

FCC Test Report (WLAN)

Report No.: RF191227E08

FCC ID: Q87-08151

Test Model: MR7350

Series Model: MR7340, MR7320, MR7310

Received Date: Dec. 27, 2019

Test Date: Jan. 13 to Feb. 24, 2020

Issued Date: Mar. 19, 2020

Applicant: LINKSYS LLC

Address: 121 Theory Drive Irvine California 92617 United States

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

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

**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 unless 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 (WLAN)	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 and References	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	20
4.1.4 Deviation from Test Standard	21
4.1.5 Test Setup	21
4.1.6 EUT Operating Conditions	22
4.1.7 Test Results	23
4.2 Conducted Emission Measurement	37
4.2.1 Limits of Conducted Emission Measurement	37
4.2.2 Test Instruments	37
4.2.3 Test Procedures	38
4.2.4 Deviation from Test Standard	38
4.2.5 Test Setup	38
4.2.6 EUT Operating Conditions	38
4.2.7 Test Results	39
4.3 6dB Bandwidth Measurement	41
4.3.1 Limits of 6dB Bandwidth Measurement	41
4.3.2 Test Setup	41
4.3.3 Test Instruments	41
4.3.4 Test Procedure	41
4.3.5 Deviation from Test Standard	41
4.3.6 EUT Operating Conditions	41
4.3.7 Test Result	42
4.4 Conducted Output Power Measurement	44
4.4.1 Limits of Conducted Output Power Measurement	44
4.4.2 Test Setup	44
4.4.3 Test Instruments	44
4.4.4 Test Procedures	44
4.4.5 Deviation from Test Standard	44
4.4.6 EUT Operating Conditions	44
4.4.7 Test Results	45
4.5 Power Spectral Density Measurement	47
4.5.1 Limits of Power Spectral Density Measurement	47
4.5.2 Test Setup	47
4.5.3 Test Instruments	47
4.5.4 Test Procedure	47
4.5.5 Deviation from Test Standard	48
4.5.6 EUT Operating Condition	48

4.5.7 Test Results	49
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.....	60
Appendix – Information of the Testing Laboratories	61

Release Control Record

Issue No.	Description	Date Issued
RF191227E08	Original release.	Mar. 19, 2020

1 Certificate of Conformity

Product: Linksys Dual-Band 802.11ax Wireless Router

Brand: Linksys

Test Model: MR7350

Series Model: MR7340, MR7320, MR7310

Sample Status: ENGINEERING SAMPLE

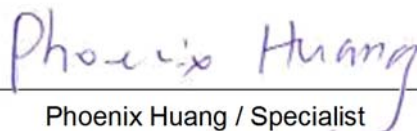
Applicant: LINKSYS LLC

Test Date: Jan. 13 to Feb. 24, 2020

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:

Mar. 19, 2020

Approved by :



Clark Lin / Technical Manager

Date:

Mar. 19, 2020

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 -9.37 dB at 0.16172 MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -1.0 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) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	1.8 dB
Conducted emissions	-	3.1 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.0 dB
	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 (WLAN)

Product	Linksys Dual-Band 802.11ax Wireless Router
Brand	Linksys
Test Model	MR7350
Series Model	MR7340, MR7320, MR7310
Status of EUT	ENGINEERING SAMPLE
Driver version	v0.e.10
Test Software Version	qdart_conn.win.1.0_installer_00073.2 for CDD mode; paste Hyperterminal MR7350 TxBf EMI command for Beamforming mode
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 1024QAM for OFDMA in 11ax HE mode
Modulation Technology	DSSS, OFDM, OFDMA
Transfer Rate	802.11b: up to 11 Mbps 802.11a/g: up to 54 Mbps 802.11n: up to 300 Mbps 802.11ac: up to 866.7 Mbps 802.11ax: up to 1201.0 Mbps
Operating Frequency	2.4GHz: 2.412 ~ 2.462 GHz 5GHz: 5.18 ~ 5.24 GHz, 5.745 ~ 5.825 GHz
Number of Channel	2.4GHz: 802.11b, 802.11g, 802.11n (HT20), VHT20, 802.11ax (HE20): 11 802.11n (HT40), VHT40, 802.11ax (HE40): 7 5GHz: 802.11a, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20): 9 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40): 4 802.11ac (VHT80), 802.11ax (HE80): 2
Output Power	CDD Mode: 2.412 ~ 2.462 GHz: 974.252 mW 5.18 ~ 5.24 GHz: 918.001 mW 5.745 ~ 5.825 GHz: 958.805 mW Beamforming Mode: 2.412 ~ 2.462 GHz: 902.701 mW 5.18 ~ 5.24 GHz: 763.779 mW 5.745 ~ 5.825 GHz: 909.87 mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Adapter x 1
Data Cable Supplied	RJ-45 Cable x 1 (Unshielded, 1 m)

Note:

1. The EUT has below model names, which are identical to each other in all aspects except for the following table:

Brand Name	Model No.	Description
Linksys	MR7350	For Marketing Purpose
	MR7340	
	MR7320	
	MR7310	

Note: From the above models, model: MR7350 was selected as representative model for the test and its data was recorded in this report.

2. The EUT has below radios as following table:

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

3. Simultaneously transmission condition.

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

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

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

No.	Brand	Model No.	Spec.
1	Ktec	KSA-24W-120200HU	Input: 100-240Vac, 0.6A, 50/60Hz Output: 12V, 2A DC output cable: Unshielded, 1.5m
2	APD	WB-24J12FU	Input: 100-240Vac, 0.7A, 50-60Hz Output: 12V, 2A DC output cable: Unshielded, 1.5m

Note: From the above adapters, the AC Power Conducted Emission and Radiated Emissions test worse case was found in **Adapter No. 2**. Therefore only the test data of the mode was recorded in this report.

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

Antenna No.	Antenna Net Gain (dBi)	Frequency Range (GHz)	Antenna Type	Connecteur Type	Cable Length (mm)
WiFi 1	2.05	2.4~2.4835	Dipole	i-pex(MHF)	330
	2.44	5.15~5.25			
	2.71	5.25~5.35			
	3.07	5.47~5.725			
	3.02	5.725~5.85			
WiFi 2	2.39	2.4~2.4835	Dipole	i-pex(MHF)	80
	3.07	5.15~5.25			
	3.03	5.25~5.35			
	3.08	5.47~5.725			
	3.13	5.725~5.85			
BT	3.6	2.4~2.4835	Metal	none	NA

6. The EUT incorporates a MIMO function:

2.4GHz Band		
MODULATION MODE	TX & RX CONFIGURATION	
802.11b	2TX	2RX
802.11g	2TX	2RX
802.11n (HT20)	2TX	2RX
802.11n (HT40)	2TX	2RX
VHT20	2TX	2RX
VHT40	2TX	2RX
802.11ax (HE20)	2TX	2RX
802.11ax (HE40)	2TX	2RX
5GHz Band		
MODULATION MODE	TX & RX CONFIGURATION	
802.11a	2TX	2RX
802.11n (HT20)	2TX	2RX
802.11n (HT40)	2TX	2RX
802.11ac (VHT20)	2TX	2RX
802.11ac (VHT40)	2TX	2RX
802.11ac (VHT80)	2TX	2RX
802.11ax (HE20)	2TX	2RX
802.11ax (HE40)	2TX	2RX
802.11ax (HE80)	2TX	2RX

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 VHT mode for 20MHz (40MHz) and 802.11ax mode for 20MHz (40MHz), therefore the manufacturer will control the power for 802.11n/VHT mode is the same as the 802.11ax or more lower than it and investigated worst case to representative mode in test report. (Final test mode refer to section 3.2.1)

7. The power setting are list as below:

802.11b		802.11g		VHT20		VHT40		802.11ax (HE20)		802.11ax (HE40)	
Freq. (MHz)	Power Setting	Freq. (MHz)	Power Setting	Freq. (MHz)	Power Setting	Freq. (MHz)	Power Setting	Freq. (MHz)	Power Setting	Freq. (MHz)	Power Setting
2412	22.5	2412	19.5	2412	22	2422	20	2412	22	2422	20
2437	23.5	2437	22.5	2437	26	2437	21	2437	26	2437	21
2462	23	2462	18.5	2462	20	2452	18	2462	20	2452	18

8. 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, 802.11ax (HE20):

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, 802.11ax (HE40):

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

Note: 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 Parameter
802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1Mb/s
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6Mb/s
Beamforming Mode					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	Data Rate Parameter
802.11ax (HE20)	1 to 11	1, 6, 11	OFDMA	BPSK	MCS0
802.11ax (HE40)	3 to 9	3, 6, 9	OFDMA	BPSK	MCS0

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 Parameter
802.11b	1 to 11	6	DSSS	DBPSK	1Mb/s

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 Parameter
802.11b	1 to 11	6	DSSS	DBPSK	1Mb/s

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 Parameter
802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1Mb/s
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6Mb/s
Beamforming Mode					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	Data Rate Parameter
VHT20 (output power only)	1 to 11	1, 6, 11	OFDM	BPSK	MCS0
VHT40 (output power only)	3 to 9	3, 6, 9	OFDM	BPSK	MCS0
802.11ax (HE20)	1 to 11	1, 6, 11	OFDMA	BPSK	MCS0
802.11ax (HE40)	3 to 9	3, 6, 9	OFDMA	BPSK	MCS0

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	25deg. C, 67%RH	120Vac, 60Hz	Jeff Lee
RE<1G	23deg. C, 65%RH	120Vac, 60Hz	Tom Yang
PLC	25deg. C, 75%RH	120Vac, 60Hz	Kevin Ko
APCM	21deg. C, 59%RH	120Vac, 60Hz	Andy Ho

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.

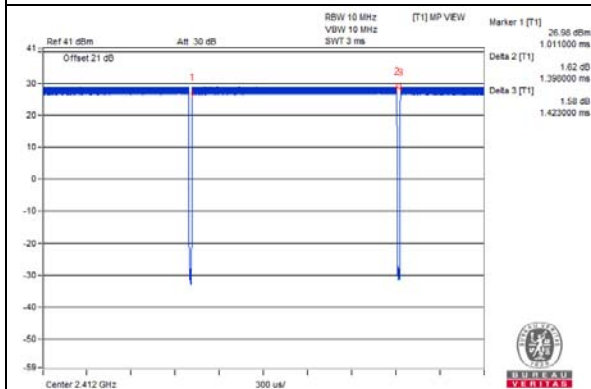
802.11b: Duty cycle = $1.398 \text{ ms} / 1.423 \text{ ms} = 0.982$

802.11g: Duty cycle = $0.449 \text{ ms} / 0.478 \text{ ms} = 0.939$, Duty factor = $10 * \log (1/\text{Duty cycle}) = 0.27 \text{ dB}$

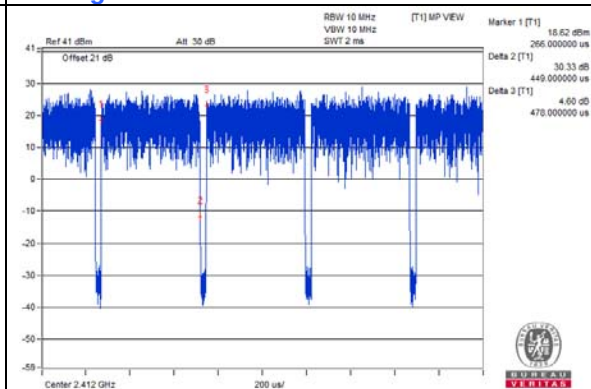
802.11ax (HE20): Duty cycle = $0.3 \text{ ms} / 0.333 \text{ ms} = 0.901$, Duty factor = $10 * \log (1/\text{Duty cycle}) = 0.45 \text{ dB}$

802.11ax (HE40): Duty cycle = $0.446 \text{ ms} / 0.475 \text{ ms} = 0.939$, Duty factor = $10 * \log (1/\text{Duty cycle}) = 0.27 \text{ dB}$

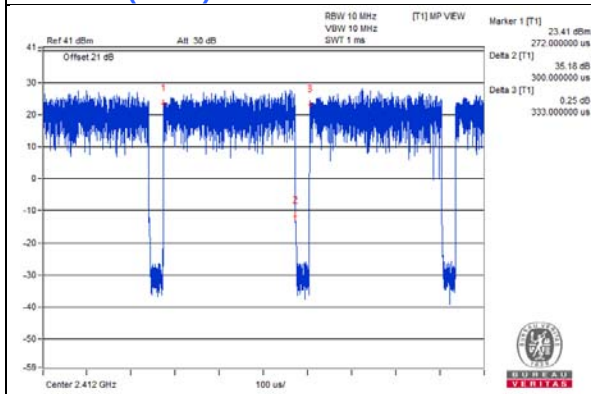
802.11b



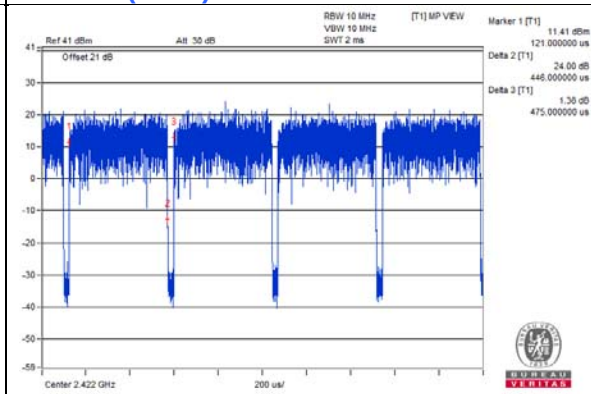
802.11g



802.11ax (HE20)



802.11ax (HE40)



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.

