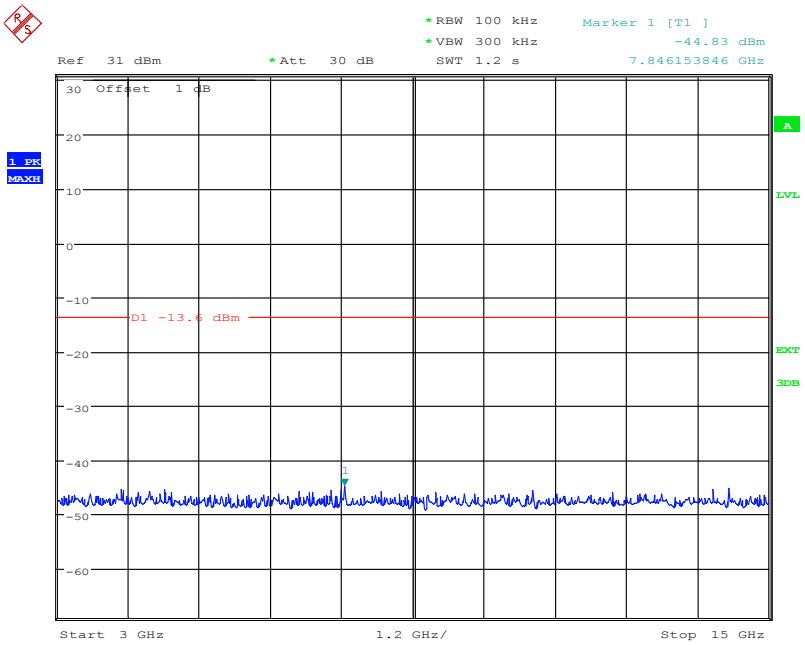
(Plot 4.6.1 A2: Channel 1: 2412MHz @ 802.11b)



(Plot 4.6.1 A3: Channel 1: 2412MHz @ 802.11b)

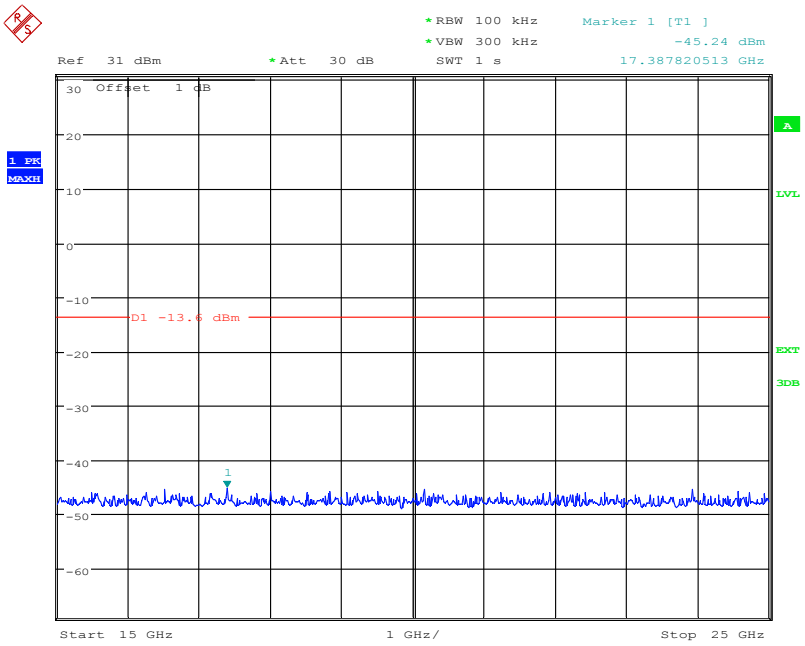


(Plot 4.6.1 B1: Channel 6: 2437MHz @ 802.11b)



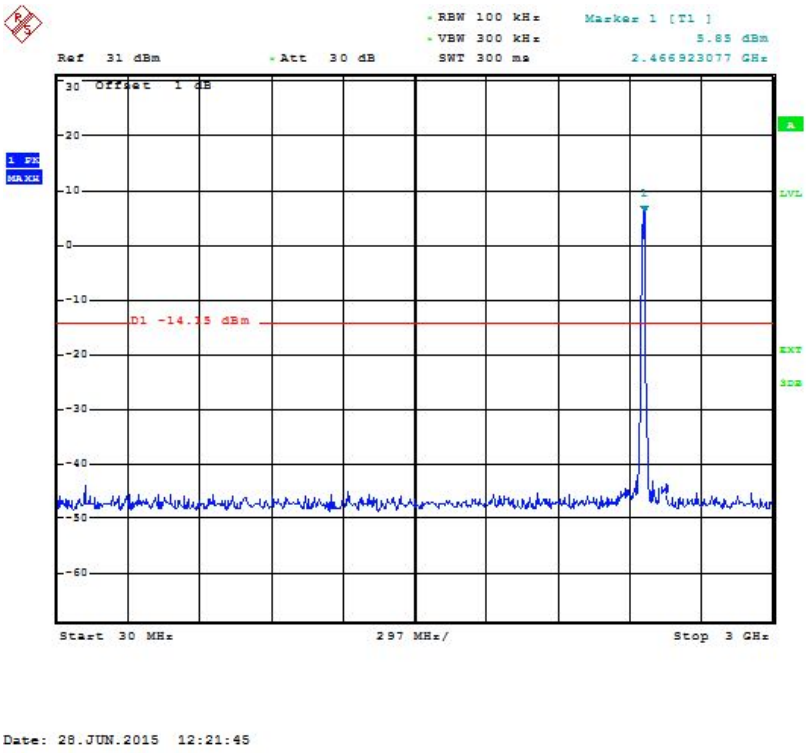
Date: 28.JUN.2015 12:21:14

(Plot 4.6.1 B2: Channel 6: 2437MHz @ 802.11b)

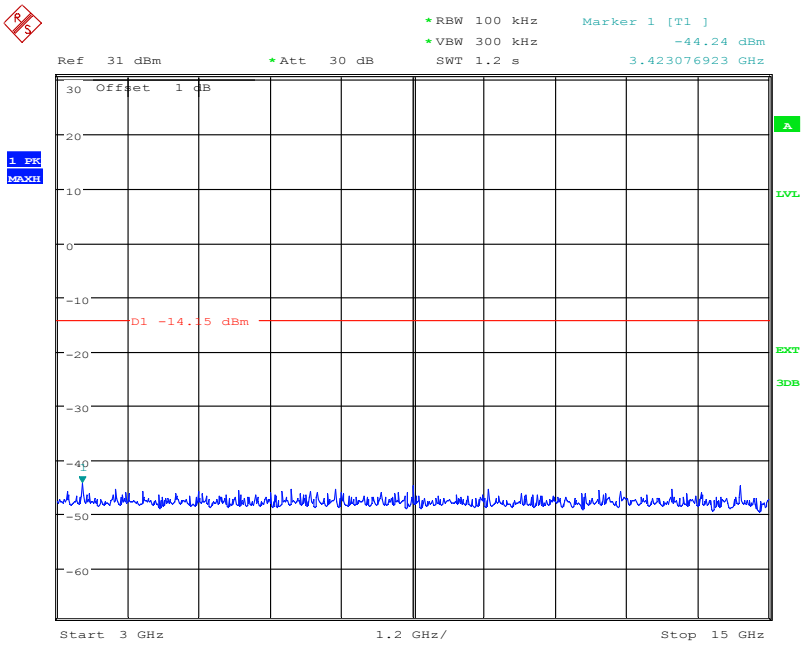


Date: 28.JUN.2015 12:21:25

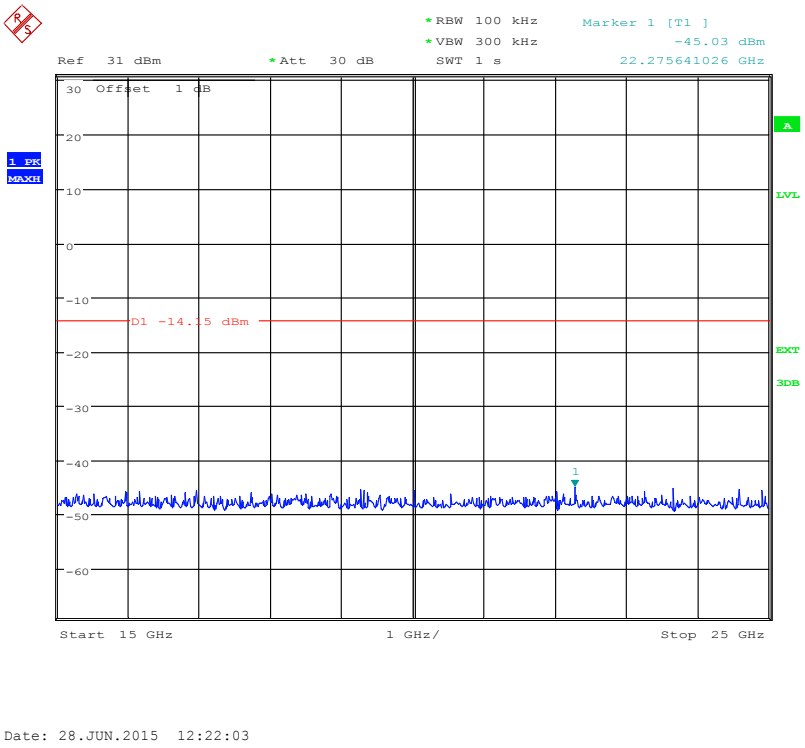
(Plot 4.6.1 B3: Channel 6: 2437MHz @ 802.11b)



(Plot 4.6.1 C1: Channel 11: 2462MHz @ 802.11b)



(Plot 4.6.1 C2: Channel 11: 2462MHz @ 802.11b)



(Plot 4.6.1 C3: Channel 11: 2462MHz @ 802.11b)

