FCC Test Report

Report No.:	RF171003C10C
FCC ID:	S4L4FIC00
Test Model:	4FIC00
Received Date:	Oct. 03, 2017
Test Date:	Oct. 25 ~ Nov. 07, 2017
Issued Date:	Nov. 09, 2017
Applicant:	TomTom International B.V.
Address:	De Ruijterkade 154, 1011 AC Amsterdam The Netherlands
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan (R.O.C.)
Test Location (1):	No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN (R.O.C.)
Test Location (2):	No.215, Sec. 3, Beixin Rd., Xindian Dist., New Taipei City 231, Taiwan, R.O.C
FCC Registration / Designation Number:	427177 / TW0011

Testing Laboratory
2021

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Release Control Record

Issue No.	Description	Date Issued
RF171003C10C	Original release	Nov. 09, 2017

1 Certificate of Conformity

Product:	TomTom BRIDGE Hub
Brand:	TOMTOM
Test Model:	4FIC00
Sample Status:	Pre-MFB build sample
Applicant:	TomTom International B.V.
Test Date:	Oct. 25 ~ Nov. 07, 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 : Celine Chou , **Date:** Nov. 09, 2017

Celine Chou / Specialist

Approved by : Ken Liu , **Date:** Nov. 09, 2017

Ken Liu / Senior 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 -26.75dB at 16.16536MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -0.96dB at 2484.04MHz.
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	No antenna connector is used.

2.1 Measurement Uncertainty

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

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

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	TomTom BRIDGE Hub
Brand	TOMTOM
Test Model	4FIC00
Sample Status	Pre-MFB build sample
Power Supply Rating	12-24Vdc, 2.0A
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b:11/5.5/2/1Mbps 802.11g: 54/48/36/24/18/12/9/6Mbps 802.11n: up to 65Mbps
Operating Frequency	2412 ~ 2462MHz
Number of Channel	11
Output Power	83.753mW
Antenna Type	Chip antenna with 1.69dBi gain
Antenna Connector	NA
Accessory Device	Refer to note
Cable Supplied	Refer to note

Note:

1. The EUT provides 1 completed transmitter and 1 receiver.

Modulation Mode	TX Function
802.11b	1TX
802.11g	1TX
802.11n (HT20)	1TX

2. The EUT contains the following accessories.

Item	Brand	Model	Specification	Remark
Car Charger	TomTom	CLA 4FIC0, 4FIC.000.02	Input: 12/24Vdc, 2A Output: 12/24Vdc, 2A FUSE: 125V, 5A	Option
InCube Power Cable	TomTom	4FIC.000.01	2m non-shielded power cable without core	Accessory
InCube CLA Car Charger Cable	TomTom	4FIC.000.02	2m non-shielded power cable without core	Option
InCube Full Power Cable (Harnessed)	TomTom	4FIC.000.03	2m non-shielded power cable without core	Option

3. WLAN (2.4GHz or 5GHz) and BT (BT EDR or BT LE) technology can transmit simultaneously.
4. Spurious emission of the simultaneous operation (WLAN (2.4GHz or 5GHz) and BT (BT EDR or BT LE) has been evaluated and no non-compliance was found.

3.2 Description of Test Modes

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

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

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable to				Description
	RE≥1G	RE<1G	PLC	APCM	
A	√	√	√	√	12Vdc
B	-	√	√	√	24Vdc

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.**

Radiated Emission Test (Above 1GHz):

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

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

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

Radiated Emission Test (Below 1GHz):

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

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

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
A, B	802.11b	1 to 11	1	DSSS	DBPSK	1.0

Power Line Conducted Emission Test:

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

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

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
A, B	802.11b	1 to 11	1	DSSS	DBPSK	1.0

Antenna Port Conducted Measurement:

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

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

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

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

Test Condition:

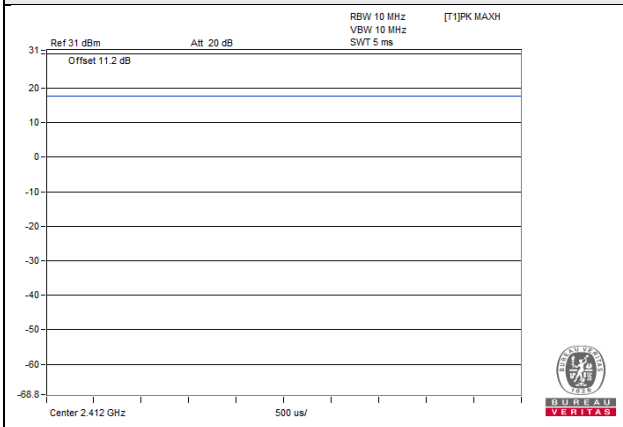
Applicable to	Environmental Conditions	Input Power	Tested by
RE≥1G	25 deg. C, 65% RH	12Vdc	Karl Lee
RE<1G	25 deg. C, 65% RH	12Vdc 24Vdc	Karl Lee
PLC	25 deg. C, 65% RH	12Vdc 24Vdc	Greg Lin
APCM	25 deg. C, 60% RH	12Vdc	Luke Chen

3.3 Duty Cycle of Test Signal

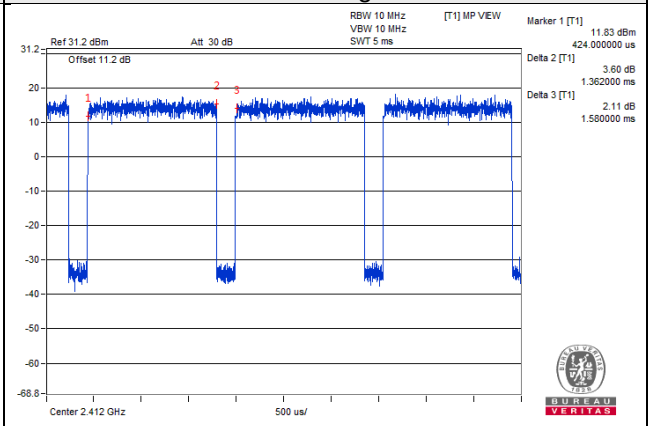
802.11b: Duty cycle of test signal is 100%.
802.11g, 802.11n (HT20): Duty cycle of test signal is < 98%.

802.11g: Duty cycle = 1.362/1.580 = 0.862, Duty factor = 10 * log(1/0.862) = 0.64
802.11n (HT20): Duty cycle = 1.275/1.475 = 0.864, Duty factor = 10 * log(1/0.864) = 0.63

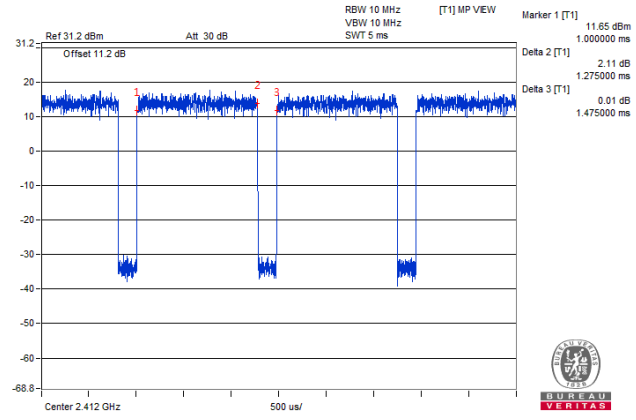
802.11b



802.11g



802.11n (HT20)



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.

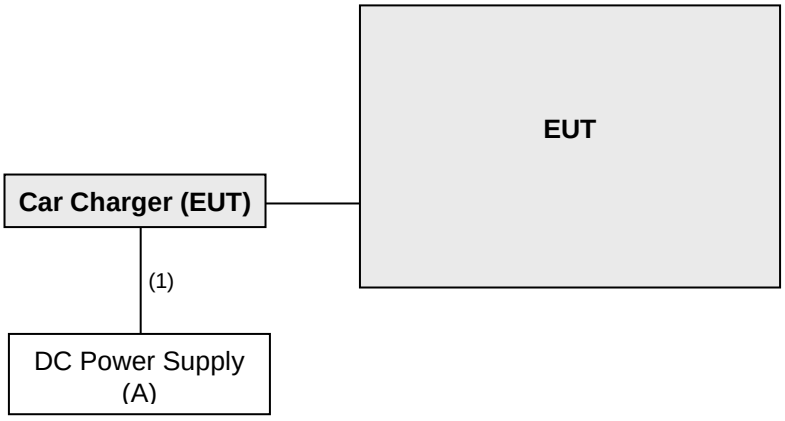
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	DC Power Supply	Topward	33010D	807748	NA	-

Note:

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

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DC	1	0.5	N	0	-

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standards

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

FCC Part 15, Subpart C (15.247)
KDB 558074 D01 DTS Meas Guidance v04
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 20dB below the highest level of the desired power:

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

Note:

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

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver Agilent Technologies	N9038A	MY52260177	Jul. 05, 2017	Jul. 04, 2018
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Dec. 13, 2016	Dec. 12, 2017
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Dec. 16, 2016	Dec. 15, 2017
HORN Antenna ETS-Lindgren	3117	00143293	Dec. 29, 2016	Dec. 28, 2017
HORN Antenna SCHWARZBECK	BBHA 9170	9170-480	Dec. 14, 2016	Dec. 13, 2017
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 17, 2017	Apr. 16, 2018
Bluetooth Tester	CBT	100980	Jun. 28, 2017	Jun. 27, 2019
Loop Antenna	HLA 6121	45745	May 19, 2017	May 18, 2018
Preamplifier Agilent	310N	187226	Jun. 23, 2017	Jun. 22, 2018
Preamplifier Agilent	83017A	MY39501357	Jun. 23, 2017	Jun. 22, 2018
Power Meter Anritsu	ML2495A	1232002	Sep. 08, 2017	Sep. 07, 2018
Power Sensor Anritsu	MA2411B	1207325	Sep. 08, 2017	Sep. 07, 2018
RF signal cable ETS-LINDGREN	5D-FB	Cable-CH1-01(RFC-SMS-100-SMS-120+RFC-SMS-100-SMS-400)	Jun. 23, 2017	Jun. 22, 2018
RF signal cable ETS-LINDGREN	8D-FB	Cable-CH1-02(RFC-SMS-100-SMS-24)	Jun. 23, 2017	Jun. 22, 2018
Software BV ADT	E3 8.130425b	NA	NA	NA
Antenna Tower MF	NA	NA	NA	NA
Turn Table MF	NA	NA	NA	NA
Antenna Tower &Turn Table Controller MF	MF-7802	NA	NA	NA

Note:
1. The calibration interval of the above test instruments is 12 / 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HsinTien Chamber 1.
3. The horn antenna and preamplifier (model: 83017A) are used only for the measurement of emission frequency above 1 GHz if tested.
4. The FCC Designation Number is TW0011. The number will be varied with the Lab location and scope as attached.
5. The IC Site Registration No. is IC7450I-1.

4.1.3 Test Procedures

For Radiated emission below 30MHz

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

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

c. 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:

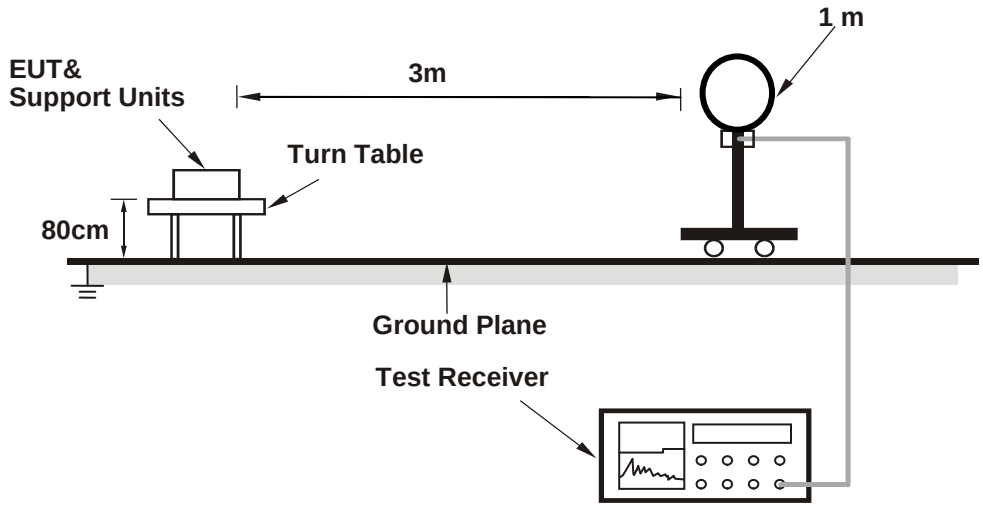
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10 Hz (Duty cycle ≥ 98%) for Peak detection 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

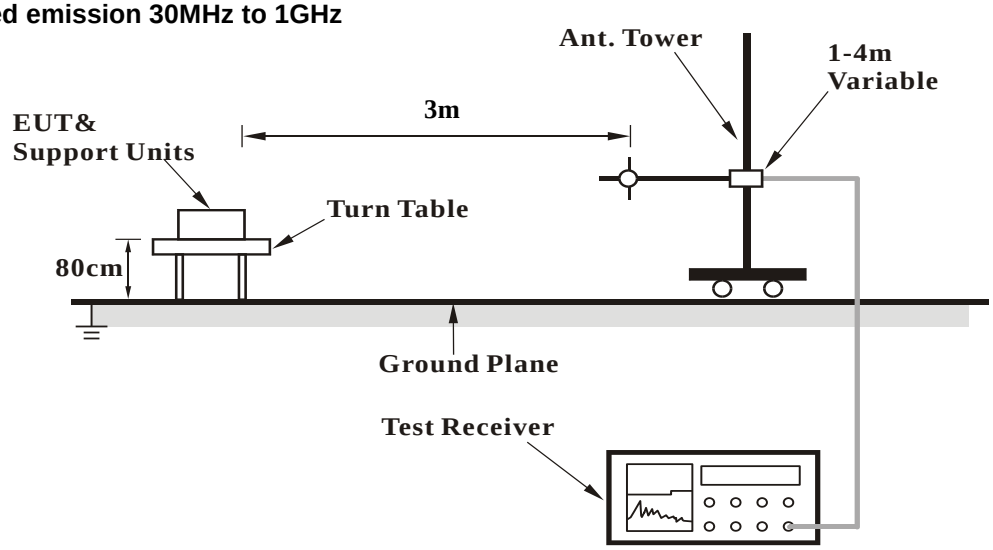
No deviation.

4.1.5 Test Setup

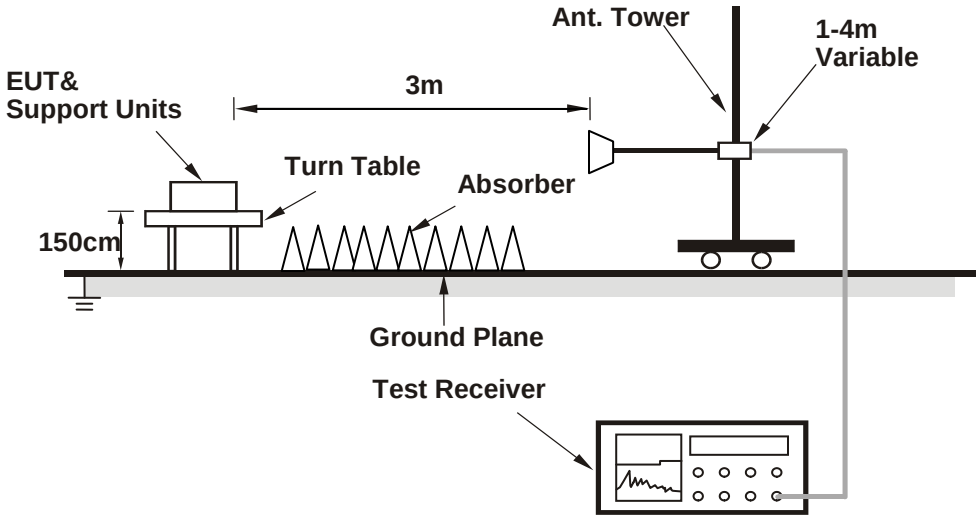
For Radiated emission below 30MHz



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. Set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

Above 1GHz Data:

802.11b

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	1 GHz ~ 25 GHz
Input Power	12Vdc	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2388.03	50.78	49.07	54.00	-3.22	31.80	5.40	35.49	118	24	Average
2388.03	57.55	55.84	74.00	-16.45	31.80	5.40	35.49	118	24	Peak
2412.00	106.51	104.74			31.81	5.43	35.47	118	24	Average
2412.00	109.10	107.33			31.81	5.43	35.47	118	24	Peak
4824.00	38.14	30.01	54.00	-15.86	33.97	8.26	34.10	153	128	Average
4824.00	47.38	39.25	74.00	-26.62	33.97	8.26	34.10	153	128	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2387.94	43.25	41.54	54.00	-10.75	31.80	5.40	35.49	223	146	Average
2387.94	53.76	52.05	74.00	-20.24	31.80	5.40	35.49	223	146	Peak
2412.00	99.95	98.18			31.81	5.43	35.47	223	146	Average
2412.00	102.59	100.82			31.81	5.43	35.47	223	146	Peak
4824.00	38.23	30.10	54.00	-15.77	33.97	8.26	34.10	196	121	Average
4824.00	47.58	39.45	74.00	-26.42	33.97	8.26	34.10	196	121	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin value = Emission level – Limit value
2. 2412 MHz: Fundamental frequency.