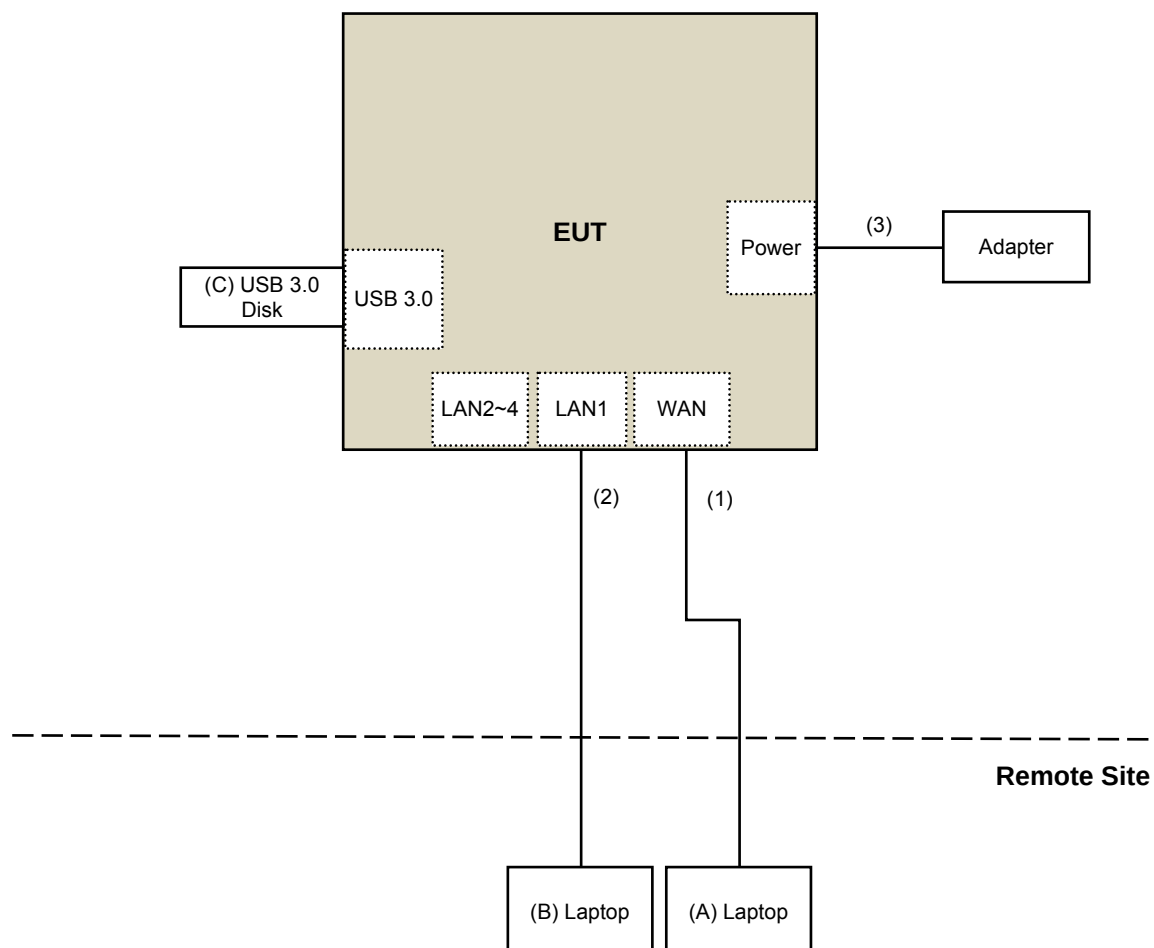
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Laptop	DELL	E6420	B92T3R1	FCC DoC	Provided by Lab
B.	Laptop	DELL	E5430	HYV4VY1	FCC DoC	Provided by Lab
C.	USB 3.0 Disk	SanDisk	BM181225896Z	NA	NA	Provided by Lab

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.	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 and references:

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 below 1GHz:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY51210202	Dec. 13, 2019	Dec. 12, 2020
Pre-Amplifier EMCI	EMC001340	980142	May 30, 2019	May 29, 2020
Loop Antenna Electro-Metrics	EM-6879	269	Sep. 16, 2019	Sep. 15, 2020
RF Cable	NA	LOOPCAB-001	Jan. 08, 2020	Jan. 07, 2021
RF Cable	NA	LOOPCAB-002	Jan. 08, 2020	Jan. 07, 2021
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
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	NA	NA

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in 966 Chamber No. 4.
3. Loop antenna was used for all emissions below 30 MHz.
4. Tested Date: Jan. 14, 2020

For other test items:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY51210202	Dec. 13, 2019	Dec. 12, 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. 15, 2020	Jan. 14, 2021
RF Cable	104 RF cable	131215	Jan. 09, 2020	Jan. 08, 2021
RF Cable	EMC104-SM-SM-6000	180418	May 03, 2019	May 02, 2020
Pre-Amplifier EMCI	EMC184045SE	980387	Jan. 15, 2020	Jan. 14, 2021
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170519	Nov. 24, 2019	Nov. 23, 2020
RF Cable	EMC102-KM-KM-1200	160924	Jan. 15, 2020	Jan. 14, 2021
RF Cable	EMC102-KM-KM-4500	181205	Aug. 26, 2019	Aug. 25, 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. Tested Date: Jan. 15 to Feb. 24, 2020

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:

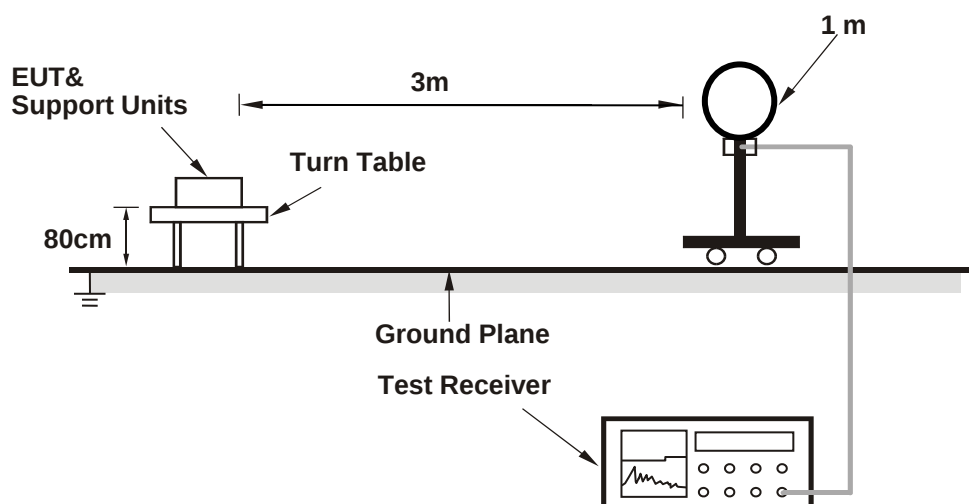
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

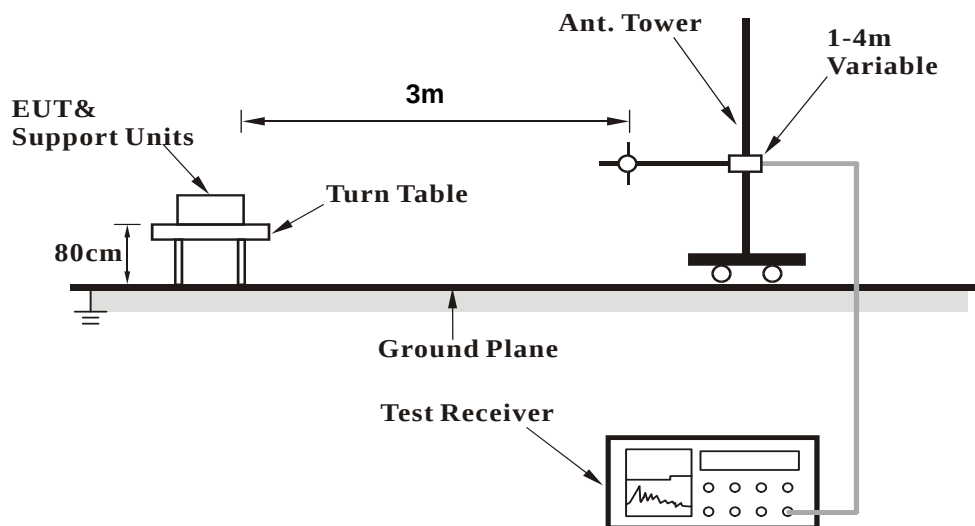
No deviation.

4.1.5 Test Setup

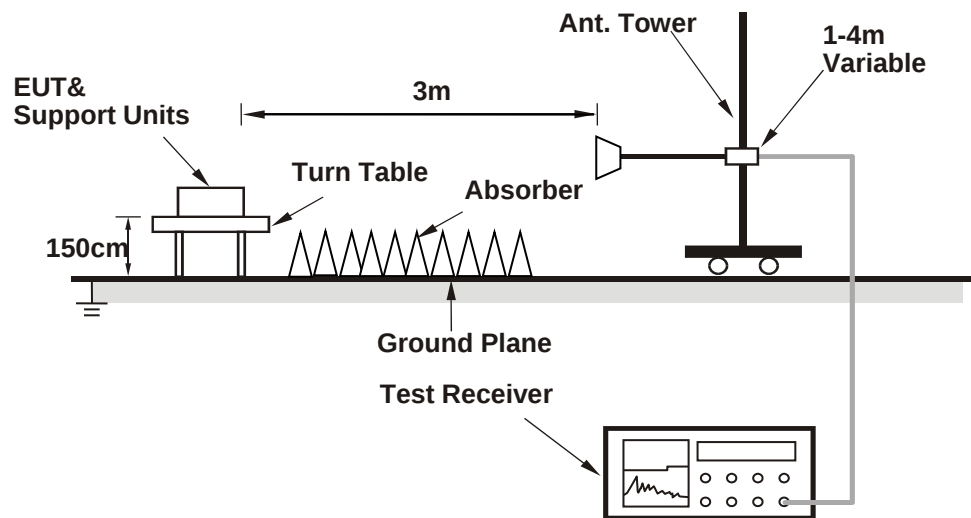
For Radiated emission below 30MHz



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 (qdart_conn.win.1.0_installer_00073.2 for CDD mode; paste Hyperterminal MR7350 TxBf EMI command for Beamforming mode) has been activated to set the EUT under transmission condition continuously.

