IBN LLC.

Application
For
Certification

FCC ID: 2AALX-HAO

HIGH DEFINITION DIGITAL OTT BOX

Model: HA2800
Additional Models: HAM2, HAO1, HAO2, HAO3, HAO4, HAO5, HAO6, HAO7, HAO8, HAO9

Trademark: HAO

WiFi Transceiver

Report No.: 130514024SZN-001

We hereby certify that the sample of the above item is considered to comply with the requirements of FCC Part 15, Subpart C for Intentional Radiator, mention 47 CFR [10-1-12]

Prepared and Checked by:	Approved by:
Sign on file	Digitally signed by Tommy Leung Location: Intertek Testing Services
Robert Li Project Engineer	Billy Li Supervisor Date: July 30, 2013

TRF no.: FCC 15C_Tx_b

LIST OF EXHIBITS

MEASUREMENT/TECHNICAL REPORT

MODEL: HA2800
Additional Models: HAM2, HAO1, HAO2, HAO3, HAO4, HAO5, HAO6, HAO7, HAO8, HAO9

FCC ID: 2AALX-HAO

This report concerns (check one) Original Grant ___X___ Class II Change ____

Equipment Type: DTS - Part 15 Digital Transmission Systems (WiFi transmitter portion)

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? Yes _____ No ___X___

If yes, defer until : _____ date

Company Name agrees to notify the Commission by: _____ date

of the intended date of announcement of the product so that the grant can be issued on that date.

Transition Rules Request per 15.37? Yes _____ No ___X___

If no, assumed Part 15, Subpart C for intentional radiator - the new 47 CFR [10-01-12 Edition] provision.

Report prepared by:

Billy Li
Intertek Testing Services Shenzhen Ltd.
Kejiyuan Branch
6F, Block D, Huahan Building, Langshan Road,
Nanshan District, Shenzhen, P. R. China
Phone: (86 755) 8614 0645
Fax: (86 755) 8614 6751

Table of Contents

List of attached file

Exhibit type	File Description	Filename
Test Report	Test Report	report.pdf
Test Setup Photo	Radiated Emission	radiated photos.pdf
Test Setup Photo	Conducted Emission	conducted photos.pdf
External Photo	External Photo	external photos.pdf
Internal Photo	Internal Photo	internal photos.pdf
Block Diagram	Block Diagram	block.pdf
Schematics	Circuit Diagram	circuit.pdf
Operation Description	Technical Description	descri.pdf
ID Label/Location	Label Artwork and Location	label.pdf
User Manual	User Manual	manual.pdf
Cover Letter	Confidentiality Letter	request.pdf
Cover Letter	Letter of Agency	agency.pdf
Cover Letter	Certification Agreement	agreement.pdf

EXHIBIT 1

SUMMARY OF TEST RESULTS

1.0 Summary of Test

MODEL: HA2800
Additional Models: HAM2, HAO1, HAO2, HAO3, HAO4, HAO5, HAO6, HAO7, HAO8, HAO9

FCC ID: 2AALX-HAO

TEST	REFERENCE	RESULTS
Max. Output power	15.247(b)(3)	Pass
6 dB Bandwidth	15.247(a)(2)	Pass
Max. Power Density	15.247(e)	Pass
Out of Band Antenna Conducted Emission	15.247(d)	Pass
Radiated Emission in Restricted Bands	15.247(d)	Pass
AC Conducted Emission	15.207	Pass
Antenna Requirement	15.203	Pass (See Notes)

Notes: The EUT uses an integral Antenna which in accordance to Section 15.203 is considered sufficient to comply with the provisions of this section.

EXHIBIT 2

GENERAL DESCRIPTION

2.0 General Description

2.1 Product Description

The Equipment Under Test (EUT) is a HIGH DEFINITION DIGITAL OTT BOX with internal WiFi function operating at 2412-2462MHz for 802.11b/g/n-HT20, 11 channels with 5MHz channel spacing and 2422-2452MHz for 802.11n-HT40, 7 channels with 5MHz channel spacing. The EUT can be powered by Adapter with Model: RJ-AS120200U105-B; input: AC 100-240V, 50/60Hz, Max 1.0A; output: DC 12V, 2A. For more detailed features description, please refer to the user's manual.

Type of Modulation: BPSK, QPSK, 16QAM, 64QAM, CCK.
Antenna Type: Integral Antenna.

The Models: HAM2, HAO1, HAO2, HAO3, HAO4, HAO5, HAO6, HAO7, HAO8, HAO9 are the same as the Model: HA2800 in hardware aspect (electrically identical). The difference in model number serves as marketing strategy.

For electronic filing, the brief circuit description is saved with filename: descri.pdf.

2.2 Related Submittal(s) Grants
This is an application for certification of:
DTS- Part 15 Digital Transmission Systems (WiFi transmitter portion)

Remaining portions are subject to the following procedures:
1. Receiver portion of WiFi: exempt from technical requirement of this Part.
2. Other Digital Function: Report No.: 130514024SZN-002

2.3 Test Methodology
Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.4 (2009) and KDB 558074. Radiated emission measurement was performed in semi-anechoic chamber and conducted emission measurement was performed in shield room. For radiated emission measurement, preliminary scans were performed in the semi-anechoic chamber only to determine the worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the “Justification Section” of this Application. All other measurements were made in accordance with the procedures in part 2 of CFR 47.

2.4 Test Facility
The Semi-Anechoic chamber and shield room used to collect the radiated data and conducted data are **Intertek Testing Services Shenzhen Ltd. Kejiyuan Branch** and located at 6F, Block D, Huahan Building, Langshan Road, Nanshan District, Shenzhen, P. R. China. This test facility and site measurement data have been fully placed on file with the FCC (Registration Number: 242492).

EXHIBIT 3

SYSTEM TEST CONFIGURATION

3.0 System Test Configuration

3.1 Justification

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, all cables and accessories were manipulated to produce worst case emissions. The EUT was powered by AC 120V, 60Hz with Adapter (Model: RJ-AS120200U105-B; input: AC 100-240V, 50/60Hz, Max 1.0A; output: DC 12V, 2A)during the test.

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance.

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000 MHz. The resolution is 1 MHz or greater for frequencies above 1000 MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

Radiated emission measurement were performed the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

3.2 EUT Exercising Software

The EUT exercise program (provided by client) used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. The worst case configuration is used in all specified testing.

The parameters of test software setting:
During the test, Channel and power controlling software provided by the applicant was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the application and is going to be fixed on the firmware of the end product.

Power Parameters of IEEE 802.11b/g/n

Test software setting of IEEE 802.11b/g/n			
Channel No.	Output Power Level	Data rate	Modulation type
1,6,11	15.0	802.11b: 1-11Mbps	802.11b: CCK
	15.0	802.11g: 6-54Mbps	802.11g: BPSK, QPSK, 16QAM
1,6,11	15.0	802.11n-HT20: 6.5-65Mbps	802.11n: BPSK, QPSK, 16QAM,
3,6,9	15.0	802.11n-HT40: 13.5-135Mbps	802.11n: BPSK, QPSK, 16QAM, 64QAM

We test all data rate and only the worst – case data is shown in the report.

3.3 Special Accessories

N/A

3.4 Measurement Uncertainty

When determining of the test conclusion, the Measurement Uncertainty of test has been considered.

Uncertainty and Compliance – Unless the standard specifically states that measured values are to be extended by the measurement uncertainty in determining compliance, all compliance determinations are based on the actual measured value.

3.5 Equipment Modification

Any modifications installed previous to testing by IBN LLC. will be incorporated in each production model sold / leased in the United States.

No modifications were installed by Intertek Testing Services Shenzhen Ltd. Kejiyuan Branch.

3.6 Support Equipment List and Description

This product was tested in the following configuration:

Refer List:

Description	Manufacturer	Model No.
USB Memory1	TOSHIBA	UHYBS-004G-BL
USB Memory2	SanDisk	SDCZ36-002G-P36
USB Memory3	SSK	SFD010
USB Memory4	SanDisk	SDCZ36-004G-P36
Dummy Load	N/A	N/A
Adapter	Shenzhen ruijing Industrial Co. Ltd	Model: RJ-AS120200U105-B Input: AC 100-240V, 50/60Hz, 1.0A Output: DC 12V, 2A
Router	TP-Link	S535D24
RJ 45 Cable	N/A	Unshielded 4.0m
AV Cable	N/A	Unshielded 1.5m
Infrared receiver	IBN LLC.	NA
SPDIF Cable	N/A	Unshielded 4.5m
SPDIF load	N/A	N/A
HDMI Cable	N/A	Unshielded 1.2m
Test TV	SONY	KDL-24EX520

EXHIBIT 4

MEASUREMENT RESULTS

Applicant: IBN LLC. Date of Test: July 30, 2013
Model: HA2800

4.0 **Measurement Results**

4.1 Maximum Conducted Output Power at Antenna Terminals, FCC Rules 15.247(b) (3):

[ ] The antenna power of the EUT was connected to the input of a spectrum analyzer. Power was read directly and cable loss correction was added to the reading to obtain power at the EUT antenna terminals.

[ ] The antenna port of the EUT was connected to the input of a spectrum analyzer. The analyzer was set according to the FCC KDB 558074 spectrum analyzer's integrated band power measurement function with band limits set equal to the EBW band edges and power was read directly in dBm. External attenuation and cable loss were compensated from the measured value.

[×] The antenna power of the EUT was connected to the input of a broadband peak RF power meter. The power meter have a video bandwidth that is greater than DTS bandwidth and utilize a fast-responding diode detector. Power was read directly at the EUT antenna terminals with cable loss added.

For antennas with gains of 6 dBi or less, maximum allowed Transmitter output is 1 watt (+30 dBm).

IEEE 802.11b (Antenna Gain = 2dBi) (CCK, 1Mbps)		
Frequency (MHz)	Output in dBm	Output in mWatt
Low Channel: 2412	15.51	35.56
Middle Channel: 2437	15.20	33.11
High Channel: 2462	14.34	27.16

IEEE 802.11g (Antenna Gain = 2dBi) (16QAM, 6Mbps)		
Frequency (MHz)	Output in dBm	Output in mWatt
Low Channel: 2412	19.46	88.31
Middle Channel: 2437	19.02	79.80
High Channel: 2462	18.75	74.99

IEEE 802.11n-HT20 (Antenna Gain = 2dBi) (16QAM, 6.5Mbps)		
Frequency (MHz)	Output in dBm	Output in mWatt
Low Channel: 2412	19.27	84.53
Middle Channel: 2437	18.59	72.28
High Channel: 2462	18.22	66.37

IEEE 802.11n-HT40 (Antenna Gain = 2dBi) (64QAM, 13.5Mbps)		
Frequency (MHz)	Output in dBm	Output in mWatt
Low Channel: 2422	19.26	84.33
Middle Channel: 2437	19.29	84.92
High Channel: 2452	19.00	79.43

Cable loss: 0.6 dB External Attenuation: 0 dB

EUT max. output level (dBm)= 19.46dBm

Applicant: IBN LLC. Date of Test: July 30, 2013
Model: HA2800

4.2 Minimum 6 dB RF Bandwidth, FCC Rule 15.247(a) (2):

The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RES BW was set to 100 KHz according to FCC KDB 558074. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was taken, a DISPLAY line was drawn 6 dB lower than PEAK level. The 6dB bandwidth was determined from where the channel output spectrum intersected the display line.

Limit: The 6 dB Bandwidth is at least 500 kHz.

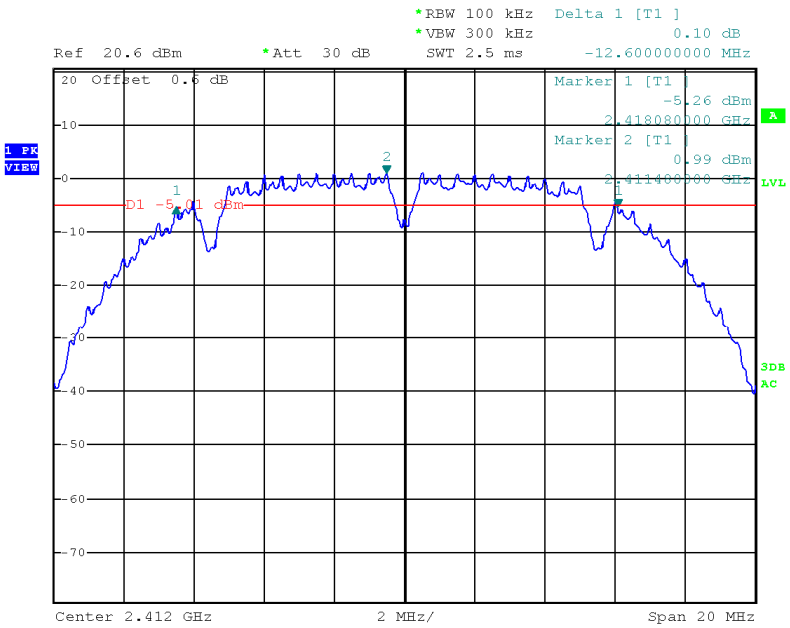
IEEE 802.11b (CCK, 1Mbps)	
Frequency (MHz)	6 dB Bandwidth (MHz)
2412	12.60
2437	12.16
2462	12.12

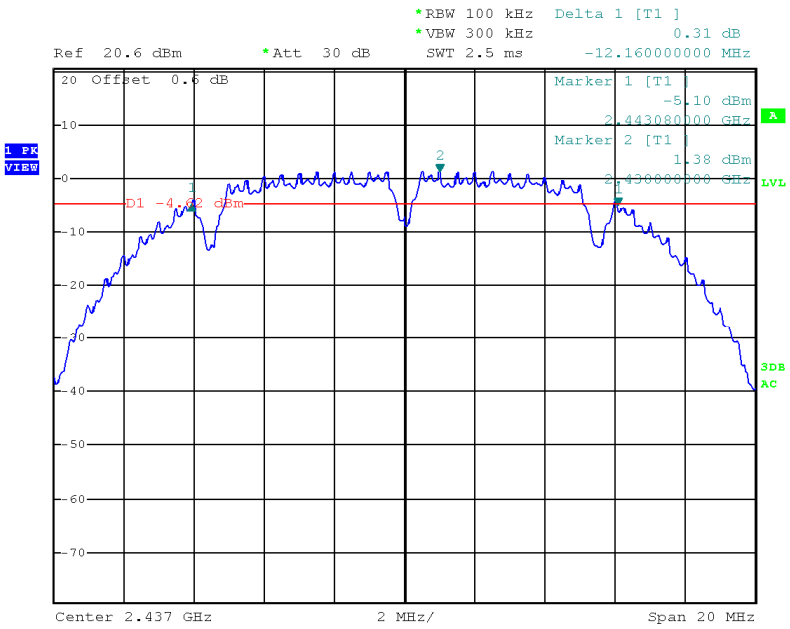
IEEE 802.11g (16QAM, 6Mbps)	
Frequency (MHz)	6 dB Bandwidth (MHz)
2412	16.48
2437	16.24
2462	16.44
IEEE 802.11n-HT20 (16QAM, 6.5Mbps)	
Frequency (MHz)	6 dB Bandwidth (MHz)
2412	17.24
2437	16.96
2462	17.12

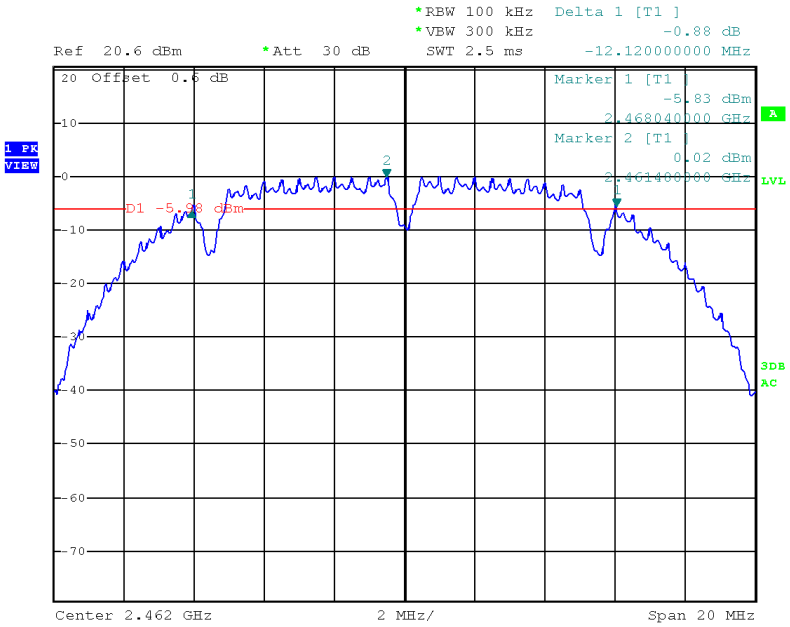
IEEE 802.11n-HT40 (64QAM, 13.5Mbps)	
Frequency (MHz)	6 dB Bandwidth (MHz)
2422	35.20
2437	35.20
2452	35.20

The test plots are attached as below.

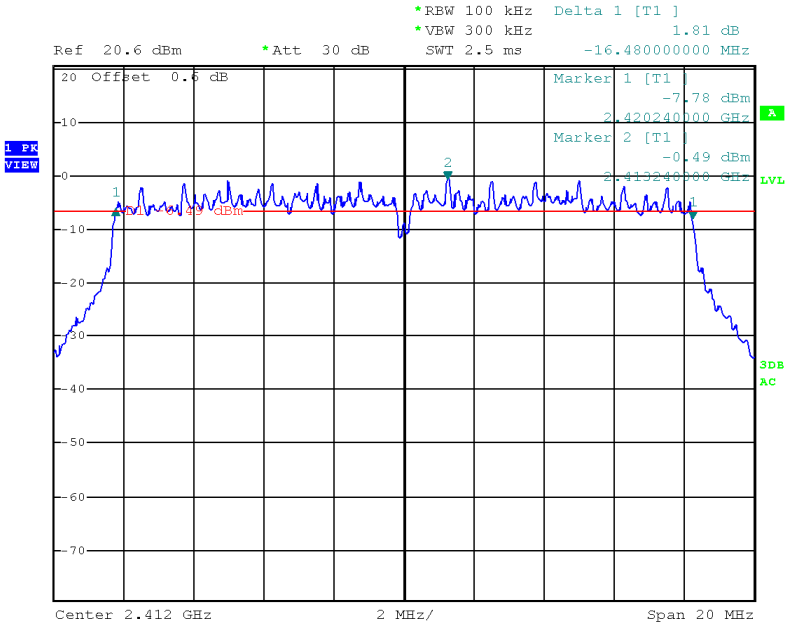
802.11b

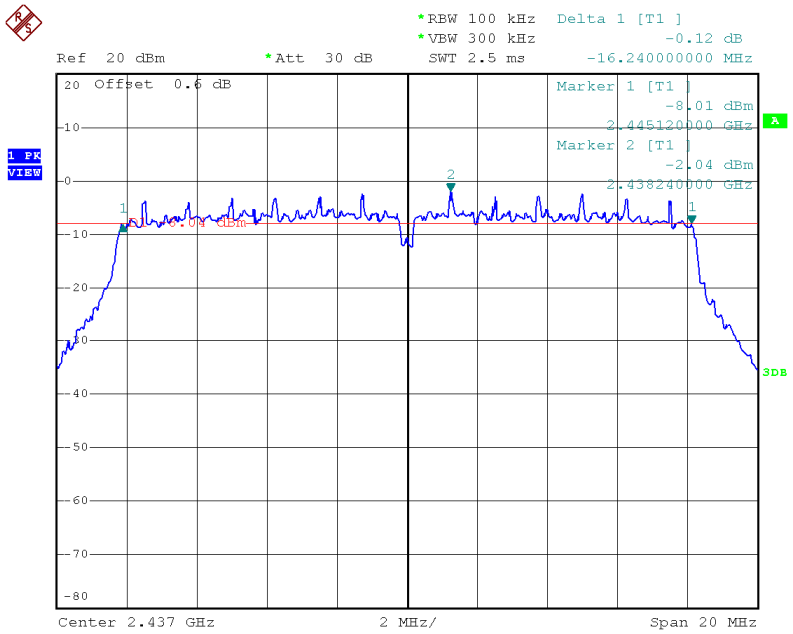

*RBW 100 kHz
*VBW 300 kHz
SWT 2.5 ms
Delta 1 [T1]
0.10 dB
-12.600000000 MHz
Ref 20.6 dBm
*Att 30 dB
20 Offset 0.6 dB
Marker 1 [T1]
-5.26 dBm
2.418080000 GHz
Marker 2 [T1]
0.99 dBm
2.411400000 GHz
1 PK VIEW
D1 -5.01 dBm
LVL
3DB AC
Center 2.412 GHz
2 MHz/
Span 20 MHz

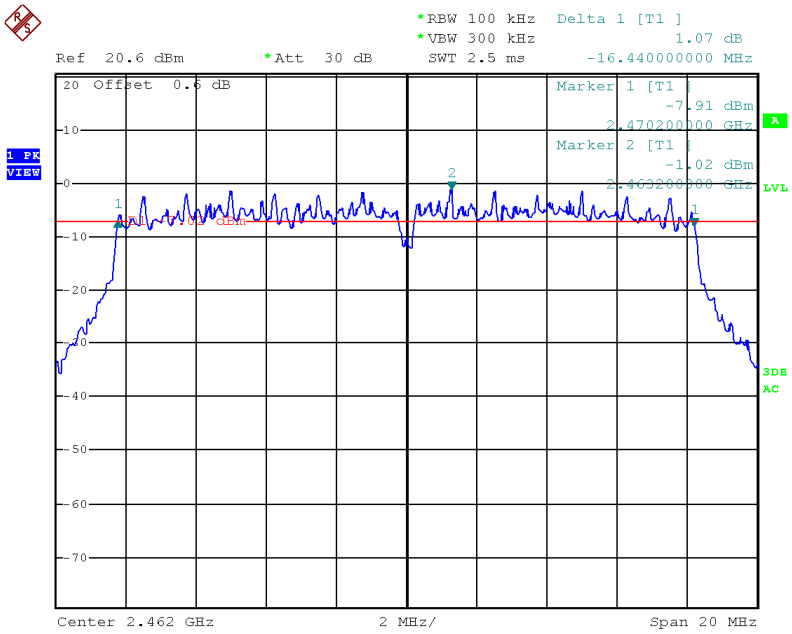

*RBW 100 kHz
*VBW 300 kHz
SWT 2.5 ms
Delta 1 [T1]
0.31 dB
-12.160000000 MHz
Ref 20.6 dBm
*Att 30 dB
20 Offset 0.6 dB
Marker 1 [T1]
-5.10 dBm
2.443080000 GHz
Marker 2 [T1]
1.38 dBm
2.430000000 GHz
1 PK VIEW
D1 -4.62 dBm
LVL
3DB AC
Center 2.437 GHz
2 MHz/
Span 20 MHz


*RBW 100 kHz
*VBW 300 kHz
SWT 2.5 ms
Delta 1 [T1]
-0.88 dB
-12.120000000 MHz
Ref 20.6 dBm
*Att 30 dB
20 Offset 0.6 dB
Marker 1 [T1]
-5.83 dBm
2.468040000 GHz
Marker 2 [T1]
0.02 dBm
2.461400300 GHz
1 PK VIEW
D1 -5.98 dBm
LVL
3DB AC
Center 2.462 GHz
2 MHz/
Span 20 MHz

