

FCC Test Report

Report No.: RF191106E07

FCC ID: Q87-08177

Test Model: EA8100 V2

Received Date: Nov. 06, 2019

Test Date: Nov. 23 to 26, 2019

Issued Date: Dec. 20, 2019

Applicant: LINKSYS LLC

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
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**FCC Registration /
Designation Number:** 723255 / TW2022



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Release Control Record

Issue No.	Description	Date Issued
RF191106E07	Original release.	Dec. 20, 2019

1 Certificate of Conformity

Product: LINKSYS MAX-STREAM AC2600 MU-MIMO GIGABIT ROUTER

Brand: Linksys

Test Model: EA8100 V2

Sample Status: ENGINEERING SAMPLE

Applicant: LINKSYS LLC

Test Date: Nov. 23 to 26, 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 : Vivian Huang , **Date:** Dec. 20, 2019
Vivian Huang / Specialist

Approved by : Clark Lin , **Date:** Dec. 20, 2019
Clark Lin / Technical Manager

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 -15.44 dB at 0.35313 MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -0.2 dB at 2390.00 MHz
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(MHF) 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) ($\pm$)
Conducted Emissions at mains ports	150kHz ~ 30MHz	1.8 dB
Conducted Emissions	-	3.1 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	LINKSYS MAX-STREAM AC2600 MU-MIMO GIGABIT ROUTER
Brand	Linksys
Test Model	EA8100 V2
Status of EUT	ENGINEERING SAMPLE
Driver Version	HW: HW2.0 (Verison code:20) SW: 2.0.0.1xxxxx
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 VHT20/40 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: 2.412GHz ~ 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	CDD Mode: 2.4GHz: 855.123 mW 5.18 ~ 5.24GHz: 560.772 mW 5.745 ~ 5.825GHz: 771.566 mW Beamforming Mode: 2.4GHz: 616.742mW 5.18 ~ 5.24GHz: 560.772 mW 5.745 ~ 5.825GHz: 771.566 mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Adapter x1
Data Cable Supplied	RJ45 Cable x1 (Unshielded, 1m)

Note:

1. Simultaneously transmission condition.

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

2. The EUT must be supplied power adapter and following different models could be chosen as following table:

No.	Brand	Model No.	Spec.	Plug
1	Ktec	KSA-36W-120250HU	AC Input: 100-240Vac, 1.0A, 50/60Hz DC Output: 12V, 2.5A DC Output Cable: 1.5m, Unshielded	FCC/IC
2	APD	WA-30P12FU	AC Input: 100-240Vac, 0.9AMAX, 50-60Hz DC Output: 12V, 2.5A DC Output Cable: 1.5m, Unshielded	FCC/IC
3	Ktec	KSA-36W-120250D5	AC Input: 100-240Vac, 1.0A, 50/60Hz DC Output: 12V, 2.5A DC Output Cable: 1.5m, Unshielded	FCC/CE/UK
4	APD	WA-30P12R	AC Input: 100-240Vac, 0.9AMAX, 50/60Hz DC Output: 12V, 2.5A DC Output Cable: 1.5m, Unshielded	FCC/CE/UK

Note:

- The adapters 3 is as same as adapter 1 except for plug shapes is different ; adapters 4 is as same as adapter 2 except for plug shapes is different
- From the above adapters, the worst radiated emission test was found in Adapter 1 and the worst conducted emission test was found in Adapter 2. Therefore only the test data of the modes were recorded in this report.

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

Antenna NO.	RF Chain NO.	Antenna Net Gain(dBi)	Frequency range	Antenna Type	Connector Type	Cable Length	Cable Loss(dB)	excluding cable loss Antenna Gain(dBi)
1	Chain3	0.38	2.4~2.4835GHz	Dipole	i-pex(MHF)	290mm	0.9	1.28
	Chain0	0.14	5.15~5.47GHz				1.8	1.94
		0.78	5.5~5.85GHz					2.58
2	Chain2	0.63	2.4~2.4835GHz	Dipole	i-pex(MHF)	245mm	0.75	1.38
	Chain1	0.09	5.15~5.47GHz				1.5	1.59
		0.96	5.5~5.85GHz					2.46
3	Chain1	0.64	2.4~2.4835GHz	Dipole	i-pex(MHF)	300mm	0.9	1.54
	Chain2	0.25	5.15~5.47GHz				1.8	2.05
		0.84	5.5~5.85GHz					2.64
4	Chain0	0.94	2.4~2.4835GHz	Dipole	i-pex(MHF)	215mm	0.6	1.54
	Chain3	0.93	5.15~5.47GHz				1.2	2.13
		1.44	5.5~5.85GHz					2.64

4. The EUT incorporates a MIMO function:

2.4GHz Band		
MODULATION MODE	TX & RX CONFIGURATION	
802.11b	4TX	4RX
802.11g	4TX	4RX
802.11n (HT20)	4TX	4RX
802.11n (HT40)	4TX	4RX
VHT20	4TX	4RX
VHT40	4TX	4RX
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 non-beamforming 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 the manufacturer will control the 802.11n mode power as same as 802.11ac and investigated worst case to representative mode in test report. (Final test mode refer section 3.2.1)
5. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

3.2 Description of Test Modes

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

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), VHT40:

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 $\geq$ 1G	RE<1G	PLC	APCM	
-	√	√	√	√	-

Where **RE $\geq$ 1G**: Radiated Emission above 1GHz & Bandedge Measurement
RE<1G: Radiated Emission below 1GHz
PLC: Power Line Conducted Emission
APCM: Antenna Port Conducted Measurement

NOTE:

1. The EUT had been pre-tested on the positioned of each 2 axis. The worst case was found when positioned on **X-plane**.

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
VHT20	1 to 11	1, 6, 11	OFDM	BPSK	6.5
VHT40	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	6	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	6	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
VHT20	1 to 11	1, 6, 11	OFDM	BPSK	6.5
VHT40	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)
VHT20	1 to 11	1, 6, 11	OFDM	BPSK	6.5
VHT40	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, 71%RH	120Vac, 60Hz	Jeff Lee
RE<1G	23deg. C, 62%RH	120Vac, 60Hz	Tom Yang
PLC	25deg. C, 75%RH	120Vac, 60Hz	Kevin Ko
APCM	25deg. C, 60%RH	120Vac, 60Hz	Anderson Chen

3.3 Duty Cycle of Test Signal

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

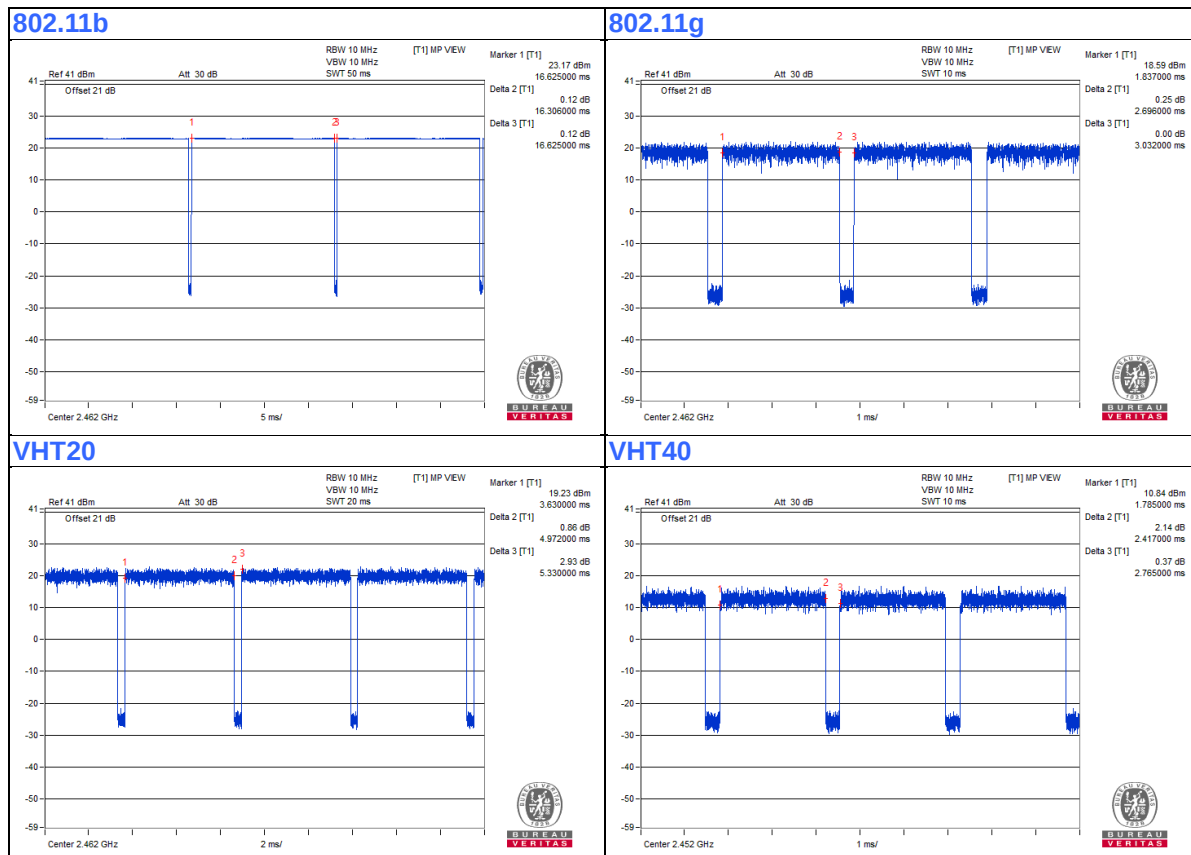
If duty cycle of test signal is $< 98\%$, duty factor shall be considered.

802.11b: Duty cycle = $16.306/16.625 = 0.981$

802.11g: Duty cycle = $2.696/3.032 = 0.889$, Duty factor = $10 * \log(1/\text{Duty cycle}) = 0.51$

VHT20: Duty cycle = $4.972/5.33 = 0.933$, Duty factor = $10 * \log(1/\text{Duty cycle}) = 0.30$

VHT40: Duty cycle = $2.417/2.765 = 0.874$, Duty factor = $10 * \log(1/\text{Duty cycle}) = 0.58$



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.

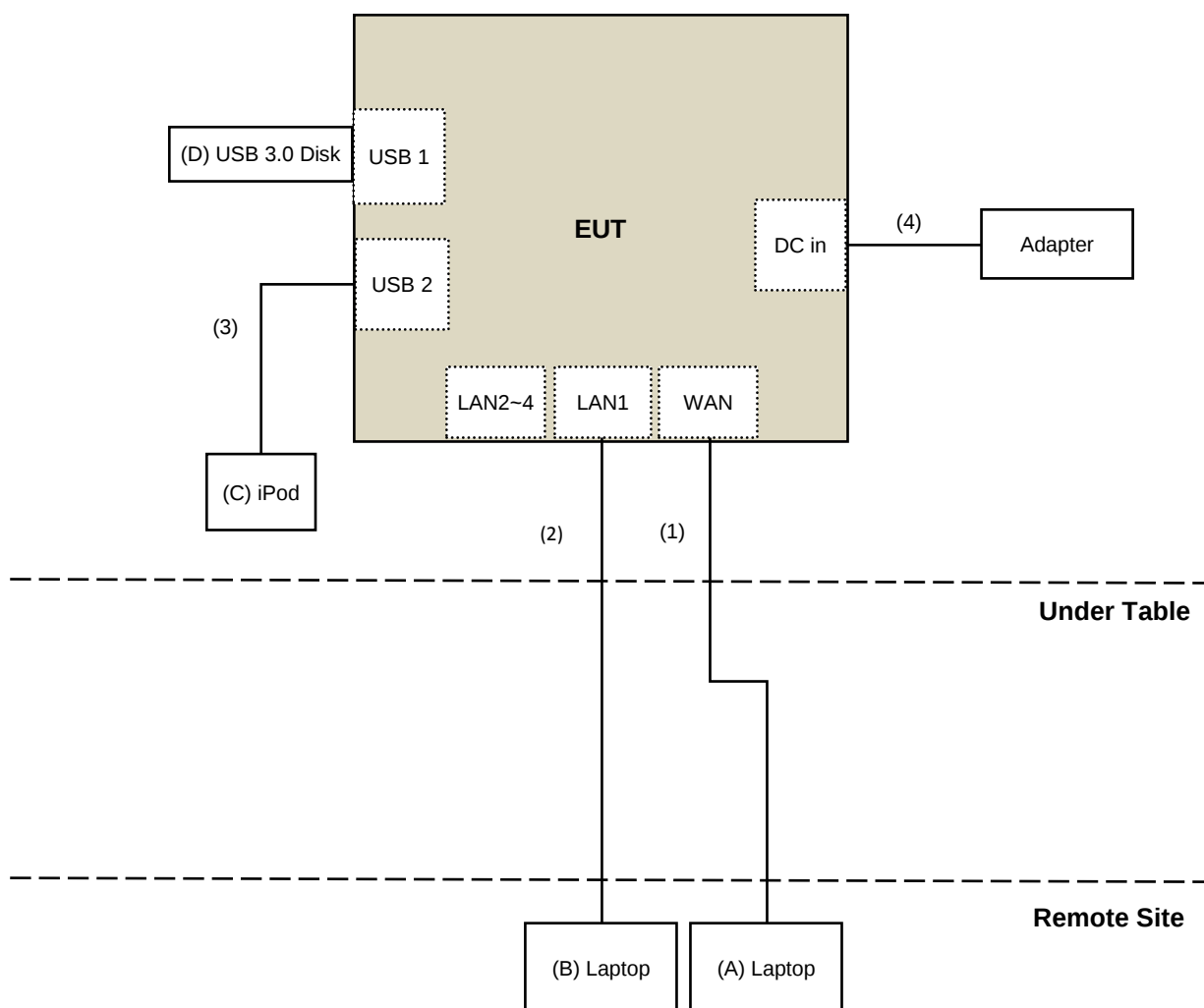
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Laptop	DELL	E5430	DM1SKV1	FCC DoC	Provided by Lab
B.	Laptop	DELL	E5430	HYV4VY1	FCC DoC	Provided by Lab
C.	iPod	Apple	MC749TA/A	CC4DN25WDFDM	NA	Provided by Lab
D.	USB 3.0 Disk	NA	NA	NA	NA	Provided by Lab

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.	RJ-45 Cable	1	10	No	0	Provided by Lab
2.	RJ-45 Cable	1	10	No	0	Provided by Lab
3.	USB Cable	1	0.1	Yes	0	Provided by Lab
4.	DC Cable	1	1.5	No	0	Supplied by client

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standards and references

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

Test standard:

FCC Part 15, Subpart C (15.247)

ANSI C63.10-2013

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

References Test Guidance :

KDB 558074 D01 15.247 Meas Guidance v05r02

KDB 662911 D01 Multiple Transmitter Output v02r01

All test items have been performed as a reference to the above KDB test guidance.

