

FCC Test Report

Report No.: RF160727E13

FCC ID: O5P-AN-N20-01

Test Model: AN-N20-01

Received Date: July 27, 2016

Test Date: July 29 to Aug. 05, 2016

Issued Date: Mar. 06, 2017

Applicant: VIVOTEK INC.

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
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Release Control Record

Issue No.	Description	Date Issued
RF160727E13	Original release.	Mar. 06, 2017

1 Certificate of Conformity

Product: Wireless Router

Brand: VIVOTEK

Test Model: AN-N20-01

Sample Status: ENGINEERING SAMPLE

Applicant: VIVOTEK INC.

Test Date: July 29 to Aug. 05, 2016

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 : Midoli Peng , **Date:** Mar. 06, 2017
Midoli Peng / Specialist

Approved by : May Chen , **Date:** Mar. 06, 2017
May Chen / Manager

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (SECTION 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -11.50dB at 0.43516MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -0.2dB at 7311.00MHz & 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.

2.1 Measurement Uncertainty

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

Measurement	Frequency	Expanded Uncertainty (k=2) ($\pm$)
Conducted Emissions at mains ports	150kHz ~ 30MHz	1.83 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	5.19 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	3.43 dB
	6GHz ~ 18GHz	3.49 dB
	18GHz ~ 40GHz	4.11 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Wireless Router
Brand	VIVOTEK
Test Model	AN-N20-01
Status of EUT	ENGINEERING SAMPLE
Power Supply Rating	DC 5V or 12V from power 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	2412 ~ 2462 MHz
Number of Channel	11 for 802.11b, 802.11g, 802.11n (HT20) 7 for 802.11n (HT40)
Output Power	352.136mW
Antenna Type	Please see note
Antenna Connector	Please see note
Accessory Device	Adapter x1
Data Cable Supplied	NA

Note:

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

Ant. No	Transmitter Circuit	Antenna Net Gain (dBi)	Antenna Type	Connector Type	Frequency range (GHz to GHz)	Cable Length (mm)
1	Chain (0)	5	Dipole	none	2.4~2.4835	60
2	Chain (1)	5	Dipole	none	2.4~2.4835	145

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

No	Brand	Model No.	Spec.
1	ZZU	ZZU1001-100120-2A	Input: 100-240V, 0.5A, 47-63Hz Output: 12V, 1A DC output cable (Unshielded, 1.4m)
2	ZZU	ZZU1001-100050-2A	Input: 100-240V, 0.5A, 47-63Hz Output: 5V, 1A DC output cable (Unshielded, 1.5m)

From the above adapters, the radiated emission worse case was found in **adapter 2**. Therefore only the test data of the mode was recorded in this report.

3. The EUT incorporates a MIMO function.

MODULATION MODE	DATA RATE (MCS)	TX & RX CONFIGURATION	
802.11b	1 ~ 11Mbps	1TX Fixed Chan 0	1RX Fixed Chain 0
802.11g	6 ~ 54Mbps	1TX Fixed Chan 0	1RX Fixed Chain 0
802.11n (HT20)	MCS 0~7	2TX	2RX
	MCS 8~15	2TX	2RX
802.11n (HT40)	MCS 0~7	2TX	2RX
	MCS 8~15	2TX	2RX

4. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3.2 Description of Test Modes

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

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

7 channels are provided for 802.11n (HT40):

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

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.

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 (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
802.11n (HT40)	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.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11n (HT20)	1 to 11	11	OFDM	BPSK	6.5

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.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11n (HT20)	1 to 11	11	OFDM	BPSK	6.5

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.

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 (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5

Test Condition:

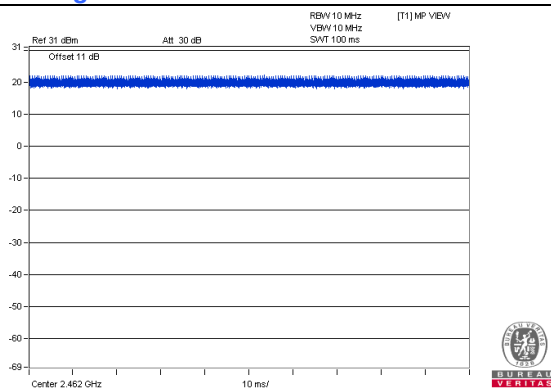
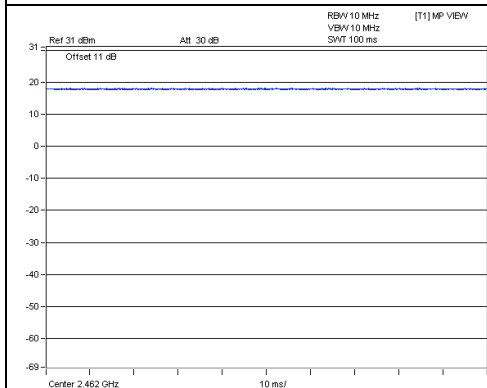
APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE $\geq$ 1G	22deg. C, 66%RH	120Vac, 60Hz	Gary Cheng
RE<1G	21deg. C, 69%RH	120Vac, 60Hz	Gary Cheng
PLC	25deg. C, 61%RH	120Vac, 60Hz	Jyunchun Lin
APCM	25deg. C, 60%RH	120Vac, 60Hz	Robert Cheng

3.3 Duty Cycle of Test Signal

Duty cycle of test signal is 100 %, duty factor is not required.

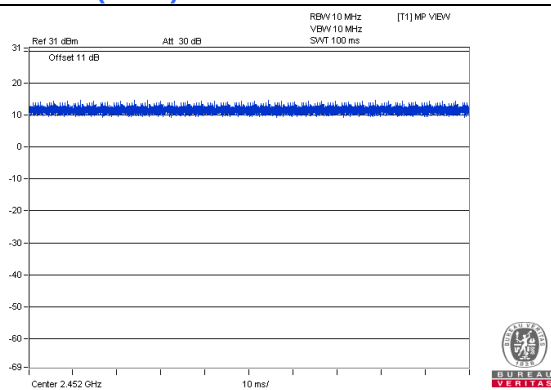
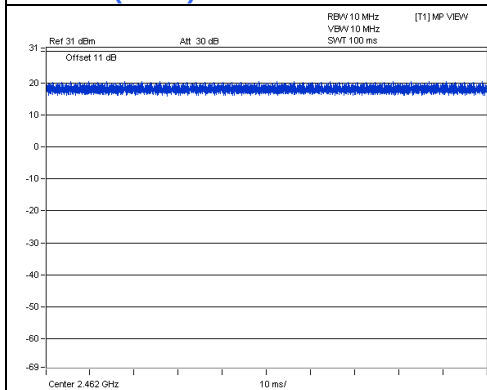
802.11b

802.11g



802.11n (HT20)

802.11n (HT40)



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.

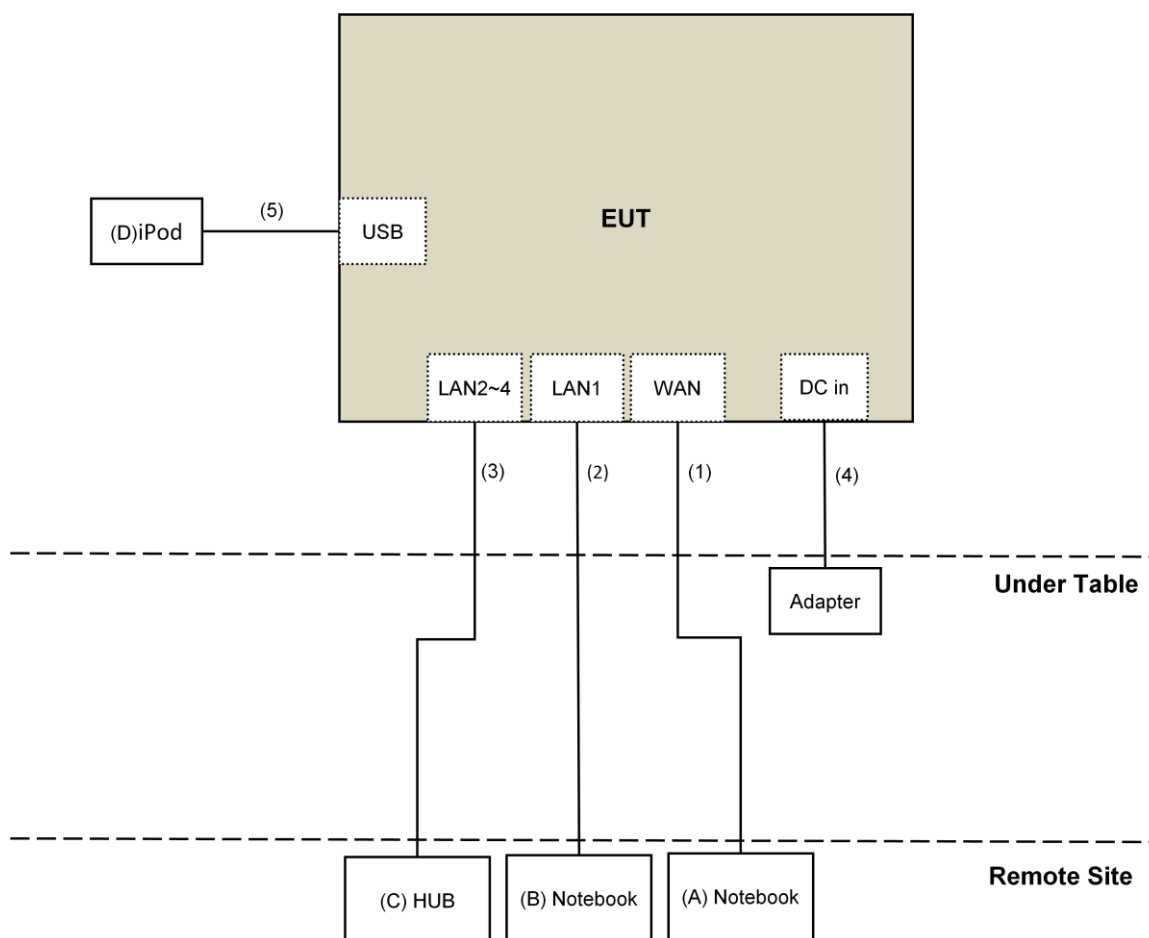
No.	Product	Brand	Model No.	Serial No.	FCC ID	Remark
A	Notebook Computer	LENOVO	E440	PF071LWC	NA	Provided by Lab
B	Notebook Computer	DELL	E5430	4YV4VY1	FCC DoC	Provided by Lab
C	HUB	ZyXEL	ES-116P	S060H02000215	FCC DoC	Provided by Lab
D	iPod shuffle	Apple	MC749TA/A	CC4DN29UDFDM	NA	Provided by Lab

Note:

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

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	RJ-45 Cable	1	10	No	0	Provided by Lab
2.	RJ-45 Cable	1	10	No	0	Provided by Lab
3.	RJ-45 Cable	3	10	No	0	Provided by Lab
4.	DC Cable	1	1.5	No	0	Supplied by client
5.	USB Cable	1	0.1	Yes	0	Provided by Lab

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 v03r05

KDB 662911 D01 Multiple Transmitter Output v02r01

ANSI C63.10-2013

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

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

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 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.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Keysight	N9038A	MY54450088	July 20, 2016	July 19, 2017
Pre-Amplifier ^(*) EMCI	EMC001340	980142	Jan. 20, 2016	Jan. 19, 2018
Loop Antenna ^(*) Electro-Metrics	EM-6879	264	Dec. 16, 2014	Dec. 15, 2016
RF Cable	NA	LOOPCAB-001 LOOPCAB-002	Jan. 18, 2016	Jan. 17, 2017
Pre-Amplifier Mini-Circuits	ZFL-1000VH2 B	AMP-ZFL-01	Nov. 11, 2015	Nov. 10, 2016
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-406	Jan. 04, 2016	Jan. 03, 2017
RF Cable	8D	966-4-1 966-4-2 966-4-3	Apr. 02, 2016	Apr. 01, 2017
Horn_Antenna SCHWARZBECK	BBHA 9120D	9120D-783	Jan. 19, 2016	Jan. 18, 2017
Pre-Amplifier Agilent	8449B	3008A01922	Sep. 19, 2015	Sep. 18, 2016
RF Cable	EMC104-SM- SM-2000 EMC104-SM- SM-5000 EMC104-SM- SM-5000	150318 150323 150324	Mar. 30, 2016	Mar. 29, 2017
Pre-Amplifier EMCI	EMC184045	980143	Jan. 15, 2016	Jan. 14, 2017
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170608	Jan. 08, 2016	Jan. 07, 2017
RF Cable	SUCOFLEX 102	36432/2 36441/2	Jan. 16, 2016	Jan. 15, 2017
Software	ADT_Radiated _V8.7.07	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208410	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP02	NA	NA
Spectrum Analyzer R&S	FSP40	100036	Jan. 27, 2016	Jan. 26, 2017
Power meter Anritsu	ML2495A	0824006	May 26, 2016	May 25, 2017
Power sensor Anritsu	MA2411B	0738172	May 26, 2016	May 25, 2017

Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. *The calibration interval of the above test instruments is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
- 3 Loop antenna was used for all emissions below 30 MHz.
4. The test was performed in 966 Chamber No. 4.
5. The FCC Site Registration No. is 292998
6. The CANADA Site Registration No. is 20331-2
7. Tested Date: Aug. 02 to 05, 2016

4.1.3 Test Procedures

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

Note:

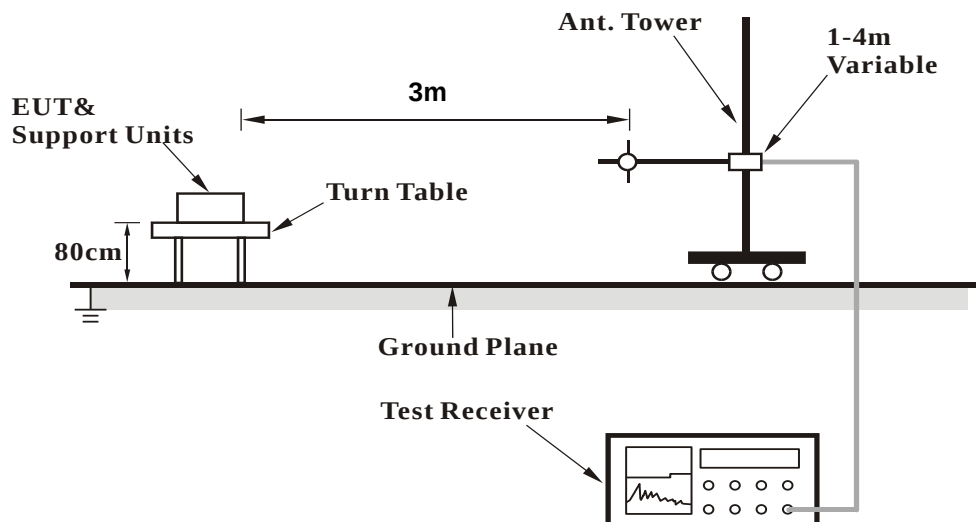
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average (Duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor ($10 \log(1/\text{duty cycle})$).
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.
5. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

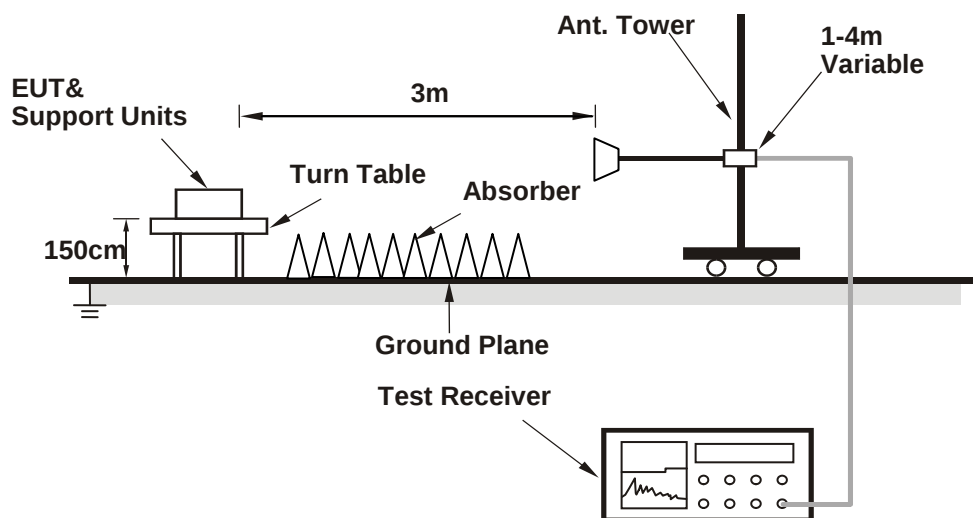
No deviation.

4.1.5 Test Setup

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



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

4.1.6 EUT Operating Conditions

- Connect the EUT with the support units A~B (Notebook Computer) which is placed outside of testing area.
- The communication partner run test program "MP_TEST. exe" to enable EUT under transmission/receiving 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	47.6 PK	74.0	-26.4	1.10 H	226	53.2	-5.6
2	2390.00	35.1 AV	54.0	-18.9	1.10 H	226	40.7	-5.6
3	*2412.00	95.3 PK			1.10 H	226	100.8	-5.5
4	*2412.00	92.8 AV			1.10 H	226	98.3	-5.5
5	4824.00	55.3 PK	74.0	-18.7	3.61 H	140	54.4	0.9
6	4824.00	52.7 AV	54.0	-1.3	3.61 H	140	51.8	0.9
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	54.3 PK	74.0	-19.7	1.34 V	360	59.9	-5.6
2	2390.00	41.8 AV	54.0	-12.2	1.34 V	360	47.4	-5.6
3	*2412.00	108.5 PK			1.34 V	360	114.0	-5.5
4	*2412.00	104.6 AV			1.34 V	360	110.1	-5.5
5	4824.00	56.0 PK	74.0	-18.0	1.48 V	280	55.1	0.9
6	4824.00	53.6 AV	54.0	-0.4	1.48 V	280	52.7	0.9

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	41.2 PK	74.0	-32.8	1.06 H	221	46.8	-5.6
2	2390.00	32.6 AV	54.0	-21.4	1.06 H	221	38.2	-5.6
3	*2437.00	95.6 PK			1.06 H	221	101.0	-5.4
4	*2437.00	93.3 AV			1.06 H	221	98.7	-5.4
5	2483.50	42.5 PK	74.0	-31.5	1.06 H	221	47.8	-5.3
6	2483.50	33.6 AV	54.0	-20.4	1.06 H	221	38.9	-5.3
7	4874.00	54.8 PK	74.0	-19.2	3.61 H	150	53.8	1.0
8	4874.00	52.4 AV	54.0	-1.6	3.61 H	150	51.4	1.0
9	7311.00	52.7 PK	74.0	-21.3	3.94 H	98	45.1	7.6
10	7311.00	45.5 AV	54.0	-8.5	3.94 H	98	37.9	7.6

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	50.4 PK	74.0	-23.6	1.25 V	336	56.0	-5.6
2	2390.00	38.6 AV	54.0	-15.4	1.25 V	336	44.2	-5.6
3	*2437.00	106.2 PK			1.25 V	336	111.6	-5.4
4	*2437.00	102.6 AV			1.25 V	336	108.0	-5.4
5	2483.50	51.7 PK	74.0	-22.3	1.25 V	336	57.0	-5.3
6	2483.50	39.6 AV	54.0	-14.4	1.25 V	336	44.9	-5.3
7	4874.00	55.6 PK	74.0	-18.4	1.73 V	280	54.6	1.0
8	4874.00	53.4 AV	54.0	-0.6	1.73 V	280	52.4	1.0
9	7311.00	55.0 PK	74.0	-19.0	2.41 V	156	47.4	7.6
10	7311.00	47.8 AV	54.0	-6.2	2.41 V	156	40.2	7.6

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
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	95.4 PK			1.07 H	216	100.7	-5.3
2	*2462.00	92.9 AV			1.07 H	216	98.2	-5.3
3	2483.50	47.3 PK	74.0	-26.7	1.07 H	216	52.6	-5.3
4	2483.50	35.8 AV	54.0	-18.2	1.07 H	216	41.1	-5.3
5	4924.00	55.5 PK	74.0	-18.5	3.56 H	136	54.2	1.3
6	4924.00	52.7 AV	54.0	-1.3	3.56 H	136	51.4	1.3
7	7386.00	52.6 PK	74.0	-21.4	3.96 H	108	44.9	7.7
8	7386.00	45.3 AV	54.0	-8.7	3.96 H	108	37.6	7.7
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	107.5 PK			1.52 V	360	112.8	-5.3
2	*2462.00	103.6 AV			1.52 V	360	108.9	-5.3
3	2483.50	54.9 PK	74.0	-19.1	1.52 V	360	60.2	-5.3
4	2483.50	43.7 AV	54.0	-10.3	1.52 V	360	49.0	-5.3
5	4924.00	55.7 PK	74.0	-18.3	1.61 V	281	54.4	1.3
6	4924.00	53.4 AV	54.0	-0.6	1.61 V	281	52.1	1.3
7	7386.00	54.5 PK	74.0	-19.5	2.39 V	169	46.8	7.7
8	7386.00	47.5 AV	54.0	-6.5	2.39 V	169	39.8	7.7

REMARKS:

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

802.11g

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	56.1 PK	74.0	-17.9	1.10 H	226	61.7	-5.6
2	2390.00	42.4 AV	54.0	-11.6	1.10 H	226	48.0	-5.6
3	*2412.00	98.2 PK			1.10 H	226	103.7	-5.5
4	*2412.00	88.8 AV			1.10 H	226	94.3	-5.5
5	4824.00	63.2 PK	74.0	-10.8	3.58 H	126	62.3	0.9
6	4824.00	48.3 AV	54.0	-5.7	3.58 H	126	47.4	0.9
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	69.2 PK	74.0	-4.8	1.25 V	360	74.8	-5.6
2	2390.00	53.2 AV	54.0	-0.8	1.25 V	360	58.8	-5.6
3	*2412.00	111.9 PK			1.25 V	360	117.4	-5.5
4	*2412.00	102.3 AV			1.25 V	360	107.8	-5.5
5	4824.00	64.6 PK	74.0	-9.4	1.70 V	299	63.7	0.9
6	4824.00	49.6 AV	54.0	-4.4	1.70 V	299	48.7	0.9

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	59.6 PK	74.0	-14.4	1.12 H	235	65.2	-5.6
2	2390.00	42.5 AV	54.0	-11.5	1.12 H	235	48.1	-5.6
3	*2437.00	103.5 PK			1.12 H	235	108.9	-5.4
4	*2437.00	94.6 AV			1.12 H	235	100.0	-5.4
5	2483.50	56.8 PK	74.0	-17.2	1.12 H	235	62.1	-5.3
6	2483.50	40.6 AV	54.0	-13.4	1.12 H	235	45.9	-5.3
7	4874.00	54.2 PK	74.0	-19.8	3.55 H	155	53.2	1.0
8	4874.00	52.0 AV	54.0	-2.0	3.55 H	155	51.0	1.0
9	7311.00	53.2 PK	74.0	-20.8	3.99 H	86	45.6	7.6
10	7311.00	52.4 AV	54.0	-1.6	3.99 H	86	44.8	7.6

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	69.1 PK	74.0	-4.9	1.15 V	360	74.7	-5.6
2	2390.00	51.7 AV	54.0	-2.3	1.15 V	360	57.3	-5.6
3	*2437.00	116.7 PK			1.15 V	360	122.1	-5.4
4	*2437.00	107.2 AV			1.15 V	360	112.6	-5.4
5	2483.50	66.7 PK	74.0	-7.3	1.15 V	360	72.0	-5.3
6	2483.50	49.9 AV	54.0	-4.1	1.15 V	360	55.2	-5.3
7	4874.00	67.4 PK	74.0	-6.6	1.73 V	280	66.4	1.0
8	4874.00	53.5 AV	54.0	-0.5	1.73 V	280	52.5	1.0
9	7311.00	67.0 PK	74.0	-7.0	1.82 V	155	59.4	7.6
10	7311.00	53.8 AV	54.0	-0.2	1.82 V	155	46.2	7.6

