FCC/IC - TEST REPORT

Report Number	:	**68.960.15.026.01**	Date of Issue:	March 27, 2015

Model	:	**iT20**
Product Type	:	Telemetry Transmitter
Applicant	:	EDAN INSTRUMENTS,INC.
Address	:	3/F-B, Nanshan Medical Equipment Park, Nanhai Rd 1019#, Shekou, Nanshan Shenzhen, 518067 P.R. CHINA
Production Facility	:	EDAN INSTRUMENTS,INC.
Address	:	3/F-B, Nanshan Medical Equipment Park, Nanhai Rd 1019#, Shekou, Nanshan Shenzhen, 518067 P.R. CHINA

Test Result	:	■ **Positive** ☐ **Negative**
Total pages including Appendices	:	39

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1 Table of Contents

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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
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Shenzhen City, 518052,
P. R. China

FCC Registration Number: 502708

Telephone: 86 755 8828 6998
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3 Description of the Equipment Under Test

Product:	Telemetry Transmitter
Model no.:	iT20
FCC ID:	SMQIT20EDAN
Brand Name:	EDAN
Options and accessories:	NIL
Rating:	DC 3.0V By 2*AA Batteries
RF Transmission Frequency:	2412-2462MHz
No. of Operated Channel:	11
Modulation:	DSSS, OFDM
Antenna Type:	Internal
Antenna Gain:	3.0dBi
Description of the EUT:	The Equipment Under Test (EUT) is a Telemetry Transmitter operated at 2.4GHz

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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
RSS-Gen Issue 4 November 2014	General Requirements and Information for the Certification of Radio Apparatus
RSS-210 Issue 8 December 2010	RSS-210 — Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

All the test methods were according to Public Notice DA 00-705 -Frequency Hopper Spread Spectrum Test Procedure released by FCC on March 30, 2000 and C63.10 (2009).

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5 Summary of Test Results

Technical Requirements					
FCC Part 15 Subpart C, RSS-Gen, RSS-210					
Test Condition			Pages	Test Site	Test Result
§15.207	RSS-GEN A8.8	Conducted emission AC power port	---	---	N/A
§15.247(b)(1)	RSS-210 A8.4	Conducted peak output power	13	Site 2	Pass
§15.247(a)(2)	RSS-210 A8.2(a)	20dB bandwidth	---	---	N/A
§15.247(a)(1)	RSS-210 A8.1(a) & RSSGEN 6.6	6dB bandwidth and 99% Occupied Bandwidth	15	Site 2	Pass
§15.247(a)(1)	RSS-210 A8.1(b)	Carrier frequency separation	---	---	N/A
§15.247(a)(1)(iii)	RSS-210 A8.1(d)	Number of hopping frequencies	---	---	N/A
§15.247(a)(1)(iii)	RSS-210 A8.1(c)	Dwell Time	---	---	N/A
§15.247(e)	RSS-210 A8.2(b)	Power spectral density	22	Site 2	Pass
§15.247(d)	RSS-210 A8.5	Spurious RF conducted emissions	23	Site 2	Pass
§15.247(d)	RSS-210 A8.5	Band edge	30	Site 2	Pass
§15.247(d) & §15.209 &	RSS-210 2.5 & RSSGEN 6.13	Spurious radiated emissions for transmitter and receiver	35	Site 2	Pass
§15.203	RSSGEN 8.3	Antenna requirement	See note 2		Pass

Note 1: N/A=Not Applicable.
Note 2: The EUT uses a permanently ceramic antenna, which gain is 3.0dBi. In accordance to §15.203, It is considered sufficiently to comply with the provisions of this section.

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6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: SMQIT20EDAN, complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C Rules and RSS-210.

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: March 2, 2015

Testing Start Date: March 2, 2015

Testing End Date: March 20, 2015

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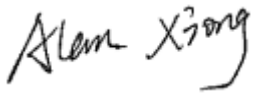
Reviewed by:

John Zhi
EMC Project Manager

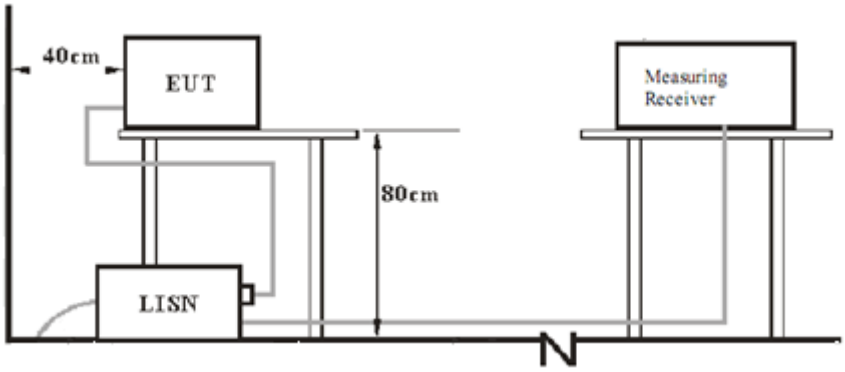
Prepared by:



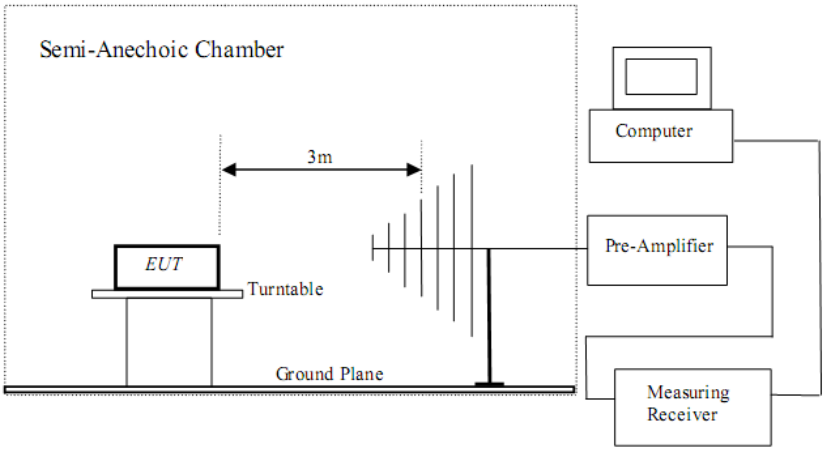
Alan Xiong
EMC Project Engineer

7 Test Setups

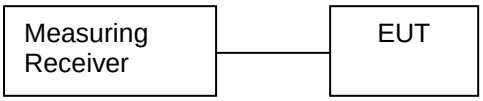
7.1 AC Power Line Conducted Emission test setups



7.2 Radiated test setups



7.3 Conducted RF test setups



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8 Systems test configuration

Auxiliary Equipment Used during Test:

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

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9 Technical Requirement

9.1 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

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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

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9.2 6dB bandwidth

Test Method

1. Use the following spectrum analyzer settings:
   RBW=100K, VBW≥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 ≥ 6 dB.
3. Allow the trace to stabilize, record the X dB Bandwidth value.

Limit

Limit [kHz]
≥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

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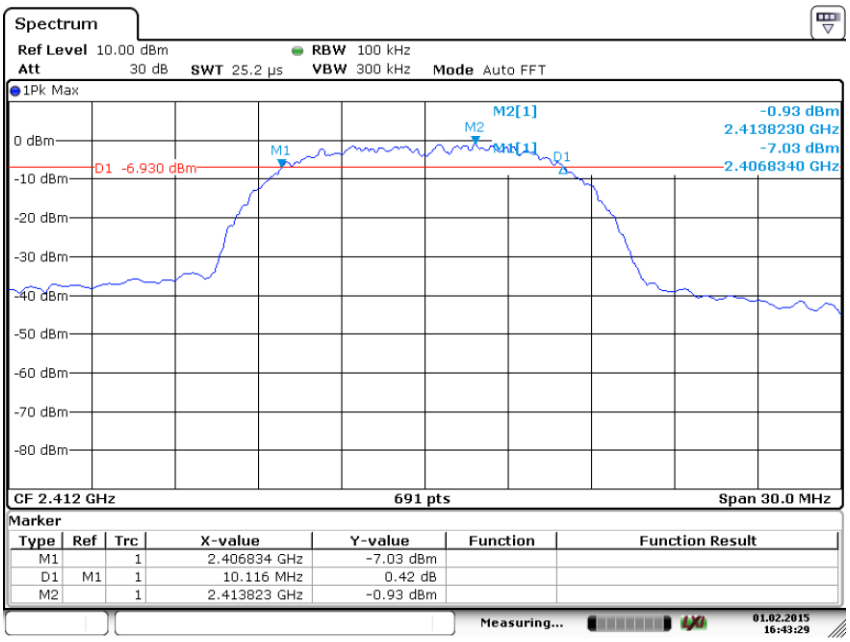
802.11b-2412MHz