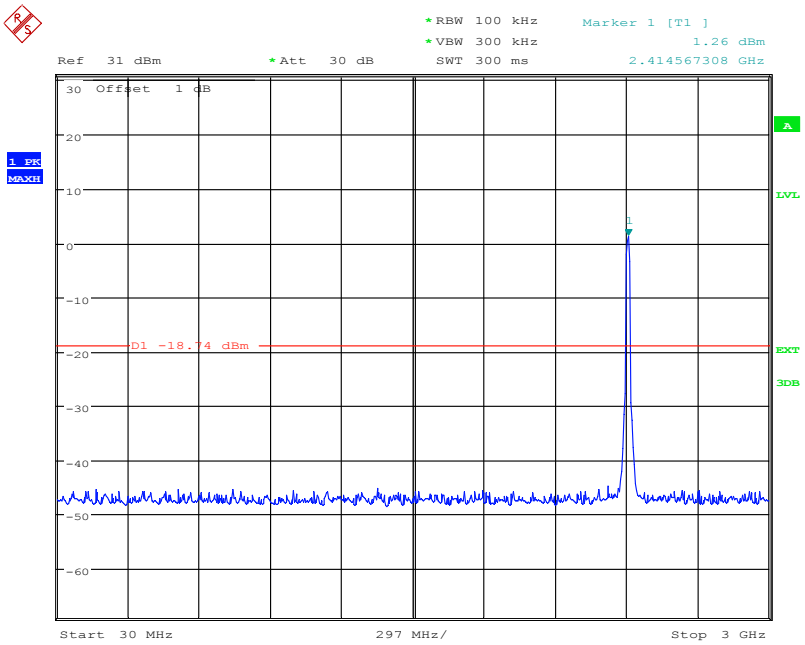
4.6.2 802.11g Test Mode

A. Test Verdict

Channel	Frequency (MHz)	Frequency Range	Refer to Plot	Limit (dBc)	Verdict
1	2412	30MHz -3GHz	Plot 4.6.2 A1	---	PASS
		3GHz -15GHz	Plot 4.6.2 A2	-20	PASS
		15GHz -25GHz	Plot 4.6.2 A3	-20	PASS
6	2437	30MHz -3GHz	Plot 4.6.2 B1	---	PASS
		3GHz -15GHz	Plot 4.6.2 B2	-20	PASS
		15GHz -25GHz	Plot 4.6.2 B3	-20	PASS
11	2462	30MHz -3GHz	Plot 4.6.2 C1	---	PASS
		3GHz -15GHz	Plot 4.6.2 C2	-20	PASS
		15GHz -25GHz	Plot 4.6.2 C3	-20	PASS

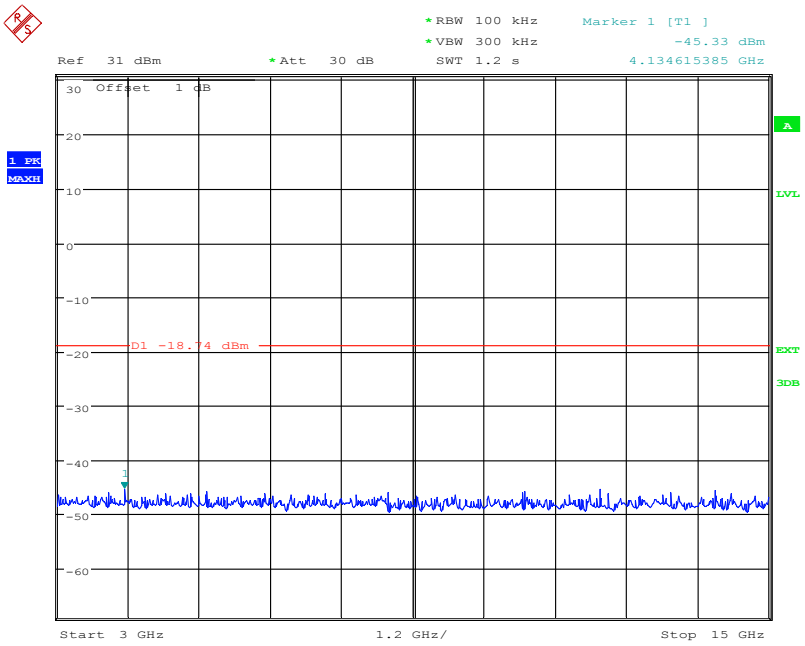
Note:
1. For 802.11g mode at finial test to get the worst-case emission at 6Mbps.
2. The test results including the cable lose.
3. For 9KHz -30MHz,Because there was more 20dB less than limt So We did not recorded data

B. Test Plots



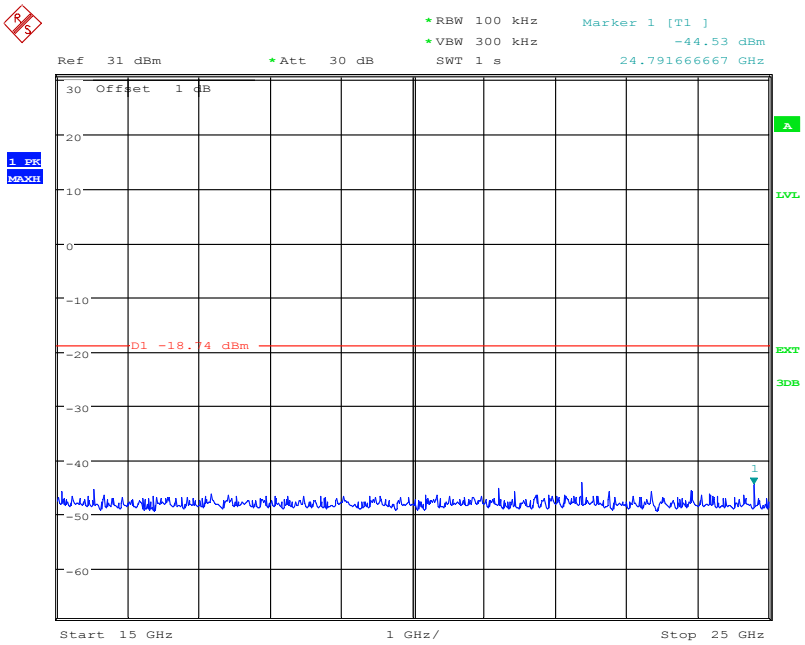
Date: 28.JUN.2015 12:22:27

(Plot 4.6.2 A1: Channel 1: 2412MHz @ 802.11g)



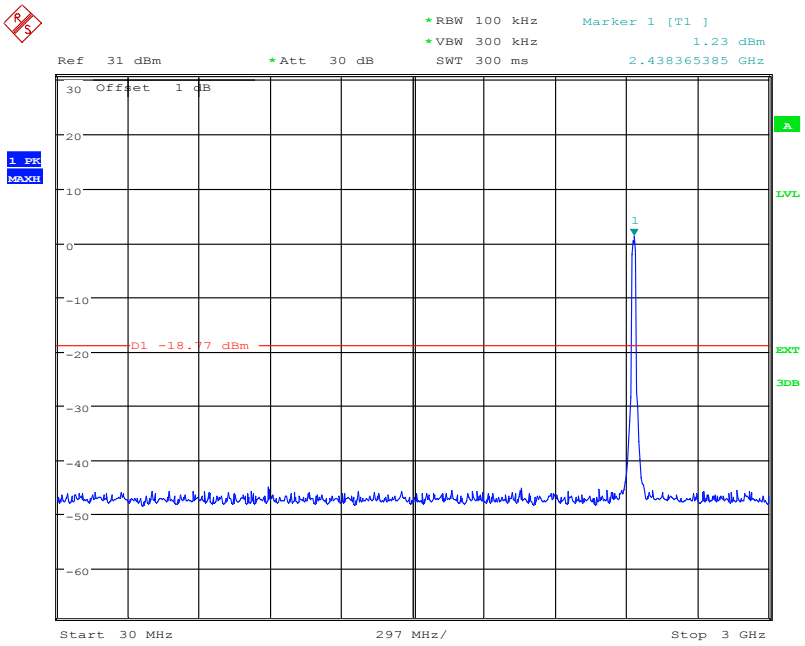
Date: 28.JUN.2015 12:22:34

(Plot 4.6.2 A2: Channel 1: 2412MHz @ 802.11g)



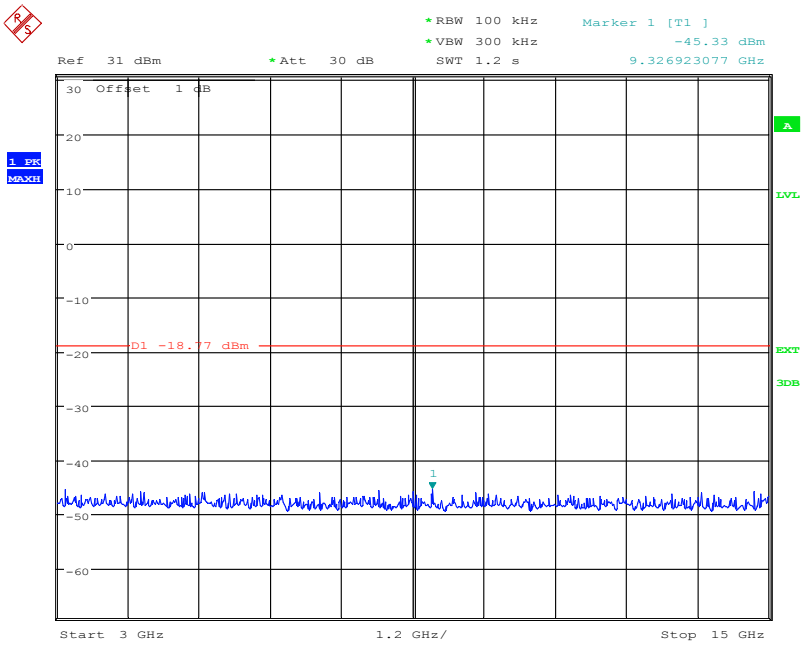
Date: 28.JUN.2015 12:22:43

(Plot 4.6.2 A3: Channel 1: 2412MHz @ 802.11g)



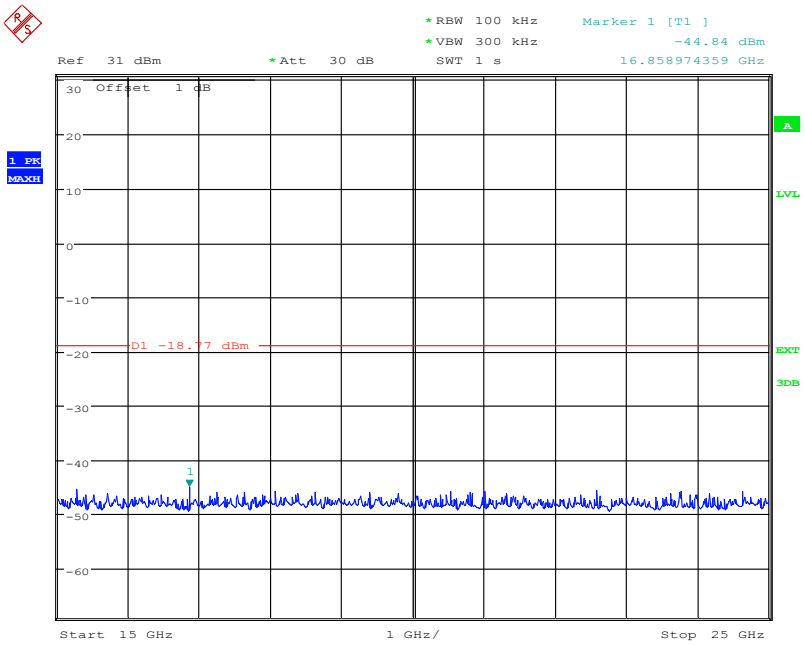
Date: 28.JUN.2015 12:23:00

(Plot 4.6.2 B1: Channel 6: 2437MHz @ 802.11g)



