



FCC 47 CFR PART 15 SUBPART C

TEST REPORT

For

Computer

**Model: TREK-743; TREK-743XXXXXXXXXXXXXXXXXX
(where "X" may be any alphanumeric character , "-" or blank)**

Trade Name: ADVANTECH

Issued to

**Advantech Co., Ltd.
No.1, Alley 20, Lane 26, Rueiguang Road,
Neihu District, Taipei 114, Taiwan, R.O.C.**

Issued by

**Compliance Certification Services Inc.
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Revision History

| Rev. | Issue Date | Revisions | Effect Page | Revised By |
|------|------------------|---------------|-------------|------------|
| 00 | January 15, 2013 | Initial Issue | ALL | Jill Shiao |
| | | | | |
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1. TEST RESULT CERTIFICATION

Applicant: **Advantech Co., Ltd.**
No.1, Alley 20, Lane 26, Rueiguang Road,
Neihu District, Taipei 114, Taiwan, R.O.C.

Manufacturer: **Advantech Co., Ltd.**
No.1, Alley 20, Lane 26, Rueiguang Road,
Neihu District, Taipei 114, Taiwan, R.O.C.

Equipment Under Test: Computer

Trade Name: ADVANTECH

Model: TREK-743; TREK-743XXXXXXXXXXXXXXXXXX (where "X"
may be any alphanumeric character , "-" or blank)

Date of Test: November 22, 2012 ~ January 15, 2013

| APPLICABLE STANDARDS | |
|------------------------------|-------------------------|
| STANDARD | TEST RESULT |
| FCC 47 CFR Part 15 Subpart C | No non-compliance noted |

We hereby certify that:

The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 15.207, 15.209, 15.247.

The test results of this report relate only to the tested sample EUT identified in this report.

Approved by:

Stan Lin
Section Manager

Reviewed by:

Angel Hu
Section Manager



2. EUT DESCRIPTION

| | | | |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|---------|
| Product | Computer | | |
| Trade Name | ADVANTECH | | |
| Model Number | TREK-743; TREK-743XXXXXXXXXXXXXXXXXX (where "X" may be any alphanumeric character , "-" or blank) | | |
| Model Discrepancy | <ol style="list-style-type: none"> 1. For marketing purpose only, all the model numbers are identical 2. The mean of "XXXXXXXXXXXXXXXXXX (where "X" may be any alphanumeric character , "-" or blank)" on model number just for marketing purpose only. 3. Client consigns only one model sample to test (model number: TREK-743). Therefore, the testing Lab. just guarantees the unit, which has been tested. | | |
| EUT Power Rating | 9~36VDC | | |
| RF Module Manufacturer | Ralink | Model | RT3062F |
| Operating Frequency Range | IEEE 802.11 b/g/HT 20MHz: 2412 ~ 2462 MHz IEEE 802.11 HT 40MHz: 2422 ~ 2452 MHz | | |
| Transmit Power | IEEE 802.11b mode: 21.80 dBm (0.1514W) IEEE 802.11g mode: 22.16 dBm (0.1644W) IEEE 802.11n HT20 mode: 21.98 dBm (0.1578W) IEEE 802.11n HT40 mode: 21.45 dBm (0.1396W) | | |
| Modulation Technique | IEEE 802.11b mode: DSSS (1, 2, 5.5 and 11 Mbps) IEEE 802.11g mode: OFDM (6, 9, 12, 18, 24, 36, 48 and 54 Mbps) IEEE 802.11n HT20 mode: OFDM (6.5, 7.2, 13, 14.4, 19.5, 21.7, 26, 28.9, 39, 43.3, 57.8, 58.5, 65.0, 72.2 Mbps) IEEE 802.11n HT40 mode: OFDM (13.5, 15, 27, 30, 40.5, 45, 54, 60, 81, 90, 108, 120, 121.5, 135, 150 Mbps) | | |
| Number of Channels | IEEE 802.11b/g mode: 11 Channels IEEE 802.11n HT20 mode: 11 Channels IEEE 802.11n HT40 mode: 7 Channels | | |
| Antenna Specification | Dipole Antenna / Gain: 2.0dBi | | |

Remark:

1. The sample selected for test was production product and was provided by manufacturer.
2. This submittal(s) (test report) is intended for FCC ID: **M82-TREK743A2** filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.



3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4 and FCC CFR 47 Part 2, Part 15.207, 15.209 and 15.247.

3.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

3.2 EUT EXERCISE

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

3.3 GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4..



3.4 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

(a) Except as shown 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 | 399.9 - 410 | 4.5 - 5.15 |
| ¹ 0.495 - 0.505 | 16.69475 - 16.69525 | 608 - 614 | 5.35 - 5.46 |
| 2.1735 - 2.1905 | 16.80425 - 16.80475 | 960 - 1240 | 7.25 - 7.75 |
| 4.125 - 4.128 | 25.5 - 25.67 | 1300 - 1427 | 8.025 - 8.5 |
| 4.17725 - 4.17775 | 37.5 - 38.25 | 1435 - 1626.5 | 9.0 - 9.2 |
| 4.20725 - 4.20775 | 73 - 74.6 | 1645.5 - 1646.5 | 9.3 - 9.5 |
| 6.215 - 6.218 | 74.8 - 75.2 | 1660 - 1710 | 10.6 - 12.7 |
| 6.26775 - 6.26825 | 108 - 121.94 | 1718.8 - 1722.2 | 13.25 - 13.4 |
| 6.31175 - 6.31225 | 123 - 138 | 2200 - 2300 | 14.47 - 14.5 |
| 8.291 - 8.294 | 149.9 - 150.05 | 2310 - 2390 | 15.35 - 16.2 |
| 8.362 - 8.366 | 156.52475 - | 2483.5 - 2500 | 17.7 - 21.4 |
| 8.37625 - 8.38675 | 156.52525 | 2655 - 2900 | 22.01 - 23.12 |
| 8.41425 - 8.41475 | 156.7 - 156.9 | 3260 - 3267 | 23.6 - 24.0 |
| 12.29 - 12.293 | 162.0125 - 167.17 | 3332 - 3339 | 31.2 - 31.8 |
| 12.51975 - 12.52025 | 167.72 - 173.2 | 3345.8 - 3358 | 36.43 - 36.5 |
| 12.57675 - 12.57725 | 240 - 285 | 3600 - 4400 | (²) |
| 13.36 - 13.41 | 322 - 335.4 | | |

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

² Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.



3.5 DESCRIPTION OF TEST MODES

The EUT is a 1Tx1R SISO transmitter.

Software used to control the EUT for staying in continuous transmitting mode was programmed.

The worst case data rate is determined as the data rate with highest output power. After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz, which worst case was in normal link mode only.

IEEE 802.11b mode:

Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 1Mbps data rate was chosen for full testing.

IEEE 802.11g mode:

Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 6Mbps data rate was chosen for full testing.

IEEE 802.11n HT20 mode:

Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 6.5Mbps data rate were chosen for full testing.

IEEE 802.11n HT40 mode:

Channel Low (2422MHz), Channel Mid (2437MHz) and Channel High (2452MHz) with 13.5Mbps data rate were chosen for full testing.



4. INSTRUMENT CALIBRATION

4.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

4.2 MEASUREMENT EQUIPMENT USED

Equipment Used for Emissions Measurement

| Conducted Emissions Test Site | | | | |
|-------------------------------|--------------|---------|---------------|-----------------|
| Name of Equipment | Manufacturer | Model | Serial Number | Calibration Due |
| Spectrum Analyzer | Agilent | E4446A | MY48250064 | 01/01/2014 |
| Spectrum Analyzer | R&S | FSEB | 825829/011 | 12/18/2013 |
| Power meter | Anritsu | ML2495A | 1033009 | 08/19/2013 |
| Power Sensor | Anritsu | MA2411B | 0917221 | 08/19/2013 |

| 3M Semi Anechoic Chamber | | | | |
|--------------------------|----------------------------------------------|-------------------------|---------------|-----------------|
| Name of Equipment | Manufacturer | Model | Serial Number | Calibration Due |
| Spectrum Analyzer | Agilent | E4446A | MY48250064 | 12/23/2013 |
| Pre-Amplifier | HP | 8447D | 2944A06530 | 01/02/2014 |
| Pre-Amplifier | HP | 8449B | 3008A01738 | 04/17/2013 |
| Pre-Amplifier | MITEQ | AMF-6F-26040 0-40-8P | 985646 | 05/20/2013 |
| EMI Test Receiver | SCHAFFNER | SCR 3501 | 430 | 01/11/2013 |
| Loop Antenna | EMCO | 6502 | 2356 | 06/11/2013 |
| Bilog Antenna | SCHWAZBECK | VULB9160 | 3084 | 09/26/2013 |
| Horn Antenna | EMCO | 3115 | 9602-4659 | 06/14/2013 |
| Horn Antenna | EMCO | 3116 | 00026370 | 10/07/2013 |
| Antenna Tower | CCS | CC-A-1F | N/A | N.C.R |
| Turn Table | CCS | CC-T-1F | N/A | N.C.R |
| Test S/W | LabVIEW 6.1 (Wugu Chamber EMI Teat V1_4.5.3) | | | |

- NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 2. N.C.R = No Calibration Request.



4.3 MEASUREMENT UNCERTAINTY

| Parameter | Uncertainty |
|-----------------------------------------|-------------|
| Powerline Conducted Emission | N/A |
| 3M Semi Anechoic Chamber / 30MHz ~ 1GHz | ±3.7046 |
| 3M Semi Anechoic Chamber / 1 ~ 8GHz | ±1.9652 |
| 3M Semi Anechoic Chamber / 8 ~ 18GHz | ±1.9142 |
| 3M Semi Anechoic Chamber / 18 ~ 26GHz | ±2.1390 |
| 3M Semi Anechoic Chamber / 26 ~ 40GHz | ±2.9424 |

Remark: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.



5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

- No. 163-1, Jhongsheng Rd., Sindien District, Taipei City 23151, Taiwan
Tel: 886-2-2217-0894 / Fax: 886-2-2217-1029

- No 11, Wugong 6th Rd, Wugu District, New Taipei City 24891, Taiwan (R.O.C)
Tel: 886-2-2299-9720 / Fax: 886-2-2298-4045

- No.81-1, Lane 210, Bade 2nd Rd., Lujhu Township, Taoyuan County 33841, Taiwan
Tel: 886-3-324-0332 / Fax: 886-3-324-5235

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.





Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."



5.3 TABLE OF ACCREDITATIONS AND LISTINGS

| Country | Agency | Scope of Accreditation | Logo |
|---------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| USA | A2LA | CFR 47, FCC Part15/18, CISPR 22, EN 55022, ICES-003, AS/NZS CISPR 22, VCCI V-3, EN 55011, CISPR 11, IEC/EN 61000-4-2/3/4/5/6/8/11, EN 61000-6-1/2/3/4, EN 55024, CISPR 24, AS/NZS CISPR 24, AS/NZS 61000.6.2, EN 55014-1/-2, ETSI EN 300 386 v1.3.2/v1.3.3, IEC/EN 61000-3-2, AS/NZS 61000.3.2, IEC/EN 61000-3-3, AS/NZS 61000.3.3 |  TESTING CERT #0824.01 |
| USA | FCC MRA | 3/10 meter Open Area Test Sites to perform FCC Part 15/18 measurements |  |
| Japan | VCCI | 3/10 meter Open Area Test Sites and conducted test sites to perform radiated/conducted measurements | VCCI R-2882/2541/2798/725/1868 C-402/747/912 T-1930/1646 |
| Taiwan | TAF | EN 55014-1, CISPR 14, CNS 13781-1, EN 55013, CISPR 13, CNS 13439, EN 55011, CISPR 11, CNS 13803, PLMN09, IS2045-0, LP0002 FCC Part 27/90, Part 15B/C/D/E, RSS-192/193/210/310 ETSI EN 300 328/ 300 220-1/ 300 220-2/ 301 893/ 301 489-01/ 301 489-03/ 301 489-07 / 301 489-17/ 300 440-1/ 300 440-2 AS/NZS 4268, AS/NZS 4771 CISPR 22, EN 55022, CNS 13438, AS/NZS CISPR 22, VCCI, IEC/EN 61000-4-2/3/4/5/6/8/11, CNS 14676-2/3/4/5/6/8, CNS 14934-2/3, CNS 13783-1, CNS 13439, CNS 13803 |  |
| Taiwan | BSMI | CNS 13438, CNS 13783-1, CNS 13439, CNS 14115 | SL2-IS-E-0014 / IN-E-0014 /A1-E-0014 /R1-E-0014 /R2-E-0014 /L1-E-0014 |
| Canada | Industry Canada | RSS-Gen Issue 3 |  IC 2324C-5 |

Note: No part of this report may be used to claim or imply product endorsement by A2LA, TAF or other government agency.



6. SETUP OF EQUIPMENT UNDER TEST

6.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

6.2 SUPPORT EQUIPMENT

| For Radiated Emission (Above 1GHz) and Conducted Emission Measurement: | | | | | | | |
|------------------------------------------------------------------------|-----------------|-------|----------|------------|---------|---------------|------------------|
| No. | Device Type | Brand | Model | Series No. | FCC ID | Data Cable | Power Cord |
| 1 | DC Power Supply | GW | GPS-3303 | 0011606 | FCC DoC | Shielded, 18m | Unshielded, 1.8m |

| For Radiated Emission (Below 1GHz) Measurement: | | | | | | | |
|-------------------------------------------------|----------------------|---------------|-----------|------------|------------|-------------------------------|---------------------------------------------------------------------------|
| No. | Device Type | Brand | Model | Series No. | FCC ID | Data Cable | Power Cord |
| 1 | Test Jig | N/A | N/A | N/A | N/A | Unshielded, 1.0m | AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core |
| 2 | Modem | ACEEX | DM-1414 | 304012261 | IFAXDM1414 | Unshielded, 1.0m | Unshielded, 1.8m |
| 3 | Modem | ACEEX | DM-1414 | 304012262 | IFAXDM1414 | Unshielded, 1.0m | Unshielded, 1.8m |
| 4 | USB Keyboard | DELL | SK-8115 | N/A | FCC DoC | Shielded, 1.8m with a Core | N/A |
| 5 | USB Mouse | DELL | MO56UOA | FQJ003BD | FCC DoC | Shielded, 1.8m | N/A |
| 6 | USB 2.0 External HDD | SILICON POWER | Armor A50 | N/A | FCC DoC | Shielded, 1.8m with a Core | N/A |
| 7 | DC Power Supply | GW | GPS-3303 | 0011606 | FCC DoC | Shielded, 18m | Unshielded, 1.8m |
| 8 | Notebook PC (Remote) | DELL | D400 | 0932RY | E2K24GBRL | LAN Cable: Unshielded, 10m | AC I/P: Unshielded, 1.8m DC O/P: Unshielded, 1.8m with a core |

Remark: Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.



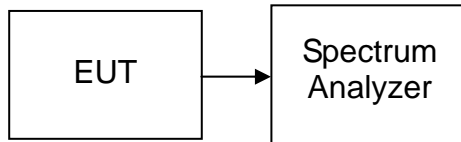
7. FCC PART 15.247 REQUIREMENTS

7.1 6dB BANDWIDTH

LIMIT

According to §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.

TEST CONFIGURATION



TEST PROCEDURE

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW = 100kHz, VBW = 300kHz, Span = 30MHz, Sweep = auto.
4. Mark the peak frequency and -6dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

TEST RESULTS

No non-compliance noted



TEST DATA

Test mode: IEEE 802.11b mode

| Channel | Frequency (MHz) | Bandwidth (MHz) | Limit (kHz) | Result |
|---------|-----------------|-----------------|-------------|--------|
| Low | 2412 | 12.144 | >500 | PASS |
| Mid | 2437 | 12.144 | | PASS |
| High | 2462 | 12.162 | | PASS |

Test mode: IEEE 802.11g mode

| Channel | Frequency (MHz) | Bandwidth (MHz) | Limit (kHz) | Result |
|---------|-----------------|-----------------|-------------|--------|
| Low | 2412 | 16.473 | >500 | PASS |
| Mid | 2437 | 16.491 | | PASS |
| High | 2462 | 16.491 | | PASS |

Test mode: IEEE 802.11n HT20 mode

| Channel | Frequency (MHz) | Bandwidth (MHz) | Limit (kHz) | Result |
|---------|-----------------|-----------------|-------------|--------|
| Low | 2412 | 17.393 | >500 | PASS |
| Mid | 2437 | 17.435 | | PASS |
| High | 2462 | 17.435 | | PASS |

Test mode: IEEE 802.11n HT40 mode

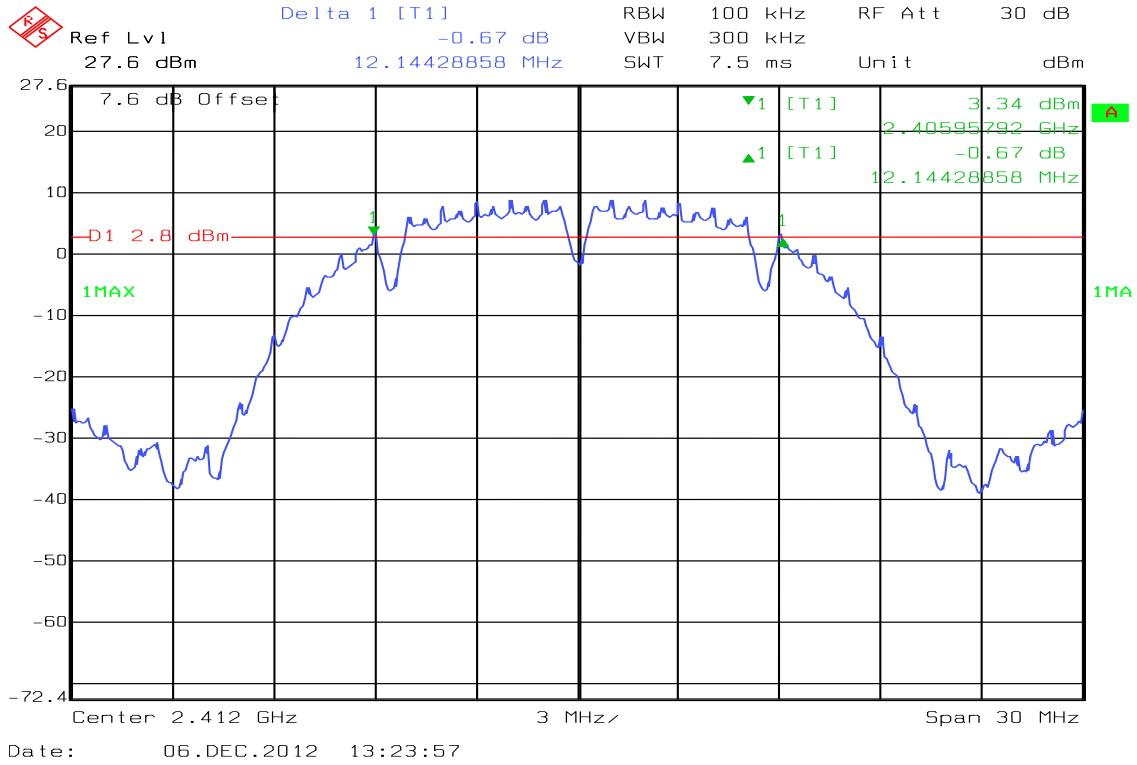
| Channel | Frequency (MHz) | Bandwidth (MHz) | Limit (kHz) | Result |
|---------|-----------------|-----------------|-------------|--------|
| Low | 2422 | 36.092 | >500 | PASS |
| Mid | 2437 | 35.822 | | PASS |
| High | 2452 | 35.972 | | PASS |



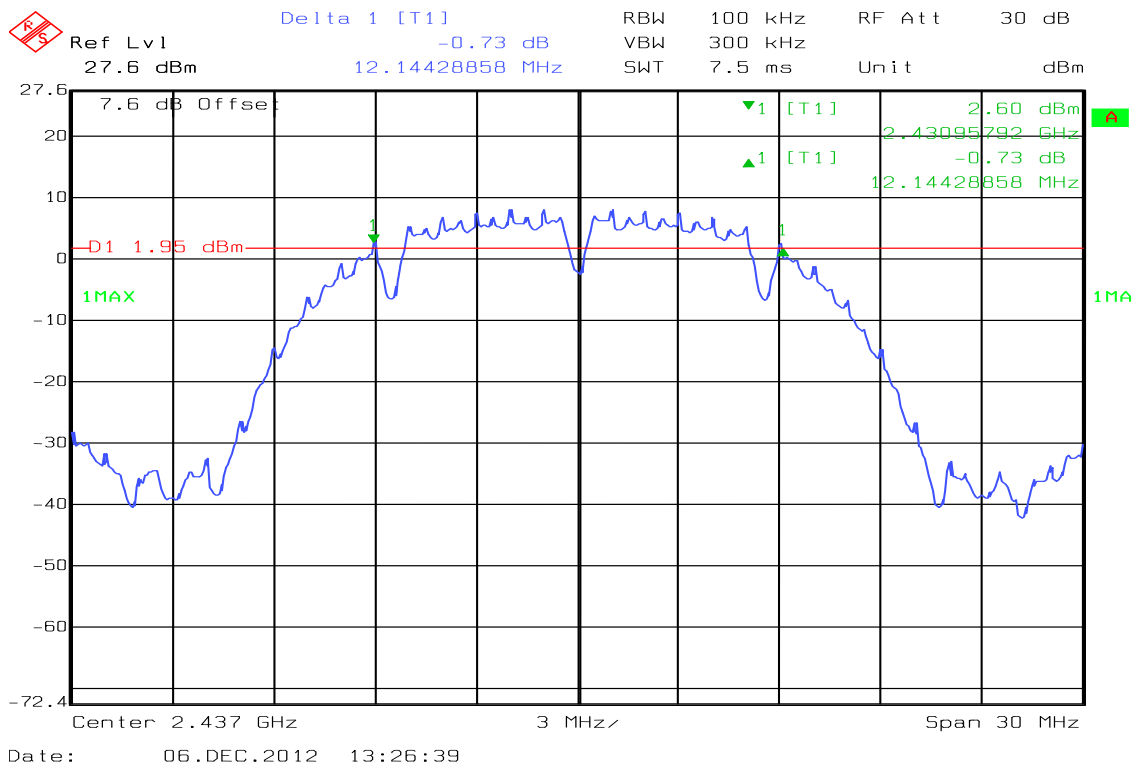
Test Plot

IEEE 802.11b mode

6dB Bandwidth (CH Low)

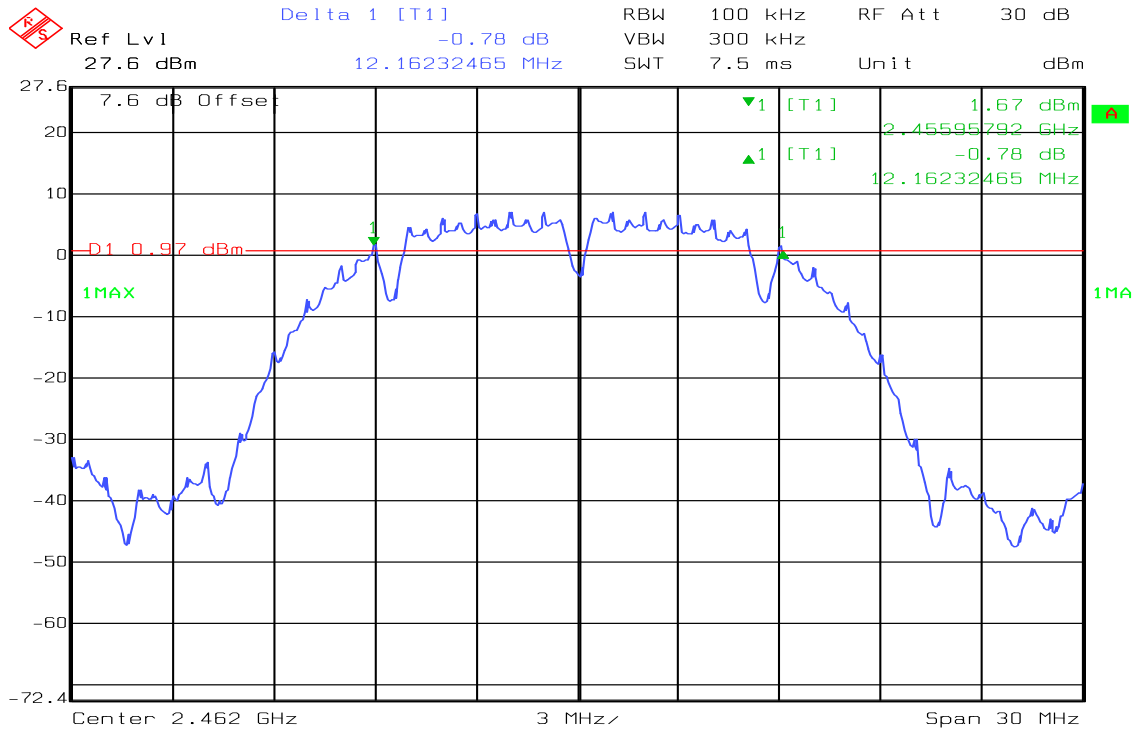


6dB Bandwidth (CH Mid)





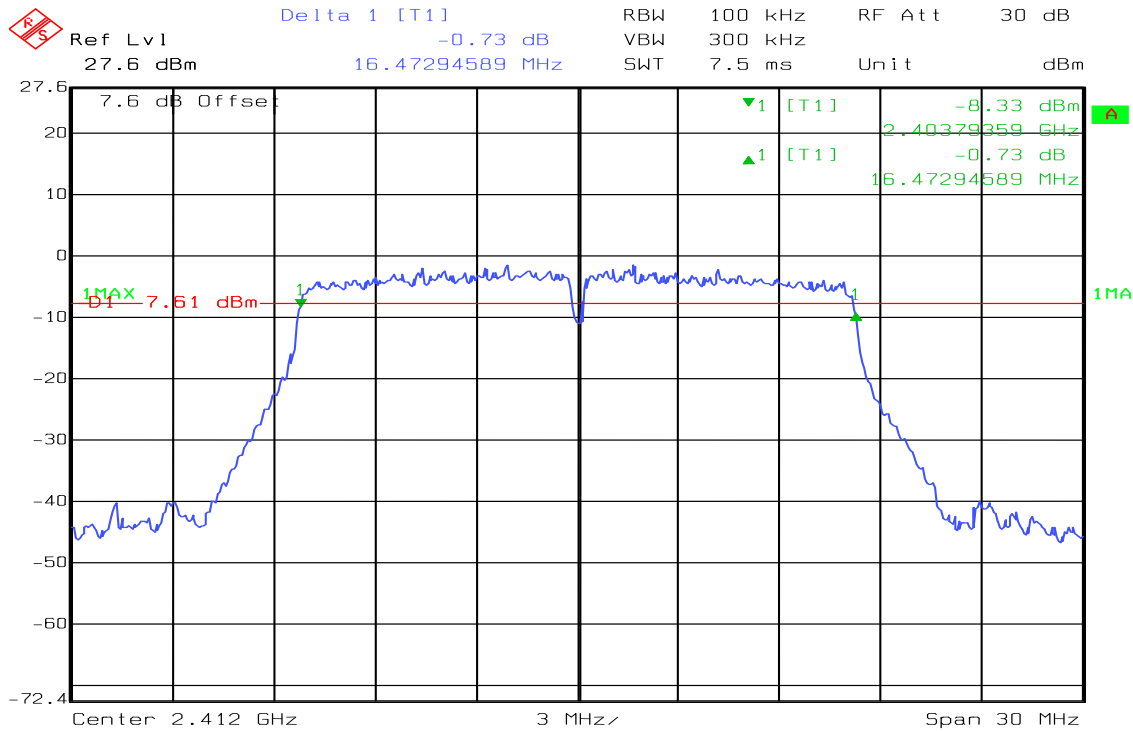
6dB Bandwidth (CH High)



Date: 06.DEC.2012 13:27:50

IEEE 802.11g mode

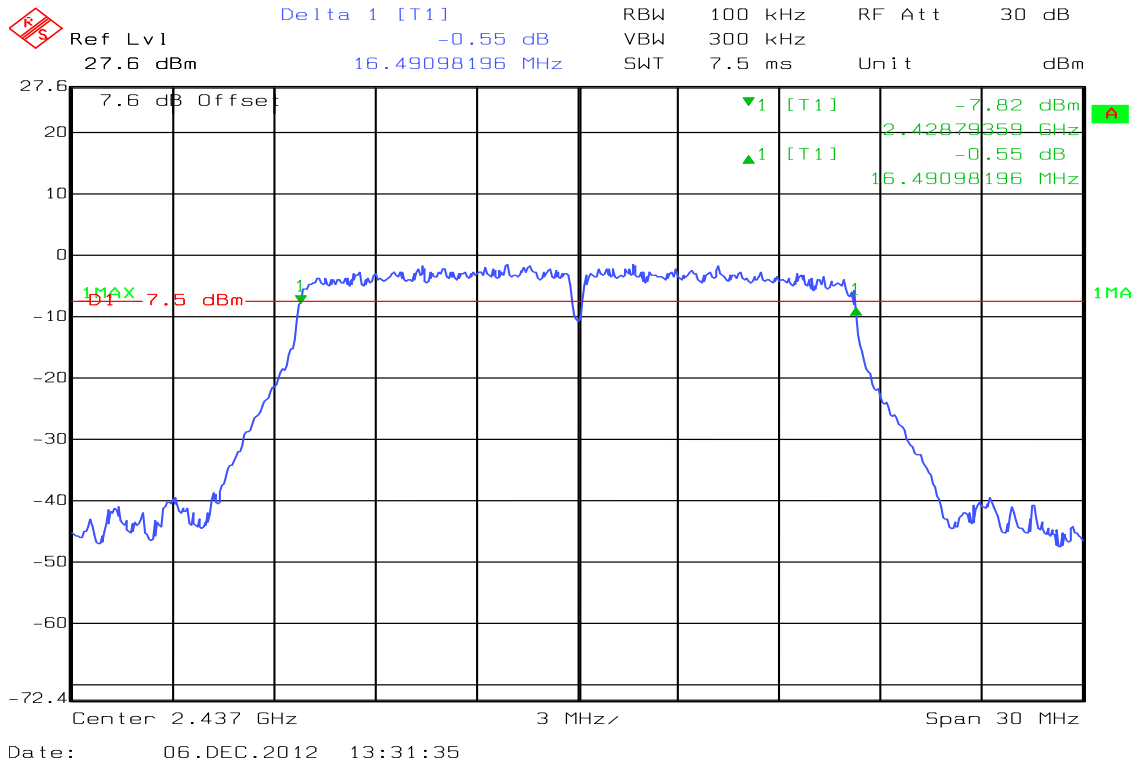
6dB Bandwidth (CH Low)



