FCC Test Report

Report No.:	RFBHKB-WTW-P22041038-2
FCC ID:	S4L4GF41
Test Model:	4GF41
Received Date:	Apr. 29, 2022
Test Date:	Jun. 25 ~ Jun. 28, 2022
Issued Date:	Nov. 29, 2022
Applicant:	TomTom International B.V.
Address:	De Ruijterkade 154, 1011 AC Amsterdam The Netherlands
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan
Test Location:	No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN
FCC Registration / Designation Number:	788550 / TW0003

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Release Control Record

Issue No.	Description	Date Issued
RFBHKB-WTW-P22041038-2	Original release	Nov. 29, 2022

1 Certificate of Conformity

Product:	GPS Navigation System
Brand:	TOMTOM
Test Model:	4GF41
Sample Status:	Mass product
Applicant:	TomTom International B.V.
Test Date:	Jun. 25 ~ Jun. 28, 2022
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.247) ANSI C63.10:2013

This report is issued as a supplementary report of RF171213C12-2. This report shall be used combined together with its original report.

Prepared by : Celine Chou , **Date:** Nov. 29, 2022

Celine Chou / Senior Specialist

Approved by : Jeremy Lin , **Date:** Nov. 29, 2022

Jeremy Lin / Project Engineer

Note: Radiated emissions and band edge are performed for the addendum. Refer to original report for the other test data.

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	N/A	EUT is powered from DC
15.247(a)(1)(iii)	Number of Hopping Frequency Used	N/A	Refer to Note 1
15.247(a)(1)(iii)	Dwell Time on Each Channel	N/A	Refer to Note 1
15.247(a)(1)	1. Hopping Channel Separation 2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	N/A	Refer to Note 1
15.247(a)(1)	Maximum Peak Output Power	N/A	Refer to Note 1
15.205 & 209 & 15.247(d)	Radiated Emissions & Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -2.1dB at 30.97MHz.
15.247(d)	Antenna Port Emission	N/A	Refer to Note 1
15.203	Antenna Requirement	Pass	No antenna connector is used.

Note:

1. Radiated emissions and band edge are performed for the addendum. Refer to original report for the other test data.
2. For 2.4G band compliance with rule 15.247(d) of the band-edge items, the test plots were recorded in Annex A. Test Procedures refer to report 4.1.3.
3. 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.
4. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.04 dB
	30MHz ~ 200MHz	3.59 dB
	200MHz ~1000MHz	3.60 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	GPS Navigation System
Brand	TOMTOM
Test Model	4GF41
Sample Status	Mass product
Power Supply Rating	3.6Vdc (Battery) 5Vdc (Car Charger or Bike Docking or Car Docking)
Modulation Type	GFSK, π/4-DQPSK, 8DPSK
Modulation Technology	FHSS
Transfer Rate	1/2/3Mbps
Operating Frequency	2402~2480MHz
Number of Channel	79
Output Power	1.570mW
Antenna Type	Chip antenna with -1.2dBi gain
Antenna Connector	NA
Accessory Device	Refer to note
Data Cable Supplied	Refer to note

Note:

1. This report is prepared for FCC class II permissive change. The differences compared with the original report no. RF171213C12-2 changing display bridge IC, minor changing of layout, DDR changing and FW changing (Does not affect RF characteristics). Therefore, only radiated emissions and band edge for worst channel are performed for the addendum. Refer to original report for the other test data.
2. The EUT has two kinds of capacities for sale (8GB and 16GB), after pre-tested found 16GB was the worse, therefore chosen for final test and presented in the test report.
3. The EUT contains the following accessories.

Item	Brand	Model	Specification	Remark
Car Charger	TOMTOM	4UUC3Z	Input: 12/24Vdc, 1A Output: 5Vdc, 1.2A	Option
Bike Docking	TOMTOM	4GF01	Input: 12/24Vdc, 1.3A Output: 5Vdc, 2A	Accessory
Bike Power Cable	TOMTOM	4GE0.001.04	1.9m ±1cm non-shielded power cable without core	Accessory
Car Docking	TOMTOM	4GF02	Input: 5Vdc Output: pass though to output directly	Option
USB Cable	TOMTOM	4UUC.001.04B	1.5m shielded USB cable without core	Accessory
Battery	TOMTOM (Skypower)	VF3W	Power rating: 3.6Vdc , 3220mAh	Accessory

4. WLAN, BT and BT LE technology cannot transmit simultaneously.
5. Detail antenna specification please refer to antenna datasheet and/or antenna measurement report.