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

For Radiated Emission test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Keysight	N9038A	MY54450088	July 03, 2019	July 02, 2020
Pre-Amplifier EMCI	EMC001340	980142	May 30, 2019	May 29, 2020
Loop Antenna Electro-Metrics	EM-6879	264	Jan. 22, 2019	Jan. 21, 2020
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. 23, 2019	Oct. 22, 2020
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-406	Nov. 11, 2019	Nov. 10, 2020
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. 26, 2019	Sep. 25, 2020
Horn_Antenna SCHWARZBECK	BBHA 9120D	9120D-783	Nov. 24, 2019	Nov. 23, 2020
Pre-Amplifier EMCI	EMC12630SE	980385	Aug. 15, 2019	Aug. 14, 2020
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 03, 2019	May 02, 2020
Pre-Amplifier EMCI	EMC184045SE	980387	Jan. 28, 2019	Jan. 27, 2020
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170519	Nov. 24, 2019	Nov. 23, 2020
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 04, 2019	June 03, 2020
Power meter Anritsu	ML2495A	1014008	May 13, 2019	May 12, 2020
Power sensor Anritsu	MA2411B	0917122	May 13, 2019	May 12, 2020
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 15, 2019	Apr. 14, 2020

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: Nov. 25 to 26, 2019

For other test:

Description & Manufacturer	Model no.	Serial No.	Calibrated DATE	Calibrated Until
Spectrum Analyzer R&S	FSV40	100964	June 04, 2019	June 03, 2020
Power meter Anritsu	ML2495A	1014008	May 13, 2019	May 12, 2020
Power sensor Anritsu	MA2411B	0917122	May 13, 2019	May 12, 2020
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 15, 2019	Apr. 14, 2020

- NOTE:**
1. The test was performed in Oven room 2.
 2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 3. Tested Date: Nov. 23, 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:

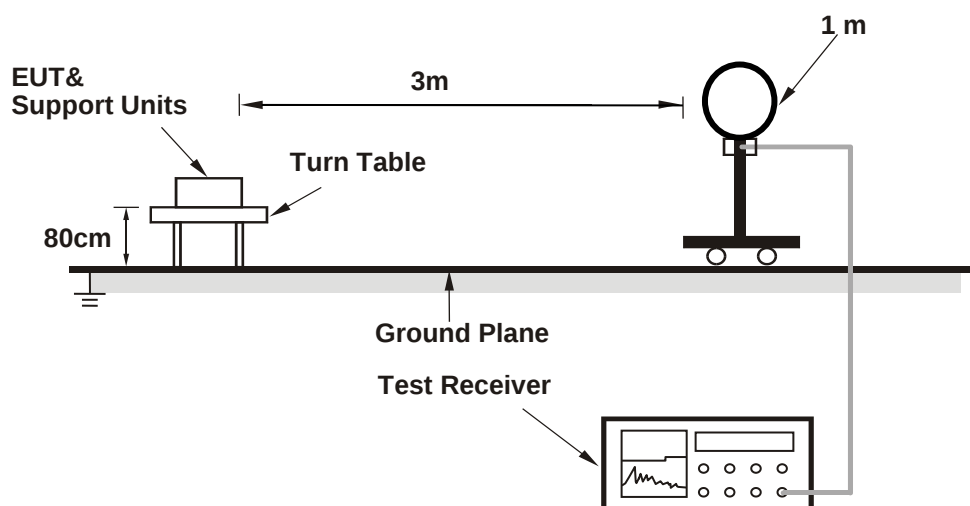
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
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

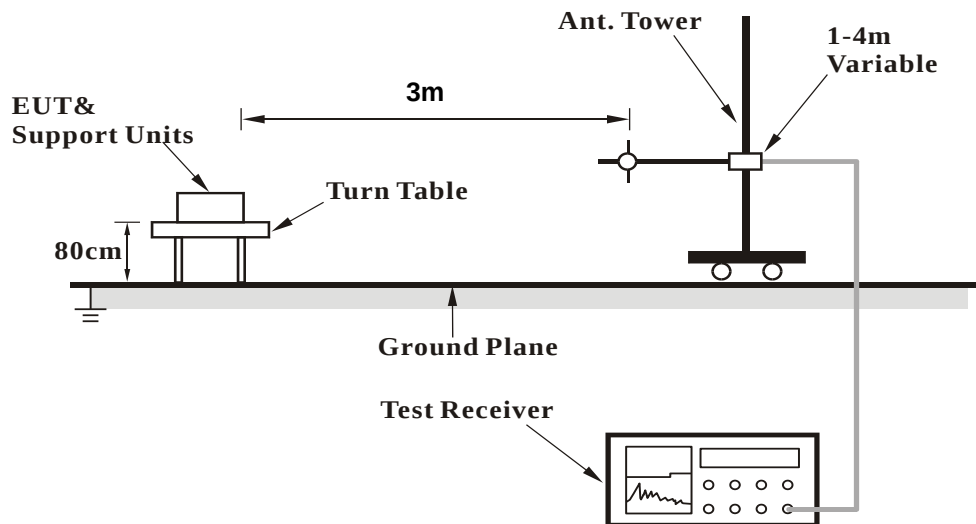
No deviation.

4.1.5 Test Setup

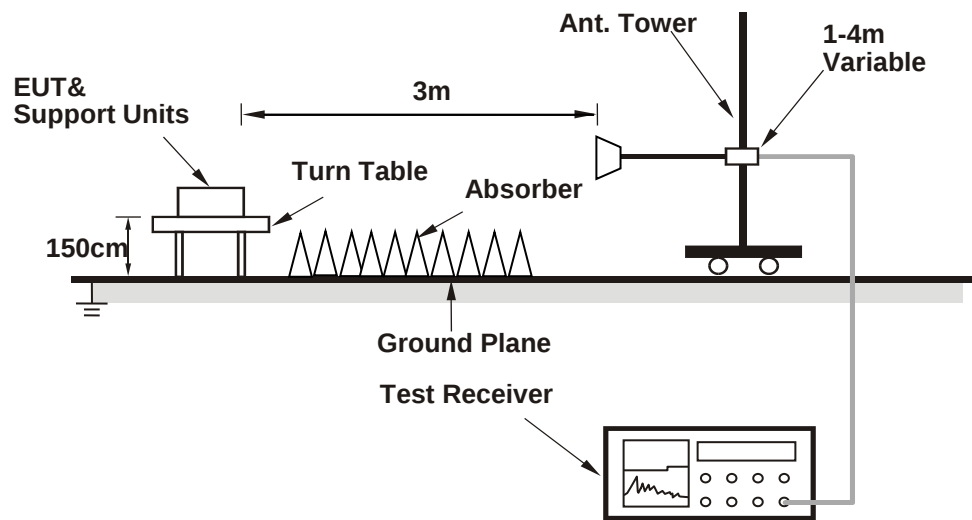
For Radiated emission below 30MHz



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 (MT7615 QA V0.0.1.91) has been activated to set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

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	2390.00	56.3 PK	74.0	-17.7	2.37 H	333	57.9	-1.6
2	2390.00	43.6 AV	54.0	-10.4	2.37 H	333	45.2	-1.6
3	*2412.00	111.1 PK			2.37 H	333	112.8	-1.7
4	*2412.00	109.7 AV			2.37 H	333	111.4	-1.7
5	4824.00	43.3 PK	74.0	-30.7	2.60 H	359	41.0	2.3
6	4824.00	39.0 AV	54.0	-15.0	2.60 H	359	36.7	2.3
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	2390.00	61.8 PK	74.0	-12.2	1.00 V	261	63.4	-1.6
2	2390.00	53.5 AV	54.0	-0.5	1.00 V	261	55.1	-1.6
3	*2412.00	120.3 PK			1.00 V	261	122.0	-1.7
4	*2412.00	118.0 AV			1.00 V	261	119.7	-1.7
5	4824.00	46.6 PK	74.0	-27.4	1.52 V	51	44.3	2.3
6	4824.00	41.6 AV	54.0	-12.4	1.52 V	51	39.3	2.3

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.

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	55.4 PK	74.0	-18.6	2.42 H	331	57.0	-1.6
2	2390.00	43.1 AV	54.0	-10.9	2.42 H	331	44.7	-1.6
3	*2437.00	113.6 PK			2.42 H	331	115.4	-1.8
4	*2437.00	111.4 AV			2.42 H	331	113.2	-1.8
5	2483.50	52.6 PK	74.0	-21.4	2.42 H	331	54.3	-1.7
6	2483.50	41.5 AV	54.0	-12.5	2.42 H	331	43.2	-1.7
7	4874.00	43.1 PK	74.0	-30.9	2.64 H	0	40.7	2.4
8	4874.00	39.4 AV	54.0	-14.6	2.64 H	0	37.0	2.4
9	7311.00	49.7 PK	74.0	-24.3	1.61 H	276	40.5	9.2
10	7311.00	44.9 AV	54.0	-9.1	1.61 H	276	35.7	9.2

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	60.0 PK	74.0	-14.0	1.00 V	266	61.6	-1.6
2	2390.00	52.7 AV	54.0	-1.3	1.00 V	266	54.3	-1.6
3	*2437.00	122.5 PK			1.00 V	266	124.3	-1.8
4	*2437.00	120.3 AV			1.00 V	266	122.1	-1.8
5	2483.50	59.9 PK	74.0	-14.1	1.00 V	266	61.6	-1.7
6	2483.50	50.6 AV	54.0	-3.4	1.00 V	266	52.3	-1.7
7	4874.00	49.5 PK	74.0	-24.5	1.55 V	64	47.1	2.4
8	4874.00	42.7 AV	54.0	-11.3	1.55 V	64	40.3	2.4
9	7311.00	54.6 PK	74.0	-19.4	1.40 V	270	45.4	9.2
10	7311.00	48.5 AV	54.0	-5.5	1.40 V	270	39.3	9.2

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	110.2 PK			2.39 H	337	112.0	-1.8
2	*2462.00	108.2 AV			2.39 H	337	110.0	-1.8
3	2483.50	56.0 PK	74.0	-18.0	2.39 H	337	57.7	-1.7
4	2483.50	42.7 AV	54.0	-11.3	2.39 H	337	44.4	-1.7
5	4924.00	42.9 PK	74.0	-31.1	2.64 H	357	40.4	2.5
6	4924.00	39.2 AV	54.0	-14.8	2.64 H	357	36.7	2.5
7	7386.00	48.2 PK	74.0	-25.8	1.59 H	279	38.8	9.4
8	7386.00	43.9 AV	54.0	-10.1	1.59 H	279	34.5	9.4
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	120.1 PK			1.00 V	260	121.9	-1.8
2	*2462.00	117.0 AV			1.00 V	260	118.8	-1.8
3	2483.50	69.4 PK	74.0	-4.6	1.00 V	260	71.1	-1.7
4	2483.50	53.5 AV	54.0	-0.5	1.00 V	260	55.2	-1.7
5	4924.00	45.5 PK	74.0	-28.5	1.50 V	58	43.0	2.5
6	4924.00	40.2 AV	54.0	-13.8	1.50 V	58	37.7	2.5
7	7386.00	50.1 PK	74.0	-23.9	1.35 V	278	40.7	9.4
8	7386.00	46.0 AV	54.0	-8.0	1.35 V	278	36.6	9.4

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.
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	57.2 PK	74.0	-16.8	2.38 H	340	58.8	-1.6
2	2390.00	42.5 AV	54.0	-11.5	2.38 H	340	44.1	-1.6
3	*2412.00	109.3 PK			2.38 H	340	111.0	-1.7
4	*2412.00	100.1 AV			2.38 H	340	101.8	-1.7
5	4824.00	37.9 PK	74.0	-36.1	2.58 H	355	35.6	2.3
6	4824.00	30.5 AV	54.0	-23.5	2.58 H	355	28.2	2.3
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	2390.00	69.6 PK	74.0	-4.4	1.00 V	262	71.2	-1.6
2	2390.00	53.5 AV	54.0	-0.5	1.00 V	262	55.1	-1.6
3	*2412.00	117.4 PK			1.00 V	262	119.1	-1.7
4	*2412.00	108.4 AV			1.00 V	262	110.1	-1.7
5	4824.00	39.5 PK	74.0	-34.5	1.51 V	61	37.2	2.3
6	4824.00	32.6 AV	54.0	-21.4	1.51 V	61	30.3	2.3

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.

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	56.8 PK	74.0	-17.2	2.30 H	338	58.4	-1.6
2	2390.00	40.7 AV	54.0	-13.3	2.30 H	338	42.3	-1.6
3	*2437.00	115.2 PK			2.30 H	338	117.0	-1.8
4	*2437.00	105.3 AV			2.30 H	338	107.1	-1.8
5	2483.50	55.5 PK	74.0	-18.5	2.30 H	338	57.2	-1.7
6	2483.50	38.6 AV	54.0	-15.4	2.30 H	338	40.3	-1.7
7	4874.00	40.7 PK	74.0	-33.3	2.60 H	357	38.3	2.4
8	4874.00	36.1 AV	54.0	-17.9	2.60 H	357	33.7	2.4
9	7311.00	46.6 PK	74.0	-27.4	1.61 H	281	37.4	9.2
10	7311.00	38.8 AV	54.0	-15.2	1.61 H	281	29.6	9.2

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	60.1 PK	74.0	-13.9	1.00 V	265	61.7	-1.6
2	2390.00	48.2 AV	54.0	-5.8	1.00 V	265	49.8	-1.6
3	*2437.00	122.9 PK			1.00 V	265	124.7	-1.8
4	*2437.00	114.0 AV			1.00 V	265	115.8	-1.8
5	2483.50	60.6 PK	74.0	-13.4	1.00 V	265	62.3	-1.7
6	2483.50	46.0 AV	54.0	-8.0	1.00 V	265	47.7	-1.7
7	4874.00	43.2 PK	74.0	-30.8	1.50 V	58	40.8	2.4
8	4874.00	38.5 AV	54.0	-15.5	1.50 V	58	36.1	2.4
9	7311.00	48.5 PK	74.0	-25.5	1.36 V	278	39.3	9.2
10	7311.00	41.2 AV	54.0	-12.8	1.36 V	278	32.0	9.2

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	108.7 PK			2.37 H	333	110.5	-1.8
2	*2462.00	99.2 AV			2.37 H	333	101.0	-1.8
3	2483.50	57.5 PK	74.0	-16.5	2.37 H	333	59.2	-1.7
4	2483.50	42.5 AV	54.0	-11.5	2.37 H	333	44.2	-1.7
5	4924.00	37.5 PK	74.0	-36.5	2.54 H	353	35.0	2.5
6	4924.00	30.7 AV	54.0	-23.3	2.54 H	353	28.2	2.5
7	7386.00	40.0 PK	74.0	-34.0	1.64 H	274	30.6	9.4
8	7386.00	32.6 AV	54.0	-21.4	1.64 H	274	23.2	9.4
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	116.7 PK			1.00 V	263	118.5	-1.8
2	*2462.00	107.8 AV			1.00 V	263	109.6	-1.8
3	2483.50	68.7 PK	74.0	-5.3	1.00 V	263	70.4	-1.7
4	2483.50	53.3 AV	54.0	-0.7	1.00 V	263	55.0	-1.7
5	4924.00	38.4 PK	74.0	-35.6	1.52 V	60	35.9	2.5
6	4924.00	32.0 AV	54.0	-22.0	1.52 V	60	29.5	2.5
7	7386.00	41.3 PK	74.0	-32.7	1.41 V	282	31.9	9.4
8	7386.00	34.7 AV	54.0	-19.3	1.41 V	282	25.3	9.4

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.
5. " * ": Fundamental frequency.

VHT20

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	58.9 PK	74.0	-15.1	2.43 H	331	60.5	-1.6
2	2390.00	42.2 AV	54.0	-11.8	2.43 H	331	43.8	-1.6
3	*2412.00	108.8 PK			2.43 H	331	110.5	-1.7
4	*2412.00	99.7 AV			2.43 H	331	101.4	-1.7
5	4824.00	37.8 PK	74.0	-36.2	2.56 H	356	35.5	2.3
6	4824.00	30.4 AV	54.0	-23.6	2.56 H	356	28.1	2.3
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	2390.00	71.6 PK	74.0	-2.4	1.00 V	257	73.2	-1.6
2	2390.00	53.6 AV	54.0	-0.4	1.00 V	257	55.2	-1.6
3	*2412.00	117.1 PK			1.00 V	257	118.8	-1.7
4	*2412.00	107.7 AV			1.00 V	257	109.4	-1.7
5	4824.00	39.8 PK	74.0	-34.2	1.52 V	64	37.5	2.3
6	4824.00	33.0 AV	54.0	-21.0	1.52 V	64	30.7	2.3

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.

