

FCC Part 15 EMI TEST REPORT of

E.U.T. : Smartphone Wireless System
/ VoIP Server

FCC ID. : D6XIG7600

Model No. : IG7600 / IPX-25 / X-25

for

APPLICANT : TECOM CO., LTD.

ADDRESS : 23, R&D Road 2 Science-Based Industrial Park
Hsin-Chu Taiwan R.O.C.

Test Performed by

ELECTRONICS TESTING CENTER, TAIWAN

NO. 34. LIN 5. DINGFU, LINKOU DIST.,
NEW TAIPEI CITY, TAIWAN, 24442, R.O.C.

Tel : (02)26023052 Fax : (02)26010910

<http://www.etc.org.tw> ; e-mail: emc@etc.org.tw

Report Number : 13-08-RBF-008-01

TEST REPORT CERTIFICATION

Applicant : TECOM CO., LTD.
23, R&D Road 2 Science-Based Industrial Park Hsin-Chu Taiwan
R.O.C.

Manufacturer : TECOM CO., LTD.
23, R&D Road 2 Science-Based Industrial Park Hsin-Chu Taiwan
R.O.C.

Description of EUT

- a) Type of EUT : Smartphone Wireless System / VoIP Server
b) Trade Name : MOCET / MOCET / Xblue
c) Model No. : IG7600 / IPX-25 / X-25
e) Power Supply : Adapter:LTE10W-S2
I/P:100-240Vac,50/60Hz,0.5A
O/P:12.Vdc,1.5A,MAX:18W

Regulation Applied : FCC Rules and Regulations Part 15 Subpart C

I HEREBY CERTIFY THAT: The data shown in this report were made in accordance with the procedures given in ANSI C63.4, and the energy emitted by the device was founded to be within the limits applicable. I assume full responsibility for accuracy and completeness of these data.

Note: 1. The result of the testing report relate only to the item tested.

2. The testing report shall not be reproduced expect in full, without the written approval of ETC

Summary of Tests

Test	Results
Radiated Emission	Pass
Conducted Emission	Pass
Emission Bandwidth	Pass
Output Power	Pass
100 kHz Bandwidth of Band Edges	Pass
Power Density	Pass
Out-of-Band Conducted Emission	Pass

Date Test Item Received : Aug. 12, 2013

Date Test Campaign Completed : Oct. 04, 2013

Date of Issue : Oct. 22, 2013

Test Engineer : *Jiapeng Chen*
(Jiapeng Chen, Engineer)

Approve & Authorized Signer : *S. S. Liou*
S. S. Liou, Section Manager
EMC Dept. II of ELECTRONICS
TESTING CENTER, TAIWAN

Table of Contents	Page
1 GENERAL INFORMATION.....	1
1.1 Product Description.....	1
1.2 Characteristics of Device	1
1.3 Test Methodology	2
1.4 Test Facility.....	2
2 PROVISIONS APPLICABLE.....	3
2.1 Definition	3
2.2 Requirement for Compliance	4
2.3 Restricted Bands of Operation	6
2.4 Labeling Requirement.....	6
2.5 User Information	7
3. SYSTEM TEST CONFIGURATION.....	8
3.1 Justification	8
3.2 Devices for Tested System.....	8
4 RADIATED EMISSION MEASUREMENT	9
4.1 Applicable Standard.....	9
4.2 Measurement Procedure.....	9
4.3 Measuring Instrument	11
4.4 Radiated Emission Data	12
4.5 Field Strength Calculation	30
4.6 Photos of Radiation Measuring Setup.....	31
5 CONDUCTED EMISSION MEASUREMENT.....	32
5.1 Standard Applicable.....	32
5.2 Measurement Procedure.....	32
5.3 Conducted Emission Data	33
5.4 Result Data Calculation	35
5.5 Conducted Measurement Equipment	35
5.6 Photos of Conduction Measuring Setup.....	36
6 ANTENNA REQUIREMENT	37
6.1 Standard Applicable.....	37
6.2 Antenna Construction and Directional Gain.....	37
7 EMISSION BANDWIDTH MEASUREMENT.....	38
7.1 Standard Applicable.....	38
7.2 Measurement Procedure.....	38

7.3 Measurement Equipment	38
7.4 Measurement Data	39
8 OUTPUT POWER MEASUREMENT	58
8.1 Standard Applicable	58
8.2 Measurement Procedure	58
8.3 Measurement Equipment	58
8.4 Measurement Data	59
9 100 kHz BANDWIDTH OF BAND EDGES MEASUREMENT	79
9.1 Standard Applicable	79
9.2 Measurement Procedure	79
9.3 Measurement Equipment	79
9.4 Measurement Data	80
10 POWER DENSITY MEASUREMENT	93
10.1 Standard Applicable	93
10.2 Measurement Procedure	93
10.3 Measurement Equipment	93
10.4 Measurement Data	94
11. OUT-OF-BAND CONDUCTED EMISSION MEASUREMENT	113
11.1 Standard Applicable	113
11.2 Measurement Procedure	113
11.3 Measurement Equipment	113
11.4 Measurement Data	114

1 GENERAL INFORMATION

1.1 Product Description

- a) Type of EUT : Smartphone Wireless System / VoIP Server
- b) Trade Name : MOCET / MOCET / Xblue
- c) Model No. : IG7600 / IPX-25 / X-25
- d) Power Supply : Adapter:LTE10W-S2
I/P:100-240Vac,50/60Hz,0.5A
O/P:12.Vdc,1.5A,MAX:18W

1.2 Characteristics of Device

GENERAL DESCRIPTION OF EUT

PRODUCT	Smartphone Wireless System / VoIP Server
MODEL NO.	IG7600 / IPX-25 / X-25
FCC ID	D6XIG7600
POWER SUPPLY	Adaptor Model No.: LTE18W-S2 I/P: 100-240Vac, 50/60Hz, 0.5A; O/P: 12Vdc, 1.5A
MODULATION TYPE	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
MODULATION TECHNOLOGY	DSSS, OFDM
TRANSFER RATE	802.11b: 11 / 5.5 / 2 / 1Mbps 802.11g: 54 / 48 / 36 / 24 / 18 / 12 / 9 / 6Mbps Draft 802.11n (20MHz) (800ns GI): 130 / 117 / 104 / 78 / 65 / 58.5 / 52 / 39 / 26 / 19.5 / 13 / 6.5Mbps. Draft 802.11n (40MHz) (400ns GI): 270 / 243 / 216 / 162 / 135 / 121.5 / 108 / 81 / 54 / 40.5 / 27 / 13.5Mbps.
FREQUENCY RANGE	802.11b & 802.11g: 2412 ~ 2462MHz
NUMBER OF CHANNEL	11 for 802.11b, 802.11g, draft 802.11n (20MHz) 7 for draft 802.11n (40MHz)

Operated in 2400 ~ 2483.5MHz band:

Eleven channels are provided for 802.11b, 802.11g, draft 802.11n (20MHz):

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
1	2412MHz	7	2442MHz
2	2417MHz	8	2447MHz
3	2422MHz	9	2452MHz
4	2427MHz	10	2457MHz
5	2432MHz	11	2462MHz
6	2437MHz		

Seven channels are provided for draft 802.11n (40MHz):

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
1	2422MHz	5	2442MHz
2	2427MHz	6	2447MHz
3	2432MHz	7	2452MHz
4	2437MHz		

1.3 Test Methodology

Both conducted and radiated emissions were performed according to the procedures illustrated in ANSI C63.4 (2003). Other required measurements were illustrated in separate sections of this test report for details.

1.4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the roof top of Building at NO. 34. LIN 5. DINGFU, LINKOU DIST., NEW TAIPEI CITY, TAIWAN, 24442, R.O.C.

This site has been fully described in a report submitted to your office, and accepted in a letter dated Jan. 11, 2011

2 PROVISIONS APPLICABLE

2.1 Definition

Unintentional radiator:

A device that intentionally generates and radio frequency energy for use within the device, or that sends radio frequency signals by conduction to associated equipment via connecting wiring, but which is not intended to emit RF energy by radiation or induction.

Class A Digital Device:

A digital device which is marketed for use in commercial or business environment; exclusive of a device which is market for use by the general public, or which is intended to be used in the home.

Class B Digital Device :

A digital device which is marketed for use in a residential environment notwithstanding use in a commercial, business of industrial environment. Example of such devices that are marketed for the general public.

Note : A manufacturer may also qualify a device intended to be marketed in a commercial, business, or industrial environment as a Class B digital device, and in fact is encouraged to do so, provided the device complies with the technical specifications for a Class B Digital Device. In the event that a particular type of device has been found to repeatedly cause harmful interference to radio communications, the Commission may classify such a digital device as a Class B Digital Device, Regardless of its intended use.

Intentional radiator:

A device that intentionally generates and emits radio frequency energy by radiation or induction.

2.2 Requirement for Compliance

(1) Conducted Emission Requirement

Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency MHz	Quasi Peak dB μ V	Average dB μ V
0.15 - 0.5	66-56*	56-46*
0.5 - 5.0	56	46
5.0 - 30.0	60	50

* Decreases with the logarithm of the frequency

(2) Radiated Emission Requirement

For unintentional device, according to §15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency MHz	Distance Meters	Radiated dB μ V/m	Radiated μ V/m
30 - 88	3	40.0	100
88 - 216	3	43.5	150
216 - 960	3	46.0	200
Above 960	3	54.0	500

For intentional device, according to §15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

(3) Antenna Requirement

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

(4) Bandwidth Requirement

For direct sequence system, according to 15.247(a)(2), the minimum 6dB bandwidth shall be at least 500 kHz.

(5) Output Power Requirement

For direct sequence system, according to 15.247(b), the maximum peak output power of the transmitter shall not exceed 1 Watt. If transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(6) 100 kHz Bandwidth of Frequency Band Edges Requirement

According to 15.247(c), if any 100 kHz bandwidth outside these frequency bands, the radio frequency power that is produced by the modulation products of the spreading sequence, the information sequence and the carrier frequency shall be either at least 20 dB below that in any 100 kHz bandwidth within the band that contains the highest level of the desired power or shall not exceed the general levels specified in §15.209(a), whichever results in the lesser attenuation.

(7) Power Density Requirement

According to 15.247(d), for direct sequence systems, the transmitted power density averaged over any 1 second interval shall not be greater than 8 dBm in any 3 kHz bandwidth within these bands.

2.3 Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands listed below :

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42-16.423	399.9-410	4.5-5.15
0.495 - 0.505 **	16.69475 - 16.69525	608-614	5.35-5.46
2.1735 - 2.1905	16.80425 - 16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475 - 156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3360-4400	Above 38.6
13.36-13.41			

** : Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

2.4 Labeling Requirement

The device shall bear the following statement in a conspicuous location on the device :

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions : (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

2.5 User Information

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual.

The Federal Communications Commission Radio Frequency Interference Statement includes the following paragraph.

This equipment has been tested and found to comply with the limits for a Class B Digital Device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction may cause harmful interference to radio communication. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio / TV technician for help.

3. SYSTEM TEST CONFIGURATION

3.1 Justification

For both radiated and conducted emissions below 1 GHz, the system was configured for testing in a typical fashion as a customer would normally use it. The peripherals other than EUT were connected in normally standing by situation. Measurement was performed under the condition that a computer program was exercised to simulate data communication of EUT, and the transmission rate was set to maximum allowed by EUT. Three highest emissions were verified with varying placement of the cables connected to EUT to maximize the emission from EUT.

For conducted and radiated spurious emissions, whichever RF channel is operated, the digital circuits function identically. As the reason, measurement of radiated emissions from digital circuits is only performed with channel 7 by transmitting mode.

3.2 Devices for Tested System

Device	Manufacture	Model	Cable Description
Smartphone	Wireless	TECOM	IG7600 / IPX-25 / X-25
System / VoIP Server *	CO.,LTD.		1.5 Unshielded AC Adapter Power Cord. 3.0m Unshielded RJ45 Line*2 3.0m Unshielded RJ11 Line*5
Notebook PC	DELL	PP25L	1.8m Unshielded AC Adaptor Power Cord

Remark “*” means equipment under test.

4 RADIATED EMISSION MEASUREMENT

4.1 Applicable Standard

For unintentional radiator, the radiated emission shall comply with §15.109(a).

For intentional radiators, according to §15.247 (a), operation under this provision is limited to frequency hopping and direct sequence spread spectrum, and the out band emission shall be comply with §15.247 (c)

4.2 Measurement Procedure

1. Setup the configuration per figure 1 and 2 for frequencies measured below and above 1 GHz respectively.
2. For emission frequencies measured below 1 GHz, a pre-scan is performed in a shielded chamber to determine the accurate frequencies of higher emissions will be checked on a open test site. As the same purpose, for emission frequencies measured above 1 GHz, a pre-scan also be performed with a 1 meter measuring distance before final test.
3. For emission frequencies measured below and above 1 GHz, set the spectrum analyzer on a 100 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.
4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0 ° to 360 ° with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading. A RF test receiver is also used to confirm emissions measured.
5. Repeat step 4 until all frequencies need to be measured were complete.
6. Repeat step 5 with search antenna in vertical polarized orientations.
7. Check the three frequencies of highest emission with varying the placement of cables associated with EUT to obtain the worse case and record the result.

Figure 1 : Frequencies measured below 1 GHz configuration

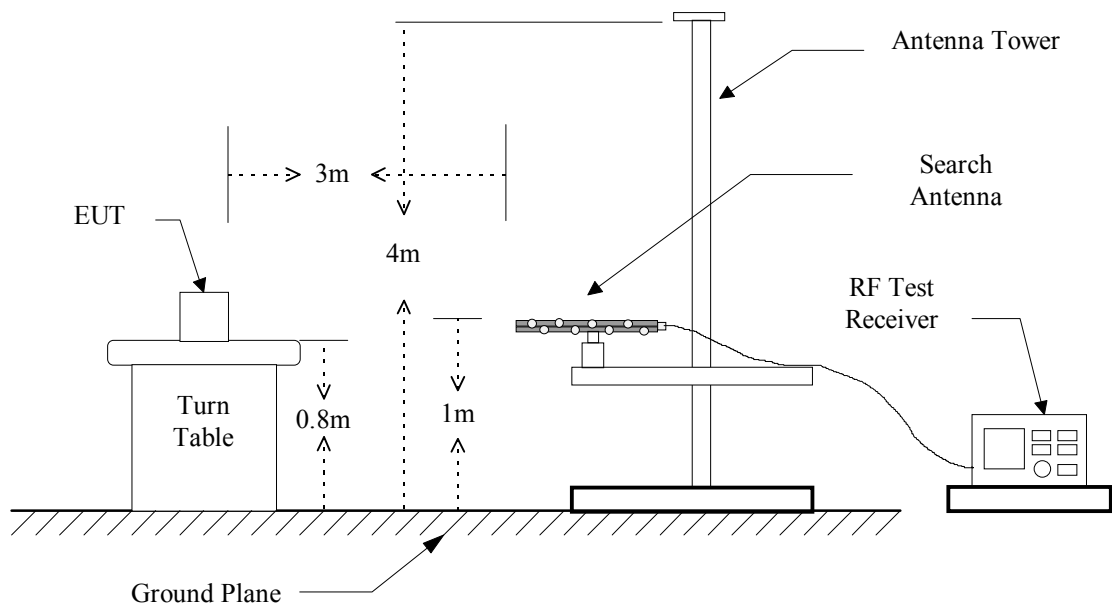
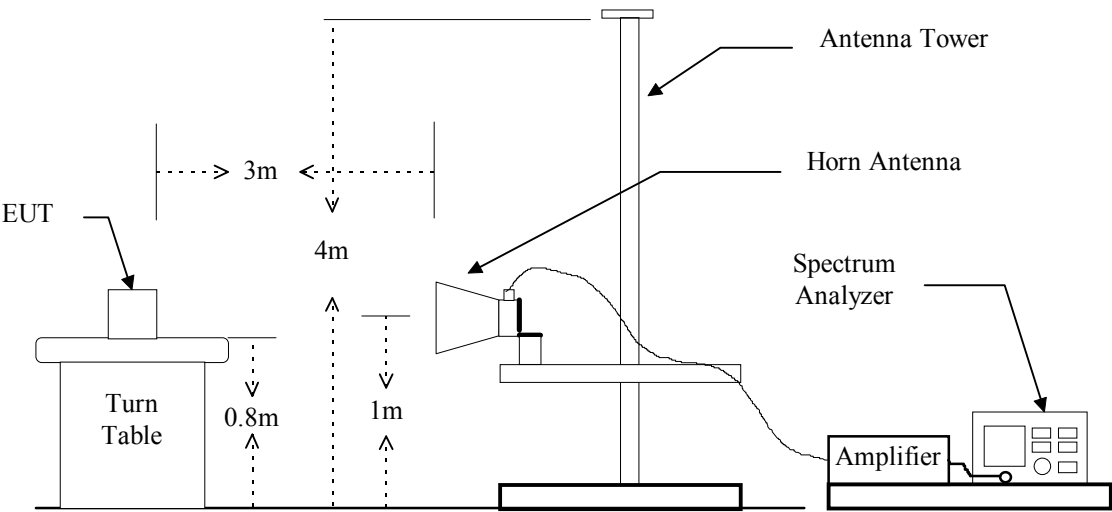


Figure 2 : Frequencies measured above 1 GHz configuration



4.3 Measuring Instrument

The following instrument are used for radiated emissions measurement:

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Spectrum	Rohde & Schwarz	FSP40	2012/12/07	2013/12/06
EMI Test Receiver	Rohde & Schwarz	ESCI	2013/07/15	2014/07/14
Test Receiver	Rohde & Schwarz	ESVS30	2013/05/06	2014/05/05
Double Ridged Antenna	EMCO	3115	2013/04/29	2014/04/28
Double Ridged Guide Horn Antenna	EMCO	3116	2012/11/23	2013/11/22
Log-periodic Antenna	EMCO	3146	2012/10/17	2013/10/16
Biconical Antenna	EMCO	3110B	2012/12/13	2013/12/12
Amplifier	HP	8449B	2013/01/09	2014/01/08
Amplifier	HP	8447D	2013/05/03	2014/05/02
Amplifier	HP	83051A	2013/05/06	2014/05/05

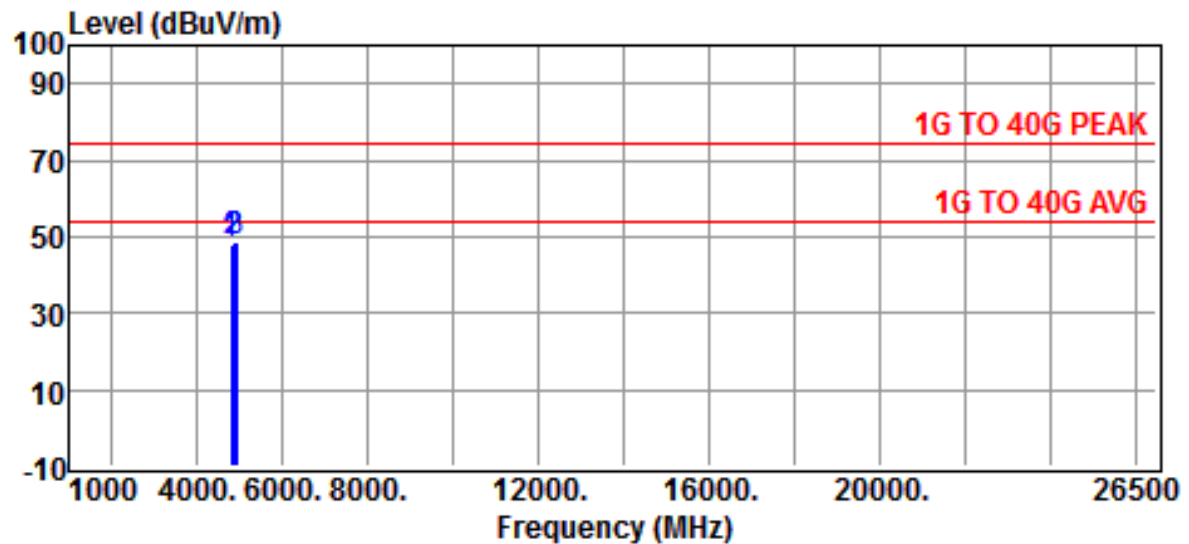
Measuring instrument setup in measured frequency band when specified detector function is used :

Frequency Band (MHz)	Instrument	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	RF Test Receiver	Quasi-Peak	120 kHz	N/A
	Spectrum Analyzer	Peak	100 kHz	100 kHz
Above 1000	Spectrum Analyzer	Peak	1 MHz	1 MHz
	Spectrum Analyzer	Average	1 MHz	10 Hz

4.4 Radiated Emission Data

4.4.1 RF Portion

A. (802.11b)

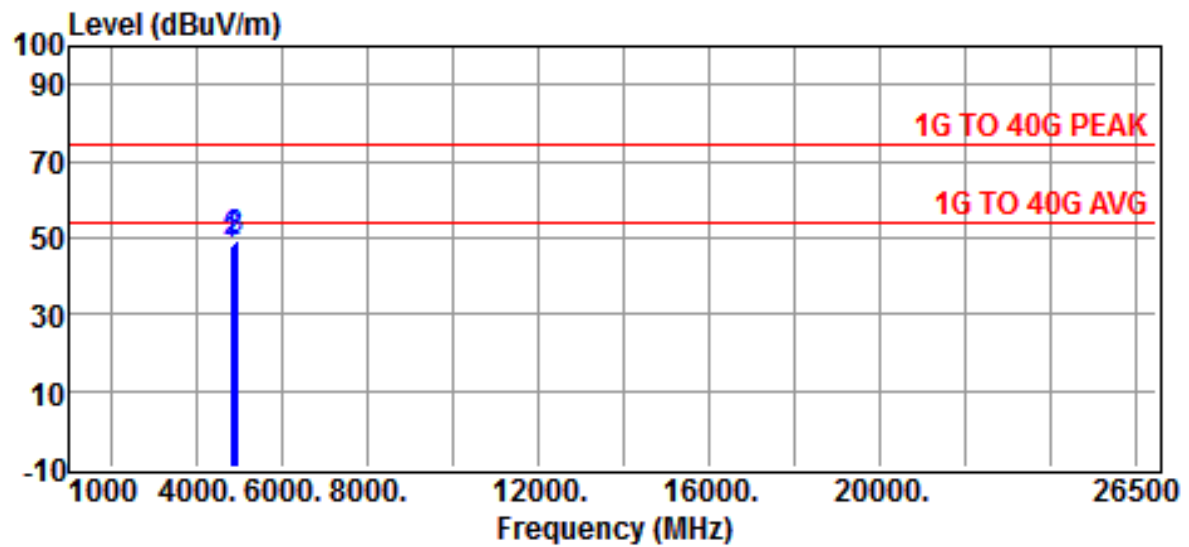


Site	:Chamber #2	Date	:2013-10-07
Limit	:1G TO 40G PEAK	Ant. Pol.	:HORIZONTAL
EUT	: Smartphone Wireless System / VoIP Server		
Temp.	:24°C		
Power Rating	:120V/60Hz	Humi.	:60%
Model	:IG7600	Engineer.	:Jiapeng
Test Mode	:802.11B		

Freq MHz	Reading dBuV	Correction Factor dB	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
4824.0000	46.8	1.3	48.1	74.0	-25.9	Peak
4874.0000	47.2	1.4	48.6	74.0	-25.4	Peak
4924.0000	47.4	1.5	48.9	74.0	-25.1	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

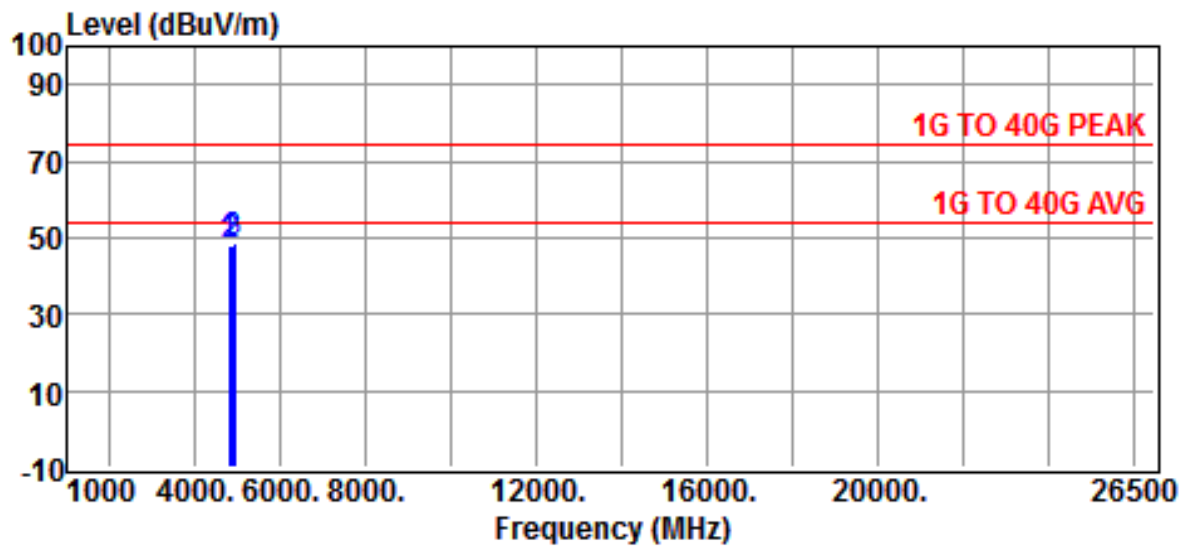


Site :Chamber #2 Date :2013-10-07
 Limit :1G TO 40G PEAK Ant. Pol. :VERTICAL
 EUT : Smartphone Wireless System / VoIP Server
 Temp. :24°C
 Power Rating :120V/60Hz Humi. :60%
 Model :IG7600 Engineer. :Jiapeng
 Test Mode :802.11B
 Test Mode :

Freq MHz	Reading dBuV	Correction Factor dB	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
4824.0000	46.8	1.3	48.1	74.0	-25.9	Peak
4874.0000	46.9	1.4	48.3	74.0	-25.7	Peak
4924.0000	47.6	1.5	49.1	74.0	-24.9	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

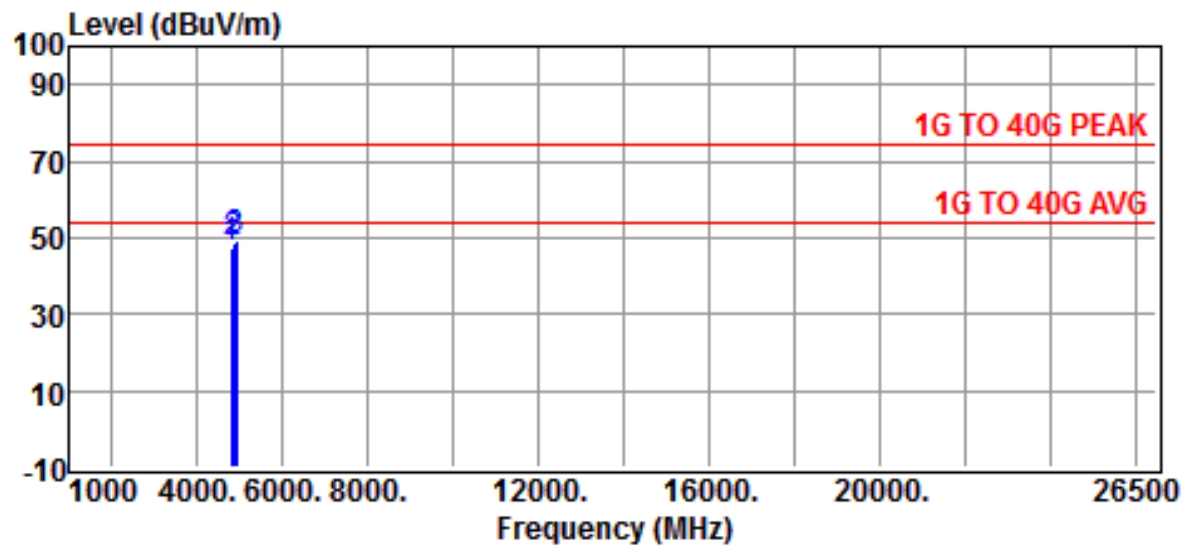
B. (802.11g)

Site :Chamber #2 Date :2013-10-08
 Limit :1G TO 40G PEAK Ant. Pol. :HORIZONTAL
 EUT : Smartphone Wireless System / VoIP Server
 Temp. :24°C
 Power Rating :120V/60Hz Humi. :60%
 Model :IG7600 Engineer. :Jiapeng
 Test Mode :802.11G

Freq MHz	Reading dBuV	Correction Factor dB	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
4824.0000	46.6	1.3	47.9	74.0	-26.1	Peak
4874.0000	46.8	1.4	48.2	74.0	-25.8	Peak
4924.0000	47.1	1.5	48.6	74.0	-25.4	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

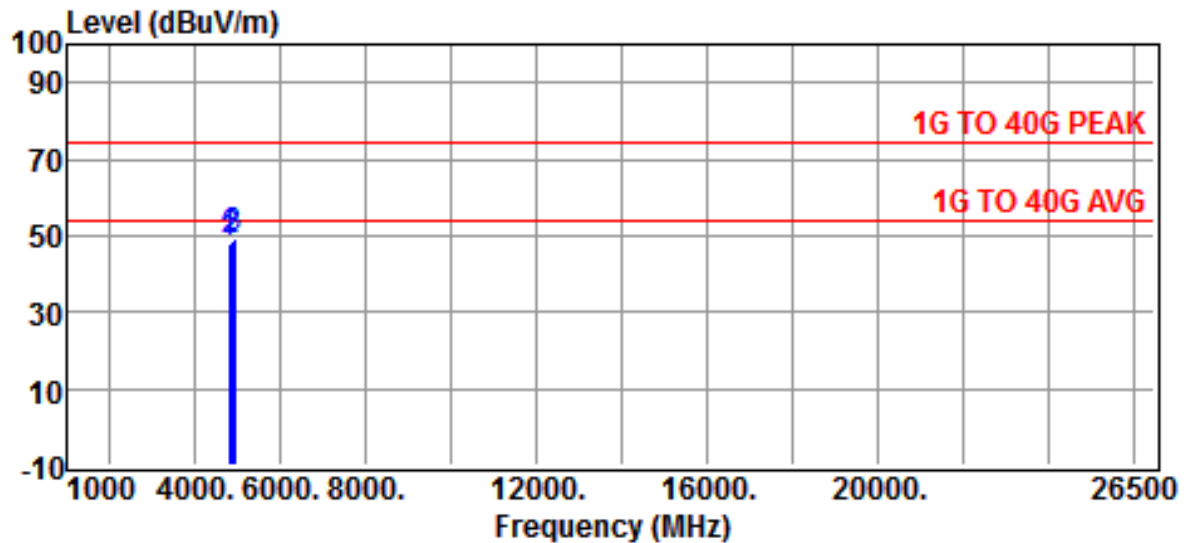


Site :Chamber #2 Date :2013-10-08
 Limit :1G TO 40G PEAK Ant. Pol. :VERTICAL
 EUT : Smartphone Wireless System / VoIP Server
 Temp. :24°C
 Power Rating :120V/60Hz Humi. :60%
 Model :IG7600 Engineer. :Jiapeng
 Test Mode :802.11G

Freq MHz	Reading dBuV	Correction Factor dB	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
4824.0000	46.3	1.3	47.6	74.0	-26.4	Peak
4874.0000	47.1	1.4	48.5	74.0	-25.5	Peak
4924.0000	47.6	1.5	49.1	74.0	-24.9	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

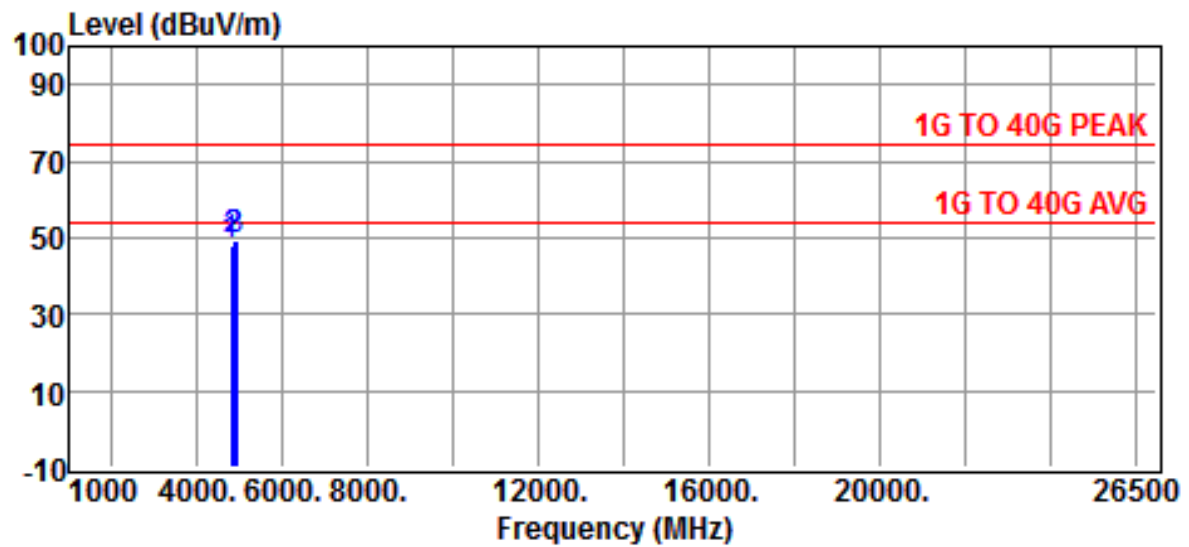
C. (802.11n HT-20)

Site :Chamber #2 Date :2013-10-08
 Limit :1G TO 40G PEAK Ant. Pol. :HORIZONTAL
 EUT : Smartphone Wireless System / VoIP Server
 Temp. :24°C
 Power Rating :120V/60Hz Humi. :60%
 Model :IG7600 Engineer. :Jiapeng
 Test Mode :802.11N20

Freq MHz	Reading dBuV	Correction Factor dB	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
4824.0000	46.4	1.3	47.7	74.0	-26.3	Peak
4874.0000	47.2	1.4	48.6	74.0	-25.4	Peak
4924.0000	47.7	1.5	49.2	74.0	-24.8	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

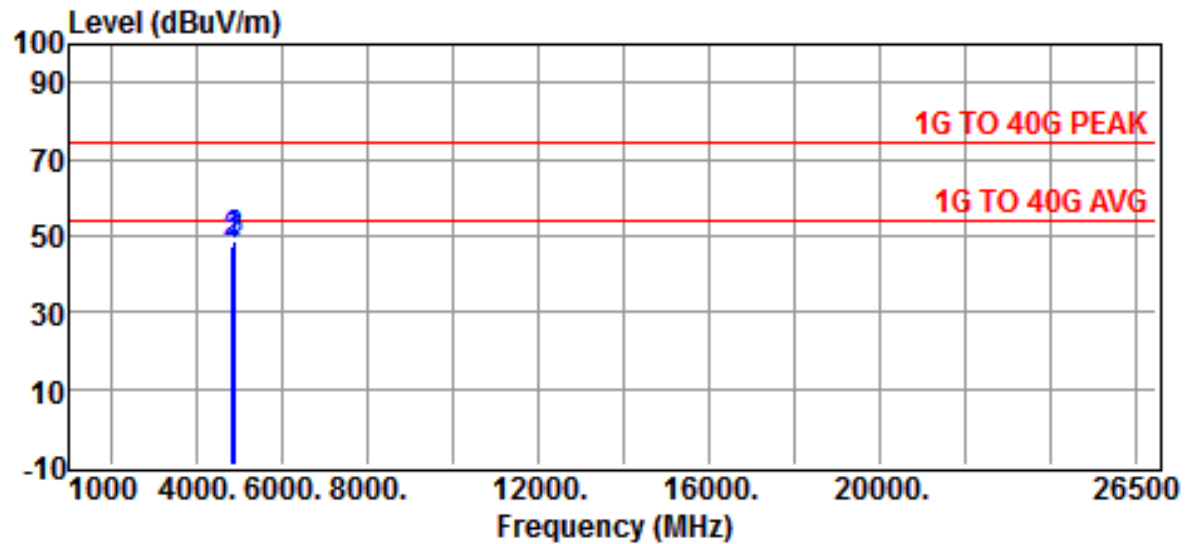


Site :Chamber #2 Date :2013-10-08
 Limit :1G TO 40G PEAK Ant. Pol. :VERTICAL
 EUT : Smartphone Wireless System / VoIP Server
 Temp. :24°C
 Power Rating :120V/60Hz Humi. :60%
 Model :IG7600 Engineer. :Jiapeng
 Test Mode :802.11N20
 Test Mode :

Freq MHz	Reading dBuV	Correction Factor dB	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
4824.0000	46.9	1.3	48.2	74.0	-25.8	Peak
4874.0000	48.2	1.4	49.6	74.0	-24.4	Peak
4924.0000	47.6	1.5	49.1	74.0	-24.9	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

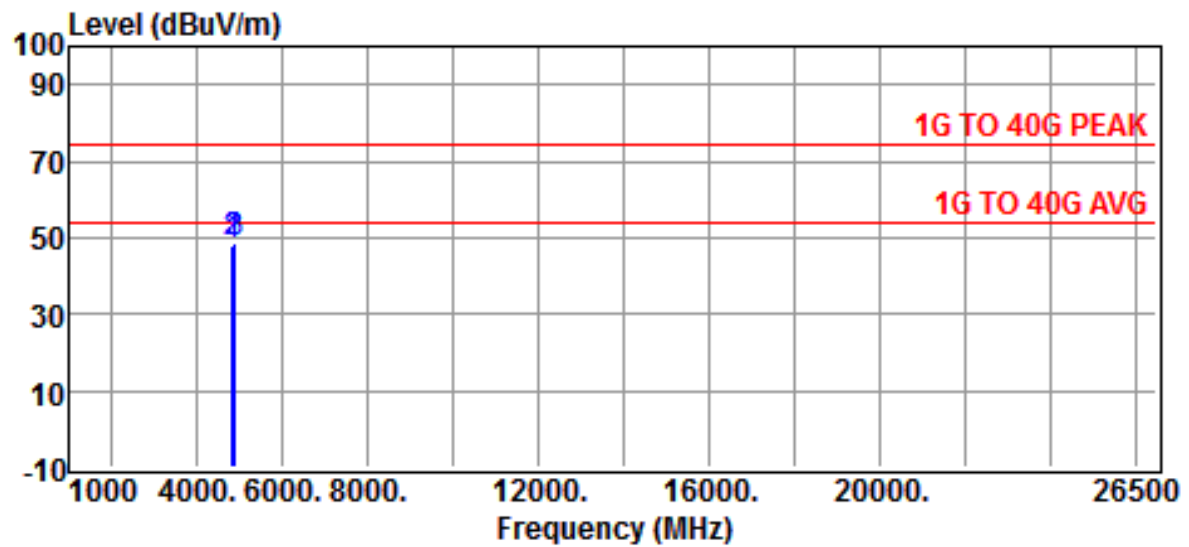
D. (802.11n HT-40)

Site	:Chamber #2	Date	:2013-10-08
Limit	:1G TO 40G PEAK	Ant. Pol.	:HORIZONTAL
EUT	: Smartphone Wireless System / VoIP Server		
Temp.	:24°C		
Power Rating	:120V/60Hz	Humi.	:60%
Model	:IG7600	Engineer.	:Jiapeng
Test Mode	:802.11N40		
Test Mode	:		

Freq MHz	Reading dBuV	Correction Factor dB	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
4844.0000	46.2	1.3	47.5	74.0	-26.5	Peak
4874.0000	46.7	1.4	48.1	74.0	-25.9	Peak
4904.0000	47.5	1.4	48.9	74.0	-25.1	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.