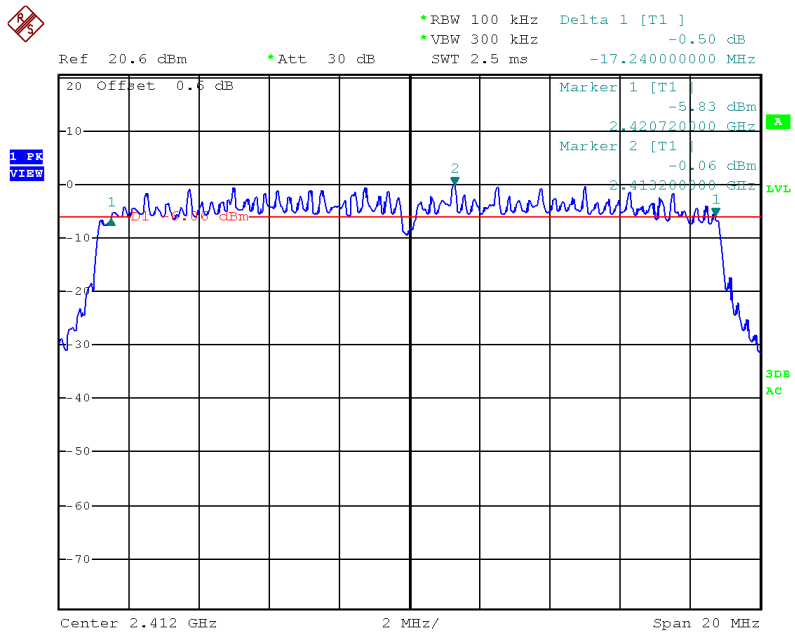
802.11g

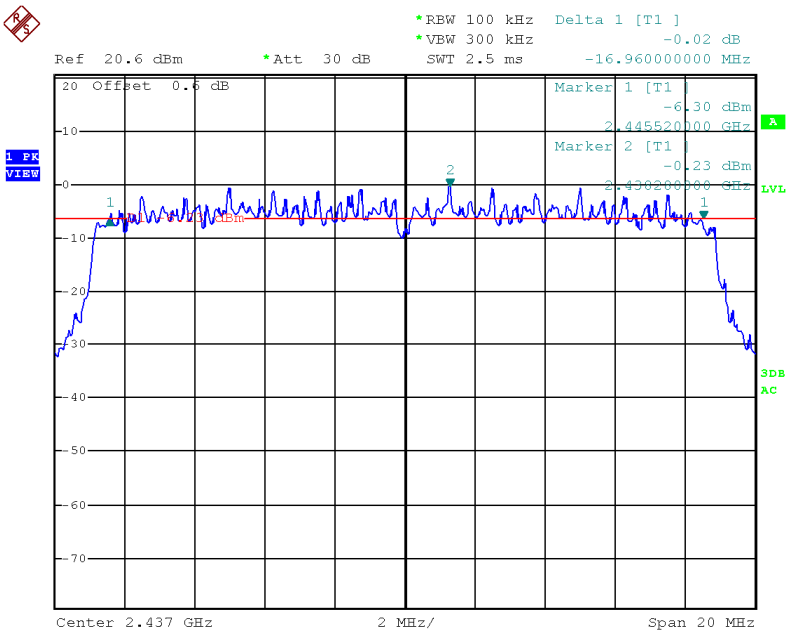

*RBW 100 kHz
*VBW 300 kHz
SWT 2.5 ms
Delta 1 [T1]
1.81 dB
-16.480000000 MHz
Ref 20.6 dBm
*Att 30 dB
20 Offset 0.6 dB
Marker 1 [T1]
-7.78 dBm
2.420240000 GHz
Marker 2 [T1]
-0.49 dBm
2.413240300 GHz
1 PK VIEW
LVL
3DB AC
Center 2.412 GHz
2 MHz/
Span 20 MHz

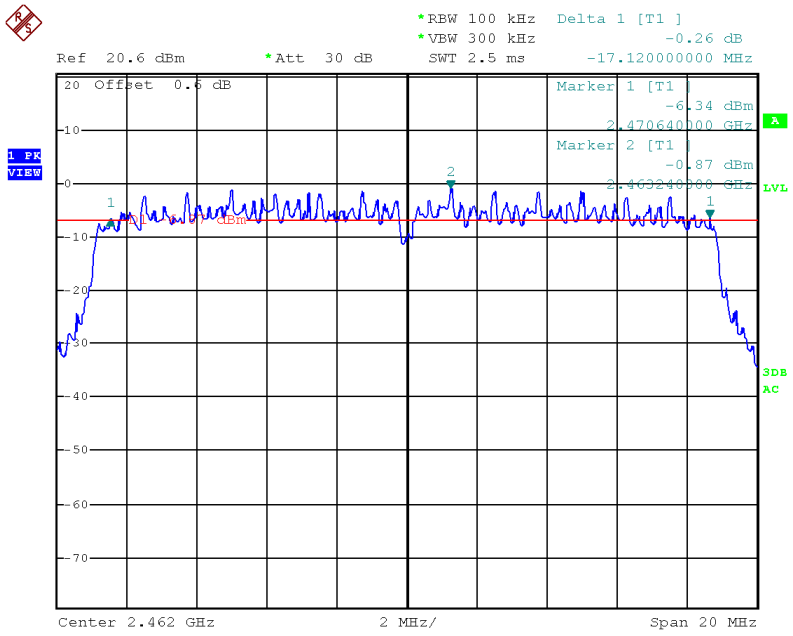

*RBW 100 kHz
*VBW 300 kHz
Ref 20 dBm
*Att 30 dB
SWT 2.5 ms
Delta 1 [T1]
-0.12 dB
-16.240000000 MHz
20 Offset 0.6 dB
Marker 1 [T1]
-8.01 dBm
2.445120000 GHz
Marker 2 [T1]
-2.04 dBm
2.438240000 GHz
1 PK VIEW
3DB
Center 2.437 GHz
2 MHz/
Span 20 MHz


*RBW 100 kHz
*VBW 300 kHz
Ref 20.6 dBm
*Att 30 dB
SWT 2.5 ms
Delta 1 [T1]
1.07 dB
-16.440000000 MHz
20 Offset 0.6 dB
Marker 1 [T1]
-7.91 dBm
2.470200000 GHz
Marker 2 [T1]
-1.02 dBm
1 PK VIEW
LVL
3DB
AC
Center 2.462 GHz
2 MHz/
Span 20 MHz

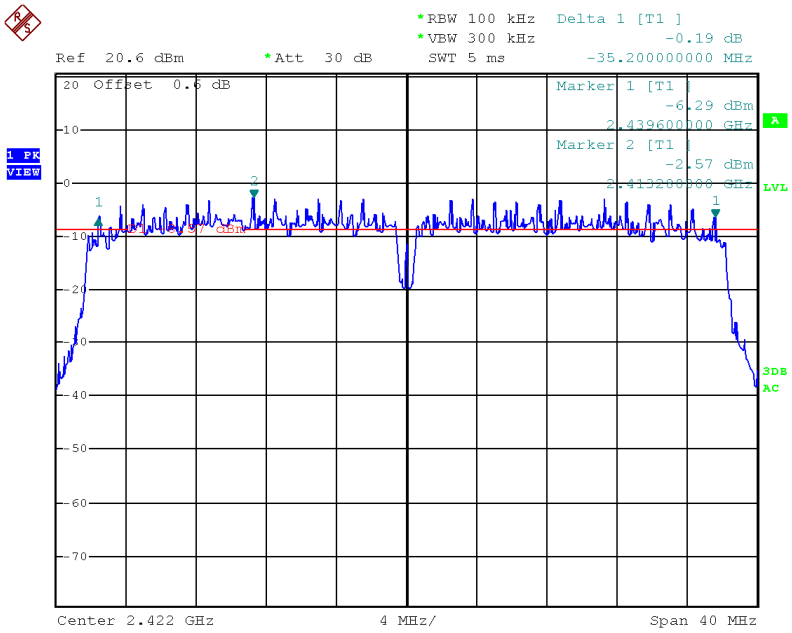
802.11 n-HT20

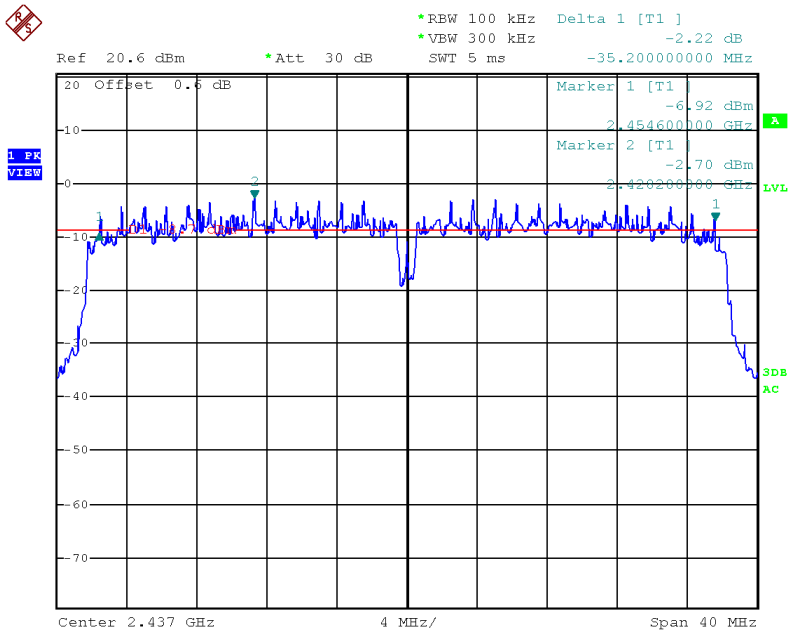

*RBW 100 kHz
*VBW 300 kHz
SWT 2.5 ms
Delta 1 [T1]
-0.50 dB
-17.240000000 MHz
Ref 20.6 dBm
*Att 30 dB
20 Offset 0.6 dB
Marker 1 [T1]
-5.83 dBm
2.420720000 GHz
Marker 2 [T1]
-0.06 dBm
2.413200000 GHz
1 PK VIEW
LVL
3DB AC
Center 2.412 GHz
2 MHz/
Span 20 MHz

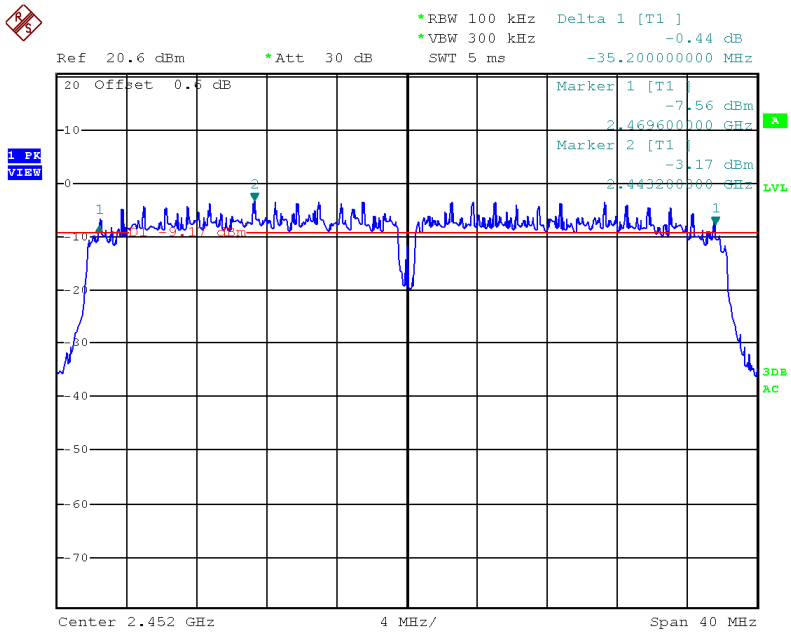

*RBW 100 kHz
*VBW 300 kHz
SWT 2.5 ms
Delta 1 [T1]
-0.02 dB
-16.960000000 MHz
Ref 20.6 dBm
*Att 30 dB
20 Offset 0.6 dB
Marker 1 [T1]
-6.30 dBm
2.445520000 GHz
Marker 2 [T1]
-0.23 dBm
2.430200000 GHz
1 PK VIEW
LVL
3DB AC
Center 2.437 GHz
2 MHz/
Span 20 MHz


*RBW 100 kHz
*VBW 300 kHz
SWT 2.5 ms
Delta 1 [T1]
-0.26 dB
-17.120000000 MHz
Ref 20.6 dBm
*Att 30 dB
20 Offset 0.6 dB
Marker 1 [T1]
-6.34 dBm
2.470640000 GHz
Marker 2 [T1]
-0.87 dBm
2.462240000 GHz
1 PK VIEW
LVL
3DB AC
Center 2.462 GHz
2 MHz/
Span 20 MHz

802.11 n-HT40


*RBW 100 kHz
*VBW 300 kHz
SWT 5 ms
Delta 1 [T1]
-0.19 dB
-35.200000000 MHz
Ref 20.6 dBm
*Att 30 dB
20 Offset 0.6 dB
Marker 1 [T1]
-6.29 dBm
2.439600000 GHz
Marker 2 [T1]
-2.57 dBm
2.413200000 GHz
1 PK VIEW
LVL
3DB AC
Center 2.422 GHz
4 MHz/
Span 40 MHz


*RBW 100 kHz
*VBW 300 kHz
SWT 5 ms
Delta 1 [T1]
-2.22 dB
-35.200000000 MHz
Ref 20.6 dBm
*Att 30 dB
20 Offset 0.6 dB
Marker 1 [T1]
-6.92 dBm
2.454600000 GHz
Marker 2 [T1]
-2.70 dBm
2.420200000 GHz
1 PK VIEW
A
LVL
3DB AC
Center 2.437 GHz
4 MHz/
Span 40 MHz


*RBW 100 kHz
*VBW 300 kHz
SWT 5 ms
Delta 1 [T1]
-0.44 dB
-35.200000000 MHz
Ref 20.6 dBm
*Att 30 dB
20 Offset 0.6 dB
Marker 1 [T1]
-7.56 dBm
2.469600000 GHz
Marker 2 [T1]
-3.17 dBm
2.443200000 GHz
1 PK VIEW
A
LVL
3DB AC
Center 2.452 GHz
4 MHz/
Span 40 MHz

Applicant: IBN LLC. Date of Test: July 30, 2013
Model: HA2800

4.3 Maximum Power Density Reading, FCC Rule 15.247(e):

The Measurement Procedure PKPSD was set according to the FCC KDB 558074.
Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW. If the measured value exceed limit, reduce the RBW (no less than 3KHz) to retest.

Antenna output of the EUT was coupled directly to spectrum analyzer; if an external attenuator and/or cable was used, these losses are compensated for with the analyzer OFFSET function.

Limit: The Power Density does not exceed 8dBm/ 3 kHz.

IEEE 802.11b (CCK, 1Mbps)	
Frequency (MHz)	Power Density with RBW 100KHz
2412	1.16
2437	0.65
2462	-0.15

IEEE 802.11g (16QAM, 6Mbps)	
Frequency (MHz)	Power Density with RBW 100KHz
2412	0.01
2437	-0.98
2462	-1.16

IEEE 802.11n-HT20 (16QAM, 6.5Mbps)	
Frequency (MHz)	Power Density with RBW 100KHz
2412	-0.16
2437	-0.36
2462	-1.08

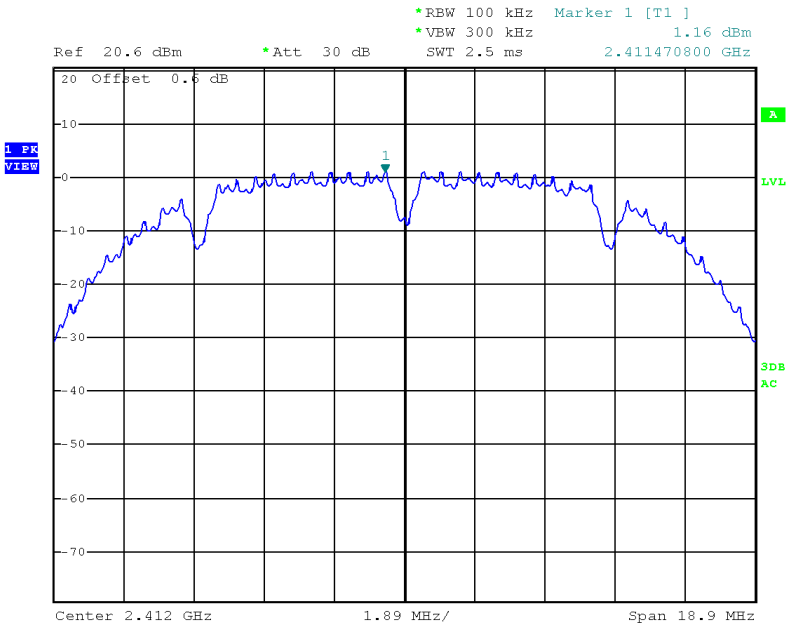
IEEE 802.11n-HT40 (64QAM, 13.5Mbps)	
Frequency (MHz)	Power Density with RBW 100KHz
2422	-2.74
2437	-2.91
2452	-3.13

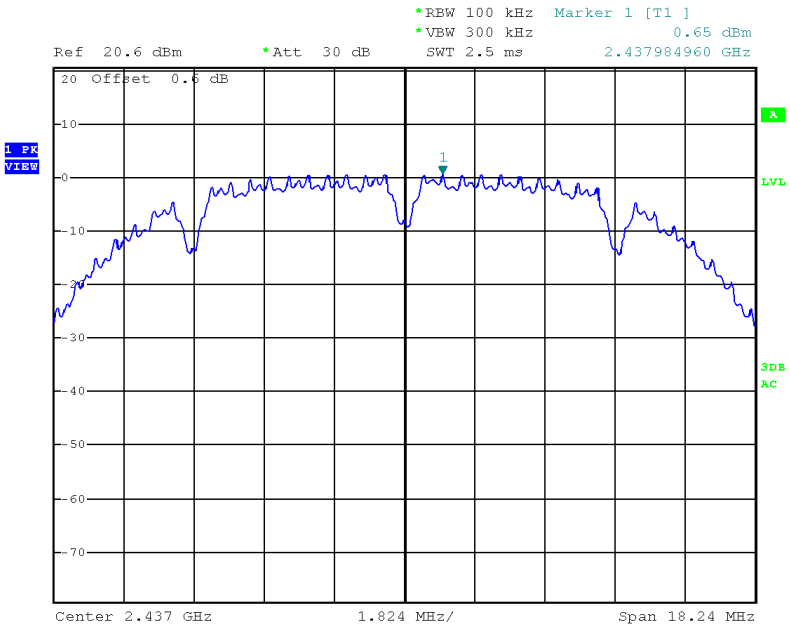
Cable loss: 0.6 dB External Attenuation: 0 dB

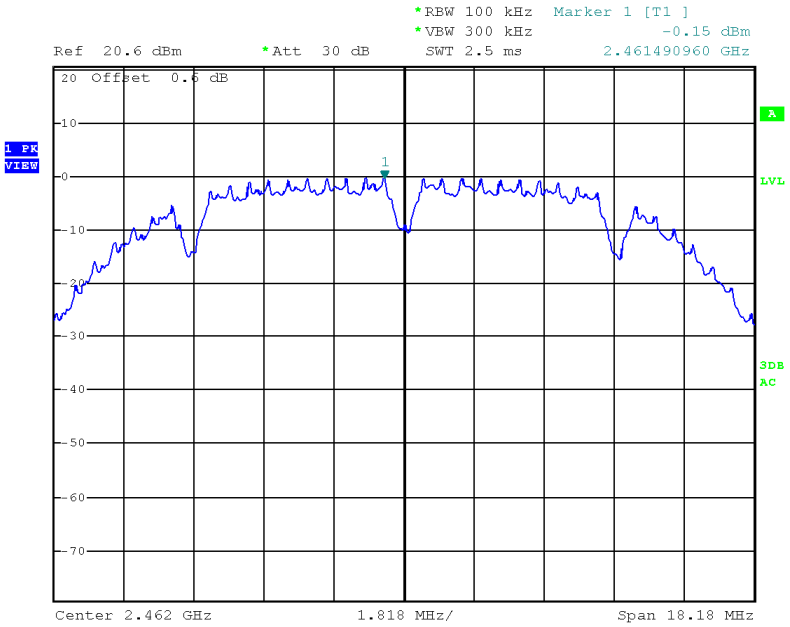
Cable loss, external attenuation has been included in OFFSET function

The test plots are attached as below.

