FCC PART 15.247

TEST REPORT

For

UTStarcom Inc.

1732 North 1st St Suite 220, San Jose, CA

FCC ID: 2ACKN-UOA5280

Report Type:	**Product Name:**
Original Report	Dual-Band 802.11ac Outdoor Access Point

Test Engineer:	Kevin Tao
Report Number:	RSC150615001
Report Date:	2015-08-24
Reviewed By:	Harry Wu Technical Leader
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Chengdu) 5040, HuiLongWan Plaza, No. 1, ShaWan Road, JinNiu District, ChengDu, China Tel: 028-65523123, Fax: 028-65525125 www.baclcorp.com

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *UTStarcom Inc.*'s product, model number: *UOA5280 (FCC ID: 2ACKN-UOA5280)* (the "EUT") in this report was the Dual-Band 802.11ac Outdoor Access Point, which was measured approximately: 260mm (W) x 210mm (D) x 80mm (H).

POE:
Input: AC 100 - 240V, 50/60Hz
Output: DC 48 - 56V

**All measurement and test data in this report were gathered from final production sample, serial number: 4062013062800001 (provided by Applicant). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2015-06-15, and EUT complied with test requirement.*

Objective

This report is prepared on behalf of *UTStarcom Inc.* accordance with Part 2-Subpart J, Part 15-Subparts A, B and C of the Federal Communication Commissions rules.

The tests were performed in order to determine the compliance of the EUT with FCC Part 15-Subpart C, section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

FCC Part 15.407 submissions with FCC ID: 2ACKN-UOA5280.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Chengdu). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

The uncertainty of any RF tests which use conducted method measurement is ±3.17 dB, the uncertainty of any radiation on emissions measurement is:

30M~200MHz: ±4.7 dB;
200M~1GHz: ±6.0 dB;
1G-6GHz:: ±5.13dB；
6G~25GHz: ±5.47dB；

And the uncertainty will not be taken into consideration for all test data recorded in the report.

Test Facility

The test site used by BACL to collect test data is located in the 5040, HuiLongWan Plaza, No. 1, ShaWan Road, JinNiu District, ChengDu, China

Test site at BACL has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on July 31, 2009. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 560332. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for test in testing mode, which was provided by manufacturer.

For 802.11b, 802.11g, and 802.11n-HT20 mode, 11 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	7	2442
2	2417	8	2447
3	2422	9	2452
4	2427	10	2457
5	2432	11	2462
6	2437	-	-

For 802.11b, 802.11g, and 802.11n HT20 modes were tested with Channel 1, 6 and 11.

For 802.11n-HT40 mode, 7 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2422	5	2442
2	2427	6	2447
3	2432	7	2452
4	2437	-	-

For 802.11n-HT40 mode was tested with Channel 1, 4 and 7.

The worst-case data rates are determined to be as follows for each mode based upon investigations by measuring the average power, PSD across all date rates bandwidths and modulations.

EUT Exercise Software

The software “art2_ver_4_9_93_RC_Bin, SecureCRT 7.1 & tftpd32” was used for testing, which was provided by manufacturer.

Test Mode	Test Software Version	art2_ver_4_9_93_RC_Bin, SecureCRT 7.1 & tftpd32		
802.11b	Test Frequency	2412MHz	2437MHz	2462MHz
	Data Rate	CCK 1M	CCK 1M	CCK 1M
	Power Level Setting Antenna 0	21	21	21
	Power Level Setting Antenna 1	20	21	20
	Power Level Setting Antenna 2	20	21	20
802.11g	Test Frequency	2412MHz	2437MHz	2462MHz
	Data Rate	OFDM 6M	OFDM 6M	OFDM 6M
	Power Level Setting Antenna 0	14	15	15
	Power Level Setting Antenna 1	14	15	15
	Power Level Setting Antenna 2	14	15	15
802.11n HT20	Test Frequency	2412MHz	2437MHz	2462MHz
	Data Rate	MCS0	MCS0	MCS0
	Power Level Setting Antenna 0	14	15	15
	Power Level Setting Antenna 1	14	15	15
	Power Level Setting Antenna 2	14	15	15
802.11n HT40	Test Frequency	2422MHz	2437MHz	2452MHz
	Data Rate	MCS0	MCS0	MCS0
	Power Level Setting Antenna 0	14	14	15
	Power Level Setting Antenna 1	14	14	15
	Power Level Setting Antenna 2	14	14	15

Note 1: The device supports SISO and MIMO mode, 100% duty cycle was configured. Power and PSD test results were the same as MIMO and SISO mode. So only the SISO mode was tested for these items and used to evaluate MIMO mode compliance.
Note 2: All test modes (b/g/n20/n40) support SISO and MIMO mode.

Equipment Modifications

No modification was made to the EUT.

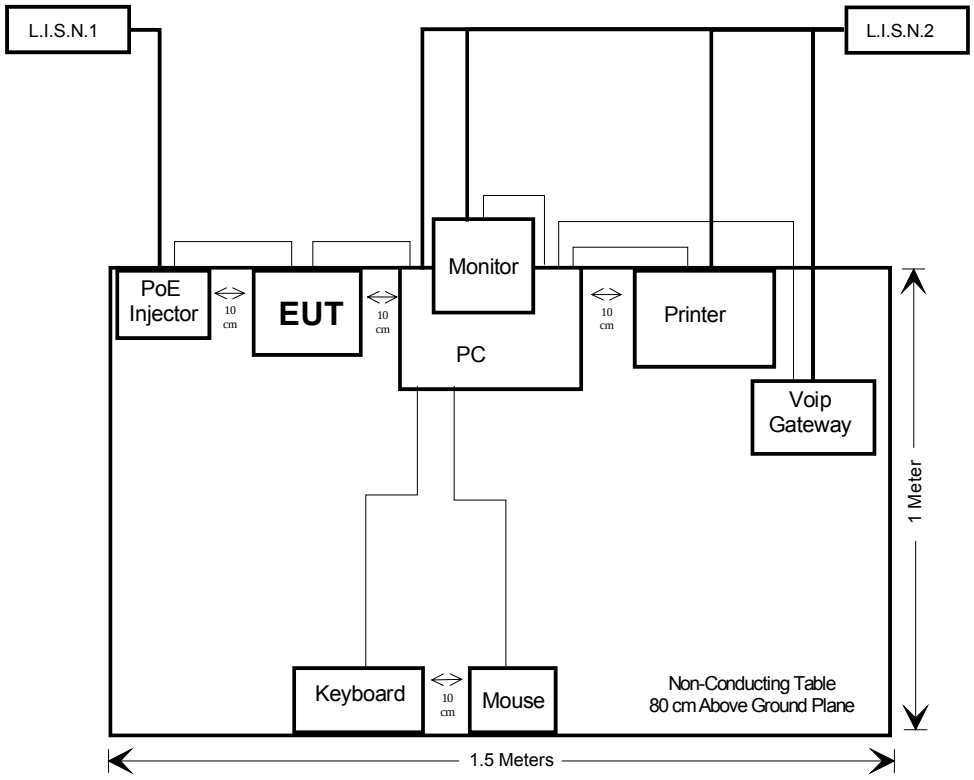
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
IBM	PC	8176	99Y7315
DELL	Monitor	SK-8815	9161649
IBM	Keyboard	KM-110X	XBK133000993
Logitech	Mouse	M-U0004	810-001808
Antek	Voip Gateway	EGW802	050830054-1B
EPSON	Printer	B261A	GXSK285854
GIGADIT	PoE Injector	NONE	NONE

External I/O Cable

Cable Description	Length (m)	From	To
Unshielded LAN/Power cable	1.0	PoE Injector	EUT
Shielded VGA cable	1.5	PC	Monitor
Unshielded LAN cable	1.0	PC	EUT
Shielded Mouse cable	1.5	PC	Mouse
Shielded Keyboard cable	1.5	PC	Keyboard
Shielded LPT Cable	1.5	PC	Printer
Shielded RS232 Cable	0.5	PC	Voip Gateway

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247(i), §2.1091 & §1.1307(b)(1)	Maximum Permissible exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247 (a)(2)	6 dB Emission Bandwidth	Compliance
§15.247(b)(3)	Maximum Peak Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

FCC §15.247 (i), §2.1091 & §1.1307(b)(1)- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.247(i)and subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (minutes)**
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f²)	30
30–300	27.5	0.073	0.2	30
300–1500	-	-	f/1500	30
1500–100,000	-	-	1.0	30

f = frequency in MHz; * = Plane-wave equivalent power density;

According to §1.1310 and §2.1091 RF exposure is calculated.

Per 447498 D01 General RF Exposure Guidance v05r02**,** simultaneous transmission MPE test exclusion applies when the sum of the MPE for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modeled or measured field strengths or power density, is $\leqslant$ 1.0.

Calculated Formulary:

Predication of MPE limit at a given distance

$$S = PG/4\pi R^2$$

Where:
S = power density (in appropriate units, e.g. mW/cm^2);
P = power input to the antenna (in appropriate units, e.g., mW);
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

DTS Band：

Mode	Frequency (MHz)	Antenna Gain		Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBi)	(numeric)	(dBm)	(mW)			
802.11b	2412	9	7.94	26.94	494.31	25	0.500	1.0
802.11g	2462	9	7.94	26.96	496.59	25	0.502	1.0
802.11n HT20	2437	9	7.94	26.73	470.98	25	0.477	1.0
802.11n HT40	2452	9	7.94	26.99	500.03	25	**0.506**	1.0

UNII Band：

5150-5250 MHz

Mode	Frequency (MHz)	Antenna Gain		Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBi)	(numeric)	(dBm)	(mW)			
802.11a	5240	9	7.94	19.88	97.27	25	0.098	1.0
802.11ac VHT20	5180	9	7.94	19.86	96.83	25	0.098	1.0
802.11ac VHT40	5230	9	7.94	19.53	89.74	25	0.091	1.0
802.11ac VHT80	5210	9	7.94	19.48	88.72	25	0.090	1.0
802.11n HT20	5240	9	7.94	19.24	83.95	25	0.085	1.0
802.11n HT40	5230	9	7.94	19.38	86.70	25	0.088	1.0

5725-5850 MHz

Mode	Frequency (MHz)	Antenna Gain		Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBi)	(numeric)	(dBm)	(mW)			
802.11a	5745	9	7.94	25.16	328.10	25	**0.332**	1.0
802.11ac VHT20	5745	9	7.94	25.05	319.89	25	0.324	1.0
802.11ac VHT40	5795	9	7.94	24.48	280.54	25	0.284	1.0
802.11ac VHT80	5775	9	7.94	24.71	295.80	25	0.299	1.0
802.11n HT20	5745	9	7.94	25.00	316.23	25	0.320	1.0
802.11n HT40	5755	9	7.94	24.70	295.12	25	0.299	1.0

Note:
For WIFI module, 2.4GHz and 5GHz can transmit simultaneously, the worst case for MPE was chosen to be added up. Total sum of MPE is 0.838 (0.506+0.332=0.838).

Result: 0.838<1.0, the device meet FCC MPE at 25 cm distance.

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

According to FCC §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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.
b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

Antenna Connector Construction

The EUT has six PCB antennas (three antennas for 2.4GHz & three antennas for 5GHz)，which were permanently attached to the EUT, and complied with 15.203, the maximum gain is 9 dBi. Please refer to the EUT internal photos.

Result: Compliance.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207

Measurement Uncertainty

Compliance or non- compliance with a disturbance limit shall be determined in the following manner：

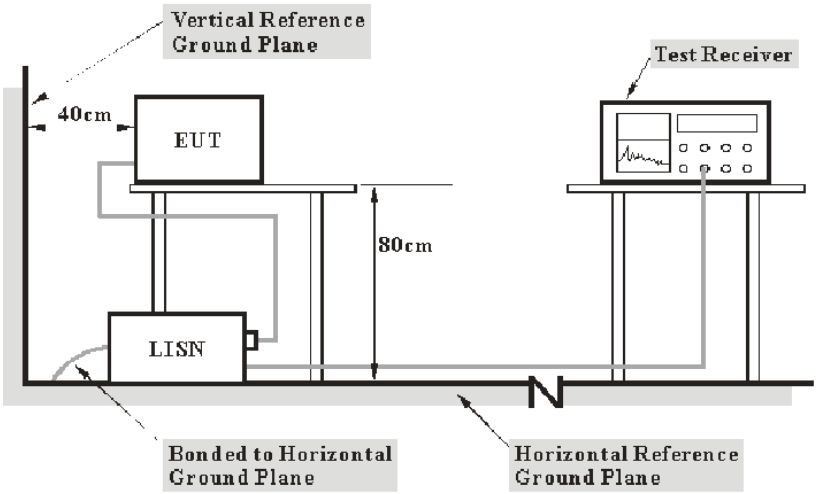
If U_{lab} is less than or equal to U_{cispr} of Table 1, then:
–compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
–non - compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.
If U_{lab} is greater than U_{cispr} of Table 1, then:
–compliance is deemed to occur if no measured disturbance level, increased by (U_{lab} − U_{cispr}), exceeds the disturbance limit;
–non - compliance is deemed to occur if any measured disturbance level, increased by (U_{lab} − U_{cispr}), exceeds the disturbance limit.

Based on CISPR 16-4-2:2011, measurement uncertainty of conducted disturbance at mains port using AMN at Bay Area Compliance Laboratories Corp. (Chengdu) is ±3.17 dB (150 kHz to 30 MHz).

Table 1 – Values of U_{cispr}

Measurement	U_{cispr}
Conducted disturbance at mains port using AMN (150 kHz to 30 MHz)	3.4 dB

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT was according to ANSI C63.4-2003 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The power cables and external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

DC 48V was used by the EUT through POE injector.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the POE injector was connected to the outlet of the first LISN and the other support equipments were connected to the outlet of the second LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$V_C = V_R + A_C + VDF$

Herein,s
V_C: corrected voltage amplitude
V_R: reading voltage amplitude
A_c: attenuation caused by cable loss
VDF: voltage division factor of AMN or ISN

The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of 7dB means the emission is 7dB below the maximum limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

Test Equipment List and Details

Manufacturer	Description	Model Number	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS 30	836858/0016	2015-06-23	2016-06-22
Rohde & Schwarz	L.I.S.N.	ENV216	3560.6550.06	2015-06-23	2016-06-22
Rohde & Schwarz	Pluse Limter	ESH3Z2	357.8810.52	2015-02-08	2016-02-07
Rohde & Schwarz	L.I.S.N.	ENV216	3560.6550.12	2015-02-08	2016-02-07

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207, with the worst margin reading of:

1.3 dB at **2.840386 MHz** in the **Line** conducted mode.

Test Data

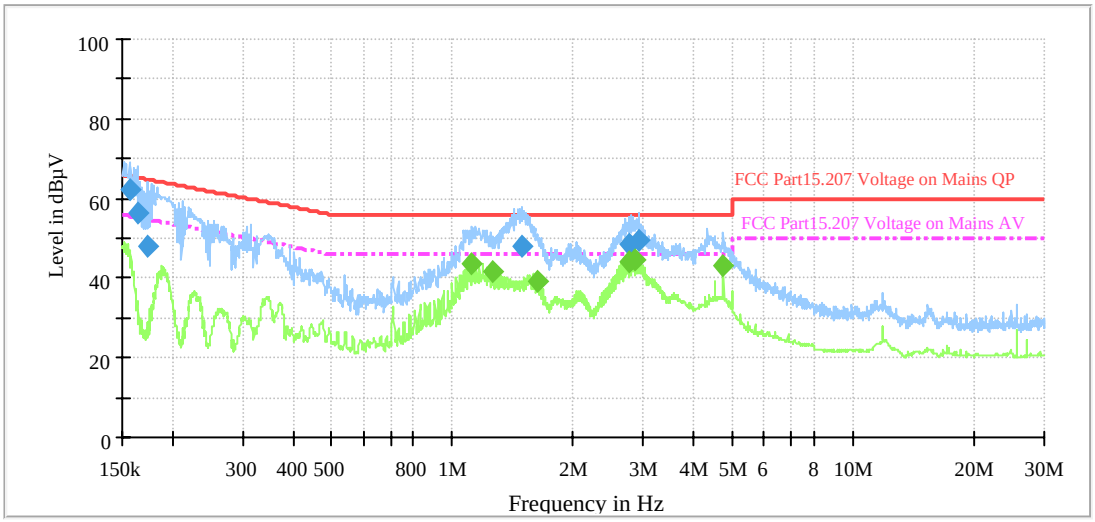
Environmental Conditions

Temperature:	26 °C
Relative Humidity:	67 %
ATM Pressure:	97.1 kPa

The testing was performed by Kevin Tao on 2015-06-29.

Test Mode: Transmitting

Line

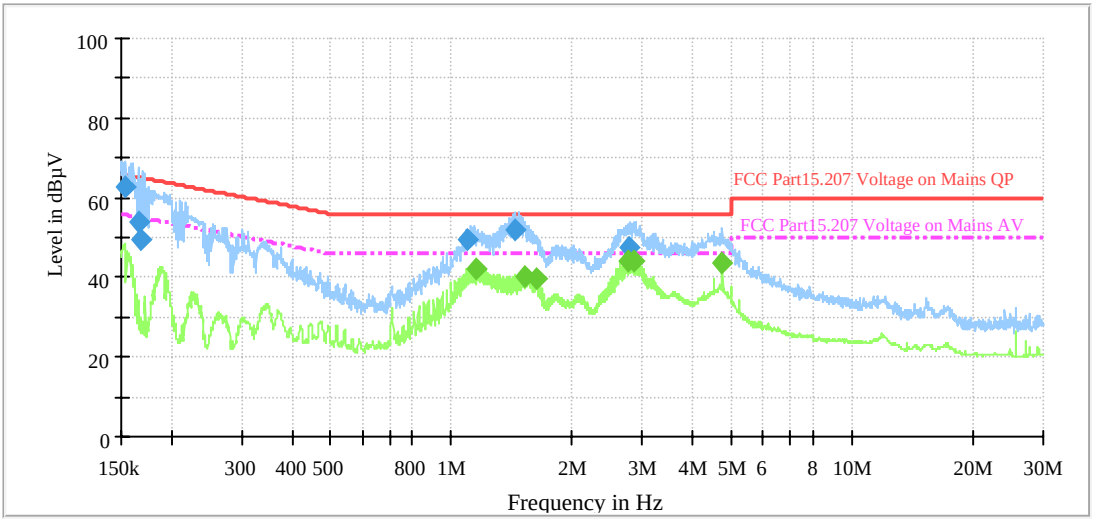


Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Neutral	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.156115	62.5	9.000	L1	18.8	3.2	65.7
0.163457	56.5	9.000	L1	18.9	8.7	65.3
0.173901	48.3	9.000	L1	19.0	16.5	64.8
1.489715	47.9	9.000	L1	20.2	8.1	56.0
2.756522	48.4	9.000	L1	20.4	7.6	56.0
2.920959	49.4	9.000	L1	20.4	6.6	56.0

Frequency (MHz)	Average (dBuV)	Bandwidth (kHz)	Neutral	Corr. (dB)	Margin (dB)	Limit (dBuV)
1.119487	43.6	9.000	L1	20.2	*2.4	46.0
1.264591	41.6	9.000	L1	20.2	4.4	46.0
1.636388	39.1	9.000	L1	20.3	6.9	46.0
2.745529	44.1	9.000	L1	20.4	*1.9	46.0
2.840386	44.7	9.000	L1	20.4	*1.3	46.0
4.746591	43.4	9.000	L1	20.5	*2.6	46.0

**Within measurement uncertainty!*

Neutral



Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Neutral	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.152722	63.0	9.000	N	18.8	*2.9	65.9
0.165098	54.1	9.000	N	18.9	11.1	65.2
0.167758	49.3	9.000	N	18.9	15.7	65.1
1.058560	49.3	9.000	N	20.2	6.7	56.0
1.445731	52.1	9.000	N	20.2	3.9	56.0
2.745690	48.3	9.000	N	20.4	7.7	56.0

Frequency (MHz)	Average (dBuV)	Bandwidth (kHz)	Neutral	Corr. (dB)	Margin (dB)	Limit (dBuV)
1.155853	42.1	9.000	N	20.2	3.9	46.0
1.528916	40.2	9.000	N	20.3	5.8	46.0
1.636388	39.5	9.000	N	20.3	6.5	46.0
2.745529	44.0	9.000	N	20.4	*2.0	46.0
2.840386	44.2	9.000	N	20.4	*1.8	46.0
4.746591	43.5	9.000	N	20.4	*2.5	46.0

**Within measurement uncertainty!*

Note: EUT transmitting simultaneously with 2.4G and 5G radio frequency and supports intelligent radio frequency management functionalities.

FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

FCC §15.247 (d); §15.209; §15.205;

Measurement Uncertainty

Compliance or non- compliance with a disturbance limit shall be determined in the following manner：

If U_{lab} is less than or equal to U_{cispr} of Table 2, then:
–compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
–non - compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.
If U_{lab} is greater than U_{cispr} of Table 2, then:
–compliance is deemed to occur if no measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit;
–non - compliance is deemed to occur if any measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit.

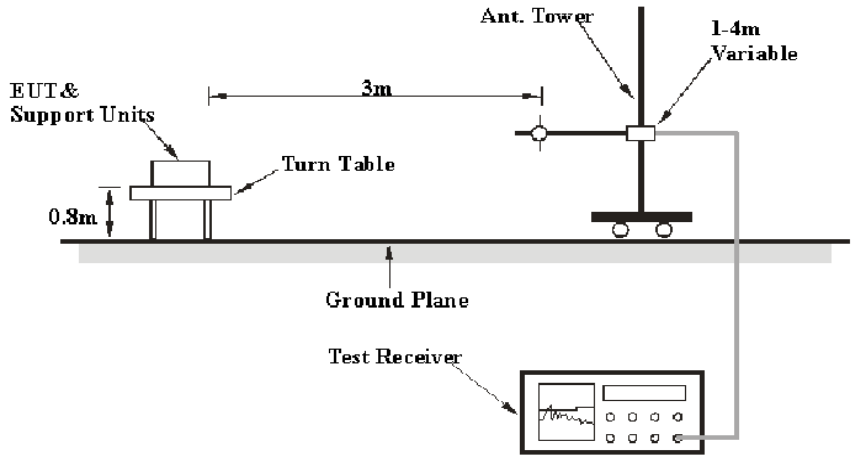
Based on CISPR 16-4-2-2011, measurement uncertainty of radiated emission at a distance of 3m at Bay Area Compliance Laboratories Corp. (Chengdu) is:
30M~200MHz: ±4.7 dB ;
200M~1GHz: ±6.0 dB ;
1G-6GHz: ±5.13dB;
6G~25GHz: ±5.47 dB;

Table 2 – Values of U_{cispr}

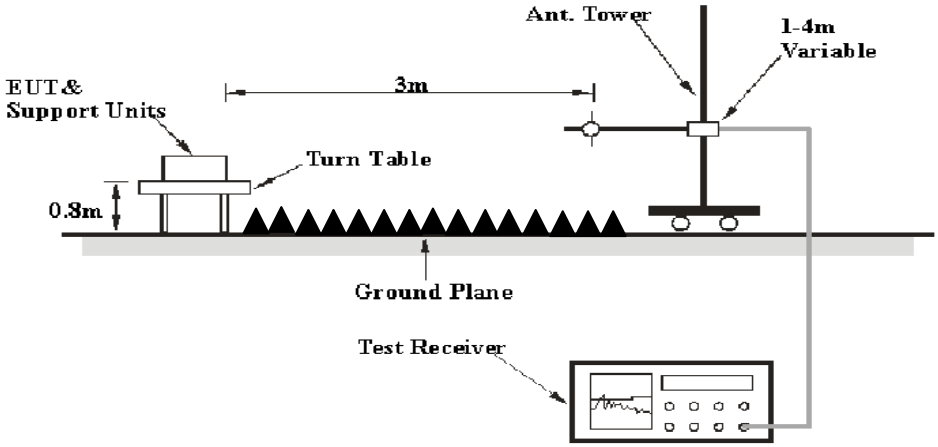
Measurement	U_{cispr}
Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz)	5.5 dB

EUT Setup

Below 1 GHz:



Above 1 GHz:



The radiated emission tests were performed in the 3 meters Semi-Anechoic Chamber, using the setup in accordance with the ANSI C63.4-2003. The specification used was the FCC 15.209 and FCC 15.247 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

DC 48V was used by the EUT through POE injector.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1 MHz	3 MHz	/	PK
	1 MHz	10 Hz	/	Ave.

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1 GHz, peak and Average detection modes for frequencies above 1 GHz.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude = Receiver Reading + Cable loss + Antenna Factor – Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin = Limit-Corrected Amplitude

Test Equipment List and Details

Manufacturer	Description	Model Number	Serial Number	Calibration Date	Calibration Due Date
Agilent	Amplifier	8447D	2944A10442	2015-06-23	2016-06-22
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2015-06-23	2016-06-22
Sunol Sciences	Broadband Antenna	JB3	A101808	2013-04-10	2016-04-09
Rohde & Schwarz	Spectrum Analyzer	FSL18	100180	2015-06-23	2016-06-22
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2014-10-17	2015-10-16
EM TEST	Horn Antenna	3115	003-6076	2015-04-09	2016-04-08
WEINSCHEL ENGINEERING	Attenuator	1A 10dB	AB1165	2014-10-31	2015-10-30
Mini-circuits	Filter	VHF-3100+	31306	2015-07-15	2016-07-14
Mini-circuits	Filter	VHF-6010+	31336	2015-07-15	2016-07-14
Mini-circuits	Amplifier	ZVA-183-S+	771001215	2014-11-18	2015-11-17
EMCT	Semi-Anechoic Chamber	966	N/A	2015-04-24	2018-04-23

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Section 15.205, 15.209 and 15.247, with the worst margin reading of:

3.19 dB at **2483.9 MHz** in the **Horizontal** polarization for 802.11n HT40 mode

Test Data

Environmental Conditions

Temperature:	24 °C
Relative Humidity:	51 %
ATM Pressure:	99.6kPa

The testing was performed by Kevin Tao on 2015-08-24.

Test Mode: Transmitting

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	FCC 15.247	
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)				Limit (dBμV/m)	Margin (dB)
802.11b mode, Low Channel: 2412 MHz									
2412	86.31	PK	H	23.14	2.80	0.00	112.25	N/A	N/A
2412	80.52	AV	H	23.14	2.80	0.00	106.46	N/A	N/A
2412	82.38	PK	V	23.14	2.80	0.00	108.32	N/A	N/A
2412	77.11	AV	V	23.14	2.80	0.00	103.05	N/A	N/A
2389.5	29.85	PK	H	23.08	2.63	0.00	55.56	74.00	18.44
2389.5	17.59	AV	H	23.08	2.63	0.00	43.30	54.00	10.70
4824	43.38	PK	H	30.76	4.26	26.81	51.59	74.00	22.41
4824	39.86	AV	H	30.76	4.26	26.81	48.07	54.00	5.93
7236	30.33	PK	H	34.35	4.80	26.62	42.86	74.00	31.14
7236	16.57	AV	H	34.35	4.80	26.62	29.10	54.00	24.90
9648	30.12	PK	H	37.08	6.15	26.35	47.00	74.00	27.00
9648	16.54	AV	H	37.08	6.15	26.35	33.42	54.00	20.58
2593	36.67	PK	H	26.14	2.84	26.81	38.84	74.00	35.16
2593	19.11	AV	H	26.14	2.84	26.81	21.28	54.00	32.72
37.9	46.7	QP	V	14.86	0.76	28.02	34.30	40.00	5.70
802.11b mode, Middle Channel: 2437 MHz									
2437	81.69	PK	H	25.74	2.81	0.00	110.24	N/A	N/A
2437	77.01	AV	H	25.74	2.81	0.00	105.56	N/A	N/A
2437	82.62	PK	V	25.74	2.81	0.00	111.17	N/A	N/A
2437	75.61	AV	V	25.74	2.81	0.00	104.16	N/A	N/A
4874	37.81	PK	H	30.77	4.29	26.78	46.09	74.00	27.91
4874	31.79	AV	H	30.77	4.29	26.78	40.07	54.00	13.93
7311	32.26	PK	H	34.35	4.79	26.56	44.84	74.00	29.16
7311	18.13	AV	H	34.35	4.79	26.56	30.71	54.00	23.29
9748	30.16	PK	H	36.30	6.19	26.32	46.33	74.00	27.67
9748	18.54	AV	H	36.30	6.19	26.32	34.71	54.00	19.29
2769	35.12	PK	H	26.60	3.06	26.81	37.97	74.00	36.03
2769	20.59	AV	H	26.60	3.06	26.81	23.44	54.00	30.56
3469	34.56	PK	H	28.70	3.28	26.81	39.73	74.00	34.27
3469	20.18	AV	H	28.70	3.28	26.81	25.35	54.00	28.65
37.8	46.9	QP	V	14.86	0.76	28.02	34.50	40.00	5.50
802.11b mode, High Channel: 2462 MHz									
2462	85.55	PK	H	25.80	2.82	0.00	114.17	N/A	N/A
2462	79.81	AV	H	25.80	2.82	0.00	108.43	N/A	N/A
2462	82.55	PK	V	25.80	2.82	0.00	111.17	N/A	N/A
2462	76.73	AV	V	25.80	2.82	0.00	105.35	N/A	N/A
2483.6	30.12	PK	H	25.86	2.83	0.00	58.81	74.00	15.19
2483.6	17.81	AV	H	25.86	2.83	0.00	46.50	54.00	7.50
4924	39.29	PK	H	30.90	4.31	26.71	47.79	74.00	26.21
4924	34.38	AV	H	30.90	4.31	26.71	42.88	54.00	11.12
7386	32.78	PK	H	34.53	4.85	26.53	45.63	74.00	28.37
7386	17.79	AV	H	34.53	4.85	26.53	30.64	54.00	23.36
9848	31.55	PK	H	36.54	6.24	26.30	48.03	74.00	25.97
9848	17.37	AV	H	36.54	6.24	26.30	33.85	54.00	20.15
2769	36.58	PK	H	26.60	3.06	26.81	39.43	74.00	34.57
2769	23.14	AV	H	26.60	3.06	26.81	25.99	54.00	28.01
37.9	46.3	QP	V	14.86	0.76	28.02	33.90	40.00	6.10

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	FCC 15.247	
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)				Limit (dBμV/m)	Margin (dB)
802.11g mode, Low Channel: 2412 MHz									
2412	80.79	PK	H	23.14	2.80	0.00	106.73	N/A	N/A
2412	66.76	AV	H	23.14	2.80	0.00	92.70	N/A	N/A
2412	79.09	PK	V	23.14	2.80	0.00	105.03	N/A	N/A
2412	65.79	AV	V	23.14	2.80	0.00	91.73	N/A	N/A
2389.7	31.01	PK	H	23.08	2.63	0.00	56.72	74.00	17.28
2389.7	17.17	AV	H	23.08	2.63	0.00	42.88	54.00	11.12
4824	46.36	PK	H	30.76	4.26	26.81	54.57	74.00	19.43
4824	32.09	AV	H	30.76	4.26	26.81	40.30	54.00	13.70
7236	29.56	PK	H	34.35	4.80	26.62	42.09	74.00	31.91
7236	16.32	AV	H	34.35	4.80	26.62	28.85	54.00	25.15
9648	28.76	PK	H	37.08	6.15	26.35	45.64	74.00	28.36
9648	14.35	AV	H	37.08	6.15	26.35	31.23	54.00	22.77
2692	35.12	PK	H	26.40	2.84	26.81	37.55	74.00	36.45
2692	22.84	AV	H	26.40	2.84	26.81	25.27	54.00	28.73
37.8	46.4	QP	V	14.86	0.76	28.00	34.02	40.00	5.98
802.11g mode, Middle Channel: 2437 MHz									
2437	81.45	PK	H	25.74	2.81	0.00	110.00	N/A	N/A
2437	66.83	AV	H	25.74	2.81	0.00	95.38	N/A	N/A
2437	79.74	PK	V	25.74	2.81	0.00	108.29	N/A	N/A
2437	66.81	AV	V	25.74	2.81	0.00	95.36	N/A	N/A
4874	37.15	PK	H	30.77	4.29	26.78	45.43	74.00	28.57
4874	23.87	AV	H	30.77	4.29	26.78	32.15	54.00	21.85
7311	29.44	PK	H	34.35	4.79	26.56	42.02	74.00	31.98
7311	16.86	AV	H	34.35	4.79	26.56	29.44	54.00	24.56
9748	27.98	PK	H	36.30	6.19	26.32	44.15	74.00	29.85
9748	13.54	AV	H	36.30	6.19	26.32	29.71	54.00	24.29
2692	34.86	PK	H	26.40	3.06	26.81	37.51	74.00	36.49
2692	18.45	AV	H	26.40	3.06	26.81	21.10	54.00	32.90
3526	35.48	PK	H	28.86	3.28	26.81	40.81	74.00	33.19
3526	22.75	AV	H	28.86	3.28	26.81	28.08	54.00	25.92
38.1	45.9	QP	V	14.86	0.76	28.02	33.50	40.00	6.50
802.11g mode, High Channel: 2462 MHz									
2462	80.71	PK	H	25.80	2.82	0.00	109.33	N/A	N/A
2462	66.74	AV	H	25.80	2.82	0.00	95.36	N/A	N/A
2462	78.28	PK	V	25.80	2.82	0.00	106.90	N/A	N/A
2462	64.91	AV	V	25.80	2.82	0.00	93.53	N/A	N/A
2483.7	31.56	PK	H	25.86	2.83	0.00	60.25	74.00	13.75
2483.7	17.73	AV	H	25.86	2.83	0.00	46.42	54.00	7.58
4924	40.8	PK	H	30.90	4.31	26.71	49.30	74.00	24.70
4924	25.66	AV	H	30.90	4.31	26.71	34.16	54.00	19.84
7386	29.46	PK	H	34.53	4.85	26.53	42.31	74.00	31.69
7386	14.65	AV	H	34.53	4.85	26.53	27.50	54.00	26.50
9848	28.63	PK	H	36.54	6.24	26.30	45.11	74.00	28.89
9848	15.42	AV	H	36.54	6.24	26.30	31.90	54.00	22.10
2692	32.48	PK	H	26.40	3.06	26.81	35.13	74.00	38.87
2692	21.67	AV	H	26.40	3.06	26.81	24.32	54.00	29.68
38.1	46.2	QP	V	14.86	0.76	28.02	33.80	40.00	6.20

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	FCC 15.247	
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)				Limit (dBμV/m)	Margin (dB)
802.11n HT20 mode, Low Channel: 2412 MHz									
2412	80.66	PK	H	23.14	2.80	0.00	106.60	N/A	N/A
2412	66.37	AV	H	23.14	2.80	0.00	92.31	N/A	N/A
2412	79.28	PK	V	23.14	2.80	0.00	105.22	N/A	N/A
2412	65.92	AV	V	23.14	2.80	0.00	91.86	N/A	N/A
2389.9	30.02	PK	H	23.08	2.63	0.00	55.73	74.00	18.27
2389.9	18.16	AV	H	23.08	2.63	0.00	43.87	54.00	10.13
4824	46.59	PK	H	30.76	4.26	26.81	54.80	74.00	19.20
4824	30.83	AV	H	30.76	4.26	26.81	39.04	54.00	14.96
7236	29.88	PK	H	34.35	4.80	26.62	42.41	74.00	31.59
7236	17.35	AV	H	34.35	4.80	26.62	29.88	54.00	24.12
9648	28.41	PK	H	37.08	6.15	26.35	45.29	74.00	28.71
9648	14.22	AV	H	37.08	6.15	26.35	31.10	54.00	22.90
2692	33.48	PK	H	26.40	2.84	26.81	35.91	74.00	38.09
2692	21.55	AV	H	26.40	2.84	26.81	23.98	54.00	30.02
38.1	46.3	QP	V	14.86	0.76	28.02	33.90	40.00	6.10
802.11n HT20mode, Middle Channel: 2437 MHz									
2437	81.13	PK	H	25.74	2.81	0.00	109.68	N/A	N/A
2437	68.22	AV	H	25.74	2.81	0.00	96.77	N/A	N/A
2437	79.47	PK	V	25.74	2.81	0.00	108.02	N/A	N/A
2437	65.61	AV	V	25.74	2.81	0.00	94.16	N/A	N/A
4874	37.94	PK	H	30.77	4.29	26.78	46.22	74.00	27.78
4874	24.1	AV	H	30.77	4.29	26.78	32.38	54.00	21.62
7311	31.02	PK	H	34.35	4.79	26.56	43.60	74.00	30.40
7311	18.26	AV	H	34.35	4.79	26.56	30.84	54.00	23.16
9748	28.74	PK	H	36.30	6.19	26.32	44.91	74.00	29.09
9748	17.76	AV	H	36.30	6.19	26.32	33.93	54.00	20.07
2692	33.34	PK	H	26.40	3.06	26.81	35.99	74.00	38.01
2692	17.68	AV	H	26.40	3.06	26.81	20.33	54.00	33.67
3526	36.25	PK	H	28.86	3.28	26.81	41.58	74.00	32.42
3526	22.58	AV	H	28.86	3.28	26.81	27.91	54.00	26.09
37.95	45.9	QP	V	14.86	0.76	28.02	33.50	40.00	6.50
802.11n HT20 mode, High Channel: 2462 MHz									
2462	81.46	PK	H	25.80	2.82	0.00	110.08	N/A	N/A
2462	68.79	AV	H	25.80	2.82	0.00	97.41	N/A	N/A
2462	79.17	PK	V	25.80	2.82	0.00	107.79	N/A	N/A
2462	65.36	AV	V	25.80	2.82	0.00	93.98	N/A	N/A
2483.9	30.97	PK	H	25.86	2.83	0.00	59.66	74.00	14.34
2483.9	18.49	AV	H	25.86	2.83	0.00	47.18	54.00	6.82
4924	40.14	PK	H	30.90	4.31	26.71	48.64	74.00	25.36
4924	25.53	AV	H	30.90	4.31	26.71	34.03	54.00	19.97
7386	30.12	PK	H	34.53	4.85	26.53	42.97	74.00	31.03
7386	18.02	AV	H	34.53	4.85	26.53	30.87	54.00	23.13
9848	28.89	PK	H	36.54	6.24	26.30	45.37	74.00	28.63
9848	15.45	AV	H	36.54	6.24	26.30	31.93	54.00	22.07
3526	34.89	PK	H	28.86	3.06	26.81	40.00	74.00	34.00
3526	21.56	AV	H	28.86	3.06	26.81	26.67	54.00	27.33
38.1	45.7	QP	V	14.86	0.76	28.02	33.30	40.00	6.70

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	FCC 15.247	
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)				Limit (dBμV/m)	Margin (dB)
802.11n HT40 mode, Low Channel: 2422 MHz									
2422	79.12	PK	H	23.14	2.80	0.00	105.06	N/A	N/A
2422	65.8	AV	H	23.14	2.80	0.00	91.74	N/A	N/A
2422	77.57	PK	V	23.14	2.80	0.00	103.51	N/A	N/A
2422	63.77	AV	V	23.14	2.80	0.00	89.71	N/A	N/A
2388.6	31.85	PK	H	23.08	2.63	0.00	57.56	74.00	16.44
2388.6	18.46	AV	H	23.08	2.63	0.00	44.17	54.00	9.83
4844	42.58	PK	H	30.76	4.27	26.81	50.80	74.00	23.20
4844	26.25	AV	H	30.76	4.27	26.81	34.47	54.00	19.53
7266	29.88	PK	H	34.35	4.79	26.62	42.40	74.00	31.60
7266	16.58	AV	H	34.35	4.79	26.62	29.10	54.00	24.90
9688	27.86	PK	H	37.08	6.16	26.35	44.75	74.00	29.25
9688	14.65	AV	H	37.08	6.16	26.35	31.54	54.00	22.46
2692	32.16	PK	H	26.40	2.84	26.81	34.59	74.00	39.41
2692	21.23	AV	H	26.40	2.84	26.81	23.66	54.00	30.34
38.1	46.1	QP	V	14.86	0.76	28.02	33.70	40.00	6.30
802.11n HT40 mode, Middle Channel: 2437 MHz									
2437	78.33	PK	H	25.74	2.81	0.00	106.88	N/A	N/A
2437	64.88	AV	H	25.74	2.81	0.00	93.43	N/A	N/A
2437	77.13	PK	V	25.74	2.81	0.00	105.68	N/A	N/A
2437	63.45	AV	V	25.74	2.81	0.00	92.00	N/A	N/A
4874	35.79	PK	H	30.77	4.29	26.78	44.07	74.00	29.93
4874	21.99	AV	H	30.77	4.29	26.78	30.27	54.00	23.73
7311	31.85	PK	H	34.35	4.79	26.56	44.43	74.00	29.57
7311	19.92	AV	H	34.35	4.79	26.56	32.50	54.00	21.50
9748	30.62	PK	H	36.30	6.19	26.32	46.79	74.00	27.21
9748	18.05	AV	H	36.30	6.19	26.32	34.22	54.00	19.78
2692	34.68	PK	H	26.40	3.06	26.81	37.33	74.00	36.67
2692	18.67	AV	H	26.40	3.06	26.81	21.32	54.00	32.68
3526	35.24	PK	H	28.86	3.28	26.81	40.57	74.00	33.43
3526	21.84	AV	H	28.86	3.28	26.81	27.17	54.00	26.83
37.9	46.3	QP	V	14.86	0.76	28.02	33.90	40.00	6.10
802.11n HT40 mode, High Channel: 2452 MHz									
2452	78.21	PK	H	25.78	2.81	0.00	106.80	N/A	N/A
2452	62.81	AV	H	25.78	2.81	0.00	91.40	N/A	N/A
2452	75.45	PK	V	25.78	2.81	0.00	104.04	N/A	N/A
2452	61.06	AV	V	25.78	2.81	0.00	89.65	N/A	N/A
2483.9	36.72	PK	H	25.86	2.83	0.00	65.41	74.00	8.59
2483.9	22.12	AV	H	25.86	2.83	0.00	50.81	54.00	*3.19
4904	36.22	PK	H	30.85	4.30	26.71	44.66	74.00	29.34
4904	22.88	AV	H	30.85	4.30	26.71	31.32	54.00	22.68
7356	30.28	PK	H	34.45	4.83	26.53	43.03	74.00	30.97
7356	16.52	AV	H	34.45	4.83	26.53	29.27	54.00	24.73
9808	28.99	PK	H	36.44	6.22	26.30	45.35	74.00	28.65
9808	14.32	AV	H	36.44	6.22	26.30	30.68	54.00	23.32
2692	32.15	PK	H	26.40	2.84	26.81	34.58	74.00	39.42
2692	16.89	AV	H	26.40	2.84	26.81	19.32	54.00	34.68
37.8	45.8	QP	V	14.86	0.76	28.02	33.40	40.00	6.60

** Within Measurement Uncertainty.*

For co-location evaluation data (2.4 GHz & 5GHz work simultaneously)
2462MHz and 5745MHz were chosen to be tested.

