SGS-CSTC Standards Technical Services Co., Ltd.
Shenzhen Branch

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FCC REPORT

Application No:	SZEM1603001234CR
Applicant:	Shenzhen Ai-Thinker Technology Co., Ltd
Manufacturer:	Shenzhen Ai-Thinker Technology Co., Ltd
Factory:	Shenzhen Ai-Thinker Technology Co., Ltd
Product Name:	WIFI Module
Model No.(EUT):	ESO-12S
FCC ID:	2AHMR-ESP12S
Standards:	47 CFR Part 15, Subpart C (2015)
Date of Receipt:	2016-03-09
Date of Test:	2016-06-24 to 2016-07-01
Date of Issue:	2016-07-08
Test Result:	**PASS ***

. * In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

Jack Zhang
EMC Laboratory Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.
If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.
The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. All test results in this report can be traceable to National or International Standards.

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2 Version

Revision Record				
Version	***Chapter***	***Date***	***Modifier***	***Remark***
00		*2016-07-08*		*Original*

Authorized for issue by:				
Tested By		Peter Geng **(Peter Geng) /Project Engineer**		2016-07-01 **Date**
Prepared By		Joyce Shi **(Joyce Shi) /Clerk**		2016-06-02 **Date**
Checked By		Eric Fu **(Eric Fu) /Reviewer**		2016-06-02 **Date**

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3 Test Summary

Test Item	Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15, Subpart C Section 15.203/15.247 (c)	ANSI C63.10 2013	PASS
AC Power Line Conducted Emission	47 CFR Part 15, Subpart C Section 15.207	ANSI C63.10 2013	PASS
Conducted Peak Output Power	47 CFR Part 15, Subpart C Section 15.247 (b)(3)	ANSI C63.10 2013	PASS
6dB Occupied Bandwidth	47 CFR Part 15, Subpart C Section 15.247 (a)(2)	ANSI C63.10 2013	PASS
Power Spectral Density	47 CFR Part 15, Subpart C Section 15.247 (e)	ANSI C63.10 2013	PASS
Band-edge for RF Conducted Emissions	47 CFR Part 15, Subpart C Section 15.247(d)	ANSI C63.10 2013	PASS
RF Conducted Spurious Emissions	47 CFR Part 15, Subpart C Section 15.247(d)	ANSI C63.10 2013	PASS
Radiated Spurious Emissions	47 CFR Part 15, Subpart C Section 15.205/15.209	ANSI C63.10 2013	PASS
Restricted bands around fundamental frequency (Radiated Emission)	47 CFR Part 15, Subpart C Section 15.205/15.209	ANSI C63.10 2013	PASS

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5 General Information

5.1 Client Information

Applicant:	Shenzhen Ai-Thinker Technology Co., Ltd
Address of Applicant:	6/F,Block C2,Huafeng Industrial Park, Hangcheng Road,Baoan district ,Shenzhen ,China
Manufacturer:	Shenzhen Ai-Thinker Technology Co., Ltd
Address of Manufacturer:	6/F,Block C2,Huafeng Industrial Park, Hangcheng Road,Baoan district ,Shenzhen ,China
Factory:	Shenzhen Ai-Thinker Technology Co., Ltd
Address of Factory:	6/F,Block C2,Huafeng Industrial Park, Hangcheng Road,Baoan district ,Shenzhen ,China

5.2 General Description of EUT

Product Name:	WIFI Module
Model No.:	ESO-12S
Operation Frequency:	IEEE 802.11b/g/n(HT20): 2412MHz to 2462MHz
Channel Numbers:	IEEE 802.11b/g, IEEE 802.11n HT20: 11 Channels
Channel Separation:	5MHz
Type of Modulation:	IEEE for 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE for 802.11g : OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE for 802.11n(HT20) : OFDM (64QAM, 16QAM,QPSK,BPSK)
Antenna Type:	omni antenna
Antenna Gain:	3dBi
AC adapter	DC 5V from USB port
Battery	DC 5V from USB port

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Operation Frequency each of channel(802.11b/g/n HT20)							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2412MHz	4	2427MHz	7	2442MHz	10	2457MHz
2	2417MHz	5	2432MHz	8	2447MHz	11	2462MHz
3	2422MHz	6	2437MHz	9	2452MHz		

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

For 802.11b/g/n (HT20):

Channel	Frequency
The Lowest channel	2412MHz
The Middle channel	2437MHz
The Highest channel	2462MHz

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5.3 Test Environment and Mode

Operating Environment:	
Temperature:	25.0 °C
Humidity:	55 % RH
Atmospheric Pressure:	1015 mbar
Test mode:	
Transmitting mode:	Keep the EUT in transmitting mode with all kind of modulation and all kind of data rate.

5.4 Description of Support Units

The EUT has been tested with following associated Units.

Description	Manufacture	S/N serial number
Laptop	Lenovo	T430u

5.5 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch E&E Lab,

No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Shenzhen, Guangdong, China. 518057.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

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5.6 Test Facility

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

• **CNAS (No. CNAS L2929)**

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

• **A2LA (Certificate No. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

• **VCCI**

The 10m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-823, R-4188, T-1153 and C-2383 respectively.

• **FCC – Registration No.: 556682**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No.: 556682.

• **Industry Canada (IC)**

Two 3m Semi-anechoic chambers and the 10m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1, 4620C-2, 4620C-3.

5.7 Deviation from Standards

None.

5.8 Abnormalities from Standard Conditions

None.

5.9 Other Information Requested by the Customer

None.

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5.10Equipment List

Conducted Emission						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal. date (yyyy-mm-dd)**	**Cal.Due date (yyyy-mm-dd)**
1	Shielding Room	ZhongYu Electron	GB-88	SEM001-06	2016-05-13	2017-05-13
2	LISN	Rohde & Schwarz	ENV216	SEM007-01	2015-10-09	2016-10-09
3	LISN	ETS-LINDGREN	3816/2	SEM007-02	2016-04-25	2017-04-25
4	8 Line ISN	Fischer Custom Communications Inc.	FCC-TLISN-T8-02	EMC0120	2015-08-30	2016-08-30
5	4 Line ISN	Fischer Custom Communications Inc.	FCC-TLISN-T4-02	EMC0121	2015-08-30	2016-08-30
6	2 Line ISN	Fischer Custom Communications Inc.	FCC-TLISN-T2-02	EMC0122	2015-08-30	2016-08-30
7	EMI Test Receiver	Rohde & Schwarz	ESCI	SEM004-02	2016-04-25	2017-04-25
8	DC Power Supply	Zhao Xin	RXN-305D	SEM011-02	2015-10-09	2016-10-09

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RE in Chamber						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal. date (yyyy-mm-dd)**	**Cal.Due date (yyyy-mm-dd)**
1	10m Semi-Anechoic Chamber	SAEMC	FSAC1018	SEM001-03	2015-08-01	2016-08-01
2	EMI Test Receiver (9k-3GHz)	Rohde & Schwarz	ESCI	SEM004-01	2016-04-25	2017-04-25
3	Trilog-Broadband Antenna(30M-1GHz)	Schwarzbeck	VULB9168	SEM003-17	2016-01-26	2017-01-26
4	Pre-amplifier	Sonoma Instrument Co	310N	SEM005-03	2016-04-25	2017-04-25
5	Loop Antenna	ETS-Lindgren	6502	SEM003-08	2015-08-14	2016-08-14

RE in Chamber						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal. date (yyyy-mm-dd)**	**Cal.Due date (yyyy-mm-dd)**
1	3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2016-05-13	2017-05-13
2	EMI Test Receiver	Rohde & Schwarz	ESIB26	SEM004-04	2016-04-25	2017-04-25
3	BiConiLog Antenna (26-3000MHz)	ETS-Lindgren	3142C	SEM003-02	2014-11-15	2017-11-15
4	Amplifier (0.1-1300MHz)	HP	8447D	SEM005-02	2015-10-09	2016-10-09
5	Horn Antenna (1-18GHz)	Rohde & Schwarz	HF907	SEM003-07	2015-06-14	2018-06-14
6	Horn Antenna (18-26GHz)	ETS-LINDGREN	3160	SEL0076	2014-11-24	2017-11-24
7	Low Noise Amplifier	Black Diamond Series	BDLNA-0118-352810	SEM005-05	2015-10-09	2016-10-09
8	Band filter	Amindeon	Asi 3314	SEM023-01	N/A	N/A

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RF connected test						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal. date (yyyy-mm-dd)**	**Cal.Due date (yyyy-mm-dd)**
1	DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2015-10-09	2016-10-09
2	Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2015-10-17	2016-10-17
3	Signal Generator	Rohde & Schwarz	SML03	SEM006-02	2016-04-25	2017-04-25
4	Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2015-10-09	2016-10-09

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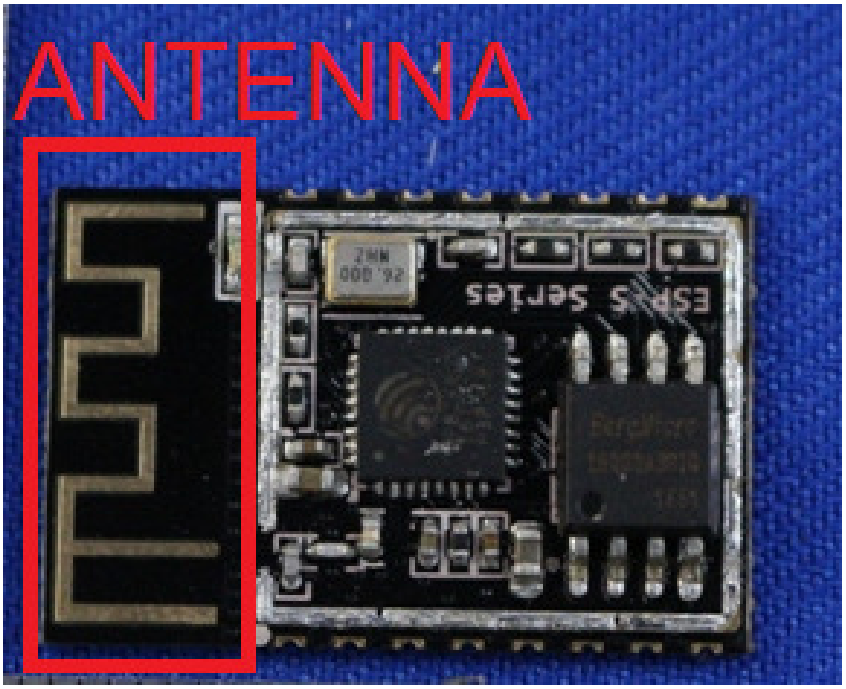
6 Test results and Measurement Data

6.1 Antenna Requirement

Standard requirement:	47 CFR Part 15C Section 15.203 /247(c)
15.203 requirement: 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. 15.247(b) (4) requirement: The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.	
EUT Antenna:	
The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 3dBi.	

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6.2 Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.207
Test Method:	ANSI C63.10: 2013
Test Frequency Range:	150kHz to 30MHz
Limit:	

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

Test Procedure:

1) The mains terminal disturbance voltage test was conducted in a shielded room.
2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement.

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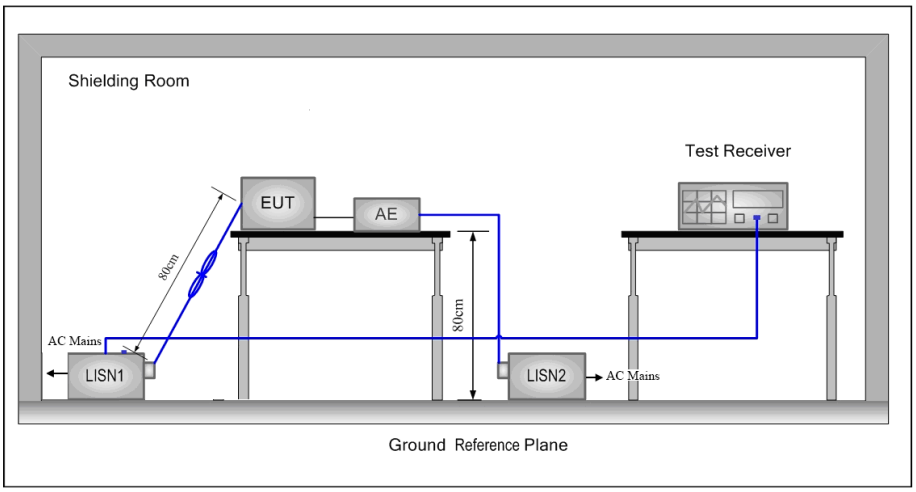
Test Setup:	
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates at lowest, middle and highest channel. Transmitting mode.
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate of 802.11b at lowest channel is the worst case. Transmitting mode. Only the worst case is recorded in the report.
Instruments Used:	Refer to section 5.10 for details
Test Results:	Pass

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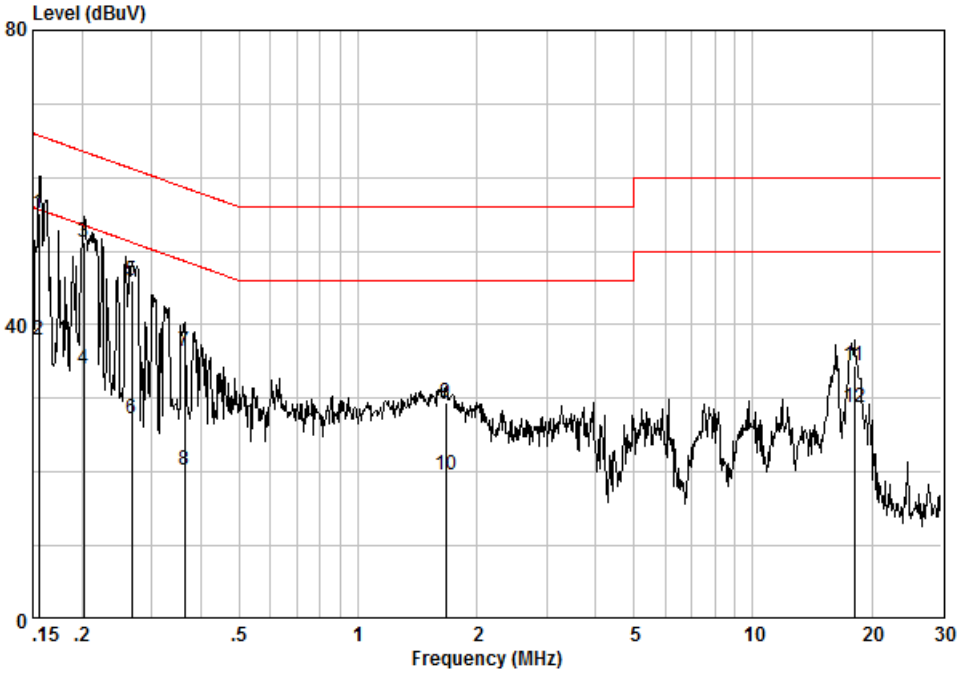
Measurement Data

An initial pre-scan was performed on the live and neutral lines with peak detector.

Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

Live Line:



Site : Shielding Room
Condition : CE LINE
Job No. : 1234CR
Test Mode : TX

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.15567	0.02	9.59	45.63	55.24	65.69	-10.45	QP
2	0.15567	0.02	9.59	28.23	37.84	55.69	-17.85	AVERAGE
3	0.20181	0.02	9.60	41.57	51.19	63.54	-12.35	QP
4	0.20181	0.02	9.60	24.40	34.02	53.54	-19.52	AVERAGE
5	0.26724	0.02	9.60	36.33	45.94	61.20	-15.26	QP
6	0.26724	0.02	9.60	17.54	27.16	51.20	-24.05	AVERAGE
7	0.36338	0.02	9.59	26.79	36.40	58.65	-22.25	QP
8	0.36338	0.02	9.59	10.66	20.28	48.65	-28.37	AVERAGE
9	1.671	0.03	9.60	19.82	29.45	56.00	-26.55	QP
10	1.671	0.03	9.60	10.09	19.73	46.00	-26.27	AVERAGE
11	18.039	0.17	9.77	24.51	34.45	60.00	-25.55	QP
12	18.039	0.17	9.77	18.89	28.83	50.00	-21.17	AVERAGE

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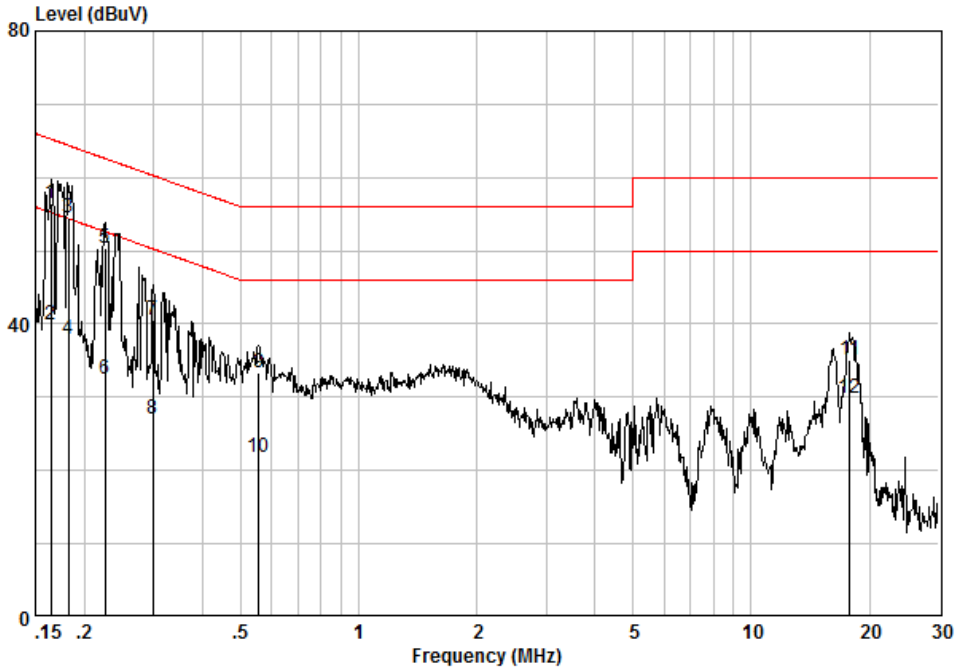
Neutral Line:



Site : Shielding Room
Condition : CE NEUTRAL
Job No. : 1234CR
Test Mode : TX

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1 @	0.16414	0.02	9.61	46.77	56.40	65.25	-8.85	QP
2	0.16414	0.02	9.61	30.28	39.90	55.25	-15.35	AVERAGE
3	0.18249	0.02	9.61	44.76	54.39	64.37	-9.98	QP
4	0.18249	0.02	9.61	28.27	37.90	54.37	-16.48	AVERAGE
5	0.22556	0.02	9.61	40.69	50.32	62.61	-12.29	QP
6	0.22556	0.02	9.61	22.90	32.53	52.61	-20.08	AVERAGE
7	0.29869	0.02	9.62	31.01	40.65	60.28	-19.63	QP
8	0.29869	0.02	9.62	17.40	27.04	50.28	-23.24	AVERAGE
9	0.55520	0.02	9.63	23.67	33.32	56.00	-22.68	QP
10	0.55520	0.02	9.63	12.10	21.76	46.00	-24.24	AVERAGE
11	17.849	0.17	9.95	24.93	35.05	60.00	-24.95	QP
12	17.849	0.17	9.95	19.73	29.85	50.00	-20.15	AVERAGE

Notes:

1. The following Quasi-Peak and Average measurements were performed on the EUT:

2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.

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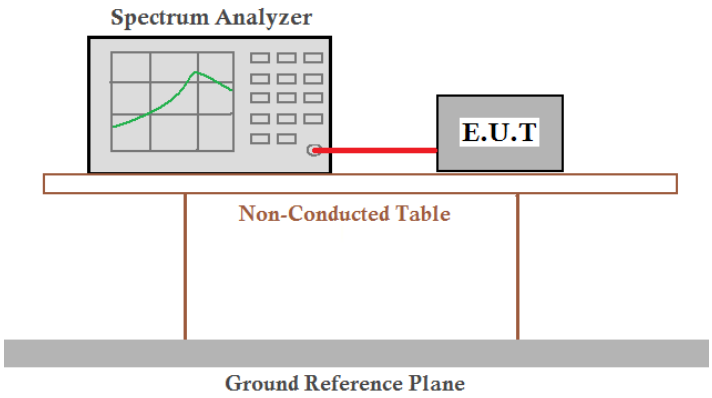
6.3 Conducted Peak Output Power

Test Requirement:	47 CFR Part 15C Section 15.247 (b)(3)
Test Method:	ANSI C63.10 :2013 Section 11.9.1
Test Setup:	 *Remark:* *Offset the High-Frequency cable loss 1.5dB in the spectrum analyzer.*
Test Instruments:	Refer to section 5.10 for details
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g ; 6.5Mbps of rate is the worst case of 802.11n(HT20).
Limit:	30dBm
Test Results:	Pass

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Pre-scan under all rate at lowest channel 1

Mode	802.11b							
Data Rate	1Mbps	2Mbps	5.5Mbps	11Mbps				
Power (dBm)	5.88	5.86	5.84	5.81				
Mode	802.11g							
Data Rate	6Mbps	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
Power (dBm)	10.18	10.16	10.12	10.11	10.08	10.07	10.01	9.99
Mode	802.11n(HT20)							
Data Rate	6.5Mbps	13Mbps	19.5Mbps	26Mbps	39Mbps	52Mbps	58.5Mbps	65Mbps
Power (dBm)	11.55	11.51	11.47	11.46	11.43	11.38	11.33	11.32
Mode	802.11n(HT40)							
Data Rate	13.5Mbps	27Mbps	40.5Mbps	54Mbps	81Mbps	108Mbps	121.5Mbps	135Mbps
Power (dBm)								

Through Pre-scan, 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g; 6.5Mbps of rate is the worst case of 802.11n(HT20);

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Measurement Data

802.11b mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	5.88	30.00	Pass
Middle	5.57	30.00	Pass
Highest	4.98	30.00	Pass
802.11g mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	10.18	30.00	Pass
Middle	9.89	30.00	Pass
Highest	10.20	30.00	Pass
802.11n(HT20)mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	11.55	30.00	Pass
Middle	11.04	30.00	Pass
Highest	10.37	30.00	Pass

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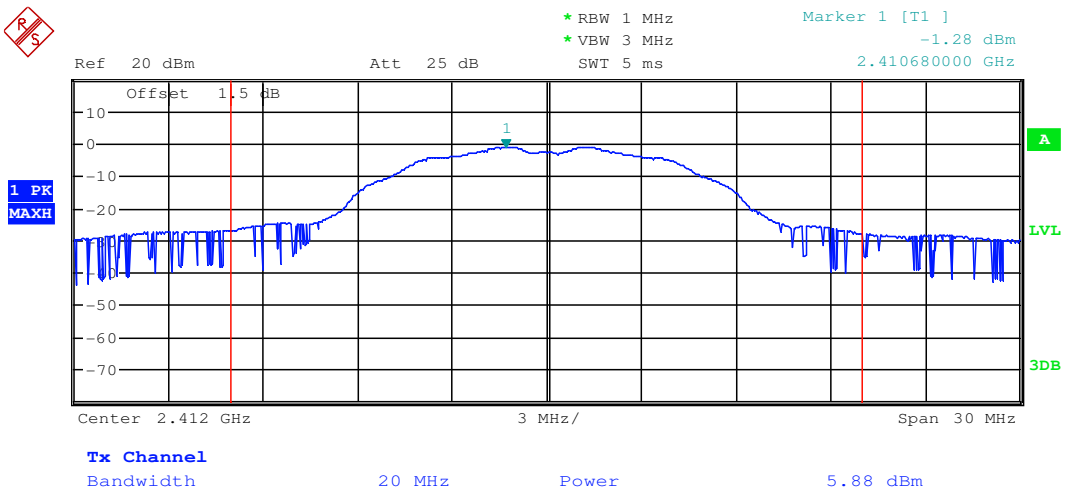
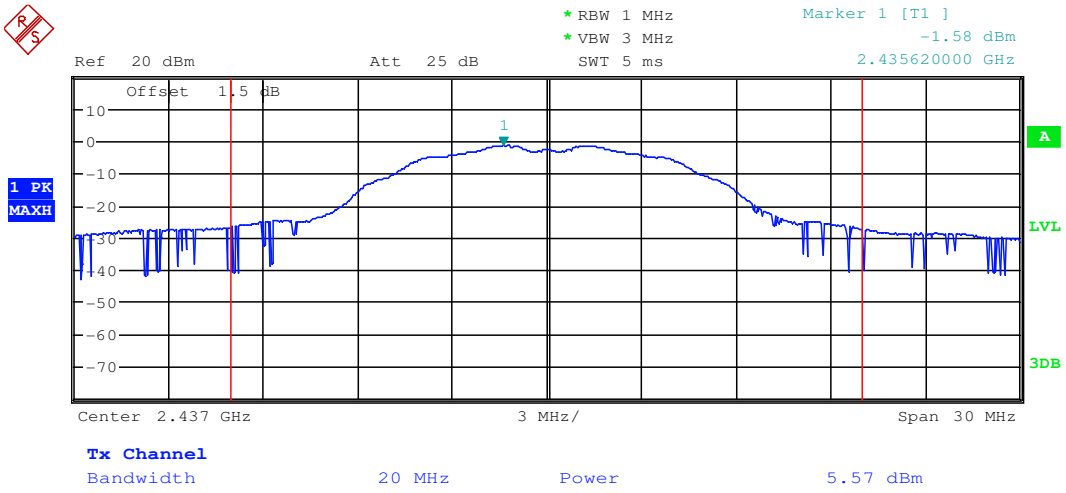
Test plot as follows:

Test mode:	802.11b	Test channel:	Lowest



Test mode:	802.11b	Test channel:	Middle



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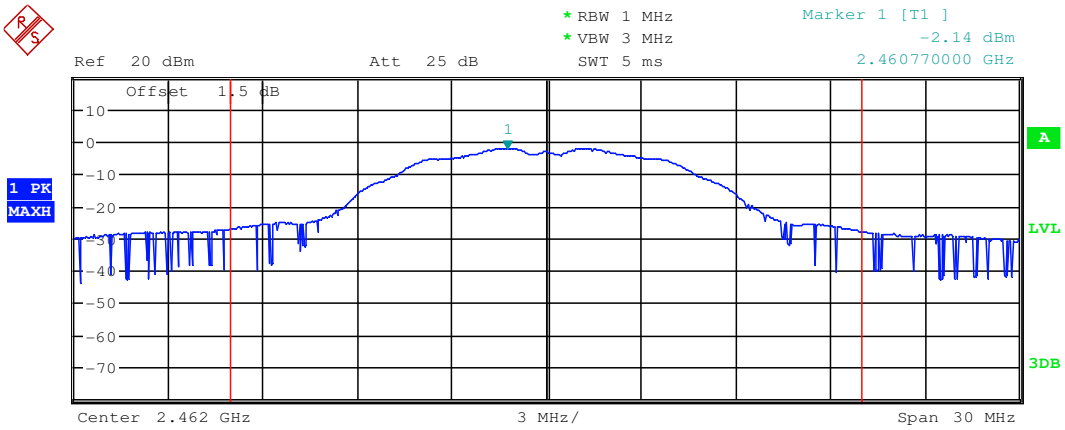
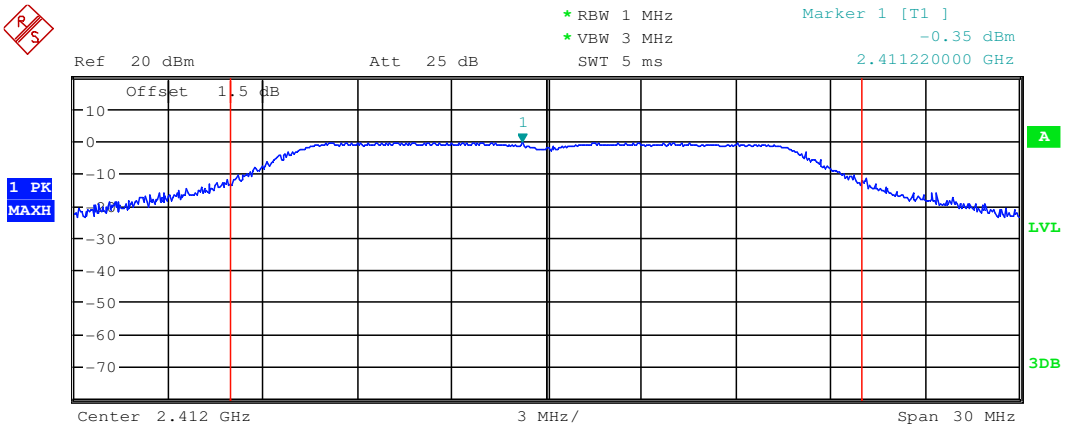
Test mode:	802.11b	Test channel:	Highest



Tx Channel
Bandwidth 20 MHz Power 4.98 dBm

Test mode:	802.11g	Test channel:	Lowest



Tx Channel
Bandwidth 20 MHz Power 10.18 dBm

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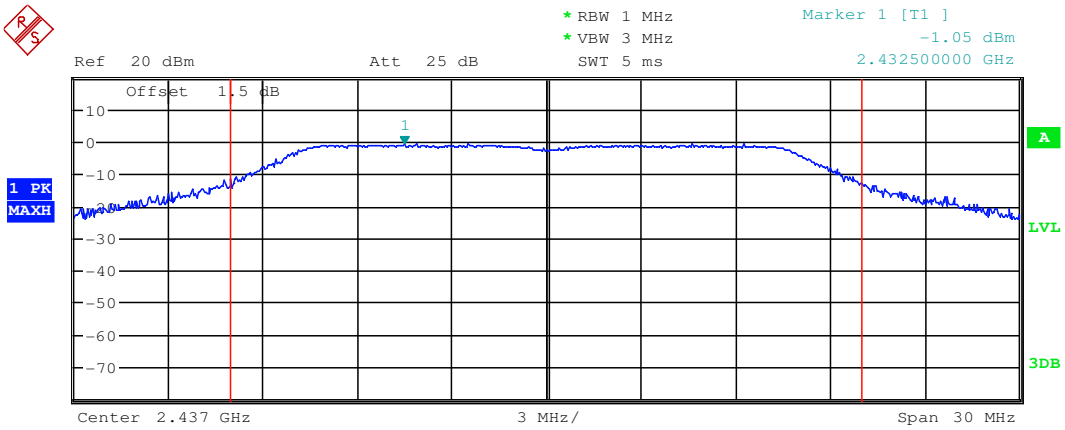
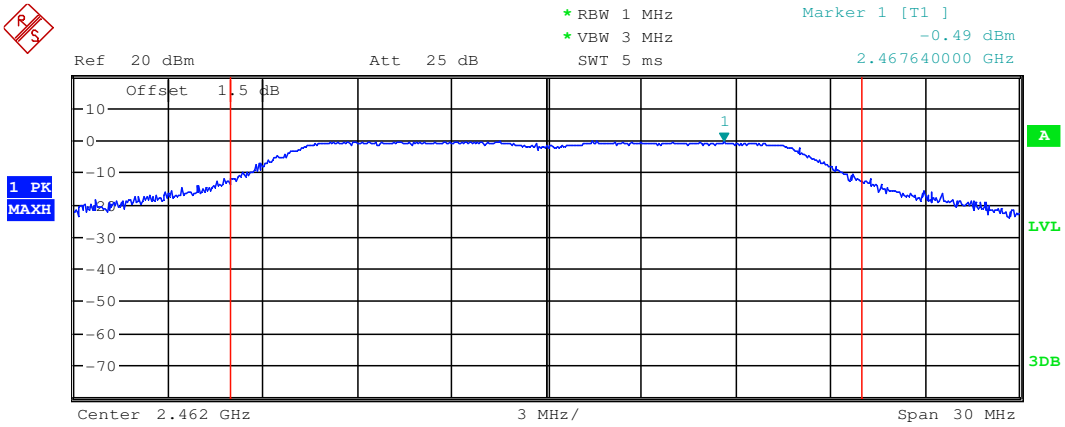
Test mode:	802.11g	Test channel:	Middle



Tx Channel
Bandwidth 20 MHz Power 9.89 dBm

Test mode:	802.11g	Test channel:	Highest



Tx Channel
Bandwidth 20 MHz Power 10.20 dBm

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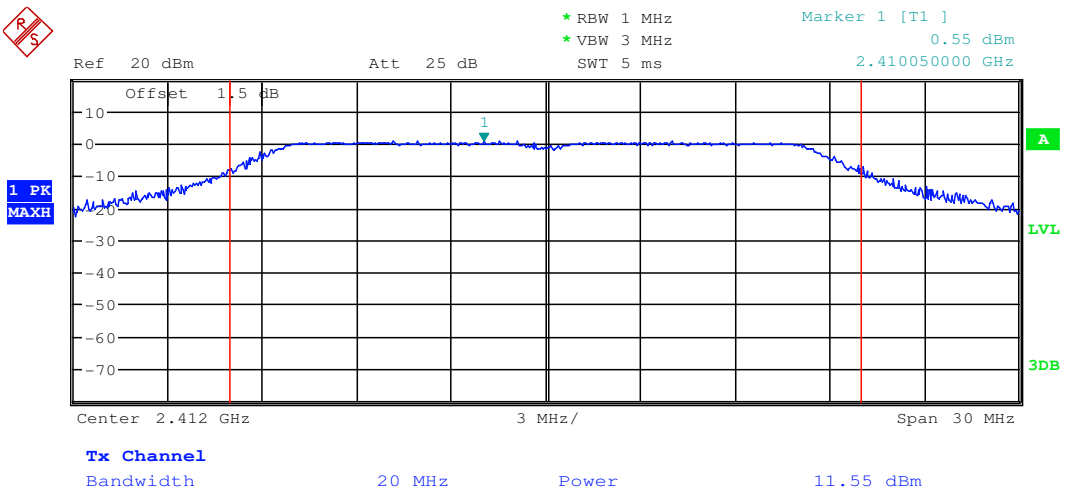
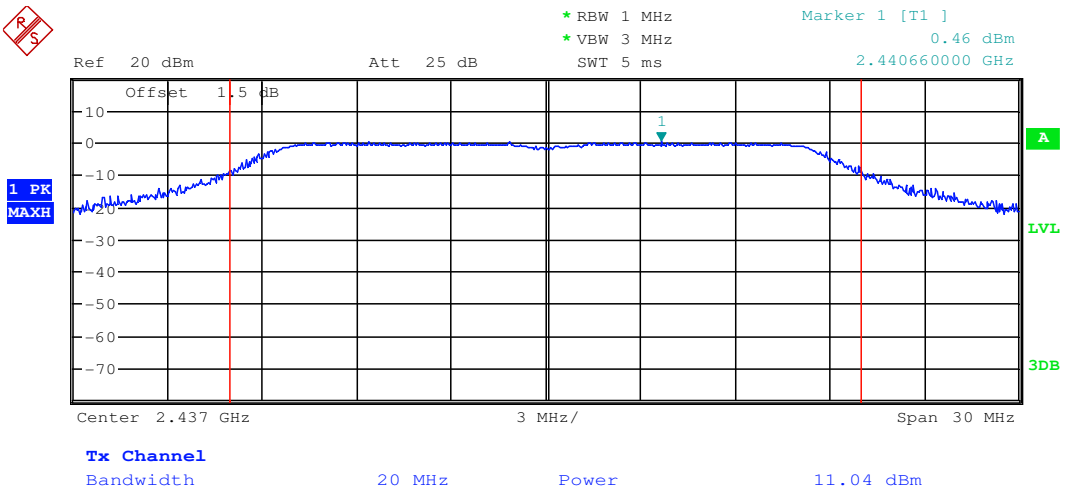
Test mode:	802.11n(HT20)	Test channel:	Lowest



Test mode:	802.11n(HT20)	Test channel:	Middle



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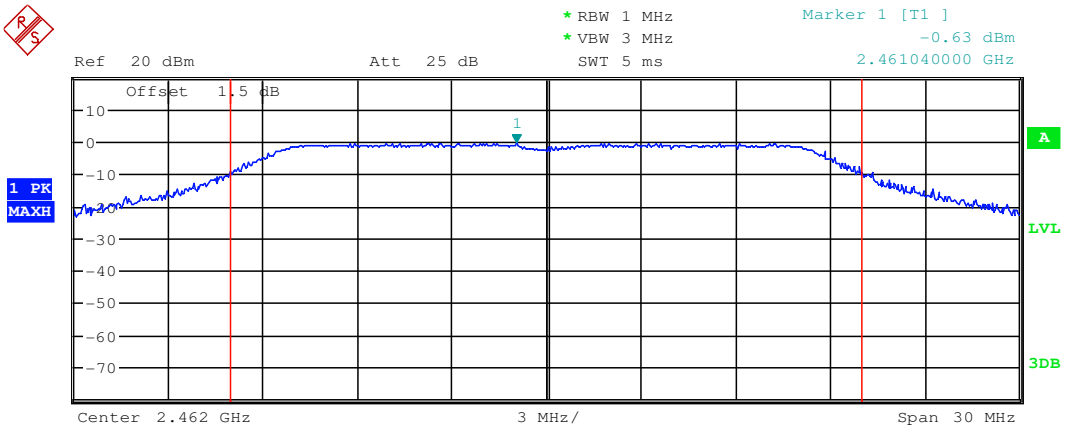
Test mode:	802.11n(HT20)	Test channel:	Highest



Tx Channel
Bandwidth 20 MHz Power 10.37 dBm

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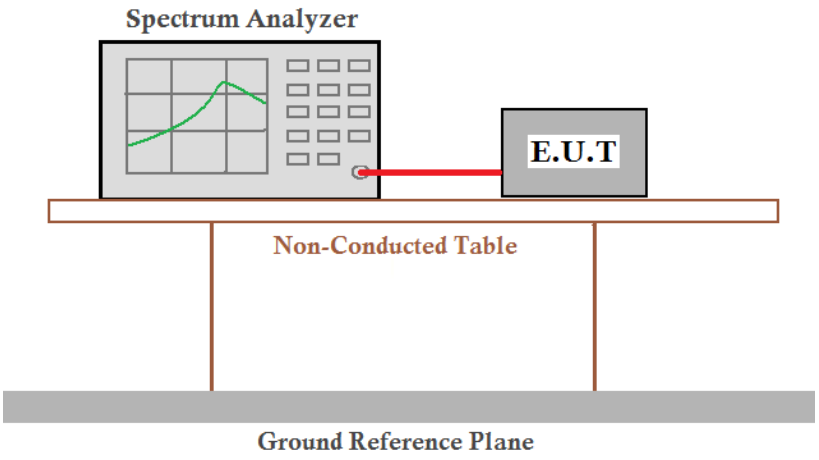
6.4 6dB Occupy Bandwidth

Test Requirement:	47 CFR Part 15C Section 15.247 (a)(2)
Test Method:	ANSI C63.10: 2013 Section 11.8
Test Setup:	
Instruments Used:	Refer to section 5.10 for details
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g ; 6.5Mbps of rate is the worst case of 802.11n(HT20).
Limit:	≥ 500 kHz
Test Results:	Pass

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Measurement Data

802.11b mode			
Test channel	6dB Occupy Bandwidth (MHz)	Limit (kHz)	Result
Lowest	8.58	≥500	Pass
Middle	8.61	≥500	Pass
Highest	8.10	≥500	Pass
802.11g mode			
Test channel	6dB Occupy Bandwidth (MHz)	Limit (kHz)	Result
Lowest	16.41	≥500	Pass
Middle	16.41	≥500	Pass
Highest	16.41	≥500	Pass
802.11n(HT20) mode			
Test channel	6dB Occupy Bandwidth (MHz)	Limit (kHz)	Result
Lowest	17.67	≥500	Pass
Middle	17.64	≥500	Pass
Highest	17.67	≥500	Pass

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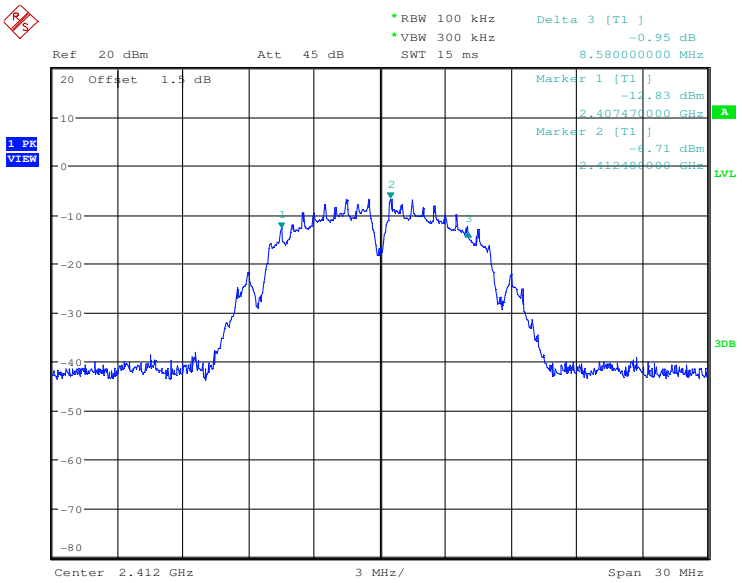
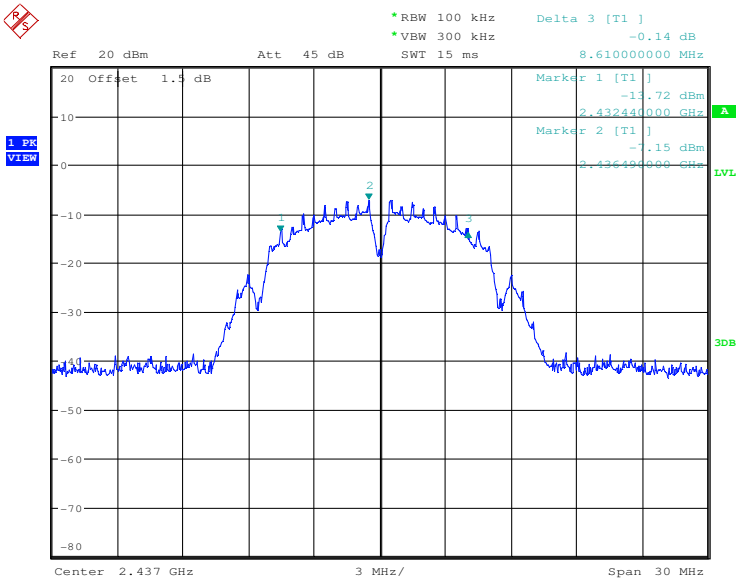
Test plot as follows:

Test mode:	802.11b	Test channel:	Lowest



Test mode:	802.11b	Test channel:	Middle



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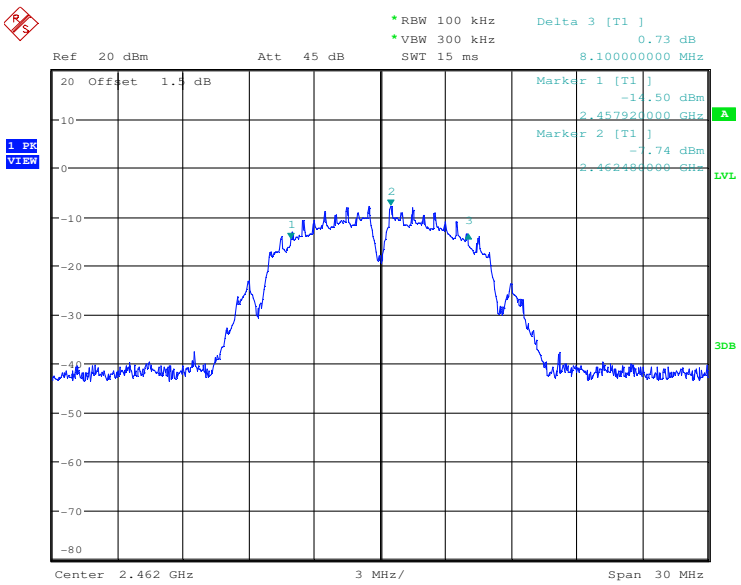
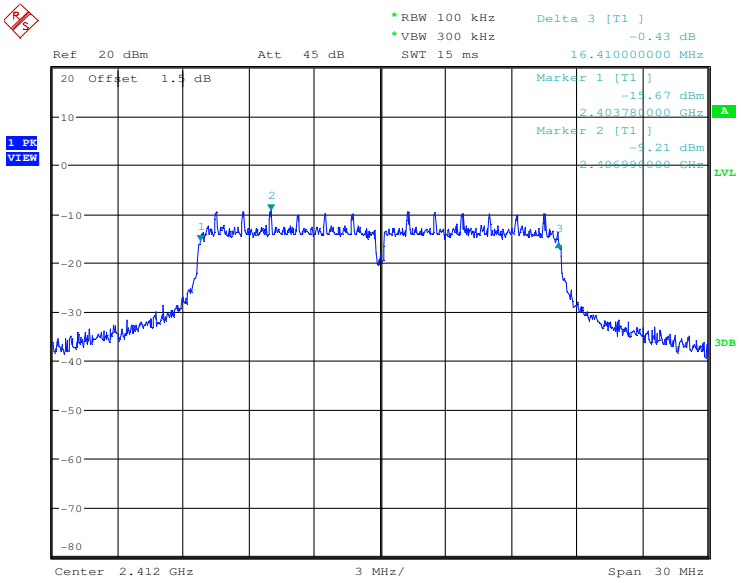
Test mode:	802.11b	Test channel:	Highest



Test mode:	802.11g	Test channel:	Lowest



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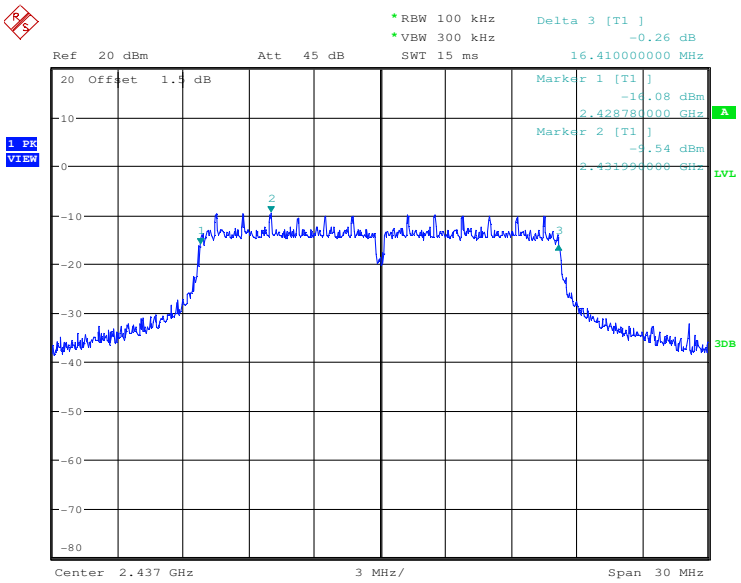
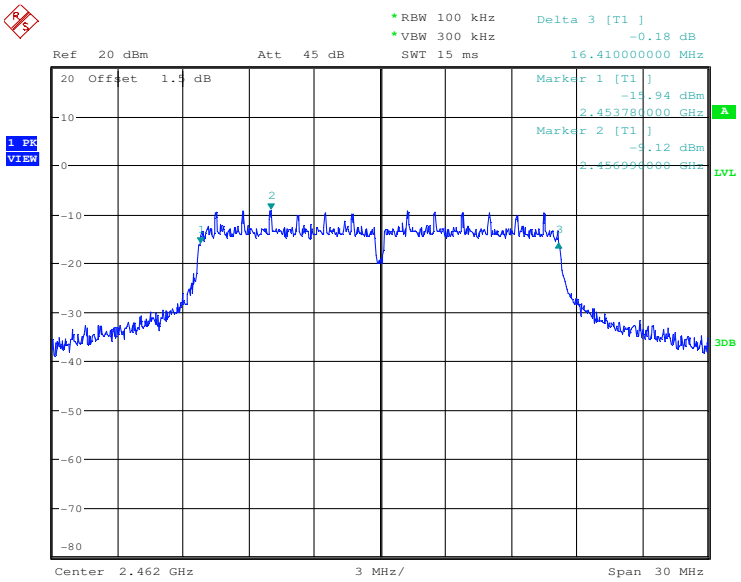
Test mode:	802.11g	Test channel:	Middle



Test mode:	802.11g	Test channel:	Highest



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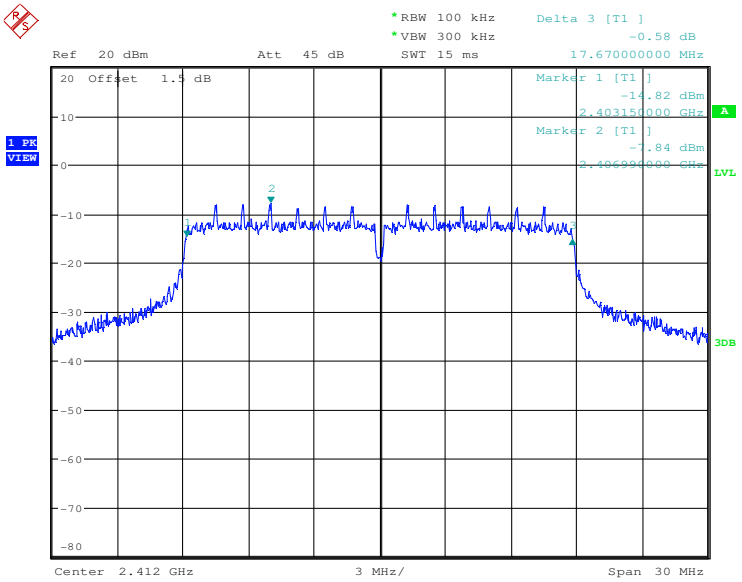
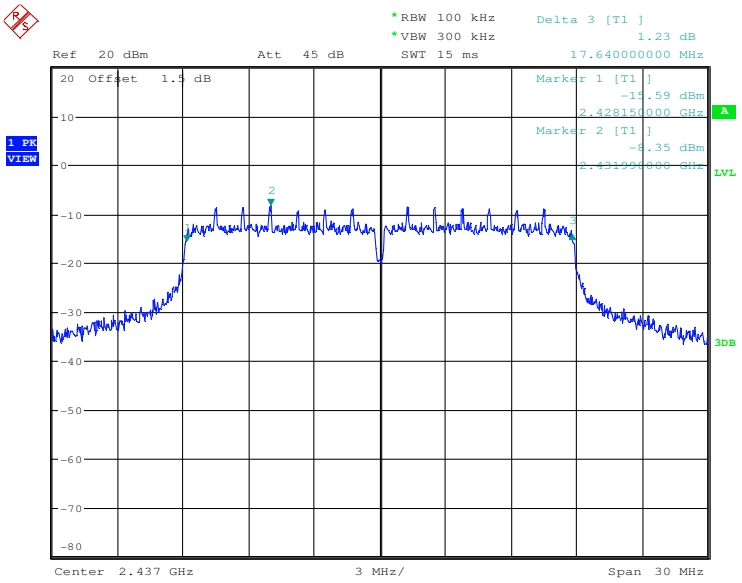
Test mode:	802.11n(HT20)	Test channel:	Lowest



Test mode:	802.11n(HT20)	Test channel:	Middle



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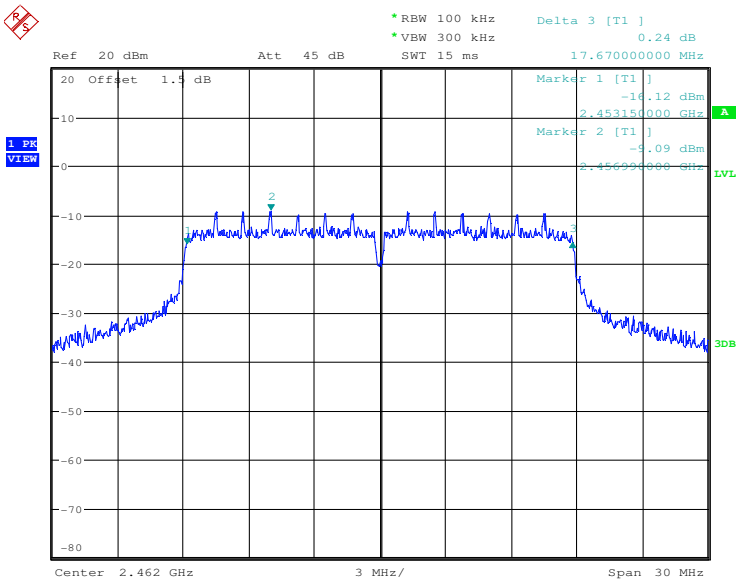
Test mode:	802.11n(HT20)	Test channel:	Highest



