TEST REPORT

Applicant	SB C&S Corp.
Address	19F, Shiodome-Sumitomo Bldg.,1-9-2 Higashi Shimbashi, Minato-ku, Tokyo, JAPAN

Manufacturer or Supplier	SB C&S Corp.
Address	19F, Shiodome-Sumitomo Bldg.,1-9-2 Higashi Shimbashi, Minato-ku, Tokyo, JAPAN
Product	GLIDiC Sound Air SPT-7000
Brand Name	GLIDiC
Model	SB-WS73-MRTW(L)
Additional Model & Model Difference	N/A
Date of tests	Oct. 22, 2019 ~ Oct. 29, 2019

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

☒ **FCC Part 15, Subpart C, Section 15.247**

CONCLUSION: The submitted sample was found to COMPLY with the test requirement

Tested by Andy Zhu Project Engineer / EMC Department	Approved by Glyn He Supervisor / EMC Department
	Date: Nov. 28, 2019

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF191108N031-1L	Original release	Nov.28, 2019

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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	N/A	Power by Battery
15.205 15.209	Radiated Emission	PASS	Meet the requirement of limit.
15.247(d)	Out of band Emission Measurement	PASS	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	PASS	Meet the requirement of limit.
15.247(b)	Conducted Output power	PASS	Meet the requirement of limit.
15.247(e)	Power Spectral Density	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	No antenna connector is used

2 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	0.15MHz ~ 30MHz	2.66 dB
Radiated emissions	9KHz ~ 30MHz	2.90dB
	30MHz ~ 1GMHz	3.47 dB
	1GHz ~ 18GHz	4.84 dB
	18GHz ~ 40GHz	4.62 dB

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

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	GLIDiC Sound Air SPT-7000
BRAND	GLIDiC
MODEL NO.	SB-WS73-MRTW(L)
ADDITIONAL MODEL	N/A
FCC ID	2AO2PSPT-7000-L
NOMINAL VOLTAGE	Earphone: DC 3.7V from Li-ion Battery or DC 5V from Charger base Charger base: DC 3.7V from Li-ion Battery or DC 5V from Host Unit
MODULATION TECHNOLOGY	DTS
MODULATION TYPE	BT-LE GFSK (1, 2Mbps)
OPERATING FREQUENCY	2402-2480MHz
AVERAGE OUTPUT POWER	3.381mW (Max. Measured)
ANTENNA TYPE	Integral Antenna, 0.47dBi Gain
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	USB Line: unshielded detachable 0.3m

NOTES:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.
3. Please refer to the EUT photo document (Reference No.: 191108N031) for detailed product photo.
4. When the EUT (Earphone) in charging mode that RF function can't working.

3.2 DESCRIPTION OF TEST MODES

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

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

3.2.1. CONFIGURATION OF SYSTEM UNDER TEST

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

3.2.2. TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports
The worst case was found when positioned on X 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				DESCRIPTION
	RE<1G	RE≥1G	PLC	APCM	
A	√	√	X	√	DC 3.7V from Li-ion Battery

Where **RE<1G:** Radiated Emission below 1GHz **RE≥1G:** Radiated Emission above 1GHz
PLC: Power Line Conducted Emission **APCM:** Antenna Port Conducted Measurement

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, XYZ axis and antenna ports (if EUT with antenna diversity architecture).

☒ Following channels were selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
BT-LE	0 to 39	39	DTS	GFSK	1 Mbps
BT-LE	0 to 39	39	DTS	GFSK	2 Mbps

For the test results, only the worst case was shown in test report.

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, XYZ axis and antenna ports (if EUT with antenna diversity architecture).

☒ Following channels were selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
BT-LE	0 to 39	0,19, 39	DTS	GFSK	1 Mbps
BT-LE	0 to 39	0,19,39	DTS	GFSK	2 Mbps

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 channels were selected for the final test as listed below.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
BT-LE	0 to 39	0, 19, 39	DTS	GFSK	1 Mbps
BT-LE	0 to 39	0, 19, 39	DTS	GFSK	2 Mbps

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	TEST VOLTAGE	TESTED BY
RE<1G	25deg. C, 55%RH	DC 3.7V from Li-ion Battery	Tank Tan
RE≥1G	25deg. C, 55%RH	DC 3.7V from Li-ion Battery	Tank Tan
PLC	25deg. C, 49%RH	DC 3.7V from Li-ion Battery	Rex Yang
APCM	25deg. C, 60%RH	DC 3.7V from Li-ion Battery	Rex Yang

3.3 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

558074 D01 15.247 Meas Guidance v05r02

ANSI C63.10-2013

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

3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an dependent 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	Notebook	LENOVO	Thinkpad	KKA9196S	N/A

NO.	DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	N/A

4 TEST TYPES AND RESULTS

4.1 CONDUCTED EMISSION MEASUREMENT

Note: The UUT operating only power supply by battery, no need to testing this item.

4.2 RADIATED EMISSION MEASUREMENT

4.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

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

FREQUENCIES (MHz)	FIELD STRENGTH (microvolts/meter)	MEASUREMENT DISTANCE (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

NOTES:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

4.2.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
EMI Test Receiver Rohde&Schwarz	ESCI 7	100962	2019-7-16	2020-7-15
Broadband antenna Schwarzbeck	VULB 9168	00937	2019-10-18	2020-10-17
3m Semi-anechoic Chamber MAORUI	9m*6m*6m	NSEMC003	2018-10-20	2020-10-19
Signal Amplifier Com-power	PAM-103	18020051	2019-10-18	2020-10-17
Attenuator Rohde&Schwarz	TS2GA-6dB	18101101	N/A	N/A
Test software FARAD	FARAD	EZ_EMCV1.1.4.2	N/A	N/A
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	2019-10-18	2020-10-17
Loop Antenna	HLA 6121	45745	2019-10-18	2020-10-17
Preamplifier EMCI	EMC001340	980201	2019-10-18	2020-10-17
Digital Multimete FLUKE	15B+	43512617WS	2019-10-18	2020-10-17
Horn Antenna Schwarzbeck	BBHA 9170	01959	2019-10-18	2020-10-17
Spectrum Analyzer Rohde&Schwarz	FSV-40N	101783	2019-10-18	2020-10-17
Broadband Coaxial Preamplifier Schwarzbeck	BBV 9718	00025	2019-10-18	2020-10-17
Horn Antenna Schwarzbeck	BBHA 9170	BBHA9170242	2019-05-05	2020-05-04
Pre-Amplifier EMCI	EMC 184045	980102	2019-10-18	2020-10-17
Spectrum Keysight	N9020A	MY51240612	2019-10-18	2020-10-17
Antenna Tower MF	MFA-440H	NA	NA	NA
Turn Table MF	MFT-201SS	NA	NA	NA
Antenna Tower&Turn Table Controller MF	MF-7802	NA	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA.