EUT Test Condition		Measurement Detail	
Channel	Channel 6	Frequency Range	1 GHz ~ 25 GHz
Input Power	12Vdc	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2352.03	41.37	39.78	54.00	-12.63	31.76	5.33	35.50	131	24	Average
2352.03	53.10	51.51	74.00	-20.90	31.76	5.33	35.50	131	24	Peak
2437.00	106.85	105.00			31.85	5.46	35.46	131	24	Average
2437.00	109.59	107.74			31.85	5.46	35.46	131	24	Peak
2485.20	42.36	40.37	54.00	-11.64	31.88	5.53	35.42	131	24	Average
2485.20	52.60	50.61	74.00	-21.40	31.88	5.53	35.42	131	24	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2385.87	40.42	38.71	54.00	-13.58	31.80	5.40	35.49	287	142	Average
2385.87	52.59	50.88	74.00	-21.41	31.80	5.40	35.49	287	142	Peak
2437.00	99.91	98.06			31.85	5.46	35.46	287	142	Average
2437.00	102.63	100.78			31.85	5.46	35.46	287	142	Peak
2497.44	40.99	38.97	54.00	-13.01	31.90	5.53	35.41	287	142	Average
2497.44	52.67	50.65	74.00	-21.33	31.90	5.53	35.41	287	142	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin value = Emission level – Limit value
2. 2437 MHz: Fundamental frequency.

EUT Test Condition		Measurement Detail	
Channel	Channel 11	Frequency Range	1 GHz ~ 25 GHz
Input Power	12Vdc	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462.00	107.41	105.48			31.87	5.50	35.44	272	23	Average
2462.00	110.12	108.19			31.87	5.50	35.44	272	23	Peak
2483.64	46.40	44.44	54.00	-7.60	31.88	5.50	35.42	272	23	Average
2483.64	55.00	53.04	74.00	-19.00	31.88	5.50	35.42	272	23	Peak
4924.00	38.10	29.85	54.00	-15.90	33.99	8.28	34.02	127	245	Average
4924.00	47.33	39.08	74.00	-26.67	33.99	8.28	34.02	127	245	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462.00	101.39	99.46			31.87	5.50	35.44	294	288	Average
2462.00	104.09	102.16			31.87	5.50	35.44	294	288	Peak
2484.28	43.61	41.62	54.00	-10.39	31.88	5.53	35.42	294	288	Average
2484.28	52.99	51.00	74.00	-21.01	31.88	5.53	35.42	294	288	Peak
4924.00	38.37	30.12	54.00	-15.63	33.99	8.28	34.02	128	306	Average
4924.00	47.18	38.93	74.00	-26.82	33.99	8.28	34.02	128	306	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin value = Emission level – Limit value
2. 2462 MHz: Fundamental frequency.

802.11g

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	1 GHz ~ 25 GHz
Input Power	12Vdc	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.74	52.93	51.22	54.00	-1.07	31.80	5.40	35.49	118	24	Average
2389.74	71.70	69.99	74.00	-2.30	31.80	5.40	35.49	118	24	Peak
2412.00	98.24	96.47			31.81	5.43	35.47	118	24	Average
2412.00	106.68	104.91			31.81	5.43	35.47	118	24	Peak
4824.00	38.40	30.27	54.00	-15.60	33.97	8.26	34.10	105	67	Average
4824.00	47.53	39.40	74.00	-26.47	33.97	8.26	34.10	105	67	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.74	45.21	43.50	54.00	-8.79	31.80	5.40	35.49	223	146	Average
2389.74	59.88	58.17	74.00	-14.12	31.80	5.40	35.49	223	146	Peak
2412.00	91.34	89.57			31.81	5.43	35.47	223	146	Average
2412.00	99.31	97.54			31.81	5.43	35.47	223	146	Peak
4824.00	38.27	30.14	54.00	-15.73	33.97	8.26	34.10	163	182	Average
4824.00	47.63	39.50	74.00	-26.37	33.97	8.26	34.10	163	182	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin value = Emission level – Limit value
2. 2412 MHz: Fundamental frequency.

EUT Test Condition		Measurement Detail	
Channel	Channel 6	Frequency Range	1 GHz ~ 25 GHz
Input Power	12Vdc	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.47	42.83	41.12	54.00	-11.17	31.80	5.40	35.49	131	24	Average
2389.47	52.19	50.48	74.00	-21.81	31.80	5.40	35.49	131	24	Peak
2437.00	99.07	97.22			31.85	5.46	35.46	131	24	Average
2437.00	107.40	105.55			31.85	5.46	35.46	131	24	Peak
2485.24	42.04	40.05	54.00	-11.96	31.88	5.53	35.42	131	24	Average
2485.24	53.26	51.27	74.00	-20.74	31.88	5.53	35.42	131	24	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2368.14	40.54	38.90	54.00	-13.46	31.76	5.37	35.49	287	142	Average
2368.14	51.47	49.83	74.00	-22.53	31.76	5.37	35.49	287	142	Peak
2437.00	92.53	90.68			31.85	5.46	35.46	287	142	Average
2437.00	101.22	99.37			31.85	5.46	35.46	287	142	Peak
2484.28	41.07	39.08	54.00	-12.93	31.88	5.53	35.42	287	142	Average
2484.28	51.77	49.78	74.00	-22.23	31.88	5.53	35.42	287	142	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin value = Emission level – Limit value
2. 2437 MHz: Fundamental frequency.

EUT Test Condition		Measurement Detail	
Channel	Channel 11	Frequency Range	1 GHz ~ 25 GHz
Input Power	12Vdc	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462.00	99.99	98.06			31.87	5.50	35.44	272	23	Average
2462.00	108.30	106.37			31.87	5.50	35.44	272	23	Peak
2483.88	52.23	50.27	54.00	-1.77	31.88	5.50	35.42	272	23	Average
2483.88	71.10	69.14	74.00	-2.90	31.88	5.50	35.42	272	23	Peak
4924.00	38.08	29.83	54.00	-15.92	33.99	8.28	34.02	192	127	Average
4924.00	47.21	38.96	74.00	-26.79	33.99	8.28	34.02	192	127	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462.00	95.51	93.58			31.87	5.50	35.44	294	288	Average
2462.00	103.65	101.72			31.87	5.50	35.44	294	288	Peak
2483.60	48.68	46.72	54.00	-5.32	31.88	5.50	35.42	294	288	Average
2483.60	64.92	62.96	74.00	-9.08	31.88	5.50	35.42	294	288	Peak
4924.00	38.37	30.12	54.00	-15.63	33.99	8.28	34.02	105	232	Average
4924.00	47.29	39.04	74.00	-26.71	33.99	8.28	34.02	105	232	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin value = Emission level – Limit value
2. 2462 MHz: Fundamental frequency.

802.11n (HT20)

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	1 GHz ~ 25 GHz
Input Power	12Vdc	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.20	51.50	49.79	54.00	-2.50	31.80	5.40	35.49	118	24	Average
2389.20	68.72	67.01	74.00	-5.28	31.80	5.40	35.49	118	24	Peak
2412.00	96.94	95.17			31.81	5.43	35.47	118	24	Average
2412.00	105.65	103.88			31.81	5.43	35.47	118	24	Peak
4824.00	38.43	30.30	54.00	-15.57	33.97	8.26	34.10	162	147	Average
4824.00	47.67	39.54	74.00	-26.33	33.97	8.26	34.10	162	147	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.74	44.45	42.74	54.00	-9.55	31.80	5.40	35.49	223	146	Average
2389.74	61.20	59.49	74.00	-12.80	31.80	5.40	35.49	223	146	Peak
2412.00	89.89	88.12			31.81	5.43	35.47	223	146	Average
2412.00	98.14	96.37			31.81	5.43	35.47	223	146	Peak
4824.00	38.26	30.13	54.00	-15.74	33.97	8.26	34.10	126	120	Average
4824.00	47.55	39.42	74.00	-26.45	33.97	8.26	34.10	126	120	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin value = Emission level – Limit value
2. 2412 MHz: Fundamental frequency.

EUT Test Condition		Measurement Detail	
Channel	Channel 6	Frequency Range	1 GHz ~ 25 GHz
Input Power	12Vdc	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2384.97	43.89	42.20	54.00	-10.11	31.78	5.40	35.49	131	24	Average
2384.97	53.41	51.72	74.00	-20.59	31.78	5.40	35.49	131	24	Peak
2437.00	98.73	96.88			31.85	5.46	35.46	131	24	Average
2437.00	107.34	105.49			31.85	5.46	35.46	131	24	Peak
2483.68	42.82	40.86	54.00	-11.18	31.88	5.50	35.42	131	24	Average
2483.68	53.74	51.78	74.00	-20.26	31.88	5.50	35.42	131	24	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2385.87	40.74	39.03	54.00	-13.26	31.80	5.40	35.49	287	142	Average
2385.87	51.34	49.63	74.00	-22.66	31.80	5.40	35.49	287	142	Peak
2437.00	92.20	90.35			31.85	5.46	35.46	287	142	Average
2437.00	100.72	98.87			31.85	5.46	35.46	287	142	Peak
2489.76	41.20	39.19	54.00	-12.80	31.90	5.53	35.42	287	142	Average
2489.76	52.61	50.60	74.00	-21.39	31.90	5.53	35.42	287	142	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin value = Emission level – Limit value
2. 2437 MHz: Fundamental frequency.