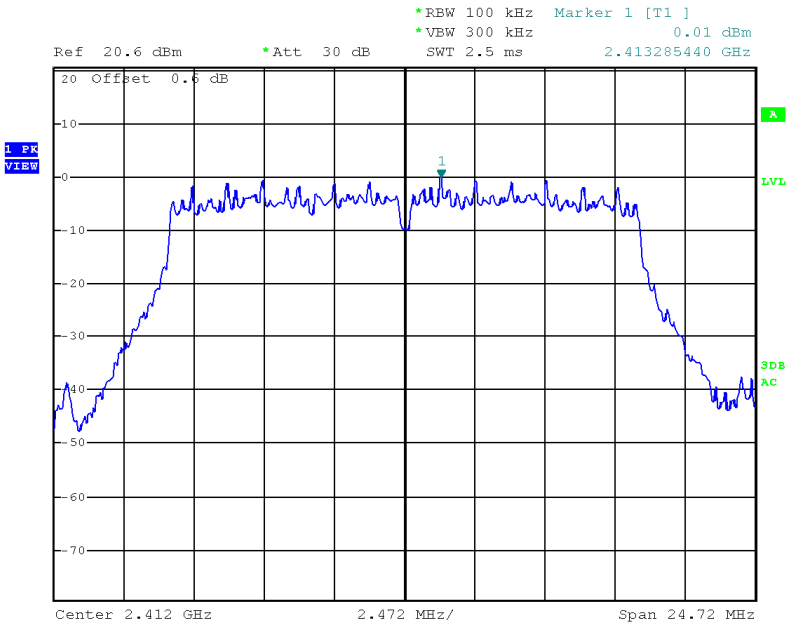
802.11b

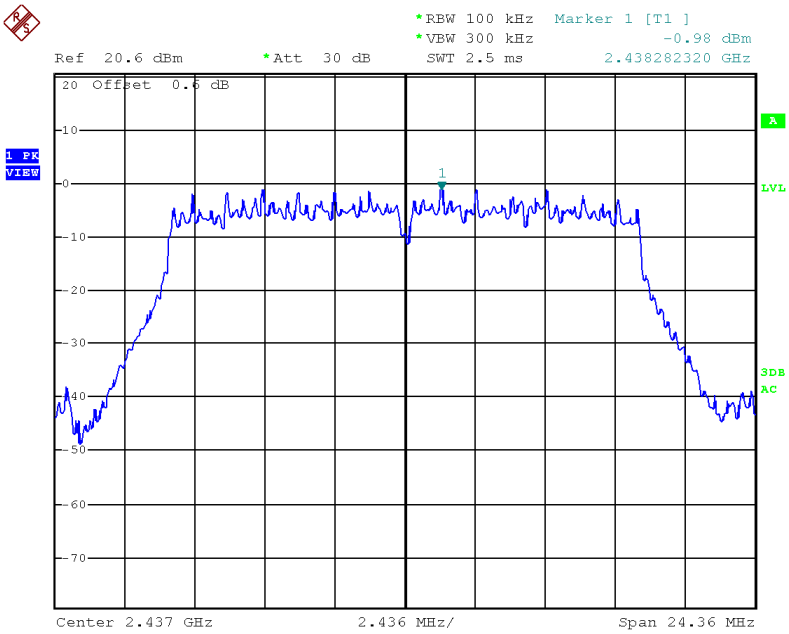

*RBW 100 kHz
Marker 1 [T1]
*VBW 300 kHz
1.16 dBm
Ref 20.6 dBm
*Att 30 dB
SWT 2.5 ms
2.411470800 GHz
20 Offset 0.6 dB
1 PK VIEW
A
LVL
3DB AC
Center 2.412 GHz
1.89 MHz/
Span 18.9 MHz

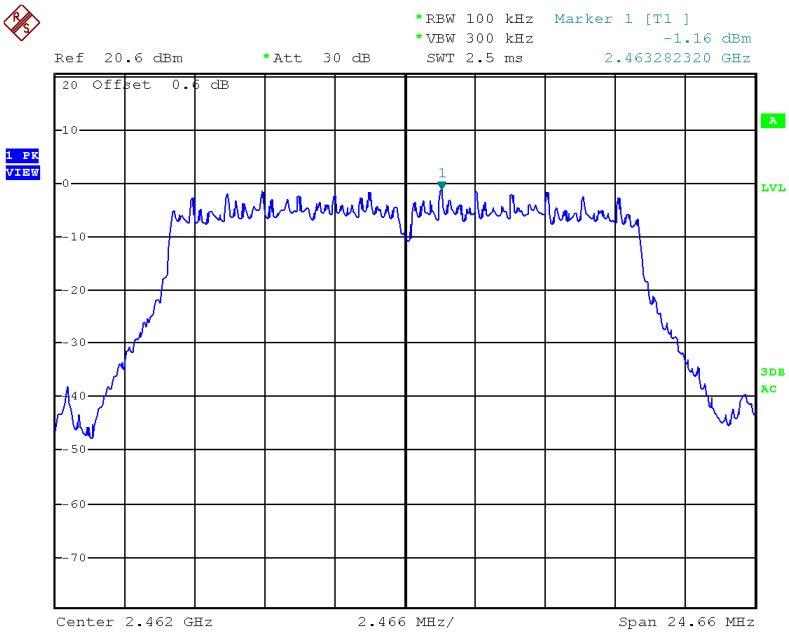

*RBW 100 kHz
Marker 1 [T1]
*VBW 300 kHz
0.65 dBm
Ref 20.6 dBm
*Att 30 dB
SWT 2.5 ms
2.437984960 GHz
20 Offset 0.6 dB
1 PK VIEW
A
LVL
3DB AC
Center 2.437 GHz
1.824 MHz/
Span 18.24 MHz


*RBW 100 kHz
Marker 1 [T1]
*VBW 300 kHz
-0.15 dBm
Ref 20.6 dBm
*Att 30 dB
SWT 2.5 ms
2.461490960 GHz
20 Offset 0.6 dB
1 PK VIEW
A
LVL
3DB AC
Center 2.462 GHz
1.818 MHz/
Span 18.18 MHz

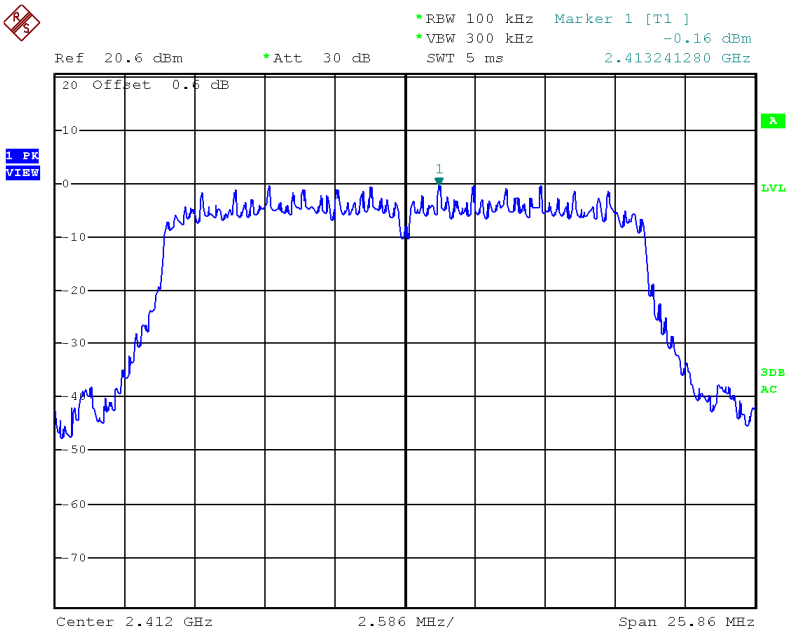
802.11g

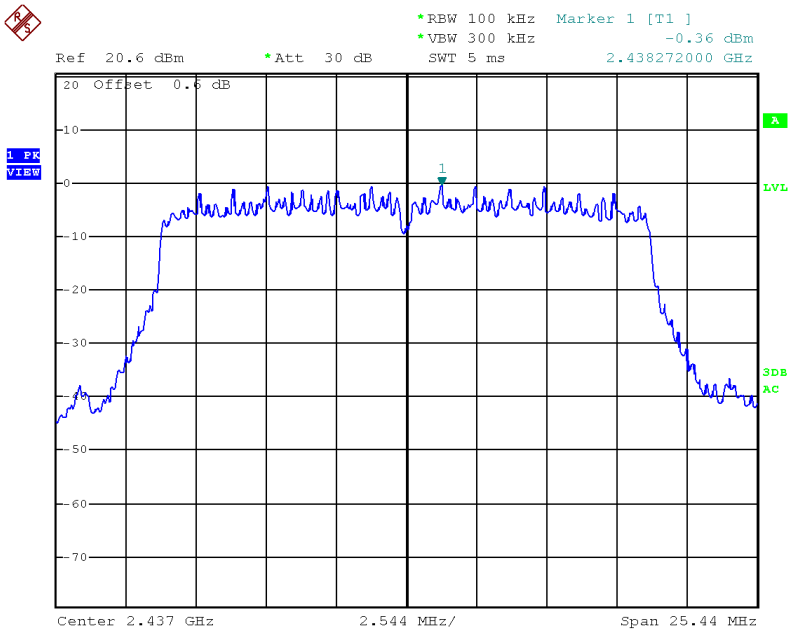

*RBW 100 kHz
Marker 1 [T1]
*VBW 300 kHz
0.01 dBm
Ref 20.6 dBm
*Att 30 dB
SWT 2.5 ms
2.413285440 GHz
20 Offset 0.6 dB
1 PK VIEW
A
LVL
3DB AC
Center 2.412 GHz
2.472 MHz/
Span 24.72 MHz

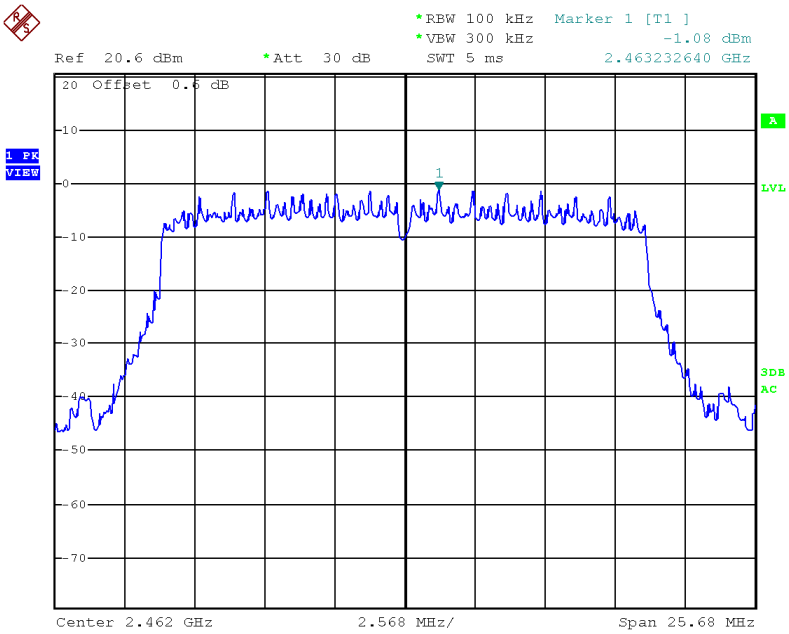

*RBW 100 kHz
Marker 1 [T1]
*VBW 300 kHz
-0.98 dBm
Ref 20.6 dBm
*Att 30 dB
SWT 2.5 ms
2.438282320 GHz
20 Offset 0.6 dB
1 PK VIEW
A
LVL
3DB AC
Center 2.437 GHz
2.436 MHz/
Span 24.36 MHz


*RBW 100 kHz
Marker 1 [T1]
*VBW 300 kHz
-1.16 dBm
Ref 20.6 dBm
*Att 30 dB
SWT 2.5 ms
2.463282320 GHz
20 Offset 0.6 dB
1 PK VIEW
A
LVL
3DB AC
Center 2.462 GHz
2.466 MHz/
Span 24.66 MHz

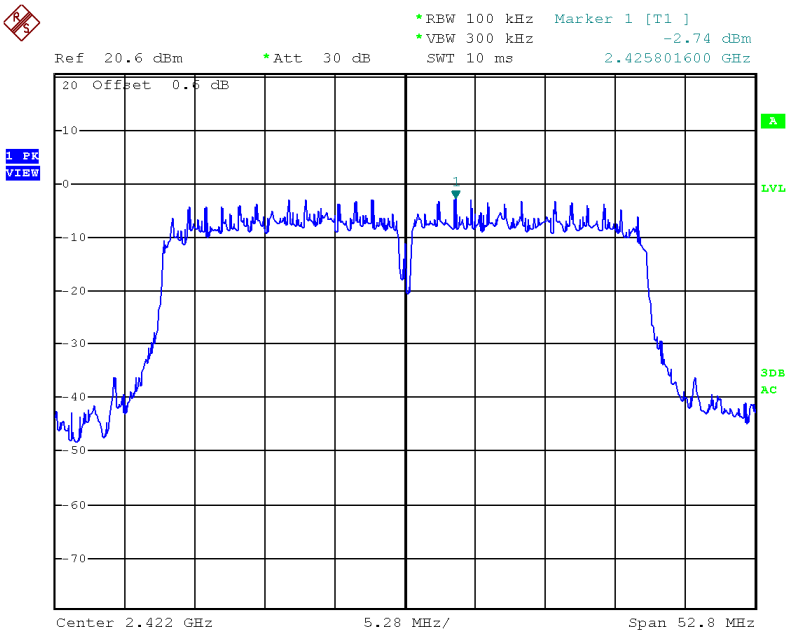
802.11 n-HT20

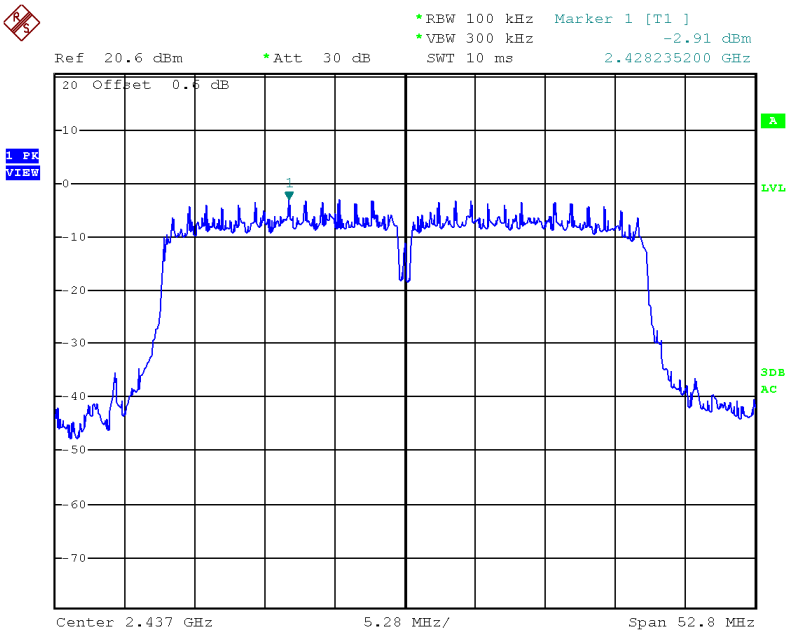

*RBW 100 kHz
Marker 1 [T1]
*VBW 300 kHz
-0.16 dBm
Ref 20.6 dBm
*Att 30 dB
SWT 5 ms
2.413241280 GHz
20 Offset 0.6 dB
1 PK VIEW
A
LVL
3DB AC
Center 2.412 GHz
2.586 MHz/
Span 25.86 MHz

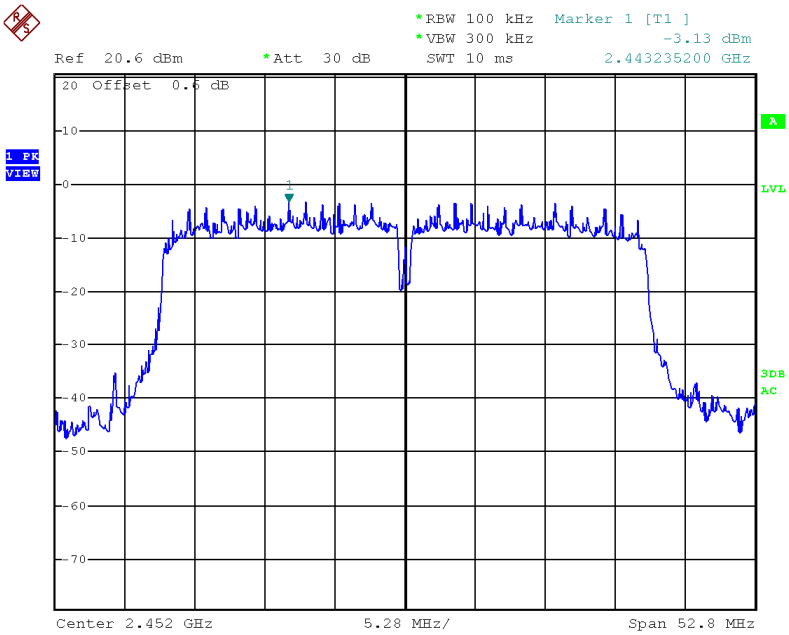

*RBW 100 kHz
Marker 1 [T1]
*VBW 300 kHz
-0.36 dBm
Ref 20.6 dBm
*Att 30 dB
SWT 5 ms
2.438272000 GHz
20 Offset 0.6 dB
1 PK VIEW
A
LVL
3DB AC
Center 2.437 GHz
2.544 MHz/
Span 25.44 MHz


*RBW 100 kHz
Marker 1 [T1]
*VBW 300 kHz
-1.08 dBm
Ref 20.6 dBm
*Att 30 dB
SWT 5 ms
2.463232640 GHz
20 Offset 0.6 dB
1 PK VIEW
A
LVL
3DB AC
Center 2.462 GHz
2.568 MHz/
Span 25.68 MHz

802.11 n-HT40


*RBW 100 kHz
Marker 1 [T1]
*VBW 300 kHz
-2.74 dBm
Ref 20.6 dBm
*Att 30 dB
SWT 10 ms
2.425801600 GHz
20 Offset 0.6 dB
1 PK VIEW
A
LVL
3DB AC
Center 2.422 GHz
5.28 MHz/
Span 52.8 MHz


*RBW 100 kHz
Marker 1 [T1]
*VBW 300 kHz
-2.91 dBm
Ref 20.6 dBm
*Att 30 dB
SWT 10 ms
2.428235200 GHz
20 Offset 0.6 dB
1 PK VIEW
A
LVL
3DB AC
Center 2.437 GHz
5.28 MHz/
Span 52.8 MHz


*RBW 100 kHz
Marker 1 [T1]
*VBW 300 kHz
-3.13 dBm
Ref 20.6 dBm
*Att 30 dB
SWT 10 ms
2.443235200 GHz
20 Offset 0.6 dB
1 PK VIEW
A
LVL
3DB AC
Center 2.452 GHz
5.28 MHz/
Span 52.8 MHz

4.4 Out of Band Conducted Emissions, FCC Rule 15.247(d)

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. The Measurement Procedure was set according to the FCC KDB 558074.

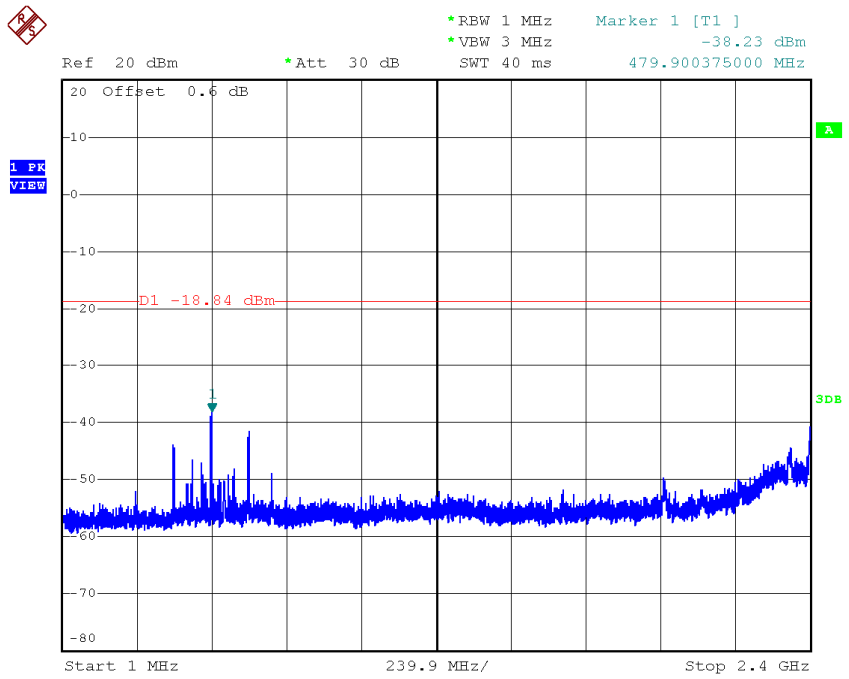
Refer to the attached test plots for out of band conducted emissions data with rate of 1Mbps for 802.11b, 6Mbps for 802.11g, 6.5Mbps for 802.11n-HT20 and 13.5Mbps for 802.11n-HT40.

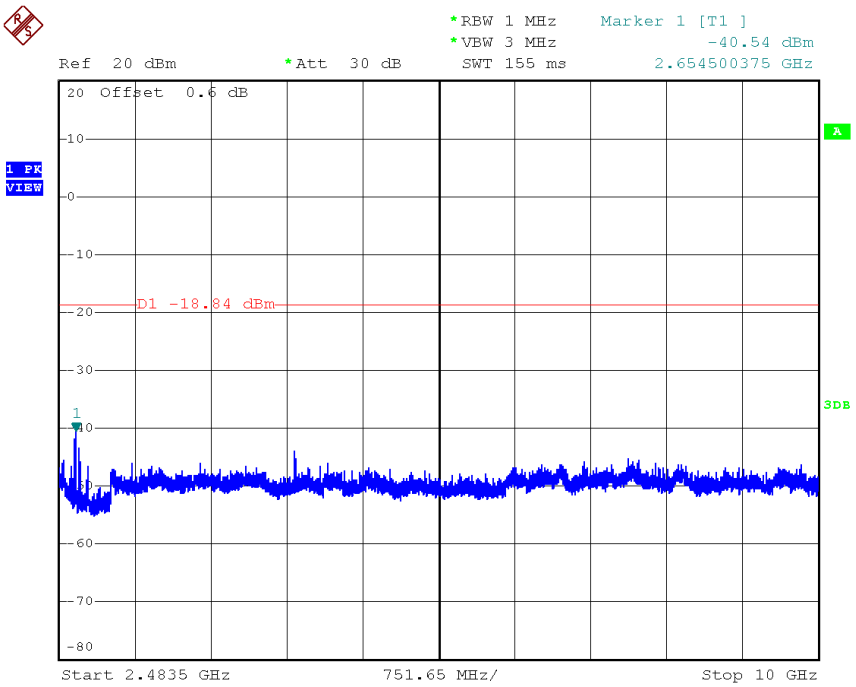
The test plots showed all spurious emission up to the tenth harmonic was measured and they were found to be at least 20 dB below the highest level of the desired power in the passband.

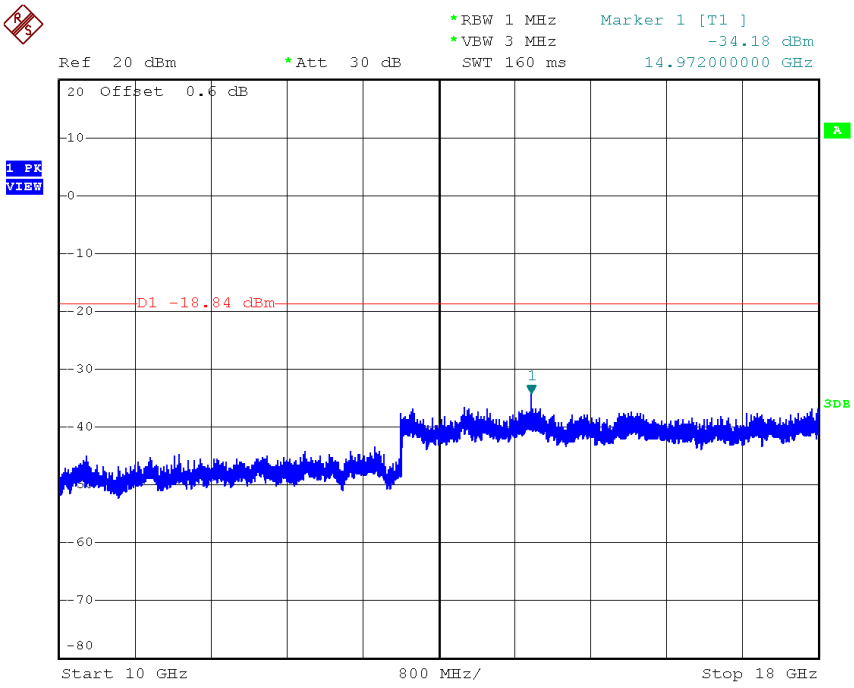
Note: the RBW was set to 1MHz rather than 100KHz in order to increase the measurement speed, if found out fail point at 1MHz RBW, the RBW will be reduced to 100KHz to determine the final result.