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	57.2 PK	74.0	-16.8	2.39 H	338	58.8	-1.6
2	2390.00	41.0 AV	54.0	-13.0	2.39 H	338	42.6	-1.6
3	*2437.00	115.6 PK			2.39 H	338	117.4	-1.8
4	*2437.00	104.3 AV			2.39 H	338	106.1	-1.8
5	2483.50	55.4 PK	74.0	-18.6	2.39 H	338	57.1	-1.7
6	2483.50	38.3 AV	54.0	-15.7	2.39 H	338	40.0	-1.7
7	4874.00	40.9 PK	74.0	-33.1	2.61 H	344	38.5	2.4
8	4874.00	36.6 AV	54.0	-17.4	2.61 H	344	34.2	2.4
9	7311.00	46.4 PK	74.0	-27.6	1.62 H	279	37.2	9.2
10	7311.00	38.7 AV	54.0	-15.3	1.62 H	279	29.5	9.2

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	61.5 PK	74.0	-12.5	1.00 V	257	63.1	-1.6
2	2390.00	47.2 AV	54.0	-6.8	1.00 V	257	48.8	-1.6
3	*2437.00	121.6 PK			1.00 V	257	123.4	-1.8
4	*2437.00	112.4 AV			1.00 V	257	114.2	-1.8
5	2483.50	67.3 PK	74.0	-6.7	1.00 V	257	69.0	-1.7
6	2483.50	47.9 AV	54.0	-6.1	1.00 V	257	49.6	-1.7
7	4874.00	43.2 PK	74.0	-30.8	1.54 V	45	40.8	2.4
8	4874.00	38.6 AV	54.0	-15.4	1.54 V	45	36.2	2.4
9	7311.00	49.0 PK	74.0	-25.0	1.39 V	271	39.8	9.2
10	7311.00	42.1 AV	54.0	-11.9	1.39 V	271	32.9	9.2

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	109.2 PK			2.38 H	342	111.0	-1.8
2	*2462.00	99.3 AV			2.38 H	342	101.1	-1.8
3	2483.50	56.9 PK	74.0	-17.1	2.38 H	342	58.6	-1.7
4	2483.50	42.3 AV	54.0	-11.7	2.38 H	342	44.0	-1.7
5	4924.00	37.7 PK	74.0	-36.3	2.56 H	343	35.2	2.5
6	4924.00	31.0 AV	54.0	-23.0	2.56 H	343	28.5	2.5
7	7386.00	40.4 PK	74.0	-33.6	1.57 H	277	31.0	9.4
8	7386.00	32.6 AV	54.0	-21.4	1.57 H	277	23.2	9.4
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	117.1 PK			1.00 V	259	118.9	-1.8
2	*2462.00	107.7 AV			1.00 V	259	109.5	-1.8
3	2483.50	73.0 PK	74.0	-1.0	1.00 V	259	74.7	-1.7
4	2483.50	53.7 AV	54.0	-0.3	1.00 V	259	55.4	-1.7
5	4924.00	38.7 PK	74.0	-35.3	1.49 V	74	36.2	2.5
6	4924.00	32.3 AV	54.0	-21.7	1.49 V	74	29.8	2.5
7	7386.00	41.7 PK	74.0	-32.3	1.42 V	280	32.3	9.4
8	7386.00	34.5 AV	54.0	-19.5	1.42 V	280	25.1	9.4

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.
5. " * ": Fundamental frequency.

VHT40

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	57.8 PK	74.0	-16.2	2.34 H	334	59.4	-1.6
2	2390.00	42.9 AV	54.0	-11.1	2.34 H	334	44.5	-1.6
3	*2422.00	104.3 PK			2.34 H	334	106.0	-1.7
4	*2422.00	93.7 AV			2.34 H	334	95.4	-1.7
5	4844.00	34.1 PK	74.0	-39.9	2.65 H	347	31.9	2.2
6	4844.00	28.9 AV	54.0	-25.1	2.65 H	347	26.7	2.2
7	7266.00	34.7 PK	74.0	-39.3	1.55 H	270	25.7	9.0
8	7266.00	30.5 AV	54.0	-23.5	1.55 H	270	21.5	9.0
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	2390.00	67.3 PK	74.0	-6.7	1.02 V	41	68.9	-1.6
2	2390.00	53.5 AV	54.0	-0.5	1.02 V	41	55.1	-1.6
3	*2422.00	110.0 PK			1.02 V	41	111.7	-1.7
4	*2422.00	100.2 AV			1.02 V	41	101.9	-1.7
5	4844.00	36.6 PK	74.0	-37.4	1.53 V	67	34.4	2.2
6	4844.00	30.3 AV	54.0	-23.7	1.53 V	67	28.1	2.2
7	7266.00	37.3 PK	74.0	-36.7	1.38 V	268	28.3	9.0
8	7266.00	32.1 AV	54.0	-21.9	1.38 V	268	23.1	9.0

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.

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	55.2 PK	74.0	-18.8	2.41 H	339	56.8	-1.6
2	2390.00	42.7 AV	54.0	-11.3	2.41 H	339	44.3	-1.6
3	*2437.00	107.2 PK			2.41 H	339	109.0	-1.8
4	*2437.00	97.2 AV			2.41 H	339	99.0	-1.8
5	2483.50	52.5 PK	74.0	-21.5	2.41 H	339	54.2	-1.7
6	2483.50	41.5 AV	54.0	-12.5	2.41 H	339	43.2	-1.7
7	4874.00	34.3 PK	74.0	-39.7	2.63 H	352	31.9	2.4
8	4874.00	30.6 AV	54.0	-23.4	2.63 H	352	28.2	2.4
9	7311.00	38.2 PK	74.0	-35.8	1.50 H	278	29.0	9.2
10	7311.00	31.6 AV	54.0	-22.4	1.50 H	278	22.4	9.2

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	66.3 PK	74.0	-7.7	1.02 V	25	67.9	-1.6
2	2390.00	53.8 AV	54.0	-0.2	1.02 V	25	55.4	-1.6
3	*2437.00	114.5 PK			1.02 V	25	116.3	-1.8
4	*2437.00	104.4 AV			1.02 V	25	106.2	-1.8
5	2483.50	64.0 PK	74.0	-10.0	1.02 V	25	65.7	-1.7
6	2483.50	50.0 AV	54.0	-4.0	1.02 V	25	51.7	-1.7
7	4874.00	38.1 PK	74.0	-35.9	1.52 V	63	35.7	2.4
8	4874.00	31.7 AV	54.0	-22.3	1.52 V	63	29.3	2.4
9	7311.00	40.1 PK	74.0	-33.9	1.40 V	274	30.9	9.2
10	7311.00	33.7 AV	54.0	-20.3	1.40 V	274	24.5	9.2

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	105.8 PK			2.39 H	330	107.6	-1.8
2	*2452.00	94.9 AV			2.39 H	330	96.7	-1.8
3	2483.50	57.2 PK	74.0	-16.8	2.39 H	330	58.9	-1.7
4	2483.50	42.3 AV	54.0	-11.7	2.39 H	330	44.0	-1.7
5	4904.00	33.9 PK	74.0	-40.1	2.67 H	356	31.4	2.5
6	4904.00	29.5 AV	54.0	-24.5	2.67 H	356	27.0	2.5
7	7356.00	35.2 PK	74.0	-38.8	1.48 H	275	26.0	9.2
8	7356.00	30.4 AV	54.0	-23.6	1.48 H	275	21.2	9.2
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	112.6 PK			1.10 V	24	114.4	-1.8
2	*2452.00	102.1 AV			1.10 V	24	103.9	-1.8
3	2483.50	71.0 PK	74.0	-3.0	1.10 V	24	72.7	-1.7
4	2483.50	53.5 AV	54.0	-0.5	1.10 V	24	55.2	-1.7
5	4904.00	36.8 PK	74.0	-37.2	1.50 V	65	34.3	2.5
6	4904.00	30.4 AV	54.0	-23.6	1.50 V	65	27.9	2.5
7	7356.00	38.0 PK	74.0	-36.0	1.42 V	280	28.8	9.2
8	7356.00	32.6 AV	54.0	-21.4	1.42 V	280	23.4	9.2

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:

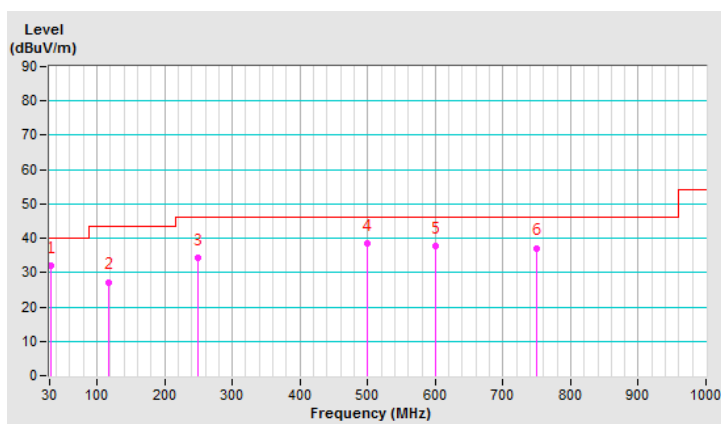
802.11b

CHANNEL	TX Channel 6	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	32.59	32.1 QP	40.0	-7.9	1.50 H	276	41.3	-9.2
2	117.15	27.3 QP	43.5	-16.2	3.00 H	290	37.4	-10.1
3	250.00	34.4 QP	46.0	-11.6	1.00 H	101	43.1	-8.7
4	499.99	38.6 QP	46.0	-7.4	2.00 H	135	40.4	-1.8
5	599.97	37.6 QP	46.0	-8.4	1.50 H	94	36.8	0.8
6	749.96	37.2 QP	46.0	-8.8	1.50 H	320	33.6	3.6

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.

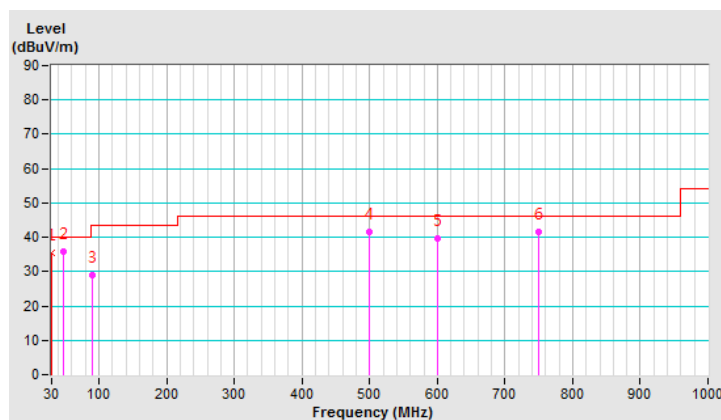


CHANNEL	TX Channel 6	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

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	30.58	35.3 QP	40.0	-4.7	1.00 V	167	44.6	-9.3
2	47.82	35.8 QP	40.0	-4.2	1.00 V	225	43.7	-7.9
3	90.36	29.0 QP	43.5	-14.5	3.00 V	360	42.7	-13.7
4	499.96	41.6 QP	46.0	-4.4	1.00 V	266	43.4	-1.8
5	599.97	39.7 QP	46.0	-6.3	1.00 V	213	38.9	0.8
6	749.98	41.6 QP	46.0	-4.4	1.50 V	109	38.0	3.6

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. 23, 2019	Oct. 22, 2020
Line-Impedance Stabilization Network (for EUT) R&S	ESH3-Z5	848773/004	Oct. 23, 2019	Oct. 22, 2020
Line-Impedance Stabilization Network (for Peripheral) R&S	ESH3-Z5	835239/001	Mar. 17, 2019	Mar. 16, 2020
50 ohms Terminator	50	3	Oct. 23, 2019	Oct. 22, 2020
RF Cable	5D-FB	COCCAB-001	Sep. 27, 2019	Sep. 26, 2020
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: Nov. 23, 2019

4.2.3 Test Procedures

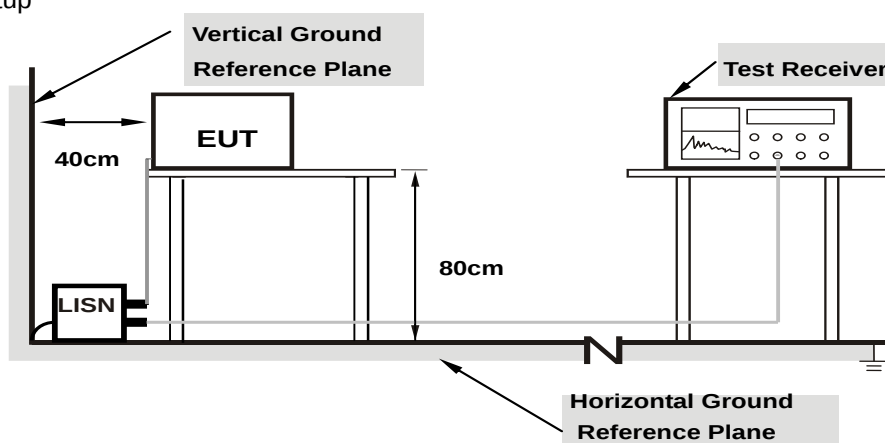
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

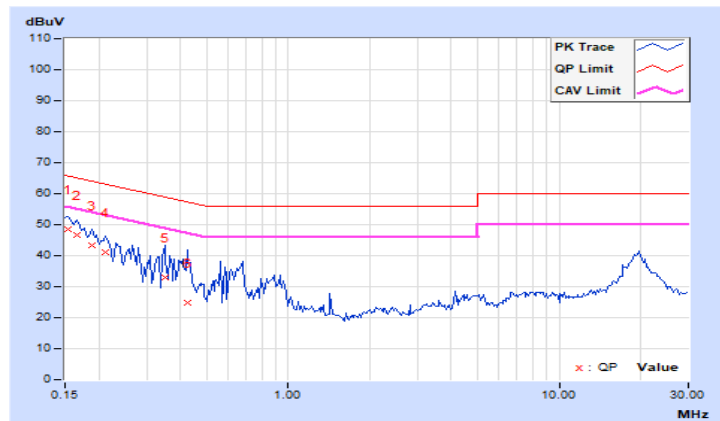
4.2.7 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
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Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	9.99	38.48	25.36	48.47	35.35	65.79	55.79	-17.32	-20.44
2	0.16562	9.99	36.51	21.56	46.50	31.55	65.18	55.18	-18.68	-23.63
3	0.18906	9.99	33.34	17.56	43.33	27.55	64.08	54.08	-20.75	-26.53
4	0.21250	9.99	31.20	14.69	41.19	24.68	63.11	53.11	-21.92	-28.43
5	0.34922	10.00	23.02	18.44	33.02	28.44	58.98	48.98	-25.96	-20.54
6	0.42344	10.00	14.81	4.34	24.81	14.34	57.38	47.38	-32.57	-33.04

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

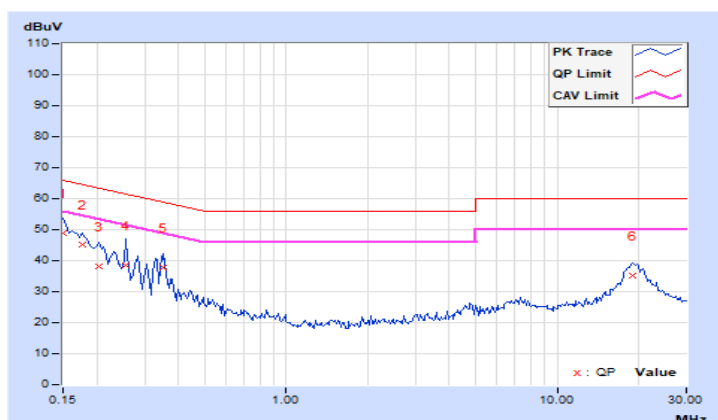


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
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Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	9.99	39.08	24.40	49.07	34.39	66.00	56.00	-16.93	-21.61
2	0.17734	9.99	35.15	20.60	45.14	30.59	64.61	54.61	-19.47	-24.02
3	0.20469	9.99	28.28	20.79	38.27	30.78	63.42	53.42	-25.15	-22.64
4	0.25547	10.00	28.66	21.28	38.66	31.28	61.58	51.58	-22.92	-20.30
5	0.35313	10.01	27.62	23.44	37.63	33.45	58.89	48.89	-21.26	-15.44
6	18.96094	11.06	23.96	17.17	35.02	28.23	60.00	50.00	-24.98	-21.77

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

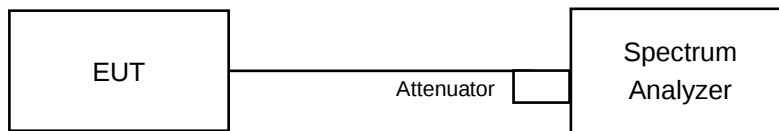


4.3 6dB Bandwidth Measurement

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) $\geq 3 \times$ 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 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