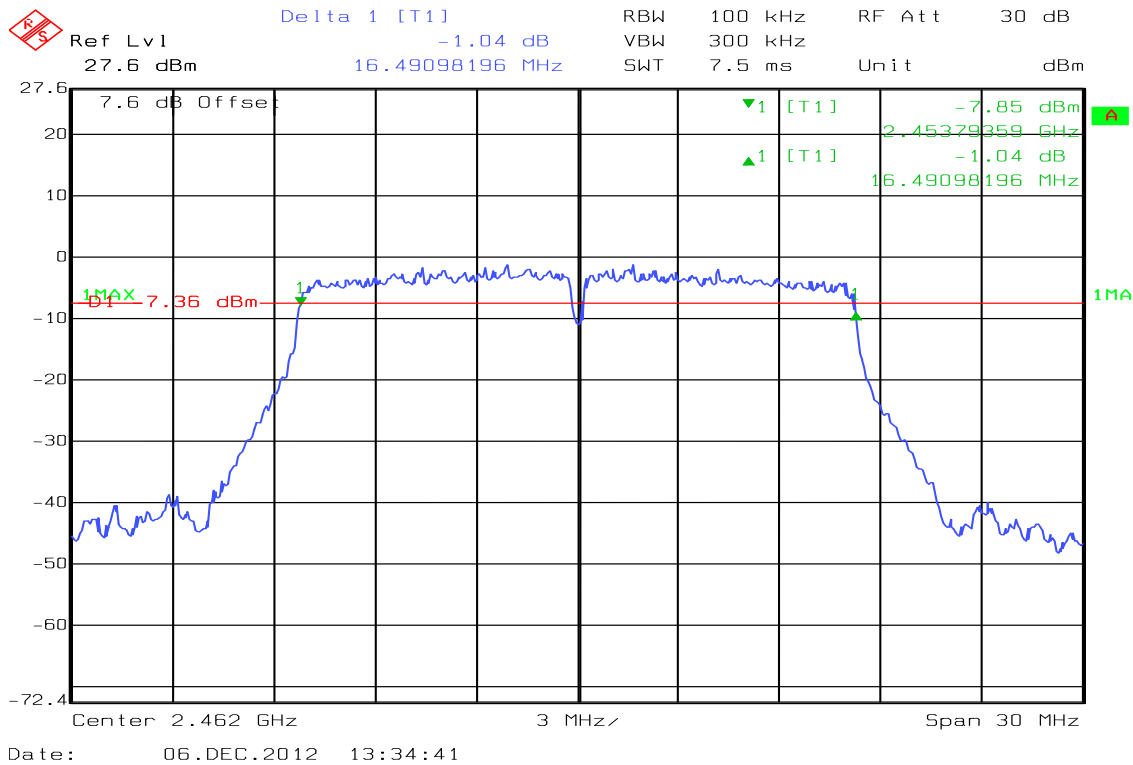
Date: 06.DEC.2012 13:30:15



6dB Bandwidth (CH Mid)



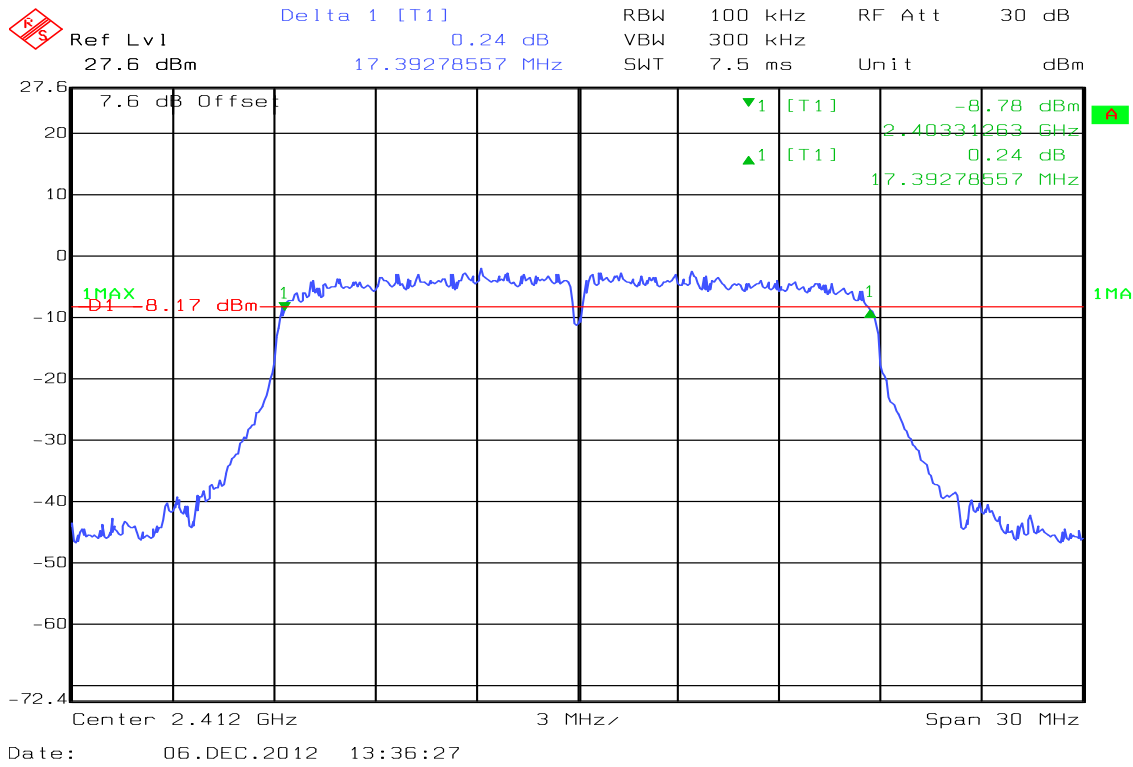
6dB Bandwidth (CH High)



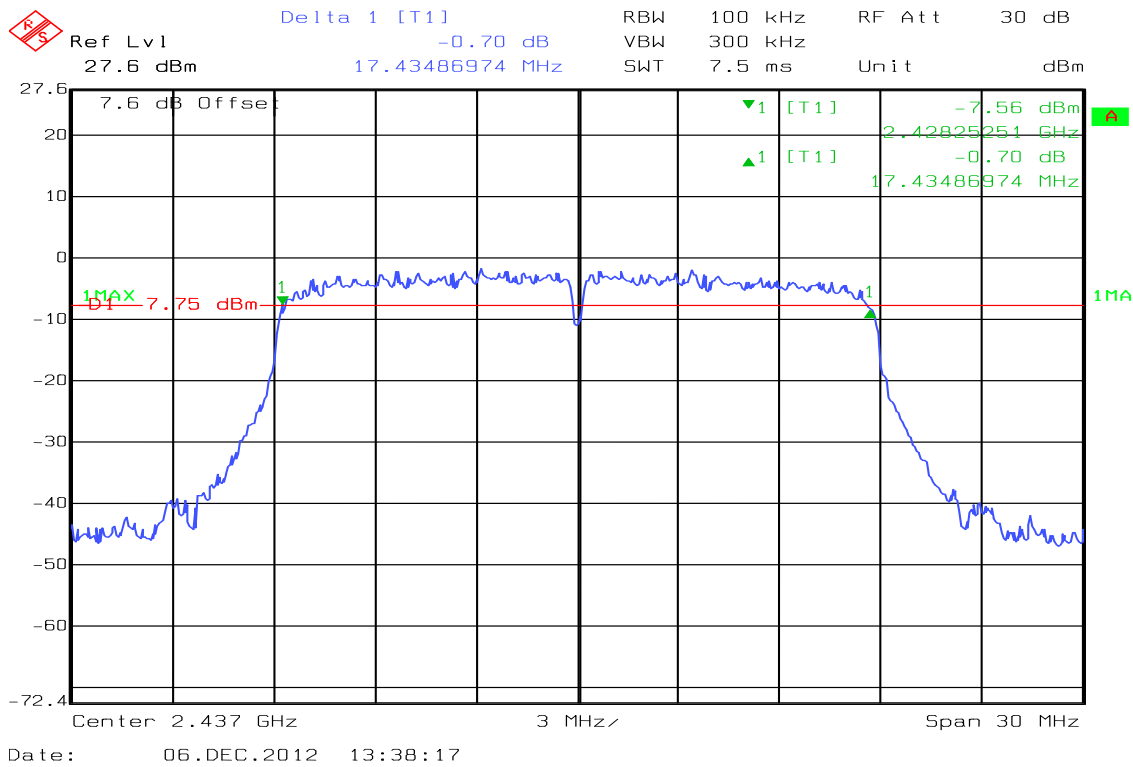


IEEE 802.11n HT20 mode

6dB Bandwidth (CH Low)

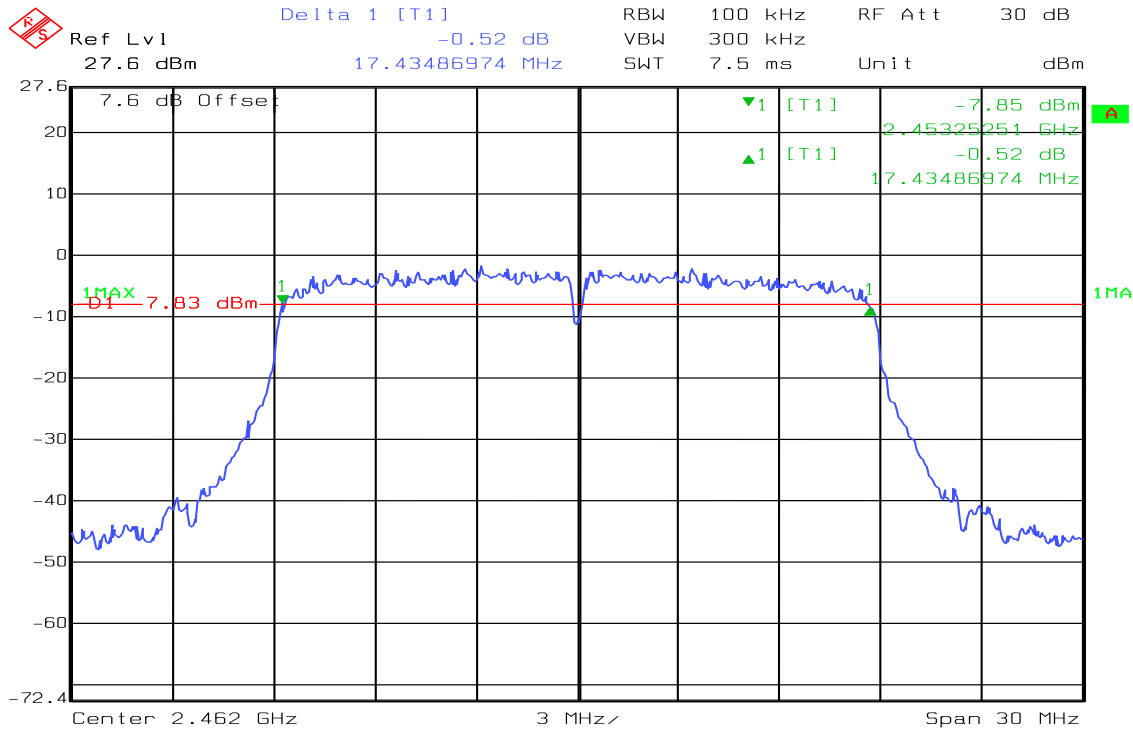


6dB Bandwidth (CH Mid)





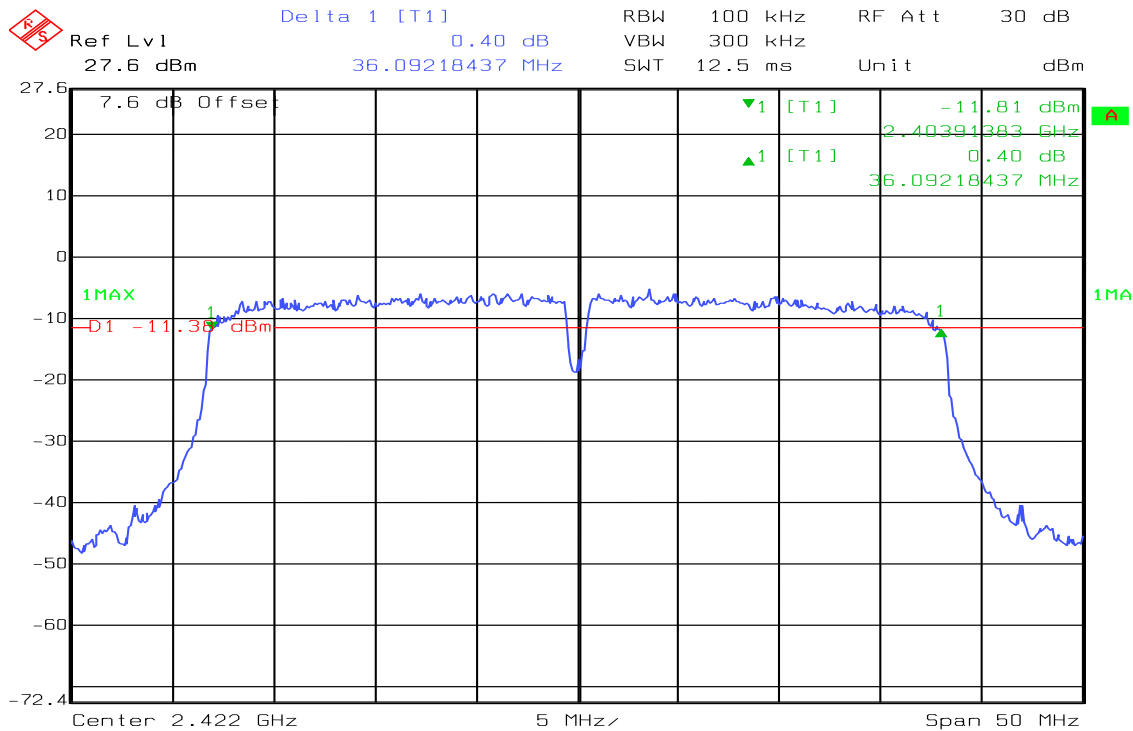
6dB Bandwidth (CH High)



Date: 06.DEC.2012 13:40:02

IEEE 802.11n HT40 mode

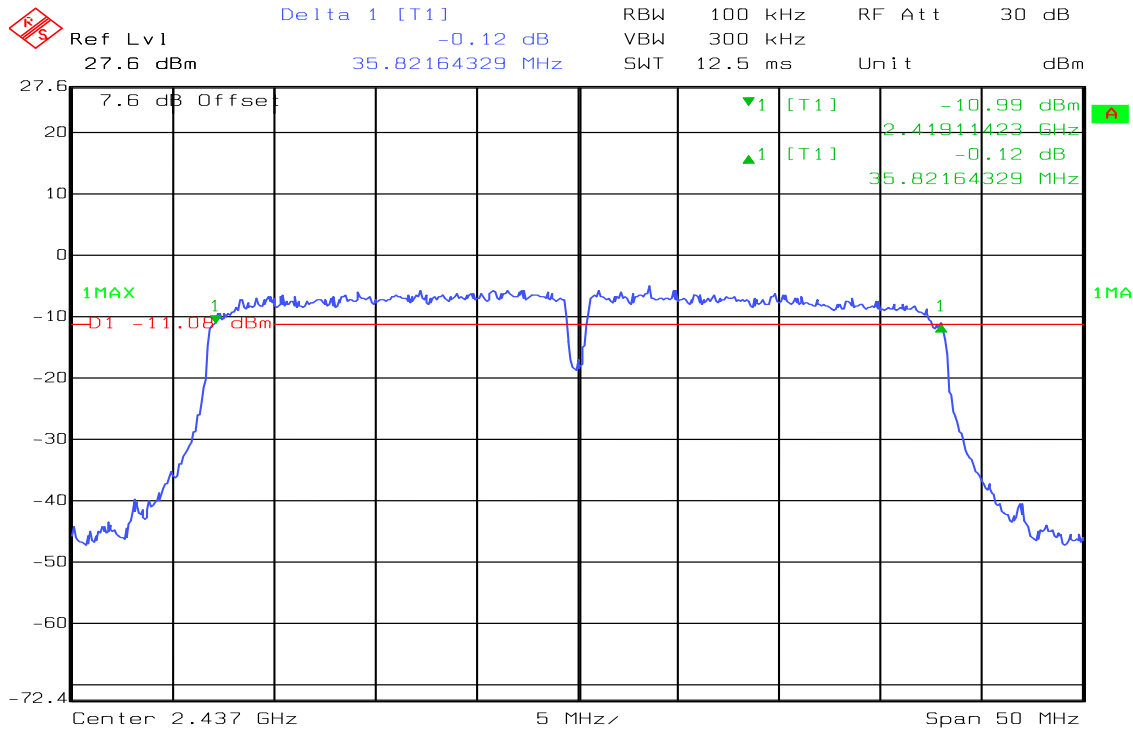
6dB Bandwidth (CH Low)



Date: 06.DEC.2012 14:42:31

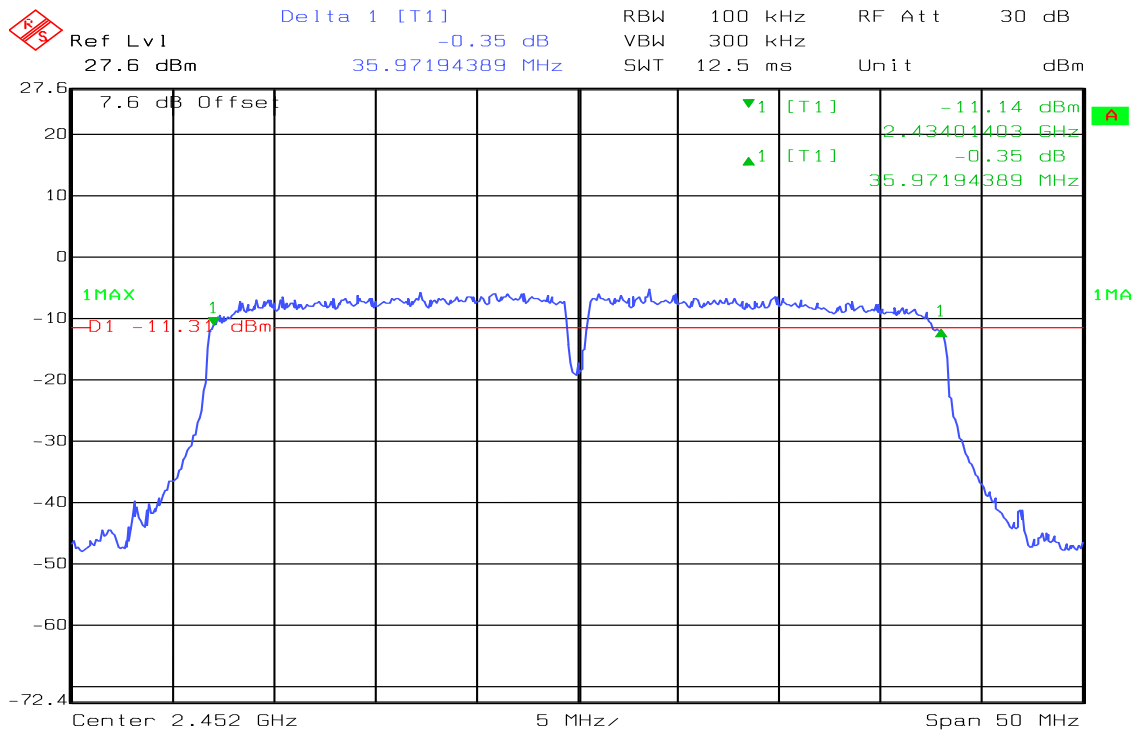


6dB Bandwidth (CH Mid)



Date: 06.DEC.2012 14:48:52

6dB Bandwidth (CH High)



Date: 06.DEC.2012 14:52:41



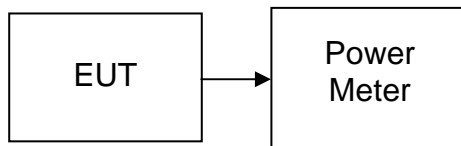
7.2 PEAK POWER

LIMIT

The maximum peak output power of the intentional radiator shall not exceed the following:

1. According to §15.247(b)(3), for systems using digital modulation in the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz: 1 Watt.
2. According to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST CONFIGURATION



TEST PROCEDURE

Per KDB 558074 V02

The transmitter output is connected to the Power Meter. The Power Meter is set to the peak power detection.

TEST RESULTS

No non-compliance noted



TEST DATA

Test mode: IEEE 802.11b mode

| Channel | Frequency (MHz) | Output Power (dBm) | Output Power (W) | Limit (W) | Result |
|---------|-----------------|--------------------|------------------|-----------|--------|
| Low | 2412 | 21.80 | 0.1514 | 1.00 | PASS |
| Mid | 2437 | 21.18 | 0.1312 | | PASS |
| High | 2462 | 20.05 | 0.1012 | | PASS |

Test mode: IEEE 802.11g mode

| Channel | Frequency (MHz) | Output Power (dBm) | Output Power (W) | Limit (W) | Result |
|---------|-----------------|--------------------|------------------|-----------|--------|
| Low | 2412 | 21.66 | 0.1466 | 1.00 | PASS |
| Mid | 2437 | 22.16 | 0.1644 | | PASS |
| High | 2462 | 21.95 | 0.1567 | | PASS |

Test mode: IEEE 802.11n HT20 mode

| Channel | Frequency (MHz) | Output Power (dBm) | Output Power (W) | Limit (W) | Result |
|---------|-----------------|--------------------|------------------|-----------|--------|
| Low | 2412 | 21.62 | 0.1452 | 1.00 | PASS |
| Mid | 2437 | 21.98 | 0.1578 | | PASS |
| High | 2462 | 21.85 | 0.1531 | | PASS |

Test mode: IEEE 802.11n HT40 mode

| Channel | Frequency (MHz) | Output Power (dBm) | Output Power (W) | Limit (W) | Result |
|---------|-----------------|--------------------|------------------|-----------|--------|
| Low | 2422 | 21.21 | 0.1321 | 1.00 | PASS |
| Mid | 2437 | 21.15 | 0.1303 | | PASS |
| High | 2452 | 21.45 | 0.1396 | | PASS |

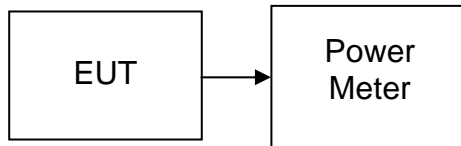


7.3 AVERAGE POWER

LIMIT

None; for reporting purposes only.

TEST CONFIGURATION



TEST PROCEDURE

Per KDB 558074 V02

The transmitter output is connected to the Power Meter. The Power Meter is set to the peak power detection.

TEST RESULTS

No non-compliance noted



TEST DATA

Test mode: IEEE 802.11b mode

| Channel | Frequency (MHz) | Output Power (dBm) | Output Power (W) |
|----------------|------------------------|---------------------------|-------------------------|
| Low | 2412 | 19.74 | 0.0942 |
| Mid | 2437 | 19.05 | 0.0804 |
| High | 2462 | 18.03 | 0.0635 |

Test mode: IEEE 802.11g mode

| Channel | Frequency (MHz) | Output Power (dBm) | Output Power (W) |
|----------------|------------------------|---------------------------|-------------------------|
| Low | 2412 | 11.52 | 0.0142 |
| Mid | 2437 | 11.92 | 0.0156 |
| High | 2462 | 11.72 | 0.0149 |

Test mode: IEEE 802.11n HT20 mode

| Channel | Frequency (MHz) | Output Power (dBm) | Output Power (W) |
|----------------|------------------------|---------------------------|-------------------------|
| Low | 2412 | 12.13 | 0.0163 |
| Mid | 2437 | 12.25 | 0.0168 |
| High | 2462 | 12.68 | 0.0185 |

Test mode: IEEE 802.11n HT40 mode

| Channel | Frequency (MHz) | Output Power (dBm) | Output Power (W) |
|----------------|------------------------|---------------------------|-------------------------|
| Low | 2422 | 11.63 | 0.0146 |
| Mid | 2437 | 11.75 | 0.0150 |
| High | 2452 | 11.95 | 0.0157 |

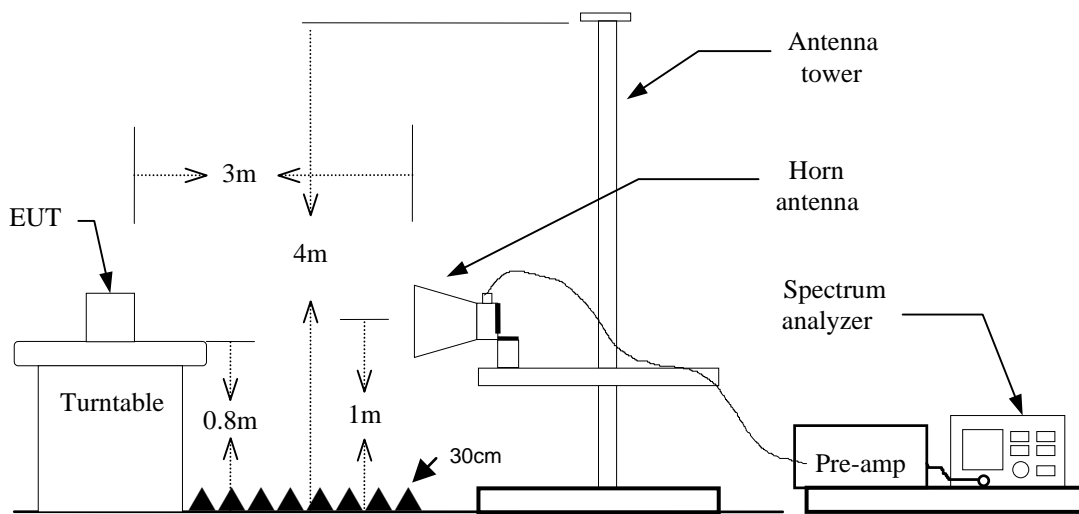


7.4 BAND EDGES MEASUREMENT

LIMIT

According to §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, provided the transmitter demonstrates compliance with the peak conducted power limits. 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 Section 15.205(c)).

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8m above the ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
 - (a) PEAK: RBW=VBW=1MHz / Sweep=100ms
 - (b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

TEST RESULTS

Refer to attach spectrum analyzer data chart.



Test Plot

Band Edges (IEEE 802.11b mode / CH Low)

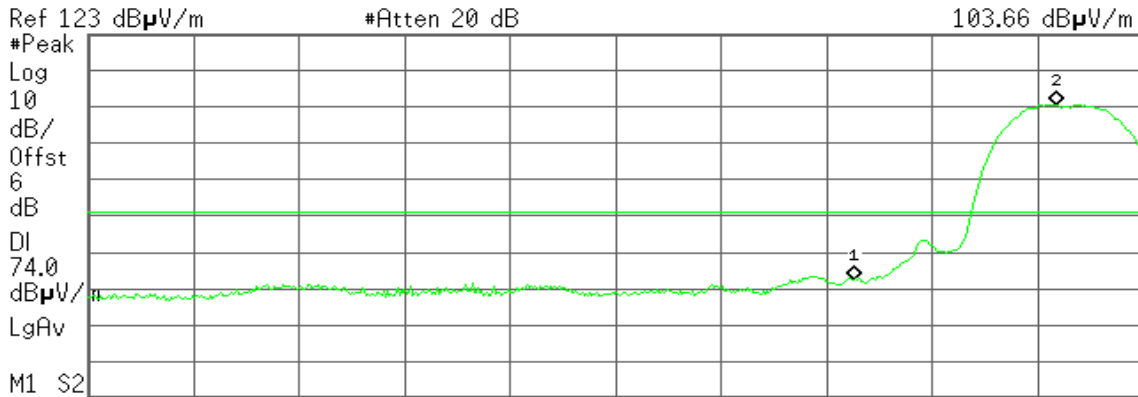
Detector mode: Peak

Polarity: Vertical

Agilent 14:10:10 Nov 22, 2012

R L

Mkr2 2.411 02 GHz
103.66 dBµV/m



Ref 123 dBµV/m #Atten 20 dB Start 2.310 00 GHz Stop 2.420 00 GHz
#Res BW 1 MHz #VBW 1 MHz #Sweep 100 ms (601 pts)

| Marker | Trace | Type | X Axis | Amplitude |
|--------|-------|------|--------------|---------------|
| 1 | (1) | Freq | 2.390 00 GHz | 55.30 dBµV/m |
| 2 | (1) | Freq | 2.411 02 GHz | 103.66 dBµV/m |

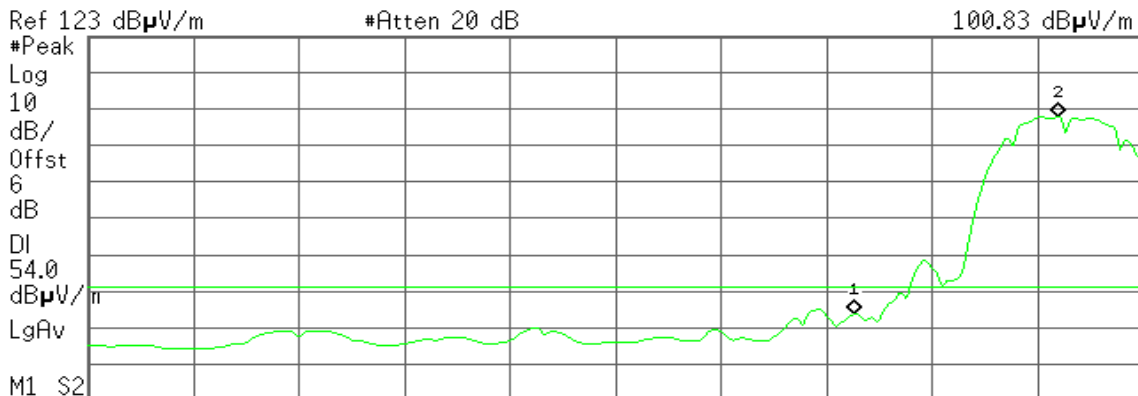
Detector mode: Average

Polarity: Vertical

Agilent 14:14:20 Nov 22, 2012

R L

Mkr2 2.411 20 GHz
100.83 dBµV/m



Ref 123 dBµV/m #Atten 20 dB Start 2.310 00 GHz Stop 2.420 00 GHz
#Res BW 1 MHz #VBW 10 Hz Sweep 8.577 s (601 pts)

| Marker | Trace | Type | X Axis | Amplitude |
|--------|-------|------|--------------|---------------|
| 1 | (1) | Freq | 2.390 00 GHz | 46.59 dBµV/m |
| 2 | (1) | Freq | 2.411 20 GHz | 100.83 dBµV/m |



Detector mode: Peak

Polarity: Horizontal

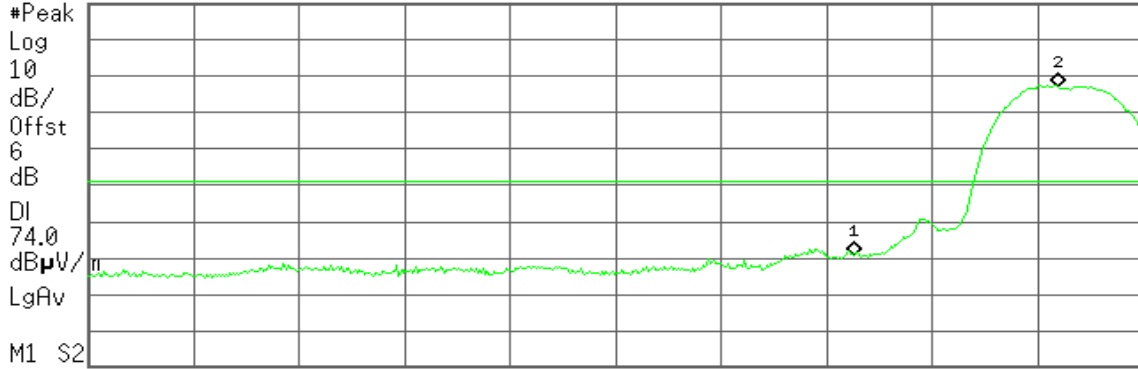
Agilent 14:19:05 Nov 22, 2012

R L

Mkr2 2.411 20 GHz
100.23 dBµV/m

Ref 123 dBµV/m

#Atten 20 dB



Start 2.310 00 GHz

Stop 2.420 00 GHz

#Res BW 1 MHz

#VBW 1 MHz

#Sweep 100 ms (601 pts)

| Marker | Trace | Type | X Axis | Amplitude |
|--------|-------|------|--------------|---------------|
| 1 | (1) | Freq | 2.390 00 GHz | 53.82 dBµV/m |
| 2 | (1) | Freq | 2.411 20 GHz | 100.23 dBµV/m |

