

FCC Test Report

Report No.: RF190218E06

FCC ID: XCNUBC1319

Test Model: UBC1319

Received Date: Feb. 18, 2019

Test Date: Apr. 08 to 10, 2019

Issued Date: May 03, 2019

Applicant: Ubee Interactive Corp.

Address: 10F-1, No. 5, Taiyuan 1st St. Jhubei Ci, Hsinchu County 302, Taiwan ,
R.O.C.

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Hsin Chu Laboratory

Lab Address: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,
Taiwan R.O.C.

Test Location: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,
Taiwan R.O.C.

**FCC Registration /
Designation Number:** 723255 / TW2022



This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification. The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any government agencies.

Table of Contents

Release Control Record	4
1 Certificate of Conformity	5
2 Summary of Test Results	6
2.1 Measurement Uncertainty	6
2.2 Modification Record	6
3 General Information	7
3.1 General Description of EUT	7
3.2 Description of Test Modes	10
3.2.1 Test Mode Applicability and Tested Channel Detail	11
3.3 Duty Cycle of Test Signal	13
3.4 Description of Support Units	14
3.4.1 Configuration of System under Test	15
3.5 General Description of Applied Standards	16
4 Test Types and Results	17
4.1 Radiated Emission and Bandedge Measurement	17
4.1.1 Limits of Radiated Emission and Bandedge Measurement	17
4.1.2 Test Instruments	18
4.1.3 Test Procedures	19
4.1.4 Deviation from Test Standard	19
4.1.5 Test Setup	20
4.1.6 EUT Operating Conditions	21
4.1.7 Test Results	22
4.2 Conducted Emission Measurement	36
4.2.1 Limits of Conducted Emission Measurement	36
4.2.2 Test Instruments	36
4.2.3 Test Procedures	37
4.2.4 Deviation from Test Standard	37
4.2.5 Test Setup	37
4.2.6 EUT Operating Conditions	37
4.2.7 Test Results	38
4.3 6dB Bandwidth Measurement	40
4.3.1 Limits of 6dB Bandwidth Measurement	40
4.3.2 Test Setup	40
4.3.3 Test Instruments	40
4.3.4 Test Procedure	40
4.3.5 Deviation from Test Standard	40
4.3.6 EUT Operating Conditions	40
4.3.7 Test Result	41
4.4 Conducted Output Power Measurement	43
4.4.1 Limits of Conducted Output Power Measurement	43
4.4.2 Test Setup	43
4.4.3 Test Instruments	43
4.4.4 Test Procedures	43
4.4.5 Deviation from Test Standard	43
4.4.6 EUT Operating Conditions	43
4.4.7 Test Results	44
4.5 Power Spectral Density Measurement	46
4.5.1 Limits of Power Spectral Density Measurement	46
4.5.2 Test Setup	46
4.5.3 Test Instruments	46
4.5.4 Test Procedure	46
4.5.5 Deviation from Test Standard	47
4.5.6 EUT Operating Condition	47

4.5.7 Test Results	48
4.6 Conducted Out of Band Emission Measurement.....	51
4.6.1 Limits of Conducted Out of Band Emission Measurement	51
4.6.2 Test Setup.....	51
4.6.3 Test Instruments	51
4.6.4 Test Procedure	51
4.6.5 Deviation from Test Standard	51
4.6.6 EUT Operating Condition	51
4.6.7 Test Results	51
5 Pictures of Test Arrangements.....	64
Appendix – Information of the Testing Laboratories	65

Release Control Record

Issue No.	Description	Date Issued
RF190218E06	Original release.	May 03, 2019

1 Certificate of Conformity

Product: DOCSIS 3.0 Wireless eMTA

Brand: Ubee

Test Model: UBC1319

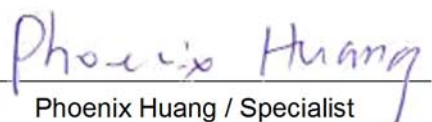
Applicant: Ubee Interactive Corp.

Test Date: Apr. 08 to 10, 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 EMC characteristics under the conditions specified in this report.


Prepared by :


Phoenix Huang / Specialist

Date:

May 03, 2019

Approved by :


May Chen / Manager

Date:

May 03, 2019

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 -19.10dB at 21.79688MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -0.1dB at 2390.00MHz and 2484.20MHz.
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	1.8 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	4.9 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.1 dB
	6GHz ~ 18GHz	4.9 dB
	18GHz ~ 40GHz	5.2 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	DOCSIS 3.0 Wireless eMTA
Brand	Ubee
Test Model	UBC1319
Power Supply Rating	12Vdc from power adapter
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode and VHT (20/40) mode in 2.4GHz
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: up to 11Mbps 802.11a/g: up to 54Mbps 802.11n: up to 600Mbps 802.11ac: up to 1733.3Mbps
Operating Frequency	2.4GHz: 2.412 ~ 2.462GHz 5GHz: 5.18~ 5.24GHz, 5.745 ~ 5.825GHz
Number of Channel	2.4GHz: 802.11b, 802.11g, 802.11n (HT20), VHT20: 11 802.11n (HT40), VHT40: 7 5GHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20): 9 802.11n (HT40), 802.11ac (VHT40): 4 802.11ac (VHT80): 2
Output Power	2.412 ~ 2.462GHz CDD Mode: 631.707mW Beamforming Mode: 622.563mW 5.18 ~ 5.24GHz CDD Mode: 447.454mW Beamforming Mode: 446.405mW 5.745 ~ 5.825GHz CDD Mode: 788.288mW Beamforming Mode: 454.004mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Adapter x1 Base top x 1
Data Cable Supplied	NA

Note:

1. The EUT has below radios as following table:

Radio 1	Radio 2
WLAN (2.4GHz)	WLAN (5GHz)

2. Simultaneously transmission condition.

Condition	Technology	
1	WLAN (2.4GHz)	WLAN (5GHz)

Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.

3. The EUT must be supplied with a power adapter as following table:

Brand	Model No.	Spec.
LEADER ELECTRONICS INC	MU30AY120250-A1	AC Input: 100-240V, 0.8A, 50/60Hz DC Output: 12V, 2.5A DC Output cable: 1.8m, Unshielded

4. The antennas provided to the EUT, please refer to the following table:

Antenna No	Transmitter Circuit	Antenna Net Gain (dBi)	Frequency Range (GHz)	Antenna Type	Connector Type	Cable Length (mm)
1	5GHz: Chain 0	2.93	5.15~5.25	Dipole	i-Pex	71
		2.5	5.25~5.35			
		2.04	5.47~5.725			
		2.04	5.725~5.85			
2	2.4GHz: Chain 2	1.67	2.4~2.4825	Dipole	i-Pex	132
	5GHz: Chain 1	1.99	5.15~5.25			
		3.2	5.25~5.35			
		2.99	5.47~5.725			
3	5GHz: Chain 2	3.17	5.725~5.85	Dipole	i-Pex	110
		2.47	2.4~2.4825			
		4.22	5.15~5.25			
		3.52	5.25~5.35			
4	5GHz: Chain 3	3.59	5.47~5.725	Dipole	i-Pex	90
		4.54	5.725~5.85			
		2.49	2.4~2.4825			
		3.82	5.15~5.25			
		2.88	5.25~5.35			
		3.64	5.47~5.725			
		3.64	5.725~5.85			

5. The EUT incorporates a MIMO function.

2.4GHz Band		
MODULATION MODE	TX & RX CONFIGURATION	
802.11b	3TX	3RX
802.11g	3TX	3RX
802.11n (HT20)	3TX	3RX
802.11n (HT40)	3TX	3RX
VHT20	3TX	3RX
VHT40	3TX	3RX
5GHz Band		
MODULATION MODE	TX & RX CONFIGURATION	
802.11a	4TX	4RX
802.11n (HT20)	4TX	4RX
802.11n (HT40)	4TX	4RX
802.11ac (VHT20)	4TX	4RX
802.11ac (VHT40)	4TX	4RX
802.11ac (VHT80)	4TX	4RX

Note:

1. All of modulation mode support beamforming function except 802.11a/b/g modulation mode.
2. The EUT support Beamforming and CDD mode, therefore both mode were investigated and the worst case scenario was identified. The worst case data were presented in test report.
3. 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.
6. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3.2 Description of Test Modes

11 channels are provided for 802.11b, 802.11g and 802.11n (HT20), VHT20:

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

7 channels are provided for 802.11n (HT40), VHT40:

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

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

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.

CDD Mode					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6
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.

CDD Mode					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 11	1	DSSS	DBPSK	1

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.

CDD Mode					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 11	1	DSSS	DBPSK	1

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.

CDD Mode					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6
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
Beamforming Mode (output power only)					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
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 \geq 1G	23deg. C, 68%RH	120Vac, 60Hz	Nelson Teng
RE $<$ 1G	21deg. C, 64%RH	120Vac, 60Hz	Weiwei Lo
PLC	24deg. C, 76%RH	120Vac, 60Hz	Andy
APCM	25deg. C, 60%RH	120Vac, 60Hz	Jyunchun Lin

3.3 Duty Cycle of Test Signal

If duty cycle of test signal is $\geq 98\%$, duty factor is not required.

If duty cycle of test signal is $< 98\%$, duty factor shall be considered.

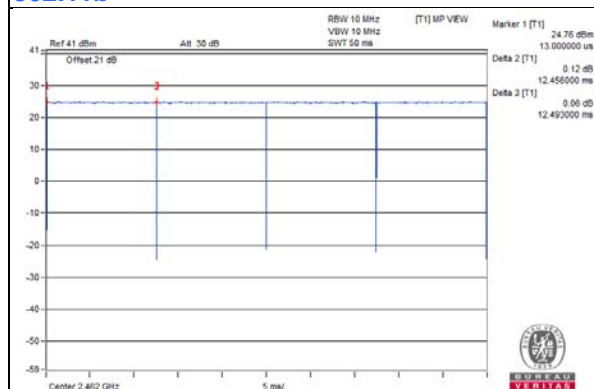
802.11b: Duty cycle = $12.456 \text{ ms} / 12.493 \text{ ms} = 0.997$

802.11g: Duty cycle = $2.062 \text{ ms} / 2.084 \text{ ms} = 0.989$

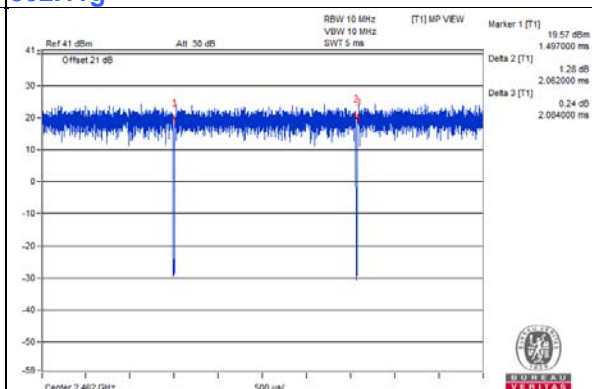
802.11n (HT20): Duty cycle = $1.41 \text{ ms} / 1.43 \text{ ms} = 0.986$

802.11n (HT40): Duty cycle = $0.951 \text{ ms} / 0.971 \text{ ms} = 0.979$, Duty factor = $10 * \log(1/\text{Duty cycle}) = 0.09$

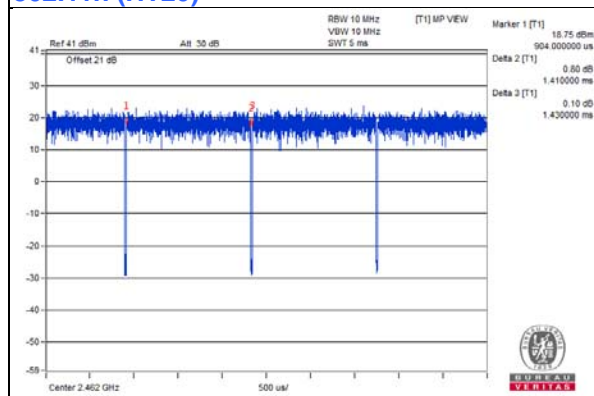
802.11b



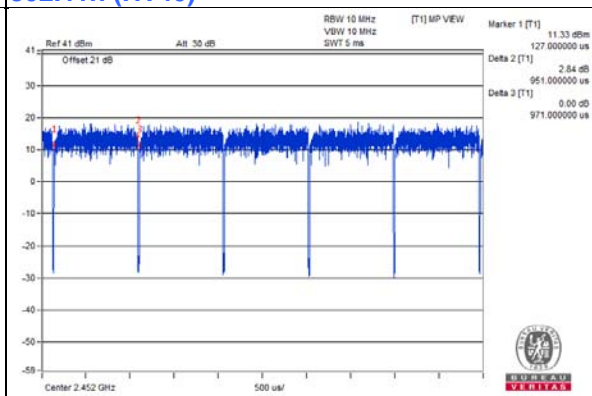
802.11g



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.

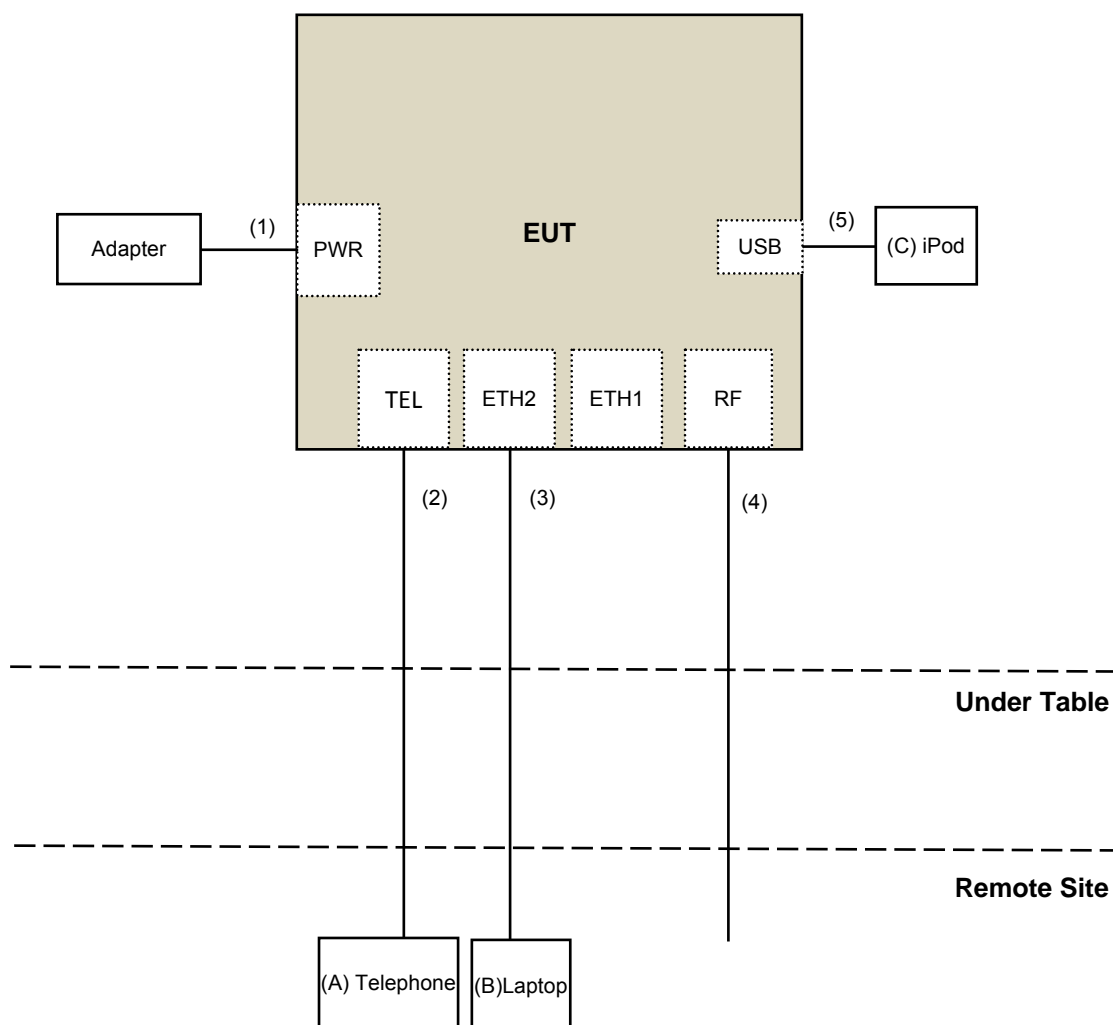
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Telephone	WONDER	WD-303	7C17KA 04011	NA	Provided by Lab
B.	Laptop	DELL	E5430	HYV4VY1	FCC DoC	Provided by Lab
C.	iPod	Apple	MC749TA/A	CC4DN25WDFDM	NA	Provided by Lab

