Test Lab
Cert 2951.01

TEST REPORT

Applicant	Shenzhen Shen's Tongchuang Aeronautic Model Co., Ltd
Address	The opposition of Xinjiang Community Education Base, Guangming New District, Shenzhen, China

Manufacturer or Supplier	Shenzhen Shen's Tongchuang Aeronautic Model Co., Ltd
Address	The opposition of Xinjiang Community Education Base, Guangming New District, Shenzhen, China
Product	2.4GHz Transmitter
Brand Name	N/A
Model	005734
Additional Model & Model Difference	N/A
Date of tests	May 14 ~ Jun. 23, 2014

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

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

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

Tested by Venless Long Project Engineer / EMC Department	Approved by Glyn He Supervisor / EMC Department
	 Date: Jun. 24,2014

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF140514N026	Original release	Jun. 24,2014

1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart C			
STANDARD SECTION	**TEST TYPE AND LIMIT**	**RESULT**	**REMARK**
15.207	AC Power Conducted Emission	PASS	EUT is powered by battery
15.247(a)(1) (iii)	Number of Hopping Frequency Used	PASS	Meet the requirement of limit.
15.247(a)(1) (iii)	Dwell Time on Each Channel	PASS	Meet the requirement of limit.
15.247(a)(1)	1. Hopping Channel Separation 2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	PASS	Meet the requirement of limit.
15.247(b)	Maximum Peak Output Power	PASS	Meet the requirement of limit.
15.247(d)& 15.209	Transmitter Radiated Emissions	PASS	Meet the requirement of limit.
15.247(d)	Out of band Measurement	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	No antenna connector is used.

NOTE: If The Frequency Hopping System operating in 2400-2483.5MHz band and the output power less than 125mW. The hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of hopping channel whichever is greater.

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	9kHz~30MHz	2.67dB
Radiated emissions	9KHz ~ 30MHz	2.74 dB
	30MHz ~ 1GMHz	4.36dB
	1GHz ~ 18GHz	3.9 dB
	18GHz ~ 40GHz	1.94dB

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

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	2.4GHz Transmitter
MODEL NO.	005734
FCC ID	XUNSSTC-0002
POWER SUPPLY	DC 6V by Battery
MODULATION TECHNOLOGY	FHSS
MODULATION TYPE	GFSK
OPERATING FREQUENCY	2406MHz~2475MHz
NUMBER OF CHANNEL	70
MAX. OUTPUT POWER	19.93dBm
ANTENNA TYPE	Integral Wire Antenna with 0dBi gain
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	N/A

NOTE:

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.:140514N026) for detailed product photo.

3.2 DESCRIPTION OF TEST MODES

70 channels are provided to this EUT:

CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)
0	**2406**	18	2424	36	2442	54	2460
1	2407	19	2425	37	2443	55	2461
2	2408	20	2426	38	2444	56	2462
3	2409	21	2427	39	2445	57	2463
4	2410	22	2428	40	2446	58	2464
5	2411	23	2429	41	2447	59	2465
6	2412	24	2430	42	2448	60	2466
7	2413	25	2431	43	2449	61	2467
8	2414	26	2432	44	2450	62	2468
9	2415	27	2433	45	2451	63	2469
10	2416	28	2434	46	2452	64	2470
11	2417	29	2435	47	2453	65	2471
12	2418	30	2436	48	2454	66	2472
13	2419	31	2437	49	2455	67	2473
14	2420	32	2438	50	2456	68	2474
15	2421	33	2439	51	2457	**69**	**2475**
16	2422	34	2440	52	2458		
17	2423	**35**	**2441**	53	2459		

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 channel(s) was (were) selected for the final test as listed below:

Channel	Freq. (MHz)
Low	2406
Middle	2441
High	2475

Note: The more detailed channel, please refer to the product specifications

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
ANSI C63.10-2009

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 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	N/A	N/A	N/A	N/A	N/A

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

4 TEST TYPES AND RESULTS

4.1. RADIATED EMISSION AND BANDEDGE MEASUREMENT

4.1.1 LIMITS OF RADIATED EMISSION AND BANDEDGE MEASUREMENT

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a). Other emissions shall be at least 20dB below the highest level of the desired power.

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

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. 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.

4.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Spectrum Analyzer	Agilent	E4446A	MY46180622	Apr. 29,14	Apr. 28,15
EMI Test Receiver	Rohde&Schwarz	ESVS10	841431/004	May 17,14	May 16,15
Loop antenna (9kHz~30MHz)	Daze	ZN30900A	0708	Dec. 05,13	Dec. 04,14
Bilog Antenna (20MHz -2GHz)	Teseq	CBL 6111D	30643	Jul. 27, 13	Jul. 26, 14
Horn Antenna (1GHz -18GHz)	ETS -Lindgren	3117	00062558	Oct. 18, 12	Oct. 17, 14
Horn Antenna (15GHz-40GHz)	SCHWARZBECK	BBHA 9170	BBHA9170242	Feb. 13,14	Feb. 12,15
Pre-Amplifier (9kHz~1GHz)	SONOMA	310D	186955	Mar. 05,14	Mar. 04,15
Signal Amplifier	Agilent	8447D	2944A10488	Jun. 25,13	Jun. 24,14
Pre-Amplifier (100MHz-26.5GHz)	Agilent	8449B	3008A00409	May 13,14	May 12,15
Pre-Amplifier (18GHz-40GHz)	EMCI	EMC 184045	980102	Nov. 04,13	Nov. 03,14
3m Semi-anechoic Chamber	ETS-LINDGREN	9m*6m*6m	NSEMC003	Jul. 27,13	Jul. 26, 14
Digital Multimeter	FLUKE	15B	A1220010DG	Oct. 30, 13	Oct. 29, 14
Test Software	ADT	ADT_Radiated_V7.6.15.9.2	N/A	N/A	N/A

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 966 Chamber.
3. The FCC Site Registration No. is 502831.

4.1.3 TEST PROCEDURES

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter 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. 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.

