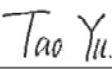


Prüfbericht-Nr.: <i>Test Report No.:</i>	50053865 001	Auftrags-Nr.: <i>Order No.:</i>	1140029035	Seite 1 von 43 Page 1 of 43	
Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	2016-08-22		
Auftraggeber: <i>Client:</i>	Beijing Siemens Cerberus Electronics Ltd. No. 1 Fengzhi Donglu, Xibeiwang Haidian District Beijing 100094 P.R.China				
Prüfgegenstand: <i>Test item:</i>	Smart Thermostat				
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	RDS120				
Auftrags-Inhalt: <i>Order content:</i>	FCC report				
Prüfgrundlage: <i>Test specification:</i>	FCC Part 15 Subpart C Section 15.207 FCC Part 15 Subpart C Section 15.209 FCC Part 15 Subpart C Section 15.247				
Wareneingangsdatum: <i>Date of receipt:</i>	2016-12-10				
Prüfmuster-Nr.: <i>Test sample No.:</i>	Engineering sample				
Prüfzeitraum: <i>Testing period:</i>	2016-12-10 to 2017-01-10				
Ort der Prüfung: <i>Place of testing:</i>	TÜV Rheinland (China) Ltd.				
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (China) Ltd.				
Prüfergebnis*: <i>Test result*:</i>	Passed				
geprüft von / tested by:		kontrolliert von / reviewed by:			
2017-01-13	Tao, Yu/PE		2017-01-13	Sun, Lixun/Reviewer	
Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>
Sonstiges / Other:					
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>		Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>			
* Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet Legend: 1 = very good 2 = good 3 = satisfactory 4 = sufficient 5 = poor P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested					
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>					

TEST SUMMARY

4.1.1 ANTENNA REQUIREMENT

RESULT: Passed

4.1.2 MINIMUM 6DB BANDWIDTH

RESULT: Passed

4.1.3 PEAK CONDUCTED OUTPUT POWER

RESULT: Passed

4.1.4 BAND EDGE COMPLIANCE

RESULT: Passed

4.1.5 POWER SPECTRAL DENSITY

RESULT: Passed

4.1.6 RADIATED SPURIOUS EMISSION

RESULT: Passed

4.1.7 CONDUCTED EMISSIONS

RESULT: Passed

4.2.1 ELECTROMAGNETIC FIELDS

RESULT: Passed

Contents

1.	TEST SITES	4
1.1	TEST FACILITIES	4
1.2	LIST OF TEST AND MEASUREMENT INSTRUMENTS.....	4
1.3	TRACEABILITY	6
1.4	CALIBRATION	6
1.5	MEASUREMENT UNCERTAINTY.....	6
2.	GENERAL PRODUCT INFORMATION	7
2.1	PRODUCT FUNCTION AND INTENDED USE.....	7
2.2	RATINGS AND SYSTEM DETAILS	7
2.3	INDEPENDENT OPERATION MODES	8
2.4	NOISE GENERATING AND NOISE SUPPRESSING PARTS	8
2.5	SUBMITTED DOCUMENTS	8
3.	TEST SET-UP AND OPERATION MODES	9
3.1	PRINCIPLE OF CONFIGURATION SELECTION.....	9
3.2	TEST OPERATION AND TEST SOFTWARE	9
3.3	SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT	9
3.4	COUNTERMEASURES TO ACHIEVE INTENTIONAL TRANSMITTER COMPLIANCE.....	10
3.5	TEST SETUP DIAGRAM	10
4.	TEST RESULTS	12
4.1	TRANSMITTER REQUIREMENT & TEST SUITES	12
4.1.1	<i>Antenna Requirement</i>	<i>12</i>
4.1.2	<i>Minimum 6dB Bandwidth</i>	<i>13</i>
4.1.3	<i>Peak Conducted Output Power</i>	<i>19</i>
4.1.4	<i>Band Edge Compliance</i>	<i>20</i>
4.1.5	<i>Power Spectral Density.....</i>	<i>27</i>
4.1.6	<i>Radiated Spurious Emission.....</i>	<i>31</i>
4.1.7	<i>Conducted Emissions</i>	<i>36</i>
4.2	RADIO FREQUENCY EXPOSURE COMPLIANCE.....	40
4.2.1	<i>Electromagnetic Fields.....</i>	<i>40</i>
5.	PHOTOGRAPHS OF THE TEST SET-UP	41
6.	LIST OF TABLES	43
7.	LIST OF FIGURES	43
8.	LIST OF PHOTOGRAPHS	43

1. Test Sites

1.1 Test Facilities

Laboratory 1: TA Beijing Limited (FCC Registration No.: 413514)
Address: Building B-4, No.1, JingHai 3rd Road, BDA East Park, Beijing, 100176 China

Laboratory 2: TÜV Rheinland (China) Ltd.
Address: Room 303, 1st Area, Building B, Chuangxin Building, No.12, Hongda North Road, Economic - Technological Development Area, Beijing, China

The used test equipment is in accordance with CISPR 16-1 for measurement of radio interference.

1.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Lab 1: (Radiated Emission, Conducted Emissions)

Kind of Equipment	Type	S/N	Manufacturer	Calibrated until
Bi-log Antenna	HL562	100488	Rohde & Schwarz	2018-02-15
Double Ridge Guide Horn Antenna	EMCO 3117	00056662	ETS-Lindgren	2018-02-15
Horn Antenna	3160-09	00165118	ETS-Lindgren	2017-03-21
EMI Test Receiver	ESIB26	100301	Rohde & Schwarz	2017-03-26
Signal Analyzer	FSQ26	200454	Rohde & Schwarz	2017-04-02
Low Frequency Amplifier	SCU03	/	Rohde & Schwarz	2017-03-17
High Frequency Amplifier	SCU18	/	Rohde & Schwarz	2017-03-17
RF Cable	NA	NA	NA	2017-03-17
RF Cable	NA	NA	NA	2017-03-17
Antenna Tower	2075	49402	ETS-Lindgren	/

Prüfbericht - Nr.: 50053865 001

Test Report No.

Seite 5 von 43

Page 5 of 43

Kind of Equipment	Type	S/N	Manufacturer	Calibrated until
Antenna Tower	7- TR/POL- 3106	46587	ETS- Lindgren	/
EMI Test Receiver	ESIB26	100301	R&S	2017-02-11
LISN	ENV 216	101094	R&S	2017-03-17

Lab 2: (Peak Conducted Output Power, Minimum 6dB Bandwidth, Band Edge Compliance, Power Spectral Density)

Kind of Equipment	Type	S/N	Manufacturer	Calibrated until
Signal analyzer	FSV30	101402	R&S	2017-11-14
Wideband Power Sensor	NRP-Z81	103551	R&S	2017-01-11

1.3 Traceability

All measurement equipment calibrations are traceable to NIM (National Institute of Metrology P.R. China) or where calibration is performed outside the United States, to equivalent nationally recognized standards organizations.

1.4 Calibration

Equipment requiring calibration is calibrated periodically by the lab or according to lab's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

1.5 Measurement Uncertainty

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

Table 2: Measurement Uncertainty

Items		Extended Uncertainty
RE (30-1000MHz)	Field strength (dBuV/m)	$U=\pm 4.94\text{dB}$, $k=2$, $\sigma=95\%$
RE (1-18GHz)	Field strength (dBuV/m)	$U=\pm 4.34\text{dB}$, $k=2$, $\sigma=95\%$

2. General Product Information

2.1 Product Function and Intended Use

The EUT (equipment under test) is a Room Thermostat. For more information, please refer to the user manual.

2.2 Ratings and System Details

Table 3: Rating of EUT

Kind of Equipment:	Smart Thermostat
Type Designation:	RDS120
Rated Input Voltage	24V AC
Rated consumption power	9VA
Hardware version	MS1
Software version	V01.02.xx_Bxx

Table 4: Technical Specification

Item	Description
Operating Frequency band	2.4GHz—2.4835GHz
Channel Number	11
Operating mode	802.11b/g/n (HT 20)
Channel Center Frequency	2412MHz, 2417MHz, 2422MHz, 2427MHz, 2432MHz, 2437MHz, 2442MHz, 2447MHz, 2452MHz, 2457MHz, 2462MHz
Modulation	CCK;DSSS;OFDM;BPSK;QPSK;16QAM;64QAM
Antenna	Integrated Antenna
Antenna Gain (dBi)	-3.5

2.3 Independent Operation Modes

The basic operation modes are:

- A. On, transmitting (802.11b/g/n (HT 20))
- B. On, receiving (802.11b/g/n (HT 20))
- C. Off

2.4 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

2.5 Submitted Documents

None.

3. Test Set-up and Operation Modes

3.1 Principle of Configuration Selection

The equipment under test (EUT) was configured to measure its maximum power level. The test modes were adapted accordingly in reference to the instructions for use.