Note:

1. All power cords of the above support units are non-shielded (1.8m).

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DC Cable	1	1.8	No	0	Supplied by client
2.	RJ-11 Cable	1	10	No	0	Provided by Lab
3.	RJ-45 Cable	1	10	No	0	Provided by Lab
4.	Coaxial Cable	1	10	Yes	0	Provided by Lab
5.	USB Cable	1	0.1	Yes	0	Provided by Lab

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.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Keysight	N9038A	MY54450088	July 05, 2018	July 04, 2019
Pre-Amplifier EMCi	EMC001340	980142	Jan. 25, 2019	Jan. 24, 2020
Loop Antenna Electro-Metrics	EM-6879	269	Sep. 07, 2018	Sep. 06, 2019
RF Cable	NA	LOOPCAB-001	Jan. 14, 2019	Jan. 13, 2020
RF Cable	NA	LOOPCAB-002	Jan. 14, 2019	Jan. 13, 2020
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-01	Oct. 30, 2018	Oct. 29, 2019
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-406	Nov. 22, 2018	Nov. 21, 2019
RF Cable	8D	966-4-1	Mar. 19, 2019	Mar. 18, 2020
RF Cable	8D	966-4-2	Mar. 19, 2019	Mar. 18, 2020
RF Cable	8D	966-4-3	Mar. 19, 2019	Mar. 18, 2020
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-4-01	Sep. 27, 2018	Sep. 26, 2019
Horn Antenna SCHWARZBECK	BBHA 9120D	9120D-783	Nov. 25, 2018	Nov. 24, 2019
Pre-Amplifier EMCi	EMC12630SE	980385	Aug. 16, 2018	Aug. 15, 2019
RF Cable	EMC104-SM-SM-1200	160923	Jan. 28, 2019	Jan. 27, 2020
RF Cable	104 RF cable	131215	Jan. 10, 2019	Jan. 09, 2020
RF Cable	EMC104-SM-SM-6000	180418	May 07, 2018	May 06, 2019
Pre-Amplifier EMCi	EMC184045SE	980387	Jan. 28, 2019	Jan. 27, 2020
Horn Antenna SCHWARZBECK	BBHA 9170	BBHA9170519	Nov. 25, 2018	Nov. 24, 2019
RF Cable	EMC102-KM-KM-1200	160924	Jan. 28, 2019	Jan. 27, 2020
RF Cable	EMC102-KM-KM-1200	160925	Jan. 28, 2019	Jan. 27, 2020
Software	ADT_Radiated V8.7.08	NA	NA	NA
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	NA	NA
Spectrum Analyzer R&S	FSV40	100964	June 20, 2018	June 19, 2019
Power meter Anritsu	ML2495A	1014008	May 09, 2018	May 08, 2019
Power sensor Anritsu	MA2411B	0917122	May 09, 2018	May 08, 2019
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 16, 2018	Apr. 15, 2019

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 966 Chamber No. 4.
3. Loop antenna was used for all emissions below 30 MHz.
4. Tested Date: Apr. 08 to 10, 2019

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 detects 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:

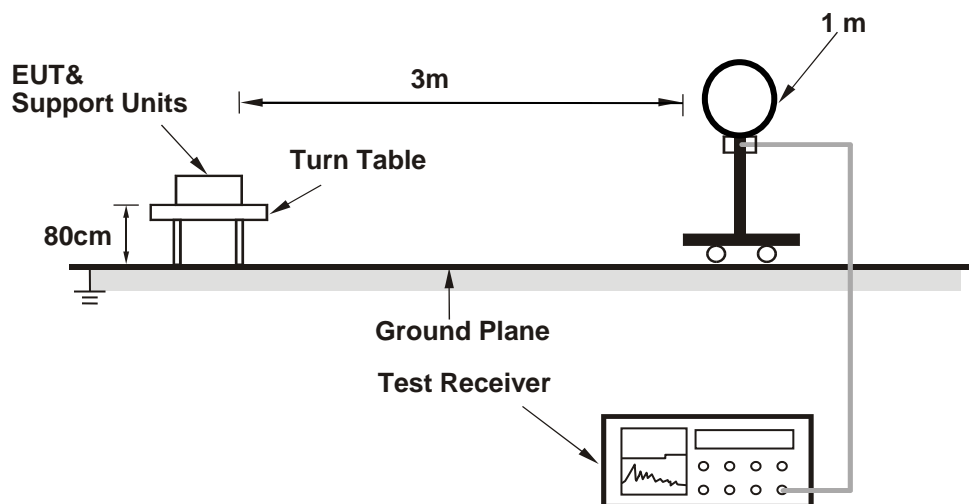
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (Duty cycle $< 98\%$) or 10Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

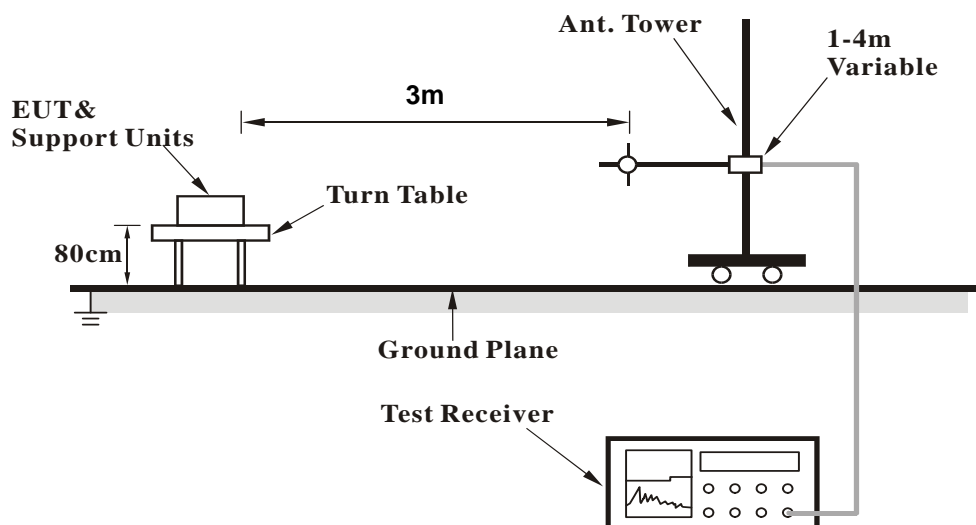
No deviation.

4.1.5 Test Setup

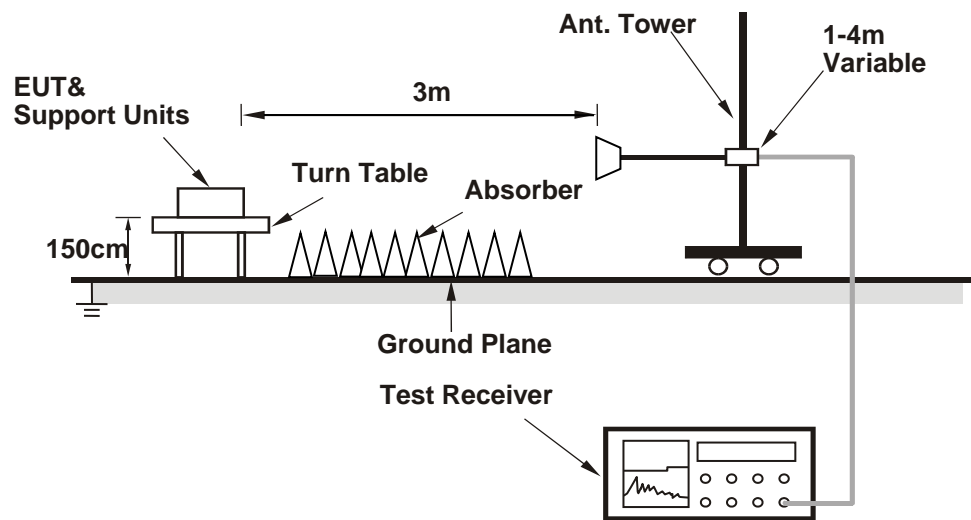
For Radiated emission below 30MHz



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

- Connected the EUT with the Laptop which is placed on remote site.
- Controlling software (Mtool 3.0.0.6) has been activated to set the EUT under transmission condition continuously.

4.1.7 Test Results

CDD Mode

Above 1GHz Data:

802.11b

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2387.30	62.2 PK	74.0	-11.8	2.61 H	144	64.4	-2.2
2	2387.30	53.0 AV	54.0	-1.0	2.61 H	144	55.2	-2.2
3	2390.00	61.6 PK	74.0	-12.4	2.61 H	144	63.8	-2.2
4	2390.00	51.8 AV	54.0	-2.2	2.61 H	144	54.0	-2.2
5	*2412.00	118.1 PK			2.61 H	144	120.4	-2.3
6	*2412.00	115.4 AV			2.61 H	144	117.7	-2.3
7	4824.00	46.9 PK	74.0	-27.1	2.27 H	272	45.2	1.7
8	4824.00	45.3 AV	54.0	-8.7	2.27 H	272	43.6	1.7
9	12060.00	53.5 PK	74.0	-20.5	2.40 H	245	41.0	12.5
10	12060.00	48.5 AV	54.0	-5.5	2.40 H	245	36.0	12.5
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2387.14	61.1 PK	74.0	-12.9	3.49 V	225	63.3	-2.2
2	2387.14	52.1 AV	54.0	-1.9	3.49 V	225	54.3	-2.2
3	2390.00	60.8 PK	74.0	-13.2	3.49 V	225	63.0	-2.2
4	2390.00	51.2 AV	54.0	-2.8	3.49 V	225	53.4	-2.2
5	*2412.00	114.6 PK			3.49 V	225	116.9	-2.3
6	*2412.00	111.9 AV			3.49 V	225	114.2	-2.3
7	4824.00	46.5 PK	74.0	-27.5	2.80 V	223	44.8	1.7
8	4824.00	45.3 AV	54.0	-8.7	2.80 V	223	43.6	1.7
9	12060.00	51.3 PK	74.0	-22.7	1.63 V	272	38.8	12.5
10	12060.00	45.3 AV	54.0	-8.7	1.63 V	272	32.8	12.5

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	57.9 PK	74.0	-16.1	2.57 H	144	60.1	-2.2
2	2390.00	44.6 AV	54.0	-9.4	2.57 H	144	46.8	-2.2
3	*2437.00	117.6 PK			2.57 H	144	120.0	-2.4
4	*2437.00	115.1 AV			2.57 H	144	117.5	-2.4
5	2483.50	57.6 PK	74.0	-16.4	2.57 H	144	59.9	-2.3
6	2483.50	44.9 AV	54.0	-9.1	2.57 H	144	47.2	-2.3
7	4874.00	47.2 PK	74.0	-26.8	2.25 H	261	45.5	1.7
8	4874.00	45.7 AV	54.0	-8.3	2.25 H	261	44.0	1.7
9	7311.00	47.6 PK	74.0	-26.4	1.43 H	306	39.4	8.2
10	7311.00	43.5 AV	54.0	-10.5	1.43 H	306	35.3	8.2
11	12185.00	53.3 PK	74.0	-20.7	2.45 H	256	40.5	12.8
12	12185.00	48.5 AV	54.0	-5.5	2.45 H	256	35.7	12.8

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	56.8 PK	74.0	-17.2	3.46 V	232	59.0	-2.2
2	2390.00	43.5 AV	54.0	-10.5	3.46 V	232	45.7	-2.2
3	*2437.00	114.1 PK			3.46 V	232	116.5	-2.4
4	*2437.00	111.6 AV			3.46 V	232	114.0	-2.4
5	2483.50	56.5 PK	74.0	-17.5	3.46 V	232	58.8	-2.3
6	2483.50	43.8 AV	54.0	-10.2	3.46 V	232	46.1	-2.3
7	4874.00	46.3 PK	74.0	-27.7	2.75 V	237	44.6	1.7
8	4874.00	45.0 AV	54.0	-9.0	2.75 V	237	43.3	1.7
9	7311.00	49.2 PK	74.0	-24.8	1.59 V	240	41.0	8.2
10	7311.00	44.0 AV	54.0	-10.0	1.59 V	240	35.8	8.2
11	12185.00	51.1 PK	74.0	-22.9	1.60 V	267	38.3	12.8
12	12185.00	45.3 AV	54.0	-8.7	1.60 V	267	32.5	12.8

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	117.2 PK			2.55 H	166	119.6	-2.4
2	*2462.00	114.8 AV			2.55 H	166	117.2	-2.4
3	2483.50	60.8 PK	74.0	-13.2	2.55 H	165	63.1	-2.3
4	2483.50	53.6 AV	54.0	-0.4	2.55 H	165	55.9	-2.3
5	4924.00	50.3 PK	74.0	-23.7	1.70 H	240	48.5	1.8
6	4924.00	48.5 AV	54.0	-5.5	1.70 H	240	46.7	1.8
7	7386.00	47.9 PK	74.0	-26.1	1.47 H	309	39.6	8.3
8	7386.00	44.0 AV	54.0	-10.0	1.47 H	309	35.7	8.3
9	12310.00	52.6 PK	74.0	-21.4	1.80 H	229	40.6	12.0
10	12310.00	48.0 AV	54.0	-6.0	1.80 H	229	36.0	12.0

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	113.7 PK			3.48 V	218	116.1	-2.4
2	*2462.00	111.3 AV			3.48 V	218	113.7	-2.4
3	2483.50	59.7 PK	74.0	-14.3	3.48 V	218	62.0	-2.3
4	2483.50	52.5 AV	54.0	-1.5	3.48 V	218	54.8	-2.3
5	4924.00	45.8 PK	74.0	-28.2	2.76 V	226	44.0	1.8
6	4924.00	44.7 AV	54.0	-9.3	2.76 V	226	42.9	1.8
7	7386.00	49.6 PK	74.0	-24.4	1.53 V	227	41.3	8.3
8	7386.00	44.4 AV	54.0	-9.6	1.53 V	227	36.1	8.3
9	12310.00	50.6 PK	74.0	-23.4	1.59 V	270	38.6	12.0
10	12310.00	45.1 AV	54.0	-8.9	1.59 V	270	33.1	12.0

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

802.11g

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	73.8 PK	74.0	-0.2	1.82 H	321	76.0	-2.2
2	2390.00	52.5 AV	54.0	-1.5	1.82 H	321	54.7	-2.2
3	*2412.00	117.8 PK			1.82 H	321	120.1	-2.3
4	*2412.00	107.3 AV			1.82 H	321	109.6	-2.3
5	4824.00	42.3 PK	74.0	-31.7	2.26 H	246	40.6	1.7
6	4824.00	31.7 AV	54.0	-22.3	2.26 H	246	30.0	1.7
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	72.5 PK	74.0	-1.5	3.38 V	242	74.7	-2.2
2	2390.00	51.2 AV	54.0	-2.8	3.38 V	242	53.4	-2.2
3	*2412.00	114.6 PK			3.38 V	242	116.9	-2.3
4	*2412.00	104.1 AV			3.38 V	242	106.4	-2.3
5	4824.00	40.6 PK	74.0	-33.4	2.66 V	238	38.9	1.7
6	4824.00	29.7 AV	54.0	-24.3	2.66 V	238	28.0	1.7