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
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	97.5 PK			1.13 H	263	102.8	-5.3
2	*2462.00	86.5 AV			1.13 H	263	91.8	-5.3
3	2483.50	57.4 PK	74.0	-16.6	1.13 H	263	62.7	-5.3
4	2483.50	40.6 AV	54.0	-13.4	1.13 H	263	45.9	-5.3
5	4924.00	63.1 PK	74.0	-10.9	3.55 H	130	61.8	1.3
6	4924.00	48.3 AV	54.0	-5.7	3.55 H	130	47.0	1.3
7	7386.00	49.6 PK	74.0	-24.4	3.86 H	120	41.9	7.7
8	7386.00	48.7 AV	54.0	-5.3	3.86 H	120	41.0	7.7
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	110.1 PK			1.26 V	360	115.4	-5.3
2	*2462.00	100.4 AV			1.26 V	360	105.7	-5.3
3	2483.50	69.8 PK	74.0	-4.2	1.26 V	360	75.1	-5.3
4	2483.50	53.8 AV	54.0	-0.2	1.26 V	360	59.1	-5.3
5	4924.00	65.1 PK	74.0	-8.9	1.66 V	285	63.8	1.3
6	4924.00	50.1 AV	54.0	-3.9	1.66 V	285	48.8	1.3
7	7386.00	65.2 PK	74.0	-8.8	1.83 V	154	57.5	7.7
8	7386.00	50.4 AV	54.0	-3.6	1.83 V	154	42.7	7.7

REMARKS:

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

802.11n (HT20)

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	55.7 PK	74.0	-18.3	2.79 H	81	61.3	-5.6
2	2390.00	39.7 AV	54.0	-14.3	2.79 H	81	45.3	-5.6
3	*2412.00	97.9 PK			2.79 H	81	103.4	-5.5
4	*2412.00	87.6 AV			2.79 H	81	93.1	-5.5
5	4824.00	61.3 PK	74.0	-12.7	3.52 H	118	60.4	0.9
6	4824.00	46.1 AV	54.0	-7.9	3.52 H	118	45.2	0.9
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	69.3 PK	74.0	-4.7	1.10 V	356	74.9	-5.6
2	2390.00	53.5 AV	54.0	-0.5	1.10 V	356	59.1	-5.6
3	*2412.00	112.2 PK			1.10 V	356	117.7	-5.5
4	*2412.00	102.2 AV			1.10 V	356	107.7	-5.5
5	4824.00	62.2 PK	74.0	-11.8	1.67 V	310	61.3	0.9
6	4824.00	47.6 AV	54.0	-6.4	1.67 V	310	46.7	0.9

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	59.8 PK	74.0	-14.2	1.14 H	237	65.4	-5.6
2	2390.00	35.8 AV	54.0	-18.2	1.14 H	237	41.4	-5.6
3	*2437.00	103.9 PK			1.14 H	237	109.3	-5.4
4	*2437.00	94.7 AV			1.14 H	237	100.1	-5.4
5	2483.50	56.7 PK	74.0	-17.3	1.14 H	237	62.0	-5.3
6	2483.50	39.5 AV	54.0	-14.5	1.14 H	237	44.8	-5.3
7	4874.00	54.5 PK	74.0	-19.5	3.58 H	161	53.5	1.0
8	4874.00	48.5 AV	54.0	-5.5	3.58 H	161	47.5	1.0
9	7311.00	53.4 PK	74.0	-20.6	4.00 H	75	45.8	7.6
10	7311.00	49.3 AV	54.0	-4.7	4.00 H	75	41.7	7.6

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	73.2 PK	74.0	-0.8	1.37 V	184	78.8	-5.6
2	2390.00	49.2 AV	54.0	-4.8	1.37 V	184	54.8	-5.6
3	*2437.00	118.2 PK			1.37 V	184	123.6	-5.4
4	*2437.00	108.2 AV			1.37 V	184	113.6	-5.4
5	2483.50	70.3 PK	74.0	-3.7	1.37 V	184	75.6	-5.3
6	2483.50	49.9 AV	54.0	-4.1	1.37 V	184	55.2	-5.3
7	4874.00	65.7 PK	74.0	-8.3	1.86 V	278	64.7	1.0
8	4874.00	50.6 AV	54.0	-3.4	1.86 V	278	49.6	1.0
9	7311.00	64.1 PK	74.0	-9.9	1.67 V	176	56.5	7.6
10	7311.00	50.2 AV	54.0	-3.8	1.67 V	176	42.6	7.6

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
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	98.2 PK			2.79 H	73	103.5	-5.3
2	*2462.00	87.8 AV			2.79 H	73	93.1	-5.3
3	2483.50	55.5 PK	74.0	-18.5	2.79 H	73	60.8	-5.3
4	2483.50	39.8 AV	54.0	-14.2	2.79 H	73	45.1	-5.3
5	4924.00	61.5 PK	74.0	-12.5	3.53 H	127	60.2	1.3
6	4924.00	46.5 AV	54.0	-7.5	3.53 H	127	45.2	1.3
7	7386.00	60.4 PK	74.0	-13.6	3.82 H	104	52.7	7.7
8	7386.00	45.4 AV	54.0	-8.6	3.82 H	104	37.7	7.7
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	111.2 PK			1.28 V	214	116.5	-5.3
2	*2462.00	101.1 AV			1.28 V	214	106.4	-5.3
3	2483.50	68.3 PK	74.0	-5.7	1.28 V	214	73.6	-5.3
4	2483.50	53.4 AV	54.0	-0.6	1.28 V	214	58.7	-5.3
5	4924.00	62.6 PK	74.0	-11.4	1.71 V	302	61.3	1.3
6	4924.00	47.8 AV	54.0	-6.2	1.71 V	302	46.5	1.3
7	7386.00	61.4 PK	74.0	-12.6	1.66 V	192	53.7	7.7
8	7386.00	46.5 AV	54.0	-7.5	1.66 V	192	38.8	7.7

REMARKS:

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

802.11n (HT40)

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	54.9 PK	74.0	-19.1	2.73 H	77	60.5	-5.6
2	2390.00	42.1 AV	54.0	-11.9	2.73 H	77	47.7	-5.6
3	*2422.00	94.3 PK			2.73 H	77	99.7	-5.4
4	*2422.00	84.3 AV			2.73 H	77	89.7	-5.4
5	4844.00	61.2 PK	74.0	-12.8	3.56 H	137	60.3	0.9
6	4844.00	46.4 AV	54.0	-7.6	3.56 H	137	45.5	0.9
7	7266.00	60.3 PK	74.0	-13.7	3.83 H	98	52.6	7.7
8	7266.00	45.1 AV	54.0	-8.9	3.83 H	98	37.4	7.7
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	66.5 PK	74.0	-7.5	1.60 V	183	72.1	-5.6
2	2390.00	53.5 AV	54.0	-0.5	1.60 V	183	59.1	-5.6
3	*2422.00	106.0 PK			1.60 V	183	111.4	-5.4
4	*2422.00	96.1 AV			1.60 V	183	101.5	-5.4
5	4844.00	62.7 PK	74.0	-11.3	1.70 V	315	61.8	0.9
6	4844.00	48.2 AV	54.0	-5.8	1.70 V	315	47.3	0.9
7	7266.00	62.0 PK	74.0	-12.0	1.66 V	195	54.3	7.7
8	7266.00	46.8 AV	54.0	-7.2	1.66 V	195	39.1	7.7

REMARKS:

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	55.4 PK	74.0	-18.6	2.69 H	73	61.0	-5.6
2	2390.00	42.4 AV	54.0	-11.6	2.69 H	73	48.0	-5.6
3	*2437.00	96.4 PK			2.74 H	81	101.8	-5.4
4	*2437.00	96.4 AV			2.74 H	81	101.8	-5.4
5	2483.50	56.4 PK	74.0	-17.6	2.74 H	81	61.7	-5.3
6	2483.50	43.4 AV	54.0	-10.6	2.74 H	81	48.7	-5.3
7	4874.00	61.3 PK	74.0	-12.7	3.59 H	147	60.3	1.0
8	4874.00	46.7 AV	54.0	-7.3	3.59 H	147	45.7	1.0
9	7311.00	60.0 PK	74.0	-14.0	3.87 H	98	52.4	7.6
10	7311.00	44.9 AV	54.0	-9.1	3.87 H	98	37.3	7.6

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	66.9 PK	74.0	-7.1	1.31 V	184	72.5	-5.6
2	2390.00	53.6 AV	54.0	-0.4	1.31 V	184	59.2	-5.6
3	*2437.00	109.2 PK			1.31 V	184	114.6	-5.4
4	*2437.00	99.3 AV			1.31 V	184	104.7	-5.4
5	2483.50	67.9 PK	74.0	-6.1	1.31 V	184	73.2	-5.3
6	2483.50	53.4 AV	54.0	-0.6	1.31 V	184	58.7	-5.3
7	4874.00	63.1 PK	74.0	-10.9	1.74 V	296	62.1	1.0
8	4874.00	48.1 AV	54.0	-5.9	1.74 V	296	47.1	1.0
9	7311.00	61.3 PK	74.0	-12.7	1.70 V	196	53.7	7.6
10	7311.00	46.2 AV	54.0	-7.8	1.70 V	196	38.6	7.6

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
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	92.4 PK			2.68 H	68	97.8	-5.4
2	*2452.00	81.6 AV			2.68 H	68	87.0	-5.4
3	2483.50	55.2 PK	74.0	-18.8	2.68 H	68	60.5	-5.3
4	2483.50	42.1 AV	54.0	-11.9	2.68 H	68	47.4	-5.3
5	4904.00	60.7 PK	74.0	-13.3	3.60 H	142	59.5	1.2
6	4904.00	46.0 AV	54.0	-8.0	3.60 H	142	44.8	1.2
7	7356.00	60.5 PK	74.0	-13.5	3.88 H	113	52.8	7.7
8	7356.00	45.5 AV	54.0	-8.5	3.88 H	113	37.8	7.7
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	103.3 PK			1.36 V	186	108.7	-5.4
2	*2452.00	93.3 AV			1.36 V	186	98.7	-5.4
3	2483.50	66.5 PK	74.0	-7.5	1.36 V	186	71.8	-5.3
4	2483.50	53.8 AV	54.0	-0.2	1.36 V	186	59.1	-5.3
5	4904.00	60.4 PK	74.0	-13.6	1.70 V	292	59.2	1.2
6	4904.00	44.3 AV	54.0	-9.7	1.70 V	292	43.1	1.2
7	7356.00	61.3 PK	74.0	-12.7	1.70 V	194	53.6	7.7
8	7356.00	44.9 AV	54.0	-9.1	1.70 V	194	37.2	7.7

REMARKS:

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

Below 1GHz Data:

802.11n (HT20)

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	Below 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	32.57	34.8 QP	40.0	-5.2	1.10 H	79	44.6	-9.8
2	100.01	40.0 QP	43.5	-3.5	2.50 H	302	52.9	-12.9
3	108.81	36.6 QP	43.5	-6.9	3.10 H	16	48.1	-11.5
4	148.10	32.7 QP	43.5	-10.8	2.50 H	69	41.2	-8.5
5	250.02	42.7 QP	46.0	-3.3	1.10 H	323	52.7	-10.0
6	500.01	41.0 QP	46.0	-5.0	1.50 H	63	43.7	-2.7
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	32.28	34.6 QP	40.0	-5.4	1.10 V	23	44.4	-9.8
2	75.01	34.4 QP	40.0	-5.6	2.50 V	231	46.4	-12.0
3	148.15	37.2 QP	43.5	-6.3	1.10 V	55	45.7	-8.5
4	250.02	37.6 QP	46.0	-8.4	1.50 V	360	47.6	-10.0
5	312.51	38.6 QP	46.0	-7.4	1.50 V	357	46.2	-7.6
6	500.01	40.2 QP	46.0	-5.8	1.10 V	93	42.9	-2.7

REMARKS:

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

4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

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

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

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

4.2.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver R&S	ESCS 30	847124/029	Oct. 23, 2015	Oct. 22, 2016
Line-Impedance Stabilization Network (for EUT) R&S	ESH3-Z5	848773/004	Oct. 28, 2015	Oct. 27, 2016
RF Cable	5D-FB	COACAB-002	Mar. 04, 2016	Mar. 03, 2017
10 dB PAD Mini-Circuits	HAT-10+	CONATT-004	Jun. 20, 2016	Jun. 19, 2017
Software BVADT	BVADT_Cond_ V7.3.7.3	NA	NA	NA

Note:

1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Shielded Room No. 1.
- 4 Tested Date: July 29, 2016

4.2.3 Test Procedures

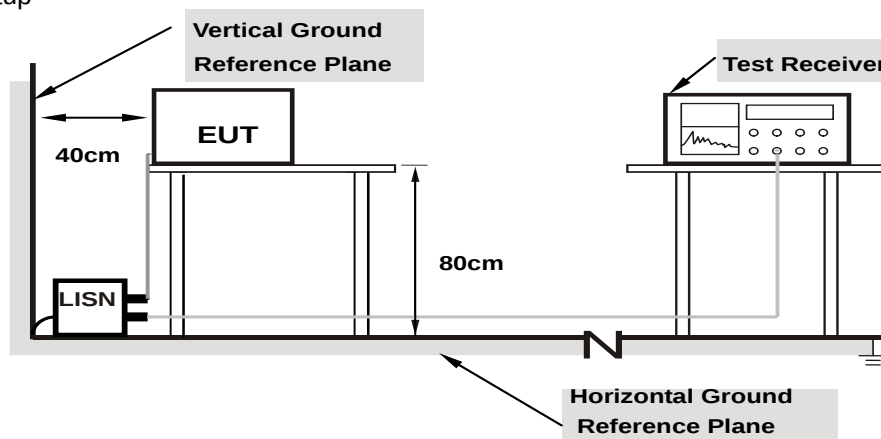
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

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

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



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

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

4.2.6 EUT Operating Conditions

Same as 4.1.6.

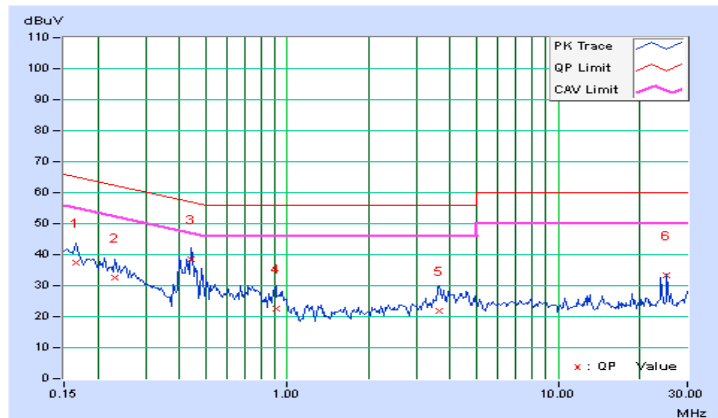
4.2.7 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
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Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16562	10.21	27.24	12.60	37.45	22.81	65.18	55.18	-27.72	-32.36
2	0.23203	10.22	22.47	7.37	32.69	17.59	62.38	52.38	-29.69	-34.79
3	0.43906	10.22	28.21	21.43	38.43	31.65	57.08	47.08	-18.65	-15.43
4	0.90781	10.25	12.19	-0.29	22.44	9.96	56.00	46.00	-33.56	-36.04
5	3.66016	10.29	11.58	1.67	21.87	11.96	56.00	46.00	-34.13	-34.04
6	25.23047	11.45	21.81	20.81	33.26	32.26	60.00	50.00	-26.74	-17.74

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

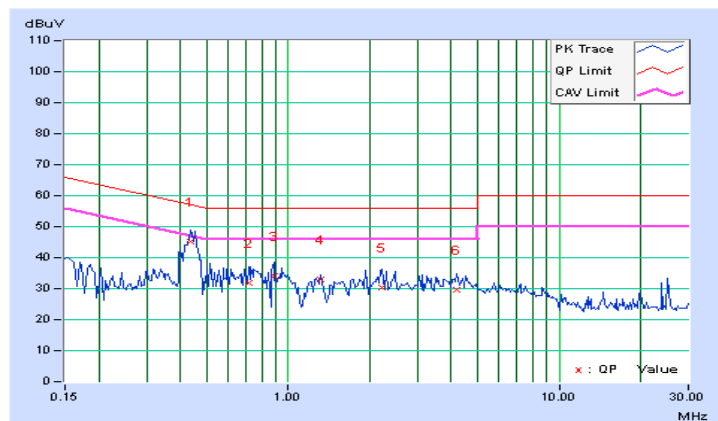


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
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Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.43516	10.20	35.01	25.45	45.21	35.65	57.15	47.15	-11.94	-11.50
2	0.71250	10.22	21.73	15.66	31.95	25.88	56.00	46.00	-24.05	-20.12
3	0.88438	10.23	23.68	15.00	33.91	25.23	56.00	46.00	-22.09	-20.77
4	1.31250	10.26	22.65	20.51	32.91	30.77	56.00	46.00	-23.09	-15.23
5	2.22266	10.29	20.03	13.09	30.32	23.38	56.00	46.00	-25.68	-22.62
6	4.19141	10.26	19.39	12.90	29.65	23.16	56.00	46.00	-26.35	-22.84

Remarks:

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

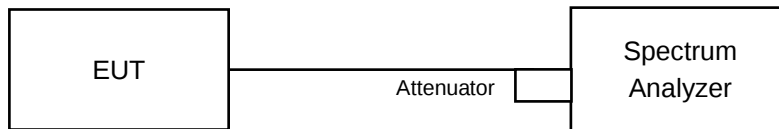


4.3 6dB Bandwidth Measurement

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

- Set resolution bandwidth (RBW) = 100kHz
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW, Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- 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
1	2412	10.11	0.5	Pass
6	2437	10.10	0.5	Pass
11	2462	10.10	0.5	Pass

802.11g

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	16.65	0.5	Pass
6	2437	16.66	0.5	Pass
11	2462	16.66	0.5	Pass

802.11n (HT20)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	17.89	17.89	0.5	Pass
6	2437	17.89	17.88	0.5	Pass
11	2462	17.89	17.89	0.5	Pass

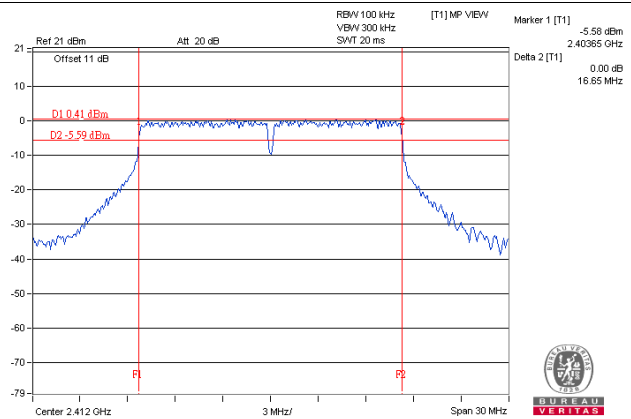
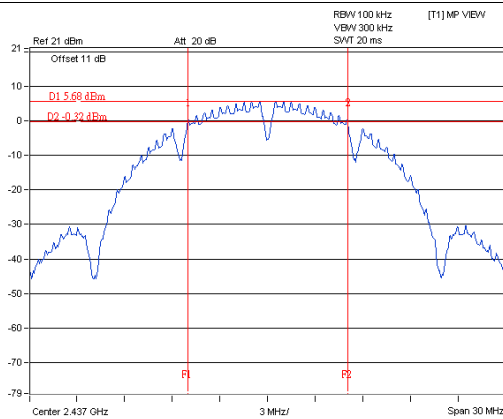
802.11n (HT40)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
3	2422	36.60	36.60	0.5	Pass
6	2437	36.62	36.62	0.5	Pass
9	2452	36.58	36.58	0.5	Pass

Spectrum Plot of Worst Value

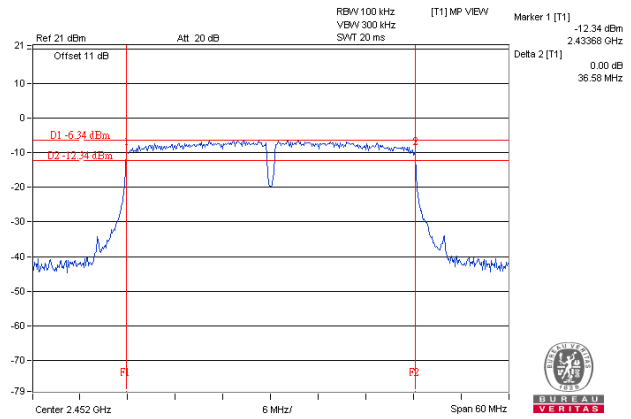
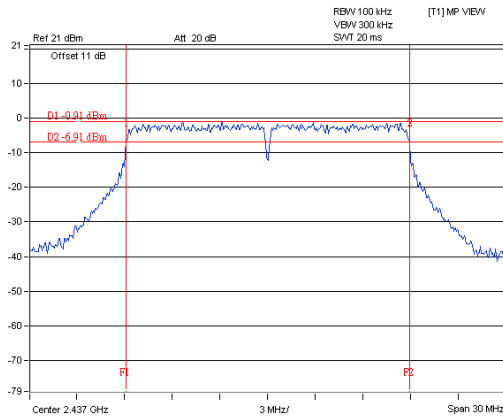
802.11b / CH6

802.11g / CH1



802.11n (HT20) / Chain 1 : CH6

802.11n (HT40) / Chain 0 : CH9



4.4 Conducted Output Power Measurement

4.4.1 Limits of Conducted Output Power Measurement

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

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

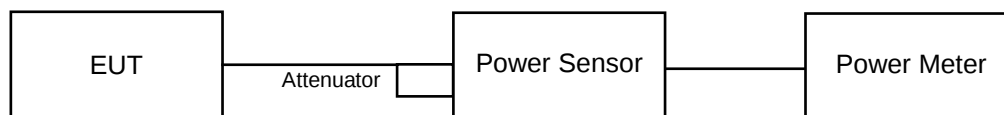
Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

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

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

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

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 Test Procedures

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	72.946	18.63	30	Pass
6	2437	66.222	18.21	30	Pass
11	2462	65.163	18.14	30	Pass

802.11g

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
1	2412	279.254	24.46	30	Pass
6	2437	285.102	24.55	30	Pass
11	2462	274.157	24.38	30	Pass

802.11n (HT20)

Chan.	Freq. (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	22.77	22.02	348.455	25.42	30	Pass
6	2437	22.43	22.07	336.05	25.26	30	Pass
11	2462	22.58	22.33	352.136	25.47	30	Pass

802.11n (HT40)

Chan.	Freq. (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	21.43	21.11	268.117	24.28	30	Pass
6	2437	22.52	21.64	324.53	25.11	30	Pass
9	2452	19.67	18.53	163.968	22.15	30	Pass

FOR AVERAGE POWER

802.11b

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	46.238	16.65
6	2437	41.783	16.21
11	2462	39.811	16.00

802.11g

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	32.509	15.12
6	2437	33.266	15.22
11	2462	32.285	15.09

802.11n (HT20)

Chan.	Frequency (MHz)	Avg. Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
1	2412	13.35	13.45	43.758	16.41
6	2437	13.44	13.53	44.622	16.50
11	2462	13.41	13.68	45.263	16.56

802.11n (HT40)

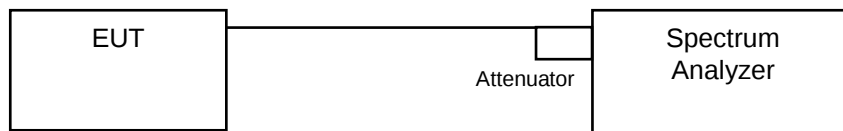
Chan.	Frequency (MHz)	Avg. Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
3	2422	13.50	12.49	40.129	16.03
6	2437	13.19	13.06	41.075	16.14
9	2452	11.42	10.34	24.682	13.92

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

- Set analyzer center frequency to DTS channel center frequency.
- Set the span to 1.5 times the DTS bandwidth.
- Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- Set the VBW $\geq 3 \times \text{RBW}$.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- 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	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
1	2412	-14.34	8	Pass
6	2437	-14.40	8	Pass
11	2462	-14.59	8	Pass

802.11g

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
1	2412	-13.99	8	Pass
6	2437	-14.24	8	Pass
11	2462	-13.92	8	Pass

802.11n (HT20)

TX chain	Channel	Freq. (MHz)	PSD (dBm/3kHz)	10 log (N=2) dB	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	1	2412	-15.02	3.01	-12.01	5.99	Pass
	6	2437	-14.70	3.01	-11.69	5.99	Pass
	11	2462	-14.45	3.01	-11.44	5.99	Pass
1	1	2412	-15.19	3.01	-12.18	5.99	Pass
	6	2437	-14.61	3.01	-11.60	5.99	Pass
	11	2462	-14.44	3.01	-11.43	5.99	Pass

NOTE: Directional gain = 5dBi + 10log(2) = 8.01dBi > 6dBi , so the power density limit shall be reduced to 8-(8.01-6) = 5.99dBm.