4.1.7 Test Results

Above 1GHz Data:

CDD Mode

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	57.9 PK	74.0	-16.1	1.53 H	226	59.6	-1.7
2	2390.00	47.3 AV	54.0	-6.7	1.53 H	226	49.0	-1.7
3	*2412.00	113.9 PK			1.53 H	226	115.7	-1.8
4	*2412.00	110.7 AV			1.53 H	226	112.5	-1.8
5	4824.00	43.6 PK	74.0	-30.4	2.54 H	162	41.5	2.1
6	4824.00	40.6 AV	54.0	-13.4	2.54 H	162	38.5	2.1
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	58.9 PK	74.0	-15.1	2.50 V	360	60.6	-1.7
2	2390.00	52.8 AV	54.0	-1.2	2.50 V	360	54.5	-1.7
3	*2412.00	119.3 PK			2.50 V	360	121.1	-1.8
4	*2412.00	116.0 AV			2.50 V	360	117.8	-1.8
5	4824.00	46.0 PK	74.0	-28.0	1.14 V	114	43.9	2.1
6	4824.00	43.0 AV	54.0	-11.0	1.14 V	114	40.9	2.1

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	51.4 PK	74.0	-22.6	1.49 H	230	53.1	-1.7
2	2390.00	39.7 AV	54.0	-14.3	1.49 H	230	41.4	-1.7
3	*2437.00	114.7 PK			1.49 H	230	116.5	-1.8
4	*2437.00	112.2 AV			1.49 H	230	114.0	-1.8
5	2483.50	50.1 PK	74.0	-23.9	1.49 H	230	51.8	-1.7
6	2483.50	39.3 AV	54.0	-14.7	1.49 H	230	41.0	-1.7
7	4874.00	42.9 PK	74.0	-31.1	2.54 H	163	40.7	2.2
8	4874.00	38.5 AV	54.0	-15.5	2.54 H	163	36.3	2.2
9	7311.00	43.9 PK	74.0	-30.1	2.13 H	286	34.9	9.0
10	7311.00	32.8 AV	54.0	-21.2	2.13 H	286	23.8	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	56.8 PK	74.0	-17.2	2.02 V	330	58.5	-1.7
2	2390.00	44.6 AV	54.0	-9.4	2.02 V	330	46.3	-1.7
3	*2437.00	121.6 PK			2.02 V	330	123.4	-1.8
4	*2437.00	118.5 AV			2.02 V	330	120.3	-1.8
5	2483.50	56.5 PK	74.0	-17.5	2.02 V	330	58.2	-1.7
6	2483.50	44.9 AV	54.0	-9.1	2.02 V	330	46.6	-1.7
7	4874.00	46.1 PK	74.0	-27.9	1.14 V	194	43.9	2.2
8	4874.00	42.9 AV	54.0	-11.1	1.14 V	194	40.7	2.2
9	7311.00	44.2 PK	74.0	-29.8	1.88 V	168	35.2	9.0
10	7311.00	34.3 AV	54.0	-19.7	1.88 V	168	25.3	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 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	115.4 PK			1.44 H	241	117.2	-1.8
2	*2462.00	113.9 AV			1.44 H	241	115.7	-1.8
3	2483.50	58.4 PK	74.0	-15.6	1.44 H	241	60.1	-1.7
4	2483.50	47.7 AV	54.0	-6.3	1.44 H	241	49.4	-1.7
5	4924.00	40.3 PK	74.0	-33.7	2.45 H	278	38.0	2.3
6	4924.00	34.4 AV	54.0	-19.6	2.45 H	278	32.1	2.3
7	7386.00	44.6 PK	74.0	-29.4	2.13 H	166	35.3	9.3
8	7386.00	34.3 AV	54.0	-19.7	2.13 H	166	25.0	9.3
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	121.2 PK			1.68 V	330	123.0	-1.8
2	*2462.00	120.2 AV			1.68 V	330	122.0	-1.8
3	2483.50	60.0 PK	74.0	-14.0	1.68 V	330	61.7	-1.7
4	2483.50	52.8 AV	54.0	-1.2	1.68 V	330	54.5	-1.7
5	4924.00	44.8 PK	74.0	-29.2	1.19 V	198	42.5	2.3
6	4924.00	42.4 AV	54.0	-11.6	1.19 V	198	40.1	2.3
7	7386.00	44.8 PK	74.0	-29.2	1.34 V	257	35.5	9.3
8	7386.00	36.4 AV	54.0	-17.6	1.34 V	257	27.1	9.3

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.

802.11g

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	59.4 PK	74.0	-14.6	1.52 H	218	61.1	-1.7
2	2390.00	47.1 AV	54.0	-6.9	1.52 H	218	48.8	-1.7
3	*2412.00	114.7 PK			1.52 H	218	116.5	-1.8
4	*2412.00	103.5 AV			1.52 H	218	105.3	-1.8
5	4824.00	40.0 PK	74.0	-34.0	2.57 H	162	37.9	2.1
6	4824.00	33.8 AV	54.0	-20.2	2.57 H	162	31.7	2.1
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	64.6 PK	74.0	-9.4	2.16 V	308	66.3	-1.7
2	2390.00	52.7 AV	54.0	-1.3	2.16 V	308	54.4	-1.7
3	*2412.00	119.6 PK			2.16 V	308	121.4	-1.8
4	*2412.00	109.8 AV			2.16 V	308	111.6	-1.8
5	4824.00	39.9 PK	74.0	-34.1	1.88 V	302	37.8	2.1
6	4824.00	36.9 AV	54.0	-17.1	1.88 V	302	34.8	2.1

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	58.7 PK	74.0	-15.3	1.55 H	224	60.4	-1.7
2	2390.00	46.7 AV	54.0	-7.3	1.55 H	224	48.4	-1.7
3	*2437.00	118.2 PK			1.55 H	224	120.0	-1.8
4	*2437.00	107.5 AV			1.55 H	224	109.3	-1.8
5	2483.50	59.3 PK	74.0	-14.7	1.55 H	224	61.0	-1.7
6	2483.50	47.2 AV	54.0	-6.8	1.55 H	224	48.9	-1.7
7	4874.00	40.2 PK	74.0	-33.8	2.54 H	172	38.0	2.2
8	4874.00	34.2 AV	54.0	-19.8	2.54 H	172	32.0	2.2
9	7311.00	36.7 PK	74.0	-37.3	2.13 H	148	27.7	9.0
10	7311.00	29.4 AV	54.0	-24.6	2.13 H	148	20.4	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	64.2 PK	74.0	-9.8	2.02 V	331	65.9	-1.7
2	2390.00	51.1 AV	54.0	-2.9	2.02 V	331	52.8	-1.7
3	*2437.00	122.2 PK			2.02 V	331	124.0	-1.8
4	*2437.00	112.9 AV			2.02 V	331	114.7	-1.8
5	2483.50	66.3 PK	74.0	-7.7	2.02 V	331	68.0	-1.7
6	2483.50	52.1 AV	54.0	-1.9	2.02 V	331	53.8	-1.7
7	4874.00	42.3 PK	74.0	-31.7	1.96 V	266	40.1	2.2
8	4874.00	38.9 AV	54.0	-15.1	1.96 V	266	36.7	2.2
9	7311.00	38.6 PK	74.0	-35.4	1.41 V	240	29.6	9.0
10	7311.00	34.6 AV	54.0	-19.4	1.41 V	240	25.6	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 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	113.9 PK			1.56 H	233	115.7	-1.8
2	*2462.00	103.2 AV			1.56 H	233	105.0	-1.8
3	2483.50	58.6 PK	74.0	-15.4	1.56 H	233	60.3	-1.7
4	2483.50	47.1 AV	54.0	-6.9	1.56 H	233	48.8	-1.7
5	4924.00	40.5 PK	74.0	-33.5	2.48 H	174	38.2	2.3
6	4924.00	34.3 AV	54.0	-19.7	2.48 H	174	32.0	2.3
7	7386.00	36.6 PK	74.0	-37.4	2.09 H	163	27.3	9.3
8	7386.00	29.4 AV	54.0	-24.6	2.09 H	163	20.1	9.3
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	119.0 PK			2.10 V	310	120.8	-1.8
2	*2462.00	109.3 AV			2.10 V	310	111.1	-1.8
3	2483.50	68.4 PK	74.0	-5.6	2.10 V	310	70.1	-1.7
4	2483.50	52.9 AV	54.0	-1.1	2.10 V	310	54.6	-1.7
5	4924.00	42.0 PK	74.0	-32.0	1.85 V	299	39.7	2.3
6	4924.00	38.8 AV	54.0	-15.2	1.85 V	299	36.5	2.3
7	7386.00	38.7 PK	74.0	-35.3	1.36 V	248	29.4	9.3
8	7386.00	34.9 AV	54.0	-19.1	1.36 V	248	25.6	9.3

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.

Beamforming Mode

802.11ax (HE20)

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	59.6 PK	74.0	-14.4	1.58 H	224	61.3	-1.7
2	2390.00	47.1 AV	54.0	-6.9	1.58 H	224	48.8	-1.7
3	*2412.00	115.4 PK			1.58 H	224	117.2	-1.8
4	*2412.00	102.3 AV			1.58 H	224	104.1	-1.8
5	4824.00	40.3 PK	74.0	-33.7	2.44 H	182	38.2	2.1
6	4824.00	34.1 AV	54.0	-19.9	2.44 H	182	32.0	2.1
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	63.6 PK	74.0	-10.4	1.89 V	48	65.3	-1.7
2	2390.00	53.0 AV	54.0	-1.0	1.89 V	48	54.7	-1.7
3	*2412.00	120.5 PK			1.89 V	48	122.3	-1.8
4	*2412.00	107.6 AV			1.89 V	48	109.4	-1.8
5	4824.00	40.4 PK	74.0	-33.6	1.89 V	274	38.3	2.1
6	4824.00	37.2 AV	54.0	-16.8	1.89 V	274	35.1	2.1

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	54.6 PK	74.0	-19.4	1.53 H	218	56.3	-1.7
2	2390.00	43.1 AV	54.0	-10.9	1.53 H	218	44.8	-1.7
3	*2437.00	120.4 PK			1.53 H	218	122.2	-1.8
4	*2437.00	109.6 AV			1.53 H	218	111.4	-1.8
5	2483.50	55.2 PK	74.0	-18.8	1.53 H	218	56.9	-1.7
6	2483.50	43.5 AV	54.0	-10.5	1.53 H	218	45.2	-1.7
7	4874.00	40.0 PK	74.0	-34.0	2.53 H	158	37.8	2.2
8	4874.00	34.0 AV	54.0	-20.0	2.53 H	158	31.8	2.2
9	7311.00	36.5 PK	74.0	-37.5	2.15 H	157	27.5	9.0
10	7311.00	29.2 AV	54.0	-24.8	2.15 H	157	20.2	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	60.6 PK	74.0	-13.4	1.64 V	46	62.3	-1.7
2	2390.00	49.9 AV	54.0	-4.1	1.64 V	46	51.6	-1.7
3	*2437.00	127.5 PK			1.64 V	46	129.3	-1.8
4	*2437.00	115.7 AV			1.64 V	46	117.5	-1.8
5	2483.50	61.2 PK	74.0	-12.8	1.64 V	46	62.9	-1.7
6	2483.50	48.7 AV	54.0	-5.3	1.64 V	46	50.4	-1.7
7	4874.00	41.4 PK	74.0	-32.6	1.91 V	282	39.2	2.2
8	4874.00	38.3 AV	54.0	-15.7	1.91 V	282	36.1	2.2
9	7311.00	38.9 PK	74.0	-35.1	1.31 V	245	29.9	9.0
10	7311.00	34.2 AV	54.0	-19.8	1.31 V	245	25.2	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 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	115.6 PK			1.47 H	229	117.4	-1.8
2	*2462.00	102.4 AV			1.47 H	229	104.2	-1.8
3	2483.50	60.2 PK	74.0	-13.8	1.47 H	229	61.9	-1.7
4	2483.50	48.2 AV	54.0	-5.8	1.47 H	229	49.9	-1.7
5	4924.00	40.8 PK	74.0	-33.2	2.44 H	167	38.5	2.3
6	4924.00	34.4 AV	54.0	-19.6	2.44 H	167	32.1	2.3
7	7386.00	36.8 PK	74.0	-37.2	2.11 H	149	27.5	9.3
8	7386.00	30.1 AV	54.0	-23.9	2.11 H	149	20.8	9.3
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	119.8 PK			1.80 V	310	121.6	-1.8
2	*2462.00	107.7 AV			1.80 V	310	109.5	-1.8
3	2483.50	65.5 PK	74.0	-8.5	1.80 V	310	67.2	-1.7
4	2483.50	52.7 AV	54.0	-1.3	1.80 V	310	54.4	-1.7
5	4924.00	40.6 PK	74.0	-33.4	1.87 V	285	38.3	2.3
6	4924.00	37.8 AV	54.0	-16.2	1.87 V	285	35.5	2.3
7	7386.00	38.6 PK	74.0	-35.4	1.35 V	237	29.3	9.3
8	7386.00	34.5 AV	54.0	-19.5	1.35 V	237	25.2	9.3

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.