Detector mode: Average

Polarity: Horizontal

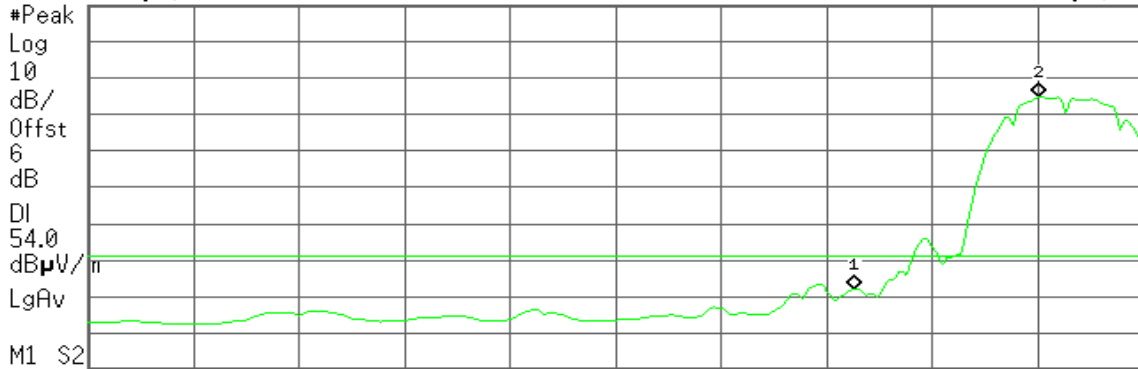
Agilent 14:21:10 Nov 22, 2012

R L

Mkr2 2.409 18 GHz
97.75 dBµV/m

Ref 123 dBµV/m

#Atten 20 dB



Start 2.310 00 GHz

Stop 2.420 00 GHz

#Res BW 1 MHz

#VBW 10 Hz

Sweep 8.577 s (601 pts)

| Marker | Trace | Type | X Axis | Amplitude |
|--------|-------|------|--------------|--------------|
| 1 | (1) | Freq | 2.390 00 GHz | 45.84 dBµV/m |
| 2 | (1) | Freq | 2.409 18 GHz | 97.75 dBµV/m |



Band Edges (IEEE 802.11b mode / CH High)

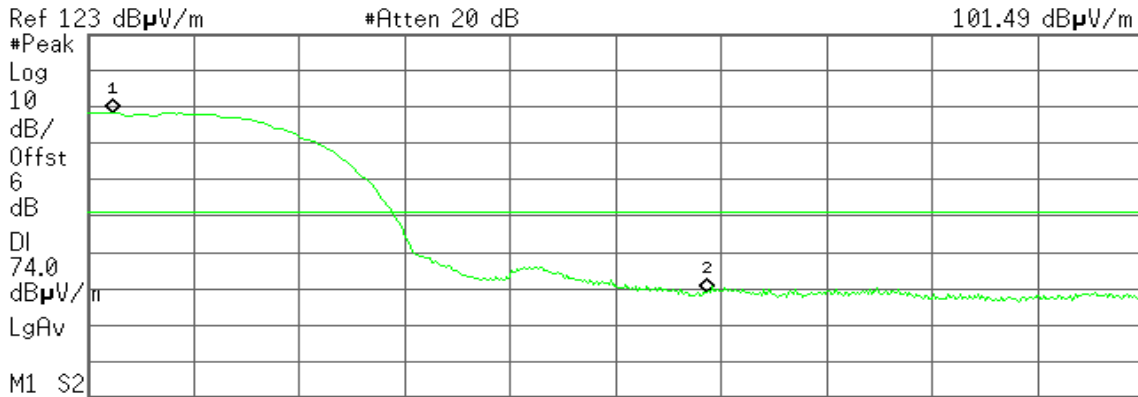
Detector mode: Peak

Polarity: Vertical

Agilent 18:23:01 Nov 22, 2012

R L

Mkr1 2.460 93 GHz
101.49 dBμV/m



Start 2.460 00 GHz Stop 2.500 00 GHz
#Res BW 1 MHz #VBW 1 MHz #Sweep 100 ms (601 pts)

| Marker | Trace | Type | X Axis | Amplitude |
|--------|-------|------|--------------|---------------|
| 1 | (1) | Freq | 2.460 93 GHz | 101.49 dBμV/m |
| 2 | (1) | Freq | 2.483 50 GHz | 51.79 dBμV/m |

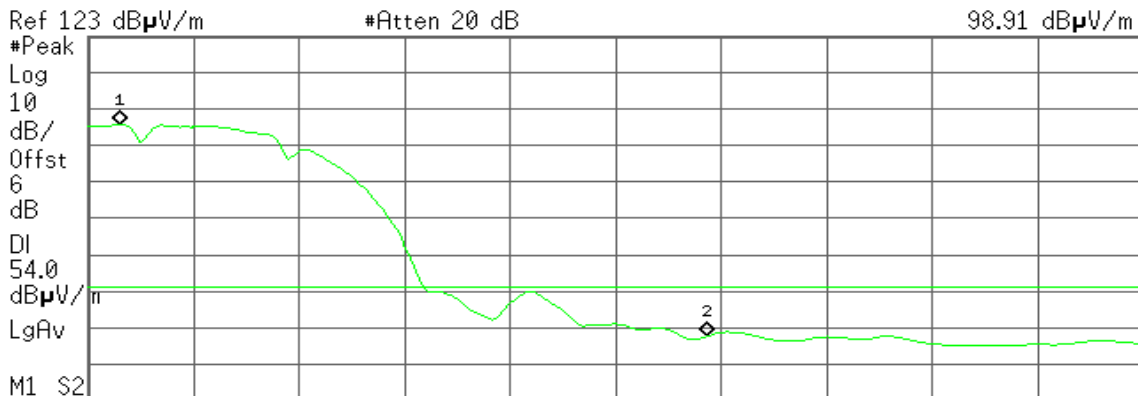
Detector mode: Average

Polarity: Vertical

Agilent 18:24:14 Nov 22, 2012

R L

Mkr1 2.461 20 GHz
98.91 dBμV/m



Start 2.460 00 GHz Stop 2.500 00 GHz
#Res BW 1 MHz #VBW 10 Hz Sweep 3.119 s (601 pts)

| Marker | Trace | Type | X Axis | Amplitude |
|--------|-------|------|--------------|--------------|
| 1 | (1) | Freq | 2.461 20 GHz | 98.91 dBμV/m |
| 2 | (1) | Freq | 2.483 50 GHz | 40.63 dBμV/m |



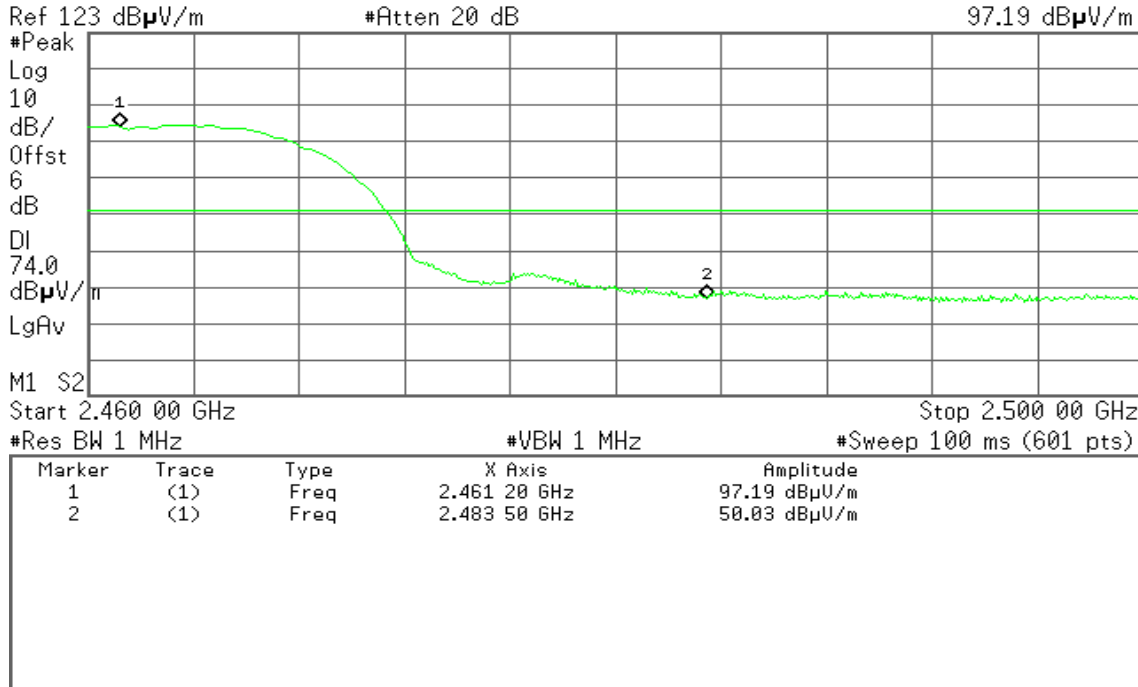
Detector mode: Peak

Polarity: Horizontal

Agilent 18:26:29 Nov 22, 2012

R L

Mkr1 2.461 20 GHz
97.19 dBµV/m



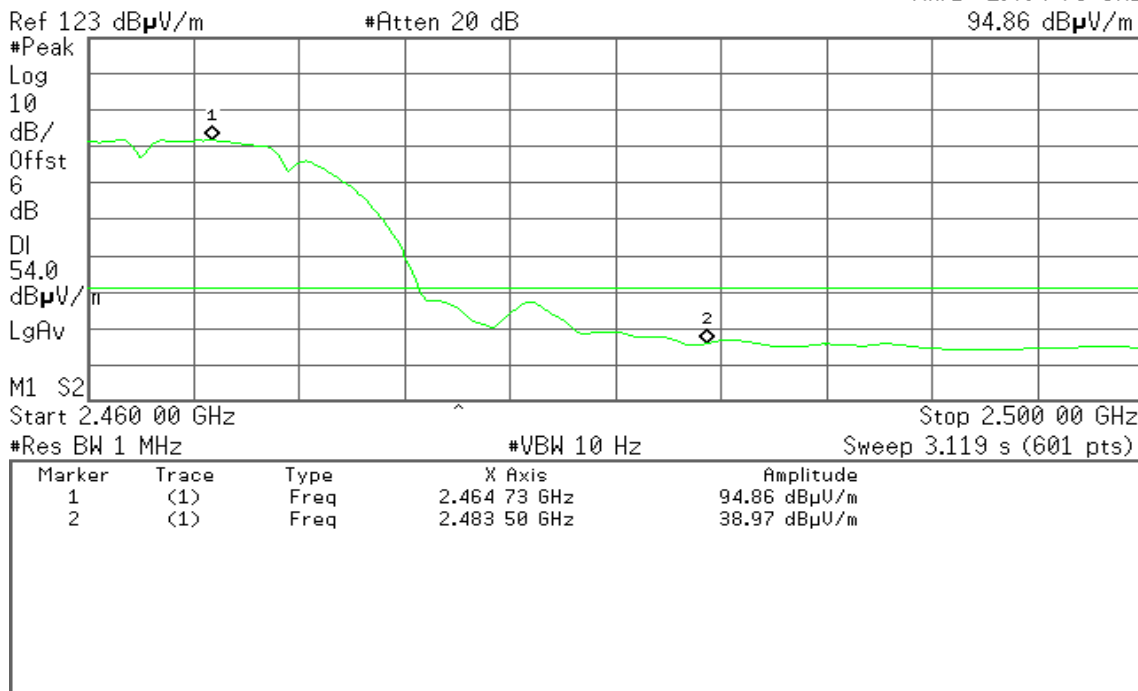
Detector mode: Average

Polarity: Horizontal

Agilent 18:27:05 Nov 22, 2012

R L

Mkr1 2.464 73 GHz
94.86 dBµV/m





Band Edges (IEEE 802.11g mode / CH Low)

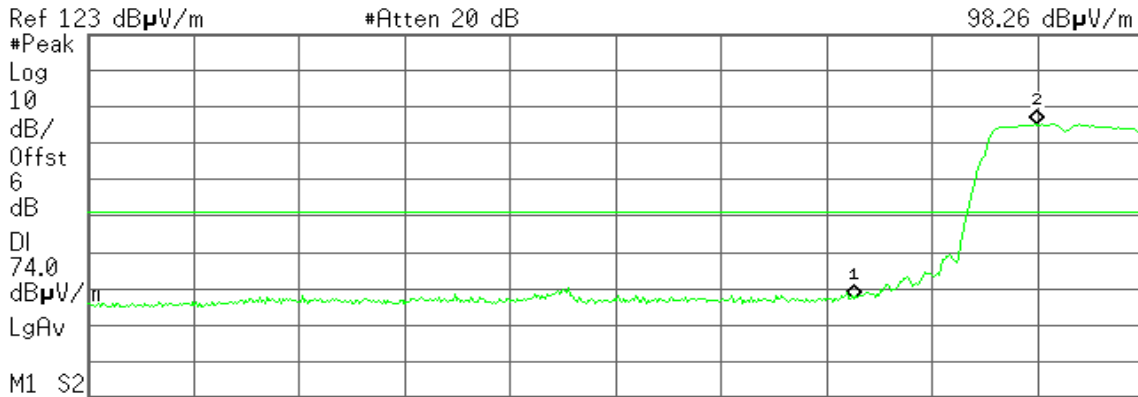
Detector mode: Peak

Polarity: Vertical

Agilent 16:57:47 Nov 22, 2012

R L

Mkr2 2.408 82 GHz
98.26 dBμV/m



| Marker | Trace | Type | X Axis | Amplitude |
|--------|-------|------|--------------|--------------|
| 1 | (1) | Freq | 2.398 00 GHz | 50.21 dBμV/m |
| 2 | (1) | Freq | 2.408 82 GHz | 98.26 dBμV/m |

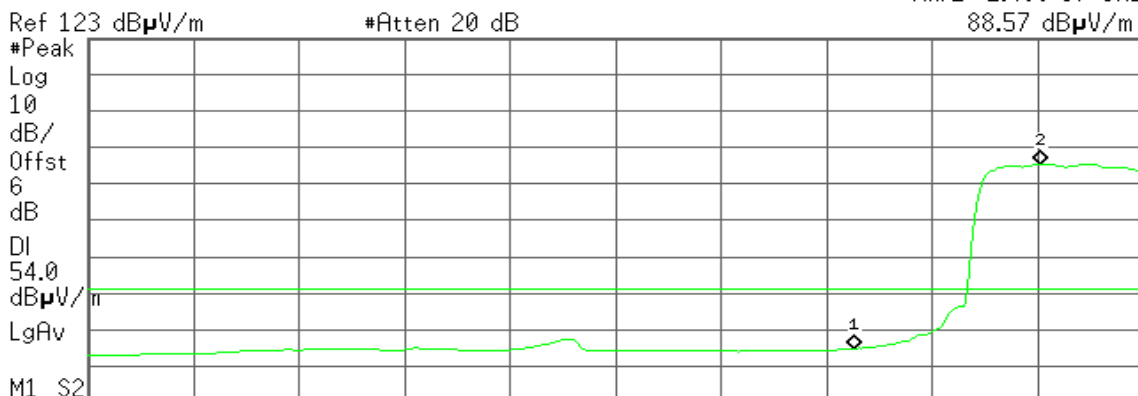
Detector mode: Average

Polarity: Vertical

Agilent 18:39:43 Nov 22, 2012

R L

Mkr2 2.409 37 GHz
88.57 dBμV/m



| Marker | Trace | Type | X Axis | Amplitude |
|--------|-------|------|--------------|--------------|
| 1 | (1) | Freq | 2.398 00 GHz | 37.88 dBμV/m |
| 2 | (1) | Freq | 2.409 37 GHz | 88.57 dBμV/m |



Detector mode: Peak

Polarity: Horizontal

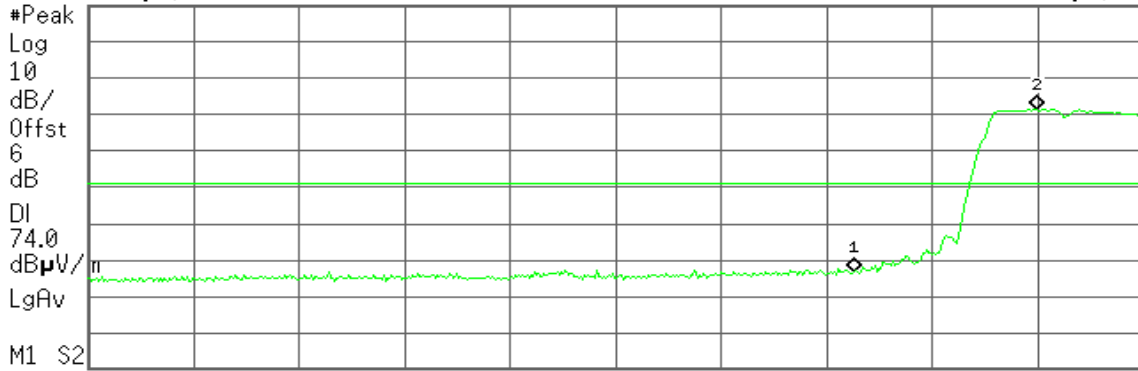
Agilent 15:23:40 Nov 22, 2012

R T

Mkr2 2.409 00 GHz
94.55 dBµV/m

Ref 123 dBµV/m

#Atten 20 dB



| Marker | Trace | Type | X Axis | Amplitude |
|--------|-------|------|--------------|--------------|
| 1 | (1) | Freq | 2.390 00 GHz | 49.66 dBµV/m |
| 2 | (1) | Freq | 2.409 00 GHz | 94.55 dBµV/m |

Detector mode: Average

Polarity: Horizontal

Agilent 15:25:15 Nov 22, 2012

R L

Mkr2 2.409 18 GHz
85.57 dBµV/m

Ref 123 dBµV/m

#Atten 20 dB



| Marker | Trace | Type | X Axis | Amplitude |
|--------|-------|------|--------------|--------------|
| 1 | (1) | Freq | 2.390 00 GHz | 36.64 dBµV/m |
| 2 | (1) | Freq | 2.409 18 GHz | 85.57 dBµV/m |



Band Edges (IEEE 802.11g mode / CH High)

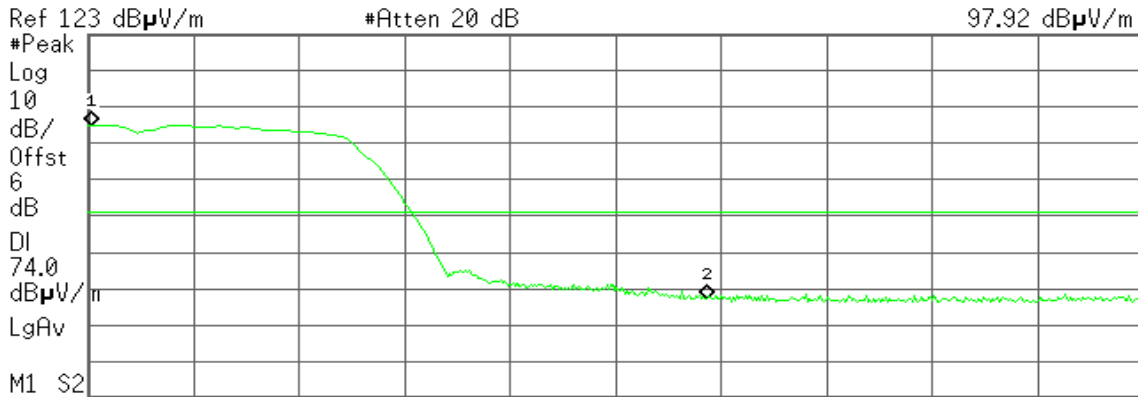
Detector mode: Peak

Polarity: Vertical

Agilent 18:05:17 Nov 22, 2012

R L

Mkr1 2.460 13 GHz
97.92 dB μ V/m



Start 2.460 00 GHz Stop 2.500 00 GHz
#Res BW 1 MHz #VBW 1 MHz #Sweep 100 ms (601 pts)

| Marker | Trace | Type | X Axis | Amplitude |
|--------|-------|------|--------------|--------------------|
| 1 | (1) | Freq | 2.460 13 GHz | 97.92 dB μ V/m |
| 2 | (1) | Freq | 2.483 50 GHz | 50.45 dB μ V/m |

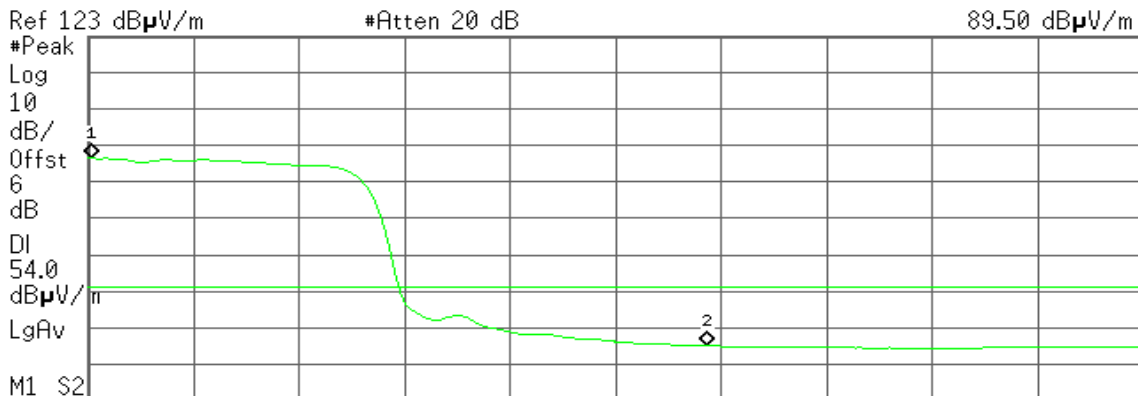
Detector mode: Average

Polarity: Vertical

Agilent 18:06:13 Nov 22, 2012

R L

Mkr1 2.460 13 GHz
89.50 dB μ V/m



Start 2.460 00 GHz Stop 2.500 00 GHz
#Res BW 1 MHz #VBW 10 Hz Sweep 3.119 s (601 pts)

| Marker | Trace | Type | X Axis | Amplitude |
|--------|-------|------|--------------|--------------------|
| 1 | (1) | Freq | 2.460 13 GHz | 89.50 dB μ V/m |
| 2 | (1) | Freq | 2.483 50 GHz | 38.02 dB μ V/m |



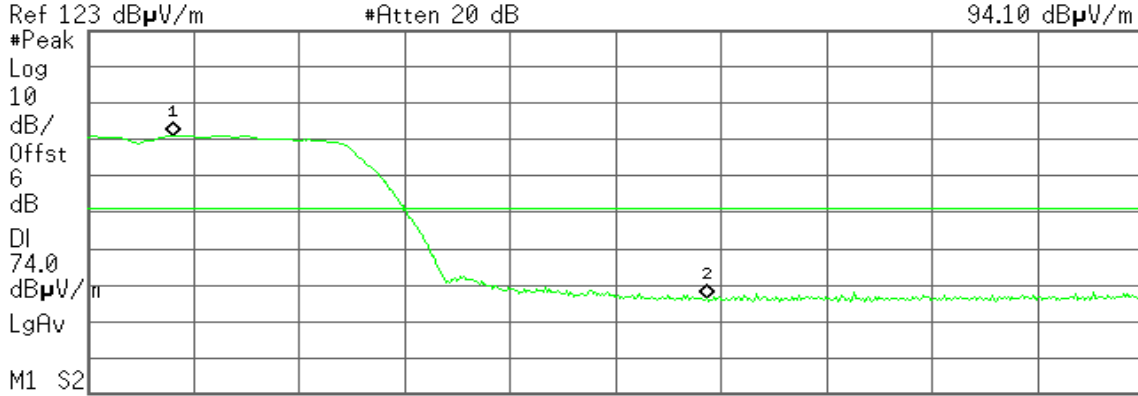
Detector mode: Peak

Polarity: Horizontal

Agilent 18:08:39 Nov 22, 2012

R L

Mkr1 2.463 20 GHz
94.10 dBµV/m



| Marker | Trace | Type | X Axis | Amplitude |
|--------|-------|------|--------------|--------------|
| 1 | (1) | Freq | 2.463 20 GHz | 94.10 dBµV/m |
| 2 | (1) | Freq | 2.483 50 GHz | 49.51 dBµV/m |

#Res BW 1 MHz #VBW 1 MHz #Sweep 100 ms (601 pts)

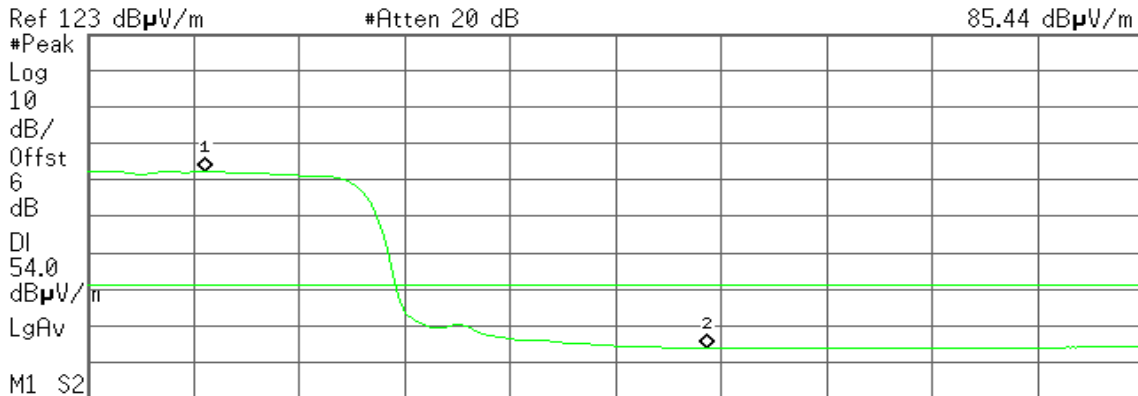
Detector mode: Average

Polarity: Horizontal

Agilent 18:09:36 Nov 22, 2012

R L

Mkr1 2.464 47 GHz
85.44 dBµV/m



| Marker | Trace | Type | X Axis | Amplitude |
|--------|-------|------|--------------|--------------|
| 1 | (1) | Freq | 2.464 47 GHz | 85.44 dBµV/m |
| 2 | (1) | Freq | 2.483 50 GHz | 36.90 dBµV/m |

#Res BW 1 MHz #VBW 10 Hz Sweep 3.119 s (601 pts)



Band Edges (IEEE 802.11n HT20 mode / CH Low)

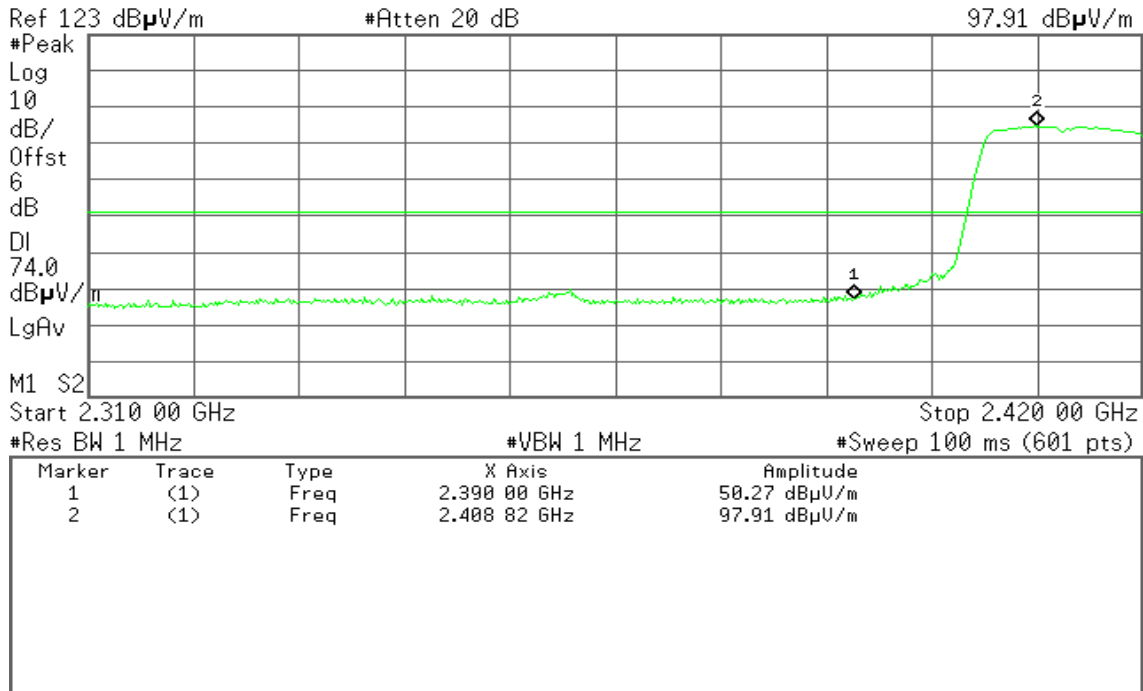
Detector mode: Peak

Polarity: Vertical

Agilent 17:03:32 Nov 22, 2012

R T

Mkr2 2.408 82 GHz
97.91 dBμV/m



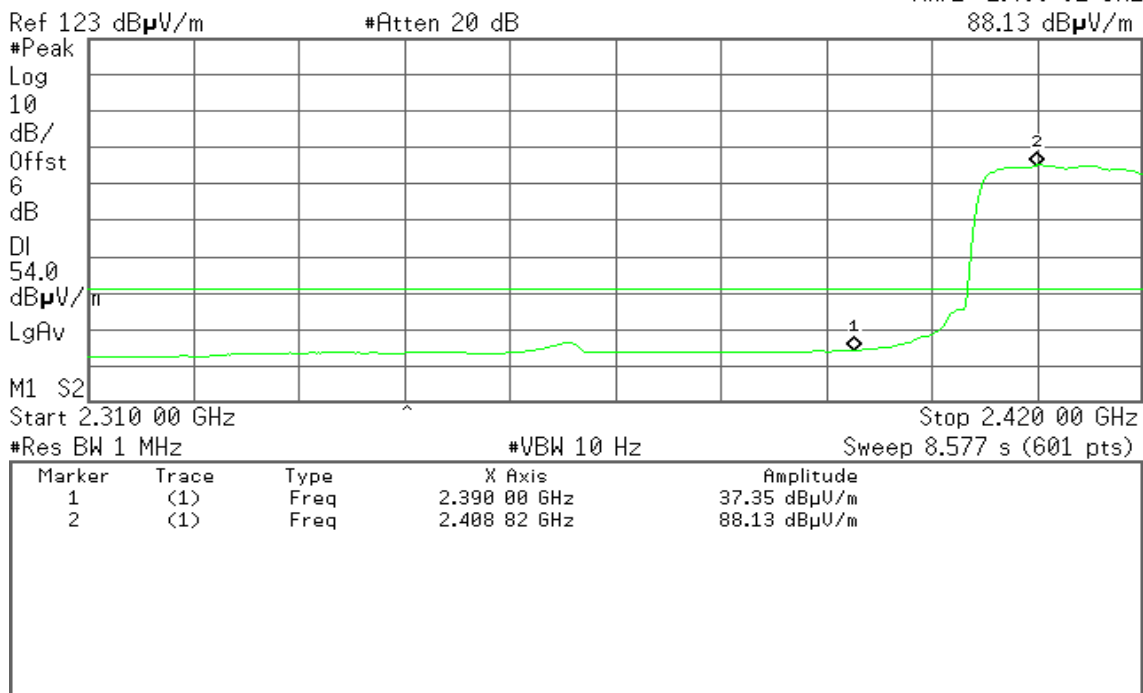
Detector mode: Average

Polarity: Vertical

Agilent 17:05:20 Nov 22, 2012

R L

Mkr2 2.408 82 GHz
88.13 dBμV/m





Detector mode: Peak

Polarity: Horizontal

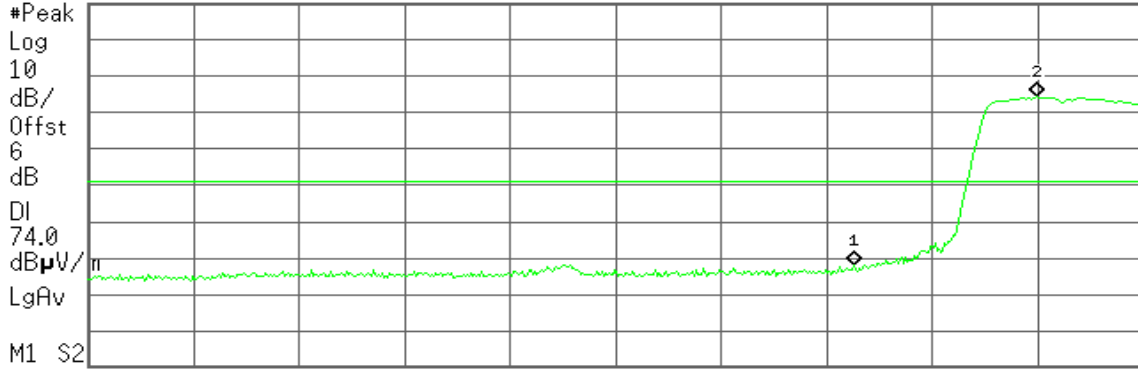
Agilent 17:09:17 Nov 22, 2012

R L

Mkr2 2.408 82 GHz
97.34 dBµV/m

Ref 123 dBµV/m

#Atten 20 dB



Start 2.310 00 GHz

Stop 2.420 00 GHz

#Res BW 1 MHz

#VBW 1 MHz

#Sweep 100 ms (601 pts)

| Marker | Trace | Type | X Axis | Amplitude |
|--------|-------|------|--------------|--------------|
| 1 | (1) | Freq | 2.390 00 GHz | 50.96 dBµV/m |
| 2 | (1) | Freq | 2.408 82 GHz | 97.34 dBµV/m |

