ACCREDITED
Certificate # 3939.01

FCC TEST REPORT

(Part 15, Subpart C)

Applicant:	Sonim Technologies, Inc.
Address:	1825 S. Grant St., Suite 200., San Mateo, CA, 94402

Manufacturer or Supplier	Sonim Technologies (Shenzhen) Limited
Address	2nd Floor, No. 2 Building Phase B, Daqian Industrial park, Longchang Road, 67 District, Baoan, Shenzhen, P. R. China
Product	Mobile Phone
Brand Name	Sonim
Model Name	XP8800
FCC ID	WYPPG4032
Date of tests	Nov. 06, 2017 ~ Dec. 10, 2017

The tests have been carried out according to the requirements of the following standard:

☒ **FCC Part 15, Subpart C, Section 15.247**
☒ **ANSI C63.10-2013**

CONCLUSION: The submitted sample was found to <u>COMPLY</u> with the test requirement

Prepared by Yuqiang Yin Engineer / Mobile Department	Approved by Bill Yao Manager / Mobile Department
Date: Dec. 11, 2017	Date: Dec. 11, 2017

This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification

BV 7Layers Communications Technology (Shenzhen) Co. Ltd

No.B102, Dazu Chuangxin Mansion, North of Beihuan Avenue, North Area, Hi-Tech Industrial Park, Nanshan District, Shenzhen, Guangdong, China

Tel: +86 755 8869 6566
Fax: +86 755 8869 6577
Email: customerservice.dg@cn.bureauveritas.com

TABLE OF CONTENTS

RELEASE CONTROL RECORD 4
1 SUMMARY OF TEST RESULTS 5
1.1 MEASUREMENT UNCERTAINTY 5
2 GENERAL INFORMATION 6
2.1 GENERAL DESCRIPTION OF EUT 6
2.2 DESCRIPTION OF TEST MODES 8
2.2.1 CONFIGURATION OF SYSTEM UNDER TEST 9
2.2.2 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL 9
2.3 DUTY CYCLE OF TEST SIGNAL 12
2.4 GENERAL DESCRIPTION OF APPLIED STANDARDS 13
2.5 DESCRIPTION OF SUPPORT UNITS 13
3 TEST TYPES AND RESULTS 14
3.1 CONDUCTED EMISSION MEASUREMENT 14
3.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT 14
3.1.2 TEST INSTRUMENTS 14
3.1.3 TEST PROCEDURES 15
3.1.4 DEVIATION FROM TEST STANDARD 15
3.1.5 TEST SETUP 16
3.1.6 EUT OPERATING CONDITIONS 16
3.1.7 TEST RESULTS 17
3.2 RADIATED EMISSION MEASUREMENT 19
3.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT 19
3.2.2 TEST INSTRUMENTS 20
3.2.3 TEST PROCEDURES 21
3.2.4 DEVIATION FROM TEST STANDARD 21
3.2.5 TEST SETUP 22
3.2.6 EUT OPERATING CONDITIONS 23
3.2.7 TEST RESULTS 24
3.3 6 DB BANDWIDTH MEASUREMENT 46
3.3.1 LIMITS OF 6DB BANDWIDTH MEASUREMENT 46
3.3.2 TEST INSTRUMENTS 46
3.3.3 TEST PROCEDURE 46
3.3.4 DEVIATION FROM TEST STANDARD 47
3.3.5 TEST SETUP 47

3.3.6 EUT OPERATING CONDITIONS 47
3.3.7 TEST RESULTS 48
3.4 CONDUCTED OUTPUT POWER 54
3.4.1 LIMITS OF CONDUCTED OUTPUT POWER MEASUREMENT 54
3.4.2 TEST SETUP 54
3.4.3 TEST INSTRUMENTS 54
3.4.4 TEST PROCEDURES 54
3.4.5 DEVIATION FROM TEST STANDARD 54
3.4.6 EUT OPERATING CONDITIONS 54
3.4.7 TEST RESULTS 55
3.4.7.1 MAXIMUM PEAK OUTPUT POWER 55
3.4.7.2 AVERAGE OUTPUT POWER (FOR REFERENCE) 57
3.5 POWER SPECTRAL DENSITY MEASUREMENT 59
3.5.1 LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT 59
3.5.2 TEST SETUP 59
3.5.3 TEST INSTRUMENTS 59
3.5.4 TEST PROCEDURE 59
3.5.5 DEVIATION FROM TEST STANDARD 59
3.5.6 EUT OPERATING CONDITION 59
3.5.7 TEST RESULTS 60
3.6 OUT OF BAND EMISSION MEASUREMENT 66
3.6.1 LIMITS OF OUT OF BAND EMISSION MEASUREMENT 66
3.6.2 TEST SETUP 66
3.6.3 TEST INSTRUMENTS 66
3.6.4 TEST PROCEDURE 66
3.6.5 DEVIATION FROM TEST STANDARD 67
3.6.6 EUT OPERATING CONDITION 67
3.6.7 TEST RESULTS 67
4 PHOTOGRAPHS OF THE TEST CONFIGURATION 80
5 APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB 81

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF170730W002-2	Original release	Nov. 23, 2017
RF171201W001-2	Based on the original report RF170730W002-2 disable CDMA function.	Dec. 11, 2017

1 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 -13.15dB at 16.360000MHz.
15.205 15.209	Radiated Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -1.95dB 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

1.1 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	2.66dB
Radiated emissions	9KHz ~ 30MHz	2.68dB
	30MHz ~ 1GMHz	3.26dB
	1GHz ~ 18GHz	4.48dB
	18GHz ~ 40GHz	4.12dB

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

2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Mobile Phone
BRAND NAME	Sonim
MODEL NAME	XP8800
TYPE NUMBER	PG4032/PG4033/PG4034/PG4035/PG4012/PG4041/ PG4022
NOMINAL VOLTAGE	5/9Vdc (adapter or host equipment) 3.85Vdc (Li-ion, 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 135 Mbps BT_LE: 1 Mbps
OPERATING FREQUENCY	2412-2462MHz for 11b/g/n(HT20) 2422-2452MHz for 11n(HT40) 2402-2480MHz for BT-LE(GFSK)
MAX. OUTPUT POWER	WLAN: 112.720mW (Maximum) BT-LE: 0.767mW (Maximum)
ANTENNA TYPE	PIFA Antenna with -1dBi gain
HW VERSION	A
SW VERSION	8A.0.0-00-7.1.1-00.01.26
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	USB cable 1: with shielded, detachable, 1.5m USB cable 2: 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
802.11n (40MHz)	1TX /1RX
BT_LE	1TX /1RX

3. The EUT was powered by the following adapter:

ADAPTER	
BRAND:	Sonim
MODEL:	S42A02
INPUT:	AC 100-240V, 500mA
OUTPUT:	DC 5V, 1500mA DC 9V, 1500mA DC 12V,1100mA

4. The EUT matched the following USB cables:

USB CABLE 1	
BRAND:	N.A
MODEL:	N.A
SIGNAL LINE:	1.5 METER

USB CABLE 2	
BRAND:	N.A
MODEL:	N.A
SIGNAL LINE:	1.0 METER

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

2.2 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		

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		

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

2.2.1 CONFIGURATION OF SYSTEM UNDER TEST

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

2.2.2 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)
802.11n HT40	3 to 9	9	OFDM	BPSK	13.5
BT-LE	0 to 39	0	DTS	GFSK	1.0

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
802.11n HT40	3 to 9	3, 6, 9	OFDM	BPSK	13.5
BT-LE	0 to 39	0,19, 39	DTS	GFSK	1.0

POWER LINE CONDUCTED EMISSION TEST:

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

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

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11n HT40	3 to 9	9	OFDM	BPSK	13.5

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
802.11n HT40	3 to 9	3, 9	OFDM	BPSK	13.5
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
802.11n HT40	3 to 9	3,6, 9	OFDM	BPSK	13.5
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 5/9V from adaptor	Simon Yang
RE≥1G	22deg. C, 54%RH	DC 5/9V from adaptor	Simon Yang
PLC	24deg. C, 55%RH	DC 5/9V from adaptor	Jocan Guo
APCM	25deg. C, 60%RH	3.85Vdc from battery	Wenliang Wu

2.3 Duty Cycle of Test Signal

WIFI 2.4GHz

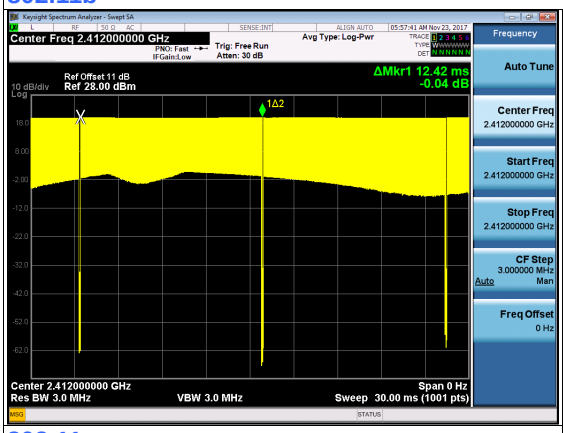
802.11b: Duty cycle = 12.42/12.45 = 0.998 > 98%, Duty factor is not required.

802.11g: Duty cycle = 2.059/2.189 = 0.941 < 98%, Duty factor = 10 * log(1/0.941) = 0.266

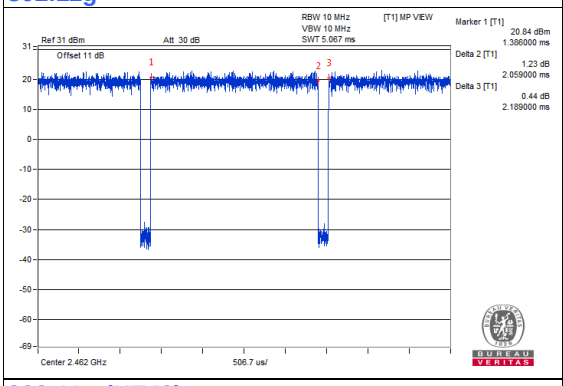
802.11n (HT20): Duty cycle = 1.919/2.029 = 0.946 < 98%, Duty factor = 10 * log(1/0.946) = 0.242

802.11n (HT40): Duty cycle = 0.944/1.062 = 0.889 < 98%, Duty factor = 10 * log(1/0.889) = 0.512

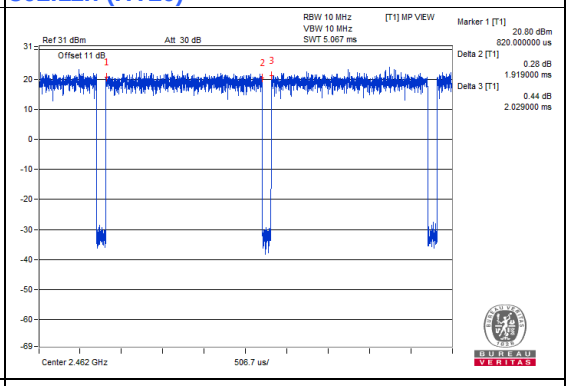
802.11b



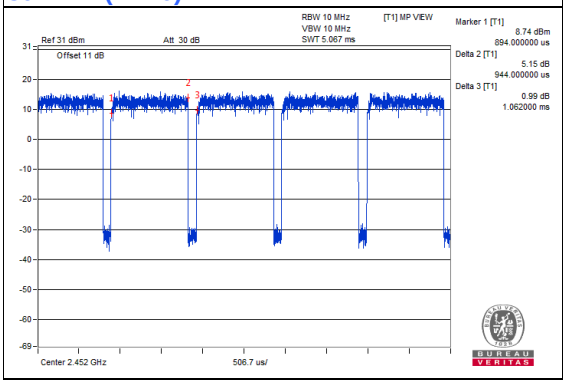
802.11g



802.11n (HT20)



802.11n (HT40)



2.4 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 v04

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 (Certification). The test report has been issued separately.

2.5 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	PC	HP	A6608CN	3CR83825X3	N/A

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

3 TEST TYPES AND RESULTS

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dBμV)	
	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.

3.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESR3	101900	Jun. 28,17	Jun. 27,18
EMC32 test software	Rohde&Schwarz	EMC32	NA	NA	NA
LISN network	Rohde&Schwarz	ENV216	101922	Sep. 18,17	Sep. 17,18

NOTE:

1. The test was performed in CE shielded room.
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.

3.1.3 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.

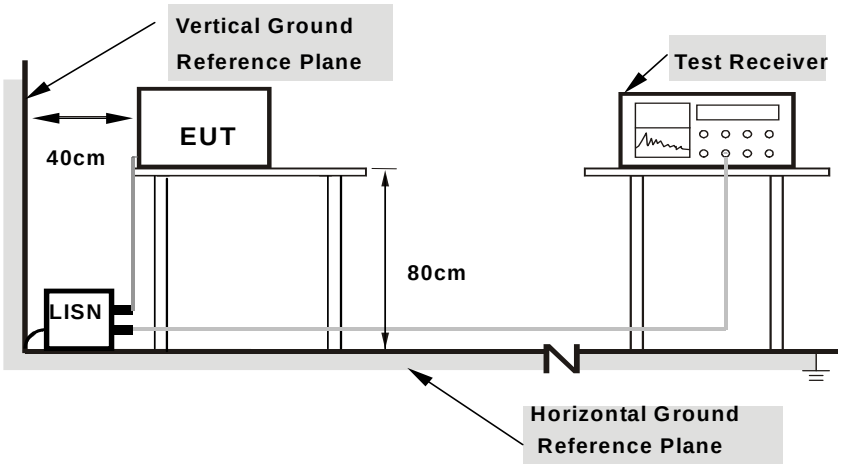
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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

3.1.4 DEVIATION FROM TEST STANDARD

No deviation.

3.1.5 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).

3.1.6 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.

