FCC Test Report

Report No.:	RF190503C13B R1
FCC ID:	MSQ-RTACRH01
Test Model:	RT-ACRH15
Series Model:	RT-AC1200GE, RT-AC59U, RT-AC1500G PLUS, RT-AC1500UHP, RT-AC57U, RT-AC58U, RT-AC1300G PLUS (Refer to item 3.1 for more details)
Received Date:	May 03, 2019
Test Date:	May 17 ~ Jul. 19, 2019
Issued Date:	Aug. 02, 2019
Applicant:	ASUSTeK COMPUTER INC.
Address:	4F, NO. 150, Li-Te Rd. Peitou, Taipei Taiwan
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan (R.O.C.)
Test Location (1):	No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN (R.O.C.)
FCC Registration / Designation Number:	788550 / TW0003
Test Location (2):	B2F., No. 215, Sec. 3, Beixin Rd., Xindian Dist., New Taipei City 231, Taiwan, R.O.C.
FCC Registration / Designation Number:	427177 / TW0011

Testing Laboratory
2021

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Release Control Record

Issue No.	Description	Date Issued
RF190503C13B	Original release.	Jul. 22, 2019
RF190503C13B R1	Added antennas (Item 5 ~ 8)	Aug. 02, 2019

1 Certificate of Conformity

Product:	Dual Band Gigabit WiFi Router
Brand:	ASUS
Test Model:	RT-ACRH15
Series Model:	RT-AC1200GE, RT-AC59U, RT-AC1500G PLUS, RT-AC1500UHP, RT-AC57U, RT-AC58U, RT-AC1300G PLUS (Refer to item 3.1 for more details)
Sample Status:	Engineering sample
Applicant:	ASUSTeK COMPUTER INC.
Test Date:	May 17 ~ Jul. 19, 2019
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.247) ANSI C63.10:2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

Prepared by : Pettie Chen , **Date:** Aug. 02, 2019

Pettie Chen / Senior Specialist

Approved by : Bruce Chen , **Date:** Aug. 02, 2019

Bruce Chen / Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -18.37dB at 17.32272MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -1.13dB at 2483.56MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	Pass	Meet the requirement of limit.
15.247(b)	Conducted power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	Antenna connector is I-PEX not a standard connector.

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.94 dB
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	2.0153 dB
	200MHz ~1000MHz	2.0224 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	1.0121 dB
	18GHz ~ 40GHz	1.1508 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Dual Band Gigabit WiFi Router
Brand	ASUS
Test Model	RT-ACRH15
Series Model	RT-AC1200GE, RT-AC59U, RT-AC1500G PLUS, RT-AC1500UHP, RT-AC57U, RT-AC58U, RT-AC1300G PLUS
Model Difference	Refer to Note
Sample Status	Engineering sample
Power Supply Rating	12Vdc (adapter)
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b:11/5.5/2/1Mbps 802.11g: 54/48/36/24/18/12/9/6Mbps 802.11n: up to 600Mbps
Operating Frequency	2412~2462MHz
Number of Channel	802.11b, 802.11g, 802.11n (HT20): 11 802.11n (HT40): 7
Output Power	468.208mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Adapter
Cable Supplied	0.9m non-shielded RJ45 cable without core

Note:

1. The following models are provided to this EUT. The model of the RT-ACRH15 was chosen for final test.

Brand	Model	Difference
ASUS	RT-ACRH15	All models are electrically identical, different model names are for marketing purpose.
	RT-AC1200GE	
	RT-AC59U	
	RT-AC1500G PLUS	
	RT-AC1500UHP	
	RT-AC57U	
	RT-AC58U	
	RT-AC1300G PLUS	

2. The EUT incorporates a MIMO function. Physically, the EUT provides 4 completed transmitters and 4 receivers.

2.4GHz Band		
Modulation Mode	Beamforming Mode	TX Function
802.11b	Not Support	4TX/4RX
802.11g	Not Support	4TX/4RX
802.11n (HT20)	Not Support	4TX/4RX
802.11n (HT40)	Not Support	4TX/4RX
802.11n (VHT20)	Not Support	4TX/4RX
802.11n (VHT40)	Not Support	4TX/4RX

* CDD mode is the worst case for final radiated emission below 1GHz and power line conducted emission tests after pretesting CDD mode and beamforming mode.
* The modulation and bandwidth are similar for 802.11n mode for 20MHz / 40MHz and 802.11ac mode for 20MHz / 40MHz, therefore investigated worst case to representative mode in test report. (Final test mode refer item 3.2.1)

3. The EUT is powered by the following adapter.

Adapter	
Brand	Shenzhen Gongjin Electronics Co., Ltd.
Model	S18B22-120A150-CJ
Input Power	100-240Vac~50/60Hz Max 0.6A
Output Power	12Vdc, 1.5A
Power Line	1.45m power cable without core

4. The following antennas were provided to the EUT.

Ant. Type	Dipole		
Connecter Type	I-PEX		
Brand	RenFeng		
Antenna Gain (dBi)			
Item	P/N	2.4G	5G
1	RF21C04368A	5	-
2	RF21C04369A	5	-
3	RF21C04370A	5	5
4	RF21C04371A	5	5
5	C6319-510239-A	5	-
6	C6319-510240-A	5	-
7	C6319-510241-A	5	5
8	C6319-510242-A	5	5

*Item 1~4 and item 5~8 are identical to each other, except the length, therefore only Item 1~4 were for final test and presented in the test report.

5. WLAN 2.4GHz and 5GHz technology can transmit at same time.

3.2 Description of Test Modes

11 channels are provided for 802.11b, 802.11g and 802.11n (HT20):

Channel	Frequency	Channel	Frequency
1	2412MHz	7	2442MHz
2	2417MHz	8	2447MHz
3	2422MHz	9	2452MHz
4	2427MHz	10	2457MHz
5	2432MHz	11	2462MHz
6	2437MHz		

7 channels are provided for 802.11n (HT40):

Channel	Frequency	Channel	Frequency
3	2422MHz	7	2442MHz
4	2427MHz	8	2447MHz
5	2432MHz	9	2452MHz
6	2437MHz		

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable to				Description
	RE≥1G	RE<1G	PLC	APCM	
-	√	√	√	√	-

Where RE≥1G: Radiated Emission above 1GHz & Bandedge Measurement RE<1G: Radiated Emission below 1GHz

PLC: Power Line Conducted Emission APCM: Antenna Port Conducted Measurement

Note: The antenna had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on X-plane. Radiated emission test (below 1GHz) and power line conducted emission test items chosen the worst maximum power.

Radiated Emission Test (Above 1GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)	Remark
-	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0	-
	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0	-
	802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5	-
	802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5	-

Radiated Emission Test (Below 1GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)	Remark
-	802.11n (HT20)	1 to 11	6	OFDM	BPSK	6.5	-

Power Line Conducted Emission Test:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)	Remark
-	802.11n (HT20)	1 to 11	6	OFDM	BPSK	6.5	-

Antenna Port Conducted Measurement:

☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)	Remark
-	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0	-
	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0	-
	802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5	-
	802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5	-

Test Condition:

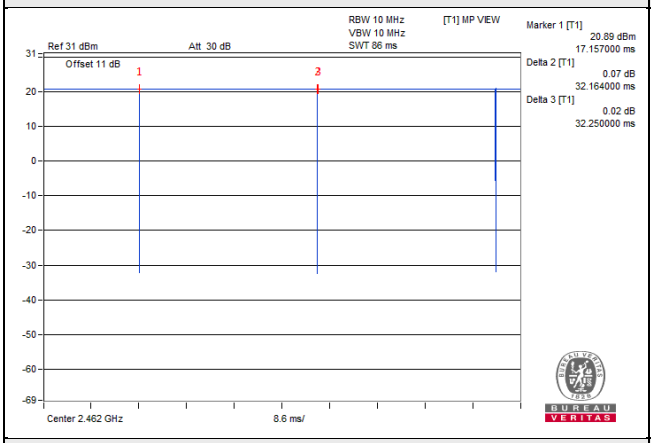
Applicable to	Environmental Conditions	Input Power	Tested by
RE≥1G	22 deg. C, 69% RH	120Vac, 60Hz	Karl Lee
RE<1G	22 deg. C, 69% RH	120Vac, 60Hz	Karl Lee
PLC	25 deg. C, 75% RH	120Vac, 60Hz	Jones Chang
APCM	25 deg. C, 60% RH	120Vac, 60Hz	Chris Lin

3.3 Duty Cycle of Test Signal

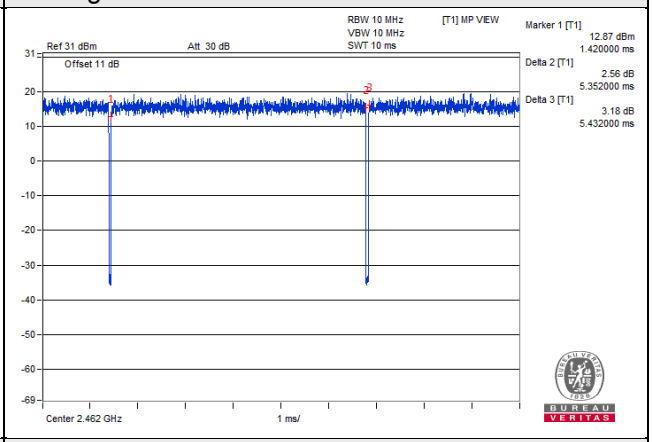
Duty cycle of test signal is ≥ 98%, duty factor is not required.
Duty cycle of test signal is < 98%, duty factor is required.

802.11b: Duty cycle = 32.164/32.25 = 0.997
802.11g: Duty cycle = 5.352/5.432 = 0.985
802.11n (HT20): Duty cycle = 4.962/5.037 = 0.985
802.11n (HT40): Duty cycle = 2.404/2.454 = 0.980

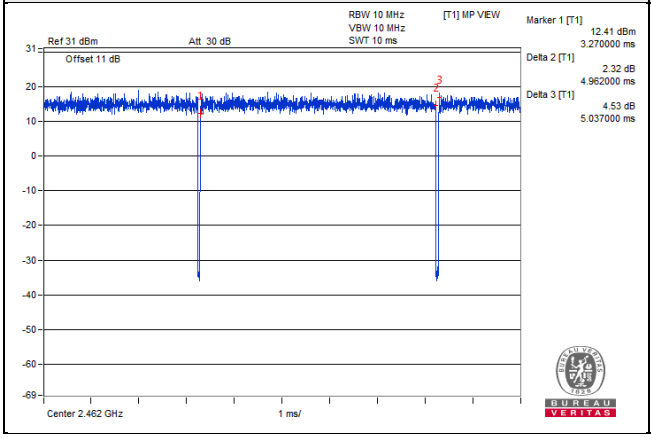
802.11b



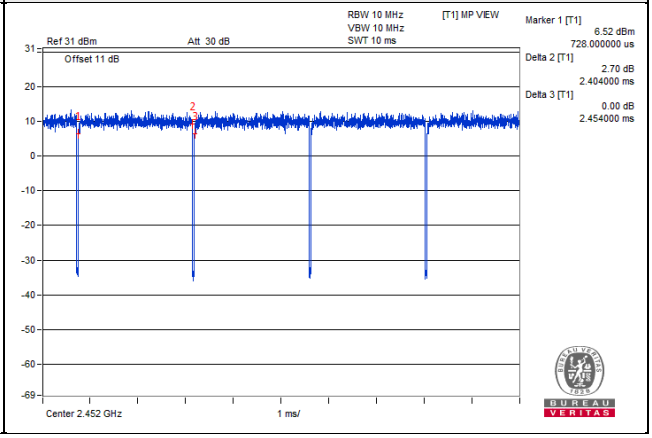
802.11g



802.11n (HT20)



802.11n (HT40)



3.4 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	DELL	E6420	D3T96R1	FCC DoC Approved	-

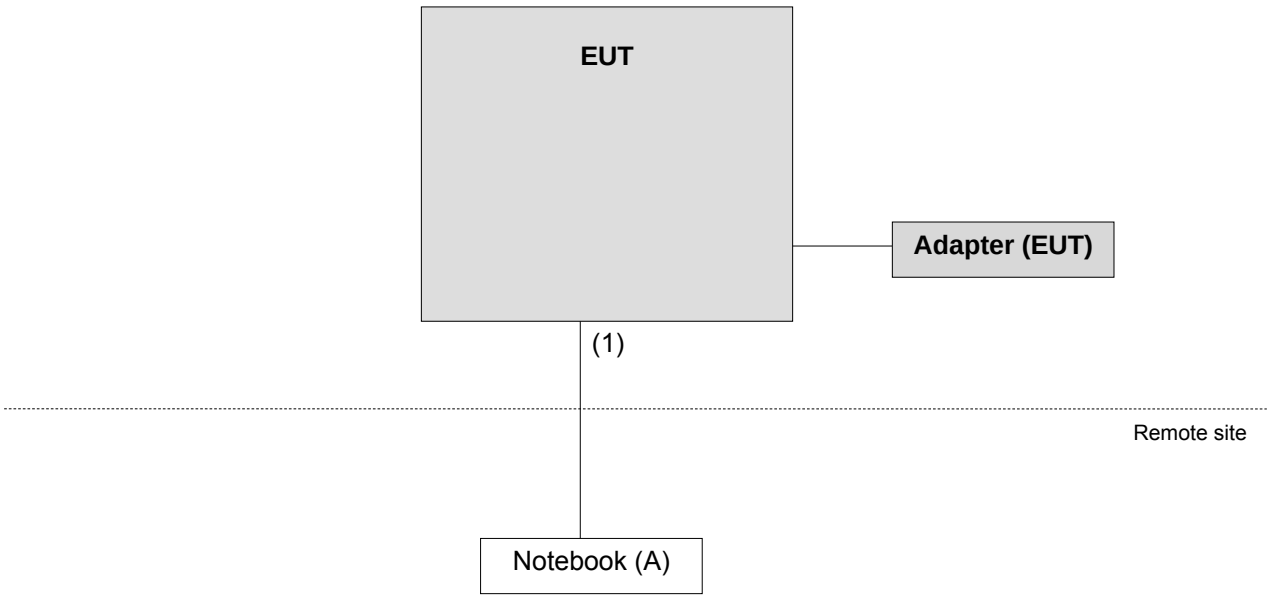
Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item A acted as a communication partner to transfer data.

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	RJ45 cable	1	10	N	0	Cat5e

.

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C (15.247)
KDB 558074 D01 15.247 Meas Guidance v05r02
KDB 662911 D01 Multiple Transmitter Output v02r01
ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 30dB below the highest level of the desired power:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver Agilent Technologies	N9038A	MY52260177	Aug. 20, 2018	Aug. 19, 2019
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Apr. 15, 2019	Apr. 14, 2020
HORN Antenna ETS-Lindgren	3117	00143293	Nov. 25, 2018	Nov. 24, 2019
BILOG Antenna SCHWARZBECK	VULB 9168	9168-616	Nov. 27, 2018	Nov. 26, 2019
HORN Antenna SCHWARZBECK	BBHA 9170	9170-480	Nov. 25, 2018	Nov. 24, 2019
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 15, 2019	Apr. 14, 2020
Preamplifier Agilent	310N	187226	Jun. 19, 2018	Jun. 18, 2019
			Jun. 18, 2019	Jun. 17, 2020
Preamplifier Agilent	83017A	MY39501357	Jun. 19, 2018	Jun. 18, 2019
			Jun. 18, 2019	Jun. 17, 2020
Preamplifier EMCI	EMC 184045	980116	Oct. 12, 2018	Oct. 11, 2019
Power Meter Anritsu	ML2495A	1012010	Sep. 05, 2018	Sep. 04, 2019
Power Sensor Anritsu	MA2411B	1315050	Sep. 04, 2018	Sep. 03, 2019
RF signal cable ETS-LINDGREN	5D-FB	Cable-CH1-01(RFC-SMS-100-SMS-120+RFC-SMS-100-SMS-400)	Jun. 19, 2018	Jun. 18, 2019
			Jun. 18, 2019	Jun. 17, 2020
RF signal cable ETS-LINDGREN	8D-FB	Cable-CH1-02(RFC-SMS-100-SMS-24)	Jun. 19, 2018	Jun. 18, 2019
			Jun. 18, 2019	Jun. 17, 2020
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Software BV ADT	E3 8.130425b	NA	NA	NA
Antenna Tower MF	NA	NA	NA	NA
Turn Table MF	NA	NA	NA	NA
Antenna Tower &Turn Table Controller MF	MF-7802	NA	NA	NA

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. The test was performed in Xindian Chamber 1.

4.1.3 Test Procedures

For Radiated emission below 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

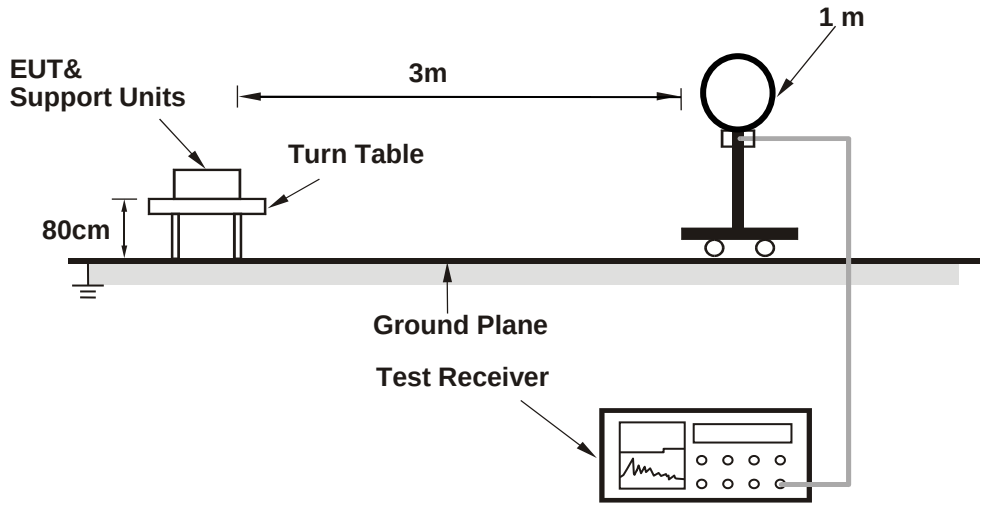
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10Hz (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.
   (802.11b: RBW = 1MHz, VBW = 10Hz; 802.11g: RBW = 1MHz, VBW = 10Hz;
   802.11n (HT20): RBW = 1MHz, VBW = 10Hz; 802.11n (HT40): RBW = 1MHz, VBW = 10Hz)
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

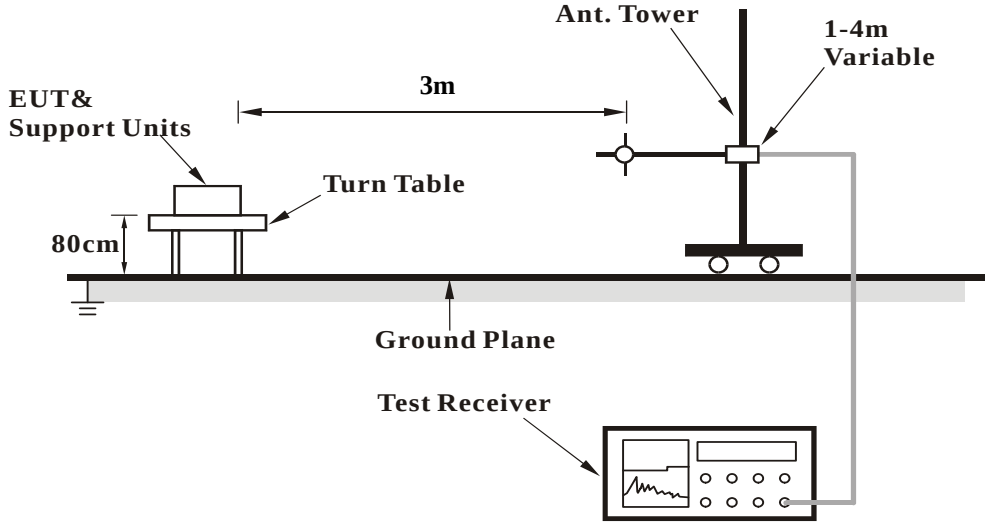
No deviation.

4.1.5 Test Setup

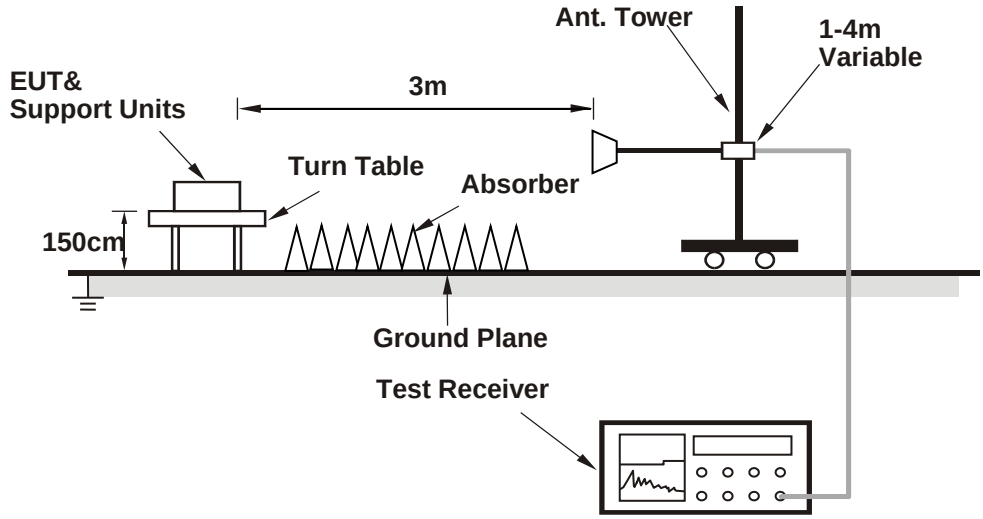
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT Operating Conditions

a. Placed the EUT on the testing table.
b. Prepared a notebook to act as a communication partner and placed it outside of testing area.
c. The communication partner connected with EUT via a RJ45 cable and ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.
d. The communication partner sent data to EUT by command "PING".

4.1.7 Test Results

Above 1GHz worst-Case data:

802.11b

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2386.86	41.12	39.41	1.71	54.0	-12.88	103	66	Average
2386.86	51.94	50.23	1.71	74.0	-22.06	103	66	Peak
2412.00	100.74	98.97	1.77			103	66	Average
2412.00	103.04	101.27	1.77			103	66	Peak
4824.00	46.73	38.60	8.13	54.0	-7.27	109	205	Average
4824.00	49.59	41.46	8.13	74.0	-24.41	109	205	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.29	47.85	46.14	1.71	54.0	-6.15	157	3	Average
2389.29	57.32	55.61	1.71	74.0	-16.68	157	3	Peak
2412.00	112.26	110.49	1.77			157	3	Average
2412.00	115.87	114.1	1.77			157	3	Peak
4824.00	51.63	43.5	8.13	54.0	-2.37	116	140	Average
4824.00	54.49	46.36	8.13	74.0	-19.51	116	140	Peak

Remarks:

1. Emission Level = Read Level + Factor

   Margin value = Emission level – Limit value

2. 2412 MHz: Fundamental frequency.