Detector mode: Average

Polarity: Horizontal

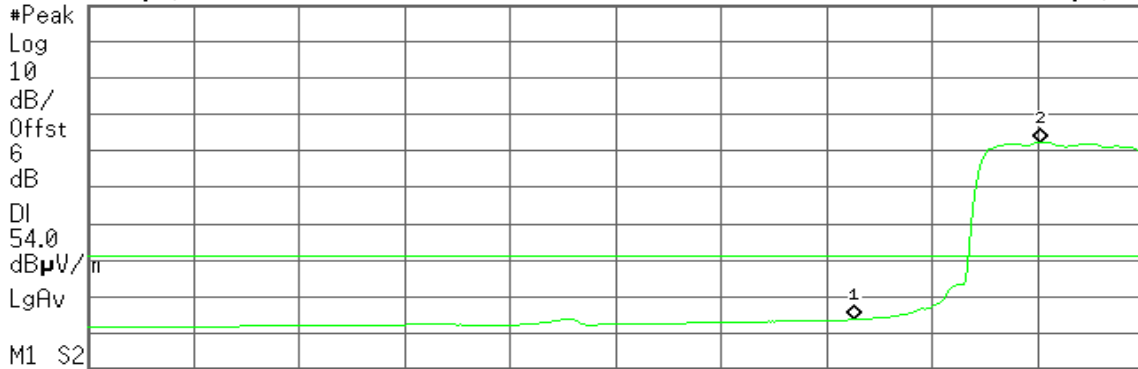
Agilent 17:16:25 Nov 22, 2012

R L

Mkr2 2.409 37 GHz
85.27 dBµV/m

Ref 123 dBµV/m

#Atten 20 dB



Start 2.310 00 GHz

Stop 2.420 00 GHz

#Res BW 1 MHz

#VBW 10 Hz

Sweep 8.577 s (601 pts)

| Marker | Trace | Type | X Axis | Amplitude |
|--------|-------|------|--------------|--------------|
| 1 | (1) | Freq | 2.390 00 GHz | 36.78 dBµV/m |
| 2 | (1) | Freq | 2.409 37 GHz | 85.27 dBµV/m |



Band Edges (IEEE 802.11n HT20 mode / CH High)

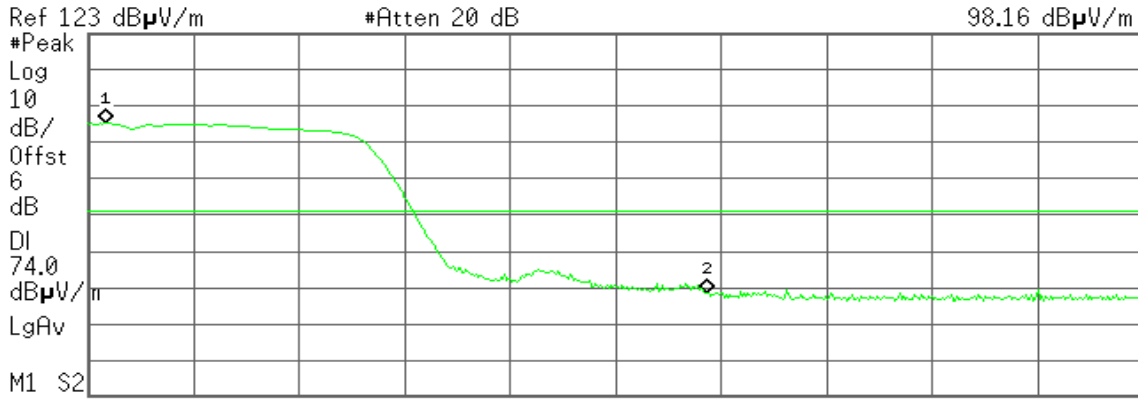
Detector mode: Peak

Polarity: Vertical

Agilent 17:59:09 Nov 22, 2012

R L

Mkr1 2.460 67 GHz
98.16 dBμV/m



Start 2.460 00 GHz Stop 2.500 00 GHz
#Res BW 1 MHz #VBW 1 MHz #Sweep 100 ms (601 pts)

| Marker | Trace | Type | X Axis | Amplitude |
|--------|-------|------|--------------|--------------|
| 1 | (1) | Freq | 2.460 67 GHz | 98.16 dBμV/m |
| 2 | (1) | Freq | 2.483 50 GHz | 51.48 dBμV/m |

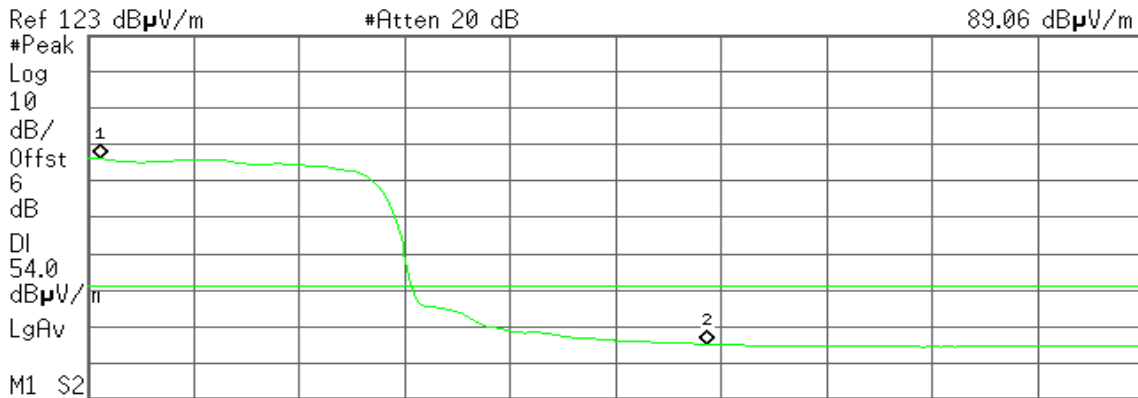
Detector mode: Average

Polarity: Vertical

Agilent 18:00:38 Nov 22, 2012

R L

Mkr1 2.460 47 GHz
89.06 dBμV/m



Start 2.460 00 GHz Stop 2.500 00 GHz
#Res BW 1 MHz #VBW 10 Hz Sweep 3.119 s (601 pts)

| Marker | Trace | Type | X Axis | Amplitude |
|--------|-------|------|--------------|--------------|
| 1 | (1) | Freq | 2.460 47 GHz | 89.06 dBμV/m |
| 2 | (1) | Freq | 2.483 50 GHz | 38.26 dBμV/m |



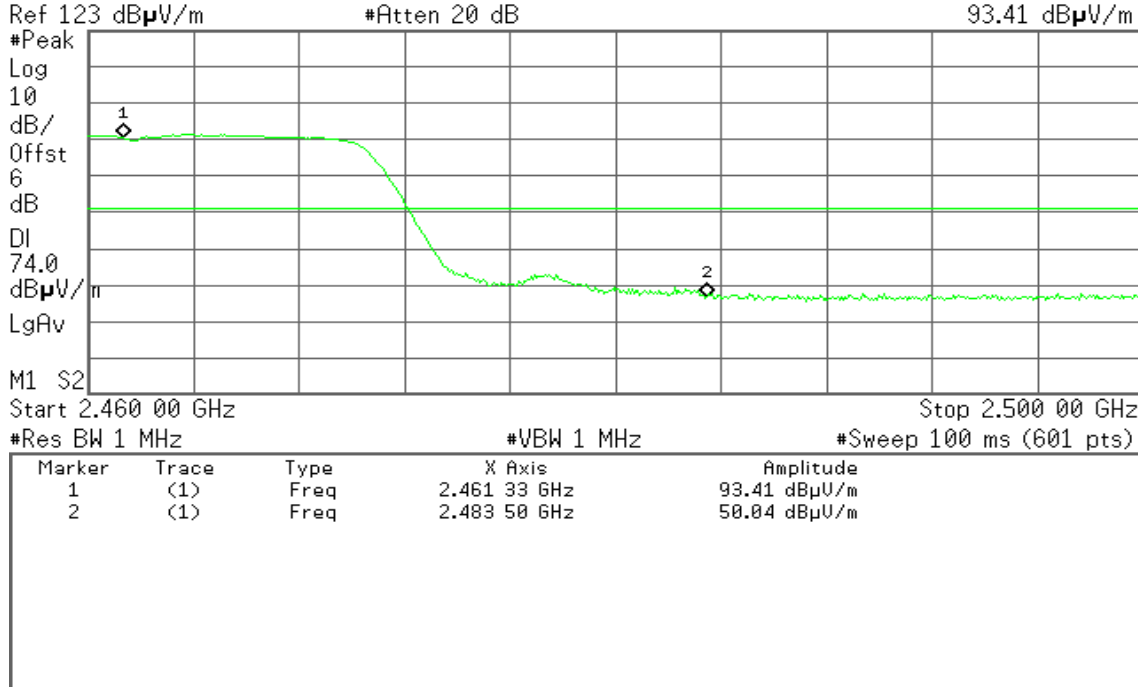
Detector mode: Peak

Polarity: Horizontal

Agilent 17:54:19 Nov 22, 2012

R L

Mkr1 2.461 33 GHz
93.41 dBµV/m



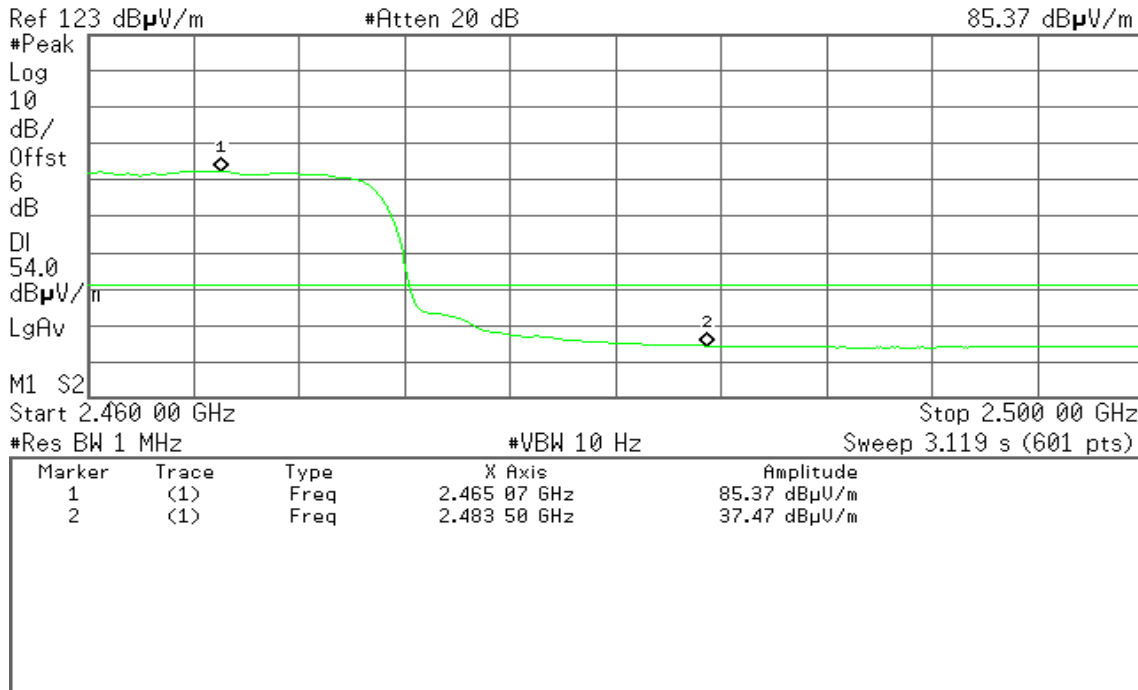
Detector mode: Average

Polarity: Horizontal

Agilent 17:56:02 Nov 22, 2012

R L

Mkr1 2.465 07 GHz
85.37 dBµV/m





Band Edges (IEEE 802.11n HT40 mode / CH Low)

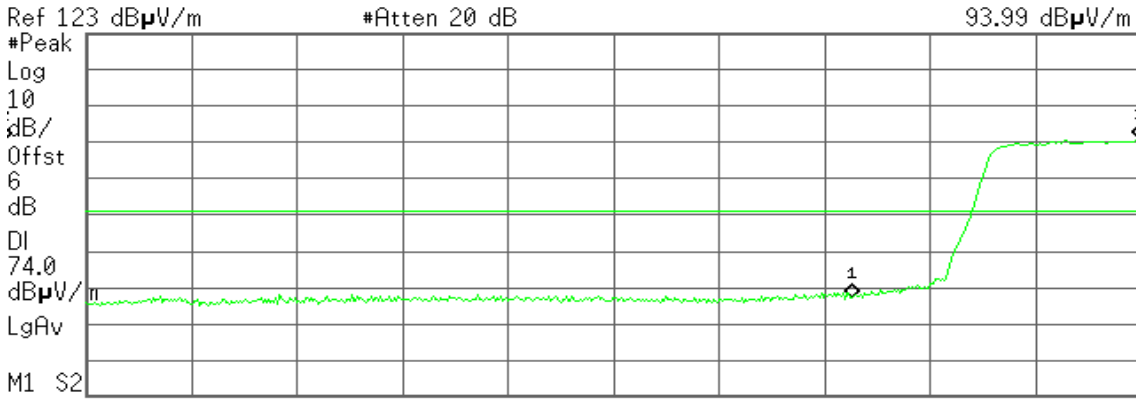
Detector mode: Peak

Polarity: Vertical

Agilent 17:32:00 Nov 22, 2012

R L

Mkr2 2.419 82 GHz
93.99 dBµV/m



Start 2.310 00 GHz Stop 2.420 00 GHz
#Res BW 1 MHz #VBW 1 MHz #Sweep 100 ms (601 pts)

| Marker | Trace | Type | X Axis | Amplitude |
|--------|-------|------|--------------|--------------|
| 1 | (1) | Freq | 2.390 00 GHz | 50.39 dBµV/m |
| 2 | (1) | Freq | 2.419 82 GHz | 93.99 dBµV/m |

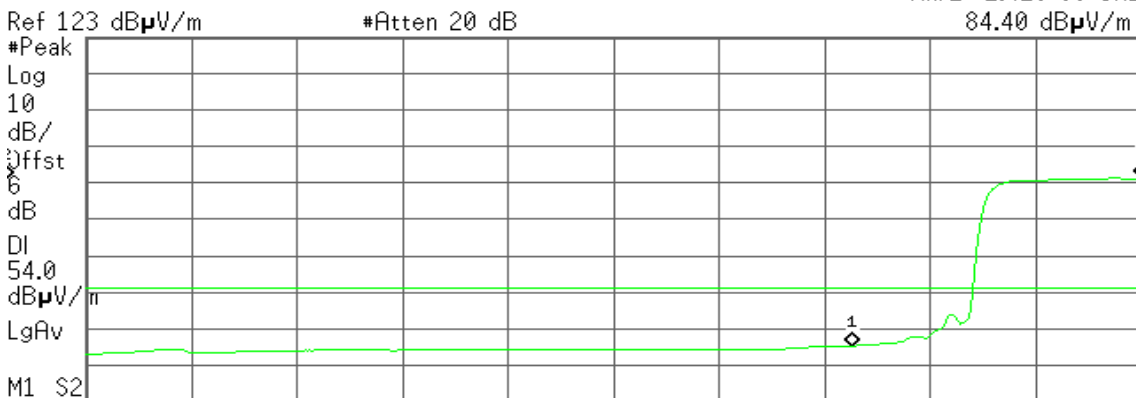
Detector mode: Average

Polarity: Vertical

Agilent 17:34:35 Nov 22, 2012

R L

Mkr2 2.420 00 GHz
84.40 dBµV/m



Start 2.310 00 GHz Stop 2.420 00 GHz
#Res BW 1 MHz #VBW 10 Hz Sweep 8.577 s (601 pts)

| Marker | Trace | Type | X Axis | Amplitude |
|--------|-------|------|--------------|--------------|
| 1 | (1) | Freq | 2.390 00 GHz | 38.26 dBµV/m |
| 2 | (1) | Freq | 2.420 00 GHz | 84.40 dBµV/m |



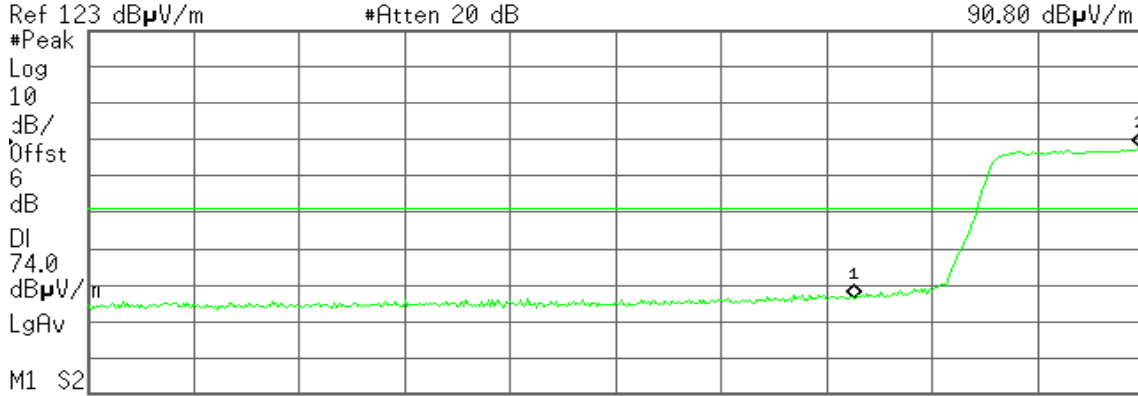
Detector mode: Peak

Polarity: Horizontal

Agilent 17:24:15 Nov 22, 2012

R L

Mkr2 2.419 63 GHz
90.80 dBµV/m



#Res BW 1 MHz #VBW 1 MHz #Sweep 100 ms (601 pts)

| Marker | Trace | Type | X Axis | Amplitude |
|--------|-------|------|--------------|--------------|
| 1 | (1) | Freq | 2.390 00 GHz | 49.46 dBµV/m |
| 2 | (1) | Freq | 2.419 63 GHz | 90.80 dBµV/m |

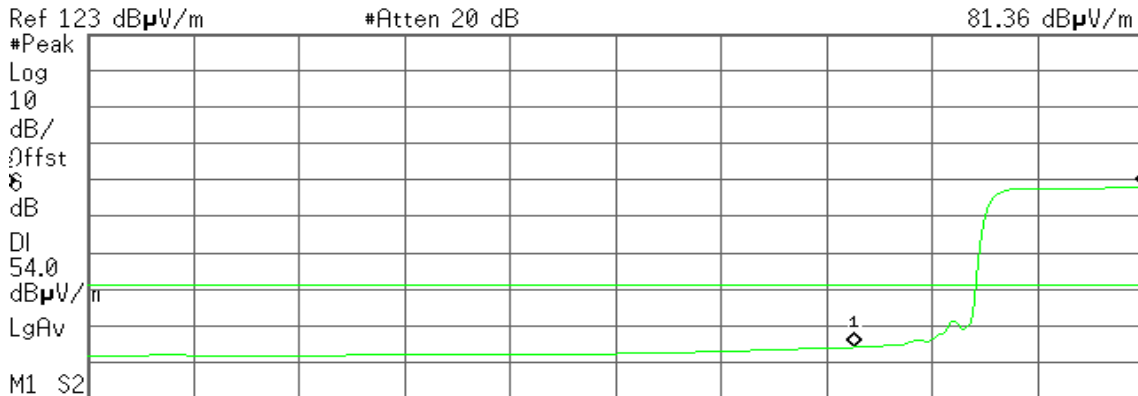
Detector mode: Average

Polarity: Horizontal

Agilent 17:27:56 Nov 22, 2012

R L

Mkr2 2.420 00 GHz
81.36 dBµV/m



#Res BW 1 MHz #VBW 10 Hz Sweep 8.577 s (601 pts)

| Marker | Trace | Type | X Axis | Amplitude |
|--------|-------|------|--------------|--------------|
| 1 | (1) | Freq | 2.390 00 GHz | 37.07 dBµV/m |
| 2 | (1) | Freq | 2.420 00 GHz | 81.36 dBµV/m |



Band Edges (IEEE 802.11n HT40 mode / CH High)

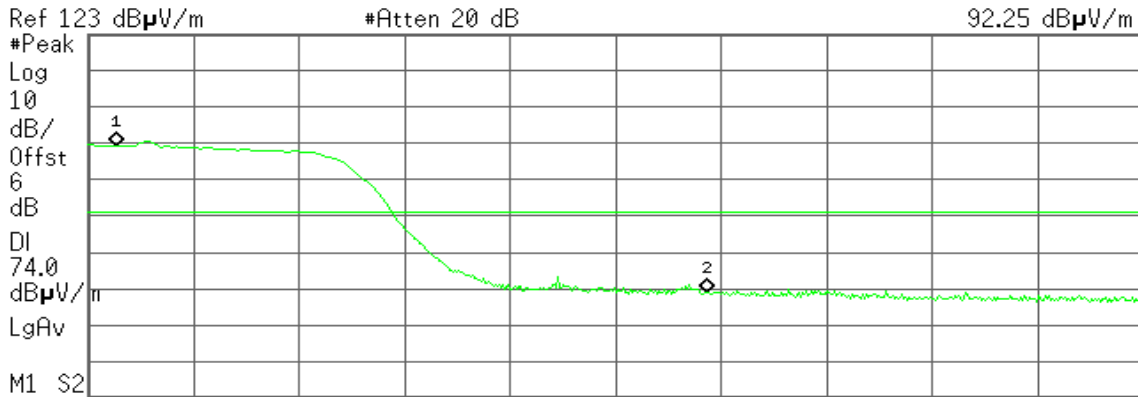
Detector mode: Peak

Polarity: Vertical

Agilent 17:44:35 Nov 22, 2012

R T

Mkr1 2.461 07 GHz
92.25 dBμV/m



Start 2.460 00 GHz Stop 2.500 00 GHz
#Res BW 1 MHz #VBW 1 MHz #Sweep 100 ms (601 pts)

| Marker | Trace | Type | X Axis | Amplitude |
|--------|-------|------|--------------|--------------|
| 1 | (1) | Freq | 2.461 07 GHz | 92.25 dBμV/m |
| 2 | (1) | Freq | 2.483 50 GHz | 52.10 dBμV/m |

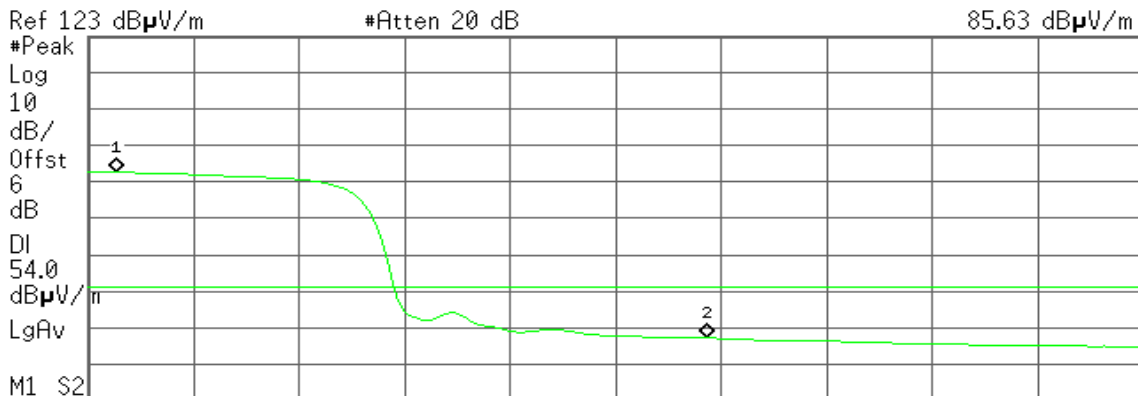
Detector mode: Average

Polarity: Vertical

Agilent 18:33:40 Nov 22, 2012

R L

Mkr1 2.461 07 GHz
85.63 dBμV/m



Start 2.460 00 GHz Stop 2.500 00 GHz
#Res BW 1 MHz #VBW 10 Hz Sweep 3.119 s (601 pts)

| Marker | Trace | Type | X Axis | Amplitude |
|--------|-------|------|--------------|--------------|
| 1 | (1) | Freq | 2.461 07 GHz | 85.63 dBμV/m |
| 2 | (1) | Freq | 2.483 50 GHz | 40.16 dBμV/m |



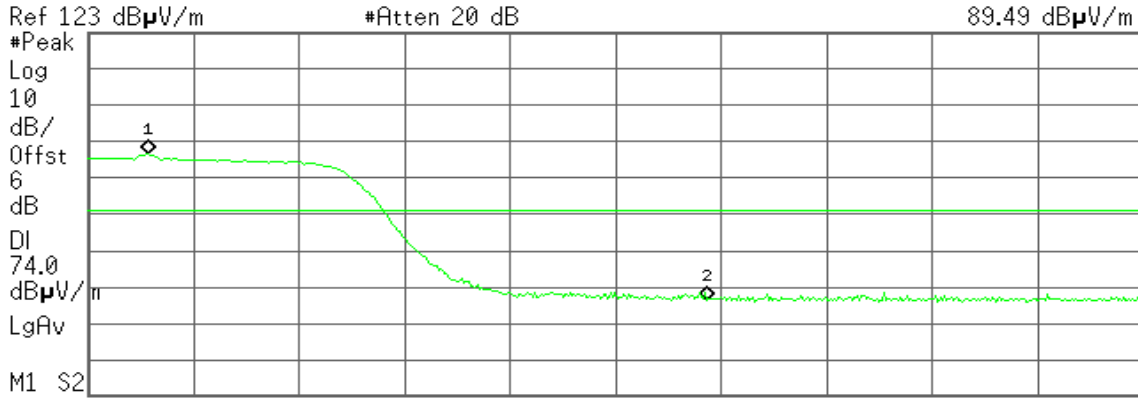
Detector mode: Peak

Polarity: Horizontal

Agilent 17:49:16 Nov 22, 2012

R T

Mkr1 2.462 27 GHz
89.49 dBµV/m



#Res BW 1 MHz #VBW 1 MHz #Sweep 100 ms (601 pts)

| Marker | Trace | Type | X Axis | Amplitude |
|--------|-------|------|--------------|--------------|
| 1 | (1) | Freq | 2.462 27 GHz | 89.49 dBµV/m |
| 2 | (1) | Freq | 2.483 50 GHz | 49.60 dBµV/m |

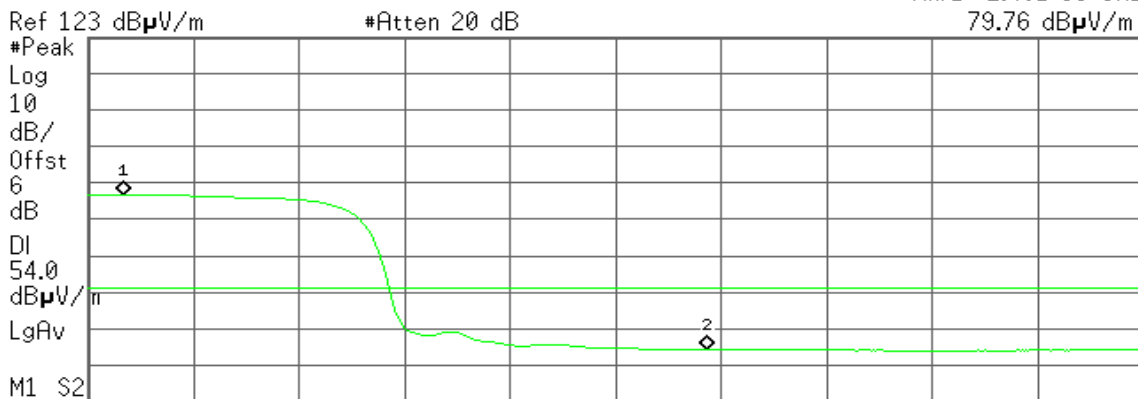
Detector mode: Average

Polarity: Horizontal

Agilent 17:50:22 Nov 22, 2012

R L

Mkr1 2.461 33 GHz
79.76 dBµV/m



#Res BW 1 MHz #VBW 10 Hz Sweep 3.119 s (601 pts)

| Marker | Trace | Type | X Axis | Amplitude |
|--------|-------|------|--------------|--------------|
| 1 | (1) | Freq | 2.461 33 GHz | 79.76 dBµV/m |
| 2 | (1) | Freq | 2.483 50 GHz | 37.31 dBµV/m |

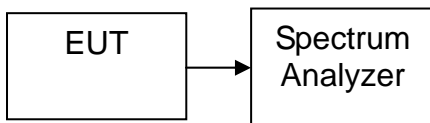


7.5 PEAK POWER SPECTRAL DENSITY

LIMIT

1. According to §15.247(e), 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.
2. According to §15.247(f), the digital modulation operation of the hybrid system, with the frequency hopping turned off, shall comply with the power density requirements of paragraph (d) of this section.

TEST CONFIGURATION



TEST PROCEDURE

Per KDB 558074 V02

1. Place the EUT on the table and set it in transmitting mode. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set the spectrum analyzer as RBW = 3kHz, VBW = 10kHz, Span = 30MHz (for IEEE 802.11 b/g/HT 20MHz) or SPAN = 60MHz (for IEEE 802.11 HT 40MHz), Sweep= auto.
3. Record the max. reading.
4. Repeat the above procedure until the measurements for all frequencies are completed.