802.11n (HT40)

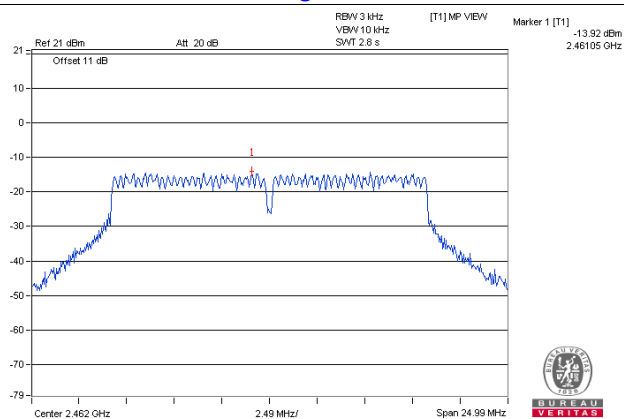
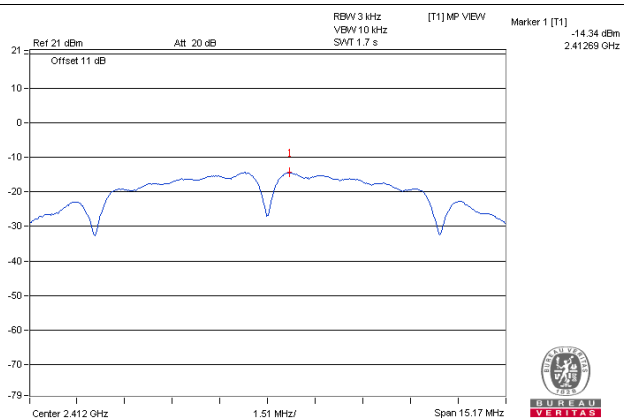
TX chain	Channel	Freq. (MHz)	PSD (dBm/3kHz)	10 log (N=2) dB	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
0	3	2422	-14.76	3.01	-11.75	5.99	Pass
	6	2437	-17.21	3.01	-14.20	5.99	Pass
	9	2452	-17.72	3.01	-14.71	5.99	Pass
1	3	2422	-18.92	3.01	-15.91	5.99	Pass
	6	2437	-16.69	3.01	-13.68	5.99	Pass
	9	2452	-21.25	3.01	-18.24	5.99	Pass

NOTE: Directional gain = 5dBi + 10log(2) = 8.01dBi > 6dBi , so the power density limit shall be reduced to 8-(8.01-6) = 5.99dBm.

Spectrum Plot of Worst Value

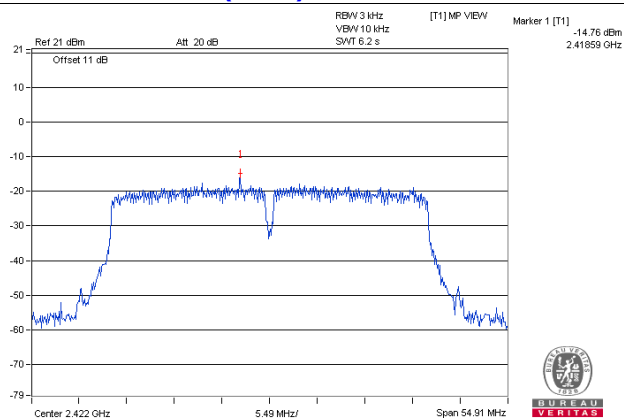
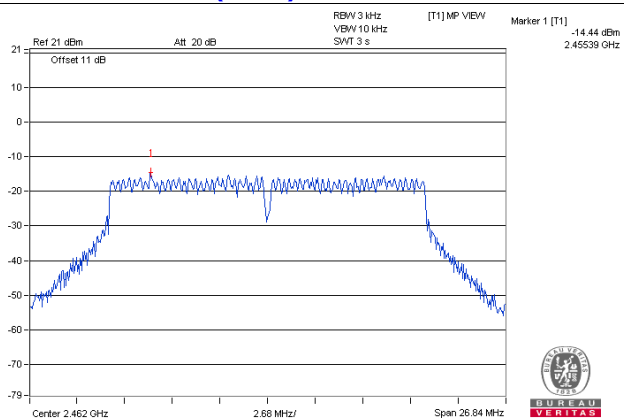
802.11b / CH1

802.11g / CH11



802.11n (HT20) / Chain 1 : CH11

802.11n (HT40) / Chain 0 : CH3

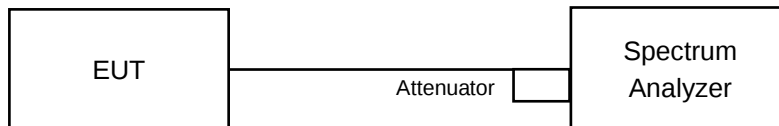


4.6 Conducted Out of Band Emission Measurement

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

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 OOBE

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

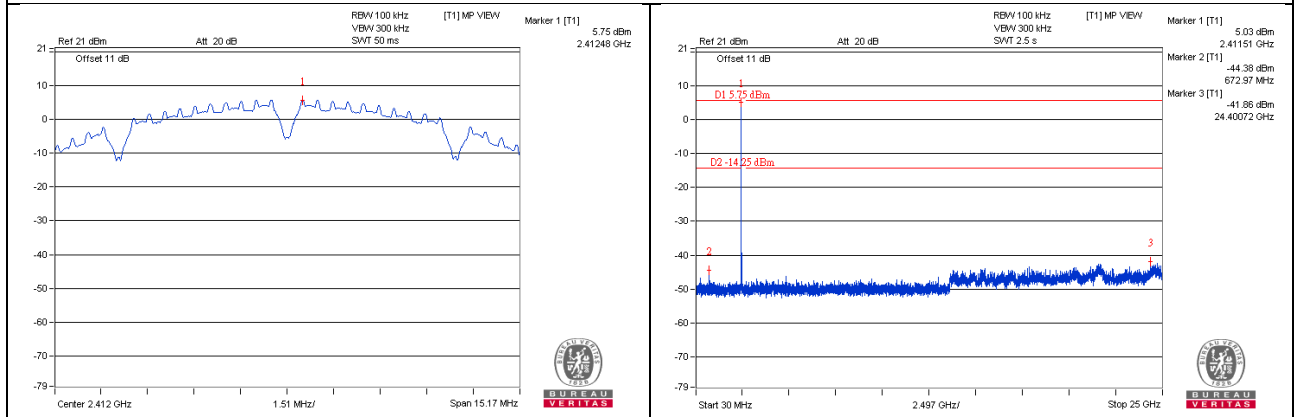
Same as Item 4.3.6

4.6.7 Test Results

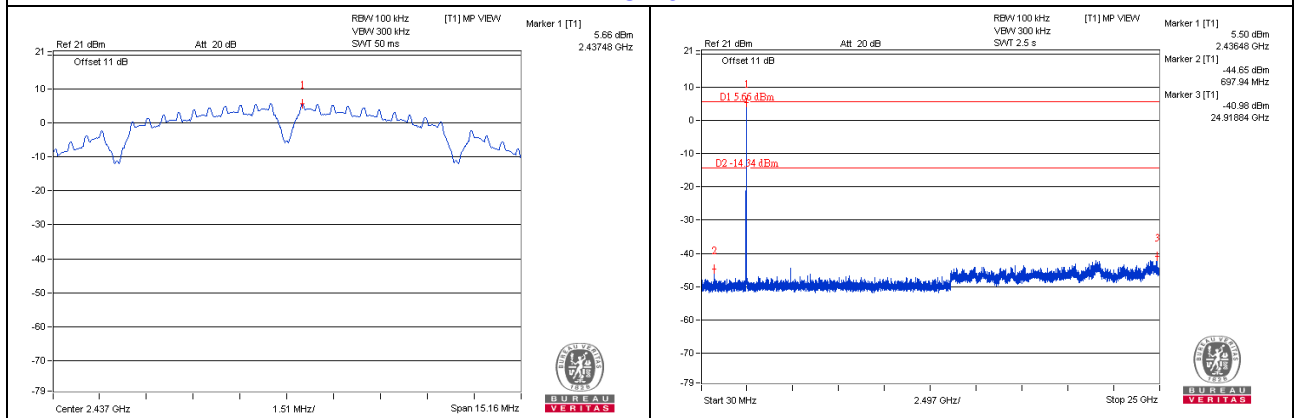
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

