



BUREAU
VERITAS

Test Report No.: RF170330W002-2



FCC TEST REPORT

(Part 15, Subpart C)

Product: Portable Tablet Computer

Model Name: TB-8704V

FCC ID: O57TB8704V

Applicant: Lenovo(Shanghai) Electronics Technology Co., Ltd.

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Report No.: RF170330W002-2

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Test Report No.: RF170330W002-2

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF170330W002-2	Original release	May 11, 2017



Test Report No.: RF170330W002-2

1 CERTIFICATION

PRODUCT: Portable Tablet Computer
BRAND NAME: Lenovo
MODEL NAME: TB-8704V
APPLICANT: Lenovo(Shanghai) Electronics Technology Co., Ltd.
TESTED: Apr. 11, 2017 ~ May 10, 2017
TEST SAMPLE: Production Unit
STANDARDS: **FCC Part 15, Subpart C. Section 15.247**
ANSI C63.10-2013

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

PREPARED BY : _____, **DATE:** May 11, 2017
(Harry Li/ Engineer)

APPROVED BY : _____, **DATE:** May 11, 2017
(Sam Tung / Manager)



2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.247)			
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT	REMARK
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -15.32dB at 0.154000MHz.
15.205 15.209	Radiated Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -1.59dB at 2483.5MHz.
15.247(d)	Out of band Emission Measurement	PASS	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	PASS	Meet the requirement of limit.
15.247(b)	Conducted Output 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	UNCERTAINTY
Conducted emissions	9kHz~30MHz	2.70dB
Radiated emissions	9KHz ~ 30MHz	2.90dB
	30MHz ~ 1GMHz	4.06dB
	1GHz ~ 18GHz	4.58dB
	18GHz ~ 40GHz	1.94dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.



3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Portable Tablet Computer
BRAND NAME	Lenovo
MODEL NAME	TB-8704V
NOMINAL VOLTAGE	5.2Vdc (adapter or host equipment) 3.85Vdc (Li-Polymer, battery)
MODULATION TECHNOLOGY	DSSS, OFDM, DTS
MODULATION TYPE	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM BT-LE(GFSK) for DTS
TRANSMISSION RATE	802.11b: 11/ 5.5/ 2.0 / 1.0 Mbps 802.11g: 54/ 48/ 36 / 24 / 18 / 9/ 6 Mbps 802.11n: up to 65 Mbps BT_LE: 1 Mbps
OPERATING FREQUENCY	2412-2462MHz for 11b/g/n(HT20) 2402-2480MHz for BT-LE(GFSK)
MAX. OUTPUT POWER	WLAN: 124.165mW (Maximum) BT-LE: 1.021mW (Maximum)
ANTENNA TYPE	PIFA Antenna with -4dBi gain
HW VERSION	Lenovo Tablet TB-8704V
SW VERSION	TB-8704V_RF01_170504
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	USB cable: non-shielded, detachable, 1.0m

NOTE:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. The EUT incorporates a SISO function. Physically, the EUT provides one transmitter and one receiver.

MODULATION MODE	TX/RX FUNCTION
802.11b	1TX /1RX
802.11g	1TX /1RX
802.11n (20MHz)	1TX /1RX



3. There were Sample A and B for this project, the difference is as below:

SAMPLE	EUT CONFIGURATION INFORMATION
A	(LCD+TP)1+ Battery1 + eMMC 1(16G+2G)+Front Camera1+Back Camera1+ USB Cable1 + Adapter 1
B	(LCD+TP)2+ Battery2 + eMMC 1 (16G+2G)+Front Camera2+Back Camera2 + USB Cable2+ Adapter 2

4. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.

List of Accessories:

Accessories	Brand	Model	Manufacturer	Specification
AC Adapter 1	Acbel	C-P35	AcBel	I/P:100-240Vac, 300mA O/P: 5.2Vdc, 2000mA
AC Adapter 2	Huntkey	C-P35	Huntkey	I/P:100-240Vac, 500mA O/P: 5.2Vdc, 2000mA
Battery 1	Sunwoda	L16D1P34	Sunwoda	Rating: 3.85Vdc, 4850mAh
Battery 2	SCUD	L16D1P34	SCUD	Rating: 3.85Vdc, 4850mAh
USB Cable 1	Deren	-	Deren	1.0m non-shielded cable w/o core
USB Cable 2	Saibao	-	Saibao	1.0m non-shielded cable w/o core
LCD+TP Panel 1	o-FILM&INX	MTF-080-2711-04IKA	o-FILM&INX	8"
LCD+TP Panel 2	GIS&BOE	TC080GFL06V.C	GIS&BOE	8"
eMMC 1	Samsung	KMQE10013M-B318	Samsung	16G+2G
eMMC 2	Hynix	H9TQ17ABJTBCUR-KUM	Hynix	16G+2G
Front Camera1	Qtech	F5695AK	Qtech	5M
Front Camera2	AVC	CCBFL05006	AVC	5M
Back Camera1	Qtech	FX219BH	Qtech	8M
Back Camera2	o-FILM	OV8856	o-FILM	8M



3.2 DESCRIPTION OF TEST MODES

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

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

40 channels are provided for BT-LE (GFSK):

CHANNEL	FREQ. (MHZ)	CHANNEL	FREQ. (MHZ)	CHANNEL	FREQ. (MHZ)	CHANNEL	FREQ. (MHZ)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480



3.2.1 CONFIGURATION OF SYSTEM UNDER TEST

Please see section 5 photographs of the test configuration for reference.

3.2.2 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports.

The worst case was found when positioned on Y axis for radiated emission. Following test modes were selected for the final test, and the final worst case is marked in boldface and recorded in the report:

EUT CONFIGURE MODE	APPLICABLE TO				MODE
	RE<1G	RE≥1G	PLC	APCM	
-	√	√	√	√	-

Where **RE<1G**: Radiated Emission below 1GHz

RE≥1G: Radiated Emission above 1GHz

PLC: Power Line Conducted Emission

APCM: Antenna Port Conducted Measurement

NOTE: No need to concern of Conducted Emission due to the EUT is powered by battery.

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)
802.11g	1 to 11	11	OFDM	BPSK	6.0
BT-LE	0 to 39	39	DTS	GFSK	1

**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	CCK	DBPSK	1.0
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
802.11n HT20	1 to 11	1, 6, 11	OFDM	BPSK	6.5
BT-LE	0 to 39	0,19, 39	DTS	GFSK	1

POWER LINE CONDUCTED EMISSION TEST:

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

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

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11g	1 to 11	11	OFDM	BPSK	6.0

BANDEDGE MEASUREMENT:

☒ 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, 11	CCK	DBPSK	1.0
802.11g	1 to 11	1, 11	OFDM	BPSK	6.0
802.11n HT20	1 to 11	1, 11	OFDM	BPSK	6.5
BT-LE	0 to 39	0, 39	DTS	GFSK	1



ANTENNA PORT CONDUCTED MEASUREMENT:

- ☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 11	1, 6, 11	CCK	DBPSK	1.0
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
802.11n HT20	1 to 11	1, 6, 11	OFDM	BPSK	6.5
BT-LE	0 to 39	0, 19, 39	DTS	GFSK	1

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	TEST VOLTAGE	TESTED BY
RE<1G	22deg. C, 54%RH	DC 5.2V from adaptor	Tony Zou
RE≥1G	22deg. C, 54%RH	DC 5.2V from adaptor	Tony Zou
PLC	24deg. C, 55%RH	DC 5.2V from adaptor	Simon Yang
APCM	25deg. C, 60%RH	3.85Vdc from battery	Wenliang Wu



3.3 DUTY CYCLE OF TEST SIGNAL

WIFI 2.4GHz

802.11b: Duty cycle = $0.565/0.569 = 0.993 > 98\%$, Duty factor is not required.

802.11g: Duty cycle = $1.354/1.558 = 0.869 < 98\%$, Duty factor = $10 * \log(1/0.869) = 0.609$

802.11n (HT20): Duty cycle = $1.263/1.470 = 0.859 < 98\%$, Duty factor = $10 * \log(1/0.859) = 0.659$





3.4 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, Section 15.247

KDB 558074 D01 DTS Meas Guidance v03r05

ANSI C63.10-2013

Note:

1. All test items have been performed and recorded as per the above standards.
2. The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (Doc). The test report has been issued separately.

3.5 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
1	DC source	LONG WEI	PS-6403D	010934269	N/A
2	PC	HP	A6608CN	3CR83825X3	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	DC Line: Unshielded, Detachable 1.0m
2	AC Line: Unshielded, Detachable 1.5m



4 TEST TYPES AND RESULTS

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dB μ V)	
	Quasi-peak	Average
0.15 ~ 0.5	66 to 56	56 to 46
0.5 ~ 5	56	46
5 ~ 30	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.

3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESR7	101494	Apr. 05,16	Apr. 04,17
Artificial Mains Network	Rohde&Schwarz	ENV216	101173	Feb. 18,17	Feb. 17,18
Artificial Mains Network	Rohde&Schwarz	ESH3-Z5	100317	Apr. 05,16	Apr. 04,17
Voltage probe	SCHWARZBECK	TK 9421	TK 9421-176	Nov. 25,16	Nov. 24,17
Test software	ADT	ADT_Cond_V7.3.7	N/A	N/A	N/A

NOTE:

1. The test was performed in shielded room 553.

2. The calibration interval of the above test instruments is 12 months. And the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.



4.1.3 TEST PROCEDURES

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

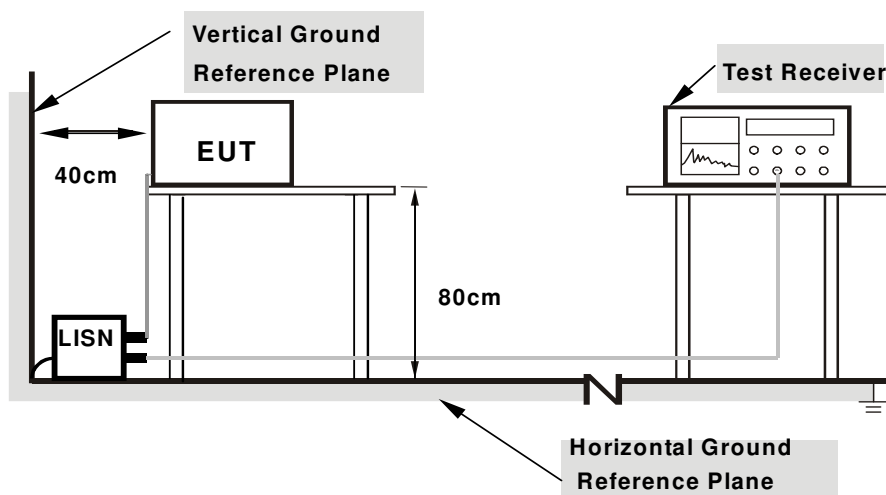
NOTE: All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 DEVIATION FROM TEST STANDARD

No deviation.



4.1.5 TEST SETUP



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

2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

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

4.1.6 EUT OPERATING CONDITIONS

- a. Turned on the power and connected of all equipment.
- b. EUT was operated according to the type used was description in manufacturer's specifications or the User's Manual.