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	FCC 15.247	
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)				Limit (dBμV/m)	Margin (dB)
4924	34.29	PK	V	31.40	4.50	26.82	43.37	74.00	30.63
4924	23.25	AV	V	31.40	4.50	26.82	32.33	54.00	21.67
7386	30.23	PK	V	35.30	5.15	27.00	43.68	74.00	30.32
7386	18.36	AV	V	35.30	5.15	27.00	31.81	54.00	22.19
9848	32.58	PK	V	37.00	6.25	25.65	50.18	74.00	23.82
9848	20.12	AV	V	37.00	6.25	25.65	37.72	54.00	16.28
280	49.5	QP	V	13.37	0.26	26.20	36.93	46.00	9.07
2399.95	50.32	PK	V	23.20	2.56	26.85	49.23	74.00	24.77
2399.95	41.27	AV	V	23.20	2.56	26.85	40.18	54.00	13.82
2483.55	52.68	PK	V	23.20	2.57	26.85	51.60	74.00	22.40
2483.55	36.94	AV	V	23.20	2.57	26.85	35.86	54.00	18.14
11490	32.46	PK	V	38.00	6.34	23.80	53.00	74.00	21.00
11490	21.35	AV	V	38.00	6.34	23.80	41.89	54.00	12.11
17235	33.12	PK	V	43.00	6.45	22.40	60.17	74.00	13.83
17235	19.86	AV	V	43.00	6.45	22.40	46.91	54.00	7.09
5724.5	45.52	PK	V	32.50	4.10	26.55	55.57	74.00	18.43
5724.5	35.17	AV	V	32.50	4.10	26.55	45.22	54.00	8.78
5850.6	40.89	PK	V	32.50	4.20	26.55	51.04	74.00	22.96
5850.6	32.68	AV	V	32.50	4.20	26.55	42.83	54.00	11.17

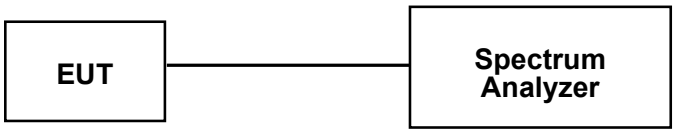
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

Applicable Standard

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

Test 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 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.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2014-10-17	2015-10-16

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	26 °C & 25 °C
Relative Humidity:	67 % & 65 %
ATM Pressure:	97.1 kPa & 97.1 kPa

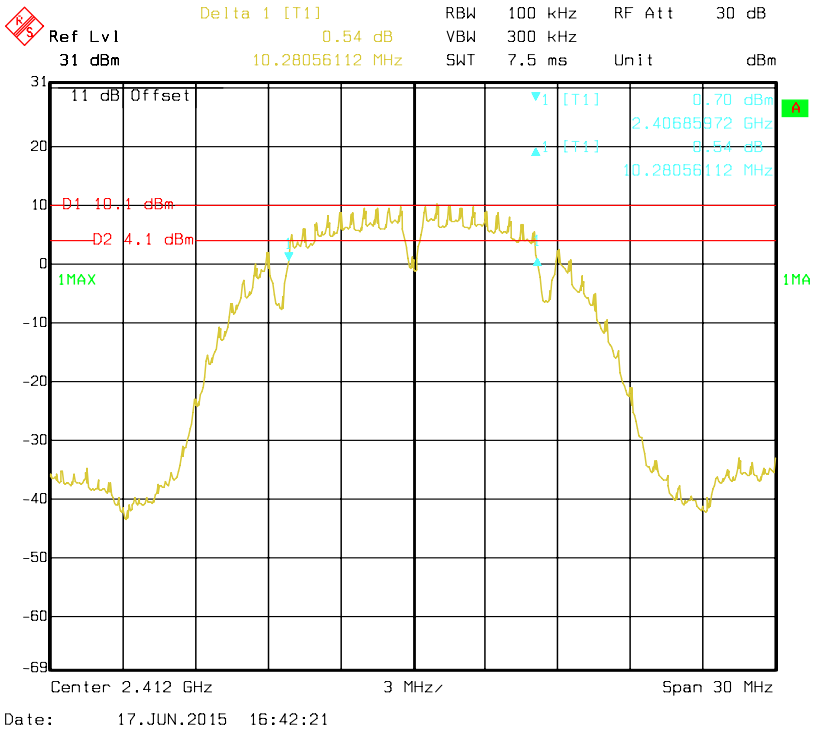
The testing was performed by Kevin Tao on 2015-06-16 & 2015-06-17.

Test Mode: Transmitting

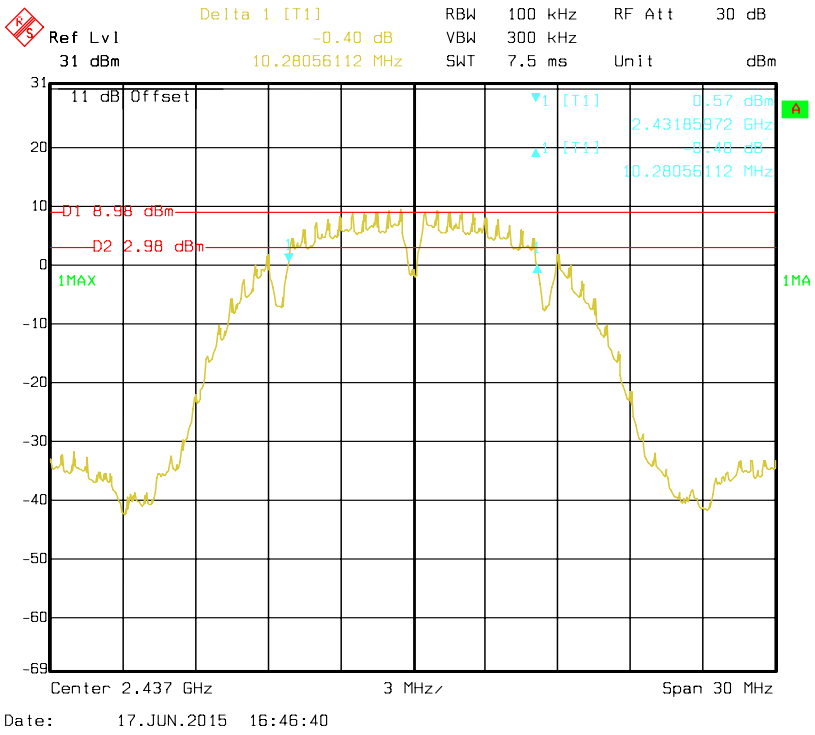
Mode	Channel	Frequency (MHz)	6 dB Bandwidth (MHz)			FCC Limit (kHz)
			Antenna 0	Antenna 1	Antenna 2	
2.4G band 802.11b	Low	2412	10.28	10.28	10.28	> 500
	Middle	2437	10.28	10.28	10.28	> 500
	High	2462	10.28	10.28	10.28	> 500
2.4G band 802.11g	Low	2412	16.59	16.59	16.59	> 500
	Middle	2437	16.59	16.59	16.59	> 500
	High	2462	16.59	16.59	16.59	> 500
2.4G band 802.11n HT20	Low	2412	17.79	17.79	17.79	> 500
	Middle	2437	17.79	17.85	17.79	> 500
	High	2462	17.79	17.79	17.79	> 500
2.4G band 802.11n HT40	Low	2422	36.67	36.67	36.67	> 500
	Middle	2437	36.67	36.79	36.67	> 500
	High	2452	36.67	36.71	36.67	> 500

Please refer to the following plots:

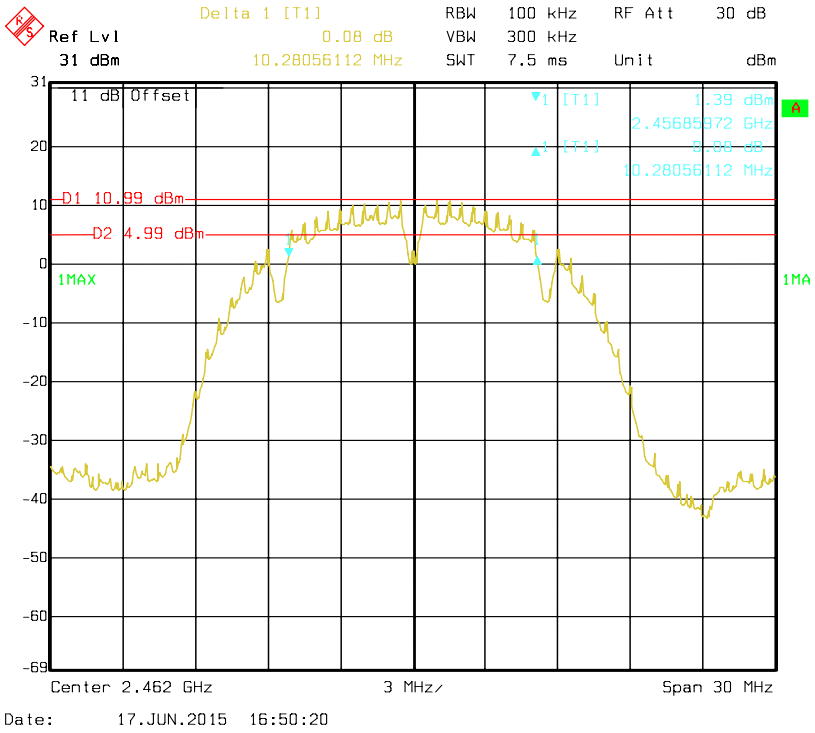
802.11b Low Channel for Antenna 0



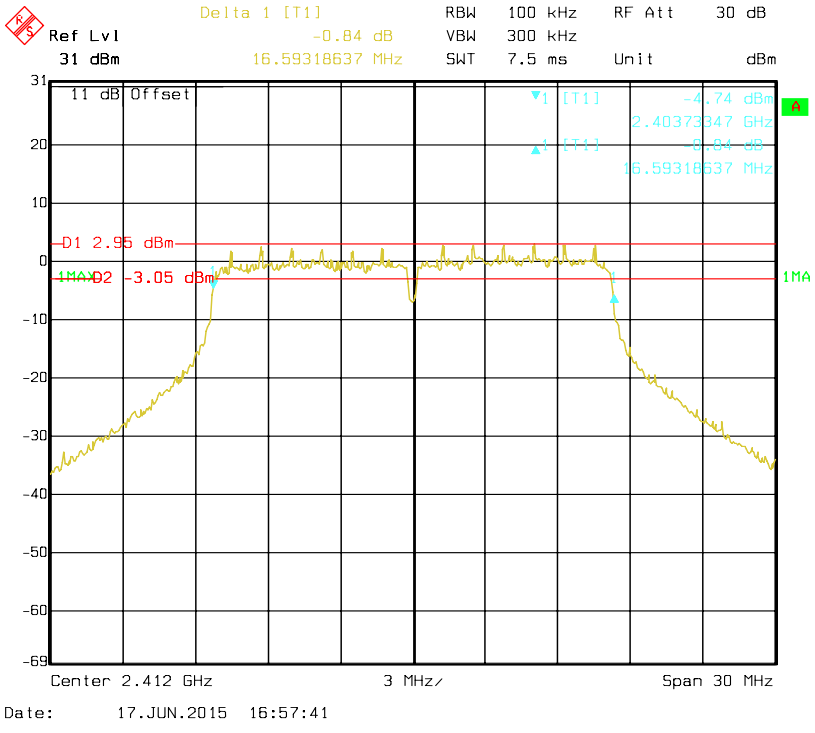
802.11b Middle Channel for Antenna 0



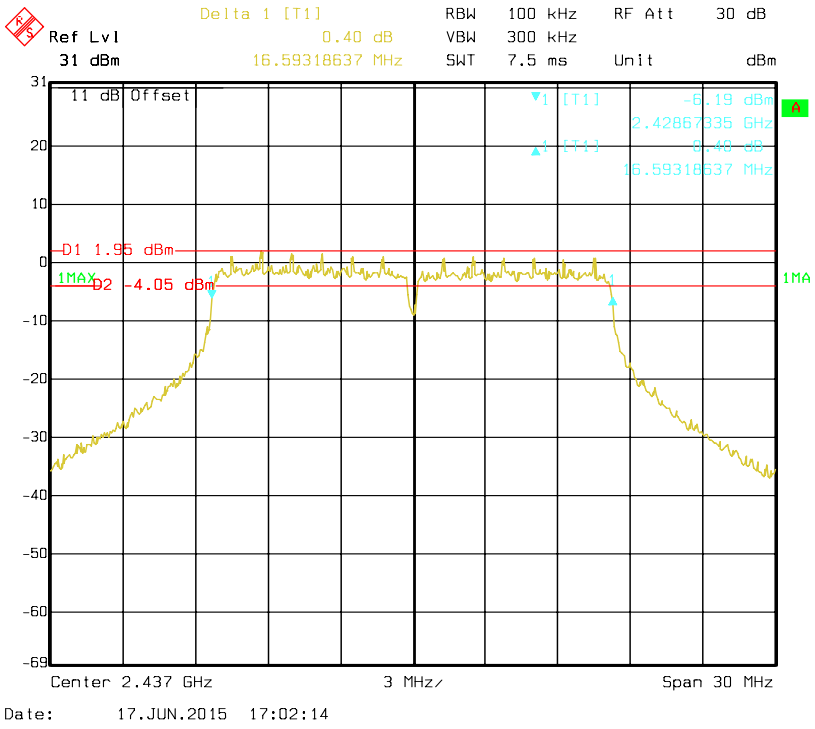
802.11b High Channel for Antenna 0



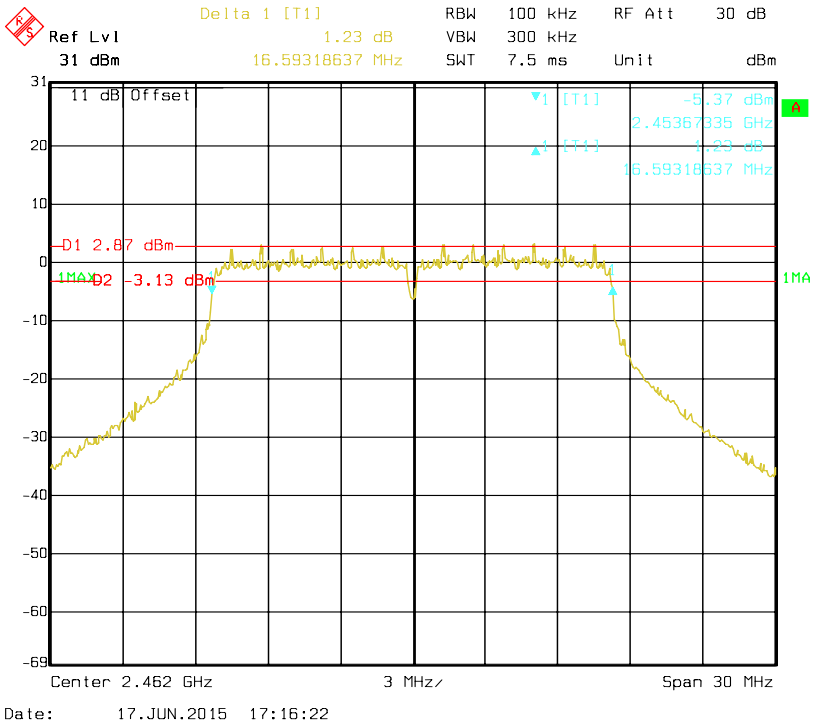
802.11g Low Channel for Antenna 0



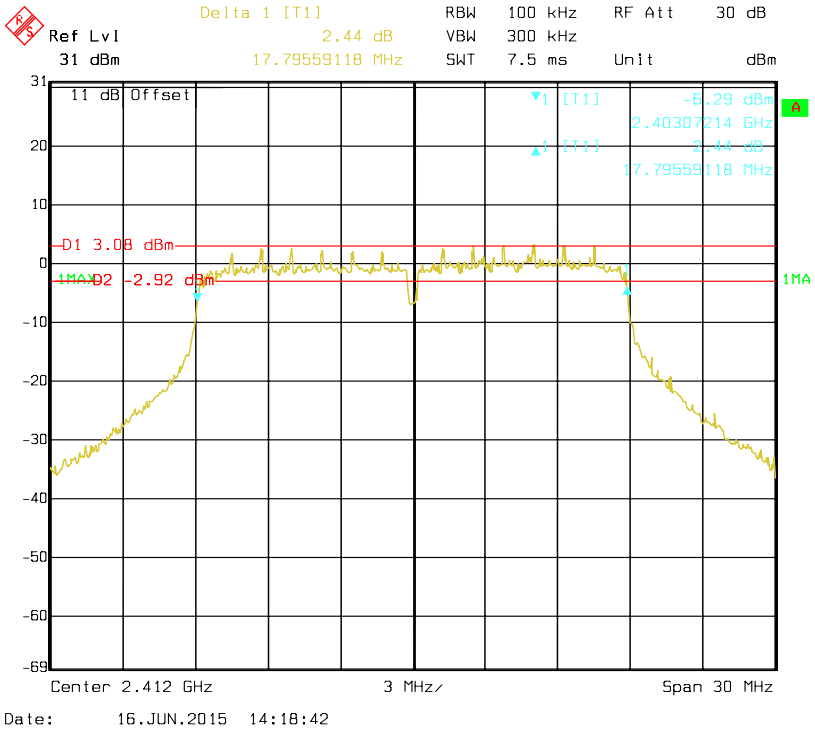
802.11g Middle Channel for Antenna 0



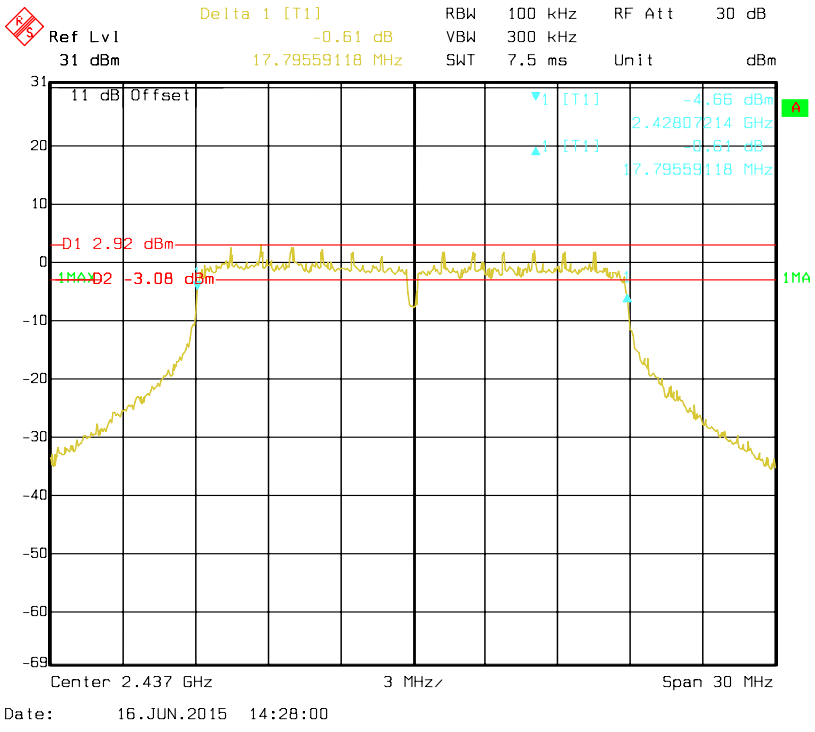
802.11g High Channel for Antenna 0



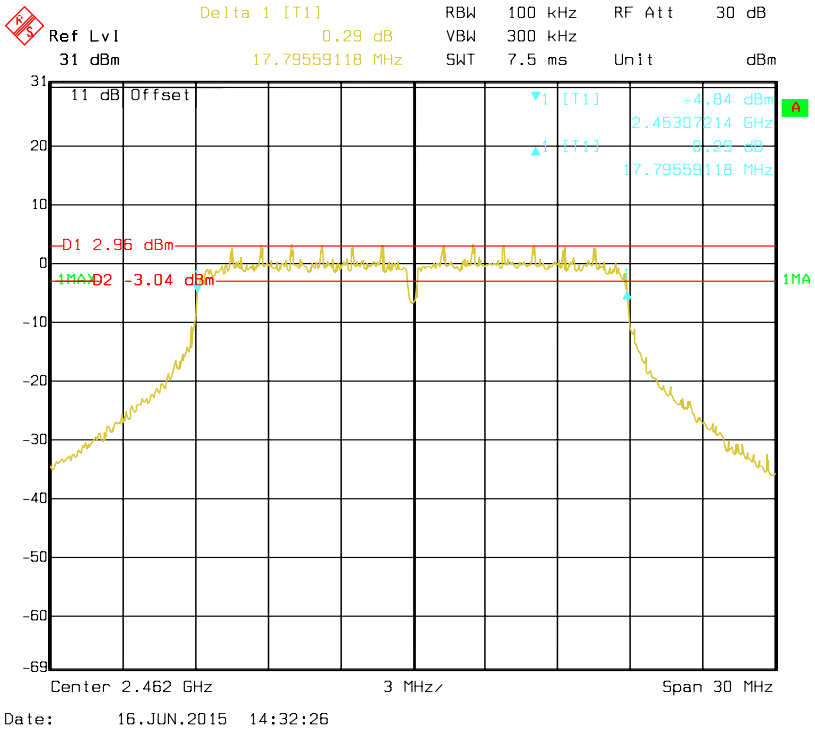
802.11n HT20 Low Channel for Antenna 0



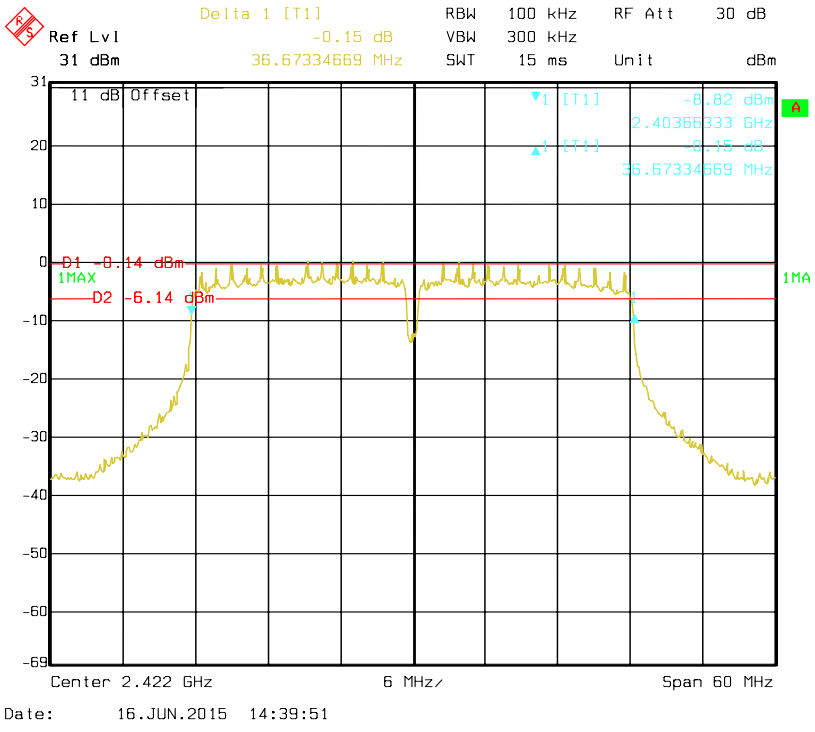
802.11n HT20 Middle Channel for Antenna 0



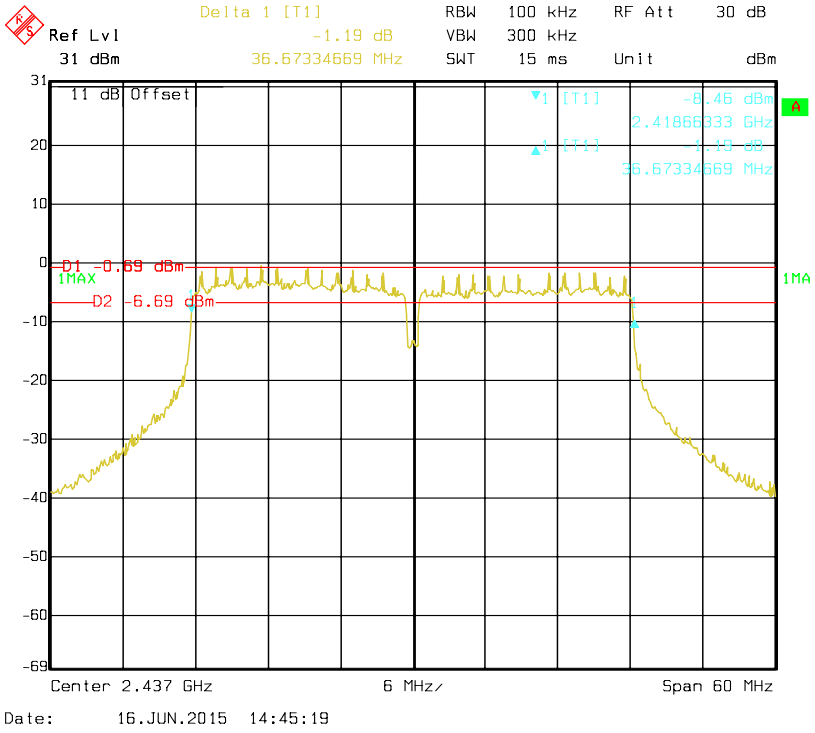
802.11n HT20 High Channel for Antenna 0



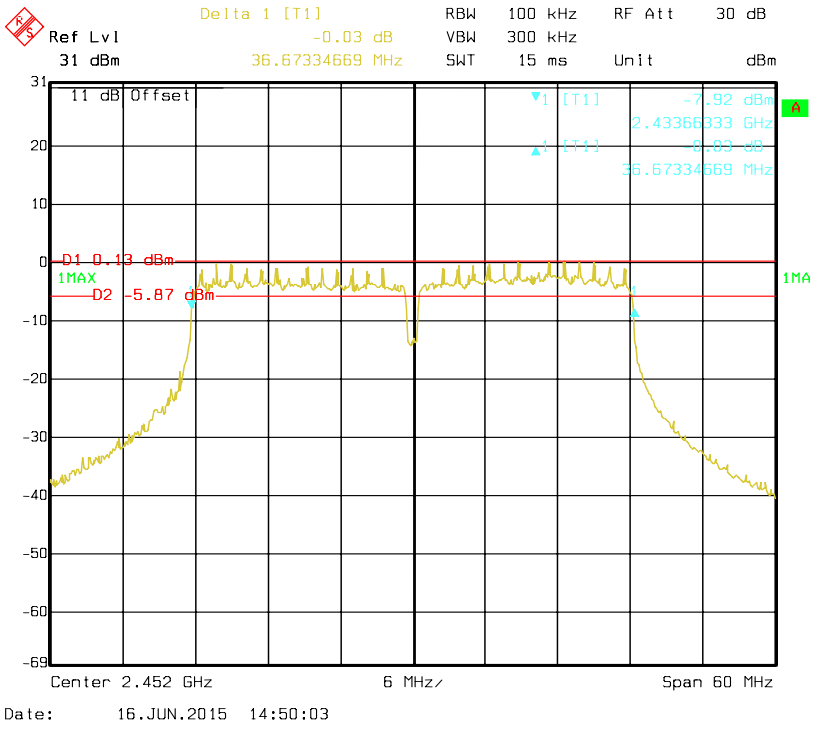
802.11n HT40 Low Channel for Antenna 0



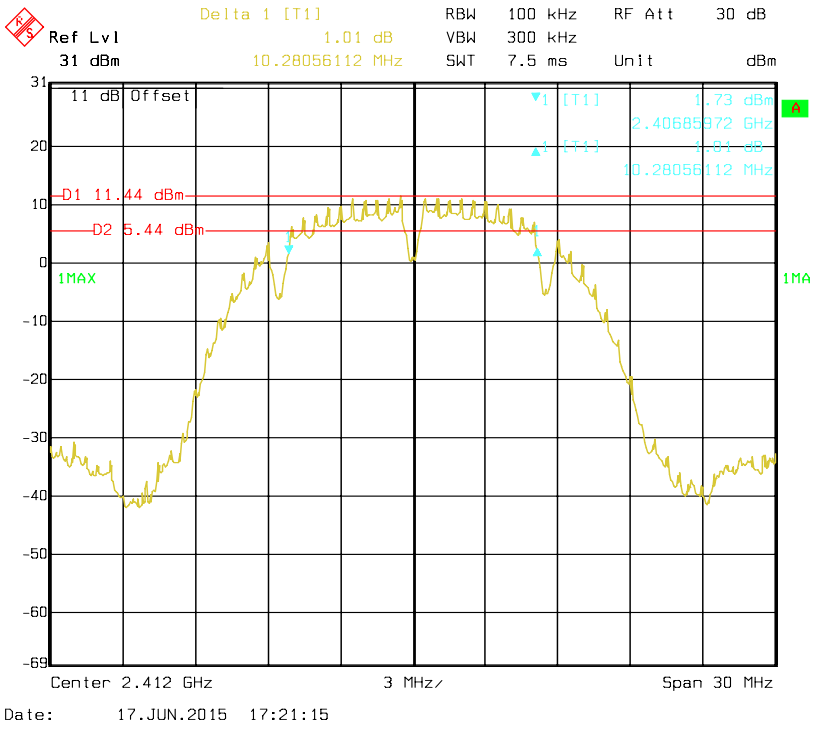
802.11n HT40 Middle Channel for Antenna 0