Site :Chamber #2 Date :2013-10-08
 Limit :1G TO 40G PEAK Ant. Pol. :VERTICAL
 EUT : Smartphone Wireless System / VoIP Server
 Temp. :24°C
 Power Rating :120V/60Hz Humi. :60%
 Model :IG7600 Engineer. :Jiapeng
 Test Mode :802.11N40
 Test Mode :

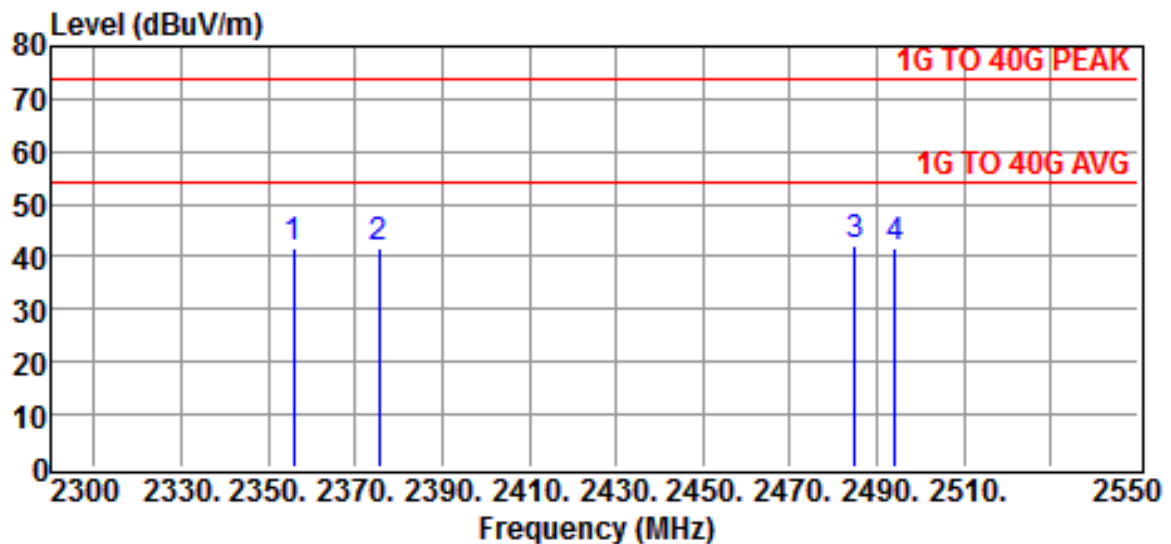
Freq MHz	Reading dBuV	Correction Factor dB	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
4844.0000	46.5	1.3	47.8	74.0	-26.2	Peak
4874.0000	46.9	1.4	48.3	74.0	-25.7	Peak
4904.0000	47.4	1.4	48.8	74.0	-25.2	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

4.4.2 Radiated Emission of Restricted bands

Mode: 802.11b

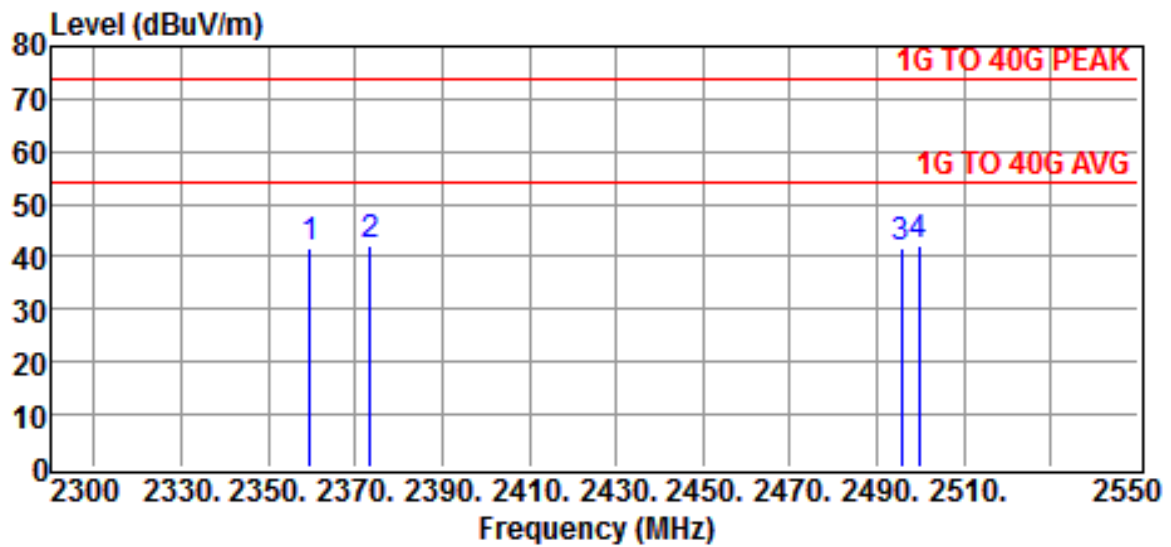


Site	:Chamber #2	Date	:2013-10-08
Limit	:1G TO 40G PEAK	Ant. Pol.	:HORIZONTAL
EUT	: Smartphone Wireless System / VoIP Server		
Temp.	:23°C		
Power Rating	:120V/60Hz	Humi.	:58%
Model	:IG7600	Engineer.	:Jiapeng
Test Mode	:CH LO & HI - Restricted Bands		
Test Mode	:802.11B		

Freq MHz	Reading dBuV	Correction Factor dB	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
2356.0000	47.7	-5.9	41.8	74.0	-32.2	Peak
2375.5000	47.4	-5.8	41.6	74.0	-32.4	Peak
2485.0000	47.5	-5.5	42.0	74.0	-32.0	Peak
2494.0000	47.3	-5.5	41.8	74.0	-32.2	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

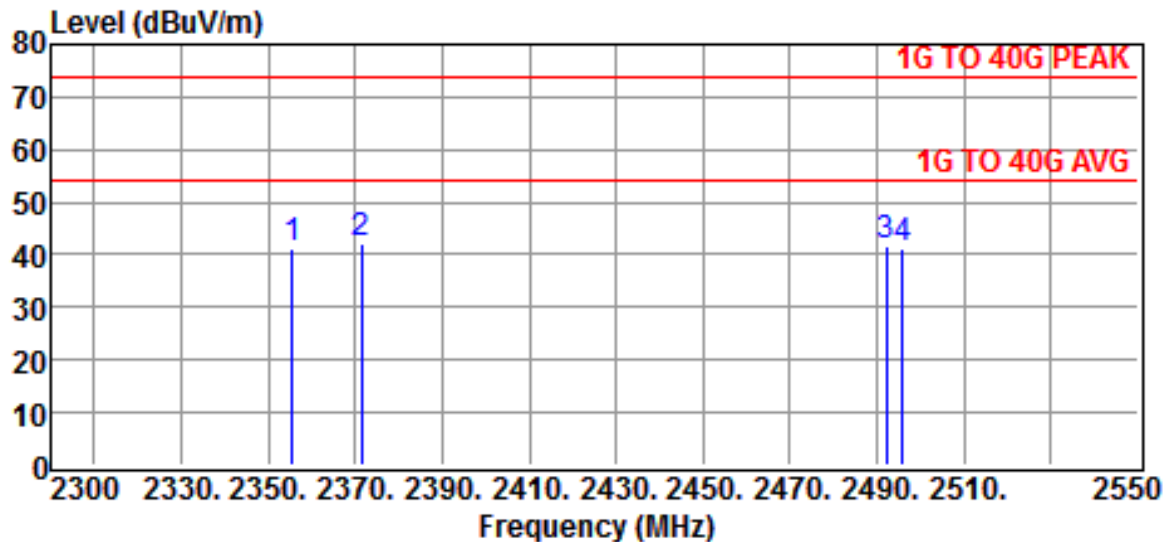


Site :Chamber #2 Date :2013-10-08
 Limit :1G TO 40G PEAK Ant. Pol. :VERTICAL
 EUT : Smartphone Wireless System / VoIP Server
 Temp. :23°C
 Power Rating :120V/60Hz Humi. :58%
 Model :IG7600 Engineer. :Jiapeng
 Test Mode :CH LO & HI - Restricted Bands
 Test Mode :802.11B

Freq MHz	Reading dBuV	Correction Factor dB	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
2359.5000	47.8	-5.9	41.9	74.0	-32.1	Peak
2373.5000	48.1	-5.8	42.3	74.0	-31.7	Peak
2495.5000	47.1	-5.5	41.6	74.0	-32.4	Peak
2499.5000	47.6	-5.5	42.1	74.0	-31.9	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

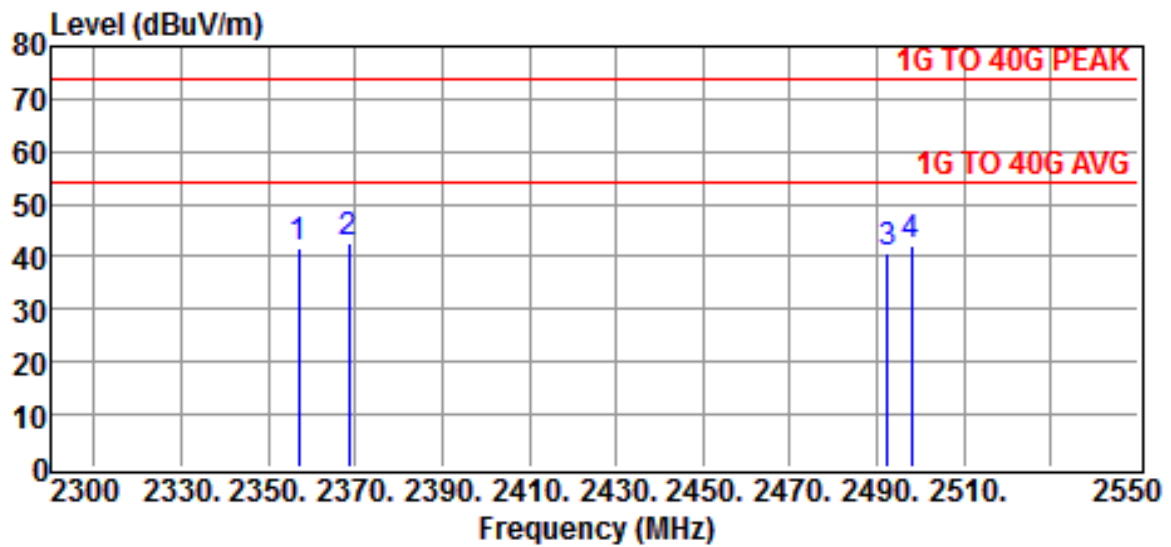
Mode: 802.11g

Site	:Chamber #2	Date	:2013-10-08
Limit	:1G TO 40G PEAK	Ant. Pol.	:HORIZONTAL
EUT	: Smartphone Wireless System / VoIP Server		
Temp.	:23°C		
Power Rating	:120V/60Hz	Humi.	:58%
Model	:IG7600	Engineer.	:Jiapeng
Test Mode	:CH LO & HI - Restricted Bands		
Test Mode	:802.11G		

Freq MHz	Reading dBuV	Correction Factor dB	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
2355.5000	47.1	-5.9	41.2	74.0	-32.8	Peak
2371.5000	48.2	-5.8	42.4	74.0	-31.6	Peak
2492.0000	47.0	-5.5	41.5	74.0	-32.5	Peak
2496.0000	46.6	-5.5	41.1	74.0	-32.9	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

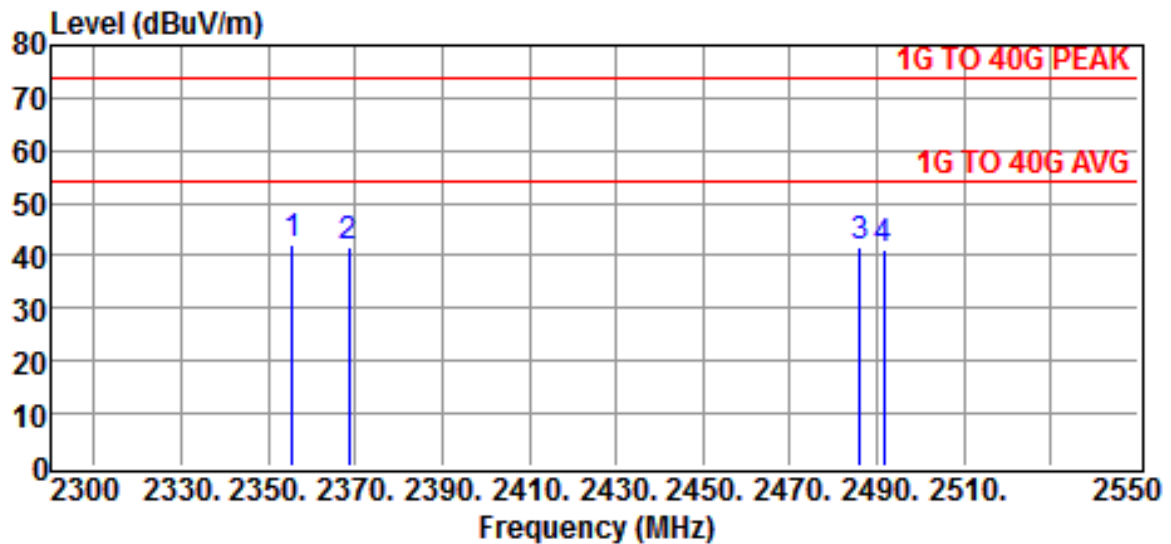


Site :Chamber #2 Date :2013-10-08
 Limit :1G TO 40G PEAK Ant. Pol. :VERTICAL
 EUT : Smartphone Wireless System / VoIP Server
 Temp. :23°C
 Power Rating :120V/60Hz Humi. :58%
 Model :IG7600 Engineer. :Jiapeng
 Test Mode :CH LO & HI - Restricted Bands
 Test Mode :802.11G

Freq MHz	Reading dBuV	Correction Factor dB	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
2357.0000	47.8	-5.9	41.9	74.0	-32.1	Peak
2368.5000	48.3	-5.9	42.4	74.0	-31.6	Peak
2492.5000	46.4	-5.5	40.9	74.0	-33.1	Peak
2498.0000	47.7	-5.5	42.2	74.0	-31.8	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

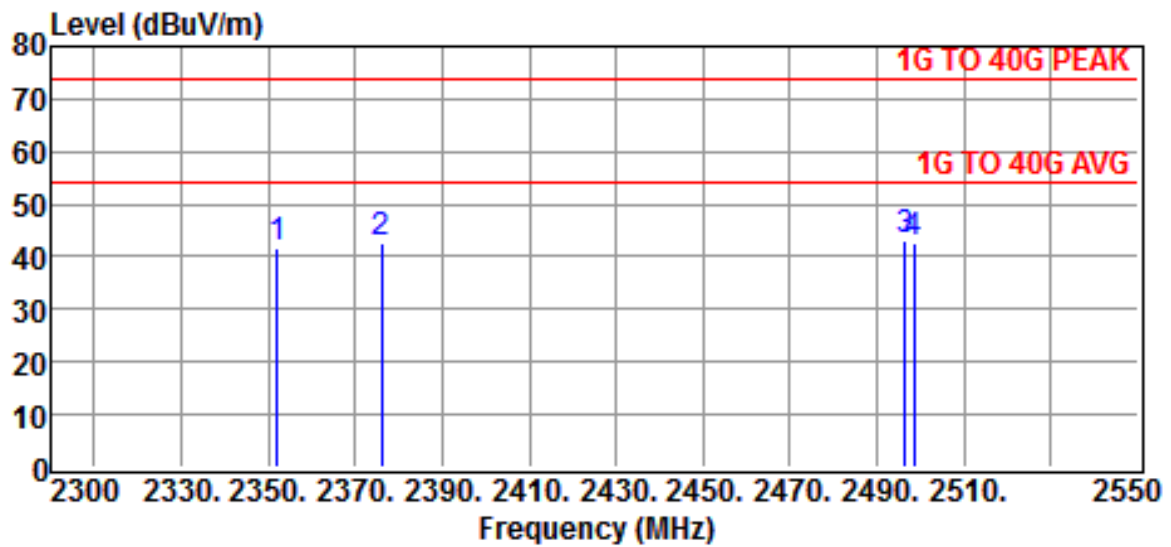
Mode: 802.11n HT-20

Site	:Chamber #2	Date	:2013-10-08
Limit	:1G TO 40G PEAK	Ant. Pol.	:HORIZONTAL
EUT	: Smartphone Wireless System / VoIP Server		
Temp.	:23°C		
Power Rating	:120V/60Hz	Humi.	:58%
Model	:IG7600	Engineer.	:Jiapeng
Test Mode	:CH LO & HI - Restricted Bands		
Test Mode	:802.11N20		

Freq MHz	Reading dBuV	Correction Factor dB	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
2355.5000	48.2	-5.9	42.3	74.0	-31.7	Peak
2368.5000	47.8	-5.9	41.9	74.0	-32.1	Peak
2486.0000	47.3	-5.5	41.8	74.0	-32.2	Peak
2491.5000	46.5	-5.5	41.0	74.0	-33.0	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

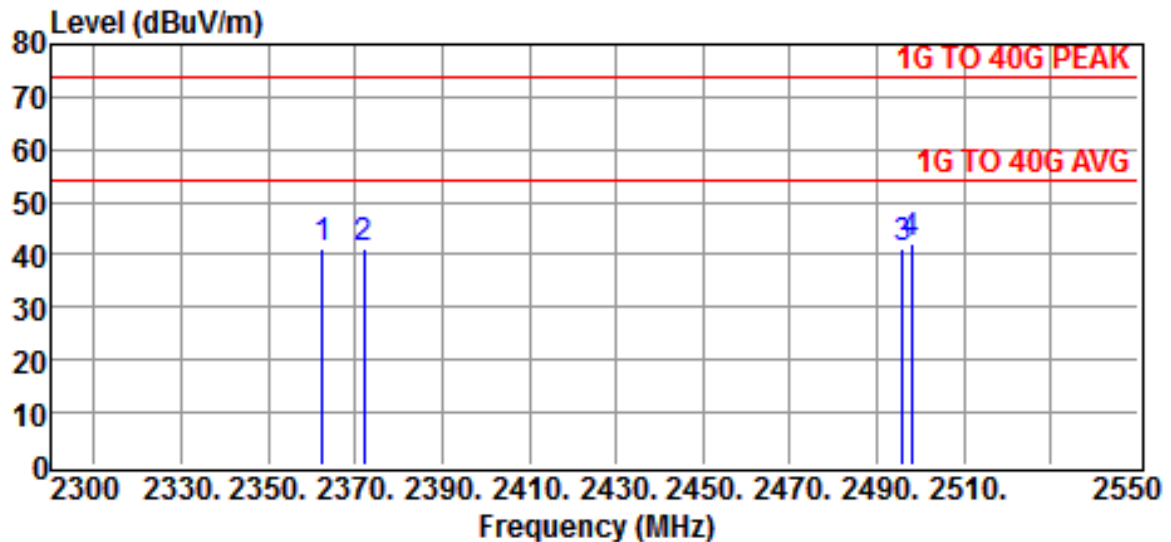


Site :Chamber #2 Date :2013-10-08
 Limit :1G TO 40G PEAK Ant. Pol. :VERTICAL
 EUT : Smartphone Wireless System / VoIP Server
 Temp. :23°C
 Power Rating :120V/60Hz Humi. :58%
 Model :IG7600 Engineer. :Jiapeng
 Test Mode :CH LO & HI - Restricted Bands
 Test Mode :802.11N20

Freq MHz	Reading dBuV	Correction Factor dB	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
2352.0000	47.4	-5.9	41.5	74.0	-32.5	Peak
2376.0000	48.7	-5.8	42.9	74.0	-31.1	Peak
2496.5000	48.7	-5.5	43.2	74.0	-30.8	Peak
2498.5000	48.3	-5.5	42.8	74.0	-31.2	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

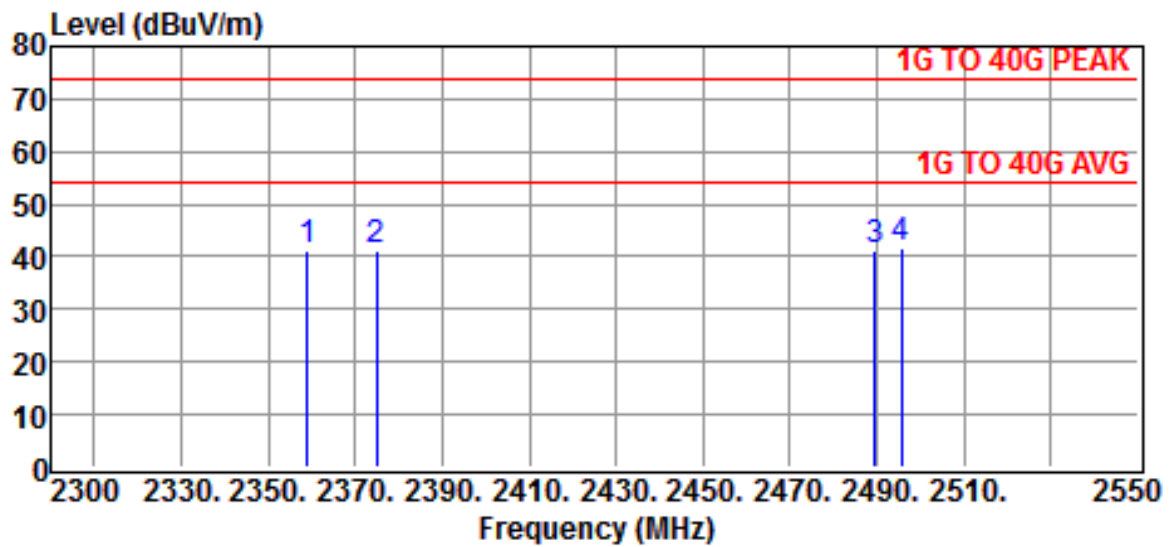
Mode: 802.11n HT-40

Site	:Chamber #2	Date	:2013-10-08
Limit	:1G TO 40G PEAK	Ant. Pol.	:HORIZONTAL
EUT	: Smartphone Wireless System / VoIP Server		
Temp.	:23°C		
Power Rating	:120V/60Hz	Humi.	:58%
Model	:IG7600	Engineer.	:Jiapeng
Test Mode	:CH LO & HI - Restricted Bands		
Test Mode	:802.11N40		

Freq MHz	Reading dBuV	Correction Factor dB	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
2362.5000	47.1	-5.9	41.2	74.0	-32.8	Peak
2372.0000	46.9	-5.8	41.1	74.0	-32.9	Peak
2496.0000	46.8	-5.5	41.3	74.0	-32.7	Peak
2498.0000	47.8	-5.5	42.3	74.0	-31.7	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.



Site	:Chamber #2	Date	:2013-10-08
Limit	:1G TO 40G PEAK	Ant. Pol.	:VERTICAL
EUT	: Smartphone Wireless System / VoIP Server		
Temp.	:23°C		
Power Rating	:120V/60Hz	Humi.	:58%
Model	:IG7600	Engineer.	:Jiapeng
Test Mode	:CH LO & HI - Restricted Bands		
Test Mode	:802.11N40		

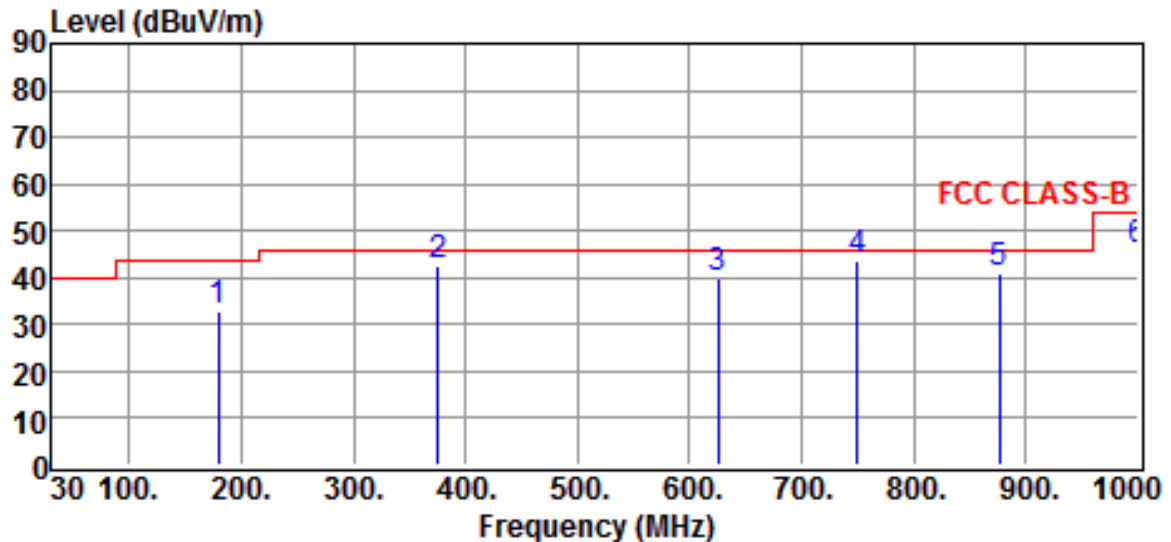
Freq MHz	Reading dBuV	Correction Factor dB	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
2359.0000	47.3	-5.9	41.4	74.0	-32.6	Peak
2375.0000	47.2	-5.8	41.4	74.0	-32.6	Peak
2489.5000	46.5	-5.5	41.0	74.0	-33.0	Peak
2495.5000	47.2	-5.5	41.7	74.0	-32.3	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result
4. Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.

4.4.3 Other Emission

a) Emission frequencies below 1 GHz

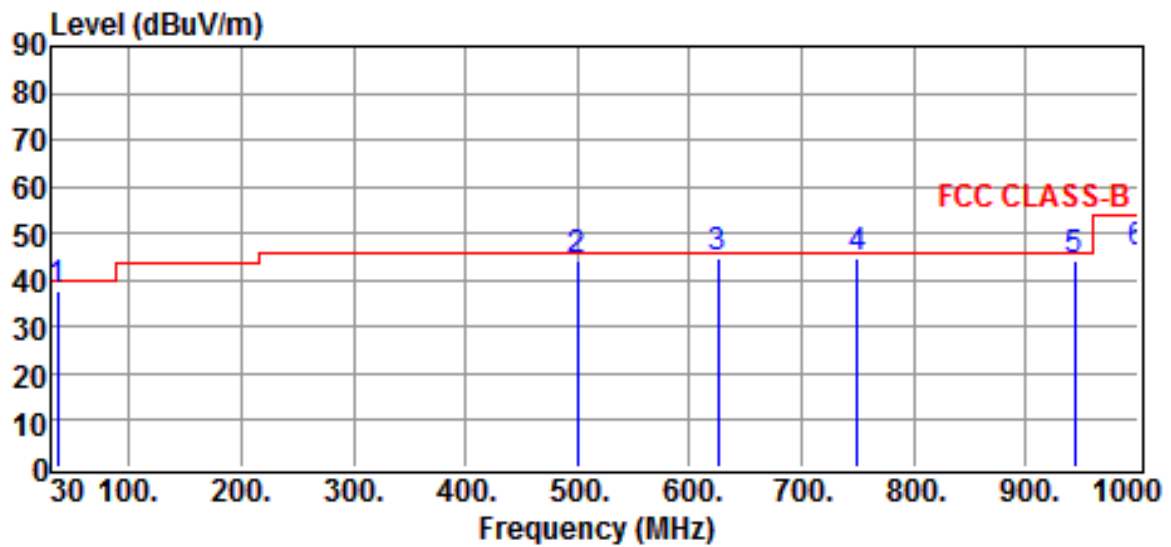


Site	:Open Site	Date	:2013-08-19
Limit	:FCC CLASS-B	Ant. Pol.	:HORIZONTAL
EUT	: Smartphone Wireless System / VoIP Server		
Temp.	:23°C		
Power Rating	:120V/60Hz	Humi.	:58%
Model	:IG7600	Engineer.	:Jiapeng
Test Mode	:		

Freq MHz	Reading dBuV	Correction Factor dB	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
179.3800	18.3	14.8	33.1	43.5	-10.4	QP
375.3200	23.9	18.5	42.4	46.0	-3.6	QP
625.5800	15.9	23.8	39.7	46.0	-6.3	QP
749.7400	17.9	25.9	43.8	46.0	-2.2	QP
875.8400	13.2	28.0	41.2	46.0	-4.8	QP
1000.0000	15.6	30.0	45.6	54.0	-8.4	QP

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss
3. The margin value=Limit - Result



Site : Open Site Date : 2013-10-08
 Limit : FCC CLASS-B Ant. Pol. : VERTICAL
 EUT : Smartphone Wireless System / VoIP Server
 Temp. : 23°C
 Power Rating : 120V/60Hz Humi. : 58%
 Model : IG7600 Engineer. : Jiapeng
 Test Mode :

Freq MHz	Reading dBuV	Correction Factor dB	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
35.8200	24.0	14.0	38.0	40.0	-2.0	QP
499.4800	22.7	21.6	44.3	46.0	-1.7	QP
625.5800	20.7	23.8	44.5	46.0	-1.5	QP
749.7400	19.0	25.9	44.9	46.0	-1.1	QP
943.7400	15.4	28.9	44.3	46.0	-1.7	QP
1000.0000	15.8	30.0	45.8	54.0	-8.2	QP

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss
3. The margin value = Limit - Result

b) Emission frequencies Above 1GHz

Radiated emission frequencies above 1 GHz to 25 GHz were too low to be measured with a pre-amplifier of 35 dB.

4.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor, High Pass Filter Loss(if used) and Cable Loss, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation calculation is as follows:

$$\textbf{Result} = \textbf{Reading} + \textbf{Corrected Factor}$$

where

Corrected Factor = Antenna FACTOR + Cable Loss + High Pass Filter Loss - Amplifier Gain

4.6 Photos of Radiation Measuring Setup



5 CONDUCTED EMISSION MEASUREMENT

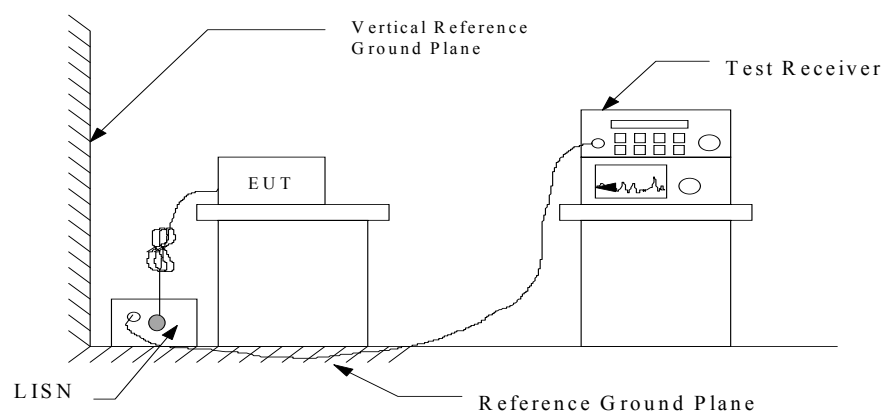
5.1 Standard Applicable

For unintentional and intentional device, Line Conducted Emission Limits are in accordance to § 15.107(a) and § 15.207(a) respectively. Both Limits are identical specification.

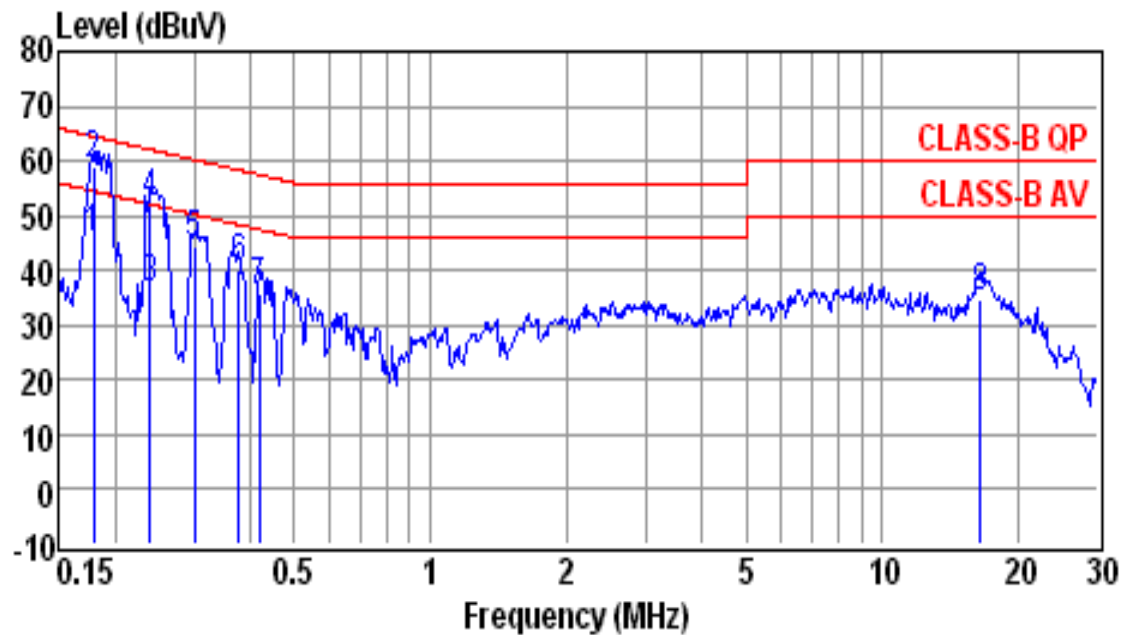
5.2 Measurement Procedure

1. Setup the configuration per figure 3.
2. A preliminary scan with a spectrum monitor is performed to identify the frequency of emission that has the highest amplitude relative to the limit by operating the EUT in selected modes of operation, typical cable positions, and with a typical system configuration.
3. Record the 6 or 8 highest emissions relative to the limit.
4. Measure each frequency obtained from step 3 by a test receiver set on quasi peak detector function, and then record the accuracy frequency and emission level. If all emissions measured in the specified band are attenuated more than 20 dB from the limit, this step would be ignored, and the peak detector function would be used.
5. Confirm the highest three emissions with variation of the EUT cable configuration and record the final data.
6. Repeat all above procedures on measuring each operation mode of EUT.