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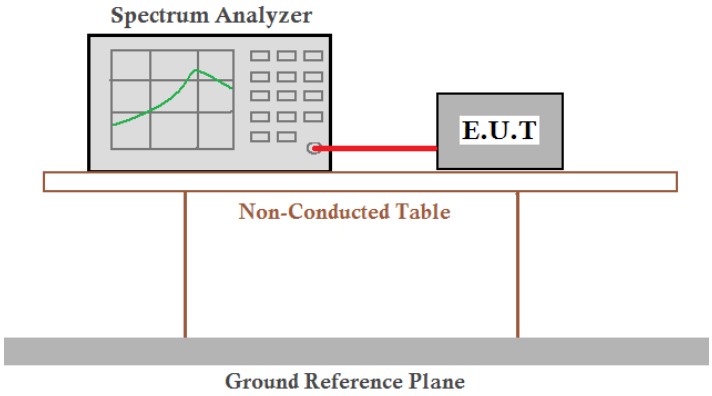
6.5 Power Spectral Density

Test Requirement:	47 CFR Part 15C Section 15.247 (e)
Test Method:	ANSI C63.10 :2013 Section 11.10.2
Test Setup:	 *Remark:* *Offset the High-Frequency cable loss 1.5dB in the spectrum analyzer.*
Test Instruments:	Refer to section 5.10 for details
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g ; 6.5Mbps of rate is the worst case of 802.11n(HT20).
Limit:	≤8.00dBm/3kHz
Test Results:	Pass

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Measurement Data

802.11b mode			
Test channel	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
Lowest	-20.89	≤8.00	Pass
Middle	-21.75	≤8.00	Pass
Highest	-22.01	≤8.00	Pass
802.11g mode			
Test channel	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
Lowest	-23.54	≤8.00	Pass
Middle	-24.52	≤8.00	Pass
Highest	-23.64	≤8.00	Pass
802.11n(HT20) mode			
Test channel	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
Lowest	-22.98	≤8.00	Pass
Middle	-23.46	≤8.00	Pass
Highest	-23.59	≤8.00	Pass

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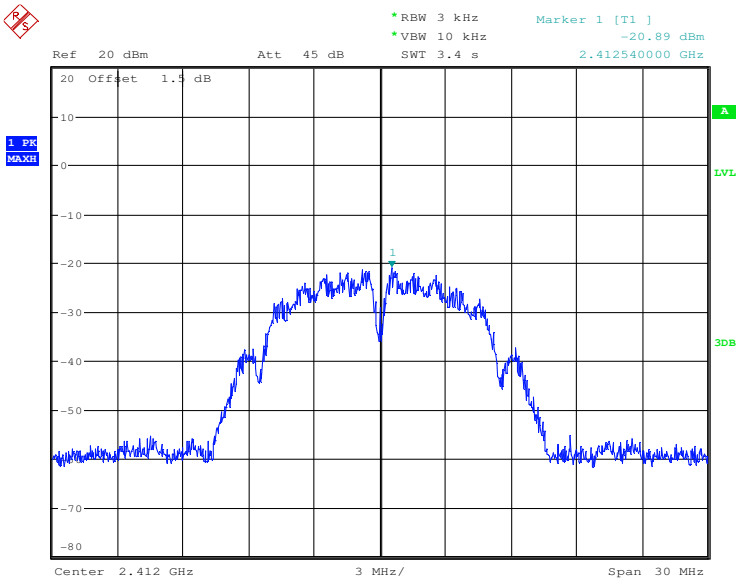
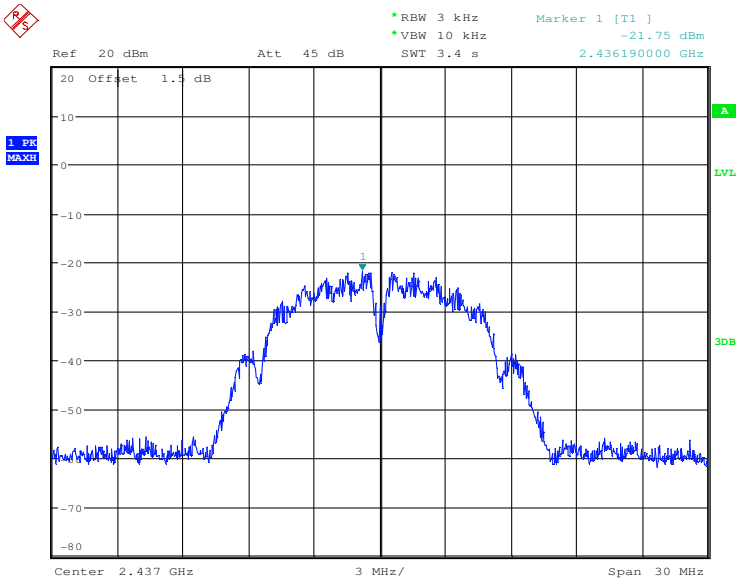
Test plot as follows:

Test mode:	802.11b	Test channel:	Lowest



Test mode:	802.11b	Test channel:	Middle



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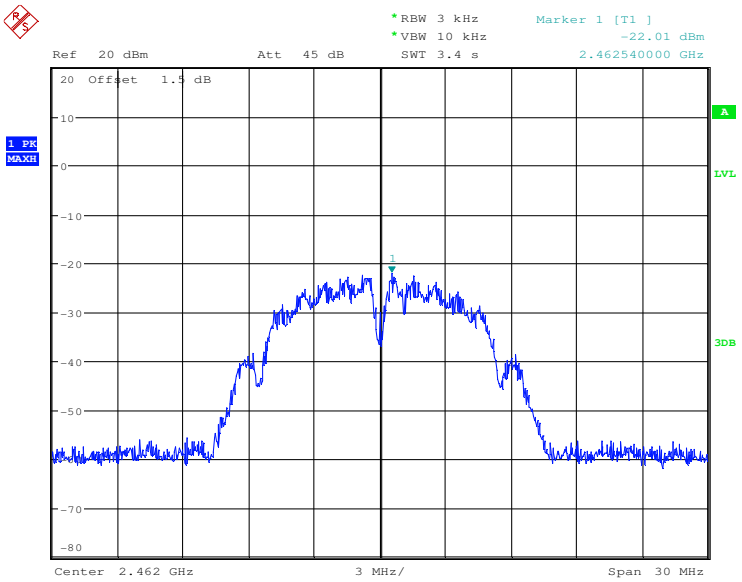
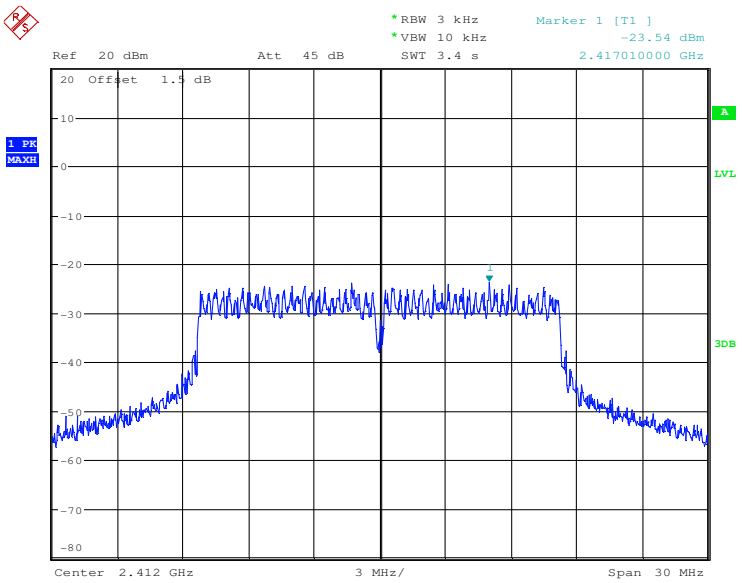
Test mode:	802.11b	Test channel:	Highest



Test mode:	802.11g	Test channel:	Lowest



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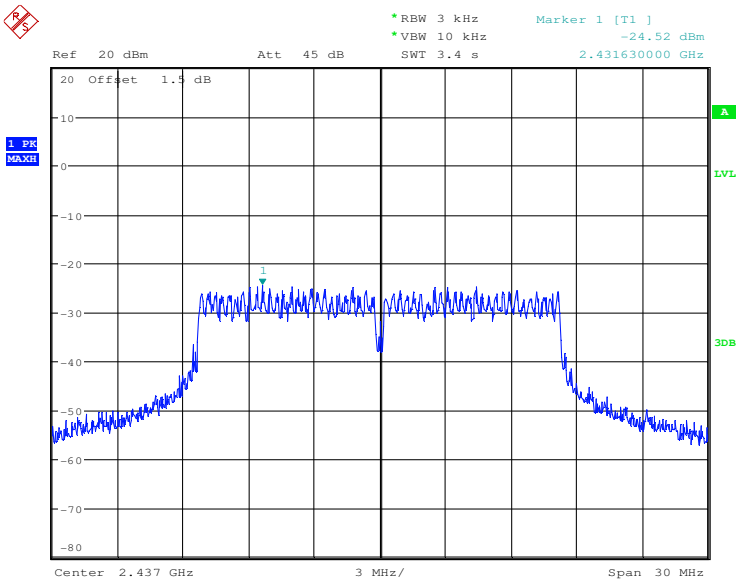
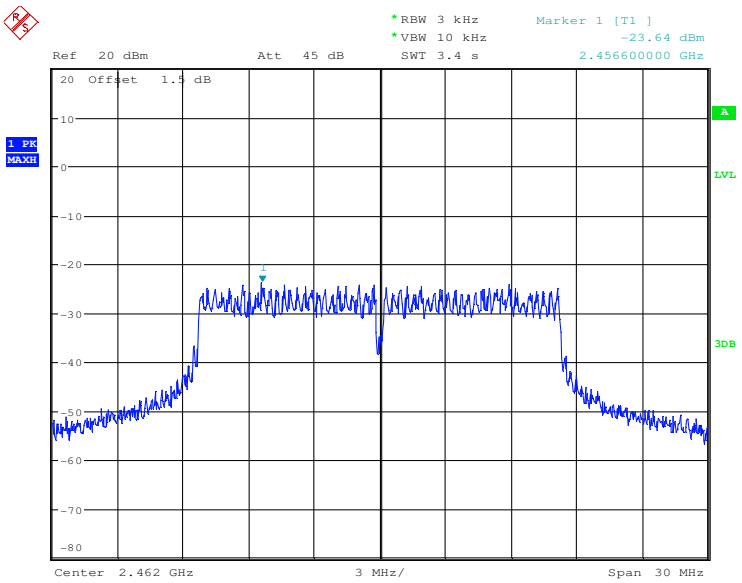
Test mode:	802.11g	Test channel:	Middle



Test mode:	802.11g	Test channel:	Highest



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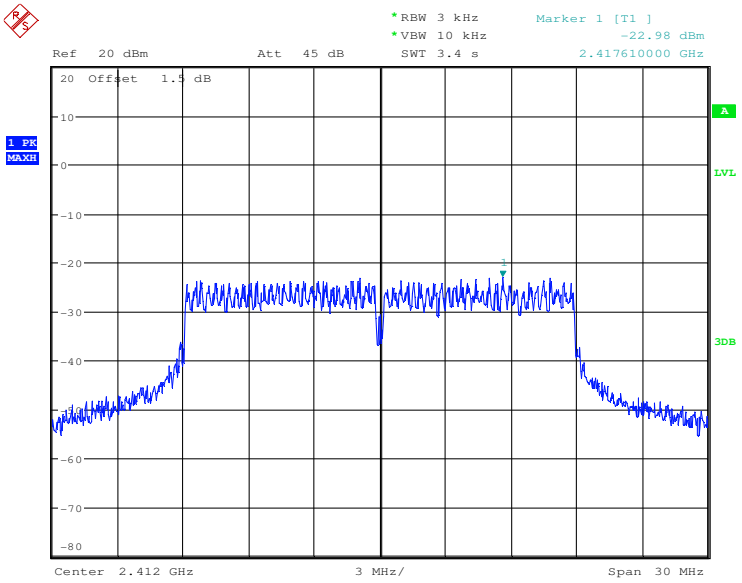
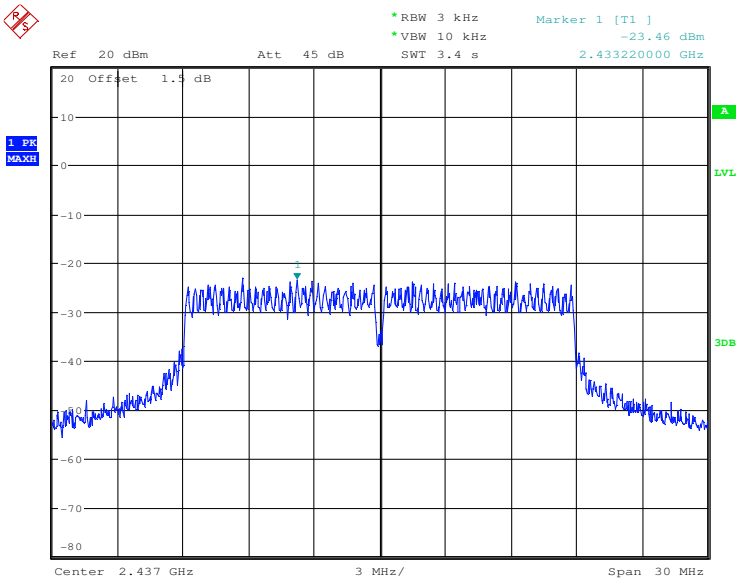
Test mode:	802.11n(HT20)	Test channel:	Lowest



Test mode:	802.11n(HT20)	Test channel:	Middle



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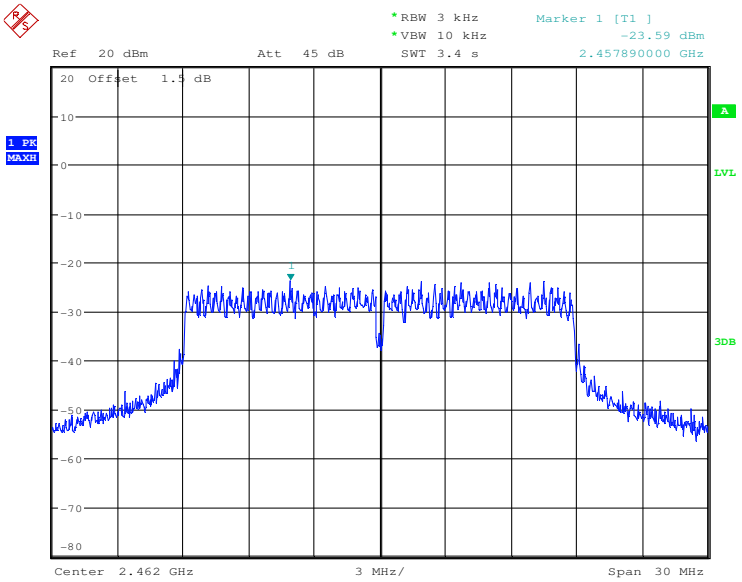
Test mode:	802.11n(HT20)	Test channel:	Highest



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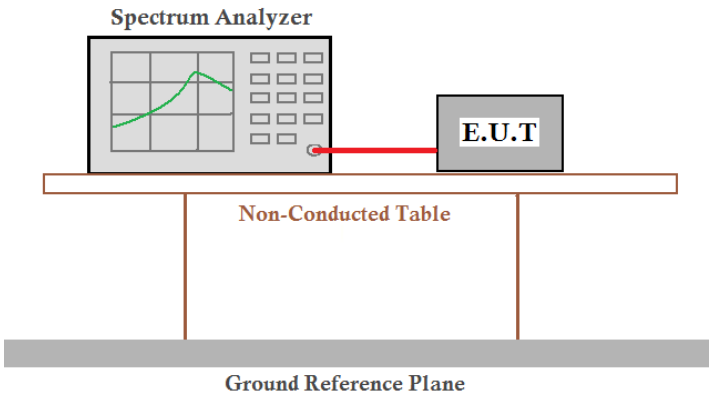
6.6 Band-edge for RF Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10: 2013 Section 11.13
Test Setup:	 *Remark:* *Offset the High-Frequency cable loss 1.5dB in the spectrum analyzer.*
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g ; 6.5Mbps of rate is the worst case of 802.11n(HT20).
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.
Instruments Used:	Refer to section 5.10 for details
Test Results:	Pass

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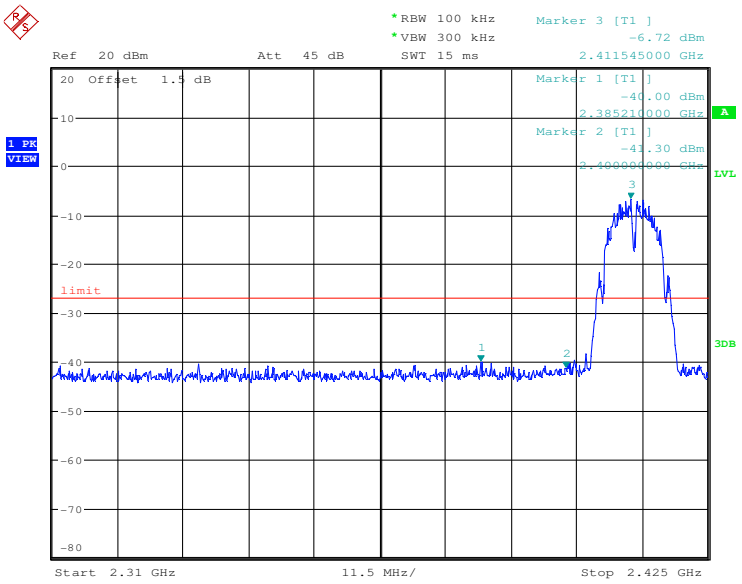
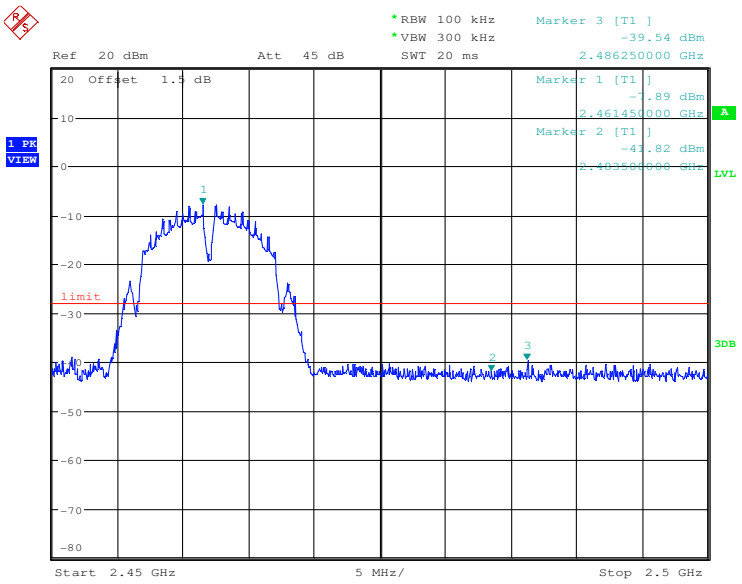
Test plot as follows:

Test mode:	802.11b	Test channel:	Lowest



Test mode:	802.11b	Test channel:	Highest



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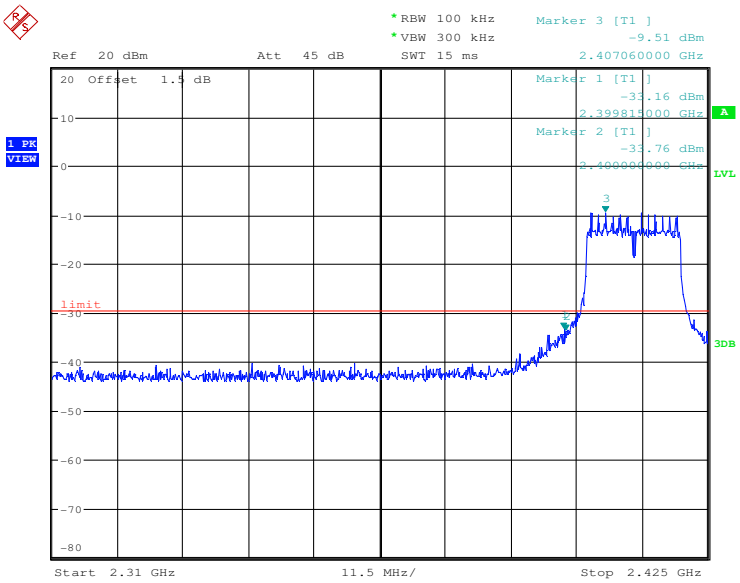
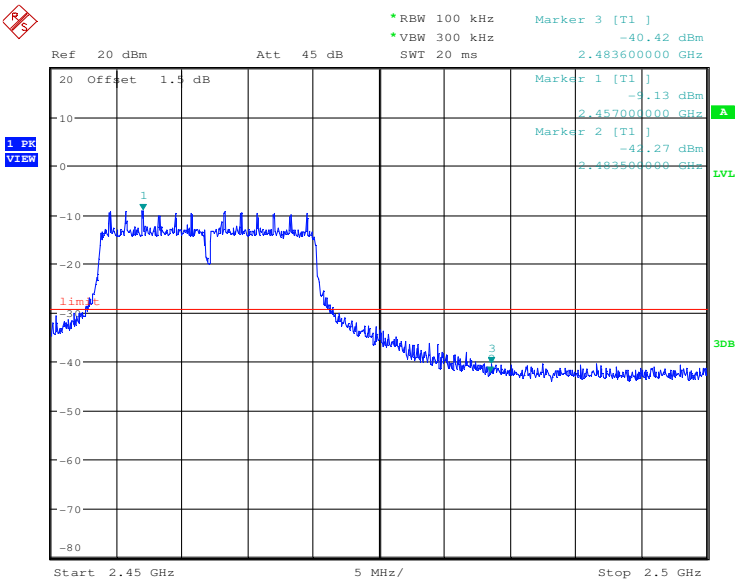
Test mode:	802.11g	Test channel:	Lowest



Test mode:	802.11g	Test channel:	Highest



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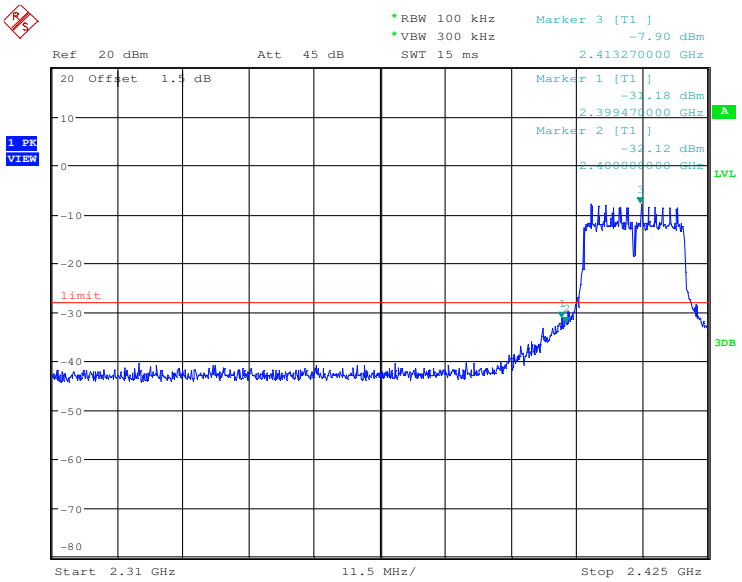
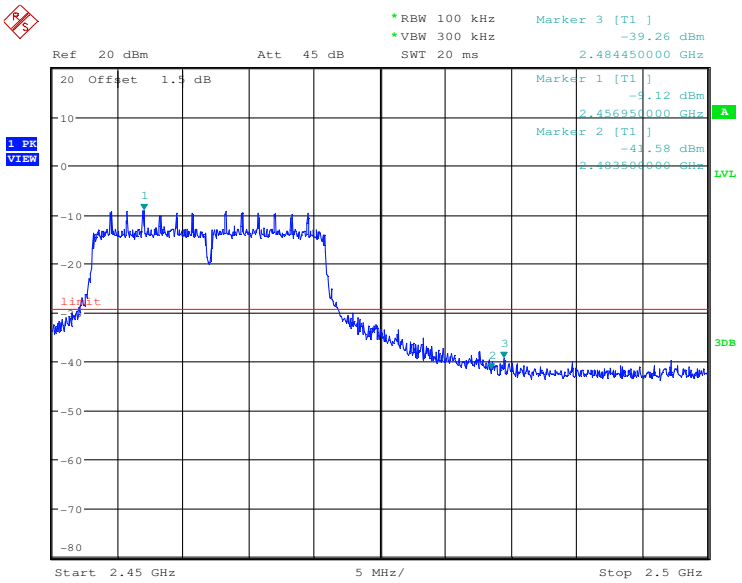
Test mode:	802.11n(HT20)	Test channel:	Lowest



Test mode:	802.11n(HT20)	Test channel:	Highest



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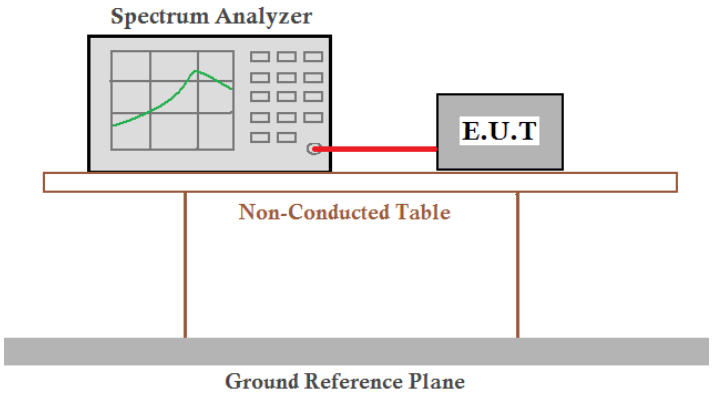
6.7 RF Conducted Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10: 2013 Section 11.11
Test Setup:	 *Remark:* *Offset the High-Frequency cable loss 1.5dB in the spectrum analyzer.*
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g ; 6.5Mbps of rate is the worst case of 802.11n(HT20).
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.
Instruments Used:	Refer to section 5.10 for details
Test Results:	Pass

