

FCC - TEST REPORT

Report Number : **68.930.15.011.01** Date of Issue: July 10, 2015Model : **SE-301, iSE-301**Product Type : ElectrocardiographApplicant : EDAN INSTRUMENTS,INC.Address : 3/F-B, Nanshan Medical Equipment Park, Nanhai Rd 1019#,
Shekou, Nanshan Shenzhen, 518067 P.R. CHINAProduction Facility : EDAN INSTRUMENTS,INC.Address : 3/F-B, Nanshan Medical Equipment Park, Nanhai Rd 1019#,
Shekou, Nanshan Shenzhen, 518067 P.R. CHINATest Result : **Positive** **Negative**Total pages including
Appendices : 40

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1 Table of Contents

| | | |
|-----|--|----|
| 1 | Table of Contents | 2 |
| 2 | Details about the Test Laboratory | 3 |
| 3 | Description of the Equipment Under Test..... | 4 |
| 4 | Summary of Test Standards..... | 5 |
| 5 | Summary of Test Results | 6 |
| 6 | General Remarks | 7 |
| 7 | Test Setups | 8 |
| 8 | Systems test configuration | 9 |
| 9 | Technical Requirement | 10 |
| 9.1 | Conducted Emission..... | 10 |
| 9.2 | Conducted peak output power | 13 |
| 9.3 | 6dB bandwidth | 15 |
| 9.4 | Power spectral density..... | 21 |
| 9.5 | Spurious RF conducted emissions | 22 |
| 9.6 | Band edge testing..... | 32 |
| 9.7 | Spurious radiated emissions for transmitter..... | 36 |
| 10 | Test Equipment List | 39 |
| 11 | System Measurement Uncertainty | 40 |

2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12&13, Zhiheng Wisdomland Business Park,
Nantou Checkpoint Road 2, Nanshan District,
Shenzhen City, 518052,
P. R. China

FCC Registration Number: 502708

Telephone: 86 755 8828 6998
Fax: 86 755 8828 5299

3 Description of the Equipment Under Test

| | |
|----------------------------|---|
| Product: | Electrocardiograph |
| Model no.: | SE-301, iSE-301 |
| FCC ID: | SMQSE301EDAN |
| Brand Name: | EDAN |
| Options and accessories: | NIL |
| Rating: | Input: AC 100-240V~50/60Hz, 1.1A (Adapter) DC 19.0V, Max 2.53A (Electrocardiograph) DC 14.8V (Rechargeable Li-ion Battery) Output: DC 19.0V/2A (Adapter) |
| RF Transmission Frequency: | 2412-2462MHz |
| No. of Operated Channel: | 11 |
| Modulation: | DSSS, OFDM |
| Antenna Type: | Internal Antenna |
| Antenna Gain: | 3.0dBi |
| Description of the EUT: | The Equipment Under Test (EUT) is a Electrocardiograph operated at 2.4GHz |

4 Summary of Test Standards

| Test Standards | |
|--|--|
| FCC Part 15 Subpart C 10-1-2014 Edition | PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators |

All the test methods were according to KDB558074 D01 DTS Meas Guidance v03r02 and ANSI C63.10 (2013).

5 Summary of Test Results

| Technical Requirements | | | | |
|--------------------------------|---|------------|-----------|-------------|
| FCC Part 15 Subpart C | | | | |
| Test Condition | | Pages | Test Site | Test Result |
| §15.207 | Conducted emission AC power port | 10 | Site 1 | Pass |
| §15.247(b)(1) | Conducted peak output power | 13 | Site 1 | Pass |
| §15.247(a)(2) | 20dB bandwidth | --- | --- | N/A |
| §15.247(a)(1) | 6dB bandwidth and 99% Occupied Bandwidth | 15 | Site 1 | Pass |
| §15.247(a)(1) | Carrier frequency separation | --- | --- | N/A |
| §15.247(a)(1)(iii) | Number of hopping frequencies | --- | --- | N/A |
| §15.247(a)(1)(iii) | Dwell Time | --- | --- | N/A |
| §15.247(e) | Power spectral density | 21 | Site 1 | Pass |
| §15.247(d) | Spurious RF conducted emissions | 22 | Site1 | Pass |
| §15.247(d) | Band edge | 32 | Site 1 | Pass |
| §15.247(d) & §15.209 & §15.205 | Spurious radiated emissions for transmitter | 36 | Site 1 | Pass |
| §15.203 | Antenna requirement | See note 2 | | Pass |

Note 1: N/A=Not Applicable.

Note 2: The EUT uses a internal antenna, which gain is 3.0dBi. In accordance to §15.203, It is considered sufficiently to comply with the provisions of this section.

6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: SMQSE301EDAN, complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C Rules.

SUMMARY:

All tests according to the regulations cited on page 5 were

- Performed

- **Not** Performed

The Equipment Under Test

- **Fulfills** the general approval requirements.

- **Does not** fulfill the general approval requirements.

Sample Received Date: April 21, 2015

Testing Start Date: July 1, 2015

Testing End Date: July 7, 2015

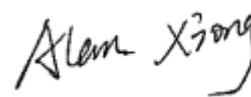
TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch

Reviewed by:

Prepared by:



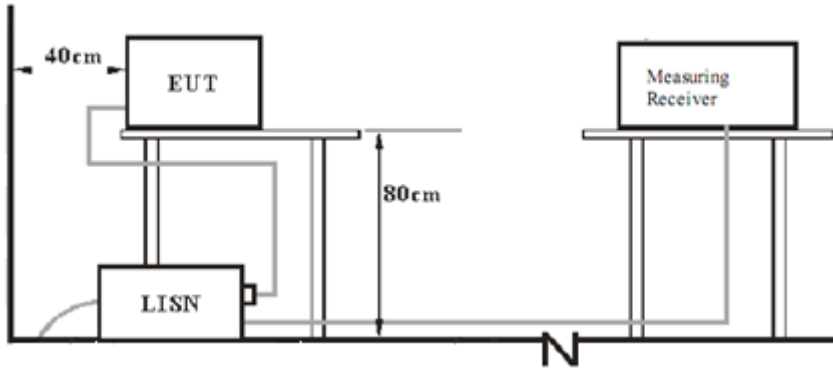
John Zhi
EMC Project Manager



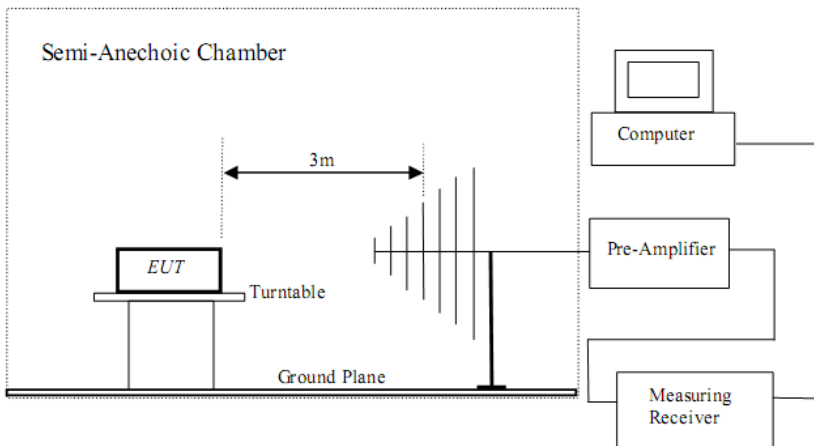
Alan Xiong
EMC Project Engineer

7 Test Setups

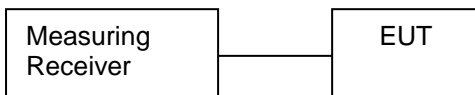
7.1 AC Power Line Conducted Emission test setups



7.2 Radiated test setups



7.3 Conducted RF test setups



8 Systems test configuration

Auxiliary Equipment Used during Test:

| DESCRIPTION | MANUFACTURER | MODEL NO.(SHIELD) | S/N(LENGTH) |
|-------------|--------------|-------------------|-------------|
| -- | -- | -- | -- |

The system was configured to non-hopping mode.

Non-hopping mode: The system was configured to operate at a signal channel transmitting. The test software allows the configuration and operation at the worst-case duty and the highest transmit power

9 Technical Requirement

9.1 Conducted Emission

Test Method

1. The EUT was placed on a table, which is 0.8m above ground plane
2. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
3. Maximum procedure was performed to ensure EUT compliance
4. A EMI test receiver is used to test the emissions from both sides of AC line

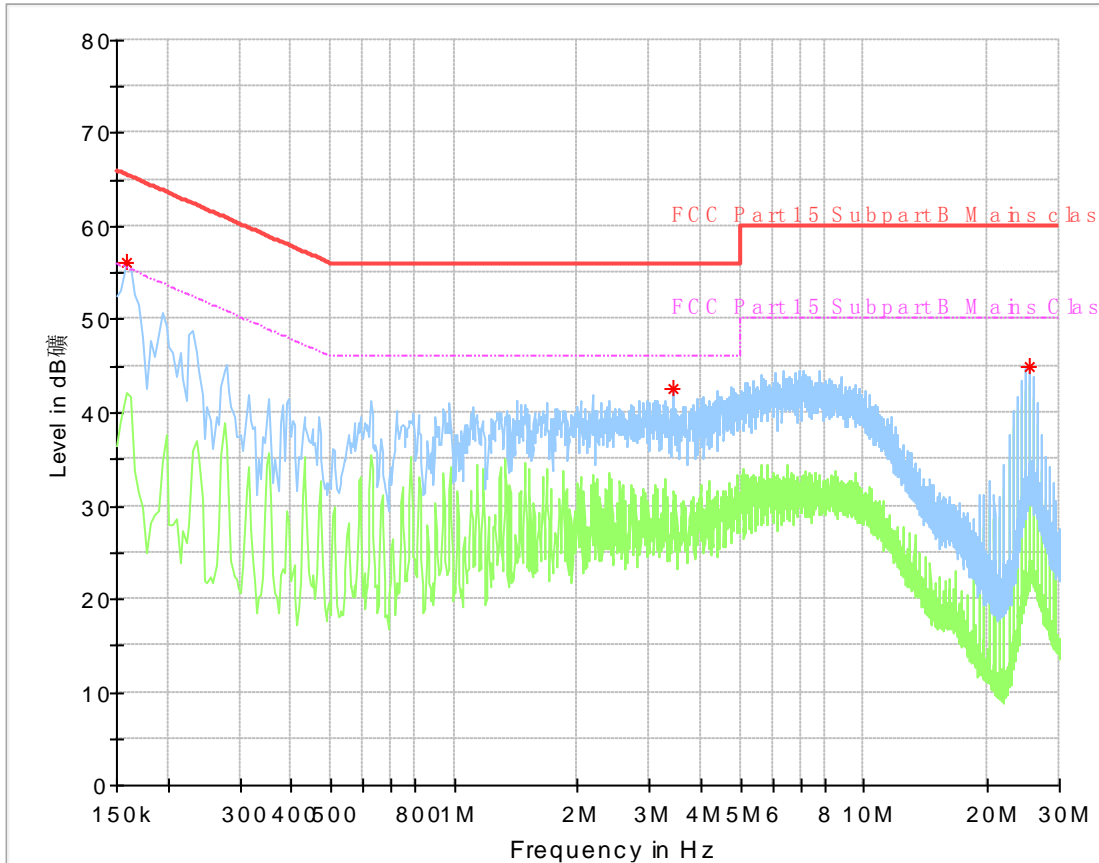
Limit

According to §15.207, conducted emissions limit as below:

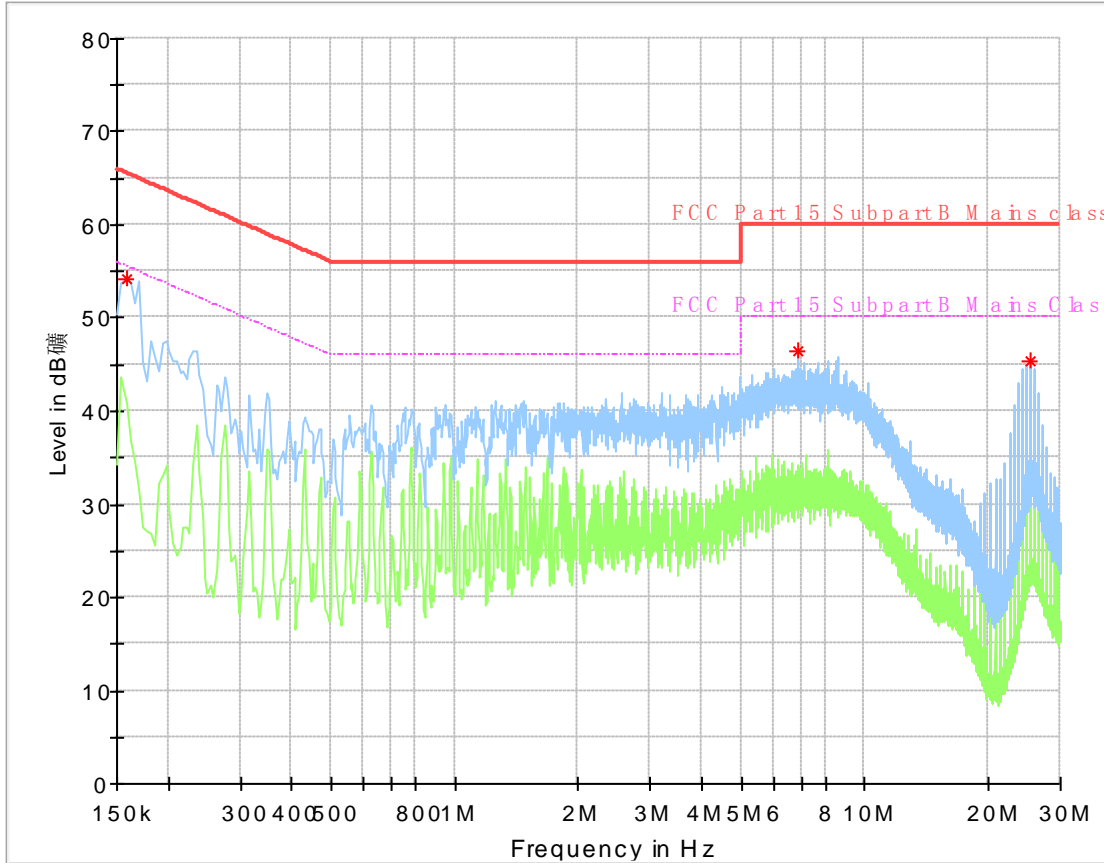
| Frequency MHz | QP Limit dB μ V | AV Limit dB μ V |
|------------------|------------------------|------------------------|
| 0.150-0.500 | 66-56* | 56-46* |
| 0.500-5 | 56 | 46 |
| 5-30 | 60 | 50 |

Decreasing linearly with logarithm of the frequency

Product Type : Electrocardiograph
 M/N : iSE-301
 Operating Condition : Transmitting
 Test Specification : Line
 Comment : AC 120V/60Hz



Product Type : Electrocardiograph
 M/N : iSE-301
 Operating Condition : Transmitting
 Test Specification : Neutral
 Comment : AC 120V/60Hz



9.2 Conducted peak output power

Test Method

1. Use the following spectrum analyzer settings:
Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel
RBW > the 20 dB bandwidth of the emission being measured, VBW ≥ RBW,
Sweep = auto, Detector function = peak, Trace = max hold
2. Add a correction factor to the display.
3. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power

Limits

According to §15.247 (b) (1) and RSS-210 A8.4, conducted peak output power limit as below:

| Frequency Range MHz | Limit W | Limit dBm |
|------------------------|------------|--------------|
| 2400-2483.5 | ≤1 | ≤30 |

Conducted peak output power

802.11b modulation Test Result

| Frequency MHz | Conducted Peak Output Power dBm | Result |
|------------------------|---------------------------------------|--------|
| Low channel 2412MHz | 9.7 | Pass |
| Middle channel 2437MHz | 9.0 | Pass |
| High channel 2462MHz | 8.5 | Pass |

802.11g modulation Test Result

| Frequency MHz | Conducted Peak Output Power dBm | Result |
|------------------------|---------------------------------------|--------|
| Low channel 2412MHz | 8.3 | Pass |
| Middle channel 2437MHz | 7.9 | Pass |
| High channel 2462MHz | 7.3 | Pass |

802.11n-HT20 modulation Test Result

| Frequency MHz | Conducted Peak Output Power dBm | Result |
|------------------------|---------------------------------------|--------|
| Low channel 2412MHz | 8.4 | Pass |
| Middle channel 2437MHz | 7.7 | Pass |
| High channel 2462MHz | 7.4 | Pass |

9.3 6dB bandwidth

Test Method

1. Use the following spectrum analyzer settings:
RBW=100K, VBW \geq 3RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Use the automatic bandwidth measurement capability of an instrument, may be employed using the X dB bandwidth mode with X set to 6 dB, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be \geq 6 dB.
3. Allow the trace to stabilize, record the X dB Bandwidth value.

Limit

Limit [kHz]

\geq 500

802.11b modulation Test Result

| Frequency MHz | 6dB bandwidth MHz | Result |
|------------------------|----------------------|--------|
| Low channel 2412MHz | 10.116 | Pass |
| Middle channel 2437MHz | 10.159 | Pass |
| High channel 2462MHz | 10.159 | Pass |

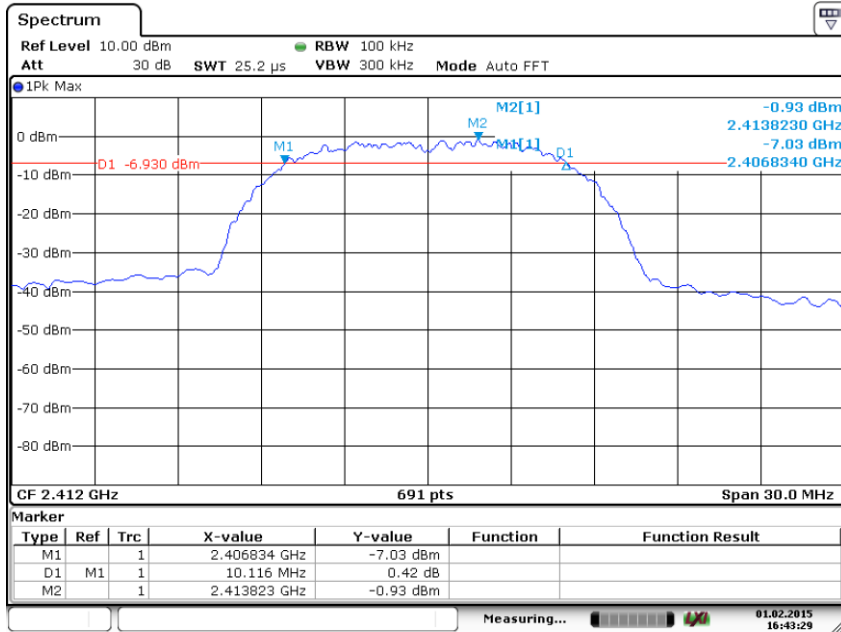
802.11g modulation Test Result

| Frequency MHz | 6dB bandwidth MHz | Result |
|------------------------|----------------------|--------|
| Low channel 2412MHz | 16.671 | Pass |
| Middle channel 2437MHz | 16.671 | Pass |
| High channel 2462MHz | 16.671 | Pass |

802.11n-HT20 modulation Test Result

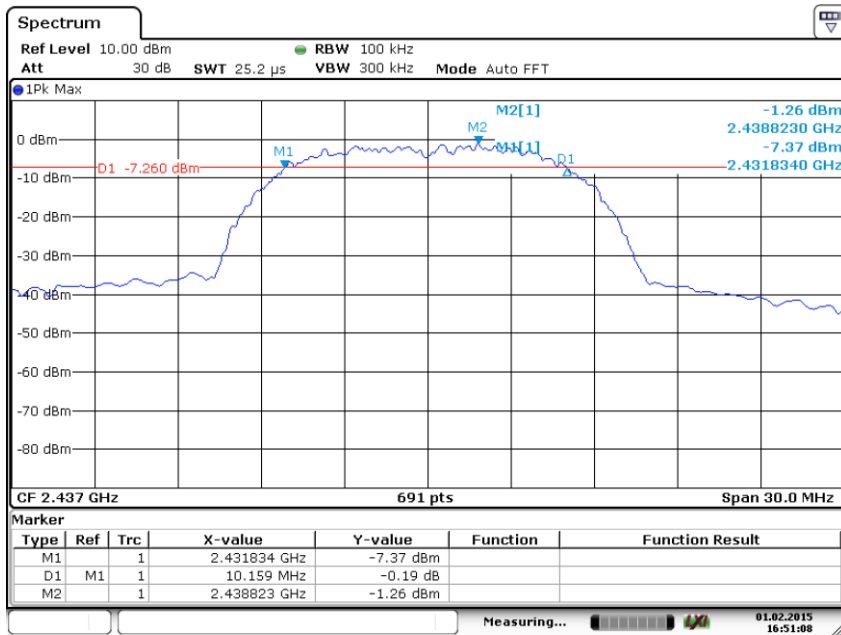
| Frequency MHz | 6dB bandwidth MHz | Result |
|------------------------|----------------------|--------|
| Low channel 2412MHz | 17.800 | Pass |
| Middle channel 2437MHz | 17.757 | Pass |
| High channel 2462MHz | 17.844 | Pass |