802.11b

Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
1	2412	9.16	9.15	9.62	9.16	0.5	Pass
6	2437	10.09	9.60	8.10	10.08	0.5	Pass
11	2462	9.14	9.10	9.15	9.14	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	15.18	15.12	15.18	15.18	0.5	Pass
6	2437	15.18	15.20	15.19	15.19	0.5	Pass
11	2462	15.18	15.19	15.19	15.20	0.5	Pass

VHT20

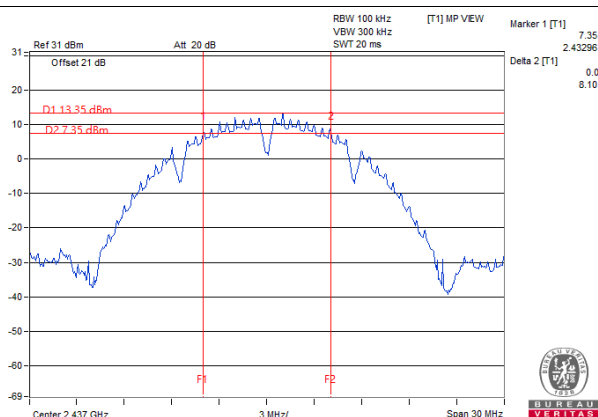
Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
1	2412	15.19	15.76	15.18	15.12	0.5	Pass
6	2437	15.77	15.76	15.18	15.19	0.5	Pass
11	2462	15.15	15.75	15.15	15.19	0.5	Pass

VHT40

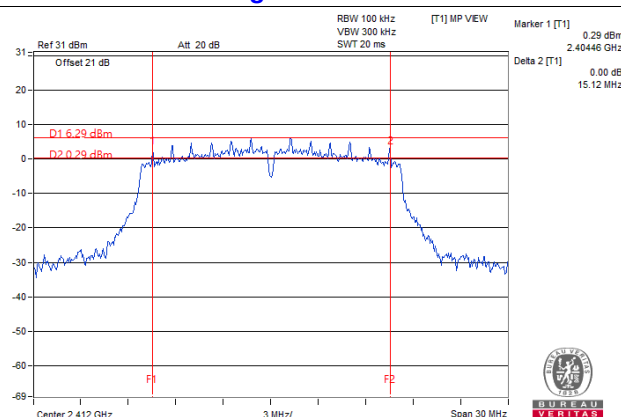
Channel	Frequency (MHz)	6dB Bandwidth (MHz)				Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2	Chain 3		
3	2422	35.15	35.13	35.15	33.96	0.5	Pass
6	2437	35.18	35.15	35.13	35.15	0.5	Pass
9	2452	35.14	35.22	33.98	33.91	0.5	Pass

Spectrum Plot of Worst Value

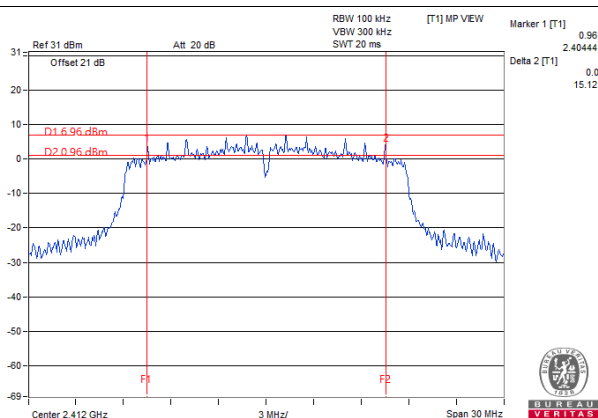
802.11b / Chain 2 : CH6



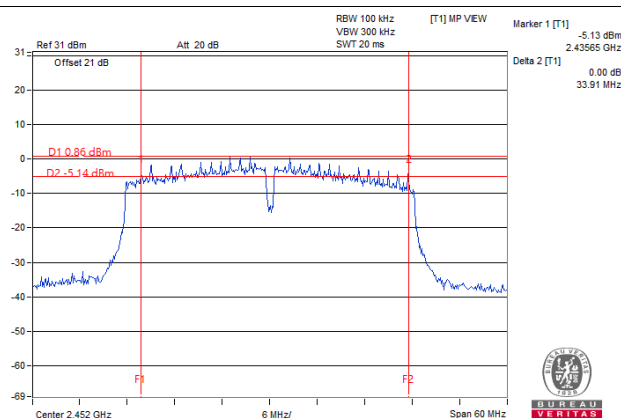
802.11g / Chain 1 : CH1



VHT20 / Chain 3 : CH1



VHT40 / Chain 3 : 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,

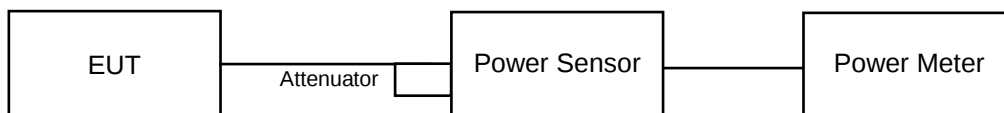
Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

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	Chain 3				
1	2412	22.23	22.42	22.11	21.64	650.127	28.13	30.00	Pass
6	2437	23.51	23.06	23.48	23.13	855.123	29.32	30.00	Pass
11	2462	20.79	20.45	20.53	20.11	446.412	26.50	30.00	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	16.71	17.02	16.74	16.55	189.623	22.78	30.00	Pass
6	2437	21.91	22.18	21.86	21.31	609.104	27.85	30.00	Pass
11	2462	15.77	15.55	15.52	15.53	145.021	21.61	30.00	Pass

VHT20

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	16.99	17.42	17.33	17.11	210.69	23.24	30.00	Pass
6	2437	21.81	22.38	21.92	21.35	616.742	27.90	30.00	Pass
11	2462	16.92	17.16	16.93	16.88	199.274	22.99	30.00	Pass

VHT40

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	11.57	11.99	11.55	11.62	58.977	17.71	30.00	Pass
6	2437	15.78	16.16	15.82	15.93	156.517	21.95	30.00	Pass
9	2452	13.56	13.89	13.58	13.51	92.432	19.66	30.00	Pass

Beamforming Mode

VHT20

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	16.99	17.42	17.33	17.11	210.69	23.24	29.33	Pass
6	2437	21.81	22.38	21.92	21.35	616.742	27.90	29.33	Pass
11	2462	16.92	17.16	16.93	16.88	199.274	22.99	29.33	Pass

Note: 1. Directional gain = $10 \log[(10^{G0/20} + 10^{G1/20} + 10^{G2/20} + 10^{G3/20})^2 / 2]$ = 6.67dBi > 6dBi , so the power limit shall be reduced to 30-(6.67-6) =29.33 dBm.

VHT40

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	11.57	11.99	11.55	11.62	58.977	17.71	29.33	Pass
6	2437	15.78	16.16	15.82	15.93	156.517	21.95	29.33	Pass
9	2452	13.56	13.89	13.58	13.51	92.432	19.66	29.33	Pass

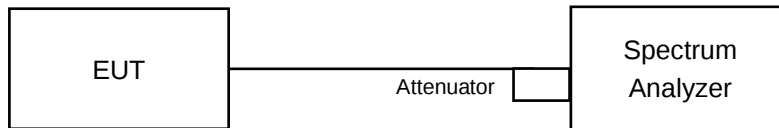
Note: 1. Directional gain = $10 \log[(10^{G0/20} + 10^{G1/20} + 10^{G2/20} + 10^{G3/20})^2 / 2]$ = 6.67dBi > 6dBi , so the power limit shall be reduced to 30-(6.67-6) =29.33 dBm.

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

802.11b

- 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 $\geq 2 \times \text{span}/\text{RBW}$.
- 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.

802.11g, VHT20, VHT40

- 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 $\geq 2 \times \text{span}/\text{RBW}$.
- 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.

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 W/O Duty Factor (dBm/3kHz)	10 log (N=4) dB	TOTAL PSD With Duty Factor (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	1	2412	-9.45	6.02	-3.43	7.33	Pass
	6	2437	-9.14	6.02	-3.12	7.33	Pass
	11	2462	-10.98	6.02	-4.96	7.33	Pass
1	1	2412	-9.81	6.02	-3.79	7.33	Pass
	6	2437	-9.16	6.02	-3.14	7.33	Pass
	11	2462	-10.94	6.02	-4.92	7.33	Pass
2	1	2412	-9.70	6.02	-3.68	7.33	Pass
	6	2437	-9.46	6.02	-3.44	7.33	Pass
	11	2462	-10.97	6.02	-4.95	7.33	Pass
3	1	2412	-10.07	6.02	-4.05	7.33	Pass
	6	2437	-8.47	6.02	-2.45	7.33	Pass
	11	2462	-11.44	6.02	-5.42	7.33	Pass

Note: 1. Directional gain = $10 \log[(10^{G0/20} + 10^{G1/20} + 10^{G2/20} + 10^{G3/20})^2 / 2] = 6.67 \text{ dBi} > 6 \text{ dBi}$, so the power limit shall be reduced to $8 - (6.67 - 6) = 7.33 \text{ dBm}$.

802.11g

TX chain	Channel	Freq. (MHz)	PSD W/O Duty Factor (dBm/3kHz)	10 log (N=4) dB	Duty Factor (dB)	TOTAL PSD With Duty Factor (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	1	2412	-14.78	6.02	0.51	-8.25	7.33	Pass
	6	2437	-10.49	6.02	0.51	-3.96	7.33	Pass
	11	2462	-15.92	6.02	0.51	-9.39	7.33	Pass
1	1	2412	-16.13	6.02	0.51	-9.60	7.33	Pass
	6	2437	-10.52	6.02	0.51	-3.99	7.33	Pass
	11	2462	-15.50	6.02	0.51	-8.97	7.33	Pass
2	1	2412	-15.33	6.02	0.51	-8.80	7.33	Pass
	6	2437	-9.92	6.02	0.51	-3.39	7.33	Pass
	11	2462	-16.18	6.02	0.51	-9.65	7.33	Pass
3	1	2412	-14.94	6.02	0.51	-8.41	7.33	Pass
	6	2437	-10.51	6.02	0.51	-3.98	7.33	Pass
	11	2462	-15.88	6.02	0.51	-9.35	7.33	Pass

Note: 1. Directional gain = $10 \log[(10^{G0/20} + 10^{G1/20} + 10^{G2/20} + 10^{G3/20})^2 / 2] = 6.67 \text{ dBi} > 6 \text{ dBi}$, so the power limit shall be reduced to $8 - (6.67 - 6) = 7.33 \text{ dBm}$.

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

VHT20

TX chain	Channel	Freq. (MHz)	PSD W/O Duty Factor (dBm/3kHz)	10 log (N=4) dB	Duty Factor (dB)	TOTAL PSD With Duty Factor (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	1	2412	-14.75	6.02	0.30	-8.43	7.33	Pass
	6	2437	-10.70	6.02	0.30	-4.38	7.33	Pass
	11	5462	-15.29	6.02	0.30	-8.97	7.33	Pass
1	1	2412	-13.57	6.02	0.30	-7.25	7.33	Pass
	6	2437	-10.60	6.02	0.30	-4.28	7.33	Pass
	11	5462	-14.62	6.02	0.30	-8.30	7.33	Pass
2	1	2412	-14.51	6.02	0.30	-8.19	7.33	Pass
	6	2437	-10.20	6.02	0.30	-3.88	7.33	Pass
	11	5462	-15.18	6.02	0.30	-8.86	7.33	Pass
3	1	2412	-13.89	6.02	0.30	-7.57	7.33	Pass
	6	2437	-10.21	6.02	0.30	-3.89	7.33	Pass
	11	5462	-14.96	6.02	0.30	-8.64	7.33	Pass

- Note:** 1. Directional gain = $10 \log[(10^{G0/20} + 10^{G1/20} + 10^{G2/20} + 10^{G3/20})^2 / 2]$ = 6.67dBi > 6dBi , so the power limit shall be reduced to $8 - (6.67 - 6) = 7.33$ dBm.
2. Refer to section 3.3 for duty cycle spectrum plot.

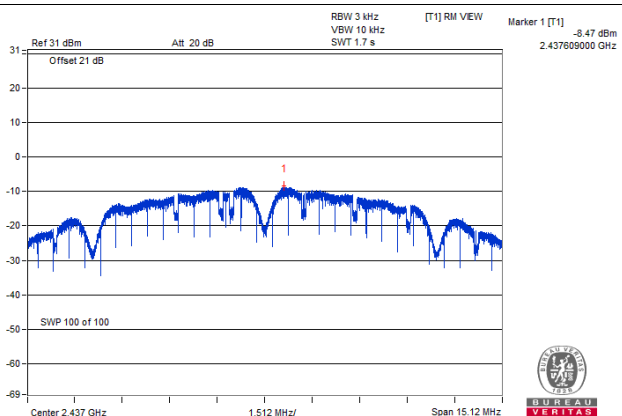
VHT40

TX chain	Channel	Freq. (MHz)	PSD W/O Duty Factor (dBm/3kHz)	10 log (N=4) dB	Duty Factor (dB)	TOTAL PSD With Duty Factor (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	3	2422	-22.23	6.02	0.58	-15.63	7.33	Pass
	6	2437	-19.84	6.02	0.58	-13.24	7.33	Pass
	9	2452	-20.39	6.02	0.58	-13.79	7.33	Pass
1	3	2422	-22.98	6.02	0.58	-16.38	7.33	Pass
	6	2437	-17.77	6.02	0.58	-11.17	7.33	Pass
	9	2452	-20.16	6.02	0.58	-13.56	7.33	Pass
2	3	2422	-22.68	6.02	0.58	-16.08	7.33	Pass
	6	2437	-18.93	6.02	0.58	-12.33	7.33	Pass
	9	2452	-21.20	6.02	0.58	-14.60	7.33	Pass
3	3	2422	-21.63	6.02	0.58	-15.03	7.33	Pass
	6	2437	-18.80	6.02	0.58	-12.20	7.33	Pass
	9	2452	-20.64	6.02	0.58	-14.04	7.33	Pass

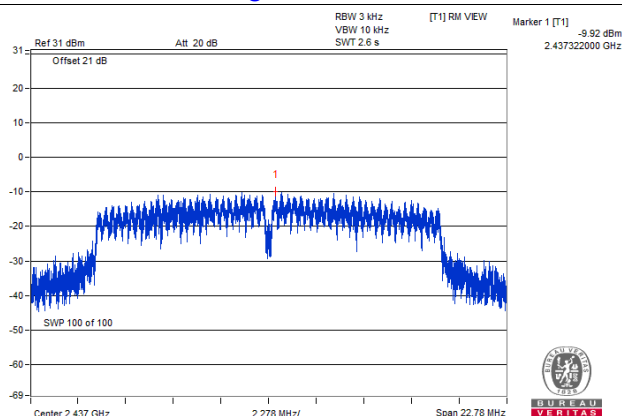
- Note:** 1. Directional gain = $10 \log[(10^{G0/20} + 10^{G1/20} + 10^{G2/20} + 10^{G3/20})^2 / 2]$ = 6.67dBi > 6dBi , so the power limit shall be reduced to $8 - (6.67 - 6) = 7.33$ dBm.
2. Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value

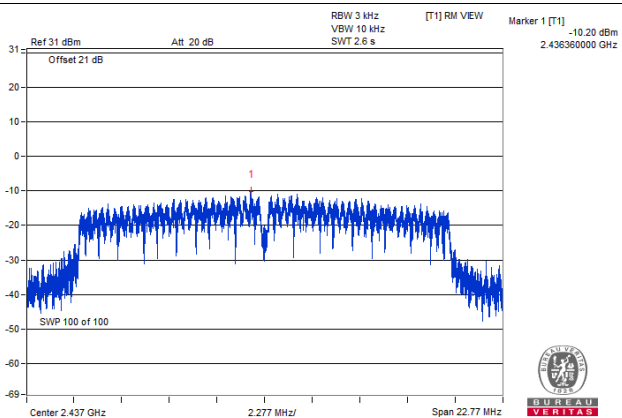
802.11b / Chain 3: CH6



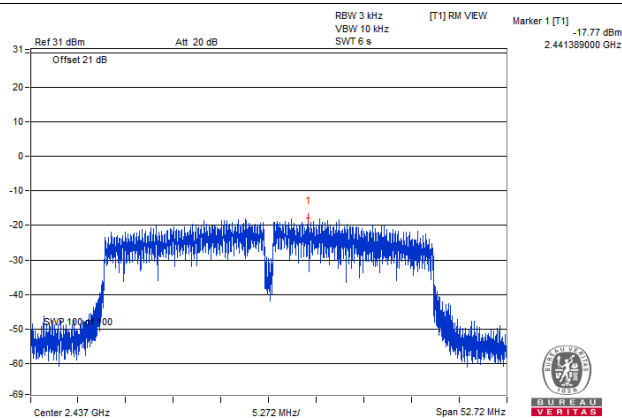
802.11g / Chain 2 : CH6



VHT20 / Chain 2: CH6



VHT40 / Chain 1: CH6

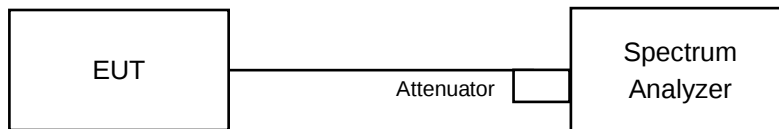


4.6 Conducted Out of Band Emission Measurement

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.