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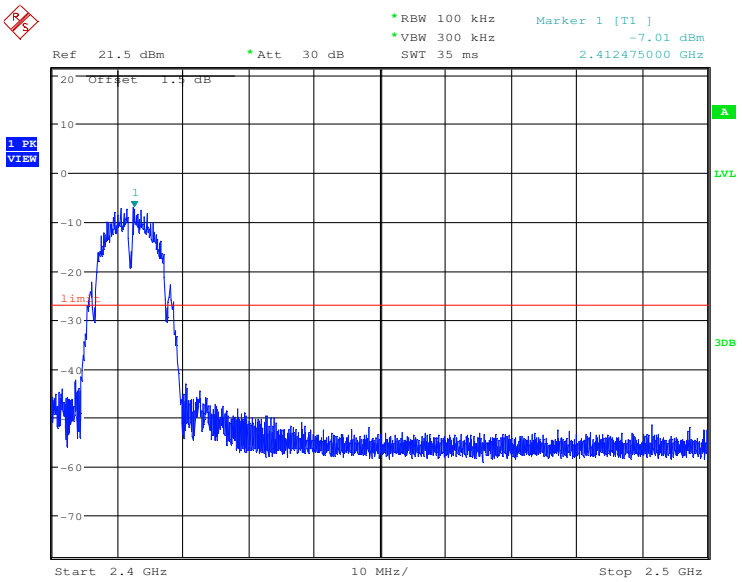
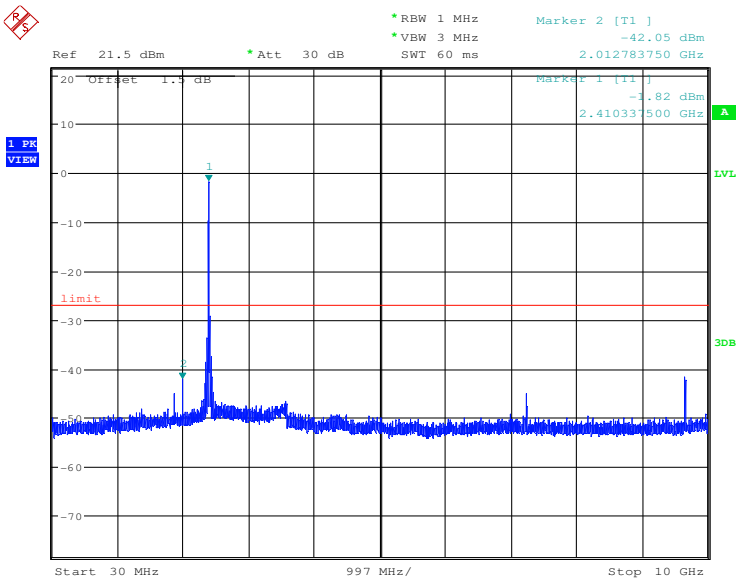
Test plot as follows:

Test mode:	802.11b	Test channel:	Lowest





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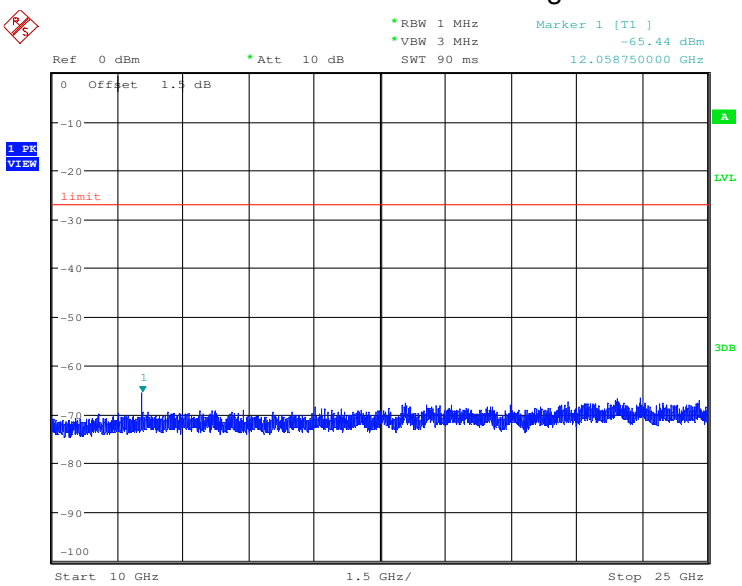
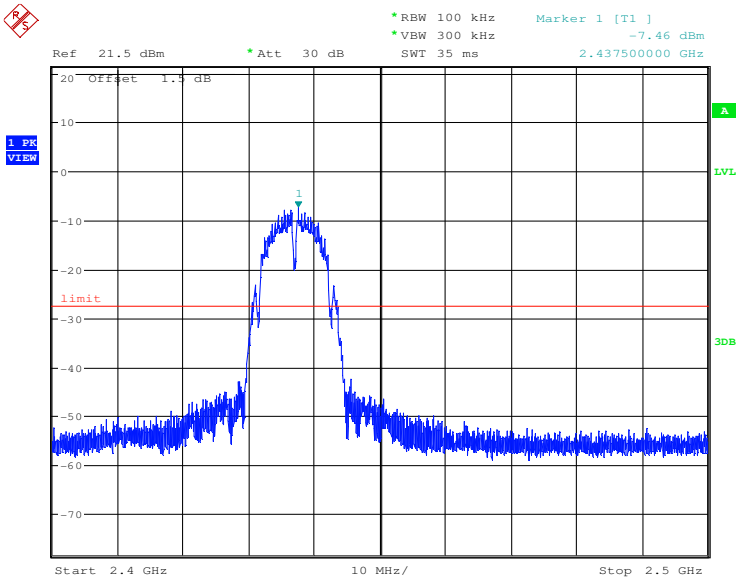


Test mode:	802.11b	Test channel:	Middle



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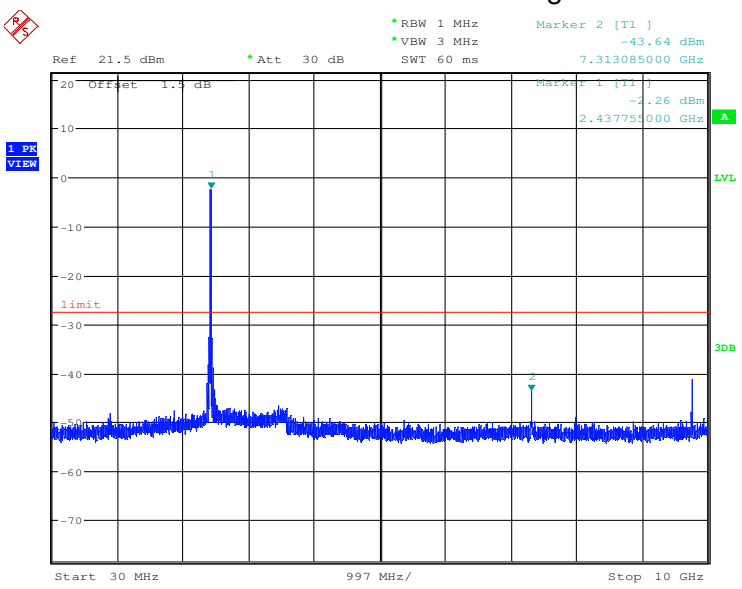

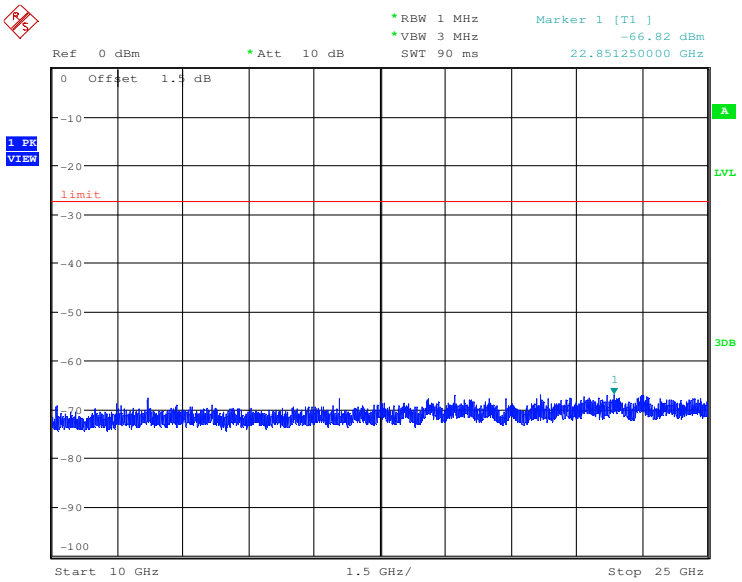

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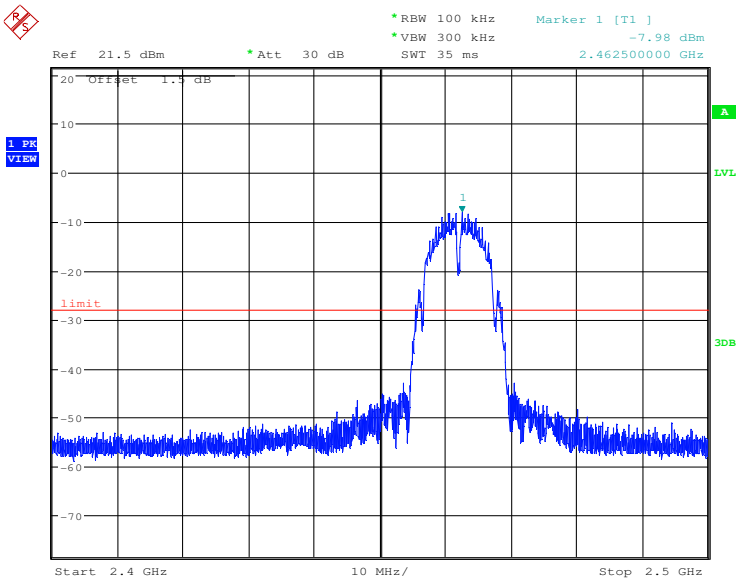
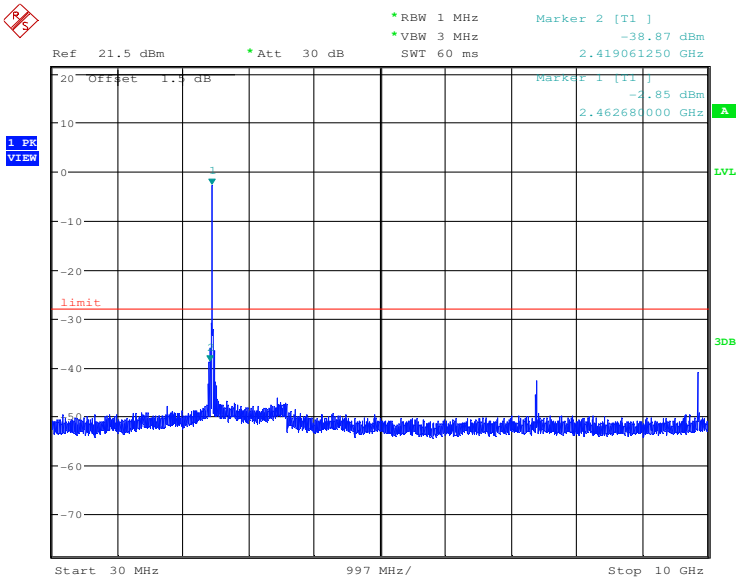
Test mode:	802.11b	Test channel:	Highest





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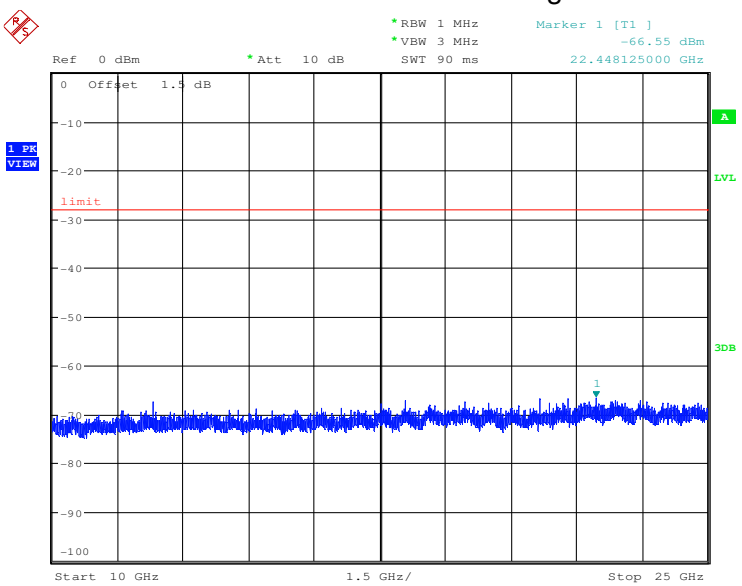
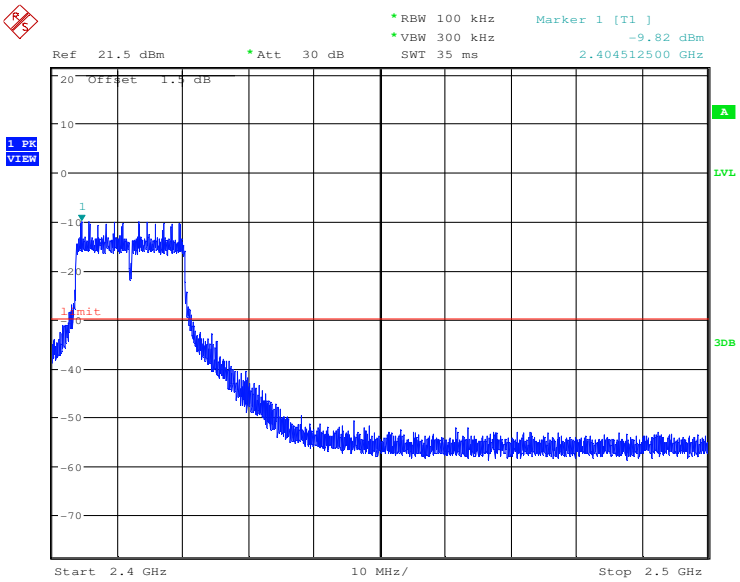


Test mode:	802.11g	Test channel:	Lowest



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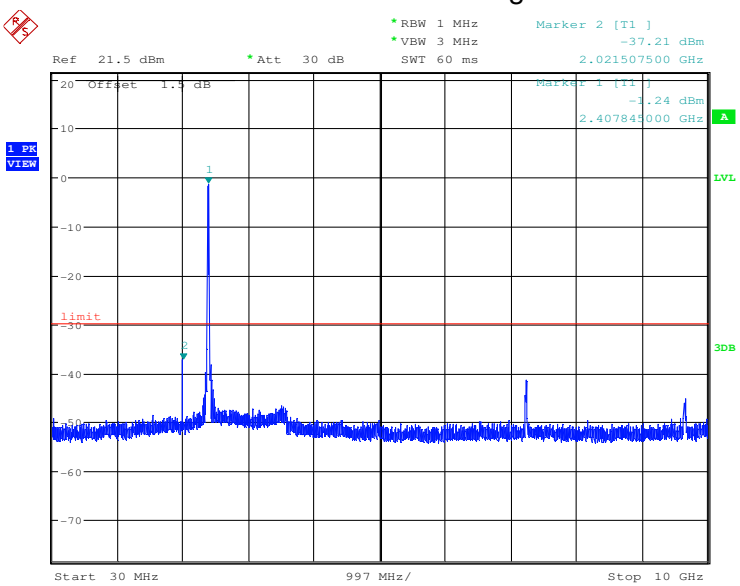

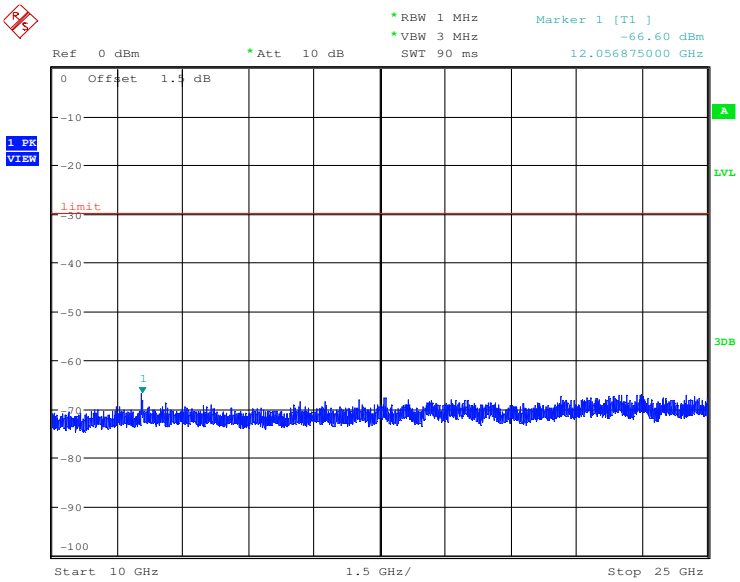

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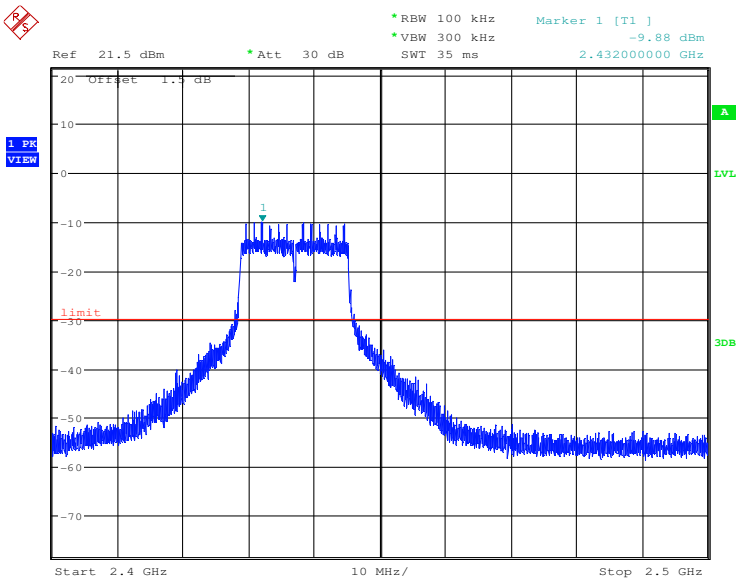
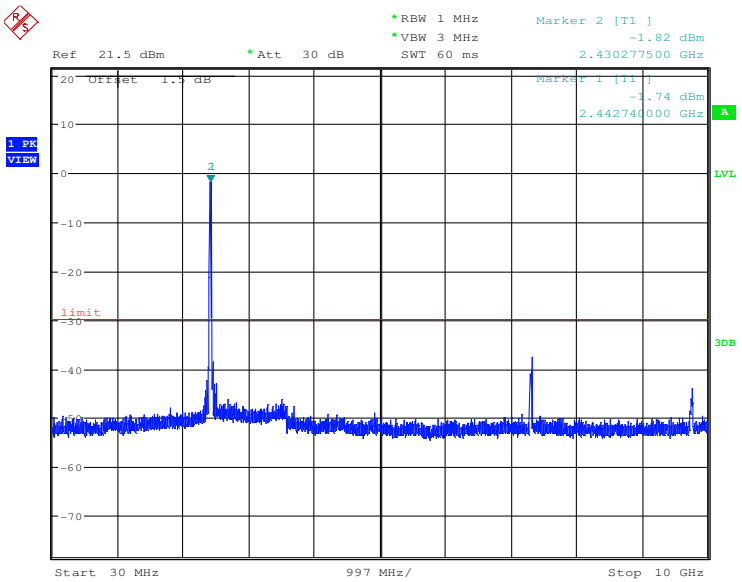
Test mode:	802.11g	Test channel:	Middle





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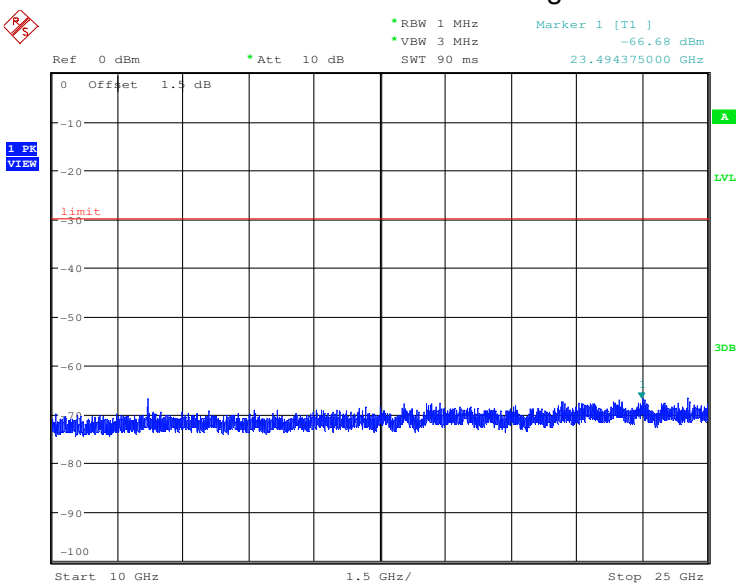
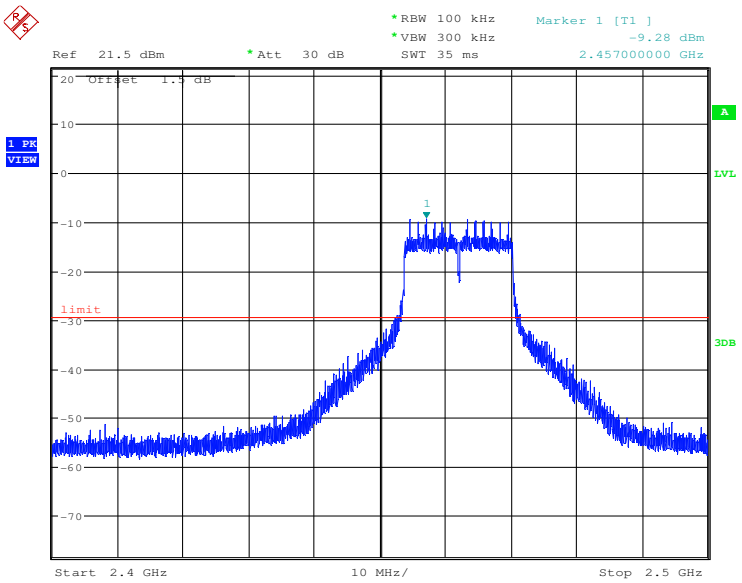


Test mode:	802.11g	Test channel:	Highest



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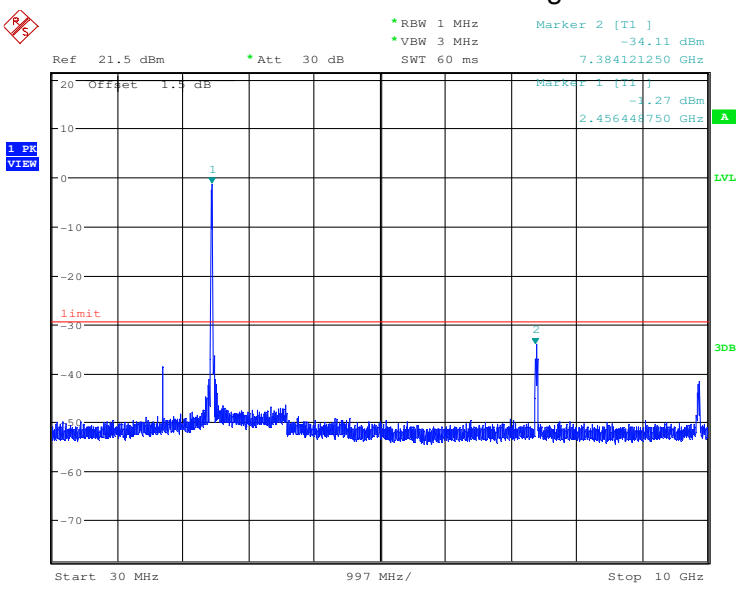

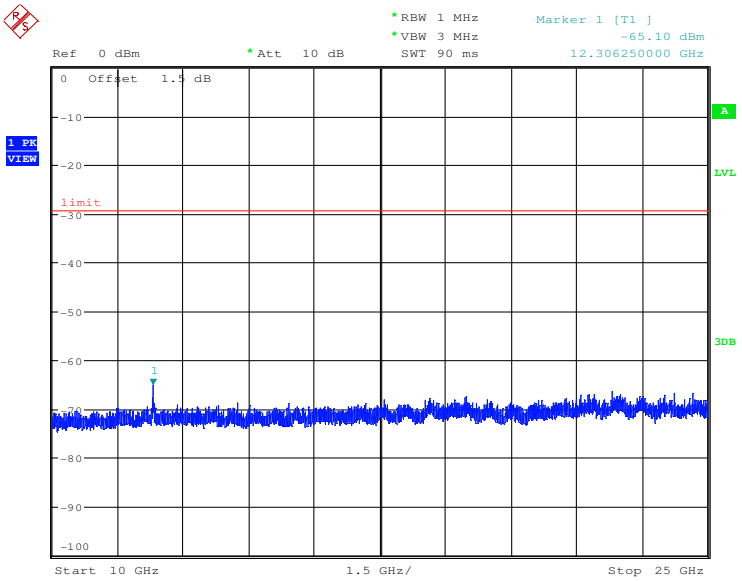

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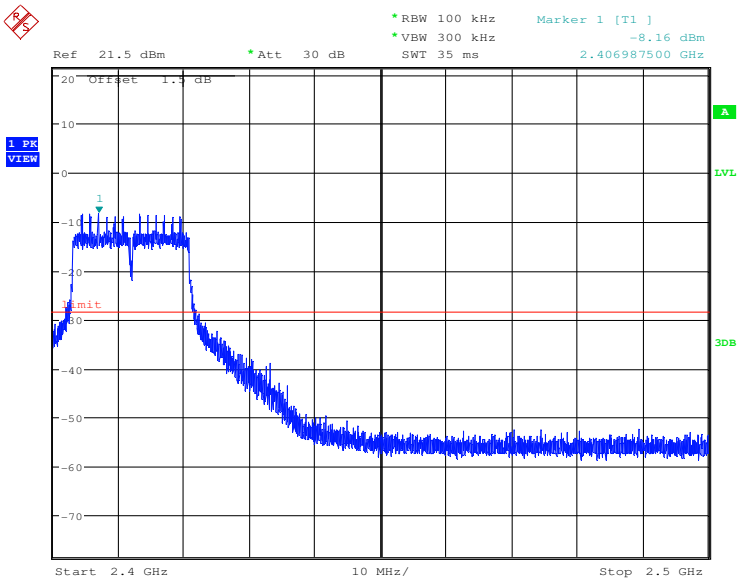
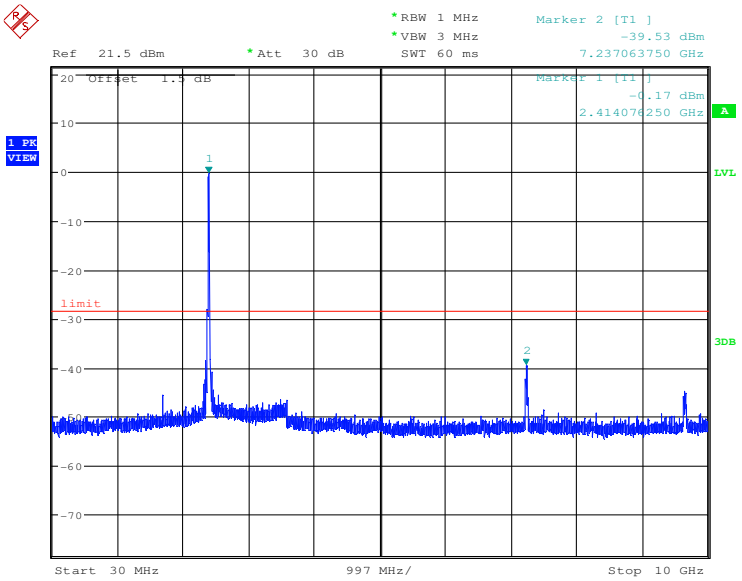
Test mode:	802.11n(HT20)	Test channel:	Lowest