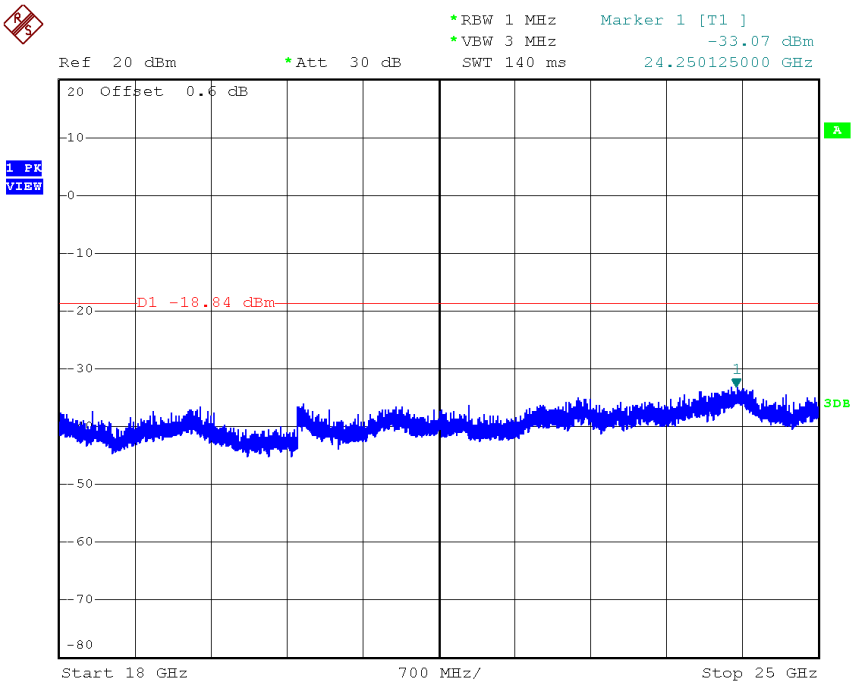
The test plots are attached as below.

802.11b
Channel 01 (2412MHz) Reference Level: 1.16dBm

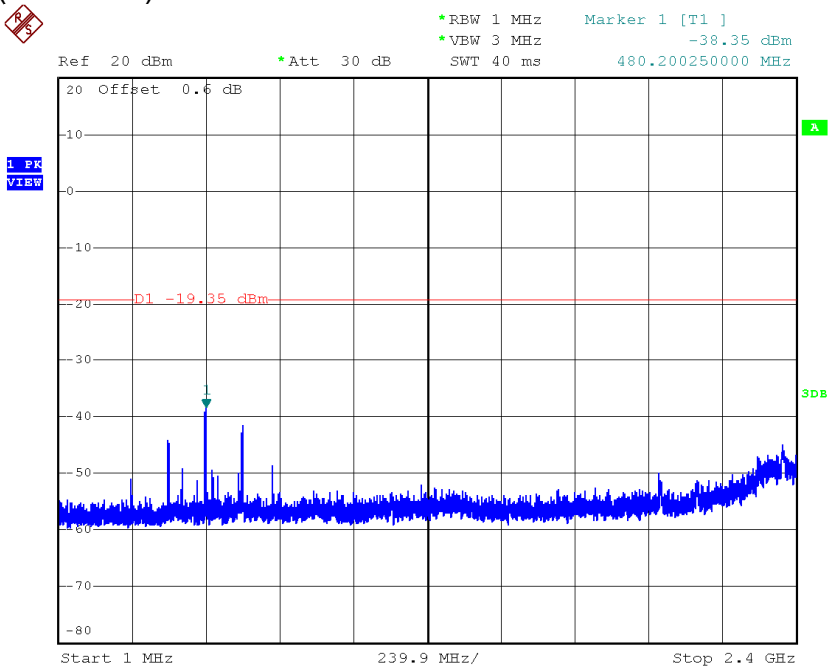


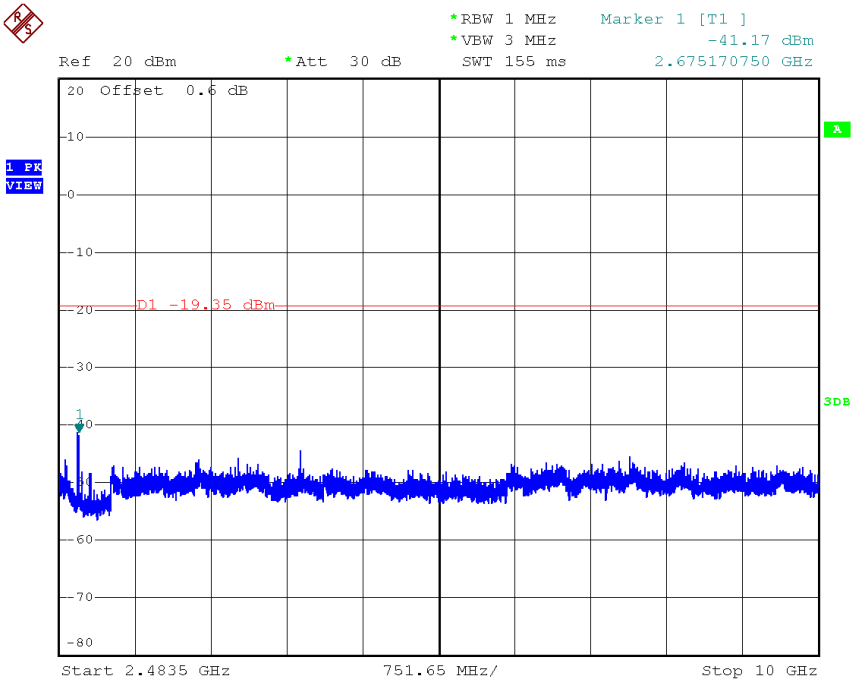


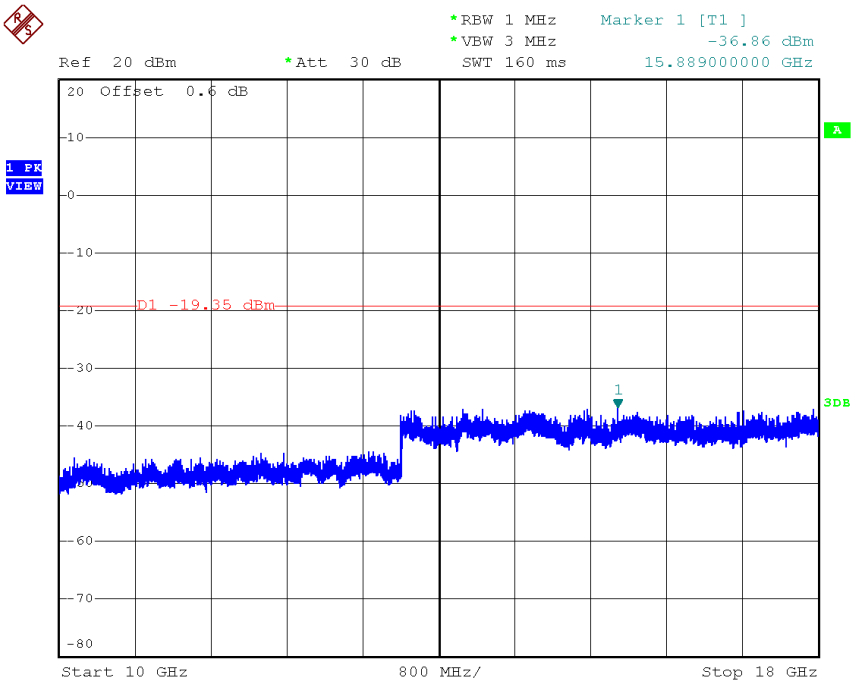

*RBW 1 MHz
*VBW 3 MHz
SWT 160 ms
Marker 1 [T1]
-34.18 dBm
14.972000000 GHz
Ref 20 dBm
*Att 30 dB
20 Offset 0.6 dB
1 PK VIEW
D1 -18.84 dBm
3DB
Start 10 GHz
800 MHz/
Stop 18 GHz

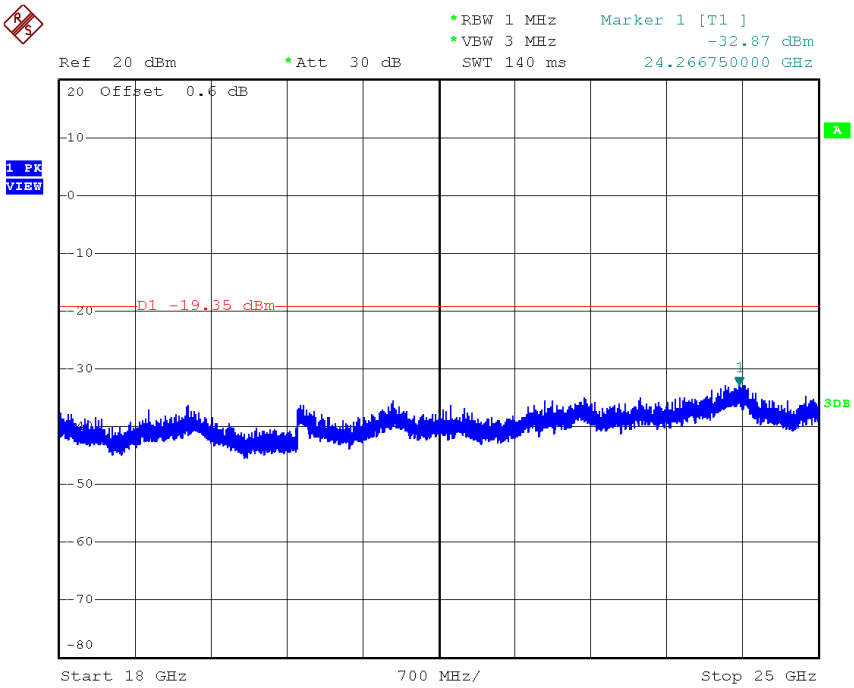

*RBW 1 MHz
*VBW 3 MHz
SWT 140 ms
Marker 1 [T1]
-33.07 dBm
24.250125000 GHz
Ref 20 dBm
*Att 30 dB
20 Offset 0.6 dB
1 PK VIEW
D1 -18.84 dBm
3DB
Start 18 GHz
700 MHz/
Stop 25 GHz

Channel 06 (2437MHz) Reference Level: 0.65dBm

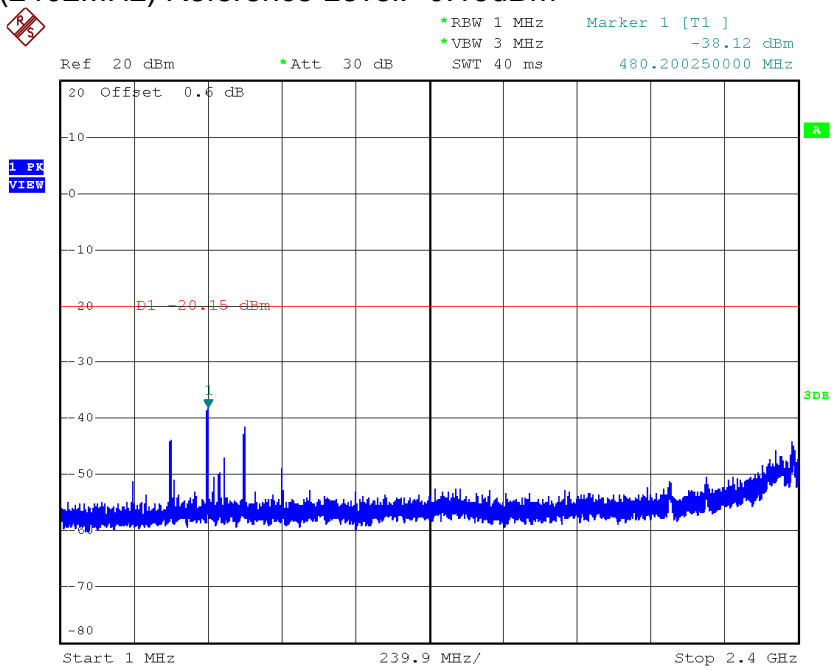


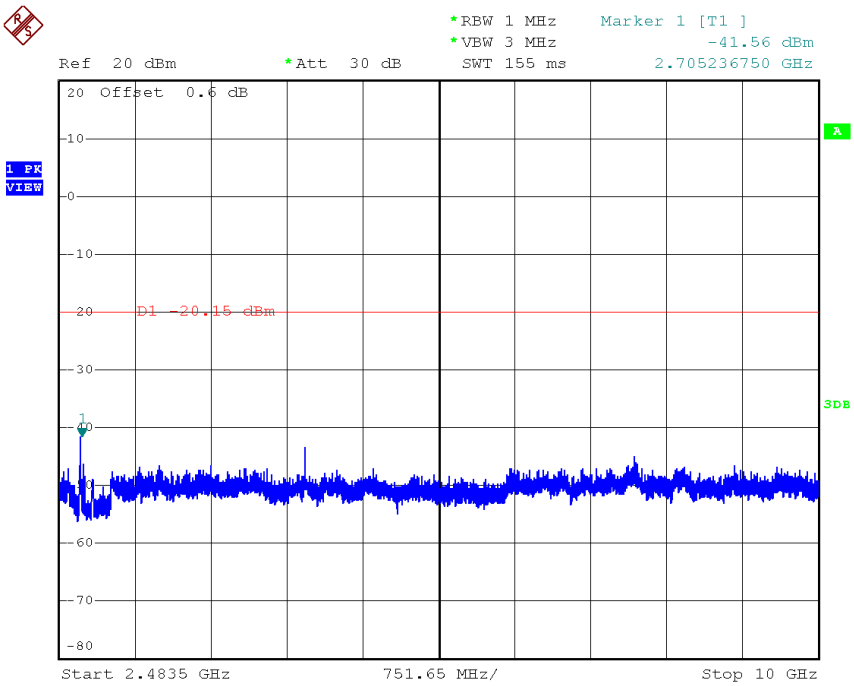


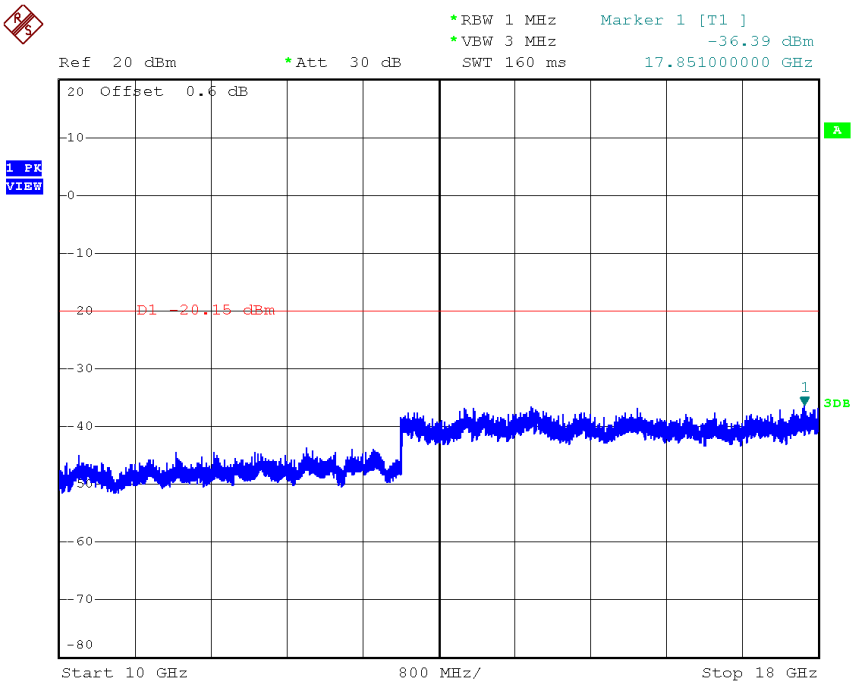

*RBW 1 MHz
Marker 1 [T1]
*VBW 3 MHz
-36.86 dBm
Ref 20 dBm
*Att 30 dB
SWT 160 ms
15.889000000 GHz
20 Offset 0.6 dB
1 PK VIEW
A
D1 -19.35 dBm
3DB
Start 10 GHz
800 MHz/
Stop 18 GHz

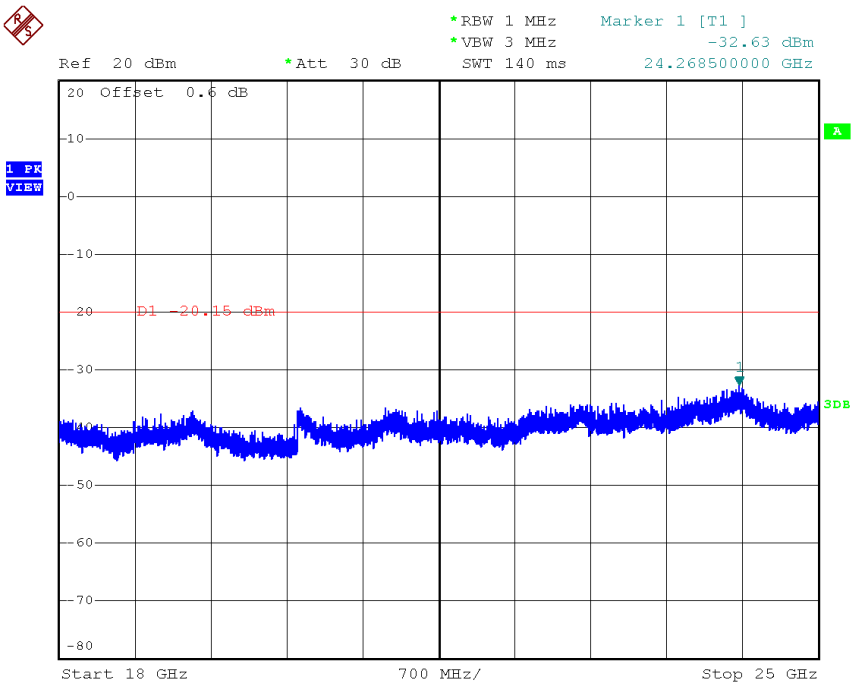

*RBW 1 MHz
Marker 1 [T1]
*VBW 3 MHz
-32.87 dBm
Ref 20 dBm
*Att 30 dB
SWT 140 ms
24.266750000 GHz
20 Offset 0.6 dB
1 PK VIEW
A
D1 -19.35 dBm
3DB
Start 18 GHz
700 MHz/
Stop 25 GHz

Channel 11 (2462MHz) Reference Level: -0.15dBm

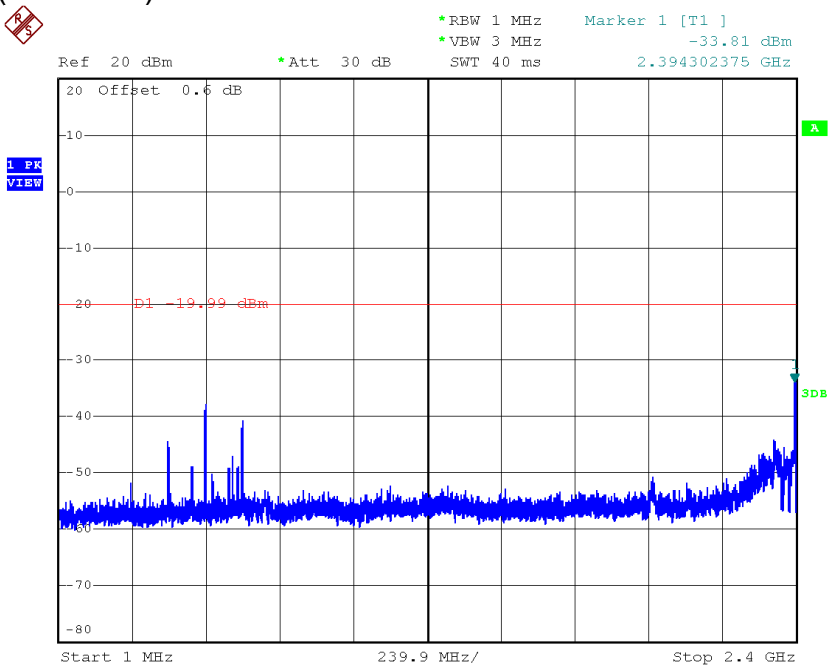


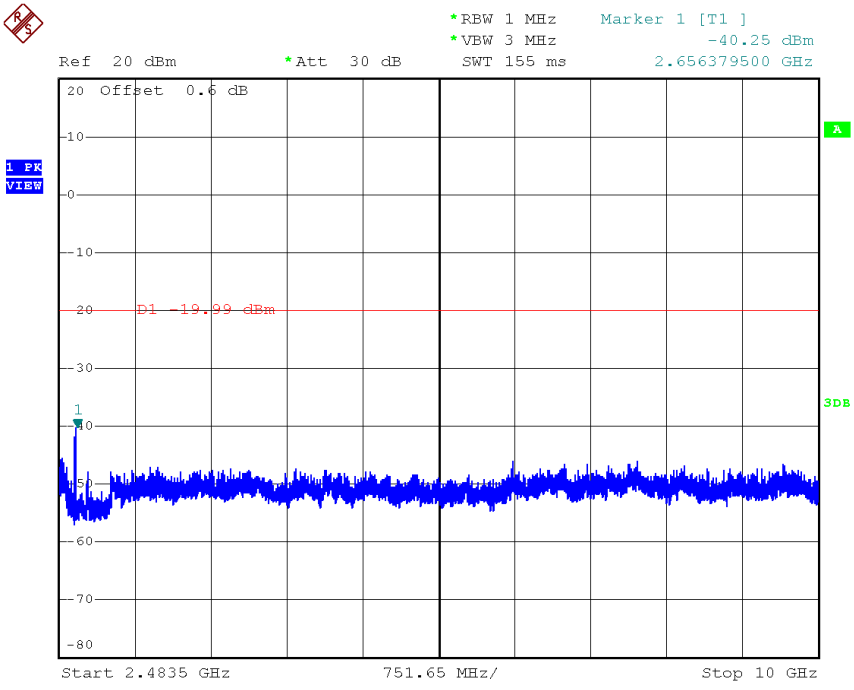


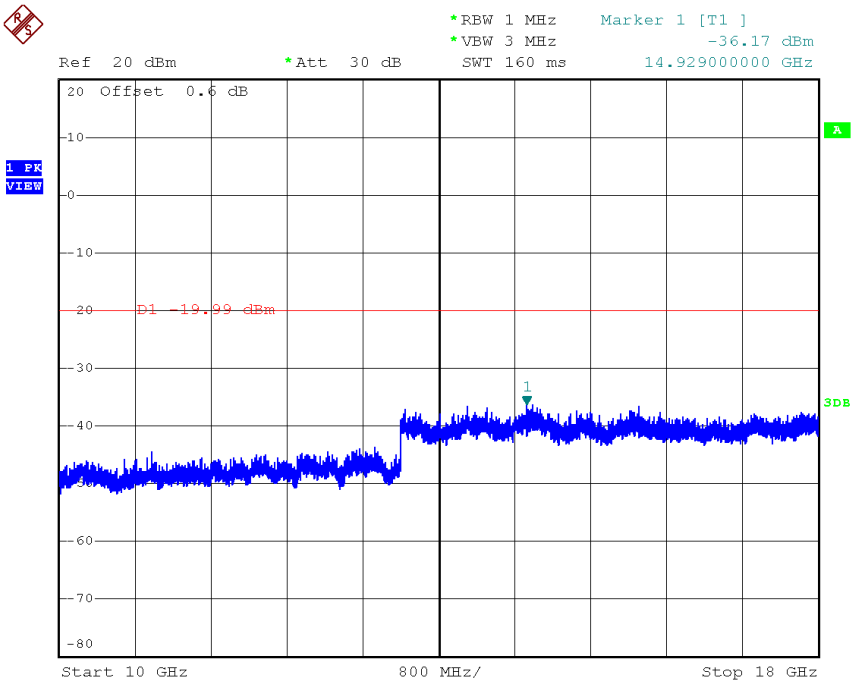

*RBW 1 MHz
Marker 1 [T1]
*VBW 3 MHz
-36.39 dBm
Ref 20 dBm
*Att 30 dB
SWT 160 ms
17.851000000 GHz
20 Offset 0.6 dB
1 PK VIEW
D1 -20.15 dBm
A
3DB
Start 10 GHz
800 MHz/
Stop 18 GHz