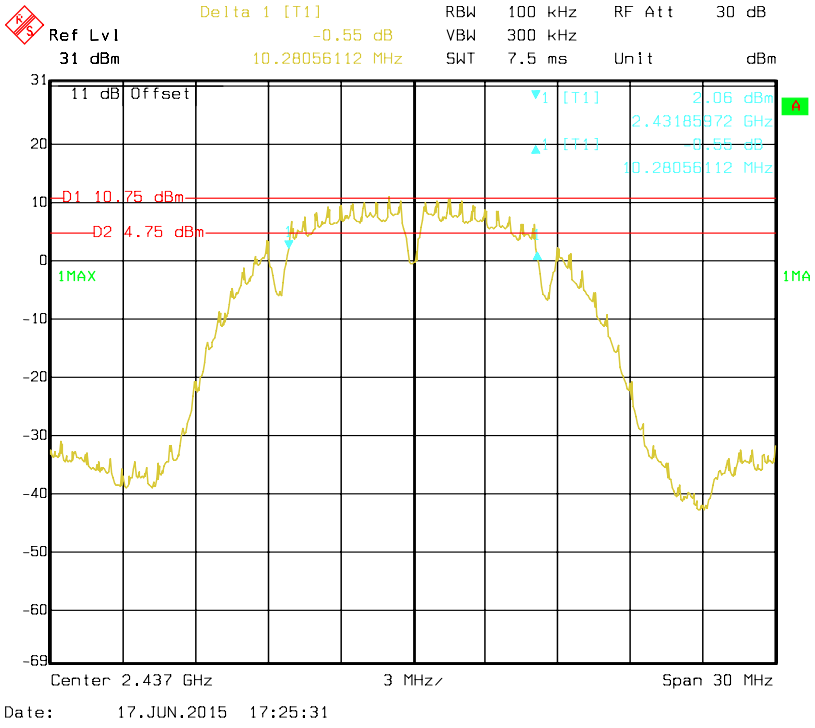
802.11n HT40 High Channel for Antenna 0



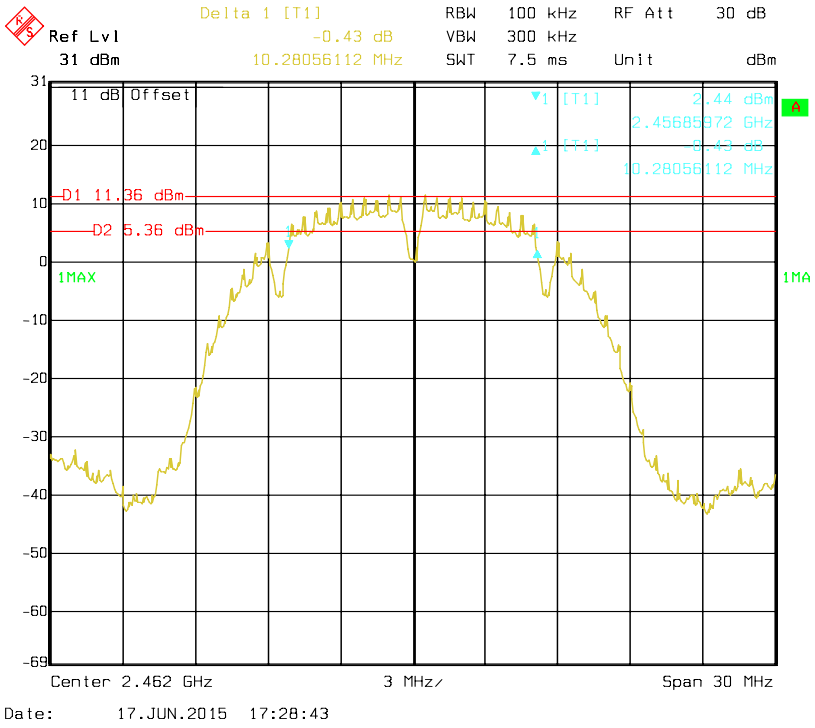
802.11b Low Channel for Antenna 1



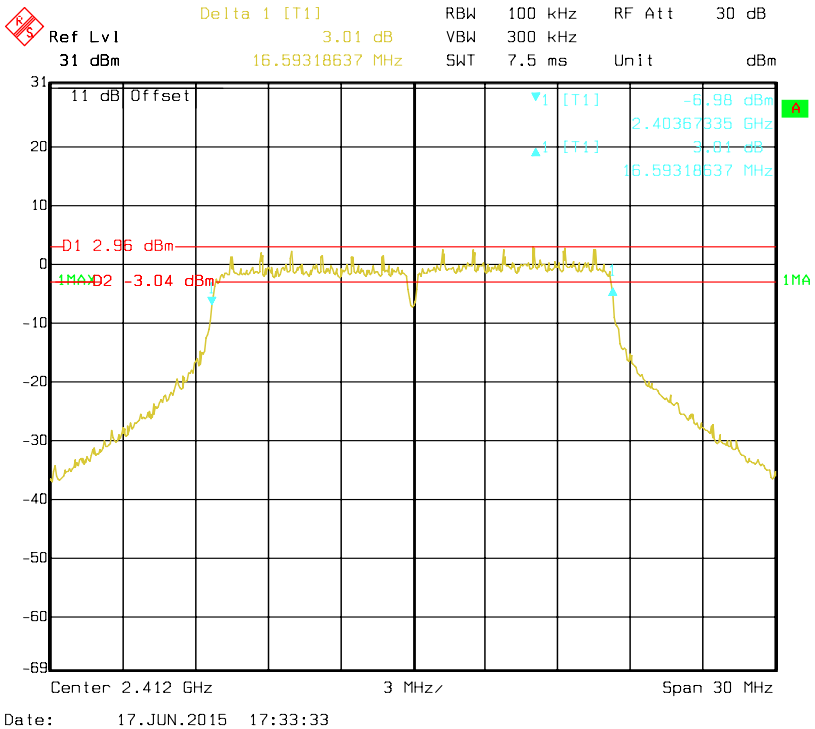
802.11b Middle Channel for Antenna 1



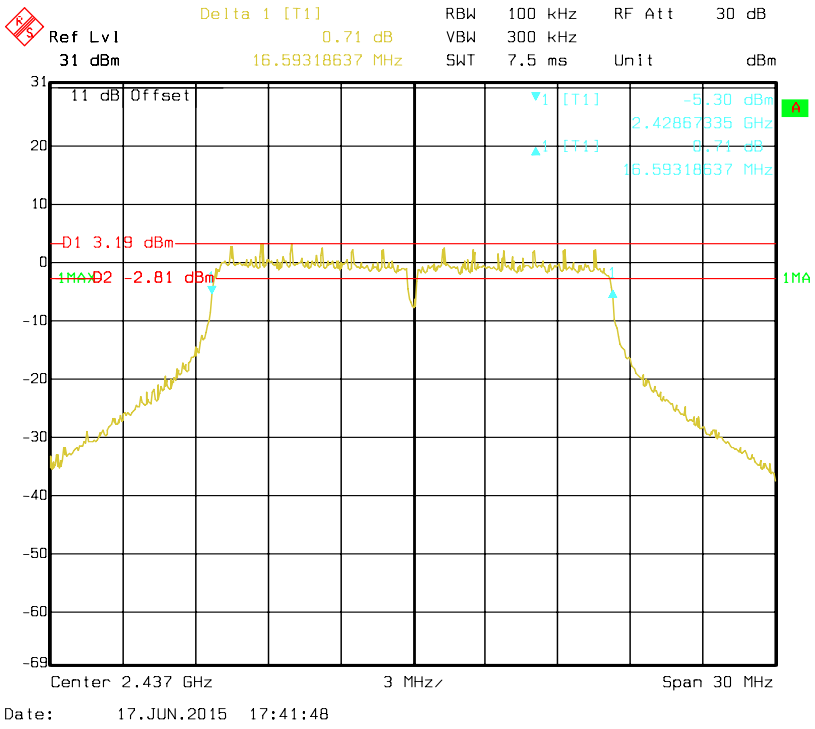
802.11b High Channel for Antenna 1



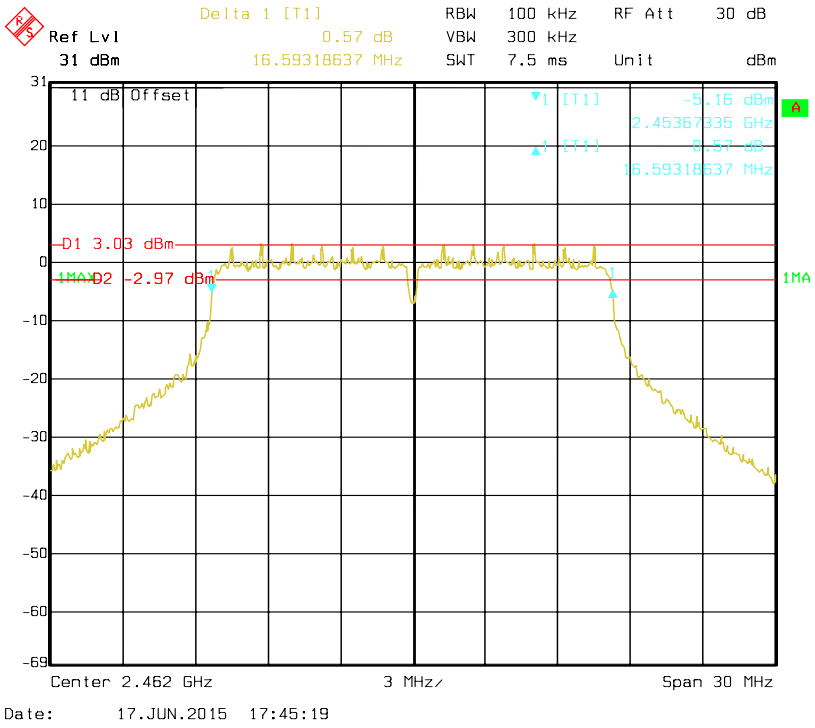
802.11g Low Channel for Antenna 1



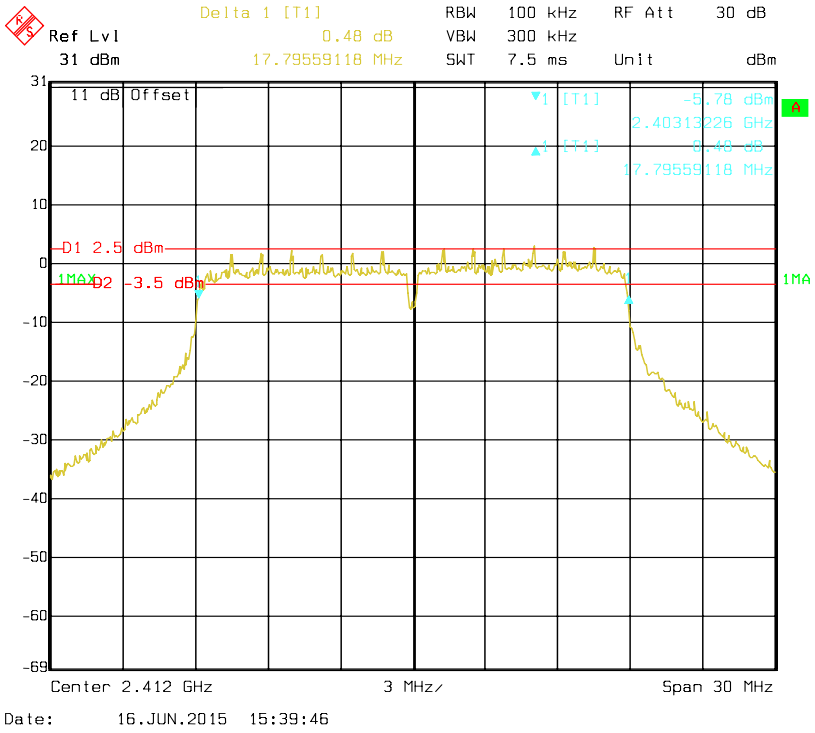
802.11g Middle Channel for Antenna 1



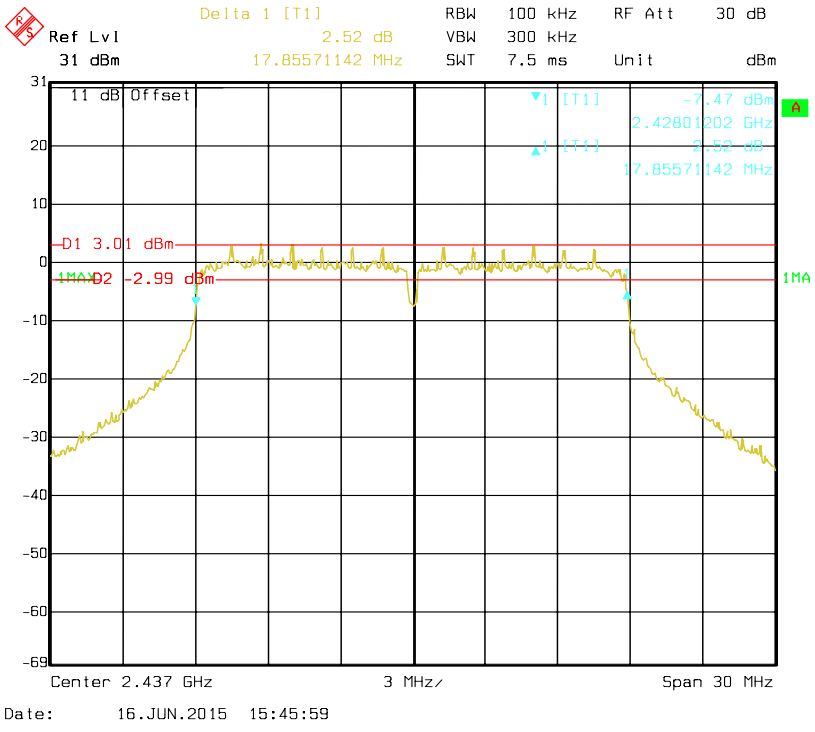
802.11g High Channel for Antenna 1



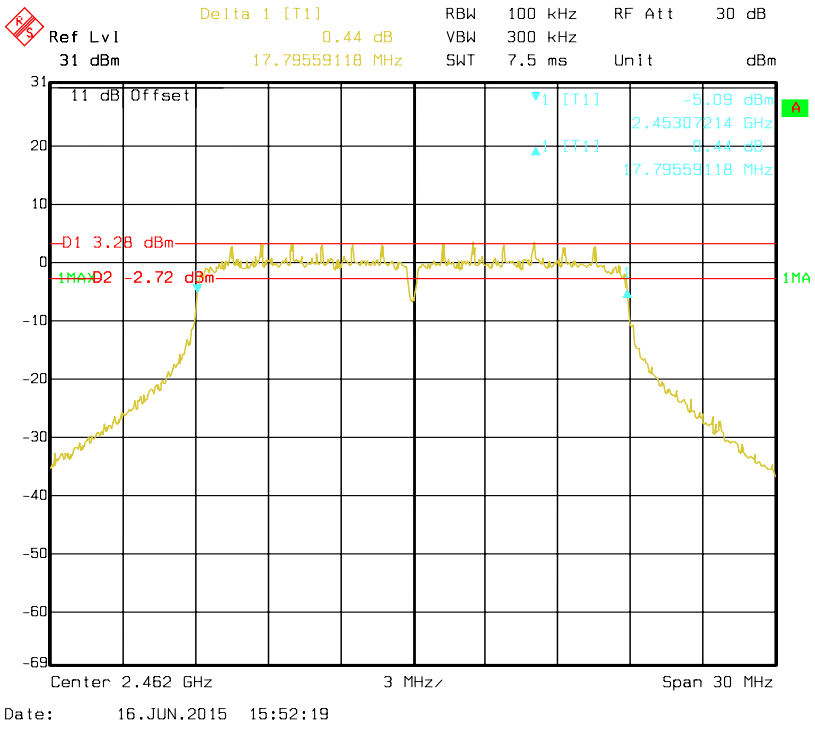
802.11n HT20 Low Channel for Antenna 1



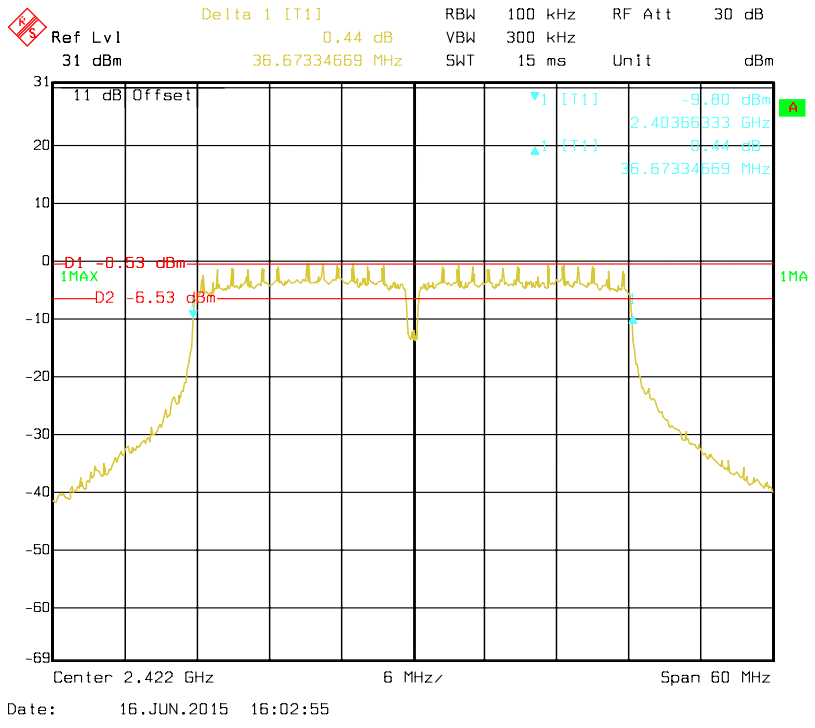
802.11n HT20 Middle Channel for Antenna 1



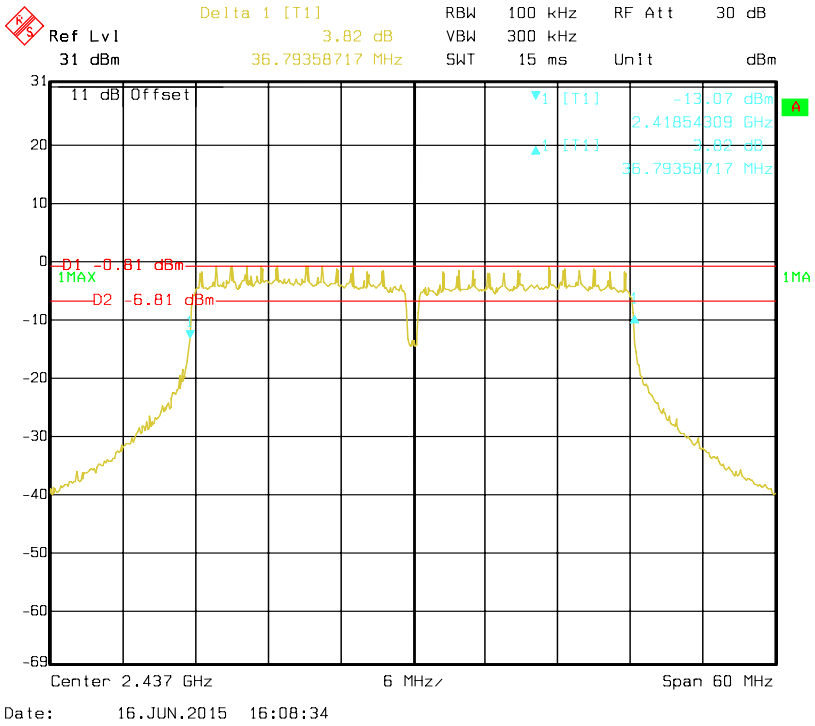
802.11n HT20 High Channel for Antenna 1



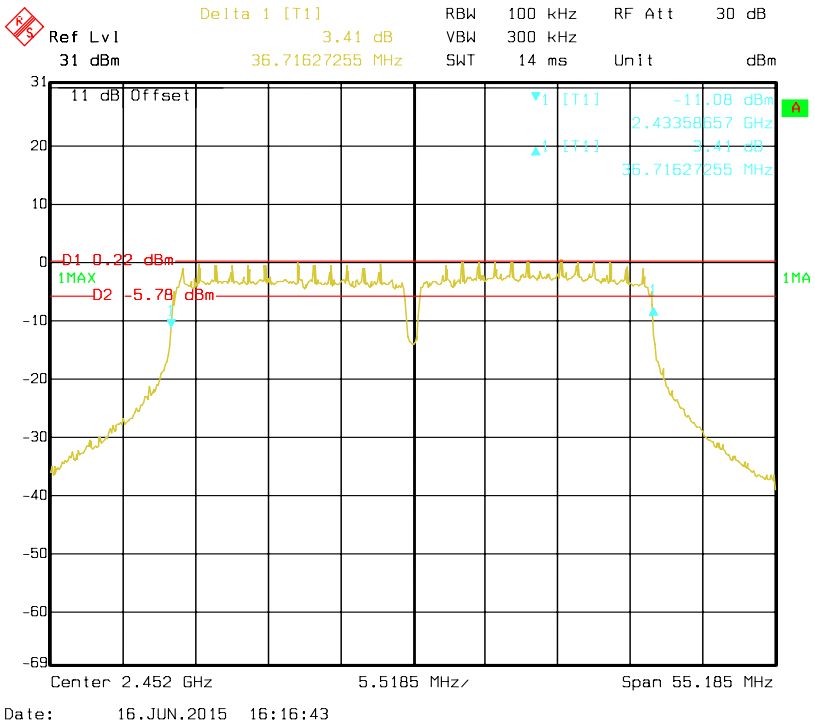
802.11n HT40 Low Channel for Antenna 1



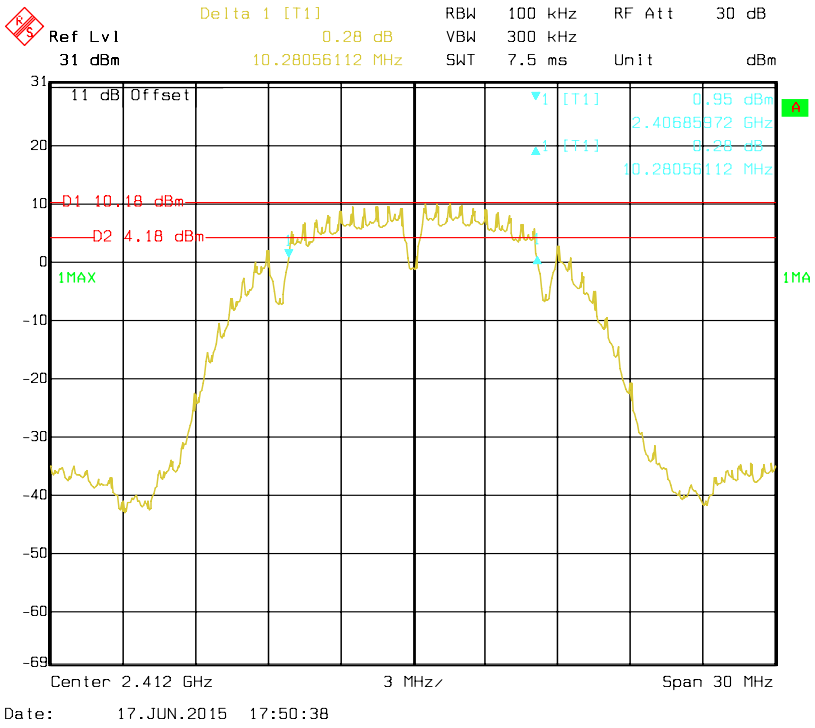
802.11n HT40 Middle Channel for Antenna 1



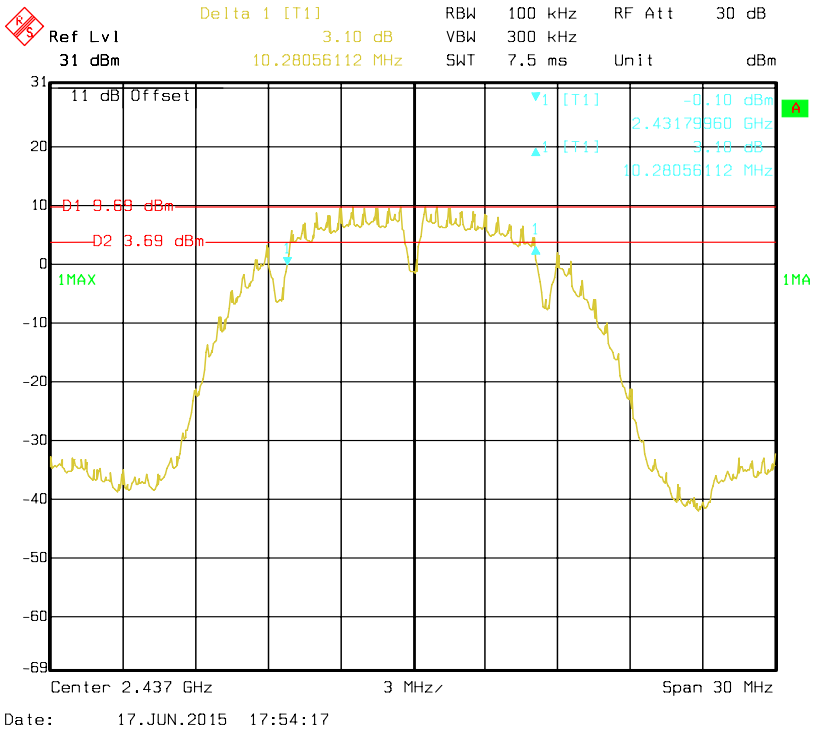
802.11n HT40 High Channel for Antenna 1



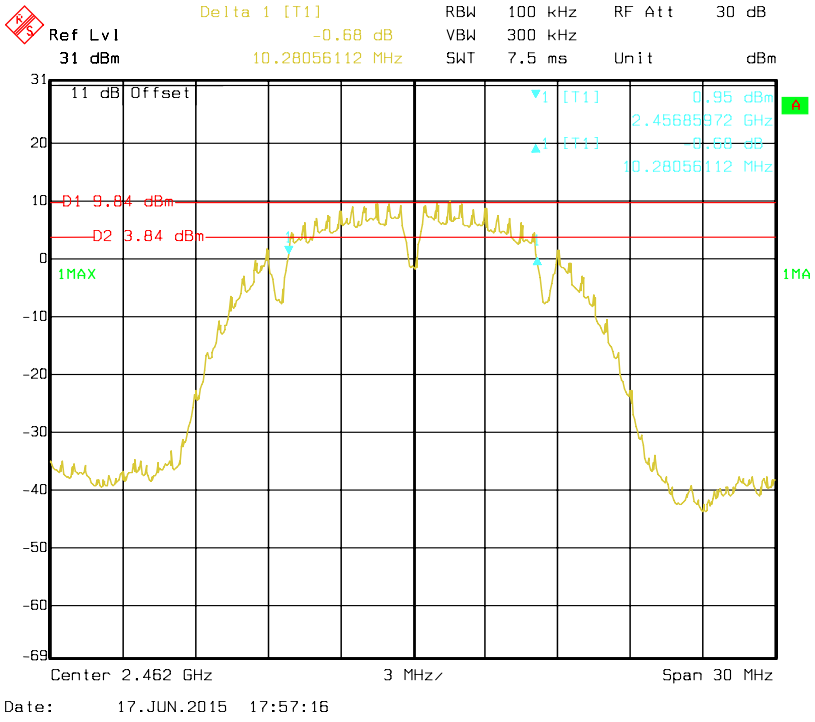
802.11b Low Channel for Antenna 2



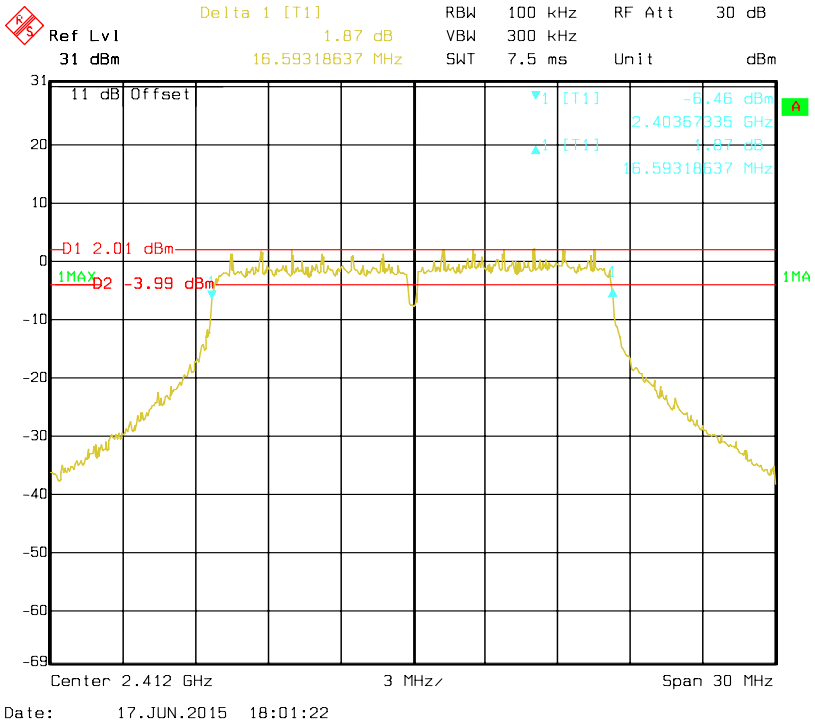
802.11b Middle Channel for Antenna 2



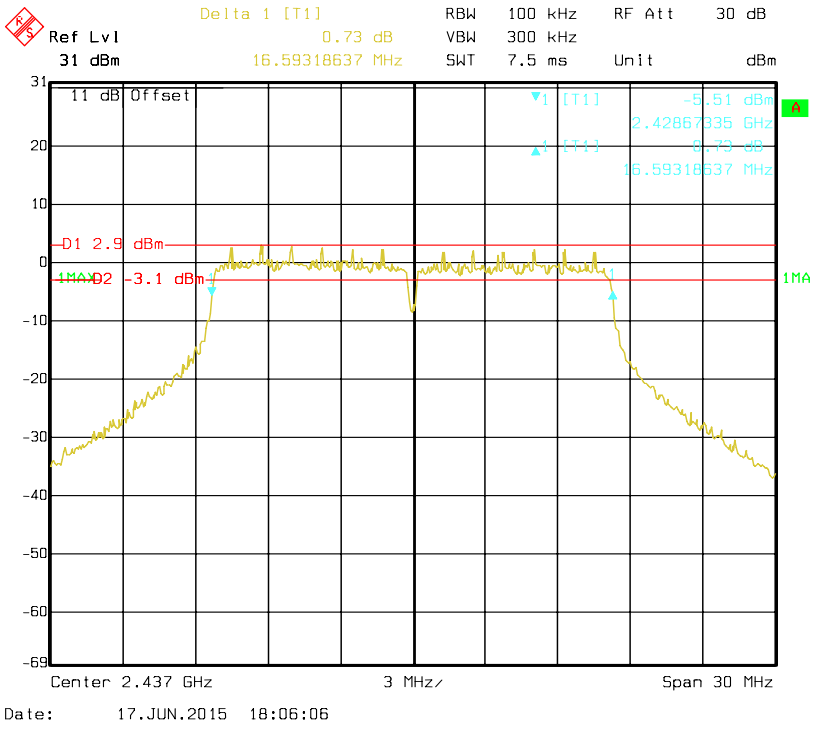
802.11b High Channel for Antenna 2



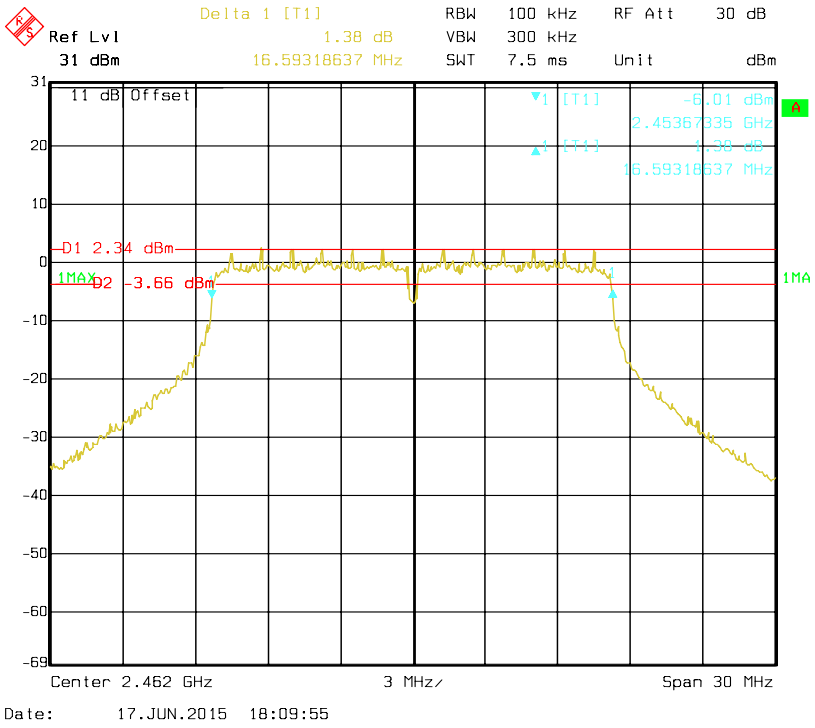
802.11g Low Channel for Antenna 2



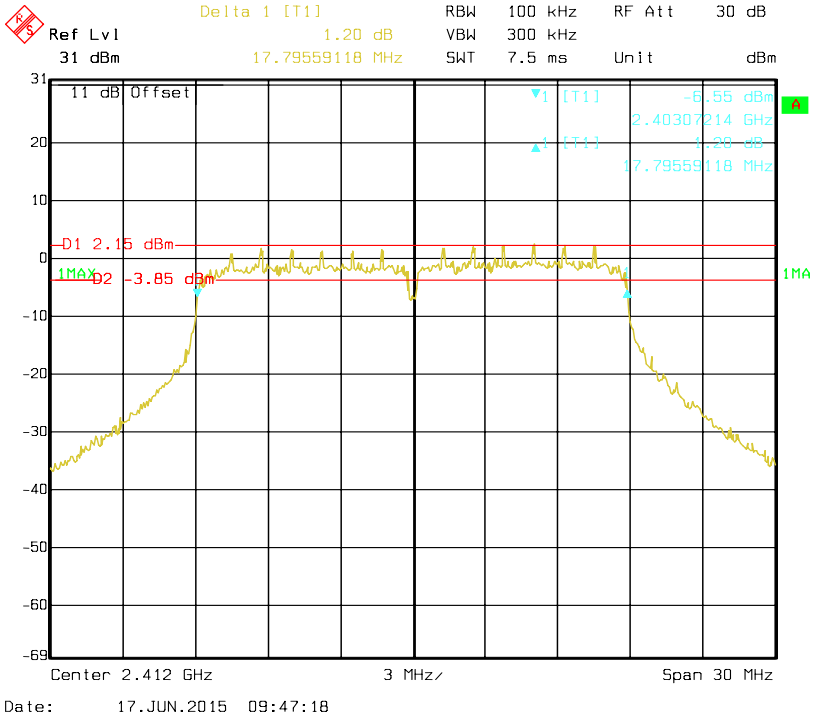
802.11g Middle Channel for Antenna 2



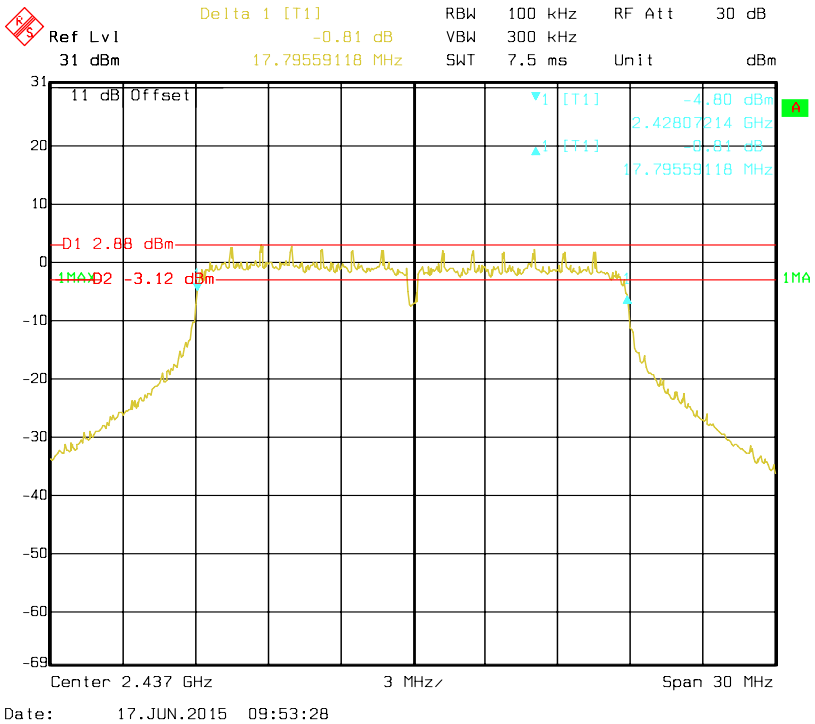
802.11g High Channel for Antenna 2



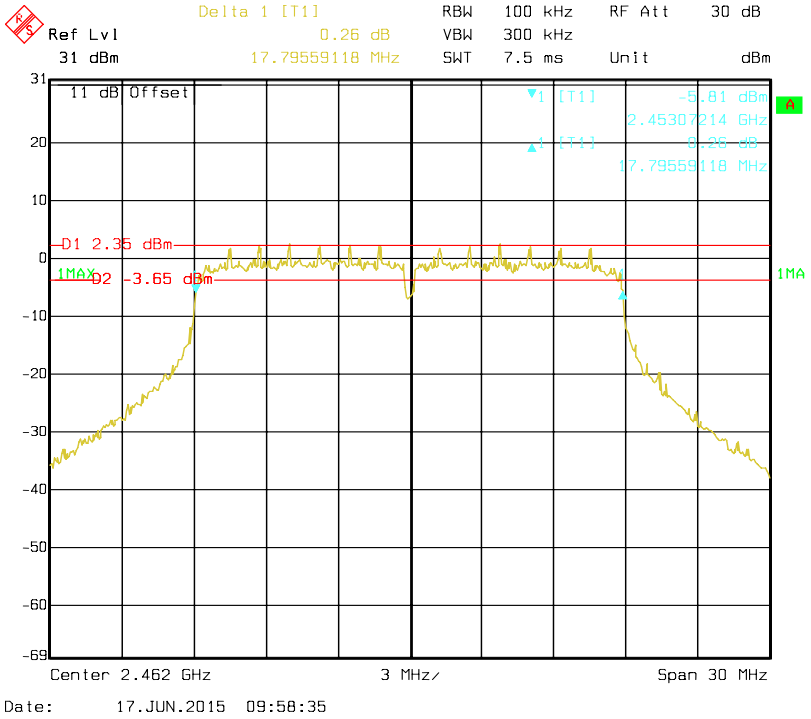
802.11n HT20 Low Channel for Antenna 2



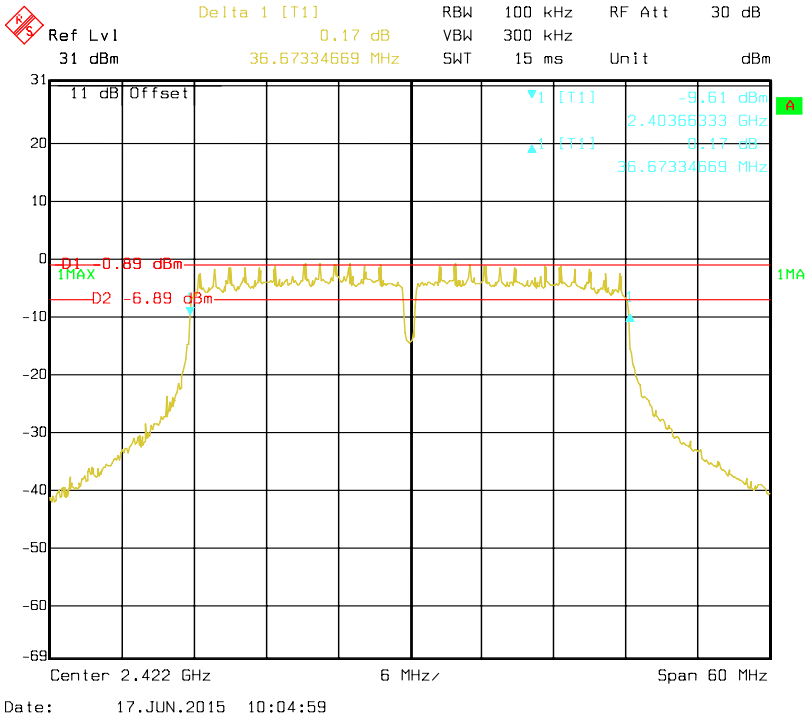
802.11n HT20 Middle Channel for Antenna 2



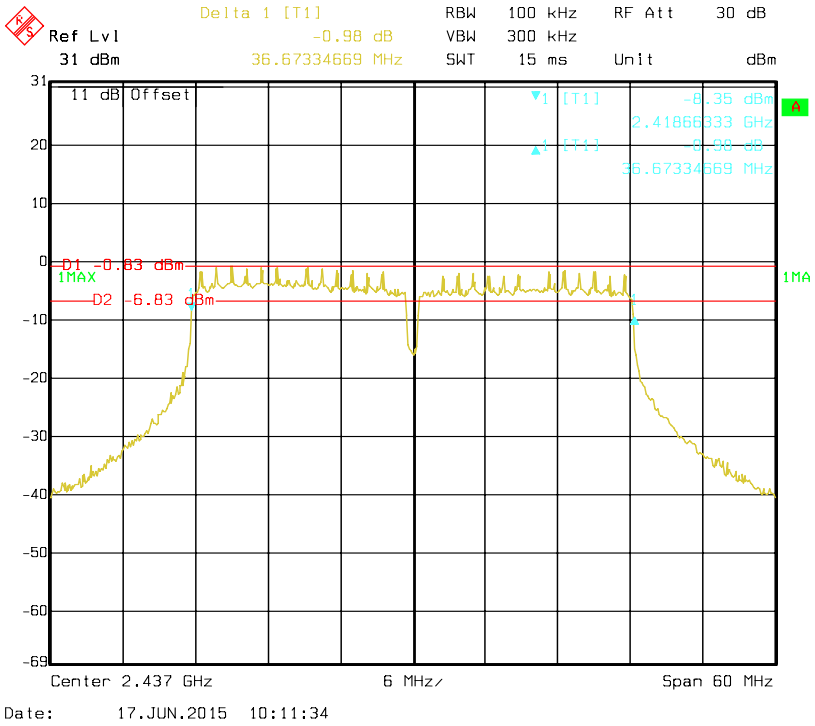
802.11n HT20 High Channel for Antenna 2



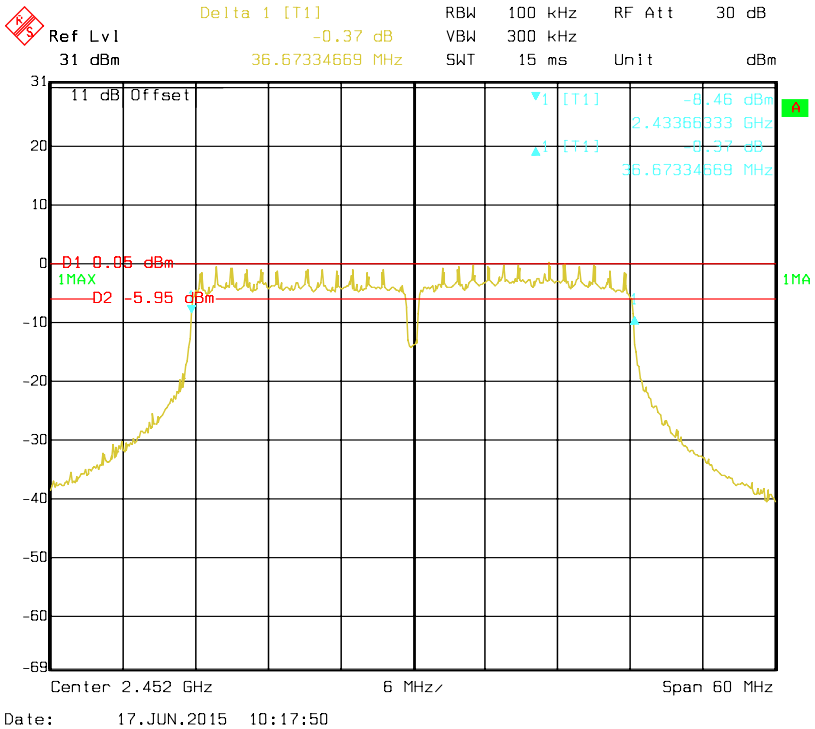
802.11n HT40 Low Channel for Antenna 2



802.11n HT40 Middle Channel for Antenna 2



802.11n HT40 High Channel for Antenna 2



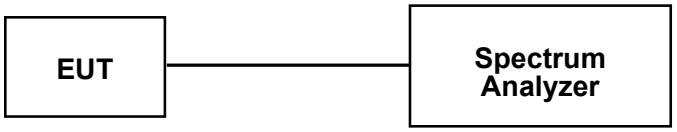
FCC §15.247(b) (3) - MAXIMUM PEAK OUTPUT POWER

Applicable Standard

According to FCC §15.247(b) (3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

Test Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to a spectrum analyzer.
3. Add a correction factor to the display.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2014-10-17	2015-10-16

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	26 °C & 25 °C
Relative Humidity:	67 % & 65 %
ATM Pressure:	97.1 kPa & 97.1 kPa

The testing was performed by Kevin Tao on 2015-06-16 & 2015-06-17.