3.2 Test Operation and Test Software

Test operation refers to test setup in chapter 5. All testing were performed according to the procedures in ANSI C63.10: 2013.

3.3 Special Accessories and Auxiliary Equipment

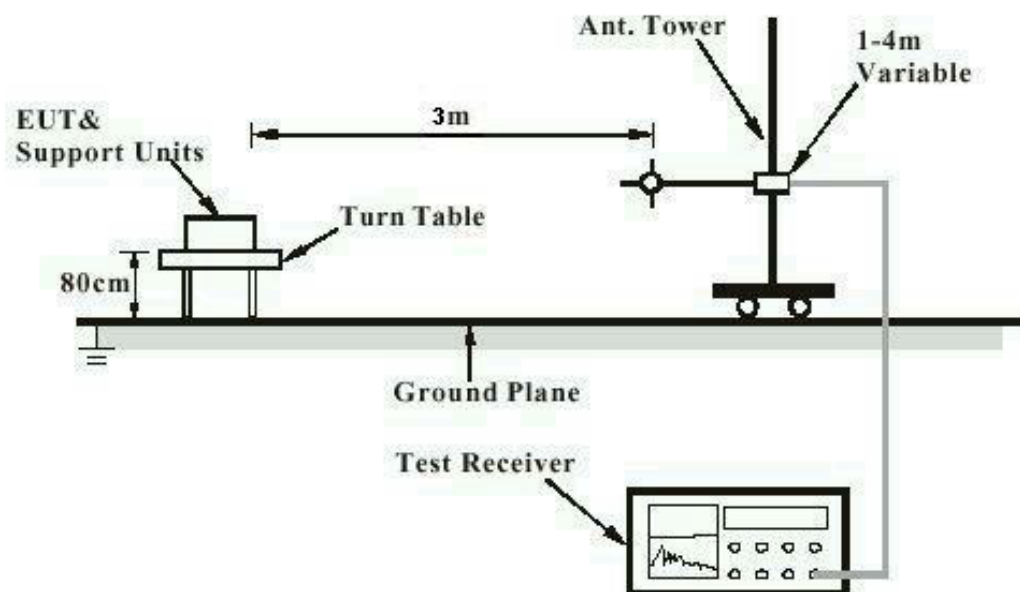
Kind of accessories	Model	Manufacture
Computer	X201	Lenovo

3.4 Countermeasures to achieve intentional transmitter Compliance

None.

3.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test



Note: Measurements above 1GHz are done with a table height of 0.8m. In addition, there is RF absorbing material on the floor of the test site for above 1GHz measurement.

Diagram of Measurement Equipment Configuration for Conduction Measurement

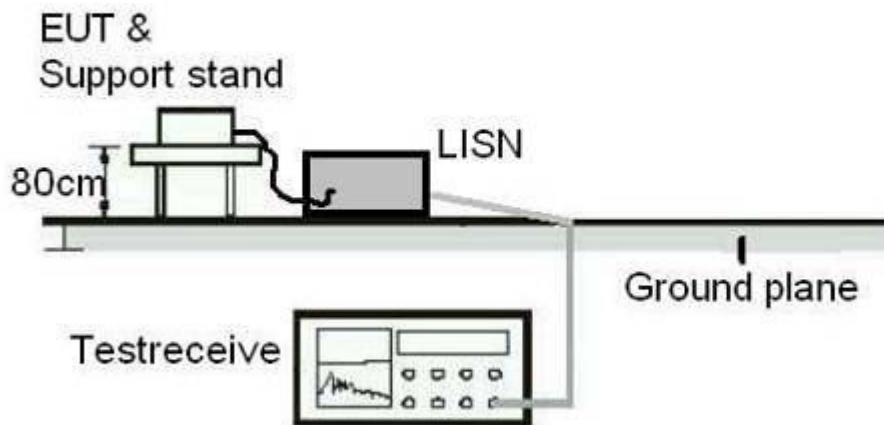
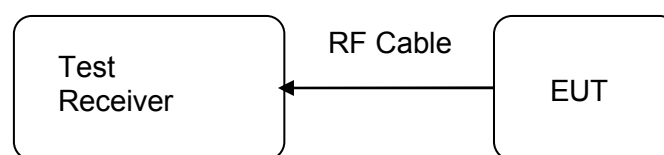


Diagram of Measurement Equipment Configuration for Transmitter Measurement



4. Test Results

4.1 Transmitter Requirement & Test Suites

4.1.1 Antenna Requirement

RESULT:**Passed**

Test date	:	2016-12-20
Test standard	:	FCC Part 15.247(b)(4) and Part 15.203
Limit	:	the use of antennas with directional gains that do not exceed 6 dBi

According to the manufacturer declared, the EUT has an Integrated Antenna, the directional gain of antenna is -3.5dBi. Therefore the EUT is considered sufficient to comply with the provision.

4.1.2 Minimum 6dB Bandwidth

RESULT:
Passed

Date of testing : 2016-12-20
 Test standard : FCC Part 15.247(a)(2)
 Basic standard : ANSI C63.10: 2013, 558074 D01 DTS
 Meas Guidance v03r05
 Kind of test site : Shielded room

Test setup

Test Channel : Low/ Middle/ High
 Operation Mode : A
 Ambient temperature : 21°C
 Relative humidity : 30%
 Atmospheric pressure : 101 kPa

Table 5: Test result of 6dB Bandwidth

802.11b:

Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)	Limit(kHz)
Low Channel	2412	9.076	>500
Mid Channel	2437	9.076	>500
High Channel	2462	9.076	>500

802.11g:

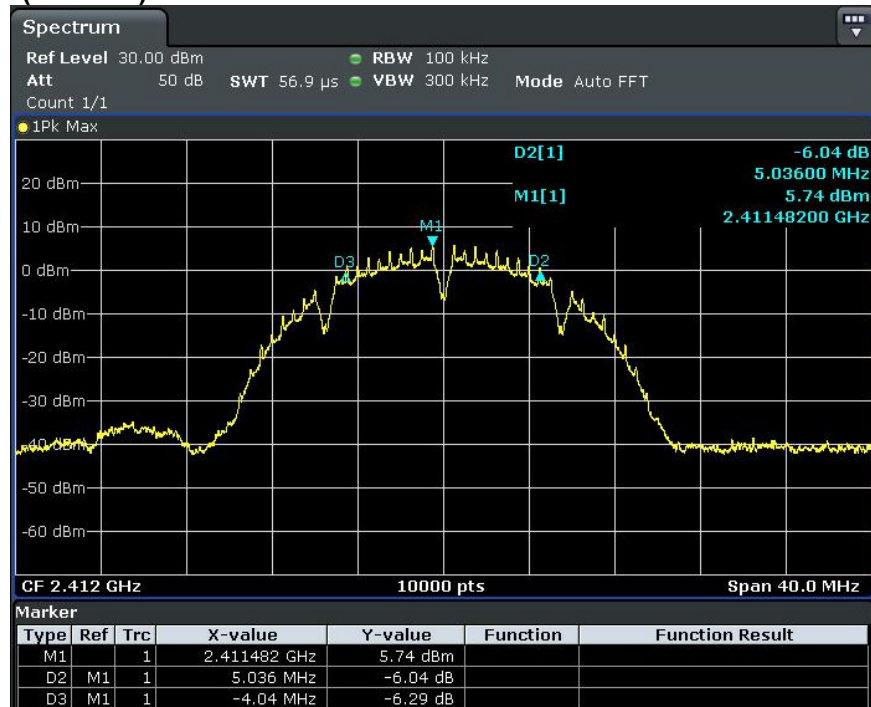
Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)	Limit(kHz)
Low Channel	2412	15.108	>500
Mid Channel	2437	15.104	>500
High Channel	2462	15.108	>500

802.11n (HT20):

Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)	Limit(kHz)
Low Channel	2412	15.096	>500
Mid Channel	2437	15.100	>500
High Channel	2462	15.108	>500

Test Graph of 6dB Bandwidth

Low Channel (802.11b)