TEST RESULTS

No non-compliance noted



TEST DATA

Test mode: IEEE 802.11b mode

| Channel | Frequency (MHz) | PPSD (dBm) | Limit (dBm) | Result |
|---------|-----------------|------------|-------------|--------|
| Low | 2412 | -12.71 | 8.00 | PASS |
| Mid | 2437 | -12.66 | | PASS |
| High | 2462 | -12.88 | | PASS |

Test mode: IEEE 802.11g mode

| Channel | Frequency (MHz) | PPSD (dBm) | Limit (dBm) | Result |
|---------|-----------------|------------|-------------|--------|
| Low | 2412 | -14.61 | 8.00 | PASS |
| Mid | 2437 | -12.33 | | PASS |
| High | 2462 | -14.05 | | PASS |

Test mode: IEEE 802.11n HT 20 MHz Channel mode

| Channel | Frequency (MHz) | PPSD (dBm) | Limit (dBm) | Result |
|---------|-----------------|------------|-------------|--------|
| Low | 2412 | -14.08 | 8.00 | PASS |
| Mid | 2437 | -14.63 | | PASS |
| High | 2462 | -14.93 | | PASS |

Test mode: IEEE 802.11n HT 40 MHz Channel mode

| Channel | Frequency (MHz) | PPSD (dBm) | Limit (dBm) | Result |
|---------|-----------------|------------|-------------|--------|
| Low | 2422 | -16.92 | 8.00 | PASS |
| Mid | 2437 | -16.96 | | PASS |
| High | 2452 | -16.98 | | PASS |



Test Plot

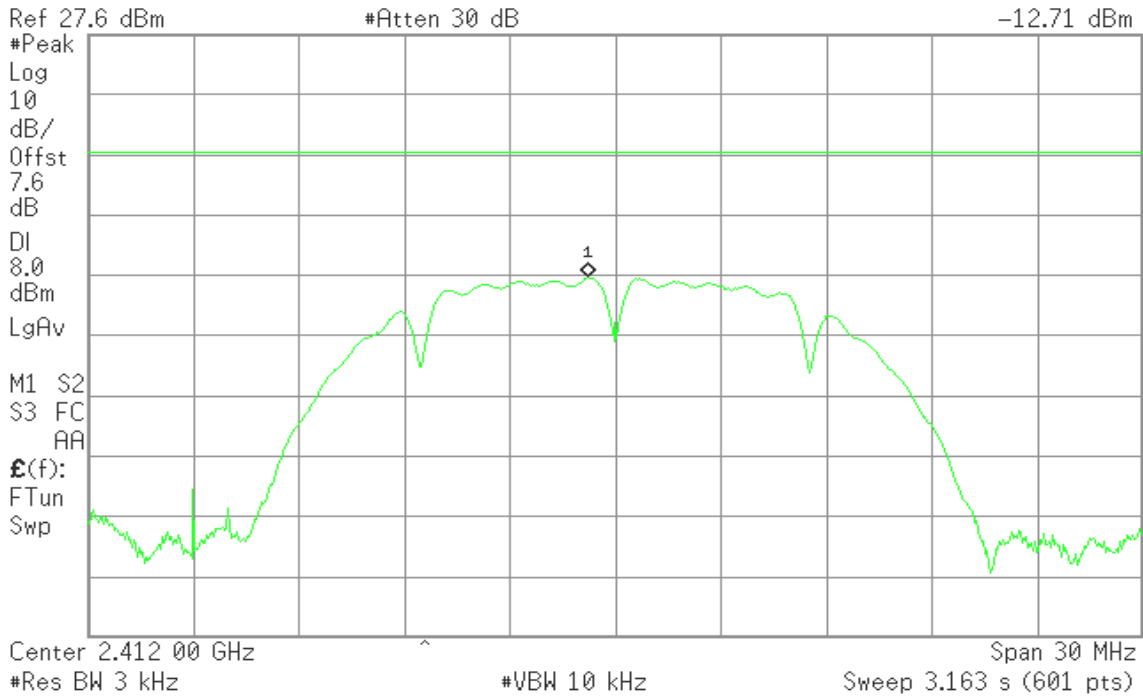
IEEE 802.11b mode

PPSD (CH Low)

Agilent 14:12:21 Jan 15, 2013

R L

Mkr1 2.411 20 GHz
-12.71 dBm

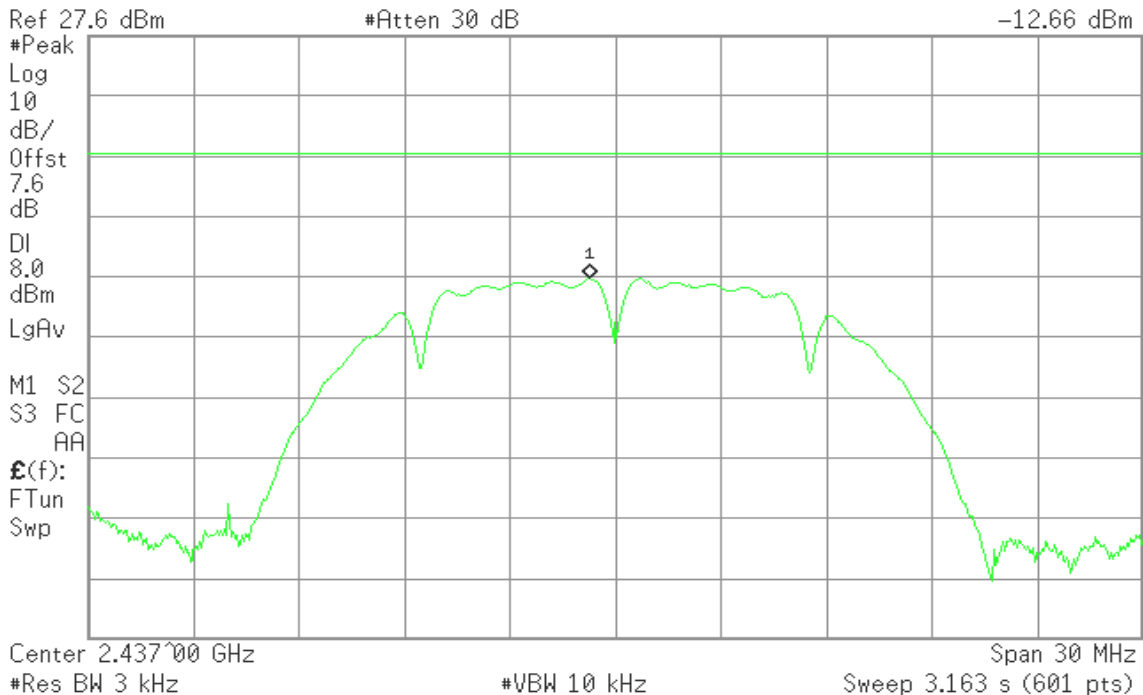


PPSD (CH Mid)

Agilent 14:13:08 Jan 15, 2013

R L

Mkr1 2.436 25 GHz
-12.66 dBm



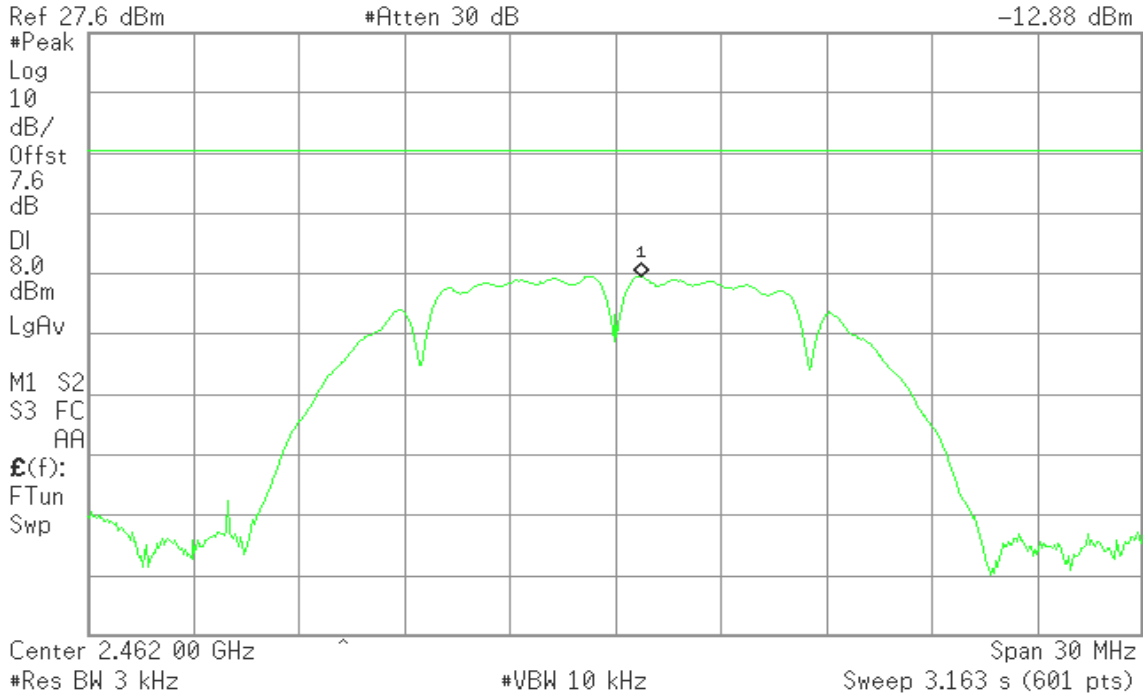


PPSD (CH High)

Agilent 14:14:06 Jan 15, 2013

R L

Mkr1 2.462 75 GHz
-12.88 dBm



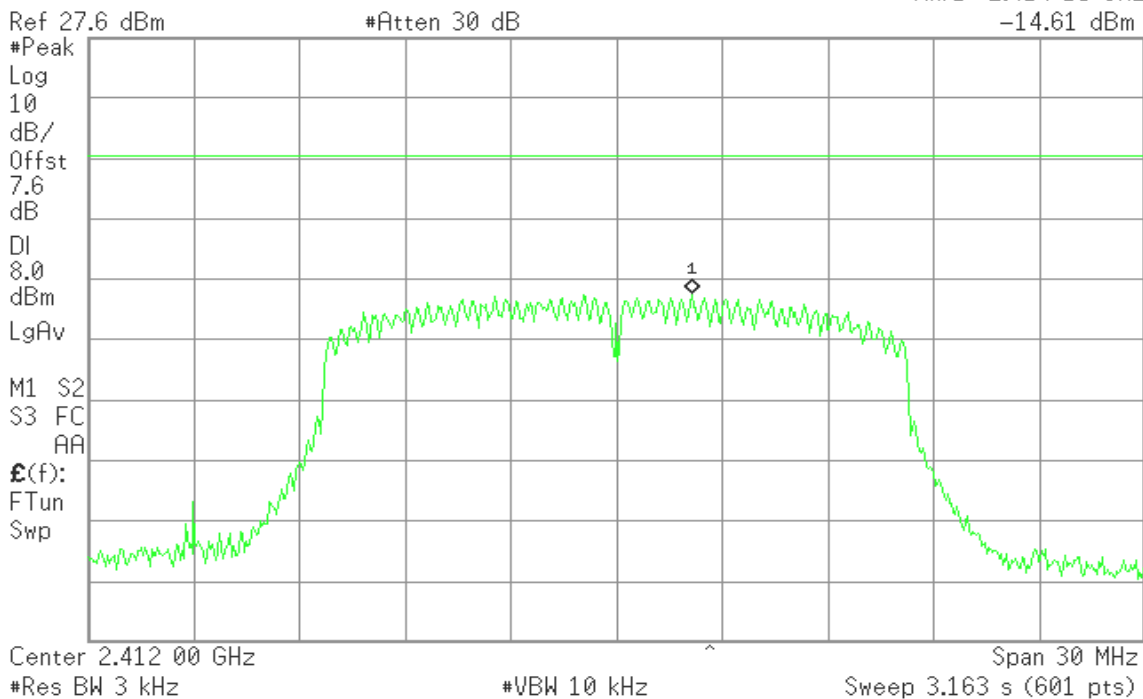
IEEE 802.11g mode

PPSD (CH Low)

Agilent 14:17:10 Jan 15, 2013

R L

Mkr1 2.414 15 GHz
-14.61 dBm



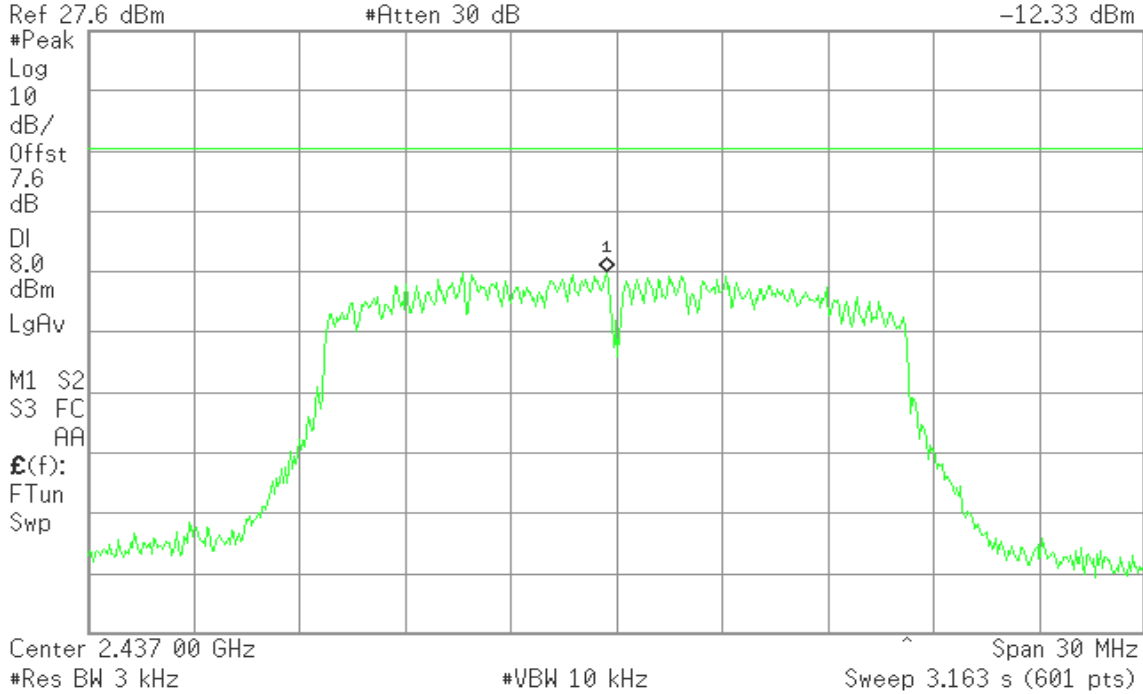


PPSD (CH Mid)

Agilent 14:16:03 Jan 15, 2013

R L

Mkr1 2.436 70 GHz
-12.33 dBm

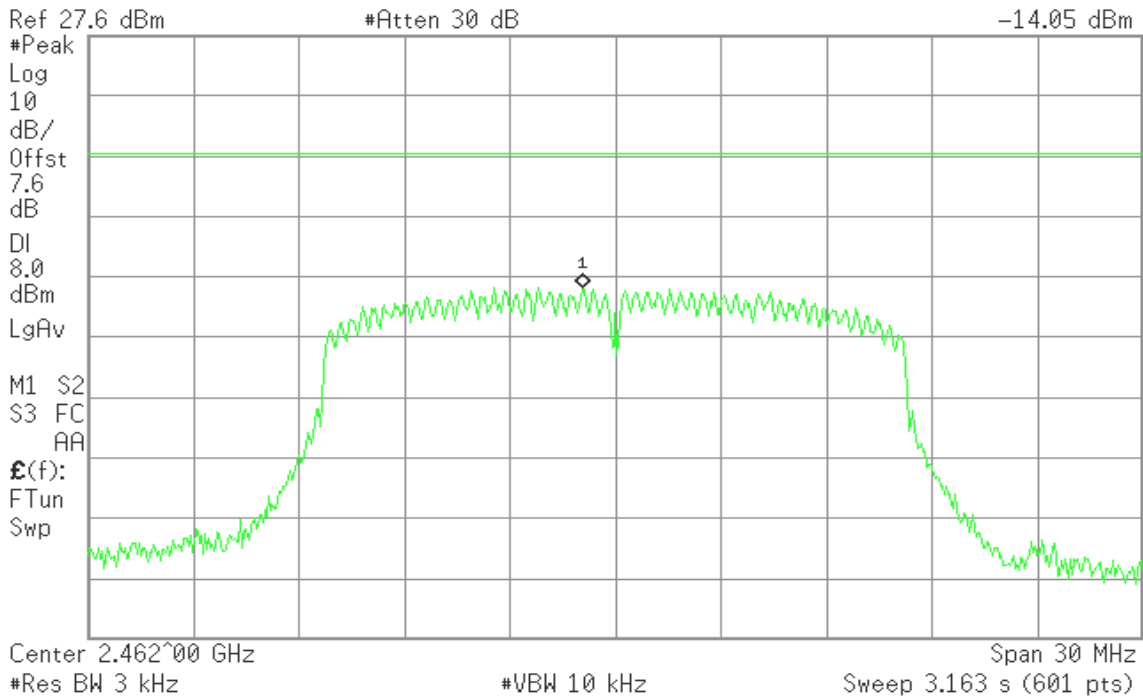


PPSD (CH High)

Agilent 14:15:03 Jan 15, 2013

R L

Mkr1 2.461 05 GHz
-14.05 dBm





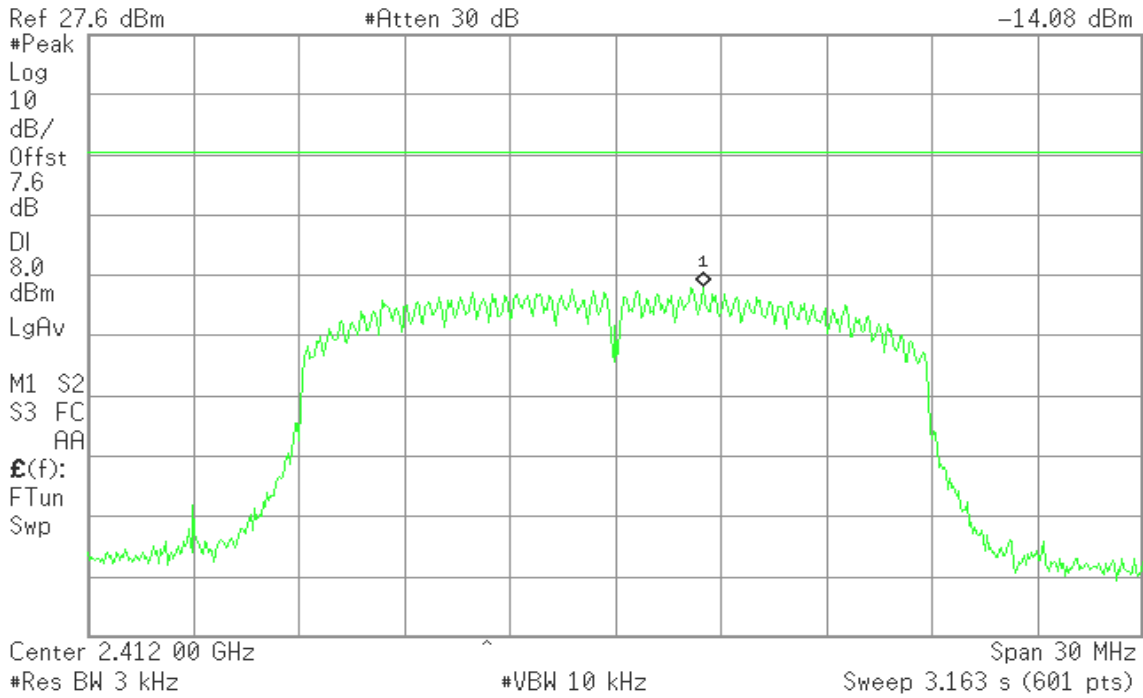
IEEE 802.11n HT20 mode

PPSD (CH Low)

Agilent 14:18:19 Jan 15, 2013

R L

Mkr1 2.414 50 GHz
-14.08 dBm

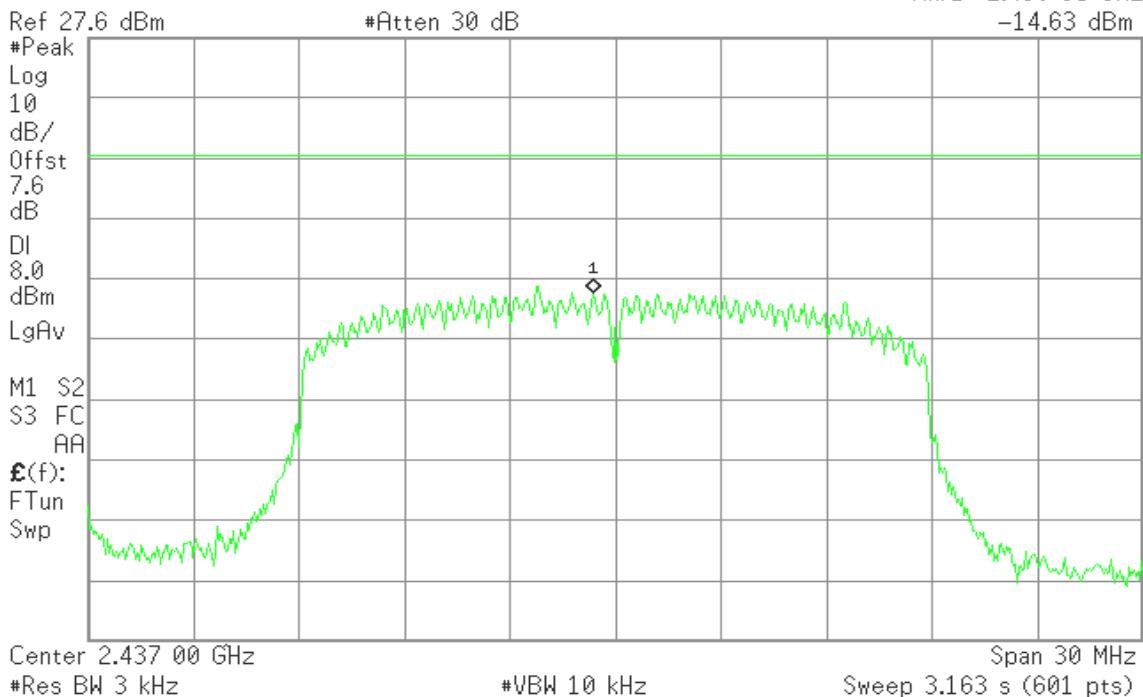


PPSD (CH Mid)

Agilent 14:19:12 Jan 15, 2013

R L

Mkr1 2.436 35 GHz
-14.63 dBm



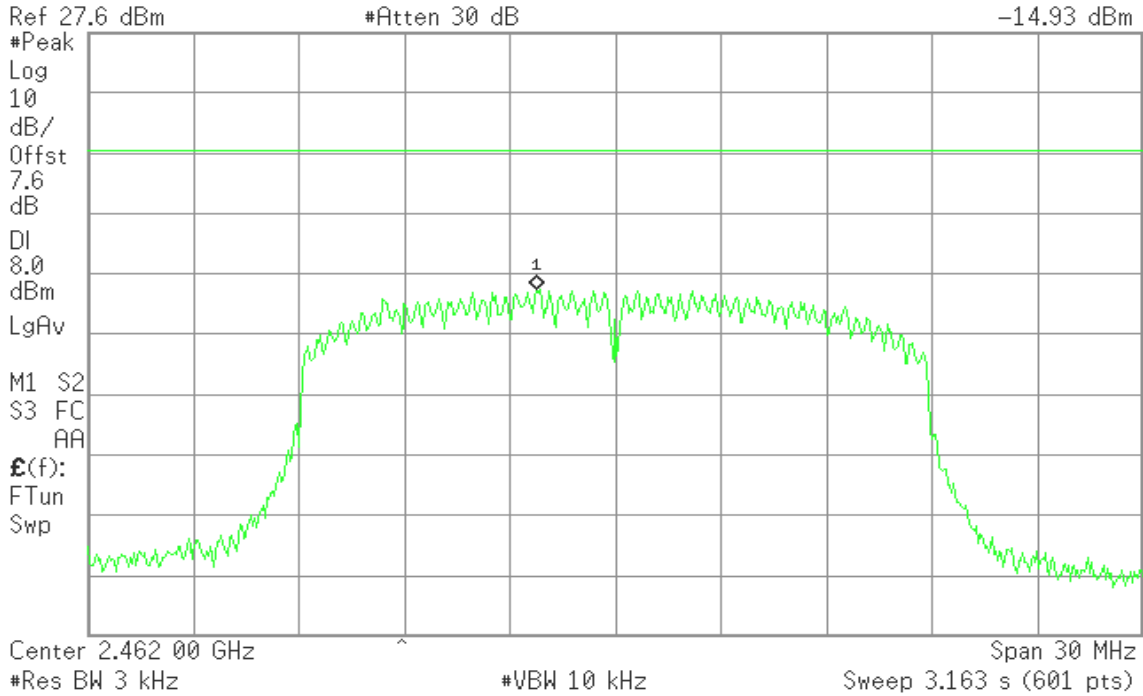


PPSD (CH High)

Agilent 14:21:47 Jan 15, 2013

R L

Mkr1 2.459 75 GHz
-14.93 dBm



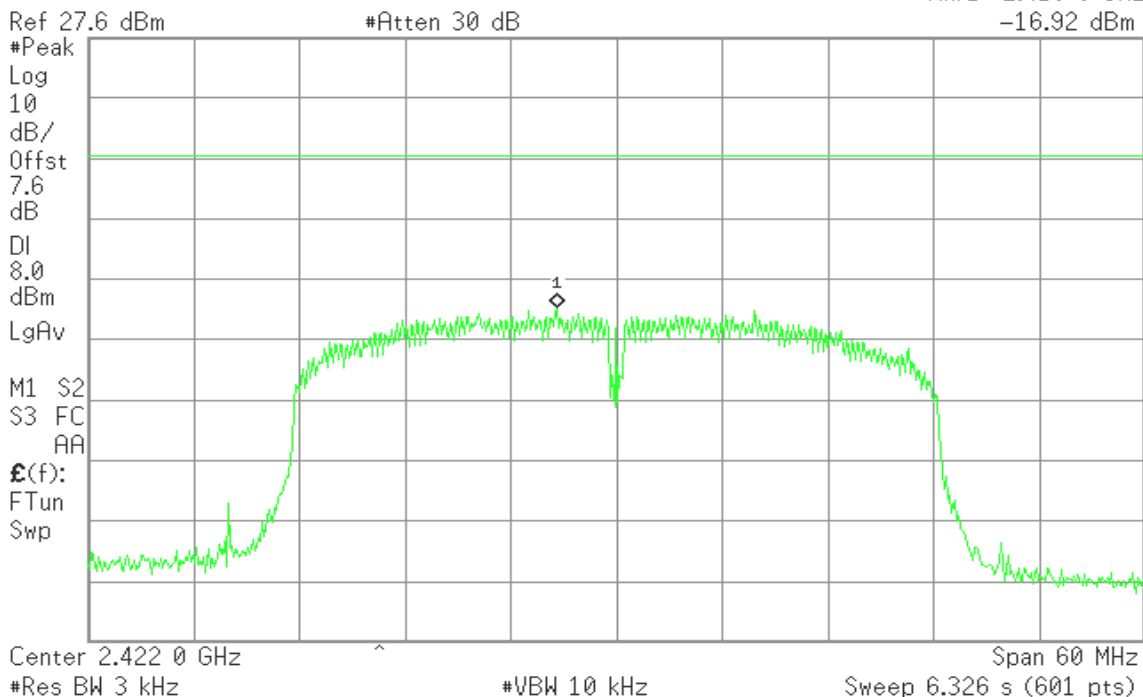
IEEE 802.11n HT40 mode

PPSD (CH Low)

Agilent 14:23:28 Jan 15, 2013

R L

Mkr1 2.418 6 GHz
-16.92 dBm



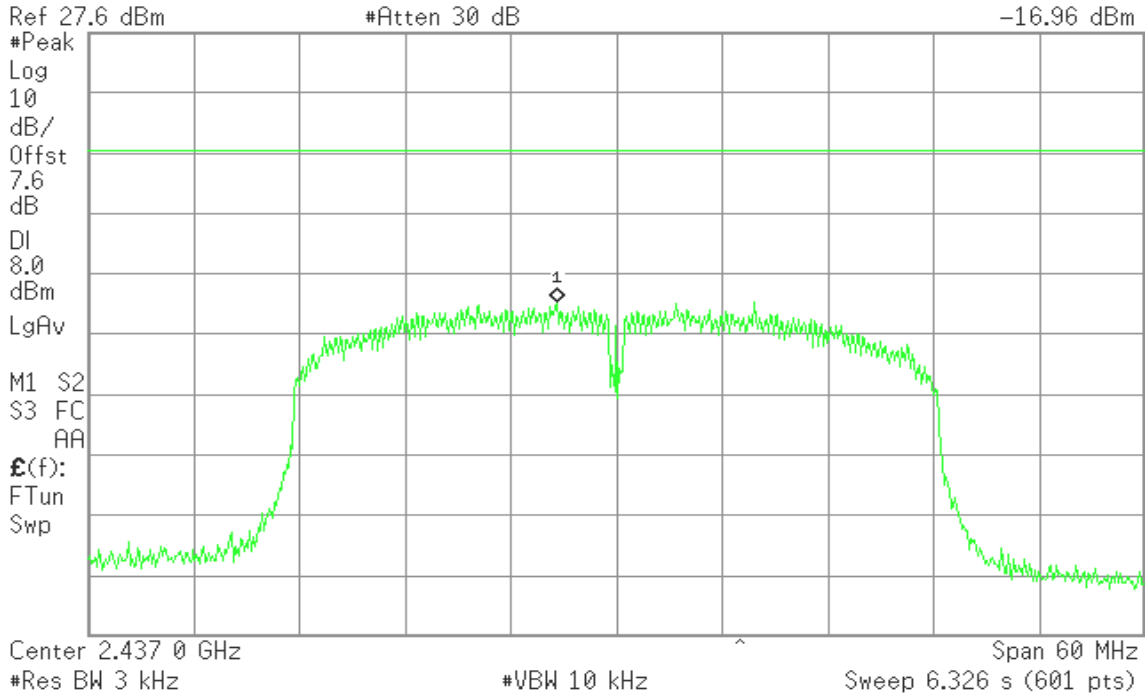


PPSD (CH Mid)

Agilent 14:24:50 Jan 15, 2013

R L

Mkr1 2.433 6 GHz
-16.96 dBm

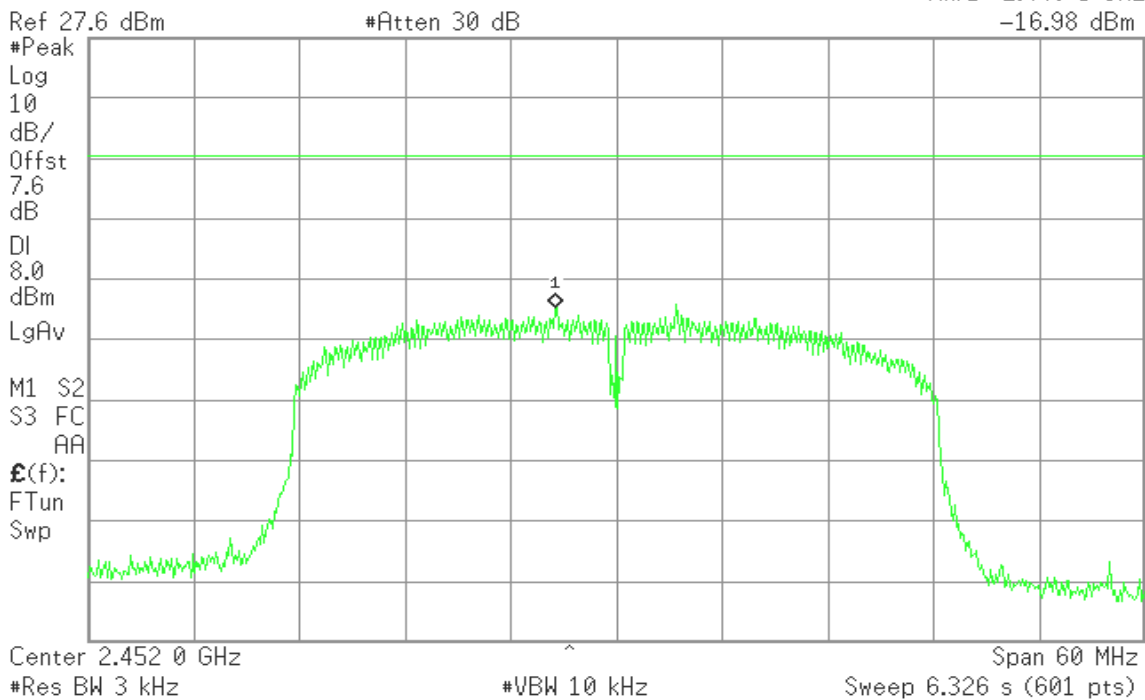


PPSD (CH High)

Agilent 14:25:46 Jan 15, 2013

R L

Mkr1 2.448 5 GHz
-16.98 dBm





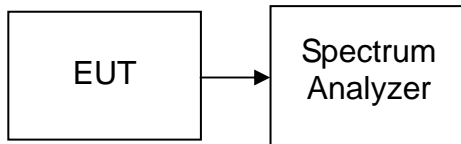
7.6 SPURIOUS EMISSIONS

7.6.1 CONDUCTED MEASUREMENT

LIMIT

According to §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, provided the transmitter demonstrates compliance with the peak conducted power limits. 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 Section 15.205(c)).

