

FCC Test Report

Report No.: RF190220D10

FCC ID: RK9-CGA0112

Test Model: CGA0112

Received Date: Feb. 20, 2019

Test Date: Mar. 11 to 26, 2019

Issued Date: Apr. 1, 2019

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(R.O.C.)

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Release Control Record

Issue No.	Description	Date Issued
RF190220D10	Original release.	Apr. 1, 2019

1 Certificate of Conformity

Product: DOCSIS3.0 Wireless Cable modem Router
Brand: Technicolor
Test Model: CGA0112
Sample Status: Engineering sample
Applicant: CastleNet Technology Inc.
Test Date: Mar. 11 to 26, 2019
Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)
ANSI C63.10: 2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

Prepared by : Annie Chang, **Date:** Apr. 1, 2019
Annie Chang / Senior Specialist

Approved by : Rex Lai, **Date:** Apr. 1, 2019
Rex Lai / Associate Technical Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -9.40dB at 0.15000MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -1.04dB at 2483.50MHz.
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.

Note:

Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

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

Measurement	Frequency	Expanded Uncertainty (k=2) ($\pm$)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.79 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	2.38 dB
	30MHz ~ 1000MHz	5.54 dB
Radiated Emissions above 1 GHz	Above 1GHz	5.48 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	DOCSIS3.0 Wireless Cable modem Router
Brand	Technicolor
Test Model	CGA0112
Status of EUT	Engineering sample
Power Supply Rating	DC 12V from Adapter
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: up to 11Mbps 802.11g: up to 54Mbps 802.11n: up to 300Mbps
Operating Frequency	2.412 ~ 2.462GHz
Number of Channel	11 for 802.11b, 802.11g, 802.11n (20MHz) 7 for 802.11n (40MHz)
Output Power	280.275mW
Antenna Type	Ant.1: Metal antenna with 2.67dBi gain Ant.2: Metal antenna with 2.90dBi gain
Antenna Connector	N/A
Accessory Device	Adapter
Data Cable Supplied	N/A

Note:

1. The EUT provides 2 completed transmitters and 2 receivers.

Modulation Mode	TX Function
802.11b	2TX
802.11g	2TX
802.11n (20MHz)	2TX
802.11n (40MHz)	2TX

2. The EUT consumes power from a switching power adapter, which has several models could be chosen, as the following:

Adapter	Brand	Model No.	Specification
1	HONOTO	ADS-24FQ-12 12021EPCU	AC I/P: 100-240V, 50/60Hz, 0.7A DC O/P: 12V, 1.75A AC 2 Pin, Non-shielded DC cable (1.4m)
2	HONOTO	ADS-24FQ-12 12021EPCU-L	AC I/P: 100-120V, 50/60Hz, 0.7A DC O/P: 12V, 1.75A AC 2 Pin, Non-shielded DC cable (1.4m)

After pre-tested, the **adapter 2** was the worst for final test.

3. 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 (20MHz):

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 (40MHz):

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

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE $\geq$ 1G	RE<1G	PLC	APCM	
-	√	√	√	√	-

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

NOTE: 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)
-	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1
-	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6
-	802.11n (20MHz)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
-	802.11n (40MHz)	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.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	802.11g	1 to 11	6	OFDM	BPSK	6

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)
-	802.11g	1 to 11	6	OFDM	BPSK	6

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)
-	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1
-	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6
-	802.11n (20MHz)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
-	802.11n (40MHz)	3 to 9	3, 6, 9	OFDM	BPSK	13.5

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested By
RE$\geq$1G	25deg. C, 76%RH	120Vac, 60Hz	Dalen Dai
RE<1G	23deg. C, 69%RH	120Vac, 60Hz	Dalen Dai
PLC	25deg. C, 75%RH	120Vac, 60Hz	Dalen Dai
APCM	25deg. C, 76%RH	120Vac, 60Hz	Saxon Lee

3.3 Duty Cycle of Test Signal

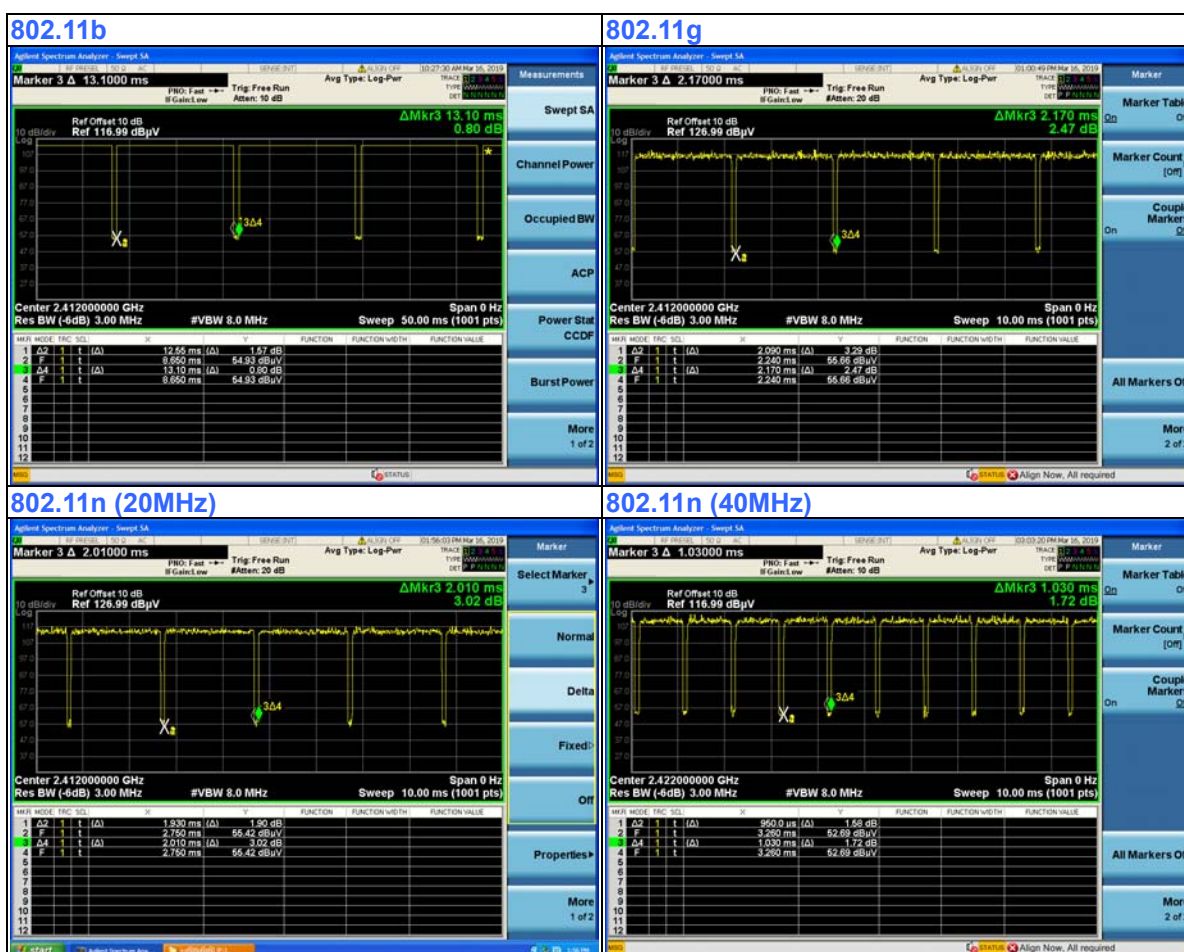
If duty cycle of test signal is < 98%, duty factor shall be considered.

802.11b: Duty cycle = 12.55/13.10 = 0.958, Duty factor = $10 * \log(1/0.958) = 0.19$

802.11g: Duty cycle = 2.09/2.17 = 0.963, Duty factor = $10 * \log(1/0.963) = 0.16$

802.11n (20MHz): Duty cycle = 1.93/2.01 = 0.960, Duty factor = $10 * \log(1/0.960) = 0.18$

802.11n (40MHz): Duty cycle = 0.95/1.03 = 0.922, Duty factor = $10 * \log(1/0.922) = 0.35$



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.	Notebook PC	DELL	E5410	BW33YM1	FCC DoC Approved	Provided by Lab

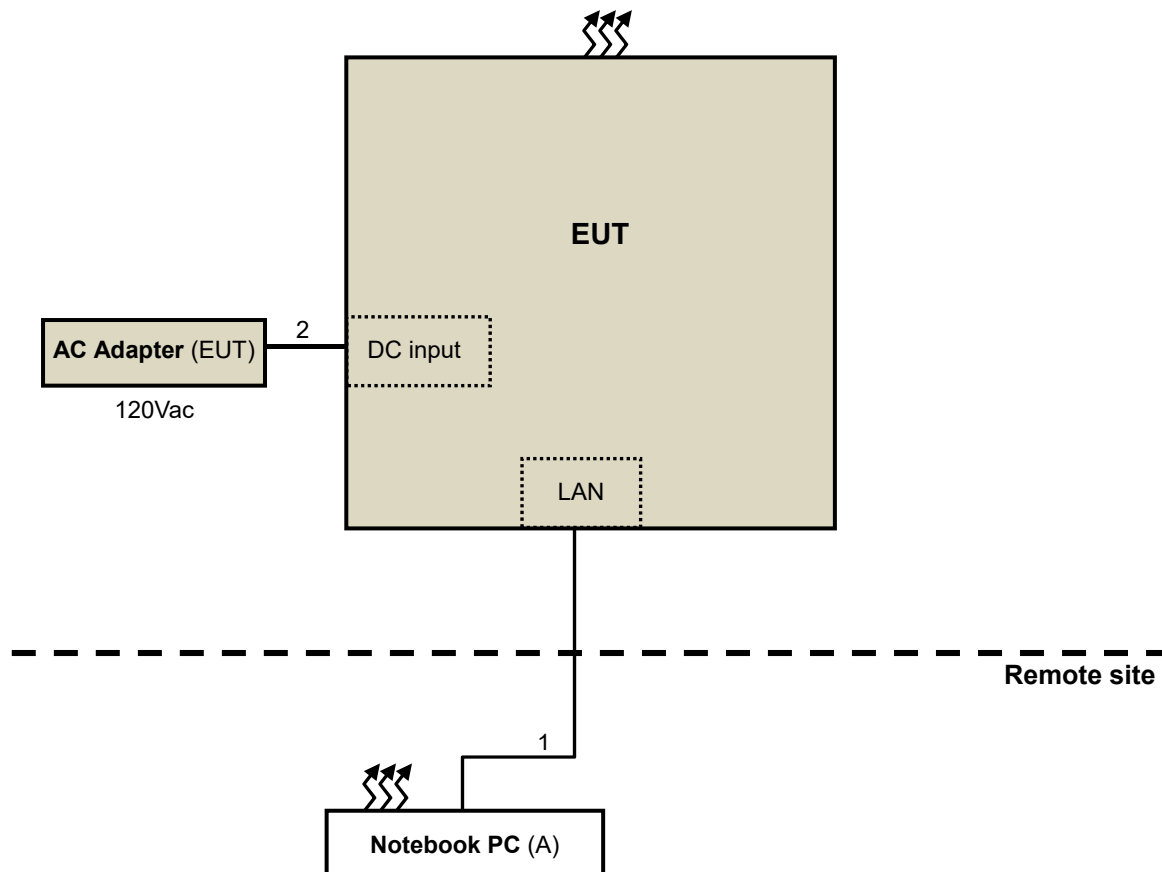
Note:

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

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	LAN cable	1	3	N	0	Provided by Lab
2.	DC cable	1	3	N	0	Supplied by client

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

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standards

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

FCC Part 15, Subpart C (15.247)

KDB 558074 D01 15.247 Meas Guidance v05r01

KDB 662911 D01 Multiple Transmitter Output v02r01

ANSI C63.10-2013

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

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

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

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

NOTE:

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

4.1.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
HP Preamplifier	8447D	2432A03504	Feb. 20, 2019	Feb. 19, 2020
HP Preamplifier	8449B	3008A01201	Feb. 21, 2019	Feb. 20, 2020
MITEQ Preamplifier	AMF-6F-260400-33-8P	892164	Feb. 20, 2019	Feb. 19, 2020
Agilent TEST RECEIVER	N9038A	MY51210129	Mar. 05, 2019	Mar. 04, 2020
Schwarzbeck Antenna	VULB 9168	139	Nov. 26, 2018	Nov. 25, 2019
Schwarzbeck Antenna	VHBA 9123	480	May 19, 2017	May 18, 2019
Schwarzbeck Horn Antenna	BBHA-9170	212	Nov. 25, 2018	Nov. 24, 2019
Schwarzbeck Horn Antenna	BBHA 9120-D1	D130	Nov. 25, 2018	Nov. 24, 2019
ADT. Turn Table	TT100	0306	NA	NA
ADT. Tower	AT100	0306	NA	NA
Software	Radiated_V7.6.15.9.5	NA	NA	NA
SUHNER RF cable With 4dB PAD	SF102	Cable-CH6-01	Aug. 13, 2018	Aug. 12, 2019
SUHNER RF cable With 3/4dB PAD	SF102	Cable-CH8-3.6m	Aug. 13, 2018	Aug. 12, 2019
KEYSIGHT MIMO Powermeasurement Test set	U2021XA	U2021XA-001	Jun. 4, 2018	Jun. 3, 2019
KEYSIGHT Spectrum Analyzer	N9030A	MY54490260	Aug. 3, 2018	Aug. 2, 2019
Loop Antenna EMCI	LPA600	270	Aug. 11, 2017	Aug. 10, 2019
EMCO Horn Antenna	3115	00028257	Nov. 25, 2018	Nov. 24, 2019
Highpass filter Wainwright Instruments	WHK 3.1/18G-10SS	SN 8	NA	NA
ROHDE & SCHWARZ Spectrum Analyzer	FSV40	101042	Sep. 27, 2018	Sep. 26, 2019
Anritsu Power Sensor	MA2411B	0738404	Apr. 26, 2018	Apr. 25, 2019
Anritsu Power Meter	ML2495A	0842014	Apr. 26, 2018	Apr. 25, 2019

- 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 horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in Chamber No. 6.
4. The Industry Canada Reference No. IC 7450E-6.