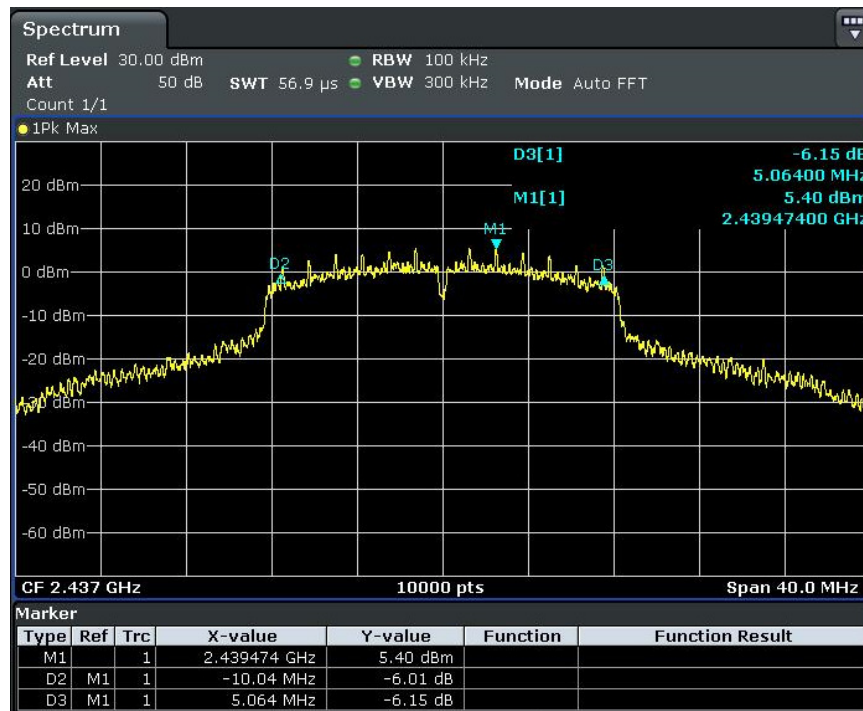
Mid Channel (802.11b)



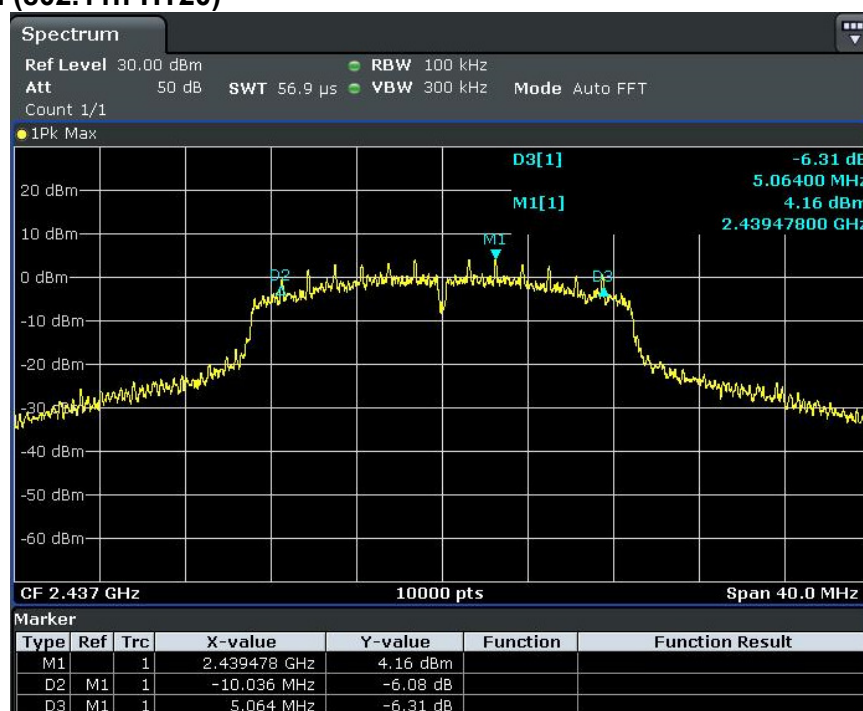
High Channel (802.11b)


Low Channel (802.11g)

Mid Channel (802.11g)


High Channel (802.11g)

Low Channel (802.11n-HT20)


Mid Channel (802.11n-HT20)

High Channel (802.11n-HT20)



	Channel Frequency (MHz)	Peak Output Power	Limit
		(dBm)	(dBm)
802.11b	2412	16.71	30
	2437	17.82	30
	2462	16.85	30
802.11g	2412	19.48	30
	2437	19.84	30
	2462	19.12	30
802.11n-HT20	2412	19.43	30
	2437	19.47	30
	2462	19.15	30

4.1.4 Band Edge Compliance

RESULT:

Passed

Date of testing	:	2016-12-20
Test standard	:	FCC part 15.247(d)
Basic standard	:	ANSI C63.10: 2013, 558074 D01 DTS Meas Guidance v03r05
Limit	:	20dB (below that in the 100kHz bandwidth within the band that contains the highest level of the desired power)
Kind of test site	:	Shield room

Test setup

Test Channel	:	Low/ Mid/High
Operation mode	:	A
Ambient temperature	:	21°C
Relative humidity	:	30%
Atmospheric pressure	:	101 kPa

Table 7: Test result of Band Edge compliance

802.11b:

Channel	Difference (dB)	Limit(dB)
Low Channel	36.68	>20
High Channel	36.15	>20

802.11g:

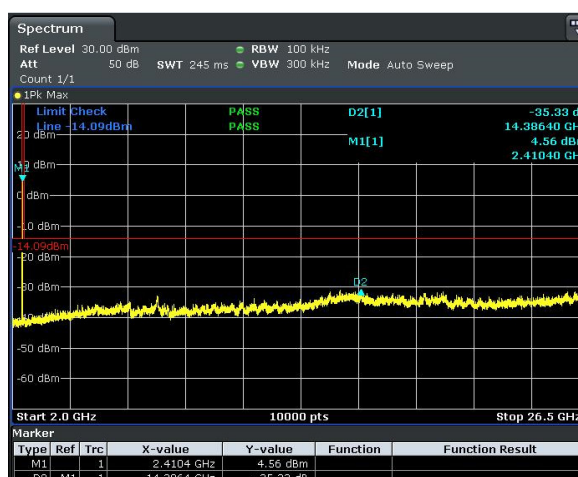
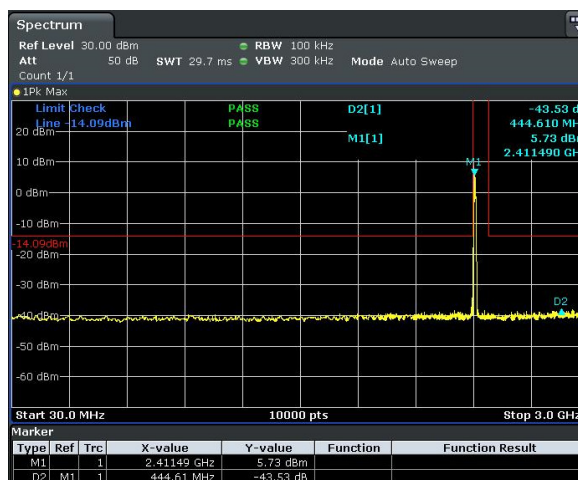
Channel	Difference (dB)	Limit(dB)
Low Channel	30.13	>20
High Channel	34.10	>20

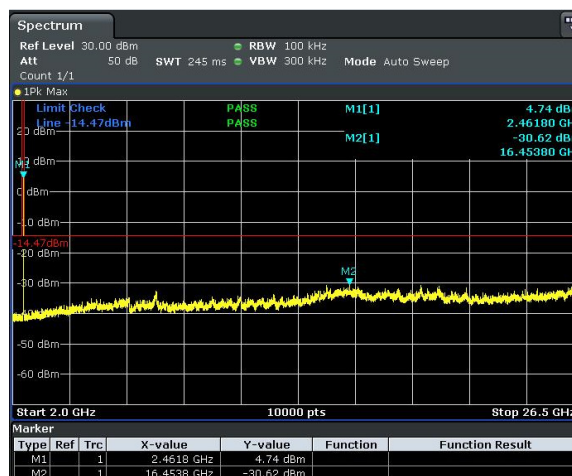
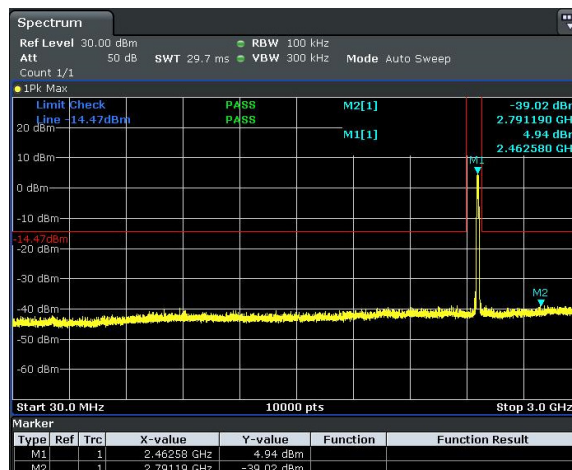
802.11n-HT20:

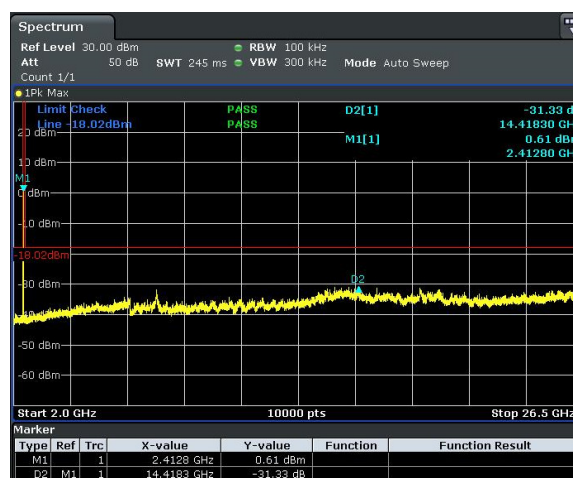
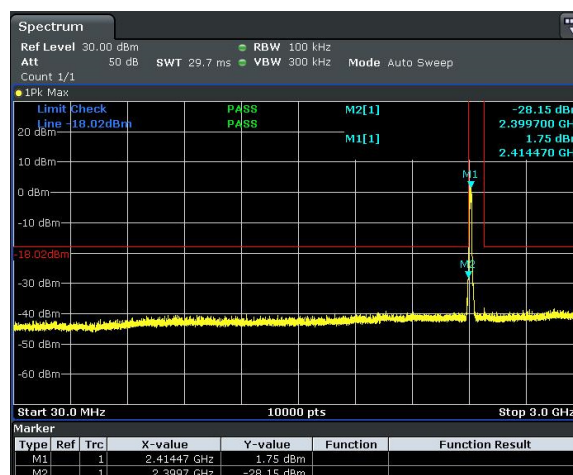
Channel	Difference (dB)	Limit(dB)
Low Channel	33.56	>20
High Channel	33.39	>20

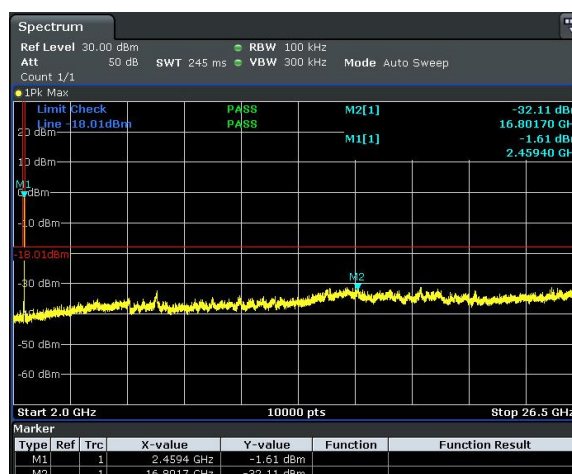
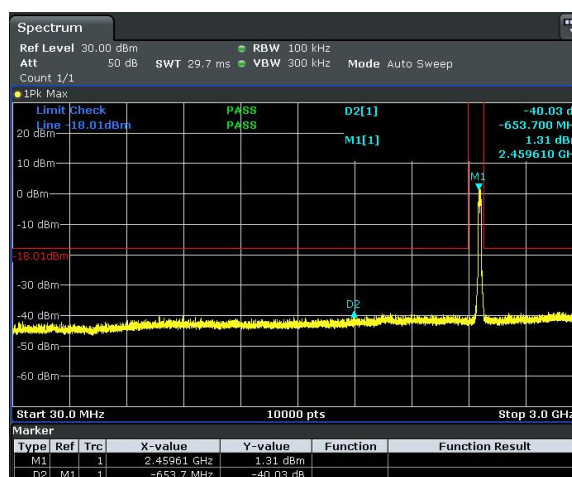
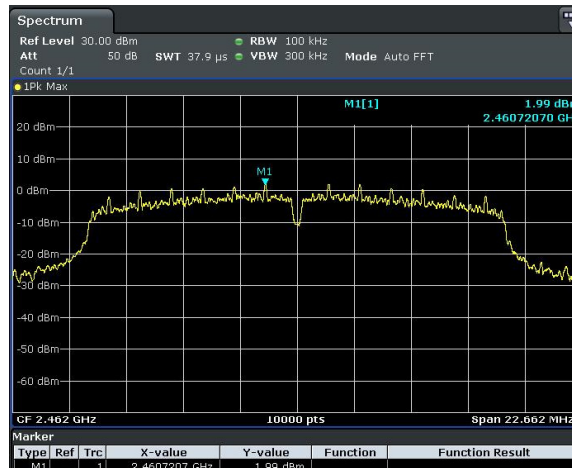
Test Graph of Band Edge Compliance

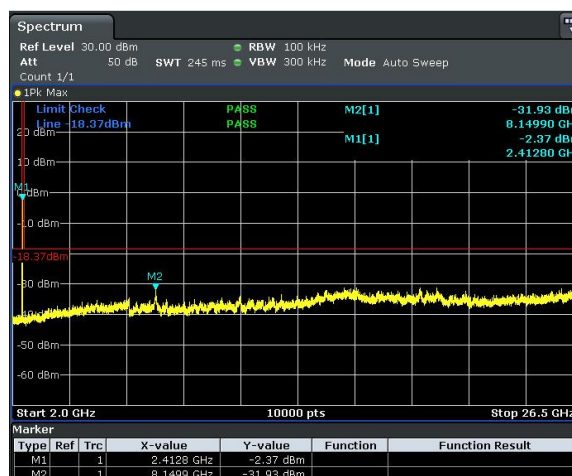
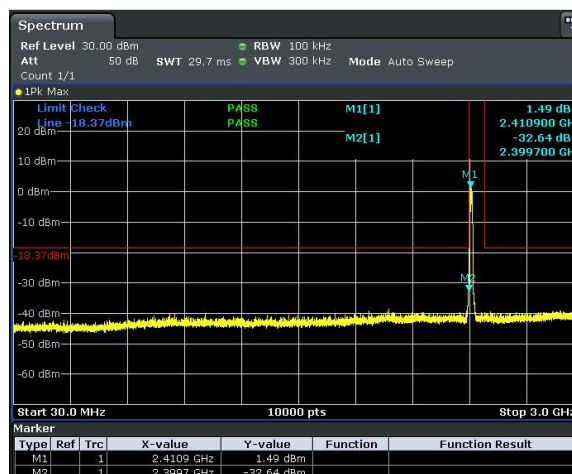
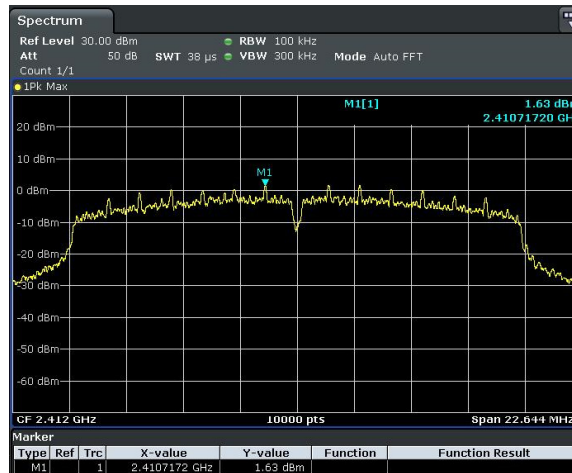
802.11b: Low Channel

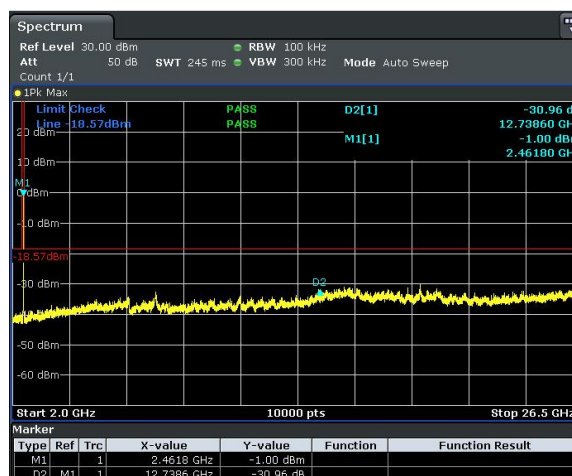
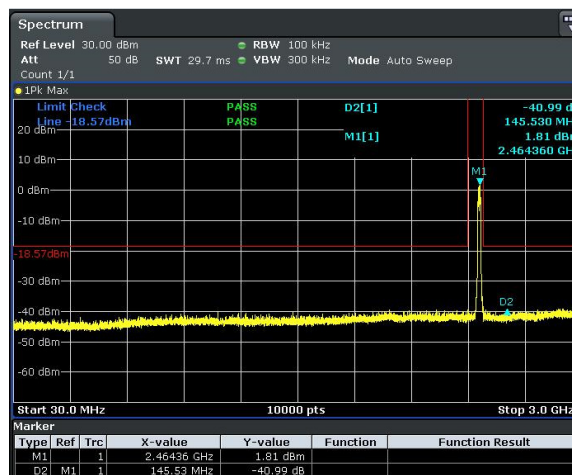
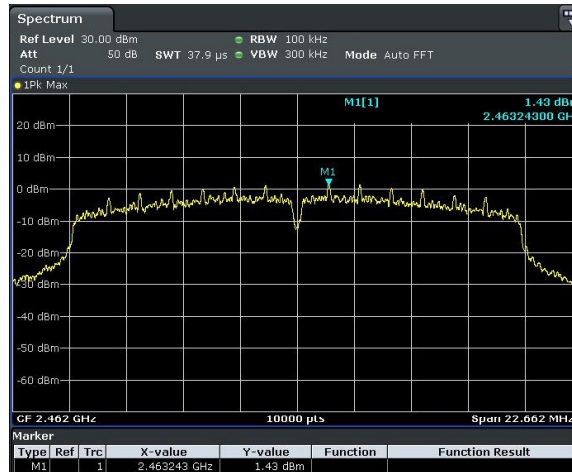