3. The emission levels of other frequencies were very low against the limit.

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2386.59	40.87	39.16	1.71	54.0	-13.13	103	66	Average
2386.59	51.94	50.23	1.71	74.0	-22.06	103	66	Peak
2437.00	98.58	96.73	1.85			103	66	Average
2437.00	101.76	99.91	1.85			103	66	Peak
2487.84	41.03	39.02	2.01	54.0	-12.97	103	66	Average
2487.84	51.87	49.86	2.01	74.0	-22.13	103	66	Peak
4874.00	45.98	37.79	8.19	54.0	-8.02	109	205	Average
4874.00	49.06	40.87	8.19	74.0	-24.94	109	205	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.74	44.41	42.7	1.71	54.0	-9.59	144	287	Average
2389.74	55.03	53.32	1.71	74.0	-18.97	144	287	Peak
2437.00	110.45	108.6	1.85			144	287	Average
2437.00	113.64	111.79	1.85			144	287	Peak
2485.56	45.52	43.53	1.99	54.0	-8.48	144	287	Average
2485.56	55.85	53.86	1.99	74.0	-18.15	144	287	Peak
4874.00	51.08	42.89	8.19	54.0	-2.92	115	140	Average
4874.00	53.58	45.39	8.19	74.0	-20.42	115	140	Peak

Remarks:

1. Emission Level = Read Level + Factor

   Margin value = Emission level – Limit value

2. 2437 MHz: Fundamental frequency.

3. The emission levels of other frequencies were very low against the limit.

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462.00	100.25	98.32	1.93			106	66	Average
2462.00	103.39	101.46	1.93			106	66	Peak
2484.96	41.34	39.35	1.99	54.0	-12.66	106	66	Average
2484.96	52.54	50.55	1.99	74.0	-21.46	106	66	Peak
4924.00	47.7	39.45	8.25	54.0	-6.30	109	205	Average
4924.00	50.3	42.05	8.25	74.0	-23.70	109	205	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462.00	112.67	110.74	1.93			157	228	Average
2462.00	115.22	113.29	1.93			157	228	Peak
2485.84	51.09	49.10	1.99	54.0	-2.91	157	214	Average
2485.84	64.84	62.85	1.99	74.0	-9.16	157	214	Peak
4924.00	51.95	43.70	8.25	54.0	-2.05	100	142	Average
4924.00	54.67	46.42	8.25	74.0	-19.33	100	142	Peak

Remarks:

1. Emission Level = Read Level + Factor

   Margin value = Emission level – Limit value

2. 2462 MHz: Fundamental frequency.

3. The emission levels of other frequencies were very low against the limit.

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CHANNEL	TX Channel 1	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.92	42.38	40.65	1.73	54.0	-11.62	103	66	Average
2389.92	54.44	52.71	1.73	74.0	-19.56	103	66	Peak
2412.00	94.04	92.27	1.77			103	66	Average
2412.00	102.39	100.62	1.77			103	66	Peak
4824.00	39.55	31.42	8.13	54.0	-14.45	134	14	Average
4824.00	45.03	36.90	8.13	74.0	-28.97	134	14	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.92	52.18	50.45	1.73	54.0	-1.82	108	283	Average
2389.92	64.44	62.71	1.73	74.0	-9.56	108	283	Peak
2412.00	107.24	105.47	1.77			157	3	Average
2412.00	115.19	113.42	1.77			157	3	Peak
4824.00	39.41	31.28	8.13	54.0	-14.59	115	15	Average
4824.00	45.24	37.11	8.13	74.0	-28.76	115	15	Peak

Remarks:

1. Emission Level = Read Level + Factor

   Margin value = Emission level – Limit value

2. 2412 MHz: Fundamental frequency.

3. The emission levels of other frequencies were very low against the limit.

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2388.93	42.29	40.58	1.71	54.0	-11.71	106	66	Average
2388.93	59.60	57.89	1.71	74.0	-14.40	106	66	Peak
2437.00	102.54	100.69	1.85			106	66	Average
2437.00	109.52	107.67	1.85			106	66	Peak
2483.72	41.93	39.97	1.96	54.0	-12.07	106	66	Average
2483.72	54.08	52.12	1.96	74.0	-19.92	106	66	Peak
4874.00	40.59	32.40	8.19	54.0	-13.41	134	207	Average
4874.00	50.23	42.04	8.19	74.0	-23.77	134	207	Peak
7311.00	44.71	34.22	10.49	54.0	-9.29	100	291	Average
7311.00	54.78	44.29	10.49	74.0	-19.22	100	291	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.56	52.50	50.79	1.71	54.0	-1.50	144	185	Average
2389.56	72.11	70.40	1.71	74.0	-1.89	144	185	Peak
2437.00	114.25	112.4	1.85			144	287	Average
2437.00	121.84	119.99	1.85			144	287	Peak
2483.68	51.73	49.77	1.96	54.0	-2.27	144	212	Average
2483.68	67.79	65.83	1.96	74.0	-6.21	144	212	Peak
4874.00	44.71	36.52	8.19	54.0	-9.29	111	144	Average
4874.00	55.28	47.09	8.19	74.0	-18.72	111	144	Peak
7311.00	49.65	39.16	10.49	54.0	-4.35	104	236	Average
7311.00	61.42	50.93	10.49	74.0	-12.58	104	236	Peak

Remarks:

1. Emission Level = Read Level + Factor

   Margin value = Emission level – Limit value

2. 2437 MHz: Fundamental frequency.

3. The emission levels of other frequencies were very low against the limit.

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462.00	94.67	92.74	1.93			106	66	Average
2462.00	101.09	99.16	1.93			106	66	Peak
2483.76	41.59	39.63	1.96	54.0	-12.41	106	66	Average
2483.76	51.99	50.03	1.96	74.0	-22.01	106	66	Peak
4924.00	39.42	31.17	8.25	54.0	-14.58	149	145	Average
4924.00	45.45	37.20	8.25	74.0	-28.55	149	145	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462.00	106.48	104.55	1.93			144	287	Average
2462.00	113.65	111.72	1.93			144	287	Peak
2483.52	52.84	50.88	1.96	54.0	-1.16	162	120	Average
2483.52	67.89	65.93	1.96	74.0	-6.11	162	120	Peak
4924.00	39.56	31.31	8.25	54.0	-14.44	121	144	Average
4924.00	46.59	38.34	8.25	74.0	-27.41	121	144	Peak

Remarks:

1. Emission Level = Read Level + Factor

   Margin value = Emission level – Limit value

2. 2462 MHz: Fundamental frequency.

3. The emission levels of other frequencies were very low against the limit.

802.11n (HT20)

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2388.30	41.23	39.52	1.71	54.0	-12.77	116	58	Average
2388.30	52.24	50.53	1.71	74.0	-21.76	116	58	Peak
2412.00	93.77	92.00	1.77			103	66	Average
2412.00	101.67	99.90	1.77			103	66	Peak
4824.00	39.42	31.29	8.13	54.0	-14.58	145	333	Average
4824.00	45.03	36.90	8.13	74.0	-28.97	145	333	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.92	52.30	50.57	1.73	54.0	-1.70	171	67	Average
2389.92	66.91	65.18	1.73	74.0	-7.09	171	67	Peak
2412.00	103.49	101.72	1.77			157	3	Average
2412.00	111.94	110.17	1.77			157	3	Peak
4824.00	39.42	31.29	8.13	54.0	-14.58	114	175	Average
4824.00	45.24	37.11	8.13	74.0	-28.76	114	175	Peak

Remarks:

1. Emission Level = Read Level + Factor

   Margin value = Emission level – Limit value

2. 2412 MHz: Fundamental frequency.

3. The emission levels of other frequencies were very low against the limit.

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2385.33	41.43	39.74	1.69	54.0	-12.57	106	66	Average
2385.33	54.98	53.29	1.69	74.0	-19.02	106	66	Peak
2437.00	101.26	99.41	1.85			106	66	Average
2437.00	108.68	106.83	1.85			106	66	Peak
2483.52	41.79	39.83	1.96	54.0	-12.21	106	66	Average
2483.52	52.33	50.37	1.96	74.0	-21.67	106	66	Peak
4874.00	39.21	31.02	8.19	54.0	-14.79	134	207	Average
4874.00	48.73	40.54	8.19	74.0	-25.27	134	207	Peak
7311.00	44.25	33.76	10.49	54.0	-9.75	100	291	Average
7311.00	53.43	42.94	10.49	74.0	-20.57	100	291	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.65	50.07	48.36	1.71	54.0	-3.93	144	192	Average
2389.65	65.00	63.29	1.71	74.0	-9.00	144	192	Peak
2437.00	113.62	111.77	1.85			144	287	Average
2437.00	120.11	118.26	1.85			144	287	Peak
2487.80	48.22	46.21	2.01	54.0	-5.78	144	287	Average
2487.80	59.63	57.62	2.01	74.0	-14.37	144	287	Peak
4874.00	42.29	34.1	8.19	54.0	-11.71	111	144	Average
4874.00	52.33	44.14	8.19	74.0	-21.67	111	144	Peak
7311.00	46.35	35.86	10.49	54.0	-7.65	104	236	Average
7311.00	56.88	46.39	10.49	74.0	-17.12	104	236	Peak

Remarks:

1. Emission Level = Read Level + Factor

   Margin value = Emission level – Limit value

2. 2437 MHz: Fundamental frequency.

3. The emission levels of other frequencies were very low against the limit.

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462.00	92.37	90.44	1.93			106	66	Average
2462.00	99.36	97.43	1.93			106	66	Peak
2483.56	41.42	39.46	1.96	54.0	-12.58	106	66	Average
2483.56	56.04	54.08	1.96	74.0	-17.96	106	66	Peak
4924.00	39.67	31.42	8.25	54.0	-14.33	130	118	Average
4924.00	45.37	37.12	8.25	74.0	-28.63	130	118	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462.00	104.29	102.36	1.93			144	287	Average
2462.00	111.03	109.10	1.93			144	287	Peak
2483.56	**52.87**	**50.91**	**1.96**	**54.0**	**-1.13**	**149**	**252**	**Average**
2483.56	67.79	65.83	1.96	74.0	-6.21	149	252	Peak
4924.00	39.74	31.49	8.25	54.0	-14.26	138	250	Average
4924.00	46.74	38.49	8.25	74.0	-27.26	138	250	Peak

Remarks:

1. Emission Level = Read Level + Factor

   Margin value = Emission level – Limit value

2. 2462 MHz: Fundamental frequency.

3. The emission levels of other frequencies were very low against the limit.

802.11n (HT40)

CHANNEL	TX Channel 3	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2384.79	41.07	39.38	1.69	54.0	-12.93	103	66	Average
2384.79	52.11	50.42	1.69	74.0	-21.89	103	66	Peak
2422.00	91.20	89.40	1.80			103	66	Average
2422.00	99.22	97.42	1.80			103	66	Peak
2486.16	41.20	39.21	1.99	54.0	-12.80	103	66	Average
2486.16	51.73	49.74	1.99	74.0	-22.27	103	66	Peak
4844.00	39.69	31.54	8.15	54.0	-14.31	142	1	Average
4844.00	45.45	37.30	8.15	74.0	-28.55	142	1	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.74	52.19	50.48	1.71	54.0	-1.81	120	101	Average
2389.74	67.18	65.47	1.71	74.0	-6.82	120	101	Peak
2422.00	102.46	100.66	1.80			168	215	Average
2422.00	111.35	109.55	1.80			168	215	Peak
2484.68	44.44	42.45	1.99	54.0	-9.56	168	215	Average
2484.68	55.76	53.77	1.99	74.0	-18.24	168	215	Peak
4844.00	40.01	31.86	8.15	54.0	-13.99	153	166	Average
4844.00	45.02	36.87	8.15	74.0	-28.98	153	166	Peak

Remarks:

1. Emission Level = Read Level + Factor

   Margin value = Emission level – Limit value

2. 2422 MHz: Fundamental frequency.

3. The emission levels of other frequencies were very low against the limit.

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2387.49	41.71	40.00	1.71	54.0	-12.29	106	66	Average
2387.49	52.21	50.50	1.71	74.0	-21.79	106	66	Peak
2437.00	94.17	92.32	1.85			106	66	Average
2437.00	101.12	99.27	1.85			106	66	Peak
2485.80	41.62	39.63	1.99	54.0	-12.38	106	66	Average
2485.80	52.52	50.53	1.99	74.0	-21.48	106	66	Peak
4874.00	39.89	31.70	8.19	54.0	-14.11	145	166	Average
4874.00	45.07	36.88	8.19	74.0	-28.93	145	166	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.92	52.64	50.91	1.73	54.0	-1.36	137	8	Average
2389.92	68.62	66.89	1.73	74.0	-5.38	137	8	Peak
2437.00	106.52	104.67	1.85			144	287	Average
2437.00	113.00	111.15	1.85			144	287	Peak
2483.88	51.42	49.46	1.96	54.0	-2.58	144	286	Average
2483.88	63.49	61.53	1.96	74.0	-10.51	144	286	Peak
4874.00	40.30	32.11	8.19	54.0	-13.70	153	26	Average
4874.00	45.18	36.99	8.19	74.0	-28.82	153	26	Peak

Remarks:

1. Emission Level = Read Level + Factor

   Margin value = Emission level – Limit value

2. 2437 MHz: Fundamental frequency.

3. The emission levels of other frequencies were very low against the limit.

CHANNEL	TX Channel 9	DETECTOR FUNCTION	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2387.13	40.64	38.93	1.71	54.0	-13.36	106	66	Average
2387.13	51.73	50.02	1.71	74.0	-22.27	106	66	Peak
2452.00	89.59	87.72	1.87			106	66	Average
2452.00	96.89	95.02	1.87			106	66	Peak
2487.12	41.46	39.47	1.99	54.0	-12.54	106	66	Average
2487.12	53.09	51.10	1.99	74.0	-20.91	106	66	Peak
4904.00	39.77	31.55	8.22	54.0	-14.23	146	11	Average
4904.00	46.89	38.67	8.22	74.0	-27.11	146	11	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2388.66	42.98	41.27	1.71	54.0	-11.02	144	287	Average
2388.66	53.94	52.23	1.71	74.0	-20.06	144	287	Peak
2452.00	101.24	99.37	1.87			144	287	Average
2452.00	108.23	106.36	1.87			144	287	Peak
2483.52	52.59	50.63	1.96	54.0	-1.41	144	354	Average
2483.52	64.90	62.94	1.96	74.0	-9.10	144	354	Peak
4904.00	39.98	31.76	8.22	54.0	-14.02	172	85	Average
4904.00	46.34	38.12	8.22	74.0	-27.66	172	85	Peak

Remarks:

1. Emission Level = Read Level + Factor

   Margin value = Emission level – Limit value

2. 2452 MHz: Fundamental frequency.

3. The emission levels of other frequencies were very low against the limit.

Below 1GHz worst-case data: 802.11n (HT20)

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

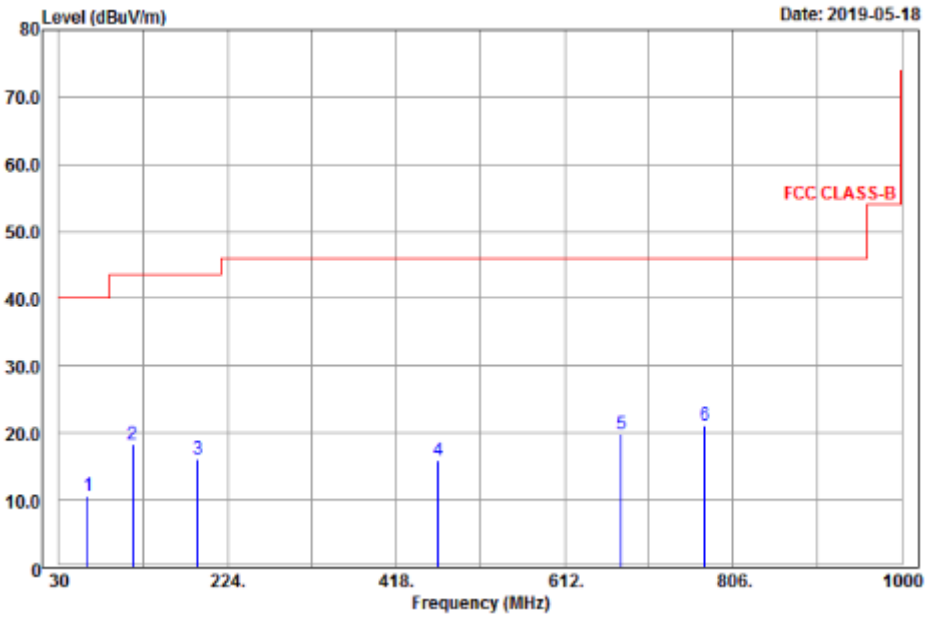
Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
62.94	10.74	29.47	-18.73	40.0	-29.26	121	146	QP
114.78	18.32	37.87	-19.55	43.5	-25.18	130	352	QP
189.84	16.21	36.23	-20.02	43.5	-27.29	165	227	QP
466.60	15.86	29.60	-13.74	46.0	-30.14	136	59	QP
677.30	19.73	29.92	-10.19	46.0	-26.27	177	124	QP
773.90	21.21	29.97	-8.76	46.0	-24.79	138	112	QP

Remarks:

1. Emission Level = Read Level + Factor

   Margin value = Emission level – Limit value

2. The emission levels of other frequencies were very low against the limit.



CHANNEL	TX Channel 6	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

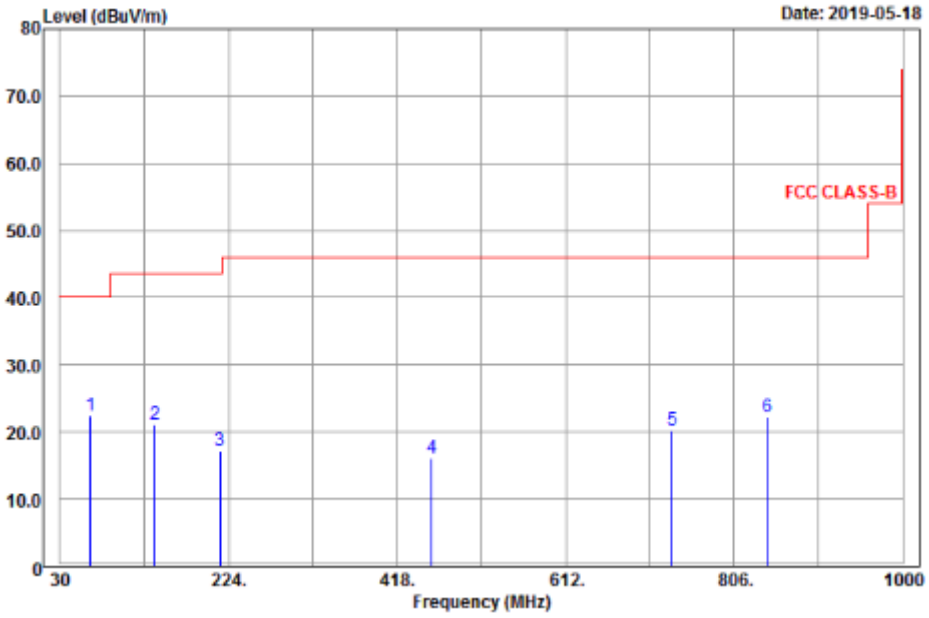
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
65.10	22.42	41.65	-19.23	40.0	-17.58	137	188	QP
139.62	21.06	43.52	-22.46	43.5	-22.44	165	108	QP
214.14	17.14	36.50	-19.36	43.5	-26.36	190	35	QP
458.20	16.21	30.18	-13.97	46.0	-29.79	104	182	QP
734.70	20.28	29.60	-9.32	46.0	-25.72	165	325	QP
844.60	22.27	29.76	-7.49	46.0	-23.73	148	124	QP

Remarks:

1. Emission Level = Read Level + Factor

   Margin value = Emission level – Limit value

2. The emission levels of other frequencies were very low against the limit.



4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Dec. 10, 2018	Dec. 09, 2019
RF signal cable Woken	5D-FB	Cable-cond1-01	Sep. 05, 2018	Sep. 04, 2019
LISN ROHDE & SCHWARZ (EUT)	ENV216	101826	Feb. 21, 2019	Feb. 20, 2020
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Aug. 19, 2018	Aug. 18, 2019
Software ADT	BV ADT_Cond_ V7.3.7.4	NA	NA	NA

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. The test was performed in HwaYa Shielded Room 1.
3. The VCCI Site Registration No. is C-12040.

4.2.3 Test Procedures

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

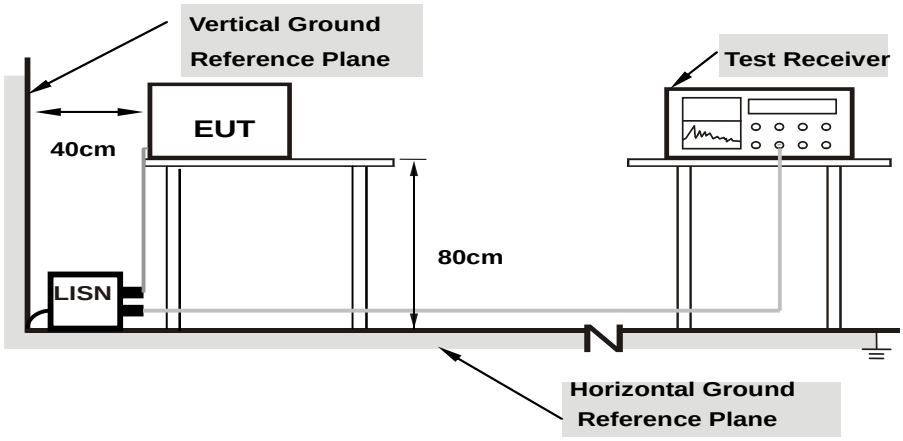
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

Note: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



Note: 1.Support units were connected to second LISN.

For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.2.6 EUT Operating Conditions

Same as 4.1.6.