802.11b-2412MHz



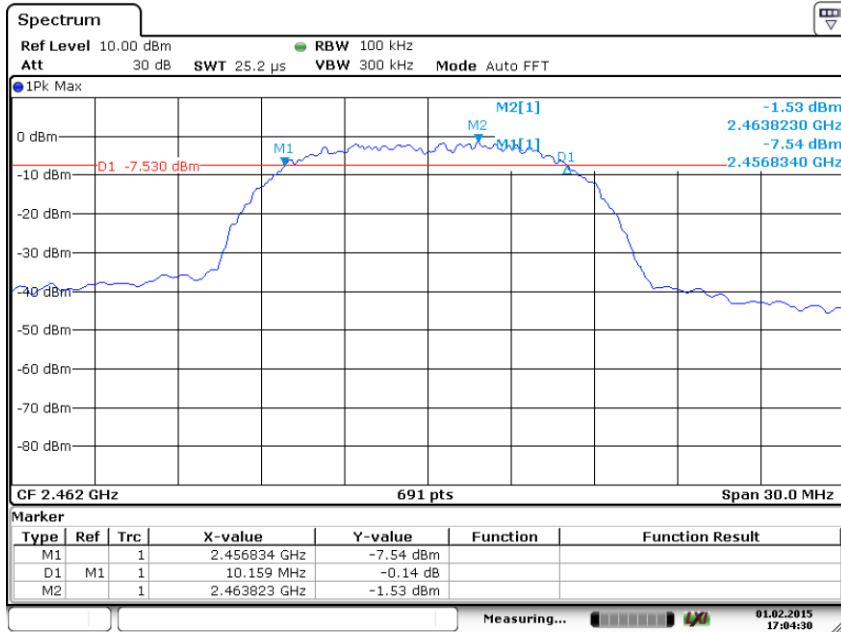
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802.11b-2437MHz



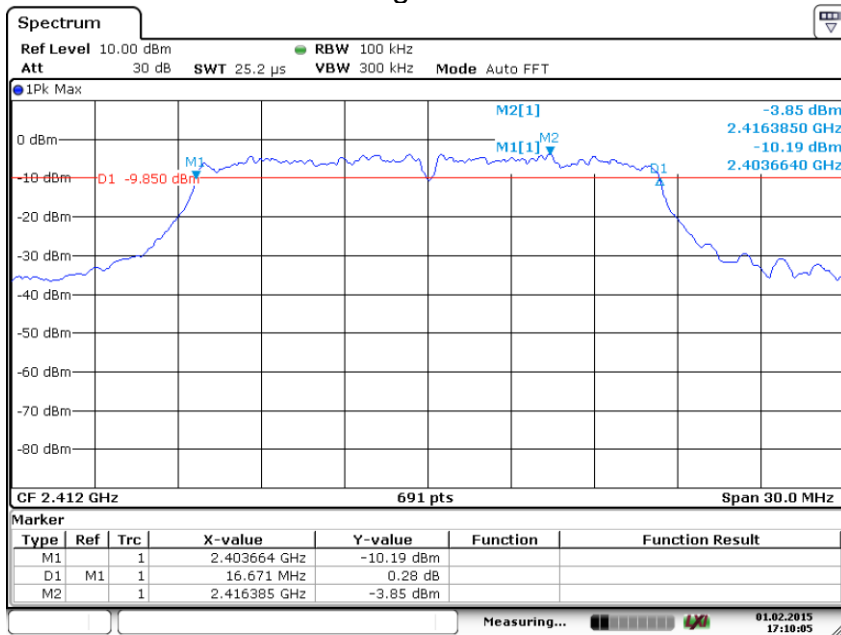
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802.11b-2462MHz



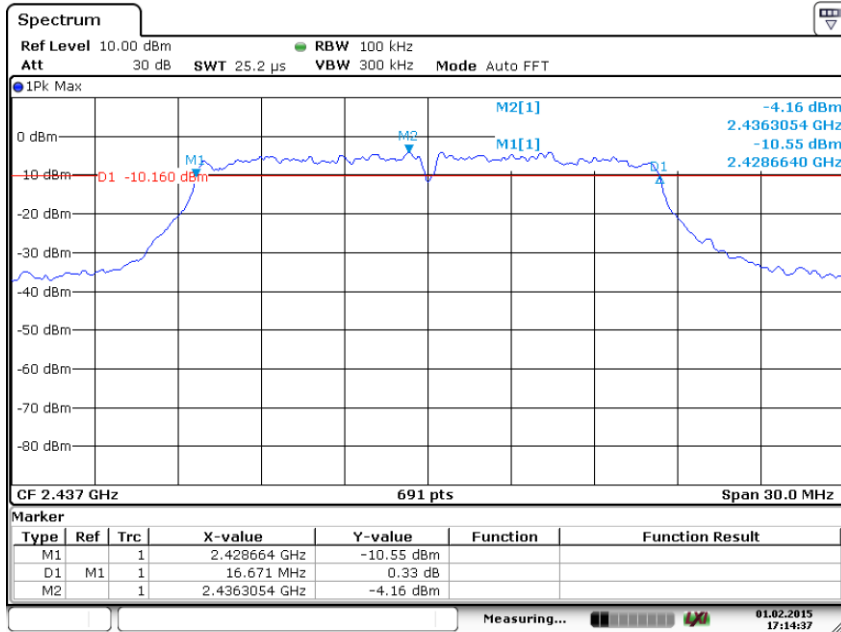
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802.11g-2412MHz



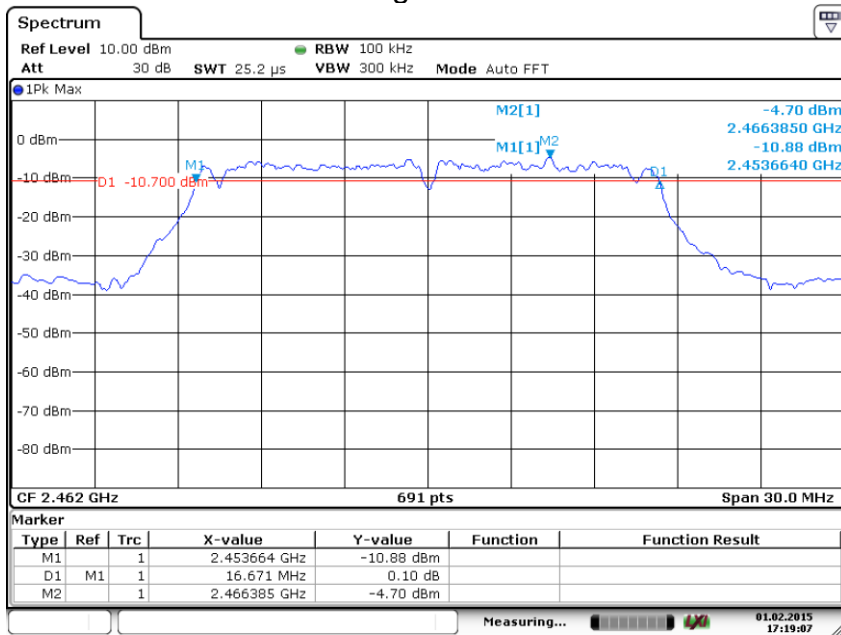
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802.11g-2437MHz



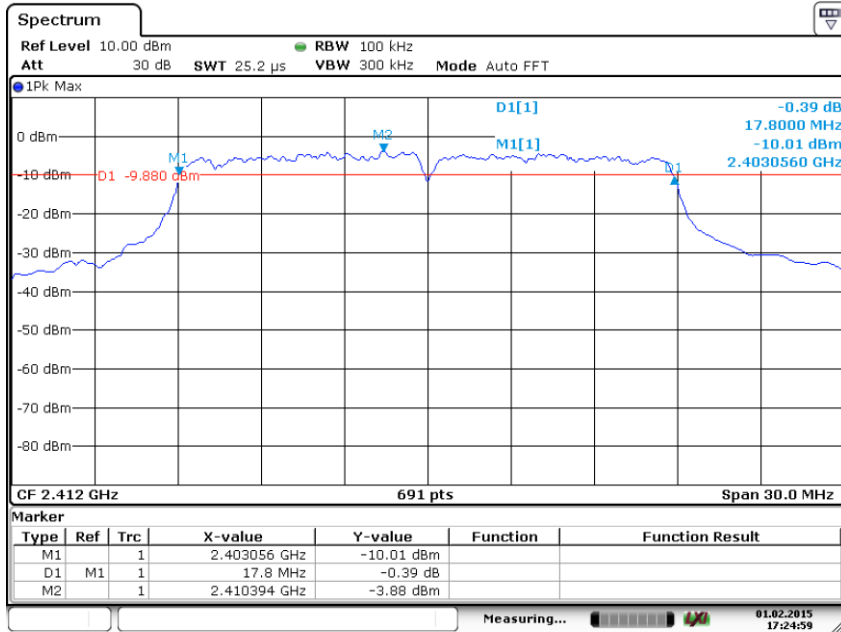
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802.11g-2462MHz



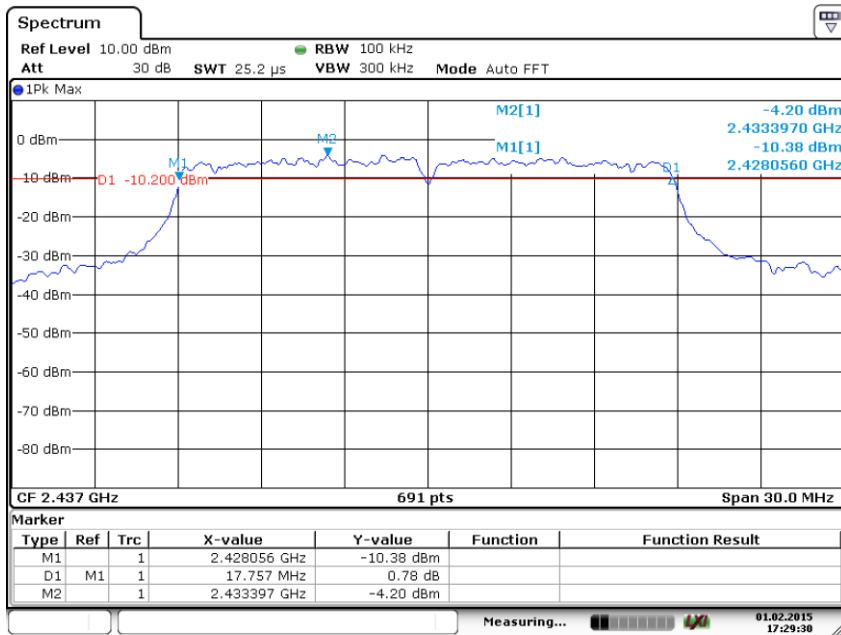
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802.11n-HT20-2412MHz