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	64.1 PK	74.0	-9.9	1.81 H	325	66.3	-2.2
2	2390.00	48.0 AV	54.0	-6.0	1.81 H	325	50.2	-2.2
3	*2437.00	120.2 PK			1.81 H	325	122.6	-2.4
4	*2437.00	109.7 AV			1.81 H	325	112.1	-2.4
5	2483.50	63.7 PK	74.0	-10.3	1.81 H	325	66.0	-2.3
6	2483.50	48.6 AV	54.0	-5.4	1.81 H	325	50.9	-2.3
7	4874.00	41.9 PK	74.0	-32.1	2.30 H	245	40.2	1.7
8	4874.00	31.2 AV	54.0	-22.8	2.30 H	245	29.5	1.7
9	7311.00	47.7 PK	74.0	-26.3	1.44 H	317	39.5	8.2
10	7311.00	36.8 AV	54.0	-17.2	1.44 H	317	28.6	8.2
11	12185.00	53.0 PK	74.0	-21.0	2.48 H	254	40.2	12.8
12	12185.00	43.2 AV	54.0	-10.8	2.48 H	254	30.4	12.8

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	62.9 PK	74.0	-11.1	3.43 V	241	65.1	-2.2
2	2390.00	46.7 AV	54.0	-7.3	3.43 V	241	48.9	-2.2
3	*2437.00	116.7 PK			3.43 V	241	119.1	-2.4
4	*2437.00	106.2 AV			3.43 V	241	108.6	-2.4
5	2483.50	62.6 PK	74.0	-11.4	3.43 V	241	64.9	-2.3
6	2483.50	47.5 AV	54.0	-6.5	3.43 V	241	49.8	-2.3
7	4874.00	41.4 PK	74.0	-32.6	2.69 V	229	39.7	1.7
8	4874.00	30.2 AV	54.0	-23.8	2.69 V	229	28.5	1.7
9	7311.00	44.5 PK	74.0	-29.5	1.65 V	224	36.3	8.2
10	7311.00	34.3 AV	54.0	-19.7	1.65 V	224	26.1	8.2
11	12185.00	46.4 PK	74.0	-27.6	1.56 V	260	33.6	12.8
12	12185.00	36.5 AV	54.0	-17.5	1.56 V	260	23.7	12.8

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	115.0 PK			1.89 H	322	117.4	-2.4
2	*2462.00	105.0 AV			1.89 H	322	107.4	-2.4
3	2483.50	73.7 PK	74.0	-0.3	1.89 H	322	76.0	-2.3
4	2483.50	53.8 AV	54.0	-0.2	1.89 H	322	56.1	-2.3
5	4924.00	41.5 PK	74.0	-32.5	2.34 H	254	39.7	1.8
6	4924.00	30.7 AV	54.0	-23.3	2.34 H	254	28.9	1.8
7	7386.00	48.0 PK	74.0	-26.0	1.43 H	324	39.7	8.3
8	7386.00	36.9 AV	54.0	-17.1	1.43 H	324	28.6	8.3
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	111.9 PK			3.48 V	239	114.3	-2.4
2	*2462.00	101.9 AV			3.48 V	239	104.3	-2.4
3	2483.50	71.6 PK	74.0	-2.4	3.48 V	239	73.9	-2.3
4	2483.50	51.7 AV	54.0	-2.3	3.48 V	239	54.0	-2.3
5	4924.00	42.1 PK	74.0	-31.9	2.73 V	222	40.3	1.8
6	4924.00	30.6 AV	54.0	-23.4	2.73 V	222	28.8	1.8
7	7386.00	44.4 PK	74.0	-29.6	1.67 V	220	36.1	8.3
8	7386.00	34.0 AV	54.0	-20.0	1.67 V	220	25.7	8.3

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

802.11n (HT20)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	70.6 PK	74.0	-3.4	1.90 H	313	72.8	-2.2
2	2390.00	53.9 AV	54.0	-0.1	1.90 H	313	56.1	-2.2
3	*2412.00	114.5 PK			1.90 H	313	116.8	-2.3
4	*2412.00	102.7 AV			1.90 H	313	105.0	-2.3
5	4824.00	41.4 PK	74.0	-32.6	2.26 H	258	39.7	1.7
6	4824.00	30.8 AV	54.0	-23.2	2.26 H	258	29.1	1.7
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	68.5 PK	74.0	-5.5	3.45 V	241	70.7	-2.2
2	2390.00	51.8 AV	54.0	-2.2	3.45 V	241	54.0	-2.2
3	*2412.00	111.0 PK			3.45 V	241	113.3	-2.3
4	*2412.00	99.2 AV			3.45 V	241	101.5	-2.3
5	4824.00	41.1 PK	74.0	-32.9	2.80 V	233	39.4	1.7
6	4824.00	30.1 AV	54.0	-23.9	2.80 V	233	28.4	1.7

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	64.0 PK	74.0	-10.0	1.89 H	311	66.2	-2.2
2	2390.00	48.2 AV	54.0	-5.8	1.89 H	311	50.4	-2.2
3	*2437.00	120.1 PK			1.89 H	311	122.5	-2.4
4	*2437.00	109.3 AV			1.89 H	311	111.7	-2.4
5	2483.50	66.5 PK	74.0	-7.5	1.89 H	311	68.8	-2.3
6	2483.50	50.0 AV	54.0	-4.0	1.89 H	311	52.3	-2.3
7	4874.00	41.2 PK	74.0	-32.8	2.27 H	254	39.5	1.7
8	4874.00	30.7 AV	54.0	-23.3	2.27 H	254	29.0	1.7
9	7311.00	47.5 PK	74.0	-26.5	1.39 H	307	39.3	8.2
10	7311.00	36.5 AV	54.0	-17.5	1.39 H	307	28.3	8.2

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	61.9 PK	74.0	-12.1	3.50 V	227	64.1	-2.2
2	2390.00	46.1 AV	54.0	-7.9	3.50 V	227	48.3	-2.2
3	*2437.00	116.6 PK			3.50 V	227	119.0	-2.4
4	*2437.00	105.8 AV			3.50 V	227	108.2	-2.4
5	2483.50	64.4 PK	74.0	-9.6	3.50 V	227	66.7	-2.3
6	2483.50	47.9 AV	54.0	-6.1	3.50 V	227	50.2	-2.3
7	4874.00	40.7 PK	74.0	-33.3	2.75 V	244	39.0	1.7
8	4874.00	29.8 AV	54.0	-24.2	2.75 V	244	28.1	1.7
9	7311.00	44.4 PK	74.0	-29.6	1.70 V	234	36.2	8.2
10	7311.00	34.4 AV	54.0	-19.6	1.70 V	234	26.2	8.2

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	115.0 PK			1.94 H	317	117.4	-2.4
2	*2462.00	103.1 AV			1.94 H	317	105.5	-2.4
3	2484.50	73.0 PK	74.0	-1.0	1.94 H	317	75.3	-2.3
4	2484.50	53.8 AV	54.0	-0.2	1.94 H	317	56.1	-2.3
5	4924.00	41.2 PK	74.0	-32.8	2.21 H	257	39.4	1.8
6	4924.00	30.6 AV	54.0	-23.4	2.21 H	257	28.8	1.8
7	7386.00	47.6 PK	74.0	-26.4	1.37 H	306	39.3	8.3
8	7386.00	36.8 AV	54.0	-17.2	1.37 H	306	28.5	8.3
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	111.5 PK			3.47 V	225	113.9	-2.4
2	*2462.00	99.6 AV			3.47 V	225	102.0	-2.4
3	2483.50	52.0 PK	74.0	-22.0	3.47 V	225	54.3	-2.3
4	2483.50	51.7 AV	54.0	-2.3	3.47 V	225	54.0	-2.3
5	4924.00	41.2 PK	74.0	-32.8	2.73 V	242	39.4	1.8
6	4924.00	30.3 AV	54.0	-23.7	2.73 V	242	28.5	1.8
7	7386.00	44.3 PK	74.0	-29.7	1.69 V	221	36.0	8.3
8	7386.00	34.5 AV	54.0	-19.5	1.69 V	221	26.2	8.3

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

802.11n (HT40)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	69.4 PK	74.0	-4.6	1.91 H	316	71.6	-2.2
2	2390.00	53.9 AV	54.0	-0.1	1.91 H	316	56.1	-2.2
3	*2422.00	109.6 PK			1.91 H	316	111.9	-2.3
4	*2422.00	97.9 AV			1.91 H	316	100.2	-2.3
5	4844.00	41.7 PK	74.0	-32.3	2.27 H	254	40.1	1.6
6	4844.00	31.2 AV	54.0	-22.8	2.27 H	254	29.6	1.6
7	7266.00	48.0 PK	74.0	-26.0	1.34 H	319	39.8	8.2
8	7266.00	36.7 AV	54.0	-17.3	1.34 H	319	28.5	8.2
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	67.3 PK	74.0	-6.7	2.47 V	147	69.5	-2.2
2	2390.00	51.8 AV	54.0	-2.2	2.47 V	147	54.0	-2.2
3	*2422.00	106.1 PK			2.47 V	147	108.4	-2.3
4	*2422.00	94.4 AV			2.47 V	147	96.7	-2.3
5	4844.00	41.0 PK	74.0	-33.0	2.75 V	250	39.4	1.6
6	4844.00	30.0 AV	54.0	-24.0	2.75 V	250	28.4	1.6
7	7266.00	44.1 PK	74.0	-29.9	1.69 V	240	35.9	8.2
8	7266.00	33.9 AV	54.0	-20.1	1.69 V	240	25.7	8.2

REMARKS:

- Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
- Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
- Margin value = Emission Level – Limit value
- The other emission levels were very low against the limit.
- " * ": Fundamental frequency.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	66.8 PK	74.0	-7.2	1.91 H	309	69.0	-2.2
2	2390.00	48.7 AV	54.0	-5.3	1.91 H	309	50.9	-2.2
3	*2437.00	114.1 PK			1.91 H	309	116.5	-2.4
4	*2437.00	101.2 AV			1.91 H	309	103.6	-2.4
5	2483.50	73.0 PK	74.0	-1.0	1.91 H	309	75.3	-2.3
6	2483.50	53.4 AV	54.0	-0.6	1.91 H	309	55.7	-2.3
7	2484.20	73.3 PK	74.0	-0.7	1.91 H	309	75.6	-2.3
8	2484.20	53.9 AV	54.0	-0.1	1.91 H	309	56.2	-2.3
9	4874.00	40.9 PK	74.0	-33.1	2.25 H	258	39.2	1.7
10	4874.00	30.7 AV	54.0	-23.3	2.25 H	258	29.0	1.7
11	7311.00	46.8 PK	74.0	-27.2	1.32 H	299	38.6	8.2
12	7311.00	36.1 AV	54.0	-17.9	1.32 H	299	27.9	8.2

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	64.7 PK	74.0	-9.3	2.47 V	151	66.9	-2.2
2	2390.00	46.6 AV	54.0	-7.4	2.47 V	151	48.8	-2.2
3	*2437.00	110.6 PK			2.47 V	151	113.0	-2.4
4	*2437.00	97.7 AV			2.47 V	151	100.1	-2.4
5	2483.50	69.9 PK	74.0	-4.1	2.47 V	151	72.2	-2.3
6	2483.50	50.3 AV	54.0	-3.7	2.47 V	151	52.6	-2.3
7	2484.57	70.2 PK	74.0	-3.8	2.47 V	151	72.5	-2.3
8	2484.57	50.9 AV	54.0	-3.1	2.47 V	151	53.2	-2.3
9	4874.00	40.3 PK	74.0	-33.7	2.80 V	251	38.6	1.7
10	4874.00	29.6 AV	54.0	-24.4	2.80 V	251	27.9	1.7
11	7311.00	44.1 PK	74.0	-29.9	1.75 V	231	35.9	8.2
12	7311.00	34.4 AV	54.0	-19.6	1.75 V	231	26.2	8.2

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2452.00	111.6 PK			1.96 H	320	114.0	-2.4
2	*2452.00	99.7 AV			1.96 H	320	102.1	-2.4
3	2483.50	69.0 PK	74.0	-5.0	1.96 H	320	71.3	-2.3
4	2483.50	48.3 AV	54.0	-5.7	1.96 H	320	50.6	-2.3
5	2484.80	69.4 PK	74.0	-4.6	1.96 H	320	71.7	-2.3
6	2484.80	53.8 AV	54.0	-0.2	1.96 H	320	56.1	-2.3
7	4904.00	41.0 PK	74.0	-33.0	2.21 H	249	39.2	1.8
8	4904.00	30.7 AV	54.0	-23.3	2.21 H	249	28.9	1.8
9	7356.00	47.5 PK	74.0	-26.5	1.35 H	313	39.3	8.2
10	7356.00	36.5 AV	54.0	-17.5	1.35 H	313	28.3	8.2

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2452.00	106.3 PK			2.49 V	149	108.7	-2.4
2	*2452.00	96.2 AV			2.49 V	149	98.6	-2.4
3	2483.50	64.2 PK	74.0	-9.8	2.49 V	149	66.5	-2.3
4	2483.50	47.0 AV	54.0	-7.0	2.49 V	149	49.3	-2.3
5	2484.80	64.7 PK	74.0	-9.3	2.49 V	149	67.0	-2.3
6	2484.80	50.1 AV	54.0	-3.9	2.49 V	149	52.4	-2.3
7	4904.00	40.7 PK	74.0	-33.3	2.77 V	260	38.9	1.8
8	4904.00	29.9 AV	54.0	-24.1	2.77 V	260	28.1	1.8
9	7356.00	44.1 PK	74.0	-29.9	1.73 V	247	35.9	8.2
10	7356.00	34.4 AV	54.0	-19.6	1.73 V	247	26.2	8.2

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

Below 1GHz Data:

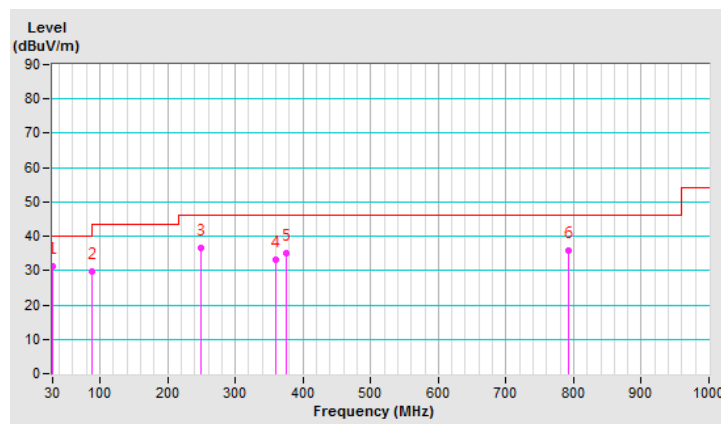
802.11b

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	30.19	31.2 QP	40.0	-8.8	1.00 H	157	45.9	-14.7
2	87.52	29.6 QP	40.0	-10.4	2.00 H	51	47.9	-18.3
3	250.02	36.6 QP	46.0	-9.4	1.50 H	64	50.3	-13.7
4	359.99	33.2 QP	46.0	-12.8	1.00 H	55	43.8	-10.6
5	375.03	35.2 QP	46.0	-10.8	1.00 H	76	45.2	-10.0
6	792.20	35.7 QP	46.0	-10.3	2.00 H	48	36.6	-0.9