4.1.7 TEST RESULTS

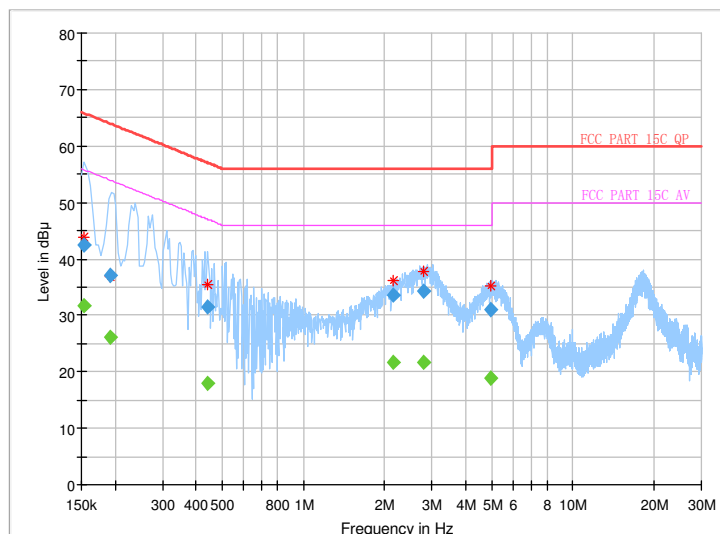
CONDUCTED WORST-CASE DATA:

Frequency Range	150KHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	120Vac, 60Hz	Environmental Conditions	24deg. C, 55RH
Tested By	Simon Yang	TEST DATE	2017/05/02

Frequency (MHz)	QuasiPeak (dB μ V)	CAverage (dB μ V)	Limit (dB μ V)	Margin (dB)	Line	Filter	Corr. (dB)
0.154000	---	31.67	55.78	-24.11	L	ON	9.6
0.154000	42.46	---	65.78	-23.32	L	ON	9.6
0.192000	---	26.15	53.95	-27.80	L	ON	9.7
0.192000	37.18	---	63.95	-26.77	L	ON	9.7
0.440000	---	17.88	47.06	-29.18	L	ON	9.7
0.440000	31.39	---	57.06	-25.67	L	ON	9.7
2.156000	---	21.68	46.00	-24.32	L	ON	9.7
2.156000	33.70	---	56.00	-22.30	L	ON	9.7
2.808000	---	21.67	46.00	-24.33	L	ON	9.7
2.808000	34.38	---	56.00	-21.62	L	ON	9.7
4.940000	---	18.83	46.00	-27.17	L	ON	9.7
4.940000	30.92	---	56.00	-25.08	L	ON	9.7

- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
 3. The emission levels of other frequencies were very low against the limit.
 4. Margin value = Emission level - Limit value
 5. Correction factor = Insertion loss + Cable loss
 6. Emission Level = Correction Factor + Reading Value.

Full Spectrum



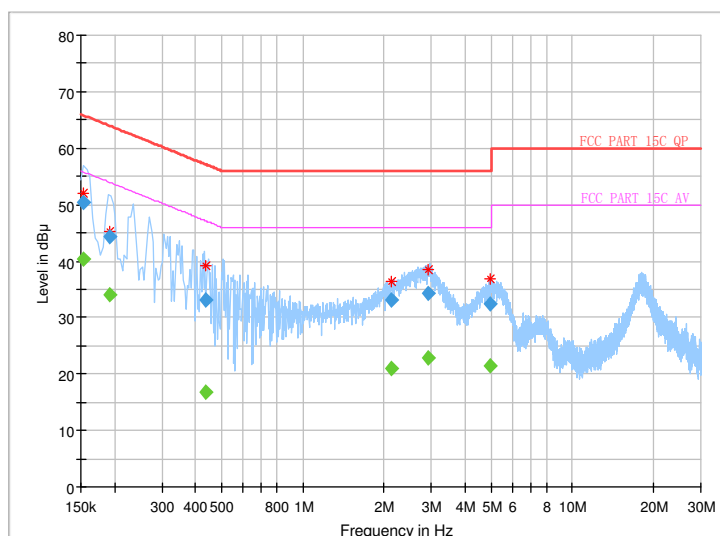


Frequency Range	150KHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	120Vac, 60Hz	Environmental Conditions	24deg. C, 55RH
Tested By	Simon Yang	TEST DATE	2017/05/02

Frequency (MHz)	QuasiPeak (dB μ V)	CAverage (dB μ V)	Limit (dB μ V)	Margin (dB)	Line	Filter	Corr. (dB)
0.154000	---	40.31	55.78	-15.47	N	ON	9.9
0.154000	50.46	---	65.78	-15.32	N	ON	9.9
0.192000	---	34.03	53.95	-19.92	N	ON	10.0
0.192000	44.22	---	63.95	-19.73	N	ON	10.0
0.436000	---	16.72	47.14	-30.42	N	ON	10.1
0.436000	33.17	---	57.14	-23.97	N	ON	10.1
2.136000	---	21.01	46.00	-24.99	N	ON	9.8
2.136000	33.08	---	56.00	-22.92	N	ON	9.8
2.920000	---	22.89	46.00	-23.11	N	ON	9.8
2.920000	34.32	---	56.00	-21.68	N	ON	9.8
4.948000	---	21.56	46.00	-24.44	N	ON	9.8
4.948000	32.48	---	56.00	-23.52	N	ON	9.8

- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
 3. The emission levels of other frequencies were very low against the limit.
 4. Margin value = Emission level - Limit value
 5. Correction factor = Insertion loss + Cable loss
 6. Emission Level = Correction Factor + Reading Value.

Full Spectrum





4.2 RADIATED EMISSION MEASUREMENT

4.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

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. As shown in 15.35(b), 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.



4.2.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESR7	101494	Apr. 01,17	Mar. 31,18
Signal and Spectrum Analyzer	Rohde&Schwarz	FSV7	102331	Nov. 04,16	Nov. 03,17
Bilog Antenna	Teseq	CBL 6111D	30643	Jul. 14, 16	Jul. 13, 17
Loop antenna	Daze	ZN30900A	0708	Nov. 28,16	Nov. 27,17
Horn Antenna (1GHz -18GHz)	ETS -Lindgren	3117	00062558	May 18,16	May 17,17
10m Semi-anechoic Chamber	CHANGLING	21.4m*12.1m*8.8m	NSEMC006	Mar. 12,16	Mar. 11,18
Test Software	E3	V 9.160323	N/A	N/A	N/A
Horn Antenna (15GHz-40GHz)	SCHWARZBECK	BBHA 9170	BBHA9170242	Mar. 02,17	Mar. 01,18
Amplifier (9kHz-1GHz)	SONOMA	310D	186955	Feb. 10,17	Feb. 09,18
Pre-Amplifier(1-18G)	HP	8449B	3008A00409	Apr. 16,17	Apr. 15,18
Pre-Amplifier (18GHz-40GHz)	EMCI	EMC 184045	980102	Nov. 04,16	Nov. 03,17
BLUETOOTH TESTER	Rohde&Schwarz	CBT32	100811	Aug. 08,16	Aug. 07,17

NOTE:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GREGT/CHINA and NIM/CHINA.
2. The test was performed in 10m Chamber.
3. The FCC Site Registration No. is 502831.



4.2.3 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 10 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 antenna is a broadband antenna, and its height 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 Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, For battery operated equipment, the equipment tests shall be perform using fresh batteries. The turntable was rotated to maximize the emission level.

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.

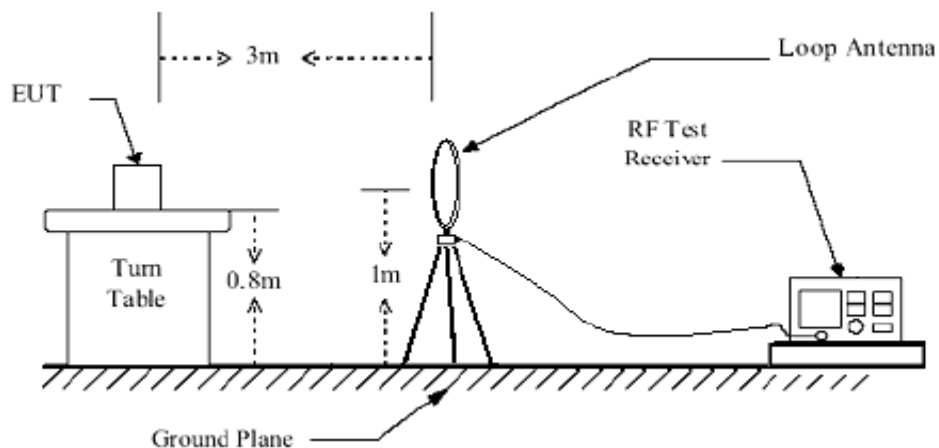
4.2.4 DEVIATION FROM TEST STANDARD

No deviation

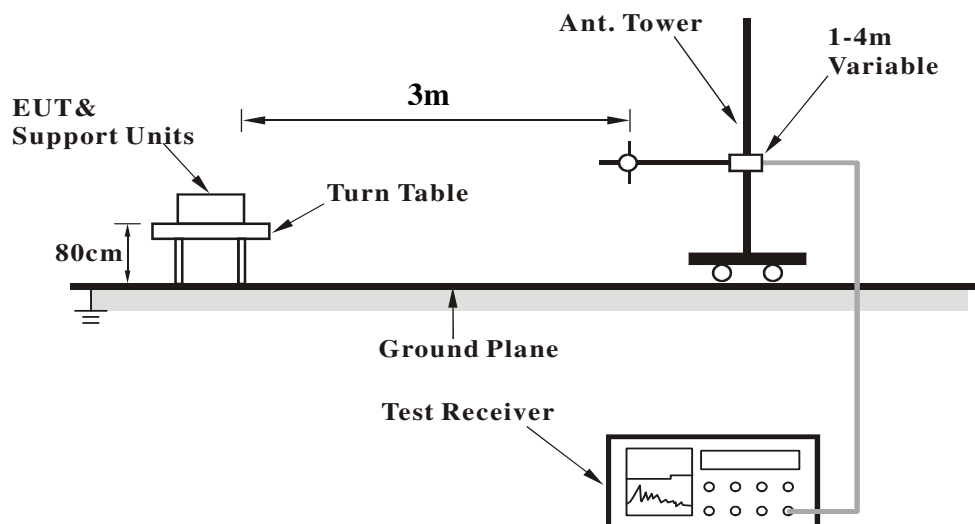


4.2.5 TEST SETUP

< Frequency Range below 30MHz >

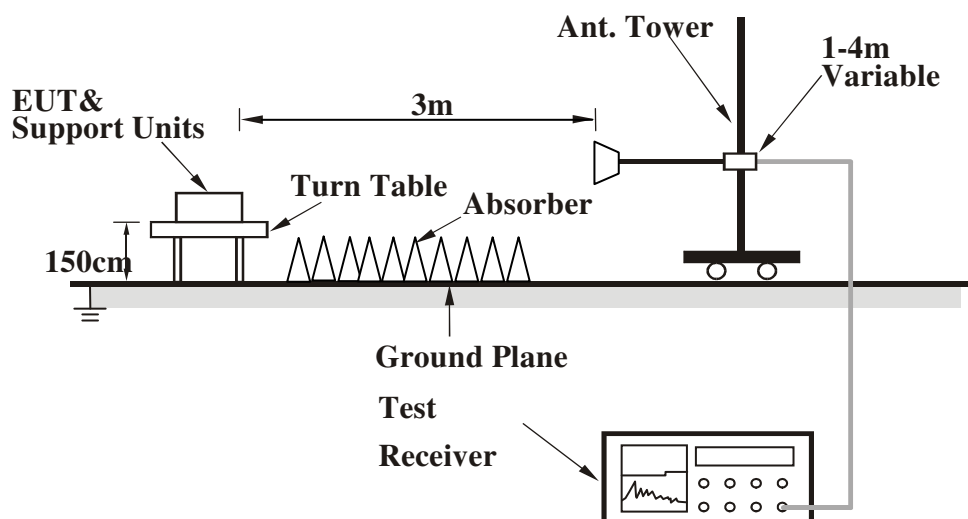


< Frequency Range 30MHz~1GHz >





<Frequency Range above 1GHz>



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

4.2.6 EUT OPERATING CONDITIONS

- Set the EUT under full load condition and placed them on a testing table.
- Set the transmitter part of EUT under transmission condition continuously at specific channel frequency.
- The necessary accessories enable the EUT in full functions.