TEST CONFIGURATION



TEST PROCEDURE

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

Measurements are made over the 30MHz to 26GHz range with the transmitter set to the lowest, middle, and highest channels.

TEST RESULTS

No non-compliance noted.



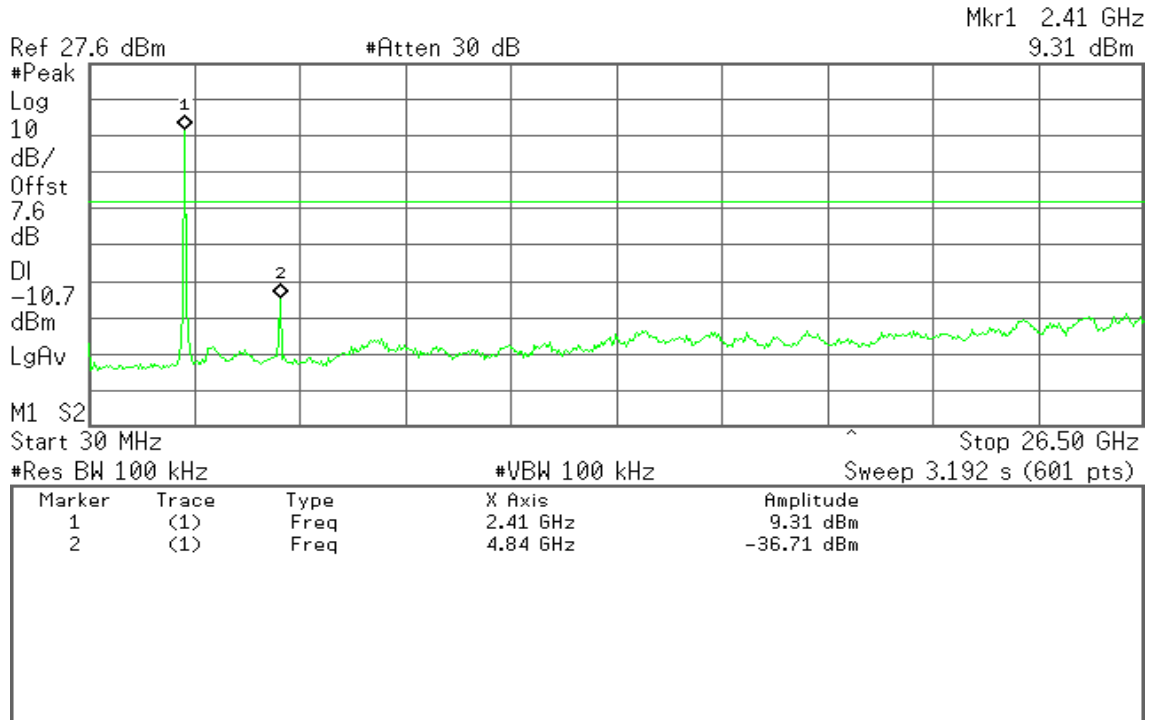
Test Plot

Spurious Emissions

IEEE 802.11b mode

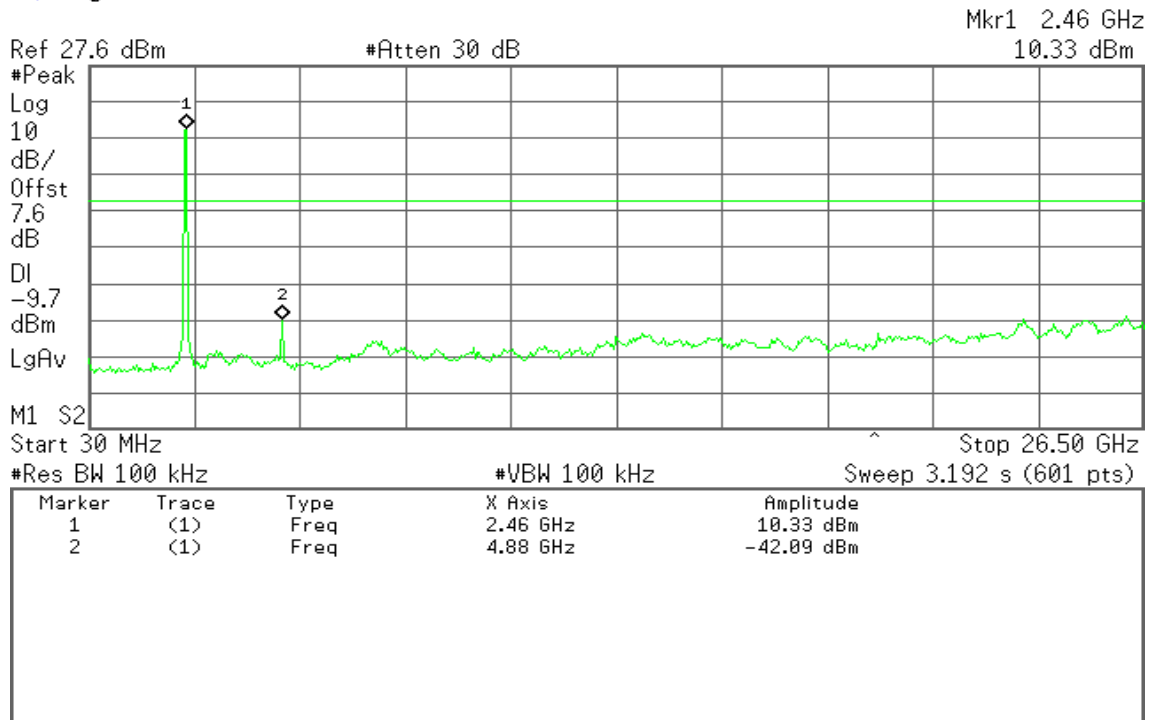
Agilent 21:03:52 Nov 24, 2012

R L



Agilent 21:05:58 Nov 24, 2012

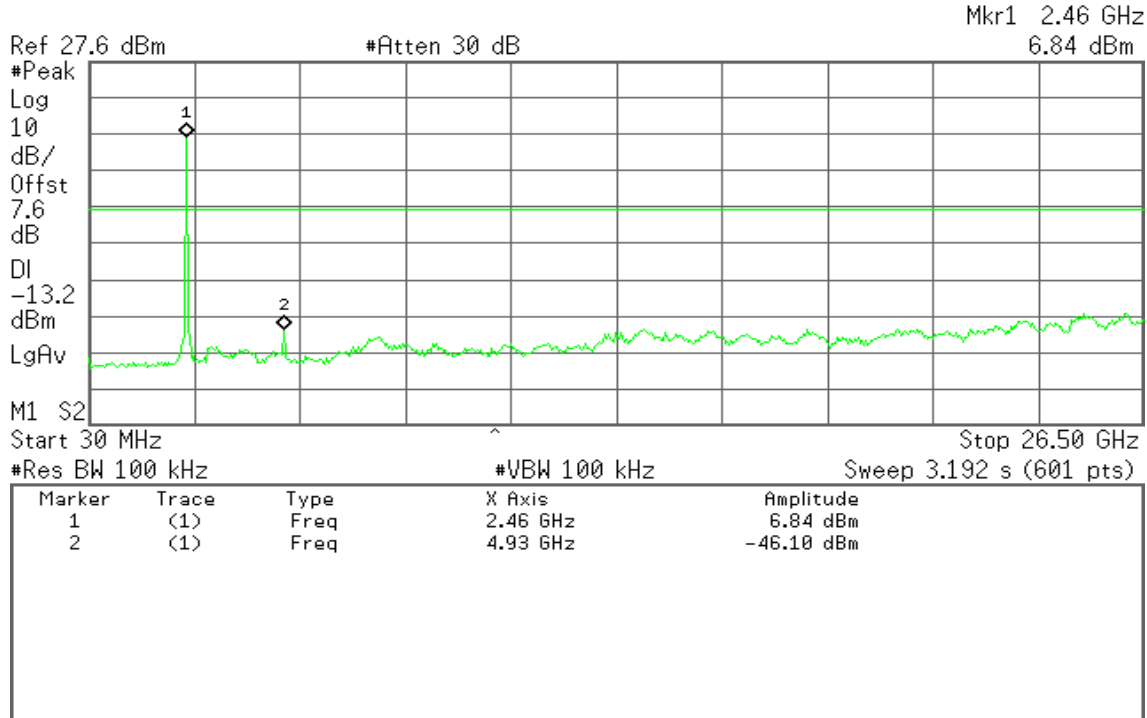
R L





Agilent 21:08:35 Nov 24, 2012

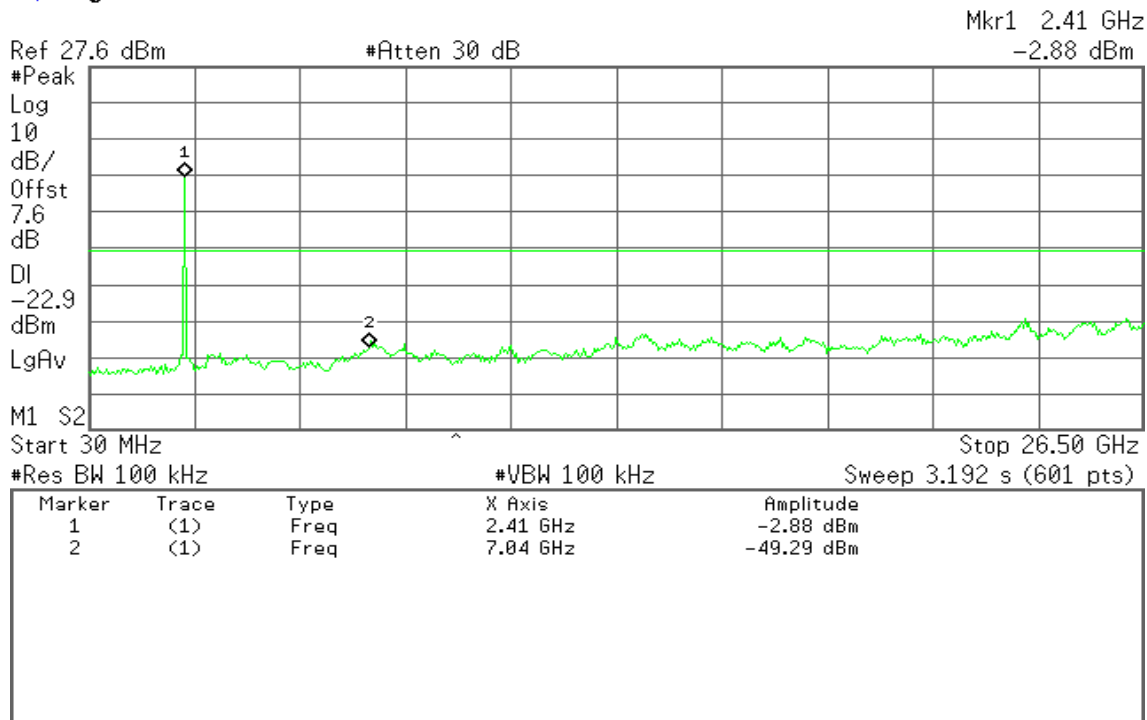
R L



IEEE 802.11g mode

Agilent 21:13:53 Nov 24, 2012

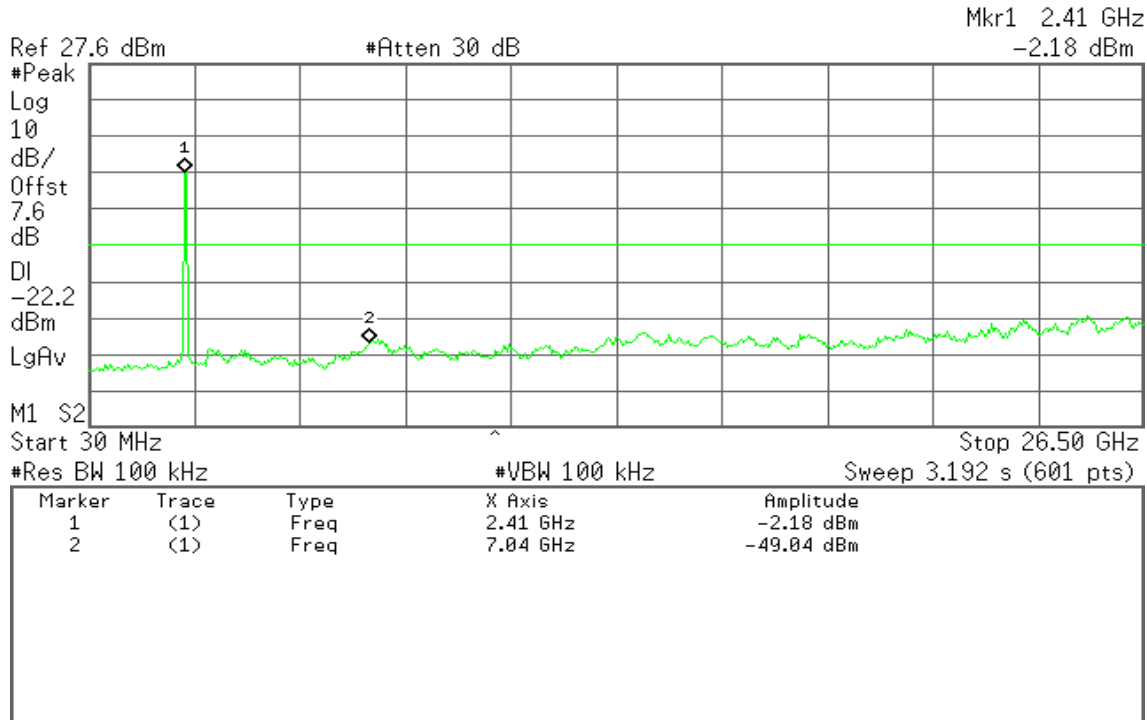
R T





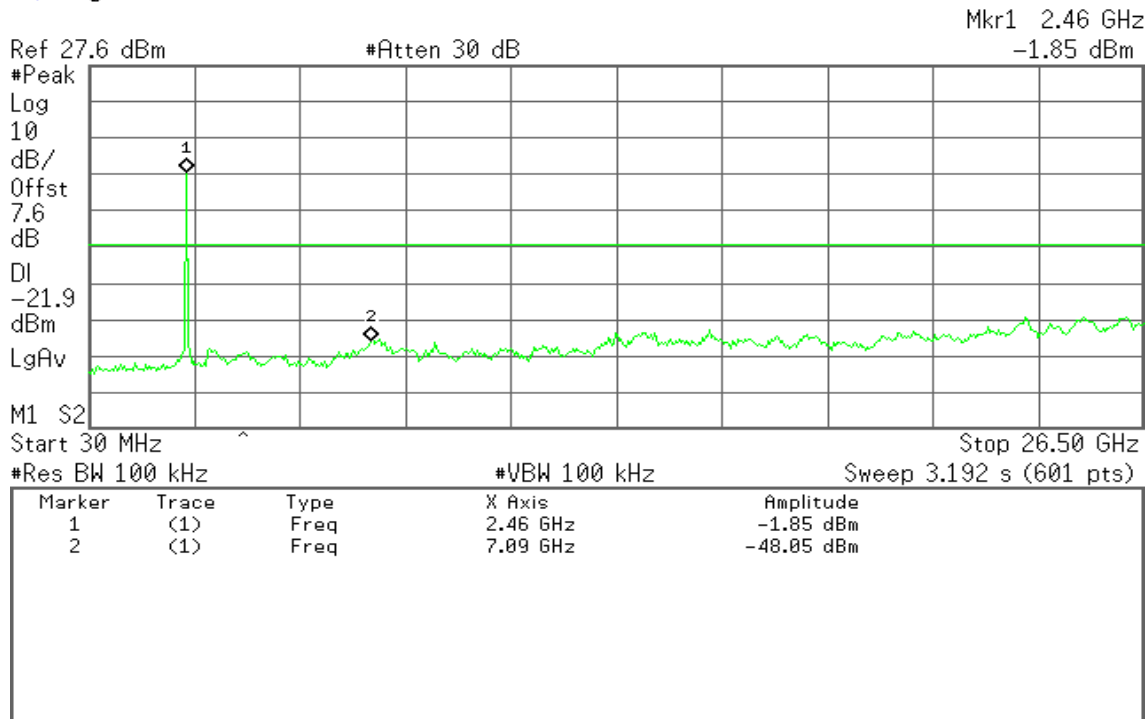
Agilent 21:12:34 Nov 24, 2012

R L



Agilent 21:11:12 Nov 24, 2012

R L



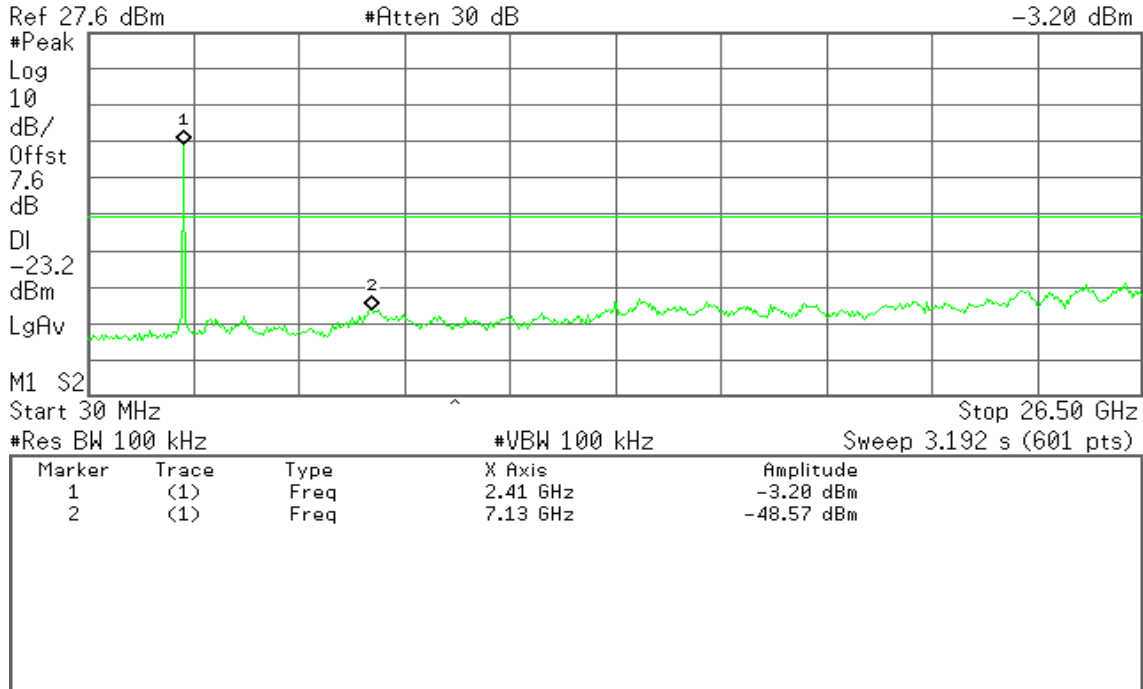


IEEE 802.11n HT20 mode

Agilent 21:15:04 Nov 24, 2012

R L

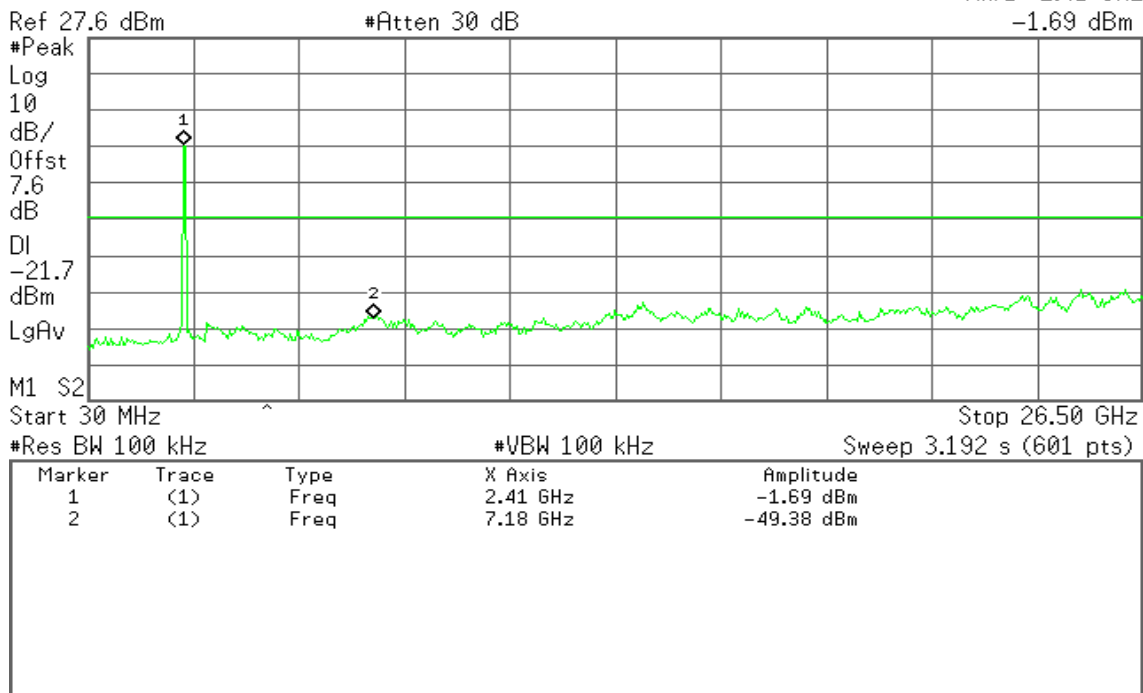
Mkr1 2.41 GHz
-3.20 dBm



Agilent 21:18:17 Nov 24, 2012

R L

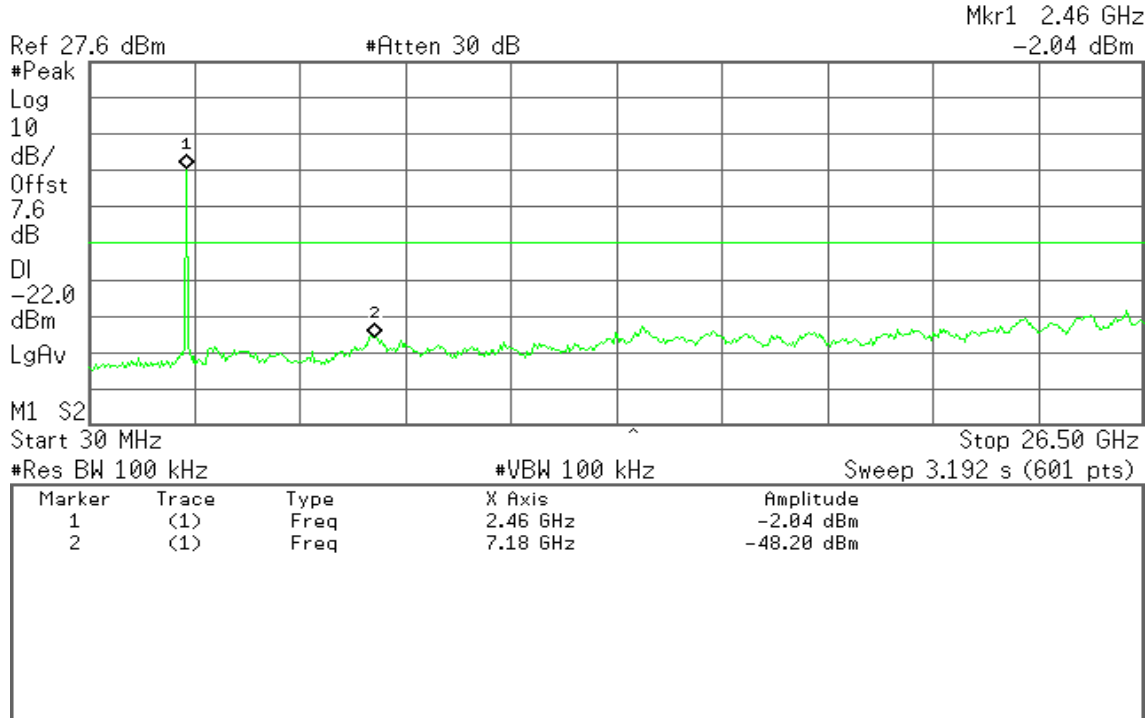
Mkr1 2.41 GHz
-1.69 dBm





Agilent 21:20:03 Nov 24, 2012

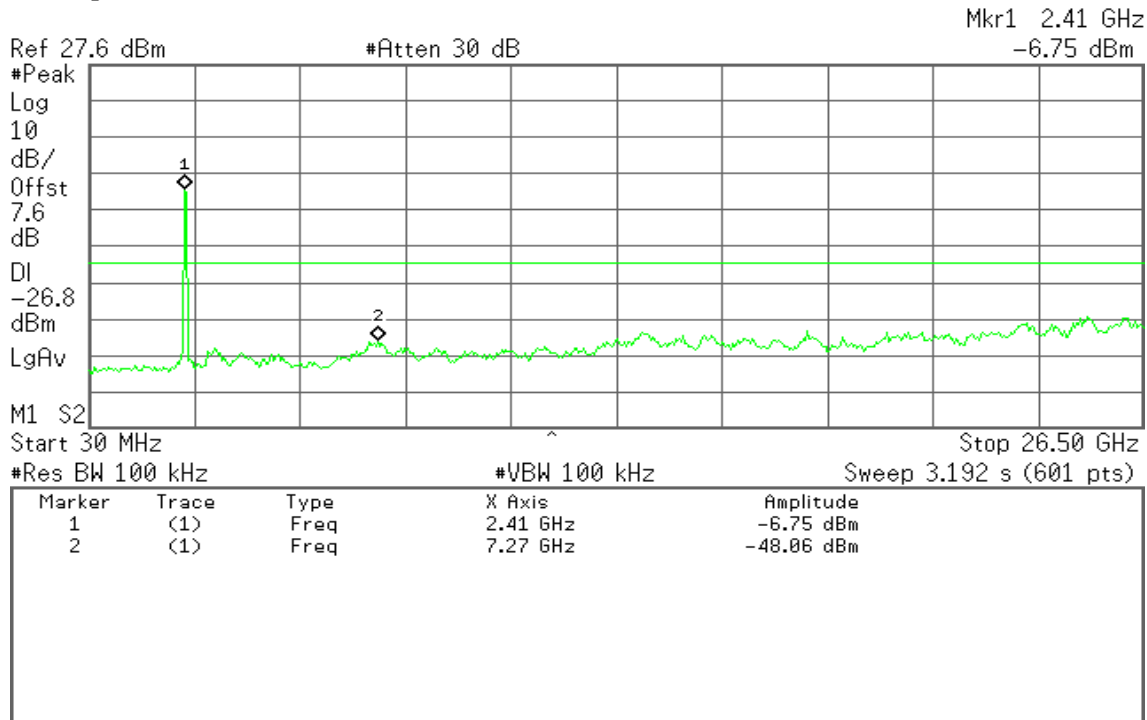
R L



IEEE 802.11n HT40 mode

Agilent 21:24:15 Nov 24, 2012

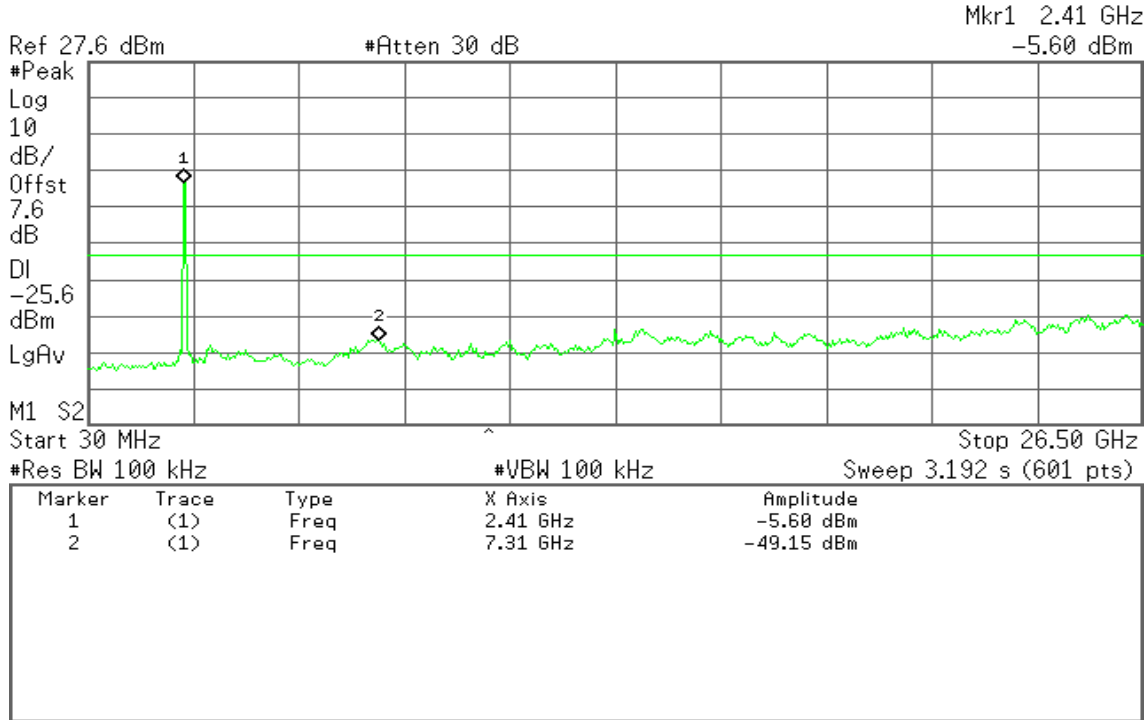
R L





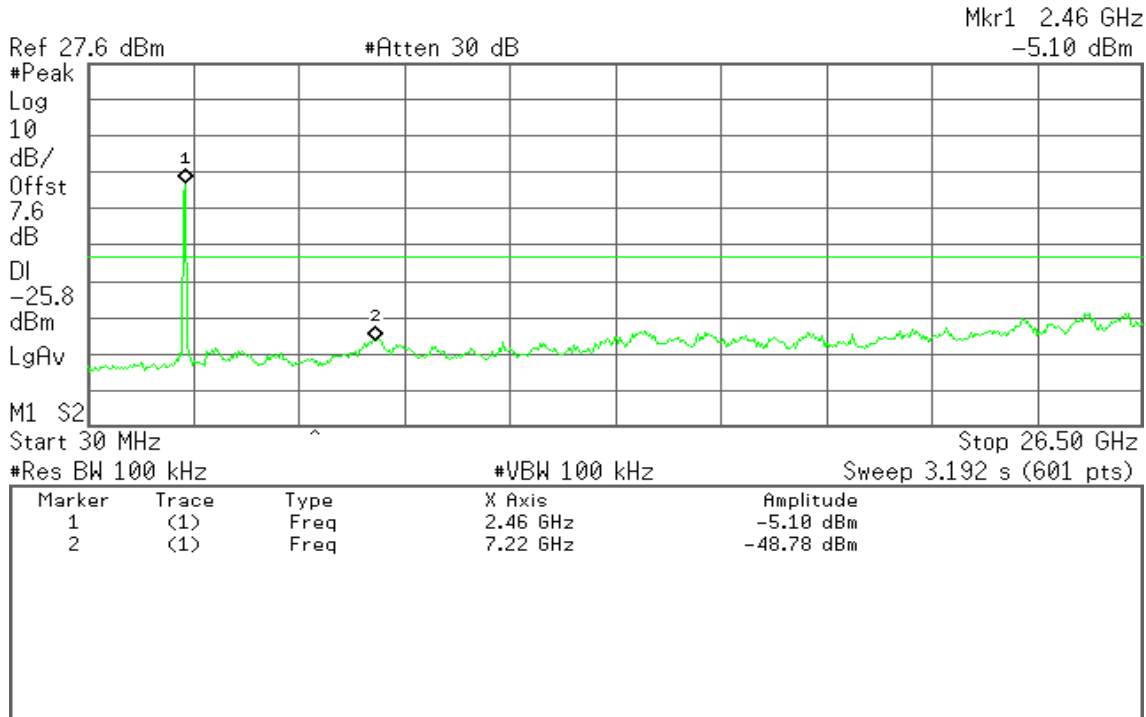
Agilent 21:23:02 Nov 24, 2012

R L



Agilent 21:21:50 Nov 24, 2012

R L

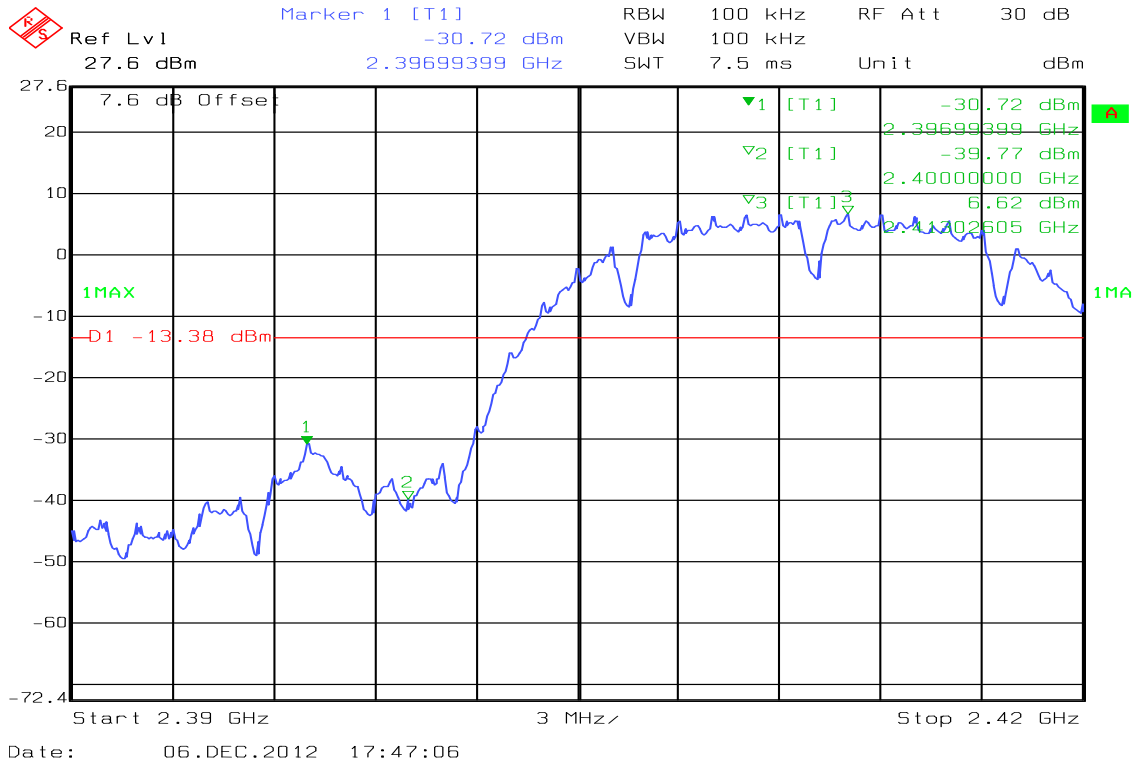




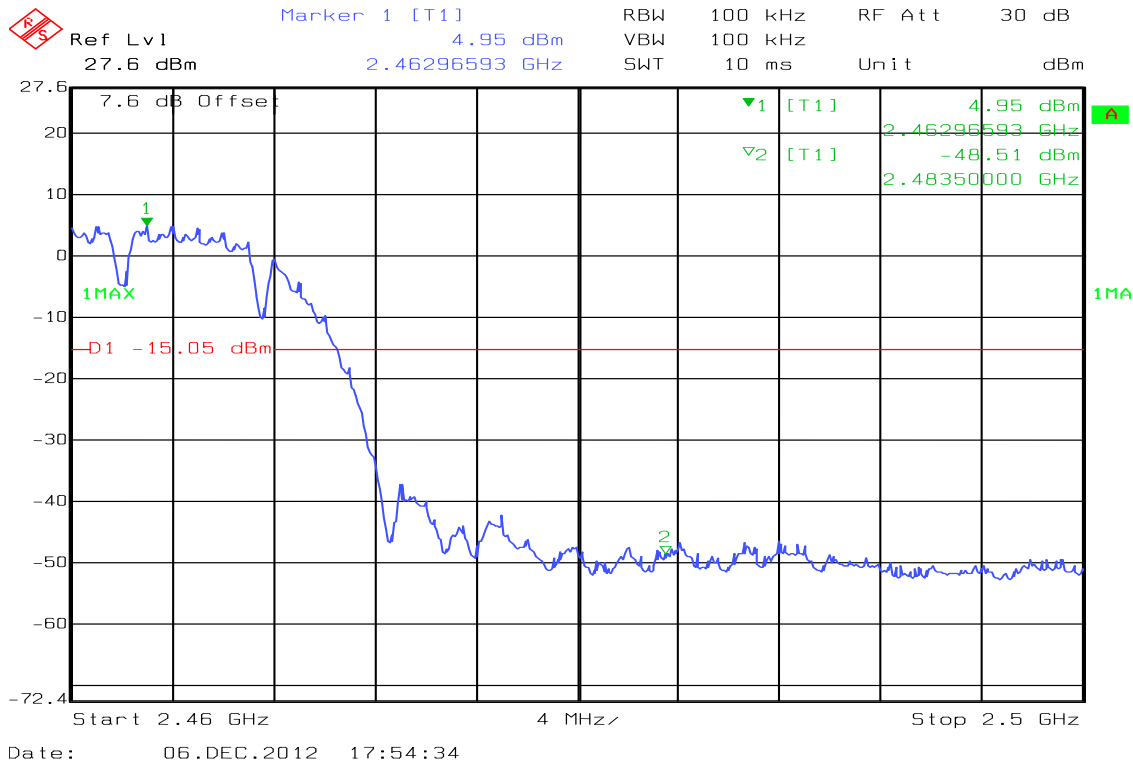
Conducted band-edge

IEEE 802.11b mode

CH Low



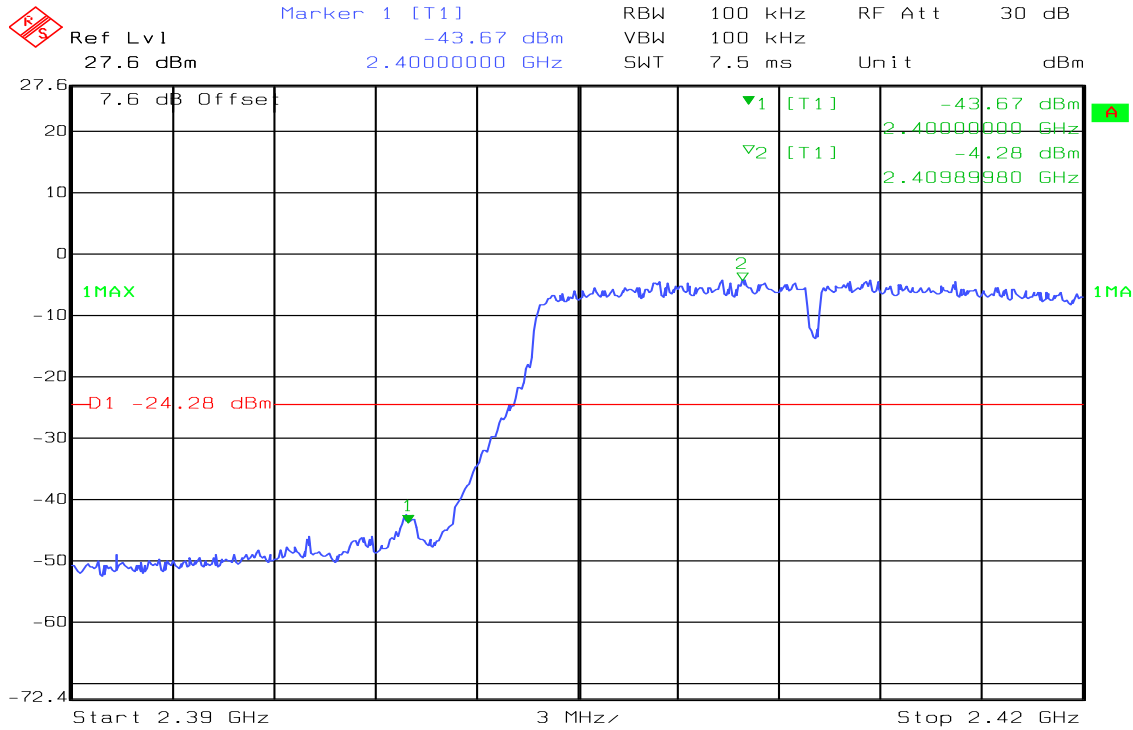
CH High





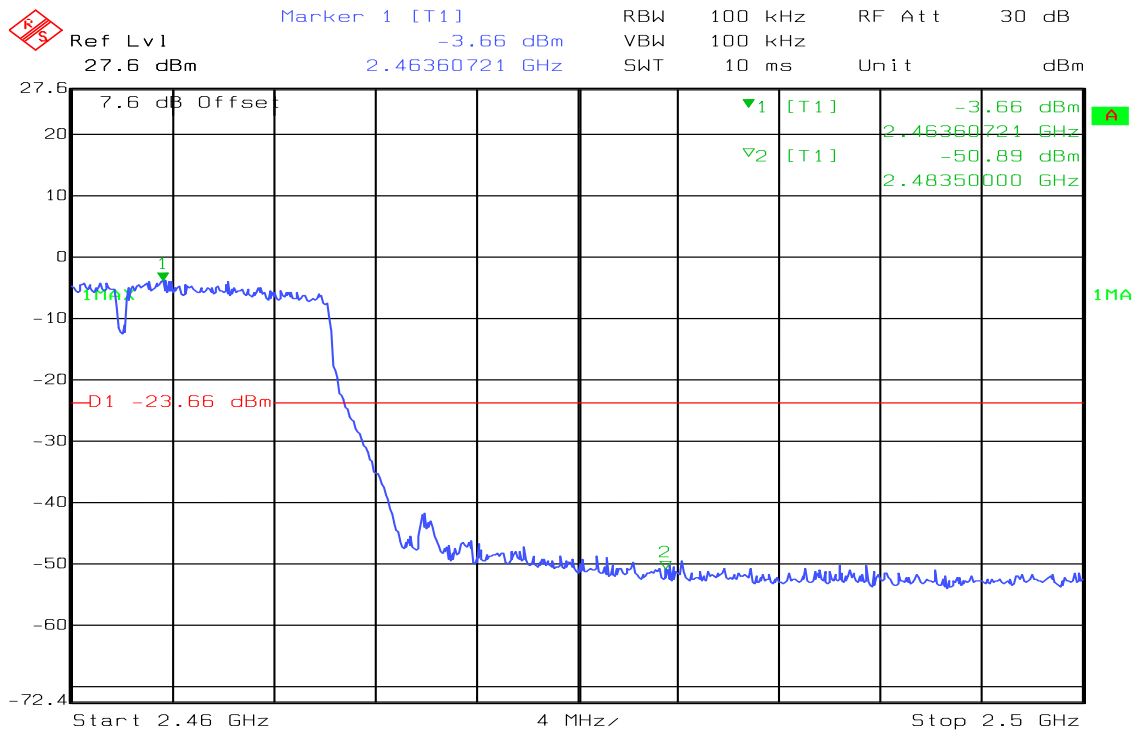
IEEE 802.11g mode

CH Low



Date: 06.DEC.2012 17:48:51

CH High

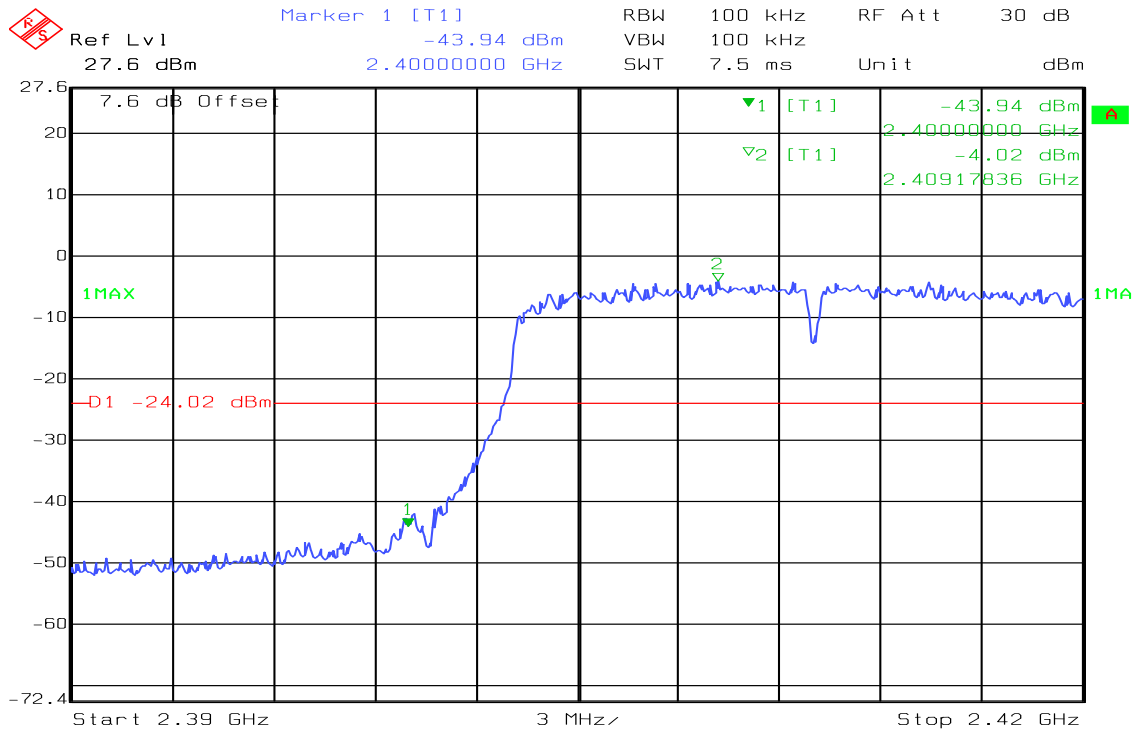


Date: 06.DEC.2012 17:53:30



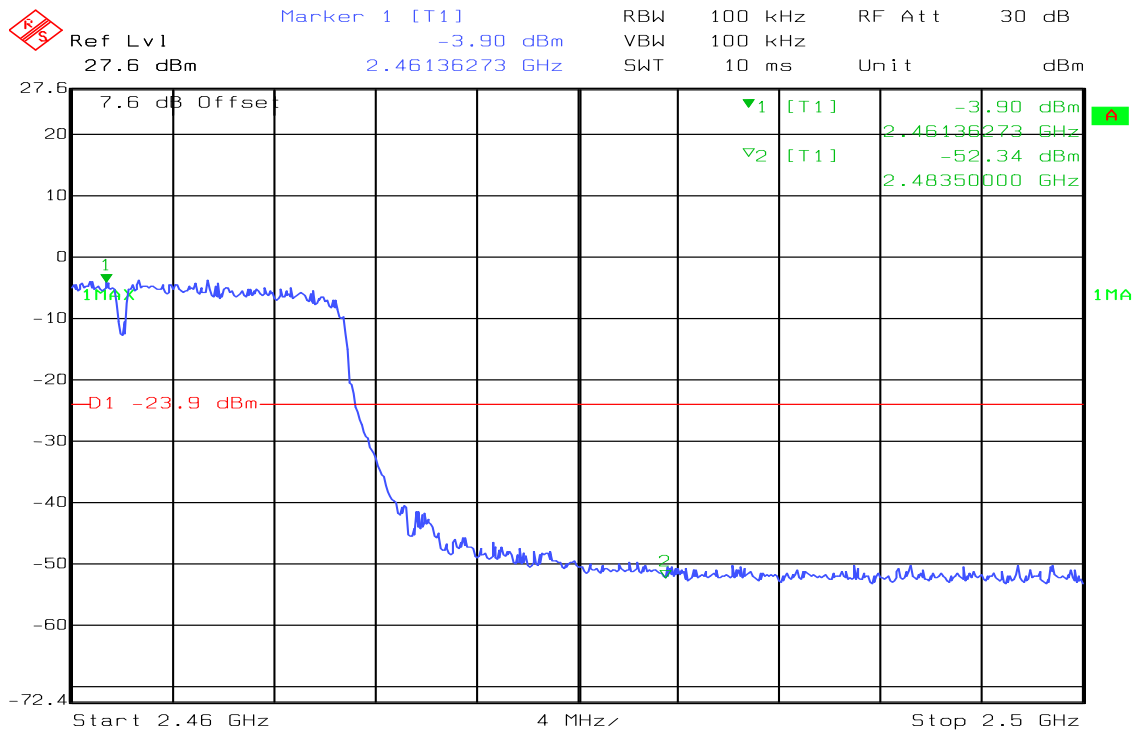
IEEE 802.11n HT20 mode

CH Low



Date: 06.DEC.2012 17:50:09

CH High



Date: 06.DEC.2012 17:52:24



7.6.2 RADIATED EMISSIONS

LIMIT

1. According to §15.209(a), 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 ($\mu\text{V/m}$) | Measurement Distance (m) |
|-----------------|------------------------------------|--------------------------|
| 30-88 | 100* | 3 |
| 88-216 | 150* | 3 |
| 216-960 | 200* | 3 |
| Above 960 | 500 | 3 |

Remark: 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.

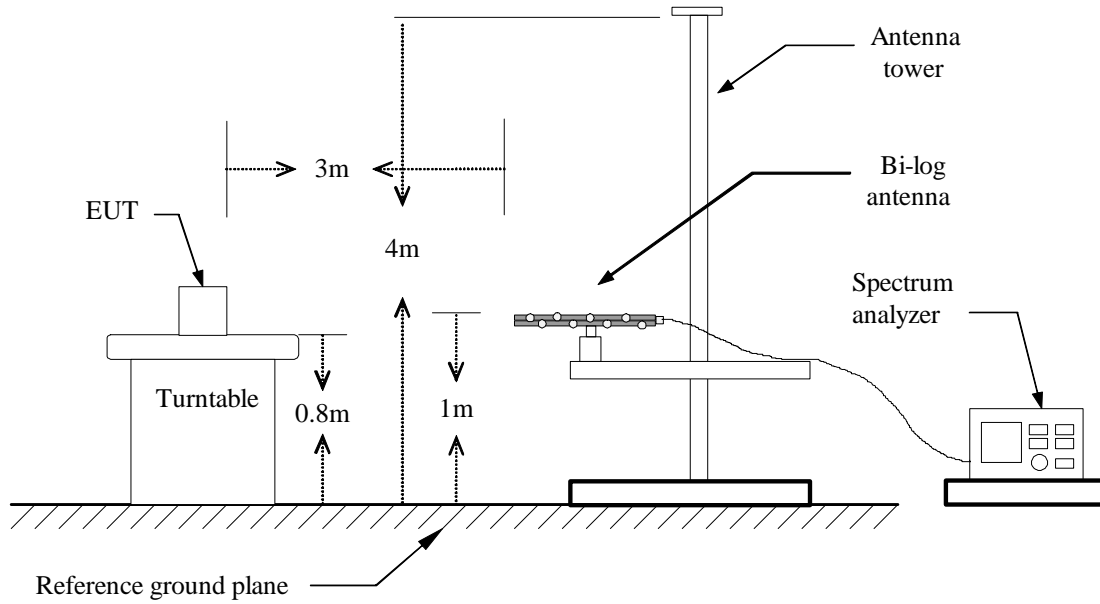
2. In the emission table above, the tighter limit applies at the band edges.

| Frequency (MHz) | Field Strength ($\mu\text{V/m}$ at 3-meter) | Field Strength (dB $\mu\text{V/m}$ at 3-meter) |
|-----------------|----------------------------------------------|------------------------------------------------|
| 30-88 | 100 | 40 |
| 88-216 | 150 | 43.5 |
| 216-960 | 200 | 46 |
| Above 960 | 500 | 54 |

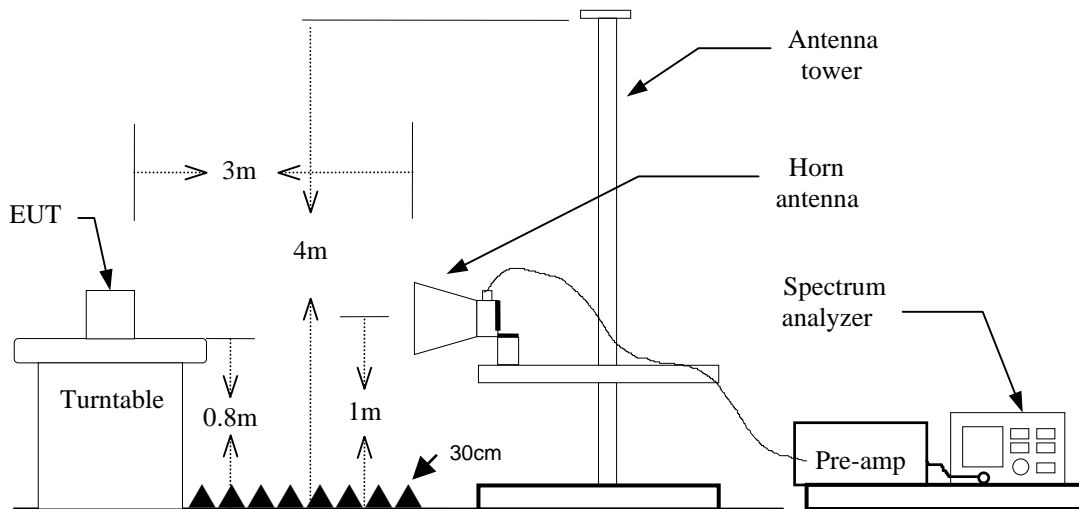


TEST CONFIGURATION

Below 1 GHz



Above 1 GHz





TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Set the spectrum analyzer in the following setting as:

Below 30MHz

RBW=9kHz / VBW=300kHz / Sweep=AUTO

30 ~ 1000MHz:

RBW=120kHz / VBW=3MHz / Sweep=AUTO

Above 1GHz:

(a) PEAK: RBW=VBW=1MHz / Sweep=AUTO

(b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO

7. Repeat above procedures until the measurements for all frequencies are complete.

TEST RESULTS

No non-compliance noted.



TEST DATA

Below 1GHz

Operation Mode: Data Link **Test Date:** December 2, 2012
Temperature: 26°C **Tested by:** Francis Lee
Humidity: 56% RH **Polarity:** Ver. / Hor.

| Frequency (MHz) | Reading (dBuV) | Correction Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Ant. Pol. (H/V) | Remark |
|-----------------|----------------|--------------------------|-----------------|----------------|-------------|-----------------|--------|
| 95.9599 | 38.90 | 1.82 | 40.72 | 43.50 | -2.78 | V | QP |
| 112.4500 | 43.20 | -2.75 | 40.45 | 43.50 | -3.05 | V | QP |
| 143.4900 | 42.60 | -1.73 | 40.87 | 43.50 | -2.63 | V | QP |
| 175.5000 | 48.60 | -8.30 | 40.30 | 43.50 | -3.20 | V | QP |
| 191.0200 | 52.70 | -15.54 | 37.16 | 43.50 | -6.34 | V | QP |
| 256.0100 | 52.30 | -9.16 | 43.14 | 46.00 | -2.86 | V | QP |
| 366.5899 | 44.30 | -8.46 | 35.84 | 46.00 | -10.16 | V | QP |
| 48.4300 | 35.60 | 1.94 | 37.54 | 40.00 | -2.46 | H | QP |
| 112.4500 | 46.50 | -6.69 | 39.81 | 43.50 | -3.69 | H | QP |
| 127.9700 | 44.20 | -3.08 | 41.12 | 43.50 | -2.38 | H | QP |
| 144.4600 | 42.20 | -0.83 | 41.37 | 43.50 | -2.13 | H | QP |
| 159.9800 | 38.00 | 3.21 | 41.21 | 43.50 | -2.29 | H | QP |
| 177.4400 | 43.80 | -3.14 | 40.66 | 43.50 | -2.84 | H | QP |
| 256.0100 | 55.50 | -12.78 | 42.72 | 46.00 | -3.28 | H | QP |