4.1.3 Test Procedures

For Radiated emission below 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

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

For Radiated emission above 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

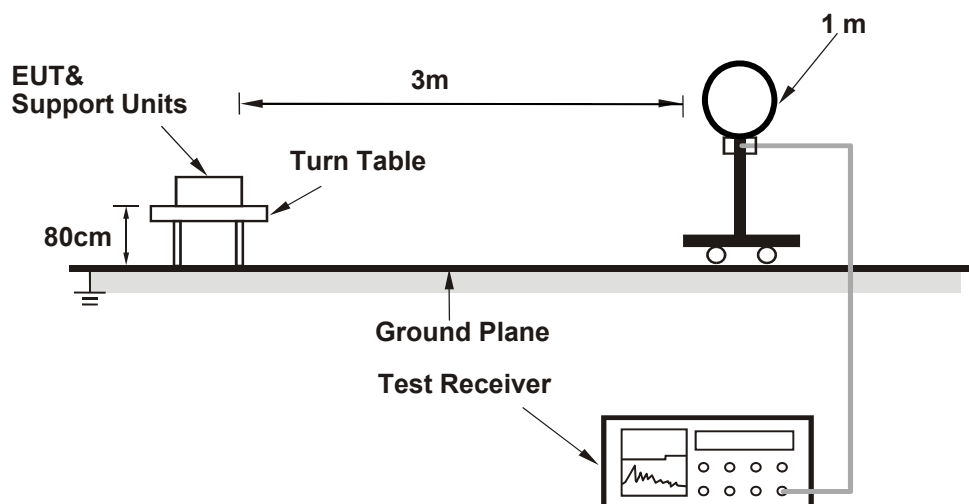
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

4.1.4 Deviation from Test Standard

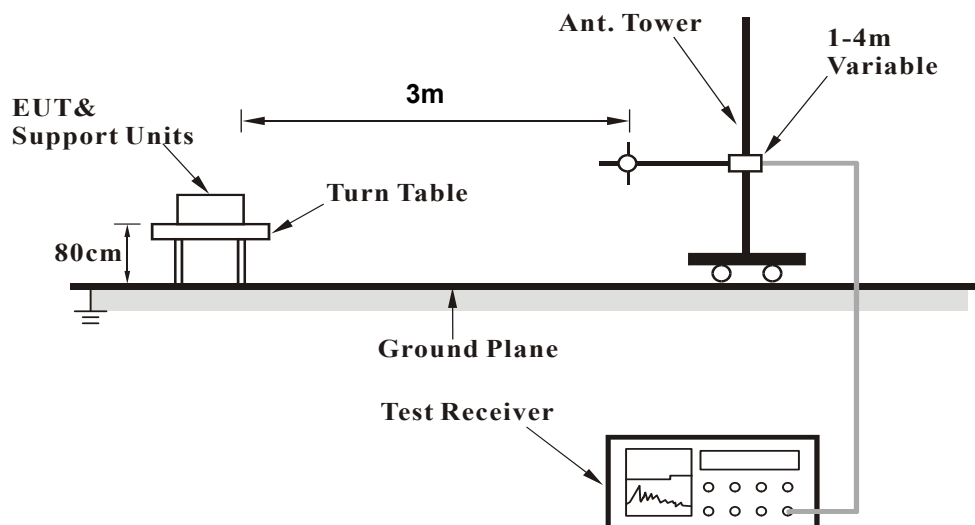
No deviation.

4.1.5 Test Setup

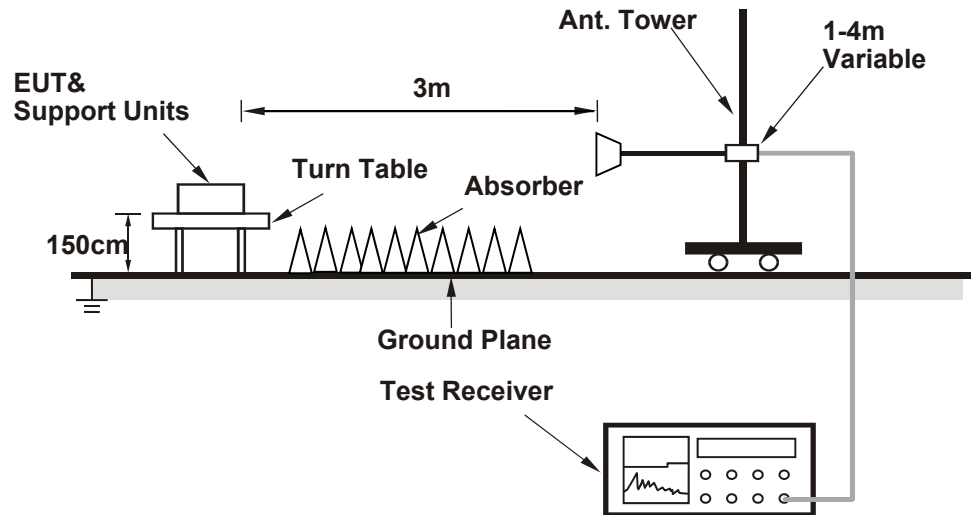
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



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

4.1.6 EUT Operating Conditions

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

4.1.7 Test Results

Above 1GHz Data :

802.11b

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	60.93 PK	74.00	-13.07	2.20 H	195	61.15	-0.22
2	2390.00	48.73 AV	54.00	-5.27	2.20 H	195	48.95	-0.22
3	*2412.00	110.72 PK			2.20 H	195	110.93	-0.21
4	*2412.00	107.65 AV			2.20 H	195	107.86	-0.21
5	4824.00	47.24 PK	74.00	-26.76	1.63 H	227	40.86	6.38
6	4824.00	35.31 AV	54.00	-18.69	1.63 H	227	28.93	6.38
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	59.55 PK	74.00	-14.45	3.74 V	87	59.77	-0.22
2	2390.00	46.41 AV	54.00	-7.59	3.74 V	87	46.63	-0.22
3	*2412.00	105.83 PK			3.74 V	87	106.04	-0.21
4	*2412.00	102.82 AV			3.74 V	87	103.03	-0.21
5	4824.00	46.90 PK	74.00	-27.10	1.82 V	306	40.52	6.38
6	4824.00	34.03 AV	54.00	-19.97	1.82 V	306	27.65	6.38

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	110.71 PK			1.80 H	178	110.91	-0.20
2	*2437.00	107.78 AV			1.80 H	178	107.98	-0.20
3	4874.00	46.97 PK	74.00	-27.03	1.58 H	231	40.79	6.18
4	4874.00	34.96 AV	54.00	-19.04	1.58 H	231	28.78	6.18

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	105.61 PK			3.67 V	96	105.81	-0.20
2	*2437.00	102.39 AV			3.67 V	96	102.59	-0.20
3	4874.00	46.51 PK	74.00	-27.49	1.79 V	311	40.33	6.18
4	4874.00	33.70 AV	54.00	-20.30	1.79 V	311	27.52	6.18

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	110.68 PK			1.87 H	182	110.86	-0.18
2	*2462.00	107.59 AV			1.87 H	182	107.77	-0.18
3	2483.50	61.12 PK	74.00	-12.88	1.87 H	182	61.28	-0.16
4	2483.50	48.08 AV	54.00	-5.92	1.87 H	182	48.24	-0.16
5	4924.00	46.86 PK	74.00	-27.14	1.66 H	217	40.75	6.11
6	4924.00	34.91 AV	54.00	-19.09	1.66 H	217	28.80	6.11
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	105.93 PK			3.51 V	73	106.11	-0.18
2	*2462.00	102.87 AV			3.51 V	73	103.05	-0.18
3	2483.50	58.13 PK	74.00	-15.87	3.51 V	73	58.29	-0.16
4	2483.50	46.14 AV	54.00	-7.86	3.51 V	73	46.30	-0.16
5	4924.00	46.68 PK	74.00	-27.32	1.82 V	301	40.57	6.11
6	4924.00	33.81 AV	54.00	-20.19	1.82 V	301	27.70	6.11

REMARKS:

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

802.11g

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	72.82 PK	74.00	-1.18	1.82 H	181	73.04	-0.22
2	2390.00	52.76 AV	54.00	-1.24	1.82 H	181	52.98	-0.22
3	*2412.00	117.10 PK			1.82 H	181	117.31	-0.21
4	*2412.00	106.82 AV			1.82 H	181	107.03	-0.21
5	4824.00	46.59 PK	74.00	-27.41	1.43 H	250	40.21	6.38
6	4824.00	34.33 AV	54.00	-19.67	1.43 H	250	27.95	6.38

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	69.89 PK	74.00	-4.11	3.75 V	268	70.11	-0.22
2	2390.00	47.42 AV	54.00	-6.58	3.75 V	268	47.64	-0.22
3	*2412.00	109.77 PK			3.75 V	268	109.98	-0.21
4	*2412.00	99.41 AV			3.75 V	268	99.62	-0.21
5	4824.00	46.32 PK	74.00	-27.68	2.03 V	320	39.94	6.38
6	4824.00	33.65 AV	54.00	-20.35	2.03 V	320	27.27	6.38

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	120.57 PK			1.77 H	181	120.77	-0.20
2	*2437.00	110.56 AV			1.77 H	181	110.76	-0.20
3	2483.50	69.45 PK	74.00	-4.55	1.77 H	181	69.61	-0.16
4	2483.50	52.89 AV	54.00	-1.11	1.77 H	181	53.05	-0.16
5	4874.00	47.85 PK	74.00	-26.15	1.52 H	245	41.67	6.18
6	4874.00	35.52 AV	54.00	-18.48	1.52 H	245	29.34	6.18
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	112.63 PK			3.72 V	277	112.83	-0.20
2	*2437.00	102.55 AV			3.72 V	277	102.75	-0.20
3	2483.50	65.27 PK	74.00	-8.73	3.72 V	277	65.43	-0.16
4	2483.50	51.06 AV	54.00	-2.94	3.72 V	277	51.22	-0.16
5	4874.00	46.71 PK	74.00	-27.29	1.82 V	298	40.53	6.18
6	4874.00	34.96 AV	54.00	-19.04	1.82 V	298	28.78	6.18

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	115.93 PK			1.80 H	176	116.11	-0.18
2	*2462.00	105.51 AV			1.80 H	176	105.69	-0.18
3	2483.50	72.85 PK	74.00	-1.15	1.80 H	176	73.01	-0.16
4	2483.50	51.96 AV	54.00	-2.04	1.80 H	176	52.12	-0.16
5	4924.00	46.29 PK	74.00	-27.71	1.47 H	236	40.18	6.11
6	4924.00	33.95 AV	54.00	-20.05	1.47 H	236	27.84	6.11
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	108.35 PK			3.77 V	271	108.53	-0.18
2	*2462.00	95.24 AV			3.77 V	271	95.42	-0.18
3	2483.50	68.98 PK	74.00	-5.02	3.77 V	271	69.14	-0.16
4	2483.50	49.81 AV	54.00	-4.19	3.77 V	271	49.97	-0.16
5	4924.00	45.96 PK	74.00	-28.04	1.91 V	310	39.85	6.11
6	4924.00	33.41 AV	54.00	-20.59	1.91 V	310	27.30	6.11

REMARKS:

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

802.11n (20MHz)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	72.76 PK	74.00	-1.24	1.79 H	180	72.98	-0.22
2	2390.00	52.22 AV	54.00	-1.78	1.79 H	180	52.44	-0.22
3	*2412.00	116.37 PK			1.79 H	180	116.58	-0.21
4	*2412.00	115.51 AV			1.79 H	180	115.72	-0.21
5	4824.00	46.51 PK	74.00	-27.49	1.52 H	234	40.13	6.38
6	4824.00	34.26 AV	54.00	-19.74	1.52 H	234	27.88	6.38

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	69.54 PK	74.00	-4.46	3.68 V	275	69.76	-0.22
2	2390.00	47.30 AV	54.00	-6.70	3.68 V	275	47.52	-0.22
3	*2412.00	108.10 PK			3.68 V	275	108.31	-0.21
4	*2412.00	97.04 AV			3.68 V	275	97.25	-0.21
5	4824.00	46.13 PK	74.00	-27.87	2.11 V	327	39.75	6.38
6	4824.00	33.60 AV	54.00	-20.40	2.11 V	327	27.22	6.38

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	120.08 PK			1.76 H	182	120.28	-0.20
2	*2437.00	109.87 AV			1.76 H	182	110.07	-0.20
3	2483.50	72.76 PK	74.00	-1.24	1.76 H	182	72.92	-0.16
4	2483.50	52.81 AV	54.00	-1.19	1.76 H	182	52.97	-0.16
5	4874.00	47.70 PK	74.00	-26.30	1.47 H	242	41.52	6.18
6	4874.00	35.45 AV	54.00	-18.55	1.47 H	242	29.27	6.18
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	111.76 PK			3.77 V	270	111.96	-0.20
2	*2437.00	101.64 AV			3.77 V	270	101.84	-0.20
3	2483.50	68.97 PK	74.00	-5.03	3.77 V	270	69.13	-0.16
4	2483.50	50.28 AV	54.00	-3.72	3.77 V	270	50.44	-0.16
5	4874.00	46.54 PK	74.00	-27.46	1.85 V	303	40.36	6.18
6	4874.00	34.79 AV	54.00	-19.21	1.85 V	303	28.61	6.18

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	114.44 PK			1.69 H	178	114.62	-0.18
2	*2462.00	103.56 AV			1.69 H	178	103.74	-0.18
3	2483.50	72.92 PK	74.00	-1.08	1.69 H	178	73.08	-0.16
4	2483.50	51.01 AV	54.00	-2.99	1.69 H	178	51.17	-0.16
5	4924.00	46.18 PK	74.00	-27.82	1.39 H	244	40.07	6.11
6	4924.00	33.74 AV	54.00	-20.26	1.39 H	244	27.63	6.11
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	106.00 PK			3.75 V	266	106.18	-0.18
2	*2462.00	96.25 AV			3.75 V	266	96.43	-0.18
3	2483.50	68.07 PK	74.00	-5.93	3.75 V	266	68.23	-0.16
4	2483.50	48.38 AV	54.00	-5.62	3.75 V	266	48.54	-0.16
5	4924.00	45.83 PK	74.00	-28.17	1.96 V	289	39.72	6.11
6	4924.00	33.29 AV	54.00	-20.71	1.96 V	289	27.18	6.11

