FCC Test Report

Report No.:	RF170825E04
FCC ID:	UXX-S5A741A
Test Model:	S5A741A
Received Date:	Aug. 25, 2017
Test Date:	Sep. 22 to Oct. 03, 2017
Issued Date:	Oct. 16, 2017
Applicant:	Cradlepoint, Inc
Address:	1111 W. Jefferson Street Suite 400 Boise, ID 83702 USA
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
Lab Address:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.
Test Location :	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan R.O.C.

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Release Control Record

Issue No.	Description	Date Issued
RF170825E04	Original release.	Oct. 16, 2017

1 Certificate of Conformity

Product:	Integrated Mobile Broadband Router
Brand:	cradlepoint
Test Model:	S5A741A
Sample Status:	ENGINEERING SAMPLE
Applicant:	Cradlepoint, Inc
Test Date:	Sep. 22 to Oct. 03, 2017
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 : _____ , **Date:** Oct. 16, 2017

Wendy Wu / Specialist

Approved by : _____ , **Date:** Oct. 16, 2017

May Chen / 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 -18.71dB at 22.69922MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -0.1dB at 2390.00MHz, 2483.50MHz, 4874.00MHz.
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 R-SMA not a standard connector.
---	Occupied Bandwidth Measurement	-	Reference only.

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	1.84 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	5.30 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.16 dB
	6GHz ~ 18GHz	4.91 dB
	18GHz ~ 40GHz	5.30 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Integrated Mobile Broadband Router
Brand	cradlepoint
Test Model	S5A741A
Status of EUT	ENGINEERING SAMPLE
Power Supply Rating	DC 9-36V, 5A
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 11ac mode and VHT20/40 mode in 2.4GHz band
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: up to 11Mbps 802.11a/g: up to 54Mbps 802.11n: up to 600Mbps 802.11ac: up to 1733.3Mbps
Operating Frequency	**2.4GHz:** 2.412 ~ 2.462GHz **5GHz:** 5.18GHz ~ 5.24GHz, 5.745GHz ~ 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	**Radio 1** **2.4GHz:** **CDD Mode:** 833.916mW **Beamforming Mode:** 734.744mW **5.18 ~ 5.24GHz** **Master Mode** **CDD Mode:** 681.538mW **Beamforming Mode:** 610.962mW **Client Mode** **CDD Mode:** 207.519mW **Beamforming Mode:** 205.918mW **5.745 ~ 5.825GHz** **Master Mode** **CDD Mode:** 873.145mW **Beamforming Mode:** 846.325mW **Client Mode** **CDD Mode:** 873.145mW **Beamforming Mode:** 846.325mW **Radio 2** **5.18 ~ 5.24GHz** **Master Mode** **CDD Mode:** 789.037mW **Beamforming Mode:** 428.397mW **Client Mode** **CDD Mode:** 214.49mW **Beamforming Mode:** 108.001mW **5.745 ~ 5.825GHz** **Master Mode** **CDD Mode:** 996.851mW **Beamforming Mode:** 432.56mW **Client Mode** **CDD Mode:** 996.851mW **Beamforming Mode:** 432.56mW

Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	NA
Data Cable Supplied	DC cable (4 pin) x 1 (Unshielding, 2m) DC COR Power & GPIO Cable (2x10 pin) x 1 (Unshielding, 2m)

Note:

1. There are WLAN, 3G/LTE and GPS technology used for the EUT.
2. The EUT contains certified 3G/LTE modular which FCC ID: RI7LM940.
3. Simultaneously transmission condition.

Condition	Technology		
1	WLAN (Radio 1) (2.4GHz + 5GHz)	WLAN (Radio 2) (5GHz)	WWAN (Radio 3) 3G/LTE
Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.			

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

WLAN

Ant Set.	Transmitter Circuit			Model	Frequency range (GHz)	Antenna Type	Connecter Type	Cable Length (mm)	Cable Loss(dB)	excluding cable loss Antenna Gain(dBi)
	Radio 1		Radio 2							
	2.4G	5G	5G							
1	GPIO 0 Chain0	Chain1	-	RFA-25-F17M3-B70-25	2.4~2.4835 5.15~5.85	Dipole	R-SMA	230	0.8 1.4	2.5 3.5
	GPIO 0 Chain1	Chain0	-		2.4~2.4835 5.15~5.85	Dipole	R-SMA	230	0.8 1.4	2.5 3.5
	GPIO 1 Chain1	-	Chain2		2.4~2.4835 5.15~5.85	Dipole	R-SMA	230	0.8 1.4	2.5 3.5
	-	-	Chain3		2.4~2.4835 5.15~5.85	Dipole	R-SMA	230	0.8 1.4	2.5 3.5
	-	-	Chain0		2.4~2.4835 5.15~5.85	Dipole	R-SMA	230	0.8 1.4	2.5 3.5
	GPIO 1 Chain0	-	Chain1		2.4~2.4835 5.15~5.85	Dipole	R-SMA	230	0.8 1.4	2.5 3.5
2	GPIO 0 Chain0	Chain1	-	TWX-1513RSXX-711	2.4~2.4835 5.15~5.85	Dipole	R-SMA	230	0.8 1.4	5 5
	GPIO 0 Chain1	Chain0	-		2.4~2.4835 5.15~5.85	Dipole	R-SMA	230	0.8 1.4	5 5
	GPIO 1 Chain1	-	Chain2		2.4~2.4835 5.15~5.85	Dipole	R-SMA	230	0.8 1.4	5 5
	-	-	Chain3		2.4~2.4835 5.15~5.85	Dipole	R-SMA	230	0.8 1.4	5 5
	-	-	Chain0		2.4~2.4835 5.15~5.85	Dipole	R-SMA	230	0.8 1.4	5 5
	GPIO 1 Chain0	-	Chain1		2.4~2.4835 5.15~5.85	Dipole	R-SMA	230	0.8 1.4	5 5

3G/LTE

Ant Set.	Transmitter Circuit	Model	Antenna Gain with cable including cable loss	Frequency range	Antenna Type	Connecter Type	Cable Length (mm)	Cable Loss (dB)
1	Main	YWX-6252SABX-711	1.0dBi@2300~2320MHz 2dBi@690~2300MHz 3dBi@2320~2700MHz	2300~2320MHz 690~2300MHz 2320~2700MHz	Dipole	SMA	230	0~1G 0.5dB 1~3G 0.9dB
	Aux	YWX-6252SABX-711	1.0dBi@2300~2320MHz 2dBi@690~2300MHz 3dBi@2320~2700MHz	2300~2320MHz 690~2300MHz 2320~2700MHz	Dipole	SMA	230	0~1G 0.5dB 1~3G 0.9dB
2	Main	YWX-6241SAXX-711D	1.0dBi@2300~2320MHz 2dBi@690~2300MHz 3dBi@2320~2700MHz	2300~2320MHz 690~2300MHz 2320~2700MHz	Dipole	SMA	230	0~1G 0.5dB 1~3G 0.9dB
	Aux	YWX-6241SAXX-711D	1.0dBi@2300~2320MHz 2dBi@690~2300MHz 3dBi@2320~2700MHz	2300~2320MHz 690~2300MHz 2320~2700MHz	Dipole	SMA	230	0~1G 0.5dB 1~3G 0.9dB

GPS

Antenna Gain with cable including cable loss	Frequency range	Antenna Type	Connecter Type
GPS: 1.36dBi GLONASS: 0.09dBi	GPS: 1574.42MHz±3MHz GLONASS: 1602MHz±0.5MHz	Dipole	SMA

Note:
1. For WLAN: Ant set 2 was selected for the final test.
2. For 2.4GHz configuration mode, GPIO 0 and GPIO 1 were pre-tested and the worst case was found in GPIO 0, therefore only the test data of the modes were recorded in this report.

5. The EUT incorporates a MIMO function:

2.4GHz Band			
MODULATION MODE	**DATA RATE (MCS)**	**TX & RX CONFIGURATION**	
802.11b	1 ~ 11Mbps	2TX	2RX
802.11g	6 ~ 54Mbps	2TX	2RX
802.11n (HT20)	MCS 0~7	2TX	2RX
	MCS 8~15	2TX	2RX
802.11n (HT40)	MCS 0~7	2TX	2RX
	MCS 8~15	2TX	2RX
VHT20	MCS0~8 Nss=1	2TX	2RX
	MCS0~8 Nss=2	2TX	2RX
VHT40	MCS0~9 Nss=1	2TX	2RX
	MCS0~9 Nss=2	2TX	2RX
5GHz Band (Radio 1)			
MODULATION MODE	**DATA RATE (MCS)**	**TX & RX CONFIGURATION**	
802.11a	6 ~ 54Mbps	2TX	2RX
802.11n (HT20)	MCS 0~7	2TX	2RX
	MCS 8~15	2TX	2RX
802.11n (HT40)	MCS 0~7	2TX	2RX
	MCS 8~15	2TX	2RX
802.11ac (VHT20)	MCS0~8 Nss=1	2TX	2RX
	MCS0~8 Nss=2	2TX	2RX
802.11ac (VHT40)	MCS0~9 Nss=1	2TX	2RX
	MCS0~9 Nss=2	2TX	2RX
802.11ac (VHT80)	MCS0~9 Nss=1	2TX	2RX
	MCS0~9 Nss=2	2TX	2RX
5GHz Band (Radio 2)			
MODULATION MODE	**DATA RATE (MCS)**	**TX & RX CONFIGURATION**	
802.11a	6 ~ 54Mbps	4TX	4RX
802.11n (HT20)	MCS 0~7	4TX	4RX
	MCS 8~15	4TX	4RX
	MCS 16~23	4TX	4RX
	MCS 24~31	4TX	4RX
802.11n (HT40)	MCS 0~7	4TX	4RX
	MCS 8~15	4TX	4RX
	MCS 16~23	4TX	4RX
	MCS 24~31	4TX	4RX
802.11ac (VHT20)	MCS 0~8, Nss=1	4TX	4RX
	MCS 0~8, Nss=2	4TX	4RX
	MCS 0~9, Nss=3	4TX	4RX
	MCS 0~8, Nss=4	4TX	4RX
802.11ac (VHT40)	MCS 0~9, Nss=1	4TX	4RX
	MCS 0~9, Nss=2	4TX	4RX
	MCS 0~9, Nss=3	4TX	4RX
	MCS 0~9, Nss=4	4TX	4RX
802.11ac (VHT80)	MCS 0~9, Nss=1	4TX	4RX
	MCS 0~9, Nss=2	4TX	4RX
	MCS 0~9, Nss=3	4TX	4RX
	MCS 0~9, Nss=4	4TX	4RX

Note:

1. All of modulation mode support beamforming function except 802.11a/b/g modulation mode.
2. The EUT support Beamforming and CDD mode, therefore both mode were investigated and the worst case scenario was identified. The worst case data were presented in test report.
3. The modulation and bandwidth are similar for 802.11n mode for 20MHz (40MHz) and 802.11ac mode for 20MHz (40MHz), therefore investigated worst case to representative mode in test report. (Final test mode refer section 3.2.1)

6. EUT has been pre-tested under following pre-test modes.

Pre-test Mode	Power
Mode A	DC cable (4 pin)
Mode B	DC COR Power & GPIO Cable (2x10 pin)
Note: From the above modes, the radiated emission worse case was found in **Mode A**. Therefore only the test data of the mode was recorded in this report.	

7. This device can support different category application which switched by access point mode and client mode by software.
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:

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≥1G	RE<1G	PLC	APCM	
1	√	√	√	√	DC cable (4 pin)
2	-	-	√	-	DC COR Power & GPIO Cable (2x10 pin)

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 3 axis. The worst case was found when positioned on **X-plane**.
NOTE: "-"means no effect.

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:

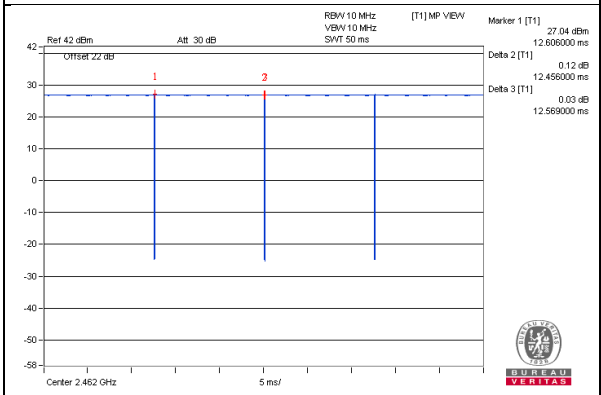
APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (SYSTEM)	TESTED BY
RE≥1G	25deg. C, 70%RH	120Vac, 60Hz	Weiwei Lo
RE<1G	27deg. C, 73%RH	120Vac, 60Hz	Andy Ho
PLC	23deg. C, 75%RH	120Vac, 60Hz	Andy Ho
APCM	25deg. C, 60%RH	120Vac, 60Hz	Robert Cheng

3.3 Duty Cycle of Test Signal

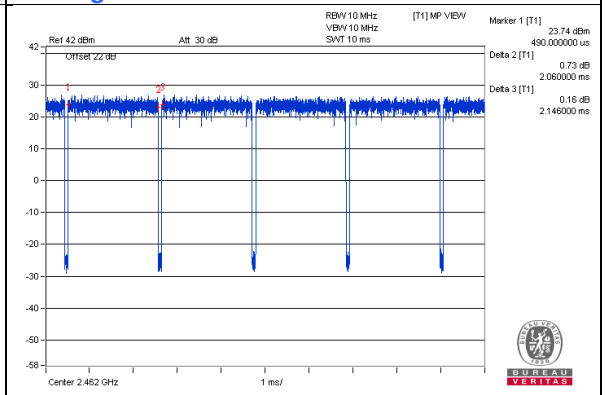
If duty cycle of test signal is ≥ 98 %, duty factor is not required.
If duty cycle of test signal is < 98%, duty factor shall be considered.