802.11b

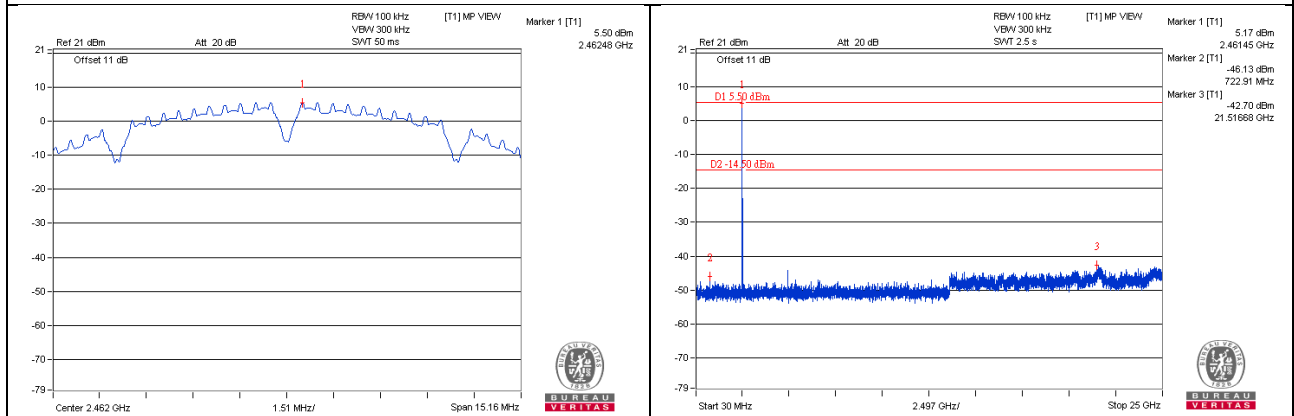
CH 1



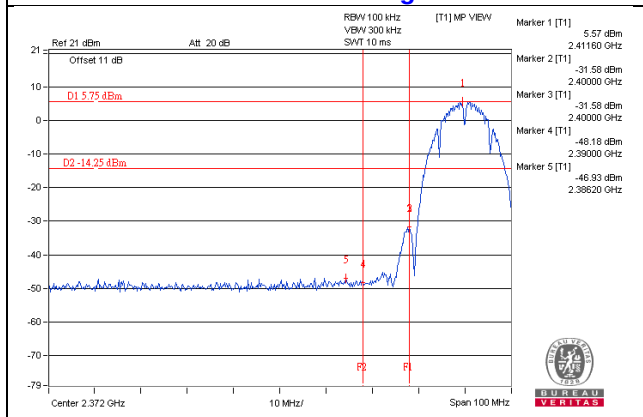
CH 6



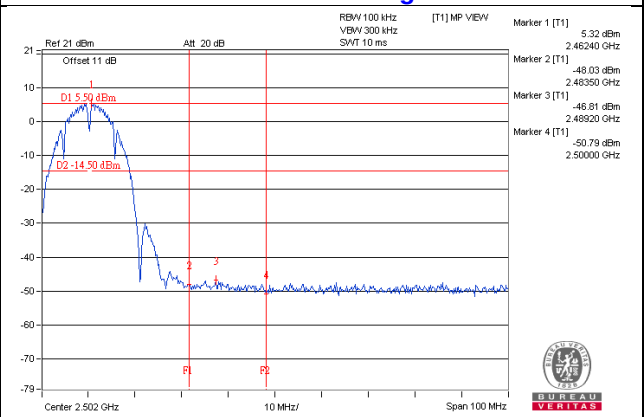
CH 11



CH 1 Band edge

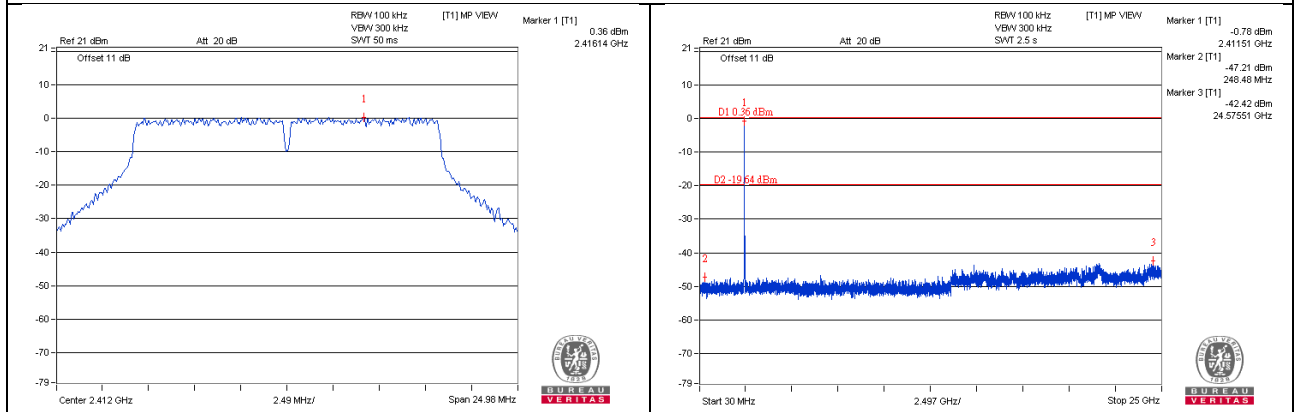


CH 11 Band edge

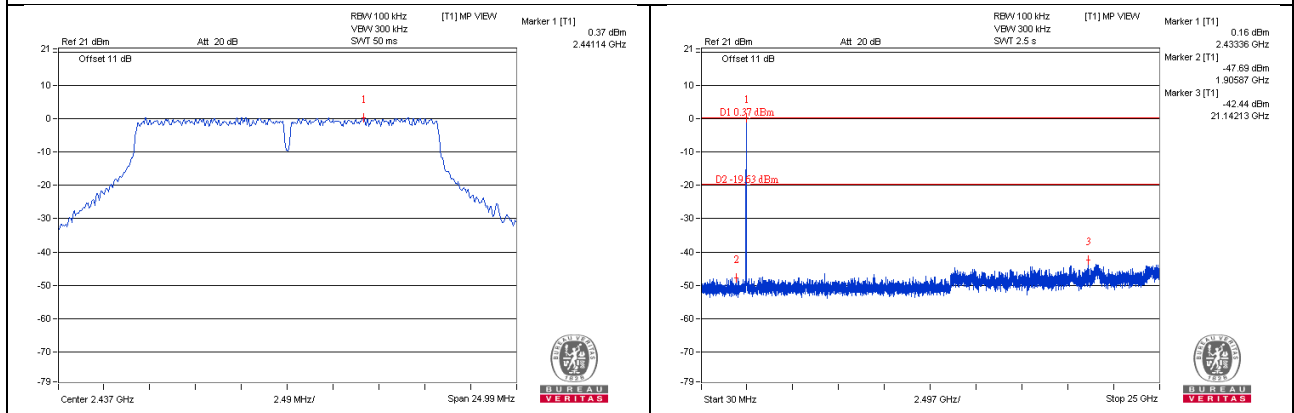


802.11g

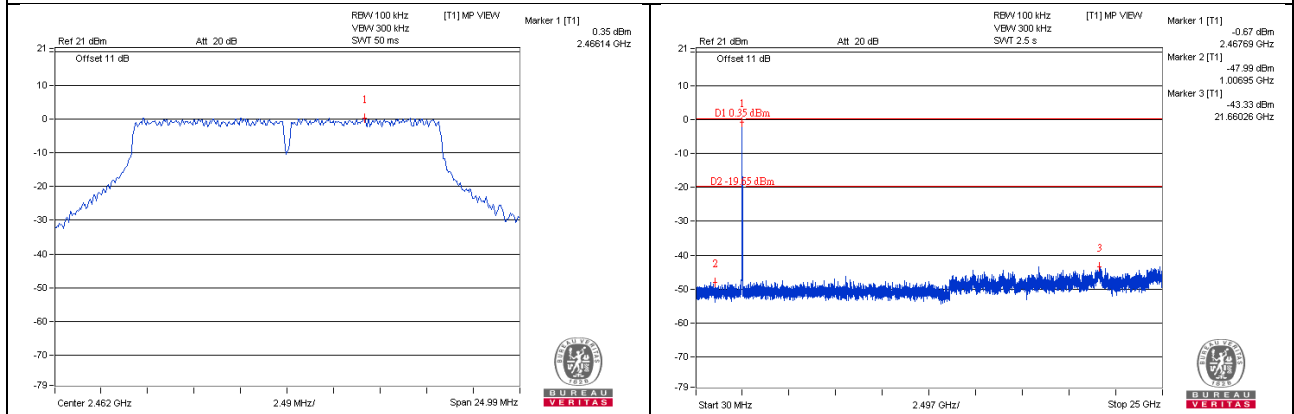
CH 1



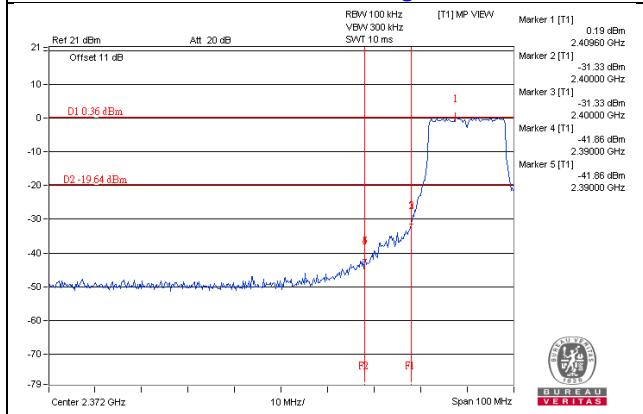
CH 6



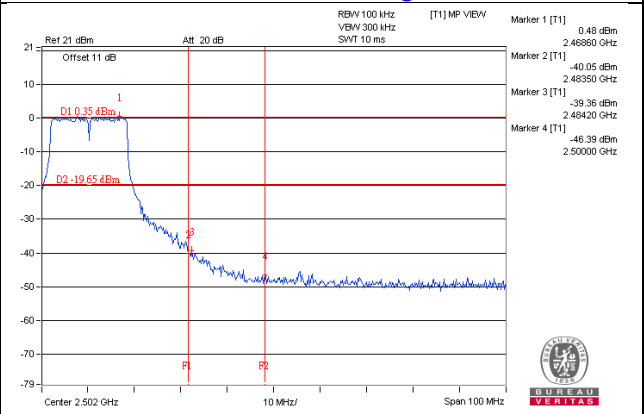
CH 11



CH 1 Band edge

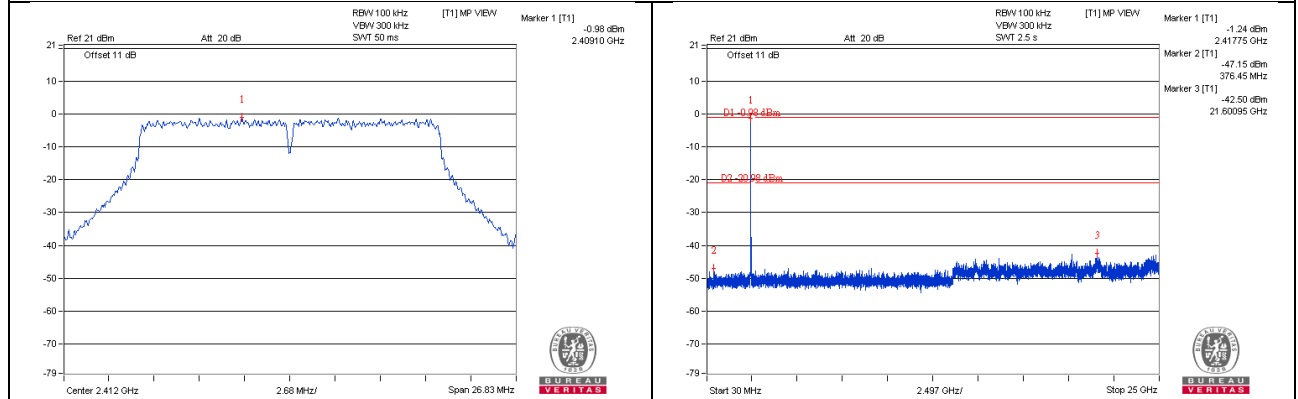


CH 11 Band edge

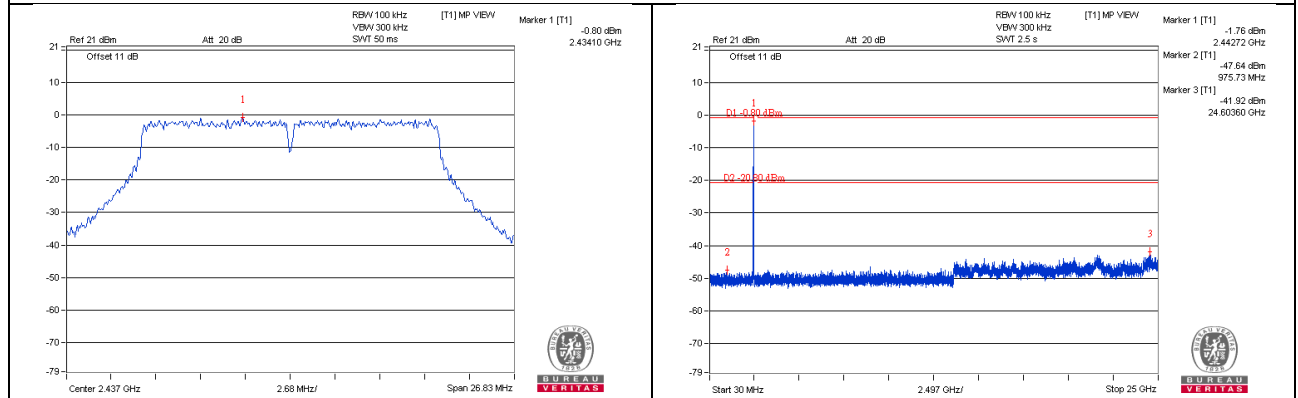