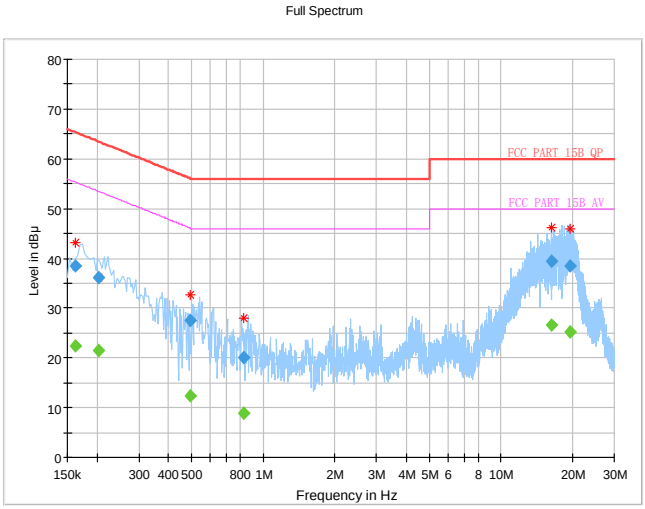
3.1.7 TEST RESULTS

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	Jocan Guo	**TEST DATE**	2017/11/07

Frequency (MHz)	QuasiPeak (dB¦ÌV)	CAverage (dB¦ÌV)	Limit (dB¦ÌV)	Margin (dB)	Line	Filter	Corr. (dB)
0.162000	---	22.47	55.36	-32.89	L	ON	9.6
0.162000	38.51	---	65.36	-26.85	L	ON	9.6
0.204000	---	21.43	53.45	-32.02	L	ON	9.7
0.204000	36.18	---	63.45	-27.27	L	ON	9.7
0.496000	---	12.28	46.07	-33.79	L	ON	9.7
0.496000	27.56	---	56.07	-28.51	L	ON	9.7
0.832000	---	8.86	46.00	-37.14	L	ON	9.7
0.832000	19.97	---	56.00	-36.03	L	ON	9.7
16.312000	---	26.63	50.00	-23.37	L	ON	9.9
16.312000	39.35	---	60.00	-20.65	L	ON	9.9
19.576000	---	25.24	50.00	-24.76	L	ON	9.9
19.576000	38.40	---	60.00	-21.60	L	ON	9.9

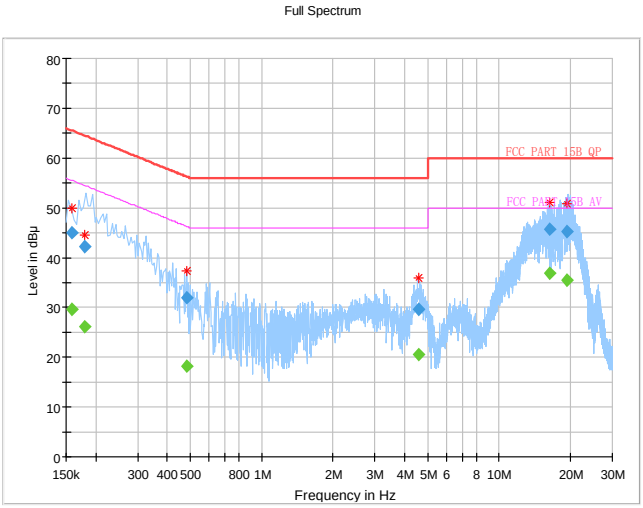
REMARKS: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission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



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	Jocan Guo	**TEST DATE**	2017/11/07

Frequency (MHz)	QuasiPeak (dB¦ÌV)	CAverage (dB¦ÌV)	Limit (dB¦ÌV)	Margin (dB)	Line	Filter	Corr. (dB)
0.158000	---	29.65	55.57	-25.92	N	ON	10.1
0.158000	45.03	---	65.57	-20.54	N	ON	10.1
0.180000	---	26.13	54.49	-28.36	N	ON	10.2
0.180000	42.21	---	64.49	-22.28	N	ON	10.2
0.484000	---	18.21	46.27	-28.06	N	ON	10.1
0.484000	32.06	---	56.27	-24.21	N	ON	10.1
4.560000	---	20.52	46.00	-25.48	N	ON	9.8
4.560000	29.62	---	56.00	-26.38	N	ON	9.8
16.360000	**---**	**36.85**	**50.00**	**-13.15**	**N**	**ON**	**10.0**
16.360000	45.80	---	60.00	-14.20	N	ON	10.0
19.448000	---	35.55	50.00	-14.45	N	ON	10.0
19.448000	45.15	---	60.00	-14.85	N	ON	10.0

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.



3.2 RADIATED EMISSION MEASUREMENT

3.2.1 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.

3.2.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
3m Semi-anechoic Chamber	ETS-LINDGREN	9m*6m*6m	Euroshieldpn-CT0001143-1216	May 06,17	May 05,18
Bilog Antenna	ETS-LINDGREN	3143B	00161965	Nov. 26,16	Nov. 25,18
Horn Antenna	ETS-LINDGREN	3117	00168728	Nov. 26,16	Nov. 25,18
Loop antenna	Daze	ZN30900A	0708	Nov. 20,17	Nov. 19,18
Horn Antenna (18GHz-40GHz)	N/A	QWH-SL-18-40-K-SG/QMS-00361	15433	Dec. 16,16	Dec. 15,17
Test Software	E3	V 9.160323	N/A	N/A	N/A
Test Software	ADT	ADT_Radiated_V7.6.15.9.2	N/A	N/A	N/A
10dB Attenuator	JFW/USA	50HF-010-SMA	1505	Jul. 24,17	Jul. 23,18
MXE EMI Receiver	KEYSIGHT	N9038A-544	MY54450026	Mar. 10,17	Mar. 09,18
Signal Pre-Amplifier	EMSI	EMC 9135	980249	Jul. 24,17	Jul. 23,18
Signal Pre-Amplifier	EMSI	EMC 012645B	980257	Jul. 24,17	Jul. 23,18
Signal Pre-Amplifier	EMSI	EMC 184045B	980259	Jul. 24,17	Jul. 23,18

NOTE: 1. The calibration interval of the above test instruments is 12 months or 24 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

2. The test was performed in 3m Chamber.

3. The FCC Site Registration No. is 525120.

3.2.3 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 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 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:

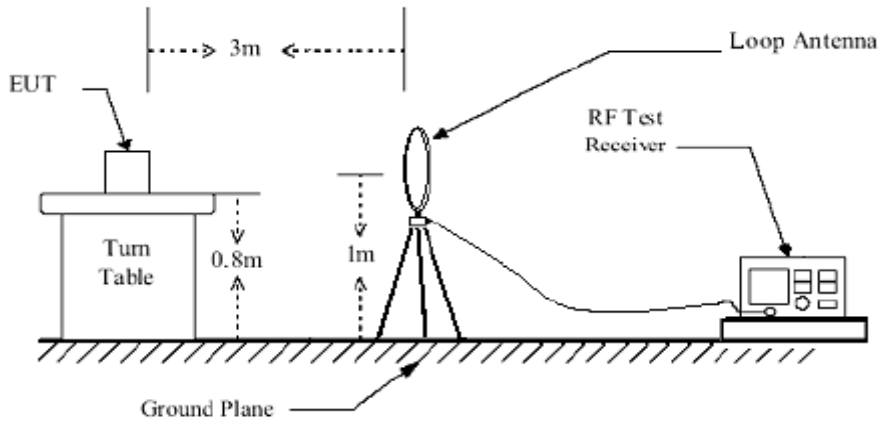
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

3.2.4 DEVIATION FROM TEST STANDARD

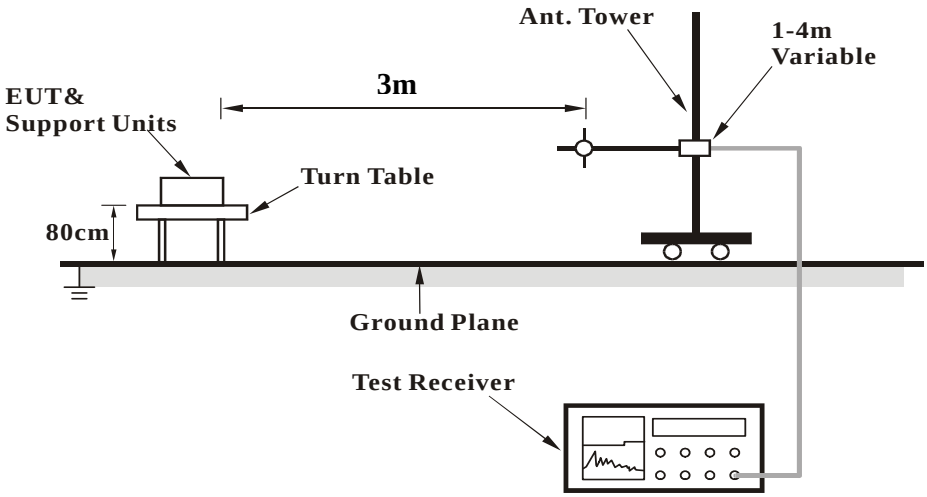
No deviation

3.2.5 TEST SETUP

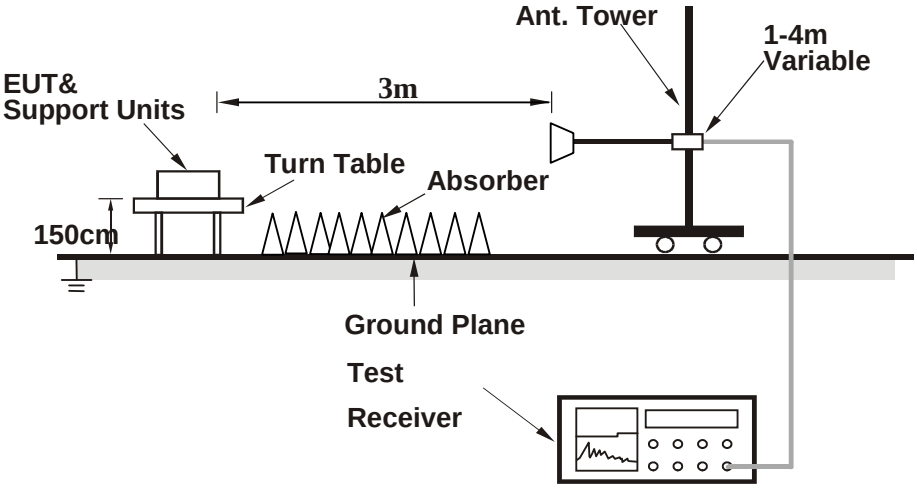
< Frequency Range below 30MHz >



< Frequency Range 30MHz~1GHz >



<Frequency Range above 1GHz>



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

3.2.6 EUT OPERATING CONDITIONS

a. Set the EUT under full load condition and placed them on a testing table.

b. Set the transmitter part of EUT under transmission condition continuously at specific channel frequency.

c. The necessary accessories enable the EUT in full functions.

3.2.7 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:

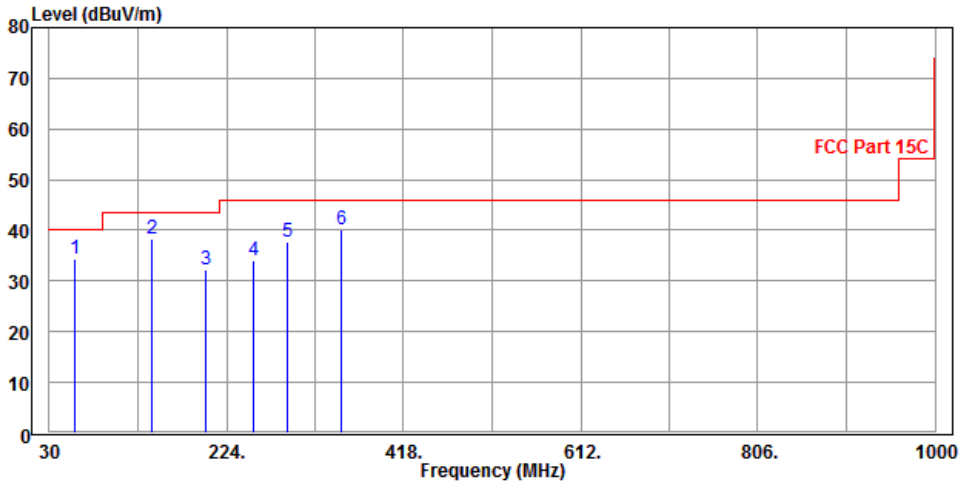
802.11n (40MHz)

CHANNEL	TX Channel 9	**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
57.16	34.41	64.17	40	-5.59	6.43	1.15	37.34	100	87	QP
141.55	38.34	65.15	43.5	-5.16	8.19	1.83	36.83	100	87	QP
201.69	32.12	56.3	43.5	-11.38	10.18	2.18	36.54	100	87	QP
254.07	34.12	55.72	46	-11.88	12.45	2.47	36.52	100	87	QP
289.96	37.84	58.79	46	-8.16	12.88	2.67	36.5	100	87	QP
349.13	40.3	58.92	46	-5.7	15.06	2.93	36.61	100	87	QP

REMARKS:

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

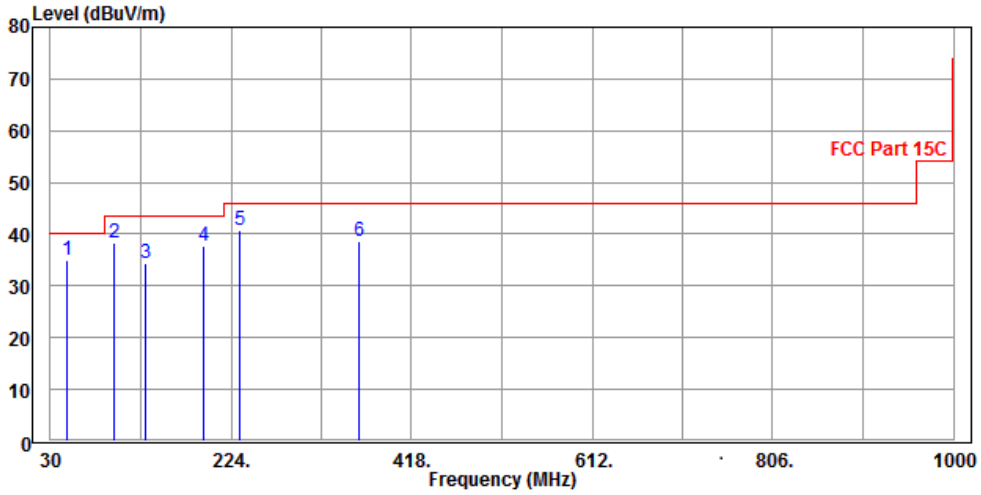


CHANNEL	TX Channel 9	**DETECTOR FUNCTION**	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