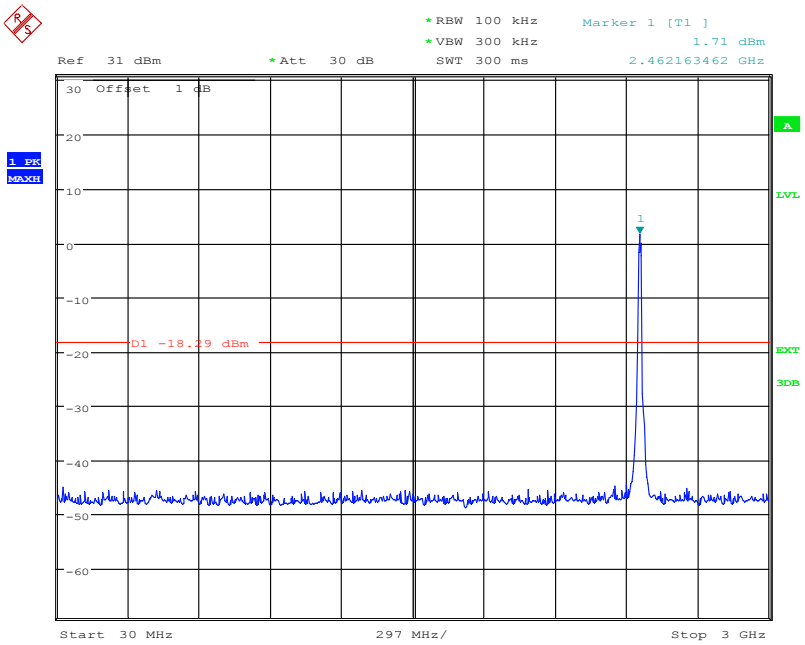
Date: 28.JUN.2015 12:23:08

(Plot 4.6.2 B2: Channel 6: 2437MHz @ 802.11g)

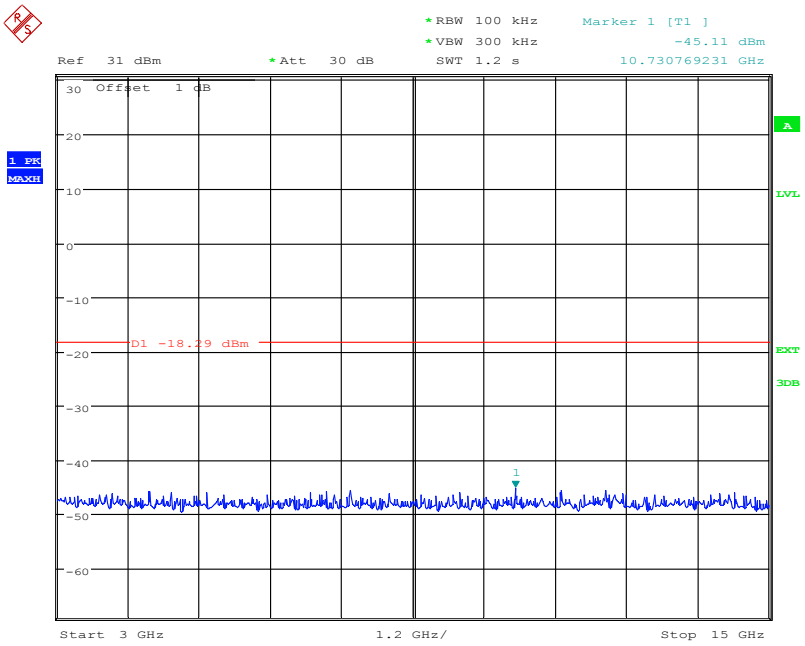


Date: 28.JUN.2015 12:23:16

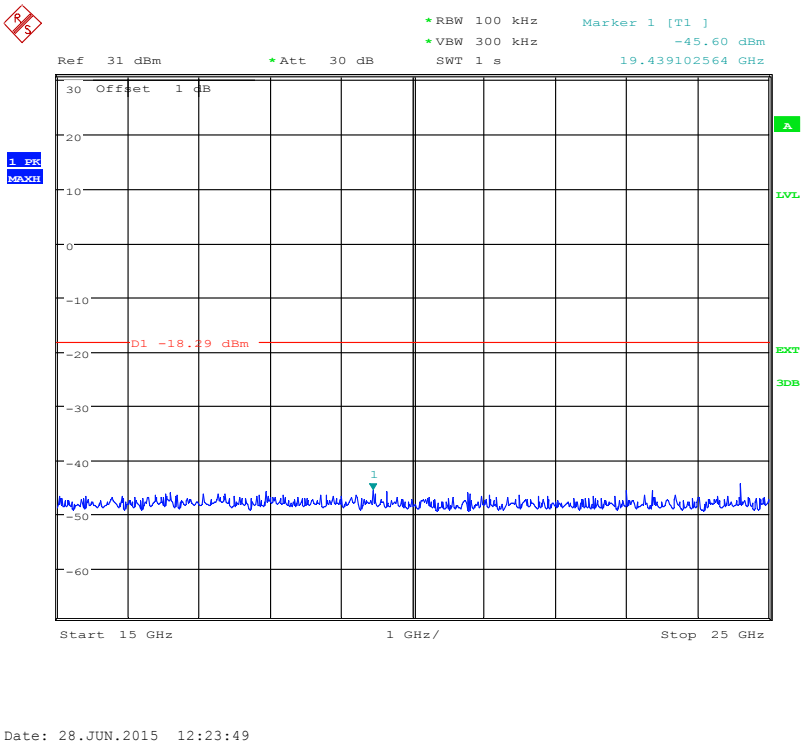
(Plot 4.6.2 B3: Channel 6: 2437MHz @ 802.11g)



(Plot 4.6.2 C1: Channel 11: 2462MHz @ 802.11g)



(Plot 4.6.2 C2: Channel 11: 2462MHz @ 802.11g)



(Plot 4.6.2 C3: Channel 11: 2462MHz @ 802.11g)

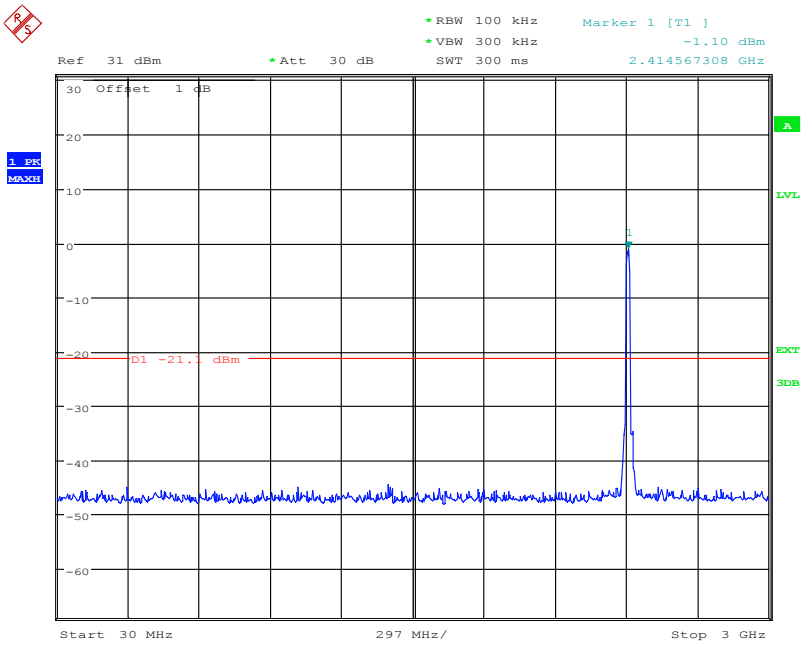
4.6.3 802.11n HT20MHz Test Mode

A. Test Verdict

Channel	Frequency (MHz)	Frequency Range	Refer to Plot	Limit (dBc)	Verdict
1	2412	30MHz -3GHz	Plot 4.6.3 A1	---	PASS
		3GHz -15GHz	Plot 4.6.3 A2	-20	PASS
		15GHz -25GHz	Plot 4.6.3 A3	-20	PASS
6	2437	30MHz -3GHz	Plot 4.6.3 A1	---	PASS
		3GHz -15GHz	Plot 4.6.3 A2	-20	PASS
		15GHz -25GHz	Plot 4.6.3 A3	-20	PASS
11	2462	30MHz -3GHz	Plot 4.6.3 A1	---	PASS
		3GHz -15GHz	Plot 4.6.3 A2	-20	PASS
		15GHz -25GHz	Plot 4.6.3 A3	-20	PASS

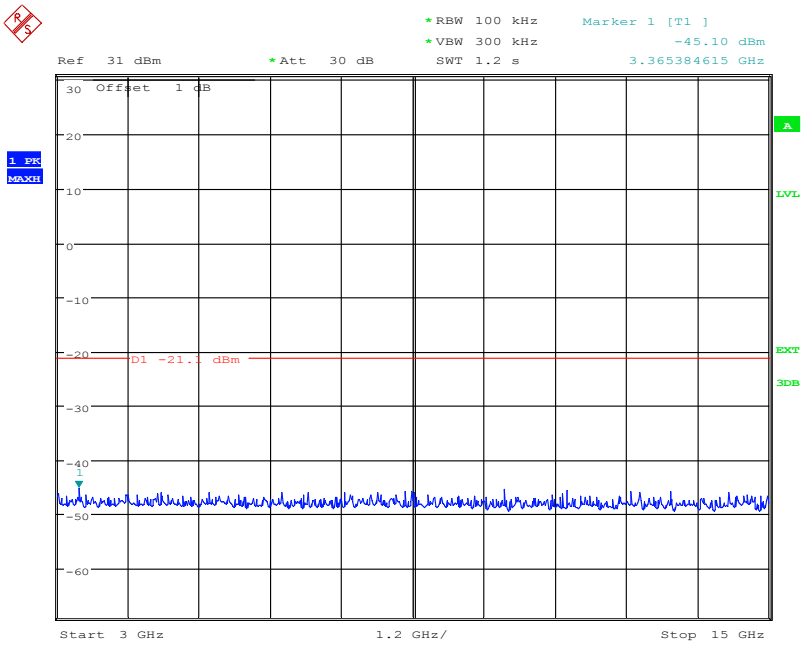
Note:
1. For 802.11n HT20MHz mode at finial test to get the worst-case emission at 6.5Mbps.
2. The test results including the cable lose.
3. For 9KHz -30MHz,Because there was more 20dB less than limt So We did not recorded data.