Figure 3 : Conducted emissions measurement configuration



5.3 Conducted Emission Data



Site : conducted #1

Date : 10-04-2013

Condition : CLASS-B QP

LISN : NEUTRAL

Tem / Hum : 23 °C / 62%

Test Mode : Operation

EUT : Smartphone Wireless System / VoIP Server

Power Rating : 120V/60Hz

Memo :

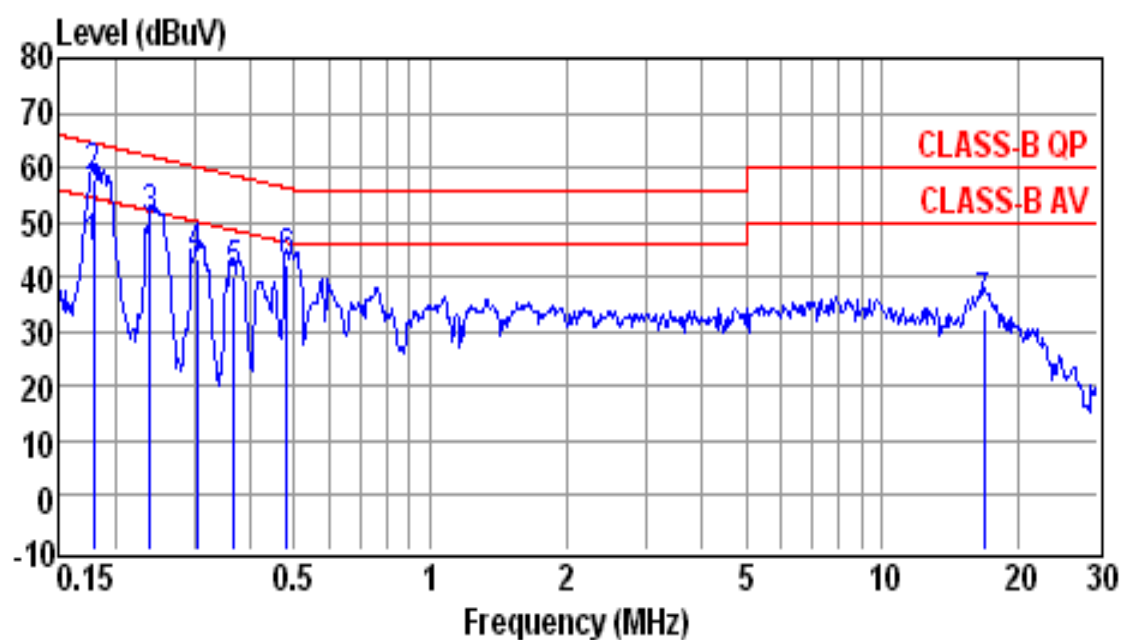
Memo :

Freq (MHz)	Reading (dBUV)	Factor (dB)	Emission Level (dBUV)	Limit Line (dBUV)	Over Limit (dB)	Remark
0.1796	35.2	10.3	45.5	54.5	-9.0	Average
0.1796	48.7	10.3	59.0	64.5	-5.5	QP
0.2391	25.9	10.3	36.2	52.1	-15.9	Average
0.2391	41.5	10.3	51.8	62.1	-10.3	QP
0.3003	34.1	10.3	44.4	60.2	-15.8	QP
0.3771	30.1	10.3	40.4	58.3	-17.9	QP
0.4171	25.6	10.3	35.9	57.5	-21.6	QP
16.4860	24.0	10.7	34.7	60.0	-25.3	QP

Note :

1. Result = Reading + Factor

2. Factor = LISN Factor + Cable Loss



Site : conducted #1 Date : 10-04-2013
 Condition : CLASS-B QP LISN : LINE
 Tem / Hum : 23 °C / 62% Test Mode : Operation
 EUT : Smartphone Wireless System / VoIP Server
 Power Rating : 120V/60Hz
 Memo : Memo :

Freq (MHz)	Reading (dBuV)	Factor (dB)	Emission Level (dBuV)	Limit Line (dBuV)	Over Limit (dB)	Remark
0.1796	34.5	10.3	44.8	54.5	-9.7	Average
0.1796	47.6	10.3	57.9	64.5	-6.6	QP
0.2391	39.9	10.3	50.2	62.1	-11.9	QP
0.3035	33.1	10.3	43.4	60.1	-16.7	QP
0.3673	29.6	10.3	39.9	58.6	-18.7	QP
0.4812	32.2	10.3	42.5	56.3	-13.8	QP
16.8390	23.0	11.0	34.0	60.0	-26.0	QP

Note :

1. Result = Reading + Factor
2. Factor = LISN Factor + Cable Loss

5.4 Result Data Calculation

The result data is calculated by adding the LISN Factor to the measured reading. The basic equation with a sample calculation is as follows:

$$\text{RESULT} = \text{READING} + \text{LISN FACTOR}$$

Assume a receiver reading of 22.5 dB μ V is obtained, and LISN Factor is 0.1 dB, then the total of disturbance voltage is 22.6 dB μ V.

$$\text{RESULT} = 22.5 + 0.1 = 22.6 \text{ dB } \mu \text{ V}$$

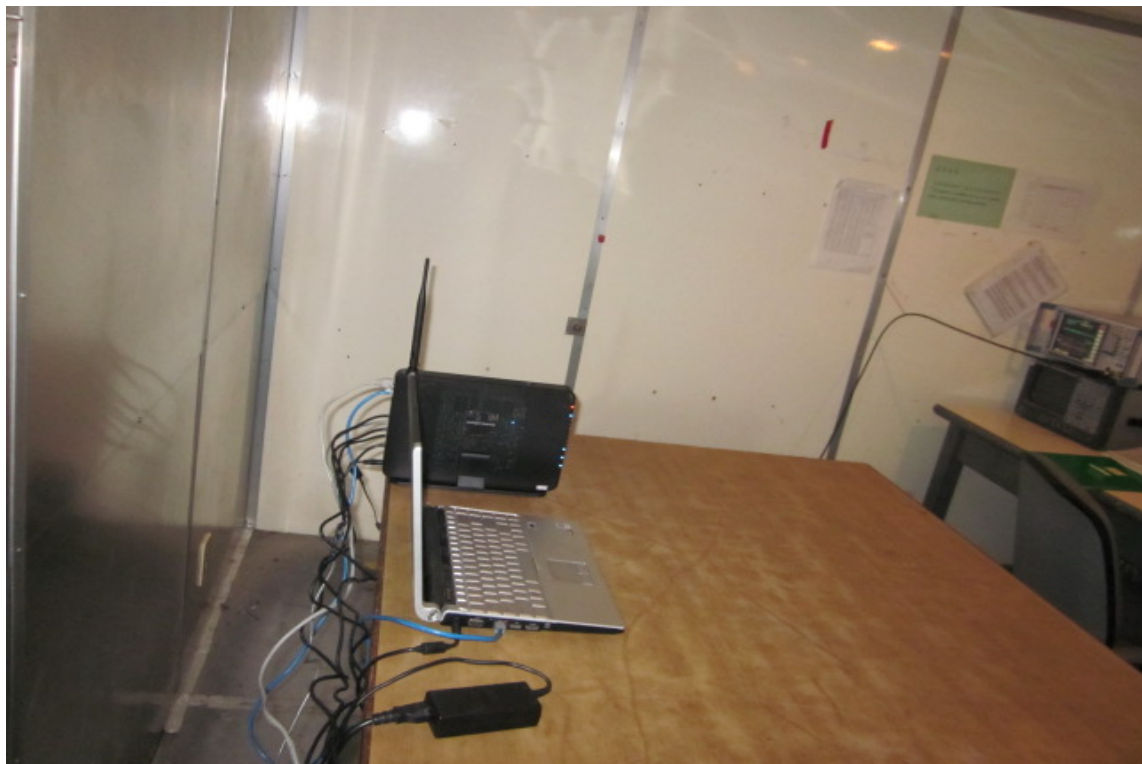
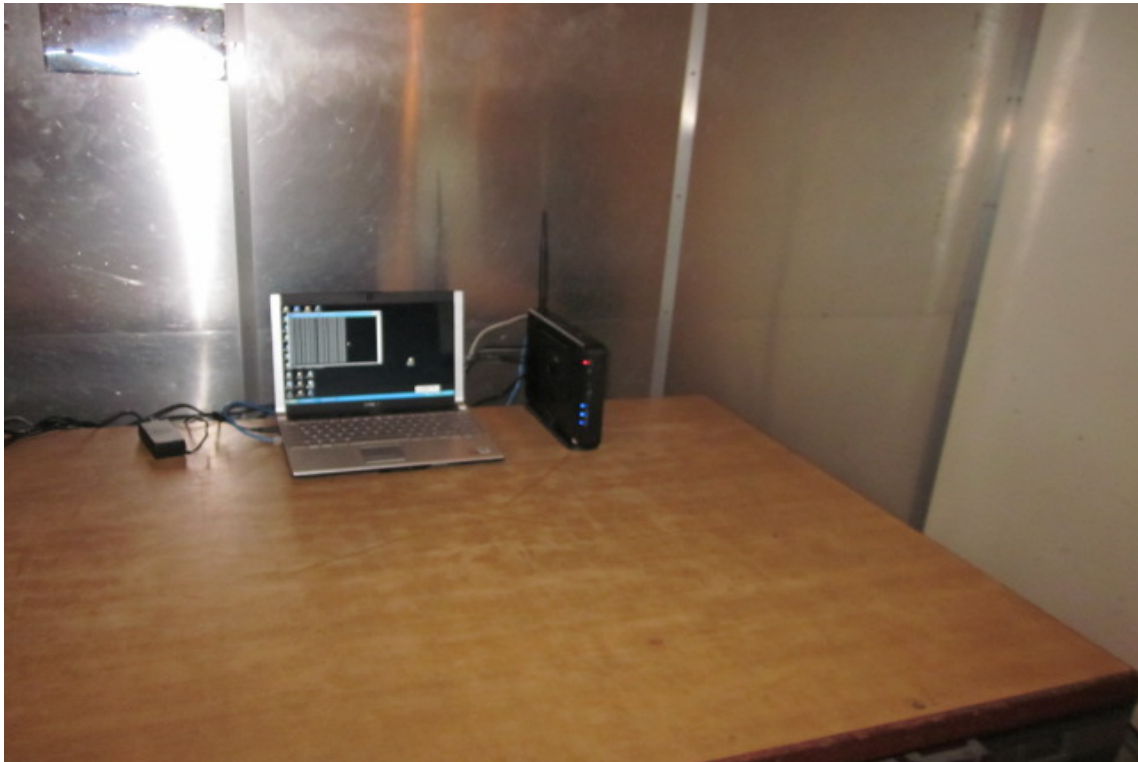
$$\begin{aligned} \text{Level in } \mu \text{ V} &= \text{Common Antilogarithm}[(22.6 \text{ dB } \mu \text{ V})/20] \\ &= 13.48 \mu \text{ V} \end{aligned}$$

5.5 Conducted Measurement Equipment

The following test equipment are used during the conducted test .

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESCI	2013/07/15	2014/07/14
LISN	EMCO	3625/2	2013/05/07	2014/05/06
LISN	Rohde & Schwarz	ESH2-Z5	2013/04/12	2014/04/11

5.6 Photos of Conduction Measuring Setup



6 ANTENNA REQUIREMENT

6.1 Standard Applicable

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

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

6.2 Antenna Construction and Directional Gain

There are two antennas equipped. The internal PCB antenna has 2dBi gain. The external antenna has 5dBi gain. Hence the total antenna gain is

$$10\log(10^{(0.2)} + 10^{(0.5)}) = 6.8 \text{ dBi}$$

so the power should be reduced by 0.8dB. Hence the maximum peak output power of the transmitter shall not exceed 29.2 dBm.

Please see construction Photos of Exhibit B and the antenna specification for details.

7 EMISSION BANDWIDTH MEASUREMENT

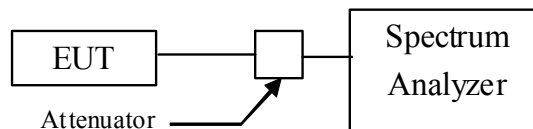
7.1 Standard Applicable

According to 15.247(a)(2), for direct sequence system, the minimum 6dB bandwidth shall be at least 500 kHz.

7.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

Figure 4: Emission bandwidth measurement configuration.



7.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Spectrum Analyzer	Rohde & Schwarz	FSP40	2012/12/07	2013/12/06

7.4 Measurement Data

Test Date : Sep. 27, 2013 Temperature : 25 °C Humidity : 65 %

A. 802.11b @1 Mbps

- a) Channel Low: 6 dB Emission Bandwidth is 8.32 MHz
- b) Channel Mid: 6 dB Emission Bandwidth is 8.32 MHz
- c) Channel High: 6 dB Emission Bandwidth is 8.32 MHz

B. 802.11g @6 Mbps

- a) Channel Low: 6 dB Emission Bandwidth is 15.2 MHz
- b) Channel Mid: 6 dB Emission Bandwidth is 15.2 MHz
- c) Channel High: 6 dB Emission Bandwidth is 15.2 MHz

C. 802.11n HT-20 Antenna 1 @6.5 Mbps

- a) Channel Low: 6 dB Emission Bandwidth is 17.52 MHz
- b) Channel Mid: 6 dB Emission Bandwidth is 17.52 MHz
- c) Channel High: 6 dB Emission Bandwidth is 17.52 MHz

D. 802.11n HT-20 Antenna 2 @6.5 Mbps

- a) Channel Low: 6 dB Emission Bandwidth is 17.52 MHz
- b) Channel Mid: 6 dB Emission Bandwidth is 17.52 MHz
- c) Channel High: 6 dB Emission Bandwidth is 17.52 MHz

E. 802.11n HT-40 Antenna 1 @13.5 Mbps

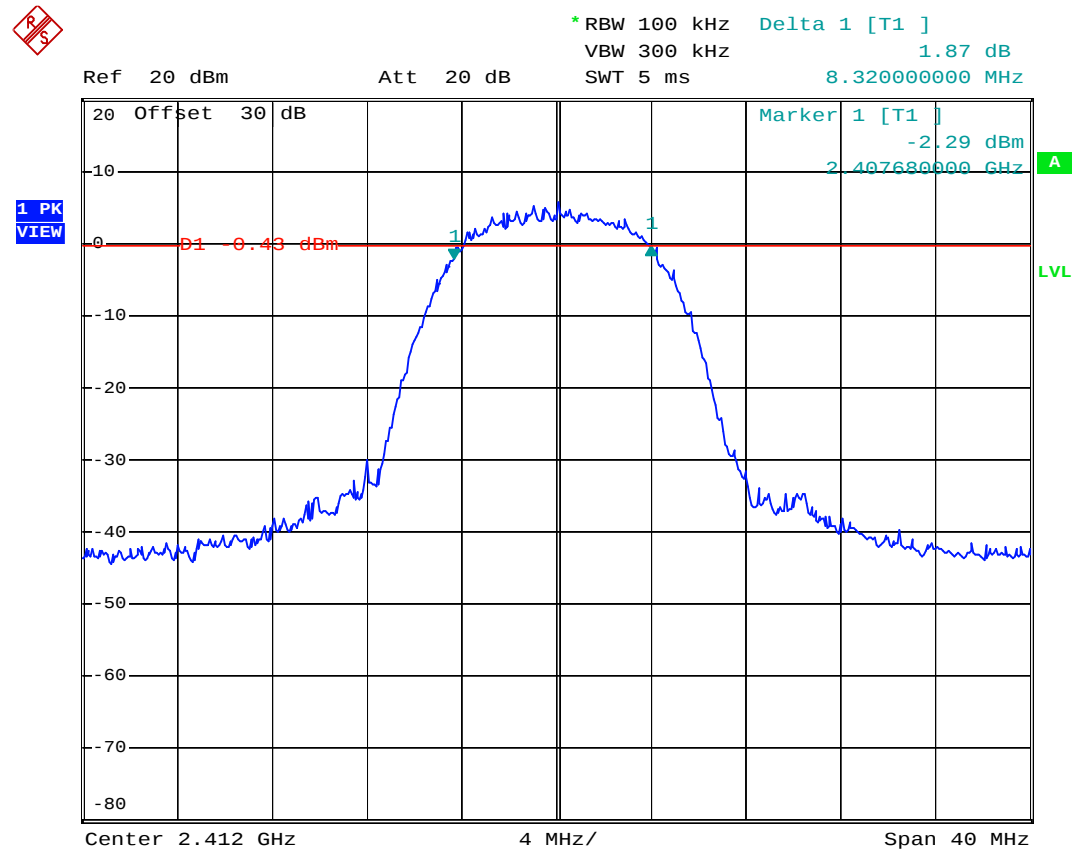
- a) Channel Low: 6 dB Emission Bandwidth is 36.6 MHz
- b) Channel Mid: 6 dB Emission Bandwidth is 36.6 MHz
- c) Channel High: 6 dB Emission Bandwidth is 36.6 MHz

F. 802.11n HT-40 Antenna 2 @13.5 Mbps

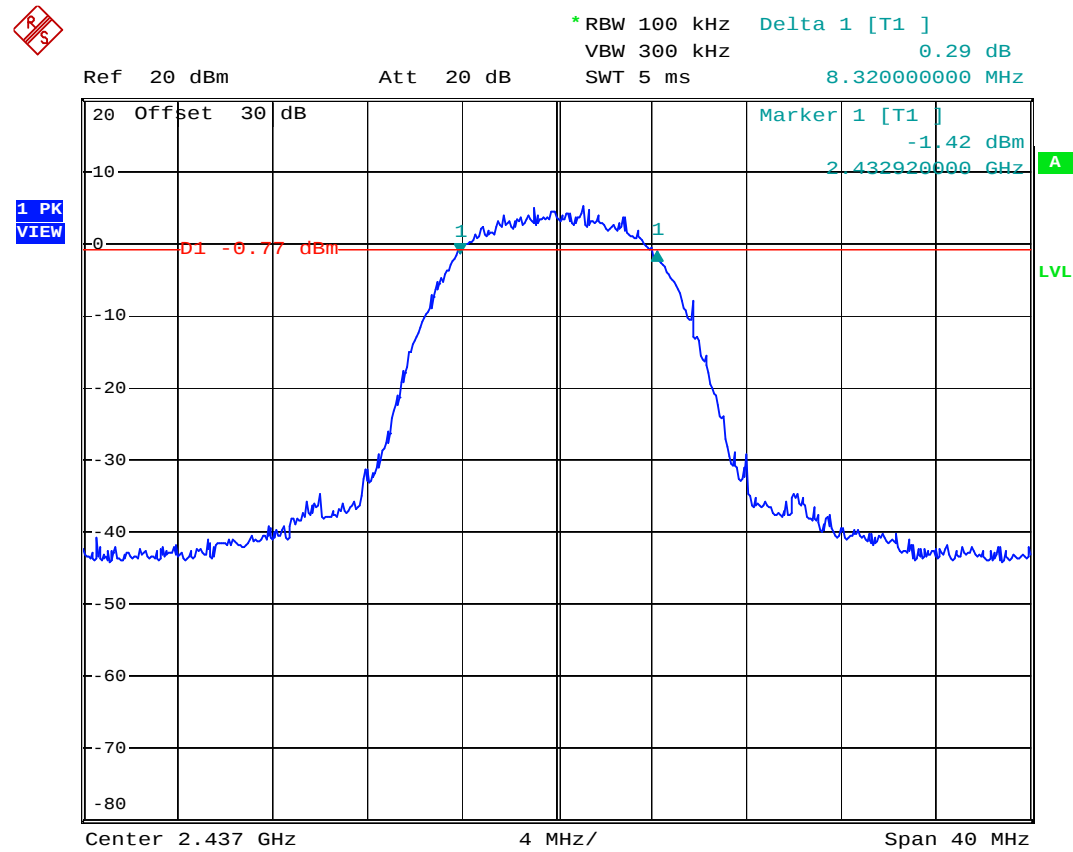
- a) Channel Low: 6 dB Emission Bandwidth is 36.6 MHz
- b) Channel Mid: 6 dB Emission Bandwidth is 36.6 MHz
- c) Channel High: 6 dB Emission Bandwidth is 36.6 MHz

Note : The expanded uncertainty: $\text{frequency} \times 1.65 \times 10^{-6}$ ($1 \text{ GHz} < f \leq 18 \text{ GHz}$).

