FCC TEST REPORT

(Part 15, Subpart C)

Applicant:	TCL Communication Ltd.
Address:	7/F, Block F4, TCL Communication Technology Building, TCL International E City, Zhong Shan Yuan Road, Nanshan District, Shenzhen, Guangdong, P.R. China 518052

Manufacturer or Supplier:	TCL Communication Ltd.
Address:	7/F, Block F4, TCL Communication Technology Building, TCL International E City, Zhong Shan Yuan Road, Nanshan District, Shenzhen, Guangdong, P.R. China 518052
Product:	LTE/UMTS/GSM Smartphone
Brand Name:	Alcatel/TCL
Model Name:	5024J, 5124J
FCC ID:	2ACCJB107
Date of tests:	Jan. 19, 2019 ~ Mar. 18, 2019

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 COMPLY with the test requirement

Prepared by Roger Li Engineer / Mobile Department	Approved by Sam Tung Manager / Mobile Department
 Date: Mar. 19, 2019	 Date: Mar. 19, 2019

TABLE OF CONTENTS

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF190118W006-2	Original release	Feb. 21, 2019
RF190219W008-2	Based on the original report RF190118W006-2 change model name, add one SIM card and remove LTE band 5/13/66.	Mar. 19, 2019

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 -14.31dB at 0.166000MHz.
15.205 15.209	Radiated Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -1.15dB 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	UNCERTAINTY
AC Power Conducted emissions	±2.70dB
All Radiated emissions	±4.48dB
Conducted emissions	±2 dB
Occupied Channel Bandwidth	±21.7KHz
Conducted Output power	±1.03 dB
Power Spectral Density	±0.95 dB

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	LTE/UMTS/GSM Smartphone
BRAND NAME	Alcatel/TCL
MODEL NAME	5024J, 5124J
NOMINAL VOLTAGE	5.0Vdc (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 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: 143.219mW (Maximum) BT-LE: 4.592mW (Maximum)
ANTENNA TYPE	IFIA Antenna with -1.2dBi gain
HW VERSION	PIO
SW VERSION	V1.0
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	USB cable: non-shielded, detachable, 1.5m Earphone cable: non-shielded, detachable, 1.4m

NOTE:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. The above models are identical except the model name and EUT logo for marketing purpose.
3. This product has two brands for different markets requirement.
4. 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
BT_LE	1TX /1RX

5. 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	alcatel	UC11US/UC11AR/UC11EU	PUAN	I/P:100-240Vac, 0.2A O/P: 5Vdc, 1A
AC Adapter 2	alcatel	UC11US	chenyang	I/P:100-240Vac, 0.2A O/P: 5Vdc, 1A
Battery 1	alcatel	TLp030K7	VEKEN	Rating: 3.85Vdc, 3000mAh
Battery 2	alcatel	TLp030KA	Tianmao	Rating: 3.85Vdc, 3000mAh
USB Cable 1	alcatel	N/A	JUWEI	1.5m shielded cable w/o core
USB Cable 2	alcatel	N/A	shenghua	1.5m shielded cable w/o core
Earphone	alcatel	N/A	JUWEI	1.4m shielded cable w/o core

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		

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)
802.11g	1 to 11	11	OFDM	BPSK	6.0
BT-LE	0 to 39	0	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 5V from adaptor	Jacky Liu
RE≥1G	22deg. C, 54%RH	DC 5V from adaptor	Jacky Liu
PLC	24deg. C, 55%RH	DC 5V from adaptor	Star Le
APCM	25deg. C, 60%RH	3.85Vdc from battery	Rain Wang

2.3 Duty Cycle of Test Signal

WIFI 2.4GHz

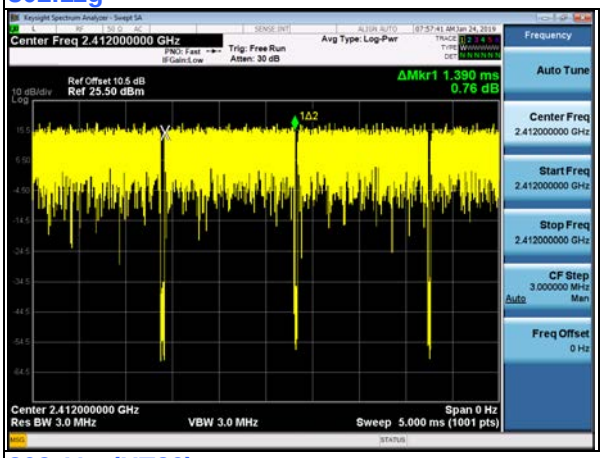
802.11b: Duty cycle = 8.360/8.404 = 0.995 > 98%, Duty factor is not required.

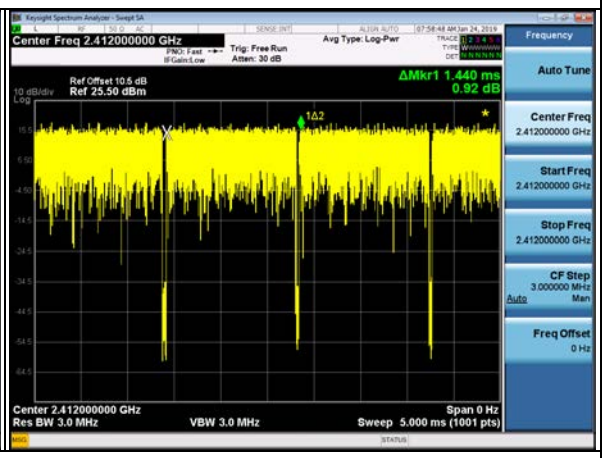
802.11g: Duty cycle = 1.390/1.440 = 0.965 < 98%, Duty factor = 10 * log(1/0.965) = 0.153

802.11n (HT20): Duty cycle = 1.284/1.332 = 0.964 < 98%, Duty factor = 10 * log(1/0.964) = 0.159

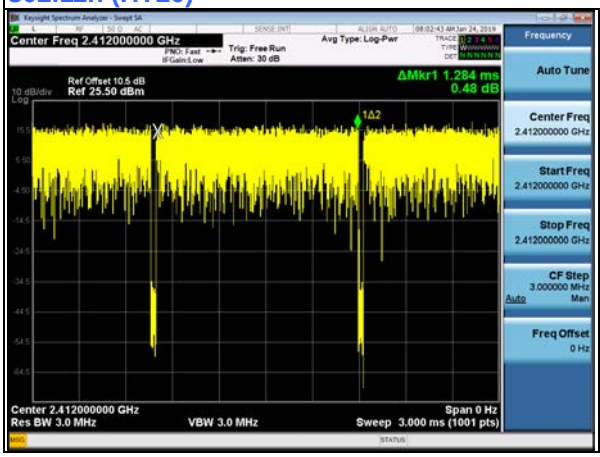
802.11b

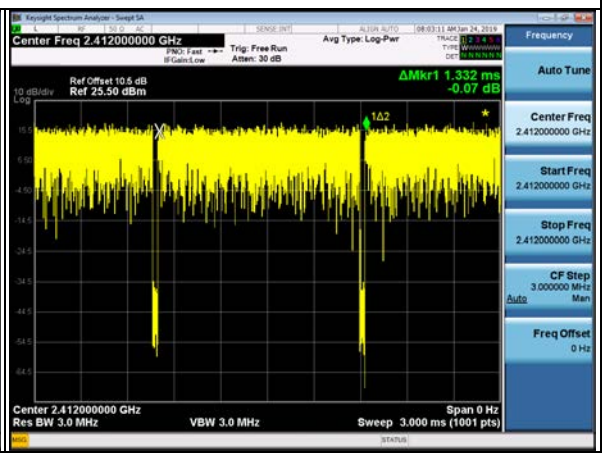
802.11g





802.11n (HT20)





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	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

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	Feb. 26,19	Feb. 25, 20
EMC32 test software	Rohde&Schwarz	EMC32	NA	NA	NA
LISN network	Rohde&Schwarz	ENV216	101922	Feb. 26,19	Feb. 25, 20

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.

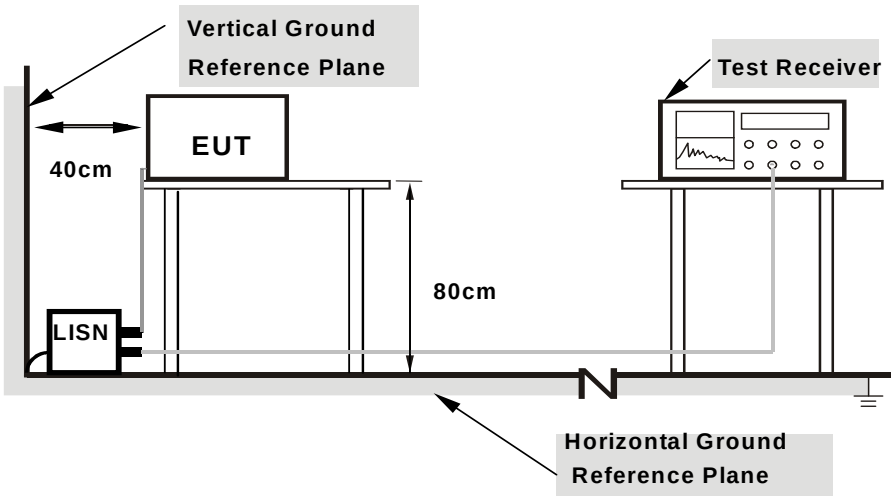
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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.

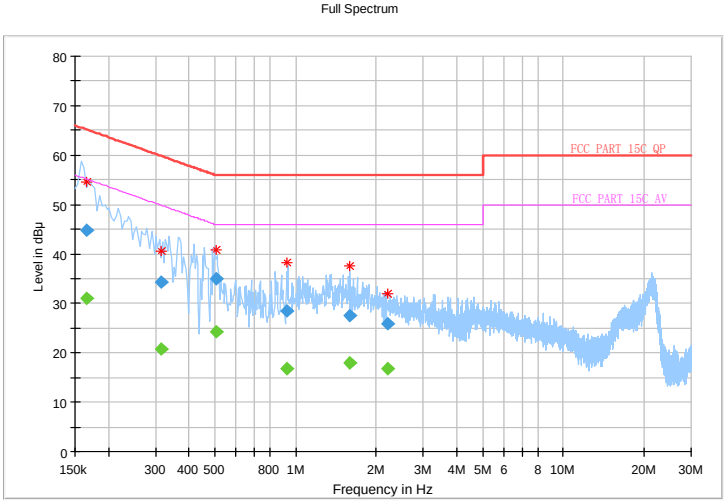
3.1.7 TEST RESULTS

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**	25deg. C, 50RH
Tested By	Star Le	**TEST DATE**	2019/01/21
Test Voltage	DC 5V From Adapter		

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.166000	---	31.00	55.16	-24.16	L1	ON	9.7
0.166000	44.77	---	65.16	-20.39	L1	ON	9.7
0.316000	---	20.82	49.81	-28.99	L1	ON	9.7
0.316000	34.21	---	59.81	-25.61	L1	ON	9.7
0.508000	---	24.20	46.00	-21.80	L1	ON	9.7
0.508000	35.01	---	56.00	-20.99	L1	ON	9.7
0.924000	---	16.72	46.00	-29.28	L1	ON	9.7
0.924000	28.50	---	56.00	-27.50	L1	ON	9.7
1.596000	---	18.03	46.00	-27.97	L1	ON	9.7
1.596000	27.60	---	56.00	-28.40	L1	ON	9.7
2.208000	---	16.86	46.00	-29.14	L1	ON	9.7
2.208000	25.91	---	56.00	-30.09	L1	ON	9.7