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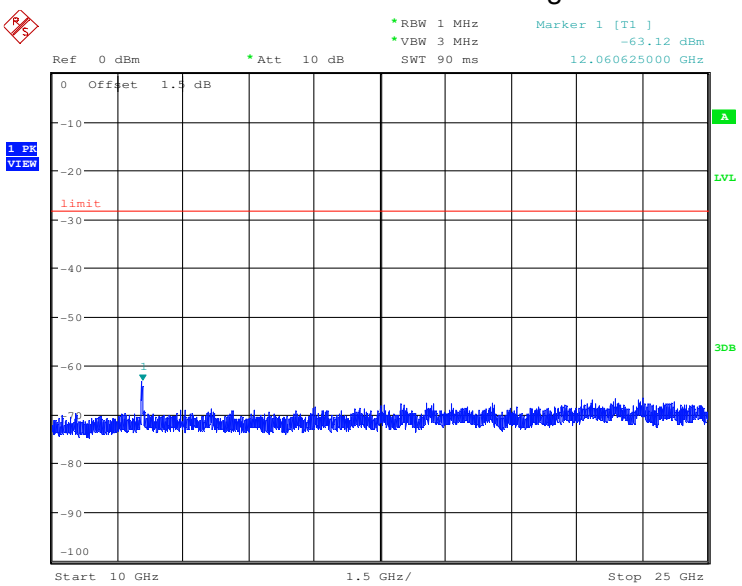
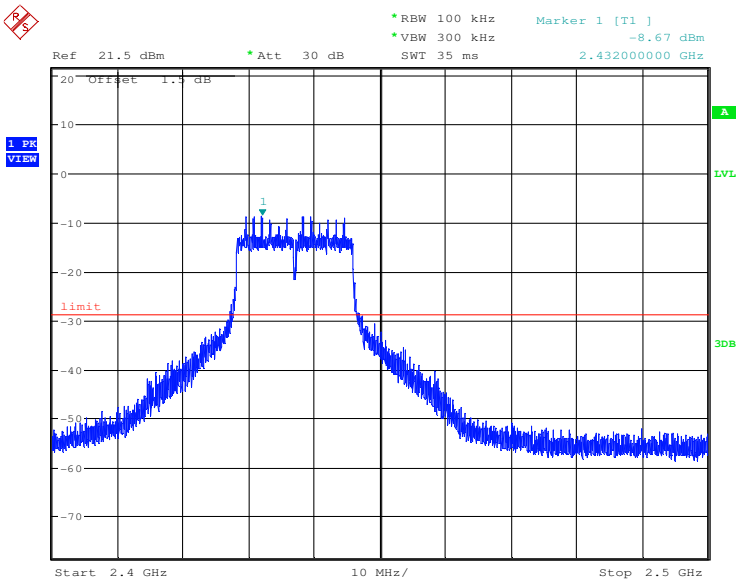


Test mode:	802.11n(HT20)	Test channel:	Middle



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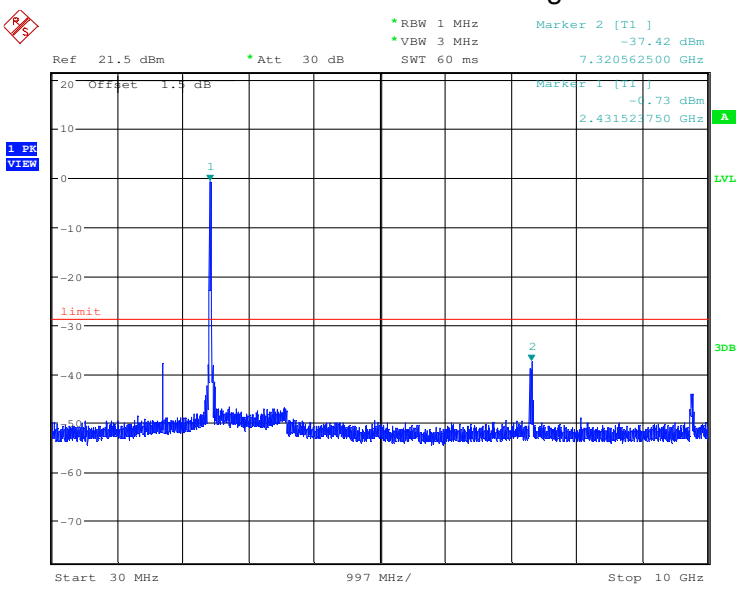

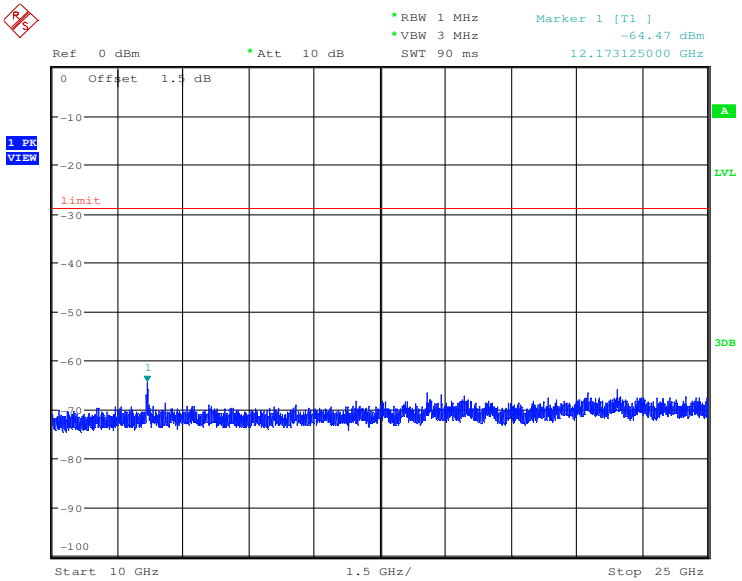

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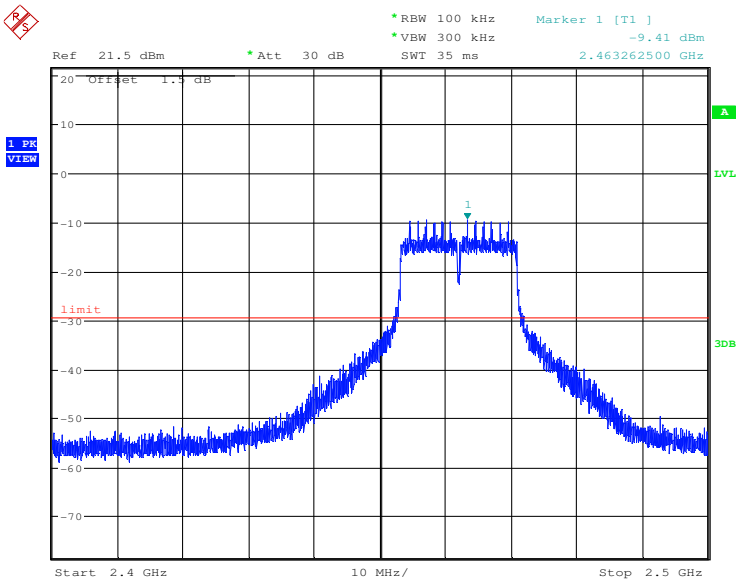
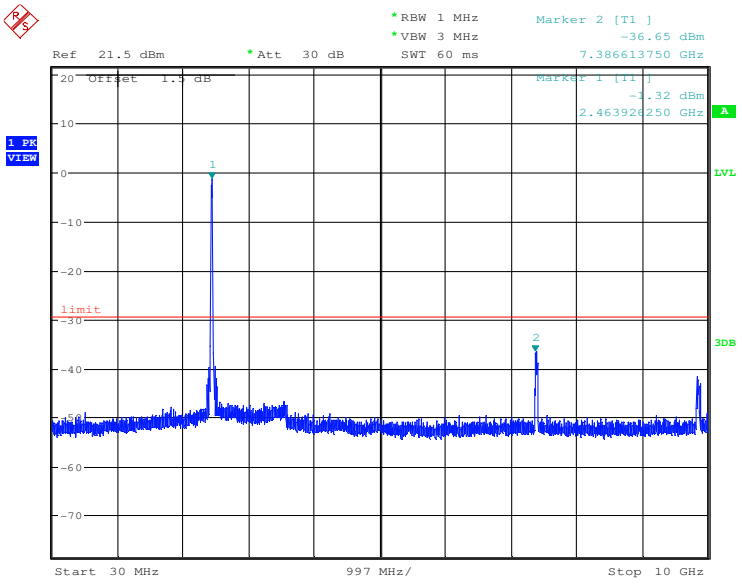
Test mode:	802.11n(HT20)	Test channel:	Highest





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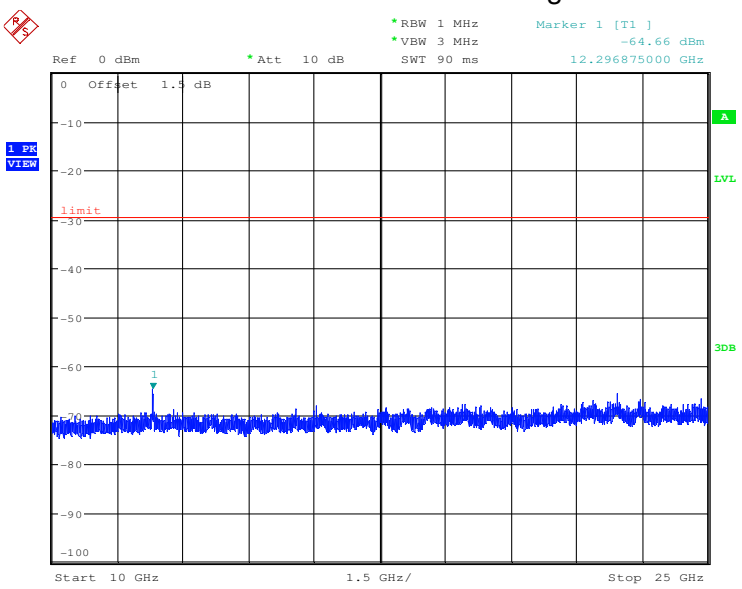

Remark:

Use 100kHz RBW to determine the relative limit in the band 2.4GHz to 2.5GHz, and Use 1MHz RBW to measure spurious emissions in the band 30MHz to 10GHz and 10GHz to 25GHz. The sweep points set to 30001.

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6.8 Radiated Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205
Test Method:	ANSI C63.10 :2013 Section 11.12
Test Site:	Measurement Distance: 3m (Semi-Anechoic Chamber) Measurement Distance: 10m (Semi-Anechoic Chamber)

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
30MHz-1GHz	Quasi-peak	100 kHz	300kHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

Limit:

Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
1.705MHz-30MHz	30	-	-	30
30MHz-88MHz	29.9	40.0	Quasi-peak	10
88MHz-216MHz	44.7	43.5	Quasi-peak	10
216MHz-960MHz	60.3	46.0	Quasi-peak	10
960MHz-1GHz	100	54.0	Quasi-peak	10
Above 1GHz	500	54.0	Average	3

Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak
emission level radiated by the device.

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Test Setup:	

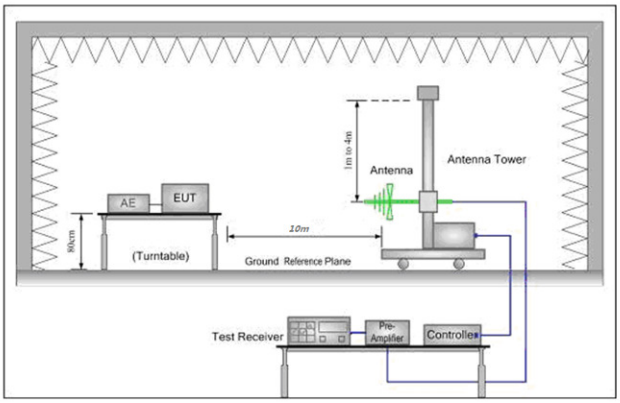

Figure 1. Below 30MHz

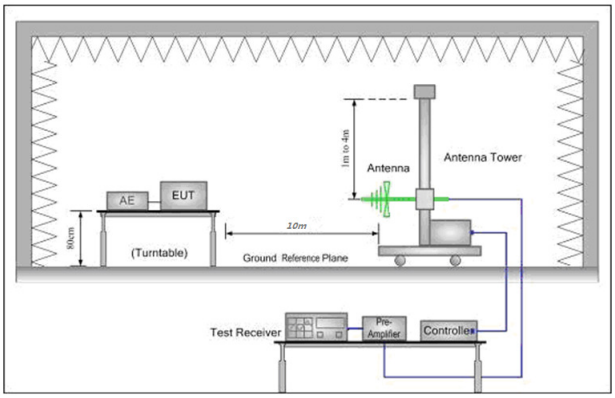

Figure 2. 30MHz to 1GHz

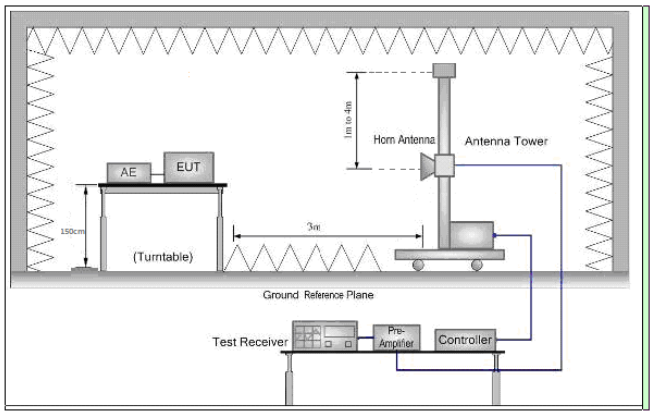

Figure 3. Above 1 GHz

Test Procedure:	a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation c. The EUT was set 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters(for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. f. The test-receiver system was set to Peak Detect Function and Specified

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	Bandwidth with Maximum Hold Mode. g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. h. Test the EUT in the lowest channel ,the middle channel ,the Highest channel i. Repeat above procedures until all frequencies measured was complete.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates. Transmitting mode
Final Test Mode:	Pretest the EUT at Transmitting mode, found the Transmitting mode which it is worse case Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g ; 6.5Mbps of rate is the worst case of 802.11n(HT20) For below 1GHz, through Pre-scan, find the 1Mbps of rate of 802.11b at lowest channel is the worst case. Only the worst case is recorded in the report.
Instruments Used:	Refer to section 5.10 for details
Test Results:	Pass

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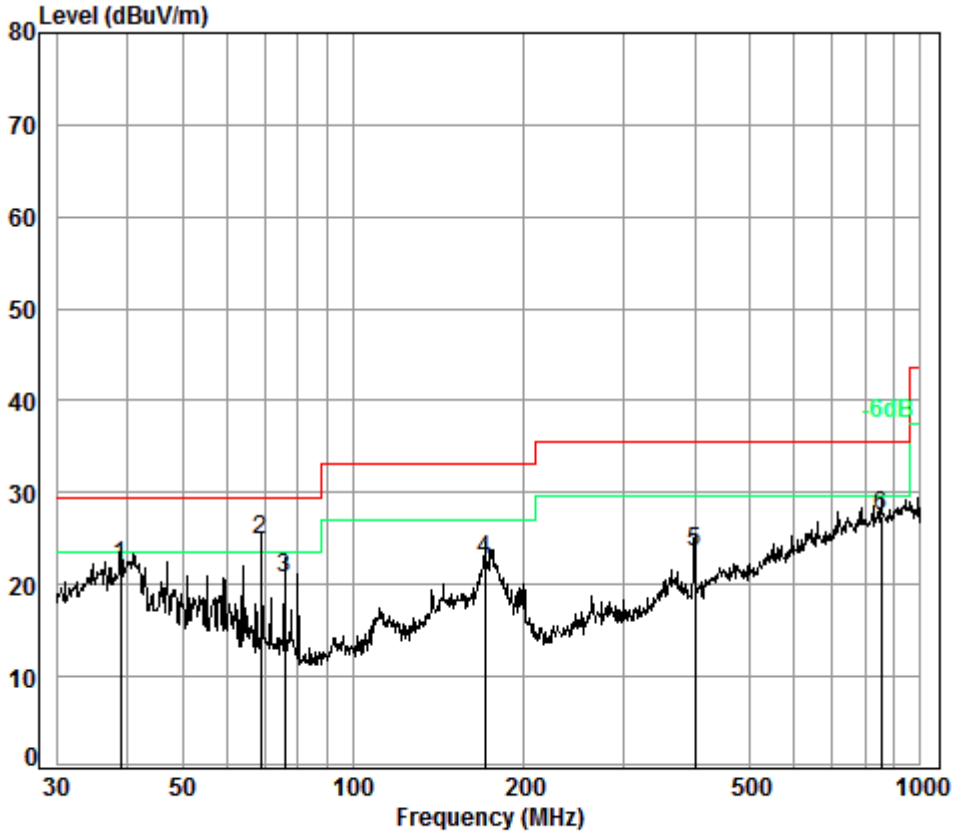
6.8.1 Radiated emission below 1GHz

30MHz~1GHz（QP）		
Test mode:	Transmitting	Vertical



Condition: 10m Vertical
Job No. : 1234CR
Test Mode: TX

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	38.89	6.78	13.18	32.98	34.94	21.92	29.50	-7.58
2 pp	68.87	6.92	10.27	32.91	40.53	24.81	29.50	-4.69
3	75.71	7.02	9.17	32.88	37.51	20.82	29.50	-8.68
4	170.79	7.50	12.30	32.72	35.57	22.65	33.10	-10.45
5	400.43	8.30	14.87	32.60	32.95	23.52	35.60	-12.08
6	851.04	9.36	21.61	32.55	28.96	27.38	35.60	-8.22

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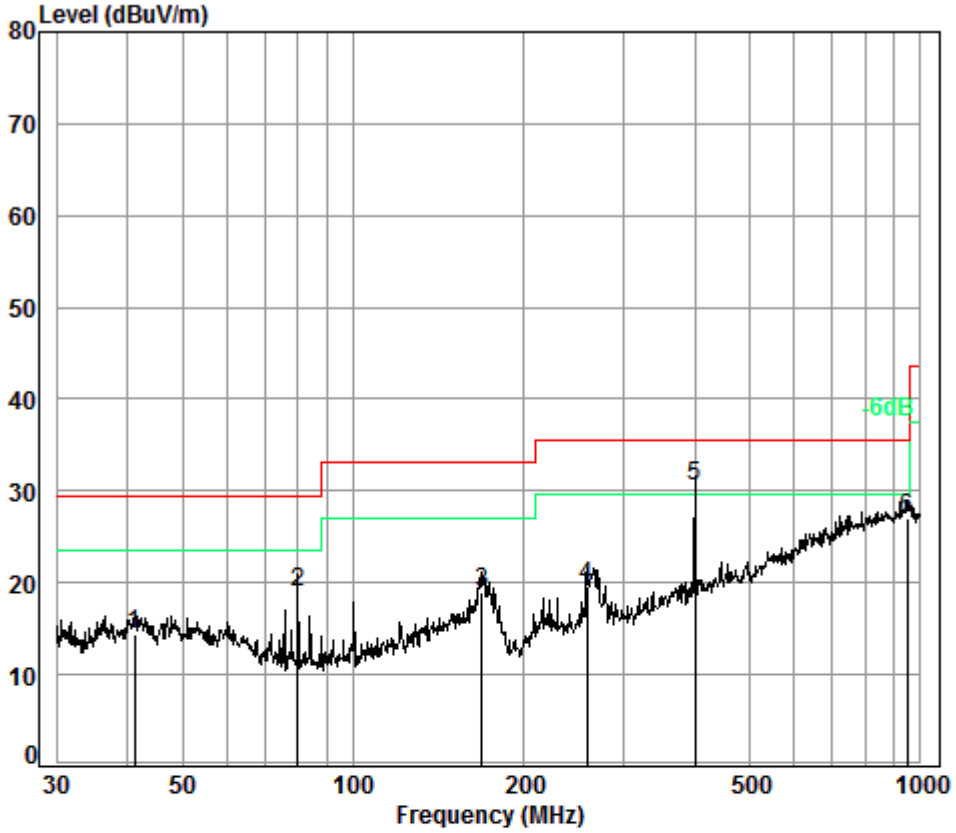
Test mode:	Transmitting	Horizontal



Condition: 10m HORIZONTAL
Job No. : 1234CR
Test Mode: TX

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	41.28	6.80	13.21	32.99	27.38	14.40	29.50	-15.10
2	79.80	7.10	8.57	32.87	36.21	19.01	29.50	-10.49
3	169.01	7.50	12.51	32.72	31.77	19.06	33.10	-14.04
4	258.33	7.90	11.44	32.64	32.85	19.55	35.60	-16.05
5 pp	400.43	8.30	14.87	32.60	39.96	30.53	35.60	-5.07
6	948.76	9.57	22.72	32.50	27.16	26.95	35.60	-8.65

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6.8.2 Transmitter emission above 1GHz

Test mode:	802.11b	Test channel:	Lowest	Remark:	Peak

Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
3589.562	32.08	7.66	38.40	48.02	49.36	74	-24.64	Vertical
4824.000	34.12	8.90	38.75	48.15	52.42	74	-21.58	Vertical
5999.562	34.70	10.56	38.96	46.12	52.42	74	-21.58	Vertical
7236.000	35.58	10.69	37.63	43.47	52.11	74	-21.89	Vertical
9648.000	37.10	12.52	36.29	37.86	51.19	74	-22.81	Vertical
12603.270	37.90	14.44	37.75	38.15	52.74	74	-21.26	Vertical
3881.276	32.98	7.77	38.52	45.95	48.18	74	-25.82	Horizontal
4824.000	34.12	8.90	38.75	49.04	53.31	74	-20.69	Horizontal
6034.386	34.72	10.52	38.91	46.05	52.38	74	-21.62	Horizontal
7236.000	35.58	10.69	37.63	42.54	51.18	74	-22.82	Horizontal
9648.000	37.10	12.52	36.29	35.28	48.61	74	-25.39	Horizontal
12603.270	37.90	14.44	37.75	36.49	51.08	74	-22.92	Horizontal

Test mode:	802.11b	Test channel:	Middle	Remark:	Peak

Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Over Limit (dB)	Polarization
3579.190	32.07	7.66	38.40	48.32	49.65	74	-24.35	Vertical
4874.000	34.17	8.97	38.76	48.21	52.59	74	-21.41	Vertical
6016.949	34.71	10.54	38.94	46.49	52.80	74	-21.20	Vertical
7311.000	35.54	10.72	37.59	41.91	50.58	74	-23.42	Vertical
9748.000	37.10	12.58	36.16	38.06	51.58	74	-22.42	Vertical
12676.420	37.94	14.65	37.82	37.92	52.69	74	-21.31	Vertical
3377.918	31.80	7.60	38.31	45.88	46.97	74	-27.03	Horizontal
4874.000	34.17	8.97	38.76	48.41	52.79	74	-21.21	Horizontal
6016.949	34.71	10.54	38.94	46.36	52.67	74	-21.33	Horizontal
7311.000	35.54	10.72	37.59	41.69	50.36	74	-23.64	Horizontal
9748.000	37.10	12.58	36.16	37.54	51.06	74	-22.94	Horizontal
12603.270	37.90	14.44	37.75	37.36	51.95	74	-22.05	Horizontal

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Test mode:	802.11b	Test channel:	Highest	Remark:	Peak

Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Over Limit (dB)	Polarization
3589.562	32.08	7.66	38.40	46.86	48.20	74	-25.80	Vertical
4924.000	34.22	9.04	38.77	47.90	52.39	74	-21.61	Vertical
6087.002	34.74	10.45	38.85	47.05	53.39	74	-20.61	Vertical
7386.000	35.51	10.75	37.56	40.74	49.44	74	-24.56	Vertical
9848.000	37.15	12.63	36.03	37.26	51.01	74	-22.99	Vertical
12566.850	37.87	14.34	37.72	37.38	51.87	74	-22.13	Vertical
3748.808	32.70	7.72	38.47	45.91	47.86	74	-26.14	Horizontal
4924.000	34.22	9.04	38.77	48.56	53.05	74	-20.95	Horizontal
6016.949	34.71	10.54	38.94	45.76	52.07	74	-21.93	Horizontal
7386.000	35.51	10.75	37.56	40.54	49.24	74	-24.76	Horizontal
9848.000	37.15	12.63	36.03	38.08	51.83	74	-22.17	Horizontal
12639.790	37.92	14.55	37.79	37.76	52.44	74	-21.56	Horizontal