2. The test was performed in Hwa-Hsing (Dongguan) Testing Co., Ltd.

4.2.3 TEST PROCEDURES

a. The EUT was placed on the top of a rotating table 1.5 meters (above 1GHz) and 0.8 meters (below 1GHz) above the ground at a 3 meters semi-anechoic chamber. 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. For below 30MHz, a loop antenna with its vertical plane is place 3m from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. And the centre of the loop shall be 1m above the ground.

g. 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.

NOTES:

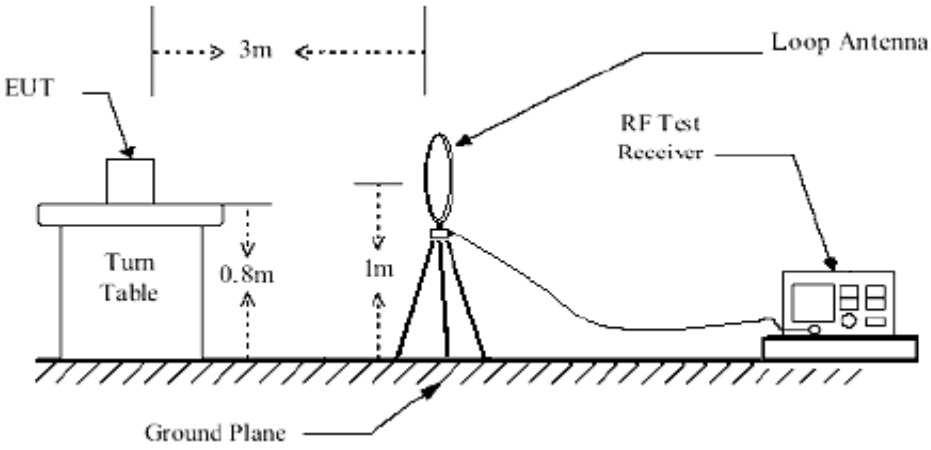
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 10Hz(Duty cycle > 98%) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.
5. The testing of the EUT was performed on all 3 orthogonal axes; the worst-case test configuration was reported on the file test setup photo.

4.2.4 DEVIATION FROM TEST STANDARD

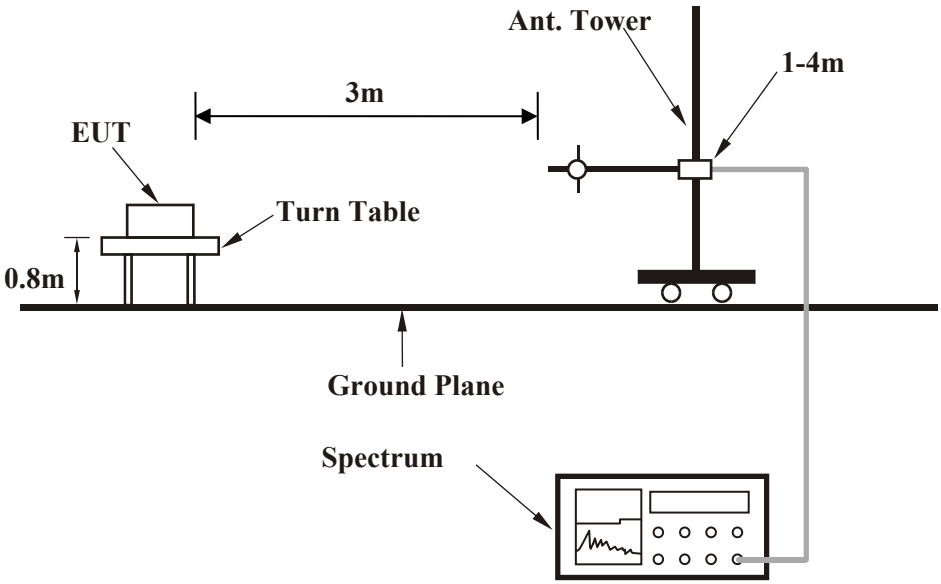
No deviation.

4.2.5 TEST SETUP

Below 30MHz test setup

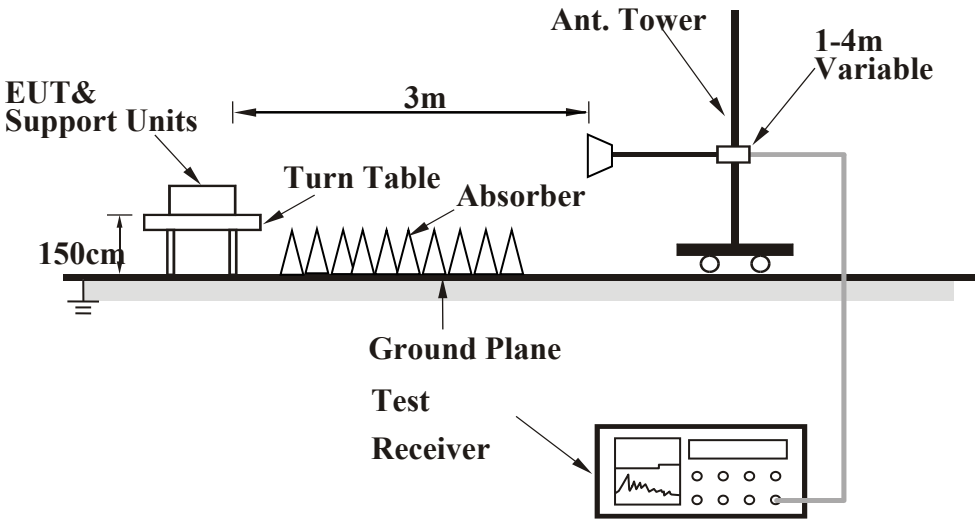


Below 1GHz test setup



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

Above 1GHz test setup



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

4.2.6 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.

4.2.7 TEST RESULTS

9kHz ~ 30MHz Data:

The amplitude of spurious emissions attenuated more than 20dB below the permissible value is not required to be report.

