FCC PART 15, SUBPART C
IC RSS-247, ISSUE 1, MAY 2015

TEST AND MEASUREMENT REPORT

For

Cisco Systems, Inc.

170 West Tasman Drive,

San Jose, CA 95134, USA

FCC ID: LDKIR829GW-LTE
IC: 2461B-IR829GWLTE

Report Type:	**Product Type:**
Original Report	Smart Grid Router

Prepared By	Jimmy Xiao Test Engineer
Report Number	R1506011-247
Report Date	2015-08-19
Reviewed By	Bo Li RF Lead

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TABLE OF CONTENTS

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1506011-247	Initial	2015-08-19

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test and measurement report has been compiled on behalf of *Cisco Systems, Inc.* and their product, *FCC ID: LDKIR829GW-LTE; IC: 2461B-IR829GWLTE,* model number: *IR829GW-LTE*, which henceforth is referred to as the EUT (Equipment under Test.) The EUT is a Smart Grid Router.

1.2 Mechanical Description of EUT

The EUT measures approximately 1.73 (H) x 11(W) x 7.7(D) in. (43.9 x 279 x 196 mm) and 1.73 (H) x 11(W) x 10.55(D) in (43.9 x 279 x 268 mm) with IP54 cable guard and weighs approximately 2kg.

The data gathered are from a typical production sample provided by the manufacturer with serial number: R1506011-01, assigned by BACL.

1.3 Objective

This report is prepared on behalf of *Cisco Systems, Inc.,* in accordance with Part 2, Subpart J, and Part 15, Subparts B and C of the Federal Communication Commission's rules and IC RSS-247 Issue 1, MAY 2015.

The objective is to determine compliance with FCC Part 15.247 and IC RSS-247 rules for Output Power, Antenna Requirements, AC Line Conducted Emissions, 6 dB Bandwidth, power spectral density, 100 kHz Bandwidth of Band Edges Measurement, Spurious Emissions, Conducted and Radiated Spurious Emissions.

1.4 Related Submittal(s)/Grant(s)

N/A

1.5 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.4-2014, 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 and FCC KDB 558074 D01 DTS Meas Guidance v03r03: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

1.6 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR16-4-2:2011, The Treatment of Uncertainty in EMC Measurements, the values ranging from $\pm$2.0 dB for Conducted Emissions tests and $\pm$4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL Corp.

1.7 Test Facility

Bay area compliance Laboratories Corp. (BACL) is:
1- An independent Commercial Test Laboratory accredited to **ISO 17025: 2005** by **A2LA**, in the fields of: Electromagnetic Compatibility & Telecommunications covering Emissions, Immunity, Radio, RF Exposure, Safety and Telecom. This includes NEBS (Network Equipment Building System), Wireless RF, Telecommunications Terminal Equipment (TTE); Network Equipment; Information Technology Equipment (ITE); Medical Electrical Equipment; Industrial, Commercial, and Medical Test Equipment; Professional Audio and Video Equipment; Electronic (Digital) Products; Industrial and Scientific Instruments; Cabled Distribution Systems and Energy Efficiency Lighting.

2- An ENERGY STAR Recognized Laboratory, for the LM80 Testing, a wide variety of Luminares and Computers.

3- A NIST Designated Phase-I and Phase-II CAB including: ACMA (Australian Communication and Media Authority), BSMI (Bureau of Standards, Metrology and Inspection of Taiwan), IDA (Infocomm Development Authority of Singapore), IC(Industry Canada), Korea (Ministry of Communications Radio Research Laboratory), NCC (Formerly DGT; Directorate General of Telecommunication of Chinese Taipei) OFTA (Office of the Telecommunications Authority of Hong Kong), Vietnam, VCCI - Voluntary Control Council for Interference of Japan and a designated EU CAB (Conformity Assessment Body) (Notified Body) for the EMC and R&TTE Directives.

4- A Product Certification Body accredited to **ISO Guide 65: 1996** by **A2LA** to certify:
2. Radio Standards Specifications (RSS) in the Category I Equipment Standards List and All Broadcasting Technical Standards (BETS) in Category I Equipment Standards List for Industry Canada.
3. Radio Communication Equipment for Singapore.
4. Radio Equipment Specifications, GMDSS Marine Radio Equipment Specifications, and Fixed Network Equipment Specifications for Hong Kong.
5. Japan MIC Telecommunication Business Law (A1, A2) and Radio Law (B1, B2 and B3).
6. Audio/Video, Battery Charging Systems, Computers, Displays, Enterprise Servers, Imaging Equipment, Set-Top Boxes, Telephony, Televisions, Ceiling Fans, CFLs (Including GU24s),Decorative Light Strings, Integral LED Lamps, Luminaires, Residential Ventilating Fans.

The test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at its facility in Sunnyvale, California, USA.

The test site at BACL Corp. has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997, and Article 8 of the VCCI regulations on December 25, 1997. The test site also complies with the test methods and procedures set forth in CISPR 22:2008 §10.4 for measurements below 1 GHz and §10.6 for measurements above 1 GHz as well as ANSI C63.4-2014, ANSI C63.4-2014, TIA/EIA-603 & CISPR 24:2010.

The Federal Communications Commission and Voluntary Control Council for Interference have the reports on file and they are listed under FCC registration number: 90464 and VCCI Registration No.: A-0027. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL Corp. is an American Association for Laboratory Accreditation (A2LA) accredited laboratory (Lab Code 3297-02). The current scope of accreditations can be found at

http://www.a2la.org/scopepdf/3297-02.pdf?CFID=1132286&CFTOKEN=e42a3240dac3f6ba-6DE17DCB-1851-9E57-477422F667031258&jsessionid=8430d44f1f47cf2996124343c704b367816b

2 System Test Configuration

2.1 Justification

The EUT was configured for testing according to ANSI C63.10-2013 and FCC KDB 558074 D01 DTS Meas Guidance v03r03.

The EUT was tested in a testing mode to represent worst-case results during the final qualification test.

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

2.2 EUT Exercise Software

The test software used was Putty, it was been used to access to IOS and perform commands to control the radio.

2.3 Equipment Modifications

No modifications were made to the EUT.

2.4 Local Support Equipment

Manufacturer	Description	Model No.	Serial No.
DELL	Laptop	Latitude E6530	-

2.5 EUT Internal Configuration Details

Manufacturer	Description	Model
Cisco Systems	Main board	1298MR
Cisco Systems	PCB board	28-12083-01
Cisco Systems	PCB board	95.0948T00 REV.215
Qualcomm	Sierra Wireless AirPrime 4G chip	MC7350
Qualcomm	5G module	AR9590
Qualcomm	2.4G Module	QCA9550

2.6 Power Supply and Line Filter

Manufacturer	Description	Model	Serial Number
Power Systems Technologies Limited	Power adapter	FA060LS1-01	PST1903F56A

2.7 Interface Ports and Cabling

Cable Description	Length (m)	To	From
RF Cable	< 1m	PSA	EUT

3 Summary of Test Results

Results reported relate only to the product tested.

FCC & IC Rules	Description of Test	Results
FCC §15.247(i), §2.1091 IC RSS-102	RF Exposure	Compliant
FCC §15.203 IC RSS-Gen §8.3	Antenna Requirement	Compliant
FCC §15.207(a) IC RSS-Gen §8.8	AC Line Conducted Emissions	Compliant
FCC §15.247 (d) IC RSS-247 §5.5	Spurious Emissions at Antenna Port	Compliant
FCC §15.205 IC RSS-Gen §8.10	Restricted Bands	Compliant
FCC §15.209, §15.247 (d) IC RSS-247 §5.5 IC RSS-Gen §8.9	Radiated Spurious Emissions	Compliant
FCC §15.247(a)(2) IC RSS-247 §5.2 IC RSS-Gen §6.6	6 dB & 99% Emission Bandwidth	Compliant
FCC §15.247(b)(3) IC RSS-247 §5.4	Maximum Peak Output Power	Compliant
FCC §15.247(d) IC RSS-247 §5.5	100 kHz Bandwidth of Frequency Band Edge	Compliant
FCC §15.247(e) IC RSS-247 §5.2	Power Spectral Density	Compliant

4 FCC §15.247(i), §2.1091 & IC RSS-102 – RF Exposure

4.1 Applicable Standard

According to FCC §15.247(i) and §1.1307(b)(1), 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 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)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	* (100)	30
1.34-30	824/f	2.19/f	* ($180/f^2$)	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

Before equipment certification is granted, the procedure of IC RSS-102 must be followed concerning the exposure of humans to RF field

According to IC RSS-102 Issue 5 section 4, RF limits used for general public will be applied to the EUT.

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Reference Period (minutes)
0.003-10[21]	83	90	-	Instantaneous*
0.1-10	-	$0.73/f$	-	6**
1.1-10	$87/f^{0.5}$	-	-	6**
10-20	27.46	0.0728	2	6
20-48	$58.07/f^{0.25}$	$0.1540/f^{0.25}$	$8.944/f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	$3.142f^{0.3417}$	$0.008335f^{0.3417}$	$0.02619f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158f^{0.5}$	$4.21 \times 10^{-4} f^{0.5}$	$6.67 \times 10^{-5} f$	$616000/f^{1.2}$

Note: f is frequency in MHz.
*Based on nerve stimulation (NS).
** Based on specific absorption rate (SAR).

4.2 MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

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

Where: S = power density
P = power input to antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

4.3 MPE Results

Antenna gain=2.2 dBi

Maximum peak output power at antenna input terminal (dBm):	24.38
Maximum peak output power at antenna input terminal (mW):	274.16
Prediction distance (cm):	20
Prediction frequency (MHz):	2412
Maximum Antenna Gain, typical (dBi):	2.2
Maximum Antenna Gain (numeric):	1.66
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.091
Power density of prediction frequency at 20.0 cm (W/m^2):	0.91
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0
IC MPE limit for uncontrolled exposure at prediction frequency (W/m^2):	5.4

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.091 mW/cm^2 (0.91 W/m^2). Limit is 1.0 mW/cm^2 (10.0 W/m^2).

Antenna gain=6.5 dBi

Maximum peak output power at antenna input terminal (dBm):	24.27
Maximum peak output power at antenna input terminal (mW):	267.30
Prediction distance (cm):	20
Prediction frequency (MHz):	2437
Maximum Antenna Gain, typical (dBi):	6.5
Maximum Antenna Gain (numeric):	4.47
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.238
Power density of prediction frequency at 20.0 cm (W/m^2):	2.38
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0
IC MPE limit for uncontrolled exposure at prediction frequency (W/m^2):	5.4

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.238 mW/cm^2 (2.38 W/m^2). Limit is 1.0 mW/cm^2 (5.4 W/m^2).

Antenna gain=13 dBi

Maximum peak output power at antenna input terminal (dBm):	18.27
Maximum peak output power at antenna input terminal (mW):	67.14
Prediction distance (cm):	20
Prediction frequency (MHz):	2412
Maximum Antenna Gain, typical (dBi):	13.0
Maximum Antenna Gain (numeric):	19.95
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.267
Power density of prediction frequency at 20.0 cm (W/m^2):	2.67
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0
IC MPE limit for uncontrolled exposure at prediction frequency (W/m^2):	5.4

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.267 mW/cm^2 (2.67 W/m^2). Limit is 1.0 mW/cm^2 (5.4 W/m^2).

Co-location:

2.4 GHz and 5 GHz bands can transmit simultaneously. A certified 2G/3G/4G module (FCC ID: N7NMC7355, IC: 2417C-MC7355) was built in the host. Per FCC KDB 447498, when RF sources have difference frequencies, the fraction of the FCC power density limit shall be determined and the sum of all fractional components shall be less than 1.

WLAN Co-location

Frequency Band	Evaluated Distance (cm)	Worst-Case MPE (mW/cm^2)	MPE Limit (mW/cm^2)	Worst-Case MPE Ratios	Sum of MPE Ratios	Limit
2.4 GHz	20	0.246	1.0	24.6 %	57.2 %	100 %
5 GHz	20	0.572	1.0	32.6 %		

2.4 GHz WLAN + 5 GHz WLAN + 850 MHz Co-Location

Frequency Band	Evaluated Distance (cm)	Worst-Case MPE (mW/cm^2)	MPE Limit (mW/cm^2)	Worst-Case MPE Ratios	Sum of MPE Ratios	Limit
2.4 GHz	20	0.246	1.0	24.6 %	93.3 %	100 %
5 GHz	20	0.572	1.0	32.6 %		
850 MHz	20	0.198	0.549	36.1 %		

2.4 GHz WLAN + 5 GHz WLAN + 1900 MHz Co-Location

Frequency Band	Evaluated Distance (cm)	Worst-Case MPE (mW/cm^2)	MPE Limit (mW/cm^2)	Worst-Case MPE Ratios	Sum of MPE Ratios	Limit
2.4 GHz	20	0.246	1.0	24.6 %	69.8 %	100 %
5 GHz	20	0.572	1.0	32.6 %		
1900 MHz	20	0.126	1.0	12.6 %		

2.4 GHz WLAN + 5 GHz WLAN + 700 MHz Co-Location

Frequency Band	Evaluated Distance (cm)	Worst-Case MPE (mW/cm^2)	MPE Limit (mW/cm^2)	Worst-Case MPE Ratios	Sum of MPE Ratios	Limit
2.4 GHz	20	0.246	1.0	24.6 %	99.6 %	100 %
5 GHz	20	0.572	1.0	32.6 %		
700 MHz	20	0.199	0.469	42.4 %		

2.4 GHz WLAN + 5 GHz WLAN + 1700 MHz Co-Location

Frequency Band	Evaluated Distance (cm)	Worst-Case MPE (mW/cm^2)	MPE Limit (mW/cm^2)	Worst-Case MPE Ratios	Sum of MPE Ratios	Limit
2.4 GHz	20	0.246	1.0	24.6 %	77.1 %	100 %
5 GHz	20	0.572	1.0	32.6 %		
1700 MHz	20	0.199	1.0	19.9 %		

Conclusion: Simultaneous transmission MPE test exclusion applied to this device due to the sum of MPE ratios for all simultaneous transmitting antennas incorporated in the host is less than 1.0.

5 FCC §15.203 & IC RSS-Gen §8.3 – Antenna Requirements

5.1 Applicable Standards

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 use of a standard antenna jack or electrical connector is prohibited.

And according to FCC §15.247 (b) (4), 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.

According to IC RSS-Gen §8.3: Transmitter Antenna

The applicant for equipment certification, as per RSP-100, must provide a list of all antenna types that may be used with the licence-exempt transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna.

Licence-exempt transmitters that have received equipment certification may operate with different types of antennas. However, it is not permissible to exceed the maximum equivalent isotropically radiated power (e.i.r.p.) limits specified in the applicable standard (RSS) for the licence-exempt apparatus.

Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level. [9] When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.

User manuals for transmitters equipped with detachable antennas shall also contain the following notice in a conspicuous location:

This radio transmitter (identify the device by certification number) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types approved for use with the transmitter, indicating the maximum permissible antenna gain (in dBi).

5.2 Antenna List and Details

Antenna Type	Antenna Gain (dBi) @ 2.4 GHz
Dual-band dipole	2
Omnidirectional	2
Dipole	2
Diversity omnidirectional	2.2
Omnidirectional collinear array	4
Dipole	5.2
Diversity patch	6.5
Two-element patch array	13

Note: 1) For the Antenna directional gain greater than 6 dBi, the limit for output and power density will be reduced by certain amount.
2) The manufacturer will use three output power settings to control this unit, the table shows below.

Antenna Type	Antenna Gain (dBi)	Software Power Setting
Dual-band dipole	2	2.2
Omnidirectional	2	2.2
Dipole	2	2.2
Diversity omnidirectional	2.2	2.2
Omnidirectional collinear array	4	6.5
Dipole	5.2	6.5
Diversity patch	6.5	6.5
Two-element patch array	13	13

6 FCC §15.207 & IC RSS-Gen §8.8 – AC Line Conducted Emissions

6.1 Applicable Standards

As per FCC §15.207 and IC RSS-Gen §8.8 Conducted limits:

For an intentional radiator 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 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/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 boundary between the frequencies ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56 Note	56 to 46 Note
0.5-5	56	46
5-30	60	50

Note: Decreases with the logarithm of the frequency.
Note: A linear average detector is required

6.2 Test Setup

The measurement was performed at shield room, using the setup per ANSI C63.4-2014 measurement procedure. The specification used was FCC §15.207 and IC RSS-Gen §8.8 limits.

External I/O cables were draped along the edge of the test table and bundle when necessary.
The AC/DC power adapter of the EUT was connected with LISN-1 which provided 120 V / 60 Hz AC power.

6.3 Test Procedure

During the conducted emissions test, the power cord of the EUT host system was connected to the mains outlet of the LISN-1 and the power cord of the support equipment was connected to LISN-2.

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

All data was recorded in the peak detection mode, quasi-peak and average. Quasi-Peak readings are distinguished with a “QP.” Average readings are distinguished with an “Ave”.

6.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Cable Loss (CL), the Attenuator Factor (Atten) to indicated Amplitude (Ai) reading. The basic equation is as follows:

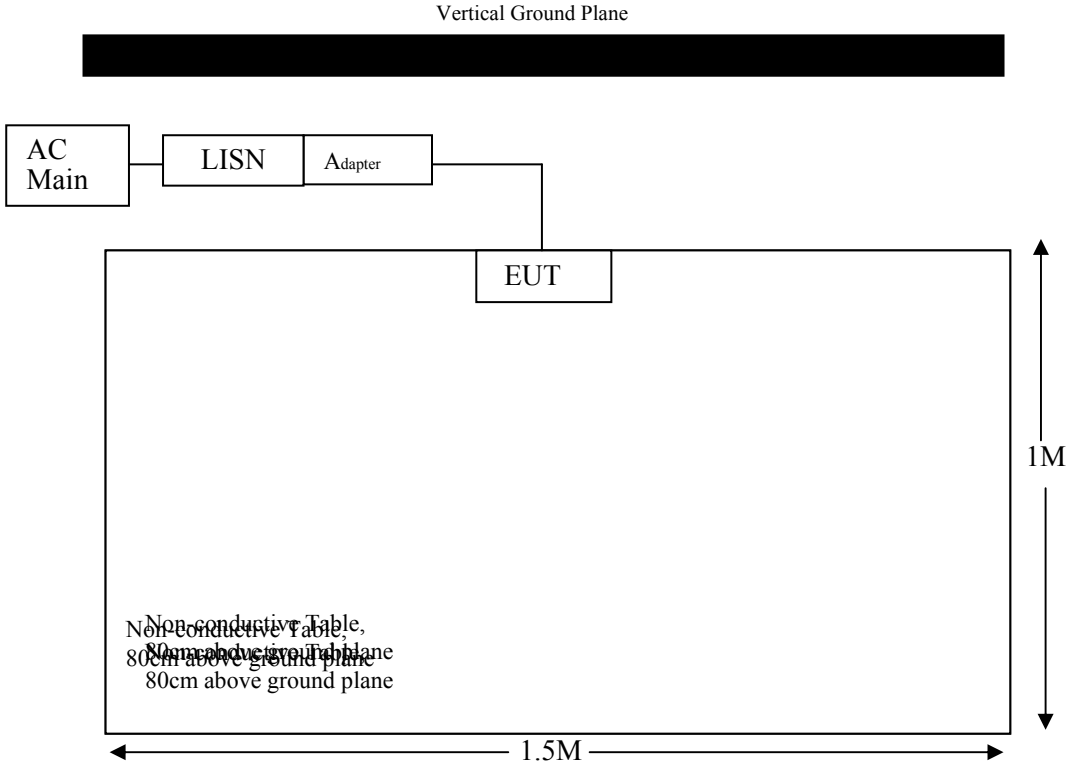
CA = Ai + CL + Atten

For example, a corrected amplitude of 46.2 dBuV = Indicated Reading (32.5 dBuV) + Cable Loss (3.7 dB) + Attenuator (10 dB)

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

Margin = Corrected Amplitude – Limit

6.5 Test Setup Block Diagram



6.6 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2014-09-28	1 year
Solar Electronics	LISN	9252-50-R-24-N	511205	2014-06-25	1 year
TTE	Filter, High Pass	H962-150k-50-21378	K7133	2015-01-30	1 year
Suirong	30 ft conductive emission cable	LMR 400	-	Cal. Not Required	N/A
Hewlett-Packard	5 ft N-type RF cable	-	1268	Cal. Not Required	N/A

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

6.7 Test Environmental Conditions

Temperature:	23º C
Relative Humidity:	46 %
ATM Pressure:	105.24 kPa

The testing was performed by Jimmy Xiao on 2015-06-18 in 5m chamber3.

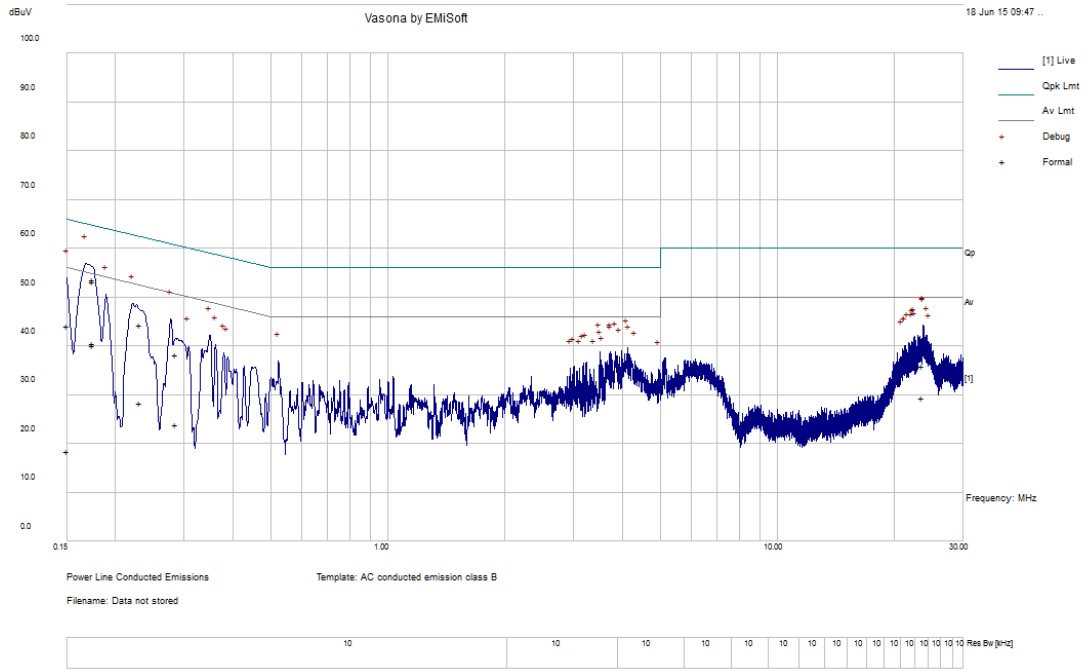
6.8 Summary of Test Results

According to the recorded data in following table, the EUT complied with the FCC 15C and IC RSS-Gen standard's conducted emissions limits, with the margin reading of:

Connection: AC/DC adapter connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Line/Neutral)**	**Range (MHz)**
-10.96	0.174459	Line	0.15-30

6.9 Conducted Emissions Test Plots and Data

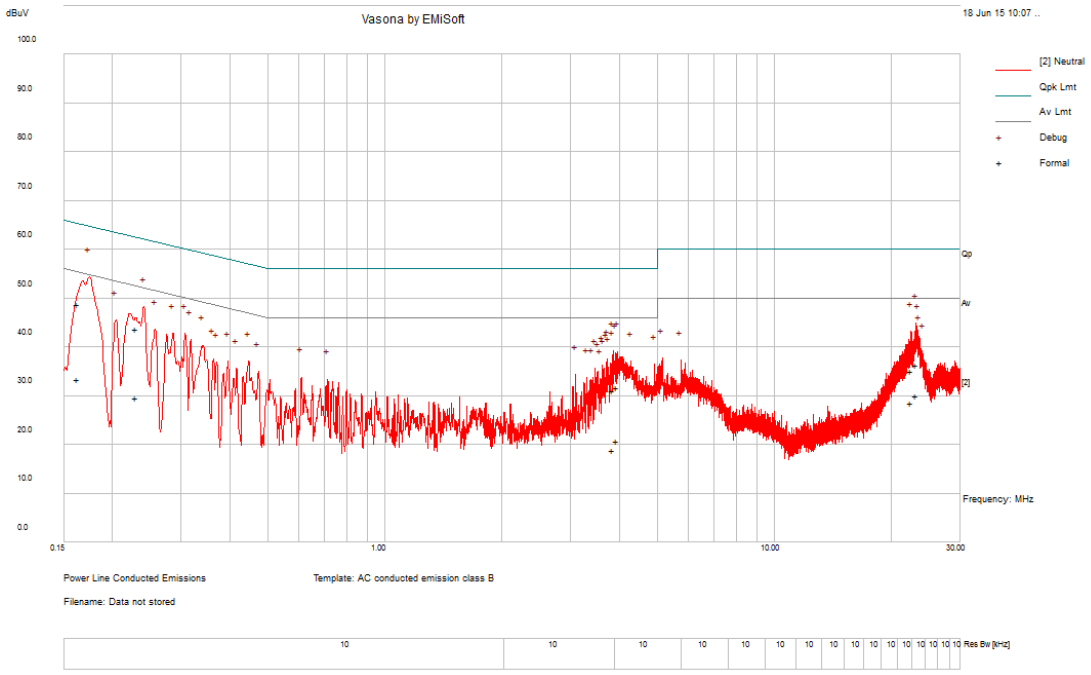
120 V, 60 Hz – Line



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.174459	53.79	Line	64.75	-10.96	QP
0.150112	44.18	Line	65.99	-21.81	QP
0.174588	53.27	Line	64.74	-11.47	QP
0.231600	44.51	Line	62.39	-17.88	QP
0.285222	38.41	Line	60.66	-22.25	QP
23.60152	35.93	Line	60.00	-24.07	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.174459	40.61	Line	54.75	-14.14	Ave.
0.150112	18.63	Line	55.99	-37.36	Ave.
0.174588	40.20	Line	54.74	-14.54	Ave.
0.231600	28.38	Line	52.39	-24.01	Ave.
0.285222	23.96	Line	50.66	-26.70	Ave.
23.60152	29.38	Line	50.00	-20.62	Ave.

120 V, 60 Hz – Neutral



Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.163098	48.94	Neutral	65.3	-16.37	QP
0.229269	43.72	Neutral	62.48	-18.75	QP
23.05518	36.42	Neutral	60	-23.58	QP
22.36209	35.08	Neutral	60	-24.92	QP
3.847561	31.27	Neutral	56	-24.73	QP
3.942338	31.82	Neutral	56	-24.18	QP

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)	Detector (QP/Ave.)
0.163098	33.42	Neutral	55.3	-21.88	Ave.
0.229269	29.76	Neutral	52.48	-22.71	Ave.
23.05518	30.17	Neutral	50	-19.83	Ave.
22.36209	28.59	Neutral	50	-21.41	Ave.
3.847561	19.01	Neutral	46	-26.99	Ave.
3.942338	20.84	Neutral	46	-25.16	Ave.

7 FCC §15.209, §15.247(d) & IC RSS-247 §5.5, RSS-GEN §8.9 – Spurious Radiated Emissions

7.1 Applicable Standards

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz.

As per FCC §15.209(a) and RSS-247: Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table

Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

As Per FCC §15.205(a) except as show in paragraph (d) of this section, 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	960 – 1240	4. 5 – 5. 15
0.495 – 0.505	16.69475 – 16.69525	1300 – 1427	5. 35 – 5. 46
2.1735 – 2.1905	25.5 – 25.67	1435 – 1626.5	7.25 – 7.75
4.125 – 4.128	37.5 – 38.25	1645.5 – 1646.5	8.025 – 8.5
4.17725 – 4.17775	73 – 74.6	1660 – 1710	9.0 – 9.2
4.20725 – 4.20775	74.8 – 75.2	1718.8 – 1722.2	9.3 – 9.5
6.215 – 6.218	108 – 121.94	2200 – 2300	10.6 – 12.7
6.26775 – 6.26825	123 – 138	2310 – 2390	13.25 – 13.4
6.31175 – 6.31225	149.9 – 150.05	2483.5 – 2500	14.47 – 14.5
8.291 – 8.294	156.52475 – 156.52525	2690 – 2900	15.35 – 16.2
8.362 – 8.366	156.7 – 156.9	3260 – 3267	17.7 – 21.4
8.37625 – 8.38675	162.0125 –167.17	3.332 – 3.339	22.01 – 23.12
8.41425 – 8.41475	167.72 – 173.2	3 3458 – 3 358	23.6 – 24.0
12.29 – 12.293	240 – 285	3.600 – 4.400	31.2 – 31.8
12.51975 – 12.52025	322 – 335.4		36.43 – 36.5
12.57675 – 12.57725	399.9 – 410		Above 38.6
13.36 – 13.41	608 – 614		

As per FCC §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, 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).

As per IC RSS-Gen 8.9,

> Except when the requirements applicable to a given device state otherwise, emissions from licence-exempt transmitters shall comply with the field strength limits shown in Table 4 or Table 5 below. Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission.

Table 4 – General Field Strength Limits for Licence-Exempt Transmitters at Frequencies Above 30 MHz

Frequency (MHz)	Field Strength (µv/m at 3 metres)
30-88	100
88-216	150
216-960	200
Above 960*	500

* Unless otherwise specified, for all frequencies greater than 1 GHz, the radiated emission limits for licence-exempt radio apparatus stated in applicable RSSs (including RSS-Gen) are based on measurements using a linear average detector function having a minimum resolution bandwidth of 1 MHz. If an average limit is specified for the EUT, then the peak emission shall also be measured with instrumentation properly adjusted for such factors as pulse desensitization to ensure the peak emission is less than 20 dB above the average limit.

Note: Transmitting devices are not permitted in restricted frequency bands unless stated otherwise in the specific RSS.

As per IC RSS-247 §5.5, in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

7.2 Test Setup

The radiated emissions tests were performed in the 5-meter Chamber, using the setup in accordance with ANSI C63.10-2013. The specification used was the FCC 15 Subpart C and IC RSS-247 limits.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.

7.3 Test Procedure

For the radiated emissions test, the EUT host, and all support equipment power cords was connected to the AC floor outlet.

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

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 meter, and the EUT is placed on a turntable, which is 0.8 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

The spectrum analyzer or receiver is set as:

Below 1000 MHz:

RBW = 100 kHz / VBW = 300 kHz / Sweep = Auto

Above 1000 MHz:

(1) Peak: RBW = 1MHz / VBW = 1MHz / Sweep = Auto
(2) Average: RBW = 1MHz / VBW = 10Hz / Sweep = Auto

7.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Antenna Factor (AF), the Cable Loss (CL), the Attenuator Factor (Atten) and subtracting the Amplifier Gain (Ga) to indicated Amplitude (Ai) reading. The basic equation is as follows:

CA = Ai + AF + CL + Atten – Ga

For example, a corrected amplitude of 40.3 dBuV/m = Indicated Reading (32.5 dBuV) + Antenna Factor (+23.5dB) + Cable Loss (3.7 dB) + Attenuator (10 dB) - Amplifier Gain (29.4 dB)

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

Margin = Corrected Amplitude - Limit

7.5 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2014-09-28	1 year
Agilent	Spectrum Analyzer	E4440A	MY44303352	2014-10-16	1 year
Sunol Science Corp	System Controller	SC99V	011003-1	N/R	N/R
Sunol Science Corp	Combination Antenna	JB3	A020106-3	2014-09-18	1 year
EMCO	Horn Antenna	3115	9511-4627	2014-10-17	1 year
Hewlett Packard	Pre-amplifier	8447D	2944A10187	2014-08-08	1 year
WiseWave	Horn Antenna	ARH-4223-02	10555-01	2014-08-09	3 Years
Suirong	30 ft conductive emission cable	LMR 400	-	2015-03-05	1 year
-	SMA cable	-	C0001	Each time[1]	N/A
IW Microwave	High Frequency Cable	DC-1438	SPS-2303-3840-SPS	2014-09-23	1 year
Suirong	30 ft conductive emission cable	LMR 400	-	2015-03-05	1 year
Hewlett-Packard	5 ft N-type RF cable	-	1268	2014-07-24	1 year
Agilent	Pre-Amplifier	8449B	3008A01978	2015-03-11	1year

Note[1]: cable and attenuator included in the test set-up will be checked each time before testing.

Statement of Traceability: BACL *attests that all calibrations have been performed per the A2LA requirements, traceable to NIST.*

7.6 Test Environmental Conditions

Temperature:	20-25º C
Relative Humidity:	40-45 %
ATM Pressure:	101.2-103.5 kPa

The testing was performed by Jimmy Xiao on 2015-06-18 in 5m chamber3 and RF site.

7.7 Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Title 47, Part 15C and IC RSS-247 standard's radiated emissions limits, and had the worst margin of:

30 MHz – 25 GHz:

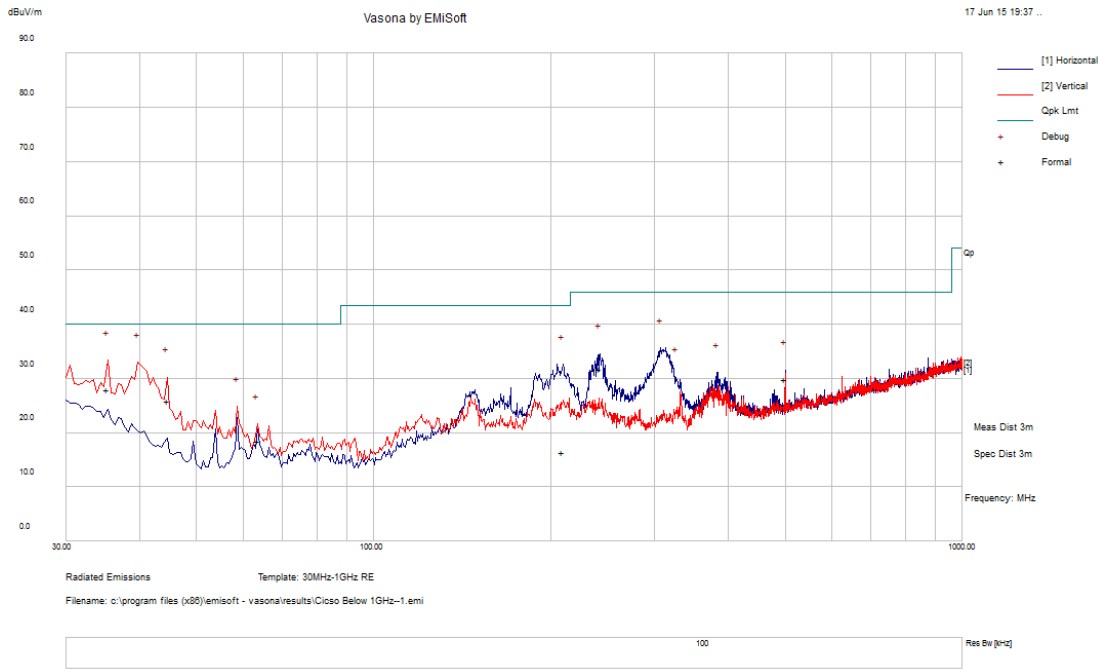
Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode, Channel**
-9.19	9748	Horizontal	802.11n20 Middle

Please refer to the following table and plots for specific test result details

7.8 Radiated Emissions Test Data and Plots

1) 30 MHz – 1 GHz

Worst Case: 2.4 GHz, 5 GHz and LTE transmitting simultaneously



Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comments
35.255	28.14	135	V	360	40	-11.86	QP
44.6715	25.99	101	V	342	40	-14.01	QP
209.602	16.46	129	H	223	43.5	-27.04	QP
241.718	31.89	121	H	18	46	-14.11	QP
500.0335	29.87	165	V	209	46	-16.13	QP
63.4985	18.59	158	H	125	40	-21.41	QP

2) 1–25 GHz

Antenna-port conducted measurement is used as an alternative to radiated measurements for demonstrating compliance in the restricted frequency bands. And the radiated emission was measured with cabinet method.