Test Mode: Transmitting

Mode	Channel	Frequency (MHz)	Conducted Output Power (dBm)				Limit (dBm)	Result
			Antenna 0	Antenna 1	Antenna 2	Total		
2.4G band 802.11b	Low	2412	21.86	22.54	22.07	26.94	27	PASS
	Middle	2437	21.46	22.24	21.63	26.56	27	PASS
	High	2462	22.05	22.28	21.40	26.70	27	PASS
2.4G band 802.11 g	Low	2412	22.06	21.79	21.62	26.60	27	PASS
	Middle	2437	21.87	21.85	21.74	26.59	27	PASS
	High	2462	22.27	22.45	21.82	26.96	27	PASS
2.4G band 802.11n HT20	Low	2412	22.09	22.04	21.58	26.68	27	PASS
	Middle	2437	21.77	22.05	22.04	26.73	27	PASS
	High	2462	22.07	21.98	21.74	26.70	27	PASS
2.4G band 802.11n HT40	Low	2422	22.22	22.26	21.71	26.84	27	PASS
	Middle	2437	21.26	21.58	21.59	26.25	27	PASS
	High	2452	22.04	22.47	22.12	26.99	27	PASS

Note:

※The device has three PCB antennas, antenna gain is 9dBi, and employed Cyclic Delay Devisity (CCD) for 802.11 MIMO transmitting, per KDB662911 D01 Multiple Transmitter Output v02r01, for power measurements on IEEE 802.11 devices:

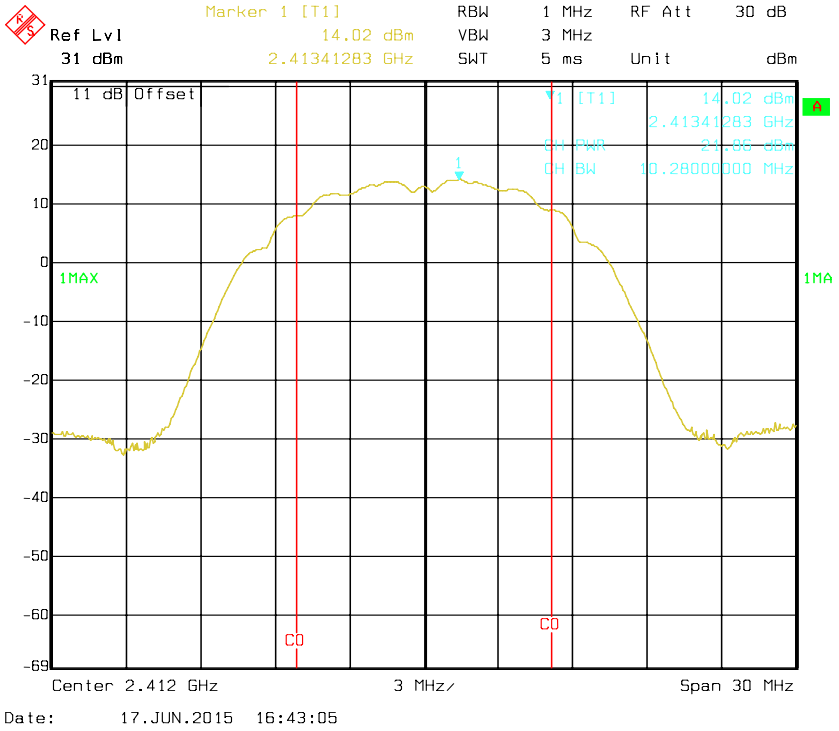
Array Gain = 0 dB (i.e., no array gain) for NANT $\leqslant$ 4:

So:

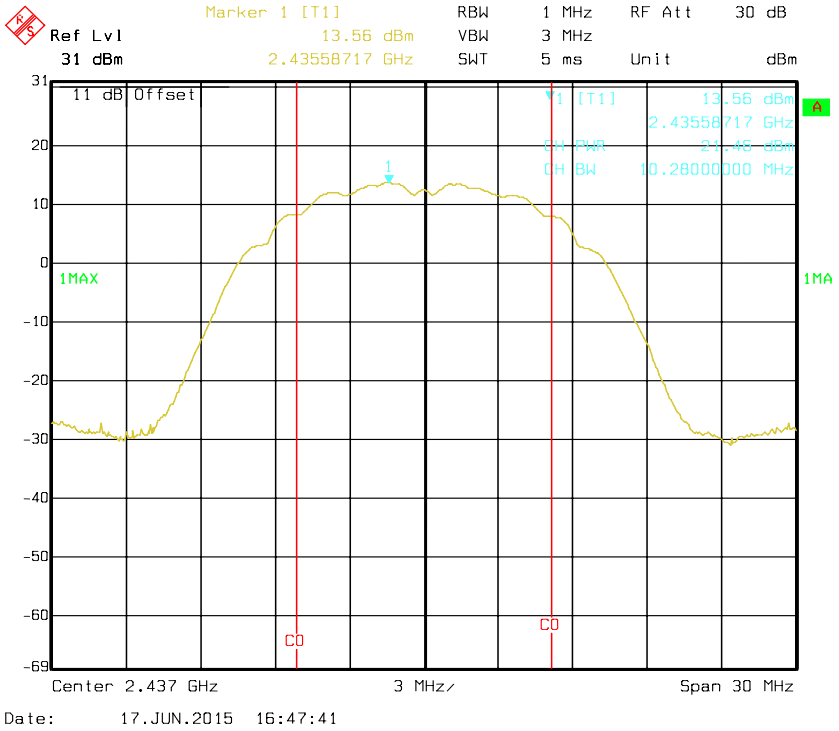
Directional gain = GANT + Array Gain =9dBi;

Limit =30 –（9-6）=27dBm.

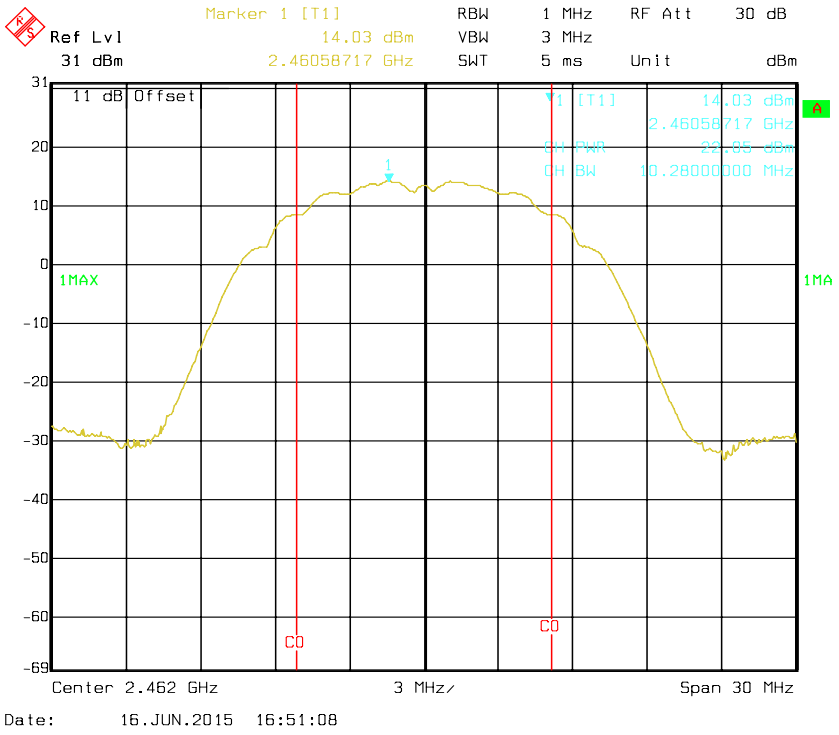
802.11b RF Output Power, Low Channel for Antenna 0



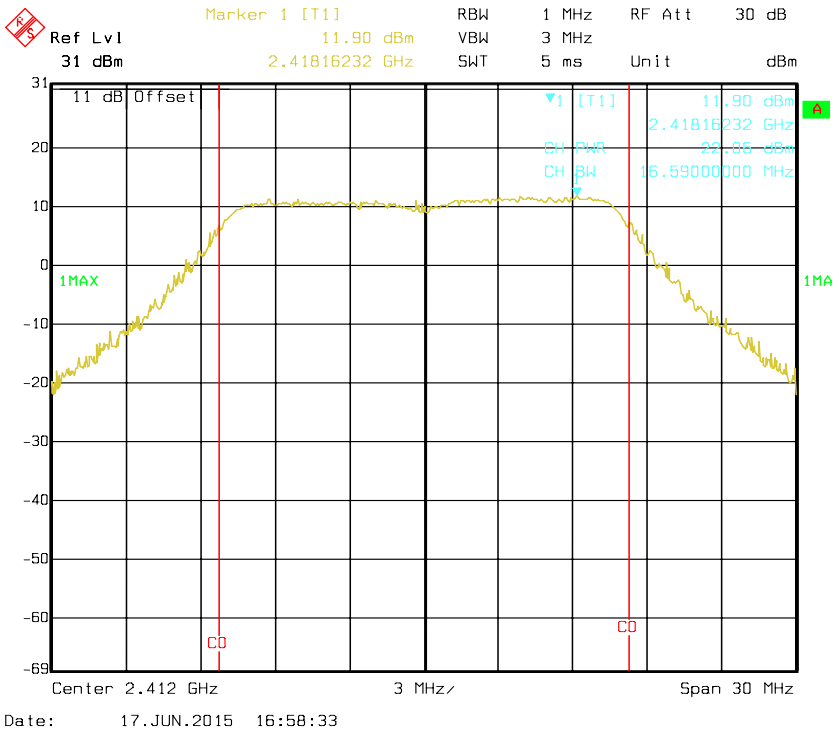
802.11b RF Output Power, Middle Channel for Antenna 0



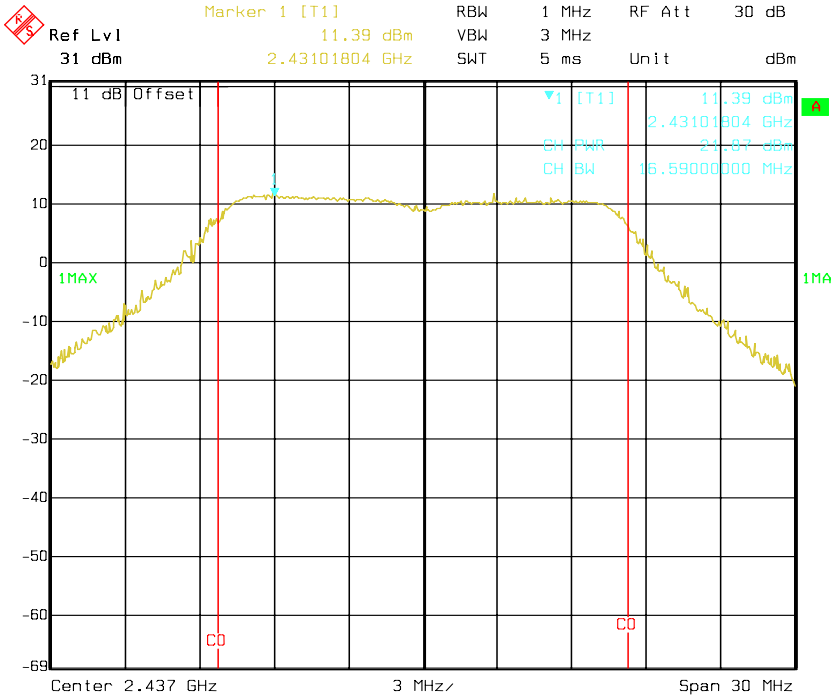
802.11b RF Output Power, High Channel for Antenna 0



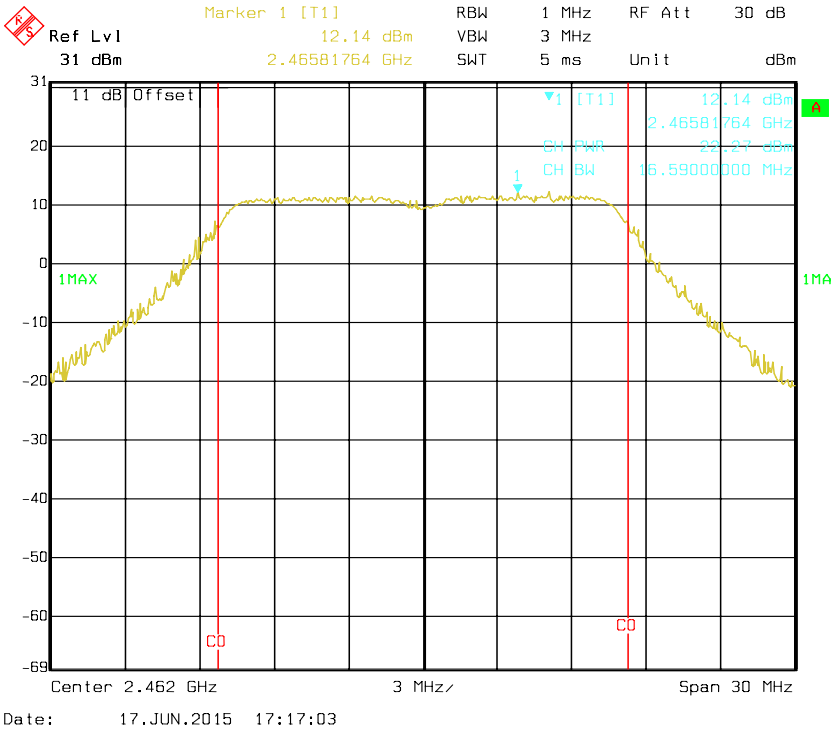
802.11g RF Output Power, Low Channel for Antenna 0



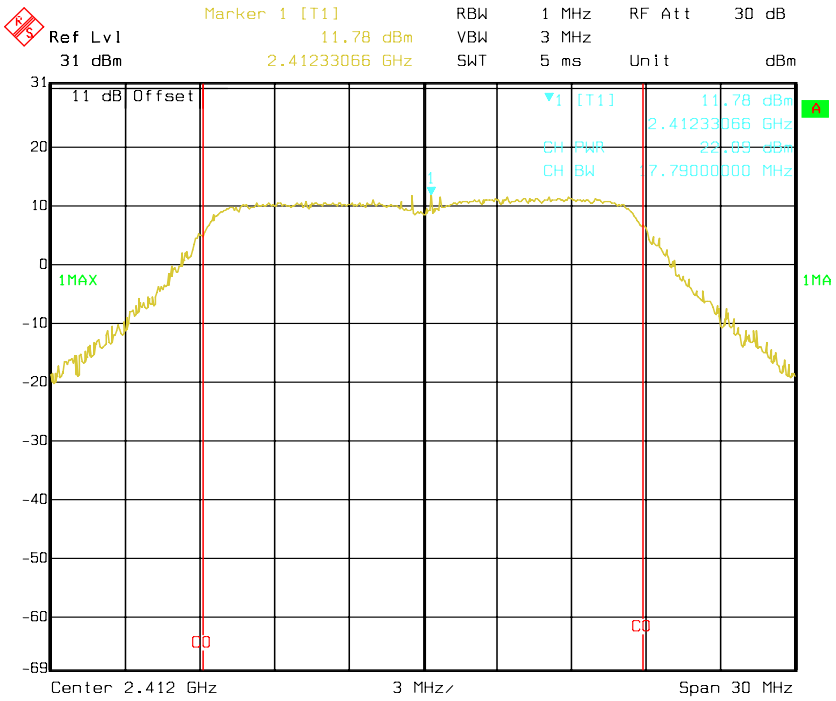
802.11g RF Output Power, Middle Channel for Antenna 0



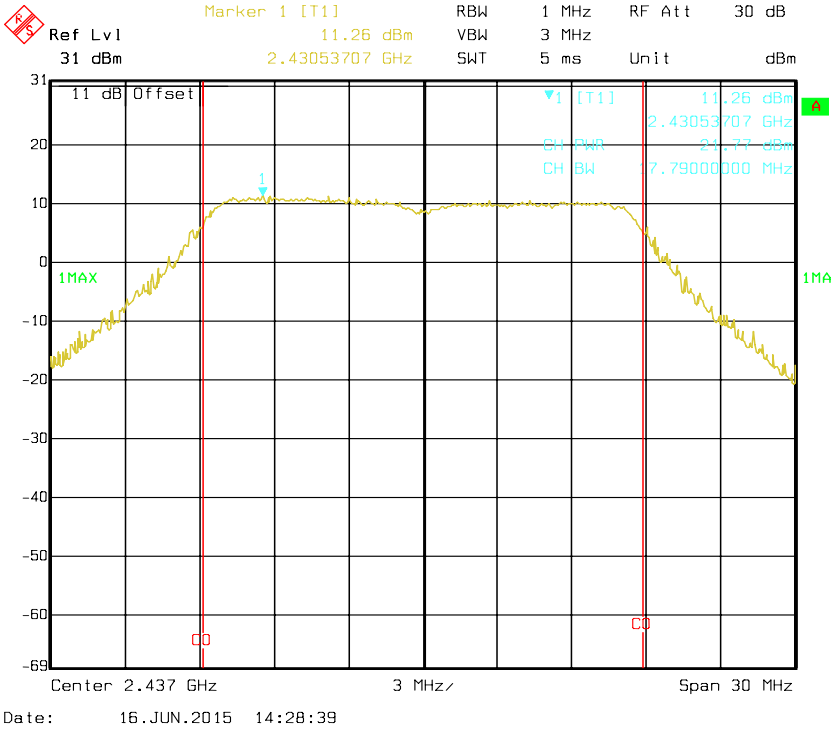
802.11g RF Output Power, High Channel for Antenna 0



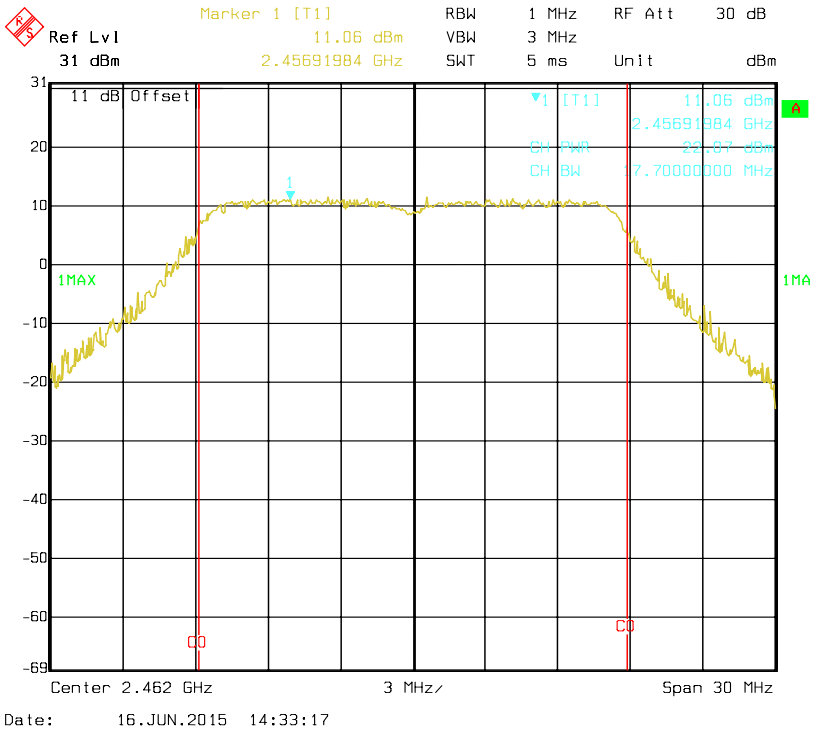
802.11n HT20 RF Output Power, Low Channel for Antenna 0



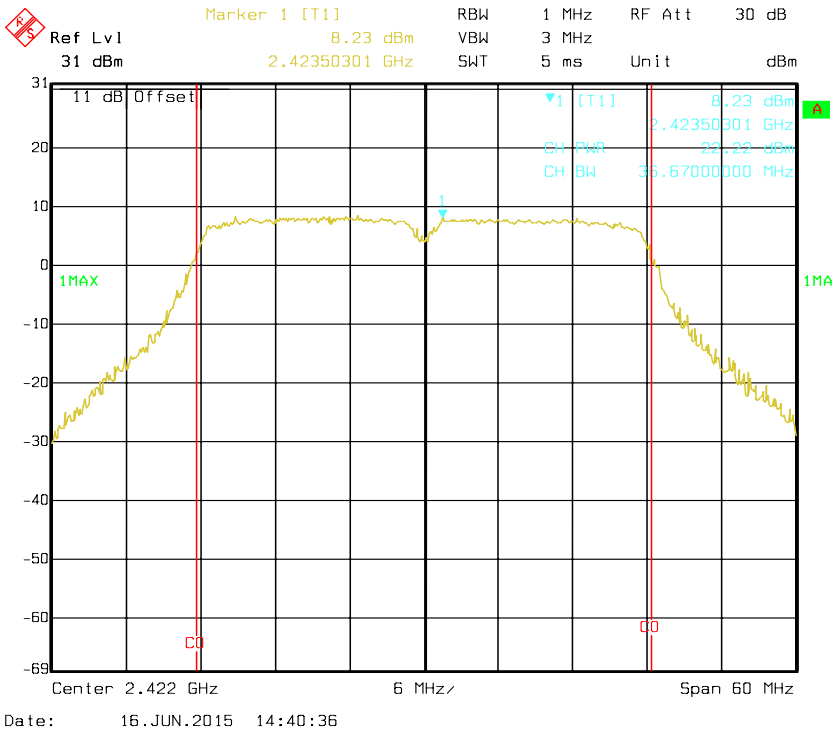
802.11n HT20 RF Output Power, Middle Channel for Antenna 0



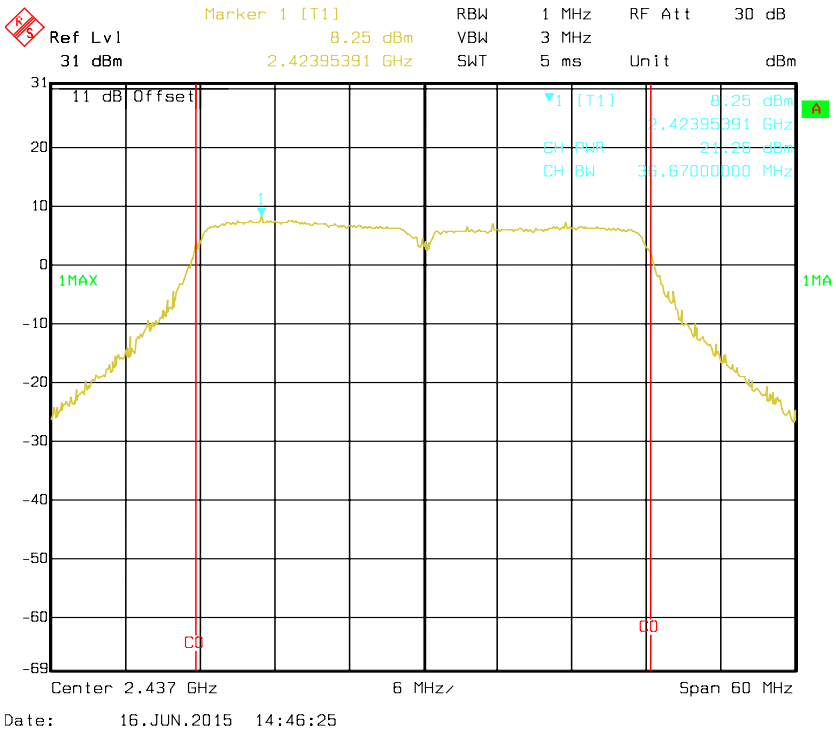
802.11n HT20 RF Output Power, High Channel for Antenna 0



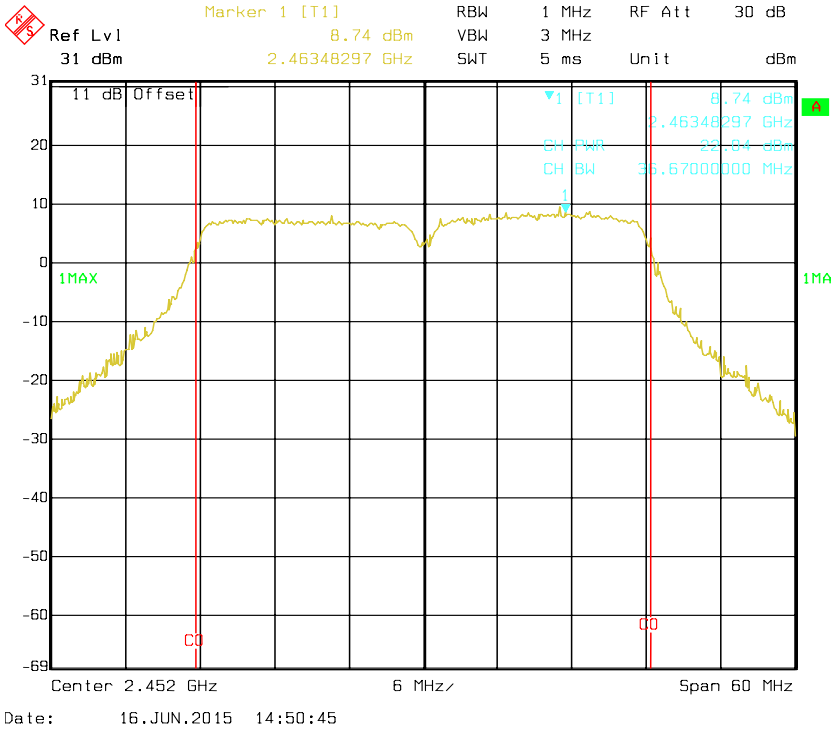
802.11n HT40 RF Output Power, Low Channel for Antenna 0



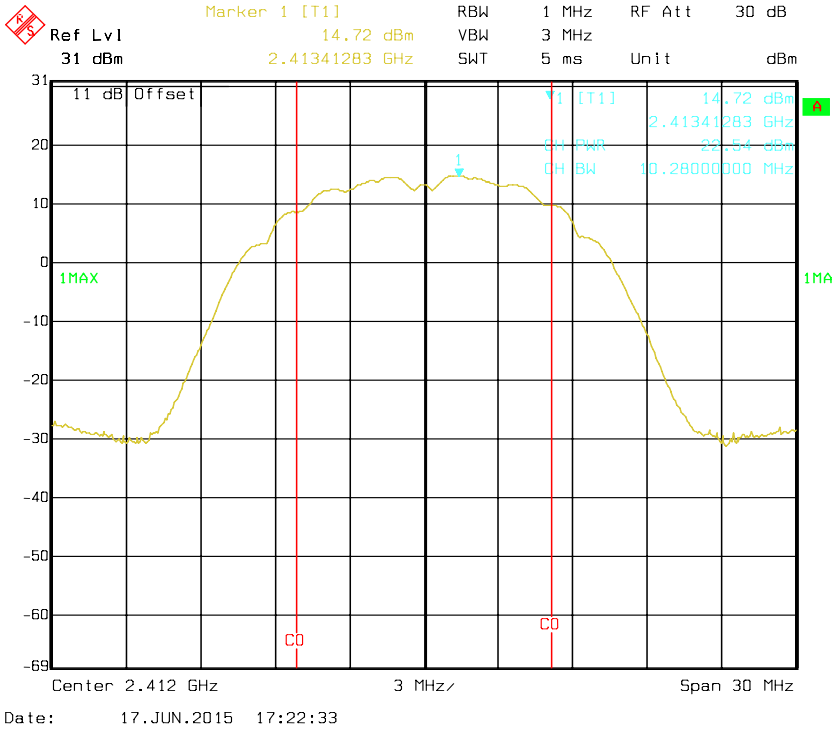
802.11n HT40 RF Output Power, Middle Channel for Antenna 0



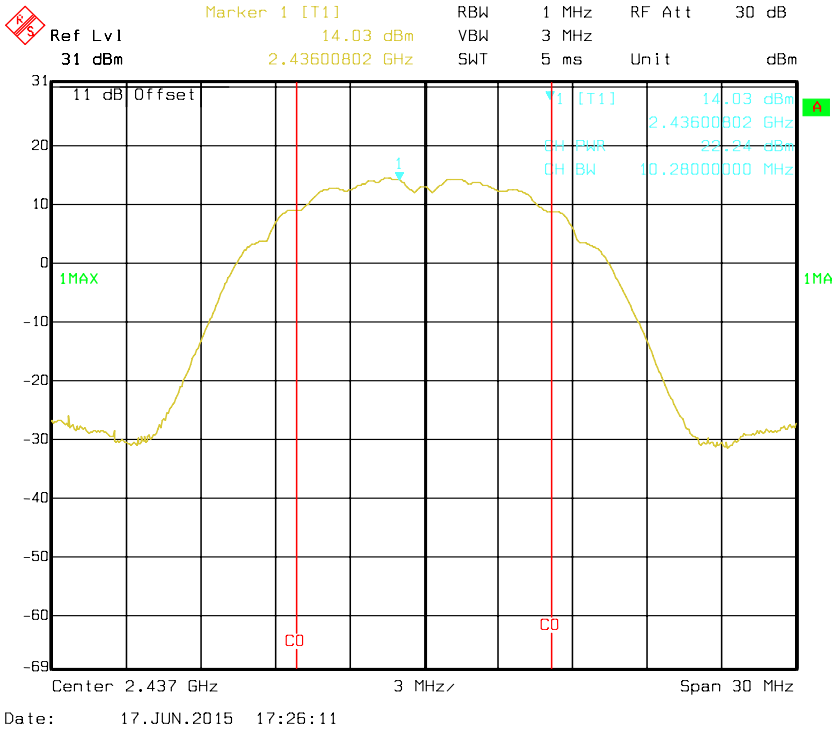
802.11n HT40 RF Output Power, High Channel for Antenna 0



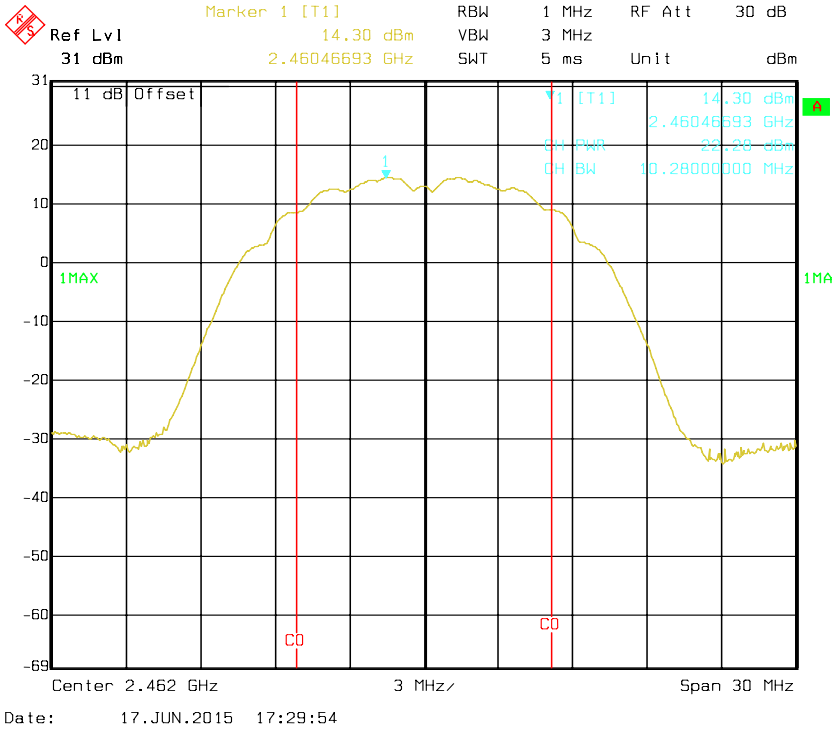
802.11b RF Output Power, Low Channel for Antenna 1



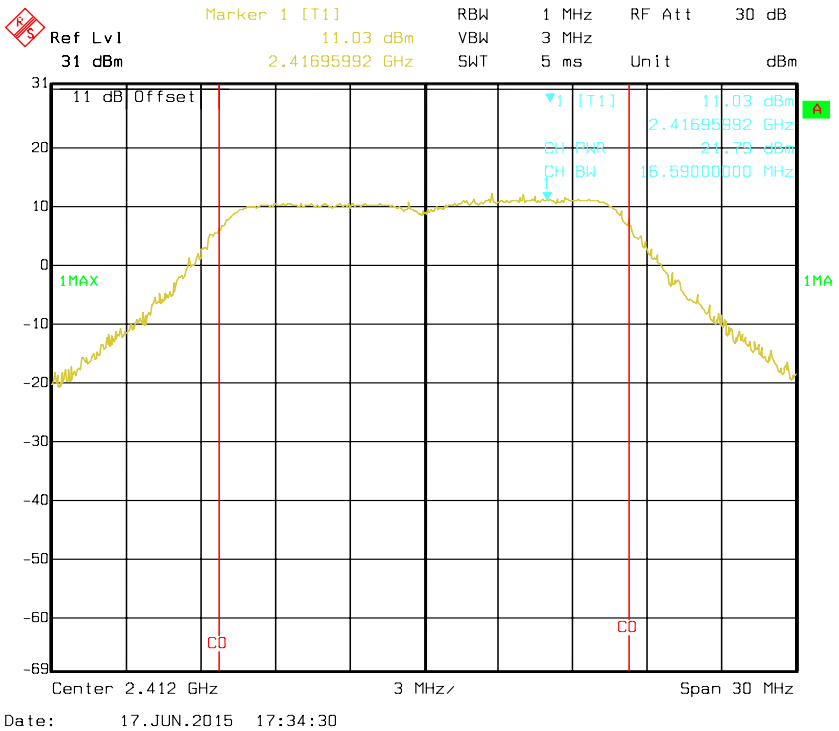
802.11b RF Output Power, Middle Channel for Antenna 1



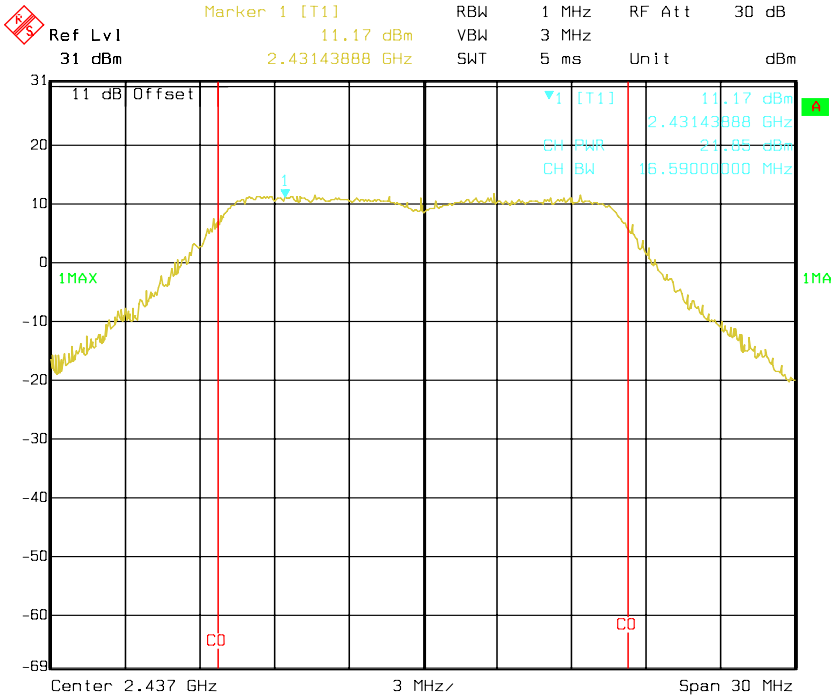
802.11b RF Output Power, High Channel for Antenna 1



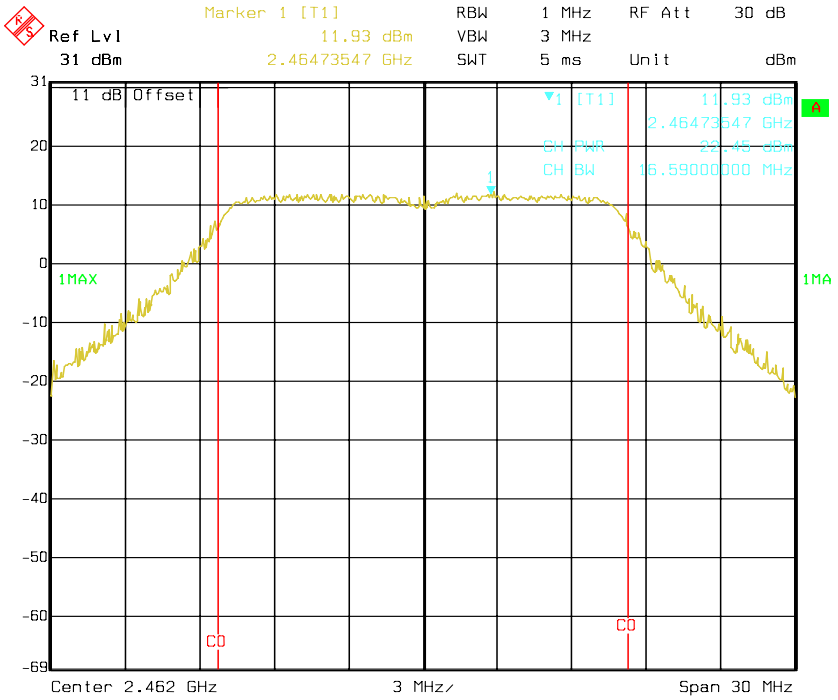
802.11g RF Output Power, Low Channel for Antenna 1



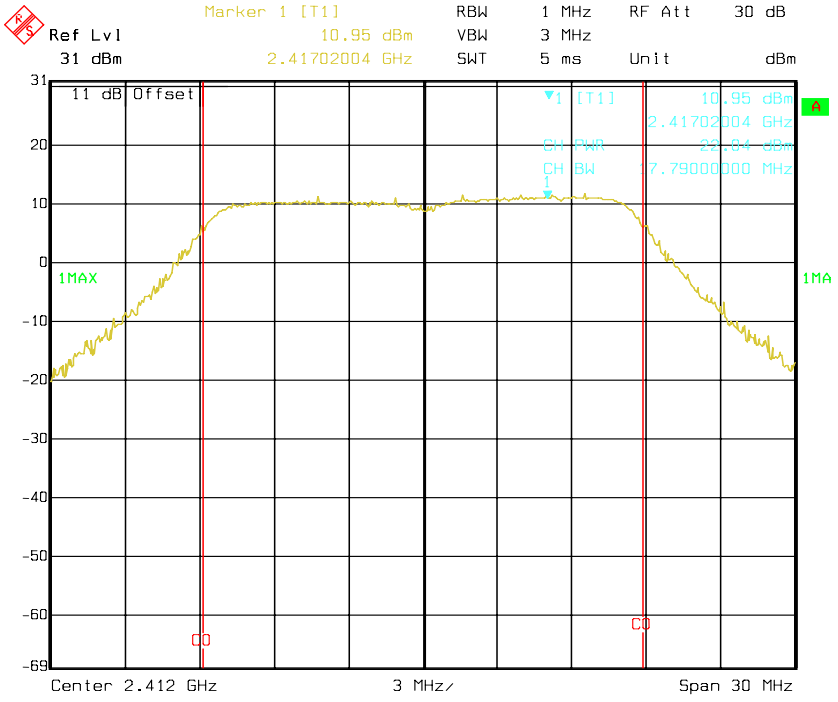
802.11g RF Output Power, Middle Channel for Antenna 1