30MHz ~ 1GHz Worst-Case Data:

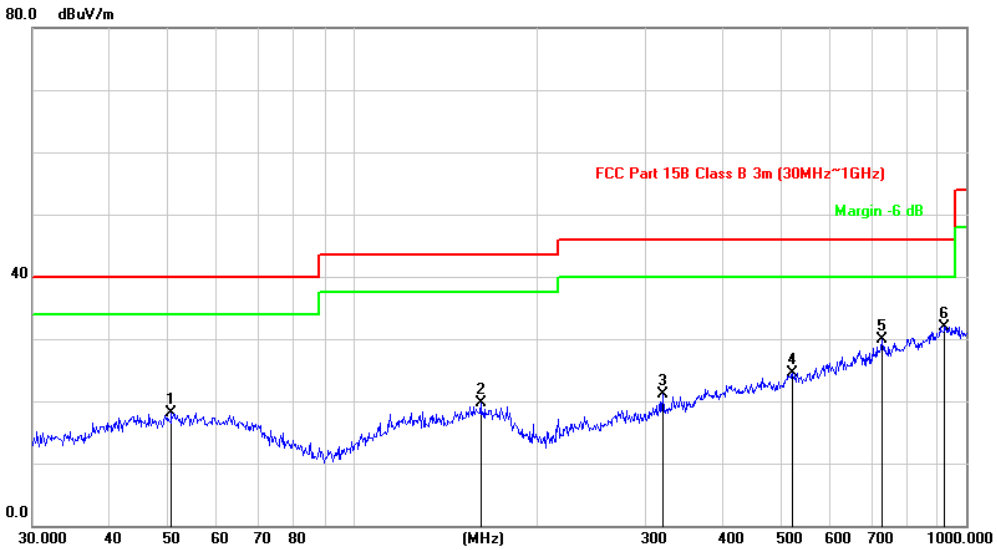
BT-LE (GFSK) (1Mbps)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M									
NO.	FREQ. (MHz)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	Det.	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)
1	50.5860	32.27	-14.15	18.12	40.00	-21.88	QP	199	246
2	161.4742	32.19	-12.52	19.67	43.50	-23.83	QP	200	179
3	319.9370	33.62	-12.48	21.14	46.00	-24.86	QP	219	274
4	520.8882	31.31	-6.78	24.53	46.00	-21.47	QP	186	259
5	729.3583	31.29	-1.44	29.85	46.00	-16.15	QP	204	238
6	922.5157	30.10	1.87	31.97	46.00	-14.03	QP	223	211

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).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.

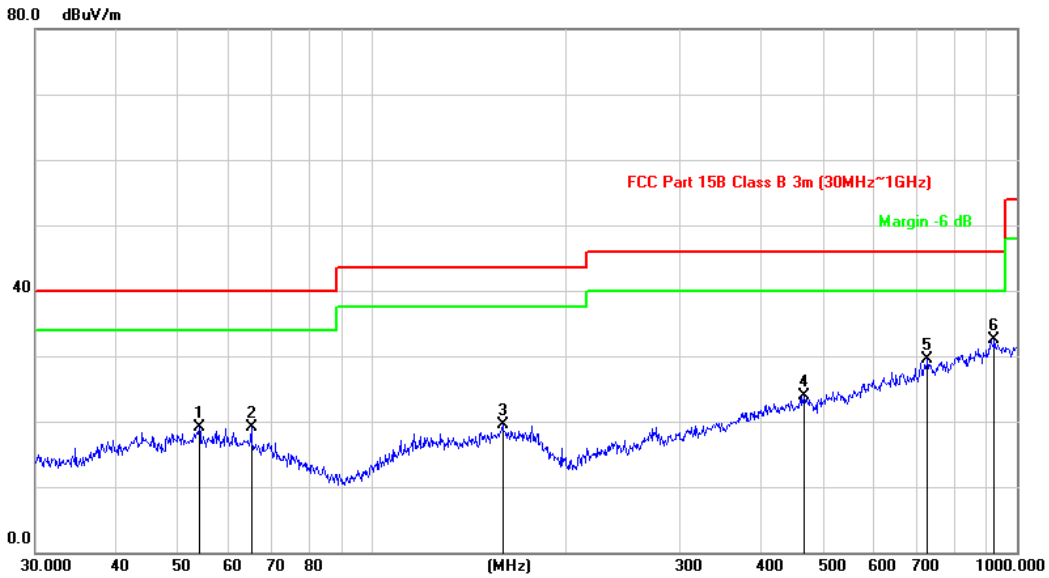


CHANNEL	TX Channel 39	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M									
NO.	FREQ. (MHz)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	Det.	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)
1	53.8818	33.62	-14.52	19.10	40.00	-20.90	QP	100	243
2	64.8865	34.24	-15.05	19.19	40.00	-20.81	QP	100	249
3	159.2251	31.88	-12.38	19.50	43.50	-24.00	QP	100	285
4	467.2349	31.79	-7.92	23.87	46.00	-22.13	QP	105	127
5	726.8052	30.92	-1.51	29.41	46.00	-16.59	QP	100	175
6	922.5157	30.67	1.87	32.54	46.00	-13.46	QP	112	215

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).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.



ABOVE 1GHz TEST DATA:

BT-LE (GFSK) (1 Mbps)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M									
NO.	FREQ. (MHz)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	Det.	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)
1	2369.720	49.70	-0.83	48.87	74.00	-25.13	peak	177	284
2	2369.720	19.60	-0.83	18.77	54.00	-35.23	AVG	177	284
3*	2402.000	102.58	-0.75	101.83			peak	177	284
4*	2402.000	72.48	-0.75	71.73			AVG	177	284
5	4803.441	62.96	5.35	68.31	74.00	-5.69	peak	150	279
6	4803.441	32.86	5.35	38.21	54.00	-15.79	AVG	150	279
7	7206.000	51.55	11.75	63.30	74.00	-10.70	peak	117	236
8	7206.000	21.45	11.75	33.20	74.00	-40.80	peak	117	236
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M									
NO.	FREQ. (MHz)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	Det.	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)
1	2390.000	42.04	-0.77	41.27	74.00	-32.73	peak	125	176
2	2390.000	11.94	-0.77	11.17	74.00	-62.83	peak	125	176
3*	2402.000	93.84	-0.75	93.09			peak	125	176
4*	2402.000	63.74	-0.75	62.99			AVG	125	176
5	4804.000	51.56	5.36	56.92	74.00	-17.08	peak	179	235
6	4804.000	21.46	5.36	26.82	74.00	-47.18	peak	179	235
7	7206.000	36.10	11.75	47.85	74.00	-26.15	peak	100	145
8	7206.000	6.00	11.75	17.75	74.00	-56.25	peak	100	145

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).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M									
NO.	FREQ. (MHz)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	Det.	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)
1*	2439.740	103.83	-0.64	103.19			peak	177	282
2*	2439.740	73.73	-0.64	73.09			AVG	177	282
3	4880.519	64.54	6.24	70.78	74.00	-3.22	peak	133	286
4	4880.519	34.44	6.24	40.68	54.00	-13.32	AVG	133	286
5	7320.579	47.90	12.13	60.03	74.00	-13.97	peak	143	261
6	7320.579	17.80	12.13	29.93	54.00	-24.07	AVG	143	261
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M									
NO.	FREQ. (MHz)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	Det.	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)
1*	2439.740	99.91	-0.64	99.27			peak	126	328
2*	2439.740	69.81	-0.64	69.17			AVG	126	328
3	4880.300	53.37	6.24	59.61	74.00	-14.39	peak	100	239
4	4880.300	23.27	6.24	29.51	54.00	-24.49	AVG	100	239
5	7319.301	47.44	12.13	59.57	74.00	-14.43	peak	100	280
6	7319.301	17.34	12.13	29.47	74.00	-44.53	peak	100	280