All the radiated emissions were investigated with the highest power setting (2.2 dBi antenna)

802.11b Mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2412 MHz											
4824	45.92	0	150	V	33.87	4.3	35.58	48.51	74.00	-25.49	Peak
4824	47.21	0	150	H	33.89	4.3	35.58	49.82	74.00	-24.18	Peak
4824	33.83	0	150	V	33.87	4.3	35.58	36.42	54.00	-17.58	Ave
4824	33.86	0	150	H	33.89	4.3	35.58	36.47	54.00	-17.53	Ave
7236	46.39	0	150	V	38.30	5.5	35.61	54.58	74.00	-19.42	Peak
7236	46.98	0	150	H	38.31	5.5	35.61	55.18	74.00	-18.82	Peak
7236	33.38	0	150	V	38.30	5.5	35.61	41.57	54.00	-12.43	Ave
7236	33.43	0	150	H	38.31	5.5	35.61	41.63	54.00	-12.37	Ave
9648	46.49	0	150	V	39.73	6.27	35.3	57.19	74.00	-16.81	Peak
9648	46.45	0	150	H	39.73	6.27	35.3	57.15	74.00	-16.85	Peak
9648	34.04	0	150	V	39.73	6.27	35.3	44.74	54.00	-9.26	Ave
9648	34.05	0	150	H	39.73	6.27	35.3	44.75	54.00	-9.25	Ave
Middle Channel 2437 MHz											
4874	46.31	0	150	V	33.87	4.30	35.58	48.90	74.00	-25.10	Peak
4874	46.30	0	150	H	33.89	4.30	35.58	48.91	74.00	-25.09	Peak
4874	34.05	0	150	V	33.87	4.30	35.58	36.64	54.00	-17.36	Ave
4874	34.07	0	150	H	33.89	4.30	35.58	36.68	54.00	-17.32	Ave
7311	46.21	0	150	V	38.30	5.50	35.61	54.40	74.00	-19.60	Peak
7311	46.07	0	150	H	38.31	5.50	35.61	54.27	74.00	-19.73	Peak
7311	33.35	0	150	V	38.30	5.50	35.61	41.54	54.00	-12.46	Ave
7311	33.35	0	150	H	38.31	5.50	35.61	41.55	54.00	-12.45	Ave
9748	47.16	0	150	V	39.73	6.27	35.3	57.86	74.00	-16.14	Peak
9748	46.92	0	150	H	39.73	6.27	35.3	57.62	74.00	-16.38	Peak
9748	33.98	0	150	V	39.73	6.27	35.3	44.68	54.00	-9.32	Ave
9748	34.03	0	150	H	39.73	6.27	35.3	44.73	54.00	-9.27	Ave
High Channel 2462 MHz											
4924	46.24	0	150	V	33.87	4.30	35.58	48.83	74.00	-42.29	Peak
4924	46.67	0	150	H	33.89	4.30	35.58	49.28	74.00	-42.27	Peak
4924	33.55	0	150	V	33.87	4.30	35.58	36.14	54.00	-22.29	Ave
4924	33.58	0	150	H	33.89	4.30	35.58	36.19	54.00	-22.27	Ave
7386	48.14	0	150	V	38.09	5.51	35.61	56.13	74.00	-25.17	Peak
7386	46.41	0	150	H	38.12	5.51	35.61	54.43	74.00	-24.72	Peak
7386	33.43	0	150	V	38.09	5.51	35.61	41.42	54.00	-17.86	Ave
7386	33.44	0	150	H	38.12	5.51	35.61	41.46	54.00	-17.81	Ave
9848	47.05	0	150	V	39.74	6.26	35.3	57.75	74.00	-17.87	Peak
9848	45.82	0	150	H	39.74	6.26	35.3	56.52	74.00	-19.58	Peak
9848	34.08	0	150	V	39.74	6.26	35.3	44.78	54.00	-12.58	Ave
9848	34.09	0	150	H	39.74	6.26	35.3	44.79	54.00	-12.55	Ave

802.11g Mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2412 MHz											
4824	46.46	0	150	V	33.84	4.24	35.53	49.01	74.00	-24.99	Peak
4824	45.93	0	150	H	33.80	4.24	35.53	48.44	74.00	-25.56	Peak
4824	33.76	0	150	V	33.84	4.24	35.53	36.31	54.00	-17.69	Ave
4824	33.73	0	150	H	33.80	4.24	35.53	36.24	54.00	-17.76	Ave
7236	46.77	0	150	V	38.47	5.42	35.61	55.05	74.00	-18.95	Peak
7236	45.27	0	150	H	38.52	5.42	35.61	53.60	74.00	-20.40	Peak
7236	33.36	0	150	V	38.47	5.42	35.61	41.64	54.00	-12.36	Ave
7236	33.31	0	150	H	38.52	5.42	35.61	41.64	54.00	-12.36	Ave
9648	46.90	0	150	V	39.59	6.24	35.34	57.39	74.00	-16.61	Peak
9648	47.74	0	150	H	39.57	6.24	35.34	58.21	74.00	-15.79	Peak
9648	33.95	0	150	V	39.59	6.24	35.34	44.44	54.00	-9.56	Ave
9648	33.97	0	150	H	39.57	6.24	35.34	44.44	54.00	-9.56	Ave
Middle Channel 2437 MHz											
4874	47.12	0	150	V	33.87	4.30	35.58	49.71	74.00	-24.29	Peak
4874	47.24	0	150	H	33.89	4.30	35.58	49.85	74.00	-24.15	Peak
4874	34.05	0	150	V	33.87	4.30	35.58	36.64	54.00	-17.36	Ave
4874	34.04	0	150	H	33.89	4.30	35.58	36.65	54.00	-17.35	Ave
7311	46.17	0	150	V	38.30	5.50	35.61	54.36	74.00	-19.64	Peak
7311	46.42	0	150	H	38.31	5.50	35.61	54.62	74.00	-19.38	Peak
7311	33.34	0	150	V	38.30	5.50	35.61	41.53	54.00	-12.47	Ave
7311	33.34	0	150	H	38.31	5.50	35.61	41.54	54.00	-12.46	Ave
9748	46.45	0	150	V	39.73	6.27	35.34	57.11	74.00	-16.89	Peak
9748	46.80	0	150	H	39.73	6.27	35.34	57.46	74.00	-16.54	Peak
9748	33.99	0	150	V	39.73	6.27	35.34	44.65	54.00	-9.35	Ave
9748	33.94	0	150	H	39.73	6.27	35.34	44.60	54.00	-9.40	Ave
High Channel 2462 MHz											
4924	46.73	0	150	V	33.87	4.30	35.58	49.32	74.00	-24.68	Peak
4924	46.12	0	150	H	33.89	4.30	35.58	48.73	74.00	-25.27	Peak
4924	33.51	0	150	V	33.87	4.30	35.58	36.10	54.00	-17.90	Ave
4924	33.53	0	150	H	33.89	4.30	35.58	36.14	54.00	-17.86	Ave
7386	46.70	0	150	V	38.09	5.51	35.61	54.69	74.00	-19.31	Peak
7386	46.29	0	150	H	38.12	5.51	35.61	54.31	74.00	-19.70	Peak
7386	33.37	0	150	V	38.09	5.51	35.61	41.36	54.00	-12.64	Ave
7386	33.39	0	150	H	38.12	5.51	35.61	41.41	54.00	-12.60	Ave
9848	46.81	0	150	V	39.74	6.26	35.30	57.51	74.00	-16.49	Peak
9848	46.19	0	150	H	39.74	6.26	35.30	56.89	74.00	-17.11	Peak
9848	33.90	0	150	V	39.74	6.26	35.30	44.60	54.00	-9.40	Ave
9848	34.07	0	150	H	39.74	6.26	35.30	44.77	54.00	-9.23	Ave

802.11n20 Mode

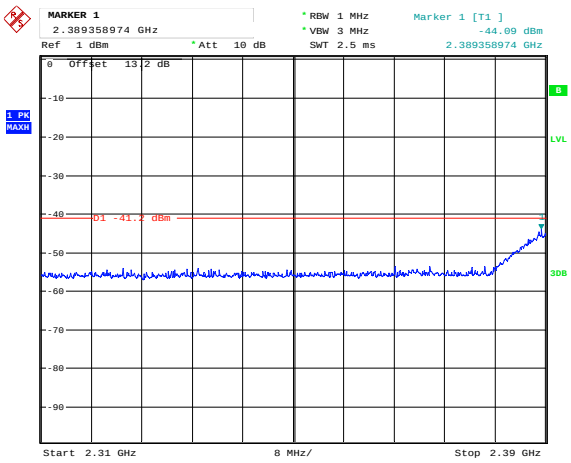
Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2412 MHz											
4824	46.21	0	150	V	33.84	4.24	35.53	48.76	74.00	-25.24	Peak
4824	45.35	0	150	H	33.80	4.24	35.53	47.86	74.00	-26.14	Peak
4824	33.47	0	150	V	33.84	4.24	35.53	36.02	54.00	-17.98	Ave
4824	33.56	0	150	H	33.80	4.24	35.53	36.07	54.00	-17.93	Ave
7236	46.78	0	150	V	38.47	5.42	35.61	55.06	74.00	-18.94	Peak
7236	45.69	0	150	H	38.52	5.42	35.61	54.02	74.00	-19.98	Peak
7236	33.45	0	150	V	38.47	5.42	35.61	41.73	54.00	-12.27	Ave
7236	33.74	0	150	H	38.52	5.42	35.61	42.07	54.00	-11.93	Ave
9648	47.26	0	150	V	39.59	6.24	35.34	57.75	74.00	-16.25	Peak
9648	47.82	0	150	H	39.57	6.24	35.34	58.29	74.00	-15.71	Peak
9648	34.02	0	150	V	39.59	6.24	35.34	44.51	54.00	-9.49	Ave
9648	34.15	0	150	H	39.57	6.24	35.34	44.62	54.00	-9.38	Ave
Middle Channel 2437 MHz											
4874	47.12	0	150	V	33.87	4.30	35.58	49.71	74.00	-24.29	Peak
4874	46.51	0	150	H	33.89	4.30	35.58	49.12	74.00	-24.88	Peak
4874	34.21	0	150	V	33.87	4.30	35.58	36.80	54.00	-17.20	Ave
4874	34.15	0	150	H	33.89	4.30	35.58	36.76	54.00	-17.24	Ave
7311	46.52	0	150	V	38.30	5.50	35.61	54.71	74.00	-19.29	Peak
7311	46.23	0	150	H	38.31	5.50	35.61	54.43	74.00	-19.57	Peak
7311	33.42	0	150	V	38.30	5.50	35.61	41.61	54.00	-12.39	Ave
7311	33.47	0	150	H	38.31	5.50	35.61	41.67	54.00	-12.33	Ave
9748	48.24	0	150	V	39.73	6.27	35.34	58.90	74.00	-15.10	Peak
9748	47.26	0	150	H	39.73	6.27	35.34	57.92	74.00	-16.08	Peak
9748	34.12	0	150	V	39.73	6.27	35.34	44.78	54.00	-9.22	Ave
9748	34.15	0	150	H	39.73	6.27	35.34	44.81	54.00	-9.19	Ave
High Channel 2462 MHz											
4924	46.32	0	150	V	33.87	4.30	35.58	48.91	74.00	-25.09	Peak
4924	45.89	0	150	H	33.89	4.30	35.58	48.50	74.00	-25.50	Peak
4924	33.21	0	150	V	33.87	4.30	35.58	35.80	54.00	-18.20	Ave
4924	33.14	0	150	H	33.89	4.30	35.58	35.75	54.00	-18.25	Ave
7386	46.82	0	150	V	38.09	5.51	35.61	54.81	74.00	-19.19	Peak
7386	45.86	0	150	H	38.12	5.51	35.61	53.88	74.00	-20.12	Peak
7386	33.52	0	150	V	38.09	5.51	35.61	41.51	54.00	-12.49	Ave
7386	33.21	0	150	H	38.12	5.51	35.61	41.23	54.00	-12.72	Ave
9848	46.56	0	150	V	39.74	6.26	35.30	57.26	74.00	-16.74	Peak
9848	46.28	0	150	H	39.74	6.26	35.30	56.98	74.00	-17.02	Peak
9848	33.62	0	150	V	39.74	6.26	35.30	44.32	54.00	-9.68	Ave
9848	33.98	0	150	H	39.74	6.26	35.30	44.68	54.00	-9.32	Ave

Restricted Bands

Chain 0:

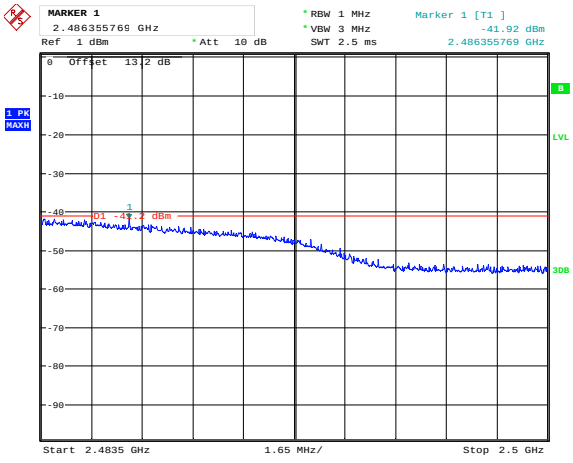
Antenna gain=2.2 dBi

802.11b-2412 MHz



Date: 28.JUN.2015 21:57:51

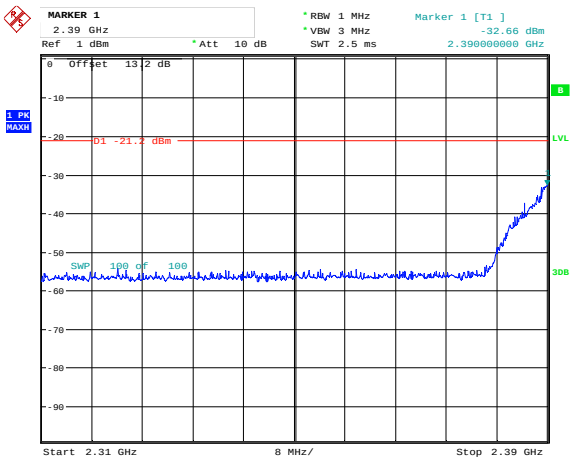
802.11b-2462 MHz



Date: 28.JUN.2015 21:59:20

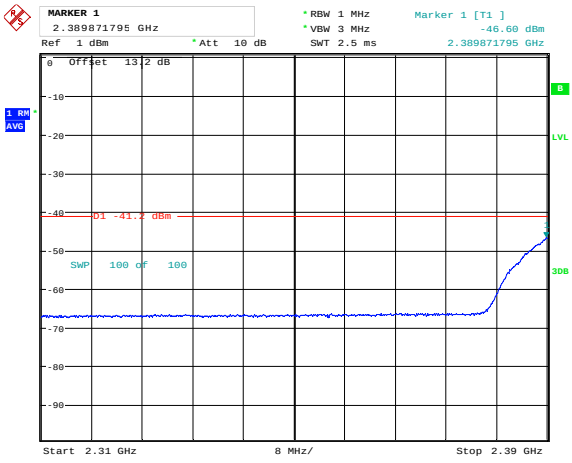
Note: The Peak detector passed average limit, therefore no average detector testing was needed.

802.11g - 2412 MHz (Peak)



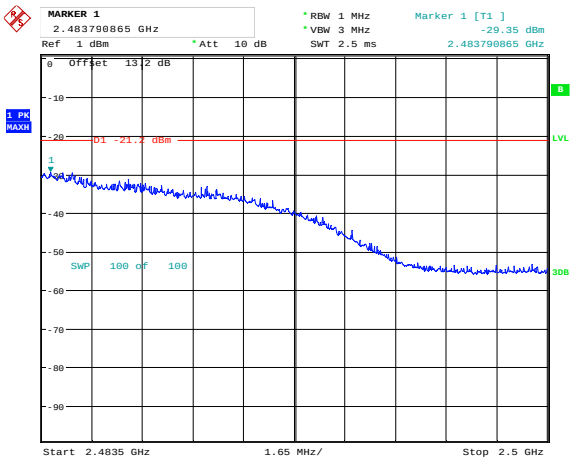
Date: 28.JUN.2015 22:02:04

802.11g - 2412 MHz (Ave)



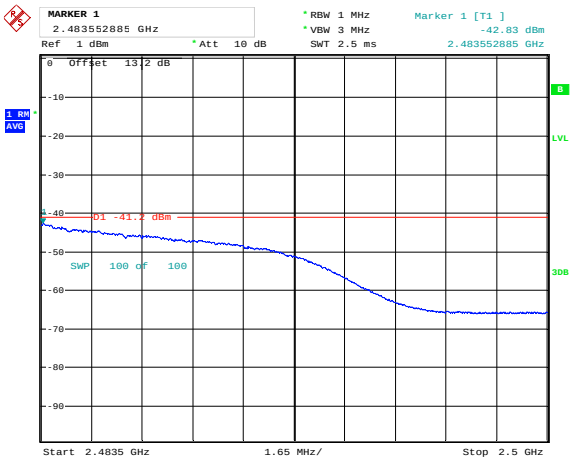
Date: 28.JUN.2015 22:01:22

802.11g - 2462 MHz (Peak)



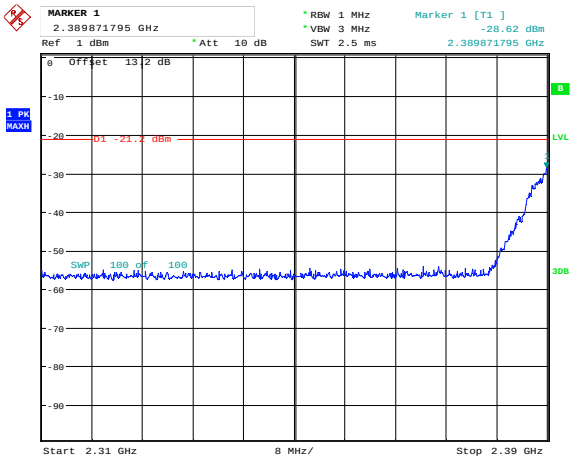
Date: 28.JUN.2015 22:03:27

802.11g - 2462 MHz (Ave)



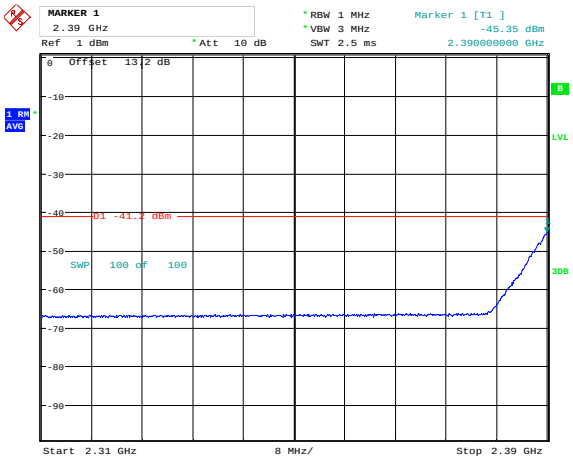
Date: 28.JUN.2015 22:04:18

802.11n20 - 2412 MHz (Peak)



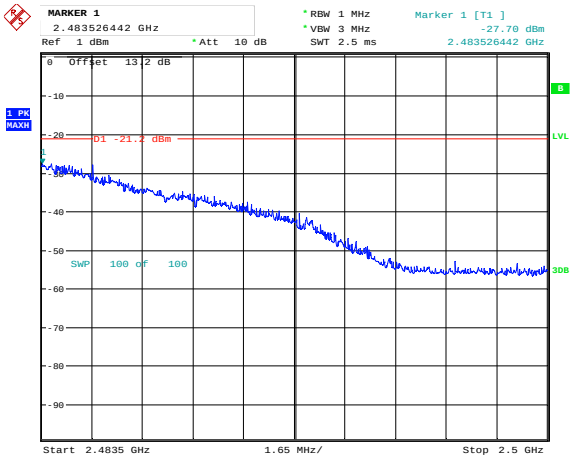
Date: 28.JUN.2015 22:06:29

802.11n20 - 2412 MHz (Ave)



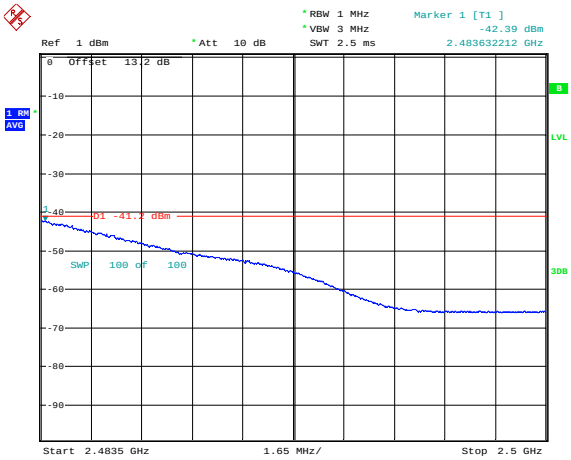
Date: 28.JUN.2015 22:05:41

802.11n20 - 2462 MHz (Peak)



Date: 28.JUN.2015 22:07:29

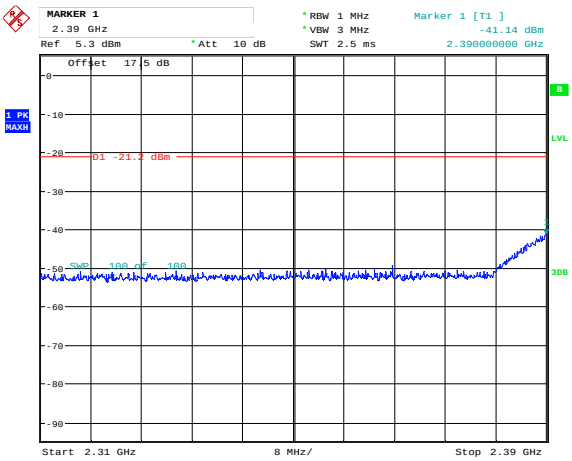
802.11n20 - 2462 MHz (Ave)



Date: 28.JUN.2015 22:08:15

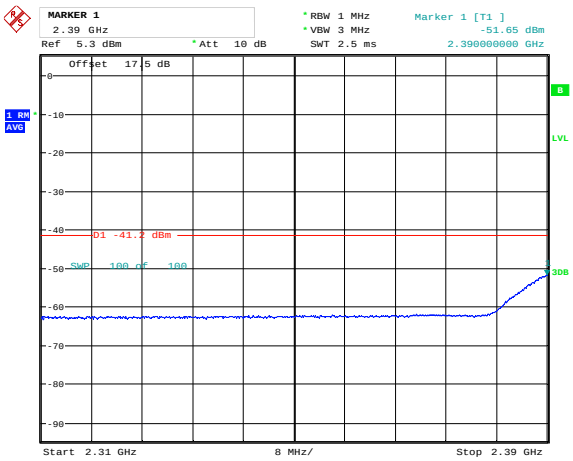
Antenna gain=6.5 dBi

802.11b - 2412 MHz (Peak)



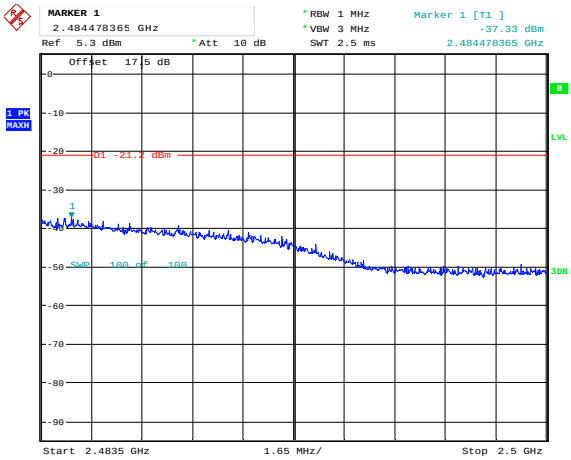
Date: 28.JUN.2015 22:13:26

802.11b - 2412 MHz (Ave)



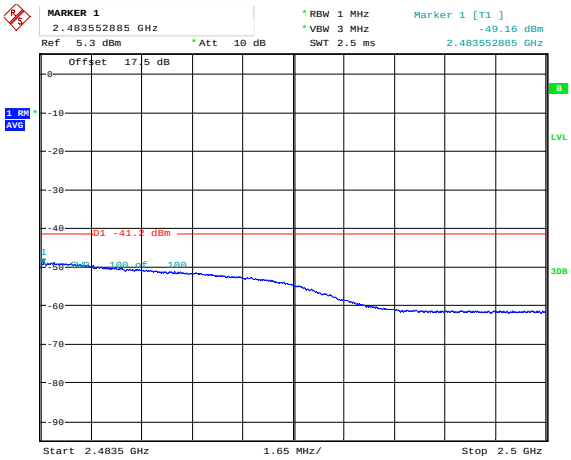
Date: 28.JUN.2015 22:12:39

802.11b - 2462 MHz (Peak)



Date: 28.JUN.2015 22:14:16

802.11b - 2462 MHz (Ave)

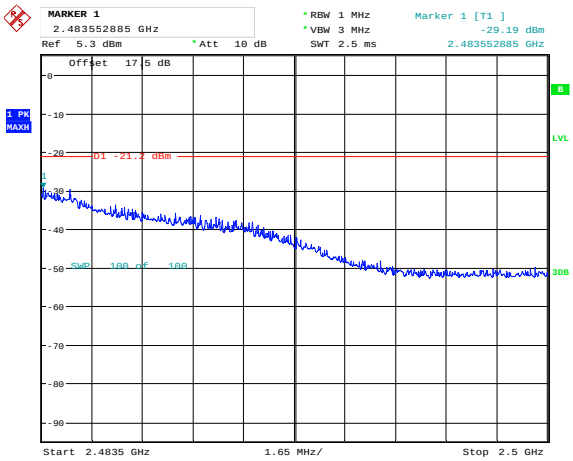


Date: 28.JUN.2015 22:14:52

Date: 28.JUN.2015 22:15:49

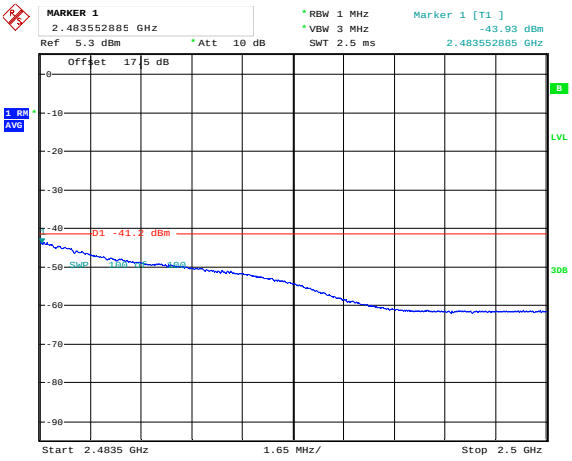
Date: 28.JUN.2015 22:16:36

802.11g - 2462 MHz (Peak)



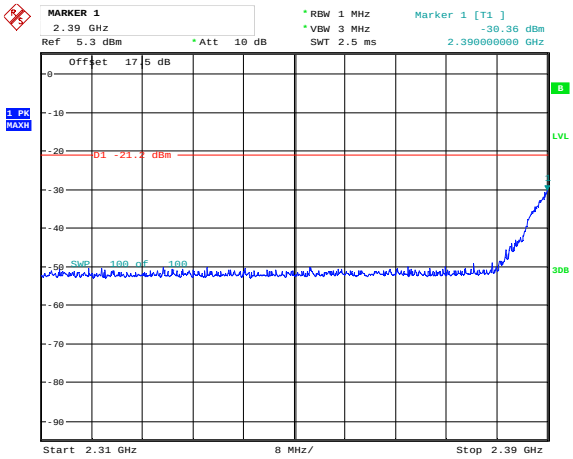
Date: 28.JUN.2015 22:21:14

802.11g - 2462 MHz (Ave)



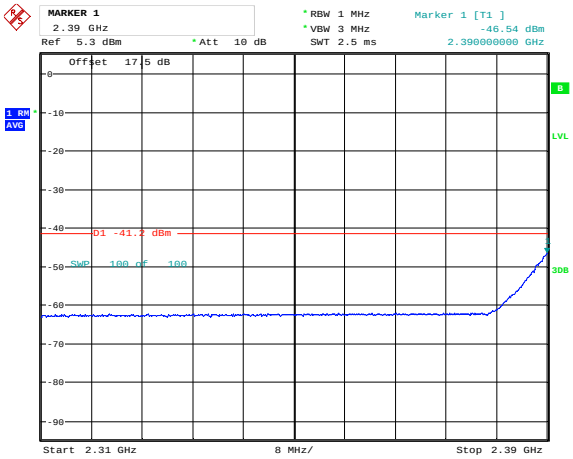
Date: 28.JUN.2015 22:20:45

802.11n20 - 2412 MHz (Peak)



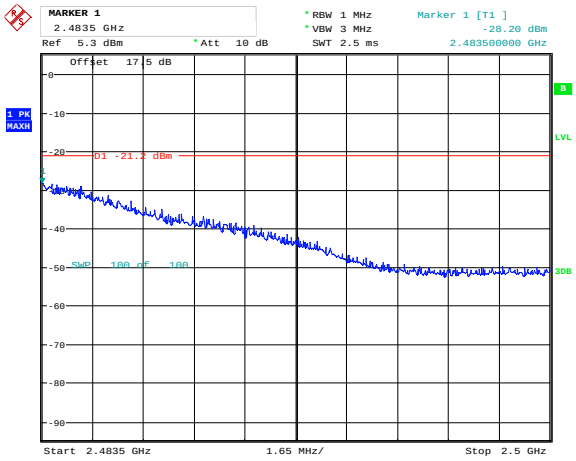
Date: 28.JUN.2015 22:23:45

802.11n20 - 2412 MHz (Ave)



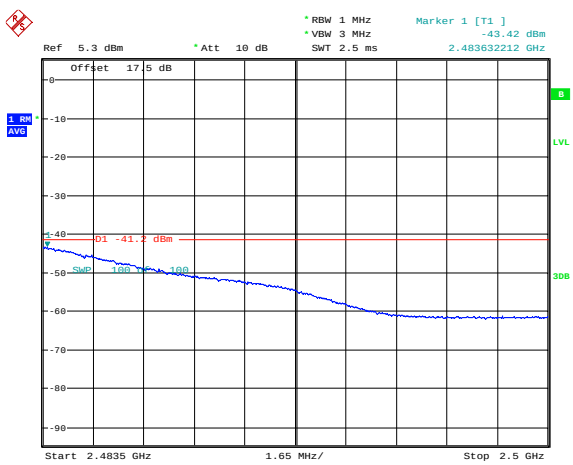
Date: 28.JUN.2015 22:24:26

802.11n20 - 2462 MHz (Peak)



Date: 28.JUN.2015 22:26:51

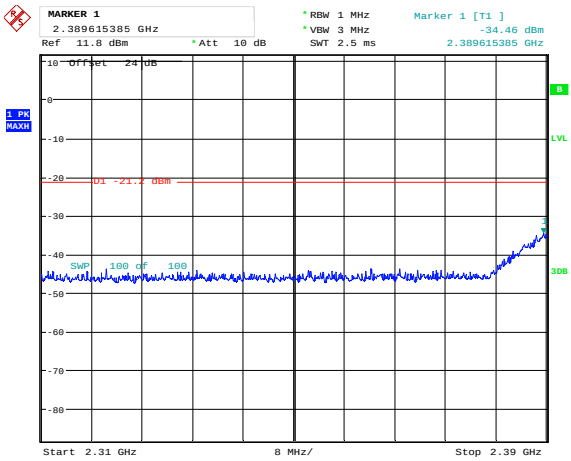
802.11n20 - 2462 MHz (Ave)



Date: 28.JUN.2015 22:26:02

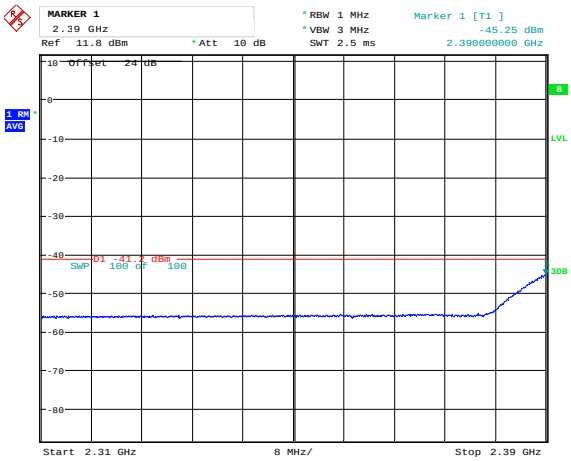
Antenna Gain=13 dBi

802.11b - 2412 MHz (Peak)



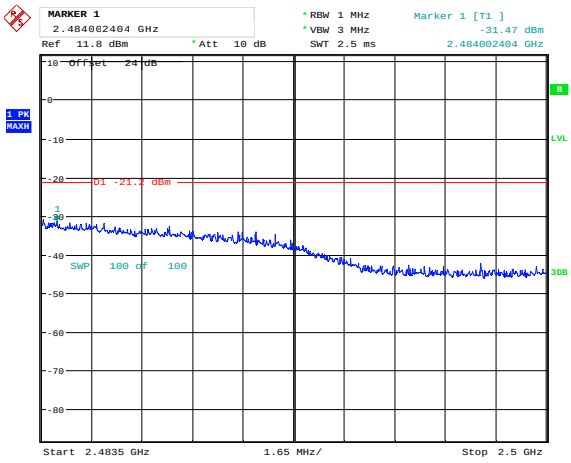
Date: 28.JUN.2015 22:30:01

802.11b - 2412 MHz (Ave)



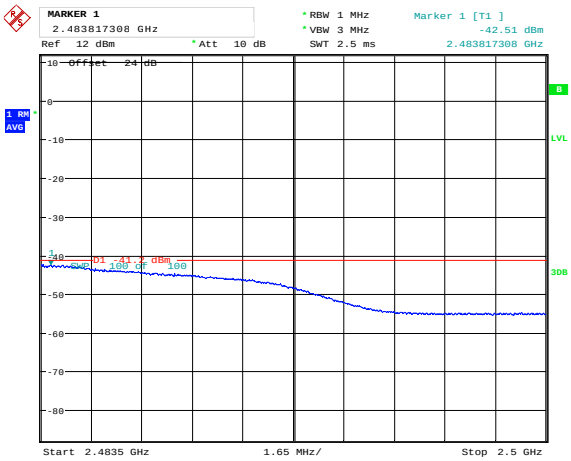
Date: 28.JUN.2015 22:29:14

802.11b - 2462 MHz (Peak)



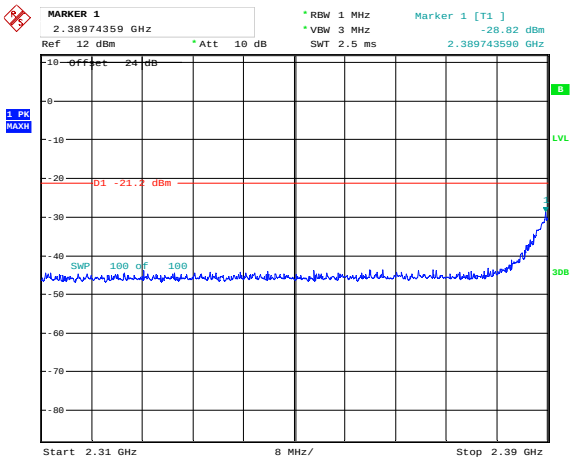
Date: 28.JUN.2015 22:30:42

802.11b - 2462 MHz (Ave)



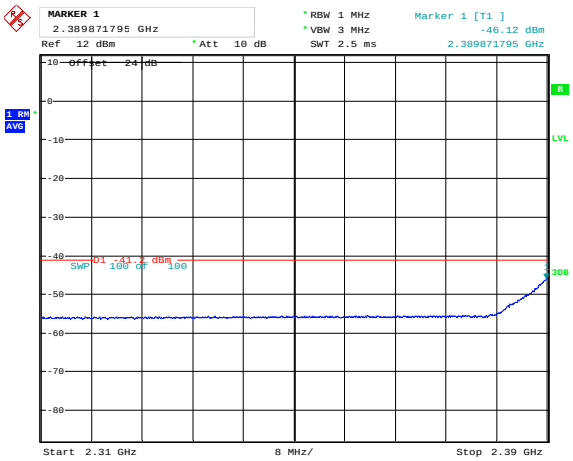
Date: 28.JUN.2015 22:31:32

802.11g - 2412 MHz (Peak)



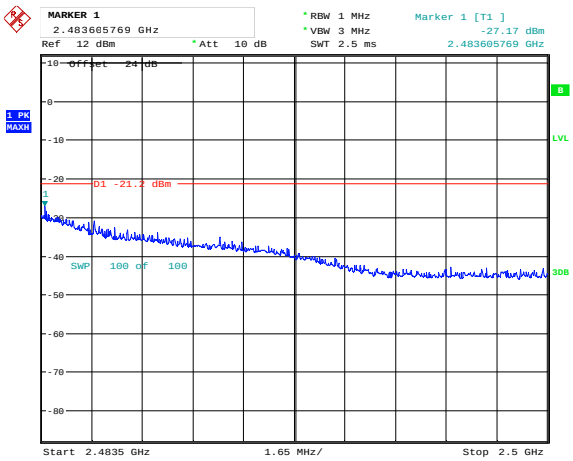
Date: 28.JUN.2015 22:35:23

802.11g - 2412 MHz (Ave)



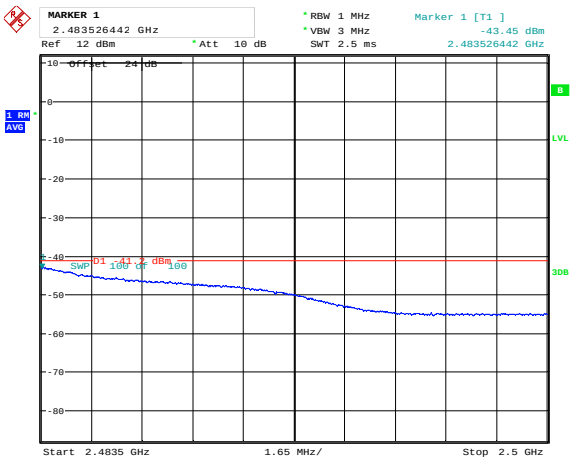
Date: 28.JUN.2015 22:34:18

802.11g - 2462 MHz (Peak)



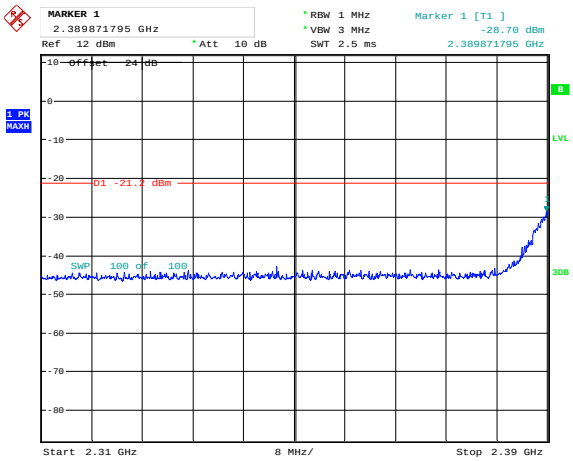
Date: 28.JUN.2015 22:36:31

802.11g - 2462 MHz (Ave)



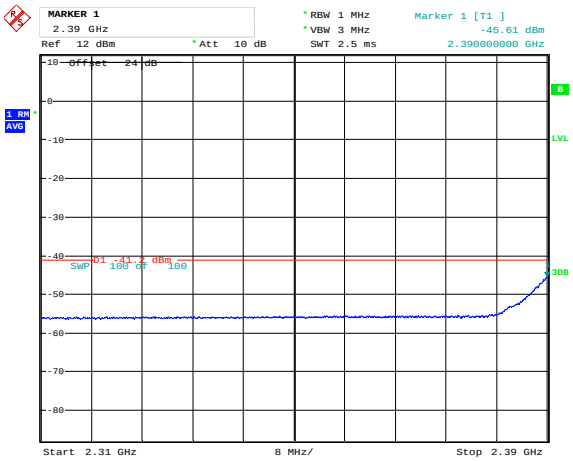
Date: 28.JUN.2015 22:38:14

802.11n20 - 2412 MHz (Peak)