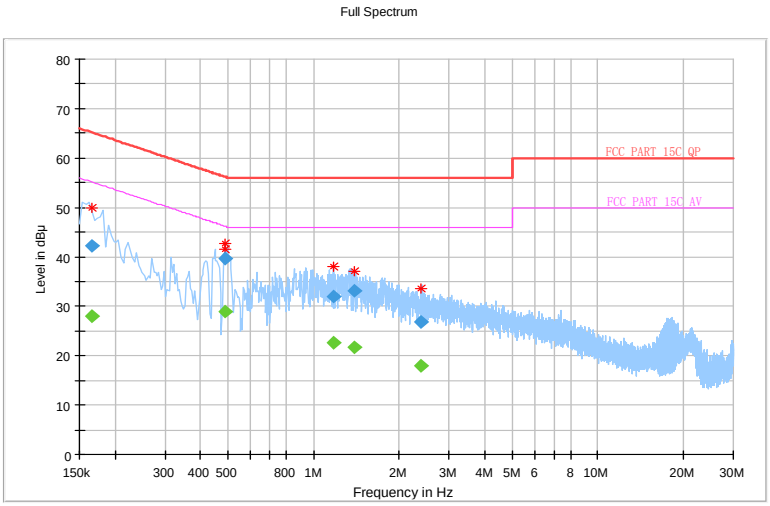
REMARKS: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission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



Frequency Range	150KHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25deg. C, 50RH
Tested By	Star Le	TEST DATE	2019/01/21
Test Voltage	DC 5V From Adapter		

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.166000	---	28.04	55.16	-27.12	N	ON	10.2
0.166000	42.29	---	65.16	-22.87	N	ON	10.2
0.488000	---	28.99	46.20	-17.21	N	ON	10.1
0.488000	39.60	---	56.20	-16.61	N	ON	10.1
0.500000	---	21.70	46.00	-24.30	N	ON	9.7
0.500000	30.85	---	56.00	-25.15	N	ON	9.7
1.176000	---	22.60	46.00	-23.40	N	ON	9.9
1.176000	32.06	---	56.00	-23.94	N	ON	9.9
1.392000	---	21.60	46.00	-24.40	N	ON	9.9
1.392000	33.00	---	56.00	-23.00	N	ON	9.9
2.380000	---	17.87	46.00	-28.13	N	ON	9.8
2.380000	26.79	---	56.00	-29.21	N	ON	9.8

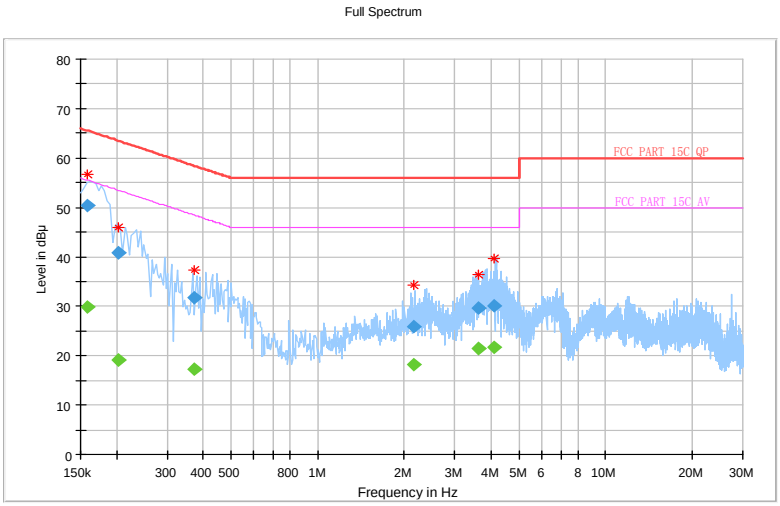
REMARKS: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission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



Frequency Range	150KHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25deg. C, 50RH
Tested By	Star Le	TEST DATE	2019/01/21
Test Voltage	Data Transmission		

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.158000	---	29.86	55.57	-25.71	L1	ON	9.6
0.158000	50.36	---	65.57	-15.20	L1	ON	9.6
0.204000	---	19.10	53.45	-34.34	L1	ON	9.7
0.204000	40.82	---	63.45	-22.63	L1	ON	9.7
0.372000	---	17.18	48.46	-31.28	L1	ON	9.7
0.372000	31.81	---	58.46	-26.64	L1	ON	9.7
2.152000	---	18.26	46.00	-27.74	L1	ON	9.7
2.152000	25.88	---	56.00	-30.12	L1	ON	9.7
3.600000	---	21.37	46.00	-24.63	L1	ON	9.7
3.600000	29.71	---	56.00	-26.29	L1	ON	9.7
4.104000	---	21.61	46.00	-24.39	L1	ON	9.7
4.104000	30.19	---	56.00	-25.81	L1	ON	9.7

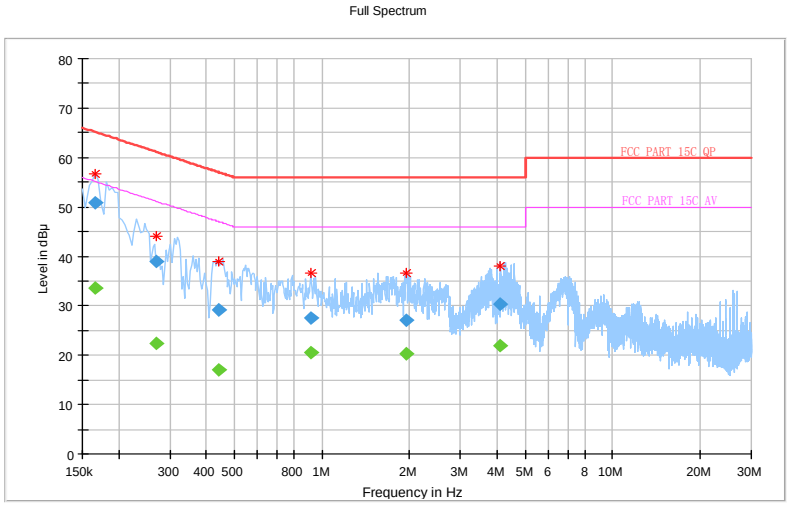
REMARKS: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission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



Frequency Range	150KHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9 kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25deg. C, 50RH
Tested By	Star Le	TEST DATE	2019/01/21
Test Voltage	Data Trasmission		

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.166000	---	33.54	55.16	-21.62	N	ON	10.2
0.166000	**50.85**	**---**	**65.16**	**-14.31**	**N**	**ON**	**10.2**
0.268000	---	22.28	51.18	-28.90	N	ON	10.0
0.268000	38.98	---	61.18	-22.20	N	ON	10.0
0.440000	---	17.11	47.06	-29.95	N	ON	10.1
0.440000	29.09	---	57.06	-27.97	N	ON	10.1
0.916000	---	20.47	46.00	-25.53	N	ON	9.9
0.916000	27.44	---	56.00	-28.56	N	ON	9.9
1.952000	---	20.20	46.00	-25.80	N	ON	9.8
1.952000	27.02	---	56.00	-28.98	N	ON	9.8
4.108000	---	21.89	46.00	-24.11	N	ON	9.8
4.108000	30.42	---	56.00	-25.58	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.



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	Apr. 21,18	Apr. 20,19
Bilog Antenna	ETS-LINDGREN	3143B	00161965	Feb. 26,19	Feb. 25,20
Horn Antenna	ETS-LINDGREN	3117	00168728	Feb. 26,19	Feb. 25,20
Loop antenna	Daze	ZN30900A	0708	Oct. 23,18	Oct. 22, 19
Horn Antenna (18GHz-40GHz)	N/A	QWH-SL-18-40-K-SG/QMS-00361	15433	Nov. 21, 18	Nov. 20, 19
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. 09,18	Jul. 08,19
MXE EMI Receiver	KEYSIGHT	N9038A-544	MY54450026	Feb. 26,19	Feb. 25,20
Signal Pre-Amplifier	EMSI	EMC 9135	980249	Jul. 09,18	Jul. 08,19
Signal Pre-Amplifier	EMSI	EMC 012645B	980257	Jul. 09,18	Jul. 08,19
Signal Pre-Amplifier	EMSI	EMC 184045B	980259	Jul. 09,18	Jul. 08,19

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; The Designation No. is CN1171.

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:

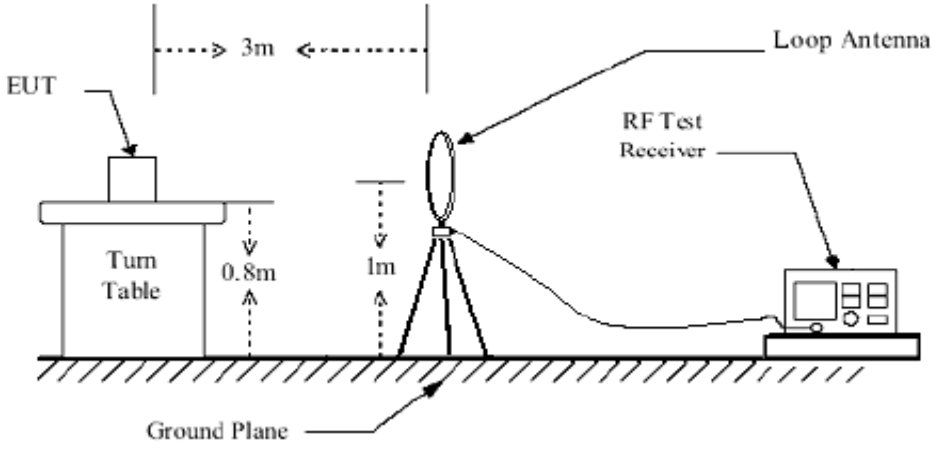
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
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

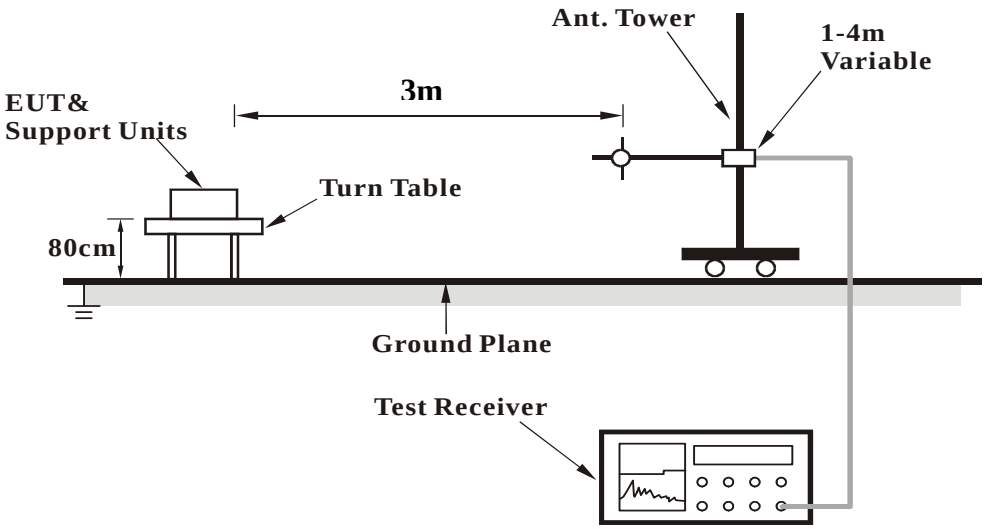
No deviation

3.2.5 TEST SETUP

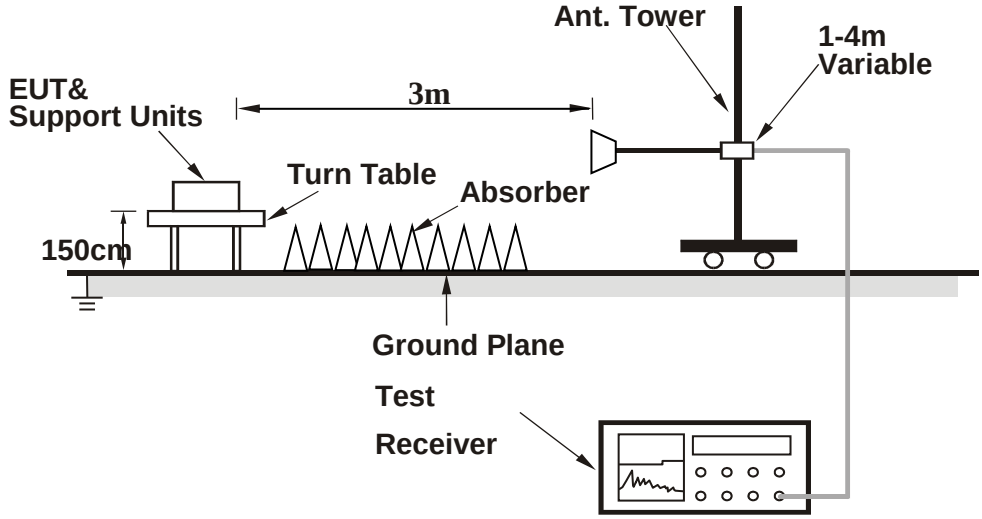
< Frequency Range below 30MHz >



< 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 MHz 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:

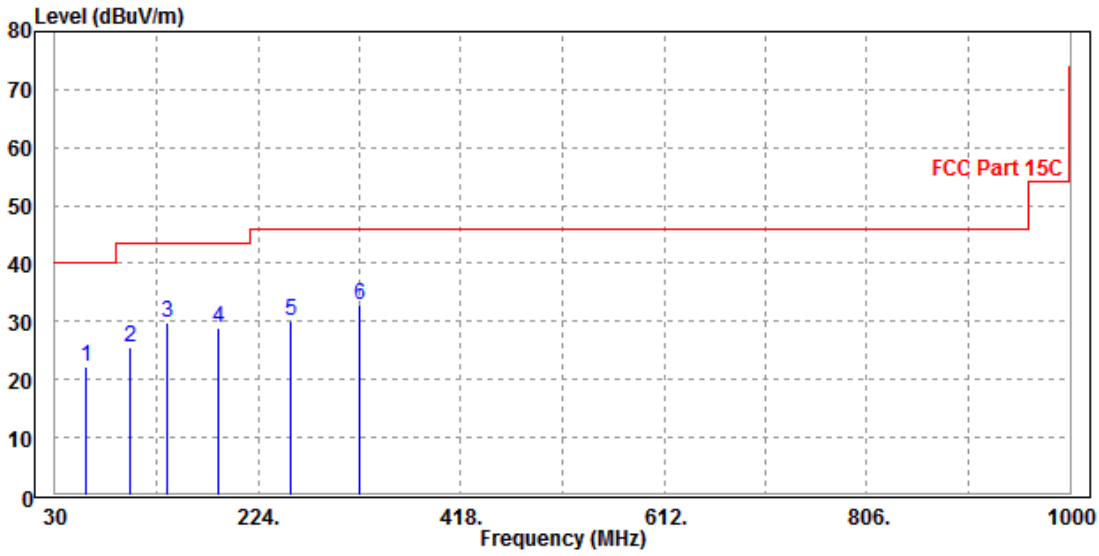
802.11g

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
60.18	22.13	51.86	40	-17.87	6.41	1.18	37.32	200	90	QP
101.26	25.7	53.18	43.5	-17.8	7.96	1.55	36.99	200	90	QP
136.95	29.69	56.87	43.5	-13.81	7.88	1.8	36.86	200	90	QP
185.62	28.88	53.48	43.5	-14.62	9.96	2.09	36.65	200	90	QP
255.71	30.06	51.63	46	-15.94	12.47	2.48	36.52	200	90	QP
321.15	32.73	52.58	46	-13.27	13.89	2.81	36.55	200	90	QP

REMARKS:

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

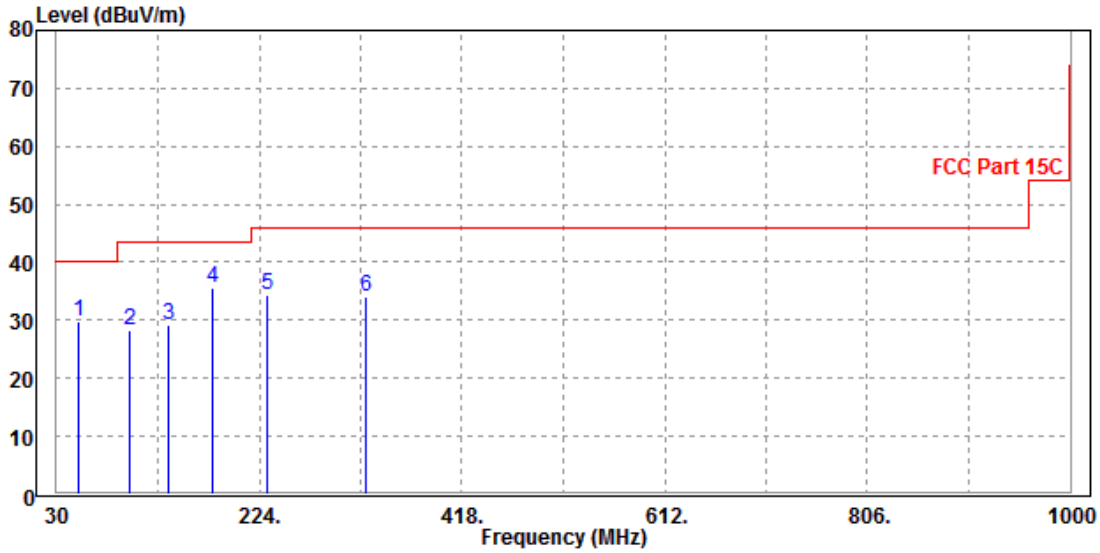


CHANNEL	TX Channel 11	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

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
51.22	29.89	59.69	40	-10.11	6.49	1.08	37.37	100	210	QP
99.87	28.31	55.77	43.5	-15.19	7.99	1.54	36.99	100	210	QP
136.59	29.25	56.45	43.5	-14.25	7.86	1.8	36.86	100	210	QP
179.86	35.48	60.21	43.5	-8.02	9.9	2.06	36.69	100	210	QP
231.25	34.47	57.11	46	-11.53	11.54	2.35	36.53	100	210	QP
326.52	34	53.62	46	-12	14.11	2.83	36.56	100	210	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	42.95	51.12	54	-11.05	32.87	4.88	45.92	179	309	Average
2390	52.56	60.73	74	-21.44	32.87	4.88	45.92	179	309	Peak
2412	102.71	110.83			32.89	4.9	45.91	179	309	Average
2412	105.35	113.47			32.89	4.9	45.91	179	309	Peak
2483.5	42.14	50.07	54	-11.86	32.98	4.98	45.89	179	309	Average
2483.5	53.83	61.76	74	-20.17	32.98	4.98	45.89	179	309	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	42.36	50.53	54	-11.64	32.87	4.88	45.92	100	303	Average
2390	53.59	61.76	74	-20.41	32.87	4.88	45.92	100	303	Peak
2412	95.56	103.68			32.89	4.9	45.91	100	303	Average
2412	99.17	107.29			32.89	4.9	45.91	100	303	Peak
2483.5	42.31	50.24	54	-11.69	32.98	4.98	45.89	100	303	Average
2483.5	54.59	62.52	74	-19.41	32.98	4.98	45.89	100	303	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	41.94	50.11	54	-12.06	32.87	4.88	45.92	176	310	Average
2390	52.36	60.53	74	-21.64	32.87	4.88	45.92	176	310	Peak
2437	98.53	106.59			32.92	4.93	45.91	176	310	Average
2437	103.22	111.28			32.92	4.93	45.91	176	310	Peak
2483.5	42.29	50.22	54	-11.71	32.98	4.98	45.89	176	310	Average
2483.5	53.12	61.05	74	-20.88	32.98	4.98	45.89	176	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	41.61	49.78	54	-12.39	32.87	4.88	45.92	100	300	Average
2390	51.85	60.02	74	-22.15	32.87	4.88	45.92	100	300	Peak
2437	93.92	101.98			32.92	4.93	45.91	100	300	Average
2437	98.73	106.79			32.92	4.93	45.91	100	300	Peak
2483.5	42.2	50.13	54	-11.8	32.98	4.98	45.89	100	300	Average
2483.5	52.96	60.89	74	-21.04	32.98	4.98	45.89	100	300	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	42.96	51.13	54	-11.04	32.87	4.88	45.92	124	285	Average
2390	53.82	61.99	74	-20.18	32.87	4.88	45.92	124	285	Peak
2462	101.39	109.38			32.95	4.96	45.9	124	285	Average
2462	104.83	112.82			32.95	4.96	45.9	124	285	Peak
2483.5	50.91	58.84	54	-3.09	32.98	4.98	45.89	124	285	Average
2483.5	57.73	65.66	74	-16.27	32.98	4.98	45.89	124	285	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	43.17	51.34	54	-10.83	32.87	4.88	45.92	100	282	Average
2390	54.15	62.32	74	-19.85	32.87	4.88	45.92	100	282	Peak
2462	102.32	110.31			32.95	4.96	45.9	100	282	Average
2462	105.03	113.02			32.95	4.96	45.9	100	282	Peak
2483.5	52.43	60.36	54	-1.57	32.98	4.98	45.89	100	282	Average
2483.5	57.64	65.57	74	-16.36	32.98	4.98	45.89	100	282	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	50.93	59.1	54	-3.07	32.87	4.88	45.92	195	335	Average
2390	65.95	74.12	74	-8.05	32.87	4.88	45.92	195	335	Peak
2412	95.13	103.25			32.89	4.9	45.91	195	335	Average
2412	105.09	113.21			32.89	4.9	45.91	195	335	Peak
2483.5	44.23	52.16	54	-9.77	32.98	4.98	45.89	195	335	Average
2483.5	55.65	63.58	74	-18.35	32.98	4.98	45.89	195	335	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	52.72	60.89	54	-1.28	32.87	4.88	45.92	100	296	Average
2390	67.48	75.65	74	-6.52	32.87	4.88	45.92	100	296	Peak
2412	97.83	105.95			32.89	4.9	45.91	100	296	Average
2412	107.23	115.35			32.89	4.9	45.91	100	296	Peak
2483.5	44.72	52.65	54	-9.28	32.98	4.98	45.89	100	296	Average
2483.5	57.52	65.45	74	-16.48	32.98	4.98	45.89	100	296	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	44.57	52.74	54	-9.43	32.87	4.88	45.92	326	190	Average
2390	55.38	63.55	74	-18.62	32.87	4.88	45.92	326	190	Peak
2437	93.47	101.53			32.92	4.93	45.91	326	190	Average
2437	104.91	112.97			32.92	4.93	45.91	326	190	Peak
2483.5	45.45	53.38	54	-8.55	32.98	4.98	45.89	326	190	Average
2483.5	56.93	64.86	74	-17.07	32.98	4.98	45.89	326	190	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	43.61	51.78	54	-10.39	32.87	4.88	45.92	100	185	Average
2390	54.19	62.36	74	-19.81	32.87	4.88	45.92	100	185	Peak
2437	94.53	102.59			32.92	4.93	45.91	100	185	Average
2437	105.21	113.27			32.92	4.93	45.91	100	185	Peak
2483.5	45.52	53.45	54	-8.48	32.98	4.98	45.89	100	185	Average
2483.5	54.96	62.89	74	-19.04	32.98	4.98	45.89	100	185	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	46.14	54.31	54	-7.86	32.87	4.88	45.92	188	328	Average
2390	57.07	65.24	74	-16.93	32.87	4.88	45.92	188	328	Peak
2462	94.55	102.54			32.95	4.96	45.9	188	328	Average
2462	105.17	113.16			32.95	4.96	45.9	188	328	Peak
2483.5	50.63	58.56	54	-3.37	32.98	4.98	45.89	188	328	Average
2483.5	65.58	73.51	74	-8.42	32.98	4.98	45.89	188	328	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	46.4	54.57	54	-7.6	32.87	4.88	45.92	100	291	Average
2390	58.72	66.89	74	-15.28	32.87	4.88	45.92	100	291	Peak
2462	96.53	104.52			32.95	4.96	45.9	100	291	Average
2462	105.87	113.86			32.95	4.96	45.9	100	291	Peak
2483.5	**52.85**	**60.78**	**54**	**-1.15**	**32.98**	**4.98**	**45.89**	**100**	**291**	**Average**
2483.5	69.19	77.12	74	-4.81	32.98	4.98	45.89	100	291	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	50.58	58.75	54	-3.42	32.87	4.88	45.92	195	336	Average
2390	64.18	72.35	74	-9.82	32.87	4.88	45.92	195	336	Peak
2412	95.39	103.51			32.89	4.9	45.91	195	336	Average
2412	105	113.12			32.89	4.9	45.91	195	336	Peak
2483.5	47.23	55.16	54	-6.77	32.98	4.98	45.89	195	336	Average
2483.5	58.52	66.45	74	-15.48	32.98	4.98	45.89	195	336	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	52.35	60.52	54	-1.65	32.87	4.88	45.92	100	306	Average
2390	65.51	73.68	74	-8.49	32.87	4.88	45.92	100	306	Peak
2412	97.51	105.63			32.89	4.9	45.91	100	306	Average
2412	108.13	116.25			32.89	4.9	45.91	100	306	Peak
2483.5	47.49	55.42	54	-6.51	32.98	4.98	45.89	100	306	Average
2483.5	59.05	66.98	74	-14.95	32.98	4.98	45.89	100	306	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	45.95	54.12	54	-8.05	32.87	4.88	45.92	187	332	Average
2390	57.17	65.34	74	-16.83	32.87	4.88	45.92	187	332	Peak
2437	94.37	102.43			32.92	4.93	45.91	187	332	Average
2437	106.2	114.26			32.92	4.93	45.91	187	332	Peak
2483.5	45.96	53.89	54	-8.04	32.98	4.98	45.89	187	332	Average
2483.5	58.55	66.48	74	-15.45	32.98	4.98	45.89	187	332	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	46.6	54.77	54	-7.4	32.87	4.88	45.92	100	275	Average
2390	57.69	65.86	74	-16.31	32.87	4.88	45.92	100	275	Peak
2437	93.53	101.59			32.92	4.93	45.91	100	275	Average
2437	105.97	114.03			32.92	4.93	45.91	100	275	Peak
2483.5	45.85	53.78	54	-8.15	32.98	4.98	45.89	100	275	Average
2483.5	58.61	66.54	74	-15.39	32.98	4.98	45.89	100	275	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	42.87	51.04	54	-11.13	32.87	4.88	45.92	140	318	Average
2390	52.94	61.11	74	-21.06	32.87	4.88	45.92	140	318	Peak
2462	91.25	99.24			32.95	4.96	45.9	140	318	Average
2462	100.42	108.41			32.95	4.96	45.9	140	318	Peak
2483.5	47.02	54.95	54	-6.98	32.98	4.98	45.89	140	318	Average
2483.5	63.22	71.15	74	-10.78	32.98	4.98	45.89	140	318	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	42.64	50.81	54	-11.36	32.87	4.88	45.92	100	292	Average
2390	52.18	60.35	74	-21.82	32.87	4.88	45.92	100	292	Peak
2462	92.23	100.22			32.95	4.96	45.9	100	292	Average
2462	101	108.99			32.95	4.96	45.9	100	292	Peak
2483.5	48.66	56.59	54	-5.34	32.98	4.98	45.89	100	292	Average
2483.5	65.8	73.73	74	-8.2	32.98	4.98	45.89	100	292	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 MHz 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:

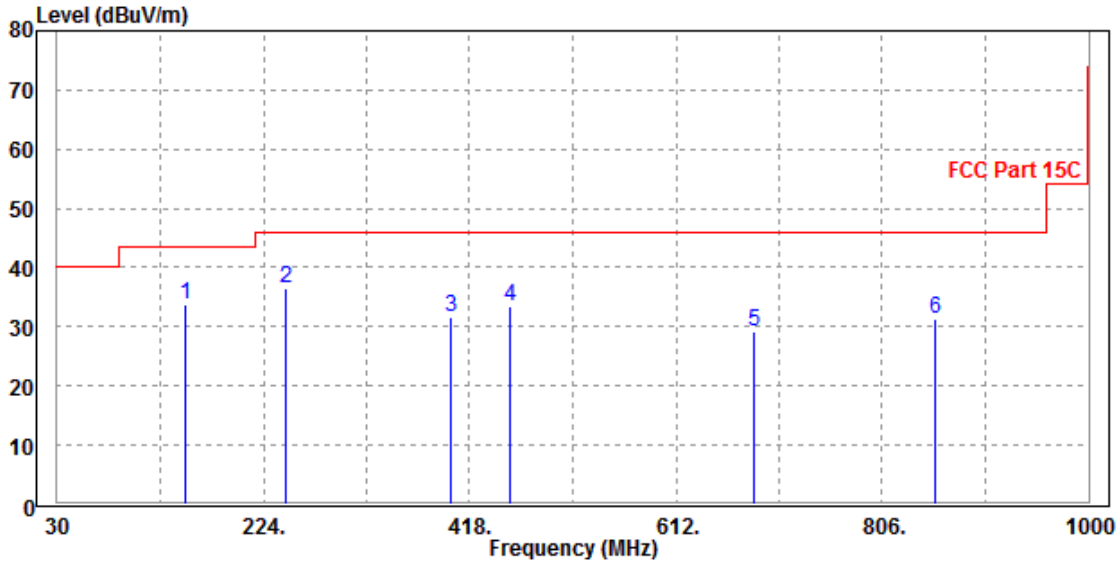
BT-LE (GFSK)

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
151.45	33.69	54.56	43.5	-9.81	9.34	6.57	36.78	100	360	QP
245.66	36.42	53.72	46	-9.58	12.2	7.02	36.52	100	360	QP
400.12	31.61	43.51	46	-14.39	17.2	7.62	36.72	100	360	QP
455.26	33.45	44.62	46	-12.55	17.86	7.82	36.85	100	360	QP
685.75	29.08	35.24	46	-16.92	22.7	8.48	37.34	100	360	QP
855.63	31.32	36.98	46	-14.68	23	8.97	37.63	100	360	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

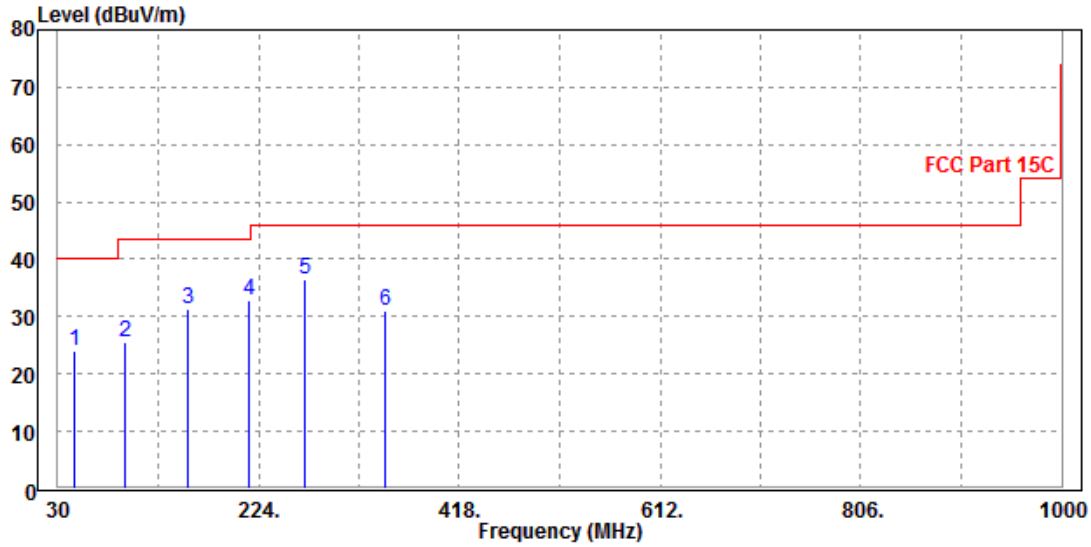


CHANNEL	TX Channel 0	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

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
45.62	23.97	47.24	40	-16.03	8.12	6.04	37.43	100	0	QP
95.45	25.56	48.77	43.5	-17.94	7.5	6.3	37.01	100	0	QP
155.69	31.18	51.55	43.5	-12.32	9.77	6.62	36.76	100	0	QP
215.48	33	51.85	43.5	-10.5	10.81	6.87	36.53	100	0	QP
268.78	36.58	53.36	46	-9.42	12.63	7.1	36.51	100	0	QP
345.89	30.93	45.2	46	-15.07	14.93	7.4	36.6	100	0	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) 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	42.26	51.01	54	-11.74	32.29	4.88	45.92	100	15	Average
2390	56.13	64.88	74	-17.87	32.29	4.88	45.92	100	15	Peak
2402	93.41	102.14			32.3	4.89	45.92	100	15	Average
2402	100.73	109.46			32.3	4.89	45.92	100	15	Peak
2483.5	42.19	50.72	54	-11.81	32.38	4.98	45.89	100	15	Average
2483.5	53.31	61.84	74	-20.69	32.38	4.98	45.89	100	15	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	**43.11**	**51.86**	**54**	**-10.89**	**32.29**	**4.88**	**45.92**	**100**	**170**	**Average**
2390	54.89	63.64	74	-19.11	32.29	4.88	45.92	100	170	Peak
2402	94.8	103.53			32.3	4.89	45.92	100	170	Average
2402	101.35	110.08			32.3	4.89	45.92	100	170	Peak
2483.5	41.3	49.83	54	-12.7	32.38	4.98	45.89	100	170	Average
2483.5	52.01	60.54	74	-21.99	32.38	4.98	45.89	100	170	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	42.15	50.9	54	-11.85	32.29	4.88	45.92	100	12	Average
2390	51.83	60.58	74	-22.17	32.29	4.88	45.92	100	12	Peak
2440	92.94	101.57			32.34	4.94	45.91	100	12	Average
2440	100.48	109.11			32.34	4.94	45.91	100	12	Peak
2483.5	42.21	50.74	54	-11.79	32.38	4.98	45.89	100	12	Average
2483.5	53.41	61.94	74	-20.59	32.38	4.98	45.89	100	12	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	41.13	49.88	54	-12.87	32.29	4.88	45.92	100	172	Average
2390	53.12	61.87	74	-20.88	32.29	4.88	45.92	100	172	Peak
2440	93.86	102.49			32.34	4.94	45.91	100	172	Average
2440	101.32	109.95			32.34	4.94	45.91	100	172	Peak
2483.5	41.25	49.78	54	-12.75	32.38	4.98	45.89	100	172	Average
2483.5	52.18	60.71	74	-21.82	32.38	4.98	45.89	100	172	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	41.27	49.89	54	-12.73	32.87	4.88	46.37	108	0	Average
2390	52.44	61.06	74	-21.56	32.87	4.88	46.37	108	0	Peak
2480	80.82	89.23			32.98	4.98	46.37	108	0	Average
2480	97.64	106.05			32.98	4.98	46.37	108	0	Peak
2483.5	41.4	49.81	54	-12.6	32.98	4.98	46.37	108	0	Average
2483.5	55.08	63.49	74	-18.92	32.98	4.98	46.37	108	0	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	41.16	49.78	54	-12.84	32.87	4.88	46.37	116	276	Average
2390	51.99	60.61	74	-22.01	32.87	4.88	46.37	116	276	Peak
2480	79.46	87.87			32.98	4.98	46.37	116	276	Average
2480	96.57	104.98			32.98	4.98	46.37	116	276	Peak
2483.5	41.5	49.91	54	-12.5	32.98	4.98	46.37	116	276	Average
2483.5	53.25	61.66	74	-20.75	32.98	4.98	46.37	116	276	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	Feb. 26,19	Feb. 25, 20
EXA Signal Analyzer	KEYSIGHT	N9010A-526	MY54510322	Feb. 26,19	Feb. 25,20
EXA Signal Analyzer	KEYSIGHT	N9010A-544	MY54510355	Feb. 26,19	Feb. 25,20
Power Sensor	ANRITSU	MA2411B	1339352	Feb. 26,19	Feb. 25,20

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.