3.2 Description of Test Modes

79 channels are provided to this EUT:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461		

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable to		Description
	RE≥1G	RE<1G	
A	√	√	EUT + USB Cable + Car Charger (12Vdc)
B	-	√	EUT + USB Cable + Car Charger (24Vdc)
C	-	√	EUT + Bike Docking + Bike Power Cable (12Vdc)
D	-	√	EUT + Bike Docking + Bike Power Cable (24Vdc)
E	-	√	EUT + Car Docking + USB Cable + Car Charger (12Vdc)
F	-	√	EUT + Car Docking + USB Cable + Car Charger (24Vdc)

Where RE≥1G: Radiated Emission above 1GHz & Bandedge Measurement RE<1G: Radiated Emission below 1GHz

Note:
1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane.**
2. No need to concern of PLC due to the EUT is powered from DC.

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.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Pakcet Type
C	0 to 78	0	FHSS	GFSK	DH5

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.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Pakcet Type
A, B, C, D, E, F	0 to 78	0	FHSS	GFSK	DH5

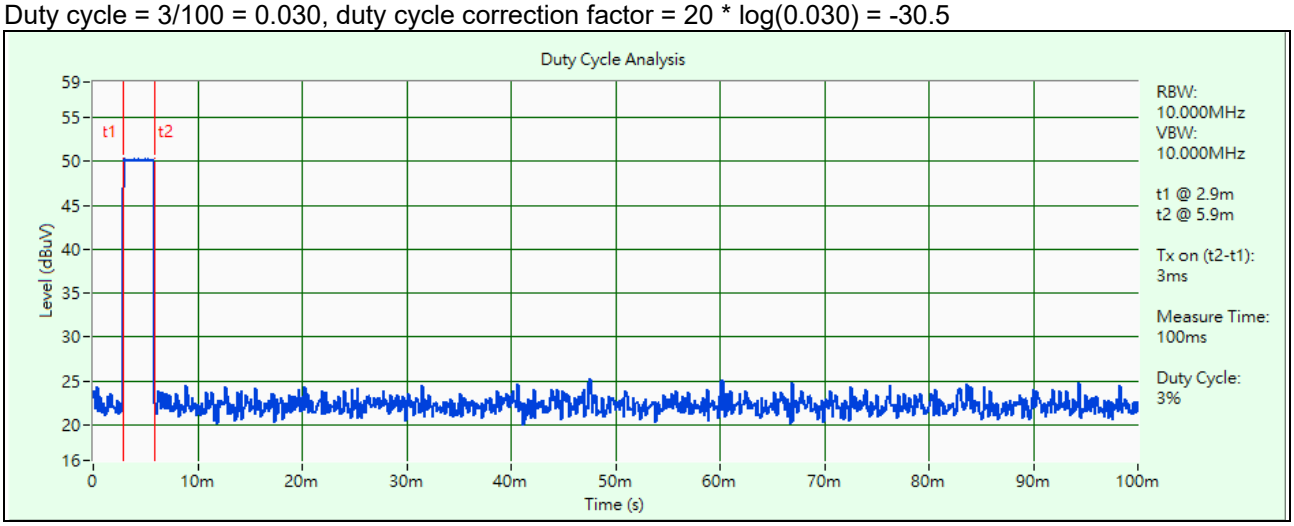
Test Condition:

Applicable to	Environmental Conditions	Input Power	Tested by
RE≥1G	19 deg. C, 65% RH	12Vdc	Rex Wang
RE<1G	19 deg. C, 65% RH	12Vdc 24Vdc	Rex Wang

3.3 Duty Cycle of Test Signal

Duty cycle of test signal is < 98%.

Duty cycle = 3/100 = 0.030, duty cycle correction factor = 20 * log(0.030) = -30.5



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.

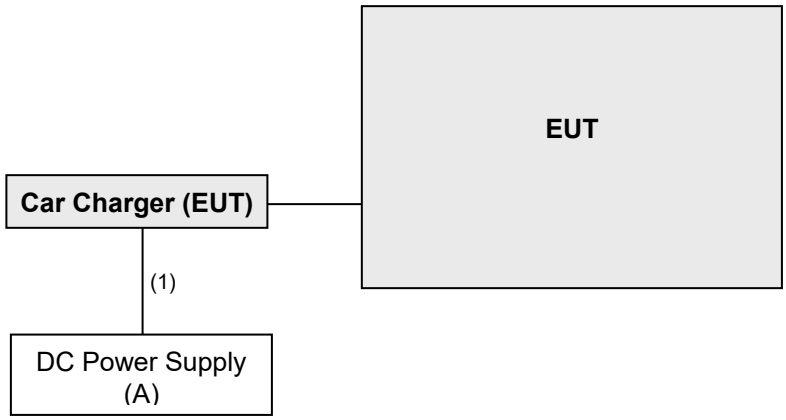
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	DC Power Supply	Keysight	U8002A	MY56330015	NA	-

Note: All power cords of the above support units are non-shielded (1.8m).

