FCC Part 15
EMI TEST REPORT

of

E.U.T.	:	Outdoor Robotic Camera
FCC ID.	:	2ABEAACR1608
Model No.	:	ACR1608
Serial Models		ACR1608R1 / ACR1608R1S / ACR1608R2 / ACR1608R2S / ACR1608R3 / ACR1608R3S / ACR1608R4 / ACR1608R4S / ACR1608R5 / ACR1608R5S / ACR1608R6 / ACR1608R6S / ACR1608R7 / ACR1608R7S / ACR1608R8 / ACR1608R8S / ACR1608R9 / ACR1608R9S

for

APPLICANT	:	Amaryllo International B.V.
ADDRESS	:	Singel 540, 1017AZ Amsterdam, the Netherlands

Test Performed by

ELECTRONICS TESTING CENTER, TAIWAN
NO. 34. LIN 5. DINGFU VIL., 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 : 16-10-RBF-035-04

TEST REPORT CERTIFICATION

Applicant : Amaryllo International B.V.
Singel 540, 1017AZ Amsterdam, the Netherlands

Manufacturer : Amaryllo International B.V.
Singel 540, 1017AZ Amsterdam, the Netherlands

Description of EUT

a) Type of EUT : Outdoor Robotic Camera

b) Trade Name : Amaryllo

c) Model No. : ACR1608

d) Serial Model : ACR1608R1 / ACR1608R1S / ACR1608R2 / ACR1608R2S / ACR1608R3 / ACR1608R3S / ACR1608R4 / ACR1608R4S / ACR1608R5 / ACR1608R5S / ACR1608R6 / ACR1608R6S / ACR1608R7 / ACR1608R7S / ACR1608R8 / ACR1608R8S / ACR1608R9 / ACR1608R9S

e) Power Supply : AC 120V, 60Hz

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 C63.10-2013, 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**
Duty Cycle	**N.A.**

Date Test Item Received	:	Oct. 24, 2016
Date Test Campaign Completed	:	Mar. 22, 2017
Date of Issue	:	Mar. 29, 2017

Test Engineer : Brian Huang

(Brian Huang, Engineer)

Approve & Authorized Signer : S. S. Liou

S. S. Liou, Section Manager
EMC Dept. II of ELECTRONICS
TESTING CENTER, TAIWAN

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1 GENERAL INFORMATION

1.1 Product Description

a) Type of EUT : Outdoor Robotic Camera

b) Trade Name : Amaryllo

c) Model No. : ACR1608

d) Serial Model : ACR1608R1 / ACR1608R1S / ACR1608R2 / ACR1608R2S / ACR1608R3 / ACR1608R3S / ACR1608R4 / ACR1608R4S / ACR1608R5 / ACR1608R5S / ACR1608R6 / ACR1608R6S / ACR1608R7 / ACR1608R7S / ACR1608R8 / ACR1608R8S / ACR1608R9 / ACR1608R9S

e) Power Supply : AC 120V, 60Hz

f) Model difference : Only model name is different. The PCB and circuits design are the same.

1.2 Characteristics of Device

The product is a Outdoor Robotic Camera with embedded MIMO 2x2 Wi-Fi 802.11 b/g/n.

1.3 Test Methodology

Both conducted and radiated emissions were performed according to the procedures illustrated in ANSI C63.10-2013. Other required measurements were illustrated in separate sections of this test report for details. For RF test the measurement procedure was refered to FCC KDB 558074 D01 DTS Meas Guidance v03r05.

Software	Version	Note
e3	Version 6.100618b	Radiated Emission Test
e3	Version 6.100421	Conducted Emission Test

1.4 Test Facility

Location of the Test site: No.34, Lin 5, Dingfu Vil., Linkou Dist., New Taipei City, Taiwan 24442, R.O.C.

Designation Number: TW2628.

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 equpment 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 50μH/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 dBμV	Average dBμV
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 dBμV/m	Radiated μV/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 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 1 by transmitting mode. The system was configured for testing in a typical fashion as a customer would normally use it. The peripherals other than EUT, if any, were connected in normally standing by situation. Three highest emissions were verified with varying placement of the cables, if any, connected to EUT to maximize the emission from EUT.

For RF measurement, the RF module of the EUT was connected to a computer and a test program was exercised to simulate data communication of EUT. Every modulation modes and the transmission rates were invastigated and which produce the highest power level were set to final test.

3.2 Devices for Tested System

Device	Manufacture	Model	Cable Description
Outdoor Robotic Camera *	Amaryllo International B.V.	ACR1608	1.8m Unshielded AC Power Core

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

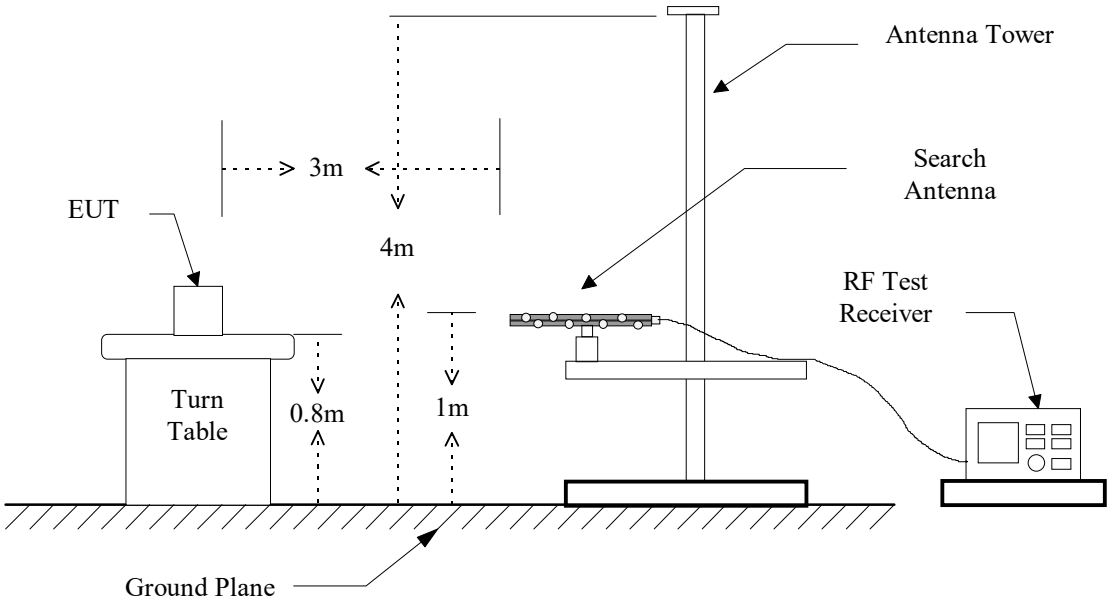
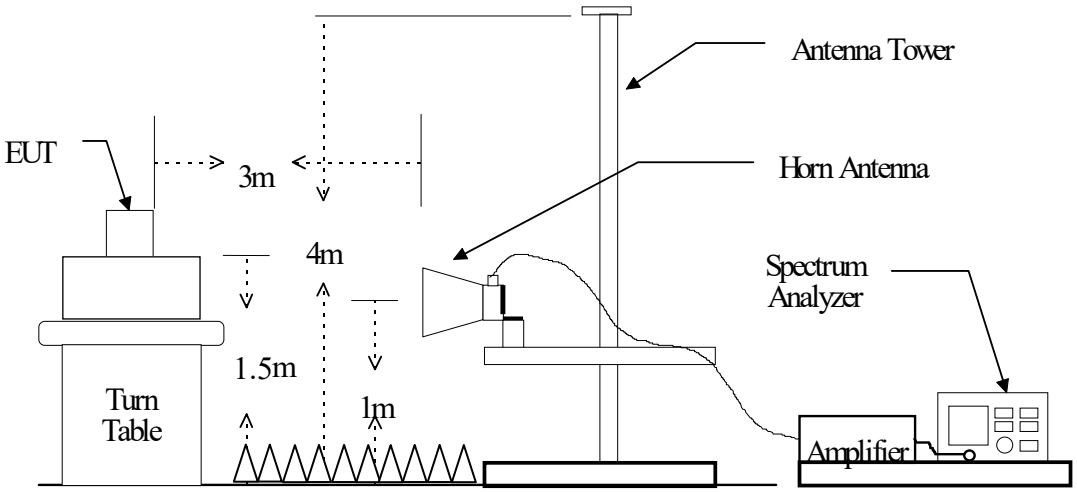


Figure 2 : Frequencies measured above 1 GHz configuration



4.3 Measuring Instrument

The following instrument are used for radiated emissions measurement:

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESU 40	2016/11/10	2017/11/09
Bi-Log Antenna	ETC	MCTD 2786	2016/07/15	2017/07/14
Horn Antenna	EMCO	3115	2016/10/05	2017/10/04
Horn Antenna	EMCO	3116	2016/10/05	2017/10/04
Amplifier	HP	8447D	2016/12/05	2017/12/04
Amplifier	HP	83051A	2016/07/18	2017/07/17
LOOP Antenna	EMCO	6512	2016/10/12	2017/10/11

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

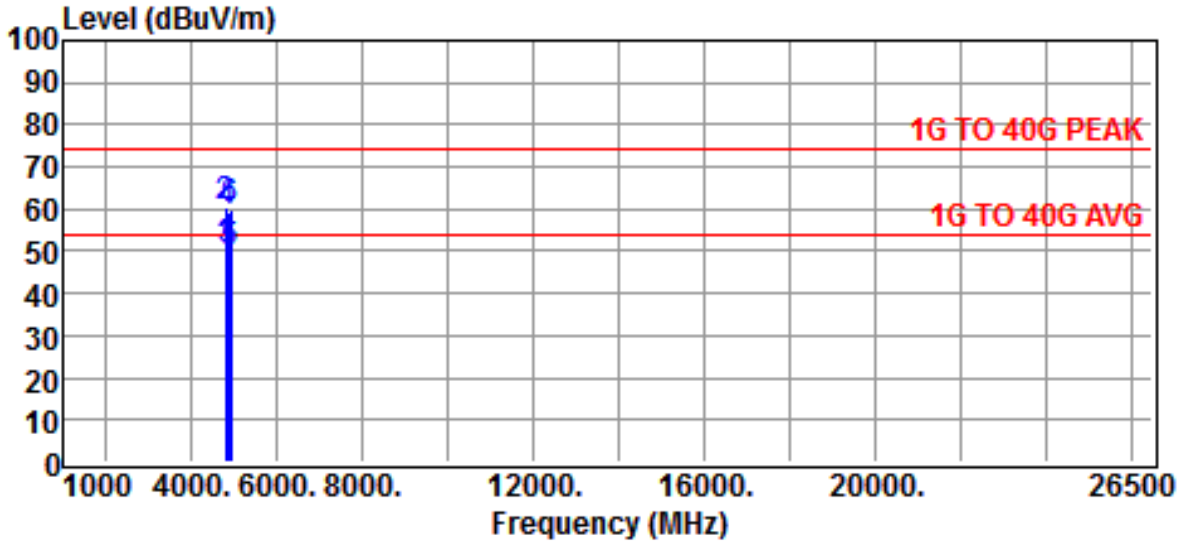
Frequency Band (MHz)	Instrument	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	RF Test Receiver	Quasi-Peak	120 kHz	N/A
	Spectrum Analyzer	Peak	100 kHz	100 kHz
Above 1000	Spectrum Analyzer	Peak	1 MHz	1 MHz
	Spectrum Analyzer	Average	1 MHz	10 Hz or ≥ 1/T (Note 1)

Note 1:
VBW = 10 Hz, when the duty cycle is no less than 98%.
VBW ≥ 1/T, when duty cycle is less than 98% where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

4.4 Radiated Emission Data

4.4.1 RF Portion

A. (802.11b)

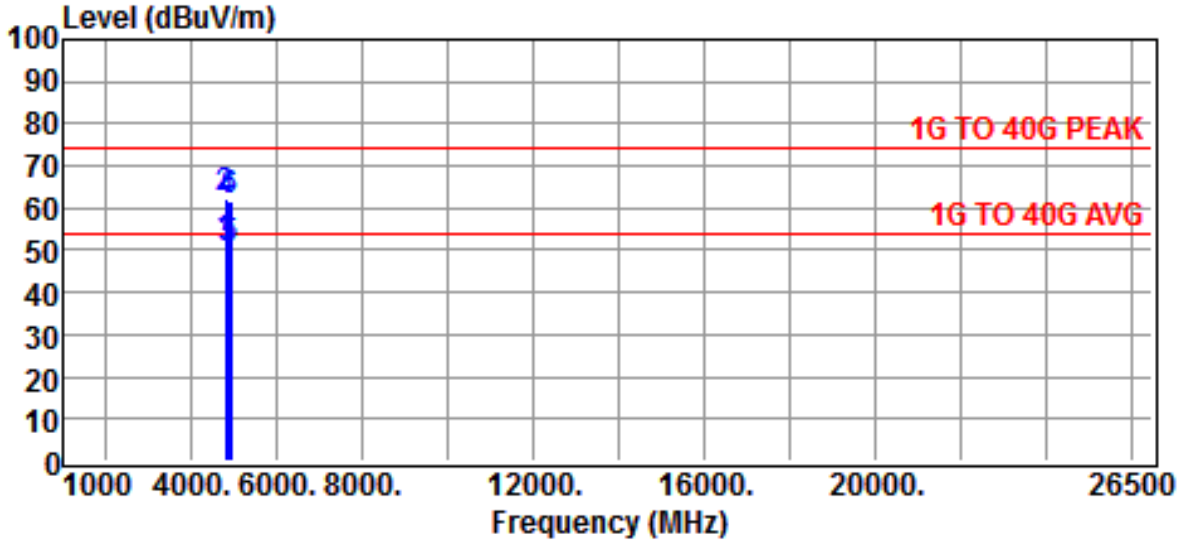


Site	:CHAMBER	Date	:2016-12-14
Limit	:1G TO 40G PEAK	Ant. Pol.	:HORIZONTAL
EUT	:Wireless IP Camera	Model	:ACR1608
Power Rating	:AC 120V60Hz	Temp.	:22˚C
Engineer	:Brian Huang	Humi.	:56 %
Test Mode	:802.11B		

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits dBµV/m	Over limit dB	Detector
4824.0000	49.20	1.29	50.49	54.00	-3.51	Average
4824.0000	59.22	1.29	60.51	74.00	-13.49	Peak
4874.0000	48.65	1.44	50.09	54.00	-3.91	Average
4874.0000	58.04	1.44	59.48	74.00	-14.52	Peak
4924.0000	48.32	1.62	49.94	54.00	-4.06	Average
4924.0000	58.29	1.62	59.91	74.00	-14.09	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result



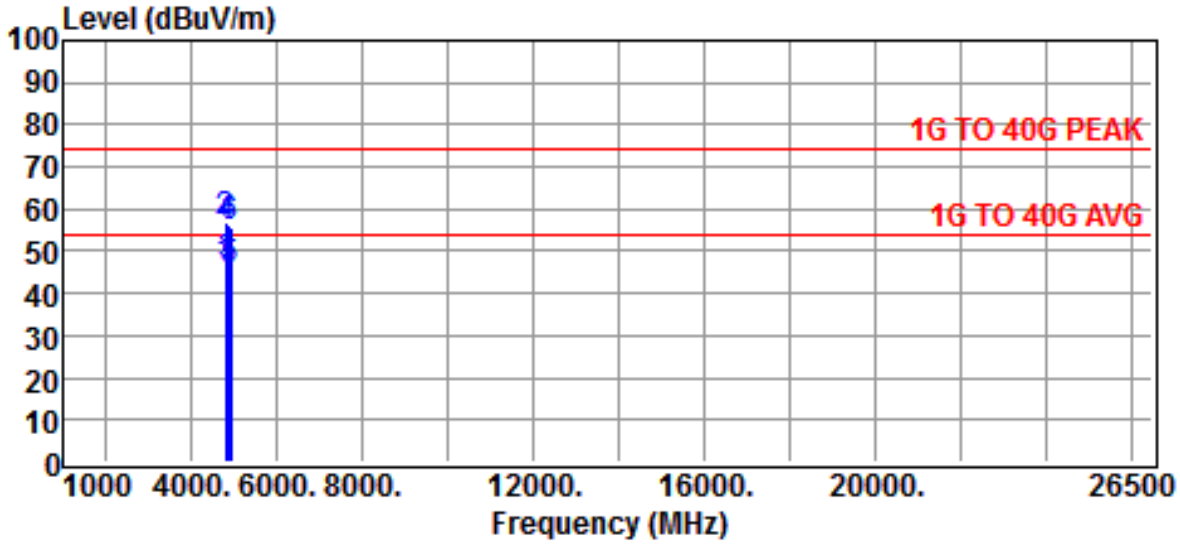
Site	:CHAMBER	Date	:2016-12-14
Limit	:1G TO 40G PEAK	Ant. Pol.	:VERTICAL
EUT	:Wireless IP Camera	Model	:ACR1608
Power Rating	:AC 120V60Hz	Temp.	:22˚C
Engineer	:Brian Huang	Humi.	:56 %
Test Mode	:802.11B		

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits dBµV/m	Over limit dB	Detector
4824.0000	49.93	1.29	51.22	54.00	-2.78	Average
4824.0000	61.01	1.29	62.30	74.00	-11.70	Peak
4874.0000	48.78	1.44	50.22	54.00	-3.78	Average
4874.0000	60.46	1.44	61.90	74.00	-12.10	Peak
4924.0000	48.71	1.62	50.33	54.00	-3.67	Average
4924.0000	60.18	1.62	61.80	74.00	-12.20	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result

B. (802.11g)

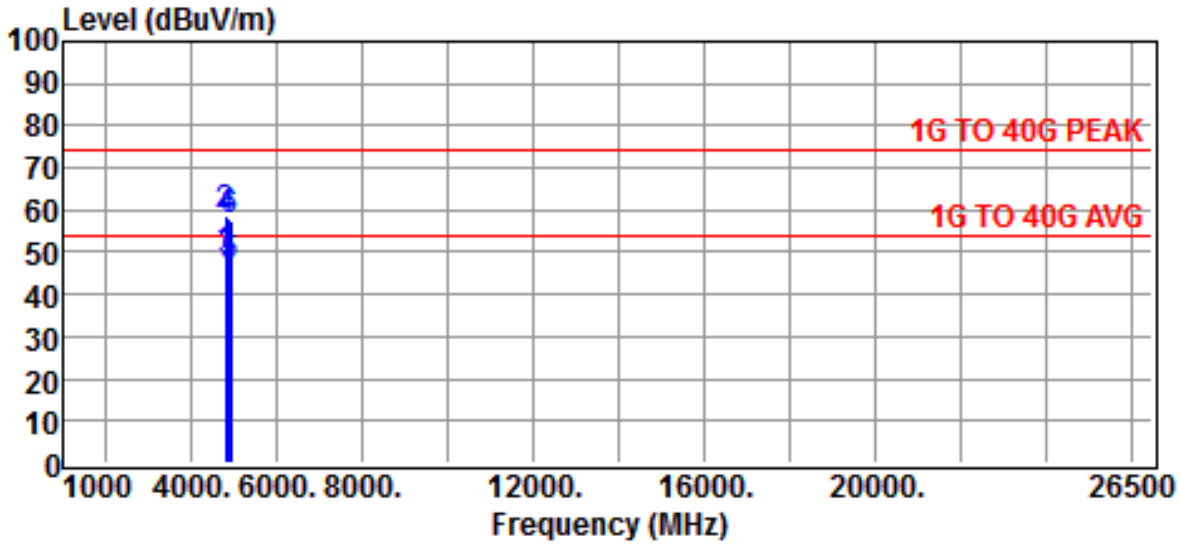


Site	:CHAMBER	Date	:2016-12-14
Limit	:1G TO 40G PEAK	Ant. Pol.	:HORIZONTAL
EUT	:Wireless IP Camera	Model	:ACR1608
Power Rating	:AC 120V60Hz	Temp.	:22˚C
Engineer	:Brian Huang	Humi.	:56 %
Test Mode	:802.11G		

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits dBµV/m	Over limit dB	Detector
4824.0000	44.66	1.29	45.95	54.00	-8.05	Average
4824.0000	55.76	1.29	57.05	74.00	-16.95	Peak
4874.0000	45.25	1.44	46.69	54.00	-7.31	Average
4874.0000	54.77	1.44	56.21	74.00	-17.79	Peak
4924.0000	43.69	1.62	45.31	54.00	-8.69	Average
4924.0000	54.26	1.62	55.88	74.00	-18.12	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result



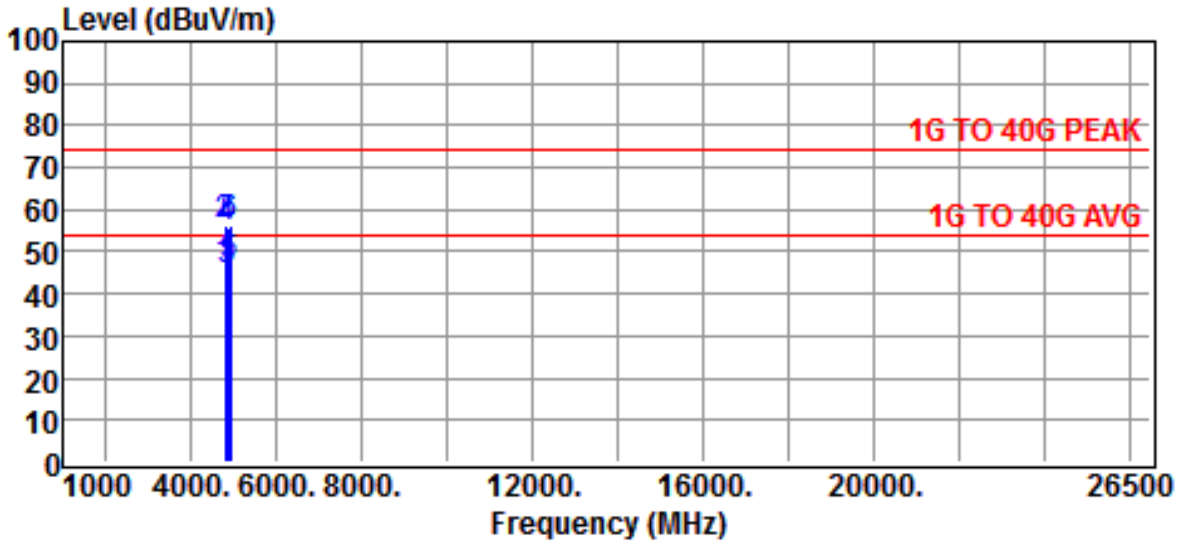
Site	:CHAMBER	Date	:2016-12-14
Limit	:1G TO 40G PEAK	Ant. Pol.	:VERTICAL
EUT	:Wireless IP Camera	Model	:ACR1608
Power Rating	:AC 120V60Hz	Temp.	:22˚C
Engineer	:Brian Huang	Humi.	:56 %
Test Mode	:802.11G		

Freq MHz	Reading dBμV	Correction Factor dB	Result dBμV/m	Limits dBμV/m	Over limit dB	Detector
4824.0000	47.91	1.29	49.20	54.00	-4.80	Average
4824.0000	57.11	1.29	58.40	74.00	-15.60	Peak
4874.0000	46.62	1.44	48.06	54.00	-5.94	Average
4874.0000	56.36	1.44	57.80	74.00	-16.20	Peak
4924.0000	45.25	1.62	46.87	54.00	-7.13	Average
4924.0000	55.98	1.62	57.60	74.00	-16.40	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result

C. (802.11n HT-20)

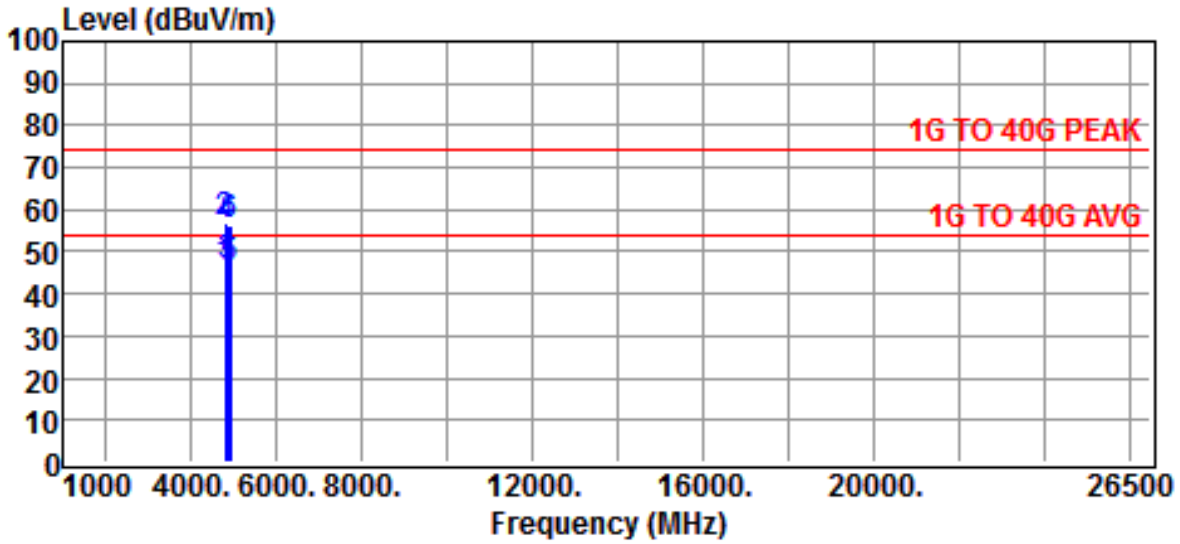


Site	:CHAMBER	Date	:2017-03-22
Limit	:1G TO 40G PEAK	Ant. Pol.	:HORIZONTAL
EUT	:Wireless IP Camera	Model	:ACR1608
Power Rating	:AC 120V60Hz	Temp.	:22˚C
Engineer	:Brian Huang	Humi.	:56 %
Test Mode	:802.11N20	Memo	:MIMO

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits dBµV/m	Over limit dB	Detector
4824.0000	44.86	1.31	46.17	54.00	-7.83	Average
4824.0000	54.85	1.31	56.16	74.00	-17.84	Peak
4874.0000	43.90	1.47	45.37	54.00	-8.63	Average
4874.0000	54.32	1.47	55.79	74.00	-18.21	Peak
4924.0000	45.28	1.65	46.93	54.00	-7.07	Average
4924.0000	54.40	1.65	56.05	74.00	-17.95	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result



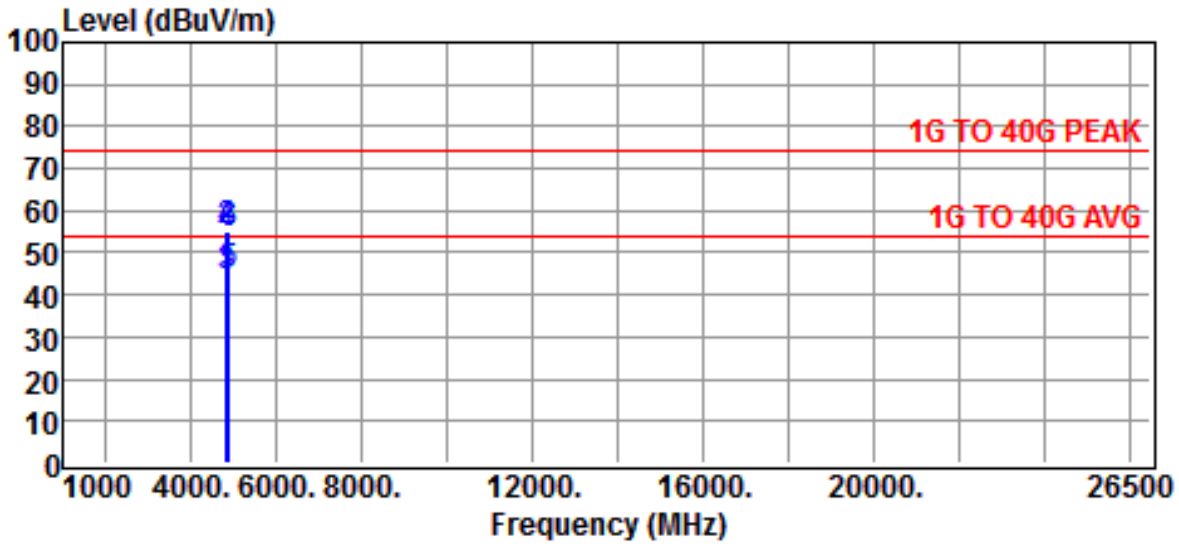
Site	:CHAMBER	Date	:2017-03-22
Limit	:1G TO 40G PEAK	Ant. Pol.	:VERTICAL
EUT	:Wireless IP Camera	Model	:ACR1608
Power Rating	:AC 120V60Hz	Temp.	:22˚C
Engineer	:Brian Huang	Humi.	:56 %
Test Mode	:802.11N20	Memo	:MIMO

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits dBµV/m	Over limit dB	Detector
4824.0000	44.86	1.31	46.17	54.00	-7.83	Average
4824.0000	55.28	1.31	56.59	74.00	-17.41	Peak
4874.0000	45.53	1.47	47.00	54.00	-7.00	Average
4874.0000	55.10	1.47	56.57	74.00	-17.43	Peak
4924.0000	44.31	1.65	45.96	54.00	-8.04	Average
4924.0000	54.91	1.65	56.56	74.00	-17.44	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result

D. (802.11n HT-40)

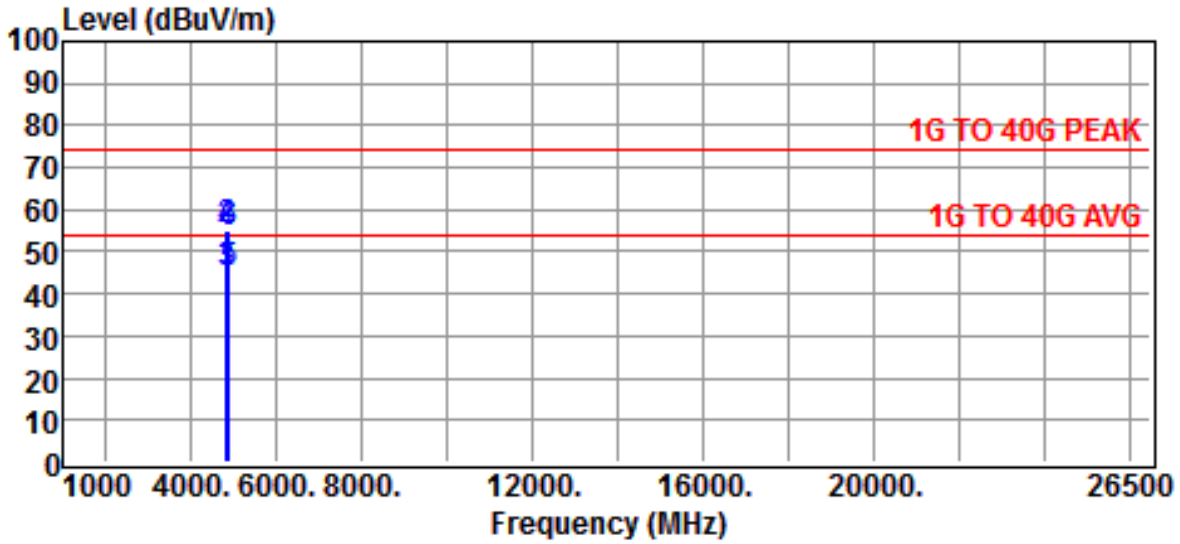


Site	:CHAMBER	Date	:2017-03-22
Limit	:1G TO 40G PEAK	Ant. Pol.	:HORIZONTAL
EUT	:Wireless IP Camera	Model	:ACR1608
Power Rating	:AC 120V60Hz	Temp.	:22˚C
Engineer	:Brian Huang	Humi.	:56 %
Test Mode	:802.11N40	Memo	:MIMO

Freq MHz	Reading dBμV	Correction Factor dB	Result dBμV/m	Limits dBμV/m	Over limit dB	Detector
4844.0000	43.02	1.37	44.39	54.00	-9.61	Average
4844.0000	53.44	1.37	54.81	74.00	-19.19	Peak
4874.0000	42.90	1.47	44.37	54.00	-9.63	Average
4874.0000	53.37	1.47	54.84	74.00	-19.16	Peak
4904.0000	43.23	1.59	44.82	54.00	-9.18	Average
4904.0000	52.80	1.59	54.39	74.00	-19.61	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result



Site	:CHAMBER	Date	:2017-03-22
Limit	:1G TO 40G PEAK	Ant. Pol.	:VERTICAL
EUT	:Wireless IP Camera	Model	:ACR1608
Power Rating	:AC 120V60Hz	Temp.	:22˚C
Engineer	:Brian Huang	Humi.	:56 %
Test Mode	:802.11N40	Memo	:MIMO

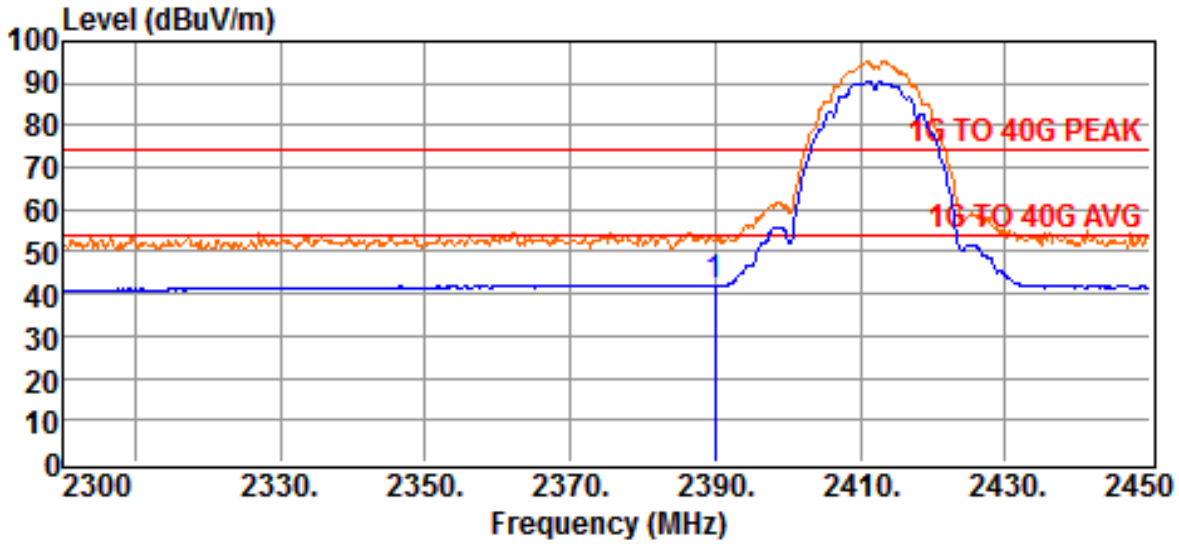
Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits dBµV/m	Over limit dB	Detector
4844.0000	43.93	1.37	45.30	54.00	-8.70	Average
4844.0000	53.98	1.37	55.35	74.00	-18.65	Peak
4874.0000	43.32	1.47	44.79	54.00	-9.21	Average
4874.0000	53.77	1.47	55.24	74.00	-18.76	Peak
4904.0000	43.12	1.59	44.71	54.00	-9.29	Average
4904.0000	53.10	1.59	54.69	74.00	-19.31	Peak

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result

4.4.2 Radiated Eimssion of Restricted bands

Mode: 802.11b

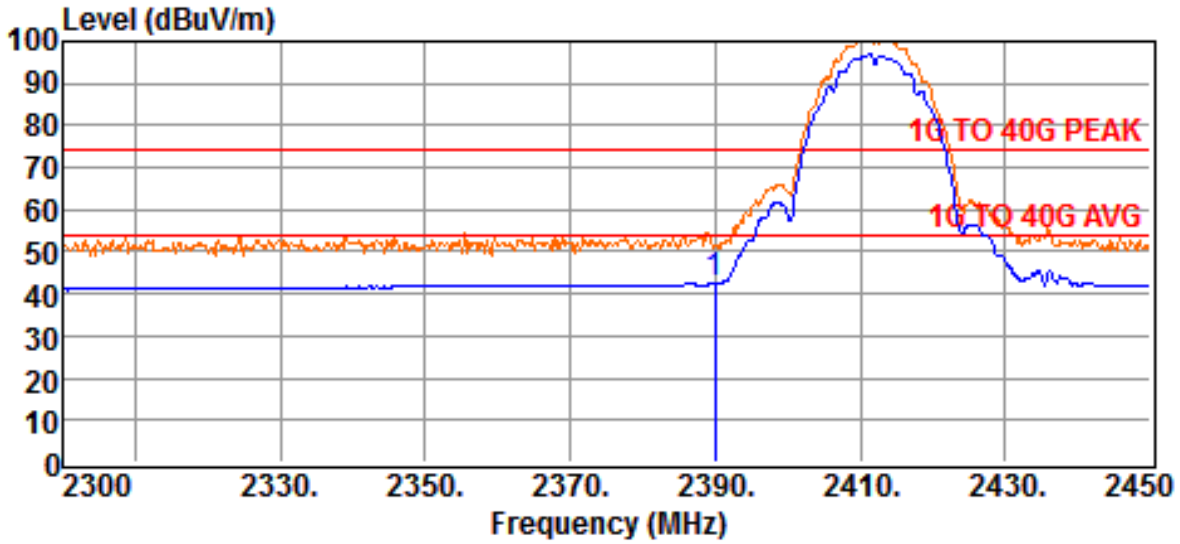


Site	:CHAMBER	Date	:2017-03-22
Limit	:1G TO 40G PEAK	Ant. Pol.	:HORIZONTAL
EUT	:Wireless IP Camera	Model	:ACR1608
Power Rating	:AC 120V60Hz	Temp.	:22˚C
Engineer	:Brian Huang	Humi.	:56 %
Test Mode	:CH Low - Restricted Bands	Test Mode	:802.11B

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits (AVG) dBµV/m	Over limit dB	Detector
2390.0000	47.53	-5.61	41.92	54.00	-12.08	Average

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result

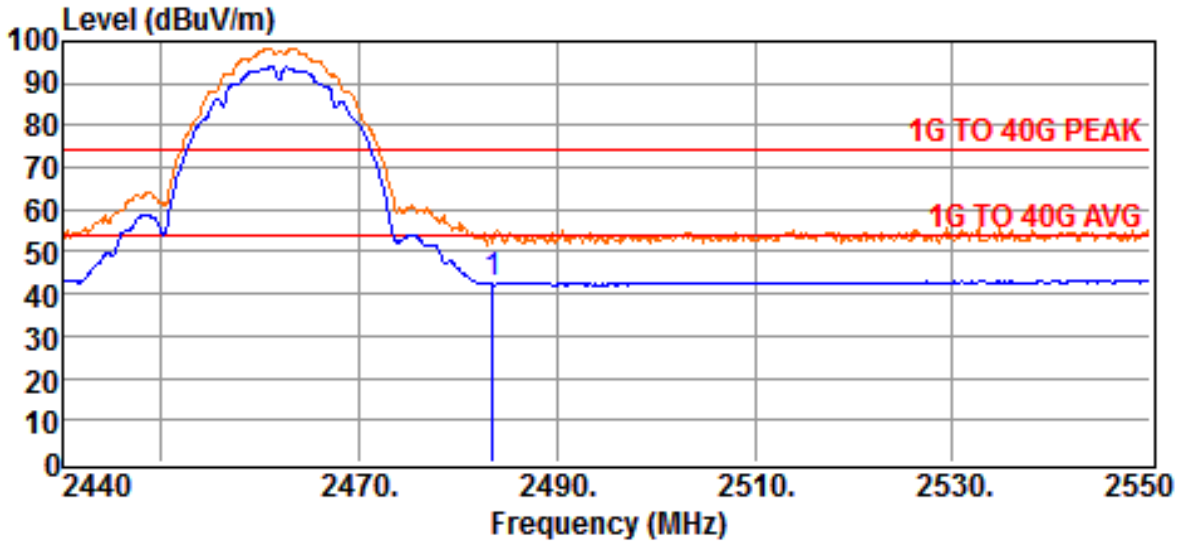


Site	:CHAMBER	Date	:2017-03-22
Limit	:1G TO 40G PEAK	Ant. Pol.	:VERTICAL
EUT	:Wireless IP Camera	Model	:ACR1608
Power Rating	:AC 120V60Hz	Temp.	:22˚C
Engineer	:Brian Huang	Humi.	:56 %
Test Mode	:CH Low - Restricted Bands	Test Mode	:802.11B