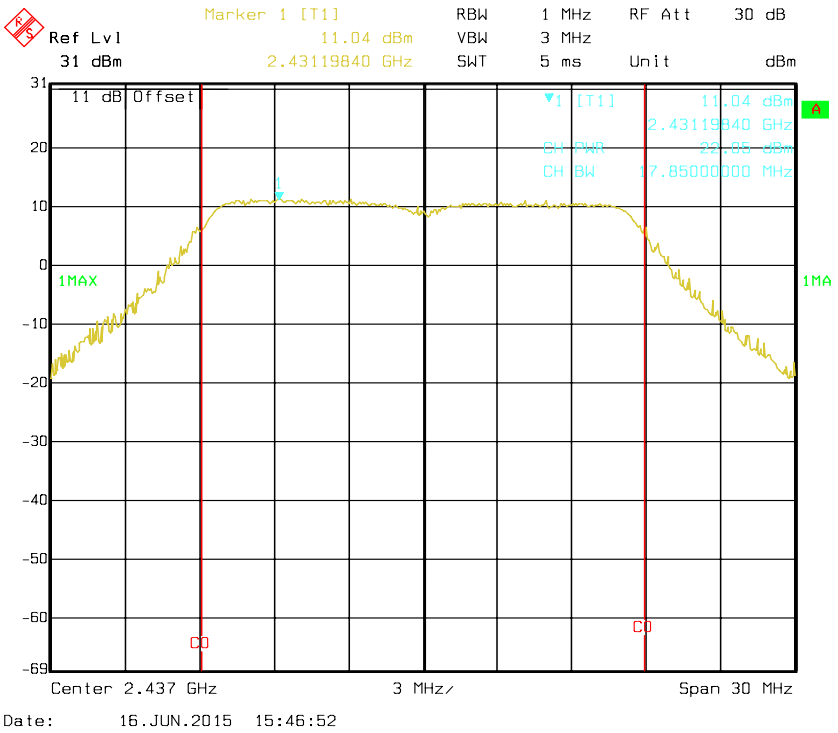
802.11g RF Output Power, High Channel for Antenna 1



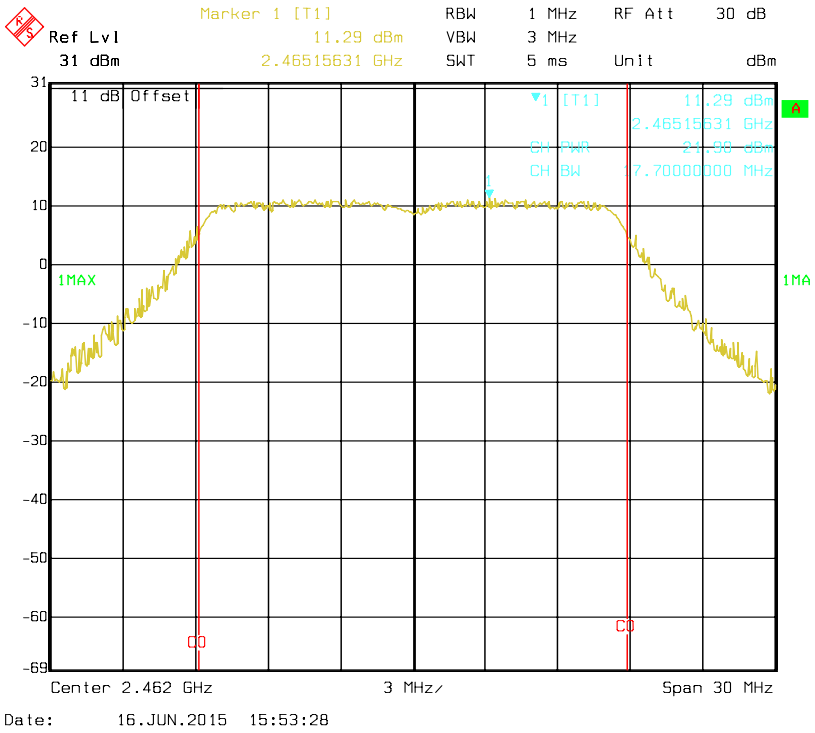
802.11n HT20 RF Output Power, Low Channel for Antenna 1



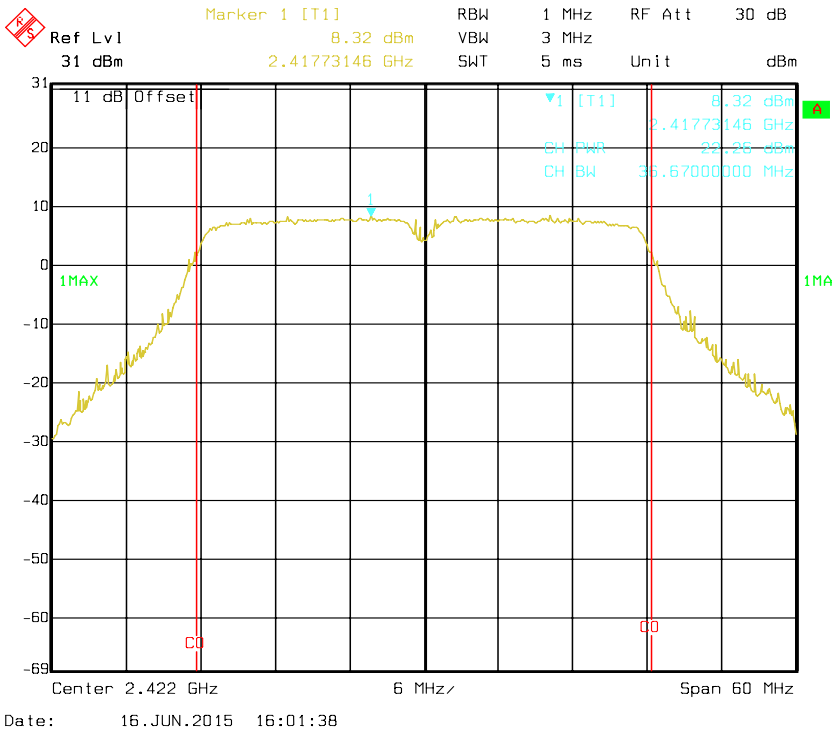
802.11n HT20 RF Output Power, Middle Channel for Antenna 1



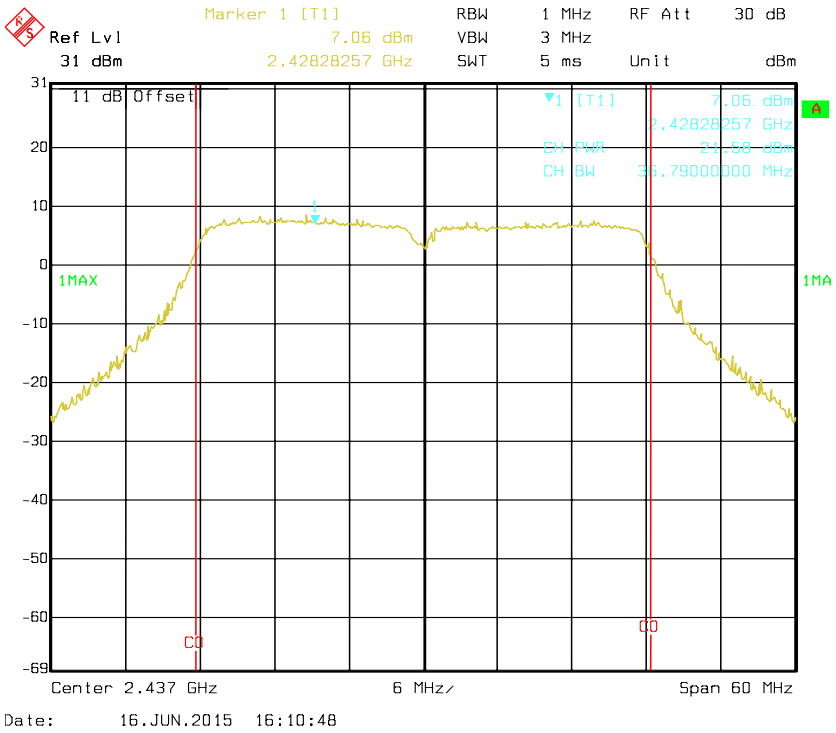
802.11n HT20 RF Output Power, High Channel for Antenna 1



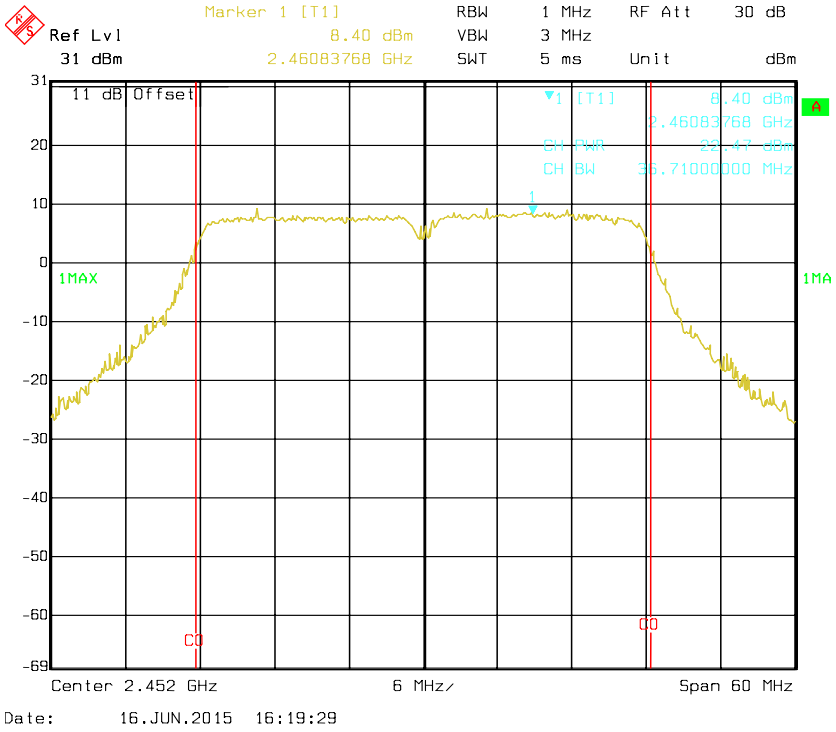
802.11n HT40 RF Output Power, Low Channel for Antenna 1



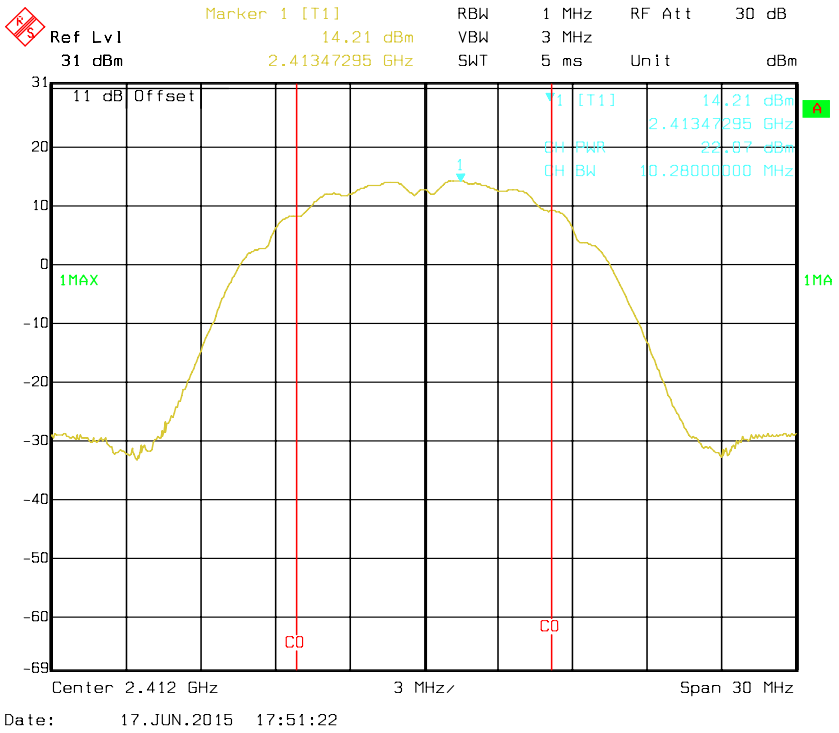
802.11n HT40 RF Output Power, Middle Channel for Antenna 1



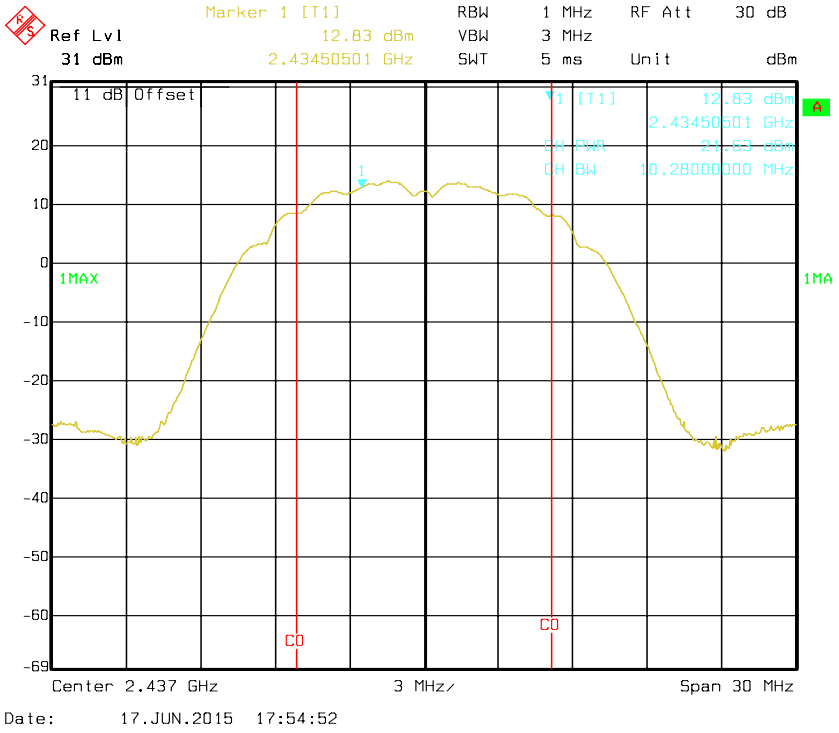
802.11n HT40 RF Output Power, High Channel for Antenna 1



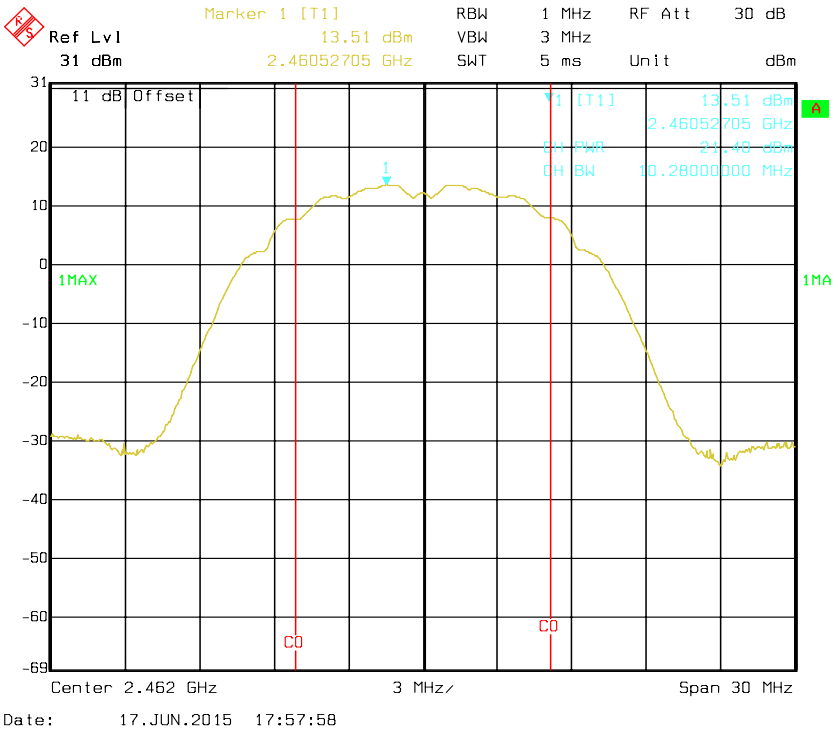
802.11b RF Output Power, Low Channel for Antenna 2



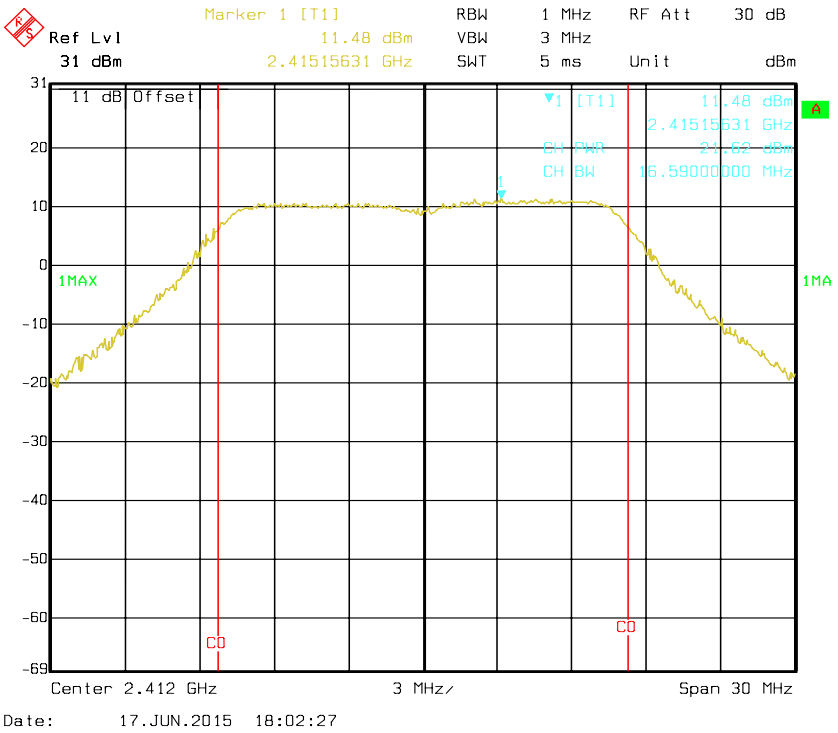
802.11b RF Output Power, Middle Channel for Antenna 2



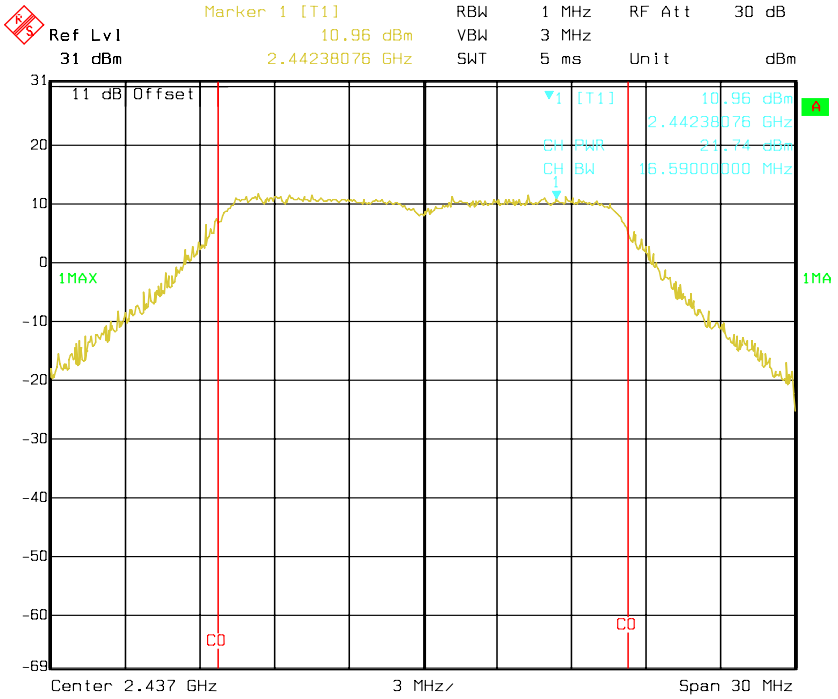
802.11b RF Output Power, High Channel for Antenna 2



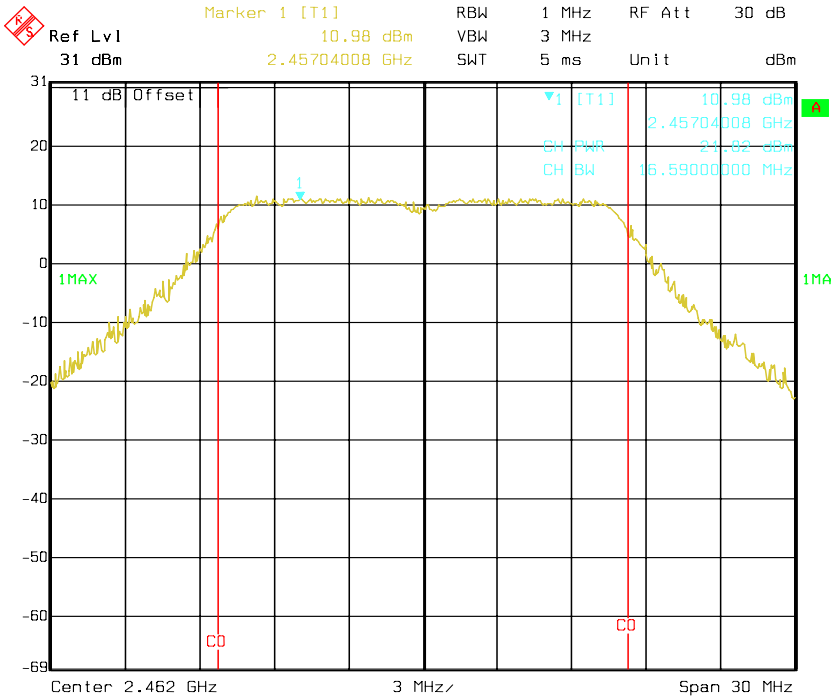
802.11g RF Output Power, Low Channel for Antenna 2



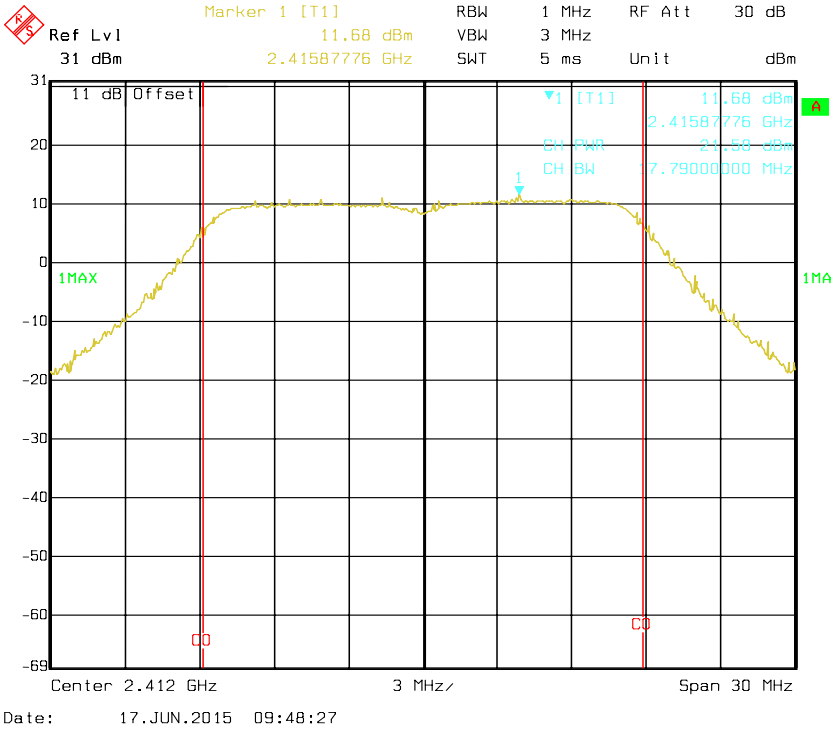
802.11g RF Output Power, Middle Channel for Antenna 2



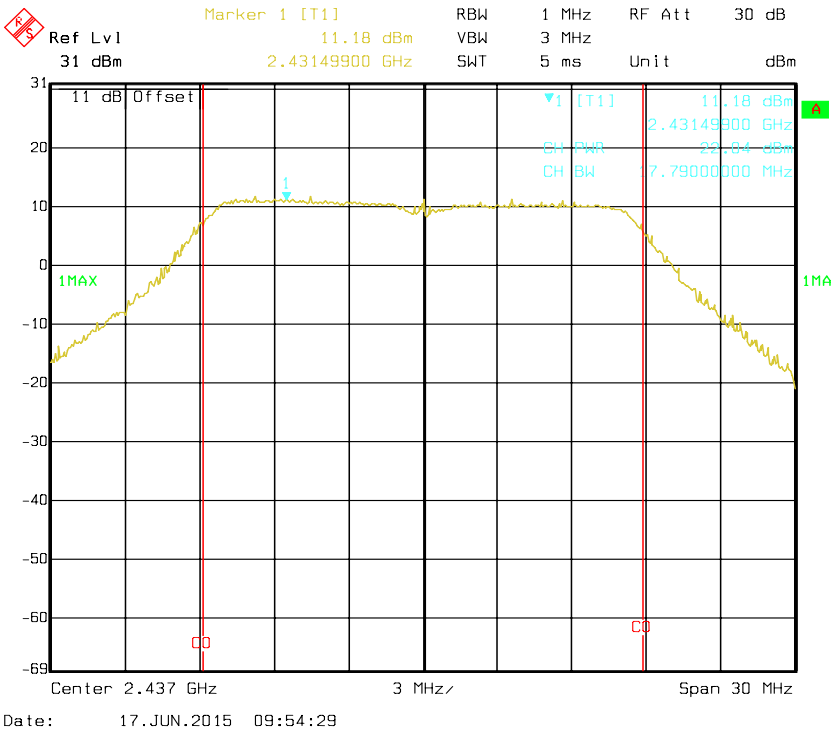
802.11g RF Output Power, High Channel for Antenna 2



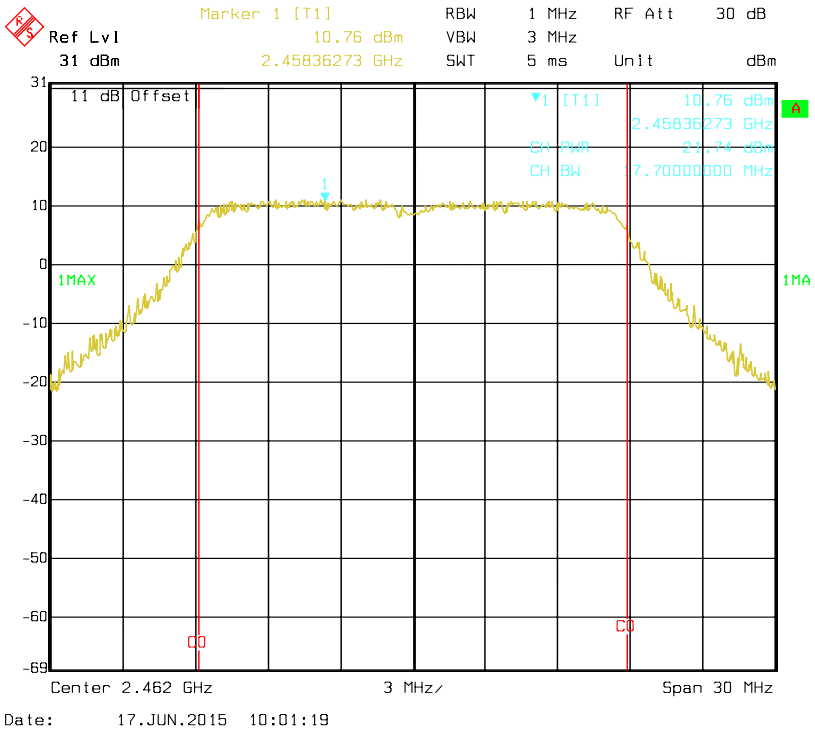
802.11n HT20 RF Output Power, Low Channel for Antenna 2



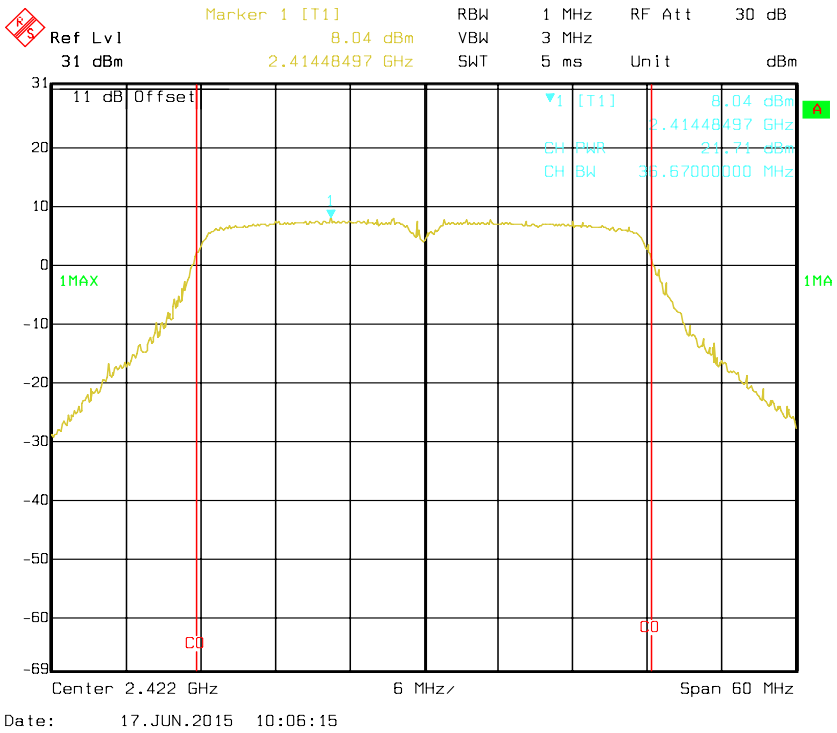
802.11n HT20 RF Output Power, Middle Channel for Antenna 2



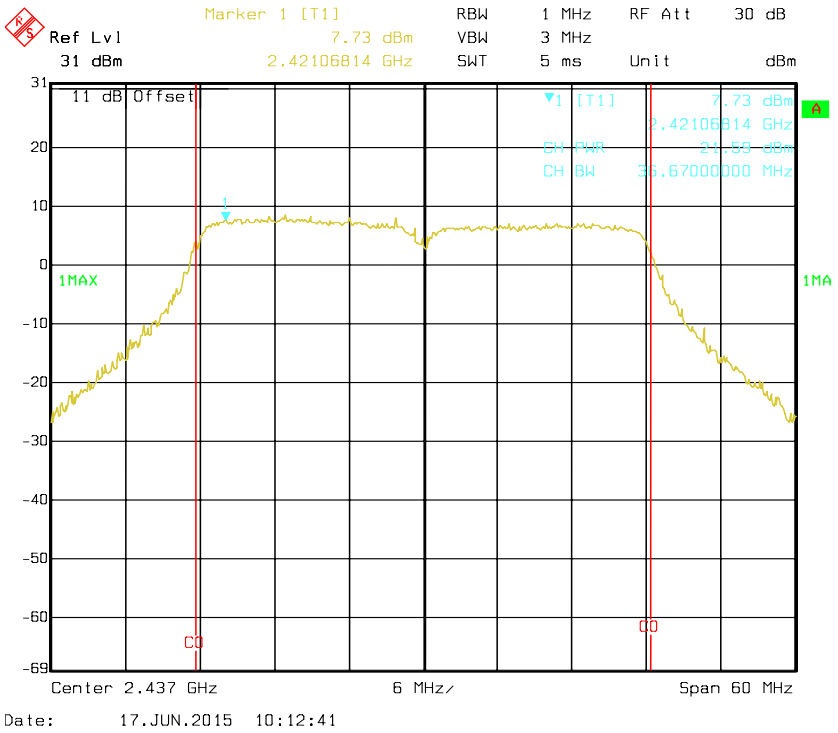
802.11n HT20 RF Output Power, High Channel for Antenna 2



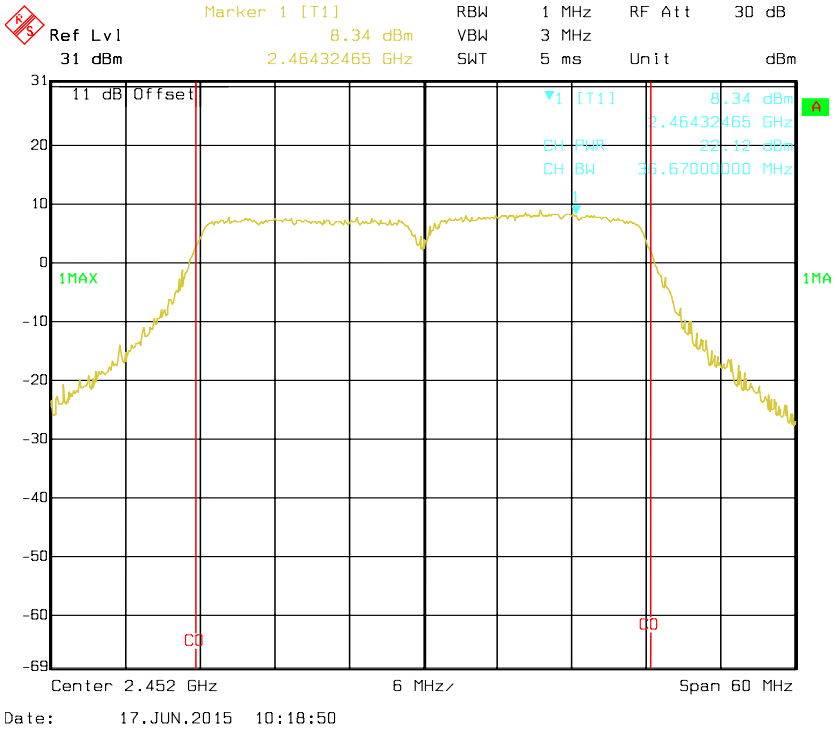
802.11n HT40 RF Output Power, Low Channel for Antenna 2



802.11n HT40 RF Output Power, Middle Channel for Antenna 2



802.11n HT40 RF Output Power, High Channel for Antenna 2



FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE

Applicable Standard

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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test 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 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 RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz 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.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2014-10-17	2015-10-16

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

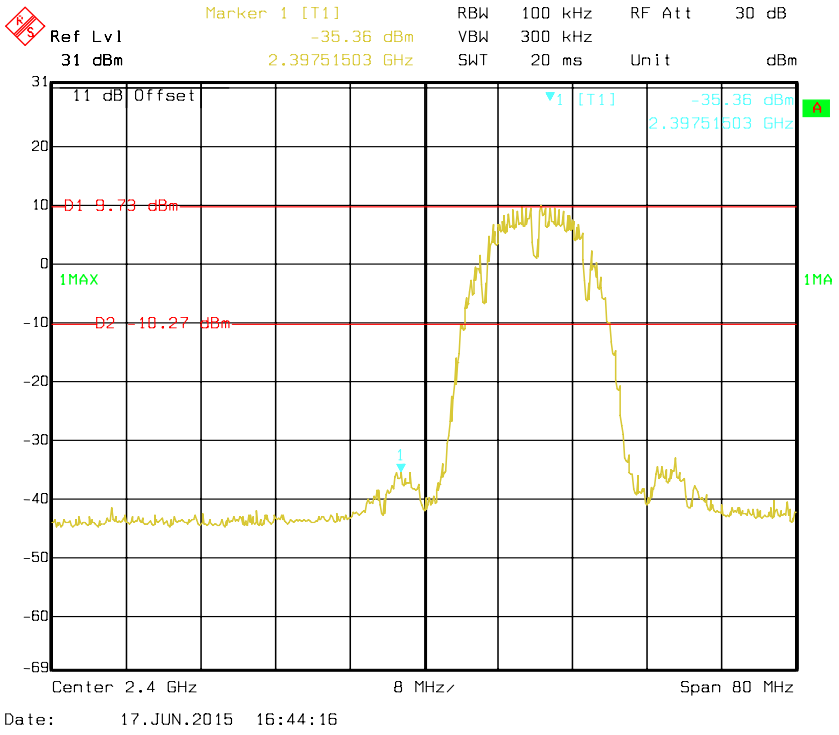
Temperature:	26 °C & 25 °C
Relative Humidity:	67 % & 65 %
ATM Pressure:	97.1 kPa & 97.1 kPa

The testing was performed by Kevin Tao on 2015-06-16 & 2015-06-17.

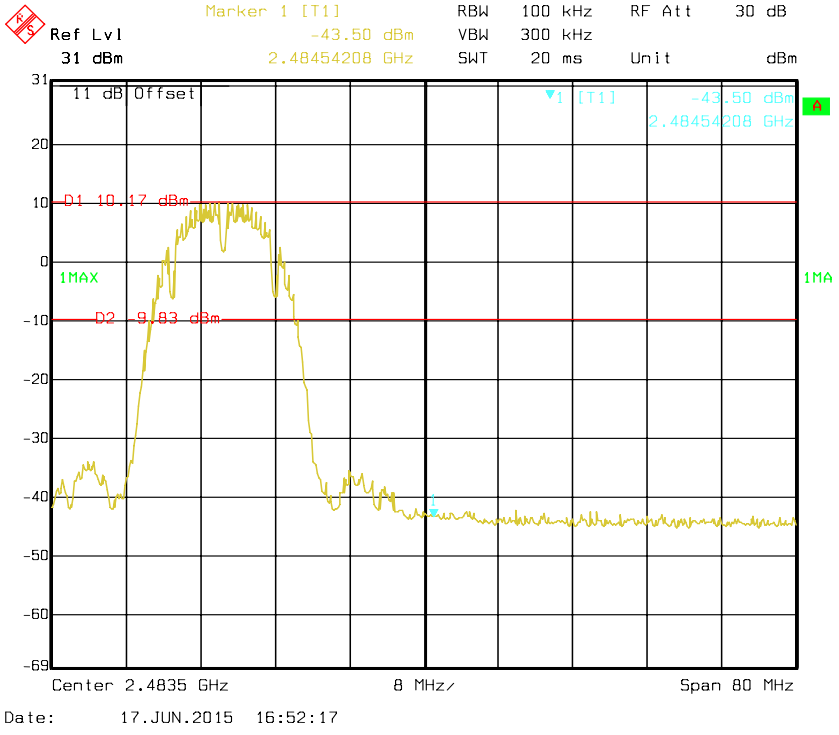
Test Mode: Transmitting

Test Result: Compliance, Please refer to following table and plots.