EUT Test Condition		Measurement Detail	
Channel	Channel 11	Frequency Range	1 GHz ~ 25 GHz
Input Power	12Vdc	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462.00	99.41	97.48			31.87	5.50	35.44	272	23	Average
2462.00	107.92	105.99			31.87	5.50	35.44	272	23	Peak
2484.04	52.61	50.65	54.00	-1.39	31.88	5.50	35.42	272	23	Average
2484.04	**73.04**	**71.08**	**74.00**	**-0.96**	**31.88**	**5.50**	**35.42**	**272**	**23**	**Peak**
4924.00	38.39	30.14	54.00	-15.61	33.99	8.28	34.02	154	216	Average
4924.00	47.29	39.04	74.00	-26.71	33.99	8.28	34.02	154	216	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462.00	94.97	93.04			31.87	5.50	35.44	294	288	Average
2462.00	102.83	100.90			31.87	5.50	35.44	294	288	Peak
2483.56	49.73	47.77	54.00	-4.27	31.88	5.50	35.42	294	288	Average
2483.56	70.71	68.75	74.00	-3.29	31.88	5.50	35.42	294	288	Peak
4924.00	38.32	30.07	54.00	-15.68	33.99	8.28	34.02	126	138	Average
4924.00	47.57	39.32	74.00	-26.43	33.99	8.28	34.02	126	138	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin value = Emission level – Limit value
2. 2462 MHz: Fundamental frequency.

9 kHz ~ 30 MHz Data:

The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

30 MHz ~ 1 GHz Worst-Case Data:

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	30 MHz ~ 1 GHz
Input Power	12Vdc	Detector Function	Peak (PK) Quasi-peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee
Test Mode	A		

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
53.22	27.52	44.55	40.00	-12.48	14.30	0.90	32.23	125	138	Peak
112.62	29.86	49.17	43.50	-13.64	11.66	1.28	32.25	185	164	Peak
196.32	28.58	48.28	43.50	-14.92	10.97	1.61	32.28	107	125	Peak
421.10	18.42	32.96	46.00	-27.58	15.24	2.41	32.19	195	136	Peak
542.90	17.22	29.71	46.00	-28.78	16.94	2.76	32.19	165	41	Peak
829.90	22.55	30.30	46.00	-23.45	20.77	3.38	31.90	170	143	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
62.40	26.90	45.37	40.00	-13.10	12.86	0.90	32.23	108	196	Peak
124.23	24.24	45.43	43.50	-19.26	9.67	1.38	32.24	132	105	Peak
229.80	32.46	51.03	46.00	-13.54	11.76	1.85	32.18	175	165	Peak
314.70	26.58	43.18	46.00	-19.42	13.40	2.11	32.11	159	126	Peak
490.40	19.95	33.21	46.00	-26.05	16.22	2.63	32.11	100	164	Peak
715.80	27.07	36.61	46.00	-18.93	19.46	3.11	32.11	134	105	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   Margin value = Emission level – Limit value

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	30 MHz ~ 1 GHz
Input Power	24Vdc	Detector Function	Peak (PK) Quasi-peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Karl Lee
Test Mode	B		

Antennal Polarity & Test Distance: Horizontal at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
73.20	25.86	48.19	40.00	-14.14	8.78	1.11	32.22	163	150	Peak
118.83	28.16	48.74	43.50	-15.34	10.39	1.28	32.25	195	162	Peak
244.38	27.10	45.18	46.00	-18.90	12.19	1.85	32.12	131	148	Peak
349.70	23.63	39.29	46.00	-22.37	14.22	2.19	32.07	162	118	Peak
557.60	18.88	31.08	46.00	-27.12	17.24	2.76	32.20	190	126	Peak
750.80	26.56	35.66	46.00	-19.44	19.82	3.22	32.14	125	245	Peak
Antennal Polarity & Test Distance: Vertical at 3 m										
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
38.64	32.95	51.26	40.00	-7.05	13.18	0.74	32.23	174	115	Peak
115.86	25.53	45.43	43.50	-17.97	11.07	1.28	32.25	200	144	Peak
192.00	33.77	53.67	43.50	-9.73	10.75	1.61	32.26	165	216	Peak
324.50	26.87	43.21	46.00	-19.13	13.65	2.11	32.10	166	124	Peak
701.80	23.18	32.89	46.00	-22.82	19.27	3.11	32.09	187	124	Peak
904.10	24.63	31.07	46.00	-21.37	21.48	3.53	31.45	131	65	Peak

Remarks:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
   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.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Nov. 21, 2016	Nov. 20, 2017
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond1-01	Dec. 22, 2016	Dec. 21, 2017
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Mar. 10, 2017	Mar. 09, 2018
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Aug. 15, 2017	Aug. 14, 2018
Software ADT	BV ADT_Cond_ V7.3.7.3	NA	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Shielded Room 1.
3. The VCCI Site Registration No. is C-2040.

4.2.3 Test Procedures

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

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

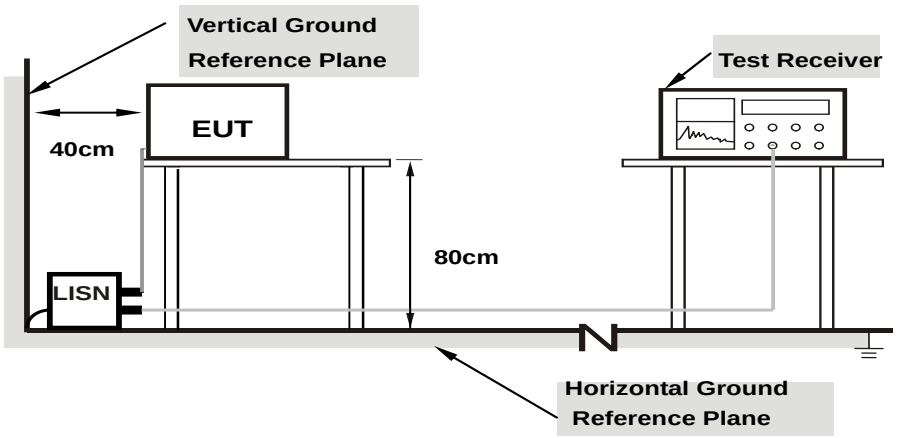
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



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

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

4.2.6 EUT Operating Conditions

Same as 4.1.6.

4.2.7 Test Results

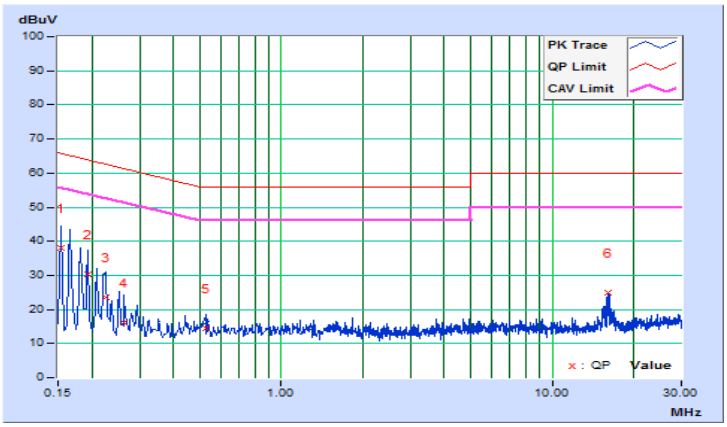
Worst-case data: 802.11b

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

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	0.15391	10.45	27.58	10.14	38.03	20.59	65.79	55.79	-27.76	-35.20
2	0.19301	10.45	19.72	5.73	30.17	16.18	63.91	53.91	-33.74	-37.73
3	0.22429	10.46	12.96	8.64	23.42	19.10	62.66	52.66	-39.24	-33.56
4	0.26346	10.47	5.68	1.05	16.15	11.52	61.32	51.32	-45.17	-39.80
5	0.52536	10.51	4.05	1.31	14.56	11.82	56.00	46.00	-41.44	-34.18
6	**16.16536**	**11.23**	**13.68**	**12.02**	**24.91**	**23.25**	**60.00**	**50.00**	**-35.09**	**-26.75**

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.

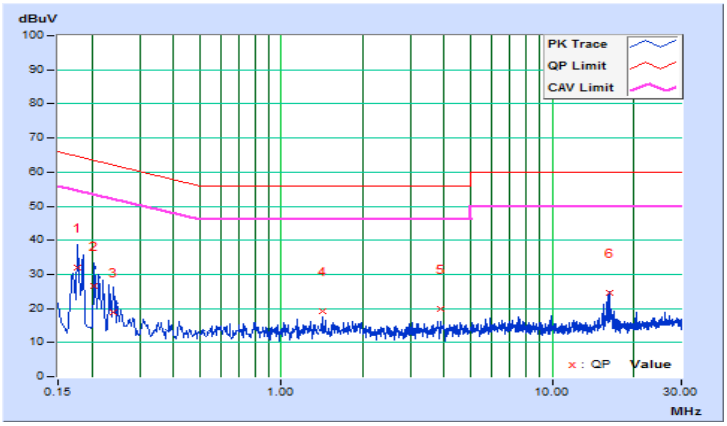


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	A		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.17737	10.21	21.83	13.67	32.04	23.88	64.61	54.61	-32.57	-30.73
2	0.20474	10.22	16.26	7.12	26.48	17.34	63.42	53.42	-36.94	-36.08
3	0.23993	10.23	8.58	1.18	18.81	11.41	62.10	52.10	-43.29	-40.69
4	1.42857	10.28	8.89	2.64	19.17	12.92	56.00	46.00	-36.83	-33.08
5	3.89187	10.40	9.33	3.67	19.73	14.07	56.00	46.00	-36.27	-31.93
6	16.22792	10.91	13.76	12.03	24.67	22.94	60.00	50.00	-35.33	-27.06

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.