Date: 28.JUN.2015 22:40:11

802.11n20 - 2412 MHz (Ave)



Date: 28.JUN.2015 22:39:26

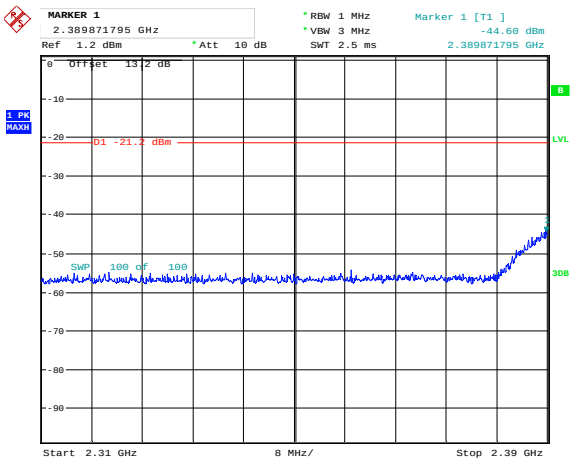
Date: 28.JUN.2015 22:41:54

Date: 28.JUN.2015 22:41:08

Antenna 1:

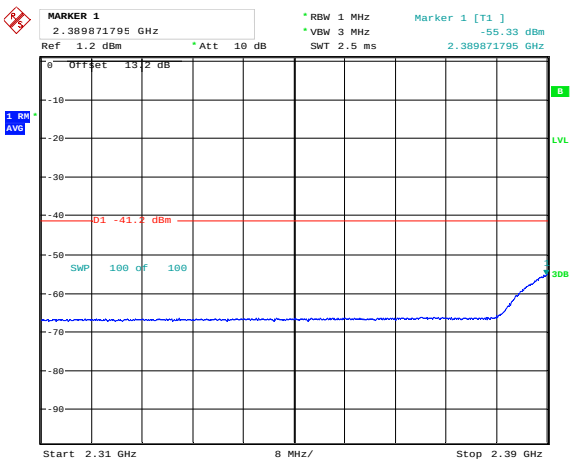
Antenna gain=2.2 dBi

802.11b - 2412 MHz (Peak)



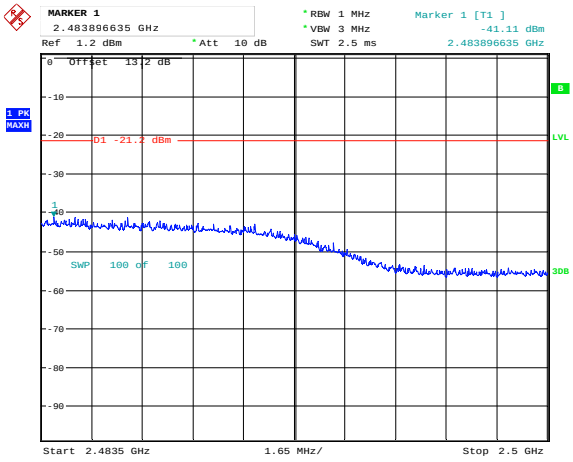
Date: 28.JUN.2015 22:48:00

802.11b - 2412 MHz (Ave)



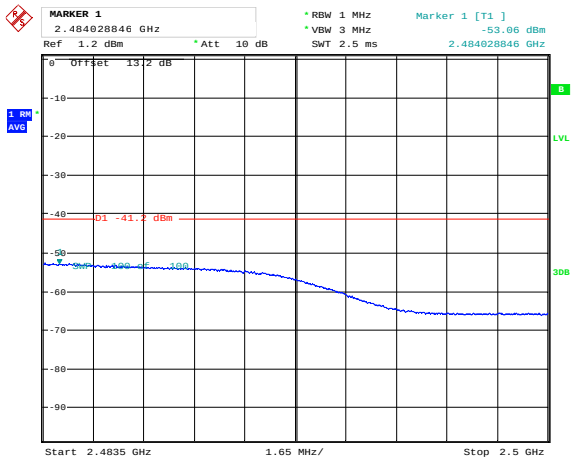
Date: 28.JUN.2015 22:47:07

802.11b - 2462 MHz (Peak)



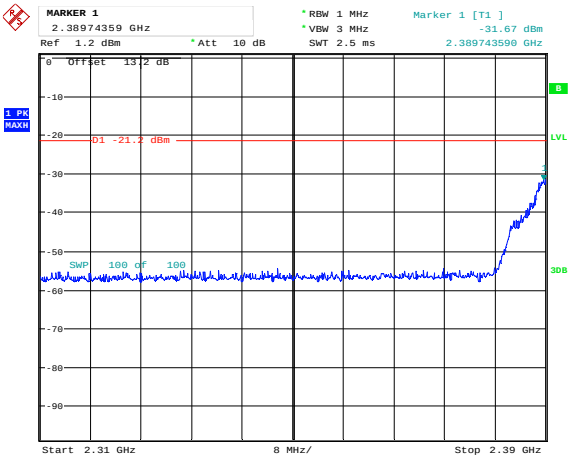
Date: 28.JUN.2015 22:49:45

802.11b - 2462 MHz (Ave)



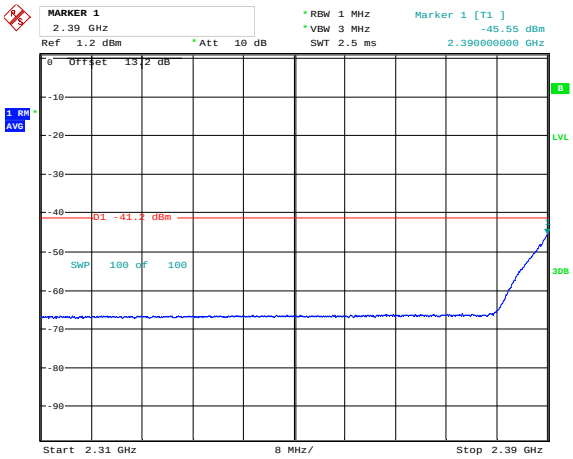
Date: 28.JUN.2015 22:50:31

802.11g - 2412 MHz (Peak)



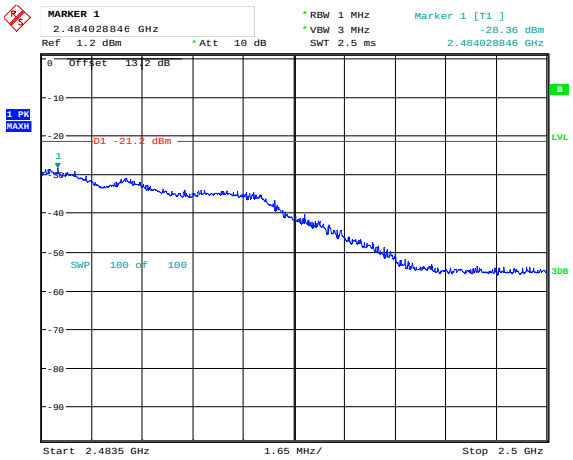
Date: 28.JUN.2015 22:52:06

802.11g - 2412 MHz (Ave)



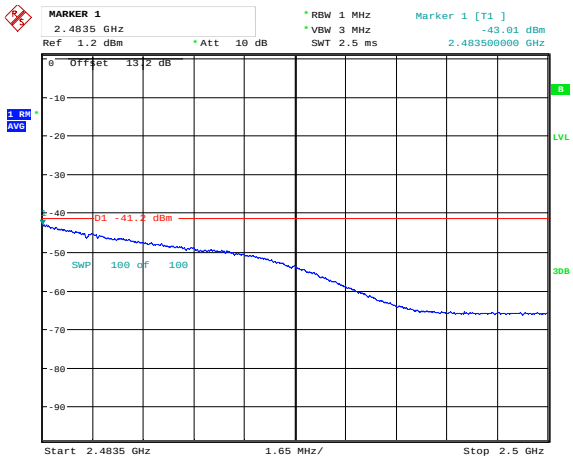
Date: 28.JUN.2015 22:51:33

802.11g - 2462 MHz (Peak)



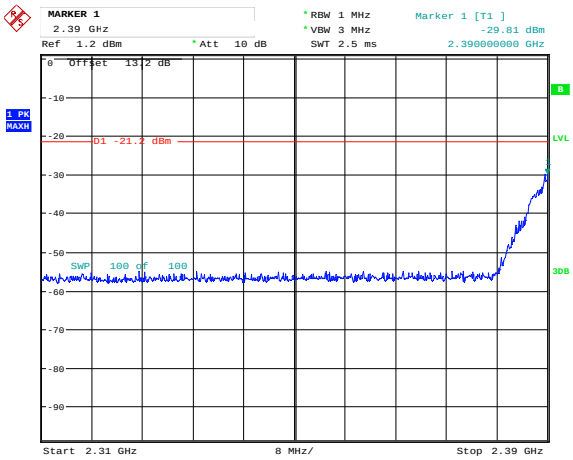
Date: 28.JUN.2015 22:53:29

802.11g - 2462 MHz (Ave)



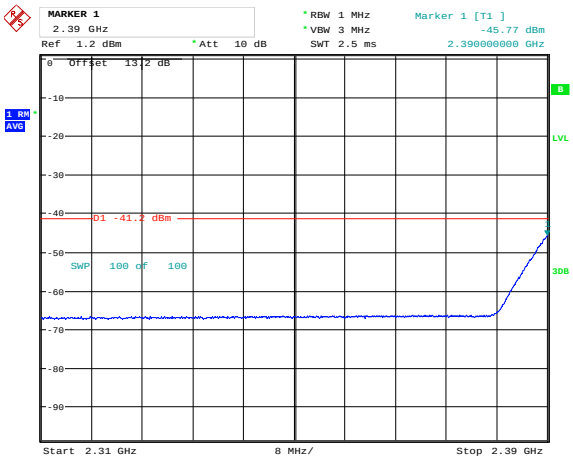
Date: 28.JUN.2015 22:54:07

802.11n20 - 2412 MHz (Peak)



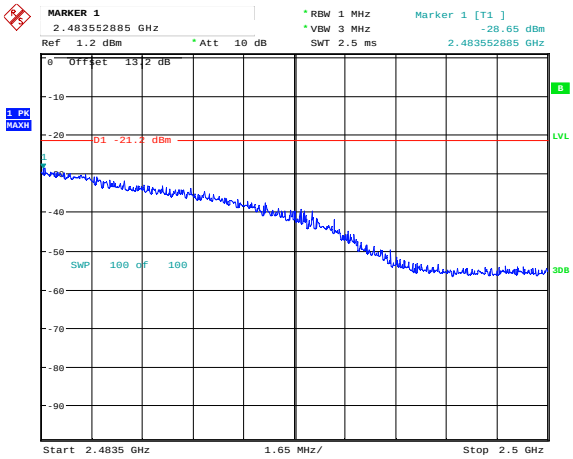
Date: 28.JUN.2015 22:55:56

802.11n20 - 2412 MHz (Ave)



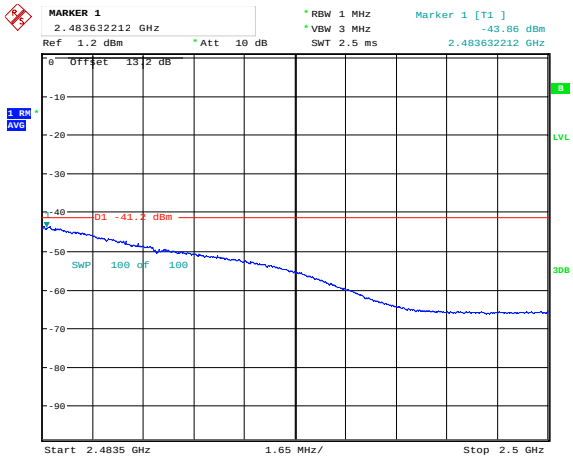
Date: 28.JUN.2015 22:55:14

802.11n20 - 2462 MHz (Peak)



Date: 28.JUN.2015 22:56:49

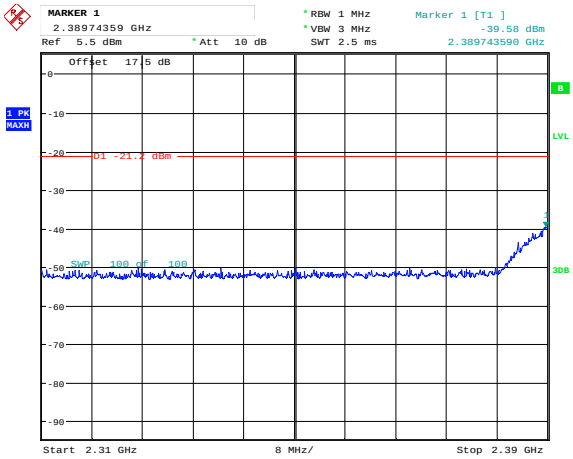
802.11n20 - 2462 MHz (Ave)



Date: 28.JUN.2015 22:57:21

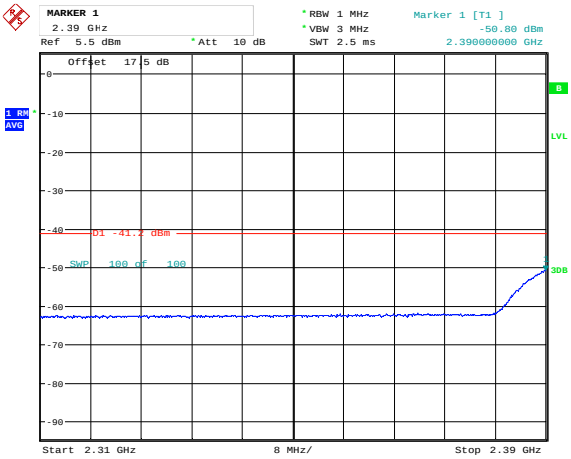
Antenna gain=6.5 dBi

802.11b - 2412 MHz (Peak)



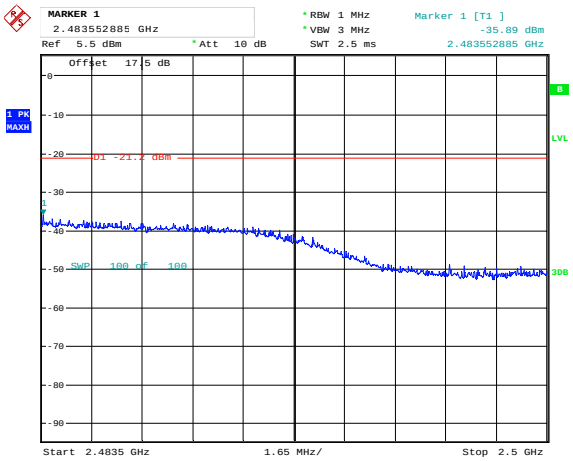
Date: 28.JUN.2015 23:00:24

802.11b - 2412 MHz (Ave)



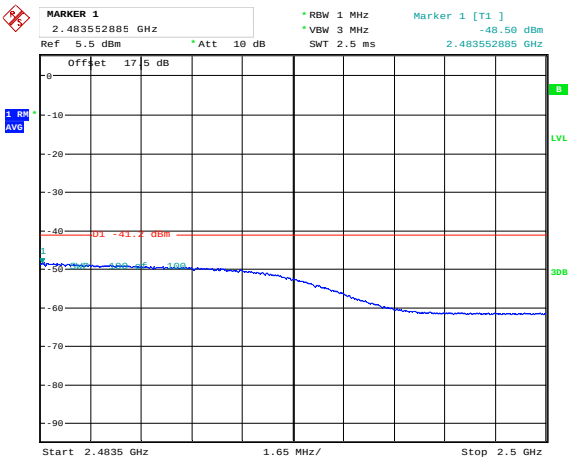
Date: 28.JUN.2015 22:59:33

802.11b - 2462 MHz (Peak)



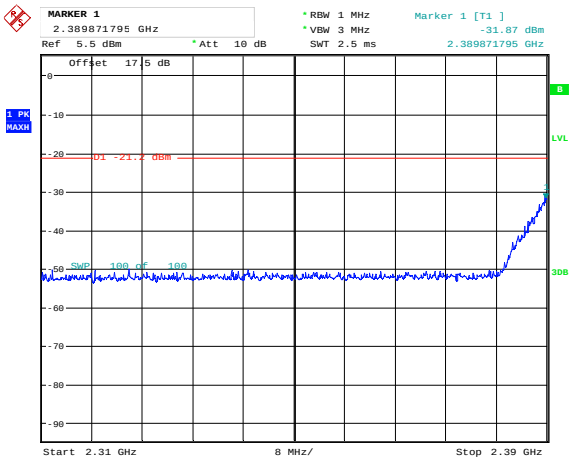
Date: 28.JUN.2015 23:01:24

802.11b - 2462 MHz (Ave)



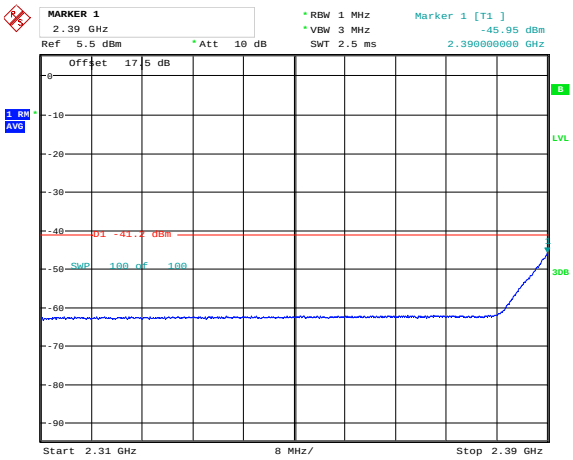
Date: 28.JUN.2015 23:02:07

802.11g - 2412 MHz (Peak)



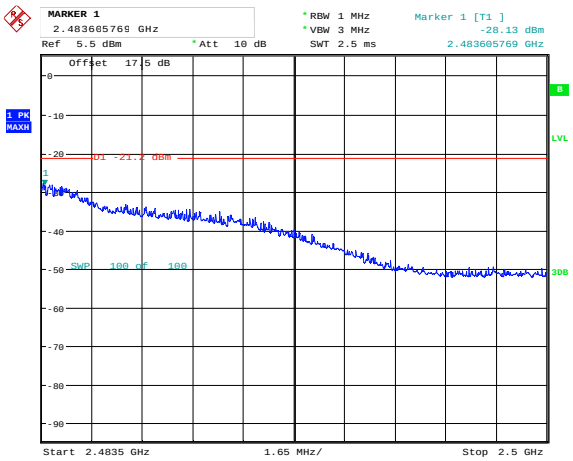
Date: 28.JUN.2015 23:04:05

802.11g - 2412 MHz (Ave)



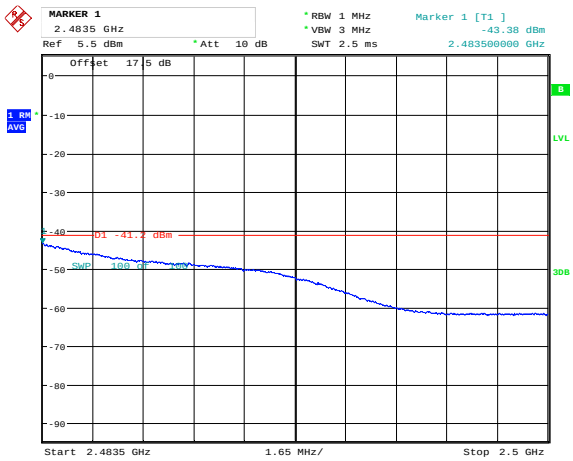
Date: 28.JUN.2015 23:03:11

802.11g - 2462 MHz (Peak)



Date: 28.JUN.2015 23:12:30

802.11g - 2462 MHz (Ave)

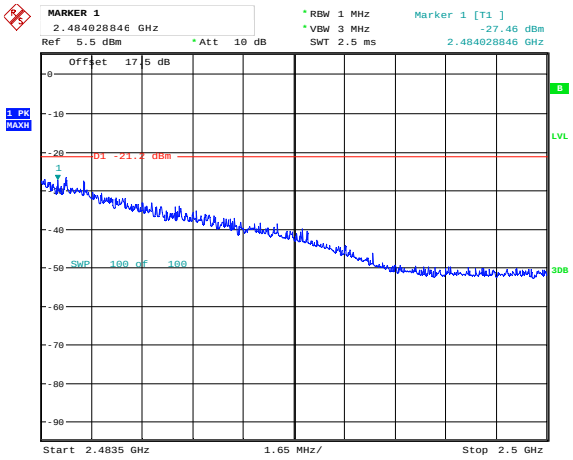


Date: 28.JUN.2015 23:13:26

Date: 28.JUN.2015 23:06:44

Date: 28.JUN.2015 23:07:28

802.11n20 - 2462 MHz (Peak)



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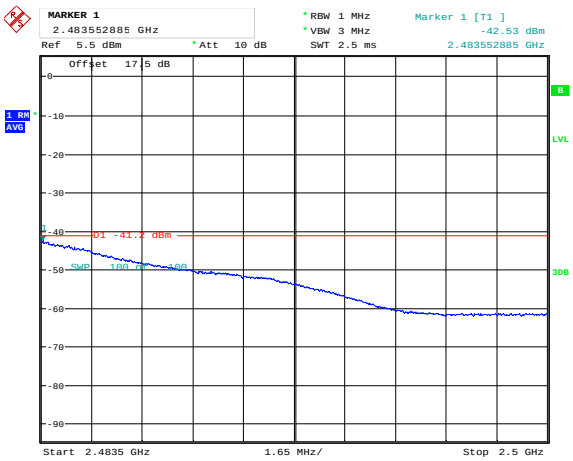
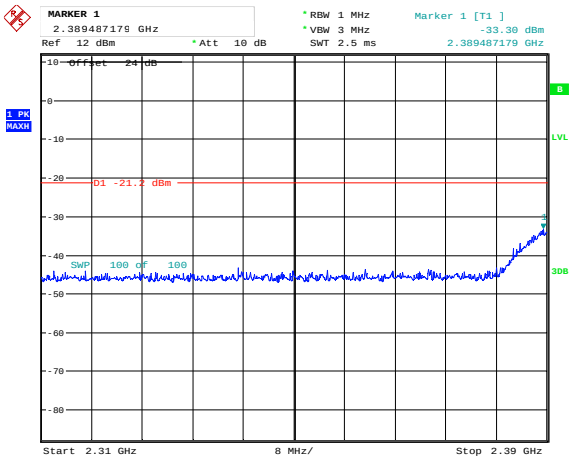
802.11n20 - 2462 MHz (Ave)



Date: 28.JUN.2015 23:10:13

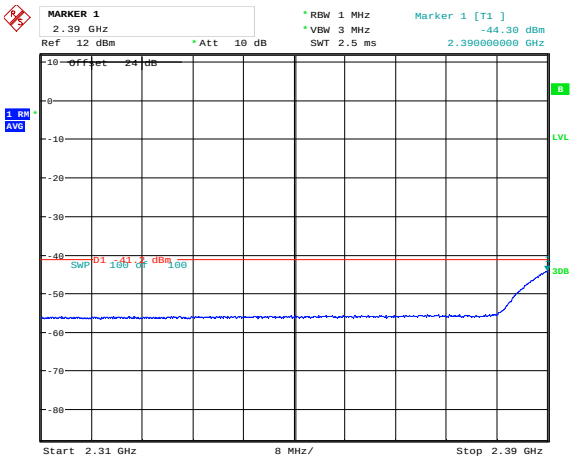
Antenna gain=13 dBi

802.11b - 2412 MHz (Peak)



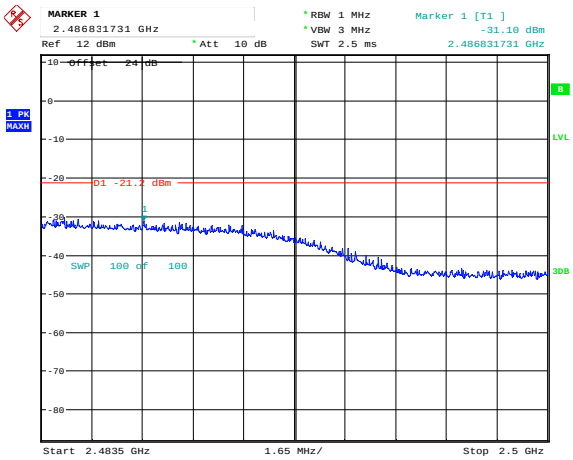
Date: 28.JUN.2015 23:16:13

802.11b - 2412 MHz (Ave)



Date: 28.JUN.2015 23:15:33

802.11b - 2462 MHz (Peak)



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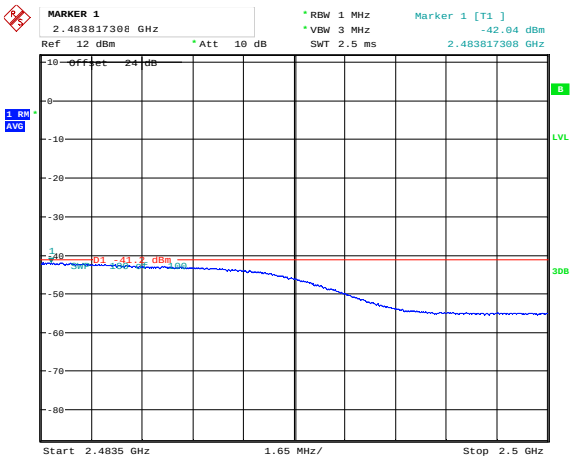
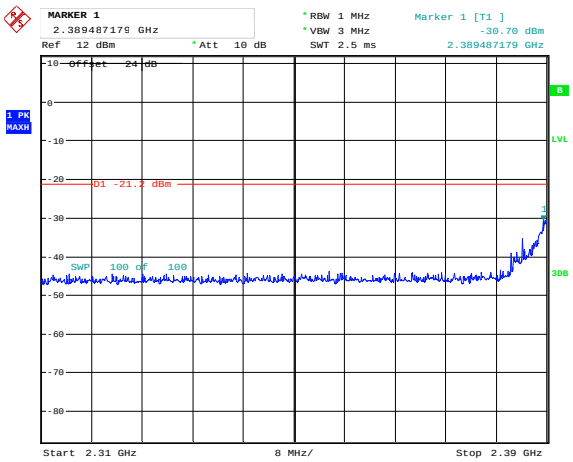
802.11b - 2462 MHz (Ave)



Date: 28.JUN.2015 23:18:49

802.11g - 2412 MHz (Peak)



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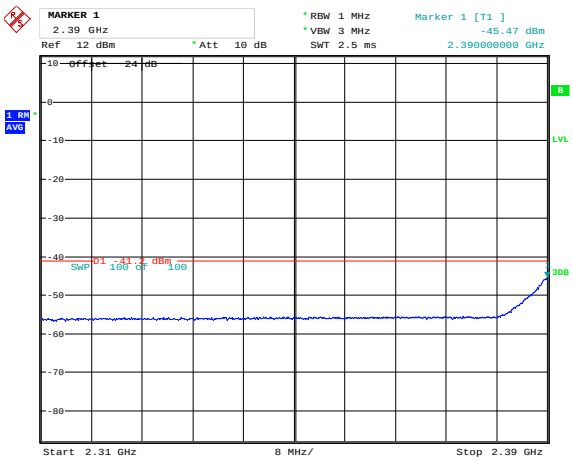
802.11g - 2412 MHz (Ave)



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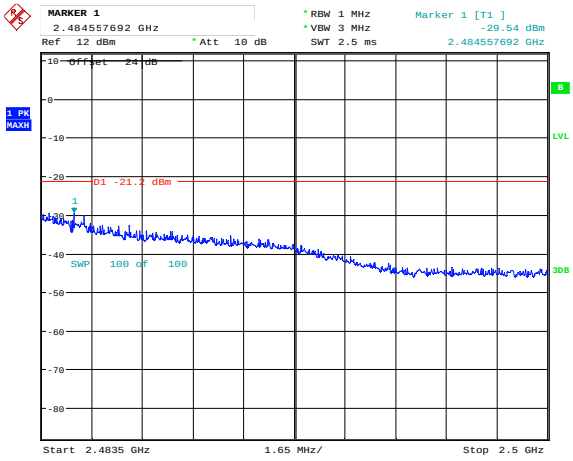
802.11g - 2462 MHz (Peak)



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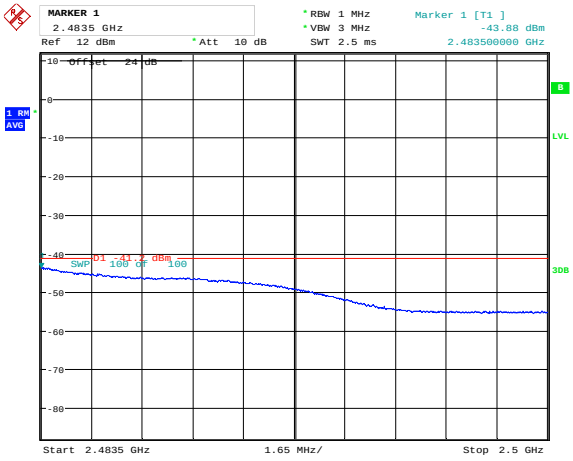

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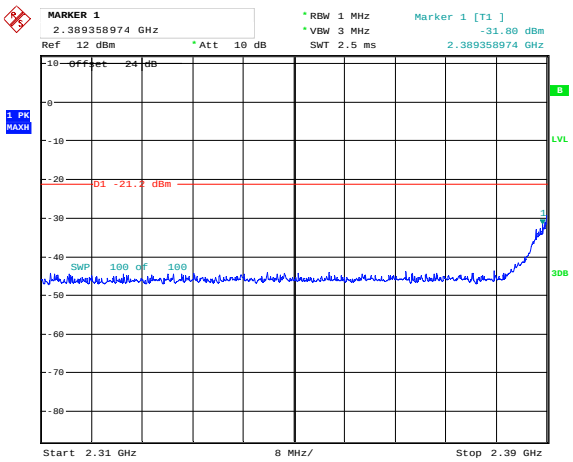
802.11n20 - 2412 MHz (Peak)



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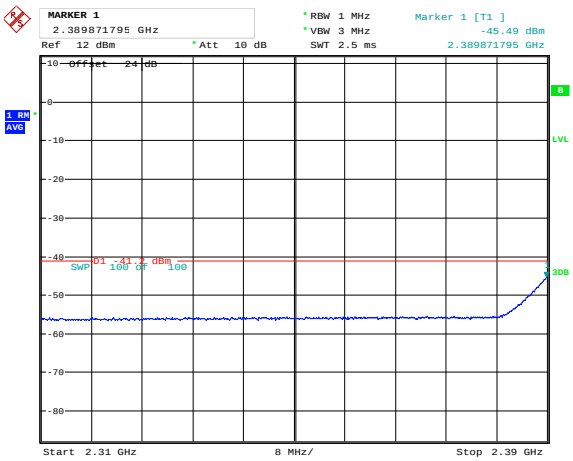

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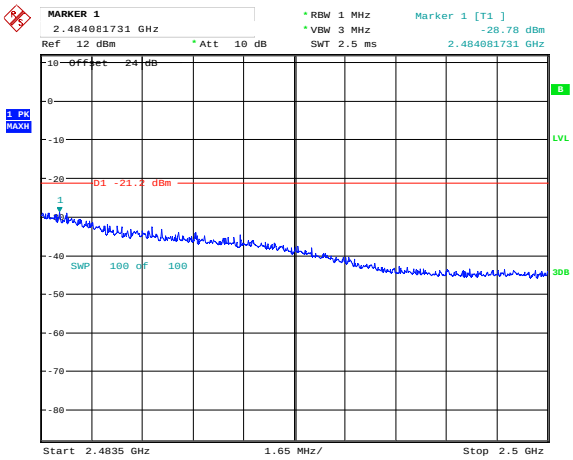
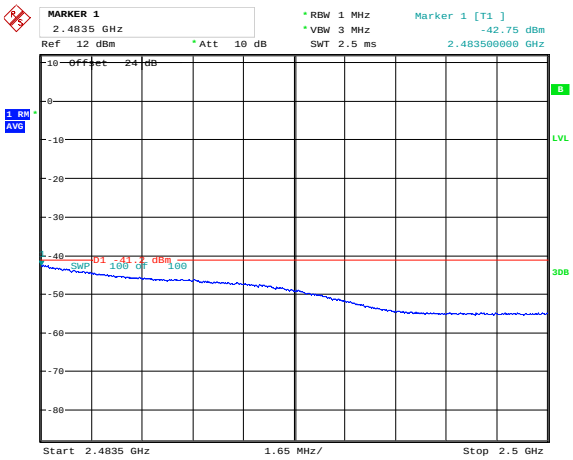
802.11n20 - 2462 MHz (Peak)



Date: 28.JUN.2015 23:24:09

802.11n20 - 2462 MHz (Ave)



Date: 28.JUN.2015 23:24:53

8 FCC §15.247(a)(2) & IC RSS-247 §5.2, RSS-Gen §6.6 – 6 dB & 99% Emission Bandwidth

8.1 Applicable Standards

According to FCC §15.247(a)(2), 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

According to IC RSS-247 §5.2, the following applies to the bands 902-928 MHz and 2400- 2483.5 MHz: The minimum 6 dB bandwidth shall be 500 kHz.

8.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v03r03: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 8: DTS bandwidth

8.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	Spectrum Analyzer	FSQ	1155.5001.26	2015-03-09	1 year
-	SMA Cable	-	C0001	Each Time[1]	N/A
-	Attenuator	BW-S10W5	1419	Each Time[1]	N/A

Note[1]: cable and attenuator included in the test set-up will be checked each time before testing.

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

8.4 Test Environmental Conditions

Temperature:	22 ºC
Relative Humidity:	42 %
ATM Pressure:	102.7 kPa

The testing was performed by Jimmy Xiao on 2015-06-29 in RF site.