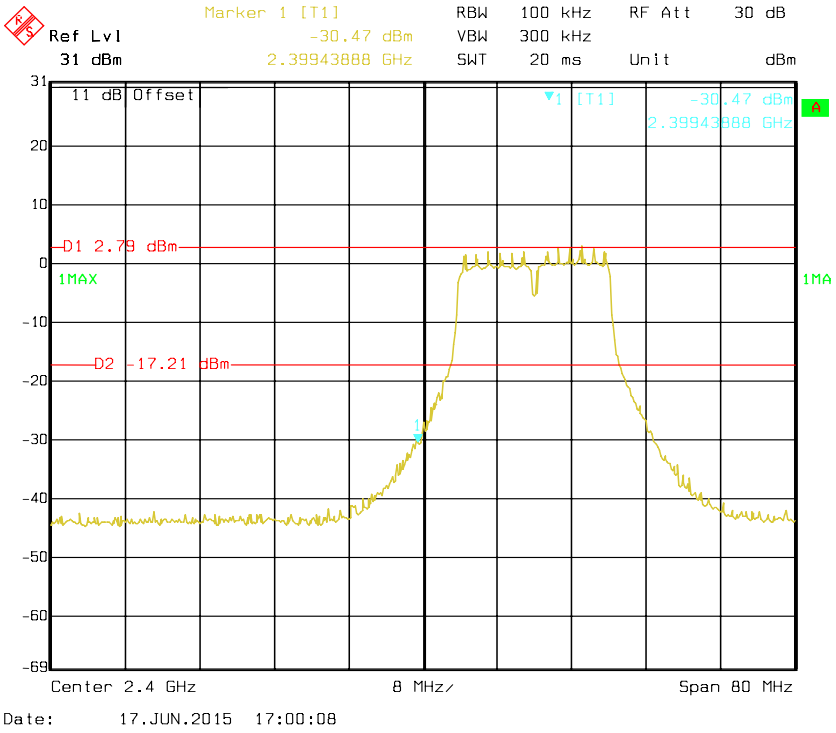
802.11b: Band Edge, Left Side for Antenna 0



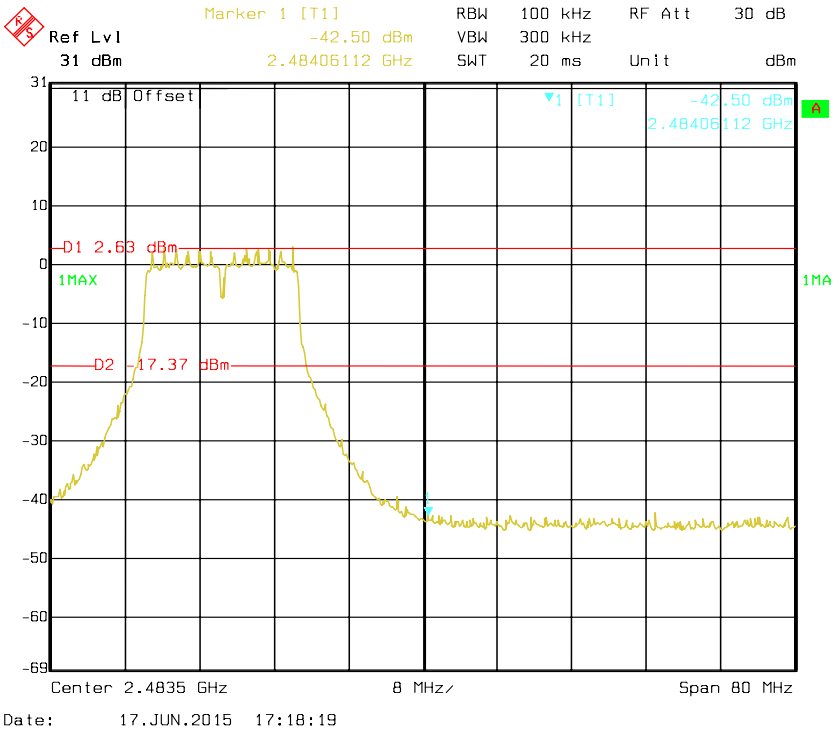
802.11b: Band Edge, Right Side for Antenna 0



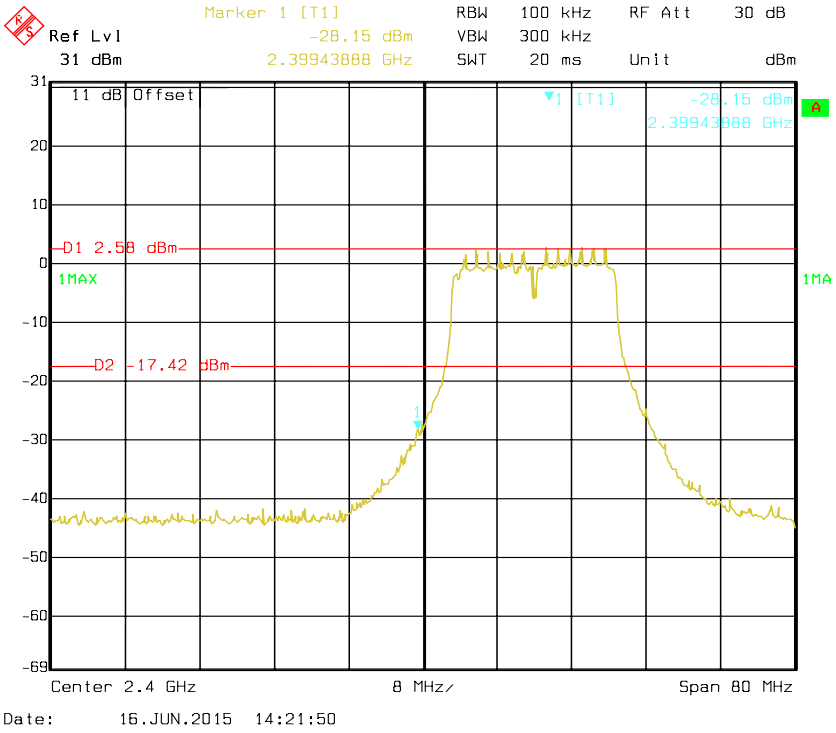
802.11g: Band Edge, Left Side for Antenna 0



802.11g: Band Edge, Right Side for Antenna 0

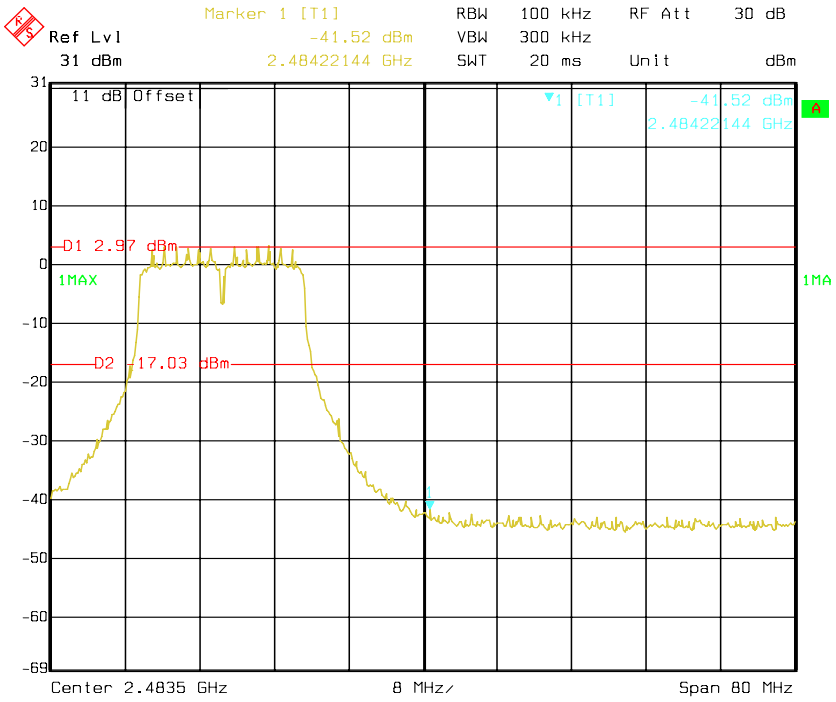


802.11n HT20 Band Edge, Left Side for Antenna 0



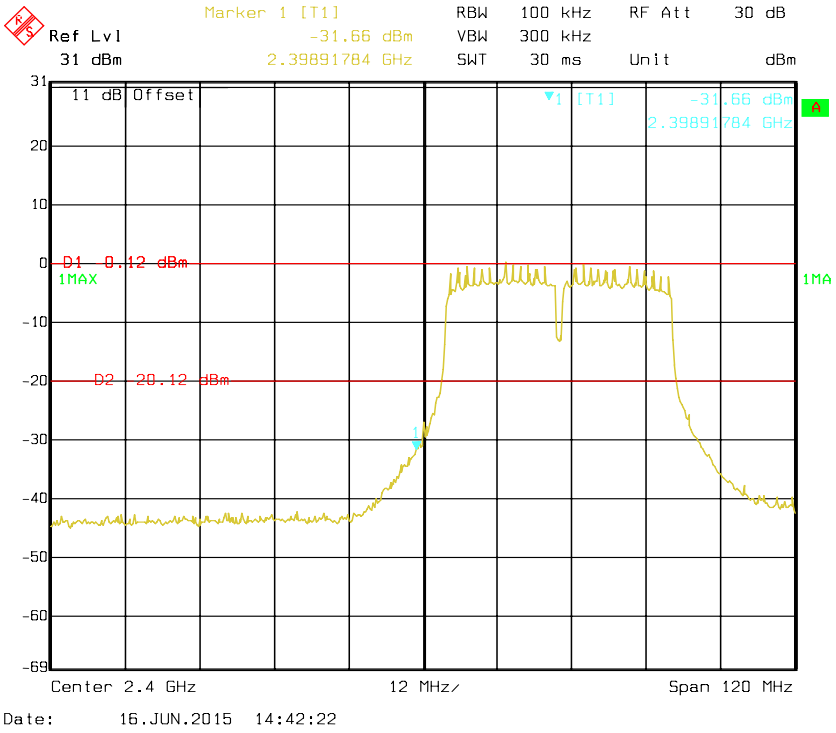
Date: 16.JUN.2015 14:21:50

802.11n HT20 Band Edge, Right Side for Antenna 0

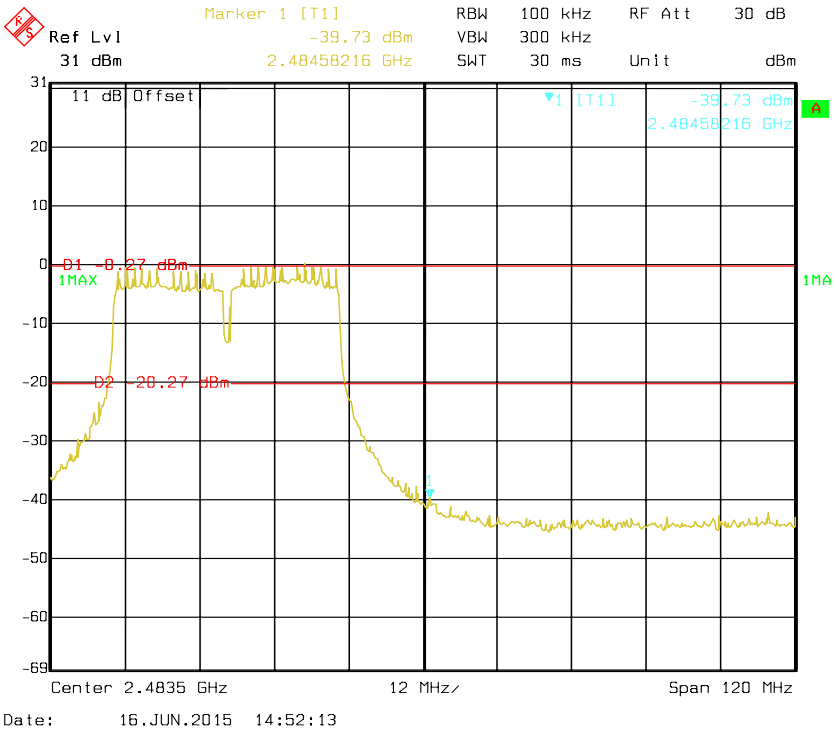


Date: 16.JUN.2015 14:34:34

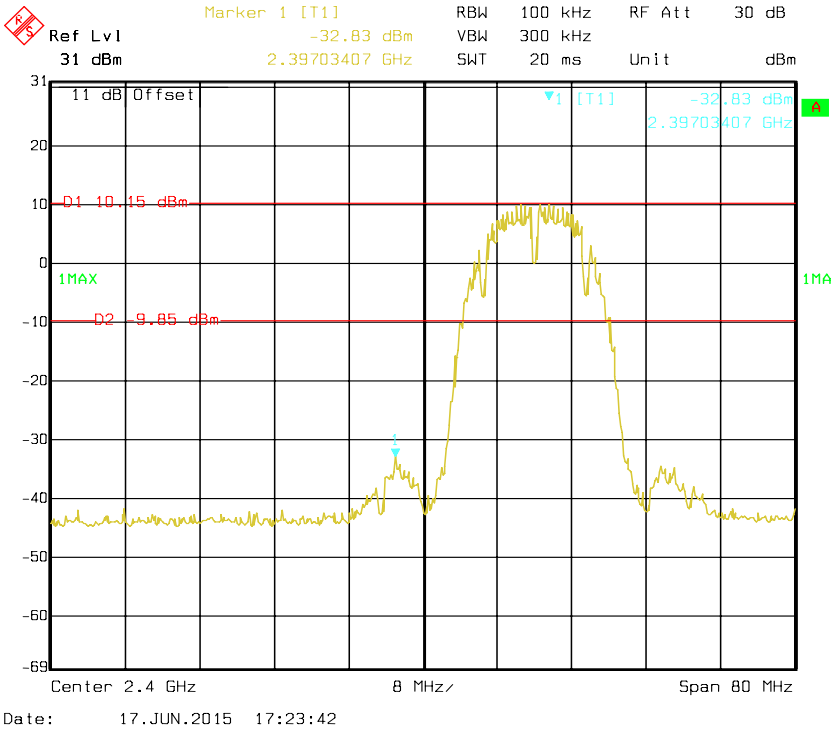
802.11n HT40 Band Edge, Left Side for Antenna 0



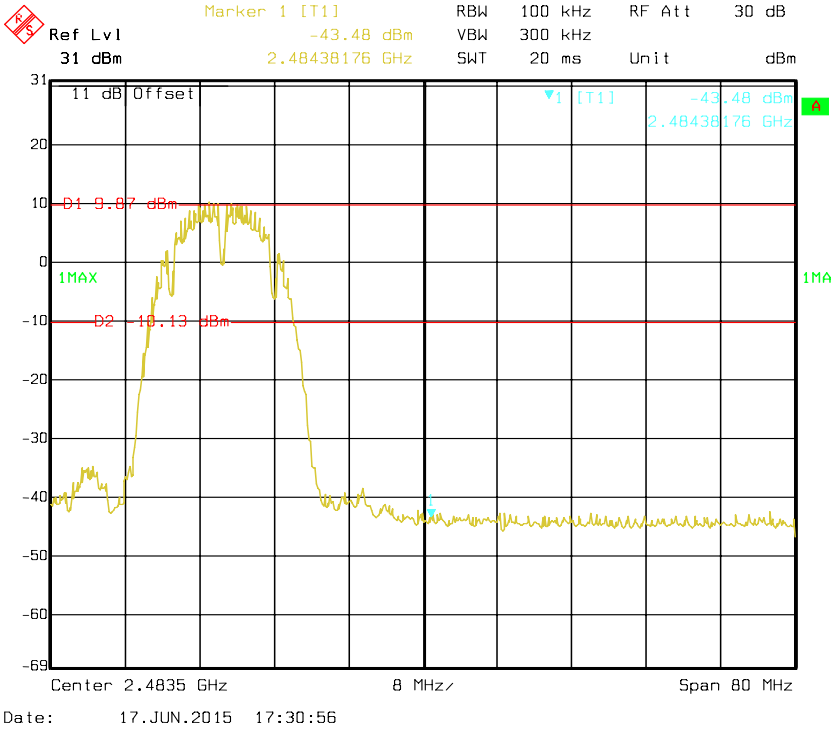
802.11n HT40 Band Edge, Right Side for Antenna 0



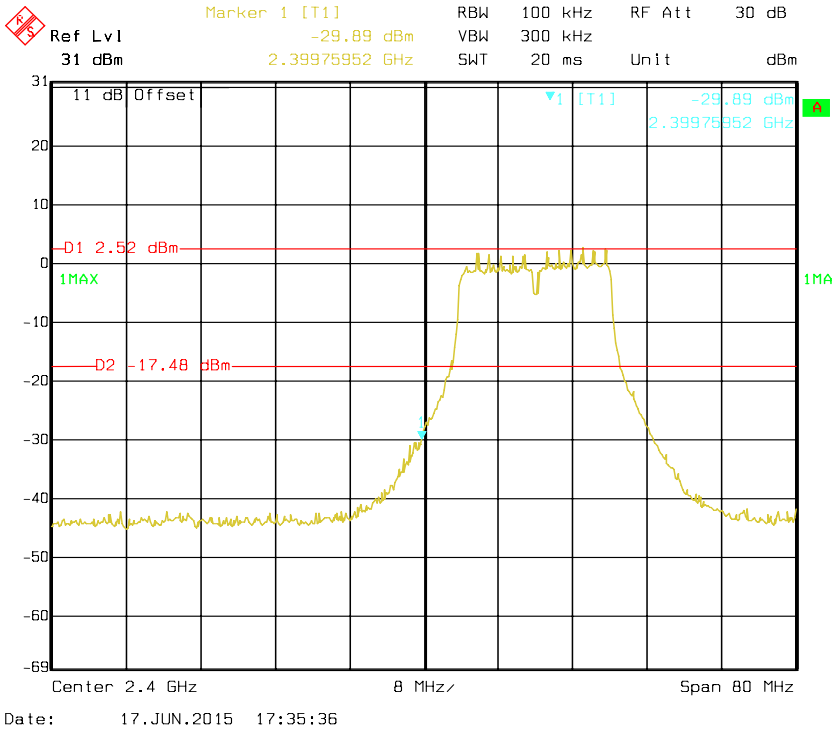
802.11b: Band Edge, Left Side for Antenna 1



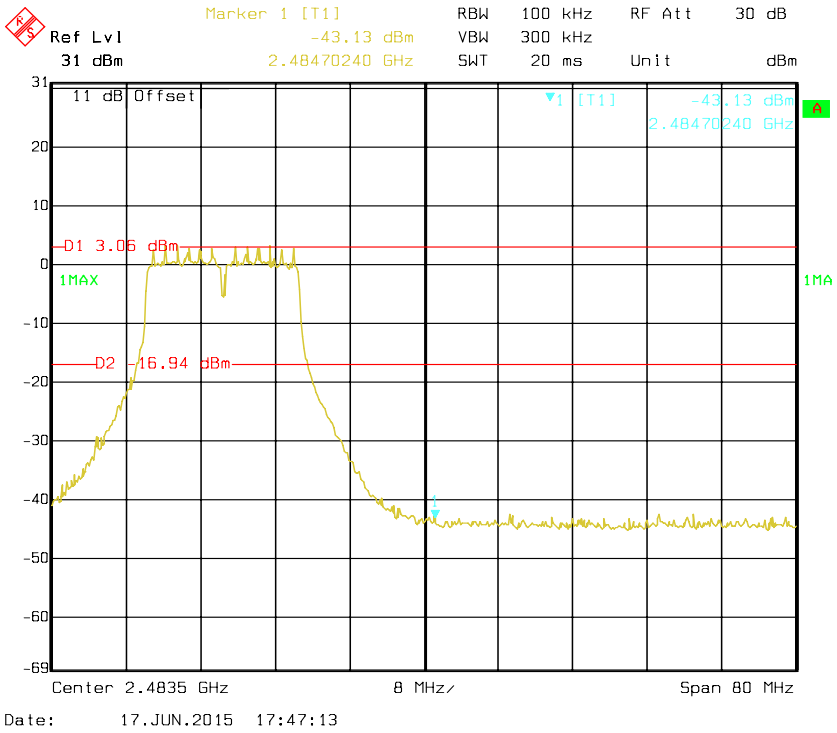
802.11b: Band Edge, Right Side for Antenna 1



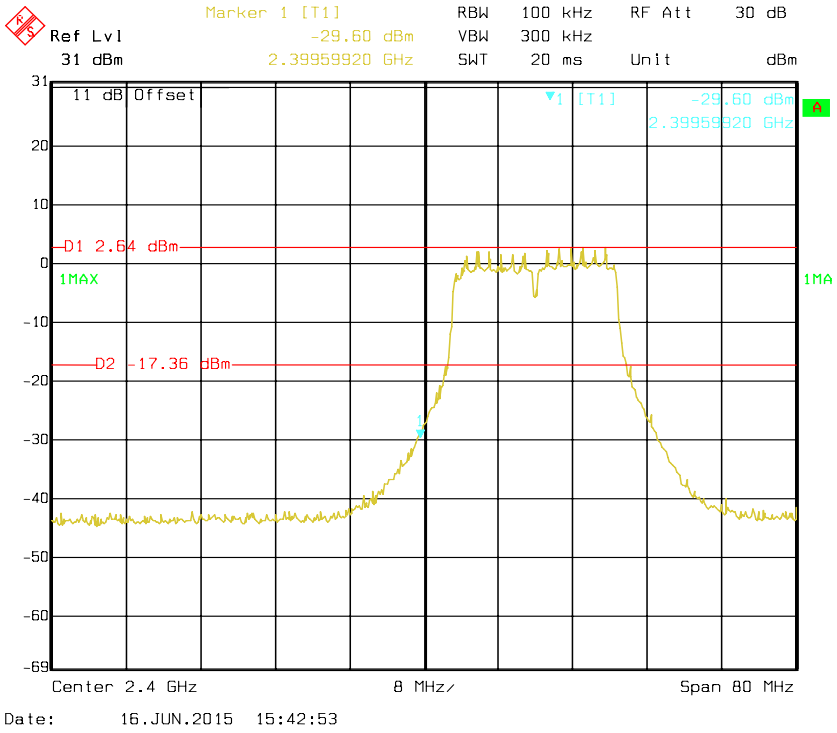
802.11g: Band Edge, Left Side for Antenna 1



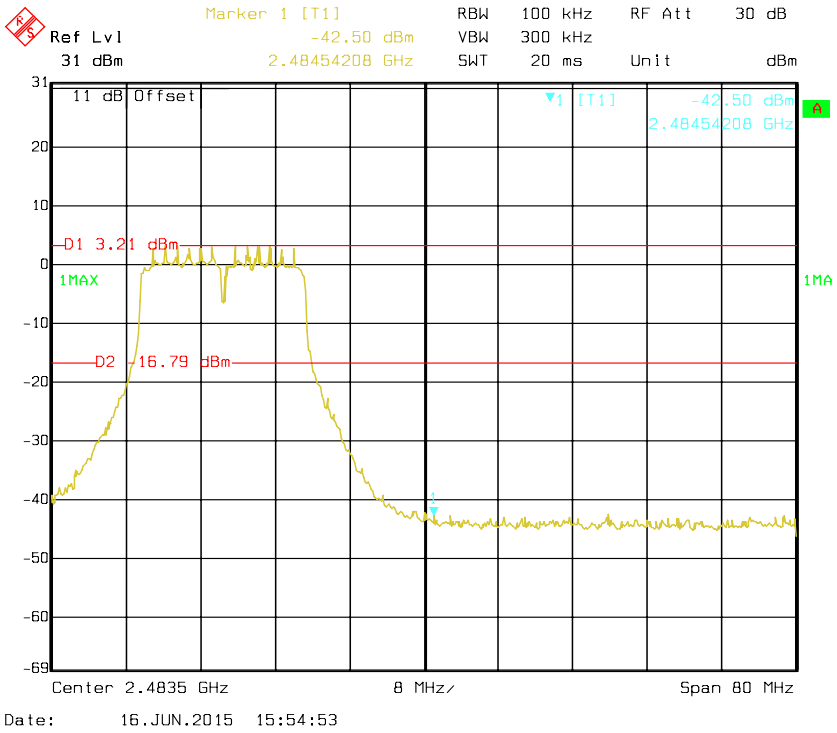
802.11g: Band Edge, Right Side for Antenna 1



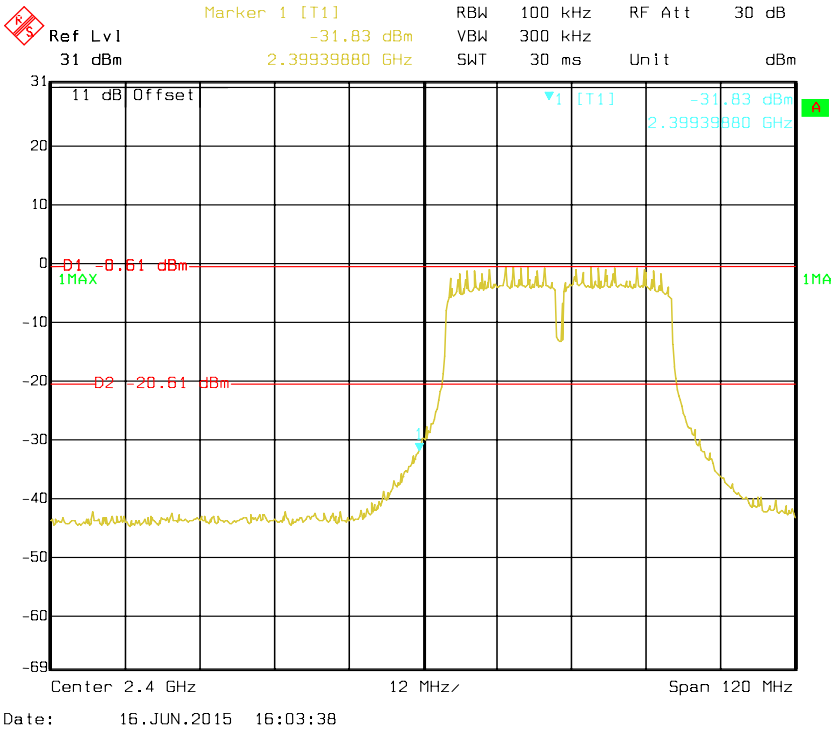
802.11n HT20 Band Edge, Left Side for Antenna 1



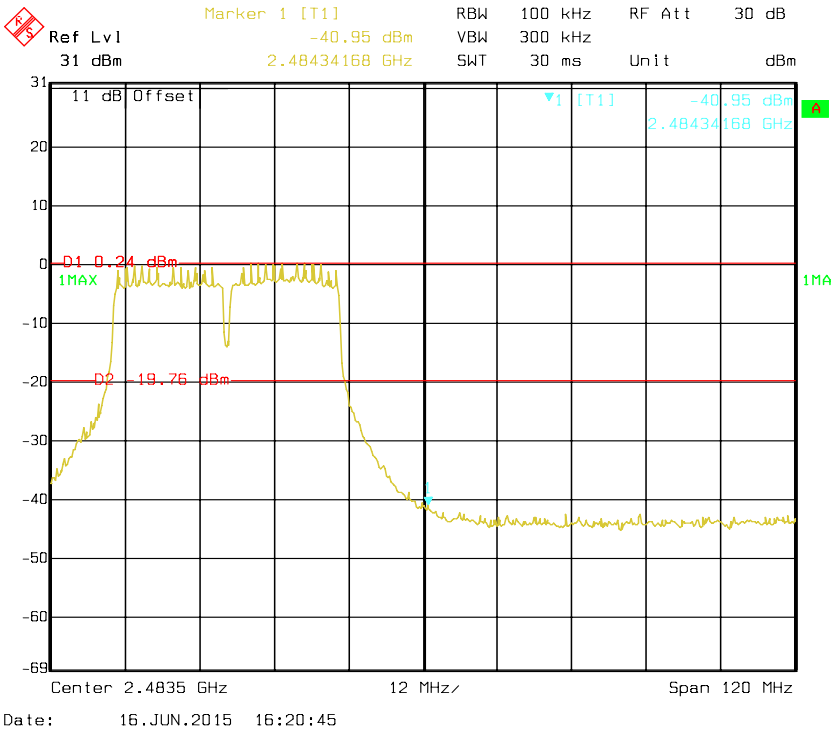
802.11n HT20 Band Edge, Right Side for Antenna 1



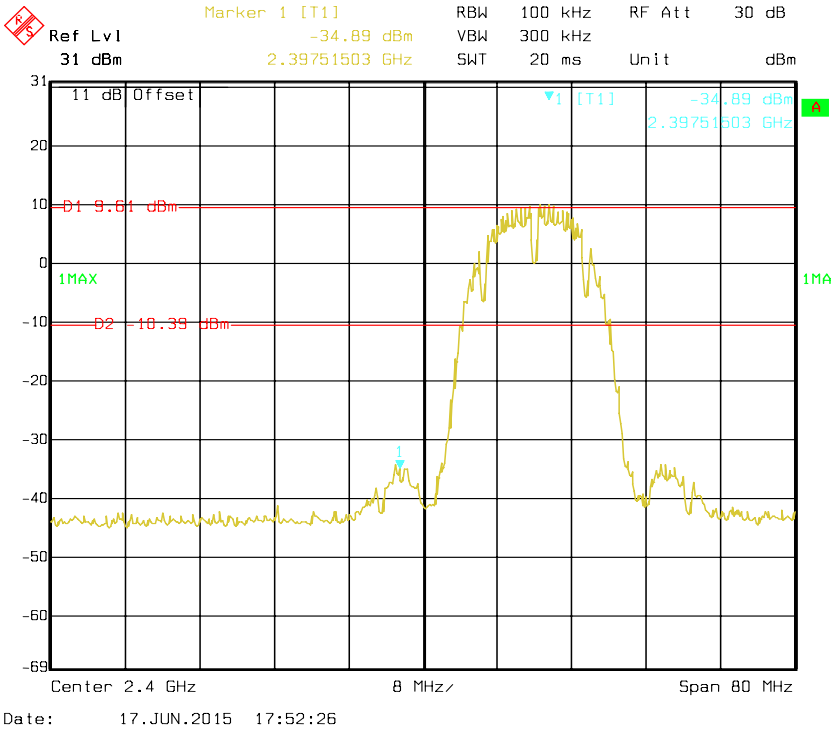
802.11n HT40 Band Edge, Left Side for Antenna 1



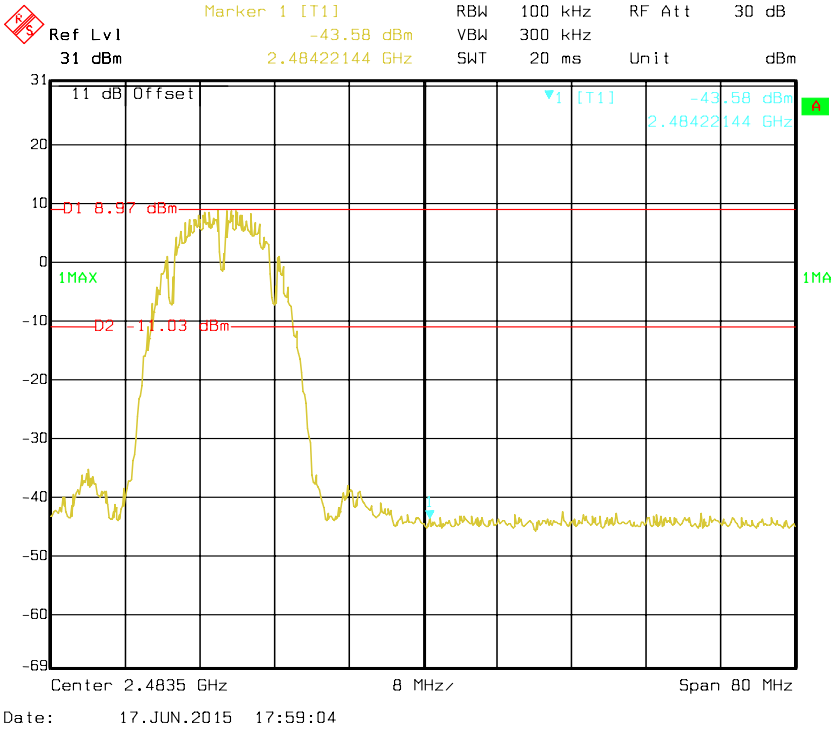
802.11n HT40 Band Edge, Right Side for Antenna 1



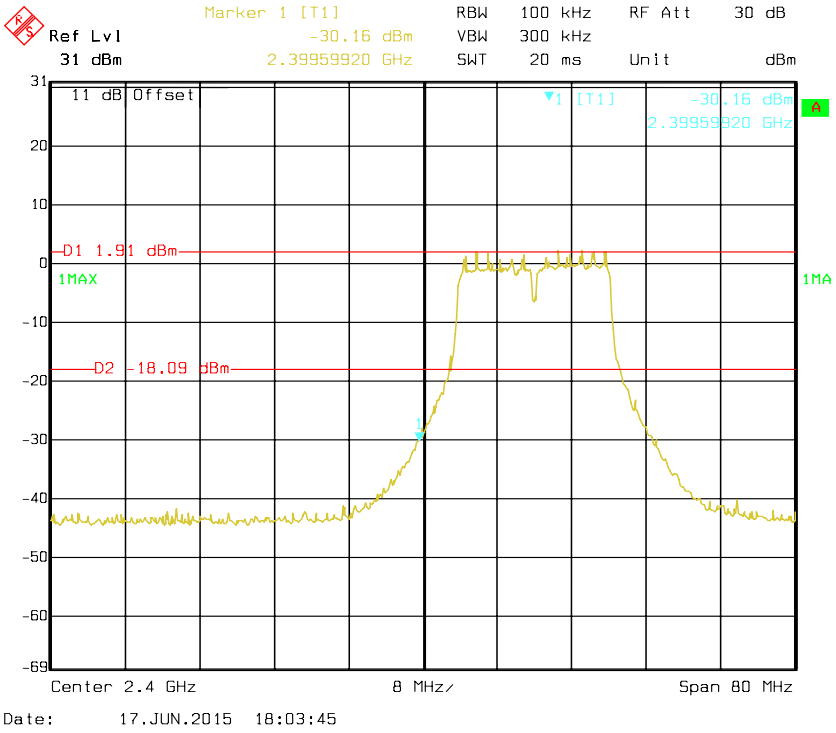
802.11b: Band Edge, Left Side for Antenna 2



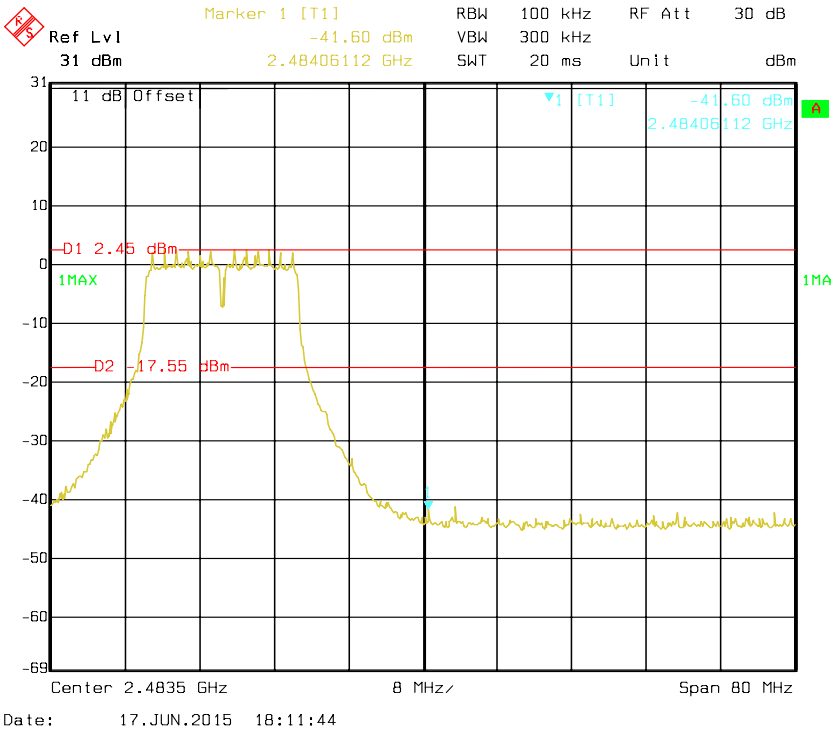
802.11b: Band Edge, Right Side for Antenna 2



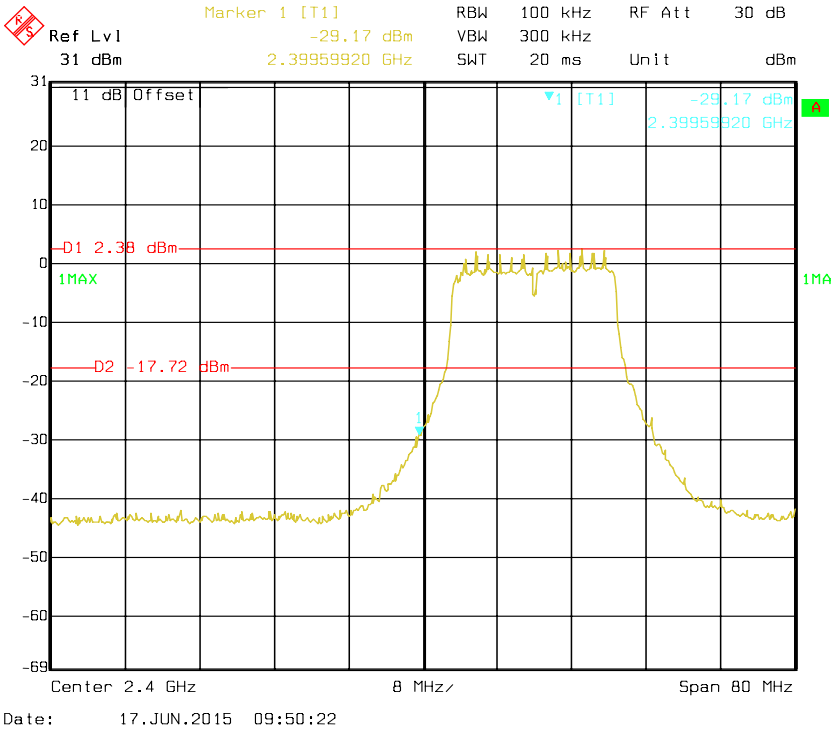
802.11g: Band Edge, Left Side for Antenna 2



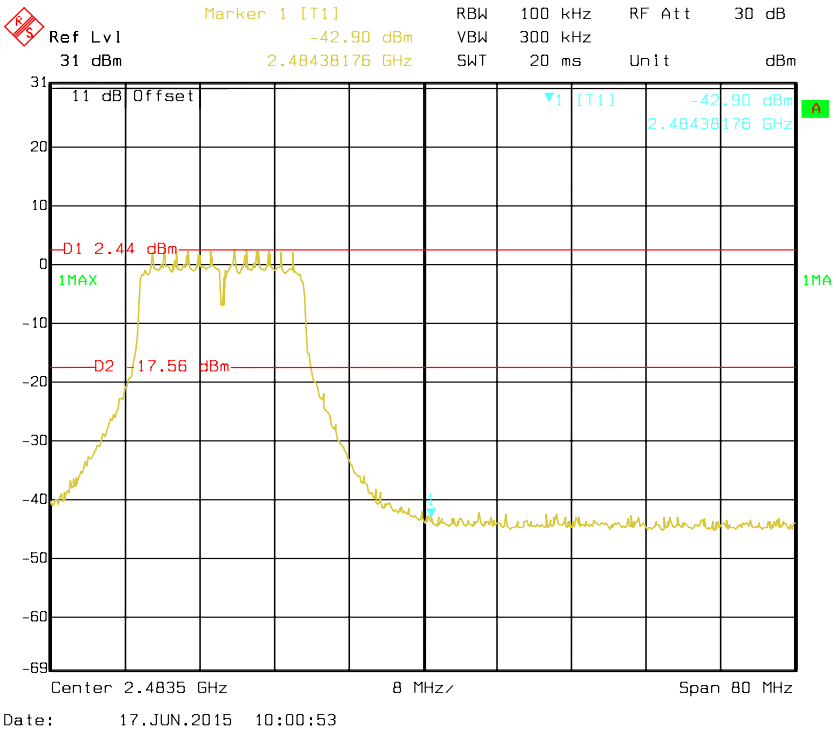
802.11g: Band Edge, Right Side for Antenna 2



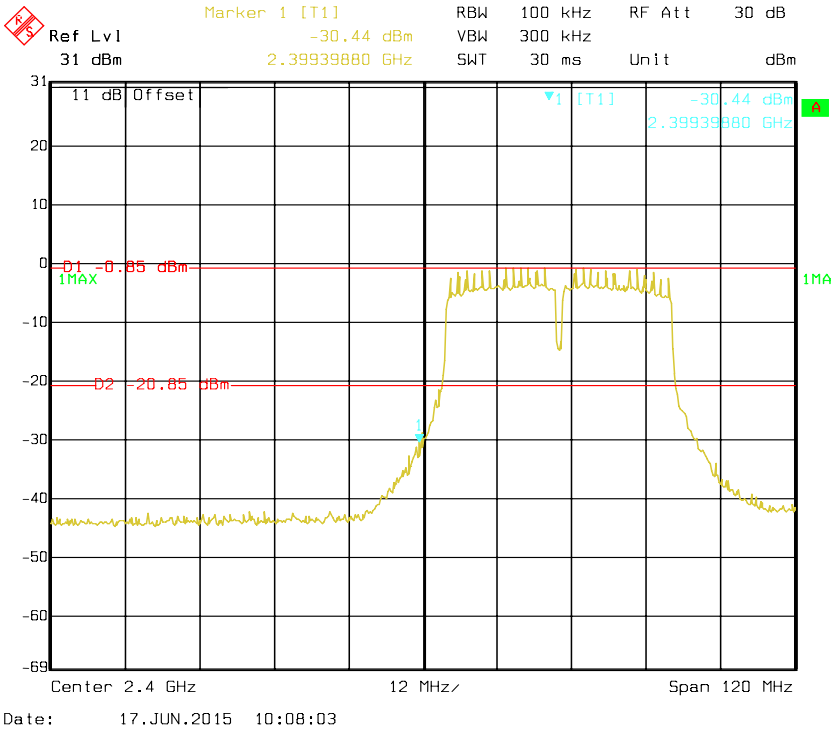
802.11n HT20 Band Edge, Left Side for Antenna 2



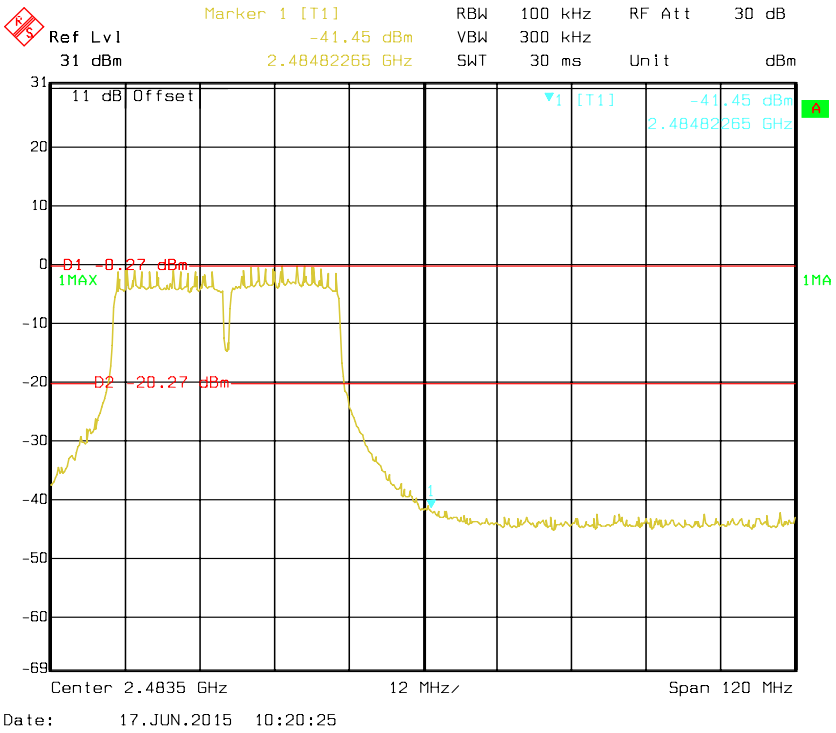
802.11n HT20 Band Edge, Right Side for Antenna 2



802.11n HT40 Band Edge, Left Side for Antenna 2



802.11n HT40 Band Edge, Right Side for Antenna 2



FCC §15.247(e) - POWER SPECTRAL DENSITY

Applicable Standard

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

Test 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 was set 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. According to KDB 558074 D01 DTS Meas Guidance v03v03, set the RBW = 3 kHz, VBW = 10 kHz, Set the span to 1.5 times the DTS channel bandwidth.
4. Use the peak marker function to determine the maximum power level in any 3 kHz band segment within the fundamental EBW.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2014-10-17	2015-10-16

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	26 °C & 25 °C
Relative Humidity:	67 % & 65 %
ATM Pressure:	97.1 kPa & 97.1 kPa

The testing was performed by Kevin Tao on 2015-06-16 & 2015-06-17.