REMARKS:

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

802.11n (40MHz)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	72.90 PK	74.00	-1.10	1.80 H	181	73.12	-0.22
2	2390.00	52.74 AV	54.00	-1.26	1.80 H	181	52.96	-0.22
3	*2422.00	111.16 PK			1.80 H	181	111.36	-0.20
4	*2422.00	101.07 AV			1.80 H	181	101.27	-0.20
5	4844.00	45.92 PK	74.00	-28.08	1.45 H	251	39.63	6.29
6	4844.00	34.04 AV	54.00	-19.96	1.45 H	251	27.75	6.29

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	69.86 PK	74.00	-4.14	3.77 V	266	70.08	-0.22
2	2390.00	50.07 AV	54.00	-3.93	3.77 V	266	50.29	-0.22
3	*2422.00	104.09 PK			3.77 V	266	104.29	-0.20
4	*2422.00	93.97 AV			3.77 V	266	94.17	-0.20
5	4844.00	45.77 PK	74.00	-28.23	2.08 V	314	39.48	6.29
6	4844.00	33.45 AV	54.00	-20.55	2.08 V	314	27.16	6.29

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	112.26 PK			1.76 H	182	112.46	-0.20
2	*2437.00	102.23 AV			1.76 H	182	102.43	-0.20
3	2483.50	72.92 PK	74.00	-1.08	1.76 H	182	73.08	-0.16
4	2483.50	51.56 AV	54.00	-2.44	1.76 H	182	51.72	-0.16
5	4874.00	46.06 PK	74.00	-27.94	1.52 H	249	39.88	6.18
6	4874.00	34.11 AV	54.00	-19.89	1.52 H	249	27.93	6.18
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	104.91 PK			3.69 V	272	105.11	-0.20
2	*2437.00	94.83 AV			3.69 V	272	95.03	-0.20
3	2483.50	69.06 PK	74.00	-4.94	3.69 V	272	69.22	-0.16
4	2483.50	49.01 AV	54.00	-4.99	3.69 V	272	49.17	-0.16
5	4874.00	45.79 PK	74.00	-28.21	2.02 V	307	39.61	6.18
6	4874.00	33.46 AV	54.00	-20.54	2.02 V	307	27.28	6.18

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2452.00	110.68 PK			1.82 H	184	110.86	-0.18
2	*2452.00	100.98 AV			1.82 H	184	101.16	-0.18
3	2483.50	72.96 PK	74.00	-1.04	1.82 H	184	73.12	-0.16
4	2483.50	52.78 AV	54.00	-1.22	1.82 H	184	52.94	-0.16
5	4904.00	46.23 PK	74.00	-27.77	1.41 H	249	40.13	6.10
6	4904.00	33.80 AV	54.00	-20.20	1.41 H	249	27.70	6.10
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	102.99 PK			3.72 V	278	103.17	-0.18
2	*2452.00	93.26 AV			3.72 V	278	93.44	-0.18
3	2483.50	68.97 PK	74.00	-5.03	3.72 V	278	69.13	-0.16
4	2483.50	49.93 AV	54.00	-4.07	3.72 V	278	50.09	-0.16
5	4904.00	45.71 PK	74.00	-28.29	1.88 V	274	39.61	6.10
6	4904.00	33.35 AV	54.00	-20.65	1.88 V	274	27.25	6.10

REMARKS:

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

Below 1GHz Data:

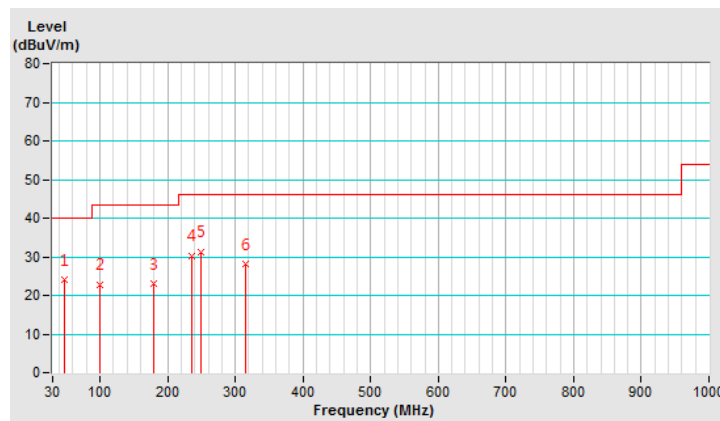
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CHANNEL	TX Channel 6	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

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	48.04	23.94 QP	40.00	-16.06	2.13 H	26	31.02	-7.08
2	100.18	22.65 QP	43.50	-20.85	1.52 H	290	33.91	-11.26
3	179.19	22.91 QP	43.50	-20.59	2.06 H	269	30.96	-8.05
4	235.54	30.23 QP	46.00	-15.77	1.54 H	260	38.01	-7.78
5	249.95	31.11 QP	46.00	-14.89	1.89 H	106	38.06	-6.95
6	316.05	28.01 QP	46.00	-17.99	1.15 H	227	32.57	-4.56

REMARKS:

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

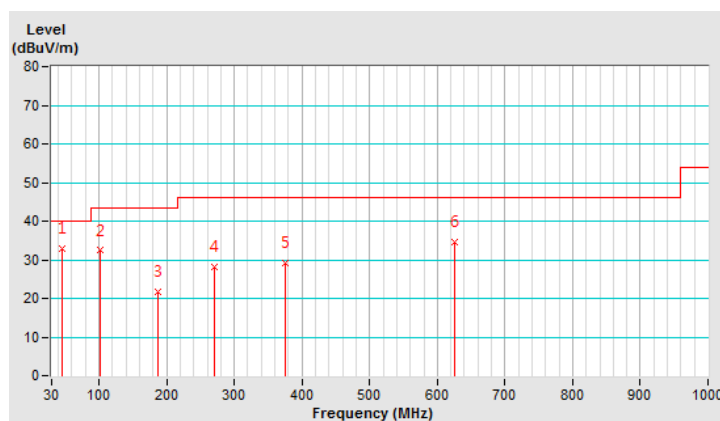


CHANNEL	TX Channel 6	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	45.57	33.04 QP	40.00	-6.96	1.34 V	10	40.27	-7.23
2	102.02	32.44 QP	43.50	-11.06	1.24 V	334	43.49	-11.05
3	186.36	21.71 QP	43.50	-21.79	2.06 V	264	30.47	-8.76
4	269.88	28.28 QP	46.00	-17.72	1.52 V	240	34.28	-6.00
5	375.03	29.08 QP	46.00	-16.92	1.15 V	186	32.78	-3.70
6	625.00	34.58 QP	46.00	-11.42	1.87 V	159	33.02	1.56

REMARKS:

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



4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

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

Note: 1. The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
ROHDE & SCHWARZ TEST RECEIVER	ESR3	102414	Jan. 17, 2019	Jan. 16, 2020
ROHDE & SCHWARZ Artificial Mains Network (for EUT)	ENV216	101197	May 23, 2018	May 22, 2019
LISN With Adapter (for EUT)	AD10	C10Ada-002	May 23, 2018	May 22, 2019
ROHDE & SCHWARZ Artificial Mains Network (for peripherals)	ESH3-Z5	100218	Nov. 30, 2018	Nov. 29, 2019
SCHWARZBECK Artificial Mains Network (For EUT)	NNLK8129	8129229	May 3, 2018	May 2, 2019
Software	Cond_V7.3.7.4	NA	NA	NA
RF cable (JYEBAO) With 10dB PAD	5D-FB	Cable-C10.01	Feb. 13, 2019	Feb. 12, 2020
SUHNTER Terminator (For ROHDE & SCHWARZ LISN)	65BNC-5001	E1-011484	May 8, 2018	May 7, 2019
ROHDE & SCHWARZ Artificial Mains Network (For TV EUT)	ESH3-Z5	100220	Nov. 21, 2018	Nov. 20, 2019
LISN With Adapter (for TV EUT)	100220	NA	Nov. 21, 2018	Nov. 20, 2019

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The test was performed in Shielded Room No. 10.

4.2.3 Test Procedures

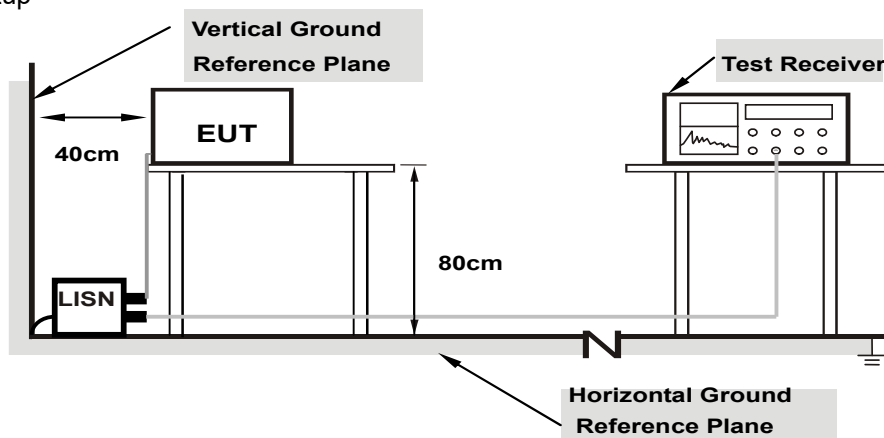
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



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

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

4.2.6 EUT Operating Conditions

Same as 4.1.6.

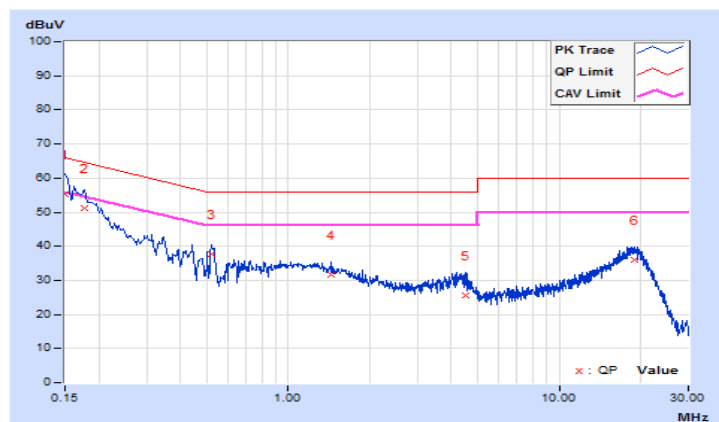
4.2.7 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
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No	Freq. [MHz]	Corr.	Reading Value		Emission Level		Limit		Margin	
		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
		(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	9.70	45.64	26.97	55.34	36.67	66.00	56.00	-10.66	-19.33
2	0.17651	9.71	41.57	25.80	51.28	35.51	64.65	54.65	-13.37	-19.14
3	0.52346	9.82	27.89	19.03	37.71	28.85	56.00	46.00	-18.29	-17.15
4	1.43449	9.96	21.57	12.03	31.53	21.99	56.00	46.00	-24.47	-24.01
5	4.50384	10.13	15.55	6.22	25.68	16.35	56.00	46.00	-30.32	-29.65
6	19.02908	10.41	25.59	19.12	36.00	29.53	60.00	50.00	-24.00	-20.47

REMARKS:

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

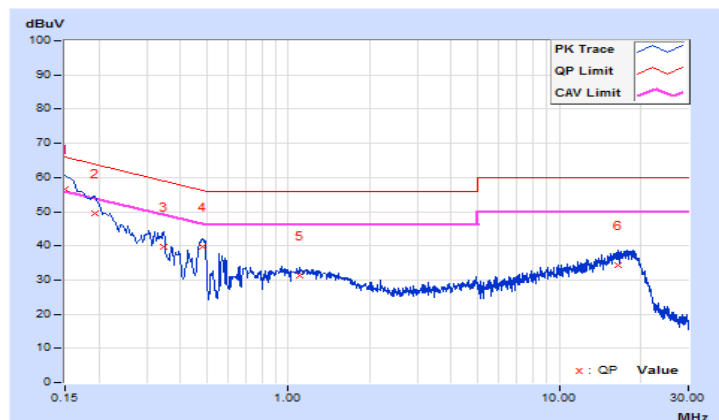


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
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No	Freq. [MHz]	Corr.	Reading Value		Emission Level		Limit		Margin	
		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
		(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	9.71	46.89	27.51	56.60	37.22	66.00	56.00	-9.40	-18.78
2	0.19254	9.75	39.72	22.21	49.47	31.96	63.93	53.93	-14.46	-21.97
3	0.34550	9.81	30.07	19.14	39.88	28.95	59.07	49.07	-19.19	-20.12
4	0.48167	9.85	29.92	22.87	39.77	32.72	56.31	46.31	-16.54	-13.59
5	1.10605	9.98	21.23	10.13	31.21	20.11	56.00	46.00	-24.79	-25.89
6	16.52668	10.40	23.89	16.78	34.29	27.18	60.00	50.00	-25.71	-22.82

REMARKS:

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

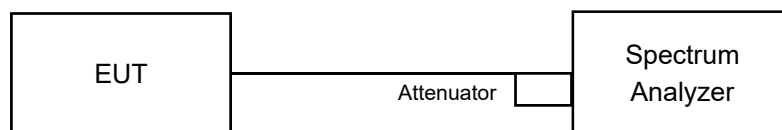


4.3 6dB Bandwidth Measurement

4.3.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

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

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

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

4.3.7 Test Result

802.11b

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	8.10	8.11	0.5	PASS
6	2437	8.11	8.09	0.5	PASS
11	2462	8.12	8.09	0.5	PASS

802.11g

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	16.40	16.41	0.5	PASS
6	2437	16.41	16.41	0.5	PASS
11	2462	16.40	16.40	0.5	PASS