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

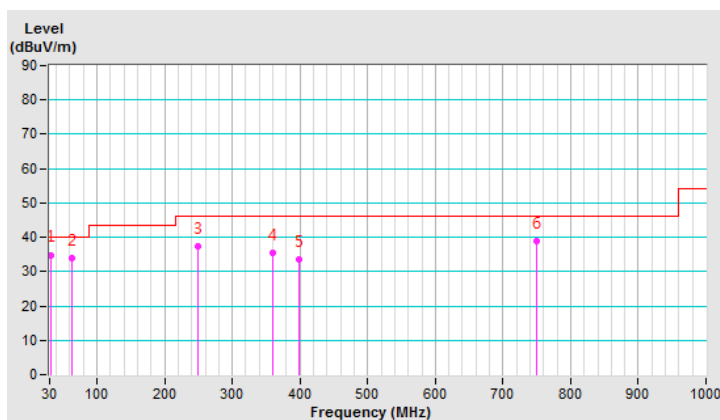


CHANNEL	TX Channel 1	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	32.72	34.9 QP	40.0	-5.1	1.00 V	167	49.5	-14.6
2	62.91	33.9 QP	40.0	-6.1	1.50 V	148	47.8	-13.9
3	250.02	37.5 QP	46.0	-8.5	1.00 V	360	51.2	-13.7
4	360.02	35.5 QP	46.0	-10.5	1.50 V	40	46.1	-10.6
5	398.87	33.7 QP	46.0	-12.3	1.50 V	216	43.1	-9.4
6	750.01	38.8 QP	46.0	-7.2	1.50 V	12	40.2	-1.4

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



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.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver R&S	ESCS 30	847124/029	Oct. 24, 2018	Oct. 23, 2019
Line-Impedance Stabilization Network (for EUT) R&S	ESH3-Z5	848773/004	Oct. 22, 2018	Oct. 21, 2019
Line-Impedance Stabilization Network (for Peripheral) R&S	ESH3-Z5	835239/001	Mar. 17, 2019	Mar. 16, 2020
50 ohms Terminator	N/A	3	Oct. 22, 2018	Oct. 21, 2019
RF Cable	5D-FB	COCCAB-001	Sep. 28, 2018	Sep. 27, 2019
Fixed attenuator EMCI	STI02-2200-10	003	Mar. 14, 2019	Mar. 13, 2020
Software BVADT	BVADT_Cond_ V7.3.7.4	NA	NA	NA

Note:

1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Conduction 1.
- 3 Tested Date: Apr. 08, 2019

4.2.3 Test Procedures

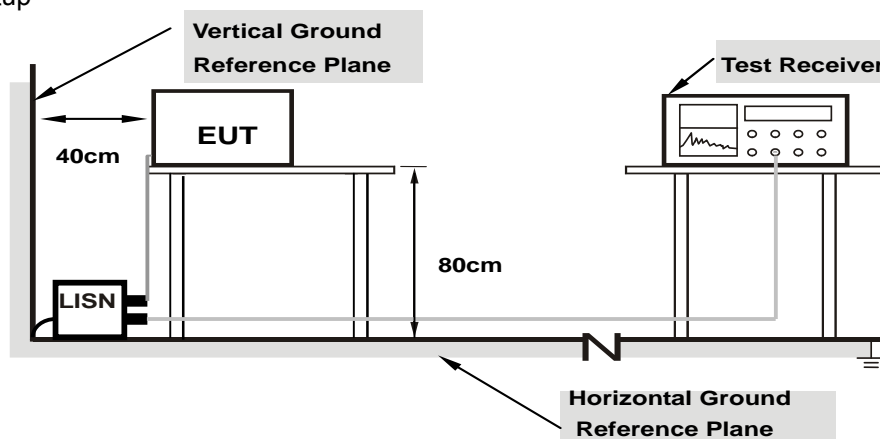
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

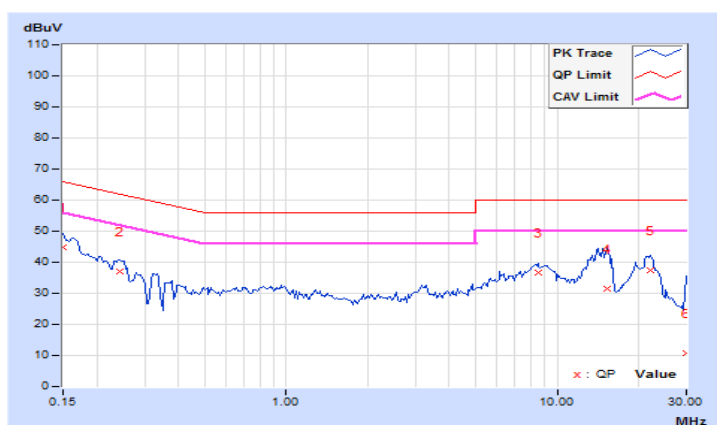
4.2.7 Test Results

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

No	Freq. [MHz]	Corr.	Reading Value		Emission Level		Limit		Margin	
		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
		(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.03	34.66	19.30	44.69	29.33	66.00	56.00	-21.31	-26.67
2	0.24375	10.06	27.03	17.26	37.09	27.32	61.97	51.97	-24.88	-24.65
3	8.49609	10.60	25.98	20.13	36.58	30.73	60.00	50.00	-23.42	-19.27
4	15.25000	11.05	20.29	14.12	31.34	25.17	60.00	50.00	-28.66	-24.83
5	22.13281	11.41	25.97	19.20	37.38	30.61	60.00	50.00	-22.62	-19.39
6	29.91406	11.60	-0.94	-6.36	10.66	5.24	60.00	50.00	-49.34	-44.76

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

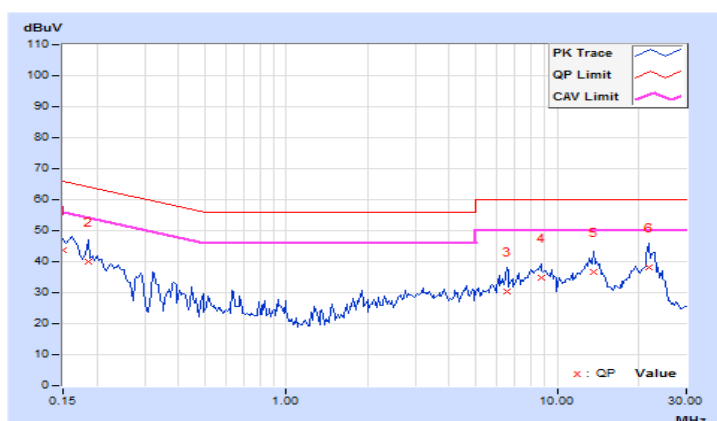


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
-------	-------------	-------------------	--------------------------------

No	Freq. [MHz]	Corr.	Reading Value		Emission Level		Limit		Margin	
		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
		(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	9.94	33.92	19.52	43.86	29.46	66.00	56.00	-22.14	-26.54
2	0.18516	9.95	30.22	14.36	40.17	24.31	64.25	54.25	-24.08	-29.94
3	6.53906	10.32	20.11	14.14	30.43	24.46	60.00	50.00	-29.57	-25.54
4	8.72266	10.45	24.49	18.99	34.94	29.44	60.00	50.00	-25.06	-20.56
5	13.72656	10.76	26.00	19.91	36.76	30.67	60.00	50.00	-23.24	-19.33
6	21.79688	11.17	27.13	19.73	38.30	30.90	60.00	50.00	-21.70	-19.10

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

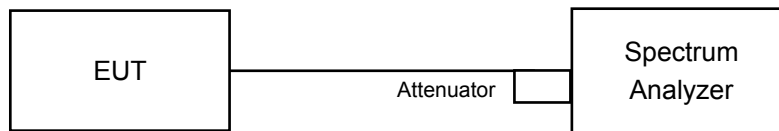


4.3 6dB Bandwidth Measurement

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

- Set resolution bandwidth (RBW) = 100kHz
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW, Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- 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 from Test 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

CDD Mode

802.11b

Channel	Frequency (MHz)	6dB Bandwidth (MHz)			Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
1	2412	9.07	9.09	9.08	0.5	Pass
6	2437	8.61	8.61	8.61	0.5	Pass
11	2462	8.62	8.62	9.08	0.5	Pass

802.11g

Channel	Frequency (MHz)	6dB Bandwidth (MHz)			Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
1	2412	16.42	16.44	16.46	0.5	Pass
6	2437	15.79	15.84	15.85	0.5	Pass
11	2462	16.35	16.41	16.45	0.5	Pass

802.11n (HT20)

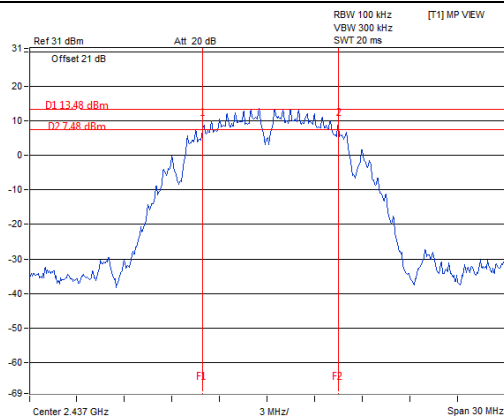
Channel	Frequency (MHz)	6dB Bandwidth (MHz)			Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
1	2412	17.62	17.70	17.67	0.5	Pass
6	2437	16.44	17.00	17.63	0.5	Pass
11	2462	17.37	17.65	17.66	0.5	Pass

802.11n (HT40)

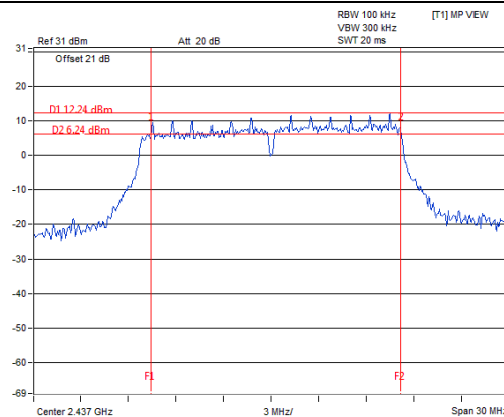
Channel	Frequency (MHz)	6dB Bandwidth (MHz)			Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
3	2422	36.29	36.54	36.16	0.5	Pass
6	2437	35.85	35.83	35.85	0.5	Pass
9	2452	35.65	35.86	35.85	0.5	Pass

Spectrum Plot of Worst Value

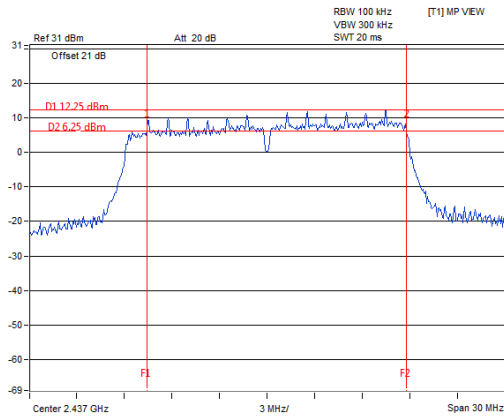
802.11b_Chain 0 / CH6



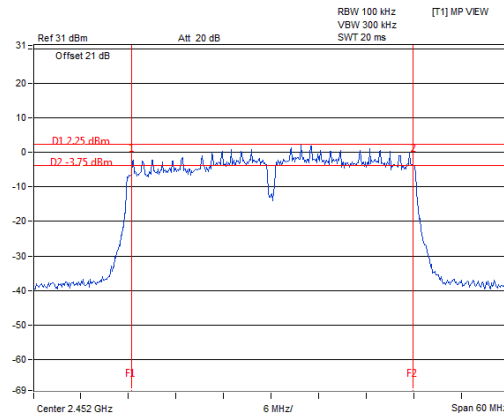
802.11g_Chain 0 / CH6



802.11n (HT20)_Chain 0 / CH6



802.11n (HT40)_Chain 0 / CH9



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,

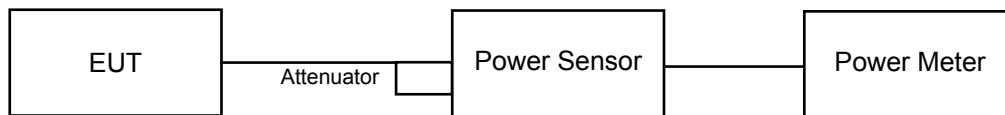
Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

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

CDD Mode

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				
1	2412	23.04	23.17	23.48	631.707	28.01	30	Pass
6	2437	22.71	23.03	23.23	597.925	27.77	30	Pass
11	2462	22.44	22.75	23.07	566.521	27.53	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				
1	2412	20.35	20.95	20.77	352.243	25.47	30	Pass
6	2437	22.75	23.20	23.51	621.683	27.94	30	Pass
11	2462	18.26	18.88	18.91	222.06	23.46	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				
1	2412	16.91	17.60	17.62	164.445	22.16	30	Pass
6	2437	22.73	23.33	23.42	622.563	27.94	30	Pass
11	2462	16.83	17.31	17.03	152.488	21.83	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				
3	2422	15.10	15.55	15.43	103.165	20.14	30	Pass
6	2437	17.93	18.46	18.55	203.847	23.09	30	Pass
9	2452	14.92	15.41	15.11	98.234	19.92	30	Pass

Beamforming Mode

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				
1	2412	16.91	17.60	17.62	164.445	22.16	29.01	Pass
6	2437	22.73	23.33	23.42	622.563	27.94	29.01	Pass
11	2462	16.83	17.31	17.03	152.488	21.83	29.01	Pass

Note: The directional gain = $10 \log[(10^{G0/20} + 10^{G1/20} + 10^{G2/20})^2 / 3] = 6.99\text{dBi} > 6\text{dBi}$, so the power limit shall be reduced to $30 - (6.99 - 6) = 29.01\text{dBm}$.

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				
3	2422	15.10	15.55	15.43	103.165	20.14	29.01	Pass
6	2437	17.93	18.46	18.55	203.847	23.09	29.01	Pass
9	2452	14.92	15.41	15.11	98.234	19.92	29.01	Pass

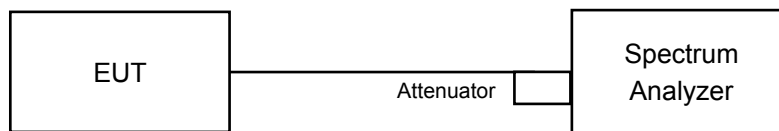
Note: The directional gain = $10 \log[(10^{G0/20} + 10^{G1/20} + 10^{G2/20})^2 / 3] = 6.99\text{dBi} > 6\text{dBi}$, so the power limit shall be reduced to $30 - (6.99 - 6) = 29.01\text{dBm}$.

4.5 Power Spectral Density Measurement

4.5.1 Limits of Power Spectral Density Measurement

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

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 802.11n (HT40)

- Measure the duty cycle (x).
- Set instrument center frequency to DTS channel center frequency.
- Set span to at least 1.5 times the OBW.
- Set RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- Set VBW $\geq 3 \times \text{RBW}$.
- Detector = power averaging (RMS) or sample detector (when RMS not available).
- Ensure that the number of measurement points in the sweep $\geq 2 \times \text{span/RBW}$.
- Sweep time = auto couple.
- Do not use sweep triggering. Allow sweep to "free run".
- Employ trace averaging (RMS) mode over a minimum of 100 traces.
- Use the peak marker function to determine the maximum amplitude level.
- 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.