4.2.7 TEST RESULTS

BELOW 1GHz WORST-CASE DATA:

9 KHz – 30 KHz data: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required in the report.

30 MHz – 1GHz data:

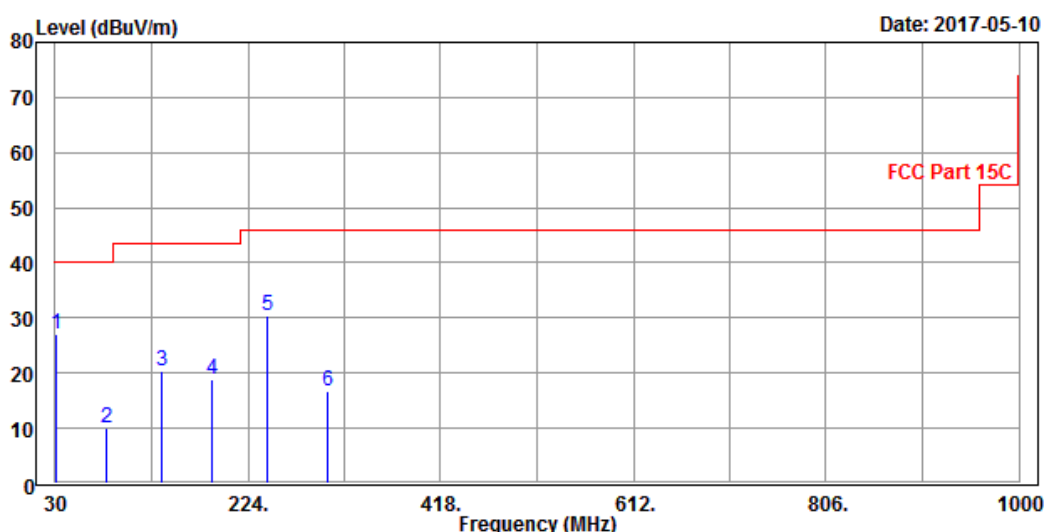
802.11g

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
30.97	27.08	47.4	40	-12.92	16.43	0.8	37.55	100	27	QP
81.41	10.08	39.18	40	-29.92	6.64	1.39	37.13	100	63	QP
136.7	20.27	47.46	43.5	-23.23	7.87	1.8	36.86	100	248	QP
187.14	18.74	43.31	43.5	-24.76	9.97	2.1	36.64	100	192	QP
243.4	30.37	52.38	46	-15.63	12.1	2.41	36.52	100	80	QP
304.51	16.76	37.34	46	-29.24	13.19	2.74	36.51	100	93	QP

REMARKS:

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



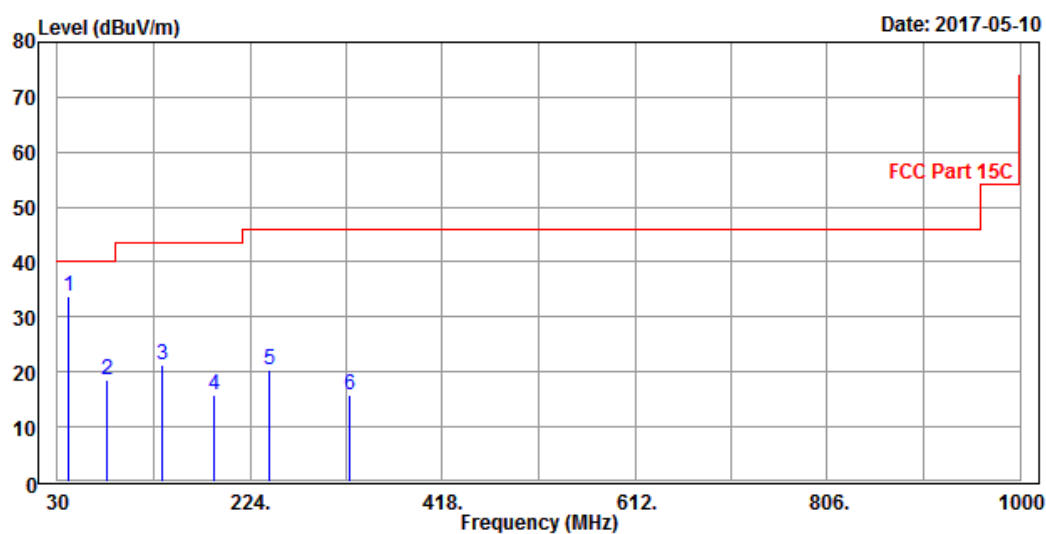


CHANNEL	TX Channel 11	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
41.64	33.72	60.64	40	-6.28	9.59	0.96	37.47	100	30	QP
80.44	18.5	47.66	40	-21.5	6.61	1.38	37.15	100	67	QP
134.76	21.25	48.55	43.5	-22.25	7.79	1.78	36.87	100	80	QP
188.11	15.9	40.45	43.5	-27.6	9.98	2.1	36.63	100	175	QP
243.4	20.3	42.31	46	-25.7	12.1	2.41	36.52	100	210	QP
323.91	15.71	35.44	46	-30.29	14	2.82	36.55	100	320	QP

REMARKS:

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





ABOVE 1GHz WORST-CASE DATA:

Note: For higher frequency, the emission is too low to be detected.

802.11b

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	44.12	51.99	54	-9.88	32.29	8.15	48.31	110	320	Average
2390	56.71	64.58	74	-17.29	32.29	8.15	48.31	110	320	Peak
2412	102.95	110.76			32.31	8.19	48.31	110	320	Average
2412	105.42	113.23			32.31	8.19	48.31	110	320	Peak
2483.5	44.31	51.91	54	-9.69	32.38	8.32	48.3	110	320	Average
2483.5	56.82	64.42	74	-17.18	32.38	8.32	48.3	110	320	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	43.69	51.56	54	-10.31	32.29	8.15	48.31	100	290	Average
2390	55.37	63.24	74	-18.63	32.29	8.15	48.31	100	290	Peak
2412	105.79	113.6			32.31	8.19	48.31	100	290	Average
2412	108.43	116.24			32.31	8.19	48.31	100	290	Peak
2483.5	44.03	51.63	54	-9.97	32.38	8.32	48.3	100	290	Average
2483.5	56.29	63.89	74	-17.71	32.38	8.32	48.3	100	290	Peak

REMARKS:

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



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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	43.94	51.81	54	-10.06	32.29	8.15	48.31	178	320	Average
2390	55.5	63.37	74	-18.5	32.29	8.15	48.31	178	320	Peak
2437	103.28	111.01			32.34	8.24	48.31	178	320	Average
2437	105.74	113.47			32.34	8.24	48.31	178	320	Peak
2483.5	44.31	51.91	54	-9.69	32.38	8.32	48.3	178	320	Average
2483.5	56.22	63.82	74	-17.78	32.38	8.32	48.3	178	320	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	43.54	51.41	54	-10.46	32.29	8.15	48.31	102	290	Average
2390	56.12	63.99	74	-17.88	32.29	8.15	48.31	102	290	Peak
2437	106.39	114.12			32.34	8.24	48.31	102	290	Average
2437	108.91	116.64			32.34	8.24	48.31	102	290	Peak
2483.5	44.41	52.01	54	-9.59	32.38	8.32	48.3	102	290	Average
2483.5	57.07	64.67	74	-16.93	32.38	8.32	48.3	102	290	Peak

REMARKS:

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



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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	43.92	51.79	54	-10.08	32.29	8.15	48.31	172	320	Average
2390	55.87	63.74	74	-18.13	32.29	8.15	48.31	172	320	Peak
2462	103.49	111.15			32.36	8.28	48.3	172	320	Average
2462	106.24	113.9			32.36	8.28	48.3	172	320	Peak
2483.5	44.41	52.01	54	-9.59	32.38	8.32	48.3	172	320	Average
2483.5	56.98	64.58	74	-17.02	32.38	8.32	48.3	172	320	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	43.64	51.51	54	-10.36	32.29	8.15	48.31	100	300	Average
2390	55.61	63.48	74	-18.39	32.29	8.15	48.31	100	300	Peak
2462	106.49	114.15			32.36	8.28	48.3	100	300	Average
2462	109.35	117.01			32.36	8.28	48.3	100	300	Peak
2483.5	44.51	52.11	54	-9.49	32.38	8.32	48.3	100	300	Average
2483.5	56.76	64.36	74	-17.24	32.38	8.32	48.3	100	300	Peak

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.
2. 2462MHz: 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										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	47.6	55.47	54	-6.4	32.29	8.15	48.31	200	320	Average
2390	64.15	72.02	74	-9.85	32.29	8.15	48.31	200	320	Peak
2412	97.31	105.12			32.31	8.19	48.31	200	320	Average
2412	108.4	116.21			32.31	8.19	48.31	200	320	Peak
2483.5	44.8	52.4	54	-9.2	32.38	8.32	48.3	200	320	Average
2483.5	56.89	64.49	74	-17.11	32.38	8.32	48.3	200	320	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	50.92	58.79	54	-3.08	32.29	8.15	48.31	100	298	Average
2390	65.95	73.82	74	-8.05	32.29	8.15	48.31	100	298	Peak
2412	99.41	107.22			32.31	8.19	48.31	100	298	Average
2412	110.04	117.85			32.31	8.19	48.31	100	298	Peak
2483.5	44.98	52.58	54	-9.02	32.38	8.32	48.3	100	298	Average
2483.5	57.64	65.24	74	-16.36	32.38	8.32	48.3	100	298	Peak

REMARKS:

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



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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	44.58	52.45	54	-9.42	32.29	8.15	48.31	248	320	Average
2390	56.5	64.37	74	-17.5	32.29	8.15	48.31	248	320	Peak
2437	96.98	104.71			32.34	8.24	48.31	248	320	Average
2437	108.14	115.87			32.34	8.24	48.31	248	320	Peak
2483.5	45.08	52.68	54	-8.92	32.38	8.32	48.3	248	320	Average
2483.5	57.03	64.63	74	-16.97	32.38	8.32	48.3	248	320	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	44.44	52.31	54	-9.56	32.29	8.15	48.31	100	290	Average
2390	56.42	64.29	74	-17.58	32.29	8.15	48.31	100	290	Peak
2437	99.65	107.38			32.34	8.24	48.31	100	290	Average
2437	110.6	118.33			32.34	8.24	48.31	100	290	Peak
2483.5	45.56	53.16	54	-8.44	32.38	8.32	48.3	100	290	Average
2483.5	57.23	64.83	74	-16.77	32.38	8.32	48.3	100	290	Peak

REMARKS:

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



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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	43.74	51.61	54	-10.26	32.29	8.15	48.31	150	310	Average
2390	55.95	63.82	74	-18.05	32.29	8.15	48.31	150	310	Peak
2462	96.86	104.52			32.36	8.28	48.3	150	310	Average
2462	107.74	115.4			32.36	8.28	48.3	150	310	Peak
2483.5	46.55	54.15	54	-7.45	32.38	8.32	48.3	150	310	Average
2483.5	64.65	72.25	74	-9.35	32.38	8.32	48.3	150	310	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	43.33	51.2	54	-10.67	32.29	8.15	48.31	100	290	Average
2390	55.14	63.01	74	-18.86	32.29	8.15	48.31	100	290	Peak
2462	100.32	107.98			32.36	8.28	48.3	100	290	Average
2462	110.92	118.58			32.36	8.28	48.3	100	290	Peak
2483.5	52.41	60.01	54	-1.59	32.38	8.32	48.3	100	290	Average
2483.5	70.33	77.93	74	-3.67	32.38	8.32	48.3	100	290	Peak

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.
2. 2462MHz: 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										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	48.81	56.68	54	-5.19	32.29	8.15	48.31	180	320	Average
2390	66.3	74.17	74	-7.7	32.29	8.15	48.31	180	320	Peak
2412	96.47	104.28			32.31	8.19	48.31	180	320	Average
2412	107.97	115.78			32.31	8.19	48.31	180	320	Peak
2483.5	43.9	51.5	54	-10.1	32.38	8.32	48.3	180	320	Average
2483.5	56.58	64.18	74	-17.42	32.38	8.32	48.3	180	320	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	52.03	59.9	54	-1.97	32.29	8.15	48.31	100	290	Average
2390	77.66	85.53	74	3.66	32.29	8.15	48.31	100	290	Peak
2412	99.48	107.29			32.31	8.19	48.31	100	290	Average
2412	109.42	117.23			32.31	8.19	48.31	100	290	Peak
2483.5	43.72	51.32	54	-10.28	32.38	8.32	48.3	100	290	Average
2483.5	56.17	63.77	74	-17.83	32.38	8.32	48.3	100	290	Peak

REMARKS:

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



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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	44.22	52.09	54	-9.78	32.29	8.15	48.31	175	320	Average
2390	56.88	64.75	74	-17.12	32.29	8.15	48.31	175	320	Peak
2437	97.14	104.87			32.34	8.24	48.31	175	320	Average
2437	107.13	114.86			32.34	8.24	48.31	175	320	Peak
2483.5	44.57	52.17	54	-9.43	32.38	8.32	48.3	175	320	Average
2483.5	56.81	64.41	74	-17.19	32.38	8.32	48.3	175	320	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	43.74	51.61	54	-10.26	32.29	8.15	48.31	100	290	Average
2390	55.31	63.18	74	-18.69	32.29	8.15	48.31	100	290	Peak
2437	100.24	107.97			32.34	8.24	48.31	100	290	Average
2437	110.74	118.47			32.34	8.24	48.31	100	290	Peak
2483.5	45.29	52.89	54	-8.71	32.38	8.32	48.3	100	290	Average
2483.5	57.24	64.84	74	-16.76	32.38	8.32	48.3	100	290	Peak

