



FCC TEST REPORT

Report No: STS1506069F02

Issued for
Relay2, Inc.

1525 McCarthy Blvd., Suite 209, Milpitas, CA 95035, USA

Product Name:	Wireless Router
Brand Name:	Relay2
Model No.:	RA200
Series Model:	N/A
FCC ID:	2AAA9-RA200
IC:	20348-RA200
Test Standard:	FCC Part 15.247 RSS 247 Issue 1 MAY 2015

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TEST RESULT CERTIFICATION

Applicant's name..... : Relay2, Inc.
 Address..... : 1525 McCarthy Blvd., Suite 209, Milpitas, CA 95035, USA
Manufacture's Name : Relay2, Inc.
 Address..... : 1525 McCarthy Blvd., Suite 209, Milpitas, CA 95035, USA

Product description

Product name : Wireless Router
 Model and/or type reference : RA200
 Serial Model : N/A

Standards..... : FCC Part15.247
 RSS-247 Issue 1 MAY 2015

Test procedure..... : ANSI C63.10-2013

This device described above has been tested by STS, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Date of Test..... :
 Date (s) of performance of tests..... : 24 July. 2015 ~31 July. 2015
 Date of Issue : 01 Aug. 2015
 Test Result : **Pass**

Testing Engineer : 

 (Tony Liu)

Technical Manager : 

 (Vita Li)

Authorized Signatory : 

 (Bovey Yang)





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Revision History

Rev.	Issue Date	Report NO.	Effect Page	Contents
00	01 Aug. 2015	STS1506069F02	ALL	Initial Issue





1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 (15.247) RSS 247, Subpart C				
Standard Section		Test Item	Judgment	Remark
15.207	Issue 4 nov 2014 Issue 3: 7.2.4	Conducted Emission	PASS	
15.247 (a)(2)	Issue 1 Issue 5 (5.2)	6dB&99% Bandwidth	PASS	
15.247 (b) (reference KDB 558074 d05 v02. /9.1.2)	Issue 1 Issue 5 (5.2)	Peak Output Power	PASS	
15.247 (c)	Issue 1 Issue 5 (5.5)	Radiated Spurious Emission	PASS	
15.247 (d)	Issue 1 Issue 5 (5.5)	Conducted Spurious Emission	PASS	
15.247 (e)	Issue 1 Issue 5 (5.2)	Power Spectral Density	PASS	
15.205	Issue 1 Issue 5 (5.5)	Band Edge Emission	PASS	
15.203	Issue 4 nov 2014 Issue 3: 7.1.2	Antenna Requirement	PASS	

NOTE:

(1) "N/A" denotes test is not applicable in this Test Report



1.1 TEST FACTORY

Shenzhen STS Test Services Co., Ltd.
Add. : 1/F., Building B, Zhuoke Science Park, No.190,Chongqing Road,
Fuyong Street, Bao'an District, Shenzhen, Guangdong,China
CNAS Registration No.: L7649;
FCC Registration No.: 842334; IC Registration No.: 12108A-1

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately **95** %.

No.	Item	Uncertainty
1	Conducted Emission (9KHz-150KHz)	$\pm 2.88\text{dB}$
2	Conducted Emission (150KHz-30MHz)	$\pm 2.67\text{dB}$
3	RF power,conducted	$\pm 0.70\text{dB}$
4	Spurious emissions,conducted	$\pm 1.19\text{dB}$
5	All emissions,radiated(<1G) 30MHz-200MHz	$\pm 2.83\text{dB}$
6	All emissions,radiated(<1G) 200MHz-1000MHz	$\pm 2.94\text{dB}$
7	All emissions,radiated(>1G)	$\pm 3.03\text{dB}$
8	Temperature	$\pm 0.5^{\circ}\text{C}$
9	Humidity	$\pm 2\%$



2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	Wireless Router	
Trade Name	Relay2	
Model Name	RA200	
Serial Model	N/A	
Model Difference	N/A	
Product Description	The EUT is a Wireless Router	
	Operation Frequency:	802.11b/g/n 20: 2412~2462 MHz 802.11n 40: 2422~2452MHz
	Modulation Type:	CCK/OFDM/DBPSK/DAPSK
	Bit Rate of Transmitter	802.11b:11/5.5/2/1 Mbps 802.11g:54/48/36/24/18/12/9/6Mbps 802.11n(20/40MHz):300/150/144.44/130/117/115.56/104/86.67/78/52/6.5Mbps
	Number Of Channel	802.11b/g/n20: 11CH 802.11n 40: 7CH
	Antenna Designation:	Please see Note 3.
	Antenna Gain (dBi)	9.3 dBi
Channel List	Please refer to the Note 2.	
Adapter	Input: AC100-240V, 700mA, 50/60 Hz Output: DC48V, 520mA	
Hardware version number	BBC01-CN713001-L01	
Software versioning number	R2OS	
Radio Hardware version	AR5005UG	
Radio Software versioning	AR5005UX	
Test Software	"PUTTY.EXE""sock_ex.exe""PC-cmd"+adb	
RF Power Setting TEST Software (power class)	(1)2.4GHz:802.11b/g/n:23/22/22 (2) 2.4GHz:802.11/n40:19	
Connecting I/O Port(s)	Please refer to the User's Manual	

Note:

- For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.



2

Channel List for 802.11b/g/n(20MHz)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2412	04	2427	07	2442	10	2457
02	2417	05	2432	08	2447	11	2462
03	2422	06	2437	09	2452		

Channel List for 802.11n(40MHz)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
03	2422	06	2437	09	2452		
04	2427	07	2442				
05	2432	08	2447				

3

Emissions Testing of Transmitters with Multiple Outputs in the Same Band.

For devices having two outputs driving a cross-polarized pair of antennas, see Attachment 662911 D02 of this publication for additional guidance.

d) *Unequal antenna gains, with equal transmit powers.* For antenna gains given by G1, G2, ..., GN dBi

(i) If transmit signals are *correlated*, then Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / NANT]$ dBi [Note the "20"s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]

(ii) If all transmit signals are *completely uncorrelated*, then Directional gain = $10 \log[(10^{G1/10} + 10^{G2/10} + \dots + 10^{GN/10}) / NANT]$ dBi

Not: If transmit signals are *correlated*, then Directional gain.

ANT-A=4.888 dBi
 ANT-B=4.638 dBi
 ANT-C=4.158 dBi

Total gain= $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / NANT]$ dBi

$10 * \text{LOG}10((10^{(4.888/20)} + 10^{(4.638/20)} + 10^{(4.158/20)})^2 / 3) = 9.3378 \approx 9.3$

Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connect or	Gain (dBi)	NOTE
A	Relay2	RA200	PIFA Antenna	N/A	9.3dbi	WIFI Antenna



2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generated from EUT, the test system was pre-scanning tested based on the consideration of following EUT operation mode or test configuration mode which possibly have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	Low
Mode 2	Middle
Mode 3	High
Mode 4	Charging + Keeping TX mode

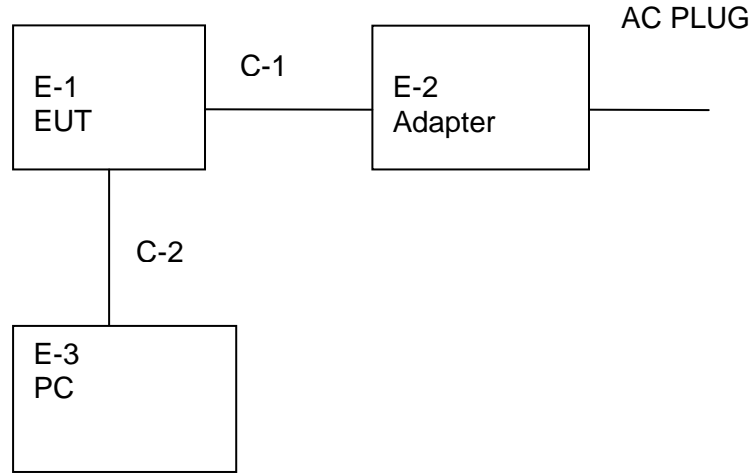
For Conducted Emission	
Final Test Mode	Description
Mode 4	Charging + Keeping TX mode

For Radiated Emission	
Final Test Mode	Description
Mode 1	Low
Mode 2	Middle
Mode 3	High
Mode 4	Charging + Keeping TX mode

Note:

- (1) The measurements are performed at the highest, middle, lowest available channels.
- (2) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported
- (3) We have been tested for all available U.S. voltage and frequencies (For 120V, 50/60Hz and 240V, 50/60Hz) for which the device is capable of operation.

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TEST



2.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	Wireless Router	Relay2	RA200	N/A	EUT
E-2	Adapter	N/A	FSP025-1AD207A	N/A	N/A
E-3	PC	HP	500-320cx	4CV428DQYN	N/A

Item	Shielded Type	Ferrite Core	Length	Note
C-1	unshielded	NO	121cm	
C-2	unshielded	NO	120cm	

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.



2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

RADIATION TEST EQUIPMENT

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Spectrum Analyzer	Agilent	E4407B	MY50140340	2014.10.25	2015.10.24
Test Receiver	R&S	ESCI	101427	2014.10.25	2015.10.24
Bilog Antenna	TESEQ	CBL6111D	34678	2014.11.25	2015.11.24
Horn Antenna	Schwarzbeck	BBHA 9120D(1201)	9120D-1343	2015.03.06	2016.03.05
50Ω Coaxial Switch	Anritsu	MP59B	6200264416	2015.06.06	2016.06.05
PreAmplifier	Agilent	8449B	60538	2014.10.25	2015.10.24
Loop Antenna	ARA	PLA-1030/B	1029	2015.06.08	2016.06.07
USB RF power sensor	DARE	RPR3006W	15I00041SNO03	2014.10.25	2015.10.24

CONDUCTION TEST EQUIPMENT

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
EMI Test Receiver	R&S	ESPI	102086	2014.11.20	2015.11.19
LISN	R&S	ENV216	101242	2014.10.25	2015.10.24
LISN	EMCO	3810/2NM	000-23625	2014.10.25	2015.10.24



3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION LIMITS

Operating frequency band. In case the emission fall within the restricted band specified on Part 15.247&207(a) limit in the table below has to be followed.

FREQUENCY (MHz)	Class B (dBuV)		Standard
	Quasi-peak	Average	
0.15 -0.5	66 - 56 *	56 - 46 *	CISPR
0.50 -5.0	56.00	46.00	CISPR
5.0 -30.0	60.00	50.00	CISPR

0.15 -0.5	66 - 56 *	56 - 46 *	FCC
0.50 -5.0	56.00	46.00	FCC
5.0 -30.0	60.00	50.00	FCC

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz



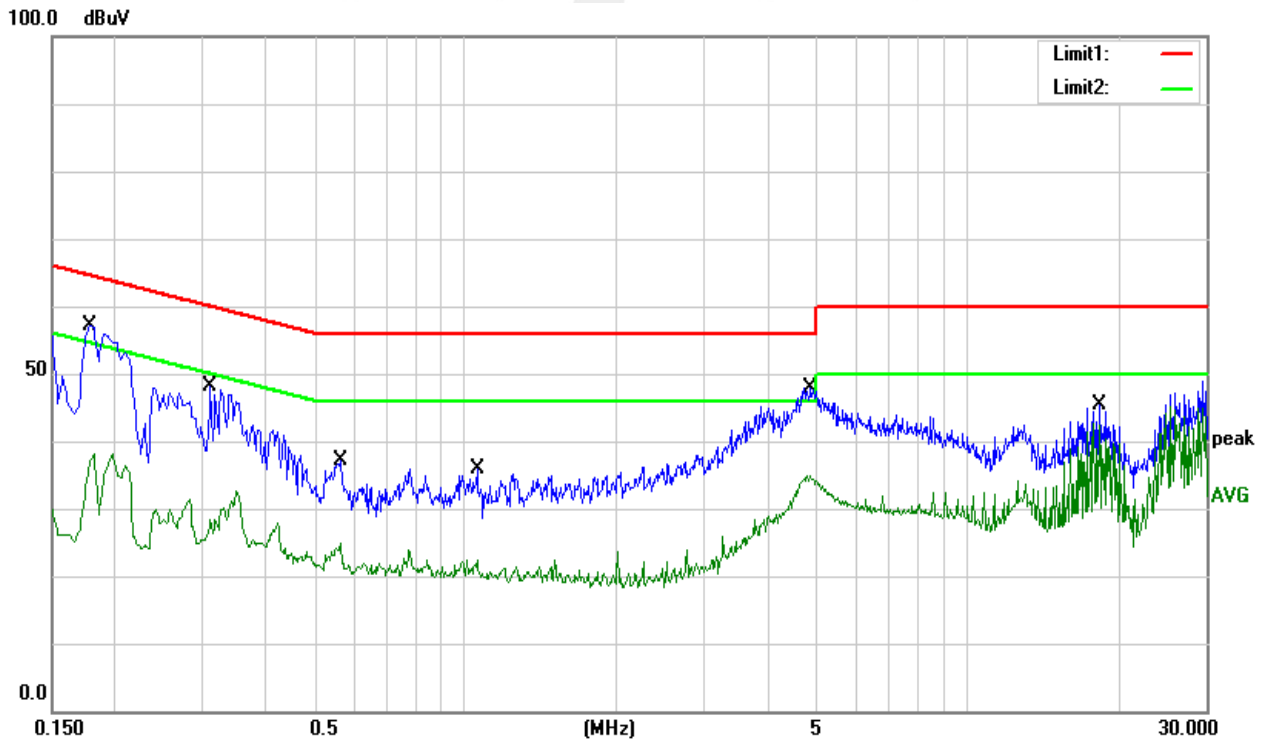
3.1.2 TEST RESULTS

Temperature :	23 °C	Relative Humidity :	50%
Pressure :	1010hPa	Phase :	L
Test Voltage :	AC120V/50HZ	Test Mode :	Link Mode

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV/m)	Margin (dB)	Detector
1	0.1767	43.11	10.00	53.11	64.64	-11.53	QP
2	0.1767	20.73	10.00	30.73	54.64	-23.91	AVG
3	0.3073	32.07	9.92	41.99	60.04	-18.05	QP
4	0.3073	16.75	9.92	26.67	50.04	-23.37	AVG
5	0.5632	23.92	9.93	33.85	56.00	-22.15	QP
6	0.5632	14.42	9.93	24.35	46.00	-21.65	AVG
7	1.0560	20.55	9.91	30.46	56.00	-25.54	QP
8	1.0560	11.44	9.91	21.35	46.00	-24.65	AVG
9	4.9290	30.73	10.20	40.93	56.00	-15.07	QP
10	4.9290	23.79	10.20	33.99	46.00	-12.01	AVG
11	18.3765	32.87	10.64	43.51	60.00	-16.49	QP
12	18.3765	32.13	10.64	42.77	50.00	-7.23	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.
3. N/A means All Data have pass Limit



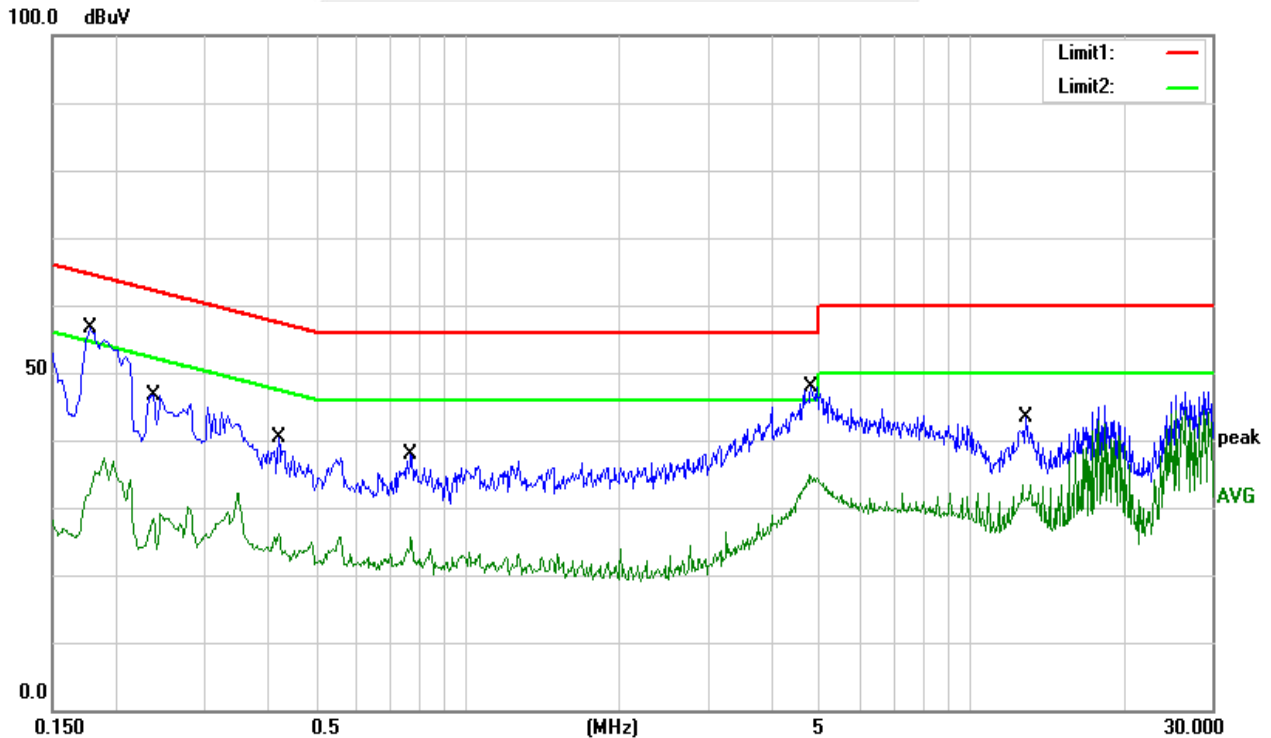


Temperature :	23 °C	Relative Humidity :	50%
Pressure :	1010hPa	Phase :	N
Test Voltage :	AC120V/50HZ	Test Mode :	Link Mode

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV/m)	Margin (dB)	Detector
1	0.1765	42.24	10.00	52.24	64.65	-12.41	QP
2	0.1765	20.40	10.00	30.40	54.65	-24.25	AVG
3	0.2350	32.80	9.96	42.76	62.27	-19.51	QP
4	0.2350	15.70	9.96	25.66	52.27	-26.61	AVG
5	0.4197	23.77	9.98	33.75	57.45	-23.70	QP
6	0.4197	14.93	9.98	24.91	47.45	-22.54	AVG
7	0.7665	23.03	10.00	33.03	56.00	-22.97	QP
8	0.7665	13.73	10.00	23.73	46.00	-22.27	AVG
9	4.8502	30.77	10.20	40.97	56.00	-15.03	QP
10	4.8502	23.94	10.20	34.14	46.00	-11.86	AVG
11	12.7876	24.99	10.30	35.29	60.00	-24.71	QP
12	12.7876	20.02	10.30	30.32	50.00	-19.68	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.
3. N/A means All Data have pass Limit





3.2 RADIATED EMISSION MEASUREMENT

3.2.1 RADIATED EMISSION LIMITS

6 dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on Part 15.247&205(a), then the Part 15.247&209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micovolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Class B (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

FREQUENCY RANGE OF RADIATED MEASUREMENT (For unintentional radiators)