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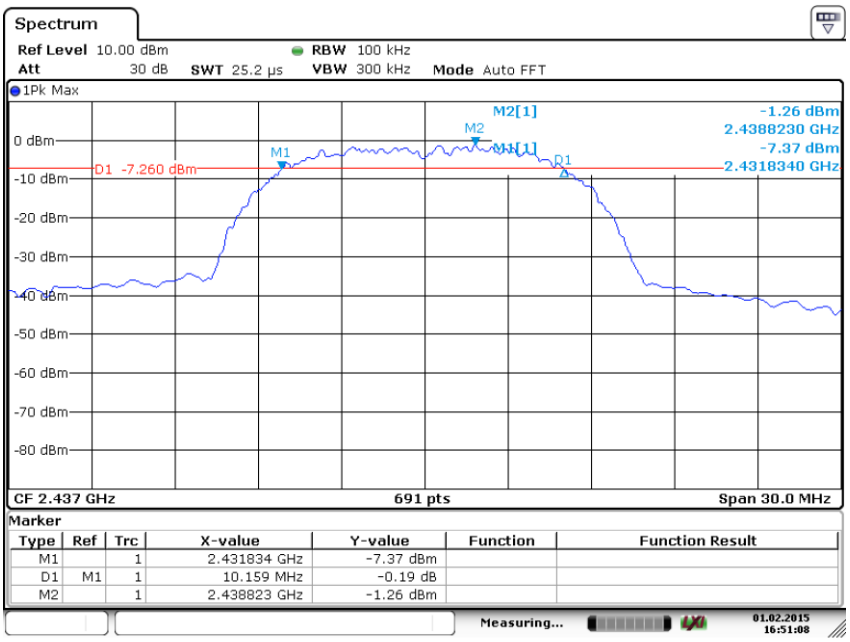
802.11b-2437MHz



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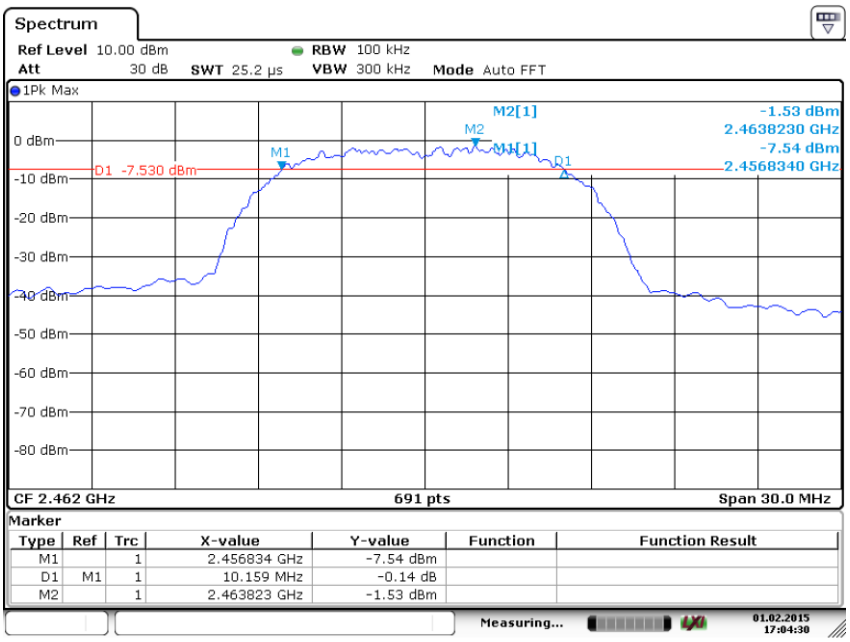
802.11b-2462MHz



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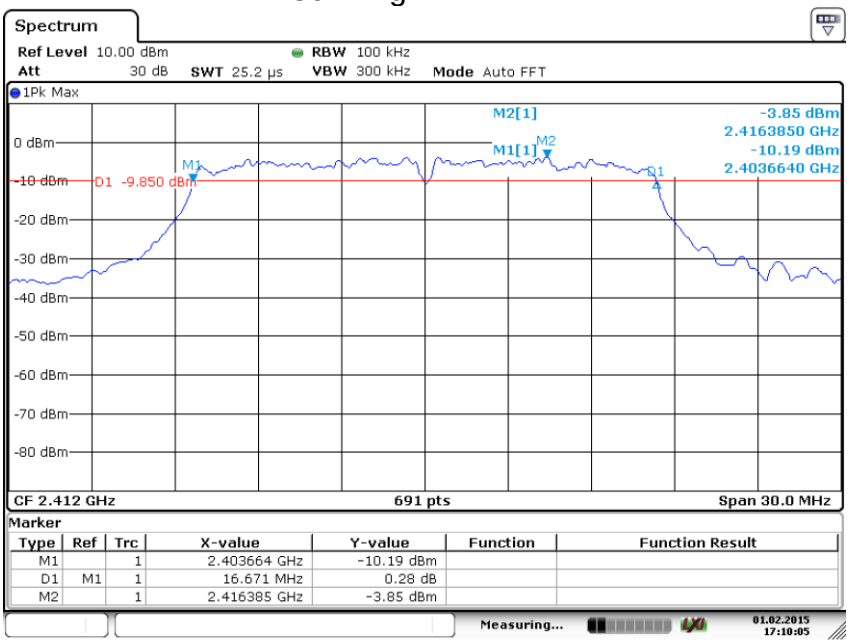
802.11g-2412MHz



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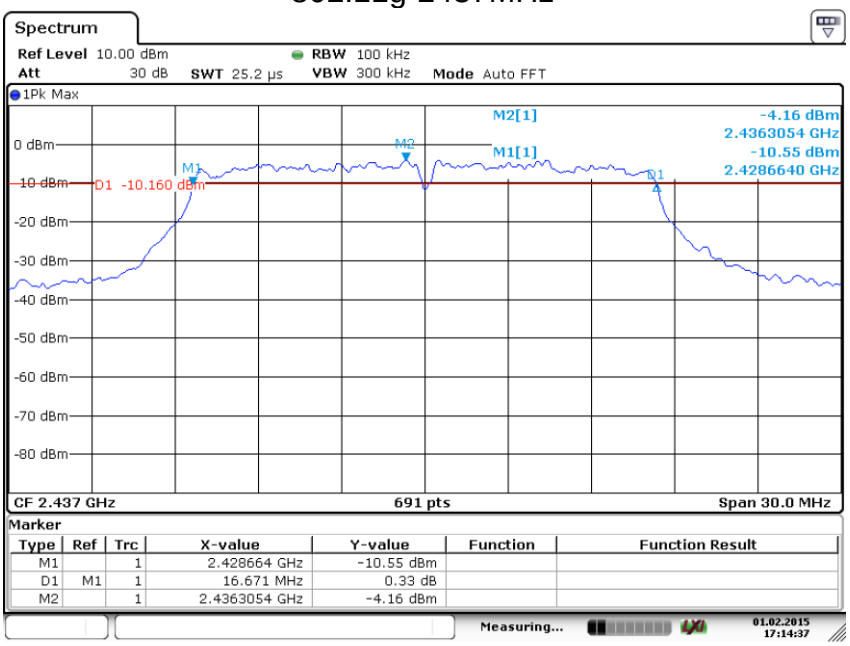
802.11g-2437MHz



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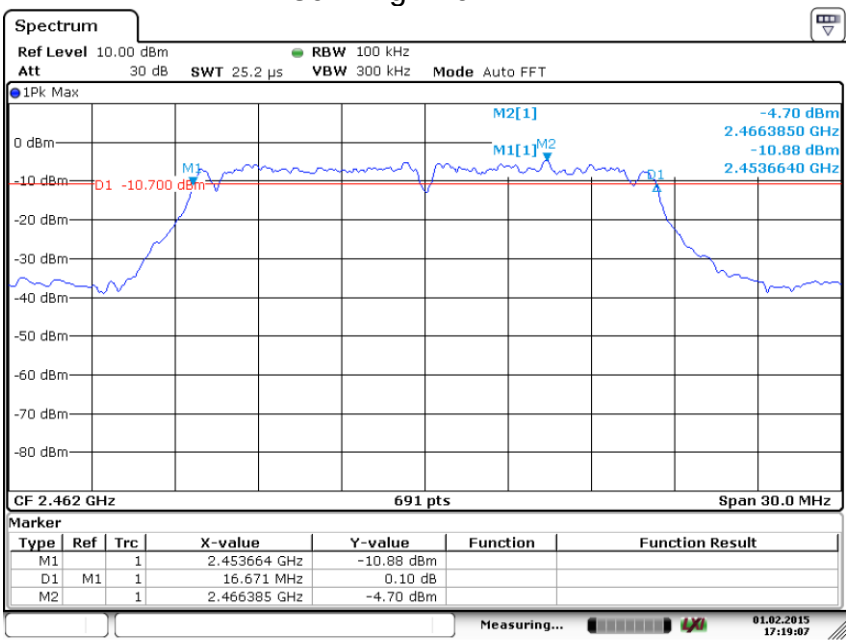
802.11g-2462MHz