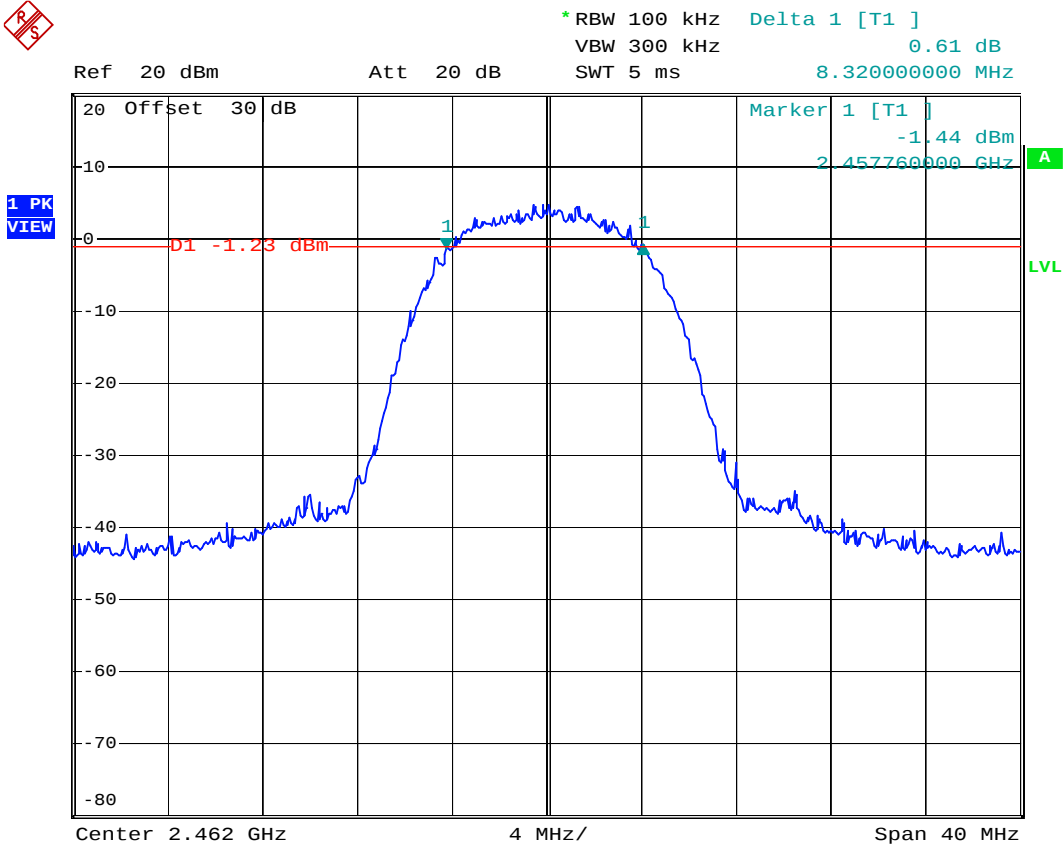
802.11b / Channel Low



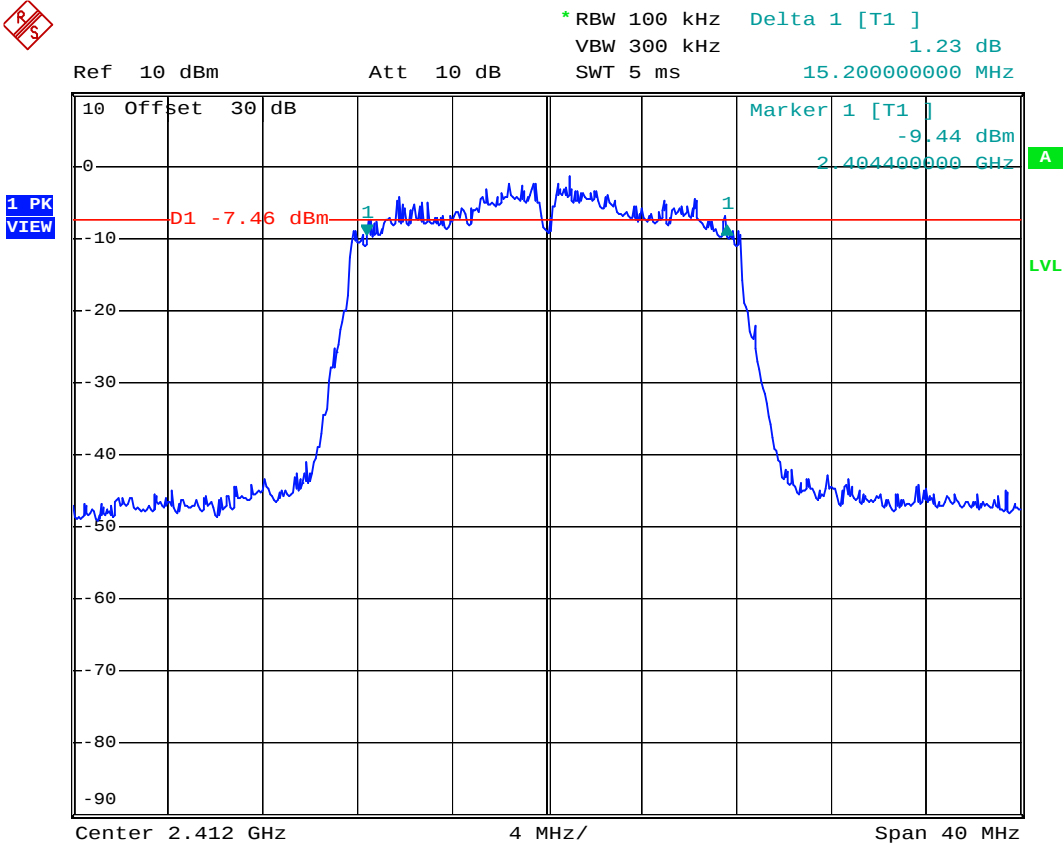
802.11b / Channel Mid



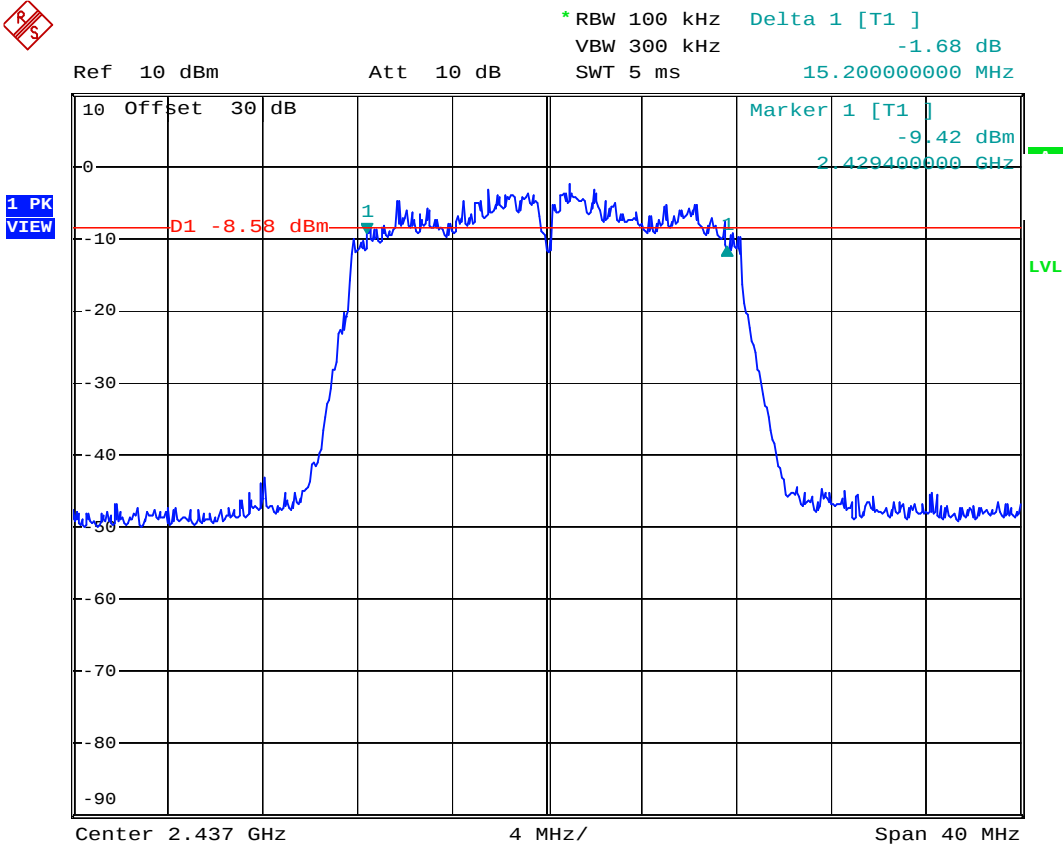
802.11b / Channel High



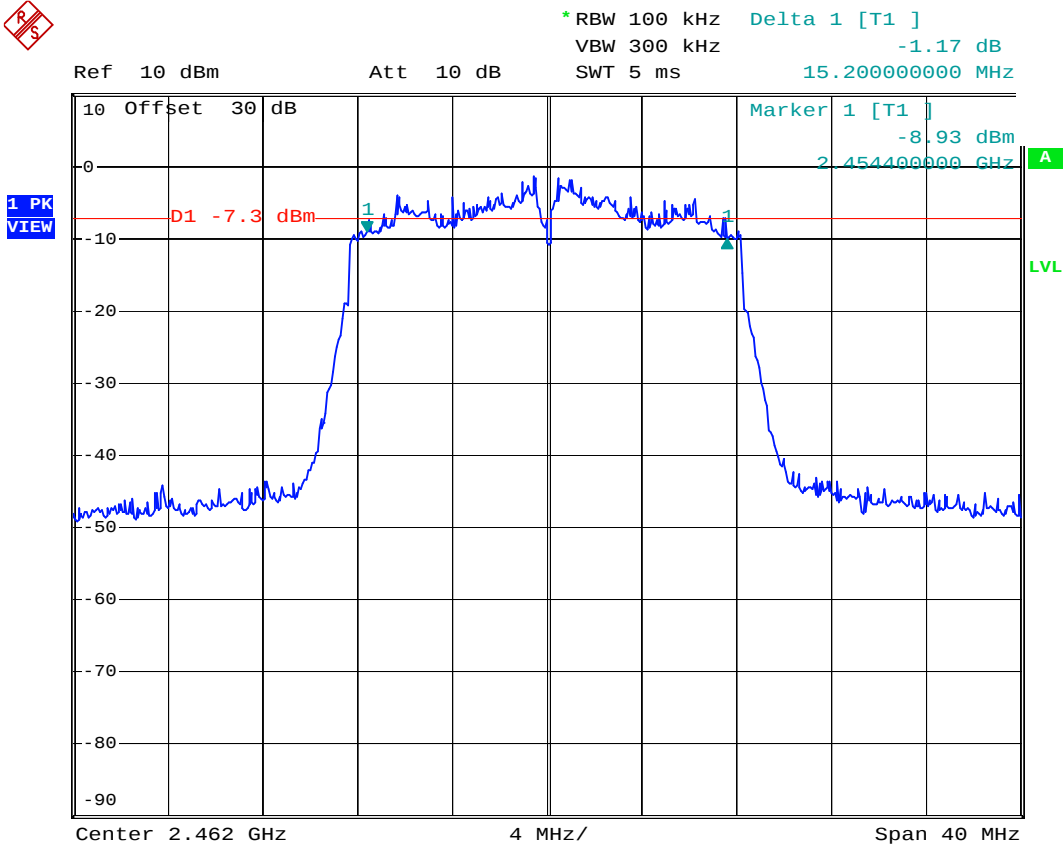
802.11g / Channel Low



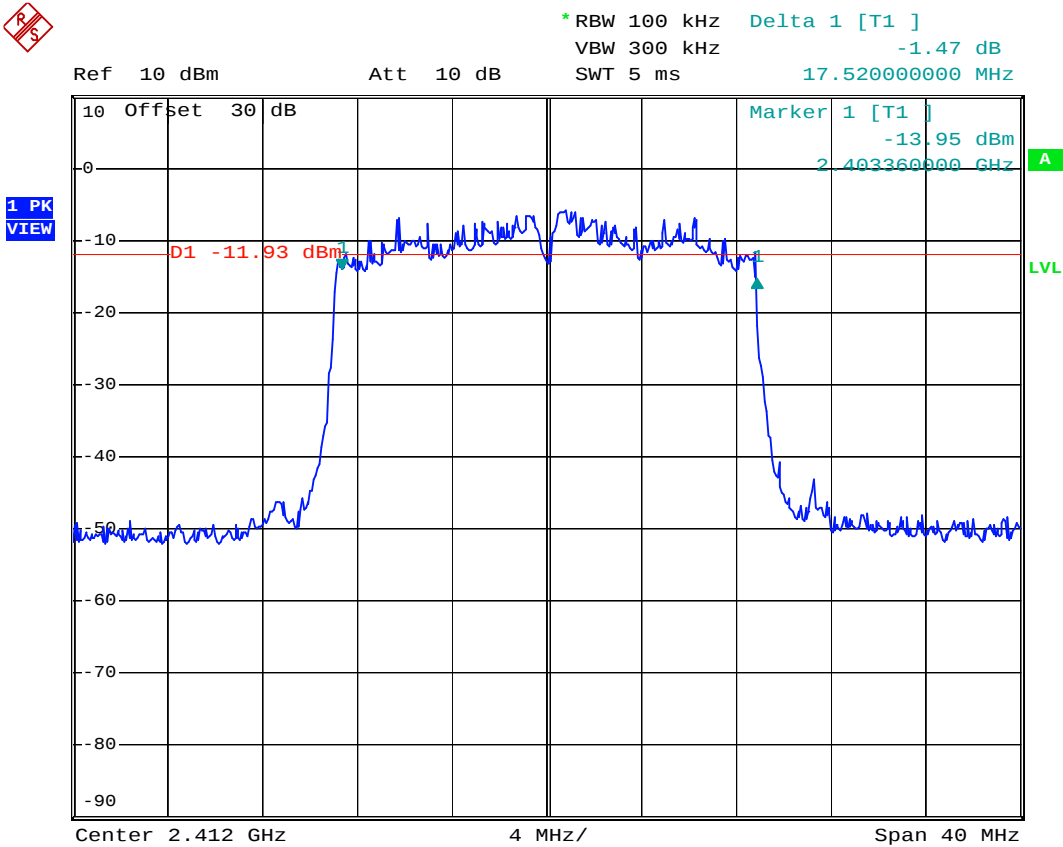
802.11g / Channel Mid



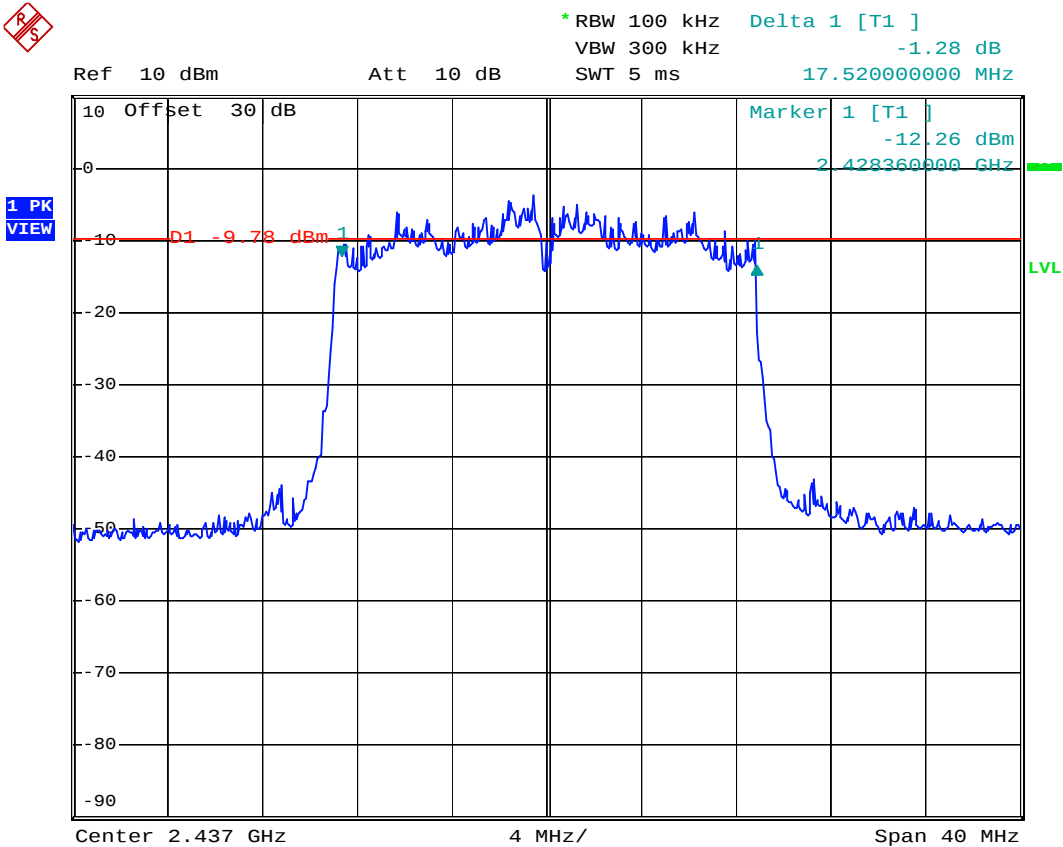
802.11g / Channel H1d1h



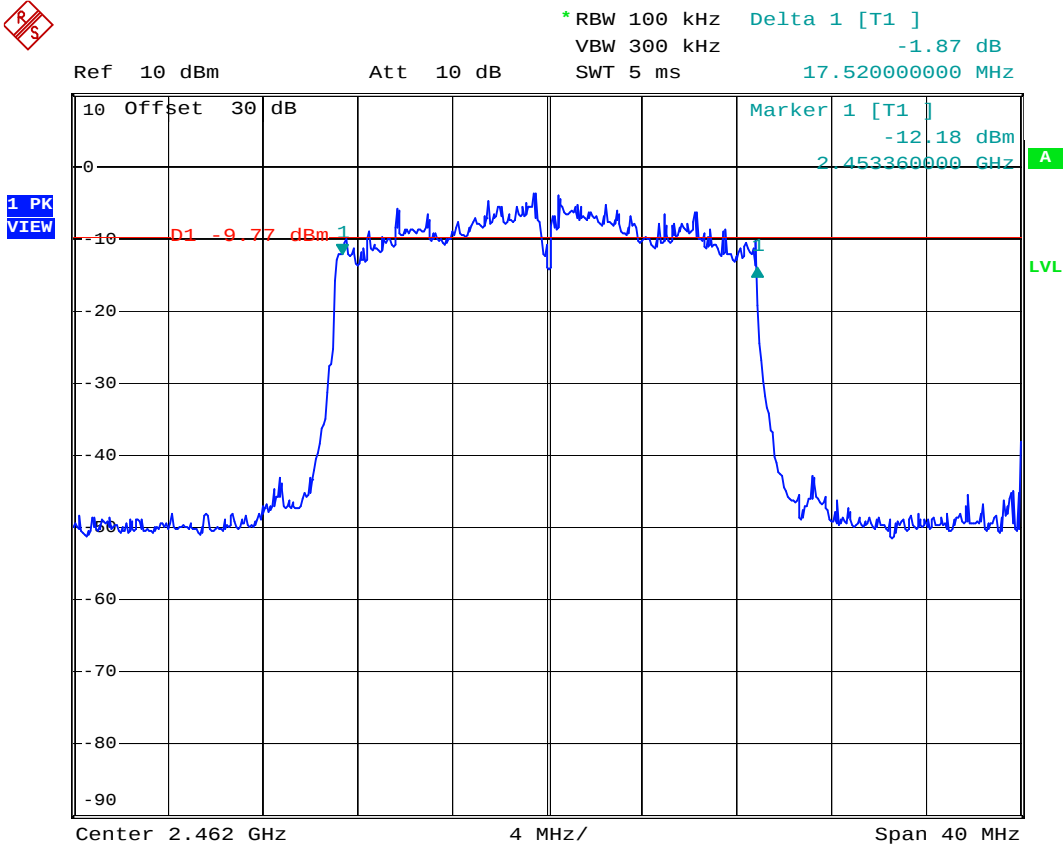
802.11n HT-20/Antenna 1/ Channel Low



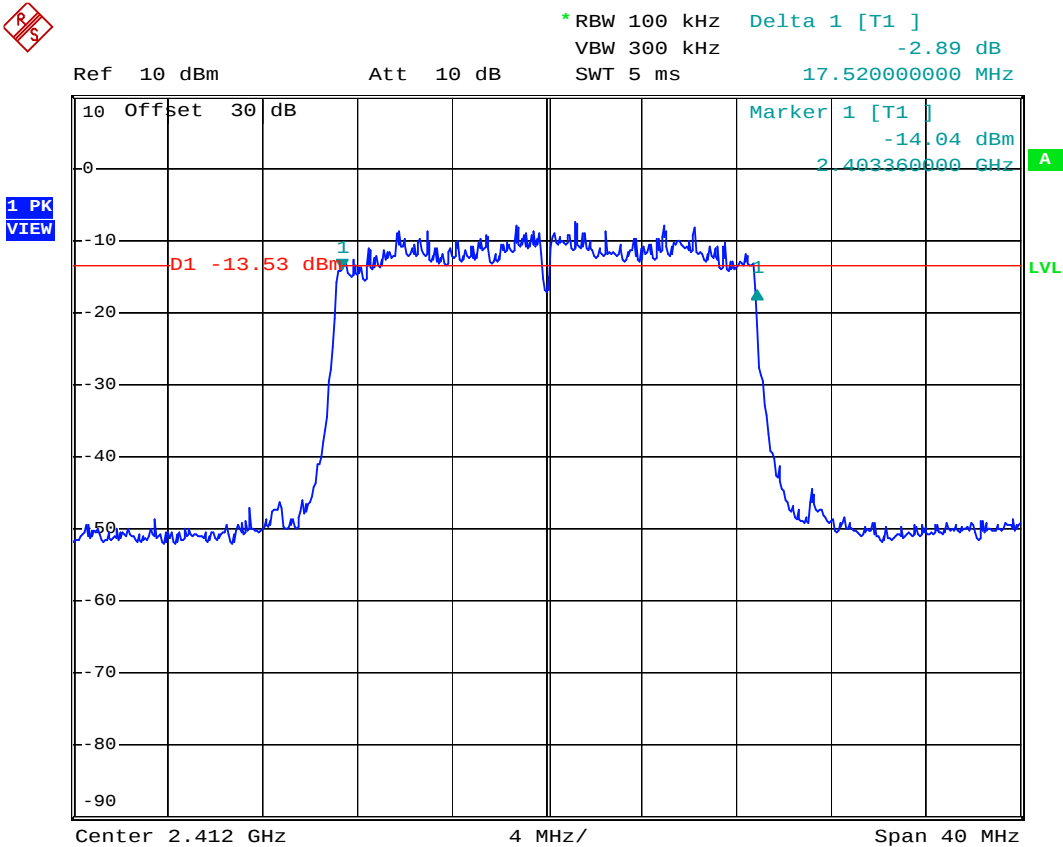
802.11n HT-20/Antenna 1/ Channel Mid



802.11n HT-20/Antenna 1/ Channel High

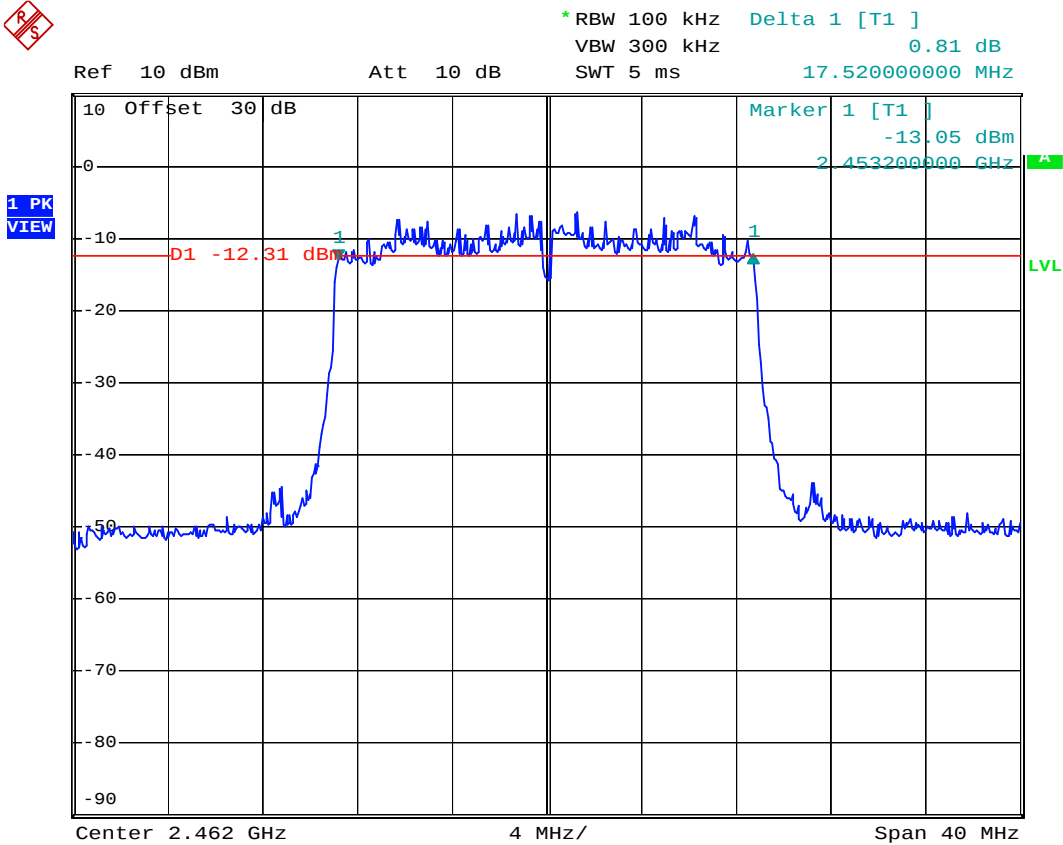


802.11n HT-20/Antenna 2/ Channel Low

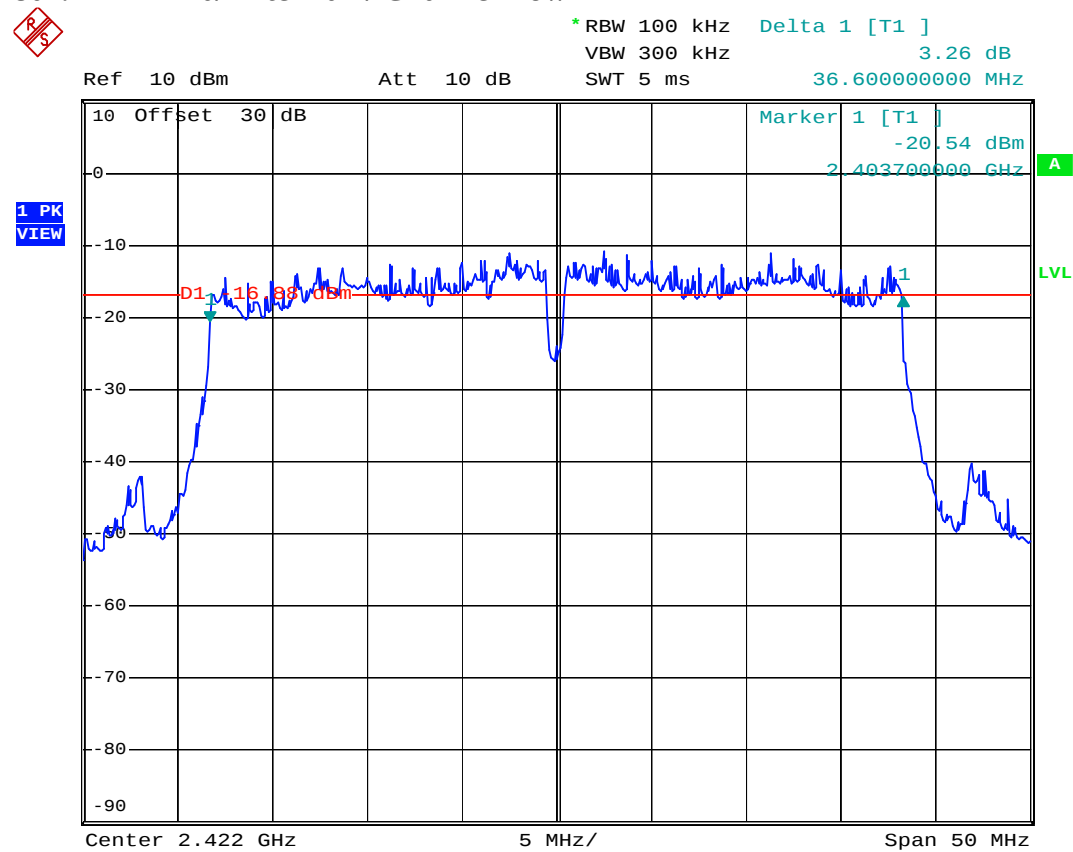


Rev. No 2.0

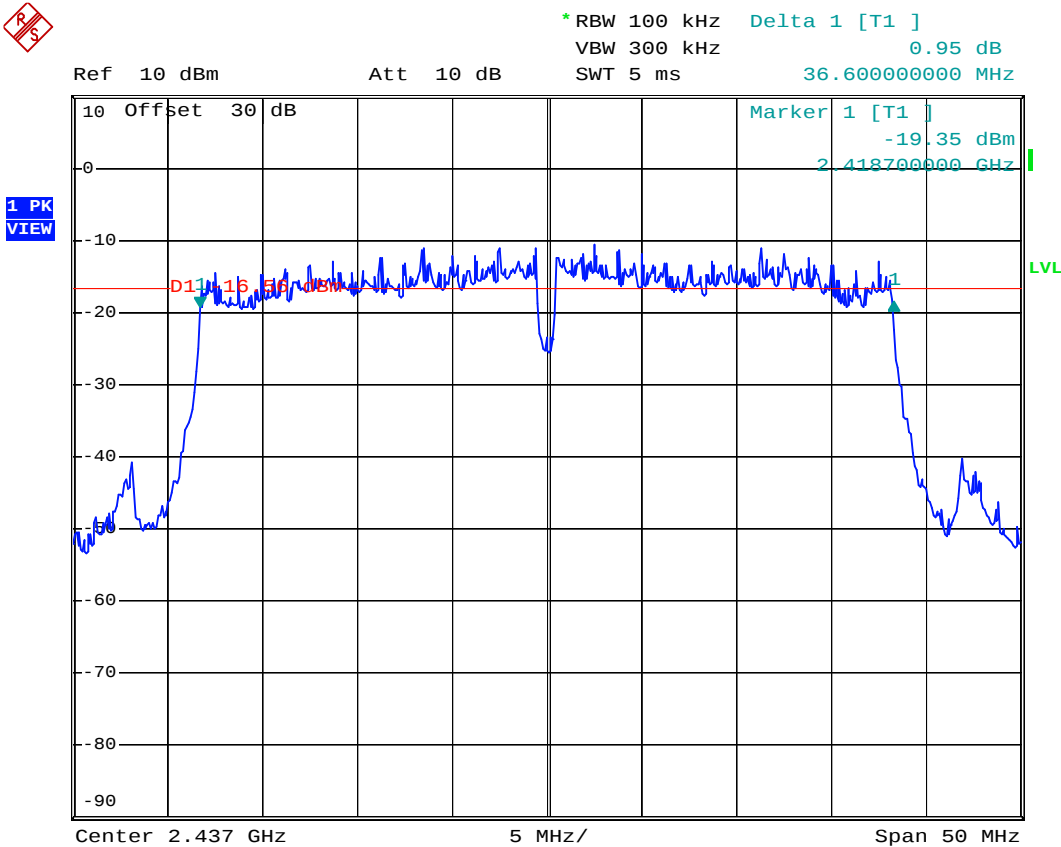
802.11n HT-20/Antenna 2/ Channel High



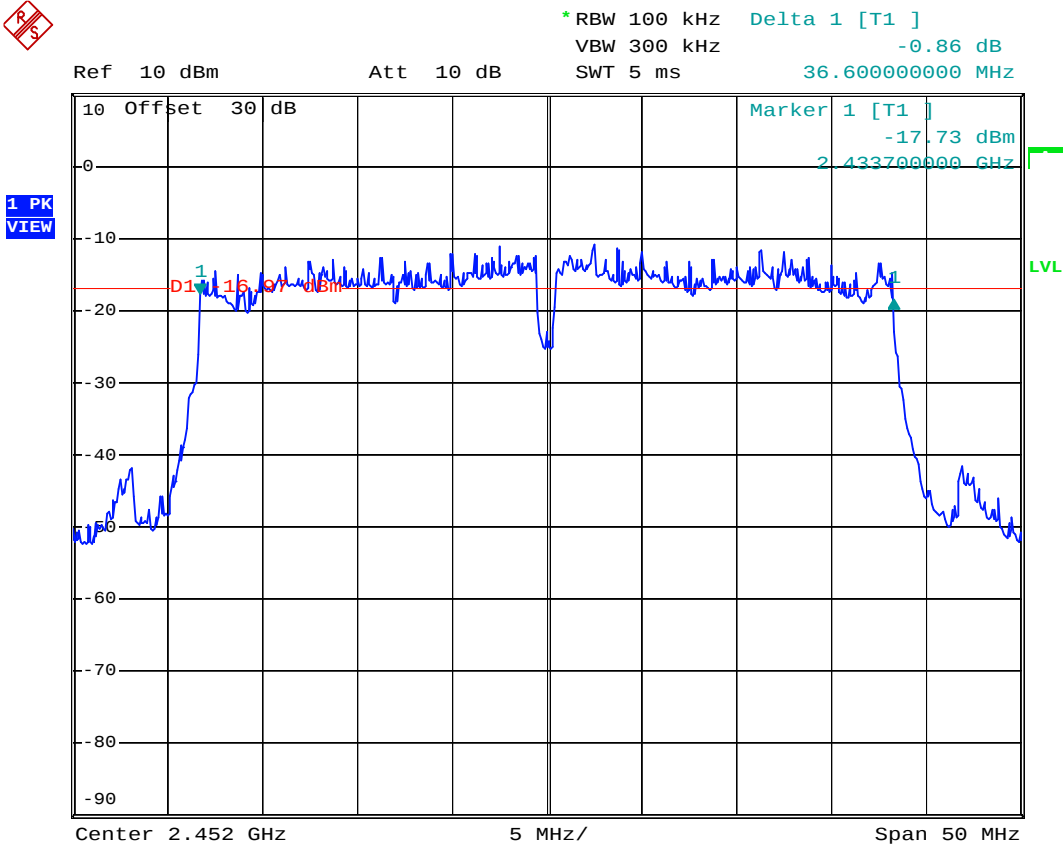
802.11n HT-40/Antenna 1/ Channel Low



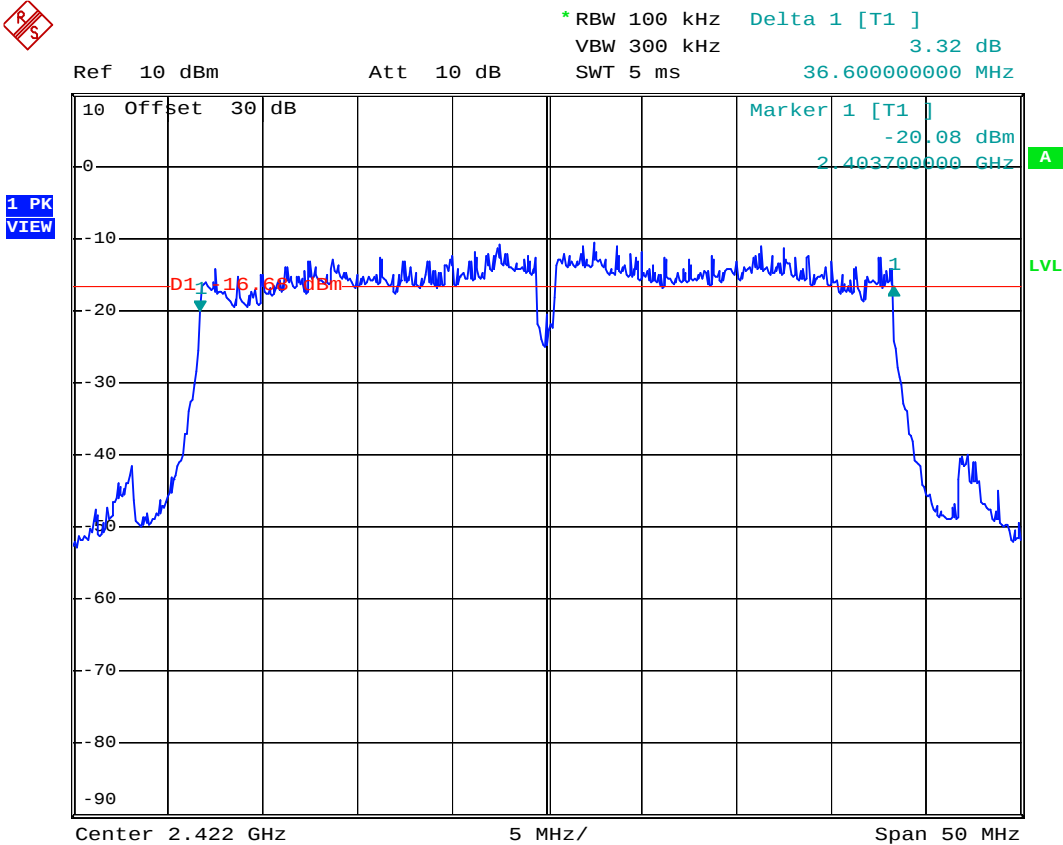
802.11n HT-40/Antenna 1/ Channel Mid



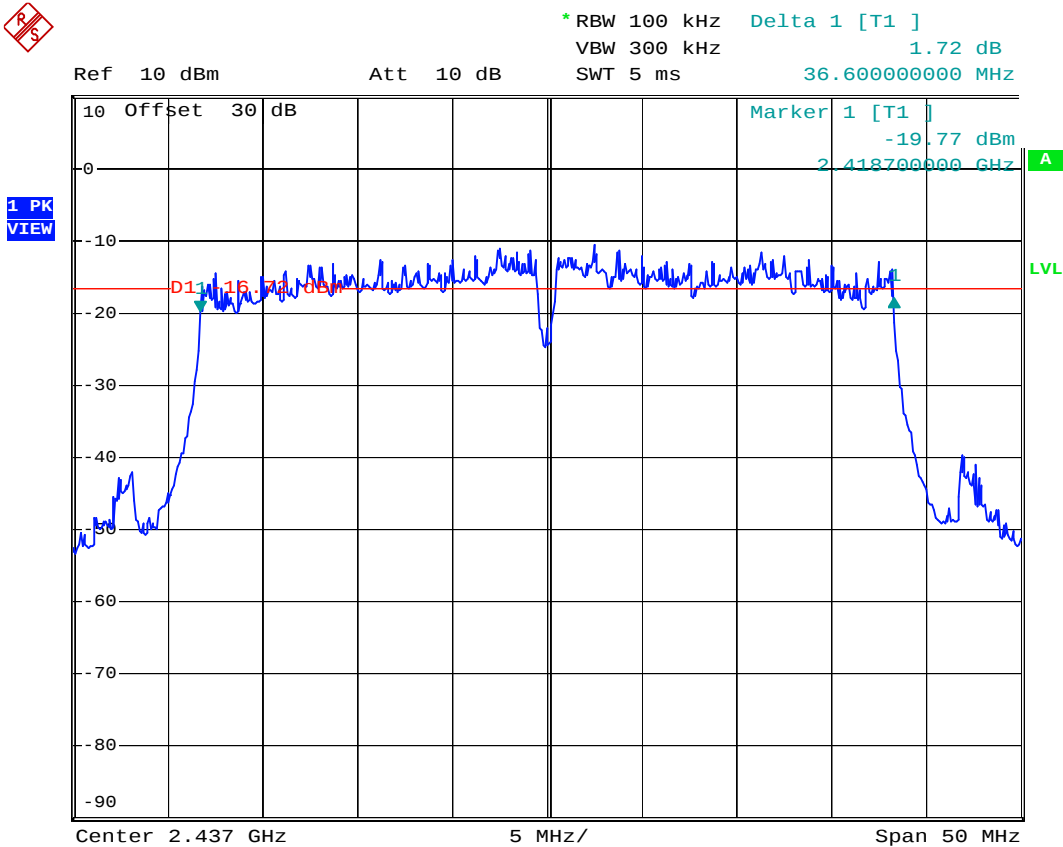
802.11n HT-40/Antenna 1/ Channel High



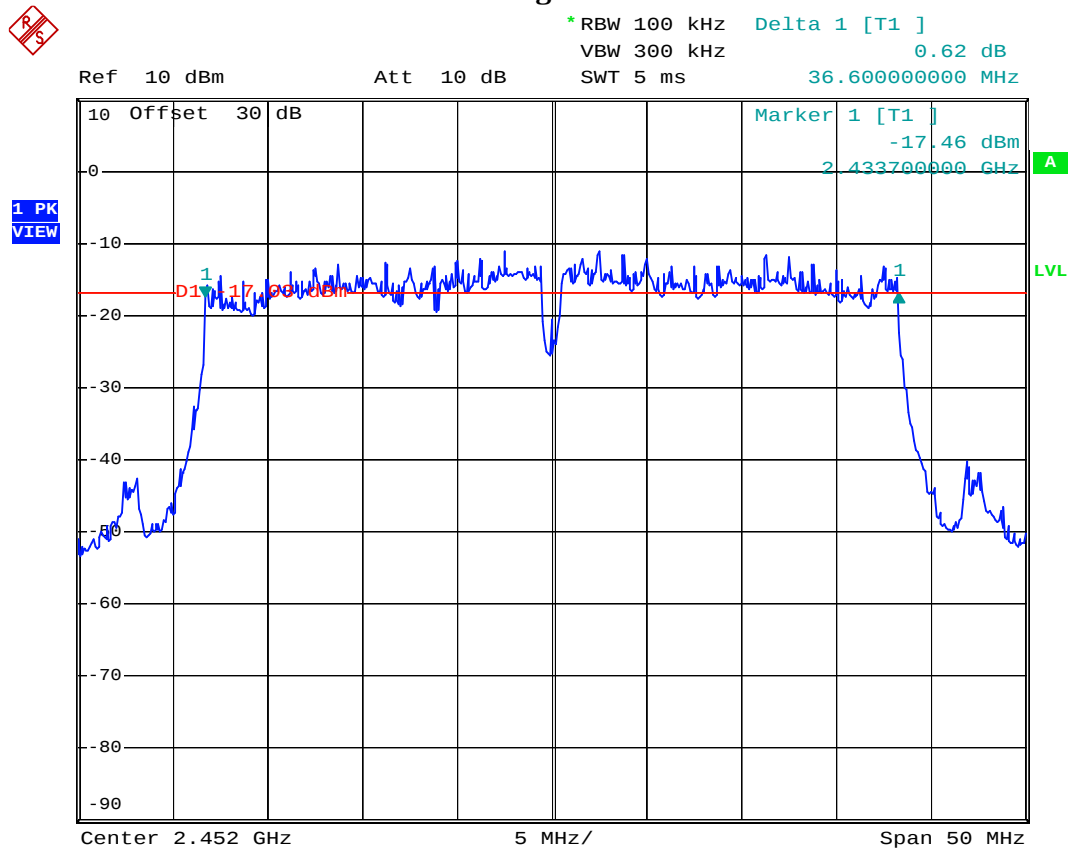
802.11n HT-40/Antenna 2/ Channel Low



802.11n HT-40/Antenna 2/ Channel Mid



802.11n HT-40/Antenna 2/ Channel High



8 OUTPUT POWER MEASUREMENT

8.1 Standard Applicable

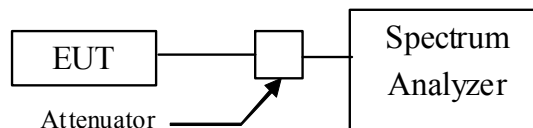
For direct sequence system, according to 15.247(b), the maximum peak output power of the transmitter shall not exceed 1 Watt. If transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

8.2 Measurement Procedure

Measurement Procedure: PK2

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 5 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Set the RBW = 1 MHz.
4. Set the VBW = 3 MHz.
5. Set the span to a value that is 5-30 % greater than the EBW.
6. Detector = peak.
7. Sweep time = auto couple.
8. Trace mode = max hold.
9. Allow trace to fully stabilize.
10. Use channel power function and record the level displayed.
11. Repeat above procedures until all frequencies measured were complete.

Figure 5: Output power and measurement configuration.



8.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Spectrum Analyzer	Rohde & Schwarz	FSP40	2012/12/07	2013/12/06

8.4 Measurement Data

Test Date : Oct. 04, 2013 Temperature : 26 °C Humidity : 60 %

The total antenna gain is 6.8dBi so the power should be reduced by 0.8dB Hence the maximum peak output power of the transmitter shall not exceed 29.2 dBm.

Measurement Procedure: PK2

A. 802.11b @1 Mbps

- a) Channel Low: Output Peak Power is 18.61 dBm **72.611** mW
- b) Channel Mid: Output Peak Power is 18.93 dBm **77.625** mW
- c) Channel High: Output Peak Power is 18.36 dBm **68.549** mW

B. 802.11g @6 Mbps

- a) Channel Low: Output Peak Power is 15.54 dBm **35.810** mW
- b) Channel Mid: Output Peak Power is 15.16 dBm **32.810** mW
- c) Channel High: Output Peak Power is 15.56 dBm **35.975** mW

C1. 802.11n HT-20 Antenna 1 @6.5 Mbps

- a) Channel Low: Output Peak Power is 12.50 dBm **17.783** mW
- b) Channel Mid: Output Peak Power is 12.56 dBm **18.030** mW
- c) Channel High: Output Peak Power is 13.00 dBm **19.953** mW

C2. 802.11n HT-20 Antenna 2 @6.5 Mbps

- a) Channel Low: Output Peak Power is 11.54 dBm **14.256** mW
- b) Channel Mid: Output Peak Power is 11.55 dBm **14.289** mW
- c) Channel High: Output Peak Power is 12.05 dBm **16.032** mW

C3. 802.11n HT-20 Combined peak out power @6.5 Mbps

- a) Channel Low: Output Peak Power is $17.783 + 14.256 = 32.039$ mW(15.06 dBm)
- b) Channel Mid: Output Peak Power is $18.030 + 14.289 = 32.319$ mW(15.09 dBm)
- c) Channel High: Output Peak Power is $19.953 + 16.032 = 35.985$ mW(15.18 dBm)

D1. 802.11n HT-40 Antenna 1 @13.5 Mbps

- a) Channel Low: Output Peak Power is 11.01 dBm **12.618** mW
- b) Channel Mid: Output Peak Power is 11.01 dBm **12.618** mW
- c) Channel High: Output Peak Power is 11.08 dBm **12.823** mW

D2. 802.11n HT-40 Antenna 2 @13.5 Mbps

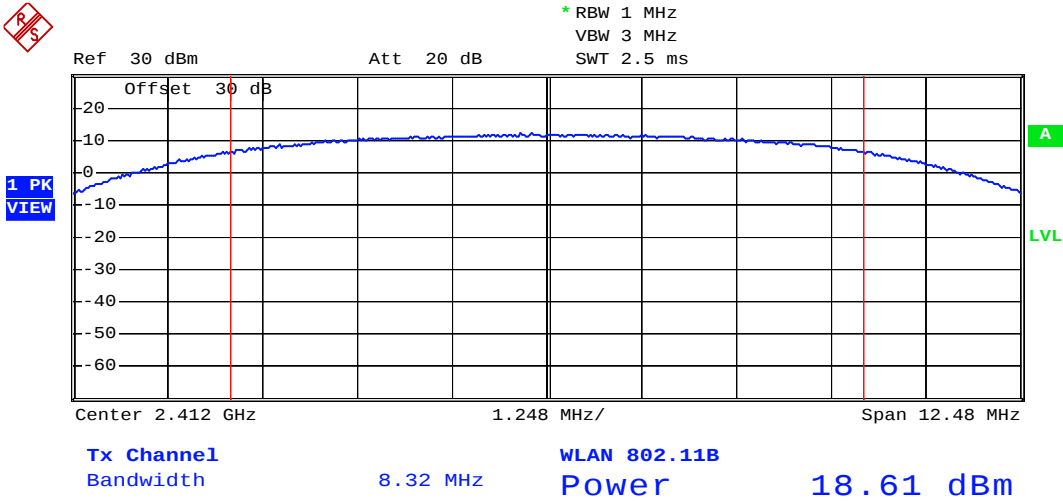
- a) Channel Low: Output Peak Power is 11.03 dBm **12.677** mW
- b) Channel Mid: Output Peak Power is 11.03 dBm **12.677** mW
- c) Channel High: Output Peak Power is 11.04 dBm **12.706** mW

D1. 802.11n HT-40 Combined peak out power @13.5 Mbps

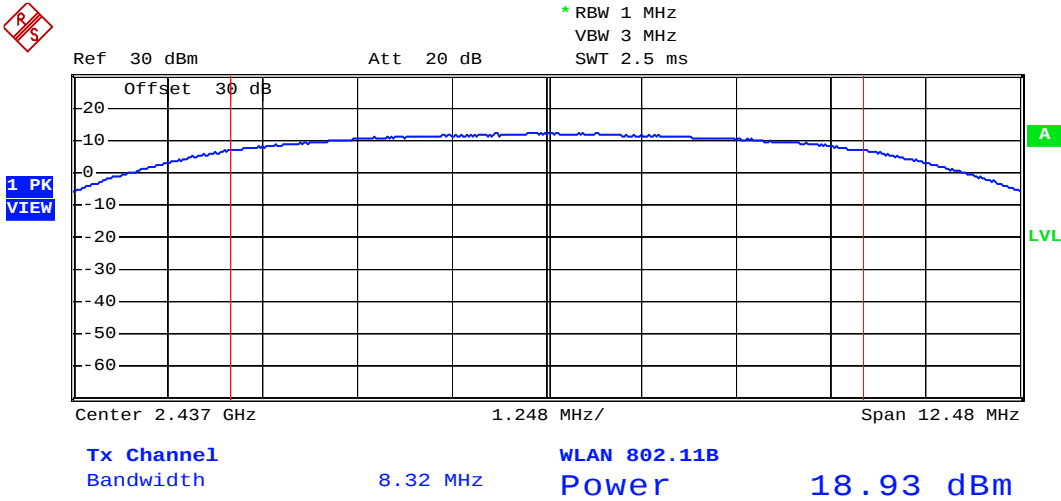
- a) Channel Low: Output Peak Power is $12.618 + 12.677 = 25.295$ mW(14.03 dBm)
- b) Channel Mid: Output Peak Power is $12.618 + 12.677 = 25.295$ mW(14.03 dBm)
- c) Channel High: Output Peak Power is $12.823 + 12.706 = 25.529$ mW(14.07 dBm)

Note : The expanded uncertainty: 2dB.