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).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M									
NO.	FREQ. (MHz)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	Det.	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)
1*	2480.000	92.84	-0.52	92.32			peak	185	153
2*	2480.000	59.75	-0.52	59.23			AVG	185	153
3	2487.712	60.18	-0.51	59.67	74.00	-14.33	peak	185	153
4	2487.712	30.08	-0.51	29.57	54.00	-24.43	AVG	185	153
5	4960.000	56.54	6.09	62.63	74.00	-11.37	peak	114	172
6	4960.000	26.44	6.09	32.53	54.00	-21.47	AVG	114	172
7	7440.000	47.61	12.53	60.14	74.00	-13.86	peak	156	268
8	7440.000	17.51	12.53	30.04	54.00	-23.96	AVG	156	268
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M									
NO.	FREQ. (MHz)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	Det.	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)
1*	2479.580	92.38	-0.53	91.85			peak	100	279
2*	2479.580	62.28	-0.53	61.75			AVG	100	279
3	2496.154	66.93	-0.48	66.45	74.00	-7.55	peak	100	279
4	2496.154	36.83	-0.48	36.35	54.00	-17.65	AVG	100	279
5	4960.400	56.11	6.09	62.20	74.00	-11.80	peak	163	275
6	4960.400	26.01	6.09	32.10	54.00	-21.90	AVG	163	275
7	7439.301	46.80	12.53	59.33	74.00	-14.67	peak	100	279
8	7439.301	16.70	12.53	29.23	54.00	-24.77	AVG	100	279

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).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.

BT-LE (GFSK) (2 Mbps)

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M									
NO.	FREQ. (MHz)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	Det.	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)
1	2390.000	40.40	-0.77	39.63	74.00	-34.37	peak	100	253
2	2390.000	39.89	-0.77	39.12	54.00	-14.88	AVG	100	253
3*	2402.000	94.56	-0.75	93.81			peak	100	253
4*	2402.000	64.54	-0.75	63.79			AVG	100	253
5	4804.000	43.63	5.36	48.99	74.00	-25.01	peak	100	172
6	4804.000	43.16	5.36	48.52	54.00	-5.48	AVG	100	172
7	7206.000	41.42	11.75	53.17	74.00	-20.83	peak	100	304
8	7206.000	38.48	11.75	50.23	54.00	-3.77	AVG	100	304
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M									
NO.	FREQ. (MHz)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	Det.	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)
1	2390.000	41.31	-0.77	40.54	74.00	-33.46	peak	100	253
2	2390.000	40.53	-0.77	39.76	54.00	-14.24	AVG	100	253
3*	2402.000	93.14	-0.75	92.39			peak	100	253
4*	2402.000	62.90	-0.75	62.15			AVG	100	253
5	4804.000	43.85	5.36	49.21	74.00	-24.79	peak	100	0
6	4804.000	43.66	5.36	49.02	54.00	-4.98	AVG	100	0
7	7206.000	41.48	11.75	53.23	74.00	-20.77	peak	100	224
8	7206.000	38.74	11.75	50.49	54.00	-3.51	AVG	100	224

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).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M									
NO.	FREQ. (MHz)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	Det.	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)
1*	2440.000	94.36	-0.64	93.72			peak	117	264
2*	2440.000	65.92	-0.64	65.28			AVG	117	264
3	4880.000	41.49	6.24	47.73	74.00	-26.27	peak	100	43
4	4880.000	28.85	6.24	35.09	54.00	-18.91	AVG	100	43
5	7320.000	42.57	12.13	54.70	74.00	-19.30	peak	100	320
6	7320.000	27.64	12.13	39.77	54.00	-14.23	AVG	100	320
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M									
NO.	FREQ. (MHz)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	Det.	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)
1*	2440.000	94.33	-0.64	93.69			peak	100	216
2*	2440.000	63.66	-0.64	63.02			AVG	100	216
3	4880.000	40.71	6.24	46.95	74.00	-27.05	peak	100	180
4	4880.000	28.87	6.24	35.11	54.00	-18.89	AVG	100	180
5	7320.000	42.15	12.13	54.28	74.00	-19.72	peak	100	154
6	7320.000	27.61	12.13	39.74	54.00	-14.26	AVG	100	154

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).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M									
NO.	FREQ. (MHz)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	Det.	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)
1*	2480.000	95.94	-0.52	95.42			peak	275	215
2*	2480.000	67.79	-0.52	67.27			AVG	275	215
3	2483.500	46.26	-0.51	45.75	74.00	-28.25	peak	275	215
4	2483.500	43.50	-0.51	42.99	54.00	-11.01	AVG	275	215
5	4960.000	40.68	6.09	46.77	74.00	-27.23	peak	100	297
6	4960.000	27.42	6.09	33.51	54.00	-20.49	AVG	100	297
7	7440.000	39.99	12.53	52.52	74.00	-21.48	peak	100	184
8	7440.000	26.95	12.53	39.48	54.00	-14.52	AVG	100	184
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M									
NO.	FREQ. (MHz)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	Det.	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)
1*	2480.000	94.48	-0.52	93.96			peak	100	219
2*	2480.000	65.96	-0.52	65.44			AVG	100	219
3	2483.500	51.85	-0.51	51.34	74.00	-22.66	peak	100	219
4	2483.500	41.53	-0.51	41.02	54.00	-12.98	AVG	100	219
5	4960.000	40.01	6.09	46.10	74.00	-27.90	peak	100	257
6	4960.000	27.44	6.09	33.53	54.00	-20.47	AVG	100	257
7	7440.000	40.54	12.53	53.07	74.00	-20.93	peak	100	233
8	7440.000	26.98	12.53	39.51	54.00	-14.49	AVG	100	233

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).
3. The emission levels of other frequencies were less than 20dB margin against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.