Highest frequency generated or Upper frequency of measurement used in the device or on which the device operates or tunes (MHz)	Range (MHz)
Below 1.705	30
1.705 – 108	1000
108 – 500	2000
500 – 1000	5000
Above 1000	5 th harmonic of the highest frequency or 40 GHz, whichever is lower



Spectrum Parameter	Setting
Attenuation	Auto
Detector	Peak
Start Frequency	1000 MHz(Peak/AV)
Stop Frequency	10 th carrier hamonic(Peak/AV)
RB / VB (emission in restricted band)	1 MHz / 1 MHz, AV=3 MHz

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

3.2.2 TEST PROCEDURE

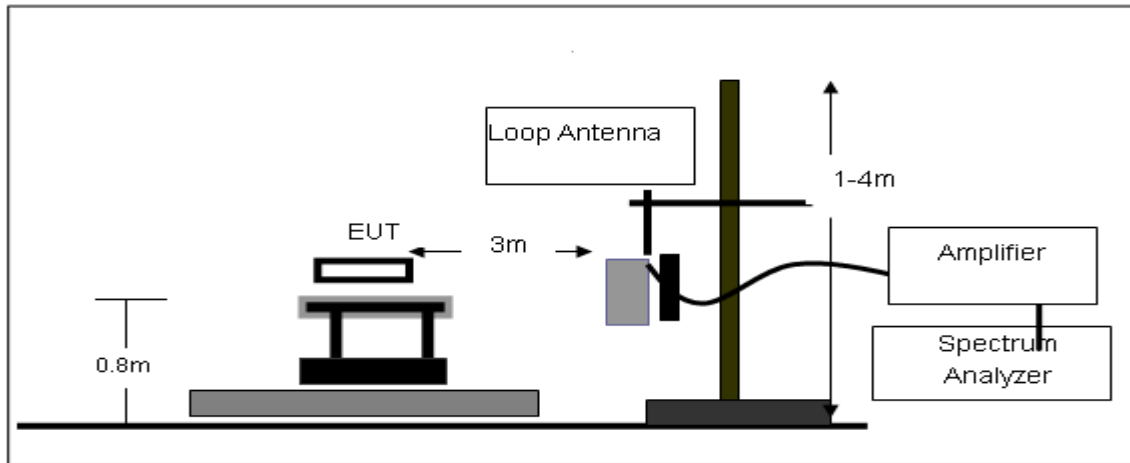
- The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- The EUT was placed on the top of a rotating table 0.8 meters(above 1GHz is 1.5 m) above the ground at a 3 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- The height of the equipment or of the substitution antenna shall be 0.8 m(above 1GHz is 1.5 m); the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

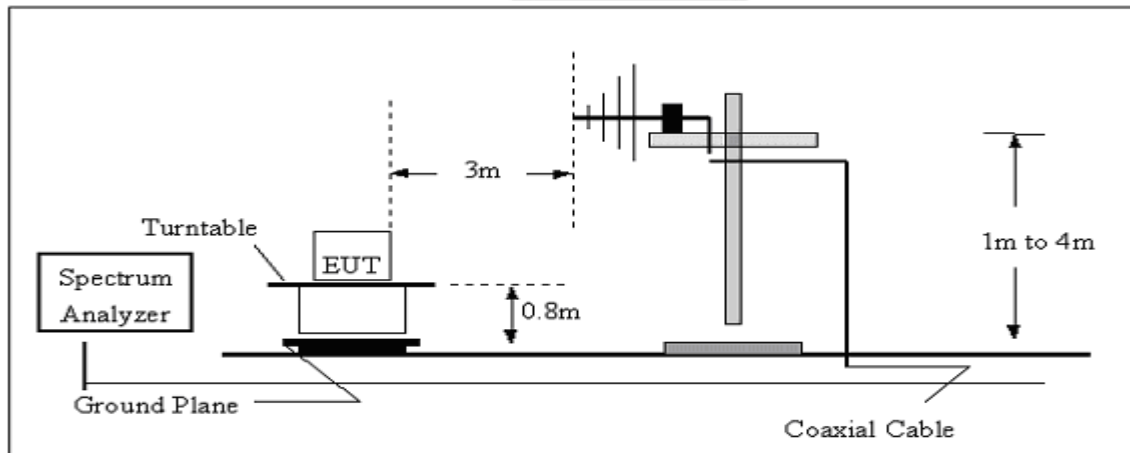
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

3.2.3 TEST SETUP

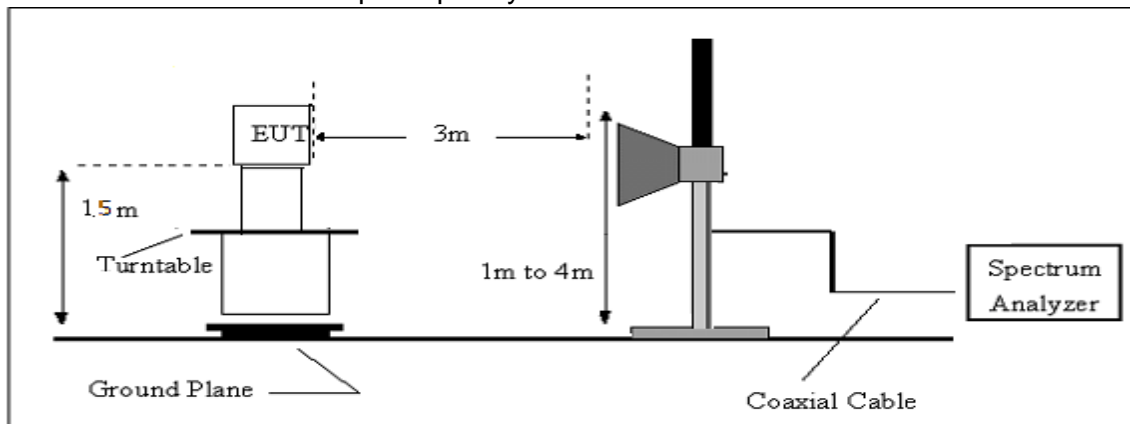
(A) Radiated Emission Test-Up Frequency Below 30MHz



(B) Radiated Emission Test-Up Frequency 30MHz~1GHz



(C) Radiated Emission Test-Up Frequency Above 1GHz



3.2.4 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.



3.2.5 TEST RESULT

9KHz-30MHz

Temperature:	20 °C	Relative Humidity:	48%
Pressure:	1010 hPa	Test Voltage :	DC 48V from Adapter with AC 120V/60Hz
Test Mode :	Mode 4	Polarization :	Horizontal

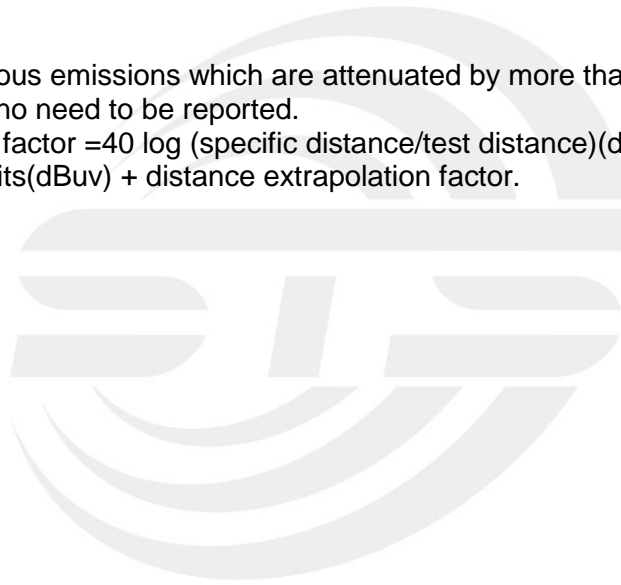
Freq. (MHz)	Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	State P/F	Test Result
--	--	--	--	--	PASS
--	--	--	--	--	PASS

NOTE:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor = $40 \log(\text{specific distance}/\text{test distance})$ (dB);

Limit line = specific limits(dBuv) + distance extrapolation factor.





30MHz - 1000MHz

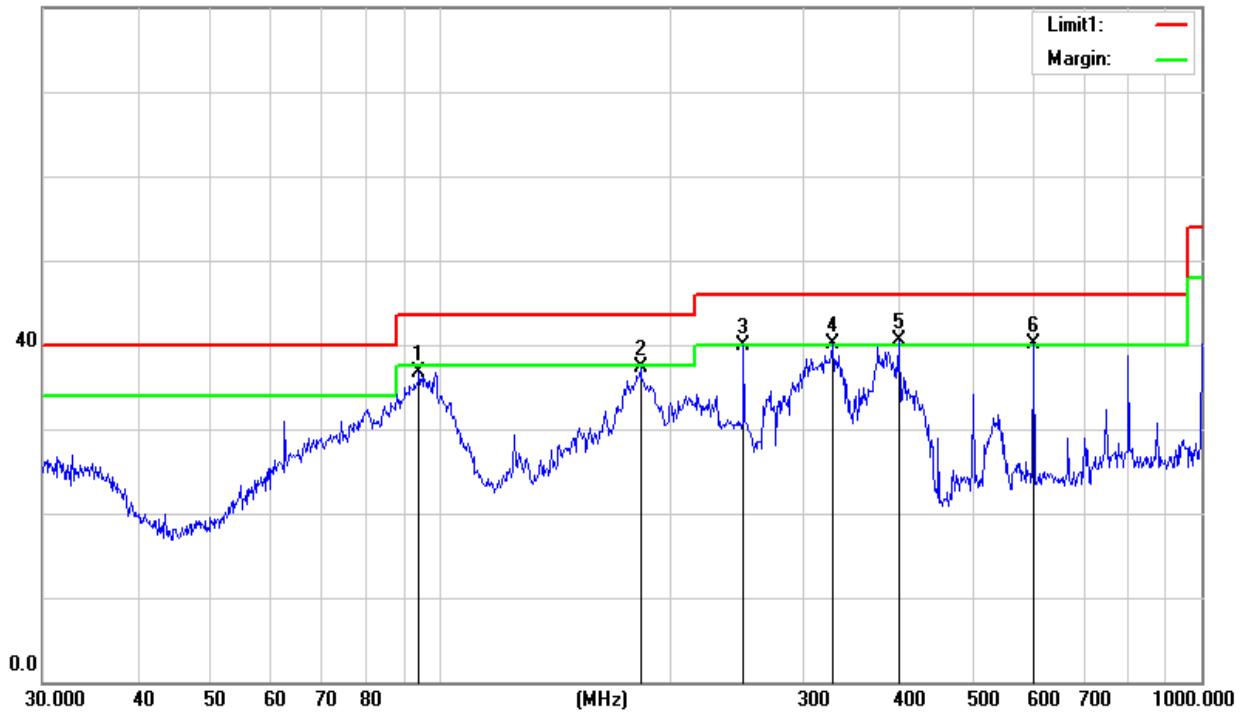
Temperature:	20 °C	Relative Humidity:	48%
Pressure:	1010 hPa	Test Voltage :	DC 48V from Adapter with AC 120V/60Hz
Test Mode :	Mode 4	Polarization :	Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	93.7685	26.79	10.01	36.80	43.50	-6.70	QP
2	183.2005	27.37	9.98	37.35	43.50	-6.15	QP
3	250.3010	26.26	13.70	39.96	46.00	-6.04	QP
4	327.8872	24.42	15.70	40.12	46.00	-5.88	QP
5	400.4318	22.42	18.03	40.45	46.00	-5.55	QP
6	601.4265	17.90	22.19	40.09	46.00	-5.91	QP

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Antenna Factor + Cable Loss.
3. N/A means All Data have pass Limit

80.0 dBuV/m





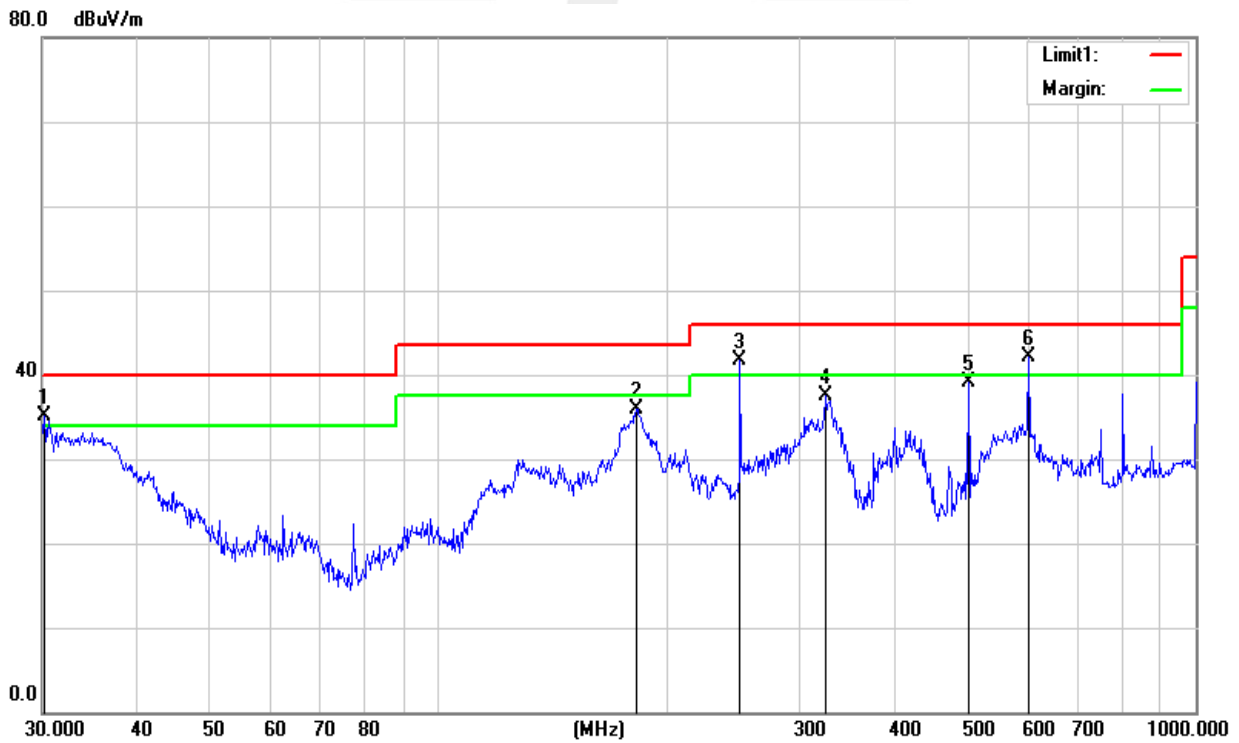
30MHz - 1000MHz

Temperature:	20 °C	Relative Humidity:	48%
Pressure:	1010 hPa	Test Voltage :	DC 48V from Adapter with AC 120V/60Hz
Test Mode :	Mode 4	Polarization :	Vertical

No.	Frequency (MHz)	Reading (dBUV)	Factor (dB)	Results (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector
1	30.2110	16.48	18.60	35.08	40.00	-4.92	QP
2	182.5592	25.91	10.03	35.94	43.50	-7.56	QP
3	250.3010	27.91	13.70	41.61	46.00	-4.39	QP
4	324.4560	21.93	15.59	37.52	46.00	-8.48	QP
5	501.1790	18.66	20.38	39.04	46.00	-6.96	QP
6	601.4265	19.90	22.19	42.09	46.00	-3.91	QP

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Antenna Factor + Cable Loss.
3. N/A means All Data have pass Limit





Above 1000MHz

Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dB μ V/m)	Limit (dBuV/m)	Margin (dB)	Detector	Comment
Low Channel (802.11b/2412 MHz)							
4824.20	66.46	-3.58	62.88	74	-11.12	PK	Vertical
4824.21	47.49	-3.58	43.91	54	-10.09	AV	Vertical
7236.14	61.94	-0.8	61.14	74	-12.86	PK	Vertical
7236.12	41.88	-0.8	41.08	54	-12.92	AV	Vertical
4824.20	61.90	-3.58	58.32	74	-15.68	PK	Horizontal
4824.21	44.44	-3.58	40.86	54	-13.14	AV	Horizontal
Mid Channel (802.11b/2437 MHz)							
4874.08	65.42	-3.56	61.86	74	-12.14	PK	Vertical
4874.07	48.99	-3.56	45.43	54	-8.57	AV	Vertical
7311.21	61.04	-0.78	60.26	74	-13.74	PK	Vertical
7311.21	44.02	-0.78	43.24	54	-10.76	AV	Vertical
4874.18	61.29	-3.56	57.73	74	-16.27	PK	Horizontal
4874.15	45.61	-3.56	42.05	54	-11.95	AV	Horizontal
High Channel (802.11b/2462 MHz)							
4944.25	61.23	-3.54	57.69	74	-16.31	PK	Vertical
4944.30	45.57	-3.54	42.03	54	-11.97	AV	Vertical
7416.32	61.53	-0.75	60.78	74	-13.22	PK	Vertical
7416.30	45.48	-0.75	44.73	54	-9.27	AV	Vertical
4944.26	61.53	-3.54	57.99	74	-16.01	PK	Horizontal
4944.30	45.21	-3.54	41.67	54	-12.33	AV	Horizontal
Remark:							
1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.							
2. Scan with 802.11b, 802.11g, 802.11n (HT-20), 802.11n (HT-40), the worst case is 802.11b.							



3.2.6 TEST RESULTS (Band edge)

Frequency (MHz)	Reading (dBUV)	Factor (dB)	Emission Level (dB μ V/m)	Limit (dBUV/m)	Margin (dB)	Detector	Comment
802.11 b							
2399.9	68.22	-12.99	55.23	74	-18.77	PK	Vertical
2399.9	54.14	-12.99	41.15	54	-12.85	AV	Vertical
2399.9	69.53	-12.99	56.54	74	-17.46	PK	Horizontal
2399.9	53.11	-12.99	40.12	54	-13.88	AV	Horizontal
2483.6	70.32	-12.78	57.54	74	-16.46	PK	Vertical
2483.6	52.9	-12.78	40.12	54	-13.88	AV	Vertical
2483.6	70.26	-12.78	57.48	74	-16.52	PK	Horizontal
2483.6	53.19	-12.78	40.41	54	-13.59	AV	Horizontal
802.11 g							
2399.9	67.85	-12.99	54.86	74	-19.14	PK	Vertical
2399.9	54.35	-12.99	41.36	54	-12.64	AV	Vertical
2399.9	69.36	-12.99	56.37	74	-17.63	PK	Horizontal
2399.9	53.25	-12.99	40.26	54	-13.74	AV	Horizontal
2483.6	69.98	-12.78	57.2	74	-16.8	PK	Vertical
2483.6	53.42	-12.78	40.64	54	-13.36	AV	Vertical
2483.6	70.07	-12.78	57.29	74	-16.71	PK	Horizontal
2483.6	53.2	-12.78	40.42	54	-13.58	AV	Horizontal



802.11 n20							
2399.9	68.36	-12.99	55.37	74	-18.63	PK	Vertical
2399.9	54.02	-12.99	41.03	54	-12.97	AV	Vertical
2399.9	68.9	-12.99	55.91	74	-18.09	PK	Horizontal
2399.9	53.07	-12.99	40.08	54	-13.92	AV	Horizontal
2483.6	70.12	-12.78	57.34	74	-16.66	PK	Vertical
2483.6	53.1	-12.78	40.32	54	-13.68	AV	Vertical
2483.6	70.27	-12.78	57.49	74	-16.51	PK	Horizontal
2483.6	52.99	-12.78	40.21	54	-13.79	AV	Horizontal
802.11 n40							
2399.9	68.38	-12.99	55.39	74	-18.61	PK	Vertical
2399.9	54.65	-12.99	41.66	54	-12.34	AV	Vertical
2399.9	69.07	-12.99	56.08	74	-17.92	PK	Horizontal
2399.9	53.23	-12.99	40.24	54	-13.76	AV	Horizontal
2483.6	70.29	-12.78	57.51	74	-16.49	PK	Vertical
2483.6	52.92	-12.78	40.14	54	-13.86	AV	Vertical
2483.6	70.21	-12.78	57.43	74	-16.57	PK	Horizontal
2483.6	52.99	-12.78	40.21	54	-13.79	AV	Horizontal
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.							
Low measurement frequencies is range from 2310 to 2400 MHz, high measurement frequencies is range from 2483.5 to 2500 MHz. Only show the worst point data of the emissions in the frequency 2310-2400 MHz and 2483.5-2500 MHz.							