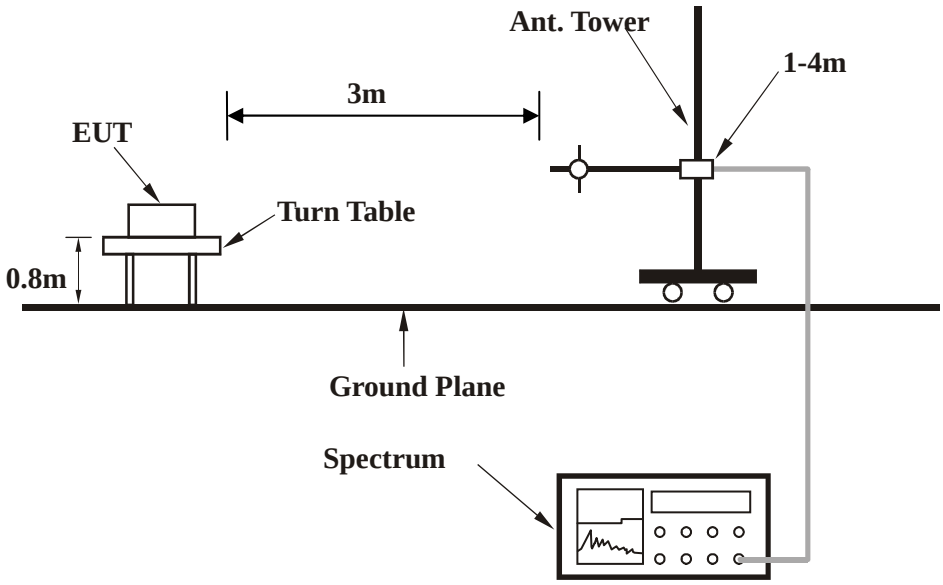
NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection 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. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 DEVIATION FROM TEST STANDARD

No deviation.

4.1.5 TEST SETUP



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

4.1.6 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.

4.1.7 TEST RESULTS

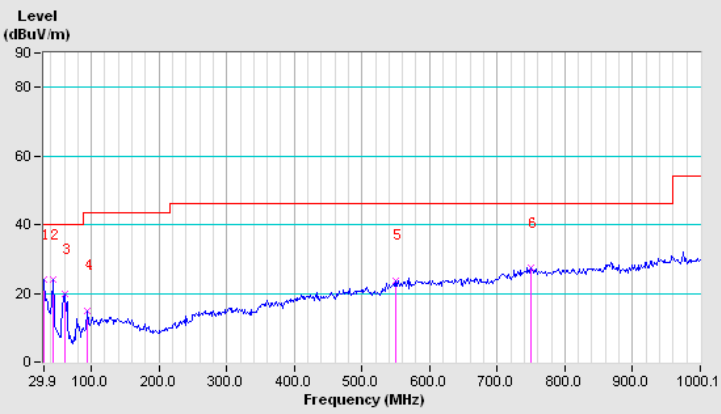
BELOW 1GHz WORST-CASE DATA

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	30.00	24.1 QP	40.0	-15.9	1.00 H	176	4.36	19.75
2	42.84	24.0 QP	40.0	-16.0	1.00 H	98	10.48	13.49
3	60.62	19.8 QP	40.0	-20.3	1.00 H	133	13.66	6.09
4	94.58	15.0 QP	43.5	-28.5	1.00 H	144	3.60	11.44
5	548.96	23.8 QP	46.0	-22.2	1.00 H	196	-0.46	24.26
6	749.47	27.5 QP	46.0	-18.5	1.00 H	156	-0.39	27.88

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 other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.

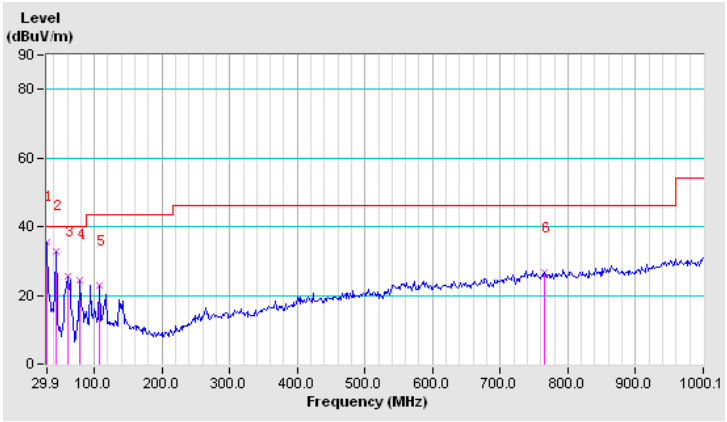


CHANNEL	Low	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 1GHz		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	**30.00**	**35.6 QP**	**40.0**	**-4.4**	**1.00 V**	**0**	**15.89**	**19.75**
2	42.84	33.0 QP	40.0	-7.0	1.00 V	0	19.47	13.49
3	60.62	25.7 QP	40.0	-14.4	1.00 V	0	19.56	6.09
4	78.41	24.6 QP	40.0	-15.4	1.00 V	0	16.95	7.64
5	107.52	22.8 QP	43.5	-20.7	1.00 V	0	10.00	12.77
6	765.63	26.5 QP	46.0	-19.5	1.00 V	0	-1.51	28.03

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 other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.



ABOVE 1GHz DATA

CHANNEL	Low	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	55.4 PK	74.0	-18.6	1.00 H	204	19.43	35.97
2	2390.00	42.2 AV	54.0	-11.8	1.00 H	204	6.23	35.97
3	#2400.00	58.6 PK	82.5	-23.9	1.00 H	22	22.62	35.98
4	#2400.00	45.5 AV	77.6	-32.1	1.00 H	22	9.52	35.98
5	*2406.00	102.5 PK	-	-	1.00 H	21	66.51	35.99
6	*2406.00	97.6 AV	-	-	1.00 H	21	61.61	35.99
7	4812.00	55.8 PK	74.0	-18.2	1.00 H	131	16.44	39.36
8	4812.00	51.4 AV	54.0	-2.6	1.00 H	131	12.04	39.36
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	58.2 PK	74.0	-15.8	1.02 V	106	22.23	35.97
2	2390.00	45.6 AV	54.0	-8.4	1.02 V	106	9.63	35.97
3	#2400.00	68.1 PK	96.8	-28.7	1.10 V	52	32.12	35.98
4	#2400.00	50.7 AV	91.6	-40.9	1.10 V	52	14.72	35.98
5	*2406.00	116.8 PK	-	-	1.15 V	282	80.81	35.99
6	*2406.00	111.6 AV	-	-	1.15 V	282	75.61	35.99
7	4812.00	56.4 PK	74.0	-17.7	1.15 V	281	16.99	39.36
8	**4812.00**	**51.9 AV**	**54.0**	**-2.1**	**1.15 V**	**281**	**12.54**	**39.36**

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 other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.
6. " # ": The radiated frequency is out of the restricted band.

CHANNEL	Middle	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2441.00	101.0 PK	-	-	1.00 H	214	64.97	36.03
2	*2441.00	86.5 AV	-	-	1.00 H	214	50.47	36.03
3	4882.00	54.4 PK	74.0	-19.6	1.00 H	215	15.02	39.38
4	4882.00	48.7 AV	54.0	-5.3	1.00 H	215	9.32	39.38
5	7323.00	56.8 PK	74.0	-17.2	1.00 H	326	14.05	42.75
6	7323.00	48.2 AV	54.0	-5.8	1.00 H	326	5.45	42.75
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2441.00	113.9 PK	-	-	1.00 V	142	77.87	36.03
2	*2441.00	108.6 AV	-	-	1.00 V	142	72.57	36.03
3	4882.00	55.4 PK	74.0	-18.6	1.00 V	201	16.02	39.38
4	4882.00	48.6 AV	54.0	-5.4	1.00 V	201	9.22	39.38
5	7323.00	54.2 PK	74.0	-19.8	1.00 V	225	11.45	42.75
6	7323.00	38.4 AV	54.0	-15.6	1.00 V	225	-4.35	42.75

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 other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.