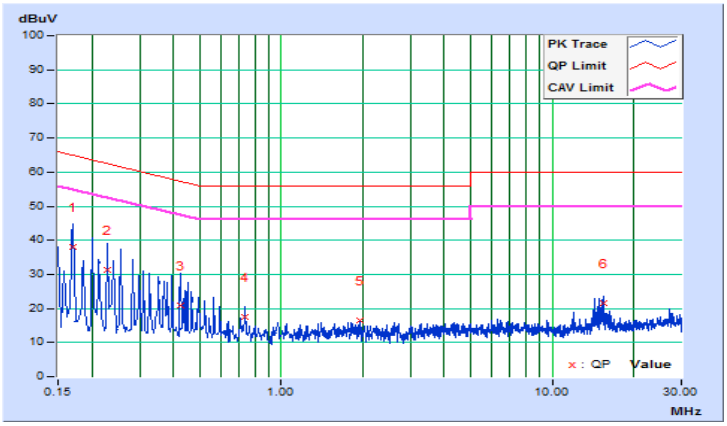


Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16955	10.45	27.49	12.38	37.94	22.83	64.98	54.98	-27.04	-32.15
2	0.22820	10.46	20.78	10.64	31.24	21.10	62.51	52.51	-31.27	-31.41
3	0.42370	10.51	10.41	5.40	20.92	15.91	57.38	47.38	-36.46	-31.47
4	0.73259	10.50	7.01	4.43	17.51	14.93	56.00	46.00	-38.49	-31.07
5	1.96424	10.52	5.88	2.55	16.40	13.07	56.00	46.00	-39.60	-32.93
6	15.43419	11.20	10.42	6.34	21.62	17.54	60.00	50.00	-38.38	-32.46

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.

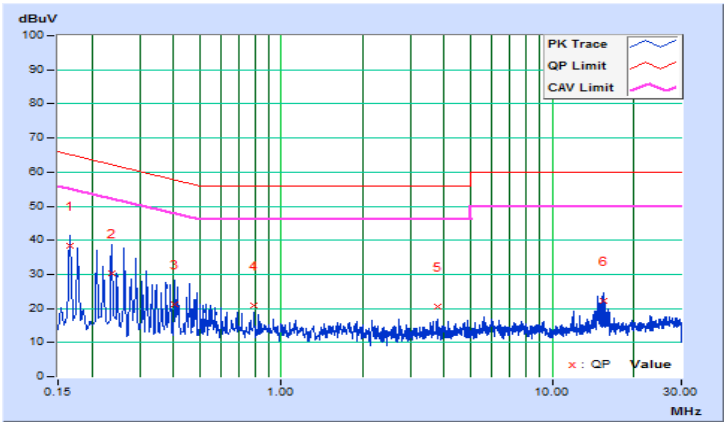


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B		

No	Freq.	Corr. Factor	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16564	10.21	28.09	12.80	38.30	23.01	65.18	55.18	-26.88	-32.17
2	0.23602	10.23	20.24	11.99	30.47	22.22	62.24	52.24	-31.77	-30.02
3	0.40415	10.24	11.03	5.33	21.27	15.57	57.77	47.77	-36.50	-32.20
4	0.79515	10.25	10.61	4.47	20.86	14.72	56.00	46.00	-35.14	-31.28
5	3.77457	10.40	10.07	3.56	20.47	13.96	56.00	46.00	-35.53	-32.04
6	15.43419	10.88	11.30	7.38	22.18	18.26	60.00	50.00	-37.82	-31.74

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.

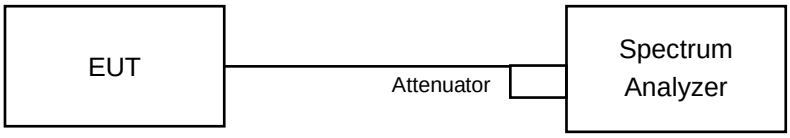


4.3 6dB Bandwidth Measurement

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

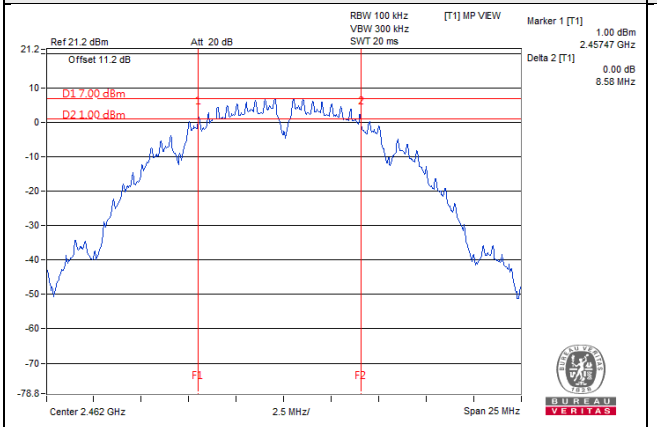
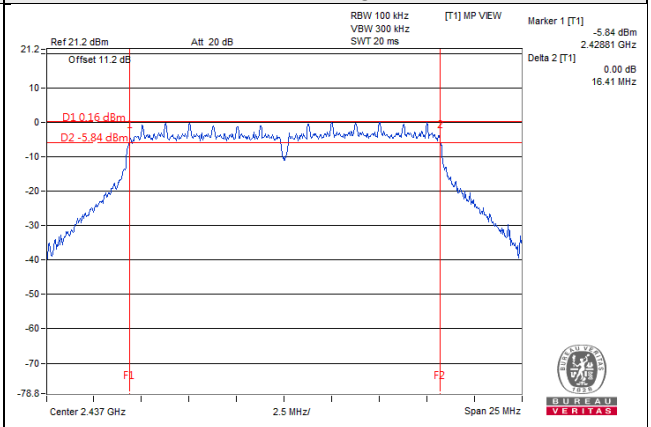
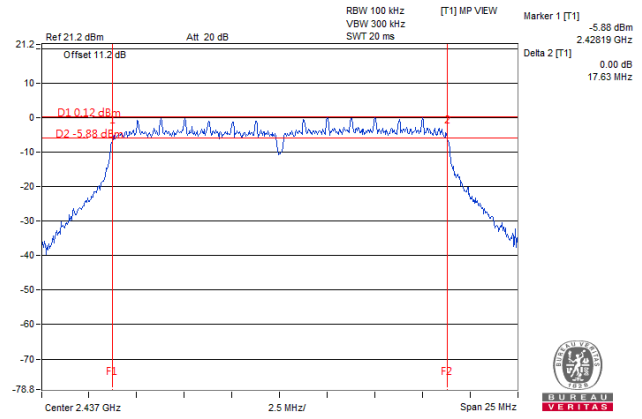
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	8.56	0.5	Pass
6	2437	8.11	0.5	Pass
11	2462	8.58	0.5	Pass

802.11g

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	16.39	0.5	Pass
6	2437	16.41	0.5	Pass
11	2462	16.38	0.5	Pass

802.11n (HT20)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	17.61	0.5	Pass
6	2437	17.63	0.5	Pass
11	2462	17.62	0.5	Pass

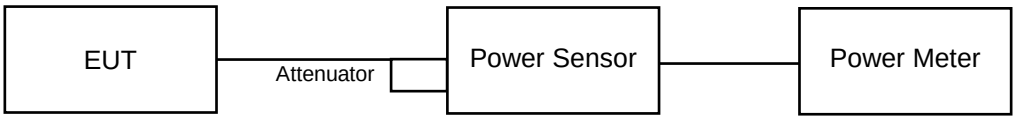
Spectrum Plot of Worst Value	
802.11b	802.11g
	
802.11n (HT20)	
	

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)

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

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

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

For Peak Power

802.11b

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	54.828	17.39	30.00	Pass
6	2437	53.456	17.28	30.00	Pass
11	2462	54.075	17.33	30.00	Pass

802.11g

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	78.163	18.93	30.00	Pass
6	2437	81.470	19.11	30.00	Pass
11	2462	75.683	18.79	30.00	Pass

802.11n (HT20)

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	77.268	18.88	30.00	Pass
6	2437	**83.753**	19.23	30.00	Pass
11	2462	78.524	18.95	30.00	Pass

For Average Power

802.11b

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	31.046	14.92
6	2437	30.690	14.87
11	2462	30.200	14.80

802.11g

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	12.162	10.85
6	2437	12.388	10.93
11	2462	11.967	10.78

802.11n (HT20)

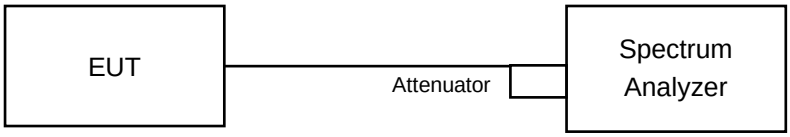
Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	12.106	10.83
6	2437	12.359	10.92
11	2462	12.246	10.88

4.5 Power Spectral Density Measurement

4.5.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8dBm.