REMARKS:

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



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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	44.12	51.99	54	-9.88	32.29	8.15	48.31	172	315	Average
2390	56.03	63.9	74	-17.97	32.29	8.15	48.31	172	315	Peak
2462	96.24	103.9			32.36	8.28	48.3	172	315	Average
2462	106.67	114.33			32.36	8.28	48.3	172	315	Peak
2483.5	46.95	54.55	54	-7.05	32.38	8.32	48.3	172	315	Average
2483.5	66.08	73.68	74	-7.92	32.38	8.32	48.3	172	315	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	44.19	52.06	54	-9.81	32.29	8.15	48.31	100	290	Average
2390	55.84	63.71	74	-18.16	32.29	8.15	48.31	100	290	Peak
2462	98.51	106.17			32.36	8.28	48.3	100	290	Average
2462	108.93	116.59			32.36	8.28	48.3	100	290	Peak
2483.5	50.36	57.96	54	-3.64	32.38	8.32	48.3	100	290	Average
2483.5	71.28	78.88	74	-2.72	32.38	8.32	48.3	100	290	Peak

REMARKS:

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



BELOW 1GHz WORST-CASE DATA:

9 KHz – 30 KHz data: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required in the report.

30 MHz – 1GHz data:

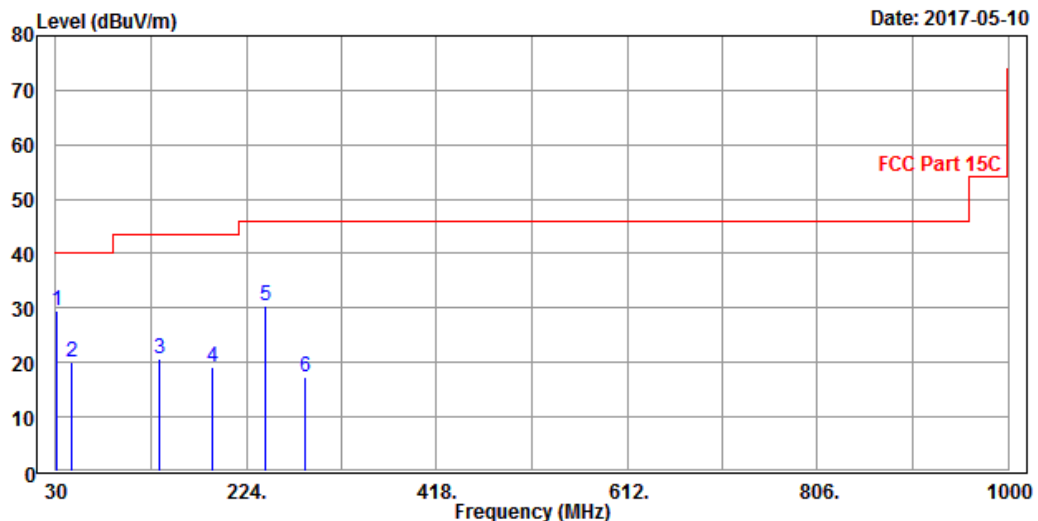
BT-LE (GFSK)

CHANNEL	TX Channel 39	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
30.97	29.59	49.91	40	-10.41	16.43	0.8	37.55	100	36	QP
45.52	20.07	48.31	40	-19.93	8.16	1.03	37.43	100	142	QP
135.73	20.59	47.83	43.5	-22.91	7.83	1.79	36.86	100	236	QP
190.05	19.23	43.72	43.5	-24.27	10	2.12	36.61	100	120	QP
243.4	30.5	52.51	46	-15.5	12.1	2.41	36.52	100	36	QP
284.14	17.42	38.49	46	-28.58	12.81	2.63	36.51	100	90	QP

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





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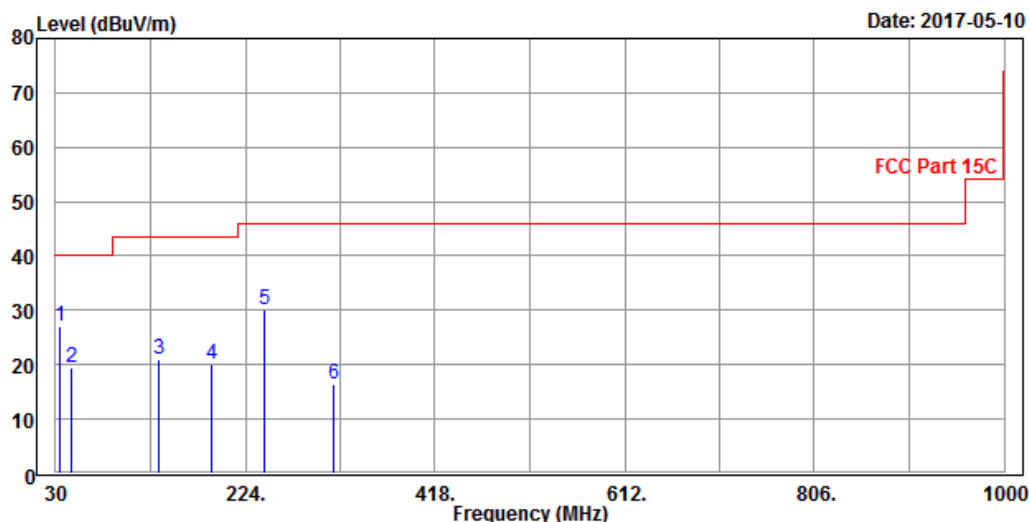
Test Report No.: RF170330W002-2

CHANNEL	TX Channel 39	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
33.88	27.18	49.42	40	-12.82	14.42	0.87	37.53	100	25	QP
46.49	19.32	47.91	40	-20.68	7.8	1.03	37.42	100	146	QP
135.73	20.92	48.16	43.5	-22.58	7.83	1.79	36.86	100	258	QP
190.05	20.11	44.6	43.5	-23.39	10	2.12	36.61	100	60	QP
243.4	30.07	52.08	46	-15.93	12.1	2.41	36.52	100	140	QP
314.21	16.42	36.57	46	-29.58	13.6	2.78	36.53	100	63	QP

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





ABOVE 1GHz TEST DATA:

Note: For higher frequency, the emission is too low to be detected.

BT-LE (GFSK)

CHANNEL	TX Channel 0	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	43.86	51.73	54	-10.14	32.29	8.15	48.31	245	315	Average
2390	55.63	63.5	74	-18.37	32.29	8.15	48.31	245	315	Peak
2402	96.38	104.22			32.3	8.17	48.31	245	315	Average
2402	101.71	109.55			32.3	8.17	48.31	245	315	Peak
2483.5	44.02	51.62	54	-9.98	32.38	8.32	48.3	245	315	Average
2483.5	56.2	63.8	74	-17.8	32.38	8.32	48.3	245	315	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	43.89	51.76	54	-10.11	32.29	8.15	48.31	102	280	Average
2390	56.03	63.9	74	-17.97	32.29	8.15	48.31	102	280	Peak
2402	94.16	102			32.3	8.17	48.31	102	280	Average
2402	99.12	106.96			32.3	8.17	48.31	102	280	Peak
2483.5	44.07	51.67	54	-9.93	32.38	8.32	48.3	102	280	Average
2483.5	56.76	64.36	74	-17.24	32.38	8.32	48.3	102	280	Peak

REMARKS:

- Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.
- 2402MHz: Fundamental frequency.



CHANNEL	TX Channel 19	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	43.9	51.77	54	-10.1	32.29	8.15	48.31	240	315	Average
2390	55.87	63.74	74	-18.13	32.29	8.15	48.31	240	315	Peak
2440	98.9	106.63			32.34	8.24	48.31	240	315	Average
2440	103.78	111.51			32.34	8.24	48.31	240	315	Peak
2483.5	44.07	51.67	54	-9.93	32.38	8.32	48.3	240	315	Average
2483.5	55.92	63.52	74	-18.08	32.38	8.32	48.3	240	315	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	43.92	51.79	54	-10.08	32.29	8.15	48.31	100	285	Average
2390	55.63	63.5	74	-18.37	32.29	8.15	48.31	100	285	Peak
2440	96.72	104.45			32.34	8.24	48.31	100	285	Average
2440	101.9	109.63			32.34	8.24	48.31	100	285	Peak
2483.5	44.05	51.65	54	-9.95	32.38	8.32	48.3	100	285	Average
2483.5	56.29	63.89	74	-17.71	32.38	8.32	48.3	100	285	Peak

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.
2. 2440MHz: Fundamental frequency.



CHANNEL	TX Channel 39	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	43.89	51.76	54	-10.11	32.29	8.15	48.31	230	315	Average
2390	55.77	63.64	74	-18.23	32.29	8.15	48.31	230	315	Peak
2480	95.59	103.2			32.38	8.31	48.3	230	315	Average
2480	100.45	108.06			32.38	8.31	48.3	230	315	Peak
2483.5	44.23	51.83	54	-9.77	32.38	8.32	48.3	230	315	Average
2483.5	56.18	63.78	74	-17.82	32.38	8.32	48.3	230	315	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB /m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	43.91	51.78	54	-10.09	32.29	8.15	48.31	130	282	Average
2390	55.64	63.51	74	-18.36	32.29	8.15	48.31	130	282	Peak
2480	92.72	100.33			32.38	8.31	48.3	130	282	Average
2480	98.33	105.94			32.38	8.31	48.3	130	282	Peak
2483.5	44.14	51.74	54	-9.86	32.38	8.32	48.3	130	282	Average
2483.5	56.42	64.02	74	-17.58	32.38	8.32	48.3	130	282	Peak

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
Margin value = Emission level – Limit value.
2. 2480MHz: Fundamental frequency.



4.3 6 dB BANDWIDTH MEASUREMENT

4.3.1 LIMITS OF 6dB BANDWIDTH MEASUREMENT

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.3.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Power Sensor	Keysight	U2021XA	MY55060016	Apr. 15, 17	Apr. 14, 18
Power Sensor	Keysight	U2021XA	MY55060018	Apr. 15, 17	Apr. 14, 18
10dB Attenuator	JFW/USA	50HF-010-SMA	1505	Jul. 27, 16	Jul. 26, 17
Digital Multimeter	FLUKE	15B	A1220010DG	Oct. 13, 16	Oct. 12, 17
Humid & Temp Programmable Tester	Haida	HD-2257	110807201	Sep. 05, 16	Sep. 04, 17
Oscilloscope	Agilent	DSO9254A	MY51260160	Nov. 04, 16	Nov. 03, 17
Signal Analyzer	Rohde & Schwarz	FSV7	102331	Nov. 04, 16	Nov. 03, 17
Signal Generator	Agilent	N5183A	MY50140980	Nov. 04, 16	Nov. 03, 17
Agile Signal Generator	Agilent	8645A	Agilent	Aug. 08, 16	Aug. 07, 17
ESG Vector Signal Generator	Agilent	E4438C	MY49072505	Apr. 15, 17	Apr. 14, 18
BLUETOOTH TESTER	Rohde&Schwarz	CBT32	100811	Aug. 08, 16	Aug. 07, 17

NOTE:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GREGT/CHINA and NIM/CHINA.
2. The test was performed in RF Oven room.

4.3.3 TEST PROCEDURE

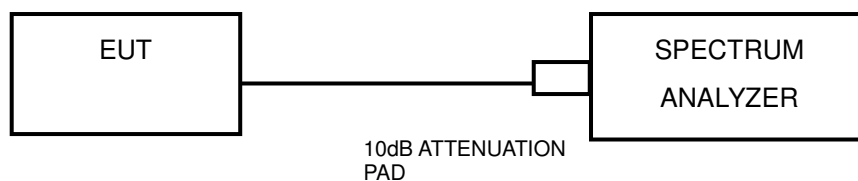
1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) ≥ 3 RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.



4.3.4 DEVIATION FROM TEST STANDARD

No deviation.