802.11b: High Channel


802.11g: Low Channel


802.11g: High Channel


802.11n-HT20: Low Channel


802.11n-HT20: High Channel


4.1.5 Power Spectral Density

RESULT:
Passed

Date of testing : 2016-12-20
 Test standard : FCC part 15.247(e)
 Basic standard : ANSI C63.10: 2013, 558074 D01 DTS
 : Meas Guidance v03r05
 Limits : 8.0 dBm (in any 3kHz band)
 Kind of test site : Shield room

Test Setup

Test Channel : Low/ Middle/ High
 Operation mode : A
 Ambient temperature : 21°C
 Relative humidity : 30%
 Atmospheric pressure : 101 kPa

Table 8: Test result of power spectral density (PSD)

802.11b:

Channel	Maximum power spectral density (dBm/3kHz)	Limit (dBm/3kHz)
Low Channel	-9.88	<8
Mid Channel	-9.32	<8
High Channel	-9.78	<8

802.11g:

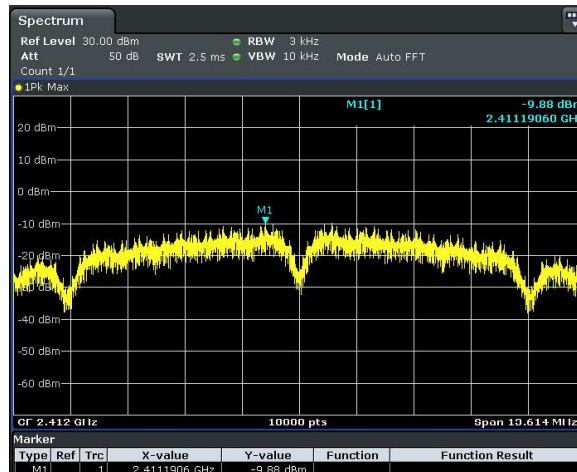
Channel	Maximum power spectral density (dBm/3kHz)	Limit (dBm/3kHz)
Low Channel	-13.04	<8
Mid Channel	-10.54	<8
High Channel	-13.29	<8

802.11n-HT20:

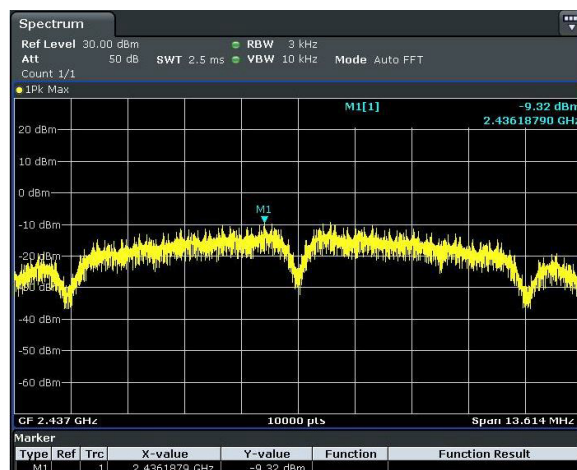
Channel	Maximum power spectral density (dBm/3kHz)	Limit (dBm/3kHz)
Low Channel	-11.80	<8
Mid Channel	-9.08	<8
High Channel	-11.58	<8

Test Graph of Power Spectral Density

802.11b: Low Channel

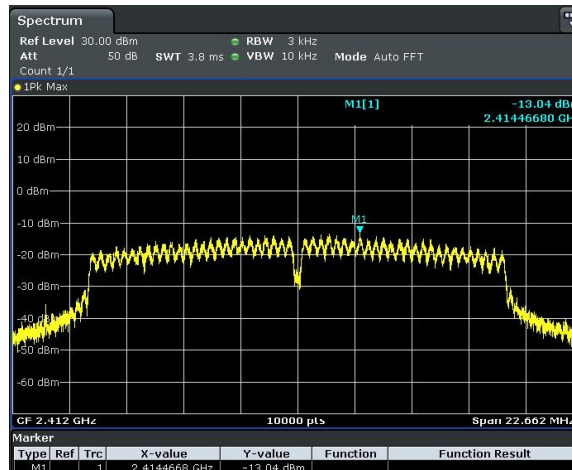
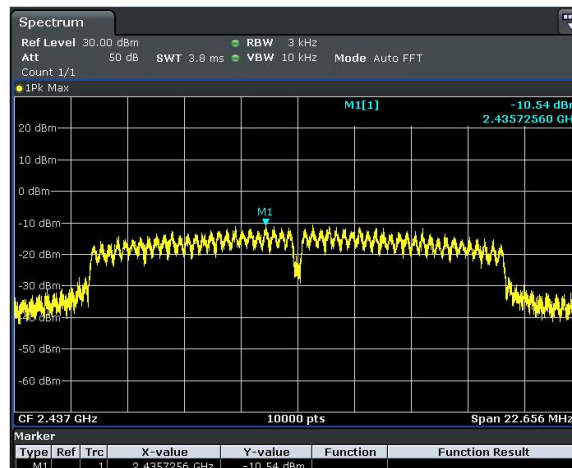
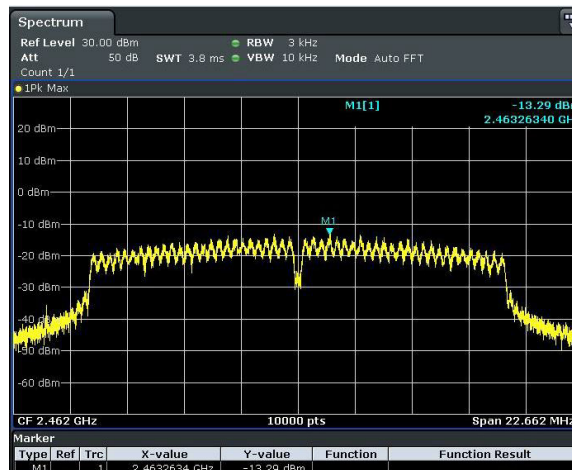


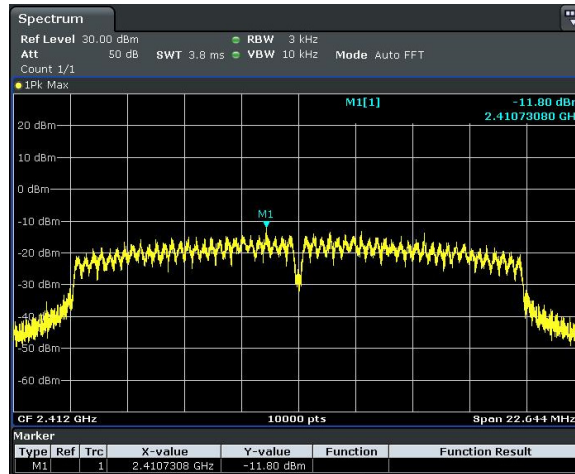
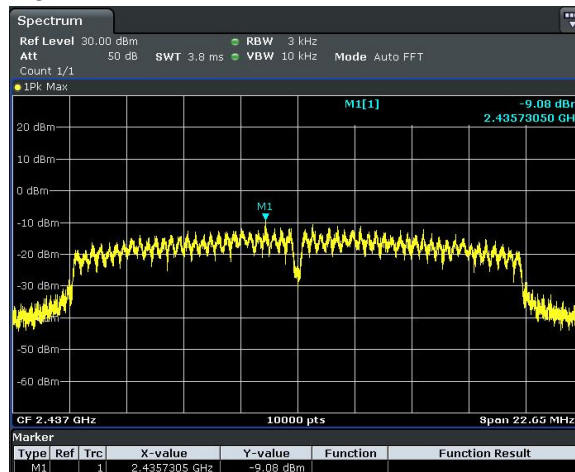
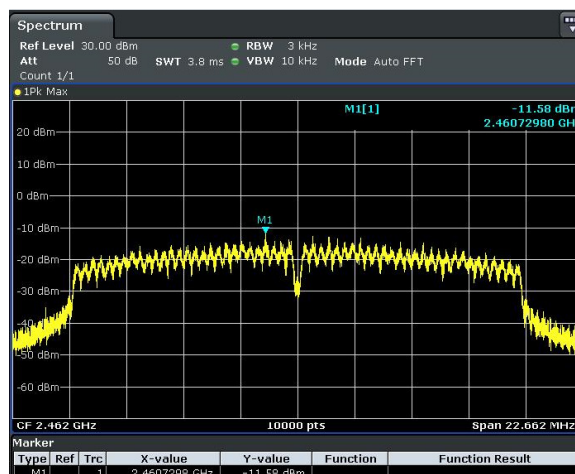
802.11b: Mid Channel