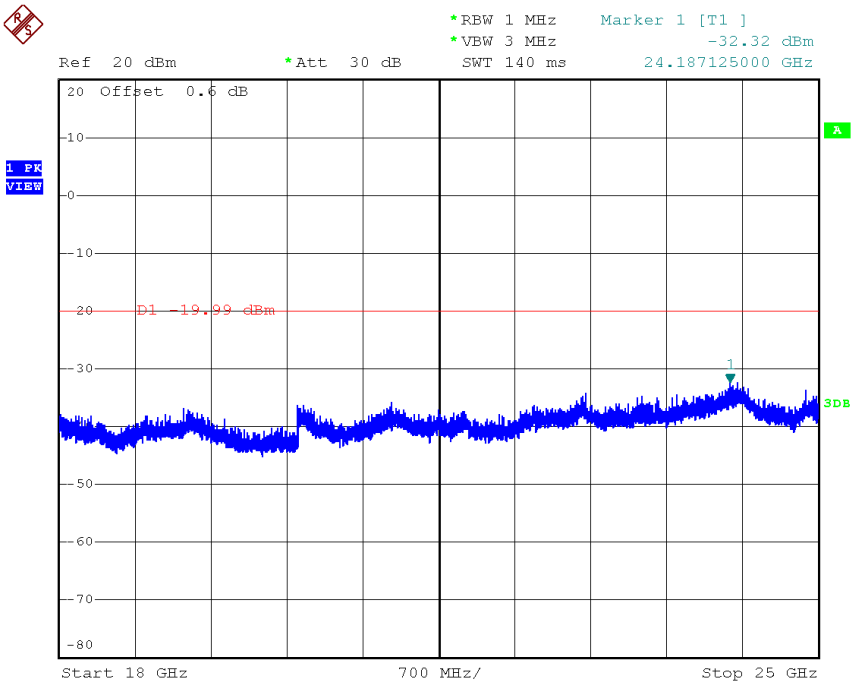

*RBW 1 MHz
Marker 1 [T1]
*VBW 3 MHz
-32.63 dBm
Ref 20 dBm
*Att 30 dB
SWT 140 ms
24.268500000 GHz
20 Offset 0.6 dB
1 PK VIEW
D1 -20.15 dBm
A
3DB
Start 18 GHz
700 MHz/
Stop 25 GHz

802.11g
Channel 01 (2412MHz) Reference Level: 0.01dBm

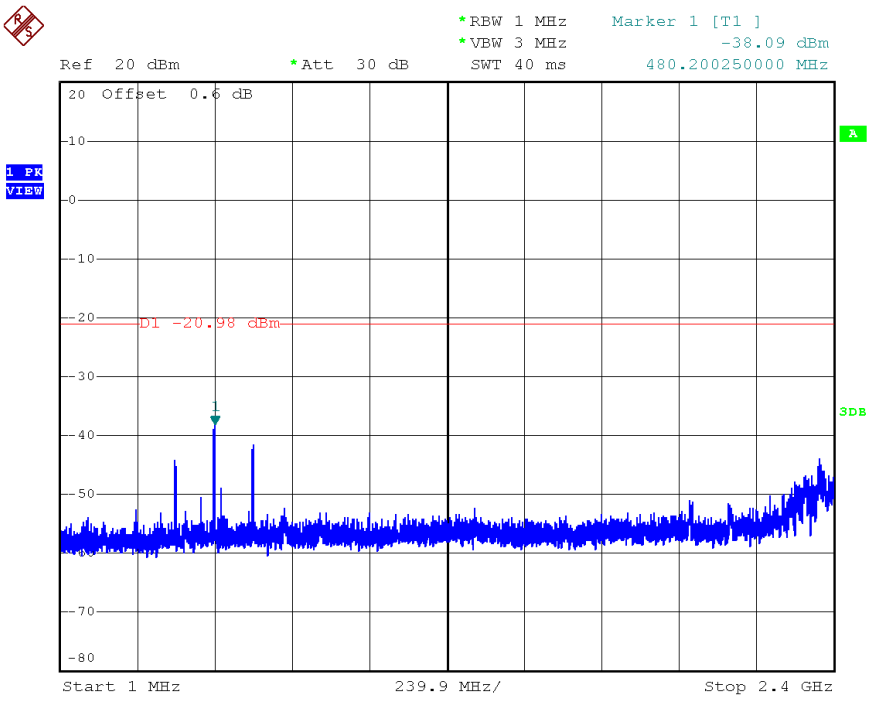


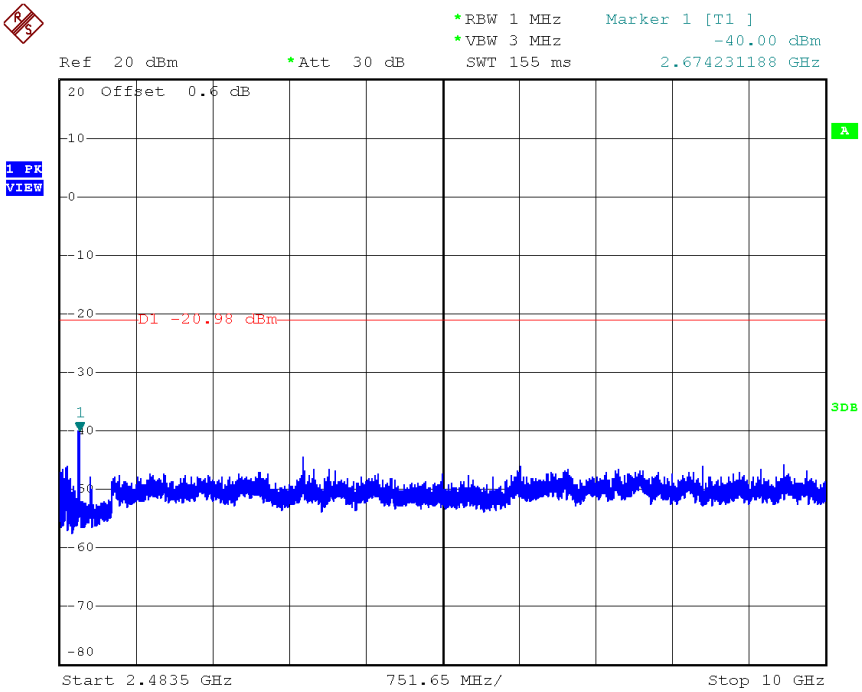


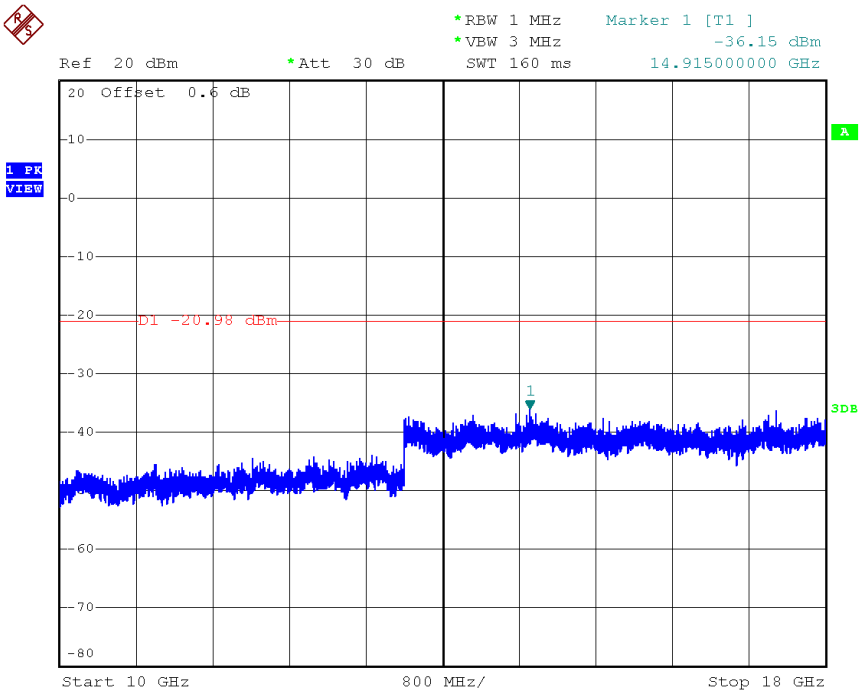

*RBW 1 MHz
Marker 1 [T1]
*VBW 3 MHz
-36.17 dBm
Ref 20 dBm
*Att 30 dB
SWT 160 ms
14.929000000 GHz
20 Offset 0.6 dB
1 PK VIEW
A
D1 -19.99 dBm
3DB
Start 10 GHz
800 MHz/
Stop 18 GHz

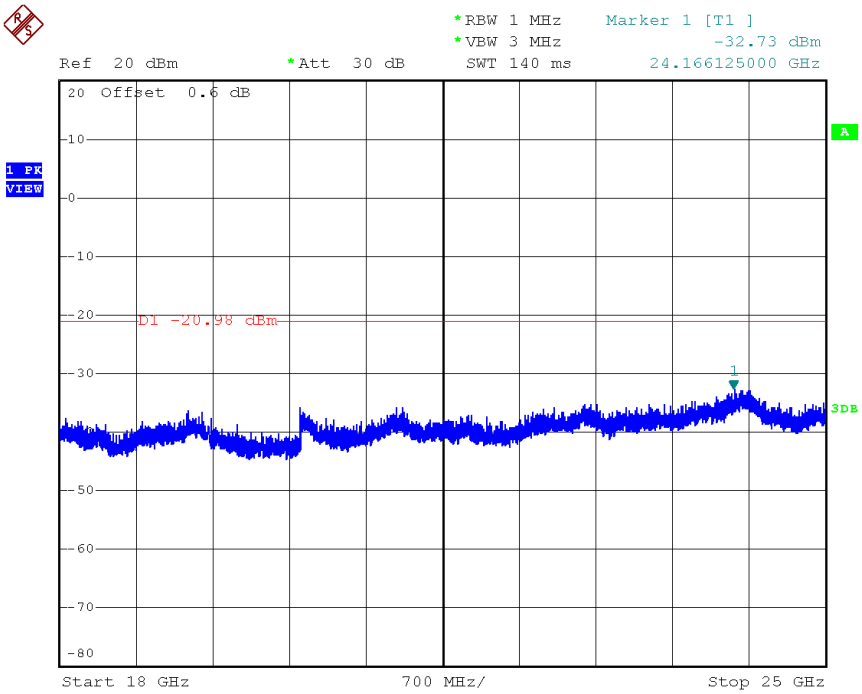

*RBW 1 MHz
Marker 1 [T1]
*VBW 3 MHz
-32.32 dBm
Ref 20 dBm
*Att 30 dB
SWT 140 ms
24.187125000 GHz
20 Offset 0.6 dB
1 PK VIEW
A
D1 -19.99 dBm
3DB
Start 18 GHz
700 MHz/
Stop 25 GHz

Channel 06 (2437MHz) Reference Level: -0.98dBm

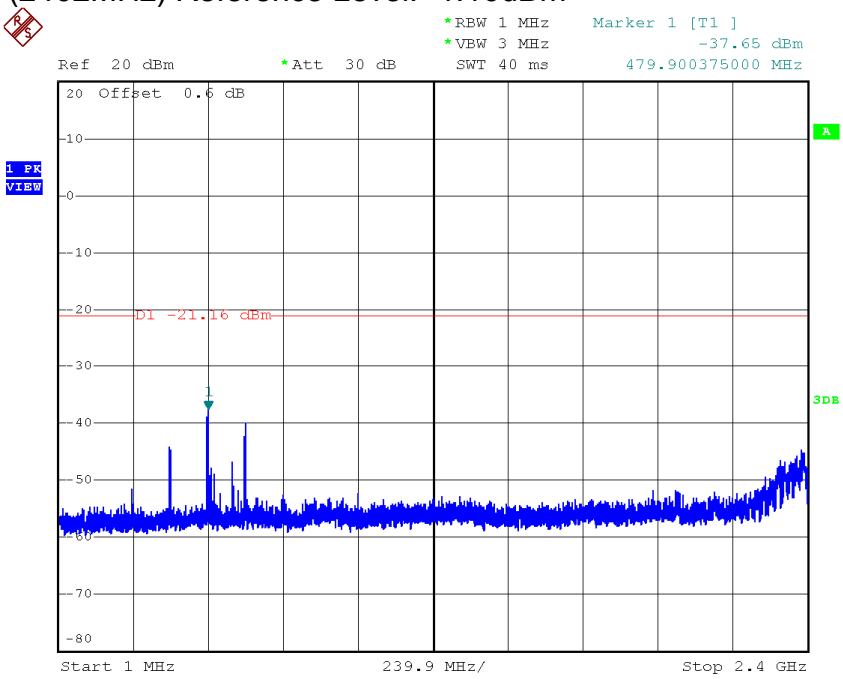


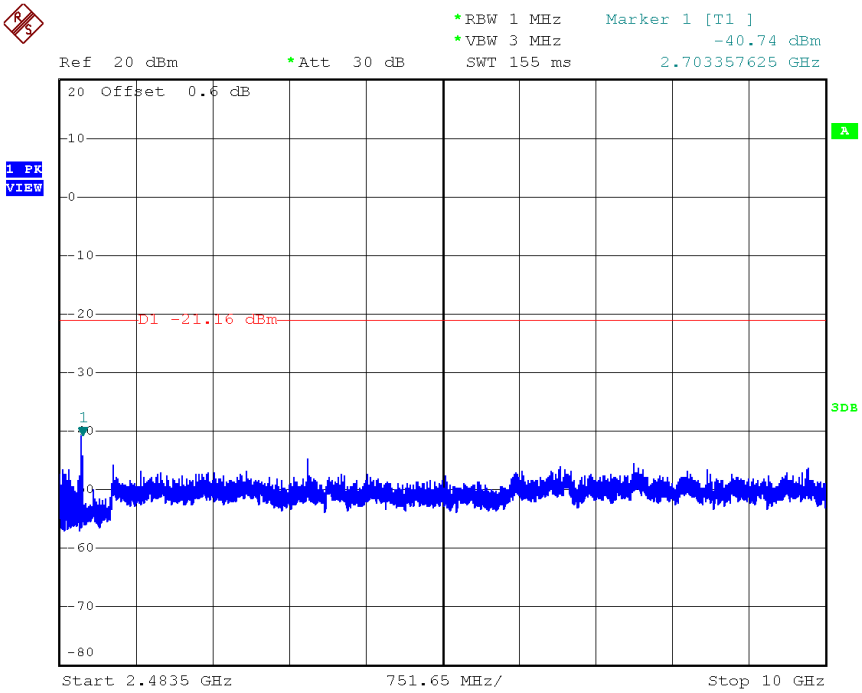


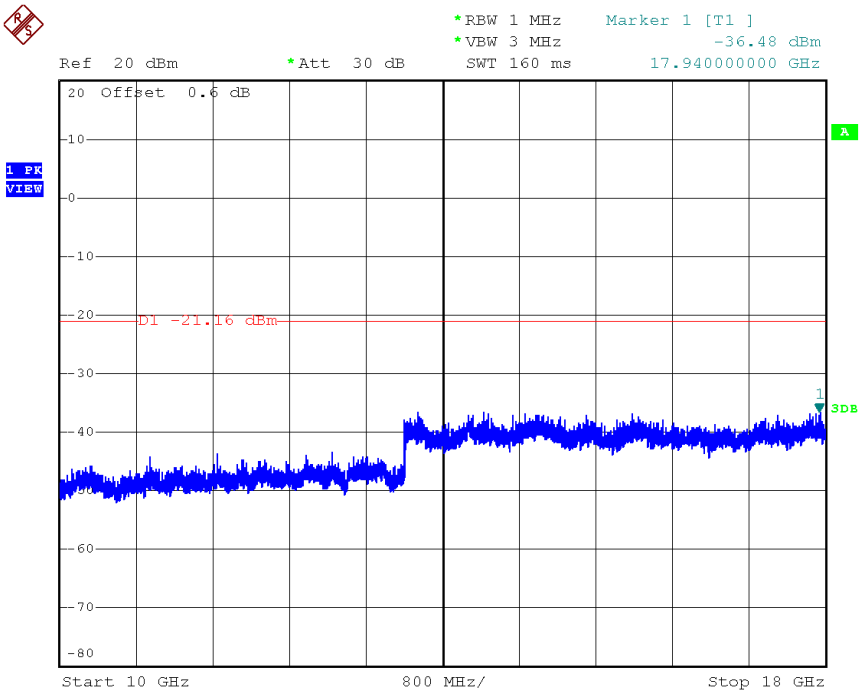

*RBW 1 MHz
Marker 1 [T1]
*VBW 3 MHz
-36.15 dBm
Ref 20 dBm
*Att 30 dB
SWT 160 ms
14.915000000 GHz
20 Offset 0.6 dB
1 PK
VIEW
A
D1 -20.98 dBm
3DB
Start 10 GHz
800 MHz/
Stop 18 GHz

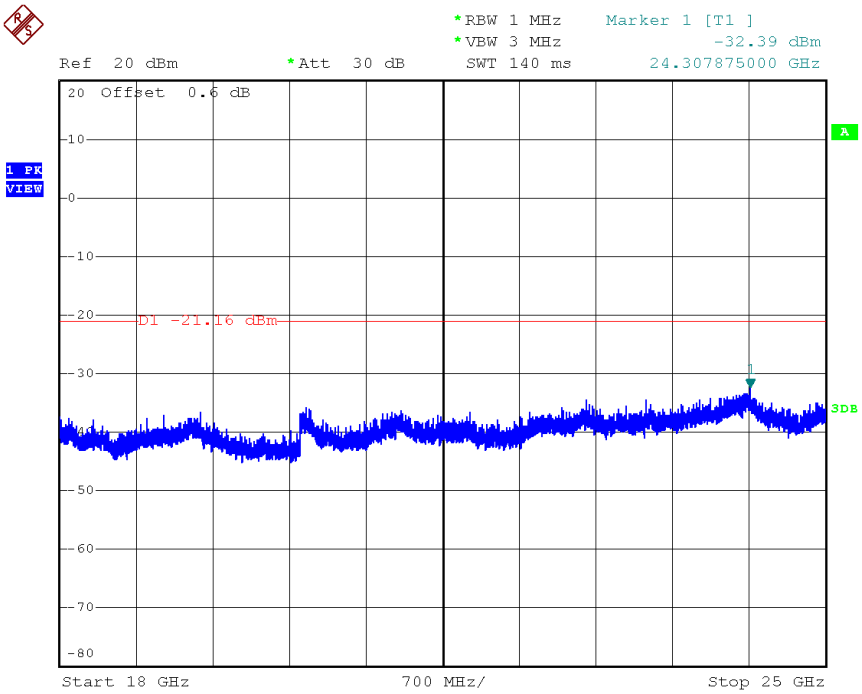

*RBW 1 MHz
Marker 1 [T1]
*VBW 3 MHz
-32.73 dBm
Ref 20 dBm
*Att 30 dB
SWT 140 ms
24.166125000 GHz
20 Offset 0.6 dB
1 PK
VIEW
A
D1 -20.98 dBm
3DB
Start 18 GHz
700 MHz/
Stop 25 GHz

Channel 11 (2462MHz) Reference Level: -1.16dBm

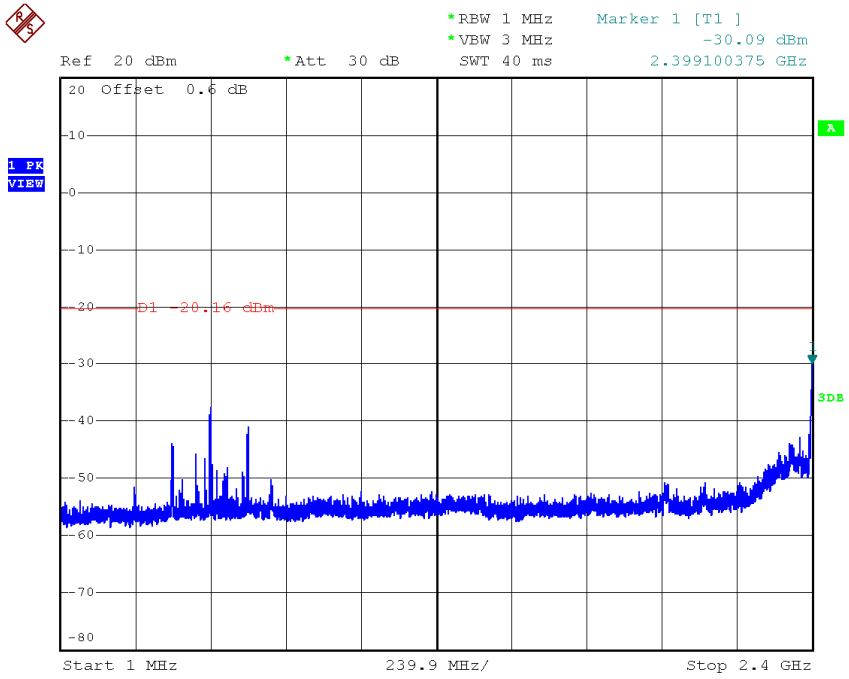


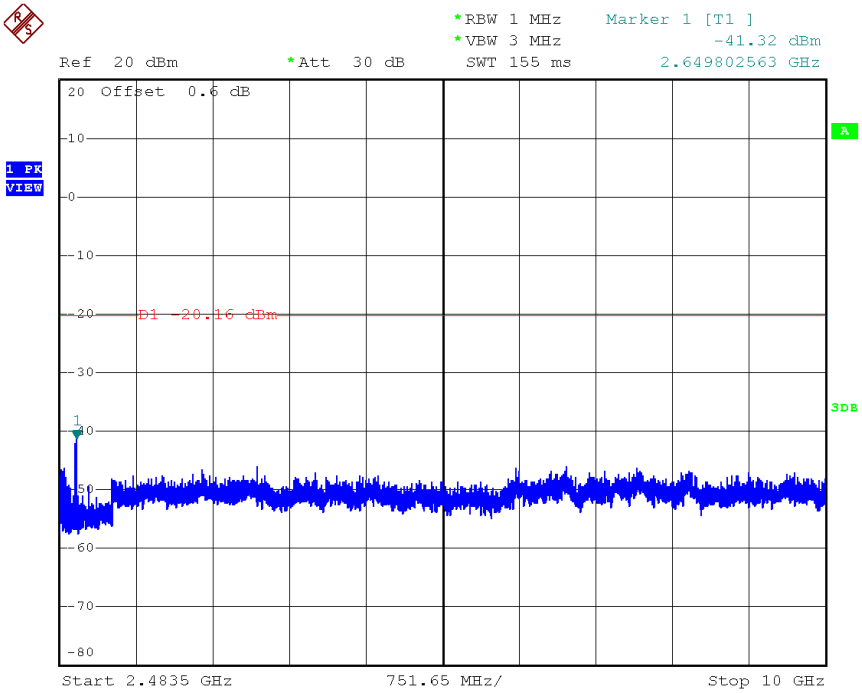


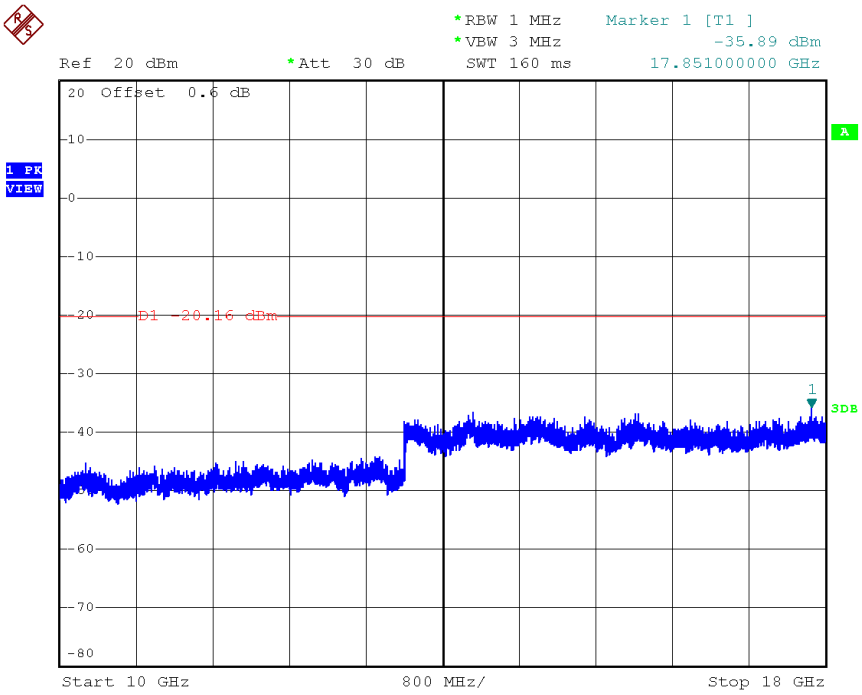

*RBW 1 MHz
*VBW 3 MHz
SWT 160 ms
Marker 1 [T1]
-36.48 dBm
17.940000000 GHz
Ref 20 dBm
*Att 30 dB
20 Offset 0.6 dB
1 PK VIEW
A
D1 -21.16 dBm
1 3DB
Start 10 GHz
800 MHz/
Stop 18 GHz