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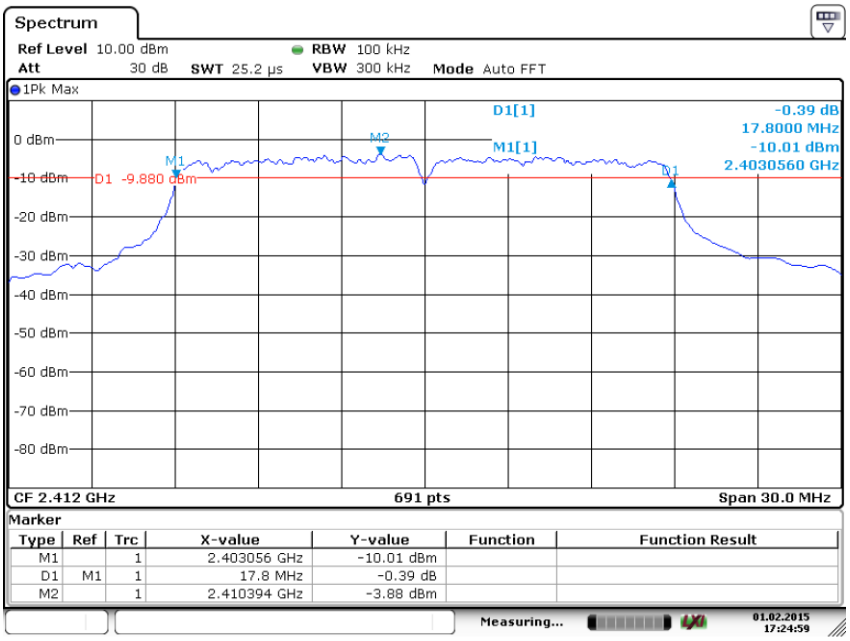
802.11n-HT20-2412MHz



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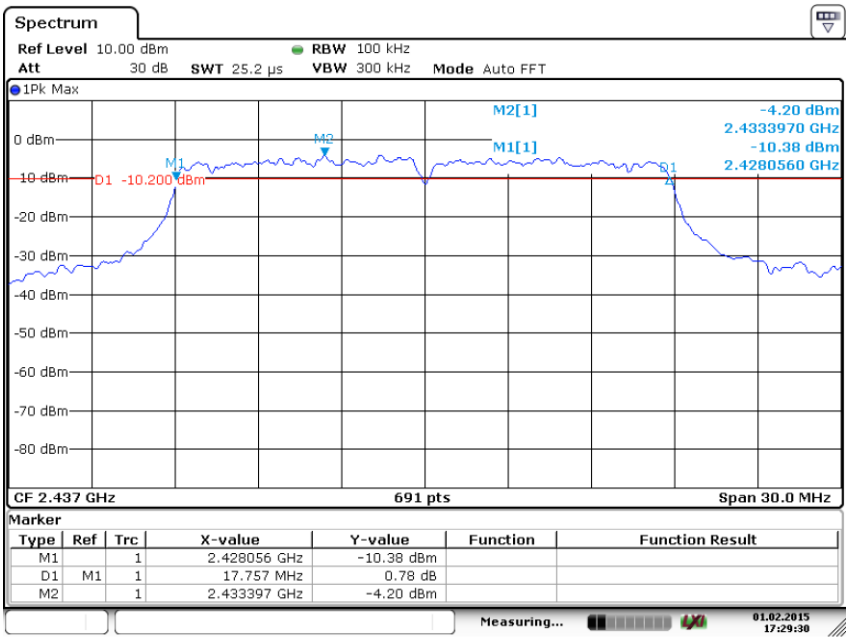
802.11n-HT20-2437MHz



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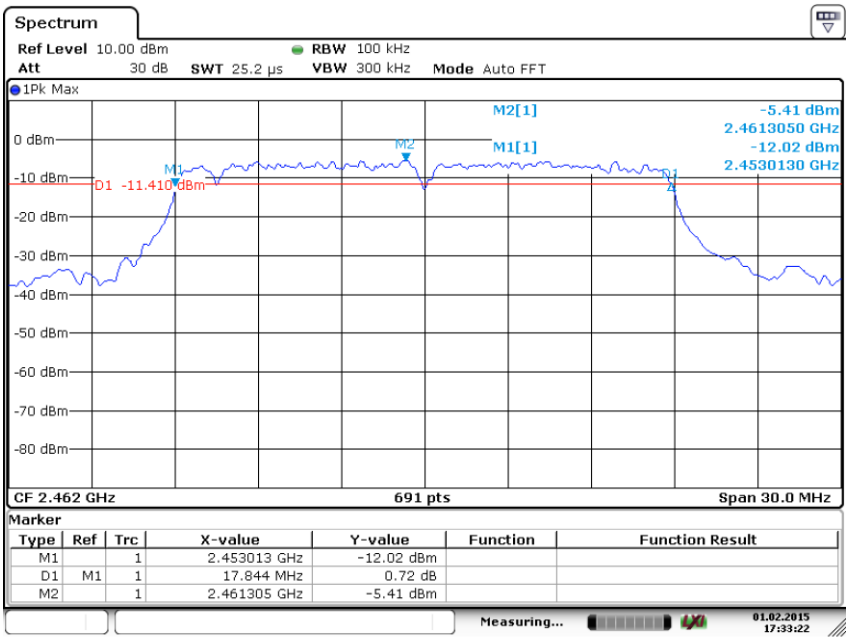
802.11n-HT20-2462MHz



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9.3 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

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9.4 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≥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

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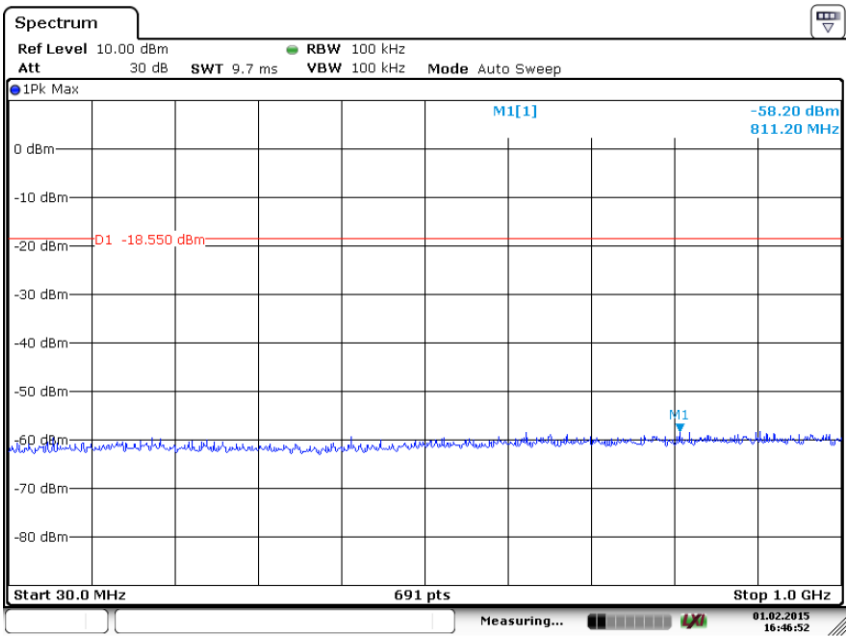
Spurious RF conducted emissions

All modulation test result is listed in the report.