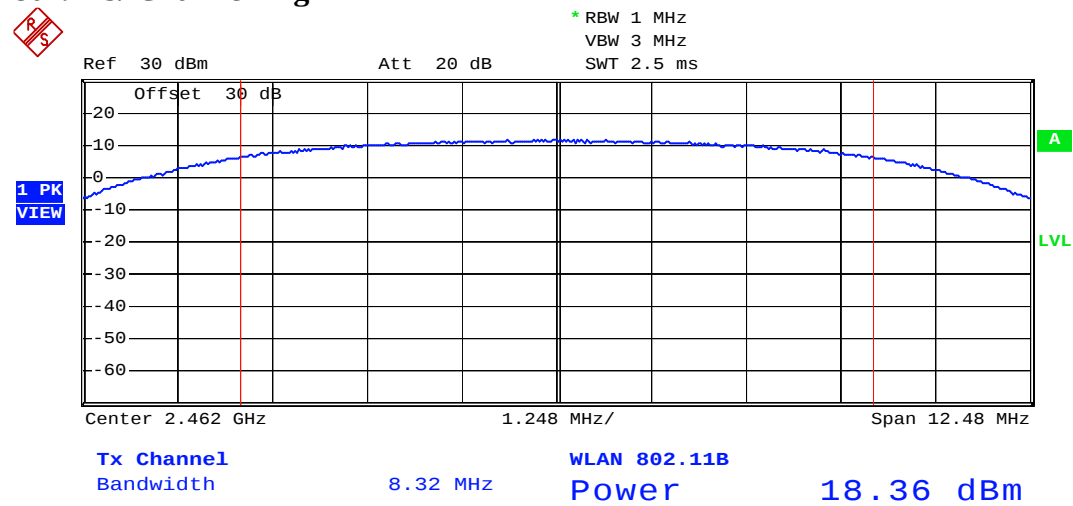
802.11b/ Channel Low



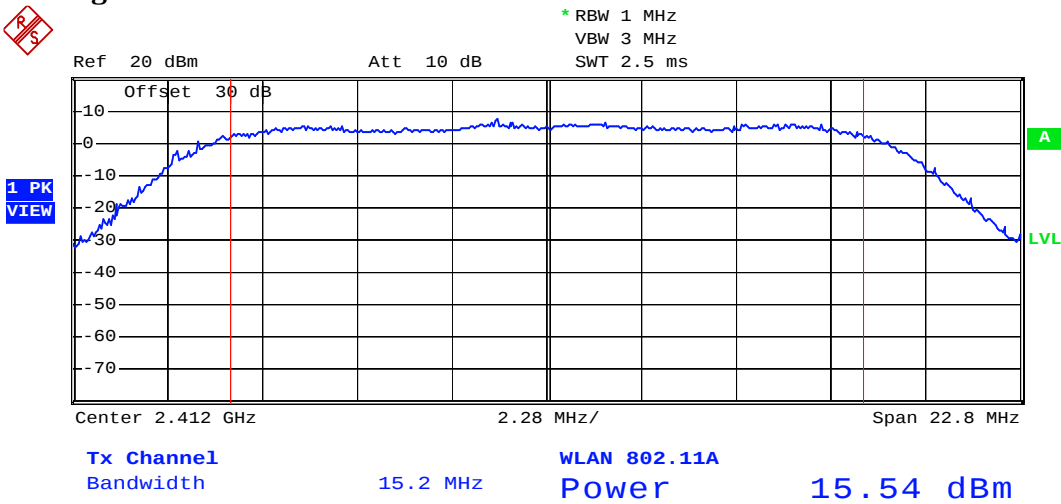
802.11b/ Channel Mid



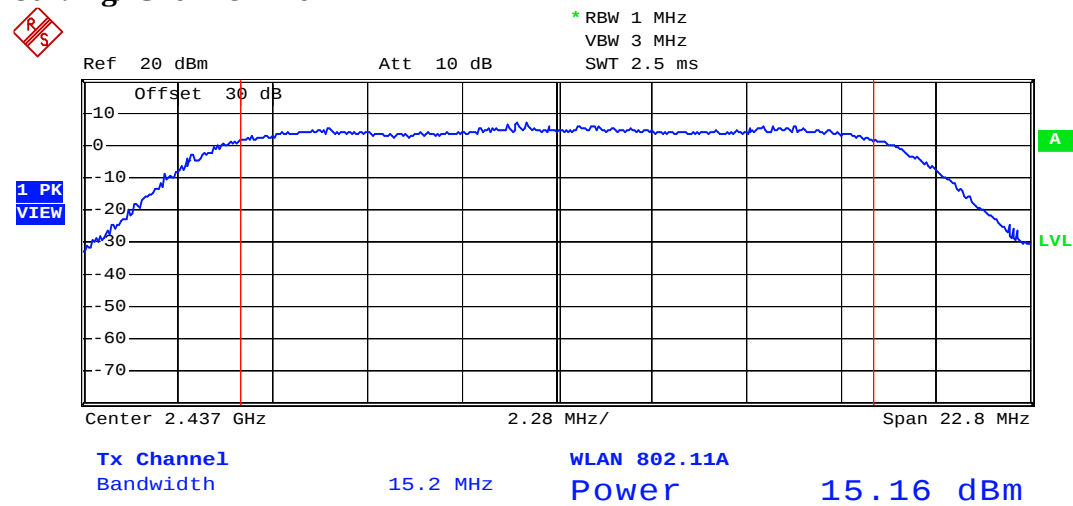
802.11b/ Channel High



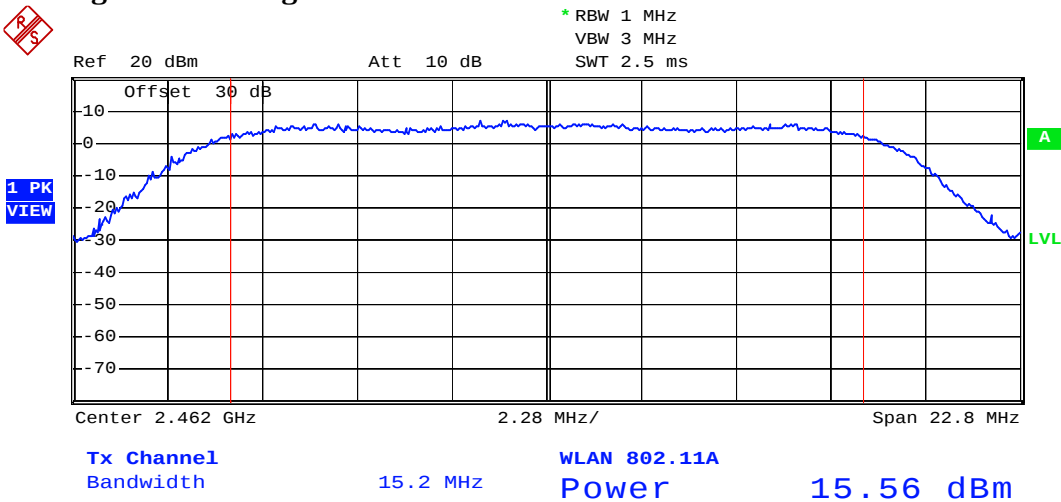
802.11g/ Channel Low



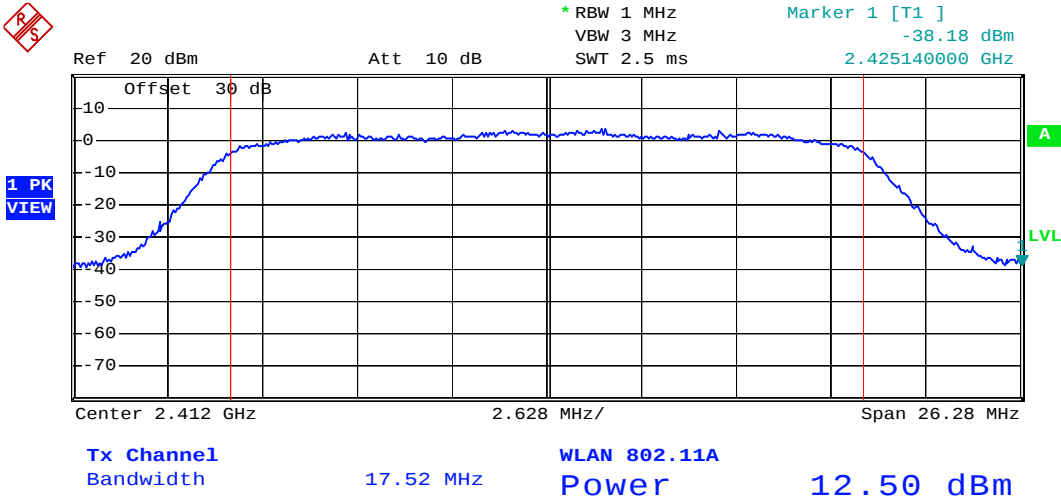
802.11g/ Channel Mid



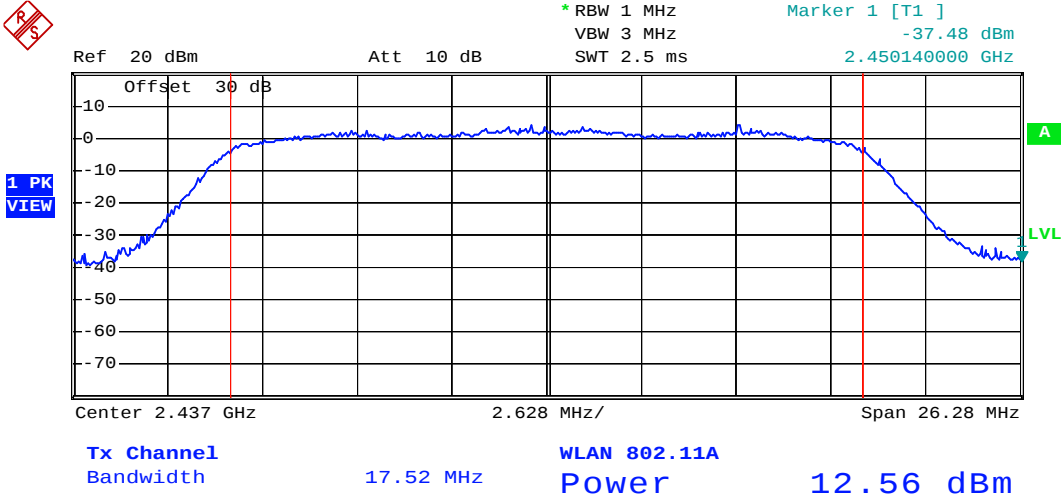
802.11g/ Channel High

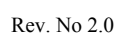


802.11n HT-20 /Antenna 1/ Channel low

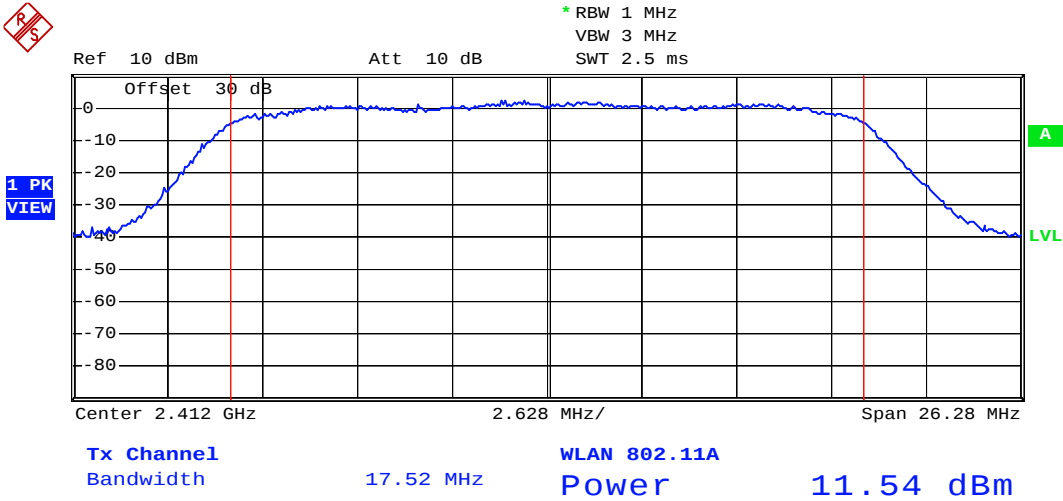


802.11n HT-20 /Antenna 1/ Channel Mid

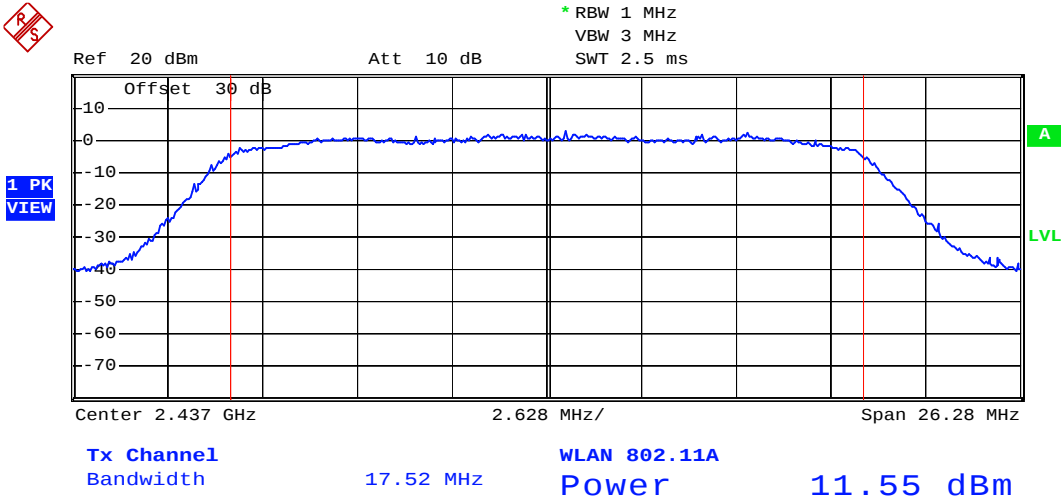




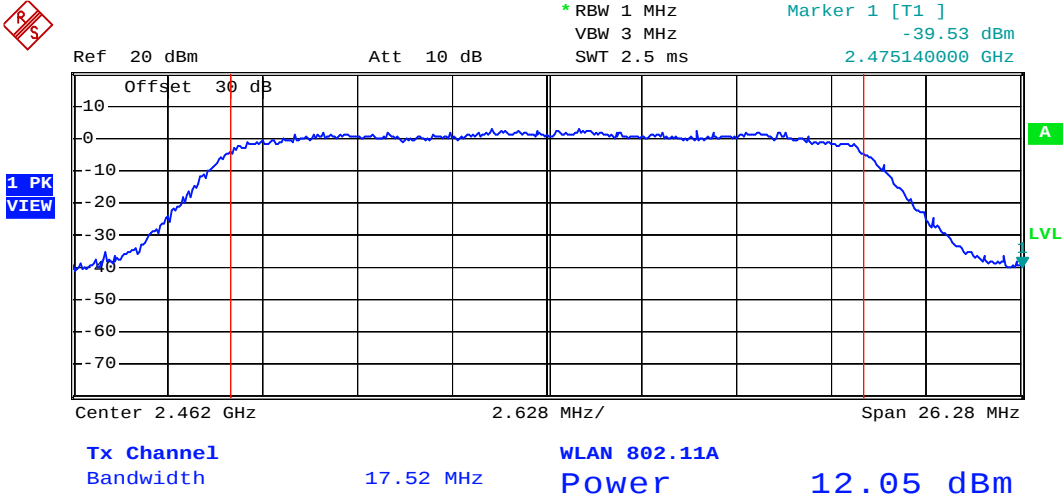
802.11n HT-20 /Antenna 2/ Channel low



802.11n HT-20 /Antenna 2/ Channel Mid



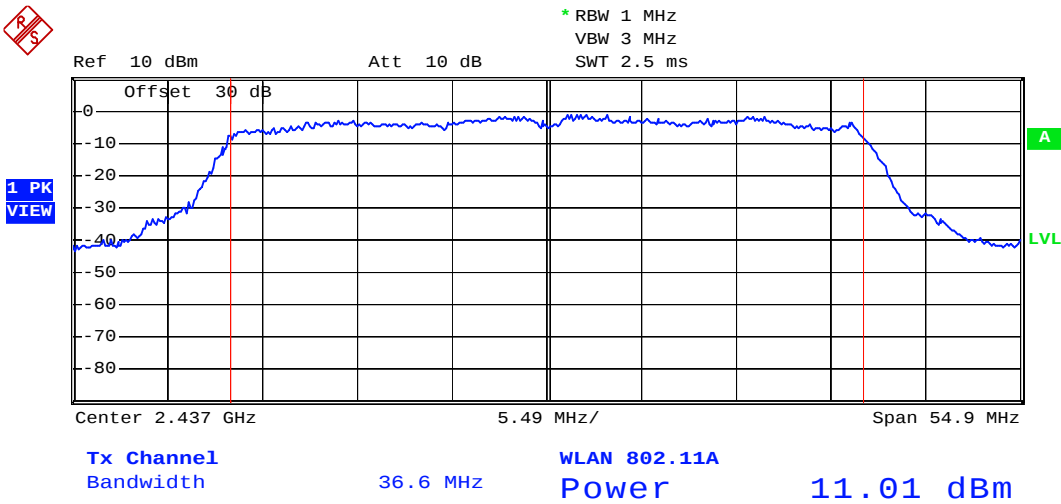
802.11n HT-20 /Antenna 2/ Channel High



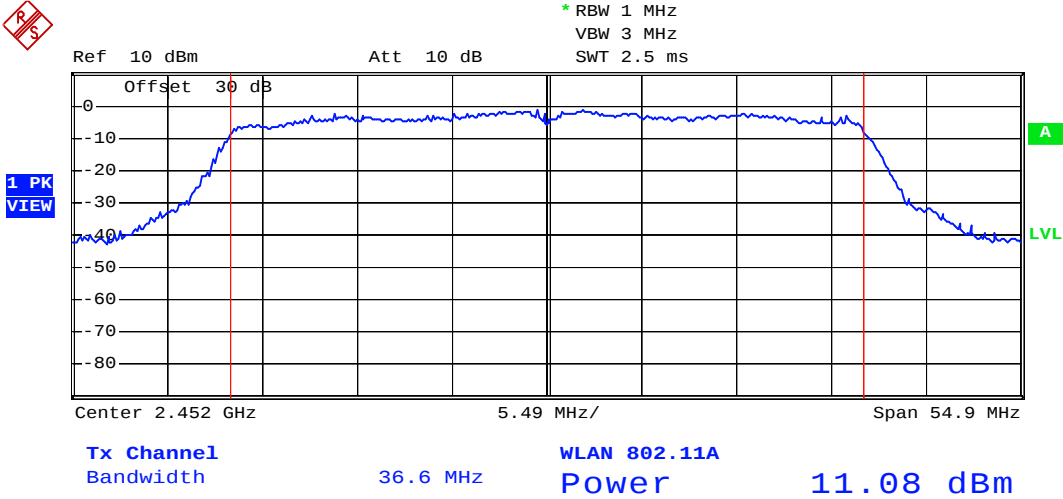
SWT 2.5 ms



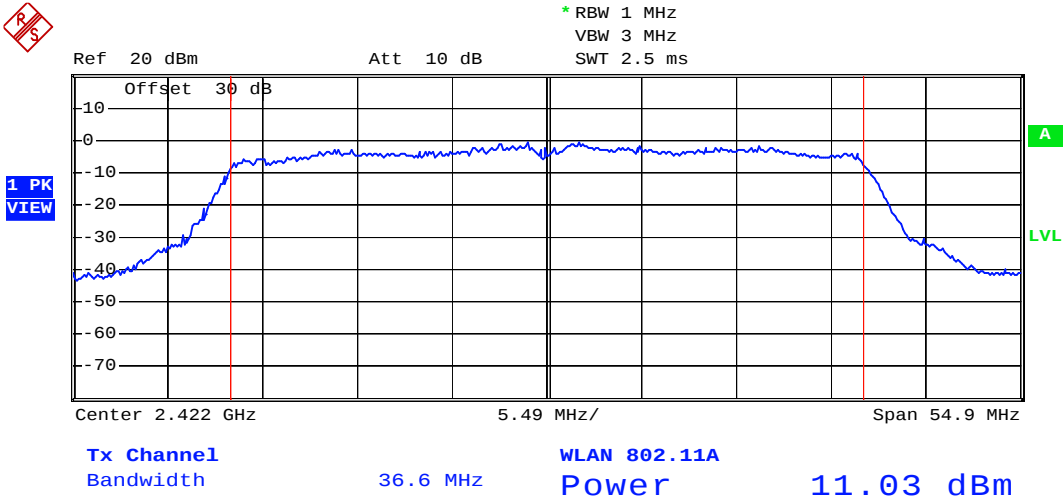
802.11n HT-40 /Antenna 1/ Channel Mid



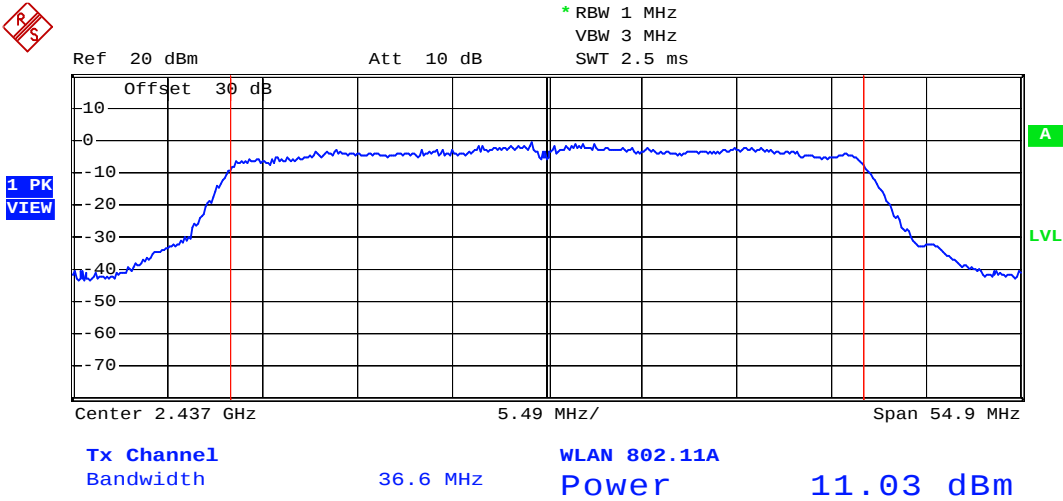
802.11n HT-40 /Antenna 1 Channel High



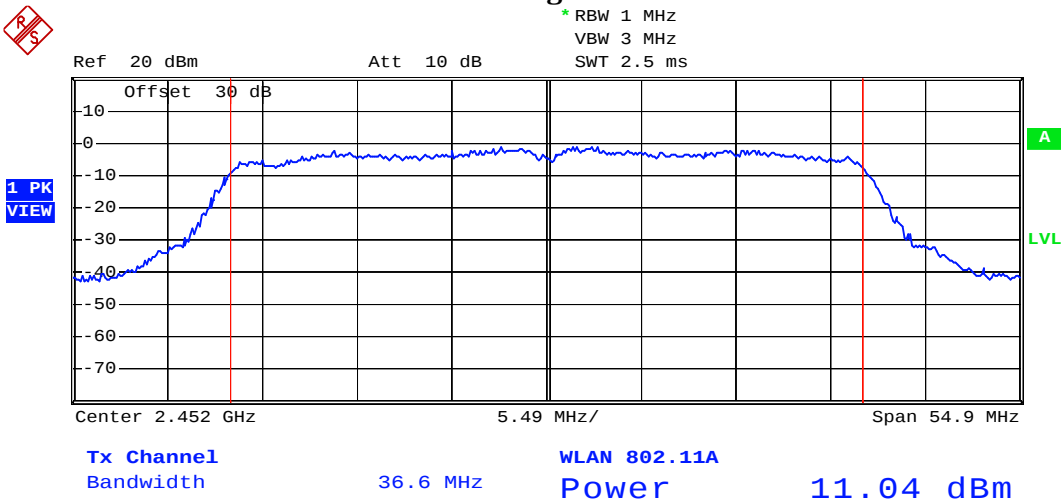
802.11n HT-40 /Antenna 2/ Channel low



802.11n HT-40 /Antenna 2/ Channel Mid



802.11n HT-40 /Antenna 2/ Channel High



9 100 kHz BANDWIDTH OF BAND EDGES MEASUREMENT

9.1 Standard Applicable

According to 15.247(c), if any 100 kHz bandwidth outside these frequency bands, the radio frequency power that is produced by the modulation products of the spreading sequence, the information sequence and the carrier frequency shall be either at least 20 dB below that in any 100 kHz bandwidth within the band that contains the highest level of the desired power or shall not exceed the general levels specified in §15.209(a), whichever results in the lesser attenuation.

9.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Set both RBW of spectrum analyzer to 100kHz and VBW to 1 MHz with a convenient frequency span including 100kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

9.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Spectrum Analyzer	Rohde & Schwarz	FSP40	2012/12/07	2013/12/06

9.4 Measurement Data

Test Date : Sep. 27, 2013 Temperature : 25 °C Humidity : 65 %

A. 802.11b @1 Mbps

- a) Lower Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.
- b) Upper Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.

B. 802.11g @6 Mbps

- a) Lower Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.
- b) Upper Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.

C. 802.11n HT-20 Antenna 1 @6.5 Mbps

- a) Lower Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.
- b) Upper Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.

D. 802.11n HT-20 Antenna 2 @6.5 Mbps

- a) Lower Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.
- b) Upper Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.

E. 802.11n HT-40 Antenna 1 @13.5 Mbps

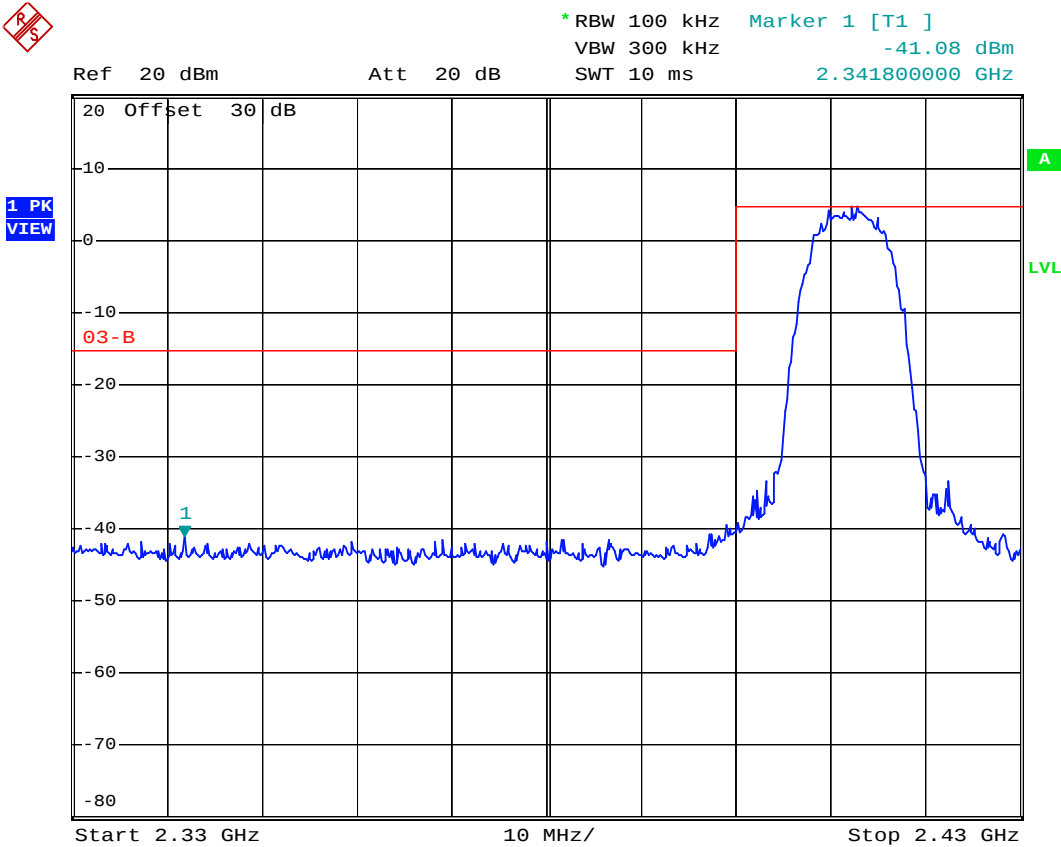
- a) Lower Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.
- b) Upper Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.

F. 802.11n HT-40 Antenna 2 @13.5 Mbps

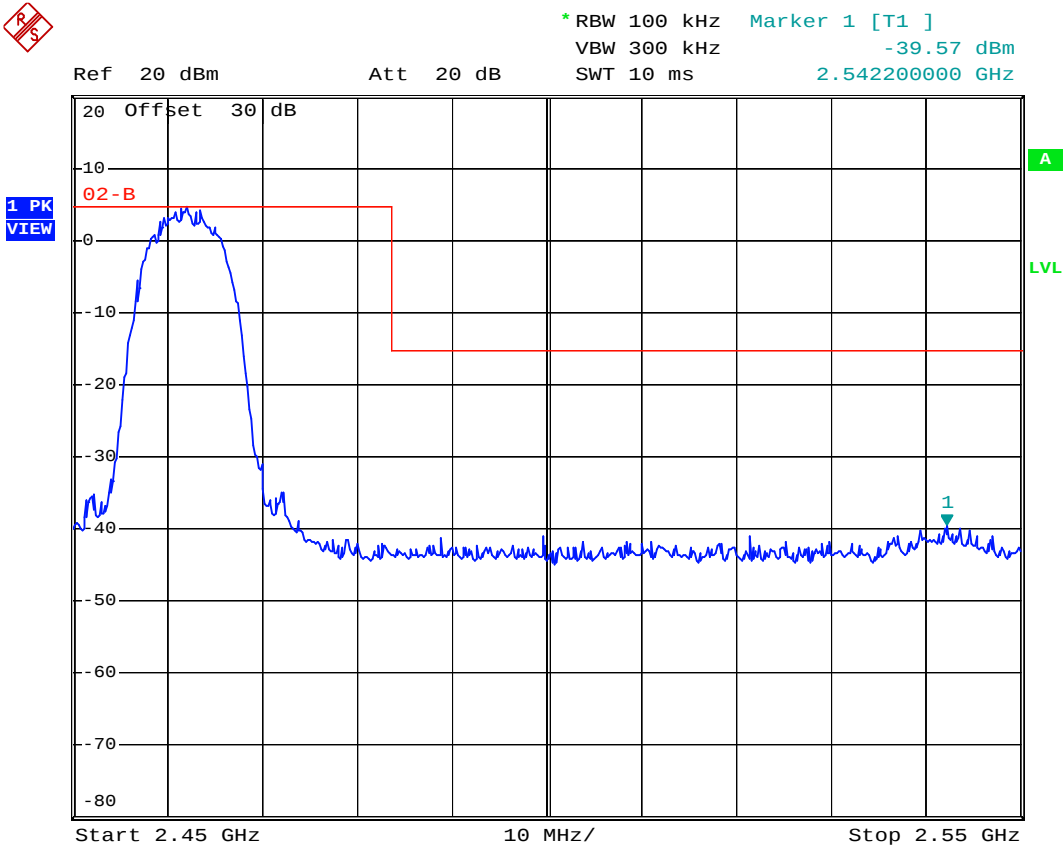
- c) Lower Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.
- d) Upper Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.

Note : The expanded uncertainty: 2dB.

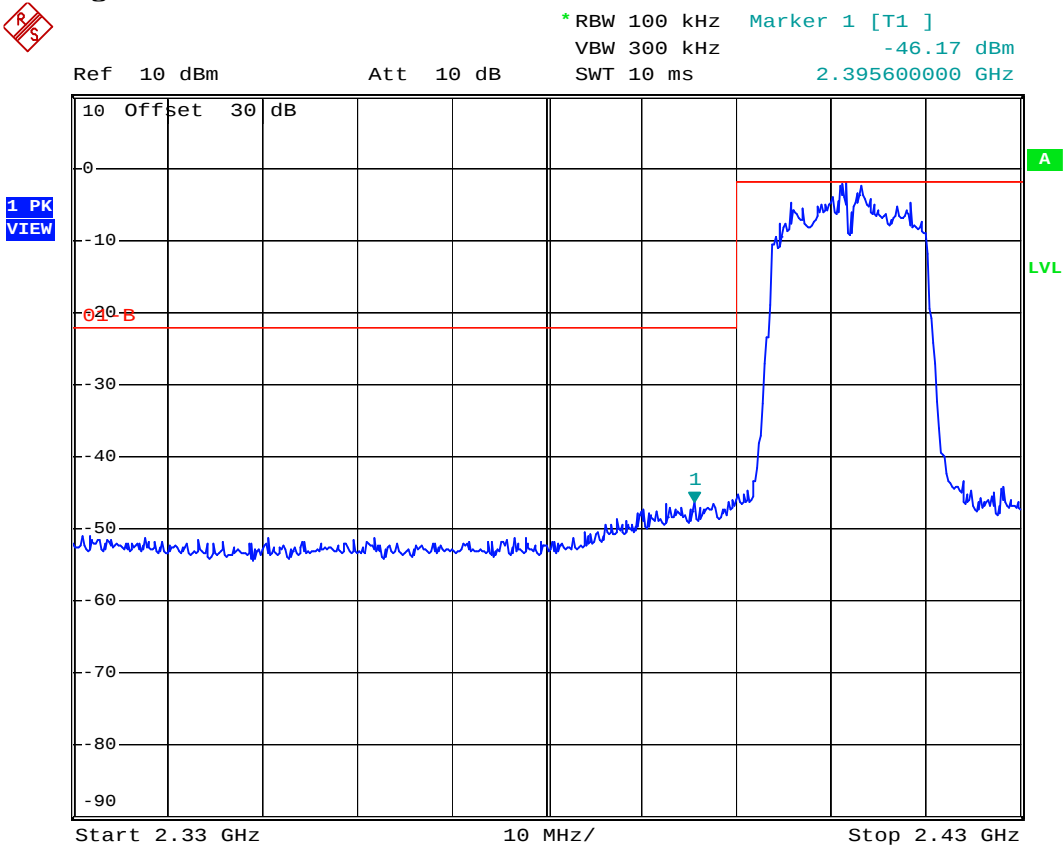
802.11b



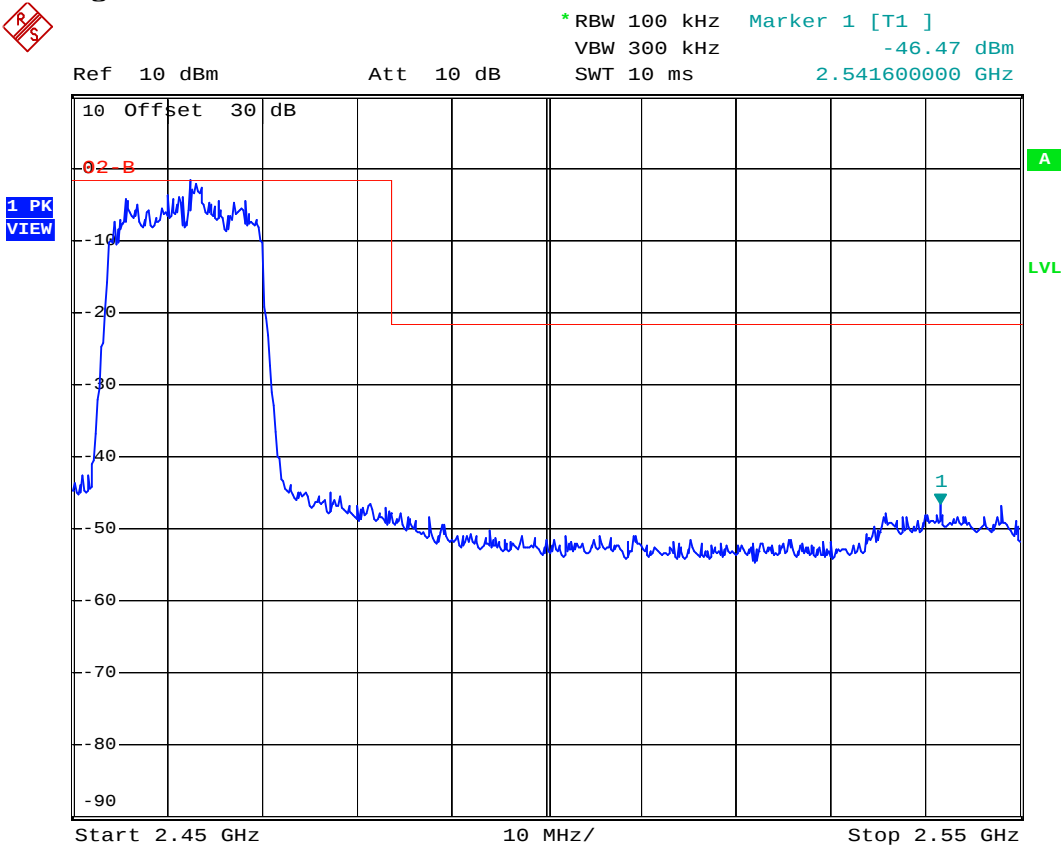
802.11b



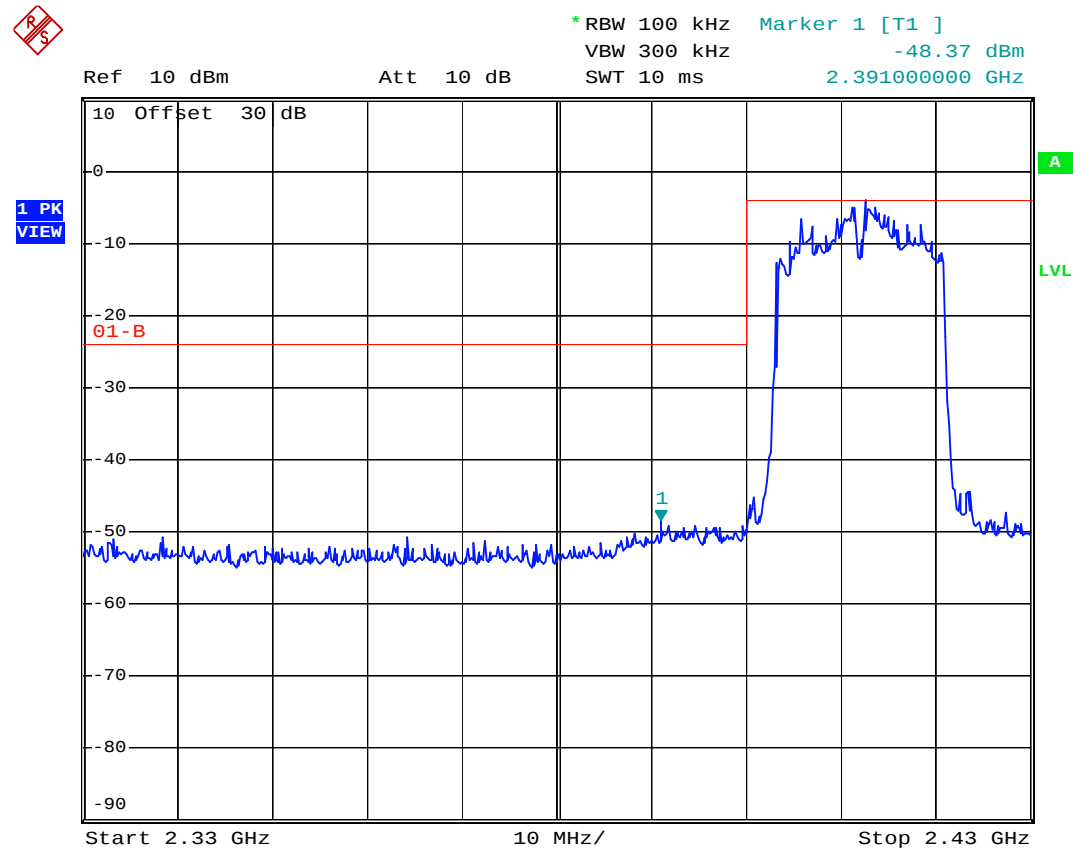
802.11g



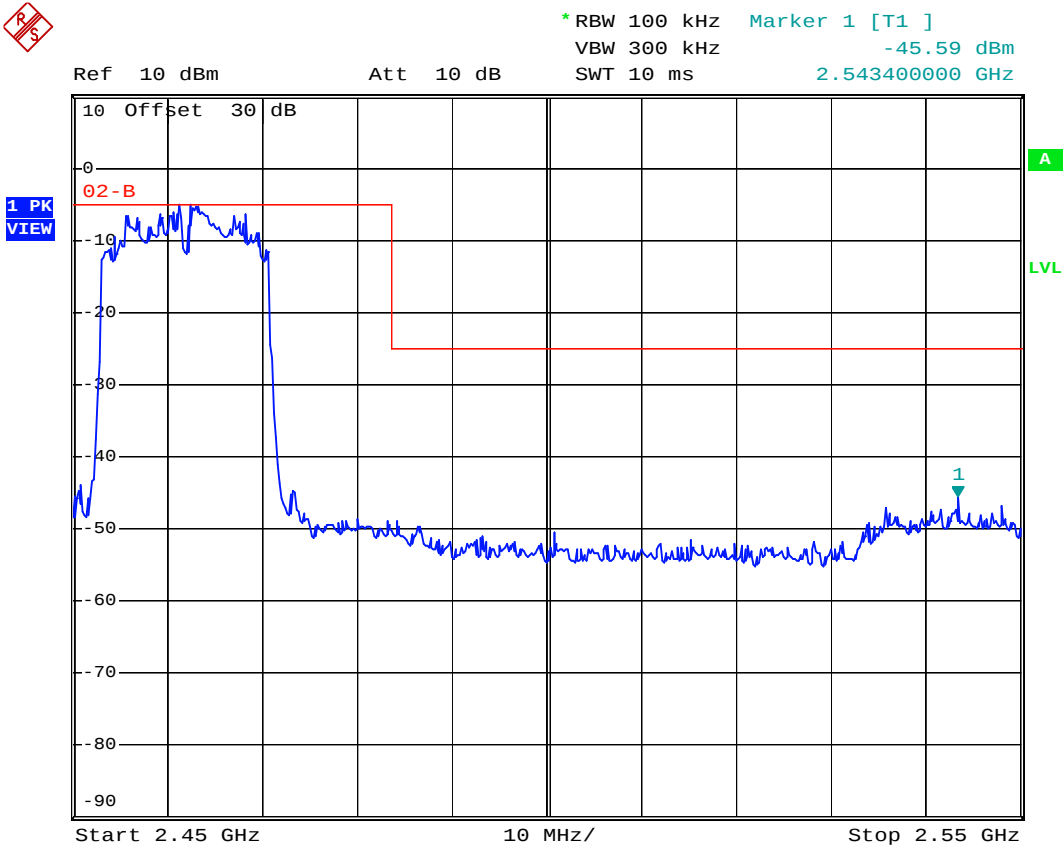
802.11g



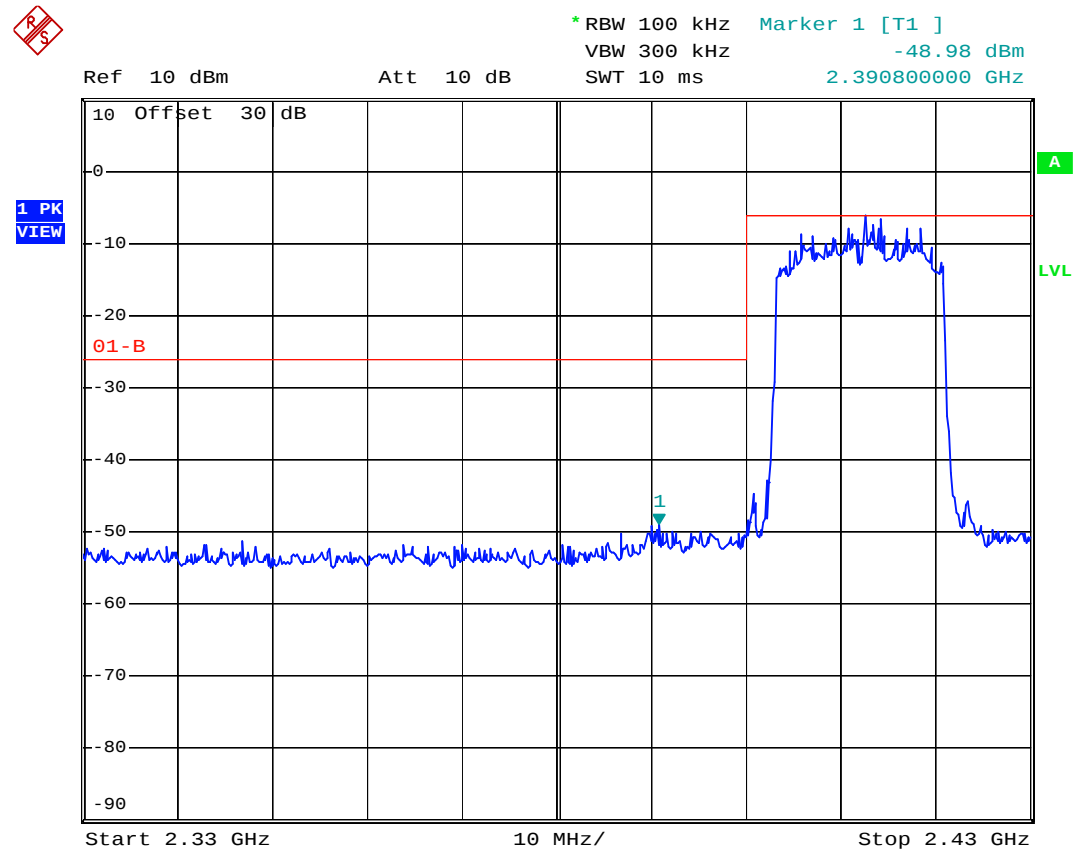
802.11n HT-20 / Antenna 1



802.11n HT-20 / Antenna 1



802.11n HT-20 / Antenna 2





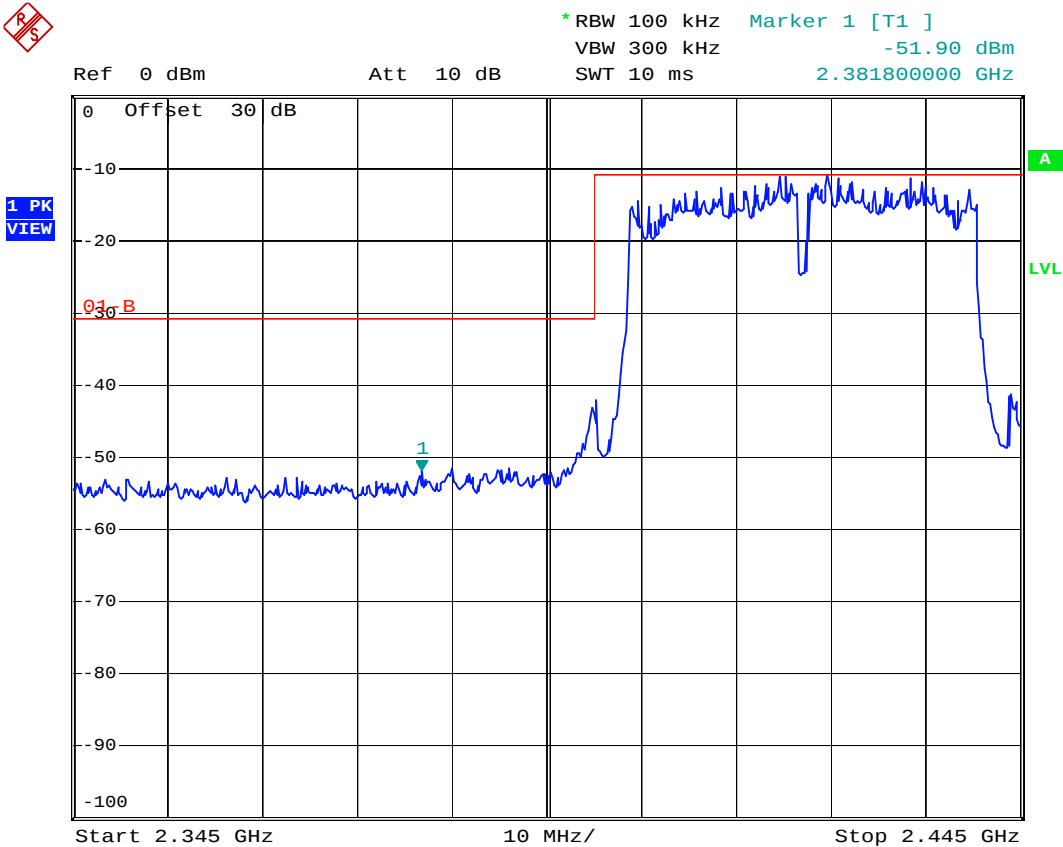
Ref 10 dBm Att 10 dB SWT 10 ms 2.543400000 GHz