802.11n (20MHz)

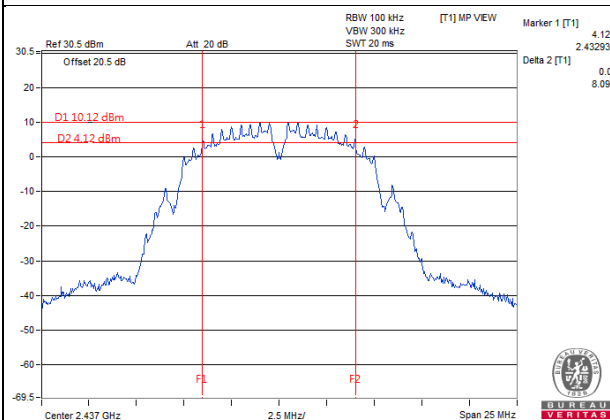
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	17.64	17.63	0.5	PASS
6	2437	17.63	17.63	0.5	PASS
11	2462	17.61	17.60	0.5	PASS

802.11n (40MHz)

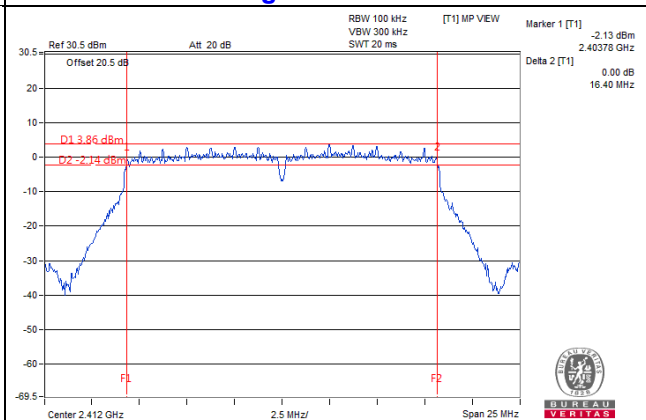
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
3	2422	35.56	35.56	0.5	PASS
6	2437	35.89	35.60	0.5	PASS
9	2452	35.73	35.79	0.5	PASS

Spectrum Plot of Worst Value

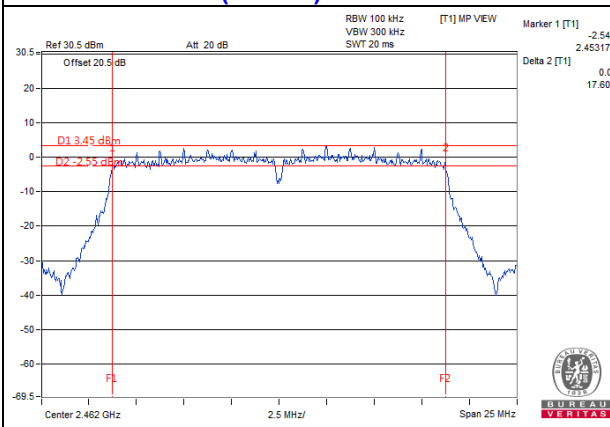
802.11b / Chain 1 : CH6



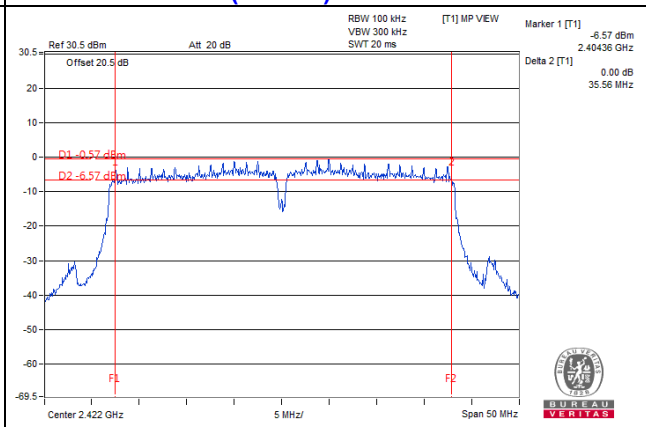
802.11g / Chain 0 : CH1



802.11n (20MHz) / Chain 1 : CH11



802.11n (40MHz) / Chain 0 : CH3



4.4 Conducted Output Power Measurement

4.4.1 Limits of Conducted Output Power Measurement

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

Per KDB 662911 D01 Multiple Transmitter Output Method of conducted output power measurement on IEEE 802.11 devices,

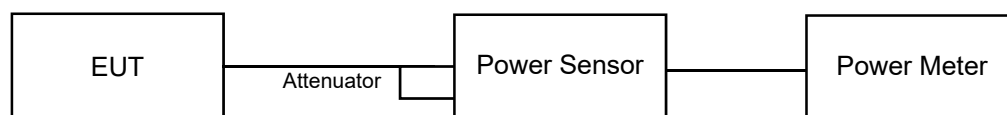
Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT} ;

Array Gain = $5 \log(N_{ANT}/N_{SS})$ dB or 3 dB, whichever is less for 20-MHz channel widths with $N_{ANT} \geq 5$.

For power measurements on all other devices: Array Gain = $10 \log(N_{ANT}/N_{SS})$ dB.

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 Test Procedures

Average power sensor was used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Conditions

Same as Item 4.3.6.

4.4.7 Test Results

802.11b

Chan.	Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	18.42	18.51	140.460	21.48	30	Pass
6	2437	18.41	18.46	139.489	21.45	30	Pass
11	2462	18.57	18.66	145.396	21.63	30	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	16.19	17.11	92.995	19.68	30	Pass
6	2437	20.79	22.05	280.275	24.48	30	Pass
11	2462	16.51	17.16	96.771	19.86	30	Pass

802.11n (20MHz)

Chan.	Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	16.42	17.19	96.213	19.83	30	Pass
6	2437	20.59	21.93	270.506	24.32	30	Pass
11	2462	15.52	16.34	78.698	18.96	30	Pass

802.11n (40MHz)

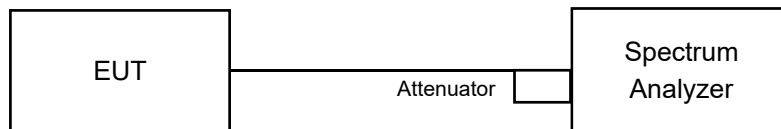
Chan.	Freq. (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	14.55	15.20	61.623	17.90	30	Pass
6	2437	16.68	17.75	106.125	20.26	30	Pass
9	2452	14.58	15.64	65.352	18.15	30	Pass

4.5 Power Spectral Density Measurement

4.5.1 Limits of Power Spectral Density Measurement

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

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedure

- 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: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- e) Set VBW $\geq 3 \times \text{RBW}$.
- f) Detector = power averaging (RMS) or sample detector (when RMS not available).
- g) Ensure that the number of measurement points in the sweep $\geq 2 \times \text{span}/\text{RBW}$.
- 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.

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

Same as Item 4.3.6

4.5.7 Test Results

802.11b

TX chain	Channel	Freq. (MHz)	PSD w/o Duty Factor (dBm/3kHz)	10 log (N=2) dB	Duty Factor (dB)	TOTAL PSD With Duty Factor (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	1	2412	-11.26	3.01	0.19	-8.06	8.00	Pass
	6	2437	-11.12	3.01	0.19	-7.92	8.00	Pass
	11	2462	-10.68	3.01	0.19	-7.48	8.00	Pass
1	1	2412	-11.30	3.01	0.19	-8.10	8.00	Pass
	6	2437	-11.44	3.01	0.19	-8.24	8.00	Pass
	11	2462	-11.17	3.01	0.19	-7.97	8.00	Pass

Note: 1. Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 5.8\text{dBi} < 6\text{dBi}$, so the power density limit is not reduced.
 2. Refer to section 3.3 for duty cycle spectrum plot.

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	-15.03	3.01	0.16	-11.86	8.00	Pass
	6	2437	-11.31	3.01	0.16	-8.14	8.00	Pass
	11	2462	-15.15	3.01	0.16	-11.98	8.00	Pass
1	1	2412	-15.39	3.01	0.16	-12.22	8.00	Pass
	6	2437	-11.06	3.01	0.16	-7.89	8.00	Pass
	11	2462	-15.36	3.01	0.16	-12.19	8.00	Pass

Note: 1. Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 5.8\text{dBi} < 6\text{dBi}$, so the power density limit is not reduced.
 2. Refer to section 3.3 for duty cycle spectrum plot.

802.11n (20MHz)

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	-15.68	3.01	0.18	-12.49	8.00	Pass
	6	2437	-11.50	3.01	0.18	-8.31	8.00	Pass
	11	2462	-16.30	3.01	0.18	-13.11	8.00	Pass
1	1	2412	-15.48	3.01	0.18	-12.29	8.00	Pass
	6	2437	-11.74	3.01	0.18	-8.55	8.00	Pass
	11	2462	-16.32	3.01	0.18	-13.13	8.00	Pass

Note: 1. Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 5.8\text{dBi} < 6\text{dBi}$, so the power density limit is not reduced.
2. Refer to section 3.3 for duty cycle spectrum plot.

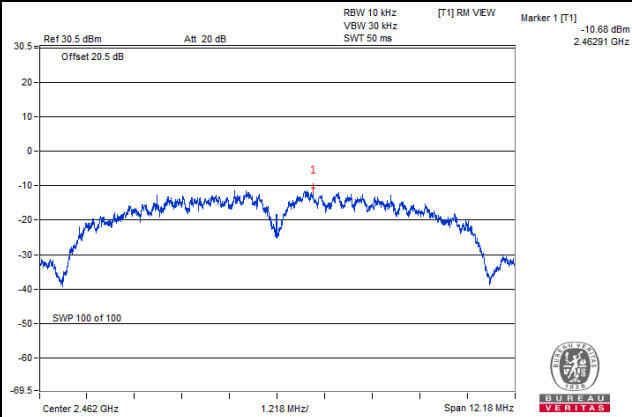
802.11n (40MHz)

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	3	2422	-20.22	3.01	0.35	-16.86	8.00	Pass
	6	2437	-17.52	3.01	0.35	-14.16	8.00	Pass
	9	2452	-20.18	3.01	0.35	-16.82	8.00	Pass
1	3	2422	-20.38	3.01	0.35	-17.02	8.00	Pass
	6	2437	-18.12	3.01	0.35	-14.76	8.00	Pass
	9	2452	-19.88	3.01	0.35	-16.52	8.00	Pass

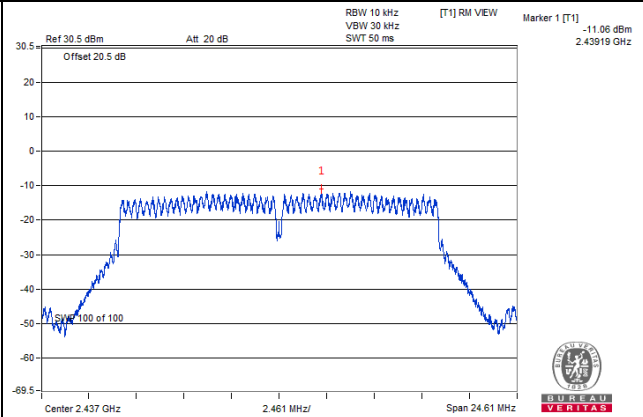
Note: 1. Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 5.8\text{dBi} < 6\text{dBi}$, so the power density limit is not reduced.
2. Refer to section 3.3 for duty cycle spectrum plot.

Spectrum Plot of Worst Value

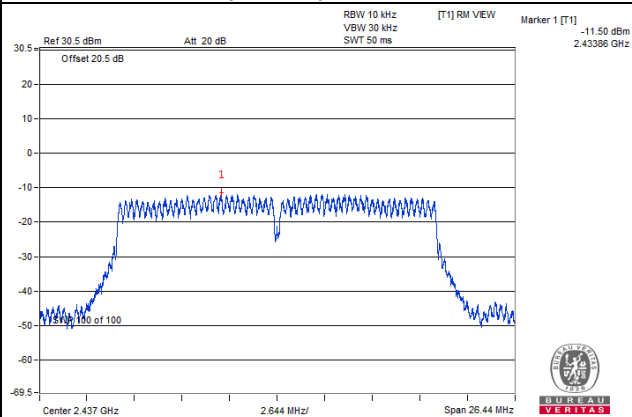
802.11b / Chain 0 : CH11



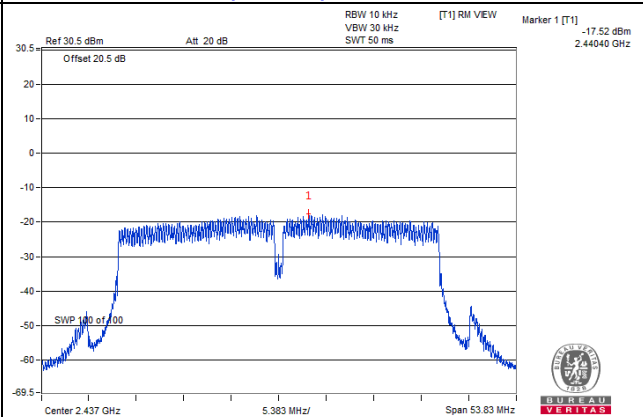
802.11g / Chain 1 : CH6



802.11n (20MHz) / Chain 0 : CH6



802.11n (40MHz) / Chain 0 : CH6

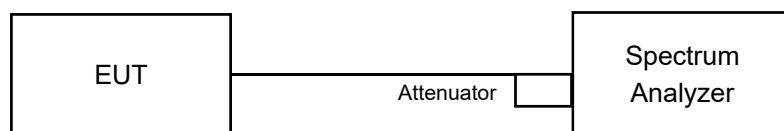


4.6 Conducted Out of Band Emission Measurement

4.6.1 Limits of Conducted Out of Band Emission Measurement

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

4.6.2 Test Setup



4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

MEASUREMENT PROCEDURE REF

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

MEASUREMENT PROCEDURE OOB

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

4.6.5 Deviation from Test Standard

No deviation.