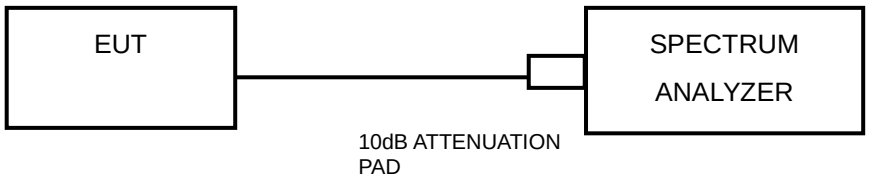
3.3.3 TEST PROCEDURE

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



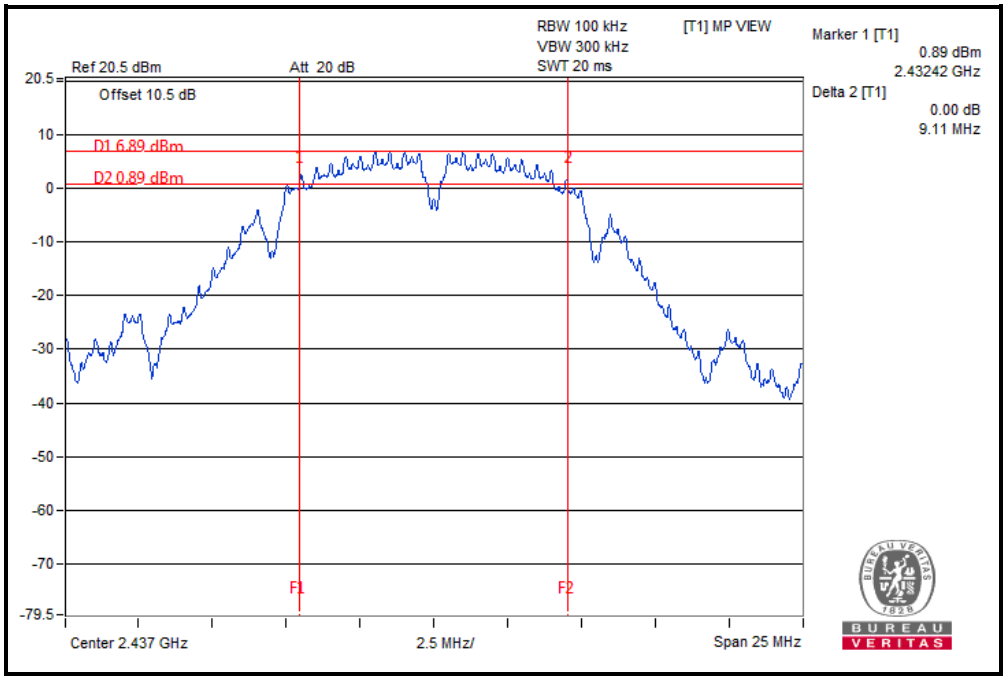
3.3.6 EUT OPERATING CONDITIONS

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

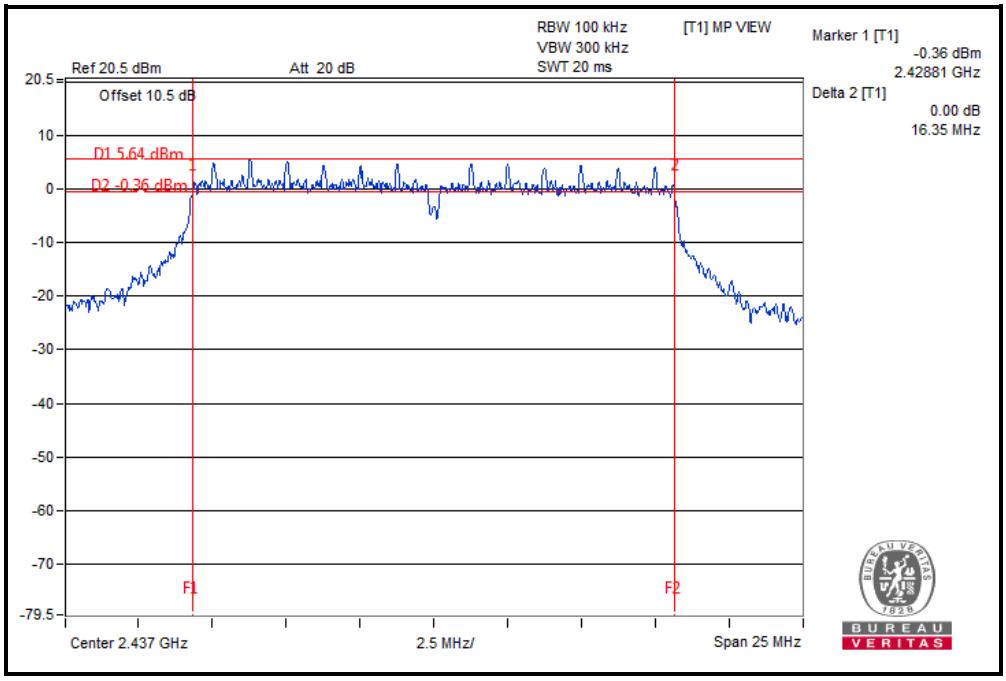
802.11b

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
1	2412	9.07	0.5	PASS
6	2437	9.11	0.5	PASS
11	2462	9.08	0.5	PASS



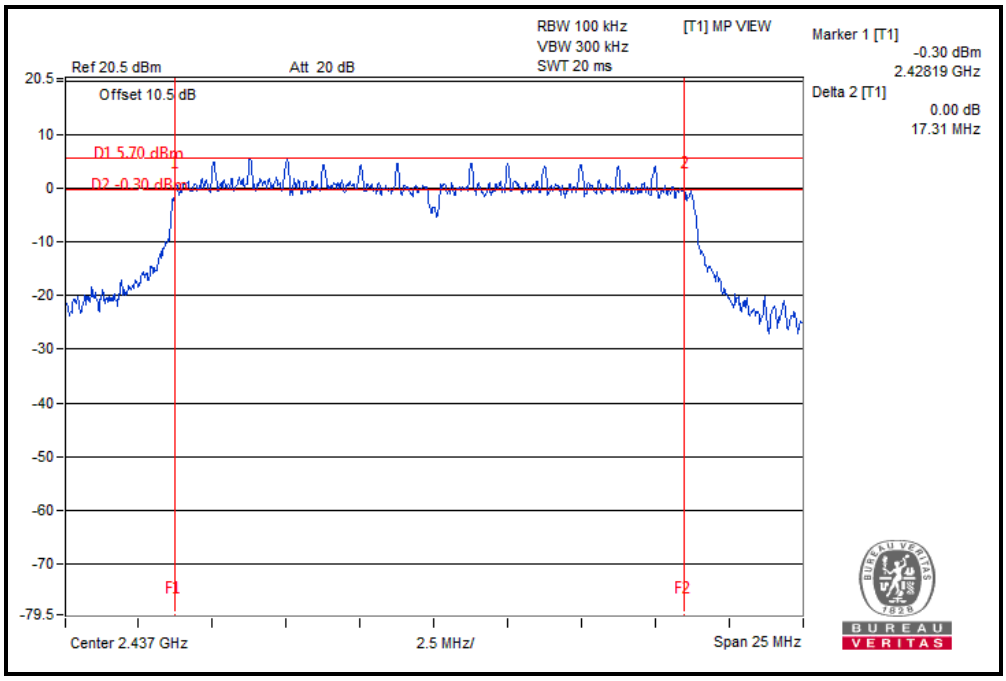
802.11g

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
1	2412	16.08	0.5	PASS
6	2437	16.35	0.5	PASS
11	2462	16.08	0.5	PASS



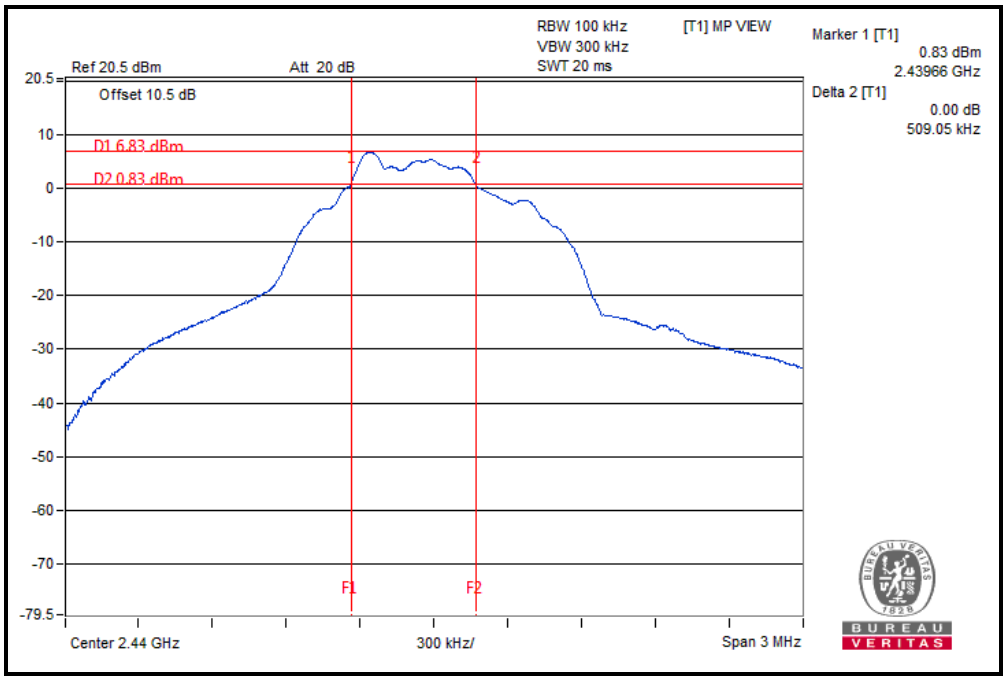
802.11n (20MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
1	2412	16.68	0.5	PASS
6	2437	17.31	0.5	PASS
11	2462	16.71	0.5	PASS



BT-LE (GFSK)

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
0	2402	0.51	0.5	PASS
19	2440	0.51	0.5	PASS
39	2480	0.51	0.5	PASS

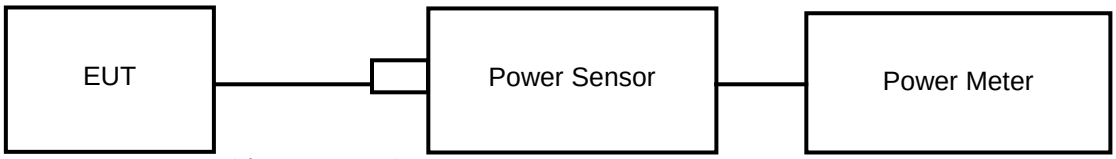


3.4 CONDUCTED OUTPUT POWER

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	19.89	97.499	1	PASS
6	2437	18.85	76.736	1	PASS
11	2462	19.12	81.658	1	PASS

802.11g

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER (dBm)	PEAK POWER (mW)	PEAK POWER LIMIT(W)	PASS/FAIL
1	2412	18.68	73.790	1	PASS
6	2437	17.46	55.719	1	PASS
11	2462	17.76	59.704	1	PASS

802.11n (20MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER (dBm)	PEAK POWER (mW)	PEAK POWER LIMIT(W)	PASS/FAIL
1	2412	21.56	**143.219**	1	PASS
6	2437	21.13	129.718	1	PASS
11	2462	21.29	134.586	1	PASS

BT-LE (GFSK)

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER (dBm)	PEAK POWER (mW)	PEAK POWER LIMIT(W)	PASS/FAIL
0	2402	4.78	3.006	1	PASS
19	2440	6.62	**4.592**	1	PASS
39	2480	6.03	4.009	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	17.04	N/A
6	2437	15.95	N/A
11	2462	16.17	N/A

802.11g

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (dBm)	PASS/FAIL
1	2412	15.69	N/A
6	2437	14.39	N/A
11	2462	14.68	N/A

802.11n (20MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (dBm)	PASS/FAIL
1	2412	15.83	N/A
6	2437	15.01	N/A
11	2462	15.03	N/A

BT-LE (GFSK)

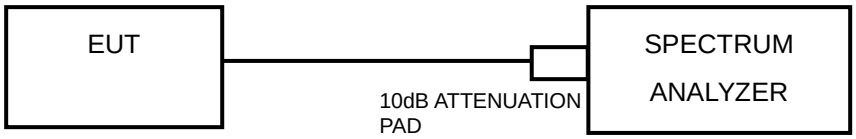
CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER (dBm)	PASS/FAIL
0	2402	4.06	N/A
19	2440	5.99	N/A
39	2480	5.34	N/A

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.