CHANNEL	High	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2475.00	101.9 PK	-	-	1.68 H	122	65.82	36.08
2	*2475.00	85.4 AV	-	-	1.68 H	122	49.32	36.08
3	2483.50	46.1 PK	74.0	-27.9	1.68 H	122	10.01	36.09
4	2483.50	31.7 AV	54.0	-22.3	1.68 H	122	-4.39	36.09
5	4950.00	55.1 PK	74.0	-18.9	1.40 H	316	15.71	39.39
6	4950.00	48.7 AV	54.0	-5.3	1.40 H	316	9.31	39.39
7	7425.00	56.2 PK	74.0	-17.8	1.52 H	30	13.54	42.66
8	7425.00	47.4 AV	54.0	-6.6	1.52 H	30	4.74	42.66
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2475.00	113.6 PK	-	-	1.13 V	107	77.52	36.08
2	*2475.00	108.5 AV	-	-	1.13 V	107	72.42	36.08
3	2483.50	63.2 PK	74.0	-10.8	1.13 V	107	27.11	36.09
4	2483.50	47.1 AV	54.0	-6.9	1.13 V	107	11.01	36.09
5	4950.00	54.2 PK	74.0	-19.8	1.00 V	340	14.81	39.39
6	4950.00	45.2 AV	54.0	-8.8	1.00 V	340	5.81	39.39
7	7425.00	49.5 PK	74.0	-24.5	1.05 V	240	6.84	42.66
8	7425.00	37.5 AV	54.0	-16.5	1.05 V	240	-5.16	42.66

REMARKS:

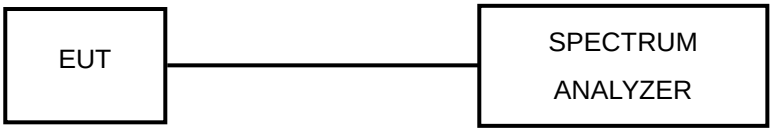
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.

4.2. NUMBER OF HOPPING FREQUENCY USED

4.2.1. LIMIT OF HOPPING FREQUENCY USED

At least 15 channels frequencies, and should be equally spaced.

4.2.2. TEST SETUP



4.2.3. TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Spectrum Analyzer (10Hz–40GHz)	Rohde&Schwarz	FSV40	101003	Apr. 09,14	Apr. 08,15
Power Meter	Anritsu	ML2495A	1139001	Feb. 21,14	Feb. 20,15
Power Sensor	Anritsu	MA2411B	1126068	Feb. 21,14	Feb. 20,15
Digital Multimeter	FLUKE	15B	A1220010DG	Oct. 30,13	Oct. 29,14
Humid & Temp Programmable Tester	Haida	HD-2257	110807201	Sep. 17,13	Sep. 16,14
Oscilloscope	Agilent	DSO9254A	MY51260160	Oct. 17, 13	Oct. 16, 14
Signal Analyzer	Rohde & Schwarz	FSV7	102331	Nov. 25,13	Nov. 24,14

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.

4.2.4. TEST PROCEDURES

a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.

b. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.

c. Set the SA on MaxHold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.

d. Set the SA on View mode and then plot the result on SA screen.

e. Repeat above procedures until all frequencies measured were completed.

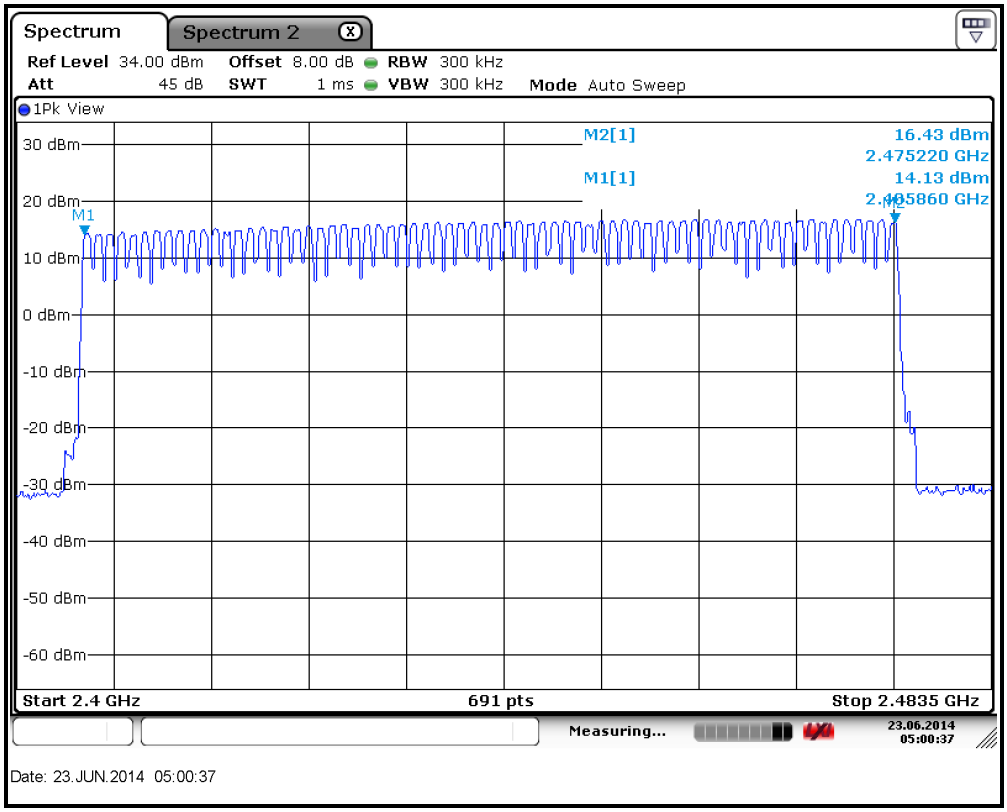
4.2.5. DEVIATION FROM TEST STANDARD

No deviation.

4.2.6. TEST RESULTS

There are 70 hopping frequencies in the hopping mode. Please refer to next page for the test result. On the plots, it shows that the hopping frequencies are equally spaced.