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits (AVG) dBµV/m	Over limit dB	Detector
2390.0000	48.03	-5.61	42.42	54.00	-11.58	Average

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result

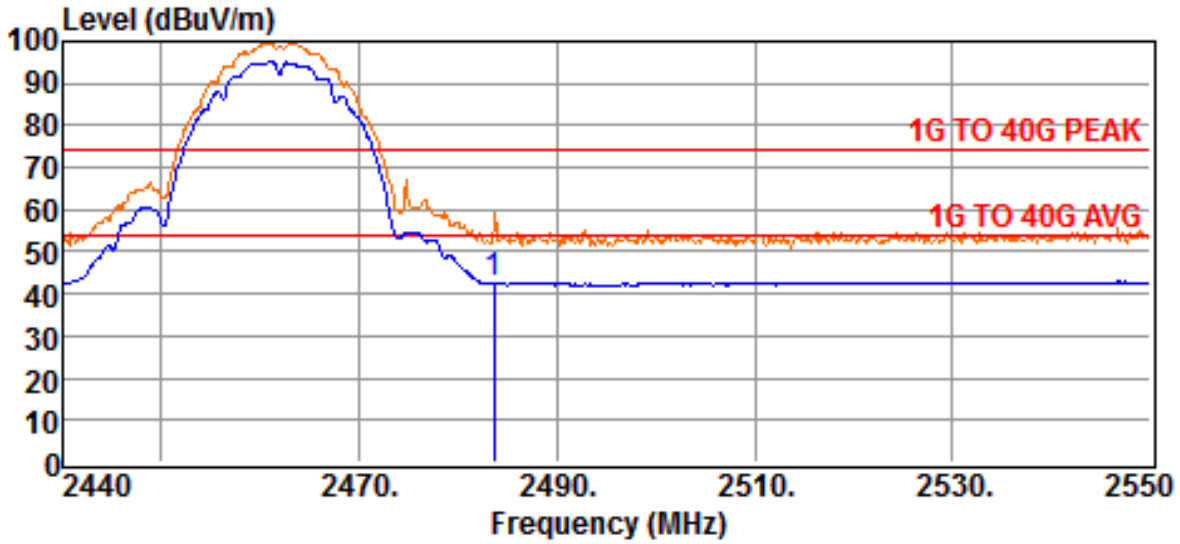


Site	:CHAMBER	Date	:2017-03-22
Limit	:1G TO 40G PEAK	Ant. Pol.	:HORIZONTAL
EUT	:Wireless IP Camera	Model	:ACR1608
Power Rating	:AC 120V60Hz	Temp.	:22˚C
Engineer	:Brian Huang	Humi.	:56 %
Test Mode	:CH High - Restricted Bands	Test Mode	:802.11B

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits (AVG) dBµV/m	Over limit dB	Detector
2483.5600	47.64	-5.40	42.24	54.00	-11.76	Average

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result



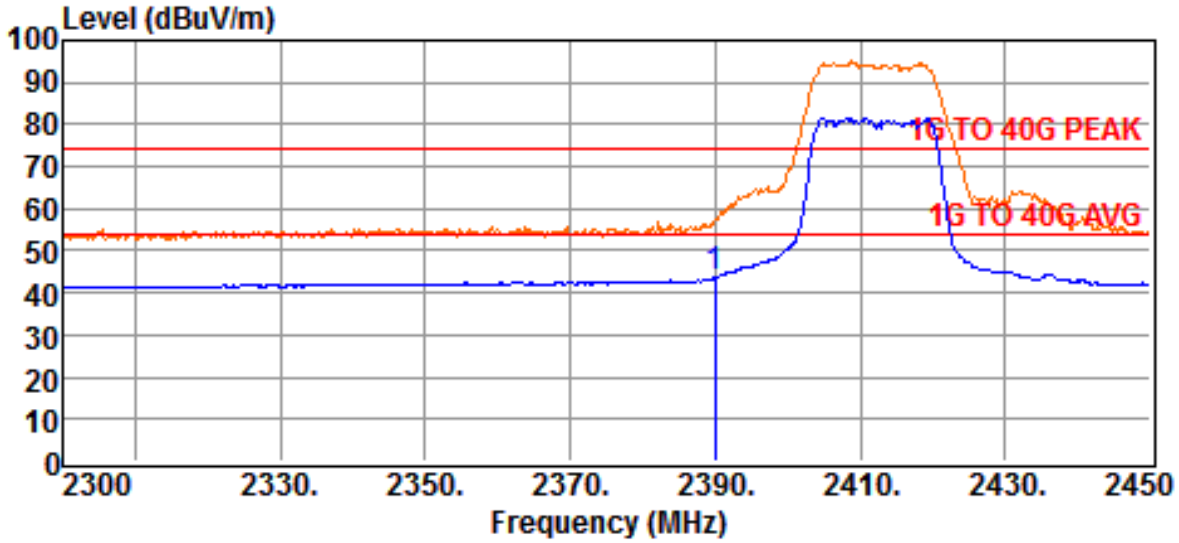
Site	:CHAMBER	Date	:2017-03-22
Limit	:1G TO 40G PEAK	Ant. Pol.	:VERTICAL
EUT	:Wireless IP Camera	Model	:ACR1608
Power Rating	:AC 120V60Hz	Temp.	:22˚C
Engineer	:Brian Huang	Humi.	:56 %
Test Mode	:CH High - Restricted Bands	Test Mode	:802.11B

Freq	Reading	Correction Factor	Result	Limits (AVG)	Over limit	Detector
MHz	dBµV	dB	dBµV/m	dBµV/m	dB	
2483.6700	47.70	-5.40	42.30	54.00	-11.70	Average

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result

Mode: 802.11g

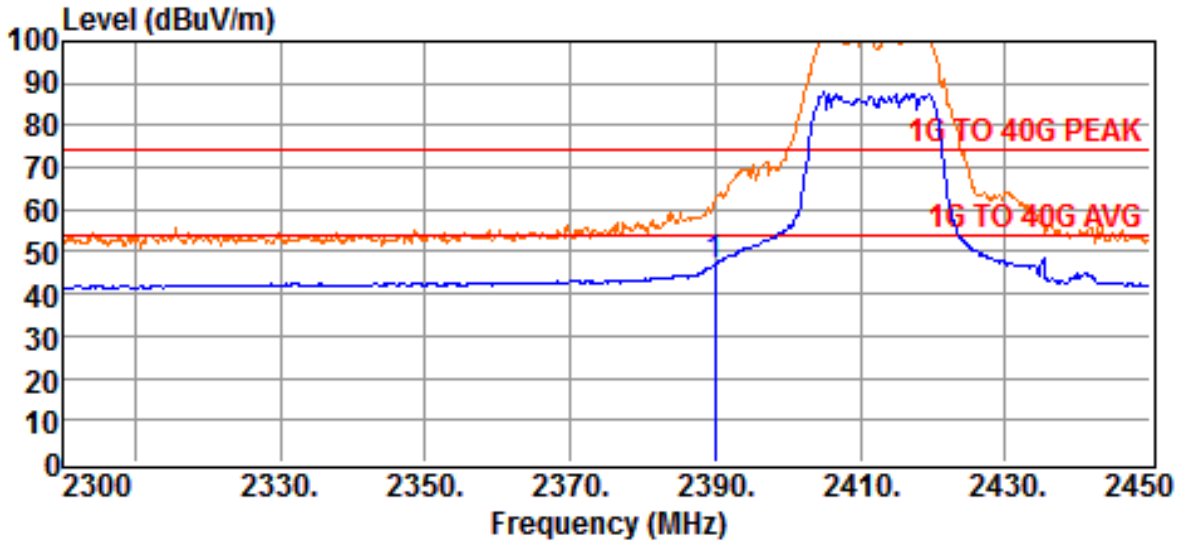


Site	:CHAMBER	Date	:2017-03-22
Limit	:1G TO 40G PEAK	Ant. Pol.	:HORIZONTAL
EUT	:Wireless IP Camera	Model	:ACR1608
Power Rating	:AC 120V60Hz	Temp.	:22˚C
Engineer	:Brian Huang	Humi.	:56 %
Test Mode	:CH Low - Restricted Bands	Test Mode	:802.11G

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits (AVG) dBµV/m	Over limit dB	Detector
2390.0000	49.15	-5.61	43.54	54.00	-10.46	Average

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result

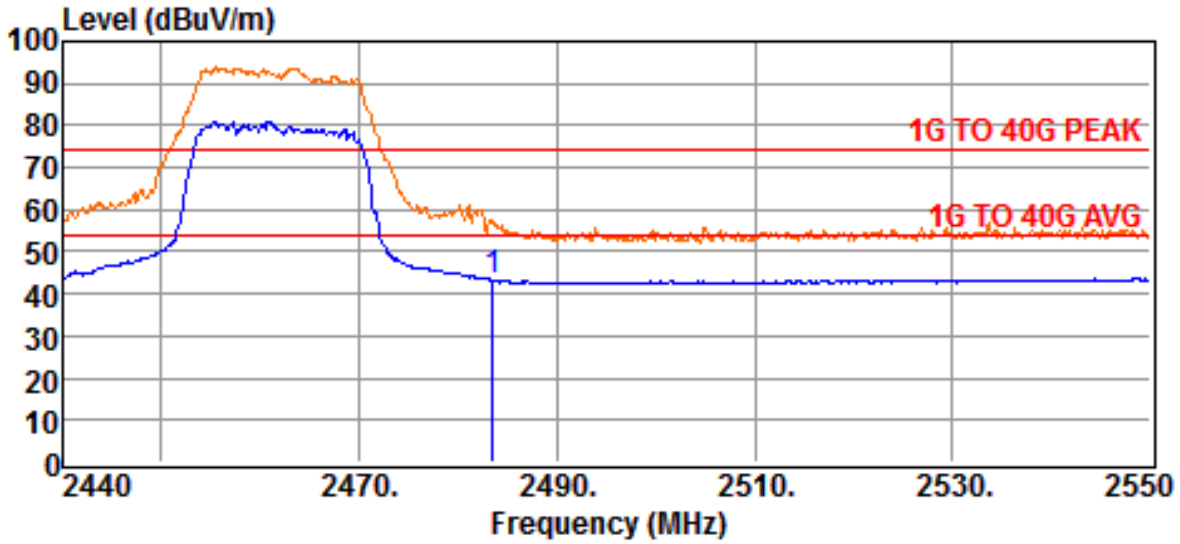


Site	:CHAMBER	Date	:2017-03-22
Limit	:1G TO 40G PEAK	Ant. Pol.	:VERTICAL
EUT	:Wireless IP Camera	Model	:ACR1608
Power Rating	:AC 120V60Hz	Temp.	:22˚C
Engineer	:Brian Huang	Humi.	:56 %
Test Mode	:CH Low - Restricted Bands	Test Mode	:802.11G

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits (AVG) dBµV/m	Over limit dB	Detector
2390.0000	52.34	-5.61	46.73	54.00	-7.27	Average

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result

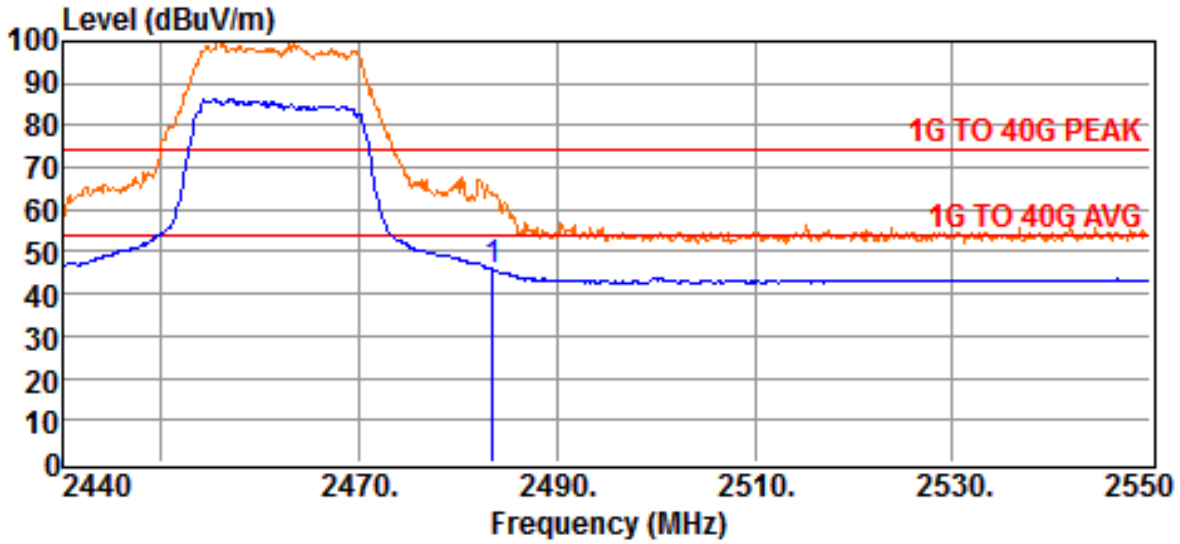


Site	:CHAMBER	Date	:2017-03-22
Limit	:1G TO 40G PEAK	Ant. Pol.	:HORIZONTAL
EUT	:Wireless IP Camera	Model	:ACR1608
Power Rating	:AC 120V60Hz	Temp.	:22˚C
Engineer	:Brian Huang	Humi.	:56 %
Test Mode	:CH High - Restricted Bands	Test Mode	:802.11G

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits (AVG) dBµV/m	Over limit dB	Detector
2483.5600	48.47	-5.40	43.07	54.00	-10.93	Average

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result



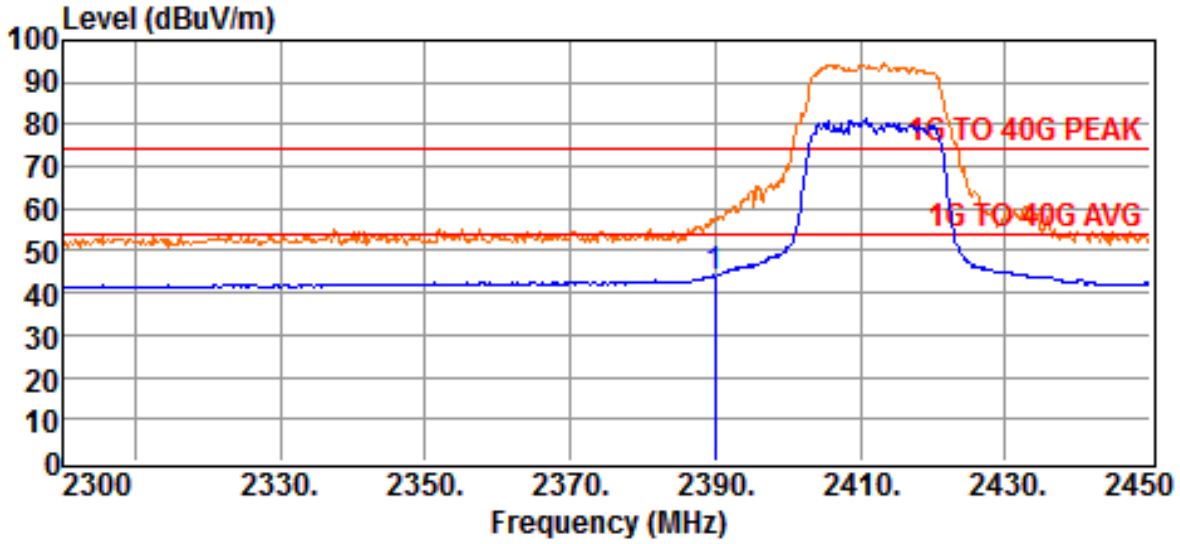
Site	:CHAMBER	Date	:2017-03-22
Limit	:1G TO 40G PEAK	Ant. Pol.	:VERTICAL
EUT	:Wireless IP Camera	Model	:ACR1608
Power Rating	:AC 120V60Hz	Temp.	:22˚C
Engineer	:Brian Huang	Humi.	:56 %
Test Mode	:CH High - Restricted Bands	Test Mode	:802.11G

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits (AVG) dBµV/m	Over limit dB	Detector
2483.5600	50.89	-5.40	45.49	54.00	-8.51	Average

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result

Mode: 802.11n HT-20

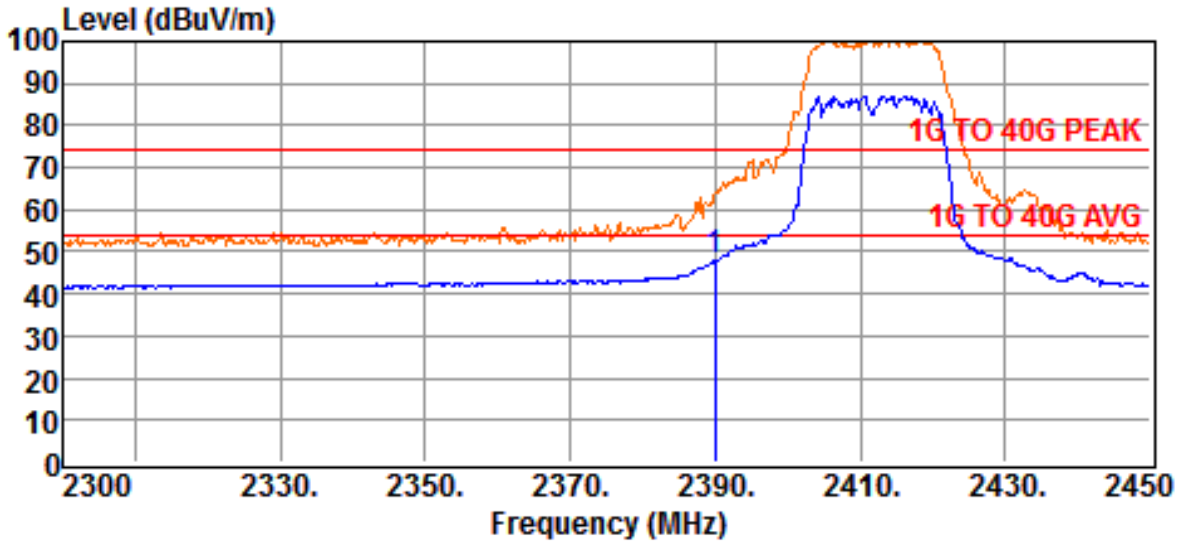


Site	:CHAMBER	Date	:2017-03-22
Limit	:1G TO 40G PEAK	Ant. Pol.	:HORIZONTAL
EUT	:Wireless IP Camera	Model	:ACR1608
Power Rating	:AC 120V60Hz	Temp.	:22˚C
Engineer	:Brian Huang	Humi.	:56 %
Test Mode	:CH Low - Restricted Bands	Test Mode	:802.11N20

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits (AVG) dBµV/m	Over limit dB	Detector
2390.0000	49.54	-5.61	43.93	54.00	-10.07	Average

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result

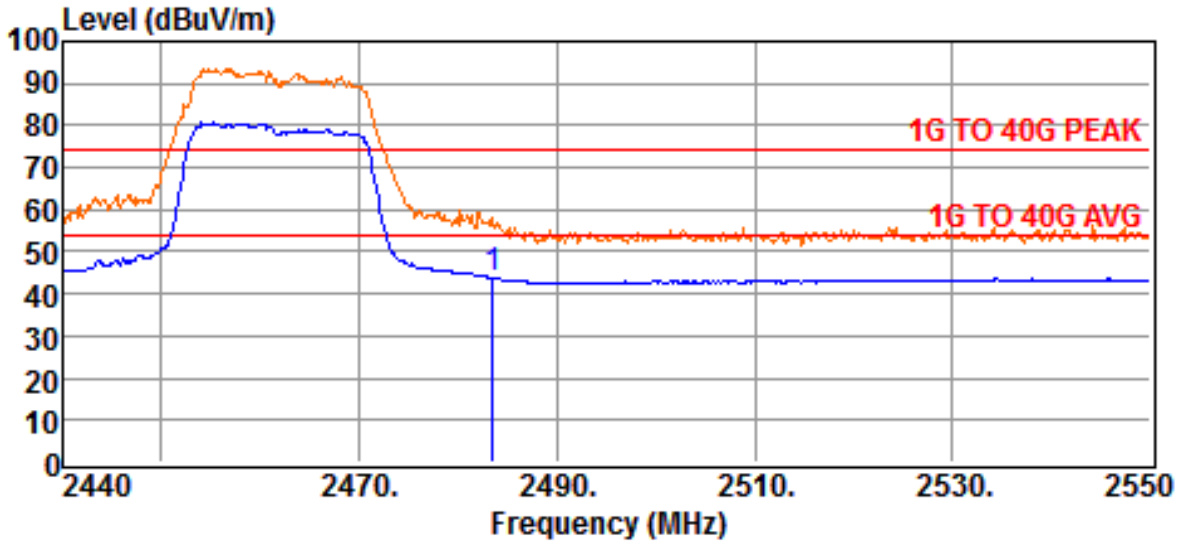


Site	:CHAMBER	Date	:2017-03-22
Limit	:1G TO 40G PEAK	Ant. Pol.	:VERTICAL
EUT	:Wireless IP Camera	Model	:ACR1608
Power Rating	:AC 120V60Hz	Temp.	:22˚C
Engineer	:Brian Huang	Humi.	:56 %
Test Mode	:CH Low - Restricted Bands	Test Mode	:802.11N20

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits (AVG) dBµV/m	Over limit dB	Detector
2390.0000	53.56	-5.61	47.95	54.00	-6.05	Average

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result

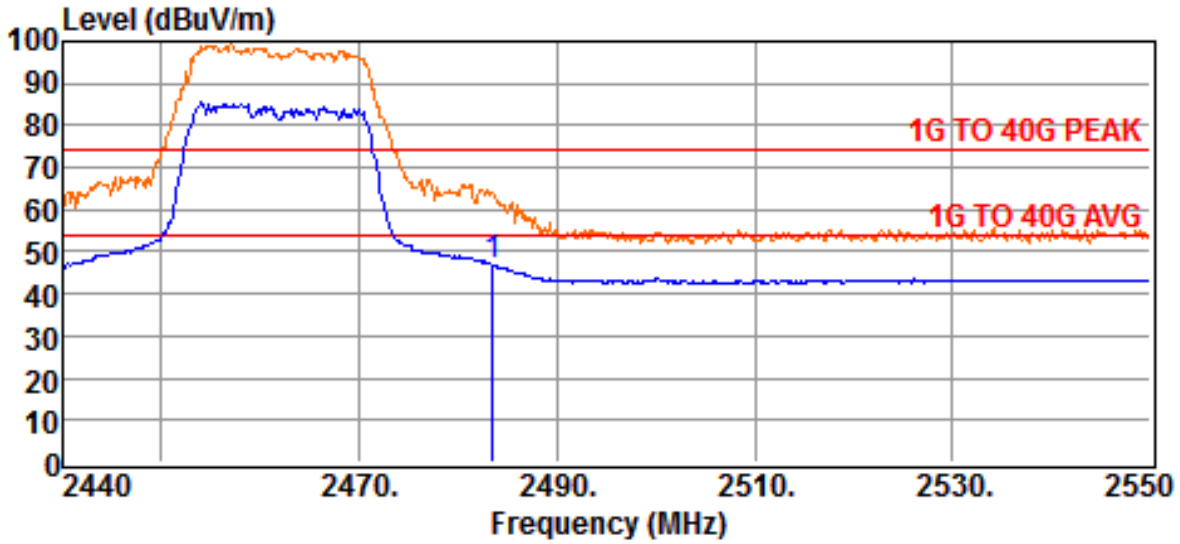


Site	:CHAMBER	Date	:2017-03-22
Limit	:1G TO 40G PEAK	Ant. Pol.	:HORIZONTAL
EUT	:Wireless IP Camera	Model	:ACR1608
Power Rating	:AC 120V60Hz	Temp.	:22˚C
Engineer	:Brian Huang	Humi.	:56 %
Test Mode	:CH High - Restricted Bands	Test Mode	:802.11N20

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits (AVG) dBµV/m	Over limit dB	Detector
2483.5600	49.15	-5.40	43.75	54.00	-10.25	Average

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result



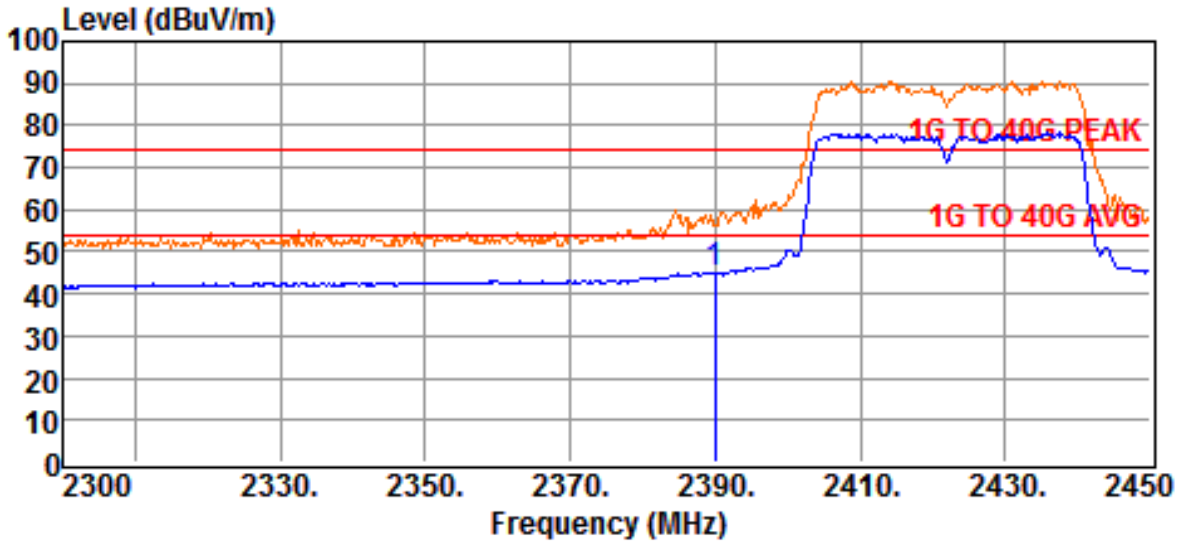
Site	:CHAMBER	Date	:2017-03-22
Limit	:1G TO 40G PEAK	Ant. Pol.	:VERTICAL
EUT	:Wireless IP Camera	Model	:ACR1608
Power Rating	:AC 120V60Hz	Temp.	:22˚C
Engineer	:Brian Huang	Humi.	:56 %
Test Mode	:CH High - Restricted Bands	Test Mode	:802.11N20

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits (AVG) dBµV/m	Over limit dB	Detector
2483.5600	52.14	-5.40	46.74	54.00	-7.26	Average

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result

Mode: 802.11n HT-40

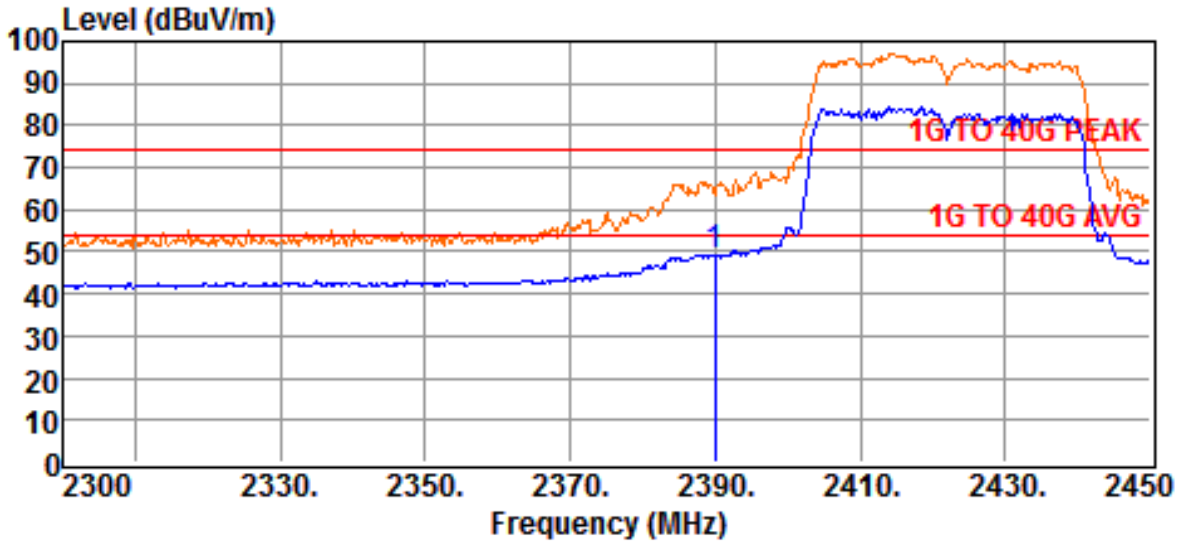


Site	:CHAMBER	Date	:2017-03-22
Limit	:1G TO 40G PEAK	Ant. Pol.	:HORIZONTAL
EUT	:Wireless IP Camera	Model	:ACR1608
Power Rating	:AC 120V60Hz	Temp.	:22˚C
Engineer	Brian Huang	Humi.	:56 %
Test Mode	:CH Low - Restricted Bands	Test Mode	:802.11N40

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits (AVG) dBµV/m	Over limit dB	Detector
2390.0000	50.65	-5.61	45.04	54.00	-8.96	Average

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result

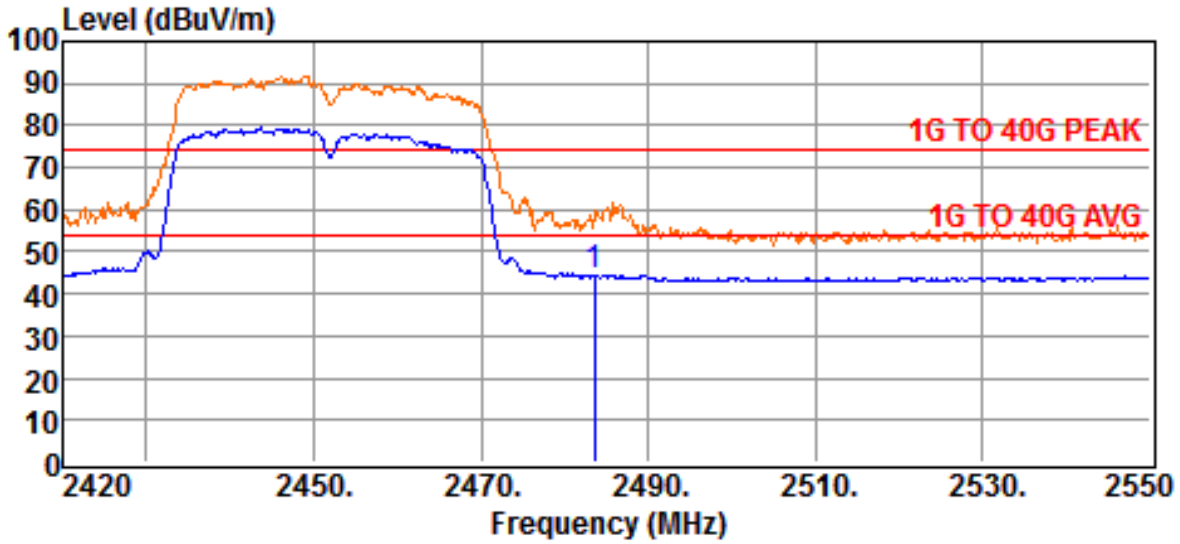


Site	:CHAMBER	Date	:2017-03-22
Limit	:1G TO 40G PEAK	Ant. Pol.	:VERTICAL
EUT	:Wireless IP Camera	Model	:ACR1608
Power Rating	:AC 120V60Hz	Temp.	:22˚C
Engineer	:Brian Huang	Humi.	:56 %
Test Mode	:CH Low - Restricted Bands	Test Mode	:802.11N40

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits (AVG) dBµV/m	Over limit dB	Detector
2390.0000	54.42	-5.61	48.81	54.00	-5.19	Average

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result

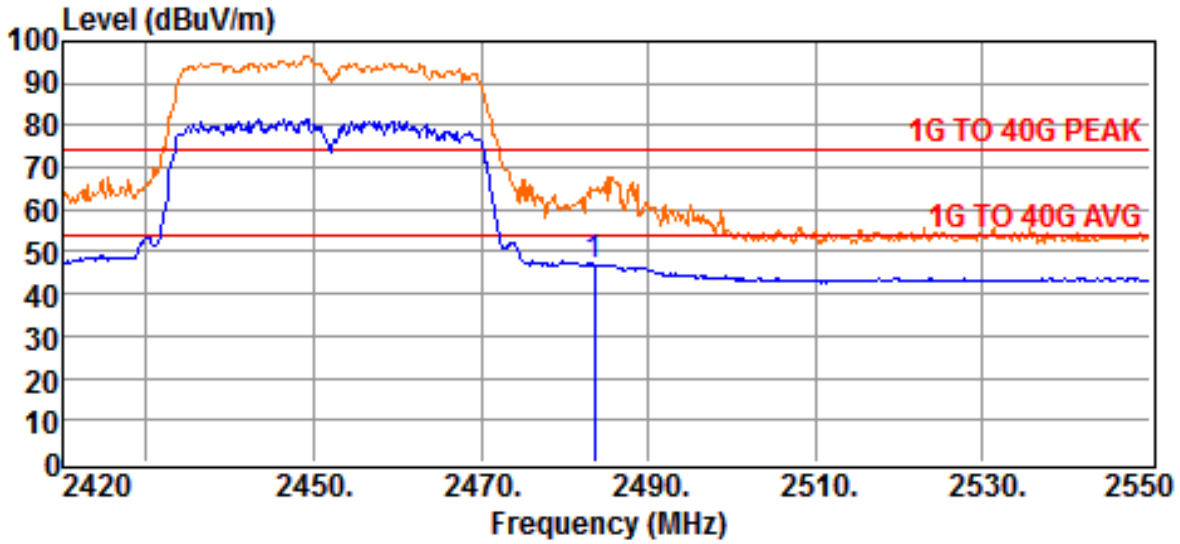


Site	:CHAMBER	Date	:2017-03-22
Limit	:1G TO 40G PEAK	Ant. Pol.	:HORIZONTAL
EUT	:Wireless IP Camera	Model	:ACR1608
Power Rating	:AC 120V60Hz	Temp.	:22˚C
Engineer	:Brian Huang	Humi.	:56 %
Test Mode	:CH High - Restricted Bands	Test Mode	:802.11N40

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits (AVG) dBµV/m	Over limit dB	Detector
2483.5700	49.53	-5.40	44.13	54.00	-9.87	Average

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result



Site	:CHAMBER	Date	:2017-03-22
Limit	:1G TO 40G PEAK	Ant. Pol.	:VERTICAL
EUT	:Wireless IP Camera	Model	:ACR1608
Power Rating	:AC 120V60Hz	Temp.	:22˚C
Engineer	:Brian Huang	Humi.	:56 %
Test Mode	:CH High - Restricted Bands	Test Mode	:802.11N40

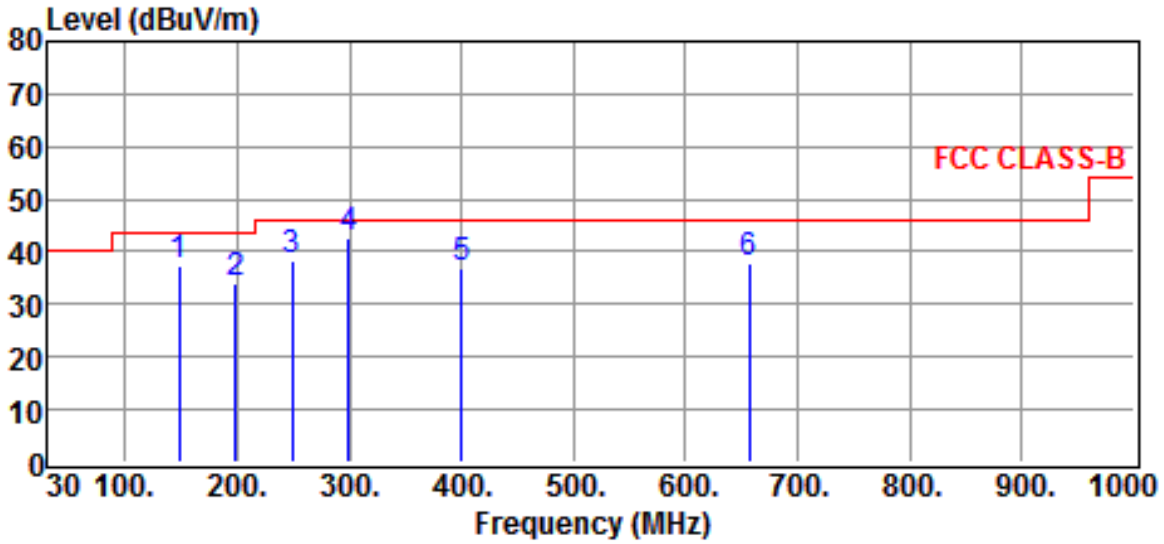
Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits (AVG) dBµV/m	Over limit dB	Detector
2483.5700	52.35	-5.40	46.95	54.00	-7.05	Average

Note :

1. Result = Reading + Corrected Factor
2. Corrected Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
3. The margin value=Limit – Result

4.4.3 Other Emission

a) Emission frequencies below 1 GHz

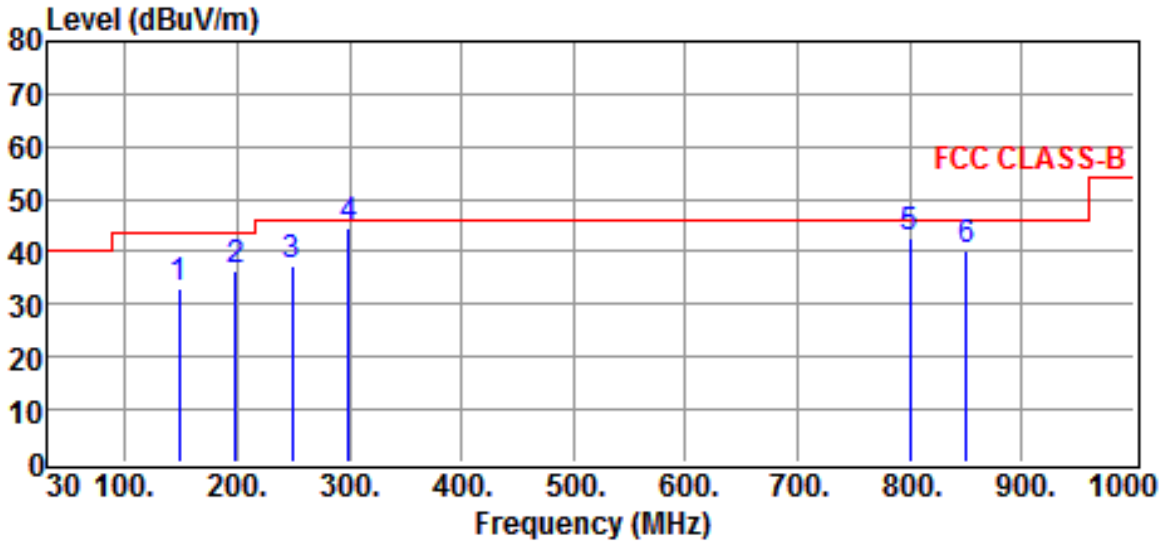


Site	:CHAMBER #2	Date	:2016-12-05
Limit	:FCC CLASS-B	Ant. Pol.	:HORIZONTAL
EUT	:Wireless IP Camera	Model	:ACR1608
Power Rating	:AC120V/60Hz	Temp.	:22˚C
Engineer	:Brian Huang	Humi.	:53 %
Test Mode	:		

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits dBµV/m	Over limit dB	Detector
148.3400	44.03	-6.83	37.20	43.50	-6.30	QP
198.7800	41.87	-7.78	34.09	43.50	-9.41	QP
249.2200	43.00	-4.76	38.24	46.00	-7.76	QP
299.6600	45.52	-2.98	42.54	46.00	-3.46	QP
400.5400	38.14	-1.02	37.12	46.00	-8.88	QP
656.6200	35.15	2.58	37.73	46.00	-8.27	QP