B. Test Plots



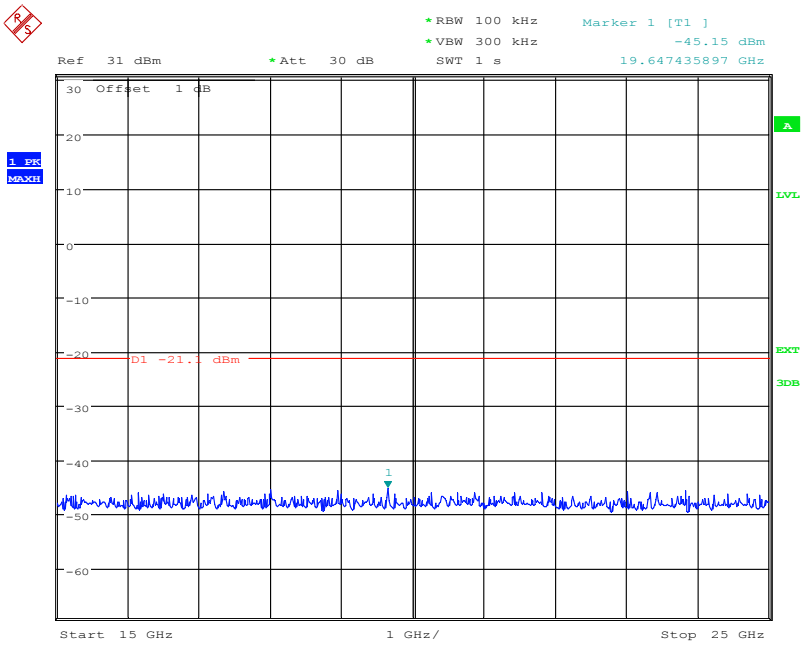
Date: 28.JUN.2015 12:24:22

(Plot 4.6.3 A1: Channel 1: 2412MHz @ 802.11n HT20)

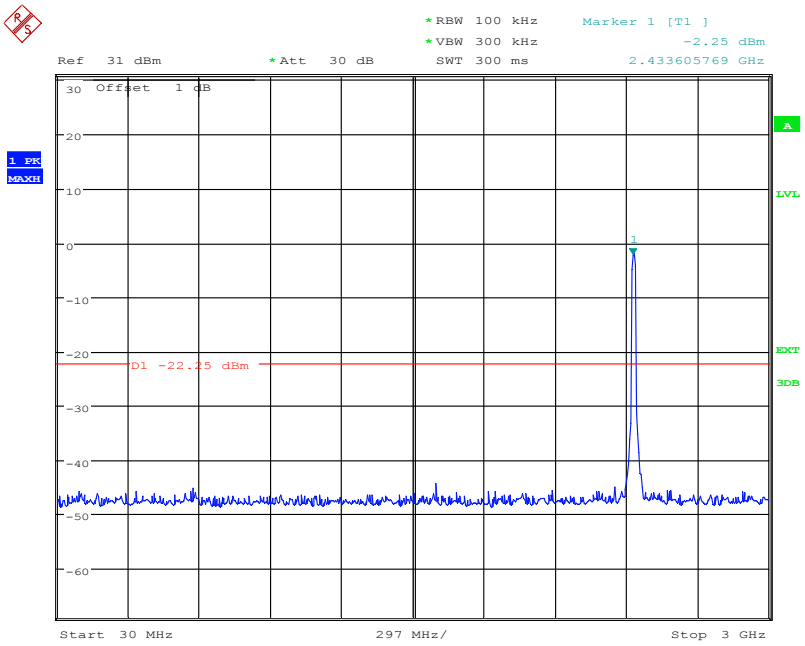


Date: 28.JUN.2015 12:24:30

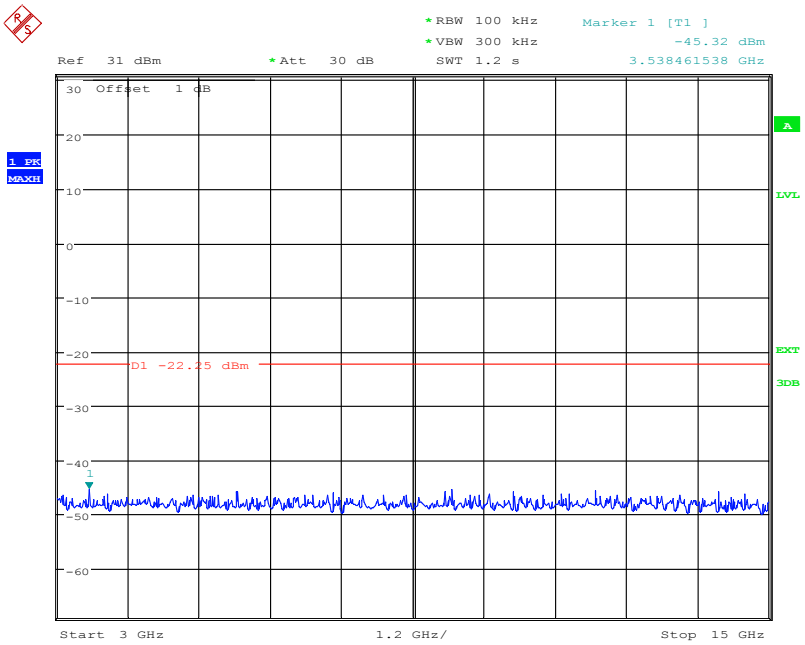
(Plot 4.6.3 A2: Channel 1: 2412MHz @ 802.11n HT20)



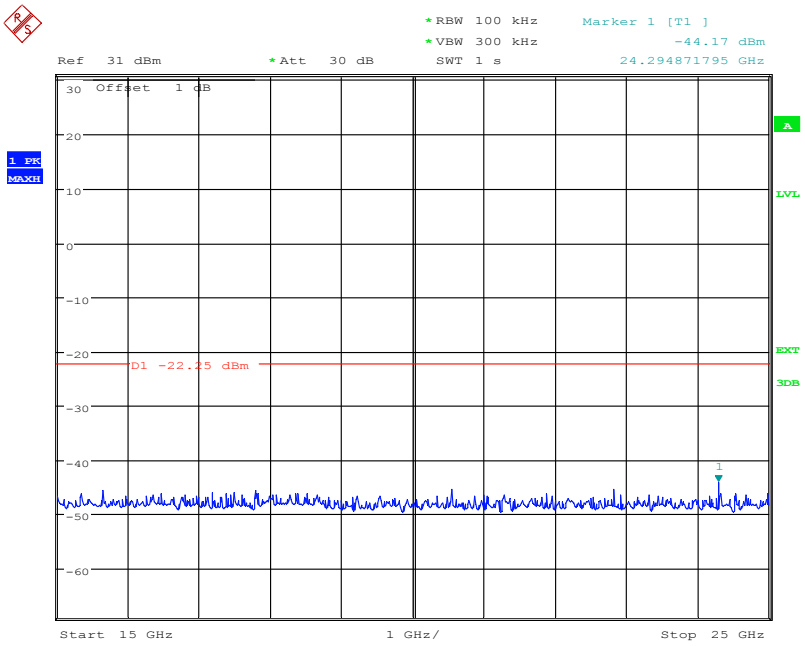
(Plot 4.6.3 A3: Channel 1: 2412MHz @ 802.11n HT20)



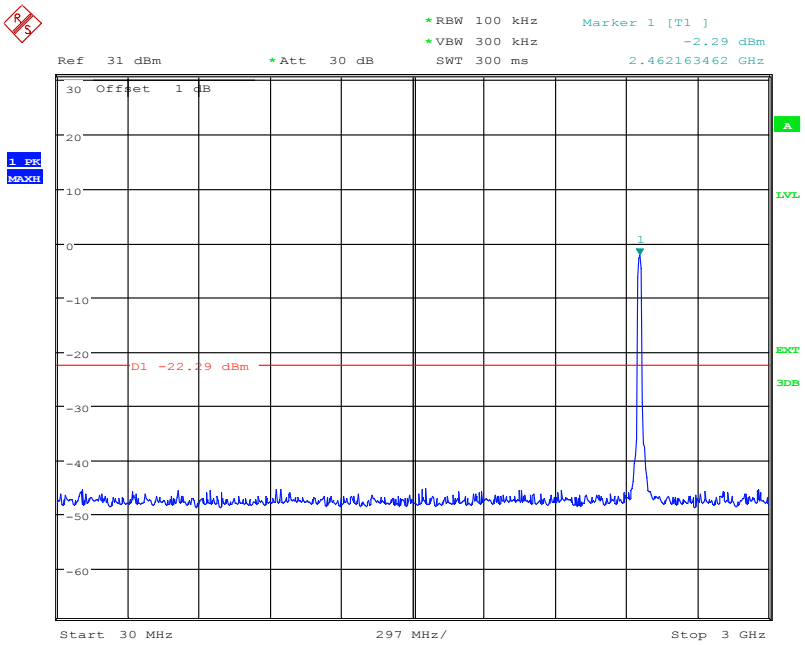
(Plot 4.6.3 B1: Channel 6: 2437MHz @ 802.11n HT20)



(Plot 4.6.3 B2: Channel 6: 2437MHz @ 802.11n HT20)

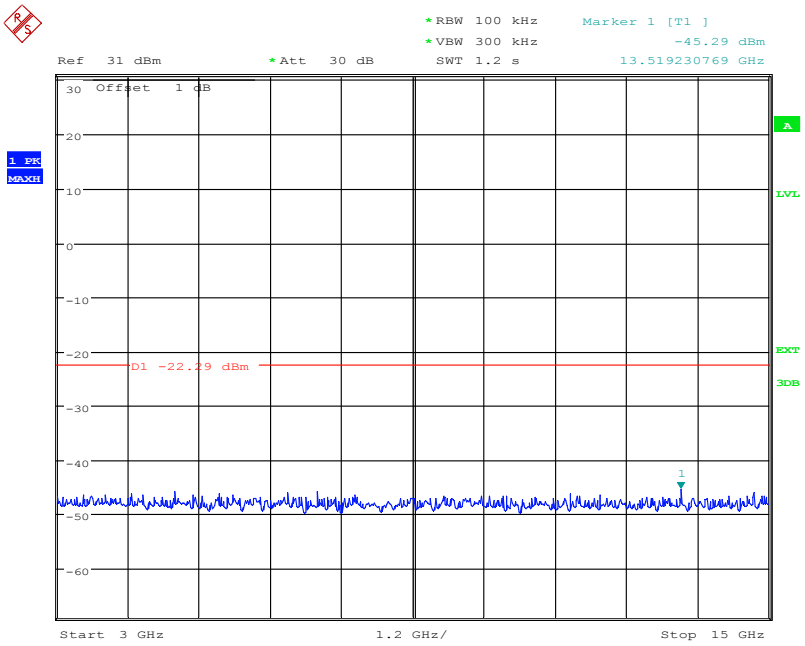


(Plot 4.6.3 B2: Channel 6: 2437MHz @ 802.11n HT20)