GFSK

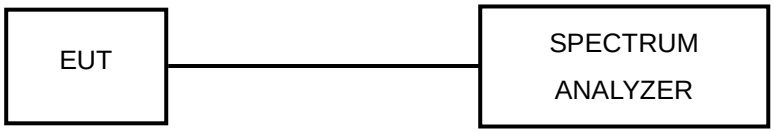

Spectrum
Spectrum 2
Ref Level 34.00 dBm Offset 8.00 dB RBW 300 kHz
Att 45 dB SWT 1 ms VBW 300 kHz Mode Auto Sweep
1Pk View
M2[1] 16.43 dBm
2.475220 GHz
M1[1] 14.13 dBm
2.405860 GHz
30 dBm
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
M1
Start 2.4 GHz
691 pts
Stop 2.4835 GHz
Measuring...
23.06.2014
05:00:37
Date: 23.JUN.2014 05:00:37

4.3. DWELL TIME ON EACH CHANNEL

4.3.1 LIMIT OF DWELL TIME USED

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

4.3.2 TEST SETUP



4.3.3 TEST INSTRUMENTS

Refer to section 4.2.3 to get information of above instrument.

4.3.4 TEST PROCEDURES

a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.

b. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.

c. Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.

d. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.

e. Repeat above procedures until all different time-slot modes have been completed.

4.3.5 DEVIATION FROM TEST STANDARD

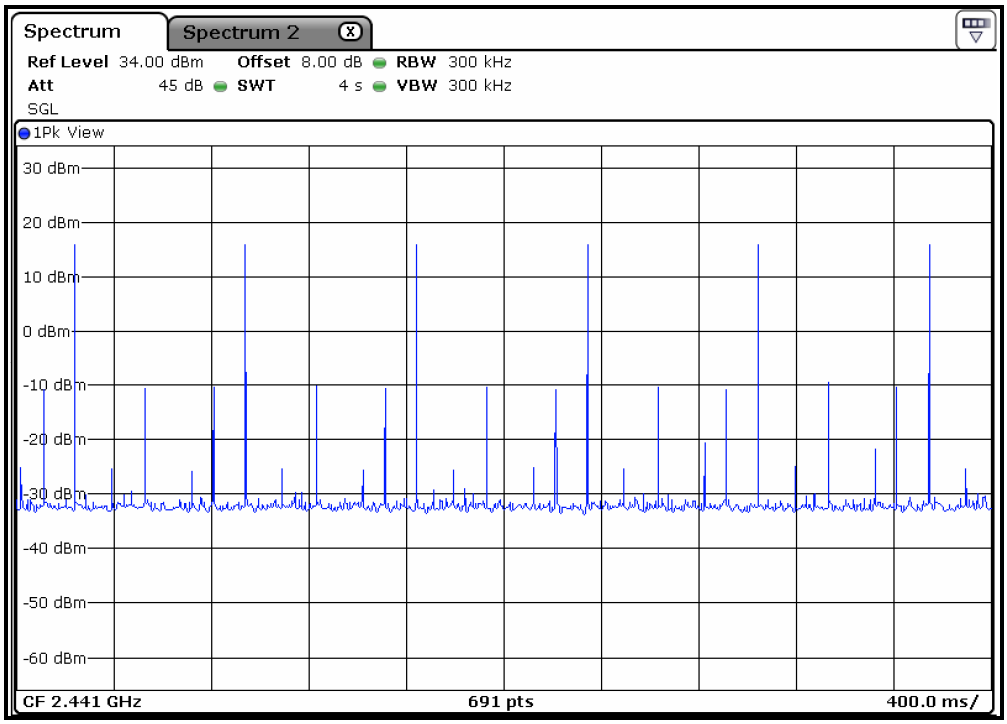
No deviation.

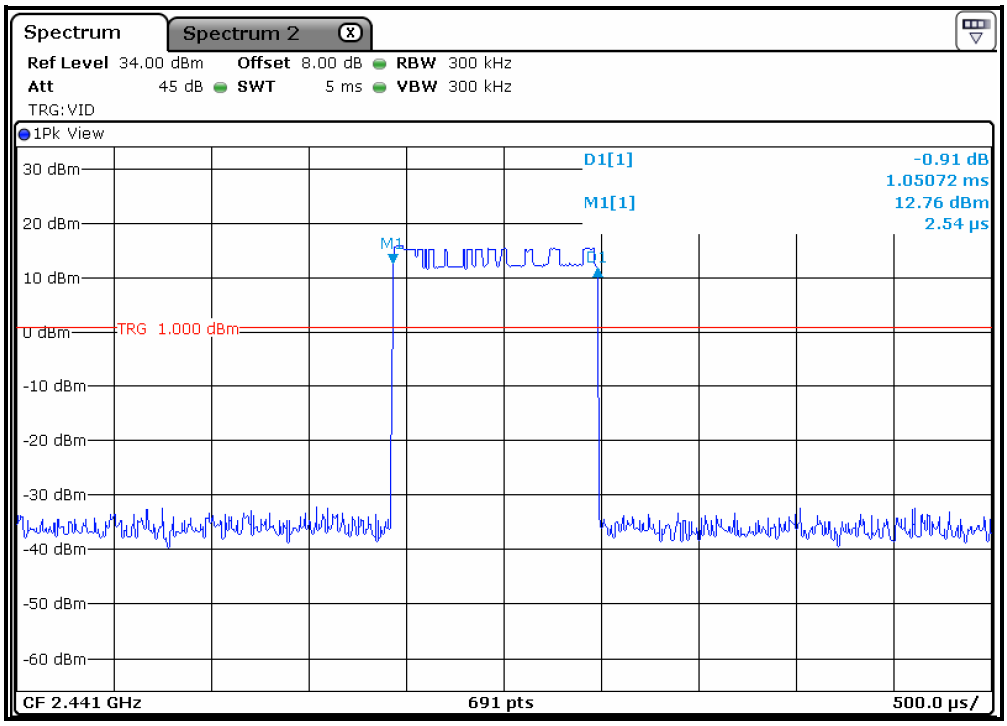
4.3.6 TEST RESULTS

GFSK

Mode	Number of Hopping Channel	Number of transmission in a period(channel number*0.4 sec)				Length of transmission time (msec)	Result (msec)	Limit (msec)	PASS / FAIL
		period (sec)	sweep time (sec)	times in a sweep	times in a period				
-	70	28	4	6	42	1.051	44.142	400	PASS

NOTE: Test plots of the transmitting time slot are shown on next page.