Note :

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



Site	:CHAMBER #2	Date	:2016-12-05
Limit	:FCC CLASS-B	Ant. Pol.	:VERTICAL
EUT	:Wireless IP Camera	Model	:ACR1608
Power Rating	:AC120V/60Hz	Temp.	:22˚C
Engineer	:Brian Huang	Humi.	:53 %
Test Mode	:		

Freq MHz	Reading dBµV	Correction Factor dB	Result dBµV/m	Limits dBµV/m	Over limit dB	Detector
148.3400	40.26	-7.33	32.93	43.50	-10.57	QP
198.7800	44.82	-8.32	36.50	43.50	-7.00	QP
249.2200	42.86	-5.27	37.59	46.00	-8.41	QP
299.6600	47.90	-3.45	44.45	46.00	-1.55	QP
800.1800	38.28	4.58	42.86	46.00	-3.14	QP
850.6200	35.25	5.00	40.25	46.00	-5.75	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:

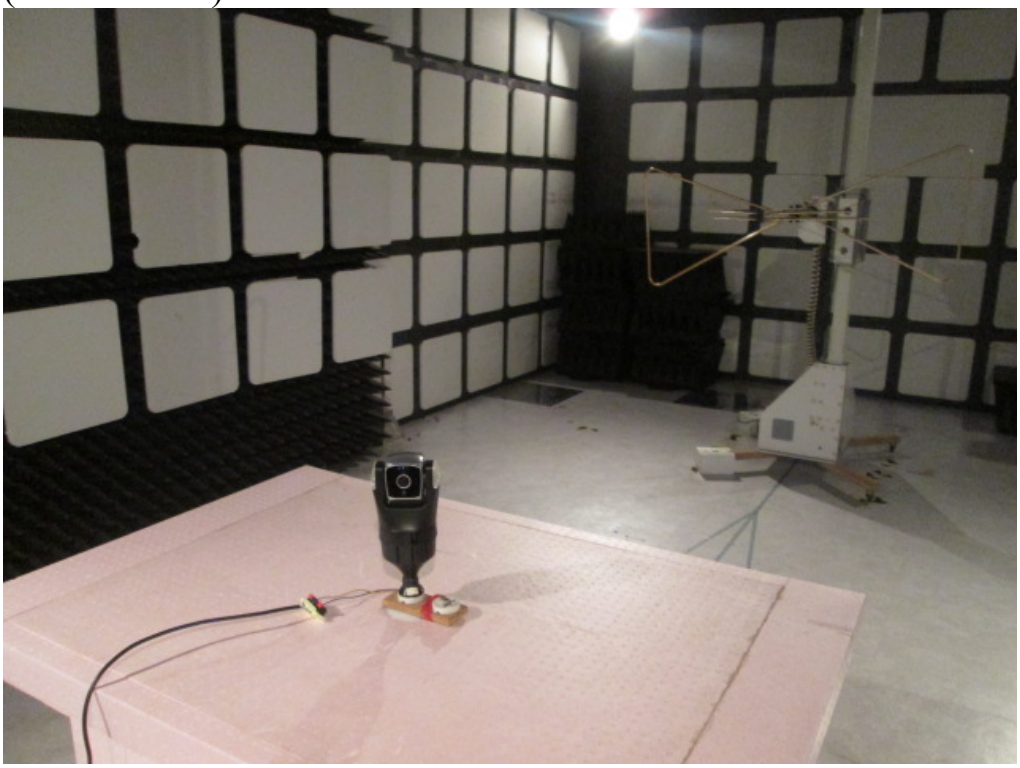
Result = Reading + Corrected Factor

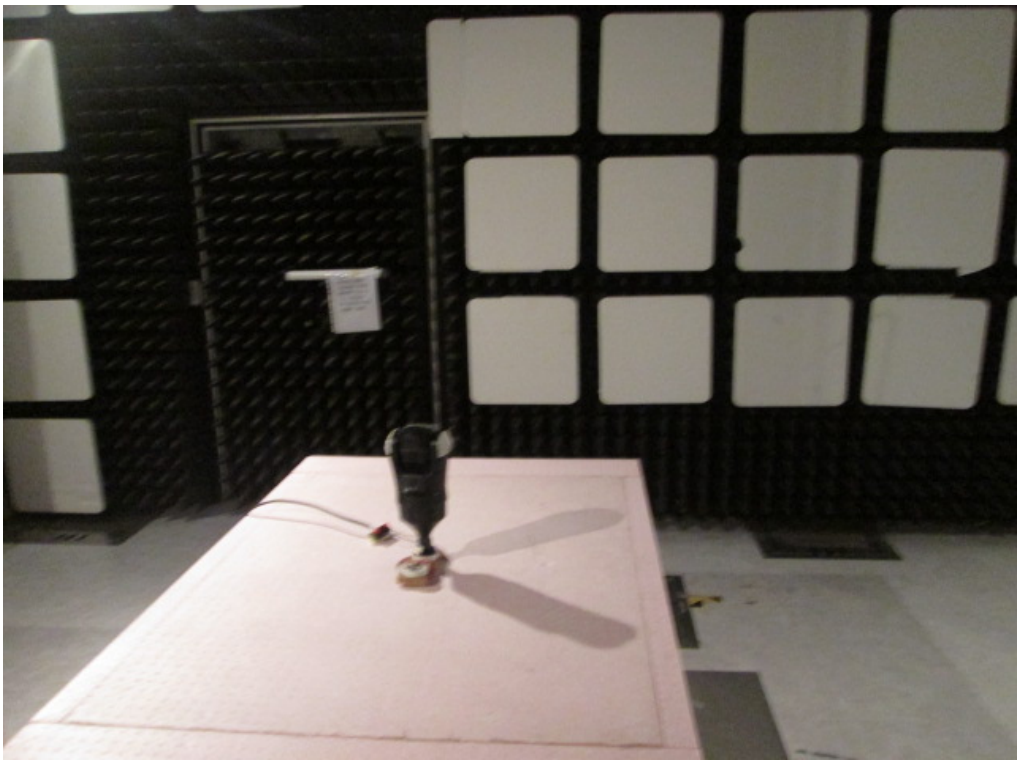
where

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

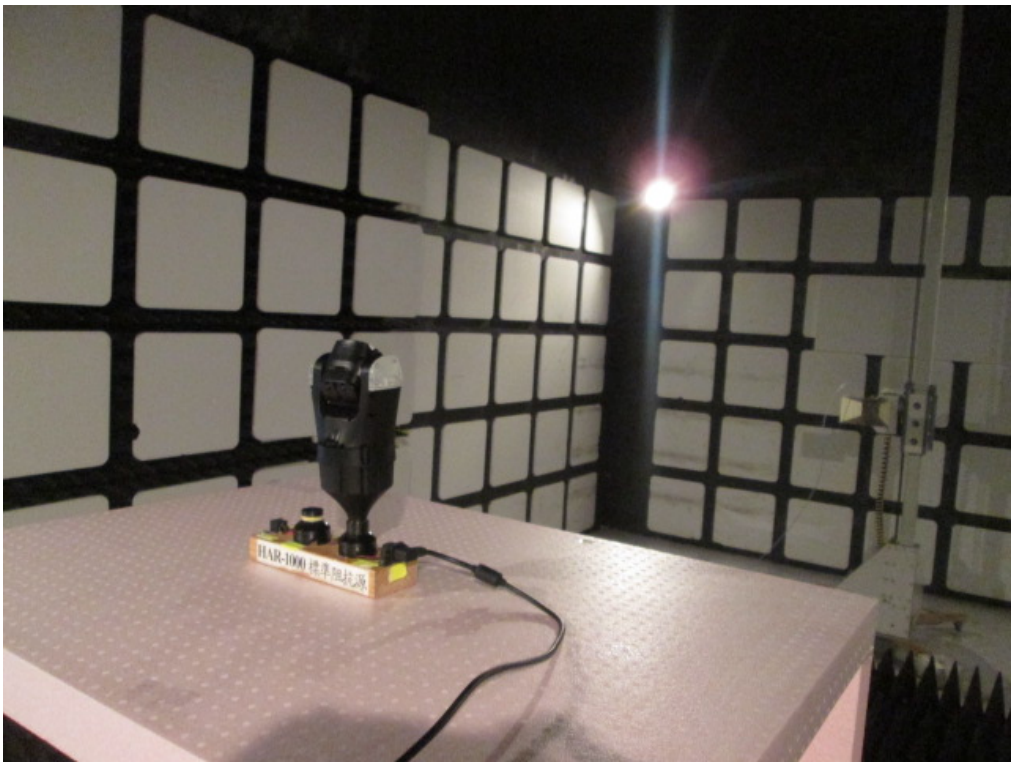
4.6 Photos of Radiation Measuring Setup

(Below 1GHz)





(Above 1GHz)



5 CONDUCTED EMISSION MEASUREMENT

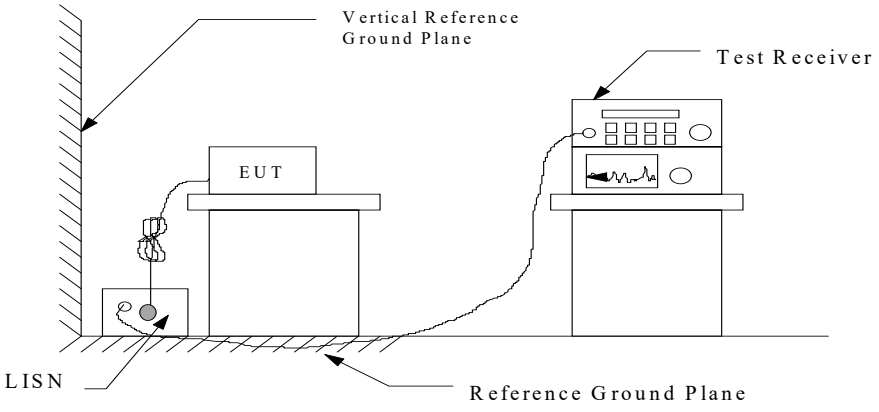
5.1 Standard Applicable

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.

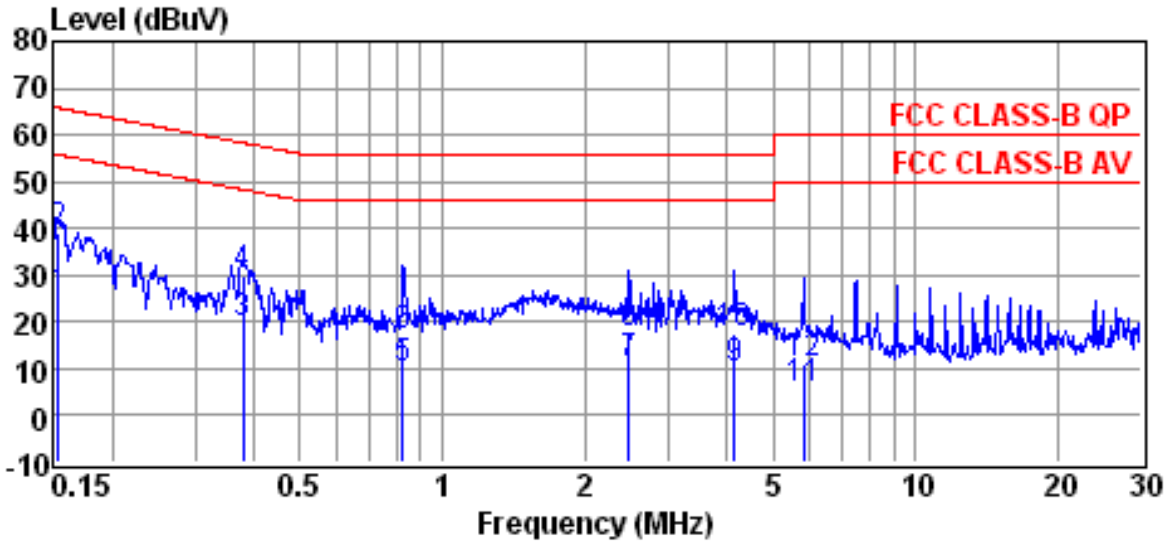
5.2 Measurement Procedure

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

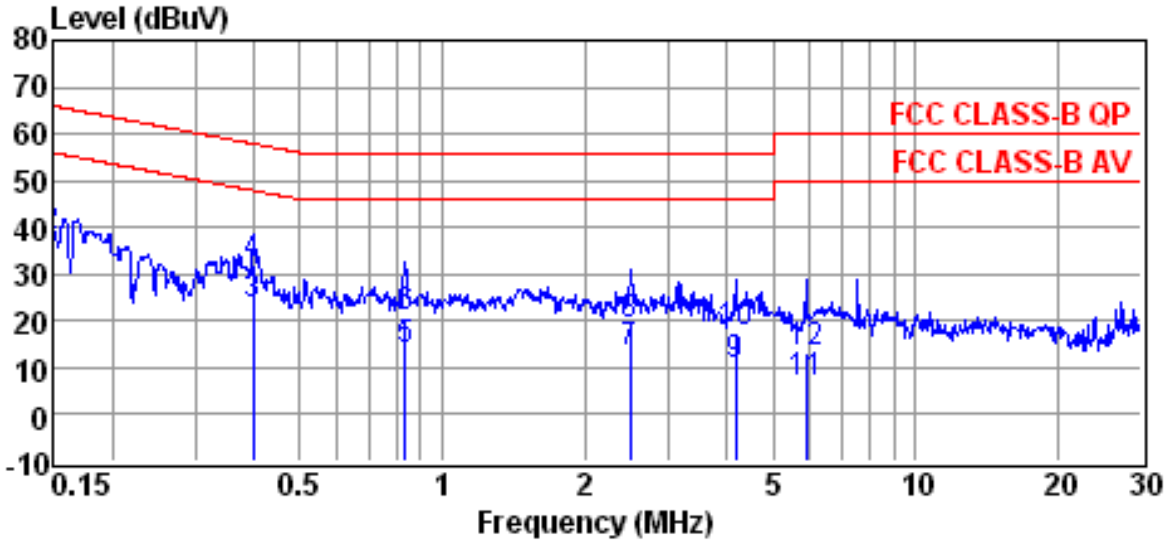


Site	: conducted #1	Date	: 11-04-2016
Condition	: FCC CLASS-B QP	LISN	: NEUTRAL
Tem / Hum	: 24 ℃ / 55%	Test Mode	: Link
EUT	: Wireless IP Camera	Power Rating	: AC 120V60Hz
Memo	:	Memo	:

Freq (MHz)	Reading (dBμV)	Factor (dB)	Emission Level (dBμV)	Limit Line (dBμV)	Over Limit (dB)	Remark
0.1540	15.00	10.15	25.15	55.78	-30.63	Average
0.1540	28.72	10.15	38.87	65.78	-26.91	QP
0.3791	9.64	10.17	19.81	48.30	-28.49	Average
0.3791	19.59	10.17	29.76	58.30	-28.54	QP
0.8261	-0.31	10.20	9.89	46.00	-36.11	Average
0.8261	6.57	10.20	16.77	56.00	-39.23	QP
2.4870	0.77	10.27	11.04	46.00	-34.96	Average
2.4870	7.01	10.27	17.28	56.00	-38.72	QP
4.1580	-0.34	10.33	9.99	46.00	-36.01	Average
4.1580	6.92	10.33	17.25	56.00	-38.75	QP
5.8050	-4.84	10.41	5.57	50.00	-44.43	Average
5.8050	0.56	10.41	10.97	60.00	-49.03	QP

Note :

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



Site	: conducted #1	Date	: 11-04-2016
Condition	: FCC CLASS-B QP	LISN	: LINE
Tem / Hum	: 24 ℃ / 55%	Test Mode	: Link
EUT	: Wireless IP Camera	Power Rating	: AC 120V60Hz
Memo	:	Memo	:

Freq (MHz)	Reading (dBµV)	Factor (dB)	Emission Level (dBµV)	Limit Line (dBµV)	Over Limit (dB)	Remark
0.1500	12.19	10.15	22.34	56.00	-33.66	Average
0.1500	27.71	10.15	37.86	66.00	-28.14	QP
0.3976	13.44	10.18	23.62	47.90	-24.28	Average
0.3976	21.61	10.18	31.79	57.90	-26.11	QP
0.8349	3.73	10.20	13.93	46.00	-32.07	Average
0.8349	10.59	10.20	20.79	56.00	-35.21	QP
2.5000	2.81	10.28	13.09	46.00	-32.91	Average
2.5000	8.74	10.28	19.02	56.00	-36.98	QP
4.1800	0.08	10.34	10.42	46.00	-35.58	Average
4.1800	6.88	10.34	17.22	56.00	-38.78	QP
5.8670	-3.50	10.43	6.93	50.00	-43.07	Average
5.8670	2.80	10.43	13.23	60.00	-46.77	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:

RESULT = READING + 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.

RESULT = 22.5 + 0.1 = 22.6 dB μ V
Level in μ V = Common Antilogarithm[(22.6 dB μ V)/20]
= 13.48 μ V

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	2016/09/07	2017/09/06
LISN	Rohde & Schwarz	ESH2-Z5	2016/05/05	2017/05/04

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

The antenna gain is 2.7dBi. There are 2 antenna so a factor of *10 log (N_{ANT}), N=2,* is added. The total gain = 2.7 + 10 log(2) = 2.7 + 3.01 = 5.71 dBi. So there is no need to reduce the power. Please see internal photos and the antenna specifications.

7 EMISSION BANDWIDTH MEASUREMENT

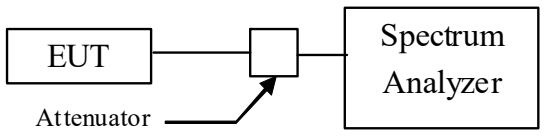
7.1 Standard Applicable

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. The settings of spectrum analyzer is as followings.
   1) Set RBW = 100 kHz.
   2) Set the video bandwidth (VBW) ≥ 3 x RBW.
   3) Detector = Peak.
   4) Trace mode = max hold.
   5) Sweep = auto couple.
   6) Allow the trace to stabilize.
   7) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.
3. 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	2016/10/03	2017/10/02
Attenuator	MINI-CIRCUITS	BW-S10W2+	2016/09/30	2017/09/29
Attenuator	MINI-CIRCUITS	BW-S20W2+	2016/09/30	2017/09/29
Attenuator	MINI-CIRCUITS	BW-S30W2+	2016/09/30	2017/09/29

7.4 Measurement Data

Test Date : Dec. 01, 2016 Temperature : 25 °C Humidity : 65 %

A. 802.11b @1 Mbps

a) Channel Low: 6 dB Emission Bandwidth is 10.08 MHz
b) Channel Mid: 6 dB Emission Bandwidth is 10.00 MHz
c) Channel High: 6 dB Emission Bandwidth is 10.08 MHz

B. 802.11g @6 Mbps

a) Channel Low: 6 dB Emission Bandwidth is 16.56 MHz
b) Channel Mid: 6 dB Emission Bandwidth is 16.48 MHz
c) Channel High: 6 dB Emission Bandwidth is 16.64 MHz

C. 802.11n HT-20 @6.5 Mbps

Antenna1
a) Channel Low: 6 dB Emission Bandwidth is 17.76 MHz
b) Channel Mid: 6 dB Emission Bandwidth is 17.68 MHz
c) Channel High: 6 dB Emission Bandwidth is 17.68 MHz

Antenna2
a) Channel Low: 6 dB Emission Bandwidth is 17.76 MHz
b) Channel Mid: 6 dB Emission Bandwidth is 17.68 MHz
c) Channel High: 6 dB Emission Bandwidth is 17.68 MHz

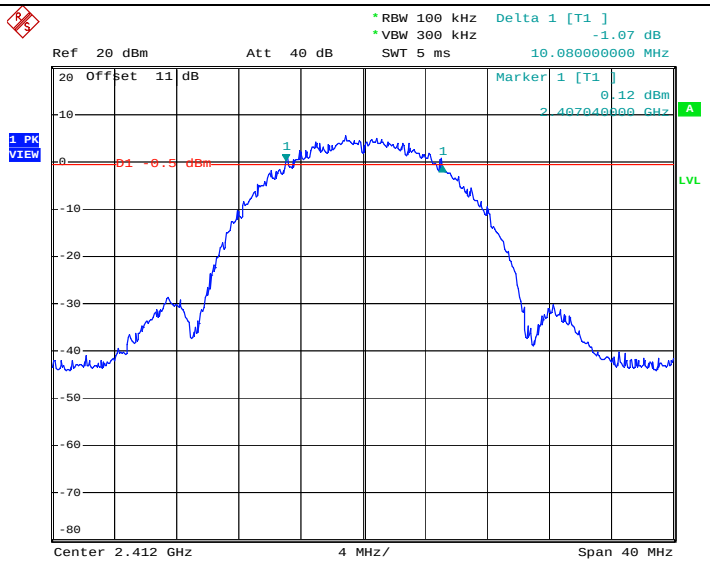
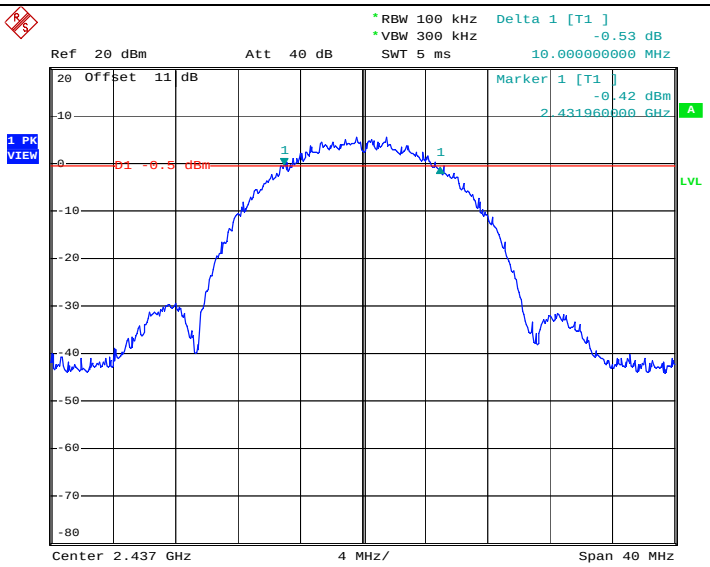
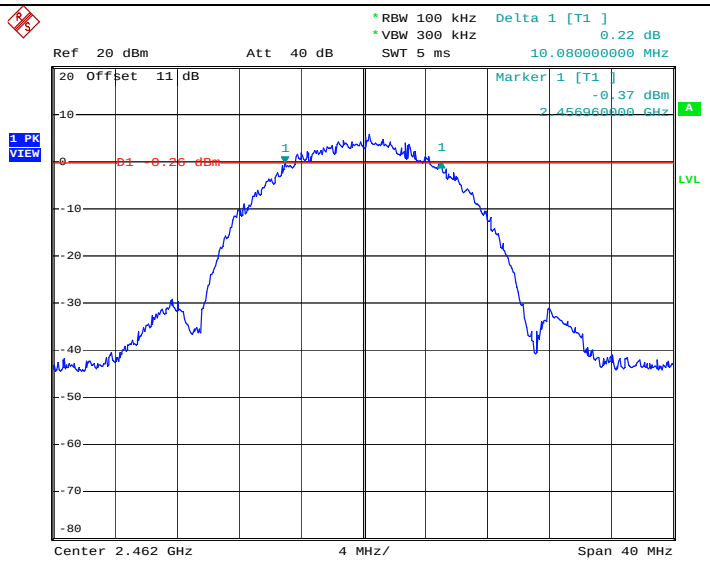
D. 802.11n HT-40 @13.5 Mbps

Antenna1
a) Channel Low: 6 dB Emission Bandwidth is 36.00 MHz
b) Channel Mid: 6 dB Emission Bandwidth is 36.00 MHz
c) Channel High: 6 dB Emission Bandwidth is 36.00 MHz

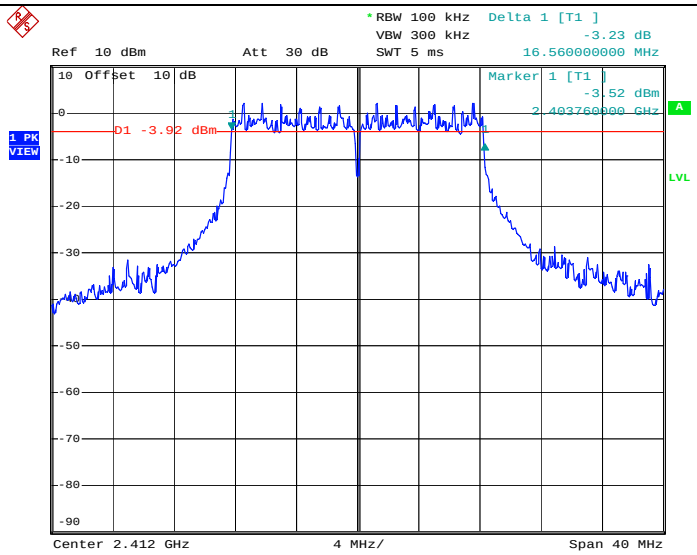
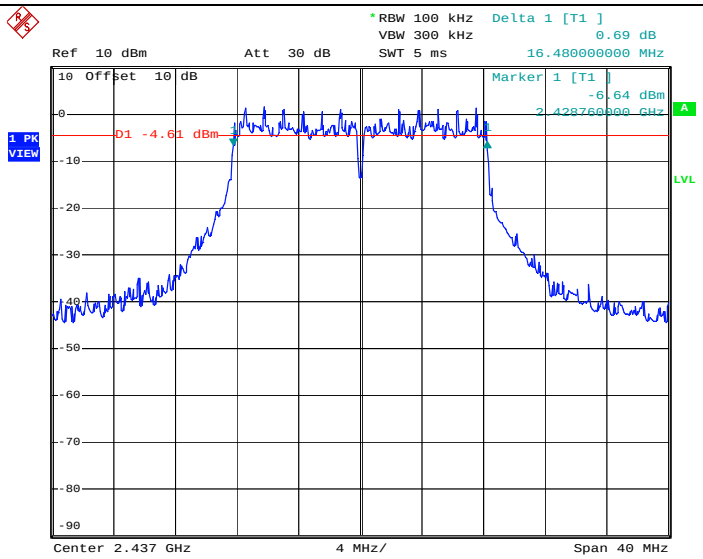
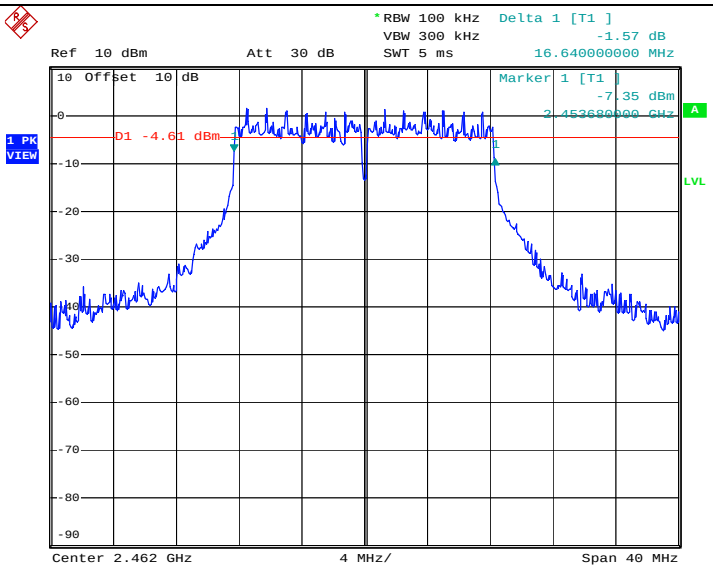
Antenna2
a) Channel Low: 6 dB Emission Bandwidth is 36.00 MHz
b) Channel Mid: 6 dB Emission Bandwidth is 36.00 MHz
c) Channel High: 6 dB Emission Bandwidth is 36.00 MHz

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

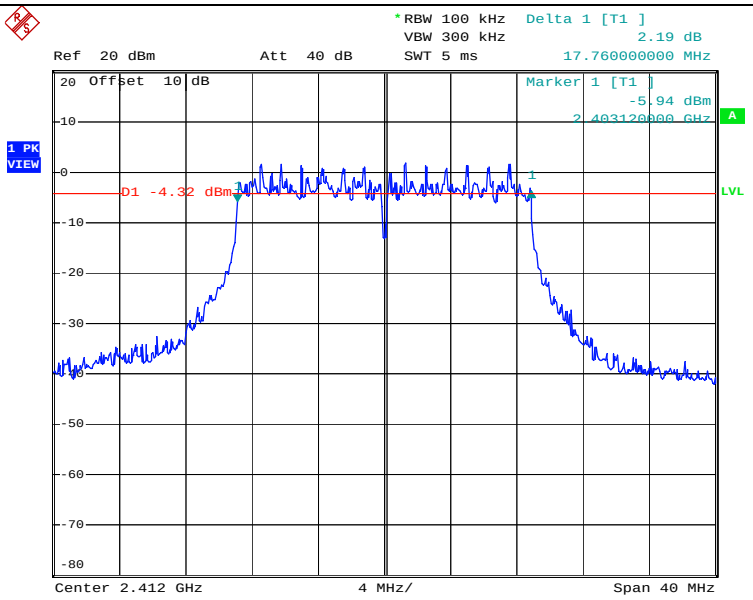
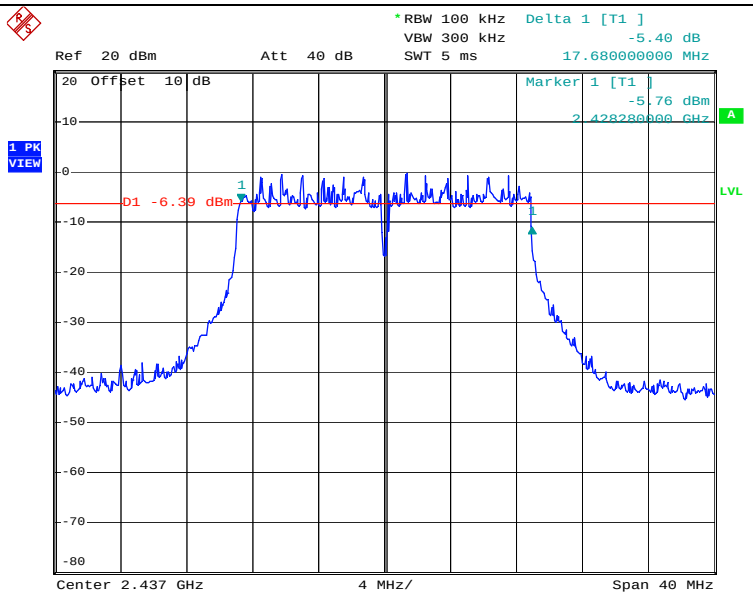
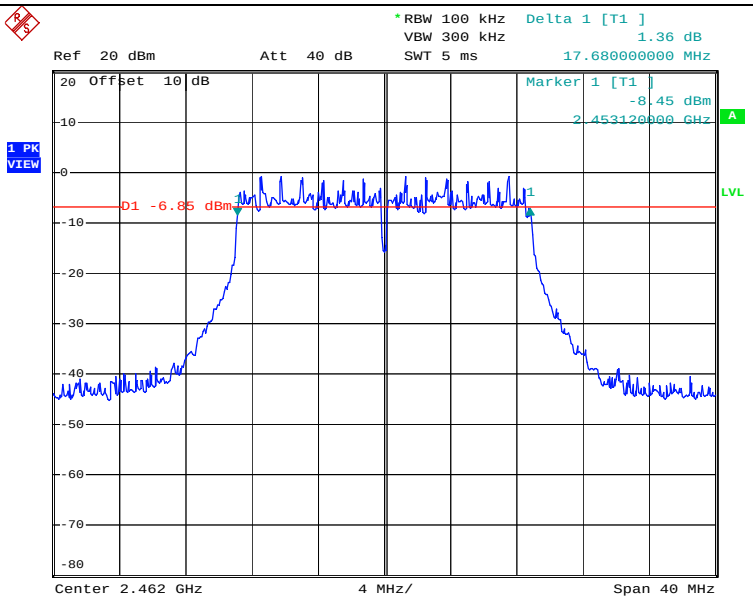
802.11b

Channel Low	
Channel Middle	
Channel High	

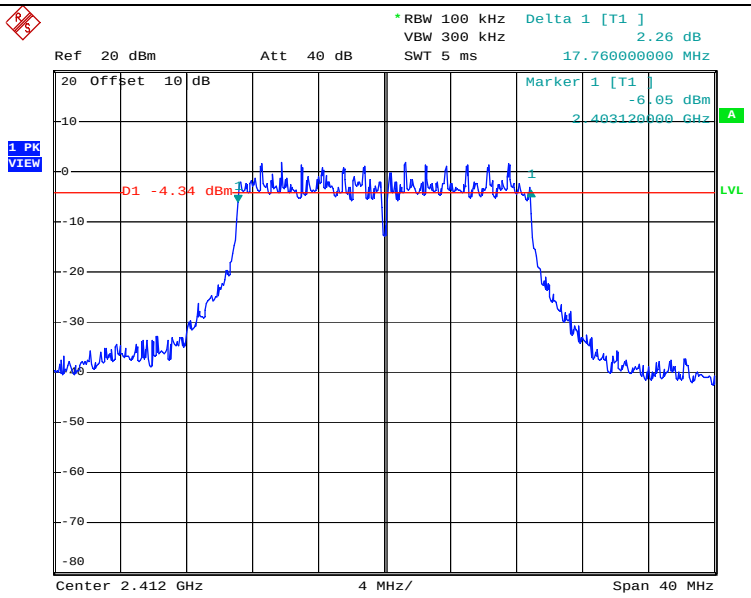
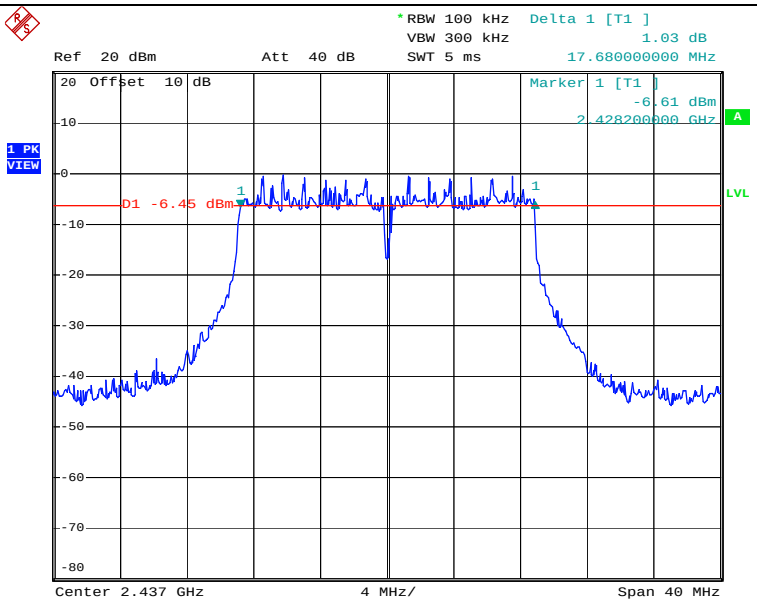
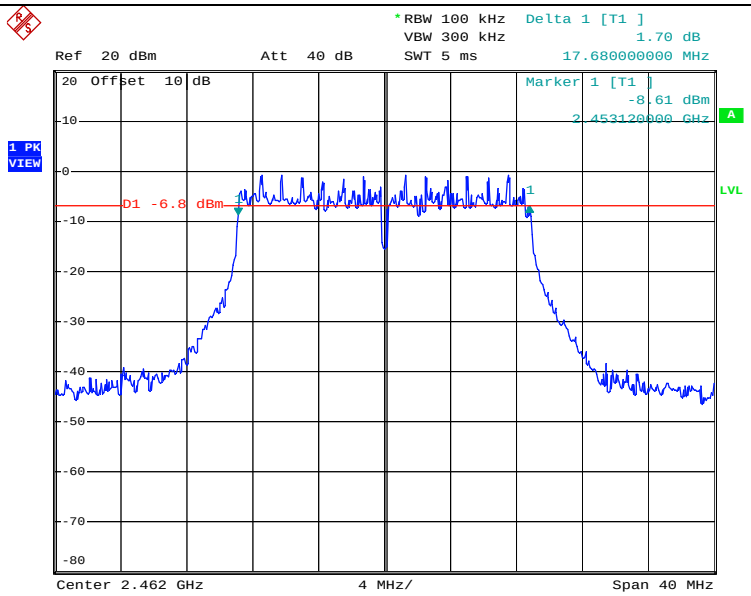
802.11g

Channel Low	
Channel Middle	
Channel High	

802.11n HT-20/ ANT1

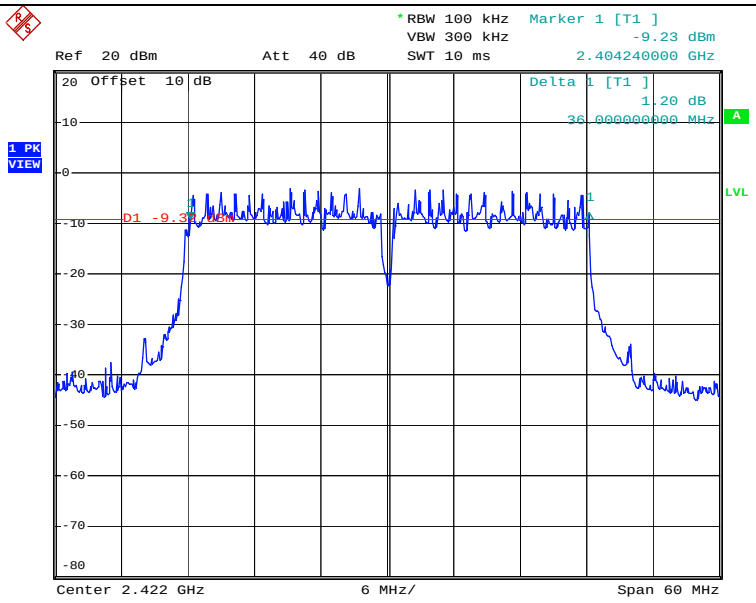
Channel Low	
Channel Middle	
Channel High	

802.11n HT-20/ ANT2

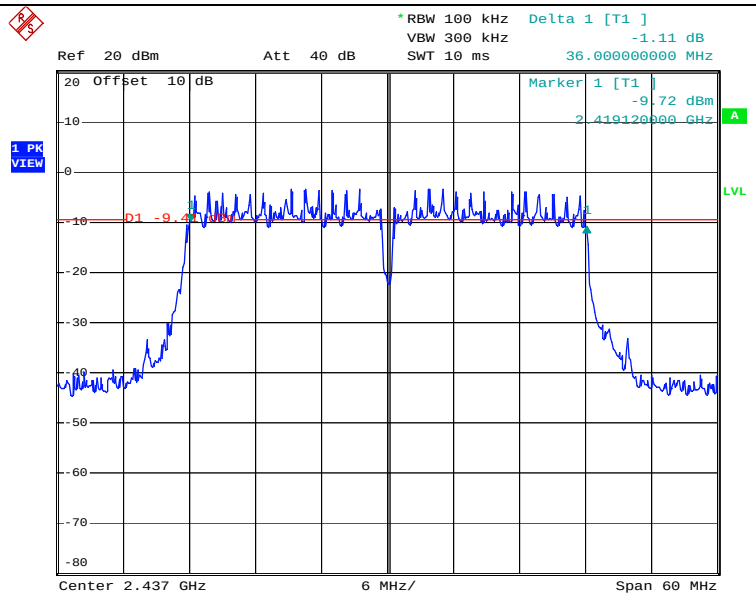
Channel Low	
Channel Middle	
Channel High	