Test mode:	802.11g	Test channel:	Lowest	Remark:	Peak

Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Over Limit (dB)	Polarization
3770.567	32.78	7.73	38.47	45.86	47.90	74	-26.10	Vertical
4824.000	34.12	8.90	38.75	46.06	50.33	74	-23.67	Vertical
5999.562	34.70	10.56	38.96	46.30	52.60	74	-21.40	Vertical
7236.000	35.58	10.69	37.63	44.09	52.73	74	-21.27	Vertical
9648.000	37.10	12.52	36.29	37.15	50.48	74	-23.52	Vertical
12530.530	37.83	14.24	37.68	37.67	52.06	74	-21.94	Vertical
3727.173	32.61	7.71	38.46	46.35	48.21	74	-25.79	Horizontal
4824.000	34.12	8.90	38.75	47.08	51.35	74	-22.65	Horizontal
6008.249	34.70	10.55	38.95	46.50	52.80	74	-21.20	Horizontal
7236.000	35.58	10.69	37.63	43.80	52.44	74	-21.56	Horizontal
9648.000	37.10	12.52	36.29	36.64	49.97	74	-24.03	Horizontal
12566.850	37.87	14.34	37.72	37.93	52.42	74	-21.58	Horizontal

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Test mode:	802.11g	Test channel:	Middle	Remark:	Peak

Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Over Limit (dB)	Polarization
3599.965	32.10	7.67	38.41	46.39	47.75	74	-26.25	Vertical
4874.000	34.17	8.97	38.76	46.21	50.59	74	-23.41	Vertical
6025.661	34.71	10.53	38.93	46.40	52.71	74	-21.29	Vertical
7311.000	35.54	10.72	37.59	42.28	50.95	74	-23.05	Vertical
9748.000	37.10	12.58	36.16	37.28	50.80	74	-23.20	Vertical
12566.850	37.87	14.34	37.72	37.91	52.40	74	-21.60	Vertical
3705.664	32.53	7.71	38.45	46.23	48.02	74	-25.98	Horizontal
4874.000	34.17	8.97	38.76	47.56	51.94	74	-22.06	Horizontal
5999.562	34.70	10.56	38.96	47.00	53.30	74	-20.70	Horizontal
7311.000	35.54	10.72	37.59	41.25	49.92	74	-24.08	Horizontal
9748.000	37.10	12.58	36.16	37.43	50.95	74	-23.05	Horizontal
12585.040	37.89	14.39	37.73	37.43	51.98	74	-22.02	Horizontal

Test mode:	802.11g	Test channel:	Highest	Remark:	Peak

Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Over Limit (dB)	Polarization
3759.672	32.74	7.73	38.47	45.75	47.75	74	-26.25	Vertical
4924.000	34.22	9.04	38.77	47.60	52.09	74	-21.91	Vertical
6016.949	34.71	10.54	38.94	46.40	52.71	74	-21.29	Vertical
7386.000	35.51	10.75	37.56	40.69	49.39	74	-24.61	Vertical
9848.000	37.15	12.63	36.03	37.49	51.24	74	-22.76	Vertical
12530.530	37.83	14.24	37.68	37.32	51.71	74	-22.29	Vertical
3641.878	32.27	7.68	38.42	46.07	47.60	74	-26.40	Horizontal
4924.000	34.22	9.04	38.77	48.80	53.29	74	-20.71	Horizontal
5999.562	34.70	10.56	38.96	46.41	52.71	74	-21.29	Horizontal
7386.000	35.51	10.75	37.56	42.65	51.35	74	-22.65	Horizontal
9848.000	37.15	12.63	36.03	37.37	51.12	74	-22.88	Horizontal
12494.320	37.79	14.15	37.65	38.00	52.29	74	-21.71	Horizontal

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Test mode:	802.11n(HT20)	Test channel:	Lowest	Remark:	Peak

Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Over Limit (dB)	Polarization
3770.567	32.78	7.73	38.47	45.55	47.59	74	-26.41	Vertical
4824.000	34.12	8.90	38.75	45.22	49.49	74	-24.51	Vertical
6087.002	34.74	10.45	38.85	46.14	52.48	74	-21.52	Vertical
7236.000	35.58	10.69	37.63	45.06	53.70	74	-20.30	Vertical
9648.000	37.10	12.52	36.29	34.63	47.96	74	-26.04	Vertical
12566.850	37.87	14.34	37.72	38.42	52.91	74	-21.09	Vertical
3803.444	32.90	7.74	38.49	44.84	46.99	74	-27.01	Horizontal
4824.000	34.12	8.90	38.75	46.35	50.62	74	-23.38	Horizontal
5999.562	34.70	10.56	38.96	45.93	52.23	74	-21.77	Horizontal
7236.000	35.58	10.69	37.63	41.65	50.29	74	-23.71	Horizontal
9648.000	37.10	12.52	36.29	33.99	47.32	74	-26.68	Horizontal
12676.420	37.94	14.65	37.82	38.05	52.82	74	-21.18	Horizontal

Test mode:	802.11n(HT20)	Test channel:	Middle	Remark:	Peak

Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Over Limit (dB)	Polarization
3814.467	32.91	7.75	38.49	45.44	47.61	74	-26.39	Vertical
4874.000	34.17	8.97	38.76	45.61	49.99	74	-24.01	Vertical
6051.874	34.73	10.49	38.89	44.91	51.24	74	-22.76	Vertical
7311.000	35.54	10.72	37.59	44.56	53.23	74	-20.77	Vertical
9748.000	37.10	12.58	36.16	39.30	52.82	74	-21.18	Vertical
12603.270	37.90	14.44	37.75	38.56	53.15	74	-20.85	Vertical
3803.444	32.90	7.74	38.49	45.09	47.24	74	-26.76	Horizontal
4874.000	34.17	8.97	38.76	45.33	49.71	74	-24.29	Horizontal
6104.642	34.75	10.42	38.82	44.89	51.24	74	-22.76	Horizontal
7311.000	35.54	10.72	37.59	44.32	52.99	74	-21.01	Horizontal
9748.000	37.10	12.58	36.16	39.24	52.76	74	-21.24	Horizontal
12676.420	37.94	14.65	37.82	39.02	53.79	74	-20.21	Horizontal

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Test mode:	802.11n(HT20)	Test channel:	Highest	Remark:	Peak

Frequency (MHz)	Antenna factors (dB/m)	Cable loss (dB)	Preamp factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Over Limit (dB)	Polarization
3803.444	32.90	7.74	38.49	44.80	46.95	74	-27.05	Vertical
4924.000	34.22	9.04	38.77	47.08	51.57	74	-22.43	Vertical
5999.562	34.70	10.56	38.96	45.67	51.97	74	-22.03	Vertical
7386.000	35.51	10.75	37.56	44.86	53.56	74	-20.44	Vertical
9848.000	37.15	12.63	36.03	39.39	53.14	74	-20.86	Vertical
12676.420	37.94	14.65	37.82	38.20	52.97	74	-21.03	Vertical
3814.467	32.91	7.75	38.49	44.51	46.68	74	-27.32	Horizontal
4924.000	34.22	9.04	38.77	46.62	51.11	74	-22.89	Horizontal
6016.949	34.71	10.54	38.94	44.75	51.06	74	-22.94	Horizontal
7386.000	35.51	10.75	37.56	41.16	49.86	74	-24.14	Horizontal
9848.000	37.15	12.63	36.03	39.21	52.96	74	-21.04	Horizontal
12603.270	37.90	14.44	37.75	38.37	52.96	74	-21.04	Horizontal

Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

   Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

2) Scan from 9kHz to 25GHz,The disturbance above 13GHz and below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported .

3) As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak measurements were shown in the report.

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6.9 Restricted bands around fundamental frequency

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205
Test Method:	ANSI C63.10: 2013 Section 11.12
Test Site:	Measurement Distance: 3m (Semi-Anechoic Chamber)
Limit:	

Frequency	Limit (dBuV/m @3m)	Remark
30MHz-88MHz	40.0	Quasi-peak Value
88MHz-216MHz	43.5	Quasi-peak Value
216MHz-960MHz	46.0	Quasi-peak Value
960MHz-1GHz	54.0	Quasi-peak Value
Above 1GHz	54.0	Average Value
	74.0	Peak Value

Test Setup:

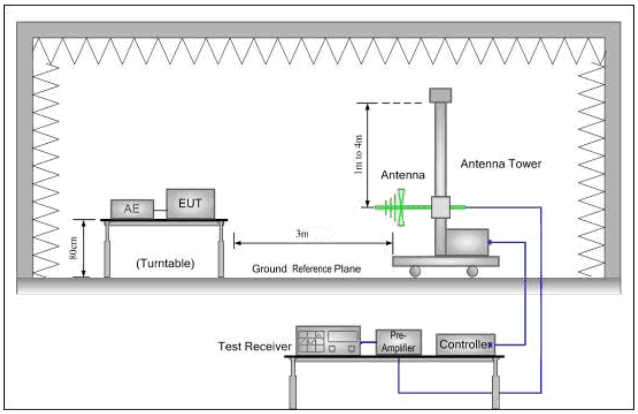

Figure 1. 30MHz to 1GHz

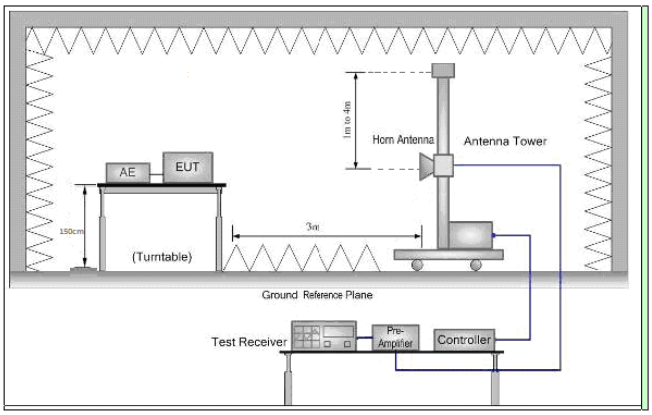

Figure 2. Above 1 GHz

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Test Procedure:	a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation. c. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. g. Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel h. Test the EUT in the lowest channel , the Highest channel i. Repeat above procedures until all frequencies measured was complete.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates. Transmitting mode.
Final Test Mode:	Pretest the EUT at Transmitting mode, found the Transmitting mode which it is worse case Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g ; 6.5Mbps of rate is the worst case of 802.11n(HT20). Only the worst case is recorded in the report.
Instruments Used:	Refer to section 5.10 for details
Test Results:	Pass

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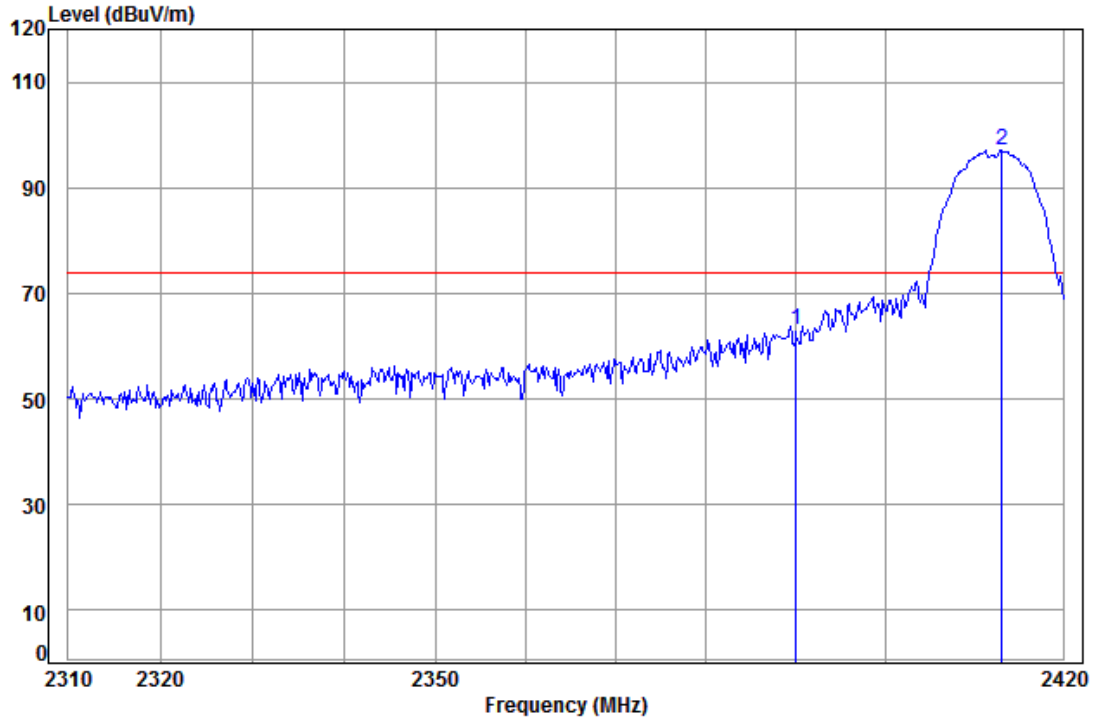
Test plot as follows:

Worse case mode:	802.11b	Test channel:	Lowest	Remark:	Peak	Vertical



Condition: 3m Vertical
Job No: : 1234CR
Mode: : 2412 Band edge
: B

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	2390.000	5.34	28.57	38.11	67.33	63.13	74.00	-10.87
2 pp	2413.142	5.36	28.66	38.11	101.17	97.08	74.00	23.08

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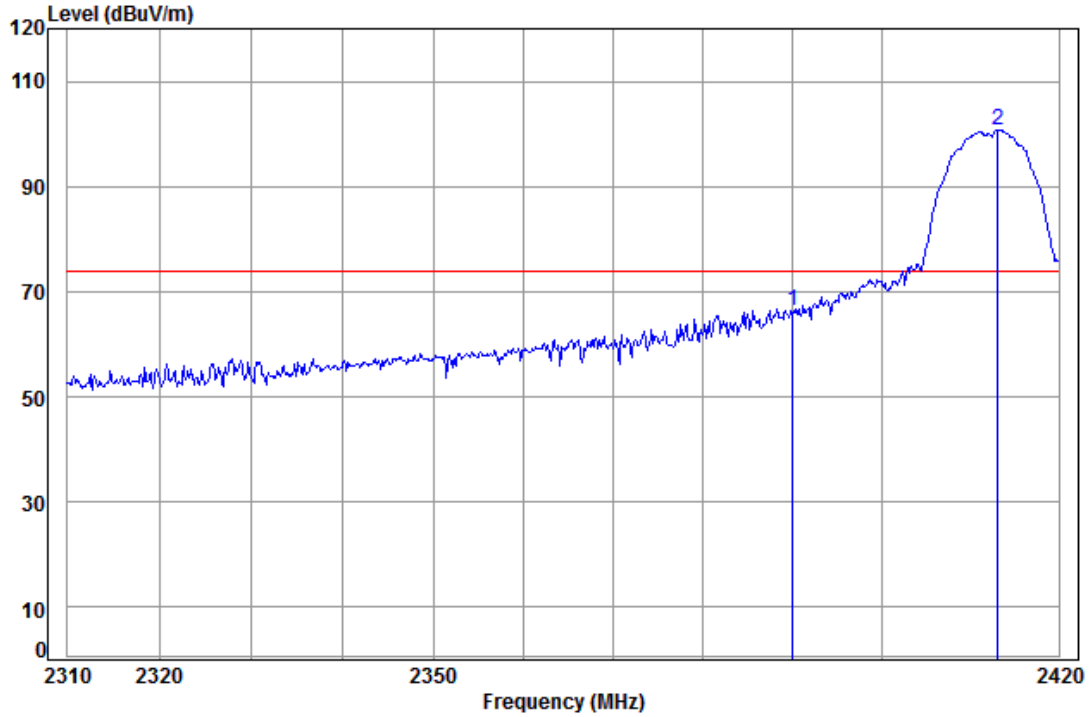
Worse case mode:	802.11b	Test channel:	Lowest	Remark:	Peak	Horizontal



Condition: 3m Horizontal
Job No: : 1234CR
Mode: : 2412 Band edge
: B

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	2390.000	5.34	28.57	38.11	70.54	66.34	74.00	-7.66
2 pp	2413.142	5.36	28.66	38.11	104.92	100.83	74.00	26.83

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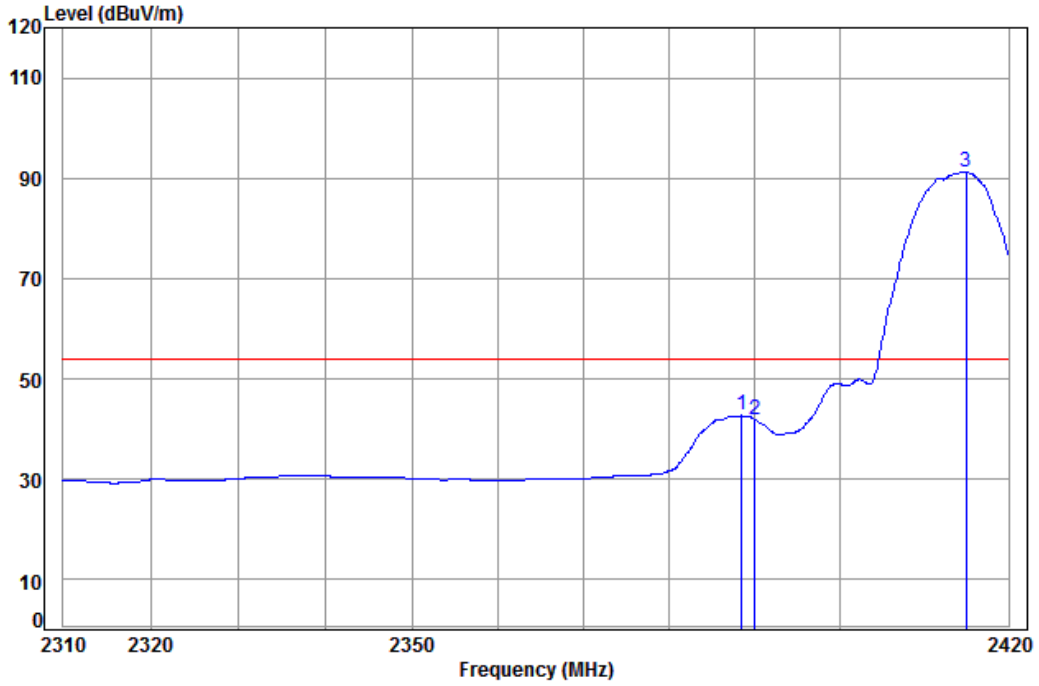
Worse case mode:	802.11b	Test channel:	Lowest	Remark:	Average	Vertical



Condition: 3m Vertical
Job No: : 1234CR
Mode: : 2412 Band edge
: B

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	2388.460	5.34	28.57	38.11	46.87	42.67	54.00	-11.33
2	2390.000	5.34	28.57	38.11	46.04	41.84	54.00	-12.16
3 pp	2414.939	5.36	28.67	38.11	95.23	91.15	54.00	37.15

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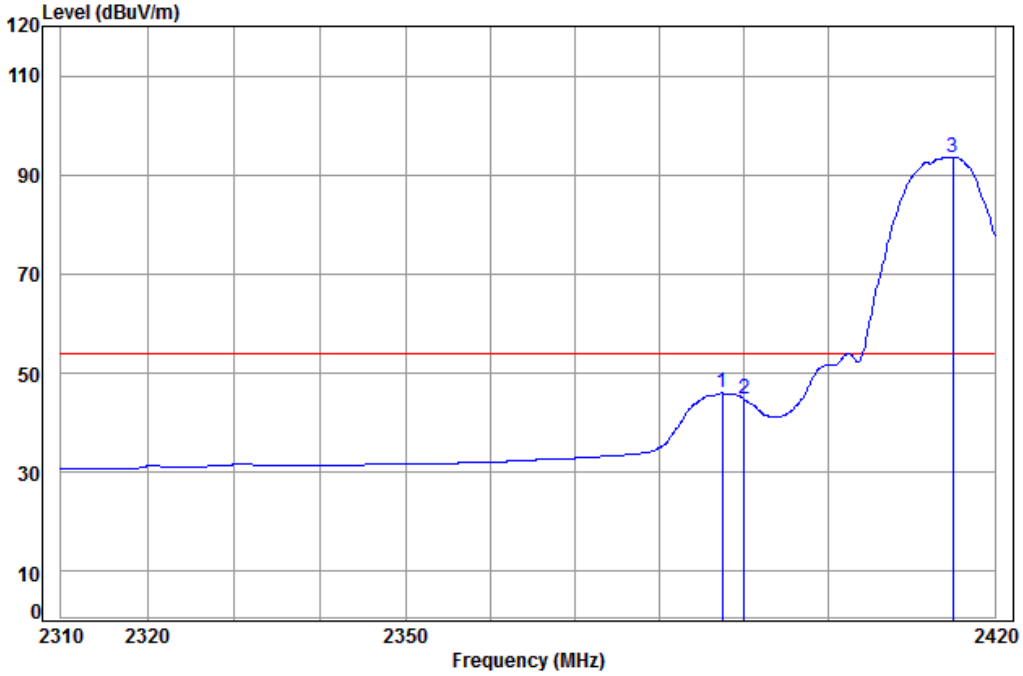
Worse case mode:	802.11b	Test channel:	Lowest	Remark:	Average	Horizontal



Condition: 3m Horizontal
Job No: : 1234CR
Mode: : 2412 Band edge
: B

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	2387.349	5.34	28.56	38.11	50.16	45.95	54.00	-8.05
2	2390.000	5.34	28.57	38.11	48.91	44.71	54.00	-9.29
3 pp	2414.939	5.36	28.67	38.11	97.66	93.58	54.00	39.58

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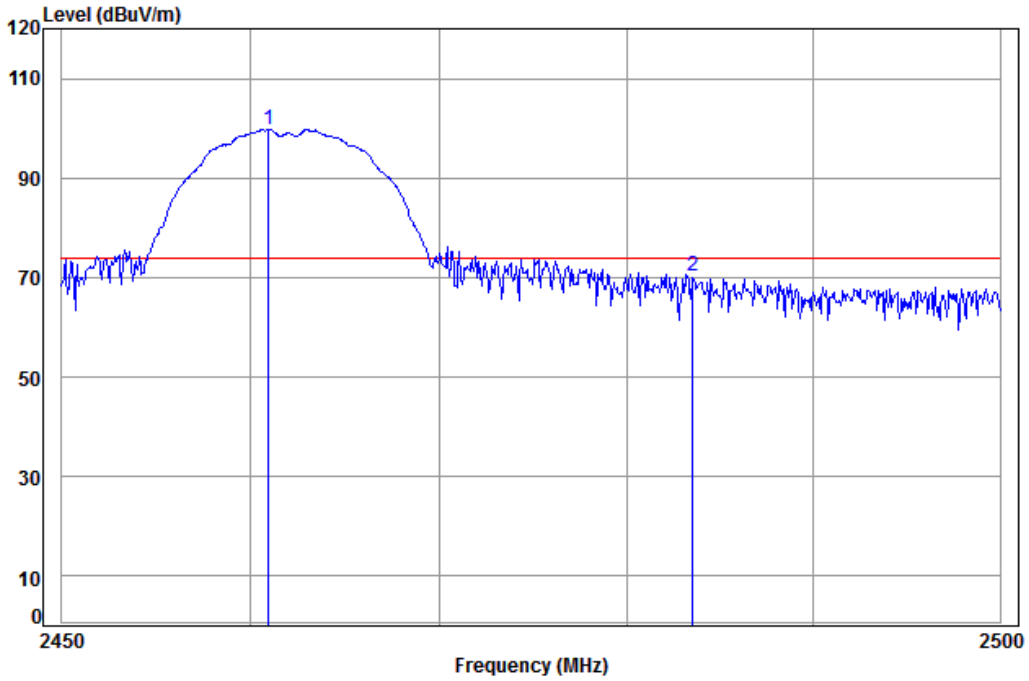
Worse case mode:	802.11b	Test channel:	Highest	Remark:	Peak	Vertical



Condition: 3m Vertical
Job No: : 1234CR
Mode: : 2462 Band edge
: B

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 pp	2460.914	5.39	28.88	38.12	103.62	99.77	74.00	25.77
2	2483.500	5.41	28.98	38.12	74.04	70.31	74.00	-3.69

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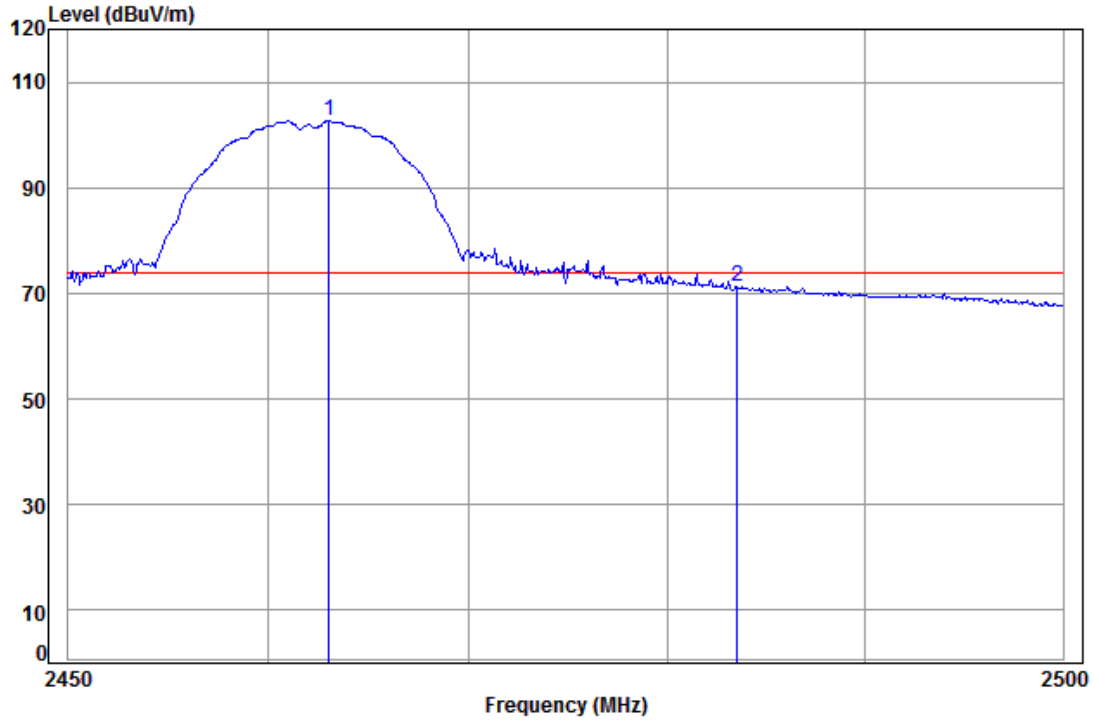
Worse case mode:	802.11b	Test channel:	Highest	Remark:	Peak	Horizontal