4.2.7 Test Results

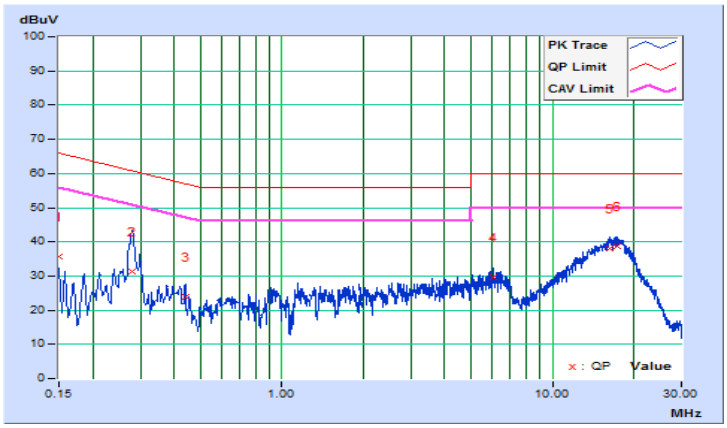
Worst-case data: 802.11n(HT20)

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	9.69	26.11	9.88	35.80	19.57	66.00	56.00	-30.20	-36.43
2	0.27918	9.68	21.75	5.37	31.43	15.05	60.84	50.84	-29.41	-35.79
3	0.43924	9.68	14.21	2.07	23.89	11.75	57.08	47.08	-33.19	-35.33
4	6.05801	9.79	19.91	10.56	29.70	20.35	60.00	50.00	-30.30	-29.65
5	16.23183	9.91	28.21	21.57	38.12	31.48	60.00	50.00	-21.88	-18.52
6	**17.32272**	**9.92**	**28.77**	**21.71**	**38.69**	**31.63**	**60.00**	**50.00**	**-21.31**	**-18.37**

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

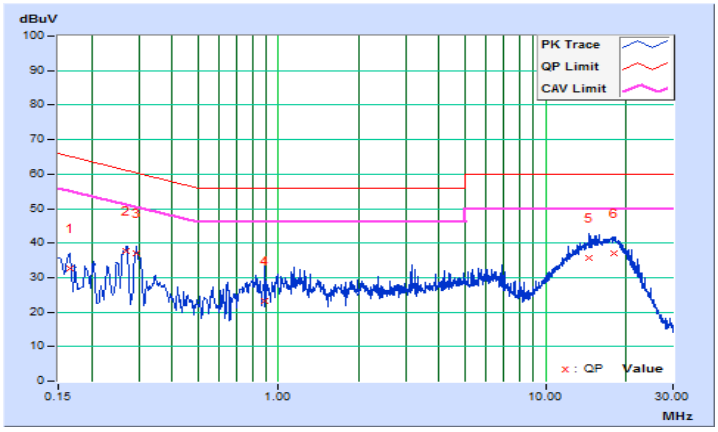


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16526	9.66	23.03	5.85	32.69	15.51	65.20	55.20	-32.51	-39.69
2	0.27049	9.66	28.04	22.21	37.70	31.87	61.10	51.10	-23.40	-19.23
3	0.29467	9.66	27.49	20.18	37.15	29.84	60.39	50.39	-23.24	-20.55
4	0.88899	9.64	13.62	0.61	23.26	10.25	56.00	46.00	-32.74	-35.75
5	14.47624	9.92	25.62	18.87	35.54	28.79	60.00	50.00	-24.46	-21.21
6	18.10472	9.97	27.07	20.75	37.04	30.72	60.00	50.00	-22.96	-19.28

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

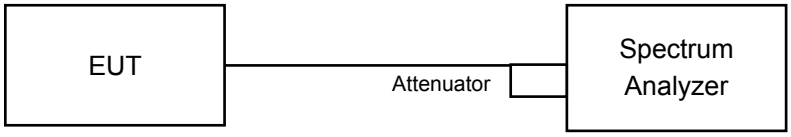


4.3 6dB Bandwidth Measurement

4.3.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

a. Set resolution bandwidth (RBW) = 100kHz.
b. Set the video bandwidth (VBW) ≥ 3 x RBW, Detector = peak.
c. Trace mode = max hold.
d. Sweep = auto couple.
e. Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

4.3.5 Deviation fromTest Standard

No deviation.

4.3.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.3.7 Test Result

802.11b

Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
1	2412	7.07	6.57	7.07	7.06	0.5	Pass
6	2437	7.08	6.62	7.09	7.09	0.5	Pass
11	2462	7.06	6.62	7.08	7.11	0.5	Pass

802.11g

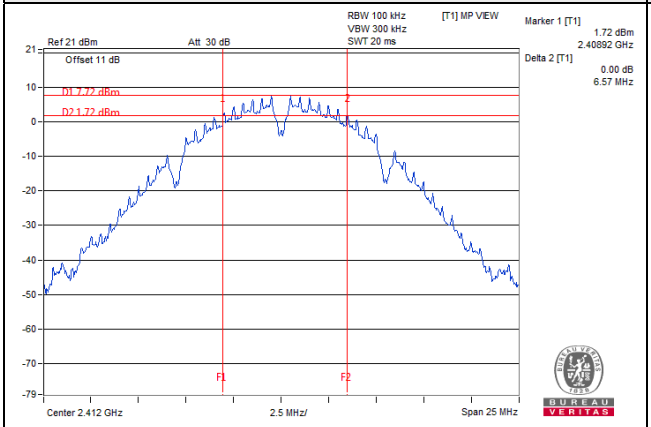
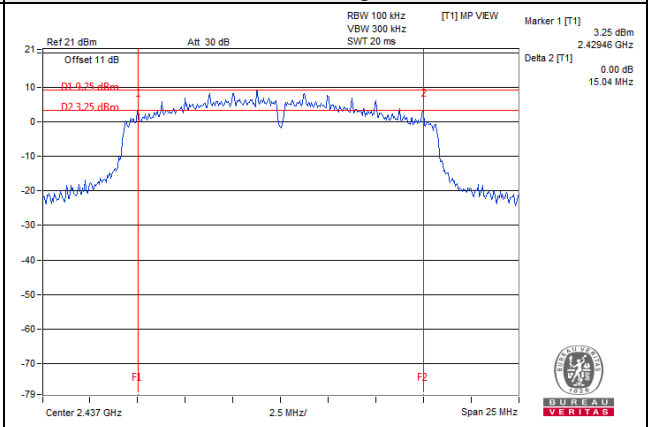
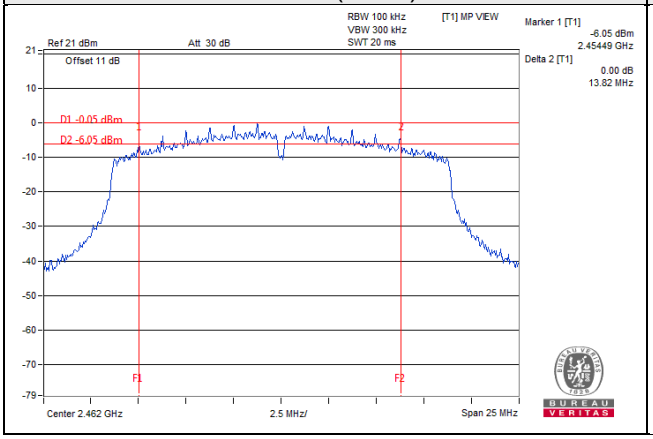
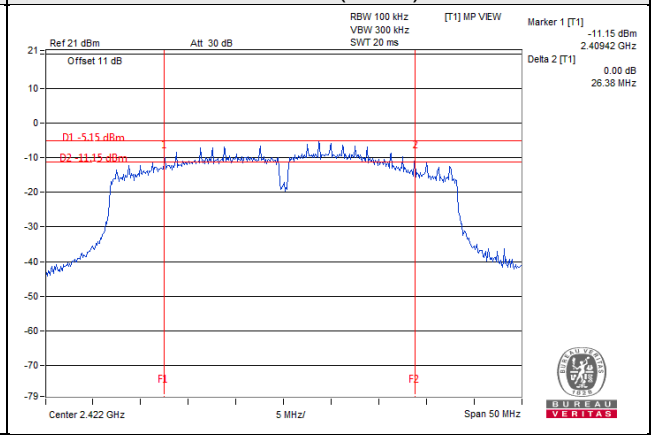
Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
1	2412	15.14	15.33	15.09	15.16	0.5	Pass
6	2437	15.11	15.04	15.07	15.08	0.5	Pass
11	2462	15.09	15.12	15.15	15.10	0.5	Pass

802.11n (HT20)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
1	2412	15.17	15.36	15.15	15.14	0.5	Pass
6	2437	15.15	15.07	15.11	15.09	0.5	Pass
11	2462	15.15	15.11	13.82	15.10	0.5	Pass

802.11n (HT40)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
3	2422	33.81	26.38	31.32	28.93	0.5	Pass
6	2437	33.81	28.84	28.83	30.13	0.5	Pass
9	2452	33.82	28.85	33.83	33.84	0.5	Pass

Spectrum Plot of Worst Value	
802.11b	802.11g
	
802.11n (HT20)	802.11n (HT40)
	

4.4 Conducted Output Power Measurement

4.4.1 Limits of Conducted Output Power Measurement

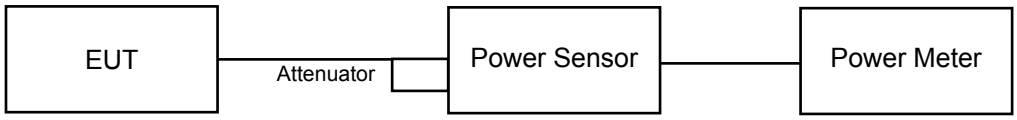
For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30dBm)

Per KDB 662911 D01 Multiple Transmitter Output Method of conducted output power measurement on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;
Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT};
Array Gain = 5 log(N_{ANT}/N_{SS}) dB or 3 dB, whichever is less for 20-MHz channel widths with $N_{ANT} \geq 5$.

For power measurements on all other devices: Array Gain = 10 log(N_{ANT}/N_{SS}) dB.

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 Test Procedures

Average power sensor was used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Conditions

Same as item 4.3.6.

4.4.7 Test Results

802.11b

Chan.	Chan. Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
1	2412	14.89	14.83	15.34	15.03	127.281	21.05	30	Pass
6	2437	15.82	15.05	15.32	15.40	138.898	21.43	30	Pass
11	2462	17.64	16.14	16.38	17.51	199.006	22.99	30	Pass

802.11g

Chan.	Chan. Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
1	2412	12.12	12.12	13.54	12.67	73.673	18.67	30	Pass
6	2437	20.07	19.57	19.39	19.64	371.139	25.70	30	Pass
11	2462	12.38	10.63	11.26	12.84	61.456	17.89	30	Pass

802.11n (HT20)

Chan.	Chan. Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
1	2412	9.95	9.61	10.73	11.05	43.592	16.39	30	Pass
6	2437	21.52	20.53	20.30	20.26	468.208	**26.70**	30	Pass
11	2462	10.89	9.54	10.01	11.50	45.417	16.57	30	Pass

802.11n (HT40)

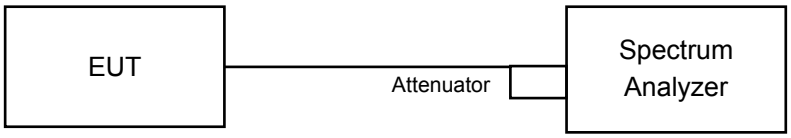
Chan.	Chan. Freq. (MHz)	Average Power (dBm)				Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3				
3	2422	7.23	7.07	7.96	7.62	22.410	13.50	30	Pass
6	2437	12.99	12.13	12.73	13.41	76.916	18.86	30	Pass
9	2452	7.89	6.88	7.31	8.29	23.155	13.65	30	Pass

4.5 Power Spectral Density Measurement

4.5.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8dBm/3kHz.

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedure

For Average Power (Duty cycle ≥ 98%)
a) Set instrument center frequency to DTS channel center frequency.
b) Set span to at least 1.5 times the OBW.
c) Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d) Set VBW ≥3 x RBW.
e) Detector = power averaging (RMS) or sample detector (when RMS not available).
f) Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW.
g) Sweep time = auto couple.
h) Employ trace averaging (RMS) mode over a minimum of 100 traces.
i) Use the peak marker function to determine the maximum amplitude level.

For Average Power (Duty cycle < 98%)
a) Measure the duty cycle (x).
b) Set instrument center frequency to DTS channel center frequency.
c) Set span to at least 1.5 times the OBW.
d) Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
e) Set VBW ≥3 x RBW.
f) Detector = power averaging (RMS) or sample detector (when RMS not available).
g) Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW.
h) Sweep time = auto couple.
i) Do not use sweep triggering. Allow sweep to “free run”.
j) Employ trace averaging (RMS) mode over a minimum of 100 traces.
k) Use the peak marker function to determine the maximum amplitude level.
l) Add 10 log (1/x), where x is the duty cycle measured in step (a, to the measured PSD to compute the average PSD during the actual transmission time.

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

Same as item 4.3.6.

4.5.7 Test Results

802.11b

TX chain	Channel	Freq. (MHz)	PSD (dBm/10kHz)	10 log (N=4) dB	Total PSD With Duty Factor (dBm/10kHz)	Limit (dBm/3kHz)	Pass / Fail
0	1	2412	-12.76	6.02	-6.74	2.98	Pass
	6	2437	-11.64	6.02	-5.62	2.98	Pass
	11	2462	-9.48	6.02	-3.46	2.98	Pass
1	1	2412	-12.31	6.02	-6.29	2.98	Pass
	6	2437	-12.76	6.02	-6.74	2.98	Pass
	11	2462	-11.15	6.02	-5.13	2.98	Pass
2	1	2412	-12.22	6.02	-6.20	2.98	Pass
	6	2437	-13.29	6.02	-7.27	2.98	Pass
	11	2462	-11.33	6.02	-5.31	2.98	Pass
3	1	2412	-12.14	6.02	-6.12	2.98	Pass
	6	2437	-11.42	6.02	-5.40	2.98	Pass
	11	2462	-10.35	6.02	-4.33	2.98	Pass

Note:
1. Method E) 2) c) of power density measurement of KDB 662911 is using for calculating total power density.
2. Directional gain = 5dBi + 10log(4) = 11.02dBi > 6dBi, so the power density limit shall be reduced to 8-(11.02-6) = 2.98dBm.

802.11g

TX chain	Channel	Freq. (MHz)	PSD (dBm/10kHz)	10 log (N=4) dB	Total PSD With Duty Factor (dBm/10kHz)	Limit (dBm/3kHz)	Pass / Fail
0	1	2412	-17.69	6.02	-11.67	2.98	Pass
	6	2437	-3.33	6.02	2.69	2.98	Pass
	11	2462	-17.81	6.02	-11.79	2.98	Pass
1	1	2412	-18.23	6.02	-12.21	2.98	Pass
	6	2437	-9.72	6.02	-3.70	2.98	Pass
	11	2462	-19.24	6.02	-13.22	2.98	Pass
2	1	2412	-16.44	6.02	-10.42	2.98	Pass
	6	2437	-10.36	6.02	-4.34	2.98	Pass
	11	2462	-19.78	6.02	-13.76	2.98	Pass
3	1	2412	-16.76	6.02	-10.74	2.98	Pass
	6	2437	-9.91	6.02	-3.89	2.98	Pass
	11	2462	-17.70	6.02	-11.68	2.98	Pass

Note:
1. Method E) 2) c) of power density measurement of KDB 662911 is using for calculating total power density.
2. Directional gain = 5dBi + 10log(4) = 11.02dBi > 6dBi, so the power density limit shall be reduced to 8-(11.02-6) = 2.98dBm.

802.11n (HT20)

TX chain	Channel	Freq. (MHz)	PSD (dBm/10kHz)	10 log (N=4) dB	Total PSD With Duty Factor (dBm/10kHz)	Limit (dBm/3kHz)	Pass / Fail
0	1	2412	-19.97	6.02	-13.95	2.98	Pass
	6	2437	-9.40	6.02	-3.38	2.98	Pass
	11	2462	-18.94	6.02	-12.92	2.98	Pass
1	1	2412	-20.85	6.02	-14.83	2.98	Pass
	6	2437	-8.99	6.02	-2.97	2.98	Pass
	11	2462	-20.32	6.02	-14.30	2.98	Pass
2	1	2412	-19.41	6.02	-13.39	2.98	Pass
	6	2437	-9.21	6.02	-3.19	2.98	Pass
	11	2462	-19.73	6.02	-13.71	2.98	Pass
3	1	2412	-18.96	6.02	-12.94	2.98	Pass
	6	2437	-9.63	6.02	-3.61	2.98	Pass
	11	2462	-18.24	6.02	-12.22	2.98	Pass

Note:

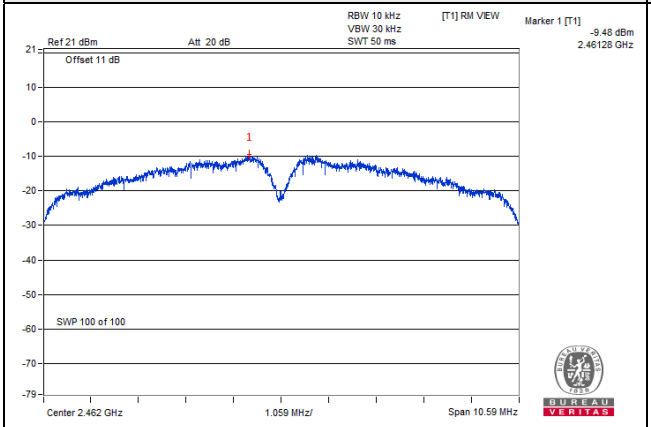
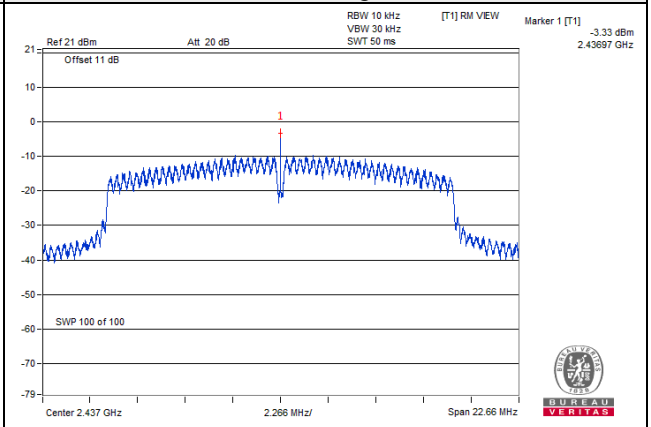
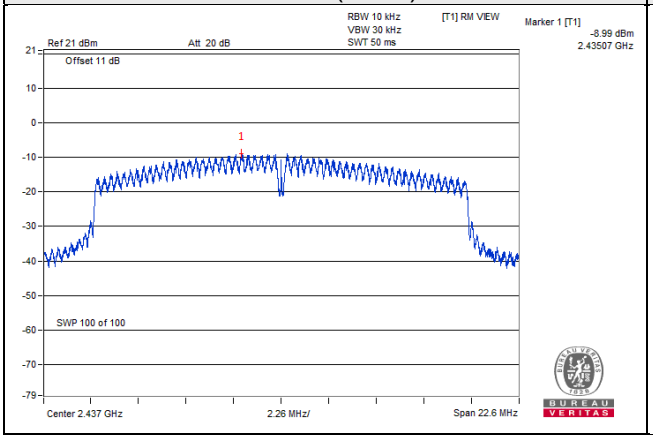
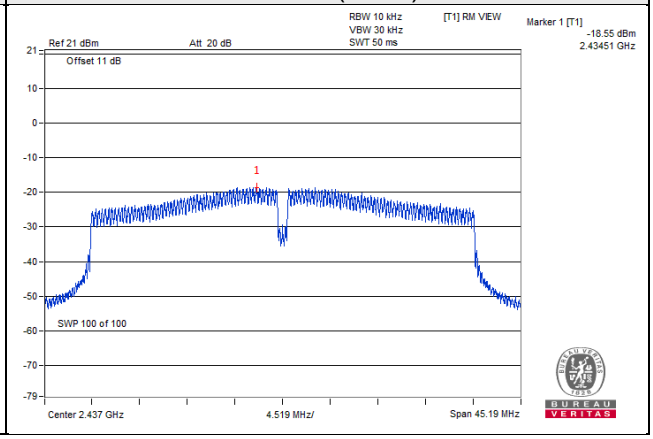
1. Method E) 2) c) of power density measurement of KDB 662911 is using for calculating total power density.
2. Directional gain = 5dBi + 10log(4) = 11.02dBi > 6dBi, so the power density limit shall be reduced to 8-(11.02-6) = 2.98dBm.

802.11n (HT40)

TX chain	Channel	Freq. (MHz)	PSD (dBm/10kHz)	10 log (N=4) dB	Total PSD With Duty Factor (dBm/10kHz)	Limit (dBm/3kHz)	Pass / Fail
0	3	2422	-25.33	6.02	-19.31	2.98	Pass
	6	2437	-19.57	6.02	-13.55	2.98	Pass
	9	2452	-24.44	6.02	-18.42	2.98	Pass
1	3	2422	-24.27	6.02	-18.25	2.98	Pass
	6	2437	-19.90	6.02	-13.88	2.98	Pass
	9	2452	-24.66	6.02	-18.64	2.98	Pass
2	3	2422	-23.93	6.02	-17.91	2.98	Pass
	6	2437	-19.67	6.02	-13.65	2.98	Pass
	9	2452	-24.18	6.02	-18.16	2.98	Pass
3	3	2422	-24.23	6.02	-18.21	2.98	Pass
	6	2437	-18.55	6.02	-12.53	2.98	Pass
	9	2452	-23.36	6.02	-17.34	2.98	Pass

Note:

1. Method E) 2) c) of power density measurement of KDB 662911 is using for calculating total power density.
2. Directional gain = 5dBi + 10log(4) = 11.02dBi > 6dBi, so the power density limit shall be reduced to 8-(11.02-6) = 2.98dBm.

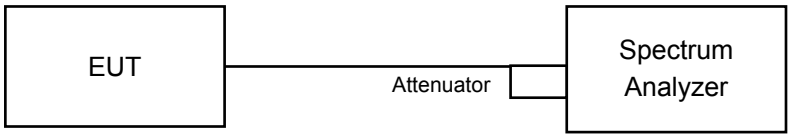
Spectrum Plot of Worst Value	
802.11b	802.11g
	
802.11n (HT20)	802.11n (HT40)
	

4.6 Conducted Out of Band Emission Measurement

4.6.1 Limits of Conducted Out of Band Emission Measurement

Below -30dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

4.6.2 Test Setup



4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

MEASUREMENT PROCEDURE REF

1. Set the RBW = 100 kHz.
2. Set the VBW ≥ 300 kHz.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

MEASUREMENT PROCEDURE OOBE

1. Set RBW = 100 kHz.
2. Set VBW ≥ 300 kHz.
3. Detector = peak.
4. Sweep = auto couple.
5. Trace Mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

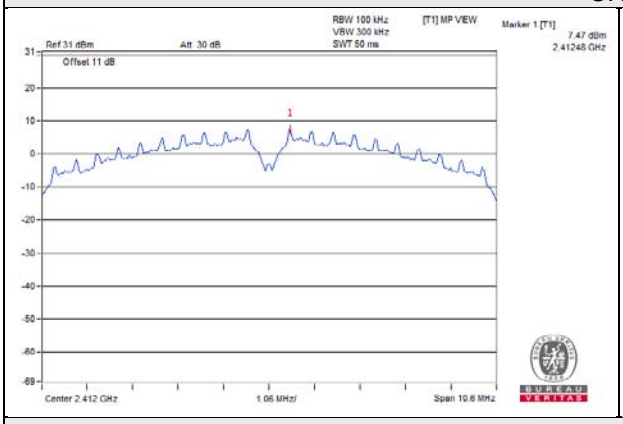
Same as item 4.3.6.