4. CONDUCTED SPURIOUS EMISSIONS

4.1 APPLIED PROCEDURES / LIMIT

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. Attenuation below the general limits specified in Section 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)).

4.2 TEST PROCEDURE

Spectrum Parameter	Setting
Detector	Peak
Start/Stop Frequency	30 MHz to 10th carrier harmonic
RB / VB (emission in restricted band)	100 KHz/300 KHz
Trace-Mode:	Max hold

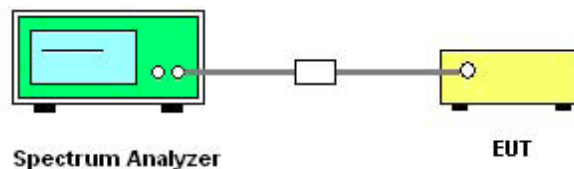
For Band edge

Spectrum Parameter	Setting
Detector	Peak
Start/Stop Frequency	Lower Band Edge: 2300 to 2430 MHz Upper Band Edge: 2450 to 2500 MHz
RB / VB (emission in restricted band)	100 KHz/300 KHz
Trace-Mode:	Max hold

4.3 DEVIATION FROM STANDARD

No deviation.

4.4 TEST SETUP



The EUT which is powered by the Battery, is coupled to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.

Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. In order to make an accurate measurement, set the span greater than RBW.

4.5 EUT OPERATION CONDITIONS

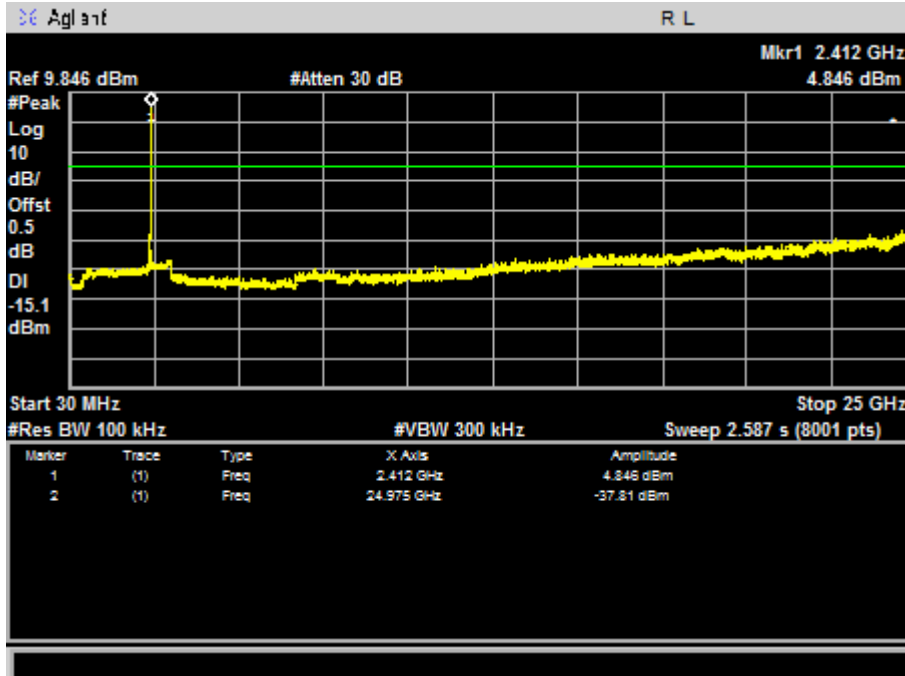
The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

4.6 TEST RESULTS

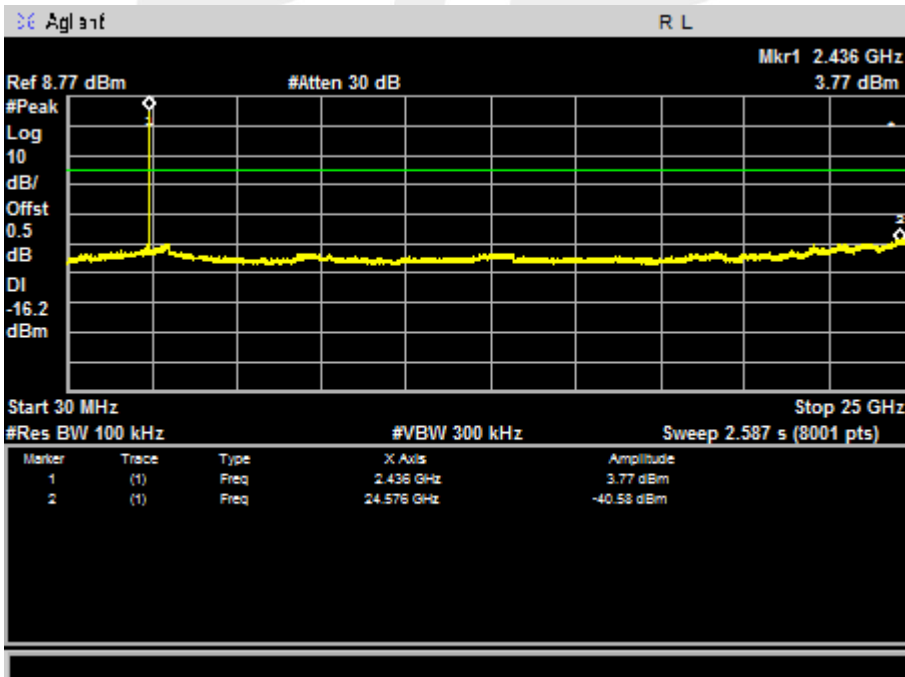
Not:A/B/C Represent the value of antennaA /B/C,The worst data is Antenna A ,only shown Antenna A Plot.

802.11b

TX 802.11b Mode CH 01 (Ant A) worst data

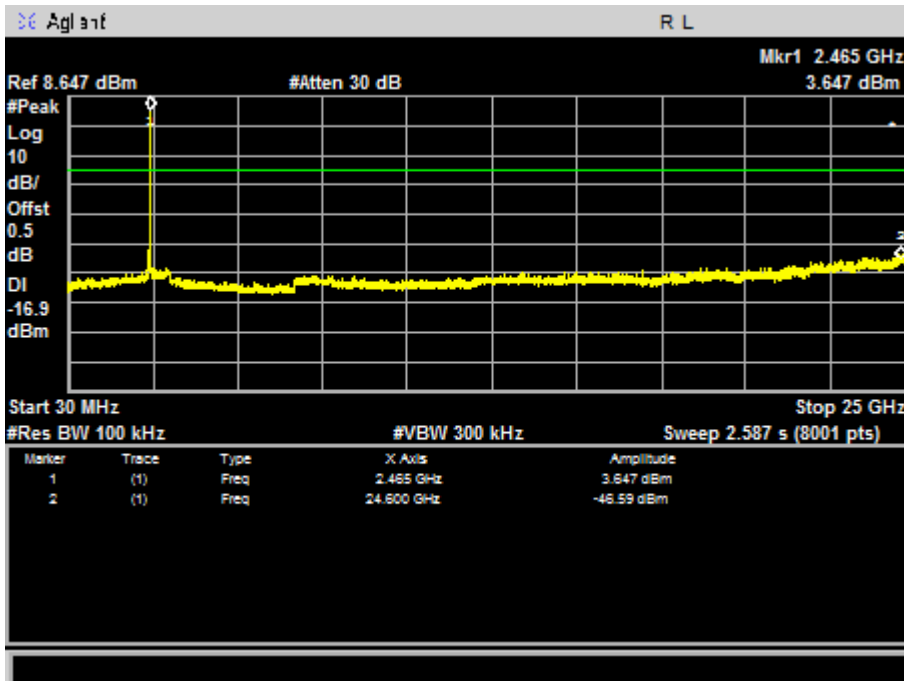


TX 802.11b Mode CH 06 (Ant A) worst data





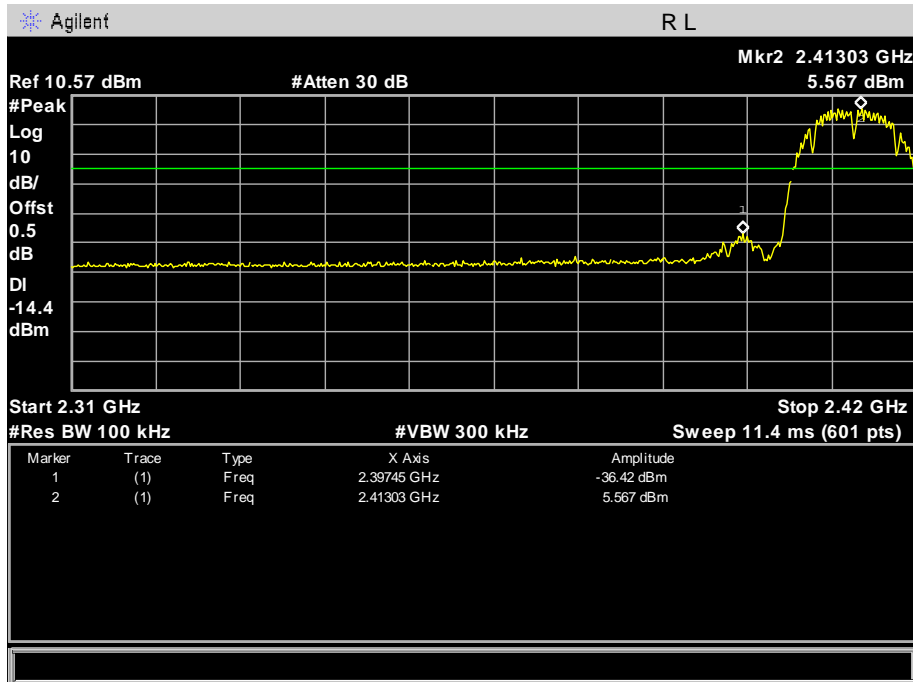
TX 802.11b Mode CH 11 (Ant A) worst data



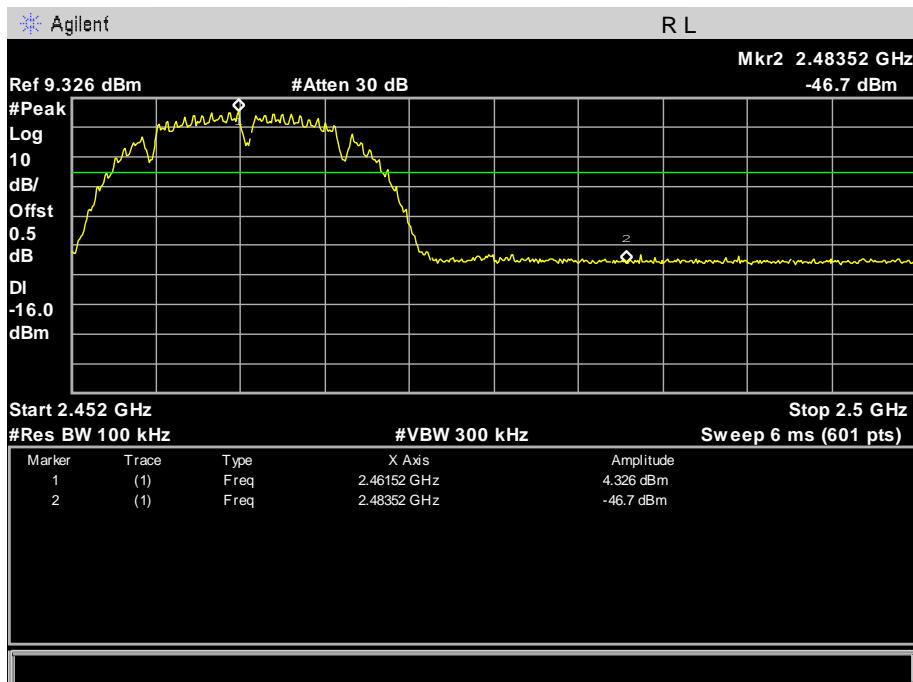


Band edge

TX 802.11b Mode CH 01 (Ant A) worst data



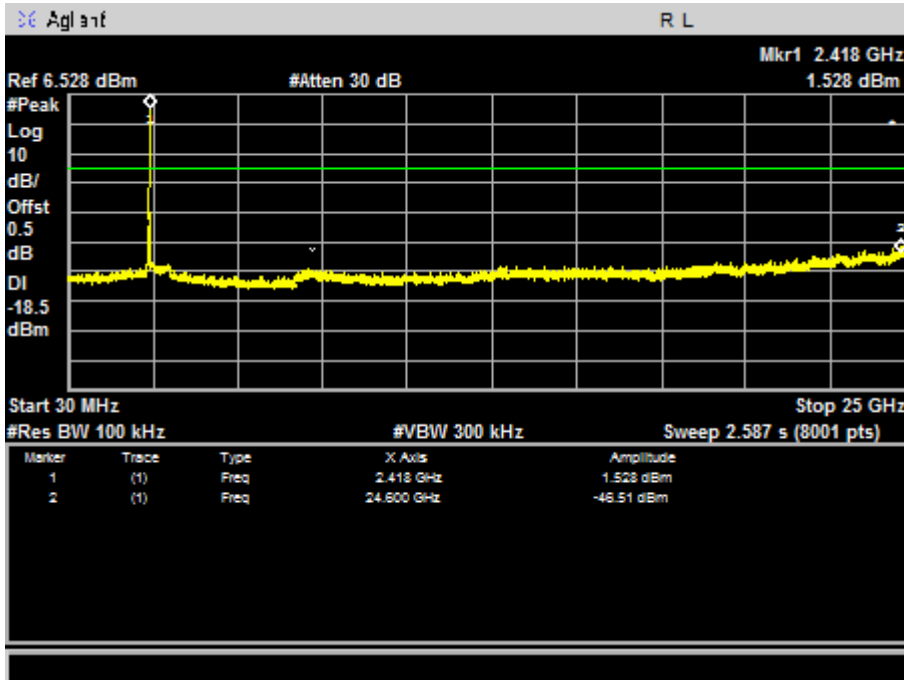
TX 802.11b Mode CH 11 (Ant A) worst data