802.11b: Duty cycle = 12.456/12.569 = 0.991
802.11g: Duty cycle = 2.06/2.146 = 0.96, Duty factor = 10 * log(1/0.96) = 0.18
VHT20: Duty cycle = 4.998/5.105 = 0.979, Duty factor = 10 * log(1/0.979) = 0.09
VHT40: Duty cycle = 2.43/2.523 = 0.963, Duty factor = 10 * log(1/0.963) = 0.16

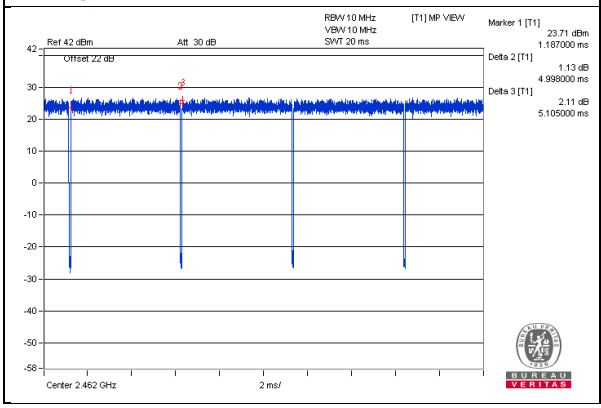
802.11b



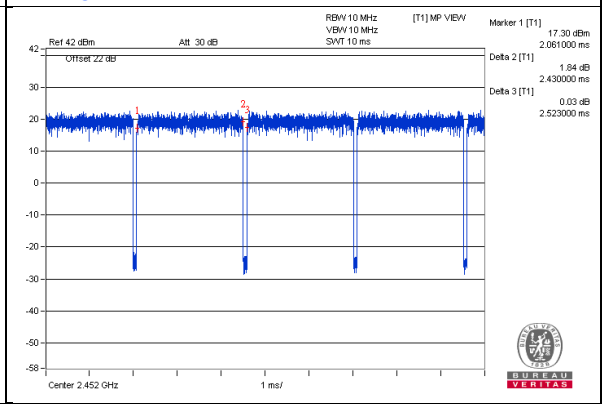
802.11g



VHT20



VHT40



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.	DC Power Supply	GOOD WILL INSTRUMENT CO., LTD.	GPC-3030D	7700087	NA	Provided by Lab
B.	Laptop	DELL	E6420	B92T3R1	FCC DoC	Provided by Lab
C.	Laptop	DELL	E6420	482T3R1	FCC DoC	Provided by Lab
D.	iPod	Apple	MD778TA/A	CC4JMFL0F4T1	NA	Provided by Lab
E.	3G/LTE Modem	cradlepoint	MC400LP6	NA	N7NMC7455	Supplied by client

Note:

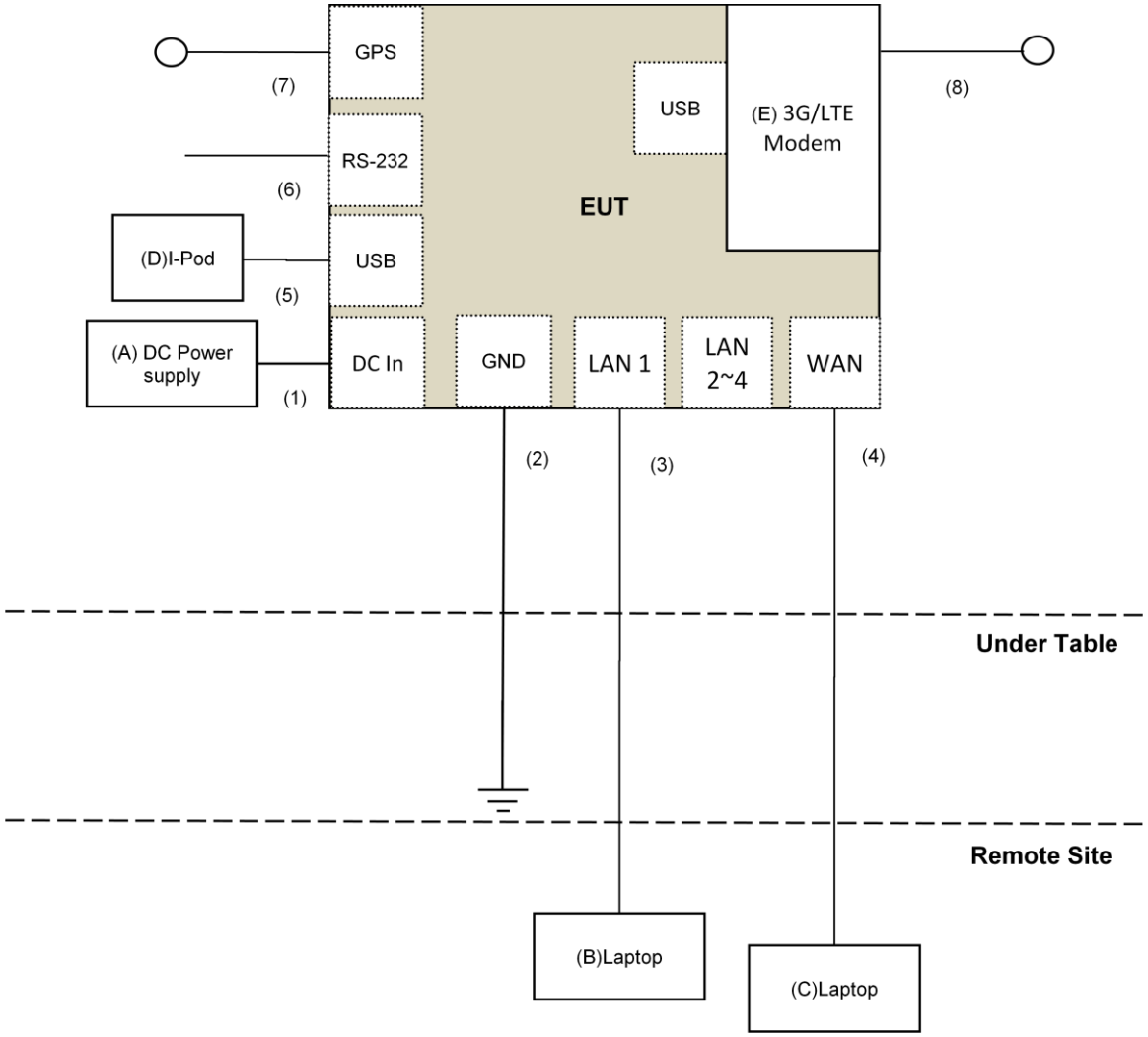
1. All power cords of the above support units are non-shielded (1.8m).

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DC Cable	1	2	No	0	Supplied by client
2.	GND Cable	1	3	No	0	Provided by Lab
3.	RJ-45 Cable	1	10	No	0	Provided by Lab
4.	RJ-45 Cable	1	10	No	0	Provided by Lab
5.	USB Cable	1	0.1	Yes	0	Provided by Lab
6.	Coaxial Cable	1	1.6	No	0	Provided by Lab
7.	GPS Cable	1	3	No	0	Supplied by client
8.	GPS Cable	1	3	No	0	Supplied by client

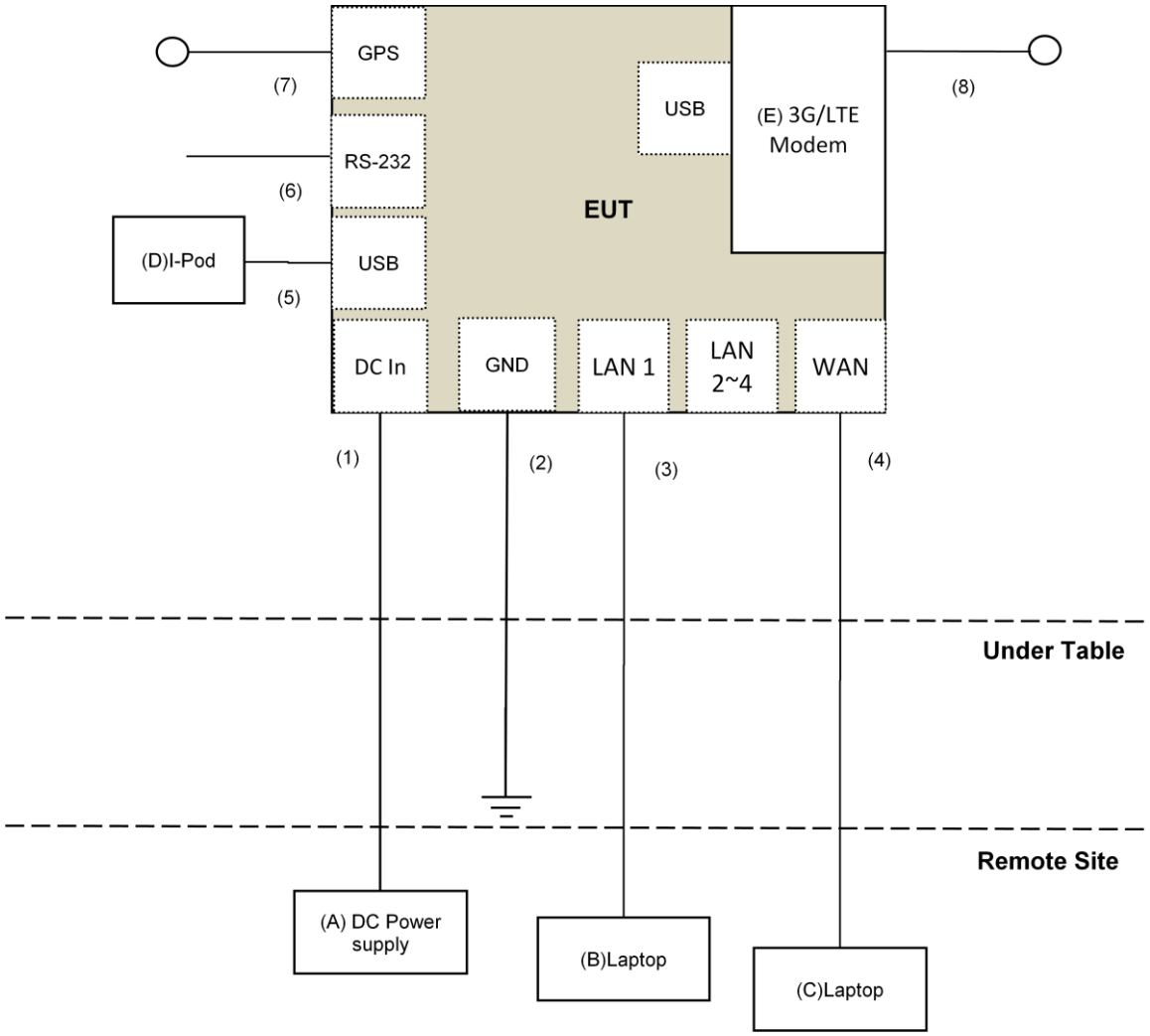
Note: The core(s) is(are) originally attached to the cable(s).

3.4.1 Configuration of System under Test

For Conducted Emission Test:



For other test:



3.5 General Description of Applied Standards

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

FCC Part 15, Subpart C (15.247)
KDB 558074 D01 DTS Meas Guidance v04
KDB 662911 D01 Multiple Transmitter Output v02r01
ANSI C63.10-2013

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

NOTE: The EUT has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

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

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

NOTE:

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

4.1.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Keysight	N9038A	MY54450088	July 08, 2017	July 07, 2018
Pre-Amplifier(*) EMCI	EMC001340	980142	Jan. 20, 2016	Jan. 19, 2018
Loop Antenna(*) Electro-Metrics	EM-6879	264	Dec. 16, 2016	Dec. 15, 2018
RF Cable	NA	LOOPCAB-001 LOOPCAB-002	Jan. 17, 2017	Jan. 16, 2018
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-01	Nov. 10, 2016	Nov. 09, 2017
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-406	Dec. 13, 2016	Dec. 12, 2017
RF Cable	8D	966-4-1 966-4-2 966-4-3	Apr. 01, 2017	Mar. 31, 2018
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-4-01	Oct. 05, 2016	Oct. 04, 2017
Horn_Antenna SCHWARZBECK	BBHA 9120D	9120D-783	Dec. 27, 2016	Dec. 26, 2017
Pre-Amplifier EMCI	EMC12630SE	980385	Feb. 02, 2017	Feb. 01, 2018
RF Cable	EMC104-SM-SM-1200 EMC104-SM-SM-2000 EMC104-SM-SM-5000	160923 150318 150321	Feb. 02, 2017 Mar. 29, 2017 Mar. 29, 2017	Feb. 01, 2018 Mar. 28, 2018 Mar. 28, 2018
Pre-Amplifier EMCI	EMC184045SE	980387	Feb. 02, 2017	Feb. 01, 2018
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170608	Dec. 15, 2016	Dec. 14, 2017
RF Cable	SUCOFLEX 102	36432/2 36433/2	Jan. 15, 2017	Jan. 14, 2018
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208410	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP02	NA	NA
Spectrum Analyzer R&S	FSv40	100964	July 1, 2017	June 30, 2018
Power meter Anritsu	ML2495A	1014008	May 11, 2017	May 10, 2018
Power sensor Anritsu	MA2411B	0917122	May 11, 2017	May 10, 2018

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 calibration interval of the above test instruments is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. The test was performed in 966 Chamber No. 4.
4. The FCC Designation Number is TW2022.
5 Loop antenna was used for all emissions below 30 MHz.
6. The CANADA Site Registration No. is 20331-2
7. Tested Date: Sep. 22 to Oct. 03, 2017

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. Both X and Y axes of the antenna are set to make the measurement.

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

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

NOTE:

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

For Radiated emission above 30MHz

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

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

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

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

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

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

Note:

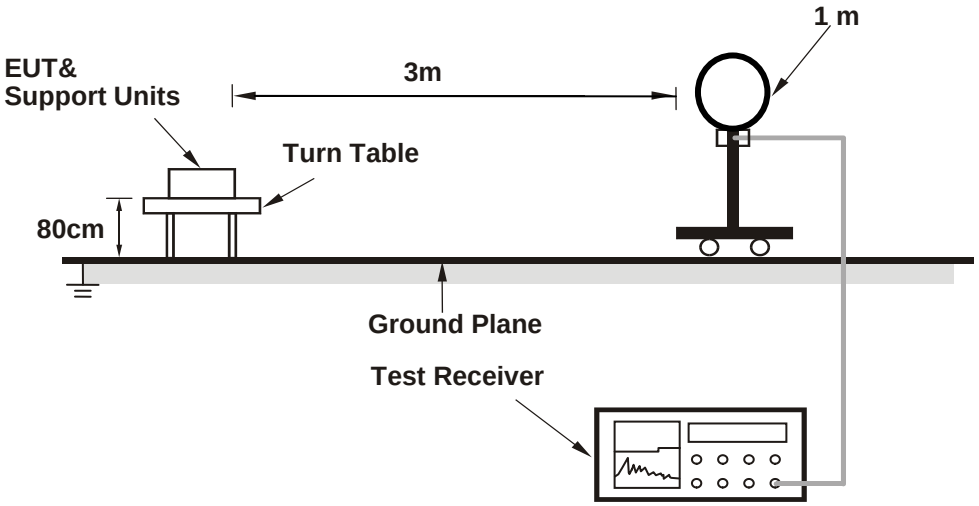
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

4.1.4 Deviation from Test Standard

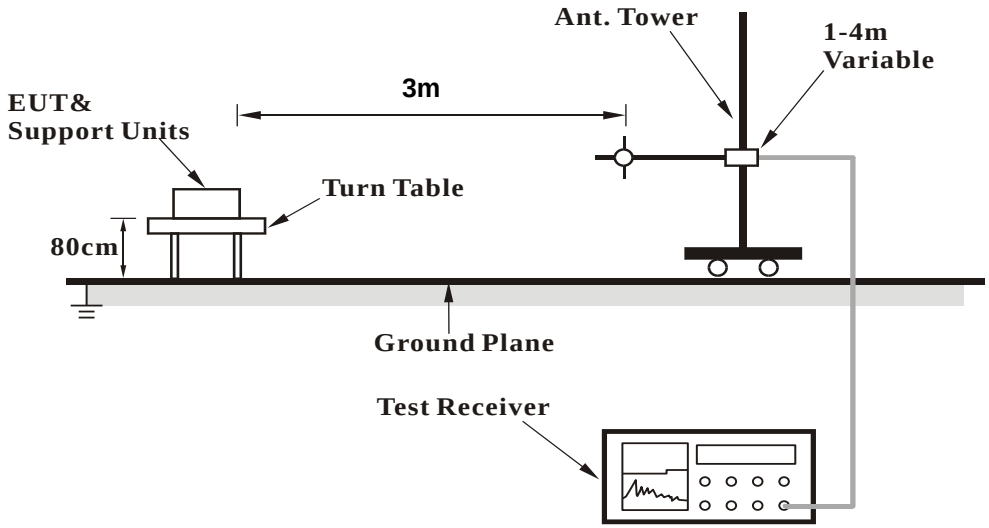
No deviation.