802.11ax (HE40)

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	59.4 PK	74.0	-14.6	1.46 H	207	61.1	-1.7
2	2390.00	47.1 AV	54.0	-6.9	1.46 H	207	48.8	-1.7
3	*2422.00	111.0 PK			1.46 H	207	112.8	-1.8
4	*2422.00	100.3 AV			1.46 H	207	102.1	-1.8
5	4844.00	39.8 PK	74.0	-34.2	2.46 H	163	37.7	2.1
6	4844.00	33.9 AV	54.0	-20.1	2.46 H	163	31.8	2.1
7	7266.00	36.4 PK	74.0	-37.6	2.12 H	157	27.6	8.8
8	7266.00	28.9 AV	54.0	-25.1	2.12 H	157	20.1	8.8
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	64.9 PK	74.0	-9.1	1.74 V	44	66.6	-1.7
2	2390.00	53.0 AV	54.0	-1.0	1.74 V	44	54.7	-1.7
3	*2422.00	116.9 PK			1.74 V	44	118.7	-1.8
4	*2422.00	105.4 AV			1.74 V	44	107.2	-1.8
5	4844.00	41.0 PK	74.0	-33.0	1.86 V	273	38.9	2.1
6	4844.00	37.9 AV	54.0	-16.1	1.86 V	273	35.8	2.1
7	7266.00	39.0 PK	74.0	-35.0	1.30 V	240	30.2	8.8
8	7266.00	34.7 AV	54.0	-19.3	1.30 V	240	25.9	8.8

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	55.3 PK	74.0	-18.7	1.51 H	211	57.0	-1.7
2	2390.00	43.5 AV	54.0	-10.5	1.51 H	211	45.2	-1.7
3	*2437.00	113.0 PK			1.51 H	211	114.8	-1.8
4	*2437.00	102.1 AV			1.51 H	211	103.9	-1.8
5	2483.50	59.6 PK	74.0	-14.4	1.51 H	211	61.3	-1.7
6	2483.50	47.4 AV	54.0	-6.6	1.51 H	211	49.1	-1.7
7	4874.00	40.4 PK	74.0	-33.6	2.50 H	148	38.2	2.2
8	4874.00	34.2 AV	54.0	-19.8	2.50 H	148	32.0	2.2
9	7311.00	36.7 PK	74.0	-37.3	2.07 H	164	27.7	9.0
10	7311.00	30.0 AV	54.0	-24.0	2.07 H	164	21.0	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	59.1 PK	74.0	-14.9	1.98 V	43	60.8	-1.7
2	2390.00	49.4 AV	54.0	-4.6	1.98 V	43	51.1	-1.7
3	*2437.00	117.8 PK			1.98 V	43	119.6	-1.8
4	*2437.00	106.1 AV			1.98 V	43	107.9	-1.8
5	2483.50	62.1 PK	74.0	-11.9	1.98 V	43	63.8	-1.7
6	2483.50	52.9 AV	54.0	-1.1	1.98 V	43	54.6	-1.7
7	4874.00	40.4 PK	74.0	-33.6	1.87 V	280	38.2	2.2
8	4874.00	37.1 AV	54.0	-16.9	1.87 V	280	34.9	2.2
9	7311.00	38.8 PK	74.0	-35.2	1.34 V	238	29.8	9.0
10	7311.00	33.9 AV	54.0	-20.1	1.34 V	238	24.9	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 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	108.4 PK			1.49 H	221	110.2	-1.8
2	*2452.00	97.7 AV			1.49 H	221	99.5	-1.8
3	2483.50	55.7 PK	74.0	-18.3	1.49 H	221	57.4	-1.7
4	2483.50	44.6 AV	54.0	-9.4	1.49 H	221	46.3	-1.7
5	4904.00	40.4 PK	74.0	-33.6	2.47 H	154	38.2	2.2
6	4904.00	34.3 AV	54.0	-19.7	2.47 H	154	32.1	2.2
7	7356.00	36.6 PK	74.0	-37.4	2.12 H	176	27.5	9.1
8	7356.00	29.2 AV	54.0	-24.8	2.12 H	176	20.1	9.1
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	115.4 PK			1.74 V	42	117.2	-1.8
2	*2452.00	102.9 AV			1.74 V	42	104.7	-1.8
3	2483.50	67.9 PK	74.0	-6.1	1.74 V	42	69.6	-1.7
4	2483.50	51.9 AV	54.0	-2.1	1.74 V	42	53.6	-1.7
5	4904.00	39.7 PK	74.0	-34.3	1.96 V	283	37.5	2.2
6	4904.00	36.7 AV	54.0	-17.3	1.96 V	283	34.5	2.2
7	7356.00	39.2 PK	74.0	-34.8	1.34 V	248	30.1	9.1
8	7356.00	34.3 AV	54.0	-19.7	1.34 V	248	25.2	9.1

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.

CDD Mode

Below 1GHz Data:

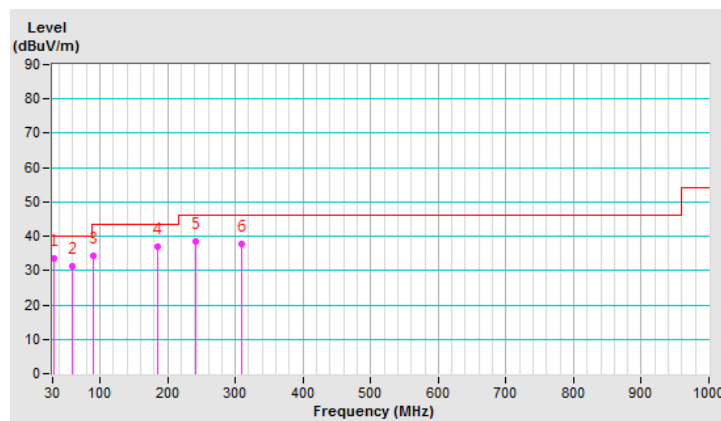
802.11b

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	32.52	33.7 QP	40.0	-6.3	1.00 H	76	42.9	-9.2
2	58.71	31.3 QP	40.0	-8.7	2.00 H	0	39.6	-8.3
3	90.33	34.3 QP	43.5	-9.2	2.00 H	114	48.0	-13.7
4	184.79	36.8 QP	43.5	-6.7	1.50 H	282	46.8	-10.0
5	241.14	38.5 QP	46.0	-7.5	1.50 H	81	47.6	-9.1
6	308.49	37.9 QP	46.0	-8.1	1.00 H	323	44.4	-6.5

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 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.

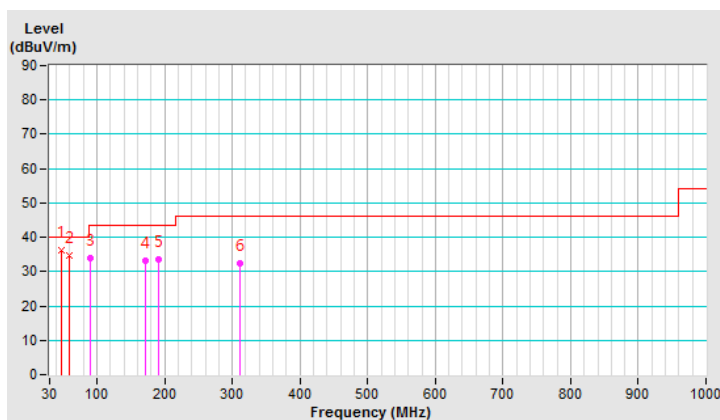


CHANNEL	TX Channel 6	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

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	47.82	36.3 QP	40.0	-3.7	1.50 V	200	44.1	-7.8
2	58.68	34.8 QP	40.0	-5.2	2.00 V	7	43.1	-8.3
3	90.38	33.8 QP	43.5	-9.7	1.00 V	210	47.5	-13.7
4	171.84	33.3 QP	43.5	-10.2	1.00 V	304	41.8	-8.5
5	190.34	33.7 QP	43.5	-9.8	2.00 V	48	44.3	-10.6
6	311.35	32.4 QP	46.0	-13.6	1.00 V	210	38.8	-6.4

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. 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: Jan. 13, 2020

4.2.3 Test Procedures

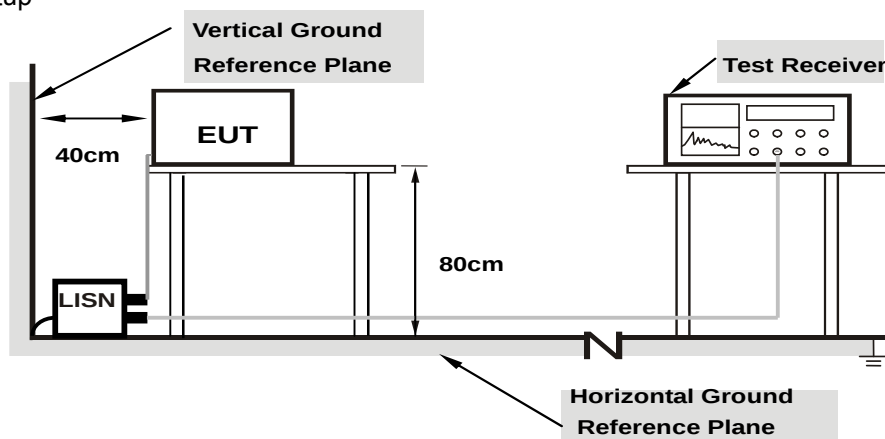
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

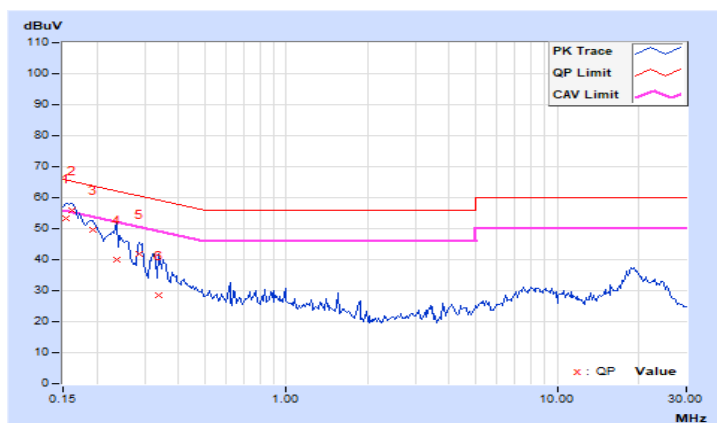
4.2.7 Test Results

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

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	43.33	30.96	53.32	40.95	65.79	55.79	-12.47	-14.84
2	0.16172	9.99	46.02	33.45	56.01	43.44	65.38	55.38	-9.37	-11.94
3	0.19297	9.99	39.46	28.24	49.45	38.23	63.91	53.91	-14.46	-15.68
4	0.23594	9.99	29.87	14.37	39.86	24.36	62.24	52.24	-22.38	-27.88
5	0.28672	9.99	31.89	23.90	41.88	33.89	60.62	50.62	-18.74	-16.73
6	0.33750	10.00	18.45	-1.25	28.45	8.75	59.26	49.26	-30.81	-40.51

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

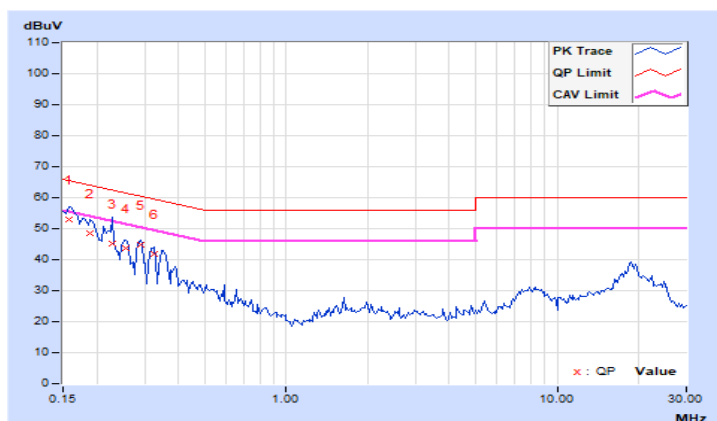


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
-------	-------------	-------------------	--------------------------------

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	0.15781	9.99	42.80	32.27	52.79	42.26	65.58	55.58	-12.79	-13.32
2	0.18906	9.99	38.42	28.94	48.41	38.93	64.08	54.08	-15.67	-15.15
3	0.22812	9.99	35.21	24.18	45.20	34.17	62.52	52.52	-17.32	-18.35
4	0.25547	10.00	33.82	26.09	43.82	36.09	61.58	51.58	-17.76	-15.49
5	0.29063	10.00	34.89	29.29	44.89	39.29	60.51	50.51	-15.62	-11.22
6	0.32578	10.00	32.02	26.90	42.02	36.90	59.56	49.56	-17.54	-12.66

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

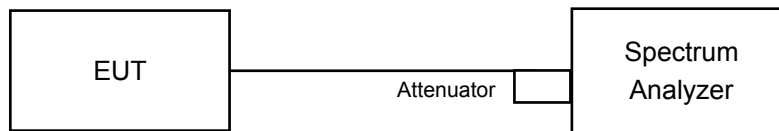


4.3 6dB Bandwidth Measurement

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

CDD Mode

802.11b

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	8.56	8.16	0.5	Pass
6	2437	8.02	9.01	0.5	Pass
11	2462	8.07	8.08	0.5	Pass