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
47.46	35.1	64.03	40	-4.9	7.44	1.04	37.41	200	0	QP
97.9	38.3	66.01	43.5	-5.2	7.77	1.52	37	200	0	QP
131.85	34.31	61.76	43.5	-9.19	7.67	1.76	36.88	200	0	QP
193.93	37.86	62.27	43.5	-5.64	10.04	2.14	36.59	200	0	QP
233.7	40.61	63.13	46	-5.39	11.65	2.36	36.53	200	0	QP
361.74	38.51	56.57	46	-7.49	15.59	2.99	36.64	200	0	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) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	44.94	50.42	54	-9.06	32.29	8.15	45.92	183	324	Average
2390	64.82	70.3	74	-9.18	32.29	8.15	45.92	183	324	Peak
2412	105.1	110.51			32.31	8.19	45.91	183	324	Average
2412	106.98	112.39			32.31	8.19	45.91	183	324	Peak
2483.5	44.1	49.29	54	-9.9	32.38	8.32	45.89	183	324	Average
2483.5	55.36	60.55	74	-18.64	32.38	8.32	45.89	183	324	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	43.73	49.21	54	-10.27	32.29	8.15	45.92	100	19	Average
2390	65.61	71.09	74	-8.39	32.29	8.15	45.92	100	19	Peak
2412	108.65	114.06			32.31	8.19	45.91	100	19	Average
2412	110.99	116.4			32.31	8.19	45.91	100	19	Peak
2483.5	44.28	49.47	54	-9.72	32.38	8.32	45.89	100	19	Average
2483.5	56.73	61.92	74	-17.27	32.38	8.32	45.89	100	19	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) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	43.65	49.13	54	-10.35	32.29	8.15	45.92	179	324	Average
2390	56.07	61.55	74	-17.93	32.29	8.15	45.92	179	324	Peak
2437	104.73	110.06			32.34	8.24	45.91	179	324	Average
2437	107.2	112.53			32.34	8.24	45.91	179	324	Peak
2483.5	44.03	49.22	54	-9.97	32.38	8.32	45.89	179	324	Average
2483.5	57.04	62.23	74	-16.96	32.38	8.32	45.89	179	324	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	49.02	54	-10.46	32.29	8.15	45.92	100	22	Average
2390	58.62	64.1	74	-15.38	32.29	8.15	45.92	100	22	Peak
2437	108.85	114.18			32.34	8.24	45.91	100	22	Average
2437	111.12	116.45			32.34	8.24	45.91	100	22	Peak
2483.5	43.98	49.17	54	-10.02	32.38	8.32	45.89	100	22	Average
2483.5	56.68	61.87	74	-17.32	32.38	8.32	45.89	100	22	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) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	43.71	49.19	54	-10.29	32.29	8.15	45.92	58	148	Average
2390	59.08	64.56	74	-14.92	32.29	8.15	45.92	58	148	Peak
2462	106.88	112.14			32.36	8.28	45.9	58	148	Average
2462	109.06	114.32			32.36	8.28	45.9	58	148	Peak
2483.5	45	50.19	54	-9	32.38	8.32	45.89	58	148	Average
2483.5	56.4	61.59	74	-17.6	32.38	8.32	45.89	58	148	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	43.65	49.13	54	-10.35	32.29	8.15	45.92	100	25	Average
2390	62.99	68.47	74	-11.01	32.29	8.15	45.92	100	25	Peak
2462	108.8	114.06			32.36	8.28	45.9	100	25	Average
2462	110.9	116.16			32.36	8.28	45.9	100	25	Peak
2483.5	45.19	50.38	54	-8.81	32.38	8.32	45.89	100	25	Average
2483.5	58.37	63.56	74	-15.63	32.38	8.32	45.89	100	25	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) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	44.86	50.34	54	-9.14	32.29	8.15	45.92	183	324	Average
2390	57.07	62.55	74	-16.93	32.29	8.15	45.92	183	324	Peak
2412	98.39	103.8			32.31	8.19	45.91	183	324	Average
2412	108.32	113.73			32.31	8.19	45.91	183	324	Peak
2483.5	43.9	49.09	54	-10.1	32.38	8.32	45.89	183	324	Average
2483.5	57.32	62.51	74	-16.68	32.38	8.32	45.89	183	324	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	51.07	56.55	54	-2.93	32.29	8.15	45.92	100	28	Average
2390	64.74	70.22	74	-9.26	32.29	8.15	45.92	100	28	Peak
2412	101.96	107.37			32.31	8.19	45.91	100	28	Average
2412	110.71	116.12			32.31	8.19	45.91	100	28	Peak
2483.5	45.07	50.26	54	-8.93	32.38	8.32	45.89	100	28	Average
2483.5	58.57	63.76	74	-15.43	32.38	8.32	45.89	100	28	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) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	44.88	50.36	54	-9.12	32.29	8.15	45.92	180	324	Average
2390	57.52	63	74	-16.48	32.29	8.15	45.92	180	324	Peak
2437	98.13	103.46			32.34	8.24	45.91	180	324	Average
2437	108	113.33			32.34	8.24	45.91	180	324	Peak
2483.5	44.84	50.03	54	-9.16	32.38	8.32	45.89	180	324	Average
2483.5	57.06	62.25	74	-16.94	32.38	8.32	45.89	180	324	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	44.5	49.98	54	-9.5	32.29	8.15	45.92	100	28	Average
2390	58.3	63.78	74	-15.7	32.29	8.15	45.92	100	28	Peak
2437	101.19	106.52			32.34	8.24	45.91	100	28	Average
2437	110.08	115.41			32.34	8.24	45.91	100	28	Peak
2483.5	45.22	50.41	54	-8.78	32.38	8.32	45.89	100	28	Average
2483.5	56.98	62.17	74	-17.02	32.38	8.32	45.89	100	28	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) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	45.87	51.35	54	-8.13	32.29	8.15	45.92	148	59	Average
2390	60.88	66.36	74	-13.12	32.29	8.15	45.92	148	59	Peak
2462	98.2	103.46			32.36	8.28	45.9	148	59	Average
2462	107.93	113.19			32.36	8.28	45.9	148	59	Peak
2483.5	50.09	55.28	54	-3.91	32.38	8.32	45.89	148	59	Average
2483.5	63.62	68.81	74	-10.38	32.38	8.32	45.89	148	59	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	44.06	49.54	54	-9.94	32.29	8.15	45.92	100	28	Average
2390	55.98	61.46	74	-18.02	32.29	8.15	45.92	100	28	Peak
2462	102.15	107.41			32.36	8.28	45.9	100	28	Average
2462	110.95	116.21			32.36	8.28	45.9	100	28	Peak
2483.5	51.77	56.96	54	-2.23	32.38	8.32	45.89	100	28	Average
2483.5	66.01	71.2	74	-7.99	32.38	8.32	45.89	100	28	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) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	46.57	52.05	54	-7.43	32.29	8.15	45.92	223	324	Average
2390	62.77	68.25	74	-11.23	32.29	8.15	45.92	223	324	Peak
2412	98.22	103.63			32.31	8.19	45.91	223	324	Average
2412	108.39	113.8			32.31	8.19	45.91	223	324	Peak
2483.5	44.36	49.55	54	-9.64	32.38	8.32	45.89	223	324	Average
2483.5	56.35	61.54	74	-17.65	32.38	8.32	45.89	223	324	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	51.7	57.18	54	-2.3	32.29	8.15	45.92	100	28	Average
2390	62.72	68.2	74	-11.28	32.29	8.15	45.92	100	28	Peak
2412	102.28	107.69			32.31	8.19	45.91	100	28	Average
2412	111.47	116.88			32.31	8.19	45.91	100	28	Peak
2483.5	45.23	50.42	54	-8.77	32.38	8.32	45.89	100	28	Average
2483.5	57.31	62.5	74	-16.69	32.38	8.32	45.89	100	28	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) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	43.82	49.3	54	-10.18	32.29	8.15	45.92	180	324	Average
2390	56.05	61.53	74	-17.95	32.29	8.15	45.92	180	324	Peak
2437	98.46	103.79			32.34	8.24	45.91	180	324	Average
2437	107.64	112.97			32.34	8.24	45.91	180	324	Peak
2483.5	44.91	50.1	54	-9.09	32.38	8.32	45.89	180	324	Average
2483.5	57.6	62.79	74	-16.4	32.38	8.32	45.89	180	324	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	43.76	49.24	54	-10.24	32.29	8.15	45.92	100	28	Average
2390	56.44	61.92	74	-17.56	32.29	8.15	45.92	100	28	Peak
2437	100.76	106.09			32.34	8.24	45.91	100	28	Average
2437	111.05	116.38			32.34	8.24	45.91	100	28	Peak
2483.5	45.43	50.62	54	-8.57	32.38	8.32	45.89	100	28	Average
2483.5	57.75	62.94	74	-16.25	32.38	8.32	45.89	100	28	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) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	43.78	49.26	54	-10.22	32.29	8.15	45.92	150	59	Average
2390	56.8	62.28	74	-17.2	32.29	8.15	45.92	150	59	Peak
2462	100.35	105.61			32.36	8.28	45.9	150	59	Average
2462	110.16	115.42			32.36	8.28	45.9	150	59	Peak
2483.5	49.99	55.18	54	-4.01	32.38	8.32	45.89	150	59	Average
2483.5	63.77	68.96	74	-10.23	32.38	8.32	45.89	150	59	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	49.17	54	-10.31	32.29	8.15	45.92	100	28	Average
2390	56.49	61.97	74	-17.51	32.29	8.15	45.92	100	28	Peak
2462	102.44	107.7			32.36	8.28	45.9	100	28	Average
2462	111.51	116.77			32.36	8.28	45.9	100	28	Peak
2483.5	51.82	57.01	54	-2.18	32.38	8.32	45.89	100	28	Average
2483.5	65.57	70.76	74	-8.43	32.38	8.32	45.89	100	28	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 (40MHz)

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

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	44.67	50.15	54	-9.33	32.29	8.15	45.92	134	58	Average
2390	57.25	62.73	74	-16.75	32.29	8.15	45.92	134	58	Peak
2422	92.31	97.69			32.32	8.21	45.91	134	58	Average
2422	101.98	107.36			32.32	8.21	45.91	134	58	Peak
2483.5	44.58	49.77	54	-9.42	32.38	8.32	45.89	134	58	Average
2483.5	56.96	62.15	74	-17.04	32.38	8.32	45.89	134	58	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	49.96	55.44	54	-4.04	32.29	8.15	45.92	100	28	Average
2390	61.43	66.91	74	-12.57	32.29	8.15	45.92	100	28	Peak
2422	96.46	101.84			32.32	8.21	45.91	100	28	Average
2422	105.64	111.02			32.32	8.21	45.91	100	28	Peak
2483.5	44.82	50.01	54	-9.18	32.38	8.32	45.89	100	28	Average
2483.5	57.12	62.31	74	-16.88	32.38	8.32	45.89	100	28	Peak

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
   Margin value = Emission level – Limit value.
2. 2422MHz: Fundamental frequency.

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

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	44.96	50.44	54	-9.04	32.29	8.15	45.92	185	58	Average
2390	56.5	61.98	74	-17.5	32.29	8.15	45.92	185	58	Peak
2437	94.64	99.97			32.34	8.24	45.91	185	58	Average
2437	102.85	108.18			32.34	8.24	45.91	185	58	Peak
2483.5	51.61	56.8	54	-2.39	32.38	8.32	45.89	185	58	Average
2483.5	64.8	69.99	74	-9.2	32.38	8.32	45.89	185	58	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	50.4	55.88	54	-3.6	32.29	8.15	45.92	100	28	Average
2390	64.22	69.7	74	-9.78	32.29	8.15	45.92	100	28	Peak
2437	96.65	101.98			32.34	8.24	45.91	100	28	Average
2437	106.18	111.51			32.34	8.24	45.91	100	28	Peak
2483.5	51.98	57.17	54	-2.02	32.38	8.32	45.89	100	28	Average
2483.5	67.45	72.64	74	-6.55	32.38	8.32	45.89	100	28	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 9	**DETECTOR FUNCTION**	Peak (PK) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	43.67	49.15	54	-10.33	32.29	8.15	45.92	148	58	Average
2390	56.36	61.84	74	-17.64	32.29	8.15	45.92	148	58	Peak
2452	93.86	99.15			32.35	8.26	45.9	148	58	Average
2452	103.46	108.75			32.35	8.26	45.9	148	58	Peak
2483.5	48.63	53.82	54	-5.37	32.38	8.32	45.89	148	58	Average
2483.5	60.8	65.99	74	-13.2	32.38	8.32	45.89	148	58	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	43.65	49.13	54	-10.35	32.29	8.15	45.92	100	28	Average
2390	56.69	62.17	74	-17.31	32.29	8.15	45.92	100	28	Peak
2452	95.84	101.13			32.35	8.26	45.9	100	28	Average
2452	105.44	110.73			32.35	8.26	45.9	100	28	Peak
2483.5	**52.05**	**57.24**	**54**	**-1.95**	**32.38**	**8.32**	**45.89**	**100**	**28**	Average
2483.5	64.77	69.96	74	-9.23	32.38	8.32	45.89	100	28	Peak

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
   Margin value = Emission level – Limit value.
2. 2452MHz: 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:

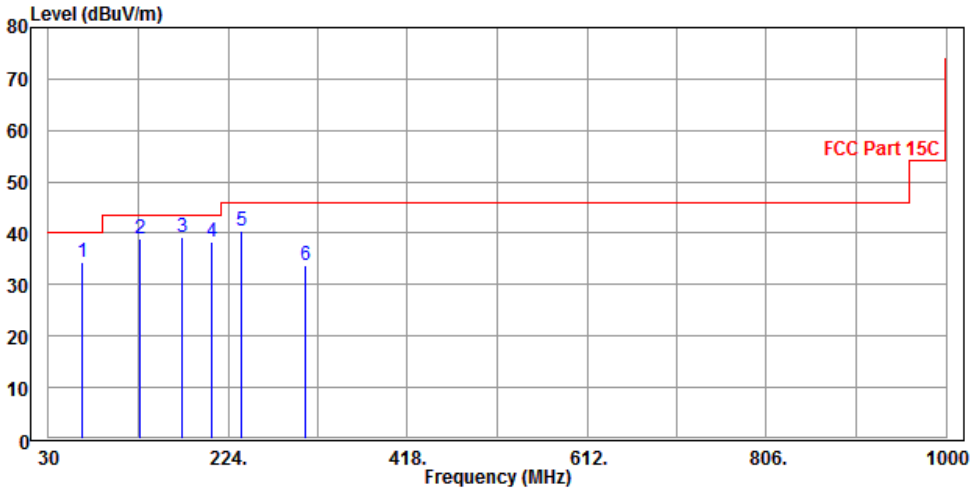
BT-LE (GFSK)

CHANNEL	TX Channel 0	**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
65.89	34.37	63.72	40	-5.63	6.69	1.24	37.28	200	130	QP
128.94	38.86	66.45	43.5	-4.64	7.57	1.74	36.9	200	130	QP
173.56	39.16	63.85	43.5	-4.34	10	2.02	36.71	200	130	QP
206.54	38.46	62.39	43.5	-5.04	10.4	2.21	36.54	200	130	QP
238.55	40.55	62.81	46	-5.45	11.87	2.39	36.52	200	130	QP
307.42	33.87	54.33	46	-12.13	13.31	2.75	36.52	200	130	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

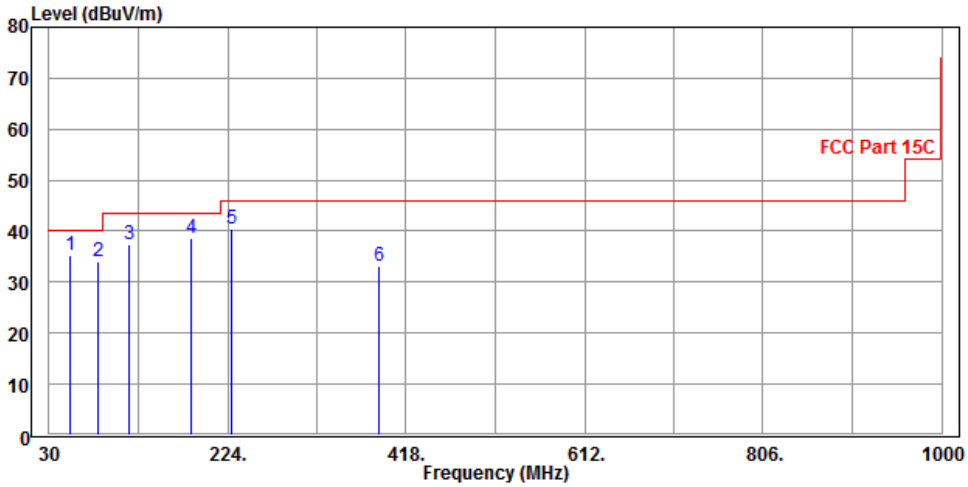


CHANNEL	TX Channel 0	**DETECTOR FUNCTION**	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