4.3.5 TEST SETUP



4.3.6 EUT OPERATING CONDITIONS

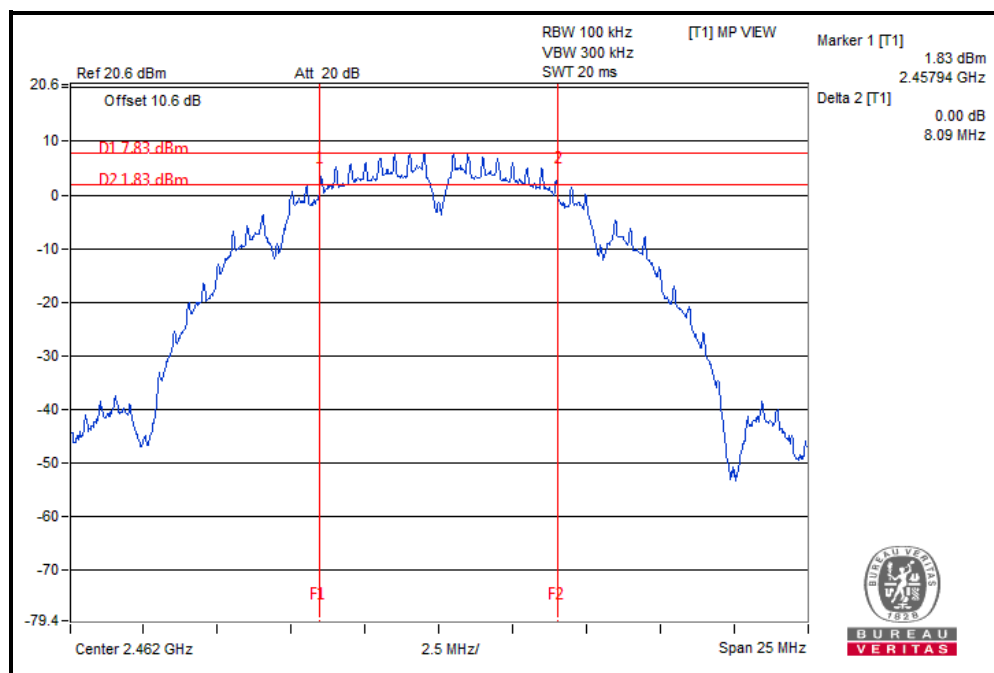
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.



4.3.7 TEST RESULTS

802.11b

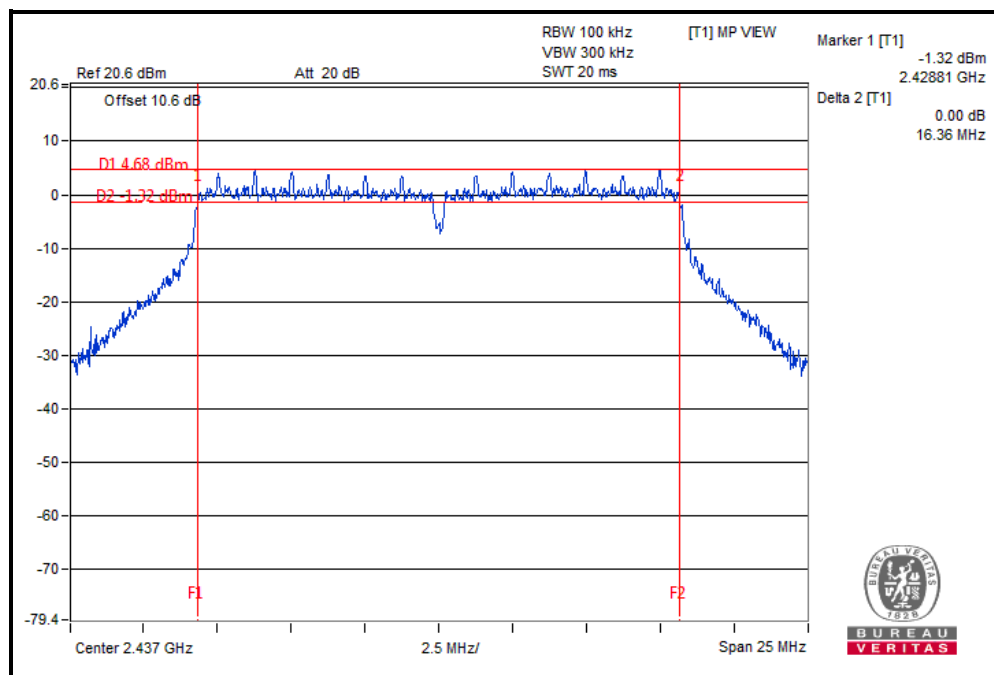
CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
1	2412	8.06	0.5	PASS
6	2437	8.08	0.5	PASS
11	2462	8.09	0.5	PASS





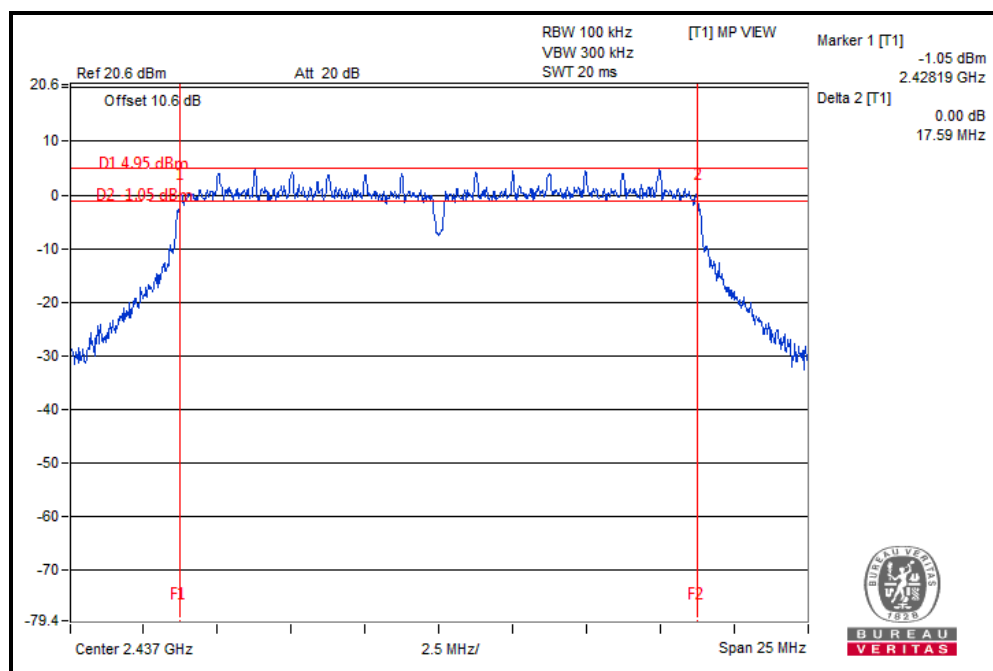
802.11g

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
1	2412	16.35	0.5	PASS
6	2437	16.36	0.5	PASS
11	2462	16.35	0.5	PASS



802.11n (20MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
1	2412	17.58	0.5	PASS
6	2437	17.59	0.5	PASS
11	2462	17.57	0.5	PASS



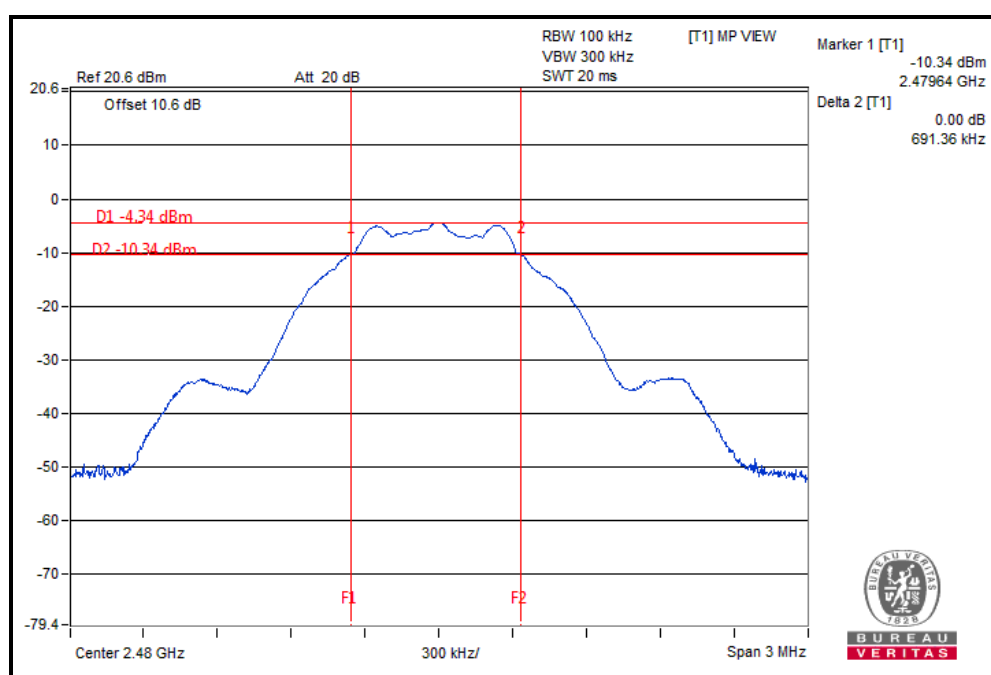


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BT-LE (GFSK)

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
0	2402	0.68	0.5	PASS
19	2440	0.67	0.5	PASS
39	2480	0.69	0.5	PASS



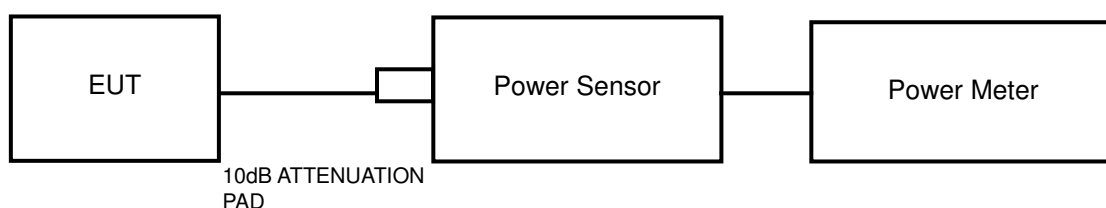


4.4 CONDUCTED OUTPUT POWER

4.4.1 LIMITS OF CONDUCTED OUTPUT POWER MEASUREMENT

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

4.4.2 TEST SETUP



4.4.3 TEST INSTRUMENTS

Refer to section 4.3.2 to get information of above instrument.

4.4.4 TEST PROCEDURES

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

4.4.5 DEVIATION FROM TEST STANDARD

No deviation.

4.4.6 EUT OPERATING CONDITIONS

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



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4.4.7 TEST RESULTS

4.4.7.1 MAXIMUM PEAK OUTPUT POWER

802.11b

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER (dBm)	PEAK POWER (mW)	PEAK POWER LIMIT(W)	PASS/FAIL
1	2412	17.58	57.280	1	PASS
6	2437	17.78	59.979	1	PASS
11	2462	17.05	50.699	1	PASS

802.11g

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER (dBm)	PEAK POWER (mW)	PEAK POWER LIMIT(W)	PASS/FAIL
1	2412	20.60	114.815	1	PASS
6	2437	20.88	122.462	1	PASS
11	2462	20.35	108.393	1	PASS

802.11n (20MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER (dBm)	PEAK POWER (mW)	PEAK POWER LIMIT(W)	PASS/FAIL
1	2412	20.71	117.761	1	PASS
6	2437	20.94	124.165	1	PASS
11	2462	20.45	110.917	1	PASS

BT-LE (GFSK)

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER (dBm)	PEAK POWER (mW)	PEAK POWER LIMIT(W)	PASS/FAIL
0	2402	-1.25	0.750	1	PASS
19	2440	0.09	1.021	1	PASS
39	2480	-3.67	0.430	1	PASS

**4.4.7.2 AVERAGE OUTPUT POWER (FOR REFERENCE)**

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

802.11b

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (dBm)	PASS/FAIL
1	2412	14.61	N/A
6	2437	14.76	N/A
11	2462	14.25	N/A

802.11g

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (dBm)	PASS/FAIL
1	2412	14.49	N/A
6	2437	14.58	N/A
11	2462	14.17	N/A

802.11n (20MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (dBm)	PASS/FAIL
1	2412	14.47	N/A
6	2437	14.68	N/A
11	2462	14.32	N/A

BT-LE (GFSK)

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (dBm)	PASS/FAIL
0	2402	-1.40	N/A
19	2440	-0.02	N/A
39	2480	-3.81	N/A

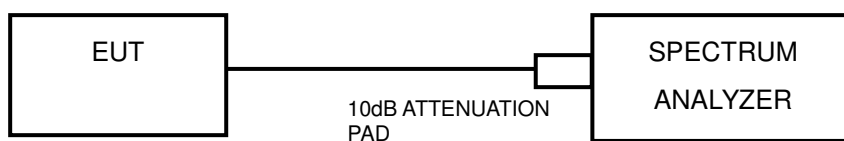


4.5 POWER SPECTRAL DENSITY MEASUREMENT

4.5.1 LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT

The Maximum of Power Spectral Density Measurement is 8dBm/3KHz.