802.11g

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	15.79	15.91	0.5	Pass
6	2437	15.70	16.33	0.5	Pass
11	2462	15.60	15.71	0.5	Pass

Beamforming Mode

802.11ax (HE20)

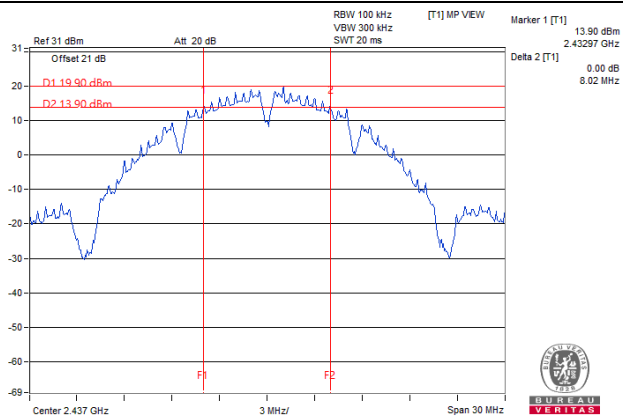
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	18.36	18.07	0.5	Pass
6	2437	18.31	18.13	0.5	Pass
11	2462	18.44	18.23	0.5	Pass

802.11ax (HE40)

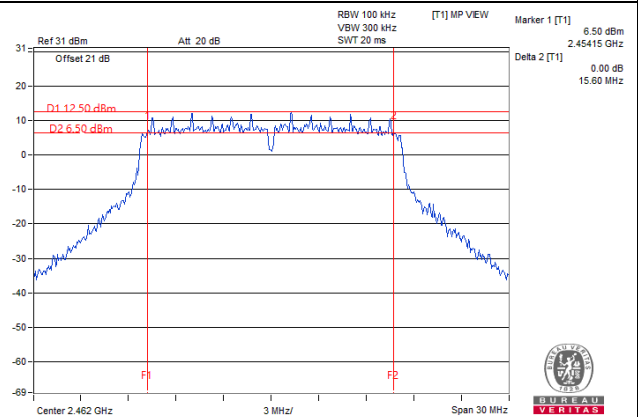
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
3	2422	37.27	37.86	0.5	Pass
6	2437	37.91	37.83	0.5	Pass
9	2452	36.99	37.92	0.5	Pass

Spectrum Plot of Worst Value

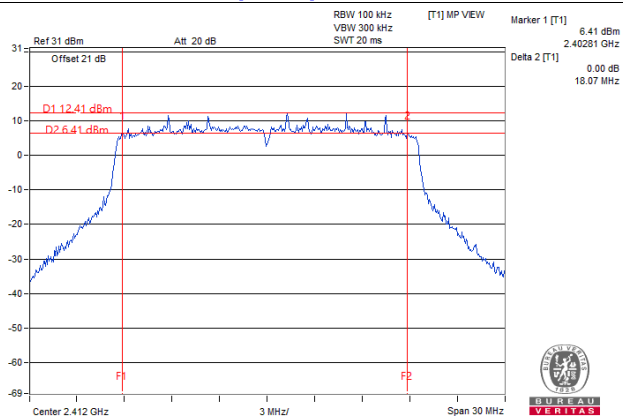
802.11b_Chain 0 / CH6



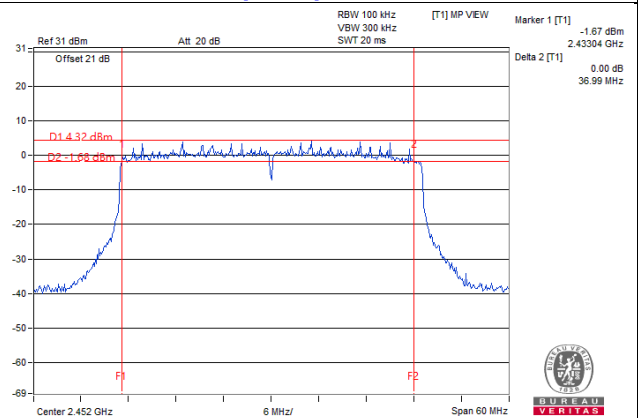
802.11g_Chain 0 / CH11



802.11ax (HE20)_Chain 1 / CH1



802.11ax (HE40)_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,

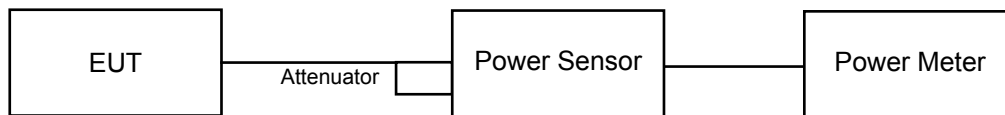
Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

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				
1	2412	26.21	25.57	778.409	28.91	30	Pass
6	2437	26.55	27.18	974.252	29.89	30	Pass
11	2462	26.21	26.67	882.346	29.46	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				
1	2412	22.80	23.28	403.36	26.06	30	Pass
6	2437	25.50	26.24	775.54	28.90	30	Pass
11	2462	23.00	23.07	402.295	26.05	30	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				
1	2412	22.64	22.55	363.541	25.61	30	Pass
6	2437	25.51	25.55	714.553	28.54	30	Pass
11	2462	21.39	21.42	276.397	24.42	30	Pass

Note: The directional gain = $10 \log[(10^{G0/20} + 10^{G1/20})^2 / 2] = 5.23 \text{ dBi} < 6 \text{ dBi}$, so the power limit shall not be reduced.

VHT40

Chan.	Chan. Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	20.38	20.42	219.298	23.41	30	Pass
6	2437	22.44	22.58	356.522	25.52	30	Pass
9	2452	18.44	18.40	139.006	21.43	30	Pass

Note: The directional gain = $10 \log[(10^{G0/20} + 10^{G1/20})^2 / 2] = 5.23 \text{ dBi} < 6 \text{ dBi}$, so the power limit shall not be reduced.

802.11ax (HE20)

Chan.	Chan. Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	22.74	22.65	372.009	25.71	30	Pass
6	2437	26.51	26.58	902.701	29.56	30	Pass
11	2462	21.49	21.52	282.835	24.52	30	Pass

Note: The directional gain = $10 \log[(10^{G0/20} + 10^{G1/20})^2 / 2] = 5.23 \text{ dBi} < 6 \text{ dBi}$, so the power limit shall not be reduced.

802.11ax (HE40)

Chan.	Chan. Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	20.48	20.51	224.147	23.51	30	Pass
6	2437	22.54	22.61	361.863	25.59	30	Pass
9	2452	18.51	18.52	142.079	21.53	30	Pass

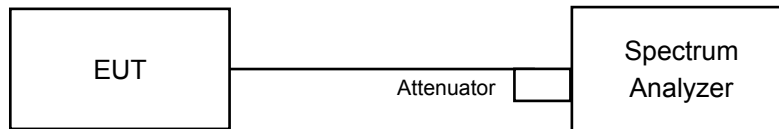
Note: The directional gain = $10 \log[(10^{G0/20} + 10^{G1/20})^2 / 2] = 5.23 \text{ dBi} < 6 \text{ dBi}$, so the power limit shall not be reduced.

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 802.11b:

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

For other modulation mode:

- 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.

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

Chan.	Chan. Freq. (MHz)	PSD (dBm/3kHz)		Total PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
		Chain0	Chain1			
1	2412	-3.89	-5.68	-1.68	8.00	Pass
6	2437	-4.68	-3.52	-1.05	8.00	Pass
11	2462	-4.70	-3.50	-1.05	8.00	Pass

- Note: 1. Method b) Measure and sum spectral maxima across the outputs of KDB 662911 is using for calculating total power density.
 2. The directional gain = $10 \log[(10^{G0/20} + 10^{G1/20})^2 / 2] = 5.23 \text{ dBi} < 6 \text{ dBi}$, so the power density limit shall not be reduced.

802.11g

Chan.	Chan. Freq. (MHz)	PSD w/o Duty Factor (dBm/3kHz)		Duty Factor (dB)	Total PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
		Chain0	Chain1				
1	2412	-9.99	-9.83	0.27	-6.63	8.00	Pass
6	2437	-7.64	-6.30	0.27	-3.64	8.00	Pass
11	2462	-10.08	-9.35	0.27	-6.42	8.00	Pass

- Note: 1. Method b) Measure and sum spectral maxima across the outputs of KDB 662911 is using for calculating total power density.
 2. The directional gain = $10 \log[(10^{G0/20} + 10^{G1/20})^2 / 2] = 5.23 \text{ dBi} < 6 \text{ dBi}$, so the power density limit shall not be reduced.
 3. Refer to section 3.3 for duty cycle spectrum plot.

Beamforming Mode

802.11ax (HE20)

Chan.	Chan. Freq. (MHz)	PSD w/o Duty Factor (dBm/3kHz)		Duty Factor (dB)	Total PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
		Chain0	Chain1				
1	2412	-13.73	-13.58	0.45	-10.19	8.00	Pass
6	2437	-9.57	-9.15	0.45	-5.89	8.00	Pass
11	2462	-13.41	-14.33	0.45	-10.39	8.00	Pass

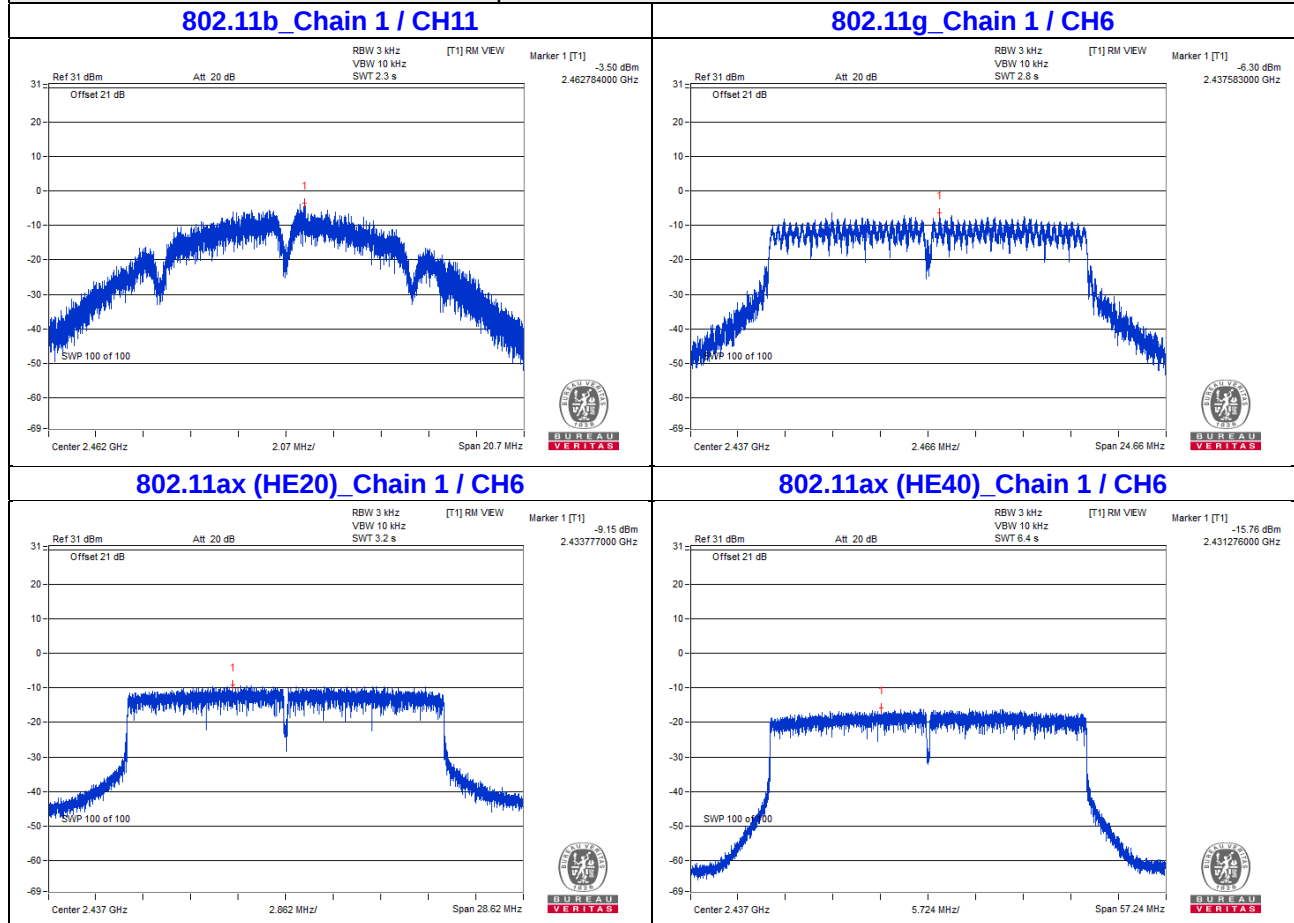
- Note: 1. Method b) Measure and sum spectral maxima across the outputs of KDB 662911 is using for calculating total power density.
 2. The directional gain = $10 \log[(10^{G0/20} + 10^{G1/20})^2 / 2] = 5.23 \text{ dBi} < 6 \text{ dBi}$, so the power density limit shall not be reduced.
 3. Refer to section 3.3 for duty cycle spectrum plot.