| 271.5299 | 52.60 | -12.55 | 40.05 | 46.00 | -5.95 | H | QP |
| 303.5400 | 56.30 | -13.04 | 43.26 | 46.00 | -2.74 | H | QP |

Remark:

1. No emission found between lowest internal used / generated frequency to 30 MHz. (9kHz ~ 30MHz)
2. Measuring frequencies from 9 kHz to the 1GHz.
3. Radiated emissions measured in the measured frequency range were made with an instrument using peak detector or quasi-peak detector mode.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz.



Above 1 GHz

Operation Mode: TX / IEEE 802.11b / CH Low

Test Date: December 1, 2012

Temperature: 26°C

Tested by: Francis Lee

Humidity: 56 % RH

Polarity: Ver. / Hor.

| Freq. (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Ant. Pol H/V | Remark |
|-------------|----------------|-----------------------|-----------------|----------------|-------------|--------------|--------|
| 1064.000 | 57.00 | -10.01 | 46.99 | 74.00 | -27.01 | V | Peak |
| 1864.000 | 52.05 | -3.72 | 48.33 | 74.00 | -25.67 | V | Peak |
| 2330.000 | 59.07 | -1.59 | 57.48 | 74.00 | -16.52 | V | Peak |
| 2330.000 | 50.10 | -1.59 | 48.51 | 54.00 | -5.49 | V | AVG |
| 2494.000 | 54.96 | -0.97 | 53.99 | 74.00 | -20.01 | V | Peak |
| 2494.000 | 48.57 | -0.97 | 47.60 | 54.00 | -6.40 | V | AVG |
| 5070.000 | 40.82 | 4.66 | 45.48 | 74.00 | -28.52 | V | Peak |
| 4825.000 | 40.84 | 2.68 | 43.52 | 74.00 | -30.48 | V | Peak |
| 7120.000 | 37.79 | 9.64 | 47.43 | 74.00 | -26.57 | V | Peak |
| 1060.000 | 61.06 | -10.59 | 50.47 | 74.00 | -23.53 | H | Peak |
| 2126.000 | 50.84 | -3.72 | 47.12 | 74.00 | -26.88 | H | Peak |
| 2490.000 | 52.21 | -4.06 | 48.15 | 74.00 | -25.85 | H | Peak |
| 4680.000 | 40.24 | 7.03 | 47.27 | 74.00 | -26.73 | H | Peak |
| 5580.000 | 38.95 | 9.13 | 48.08 | 74.00 | -25.92 | H | Peak |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.



Operation Mode: TX / IEEE 802.11b / CH Mid

Test Date: December 1, 2012

Temperature: 26°C

Tested by: Francis Lee

Humidity: 56 % RH

Polarity: Ver. / Hor.

| Freq. (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Ant. Pol H/V | Remark |
|-------------|----------------|-----------------------|-----------------|----------------|-------------|--------------|--------|
| 1064.000 | 57.41 | -10.01 | 47.40 | 74.00 | -26.60 | V | Peak |
| 1858.000 | 51.77 | -3.86 | 47.91 | 74.00 | -26.09 | V | Peak |
| 2356.000 | 59.32 | -1.62 | 57.70 | 74.00 | -16.30 | V | Peak |
| 2356.000 | 50.89 | -1.62 | 49.27 | 54.00 | -4.73 | V | AVG |
| 2520.000 | 54.49 | -1.18 | 53.31 | 74.00 | -20.69 | V | Peak |
| 2520.000 | 44.17 | -1.18 | 42.99 | 54.00 | -11.01 | V | AVG |
| 4875.000 | 43.24 | 3.81 | 47.05 | 74.00 | -26.95 | V | Peak |
| 6285.000 | 40.60 | 6.86 | 47.46 | 74.00 | -26.54 | V | Peak |
| 1064.000 | 60.87 | -10.56 | 50.31 | 74.00 | -23.69 | H | Peak |
| 2382.000 | 55.07 | -6.35 | 48.72 | 74.00 | -25.28 | H | Peak |
| 2514.000 | 52.22 | -3.75 | 48.47 | 74.00 | -25.53 | H | Peak |
| 4875.000 | 41.40 | 6.73 | 48.13 | 74.00 | -25.87 | H | Peak |
| 6895.000 | 39.64 | 9.75 | 49.39 | 74.00 | -24.61 | H | Peak |
| N/A | | | | | | | |
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Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.



Operation Mode: TX / IEEE 802.11b / CH High

Test Date: December 1, 2012

Temperature: 26°C

Tested by: Francis Lee

Humidity: 56 % RH

Polarity: Ver. / Hor.

| Freq. (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Ant. Pol H/V | Remark |
|-------------|----------------|-----------------------|-----------------|----------------|-------------|--------------|--------|
| 1060.000 | 57.60 | -9.92 | 47.68 | 74.00 | -26.32 | V | Peak |
| 1592.000 | 52.27 | -4.83 | 47.44 | 74.00 | -26.56 | V | Peak |
| 1858.000 | 52.22 | -3.86 | 48.36 | 74.00 | -25.64 | V | Peak |
| 2380.000 | 57.90 | -1.65 | 56.25 | 74.00 | -17.75 | V | Peak |
| 2380.000 | 49.35 | -1.65 | 47.70 | 54.00 | -6.30 | V | AVG |
| 2544.000 | 54.62 | -1.48 | 53.14 | 74.00 | -20.86 | V | Peak |
| 2544.000 | 47.92 | -1.48 | 46.44 | 54.00 | -7.56 | V | AVG |
| 4925.000 | 43.31 | 4.61 | 47.92 | 74.00 | -26.08 | V | Peak |
| 6310.000 | 39.78 | 6.92 | 46.70 | 74.00 | -27.30 | V | Peak |
| 1064.000 | 61.12 | -10.56 | 50.56 | 74.00 | -23.44 | H | Peak |
| 2380.000 | 55.47 | -6.35 | 49.12 | 74.00 | -24.88 | H | Peak |
| 2544.000 | 51.08 | -3.61 | 47.47 | 74.00 | -26.53 | H | Peak |
| 4695.000 | 41.31 | 7.24 | 48.55 | 74.00 | -25.45 | H | Peak |
| 5595.000 | 40.20 | 9.18 | 49.38 | 74.00 | -24.62 | H | Peak |
| N/A | | | | | | | |
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Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.