For other modulation mode

- Set instrument center frequency to DTS channel center frequency.
- Set span to at least 1.5 times the OBW.
- Set RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- Set VBW $\geq 3 \times \text{RBW}$.
- Detector = power averaging (RMS) or sample detector (when RMS not available).
- Ensure that the number of measurement points in the sweep $\geq 2 \times \text{span/RBW}$.
- Sweep time = auto couple.
- Employ trace averaging (RMS) mode over a minimum of 100 traces.
- Use the peak marker function to determine the maximum amplitude level.

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

CDD Mode

802.11b

TX chain	Channel	Freq. (MHz)	PSD (dBm/3kHz)	10 log (N=3) dB	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	1	2412	-7.60	4.77	-2.83	7.01	Pass
	6	2437	-8.08	4.77	-3.31	7.01	Pass
	11	2462	-8.25	4.77	-3.48	7.01	Pass
1	1	2412	-7.03	4.77	-2.26	7.01	Pass
	6	2437	-8.71	4.77	-3.94	7.01	Pass
	11	2462	-6.45	4.77	-1.68	7.01	Pass
2	1	2412	-6.56	4.77	-1.79	7.01	Pass
	6	2437	-7.68	4.77	-2.91	7.01	Pass
	11	2462	-8.67	4.77	-3.90	7.01	Pass

Note: The directional gain = $10 \log[(10^{G0/20} + 10^{G1/20} + 10^{G2/20})^2 / 3]$ = 6.99dBi > 6dBi, so the power density limit shall be reduced to $8-(6.99-6) = 7.01$ dBm.

802.11g

TX chain	Channel	Freq. (MHz)	PSD (dBm/3kHz)	10 log (N=3) dB	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	1	2412	-11.65	4.77	-6.88	7.01	Pass
	6	2437	-8.27	4.77	-3.50	7.01	Pass
	11	2462	-13.63	4.77	-8.86	7.01	Pass
1	1	2412	-9.45	4.77	-4.68	7.01	Pass
	6	2437	-7.57	4.77	-2.80	7.01	Pass
	11	2462	-11.10	4.77	-6.33	7.01	Pass
2	1	2412	-9.84	4.77	-5.07	7.01	Pass
	6	2437	-7.85	4.77	-3.08	7.01	Pass
	11	2462	-12.09	4.77	-7.32	7.01	Pass

Note: The directional gain = $10 \log[(10^{G0/20} + 10^{G1/20} + 10^{G2/20})^2 / 3]$ = 6.99dBi > 6dBi, so the power density limit shall be reduced to $8-(6.99-6) = 7.01$ dBm.

802.11n (HT20)

TX chain	Channel	Freq. (MHz)	PSD (dBm/3kHz)	10 log (N=3) dB	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	1	2412	-16.17	4.77	-11.40	7.01	Pass
	6	2437	-9.41	4.77	-4.64	7.01	Pass
	11	2462	-15.37	4.77	-10.60	7.01	Pass
1	1	2412	-14.52	4.77	-9.75	7.01	Pass
	6	2437	-9.21	4.77	-4.44	7.01	Pass
	11	2462	-12.49	4.77	-7.72	7.01	Pass
2	1	2412	-15.69	4.77	-10.92	7.01	Pass
	6	2437	-8.70	4.77	-3.93	7.01	Pass
	11	2462	-15.32	4.77	-10.55	7.01	Pass

Note: The directional gain = $10 \log[(10^{G0/20} + 10^{G1/20} + 10^{G2/20})^2 / 3] = 6.99\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $8-(6.99-6) = 7.01\text{dBm}$.

802.11n (HT40)

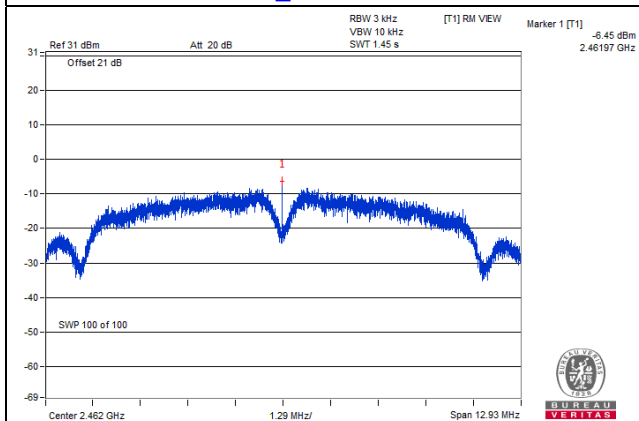
TX chain	Channel	Freq. (MHz)	PSD W/O Duty Factor (dBm/3kHz)	10 log (N=3) dB	Duty Factor (dB)	TOTAL PSD With Duty Factor (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	3	2422	-19.55	4.77	0.09	-14.69	7.01	Pass
	6	2437	-16.03	4.77	0.09	-11.17	7.01	Pass
	9	2452	-19.74	4.77	0.09	-14.88	7.01	Pass
1	3	2422	-17.34	4.77	0.09	-12.48	7.01	Pass
	6	2437	-16.83	4.77	0.09	-11.97	7.01	Pass
	9	2452	-19.28	4.77	0.09	-14.42	7.01	Pass
2	3	2422	-18.76	4.77	0.09	-13.90	7.01	Pass
	6	2437	-14.74	4.77	0.09	-9.88	7.01	Pass
	9	2452	-19.31	4.77	0.09	-14.45	7.01	Pass

Note: 1. The directional gain = $10 \log[(10^{G0/20} + 10^{G1/20} + 10^{G2/20})^2 / 3] = 6.99\text{dBi} > 6\text{dBi}$, so the power density limit shall be reduced to $8-(6.99-6) = 7.01\text{dBm}$.

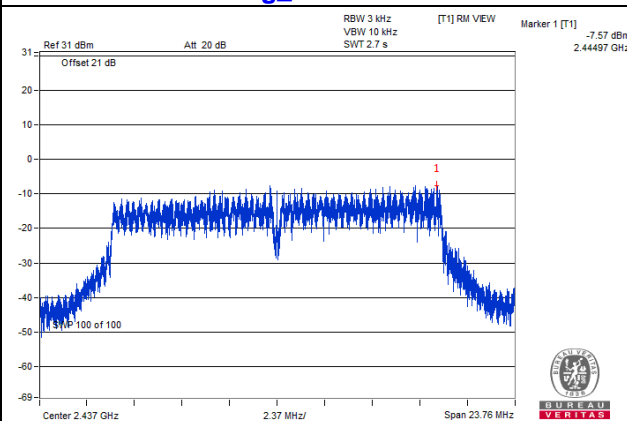
2. Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value

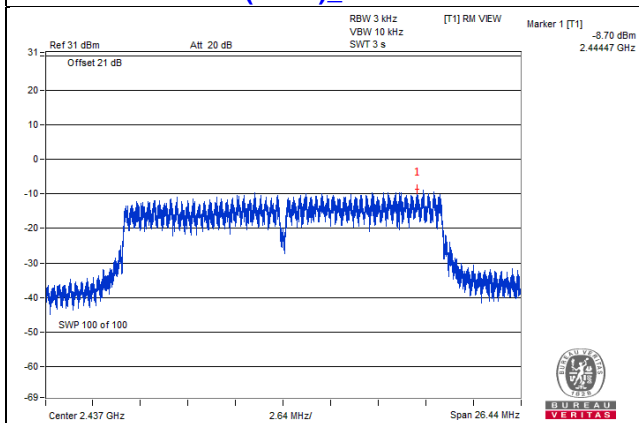
802.11b_Chain 1 / CH11



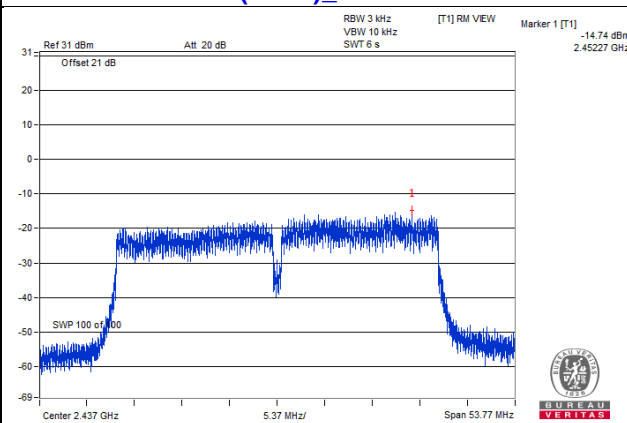
802.11g_Chain 1 / CH6



802.11n (HT20)_Chain 2 / CH6



802.11n (HT40)_Chain 2 / CH6

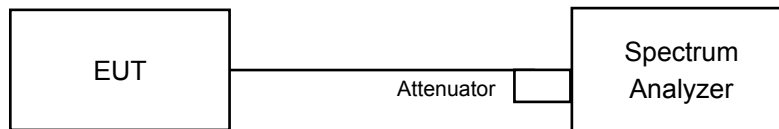


4.6 Conducted Out of Band Emission Measurement

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 \geq 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 OOB

1. Set RBW = 100 kHz.
2. Set VBW \geq 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

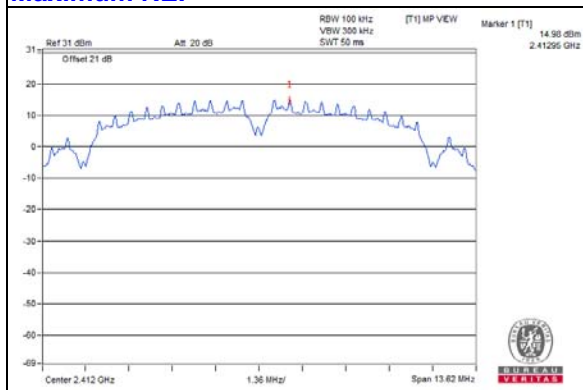
4.6.7 Test Results

The 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.

CDD Mode

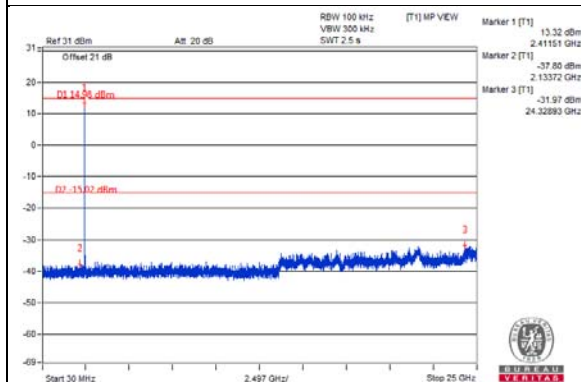
802.11b

Maximum REF

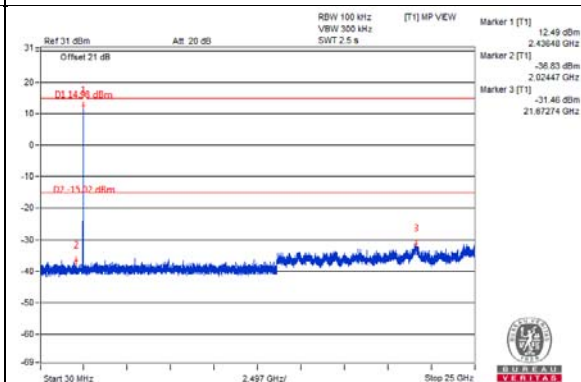


Chain 0

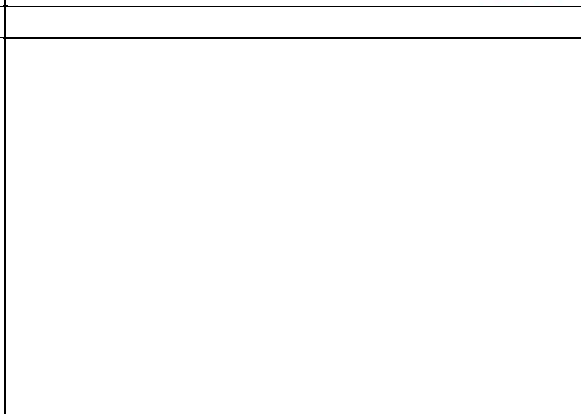
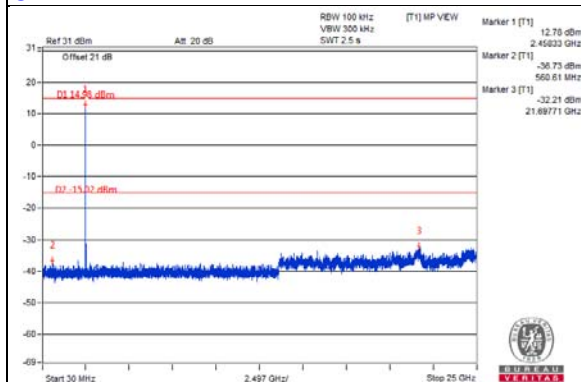
CH 1



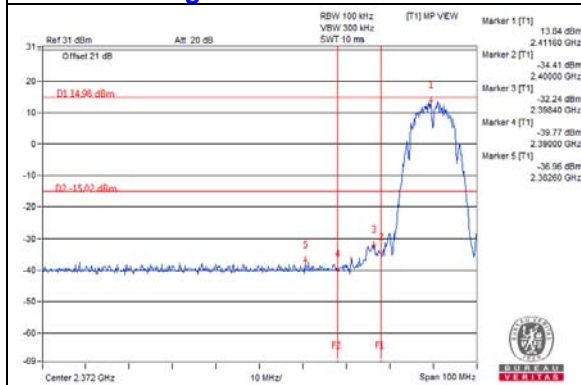
CH 6



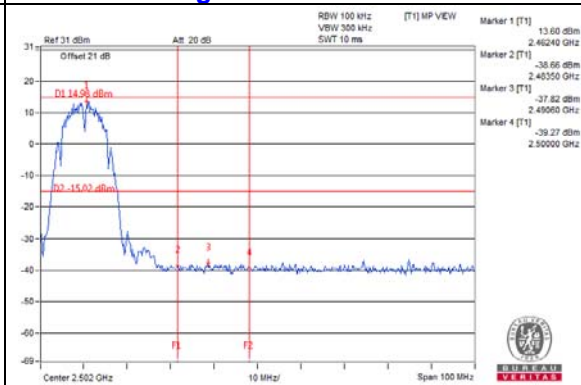
CH 11



CH 1 Band edge

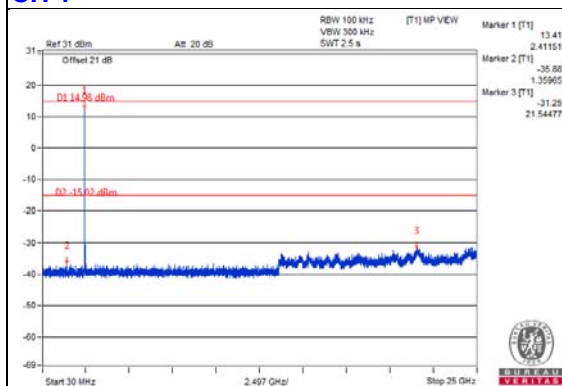


CH 11 Band edge

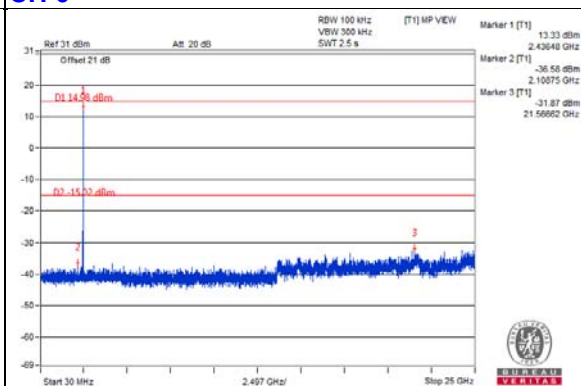


Chain 1

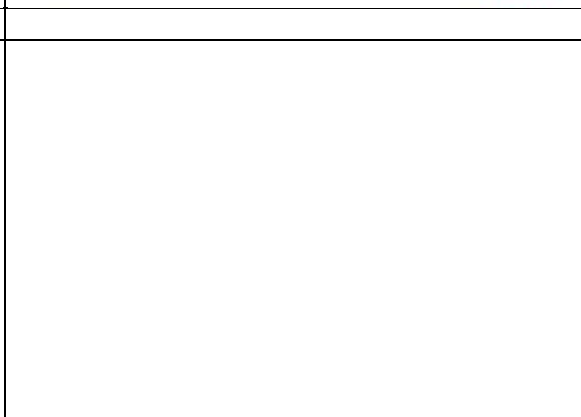
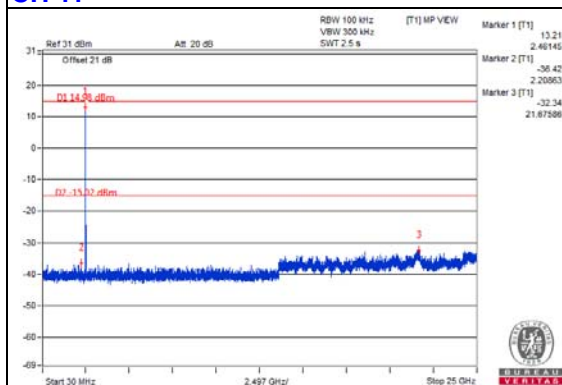
CH 1