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

a. Set analyzer center frequency to DTS channel center frequency.

b. Set the span to 1.5 times the DTS bandwidth.

c. Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.

d. Set the VBW ≥ 3 × RBW.

e. Detector = peak.

f. Sweep time = auto couple.

g. Trace mode = max hold.

h. Allow trace to fully stabilize.

i. Use the peak marker function to determine the maximum amplitude level within the RBW.

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

Same as item 4.3.6

4.5.7 Test Results

802.11b

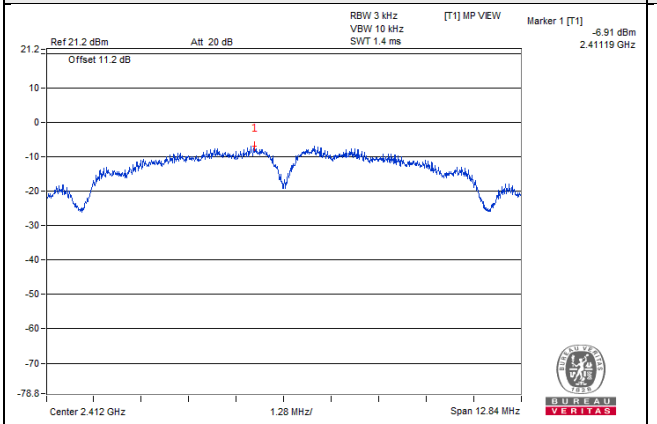
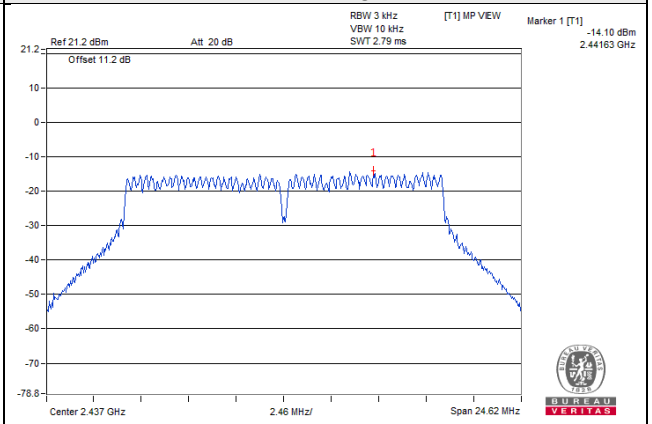
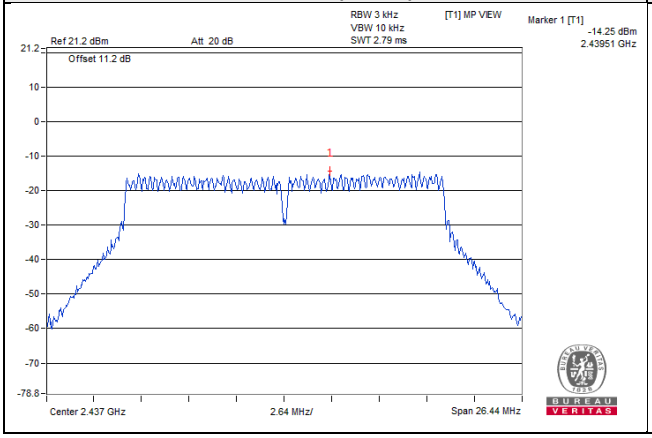
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
1	2412	-6.91	8.00	Pass
6	2437	-6.99	8.00	Pass
11	2462	-7.26	8.00	Pass

802.11g

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
1	2412	-14.85	8.00	Pass
6	2437	-14.10	8.00	Pass
11	2462	-14.40	8.00	Pass

802.11n (HT20)

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
1	2412	-14.53	8.00	Pass
6	2437	-14.25	8.00	Pass
11	2462	-14.53	8.00	Pass

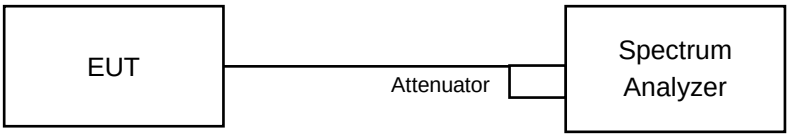
Spectrum Plot of Worst Value	
802.11b	802.11g
	
802.11n (HT20)	
	

4.6 Conducted Out of Band Emission Measurement

4.6.1 Limits of Conducted Out of Band Emission Measurement

Below 20dB 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

a. Set the RBW = 100 kHz.
b. Set the VBW ≥ 300 kHz.
c. Detector = peak.
d. Sweep time = auto couple.
e. Trace mode = max hold.
f. Allow trace to fully stabilize.
g. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

MEASUREMENT PROCEDURE OOBE

a. Set RBW = 100 kHz.
b. Set VBW ≥ 300 kHz.
c. Detector = peak.
d. Sweep = auto couple.
e. Trace Mode = max hold.
f. Allow trace to fully stabilize.
g. Use the peak marker function to determine the maximum amplitude level.

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

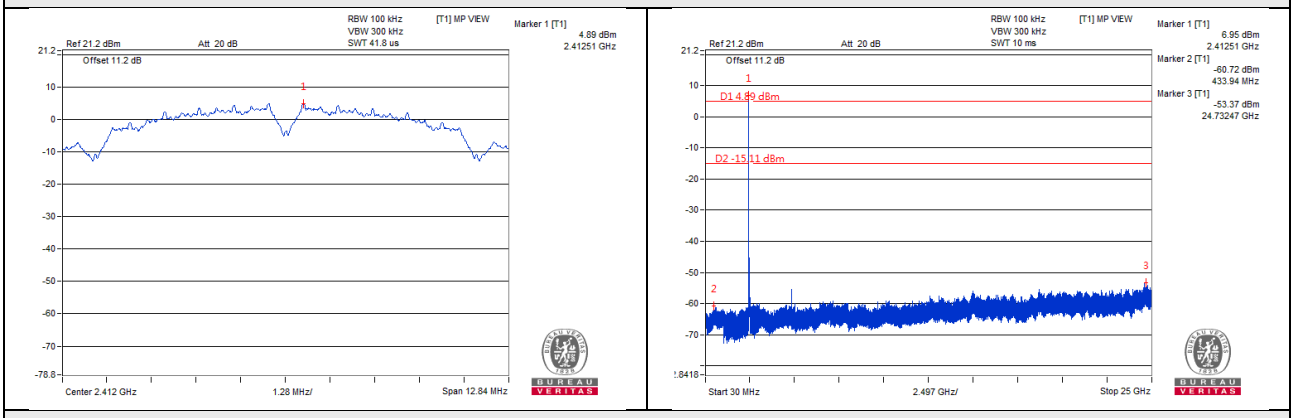
Same as item 4.3.6

4.6.7 Test Results

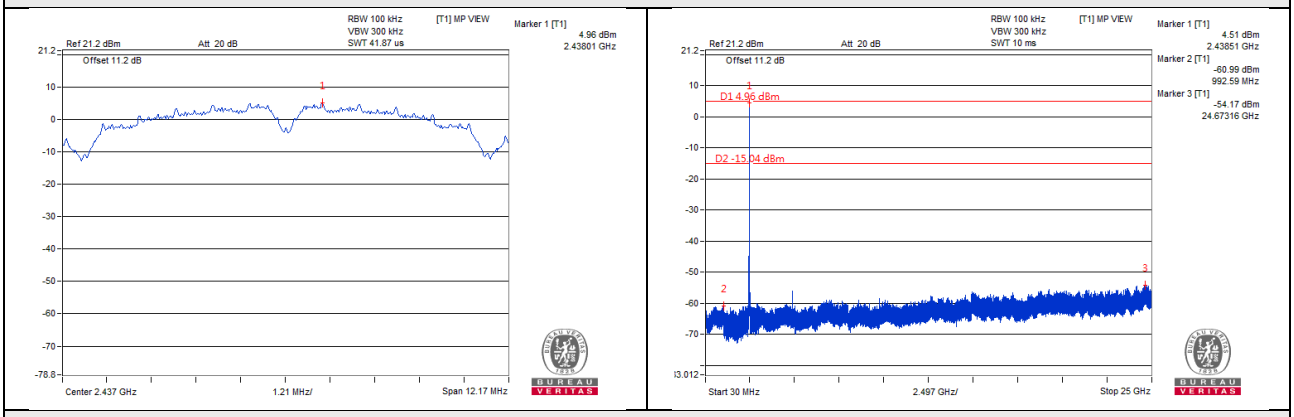
The conducted emission test is performed on each TX port of operating mode without summing or adding 10log (N) since the limit is relative emission limit.
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