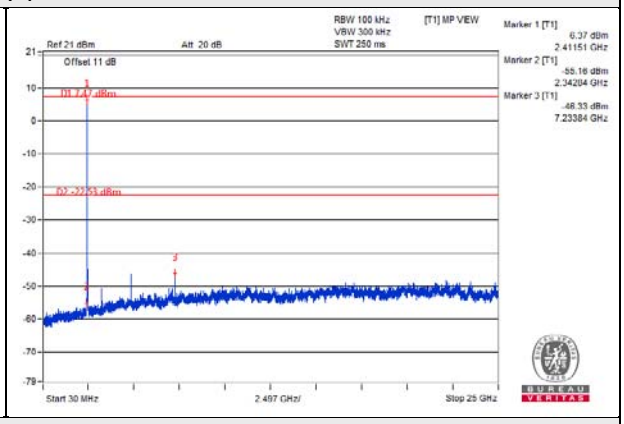
4.6.7 Test Results

The conducted emission test is performed on each TX port of operating mode without summing or adding 10log (N) since the limit is relative emission limit.
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 30dB offset below D1. It shows compliance with the requirement.

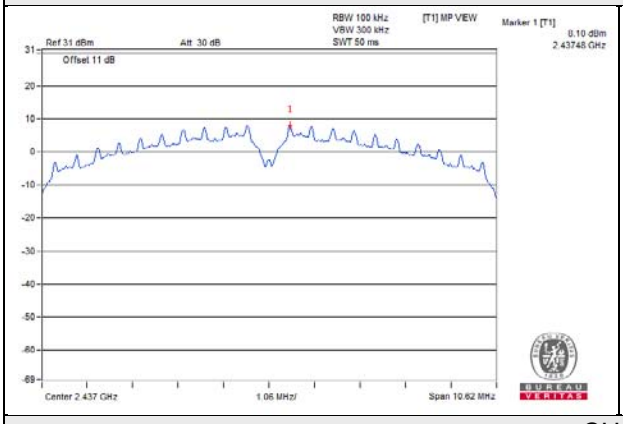
802.11b_Chain 0

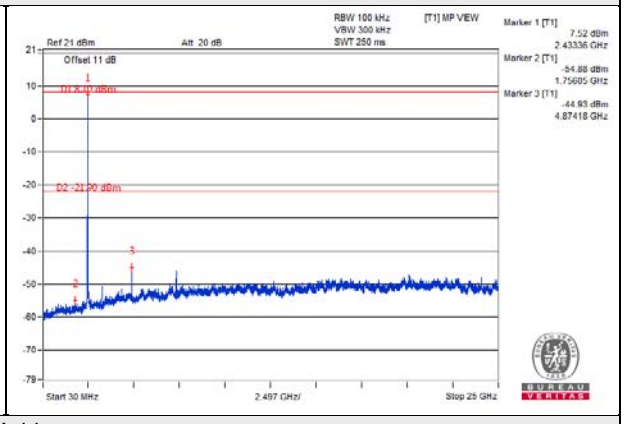
CH 1



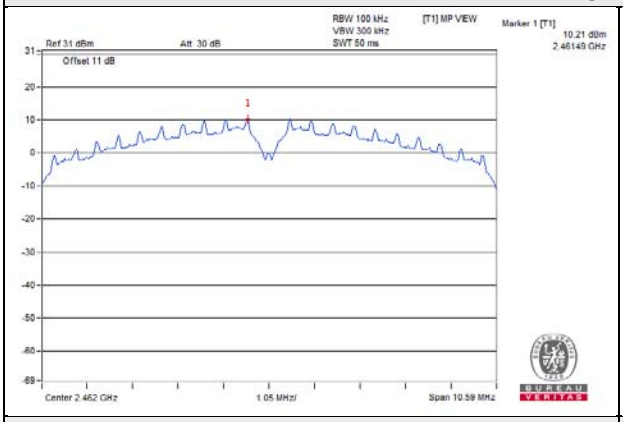


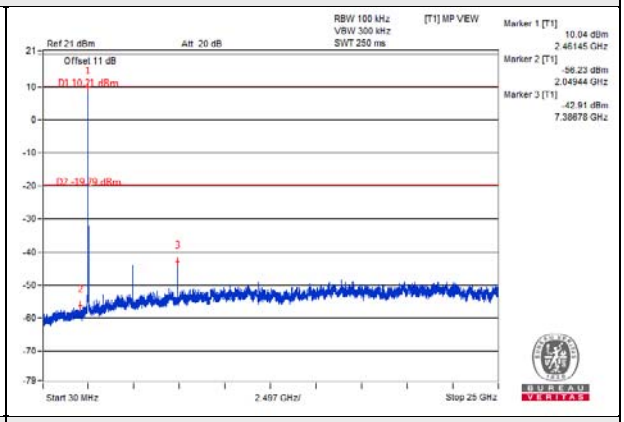
CH 6



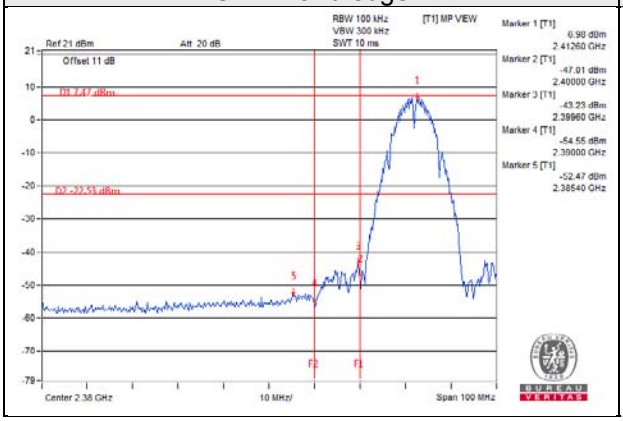


CH 11

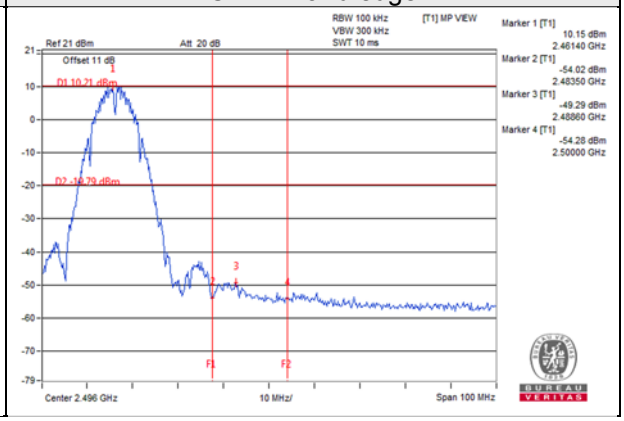




CH 1 Band edge

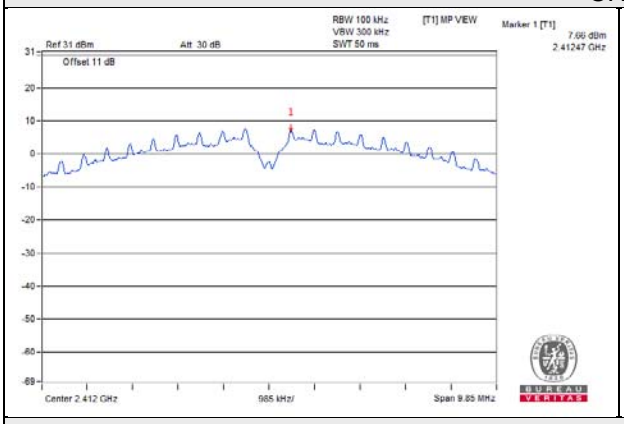


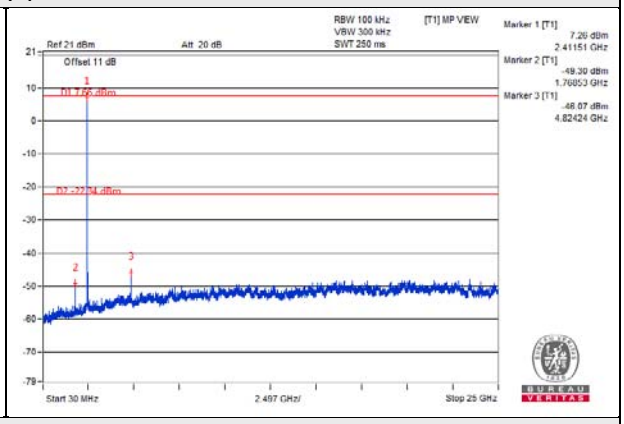
CH 11 Band edge



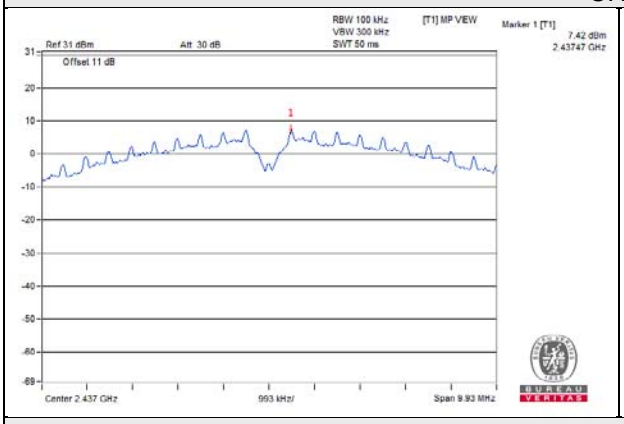
802.11b_Chain 1

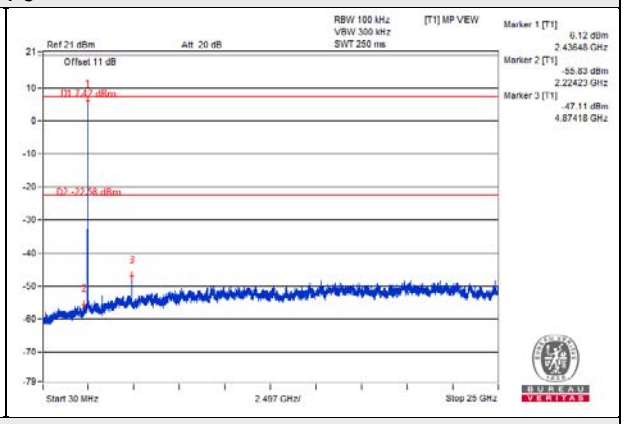
CH 1



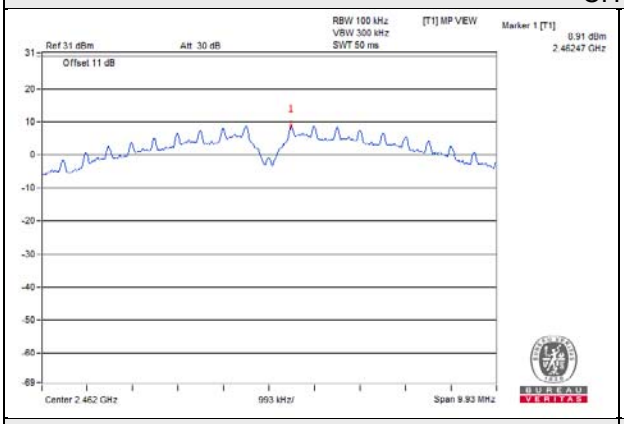


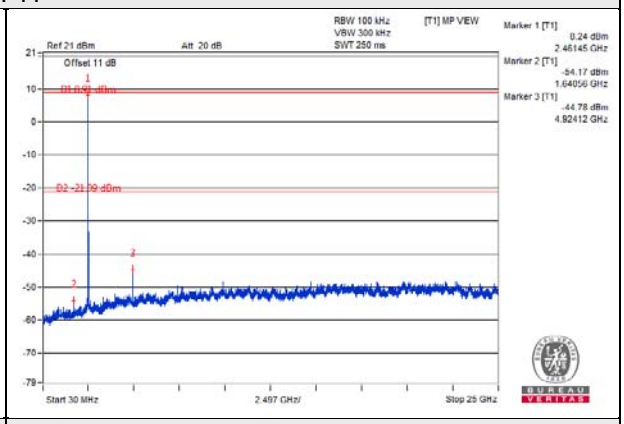
CH 6



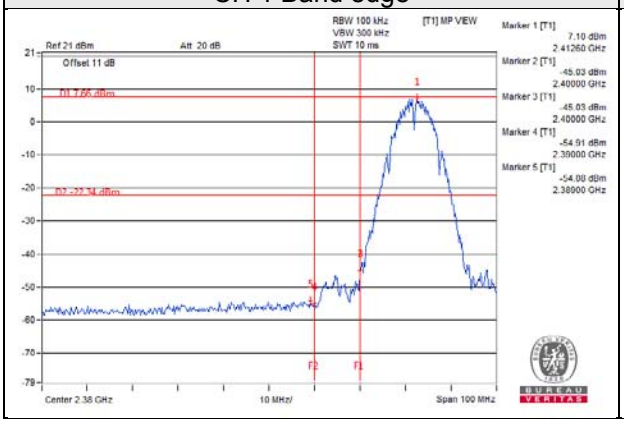


CH 11

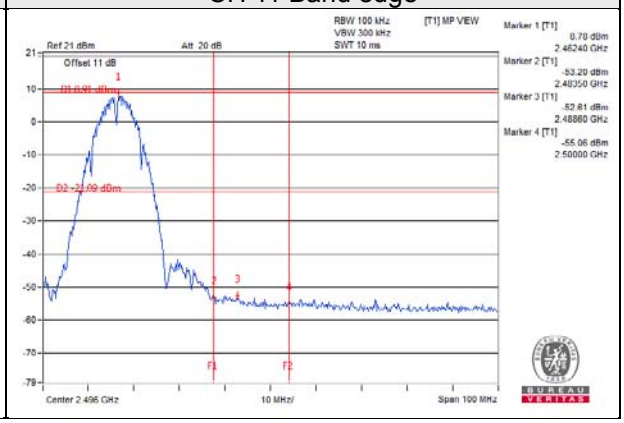




CH 1 Band edge

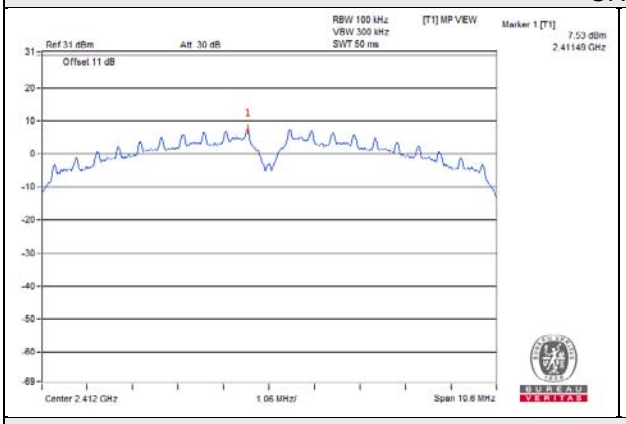


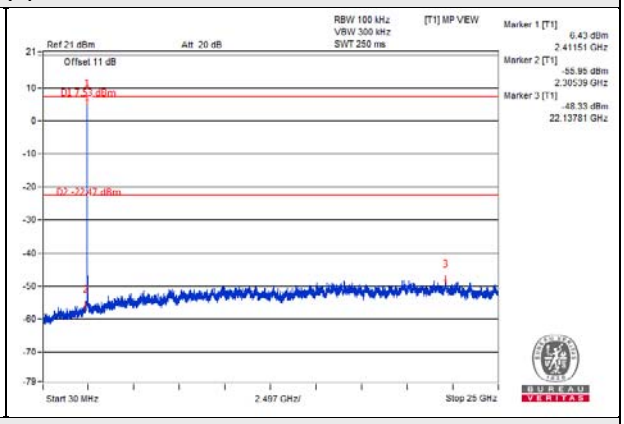
CH 11 Band edge



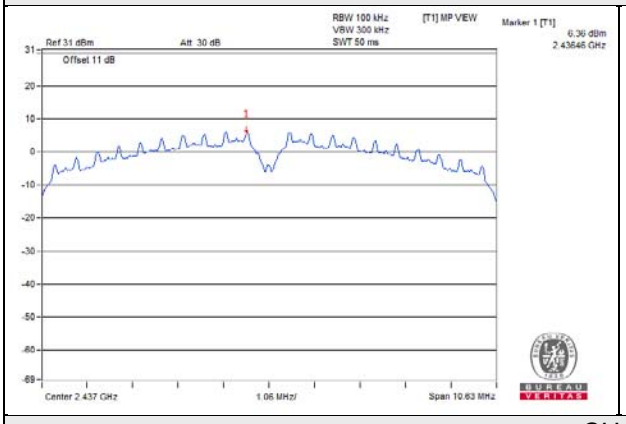
802.11b_Chain 2

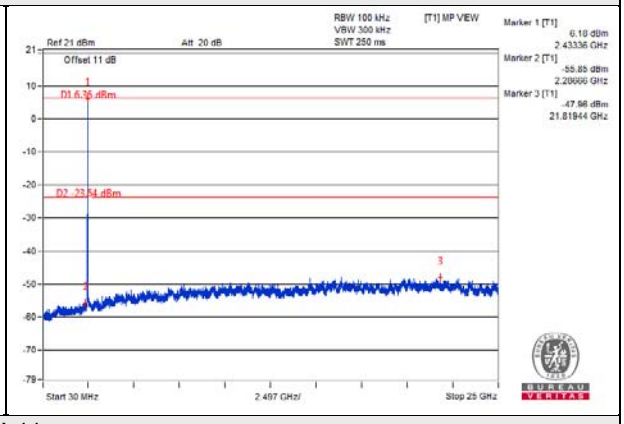
CH 1



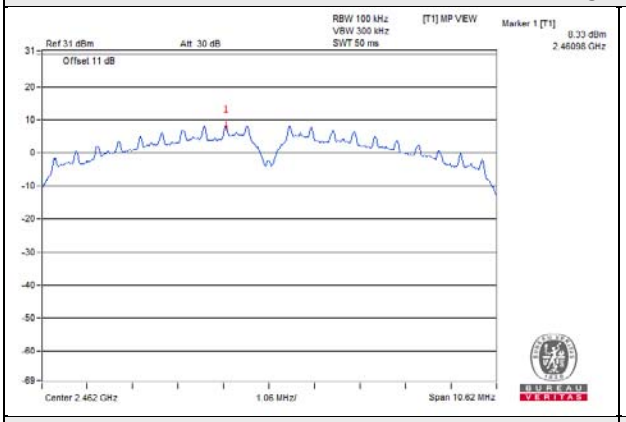


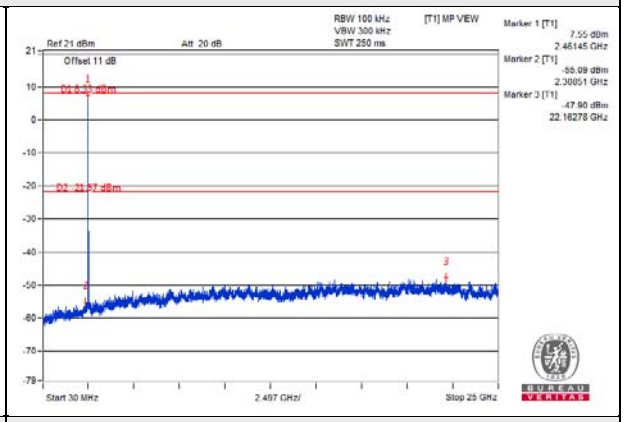
CH 6



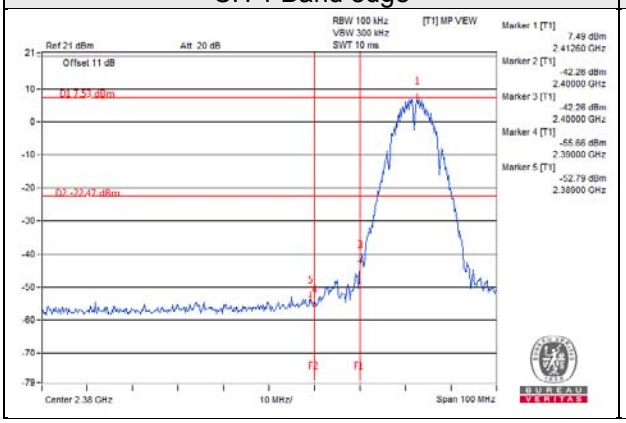


CH 11

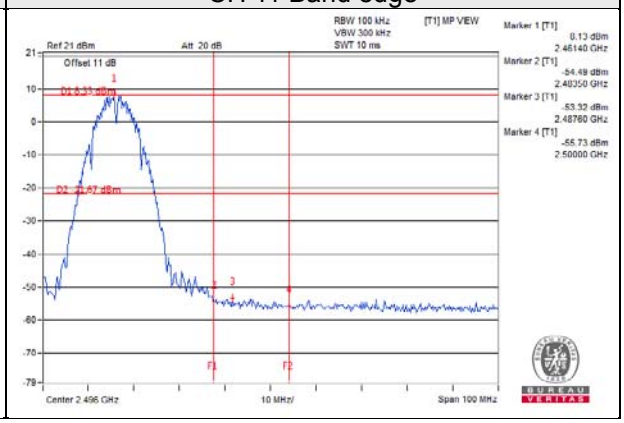