4.1.5 Test Setup

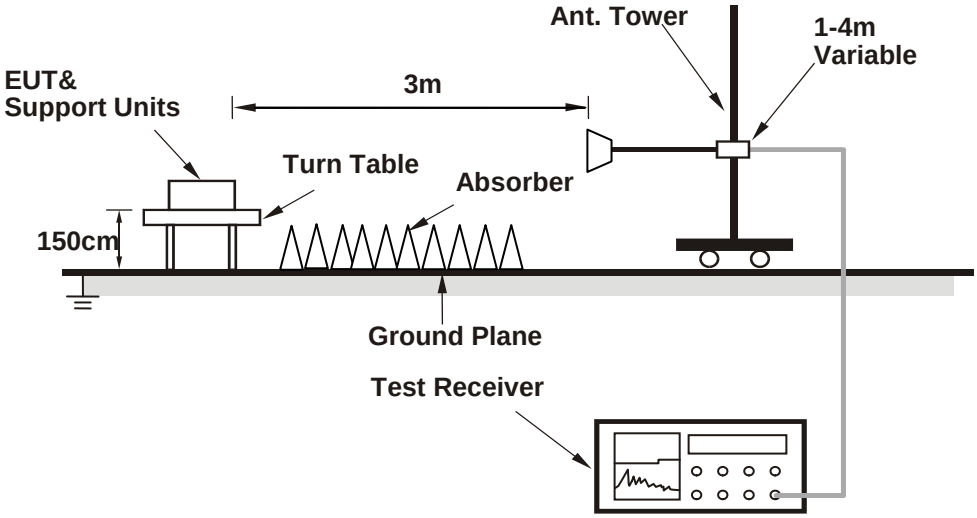
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



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

4.1.6 EUT Operating Conditions

a. Connected the EUT with the Laptop which is placed on remote site.
b. Controlling software (QCA Radio Control Toolkit Version3.0.210.0) has been activated to set the EUT on specific status.

4.1.7 Test Results

Above 1GHz Data：

802.11b

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
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	2.96 H	289	57.6	-1.3
2	2390.00	42.0 AV	54.0	-12.0	2.96 H	289	43.3	-1.3
3	*2412.00	109.6 PK			2.96 H	289	110.7	-1.1
4	*2412.00	107.0 AV			2.96 H	289	108.1	-1.1
5	4824.00	53.8 PK	74.0	-20.2	1.15 H	360	50.6	3.2
6	4824.00	52.5 AV	54.0	-1.5	1.15 H	360	49.3	3.2
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	60.4 PK	74.0	-13.6	1.26 V	324	61.7	-1.3
2	2390.00	53.8 AV	54.0	-0.2	1.26 V	324	55.1	-1.3
3	*2412.00	120.4 PK			1.26 V	324	121.5	-1.1
4	*2412.00	117.9 AV			1.26 V	324	119.0	-1.1
5	4824.00	53.9 PK	74.0	-20.1	2.29 V	313	50.7	3.2
6	4824.00	52.6 AV	54.0	-1.4	2.29 V	313	49.4	3.2

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
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	50.7 PK	74.0	-23.3	2.96 H	277	52.0	-1.3
2	2390.00	31.7 AV	54.0	-22.3	2.96 H	277	33.0	-1.3
3	*2437.00	109.0 PK			2.96 H	277	110.2	-1.2
4	*2437.00	106.7 AV			2.96 H	277	107.9	-1.2
5	2483.50	51.7 PK	74.0	-22.3	2.96 H	277	52.7	-1.0
6	2483.50	32.0 AV	54.0	-22.0	2.96 H	277	33.0	-1.0
7	4874.00	53.6 PK	74.0	-20.4	1.22 H	360	50.3	3.3
8	4874.00	51.9 AV	54.0	-2.1	1.22 H	360	48.6	3.3
9	7311.00	47.9 PK	74.0	-26.1	1.03 H	333	38.1	9.8
10	7311.00	41.5 AV	54.0	-12.5	1.03 H	333	31.7	9.8
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	54.7 PK	74.0	-19.3	1.16 V	325	56.0	-1.3
2	2390.00	42.7 AV	54.0	-11.3	1.16 V	325	44.0	-1.3
3	*2437.00	119.8 PK			1.16 V	325	121.0	-1.2
4	*2437.00	117.6 AV			1.16 V	325	118.8	-1.2
5	2483.50	55.6 PK	74.0	-18.4	1.16 V	325	56.6	-1.0
6	2483.50	42.9 AV	54.0	-11.1	1.16 V	325	43.9	-1.0
7	4874.00	54.2 PK	74.0	-19.8	2.33 V	315	50.9	3.3
8	4874.00	53.6 AV	54.0	-0.4	2.33 V	315	50.3	3.3
9	7311.00	50.3 PK	74.0	-23.7	2.50 V	47	40.5	9.8
10	7311.00	46.3 AV	54.0	-7.7	2.50 V	47	36.5	9.8

REMARKS:

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

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

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	109.8 PK			2.93 H	290	110.9	-1.1
2	*2462.00	107.5 AV			2.93 H	290	108.6	-1.1
3	2483.50	55.2 PK	74.0	-18.8	2.93 H	290	56.2	-1.0
4	2483.50	42.2 AV	54.0	-11.8	2.93 H	290	43.2	-1.0
5	4924.00	53.8 PK	74.0	-20.2	1.19 H	360	50.3	3.5
6	4924.00	52.4 AV	54.0	-1.6	1.19 H	360	48.9	3.5
7	7386.00	47.2 PK	74.0	-26.8	1.00 H	344	37.3	9.9
8	7386.00	41.1 AV	54.0	-12.9	1.00 H	344	31.2	9.9
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	120.6 PK			1.25 V	327	121.7	-1.1
2	*2462.00	118.4 AV			1.25 V	327	119.5	-1.1
3	2483.50	59.1 PK	74.0	-14.9	1.25 V	327	60.1	-1.0
4	2483.50	53.7 AV	54.0	-0.3	1.25 V	327	54.7	-1.0
5	4924.00	54.0 PK	74.0	-20.0	2.29 V	305	50.5	3.5
6	4924.00	52.7 AV	54.0	-1.3	2.29 V	305	49.2	3.5
7	7386.00	50.6 PK	74.0	-23.4	2.50 V	34	40.7	9.9
8	7386.00	46.6 AV	54.0	-7.4	2.50 V	34	36.7	9.9

REMARKS:

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

802.11g

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	66.2 PK	74.0	-7.8	2.93 H	274	67.5	-1.3
2	2390.00	49.5 AV	54.0	-4.5	2.93 H	274	50.8	-1.3
3	*2412.00	107.1 PK			2.93 H	274	108.2	-1.1
4	*2412.00	97.5 AV			2.93 H	274	98.6	-1.1
5	4824.00	58.2 PK	74.0	-15.8	1.77 H	360	55.0	3.2
6	4824.00	44.1 AV	54.0	-9.9	1.77 H	360	40.9	3.2
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	68.2 PK	74.0	-5.8	1.52 V	274	69.5	-1.3
2	2390.00	53.8 AV	54.0	-0.2	1.52 V	274	55.1	-1.3
3	*2412.00	117.9 PK			1.52 V	274	119.0	-1.1
4	*2412.00	108.4 AV			1.52 V	274	109.5	-1.1
5	4824.00	62.3 PK	74.0	-11.7	1.05 V	319	59.1	3.2
6	4824.00	49.4 AV	54.0	-4.6	1.05 V	319	46.2	3.2

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

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

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	*2437.00	112.2 PK			2.96 H	281	113.4	-1.2
2	*2437.00	102.5 AV			2.96 H	281	103.7	-1.2
3	4874.00	62.7 PK	74.0	-11.3	1.76 H	360	59.4	3.3
4	4874.00	48.6 AV	54.0	-5.4	1.76 H	360	45.3	3.3
5	7311.00	50.9 PK	74.0	-23.1	1.05 H	21	41.1	9.8
6	7311.00	38.6 AV	54.0	-15.4	1.05 H	21	28.8	9.8
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	*2437.00	123.0 PK			1.51 V	272	124.2	-1.2
2	*2437.00	113.4 AV			1.51 V	272	114.6	-1.2
3	4874.00	66.8 PK	74.0	-7.2	1.09 V	321	63.5	3.3
4	**4874.00**	**53.9 AV**	**54.0**	**-0.1**	**1.09 V**	**321**	**50.6**	**3.3**
5	7311.00	51.5 PK	74.0	-22.5	2.38 V	50	41.7	9.8
6	7311.00	40.6 AV	54.0	-13.4	2.38 V	50	30.8	9.8

REMARKS:

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

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

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	108.0 PK			2.95 H	282	109.1	-1.1
2	*2462.00	96.7 AV			2.95 H	282	97.8	-1.1
3	2483.50	67.1 PK	74.0	-6.9	2.95 H	282	68.1	-1.0
4	2483.50	48.9 AV	54.0	-5.1	2.95 H	282	49.9	-1.0
5	4924.00	58.2 PK	74.0	-15.8	1.78 H	360	54.7	3.5
6	4924.00	43.8 AV	54.0	-10.2	1.78 H	360	40.3	3.5
7	7386.00	47.5 PK	74.0	-26.5	1.01 H	18	37.6	9.9
8	7386.00	35.2 AV	54.0	-18.8	1.01 H	18	25.3	9.9
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	118.8 PK			1.52 V	293	119.9	-1.1
2	*2462.00	107.6 AV			1.52 V	293	108.7	-1.1
3	2483.50	68.9 PK	74.0	-5.1	1.52 V	293	69.9	-1.0
4	**2483.50**	**53.9 AV**	**54.0**	**-0.1**	**1.52 V**	**293**	**54.9**	**-1.0**
5	4924.00	62.1 PK	74.0	-11.9	1.09 V	329	58.6	3.5
6	4924.00	49.0 AV	54.0	-5.0	1.09 V	329	45.5	3.5
7	7386.00	48.1 PK	74.0	-25.9	2.35 V	44	38.2	9.9
8	7386.00	37.2 AV	54.0	-16.8	2.35 V	44	27.3	9.9

REMARKS:

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

VHT20

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

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	67.9 PK	74.0	-6.1	2.96 H	277	69.2	-1.3
2	2390.00	49.6 AV	54.0	-4.4	2.96 H	277	50.9	-1.3
3	*2412.00	107.0 PK			2.96 H	277	108.1	-1.1
4	*2412.00	95.8 AV			2.96 H	277	96.9	-1.1
5	4824.00	57.7 PK	74.0	-16.3	1.69 H	360	54.5	3.2
6	4824.00	43.9 AV	54.0	-10.1	1.69 H	360	40.7	3.2
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	69.9 PK	74.0	-4.1	1.28 V	337	71.2	-1.3
2	**2390.00**	**53.9 AV**	**54.0**	**-0.1**	**1.28 V**	**337**	**55.2**	**-1.3**
3	*2412.00	117.8 PK			1.28 V	337	118.9	-1.1
4	*2412.00	106.7 AV			1.28 V	337	107.8	-1.1
5	4824.00	61.5 PK	74.0	-12.5	1.33 V	308	58.3	3.2
6	4824.00	48.6 AV	54.0	-5.4	1.33 V	308	45.4	3.2

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
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	59.5 PK	74.0	-14.5	2.98 H	265	60.8	-1.3
2	2390.00	41.7 AV	54.0	-12.3	2.98 H	265	43.0	-1.3
3	*2437.00	112.8 PK			2.98 H	265	114.0	-1.2
4	*2437.00	111.3 AV			2.98 H	265	112.5	-1.2
5	2483.50	65.2 PK	74.0	-8.8	2.98 H	265	66.2	-1.0
6	2483.50	45.8 AV	54.0	-8.2	2.98 H	265	46.8	-1.0
7	4874.00	62.7 PK	74.0	-11.3	1.72 H	360	59.4	3.3
8	4874.00	48.9 AV	54.0	-5.1	1.72 H	360	45.6	3.3
9	7311.00	50.7 PK	74.0	-23.3	1.01 H	21	40.9	9.8
10	7311.00	38.6 AV	54.0	-15.4	1.01 H	21	28.8	9.8
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	61.5 PK	74.0	-12.5	1.20 V	338	62.8	-1.3
2	2390.00	45.8 AV	54.0	-8.2	1.20 V	338	47.1	-1.3
3	*2437.00	123.6 PK			1.20 V	338	124.8	-1.2
4	*2437.00	122.2 AV			1.20 V	338	123.4	-1.2
5	2483.50	67.2 PK	74.0	-6.8	1.20 V	338	68.2	-1.0
6	2483.50	50.1 AV	54.0	-3.9	1.20 V	338	51.1	-1.0
7	4874.00	66.5 PK	74.0	-7.5	1.31 V	322	63.2	3.3
8	4874.00	53.6 AV	54.0	-0.4	1.31 V	322	50.3	3.3
9	7311.00	49.9 PK	74.0	-24.1	2.46 V	50	40.1	9.8
10	7311.00	39.8 AV	54.0	-14.2	2.46 V	50	30.0	9.8

REMARKS:

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

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

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	108.1 PK			2.94 H	265	109.2	-1.1
2	*2462.00	96.8 AV			2.94 H	265	97.9	-1.1
3	2483.50	69.5 PK	74.0	-4.5	2.94 H	265	70.5	-1.0
4	2483.50	49.4 AV	54.0	-4.6	2.94 H	265	50.4	-1.0
5	4924.00	57.5 PK	74.0	-16.5	1.67 H	360	54.0	3.5
6	4924.00	43.8 AV	54.0	-10.2	1.67 H	360	40.3	3.5
7	7386.00	43.4 PK	74.0	-30.6	1.02 H	18	33.5	9.9
8	7386.00	33.6 AV	54.0	-20.4	1.02 H	18	23.7	9.9
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	118.9 PK			1.45 V	341	120.0	-1.1
2	*2462.00	107.7 AV			1.45 V	341	108.8	-1.1
3	2483.50	71.5 PK	74.0	-2.5	1.45 V	341	72.5	-1.0
4	2483.50	53.7 AV	54.0	-0.3	1.45 V	341	54.7	-1.0
5	4924.00	61.2 PK	74.0	-12.8	1.33 V	313	57.7	3.5
6	4924.00	48.4 AV	54.0	-5.6	1.33 V	313	44.9	3.5
7	7386.00	44.9 PK	74.0	-29.1	2.47 V	51	35.0	9.9
8	7386.00	34.8 AV	54.0	-19.2	2.47 V	51	24.9	9.9

REMARKS:

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

VHT40

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

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	68.5 PK	74.0	-5.5	3.04 H	257	69.8	-1.3
2	2390.00	49.5 AV	54.0	-4.5	3.04 H	257	50.8	-1.3
3	*2422.00	102.9 PK			3.04 H	257	104.2	-1.3
4	*2422.00	92.9 AV			3.04 H	257	94.2	-1.3
5	4844.00	47.4 PK	74.0	-26.6	1.50 H	360	44.1	3.3
6	4844.00	34.5 AV	54.0	-19.5	1.50 H	360	31.2	3.3
7	7266.00	43.1 PK	74.0	-30.9	1.64 H	112	33.3	9.8
8	7266.00	32.1 AV	54.0	-21.9	1.64 H	112	22.3	9.8
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	70.5 PK	74.0	-3.5	1.97 V	258	71.8	-1.3
2	2390.00	53.8 AV	54.0	-0.2	1.97 V	258	55.1	-1.3
3	*2422.00	113.7 PK			1.97 V	258	115.0	-1.3
4	*2422.00	103.8 AV			1.97 V	258	105.1	-1.3
5	4844.00	51.7 PK	74.0	-22.3	1.23 V	332	48.4	3.3
6	4844.00	37.0 AV	54.0	-17.0	1.23 V	332	33.7	3.3
7	7266.00	43.1 PK	74.0	-30.9	1.77 V	158	33.3	9.8
8	7266.00	31.2 AV	54.0	-22.8	1.77 V	158	21.4	9.8

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
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	62.6 PK	74.0	-11.4	3.06 H	266	63.9	-1.3
2	2390.00	45.1 AV	54.0	-8.9	3.06 H	266	46.4	-1.3
3	*2437.00	103.4 PK			3.06 H	266	104.6	-1.2
4	*2437.00	93.8 AV			3.06 H	266	95.0	-1.2
5	2483.50	66.7 PK	74.0	-7.3	3.06 H	266	67.7	-1.0
6	2483.50	49.6 AV	54.0	-4.4	3.06 H	266	50.6	-1.0
7	4874.00	47.8 PK	74.0	-26.2	1.52 H	360	44.5	3.3
8	4874.00	34.7 AV	54.0	-19.3	1.52 H	360	31.4	3.3
9	7311.00	42.6 PK	74.0	-31.4	1.66 H	122	32.8	9.8
10	7311.00	31.7 AV	54.0	-22.3	1.66 H	122	21.9	9.8
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	64.6 PK	74.0	-9.4	1.95 V	263	65.9	-1.3
2	2390.00	49.4 AV	54.0	-4.6	1.95 V	263	50.7	-1.3
3	*2437.00	114.2 PK			1.95 V	263	115.4	-1.2
4	*2437.00	104.7 AV			1.95 V	263	105.9	-1.2
5	2483.50	68.7 PK	74.0	-5.3	1.95 V	263	69.7	-1.0
6	**2483.50**	**53.9 AV**	**54.0**	**-0.1**	**1.95 V**	**263**	**54.9**	**-1.0**
7	4874.00	51.3 PK	74.0	-22.7	1.26 V	323	48.0	3.3
8	4874.00	36.7 AV	54.0	-17.3	1.26 V	323	33.4	3.3
9	7311.00	42.6 PK	74.0	-31.4	1.78 V	168	32.8	9.8
10	7311.00	30.8 AV	54.0	-23.2	1.78 V	168	21.0	9.8

REMARKS:

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

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

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	103.8 PK			3.04 H	273	104.9	-1.1
2	*2452.00	93.9 AV			3.04 H	273	95.0	-1.1
3	2483.50	71.2 PK	74.0	-2.8	3.04 H	273	72.2	-1.0
4	2483.50	49.6 AV	54.0	-4.4	3.04 H	273	50.6	-1.0
5	4904.00	48.1 PK	74.0	-25.9	1.54 H	360	44.6	3.5
6	4904.00	34.8 AV	54.0	-19.2	1.54 H	360	31.3	3.5
7	7356.00	43.2 PK	74.0	-30.8	1.65 H	125	33.3	9.9
8	7356.00	32.2 AV	54.0	-21.8	1.65 H	125	22.3	9.9
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	114.6 PK			1.99 V	192	115.7	-1.1
2	*2452.00	104.8 AV			1.99 V	192	105.9	-1.1
3	2483.50	73.2 PK	74.0	-0.8	1.99 V	192	74.2	-1.0
4	**2483.50**	**53.9 AV**	**54.0**	**-0.1**	**1.99 V**	**192**	**54.9**	**-1.0**
5	4904.00	51.4 PK	74.0	-22.6	1.21 V	324	47.9	3.5
6	4904.00	36.7 AV	54.0	-17.3	1.21 V	324	33.2	3.5
7	7356.00	42.1 PK	74.0	-31.9	1.83 V	156	32.2	9.9
8	7356.00	30.4 AV	54.0	-23.6	1.83 V	156	20.5	9.9

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
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	125.06	38.9 QP	43.5	-4.6	1.50 H	311	48.5	-9.6
2	249.22	31.7 QP	46.0	-14.3	1.00 H	143	41.2	-9.5
3	332.88	38.7 QP	46.0	-7.3	1.00 H	314	45.4	-6.7
4	431.58	40.7 QP	46.0	-5.3	2.00 H	247	44.7	-4.0
5	483.96	40.2 QP	46.0	-5.8	1.50 H	312	43.3	-3.1
6	951.50	36.9 QP	46.0	-9.1	1.00 H	269	32.3	4.6
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	38.11	35.7 QP	40.0	-4.3	1.00 V	0	44.0	-8.3
2	93.63	35.8 QP	43.5	-7.7	1.00 V	261	49.7	-13.9
3	124.99	33.5 QP	43.5	-10.0	1.00 V	243	43.1	-9.6
4	334.10	37.5 QP	46.0	-8.5	1.50 V	138	44.2	-6.7
5	479.40	35.3 QP	46.0	-10.7	1.50 V	224	38.3	-3.0
6	951.45	35.0 QP	46.0	-11.0	2.00 V	314	30.4	4.6

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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

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

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

4.2.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver R&S	ESCS 30	847124/029	Oct. 24, 2016	Oct. 23, 2017
Line-Impedance Stabilization Network (for EUT) R&S	ESH3-Z5	848773/004	Oct. 26, 2016	Oct. 25, 2017
Line-Impedance Stabilization Network (for Peripheral) R&S	ENV216	100072	June 03, 2017	June 02, 2018
50 ohms Terminator	N/A	EMC-02	Sep. 22, 2017	Sep. 21, 2018
RF Cable	5D-FB	COCCAB-001	Sep. 30, 2016	Sep. 29, 2017
10 dB PAD Mini-Circuits	HAT-10+	CONATT-004	June 18, 2017	June 17, 2018
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 Shielded Room No. 1.
3 Tested Date: Sep. 28, 2017

4.2.3 Test Procedures

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

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

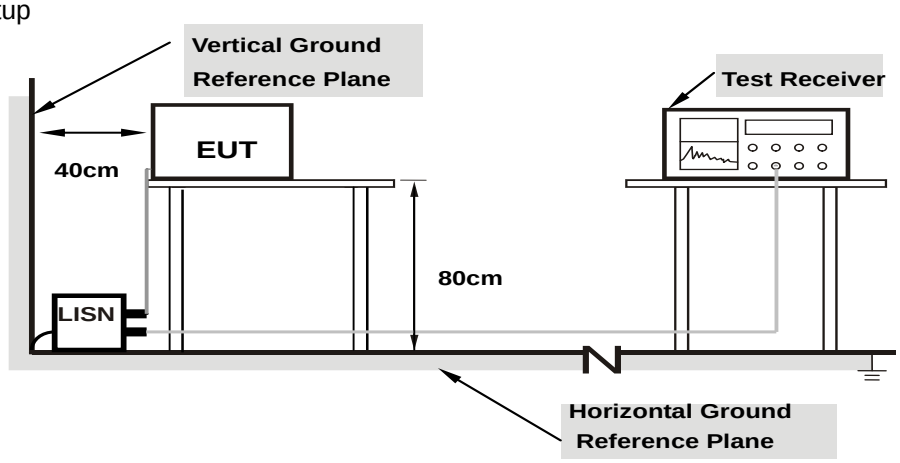
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



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

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

4.2.6 EUT Operating Conditions

Same as 4.1.6.

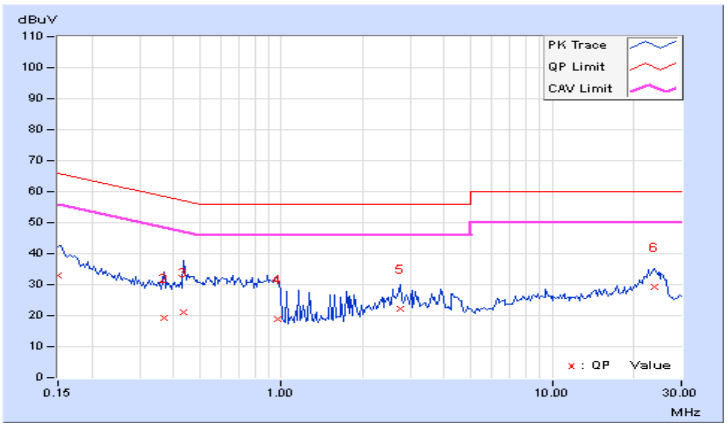
4.2.7 Test Results (Mode 1)

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

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.07	22.75	-0.88	32.82	9.19	66.00	56.00	-33.18	-46.81
2	0.36875	10.10	9.13	-7.82	19.23	2.28	58.53	48.53	-39.30	-46.25
3	0.43516	10.11	10.87	-6.35	20.98	3.76	57.15	47.15	-36.17	-43.39
4	0.96641	10.14	8.86	-4.37	19.00	5.77	56.00	46.00	-37.00	-40.23
5	2.75391	10.20	12.04	5.18	22.24	15.38	56.00	46.00	-33.76	-30.62
6	23.84766	11.32	17.98	12.55	29.30	23.87	60.00	50.00	-30.70	-26.13

REMARKS:

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

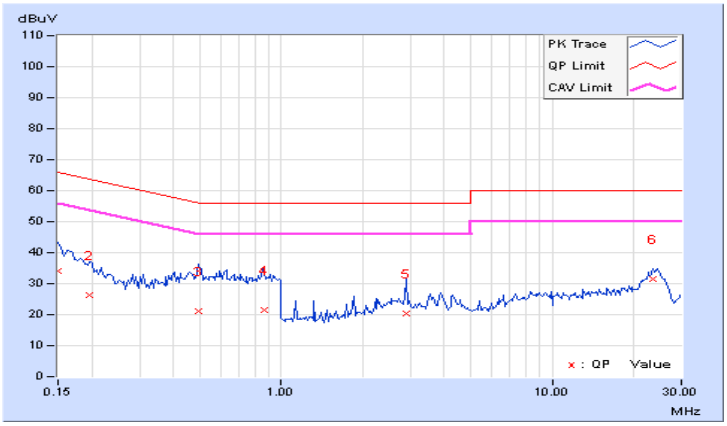


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.06	23.83	4.03	33.89	14.09	66.00	56.00	-32.11	-41.91
2	0.19687	10.03	16.44	-6.18	26.47	3.85	63.74	53.74	-37.27	-49.89
3	0.49766	10.10	11.09	0.82	21.19	10.92	56.04	46.04	-34.85	-35.12
4	0.86094	10.11	11.44	-6.04	21.55	4.07	56.00	46.00	-34.45	-41.93
5	2.90234	10.20	10.29	3.44	20.49	13.64	56.00	46.00	-35.51	-32.36
6	23.52734	10.99	20.67	14.21	31.66	25.20	60.00	50.00	-28.34	-24.80

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.