4.3 6DB BANDWIDTH MEASUREMENT

4.3.1 LIMITS OF 6dB BANDWIDTH MEASUREMENT

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.3.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Spectrum Keysight	N9020A	MY51240612	2018/10/29	2019/10/28
Spectrum Analyzer Rohde&Schwarz	FSV-40N	101783	2018/12/11	2019/12/10
Power Meter10Hz~18GHz Tonscend	JS0806-2	188060126	2018-11-10	2019-11-09
Signal generator Keysight	N5182A	GB40051020	2018/10/29	2019/10/28
Signal generator Keysight	N5182A	MY47420944	2018/10/29	2019/10/28
Test Software Tonscend	JS0806-2	NA	NA	NA
Hygrothermograph Yuhuaze	HTC-1	NA	2018/10/30	2019/10/29

NOTES:

1. The test was performed in RF Oven room in Hwa-Hsing (Dongguan) Testing Co., Ltd..
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

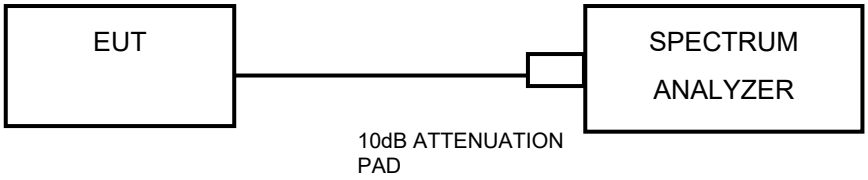
4.3.3 TEST PROCEDURE

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

4.3.4 DEVIATION FROM TEST STANDARD

No deviation.

4.3.5 TEST SETUP



4.3.6 EUT OPERATING CONDITIONS

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

4.3.7 TEST RESULTS

BT-LE (GFSK) (1 Mbps)

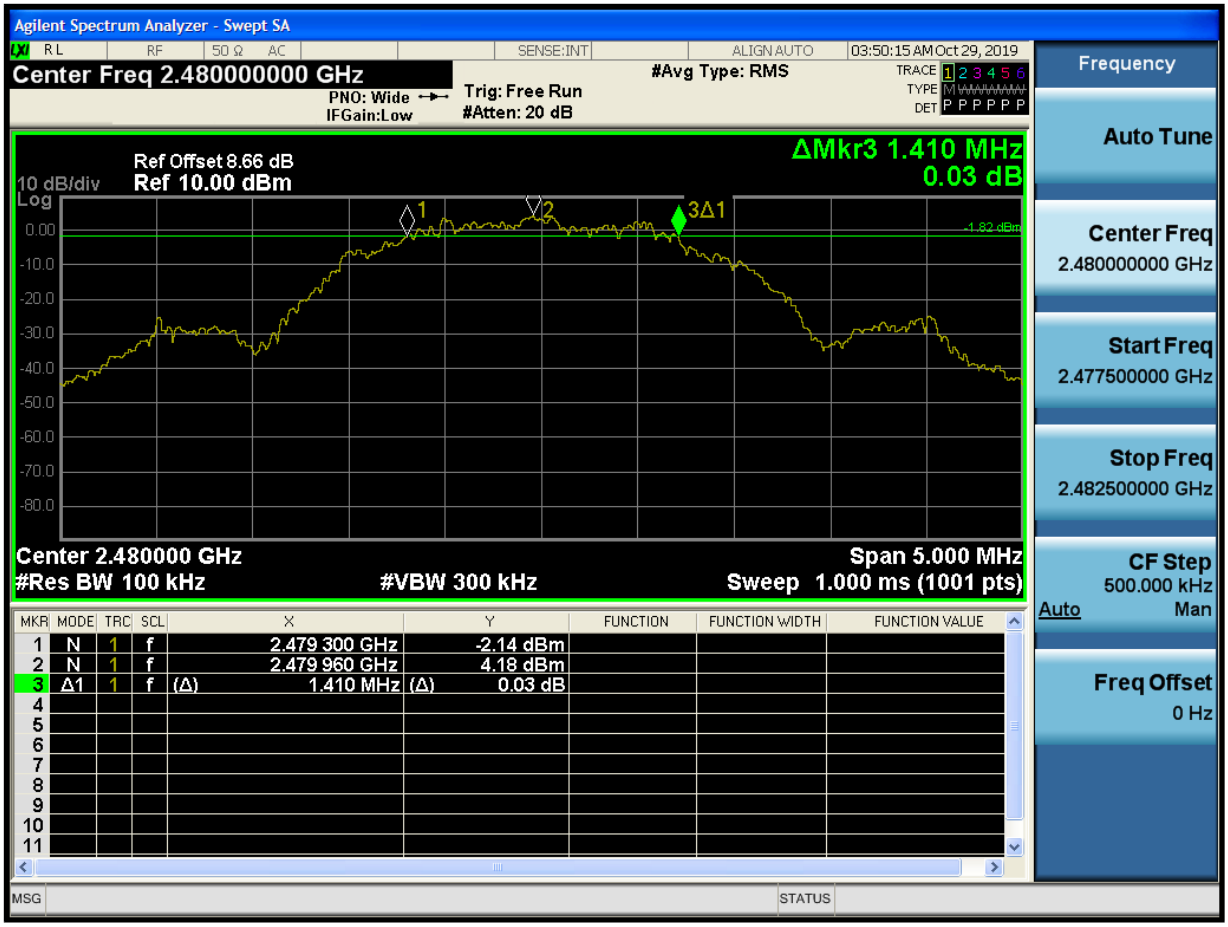
CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
0	2402	0.716	0.5	PASS
19	2440	0.708	0.5	PASS
39	2480	0.732	0.5	PASS

WORSE PLOT

BT-LE (GFSK) (2 Mbps)

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
0	2402	1.150	0.5	PASS
19	2440	1.280	0.5	PASS
39	2480	1.410	0.5	PASS

WORSE PLOT

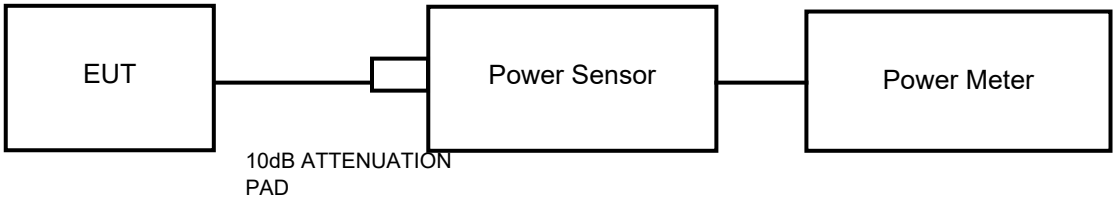


4.4 CONDUCTED OUTPUT POWER

4.4.1 LIMITS OF CONDUCTED OUTPUT POWER MEASUREMENT

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

4.4.2 TEST SETUP



4.4.3 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Spectrum Keysight	N9020A	MY51240612	2019/10/18	2020/10/17
Spectrum Analyzer Rohde&Schwarz	FSV-40N	101783	2019/10/18	2020/10/17
Power Meter10Hz~18GHz Tonscend	JS0806-2	188060126	2019/10/18	2020/10/17
Signal generator Keysight	N5182A	GB40051020	2019/10/18	2020/10/17
Signal generator Keysight	N5182A	MY47420944	2019/10/18	2020/10/17
Test Software Tonscend	JS0806-2	NA	NA	NA
Hygrothermograph Yuhuaze	HTC-1	NA	2019/10/18	2020/10/17

NOTES:

1. The test was performed in RF Oven room in Hwa-Hsing (Dongguan) Testing Co., Ltd..
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

4.4.4 TEST PROCEDURES

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

4.4.5 DEVIATION FROM TEST STANDARD

No deviation.