Test Mode: Transmitting

Mode	Channel	Frequency (MHz)	Power Spectral Density (dBm/3kHz)				Limit (dBm/3kHz)	Result
			Antenna 0	Antenna 1	Antenna 2	Total		
2.4G band 802.11b	Low	2412	-5.36	-5.43	-5.77	-0.75	0.23	PASS
	Middle	2437	-5.44	-4.71	-4.64	-0.14	0.23	PASS
	High	2462	-4.30	-5.60	-4.94	-0.14	0.23	PASS
2.4G band 802.11 g	Low	2412	-11.53	-12.15	-12.29	-7.21	0.23	PASS
	Middle	2437	-11.20	-11.29	-11.22	-6.47	0.23	PASS
	High	2462	-11.60	-11.25	-11.49	-6.67	0.23	PASS
2.4G band 802.11n HT20	Low	2412	-12.02	-12.66	-12.44	-7.59	0.23	PASS
	Middle	2437	-12.11	-11.88	-11.00	-6.87	0.23	PASS
	High	2462	-11.45	-10.92	-12.59	-6.83	0.23	PASS
2.4G band 802.11n HT40	Low	2422	-14.13	-14.93	-15.38	-10.01	0.23	PASS
	Middle	2437	-15.57	-15.56	-14.20	-10.29	0.23	PASS
	High	2452	-14.65	-13.35	-15.00	-9.50	0.23	PASS

Note:

The device has three PCB antennas, antenna gain is 9dBi, and employed Cyclic Delay Devisity(CCD) for 802.11 MIMO transmitting, per KDB662911 D01 Multiple Transmitter Output v02r01.

For power spectral density (PSD) measurements on the devices：

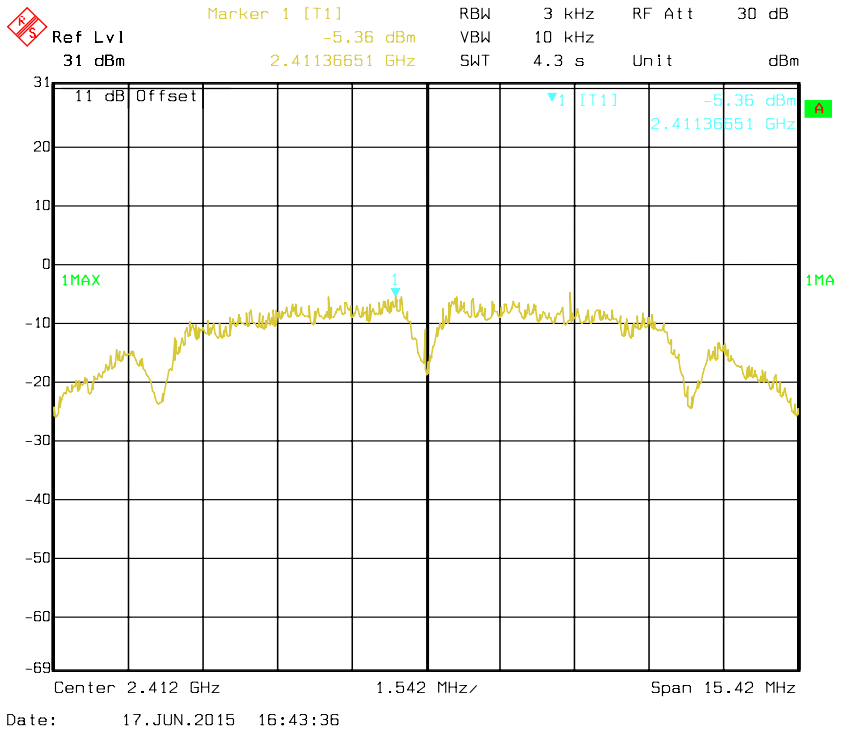
Array Gain = 10 log(NANT/NSS) dB

So:

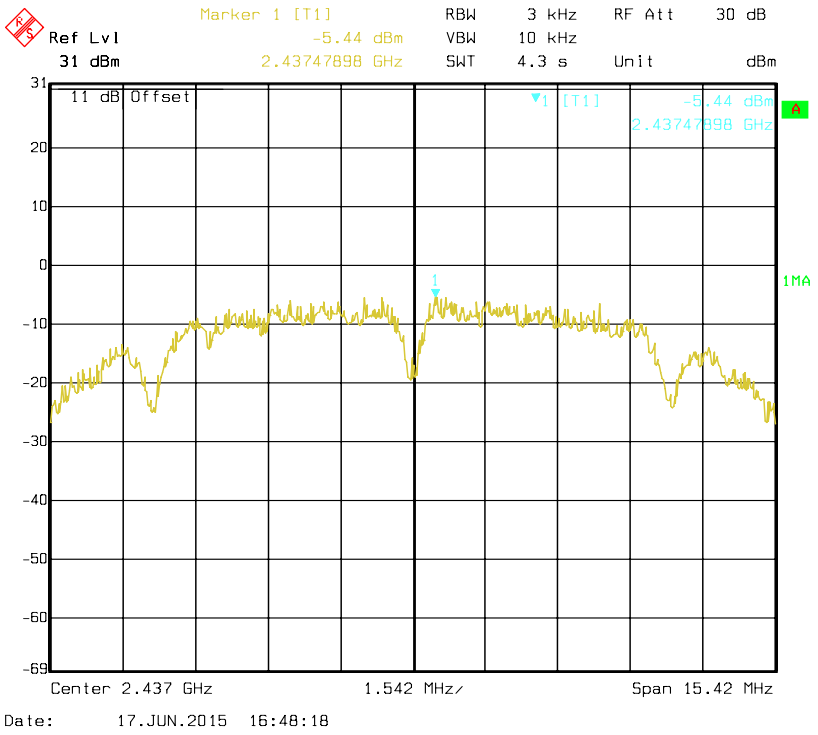
Directional gain = GANT + Array Gain=9+10* log(3)=9+4.77=13.77dBi.

The Power Spectral Density Limits were reduced 7.77dB. （13.77-6=7.77）

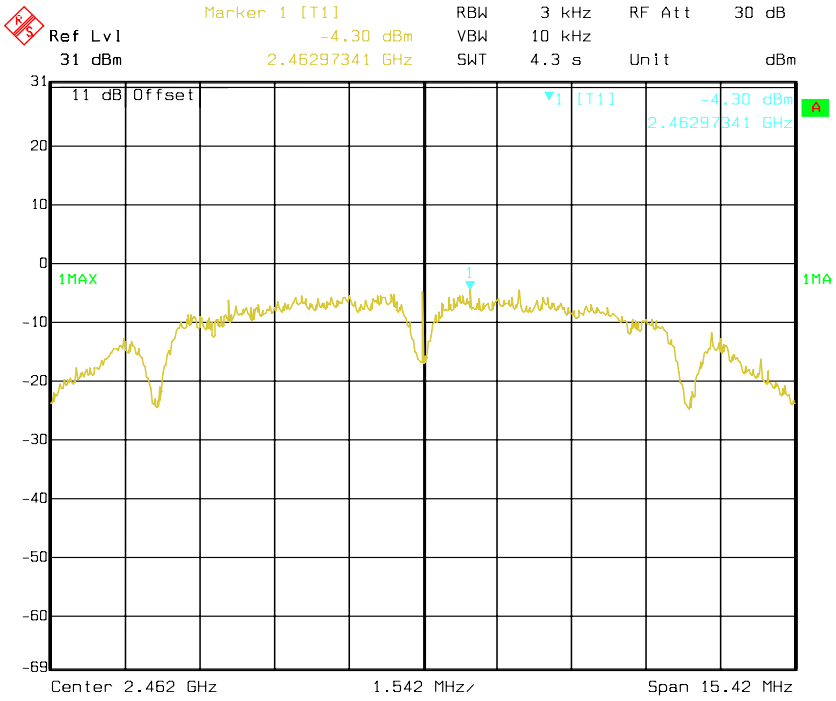
Power Spectral Density, 802.11b Low Channel for Antenna 0



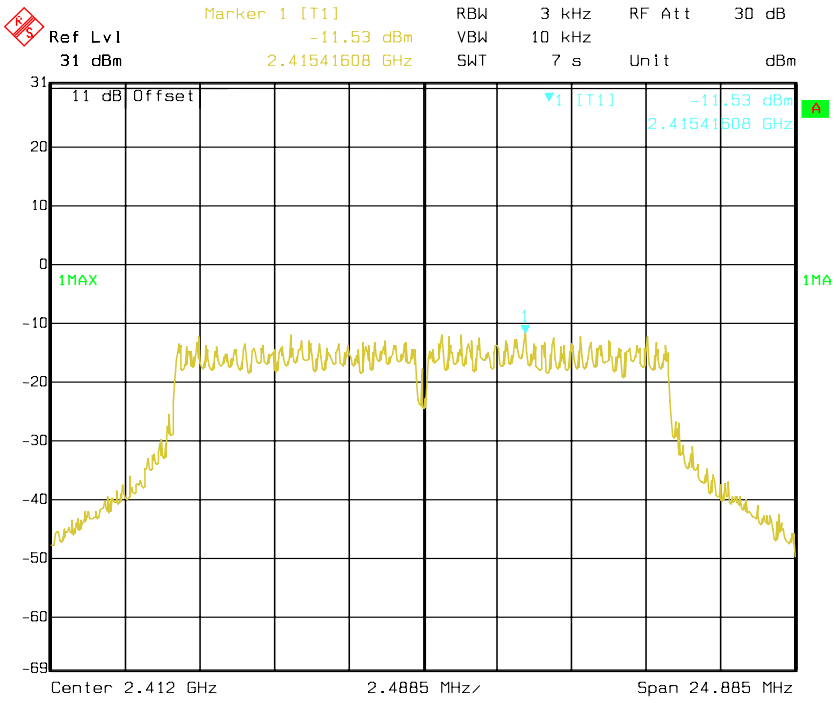
Power Spectral Density, 802.11b Middle Channel for Antenna 0



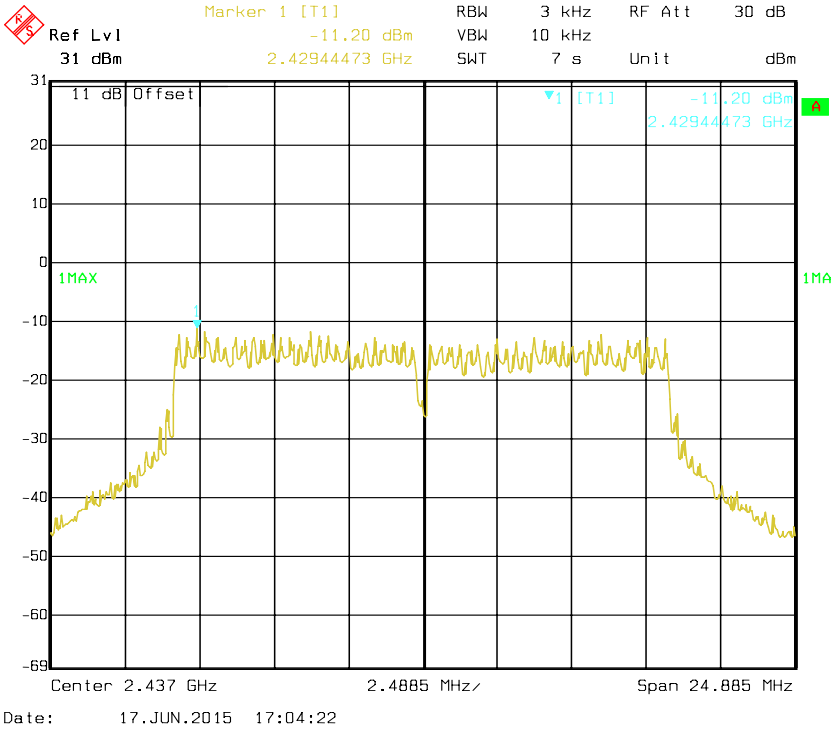
Power Spectral Density, 802.11b High Channel for Antenna 0



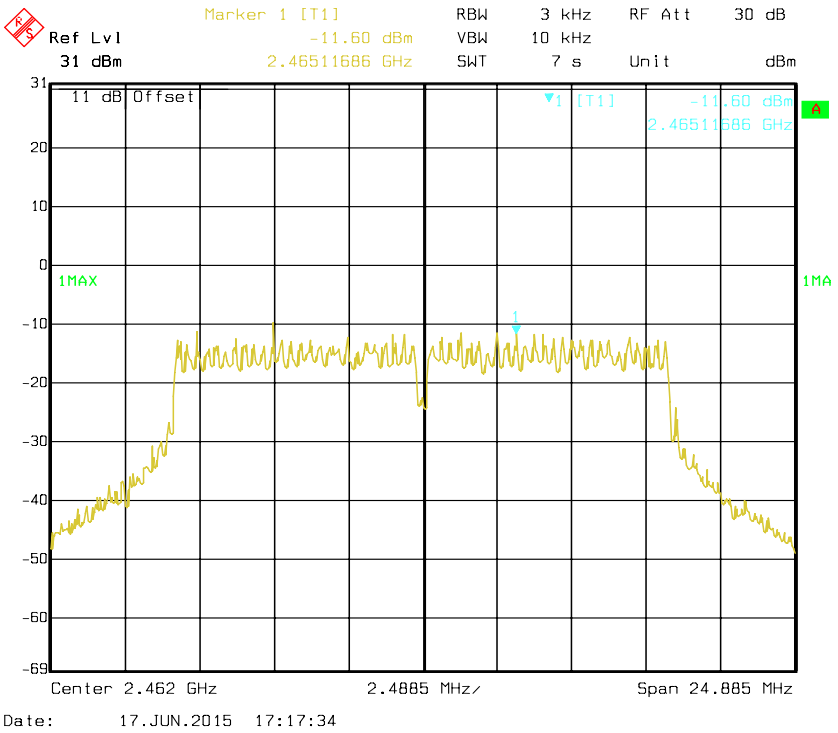
Power Spectral Density, 802.11g Low Channel for Antenna 0



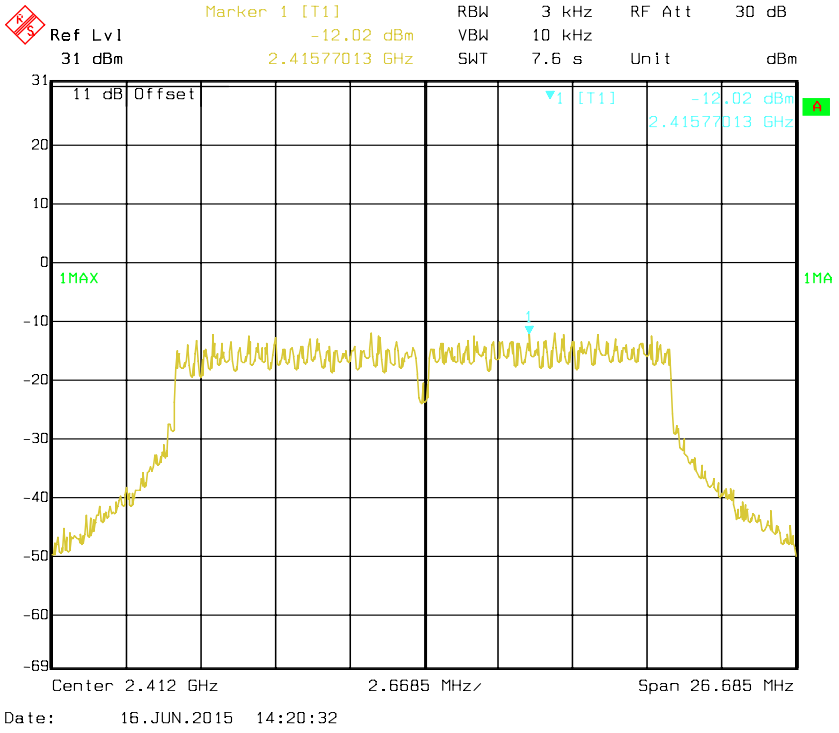
Power Spectral Density, 802.11g Middle Channel for Antenna 0



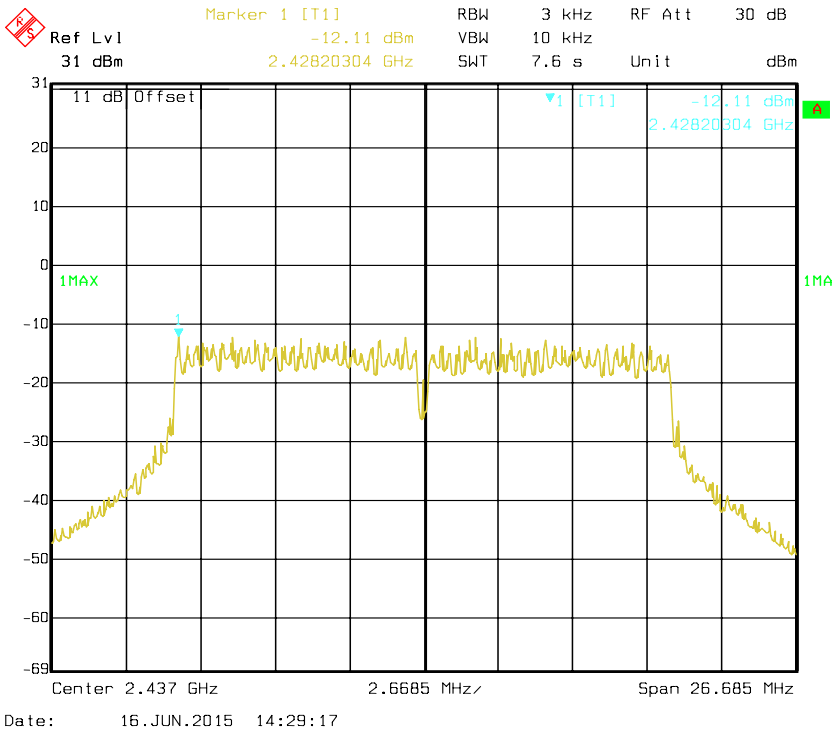
Power Spectral Density, 802.11g High Channel for Antenna 0



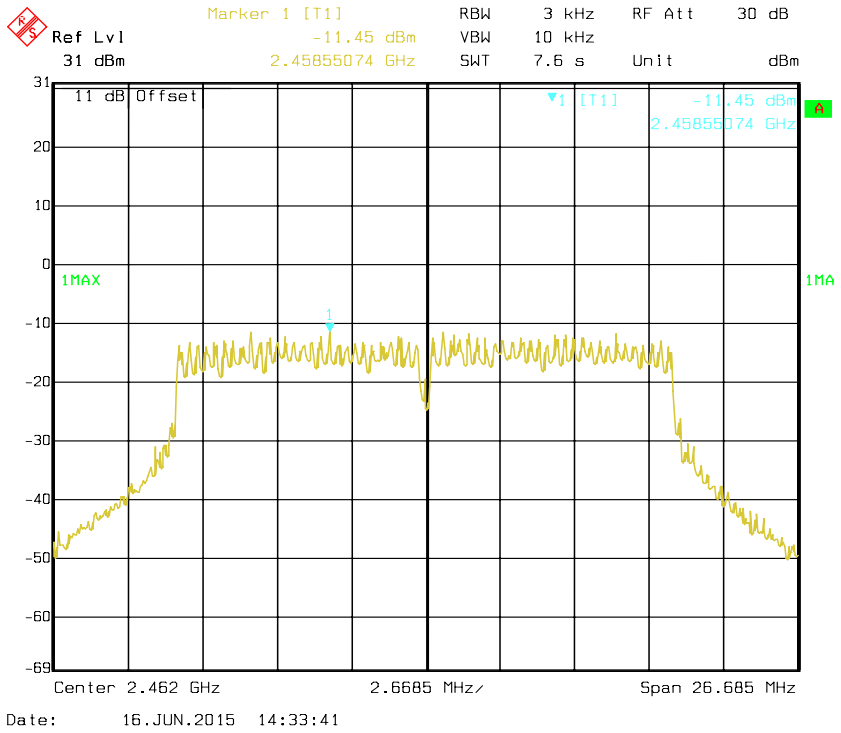
Power Spectral Density, 802.11n HT20 Low Channel for Antenna 0



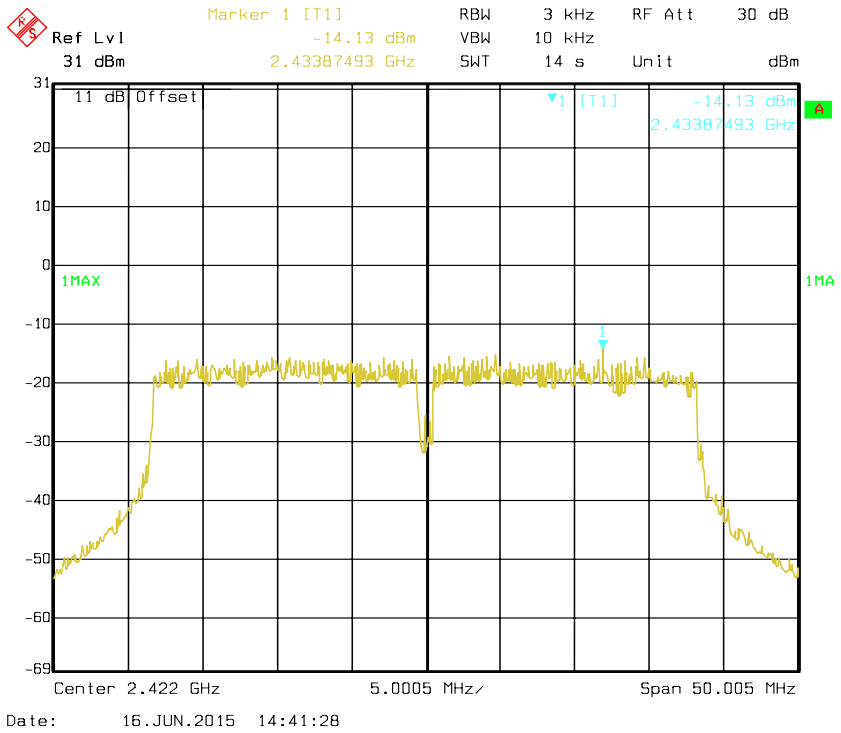
Power Spectral Density, 802.11n HT20 Middle Channel for Antenna 0



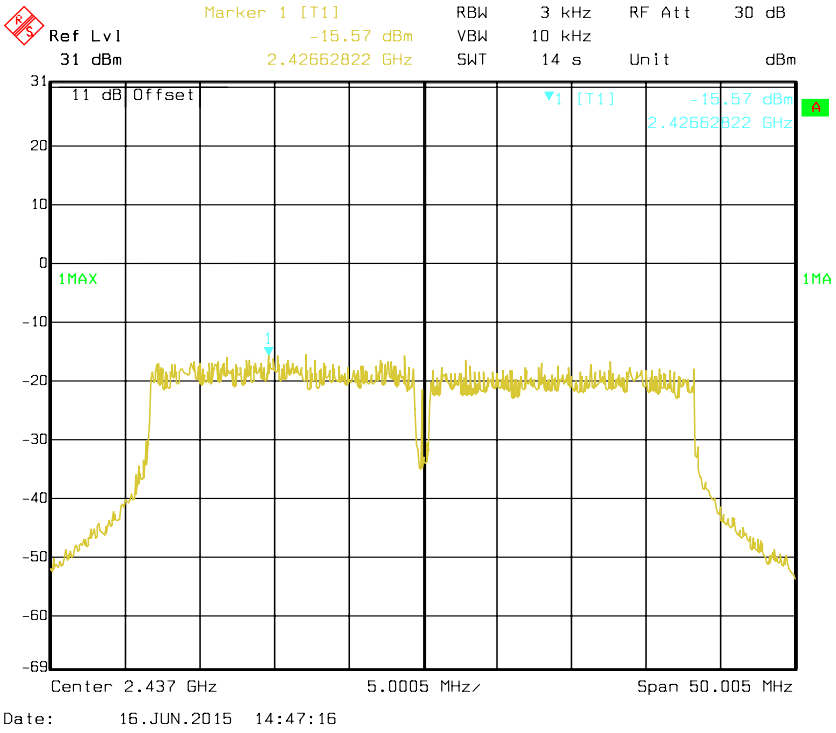
Power Spectral Density, 802.11n HT20 High Channel for Antenna 0



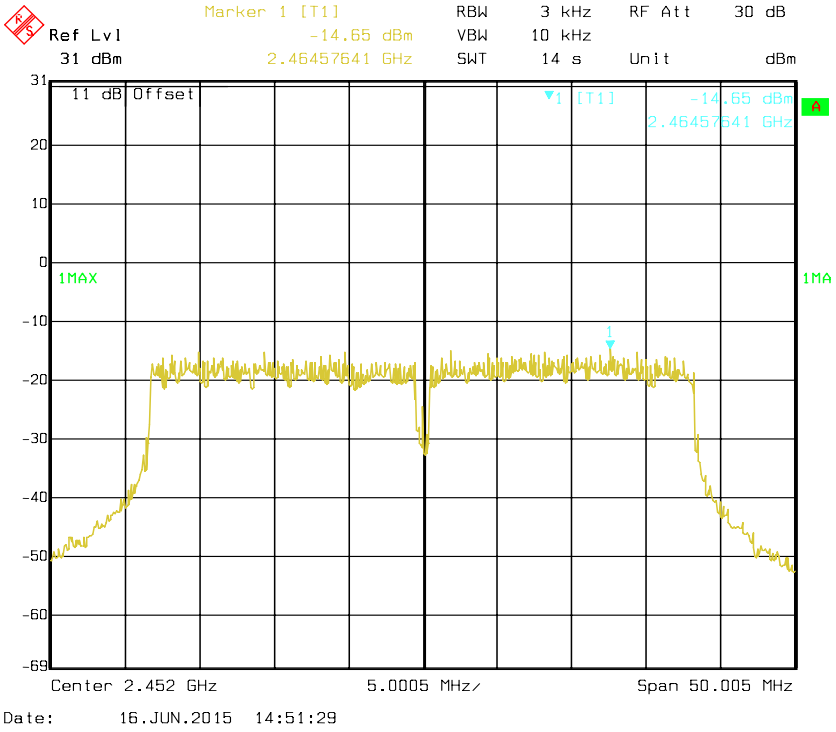
Power Spectral Density, 802.11n HT40 Low Channel for Antenna 0



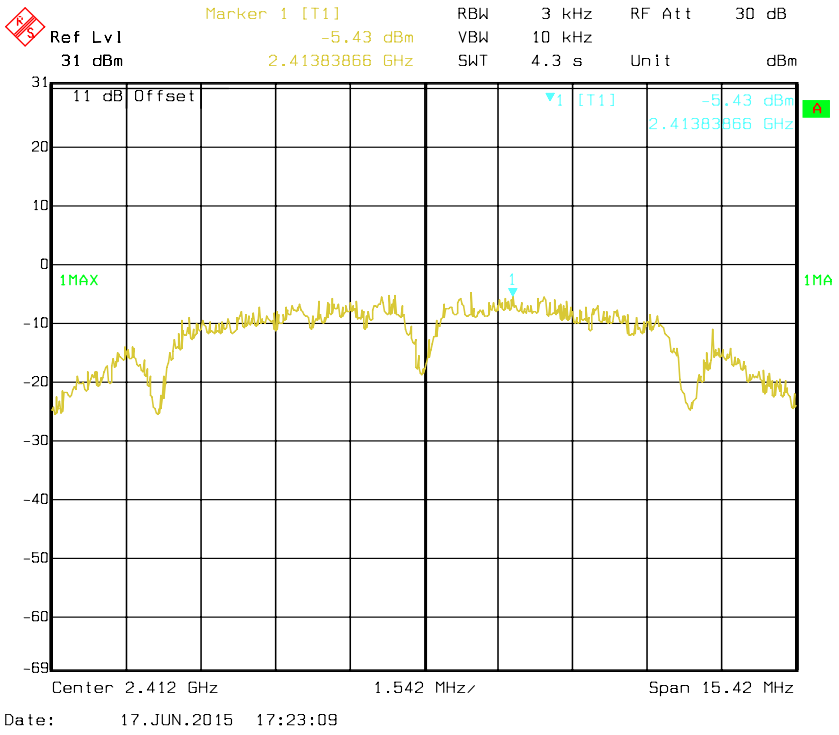
Power Spectral Density, 802.11n HT40 Middle Channel for Antenna 0



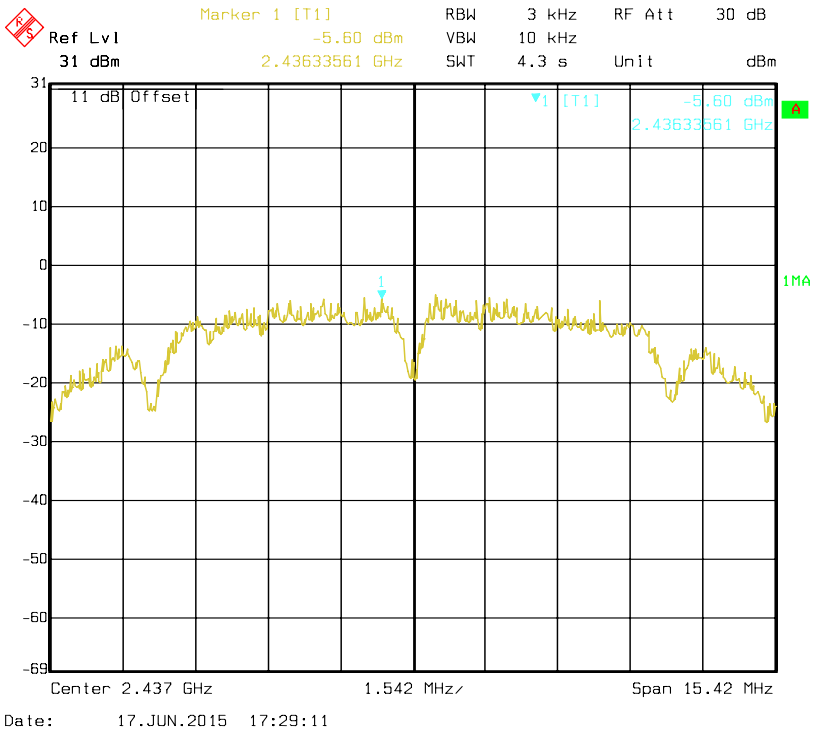
Power Spectral Density, 802.11n HT40 High Channel for Antenna 0



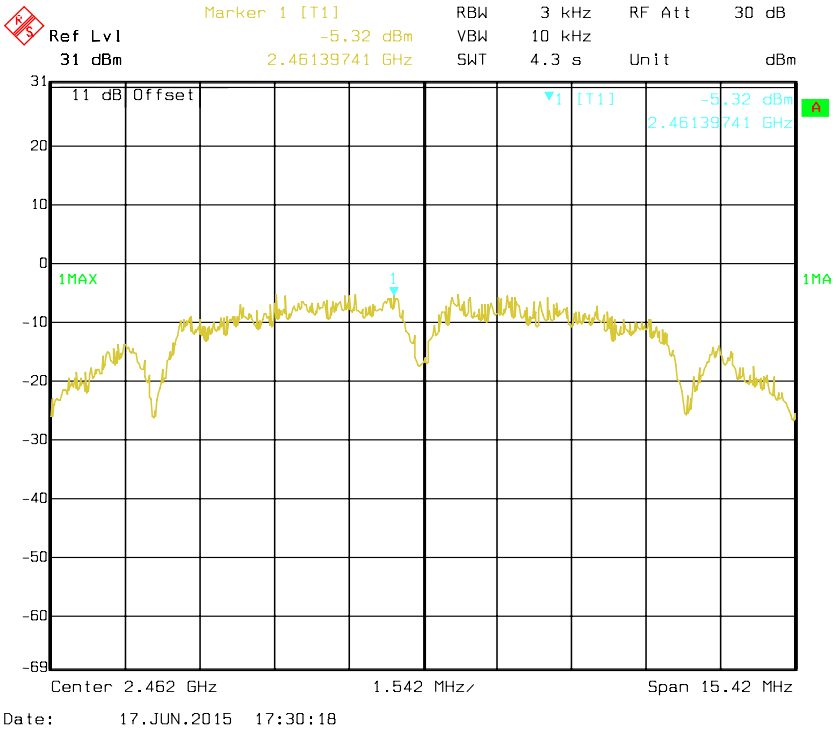
Power Spectral Density, 802.11b Low Channel for Antenna 1



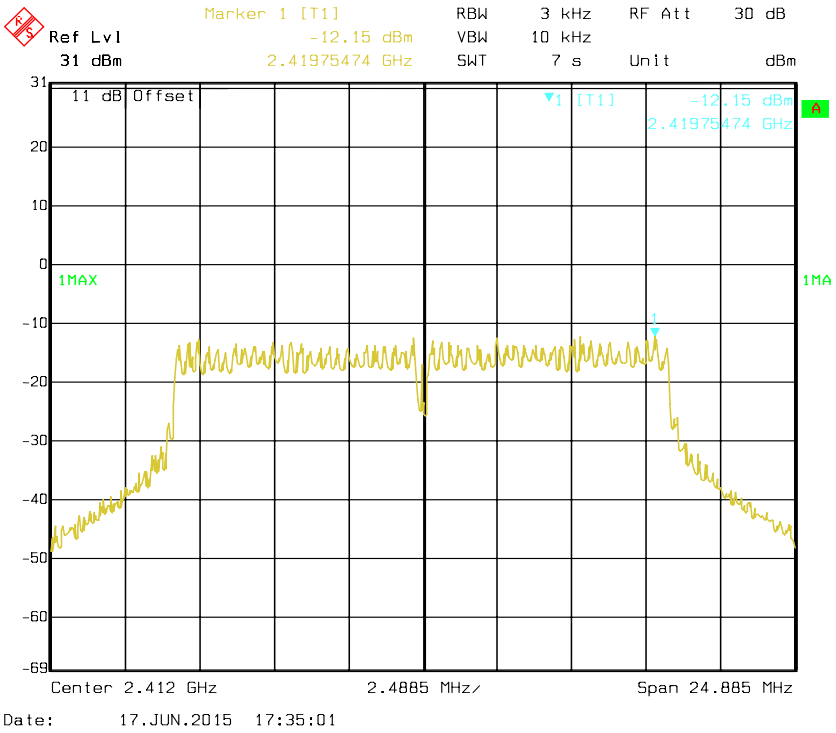
Power Spectral Density, 802.11b Middle Channel for Antenna 1



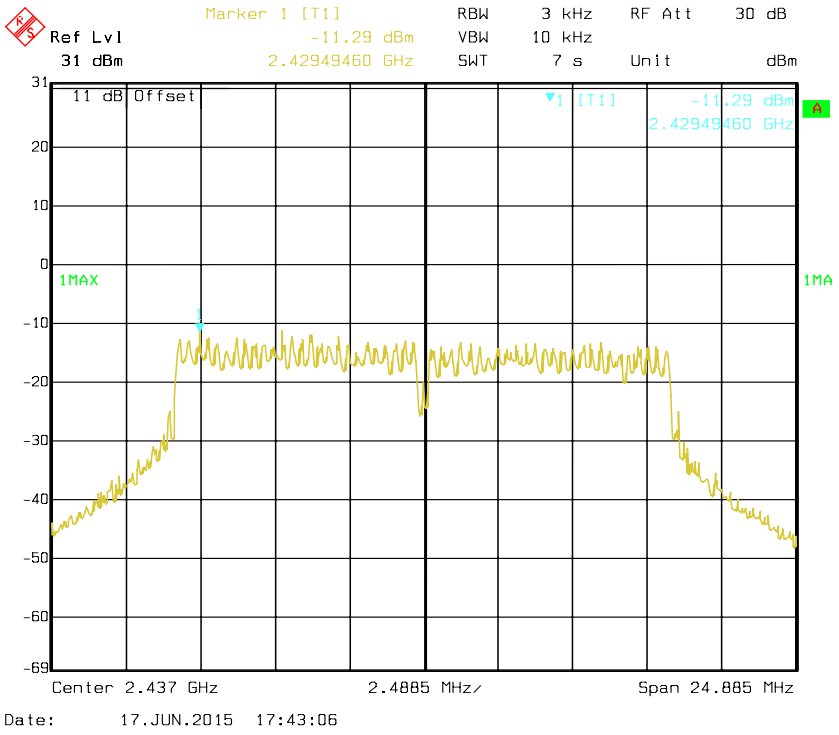
Power Spectral Density, 802.11b High Channel for Antenna 1