802.11ax (HE40)

Chan.	Chan. Freq. (MHz)	PSD w/o Duty Factor (dBm/3kHz)		Duty Factor (dB)	Total PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
		Chain0	Chain1				
3	2422	-17.96	-17.26	0.27	-14.32	8.00	Pass
6	2437	-17.22	-15.76	0.27	-13.15	8.00	Pass
9	2452	-18.94	-19.57	0.27	-15.96	8.00	Pass

- Note: 1. Method b) Measure and sum spectral maxima across the outputs of KDB 662911 is using for calculating total power density.
2. The directional gain = $10 \log[(10^{G0/20} + 10^{G1/20})^2 / 2] = 5.23 \text{ dBi} < 6 \text{ dBi}$, so the power density limit shall not be reduced.
3. Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value

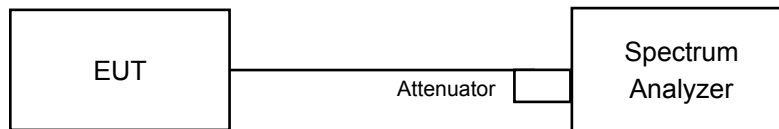


4.6 Conducted Out of Band Emission Measurement

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

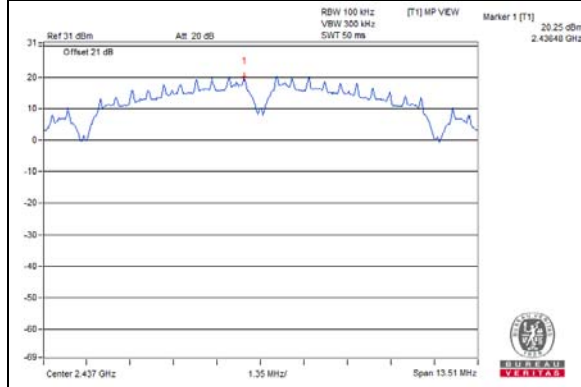
Same as Item 4.3.6

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.

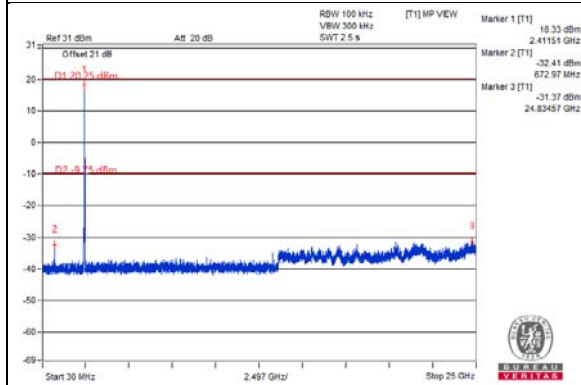
802.11b

Maximum REF

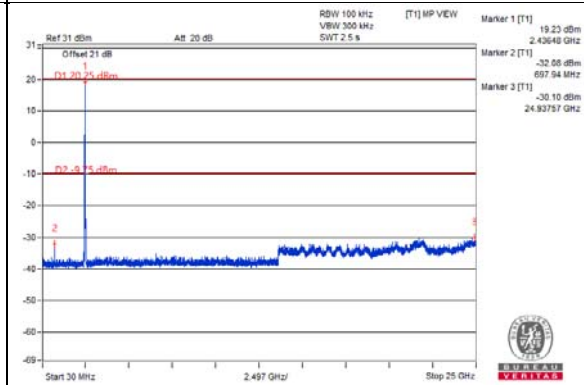


Chain 0

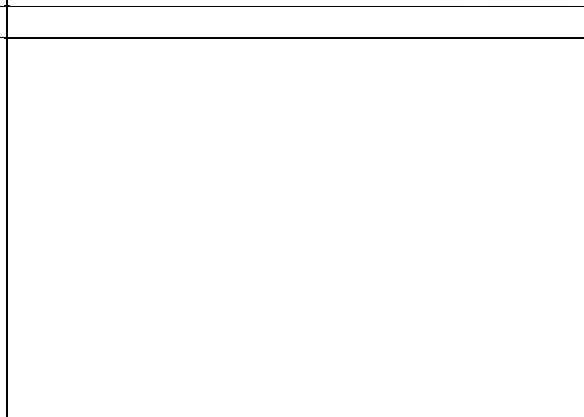
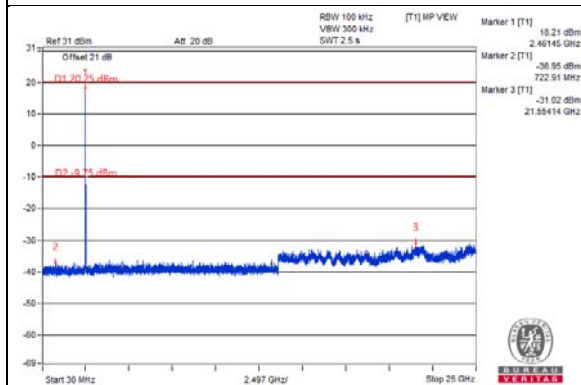
CH 1



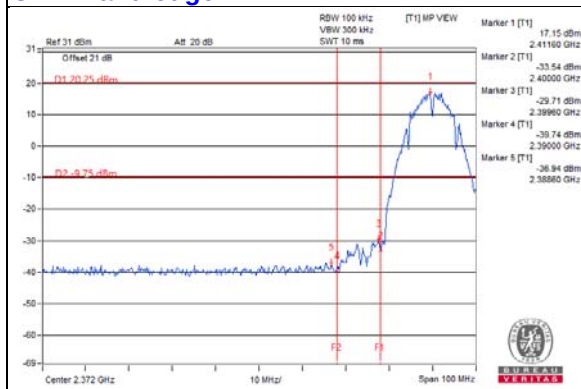
CH 6



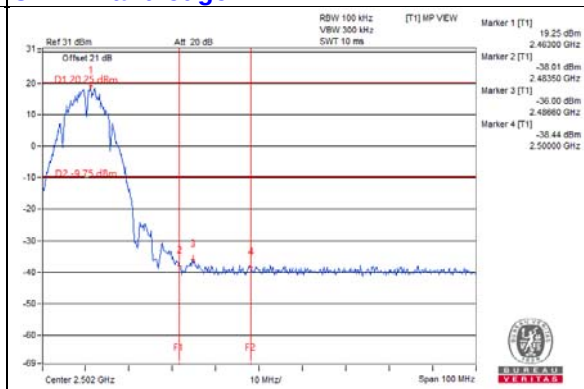
CH 11



CH 1 Band edge

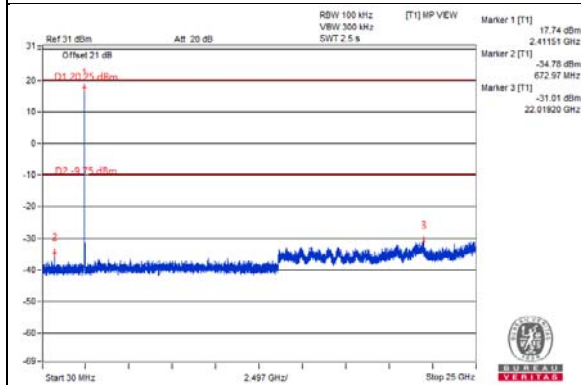


CH 11 Band edge

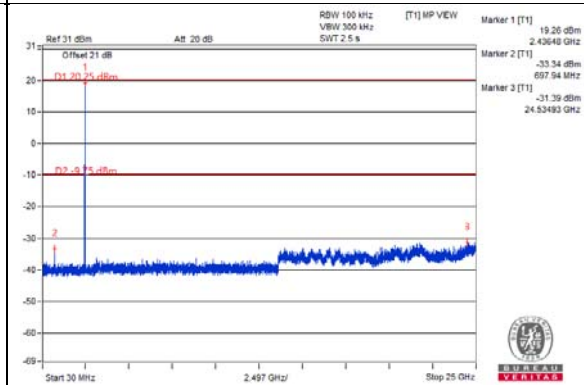


Chain 1

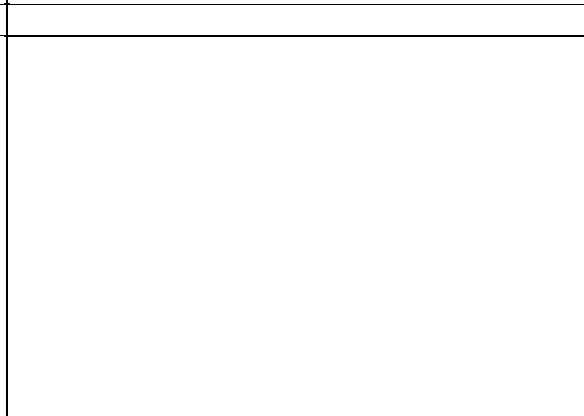
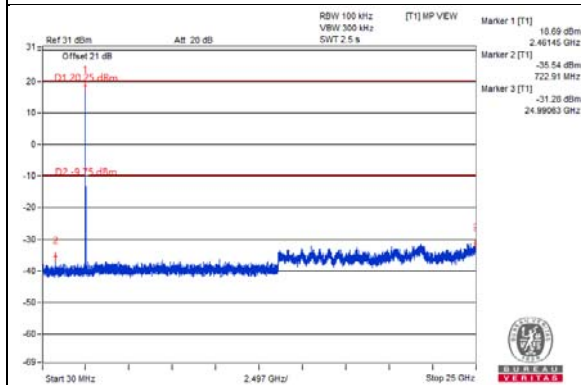
CH 1