4.6.6 EUT Operating Condition

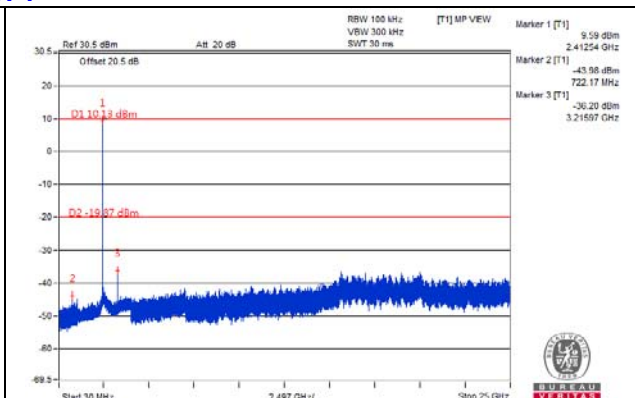
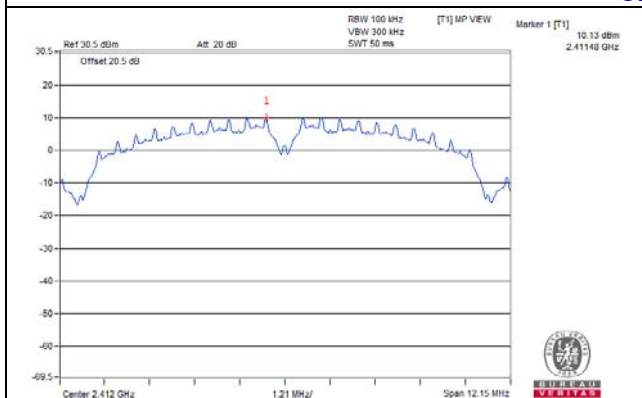
Same as Item 4.3.6

4.6.7 Test Results

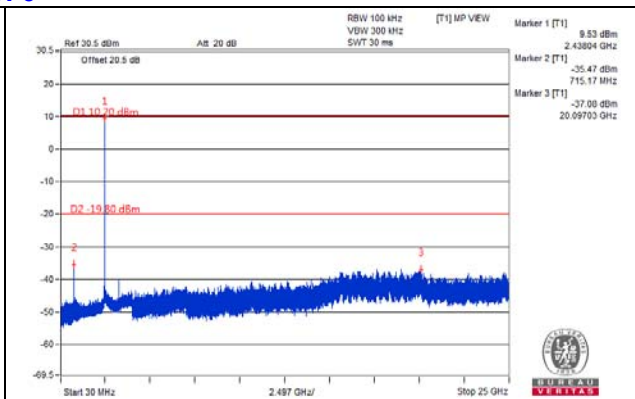
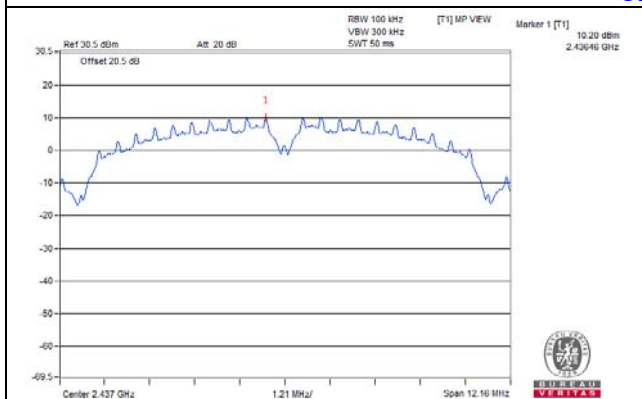
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 30dB offset below D1. It shows compliance with the requirement.

802.11b: Chain 0

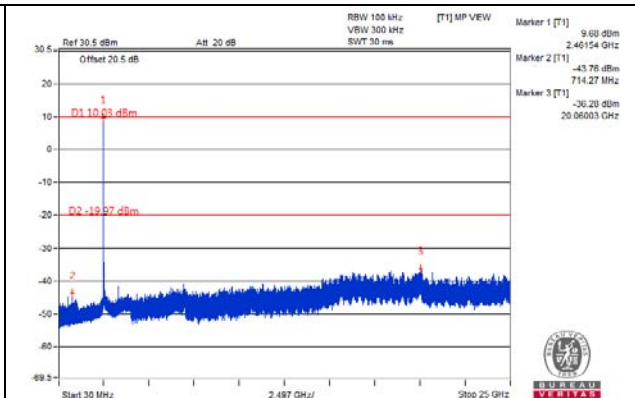
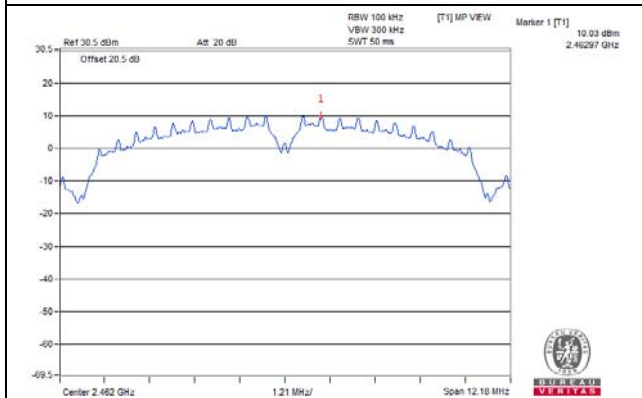
CH 1



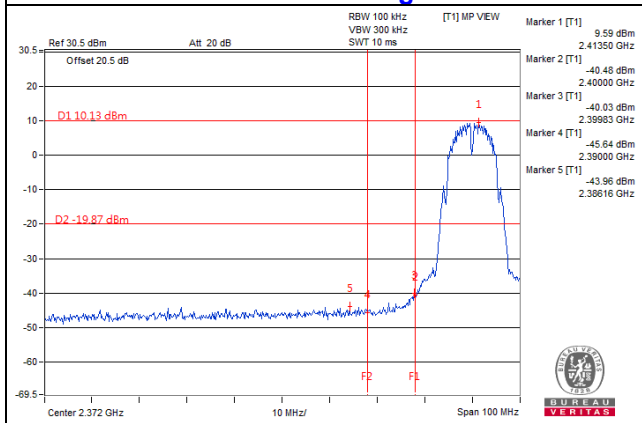
CH 6



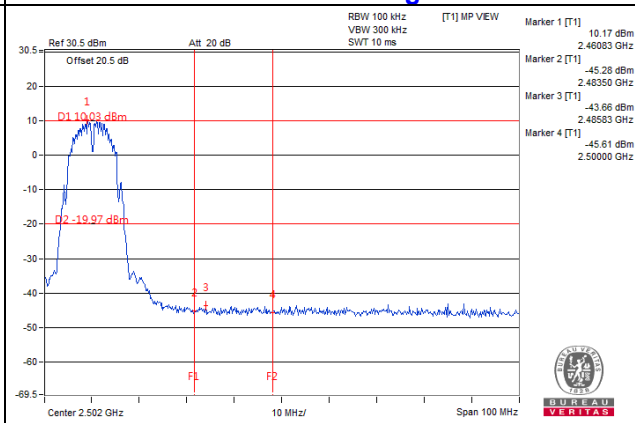
CH 11



CH 1 Band edge

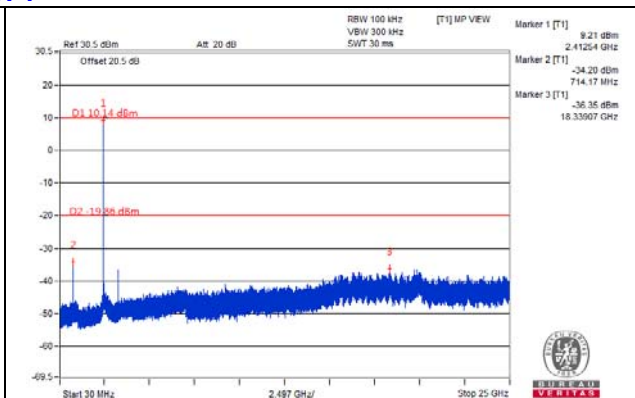
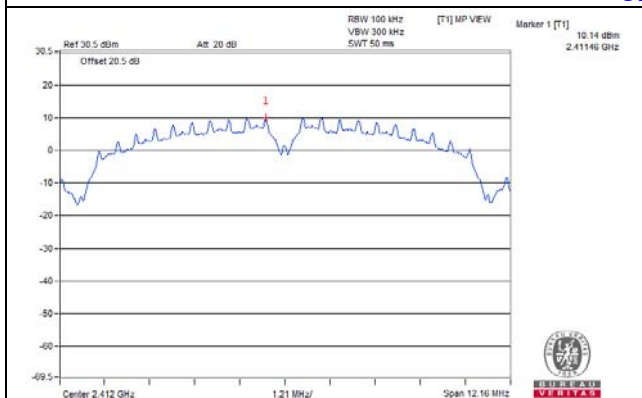


CH 11 Band edge

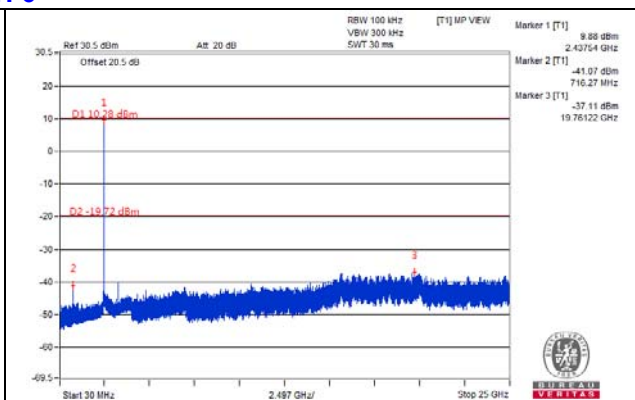
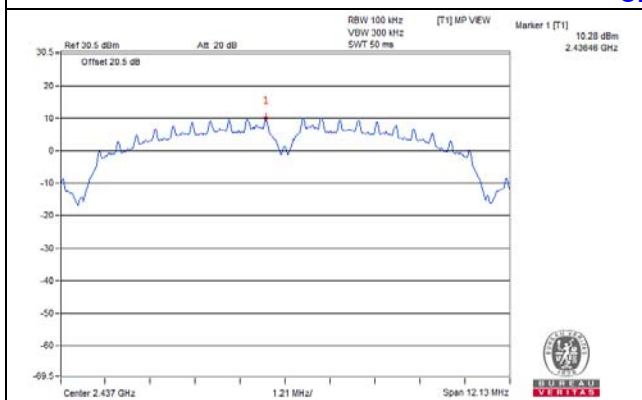


Chain 1

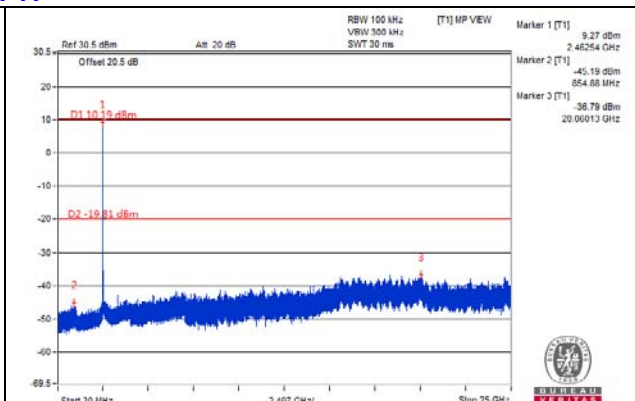
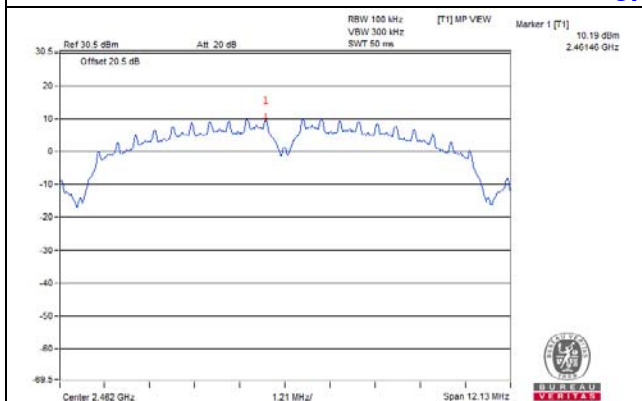
CH 1



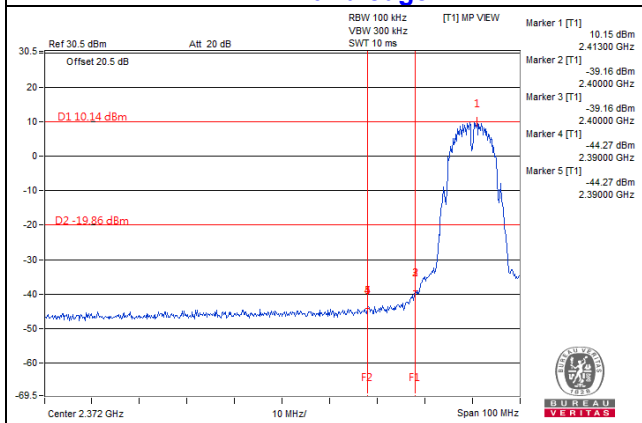
CH 6



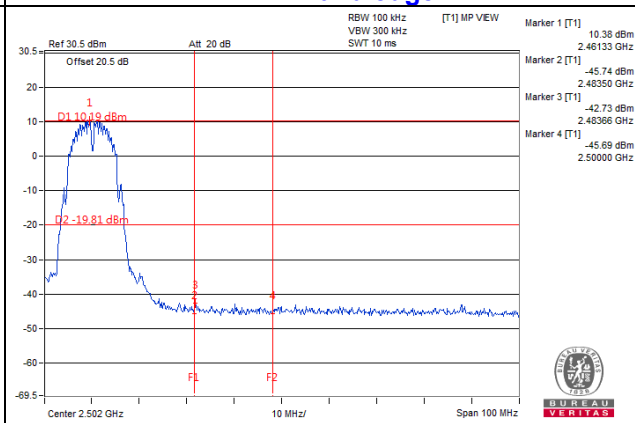
CH 11



CH 1 Band edge

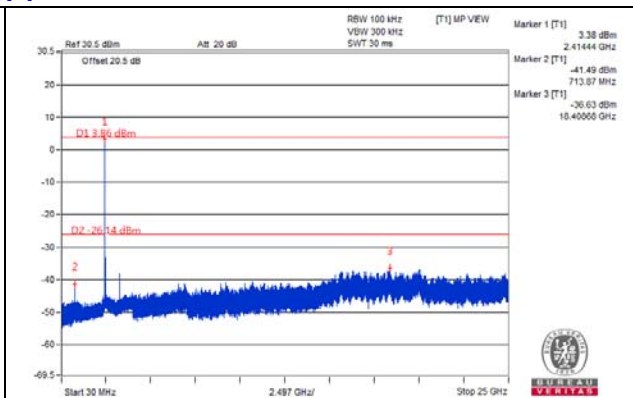
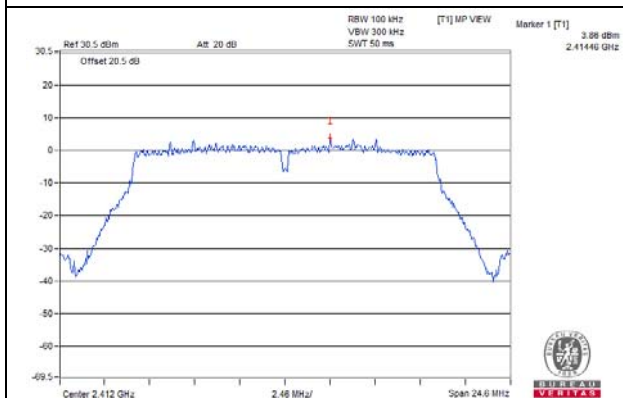