802.11n HT-40/ ANT1

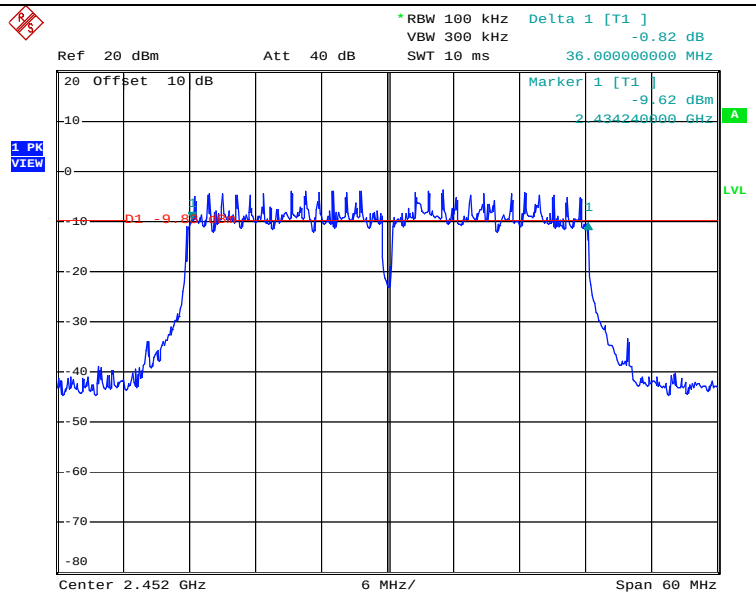
Channel Low



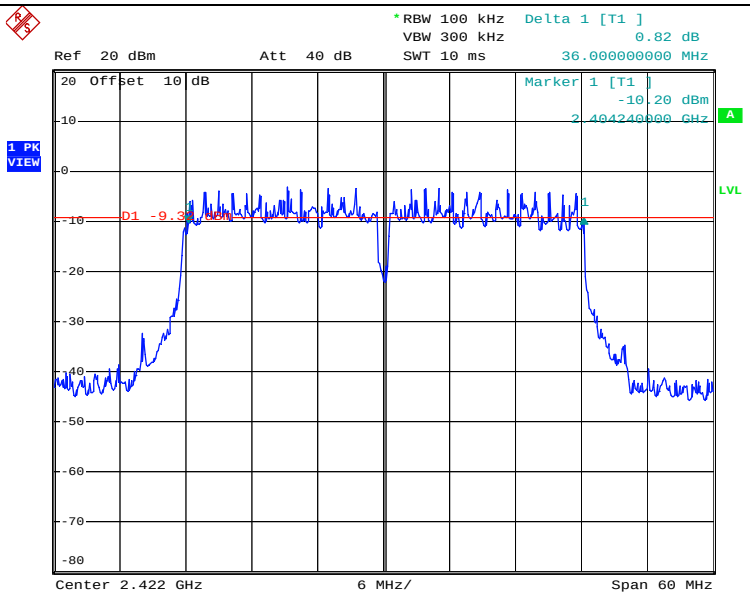
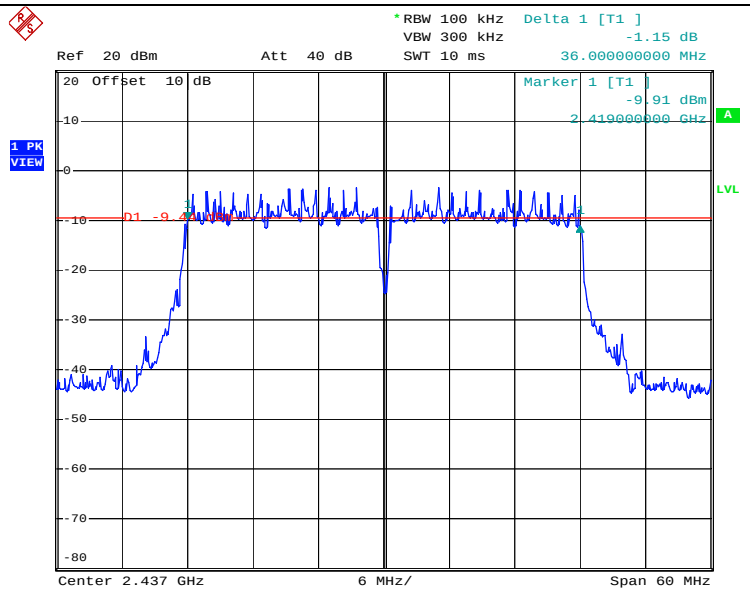
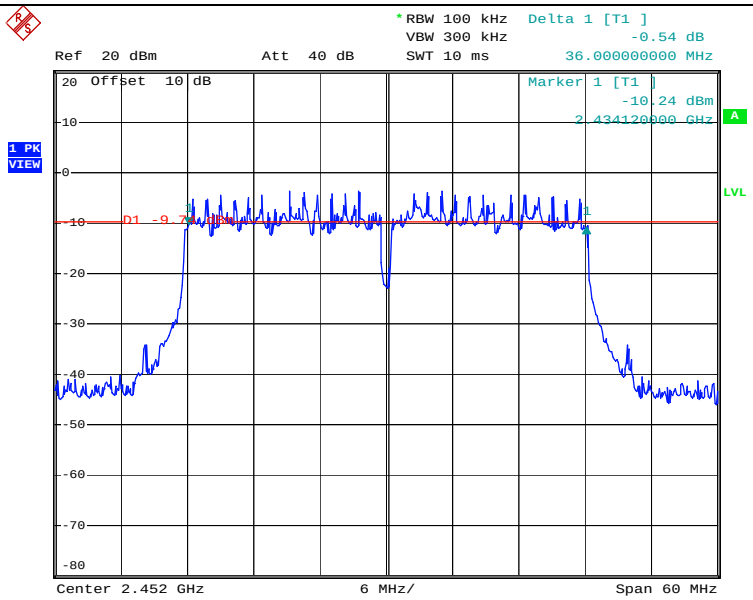
Channel Middle



Channel High



802.11n HT-40/ ANT2

Channel Low	
Channel Middle	
Channel High	

8 OUTPUT POWER MEASUREMENT

8.1 Standard Applicable

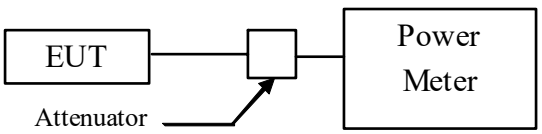
For direct sequence system, according to 15.247(b), the maximum peak output power of the transmitter shall not exceed 1 Watt. If transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

8.2 Measurement Procedure

Measurement Procedure:
9.1.2 PKPM1 Peak power meter method

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.
3. Record the readings on the instrument and add a compensat factor of the attenuator.
4. 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
POWER METER +SENSOR	ANRITSU	ML2487A +MA2491A	2016/05/12	2017/05/11
Attenuator	MINI-CIRCUITS	BW-S10W2+	2016/09/30	2017/09/29
Attenuator	MINI-CIRCUITS	BW-S20W2+	2016/09/30	2017/09/29
Attenuator	MINI-CIRCUITS	BW-S30W2+	2016/09/30	2017/09/29

8.4 Measurement Data

Test Date : Dec. 07, 2016 Temperature : 26 °C Humidity : 65 %

A. 802.11b @1 Mbps

Output Peak Power		dBm	mW
Operation	Channel Low:2412MHz	16.53	**44.978**
	Channel Mid:2437MHz	16.43	**43.954**
	Channel High:2462MHz	16.14	**41.115**

B. 802.11g @6 Mbps

Output Peak Power		dBm	mW
Operation	Channel Low:2412MHz	14.40	**27.542**
	Channel Mid:2437MHz	14.56	**28.576**
	Channel High:2462MHz	14.33	**27.102**

C. 802.11n HT-20 @6.5 Mbps

Antenna1

Output Peak Power		dBm	mW
Operation	Channel Low:2412MHz	12.81	**19.096**
	Channel Mid:2437MHz	12.64	**18.365**
	Channel High:2462MHz	12.42	**17.458**

Antenna2

Output Peak Power		dBm	mW
Operation	Channel Low:2412MHz	12.53	**17.906**
	Channel Mid:2437MHz	12.58	**18.113**
	Channel High:2462MHz	12.49	**17.741**

Total Power (Antenna 1+ Antenna 2)

Output Peak Power		dBm	mW
Operation	Channel Low:2412MHz	15.682	**37.002**
	Channel Mid:2437MHz	15.620	**36.478**
	Channel High:2462MHz	15.462	**35.199**

Remark:

Antenna total gain= 2.7+10log (2)= 5.71dBi. There is no need to reduce the power limit.

D. 802.11n HT-40 @13.5 Mbps

Antenna1

Output Peak Power		dBm	mW
Operation	Channel Low:2422MHz	12.91	**19.543**
	Channel Mid:2437MHz	12.24	**16.749**
	Channel High:2452MHz	12.05	**16.032**

Antenna2

Output Peak Power		dBm	mW
Operation	Channel Low:2422MHz	12.55	**17.989**
	Channel Mid:2437MHz	12.24	**16.749**
	Channel High:2452MHz	12.08	**16.144**

Total Power (Antenna 1+ Antenna 2)

Output Peak Power		dBm	mW
Operation	Channel Low:2422MHz	15.744	**37.532**
	Channel Mid:2437MHz	15.250	**33.498**
	Channel High:2452MHz	15.075	**32.176**

Remark:

Antenna total gain= 2.7+10log (2)= 5.71dBi. There is no need to reduce the power limit.

Note : The expanded uncertainty: 2dB.

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	2016/10/03	2017/10/02
Attenuator	MINI-CIRCUITS	BW-S10W2+	2016/09/30	2017/09/29
Attenuator	MINI-CIRCUITS	BW-S20W2+	2016/09/30	2017/09/29
Attenuator	MINI-CIRCUITS	BW-S30W2+	2016/09/30	2017/09/29

9.4 Measurement Data

Test Date : Dec. 01, 2016 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 @6.5 Mbps 2x2 MIMO

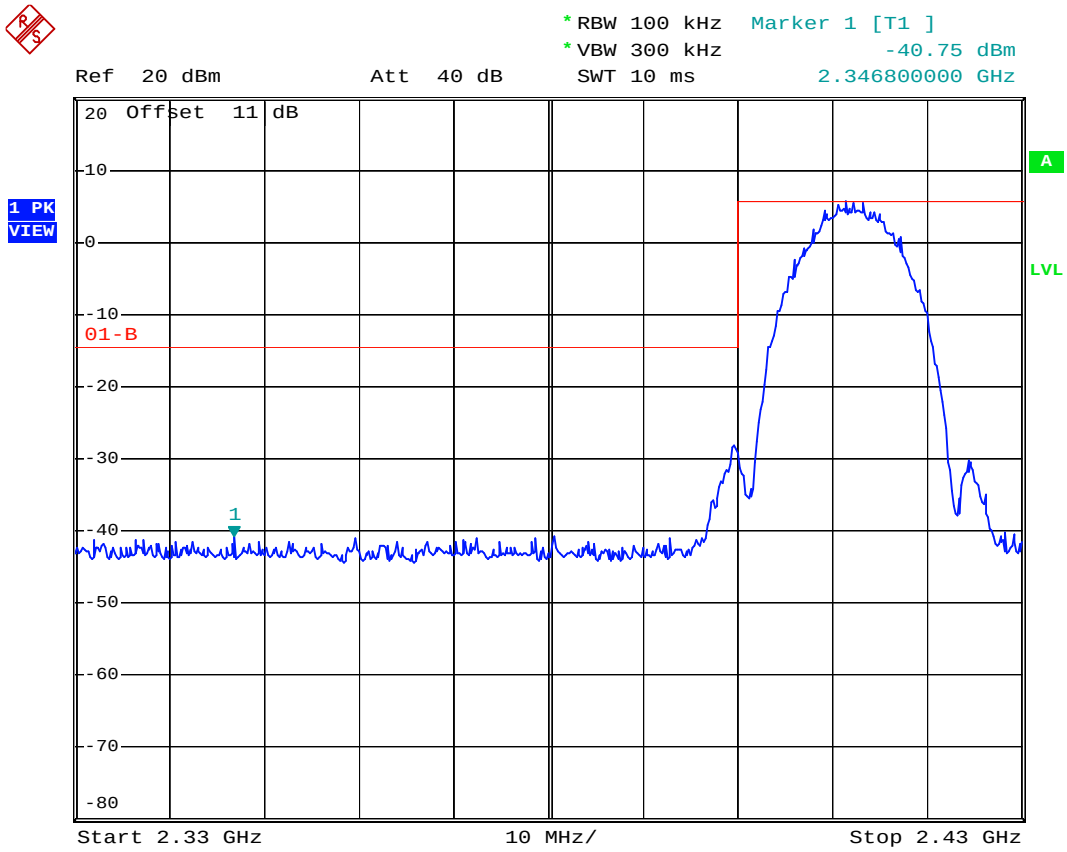
a) Lower Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.
b) Upper Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.

D. 802.11n HT-40 @13.5 Mbps 2x2 MIMO

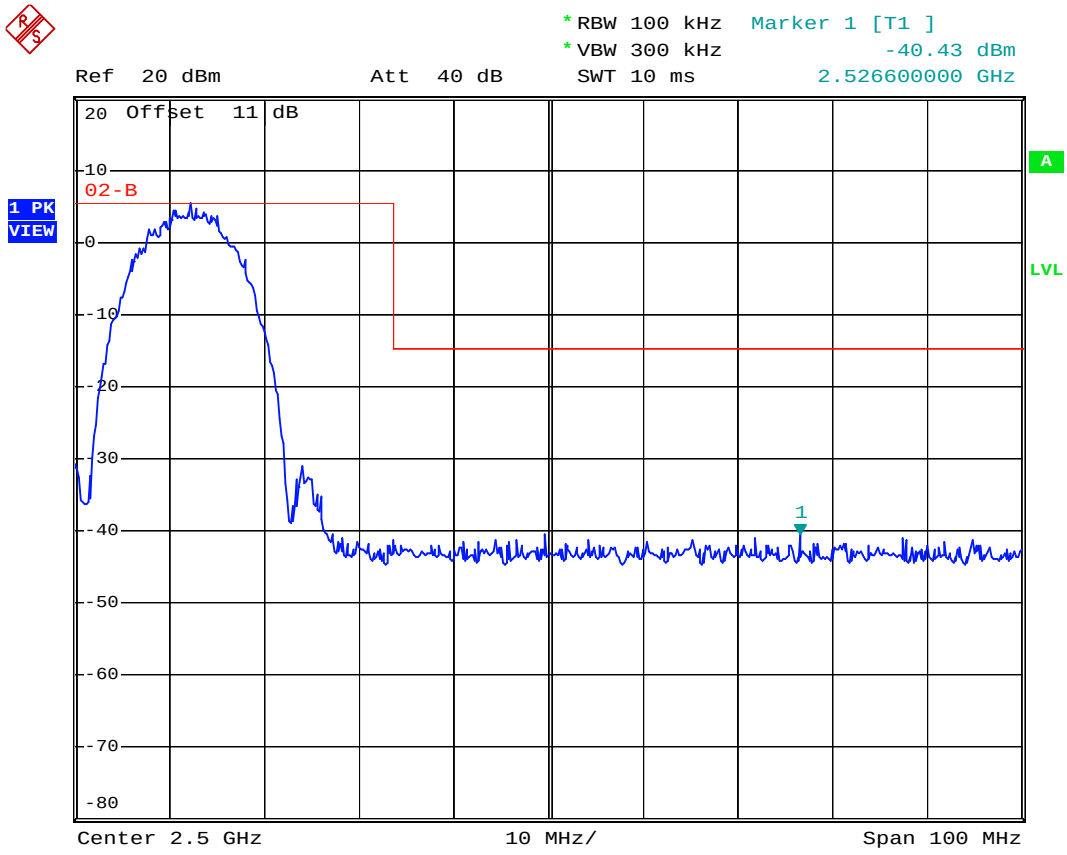
a) Lower Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.
b) Upper Band Edge : All emissions in this 100kHz bandwidth are attenuated more than 20dB from the carrier.

Note : The expanded uncertainty: 2dB.

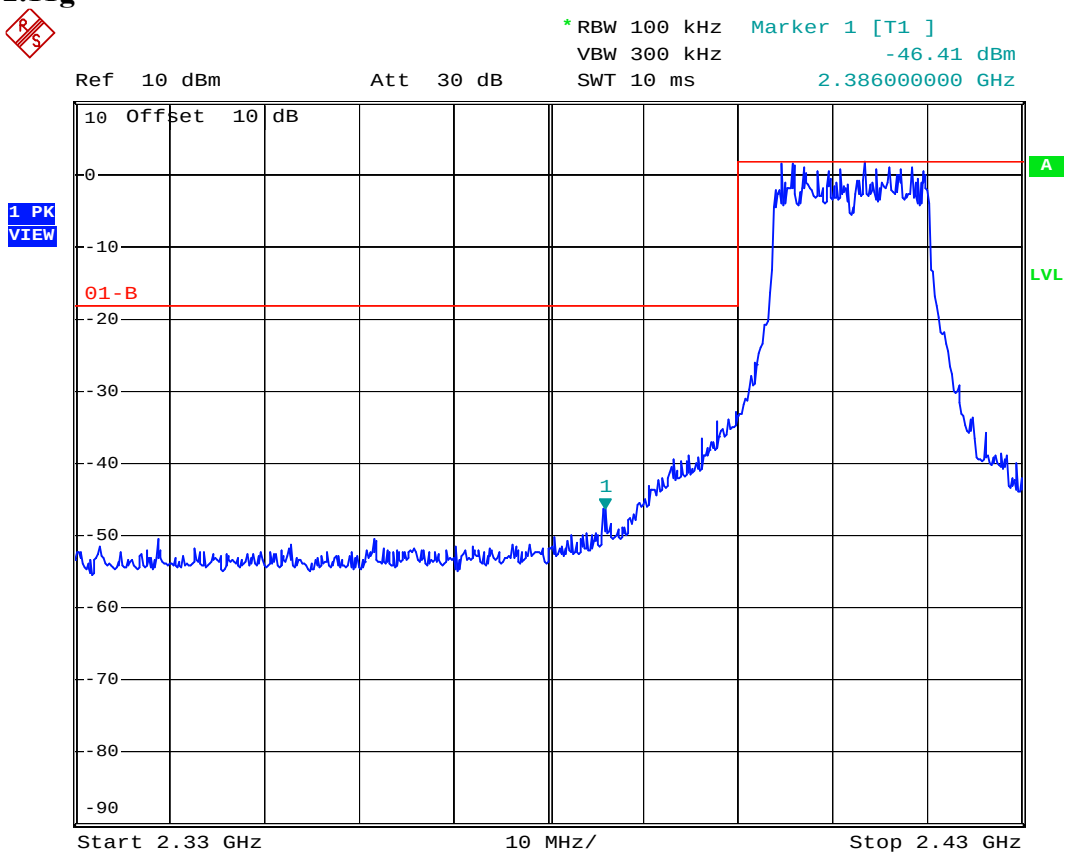
802.11b



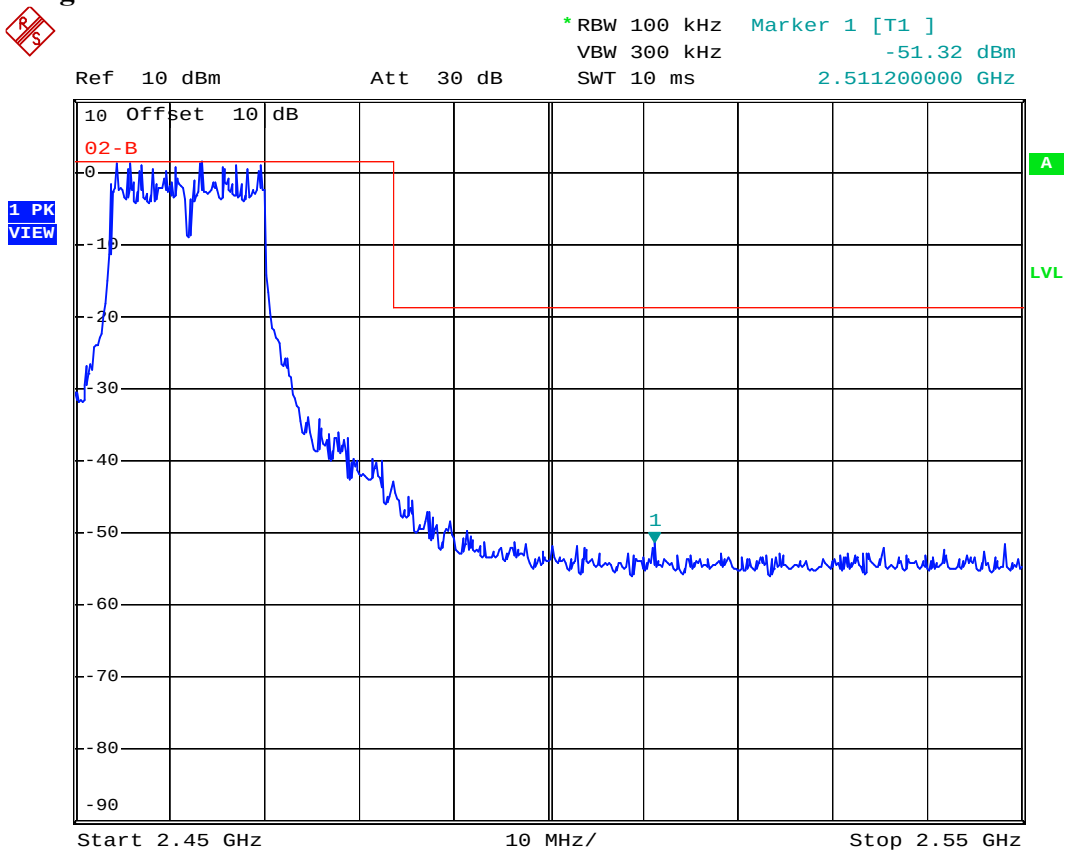
802.11b



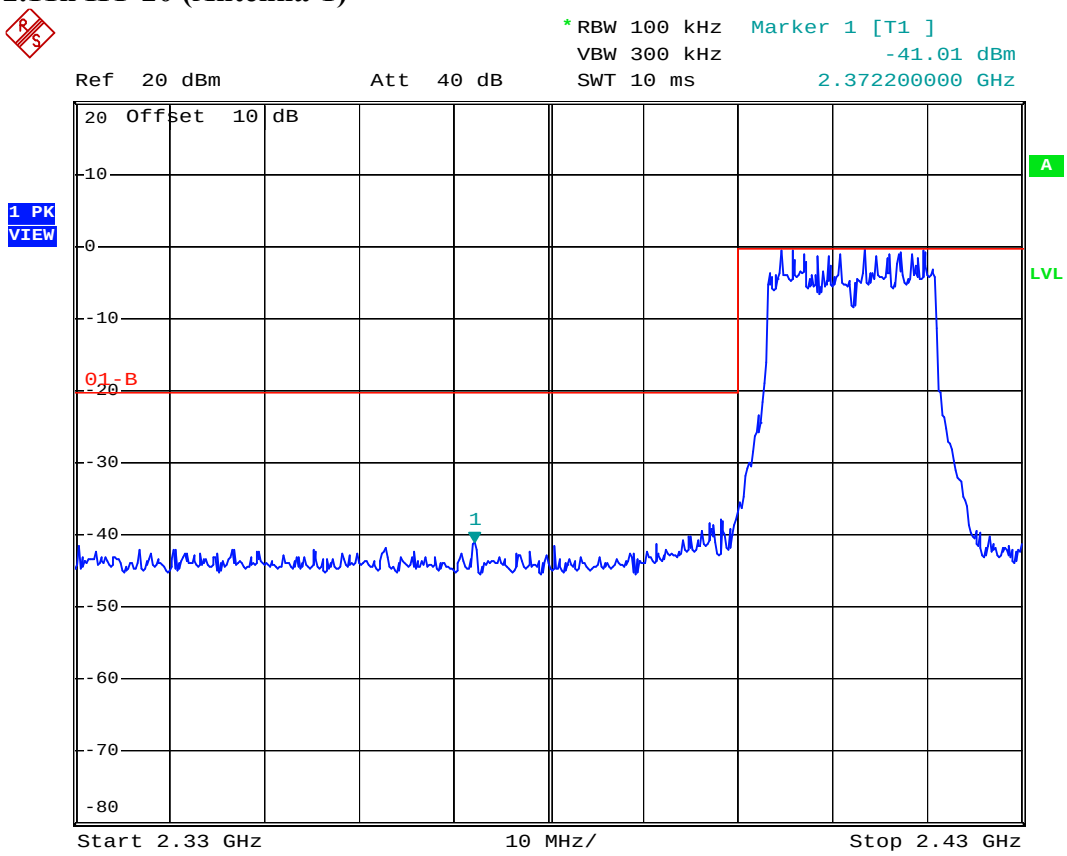
802.11g



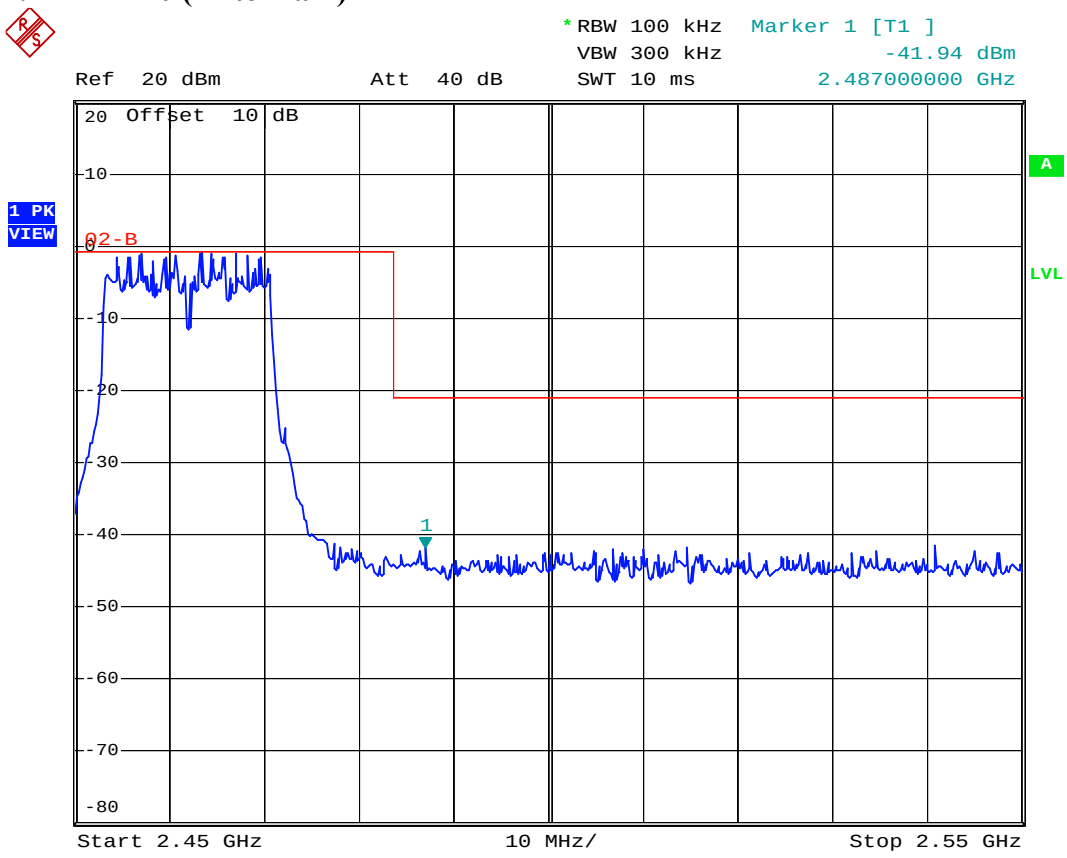
802.11g



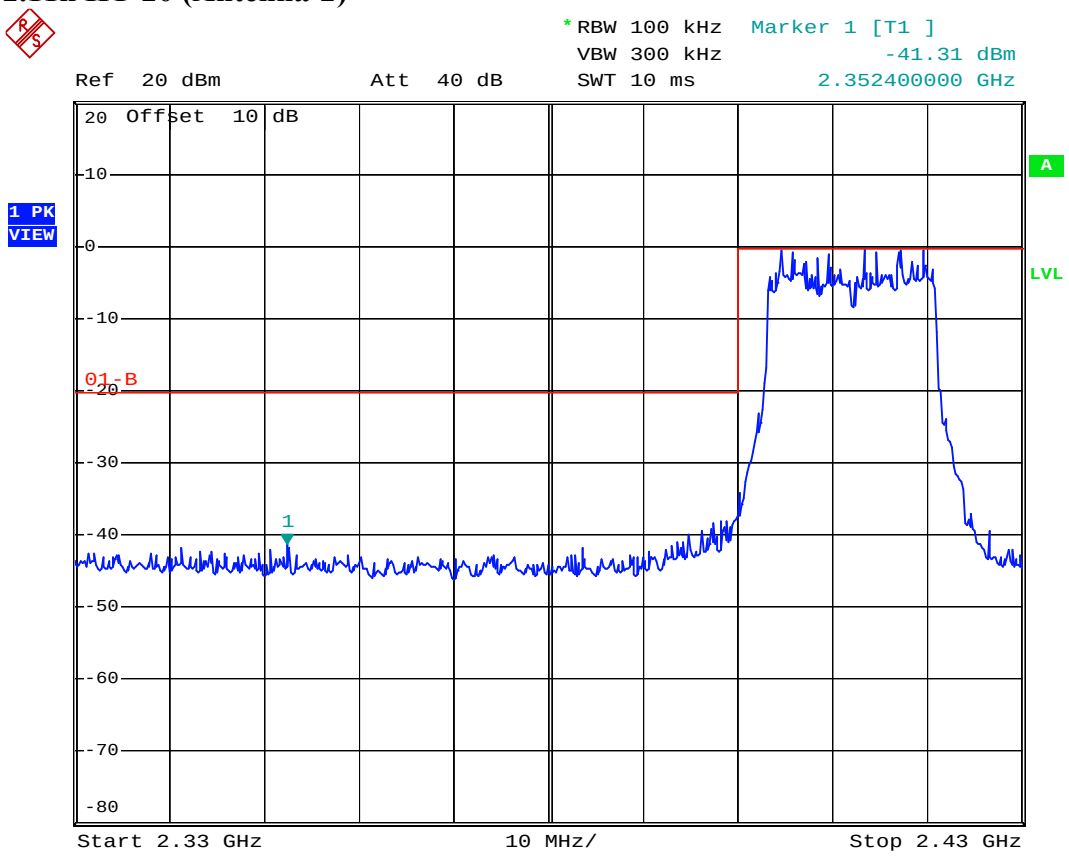
802.11n HT-20 (Antenna-1)



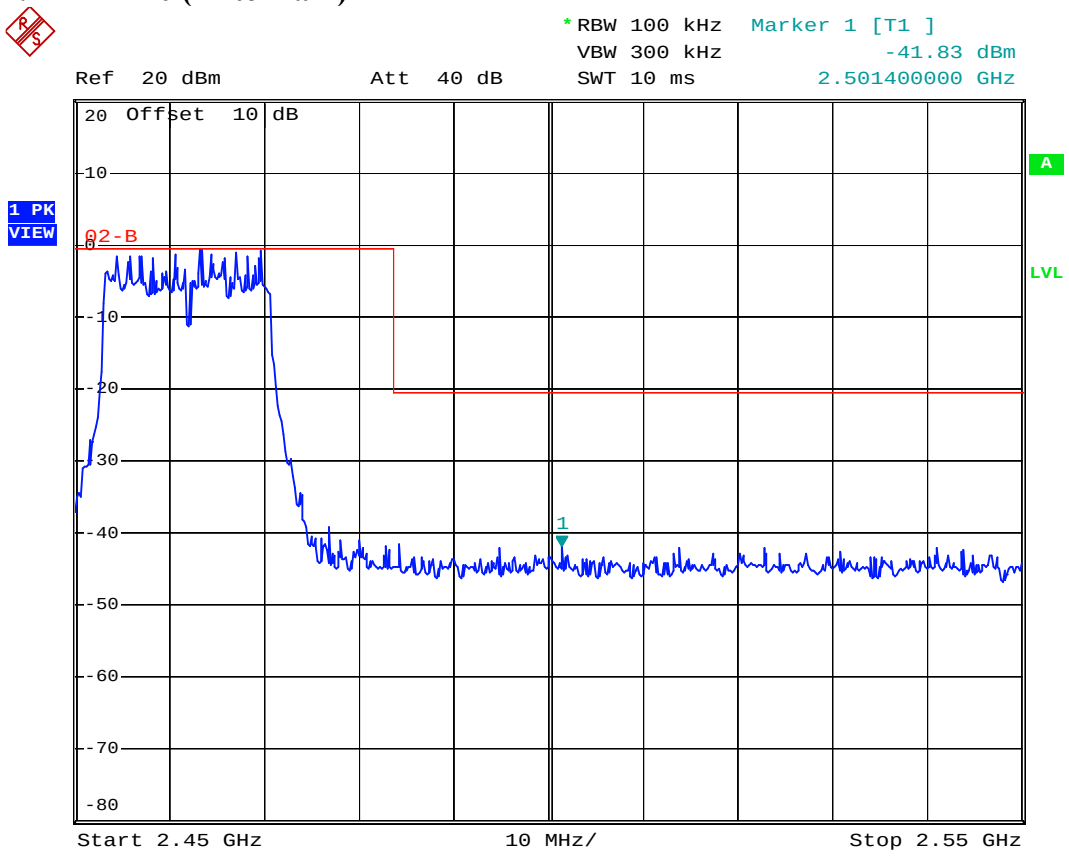
802.11n HT-20 (Antenna-1)



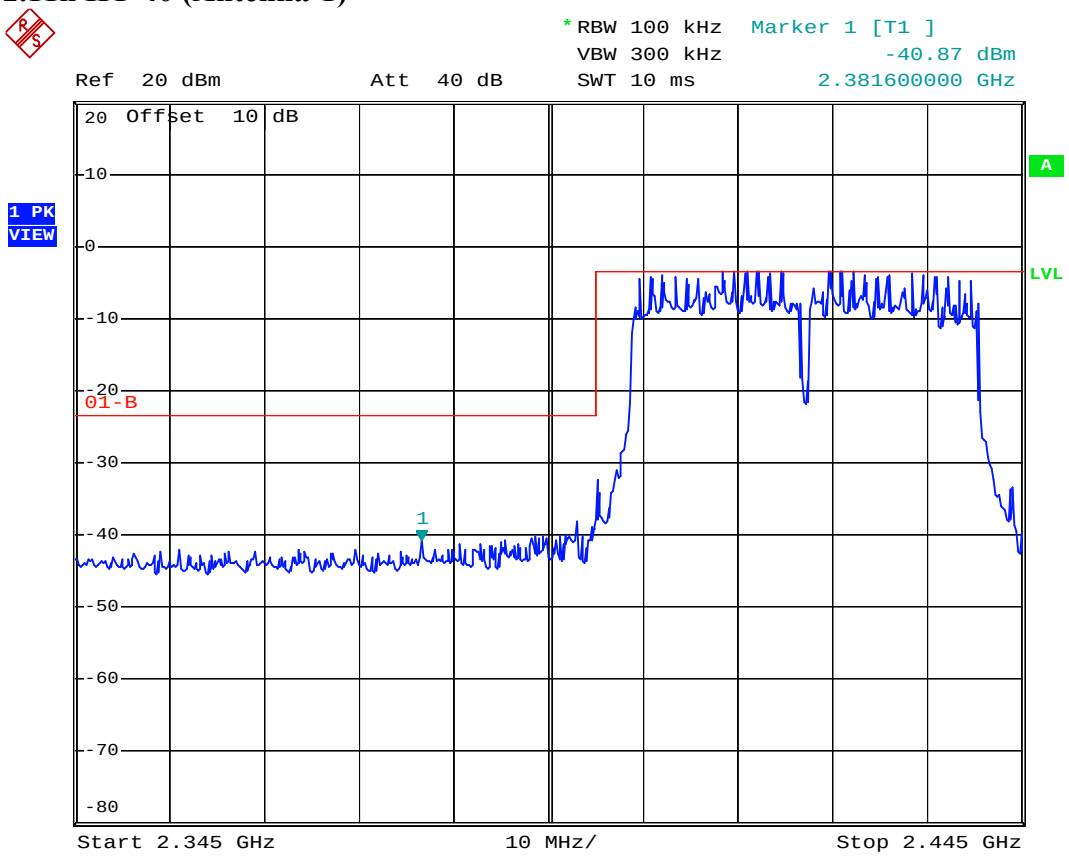
802.11n HT-20 (Antenna-2)



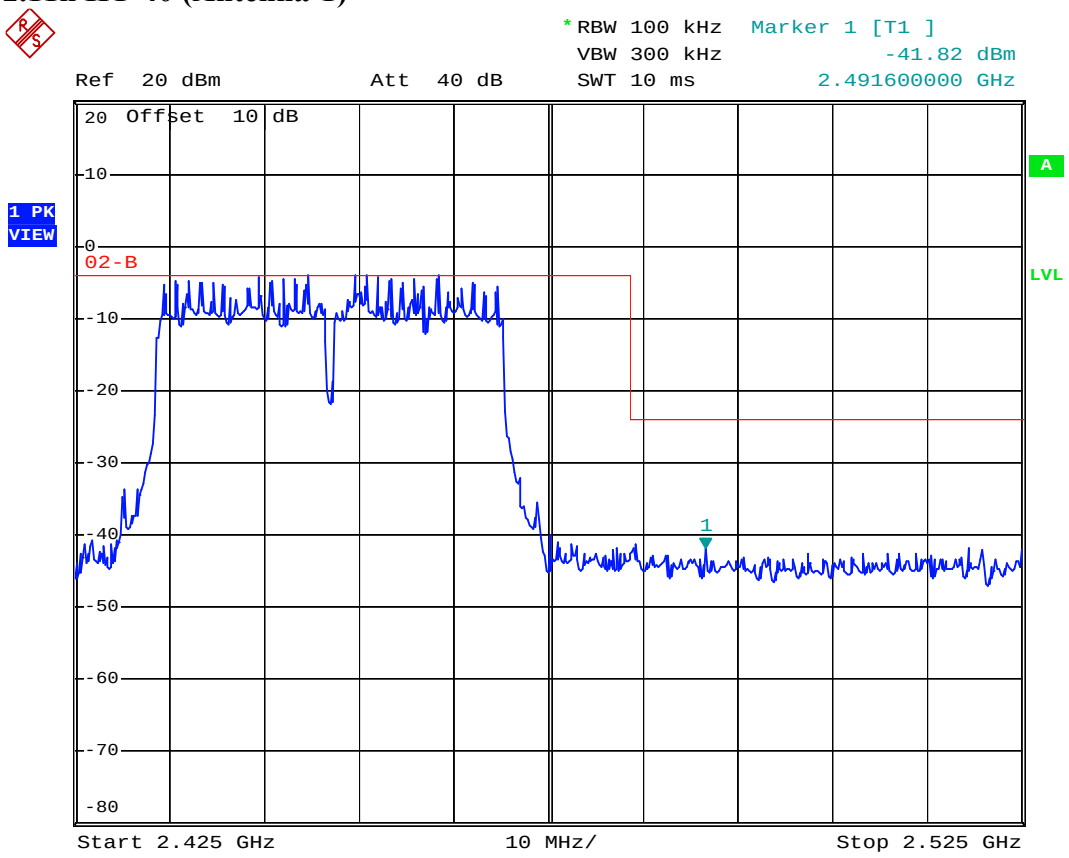
802.11n HT-20 (Antenna-2)