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
53.28	35.27	65.05	40	-4.73	6.47	1.11	37.36	100	205	QP
83.35	34.12	63.12	40	-5.88	6.7	1.41	37.11	100	205	QP
117.3	37.38	65.28	43.5	-6.12	7.39	1.66	36.95	100	205	QP
185.2	38.7	63.31	43.5	-4.8	9.95	2.09	36.65	100	205	QP
228.85	40.31	63.08	46	-5.69	11.43	2.33	36.53	100	205	QP
387.93	33.22	50.12	46	-12.78	16.69	3.1	36.69	100	205	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) (1MHz)

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

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	37.93	43.41	54	-16.07	32.29	8.15	45.92	234	66	Average
2390	47.08	52.56	74	-26.92	32.29	8.15	45.92	234	66	Peak
2402	89.52	94.97			32.3	8.17	45.92	234	66	Average
2402	94.54	99.99			32.3	8.17	45.92	234	66	Peak
2483.5	34.66	39.85	54	-19.34	32.38	8.32	45.89	234	66	Average
2483.5	46.05	51.24	74	-27.95	32.38	8.32	45.89	234	66	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	33.96	39.44	54	-20.04	32.29	8.15	45.92	100	15	Average
2390	46.92	52.4	74	-27.08	32.29	8.15	45.92	100	15	Peak
2402	92.14	97.59			32.3	8.17	45.92	100	15	Average
2402	97.37	102.82			32.3	8.17	45.92	100	15	Peak
2483.5	33.78	38.97	54	-20.22	32.38	8.32	45.89	100	15	Average
2483.5	47.35	52.54	74	-26.65	32.38	8.32	45.89	100	15	Peak

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
   Margin value = Emission level – Limit value.
2. 2402MHz: Fundamental frequency.

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

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	34.08	39.56	54	-19.92	32.29	8.15	45.92	223	66	Average
2390	45.78	51.26	74	-28.22	32.29	8.15	45.92	223	66	Peak
2440	90.98	96.31			32.34	8.24	45.91	223	66	Average
2440	95.88	101.21			32.34	8.24	45.91	223	66	Peak
2483.5	33.93	39.12	54	-20.07	32.38	8.32	45.89	223	66	Average
2483.5	46.99	52.18	74	-27.01	32.38	8.32	45.89	223	66	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	34.37	39.85	54	-19.63	32.29	8.15	45.92	100	32	Average
2390	46.21	51.69	74	-27.79	32.29	8.15	45.92	100	32	Peak
2440	94.46	99.79			32.34	8.24	45.91	100	32	Average
2440	99.3	104.63			32.34	8.24	45.91	100	32	Peak
2483.5	33.9	39.09	54	-20.1	32.38	8.32	45.89	100	32	Average
2483.5	47.17	52.36	74	-26.83	32.38	8.32	45.89	100	32	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) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	34.23	39.71	54	-19.77	32.29	8.15	45.92	244	66	Average
2390	47.4	52.88	74	-26.6	32.29	8.15	45.92	244	66	Peak
2480	92.02	97.23			32.38	8.31	45.9	244	66	Average
2480	96.86	102.07			32.38	8.31	45.9	244	66	Peak
2483.5	34.1	39.29	54	-19.9	32.38	8.32	45.89	244	66	Average
2483.5	46.86	52.05	74	-27.14	32.38	8.32	45.89	244	66	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	33.79	39.27	54	-20.21	32.29	8.15	45.92	113	29	Average
2390	46.07	51.55	74	-27.93	32.29	8.15	45.92	113	29	Peak
2480	94.02	99.23			32.38	8.31	45.9	113	29	Average
2480	98.85	104.06			32.38	8.31	45.9	113	29	Peak
2483.5	34.32	39.51	54	-19.68	32.38	8.32	45.89	113	29	Average
2483.5	47.99	53.18	74	-26.01	32.38	8.32	45.89	113	29	Peak

REMARKS:

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

BT-LE (GFSK) (2MHz)

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

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	35.2	40.68	54	-18.8	32.29	8.15	45.92	234	60	Average
2390	47.57	53.05	74	-26.43	32.29	8.15	45.92	234	60	Peak
2402	82.31	87.76			32.3	8.17	45.92	234	60	Average
2402	93.73	99.18			32.3	8.17	45.92	234	60	Peak
2483.5	33.77	38.96	54	-20.23	32.38	8.32	45.89	234	60	Average
2483.5	46.93	52.12	74	-27.07	32.38	8.32	45.89	234	60	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	34.78	40.26	54	-19.22	32.29	8.15	45.92	100	26	Average
2390	47.87	53.35	74	-26.13	32.29	8.15	45.92	100	26	Peak
2402	85.67	91.12			32.3	8.17	45.92	100	26	Average
2402	97.74	103.19			32.3	8.17	45.92	100	26	Peak
2483.5	33.77	38.96	54	-20.23	32.38	8.32	45.89	100	26	Average
2483.5	46.31	51.5	74	-27.69	32.38	8.32	45.89	100	26	Peak

REMARKS:

1. Emission Level = Read Level+ Antenna Factor + Cable Loss- Preamp Factor
   Margin value = Emission level – Limit value.
2. 2402MHz: Fundamental frequency.

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

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	33.81	39.29	54	-20.19	32.29	8.15	45.92	184	59	Average
2390	46.45	51.93	74	-27.55	32.29	8.15	45.92	184	59	Peak
2440	84.52	89.85			32.34	8.24	45.91	184	59	Average
2440	96.45	101.78			32.34	8.24	45.91	184	59	Peak
2483.5	33.93	39.12	54	-20.07	32.38	8.32	45.89	184	59	Average
2483.5	46.96	52.15	74	-27.04	32.38	8.32	45.89	184	59	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	34.65	40.13	54	-19.35	32.29	8.15	45.92	100	26	Average
2390	49.66	55.14	74	-24.34	32.29	8.15	45.92	100	26	Peak
2440	87.37	92.7			32.34	8.24	45.91	100	26	Average
2440	99.76	105.09			32.34	8.24	45.91	100	26	Peak
2483.5	34.16	39.35	54	-19.84	32.38	8.32	45.89	100	26	Average
2483.5	46.64	51.83	74	-27.36	32.38	8.32	45.89	100	26	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) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	33.55	39.03	54	-20.45	32.29	8.15	45.92	182	59	Average
2390	46.4	51.88	74	-27.6	32.29	8.15	45.92	182	59	Peak
2480	83.81	89.02			32.38	8.31	45.9	182	59	Average
2480	95.82	101.03			32.38	8.31	45.9	182	59	Peak
2483.5	34.63	39.82	54	-19.37	32.38	8.32	45.89	182	59	Average
2483.5	47.65	52.84	74	-26.35	32.38	8.32	45.89	182	59	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	36.14	41.62	54	-17.86	32.29	8.15	45.92	113	28	Average
2390	48.29	53.77	74	-25.71	32.29	8.15	45.92	113	28	Peak
2480	86.52	91.73			32.38	8.31	45.9	113	28	Average
2480	98.37	103.58			32.38	8.31	45.9	113	28	Peak
2483.5	35.01	40.2	54	-18.99	32.38	8.32	45.89	113	28	Average
2483.5	50.93	56.12	74	-23.07	32.38	8.32	45.89	113	28	Peak

REMARKS:

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

3.3 6 dB BANDWIDTH MEASUREMENT

3.3.1 LIMITS OF 6dB BANDWIDTH MEASUREMENT

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

3.3.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Power Meter	ANRITSU	ML2495A	1506002	Mar. 01,17	Feb. 28,18
EXA Signal Analyzer	KEYSIGHT	N9010A-526	MY54510523	Mar. 01,17	Feb. 28,18
EXA Signal Analyzer	KEYSIGHT	N9010A-544	MY54510332	Mar. 01,17	Feb. 28,18
Power Sensor	ANRITSU	MA2411B	1339352	Mar. 01,17	Feb. 28,18

NOTE:

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

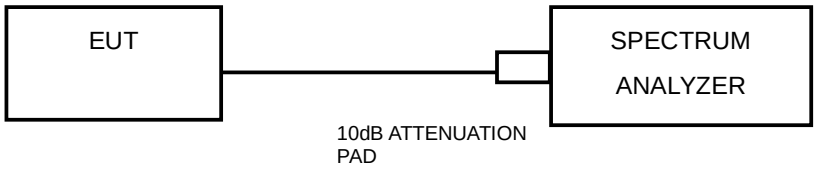
3.3.3 TEST PROCEDURE

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.

3.3.4 DEVIATION FROM TEST STANDARD

No deviation.

3.3.5 TEST SETUP



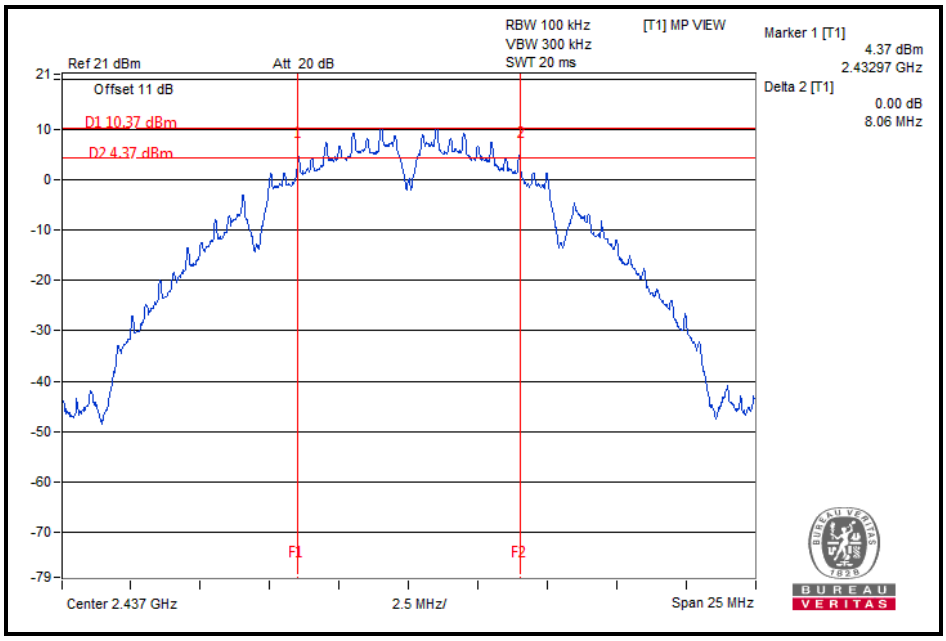
3.3.6 EUT OPERATING CONDITIONS

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

3.3.7 TEST RESULTS

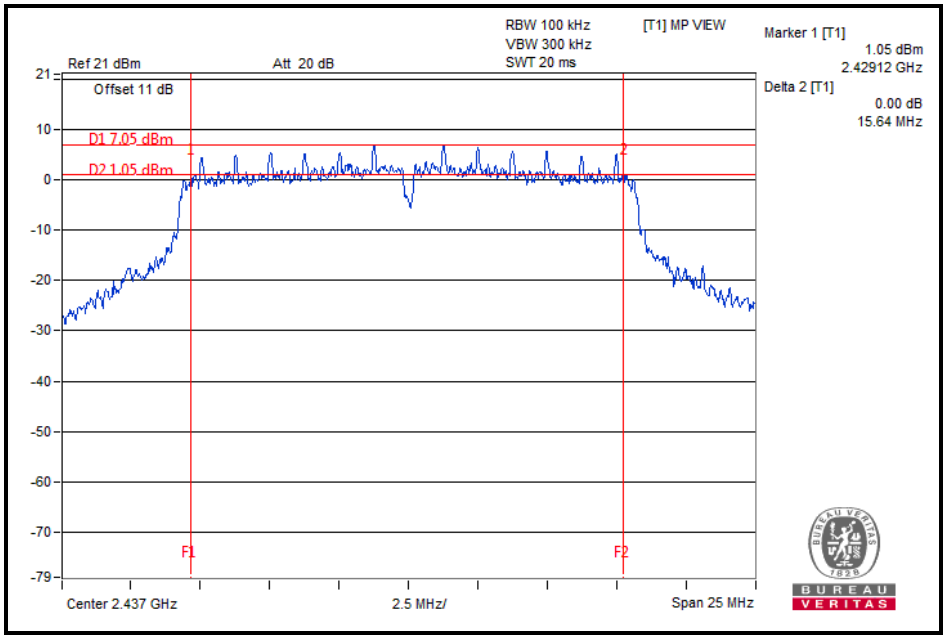
802.11b

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
1	2412	7.54	0.5	PASS
6	2437	8.06	0.5	PASS
11	2462	8.06	0.5	PASS



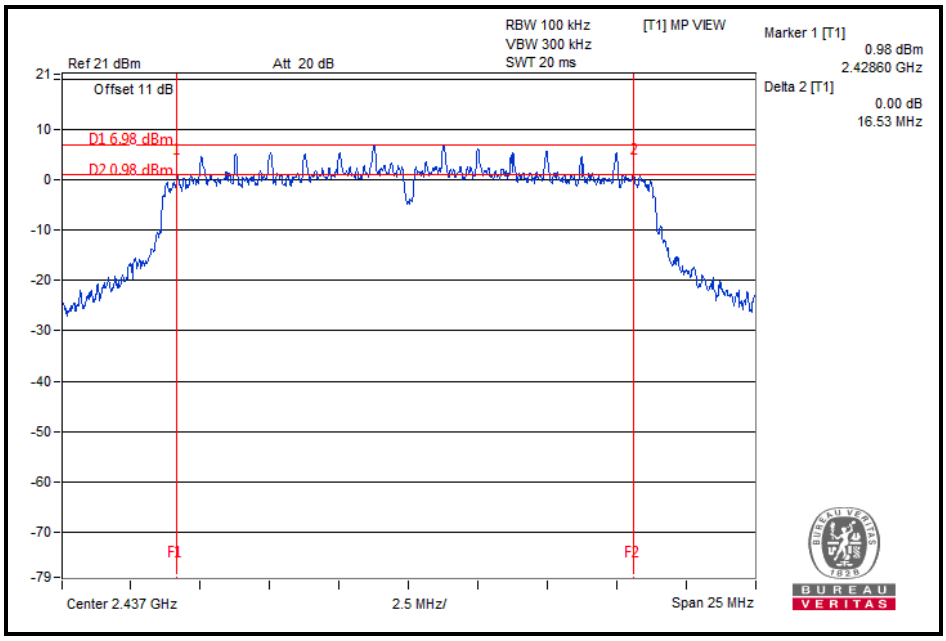
802.11g

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
1	2412	15.44	0.5	PASS
6	2437	15.64	0.5	PASS
11	2462	15.34	0.5	PASS