802.11b-2412MHz



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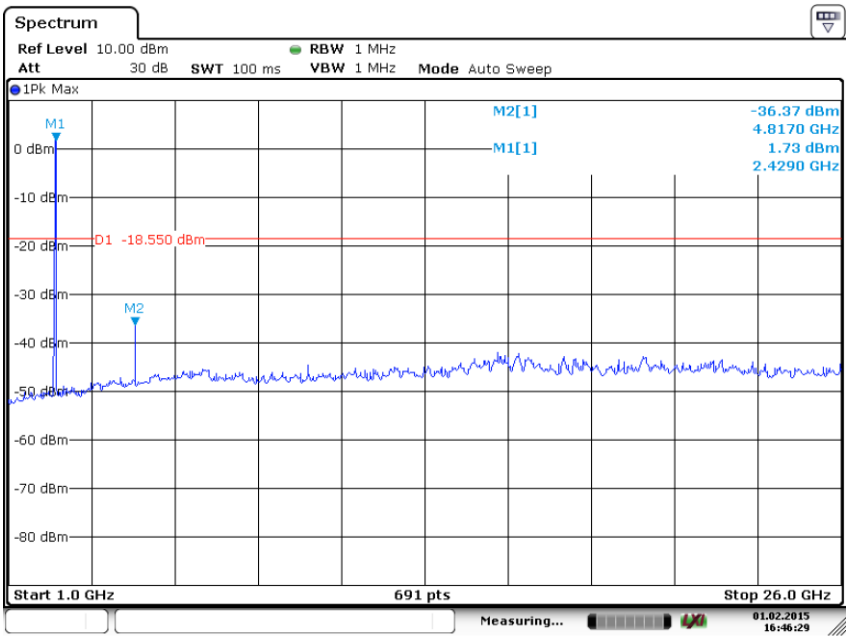

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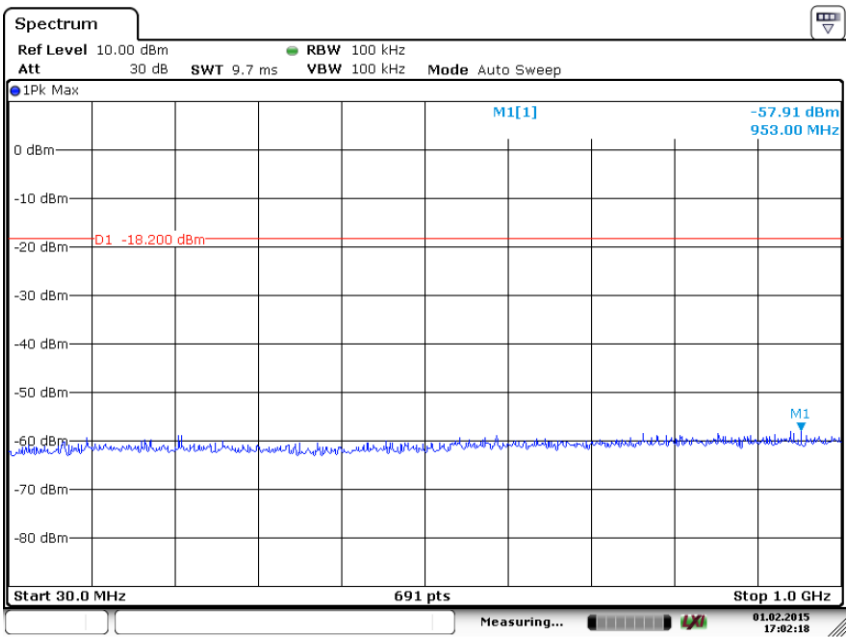
802.11b-2437MHz



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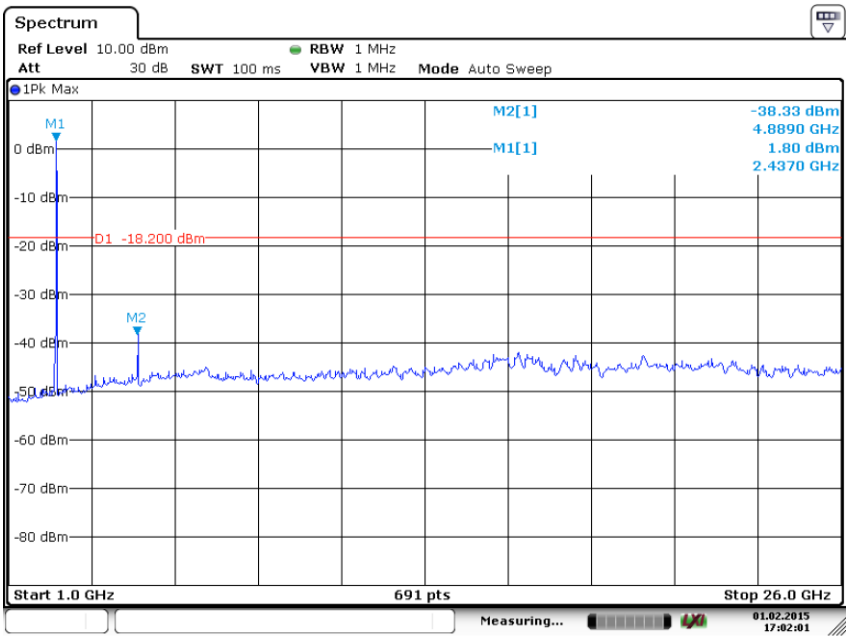

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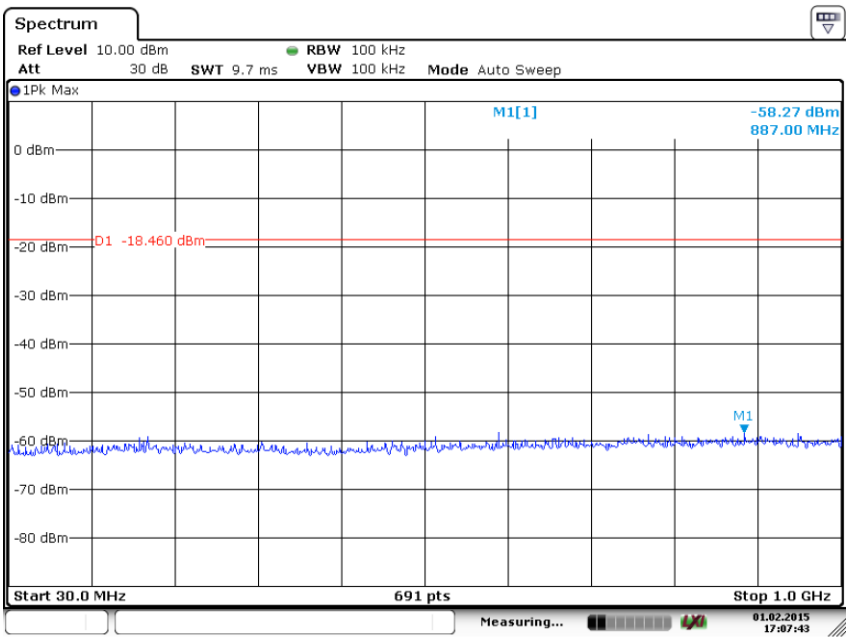
802.11b-2462MHz



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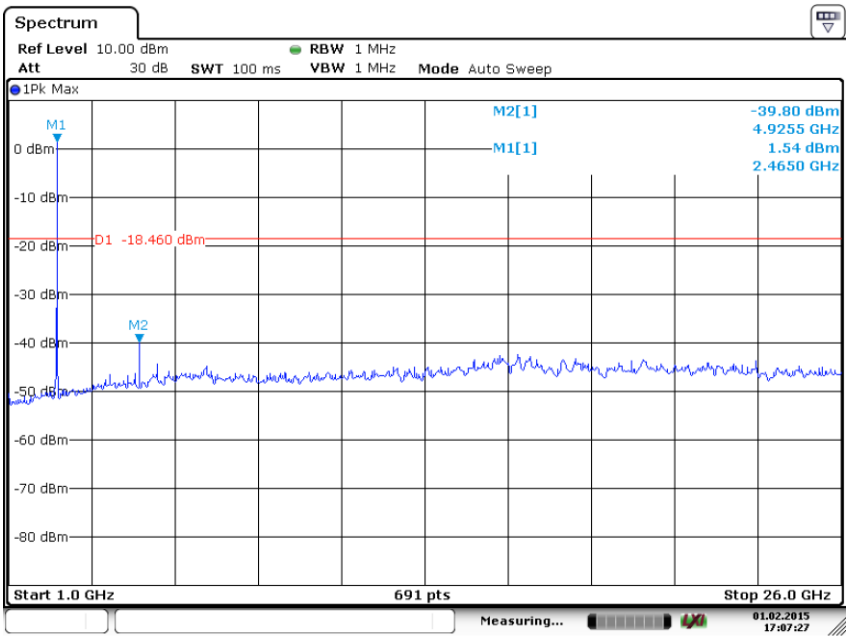

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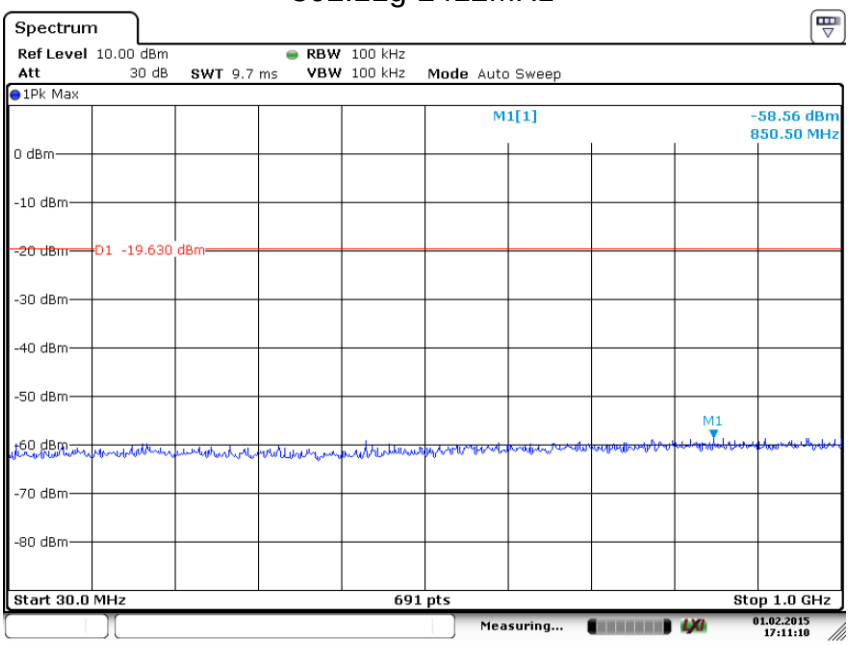
802.11g-2412MHz