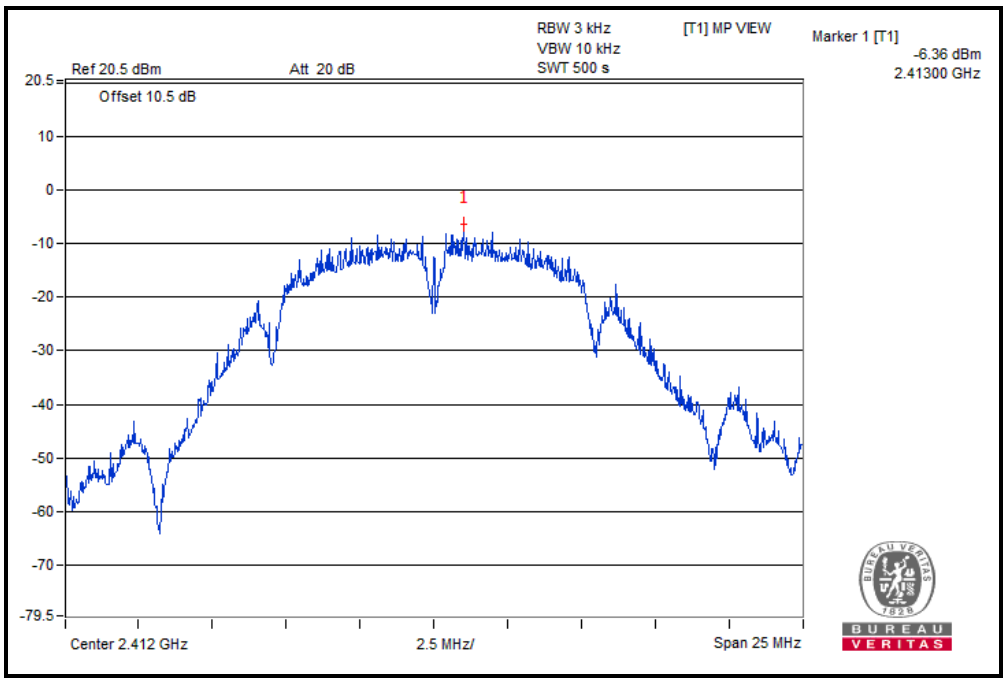
3.5.6 EUT OPERATING CONDITION

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

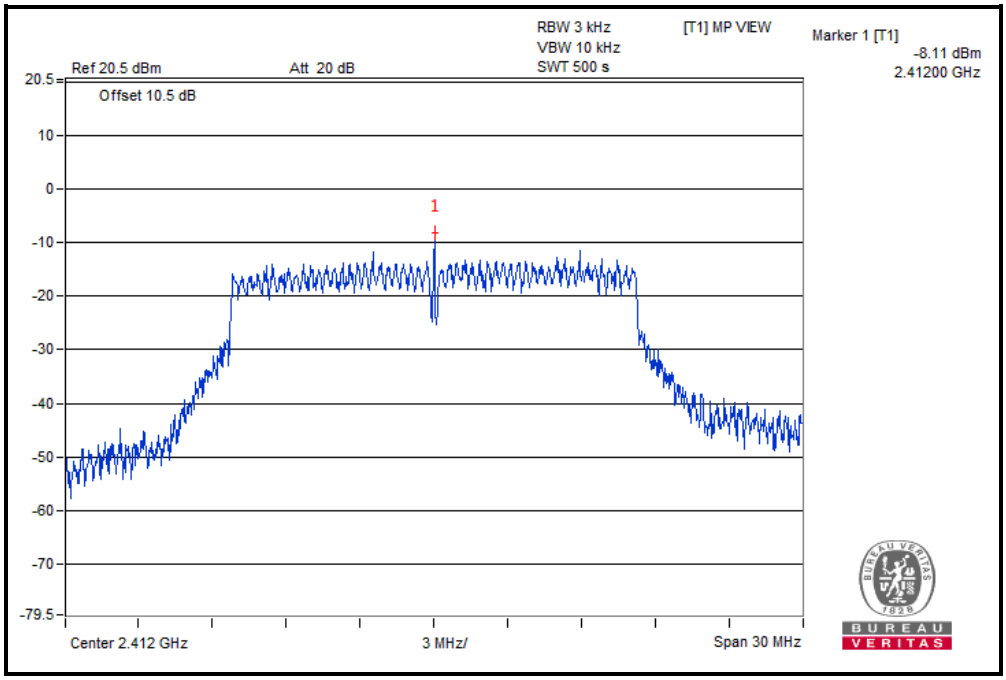
802.11b

Channel	FREQ. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
1	2412	-6.36	8	PASS
6	2437	-8.38	8	PASS
11	2462	-7.86	8	PASS



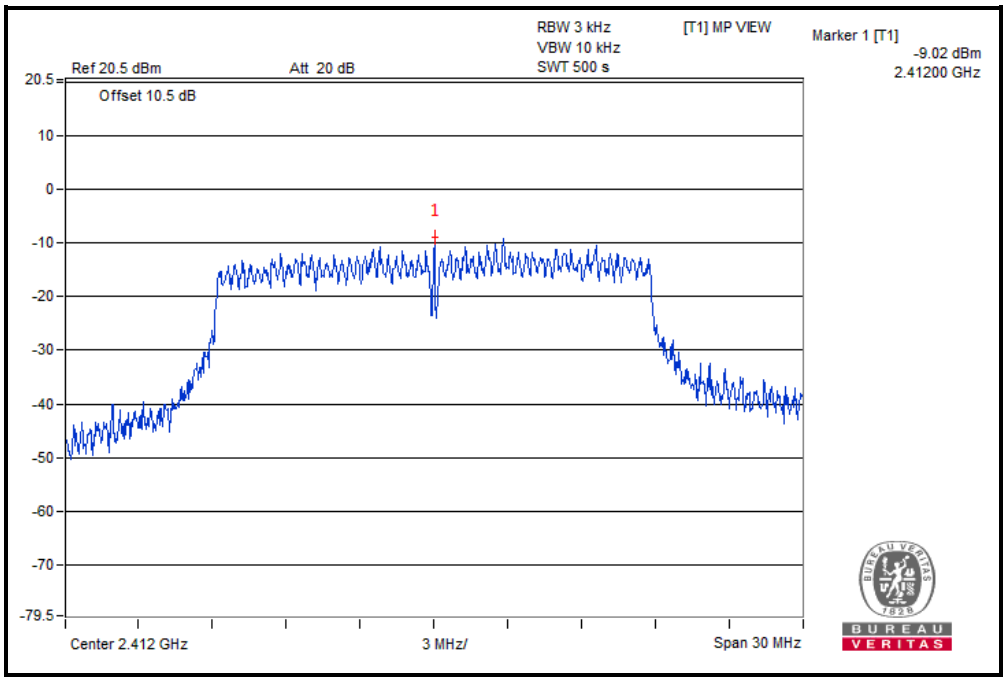
802.11g

Channel	FREQ. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
1	2412	-8.11	8	PASS
6	2437	-9.76	8	PASS
11	2462	-9.46	8	PASS



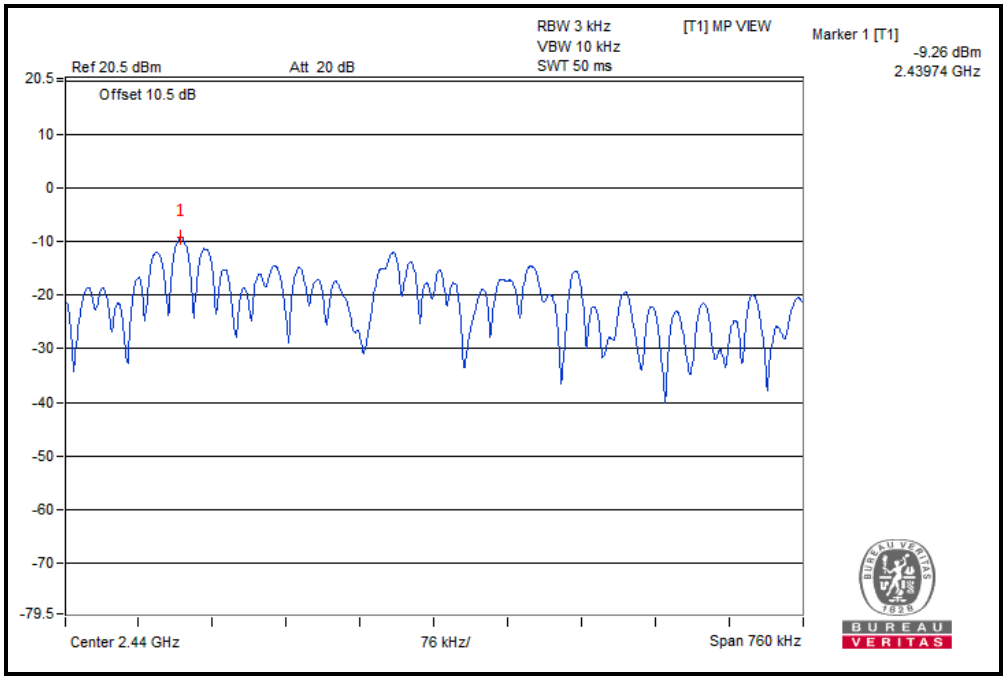
802.11n (20MHz)

Channel	FREQ. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
1	2412	-9.02	8	PASS
6	2437	-9.53	8	PASS
11	2462	-9.26	8	PASS



BT-LE (GFSK)

Channel	FREQ. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
0	2402	-11.23	8	PASS
19	2440	-9.26	8	PASS
39	2480	-9.34	8	PASS

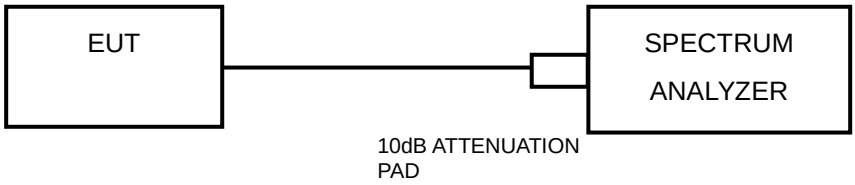


3.6 OUT OF BAND EMISSION MEASUREMENT

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

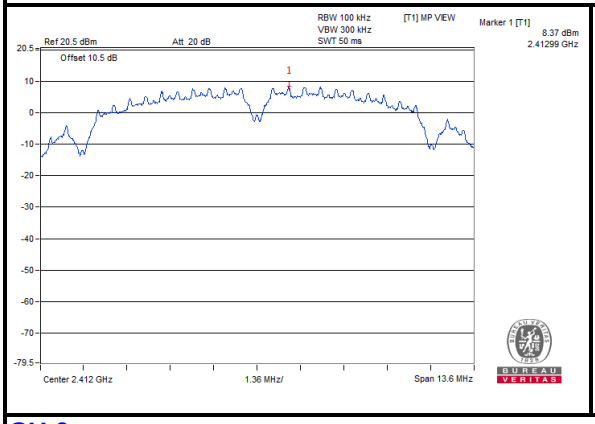
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

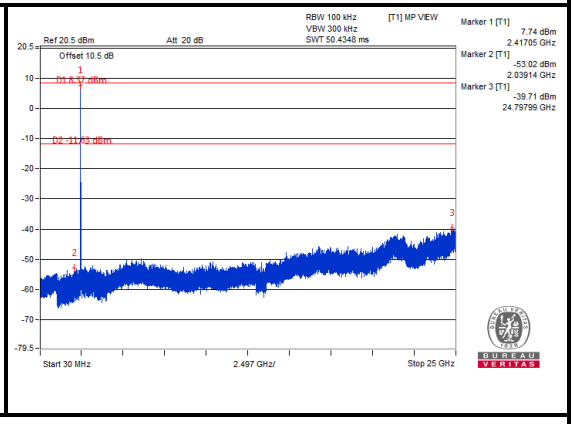
3.6.7 TEST RESULTS

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.