802.11b: High Channel



802.11g: Low Channel

802.11g: Mid Channel

802.11g: High Channel


802.11n-HT20: Low Channel

802.11n-HT20: Mid Channel

802.11n-HT20: High Channel


4.1.6 Radiated Spurious Emission

RESULT:**Passed**

Date of testing	:	2016-12-27
Test standard	:	FCC part 15.247(d)
Basic standard	:	ANSI C63.10: 2013
Limits	:	In addition, radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits specified in 15.209(a)
Kind of test site	:	3m Semi-Anechoic Chamber

Test setup

Test Channel	:	Low/ Middle/ High
Operation mode	:	A
Ambient temperature	:	21°C
Relative humidity	:	30%
Atmospheric pressure	:	100 kPa

During the test, the nonconducting table was rotated 360° around and the antenna was varied from 1m to 4m to find the maximum disturbance. The test was performed with the antenna both in its horizontal and vertical polarizations. The height and polarization of the EUT is varied to maximize the measured emissions.

The following figures and tables were those measured by an automatic measurement system. A pre-test was performed, no radiated harmonics or unintentional emission was found below 30MHz. The following plots are provided as reference. The Low, Middle and High channels were tested, only worst case showed. 9 kHz - 30 MHz emission result was far below limit, hence not presented in this test report.

Figure 1: Spurious emission measurement results, 802.11b, low channel, 30MHz-26.5GHz.

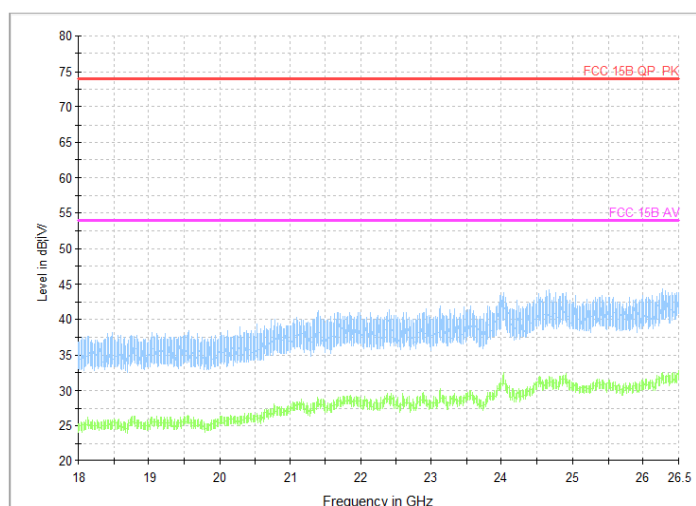
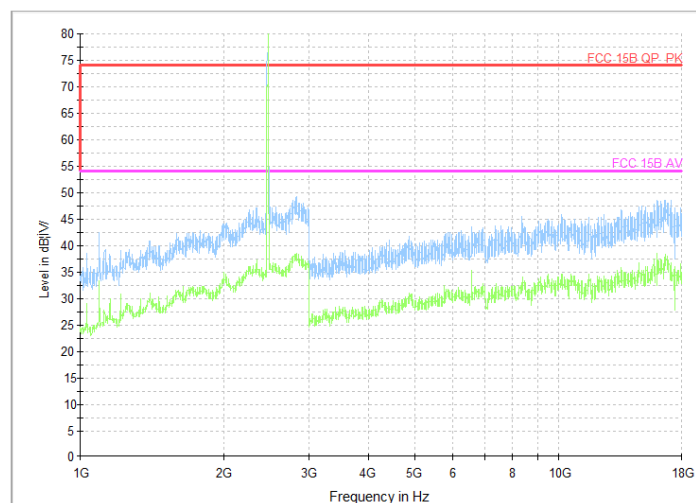
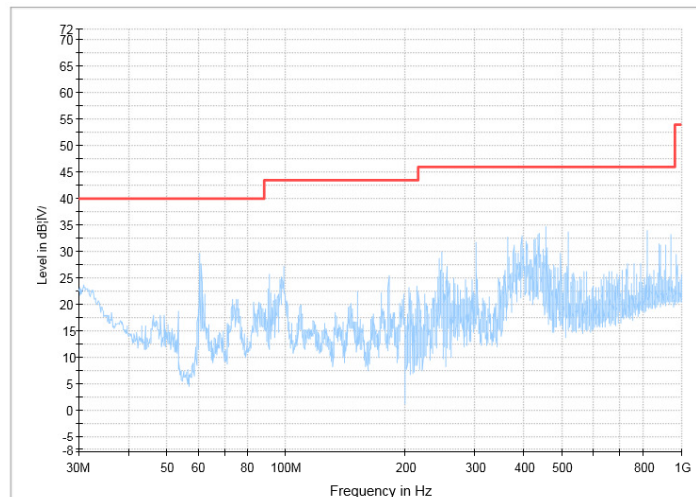


Figure 2: Spurious emission measurement results, 802.11g, low channel, 30MHz-26.5GHz.