4.5.2 TEST SETUP



4.5.3 TEST INSTRUMENTS

Refer to section 4.3.2 to get information of above instrument.

4.5.4 TEST PROCEDURE

1. Set the span to 1.5 times the DTS bandwidth
2. Set the RBW = 3 kHz, VBW $\geq 3 \times$ RBW, Detector = peak.
3. Sweep time = auto couple, Trace mode = max hold, allow trace to fully stabilize.
4. Use the peak marker function to determine the maximum amplitude level.

4.5.5 DEVIATION FROM TEST STANDARD

No deviation.

4.5.6 EUT OPERATING CONDITION

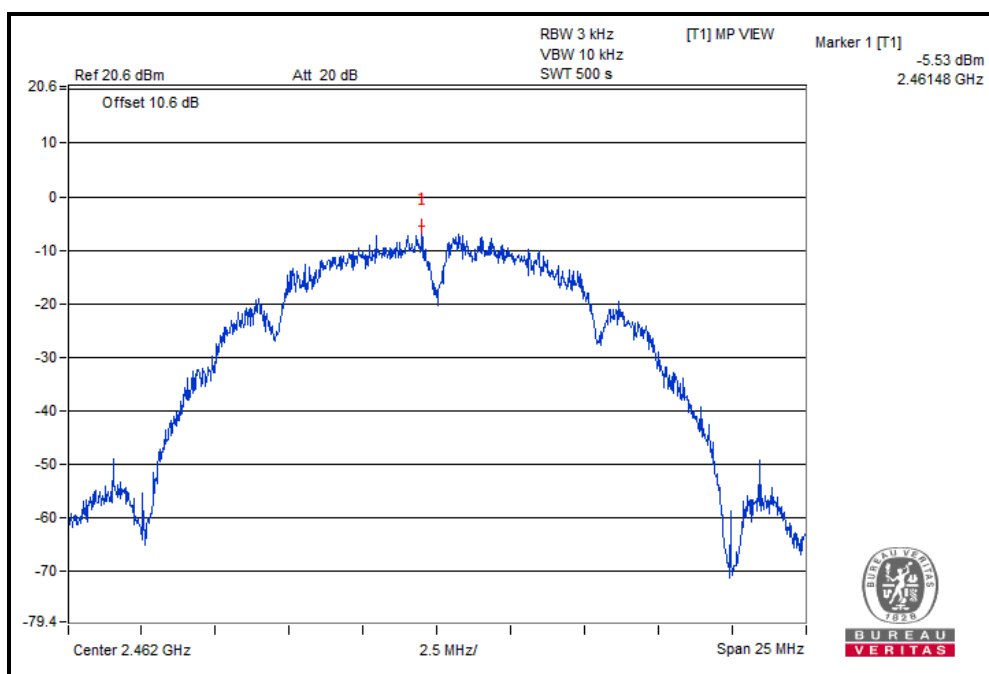
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.



4.5.7 TEST RESULTS

802.11b

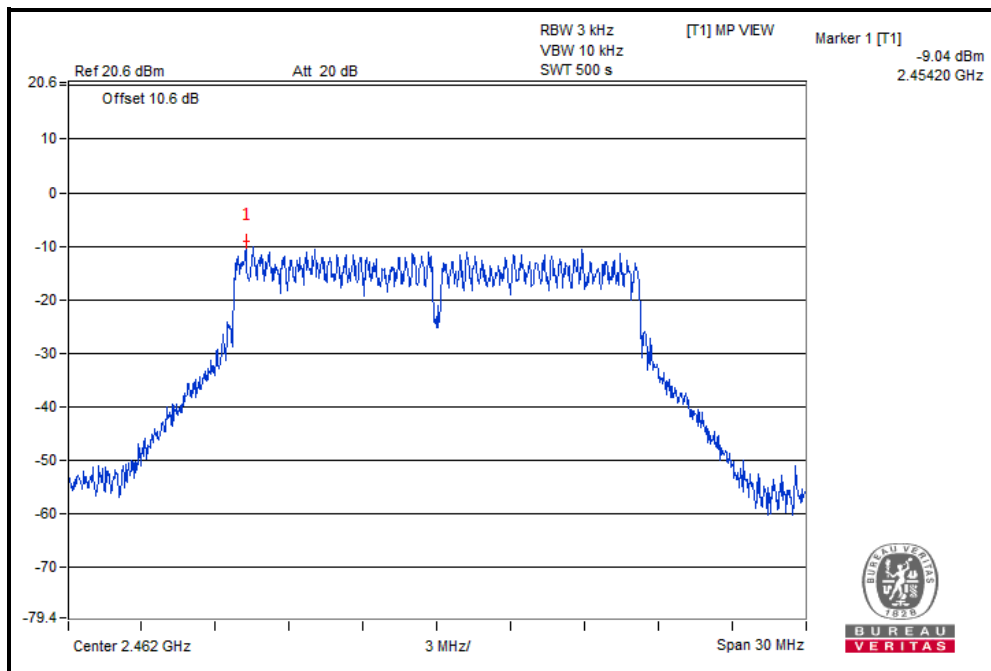
Channel	FREQ. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
1	2412	-5.82	8	PASS
6	2437	-5.79	8	PASS
11	2462	-5.53	8	PASS





802.11g

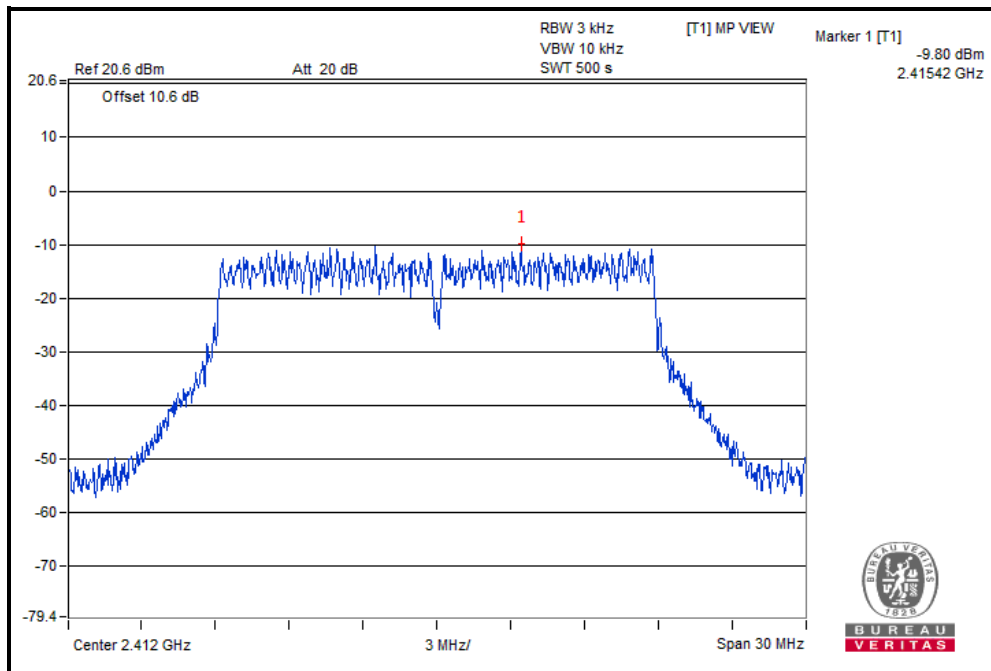
Channel	FREQ. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
1	2412	-10.13	8	PASS
6	2437	-10.24	8	PASS
11	2462	-9.04	8	PASS





802.11n (20MHz)

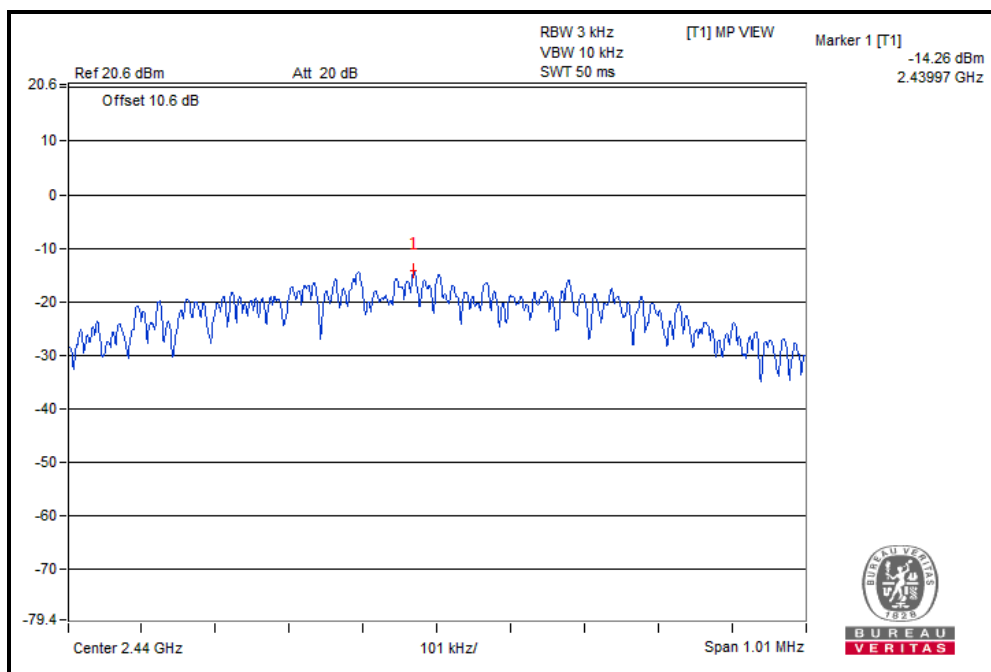
Channel	FREQ. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
1	2412	-9.80	8	PASS
6	2437	-10.49	8	PASS
11	2462	-10.02	8	PASS





BT-LE (GFSK)

Channel	FREQ. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
0	2402	-16.04	8	PASS
19	2440	-14.26	8	PASS
39	2480	-18.37	8	PASS



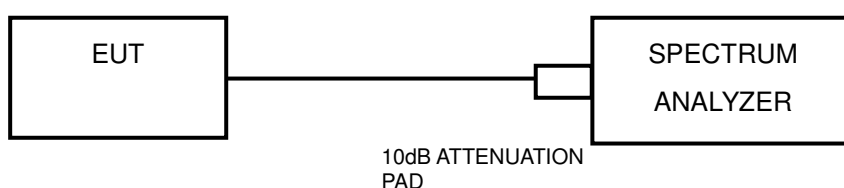


4.6 OUT OF BAND EMISSION MEASUREMENT

4.6.1 LIMITS OF 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 4.3.2 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. Set span to encompass the spectrum to be examined
4. Detector = peak.
5. Trace Mode = max hold.
6. Sweep = auto couple.

4.6.5 DEVIATION FROM TEST STANDARD

No deviation.

4.6.6 EUT OPERATING CONDITION

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

4.6.7 TEST RESULTS

The spectrum plots are attached on the following images. D1 line indicates the highest level. D2 line indicates the 20dB offset below D1. It shows compliance to the requirement.