CH 1 Band edge

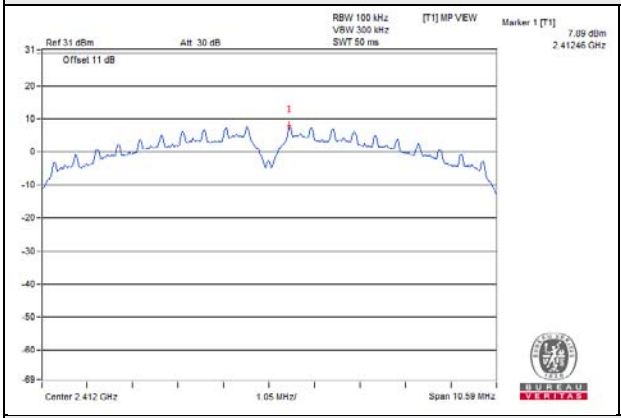


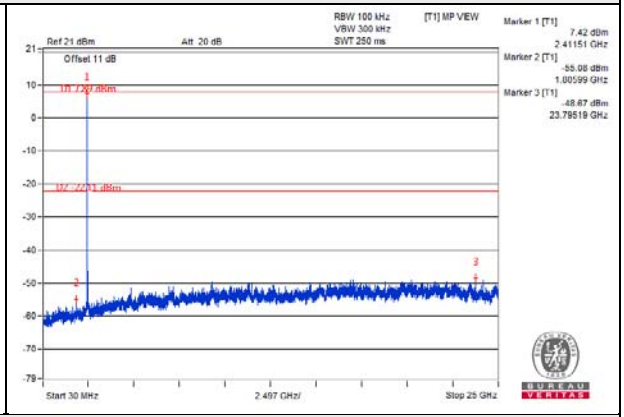
CH 11 Band edge



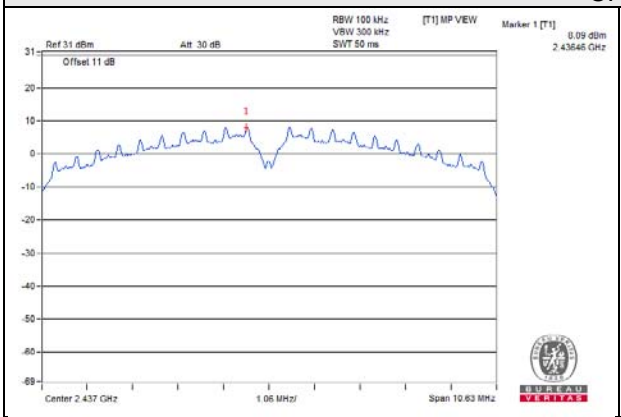
802.11b_Chain 3

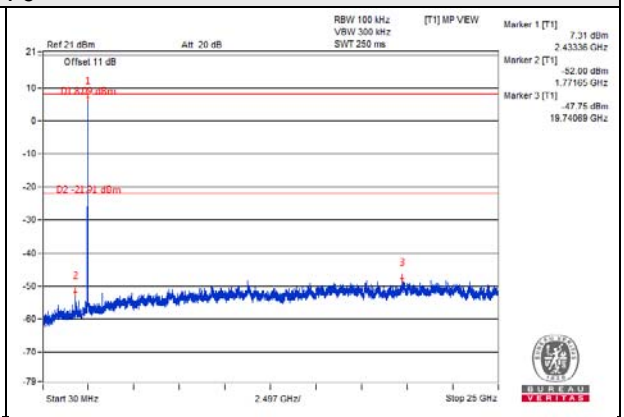
CH 1



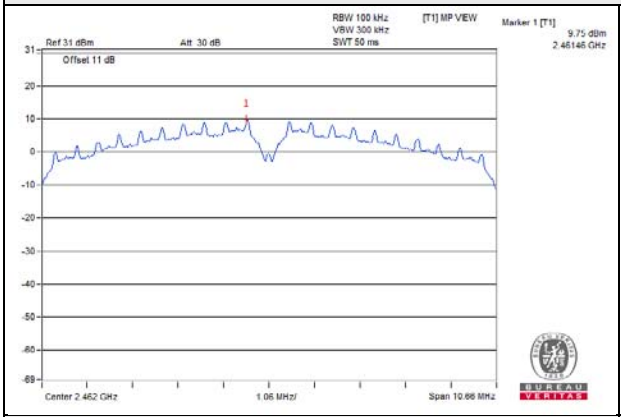


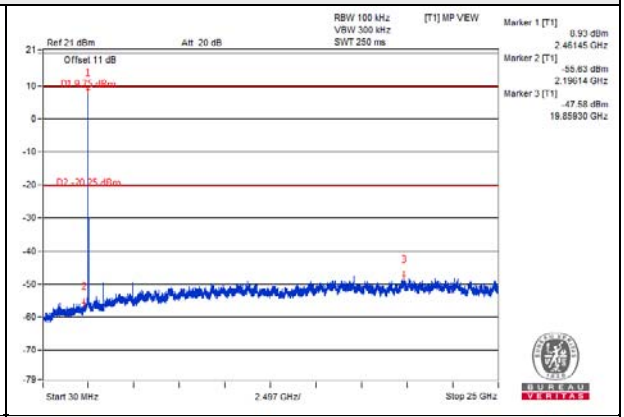
CH 6



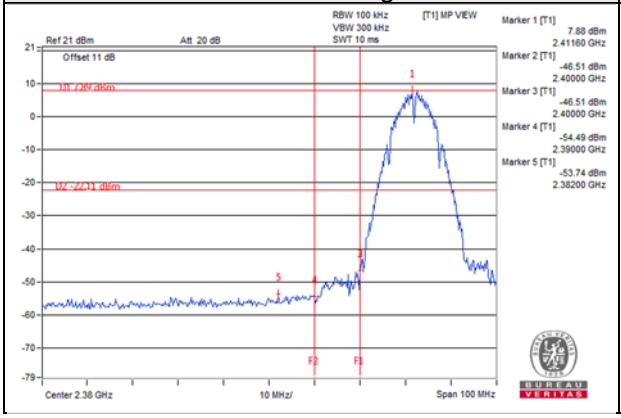


CH 11

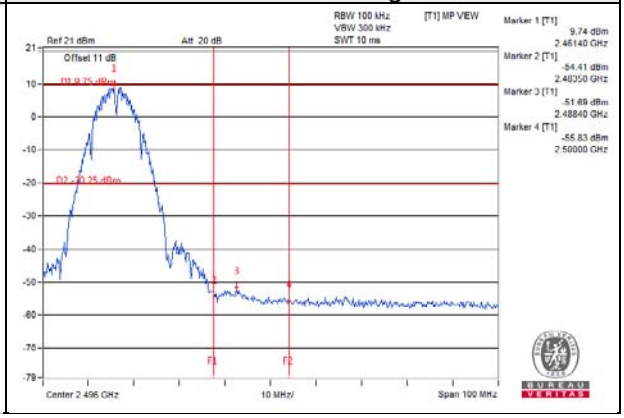




CH 1 Band edge

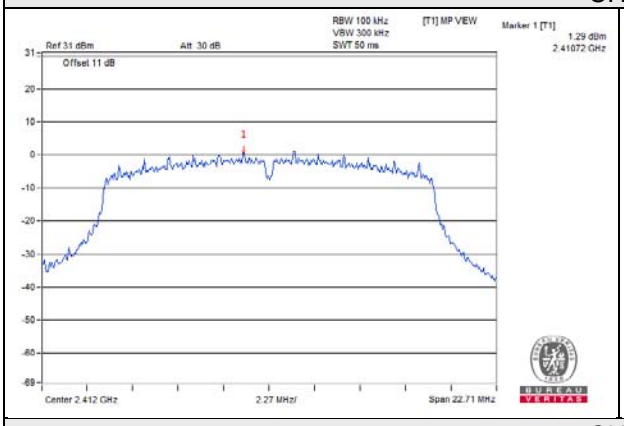


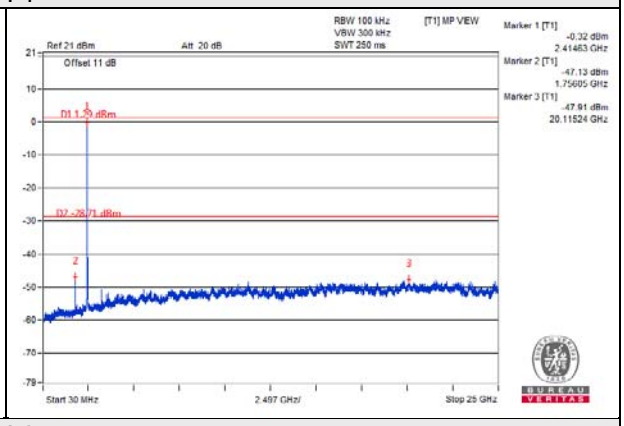
CH 11 Band edge



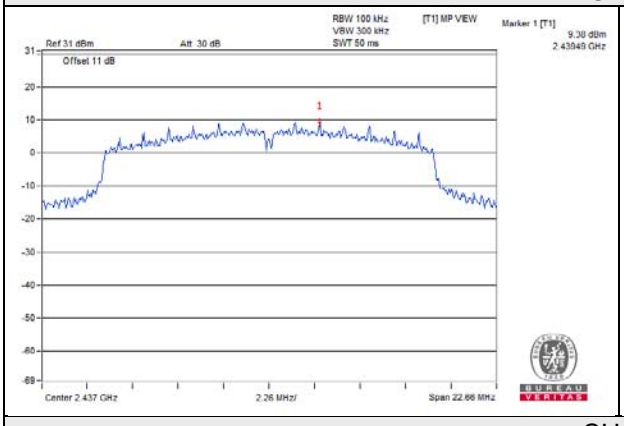
802.11g_Chain 0

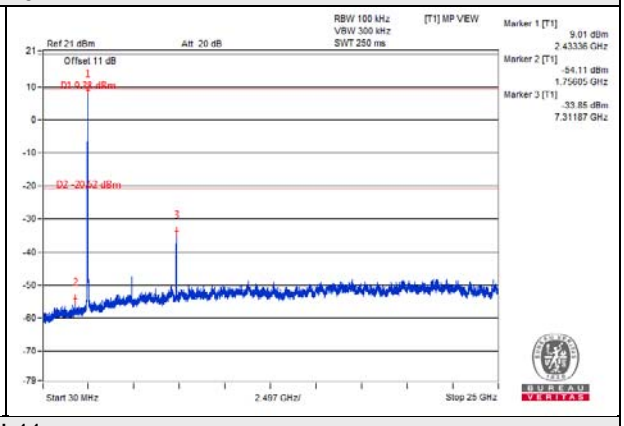
CH 1



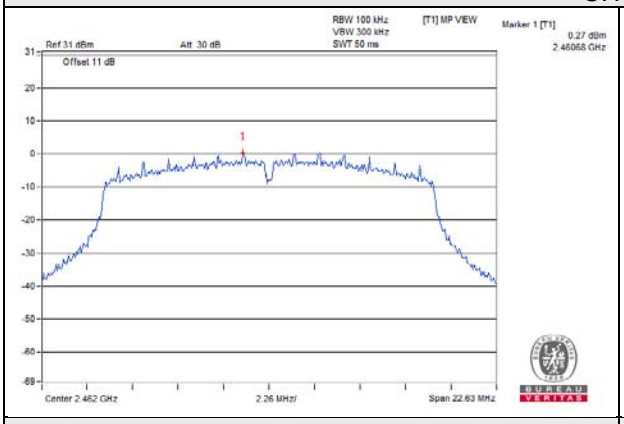


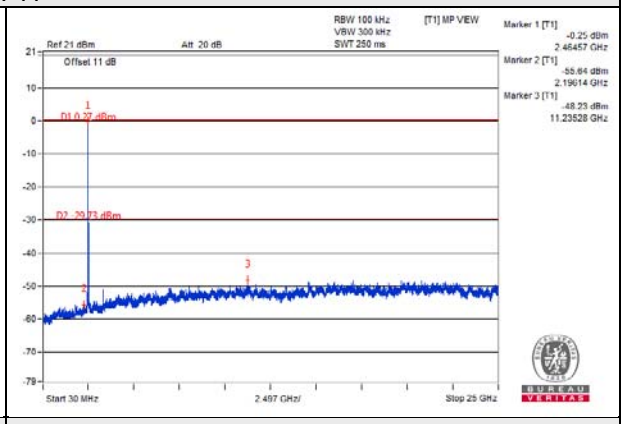
CH 6



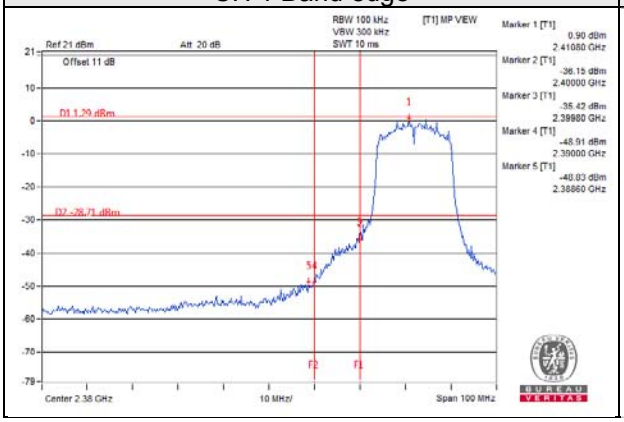


CH 11

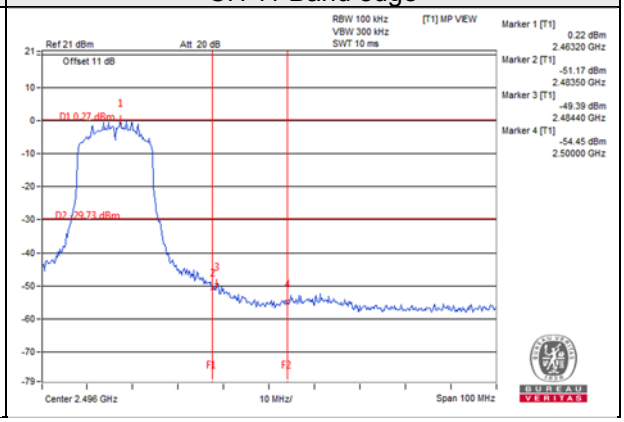




CH 1 Band edge

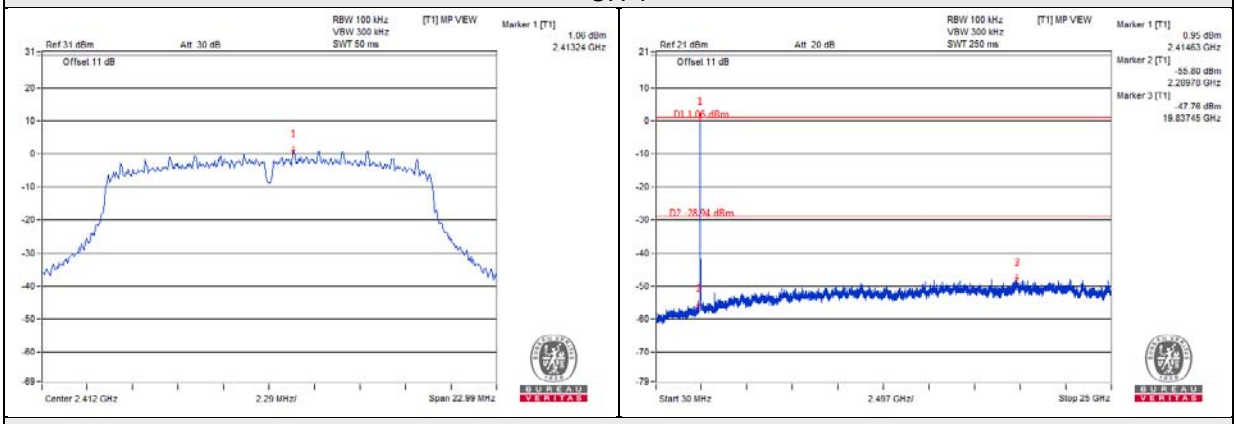


CH 11 Band edge

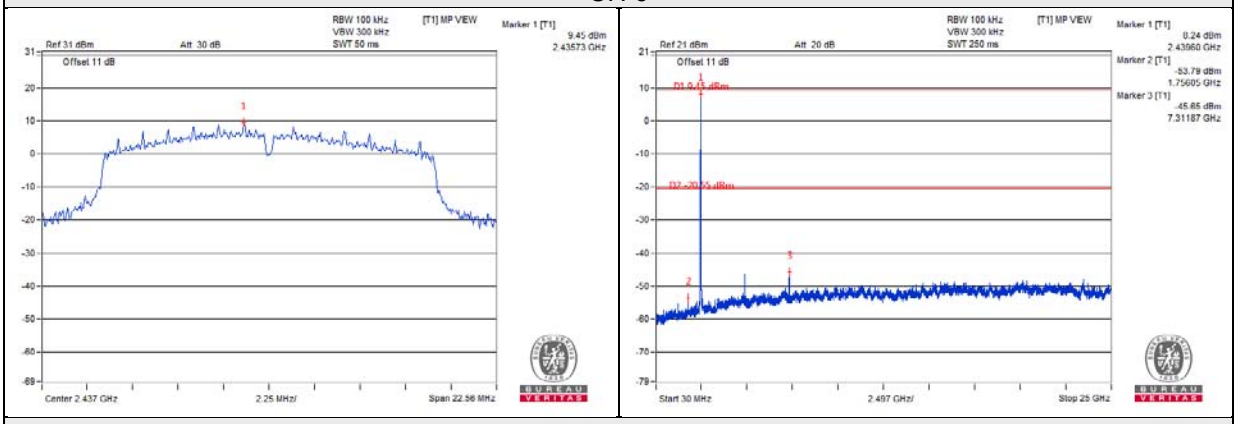


802.11g_Chain 1

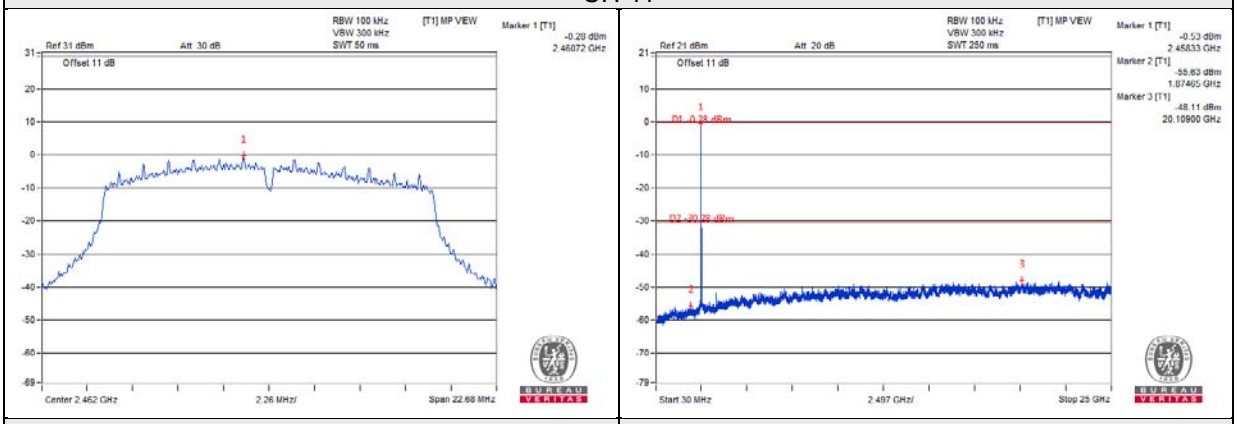
CH 1



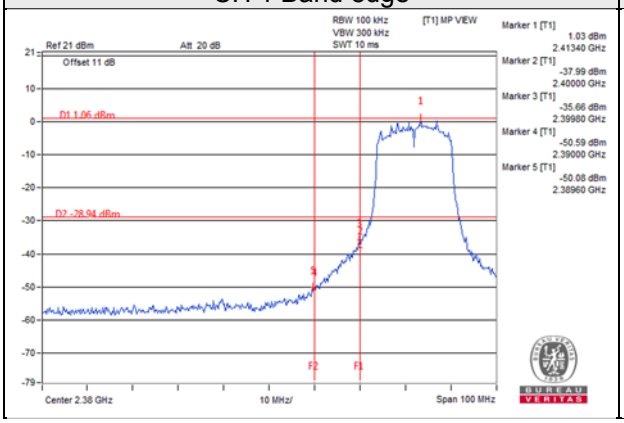
CH 6



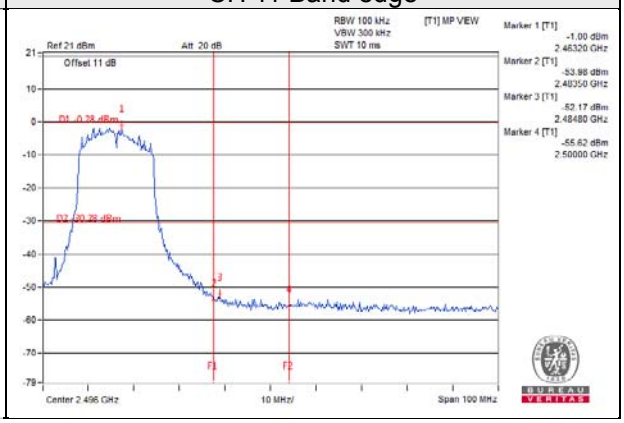
CH 11



CH 1 Band edge

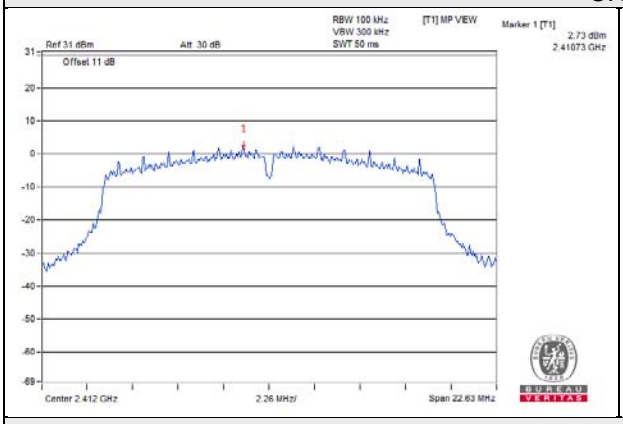


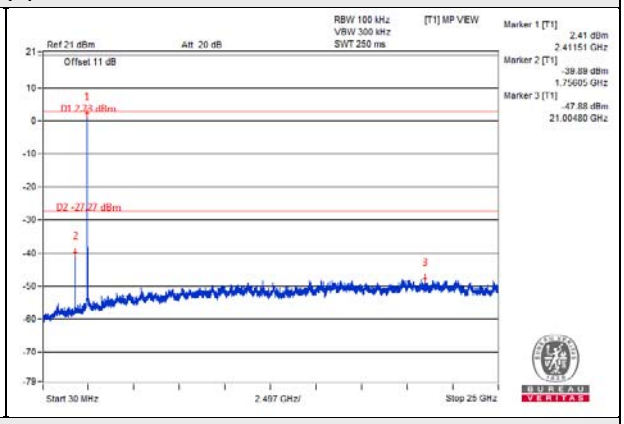
CH 11 Band edge



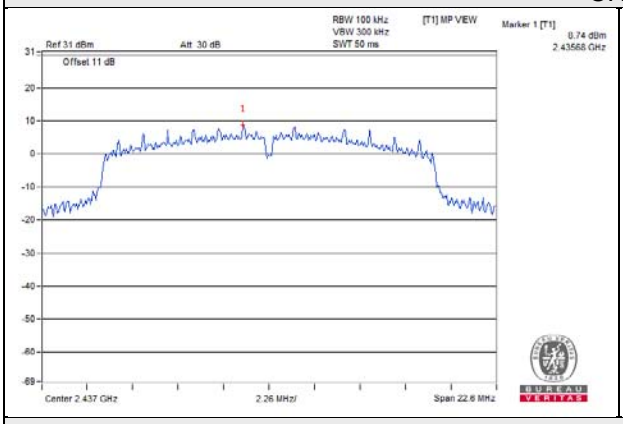
802.11g_Chain 2

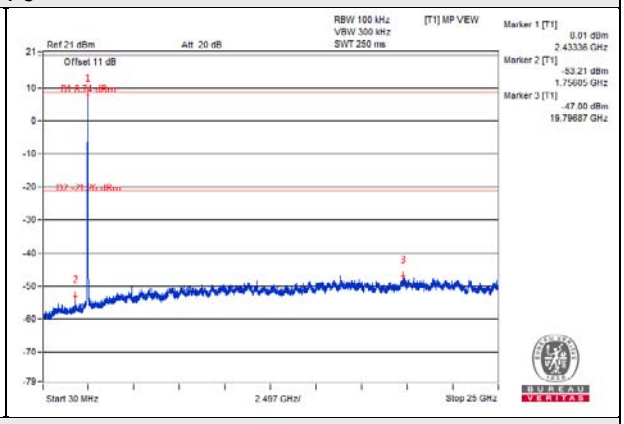
CH 1



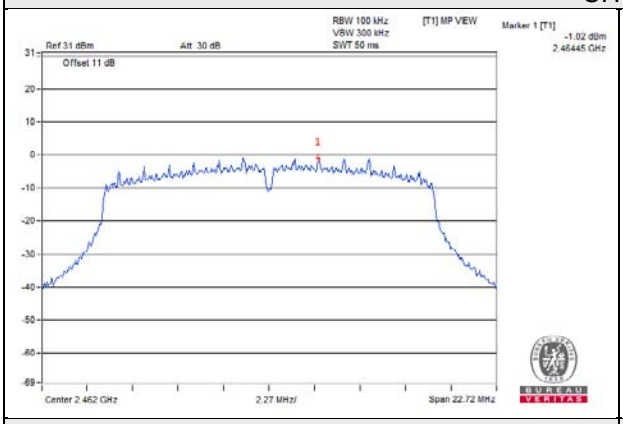


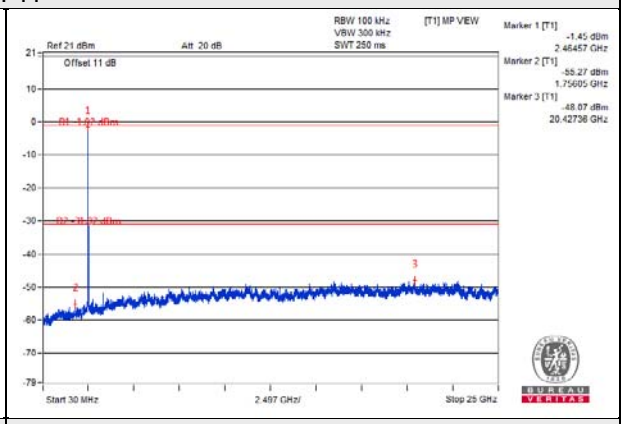
CH 6