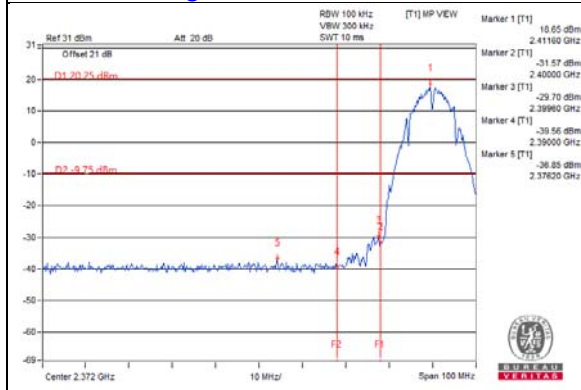
CH 6



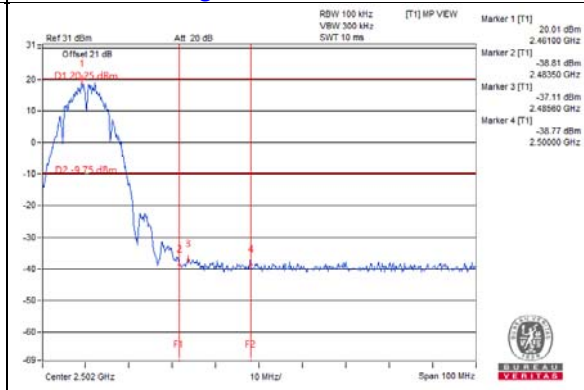
CH 11



CH 1 Band edge

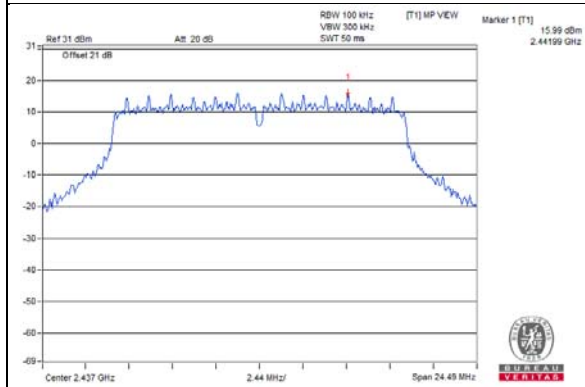


CH 11 Band edge



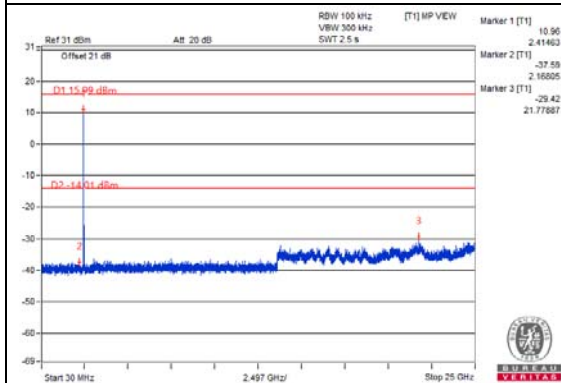
802.11g

Maximum REF

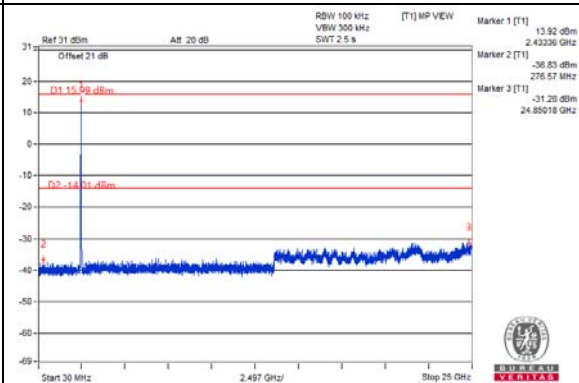


Chain 0

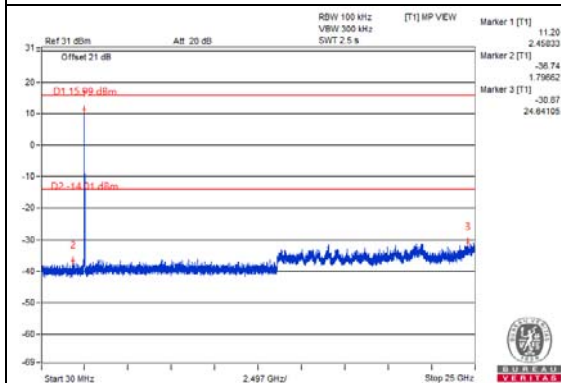
CH 1



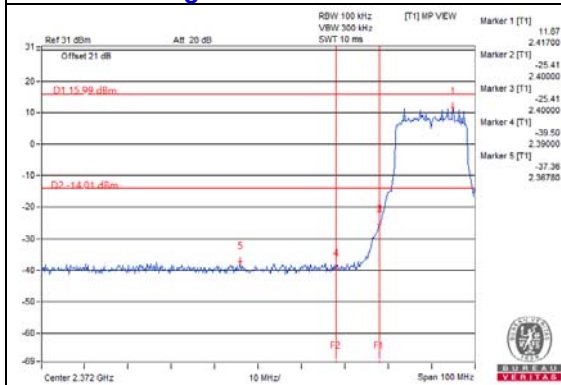
CH 6



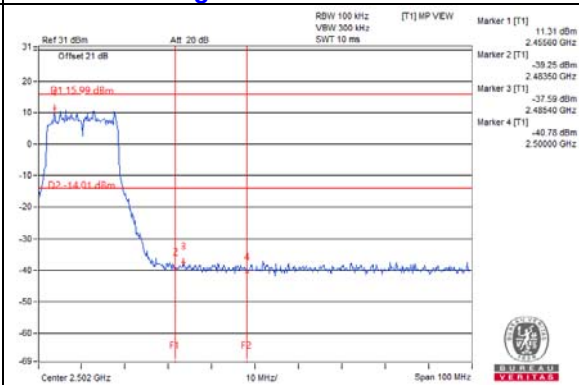
CH 11



CH 1 Band edge

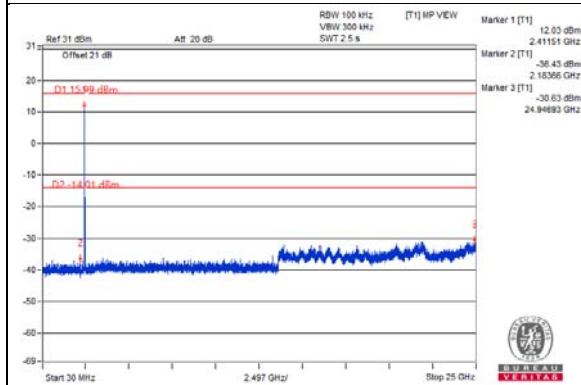


CH 11 Band edge

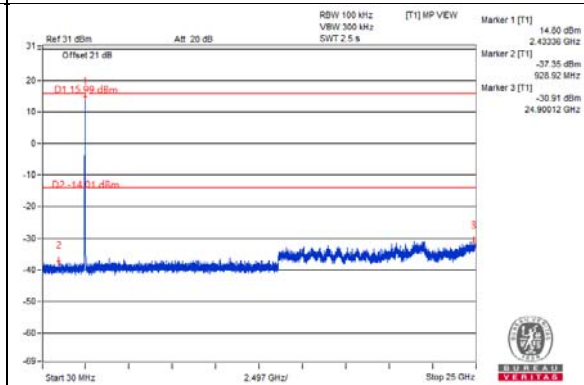


Chain 1

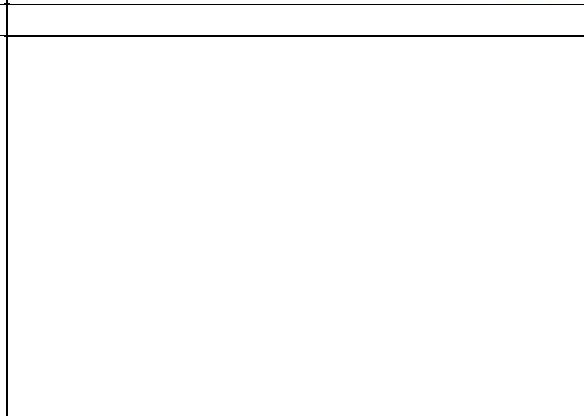
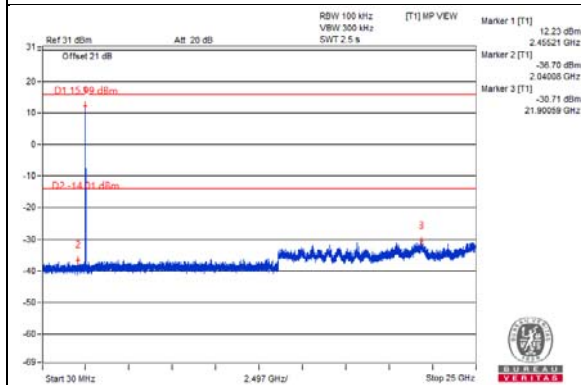
CH 1



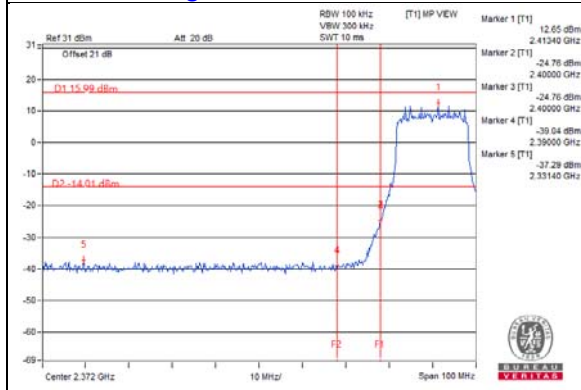
CH 6



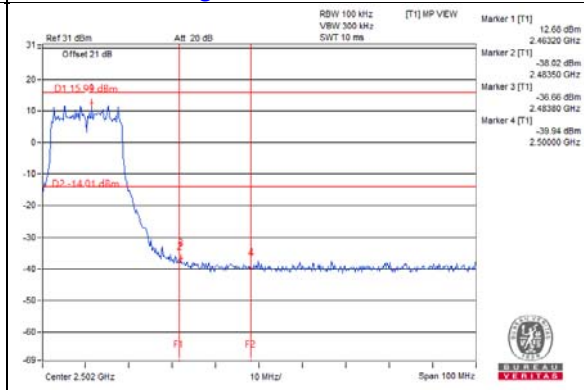
CH 11



CH 1 Band edge

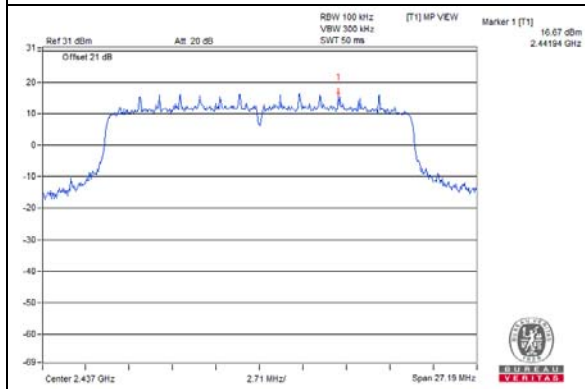


CH 11 Band edge



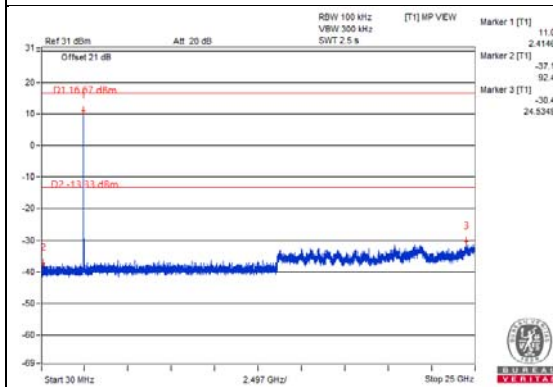
802.11ax (HE20)