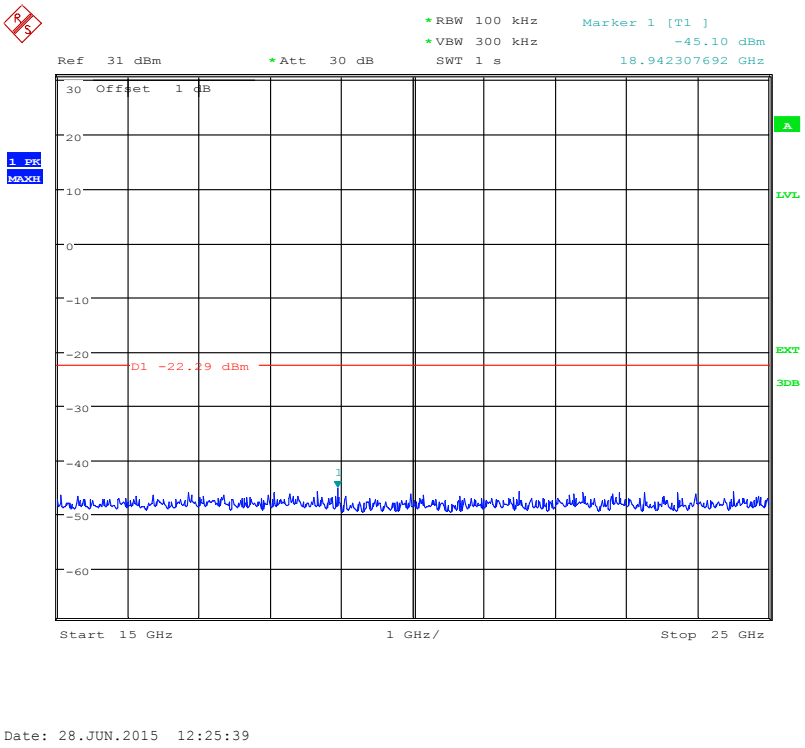
Date: 28.JUN.2015 12:25:25

(Plot 4.6.3 C1: Channel 11: 2462MHz @ 802.11n HT20)



Date: 28.JUN.2015 12:25:32

(Plot 4.6.3 C2: Channel 11: 2462MHz @ 802.11n HT20)



(Plot 4.6.3 C2: Channel 11: 2462MHz @ 802.11n HT20)

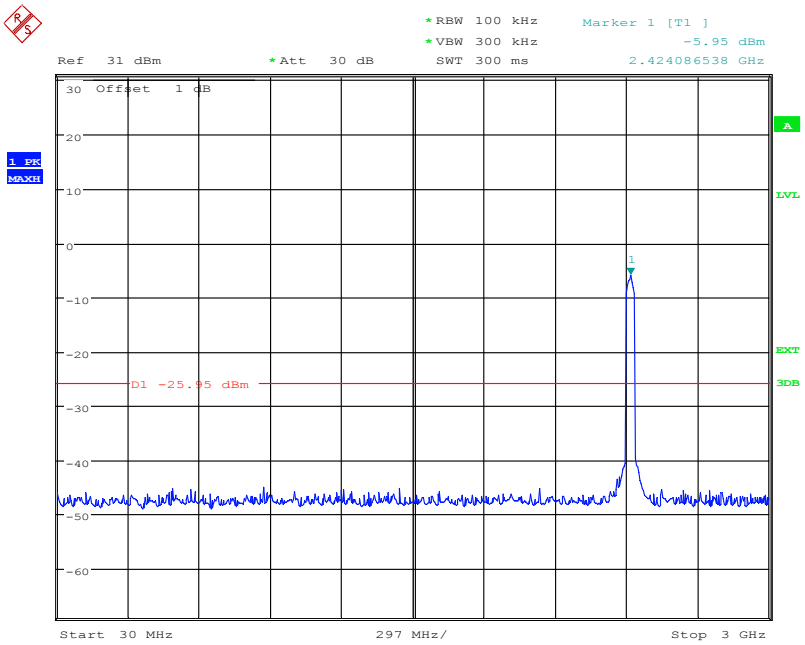
4.6.4 802.11n HT40MHz Test Mode

A. Test Verdict

Channel	Frequency (MHz)	Frequency Range	Refer to Plot	Limit (dBc)	Verdict
3	2422	30MHz -3GHz	Plot 4.6.4 A1	---	PASS
		3GHz -15GHz	Plot 4.6.4 A2	-20	PASS
		15GHz -25GHz	Plot 4.6.4 A3	-20	PASS
6	2437	30MHz -3GHz	Plot 4.6.4 B1	---	PASS
		3GHz -15GHz	Plot 4.6.4 B2	-20	PASS
		15GHz -25GHz	Plot 4.6.4 B3	-20	PASS
9	2452	30MHz -3GHz	Plot 4.6.4 C1	---	PASS
		3GHz -15GHz	Plot 4.6.3 C2	-20	PASS
		15GHz -25GHz	Plot 4.6.3 C3	-20	PASS

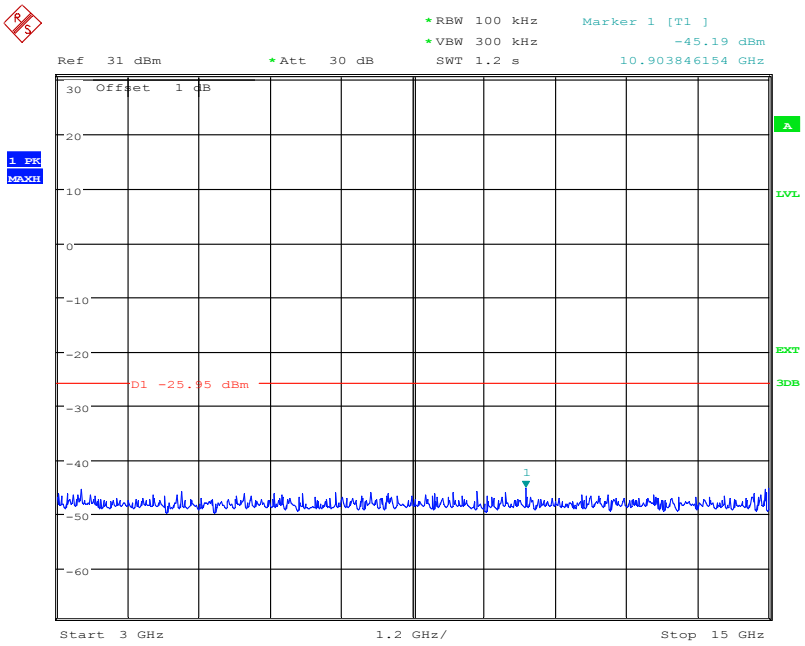
Note:
1. For 802.11n HT40MHz mode at finial test to get the worst-case emission at 13.5Mbps.
2. The test results including the cable lose.
3. For 9KHz -30MHz,Because there was more 20dB less than limt So We did not recorded data

B. Test Plots



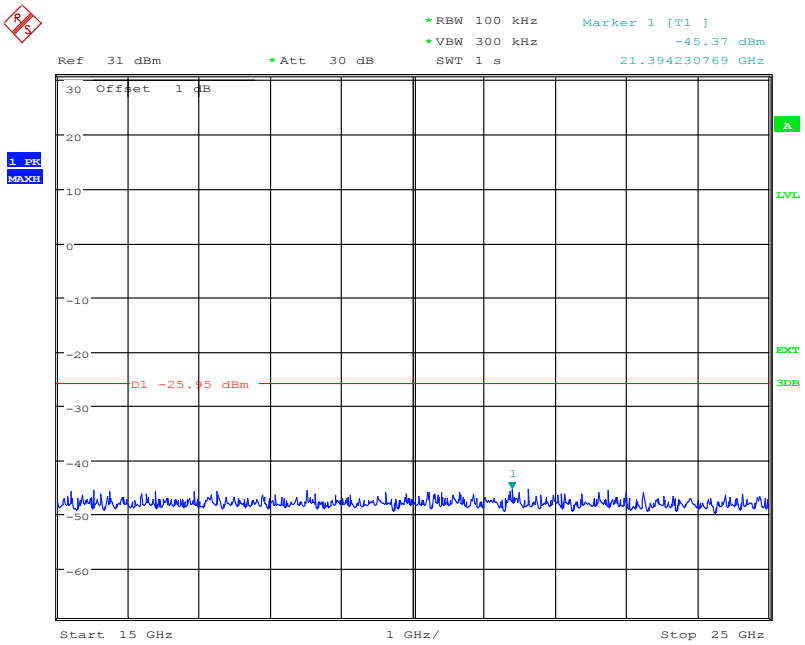
Date: 28.JUN.2015 12:25:59

(Plot 4.6.4 A1: Channel 3: 2422MHz @ 802.11n HT40)

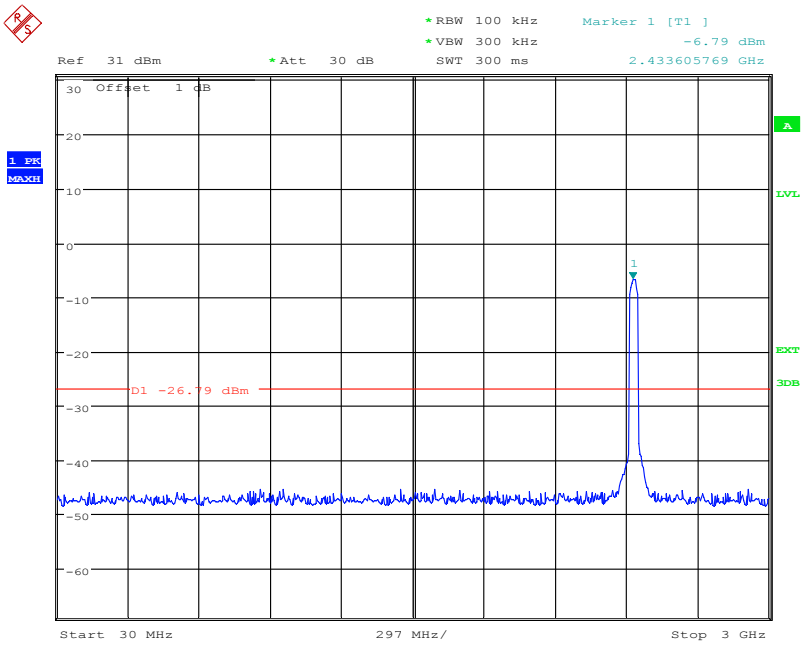


Date: 28.JUN.2015 12:26:06

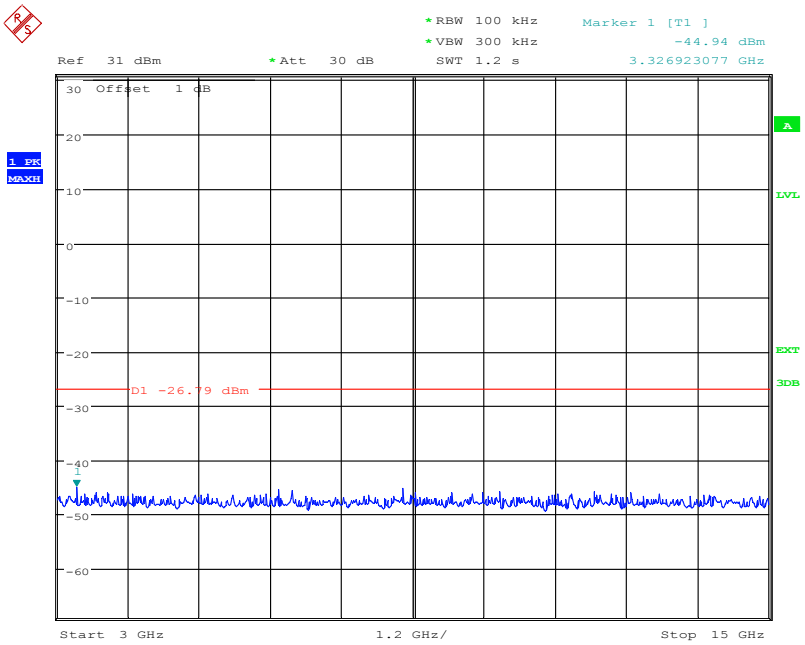
(Plot 4.6.4 A2: Channel 3: 2422MHz @ 802.11n HT40)