802.11n (HT20) Chain 0

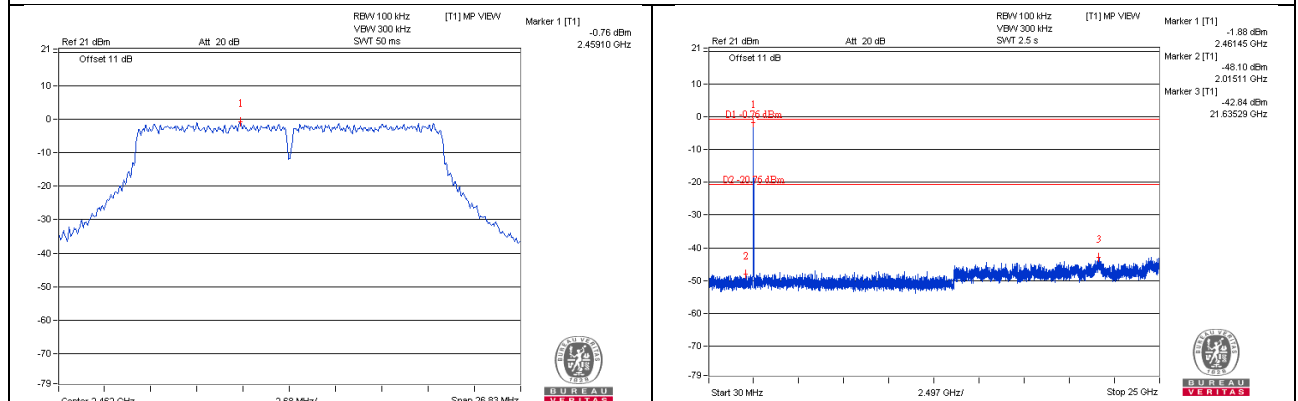
CH 1



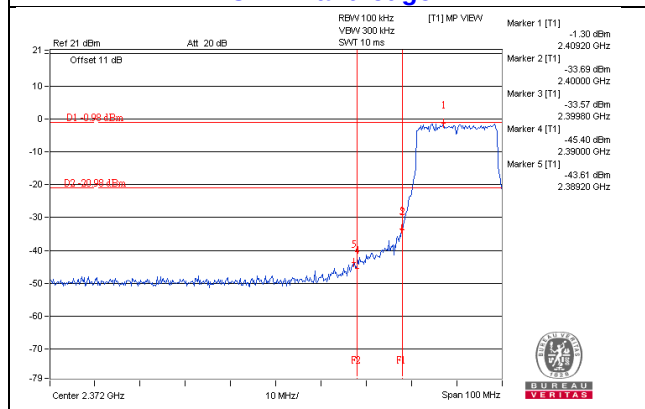
CH 6



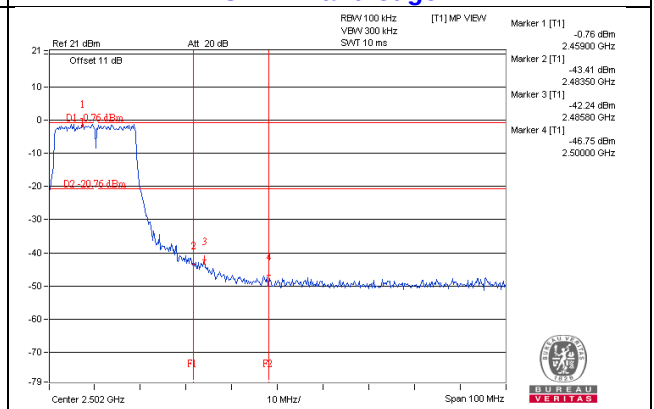
CH 11



CH 1 Band edge

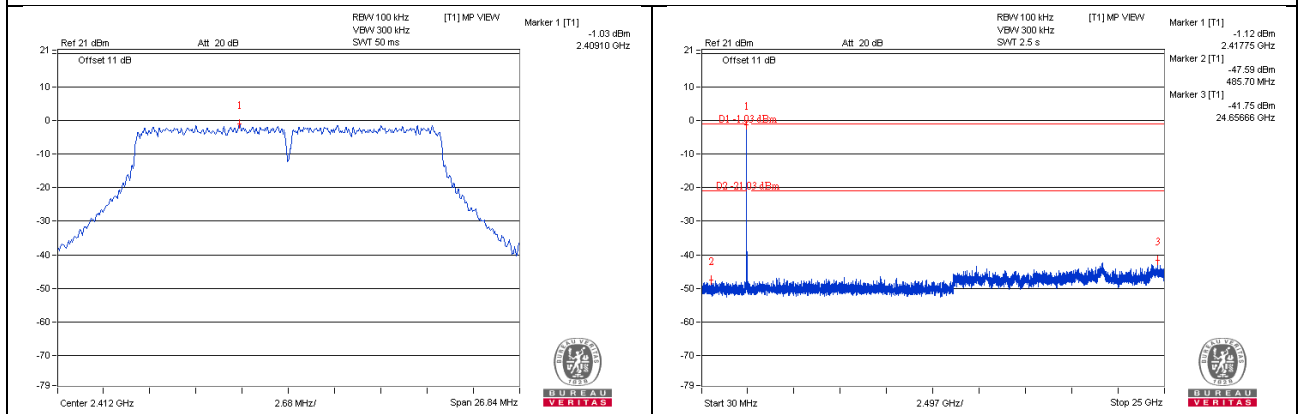


CH 11 Band edge

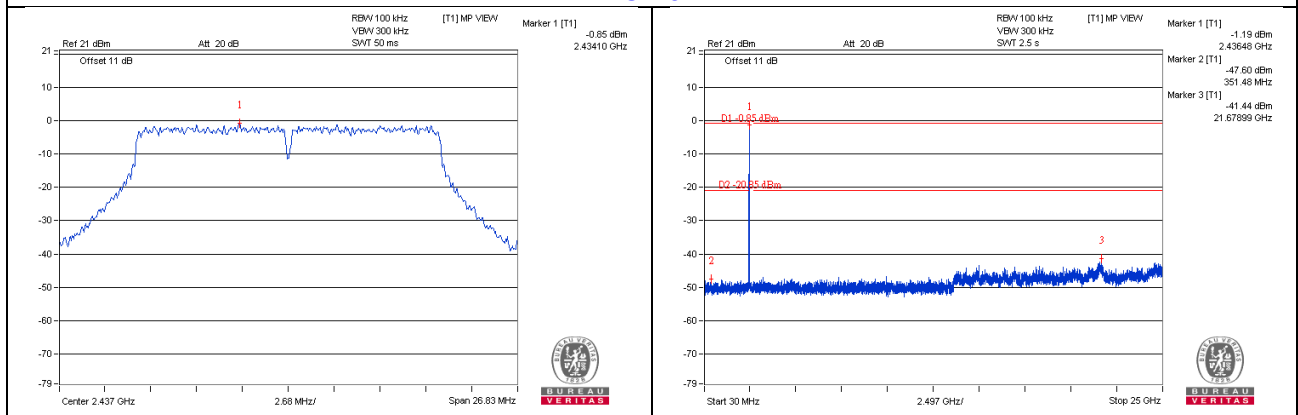


Chain 1

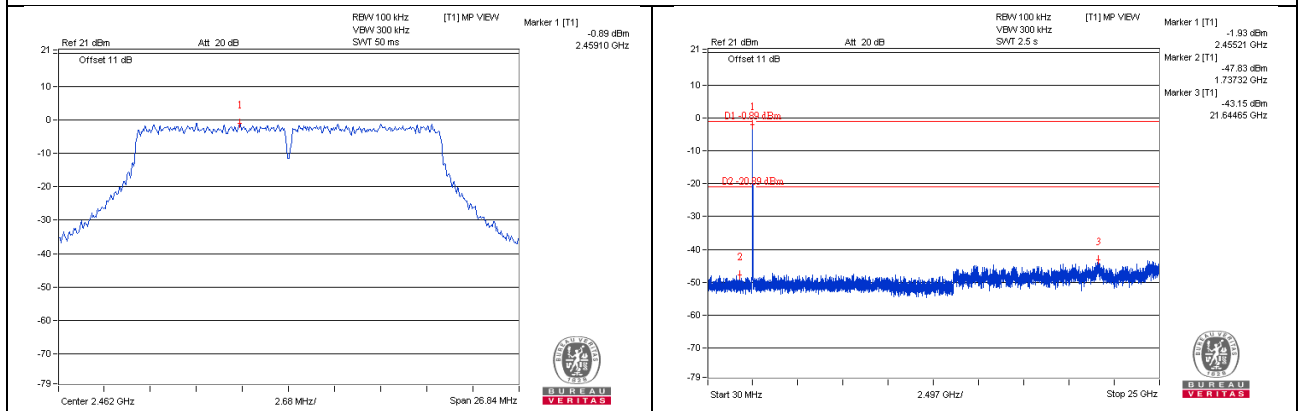
CH 1



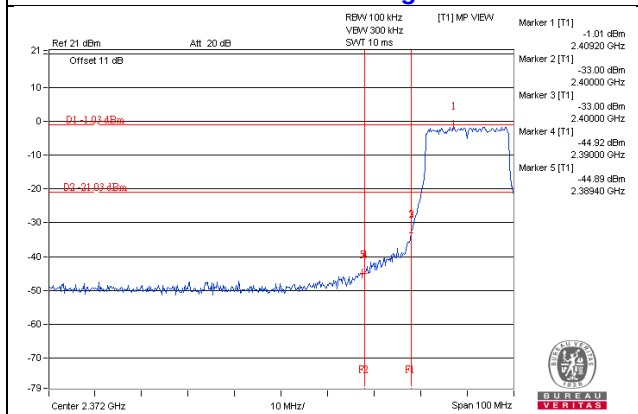
CH 6



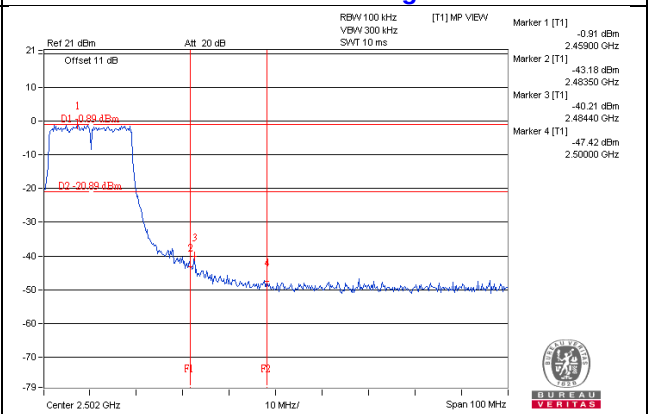
CH 11



CH 1 Band edge

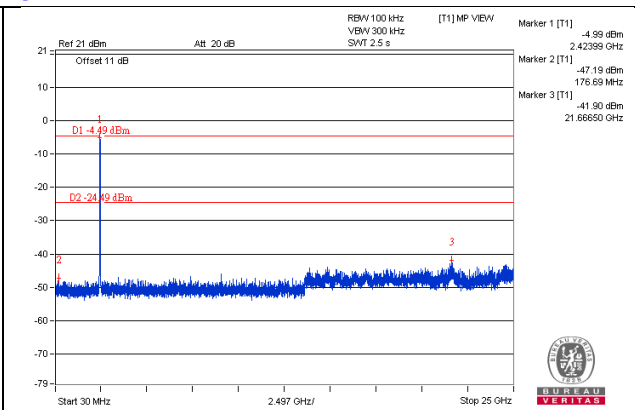
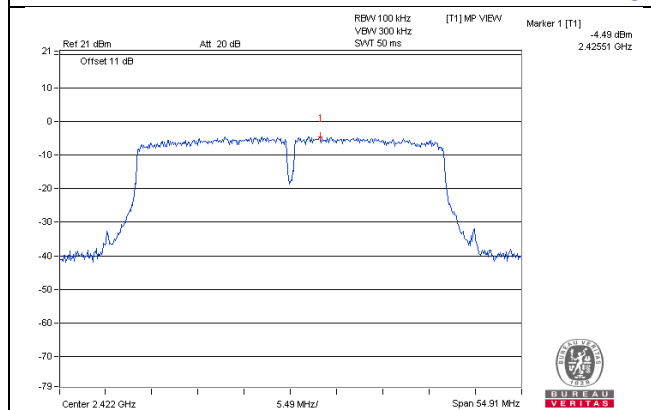