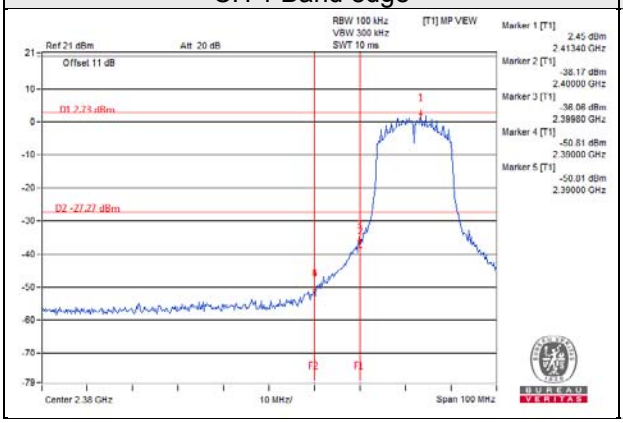


CH 11

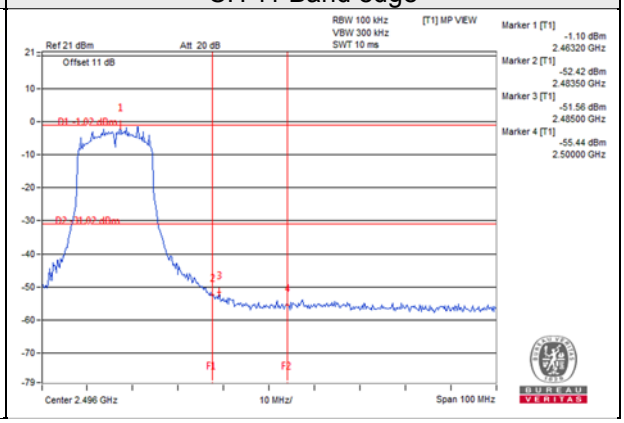




CH 1 Band edge

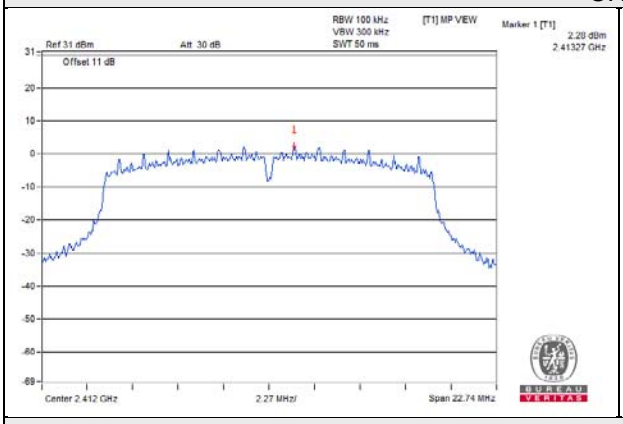


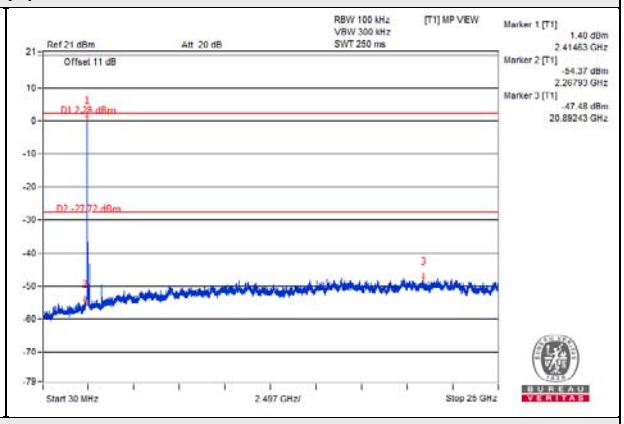
CH 11 Band edge



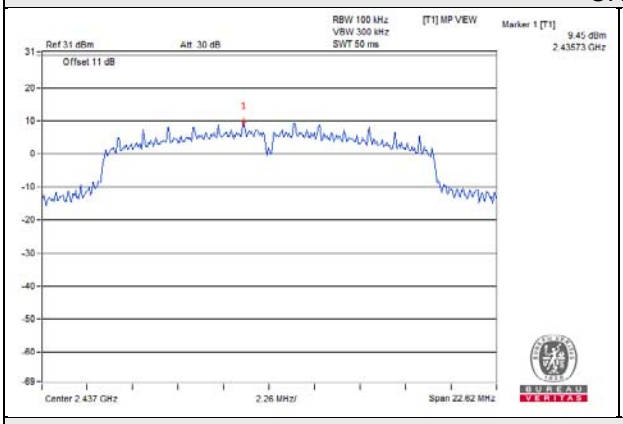
802.11g_Chain 3

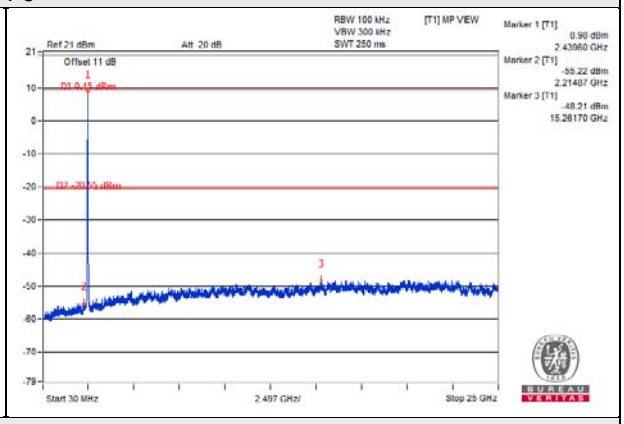
CH 1



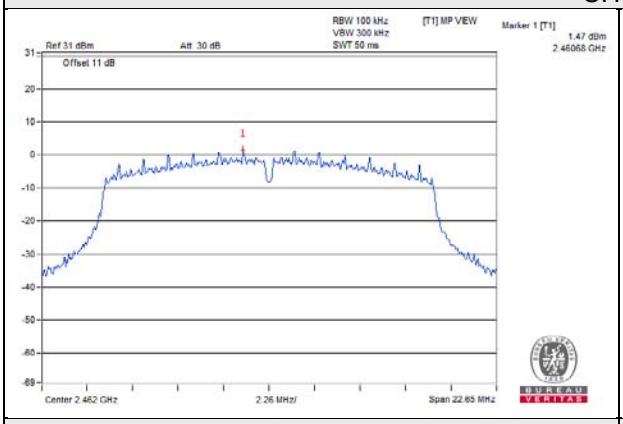


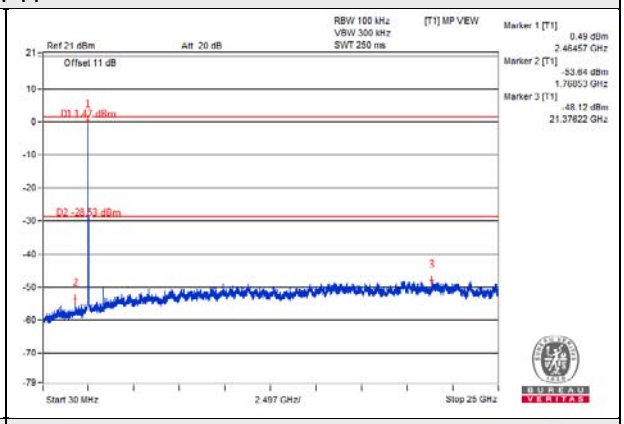
CH 6



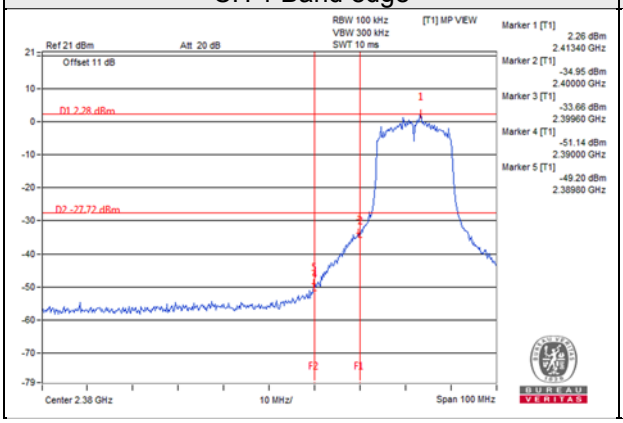


CH 11

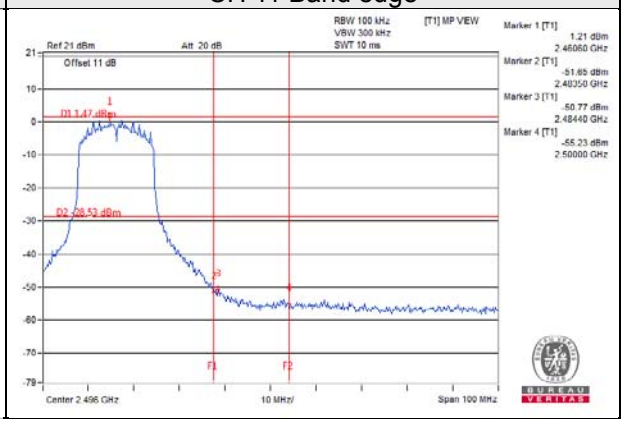




CH 1 Band edge

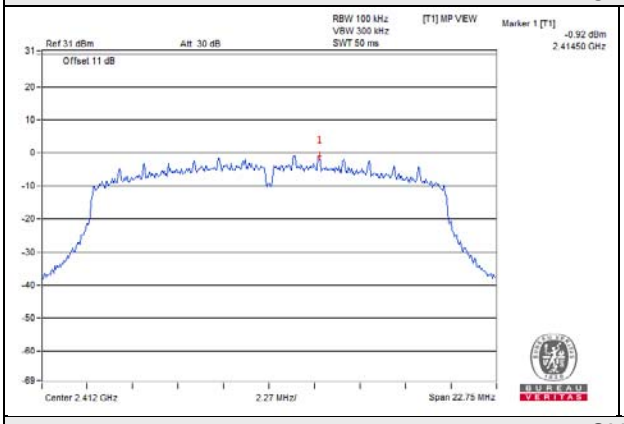


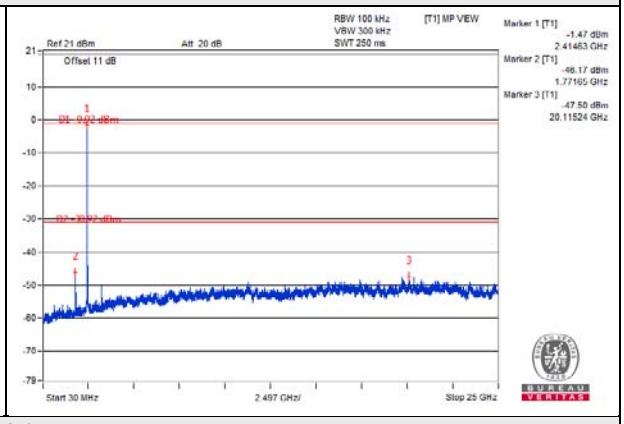
CH 11 Band edge



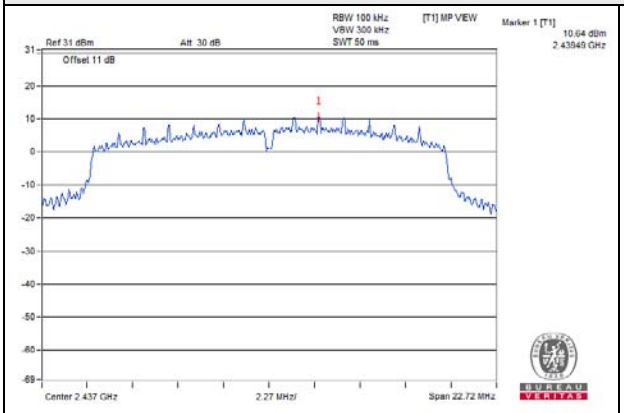
802.11n (HT20)_Chain 0

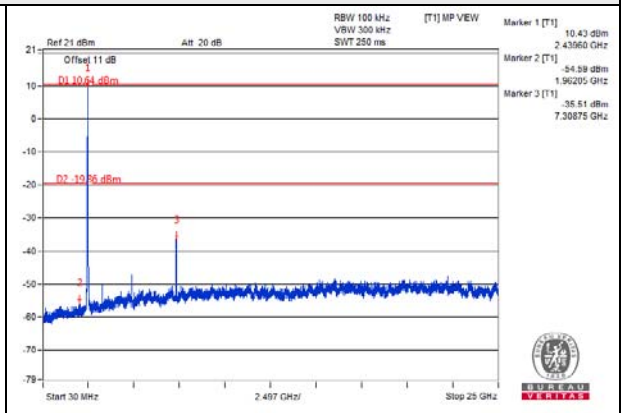
CH 1



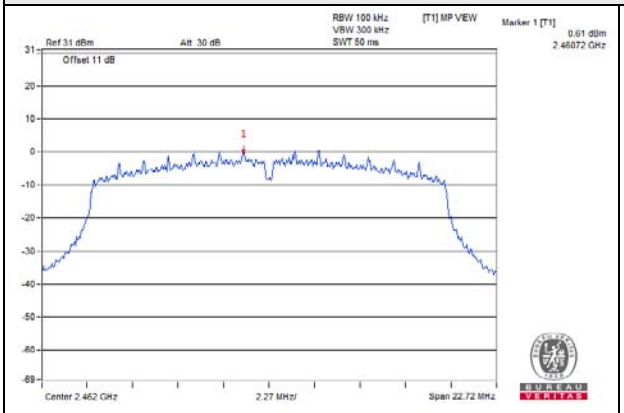


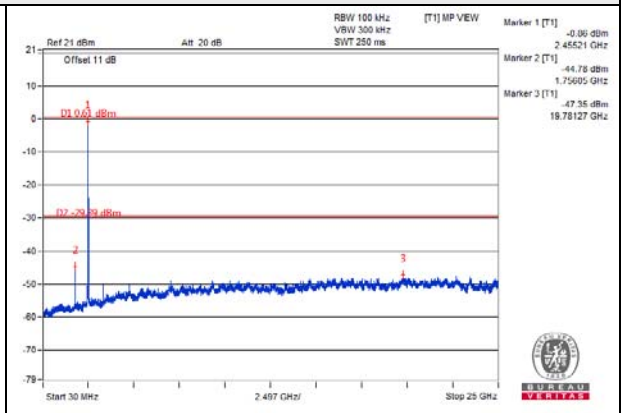
CH 6



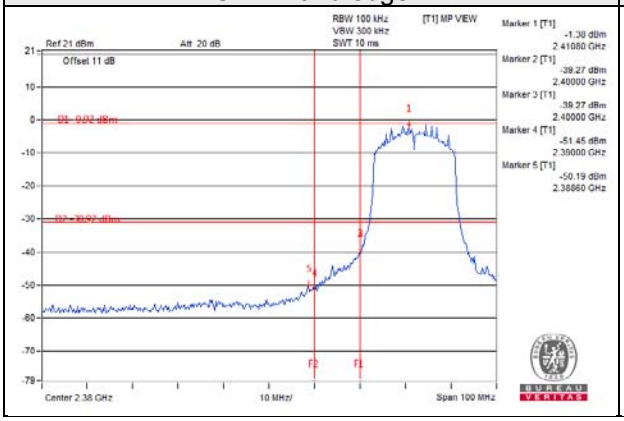


CH 11

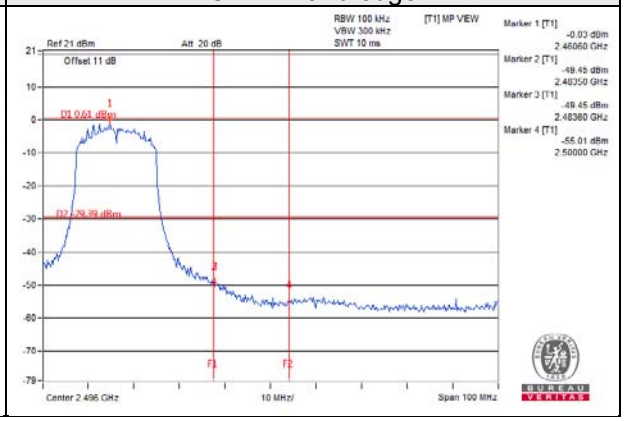




CH 1 Band edge

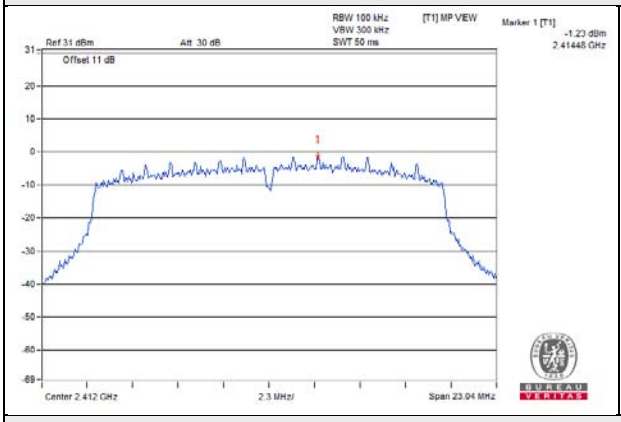


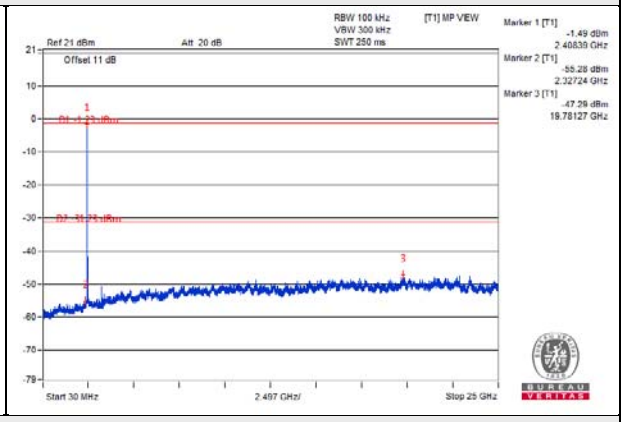
CH 11 Band edge



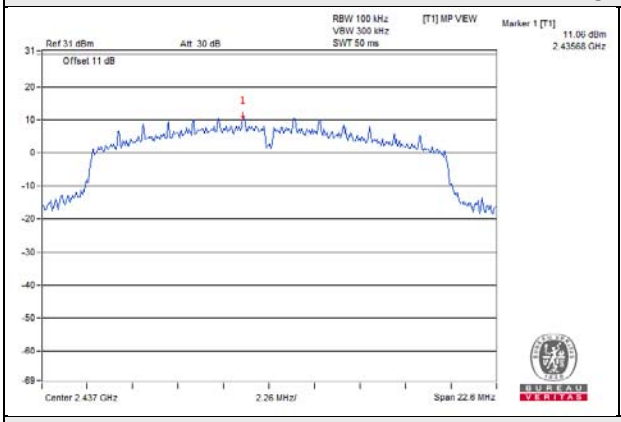
802.11n (HT20)_Chain 1

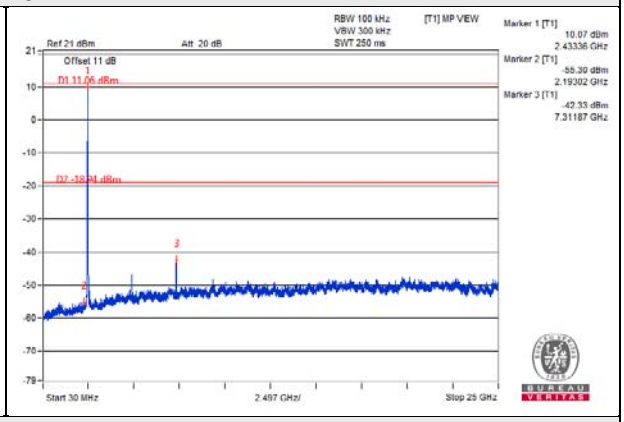
CH 1



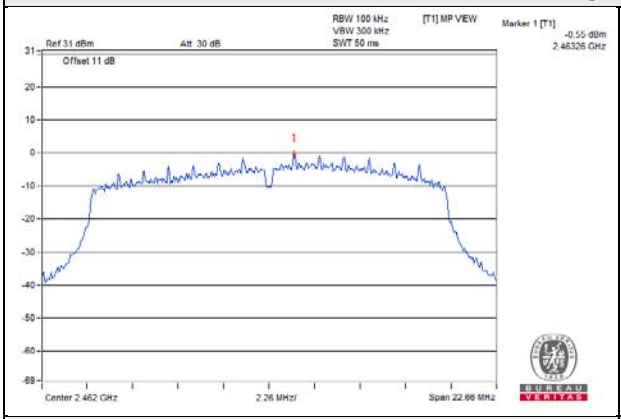


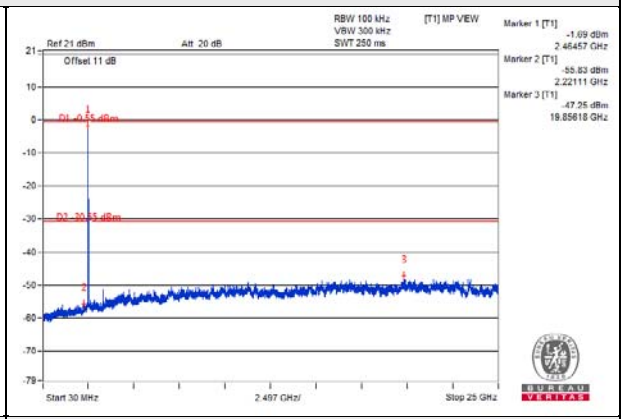
CH 6



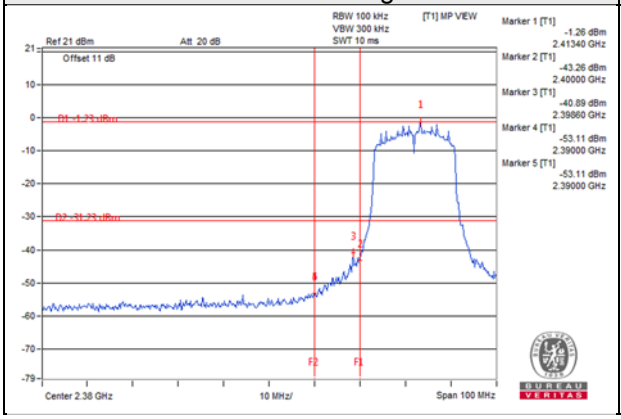


CH 11

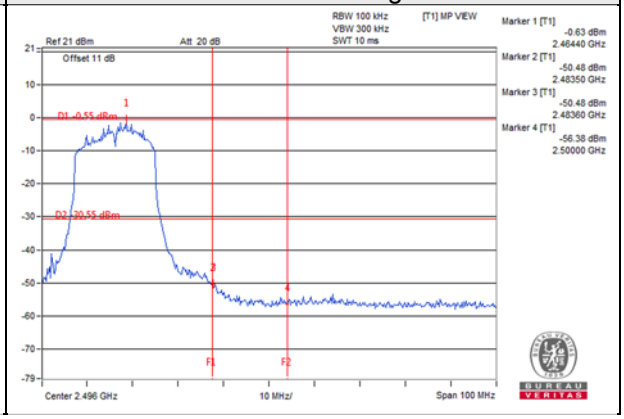




CH 1 Band edge

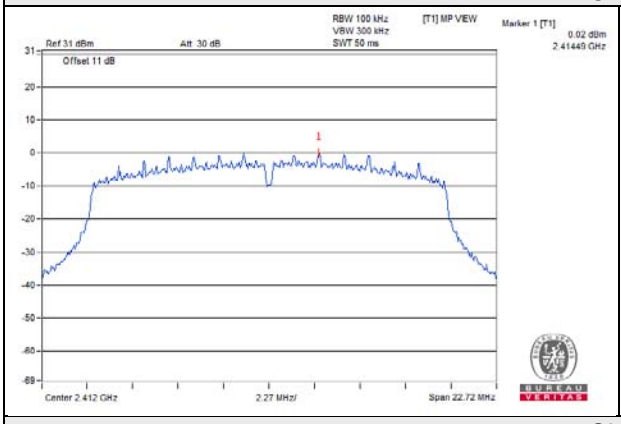


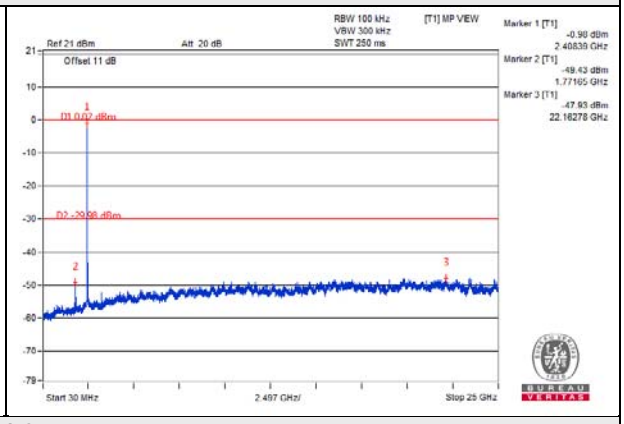
CH 11 Band edge