CH 11 Band edge

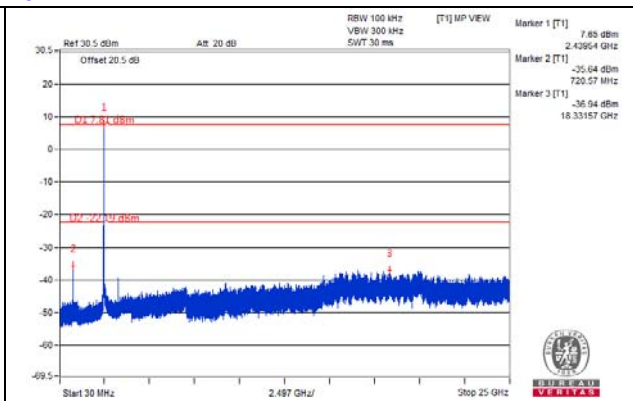
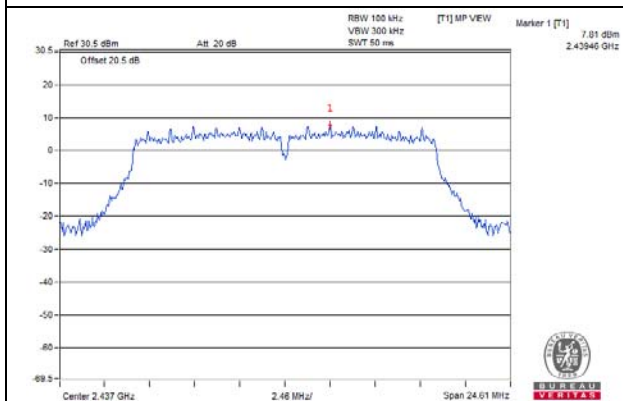


802.11g: Chain 0

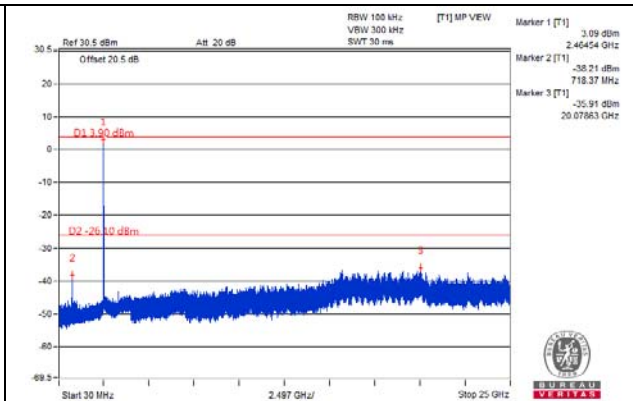
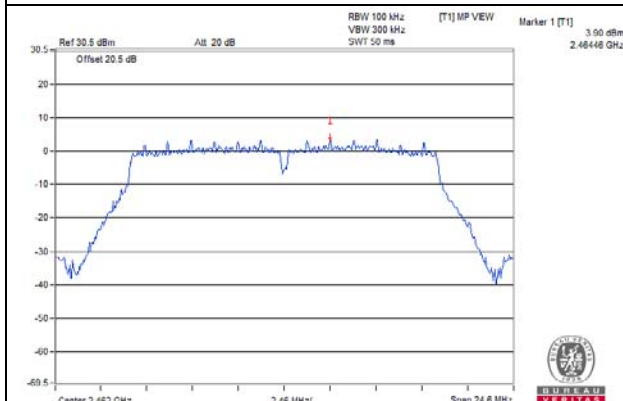
CH 1



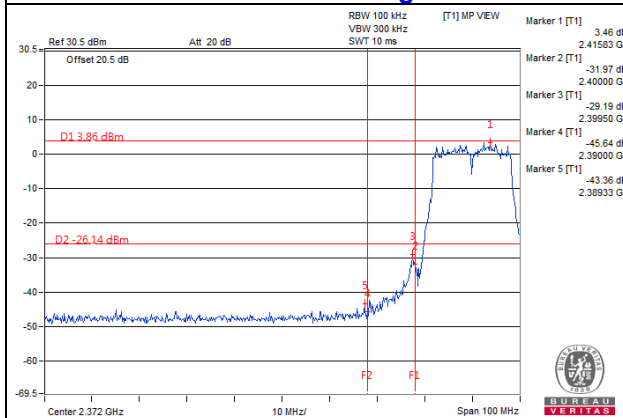
CH 6



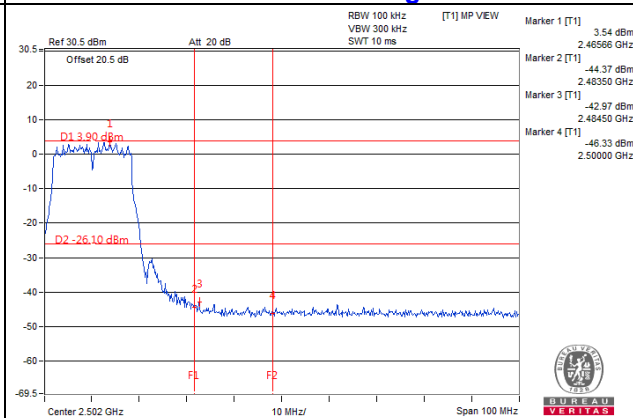
CH 11



CH 1 Band edge

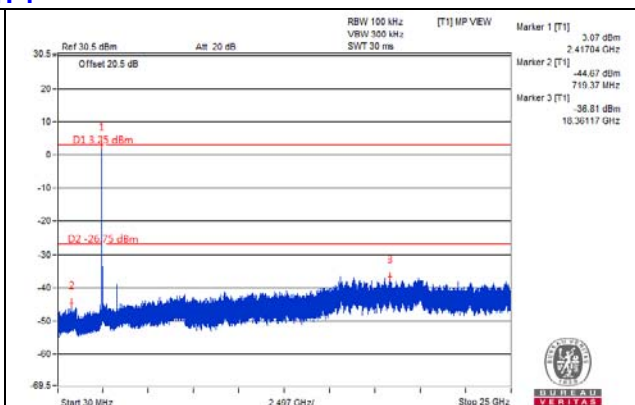
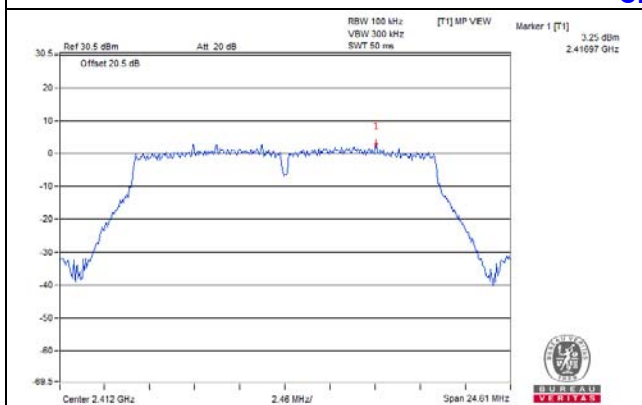


CH 11 Band edge

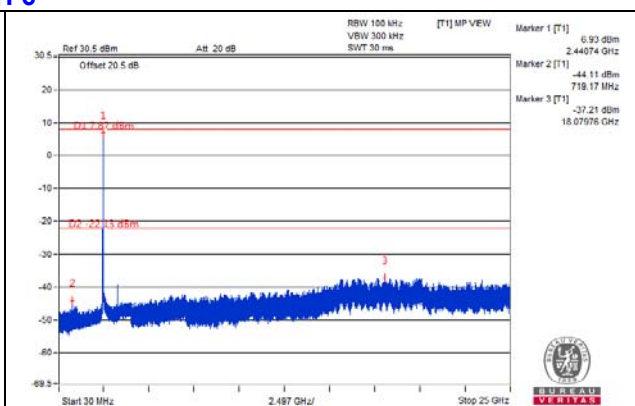
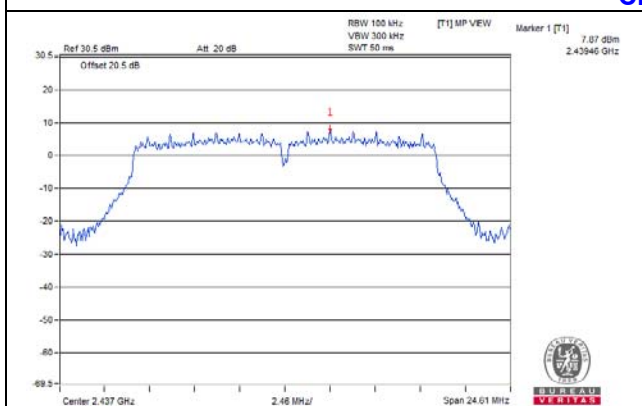


Chain 1

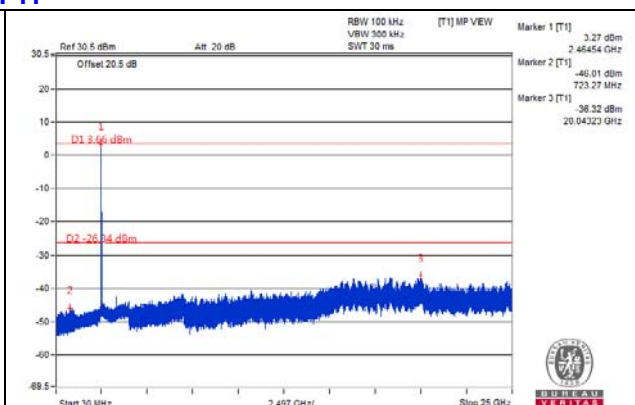
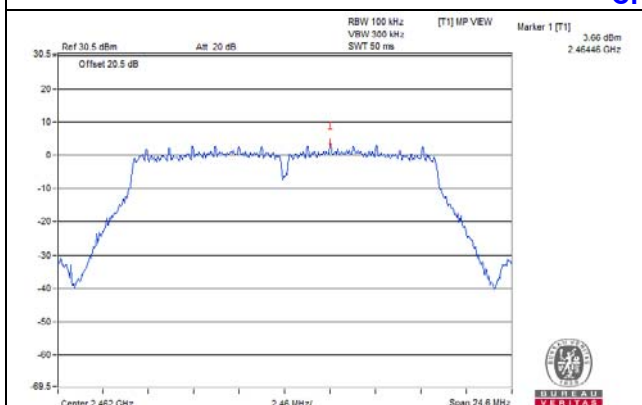
CH 1



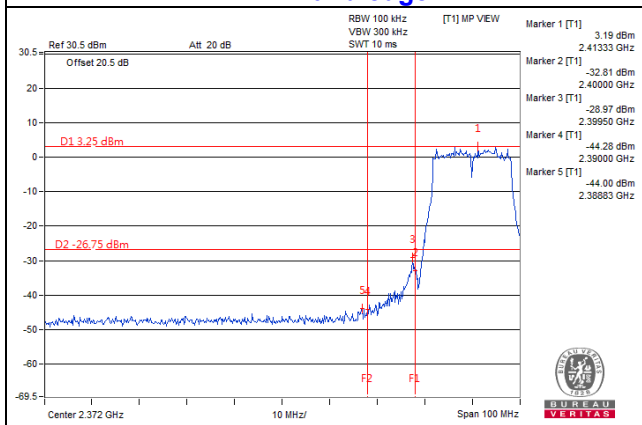
CH 6



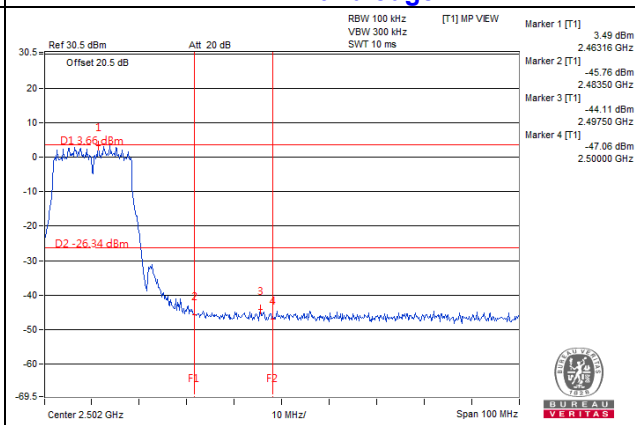
CH 11



CH 1 Band edge

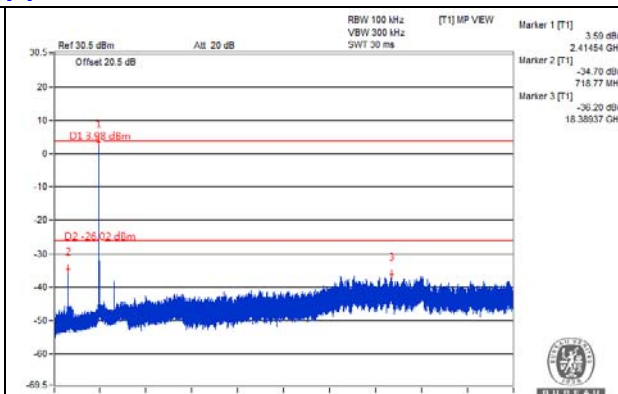
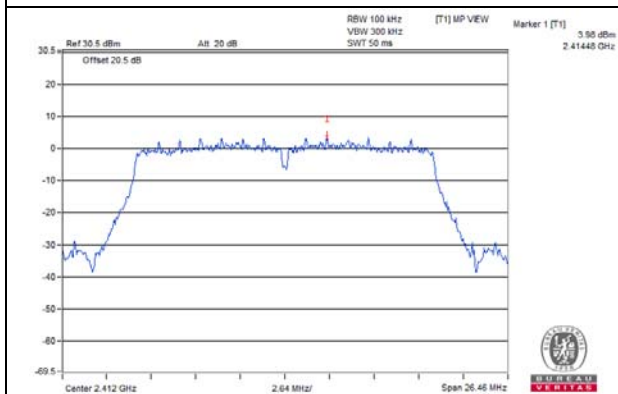