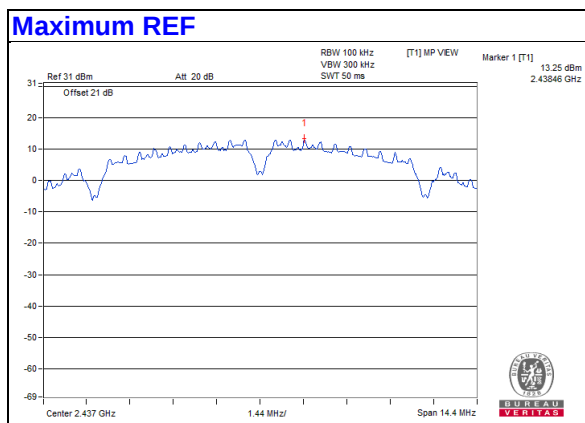
4.6.6 EUT Operating Condition

Same as Item 4.3.6

4.6.7 Test Results

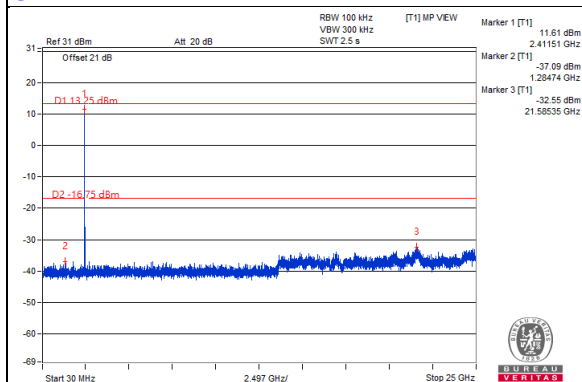
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 30dB offset below D1. It shows compliance with the requirement.

802.11b

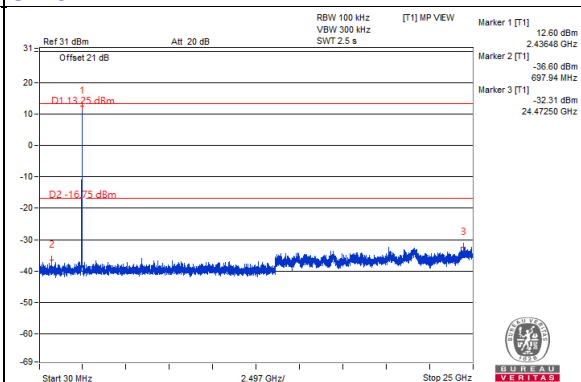


Chain 0

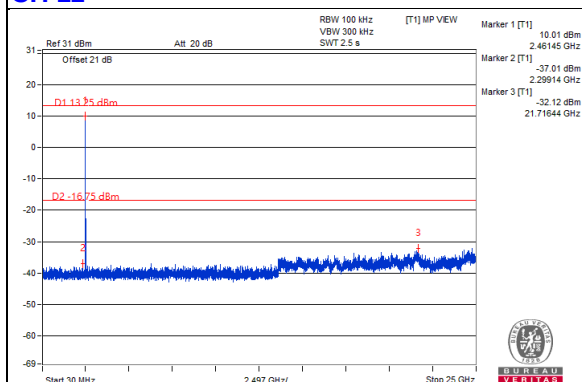
CH 1



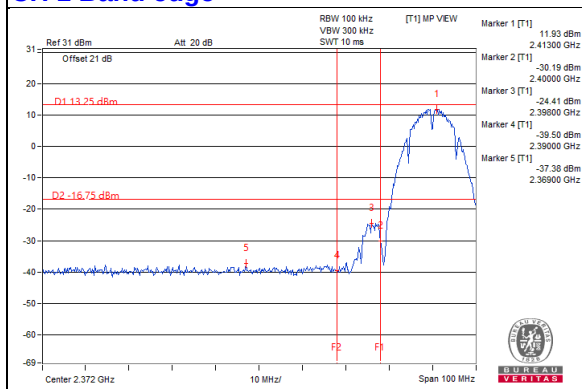
CH 6



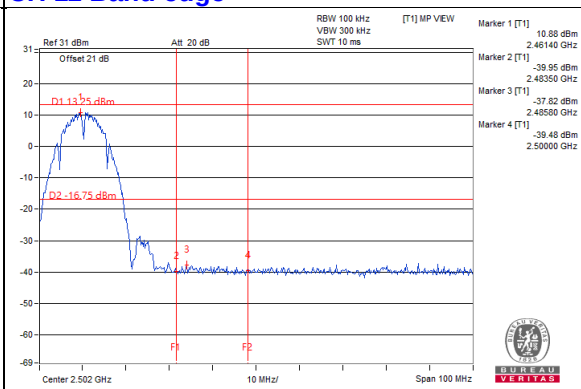
CH 11



CH 1 Band edge

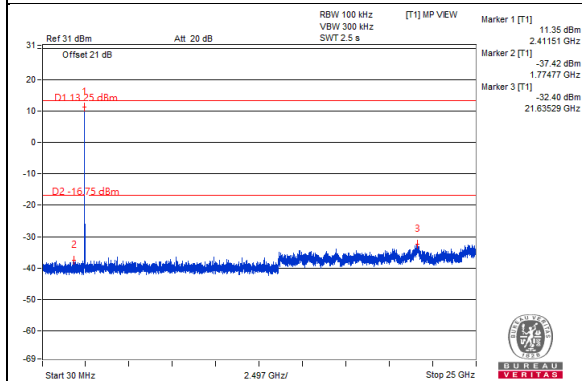


CH 11 Band edge

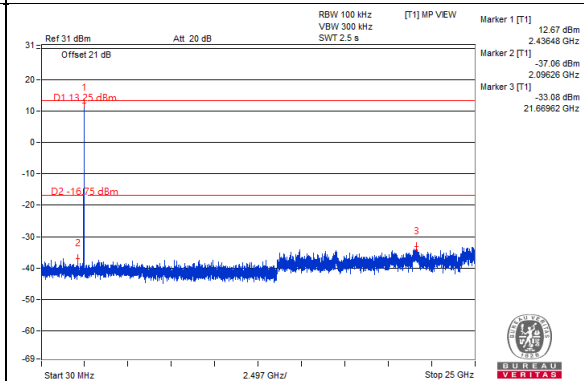


Chain 1

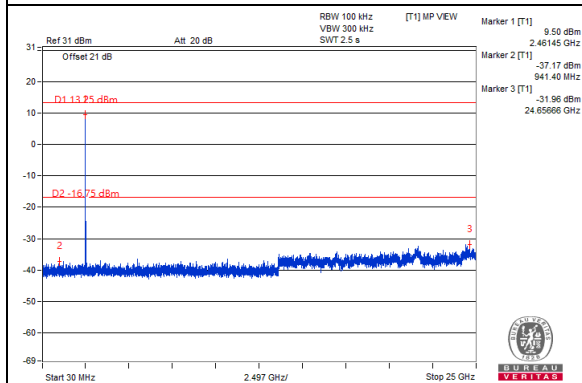
CH 1



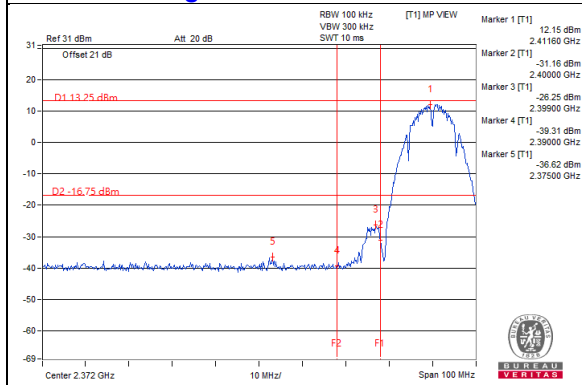
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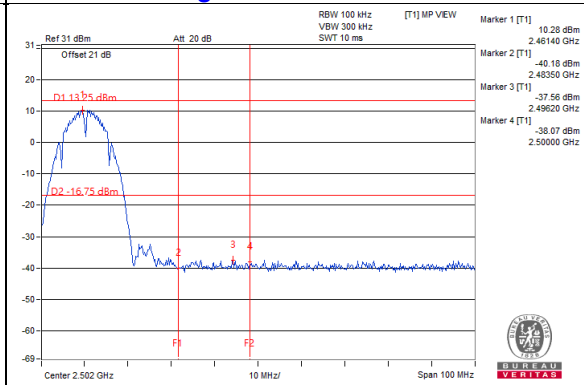
CH 11



CH 1 Band edge

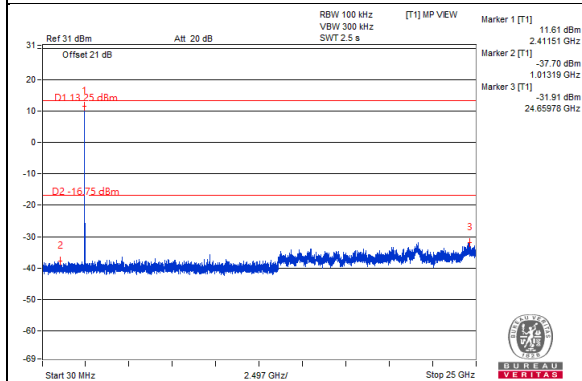


CH 11 Band edge

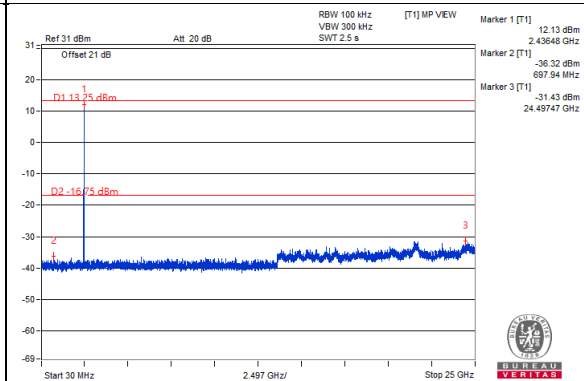


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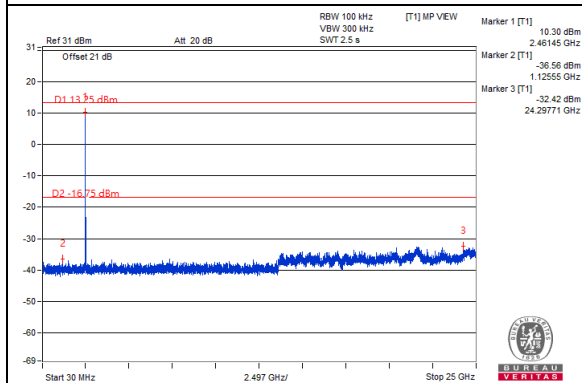
CH 1