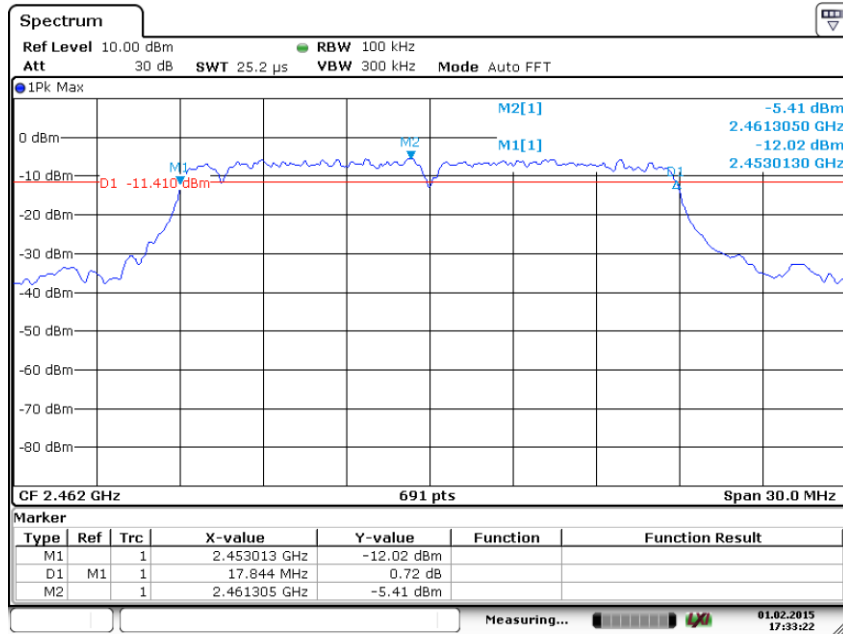
Date: 1.FEB.2015 17:24:59

802.11n-HT20-2437MHz



Date: 1.FEB.2015 17:29:30

802.11n-HT20-2462MHz



Date: 1.FEB.2015 17:33:22

9.4 Power spectral density

Test Method

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance:

1. Set analyzer center frequency to DTS channel center frequency.
RBW=3kHz,VBW≥3RBW,Span=1.5 times DTS bandwidth, Detector=Peak, Sweep=auto, Trace= max hold.
2. Allow trace to fully stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.
3. Repeat above procedures until other frequencies measured were completed.

Limit

Limit [dBm]

≤8

802.11b modulation Test Result

| Frequency MHz | Power spectral density dBm | Result |
|------------------------|-------------------------------|--------|
| Low channel 2412MHz | -18.24 | Pass |
| Middle channel 2437MHz | -18.66 | Pass |
| High channel 2462MHz | -19.02 | Pass |

802.11g modulation Test Result

| Frequency MHz | Power spectral density dBm | Result |
|------------------------|-------------------------------|--------|
| Low channel 2412MHz | -23.67 | Pass |
| Middle channel 2437MHz | -23.38 | Pass |
| High channel 2462MHz | -25.94 | Pass |

802.11n-HT20 modulation Test Result

| Frequency MHz | Power spectral density dBm | Result |
|------------------------|-------------------------------|--------|
| Low channel 2412MHz | -22.39 | Pass |
| Middle channel 2437MHz | -22.67 | Pass |
| High channel 2462MHz | -23.98 | Pass |

9.5 Spurious RF conducted emissions

Test Method

1. Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.
RBW = 100 kHz, VBW \geq RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded.
3. The level displayed must comply with the limit specified in this Section. Submit these plots.
4. Repeat above procedures until all frequencies measured were complete.

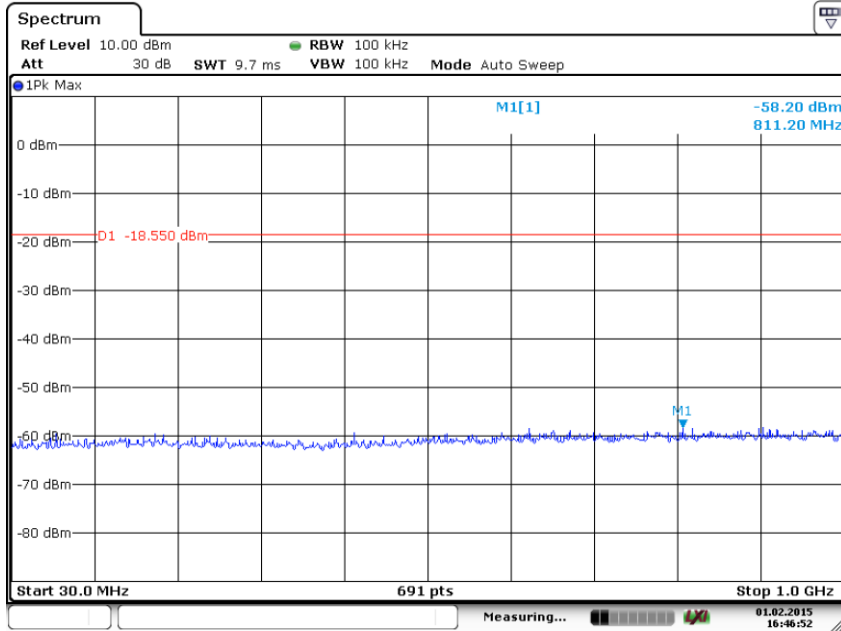
Limit

| Frequency Range MHz | Limit (dBc) |
|------------------------|-------------|
| 30-25000 | -20 |

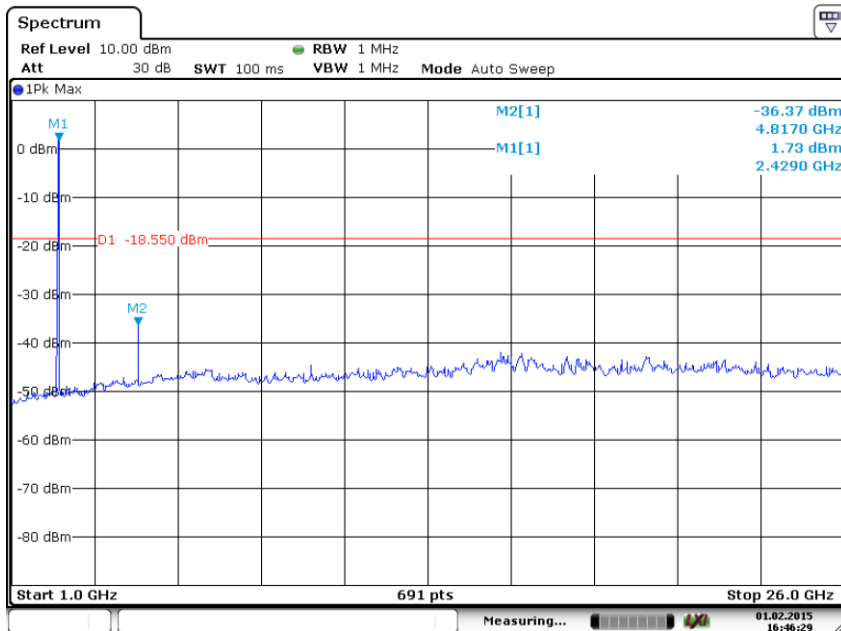
Spurious RF conducted emissions

All modulation test result is listed in the report.

802.11b-2412MHz

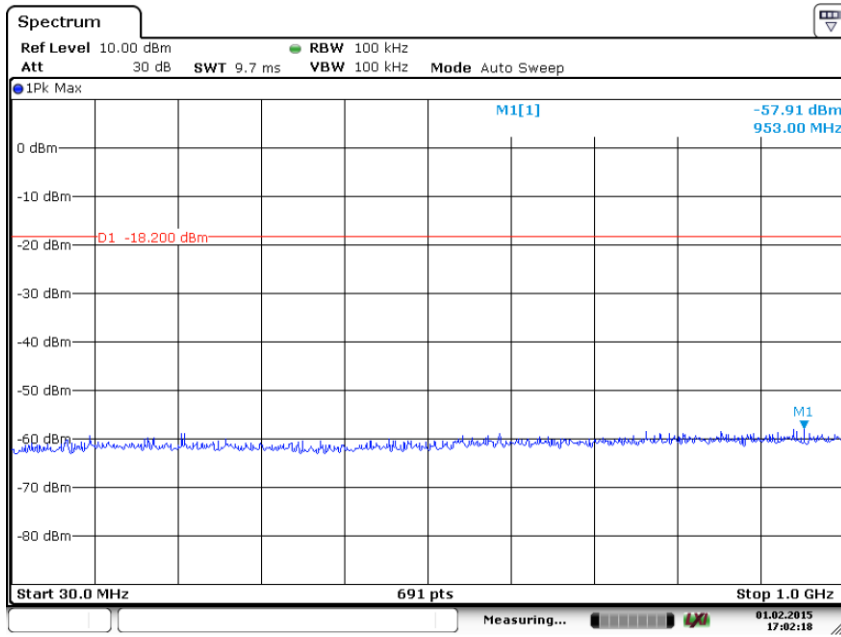


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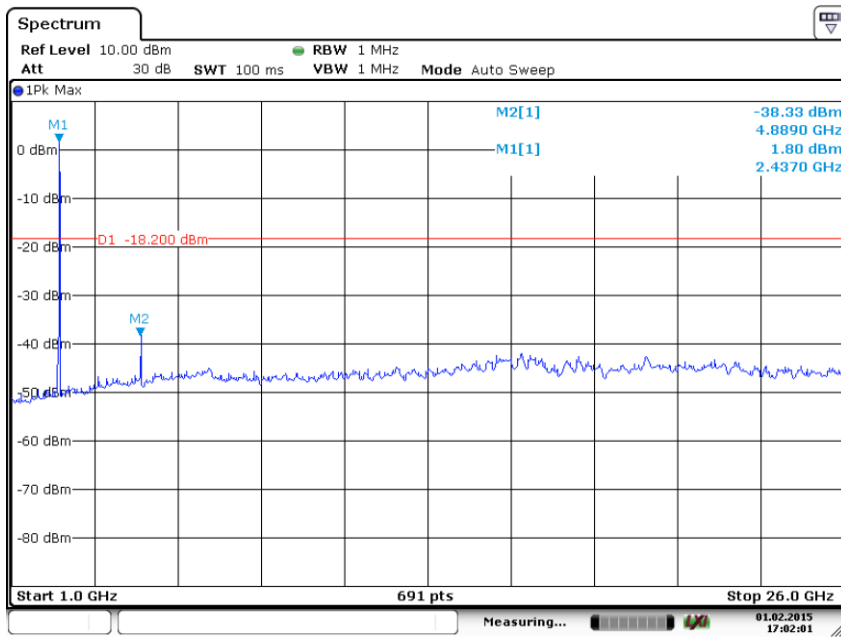