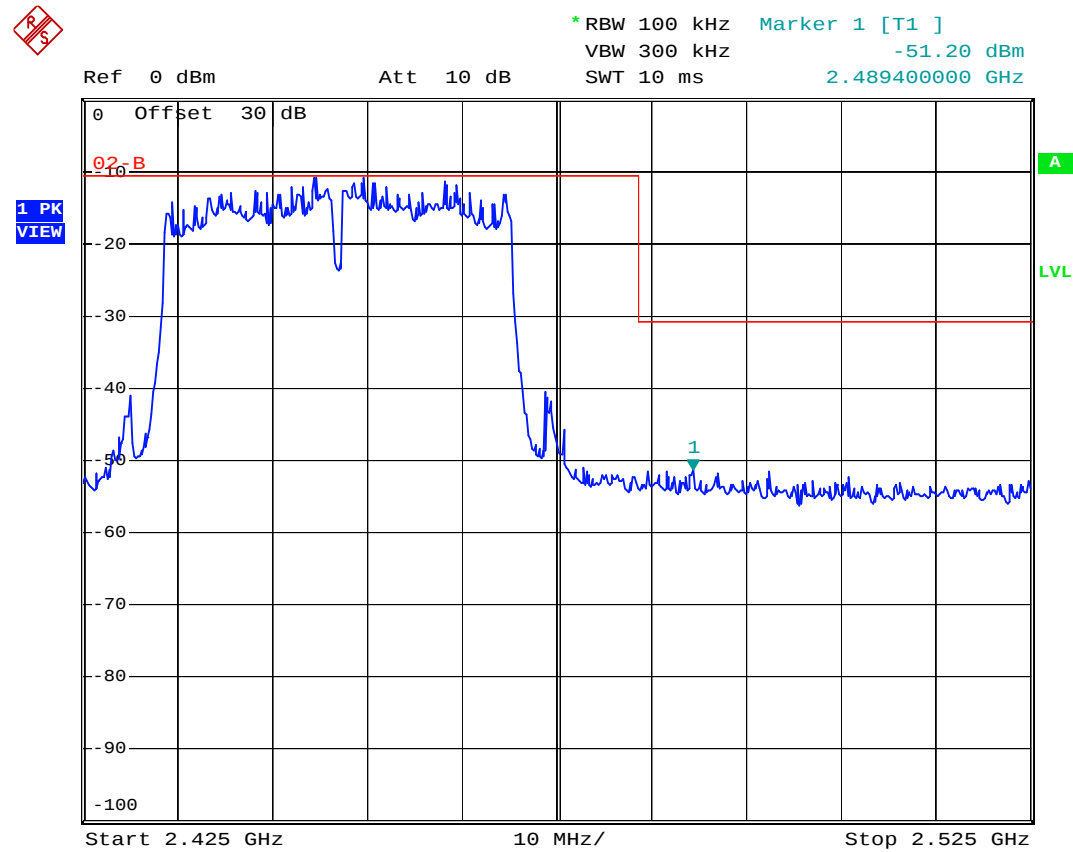
LVL

1

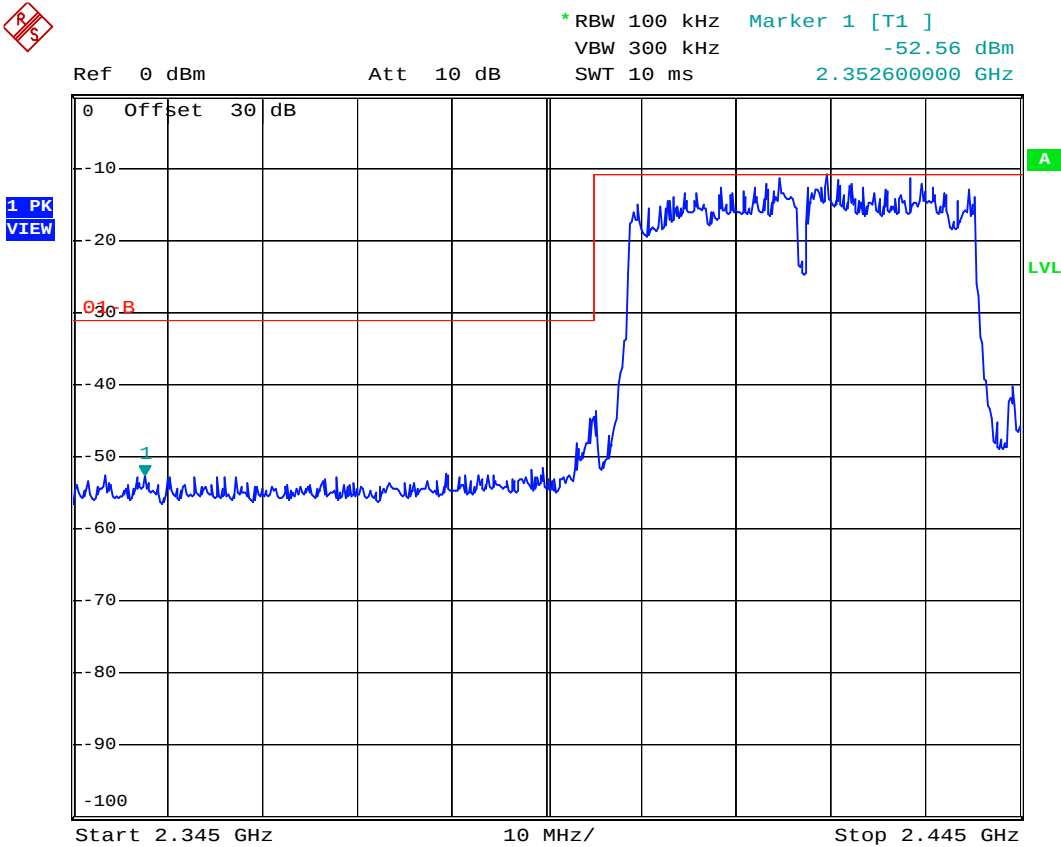
802.11n HT-40/ Antenna 1



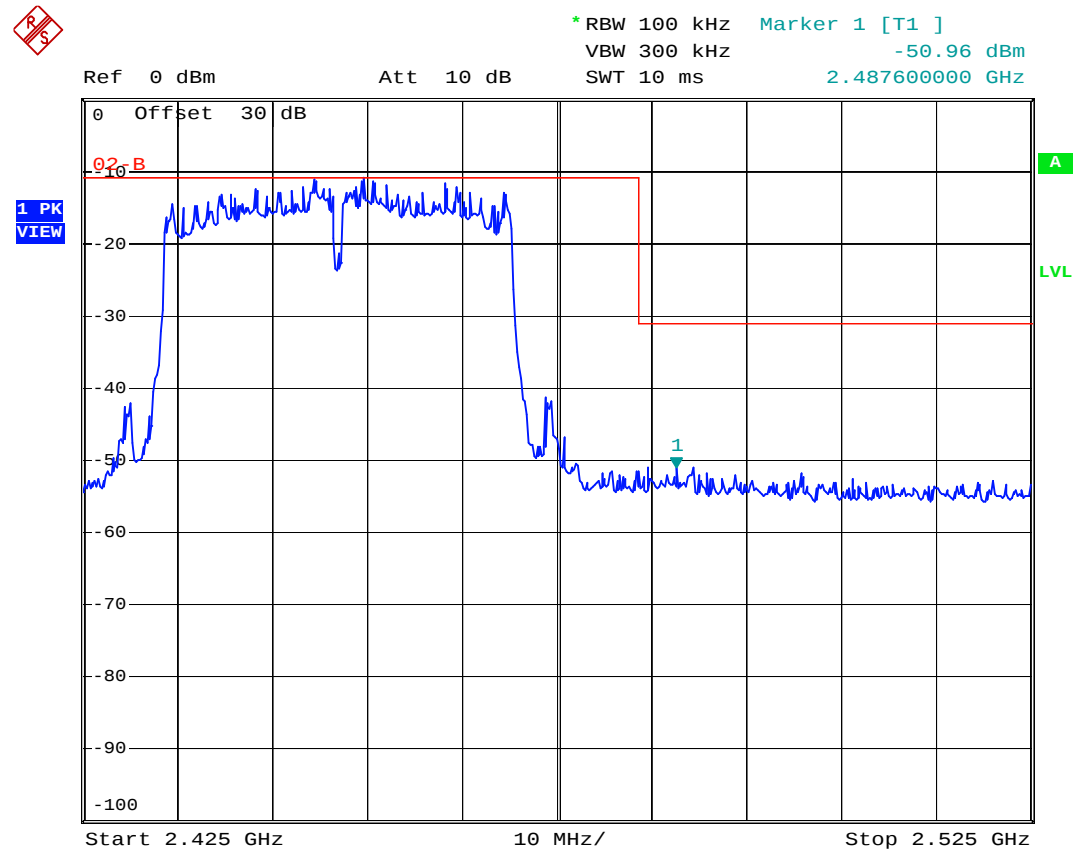
802.11n HT-40/ Antenna 1



802.11n HT-40/ Antenna 2



802.11n HT-40/ Antenna 2



10 POWER DENSITY MEASUREMENT

10.1 Standard Applicable

According to 15.247(d), for direct sequence systems, the transmitted power density averaged over any 1 second interval shall not be greater than 8 dBm in any 3 kHz bandwidth within these bands.

10.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 5 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set EUT to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Set the RBW = 100 kHz.
4. Set the VBW $\geq$ 300 kHz.
5. Set the span to 5-30 % greater than the EBW.
6. Detector = peak.
7. Sweep time = auto couple.
8. Trace mode = max hold.
9. Allow trace to fully stabilize.
10. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
11. Scale the observed power level to an equivalent value in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where $BWCF = 10\log(3 \text{ kHz}/100 \text{ kHz} = -15.2 \text{ dB})$.
12. Repeat above procedures until all measured frequencies were complete.

10.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Spectrum Analyzer	Rohde & Schwarz	FSP40	2012/12/07	2013/12/06

10.4 Measurement Data

Test Date : Oct. 04, 2013 Temperature : 26 °C Humidity : 60 %

A. 802.11b @1 Mbps

- a) Channel Low: Maximun PSD is $-8.83 -15.2 = -6.37$ dBm
- b) Channel Mid: Maximun PSD is $-8.13 -15.2 = -7.07$ dBm
- c) Channel High: Maximun PSD is $-7.87 -15.2 = -7.33$ dBm

B. 802.11g @6 Mbps

- a) Channel Low: Maximun PSD is $-17.19 -15.2 = 1.99$ dBm
- b) Channel Mid: Maximun PSD is $-17.99 -15.2 = 2.79$ dBm
- c) Channel High: Maximun PSD is $-17.84 -15.2 = 2.64$ dBm

C. 802.11n HT-20 Antenna 1 @6.5 Mbps

- a) Channel Low: Maximun PSD is $-19.48 -15.2 = -4.28$ dBm
- b) Channel Mid: Maximun PSD is $-18.78 -15.2 = -3.58$ dBm
- c) Channel High: Maximun PSD is $-19.40 -15.2 = -4.2$ dBm

D. 802.11n HT-20 Antenna 2 @6.5 Mbps

- a) Channel Low: Maximun PSD is $-23.01 -15.2 = 7.81$ dBm
- b) Channel Mid: Maximun PSD is $-22.73 -15.2 = 7.53$ dBm
- c) Channel High: Maximun PSD is $-20.76 -15.2 = 5.56$ dBm

E. 802.11n HT-40 Antenna 1 @13.5 Mbps

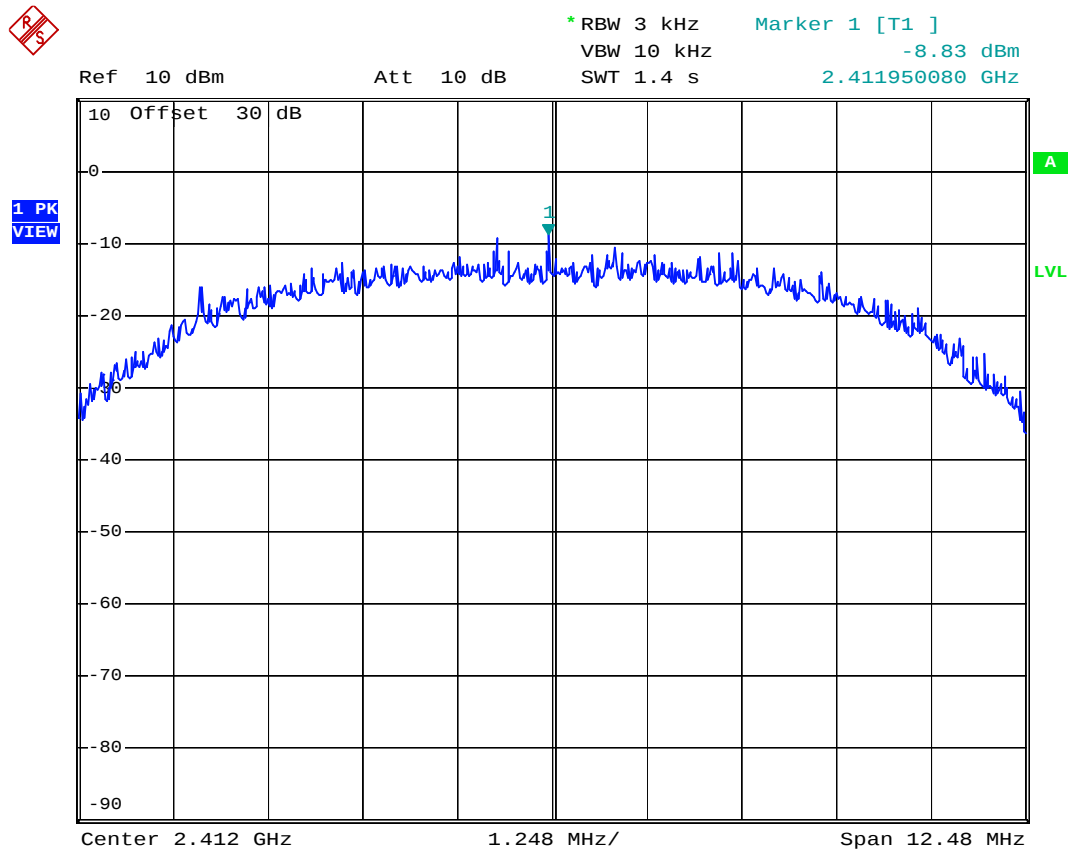
- a) Channel Low: Maximun PSD is $-25.21 -15.2 = 10.01$ dBm
- b) Channel Mid: Maximun PSD is $-24.98 -15.2 = 9.78$ dBm
- c) Channel High: Maximun PSD is $-25.14 -15.2 = 9.94$ dBm

F. 802.11n HT-40 Antenna 2 @13.5 Mbps

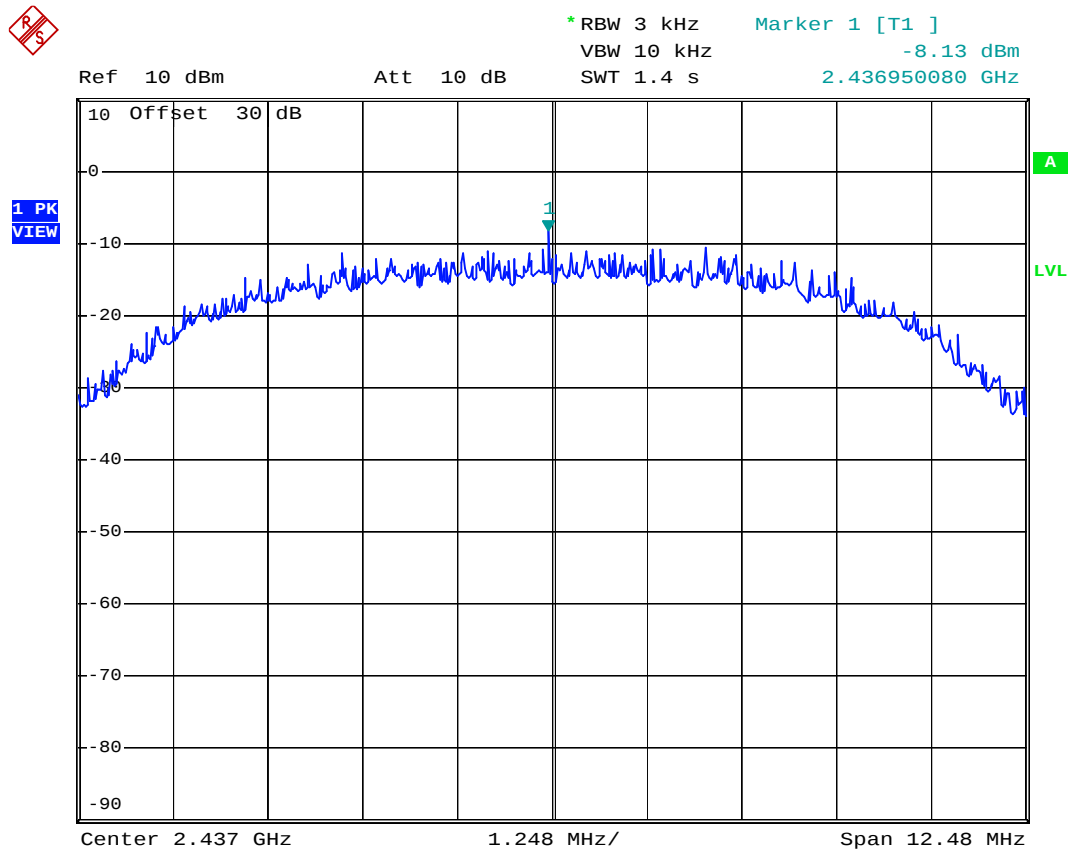
- a) Channel Low: Maximun PSD is $-25.46 -15.2 = 10.26$ dBm
- b) Channel Mid: Maximun PSD is $-24.88 -15.2 = 9.68$ dBm
- c) Channel High: Maximun PSD is $-24.93 -15.2 = 9.73$ dBm

Note : The expanded uncertainty: 2dB.