Condition: 3m Horizontal
Job No: : 1234CR
Mode: : 2462 Band edge
: B

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 pp	2463.002	5.39	28.89	38.12	106.49	102.65	74.00	28.65
2	2483.500	5.41	28.98	38.12	75.17	71.44	74.00	-2.56

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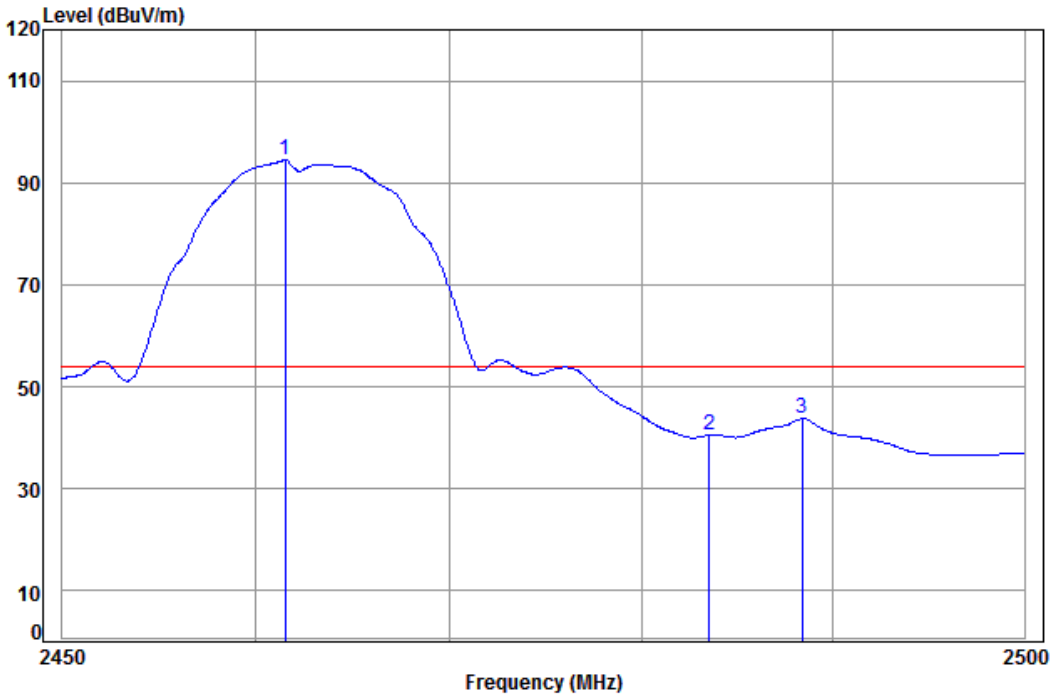
Worse case mode:	802.11b	Test channel:	Highest	Remark:	Average	Vertical



Condition: 3m Vertical
Job No: : 1234CR
Mode: : 2462 Band edge
: B

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 pp	2461.510	5.39	28.88	38.12	98.24	94.39	54.00	40.39
2	2483.500	5.41	28.98	38.12	44.28	40.55	54.00	-13.45
3	2488.360	5.41	29.01	38.12	47.43	43.73	54.00	-10.27

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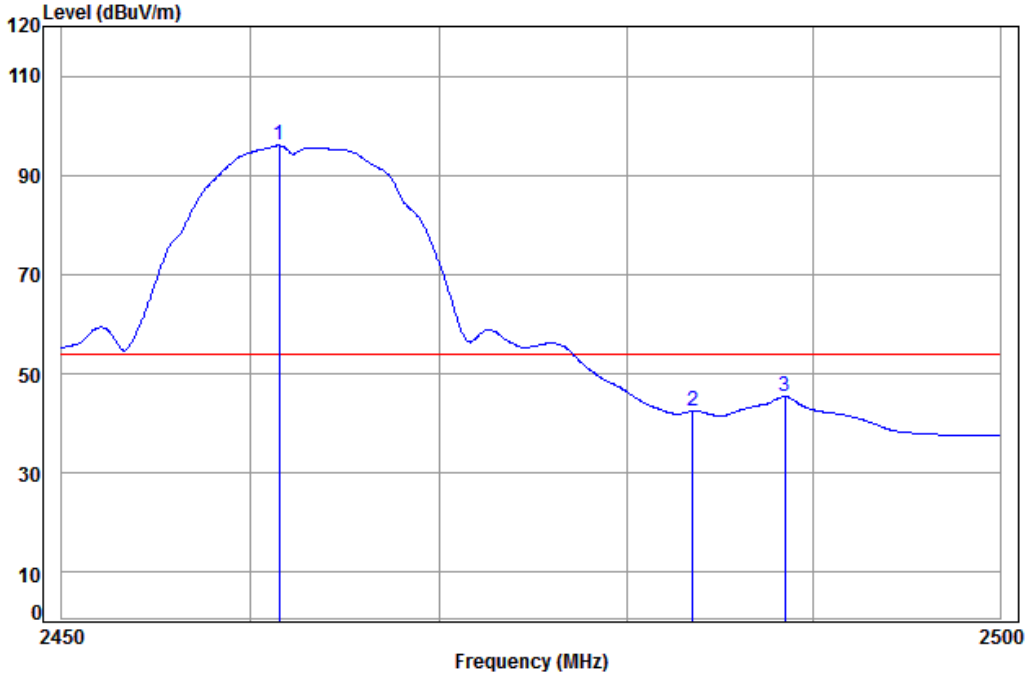
Worse case mode:	802.11b	Test channel:	Highest	Remark:	Average	Horizontal



Condition: 3m Horizontal
Job No: : 1234CR
Mode: : 2462 Band edge
: B

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 pp	2461.510	5.39	28.88	38.12	99.87	96.02	54.00	42.02
2	2483.500	5.41	28.98	38.12	46.22	42.49	54.00	-11.51
3	2488.461	5.41	29.01	38.12	49.08	45.38	54.00	-8.62

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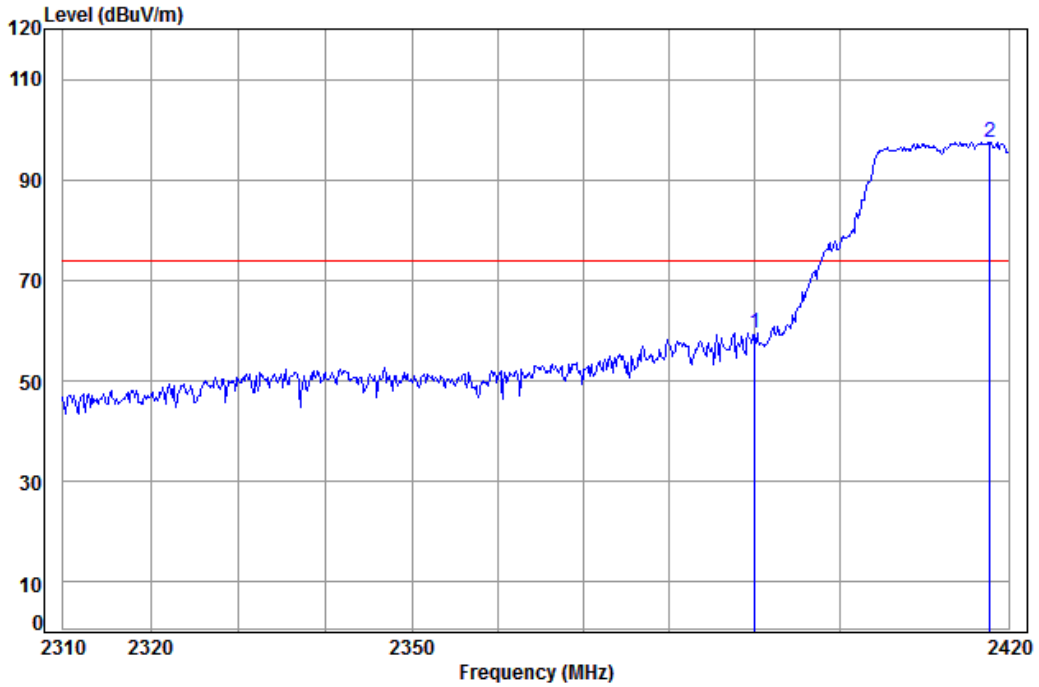
Worse case mode:	802.11g	Test channel:	Lowest	Remark:	Peak	Vertical



Condition: 3m Vertical
Job No: : 1234CR
Mode: : 2412 Band edge
: G

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	2390.000	5.34	28.57	38.11	63.65	59.45	74.00	-14.55
2 pp	2417.750	5.36	28.68	38.11	101.55	97.48	74.00	23.48

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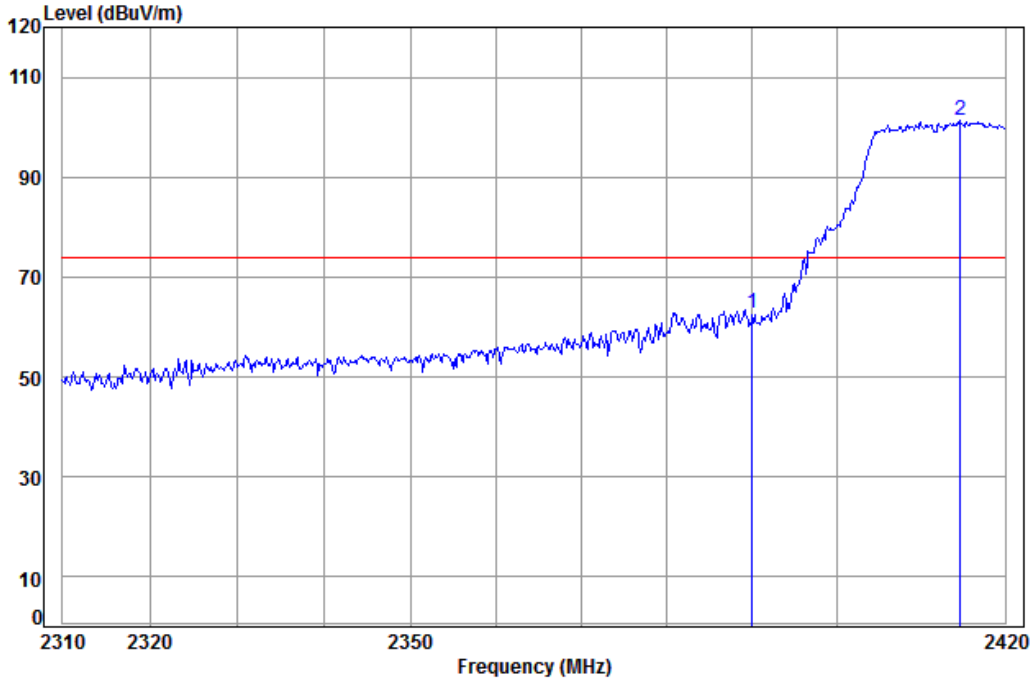
Worse case mode:	802.11g	Test channel:	Lowest	Remark:	Peak	Horizontal



Condition: 3m Horizontal
Job No: : 1234CR
Mode: : 2412 Band edge
: G

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	2390.000	5.34	28.57	38.11	66.98	62.78	74.00	-11.22
2 pp	2414.715	5.36	28.67	38.11	105.31	101.23	74.00	27.23

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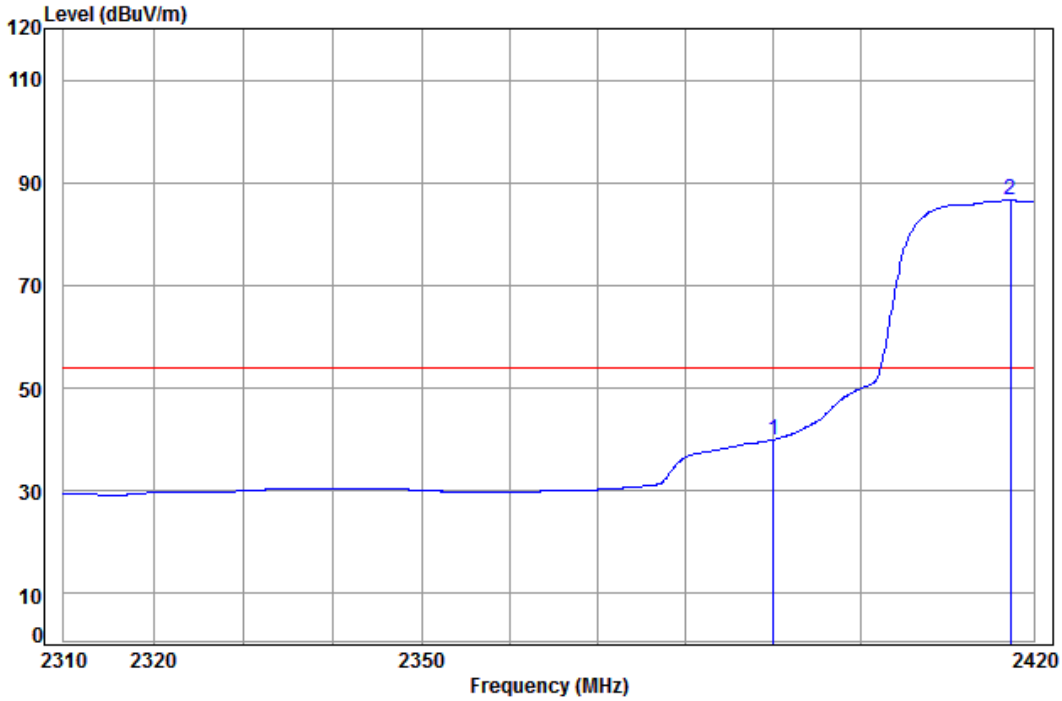
Worse case mode:	802.11g	Test channel:	Lowest	Remark:	Average	Vertical



Condition: 3m Vertical
Job No: : 1234CR
Mode: : 2412 Band edge
: G

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	2390.000	5.34	28.57	38.11	44.19	39.99	54.00	-14.01
2 pp	2417.300	5.36	28.68	38.11	90.59	86.52	54.00	32.52

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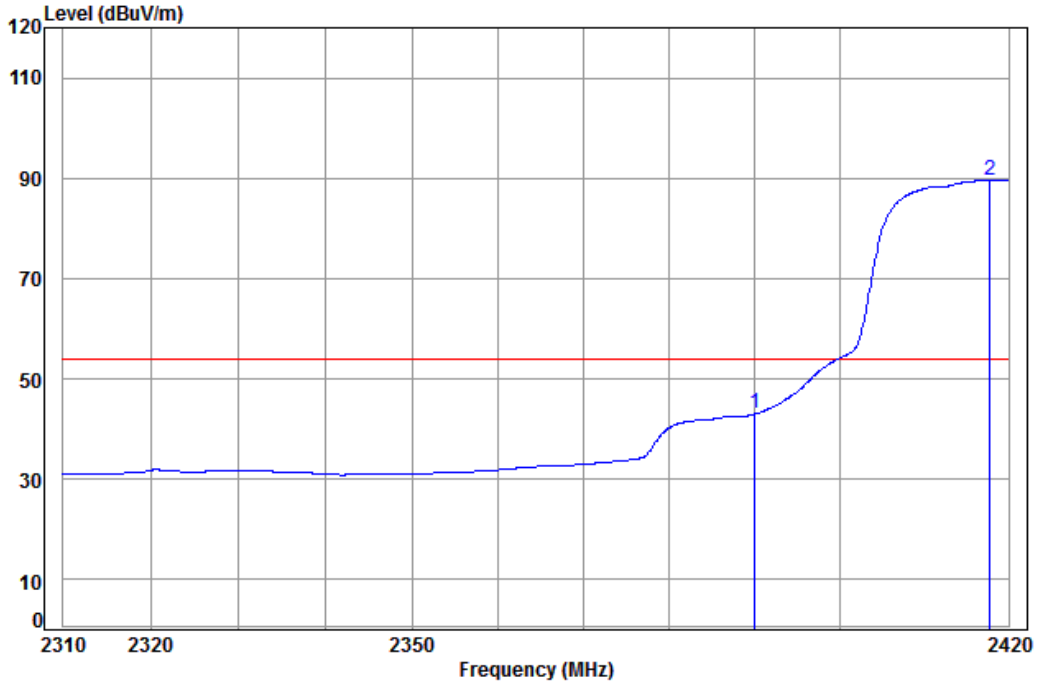
Worse case mode:	802.11g	Test channel:	Lowest	Remark:	Average	Horizontal



Condition: 3m Horizontal
Job No: : 1234CR
Mode: : 2412 Band edge
: G

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	2390.000	5.34	28.57	38.11	47.22	43.02	54.00	-10.98
2 pp	2417.750	5.36	28.68	38.11	93.63	89.56	54.00	35.56

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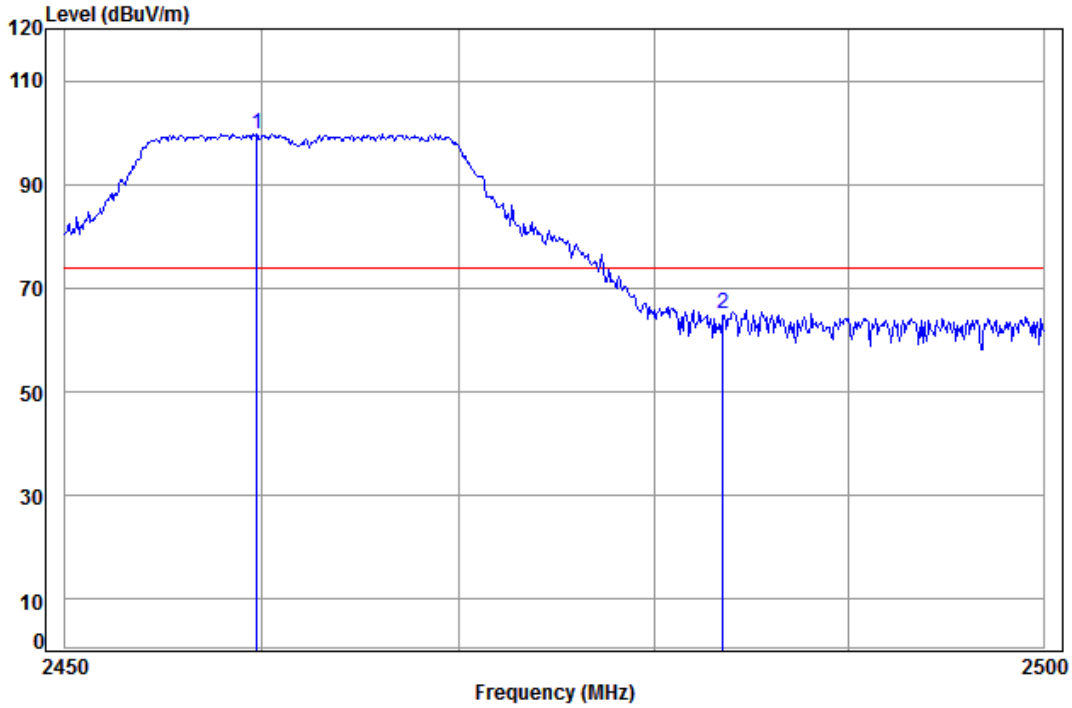
Worse case mode:	802.11g	Test channel:	Highest	Remark:	Peak	Vertical



Condition: 3m Vertical
Job No: : 1234CR
Mode: : 2462 Band edge
: G

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 pp	2459.720	5.39	28.88	38.12	103.69	99.84	74.00	25.84
2	2483.500	5.41	28.98	38.12	68.78	65.05	74.00	-8.95

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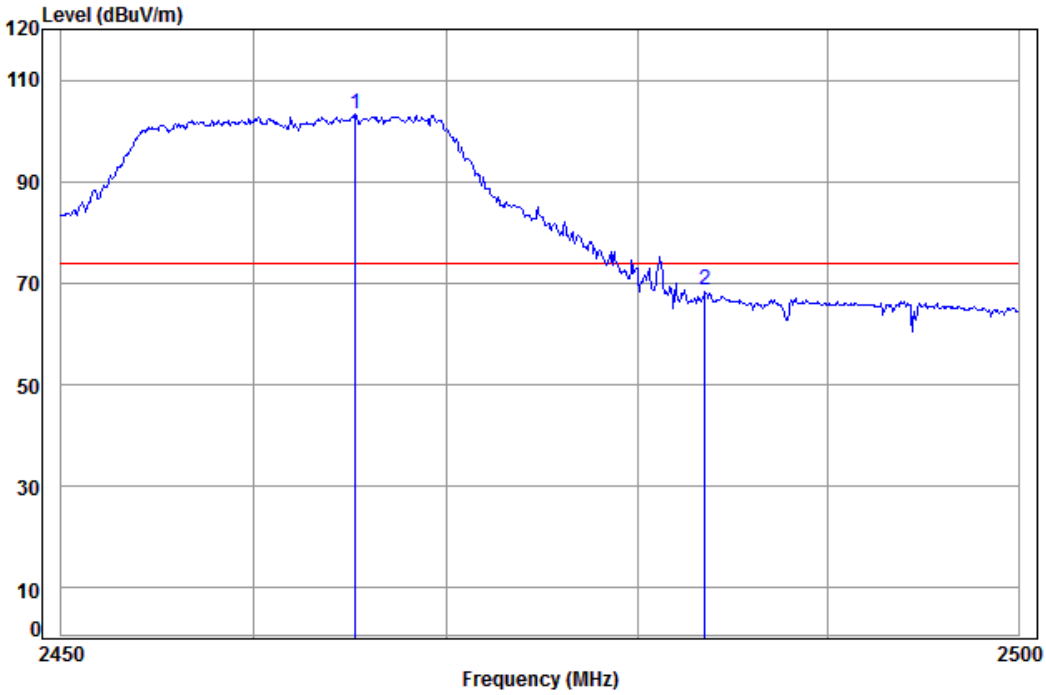
Worse case mode:	802.11g	Test channel:	Highest	Remark:	Peak	Horizontal



Condition: 3m Horizontal
Job No: : 1234CR
Mode: : 2462 Band edge
: G

		Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
		MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	pp	2465.243	5.39	28.90	38.12	107.18	103.35	74.00	29.35
2		2483.500	5.41	28.98	38.12	72.28	68.55	74.00	-5.45

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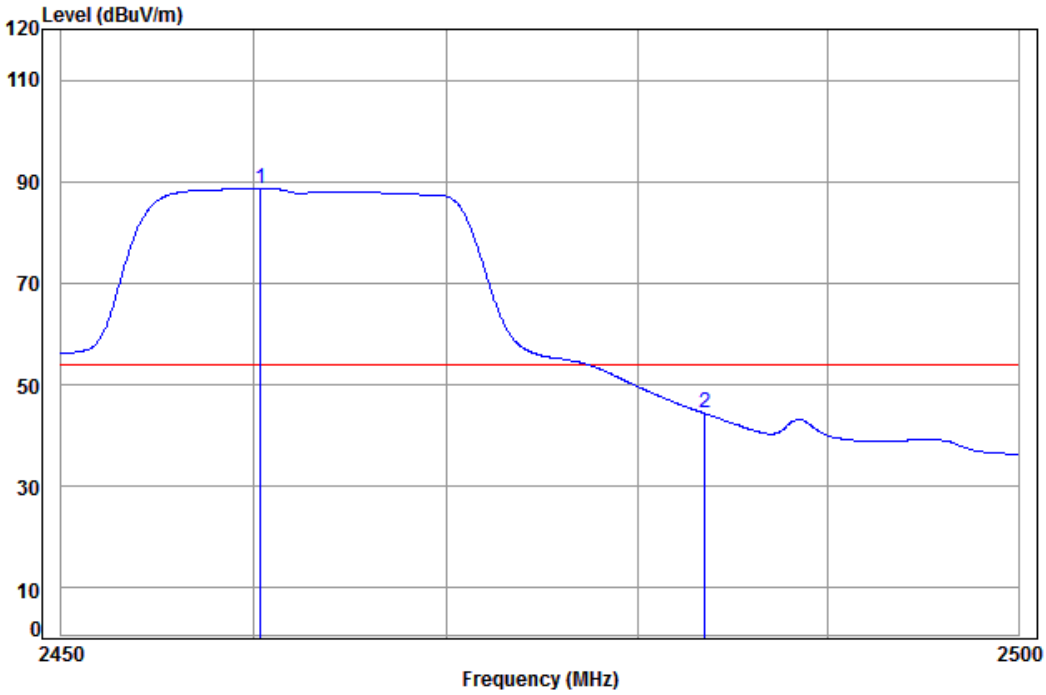
Worse case mode:	802.11g	Test channel:	Highest	Remark:	Average	Vertical



Condition: 3m Vertical
Job No: : 1234CR
Mode: : 2462 Band edge
: G

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 pp	2460.317	5.39	28.88	38.12	92.46	88.61	54.00	34.61
2	2483.500	5.41	28.98	38.12	48.08	44.35	54.00	-9.65