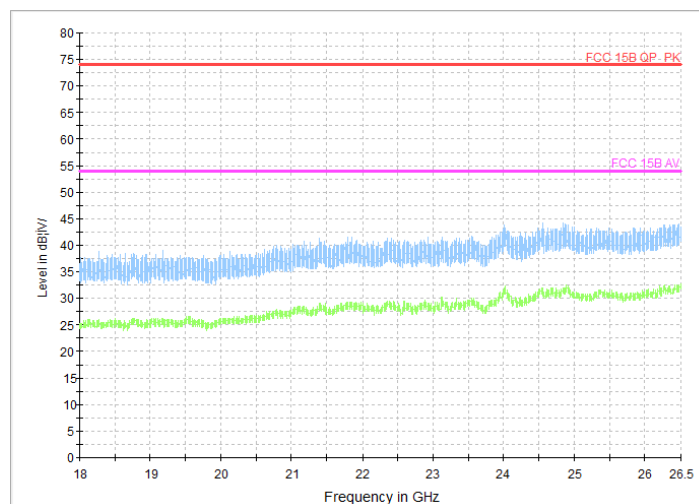
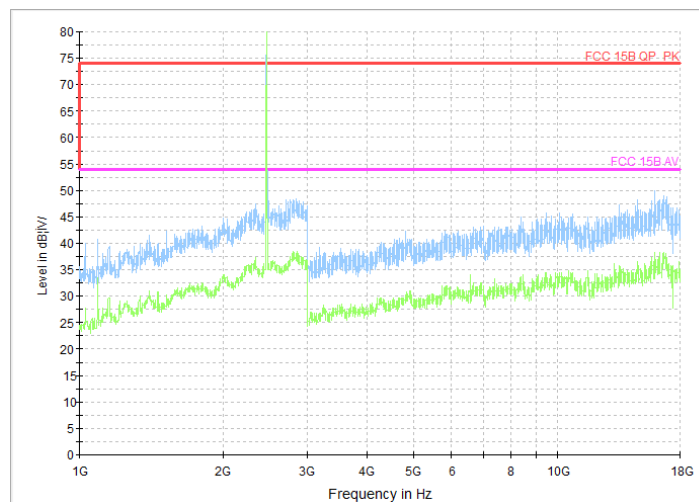
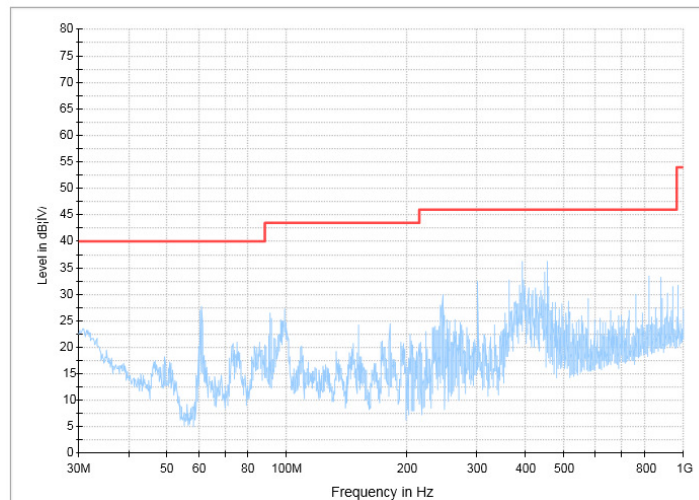
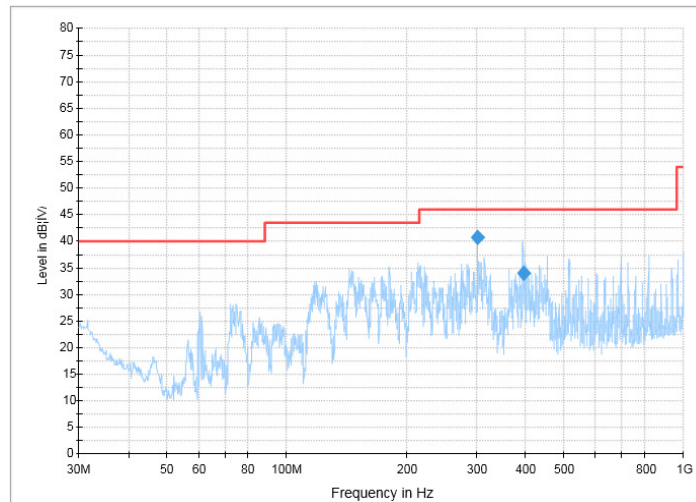
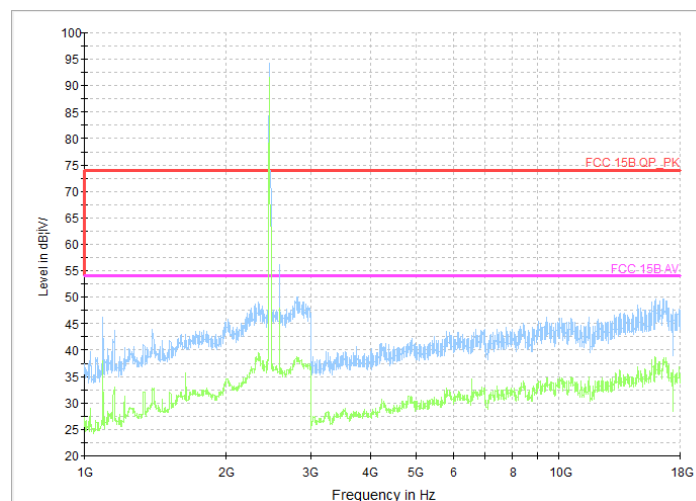
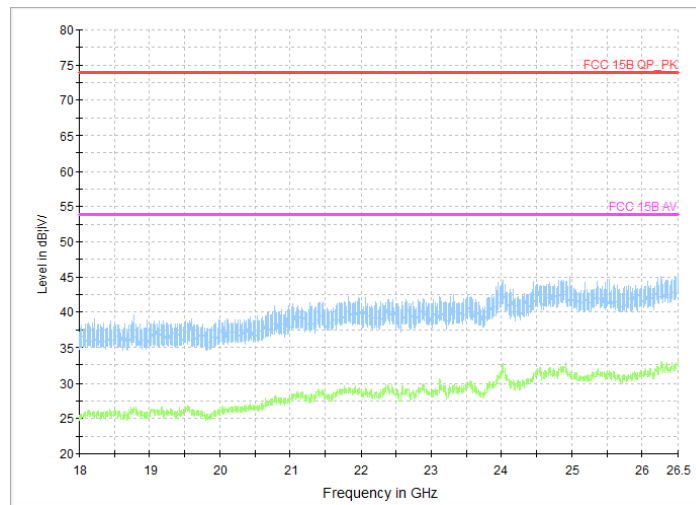


Figure 3: Spurious emission measurement results, 802.11n-HT20, low channel, 30MHz-26.5GHz.


Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)
303.46601	40.7	1000.	120.000	200.0	V	292.0	-31.8	5.30	46.00
394.78877	33.9	1000.	120.000	100.0	V	0.0	-29.5	12.10	46.00





4.1.7 Conducted Emissions

RESULT:**Passed**

Date of testing : 2017-01-08
Test standard : FCC Part 15.207(a)
Basic standard : ANSI C63.10: 2013
Frequency range : 0.15 – 30MHz
Limits : FCC Part 15.207(a)
Kind of test site : Shield room

Test setup

Input Voltage : AC 24V
Operation Mode : A
Earthing : Not Connected
Ambient temperature : 21°C
Relative humidity : 30%
Atmospheric pressure : 100 kPa
The measurement setup was made in a shielded room.

The measurement equipment like test receivers, quasi-peak detector, average detector and LISN are in compliance with CISPR 16-1 series standards and ANSI C63.10-2013. The tested object was operated under its rated voltage and its rated frequency. Prior to the measurements the test object operated about 5 minutes (warm-up) in order to stabilize its operating conditions and to ensure reliable measurement values.

Furthermore an internal calibration with the test receiver was conducted prior to each measurement.

The EUT was set 0.8m away from the LISN. The cord longer than necessary to be connected to the LISN was folded forth and back parallel so as to form a bundle with a length between 0.3m and 0.4m.

The interference voltage was determined while measuring the line conductor by turns.

The following figures and tables were those measured by an automatic measuring system. A preview test was first made with peak detector. Final test with quasi-peak detector and average detector was only performed at these critical frequencies found via preview test.