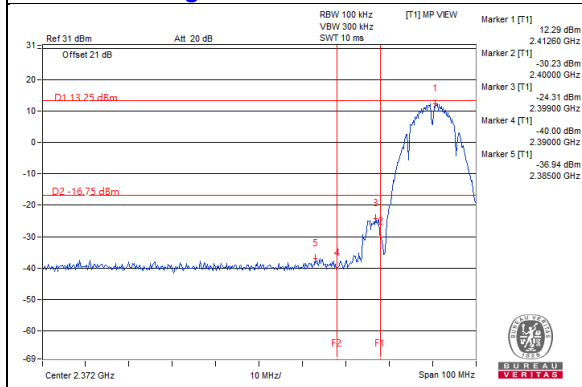
CH 6



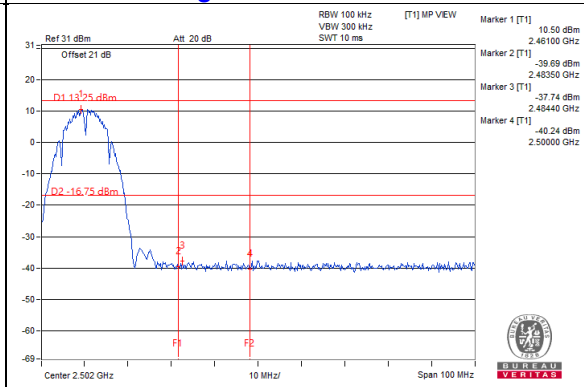
CH 11



CH 1 Band edge

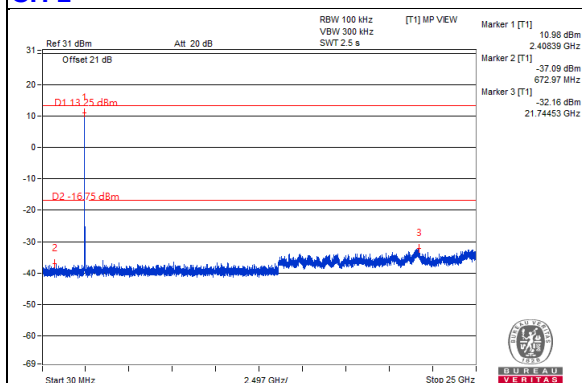


CH 11 Band edge

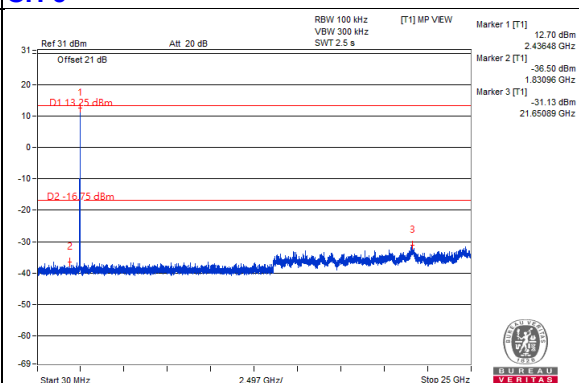


Chain 3

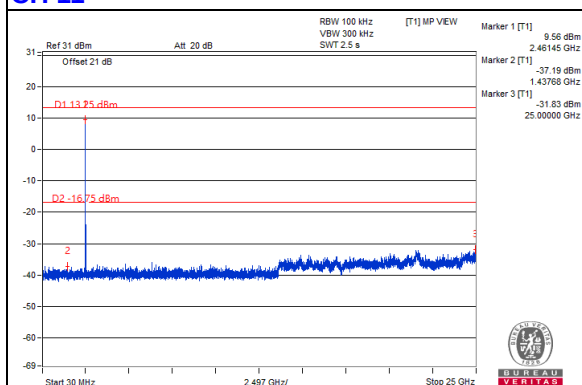
CH 1



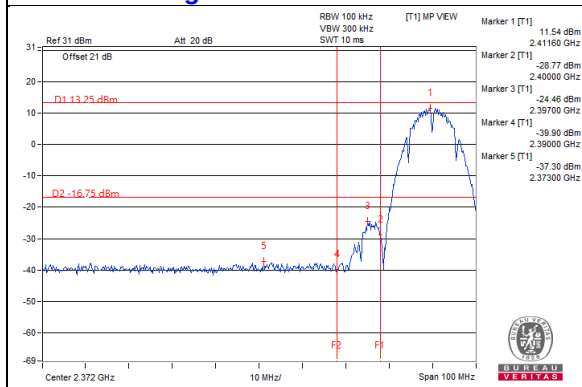
CH 6



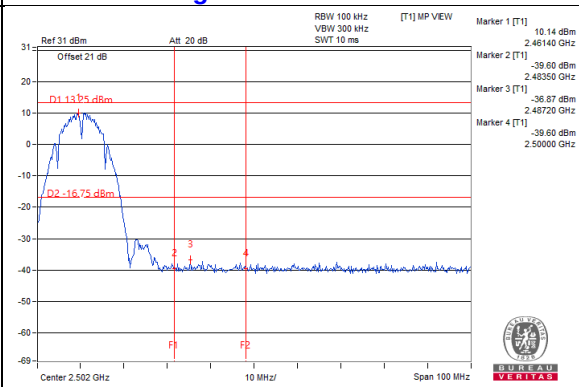
CH 11



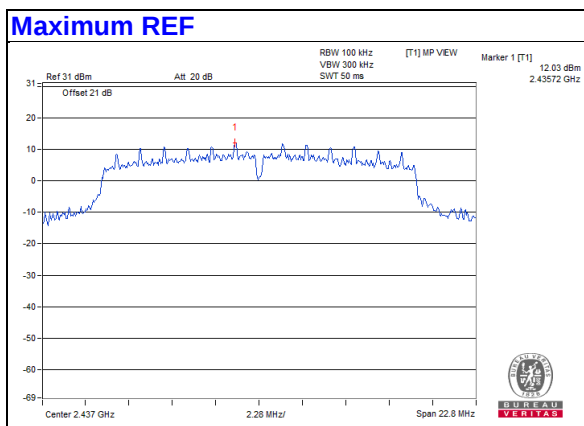
CH 1 Band edge



CH 11 Band edge

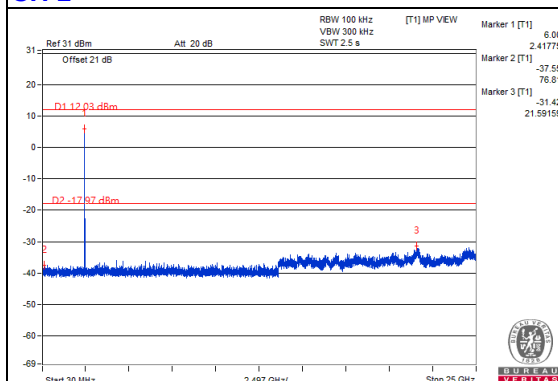


802.11g

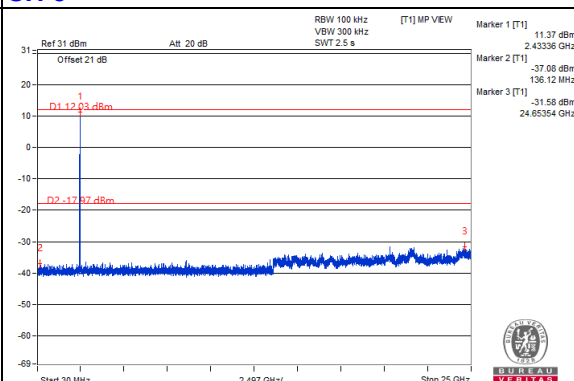


Chain 0

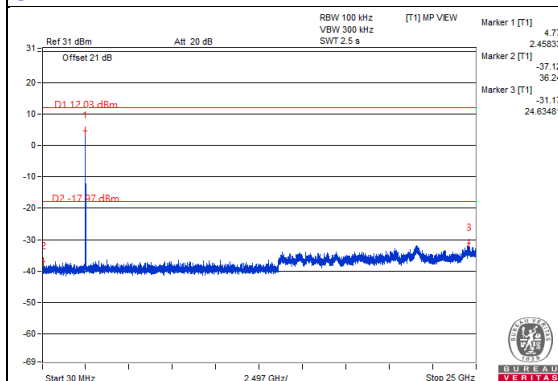
CH 1



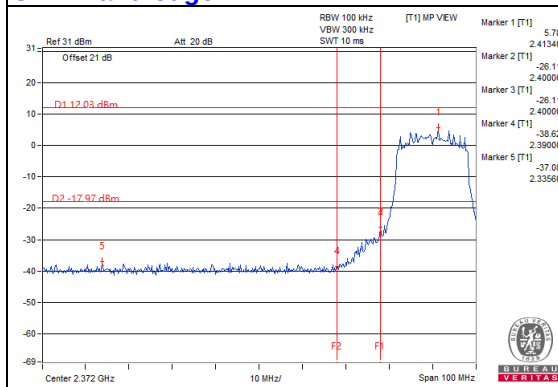
CH 6



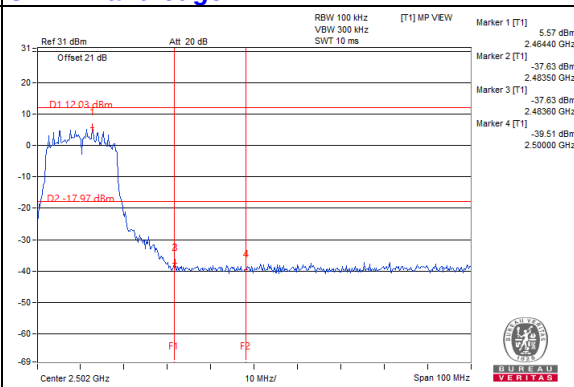
CH 11



CH 1 Band edge

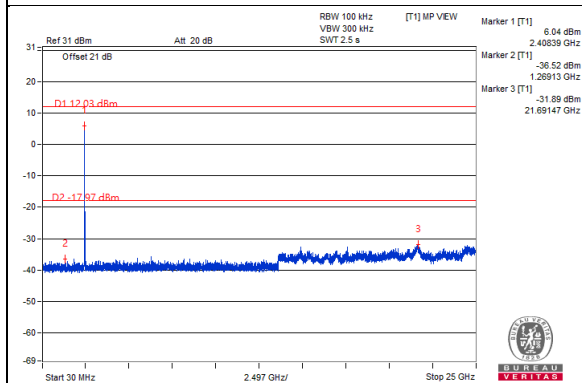


CH 11 Band edge

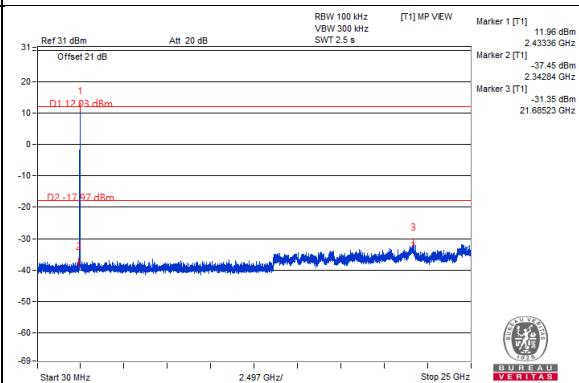


Chain 1

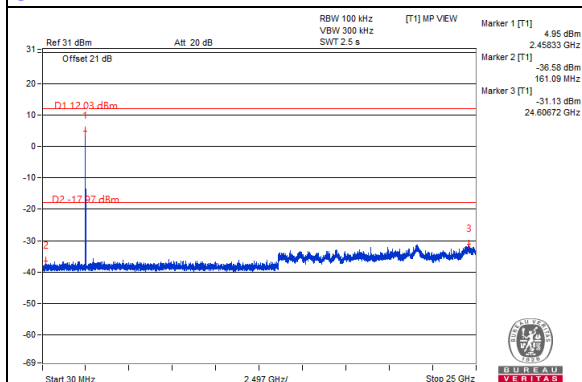
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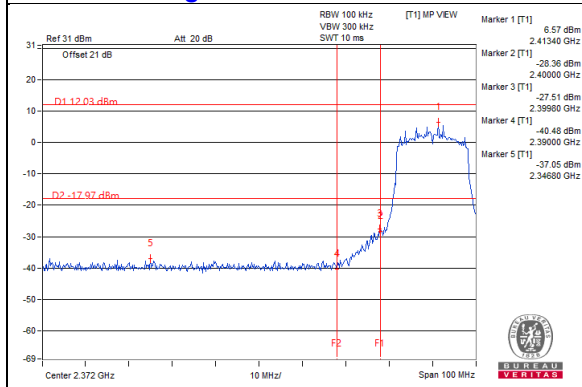
CH 6