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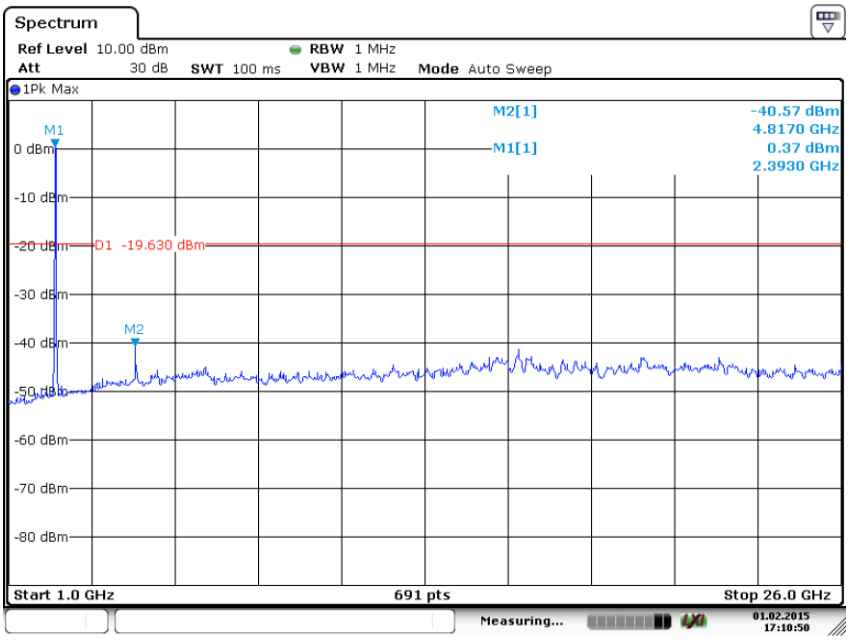

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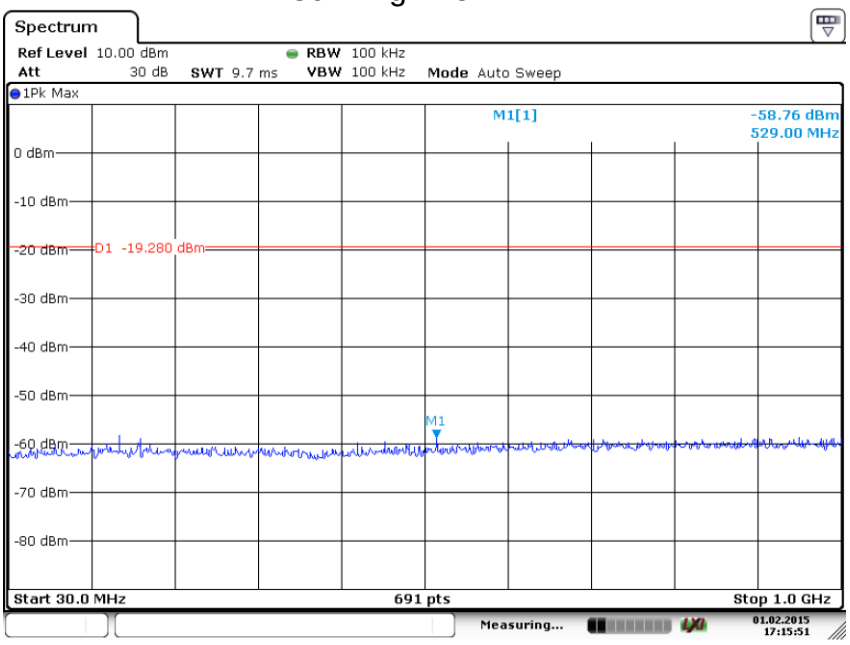
802.11g-2437MHz



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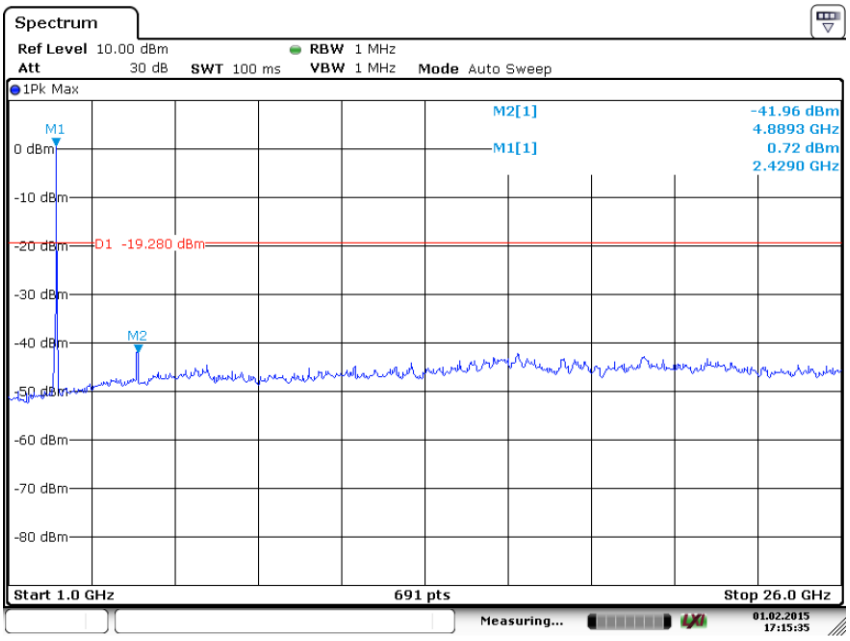

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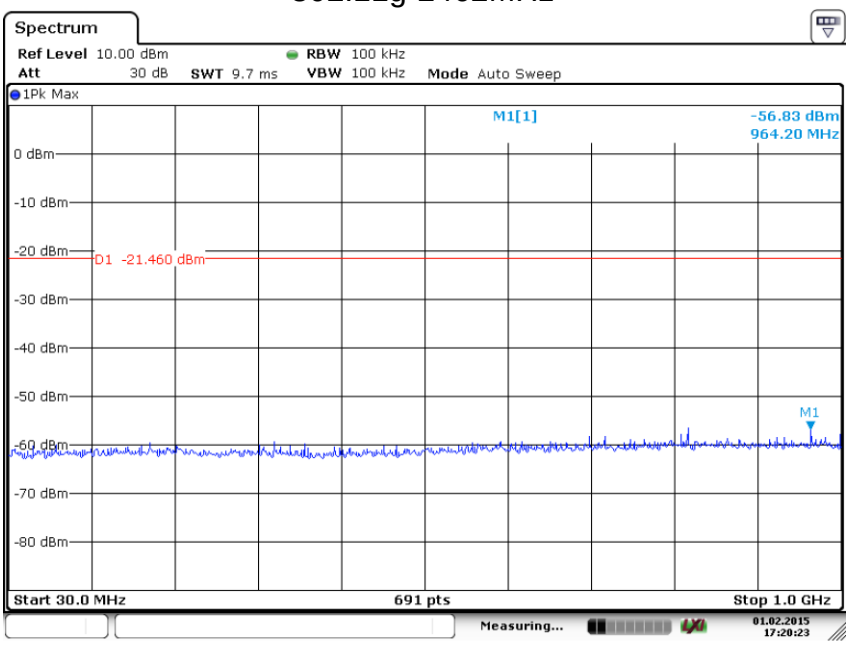
802.11g-2462MHz