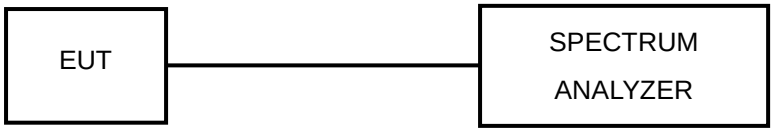

Spectrum
Spectrum 2
Ref Level 34.00 dBm
Offset 8.00 dB
RBW 300 kHz
Att 45 dB
SWT 5 ms
VBW 300 kHz
TRG: VID
1Pk View
D1[1]
-0.91 dB
1.05072 ms
M1[1]
12.76 dBm
2.54 µs
30 dBm
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
TRG 1.000 dBm
M1
D1
CF 2.441 GHz
691 pts
500.0 µs/

4.4. CHANNEL BANDWIDTH

4.4.1 LIMITS OF CHANNEL BANDWIDTH

For frequency hopping system operating in the 2400-2483.5MHz, if the 20dB bandwidth of hopping channel is greater than 25kHz, two-thirds 20dB bandwidth of hopping channel shell be a minimum limit for the hopping channel separation.

4.4.2 TEST SETUP



4.4.3 TEST INSTRUMENTS

Refer to section 4.2.3 to get information of above instrument.

4.4.4 TEST PROCEDURE

a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.

c. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.

d. Repeat above procedures until all frequencies measured were complete.

4.4.5 DEVIATION FROM TEST STANDARD

No deviation.

4.4.6 EUT OPERATING CONDITION

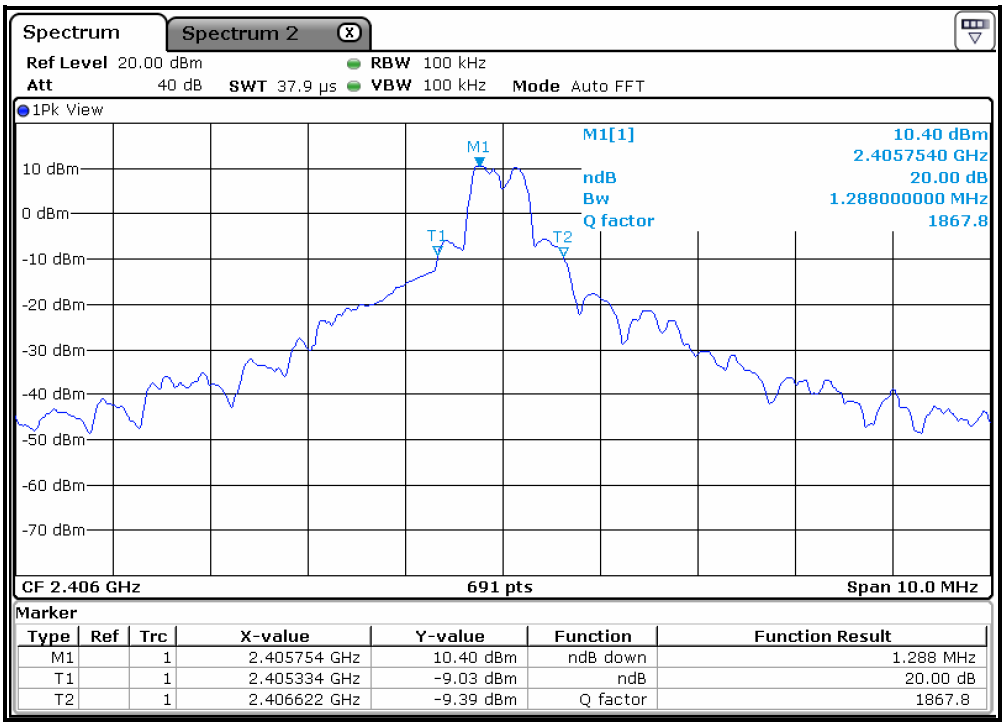
Same as item 4.1.6

4.4.7 TEST RESULTS

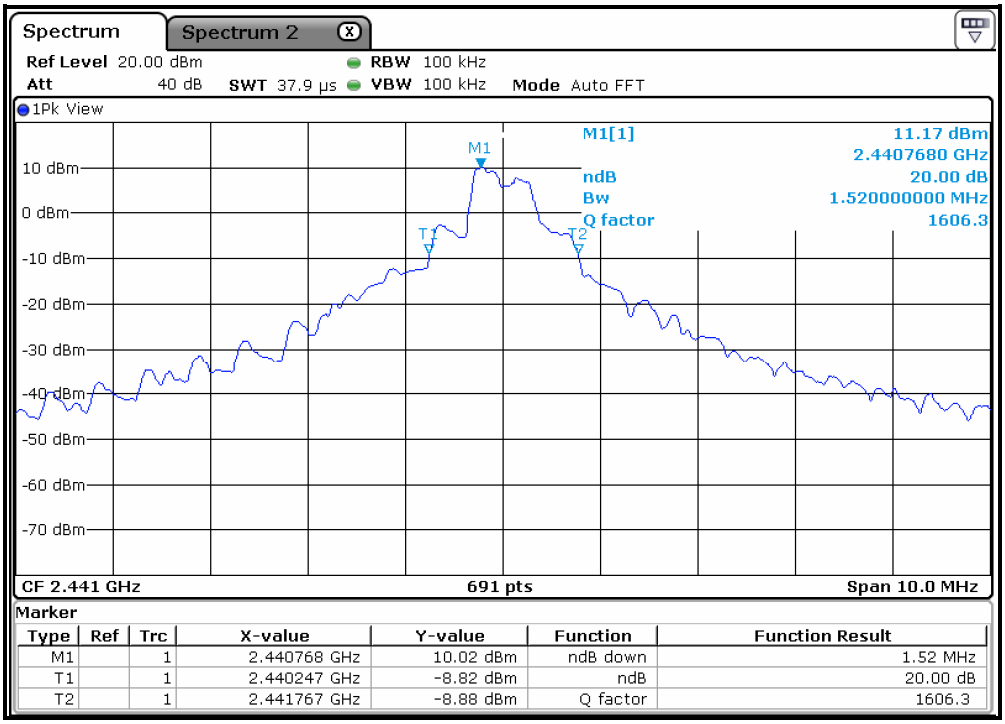
GFSK

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
Low	2406	1.288
Middle	2441	1.484
High	2475	1.491