CH 11 Band edge

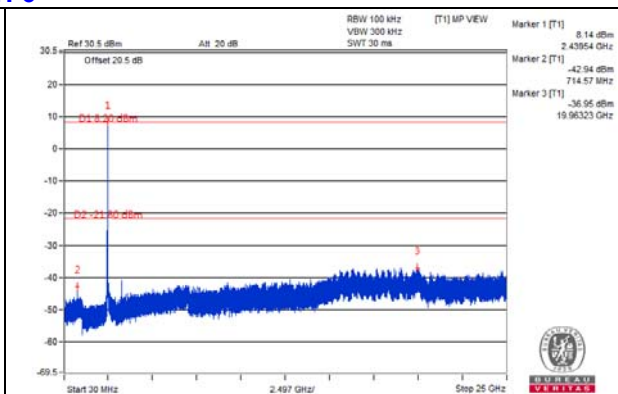
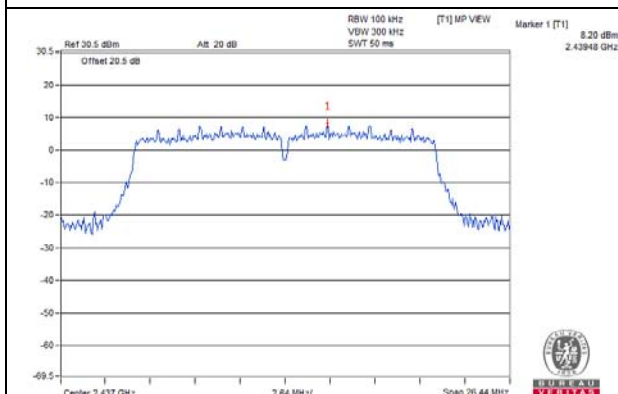


802.11n (20MHz): Chain 0

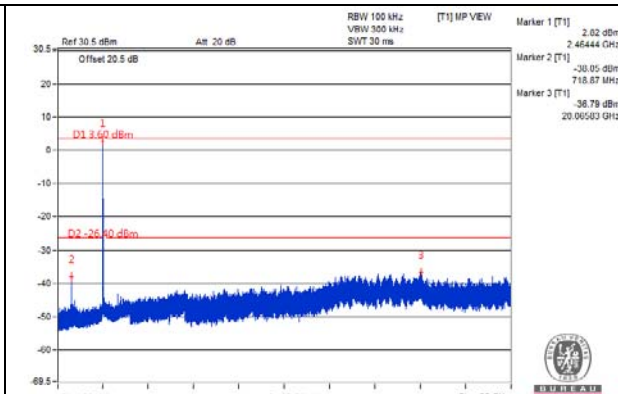
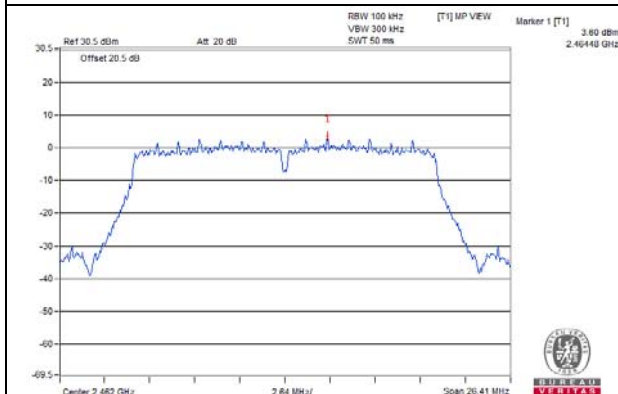
CH 1



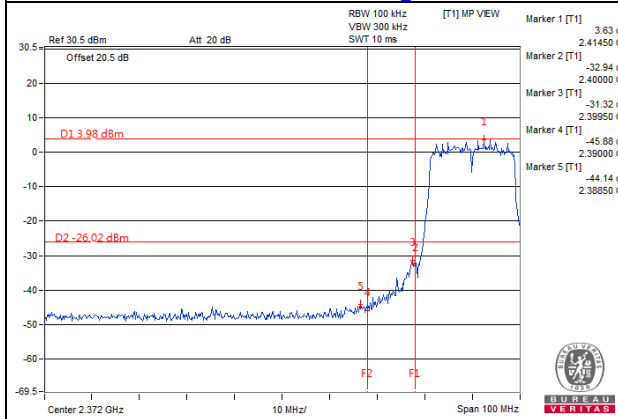
CH 6



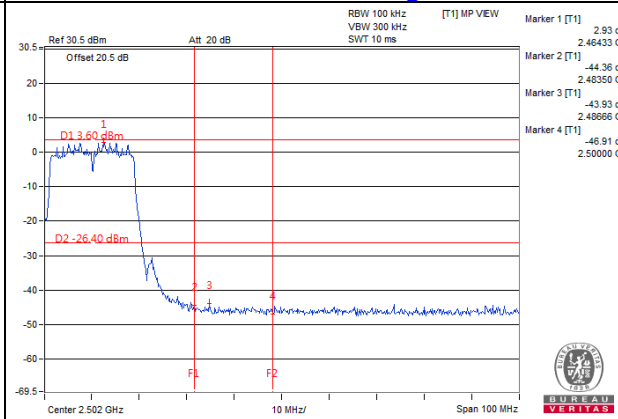
CH 11



CH 1 Band edge

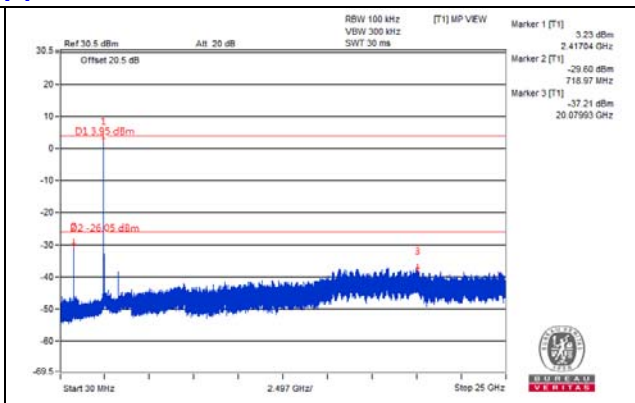
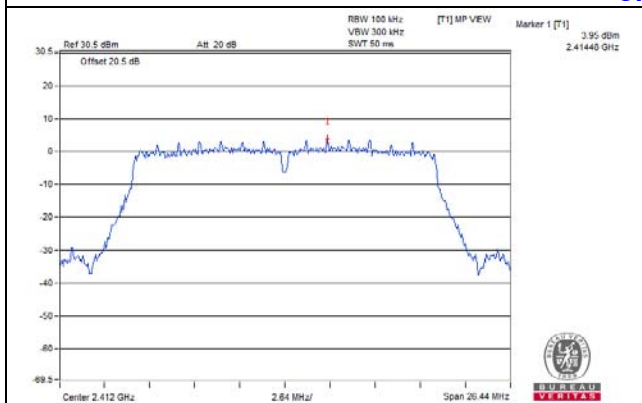


CH 11 Band edge

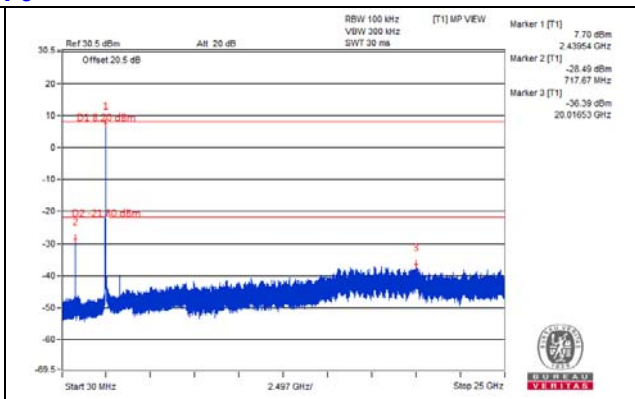
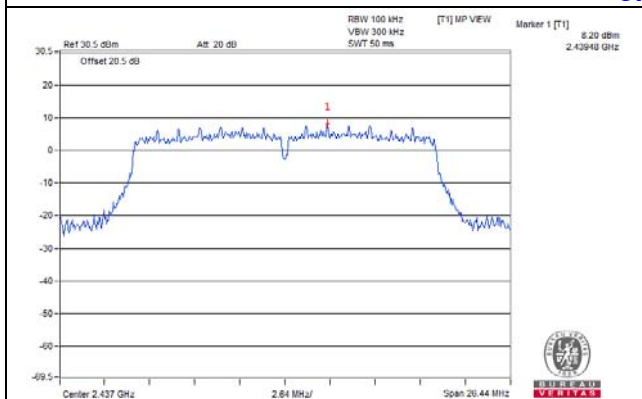


Chain 1

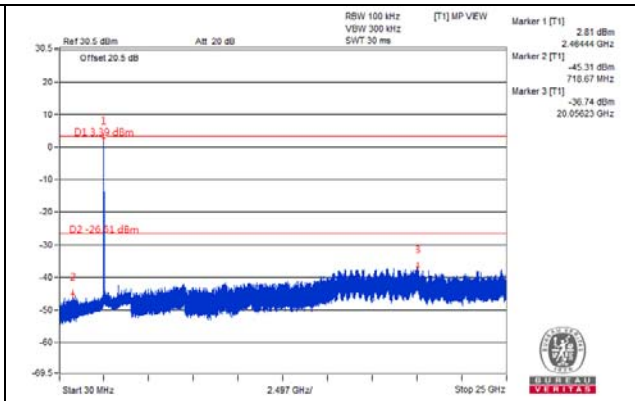
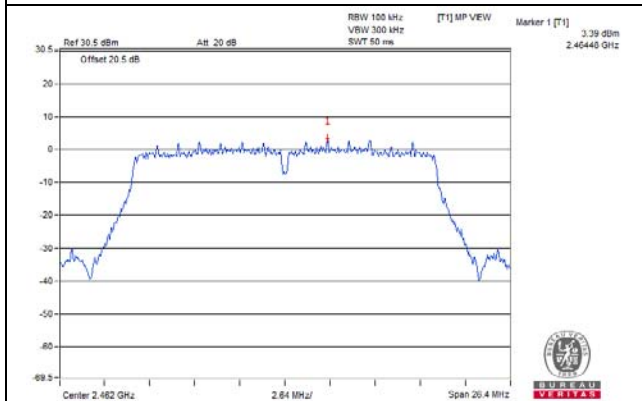
CH 1



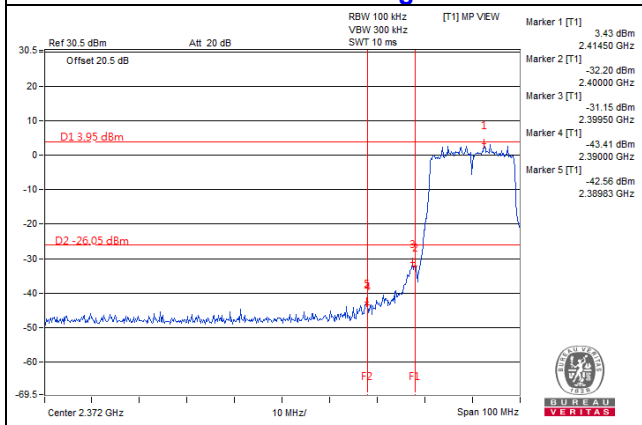
CH 6



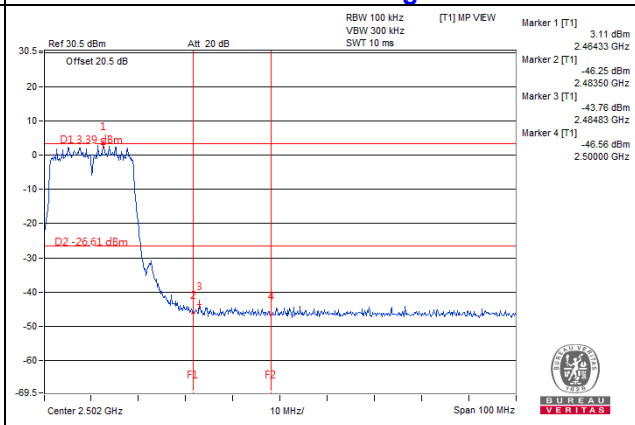
CH 11



CH 1 Band edge

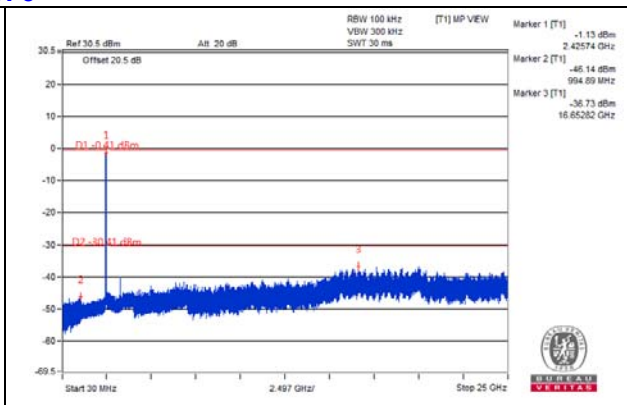
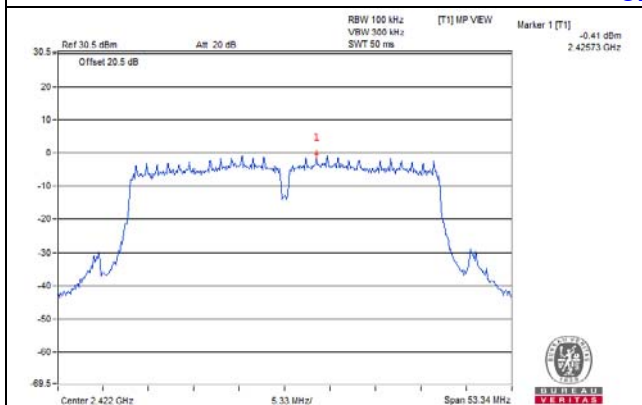