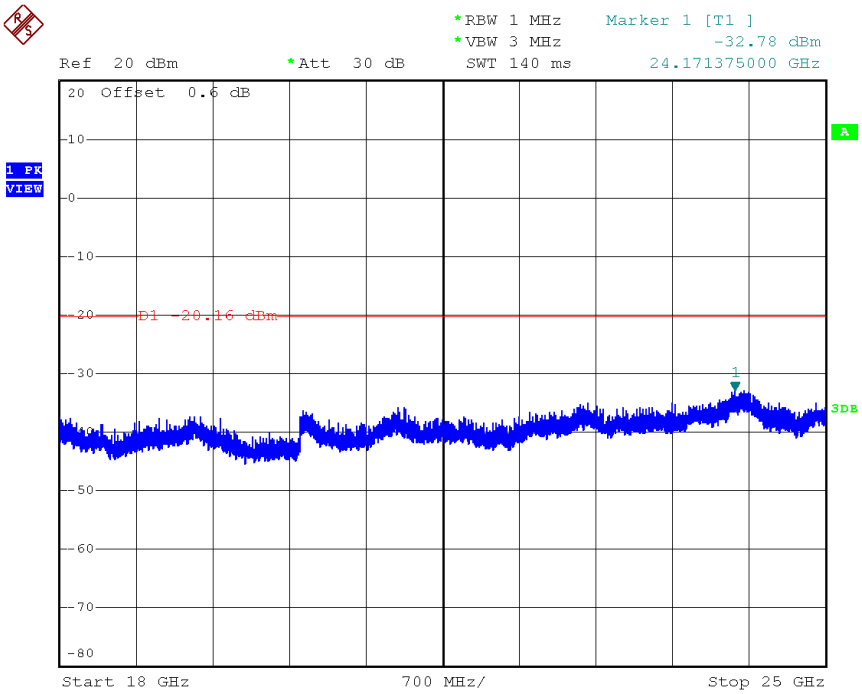

*RBW 1 MHz
*VBW 3 MHz
SWT 140 ms
Marker 1 [T1]
-32.39 dBm
24.307875000 GHz
Ref 20 dBm
*Att 30 dB
20 Offset 0.6 dB
1 PK VIEW
A
D1 -21.16 dBm
1 3DB
Start 18 GHz
700 MHz/
Stop 25 GHz

802.11 n-HT20
Channel 01 (2412MHz) Reference Level: -0.16dBm

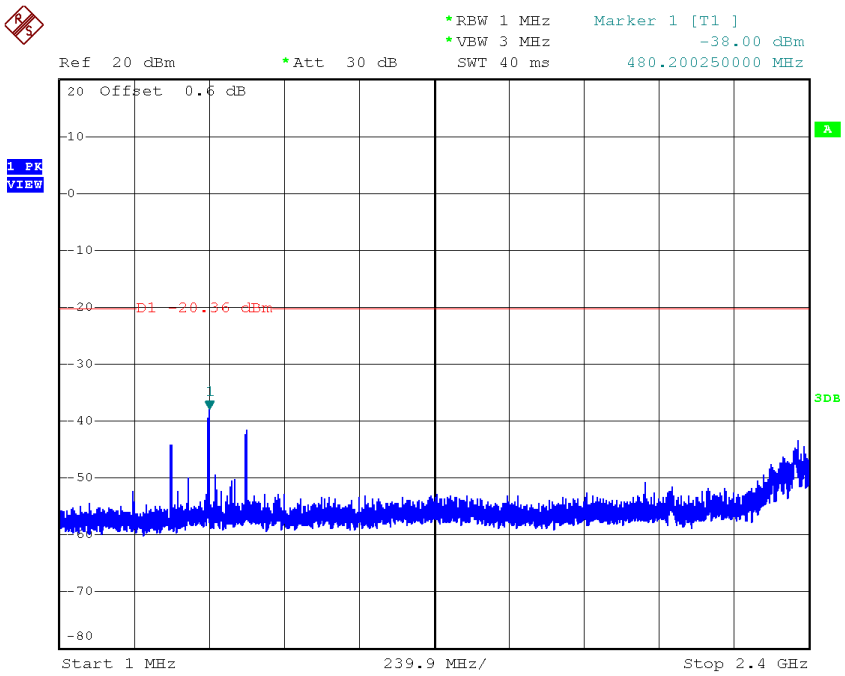


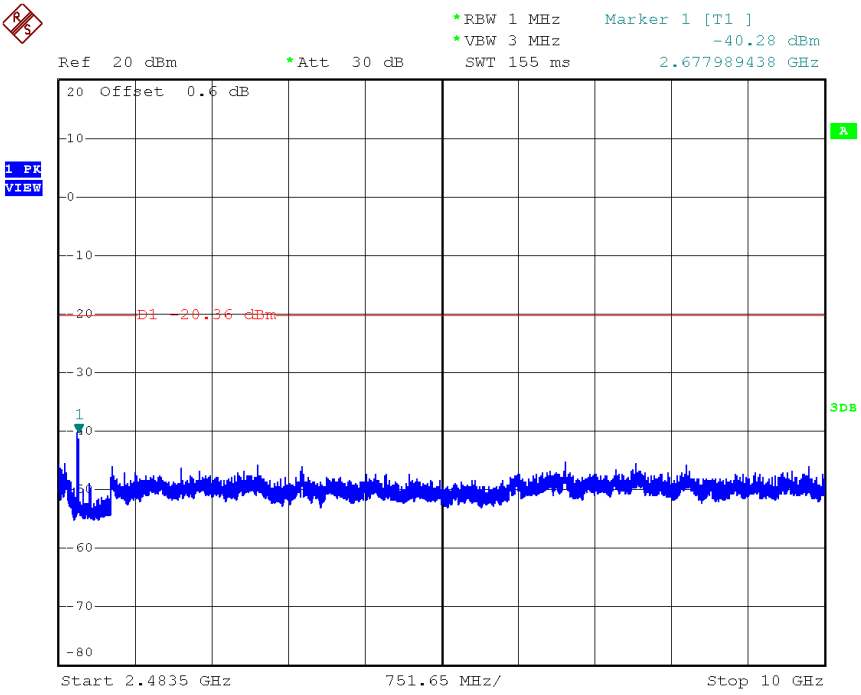


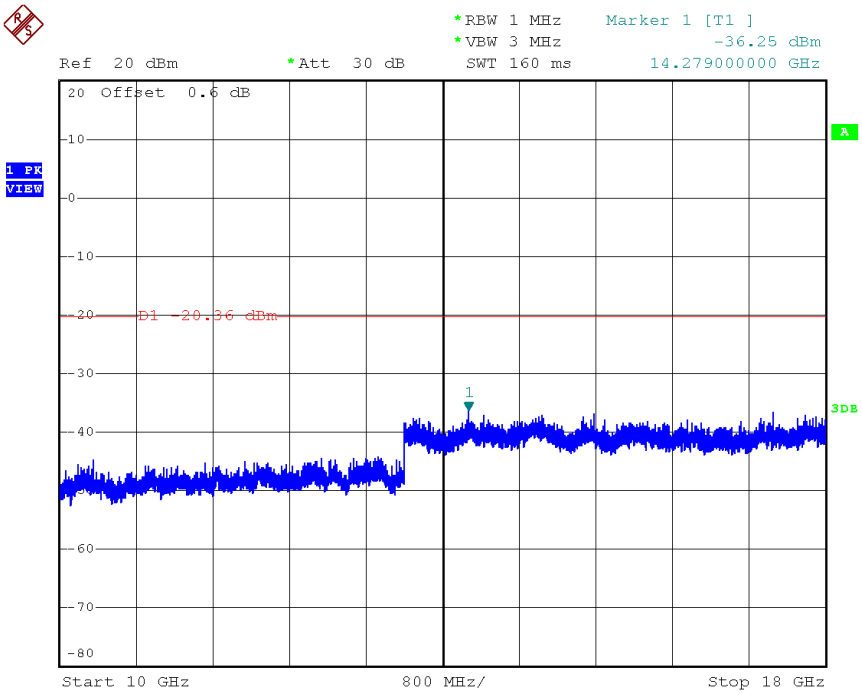

*RBW 1 MHz
Marker 1 [T1]
*VBW 3 MHz
-35.89 dBm
Ref 20 dBm
*Att 30 dB
SWT 160 ms
17.851000000 GHz
20 Offset 0.6 dB
1 PK VIEW
A
D1 -20.16 dBm
3DB
Start 10 GHz
800 MHz/
Stop 18 GHz

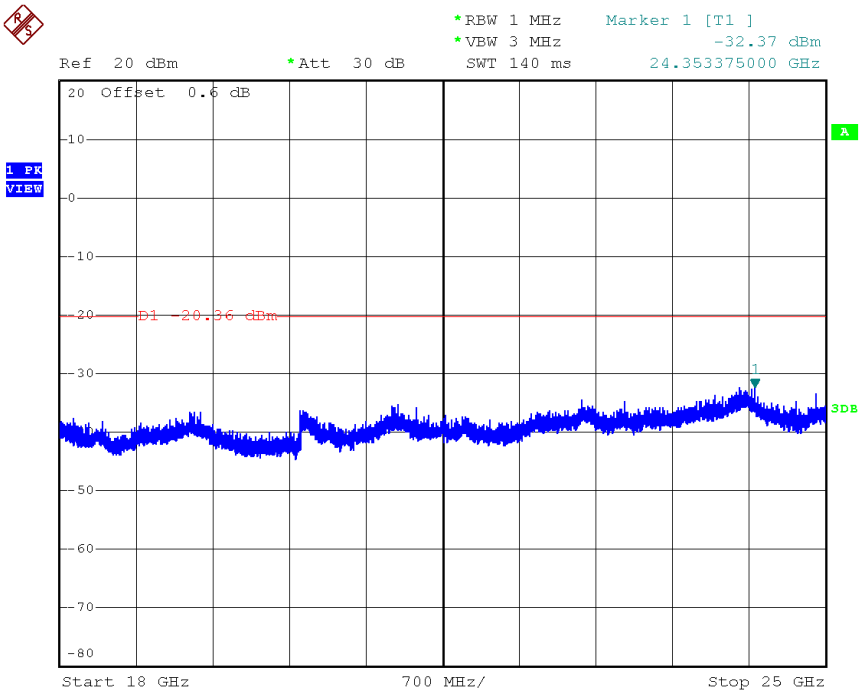

*RBW 1 MHz
Marker 1 [T1]
*VBW 3 MHz
-32.78 dBm
Ref 20 dBm
*Att 30 dB
SWT 140 ms
24.171375000 GHz
20 Offset 0.6 dB
1 PK VIEW
A
D1 -20.16 dBm
3DB
Start 18 GHz
700 MHz/
Stop 25 GHz

Channel 06 (2437MHz) Reference Level: -0.36dBm

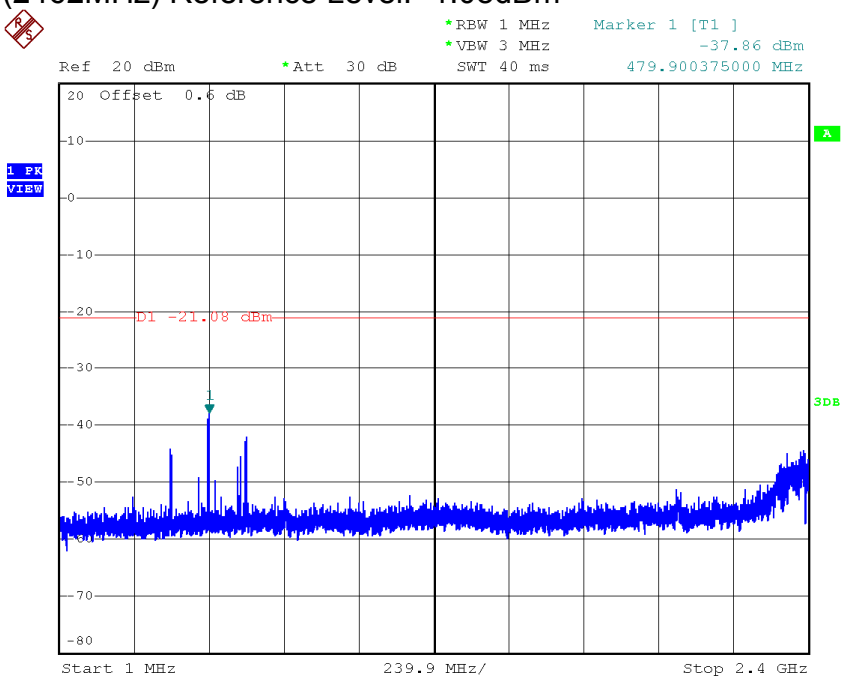


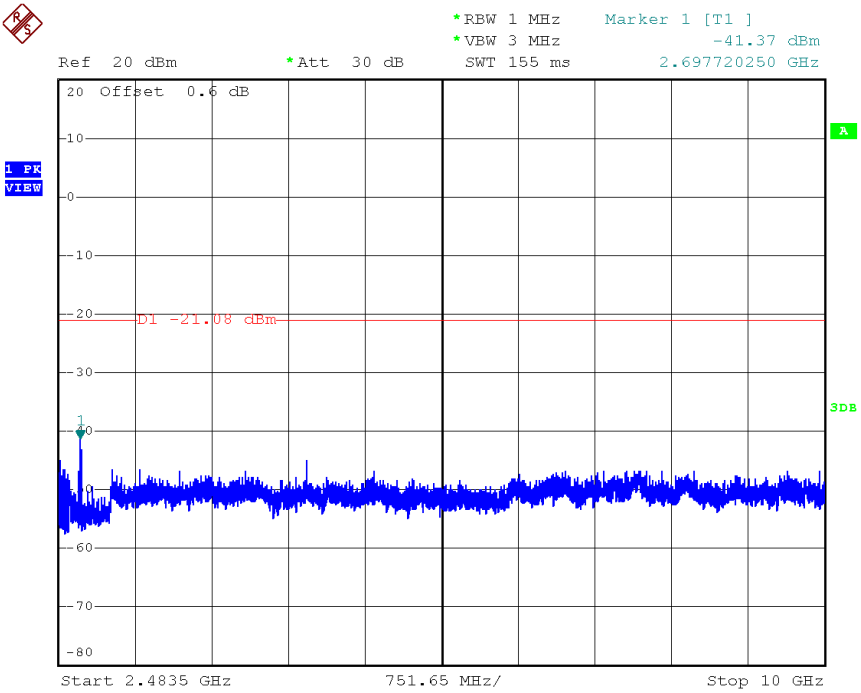


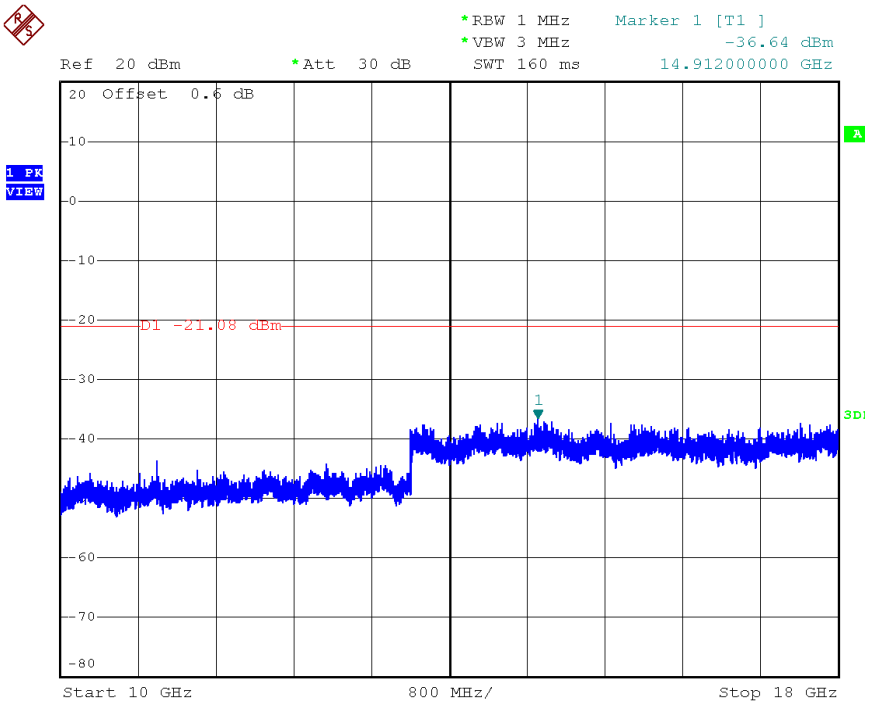

*RBW 1 MHz
Marker 1 [T1]
*VBW 3 MHz
-36.25 dBm
Ref 20 dBm
*Att 30 dB
SWT 160 ms
14.279000000 GHz
20 Offset 0.6 dB
1 PK VIEW
A
D1 -20.36 dBm
3DB
Start 10 GHz
800 MHz/
Stop 18 GHz

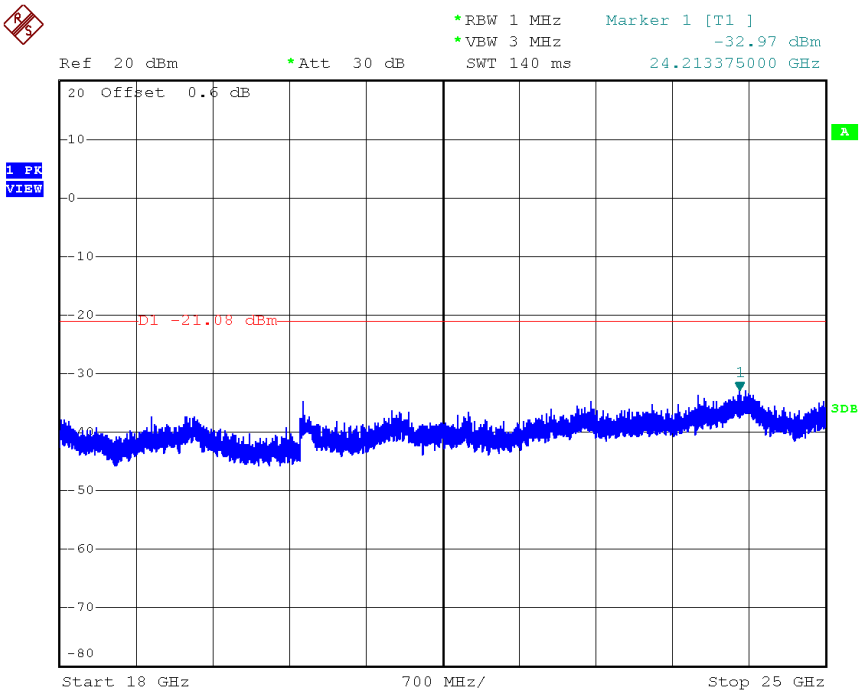

*RBW 1 MHz
Marker 1 [T1]
*VBW 3 MHz
-32.37 dBm
Ref 20 dBm
*Att 30 dB
SWT 140 ms
24.353375000 GHz
20 Offset 0.6 dB
1 PK VIEW
A
D1 -20.36 dBm
3DB
Start 18 GHz
700 MHz/
Stop 25 GHz