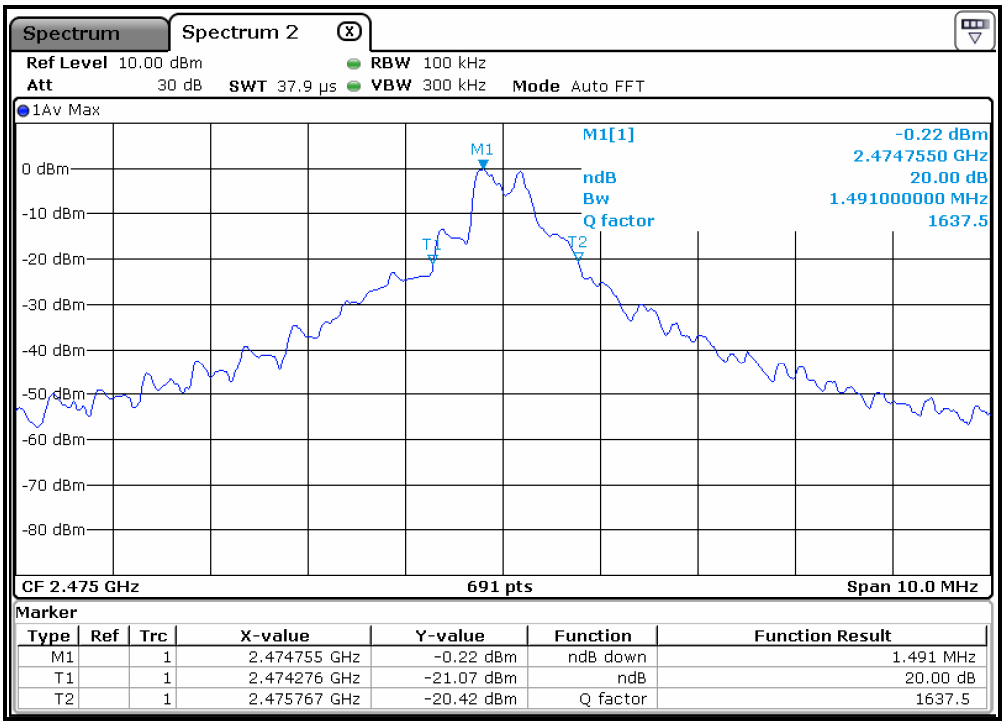
CH Low



CH Middle



CH High

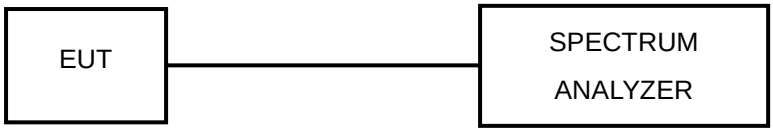


4.5. HOPPING CHANNEL SEPARATION

4.5.1. LIMIT OF HOPPING CHANNEL SEPARATION

At least 25kHz or two-third of 20dB hopping channel bandwidth (whichever is greater).

4.5.2. TEST SETUP



4.5.3. TEST INSTRUMENTS

Refer to section 4.2.3 to get information of above instrument.

4.5.4. TEST PROCEDURES

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.
3. By using the MaxHold function record the separation of two adjacent channels.
4. Measure the frequency difference of these two adjacent channels by SA MARK function. And then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

4.5.5. DEVIATION FROM TEST STANDARD

No deviation.

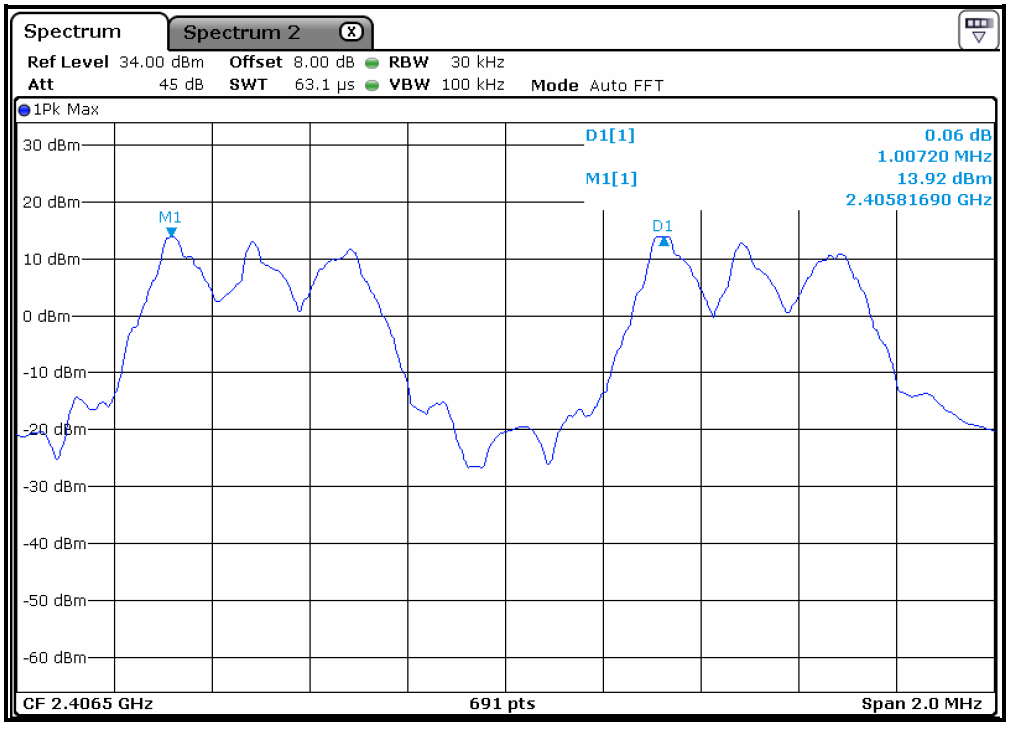
4.5.6. TEST RESULTS

GFSK

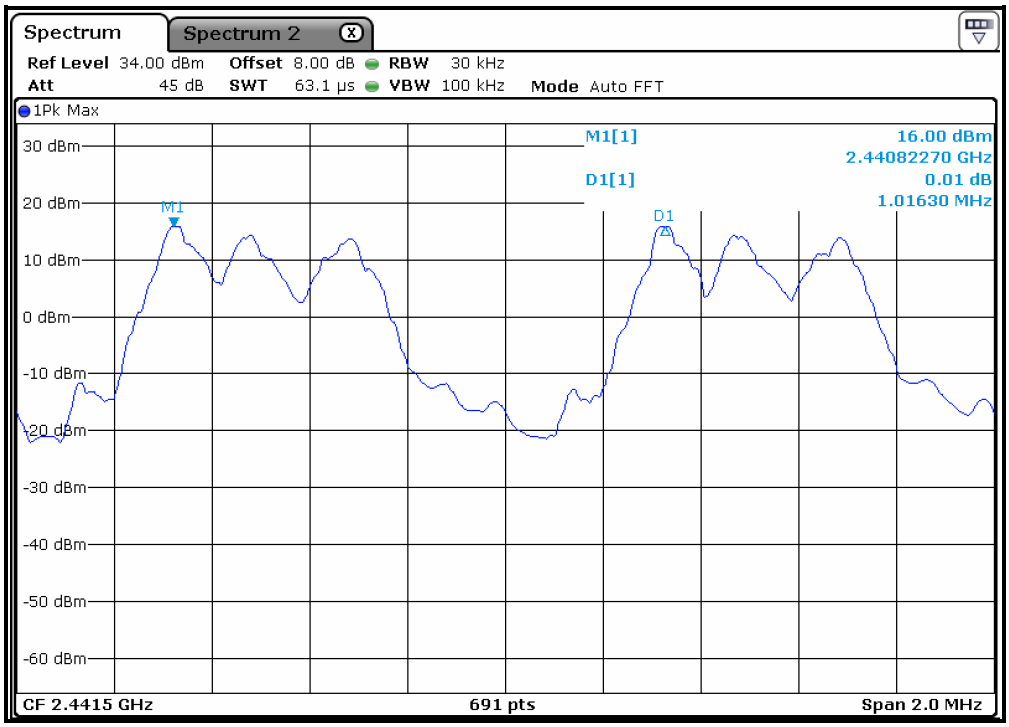
CHANNEL	FREQUENCY (MHz)	ADJACENT CHANNEL SEPARATION (MHz)	20dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
Low	2406	1.01	1.288	0.86	PASS
Middle	2441	1.01	1.520	1.01	PASS
High	2475	1.00	1.491	0.99	PASS