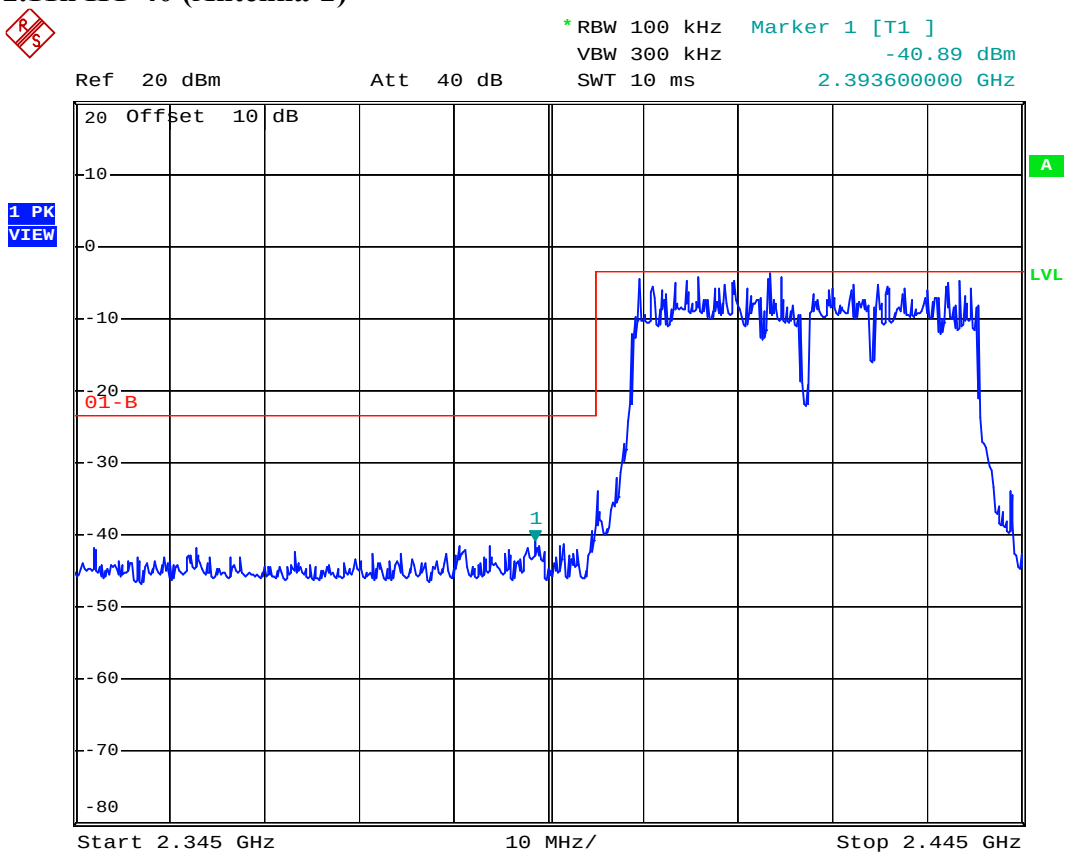
802.11n HT-40 (Antenna-1)



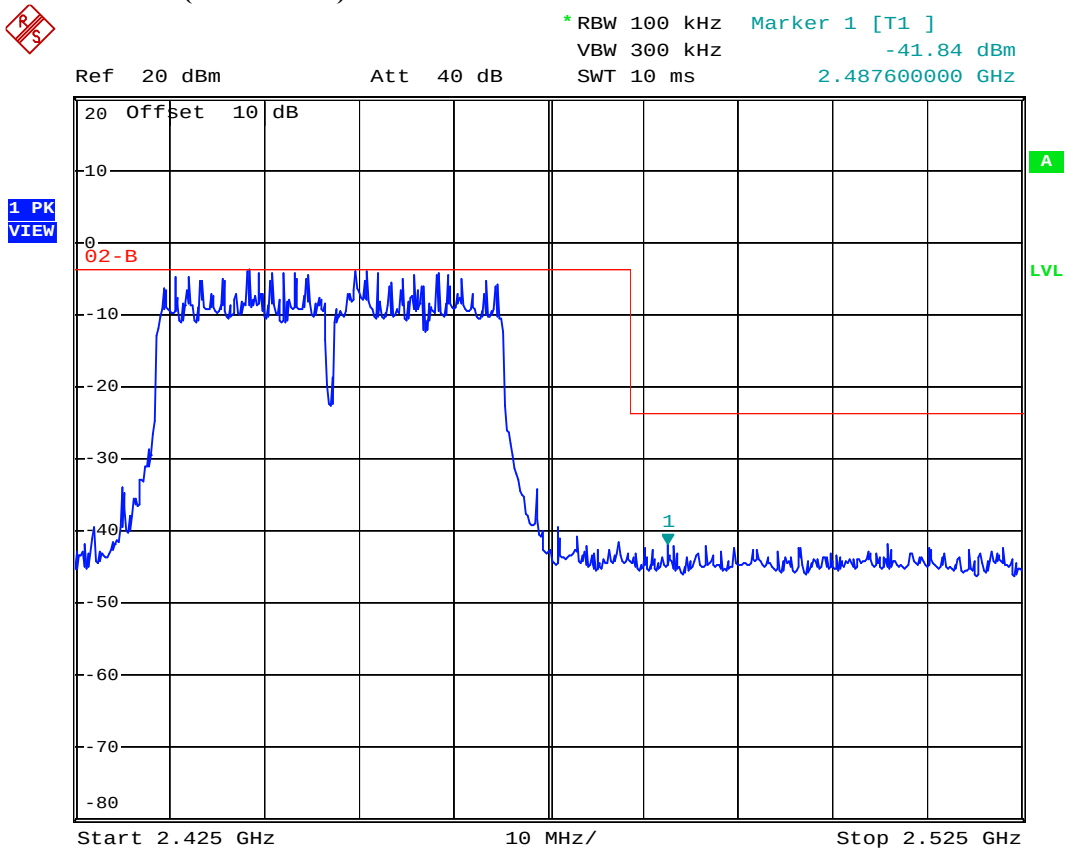
802.11n HT-40 (Antenna-1)



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

Measurement Method: PKPSD

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 analyzer center frequency to DTS channel center frequency.
4. Set the span to 1.5 times the DTS bandwidth.
5. Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
6. Set the VBW ≥ 3 x RBW.
7. Detector = peak.
8. Sweep time = auto couple.
9. Trace mode = max hold.
10. Allow trace to fully stabilize.
11. Use the peak marker function to determine the maximum amplitude level within the RBW.
12. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.
13. 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	2016/10/03	2017/10/02
Attenuator	MINI-CIRCUITS	BW-S10W2+	2016/09/30	2017/09/29
Attenuator	MINI-CIRCUITS	BW-S20W2+	2016/09/30	2017/09/29
Attenuator	MINI-CIRCUITS	BW-S30W2+	2016/09/30	2017/09/29

10.4 Measurement Data

Test Date : Dec. 07, 2016 Temperature : 25 °C Humidity : 65 %

A. 802.11b @1 Mbps

a)	Channel Low:	Maximun PSD is	-8.92	dBm
b)	Channel Mid:	Maximun PSD is	-9.01	dBm
c)	Channel High:	Maximun PSD is	-9.35	dBm

B. 802.11g @6 Mbps

a)	Channel Low:	Maximun PSD is	-13.93	dBm
b)	Channel Mid:	Maximun PSD is	-11.89	dBm
c)	Channel High:	Maximun PSD is	-13.00	dBm

C. 802.11n HT-20 @6.5 Mbps

Antenna1

a)	Channel Low:	Maximun PSD is	-15.80	dBm
b)	Channel Mid:	Maximun PSD is	-16.10	dBm
c)	Channel High:	Maximun PSD is	-16.41	dBm

Antenna2

a)	Channel Low:	Maximun PSD is	-15.49	dBm
b)	Channel Mid:	Maximun PSD is	-16.64	dBm
c)	Channel High:	Maximun PSD is	-16.17	dBm

Total PSD (Antenna1+Antenna2)

a)	Channel Low:	Maximun PSD is	-12.63	dBm
b)	Channel Mid:	Maximun PSD is	-13.35	dBm
c)	Channel High:	Maximun PSD is	-13.28	dBm

Remark:

Antenna total gain= 2.7+10log (2)= 5.71dBi. There is no need to reduce the PSD limit.

D. 802.11n HT-40 @13.5 Mbps

Antenna1

a) Channel Low: Maximun PSD is -17.22 dBm
b) Channel Mid: Maximun PSD is -17.74 dBm
c) Channel High: Maximun PSD is -17.80 dBm

Antenna2

a) Channel Low: Maximun PSD is -17.84 dBm
b) Channel Mid: Maximun PSD is -17.68 dBm
c) Channel High: Maximun PSD is -19.23 dBm

Total PSD (Antenna1+Antenna2)

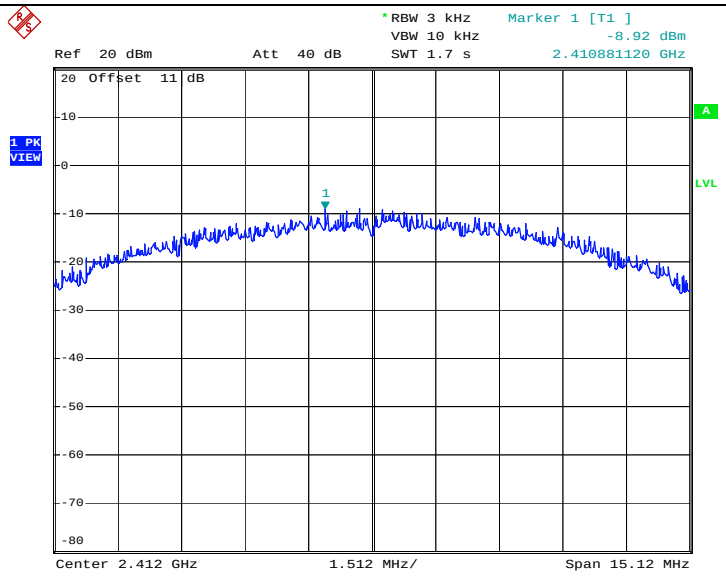
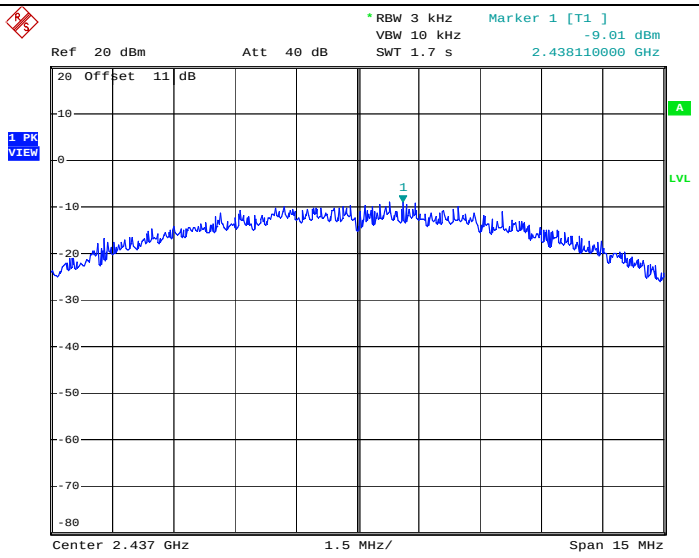
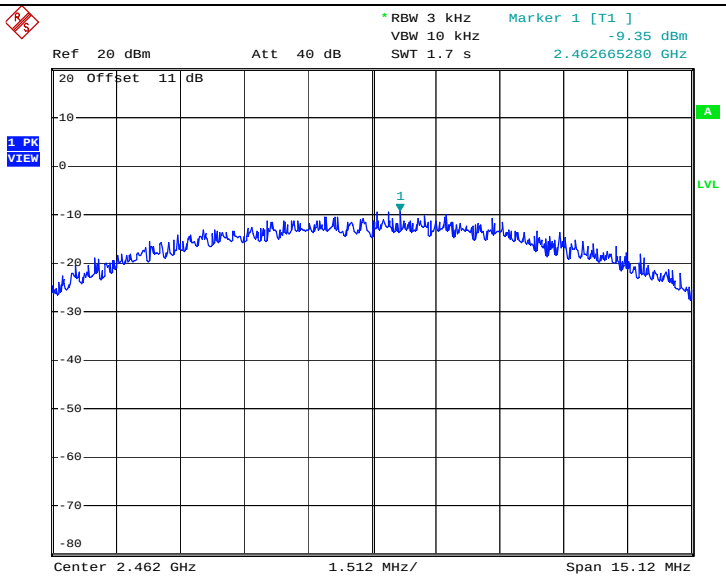
a) Channel Low: Maximun PSD is -14.51 dBm
b) Channel Mid: Maximun PSD is -14.70 dBm
c) Channel High: Maximun PSD is -15.45 dBm

Remark:

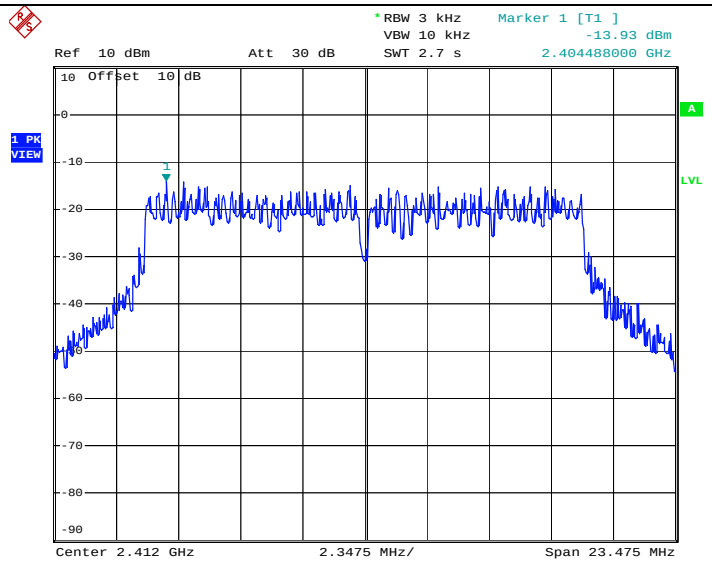
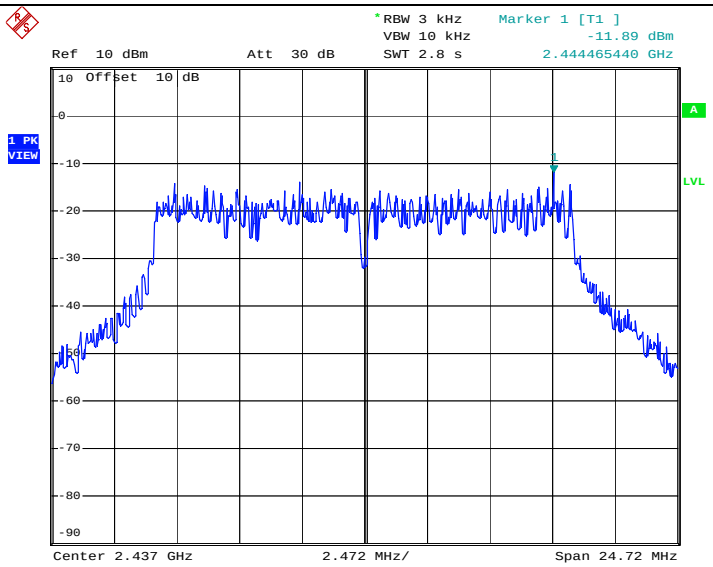
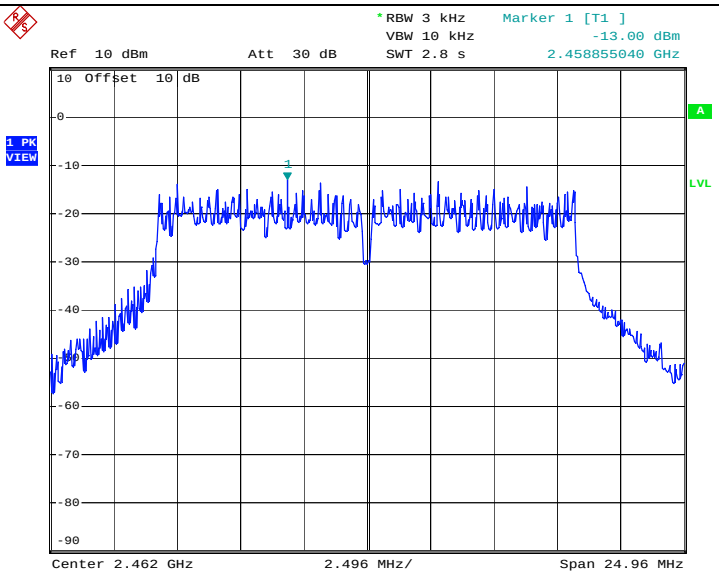
Antenna total gain= 2.7+10log (2)= 5.71dBi. There is no need to reduce the PSD limit.

Note : The expanded uncertainty: 2dB.

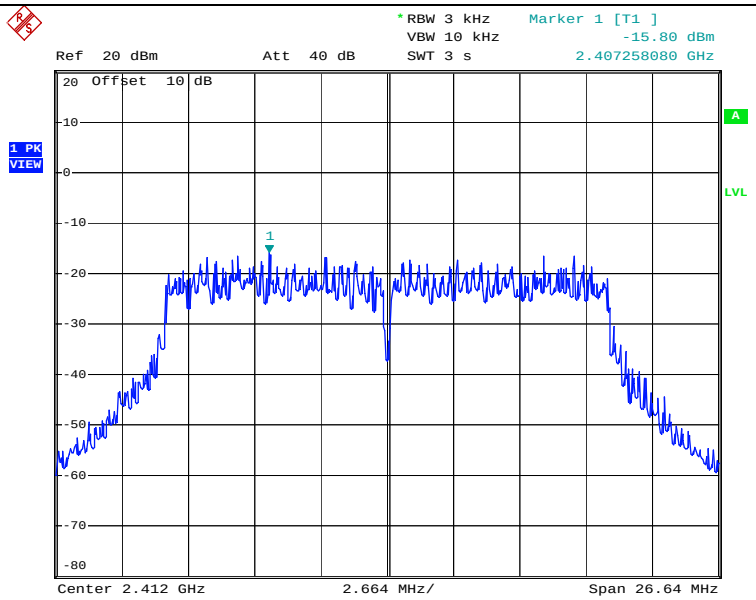
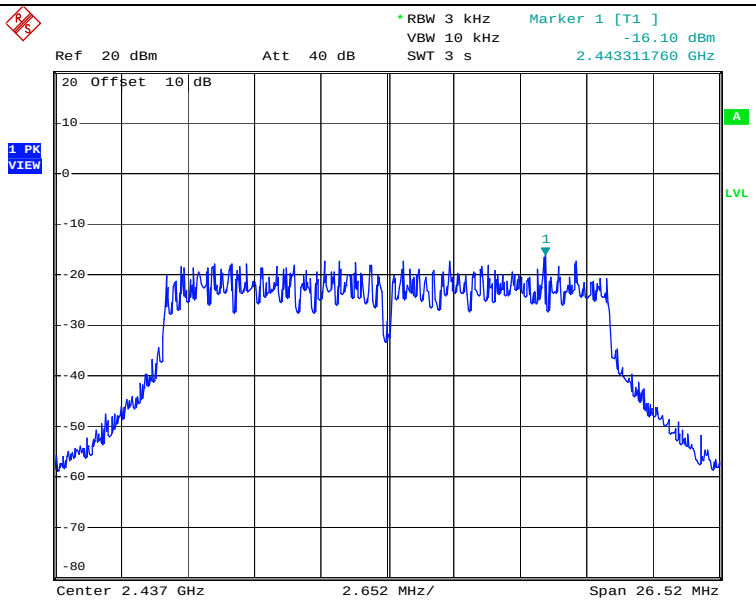
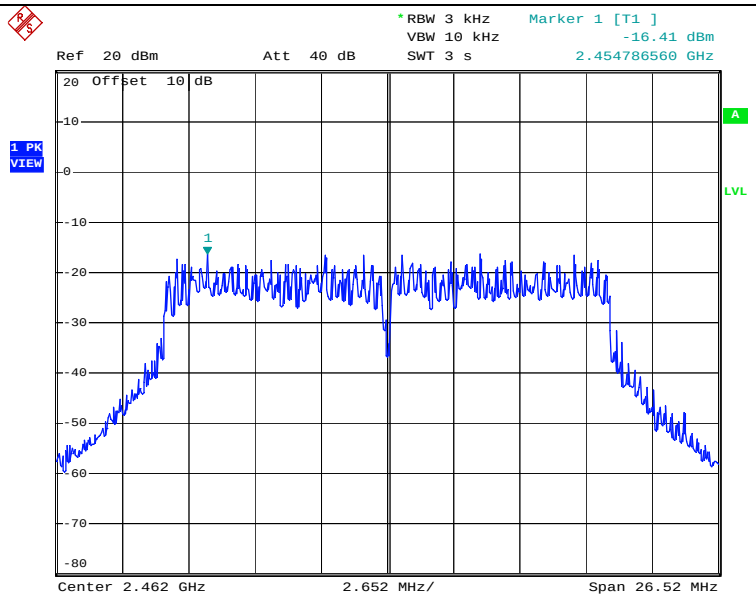
802.11b

Channel Low	
Channel Middle	
Channel High	

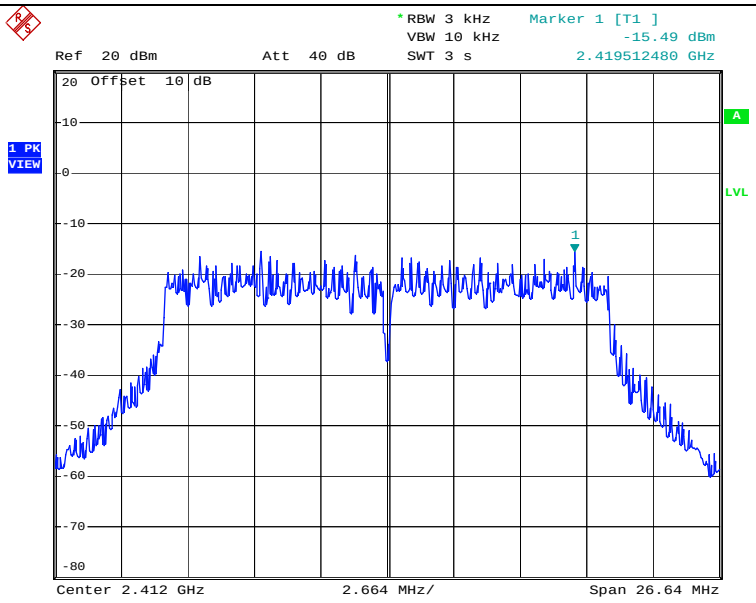
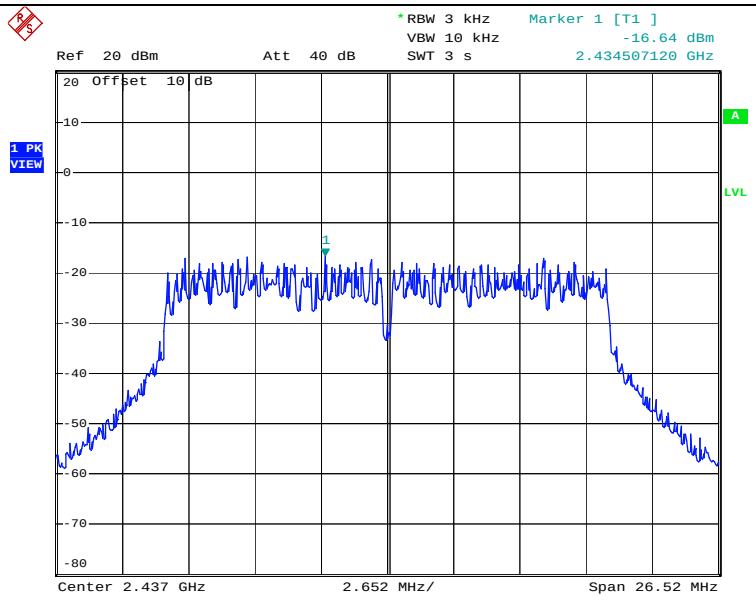
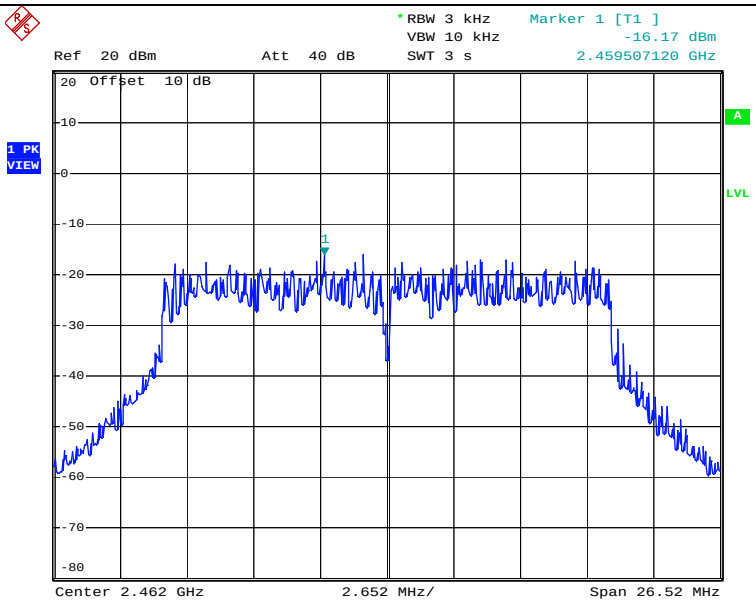
802.11g

Channel Low	
Channel Middle	
Channel High	

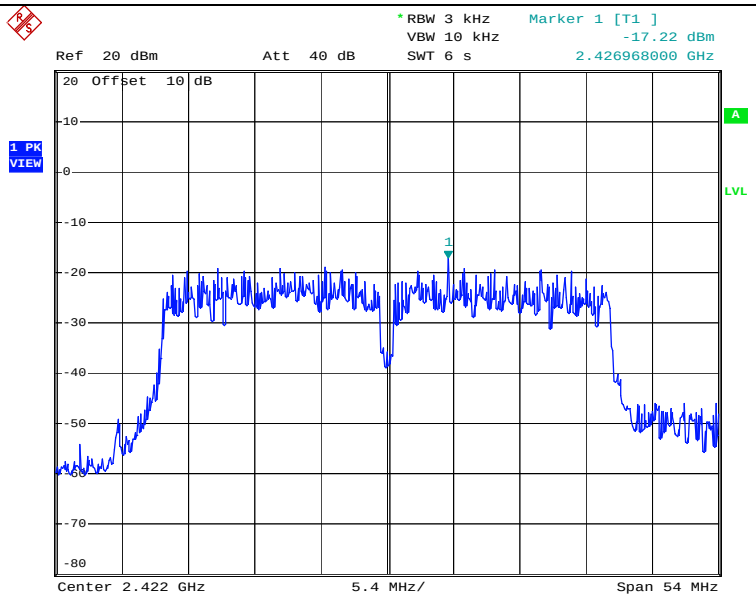
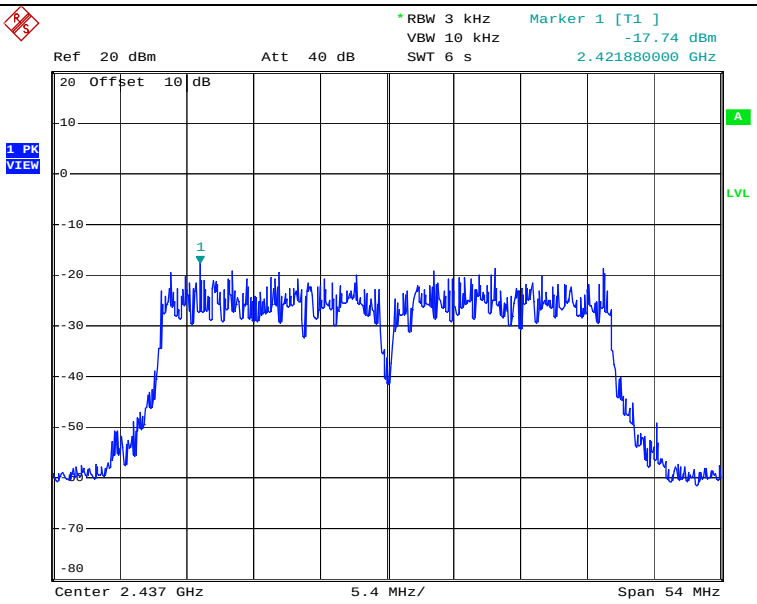
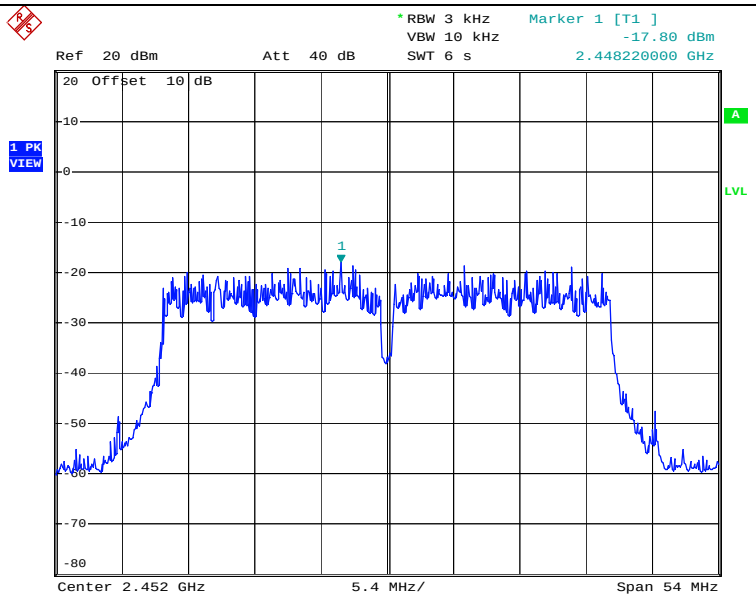
802.11n HT-20 / Antenna-1

Channel Low	
Channel Middle	
Channel High	

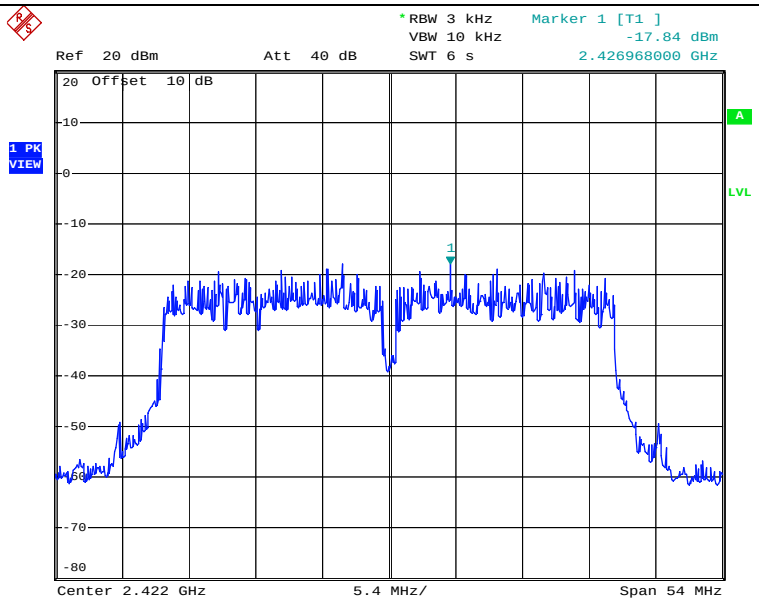
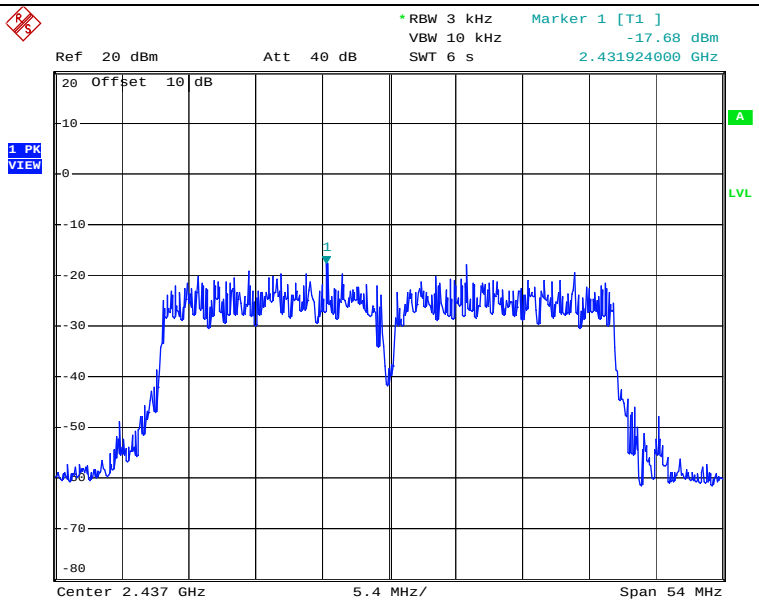
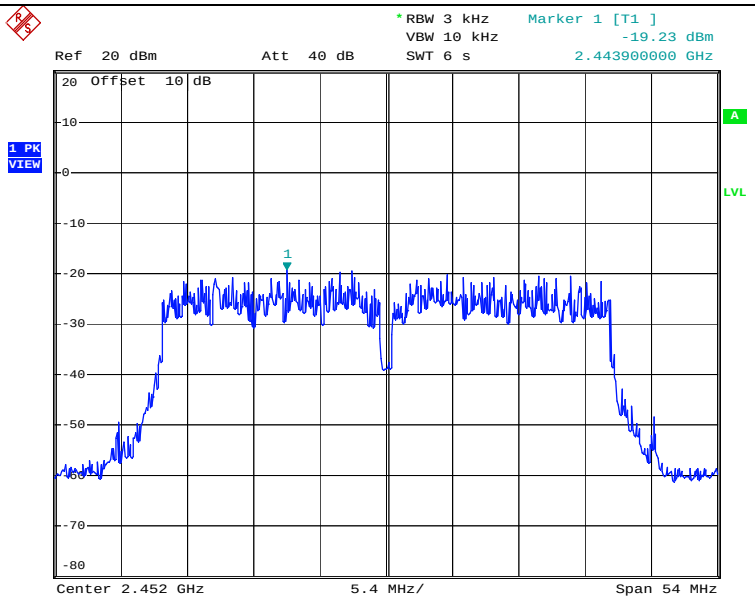
802.11n HT-20 / Antenna-2

Channel Low	
Channel Middle	
Channel High	

802.11n HT-40 / Antenna-1

Channel Low	
Channel Middle	
Channel High	

802.11n HT-40 / Antenna-2

Channel Low	
Channel Middle	
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 ≥ 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	2016/10/03	2017/10/02
Attenuator	MINI-CIRCUITS	BW-S10W2+	2016/09/30	2017/09/29
Attenuator	MINI-CIRCUITS	BW-S20W2+	2016/09/30	2017/09/29
Attenuator	MINI-CIRCUITS	BW-S30W2+	2016/09/30	2017/09/29

11.4 Measurement Data

Test Date : Dec. 01, 2016 Temperature : 25 °C Humidity : 65 %

A. 802.11b @1 Mbps

Mode: Channel Low, Mid, High

30 MHz 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

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

C. 802.11n HT-20 @6.5 Mbps

Mode: Channel Low, Mid, High

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

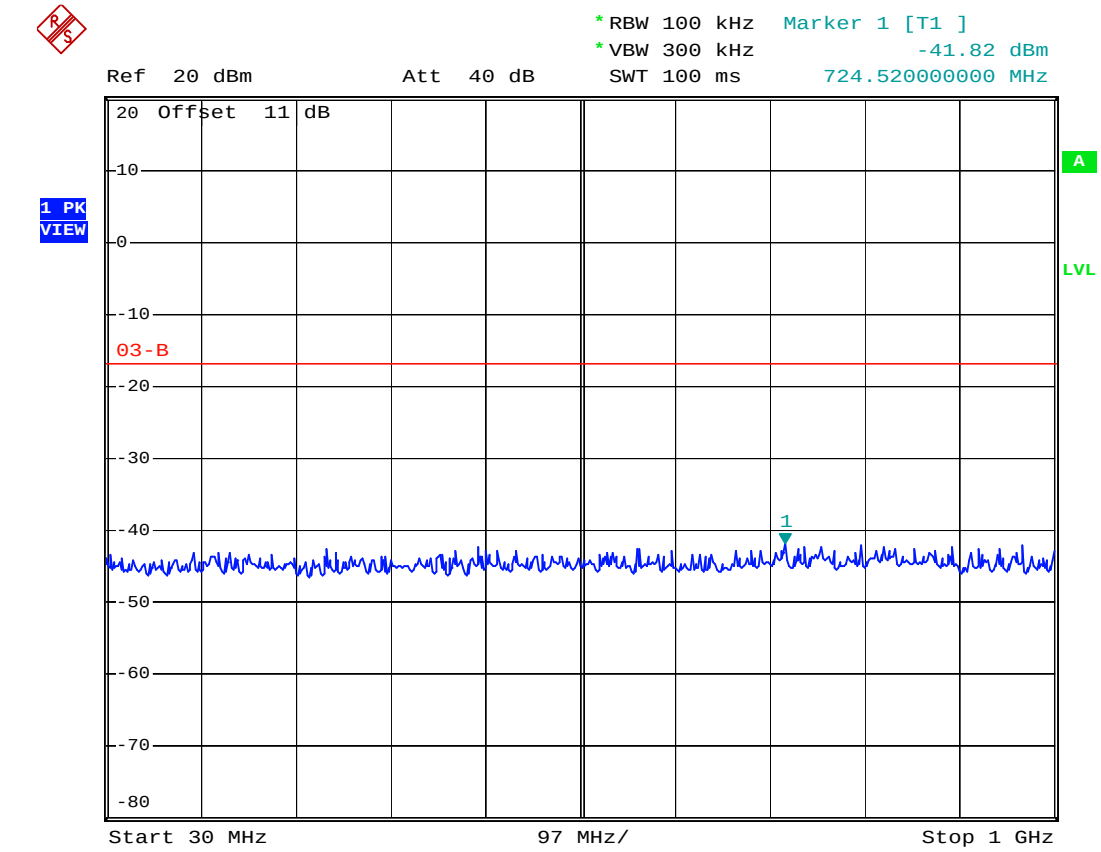
D. 802.11n HT-40 @13.5 Mbps

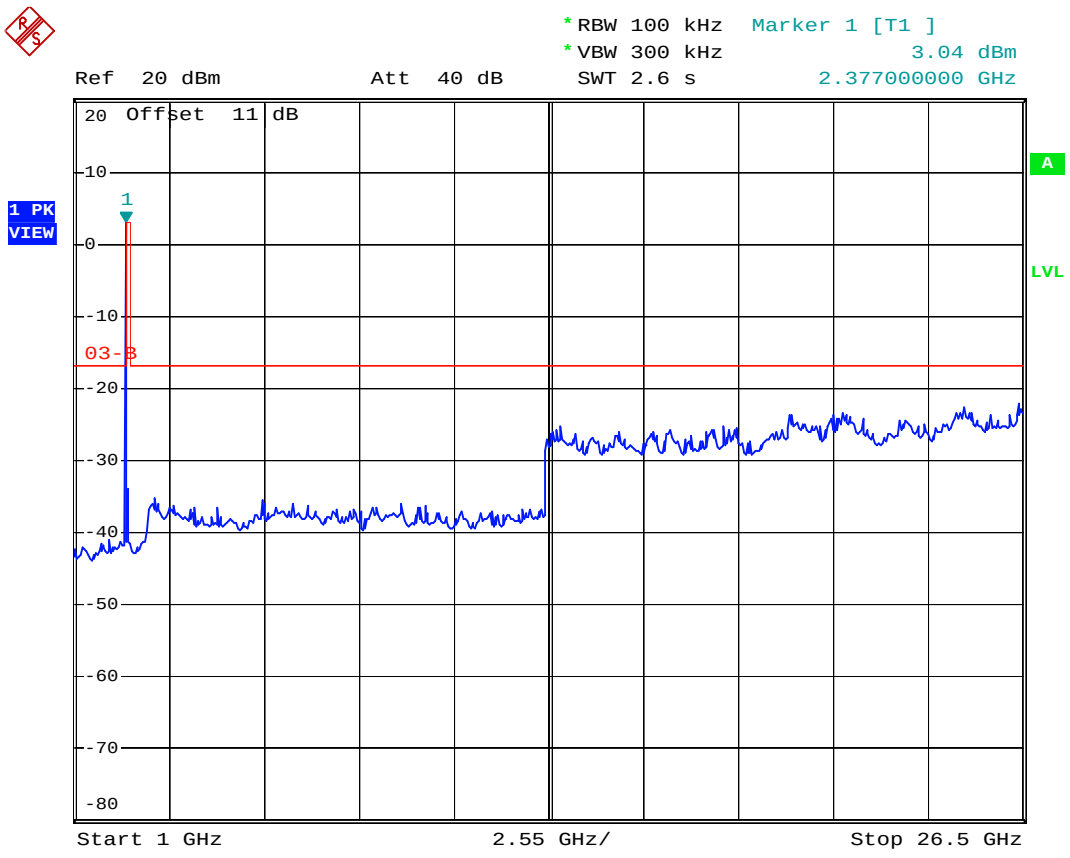
Mode: Channel Low, Mid, High

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

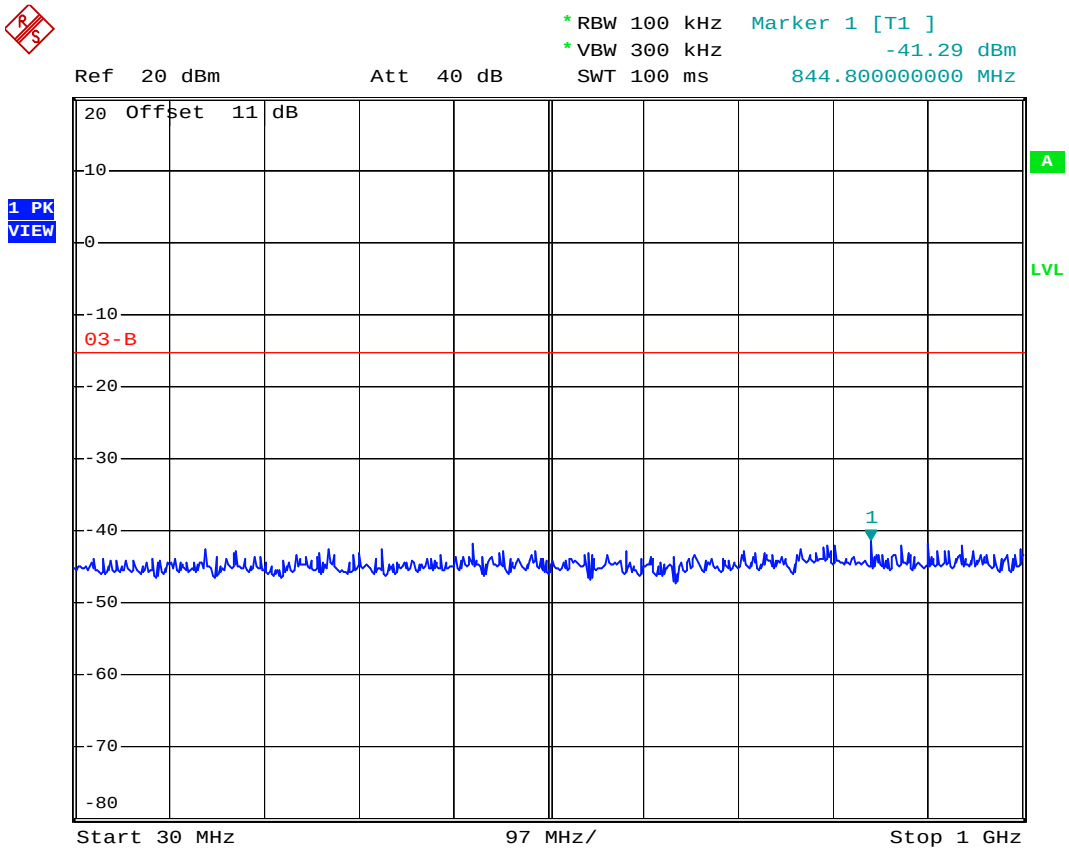
Note : The expanded uncertainty: 2dB.