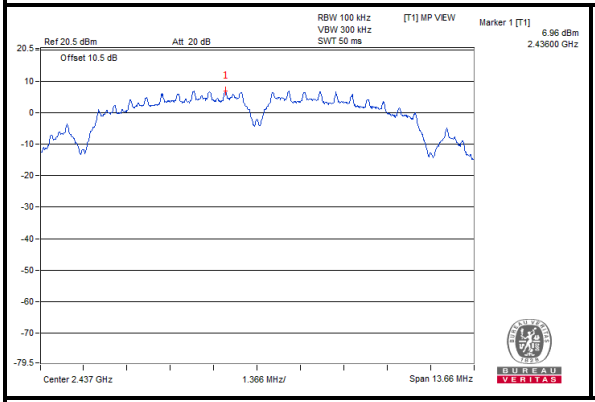
802.11b

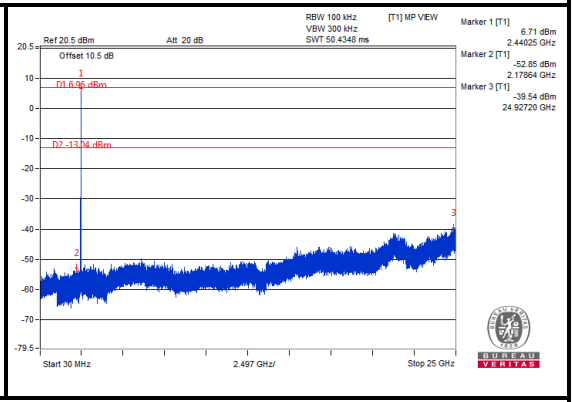
CH 1



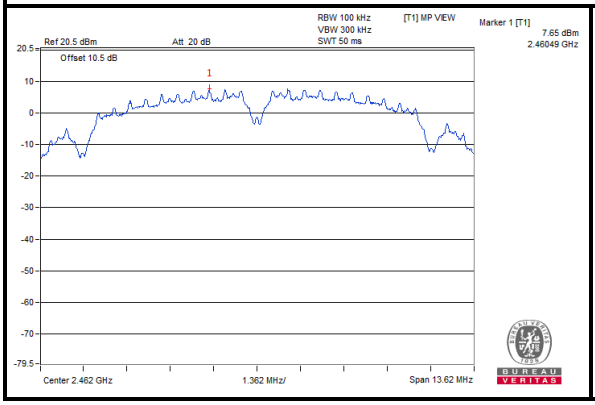


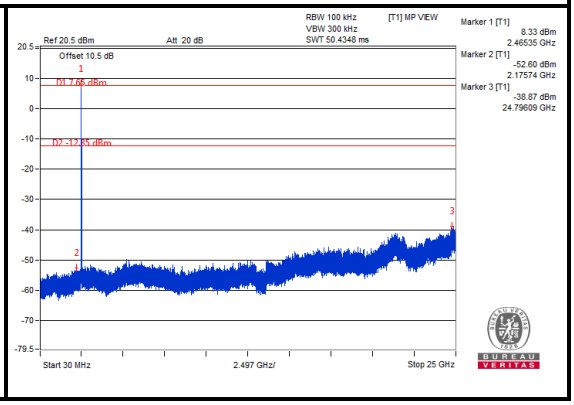
CH 6

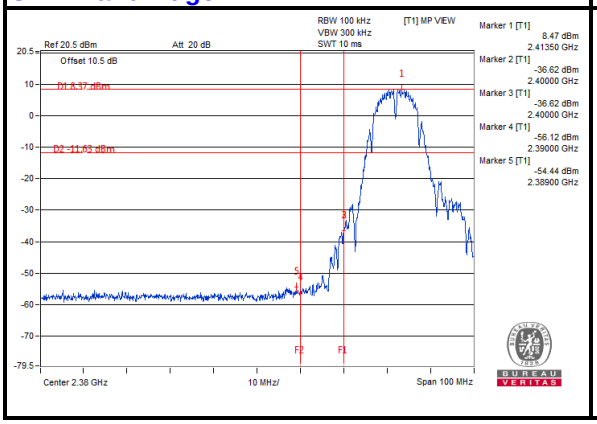
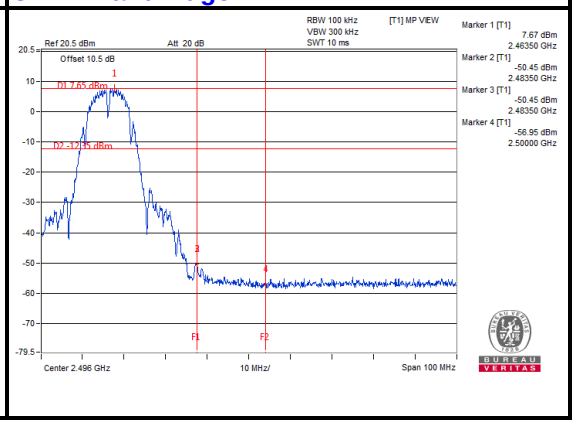




CH 11

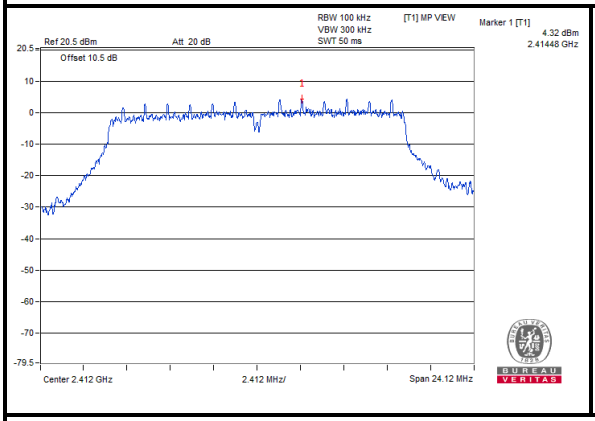


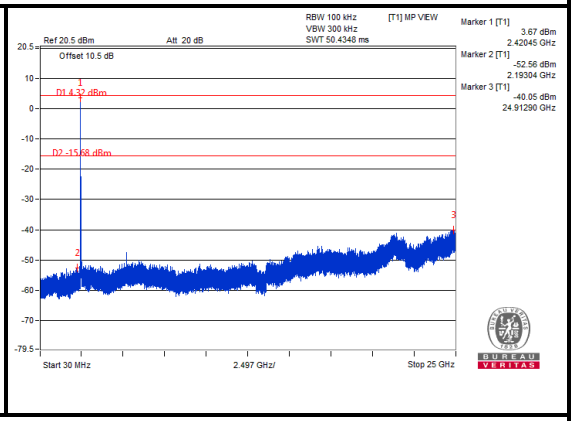


CH 1 Band Edge	CH 11 Band Edge
	

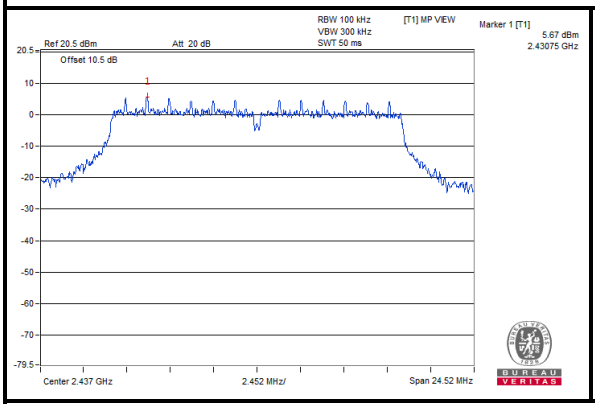
802.11g

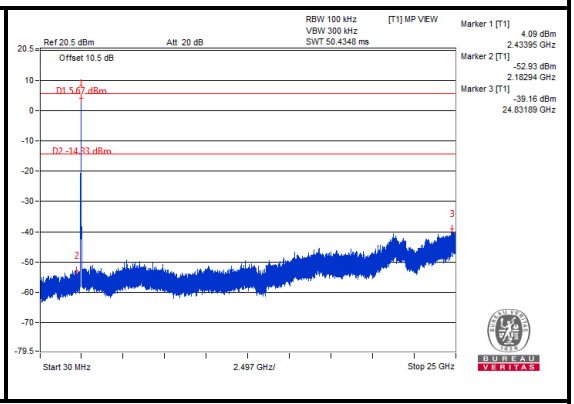
CH 1



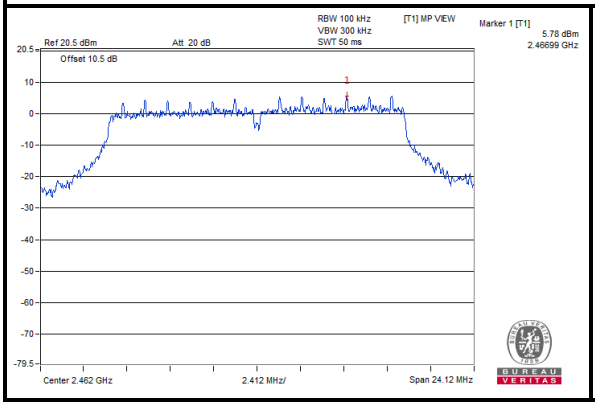


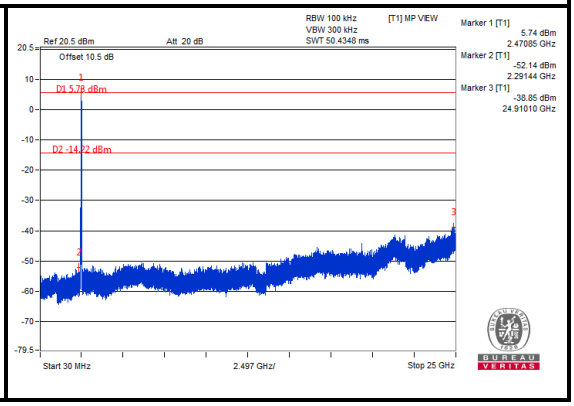
CH 6

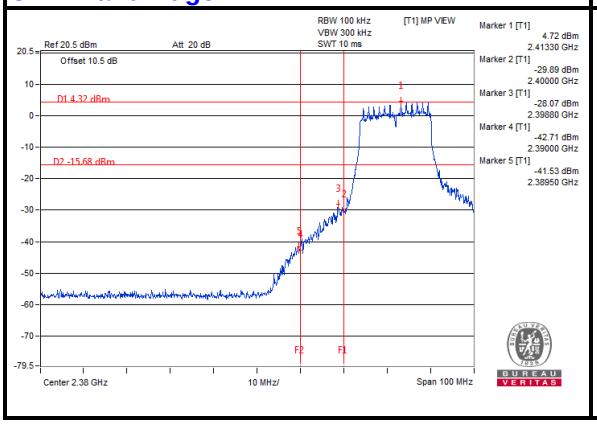
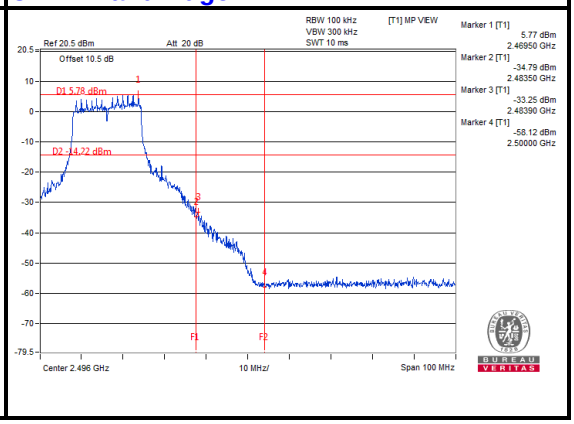