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802.11b-2437MHz

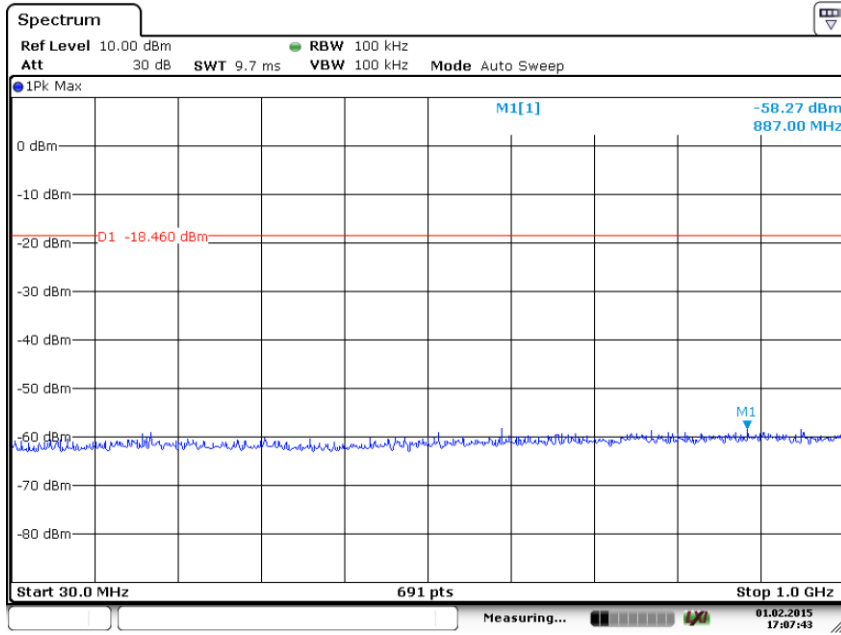


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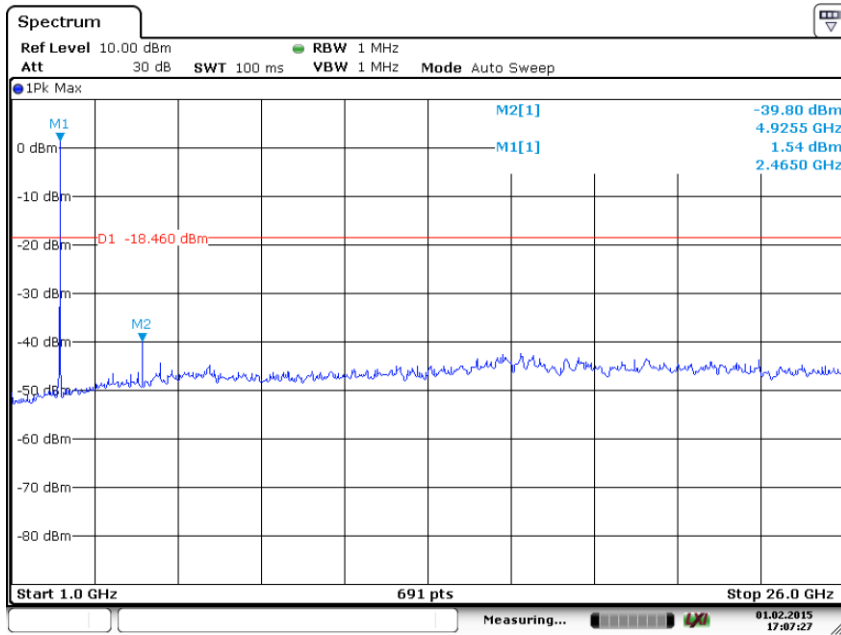


Date: 1.FEB.2015 17:02:01

802.11b-2462MHz

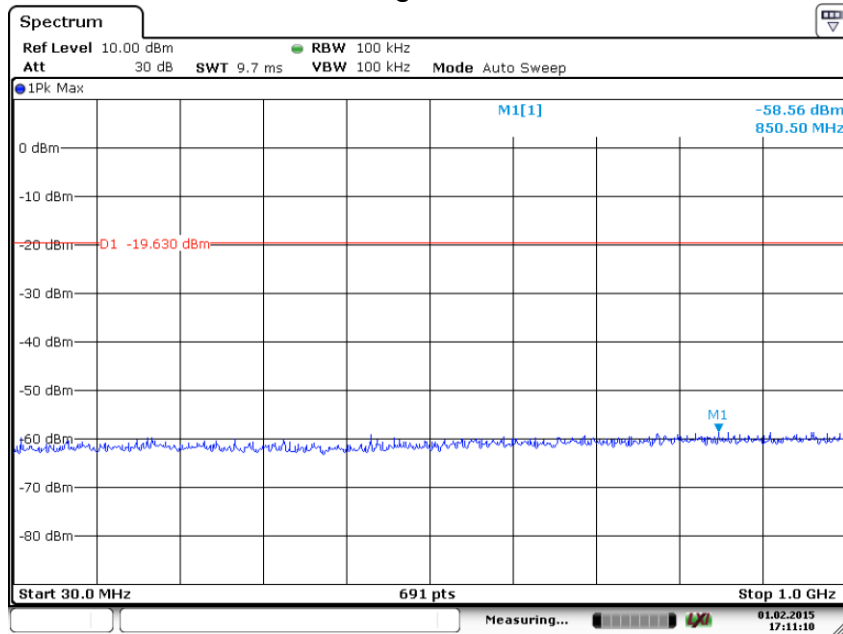


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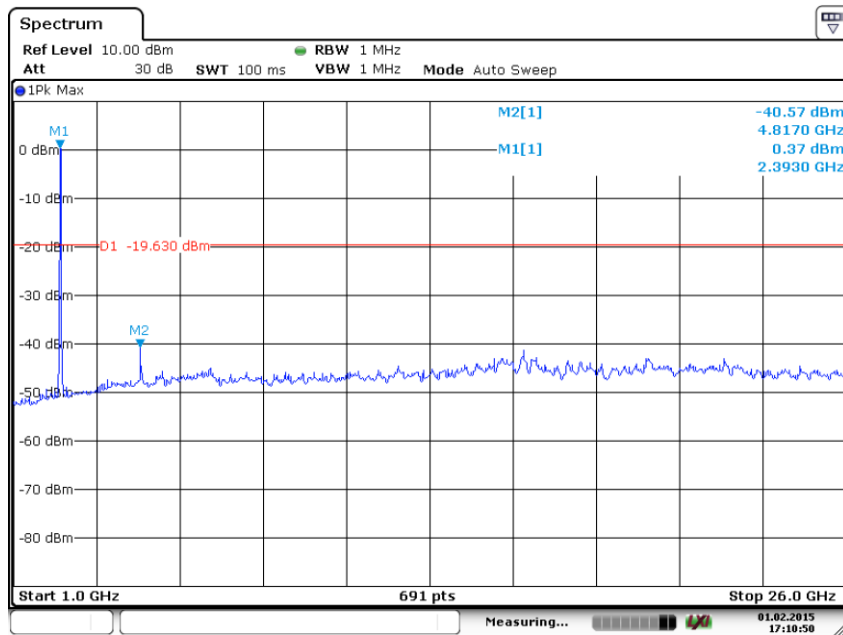


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802.11g-2412MHz

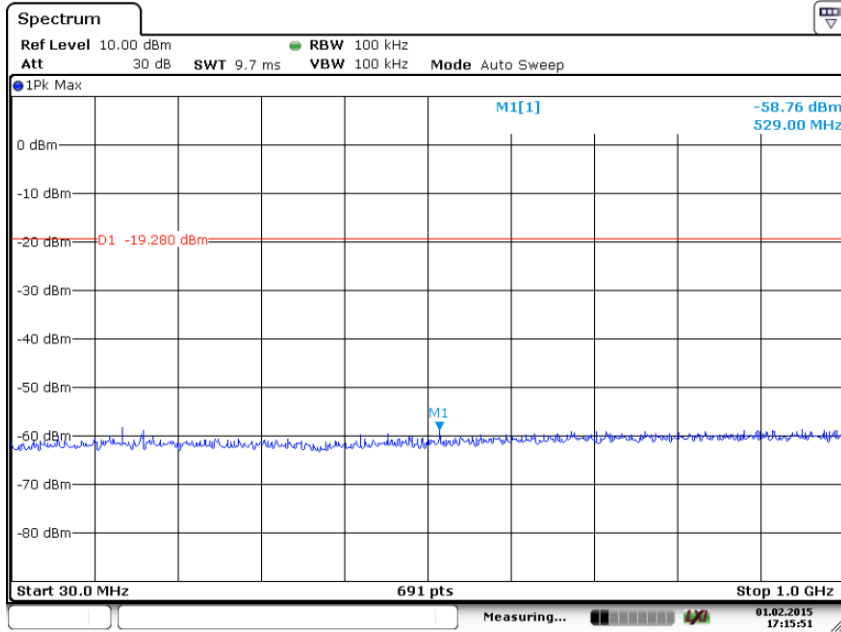


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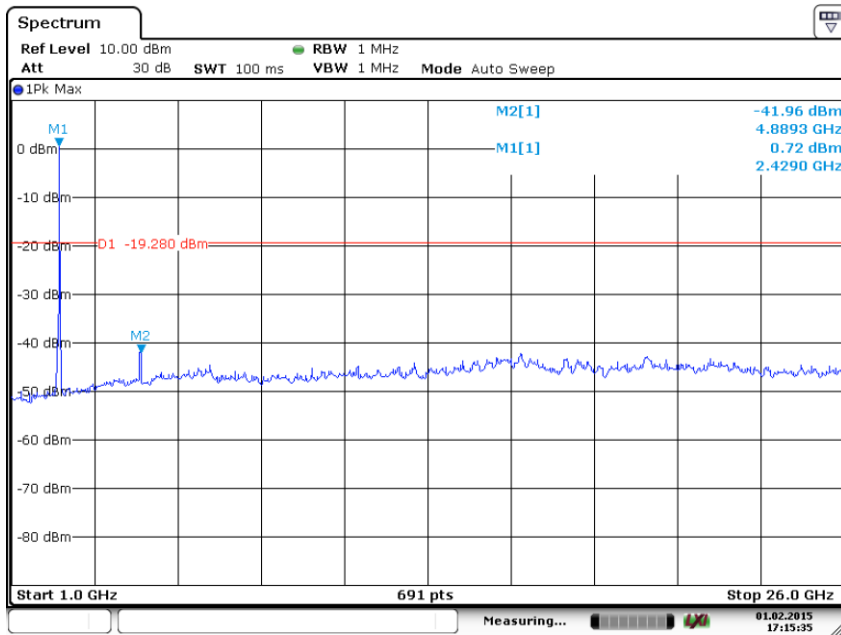