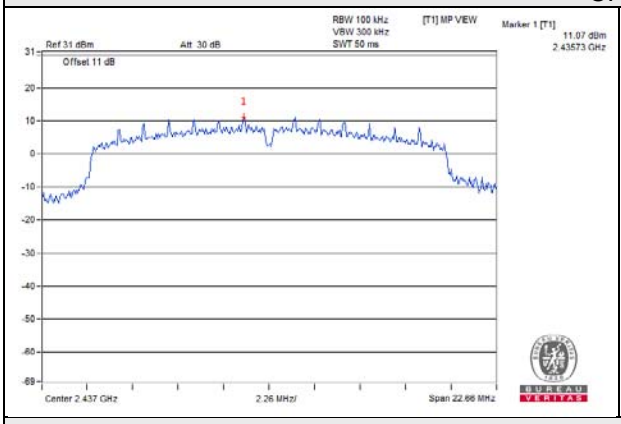
802.11n (HT20)_Chain 2

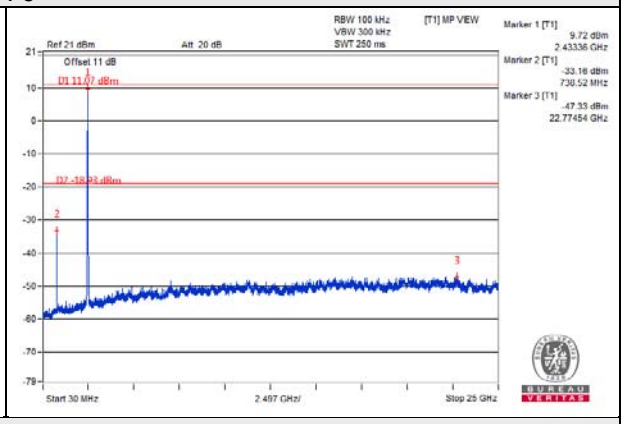
CH 1



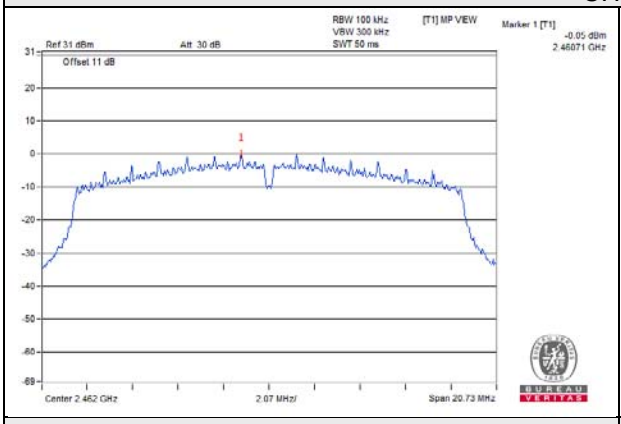


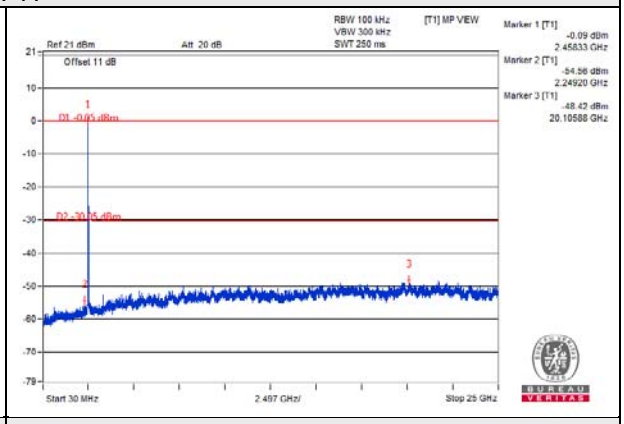
CH 6



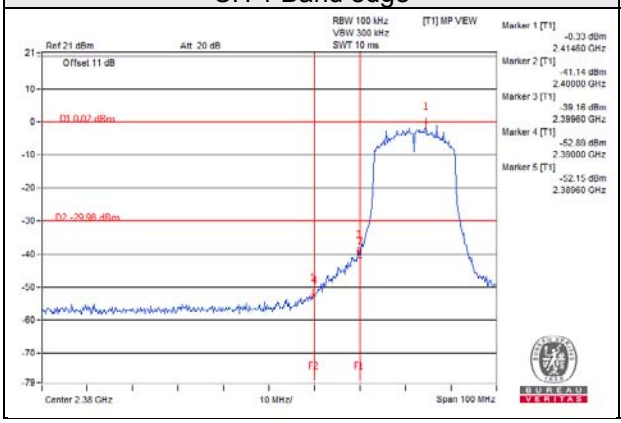


CH 11

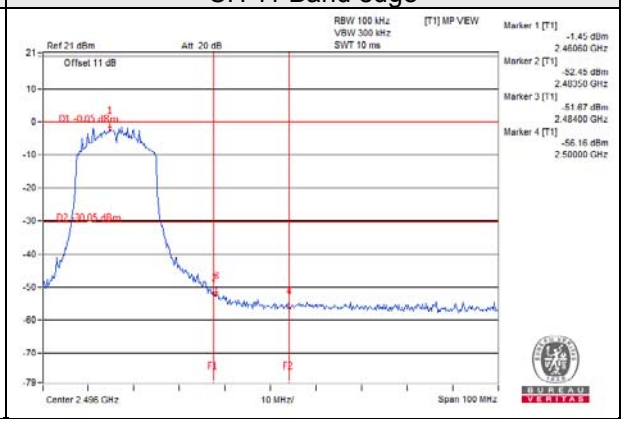




CH 1 Band edge

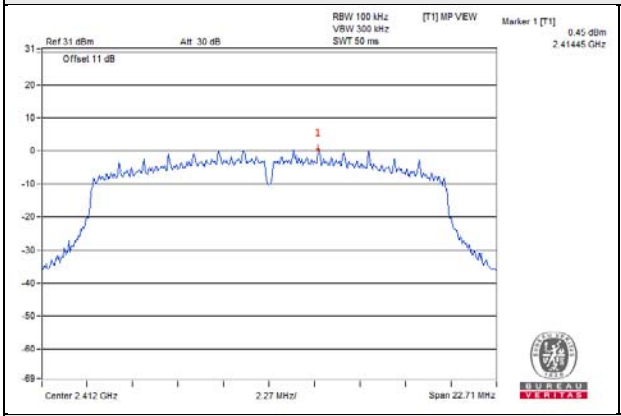


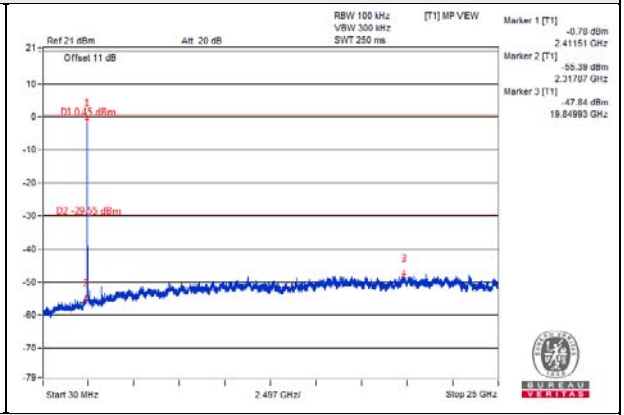
CH 11 Band edge



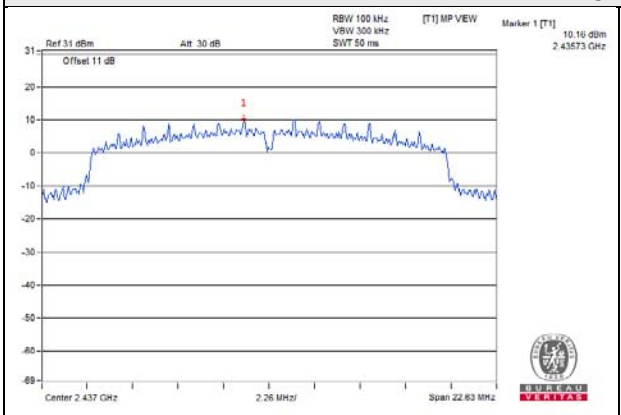
802.11n (HT20)_Chain 3

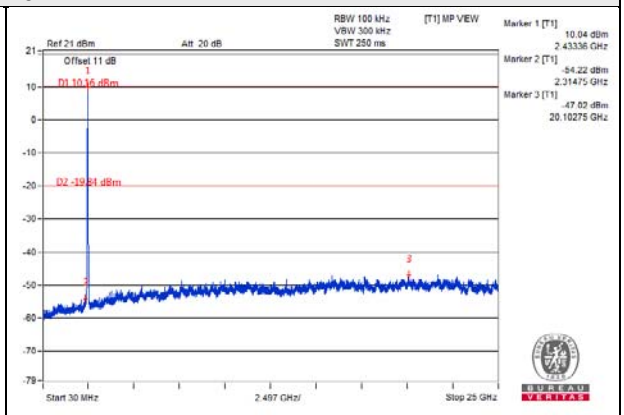
CH 1



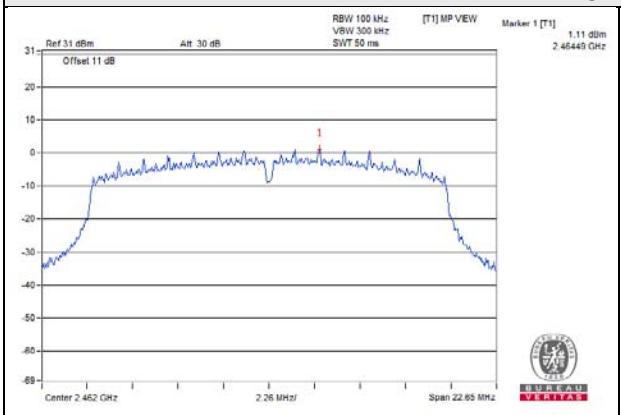


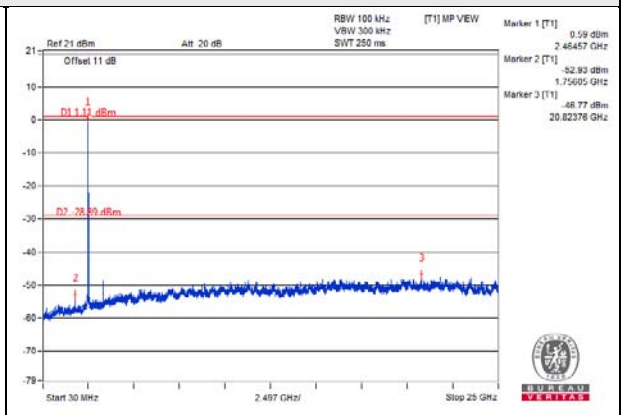
CH 6



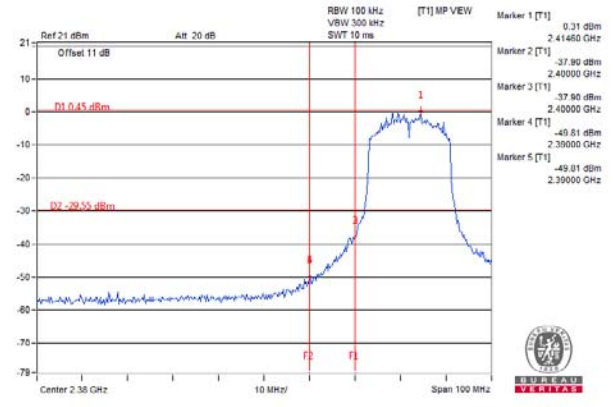


CH 11

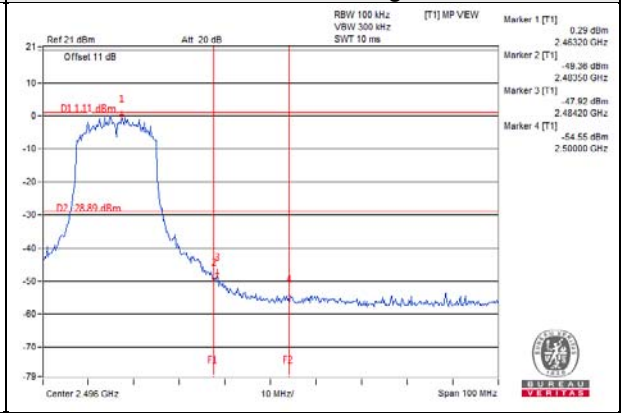




CH 1 Band edge

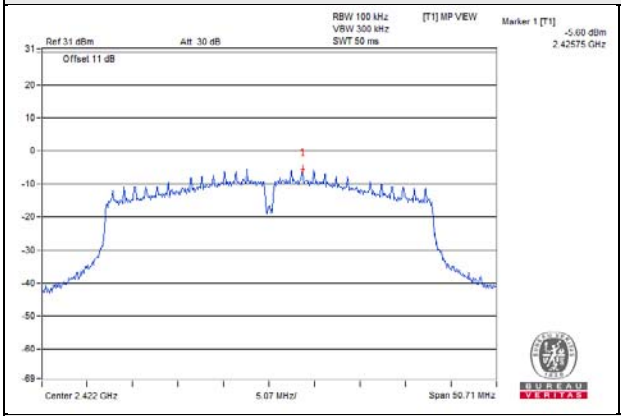


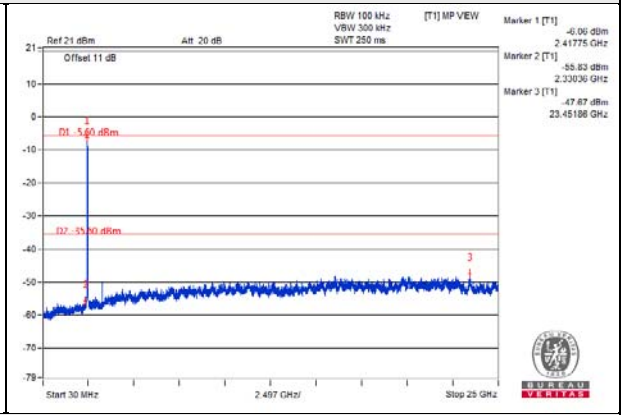
CH 11 Band edge



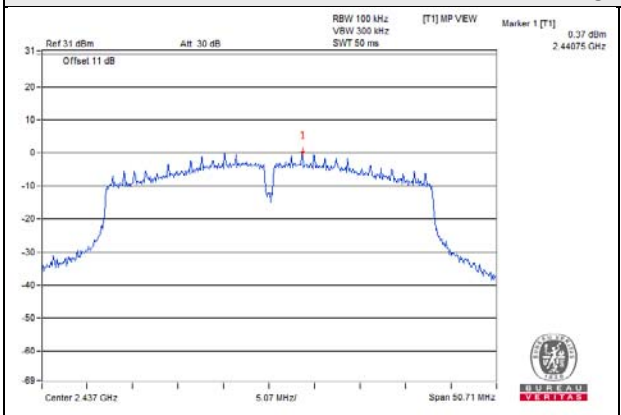
802.11n (HT40)_Chain 0

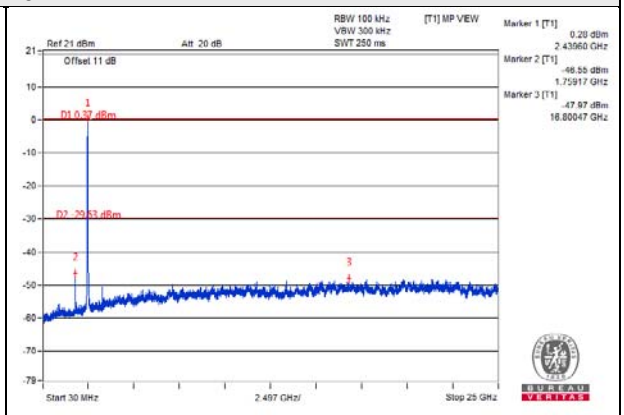
CH 3



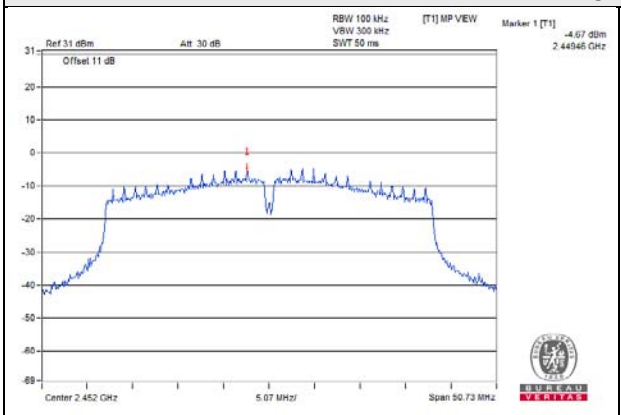


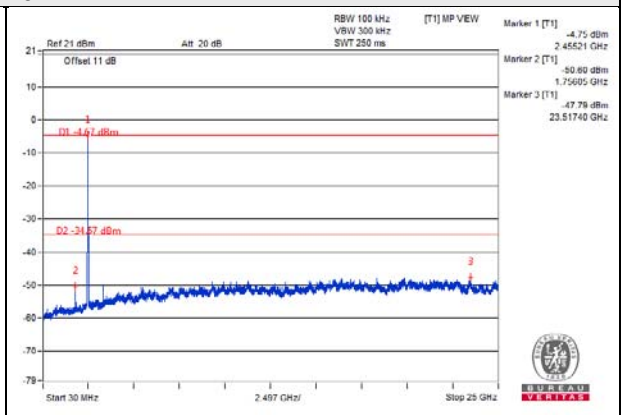
CH 6



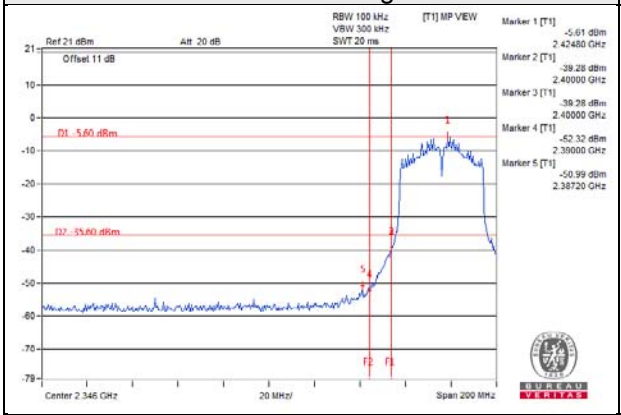


CH 9

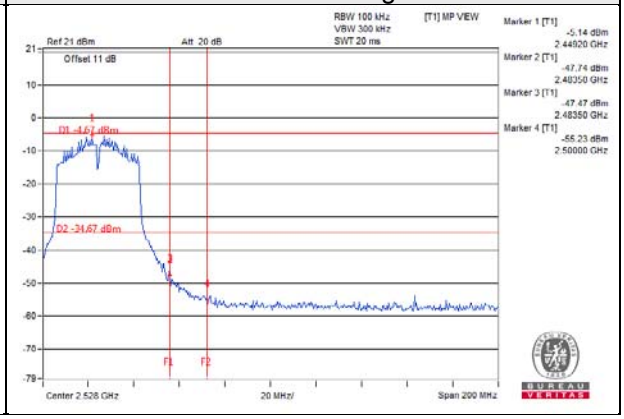




CH 3 Band edge

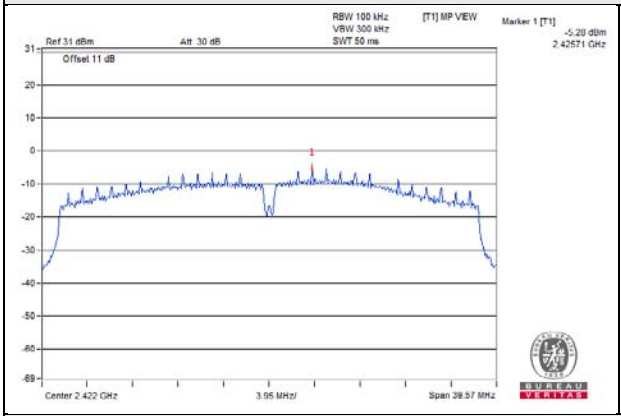


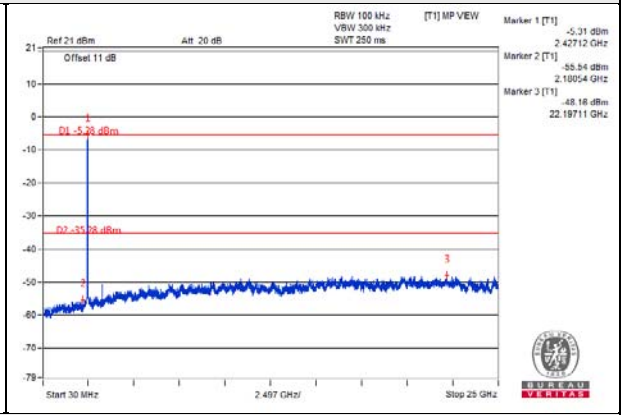
CH 9 Band edge



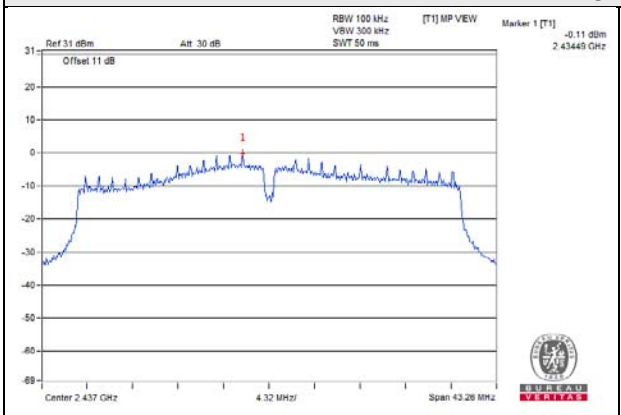
802.11n (HT40)_Chain 1

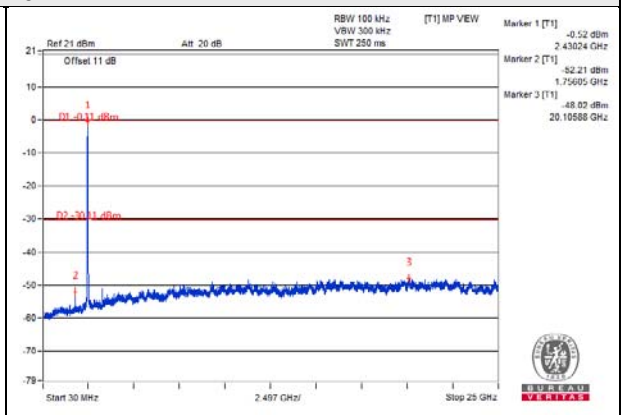
CH 3



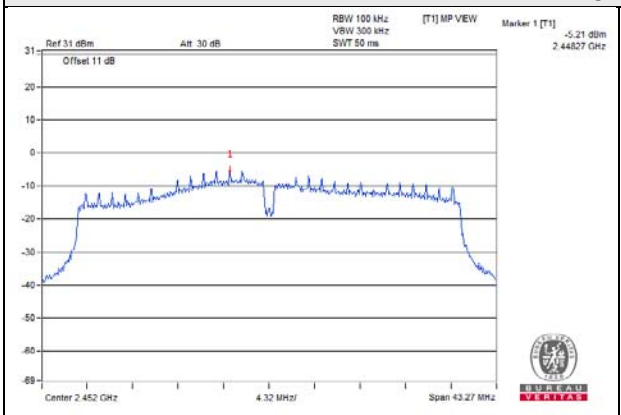


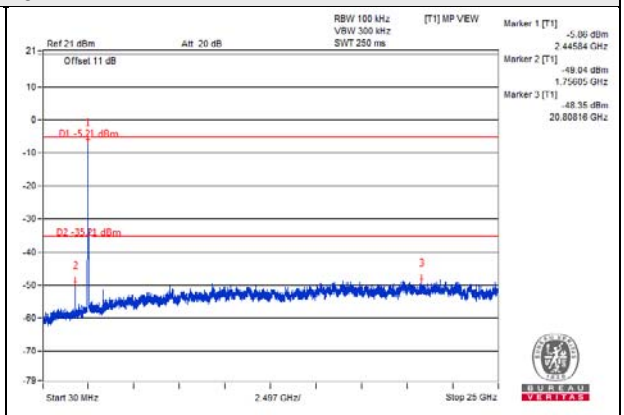