Channel 11 (2462MHz) Reference Level: -1.08dBm

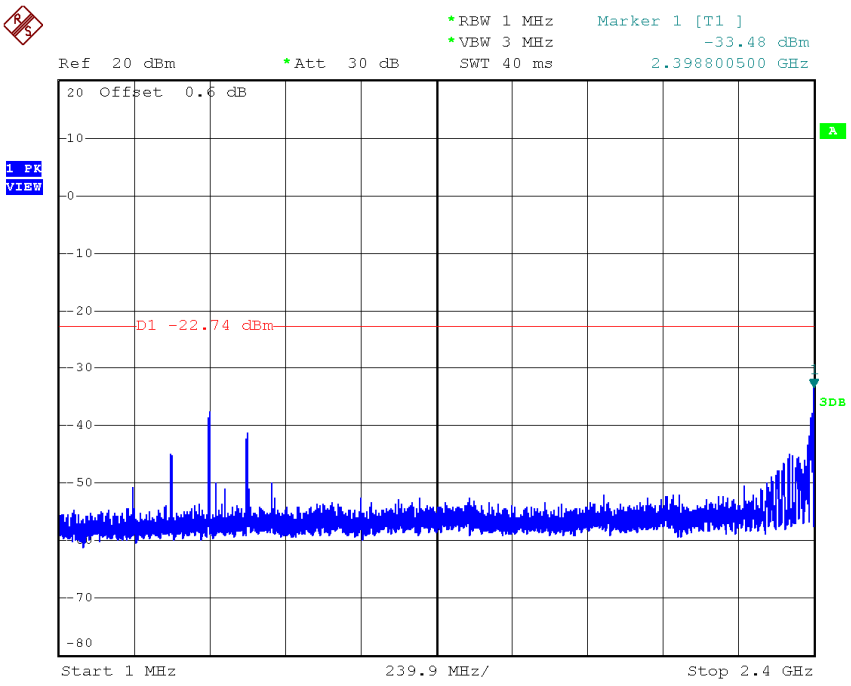


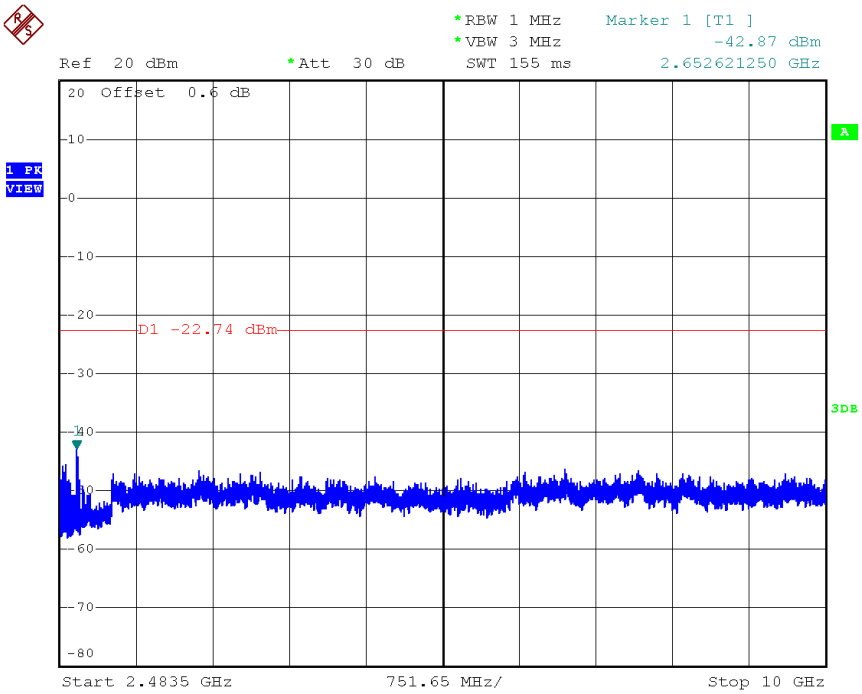


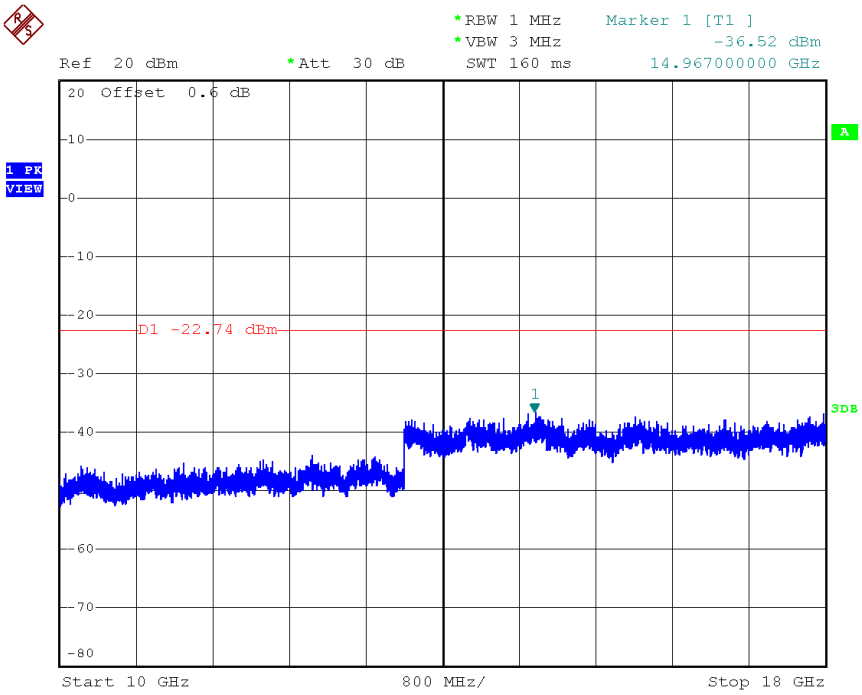

*RBW 1 MHz
*VBW 3 MHz
SWT 160 ms
Marker 1 [T1]
-36.64 dBm
14.912000000 GHz
Ref 20 dBm
*Att 30 dB
20 Offset 0.6 dB
1 PK VIEW
D1 -21.08 dBm
3DB
Start 10 GHz
800 MHz/
Stop 18 GHz

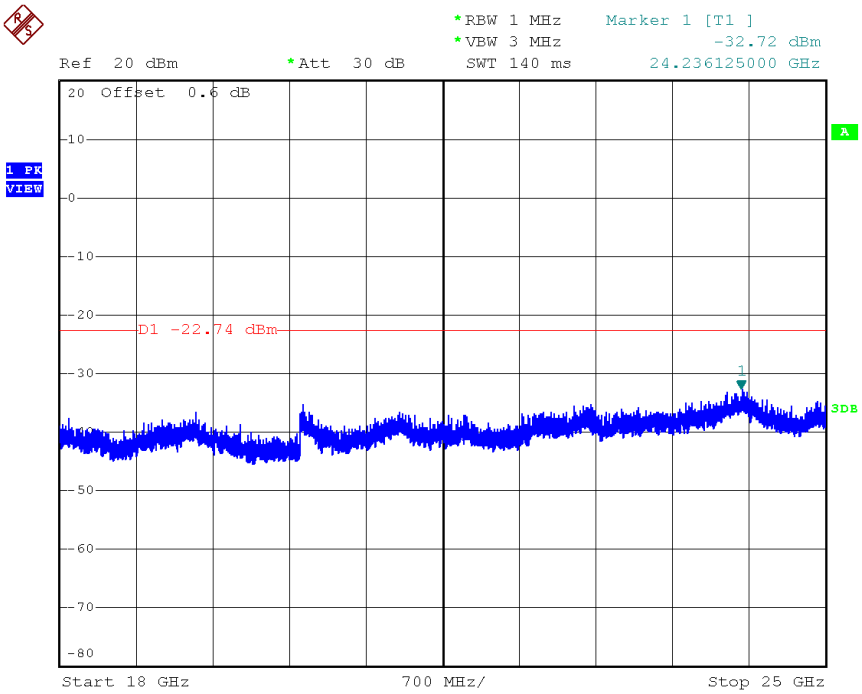

*RBW 1 MHz
*VBW 3 MHz
SWT 140 ms
Marker 1 [T1]
-32.97 dBm
24.213375000 GHz
Ref 20 dBm
*Att 30 dB
20 Offset 0.6 dB
1 PK VIEW
D1 -21.08 dBm
3DB
Start 18 GHz
700 MHz/
Stop 25 GHz

802.11 n-HT40
Channel 03 (2422MHz) Reference Level: -2.74dBm

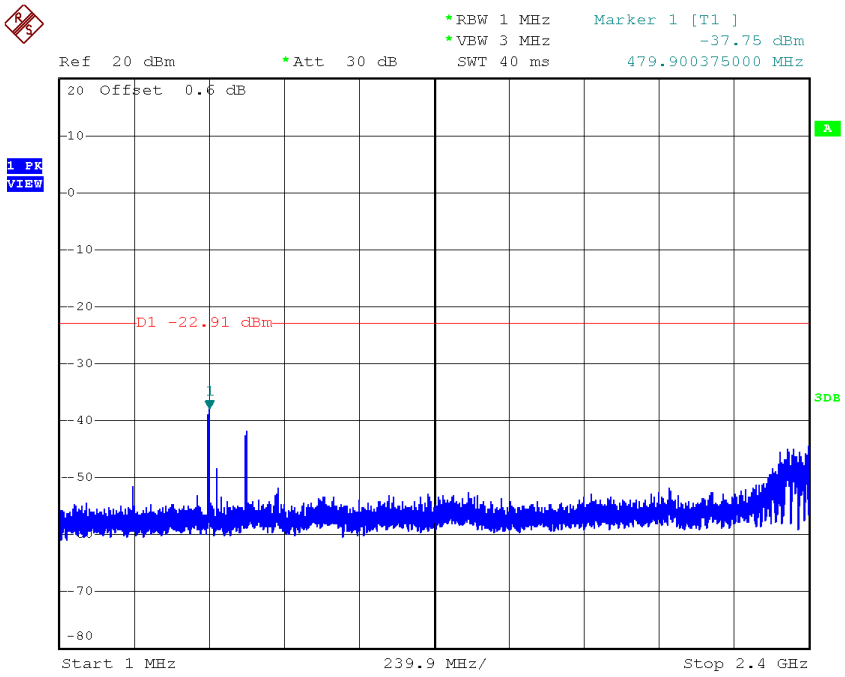


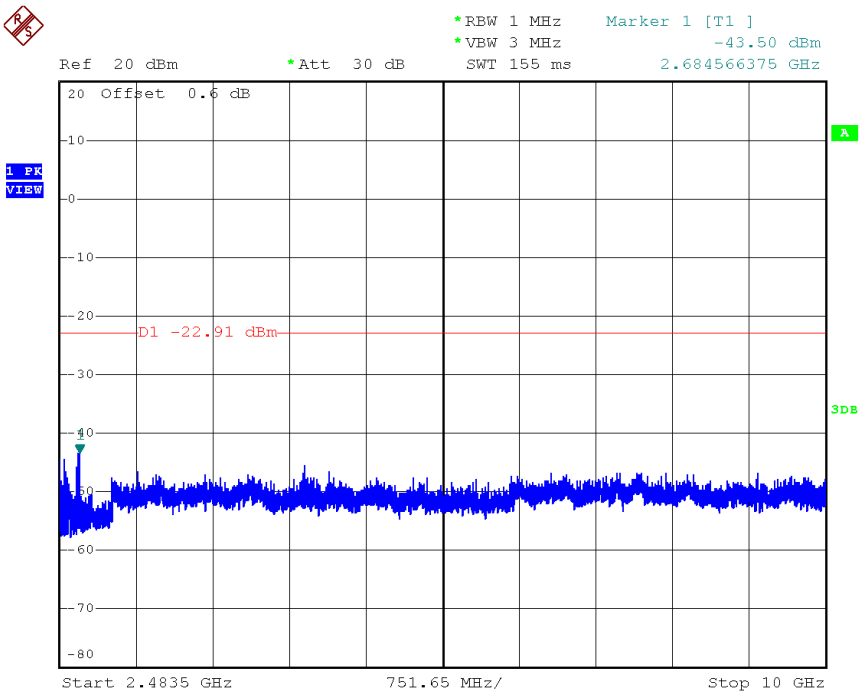


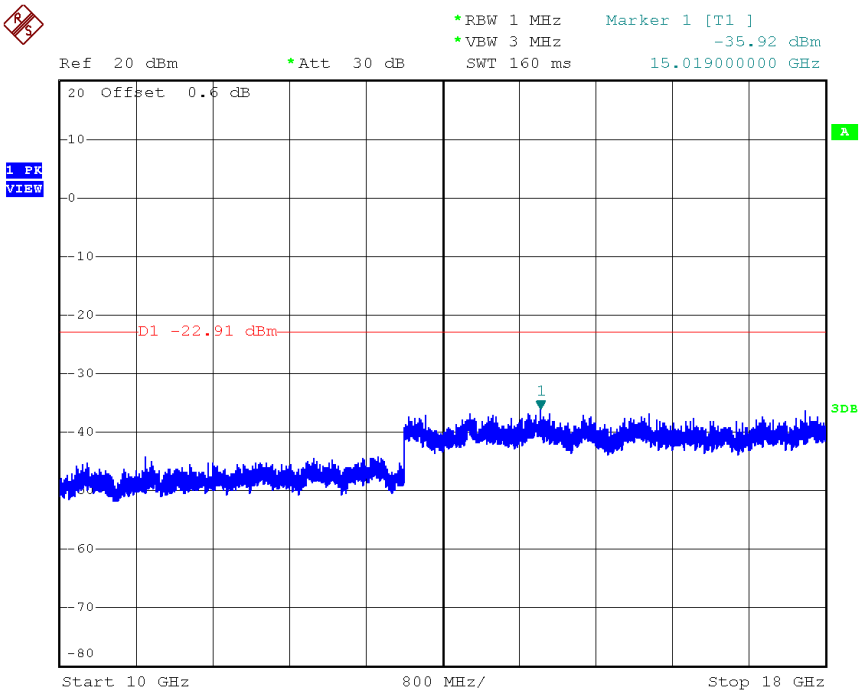

*RBW 1 MHz
*VBW 3 MHz
SWT 160 ms
Marker 1 [T1]
-36.52 dBm
14.967000000 GHz
Ref 20 dBm
*Att 30 dB
20 Offset 0.6 dB
1 PK
VIEW
D1 -22.74 dBm
3DB
Start 10 GHz
800 MHz/
Stop 18 GHz

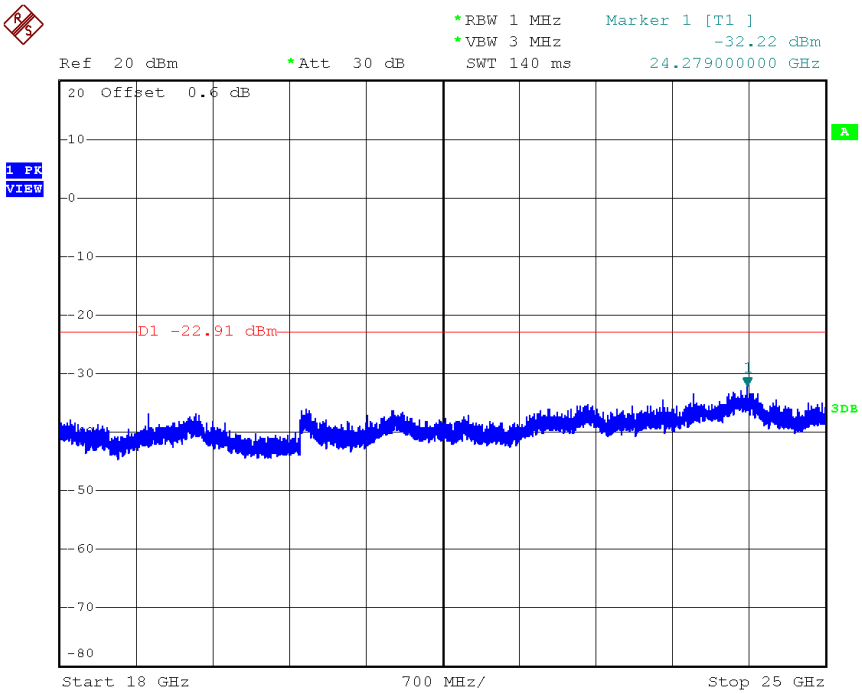

*RBW 1 MHz
*VBW 3 MHz
SWT 140 ms
Marker 1 [T1]
-32.72 dBm
24.236125000 GHz
Ref 20 dBm
*Att 30 dB
20 Offset 0.6 dB
1 PK
VIEW
D1 -22.74 dBm
3DB
Start 18 GHz
700 MHz/
Stop 25 GHz

Channel 06 (2437MHz) Reference Level: -2.91dBm

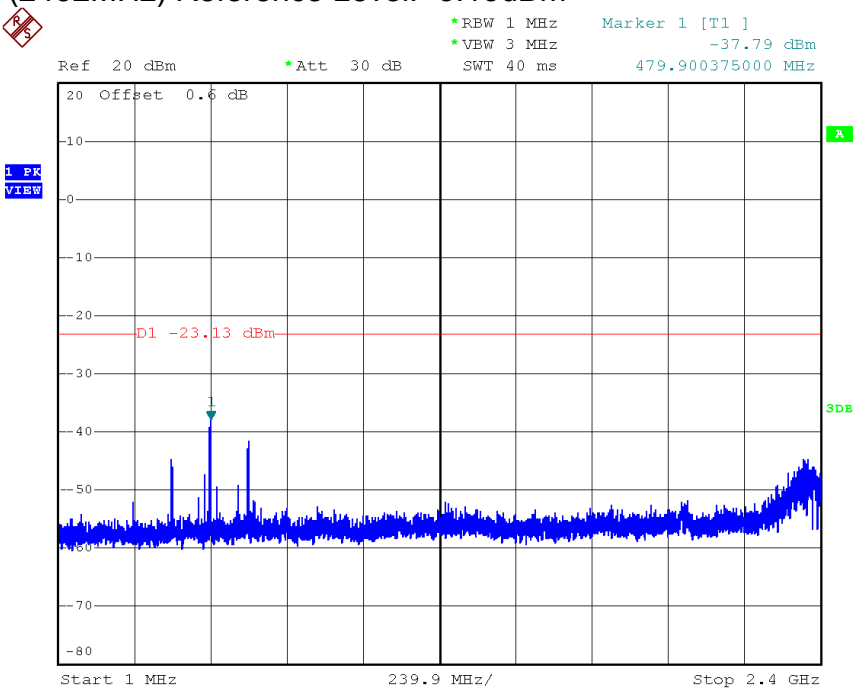


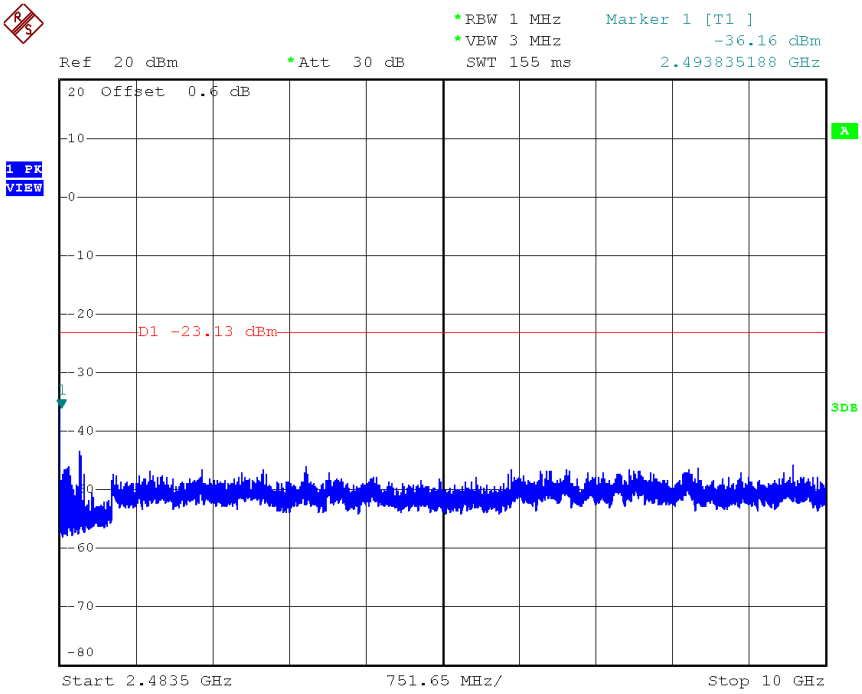


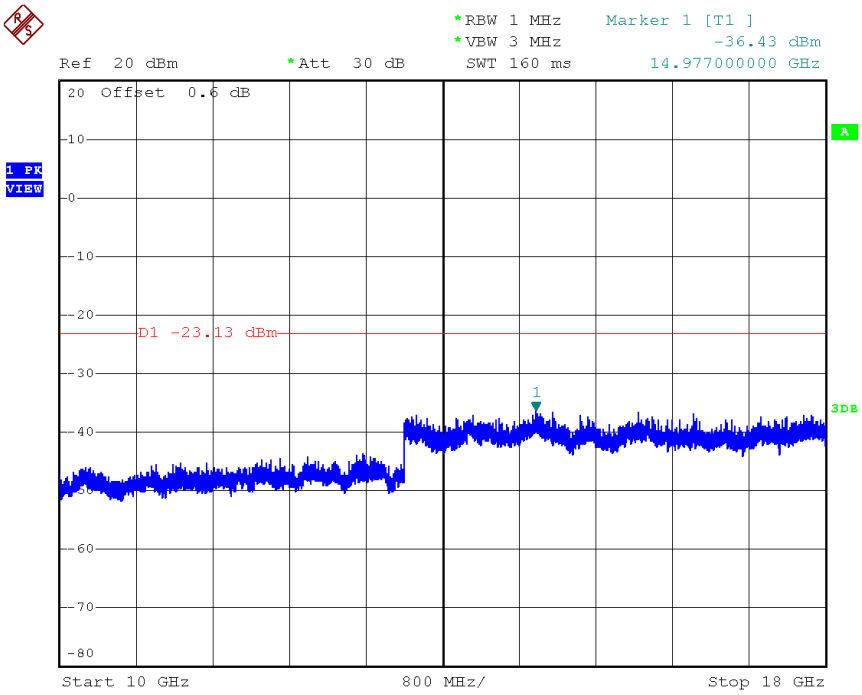

*RBW 1 MHz
Marker 1 [T1]
*VBW 3 MHz
-35.92 dBm
Ref 20 dBm
*Att 30 dB
SWT 160 ms
15.019000000 GHz
20 Offset 0.6 dB
1 PK VIEW
A
D1 -22.91 dBm
3DB
Start 10 GHz
800 MHz/
Stop 18 GHz

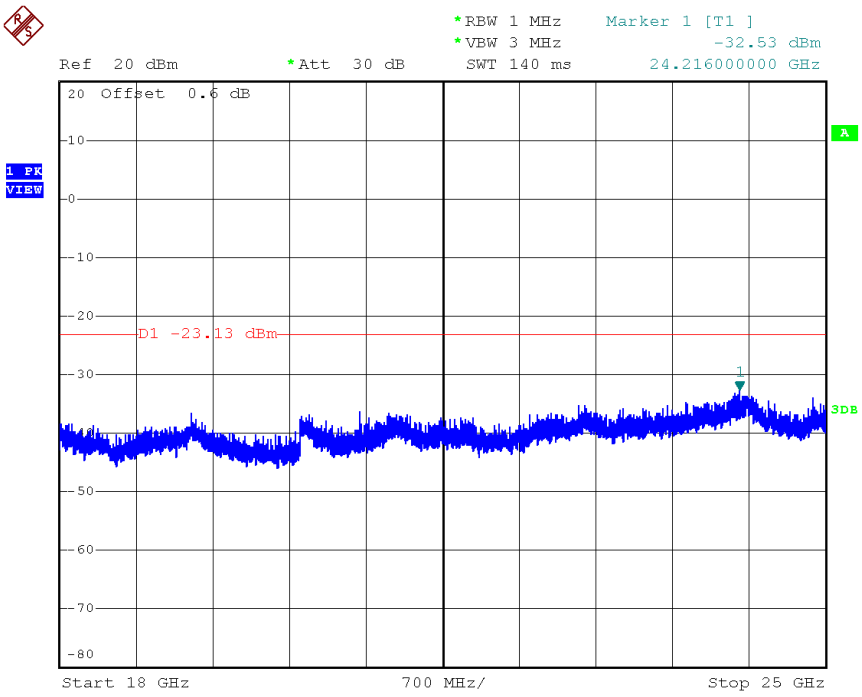

*RBW 1 MHz
Marker 1 [T1]
*VBW 3 MHz
-32.22 dBm
Ref 20 dBm
*Att 30 dB
SWT 140 ms
24.279000000 GHz
20 Offset 0.6 dB
1 PK VIEW
A
D1 -22.91 dBm
3DB
Start 18 GHz
700 MHz/
Stop 25 GHz

Channel 09 (2452MHz) Reference Level: -3.13dBm






*RBW 1 MHz
Marker 1 [T1]
*VBW 3 MHz
-36.43 dBm
Ref 20 dBm
*Att 30 dB
SWT 160 ms
14.977000000 GHz
20 Offset 0.6 dB
1 PK
VIEW
A
D1 -23.13 dBm
3DB
Start 10 GHz
800 MHz/
Stop 18 GHz


*RBW 1 MHz
Marker 1 [T1]
*VBW 3 MHz
-32.53 dBm
Ref 20 dBm
*Att 30 dB
SWT 140 ms
24.216000000 GHz
20 Offset 0.6 dB
1 PK
VIEW
A
D1 -23.13 dBm
3DB
Start 18 GHz
700 MHz/
Stop 25 GHz

4.5 Out of Band Radiated Emissions (for emissions in 4.4 above that are less than 20dB below carrier), FCC Rule 15.247(d):

For out of band emissions that are close to or that exceed the 20dB attenuation requirement described in the specification, radiated measurements were performed at a 3m separation distance to determine whether these emissions complied with the general radiated emission requirement.