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802.11g-2437MHz

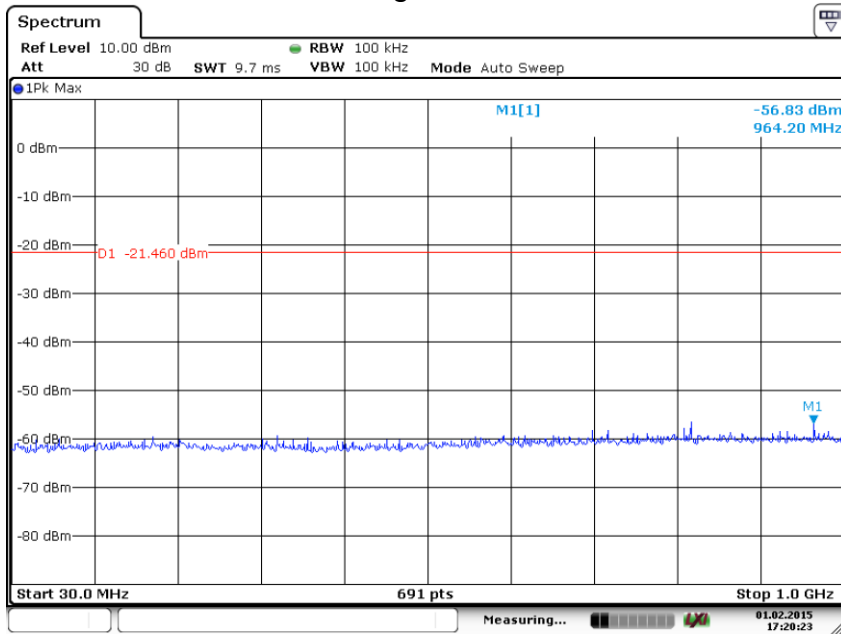


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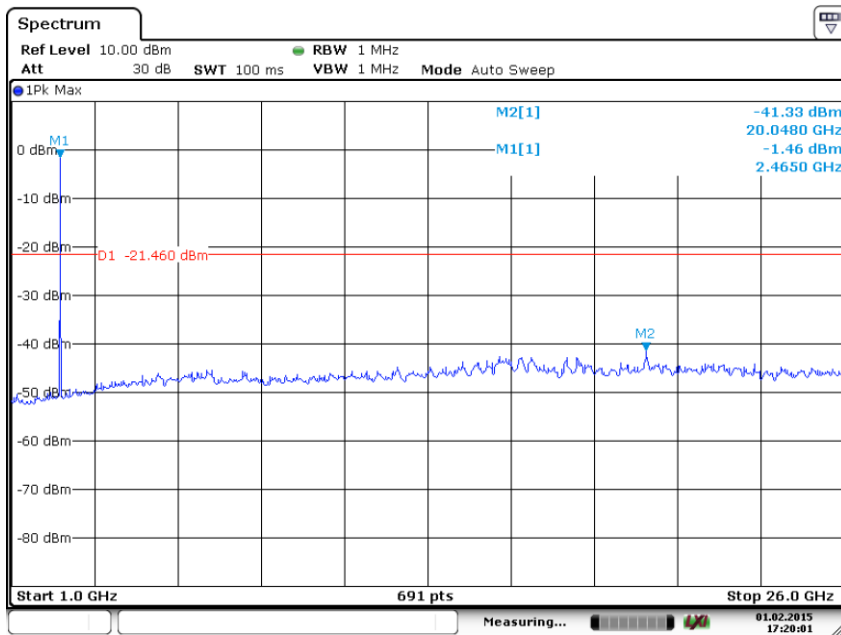


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802.11g-2462MHz

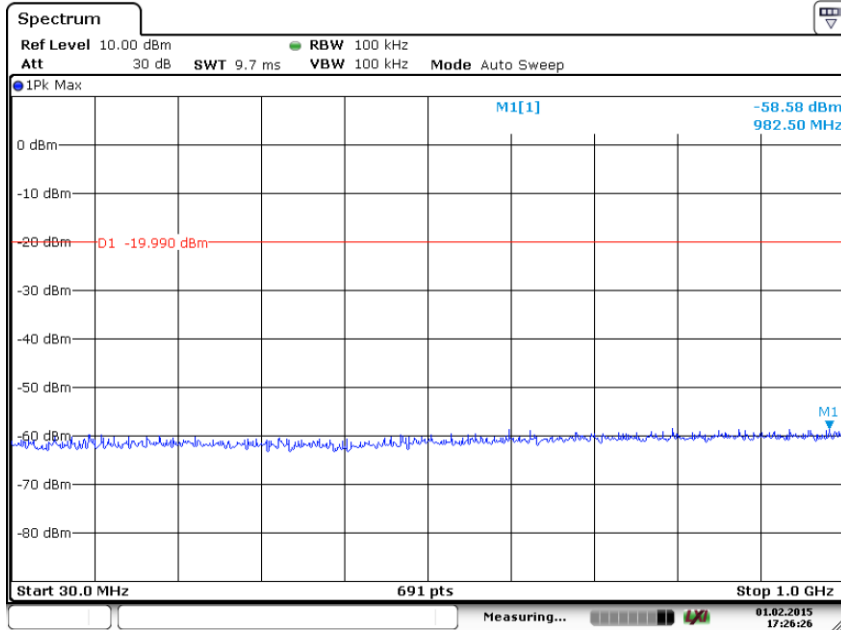


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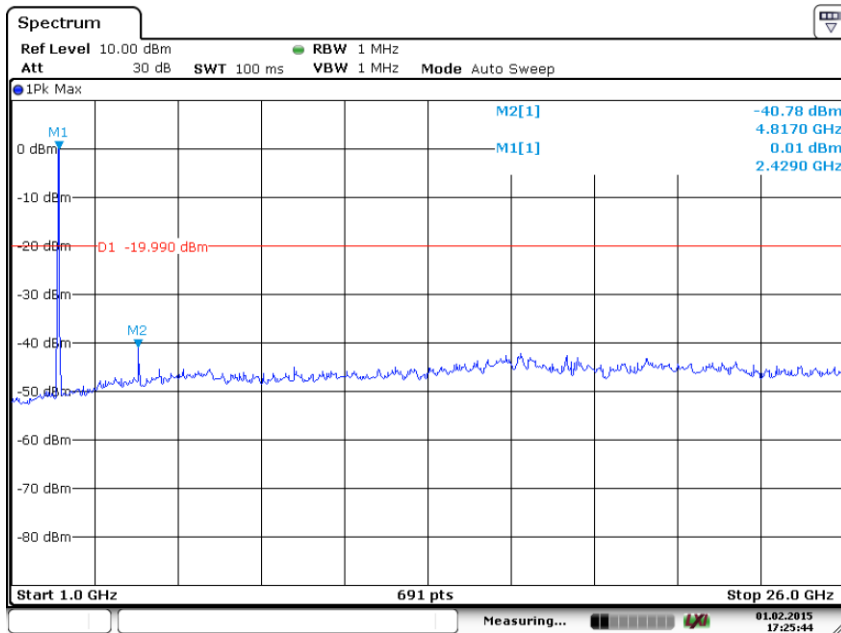