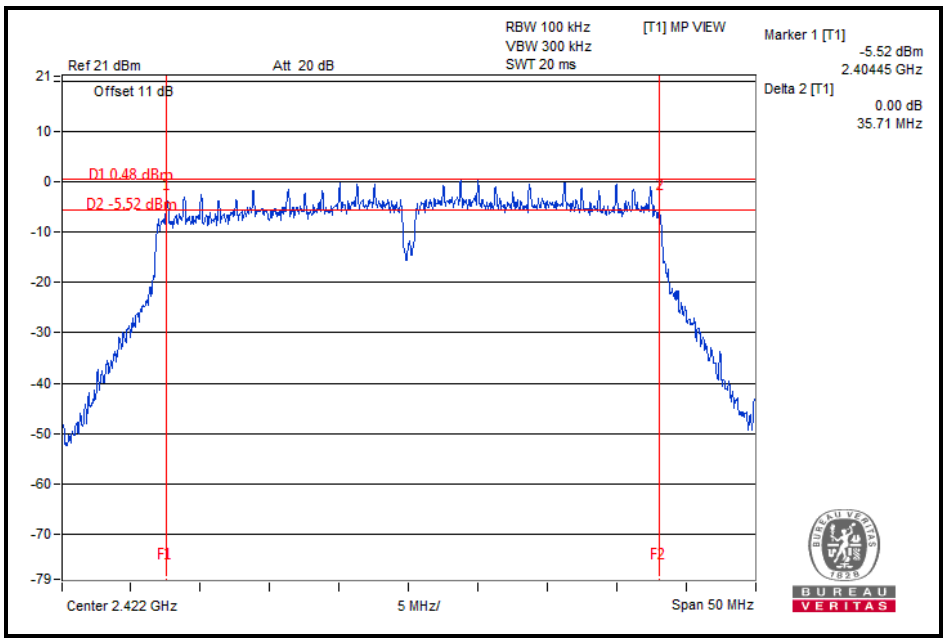
802.11n (20MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
1	2412	15.96	0.5	PASS
6	2437	16.53	0.5	PASS
11	2462	15.96	0.5	PASS



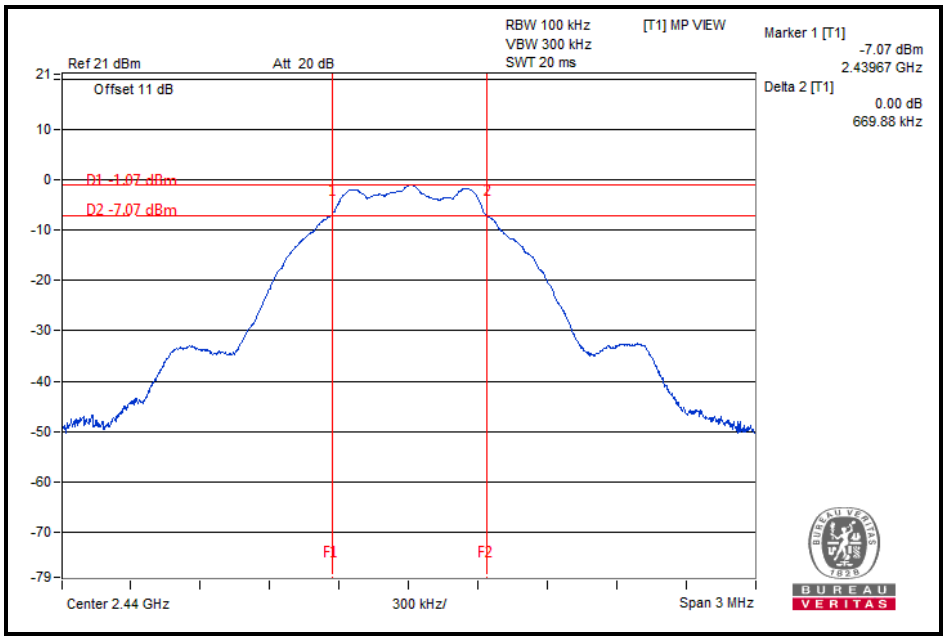
802.11n (40MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
3	2422	35.71	0.5	PASS
6	2437	35.17	0.5	PASS
9	2452	35.17	0.5	PASS



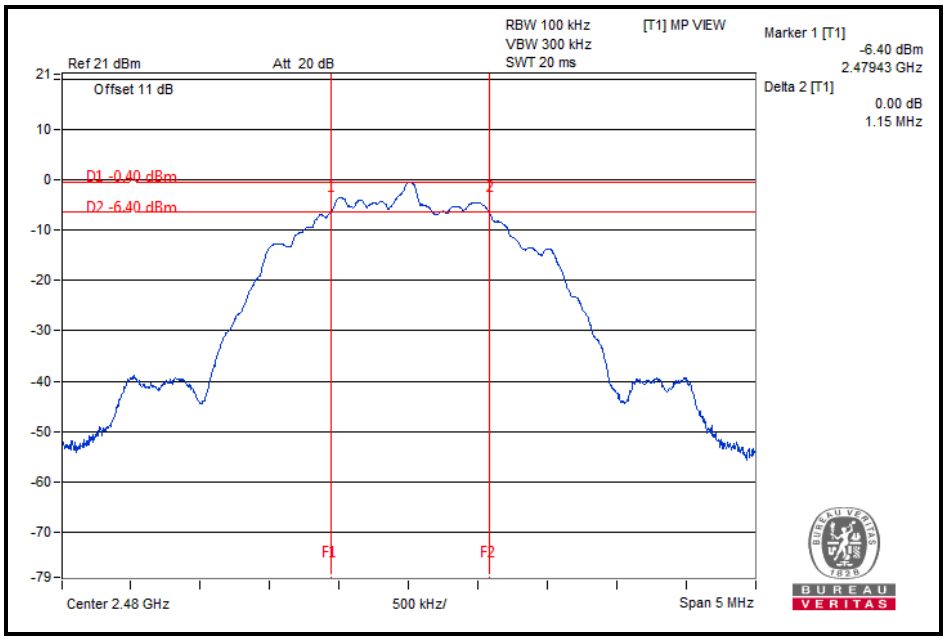
BT-LE (GFSK) (1MHz)

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



BT-LE (GFSK) (2MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
0	2402	1.14	0.5	PASS
19	2440	1.14	0.5	PASS
39	2480	1.15	0.5	PASS

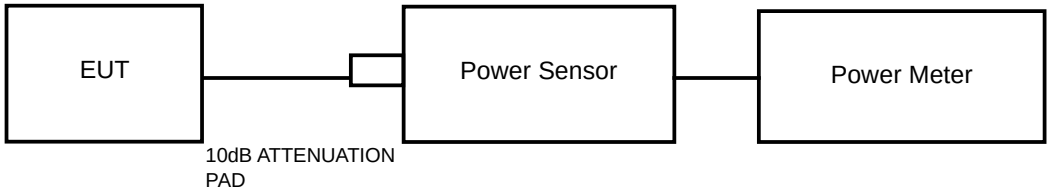


3.4 CONDUCTED OUTPUT POWER

3.4.1 LIMITS OF CONDUCTED OUTPUT POWER MEASUREMENT

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

3.4.2 TEST SETUP



3.4.3 TEST INSTRUMENTS

Refer to section 3.3.2 to get information of above instrument.

3.4.4 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.

3.4.5 DEVIATION FROM TEST STANDARD

No deviation.

3.4.6 EUT OPERATING CONDITIONS

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

3.4.7 TEST RESULTS

3.4.7.1 MAXIMUM PEAK OUTPUT POWER

802.11b

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER (dBm)	PEAK POWER (mW)	PEAK POWER LIMIT(W)	PASS/FAIL
1	2412	20.21	104.954	1	PASS
6	2437	20.02	100.462	1	PASS
11	2462	20.13	103.039	1	PASS

802.11g

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER (dBm)	PEAK POWER (mW)	PEAK POWER LIMIT(W)	PASS/FAIL
1	2412	19.97	99.312	1	PASS
6	2437	19.59	90.991	1	PASS
11	2462	20.51	112.460	1	PASS

802.11n (20MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER (dBm)	PEAK POWER (mW)	PEAK POWER LIMIT(W)	PASS/FAIL
1	2412	19.88	97.275	1	PASS
6	2437	19.40	87.096	1	PASS
11	2462	20.52	**112.720**	1	PASS

802.11n (40MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER (dBm)	PEAK POWER (mW)	PEAK POWER LIMIT(W)	PASS/FAIL
3	2422	17.55	56.885	1	PASS
6	2437	17.69	58.749	1	PASS
9	2452	17.76	59.704	1	PASS

BT-LE (GFSK) (1MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER (dBm)	PEAK POWER (mW)	PEAK POWER LIMIT(W)	PASS/FAIL
0	2402	-2.26	0.594	1	PASS
19	2440	-1.57	0.697	1	PASS
39	2480	-1.20	0.759	1	PASS

BT-LE (GFSK) (2MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER (dBm)	PEAK POWER (mW)	PEAK POWER LIMIT(W)	PASS/FAIL
0	2402	-2.10	0.617	1	PASS
19	2440	-1.23	0.753	1	PASS
39	2480	-1.15	0.767	1	PASS

3.4.7.2 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	17.76	N/A
6	2437	17.51	N/A
11	2462	17.58	N/A

802.11g

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (dBm)	PASS/FAIL
1	2412	16.49	N/A
6	2437	16.15	N/A
11	2462	16.43	N/A

802.11n (20MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (dBm)	PASS/FAIL
1	2412	16.15	N/A
6	2437	15.96	N/A
11	2462	16.35	N/A

802.11n (40MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (dBm)	PASS/FAIL
3	2422	12.84	N/A
6	2437	12.81	N/A
9	2452	13.24	N/A

BT-LE (GFSK) (1MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (dBm)	PASS/FAIL
0	2402	-2.43	N/A
19	2440	-1.68	N/A
39	2480	-1.30	N/A

BT-LE (GFSK) (2MHz)

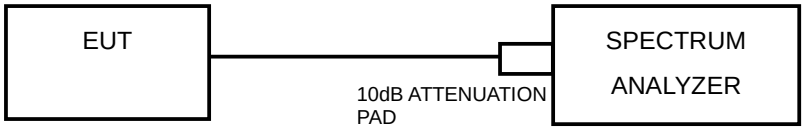
CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (dBm)	PASS/FAIL
0	2402	-2.55	N/A
19	2440	-1.64	N/A
39	2480	-1.31	N/A

3.5 POWER SPECTRAL DENSITY MEASUREMENT

3.5.1 LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT

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

3.5.2 TEST SETUP



3.5.3 TEST INSTRUMENTS

Refer to section 3.3.2 to get information of above instrument.

3.5.4 TEST PROCEDURE

1. Set the span to 1.5 times the DTS bandwidth
2. Set the RBW = 3 kHz, VBW ≥ 3 x 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.

3.5.5 DEVIATION FROM TEST STANDARD

No deviation.

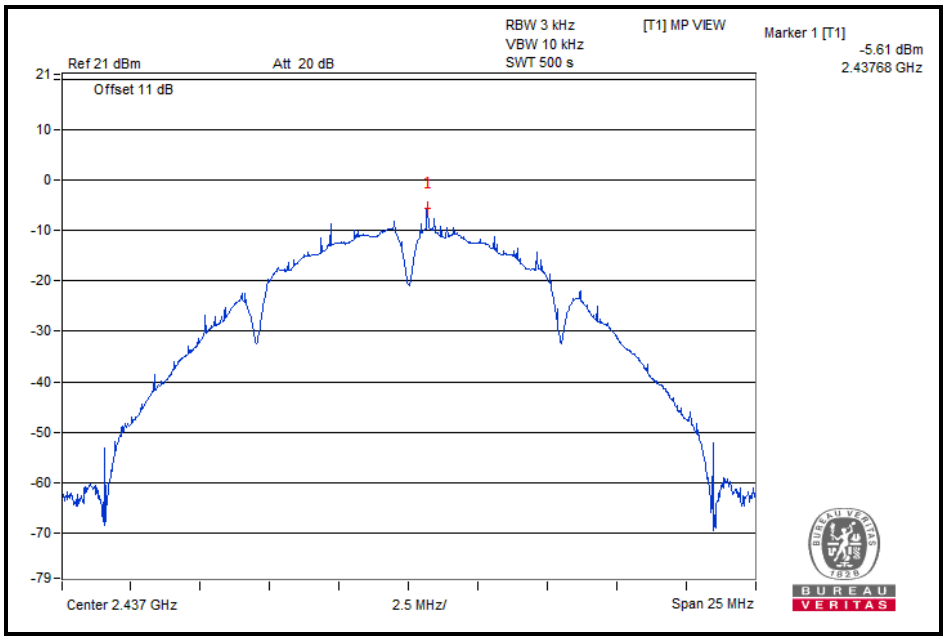
3.5.6 EUT OPERATING CONDITION

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

3.5.7 TEST RESULTS

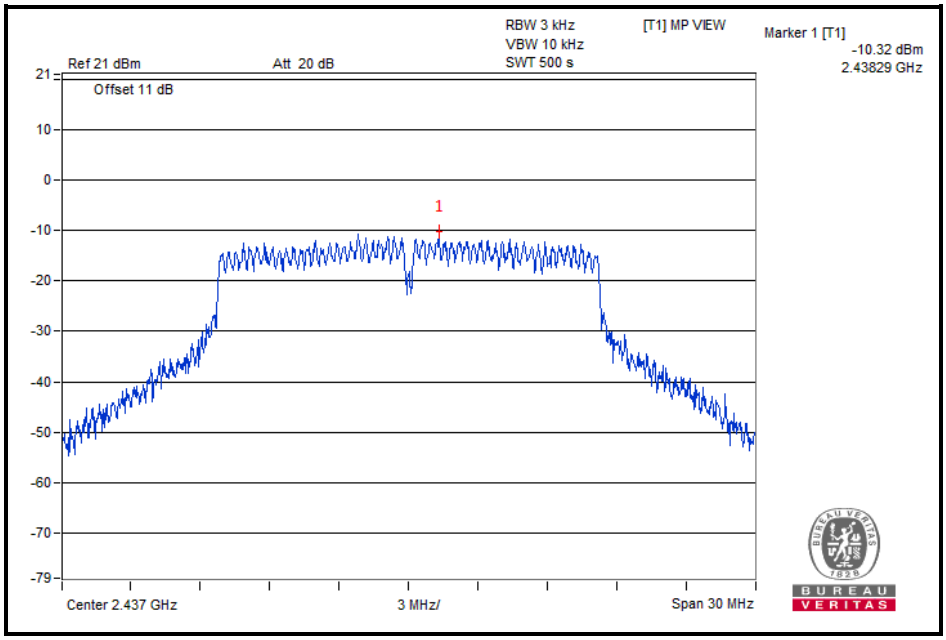
802.11b

Channel	FREQ. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
1	2412	-7.58	8	PASS
6	2437	-5.61	8	PASS
11	2462	-6.54	8	PASS