4.4.6 EUT OPERATING CONDITIONS

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

4.4.7 TEST RESULTS

4.4.7.1 MAXIMUM AVERAGE OUTPUT POWER

BT-LE (GFSK) (1 Mbps)

CHANNEL	CHANNEL FREQUENCY (MHz)	AVG POWER (dBm)	AVG POWER (mW)	AVG POWER LIMIT (W)	PASS/FAIL
0	2402	3.82	2.410	1	PASS
19	2440	3.50	2.239	1	PASS
39	2480	3.27	2.123	1	PASS

BT-LE (GFSK) (2 Mbps)

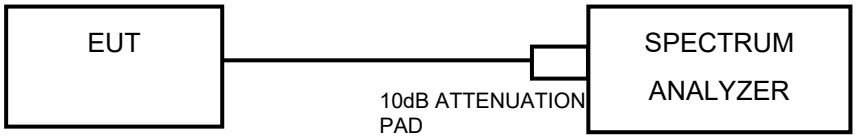
CHANNEL	CHANNEL FREQUENCY (MHz)	AVG POWER (dBm)	AVG POWER (mW)	AVG POWER LIMIT (W)	PASS/FAIL
0	2402	**5.09**	3.228	1	PASS
19	2440	5.22	3.327	1	PASS
39	2480	5.29	3.381	1	PASS

4.5 POWER SPECTRAL DENSITY MEASUREMENT

4.5.1 LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT

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

4.5.2 TEST SETUP



4.5.3 TEST INSTRUMENTS

Refer to section 4.4.3 to get information of above instrument.

4.5.4 TEST PROCEDURE

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

4.5.5 DEVIATION FROM TEST STANDARD

No deviation.

4.5.6 EUT OPERATING CONDITION

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

4.5.7 TEST RESULTS

BT-LE (GFSK) (1 Mbps)

Channel	FREQ. (MHz)	PSD (dBm/10kHz)	Limit (dBm/3kHz)	PASS /FAIL
0	2402	-5.715	8	PASS
19	2440	-6.121	8	PASS
39	2480	-5.295	8	PASS

WORSE PLOT

BT-LE (GFSK) (2 Mbps)

Channel	FREQ. (MHz)	PSD (dBm/10kHz)	Limit (dBm/3kHz)	PASS /FAIL
0	2402	-4.367	8	PASS
19	2440	-4.270	8	PASS
39	2480	-3.786	8	PASS

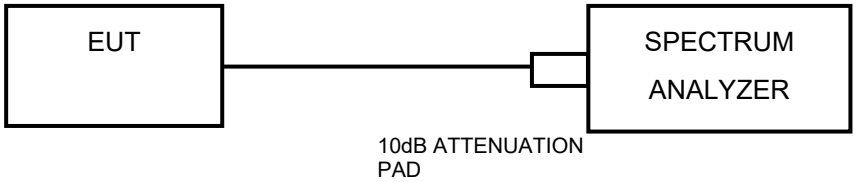
WORSE PLOT

4.6 OUT OF BAND EMISSION MEASUREMENT

4.6.1 LIMITS OF OUT OF BAND EMISSION MEASUREMENT

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

4.6.2 TEST SETUP



4.6.3 TEST INSTRUMENTS

Refer to section 4.4.3 to get information of above instrument.

4.6.4 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.

4.6.5 DEVIATION FROM TEST STANDARD

No deviation.

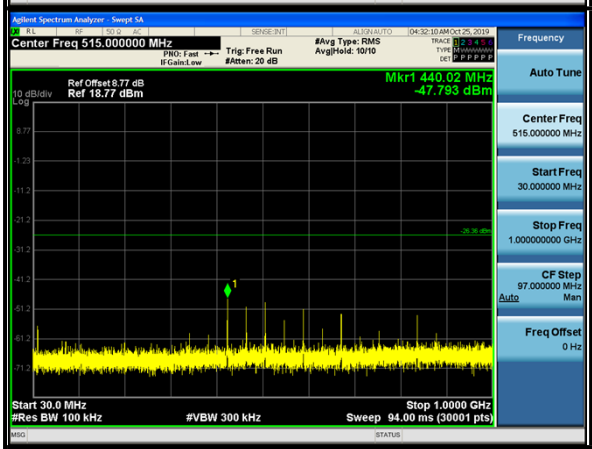
4.6.6 EUT OPERATING CONDITION

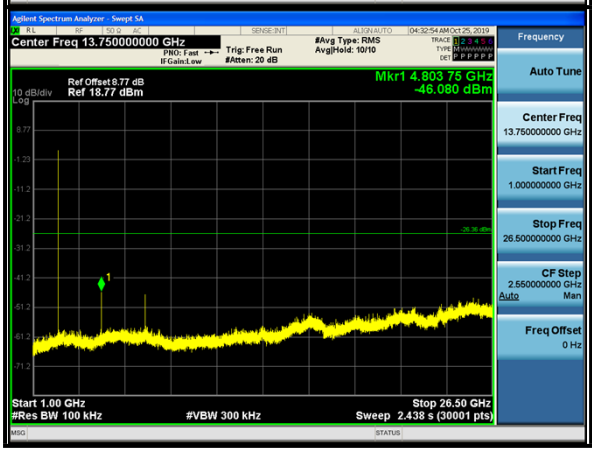
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.6.7 TEST RESULTS

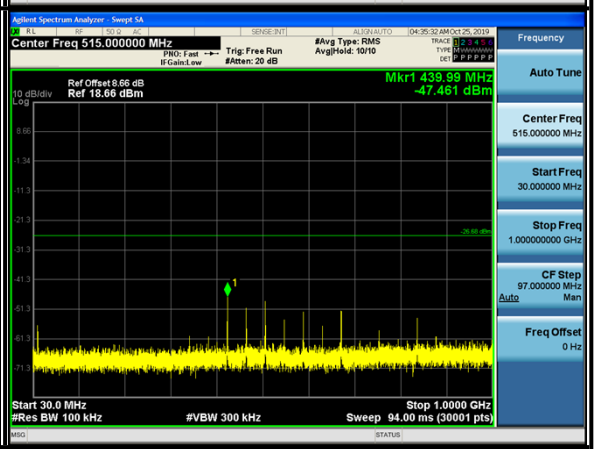
BT-LE (GFSK) (1 Mbps)