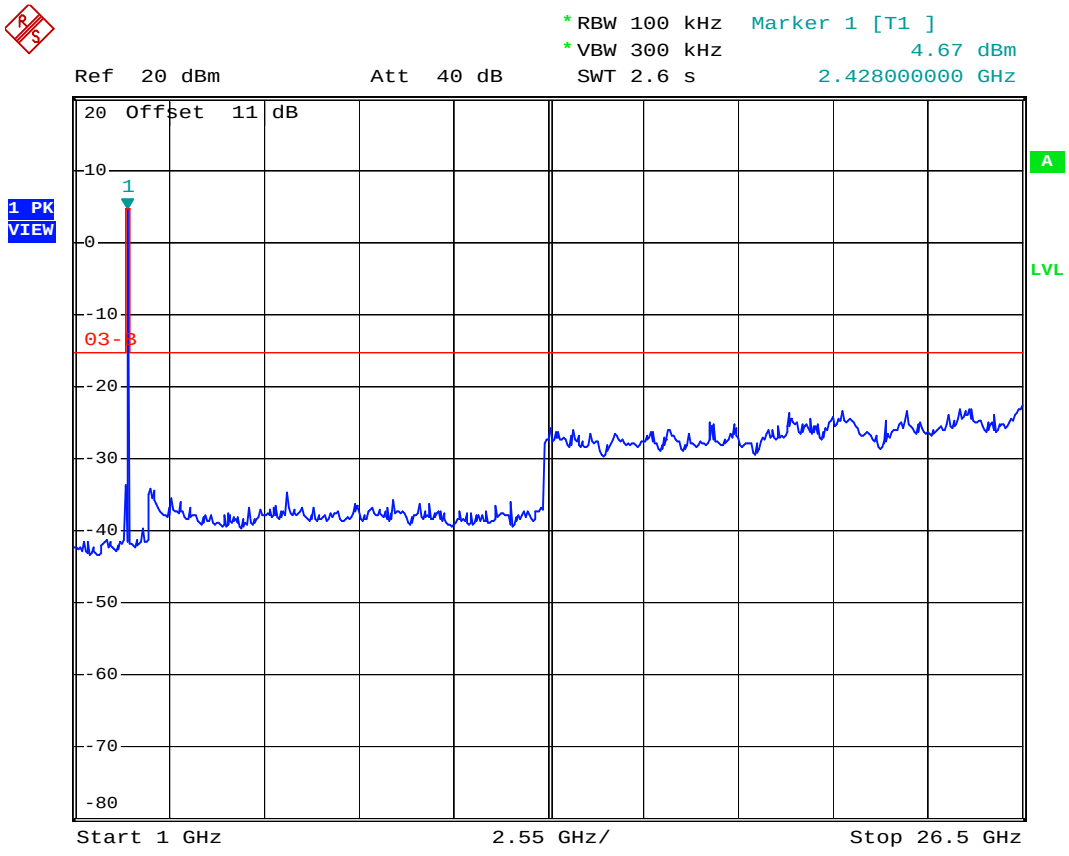
802.11b / Channel Low



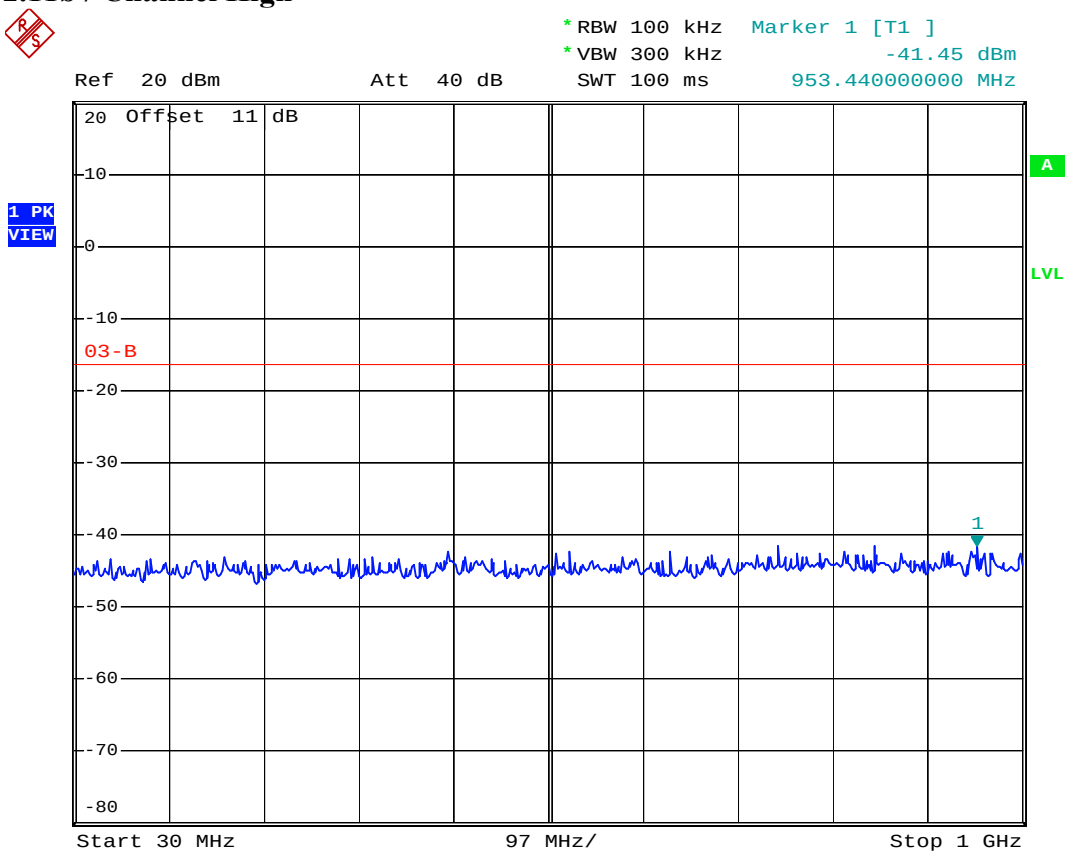


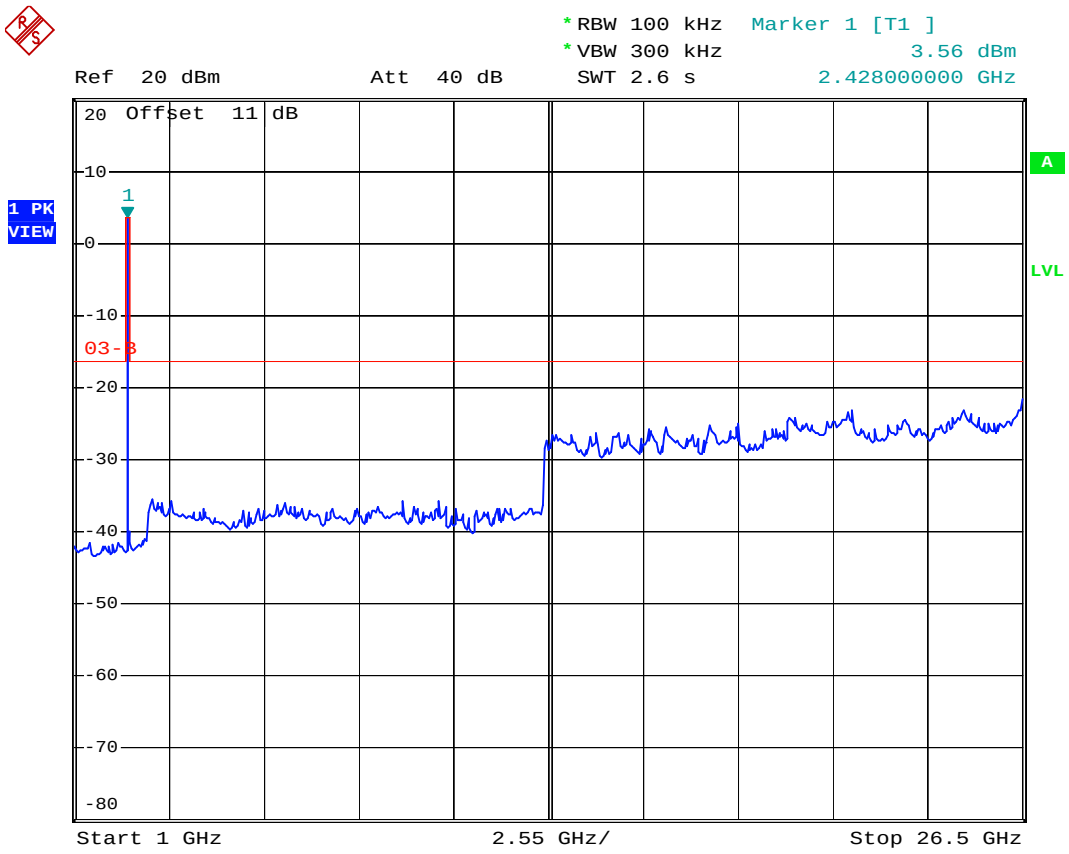
802.11b / Channel Mid



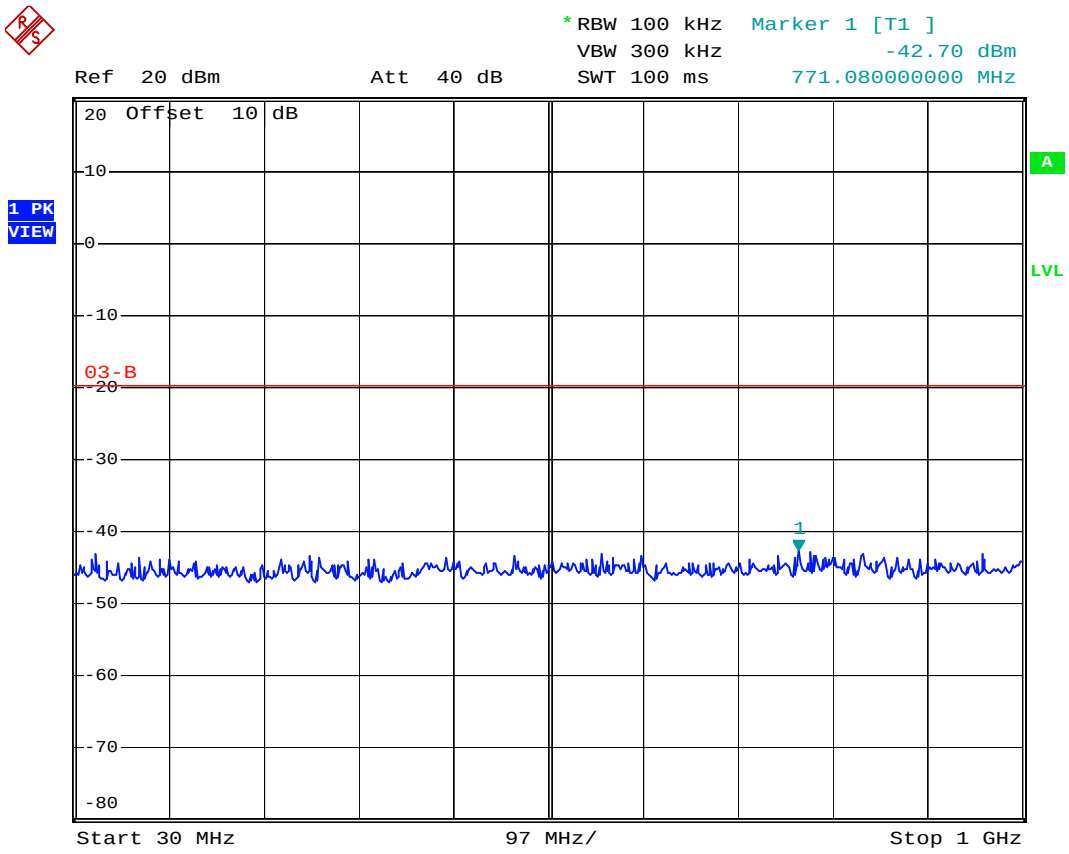


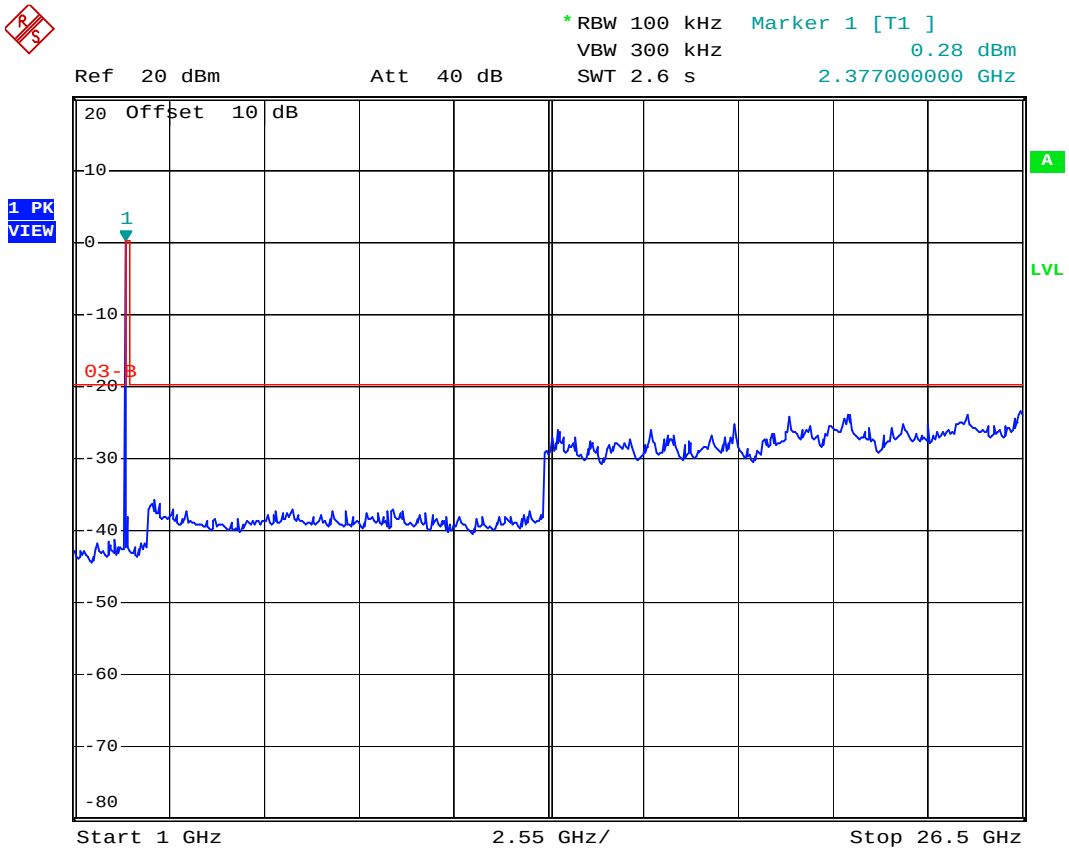
802.11b / Channel High



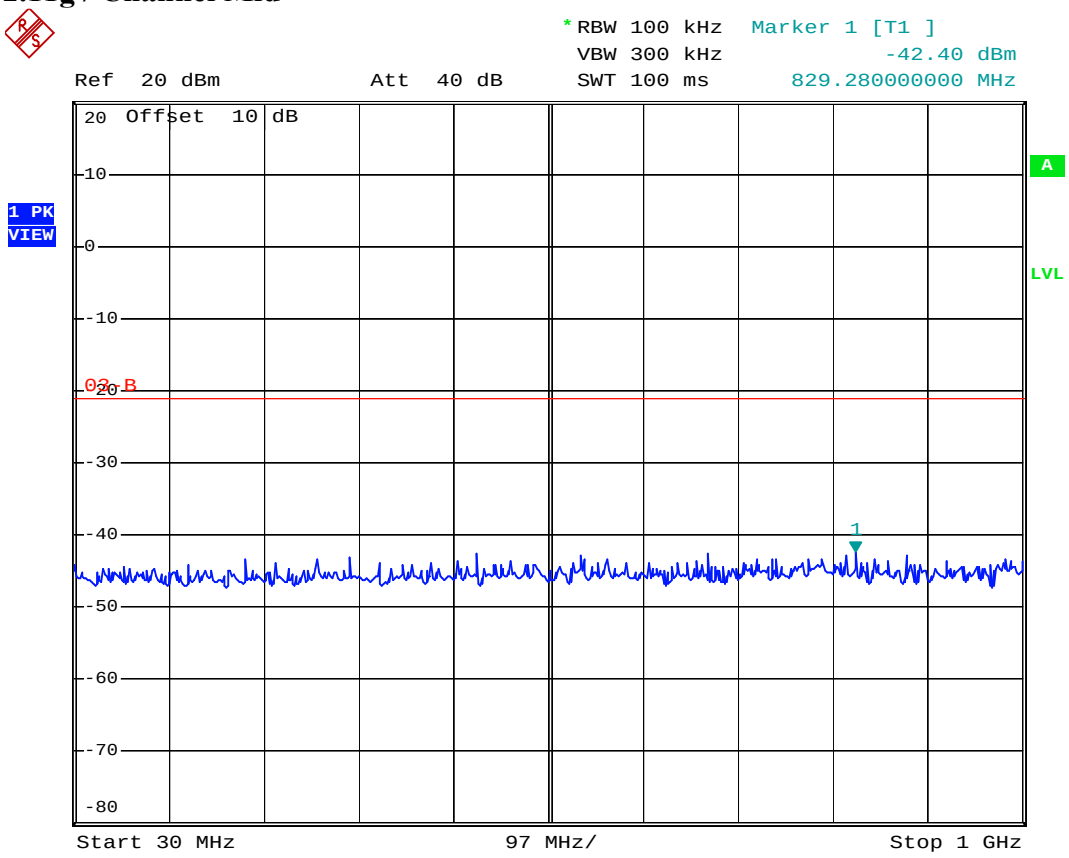


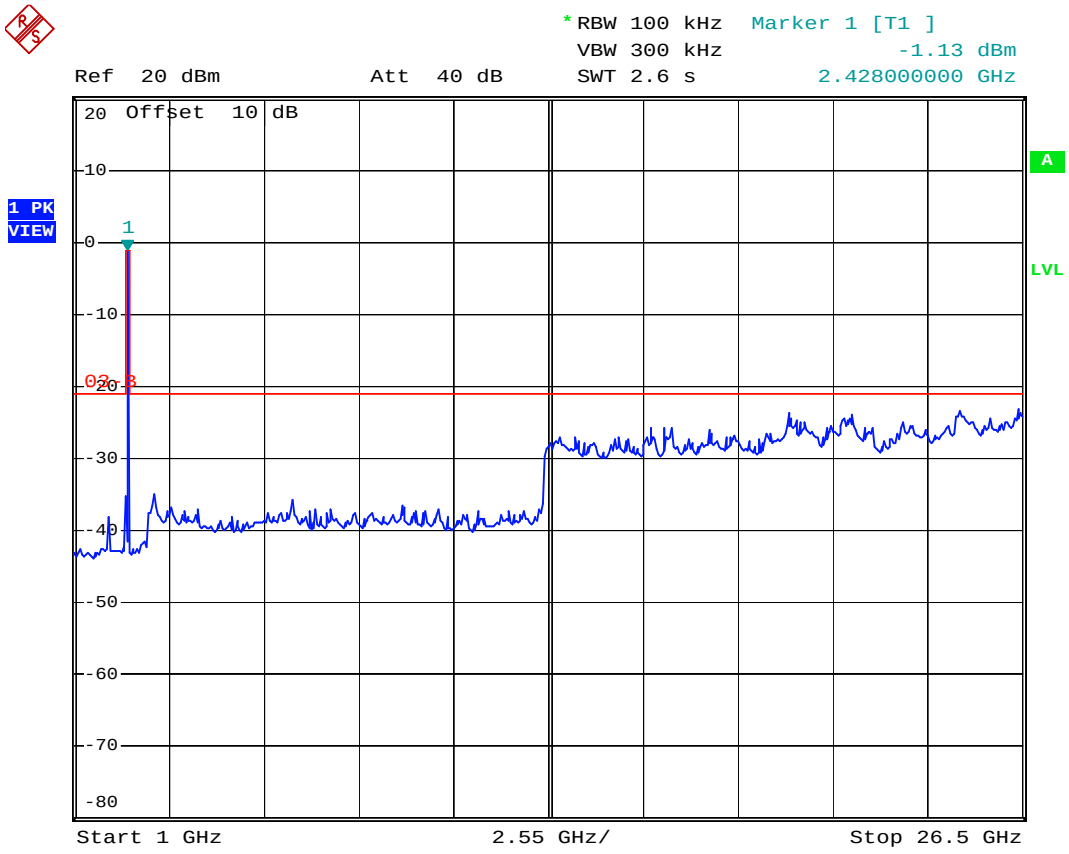
802.11g / Channel Low



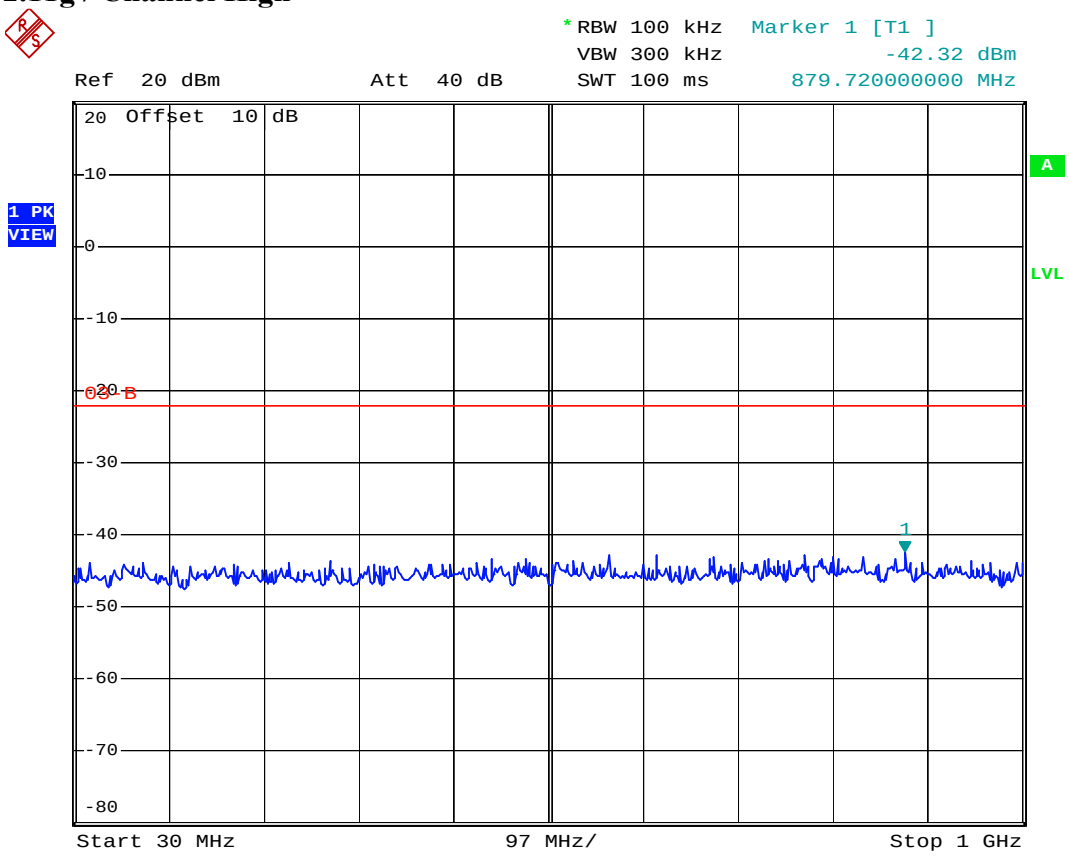


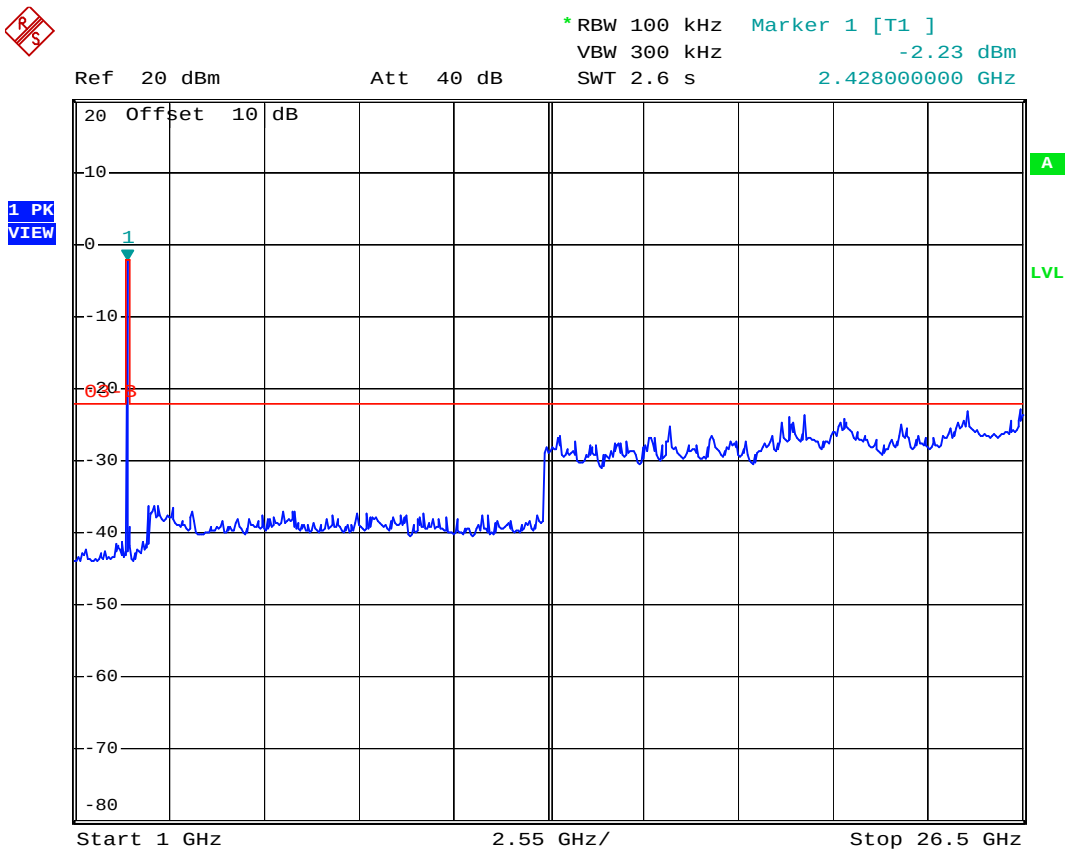
802.11g / Channel Mid



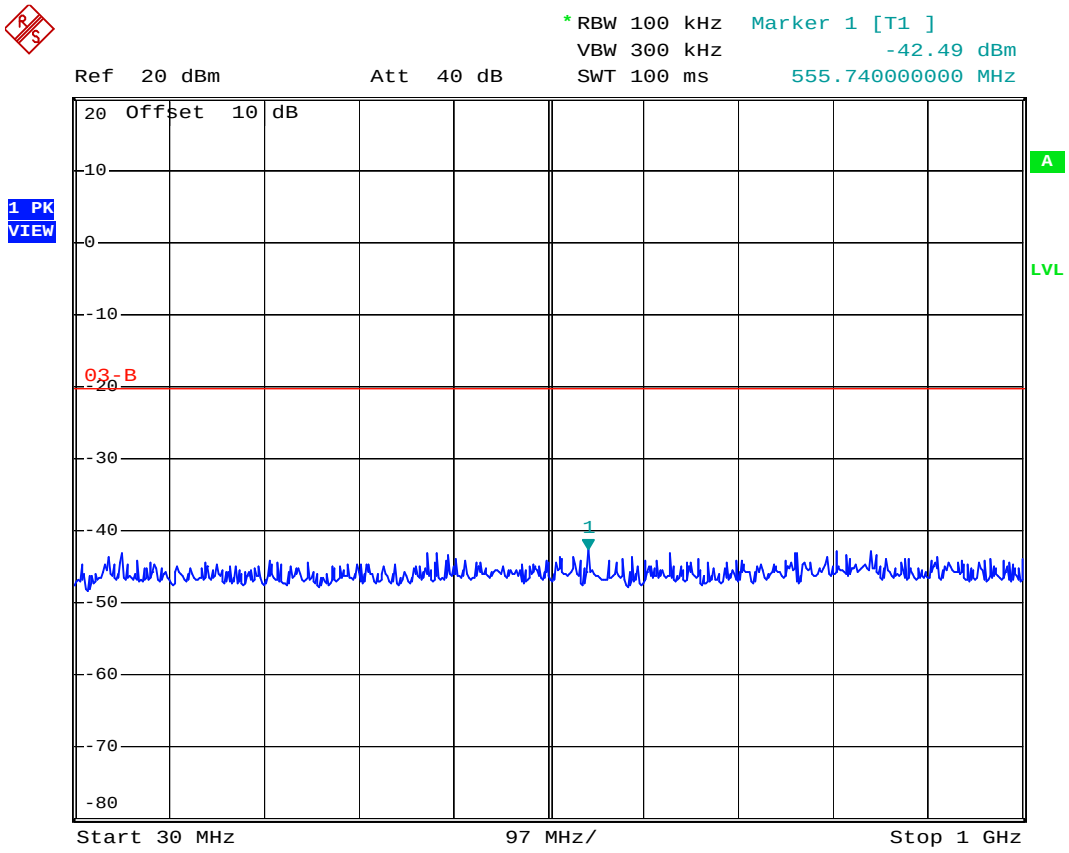


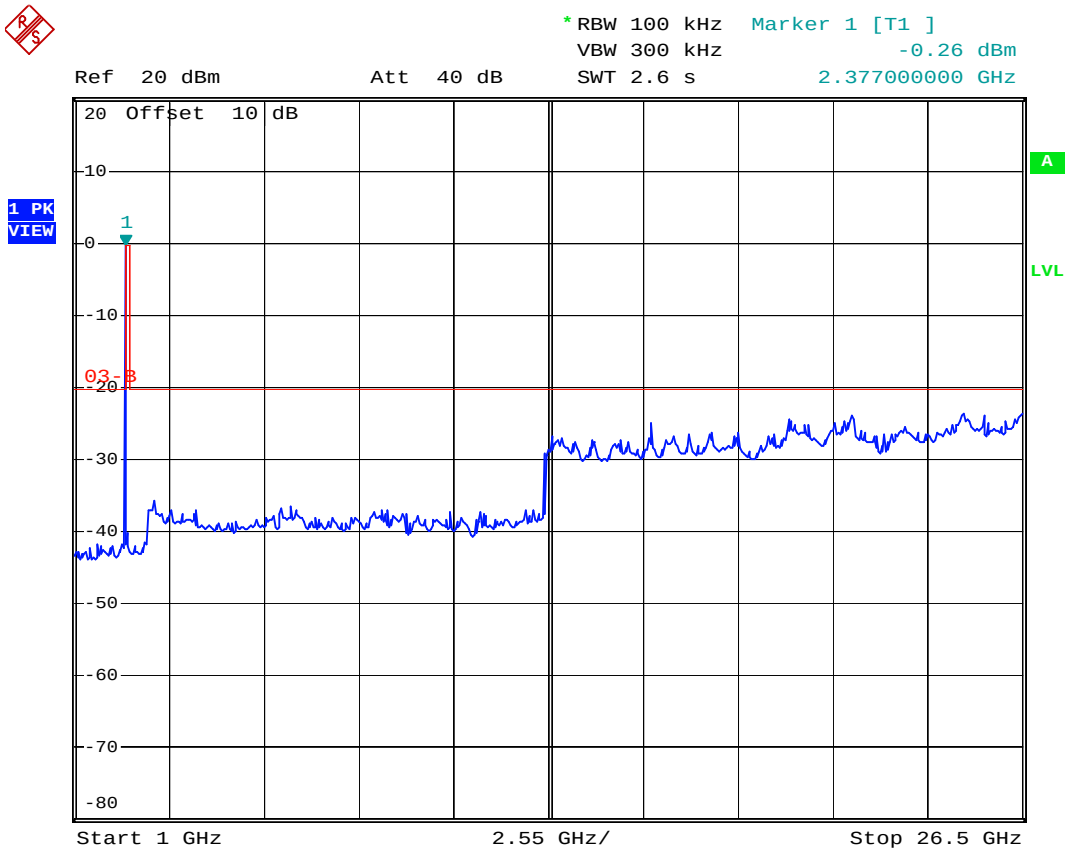
802.11g / Channel High



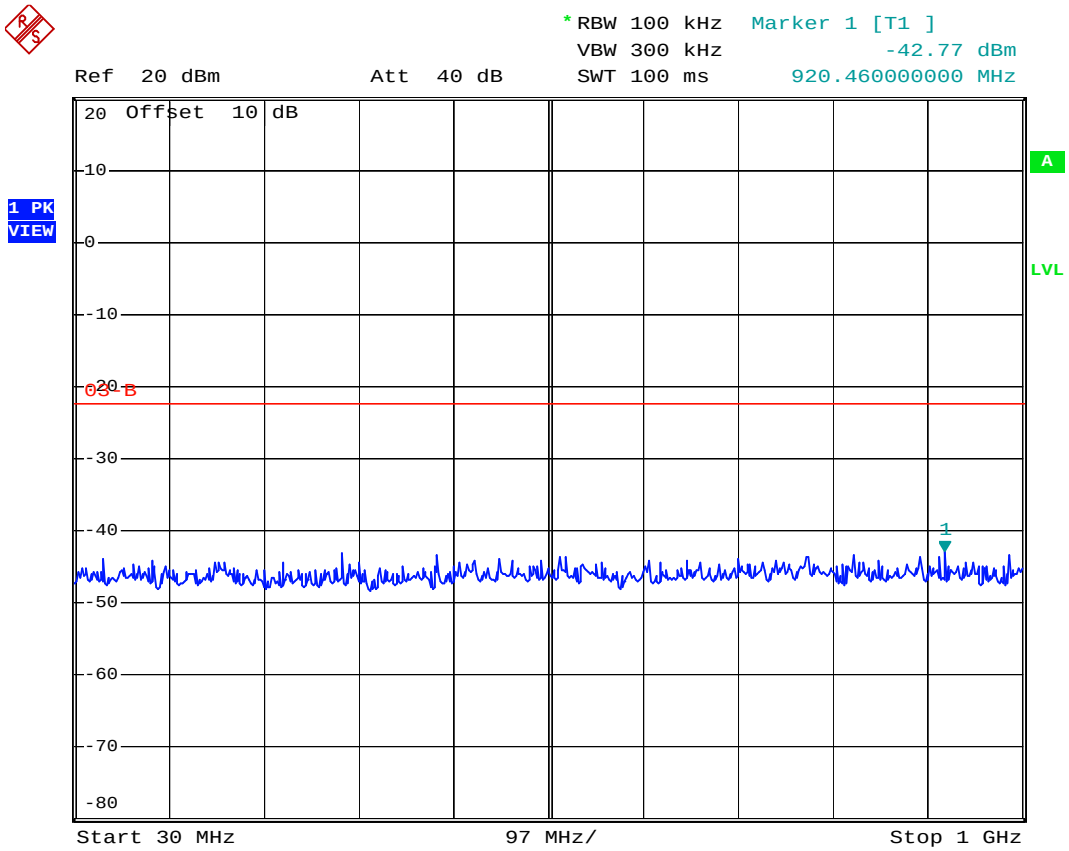


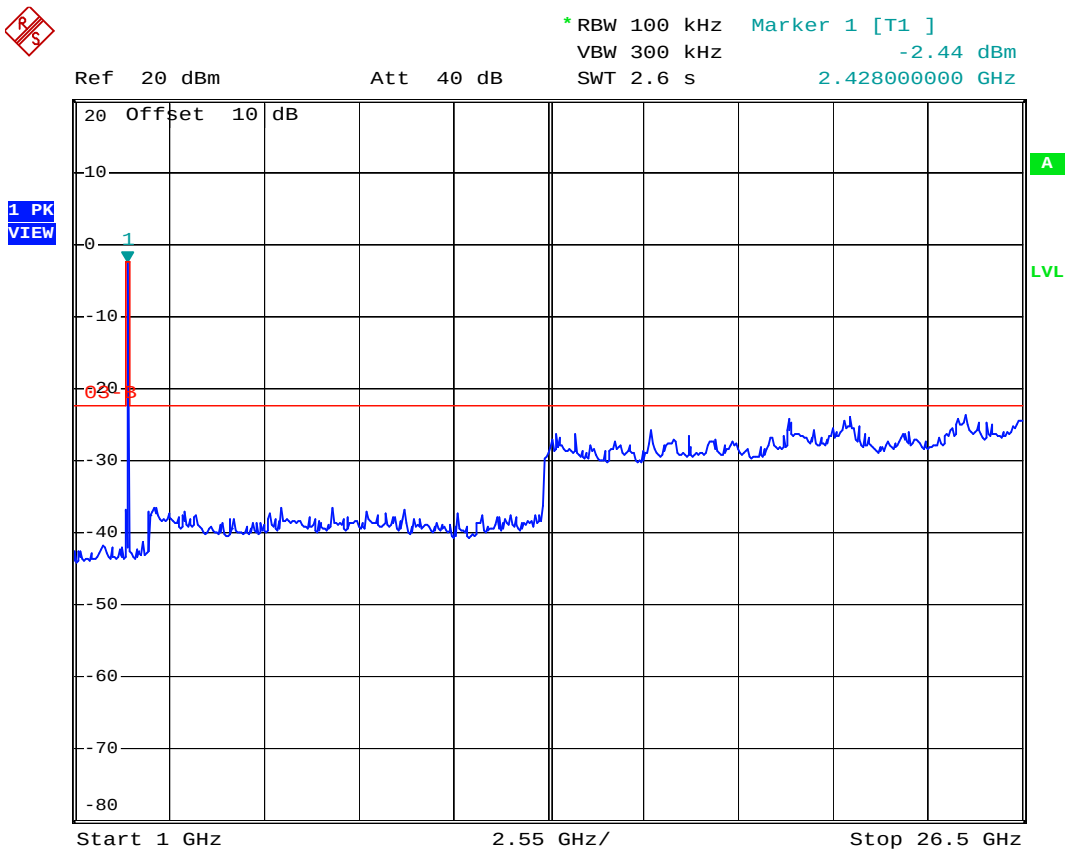
802.11n HT-20/ Channel Low (Antenna-1)