Date: 1.FEB.2015 17:20:01

802.11n-HT20-2412MHz

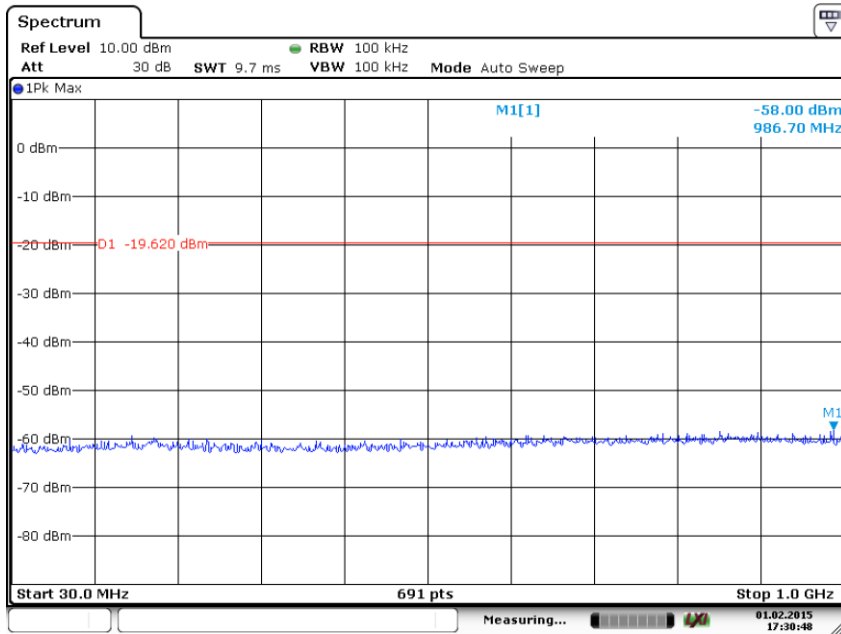


Date: 1.FEB.2015 17:26:27

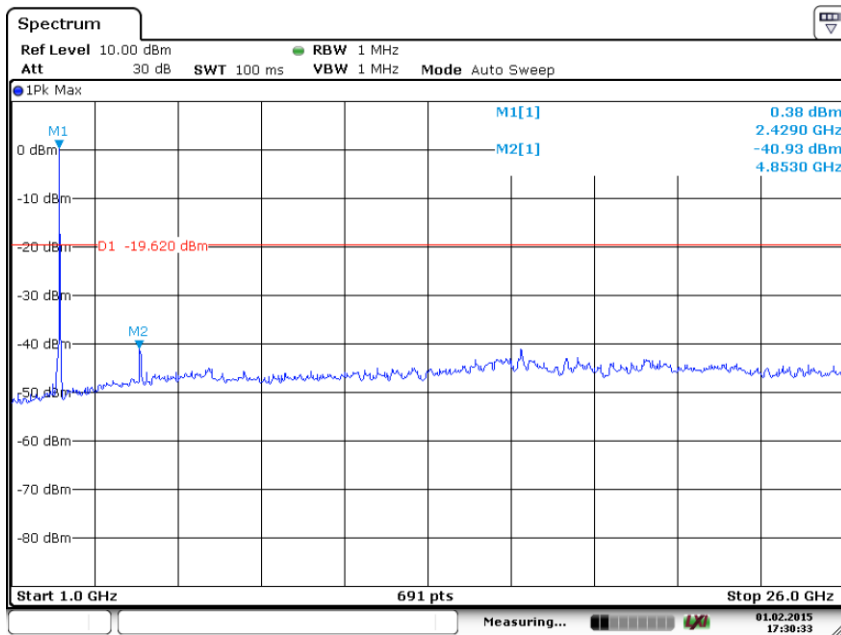


Date: 1.FEB.2015 17:25:43

802.11n-HT20-2437MHz

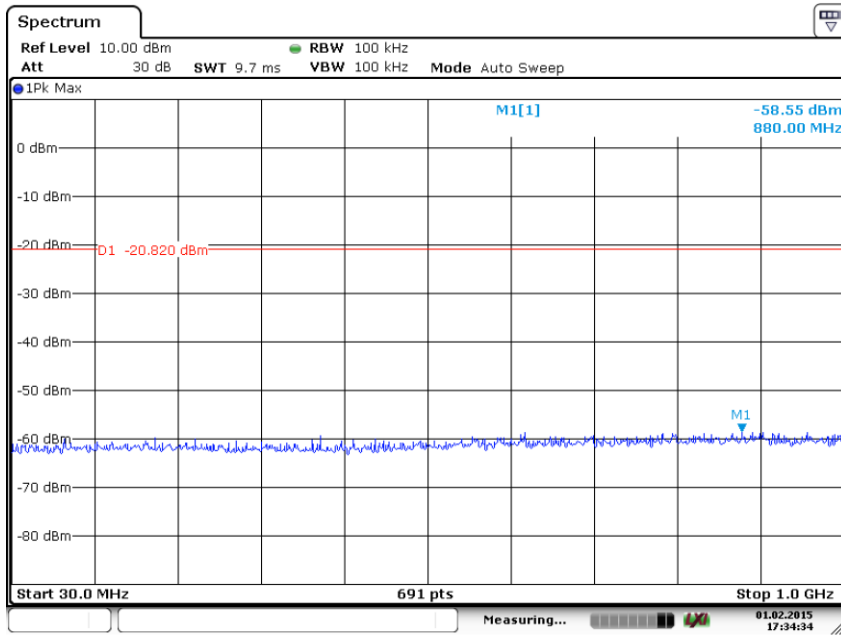


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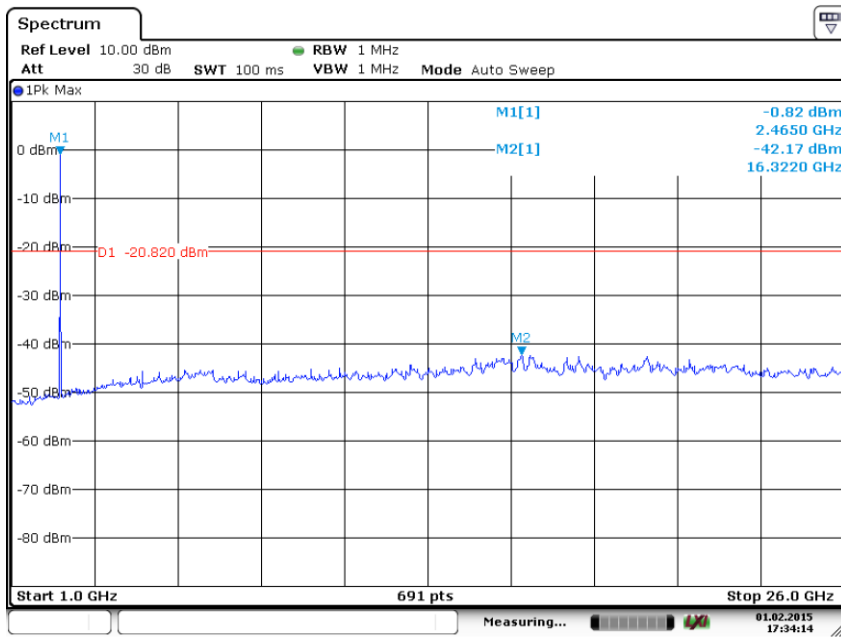


Date: 1.FEB.2015 17:30:33

802.11n-HT20-2462MHz



Date: 1.FEB.2015 17:34:34



Date: 1.FEB.2015 17:34:14

9.6 Band edge testing

Test Method

- 1 Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 kHz, VBW \geq RBW, Sweep = auto, Detector function = peak, Trace = max hold
- 2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
- 3 The level displayed must comply with the limit specified in this Section. .
- 4 Repeat the test at the hopping off and hopping on mode, submit all the plots.

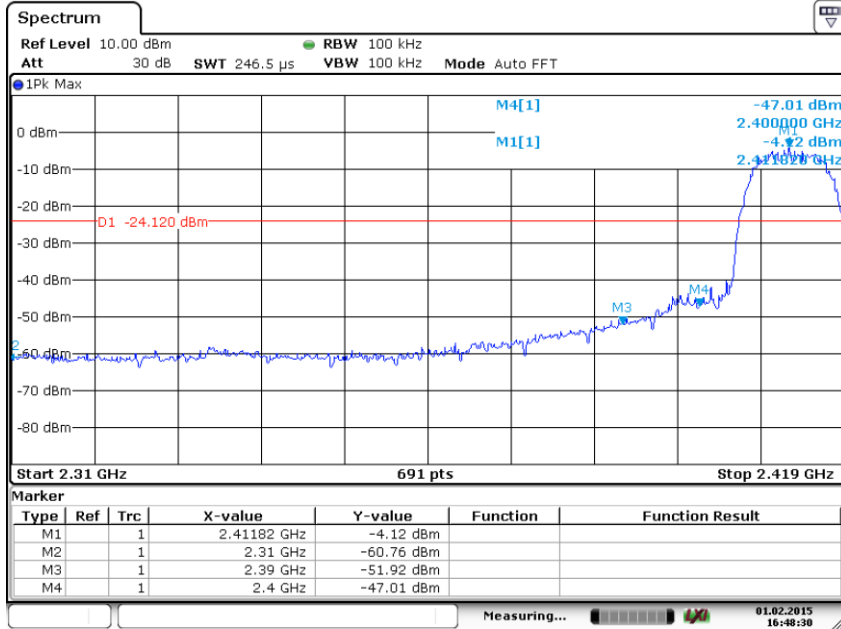
Limit:

According to §15.247(d) and RSS-210 A8.5, 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) and RSS-Gen7.2.2, must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)) and RSS-Gen.

Band edge testing

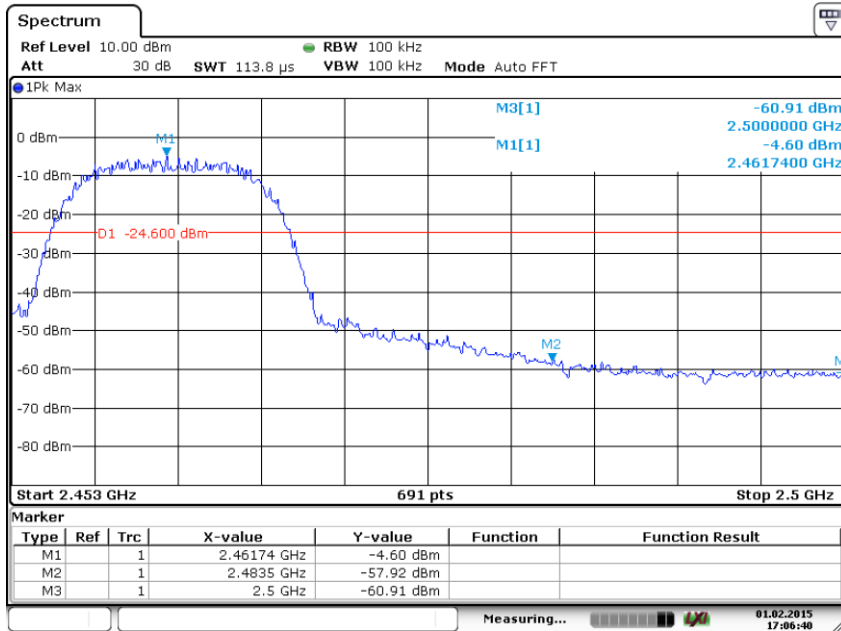
Test Result:

802.11b-2412MHz



Date: 1.FEB.2015 16:48:30

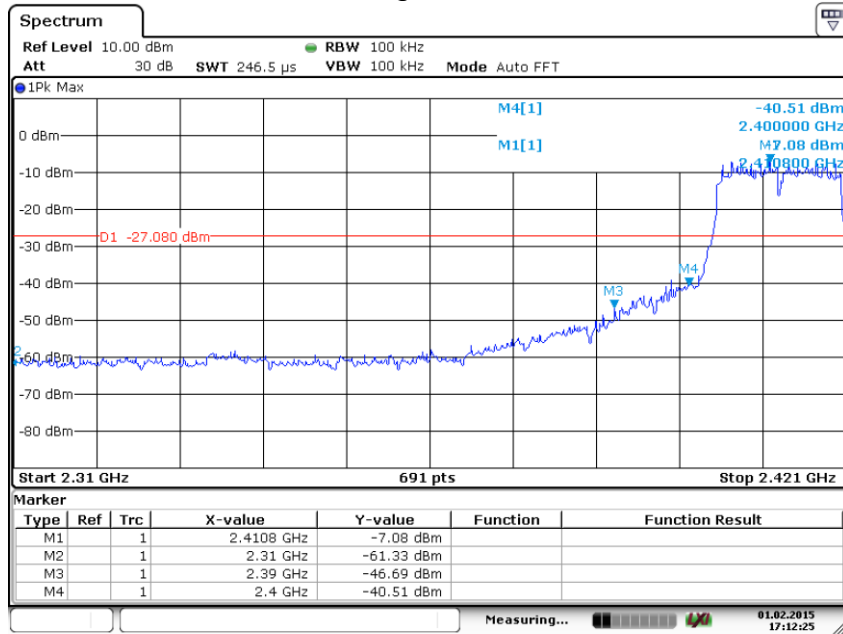
802.11b-2462MHz



Date: 1.FEB.2015 17:06:40

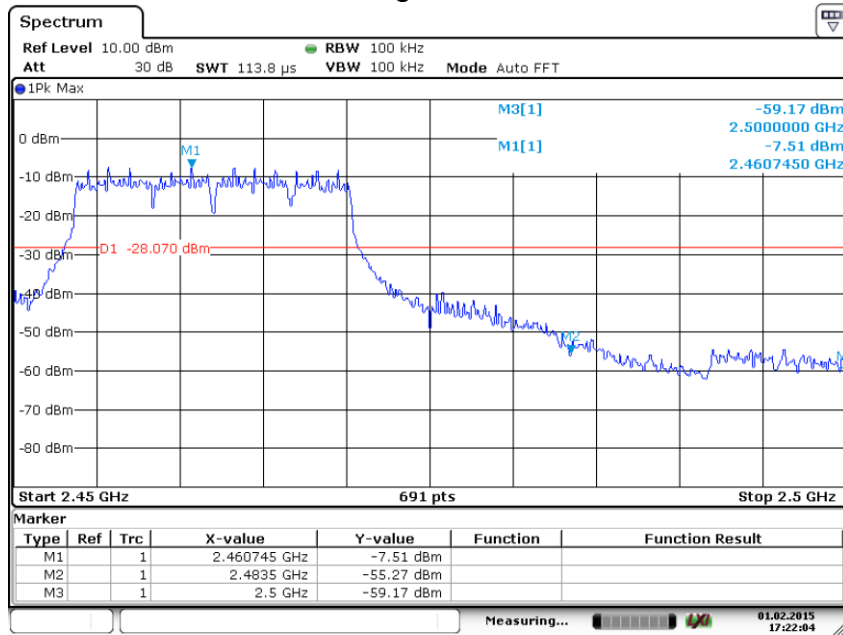
Band edge testing

802.11g-2412MHz



Date: 1.FEB.2015 17:12:25

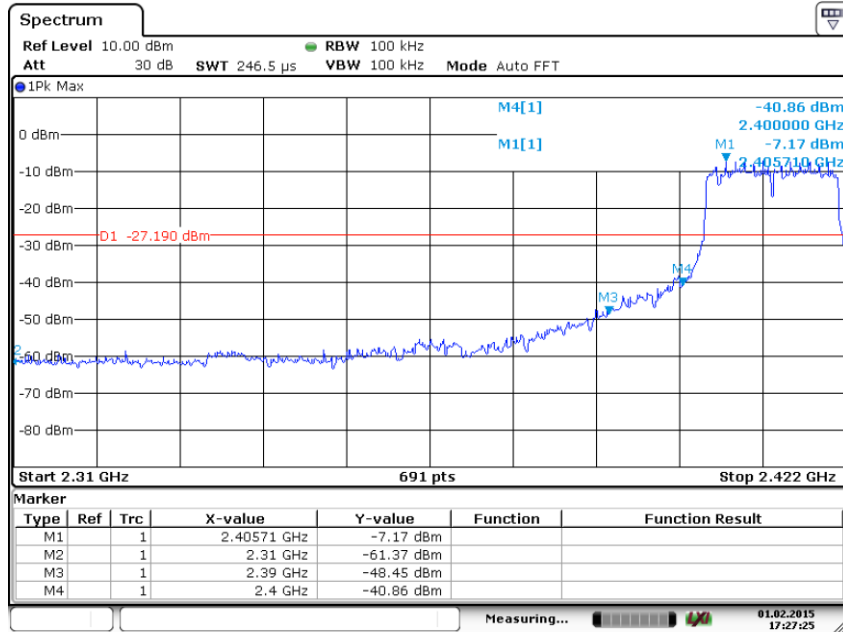
802.11g-2462MHz



Date: 1.FEB.2015 17:22:03

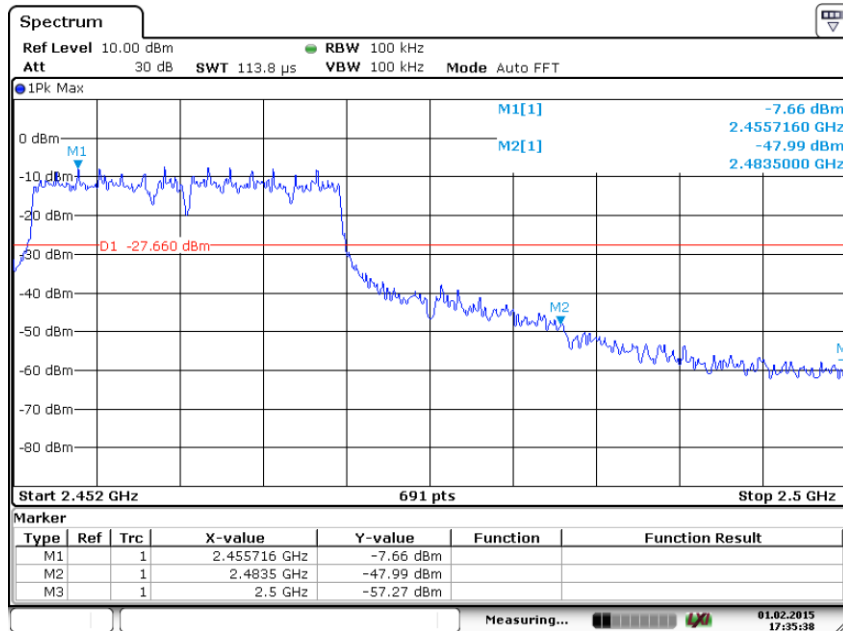
Band edge testing

802.11n-HT20-2412MHz



Date: 1.FEB.2015 17:27:25

802.11n-HT20-2462MHz



Date: 1.FEB.2015 17:35:38

9.7 Spurious radiated emissions for transmitter

Test Method

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
3. Use the following spectrum analyzer settings:
Span = wide enough to fully capture the emission being measured, RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz, VBW \geq RBW, Sweep = auto, Detector function = peak, Trace = max hold
4. Follow the guidelines in ANSI C63.4-1992 with respect to maximizing the emission by rotating the EUT, adjusting the measurement antenna height and polarization, etc.
The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, submit this data. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
5. Set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the duty cycle per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a "duty cycle correction factor", derived from $20\log(\text{duty cycle}/100 \text{ ms})$, in an effort to demonstrate compliance with the 15.209 limit. Submit this data.

Limit

According to part 15.247(d), the radio emission outside the operating frequency band 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. Radiated emissions which fall in the restricted bands, as defined in section 15.205, must comply with the radiated emission limits specified in section 15.209.

| Frequency MHz | Field Strength uV/m | Field Strength dB μ V/m | Detector |
|------------------|------------------------|--------------------------------|----------|
| 30-88 | 100 | 40 | QP |
| 88-216 | 150 | 43.5 | QP |
| 216-960 | 200 | 46 | QP |
| 960-1000 | 500 | 54 | QP |
| Above 1000 | 500 | 54 | AV |
| Above 1000 | 5000 | 74 | PK |

Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

The only worse case (802.11B mode) test result is listed in the report.

Transmitting spurious emission test result as below:

802.11B Modulation 2412MHz Test Result

| Frequency | Emission Level | Polarization | Limit | Margin | Detector | Result |
|-----------|----------------|--------------|--------|--------|----------|--------|
| MHz | dBuV/m | | dBuV/m | dB | | |
| 121.54 | 30.26 | Horizontal | 43.5 | 4.49 | QP | Pass |
| 527.97 | 41.51 | Horizontal | 46.0 | 13.24 | QP | Pass |
| 50.92 | 36.57 | Vertical | 40.0 | 3.43 | QP | Pass |
| 34.06 | 32.25 | Vertical | 40.0 | 7.75 | QP | Pass |
| 36.97 | 33.69 | Vertical | 40.0 | 6.31 | QP | Pass |
| 55.04 | 34.28 | Vertical | 40.0 | 5.72 | QP | Pass |
| *4824 | 46.31 | Horizontal | 74 | 27.69 | PK | Pass |
| 7236 | 42.00 | Horizontal | 74 | 32.00 | PK | Pass |
| *4824 | 43.81 | Vertical | 74 | 30.19 | PK | Pass |
| 7236 | 41.99 | Vertical | 74 | 32.01 | PK | Pass |

802.11B Modulation 2437MHz Test Result

| Frequency | Emission Level | Polarization | Limit | Margin | Detector | Result |
|-----------|----------------|--------------|--------|--------|----------|--------|
| MHz | dBuV/m | | dBuV/m | dB | | |
| *4874 | 44.27 | Horizontal | 74 | 29.73 | PK | Pass |
| *7311 | 41.97 | Horizontal | 74 | 32.03 | PK | Pass |
| *4874 | 44.70 | Vertical | 74 | 29.30 | PK | Pass |
| *7311 | 41.15 | Vertical | 74 | 32.85 | PK | Pass |

802.11B Modulation 2462MHz Test Result

| Frequency | Emission Level | Polarization | Limit | Margin | Detector | Result |
|-----------|----------------|--------------|--------|--------|----------|--------|
| MHz | dBuV/m | | dBuV/m | dB | | |
| *4924 | 42.42 | Horizontal | 74 | 31.58 | PK | Pass |
| *7368 | 42.40 | Horizontal | 74 | 31.60 | PK | Pass |
| *4924 | 41.39 | Vertical | 74 | 32.61 | PK | Pass |
| *7368 | 41.23 | Vertical | 74 | 32.77 | PK | Pass |

Remark:

- QP Emission Level= Antenna Factor +Cable Loss + Reading
 PK Emission Level= Antenna Factor +Cable Loss - Amp. factor + Reading
 AV Emission Level= PK Emission Level+20log(dutycycle)
- 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.

- (3) “*” means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.

10 Test Equipment List

List of Test Instruments

| | DESCRIPTION | MANUFACTURER | MODEL NO. | SERIAL NO. | CAL. DUE DATE |
|----|-------------------------------------|-----------------|-----------|------------|---------------|
| C | Signal Analyzer | Rohde & Schwarz | FSV40 | 101031 | 2015-8-17 |
| RE | EMI Test Receiver | Rohde & Schwarz | ESR 26 | 101269 | 2015-8-17 |
| | Trilog Super Broadband Test Antenna | Schwarzbeck | VULB 9163 | 707 | 2017-8-17 |
| | Horn Antenna | Rohde & Schwarz | HF907 | 102294 | 2017-8-17 |
| | Pre-amplifier | Rohde & Schwarz | SCU 18 | 102230 | 2015-8-17 |
| | 3m Semi-anechoic chamber | TDK | 9X6X6 | ---- | 2019-5-29 |

C - Conducted RF tests

- Conducted peak output power
- 6dB bandwidth
- Power spectral density
- Spurious RF conducted emissions
- Band edge

11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty

| Items | Extended Uncertainty |
|----------------------------|--|
| Radiated spurious emission | Horizontal: $U=\pm 4.83\text{dB}$ (30MHz~1GHz) Vertical: $U=\pm 4.91\text{dB}$ (30MHz~1GHz) Horizontal: $U=\pm 4.89\text{dB}$ (1GHz~18GHz) Vertical: $U=\pm 4.88\text{dB}$ (1GHz~18GHz) |