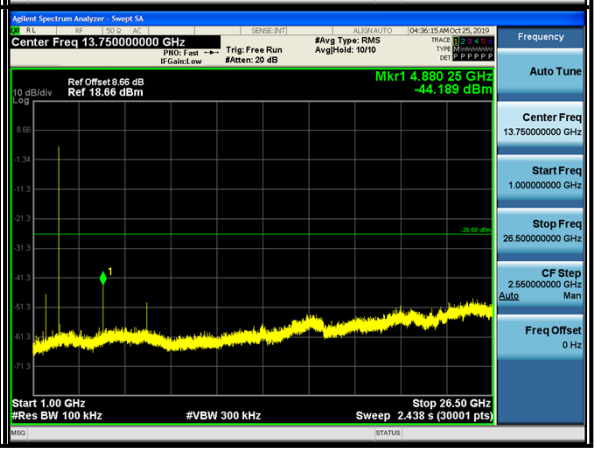
CH 0





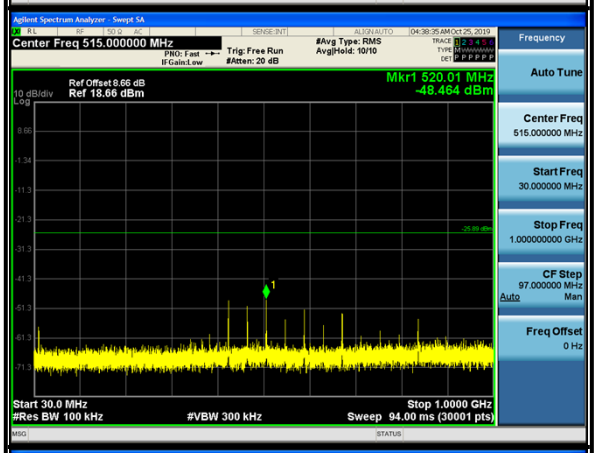
CH 19





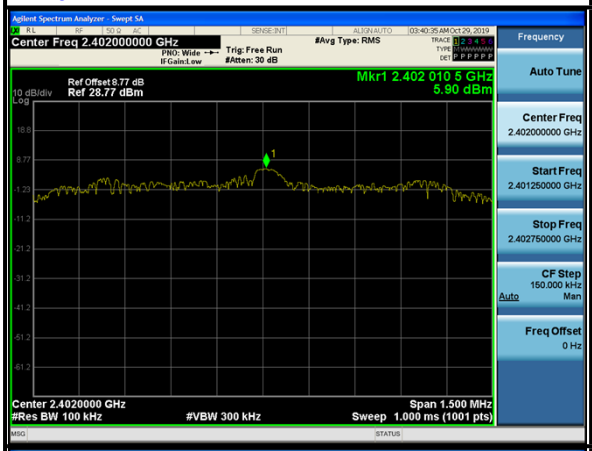
BT-LE (GFSK) (1 Mbps)

CH 39

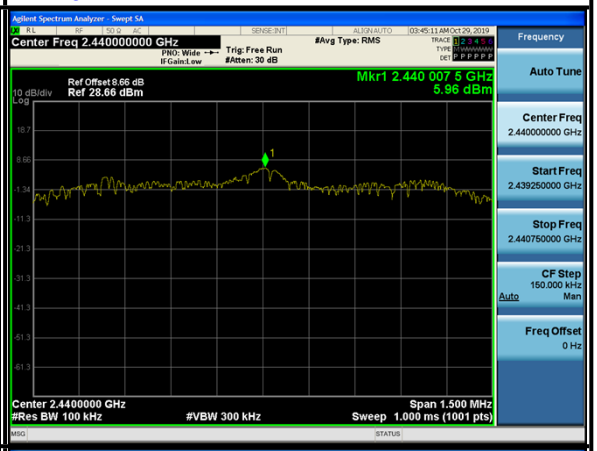


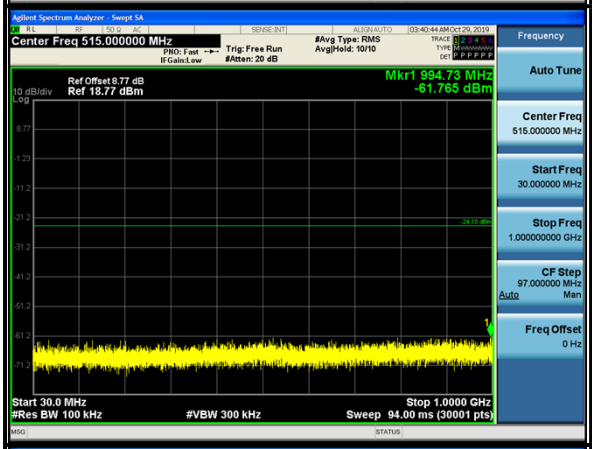
BT-LE (GFSK) (2 Mbps)