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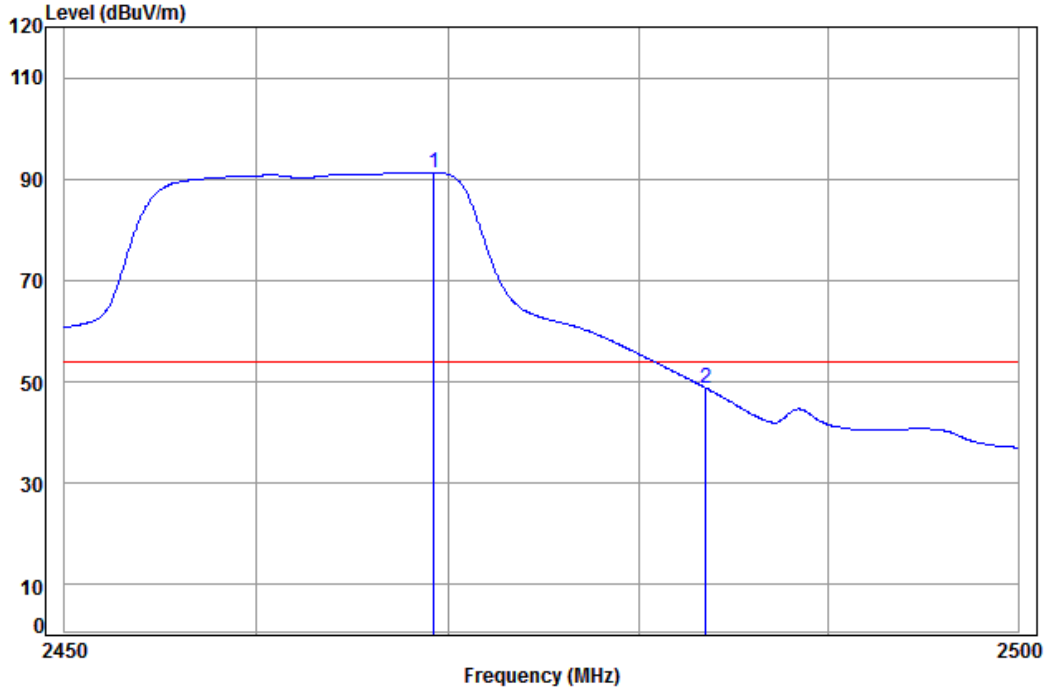
Worse case mode:	802.11g	Test channel:	Highest	Remark:	Average	Horizontal



Condition: 3m Horizontal
Job No: : 1234CR
Mode: : 2462 Band edge
: G

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 pp	2469.230	5.40	28.92	38.12	95.07	91.27	54.00	37.27
2	2483.500	5.41	28.98	38.12	52.60	48.87	54.00	-5.13

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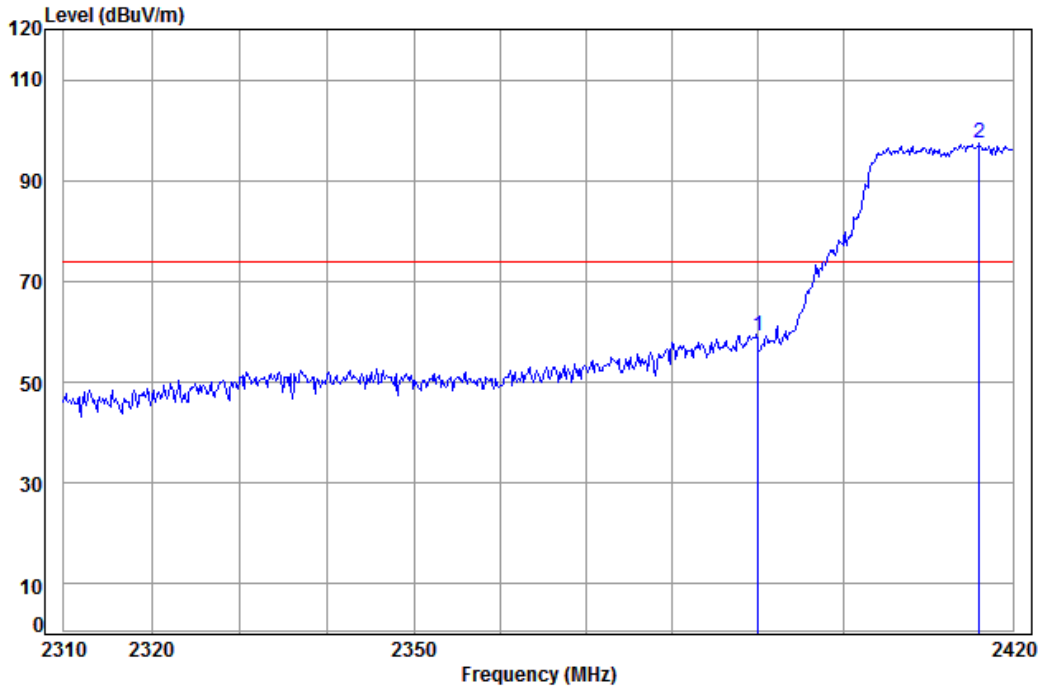
Worse case mode:	802.11n(HT20)	Test channel:	Lowest	Remark:	Peak	Vertical



Condition: 3m Vertical
Job No: : 1234CR
Mode: : 2412 Band edge
: N20

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	2390.000	5.34	28.57	38.11	63.32	59.12	74.00	-14.88
2 pp	2416.063	5.36	28.68	38.11	101.35	97.28	74.00	23.28

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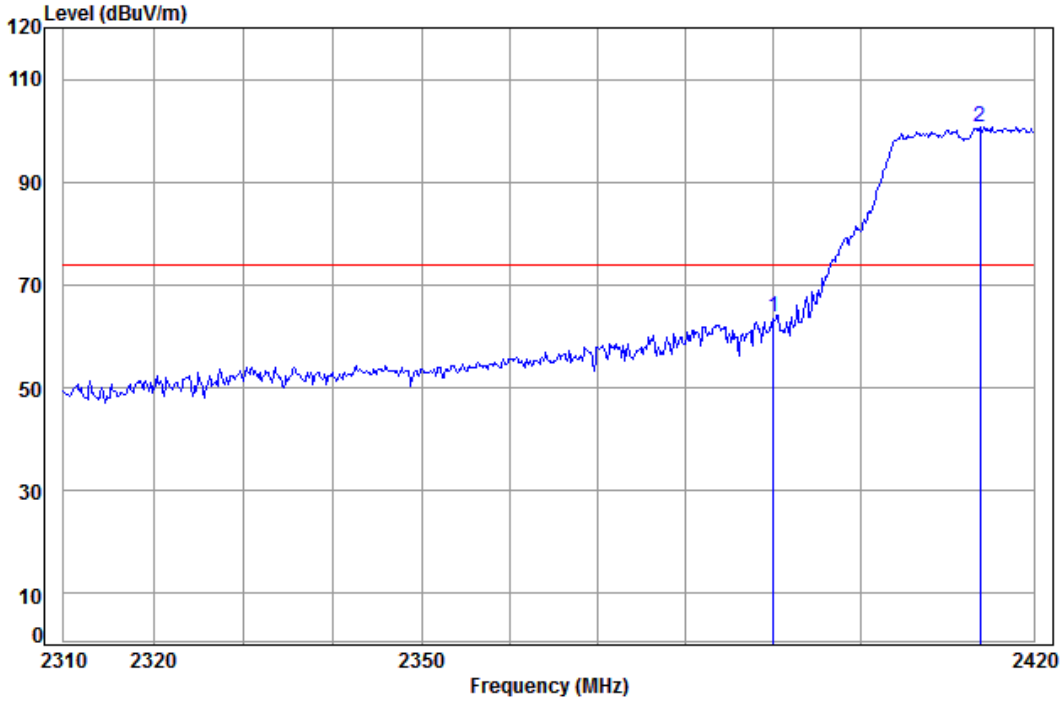
Worse case mode:	802.11n(HT20)	Test channel:	Lowest	Remark:	Peak	Horizontal



Condition: 3m Horizontal
Job No: : 1234CR
Mode: : 2412 Band edge
: N20

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	2390.000	5.34	28.57	38.11	67.88	63.68	74.00	-10.32
2 pp	2413.816	5.36	28.66	38.11	104.87	100.78	74.00	26.78

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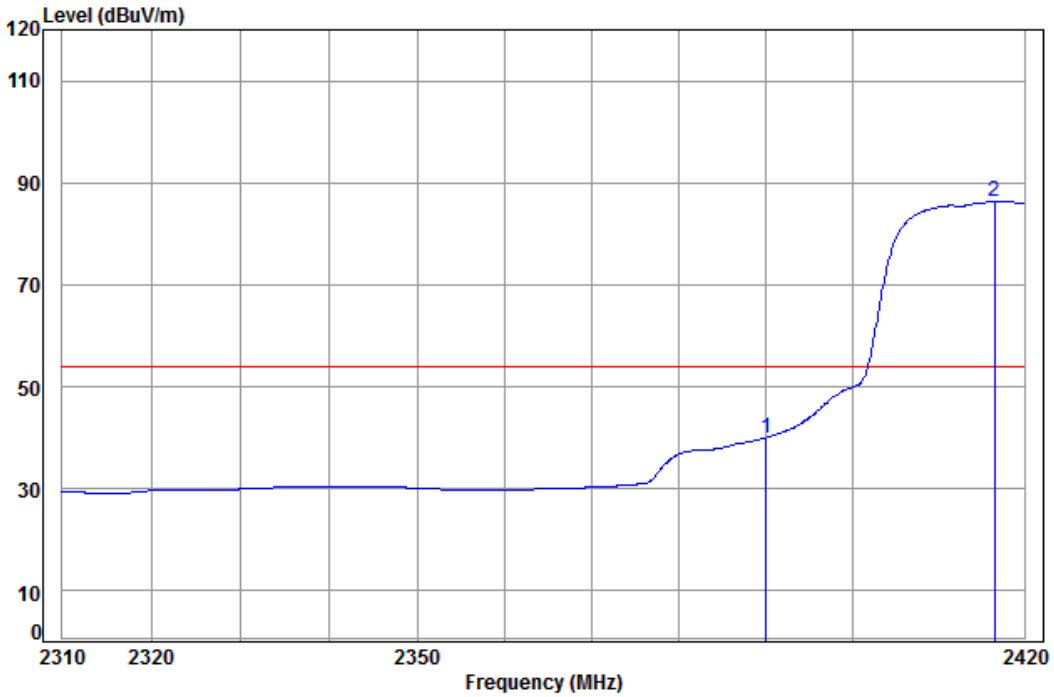
Worse case mode:	802.11n(HT20)	Test channel:	Lowest	Remark:	Average	Vertical



Condition: 3m Vertical
Job No: : 1234CR
Mode: : 2412 Band edge
: N20

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	2390.000	5.34	28.57	38.11	44.24	40.04	54.00	-13.96
2 pp	2416.513	5.36	28.68	38.11	90.31	86.24	54.00	32.24

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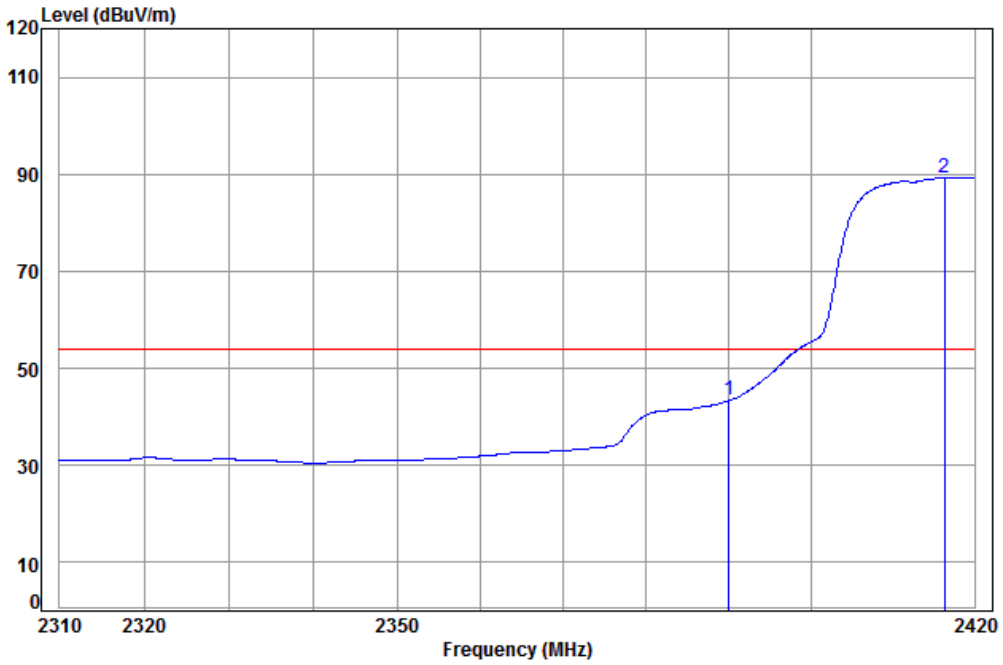
Worse case mode:	802.11n(HT20)	Test channel:	Lowest	Remark:	Average	Horizontal



Condition: 3m Horizontal
Job No: : 1234CR
Mode: : 2412 Band edge
: N20

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	2390.000	5.34	28.57	38.11	47.61	43.41	54.00	-10.59
2 pp	2416.288	5.36	28.68	38.11	93.33	89.26	54.00	35.26

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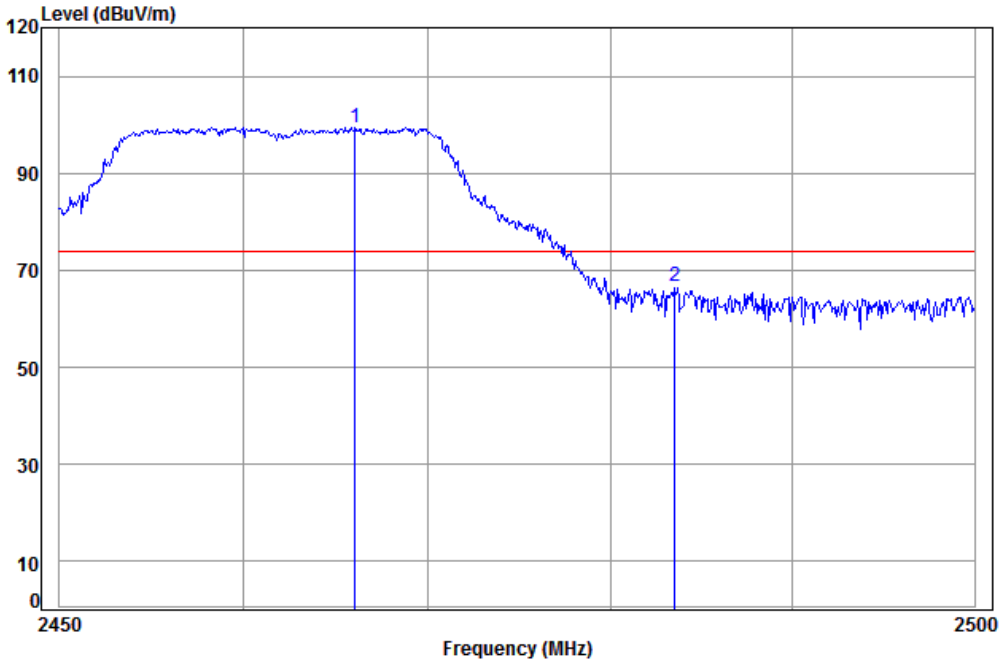
Worse case mode:	802.11n(HT20)	Test channel:	Highest	Remark:	Peak	Vertical



Condition: 3m Vertical
Job No: : 1234CR
Mode: : 2462 Band edge
: N20

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 pp	2466.040	5.39	28.91	38.12	103.32	99.50	74.00	25.50
2	2483.500	5.41	28.98	38.12	70.40	66.67	74.00	-7.33

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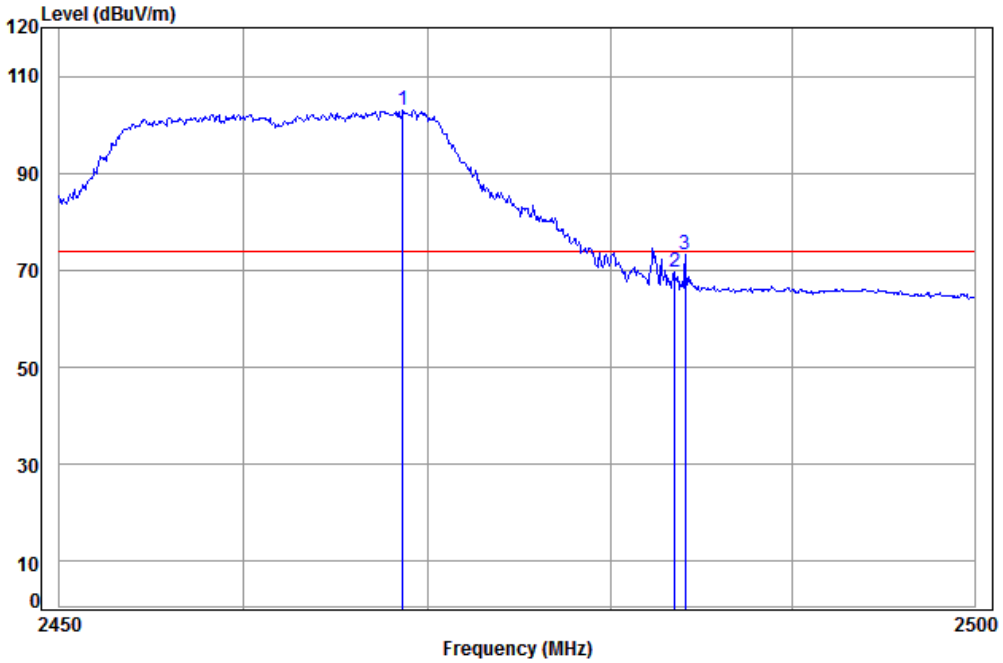
Worse case mode:	802.11n(HT20)	Test channel:	Highest	Remark:	Peak	Horizontal



Condition: 3m Horizontal
Job No: : 1234CR
Mode: : 2462 Band edge
: N20

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 pp	2468.632	5.40	28.92	38.12	106.76	102.96	74.00	28.96
2	2483.500	5.41	28.98	38.12	73.44	69.71	74.00	-4.29
3	2484.091	5.41	28.99	38.12	76.88	73.16	74.00	-0.84

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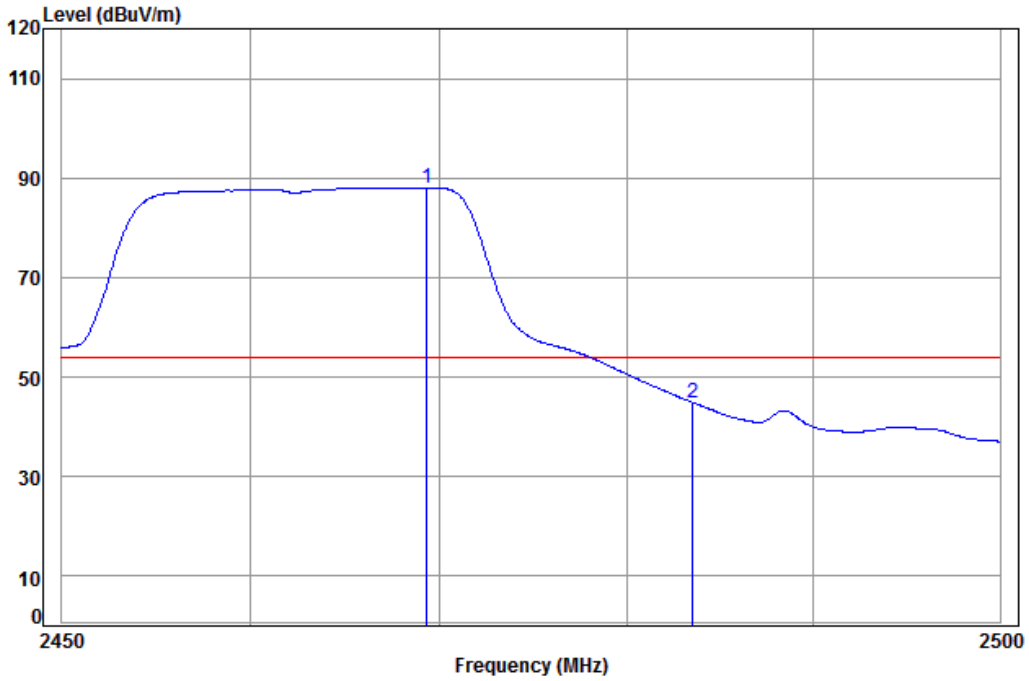
Worse case mode:	802.11n(HT20)	Test channel:	Highest	Remark:	Average	Vertical



Condition: 3m Vertical
Job No: : 1234CR
Mode: : 2462 Band edge
: N20

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 pp	2469.330	5.40	28.92	38.12	91.86	88.06	54.00	34.06
2	2483.500	5.41	28.98	38.12	48.68	44.95	54.00	-9.05

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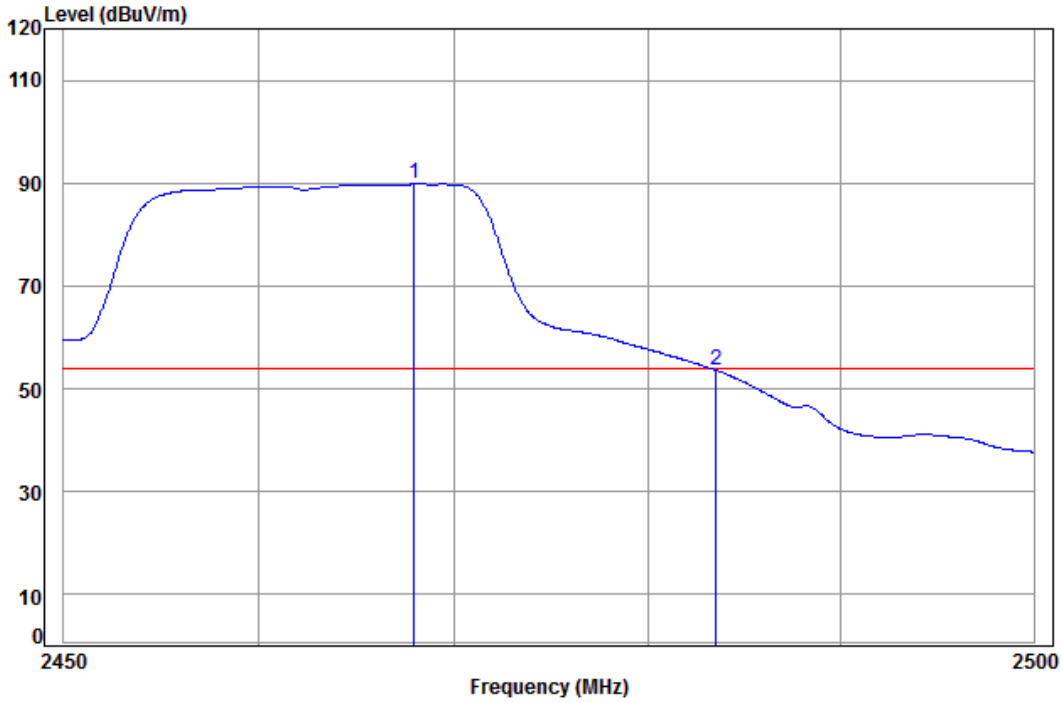
Worse case mode:	802.11n(HT20)	Test channel:	Highest	Remark:	Average	Horizontal



Condition: 3m Horizontal
Job No: : 1234CR
Mode: : 2462 Band edge
: N20

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 pp	2467.934	5.40	28.91	38.12	93.59	89.78	54.00	35.78
2	2483.500	5.41	28.98	38.12	57.39	53.66	54.00	-0.34

Note:
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

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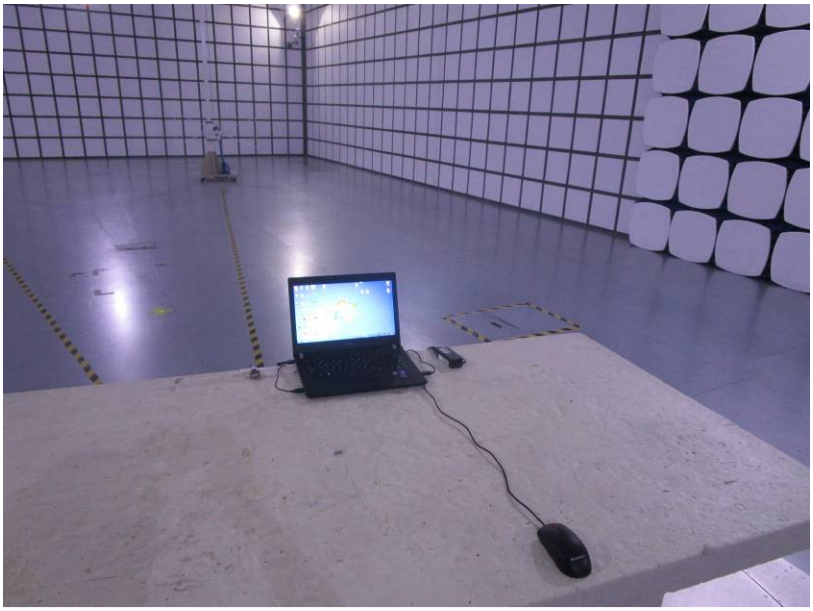
7 Photographs - EUT Test Setup

Test model No.: ESO-12S

7.1 Conducted Emission

7.2 Radiated Emission



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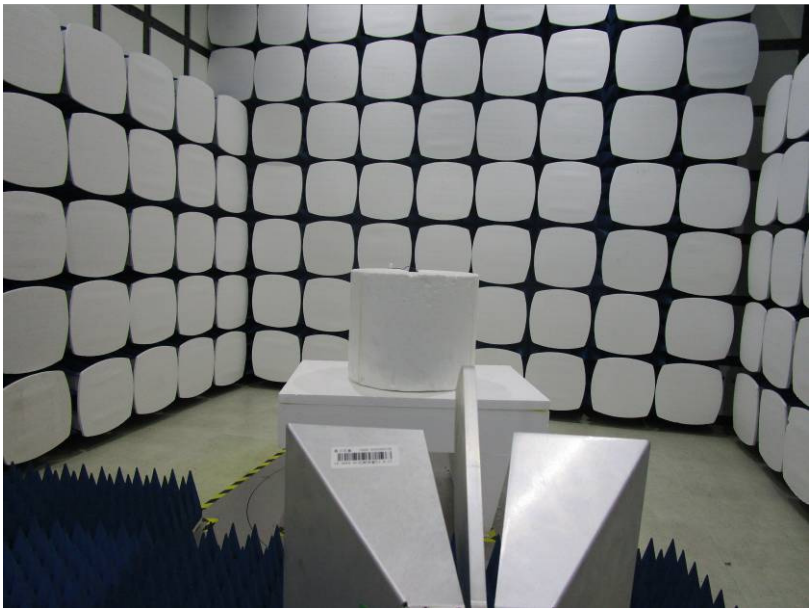
7.3 Radiated Spurious Emission



8 Photographs - EUT Constructional Details

Refer to Appendix A - Photographs of EUT Constructional Details for SZEM1603001234CR.

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