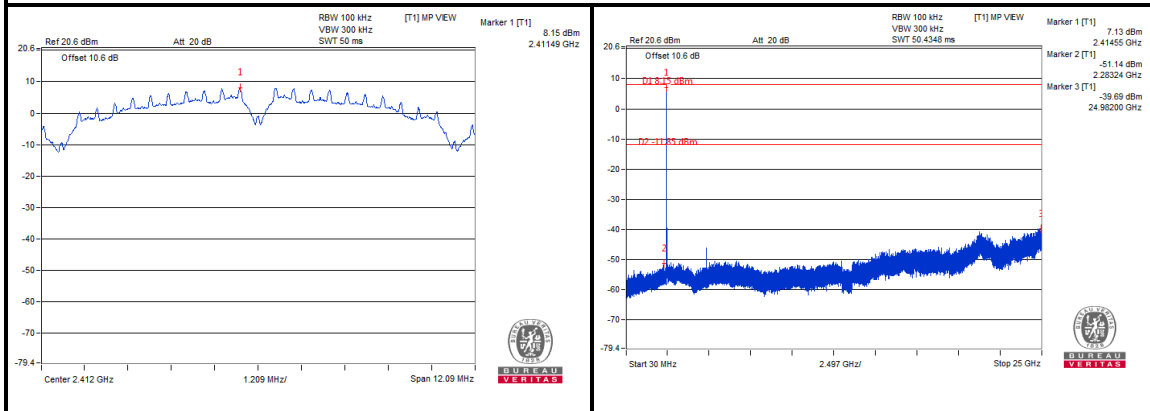


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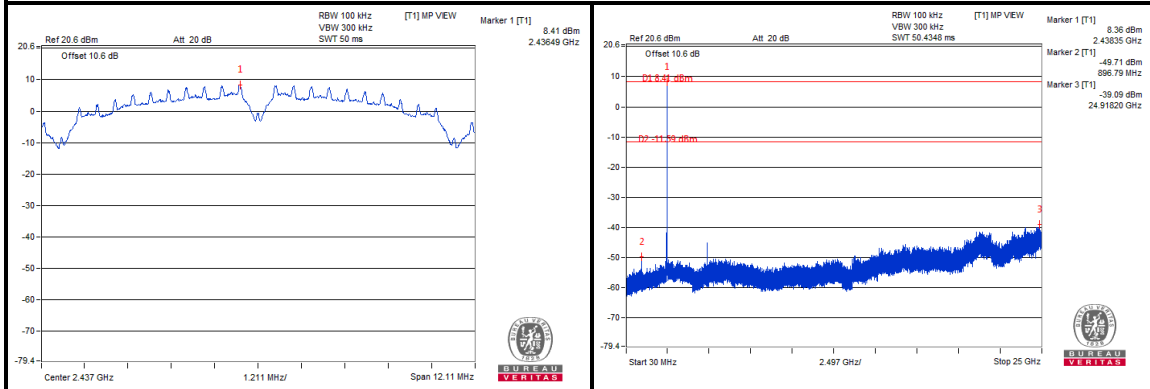
Test Report No.: RF170330W002-2