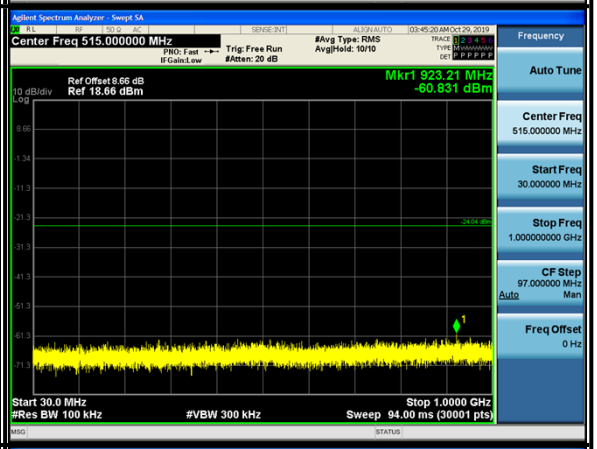
CH 0

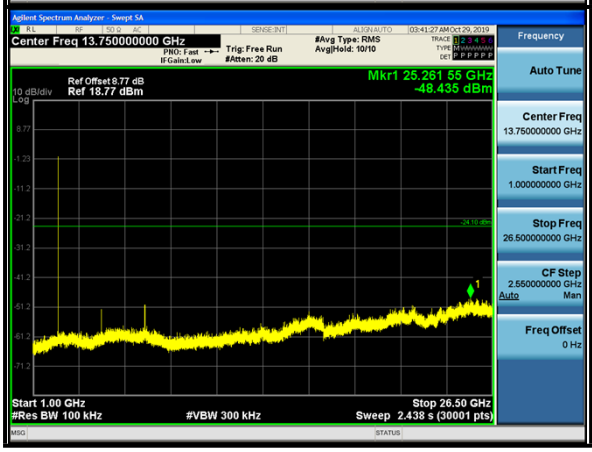


CH 19



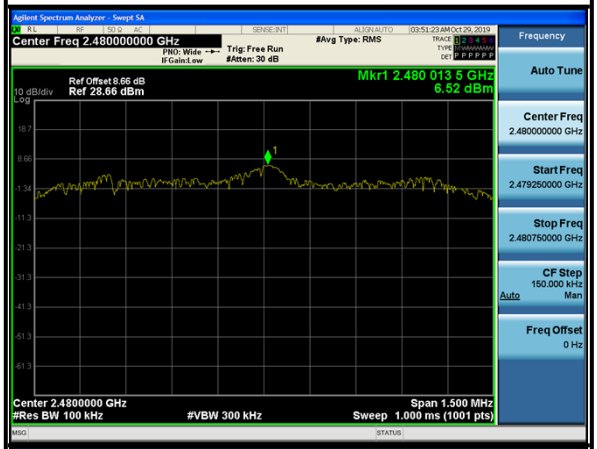


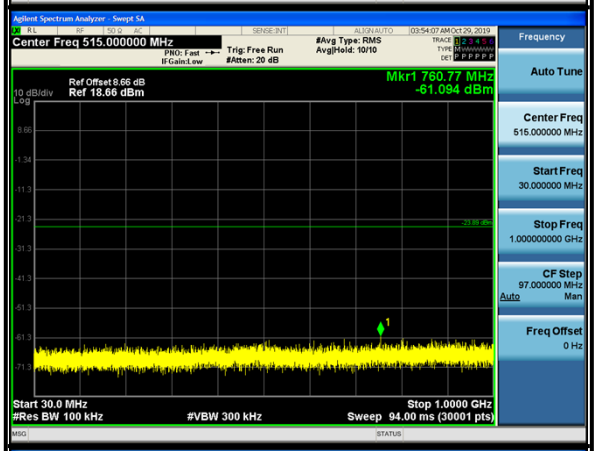


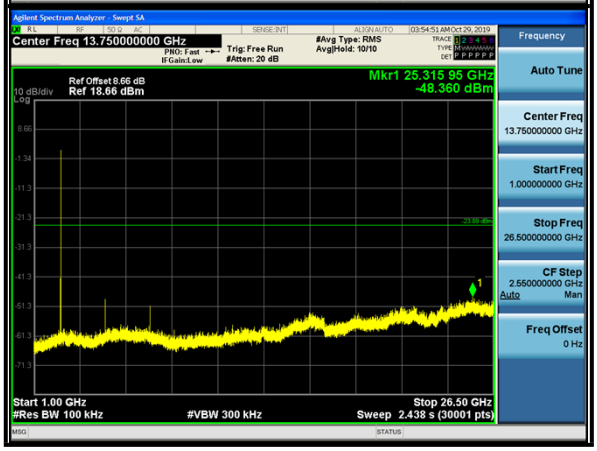


BT-LE (GFSK) (2 Mbps)

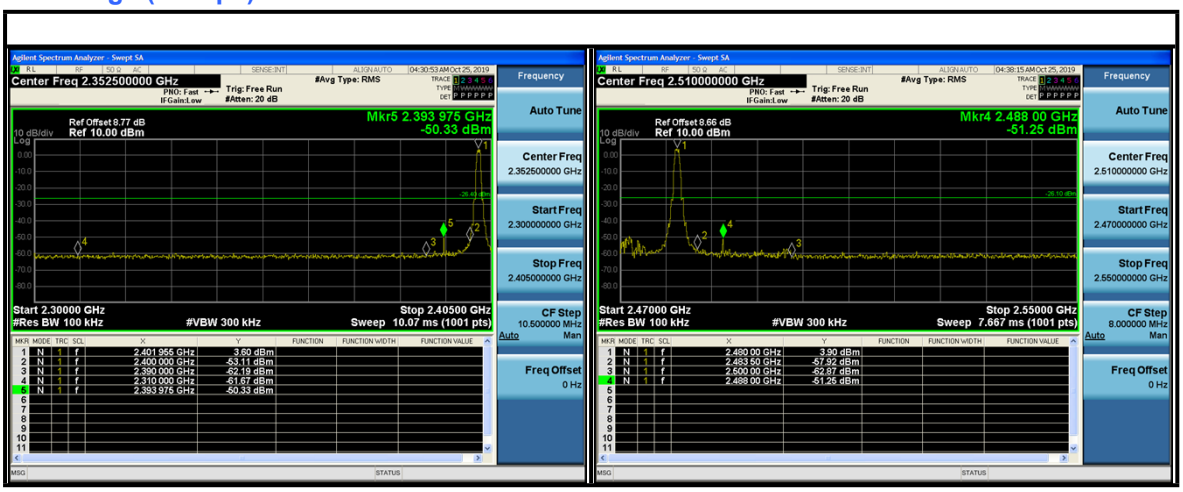
CH 39



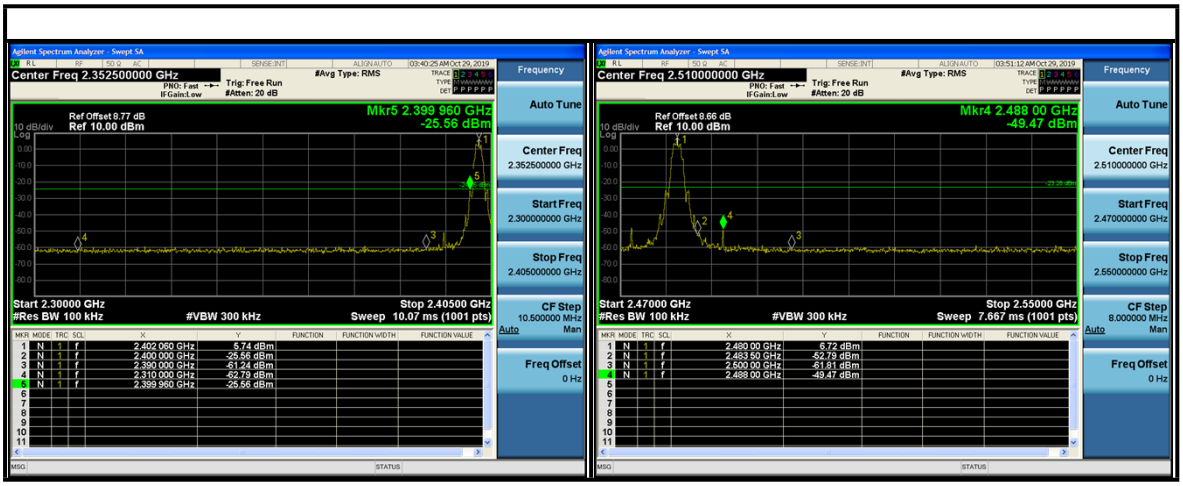




Band Edge (1 Mbps):



Band Edge (2 Mbps):



5 PHOTOGRAPHS OF THE TEST CONFIGURATION

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

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

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

---END---