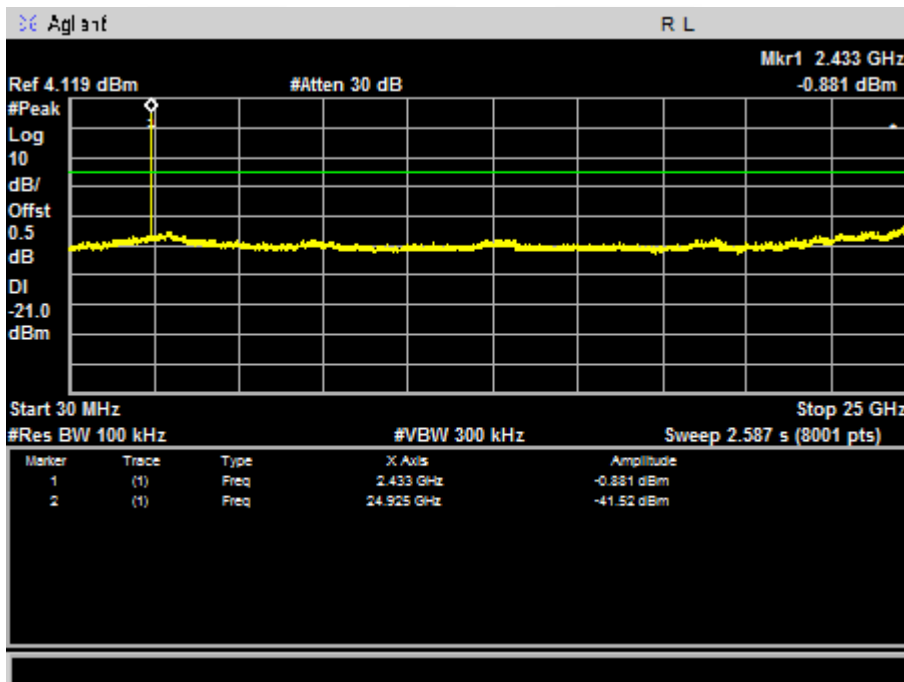


802.11g

TX 802.11g Mode CH 01 (Ant A) worst data

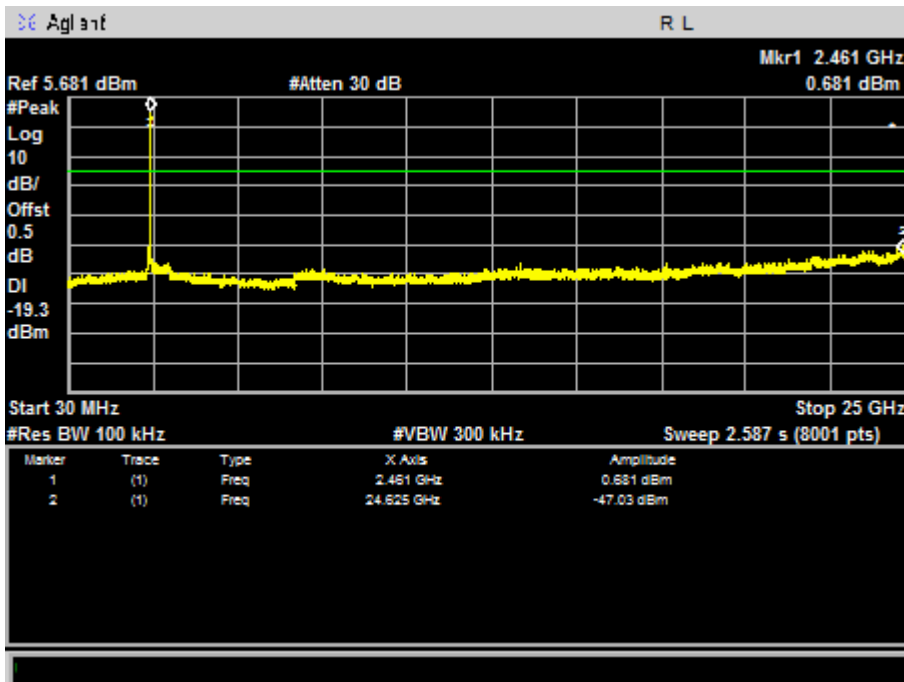


TX 802.11g Mode CH 06 (Ant A) worst data





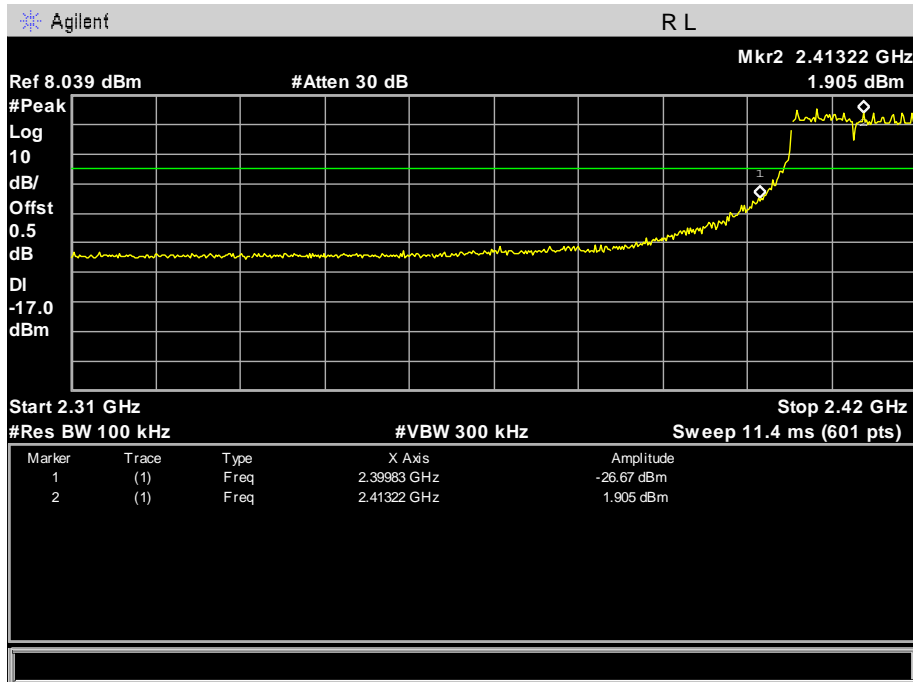
TX 802.11g Mode CH11 (Ant A) worst data



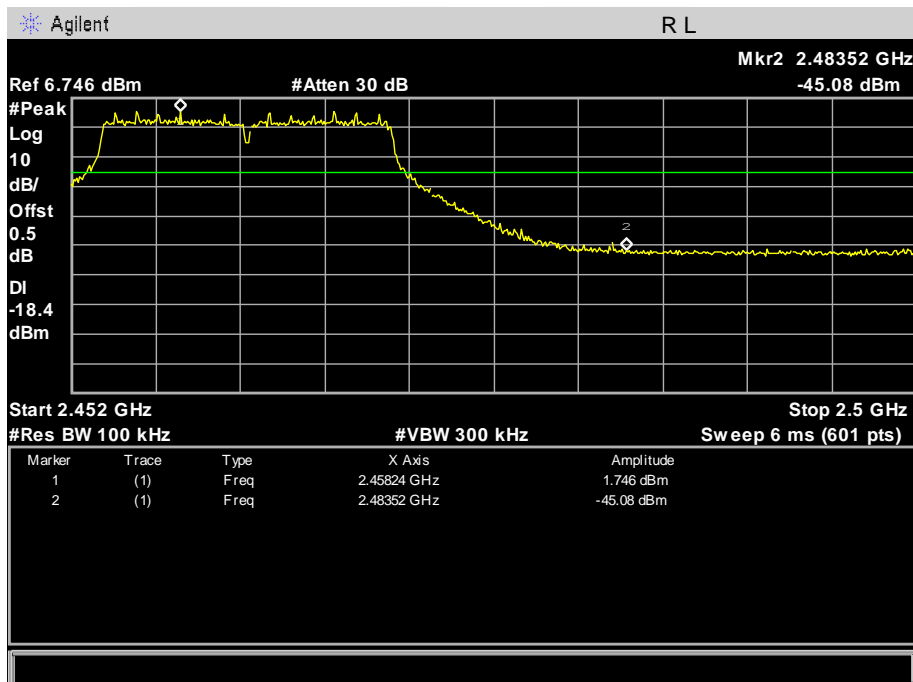


Band edge

TX 802.11g Mode CH 01 (Ant A) worst data



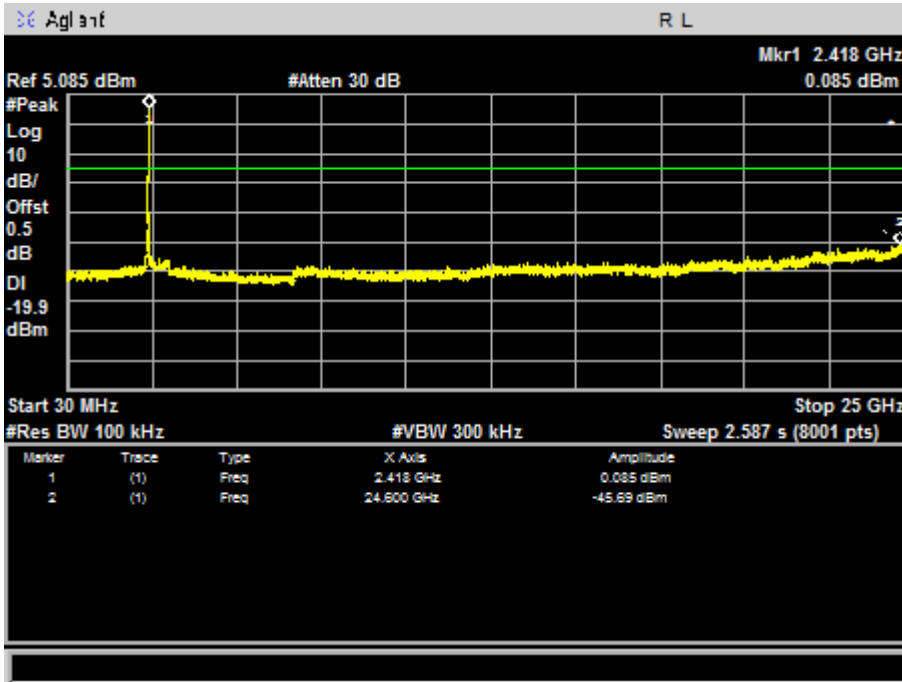
TX 802.11g Mode CH 11 (Ant A) worst data



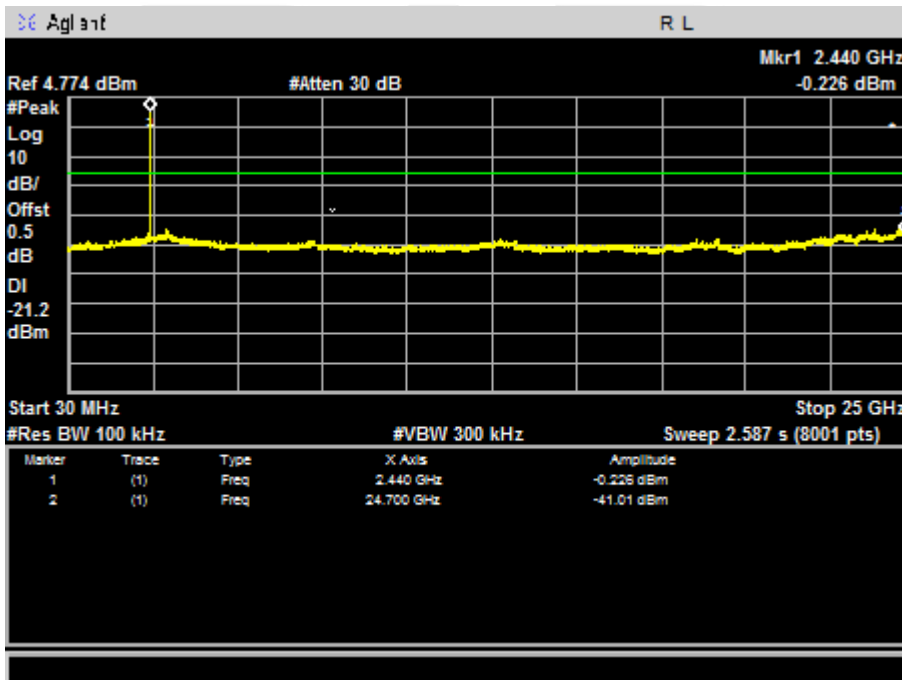


802.11n(HT20)

TX 802.11n(HT20) Mode CH 01 (Ant A) worst data

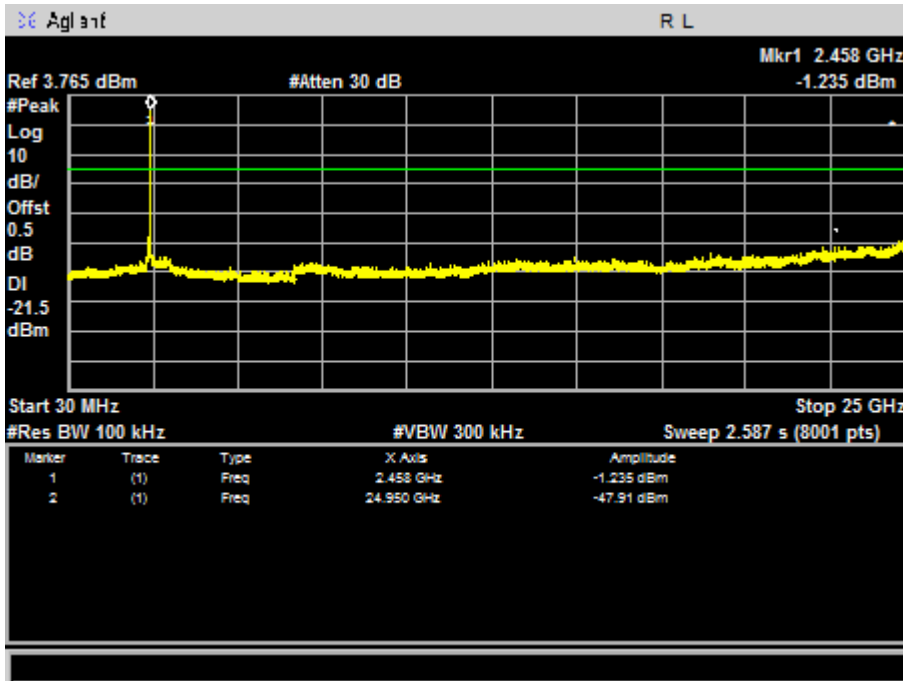


TX 802.11n(HT20) Mode CH 06 (Ant A) worst data





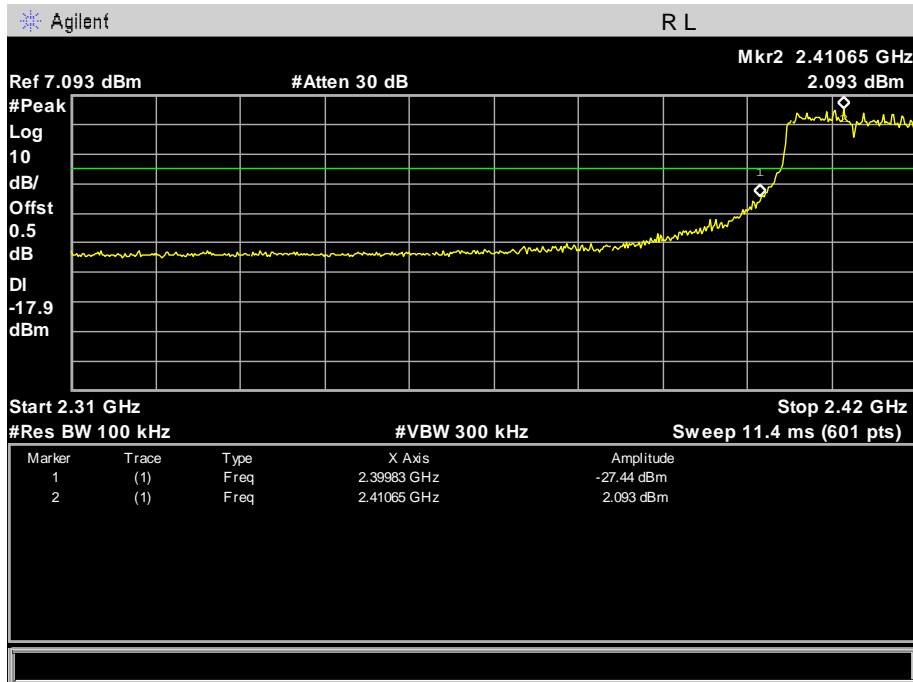
TX 802.11n(HT20) Mode CH 11 (Ant A) worst data



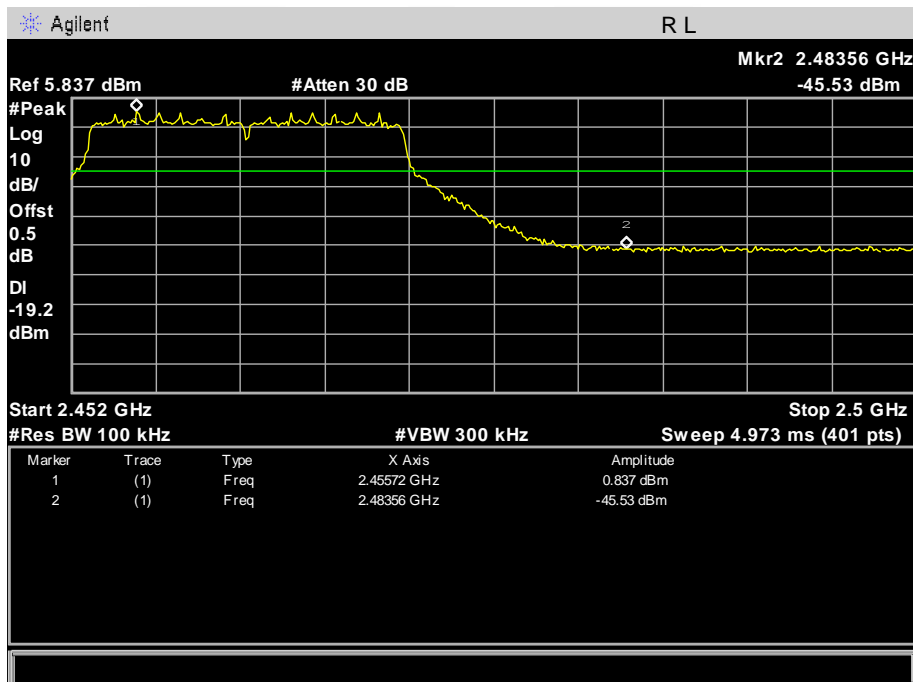


Band edge

TX 802.11n(HT20) Mode CH 01 (Ant A) worst data

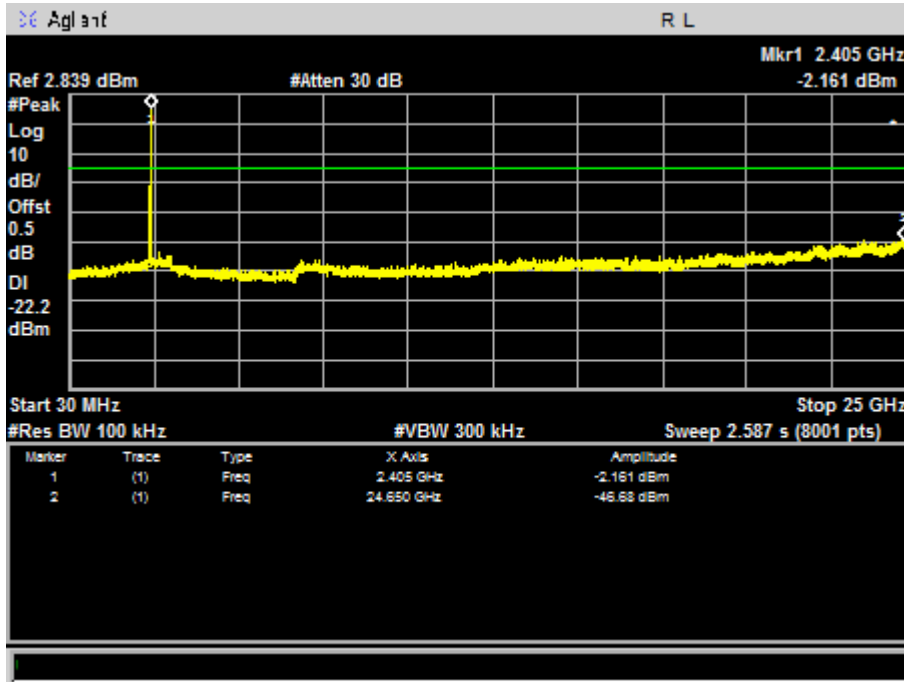


TX 802.11n(HT20) Mode CH 11 (Ant A) worst data

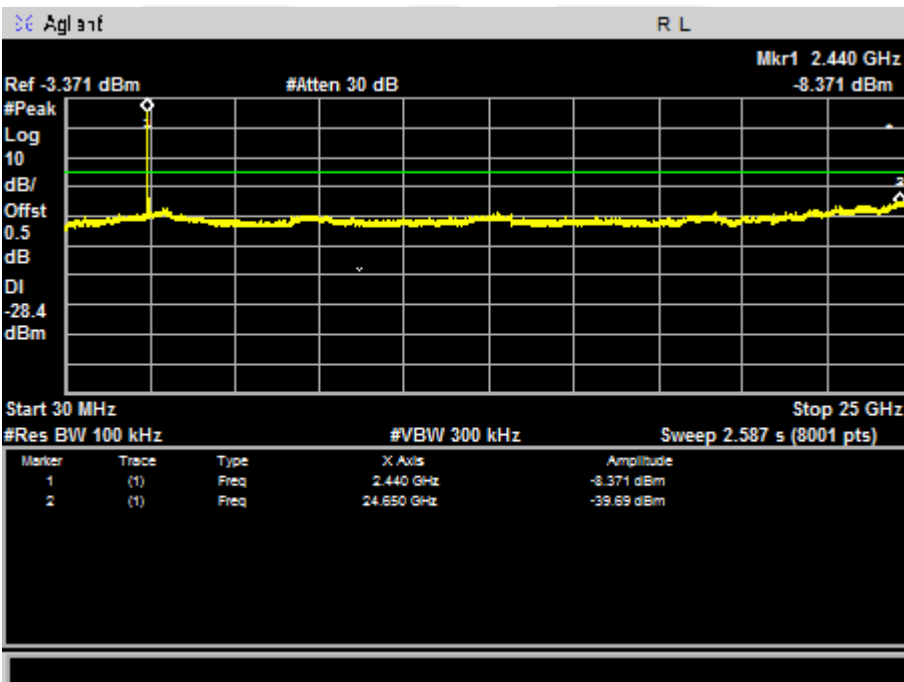


802.11n(HT40)