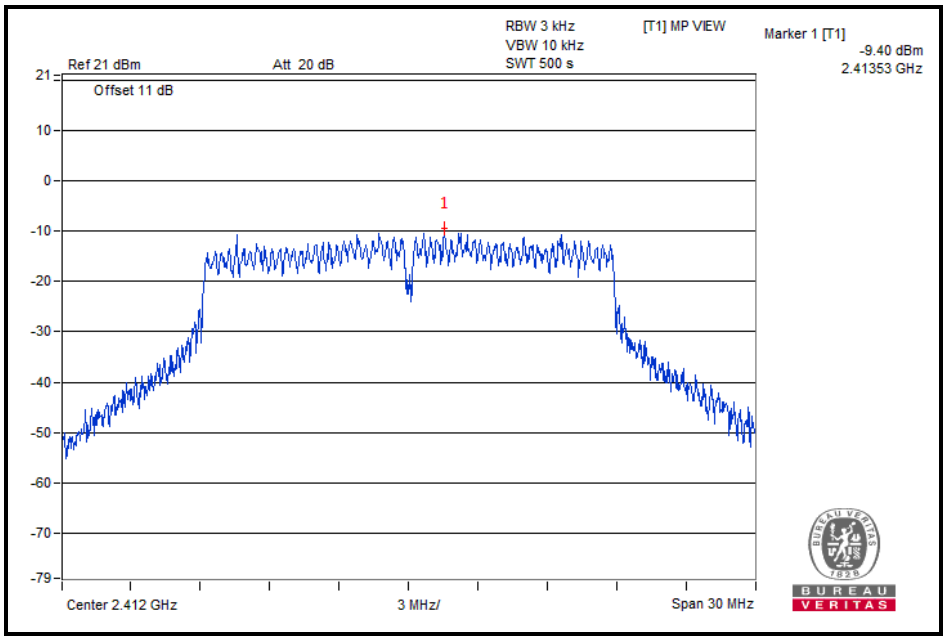
802.11g

Channel	FREQ. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
1	2412	-10.82	8	PASS
6	2437	-10.32	8	PASS
11	2462	-10.37	8	PASS



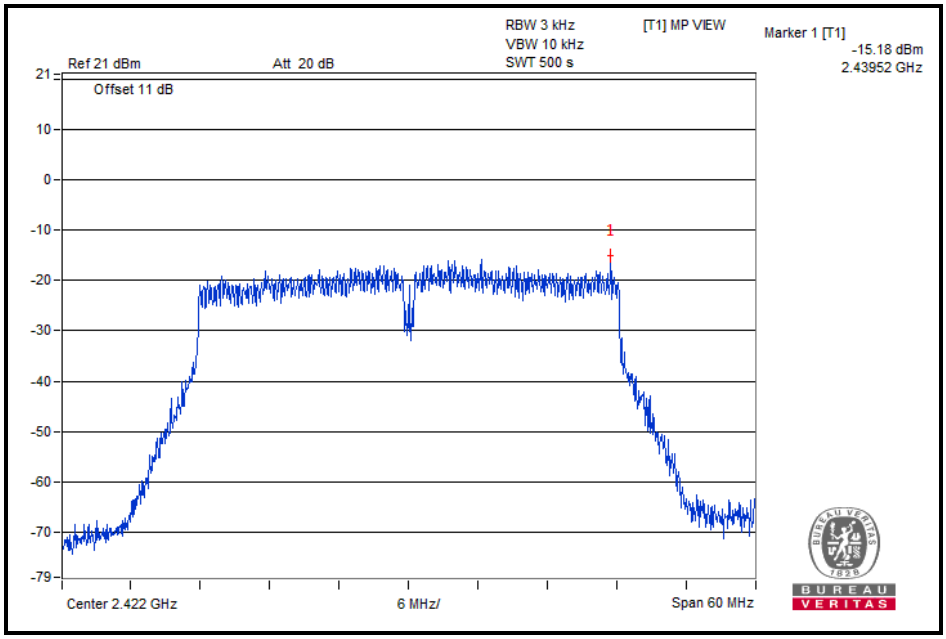
802.11n (20MHz)

Channel	FREQ. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
1	2412	-9.40	8	PASS
6	2437	-10.85	8	PASS
11	2462	-10.17	8	PASS



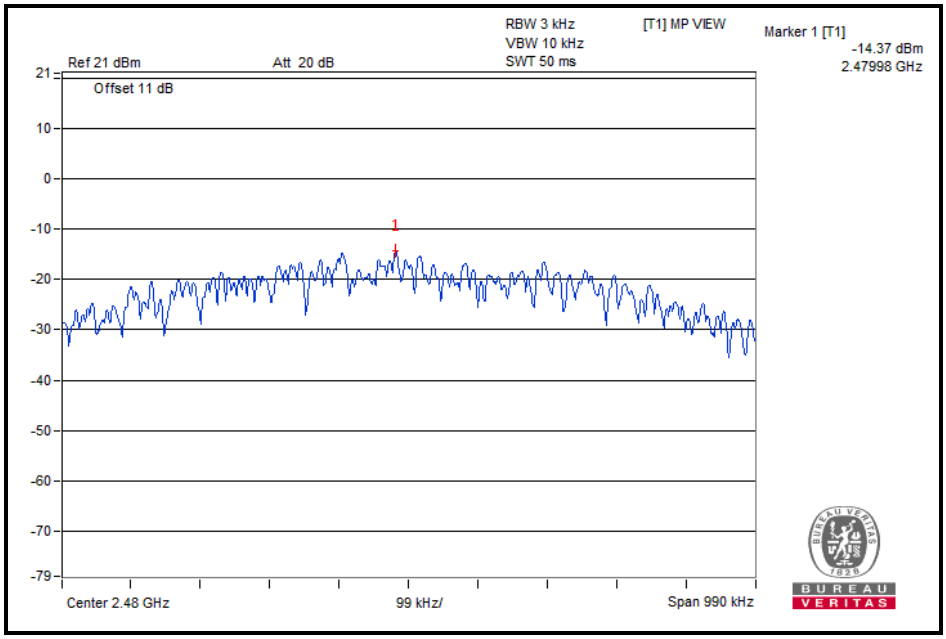
802.11n (40MHz)

Channel	FREQ. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
3	2422	-15.18	8	PASS
6	2437	-16.27	8	PASS
9	2452	-15.80	8	PASS



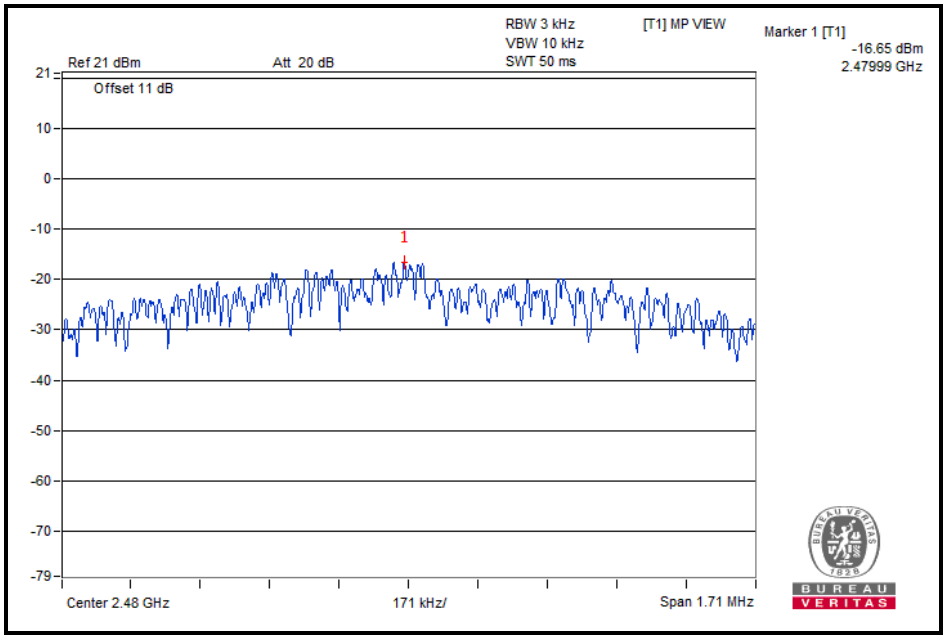
BT-LE (GFSK) (1MHz)

Channel	FREQ. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
0	2402	-15.66	8	PASS
19	2440	-14.72	8	PASS
39	2480	-14.37	8	PASS



BT-LE (GFSK) (2MHz)

Channel	FREQ. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
0	2402	-17.85	8	PASS
19	2440	-16.92	8	PASS
39	2480	-16.65	8	PASS

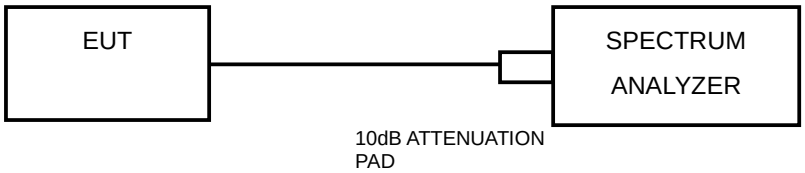


3.6 OUT OF BAND EMISSION MEASUREMENT

3.6.1 LIMITS OF OUT OF BAND EMISSION MEASUREMENT

Below –20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

3.6.2 TEST SETUP



3.6.3 TEST INSTRUMENTS

Refer to section 3.3.2 to get information of above instrument.

3.6.4 TEST PROCEDURE

MEASUREMENT PROCEDURE REF

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

MEASUREMENT PROCEDURE OOBE

1. Set RBW = 100 kHz.
2. Set VBW ≥ 300 kHz.
3. Set span to encompass the spectrum to be examined
4. Detector = peak.
5. Trace Mode = max hold.
6. Sweep = auto couple.

3.6.5 DEVIATION FROM TEST STANDARD

No deviation.

3.6.6 EUT OPERATING CONDITION

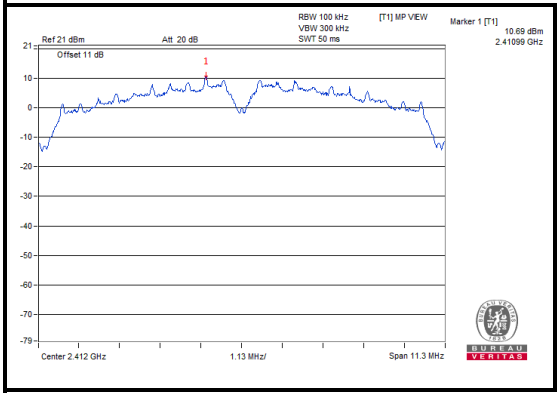
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

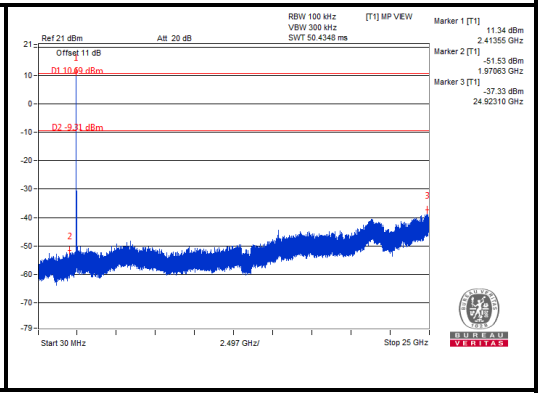
3.6.7 TEST RESULTS

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.

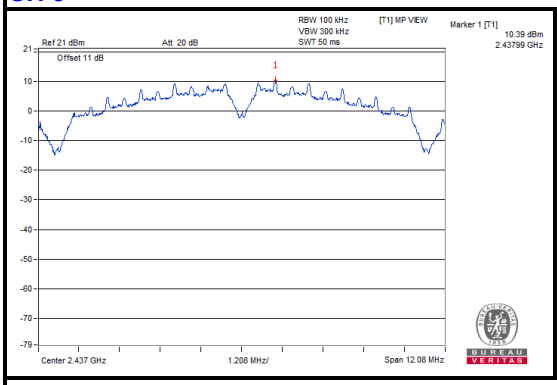
802.11b

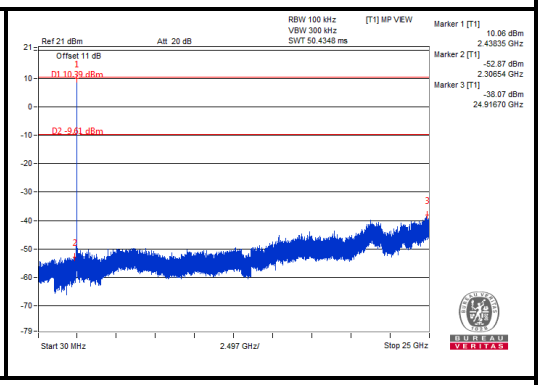
CH 1



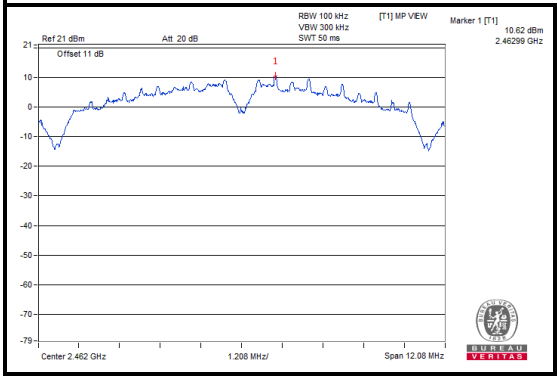


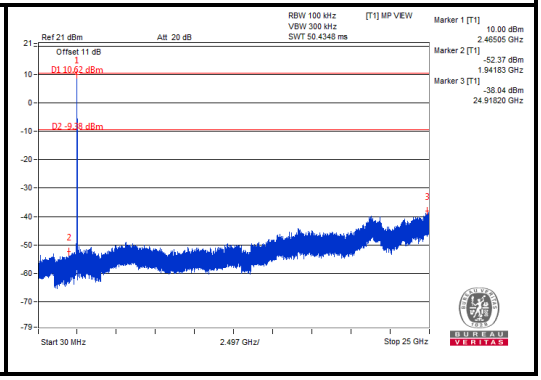
CH 6

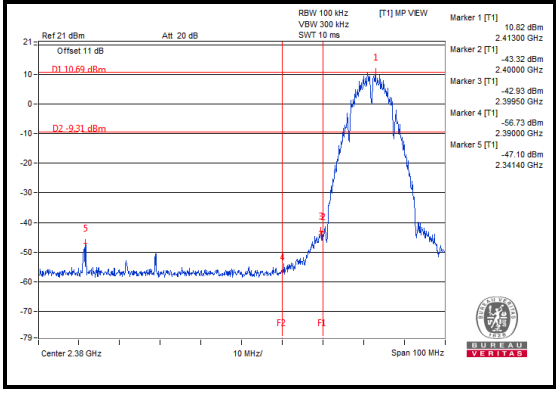
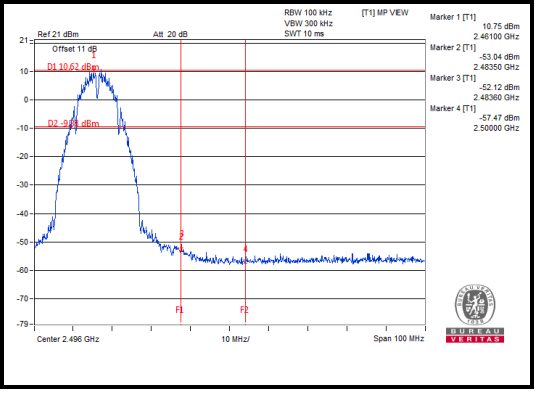