(Plot 4.6.4 A3: Channel 3: 2422MHz @ 802.11n HT40)

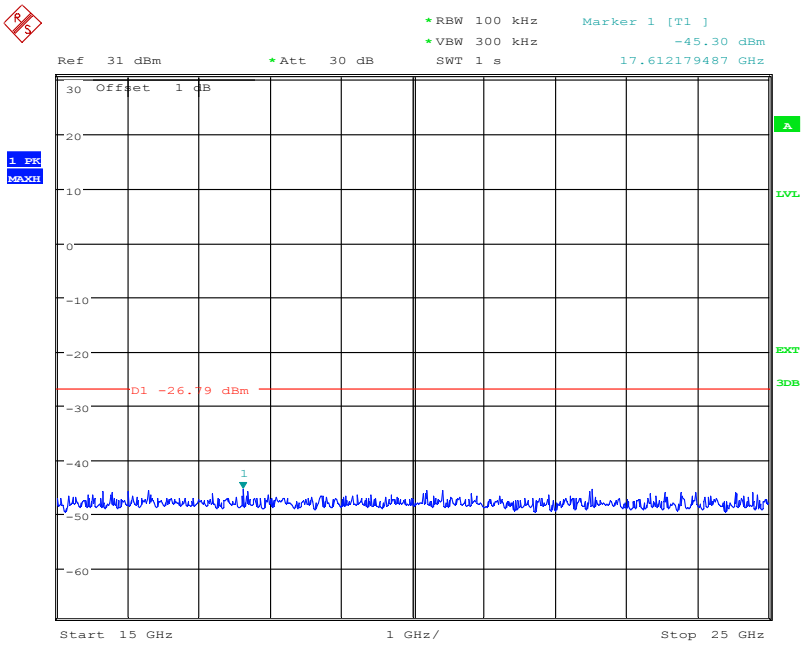


(Plot 4.6.4 B1: Channel 6: 2437MHz @ 802.11n HT40)



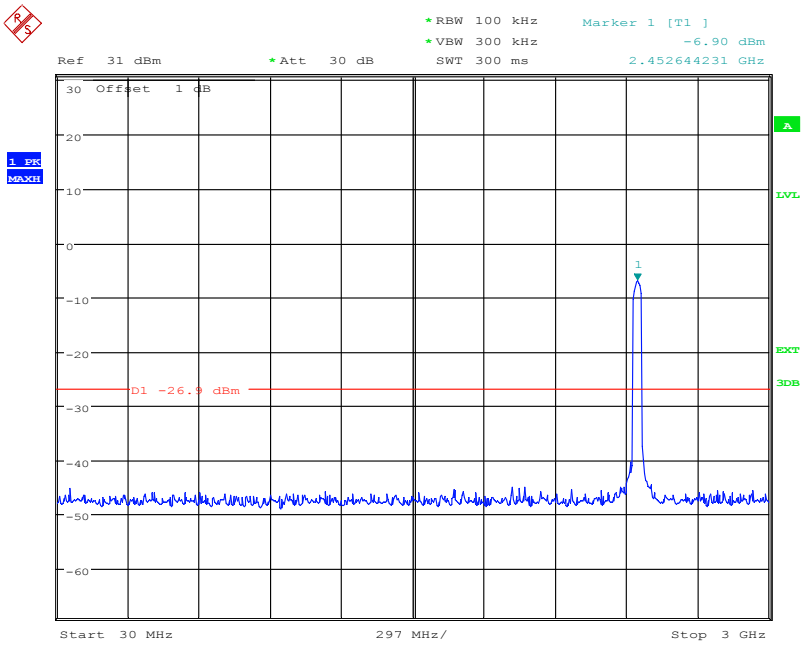
Date: 28.JUN.2015 12:26:40

(Plot 4.6.4 B2: Channel 6: 2437MHz @ 802.11n HT40)



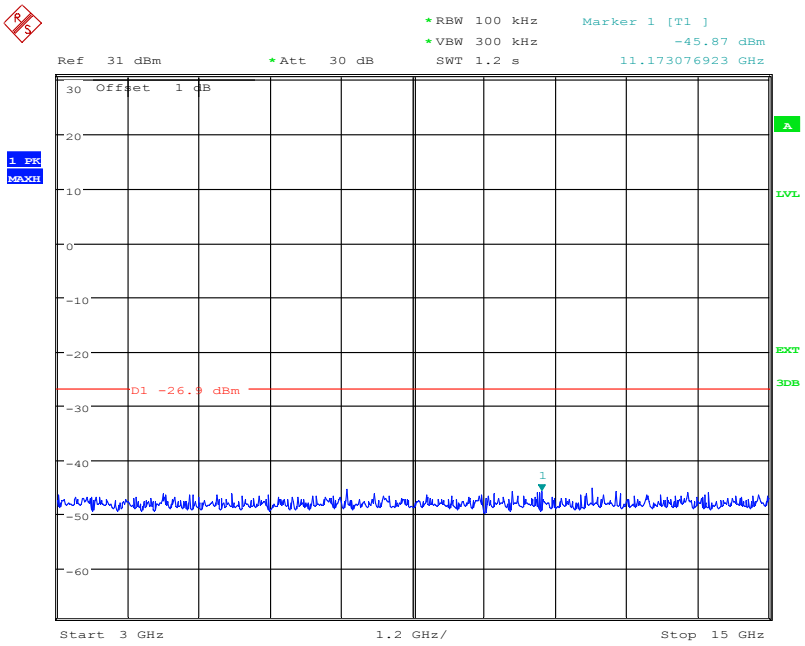
Date: 28.JUN.2015 12:26:47

(Plot 4.6.4 B3: Channel 6: 2437MHz @ 802.11n HT40)



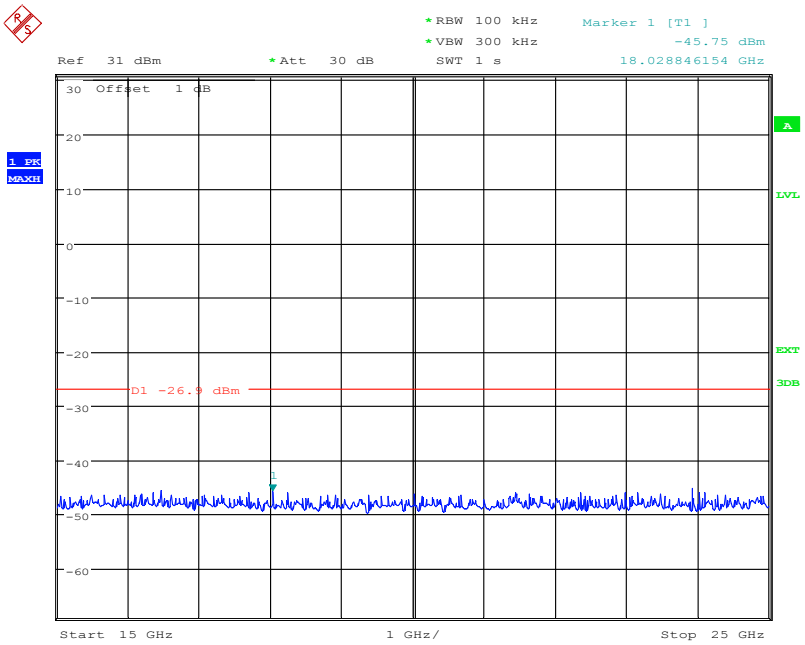
Date: 28.JUN.2015 12:27:03

(Plot 4.6.4 C1: Channel 9 : 2452MHz @ 802.11n HT40)



Date: 28.JUN.2015 12:27:10

(Plot 4.6.4 C2: Channel 9: 2452MHz @ 802.11n HT40)



(Plot 4.6.4 C2: Channel 9: 2452MHz @ 802.11n HT40)

4.7. 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) ≥ 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.

LIMIT

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

TEST RESULTS

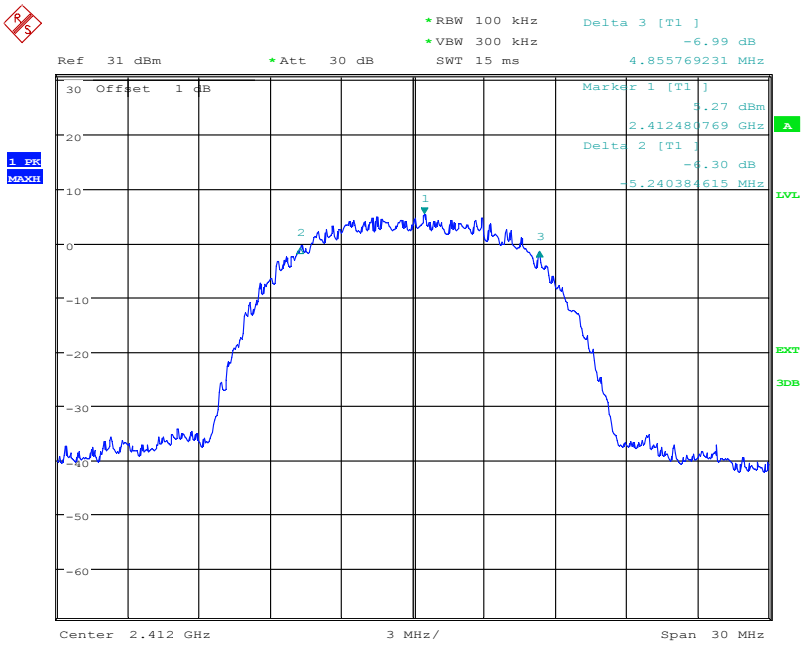
4.7.1 801.11b Test Mode

A. Test Verdict

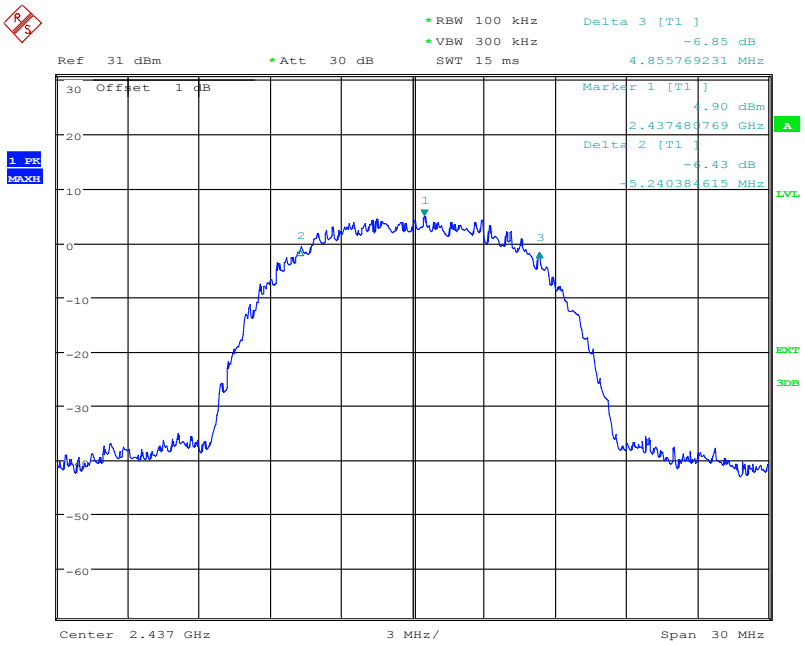
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Refer to Plot	Limits (kHz)	Verdict
1	2412	10.10	Plot 4.7.1 A	≥500	PASS
6	2437	10.10	Plot 4.7.1 B	≥500	PASS
11	2462	10.05	Plot 4.7.1 C	≥500	PASS

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.