CH 11 Band edge

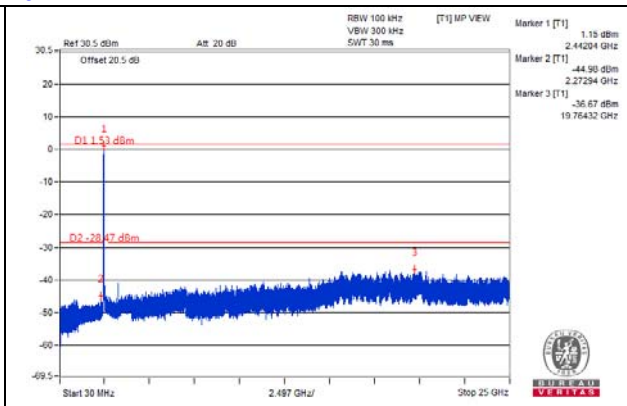
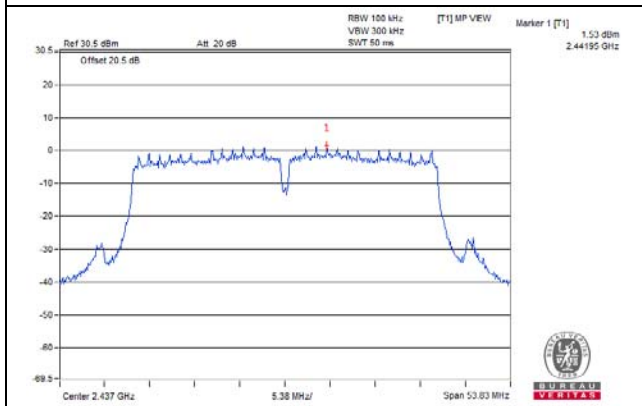


802.11n (40MHz): Chain 0

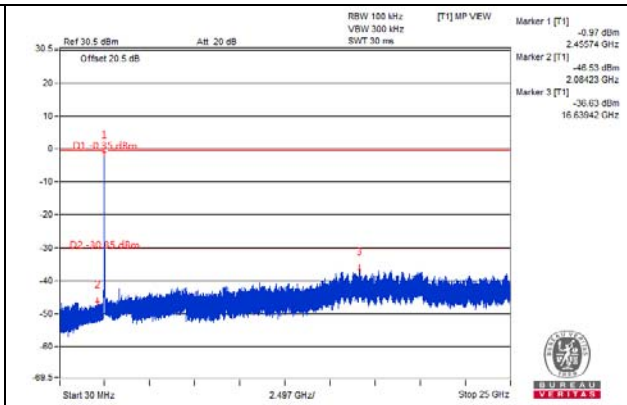
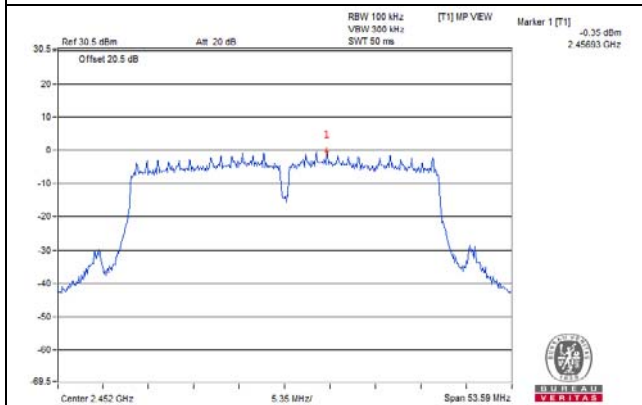
CH 3



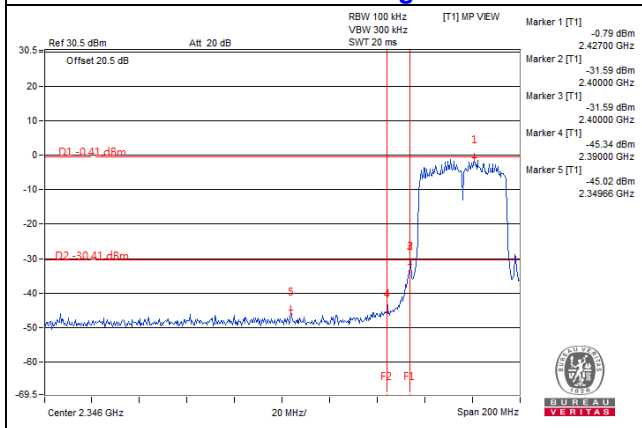
CH 6



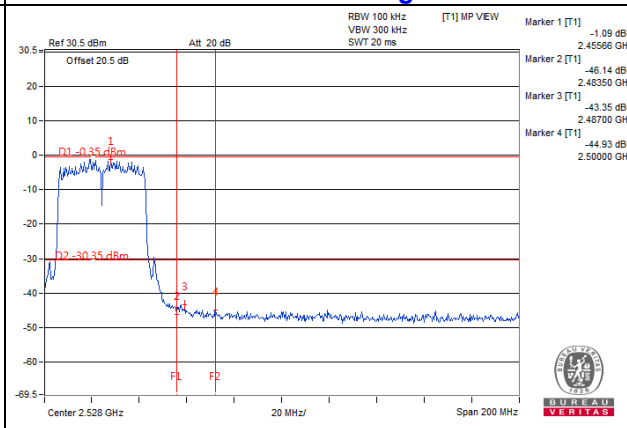
CH 9



CH 3 Band edge

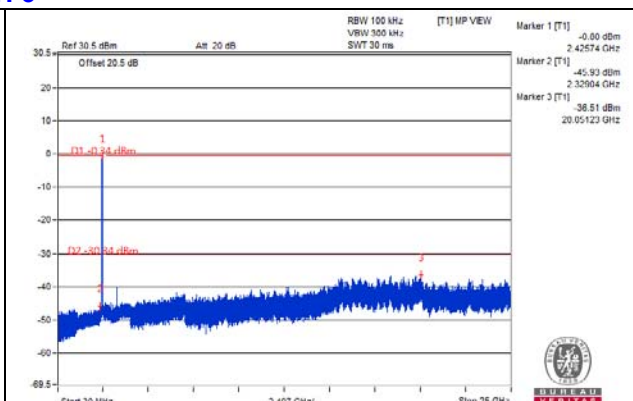
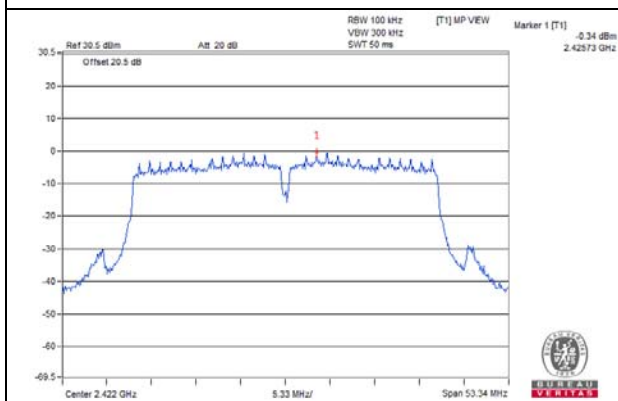


CH 9 Band edge

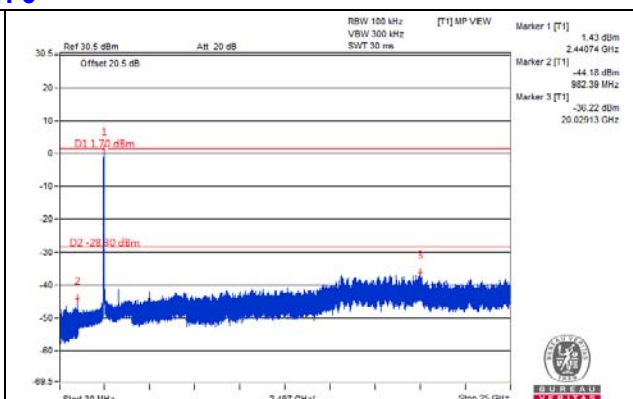
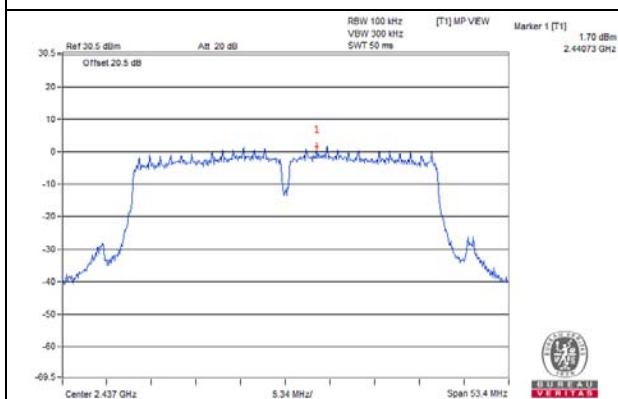


Chain 1

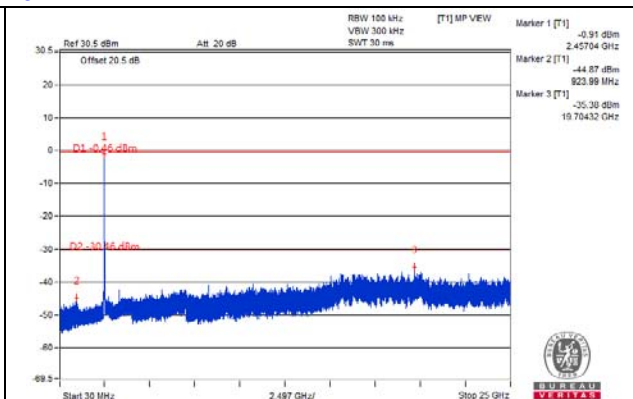
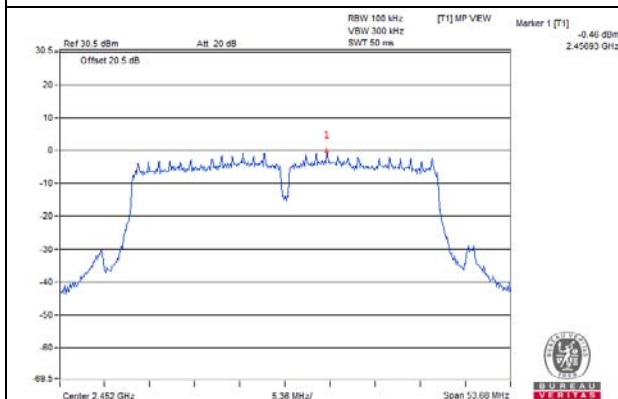
CH 3



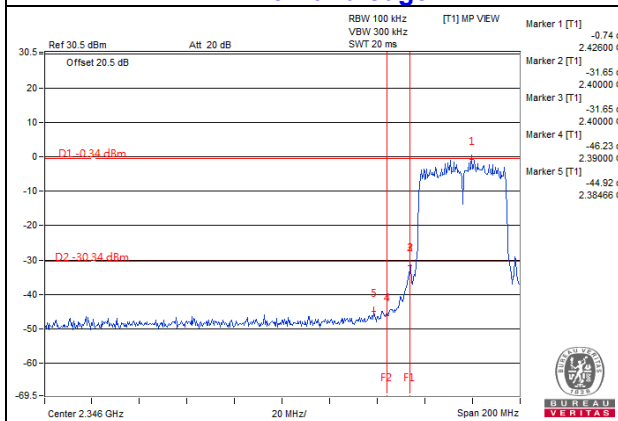
CH 6



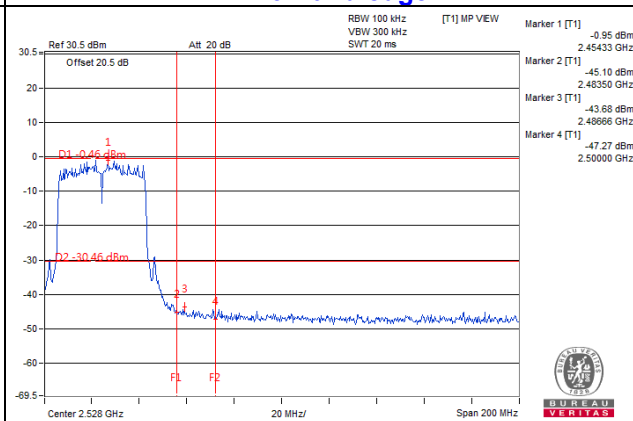
CH 9



CH 3 Band edge



CH 9 Band edge



5 Pictures of Test Arrangements

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

Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

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Web Site: www.bureauveritas-adt.com

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

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