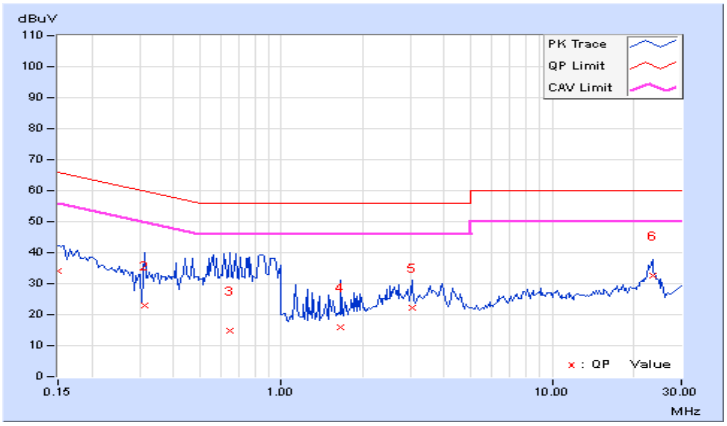
4.2.8 Test Results (Mode 2)

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

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.07	23.84	0.02	33.91	10.09	66.00	56.00	-32.09	-45.91
2	0.31406	10.09	13.02	-7.24	23.11	2.85	59.86	49.86	-36.75	-47.01
3	0.64609	10.12	4.70	-8.19	14.82	1.93	56.00	46.00	-41.18	-44.07
4	1.65234	10.14	5.63	-4.42	15.77	5.72	56.00	46.00	-40.23	-40.28
5	3.03125	10.22	11.94	4.99	22.16	15.21	56.00	46.00	-33.84	-30.79
6	23.63281	11.32	21.40	13.84	32.72	25.16	60.00	50.00	-27.28	-24.84

REMARKS:

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

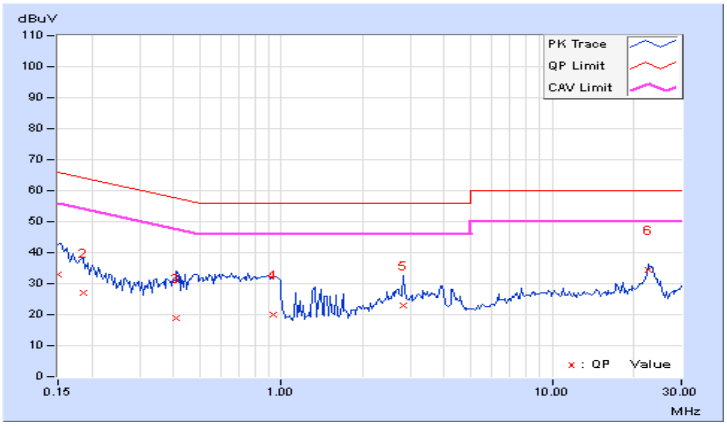


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)

No	Freq.	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.06	22.74	3.65	32.80	13.71	66.00	56.00	-33.20	-42.29
2	0.18516	10.04	17.14	-5.67	27.18	4.37	64.25	54.25	-37.07	-49.88
3	0.41172	10.10	8.92	-8.20	19.02	1.90	57.61	47.61	-38.59	-45.71
4	0.93906	10.11	9.77	-6.32	19.88	3.79	56.00	46.00	-36.12	-42.21
5	2.82031	10.20	12.77	6.28	22.97	16.48	56.00	46.00	-33.03	-29.52
6	**22.69922**	**10.99**	**23.50**	**20.30**	**34.49**	**31.29**	**60.00**	**50.00**	**-25.51**	**-18.71**

REMARKS:

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

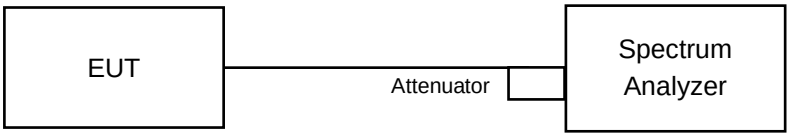


4.3 6dB Bandwidth Measurement

4.3.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

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

4.3.5 Deviation fromTest Standard

No deviation.

4.3.6 EUT Operating Conditions

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

4.3.7 Test Result

802.11b

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	7.65	9.10	0.5	PASS
6	2437	8.58	9.11	0.5	PASS
11	2462	8.14	8.14	0.5	PASS

802.11g

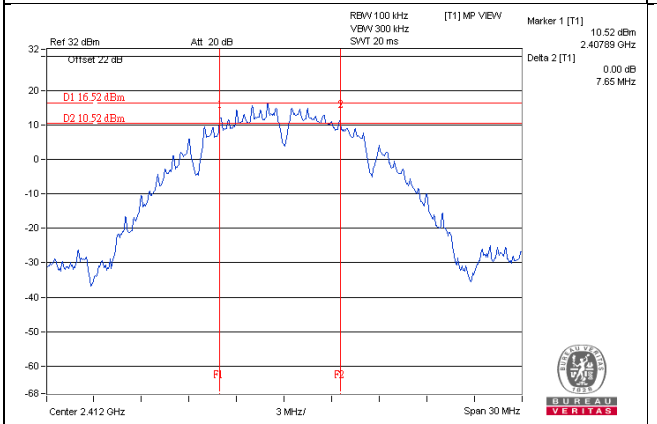
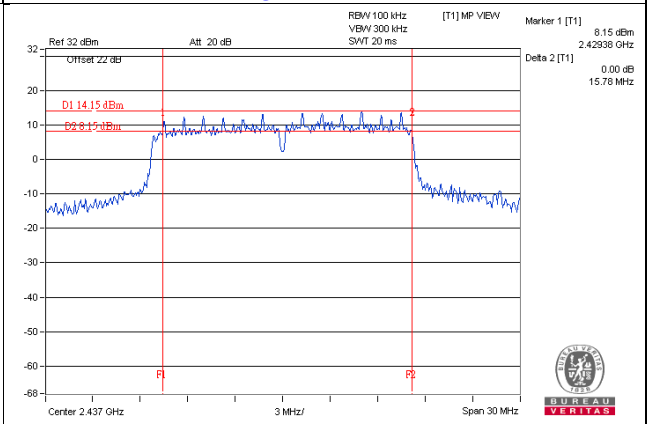
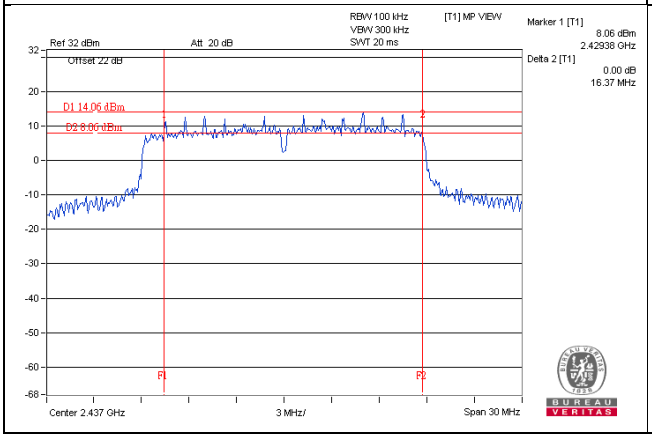
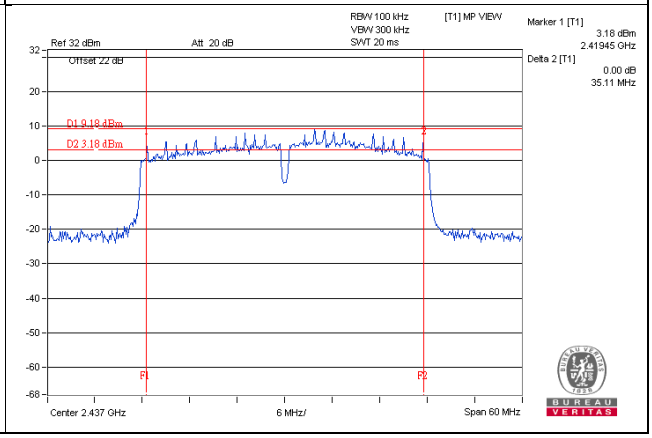
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	16.37	15.85	0.5	PASS
6	2437	15.78	15.80	0.5	PASS
11	2462	16.35	16.08	0.5	PASS

VHT20

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	17.07	17.20	0.5	Pass
6	2437	16.37	16.37	0.5	Pass
11	2462	17.57	16.94	0.5	Pass

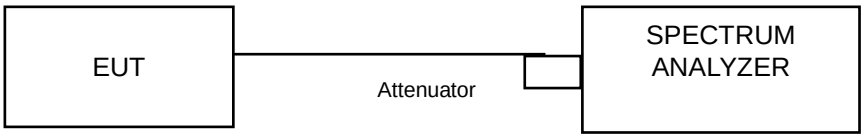
VHT40

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
3	2422	35.29	36.06	0.5	Pass
6	2437	35.28	35.11	0.5	Pass
9	2452	35.20	35.30	0.5	Pass

Spectrum Plot of Worst Value	
802.11b / Chain 0 : CH1	**802.11g / Chain 0 : CH6**
	
VHT20 / Chain 0 : CH6	**VHT40 / Chain 1 : CH6**
	

4.4 Occupied Bandwidth Measurement

4.4.1 Test Setup



4.4.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.3 Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth and set the detector to sampling. The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 %of the total mean power of a given emission.

4.4.4 Deviation from Test Standard

No deviation.

4.4.5 EUT Operating Conditions

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

4.4.6 Test Results

802.11b

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
1	2412	13.56	14.52
6	2437	14.40	14.88
11	2462	13.68	13.56

802.11g

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
1	2412	16.44	16.92
6	2437	17.52	22.20
11	2462	16.44	16.56

802.11n (HT20)

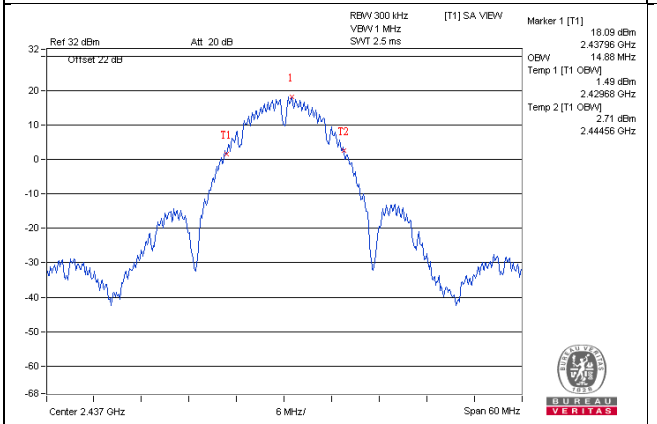
Channel	Frequency (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
1	2412	17.64	17.88
6	2437	18.12	19.68
11	2462	17.76	17.76

802.11n (HT40)

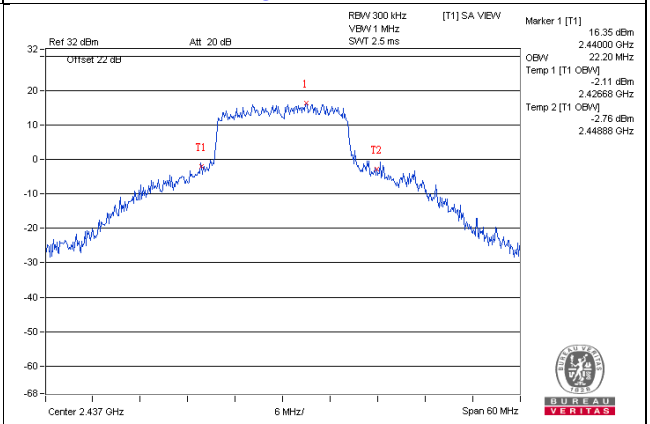
Channel	Frequency (MHz)	Occupied Bandwidth (MHz)	
		Chain 0	Chain 1
3	2422	36.24	36.48
6	2437	36.24	36.24
9	2452	36.24	36.24

Spectrum Plot of Worst Value

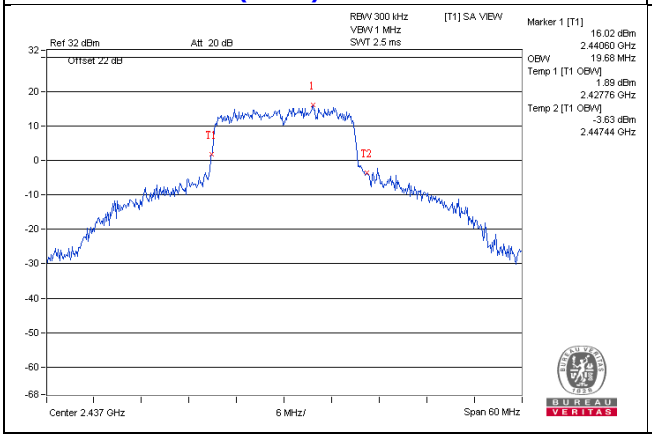
802.11b / Chain 1 : CH6



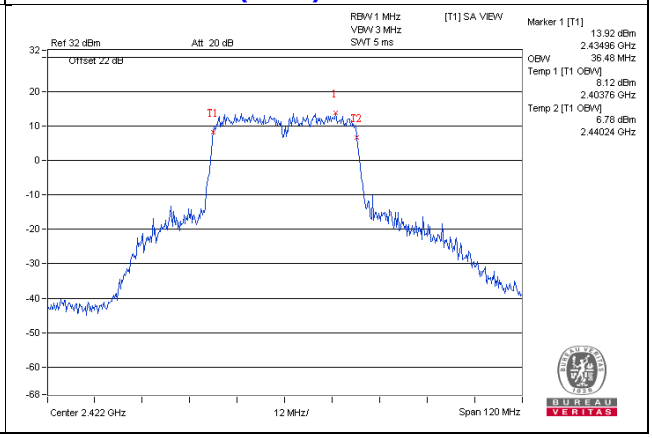
802.11g / Chain 1 : CH6



802.11n (HT20) / Chain 1 : CH6



802.11n (HT40) / Chain 1 : CH3



4.5 Conducted Output Power Measurement

4.5.1 Limits of Conducted Output Power Measurement

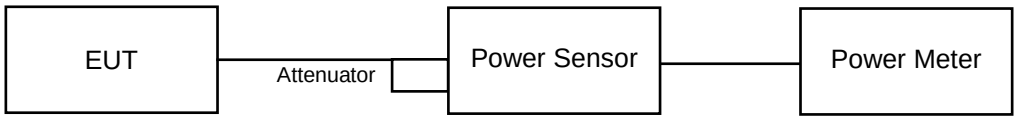
For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30dBm)

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.

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedures

An average power sensor was used on the output port of the EUT. A power meter was used to read the response of the average power sensor. Record the power level.

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Conditions

Same as Item 4.3.6.