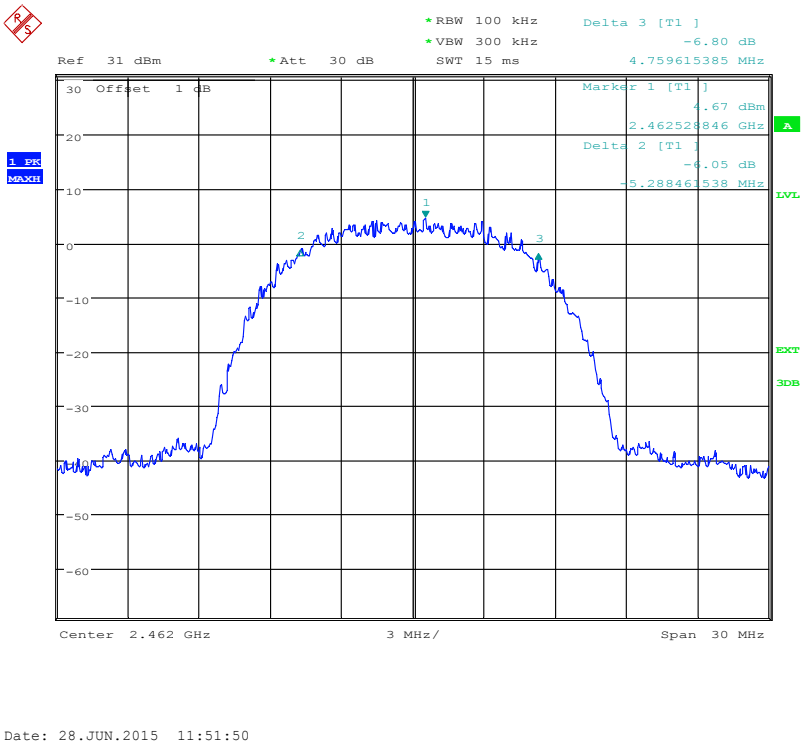
B. Test Plots



(Plot 4.7.1 A: Channel 1: 2412MHz @ 802.11b)



(Plot 4.7.1 B: Channel 6: 2437MHz @ 802.11b)



(Plot 4.7.1 C: Channel 11: 2462MHz @ 802.11b)

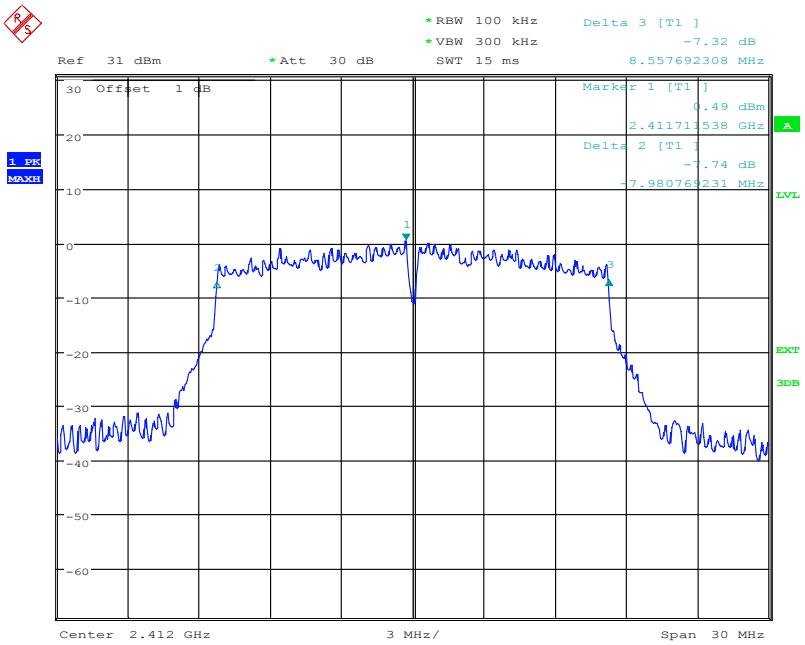
4.7.2 801.11g Test Mode

A. Test Verdict

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Refer to Plot	Limits (kHz)	Verdict
1	2412	16.54	Plot 4.7.2 A	≥500	PASS
6	2437	16.54	Plot 4.7.2 B	≥500	PASS
11	2462	16.54	Plot 4.7.2 C	≥500	PASS

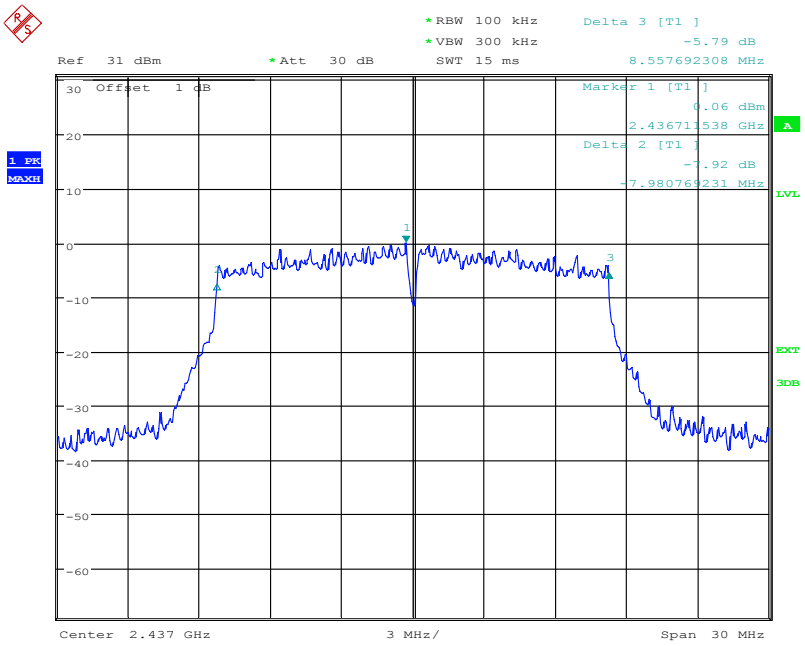
Note:
1. For 802.11g mode at finial test to get the worst-case emission at 6Mbps.
2.The test results including the cable lose.

B. Test Plots



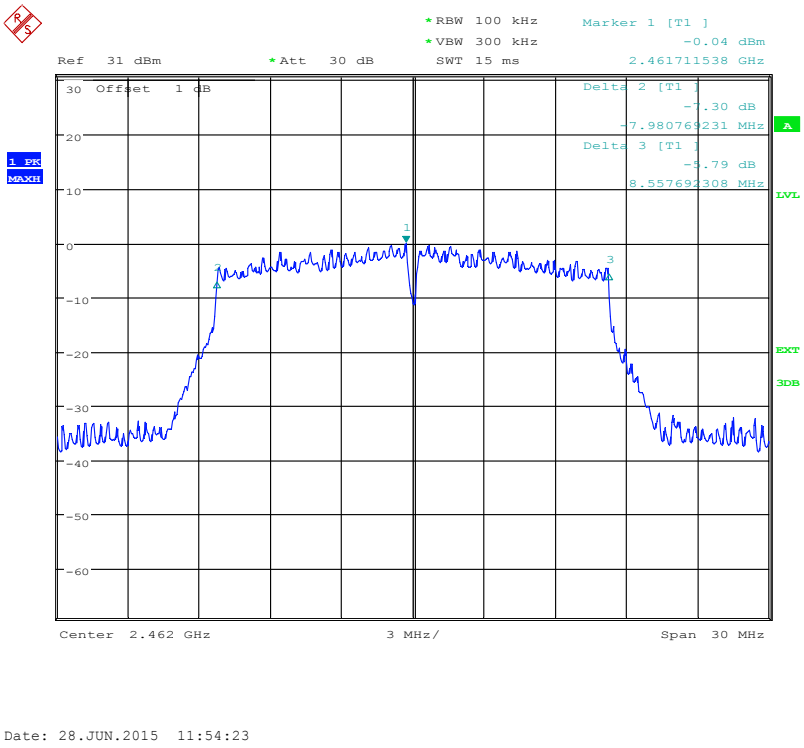
Date: 28.JUN.2015 11:53:04

(Plot 4.7.2 A: Channel 1: 2412MHz @ 802.11g)



Date: 28.JUN.2015 11:53:47

(Plot 4.7.2 B: Channel 6: 2437MHz @ 802.11g)



(Plot 4.7.2 C: Channel 11: 2462MHz @ 802.11g)

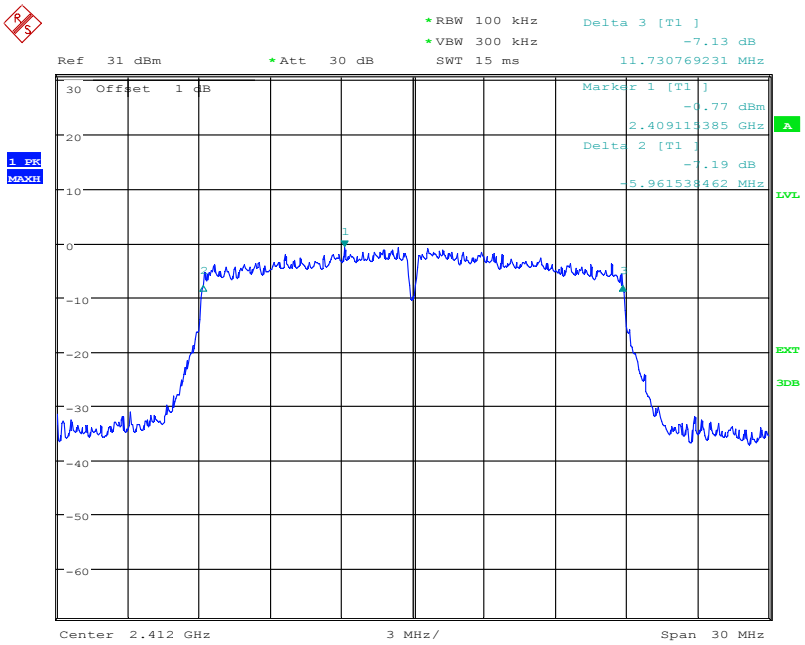
4.7.3 801.11n HT20 Test Mode

A. Test Verdict

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Refer to Plot	Limits (kHz)	Verdict
1	2412	17.69	Plot 4.7.3 A	≥500	PASS
6	2437	17.69	Plot 4.7.3 B	≥500	PASS
11	2462	17.69	Plot 4.7.3 C	≥500	PASS