802.11b

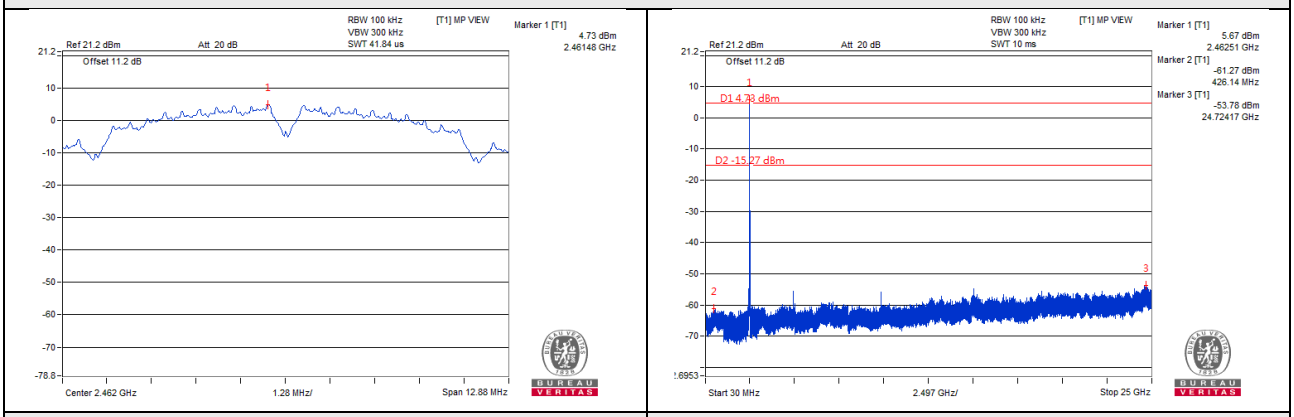
CH 1



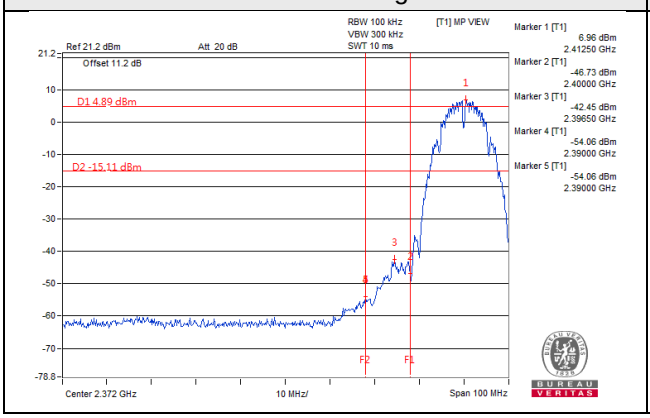
CH 6



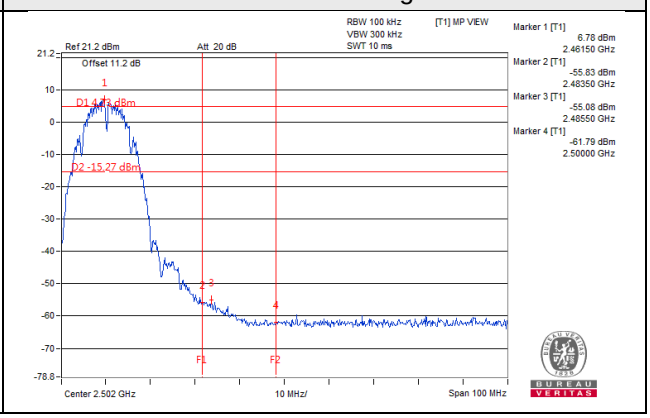
CH 11



CH 1 Band edge

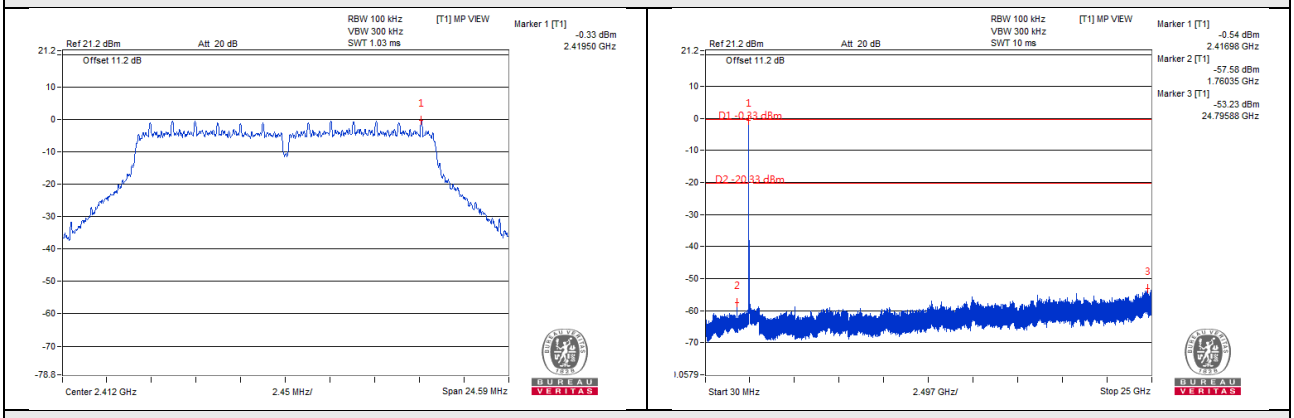


CH 11 Band edge

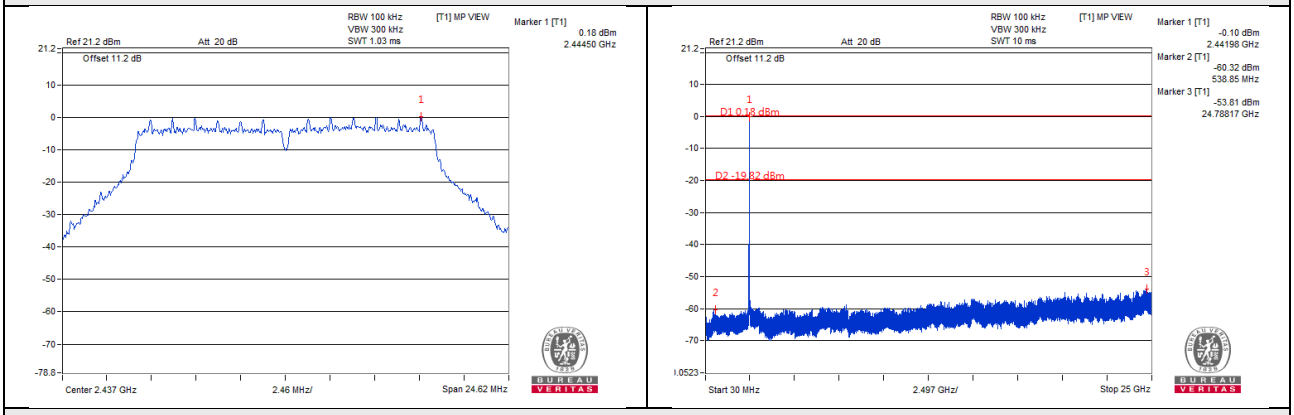


802.11g

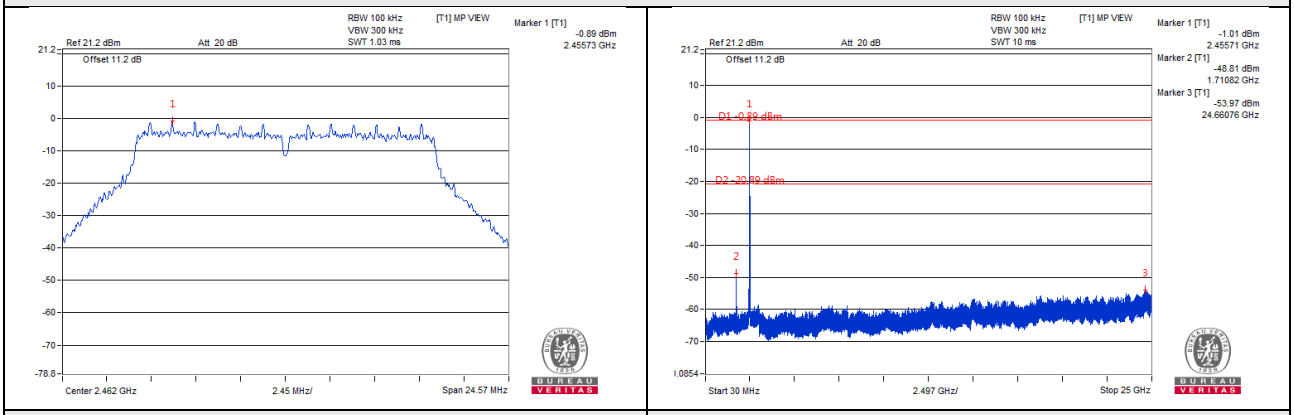
CH 1



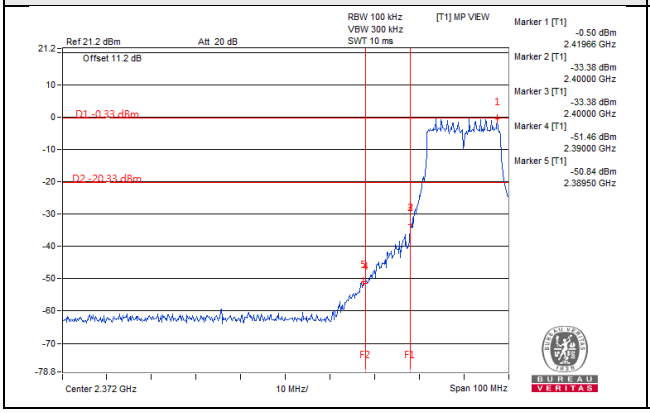
CH 6



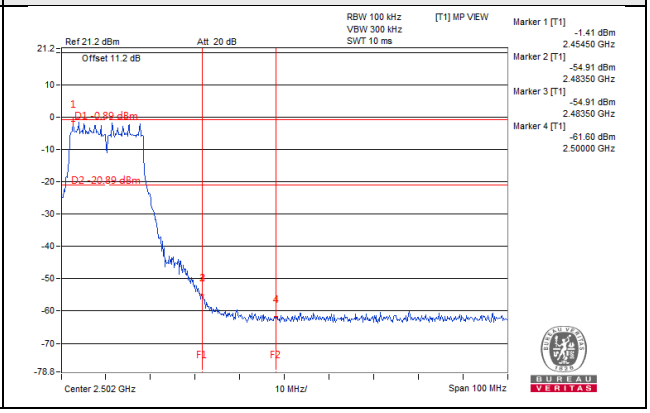
CH 11



CH 1 Band edge

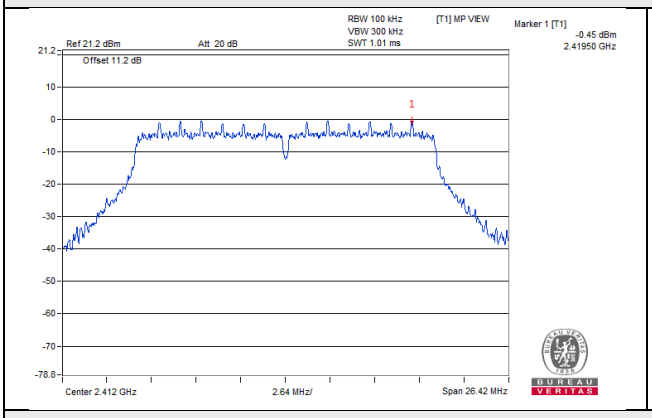


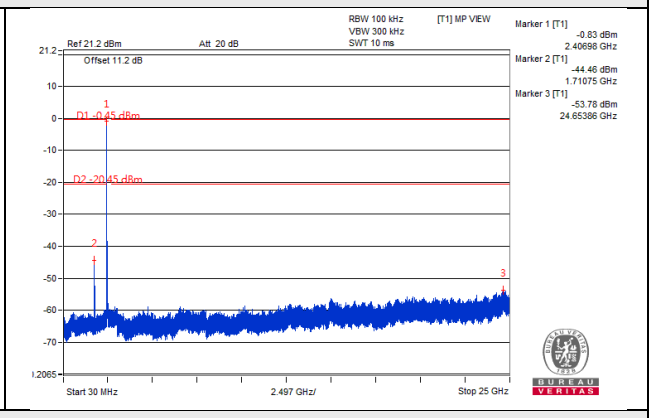