CH 11

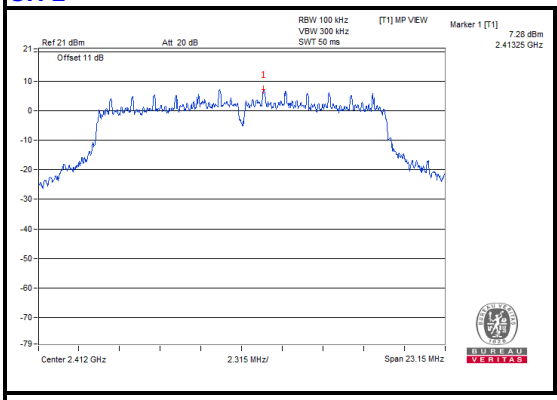


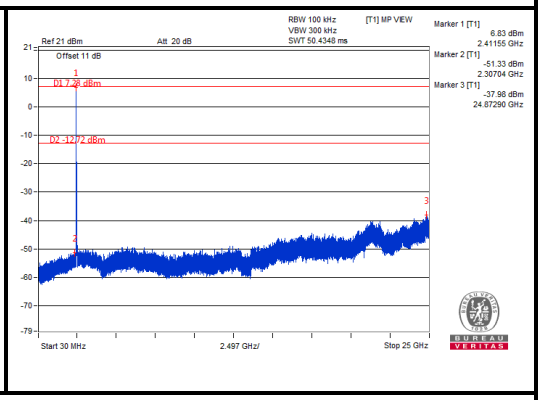


CH 1 Band Edge	CH 11 Band Edge
	

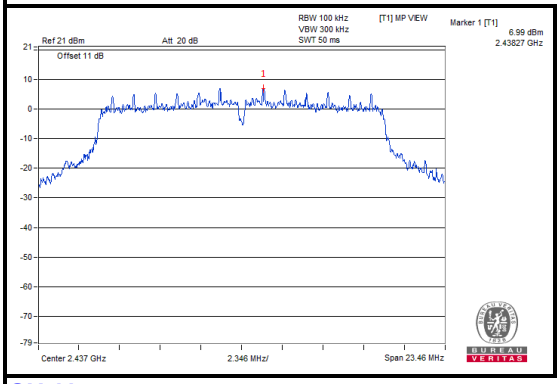
802.11g

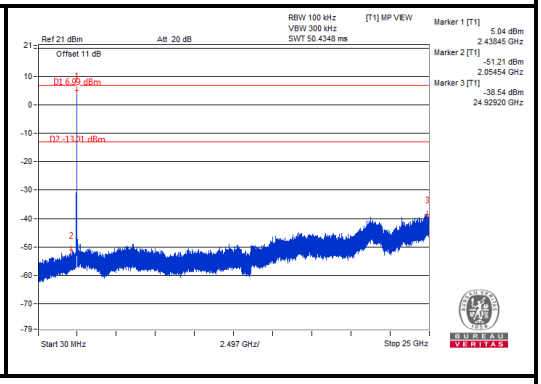
CH 1



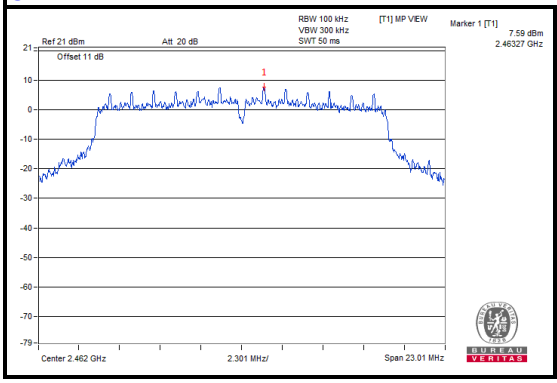


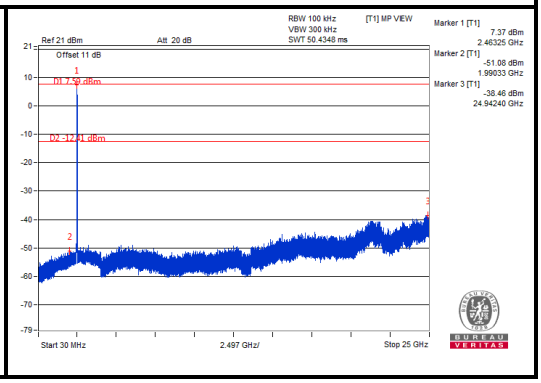
CH 6

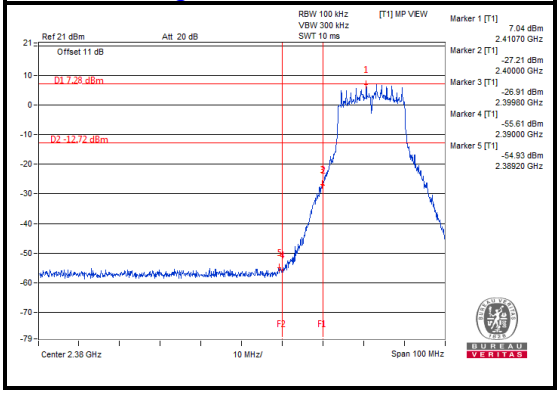
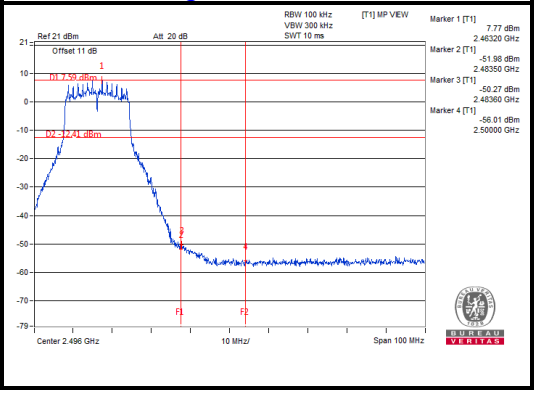




CH 11

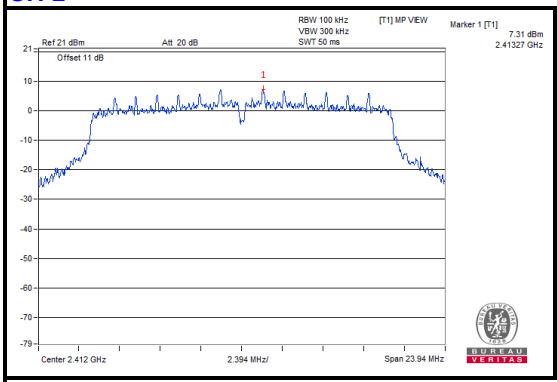


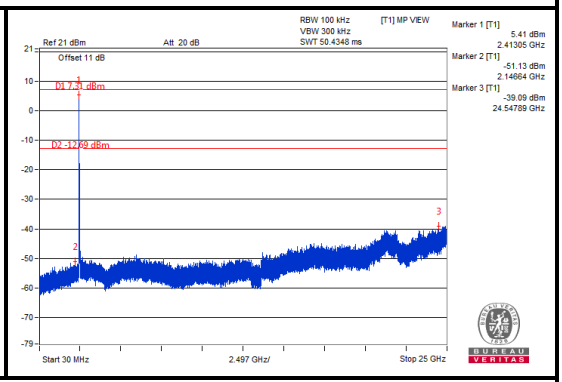


CH 1 Band Edge	CH 11 Band Edge
	

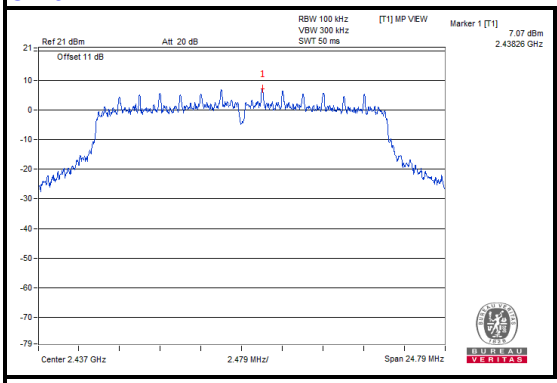
802.11n (20MHz)

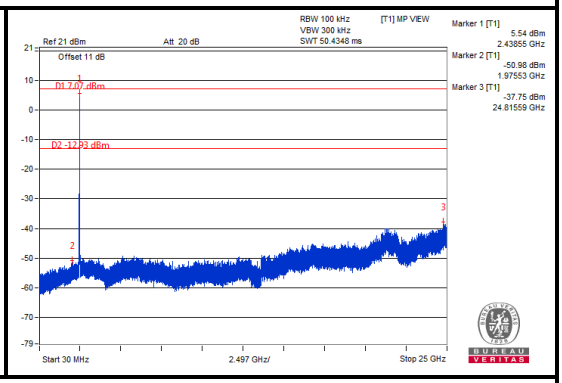
CH 1



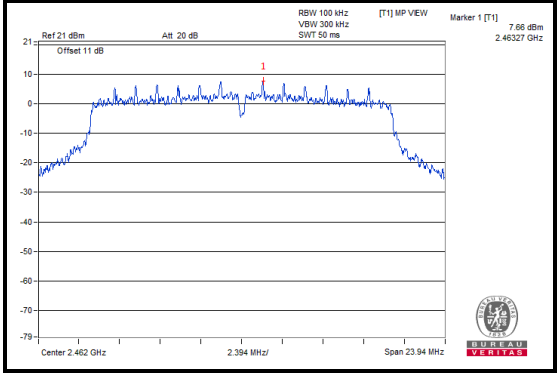


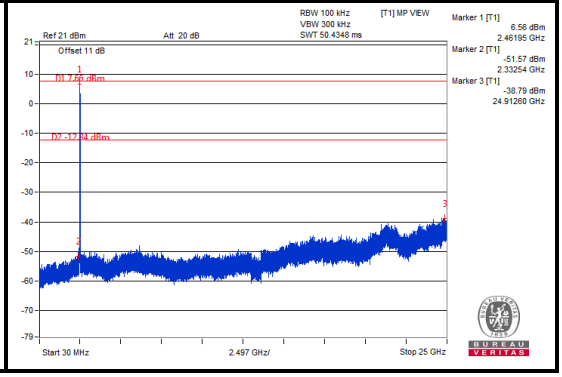
CH 6

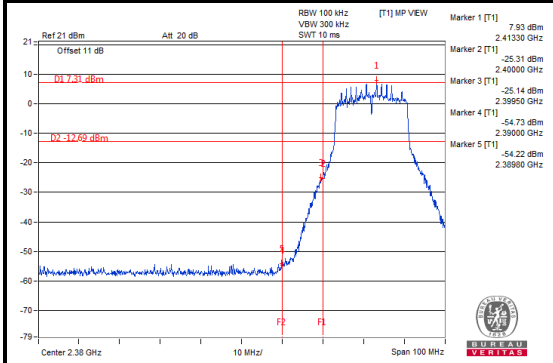
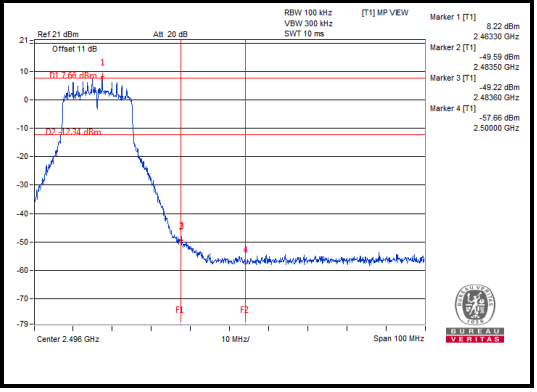




CH 11

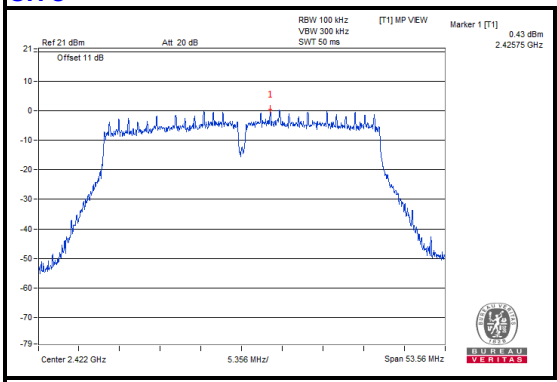


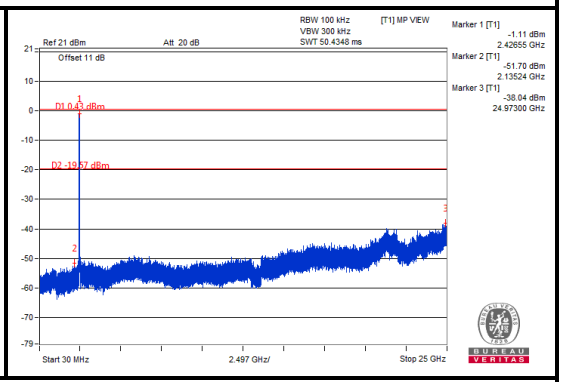


CH 1 Band Edge	CH 11 Band Edge
	

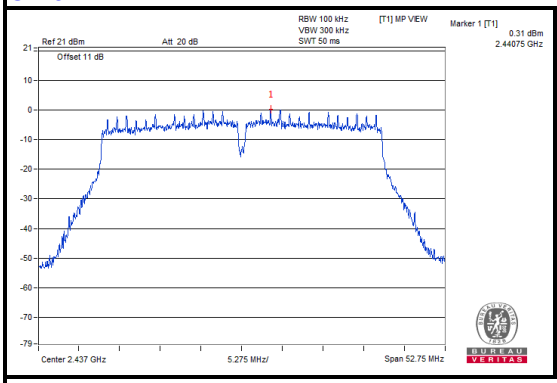
802.11n (40MHz)