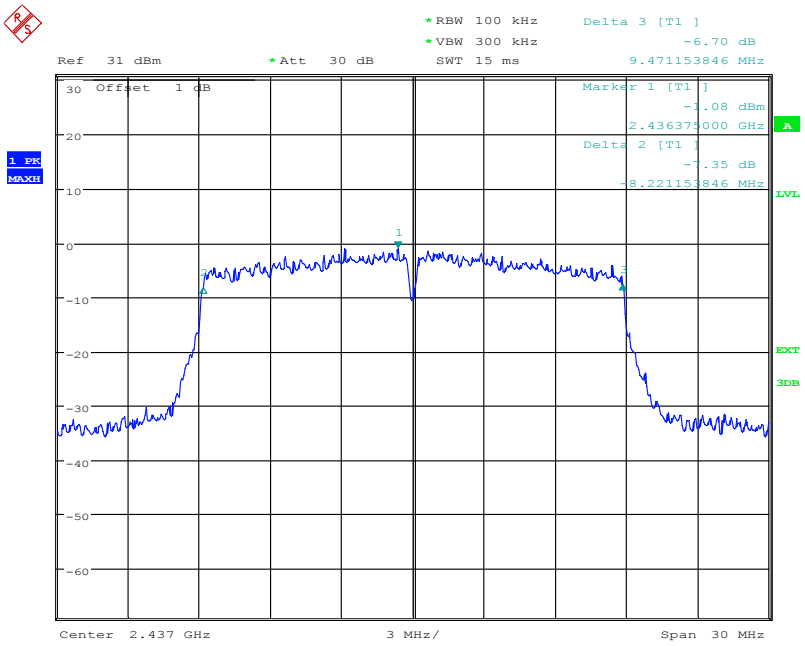
Note:
1. For 802.11n HT20 mode at finial test to get the worst-case emission at 6.5Mbps.
2.The test results including the cable lose.

B. Test Plots



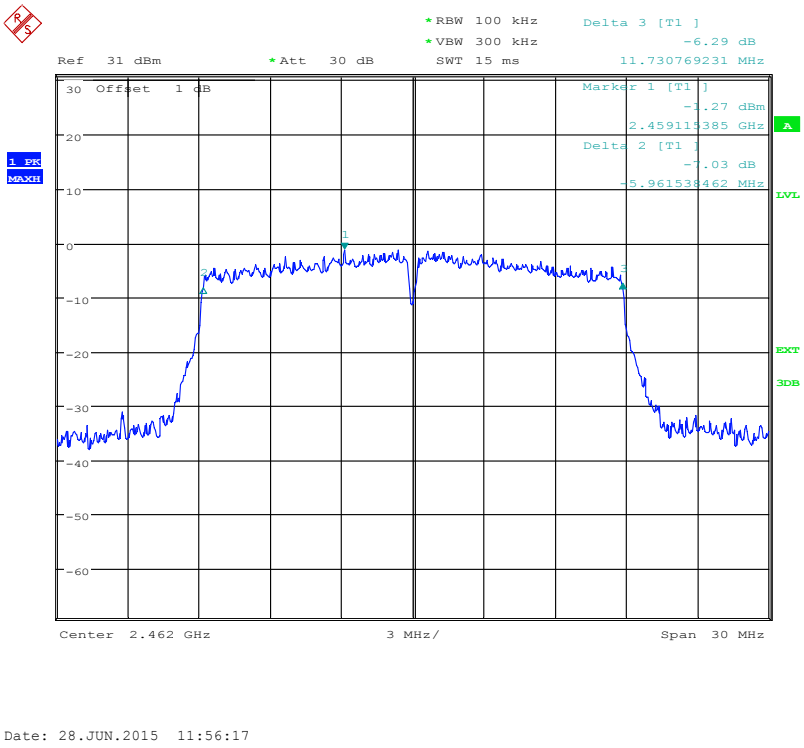
Date: 28.JUN.2015 11:55:05

(Plot 4.7.3 A: Channel 1: 2412MHz @ 802.11n HT20)



Date: 28.JUN.2015 11:55:42

(Plot 4.7.3 B: Channel 6: 2437MHz @ 802.11n HT20)



(Plot 4.7.3 C: Channel 11: 2462MHz @ 802.11n HT20)

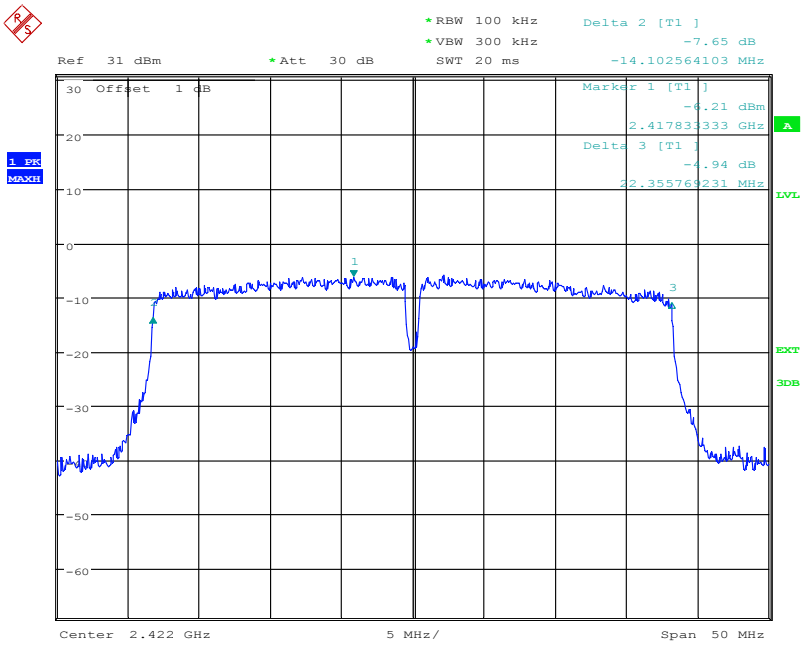
4.7.4 801.11n HT40 Test Mode

A. Test Verdict

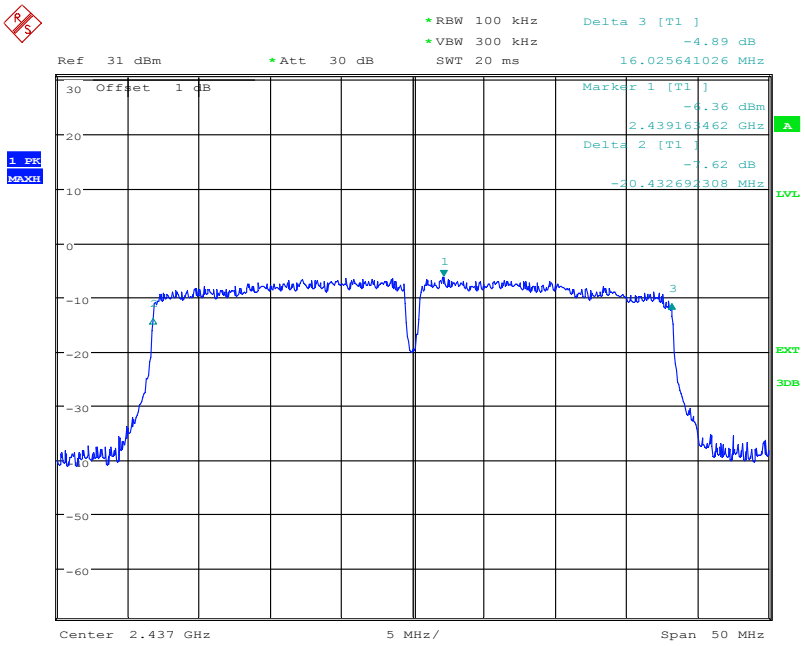
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Refer to Plot	Limits (kHz)	Verdict
3	2422	36.46	Plot 4.7.4 A	≥500	PASS
6	2437	36.46	Plot 4.7.4 B	≥500	PASS
9	2452	36.54	Plot 4.7.4 C	≥500	PASS

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.

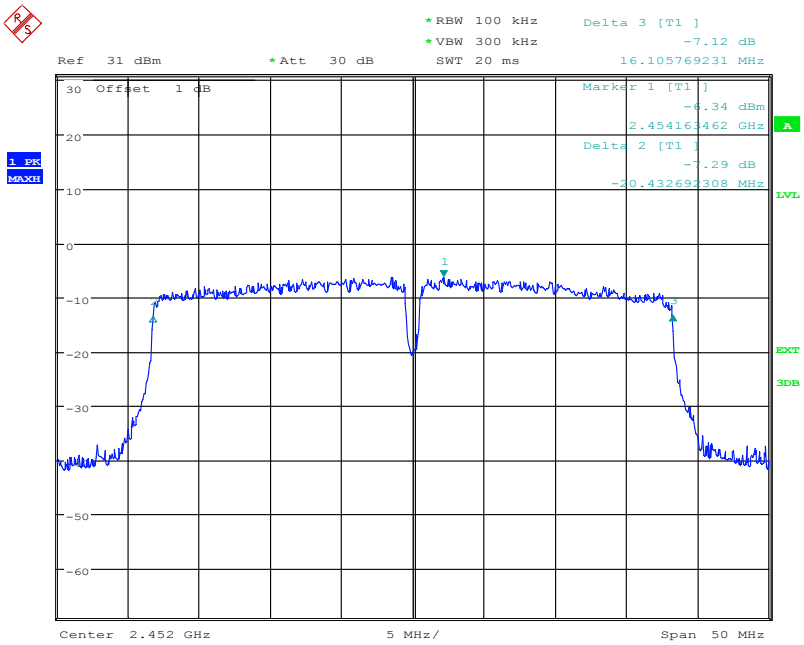
B. Test Plots



(Plot 4.7.4 A: Channel 3: 2422MHz @ 802.11n HT40)



(Plot 4.7.3 B: Channel 6: 2437MHz @ 802.11n HT40



(Plot 4.7.4 C: Channel 9: 2452MHz @ 802.11n HT40)

4.8. 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.

Antenna Connected Construction

The maximum gain of WIFI antenna was -0.58 dBi. it is a FPC ANT.

5. Test Setup Photos of the EUT

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