NOTE: The minimum limit is 2/3 * 20dB bandwidth. Test results please refer to following graph.

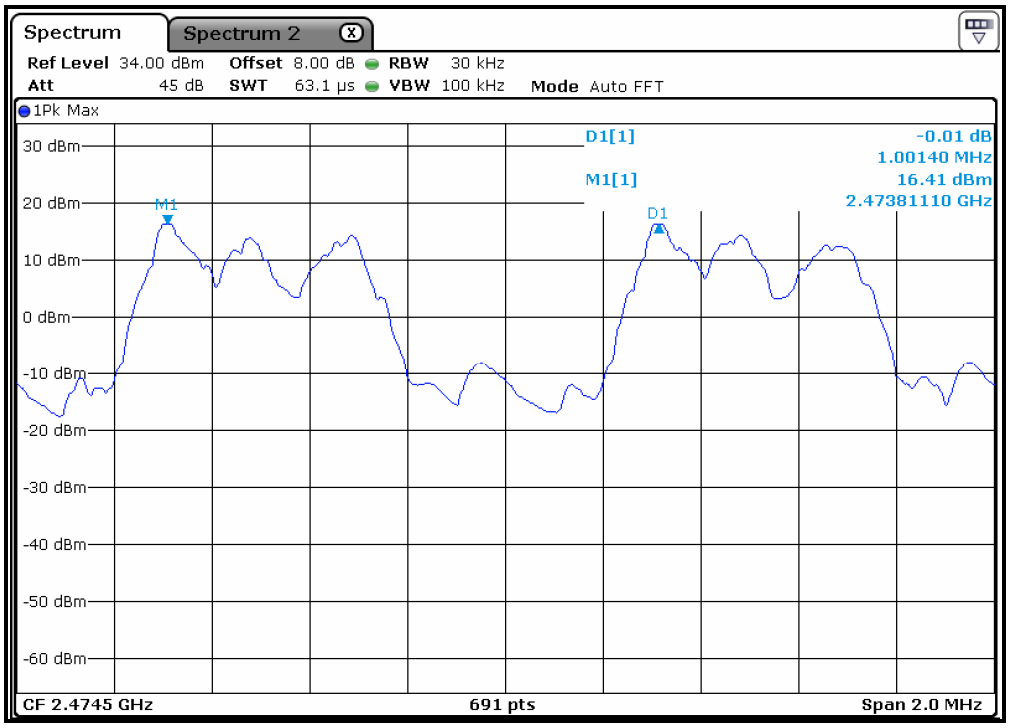
CH Low



CH Middle



CH High

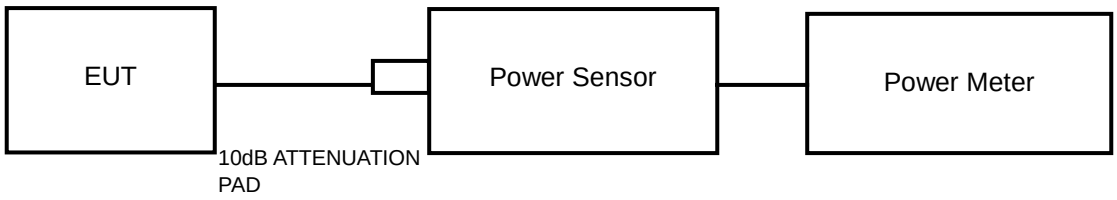


4.6. MAXIMUM OUTPUT POWER

4.6.1 LIMITS OF MAXIMUM OUTPUT POWER MEASUREMENT

The Maximum Output Power Measurement is 125mW.

4.6.2 TEST SETUP



4.6.3 TEST INSTRUMENTS

Refer to section 4.2.3 to get information of above instrument.

4.6.4 TEST PROCEDURES

A 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.

4.6.5 DEVIATION FROM TEST STANDARD

No deviation.

4.7.6 EUT OPERATING CONDITION

Same as item 4.1.6.

4.6.7 TEST RESULTS

GFSK

CHANNEL	CHANNEL FREQUENCY (MHz)	POWER OUTPUT (dBm)	POWER OUTPUT (mW)	POWER LIMIT (mW)	PASS/FAIL
Low	2406	19.93	98.401	125	PASS
Middle	2441	19.86	96.828	125	PASS
High	2475	19.74	94.189	125	PASS

4.7. OUT OF BAND MEASUREMENT

4.7.1 LIMITS OF out of band MEASUREMENT

Below –20dB of the highest emission level of operating band (in 100KHz RBW).

4.7.2 TEST INSTRUMENTS

Refer to section 4.2.3 to get information of above instrument.

4.7.3 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer via a low lose cable. Set both RBW and VBW of spectrum analyzer to 100 kHz. The band edges was measured and recorded.