8.5 Test Results

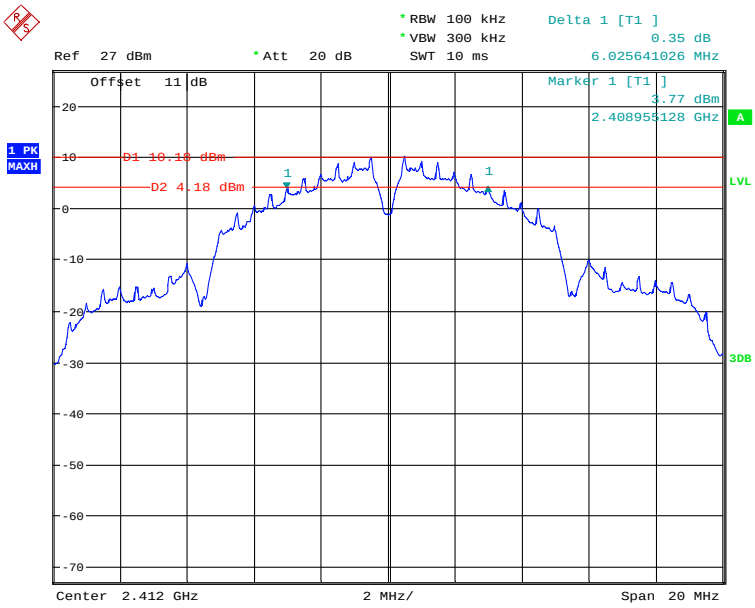
Channel	Frequency (MHz)	99 % OBW (MHz)		6 dB OBW (MHz)		6 dB OBW Limit (kHz)	Result
		Chain 0	Chain 1	Chain 0	Chain 1		
802.11b							
Low	2412	10.77	10.96	6.03	6.54	≥ 500	Pass
Middle	2437	11.03	11.03	6.06	6.03	≥ 500	Pass
High	2462	10.90	11.15	6.03	6.54	≥ 500	Pass
802.11g							
Low	2412	17.76	17.56	16.35	16.41	≥ 500	Pass
Middle	2437	17.95	17.44	16.39	16.41	≥ 500	Pass
High	2462	17.95	17.56	16.39	16.41	≥ 500	Pass
802.11n20							
Low	2412	18.65	18.78	17.26	17.56	≥ 500	Pass
Middle	2437	18.78	18.78	17.31	17.56	≥ 500	Pass
High	2462	18.85	18.91	17.31	17.56	≥ 500	Pass

Please refer to the following plots for detailed test results

6 dB Emission Bandwidth

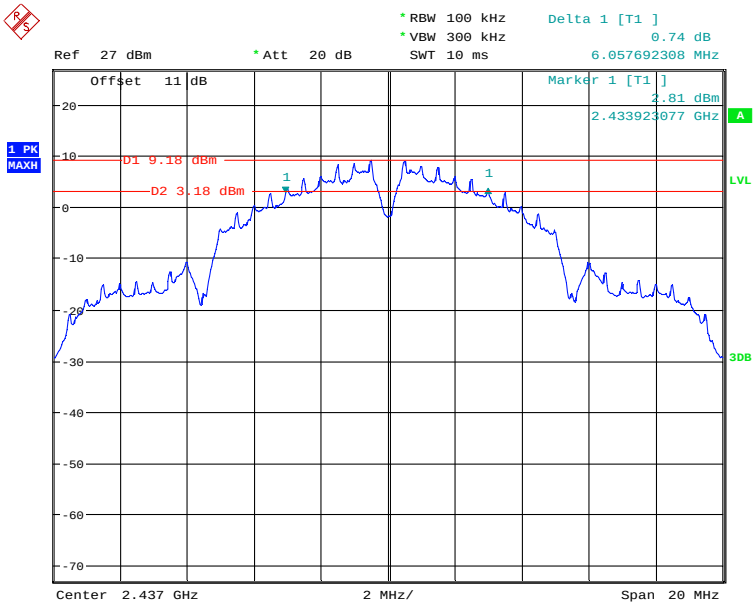
Chain 0 Port:

802.11b - 2412 MHz



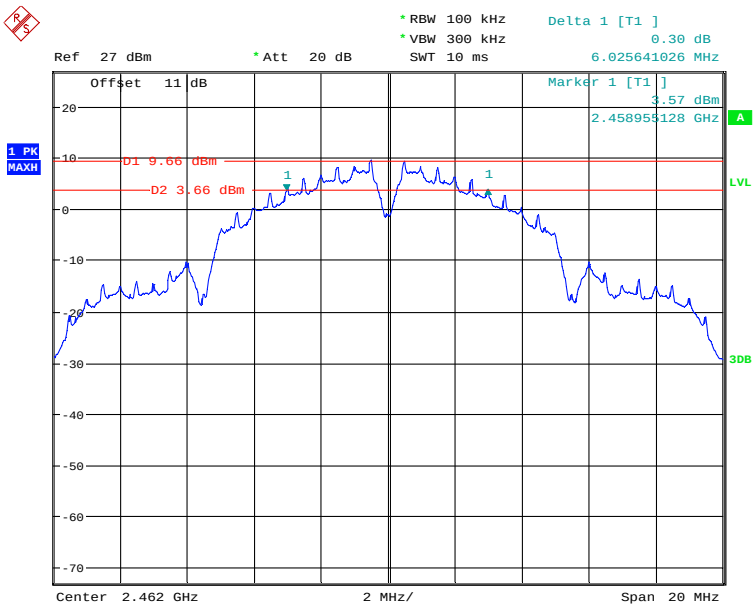
Date: 29.JUN.2015 20:15:12

802.11b - 2437 MHz



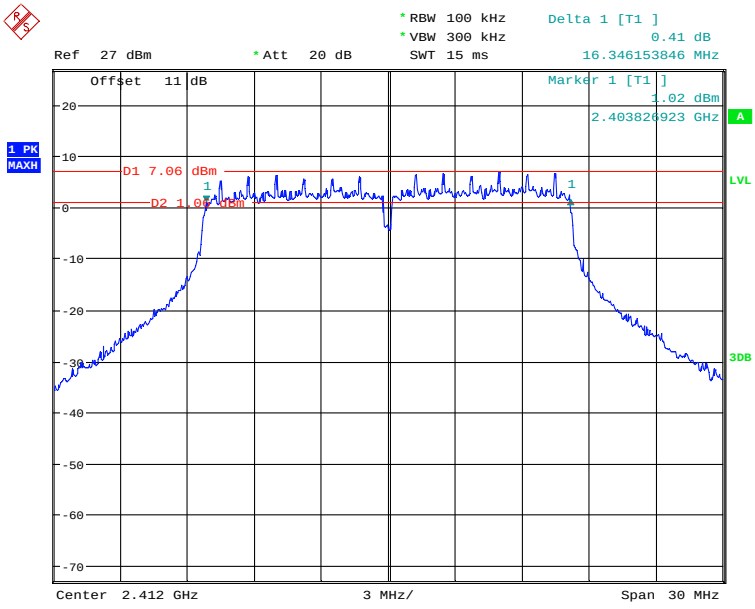
Date: 29.JUN.2015 20:17:12

802.11b - 2462 MHz



Date: 29.JUN.2015 20:18:28

802.11g - 2412 MHz



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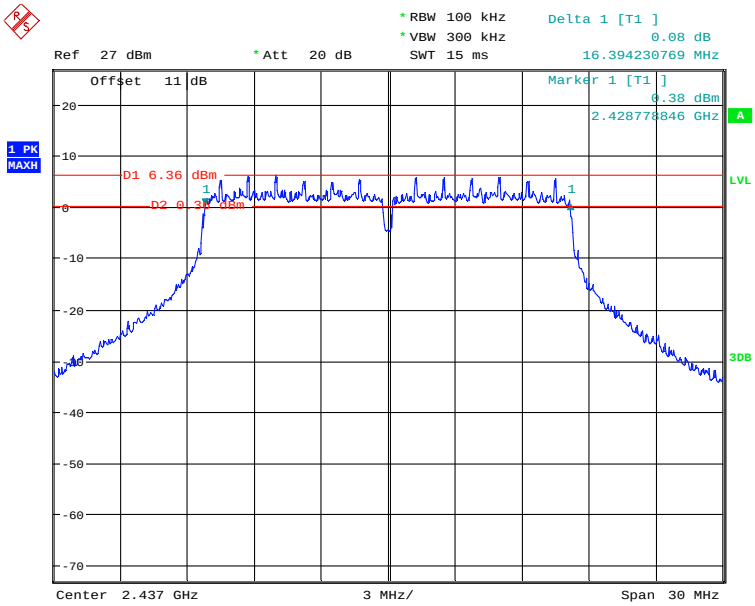
802.11g - 2437 MHz



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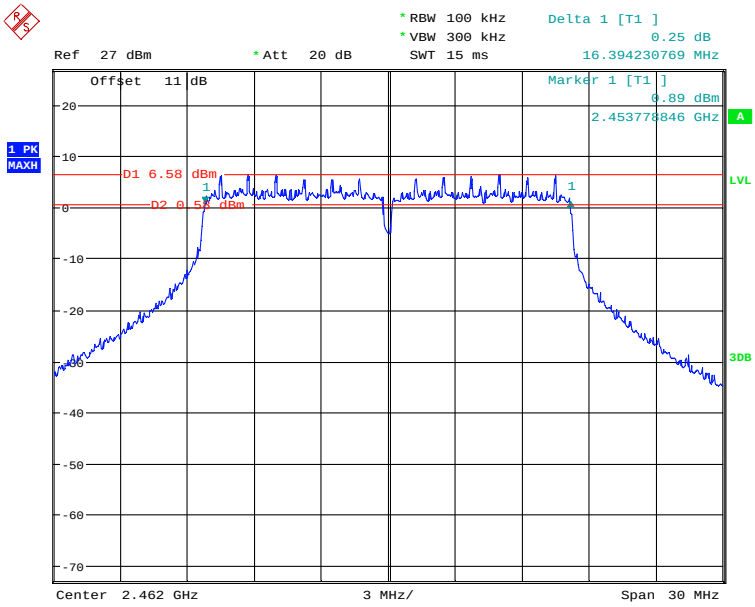
802.11g - 2462 MHz



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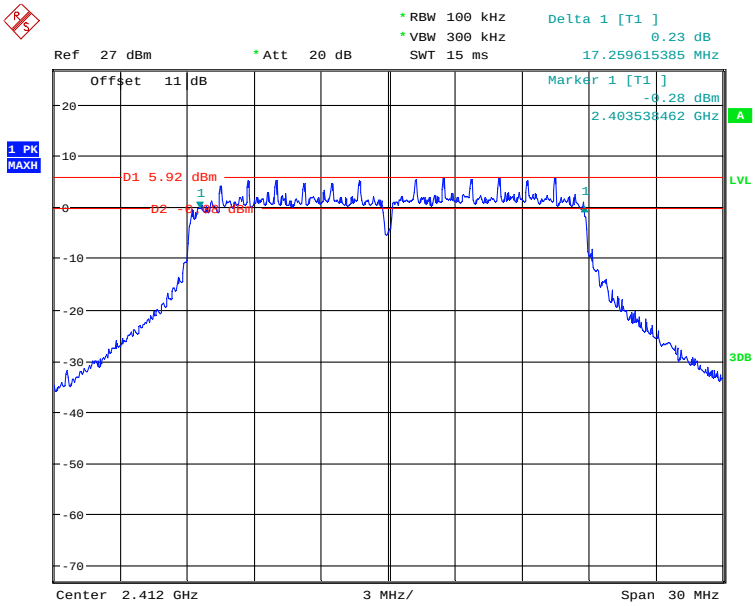
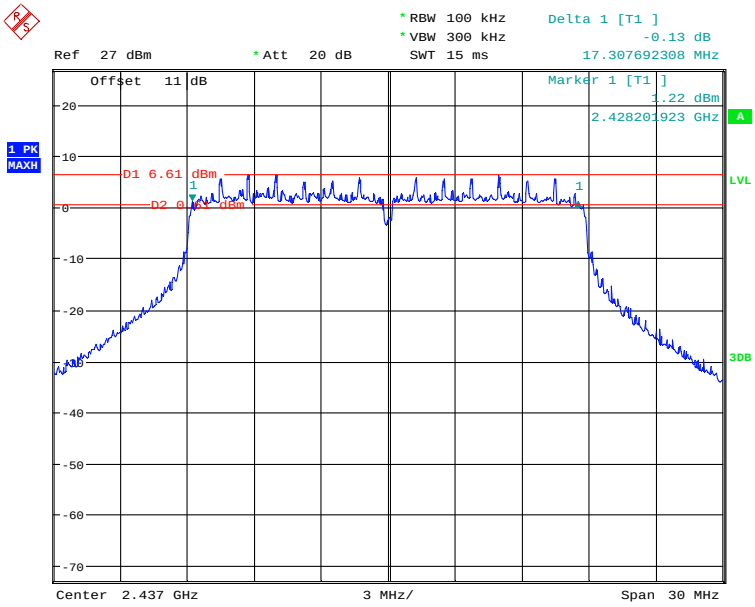
802.11n20 - 2412 MHz



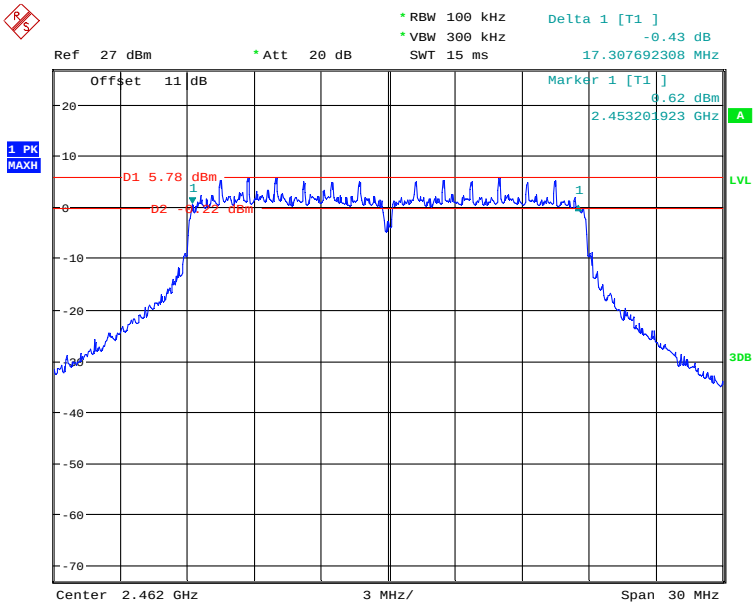
Date: 29.JUN.2015 20:25:04

802.11n20 - 2437 MHz



Date: 29.JUN.2015 20:26:52

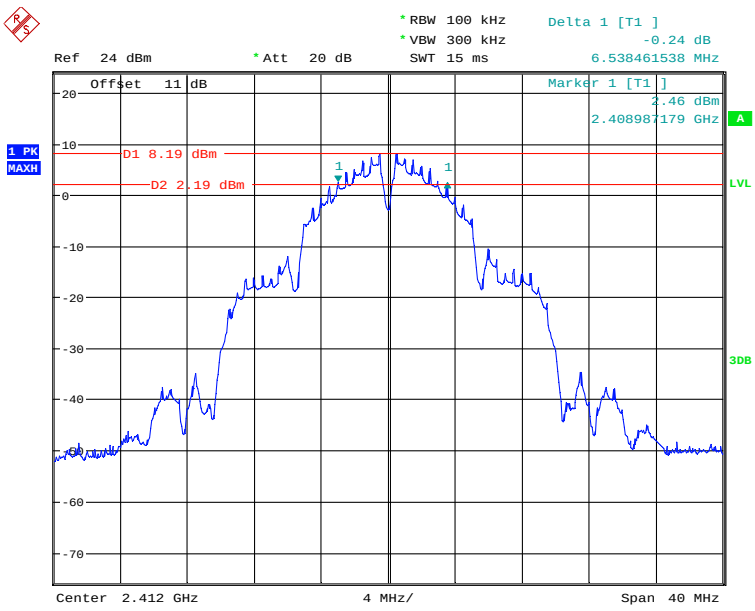
802.11n20 - 2462 MHz



Date: 29.JUN.2015 20:28:54

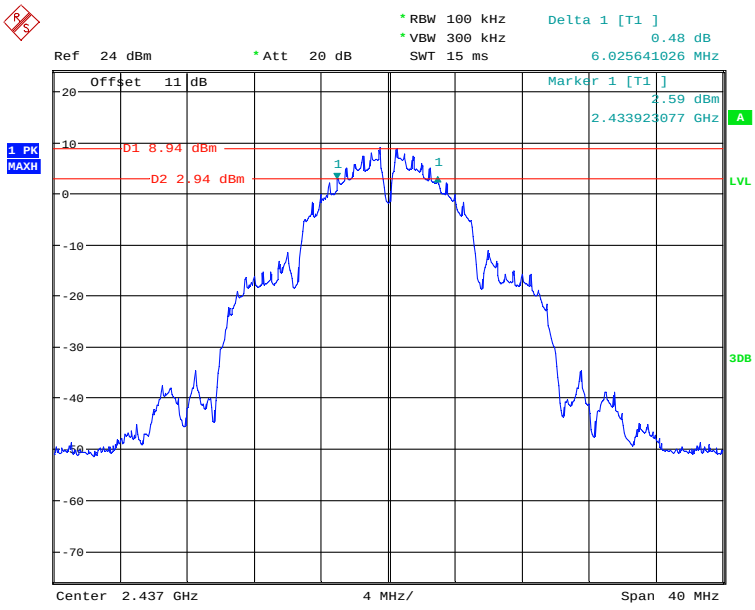
Chain 1 Port:

802.11b - 2412 MHz



Date: 29.JUN.2015 18:02:33

802.11b - 2437 MHz



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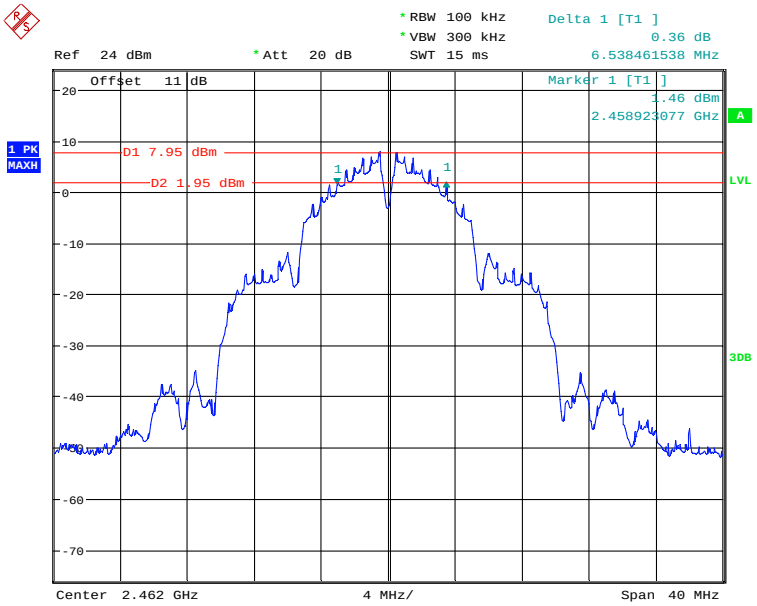
802.11b - 2462 MHz



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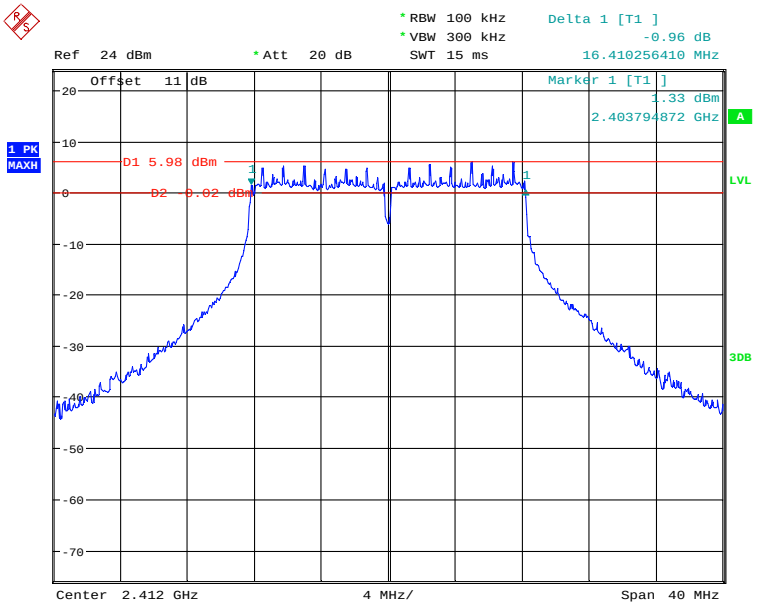
802.11g - 2412 MHz



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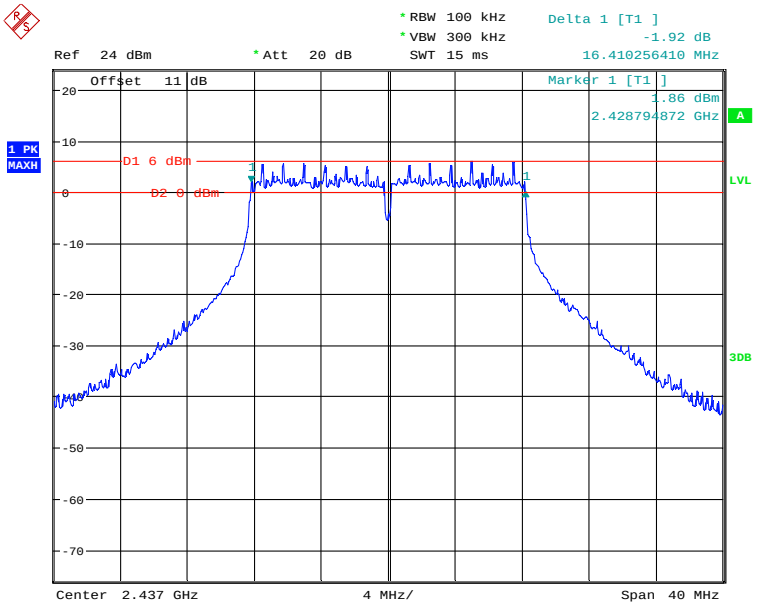
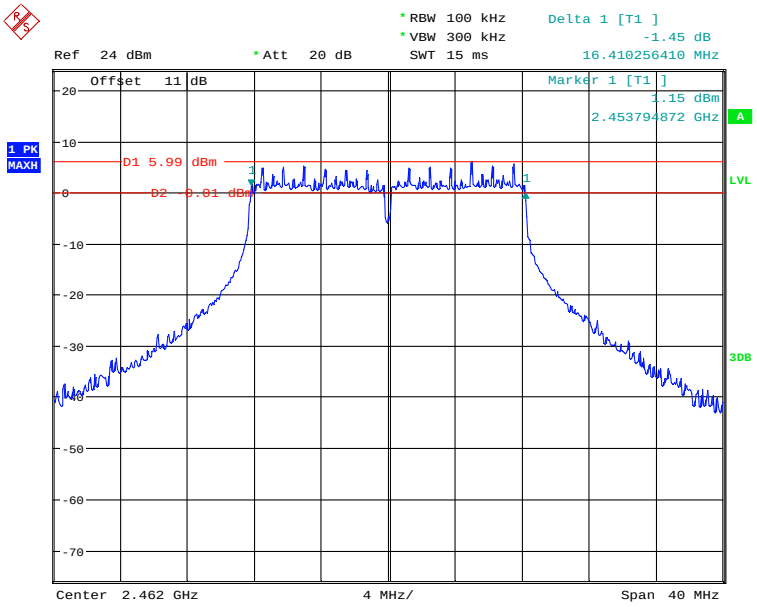
802.11g - 2437 MHz



Date: 29.JUN.2015 18:09:21

802.11g - 2462 MHz



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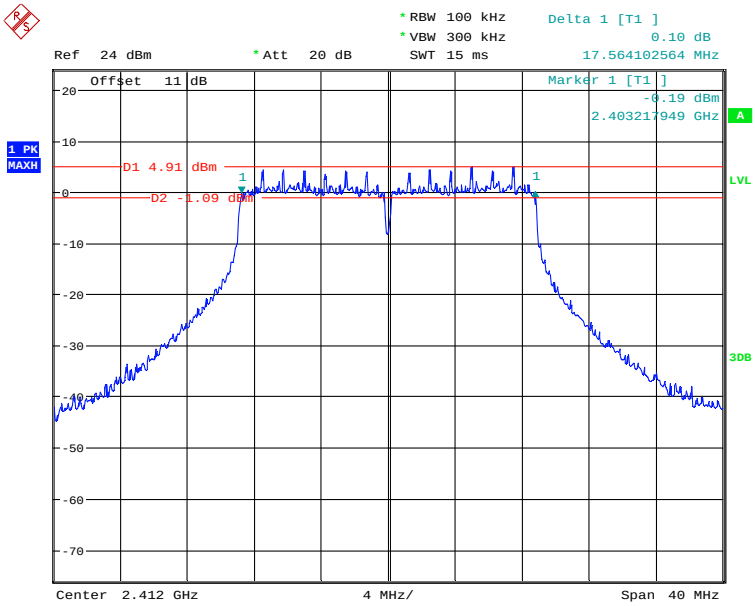
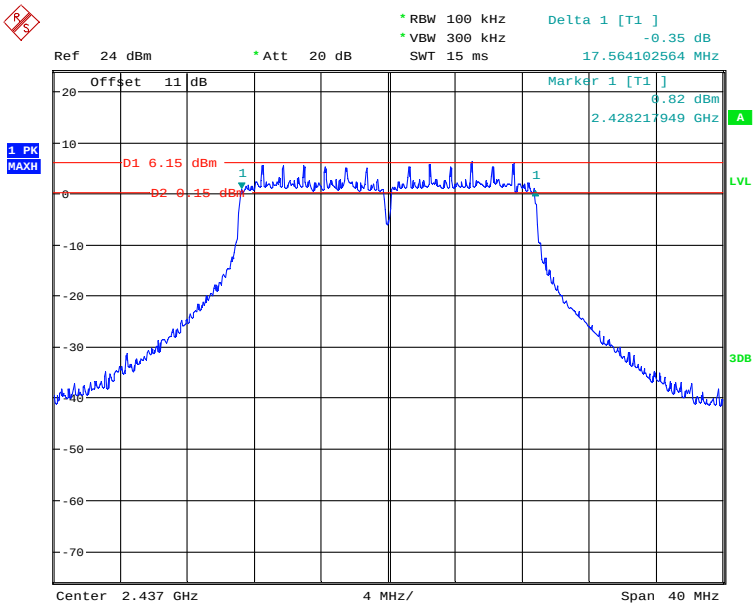
802.11n20 - 2412 MHz



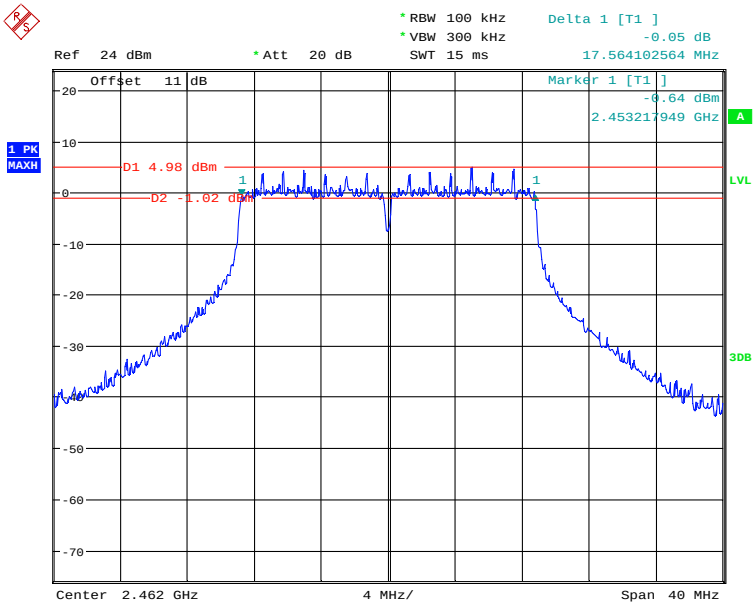
Date: 29.JUN.2015 18:12:35

802.11n20 - 2437 MHz



Date: 29.JUN.2015 18:14:34

802.11n20 - 2462 MHz

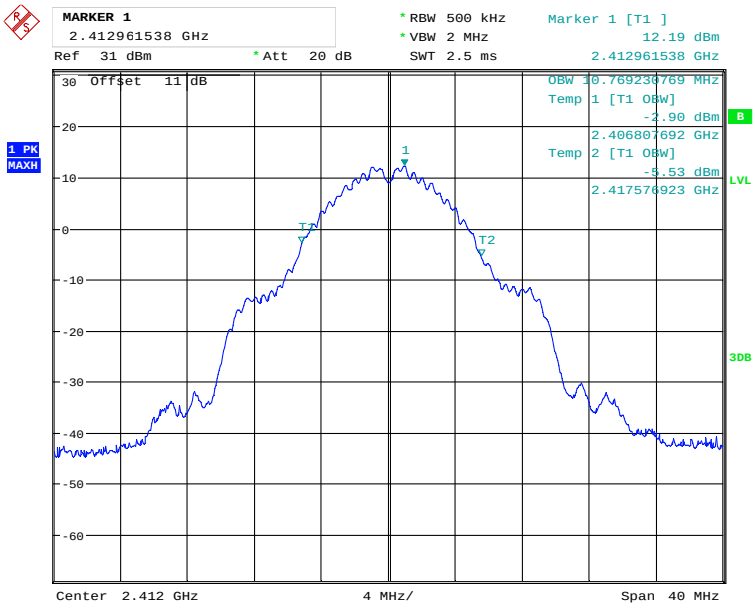


Date: 29.JUN.2015 18:15:43

99% Emission Bandwidth

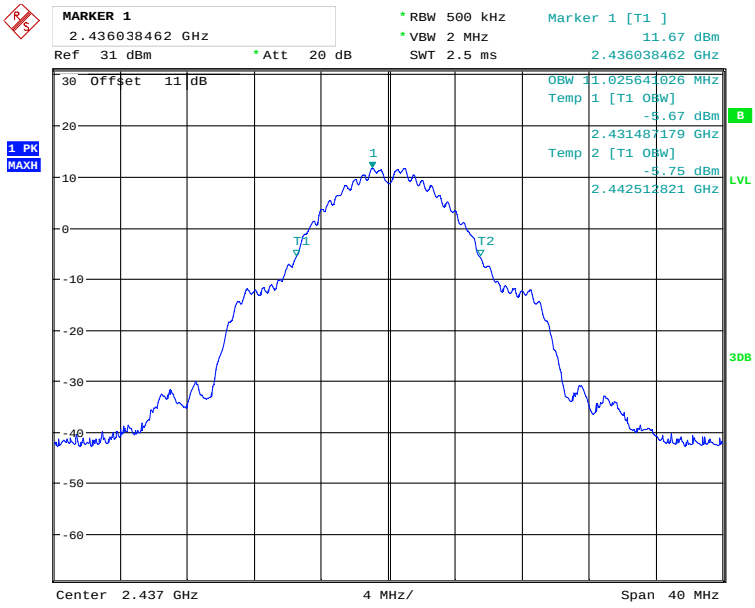
Chain 0 Port:

802.11b - 2412 MHz



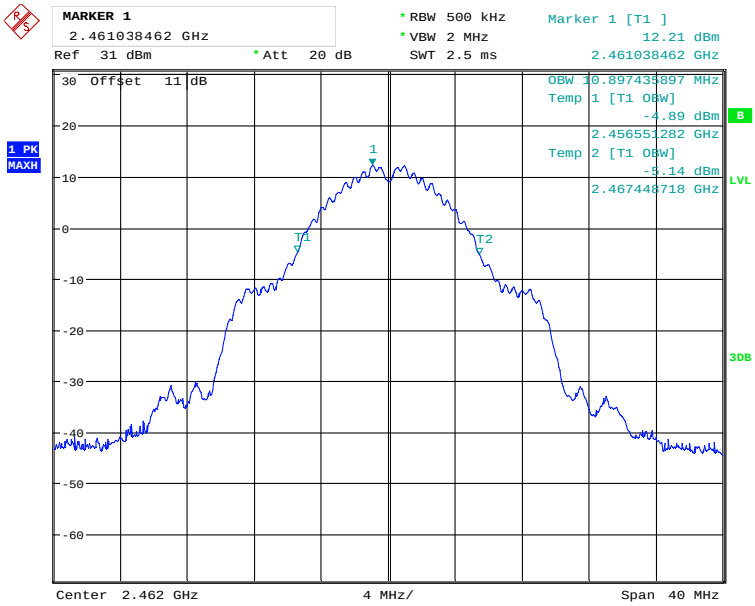
Date: 29.JUN.2015 15:12:40

802.11b - 2437 MHz



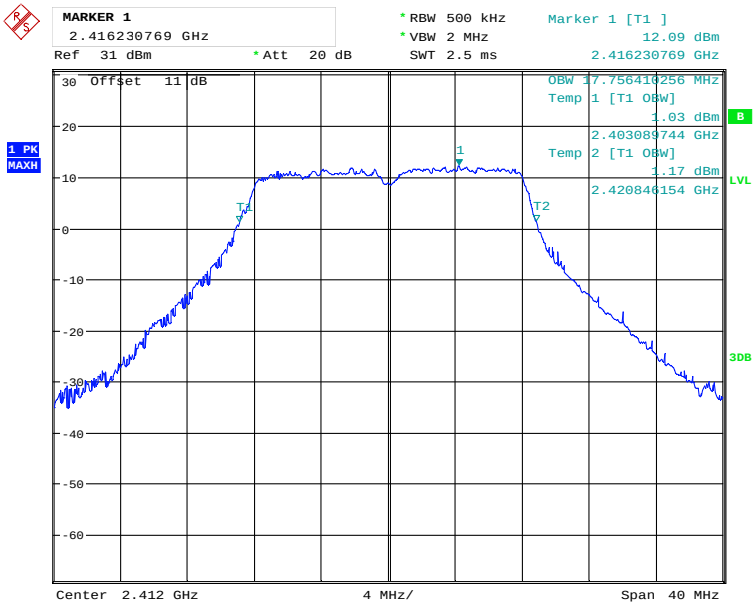
Date: 29.JUN.2015 15:14:33

802.11b - 2462 MHz



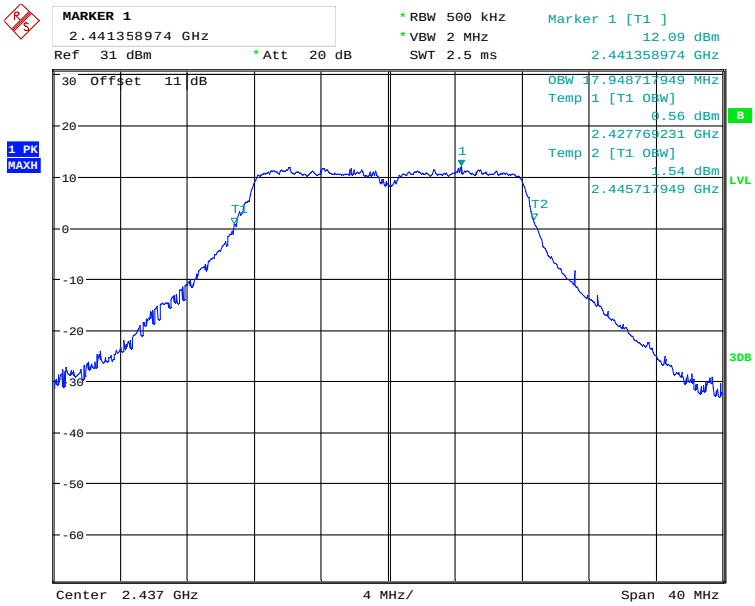
Date: 29.JUN.2015 15:15:00

802.11g - 2412 MHz



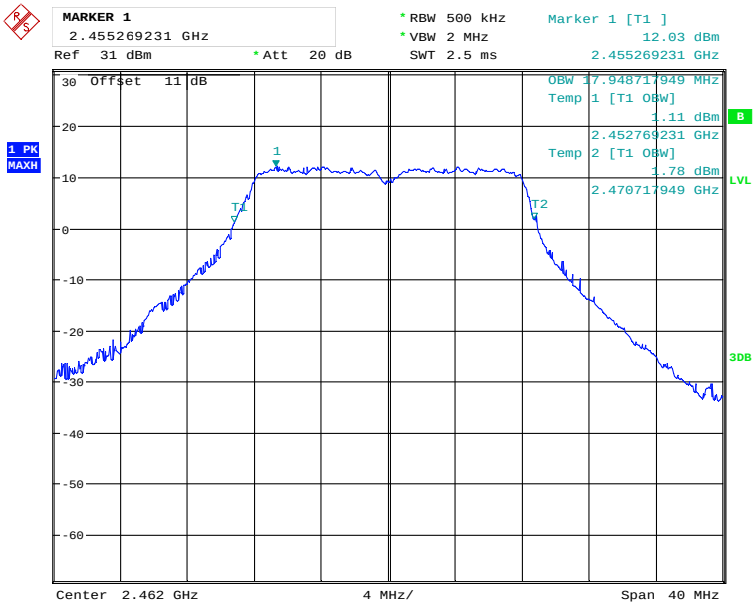
Date: 29.JUN.2015 15:16:30

802.11g - 2437 MHz



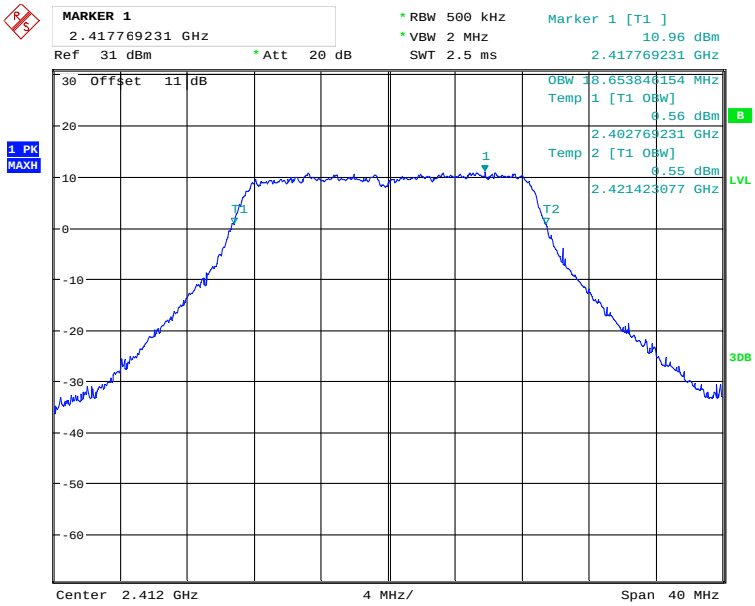
Date: 29.JUN.2015 15:17:13

802.11g - 2462 MHz



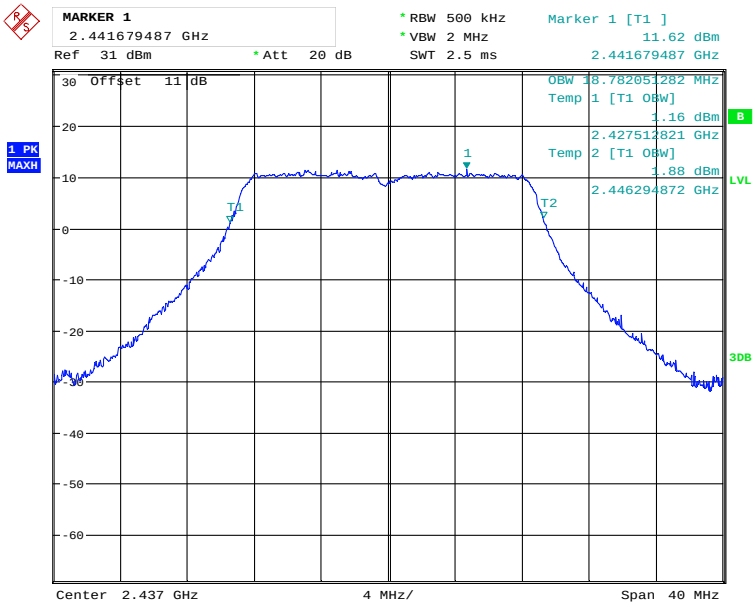
Date: 29.JUN.2015 15:17:48

802.11n20 - 2412 MHz



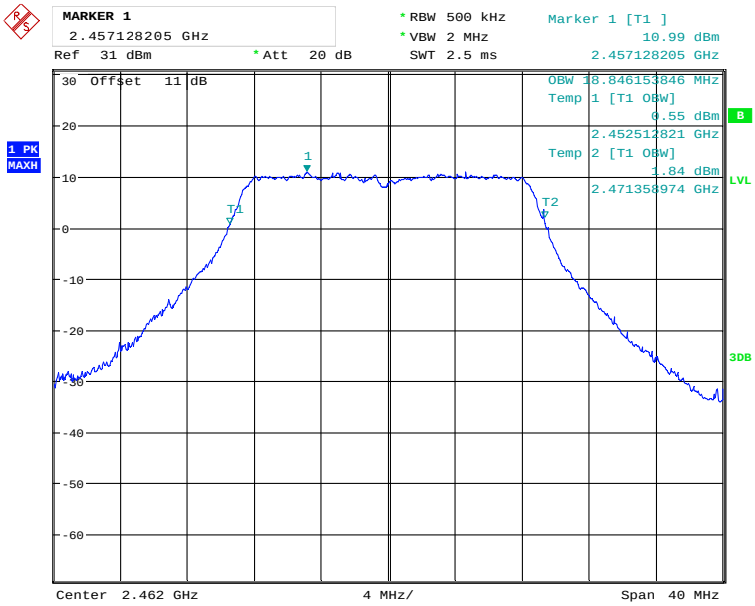
Date: 29.JUN.2015 15:18:48

802.11n20 - 2437 MHz



Date: 29.JUN.2015 15:19:34

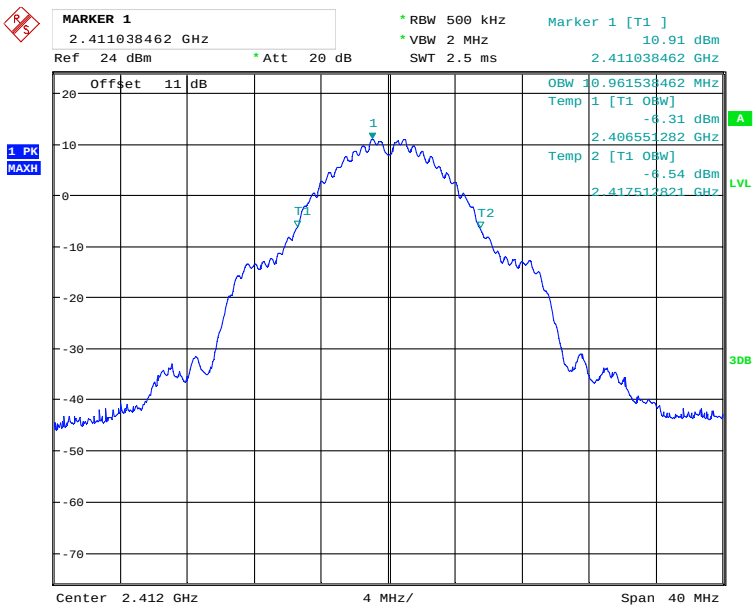
802.11n20 - 2462 MHz



Date: 29.JUN.2015 15:20:17

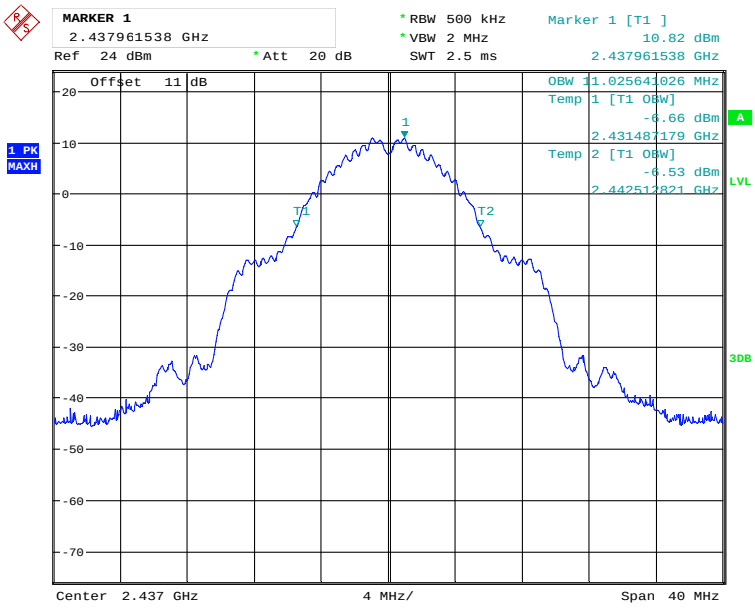
Chain 1 Port:

802.11b - 2412 MHz



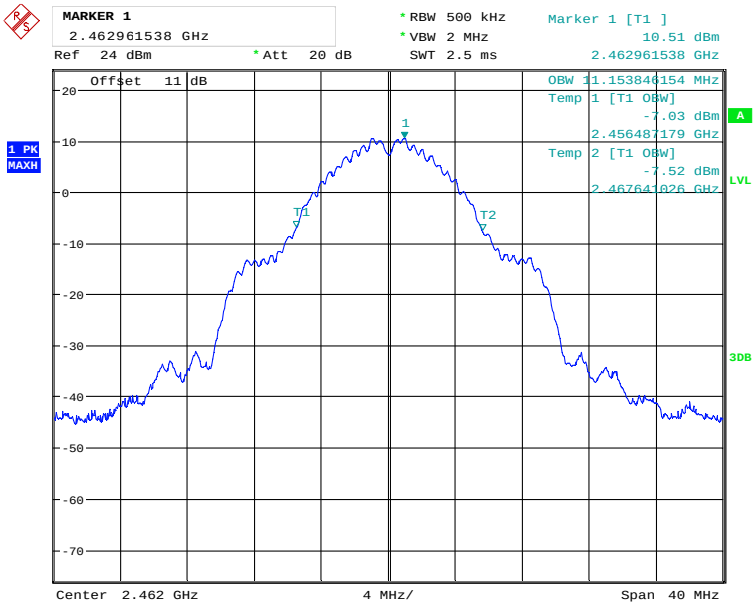
Date: 29.JUN.2015 16:26:15

802.11b - 2437 MHz



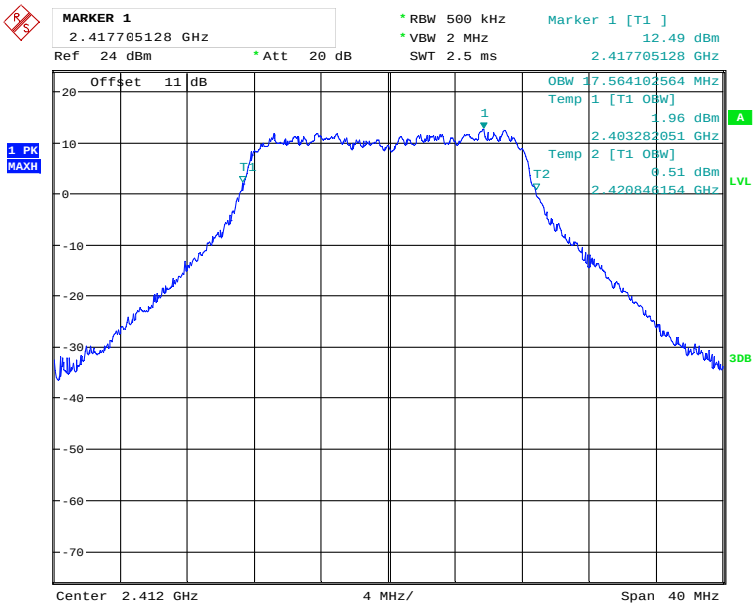
Date: 29.JUN.2015 16:27:01

802.11b - 2462 MHz



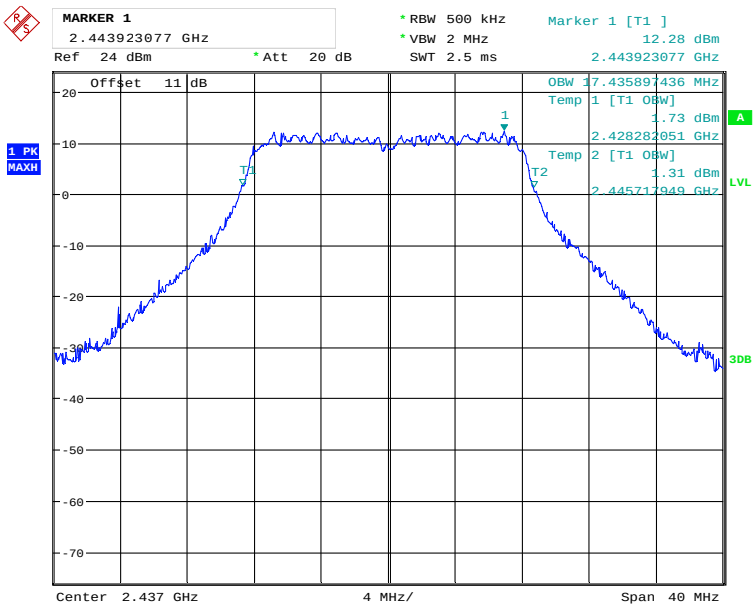
Date: 29.JUN.2015 16:27:31

802.11g - 2412 MHz



Date: 29.JUN.2015 16:28:12

802.11g - 2437 MHz



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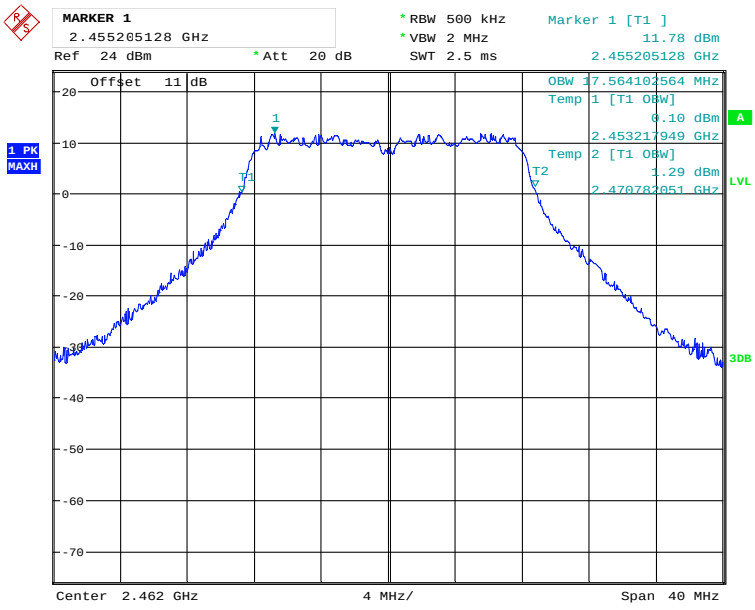
802.11g - 2462 MHz



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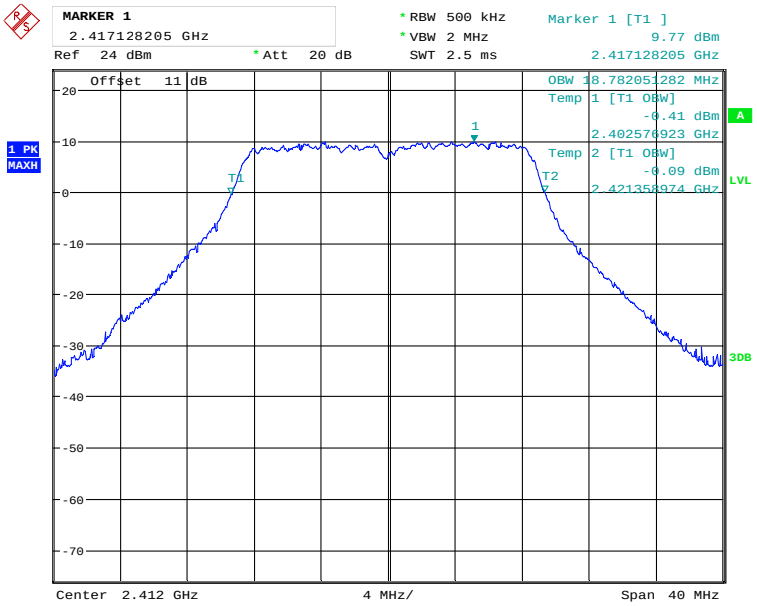
802.11n20 - 2412 MHz



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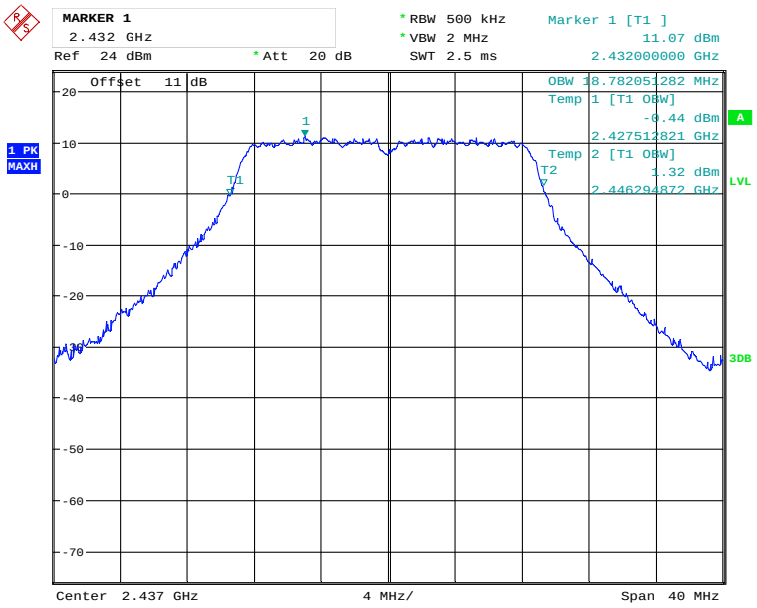
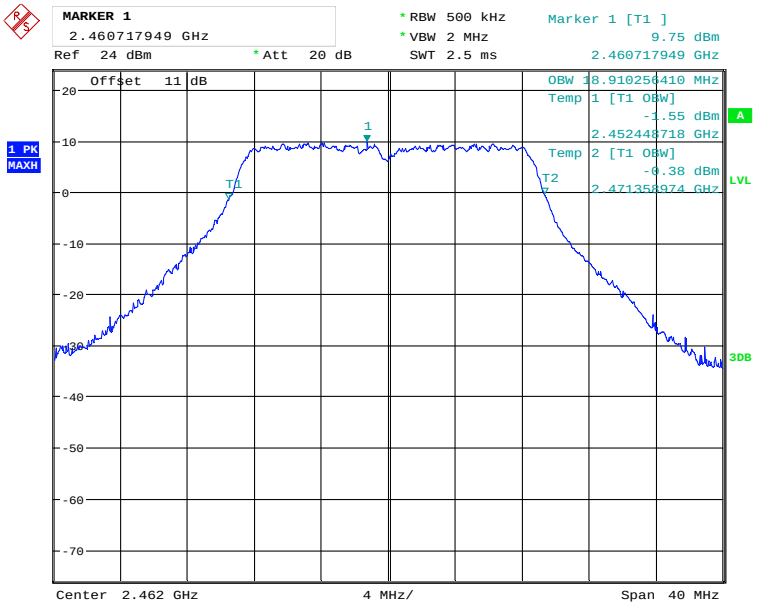
802.11n20 - 2437 MHz



Date: 29.JUN.2015 16:30:50

802.11n20 - 2462 MHz



Date: 29.JUN.2015 16:31:31

9 FCC §15.247(b) & IC RSS-247 §5.4 - Output Power Measurement

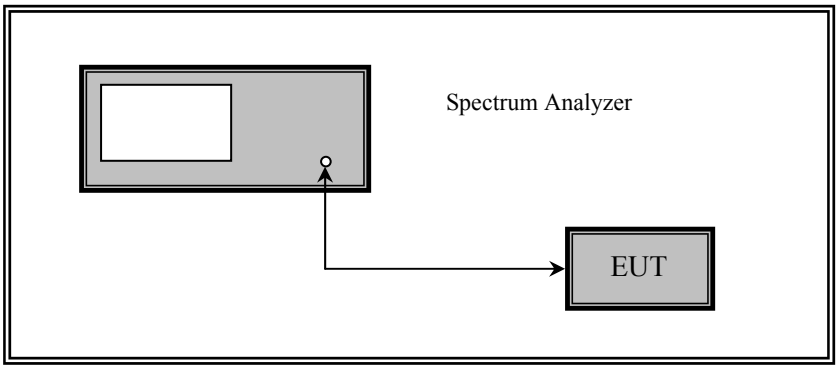
9.1 Applicable Standards

According to FCC §15.247(b) for systems using digital modulation in the 902~928 MHz, 2400~2483.5 MHz, and 5725~5850 MHz bands: 1 Watt.

According to IC RSS-247 §5.4 (4), for DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. Except as provided in Section 5.4(5), the e.i.r.p. shall not exceed 4 W.

9.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v03r03: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 9: Fundamental emission output power



9.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	Spectrum Analyzer	FSQ	1155.5001.26	2015-03-09	1 year
-	SMA Cable	-	C0001	Each Time[1]	N/A
-	Attenuator	BW-S10W5	1419	Each Time[1]	N/A

Note[1]: cable and attenuator included in the test set-up will be checked each time before testing.

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

9.4 Test Environmental Conditions

Temperature:	21-24º C
Relative Humidity:	40-44 %
ATM Pressure:	102.1-103.5 kPa

The testing was performed by Jimmy Xiao on 2015-06-29 to 2015-08-27 in RF site.

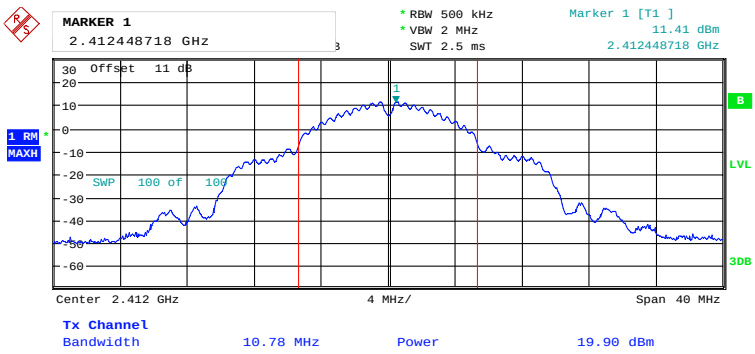
Antenna gain=2.2 dBi

Channel	Frequency (MHz)	Conducted Output Power (dBm)			Output Power Limit (dBm)	EIRP (dBm)	EIRP Limit (dBm)	Result
		Chain 0	Chain 1	Combined				
802.11b								
Low	2412	19.90	18.38	22.22	30	24.22	36	Pass
Middle	2437	19.36	18.51	21.97	30	23.97	36	Pass
High	2462	19.78	18.21	22.08	30	24.08	36	Pass
802.11g								
Low	2412	21.68	21.03	24.38	30	26.38	36	Pass
Middle	2437	21.54	20.95	24.27	30	26.27	36	Pass
High	2462	21.55	20.59	24.11	30	26.11	36	Pass
802.11n20								
Low	2412	21.08	19.84	23.51	30	25.51	36	Pass
Middle	2437	21.32	20.90	24.13	30	26.13	36	Pass
High	2462	20.77	19.72	23.29	30	25.29	36	Pass

Note: EIRP=Conducted output power + Antenna gain

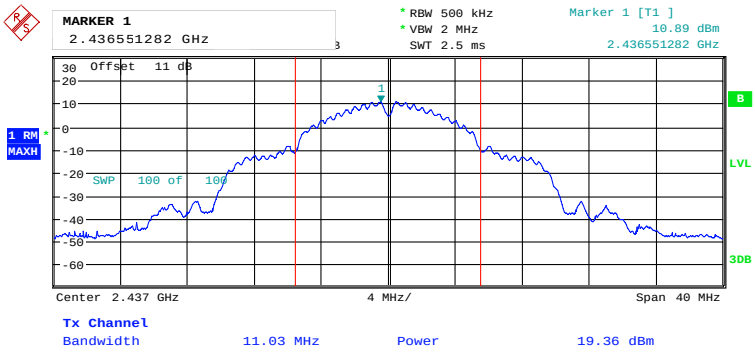
Chain 0 Port:

802.11b-2412 MHz



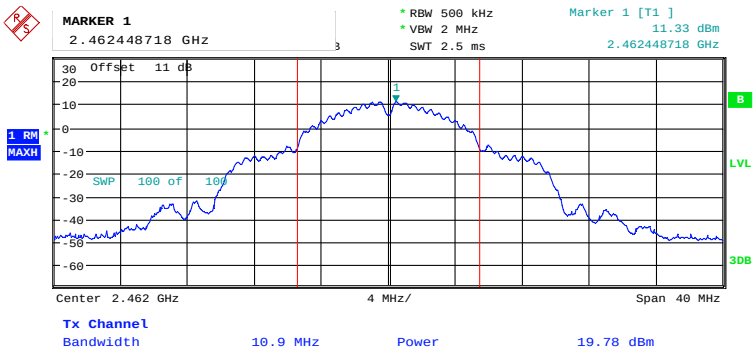
Date: 29.JUN.2015 15:40:37

802.11b-2437 MHz



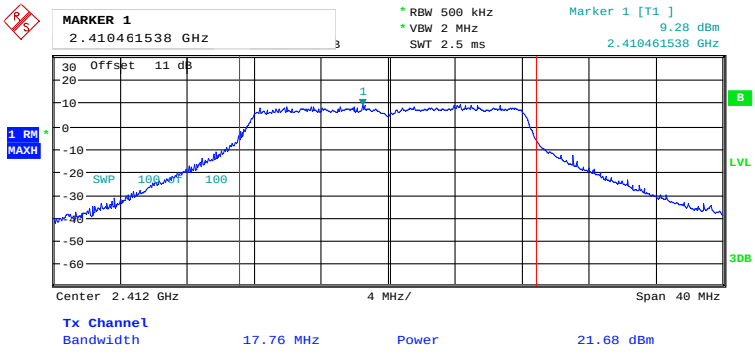
Date: 29.JUN.2015 15:42:18

802.11b-2462 MHz



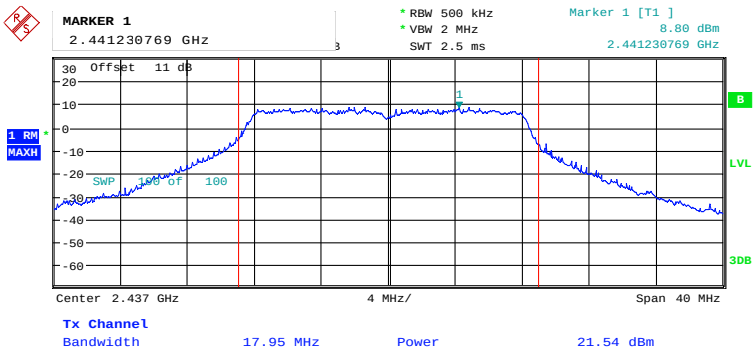
Date: 29.JUN.2015 15:43:14

802.11g-2412 MHz



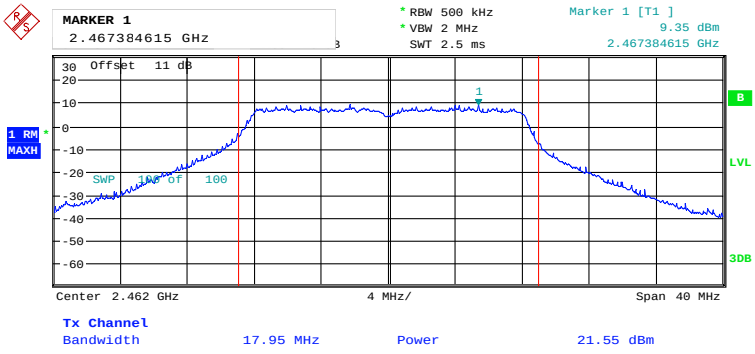
Date: 29.JUN.2015 15:48:07

802.11g-2437 MHz



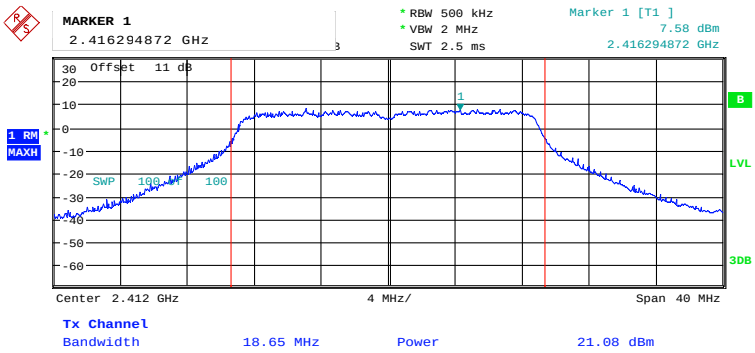
Date: 29.JUN.2015 15:49:44

802.11g-2462 MHz



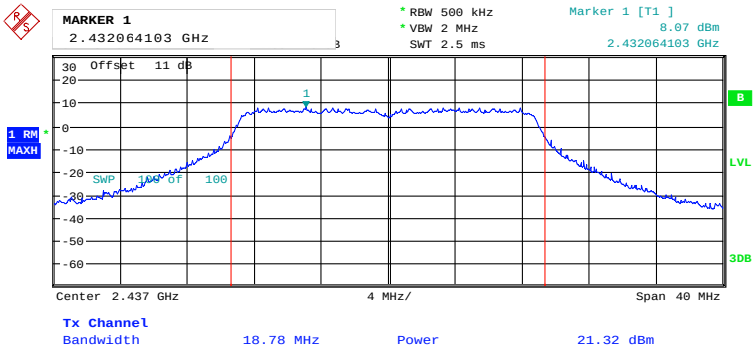
Date: 29.JUN.2015 15:50:53

802.11n20-2412 MHz



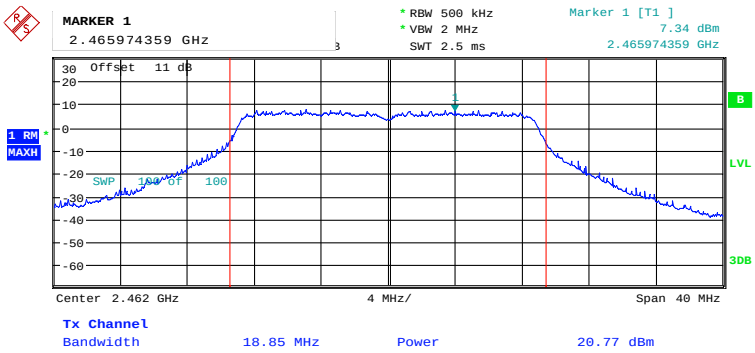
Date: 29.JUN.2015 15:52:35

802.11n20-2437 MHz



Date: 29.JUN.2015 15:54:22

802.11n20-2462 MHz



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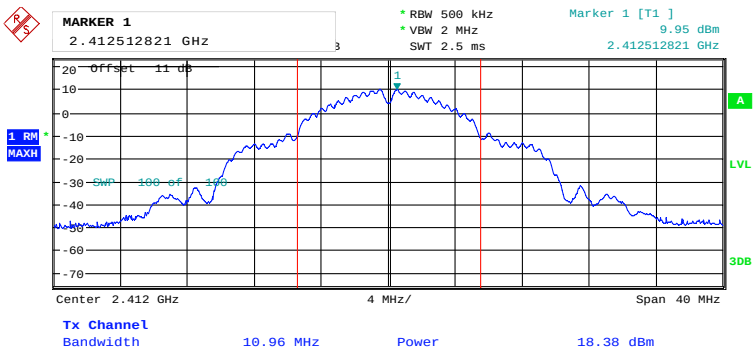
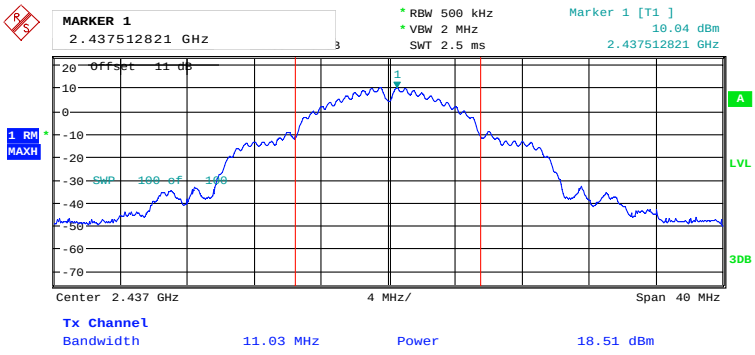
Chain 1 Port:

802.11b-2412 MHz



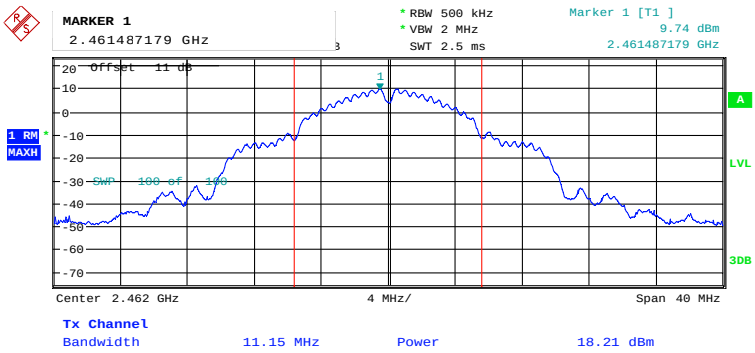
Date: 29.JUN.2015 16:48:19

802.11b-2437 MHz



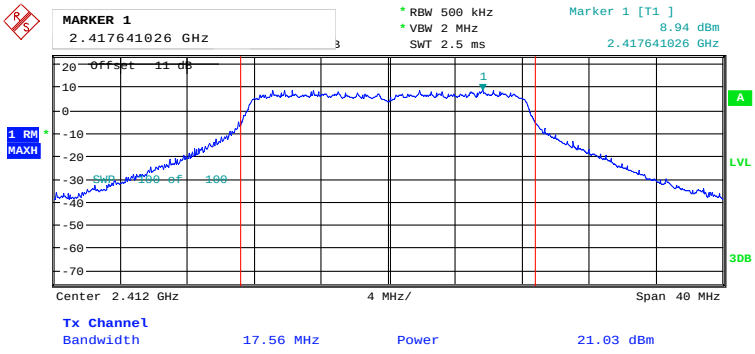
Date: 29.JUN.2015 16:49:30

802.11b-2462 MHz



Date: 29.JUN.2015 16:50:18

802.11g-2412 MHz



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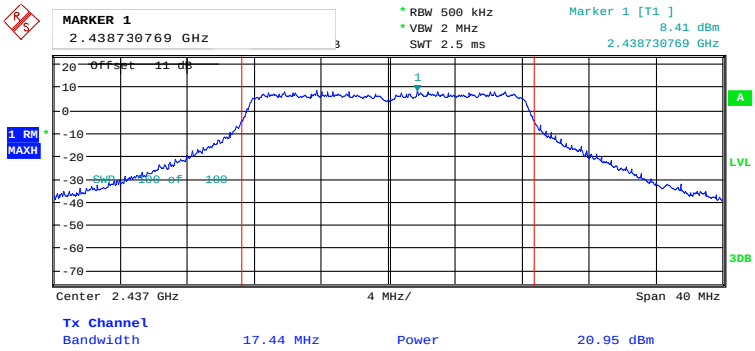
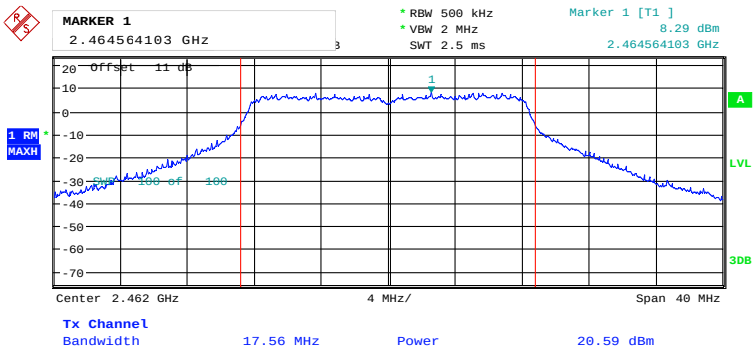
802.11g-2437 MHz



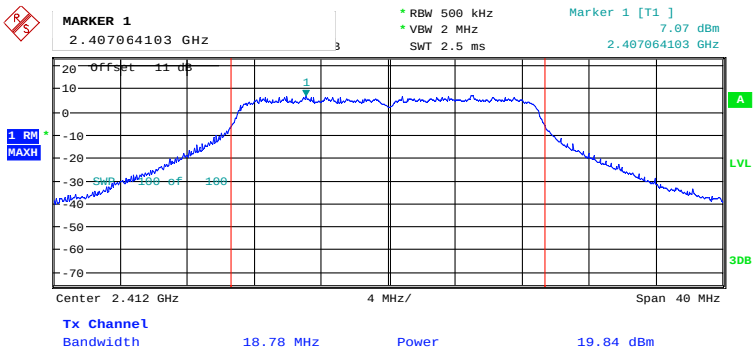
Date: 29.JUN.2015 16:52:33

802.11g-2462 MHz



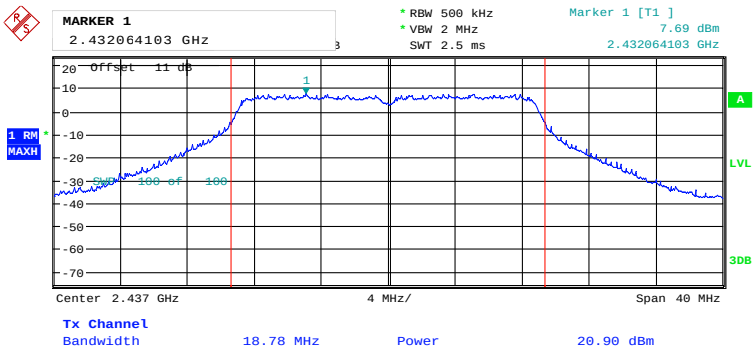
Date: 29.JUN.2015 16:53:18

802.11n20-2412 MHz



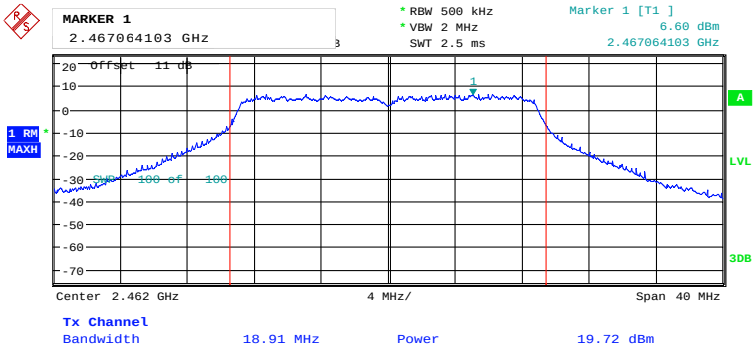
Date: 29.JUN.2015 16:54:57

802.11n20-2437 MHz



Date: 29.JUN.2015 16:56:40

802.11n20-2462 MHz



Date: 29.JUN.2015 16:58:02

Antenna gain=6.5 dBi

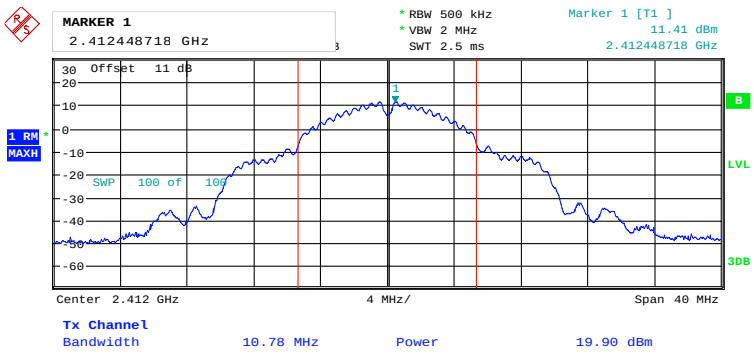
Channel	Frequency (MHz)	Conducted Output Power (dBm)			Output Power Limit (dBm)	EIRP (dBm)	EIRP Limit (dBm)	Result
		Chain 0	Chain 1	Combined				
802.11b								
Low	2412	19.90	18.38	22.22	26.49	28.72	36	Pass
Middle	2437	19.36	18.51	21.97	26.49	28.47	36	Pass
High	2462	19.78	18.21	22.08	26.49	28.58	36	Pass
802.11g								
Low	2412	19.19	17.90	21.60	26.49	28.10	36	Pass
Middle	2437	21.54	20.95	24.27	26.49	30.77	36	Pass
High	2462	19.09	17.79	21.50	26.49	28.00	36	Pass
802.11n20								
Low	2412	17.81	16.60	20.26	26.49	26.76	36	Pass
Middle	2437	21.32	20.90	24.13	26.49	30.63	36	Pass
High	2462	17.96	16.51	20.31	26.49	26.81	36	Pass

Note: EIRP=Conducted output power + Antenna gain
Directional gain=6.5dBi + 10lg2=9.51dBi
Per FCC/IC, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

So the conducted output power limit = 30 dBm - (9.51 dBi – 6 dBi) = 26.49 dBm

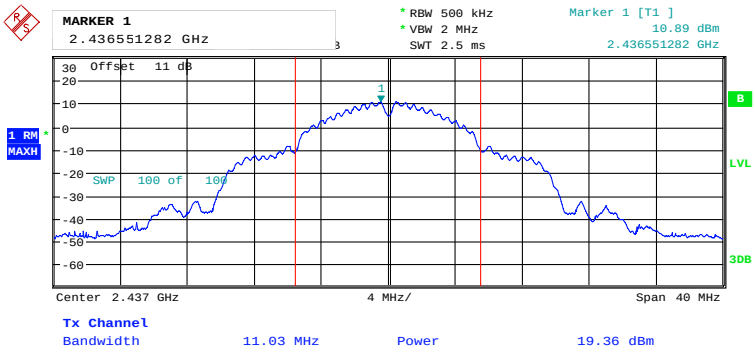
Chain 0 Port:

802.11b-2412 MHz



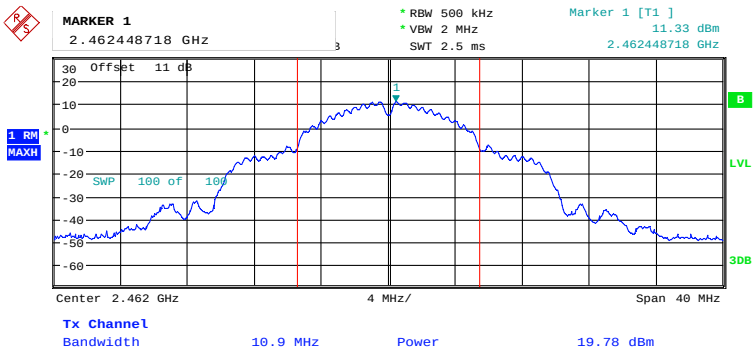
Date: 29.JUN.2015 15:40:37

802.11b-2437 MHz



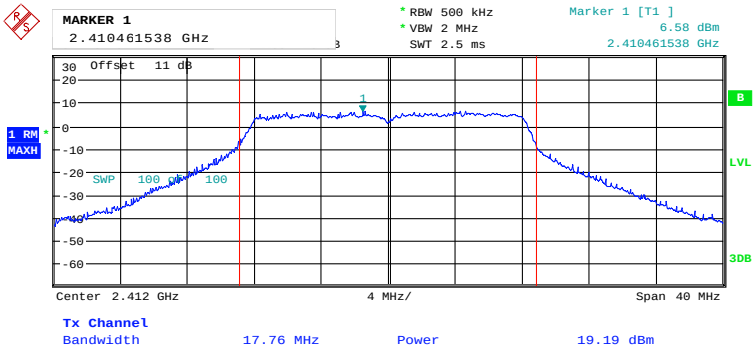
Date: 29.JUN.2015 15:42:18

802.11b-2462 MHz



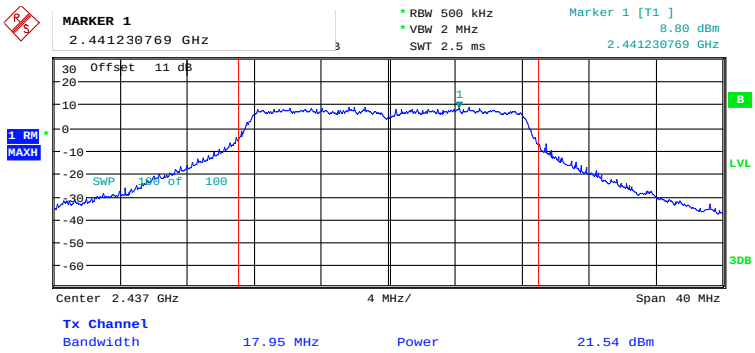
Date: 29.JUN.2015 15:43:14

802.11g-2412 MHz



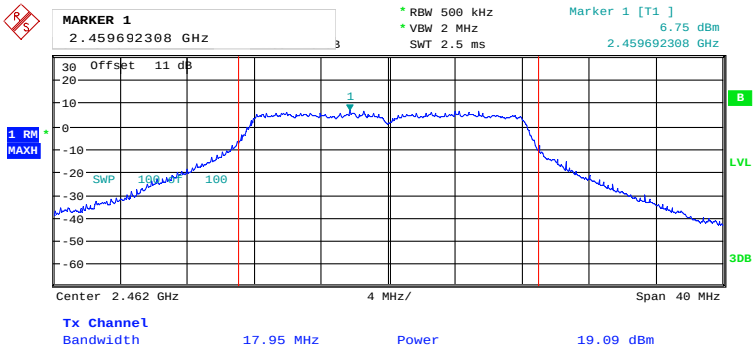
Date: 29.JUN.2015 16:02:34

802.11g-2437 MHz



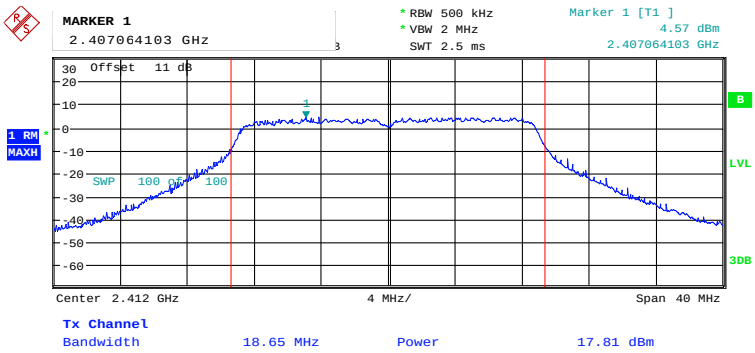
Date: 29.JUN.2015 15:49:44

802.11g-2462 MHz



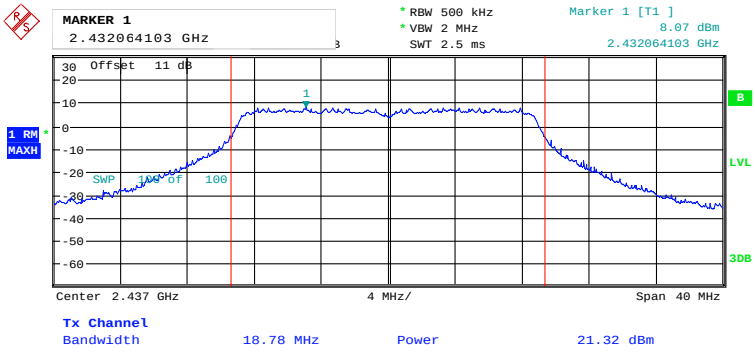
Date: 29.JUN.2015 16:03:45

802.11n20-2412 MHz



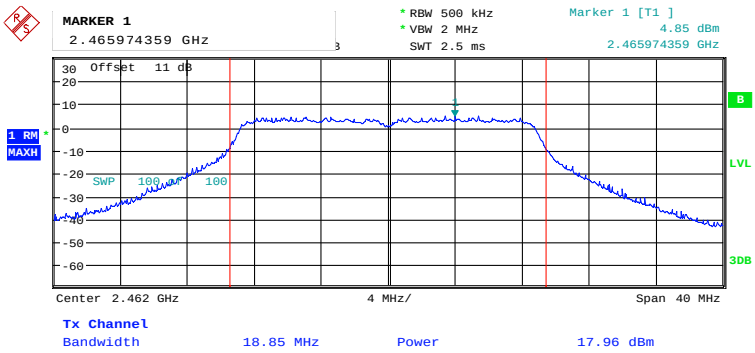
Date: 29.JUN.2015 16:04:58

802.11n20-2437 MHz



Date: 29.JUN.2015 15:54:22

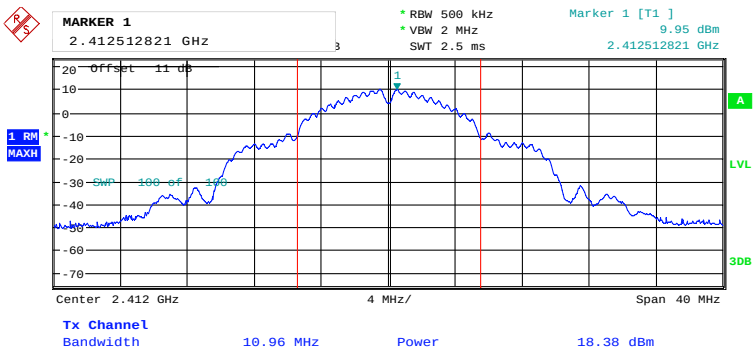
802.11n20-2462 MHz



Date: 29.JUN.2015 16:05:50

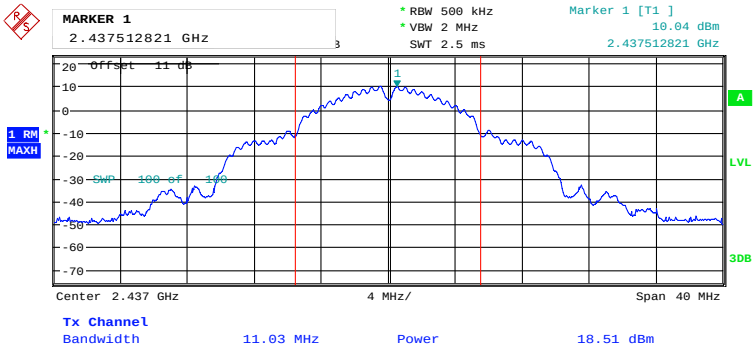
Chain 1 Port:

802.11b-2412 MHz



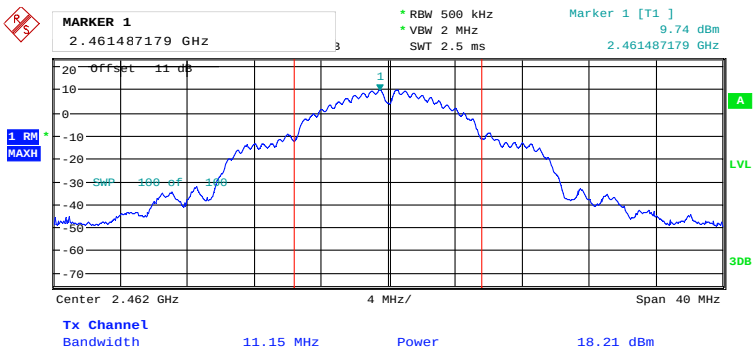
Date: 29.JUN.2015 16:48:19

802.11b-2437 MHz



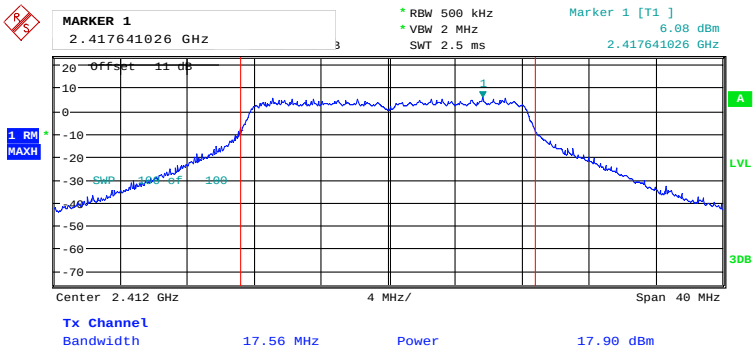
Date: 29.JUN.2015 16:49:30

802.11b-2462 MHz



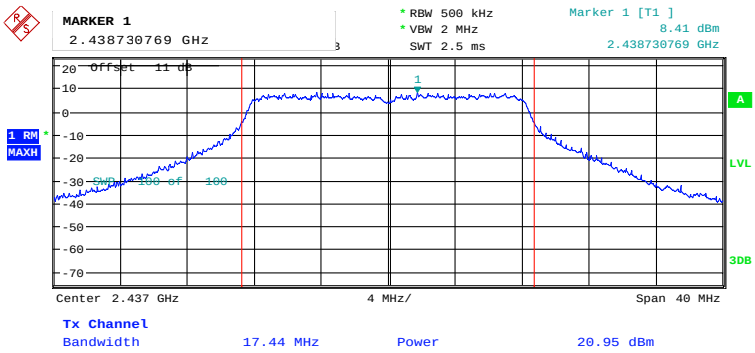
Date: 29.JUN.2015 16:50:18

802.11g-2412 MHz



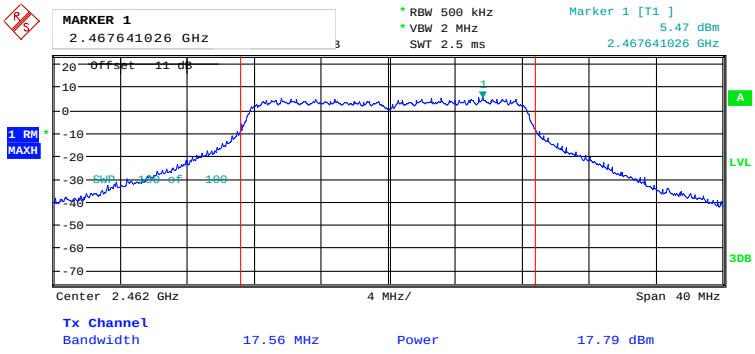
Date: 29.JUN.2015 17:01:53

802.11g-2437 MHz



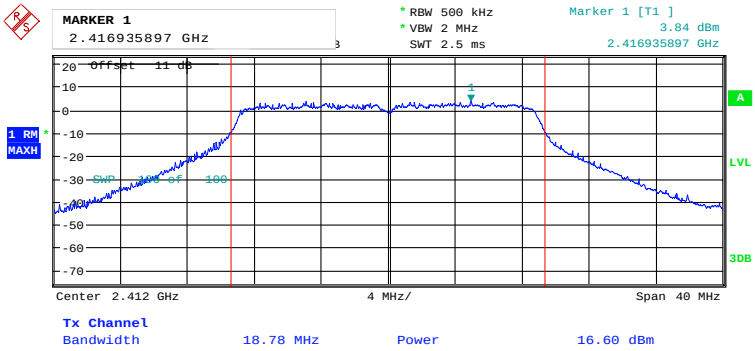
Date: 29.JUN.2015 16:52:33

802.11g-2462 MHz



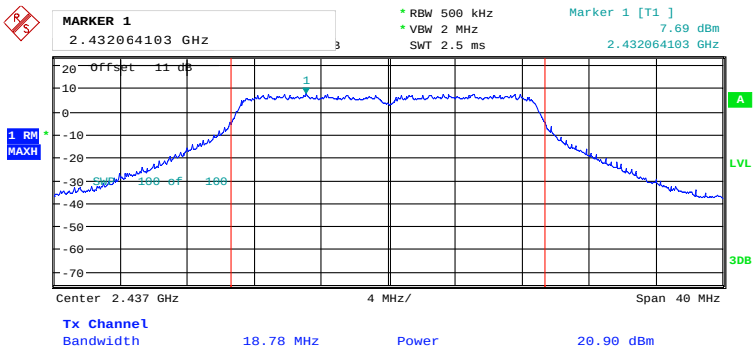
Date: 29.JUN.2015 17:02:47

802.11n20-2412 MHz



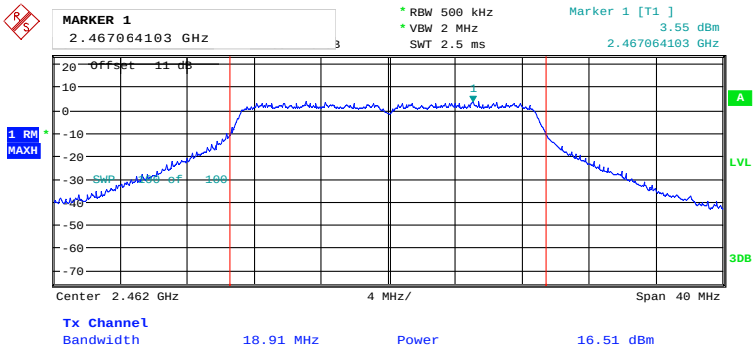
Date: 29.JUN.2015 17:03:46

802.11n20-2437 MHz



Date: 29.JUN.2015 16:56:40

802.11n20-2462 MHz



Date: 29.JUN.2015 17:04:35

Antenna gain=13 dBi

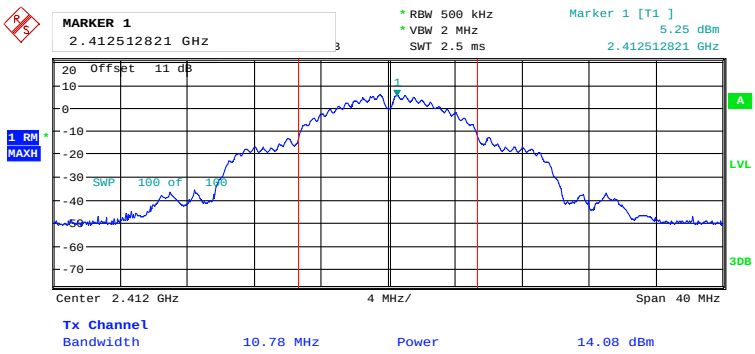
Channel	Frequency (MHz)	Conducted Output Power (dBm)			Output Power Limit (dBm)	EIRP (dBm)	EIRP Limit (dBm)	Result
		Chain 0	Chain 1	Combined				
802.11b								
Low	2412	14.08	14.56	17.34	19.99	30.34	36	Pass
Middle	2437	15.29	14.49	17.92	19.99	30.92	36	Pass
High	2462	15.23	14.11	17.72	19.99	30.72	36	Pass
802.11g								
Low	2412	14.22	12.98	16.65	19.99	29.65	36	Pass
Middle	2437	13.88	13.08	16.51	19.99	29.51	36	Pass
High	2462	14.15	12.90	16.58	19.99	29.58	36	Pass
802.11n20								
Low	2412	13.02	11.84	15.48	19.99	28.48	36	Pass
Middle	2437	13.77	13.05	16.44	19.99	29.44	36	Pass
High	2462	14.34	12.81	16.65	19.99	29.65	36	Pass

Note: EIRP=Conducted output power + Antenna gain
Directional gain=13 dBi + 10lg2=16.01dBi
Per FCC/IC, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

So the conducted output power limit = 30 dBm - (16.01 dBi – 6 dBi) = 19.99 dBm

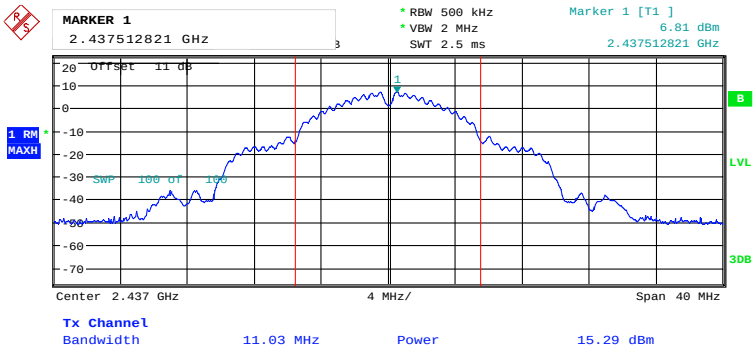
Chain 0 Port:

802.11b-2412 MHz



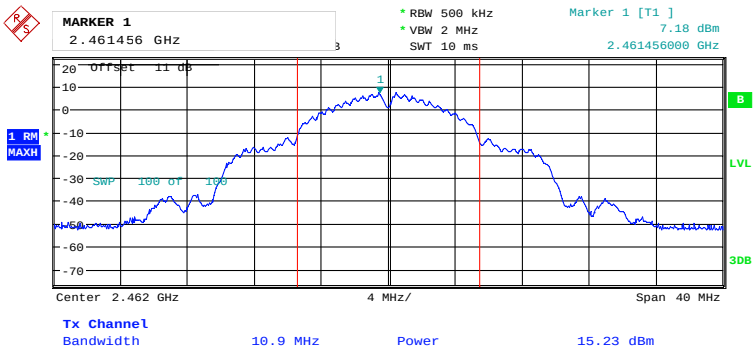
Date: 27.AUG.2015 21:20:59

802.11b-2437 MHz



Date: 7.JUL.2015 18:31:50

802.11b-2462 MHz



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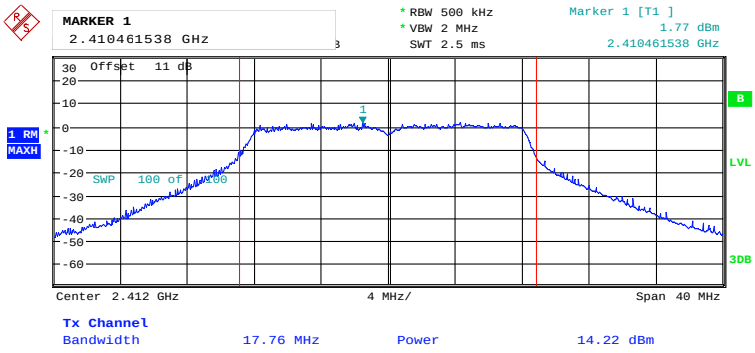
802.11g-2412 MHz



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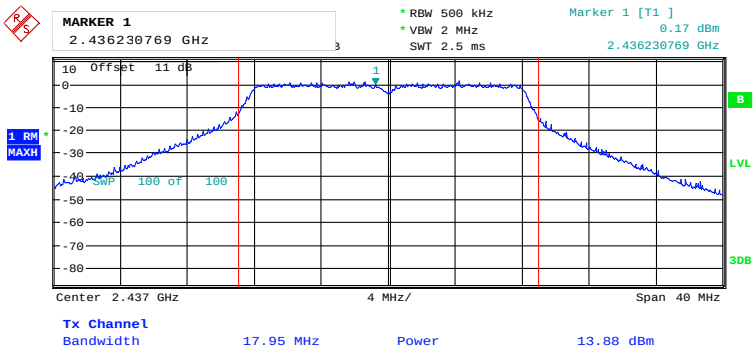
802.11g-2437 MHz



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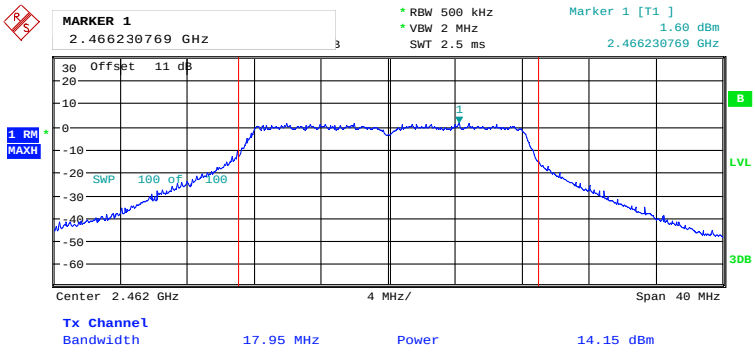
802.11g-2462 MHz



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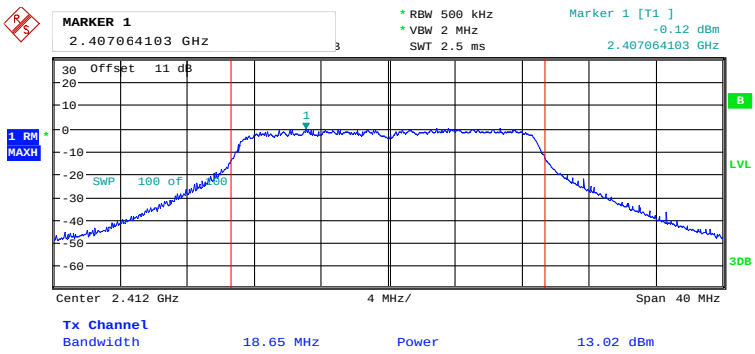
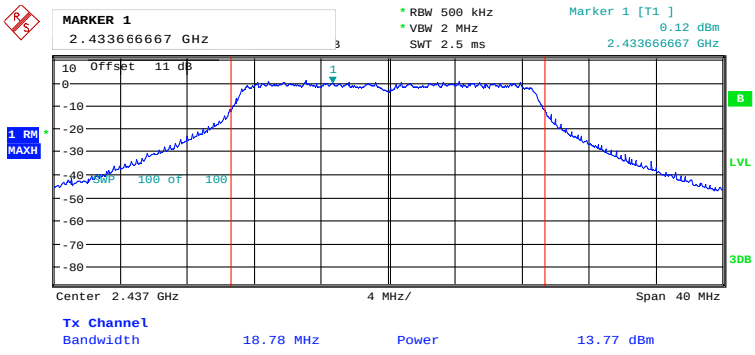
802.11n20-2412 MHz



Date: 29.JUN.2015 16:18:08

802.11n20-2437 MHz



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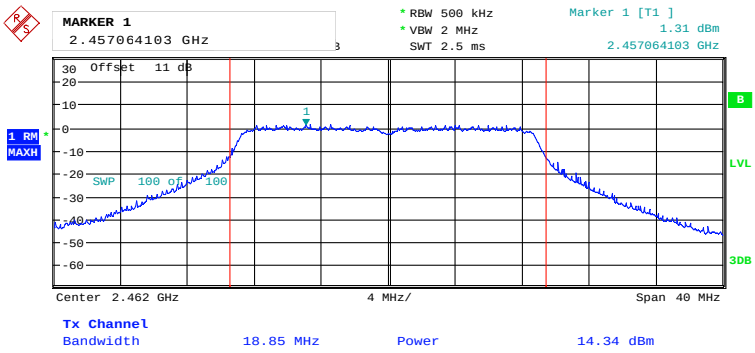
802.11n20-2462 MHz



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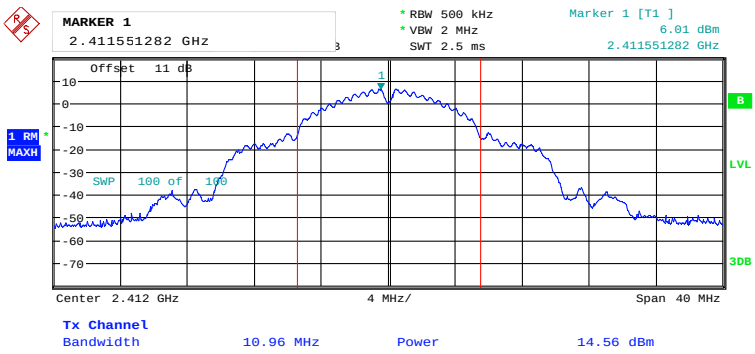
Chain 1 Port:

802.11b-2412 MHz



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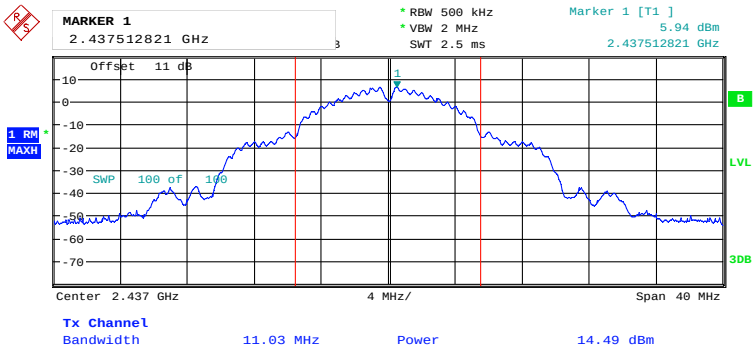
802.11b-2437 MHz



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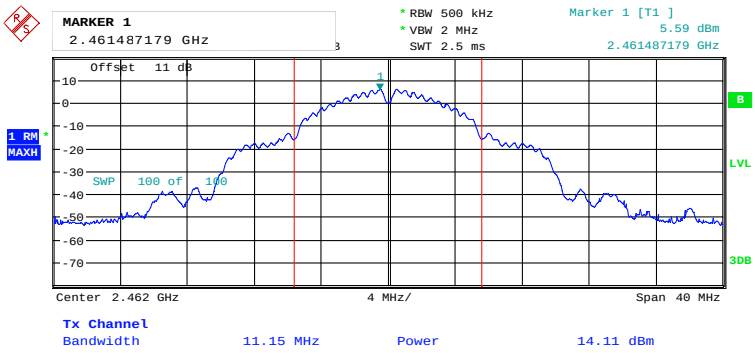
802.11b-2462 MHz



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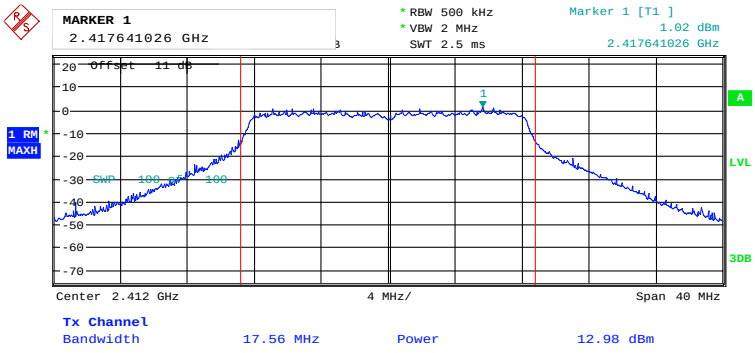
802.11g-2412 MHz



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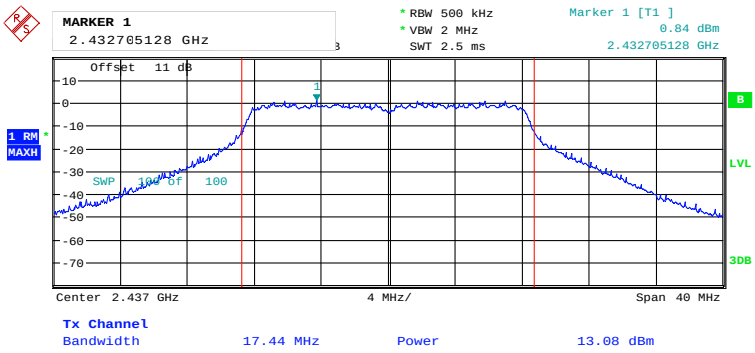
802.11g-2437 MHz



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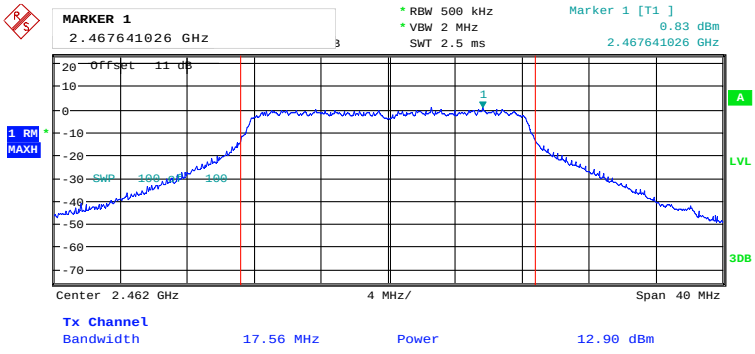
802.11g-2462 MHz



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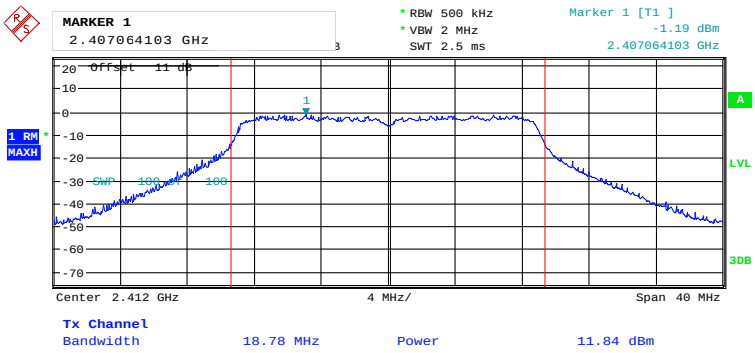
802.11n20-2412 MHz



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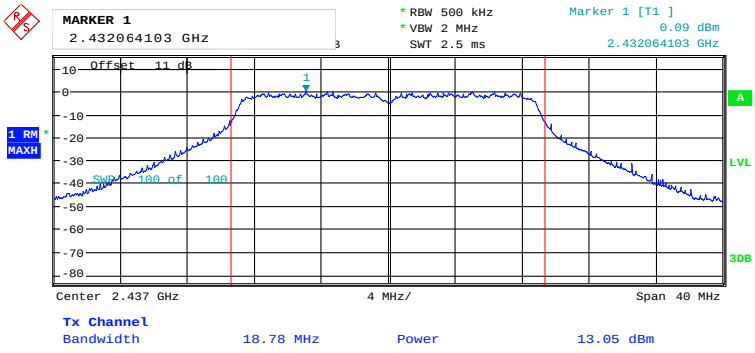
802.11n20-2437 MHz



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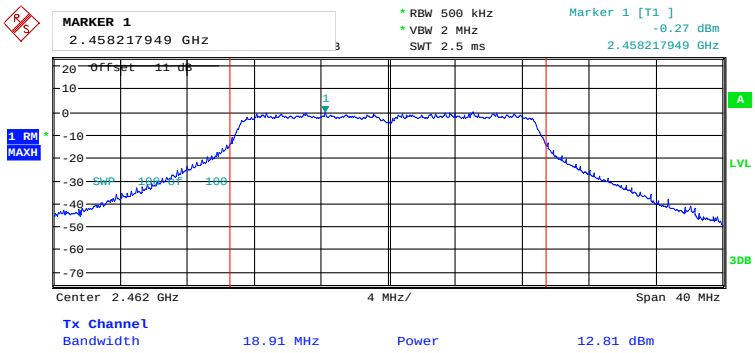
802.11n20-2462 MHz



Date: 29.JUN.2015 17:12:41

10 FCC §15.247(d) & IC RSS-247 §5.5 – Spurious Emissions at Antenna Port

10.1 Applicable Standards

According to FCC §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emissions limits specified in §15.209(a) see §15.205(c).

According to IC RSS-247 §5.5.In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

10.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v03r03: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 13: Band-edge measurements

10.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	Spectrum Analyzer	FSQ	1155.5001.26	2015-03-09	1 year
-	SMA Cable	-	C0001	Each Time[1]	N/A
-	Attenuator	BW-S10W5	1419	Each Time[1]	N/A

Note[1]: cable and attenuator included in the test set-up will be checked each time before testing.

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

10.4 Test Environmental Conditions

Temperature:	22º C
Relative Humidity:	42 %
ATM Pressure:	102.7 kPa

The testing was performed by Jimmy Xiao on 2015-06-29 in RF site.

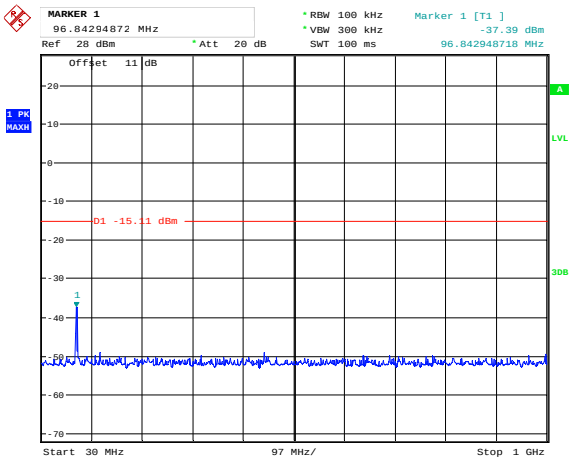
10.5 Test Results

Please refer to the following plots.