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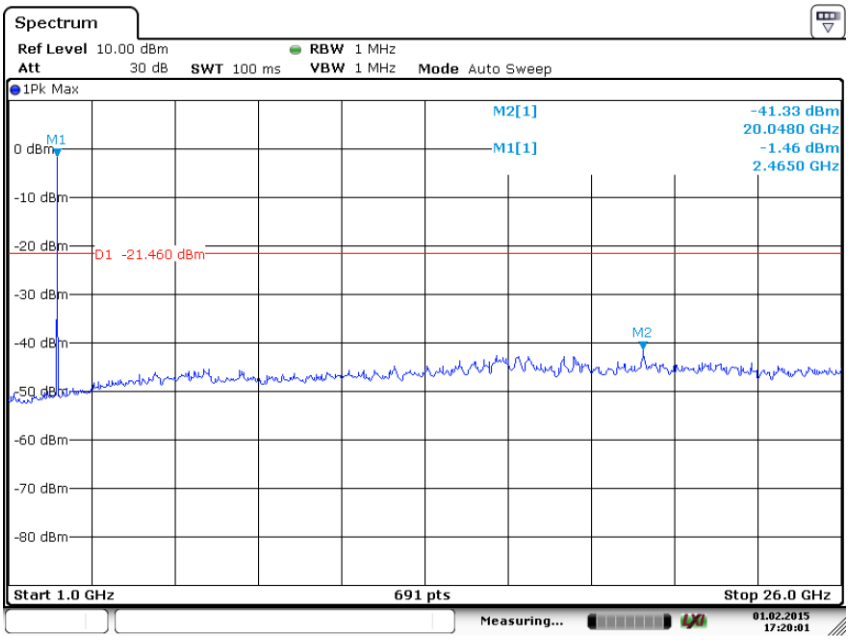

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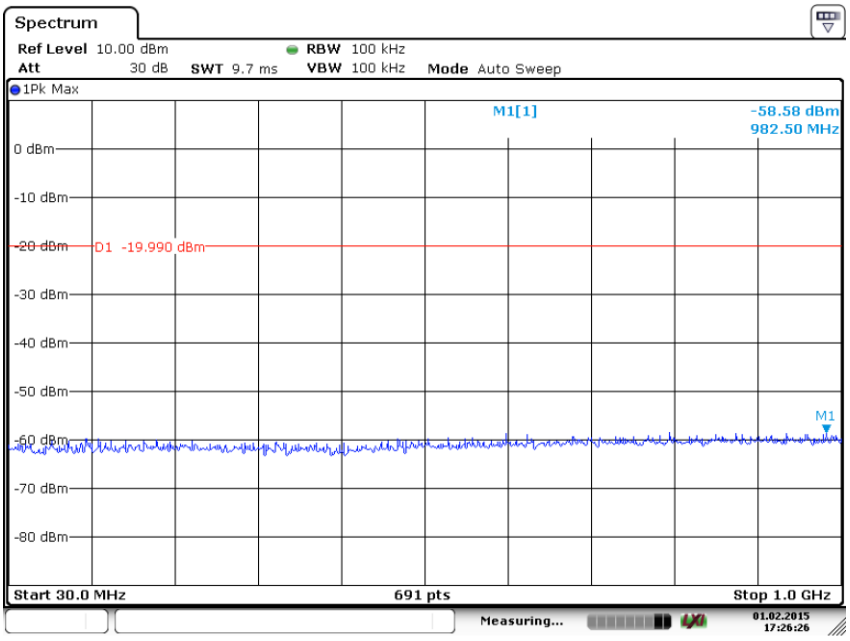
802.11n-HT20-2412MHz



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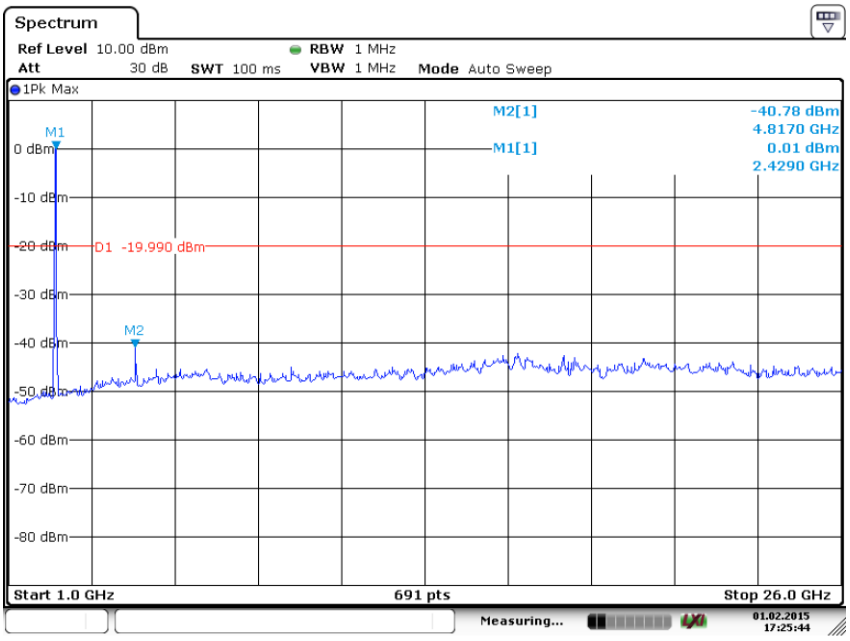

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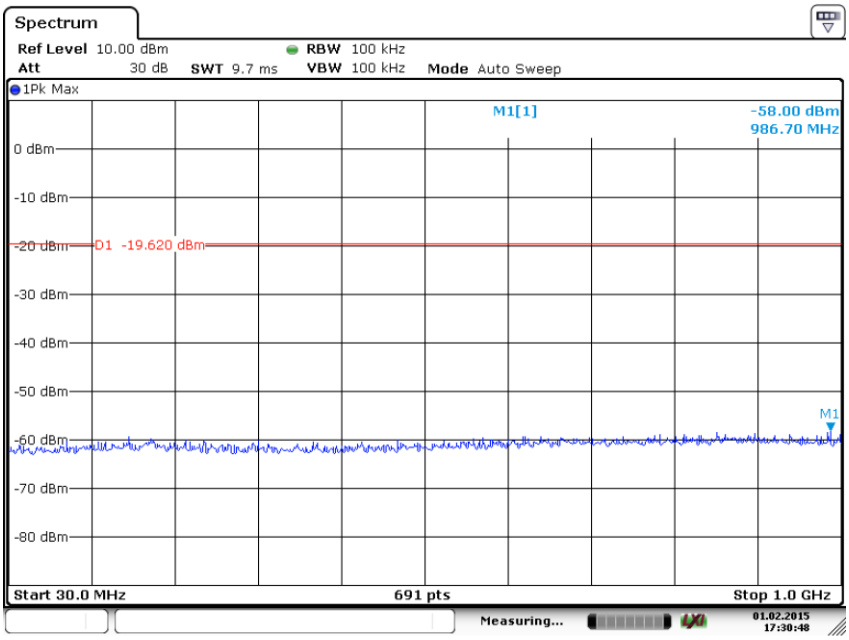
802.11n-HT20-2437MHz



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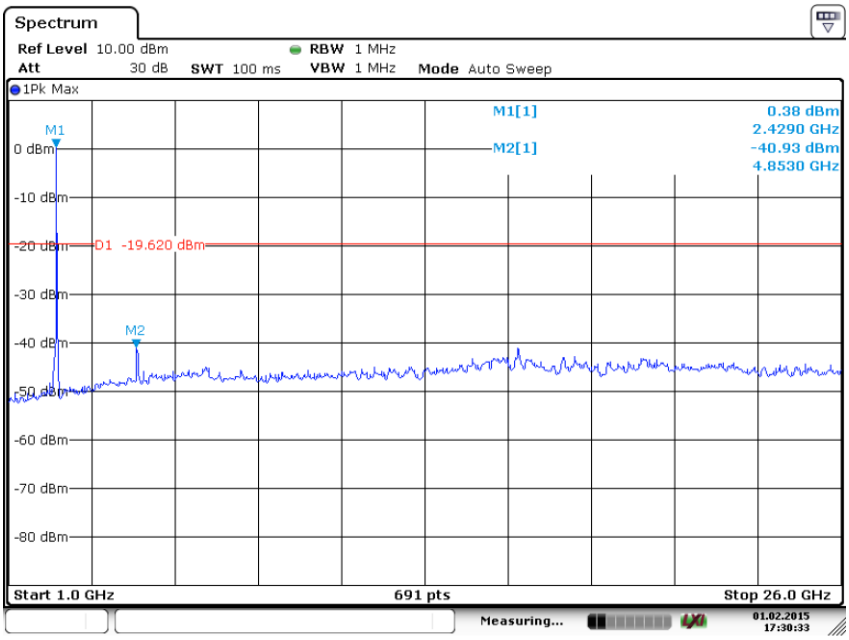