CH 11

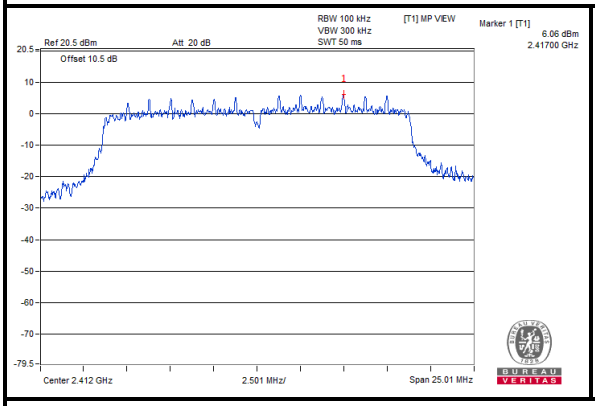


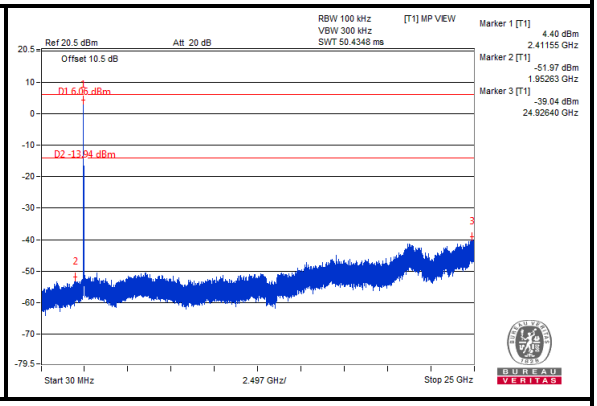


CH 1 Band Edge	CH 11 Band Edge
	

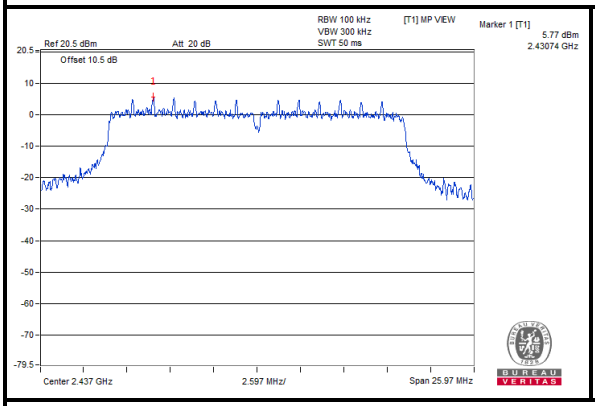
802.11n (20MHz)

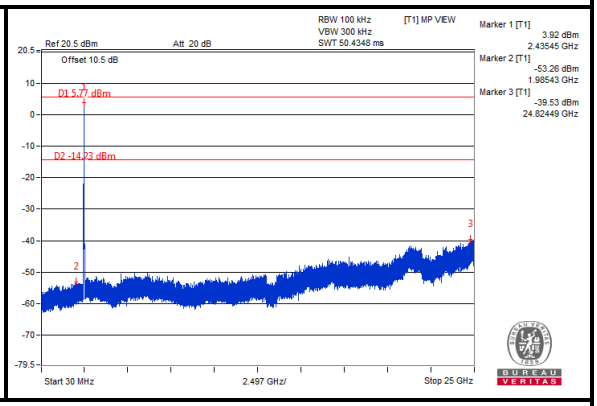
CH 1



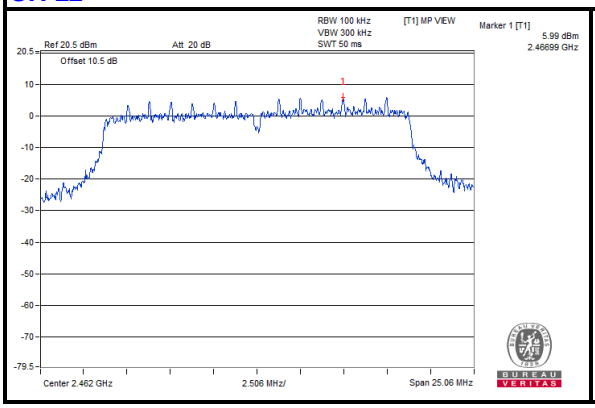


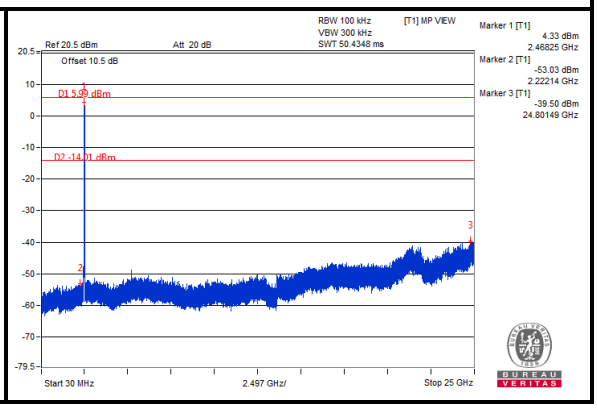
CH 6

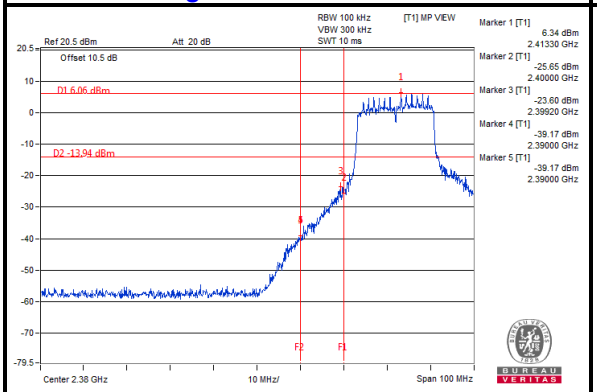
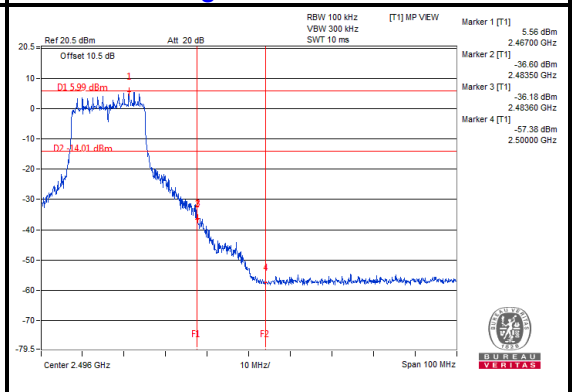




CH 11

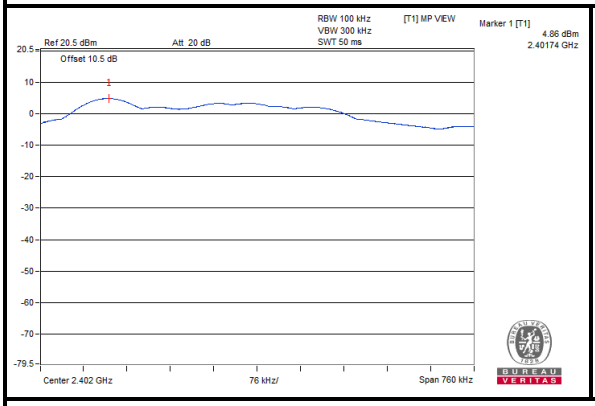


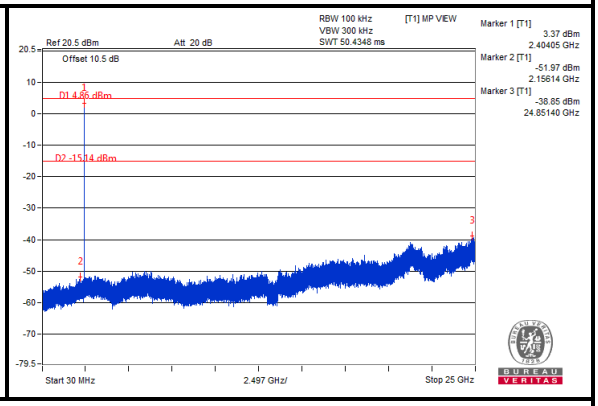


CH 1 Band Edge	CH 11 Band Edge
	

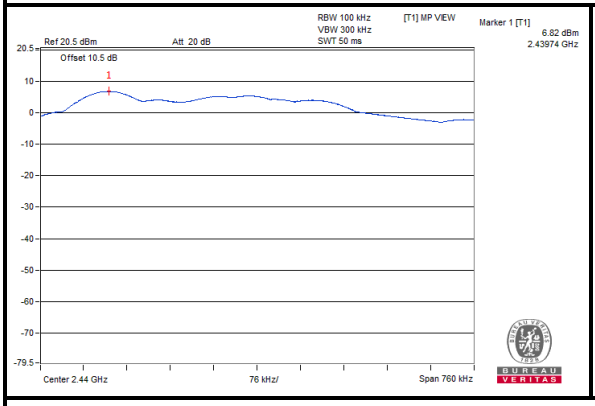
BT-LE (GFSK)

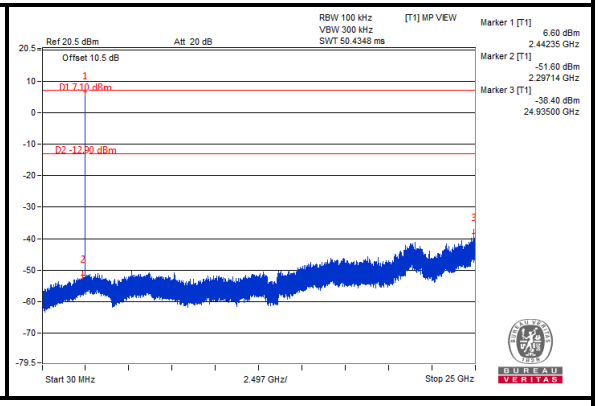
CH 0



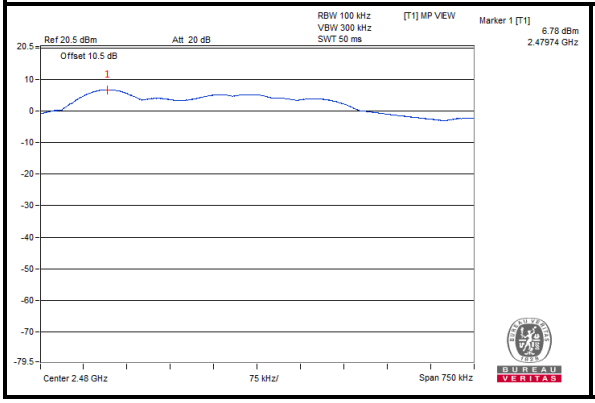


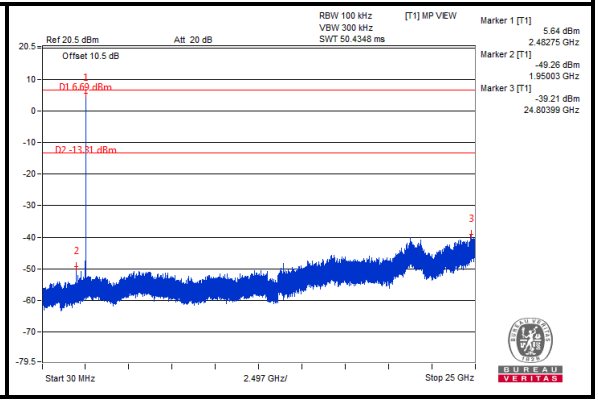
CH 19

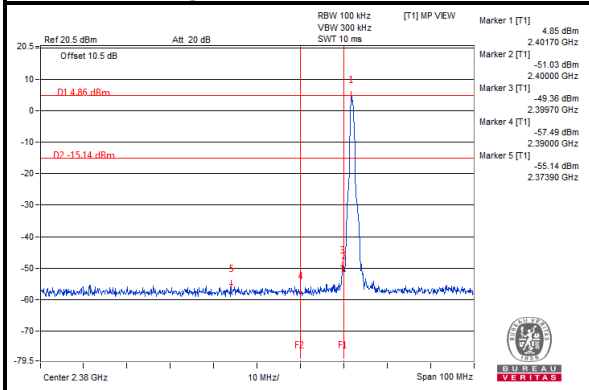
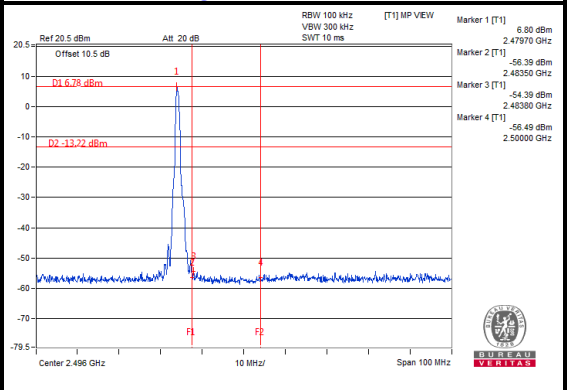




CH 39





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---