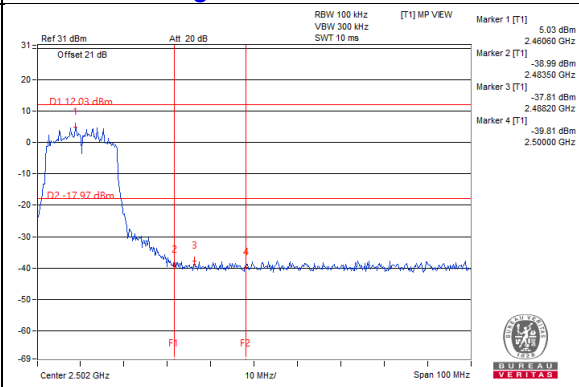
CH 11



CH 1 Band edge

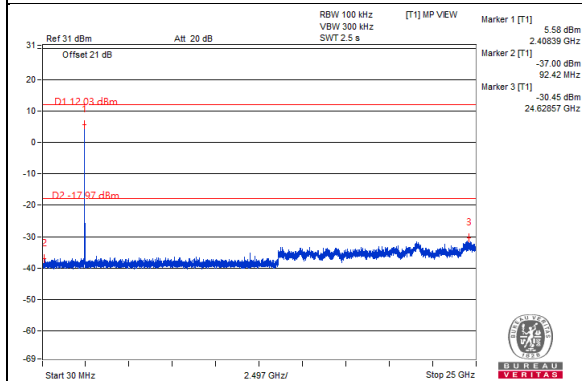


CH 11 Band edge

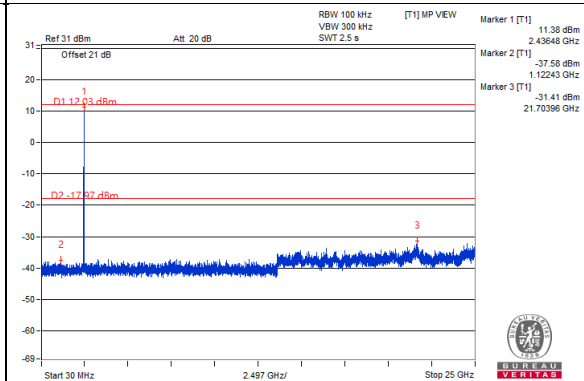


Chain 2

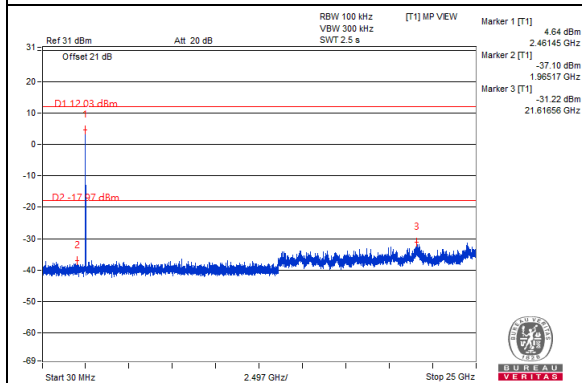
CH 1



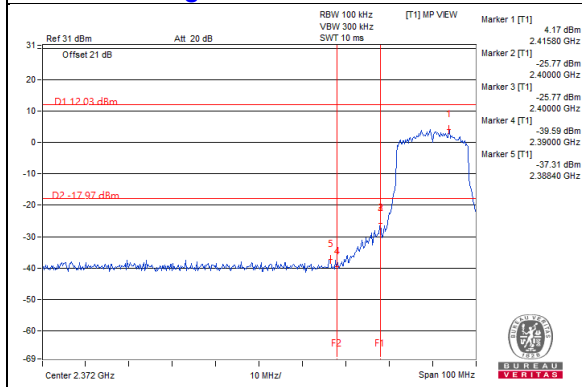
CH 6



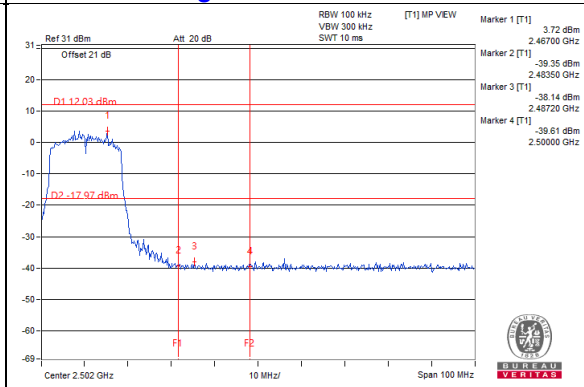
CH 11



CH 1 Band edge

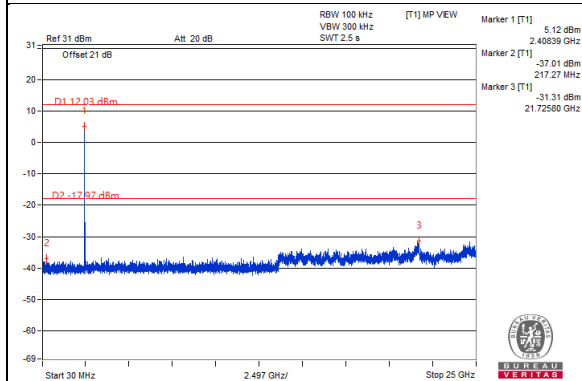


CH 11 Band edge

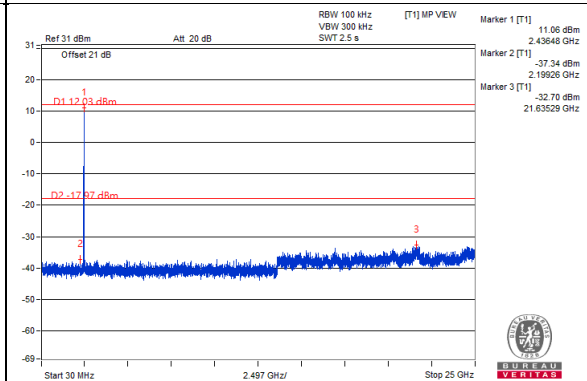


Chain 3

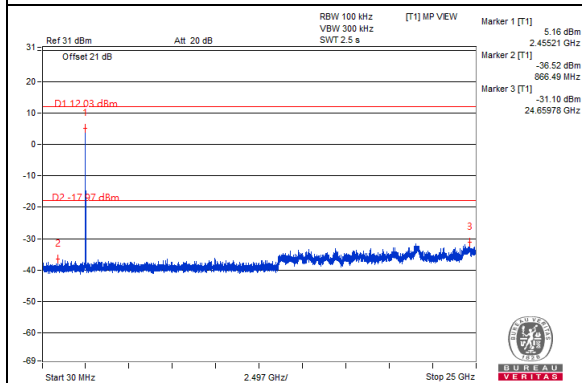
CH 1



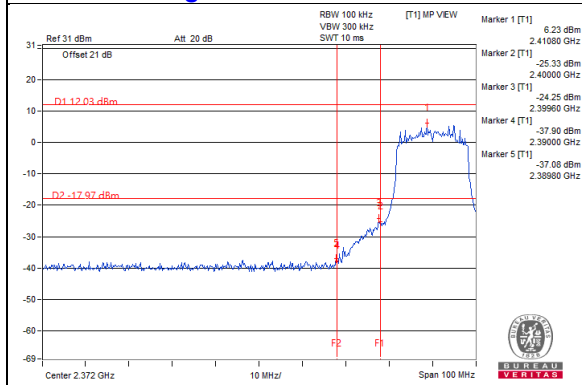
CH 6



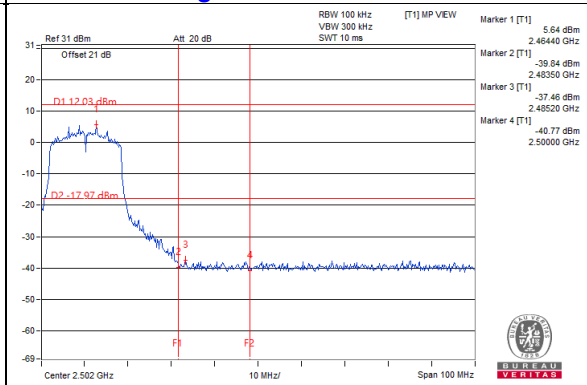
CH 11



CH 1 Band edge

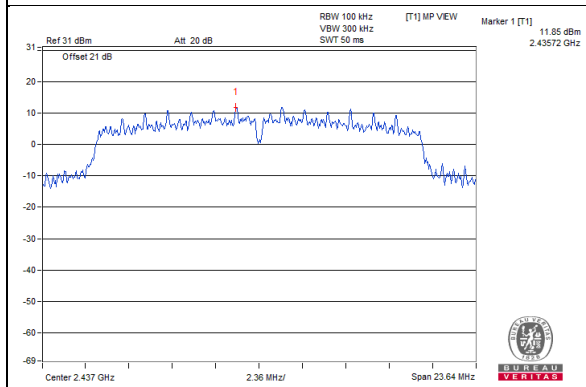


CH 11 Band edge



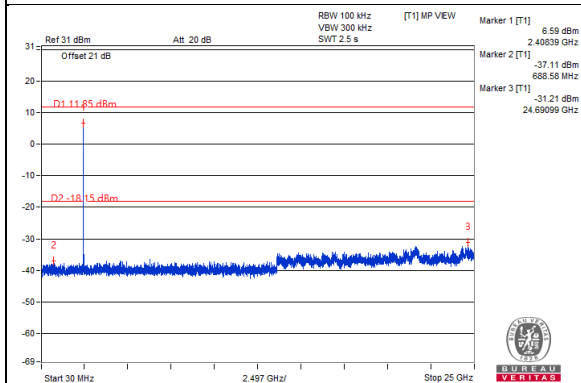
VHT20

Maximum REF

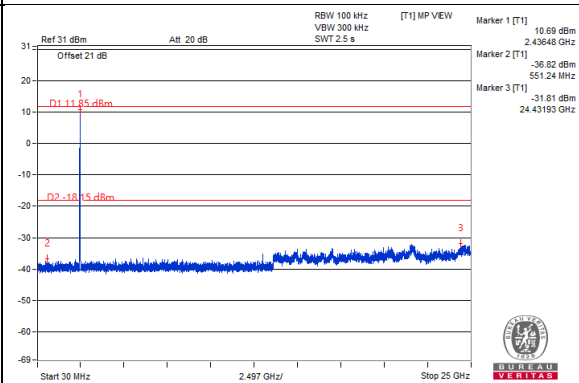


Chain 0

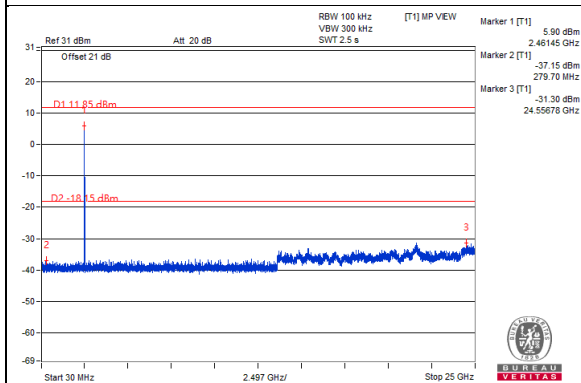
CH 1



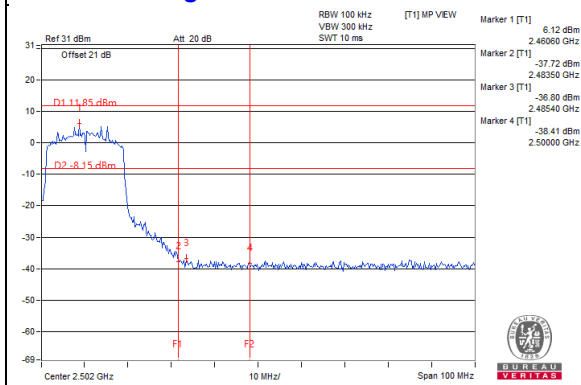
CH 6



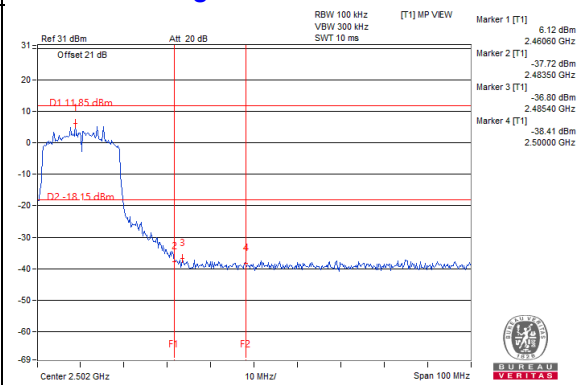
CH 11



CH 1 Band edge

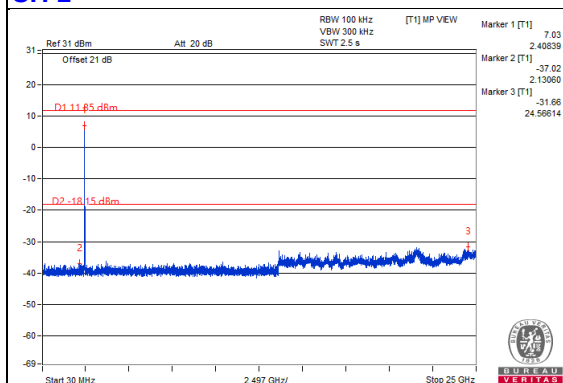


CH 11 Band edge

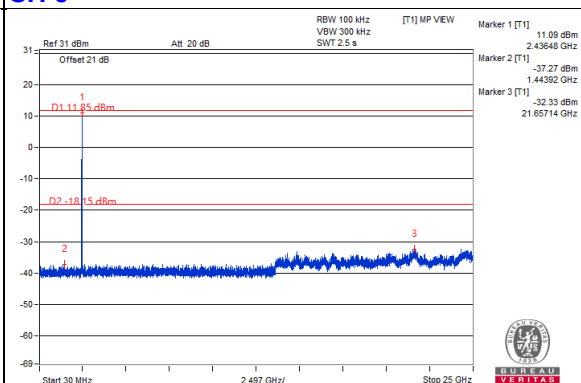


Chain 1

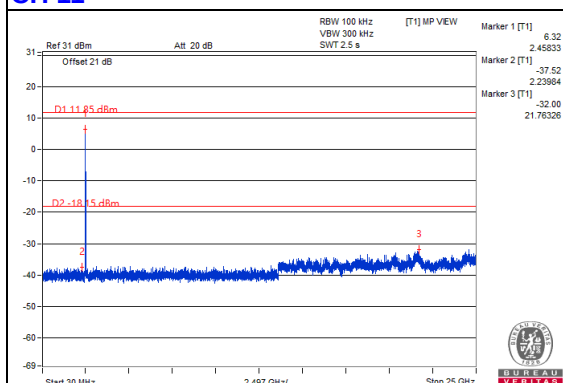
CH 1



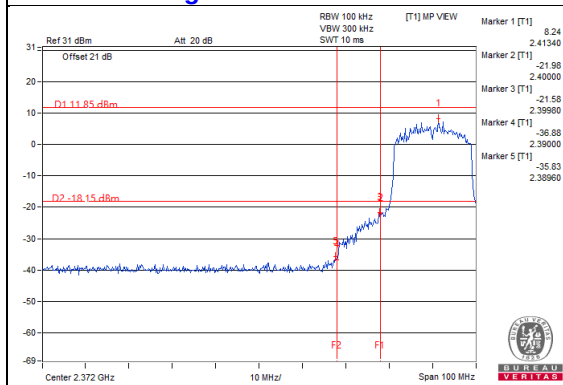
CH 6



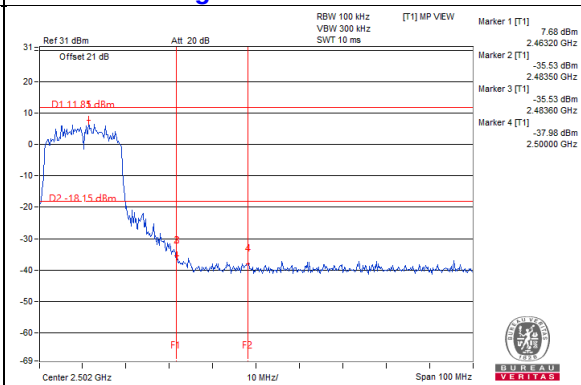
CH 11



CH 1 Band edge

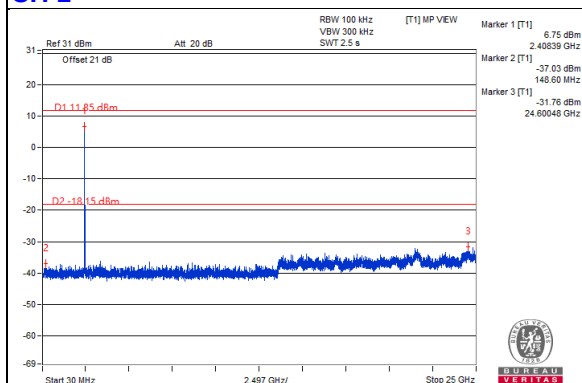


CH 11 Band edge

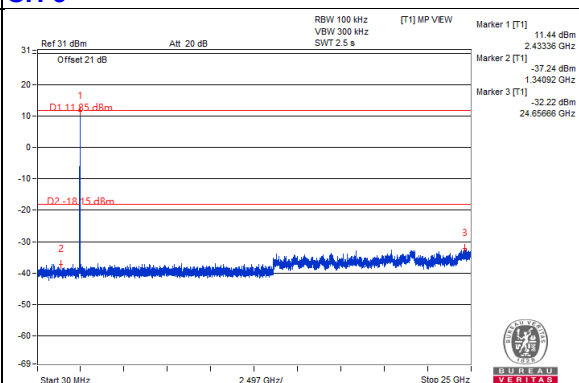


Chain 2

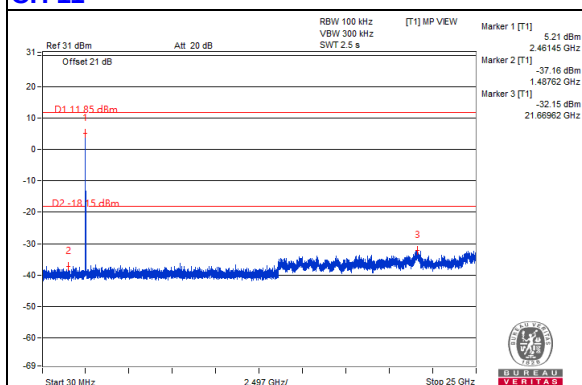
CH 1



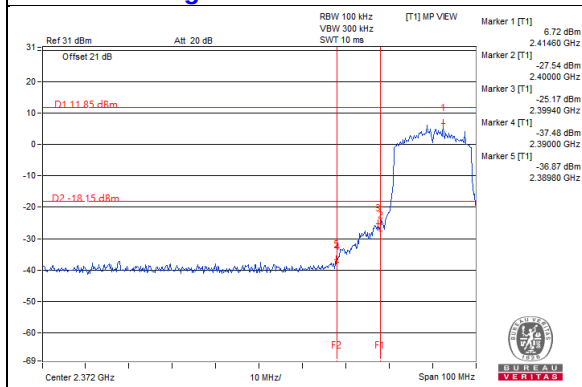
CH 6



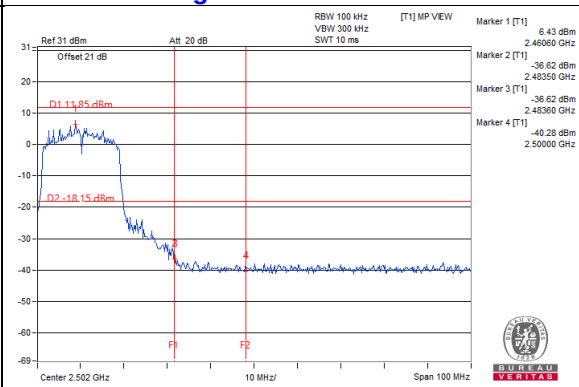
CH 11



CH 1 Band edge

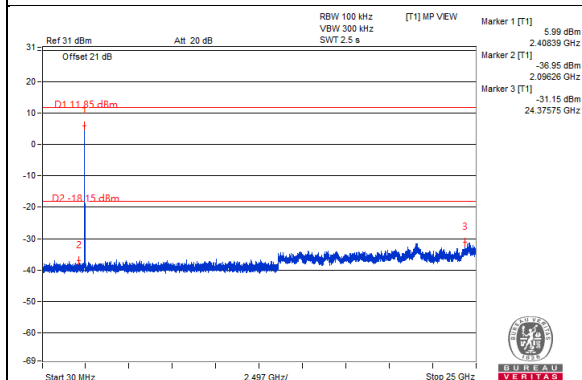


CH 11 Band edge

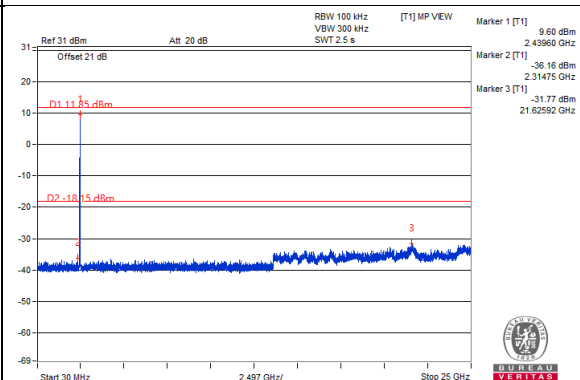