Maximum REF

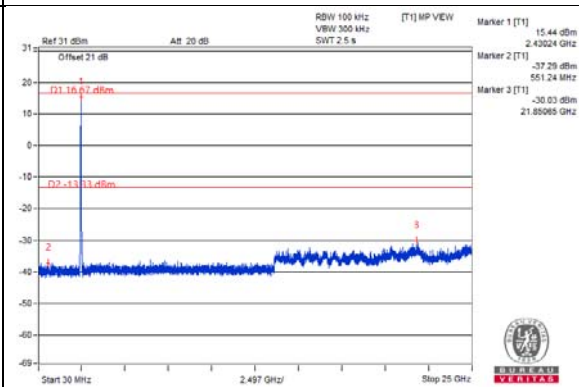


Chain 0

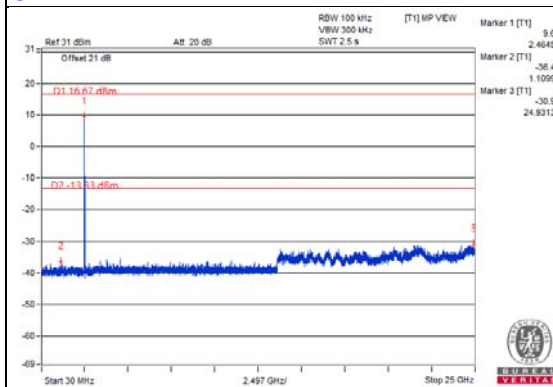
CH 1



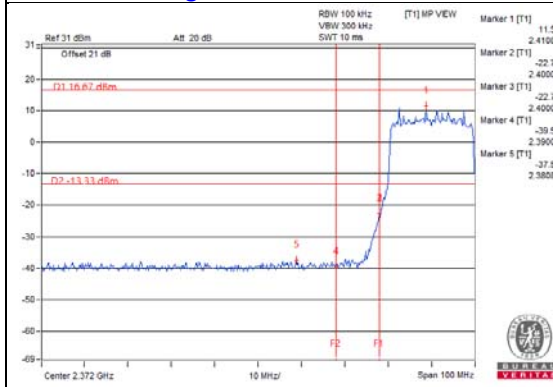
CH 6



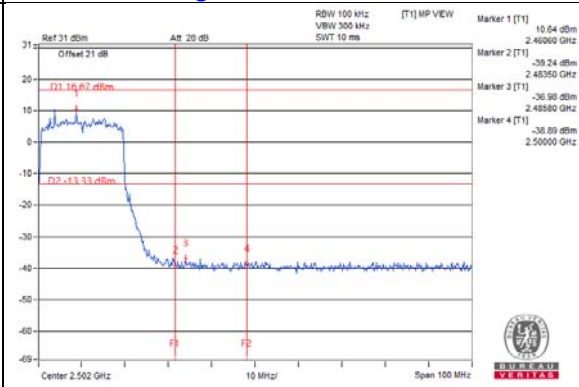
CH 11



CH 1 Band edge

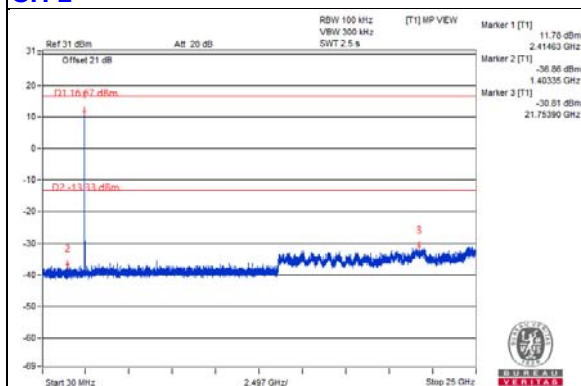


CH 11 Band edge

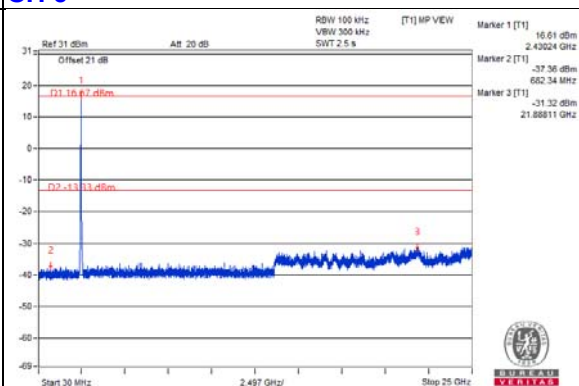


Chain 1

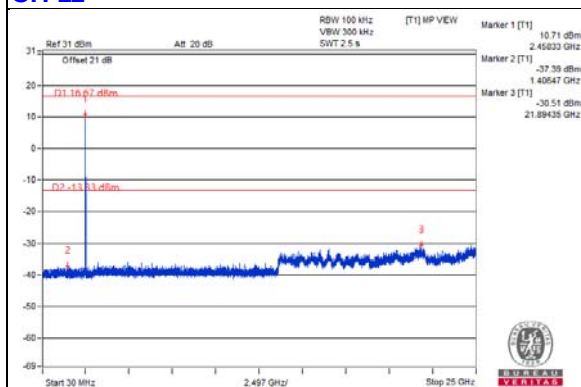
CH 1



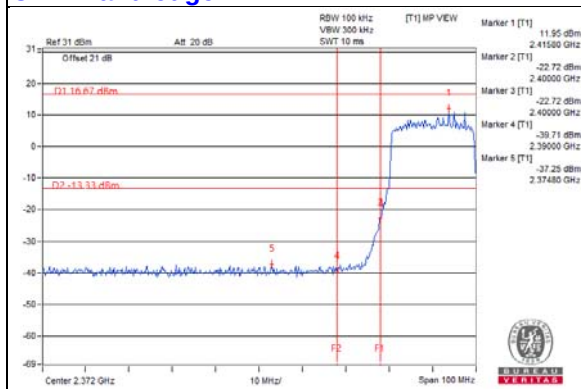
CH 6



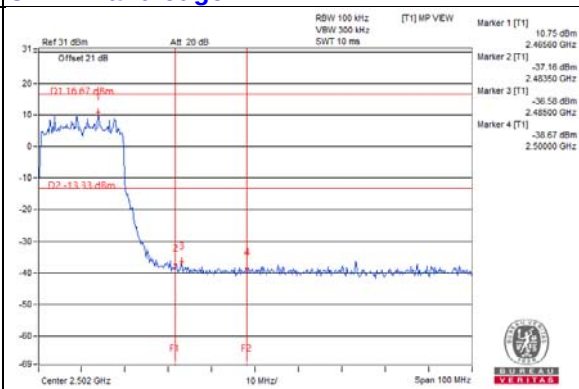
CH 11



CH 1 Band edge

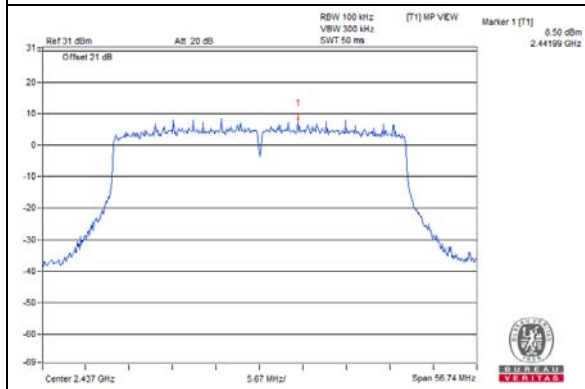


CH 11 Band edge



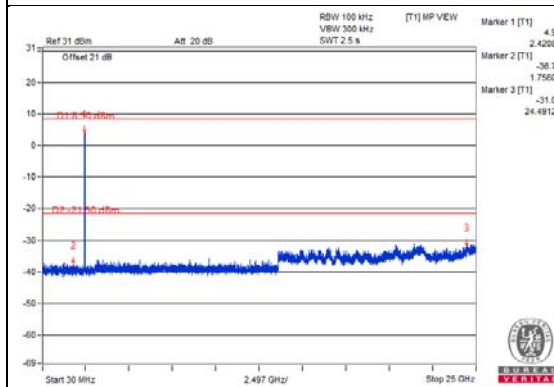
802.11ax (HE40)

Maximum REF

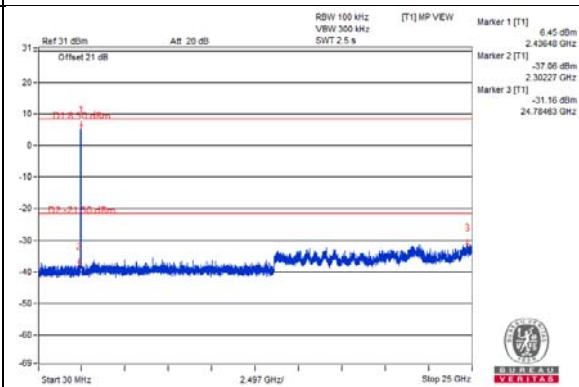


Chain 0

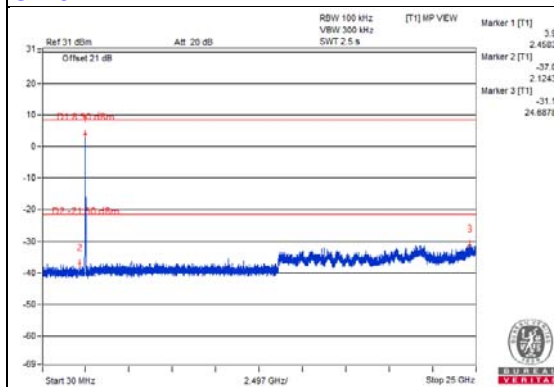
CH 3



CH 6



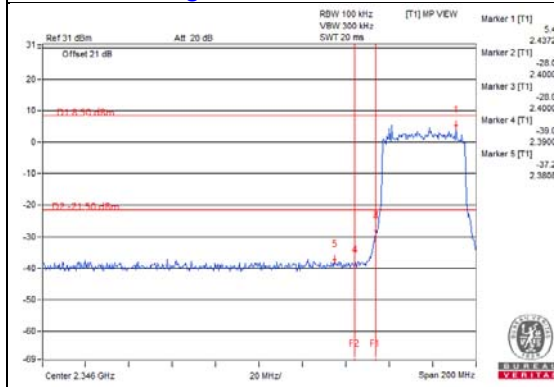
CH 9



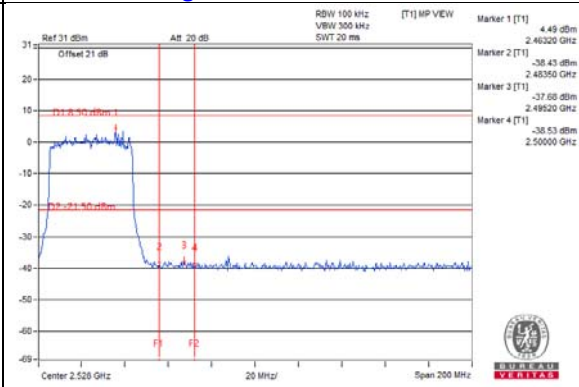
CH 9 Band edge



CH 3 Band edge

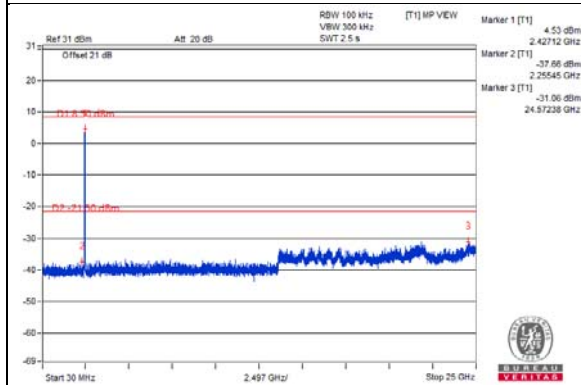


CH 9 Band edge

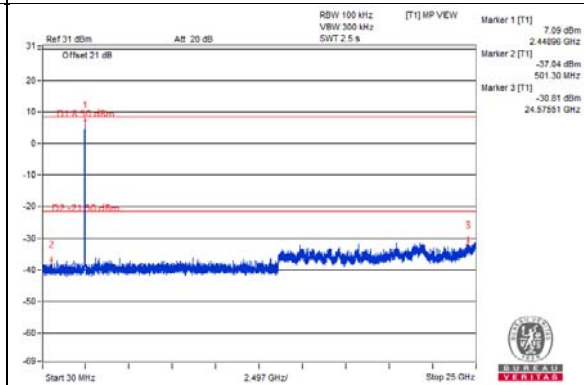


Chain 1

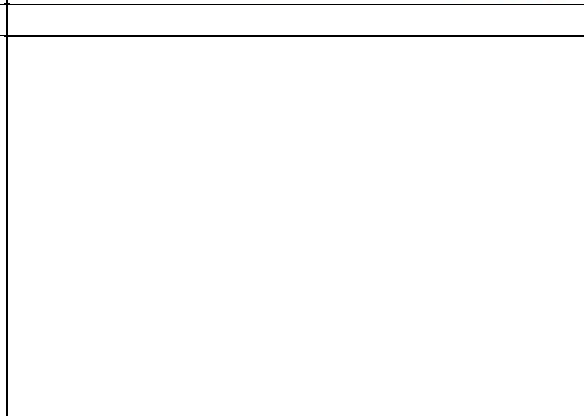
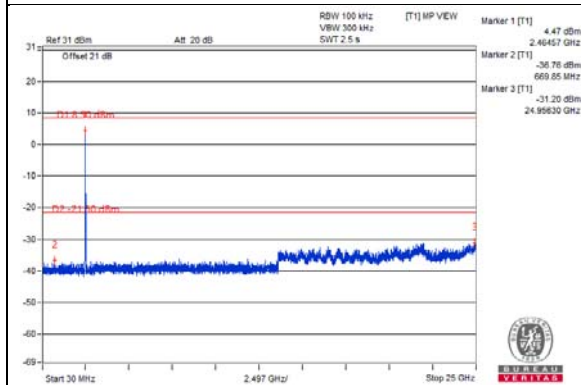
CH 3



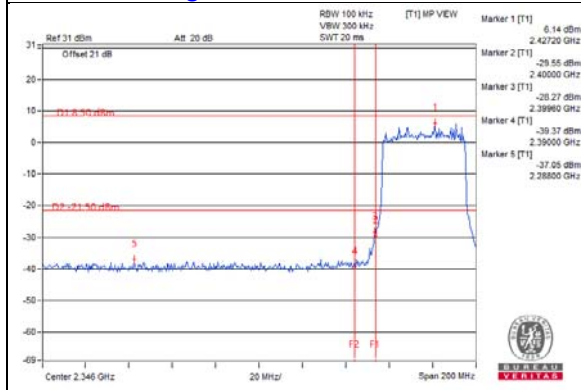
CH 6



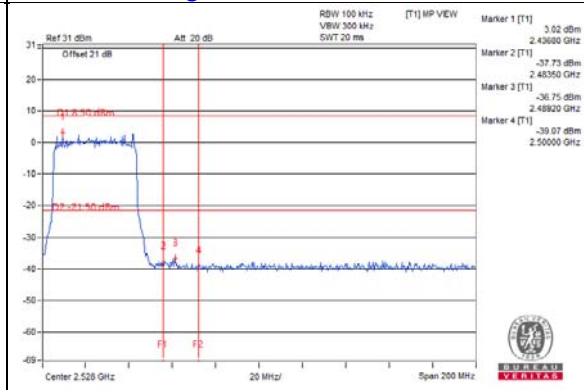
CH 9



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:

Lin Kou EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab

Tel: 886-3-3183232

Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

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

--- END ---