Spurious Emission at Antenna port

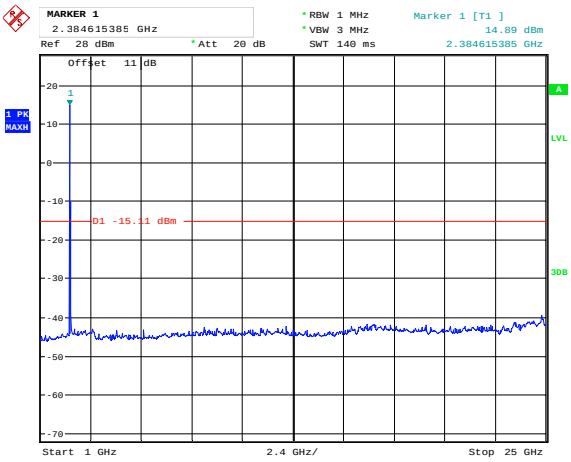
Chain 0 Port

802.11b-2412MHz (30MHz-1GHz)



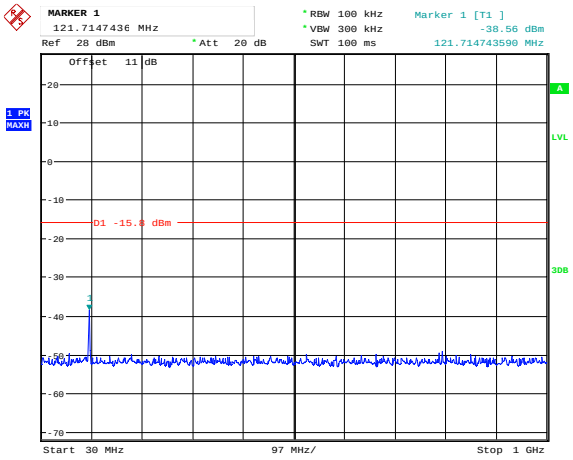
Date: 29.JUN.2015 21:08:38

802.11b-2412MHz (1-25GHz)



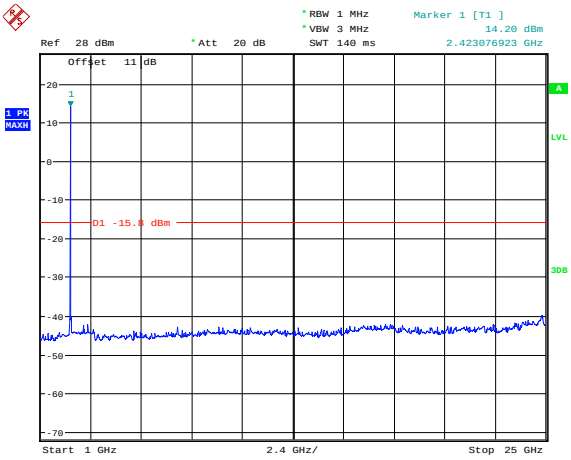
Date: 29.JUN.2015 21:07:21

802.11b-2437MHz (30MHz-1GHz)



Date: 29.JUN.2015 21:10:08

802.11b-2437MHz (1-25GHz)



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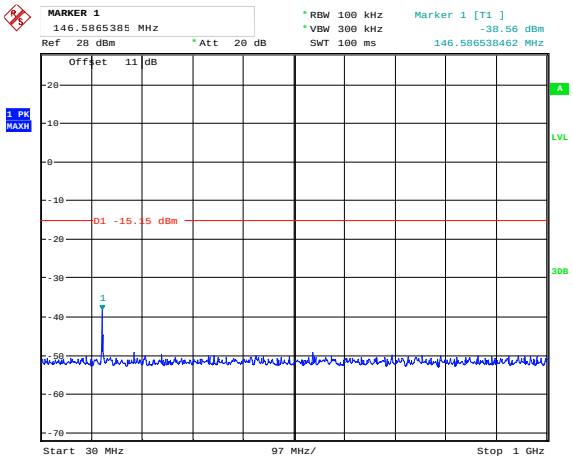
802.11b-2462MHz (30MHz-1GHz)



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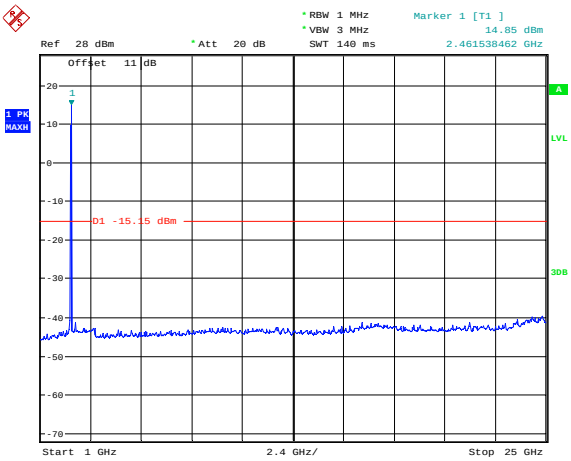
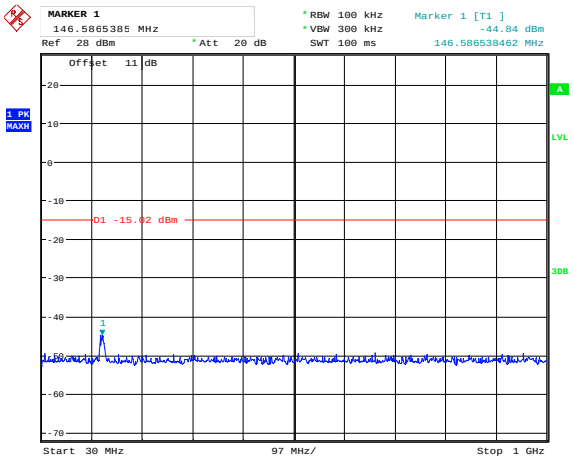
802.11b-2462MHz (1-25GHz)



Date: 29.JUN.2015 21:11:55

802.11g-2412MHz (30MHz-1GHz)



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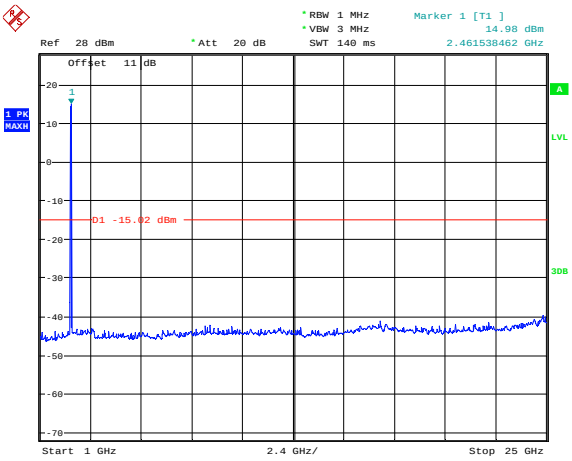
802.11g-2412MHz (1-25GHz)



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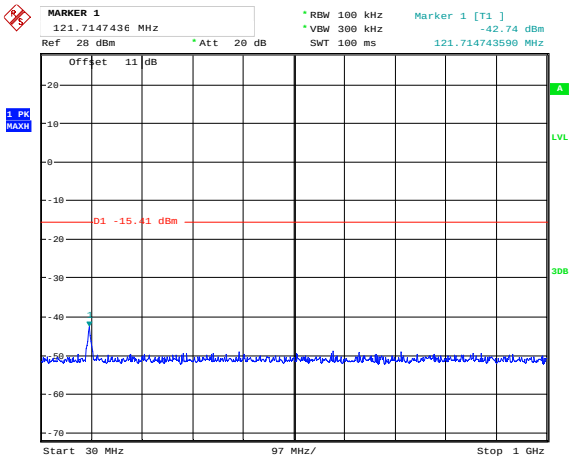
802.11g-2437MHz (30MHz-1GHz)



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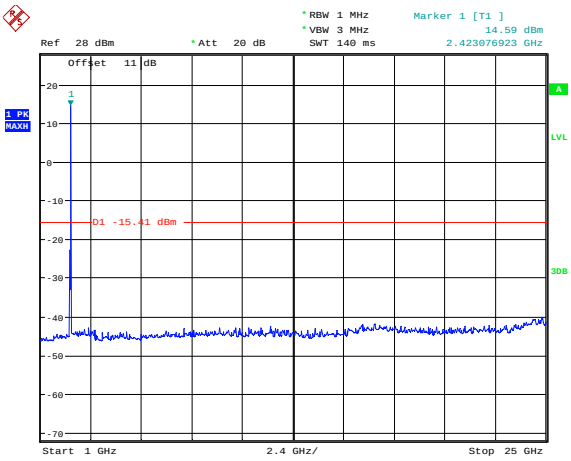
802.11g-2437MHz (1-25GHz)



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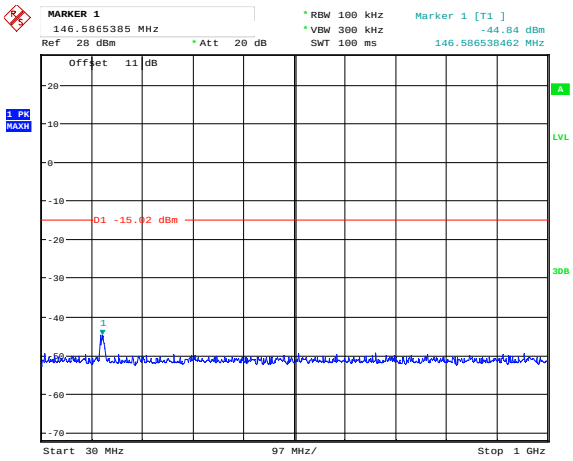
802.11g-2462MHz (30MHz-1GHz)



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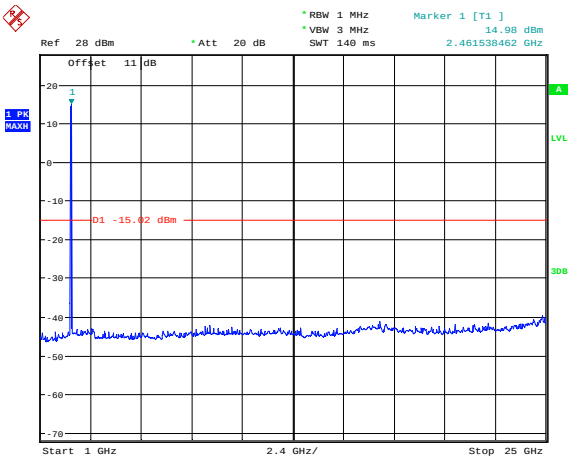
802.11g-2462MHz (1-25GHz)



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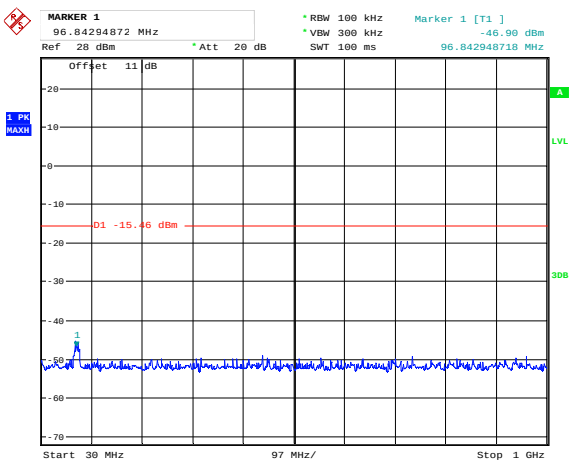
802.11n20-2412MHz (30MHz-1GHz)



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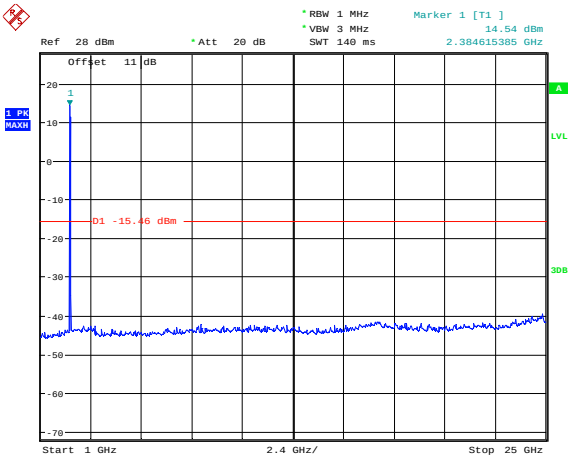
802.11n20-2412MHz (1-25GHz)



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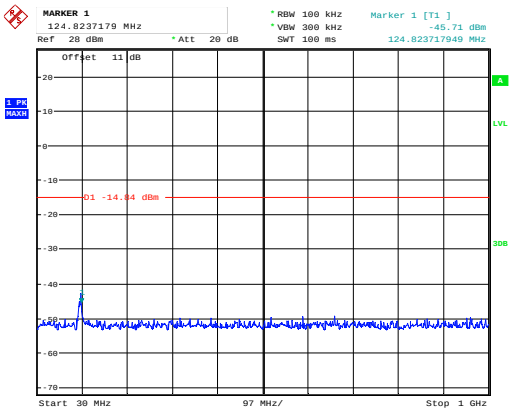
802.11n20-2437MHz (30MHz-1GHz)



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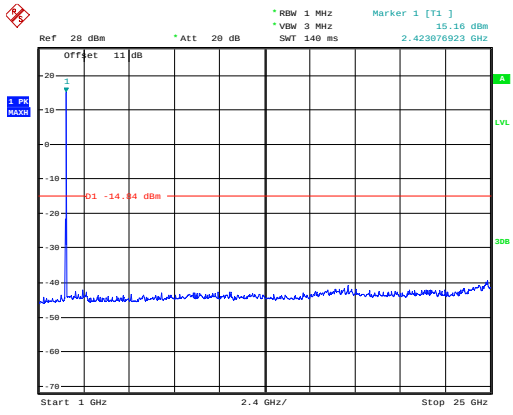
802.11n20-2437MHz (1-25GHz)



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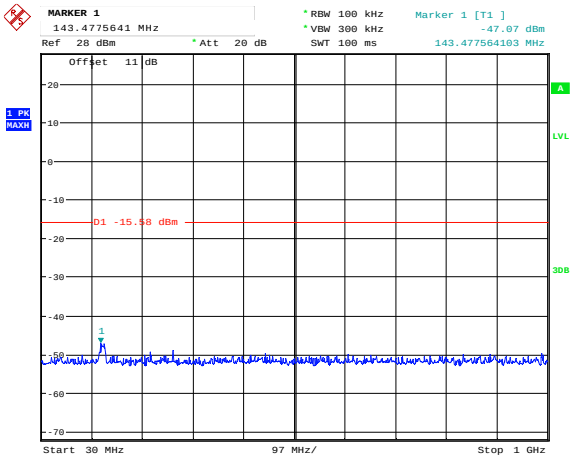
802.11n20-2462MHz (30MHz-1GHz)



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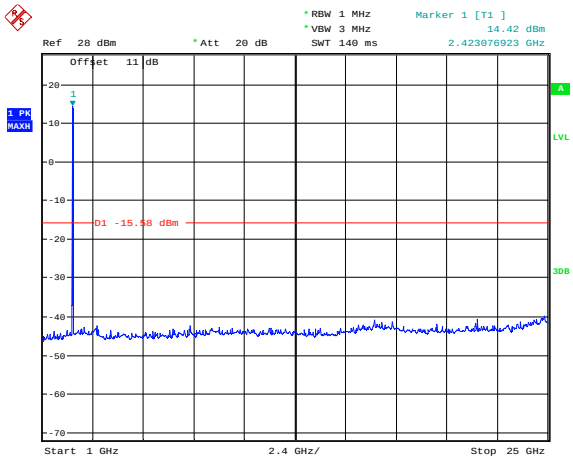
802.11n20-2462MHz (1-25GHz)



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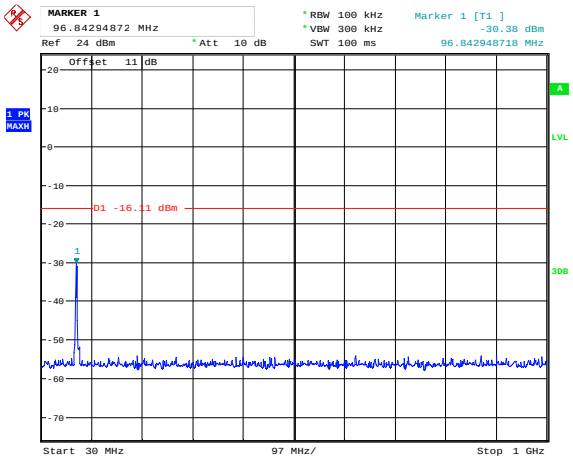
Chain 1 Port

802.11b-2412MHz (30MHz-1GHz)



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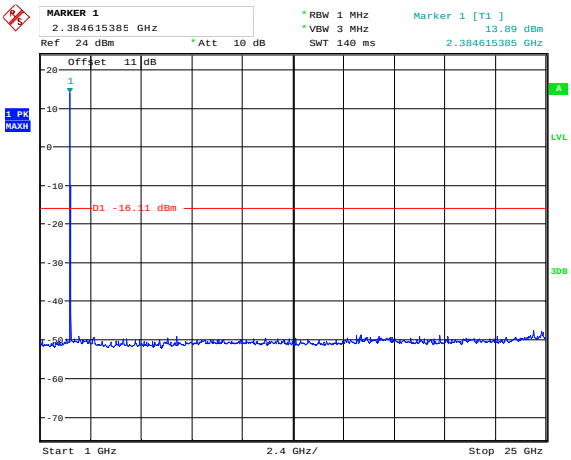
802.11b-2412MHz (1-25GHz)



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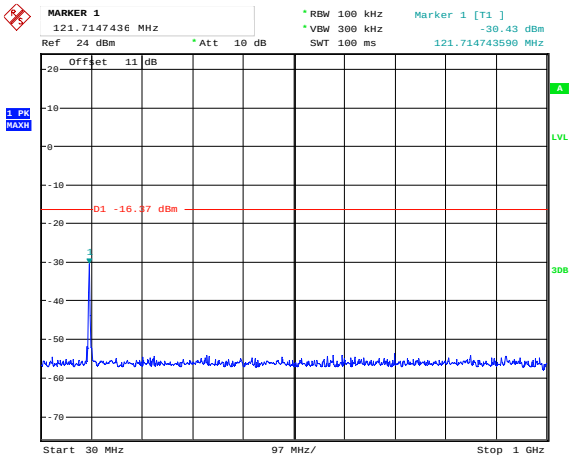
802.11b-2437MHz (30MHz-1GHz)



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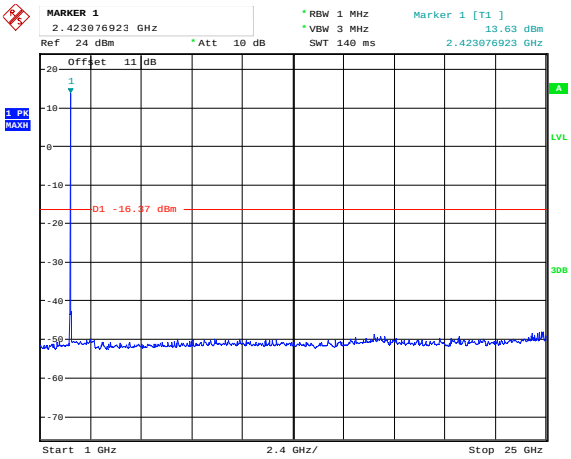
802.11b-2437MHz (1-25GHz)



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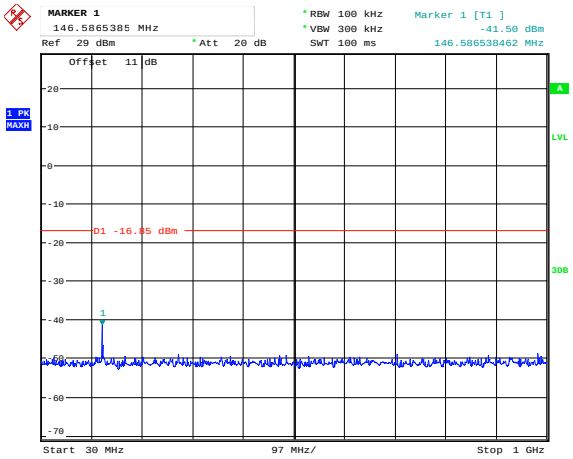
802.11b-2462MHz (30MHz-1GHz)



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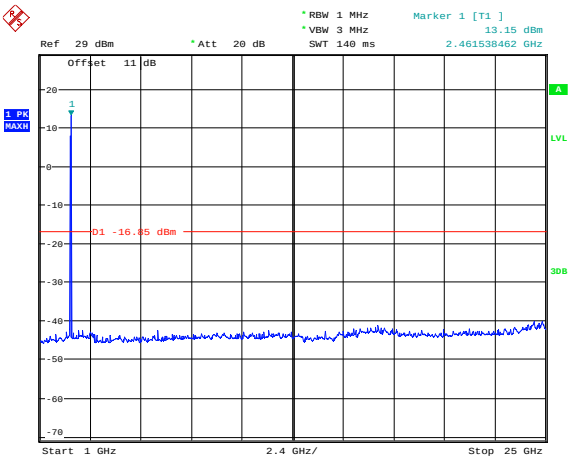
802.11b-2462MHz (1-25GHz)



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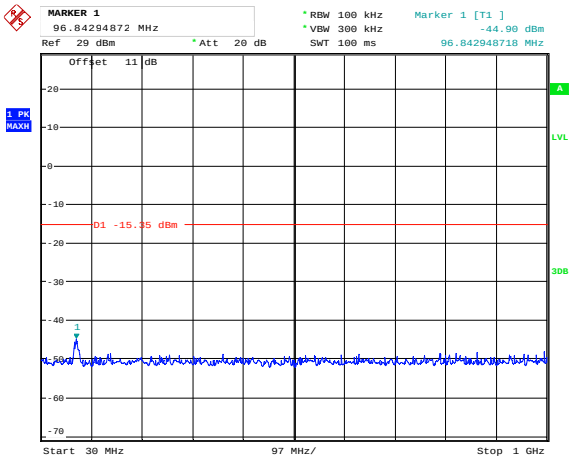
802.11g-2412MHz (30MHz-1GHz)



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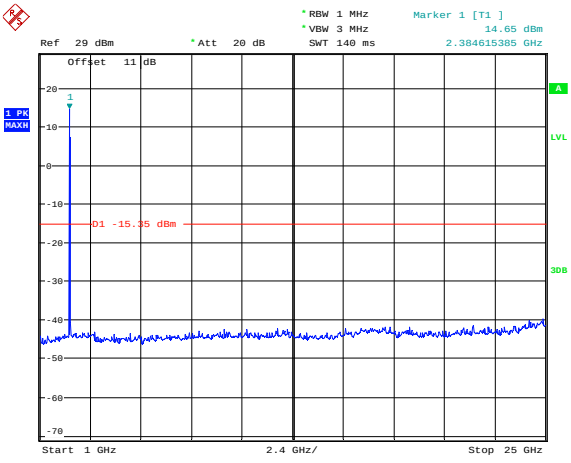
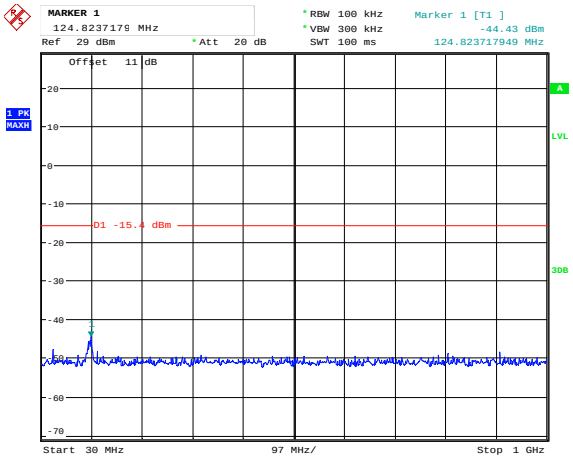
802.11g-2412MHz (1-25GHz)



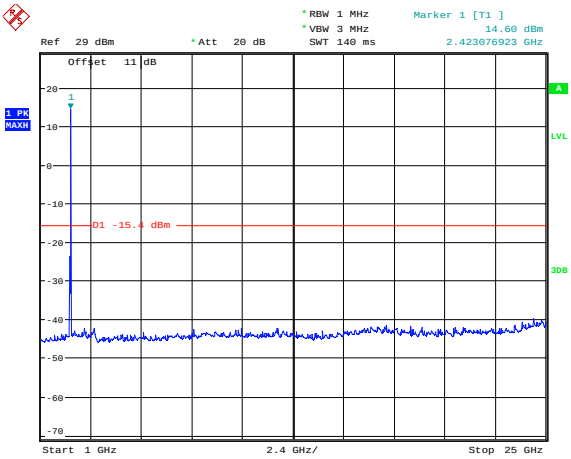
Date: 29.JUN.2015 19:31:59

802.11g-2437MHz (30MHz-1GHz)



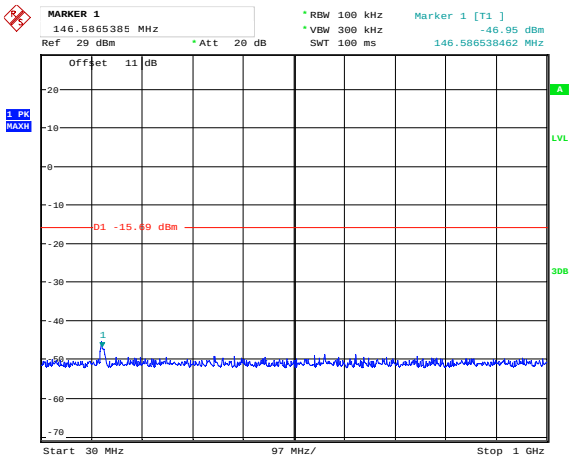
Date: 29.JUN.2015 19:34:21

802.11g-2437MHz (1-25GHz)



Date: 29.JUN.2015 19:33:44

802.11g-2462MHz (30MHz-1GHz)



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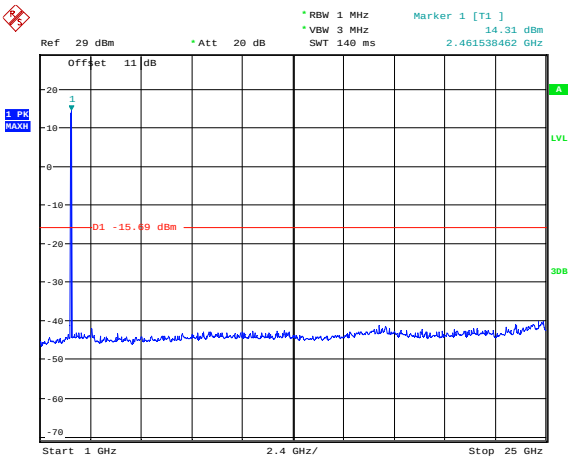
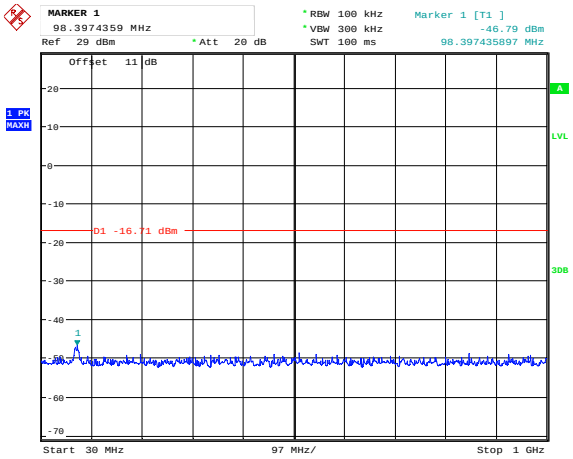
802.11g-2462MHz (1-25GHz)



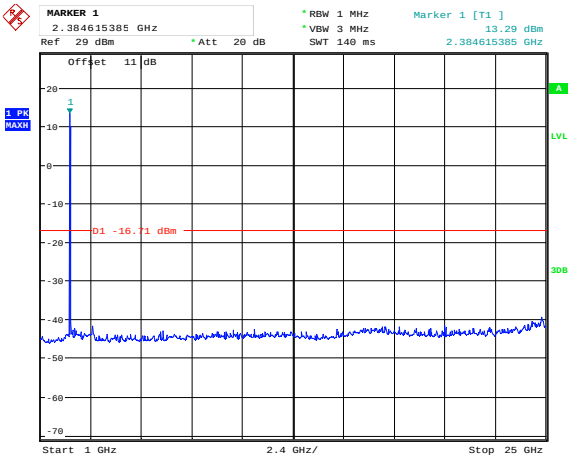
Date: 29.JUN.2015 19:35:04

802.11n20-2412MHz (30MHz-1GHz)



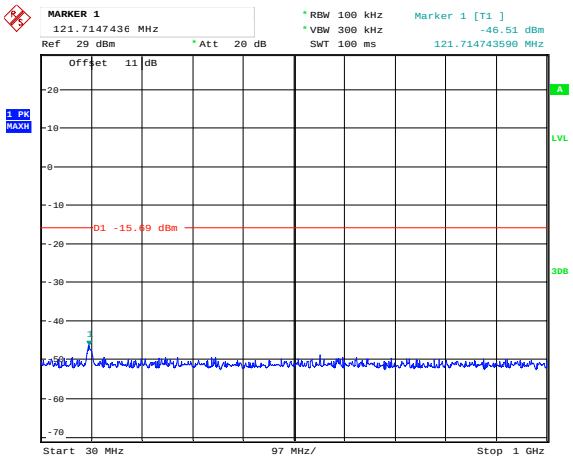
Date: 29.JUN.2015 19:43:57

802.11n20-2412MHz (1-25GHz)



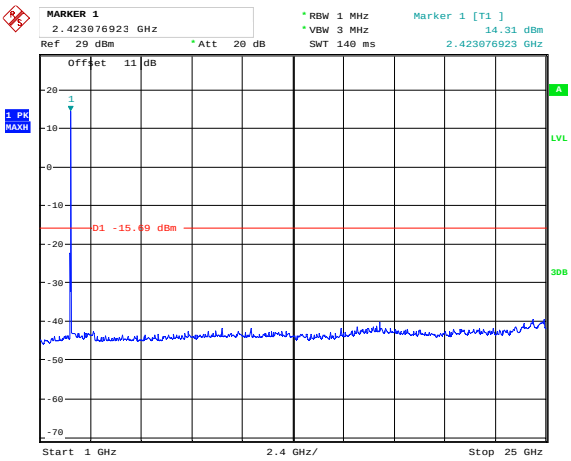
Date: 29.JUN.2015 19:36:35

802.11n20-2437MHz (30MHz-1GHz)



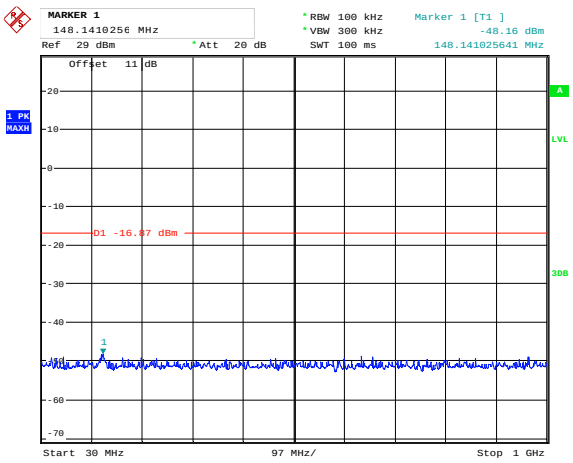
Date: 29.JUN.2015 19:39:37

802.11n20-2437MHz (1-25GHz)



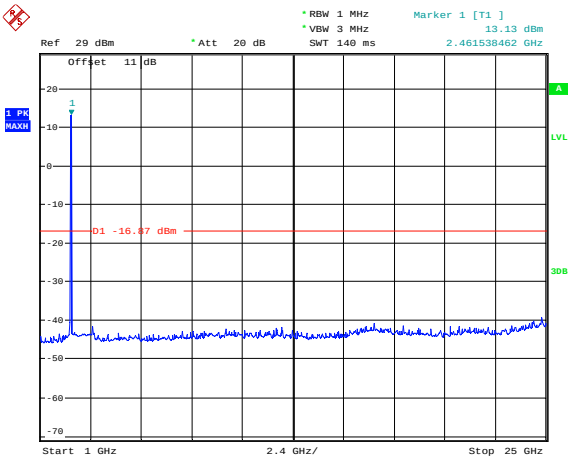
Date: 29.JUN.2015 19:39:05

802.11n20-2462MHz (30MHz-1GHz)



Date: 29.JUN.2015 19:41:21

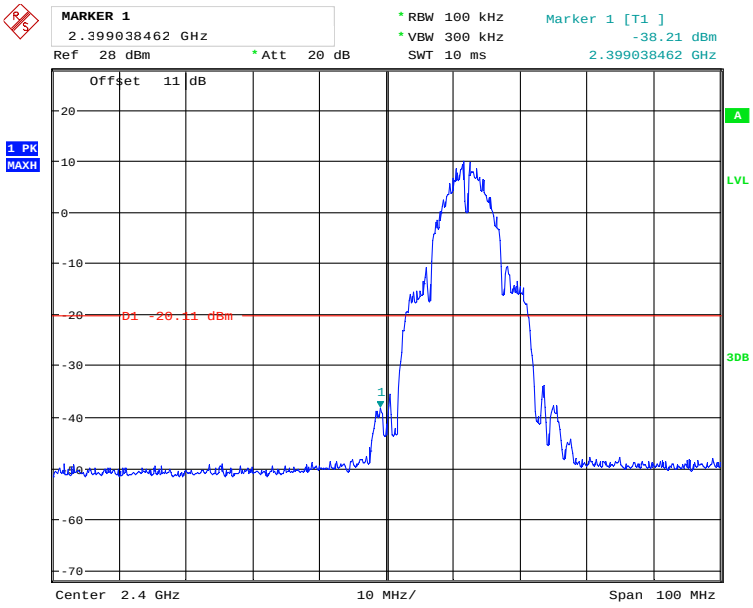
802.11n20-2462MHz (1-25GHz)



Date: 29.JUN.2015 19:40:52

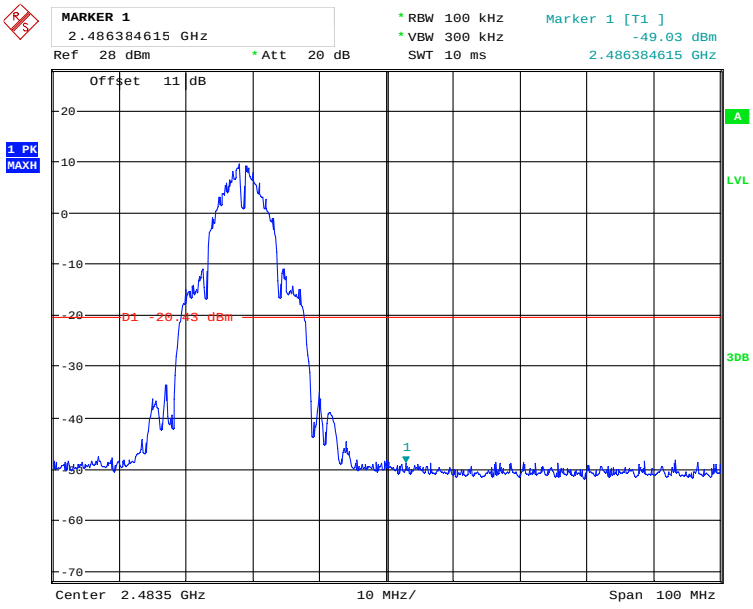
Band Edge, Chain 0 Port

802.11b - Low Band Edge



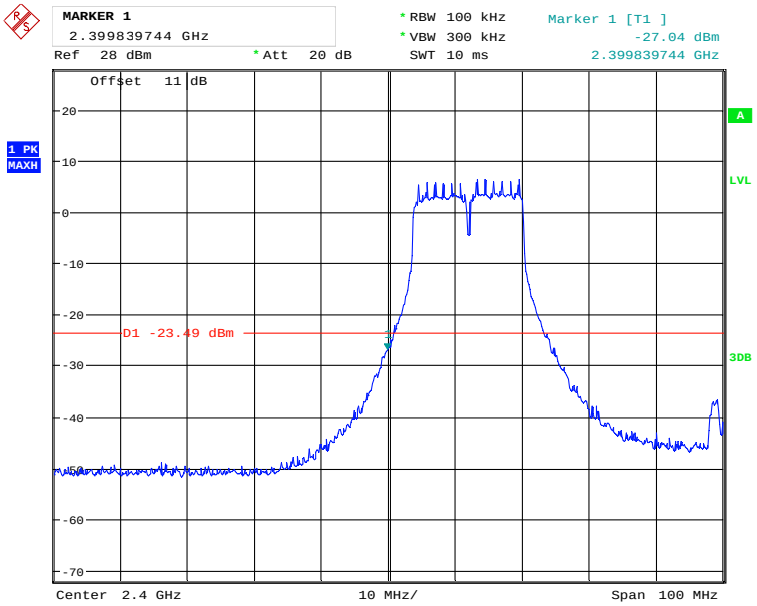
Date: 29.JUN.2015 20:59:18

802.11b - High Band Edge



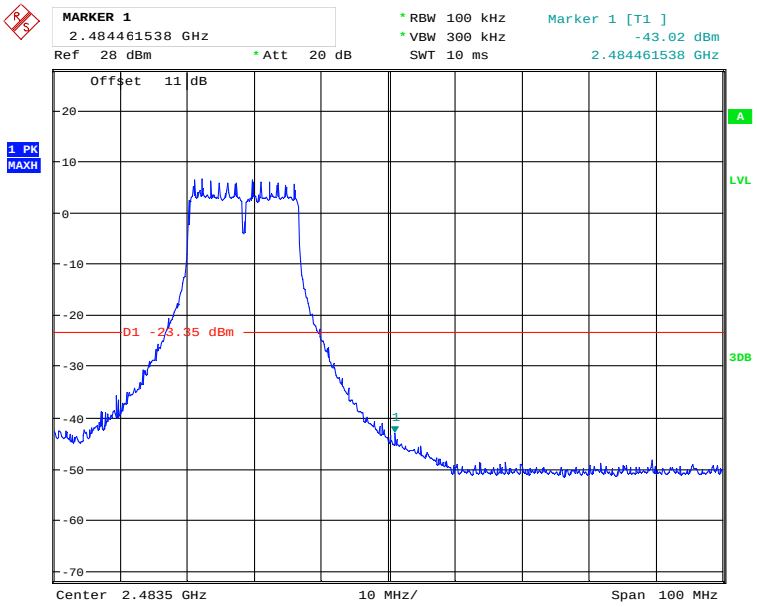
Date: 29.JUN.2015 21:00:22

802.11b - Low Band Edge



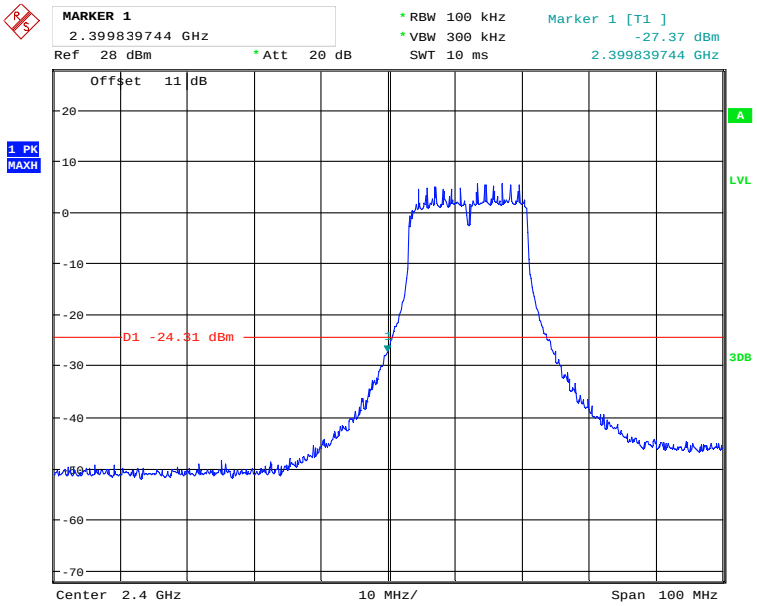
Date: 29.JUN.2015 21:01:33

802.11g - High Band Edge



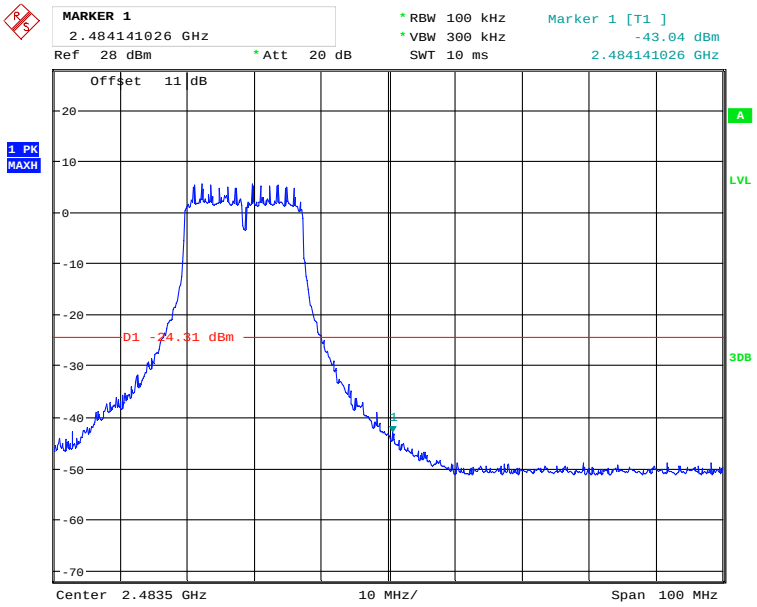
Date: 29.JUN.2015 21:02:44

802.11n20 - Low Band Edge



Date: 29.JUN.2015 21:03:57

802.11n20 - High Band Edge



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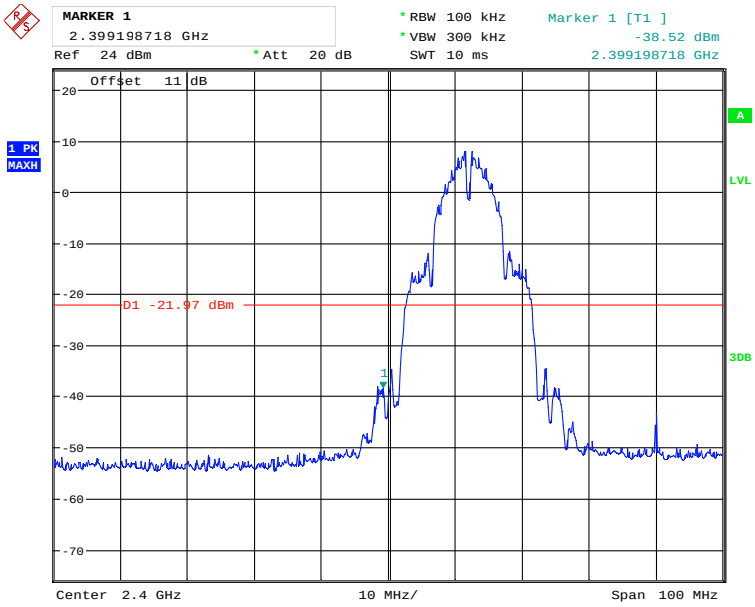
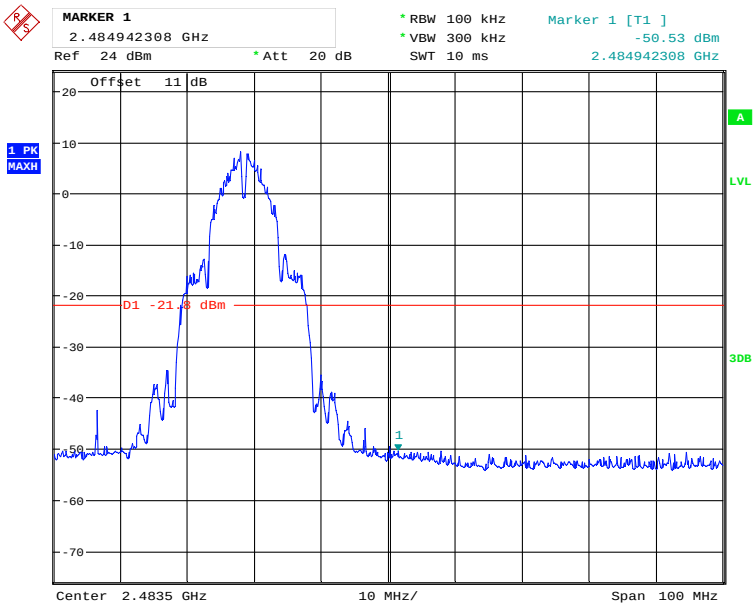
Band Edge, Chain 1 Port