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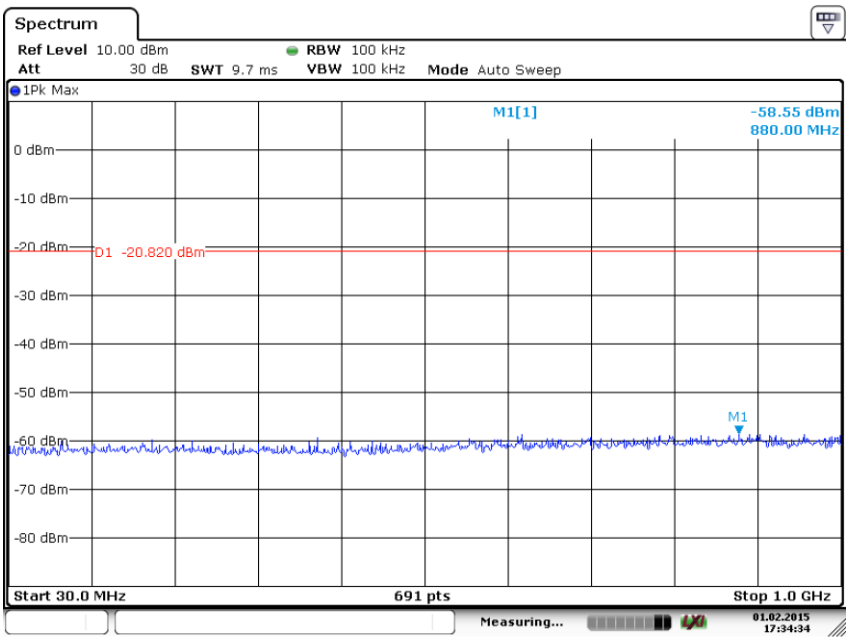
802.11n-HT20-2462MHz



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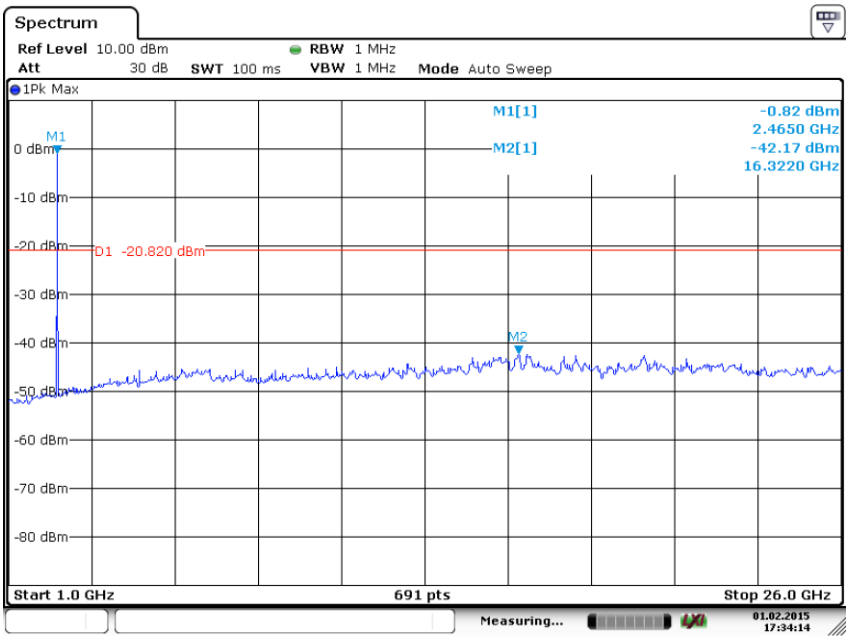

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9.5 Band edge testing

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≥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 in 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.

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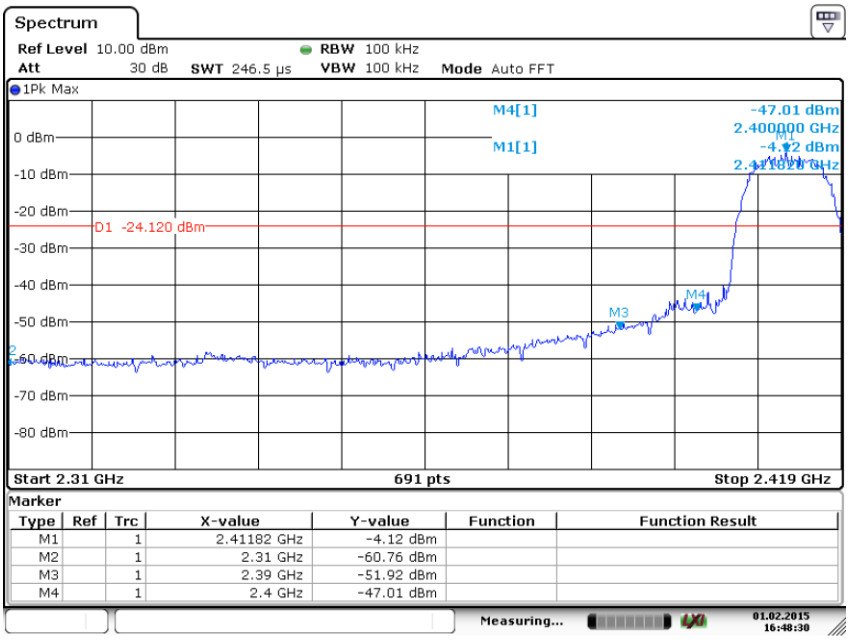
Band edge testing

Test Result:

802.11b-2412MHz



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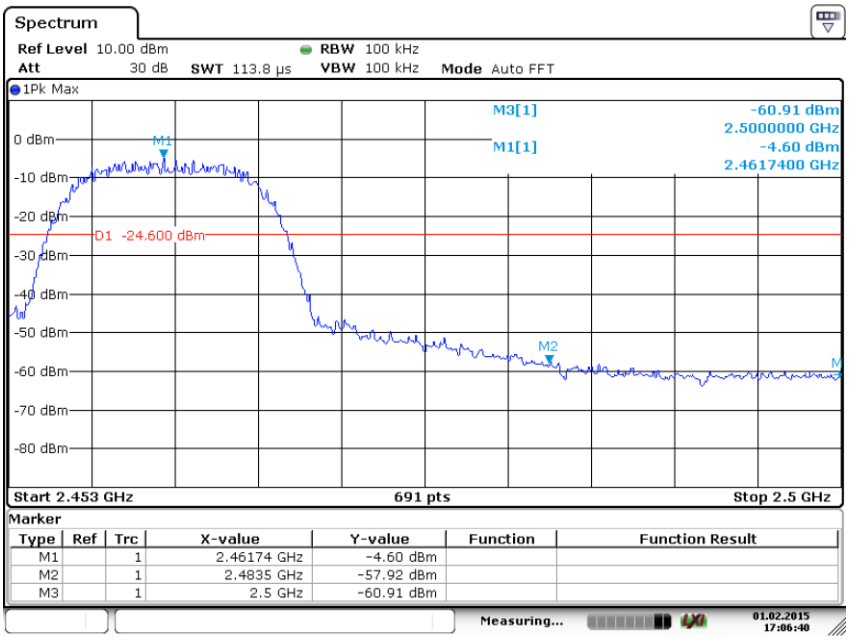
802.11b-2462MHz



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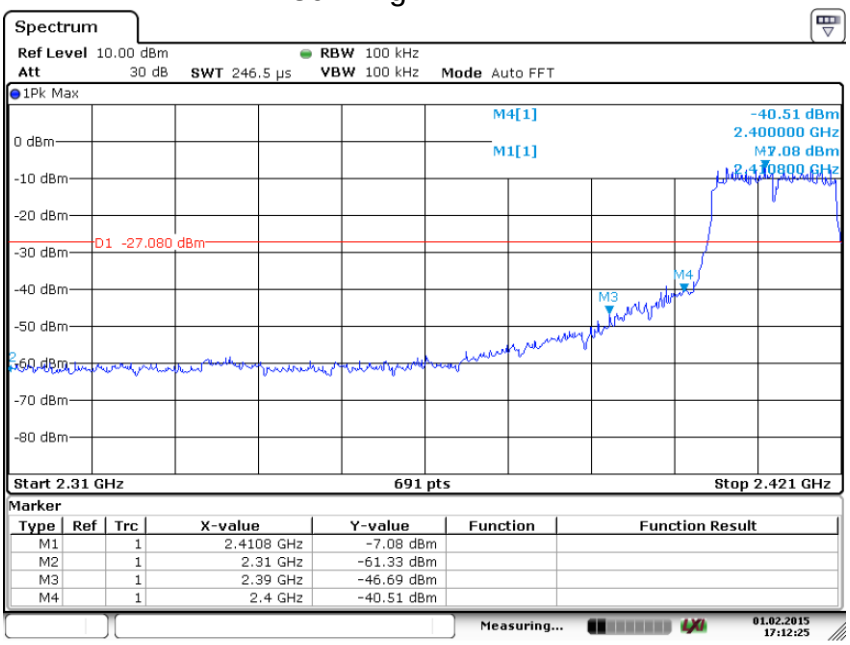
Band edge testing