TX 802.11n(HT40) Mode CH 03 (Ant A) worst data

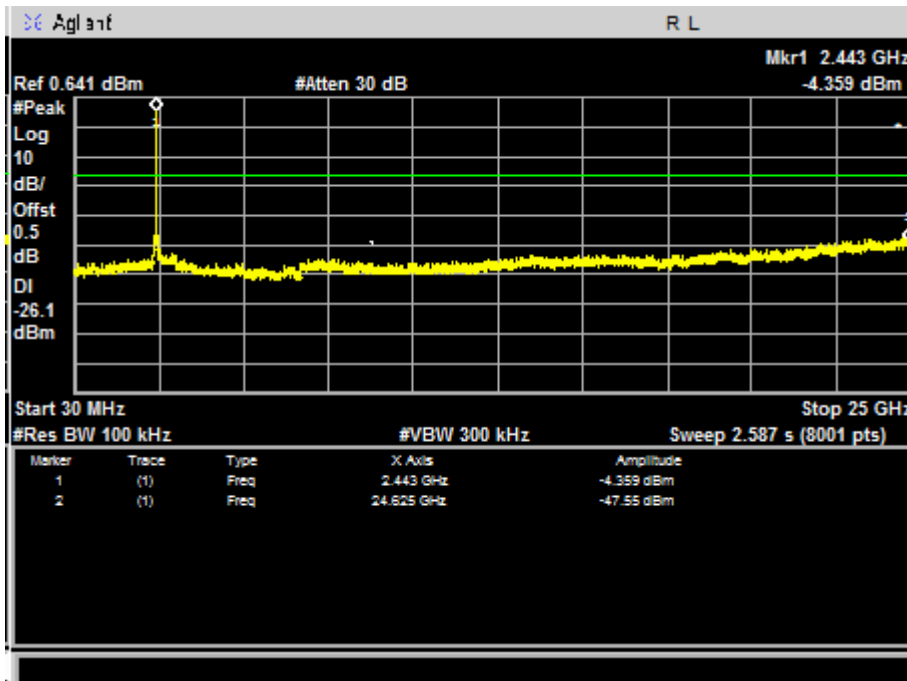


TX 802.11n(HT40) Mode CH 06 (Ant A) worst data





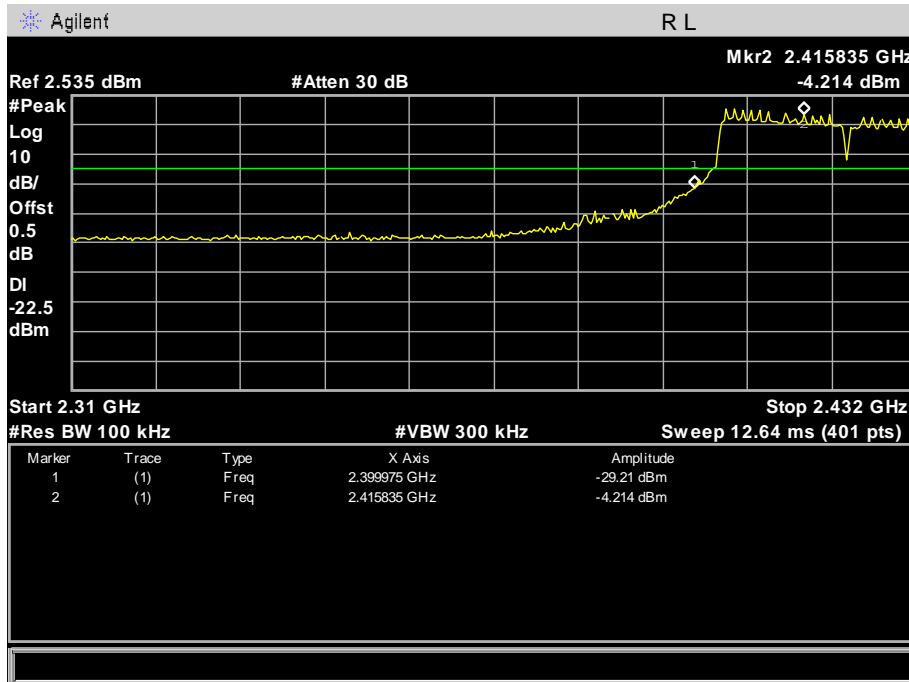
TX 802.11n(HT40) Mode CH 09 (Ant A) worst data



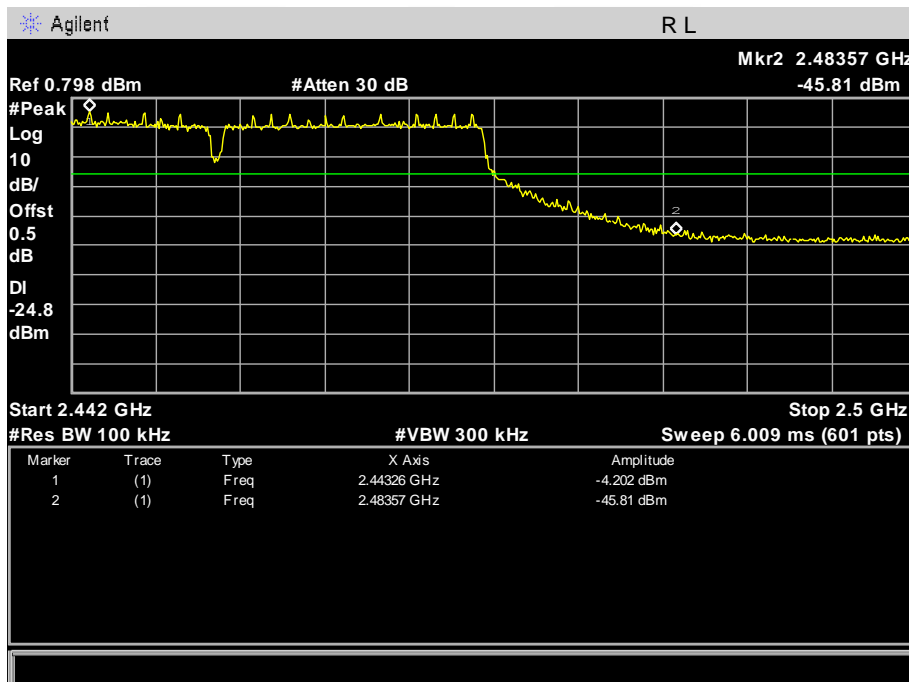


Band edge

TX 802.11n(HT40) Mode CH 03 (Ant A) worst data



TX 802.11n(HT40) Mode CH 09 (Ant A) worst data



5. POWER SPECTRAL DENSITY TEST

5.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247	Power Spectral Density	8 dBm (in any 3KHz)	2400-2483.5	PASS

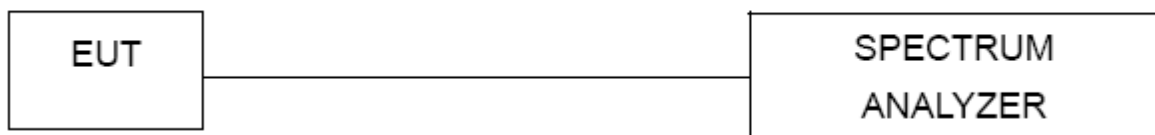
5.2 TEST PROCEDURE

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

5.3 DEVIATION FROM STANDARD

No deviation.

5.4 TEST SETUP



5.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

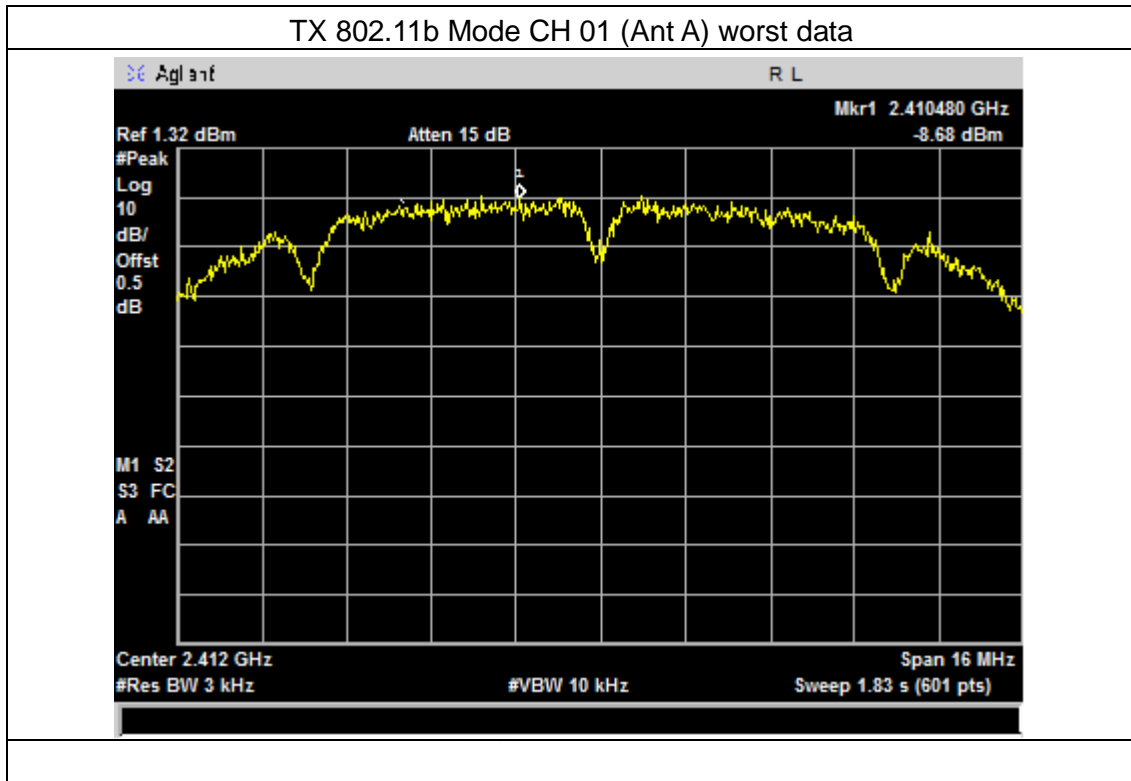


5.6 TEST RESULTS

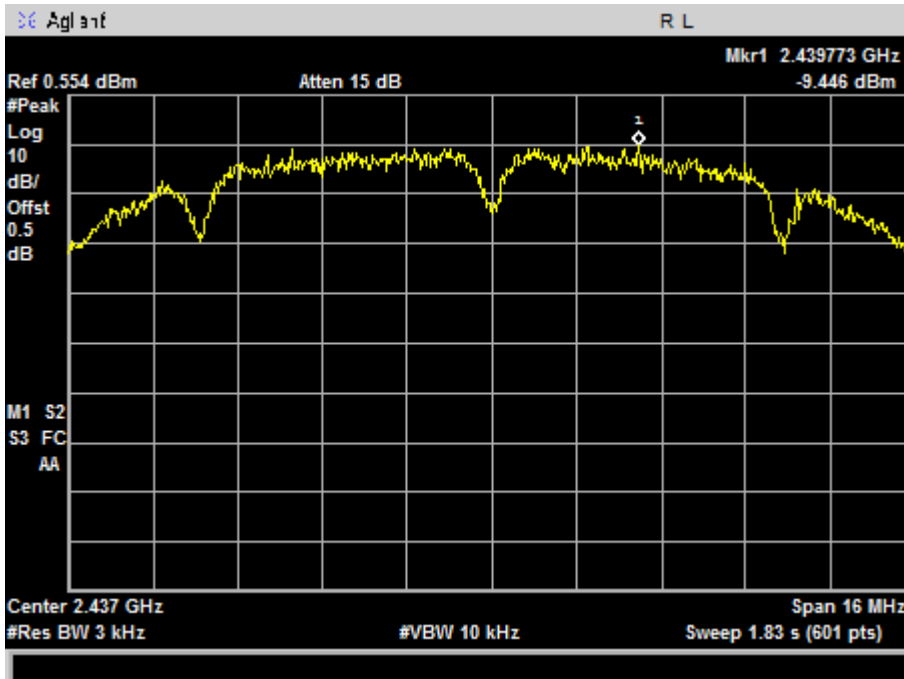
Not: Power density is the sum of the power density A/B/C, The worst data is Antenna A ,only shown Antenna A Plot.

Frequency	Power Density (A/dBm)	Power Density (B/dBm)	Power Density (C/dBm)	Total Power Density (dBm)	Limit (dBm)	Result
2412 MHz	-8.680	-5.694	-9.002	-2.750	4.7	PASS
2437 MHz	-9.446	-10.280	-10.330	-5.228	4.7	PASS
2462 MHz	-9.028	-9.023	-9.567	-4.427	4.7	PASS

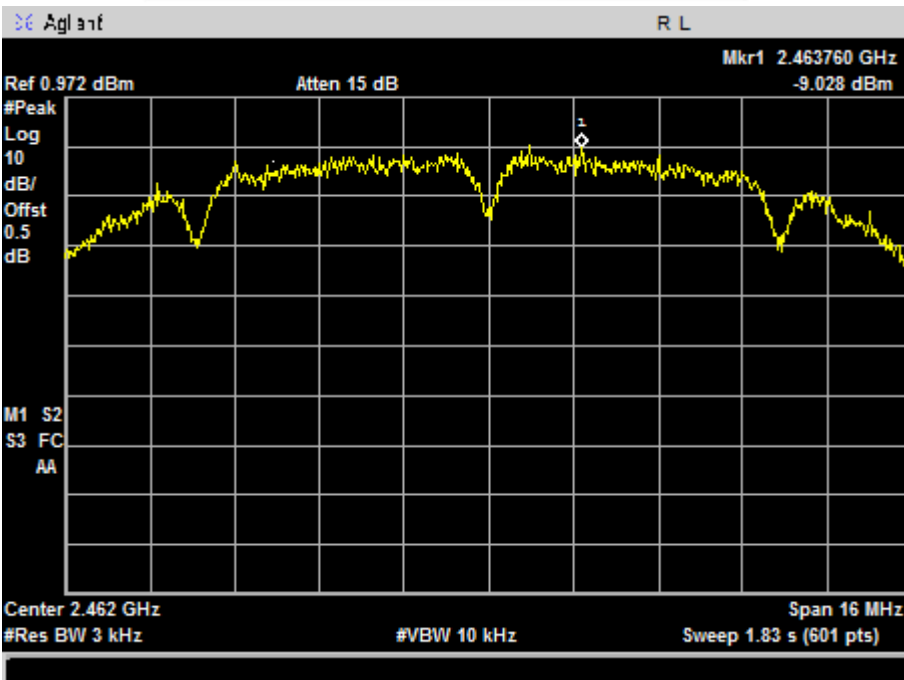
802.11b



TX 802.11b Mode CH 06 (Ant A) worst data



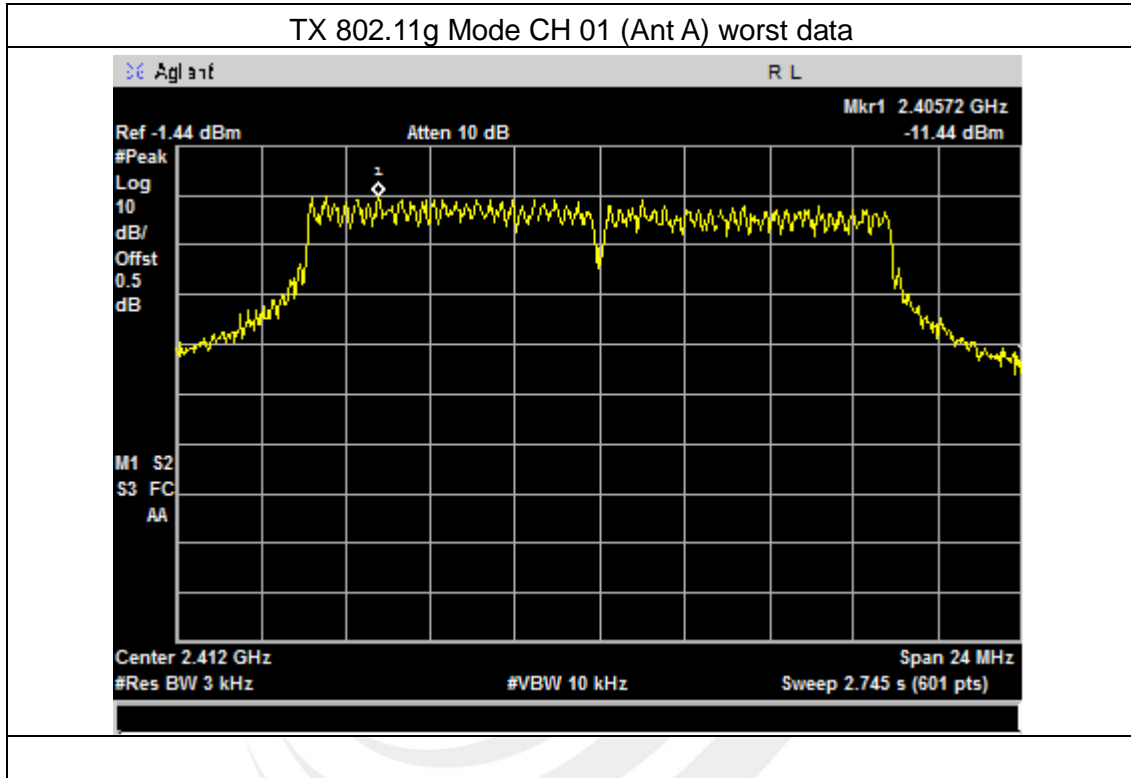
TX 802.11b Mode CH 11 (Ant A) worst data



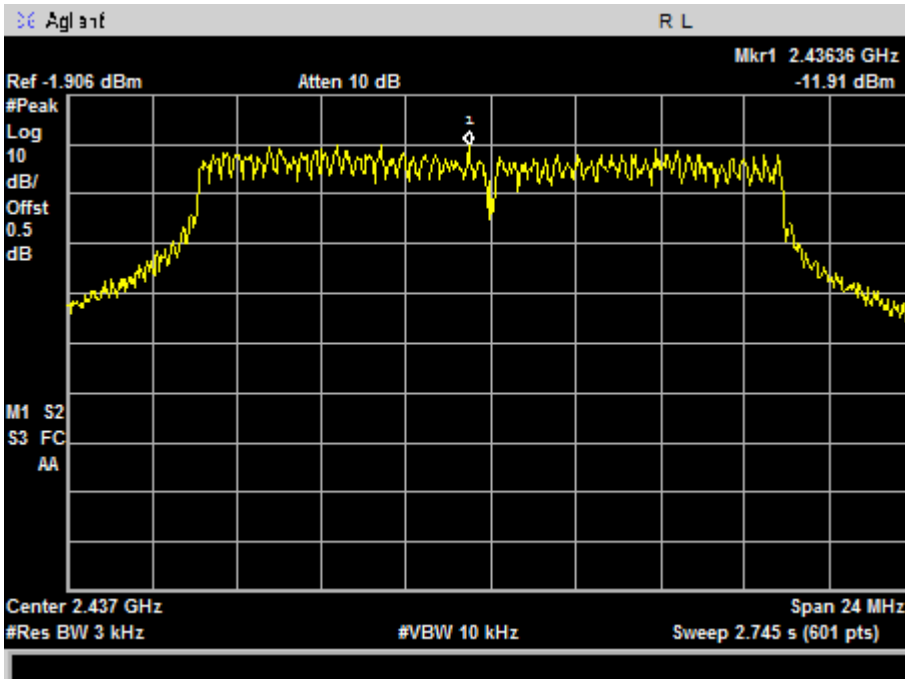


Frequency	Power Density (A/dBm)	Power Density (B/dBm)	Power Density (C/dBm)	Total Power Density (dBm)	Limit (dBm)	Result
2412 MHz	-11.44	-10.45	-10.11	-5.860	4.7	PASS
2437 MHz	-11.91	-11.58	-11.30	-6.818	4.7	PASS
2462 MHz	-12.06	-11.19	-12.20	-7.022	4.7	PASS