4.5.7 Test Results

CDD Mode

802.11b

Chan.	Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	25.32	26.54	791.225	28.98	30.00	Pass
6	2437	25.70	26.65	833.916	29.21	30.00	Pass
11	2462	25.22	26.08	738.169	28.68	30.00	Pass

802.11g

Chan.	Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	22.06	23.59	389.254	25.90	30.00	Pass
6	2437	25.17	26.26	751.521	28.76	30.00	Pass
11	2462	21.99	23.12	363.241	25.60	30.00	Pass

VHT20

Chan.	Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	21.21	22.52	310.779	24.92	30.00	Pass
6	2437	25.10	26.14	734.744	28.66	30.00	Pass
11	2462	21.52	22.10	304.087	24.83	30.00	Pass

VHT40

Chan.	Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	19.33	21.11	214.826	23.32	30.00	Pass
6	2437	21.42	22.33	309.678	24.91	30.00	Pass
9	2452	19.81	21.14	225.736	23.54	30.00	Pass

Beamforming Mode

VHT20

Chan.	Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	21.21	22.52	310.779	24.92	28.79	Pass
6	2437	25.10	26.14	734.744	28.66	28.79	Pass
11	2462	21.52	22.10	304.087	24.83	28.79	Pass

Note: 1. Directional gain = 4.20dBi + 10log(2) = 7.21dBi > 6dBi , so the power limit shall be reduced to 30-(7.21-6) = 28.79dBm

VHT40

Chan.	Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	19.33	21.11	214.826	23.32	28.79	Pass
6	2437	21.42	22.33	309.678	24.91	28.79	Pass
9	2452	19.81	21.14	225.736	23.54	28.79	Pass

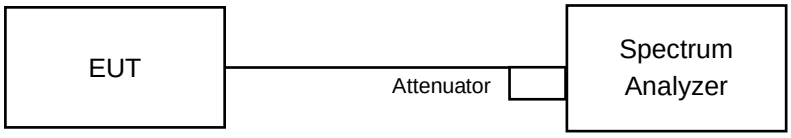
Note: 1. Directional gain = 4.20dBi + 10log(2) = 7.21dBi > 6dBi , so the power limit shall be reduced to 30-(7.21-6) = 28.79dBm

4.6 Power Spectral Density Measurement

4.6.1 Limits of Power Spectral Density Measurement

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

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

For 802.11b

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

For 802.11g, VHT20, VHT40

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

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

Same as Item 4.3.6

4.6.7 Test Results

802.11b

TX chain	Channel	Freq. (MHz)	PSD (dBm/3kHz)	10 log (N=2) dB	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	1	2412	-3.63	3.01	-0.62	6.79	Pass
	6	2437	-2.78	3.01	0.23	6.79	Pass
	11	2462	-4.21	3.01	-1.20	6.79	Pass
1	1	2412	-3.88	3.01	-0.87	6.79	Pass
	6	2437	-2.10	3.01	0.91	6.79	Pass
	11	2462	-3.60	3.01	-0.59	6.79	Pass

Note: 1. Directional gain = 4.20dBi + 10log(2) = 7.21dBi > 6dBi , so the power density limit shall be reduced to 8-(7.21-6) = 6.79dBm

802.11g

TX chain	Channel	Freq. (MHz)	PSD W/O Duty Factor (dBm/3kHz)	10 log (N=2) dB	Duty Factor (dB)	TOTAL PSD With Duty Factor (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	1	2412	-10.34	3.01	0.18	-7.15	6.79	Pass
	6	2437	-7.40	3.01	0.18	-4.21	6.79	Pass
	11	2462	-10.98	3.01	0.18	-7.79	6.79	Pass
1	1	2412	-9.00	3.01	0.18	-5.81	6.79	Pass
	6	2437	-6.30	3.01	0.18	-3.11	6.79	Pass
	11	2462	-10.46	3.01	0.18	-7.27	6.79	Pass

Note: 1. Directional gain = 4.20dBi + 10log(2) = 7.21dBi > 6dBi , so the power density limit shall be reduced to 8-(7.21-6) = 6.79dBm

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=2) dB	Duty Factor (dB)	TOTAL PSD With Duty Factor (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	1	2412	-11.40	3.01	0.09	-8.30	6.79	Pass
	6	2437	-7.08	3.01	0.09	-3.98	6.79	Pass
	11	2462	-10.75	3.01	0.09	-7.65	6.79	Pass
1	1	2412	-10.32	3.01	0.09	-7.22	6.79	Pass
	6	2437	-7.47	3.01	0.09	-4.37	6.79	Pass
	11	2462	-10.06	3.01	0.09	-6.96	6.79	Pass

Note: 1. Directional gain = 4.20dBi + 10log(2) = 7.21dBi > 6dBi , so the power density limit shall be reduced to 8-(7.21-6) = 6.79dBm

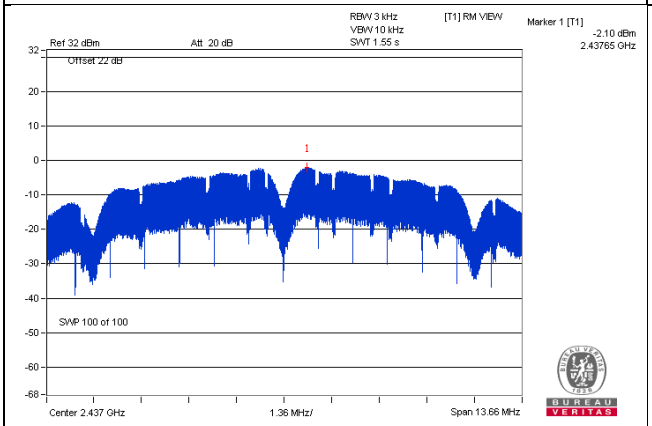
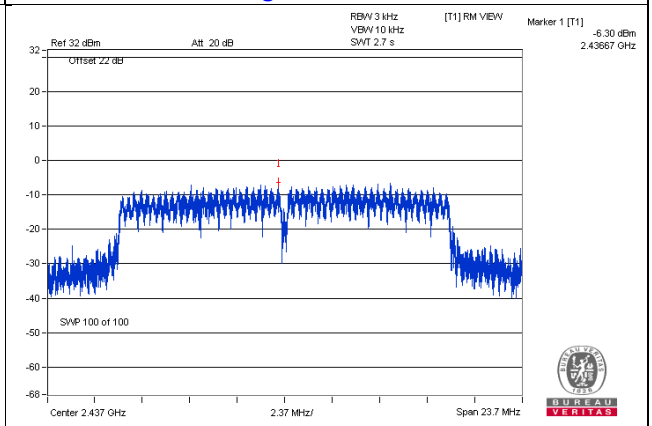
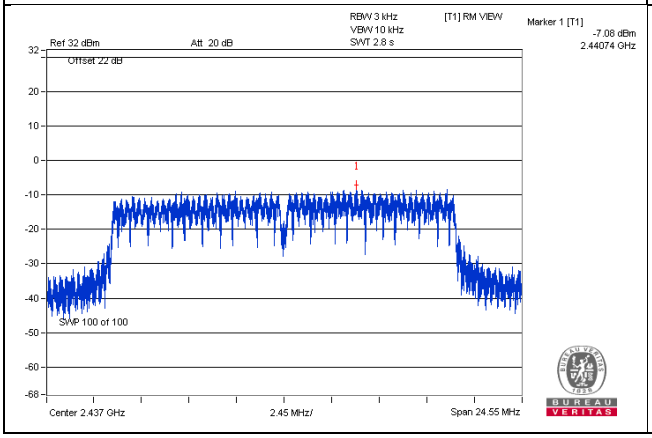
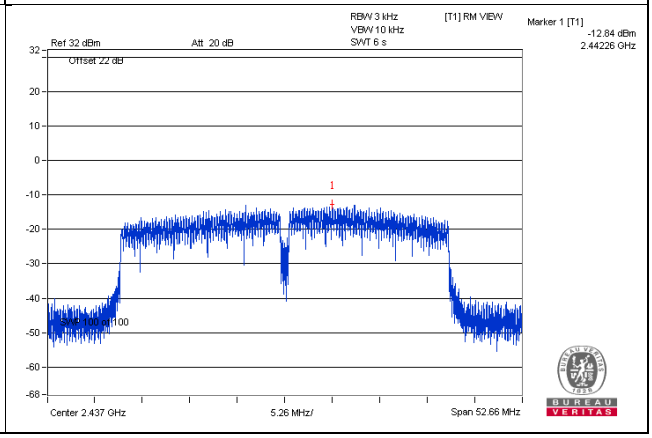
2. Refer to section 3.3 for duty cycle spectrum plot.

VHT40

TX chain	Channel	Freq. (MHz)	PSD W/O Duty Factor (dBm/3kHz)	10 log (N=2) dB	Duty Factor (dB)	TOTAL PSD With Duty Factor (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	1	2412	-15.95	3.01	0.16	-12.78	6.79	Pass
	6	2437	-13.87	3.01	0.16	-10.70	6.79	Pass
	11	2462	-15.49	3.01	0.16	-12.32	6.79	Pass
1	1	2412	-14.84	3.01	0.16	-11.67	6.79	Pass
	6	2437	-12.84	3.01	0.16	-9.67	6.79	Pass
	11	2462	-14.72	3.01	0.16	-11.55	6.79	Pass

Note: 1. Directional gain = 4.20dBi + 10log(2) = 7.21dBi > 6dBi , so the power density limit shall be reduced to 8-(7.21-6) = 6.79dBm

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

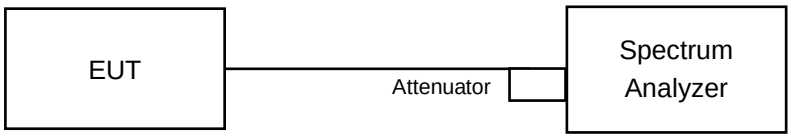
Spectrum Plot of Worst Value	
802.11b / Chain 1 : CH6	**802.11g / Chain 1 : CH6**
	
VHT20 / Chain 0 : CH6	**VHT40 / Chain 1 : CH6**
	

4.7 Conducted Out of Band Emission Measurement

4.7.1 Limits of Conducted Out of Band Emission Measurement

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

4.7.2 Test Setup



4.7.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.7.4 Test Procedure

MEASUREMENT PROCEDURE REF

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

MEASUREMENT PROCEDURE OOBE

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

4.7.5 Deviation from Test Standard

No deviation.

4.7.6 EUT Operating Condition

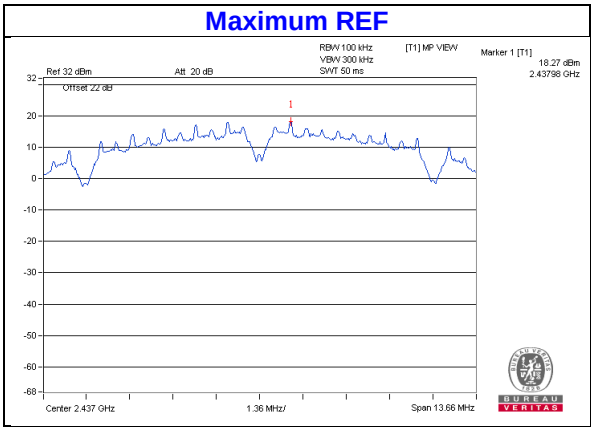
Same as Item 4.3.6

4.7.7 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.