CH 11 Band edge



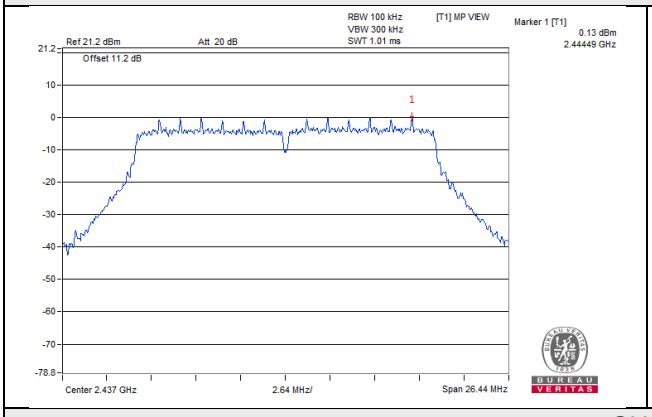
802.11n (HT20)

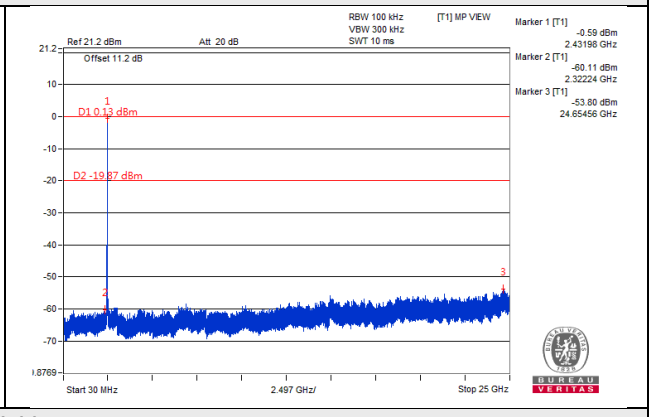
CH 1



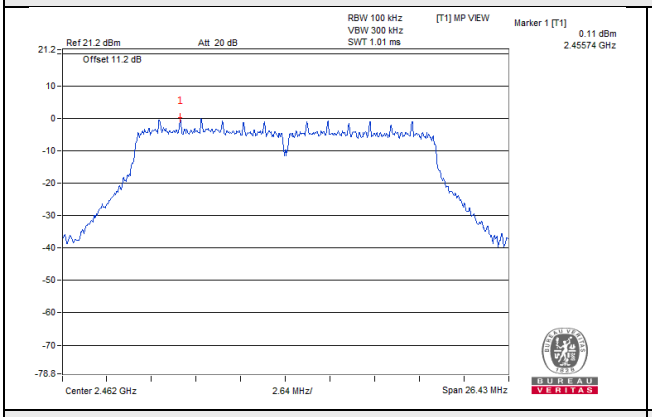


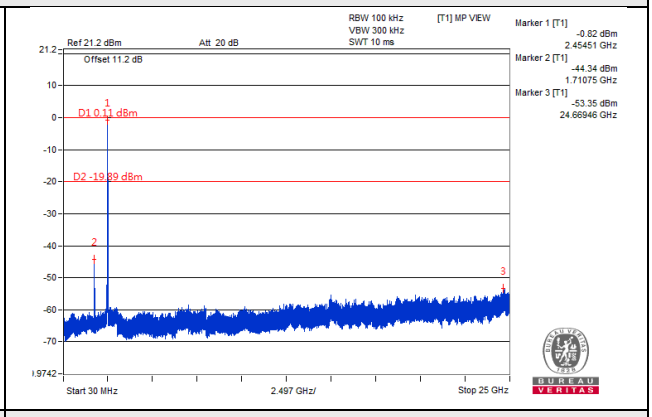
CH 6



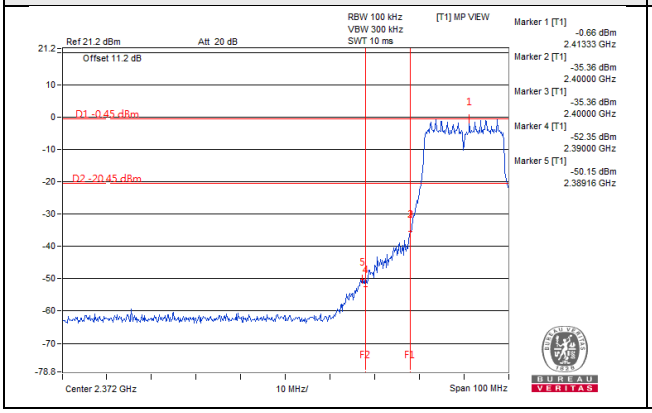


CH 11

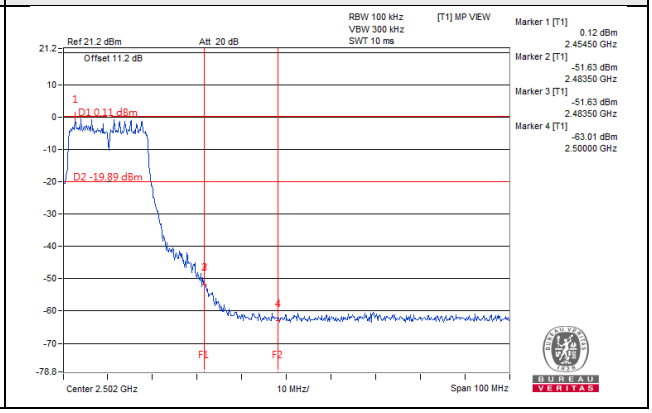




CH 1 Band edge



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 and approved according to ISO/IEC 17025.

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

Linko 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 ---