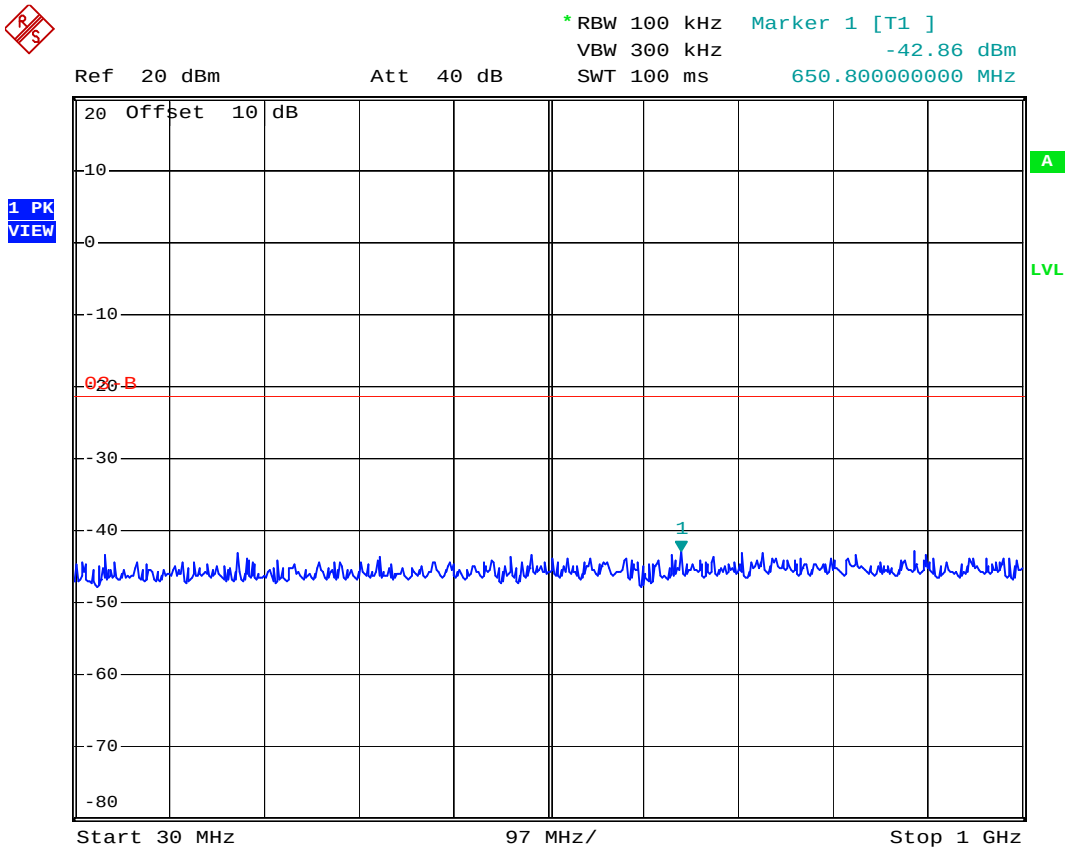


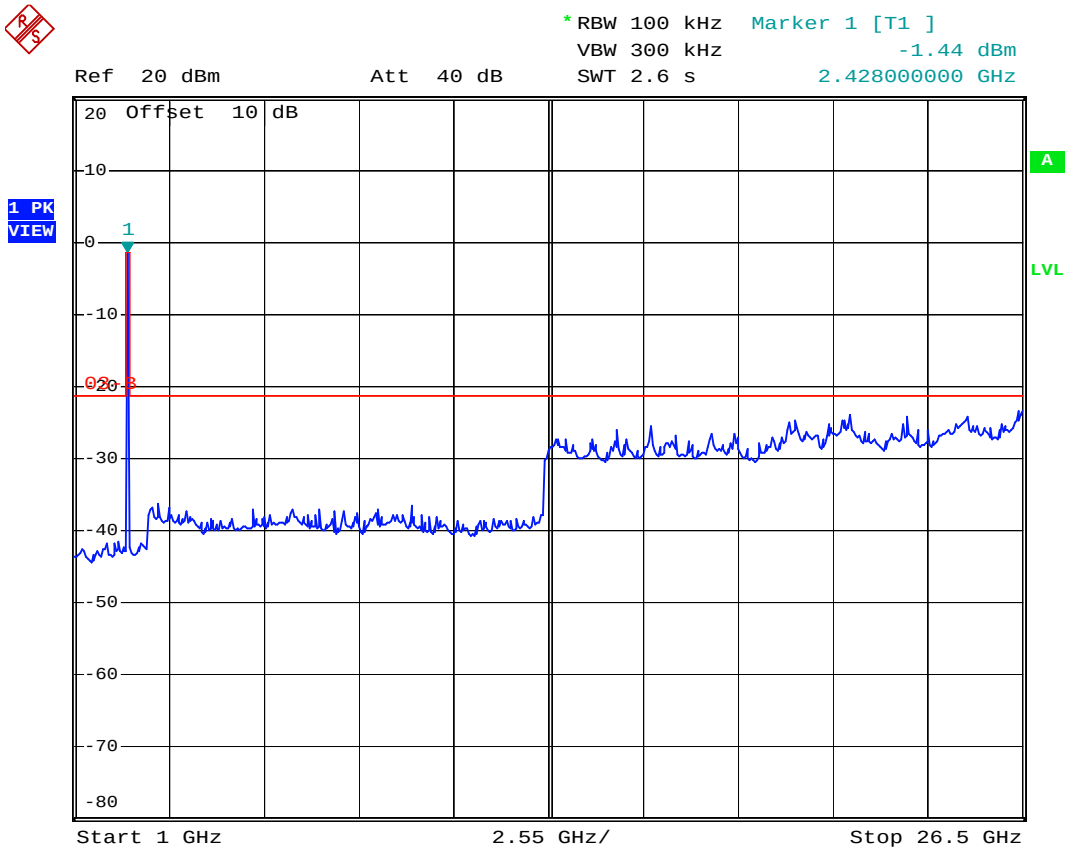
802.11n HT-20/ Channel Mid (Antenna-1)



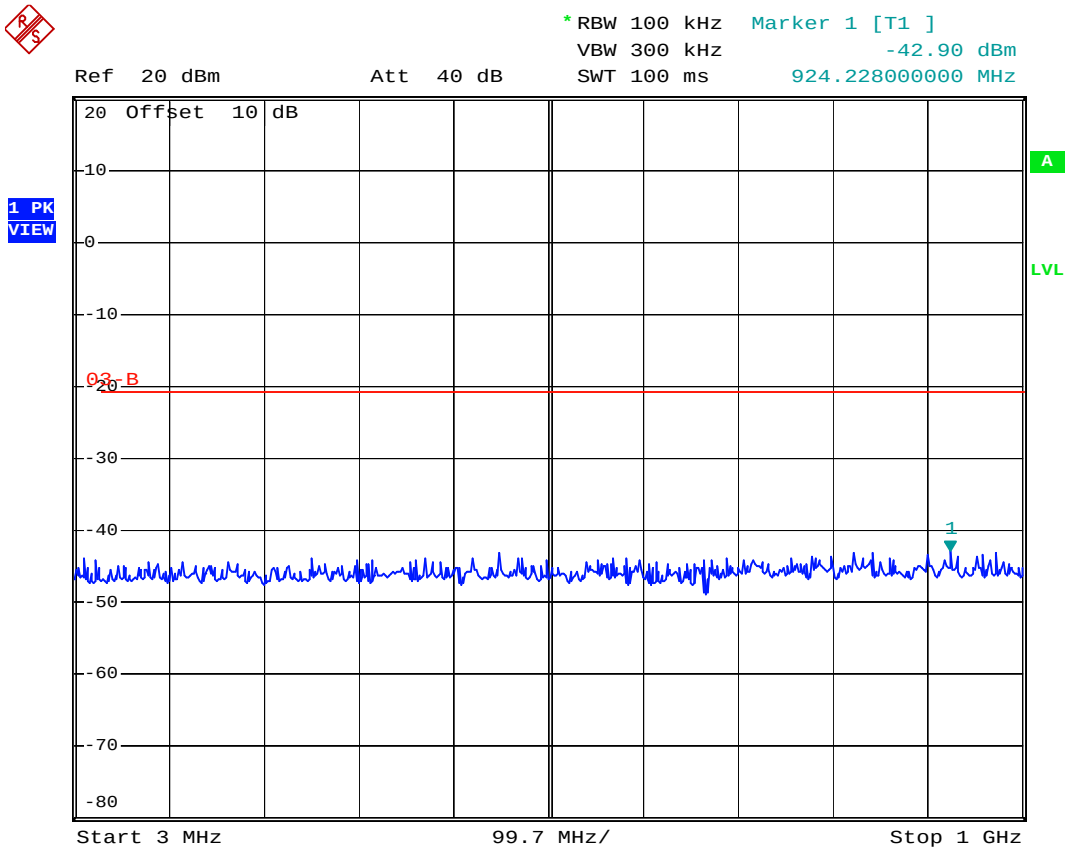


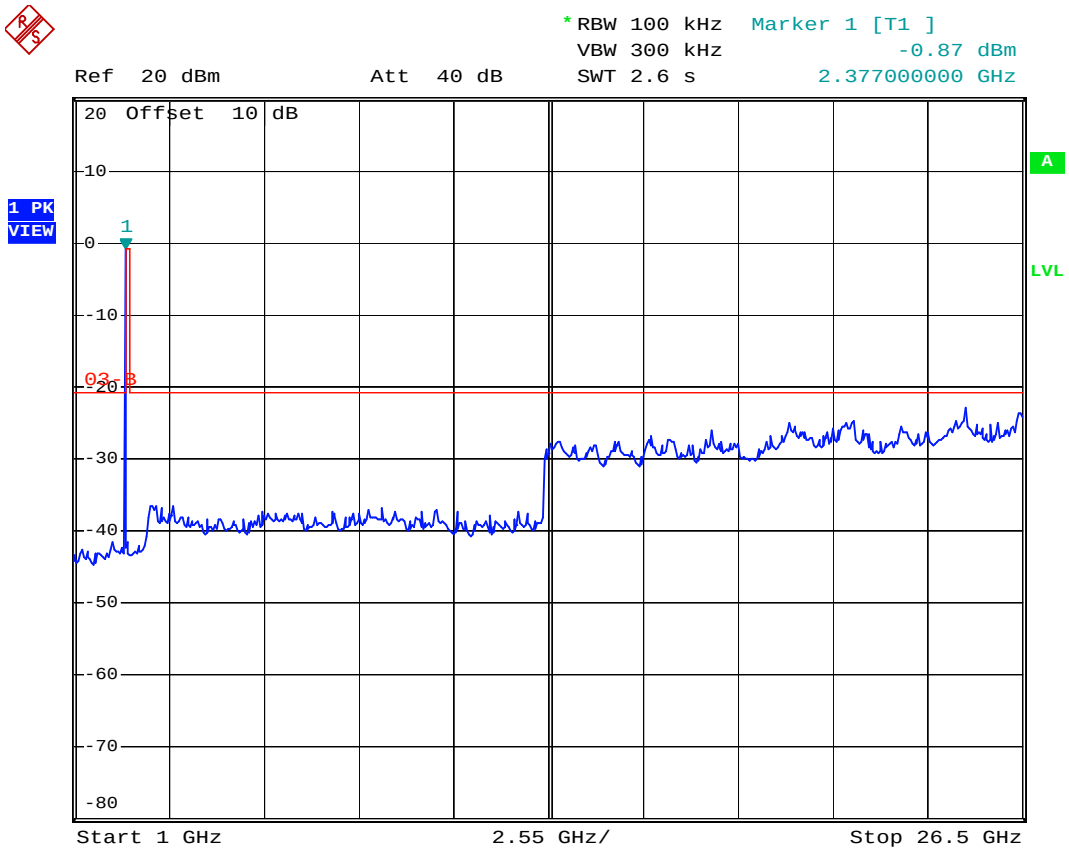
802.11n HT-20/ Channel High (Antenna-1)



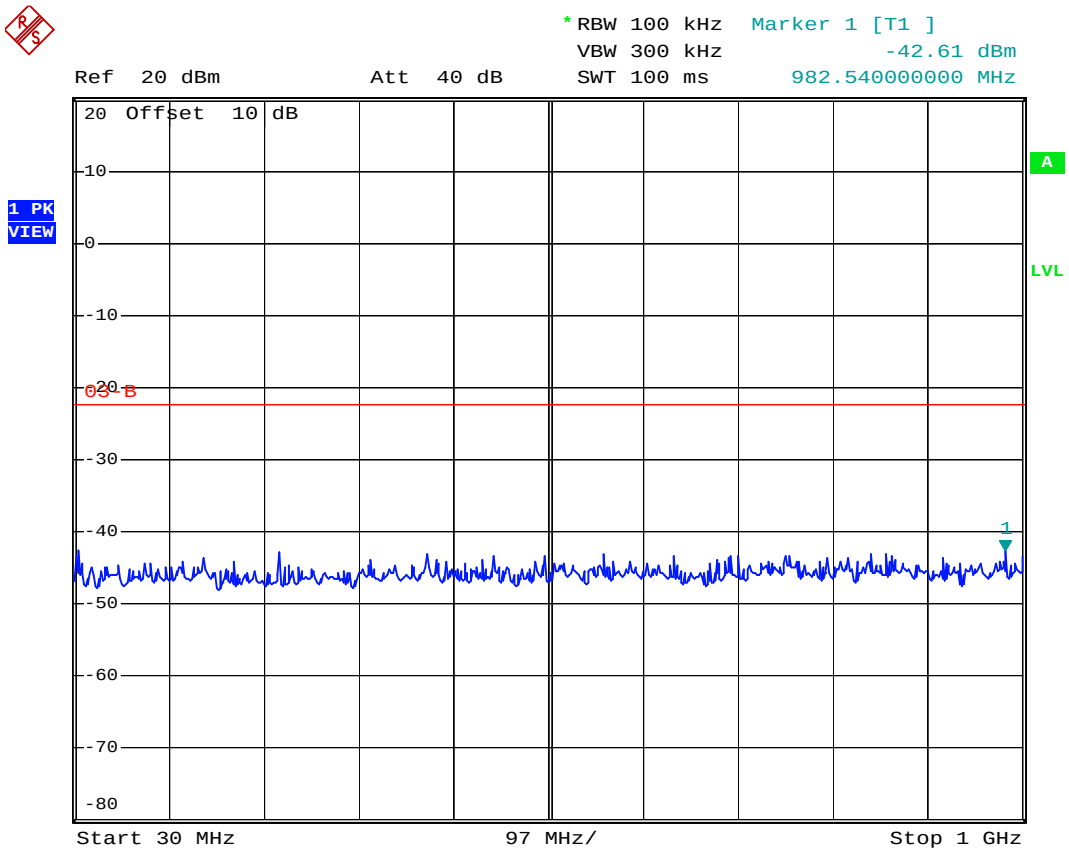


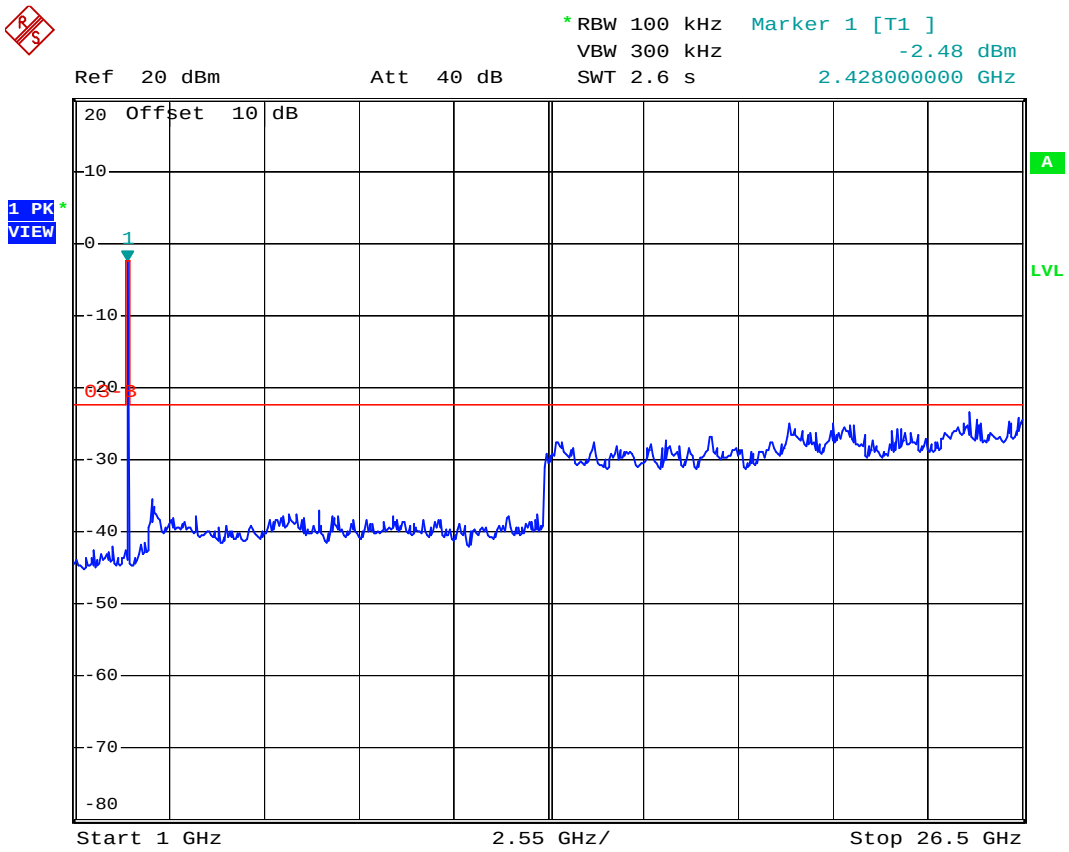
802.11n HT-20/ Channel Low (Antenna-2)



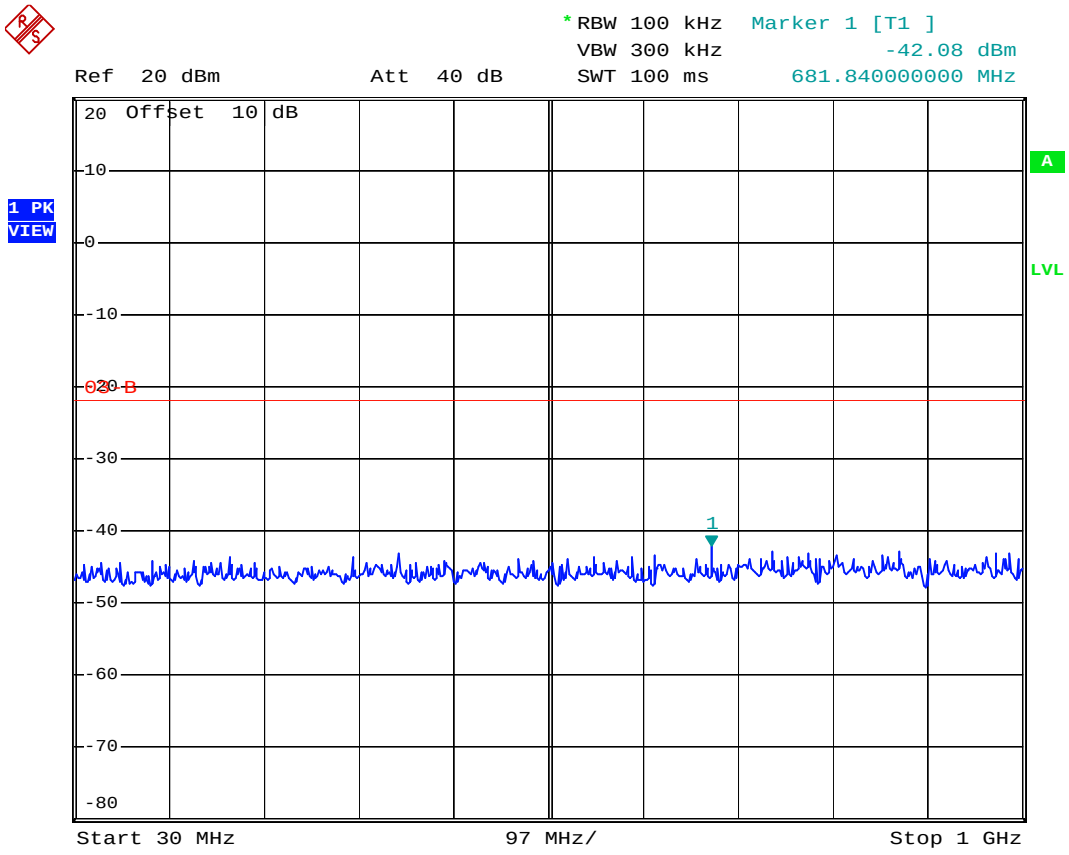


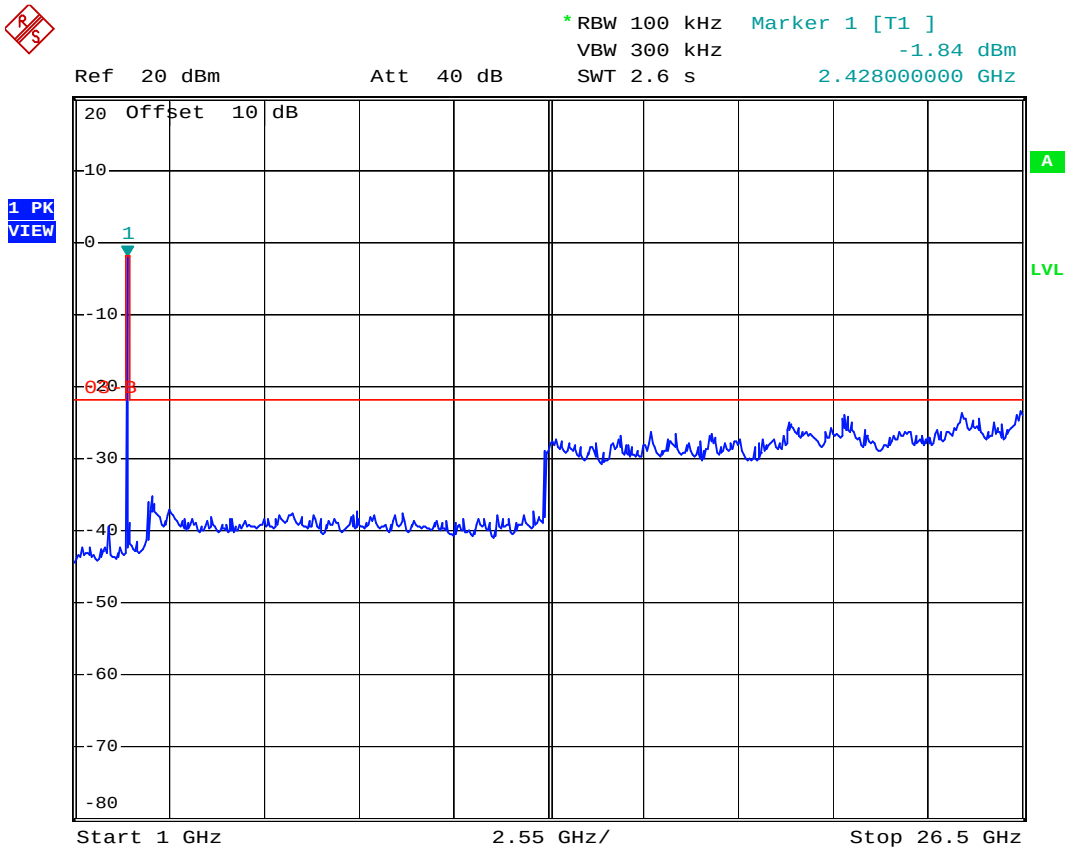
802.11n HT-20/ Channel Mid (Antenna-2)



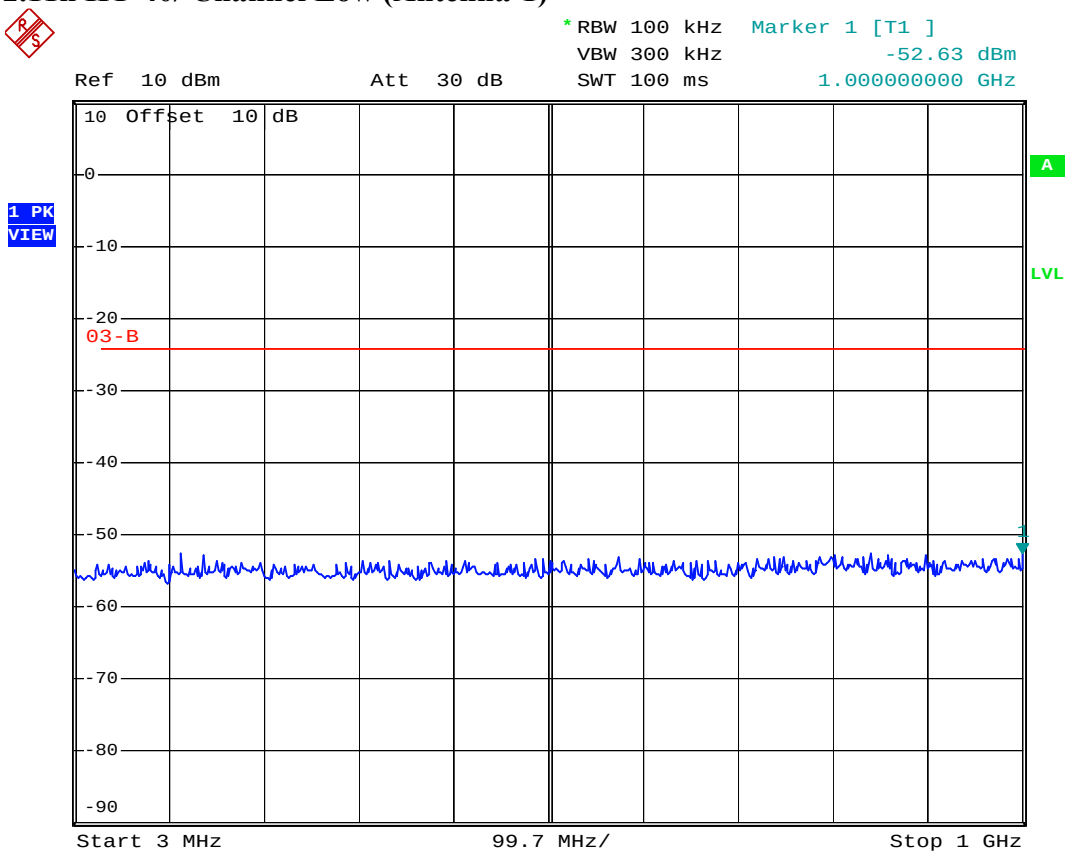


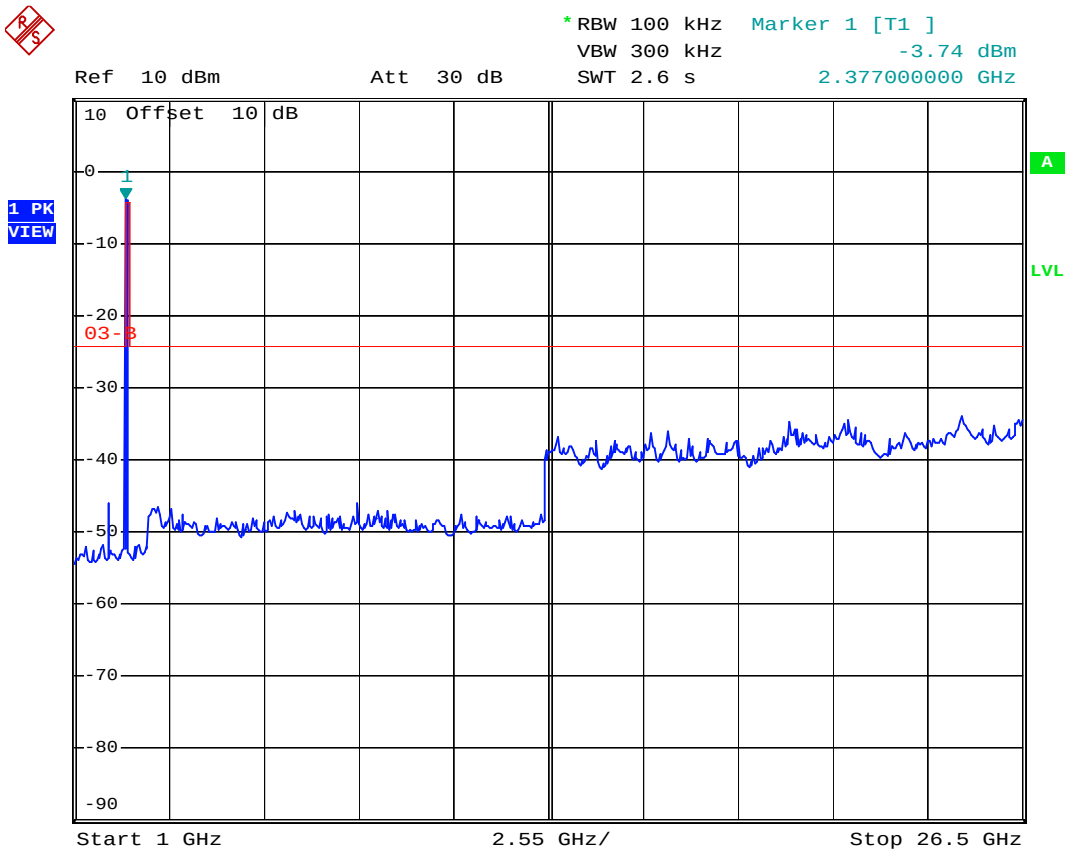
802.11n HT-20/ Channel High (Antenna-2)



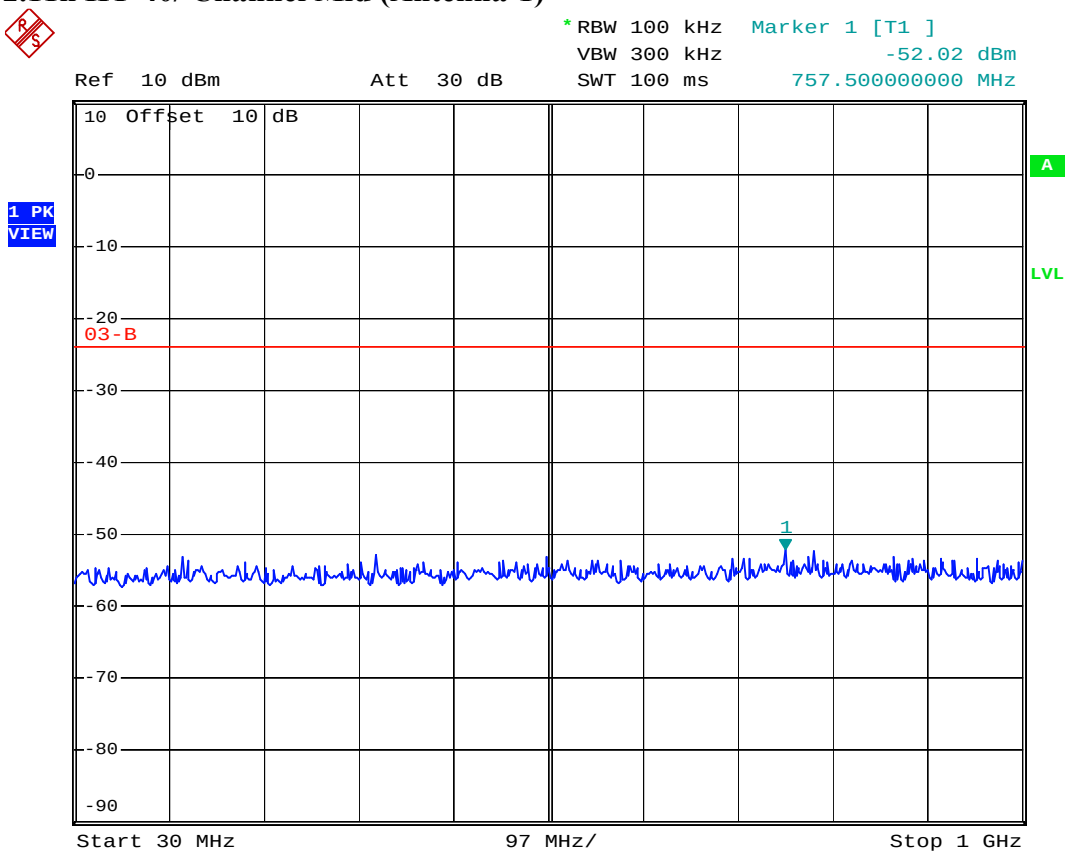


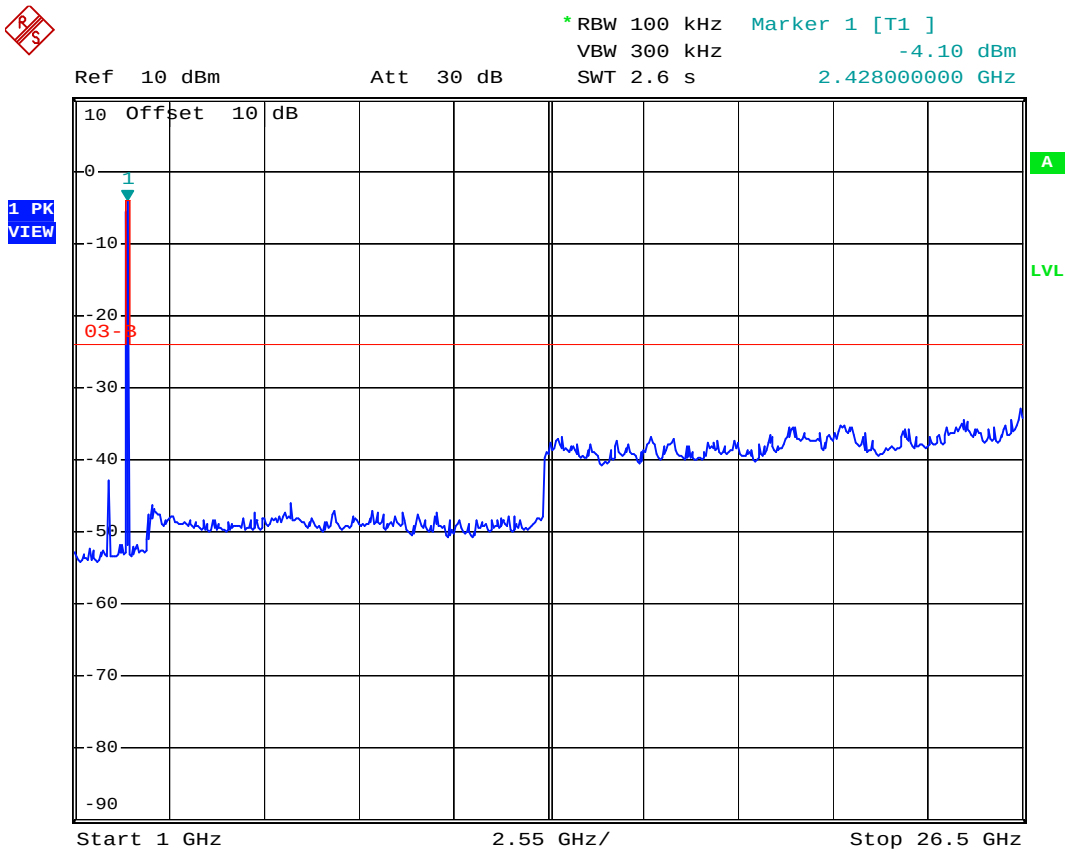
802.11n HT-40/ Channel Low (Antenna-1)



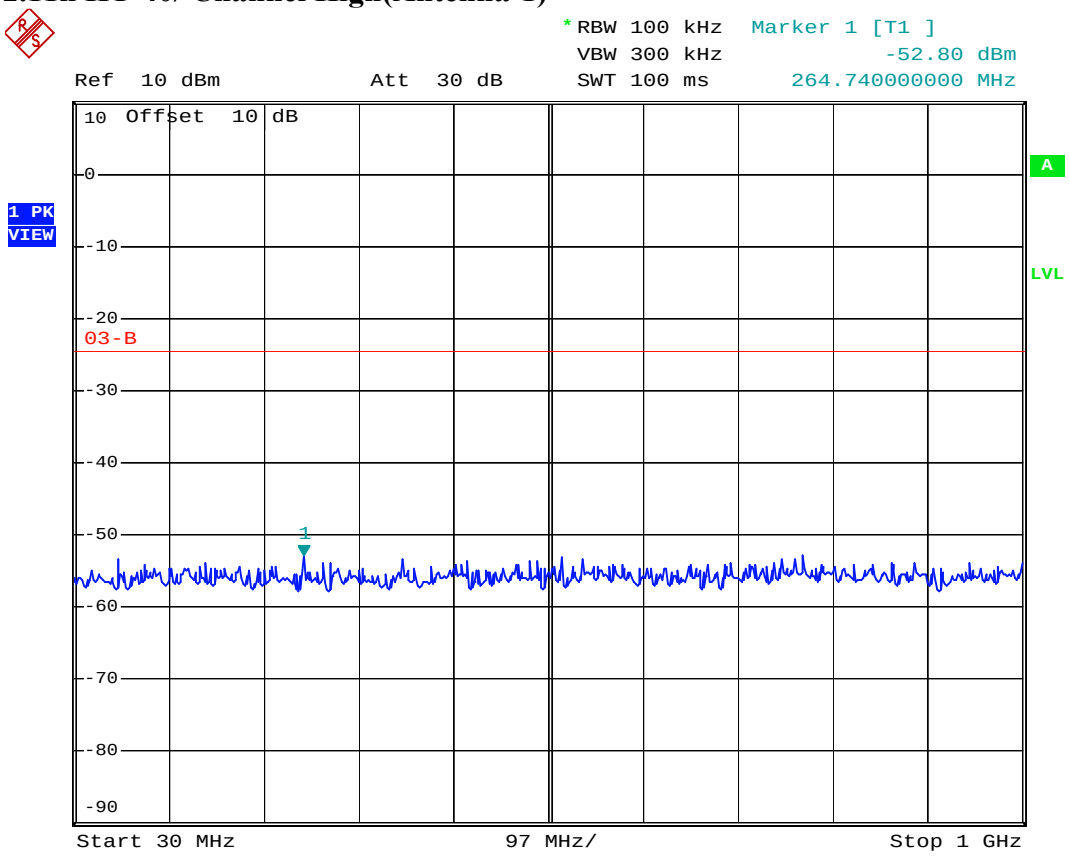


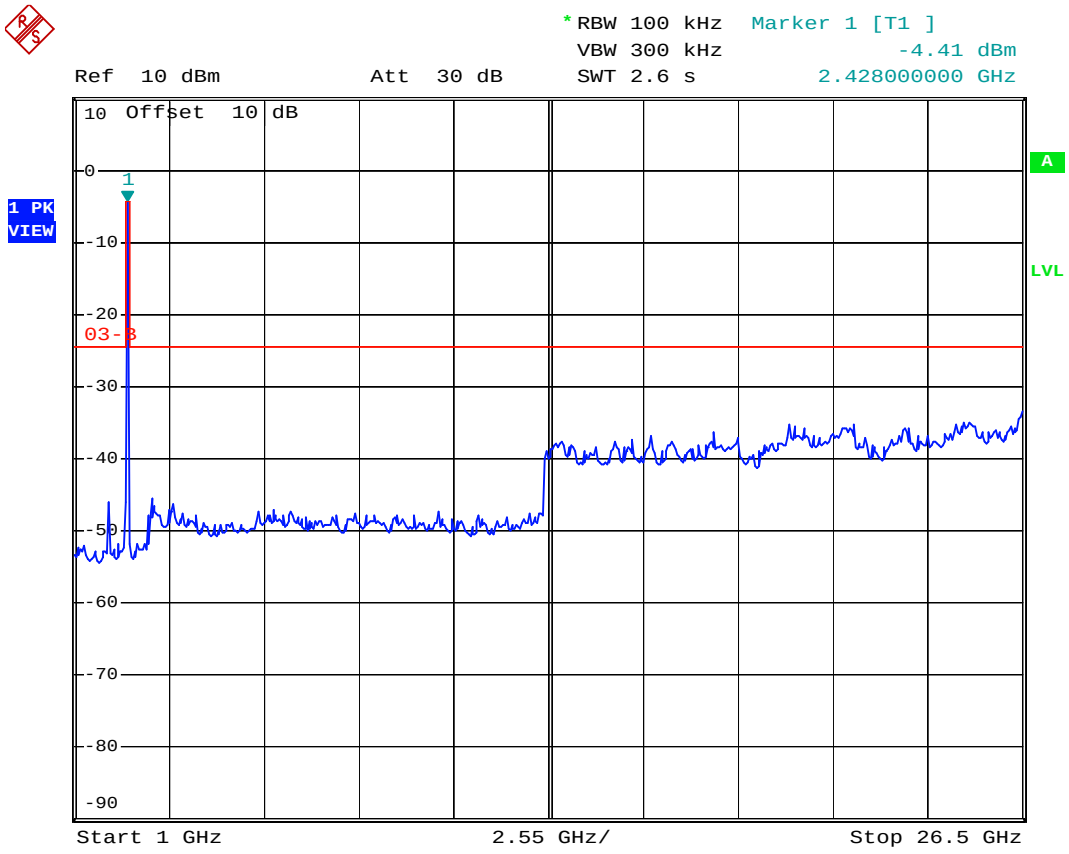
802.11n HT-40/ Channel Mid (Antenna-1)