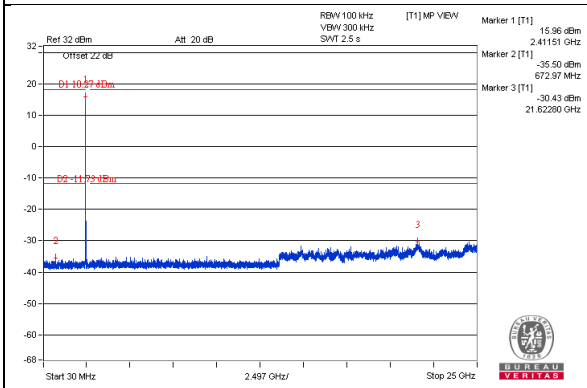
802.11b

Maximum REF

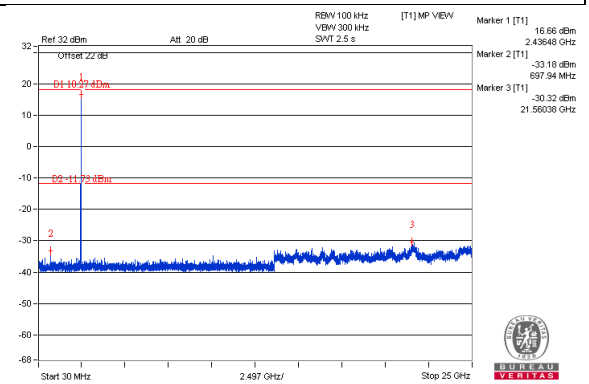


CHAIN 0

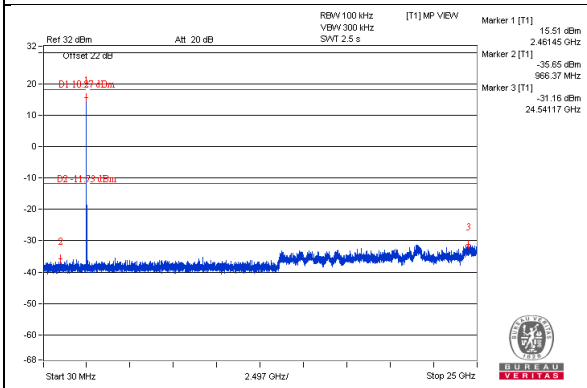
CH 1



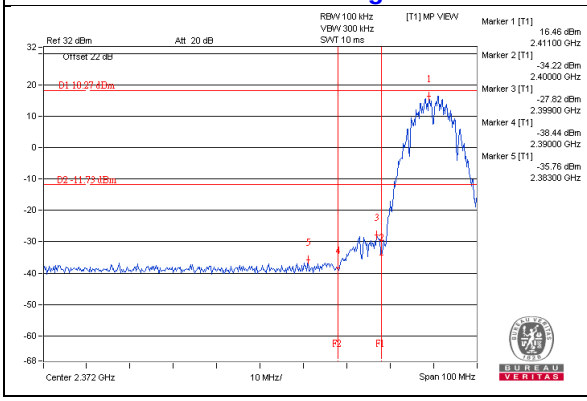
CH 6



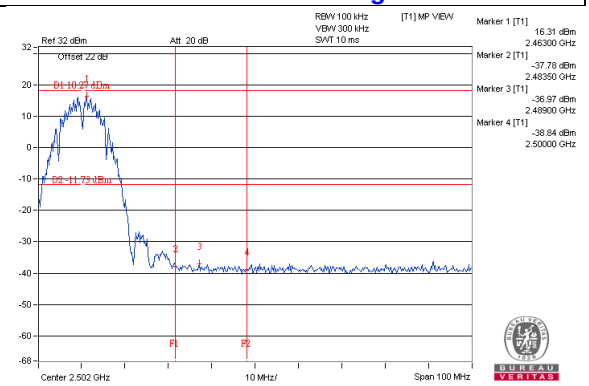
CH 11



CH 1 Band edge

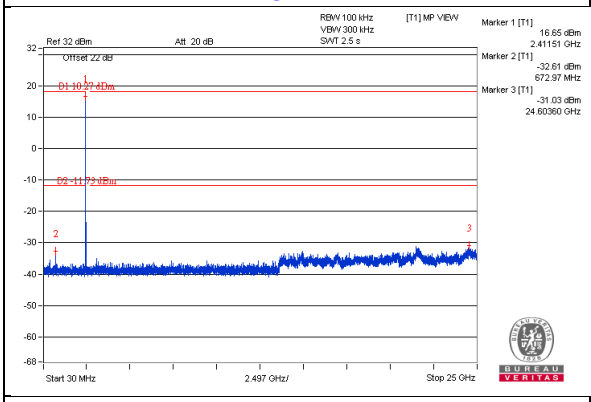


CH 11 Band edge

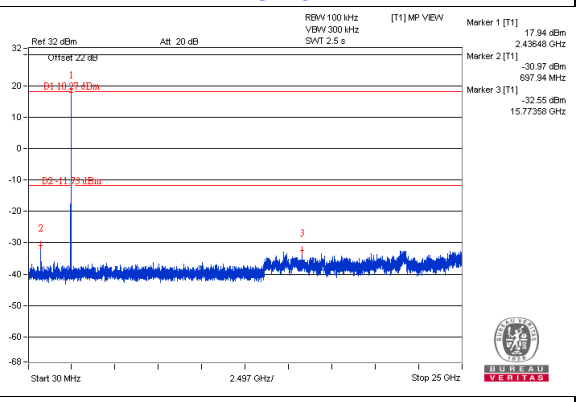


CHAIN 1

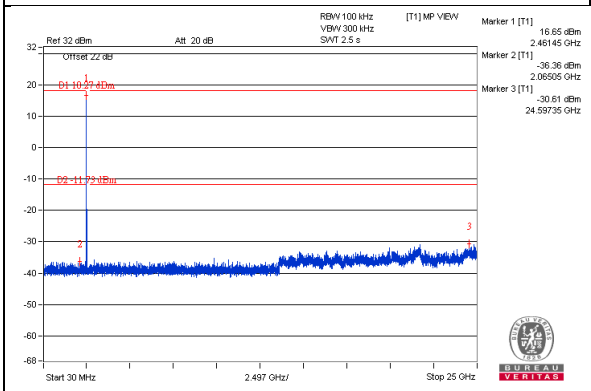
CH 1



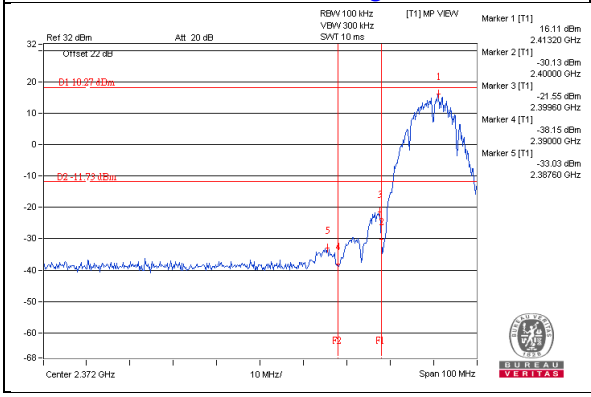
CH 6



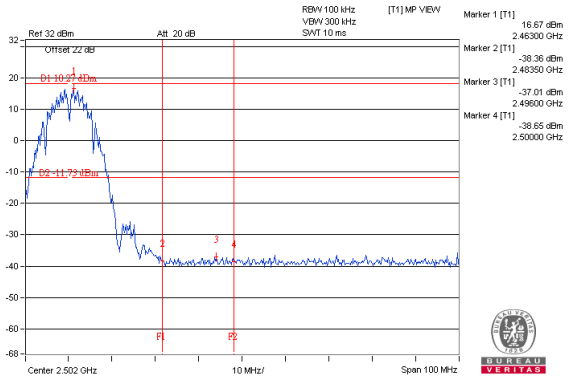
CH 11



CH 1 Band edge

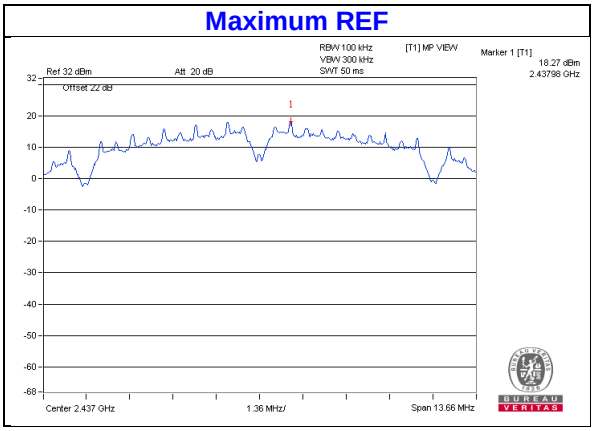


CH 11 Band edge



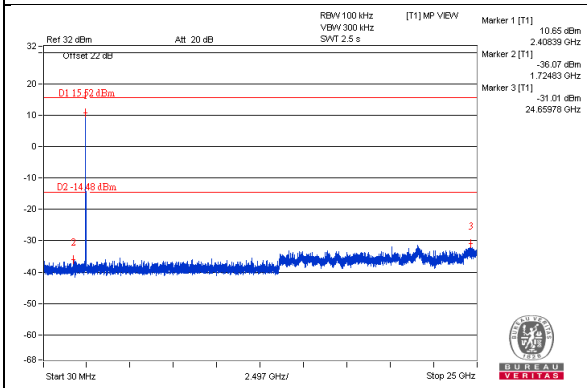
802.11g

Maximum REF

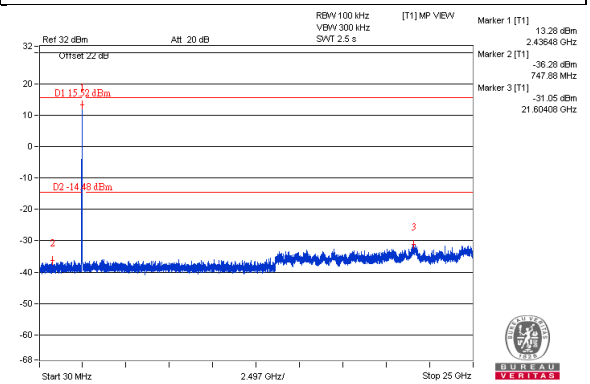


CHAIN 0

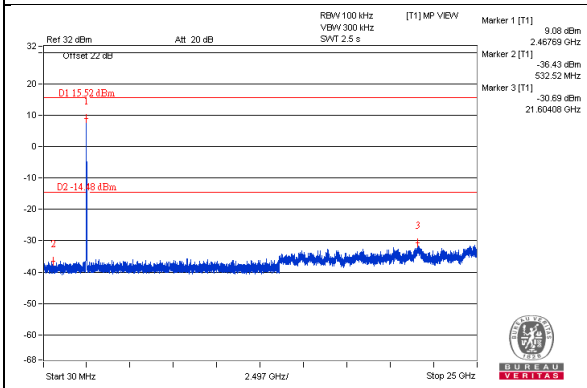
CH 1



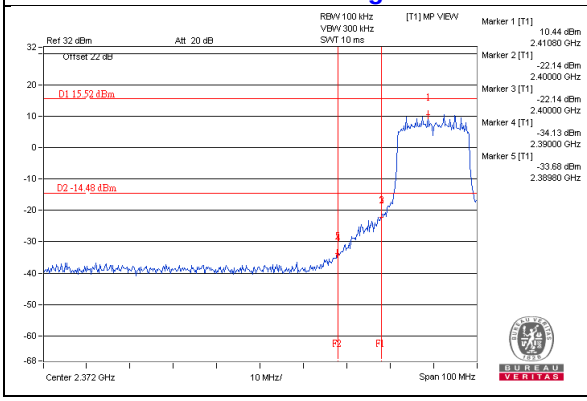
CH 6



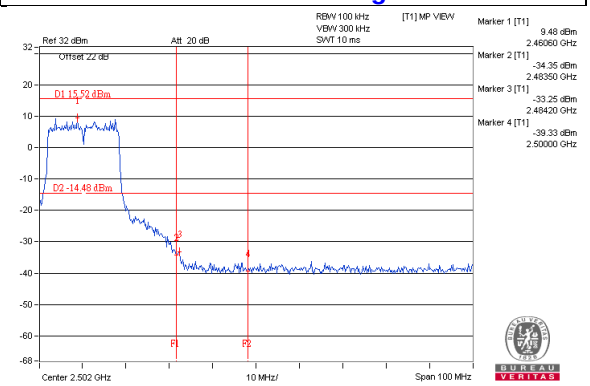
CH 11



CH 1 Band edge

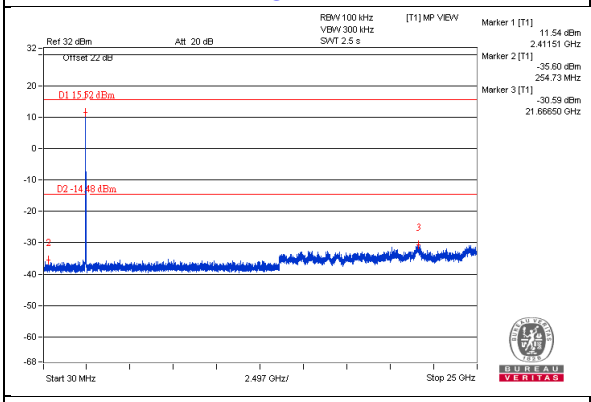


CH 11 Band edge

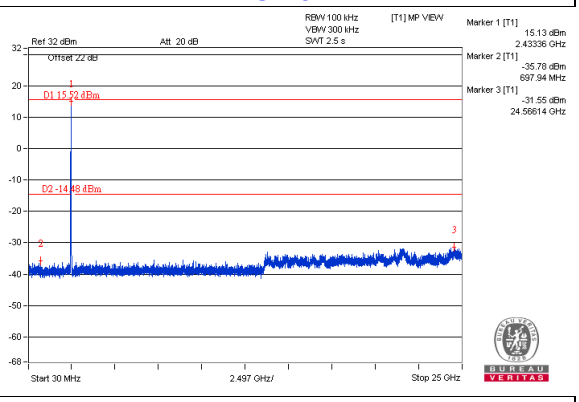


CHAIN 1

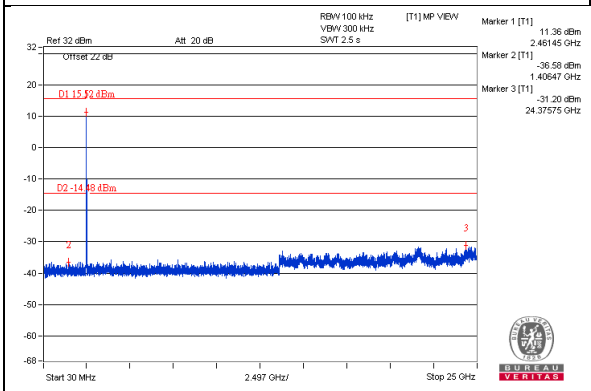
CH 1



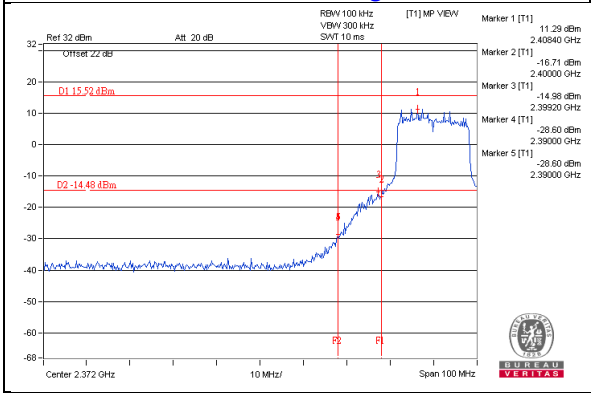
CH 6



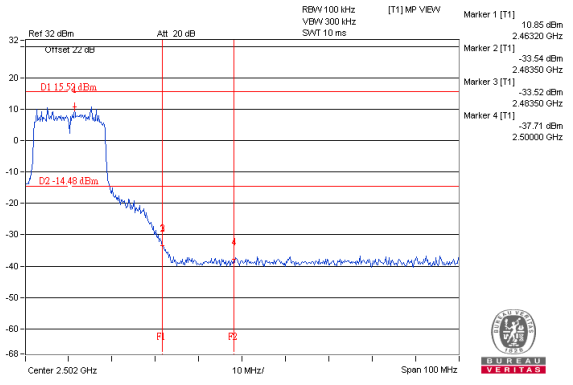
CH 11



CH 1 Band edge

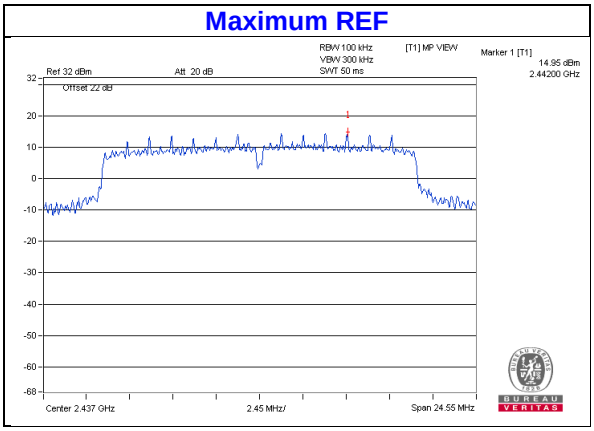


CH 11 Band edge



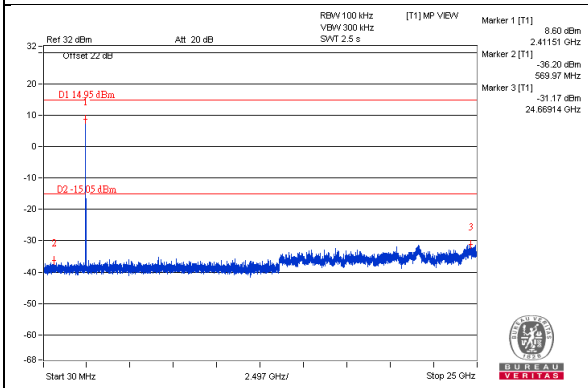
VHT20

Maximum REF

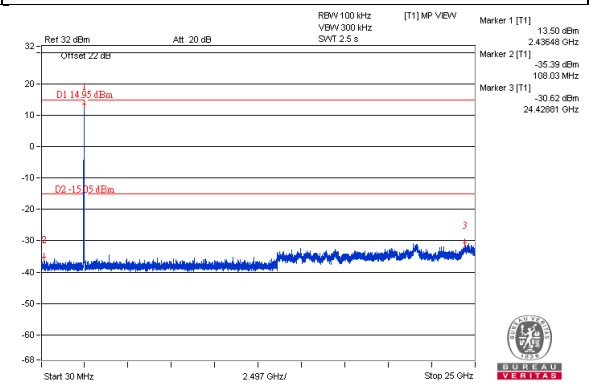


CHAIN 0

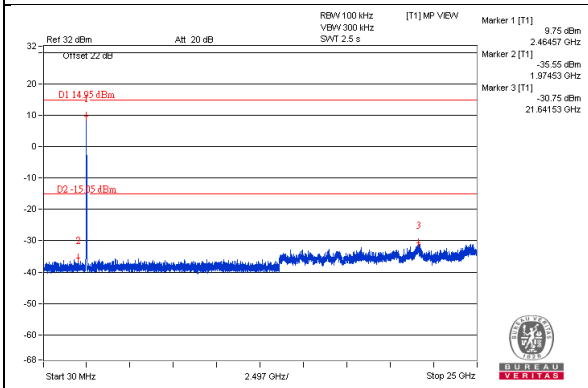
CH 1