CH 11 Band edge

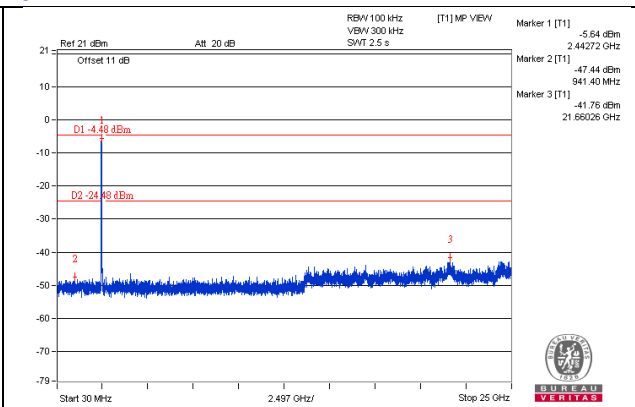
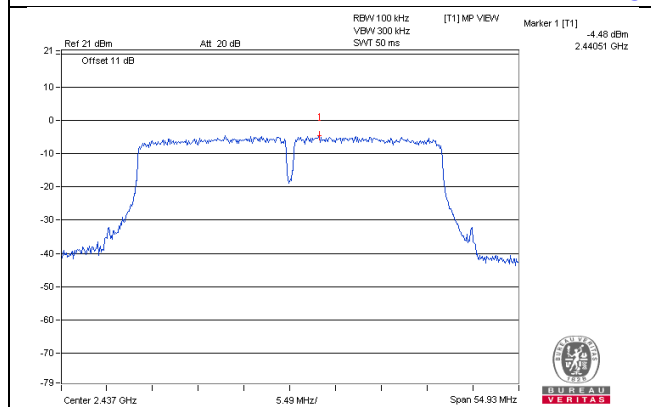


802.11n (HT40) Chain 0

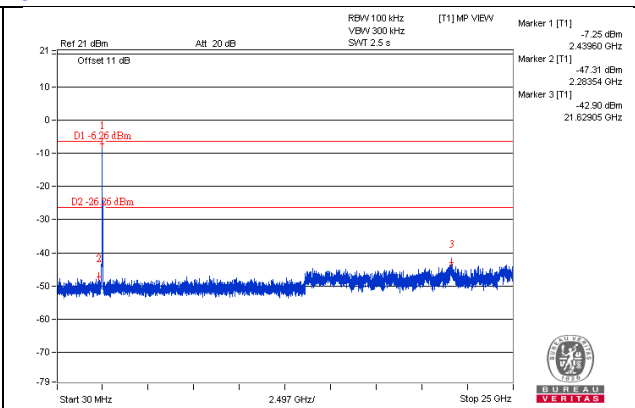
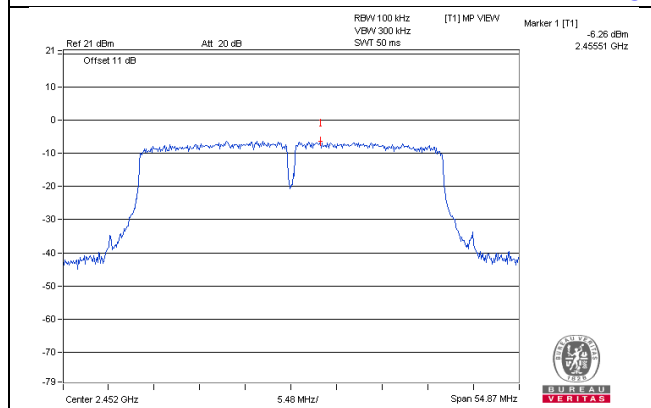
CH 3



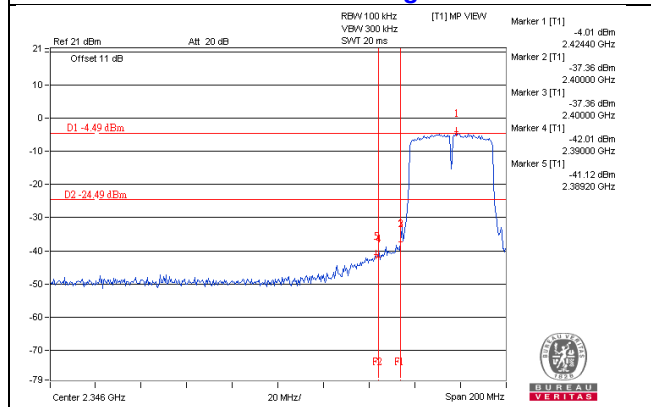
CH 6



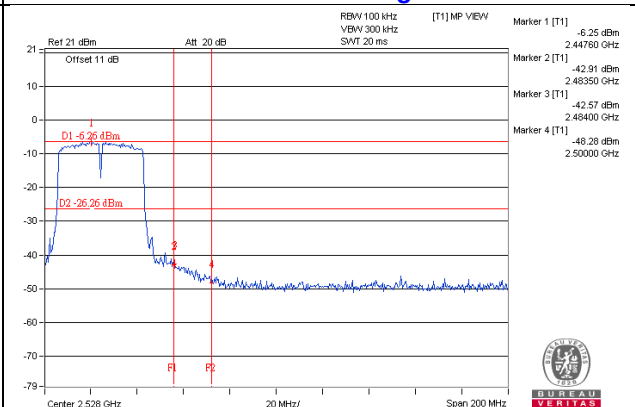
CH 9



CH 3 Band edge

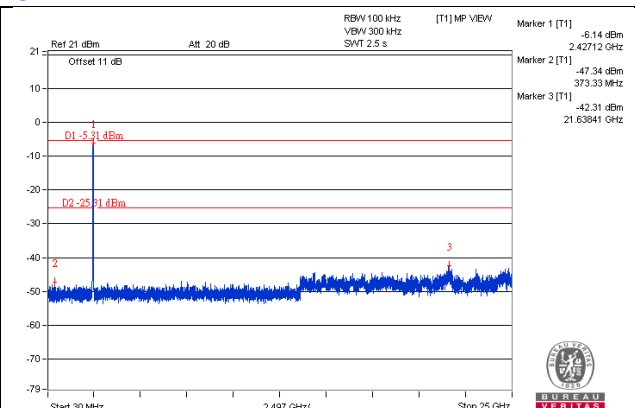
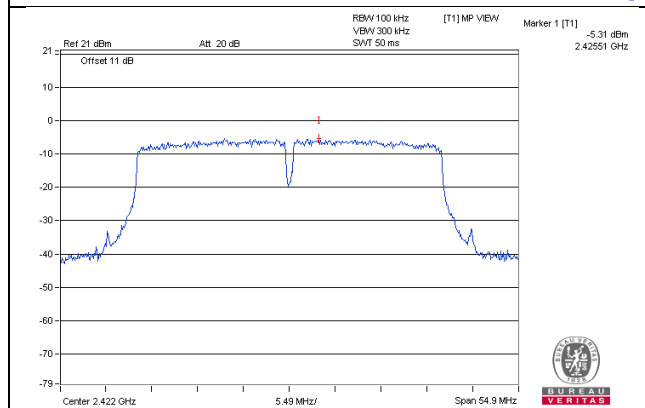


CH 9 Band edge

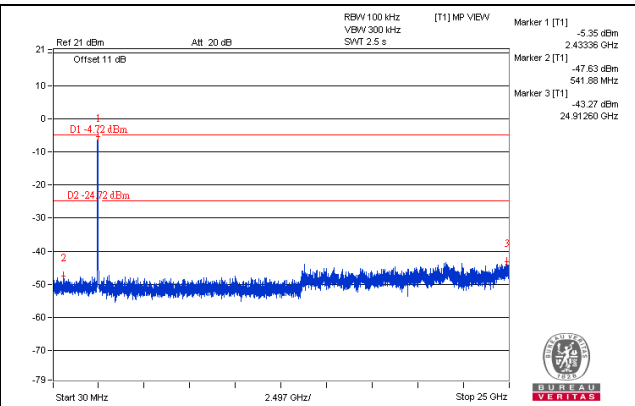
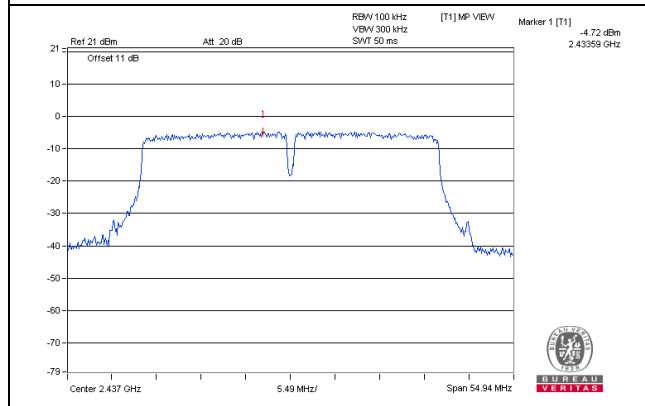


Chain 1

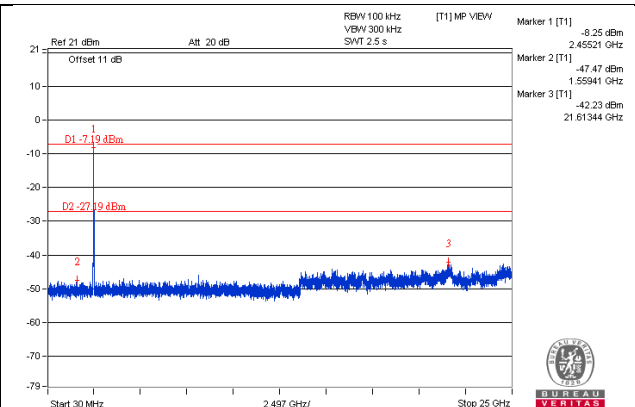
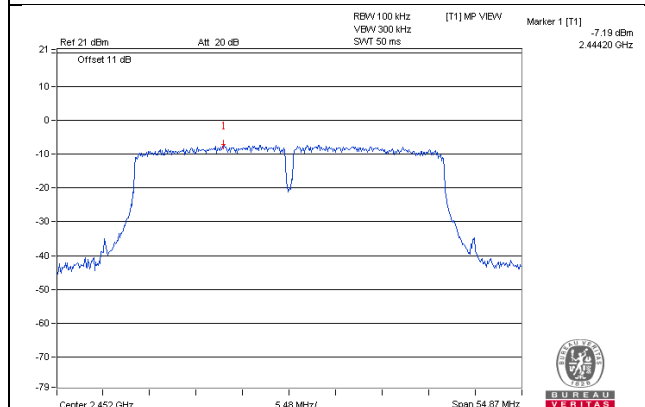
CH 3



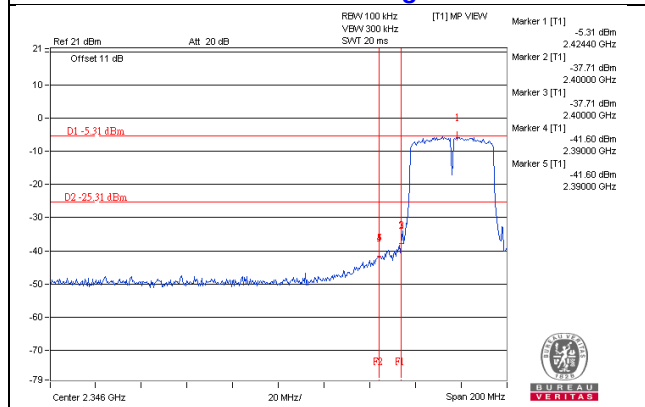
CH 6



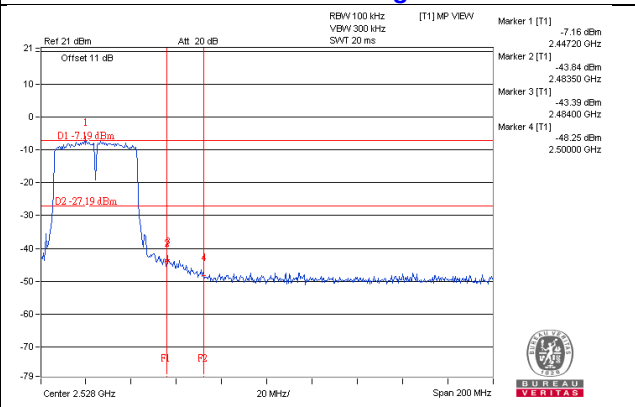
CH 9



CH 3 Band edge



CH 9 Band edge



5 Pictures of Test Arrangements

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

Appendix – Information 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 accredited and approved according to ISO/IEC 17025.

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

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Fax: 886-2-26051924

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Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

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

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