802.11g-2412MHz



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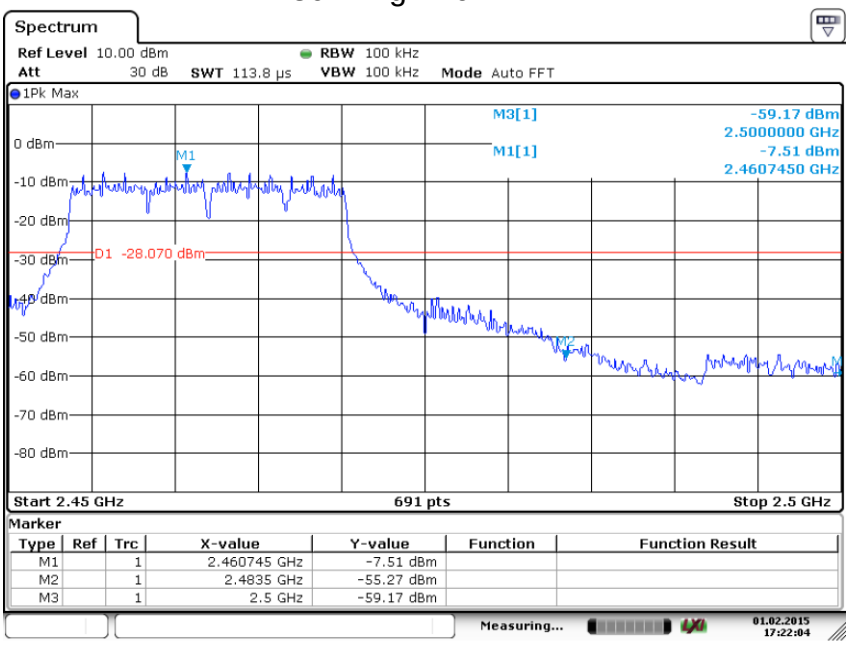
802.11g-2462MHz



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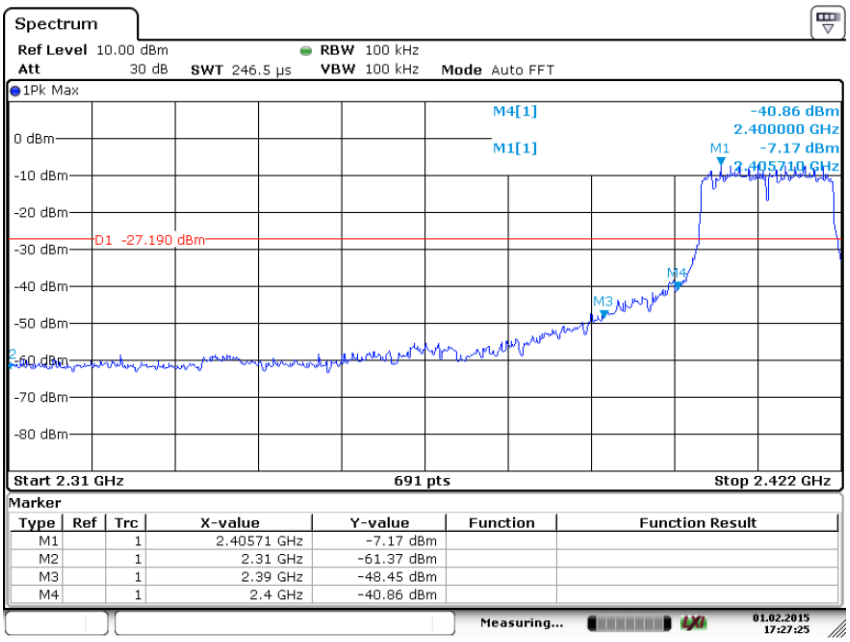
Band edge testing

802.11n-HT20-2412MHz



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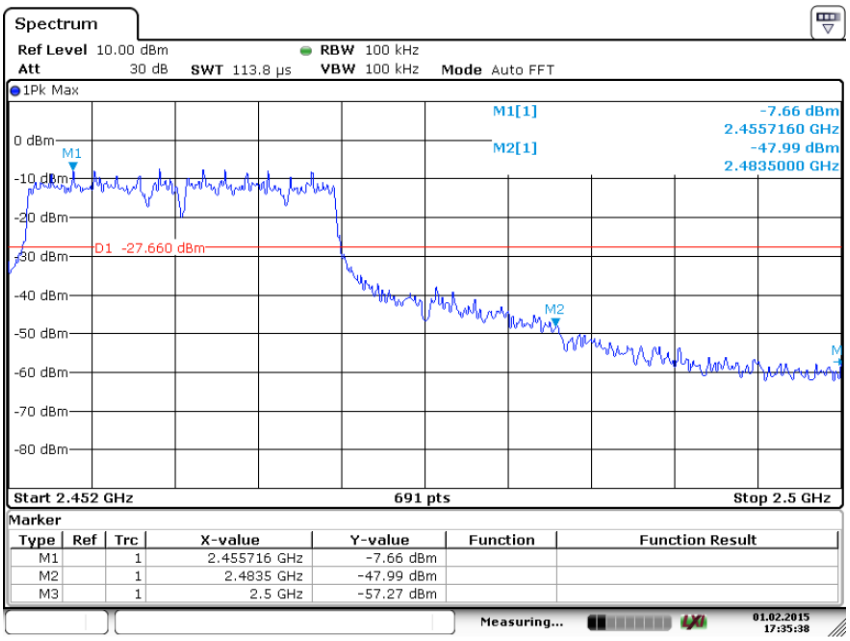
802.11b-2462MHz



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9.6 Spurious radiated emissions for transmitter and receiver

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 ≥ 1GHz, 100 kHz for f < 1 GHz, VBW ≥ 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 20log(duty cycle/100 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 section15.205, must comply with the radiated emission limits specified in section 15.209.

Frequency MHz	Field Strength uV/m	Field Strength dBµV/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

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Spurious radiated emissions for transmitter and receiver

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		dBμV/m	dB		
37.70	16.68	Horizontal	40.0	23.32	QP	Pass
59.46	18.84	Horizontal	40.0	21.16	QP	Pass
46.37	16.50	Vertical	40.0	23.50	QP	Pass
58.98	16.90	Vertical	40.0	23.10	QP	Pass
*4824	46.90	Horizontal	74	27.10	PK	Pass
*4824	43.80	Horizontal	54	10.20	AV	Pass
7236	45.00	Horizontal	74	29.00	PK	Pass
7236	41.90	Horizontal	54	12.10	AV	Pass
*4824	50.29	Vertical	74	23.71	PK	Pass
*4824	47.19	Vertical	54	6.81	AV	Pass
7236	50.99	Vertical	74	23.01	PK	Pass
7236	47.89	Vertical	54	6.11	AV	Pass

802.11B Modulation 2437MHz Test Result

Frequency	Emission Level	Polarization	Limit	Margin	Detector	Result
MHz	dBuV/m		dBμV/m	dB		
*4874	49.17	Horizontal	74	24.83	PK	Pass
*4874	46.07	Horizontal	54	7.93	AV	Pass
*7311	43.97	Horizontal	74	30.03	PK	Pass
*7311	40.87	Horizontal	54	13.13	AV	Pass
*4874	50.19	Vertical	74	23.81	PK	Pass
*4874	47.09	Vertical	54	6.91	AV	Pass
*7311	48.15	Vertical	74	25.85	PK	Pass
*7311	45.05	Vertical	54	8.95	AV	Pass

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802.11B Modulation 2462MHz Test Result

Frequency	Emission Level	Polarization	Limit	Margin	Detector	Result
MHz	dBuV/m		dBµV/m	dB		
*4924	50.81	Horizontal	74	23.19	PK	Pass
*4924	47.71	Horizontal	54	6.29	AV	Pass
*7368	44.40	Horizontal	74	29.60	PK	Pass
*7368	41.30	Horizontal	54	12.70	AV	Pass
*4924	50.57	Vertical	74	23.43	PK	Pass
*4924	47.47	Vertical	54	6.53	AV	Pass
*7368	48.23	Vertical	74	25.77	PK	Pass
*7368	45.13	Vertical	54	8.87	AV	Pass

Remark:

(1) 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)

(2) 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.

Receiving emission test result as below:

Frequency	Emission Level	Polarization	Limit	Margin	Detector	Result
MHz	dBuV/m		dBµV/m	dB		
37.70	16.68	Horizontal	40.0	23.32	QP	Pass
59.46	18.84	Horizontal	40.0	21.16	QP	Pass
46.37	16.50	Vertical	40.0	23.50	QP	Pass
58.98	16.90	Vertical	40.0	23.10	QP	Pass
1000-25000	--	Horizontal	74	--	PK	Pass
1000-25000	--	Vertical	74	--	PK	Pass

Remark:

(1) 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)

(2) Data of measurement within this frequency range shown "--" in the table above means the reading of emissions are the noise floor or 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 RSS-Gen.

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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

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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=±4.83dB（30MHz~1GHz） Vertical: U=±4.91dB（30MHz~1GHz） Horizontal: U=±4.89dB（1GHz~18GHz） Vertical: U=±4.88dB（1GHz~18GHz）

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