Operation Mode: TX / IEEE 802.11g / CH Low

Test Date: December 1, 2012

Temperature: 26°C

Tested by: Francis Lee

Humidity: 56 % RH

Polarity: Ver. / Hor.

| Freq. (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Ant. Pol H/V | Remark |
|-------------|----------------|-----------------------|-----------------|----------------|-------------|--------------|--------|
| 1064.000 | 57.33 | -10.01 | 47.32 | 74.00 | -26.68 | V | Peak |
| 2360.000 | 56.04 | -1.62 | 54.42 | 74.00 | -19.58 | V | Peak |
| 2360.000 | 43.86 | -1.62 | 42.24 | 54.00 | -11.76 | V | AVG |
| 4865.000 | 39.60 | 3.58 | 43.18 | 74.00 | -30.82 | V | Peak |
| 5190.000 | 39.73 | 5.42 | 45.15 | 74.00 | -28.85 | V | Peak |
| 6200.000 | 38.84 | 6.32 | 45.16 | 74.00 | -28.84 | V | Peak |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| 1062.000 | 61.14 | -10.58 | 50.56 | 74.00 | -23.44 | H | Peak |
| 2128.000 | 50.58 | -3.72 | 46.86 | 74.00 | -27.14 | H | Peak |
| 2912.000 | 48.25 | -1.60 | 46.65 | 74.00 | -27.35 | H | Peak |
| 4880.000 | 38.93 | 6.81 | 45.74 | 74.00 | -28.26 | H | Peak |
| 5620.000 | 38.09 | 8.98 | 47.07 | 74.00 | -26.93 | H | Peak |
| 5965.000 | 38.24 | 8.97 | 47.21 | 74.00 | -26.79 | H | Peak |
| N/A | | | | | | | |
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Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.



Operation Mode: TX / IEEE 802.11g / CH Mid

Test Date: December 1, 2012

Temperature: 26°C

Tested by: Francis Lee

Humidity: 56 % RH

Polarity: Ver. / Hor.

| Freq. (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Ant. Pol H/V | Remark |
|-------------|----------------|-----------------------|-----------------|----------------|-------------|--------------|--------|
| 1064.000 | 57.32 | -10.01 | 47.31 | 74.00 | -26.69 | V | Peak |
| 1592.000 | 52.01 | -4.83 | 47.18 | 74.00 | -26.82 | V | Peak |
| 1854.000 | 52.36 | -3.95 | 48.41 | 74.00 | -25.59 | V | Peak |
| 2384.000 | 55.44 | -1.65 | 53.79 | 74.00 | -20.21 | V | Peak |
| 2384.000 | 45.86 | -1.65 | 44.21 | 54.00 | -9.79 | V | AVG |
| 2510.000 | 52.20 | -1.05 | 51.15 | 74.00 | -22.85 | V | Peak |
| 4960.000 | 39.24 | 4.94 | 44.18 | 74.00 | -29.82 | V | Peak |
| 5690.000 | 39.37 | 5.94 | 45.31 | 74.00 | -28.69 | V | Peak |
| 6540.000 | 39.50 | 6.94 | 46.44 | 74.00 | -27.56 | V | Peak |
| 1060.000 | 61.01 | -10.59 | 50.42 | 74.00 | -23.58 | H | Peak |
| 1858.000 | 51.49 | -6.20 | 45.29 | 74.00 | -28.71 | H | Peak |
| 2386.000 | 53.95 | -6.35 | 47.60 | 74.00 | -26.40 | H | Peak |
| 4970.000 | 38.86 | 7.46 | 46.32 | 74.00 | -27.68 | H | Peak |
| 5990.000 | 38.82 | 8.87 | 47.69 | 74.00 | -26.31 | H | Peak |
| 7110.000 | 39.23 | 10.37 | 49.60 | 74.00 | -24.40 | H | Peak |
| N/A | | | | | | | |
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Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.



Operation Mode: TX / IEEE 802.11g / CH High

Test Date: December 1, 2012

Temperature: 26°C

Tested by: Francis Lee

Humidity: 56 % RH

Polarity: Ver. / Hor.

| Freq. (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Ant. Pol H/V | Remark |
|-------------|----------------|-----------------------|-----------------|----------------|-------------|--------------|--------|
| 1064.000 | 57.60 | -10.01 | 47.59 | 74.00 | -26.41 | V | Peak |
| 1596.000 | 53.03 | -4.81 | 48.22 | 74.00 | -25.78 | V | Peak |
| 1862.000 | 52.34 | -3.77 | 48.57 | 74.00 | -25.43 | V | Peak |
| 2410.000 | 55.50 | -1.60 | 53.90 | 74.00 | -20.10 | V | Peak |
| 2410.000 | 45.21 | -1.60 | 43.61 | 54.00 | -10.39 | V | AVG |
| 2550.000 | 51.87 | -1.55 | 50.32 | 74.00 | -23.68 | V | Peak |
| 3745.000 | 41.01 | 3.02 | 44.03 | 74.00 | -29.97 | V | Peak |
| 4965.000 | 38.56 | 4.99 | 43.55 | 74.00 | -30.45 | V | Peak |
| 6560.000 | 39.32 | 6.92 | 46.24 | 74.00 | -27.76 | V | Peak |
| 1060.000 | 61.07 | -10.59 | 50.48 | 74.00 | -23.52 | H | Peak |
| 2122.000 | 50.24 | -3.73 | 46.51 | 74.00 | -27.49 | H | Peak |
| 2388.000 | 53.03 | -6.35 | 46.68 | 74.00 | -27.32 | H | Peak |
| 4965.000 | 39.15 | 7.44 | 46.59 | 74.00 | -27.41 | H | Peak |
| 5550.000 | 39.20 | 9.03 | 48.23 | 74.00 | -25.77 | H | Peak |
| 6135.000 | 39.66 | 8.50 | 48.16 | 74.00 | -25.84 | H | Peak |
| N/A | | | | | | | |
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Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.



Operation Mode: TX / IEEE 802.11n HT20 / CH Low

Test Date: December 1, 2012

Temperature: 26°C

Tested by: Francis Lee

Humidity: 56 % RH

Polarity: Ver. / Hor.

| Freq. (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Ant. Pol H/V | Remark |
|-------------|----------------|-----------------------|-----------------|----------------|-------------|--------------|--------|
| 1060.000 | 57.68 | -9.92 | 47.76 | 74.00 | -26.24 | V | Peak |
| 1854.000 | 51.44 | -3.95 | 47.49 | 74.00 | -26.51 | V | Peak |
| 2358.000 | 56.15 | -1.62 | 54.53 | 74.00 | -19.47 | V | Peak |
| 2358.000 | 46.63 | -1.62 | 45.01 | 54.00 | -8.99 | V | AVG |
| 4865.000 | 39.88 | 3.58 | 43.46 | 74.00 | -30.54 | V | AVG |
| 5700.000 | 38.72 | 5.94 | 44.66 | 74.00 | -29.34 | V | Peak |
| 6725.000 | 38.31 | 7.49 | 45.80 | 74.00 | -28.20 | V | Peak |
| N/A | | | | | | | |
| . | | | | | | | |
| 1060.000 | 61.46 | -10.59 | 50.87 | 74.00 | -23.13 | H | Peak |
| 1862.000 | 52.02 | -6.16 | 45.86 | 74.00 | -28.14 | H | Peak |
| 2130.000 | 50.42 | -3.71 | 46.71 | 74.00 | -27.29 | H | Peak |
| 4045.000 | 45.51 | 5.11 | 50.62 | 74.00 | -23.38 | H | Peak |
| 4870.000 | 39.15 | 6.64 | 45.79 | 74.00 | -28.21 | H | Peak |
| 5675.000 | 39.45 | 8.37 | 47.82 | 74.00 | -26.18 | H | Peak |
| 6275.000 | 38.80 | 7.96 | 46.76 | 74.00 | -27.24 | H | Peak |
| N/A | | | | | | | |
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Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.



Operation Mode: TX / IEEE 802.11n HT20 / CH Mid

Test Date: December 1, 2012

Temperature: 26°C

Tested by: Francis Lee

Humidity: 56 % RH

Polarity: Ver. / Hor.

| Freq. (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Ant. Pol H/V | Remark |
|-------------|----------------|-----------------------|-----------------|----------------|-------------|--------------|--------|
| 1066.000 | 57.03 | -10.06 | 46.97 | 74.00 | -27.03 | V | Peak |
| 1856.000 | 52.27 | -3.91 | 48.36 | 74.00 | -25.64 | V | Peak |
| 2384.000 | 56.21 | -1.65 | 54.56 | 74.00 | -19.44 | V | Peak |
| 2384.000 | 45.71 | -1.65 | 44.06 | 54.00 | -9.94 | V | AVG |
| 4860.000 | 38.72 | 3.47 | 42.19 | 74.00 | -31.81 | V | Peak |
| 5625.000 | 39.30 | 5.92 | 45.22 | 74.00 | -28.78 | V | Peak |
| 6225.000 | 38.71 | 6.48 | 45.19 | 74.00 | -28.81 | V | Peak |
| N/A | | | | | | | |
| | | | | | | | |
| 1060.000 | 60.97 | -10.59 | 50.38 | 74.00 | -23.62 | H | Peak |
| 2120.000 | 50.82 | -3.74 | 47.08 | 74.00 | -26.92 | H | Peak |
| 2384.000 | 54.91 | -6.35 | 48.56 | 74.00 | -25.44 | H | Peak |
| 4870.000 | 39.67 | 6.64 | 46.31 | 74.00 | -27.69 | H | Peak |
| 5920.000 | 39.28 | 9.14 | 48.42 | 74.00 | -25.58 | H | Peak |
| 6885.000 | 37.84 | 9.62 | 47.46 | 74.00 | -26.54 | H | Peak |
| N/A | | | | | | | |
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Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.



Operation Mode: TX / IEEE 802.11n HT20 / CH High

Test Date: December 1, 2012

Temperature: 26°C

Tested by: Francis Lee

Humidity: 56 % RH

Polarity: Ver. / Hor.

| Freq. (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Ant. Pol H/V | Remark |
|-------------|----------------|-----------------------|-----------------|----------------|-------------|--------------|--------|
| 1066.000 | 57.42 | -10.06 | 47.36 | 74.00 | -26.64 | V | Peak |
| 1596.000 | 52.16 | -4.81 | 47.35 | 74.00 | -26.65 | V | Peak |
| 1860.000 | 52.05 | -3.81 | 48.24 | 74.00 | -25.76 | V | Peak |
| 2408.000 | 56.50 | -1.61 | 54.89 | 74.00 | -19.11 | V | Peak |
| 2408.000 | 45.84 | -1.61 | 44.23 | 54.00 | -9.77 | V | AVG |
| 4875.000 | 38.94 | 3.81 | 42.75 | 74.00 | -31.25 | V | Peak |
| 5955.000 | 39.46 | 5.68 | 45.14 | 74.00 | -28.86 | V | Peak |
| 6475.000 | 39.08 | 6.89 | 45.97 | 74.00 | -28.03 | V | Peak |
| 1064.000 | 61.48 | -10.56 | 50.92 | 74.00 | -23.08 | H | Peak |
| 1424.000 | 52.67 | -7.40 | 45.27 | 74.00 | -28.73 | H | Peak |
| 2126.000 | 51.62 | -3.72 | 47.90 | 74.00 | -26.10 | H | Peak |
| 4860.000 | 39.23 | 6.47 | 45.70 | 74.00 | -28.30 | H | Peak |
| 5610.000 | 39.59 | 9.09 | 48.68 | 74.00 | -25.32 | H | Peak |
| 7095.000 | 38.88 | 10.25 | 49.13 | 74.00 | -24.87 | H | Peak |
| N/A | | | | | | | |
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Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.



Operation Mode: TX / IEEE 802.11n HT40 / CH Low

Test Date: December 1, 2012

Temperature: 26°C

Tested by: Francis Lee

Humidity: 56 % RH

Polarity: Ver. / Hor.

| Freq. (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Ant. Pol H/V | Remark |
|-------------|----------------|-----------------------|-----------------|----------------|-------------|--------------|--------|
| 1066.000 | 57.05 | -10.06 | 46.99 | 74.00 | -27.01 | V | Peak |
| 1856.000 | 52.27 | -3.91 | 48.36 | 74.00 | -25.64 | V | Peak |
| 2320.000 | 54.78 | -1.57 | 53.21 | 74.00 | -20.79 | V | Peak |
| 2320.000 | 41.49 | -1.57 | 39.92 | 54.00 | -14.08 | V | AVG |
| 4130.000 | 39.98 | 2.93 | 42.91 | 74.00 | -31.09 | V | Peak |
| 5455.000 | 39.44 | 6.30 | 45.74 | 74.00 | -28.26 | V | Peak |
| 6735.000 | 38.73 | 7.45 | 46.18 | 74.00 | -27.82 | V | Peak |
| N/A | | | | | | | |
| 1062.000 | 61.02 | -10.58 | 50.44 | 74.00 | -23.56 | H | Peak |
| 1864.000 | 51.42 | -6.14 | 45.28 | 74.00 | -28.72 | H | Peak |
| 2128.000 | 49.98 | -3.72 | 46.26 | 74.00 | -27.74 | H | Peak |
| 4625.000 | 39.38 | 6.27 | 45.65 | 74.00 | -28.35 | H | Peak |
| 5660.000 | 39.60 | 8.53 | 48.13 | 74.00 | -25.87 | H | Peak |
| 6595.000 | 38.92 | 8.26 | 47.18 | 74.00 | -26.82 | H | Peak |
| N/A | | | | | | | |
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Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.



Operation Mode: TX / IEEE 802.11n HT40 / CH Mid

Test Date: December 1, 2012

Temperature: 26°C

Tested by: Francis Lee

Humidity: 56 % RH

Polarity: Ver. / Hor.

| Freq. (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Ant. Pol H/V | Remark |
|-------------|----------------|-----------------------|-----------------|----------------|-------------|--------------|--------|
| 1060.000 | 57.02 | -9.92 | 47.10 | 74.00 | -26.90 | V | Peak |
| 1856.000 | 51.82 | -3.91 | 47.91 | 74.00 | -26.09 | V | Peak |
| 2334.000 | 55.10 | -1.59 | 53.51 | 74.00 | -20.49 | V | Peak |
| 2334.000 | 43.46 | -1.59 | 41.87 | 54.00 | -12.13 | V | AVG |
| 3800.000 | 41.31 | 3.69 | 45.00 | 74.00 | -29.00 | V | Peak |
| 4965.000 | 39.78 | 4.99 | 44.77 | 74.00 | -29.23 | V | Peak |
| 5495.000 | 39.77 | 6.24 | 46.01 | 74.00 | -27.99 | V | Peak |
| N/A | | | | | | | |
| 1062.000 | 61.49 | -10.58 | 50.91 | 74.00 | -23.09 | H | Peak |
| 1862.000 | 51.29 | -6.16 | 45.13 | 74.00 | -28.87 | H | Peak |
| 2206.000 | 50.16 | -3.73 | 46.43 | 74.00 | -27.57 | H | Peak |
| 4275.000 | 40.54 | 7.24 | 47.78 | 74.00 | -26.22 | H | Peak |
| 4910.000 | 41.62 | 7.19 | 48.81 | 74.00 | -25.19 | H | Peak |
| 5590.000 | 39.67 | 9.17 | 48.84 | 74.00 | -25.16 | H | Peak |
| N/A | | | | | | H | Peak |
| | | | | | | | |
| | | | | | | | |

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.



Operation Mode: TX / IEEE 802.11n HT40 / CH Mid

Test Date: December 1, 2012

Temperature: 26°C

Tested by: Francis Lee

Humidity: 56 % RH

Polarity: Ver. / Hor.

| Freq. (MHz) | Reading (dBuV) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Ant. Pol H/V | Remark |
|-------------|----------------|-----------------------|-----------------|----------------|-------------|--------------|--------|
| 1060.000 | 57.85 | -9.92 | 47.93 | 74.00 | -26.07 | V | Peak |
| 1862.000 | 52.00 | -3.77 | 48.23 | 74.00 | -25.77 | V | Peak |
| 2358.000 | 55.26 | -1.62 | 53.64 | 74.00 | -20.36 | V | Peak |
| 2358.000 | 43.58 | -1.62 | 41.96 | 54.00 | -12.04 | V | AVG |
| 4930.000 | 40.78 | 4.66 | 45.44 | 74.00 | -28.56 | V | Peak |
| 5705.000 | 39.90 | 5.90 | 45.80 | 74.00 | -28.20 | V | Peak |
| 6885.000 | 39.44 | 7.66 | 47.10 | 74.00 | -26.90 | V | Peak |
| N/A | | | | | | | |
| 1060.000 | 61.35 | -10.59 | 50.76 | 74.00 | -23.24 | H | Peak |
| 1864.000 | 51.22 | -6.14 | 45.08 | 74.00 | -28.92 | H | Peak |
| 2126.000 | 51.04 | -3.72 | 47.32 | 74.00 | -26.68 | H | Peak |
| 4695.000 | 39.56 | 7.24 | 46.80 | 74.00 | -27.20 | H | Peak |
| 5605.000 | 39.30 | 9.14 | 48.44 | 74.00 | -25.56 | H | Peak |
| 6460.000 | 39.21 | 7.77 | 46.98 | 74.00 | -27.02 | H | Peak |
| N/A | | | | | | | |
| | | | | | | | |
| | | | | | | | |

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.



7.7 POWERLINE CONDUCTED EMISSIONS

LIMIT

According to §15.207(a), except as shown in paragraphs (b) and (c) of this section, 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 frequency ranges.

| Frequency Range (MHz) | Limits (dBµV) | |
|-----------------------|---------------|-----------|
| | Quasi-peak | Average |
| 0.15 to 0.50 | 66 to 56* | 56 to 46* |
| 0.50 to 5 | 56 | 46 |
| 5 to 30 | 60 | 50 |

* Decreases with the logarithm of the frequency.

TEST CONFIGURATION

See test photographs attached in Appendix II for the actual connections between EUT and support equipment.

TEST PROCEDURE

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

TEST RESULTS

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

TEST DATA

Not applicable, because this EUT is Vehicle Mounted Computer and is not connected to the AC Main Source.



8. APPENDIX I RADIO FREQUENCY EXPOSURE

LIMIT

According to §15.247(i), 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 levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this chapter.

EUT Specification

| | |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EUT | Computer |
| Frequency band (Operating) | <input checked="" type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz <input type="checkbox"/> WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz <input type="checkbox"/> WLAN: 5.745GHz ~ 5.825GHz <input type="checkbox"/> Others |
| Device category | <input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation) <input type="checkbox"/> Others |
| Exposure classification | <input type="checkbox"/> Occupational/Controlled exposure (S = 5mW/cm ²) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure (S=1mW/cm ²) |
| Antenna diversity | <input checked="" type="checkbox"/> Single antenna <input type="checkbox"/> Multiple antennas <input type="checkbox"/> Tx diversity <input type="checkbox"/> Rx diversity <input type="checkbox"/> Tx/Rx diversity |
| Max. output power (AVG.) | IEEE 802.11b mode: 19.74 dBm (94.190mW) IEEE 802.11g mode: 11.92 dBm (15.560mW) IEEE 802.11n HT20 mode: 12.68 dBm (18.535mW) IEEE 802.11n HT40 mode: 11.95 dBm (15.167mW) |
| Antenna gain (Max) | 2.0dBi (including cable loss) (Numeric gain: 1.58) |
| Evaluation applied | <input checked="" type="checkbox"/> MPE Evaluation <input type="checkbox"/> SAR Evaluation <input type="checkbox"/> N/A |

Remark:

1. The maximum output power is 19.74dBm (94.19mW) at 2412MHz (with 1.58numeric antenna gain.)
2. For mobile or fixed location transmitters, no SAR consideration applied. The maximum power density is 1.0 mW/cm² even if the calculation indicates that the power density would be larger.

TEST RESULTS

No non-compliance noted.



Calculation

Given $E = \frac{\sqrt{30 \times P \times G}}{d}$ & $S = \frac{E^2}{3770}$

Where $E =$ Field strength in Volts / meter

$P =$ Power in Watts

$G =$ Numeric antenna gain

$d =$ Distance in meters

$S =$ Power density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{3770d^2}$$

Changing to units of mW and cm, using:

$$P (mW) = P (W) / 1000 \text{ and}$$

$$d (cm) = d(m) / 100$$

Yields

$$S = \frac{30 \times (P/1000) \times G}{3770 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2} \quad \text{Equation 1}$$

Where $d =$ Distance in cm

$P =$ Power in mW

$G =$ Numeric antenna gain

$S =$ Power density in mW / cm²

Maximum Permissible Exposure

EUT output power = 94.19mW

Numeric Antenna gain = 1.58

Substituting the MPE safe distance using $d = 20$ cm into Equation 1:

Yields

$$S = 0.000199 \times P \times G$$

Where $P =$ Power in mW

$G =$ Numeric antenna gain

$S =$ Power density in mW / cm²

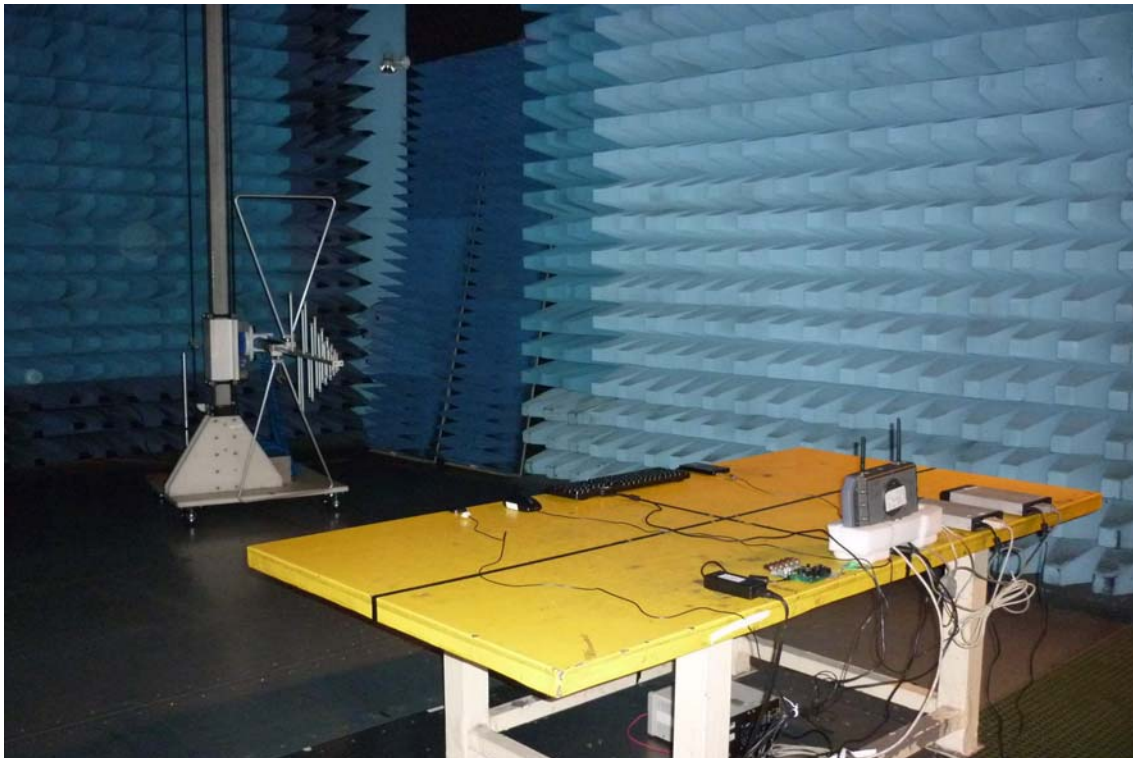
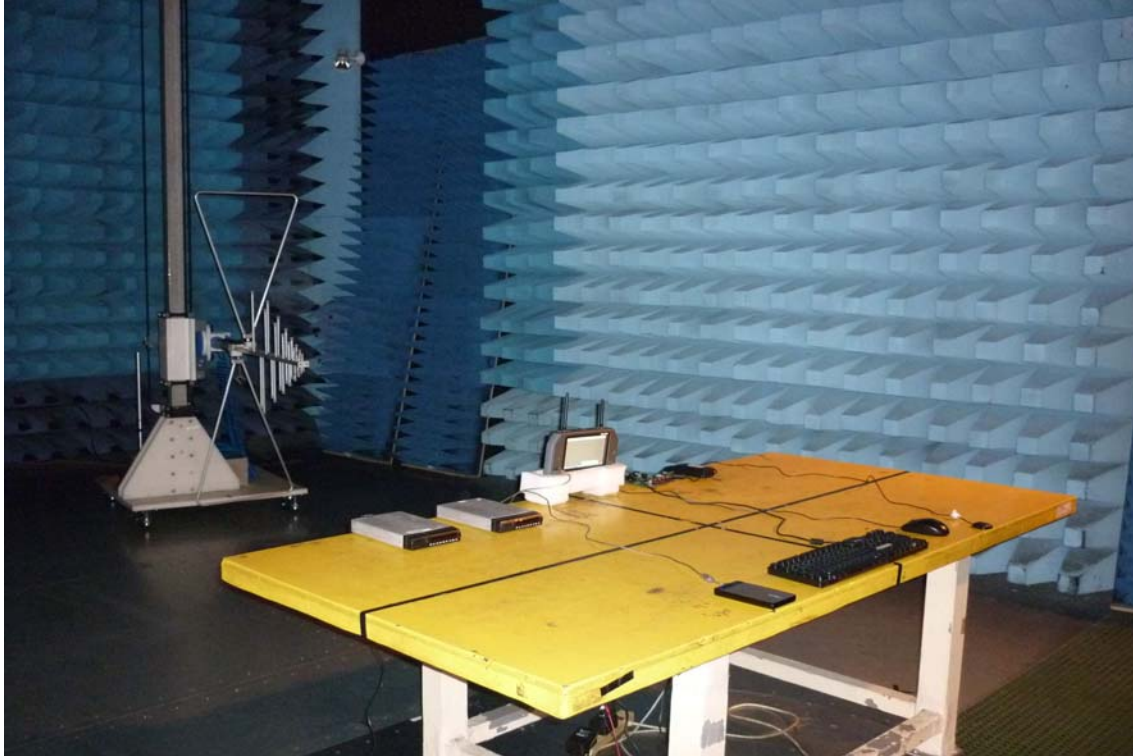
→ Power density = 0.0296 mW / cm²

(For mobile or fixed location transmitters, the maximum power density is 1.0 mW/cm² even if the calculation indicates that the power density would be larger.)



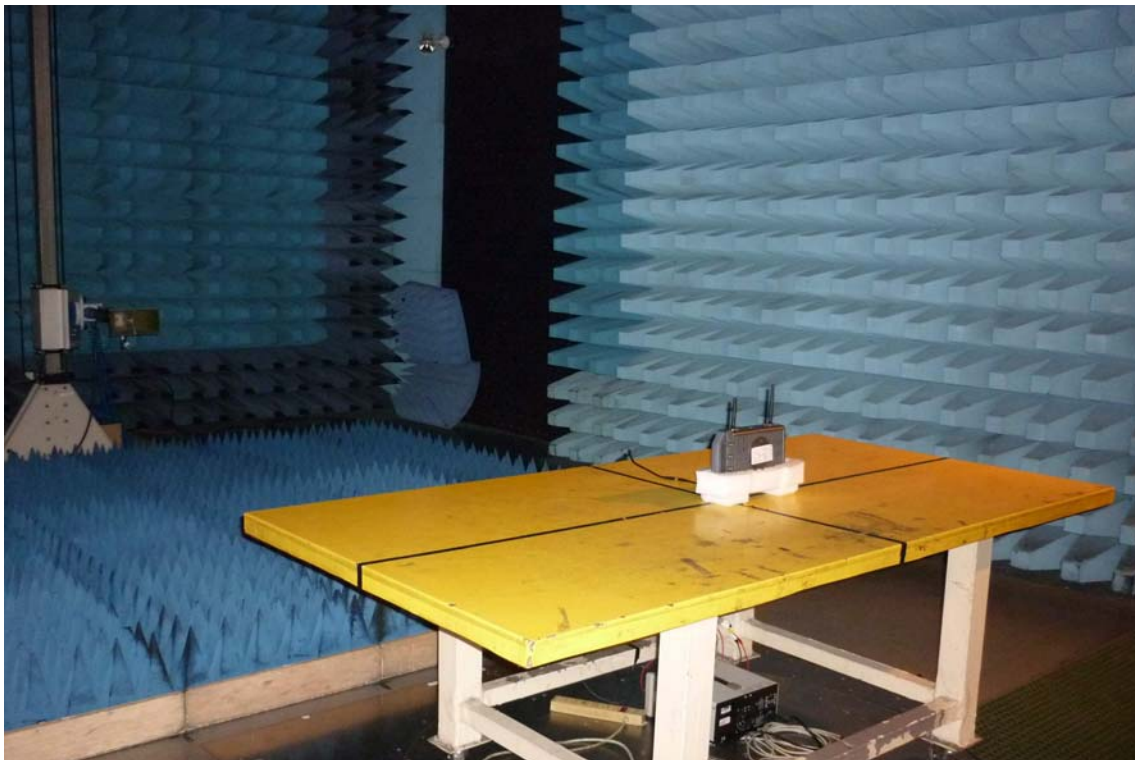
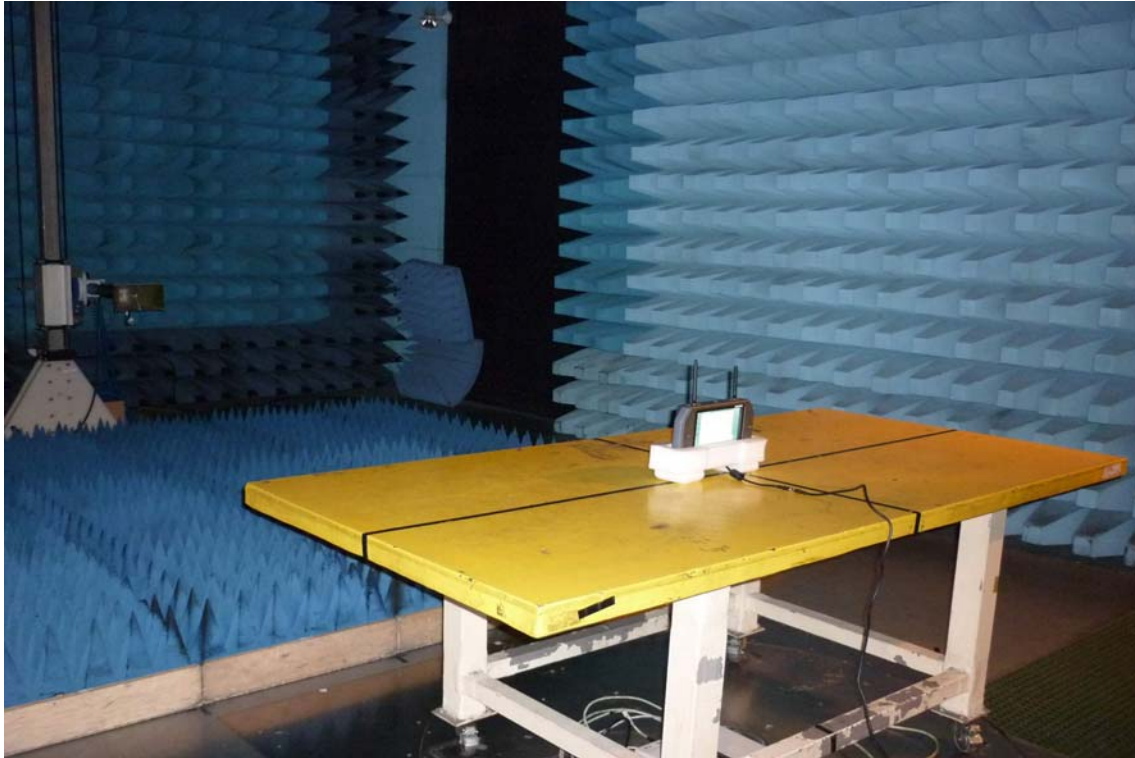
9. APPENDIX II PHOTOGRAPHS OF TEST SETUP

Radiated Emission Set up Photos Below 1GHz





Above 1GHz





Conducted Emission Setup Photos