802.11b - Low Band Edge



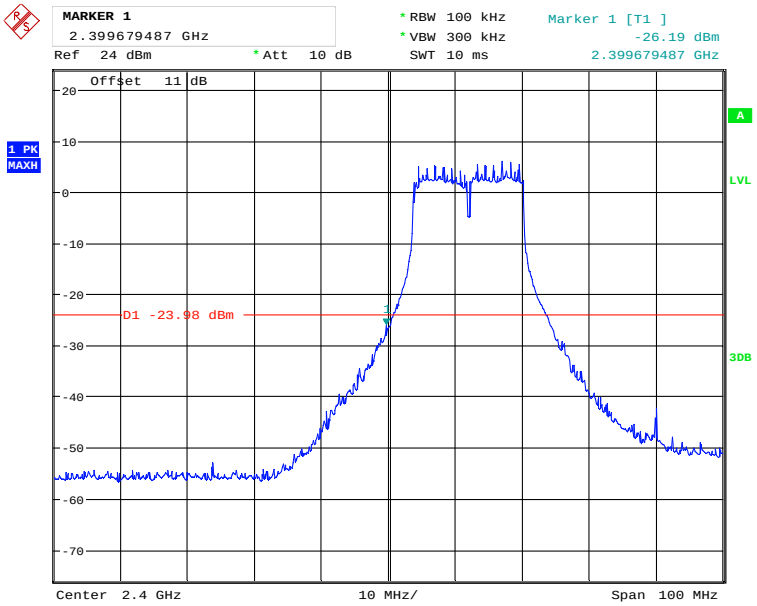
Date: 29.JUN.2015 18:21:46

802.11b - High Band Edge



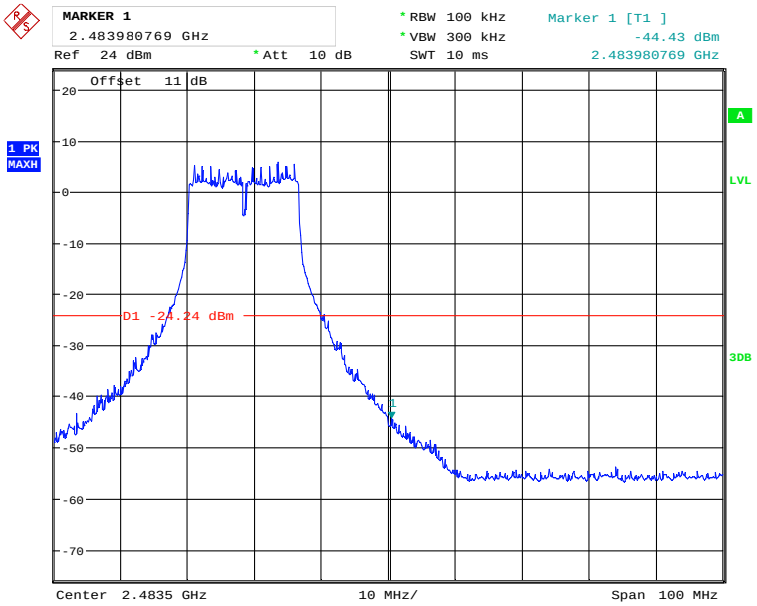
Date: 29.JUN.2015 18:28:48

802.11b - Low Band Edge



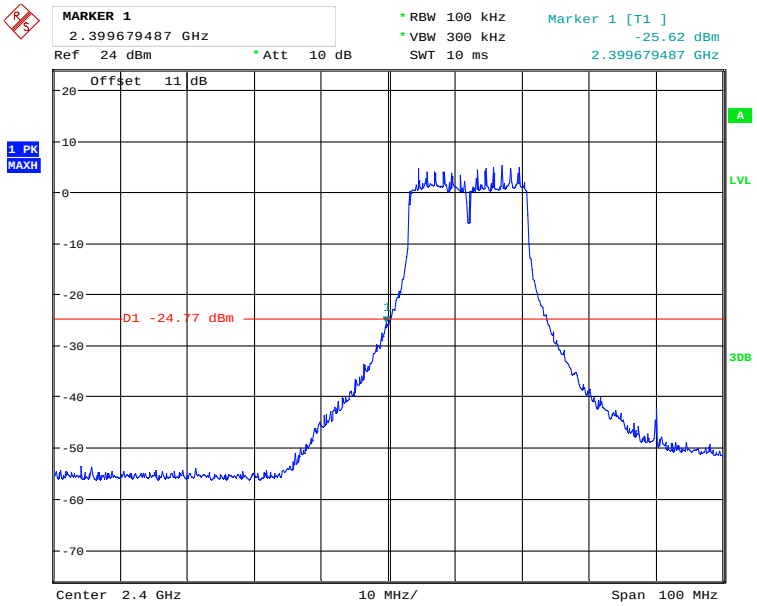
Date: 29.JUN.2015 18:31:01

802.11g - High Band Edge



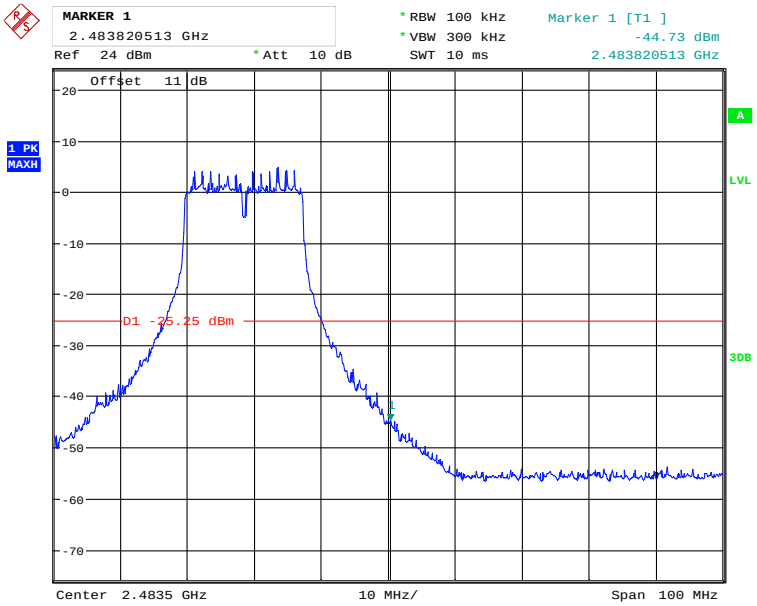
Date: 29.JUN.2015 18:32:32

802.11n20 - Low Band Edge



Date: 29.JUN.2015 18:34:28

802.11n20 - High Band Edge



Date: 29.JUN.2015 18:36:30

11 FCC §15.247(e) & IC RSS-247 §A8.2 (b) – Power Spectral Density

11.1 Applicable Standards

According to FCC §15.247(e) and RSS-247 §5.2 (b) , 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.

11.2 Measurement Procedure

The measurements are based on FCC KDB 558074 D01 DTS Meas Guidance v03r03: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 10: Maximum power spectral density level in the fundamental emission

11.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	Spectrum Analyzer	FSQ	1155.5001.26	2015-03-09	1 year
-	SMA Cable	-	C0001	Each Time[1]	N/A
-	Attenuator	BW-S10W5	1419	Each Time[1]	N/A

Note[1]: cable and attenuator included in the test set-up will be checked each time before testing.

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

11.4 Test Environmental Conditions

Temperature:	21-25º C
Relative Humidity:	42-45%
ATM Pressure:	102.1-103.7 kPa

The testing was performed by Jimmy Xiao on 2015-06-29 to 2015-07-07 in RF site.

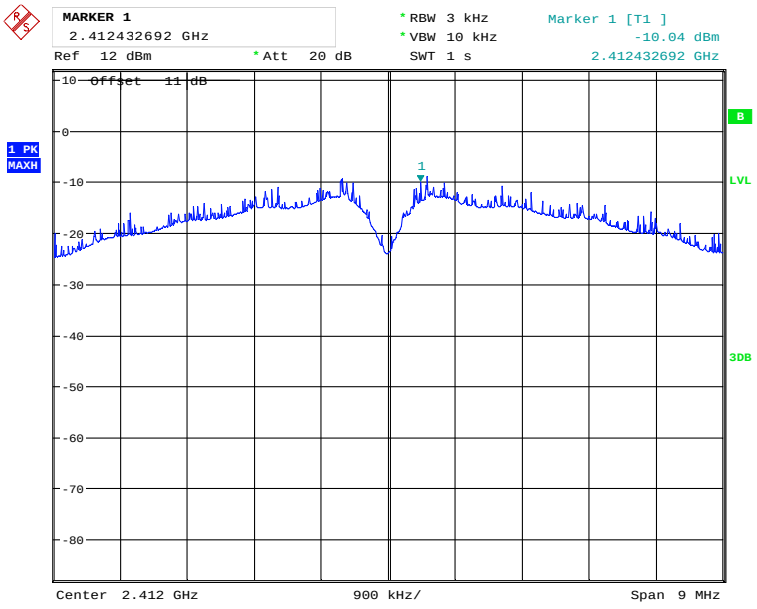
11.5 Test Results

Channel	Frequency (MHz)	Power Spectral Density (dBm)			Limit (dBm)
		Chain 0	Chain 1	Combined	
802.11b					
Low	2412	-10.04	-11.28	-7.61	8
Middle	2437	-10.11	-10.79	-7.43	8
High	2462	-10.17	-11.71	-7.86	8
802.11g					
Low	2412	-9.14	-10.79	-6.88	8
Middle	2437	-11.91	-12.65	-9.25	8
High	2462	-9.44	-11.05	-7.16	8
802.11n20					
Low	2412	-10.20	-11.42	-7.76	8
Middle	2437	-12.12	-12.14	-9.12	8
High	2462	-10.09	-11.03	-7.52	8

Please refer to the following plots.

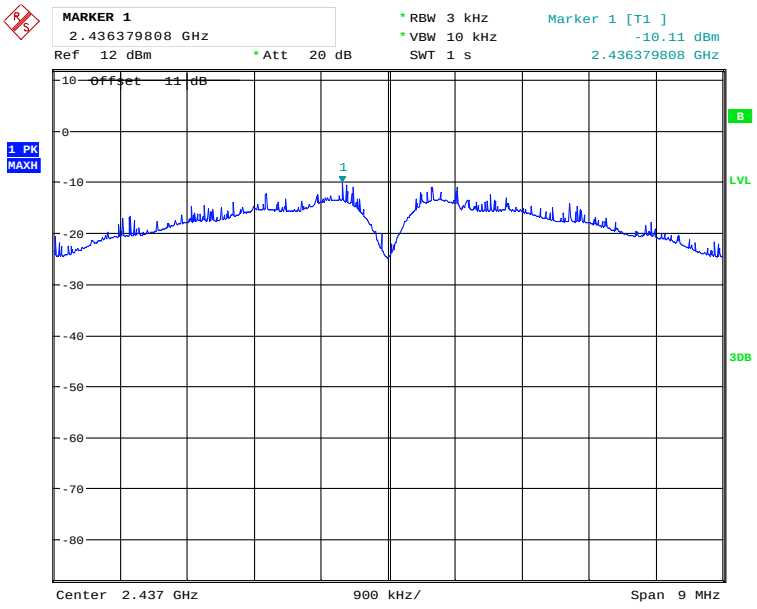
Chain 0 Port:

802.11b-2412 MHz



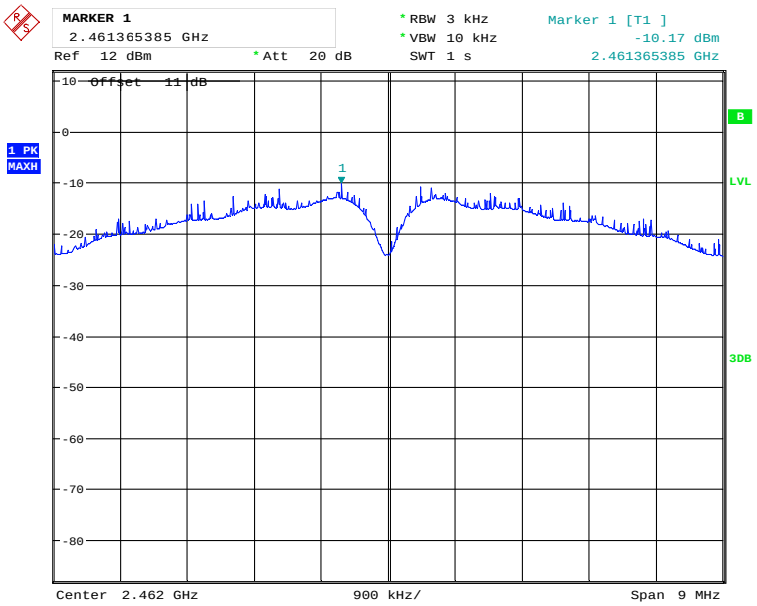
Date: 7.JUL.2015 18:43:46

802.11b-2437 MHz



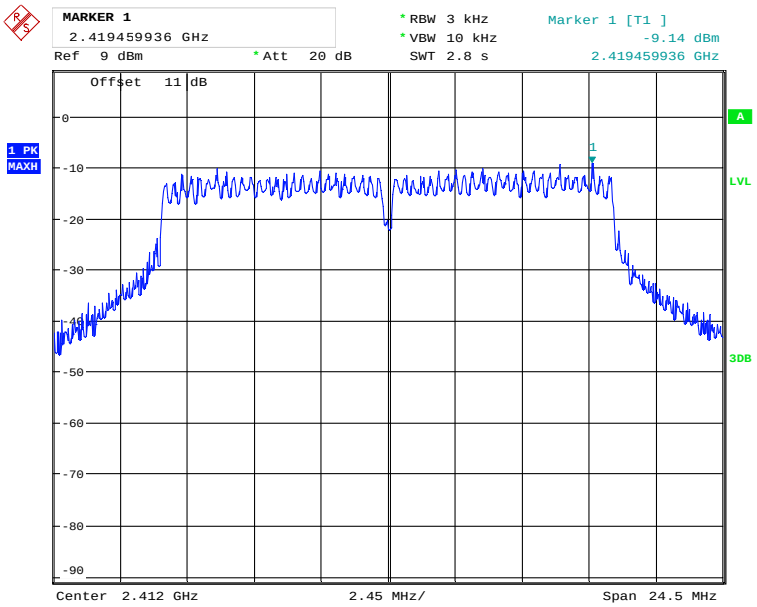
Date: 7.JUL.2015 18:44:44

802.11b-2462 MHz



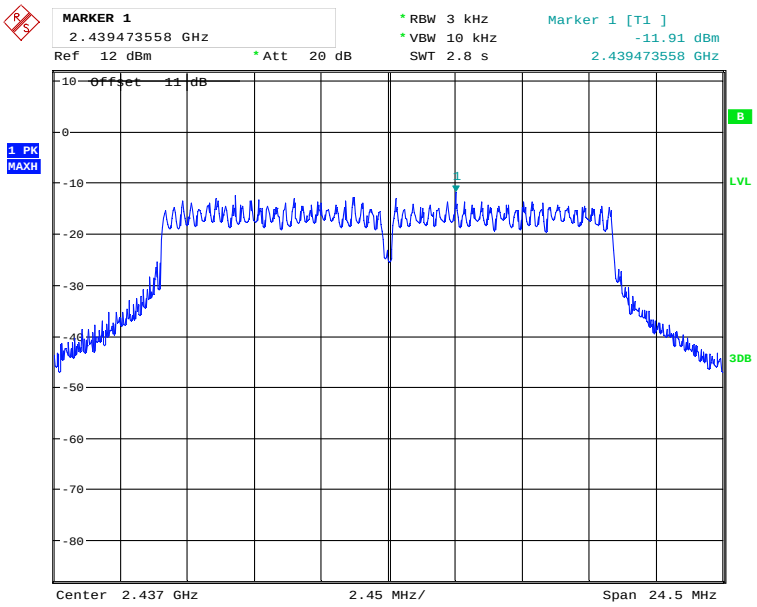
Date: 7.JUL.2015 18:45:29

802.11g-2412 MHz



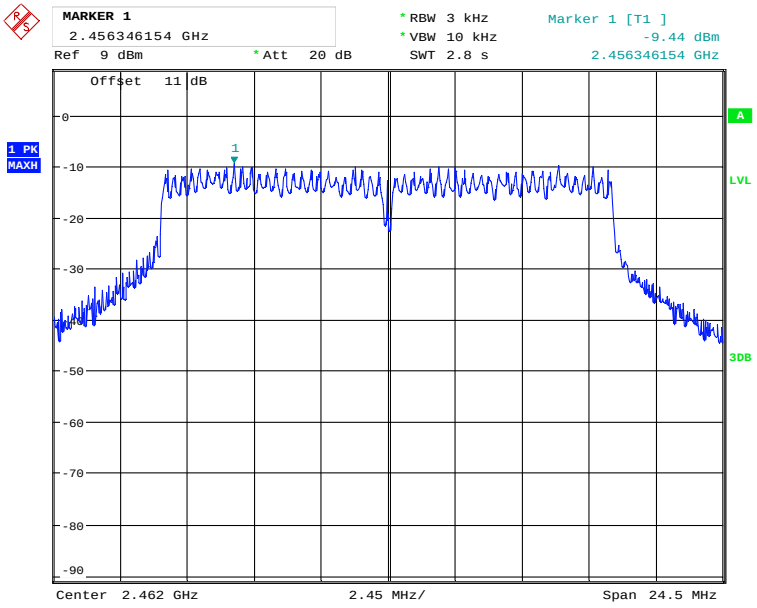
Date: 29.JUN.2015 20:34:53

802.11g-2437 MHz



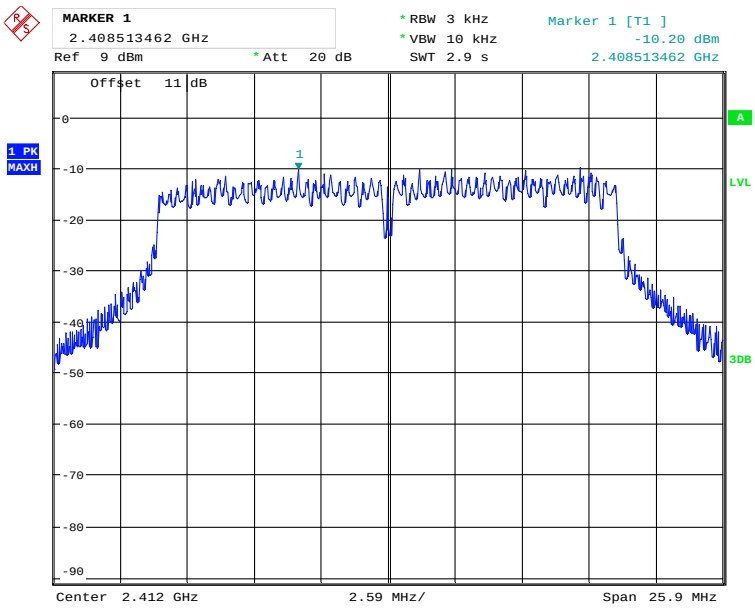
Date: 7.JUL.2015 19:41:06

802.11g-2462 MHz



Date: 29.JUN.2015 20:36:04

802.11n20-2412 MHz



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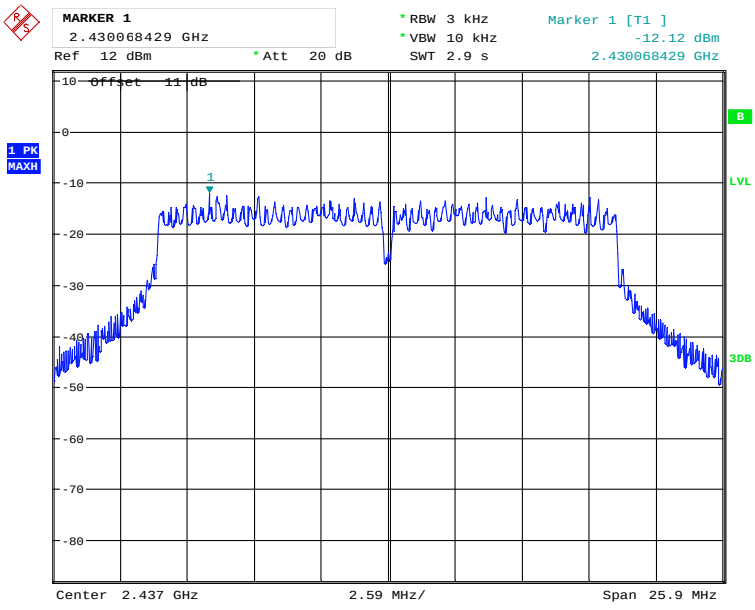
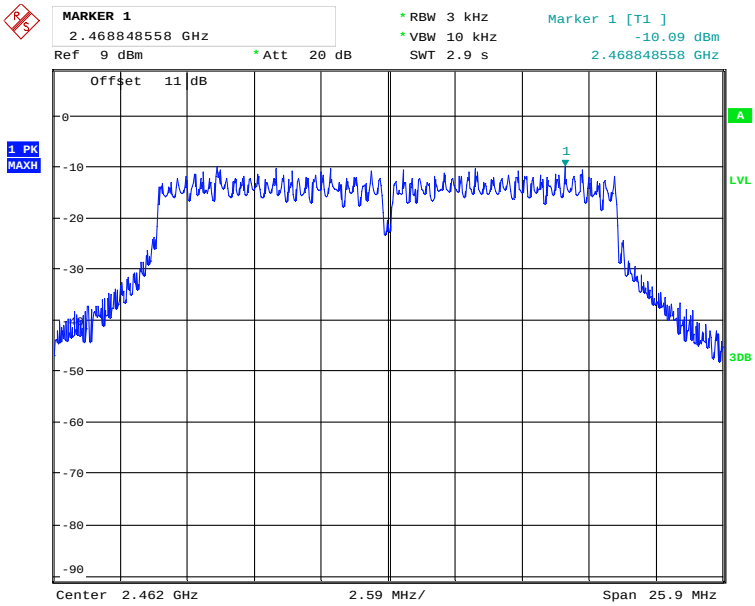
802.11n20-2437 MHz



Date: 7.JUL.2015 19:40:04

802.11n20-2462 MHz



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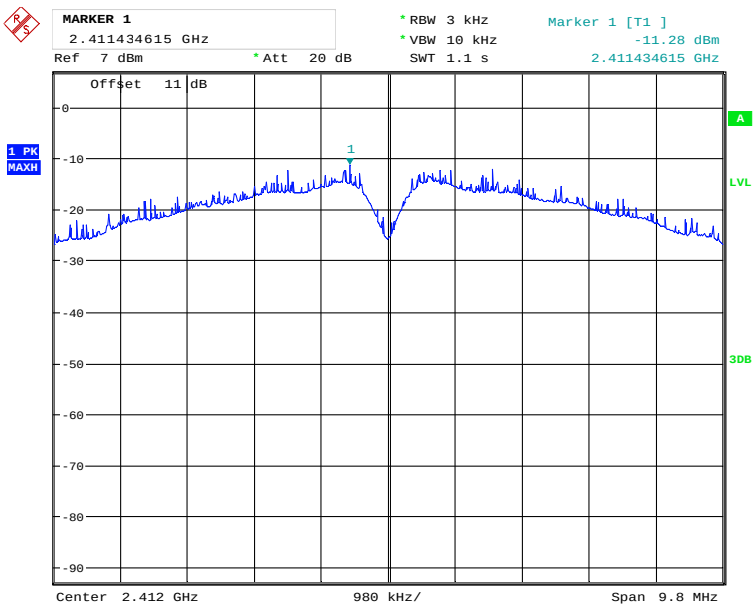
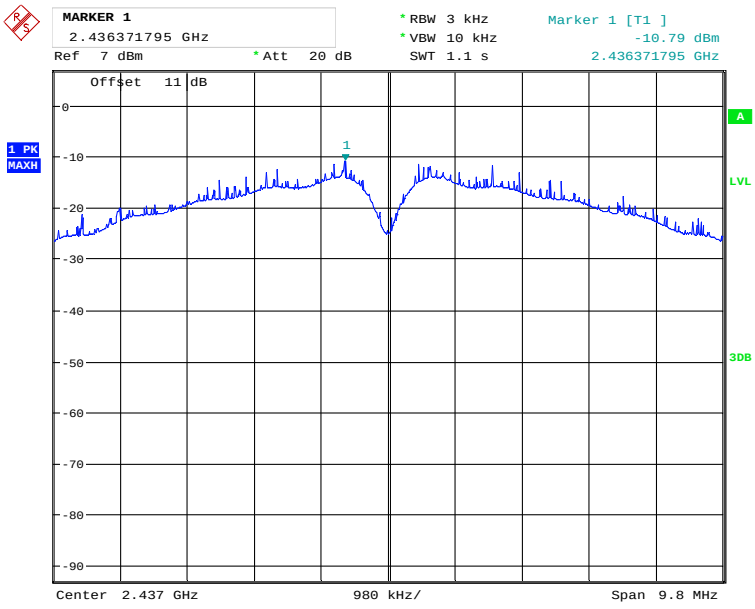
Chain 1 Port:

802.11b-2412 MHz



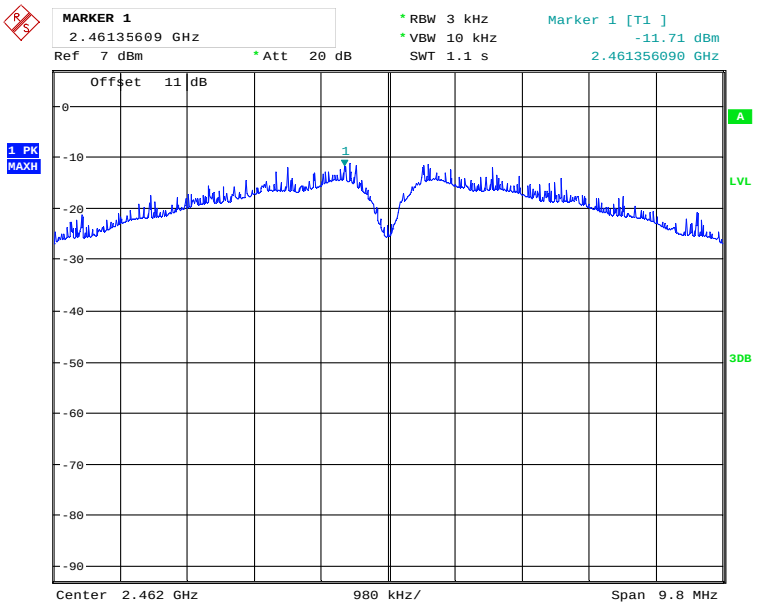
Date: 7.JUL.2015 19:52:14

802.11b-2437 MHz



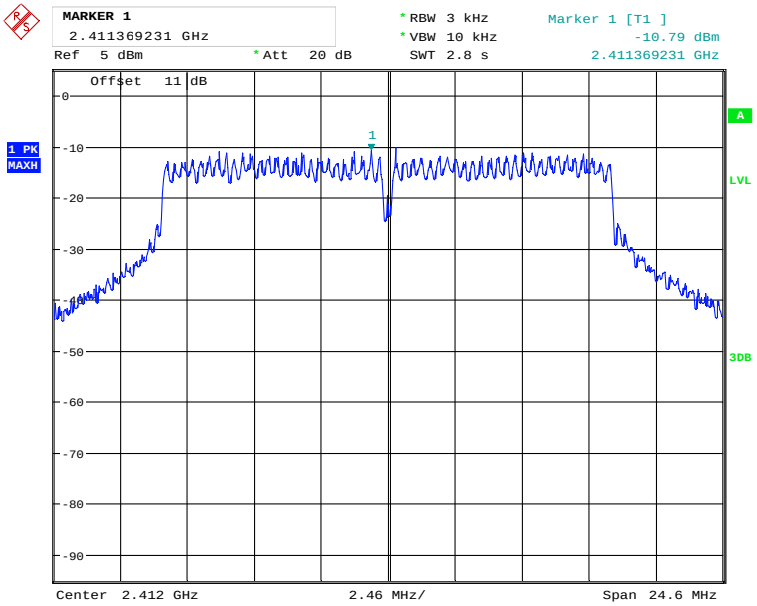
Date: 7.JUL.2015 19:52:54

802.11b-2462 MHz



Date: 7.JUL.2015 19:54:01

802.11g-2412 MHz



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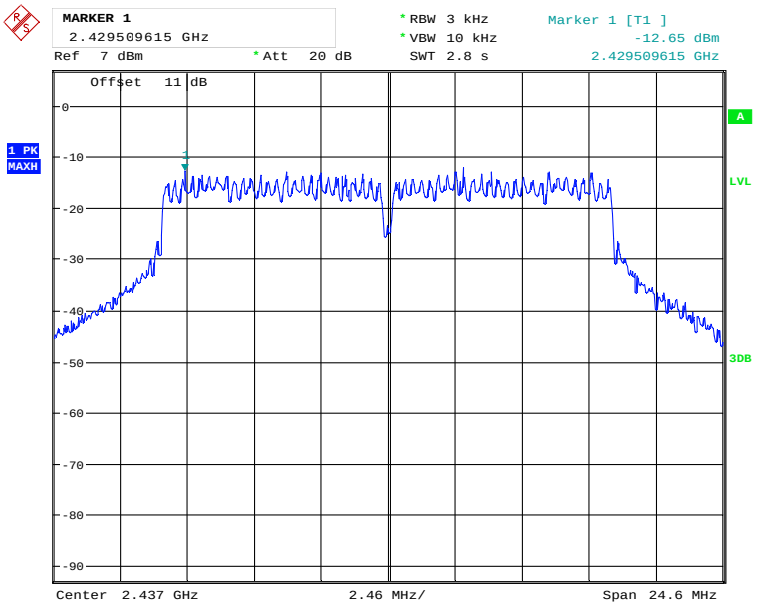
802.11g-2437 MHz



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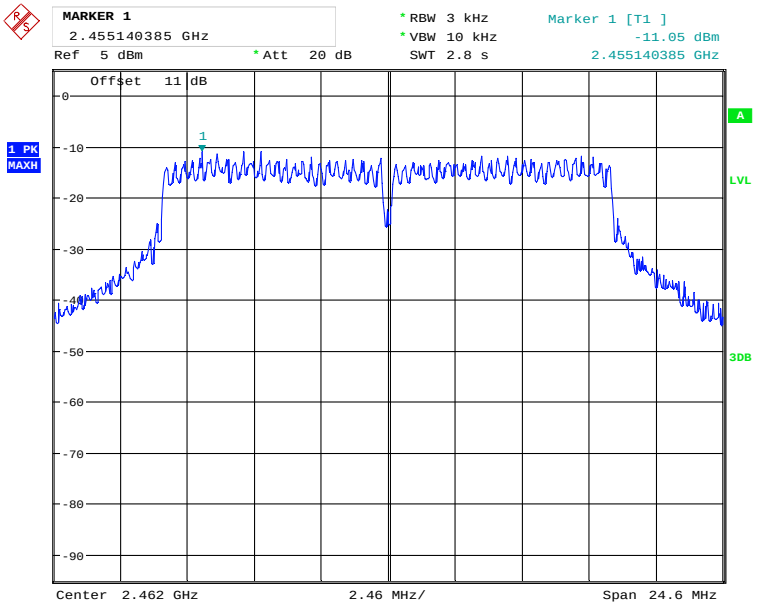
802.11g-2462 MHz



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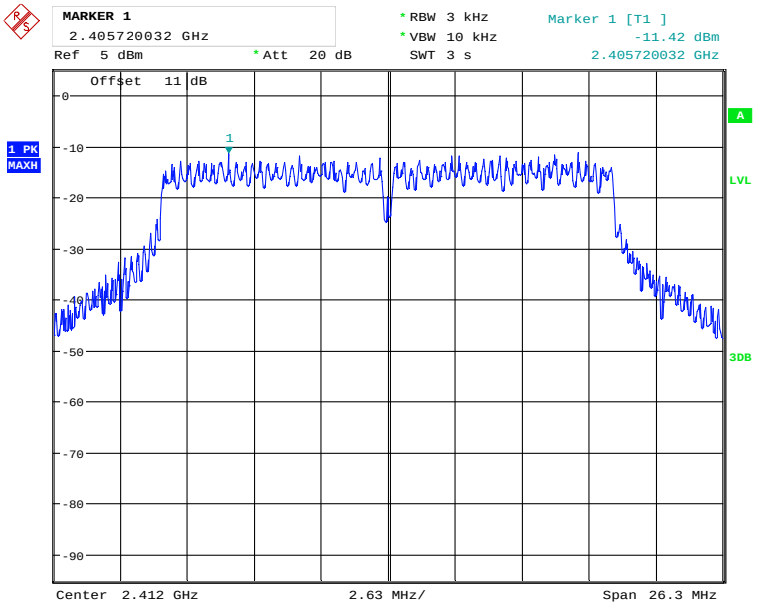
802.11n20-2412 MHz



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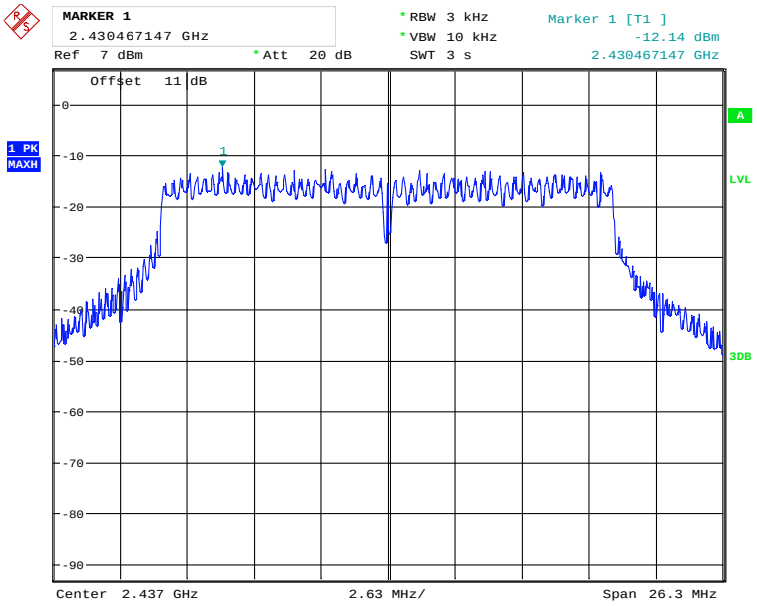
802.11n20-2437 MHz



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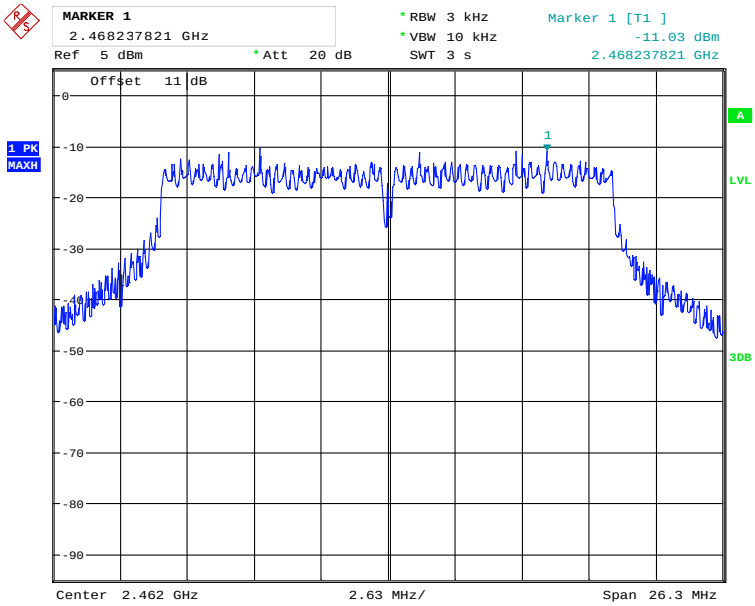
802.11n20-2462 MHz



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