[×] Not required, since all emissions are more than 20dB below fundamental
[ ] See attached data sheet

4.6 Transmitter Radiated Emissions in Restricted Bands, FCC Rule 15.35(b), (c):

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included. All measurements were performed with peak detection unless otherwise specified.

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

4.7 Field Strength Calculation

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

FS = RA + AF + CF - AG + PD

Where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB
PD = Pulse Desensitization in dB

In the radiated emission table which follows, the reading shown on the data table may reflect the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

FS = RA + AF + CF - AG + PD

Example
Assume a receiver reading of 62.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted. The pulse desensitization factor of the spectrum analyzer was 0 dB. The net field strength for comparison to the appropriate emission limit is 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 62.0 dBμV
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
PD = 0 dB
FS = 62 + 7.4 + 1.6 - 29 + 0 = 42 dBμV/m

Level in mV/m = Common Antilogarithm [(42 dBμV/m)/20] = 125.9 μV/m

4.8 Radiated Spurious Emission

Worst Case Radiated Spurious Emission (802.11n-HT20) at 2389.200MHz is passed by 2.8dB margin.

For the electronic filing, the worst case radiated emission configuration photographs are saved with filename: radiated photos.pdf.

Applicant: IBN LLC. Date of Test: July 30, 2013
Model: HA2800
Worst Case Operating Mode: Transmit (802.11g Channel 01)

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	157.580	36.7	20.0	9.1	25.8	43.5	-17.7
Horizontal	299.660	43.1	20.0	9.2	32.3	46.0	-13.7
Horizontal	407.840	38.3	20.0	9.5	27.8	46.0	-18.2
Vertical	163.860	42.2	20.0	9.4	31.6	43.5	-11.9
Vertical	287.535	44.2	20.0	9.1	33.3	46.0	-12.7
Vertical	503.845	47.6	20.0	9.0	36.6	46.0	-9.4

NOTES: 1. Quasi-Peak detector is used except for others stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. All emissions are below the QP limit.

Applicant: IBN LLC. Date of Test: July 30, 2013
Model: HA2800
Mode: 802.11b (TX-Channel 01)

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Vertical	*4824.000	50.6	36.7	34.2	48.1	74.0	-25.9
Vertical	*2359.000	57.7	36.2	28.2	49.7	74.0	-24.3

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Vertical	*4924.000	32.2	36.7	34.6	30.1	54.0	-23.9
Vertical	*2359.000	49.9	36.2	28.0	41.7	54.0	-12.3

NOTES: 1. Peak detector Data unless otherwise stated. Above 1000 MHz, RBW=1MHz, VBW=3MHz is used for Peak measurement, RBW=1MHz, VBW=10Hz is used for Average measurement.

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: IBN LLC. Date of Test: July 30, 2013
Model: HA2800
Mode: 802.11b (TX-Channel 06)

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Vertical	*4874.000	44.4	36.7	34.6	42.3	74.0	-31.7
Vertical	*7311.000	46.9	36.7	37.1	47.3	74.0	-26.7

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Vertical	*4874.000	37.2	36.7	34.6	35.1	54.0	-18.9
Vertical	*7311.000	31.9	36.7	37.1	32.3	54.0	-21.7

NOTES: 1. Peak detector Data unless otherwise stated. Above 1000 MHz, RBW=1MHz, VBW=3MHz is used for Peak measurement, RBW=1MHz, VBW=10Hz is used for Average measurement.

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: IBN LLC. Date of Test: July 30, 2013
Model: HA2800
Mode: 802.11b (TX-Channel 11)

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Vertical	*4924.000	44.8	36.7	34.2	42.3	74.0	-31.7
Vertical	*7386.000	47.1	36.7	36.9	47.3	74.0	-26.7
Vertical	*2488.100	57.5	36.2	28.2	49.5	74.0	-24.5

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Vertical	*4924.000	37.2	36.7	34.6	35.1	54.0	-18.9
Vertical	*7386.000	31.8	36.7	37.2	32.3	54.0	-21.7
Vertical	*2488.100	46.9	36.2	28.0	38.7	54.0	-15.3

NOTES: 1. Peak detector Data unless otherwise stated. Above 1000 MHz, RBW=1MHz, VBW=3MHz is used for Peak measurement, RBW=1MHz, VBW=10Hz is used for Average measurement.

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.

4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: IBN LLC. Date of Test: July 30, 2013
Model: HA2800
Mode: 802.11g (TX-Channel 01)

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Vertical	*4824.000	50.1	36.7	34.2	47.6	74.0	-26.4
Vertical	*2389.000	68.6	36.2	27.8	60.2	74.0	-13.8

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Vertical	*4824.000	36.6	36.7	34.2	34.1	54.0	-19.9
Vertical	*2389.000	59.1	36.2	27.8	50.7	54.0	-3.3

NOTES: 1. Peak detector Data unless otherwise stated. Above 1000 MHz, RBW=1MHz, VBW=3MHz is used for Peak measurement, RBW=1MHz, VBW=10Hz is used for Average measurement.

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: IBN LLC. Date of Test: July 30, 2013
Model: HA2800
Mode: 802.11g (TX-Channel 06)

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Vertical	*4874.000	44.2	36.7	34.6	42.1	74.0	-31.9
Vertical	*7311.000	52.5	36.7	37.1	52.9	74.0	-21.1

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Vertical	*4874.000	36.2	36.7	34.6	34.1	54.0	-19.9
Vertical	*7311.000	38.3	36.7	37.1	38.7	54.0	-15.3

NOTES: 1. Peak detector Data unless otherwise stated. Above 1000 MHz, RBW=1MHz, VBW=3MHz is used for Peak measurement, RBW=1MHz, VBW=10Hz is used for Average measurement.

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: IBN LLC. Date of Test: July 30, 2013
Model: HA2800
Mode: 802.11g (TX-Channel 11)

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Vertical	*4924.000	50.4	36.7	34.6	48.3	74.0	-25.7
Vertical	*7386.000	38.0	36.7	37.2	38.5	74.0	-35.5
Vertical	*2483.900	62.6	36.2	28.0	54.4	74.0	-19.6

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Vertical	*4924.000	36.0	36.7	34.6	33.9	54.0	-20.1
Vertical	*7386.000	32.7	36.7	37.2	33.2	54.0	-20.8
Vertical	*2483.900	56.6	36.2	28.0	48.4	54.0	-5.6

NOTES: 1. Peak detector Data unless otherwise stated. Above 1000 MHz, RBW=1MHz, VBW=3MHz is used for Peak measurement, RBW=1MHz, VBW=10Hz is used for Average measurement.

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: IBN LLC. Date of Test: July 30, 2013
Model: HA2800
Mode: 802.11 n-HT20 (TX-Channel 01)

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Vertical	*4824.000	51.6	36.7	34.2	49.1	74.0	-24.9
Vertical	*2389.200	72.3	36.2	27.8	63.9	74.0	-10.1

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Vertical	*4824.000	36.5	36.7	34.2	34.0	54.0	-20.0
Vertical	*2389.200	59.6	36.2	27.8	51.2	54.0	-2.8

NOTES: 1. Peak detector Data unless otherwise stated. Above 1000 MHz, RBW=1MHz, VBW=3MHz is used for Peak measurement, RBW=1MHz, VBW=10Hz is used for Average measurement.

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: IBN LLC. Date of Test: July 30, 2013
Model: HA2800
Mode: 802.11 n-HT20 (TX-Channel 06)

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Vertical	*4874.000	48.8	36.7	34.2	46.3	74.0	-27.7
Vertical	*7311.000	49.9	36.7	37.1	50.3	74.0	-23.7

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Vertical	*4874.000	34.6	36.7	34.2	32.1	54.0	-21.9
Vertical	*7311.000	38.2	36.7	37.1	38.6	54.0	-15.4

NOTES: 1. Peak detector Data unless otherwise stated. Above 1000 MHz, RBW=1MHz, VBW=3MHz is used for Peak measurement, RBW=1MHz, VBW=10Hz is used for Average measurement.

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: IBN LLC. Date of Test: July 30, 2013
Model: HA2800
Mode: 802.11 n-HT20 (TX-Channel 11)

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Vertical	*4924.000	45.4	36.7	34.6	43.3	74.0	-30.7
Vertical	*7386.000	46.1	36.7	37.2	46.6	74.0	-27.4
Vertical	*2483.700	67.1	36.2	27.8	58.7	74.0	-15.3

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Vertical	*4924.000	41.8	36.7	34.6	39.7	54.0	-14.3
Vertical	*7386.000	39.8	36.7	37.2	40.3	54.0	-13.7
Vertical	*2483.700	59.6	36.2	27.8	51.2	54.0	-2.8

NOTES: 1. Peak detector Data unless otherwise stated. Above 1000 MHz, RBW=1MHz, VBW=3MHz is used for Peak measurement, RBW=1MHz, VBW=10Hz is used for Average measurement.

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: IBN LLC. Date of Test: July 30, 2013
Model: HA2800
Mode: 802.11 n-HT40 (TX-Channel 03)

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Vertical	*4844.000	50.2	36.7	34.2	47.7	74.0	-26.3
Vertical	*7266.000	52.9	36.7	37.1	53.3	74.0	-20.7
Vertical	*2390.000	65.9	36.2	27.7	57.4	74.0	-16.6

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Vertical	*4844.000	36.8	36.7	34.2	34.3	54.0	-19.7
Vertical	*7266.000	37.3	36.7	37.1	37.7	54.0	-16.3
Vertical	*2390.000	56.9	36.2	27.7	48.4	54.0	-5.6

NOTES: 1. Peak detector Data unless otherwise stated. Above 1000 MHz, RBW=1MHz, VBW=3MHz is used for Peak measurement, RBW=1MHz, VBW=10Hz is used for Average measurement.

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: IBN LLC. Date of Test: July 30, 2013
Model: HA2800
Mode: 802.11 n-HT40 (TX-Channel 06)

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Vertical	*4874.000	49.0	36.7	34.2	46.5	74.0	-27.5
Vertical	*7311.000	51.2	36.7	37.1	51.6	74.0	-22.4

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Vertical	*4874.000	40.8	36.7	34.2	38.3	54.0	-15.7
Vertical	*7311.000	41.9	36.7	37.1	42.3	54.0	-11.7

NOTES: 1. Peak detector Data unless otherwise stated. Above 1000 MHz, RBW=1MHz, VBW=3MHz is used for Peak measurement, RBW=1MHz, VBW=10Hz is used for Average measurement.

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: IBN LLC. Date of Test: July 30, 2013
Model: HA2800
Mode: 802.11 n-HT40 (TX-Channel 09)

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Vertical	*4904.000	45.6	36.7	34.6	43.5	74.0	-30.5
Vertical	*7356.000	50.3	36.7	37.0	50.6	74.0	-23.4
Vertical	*2484.700	54.0	36.2	28.0	45.8	74.0	-28.2

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Vertical	*4904.000	38.4	36.7	34.6	36.3	54.0	-17.7
Vertical	*7356.000	38.3	36.7	37.0	38.6	54.0	-15.4
Vertical	*2484.700	45.2	36.2	28.0	37.0	54.0	-17.0

NOTES: 1. Peak detector Data unless otherwise stated. Above 1000 MHz, RBW=1MHz, VBW=3MHz is used for Peak measurement, RBW=1MHz, VBW=10Hz is used for Average measurement.

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

4.9 Conducted Emission

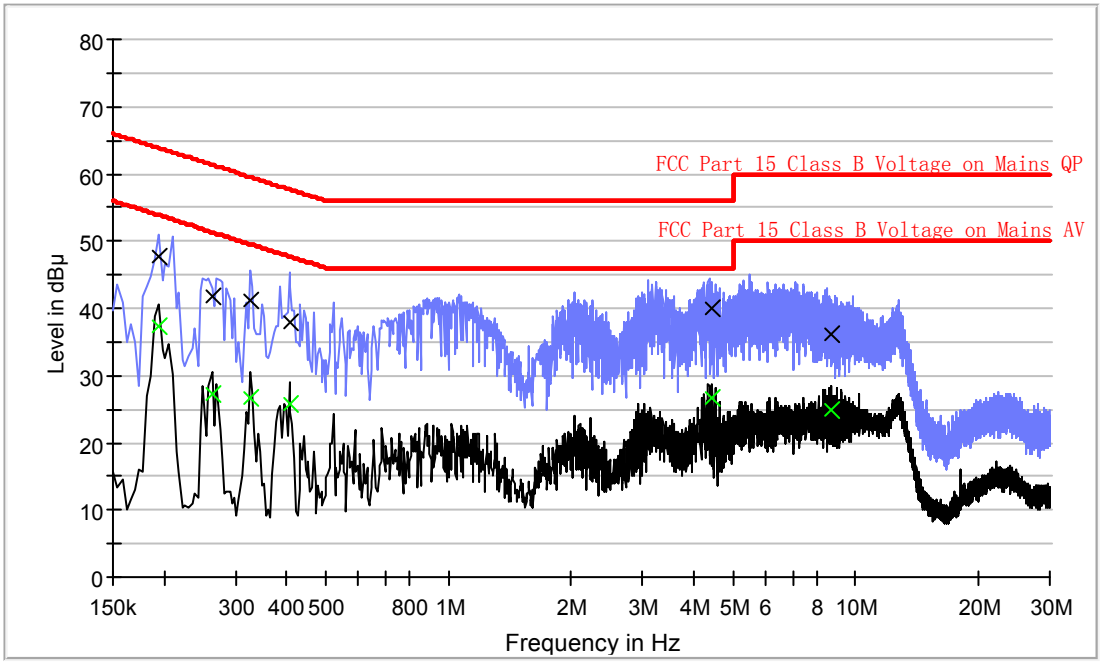
Worst Case Conducted Configuration
At

4.454 MHz

Judgement: Passed by 16.1 dB margin

For electronic filing, the worst case conducted emission configuration photograph is saved with filename: conducted photos.pdf.

Applicant: IBN LLC. Date of Test: July 30, 2013
Model: HA2800
Worst Case Operating Mode: WiFi link
Line: Live
Conducted Emission Test - FCC



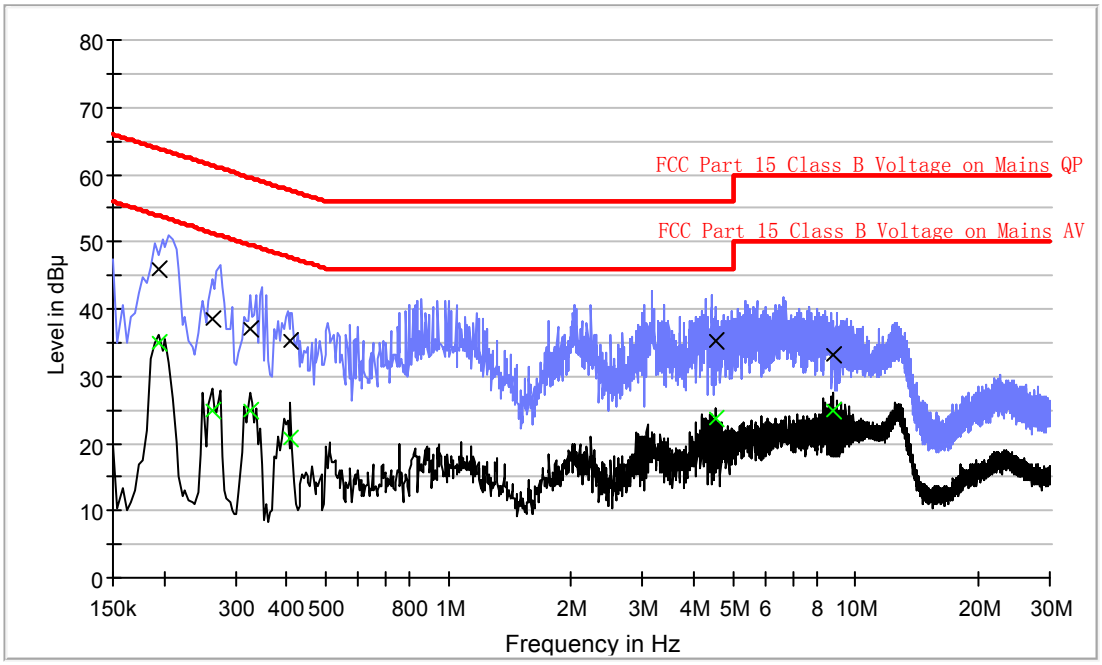
Result Table QP

Frequency (MHz)	QuasiPeak (dB µ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.195000	47.6	L1	9.6	16.2	63.8
0.262000	41.9	L1	9.6	19.5	61.4
0.326000	41.3	L1	9.6	18.4	59.6
0.406000	37.8	L1	9.6	19.9	57.7
4.454000	39.9	L1	9.8	16.1	56.0
8.722000	36.1	L1	9.9	23.9	60.0

Result Table AV

Frequency (MHz)	Average (dB µ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.195000	37.2	L1	9.6	16.6	53.8
0.262000	27.2	L1	9.6	24.2	51.4
0.326000	26.6	L1	9.6	23.0	49.6
0.406000	25.8	L1	9.6	21.9	47.7
4.454000	26.8	L1	9.8	19.2	46.0
8.722000	24.9	L1	9.9	25.1	50.0

Applicant: IBN LLC. Date of Test: July 30, 2013
Model: HA2800
Worst Case Operating Mode: WiFi link
Line: Neutral
Conducted Emission Test - FCC



Result Table QP

Frequency (MHz)	QuasiPeak (dB µ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.194000	46.1	N	9.6	17.8	63.9
0.262000	38.4	N	9.6	23.0	61.4
0.326000	37.1	N	9.6	22.5	59.6
0.410000	35.4	N	9.6	22.2	57.6
4.518000	35.4	N	9.8	20.6	56.0
8.778000	33.3	N	10.0	26.7	60.0

Result Table AV

Frequency (MHz)	Average (dB µ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.194000	34.8	N	9.6	19.1	53.9
0.262000	25.0	N	9.6	26.4	51.4
0.326000	24.9	N	9.6	24.8	49.6
0.410000	20.7	N	9.6	26.9	47.6
4.518000	23.6	N	9.8	22.4	46.0
8.778000	24.9	N	10.0	25.1	50.0

Applicant: IBN LLC. Date of Test: July 30, 2013
Model: HA2800

4.10 Radiated Emissions from Digital Section of Transceiver, FCC Ref: 15.109

[ ] Not required - No digital part

[ ] Test results are attached

[x] Included in the separated report.

Applicant: IBN LLC. Date of Test: July 30, 2013
Model: HA2800

4.11 Transmitter Duty Cycle Calculation and Measurements, FCC Rule 15.35(b), (c)

The EUT antenna output port was connected to the input of the spectrum analyzer. The analyzer center frequency was set to EUT RF channel carrier. The SWEP function on the analyzer was set to ZERO SPAN. The Transmitter ON time was determined from the resultant time-amplitude display:

	See attached spectrum analyzer chart (s) for Transmitter timing
	See Transmitter timing diagram provided by manufacturer
x	Not applicable, duty cycle was not used.

EXHIBIT 5

EQUIPMENT PHOTOGRAPHS

5.0 Equipment Photographs

For electronic filing, the photographs are saved with filename: external photos.doc & internal photos.pdf.

EXHIBIT 6

PRODUCT LABELLING

6.0 Product Labeling

For electronic filing, the FCC ID label artwork and location is saved with filename: label.pdf.

EXHIBIT 7

TECHNICAL SPECIFICATIONS

7.0 Technical Specifications

For electronic filing, the block diagram and circuit diagram are saved with filename: block.pdf and circuit.pdf respectively.

EXHIBIT 8

INSTRUCTION MANUAL

8.0 Instruction Manual

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual.pdf.

This manual will be provided to the end-user with each unit sold/leased in the United States.

EXHIBIT 9

CONFIDENTIALITY REQUEST

9.0 Confidentiality Request

For electronic filing, the confidentiality request of the tested EUT is saved with filename: request.pdf.

EXHIBIT 10

MISCELLANEOUS INFORMATION

10.0 Discussion of Pulse Desensitization

The determination of pulse desensitivity was made in accordance with Hewlett Packard Application Note 150-2, *Spectrum Analysis ... Pulsed RF.*

Pulse desensitivity is not applicable for this device since the transmitter transmits the RF signal continuously.

EXHIBIT 11

TEST EQUIPMENT LIST

11.0 Test Equipment List

Equipment No.	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
SZ061-03	BiConiLog Antenna	ETS	3142C	00078828	29-Jun-13	29-Jun-14
SZ185-01	EMI Receiver	R&S	ESCI	100547	12-Mar-13	12-Mar-14
SZ061-08	Horn Antenna	ETS	3115	00092346	03-Nov-12	03-Nov-13
SZ061-07	Horn Antenna	ETS	3160-09	00083067	16-Feb-12	16-Aug-13
SZ061-06	Active Loop Antenna	Electro-Metrics	EM-6876	217	13-May-13	13-May-14
SZ056-03	Spectrum Analyzer	R&S	FSP 30	101148	12-Mar-13	12-Mar-14
SZ181-04	Preamplifier	Agilent	8449B	3008A02474	12-Mar-13	12-Mar-14
SZ182-02	RF Power Meter	Anritsu	ML2496A	1302005	28-Feb-13	28-Feb-14
SZ182-02-01	Pulse Power Sensor	Anritsu	MA2411B	1207429	28-Feb-13	28-Feb-14
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	4102	02-Mar-13	02-Mar-14
SZ062-02	RF Cable	RADIALL	RG 213U	--	26-Feb-13	26-Aug-13
SZ062-05	RF Cable	RADIALL	0.04-26.5GHz	--	22-Apr-13	22-Oct-13
SZ062-12	RF Cable	RADIALL	0.04-26.5GHz	--	22-Apr-13	22-Oct-13
SZ067-04	Notch Filter	Micro-Tronics	BRM50702-02	--	21-May-13	21-May-14
SZ185-02	EMI Test Receiver	R&S	ESCI	100692	05-Nov-12	05-Nov-13
SZ187-01	Two-Line V-Network	R&S	ENV216	100072	05-Nov-12	05-Nov-13
SZ187-02	Two-Line V-Network	R&S	ENV216	100073	05-Nov-12	05-Nov-13
SZ188-03	Shielding Room	ETS	RFD-100	4100	10-Sep-12	10-Sep-13