Figure 4: Conducted emission measurement results, AC power line, Line L, 802.11b

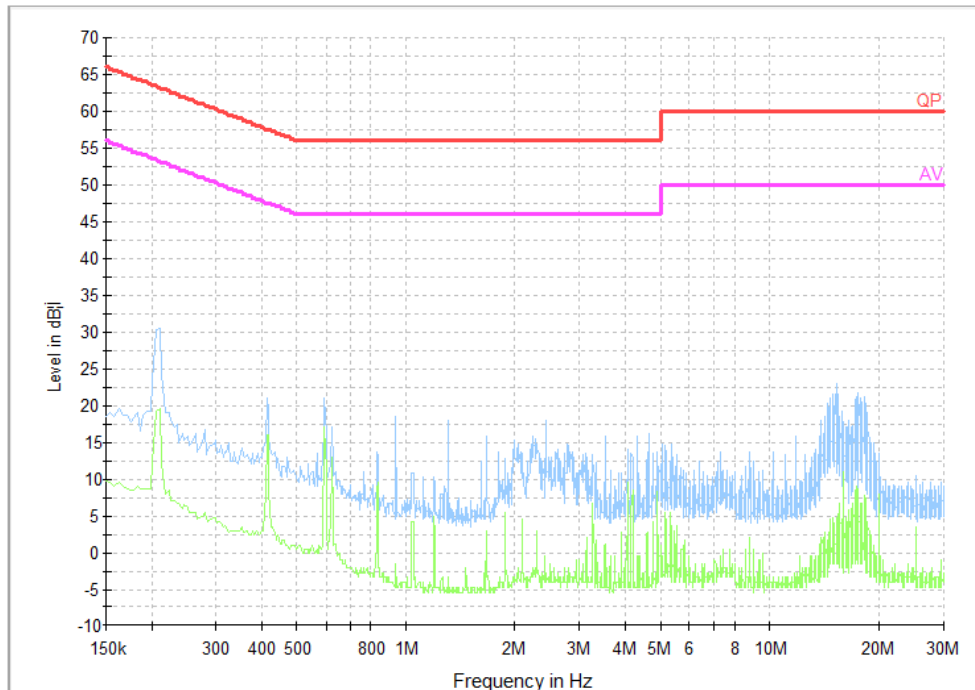


Figure 5: Conducted emission measurement results, AC power line, Line N, 802.11b

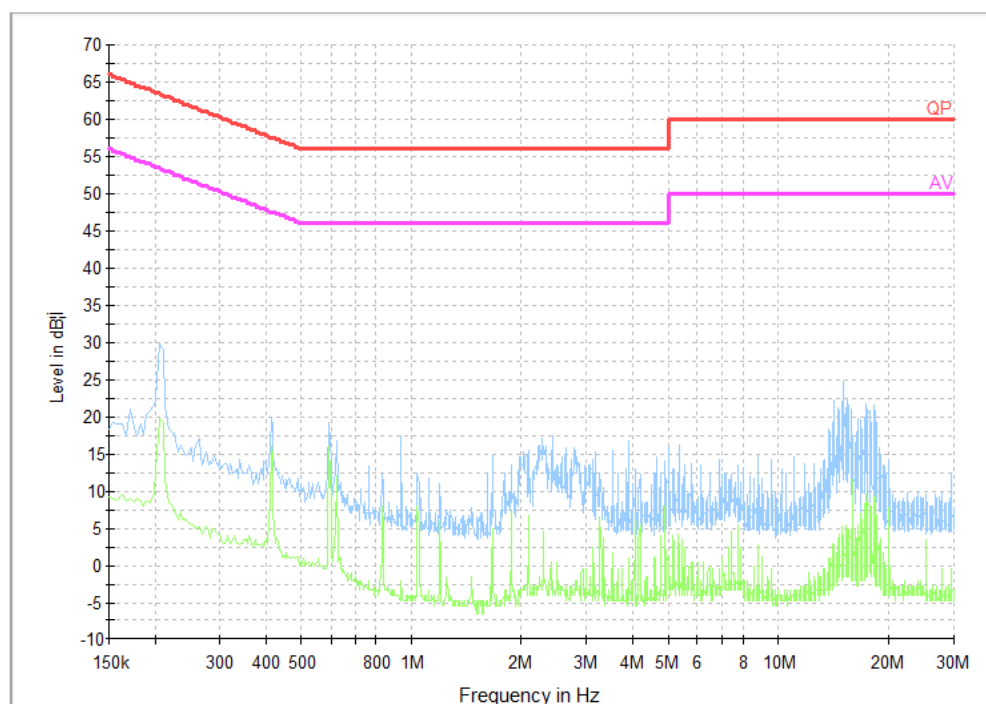


Figure 6: Conducted emission measurement results, AC power line, Line L, 802.11g

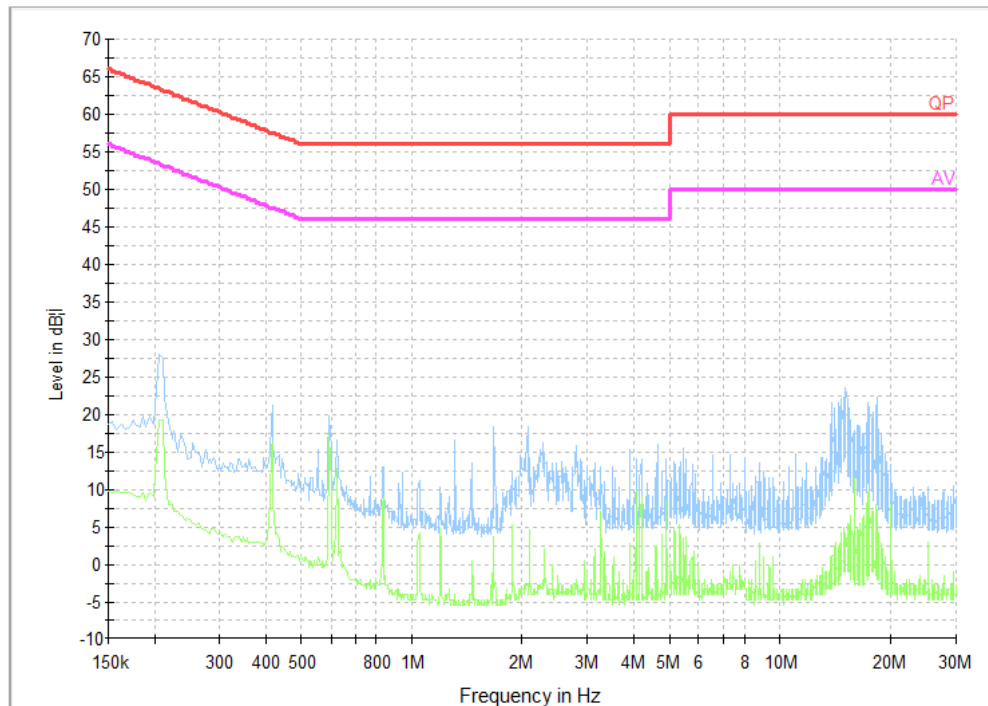


Figure 7: Conducted emission measurement results, AC power line, Line N, 802.11g

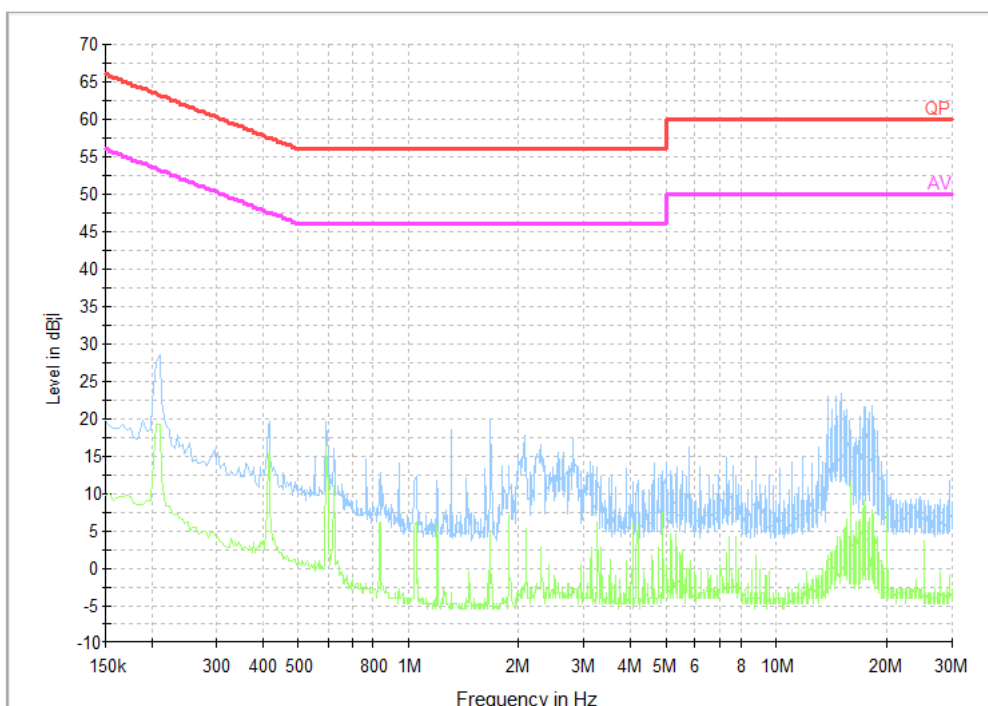


Figure 8: Conducted emission measurement results, AC power line, Line L, 802.11n-HT20

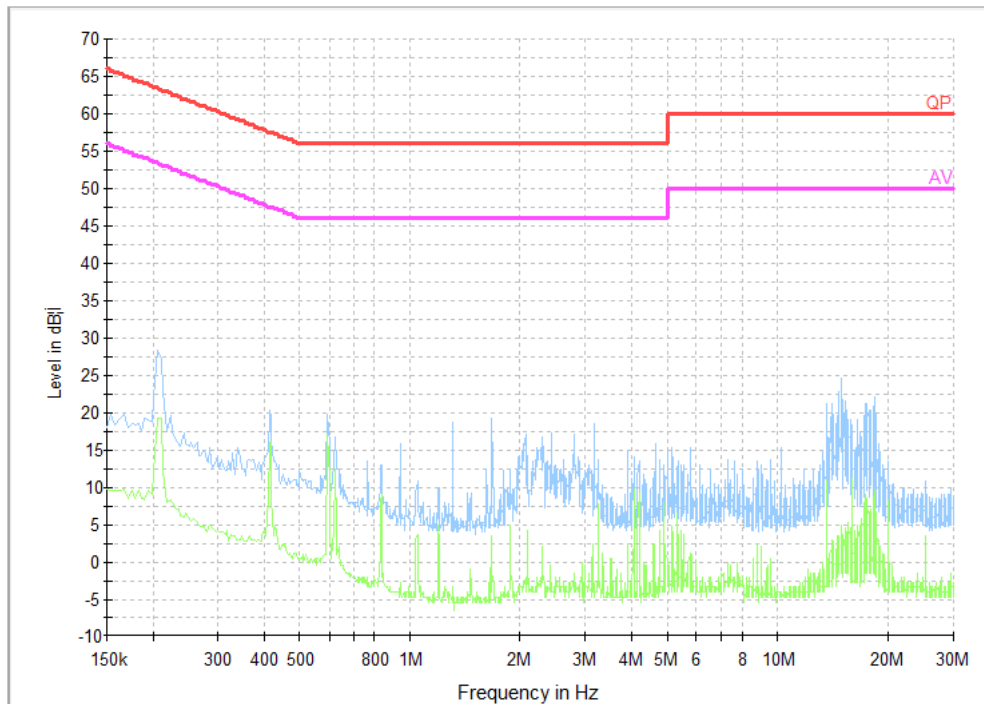


Figure 9: Conducted emission measurement results, AC power line, Line N, 802.11n-HT20