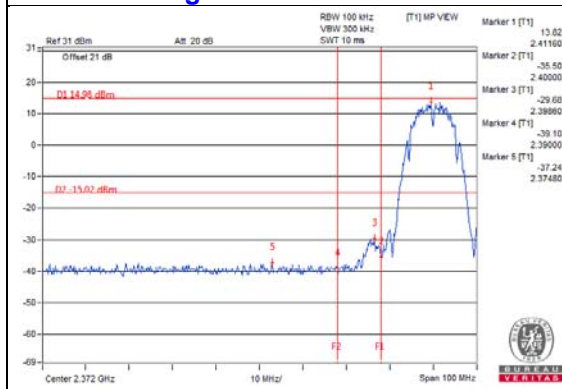
CH 6



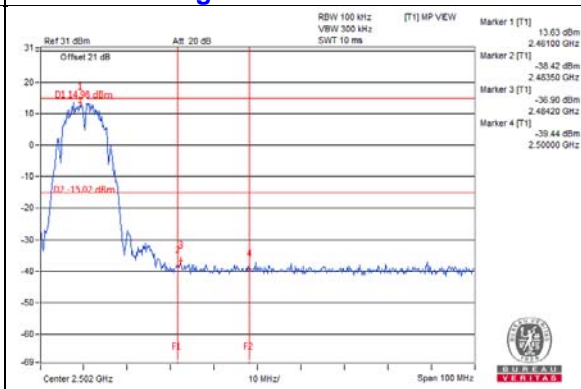
CH 11



CH 1 Band edge

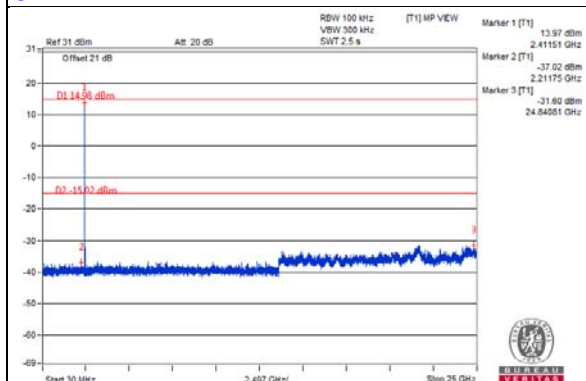


CH 11 Band edge

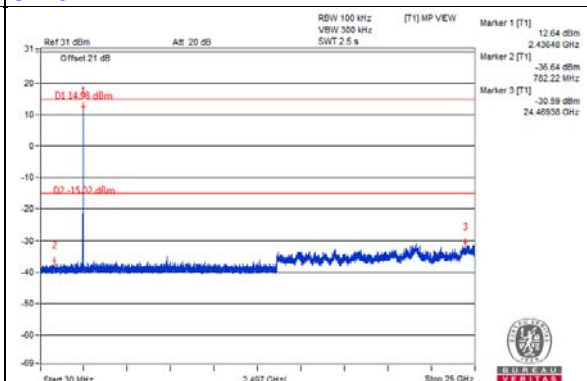


Chain 2

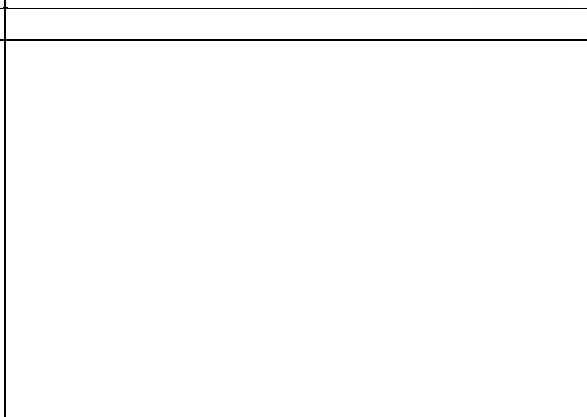
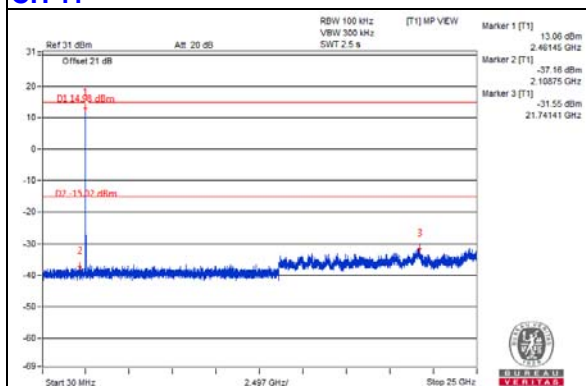
CH 1



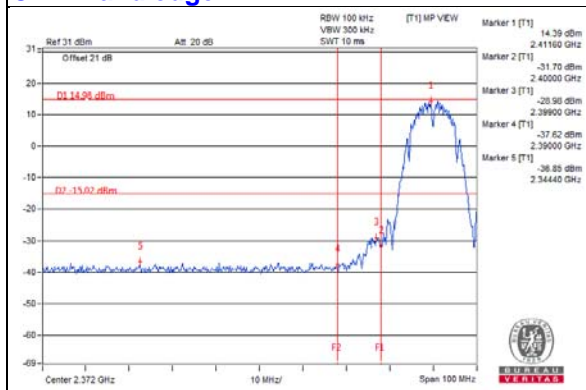
CH 6



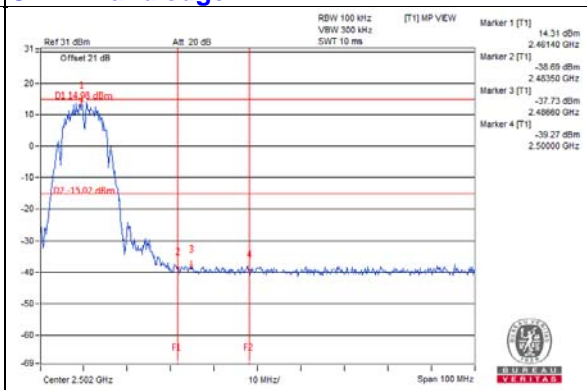
CH 11



CH 1 Band edge

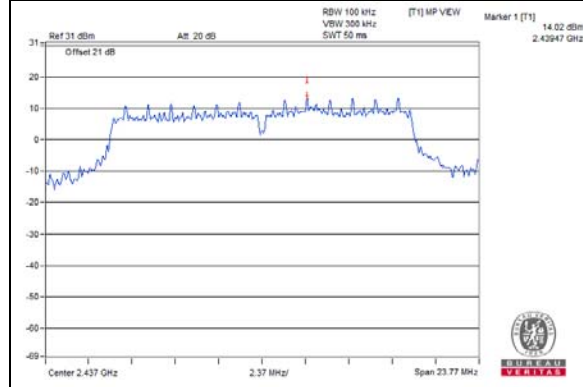


CH 11 Band edge



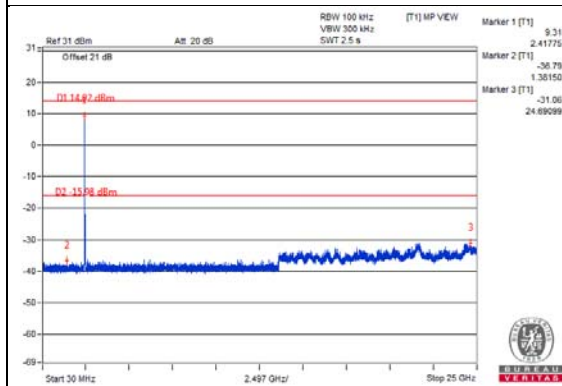
802.11g

Maximum REF

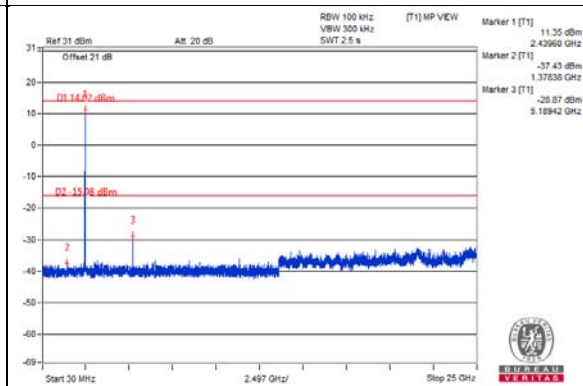


Chain 0

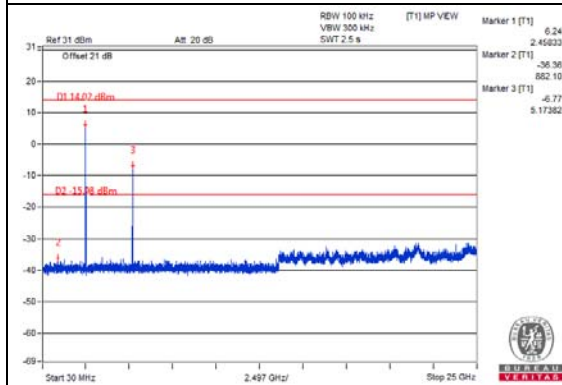
CH 1



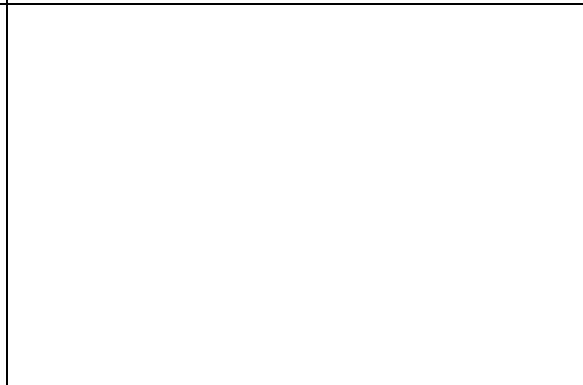
CH 6



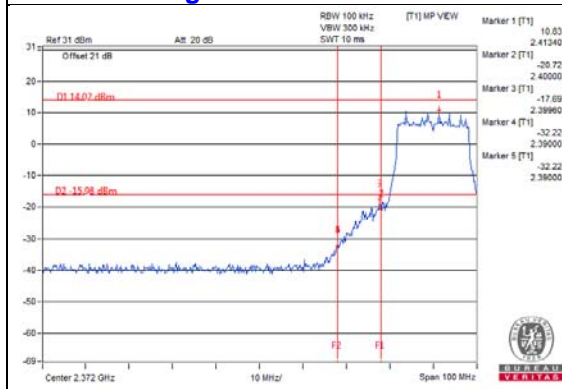
CH 11



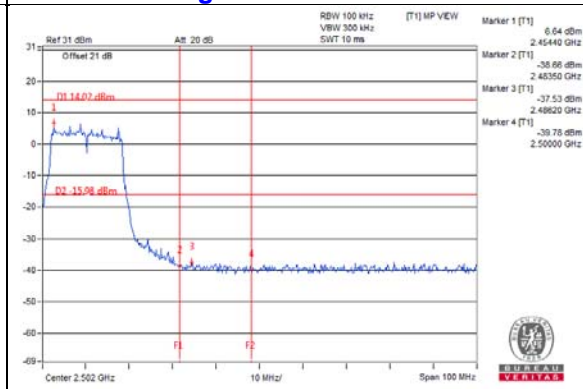
CH 11 Band edge



CH 1 Band edge

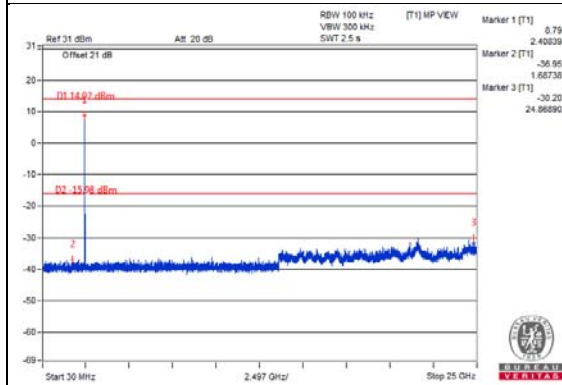


CH 11 Band edge

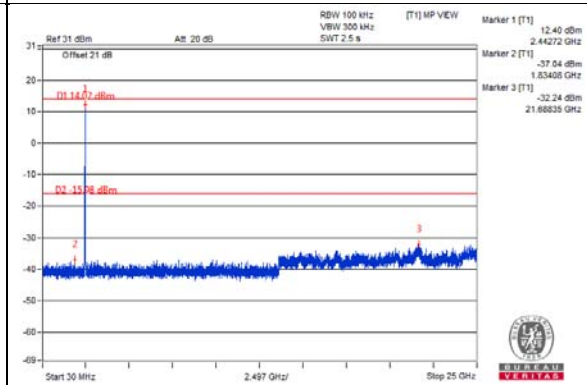


Chain 1

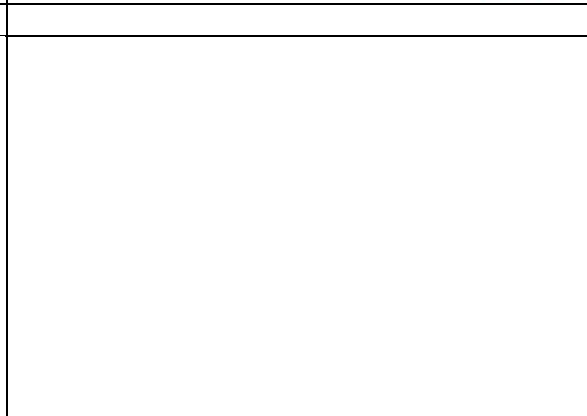
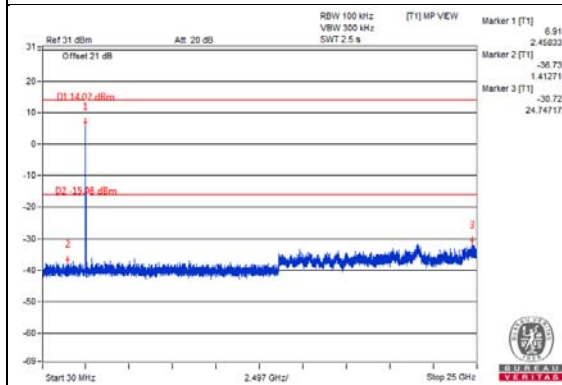
CH 1