Chain 3

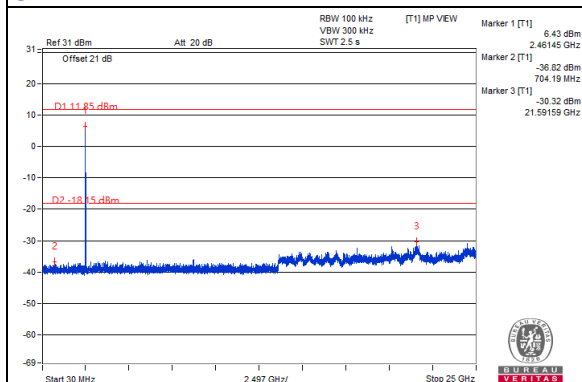
CH 1



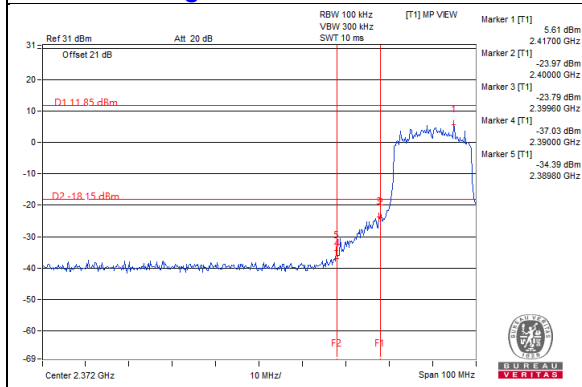
CH 6



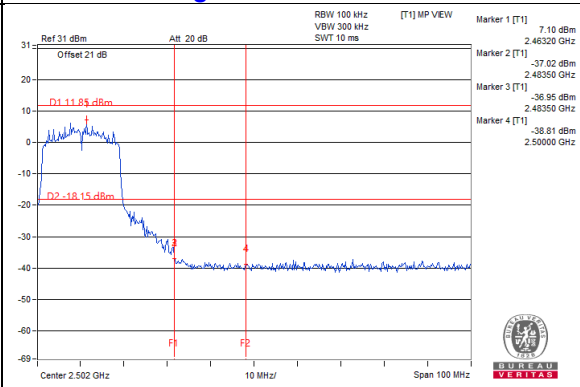
CH 11



CH 1 Band edge

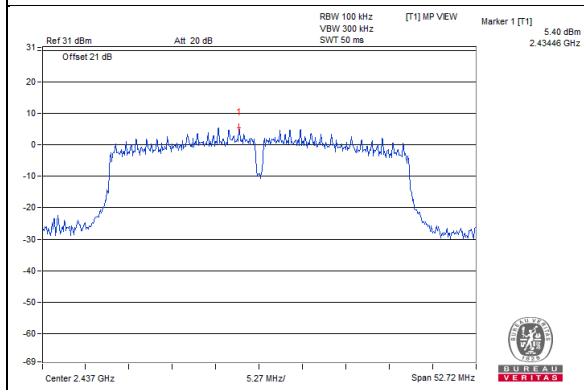


CH 11 Band edge



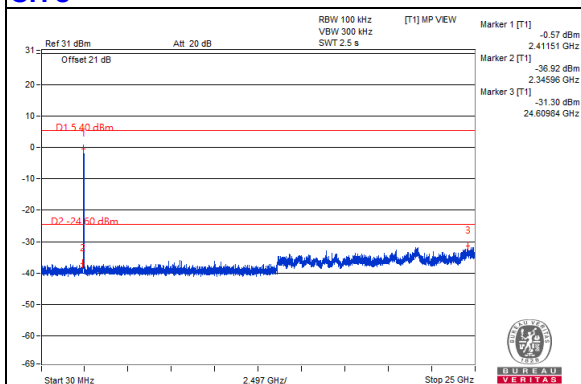
VHT40

Maximum REF

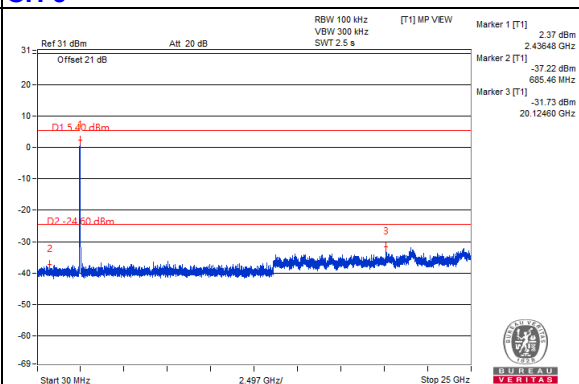


Chain 0

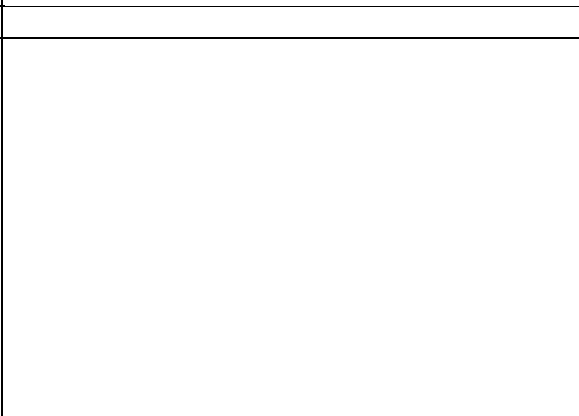
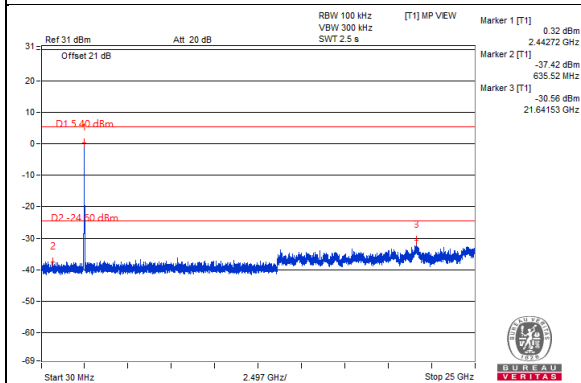
CH 3



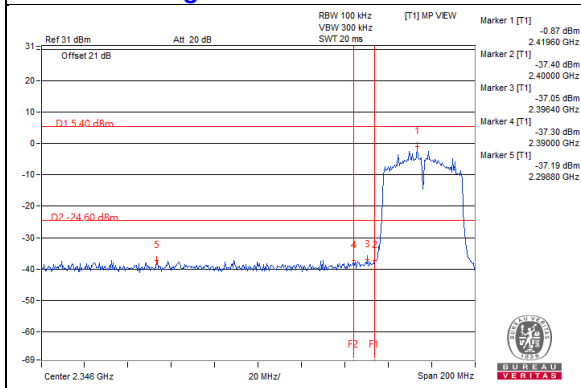
CH 6



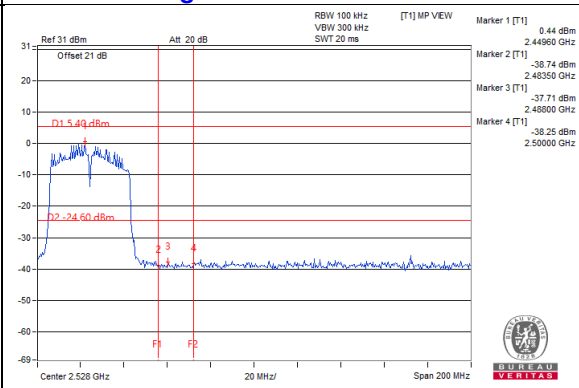
CH 9



CH 3 Band edge

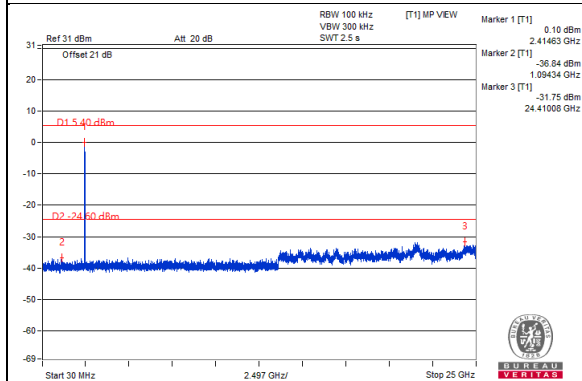


CH 9 Band edge

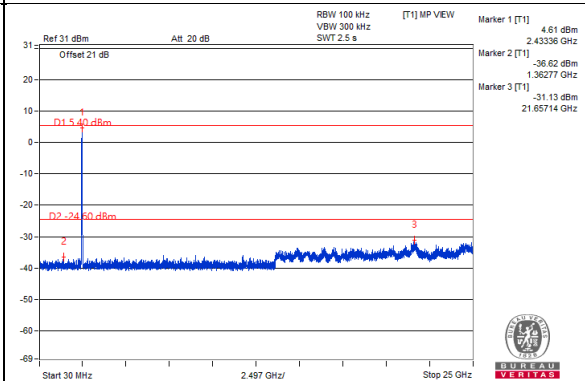


Chain 1

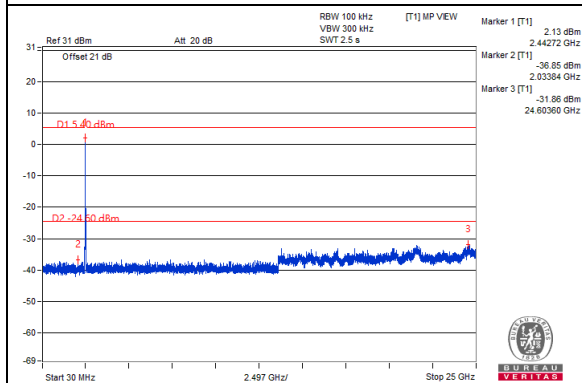
CH 3



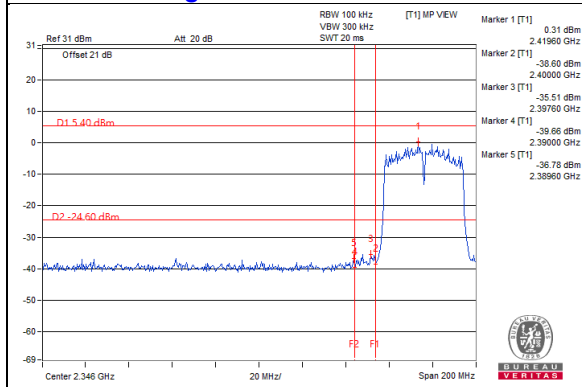
CH 6



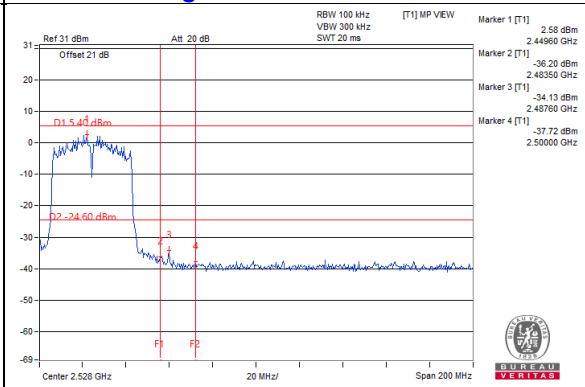
CH 9



CH 3 Band edge

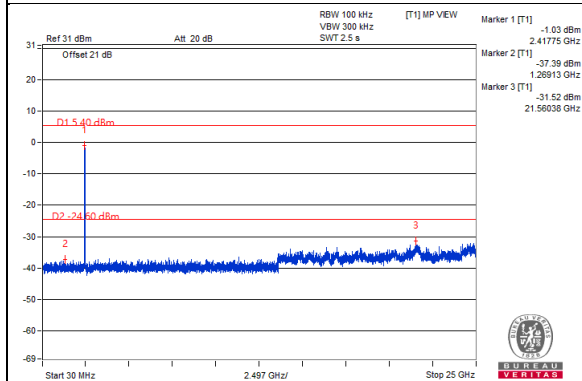


CH 9 Band edge

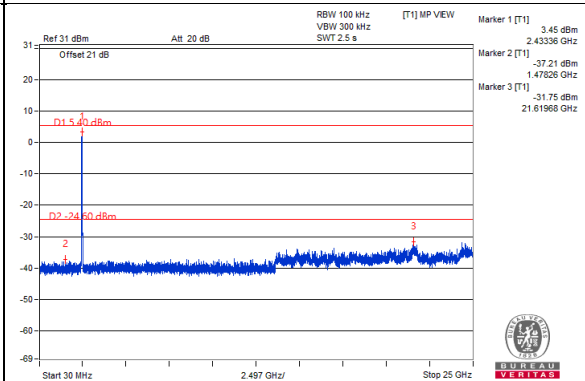


Chain 2

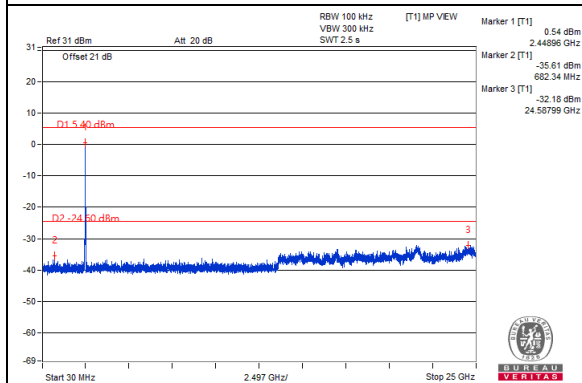
CH 3



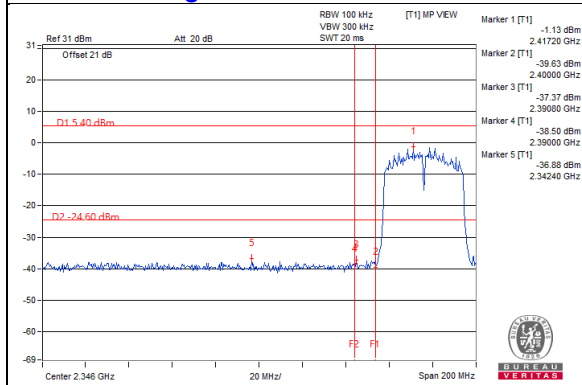
CH 6



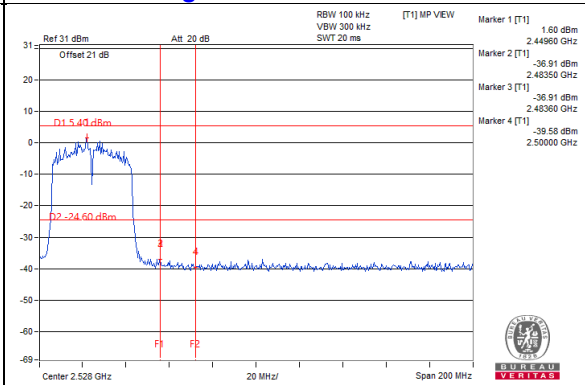
CH 9



CH 3 Band edge

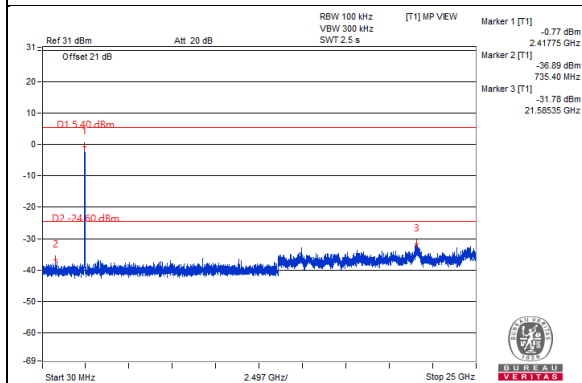


CH 9 Band edge

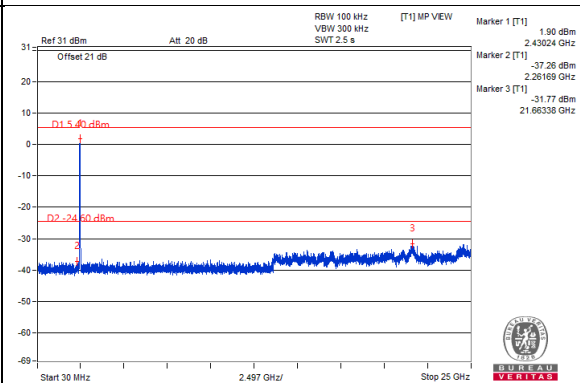


Chain 3

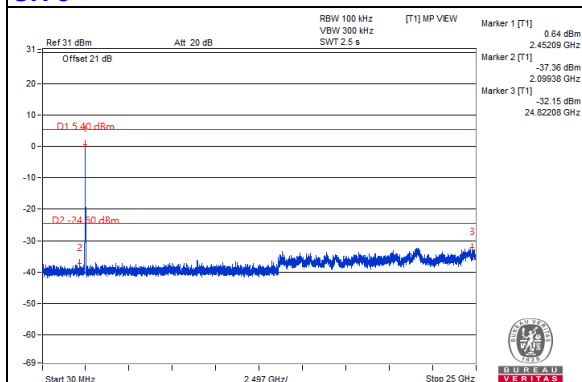
CH 3



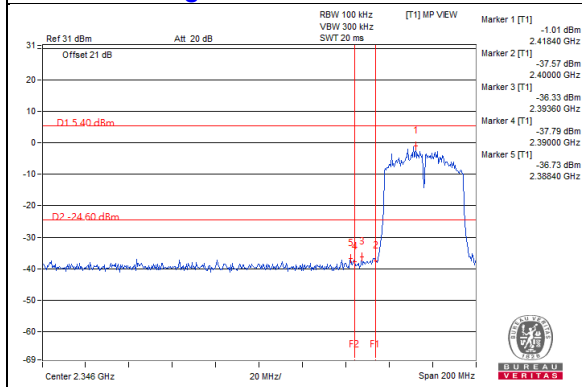
CH 6



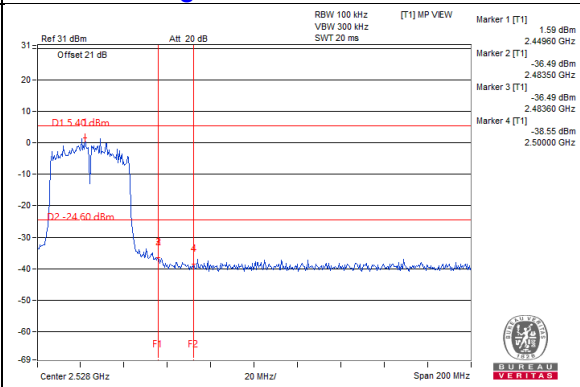
CH 9



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:

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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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