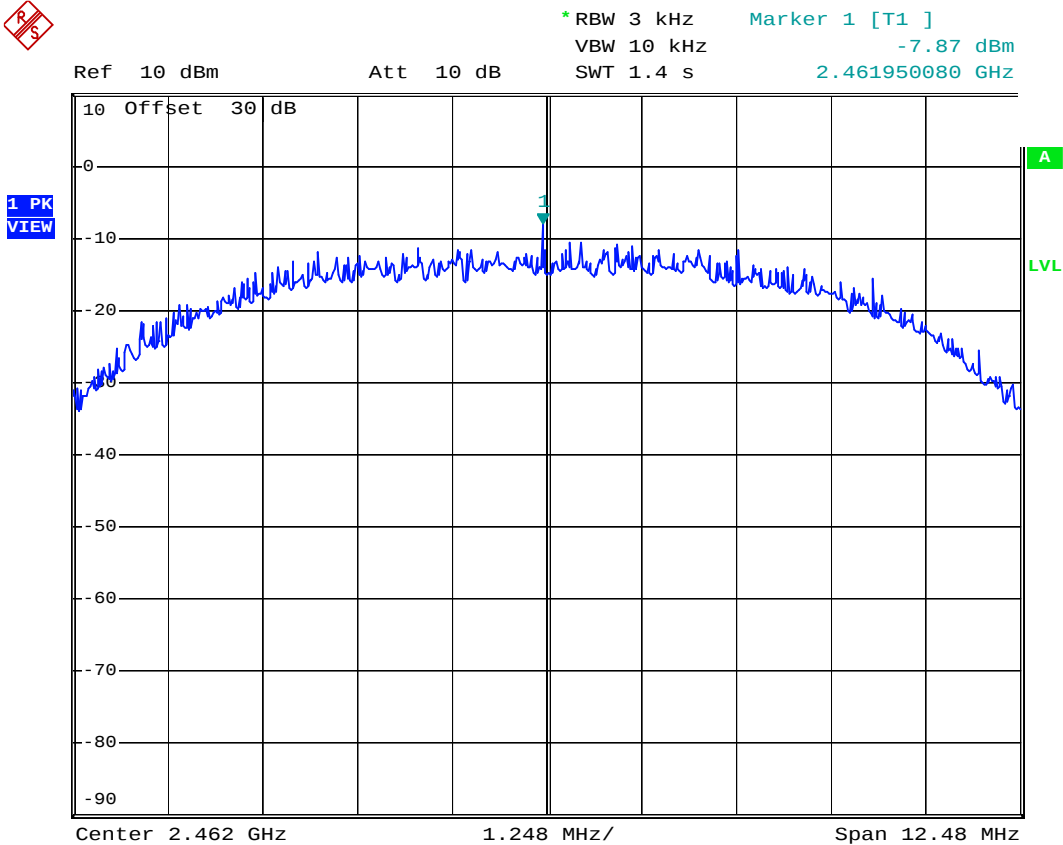
802.11b / Channel Low



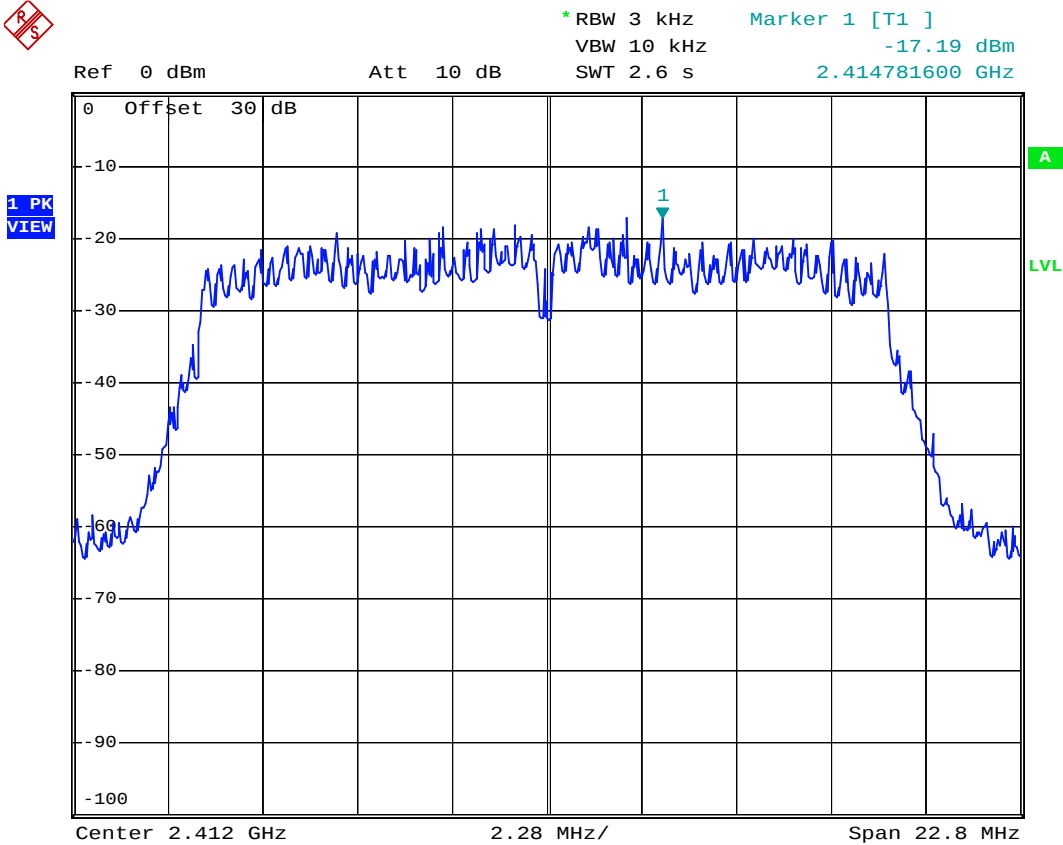
802.11b / Channel Mid



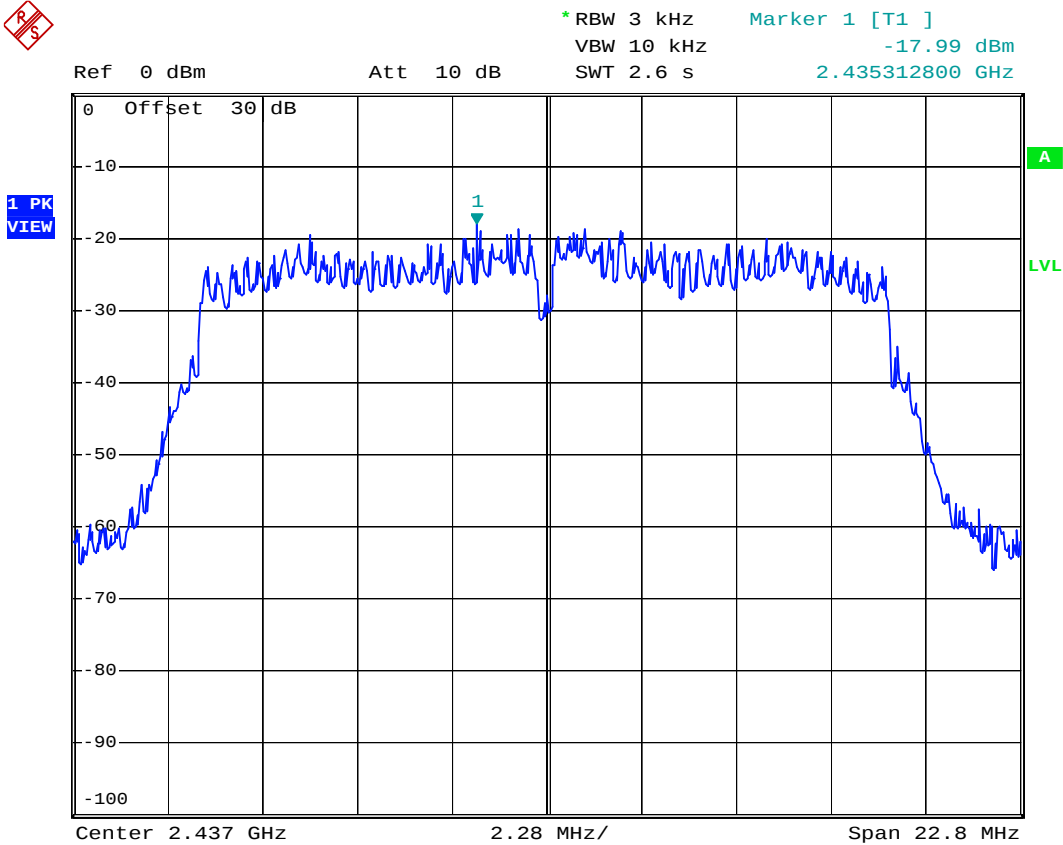
802.11b / Channel High



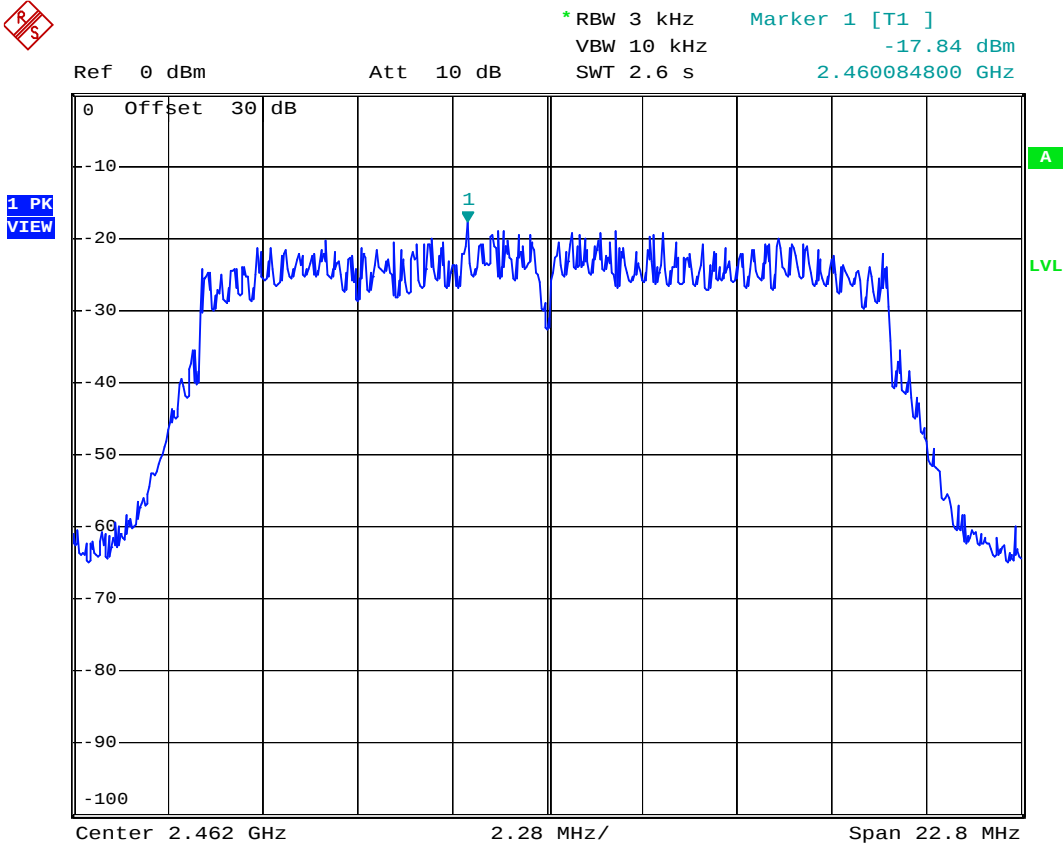
802.11g / Channel Low



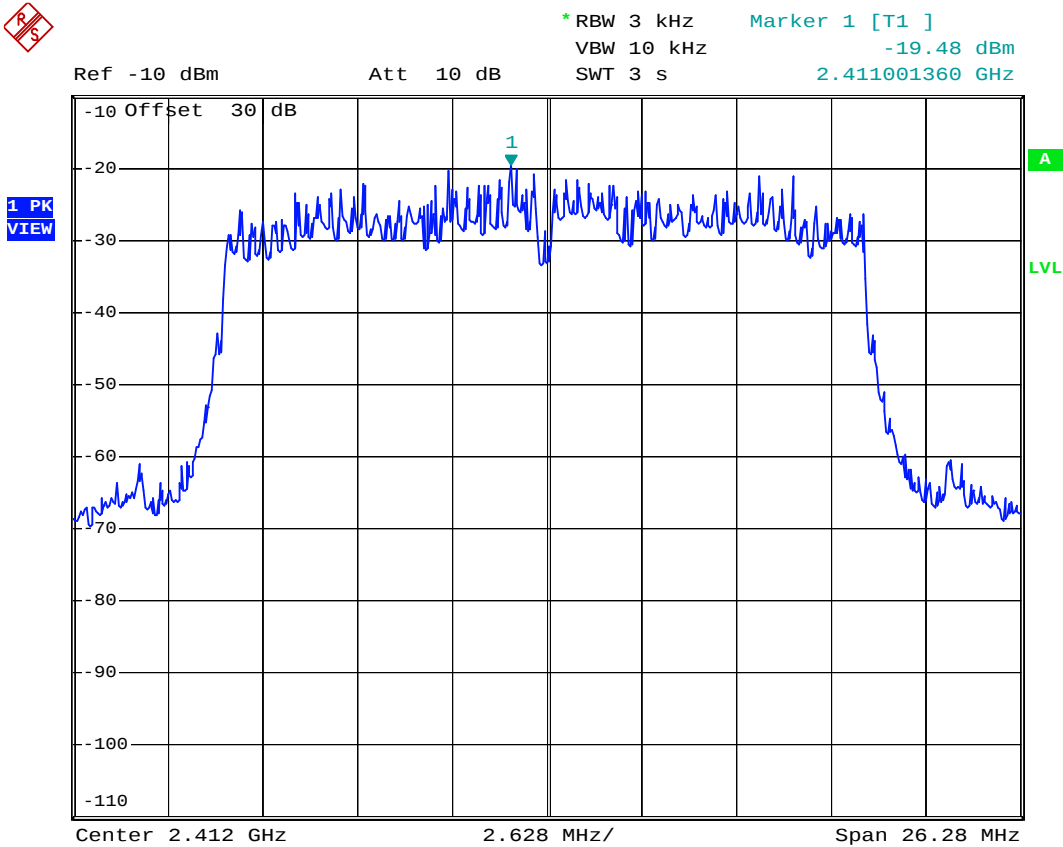
802.11g / Channel Mid



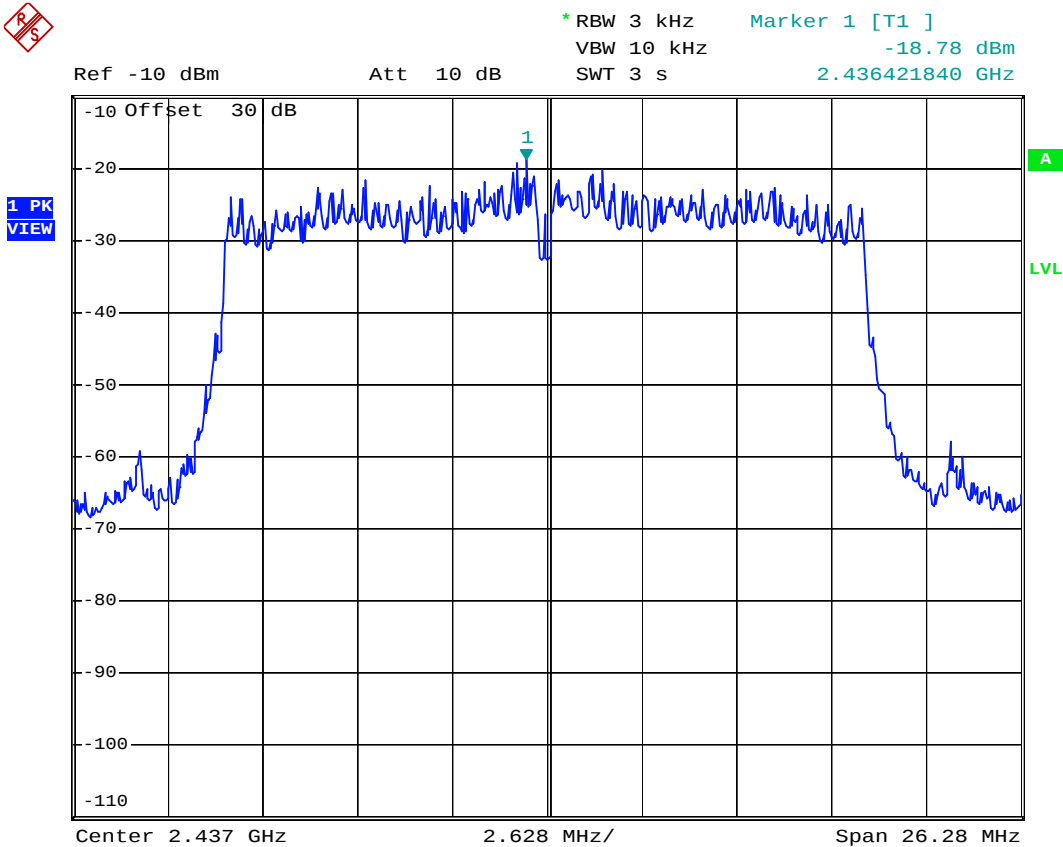
802.11g / Channel High



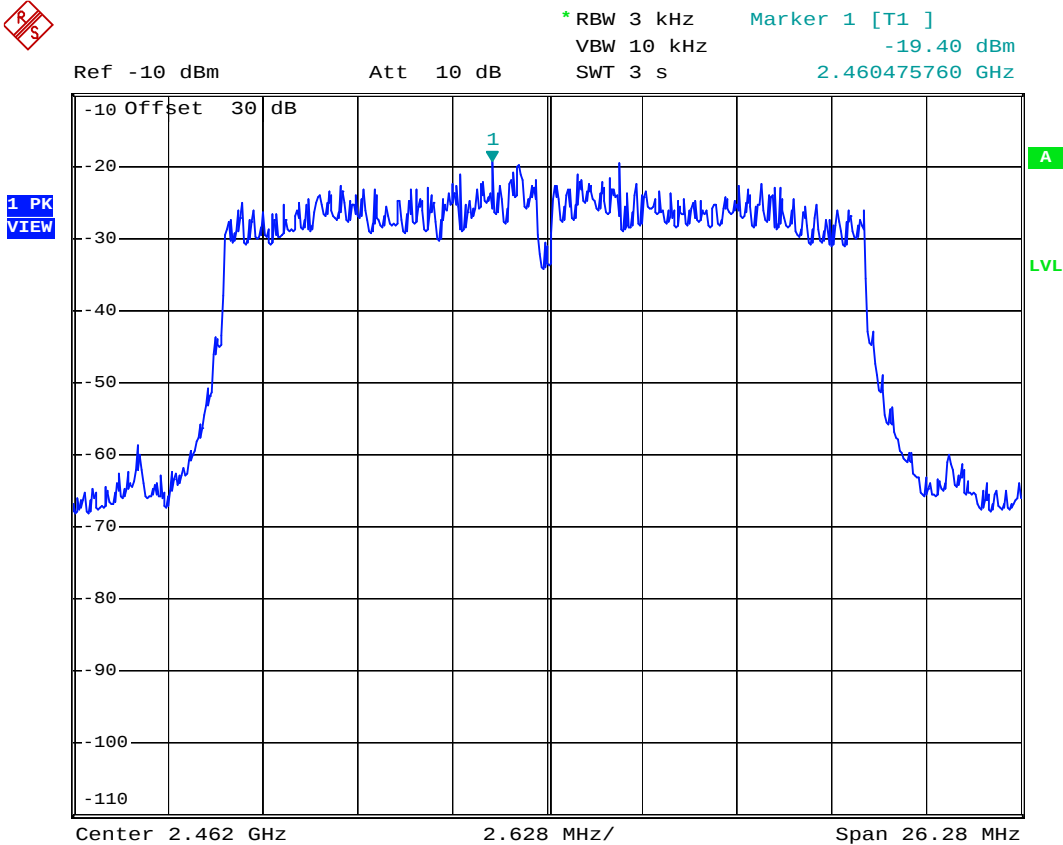
802.11n HT-20/Antenna 1/ Channel Low



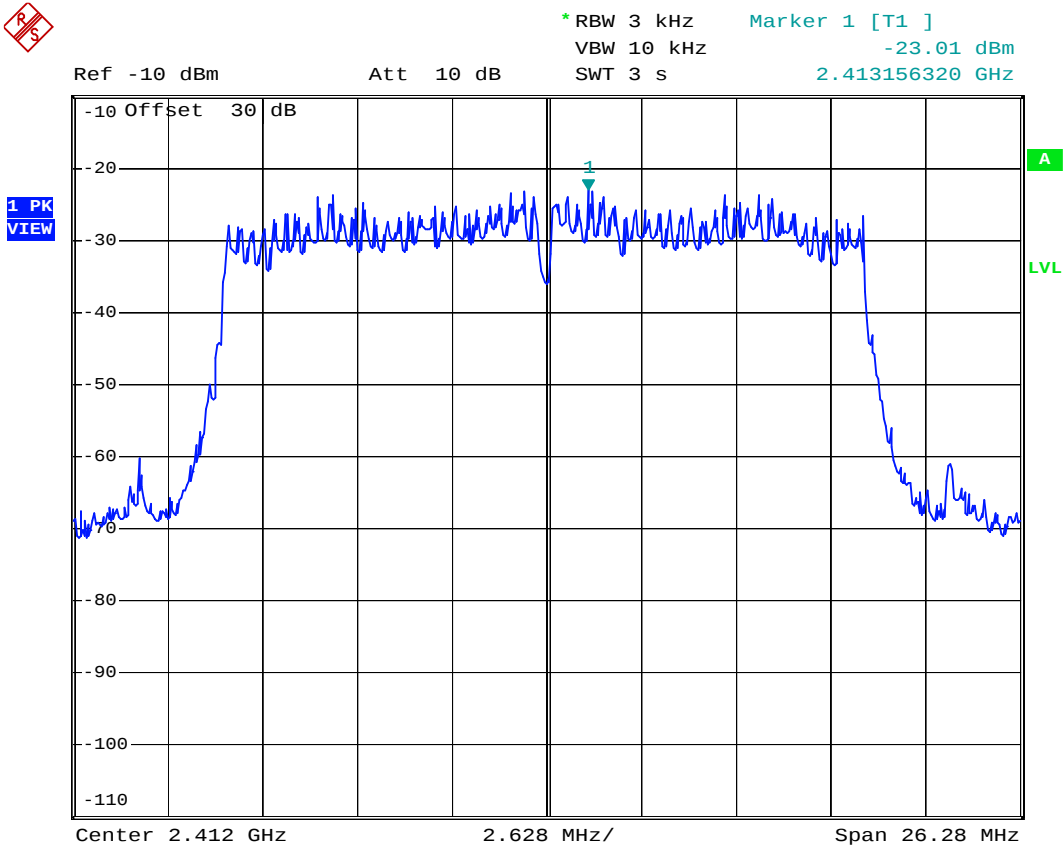
802.11n HT-20/Antenna 1/ Channel Mid



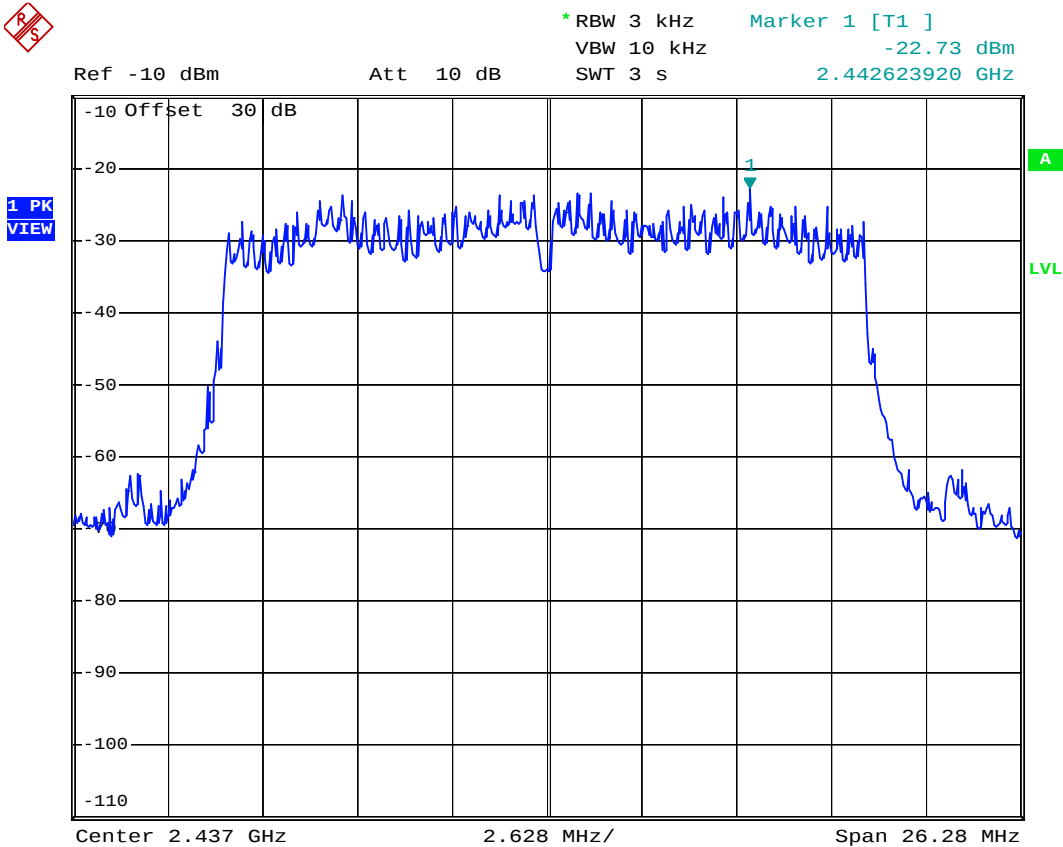
802.11n HT-20/Antenna 1/ Channel High



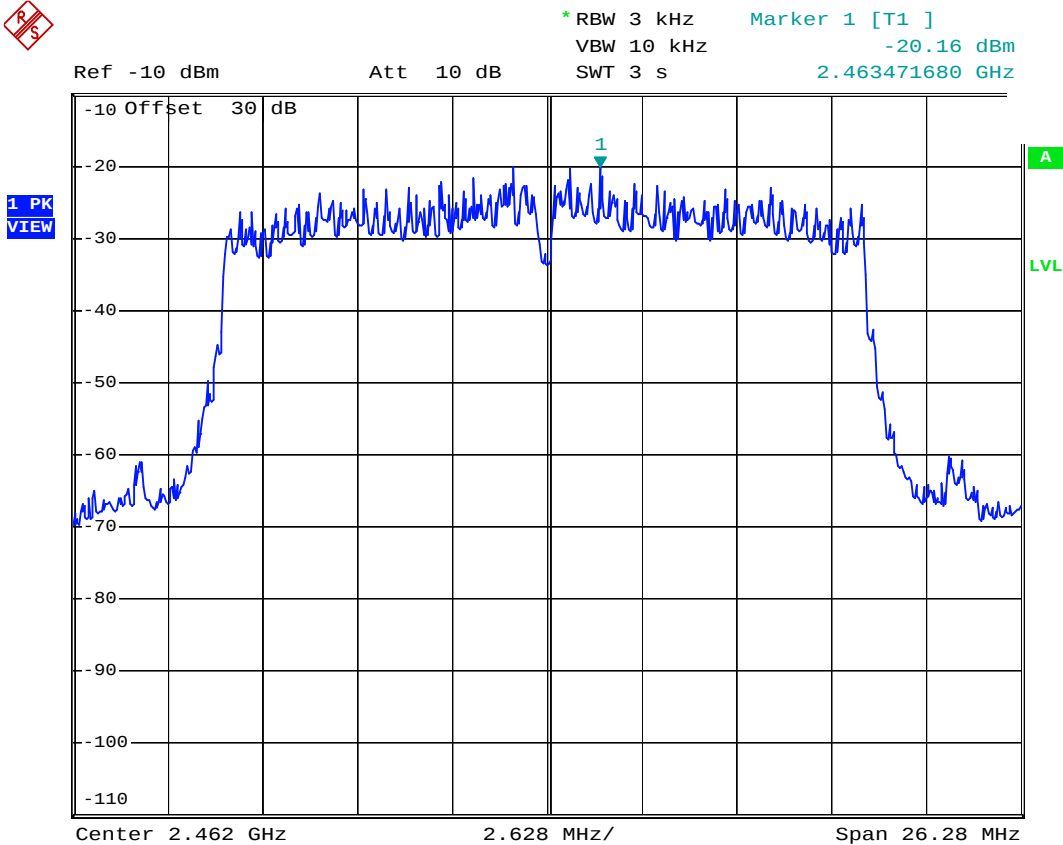
802.11n HT-20/Antenna 2/ Channel Low



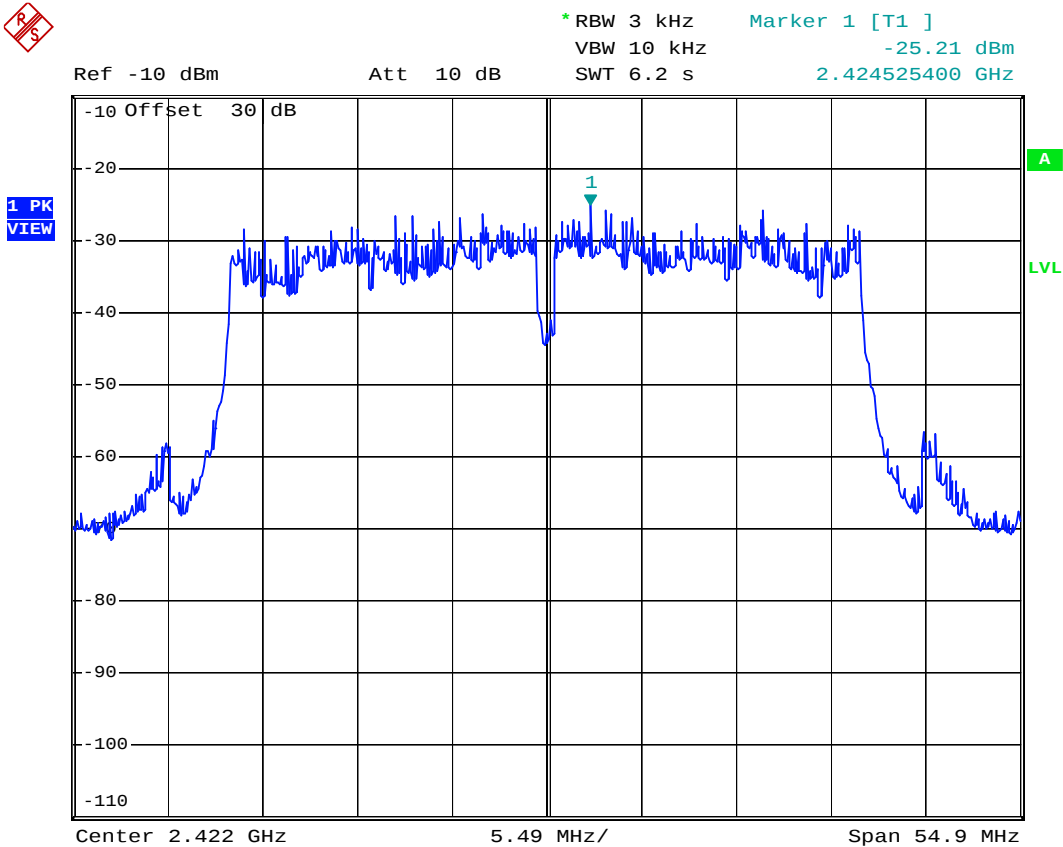
802.11n HT-20/Antenna 2/ Channel Mid



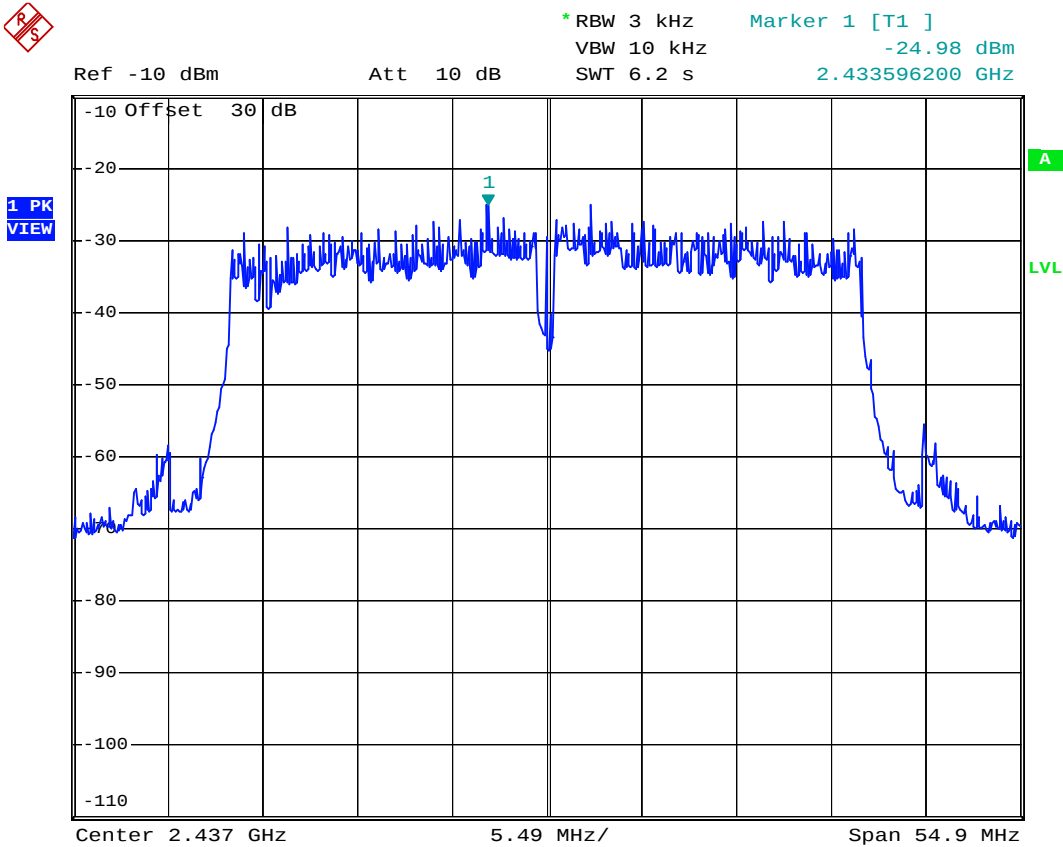
802.11n HT-20/Antenna 2/ Channel High



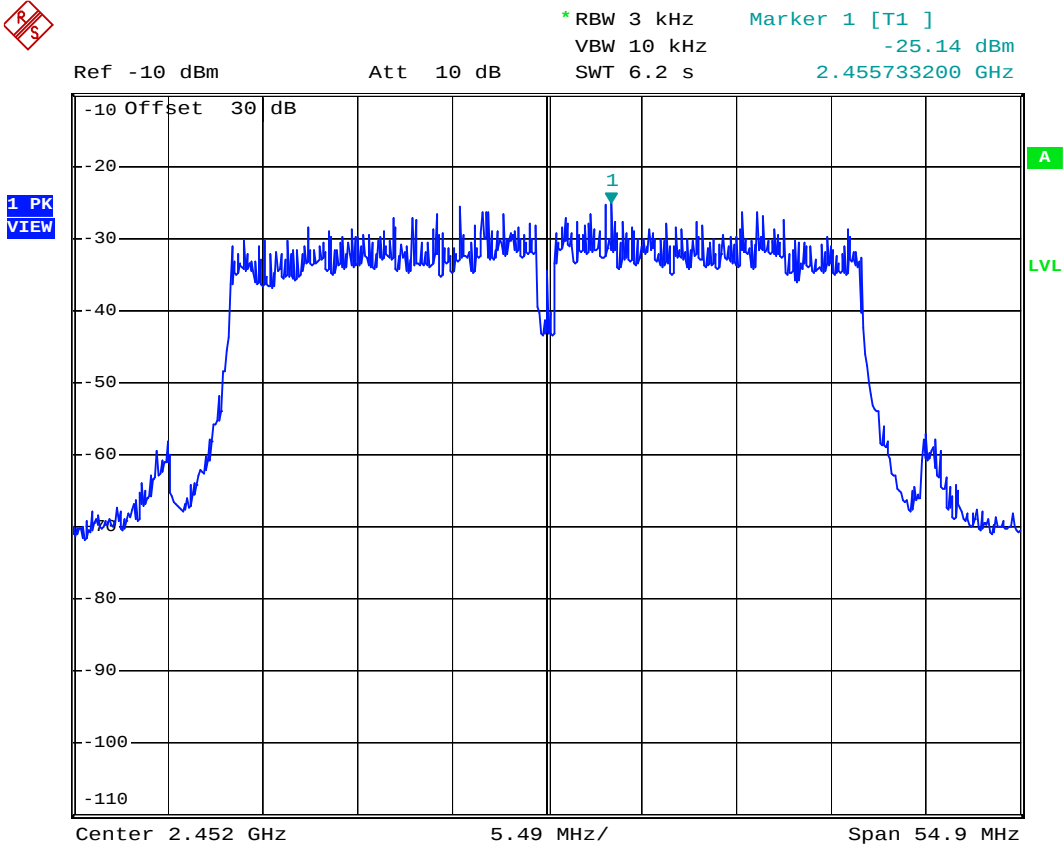
802.11n HT-40/Antenna 1/ Channel Low



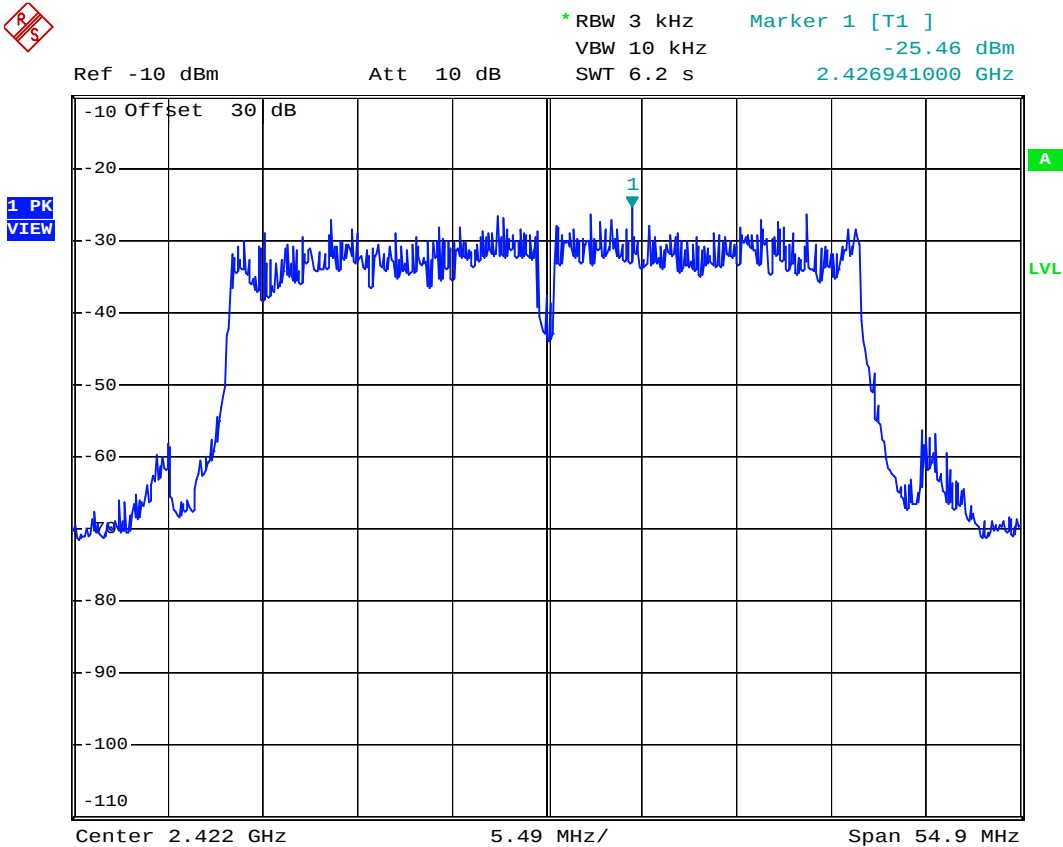
802.11n HT-40/Antenna 1/ Channel Mid



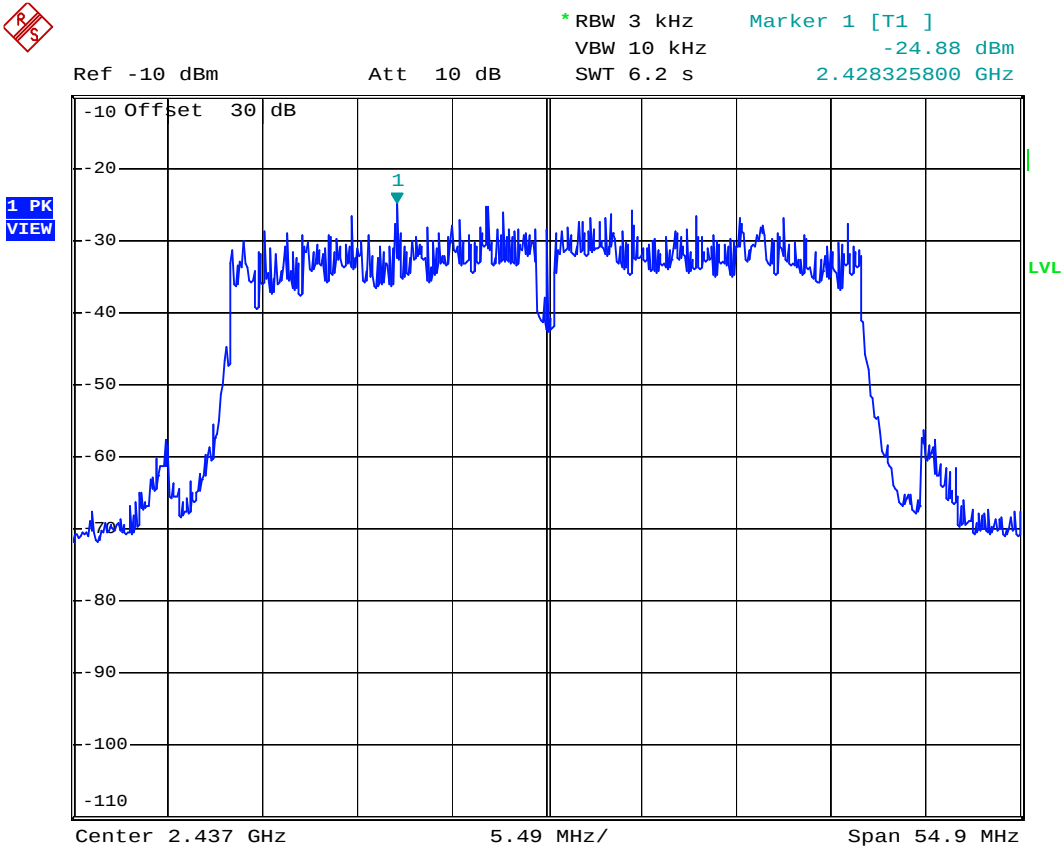
802.11n HT-40/Antenna 1/ Channel High



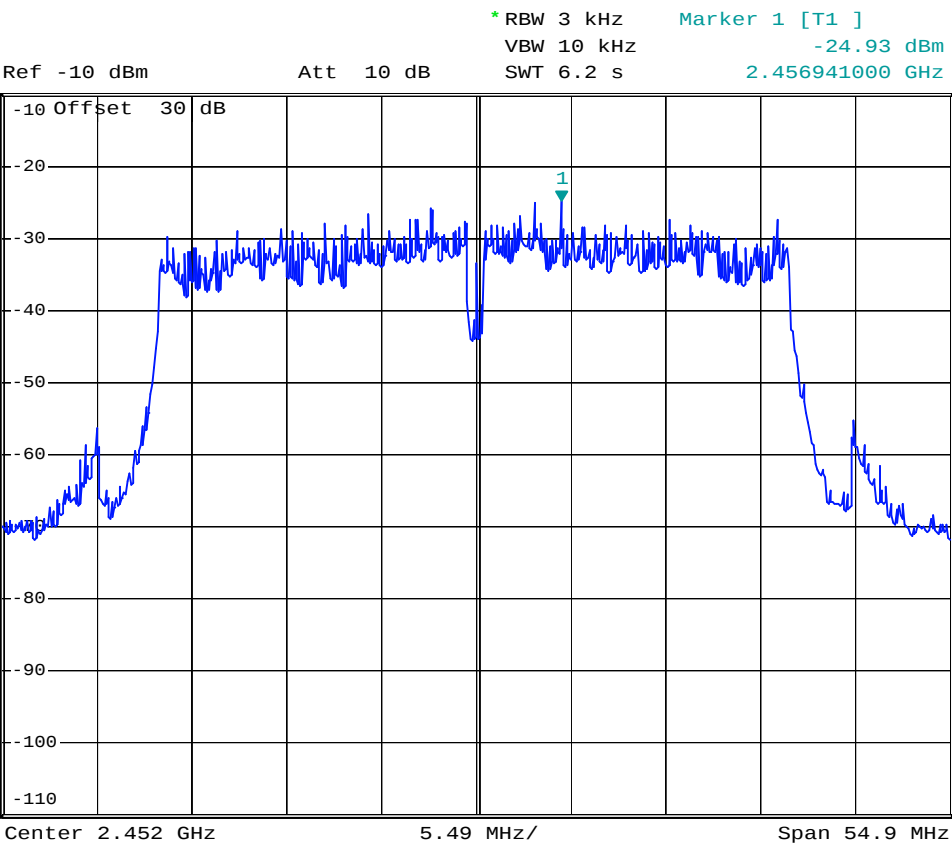
802.11n HT-40/Antenna 2/ Channel Low



802.11n HT-40/Antenna 2/ Channel Mid



802.11n HT-40/Antenna 2/ Channel High



11. OUT-OF-BAND CONDUCTED EMISSION MEASUREMENT

11.1 Standard Applicable

According to 15.247(c), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.

11.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4 without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Use the following spectrum analyzer settings:
 Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.
 RBW = 100 kHz
 VBW $\geq$ RBW
 Sweep = auto
 Detector function = peak
 Trace = max hold.
4. Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded. Plot the result on the screen of spectrum analyzer.
5. Repeat above procedures until all measured frequencies were complete.

11.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Spectrum Analyzer	Rohde & Schwarz	FSP40	2012/12/07	2013/12/06

11.4 Measurement Data

Test Date : Sep. 27, 2013 Temperature : 25 °C Humidity : 65 %

A. 802.11b @1 Mbps

Mode: Channel Low, Mid, High

1 GHz to 25 GHz frequency band: All emissions are attenuated more than 20dB from the carrier.

B. 802.11g @6 Mbps

Mode: Channel Low, Mid, High

1 GHz to 25 GHz frequency band: All emissions are attenuated more than 20dB from the carrier.

C. 802.11n HT-20 Antenna 1 @6.5 Mbps

Mode: Channel Low, Mid, High

1 GHz to 25 GHz frequency band: All emissions are attenuated more than 20dB from the carrier.

D. 802.11n HT-20 Antenna 2 @6.5 Mbps

Mode: Channel Low, Mid, High

1 GHz to 25 GHz frequency band: All emissions are attenuated more than 20dB from the carrier.

E. 802.11n HT-40 Antenna 1 @13.5 Mbps

Mode: Channel Low, Mid, High

1 GHz to 25 GHz frequency band: All emissions are attenuated more than 20dB from the carrier.

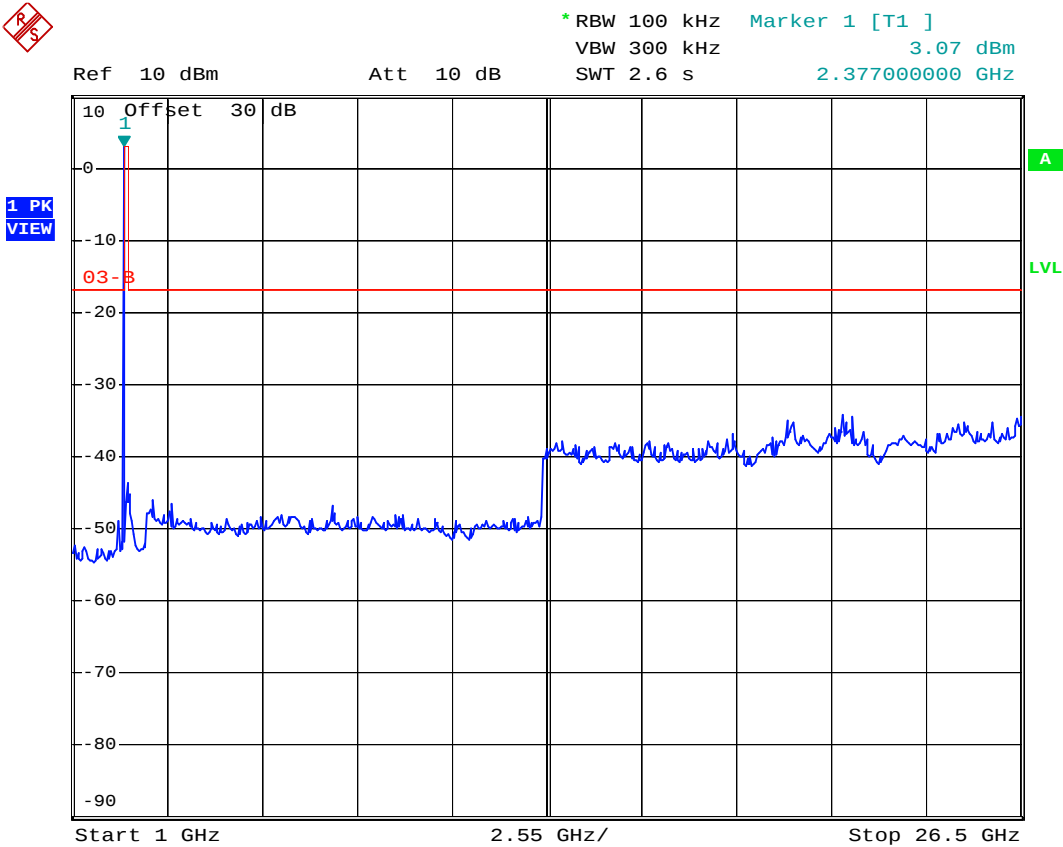
F. 802.11n HT-40 Antenna 2 @13.5 Mbps

Mode: Channel Low, Mid, High

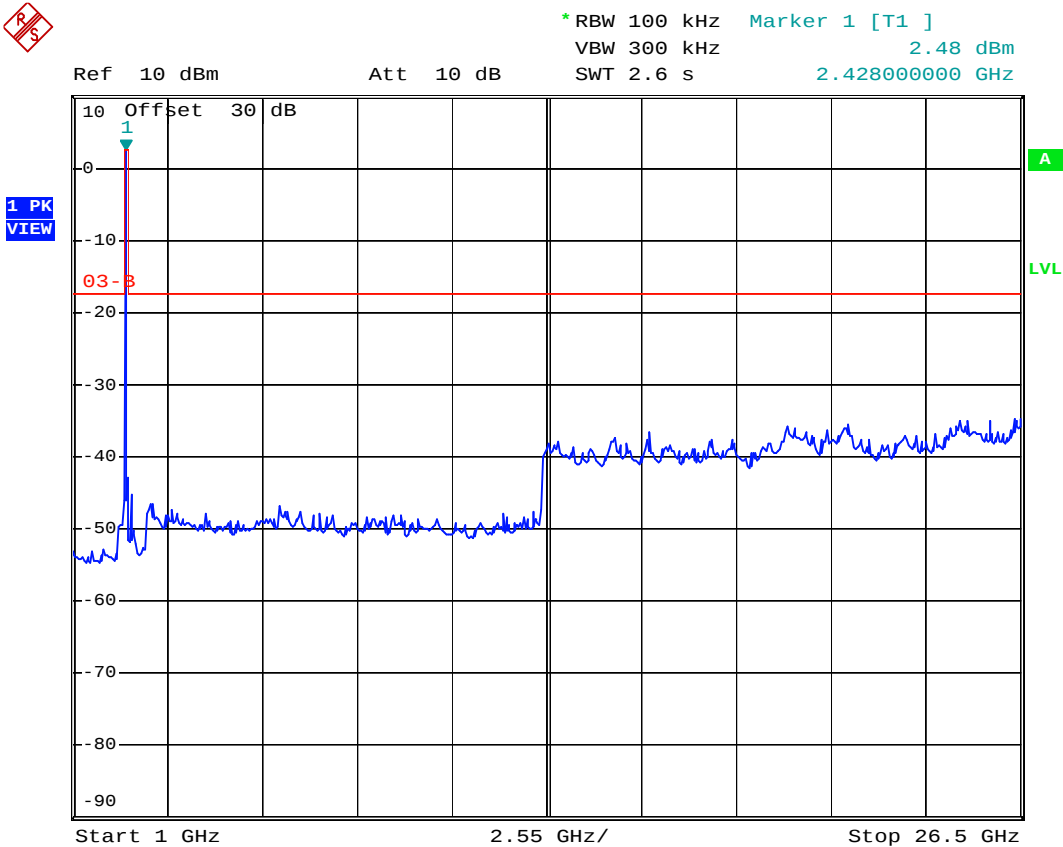
1 GHz to 25 GHz frequency band: All emissions are attenuated more than 20dB from the carrier.

Note : The expanded uncertainty: 2dB.