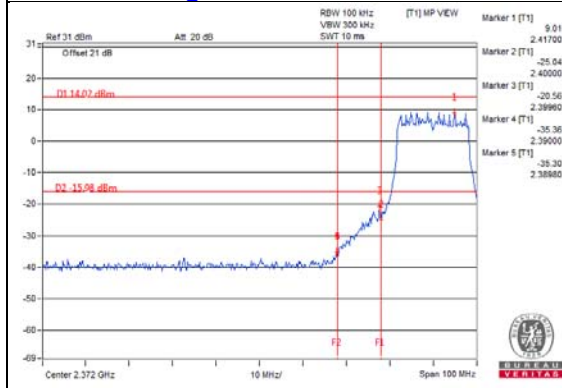
CH 6



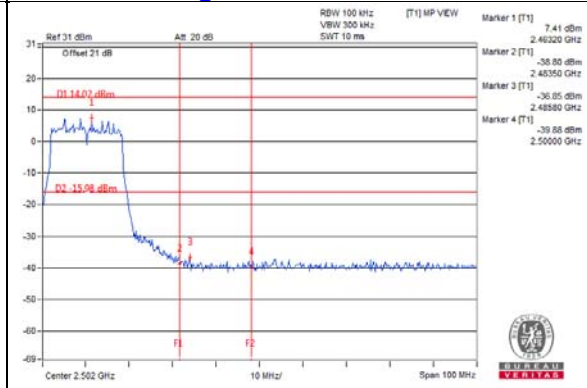
CH 11



CH 1 Band edge

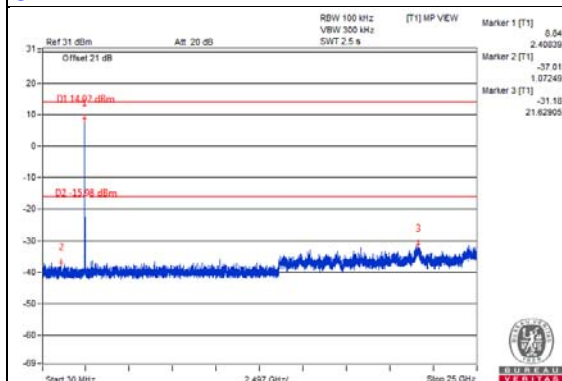


CH 11 Band edge

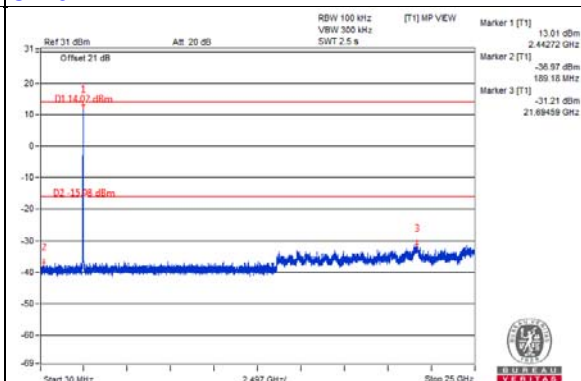


Chain 2

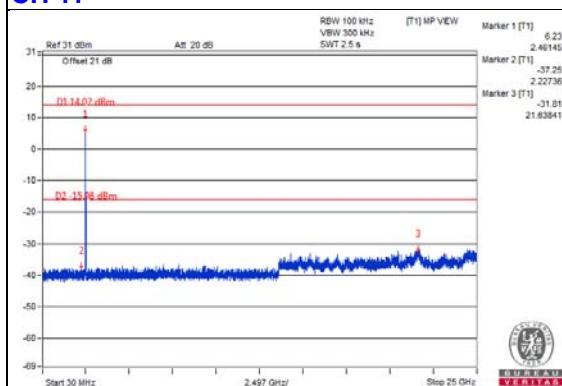
CH 1



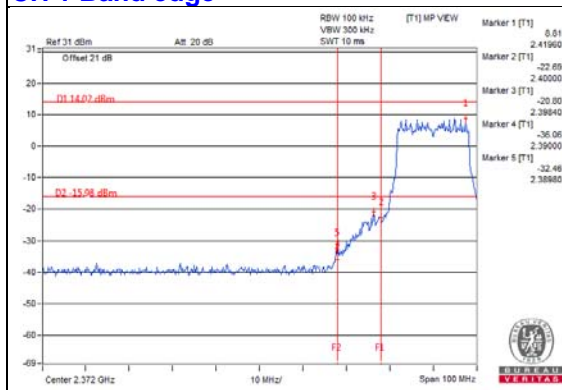
CH 6



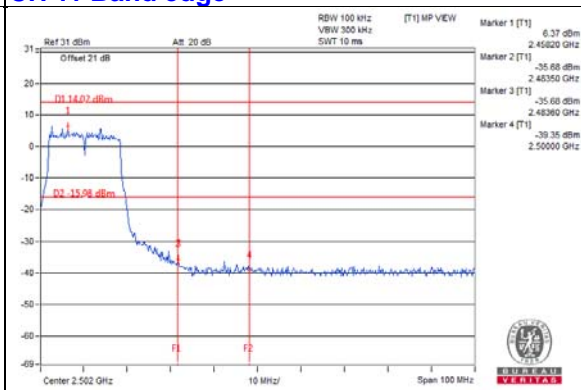
CH 11



CH 1 Band edge

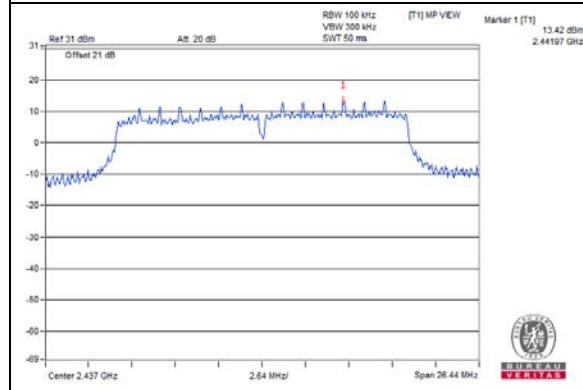


CH 11 Band edge



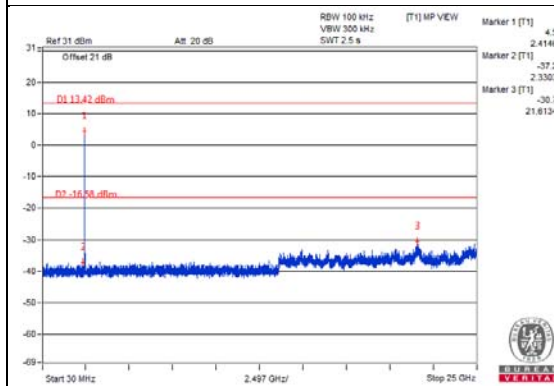
802.11n (HT20)

Maximum REF

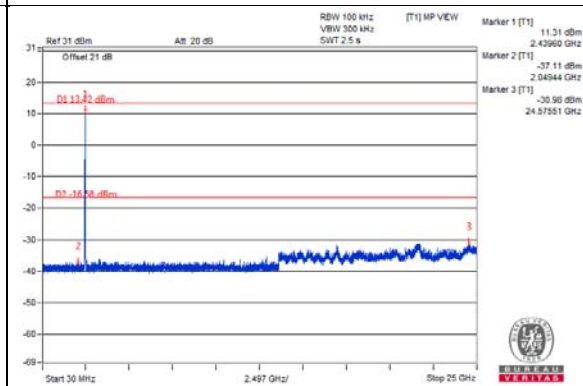


Chain 0

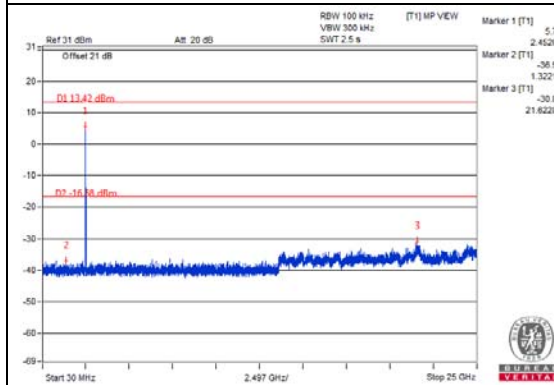
CH 1



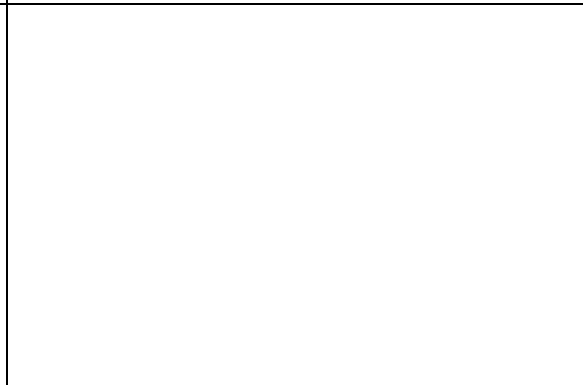
CH 6



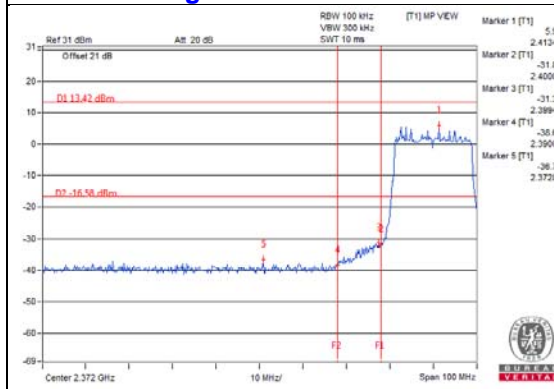
CH 11



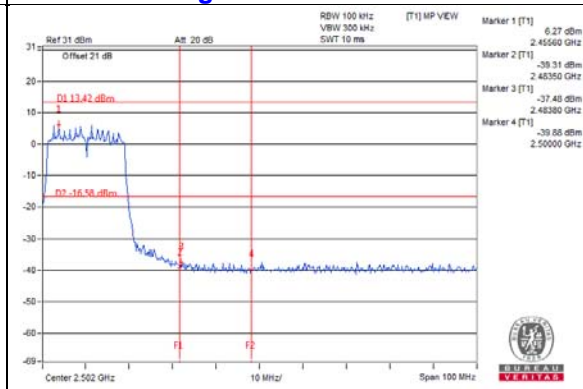
CH 11 Band edge



CH 1 Band edge

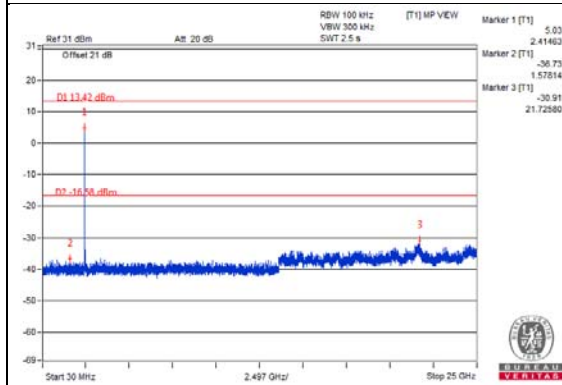


CH 11 Band edge

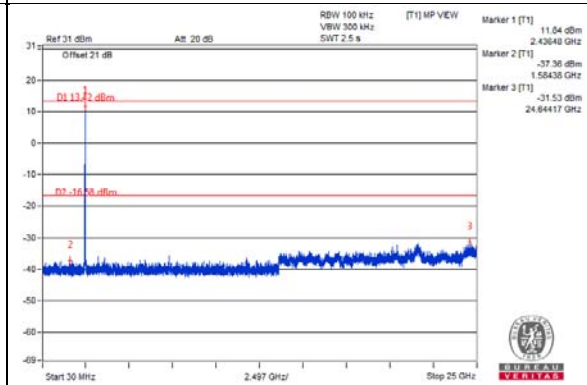


Chain 1

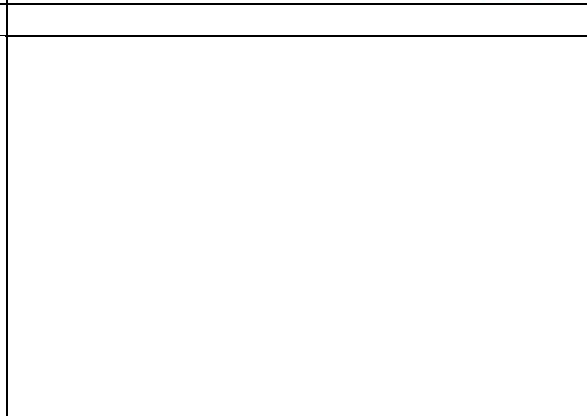
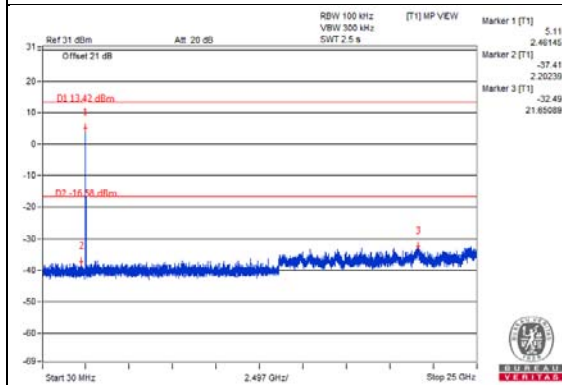
CH 1