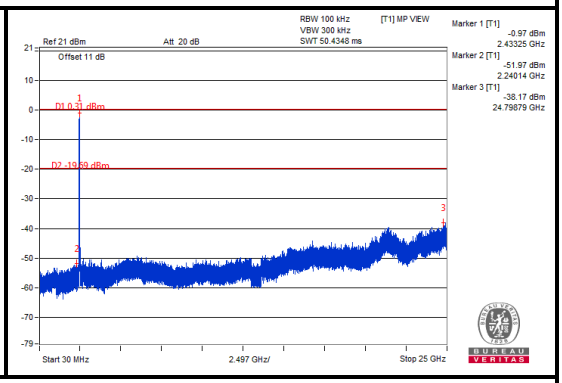
CH 3



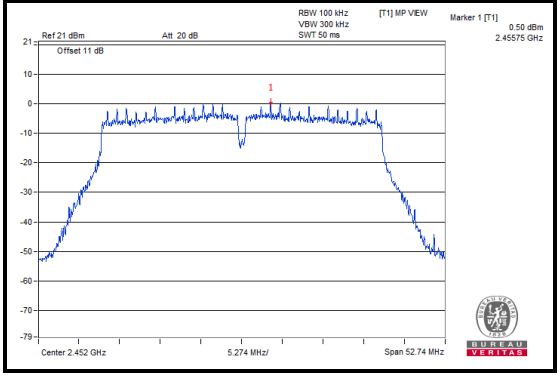


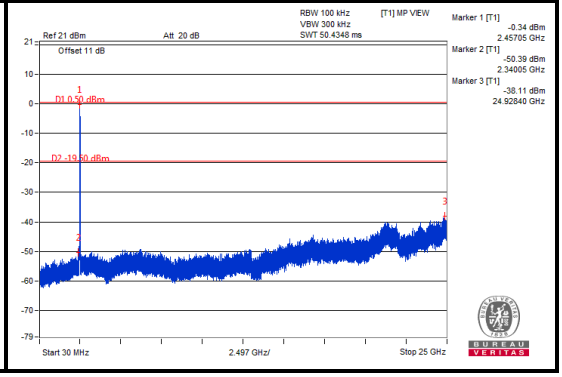
CH 6

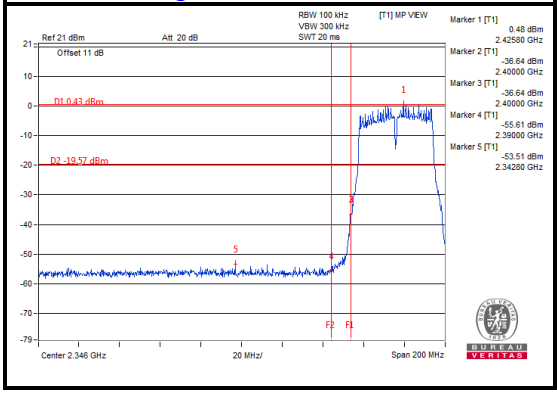
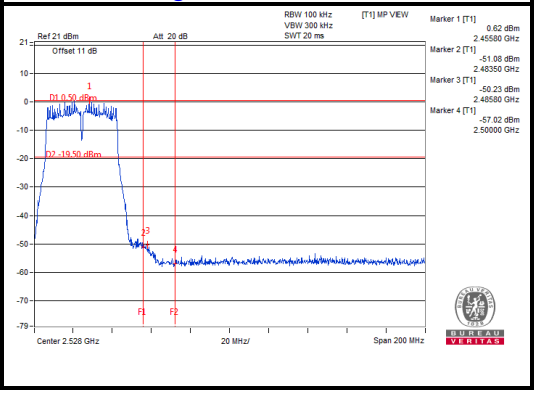




CH 9

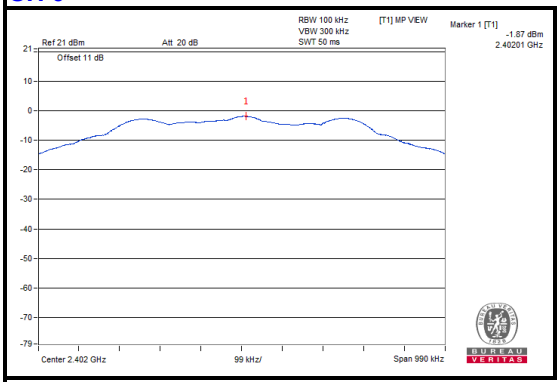


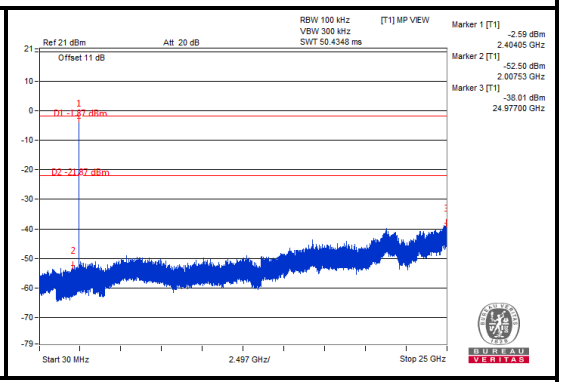


CH 3 Band Edge	CH 9 Band Edge
	

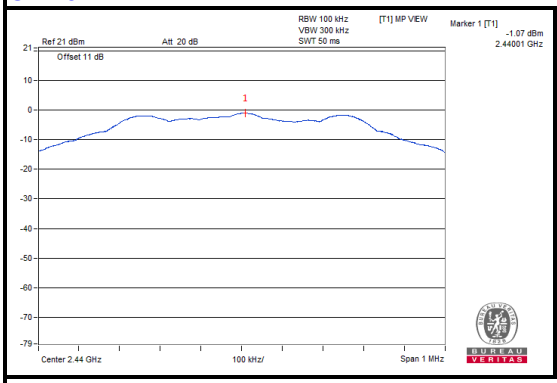
BT-LE (GFSK) (1MHz)

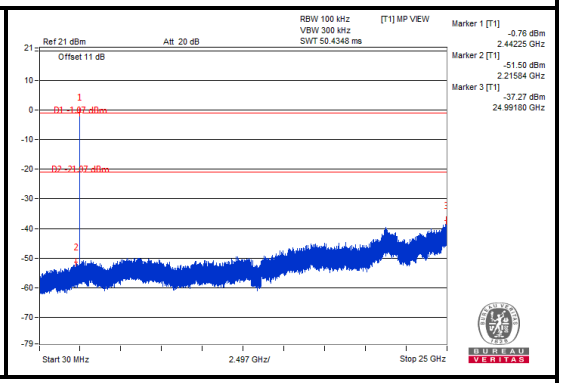
CH 0



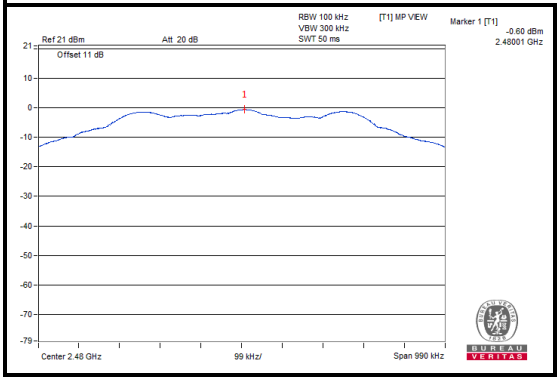


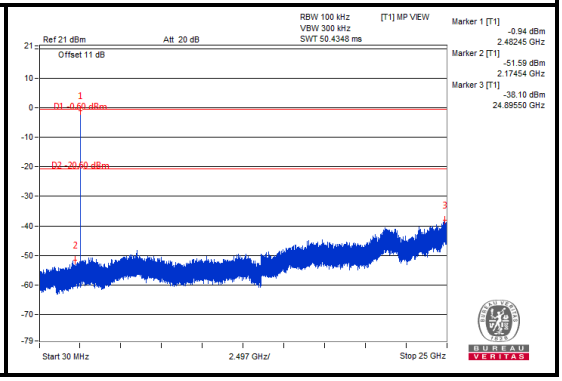
CH 19

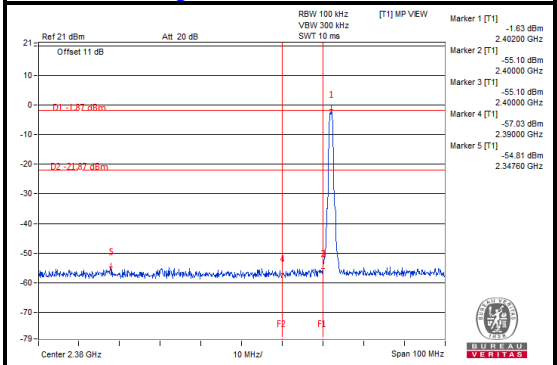
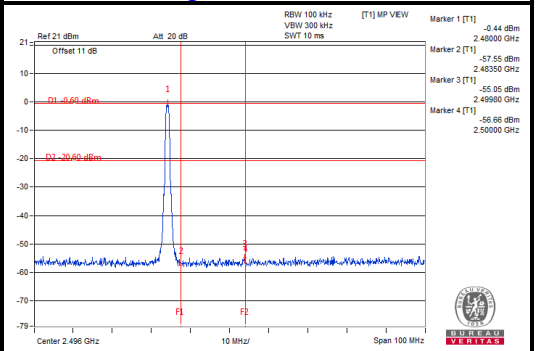




CH 39

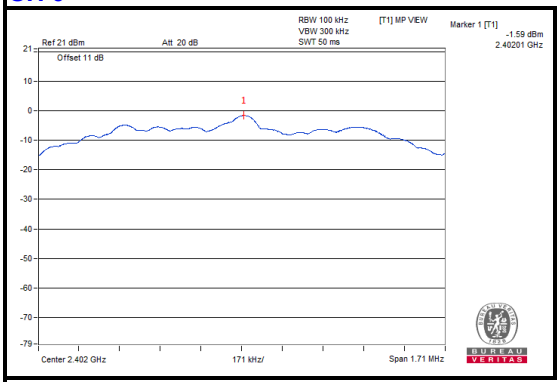


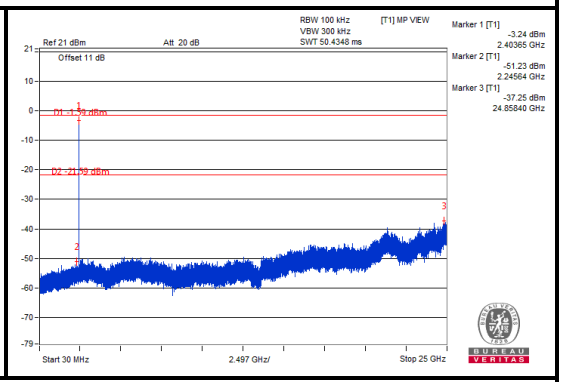


CH 0 Band Edge	CH 39 Band Edge
	

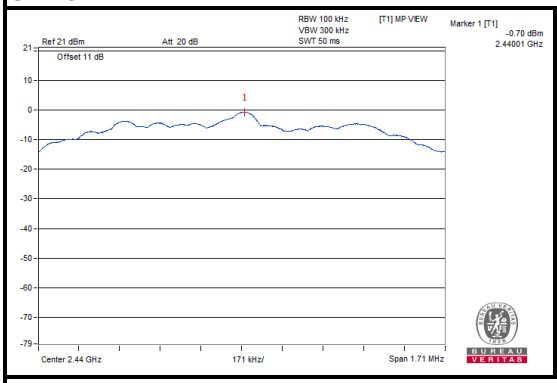
BT-LE (GFSK) (2MHz)

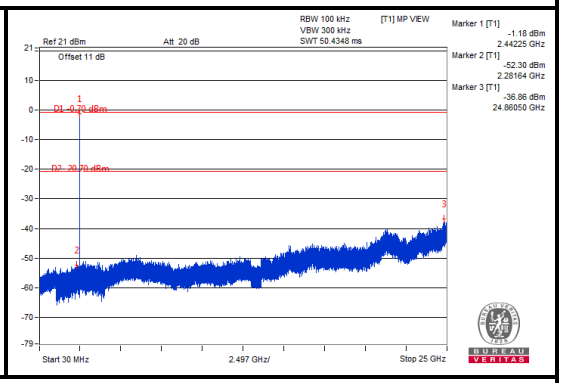
CH 0



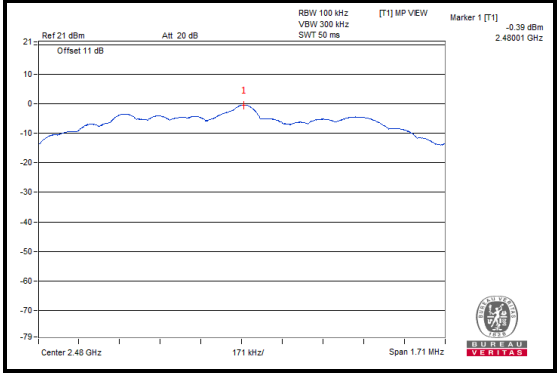


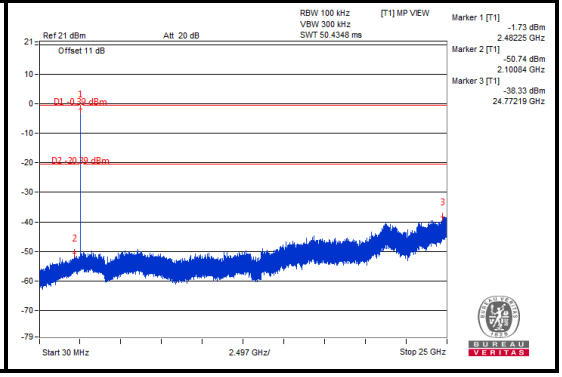
CH 19

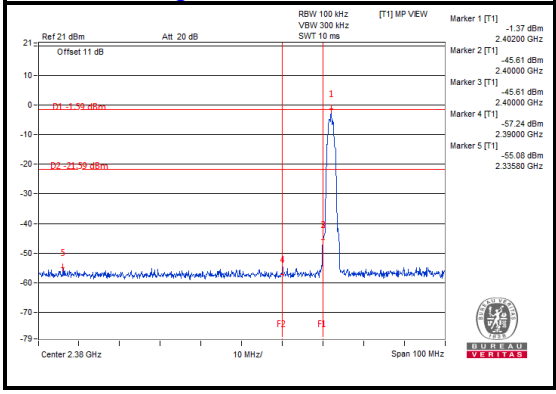
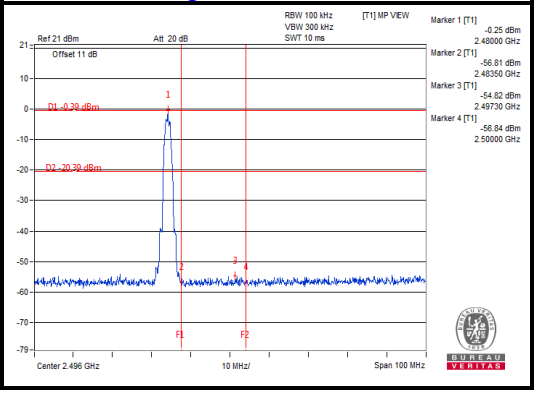




CH 39





CH 0 Band Edge	CH 39 Band Edge
	

4 PHOTOGRAPHS OF THE TEST CONFIGURATION

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

5 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---