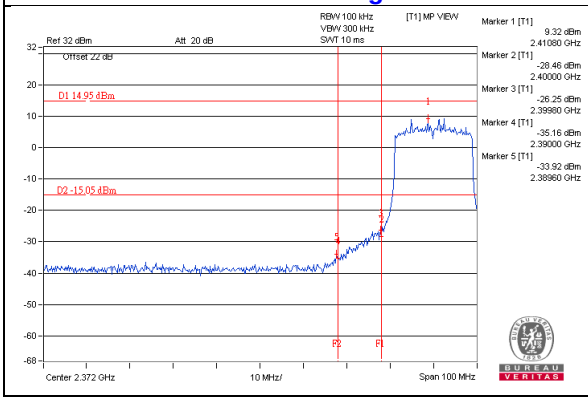
CH 6



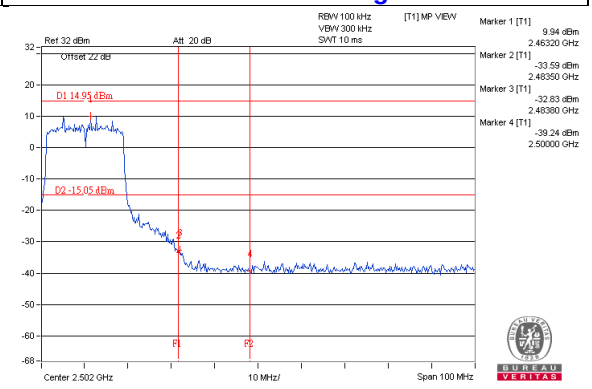
CH 11



CH 1 Band edge

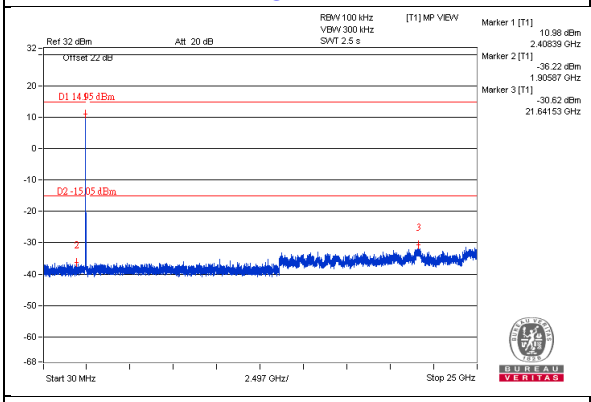


CH 11 Band edge

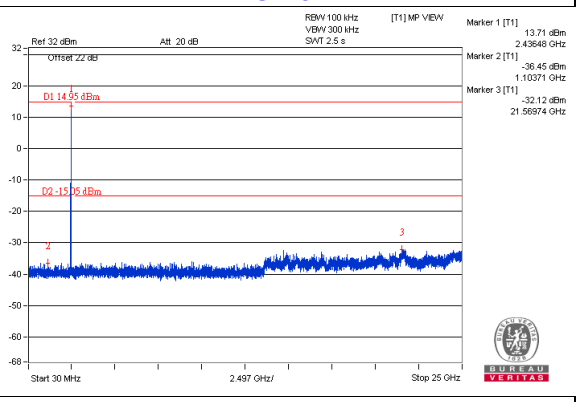


CHAIN 1

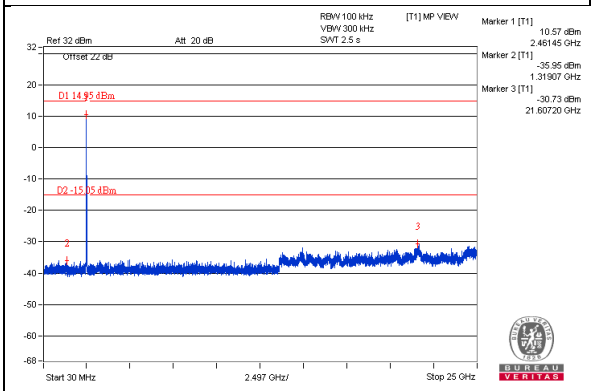
CH 1



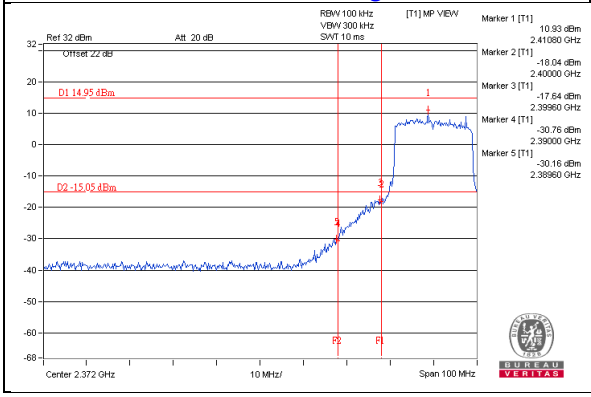
CH 6



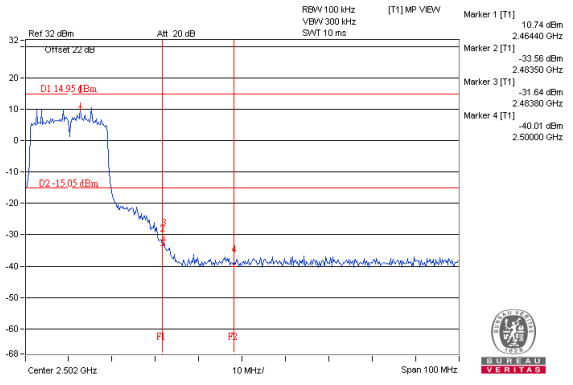
CH 11



CH 1 Band edge

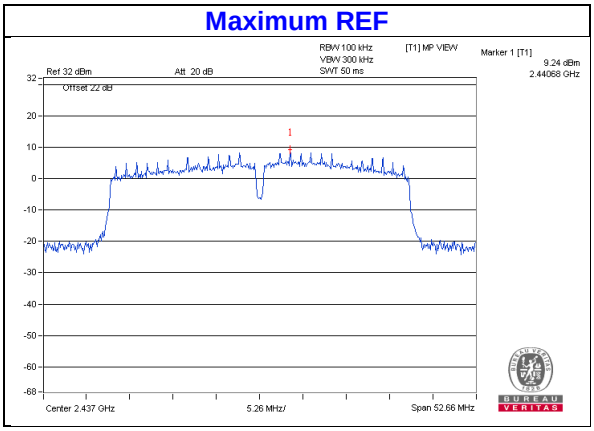


CH 11 Band edge



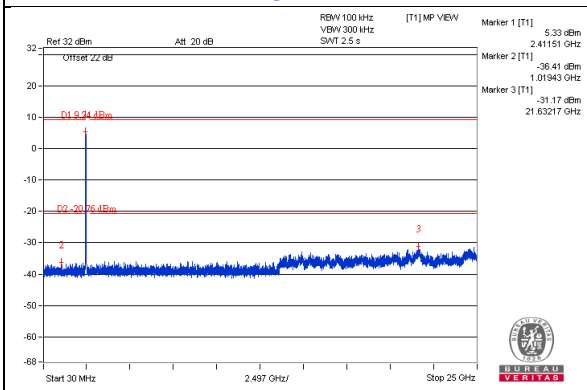
VHT40

Maximum REF

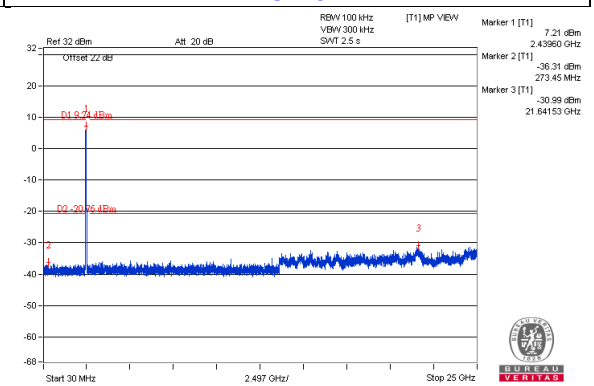


CHAIN 0

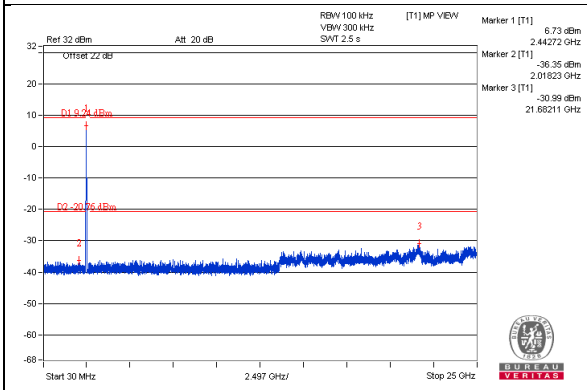
CH 1



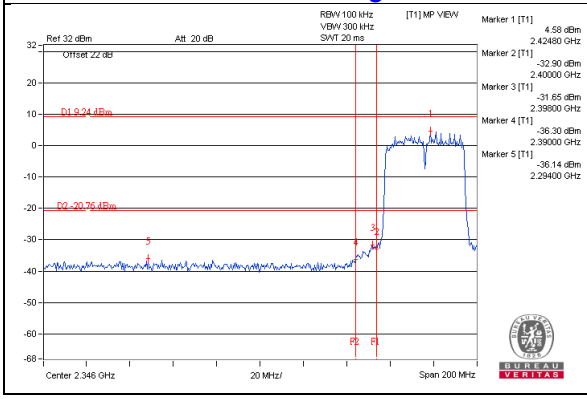
CH 6



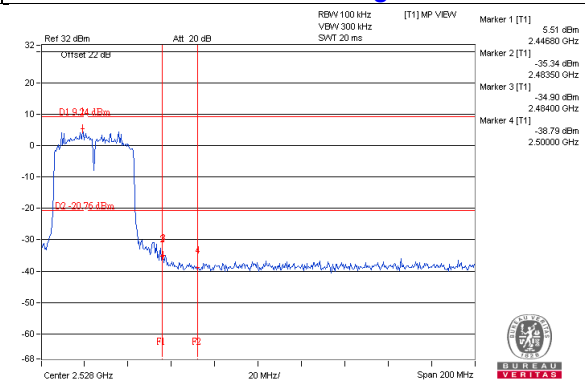
CH 11



CH 1 Band edge

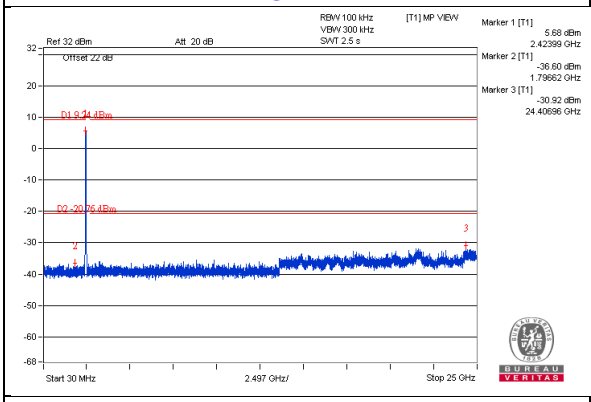


CH 11 Band edge

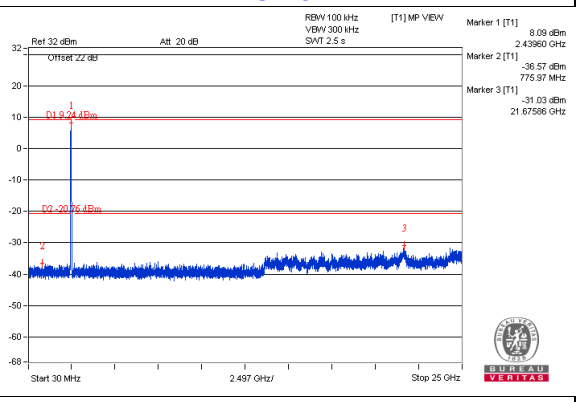


CHAIN 1

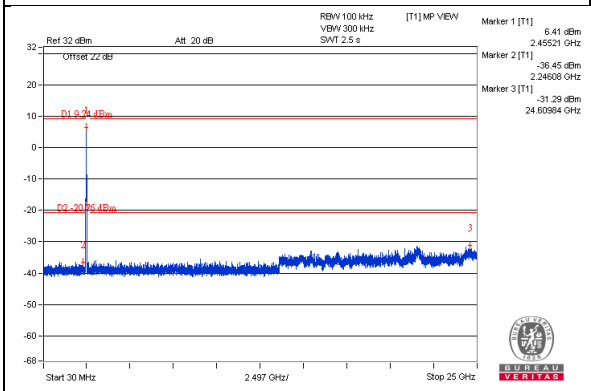
CH 1



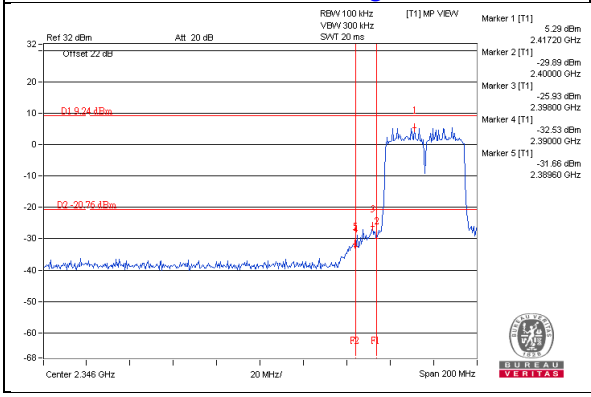
CH 6



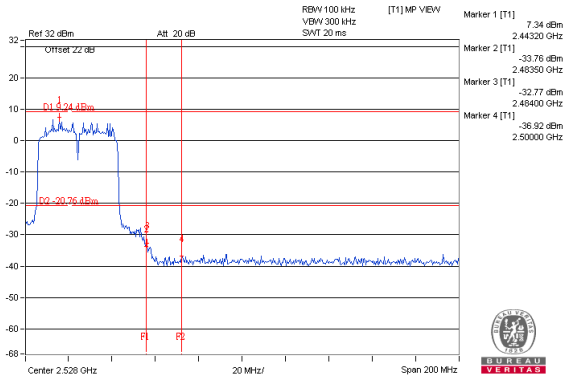
CH 11



CH 1 Band edge



CH 11 Band edge



5 Pictures of Test Arrangements

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

Appendix – Information on 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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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
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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 ---