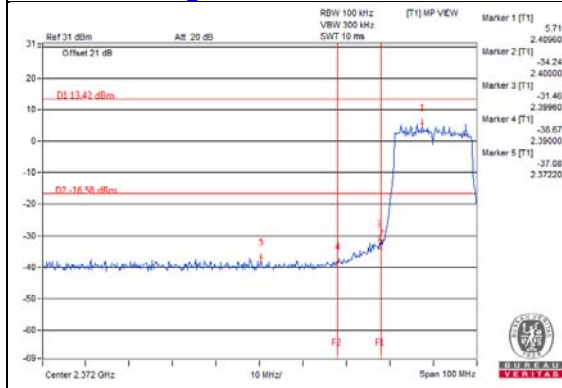
CH 6



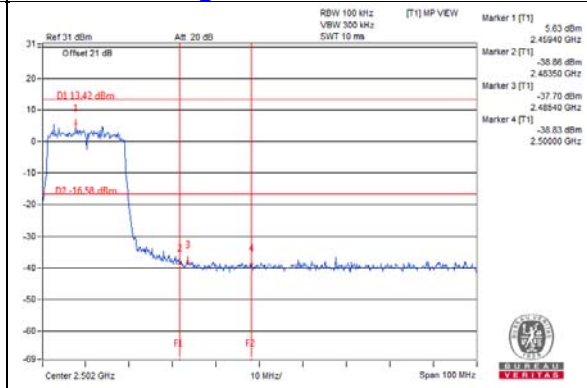
CH 11



CH 1 Band edge

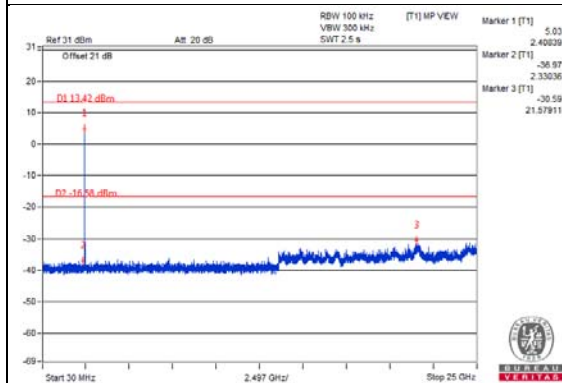


CH 11 Band edge

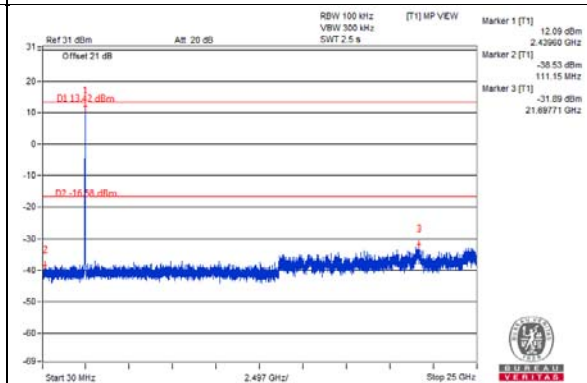


Chain 2

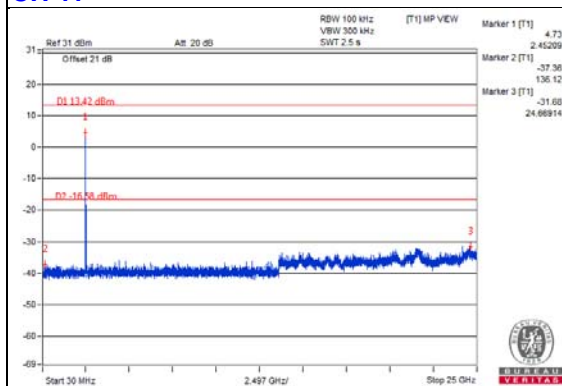
CH 1



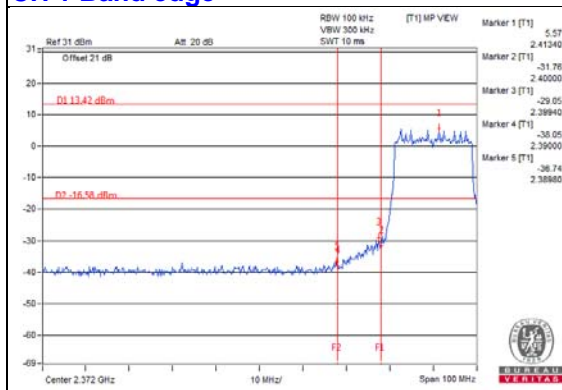
CH 6



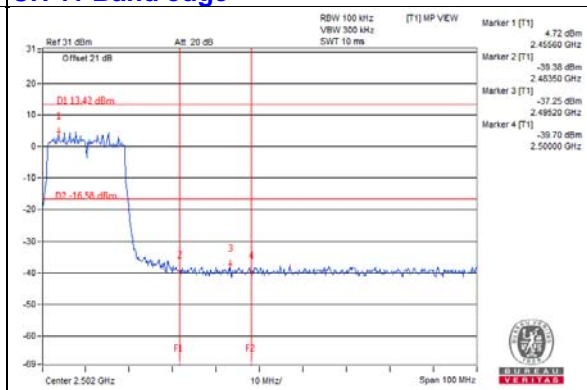
CH 11



CH 1 Band edge

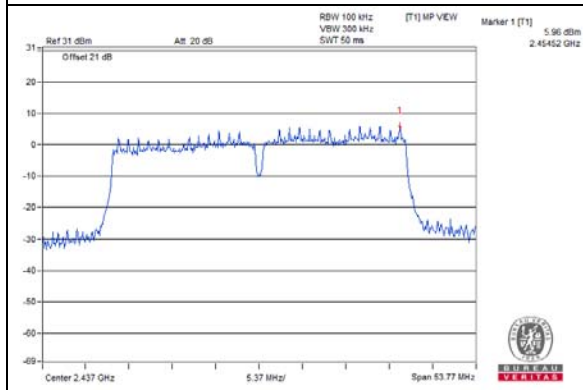


CH 11 Band edge



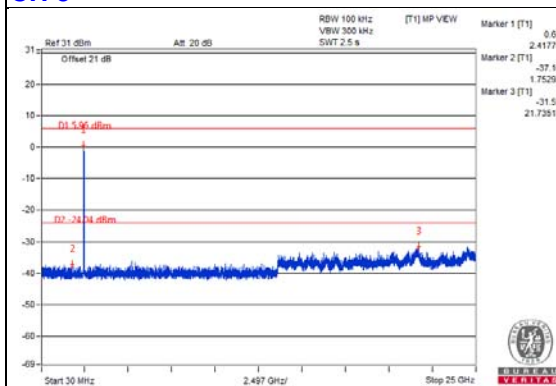
802.11n (HT40)

Maximum REF

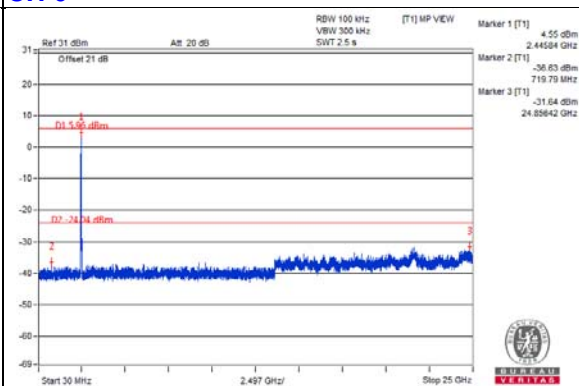


Chain 0

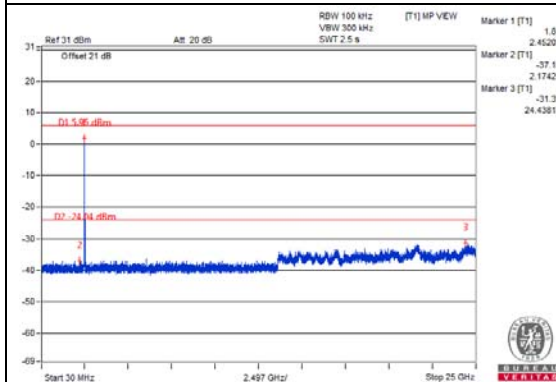
CH 3



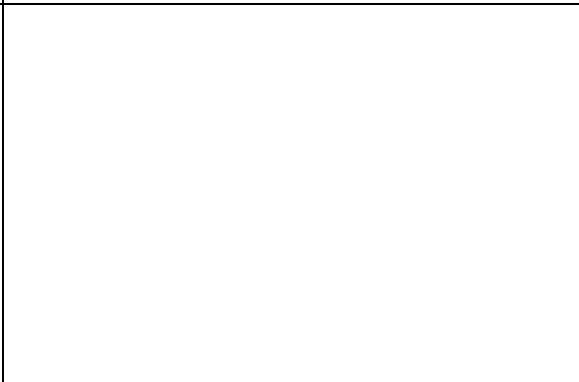
CH 6



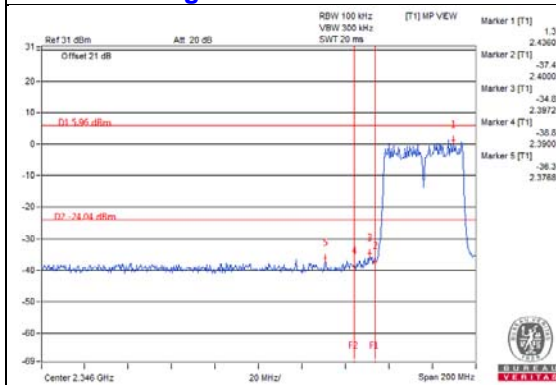
CH 9



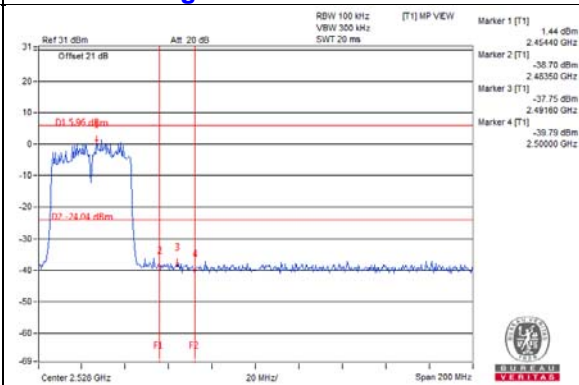
CH 9



CH 3 Band edge

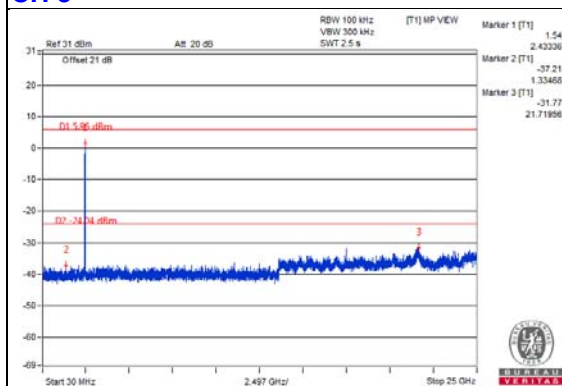


CH 9 Band edge

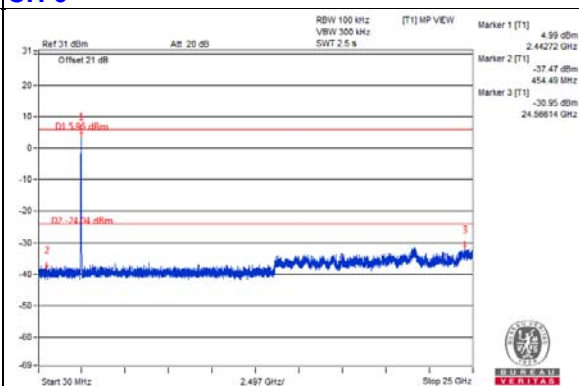


Chain 1

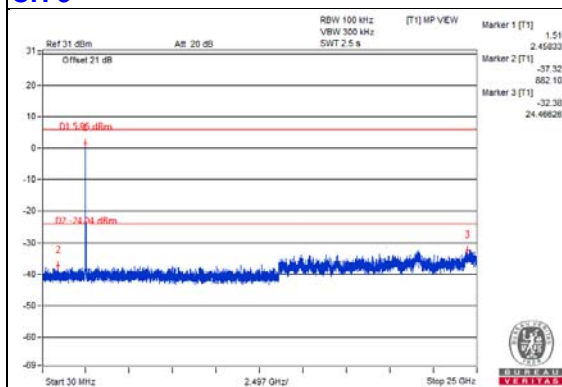
CH 3



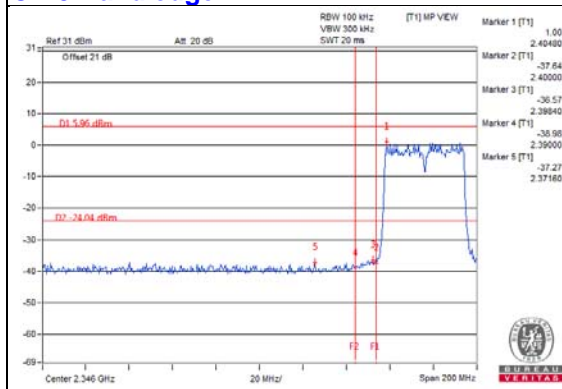
CH 6



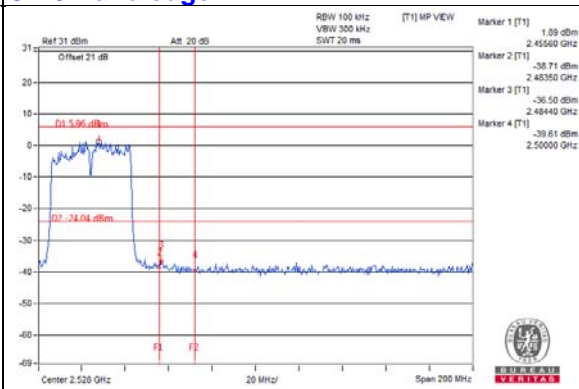
CH 9



CH 3 Band edge

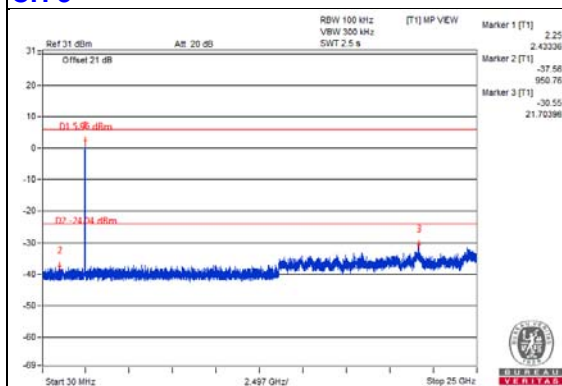


CH 9 Band edge

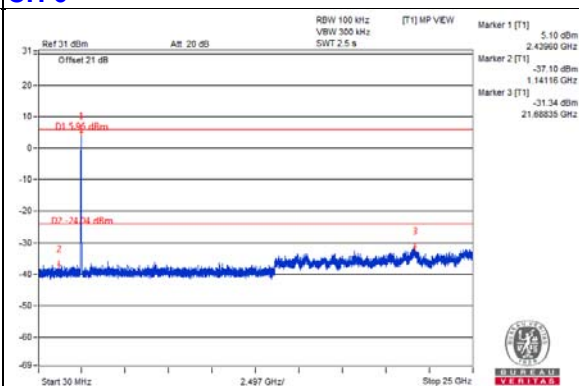


Chain 2

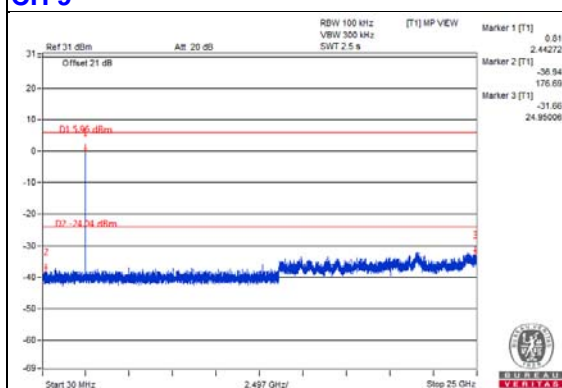
CH 3



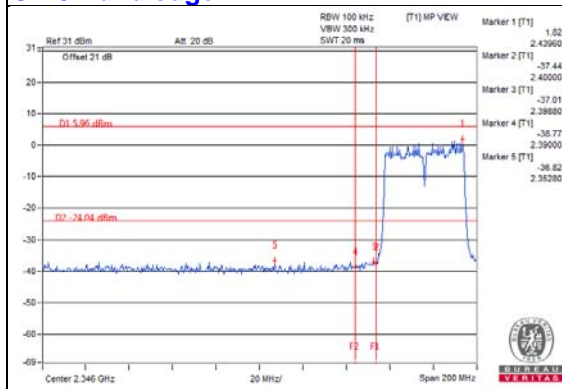
CH 6



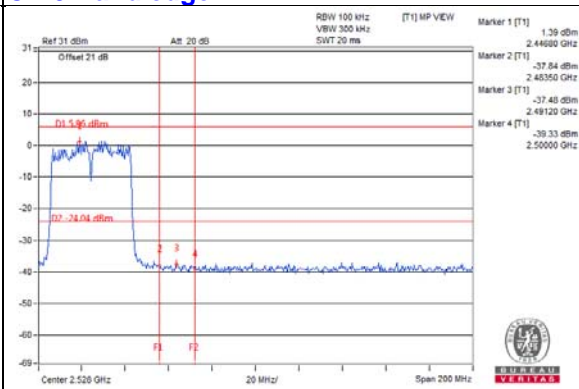
CH 9



CH 3 Band edge



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 according to ISO/IEC 17025.

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

Linkou 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.

--- END ---