CH 6



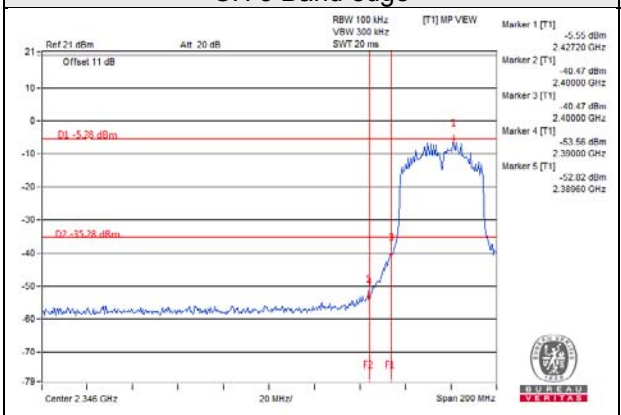


CH 9

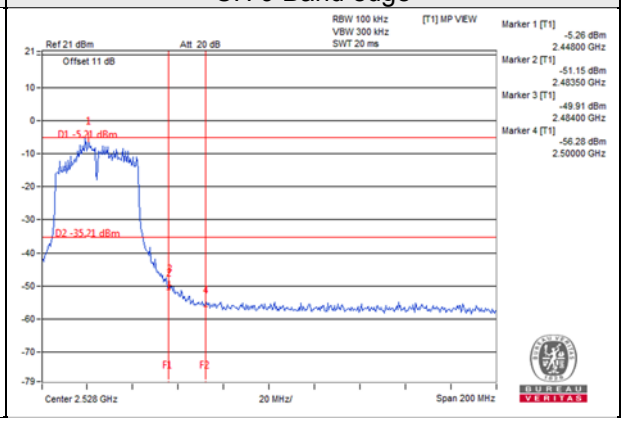




CH 3 Band edge

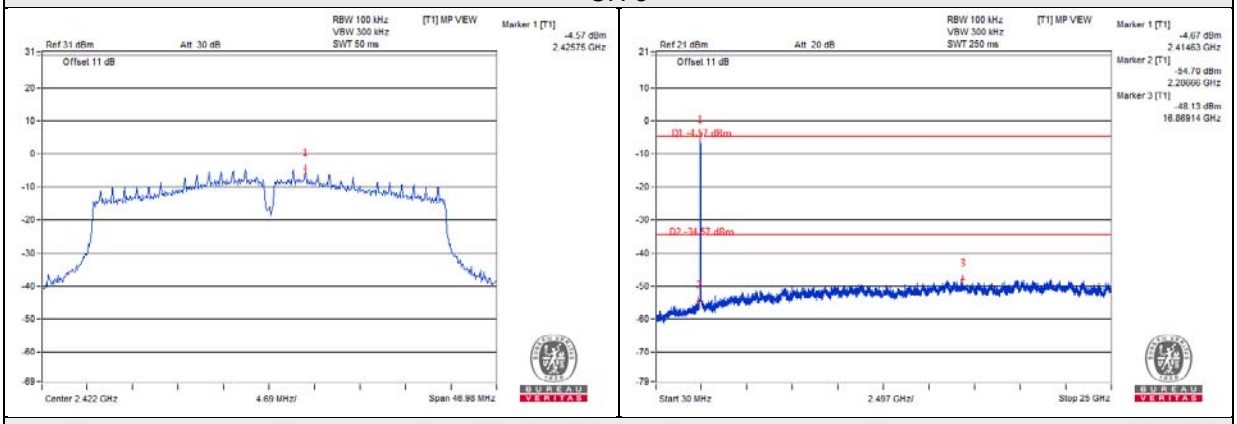


CH 9 Band edge

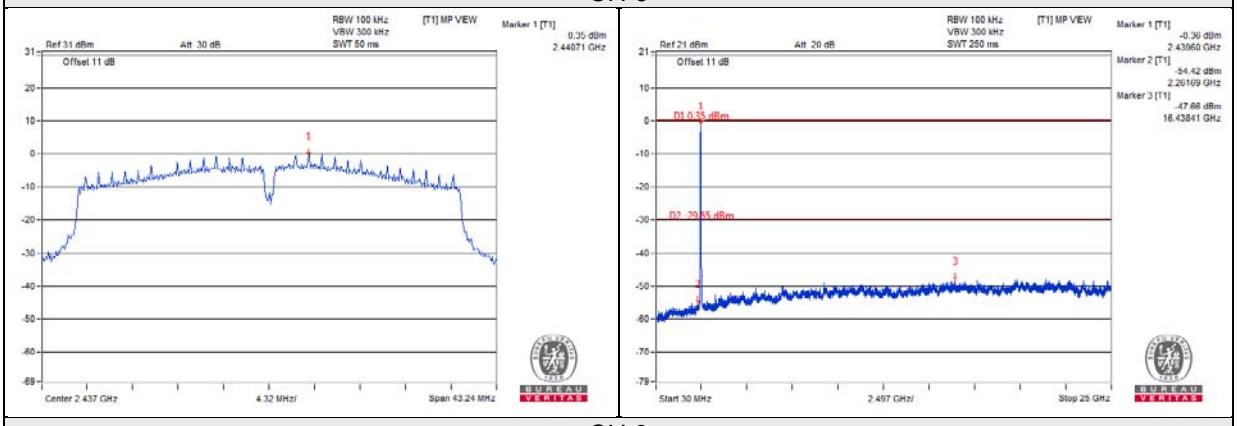


802.11n (HT40)_Chain 2

CH 3



CH 6



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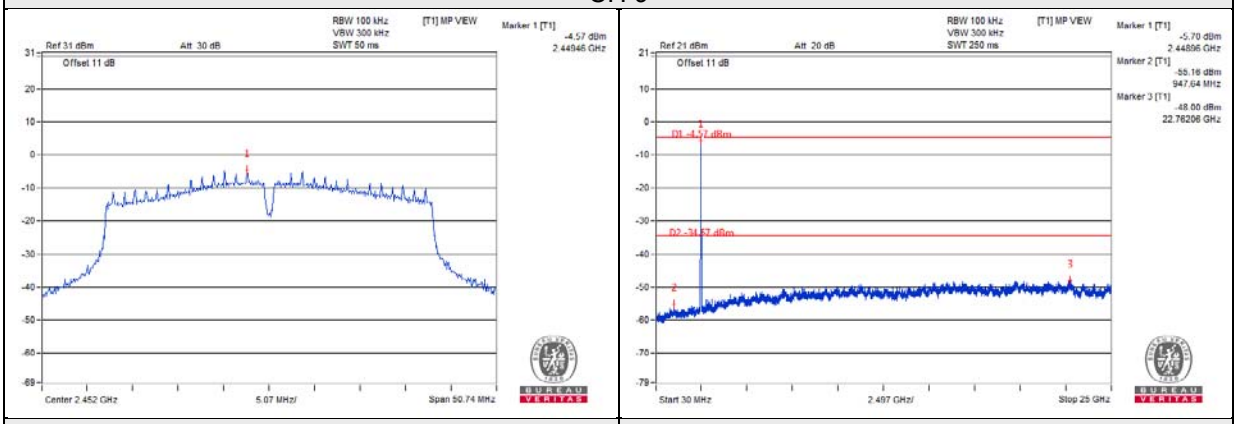
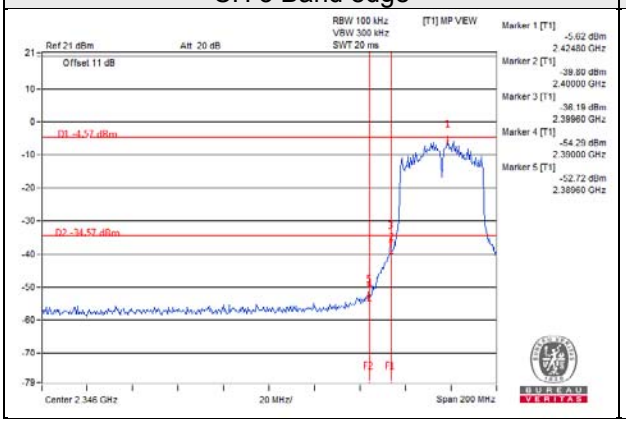


CH 3 Band edge



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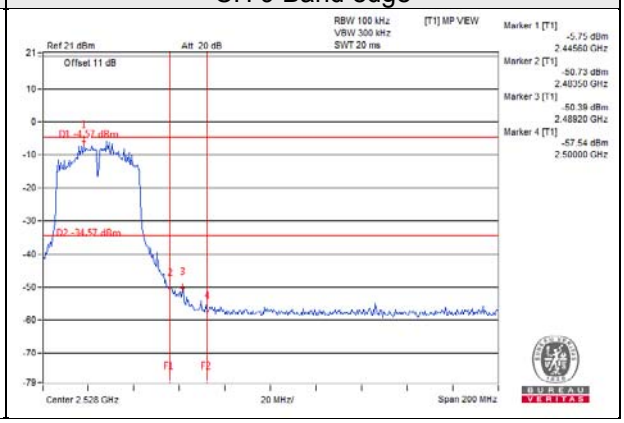
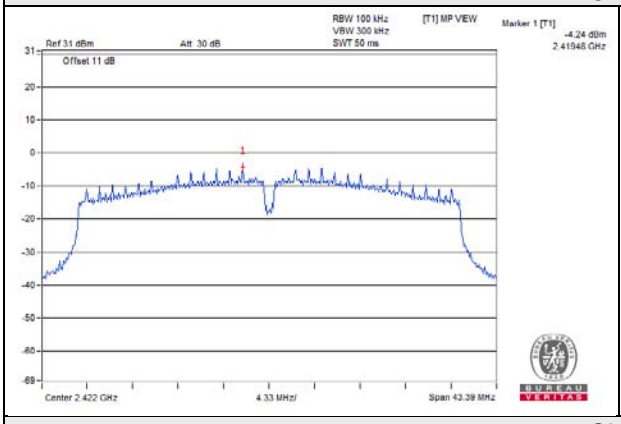
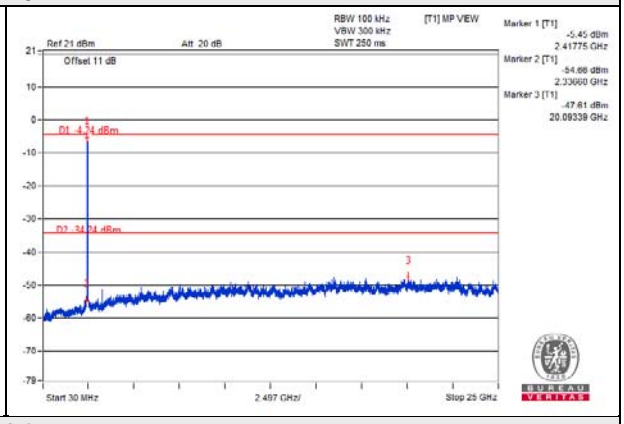


802.11n (HT40)_Chain 3

CH 3





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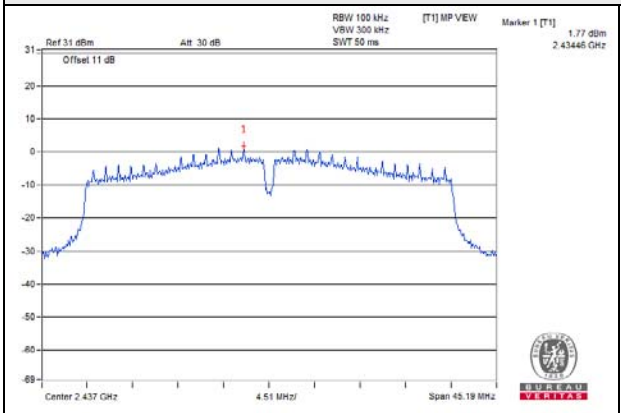

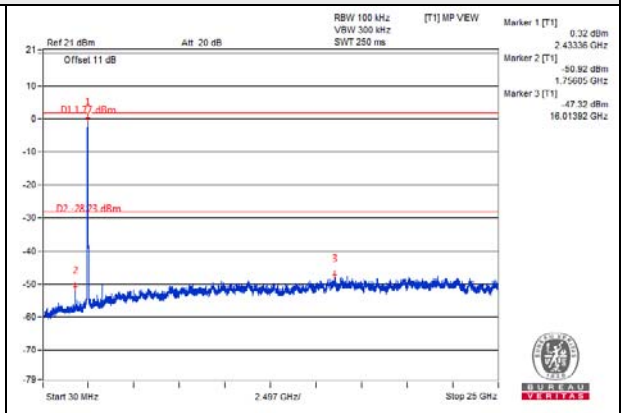

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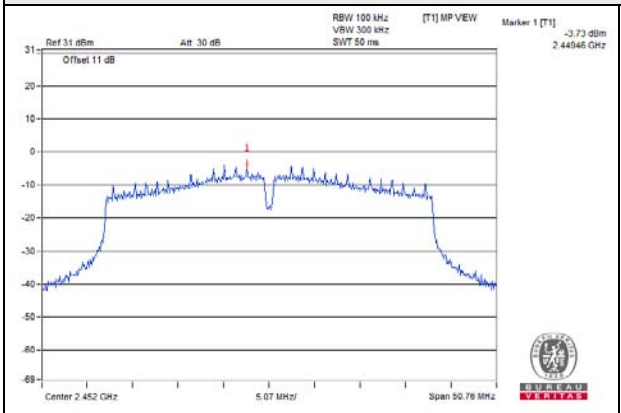

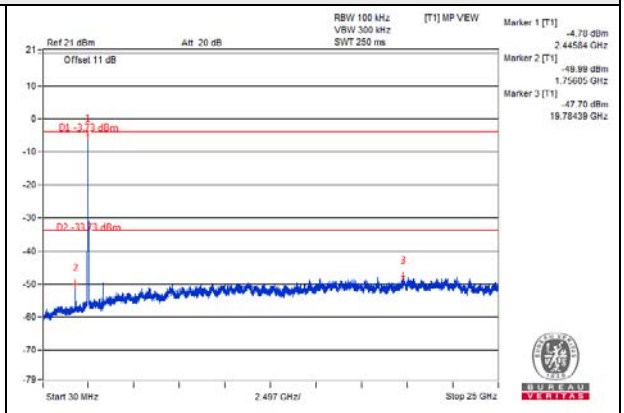

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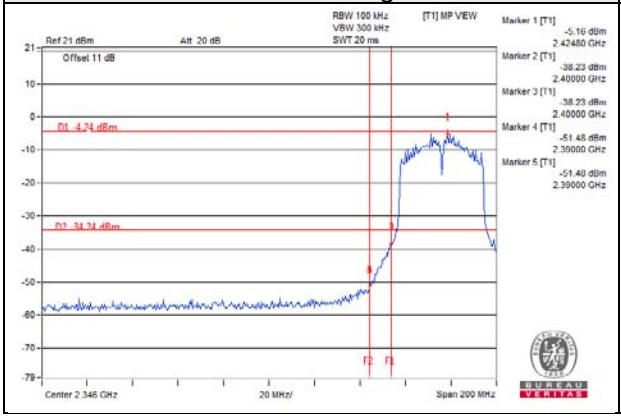
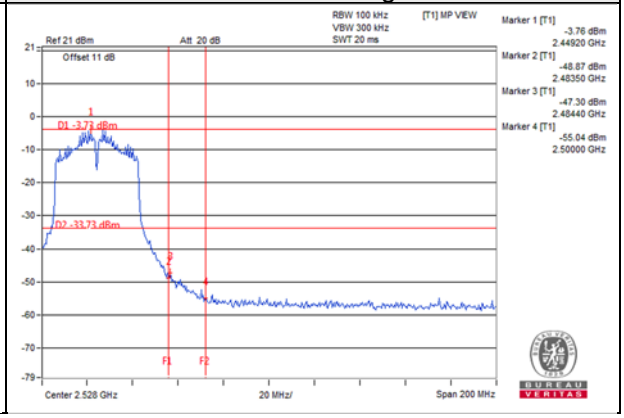


CH 9 Band edge



5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

Lin Kou EMC/RF Lab
Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab
Tel: 886-3-6668565
Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab
Tel: 886-3-3183232
Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com
Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

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