802.11b / Channel Low



802.11b / Channel Mid



10

0

-10

-20

-30

-40

-50

-60

-70

-80

-90

Start

1

GHz

2.55

GHz/

Stop

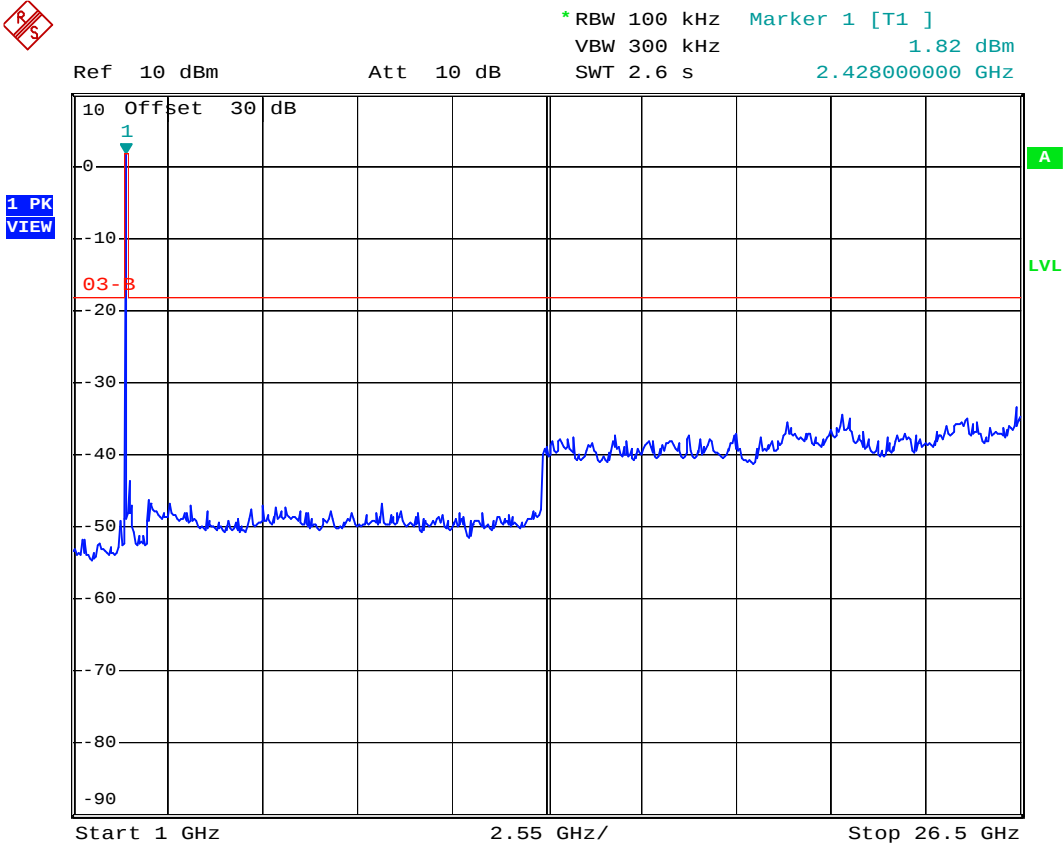
26.5

GHz

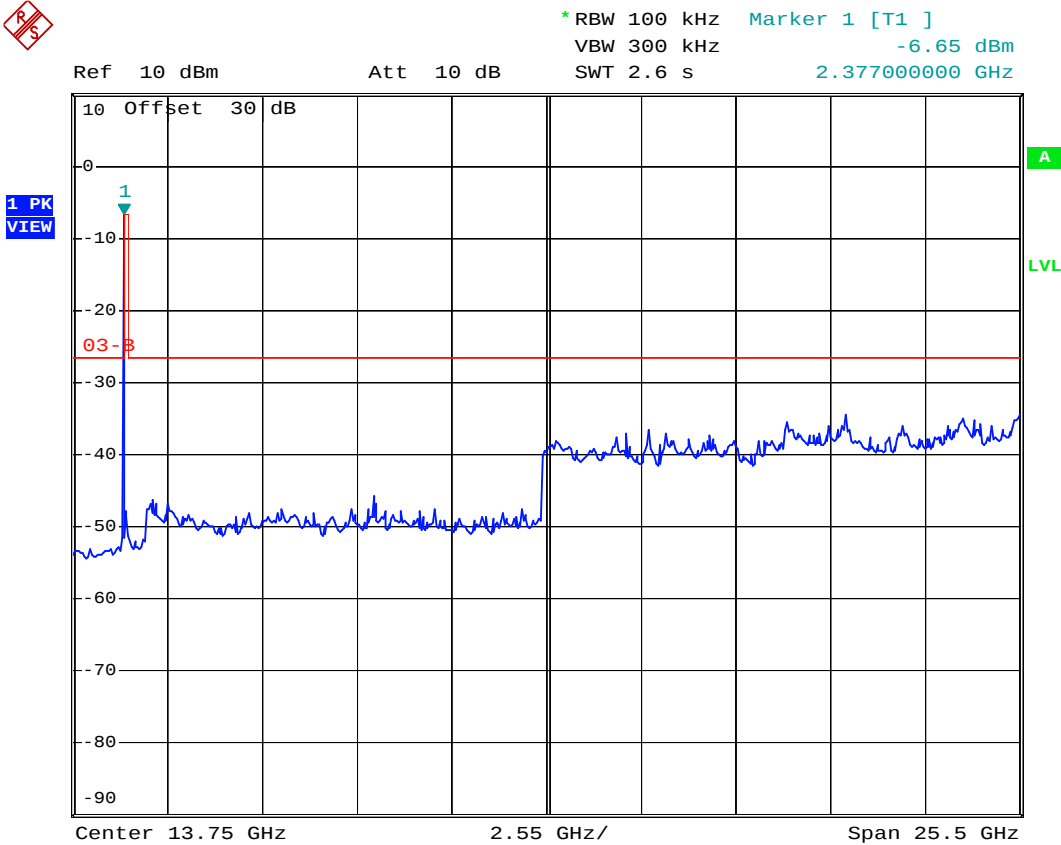
A

LVL

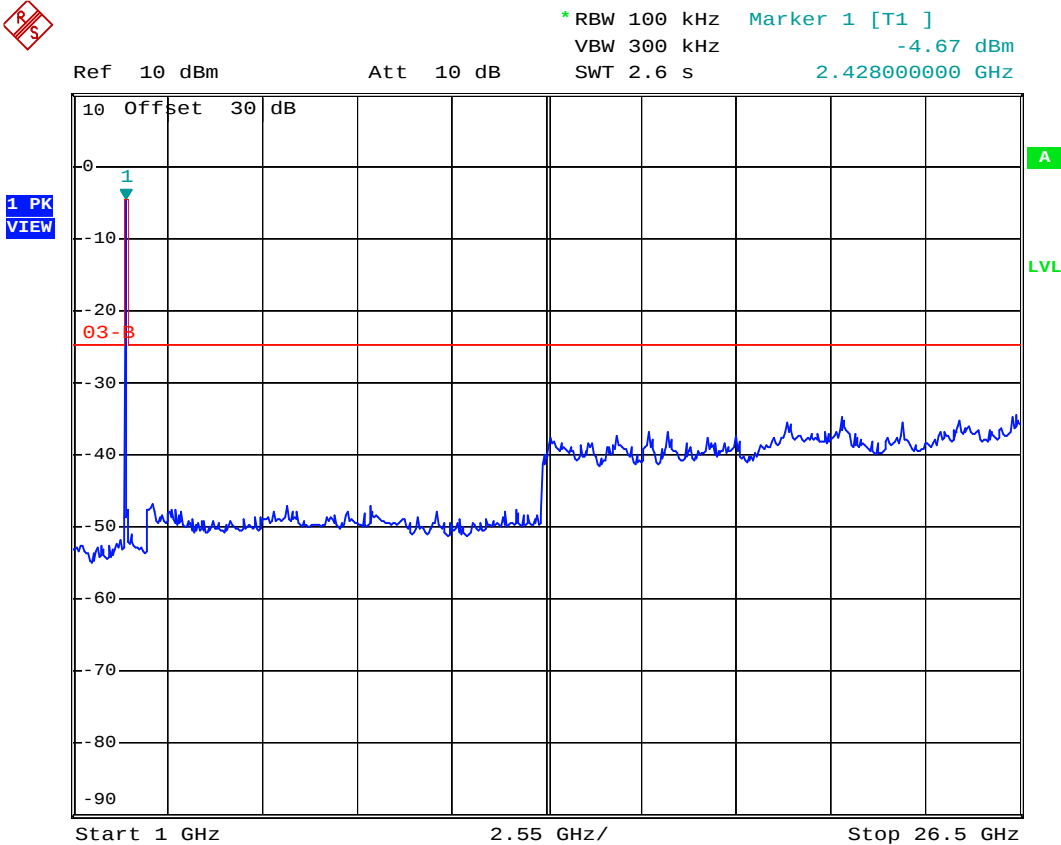
802.11b / Channel High



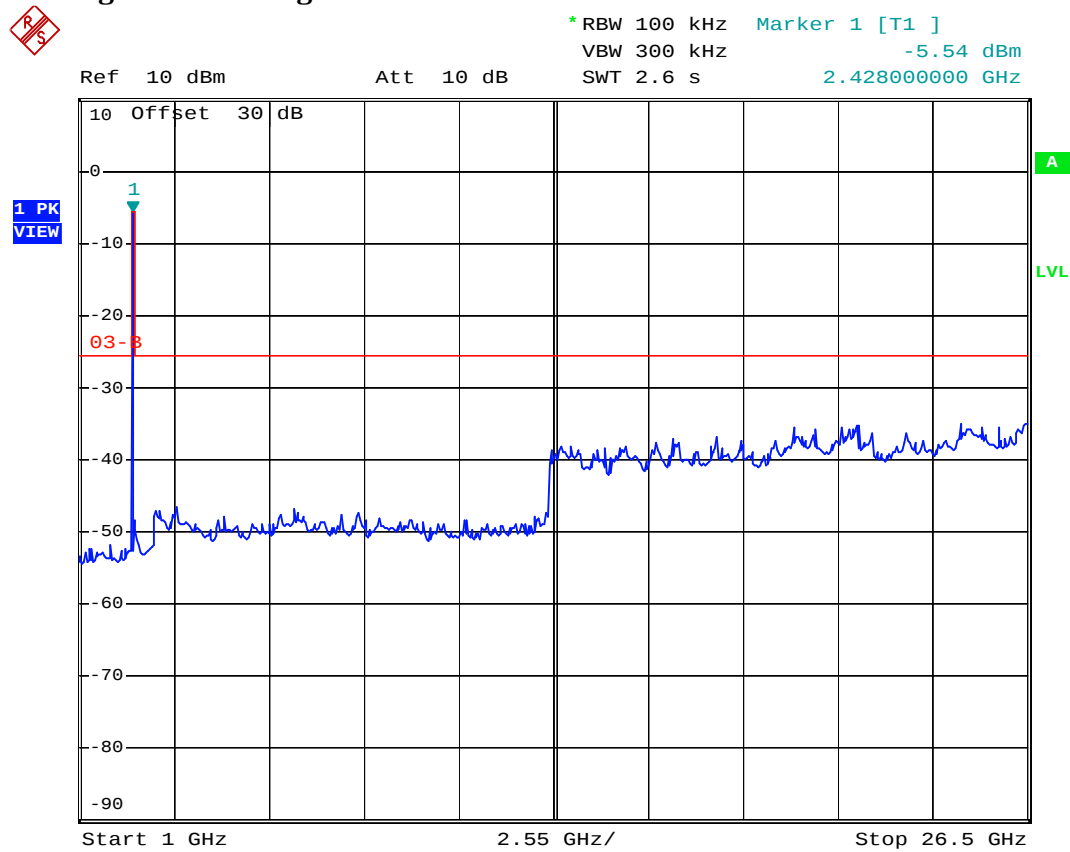
802.11g / Channel Low



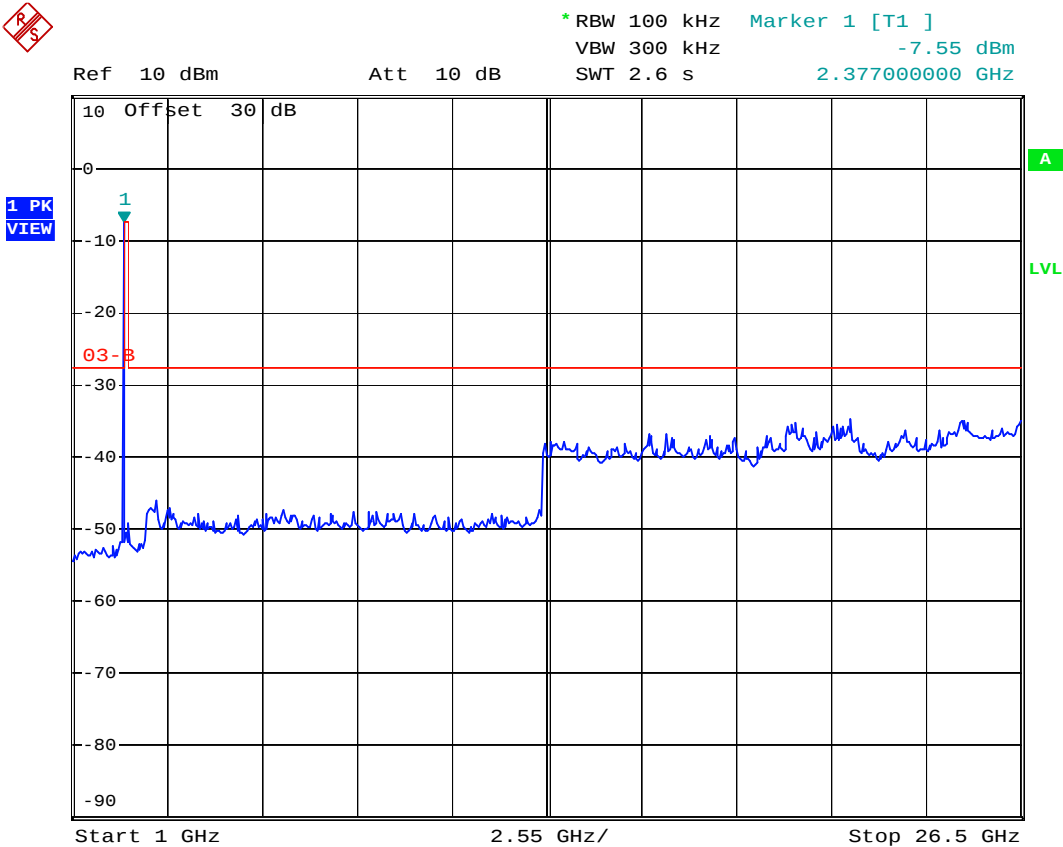
802.11g / Channel Mid



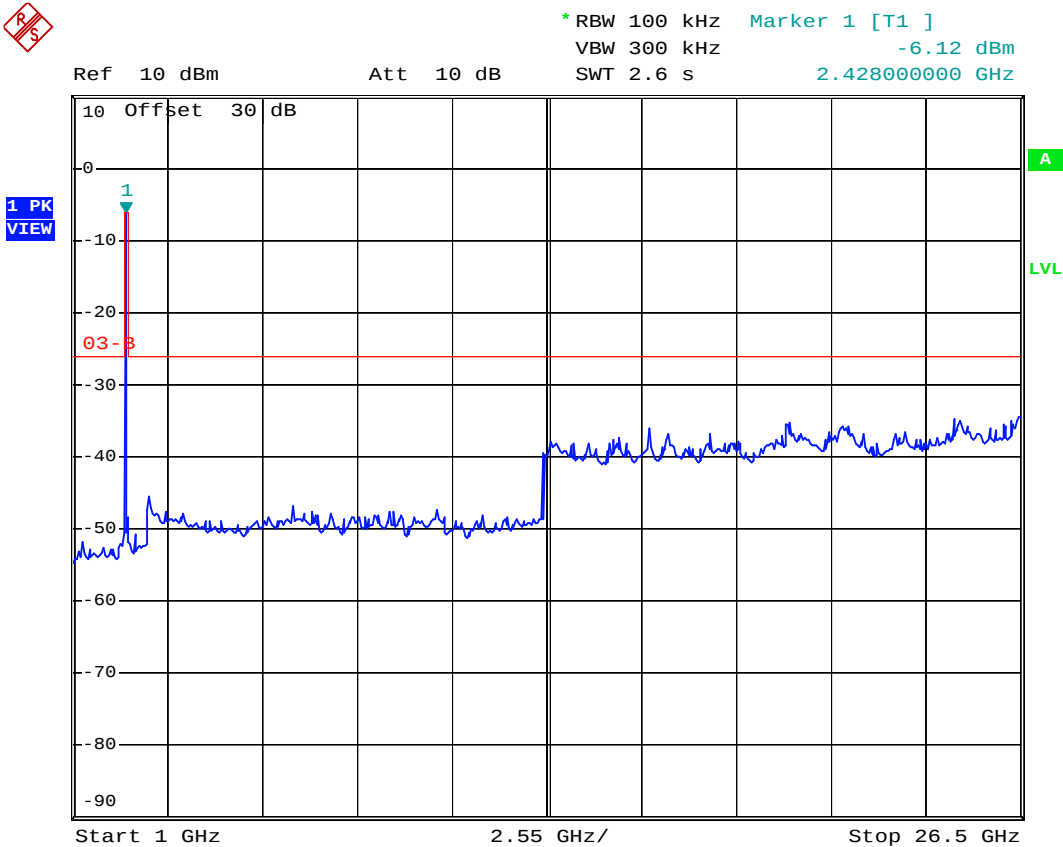
802.11g / Channel High



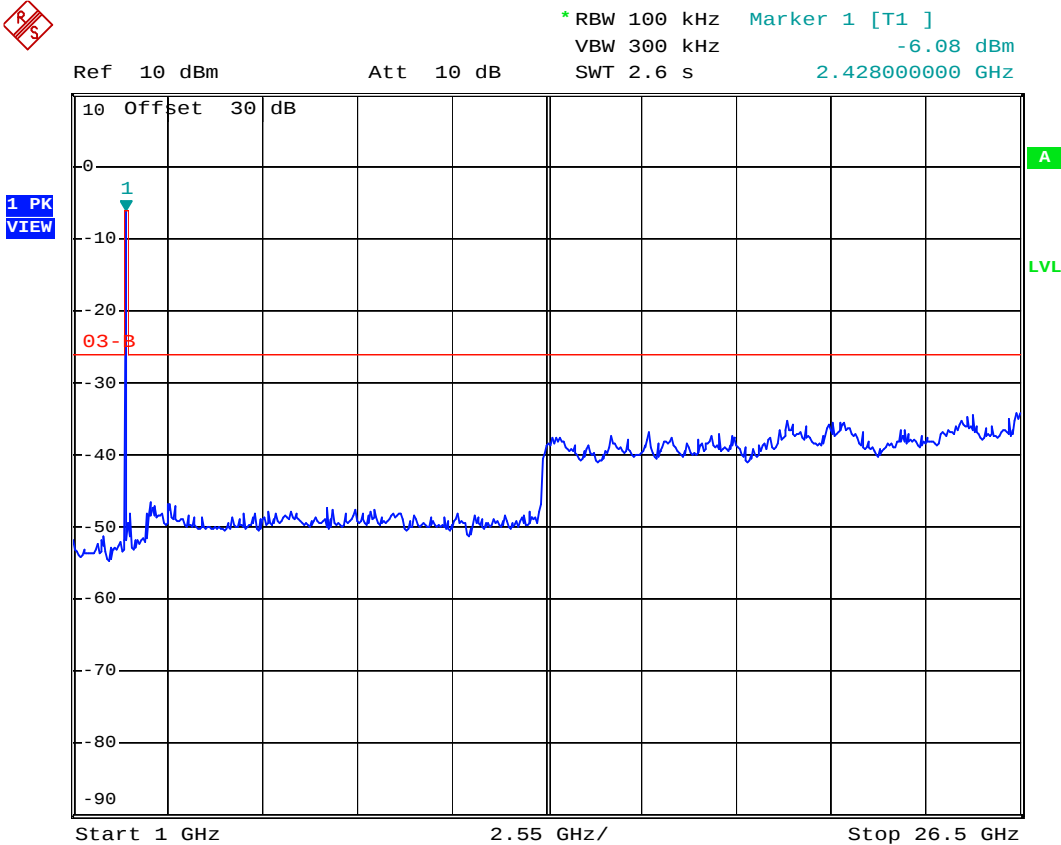
802.11n HT-20/Antenna 1/ Channel Low



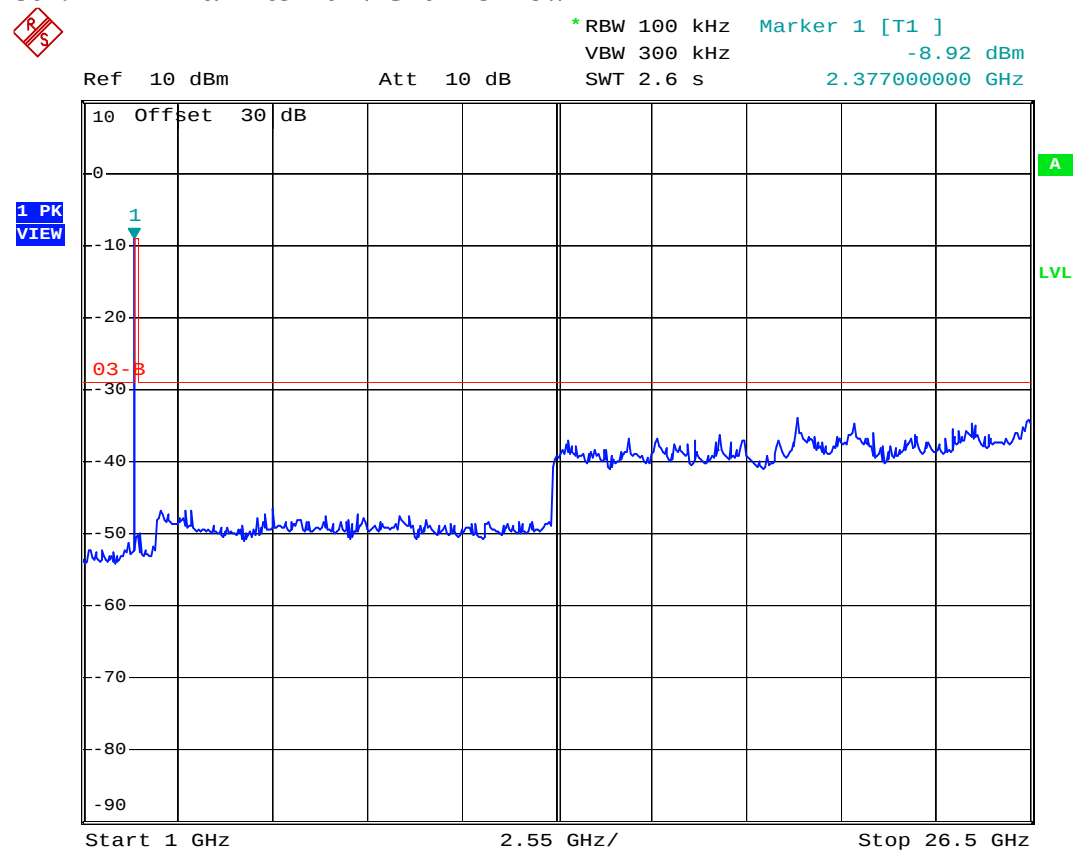
802.11n HT-20/Antenna 1/ Channel Mid



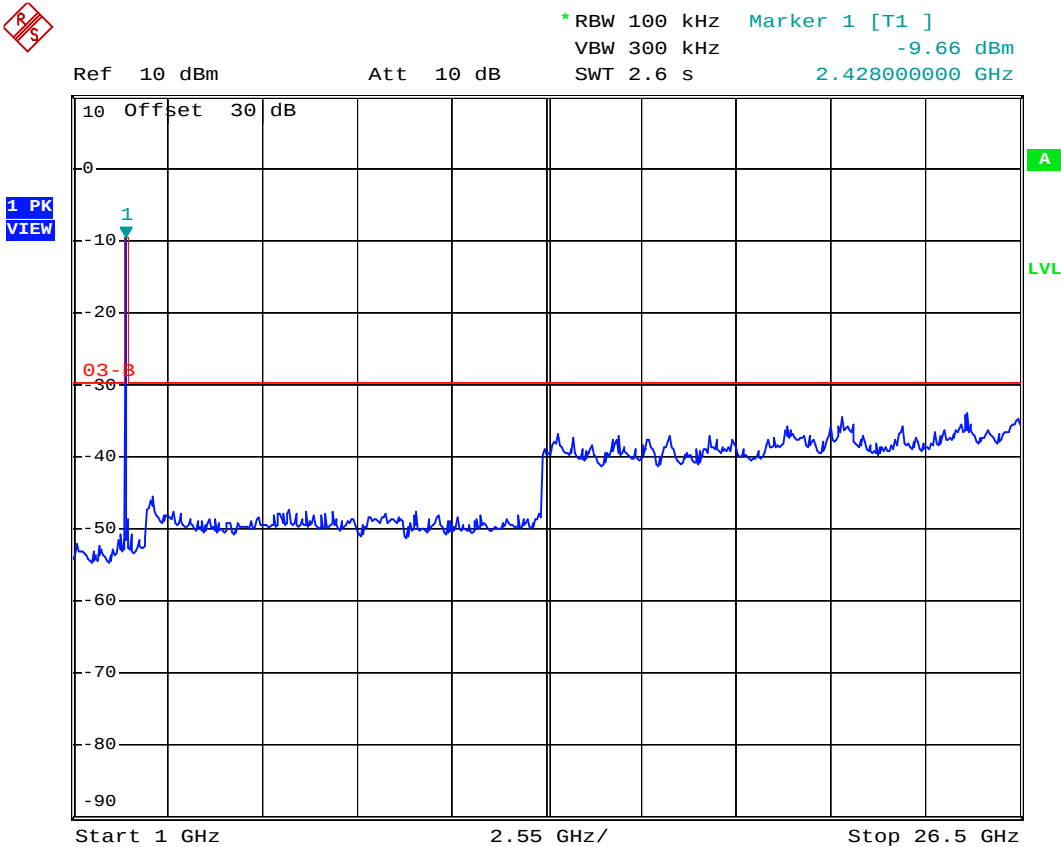
802.11n HT-20/Antenna 1/ Channel High



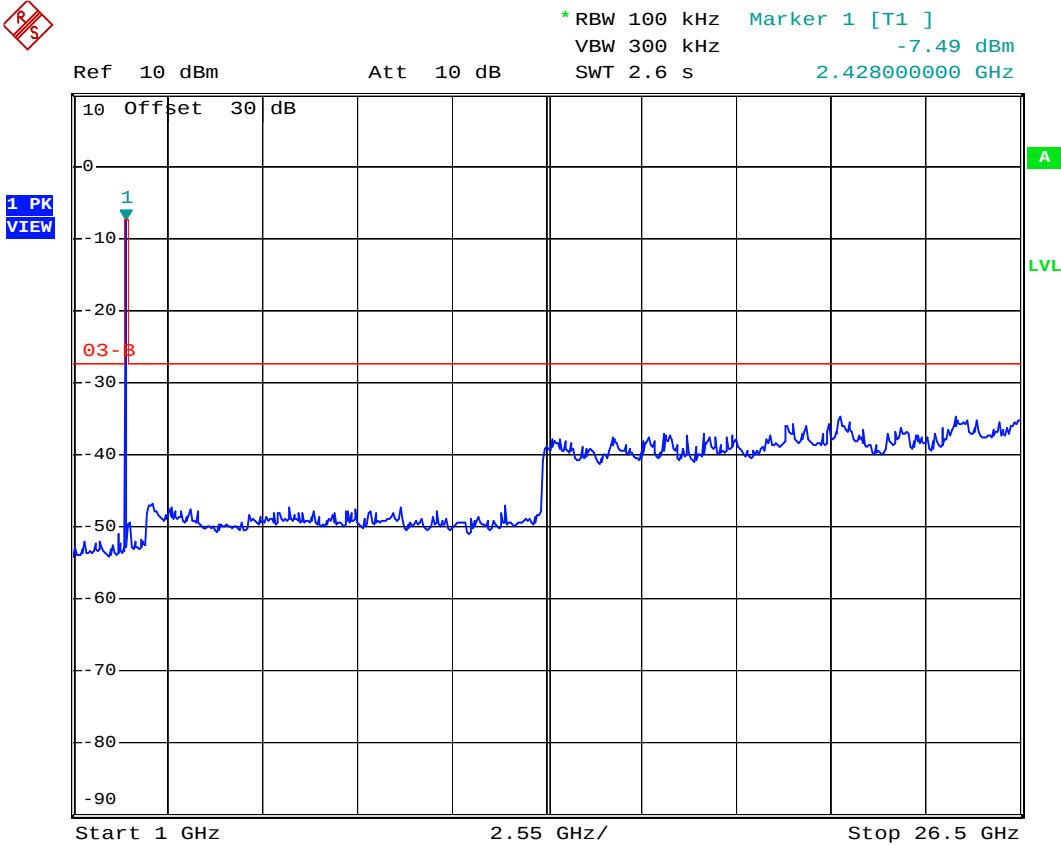
802.11n HT-20/Antenna 2/ Channel Low



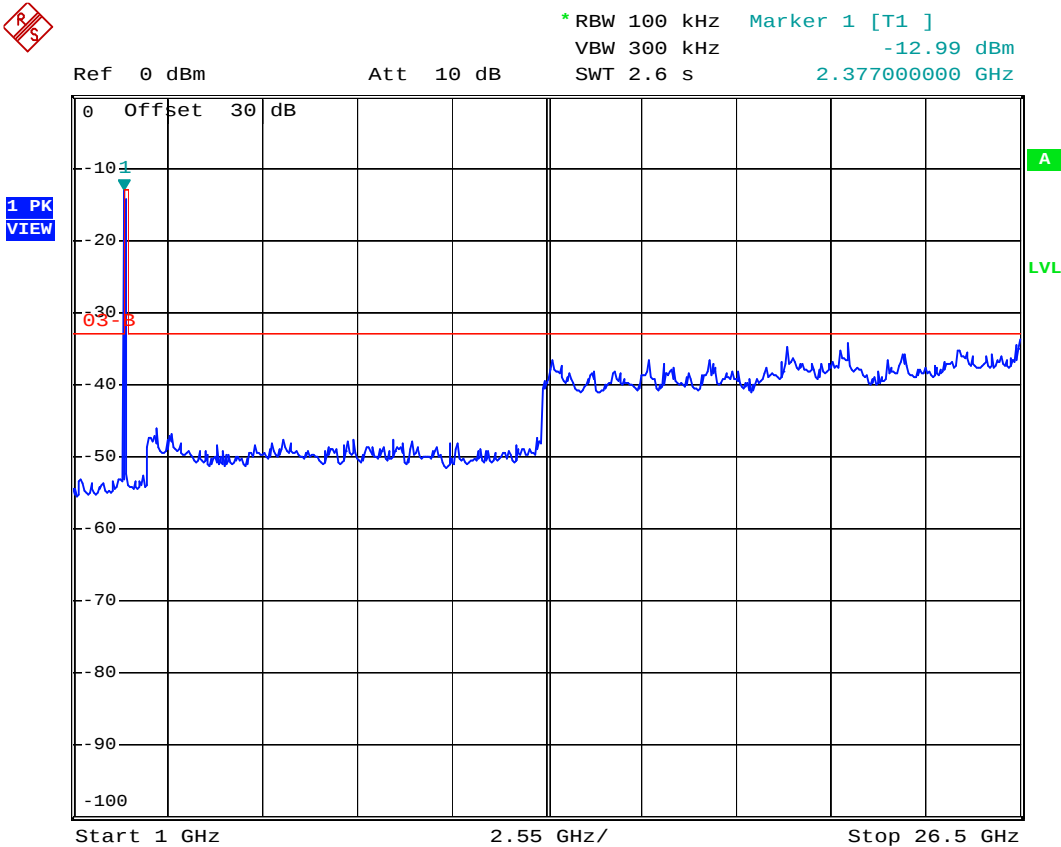
802.11n HT-20/Antenna 2/ Channel Mid



802.11n HT-20/Antenna 2/ Channel High



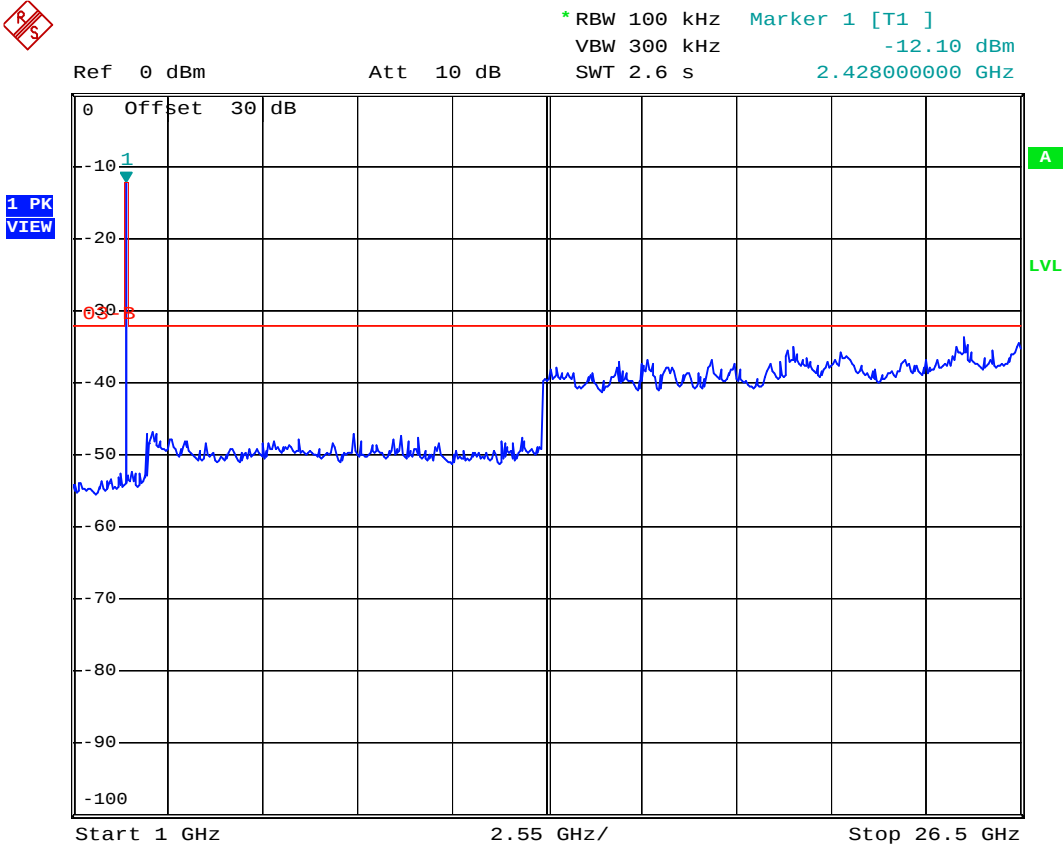
802.11n HT-40/Antenna 1/ Channel Low



SWT 2.6 s



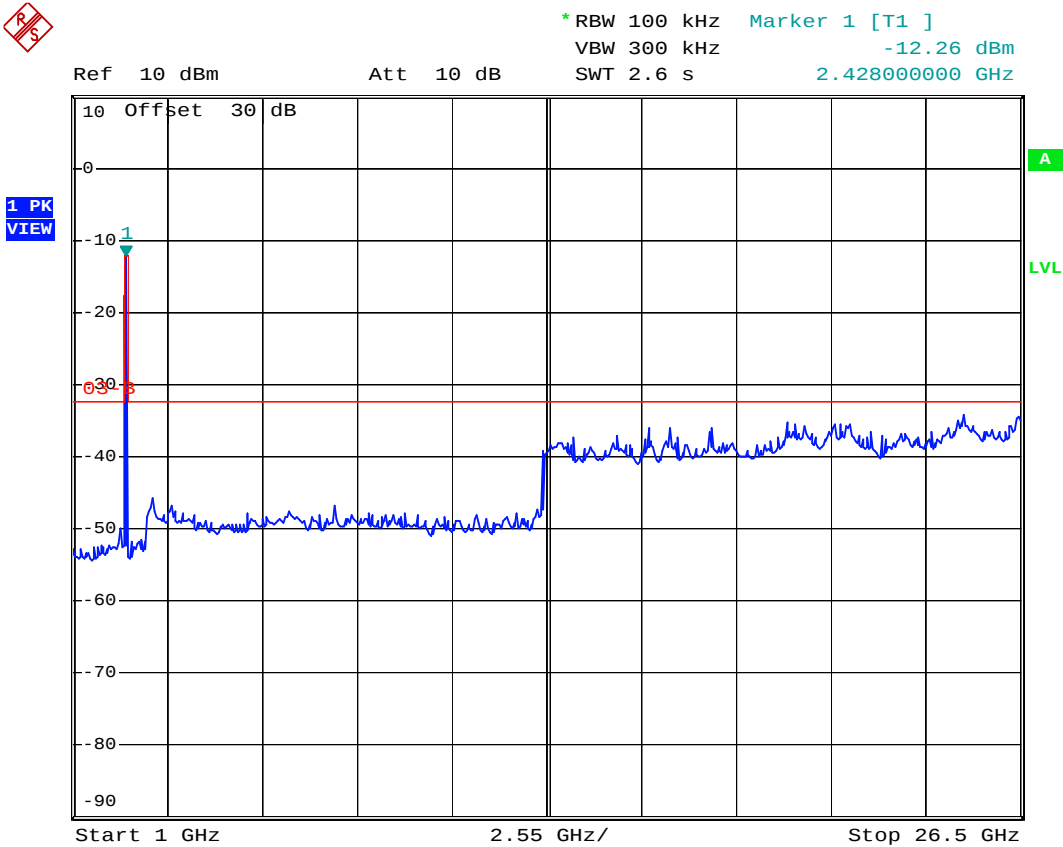
802.11n HT-40/Antenna 1/ Channel High



SWT 2.6 s



802.11n HT-40/Antenna 2/ Channel Mid



802.11n HT-40/Antenna 2/ Channel High