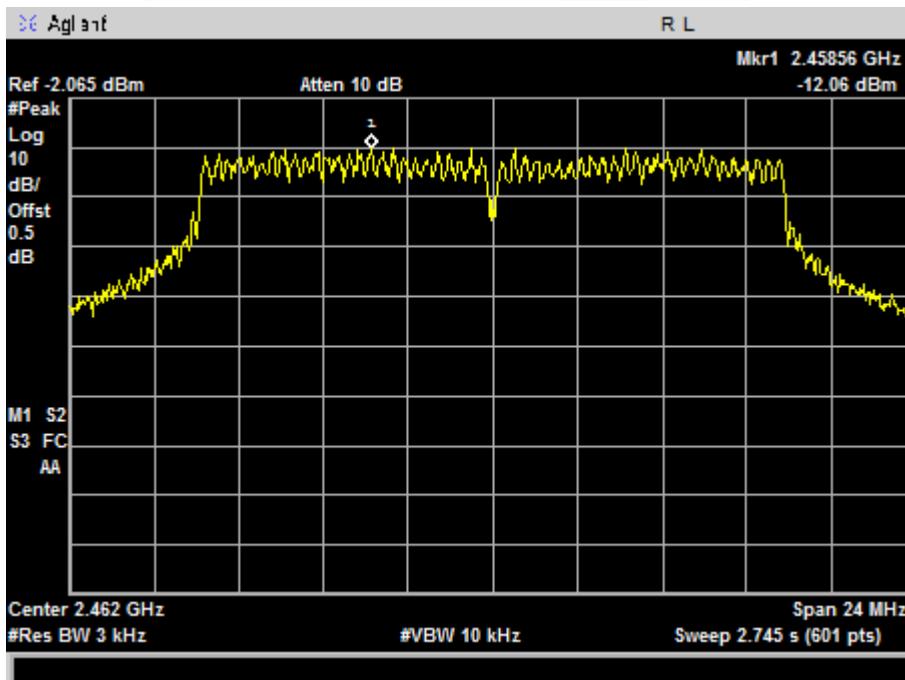
802.11g



TX 802.11g Mode CH 06 (Ant A) worst data



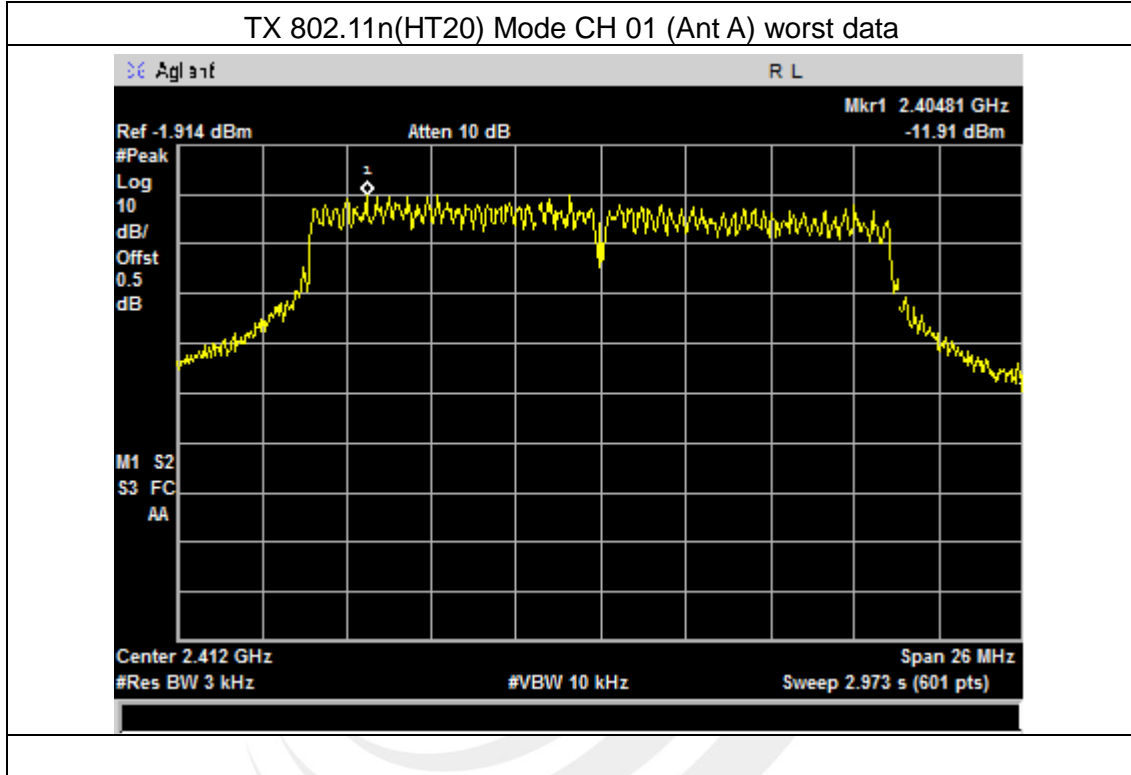
TX 802.11g Mode CH 11 (Ant A) worst data



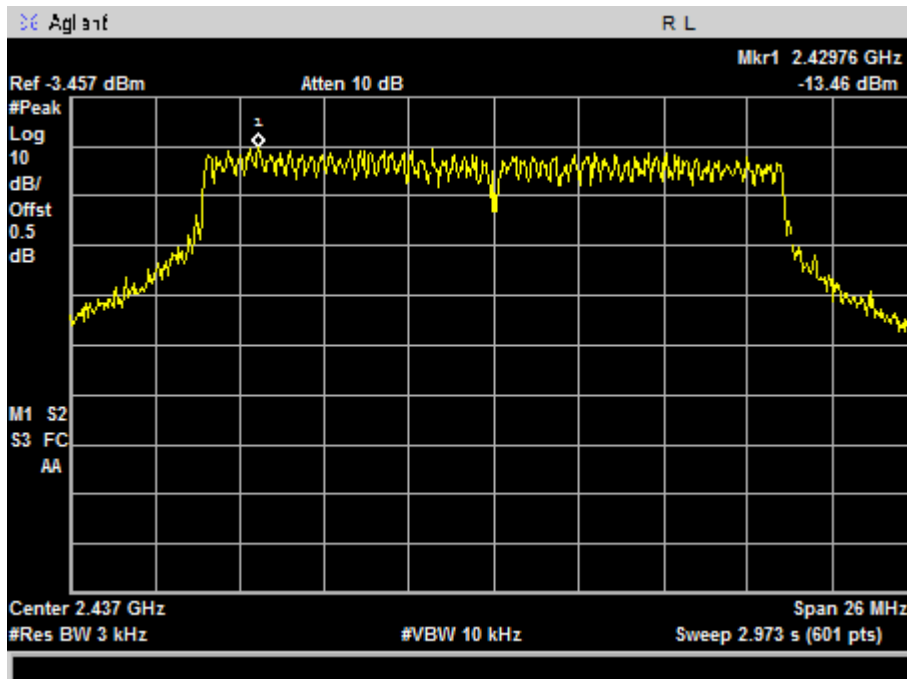


Frequency	Power Density (A/dBm)	Power Density (B/dBm)	Power Density (C/dBm)	Total Power Density (dBm)	Limit (dBm)	Result
2412 MHz	-11.91	-11.48	-11.56	-6.875	4.7	PASS
2437 MHz	-13.46	-13.71	-13.29	-8.712	4.7	PASS
2462 MHz	-11.81	-13.32	-13.67	-8.085	4.7	PASS

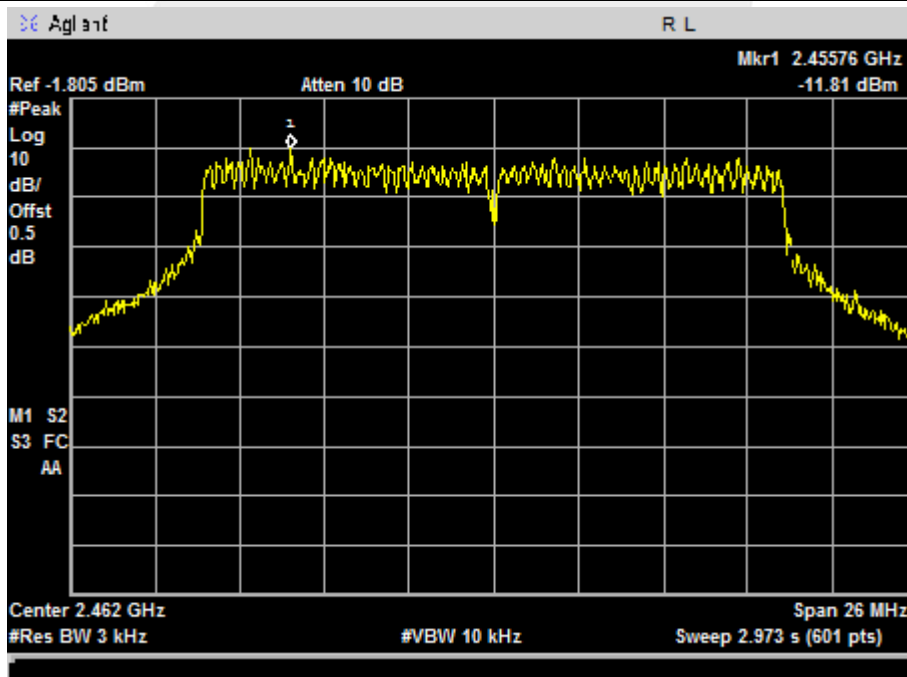
802.11n(HT20)



TX 802.11n(HT20) Mode CH 06 (Ant A) worst data



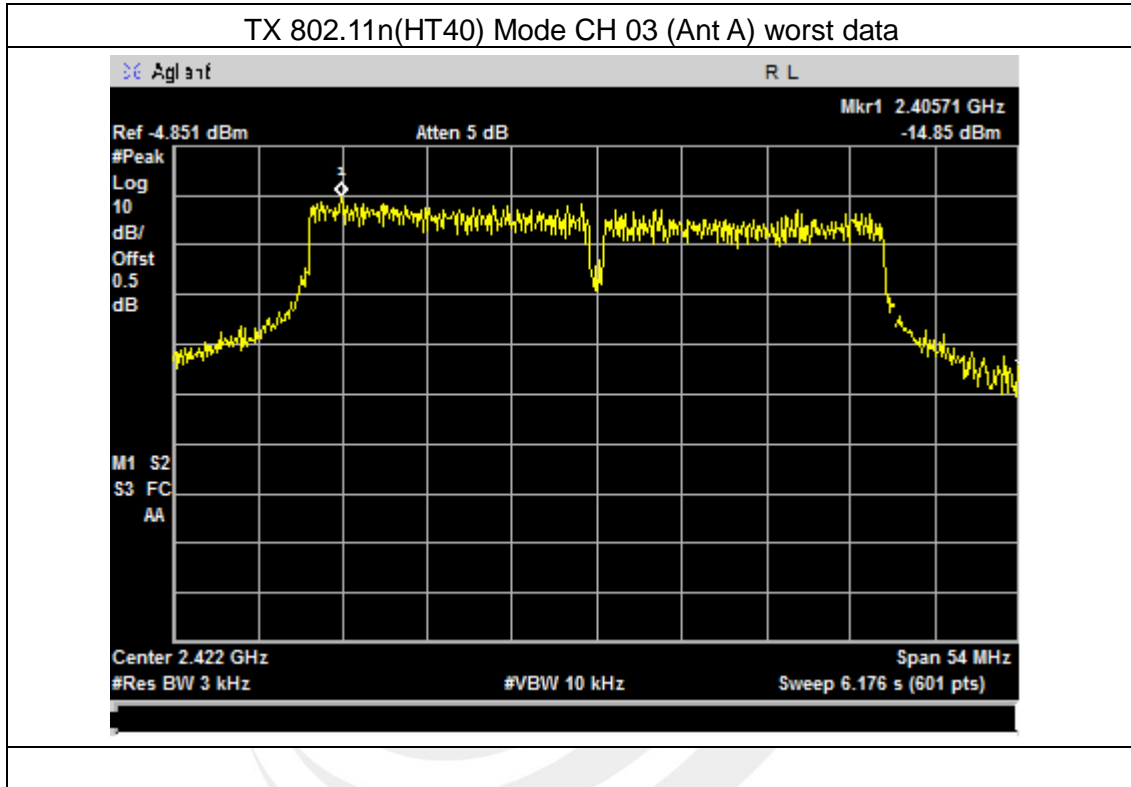
TX 802.11n(HT20) Mode CH 11 (Ant A) worst data



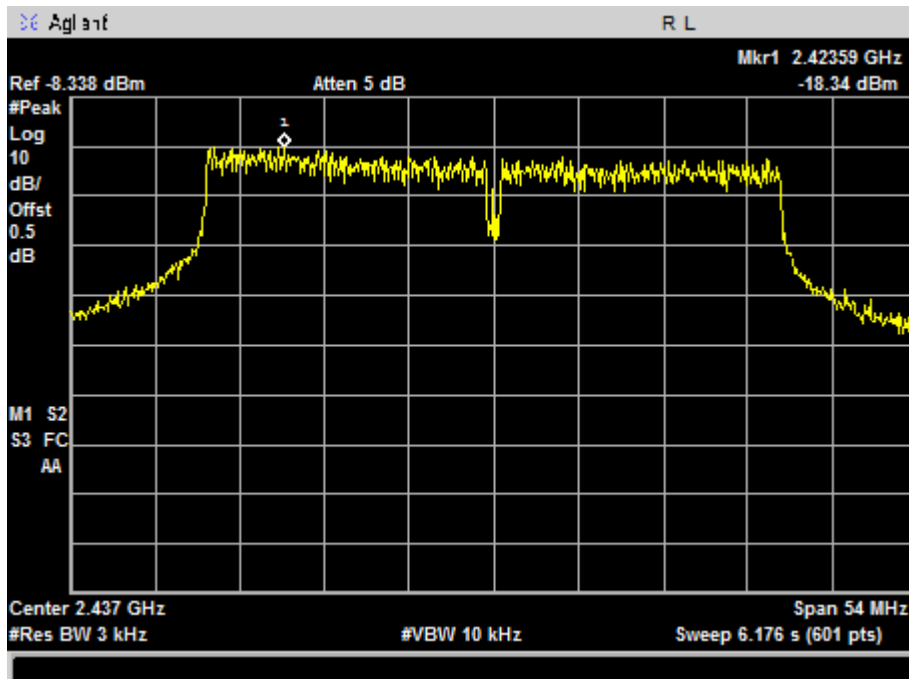


Frequency	Power Density (A/dBm)	Power Density (B/dBm)	Power Density (C/dBm)	Total Power Density (dBm)	Limit (dBm)	Result
2422 MHz	-14.85	-17.16	-16.74	-11.358	4.7	PASS
2437 MHz	-18.34	-17.47	-18.19	-13.212	4.7	PASS
2452 MHz	-18.64	-18.55	-19.00	-13.954	4.7	PASS

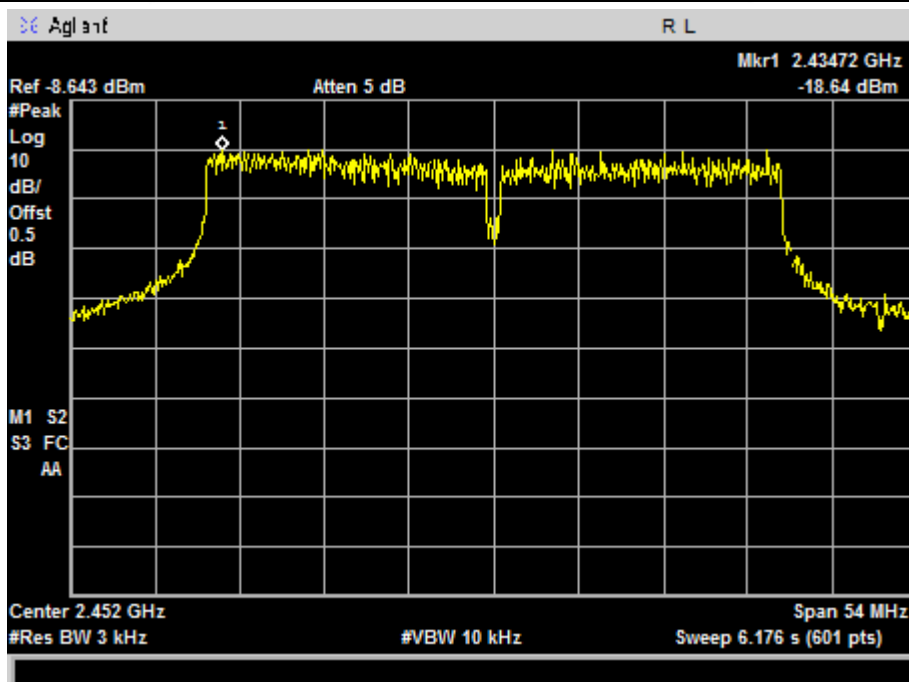
802.11n(HT40)



TX 802.11n(HT40) Mode CH 06 (Ant A) worst data



TX 802.11n(HT40) Mode CH 09 (Ant A) worst data



6. BANDWIDTH TEST

6.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) &RSS-247 , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(2)	Bandwidth	$\geq 500\text{KHz}$ (6dB&99% bandwidth)	2400-2483.5	PASS

6.2 TEST PROCEDURE

1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) $\geq 3 \times$ 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.

6.3 DEVIATION FROM STANDARD

No deviation.

6.4 TEST SETUP



6.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.



6.6 TEST RESULTS

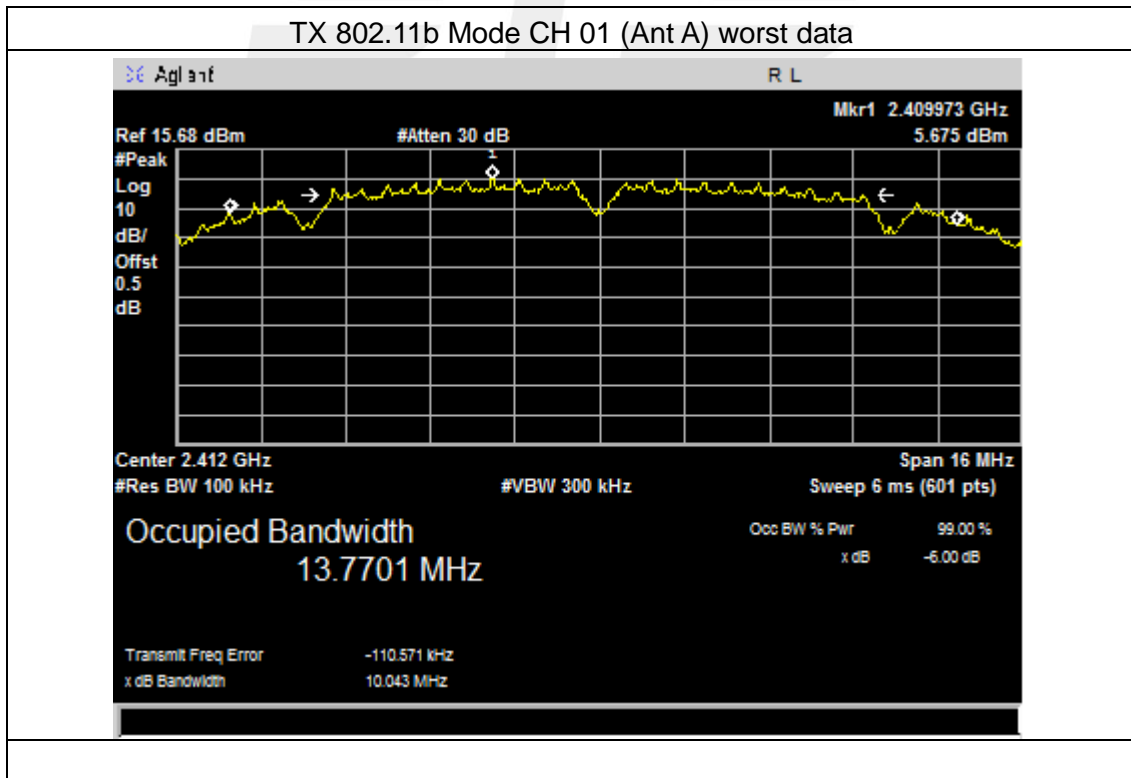
Note:

A/B/C Represent the value of antenna A/B/C, The worst data is A Antenna a ,only shown Antenna A Plot.