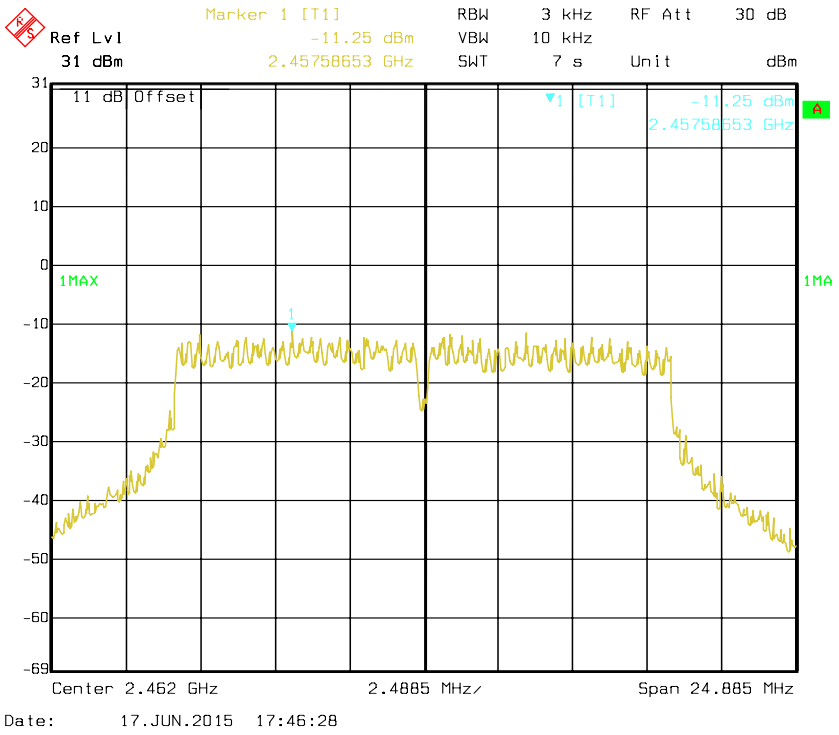
Power Spectral Density, 802.11g Low Channel for Antenna 1



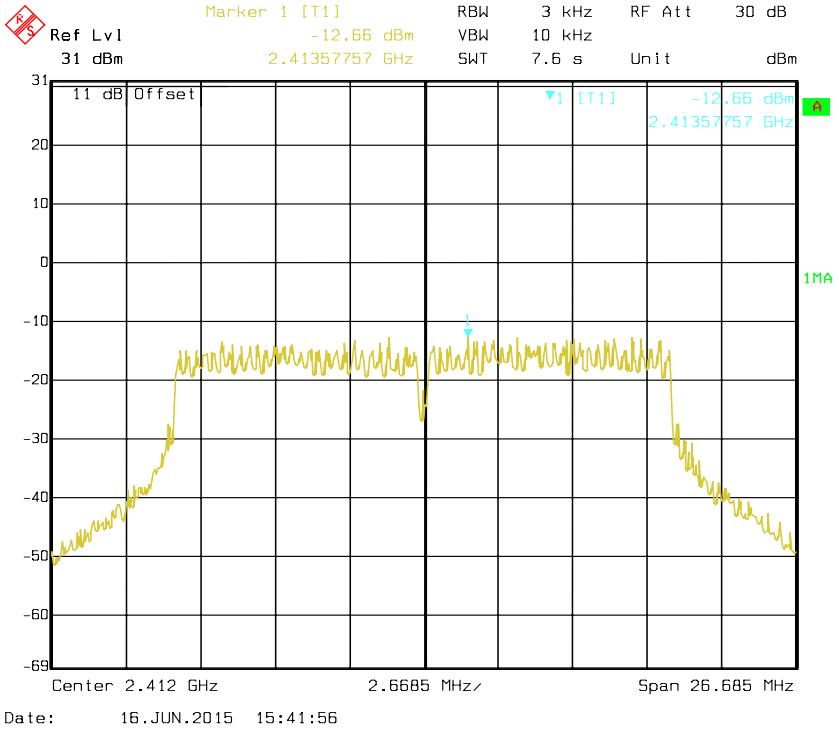
Power Spectral Density, 802.11g Middle Channel for Antenna 1



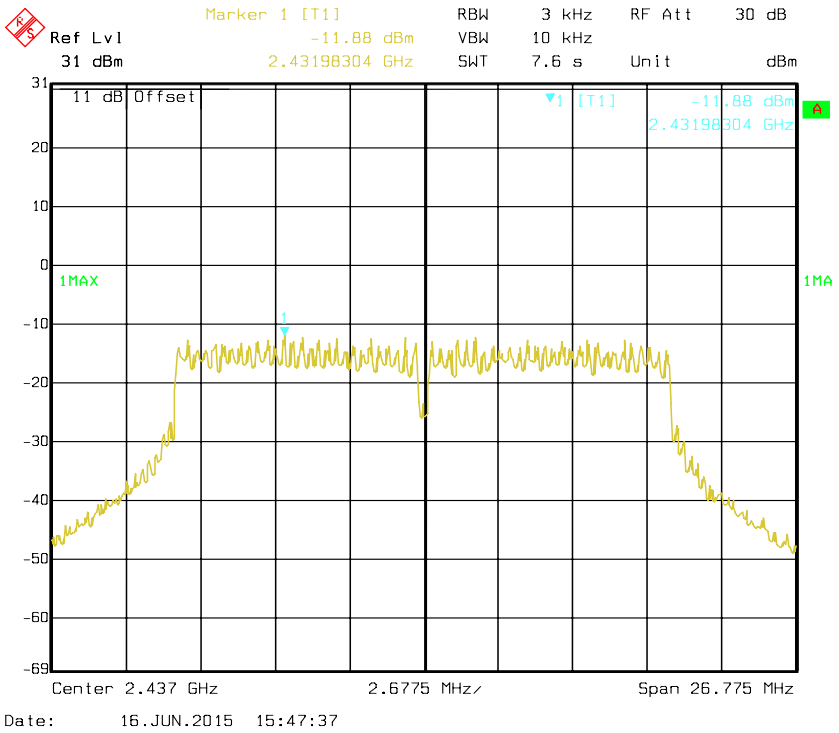
Power Spectral Density, 802.11g High Channel for Antenna 1



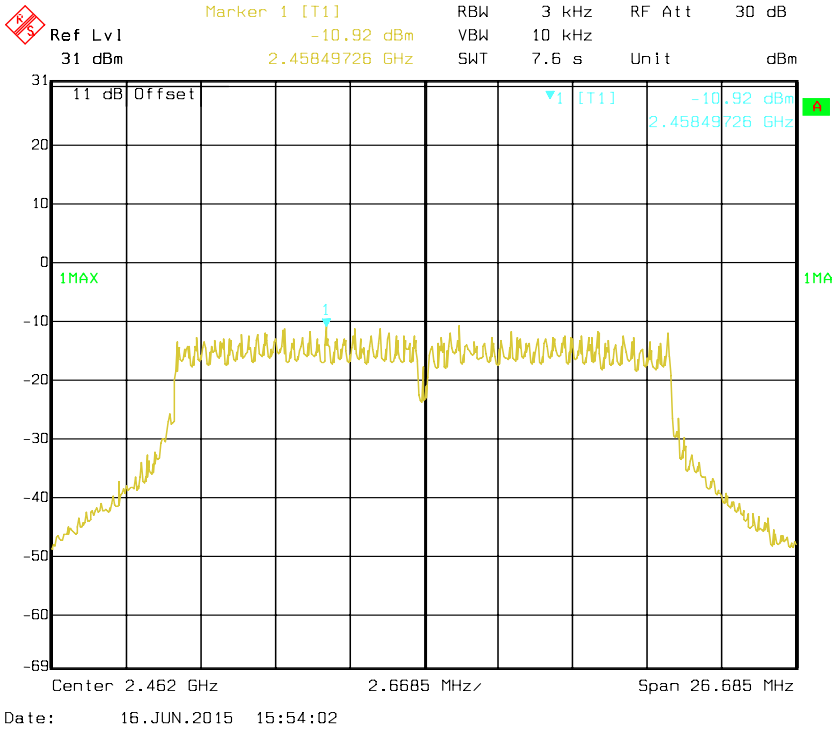
Power Spectral Density, 802.11n HT20 Low Channel for Antenna 1



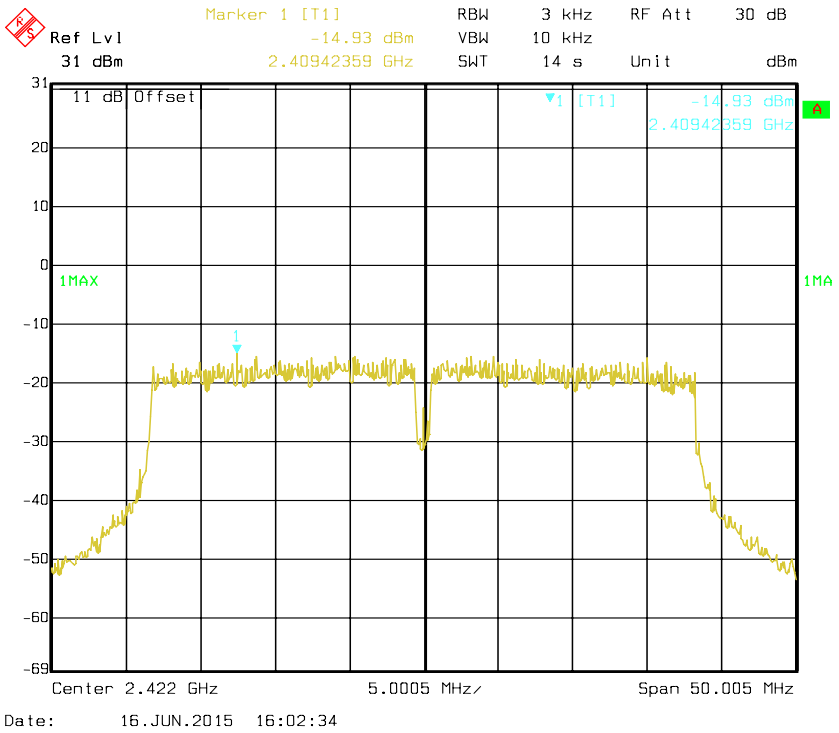
Power Spectral Density, 802.11n HT20 Middle Channel for Antenna 1



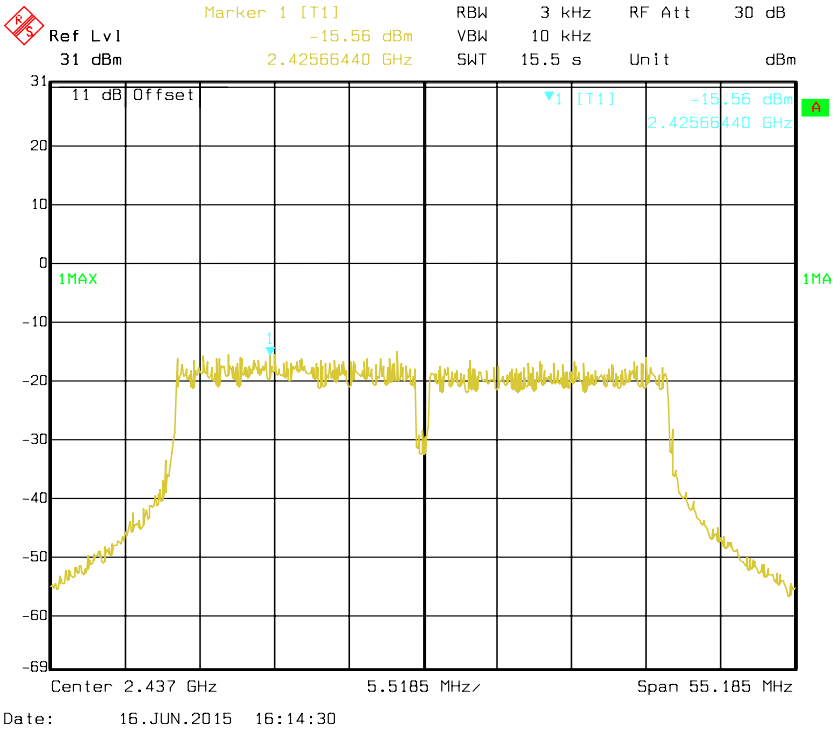
Power Spectral Density, 802.11n HT20 High Channel for Antenna 1



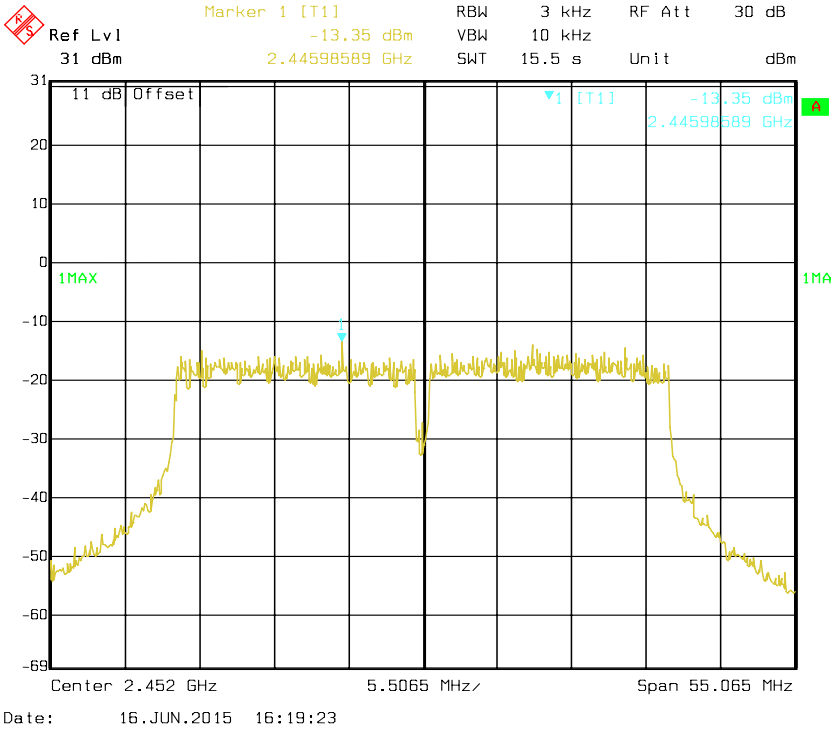
Power Spectral Density, 802.11n HT40 Low Channel for Antenna 1



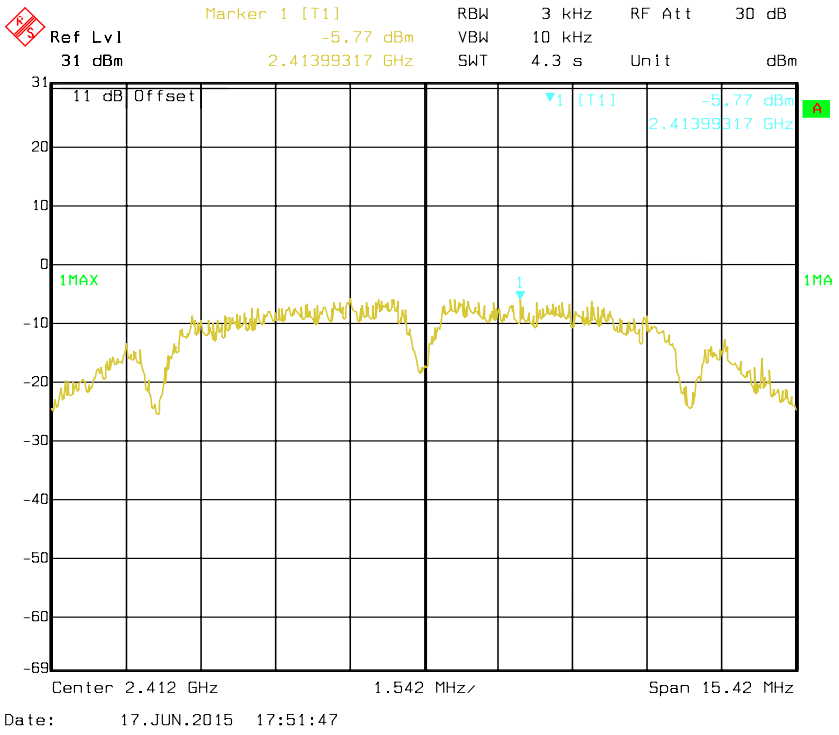
Power Spectral Density, 802.11n HT40 Middle Channel for Antenna 1



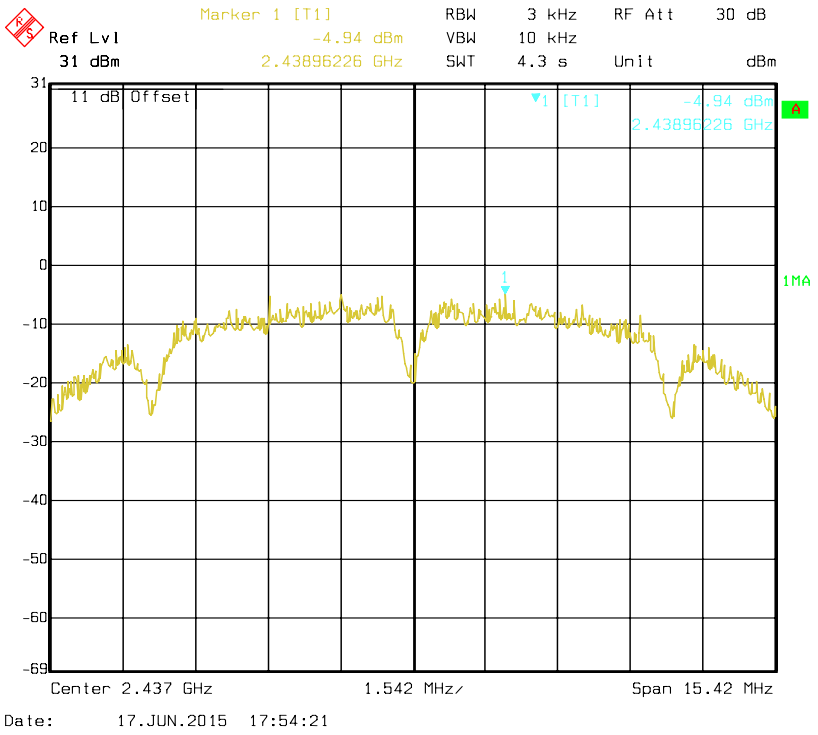
Power Spectral Density, 802.11n HT40 High Channel for Antenna 1



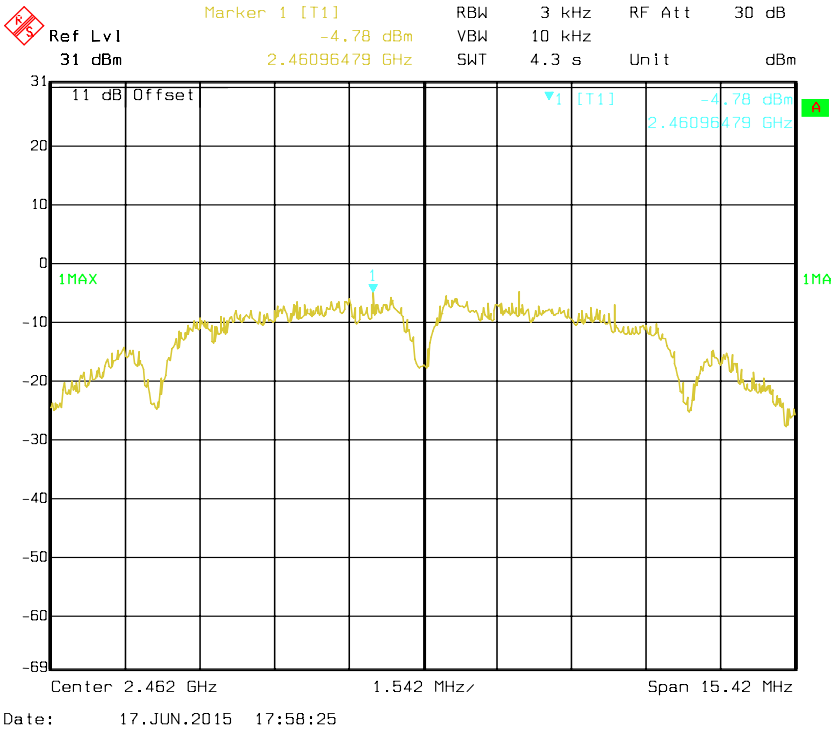
Power Spectral Density, 802.11b Low Channel for Antenna 2



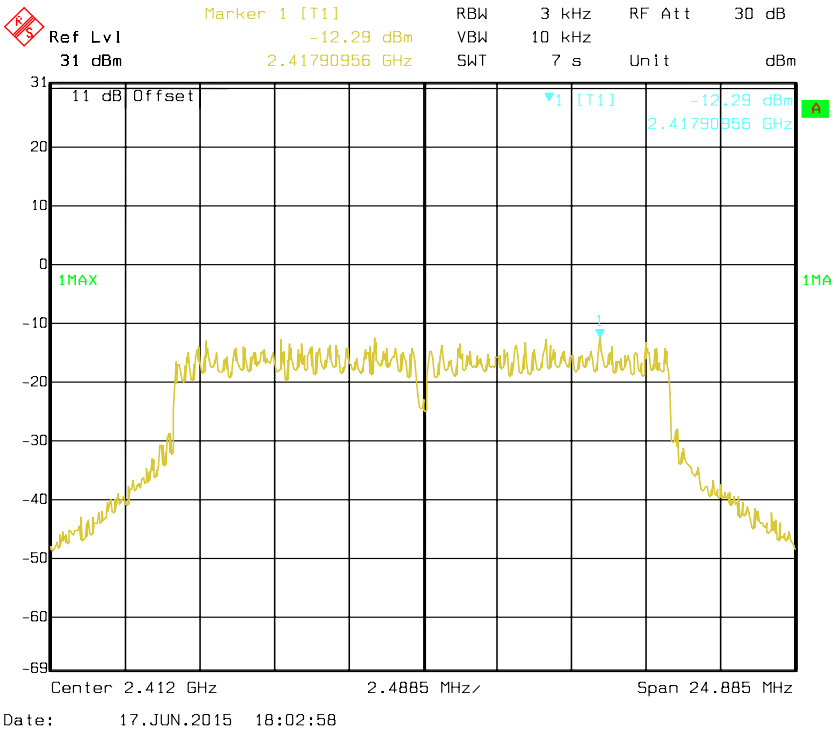
Power Spectral Density, 802.11b Middle Channel for Antenna 2



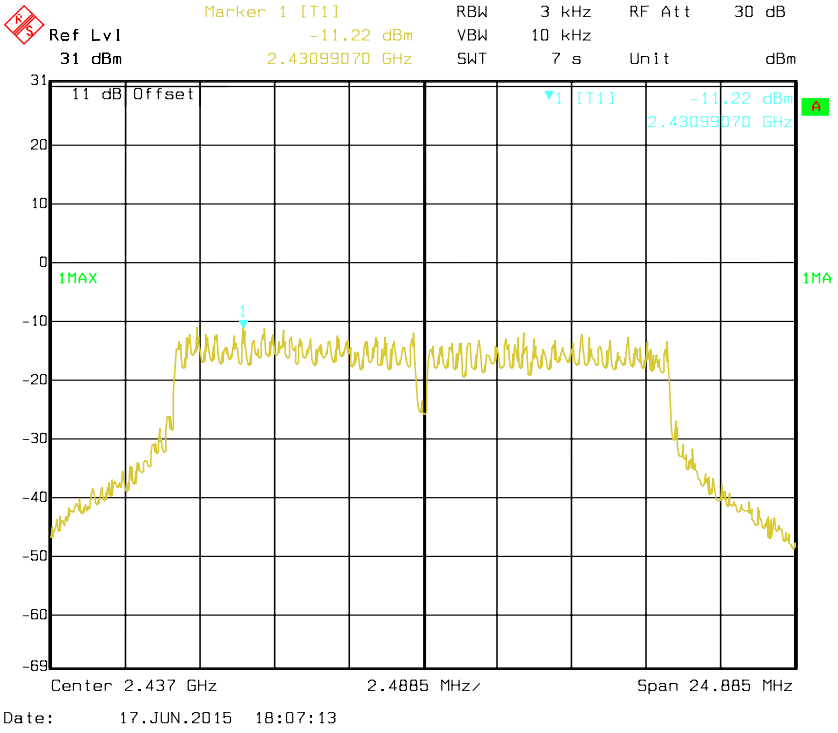
Power Spectral Density, 802.11b High Channel for Antenna 2



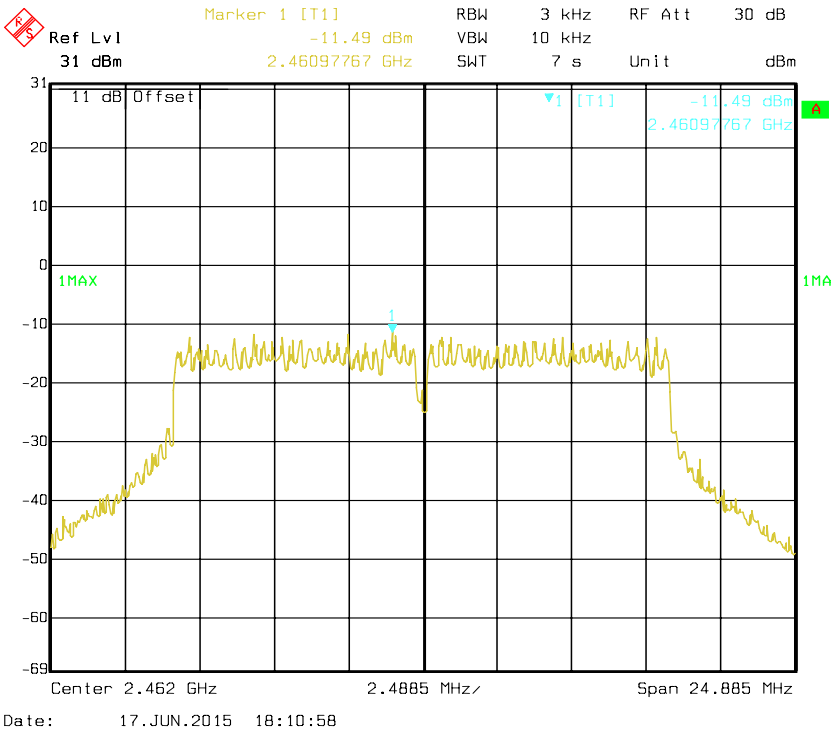
Power Spectral Density, 802.11g Low Channel for Antenna 2



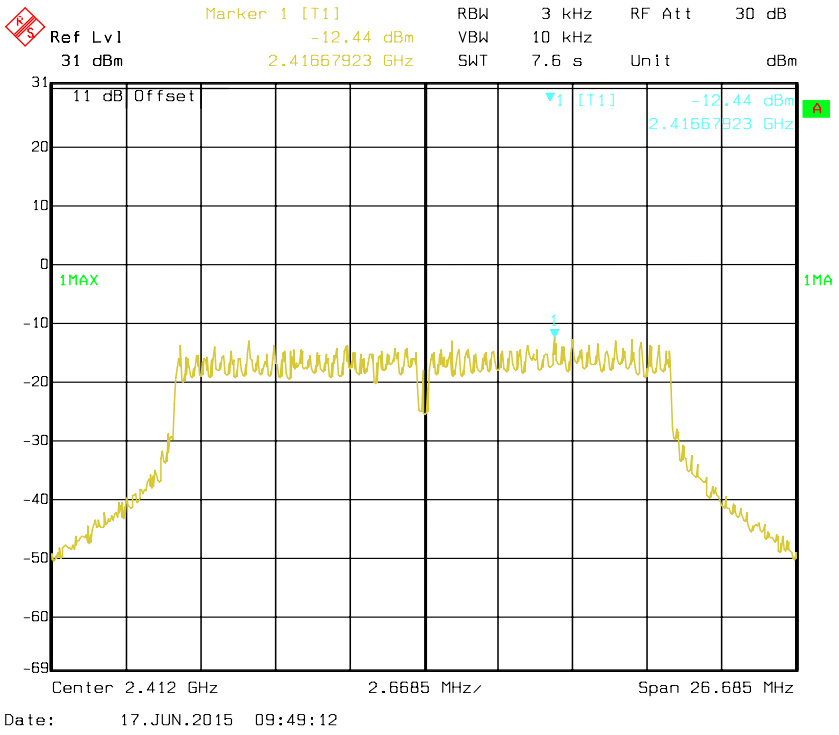
Power Spectral Density, 802.11g Middle Channel for Antenna 2



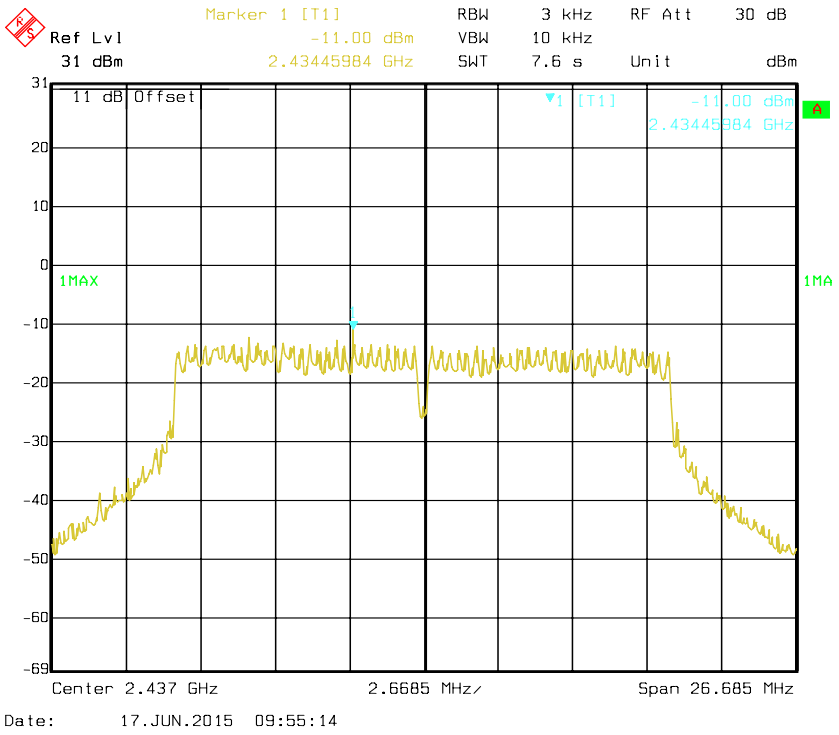
Power Spectral Density, 802.11g High Channel for Antenna 2



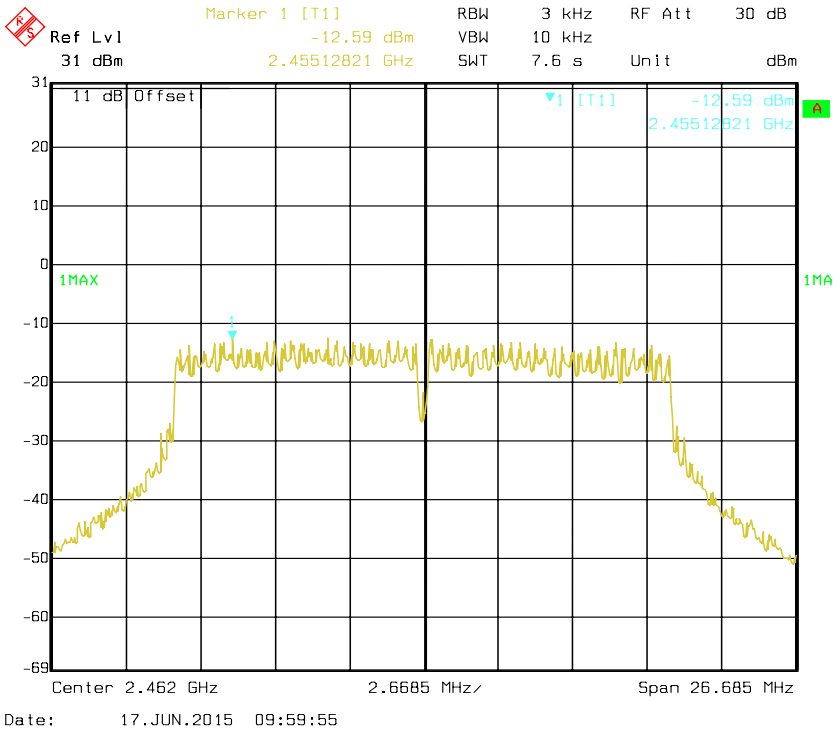
Power Spectral Density, 802.11n HT20 Low Channel for Antenna 2



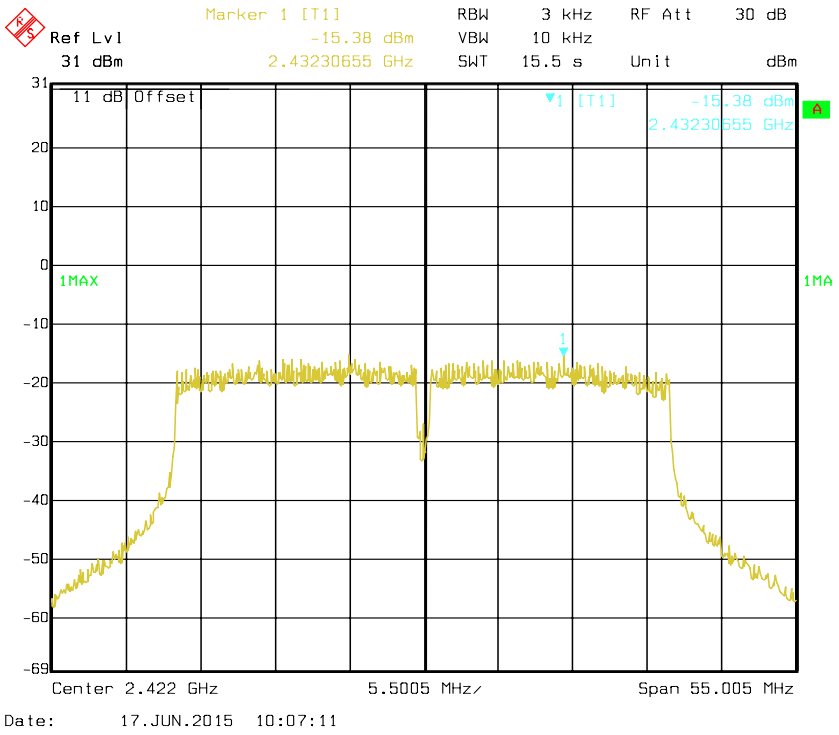
Power Spectral Density, 802.11n HT20 Middle Channel for Antenna 2



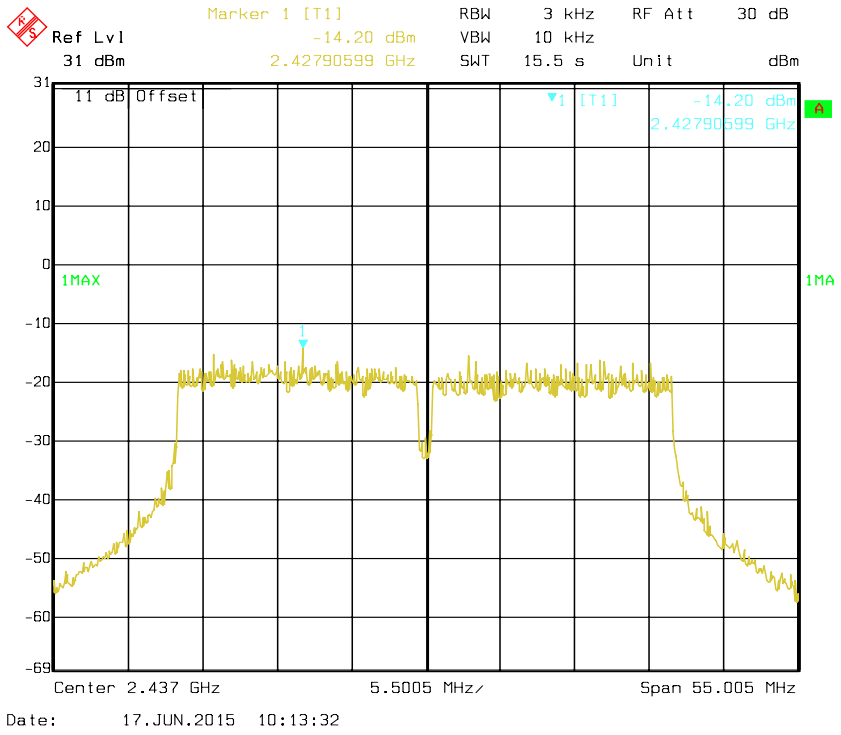
Power Spectral Density, 802.11n HT20 High Channel for Antenna 2



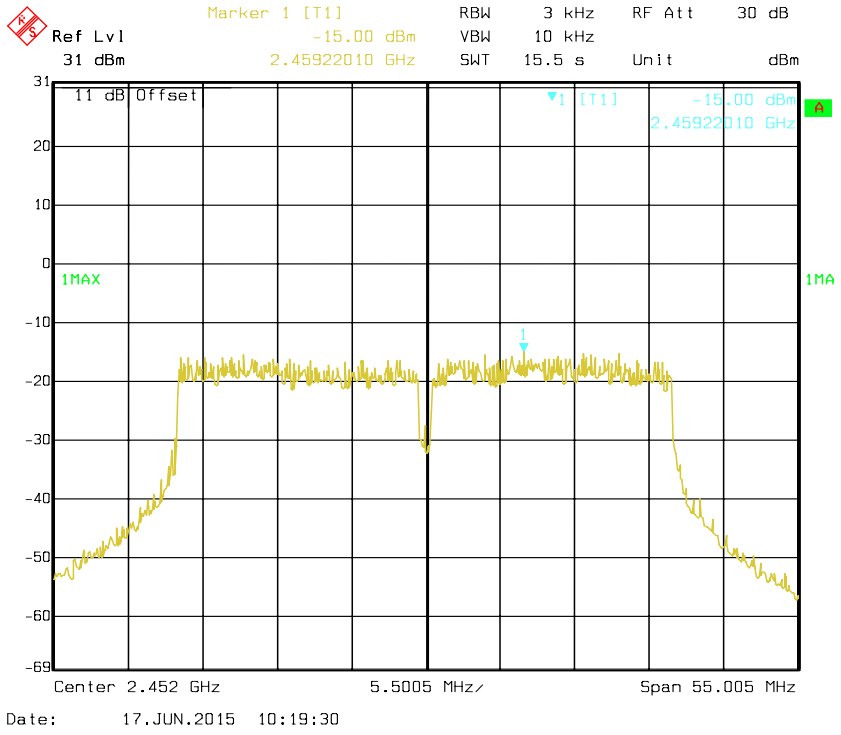
Power Spectral Density, 802.11n HT40 Low Channel for Antenna 2



Power Spectral Density, 802.11n HT40 Middle Channel for Antenna 2



Power Spectral Density, 802.11n HT40 High Channel for Antenna 2



***** *END OF REPORT* *****