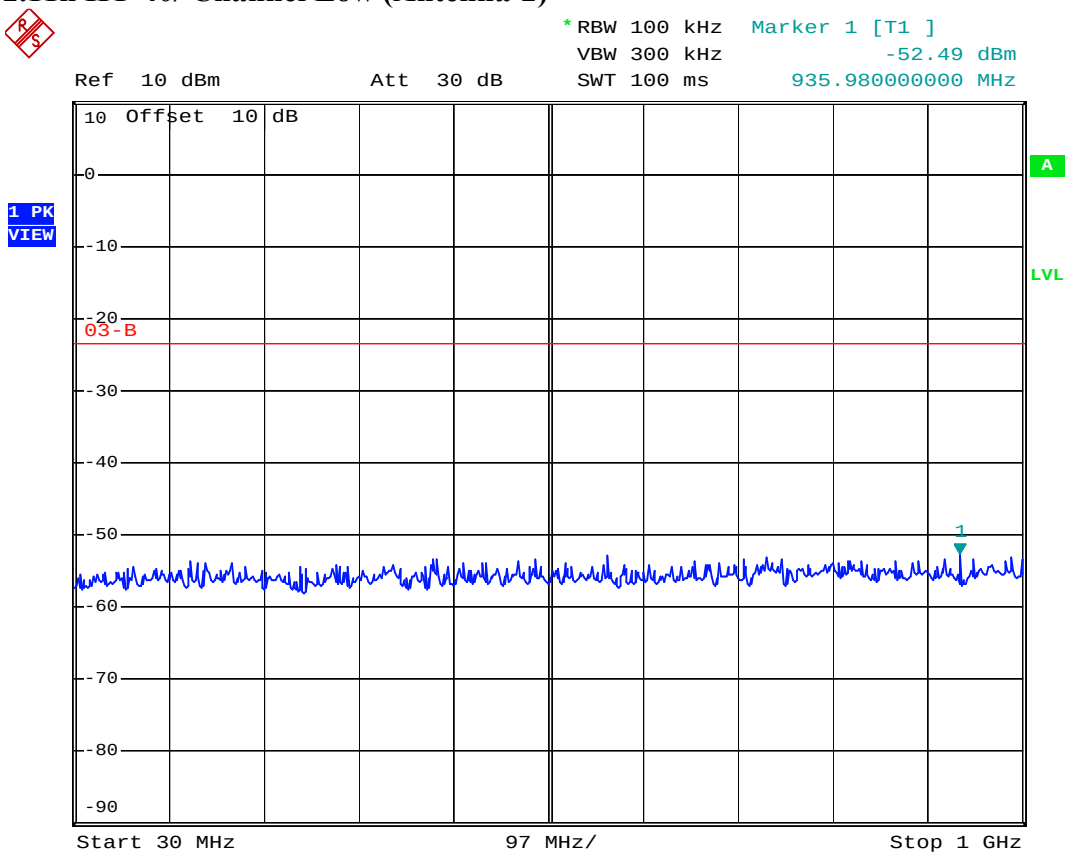


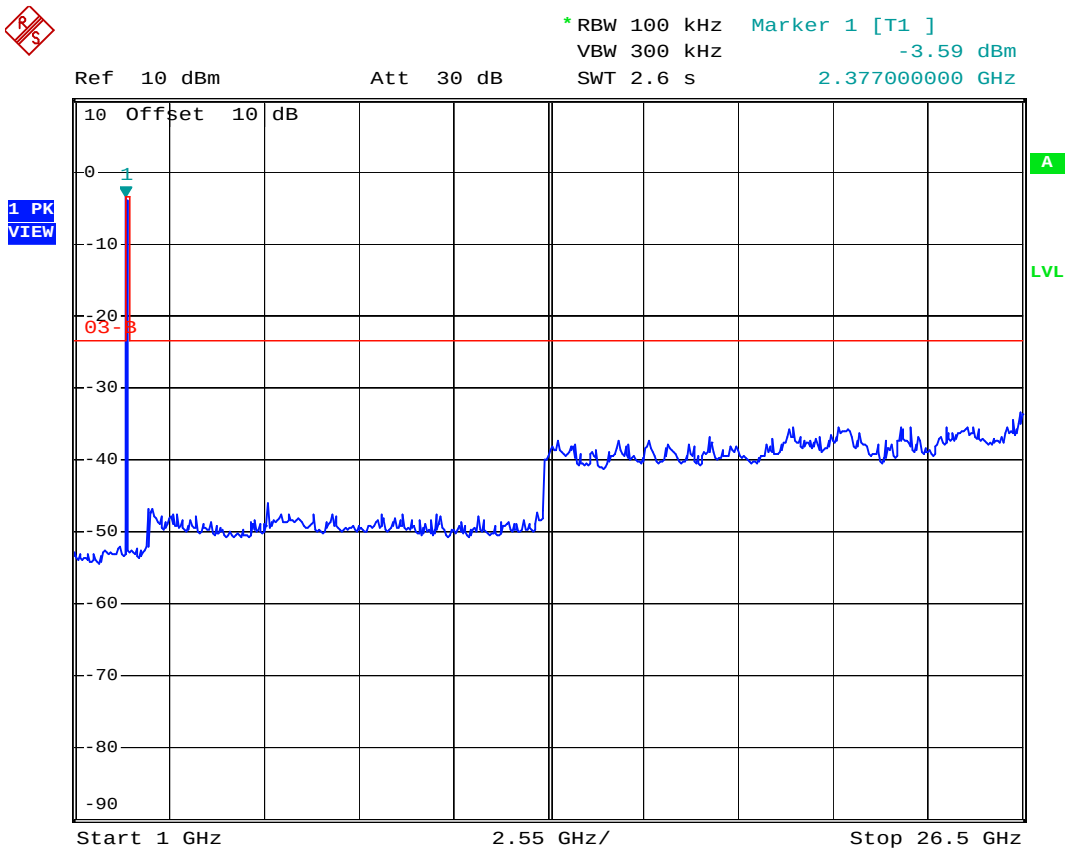
802.11n HT-40/ Channel High(Antenna-1)



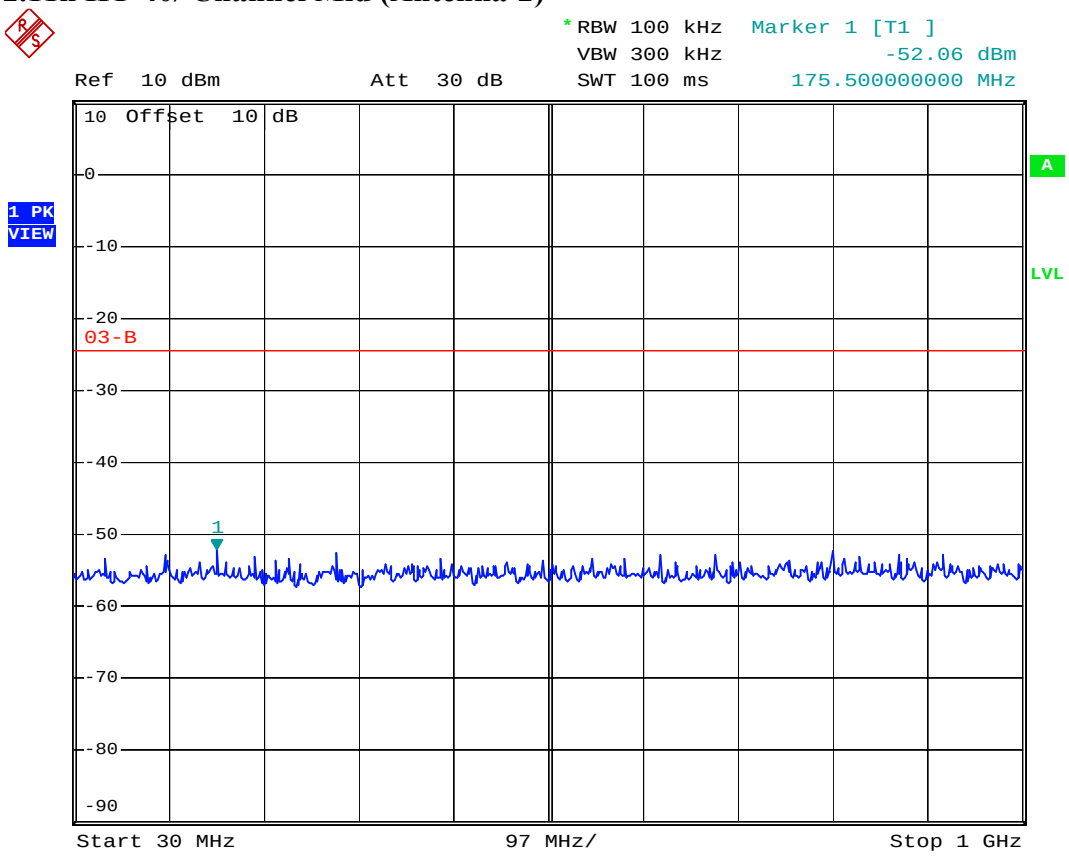


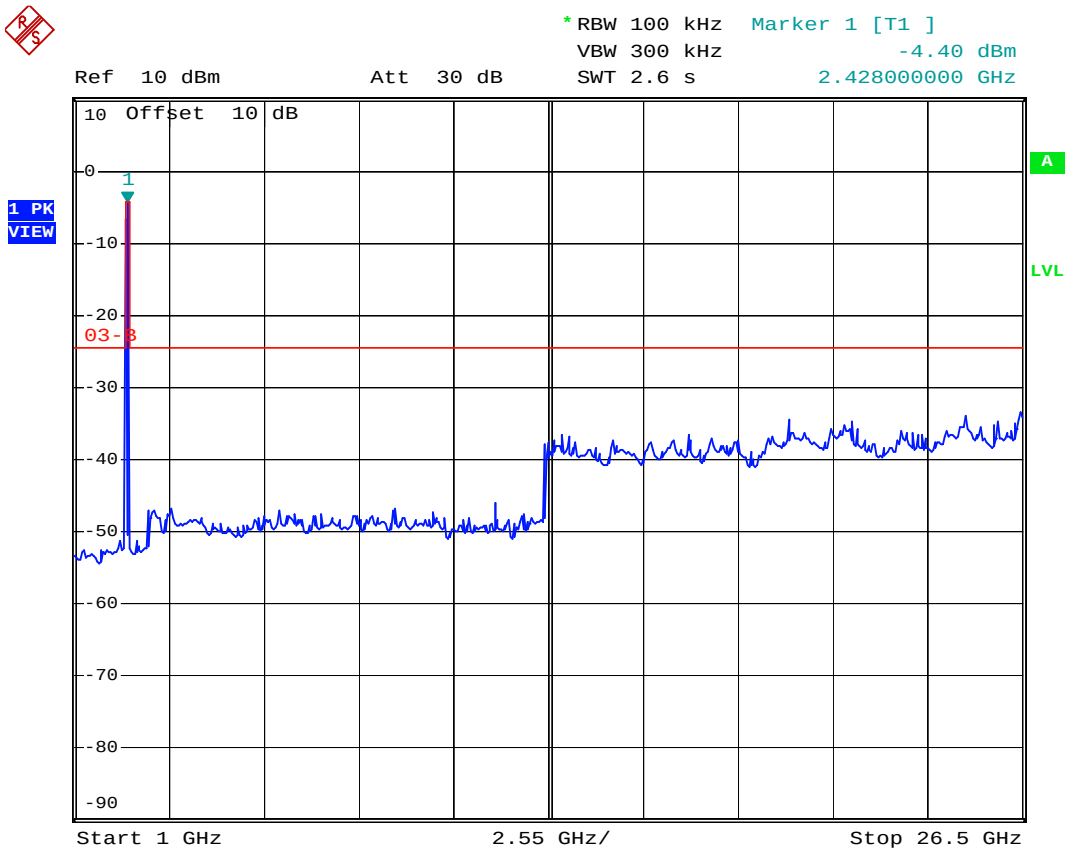
802.11n HT-40/ Channel Low (Antenna-2)



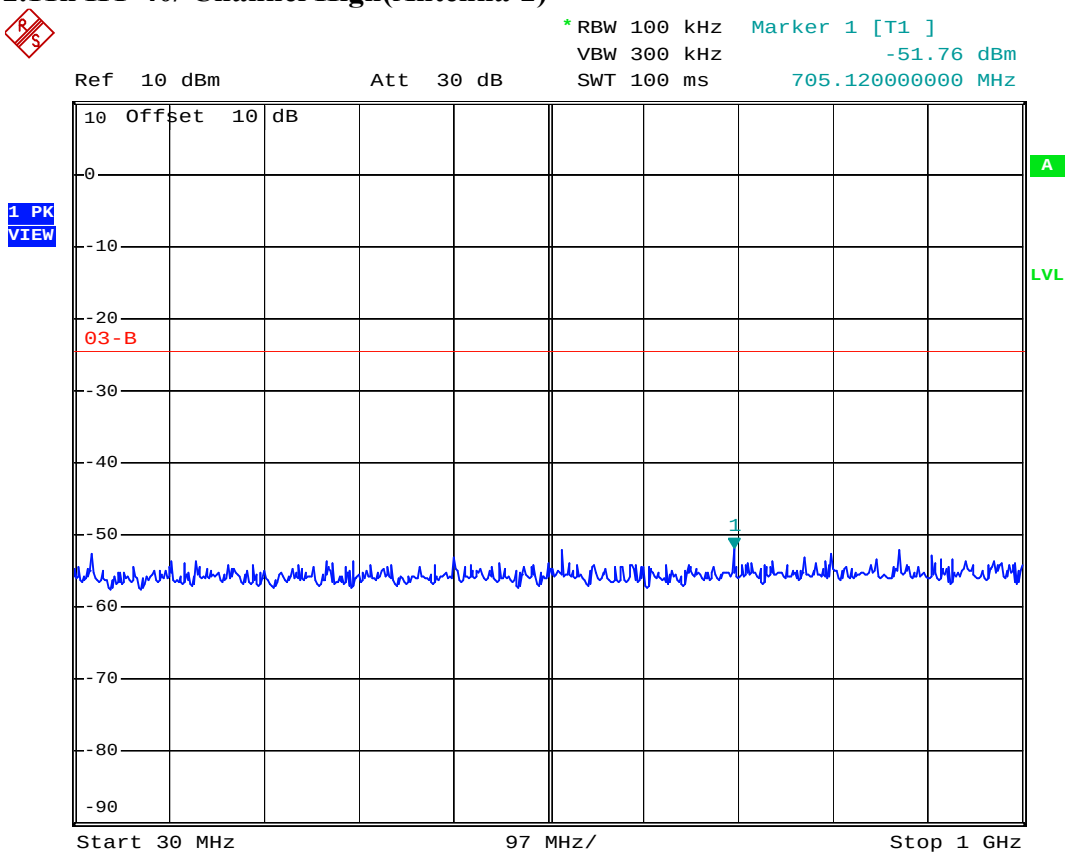


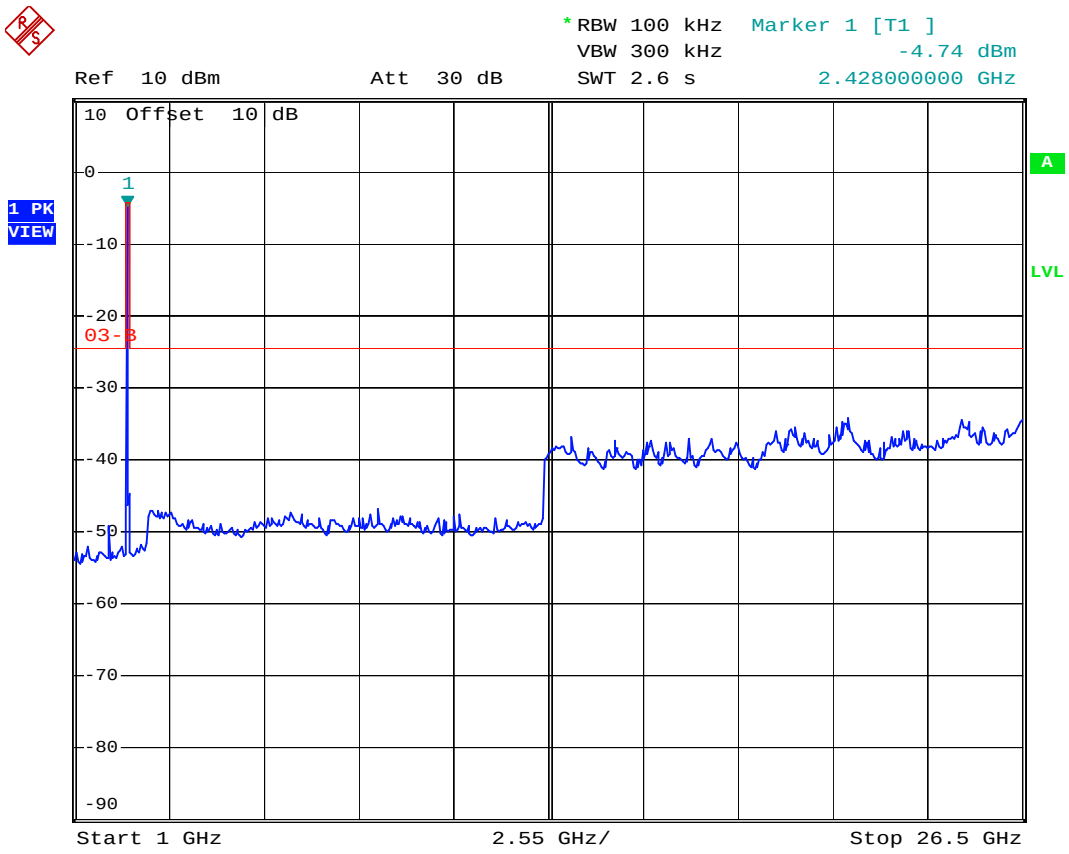
802.11n HT-40/ Channel Mid (Antenna-2)





802.11n HT-40/ Channel High(Antenna-2)





12. DUTY CYCLE

12.1 Standard Applicable

None. Refereency only.

12.2 Measurement Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Spectrum Analyzer	Rohde & Schwarz	FSP40	2016/10/03	2017/10/02

12.3 Measurement Data

Test Date : Dec. 07, 2016 Temperature : 25 °C Humidity : 65 %

Duty Cycle Calculation

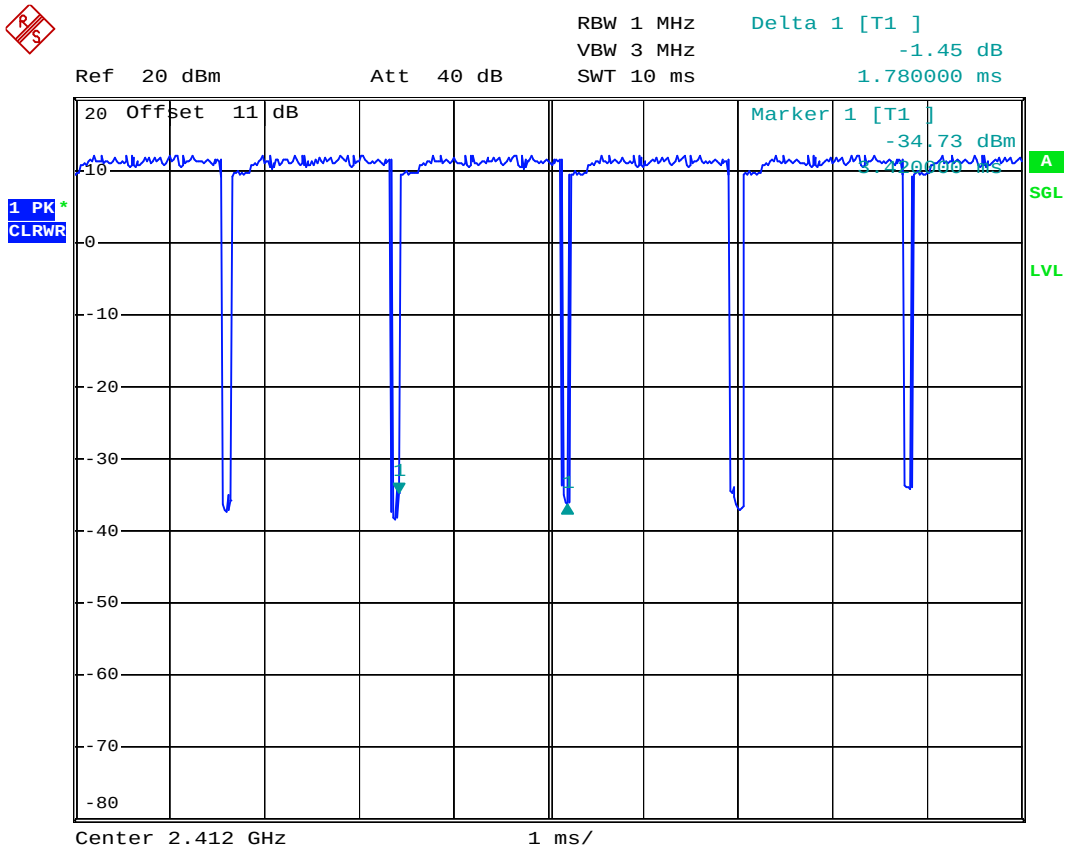
Mode	Period (ms)	Transmission duration (T) (ms)	Duty Cycle (%)	1/T (kHz)	VBW setting (kHz)
802.11b	1.78	1.74	97.8	0.574	1
802.11g	---	---	100	---	0.01
802.11n HT-20	---	---	100	---	0.01
802.11n HT-40	---	---	100	---	0.01

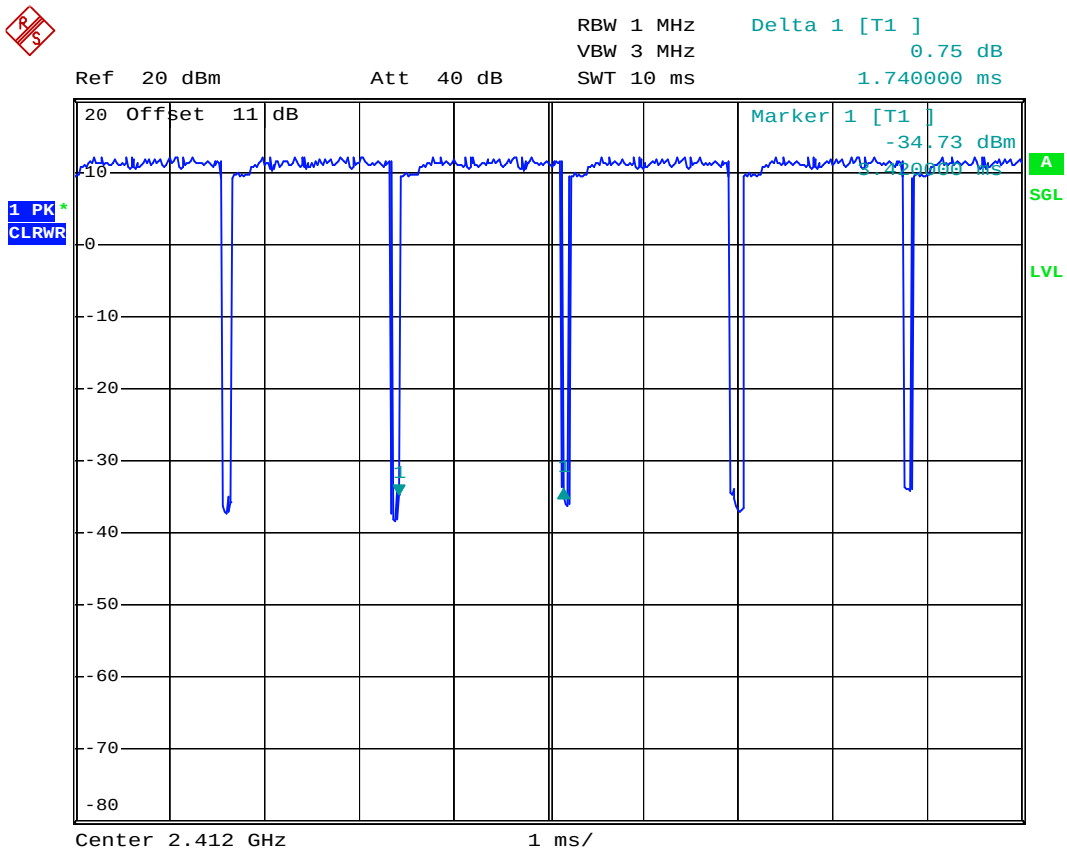
Note:

1. When the duty cycle is less than 98%, for the average measurement of the radiated emission test, the VBW setting is >1/T where the T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.
2. The EUT set for test with the continuous transmission mode and the duty cycle >98%.

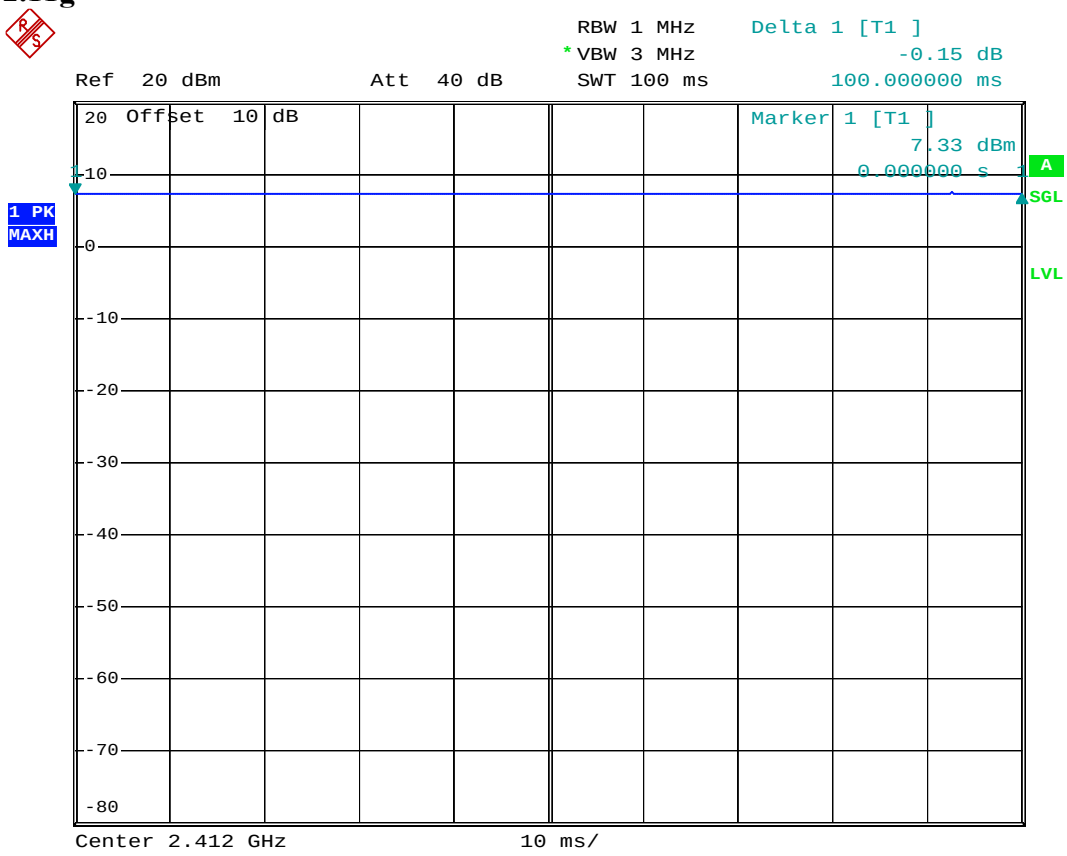
Refer to the following page for data plots.

802.11b

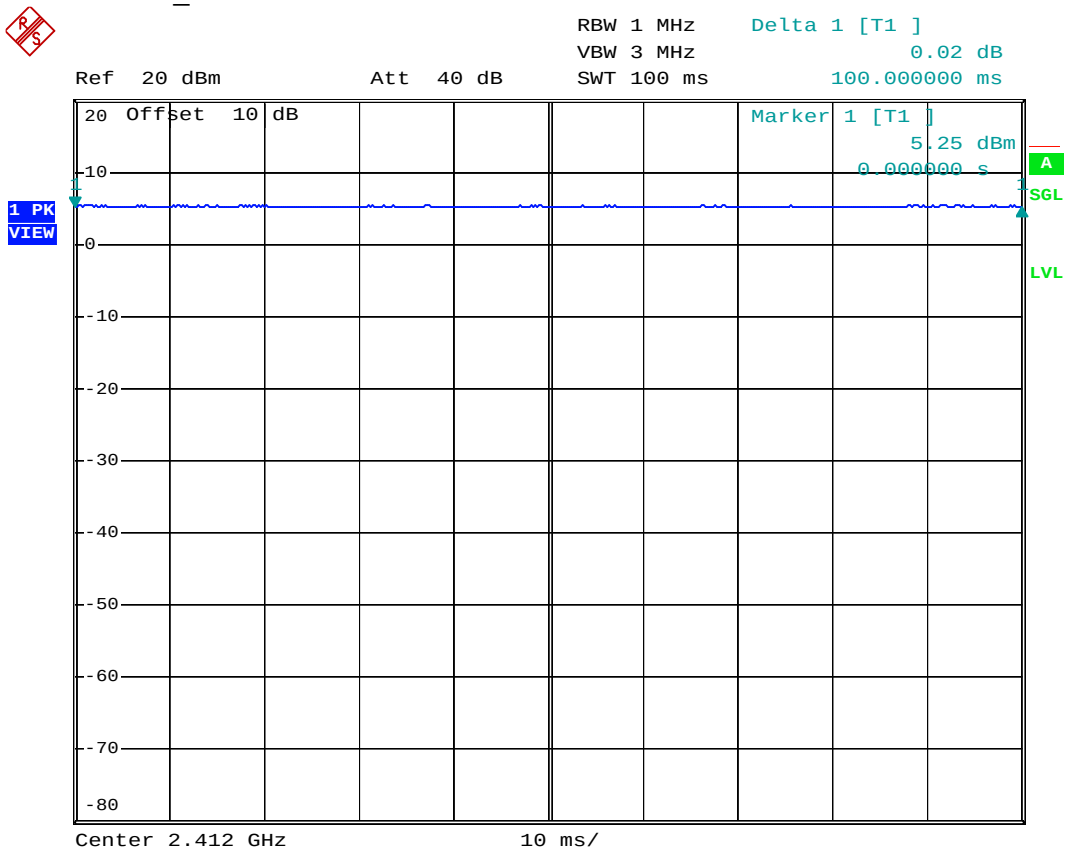

RBW 1 MHz
VBW 3 MHz
SWT 10 ms
Delta 1 [T1]
-1.45 dB
1.780000 ms
Ref 20 dBm
Att 40 dB
20 Offset 11 dB
Marker 1 [T1]
-34.73 dBm
1 PK
CLRWR
A
SGL
LVL
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.412 GHz
1 ms/


RBW 1 MHz
VBW 3 MHz
SWT 10 ms
Delta 1 [T1]
0.75 dB
1.740000 ms
Ref 20 dBm
Att 40 dB
20 Offset 11 dB
Marker 1 [T1]
-34.73 dBm
1 PK
CLRWR
A
SGL
LVL
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.412 GHz
1 ms/

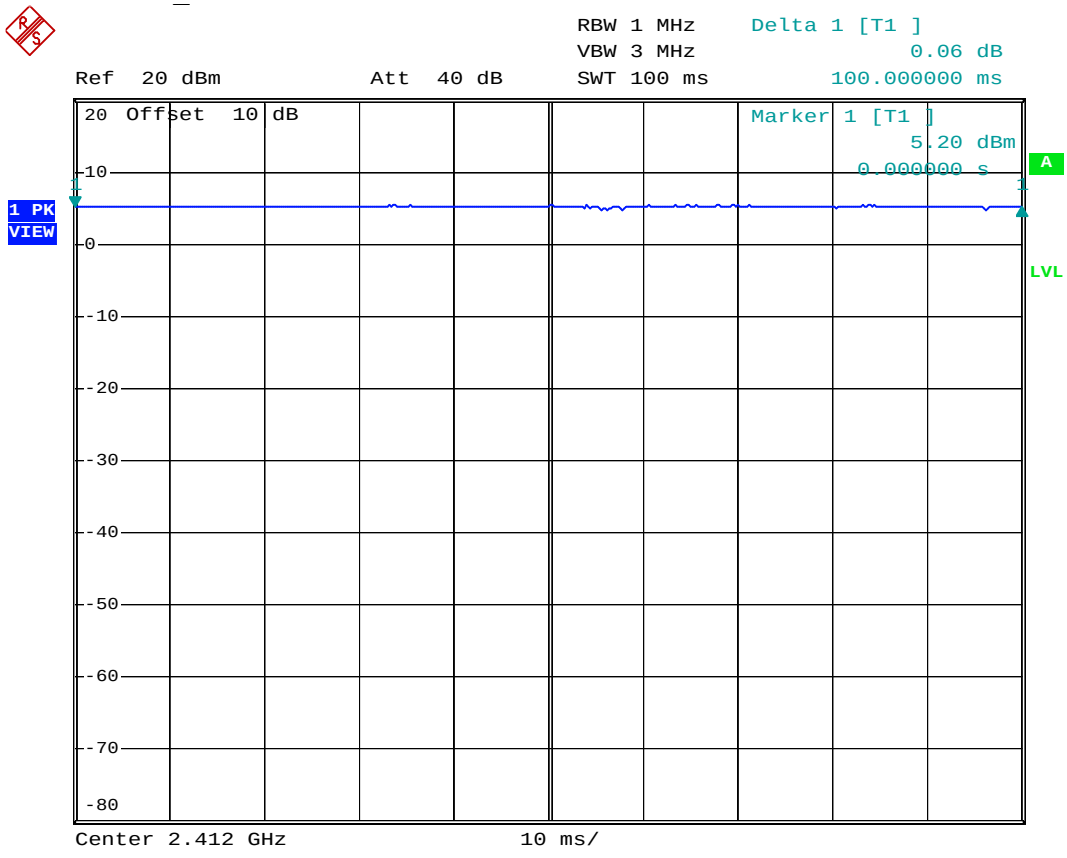
802.11g


RBW 1 MHz
Delta 1 [T1]
*VBW 3 MHz
-0.15 dB
Ref 20 dBm
Att 40 dB
SWT 100 ms
100.000000 ms
20 Offset 10 dB
Marker 1 [T1]
7.33 dBm
0.000000 s
1
A
SGL
LVL
1 PK
MAXH
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.412 GHz
10 ms/

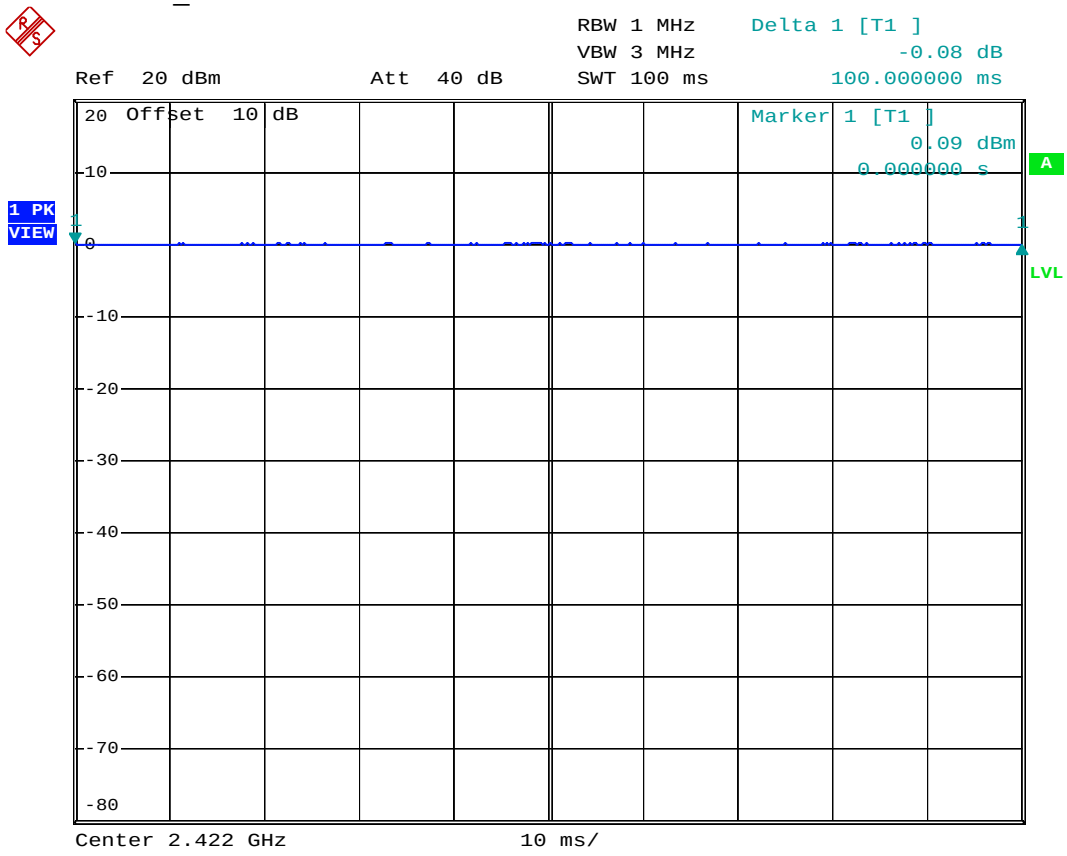
802.11n HT-20_ANT1



802.11n HT-20_ANT2



802.11n HT-40_ANT1



802.11n HT-40_ANT2