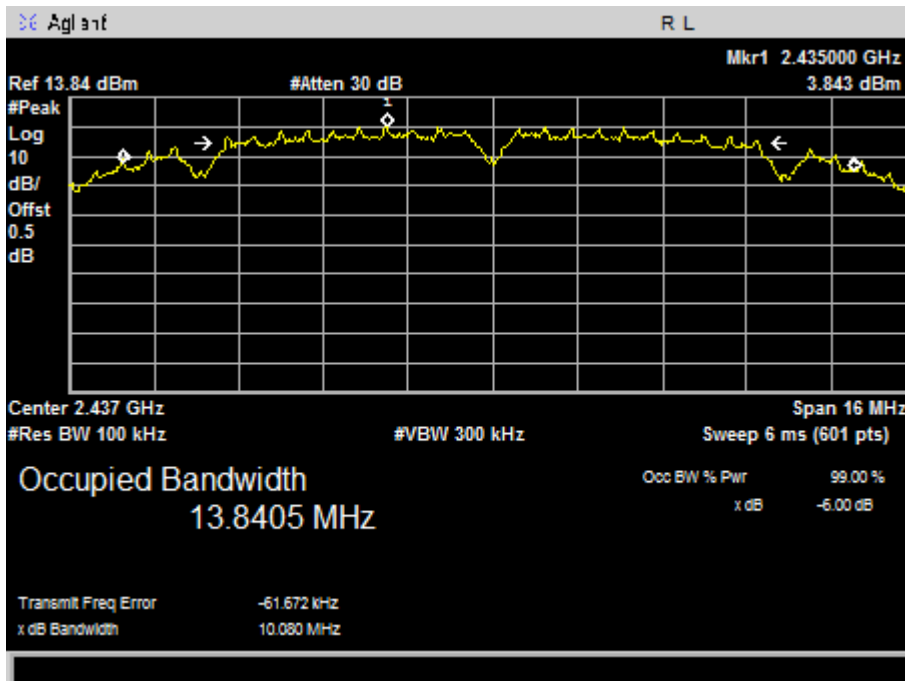
Frequency	6dB /Ant A Bandwidth (MHz)	6dB /Ant B Bandwidth (MHz)	6dB /Ant C Bandwidth (MHz)	Channel Separation (MHz)	Result
2412 MHz	10.043	10.085	10.087	>=500KHz	PASS
2437 MHz	10.080	10.096	10.028	>=500KHz	PASS
2462 MHz	10.060	10.083	10.079	>=500KHz	PASS

Frequency	99% /Ant A Bandwidth (MHz)	99% /Ant B Bandwidth (MHz)	99% /Ant C Bandwidth (MHz)	Channel Separation (MHz)	Result
2412 MHz	13.770	13.613	13.641	N/A	PASS
2437 MHz	13.841	13.795	13.822	N/A	PASS
2462 MHz	13.800	13.691	13.708	N/A	PASS

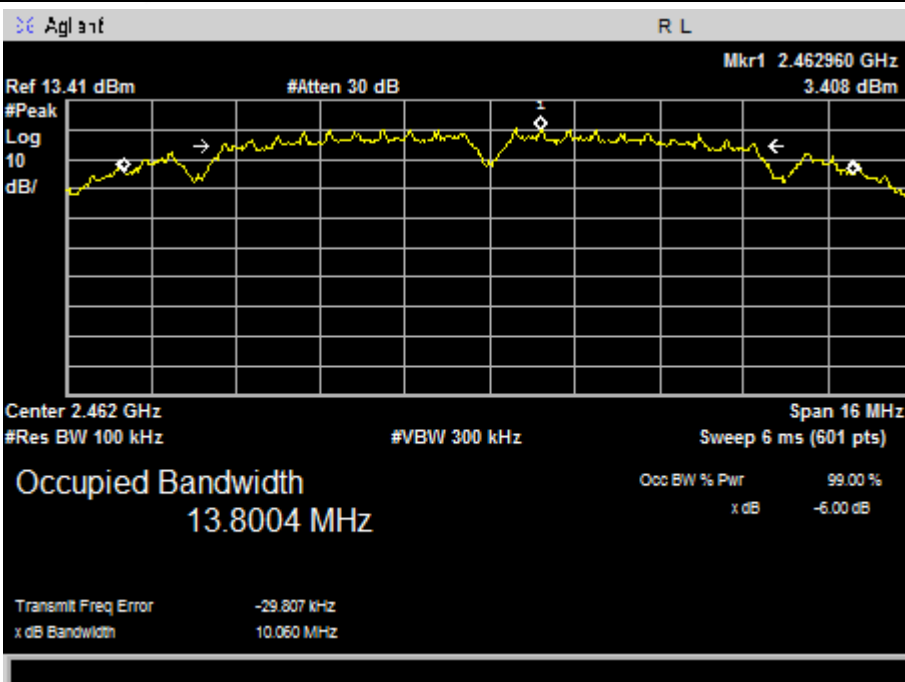
802.11b



TX 802.11b Mode CH 06 (Ant A) worst data



TX 802.11b Mode CH 11 (Ant A) worst data

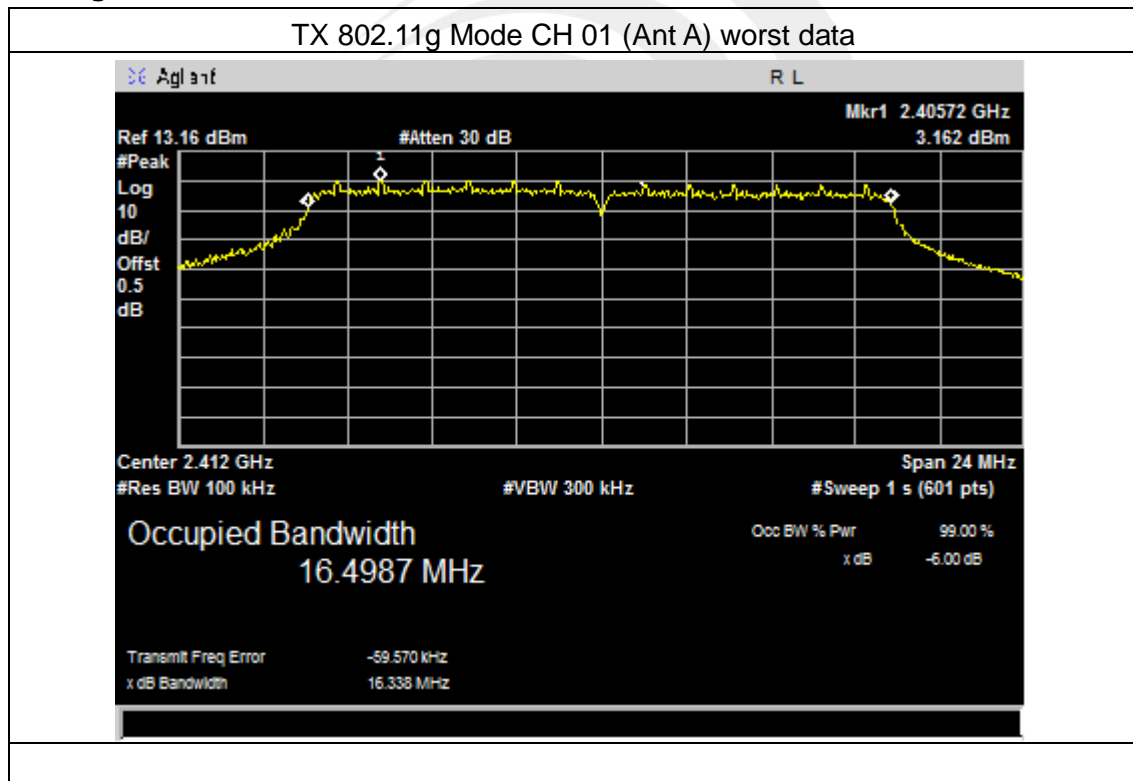




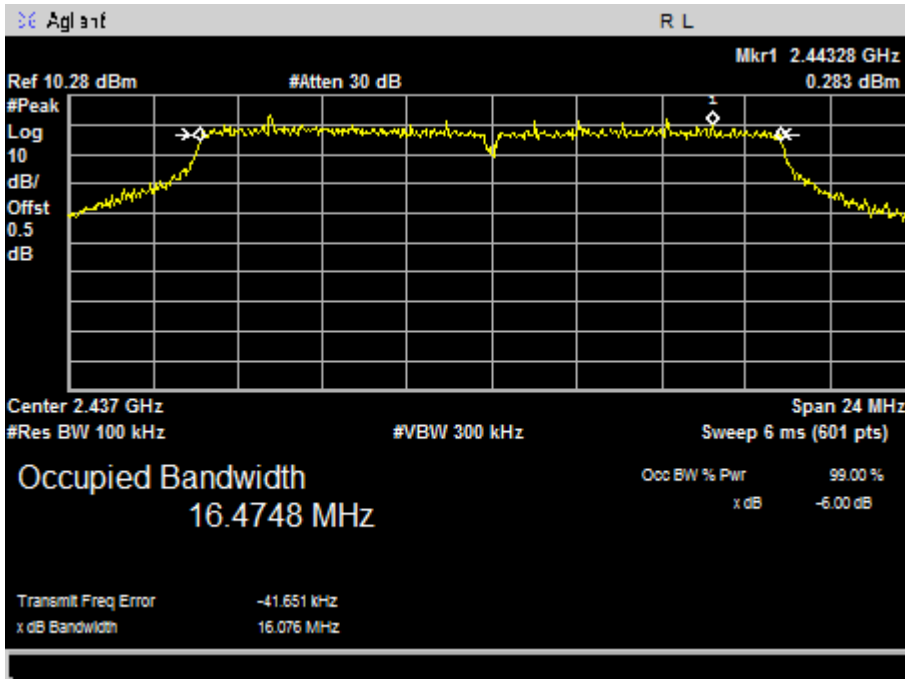
Frequency	6dB /Ant A Bandwidth (MHz)	6dB /Ant B Bandwidth (MHz)	6dB /Ant C Bandwidth (MHz)	Channel Separation (MHz)	Result
2412 MHz	16.338	16.343	16.332	>=500KHz	PASS
2437 MHz	16.076	15.910	16.311	>=500KHz	PASS
2462 MHz	16.355	16.374	16.343	>=500KHz	PASS

Frequency	99% /Ant A Bandwidth (MHz)	99% /Ant B Bandwidth (MHz)	99% /Ant C Bandwidth (MHz)	Channel Separation (MHz)	Result
2412 MHz	16.499	16.512	16.506	N/A	PASS
2437 MHz	16.475	16.471	16.485	N/A	PASS
2462 MHz	16.471	16.477	16.494	N/A	PASS

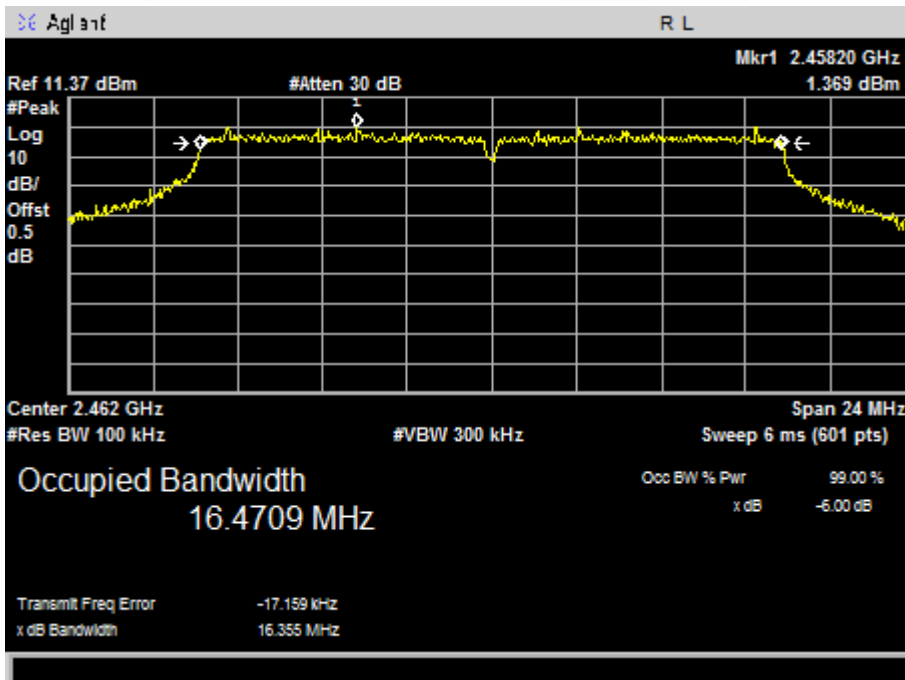
801.11g



TX 802.11g Mode CH 06 (Ant A) worst data



TX 802.11g Mode CH 11 (Ant A) worst data

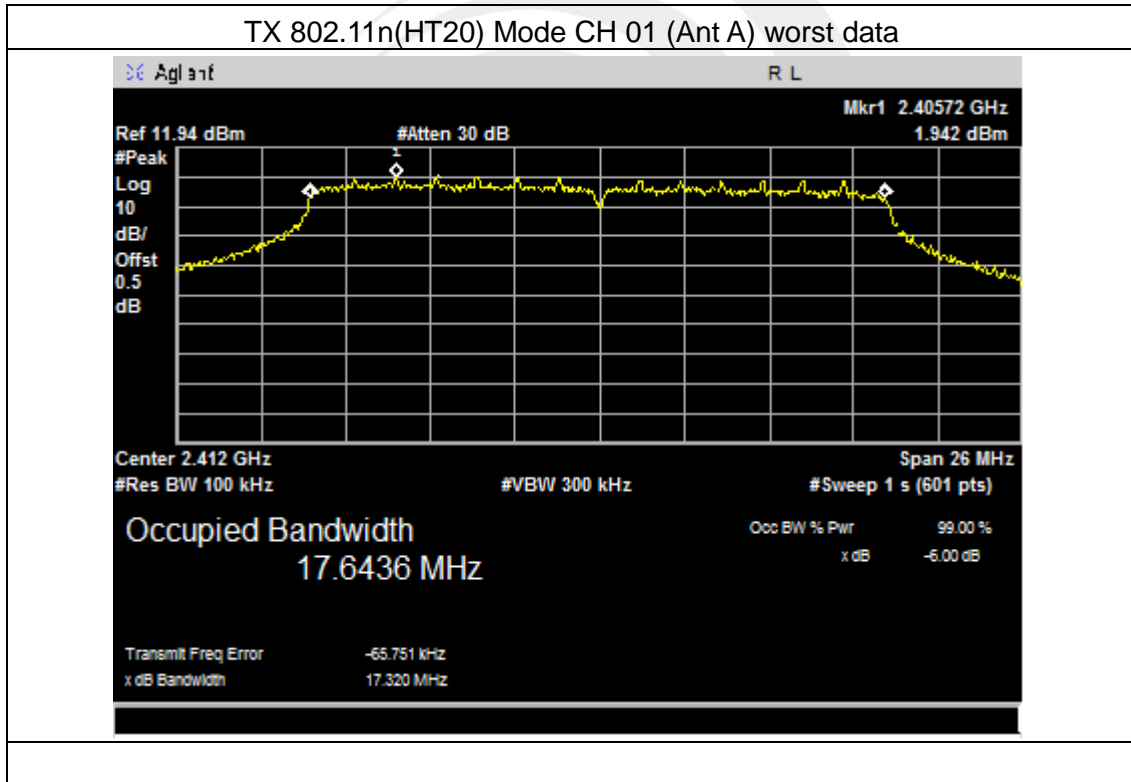




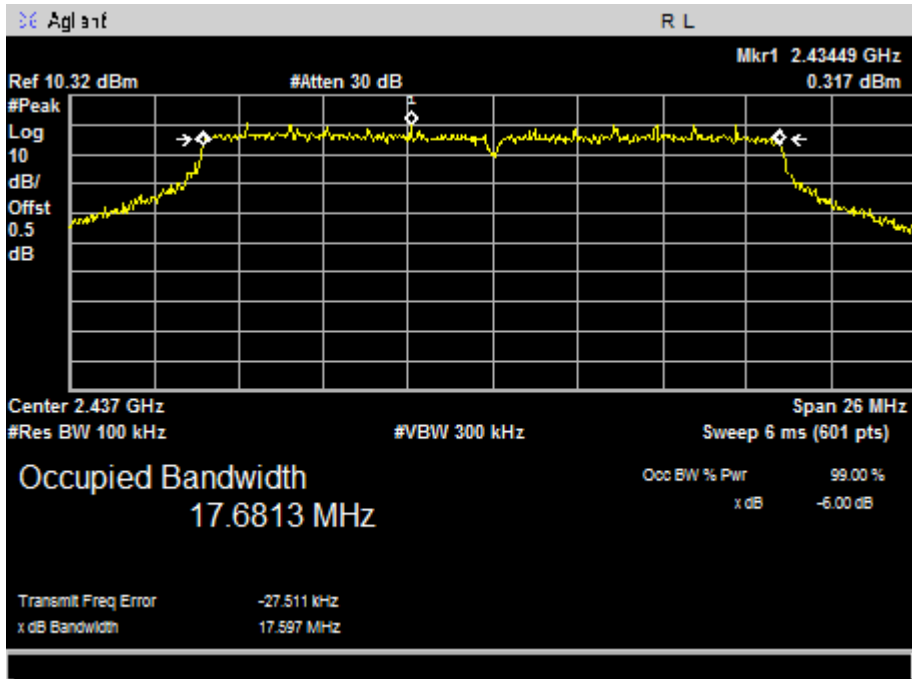
Frequency	6dB /Ant A Bandwidth (MHz)	6dB /Ant B Bandwidth (MHz)	6dB /Ant C Bandwidth (MHz)	Channel Separation (MHz)	Result
2412 MHz	17.320	17.319	16.792	>=500KHz	PASS
2437 MHz	17.597	17.405	17.567	>=500KHz	PASS
2462 MHz	17.545	17.390	17.371	>=500KHz	PASS