802.11b

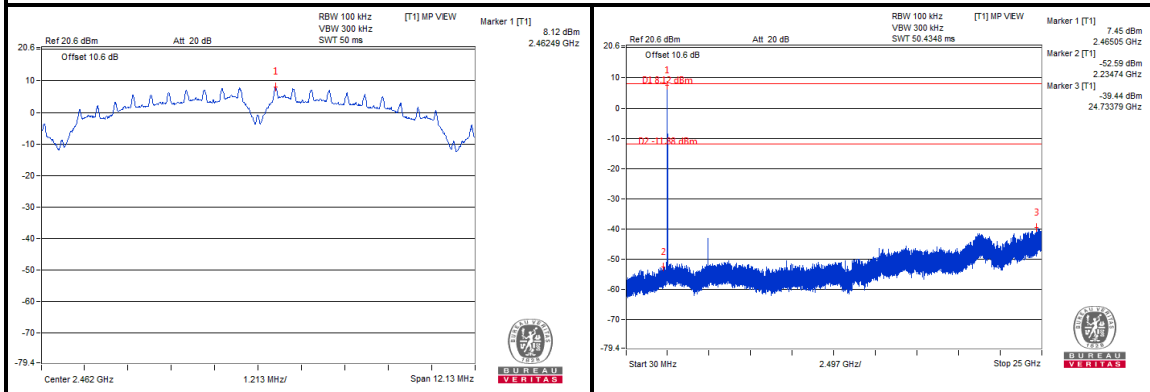
CH 1



CH 6



CH 11

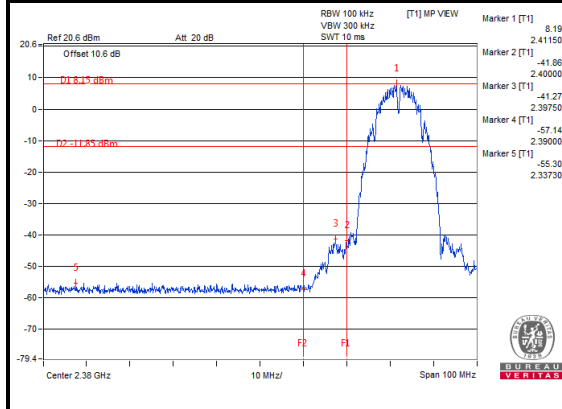




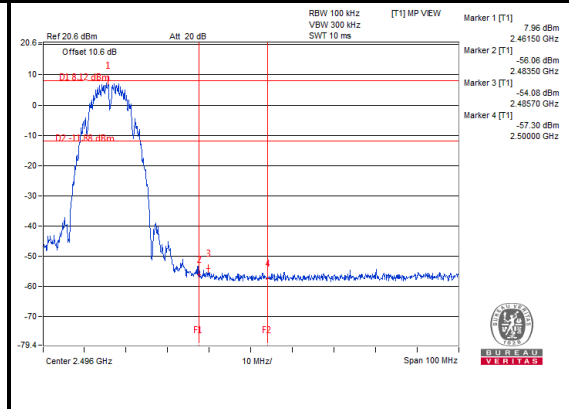
BUREAU
VERITAS

Test Report No.: RF170330W002-2

CH 1 Band Edge



CH 11 Band Edge



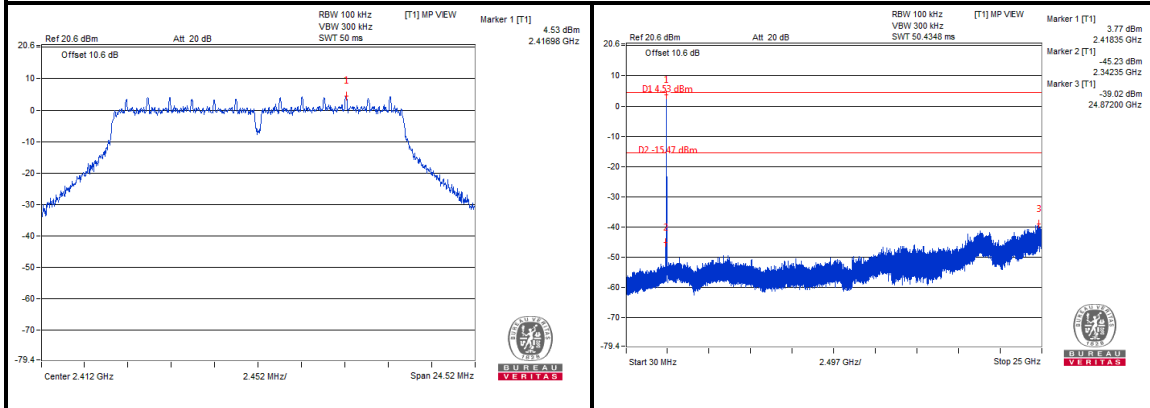


BUREAU
VERITAS

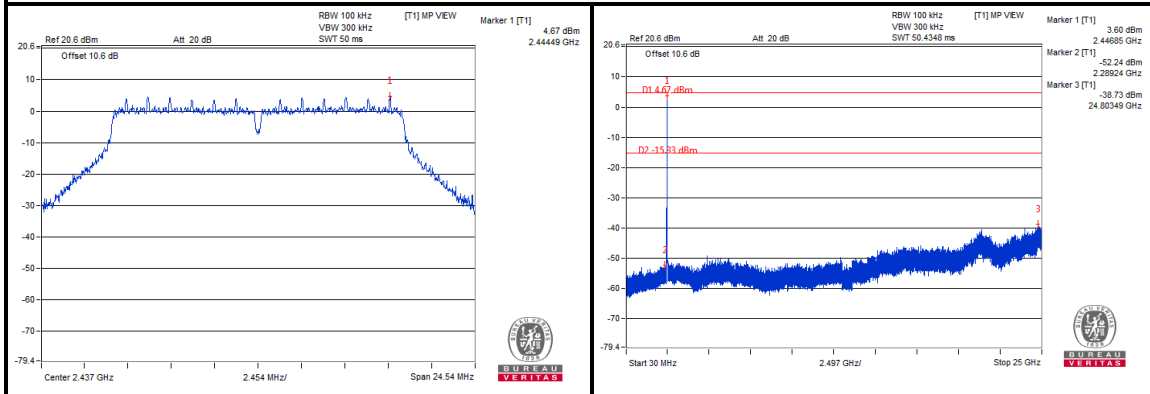
Test Report No.: RF170330W002-2

802.11g

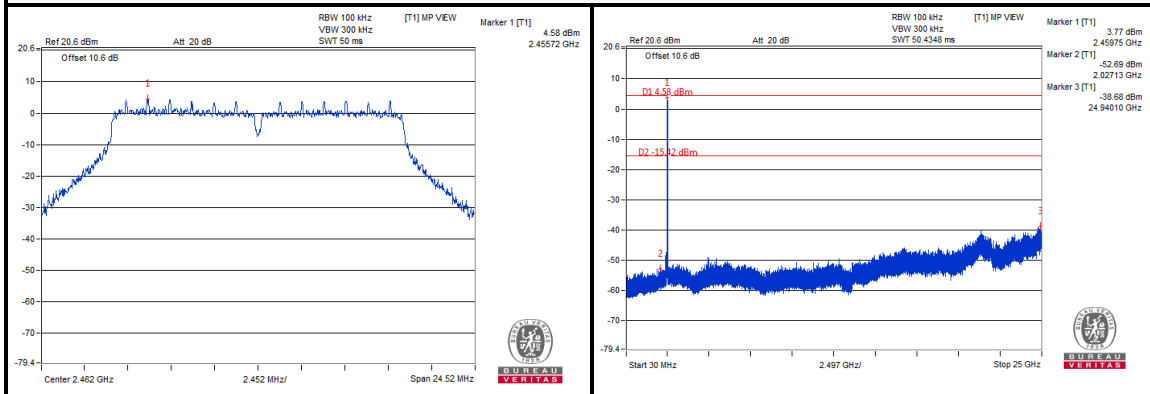
CH 1



CH 6



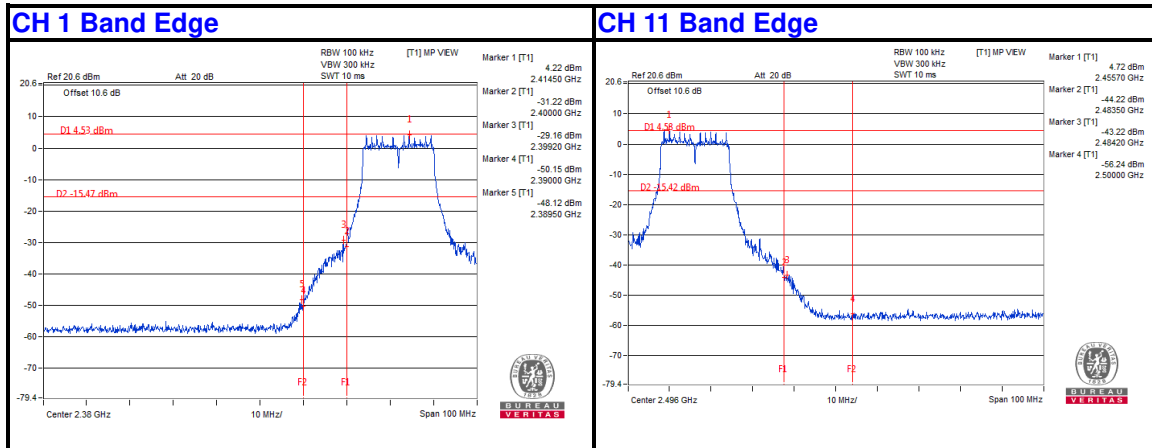
CH 11





BUREAU
VERITAS

Test Report No.: RF170330W002-2



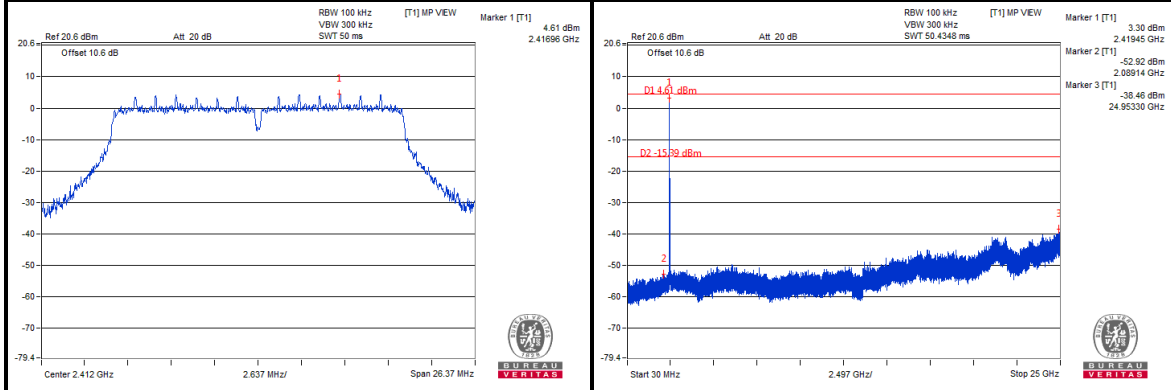


BUREAU
VERITAS

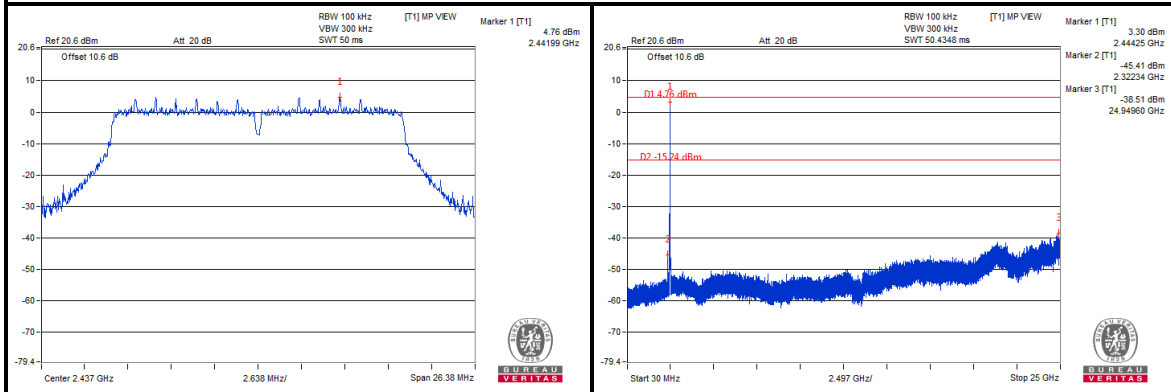
Test Report No.: RF170330W002-2

802.11n (20MHz)

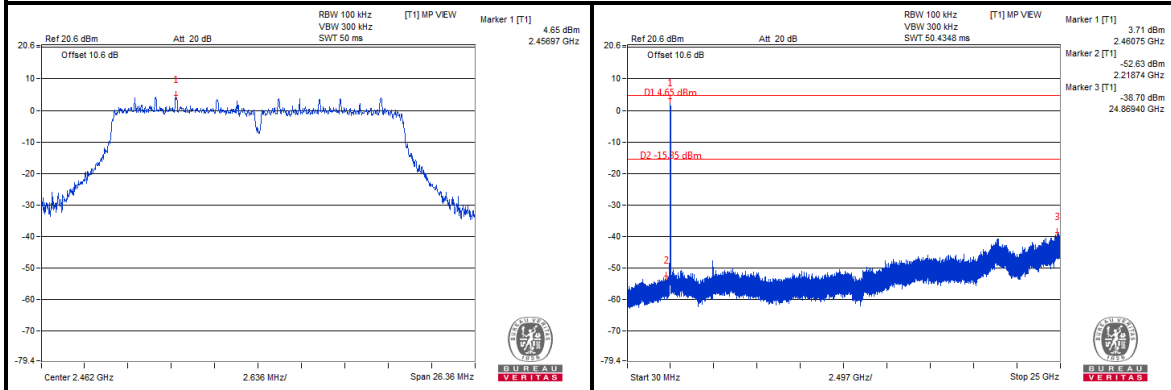
CH 1



CH 6



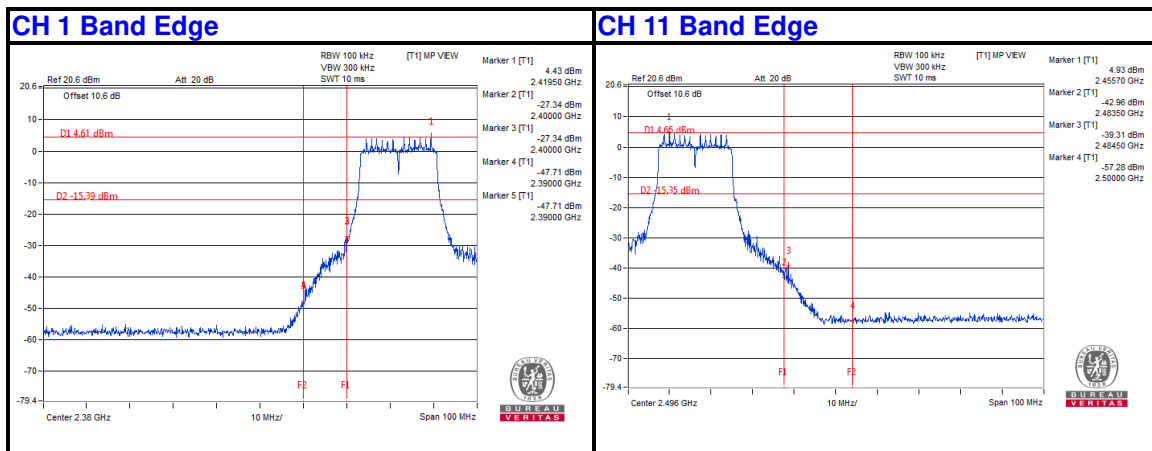
CH 11





BUREAU
VERITAS

Test Report No.: RF170330W002-2



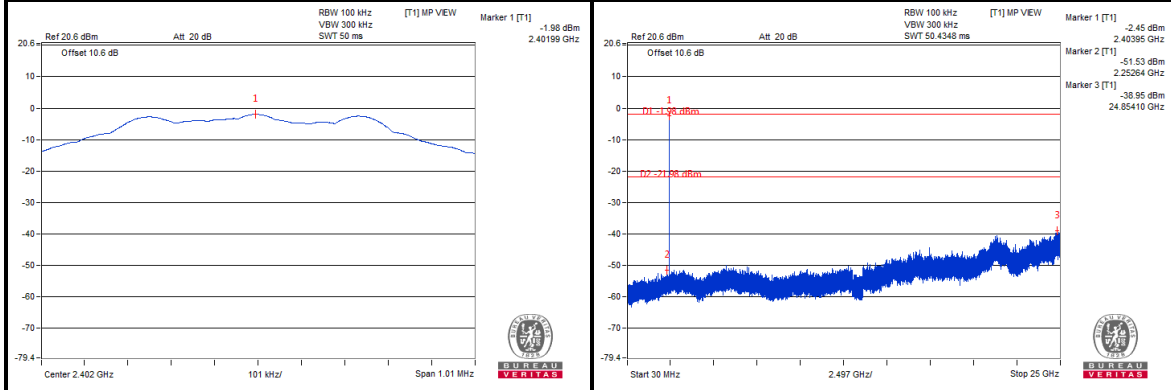


BUREAU
VERITAS

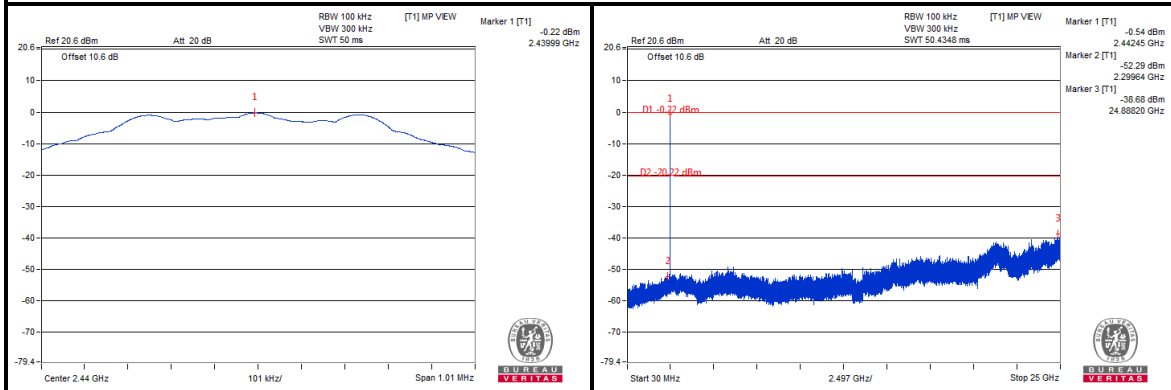
Test Report No.: RF170330W002-2

BT-LE (GFSK)

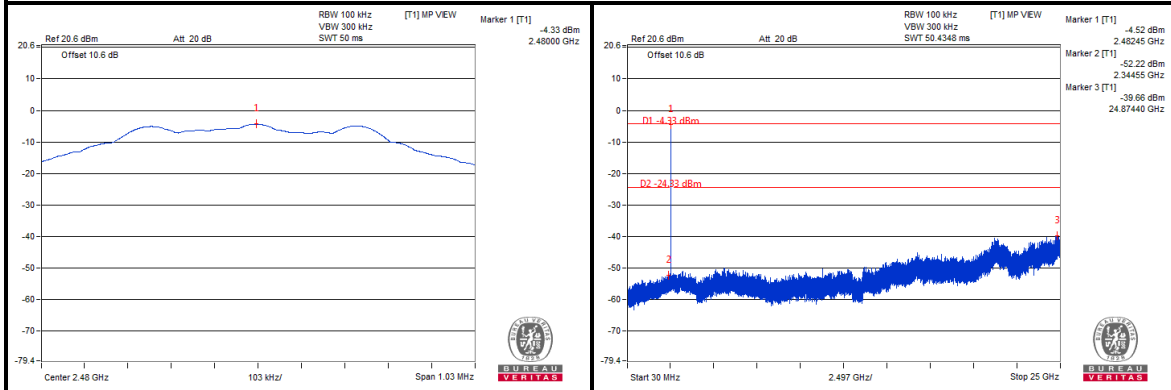
CH 0



CH 19



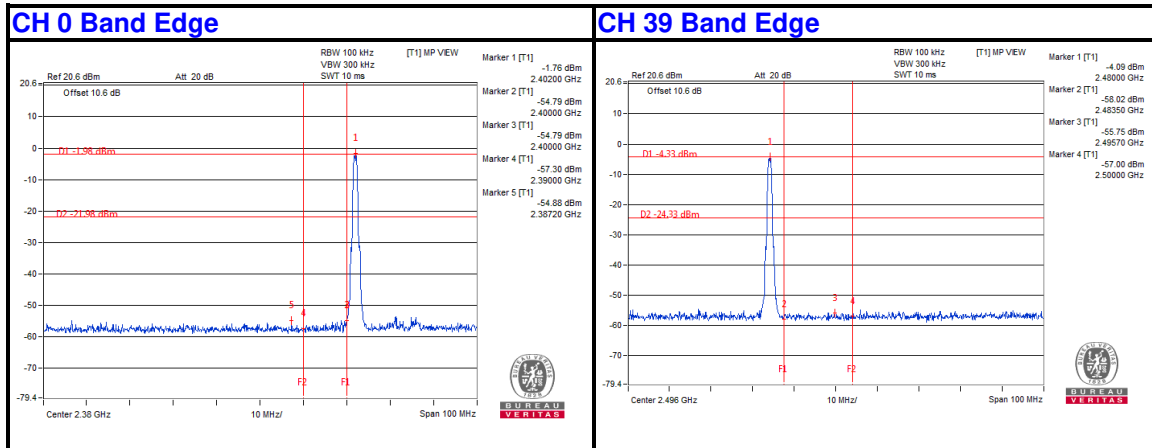
CH 39





BUREAU
VERITAS

Test Report No.: RF170330W002-2





Test Report No.: RF170330W002-2

5 PHOTOGRAPHS OF THE TEST CONFIGURATION

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



6 APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EUT by the lab during the test.

---END---