4.7.4 DEVIATION FROM TEST STANDARD

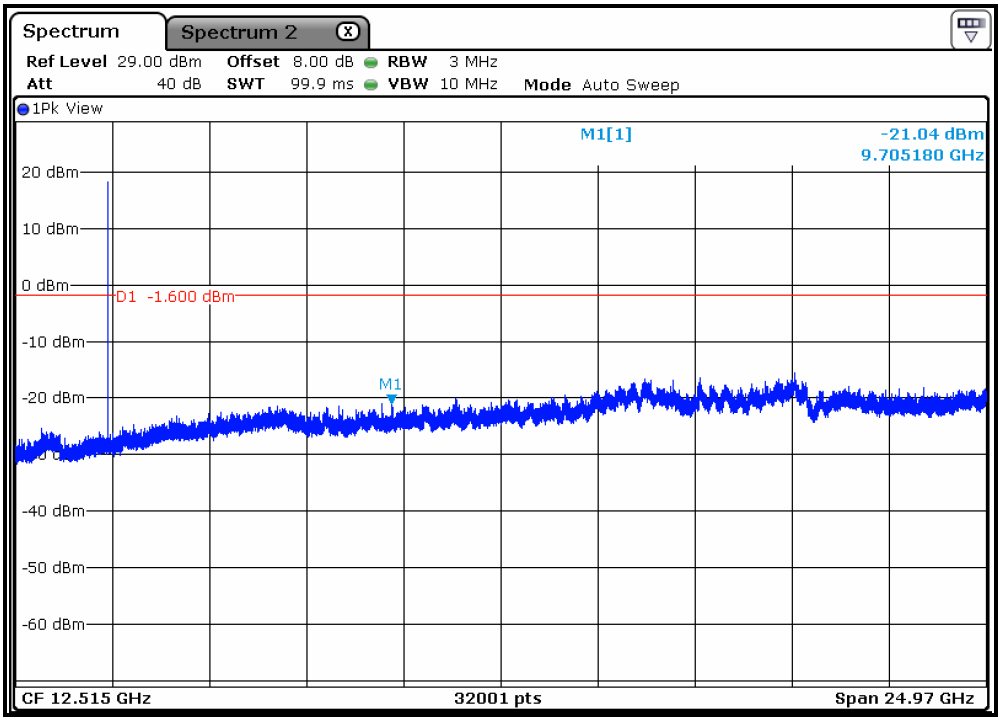
No deviation.

4.7.5 EUT OPERATING CONDITION

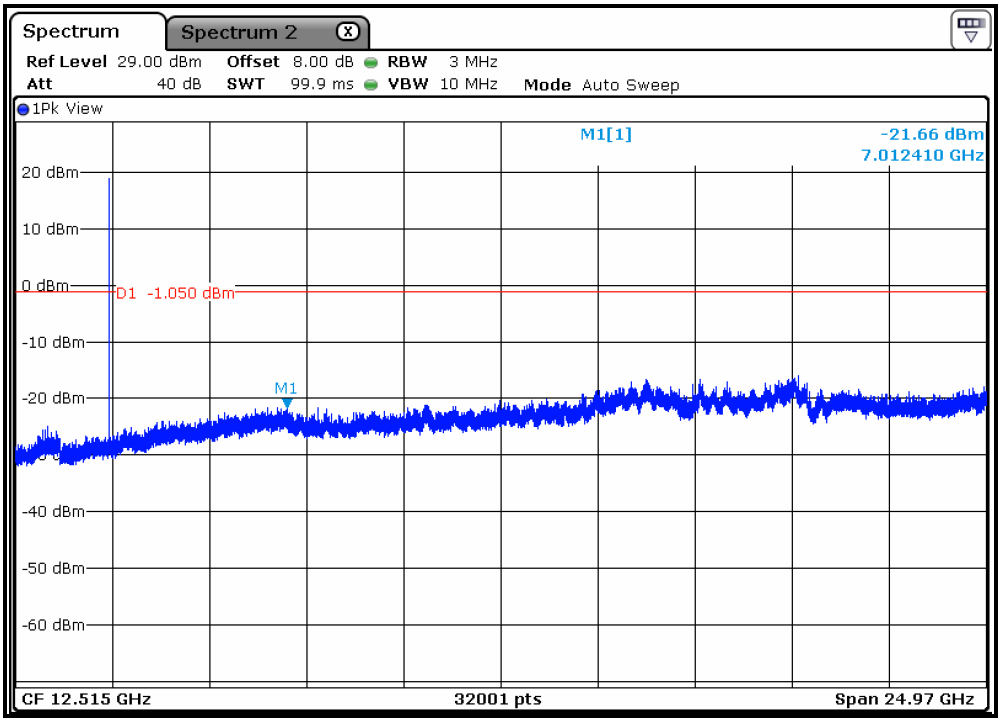
Same as item 4.2.6

4.7.6 TEST RESULTS

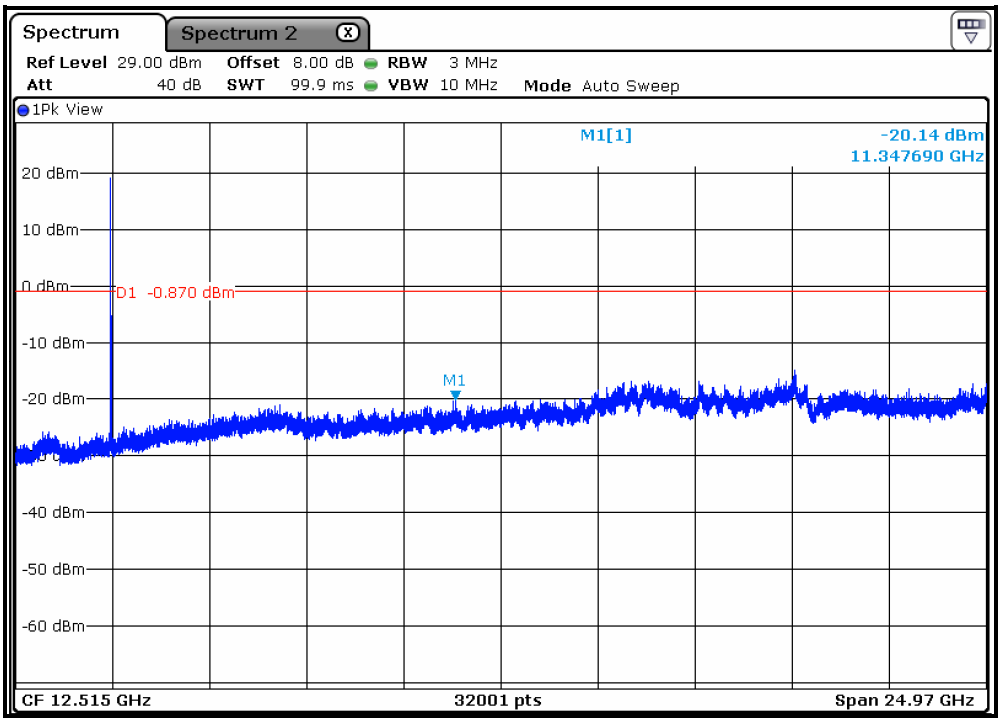
CH Low



CH Middle



CH High


Spectrum
Spectrum 2
Ref Level 29.00 dBm Offset 8.00 dB RBW 3 MHz
Att 40 dB SWT 99.9 ms VBW 10 MHz Mode Auto Sweep
1Pk View
M1[1] -20.14 dBm
11.347690 GHz
20 dBm
10 dBm
0 dBm
D1 -0.870 dBm
-10 dBm
-20 dBm
-40 dBm
-50 dBm
-60 dBm
M1
CF 12.515 GHz
32001 pts
Span 24.97 GHz

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---