Frequency	99% /Ant A Bandwidth (MHz)	99% /Ant B Bandwidth (MHz)	99% /Ant C Bandwidth (MHz)	Channel Separation (MHz)	Result
2412 MHz	17.644	17.645	17.646	N/A	PASS
2437 MHz	17.681	17.679	17.670	N/A	PASS
2462 MHz	17.678	17.696	17.681	N/A	PASS

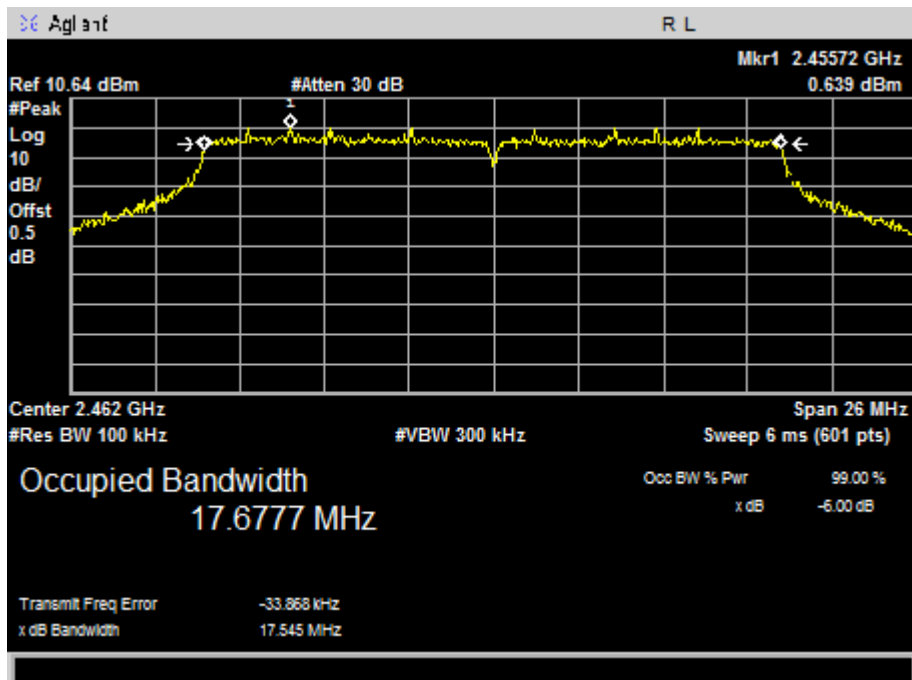
802.11n(HT20)



TX 802.11n(HT20) Mode CH 06 (Ant A) worst data



TX 802.11n(HT20) Mode CH 11 (Ant A) worst data

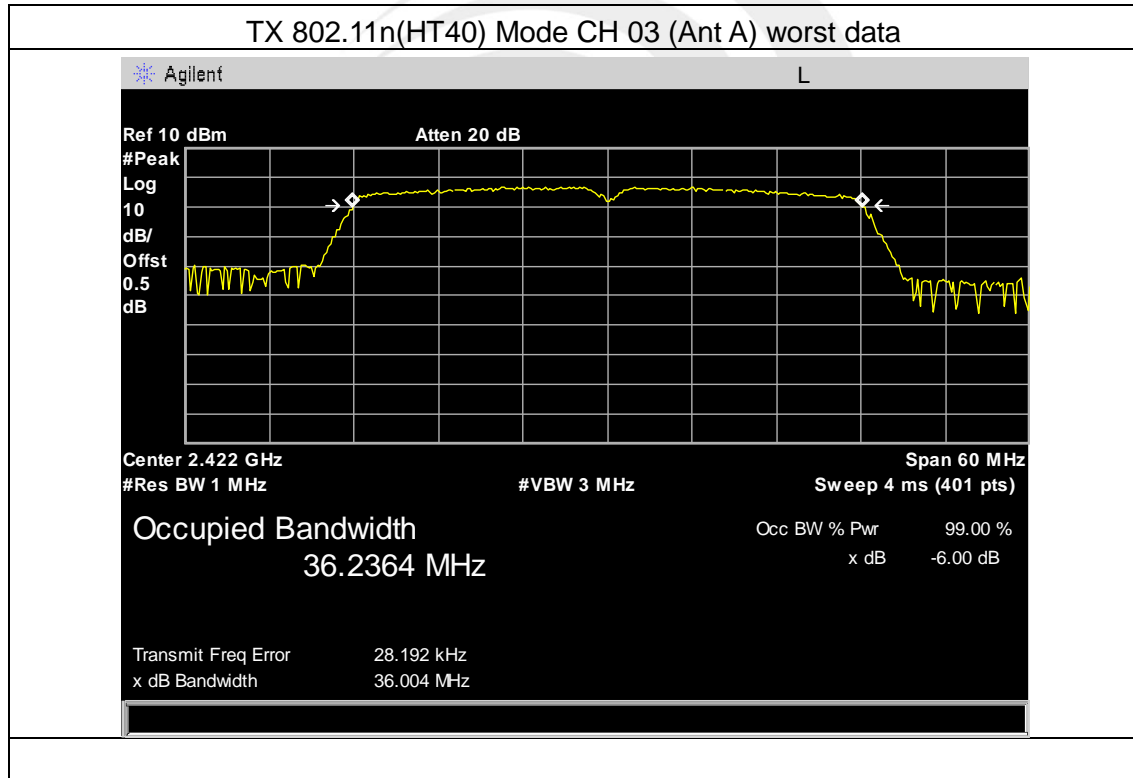


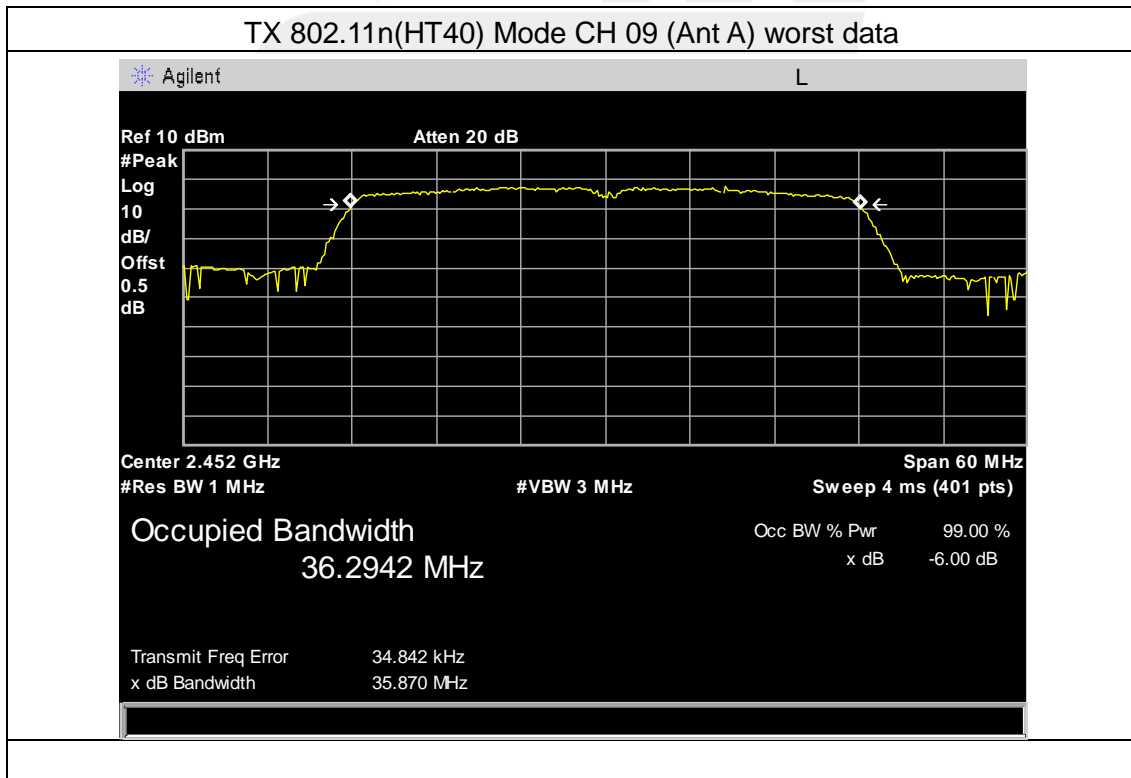
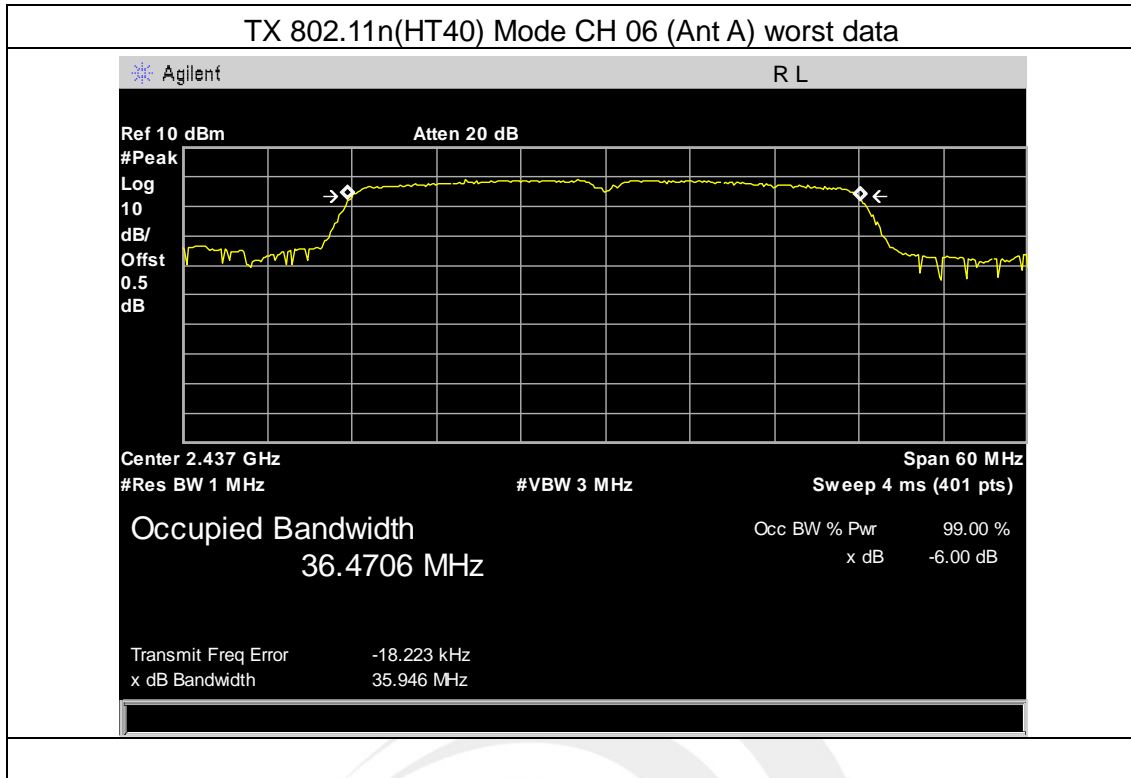


Frequency	6dB /Ant A Bandwidth (MHz)	6dB /Ant B Bandwidth (MHz)	6dB /Ant C Bandwidth (MHz)	Channel Separation (MHz)	Result
2422 MHz	36.004	35.878	35.886	>=500KHz	PASS
2437 MHz	35.946	35.273	35.906	>=500KHz	PASS
2452 MHz	35.870	35.798	36.085	>=500KHz	PASS

Frequency	99% /Ant A Bandwidth (MHz)	99% /Ant B Bandwidth (MHz)	99% /Ant C Bandwidth (MHz)	Channel Separation (MHz)	Result
2422 MHz	36.236	36.225	36.235	N/A	PASS
2437 MHz	36.471	36.235	36.260	N/A	PASS
2452 MHz	36.294	36.192	36.225	N/A	PASS

802.11n(HT40)







7. PEAK OUTPUT POWER TEST

7.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(b)(3)	Peak Output Power	1 watt or 30dBm	2400-2483.5	PASS

7.2 TEST PROCEDURE

- a. The EUT was directly connected to the Power Sensor&Power meter

7.3 DEVIATION FROM STANDARD

No deviation.

7.4 TEST SETUP



7.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.



7.6 TEST RESULTS

Temperature :	25 °C	Relative Humidity :	60%
Pressure :	1012 hPa	Test Voltage :	DC 3.3V
Test Mode :	TX b/g/n(20M,40M) Mode /CH01, CH06, CH11		

Note: Output Power is the sum of the Output power A/B/C

TX 802.11b Mode						
Test Channe	Frequency	Peak Conducted Output Power				LIMIT
	(MHz)	(A/dBm)	(B/dBm)	(C/dBm)	Total power (dBm)	dBm
CH01	2412	18.70	18.64	18.66	23.44	26.7
CH06	2437	18.22	18.11	18.04	22.90	26.7
CH11	2462	18.05	18.03	18.04	22.81	26.7

TX 802.11g Mode						
Test Channe	Frequency	Peak Conducted Output Power				LIMIT
	(MHz)	(A/dBm)	(B/dBm)	(C/dBm)	Total power (dBm)	dBm
CH01	2412	17.59	17.56	17.13	22.20	26.7
CH06	2437	16.48	16.49	16.26	21.18	26.7
CH11	2462	16.18	16.03	16.40	20.98	26.7

TX 802.11n(HT20) Mode						
Test Channe	Frequency	Peak Conducted Output Power				LIMIT
	(MHz)	(A/dBm)	(B/dBm)	(C/dBm)	Total power (dBm)	dBm
CH01	2412	18.06	18.12	17.57	22.69	26.7
CH06	2437	16.71	17.29	17.35	21.90	26.7
CH11	2462	16.87	16.96	17.04	21.73	26.7

TX 802.11n(HT40) Mode						
Test Channe	Frequency	Peak Conducted Output Power				LIMIT
	(MHz)	(A/dBm)	(B/dBm)	(C/dBm)	Total power (dBm)	dBm
CH03	2422	14.55	14.53	14.23	19.21	26.7
CH06	2437	14.47	13.83	14.54	19.06	26.7
CH09	2452	14.88	14.78	14.81	19.59	26.7



8. ANTENNA REQUIREMENT

8.1 STANDARD REQUIREMENT

15.203 requirement: For intentional device, according to 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.

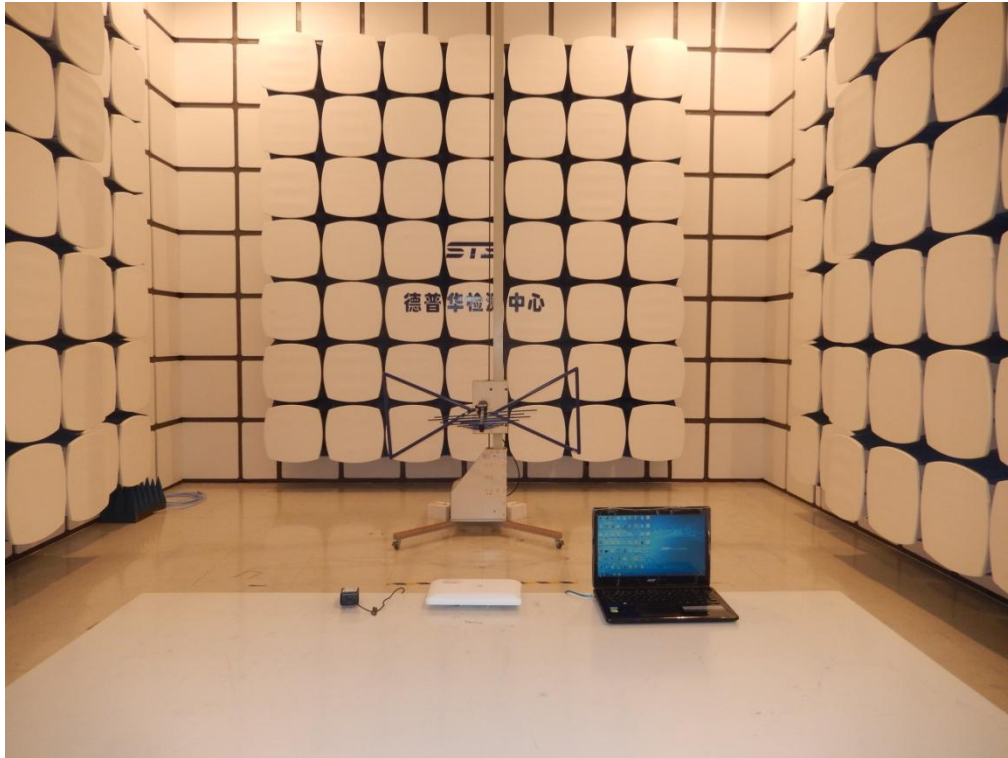
8.2 EUT ANTENNA

The EUT antenna is PIFA Antenna. It comply with the standard requirement.

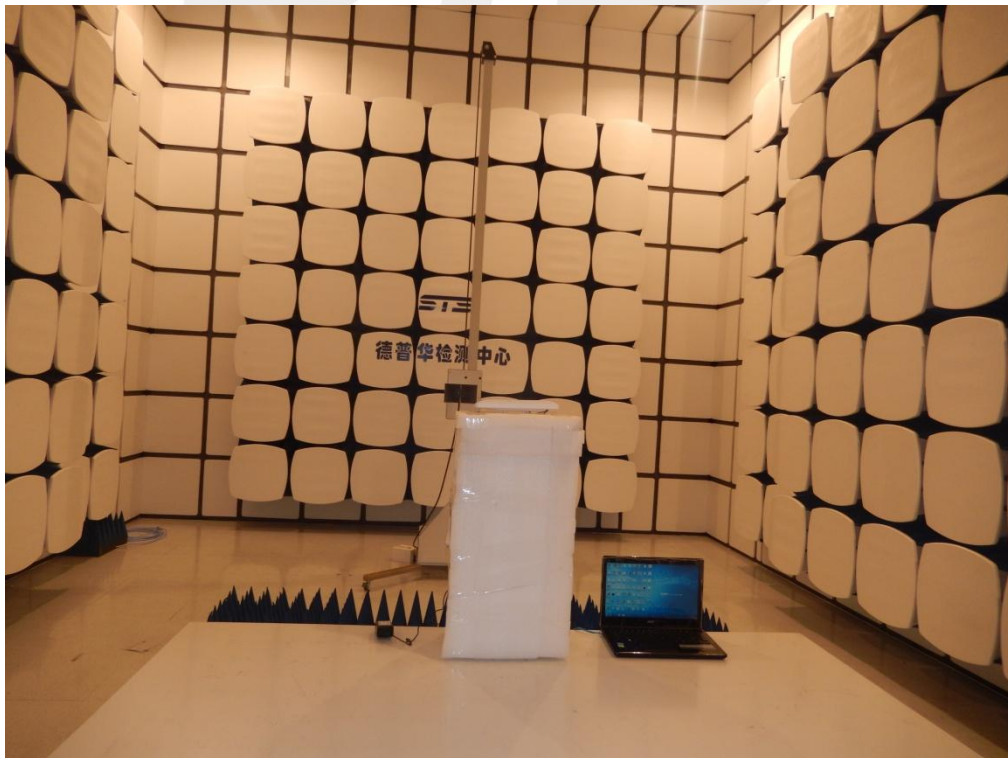


APPENDIX - PHOTOS OF TEST SETUP

**Radiated Measurement Photos
30M-1G**



Above 1G



Conducted Measurement Photos