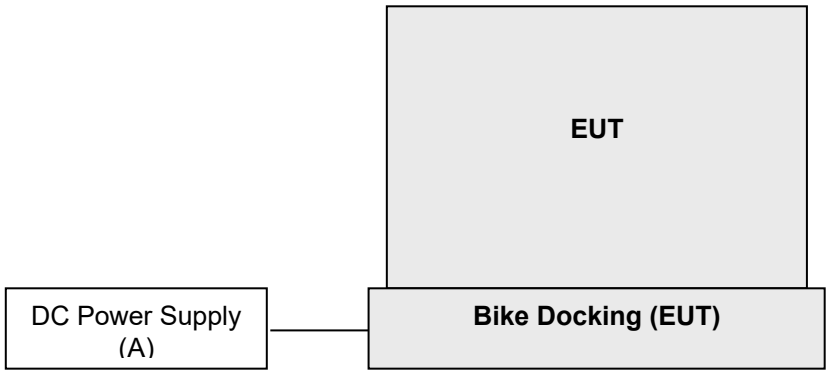
ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	DC	1	0.5	N	0	-

3.4.1 Configuration of System under Test

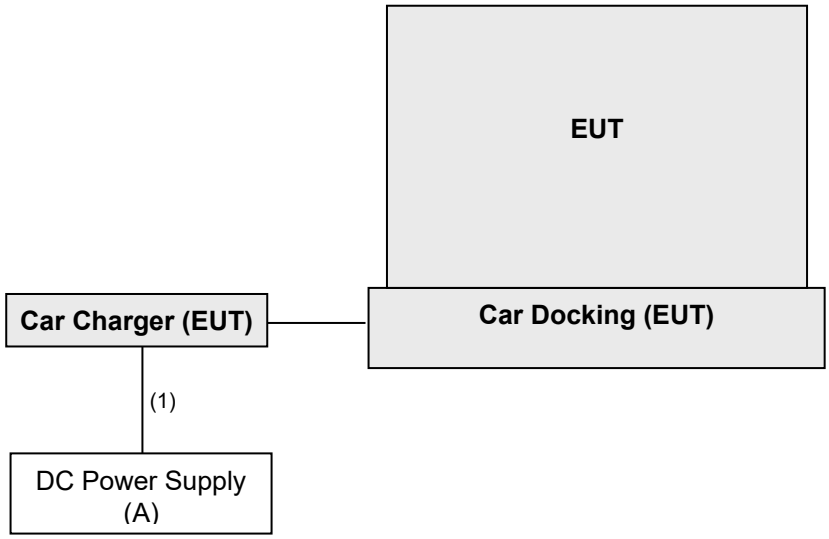
Test Mode A and B



Test Mode C and D



Test Mode E and F



3.5 General Description of Applied Standards and References

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards and references:

Test standard:
FCC Part 15, Subpart C (15.247)
ANSI C63.10:2013

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

References Test Guidance:
KDB 558074 D01 15.247 Meas Guidance v05r02

All test items have been performed as a reference to the above KDB test guidance.

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 must comply with the radiated emission limits specified as below table. 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. 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

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver KEYSIGHT	N9038A	MY55420137	Apr. 27, 2022	Apr. 26, 2023
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100040	Sep. 15, 2021	Sep. 14, 2022
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Oct. 28, 2021	Oct. 27, 2022
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Nov. 14, 2021	Nov. 13, 2022
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Oct. 26, 2021	Oct. 25, 2022
Loop Antenna TESEQ	HLA 6121	45745	Jul. 21, 2021	Jul. 20, 2022
Preamplifier Agilent (Below 1GHz)	8447D	2944A10638	May 14, 2022	May 13, 2023
Preamplifier Agilent (Above 1GHz)	8449B	3008A02367	Feb. 16, 2022	Feb. 15, 2023
RF signal cable HUBER+SUHNER&EMCI	SUCOFLEX 104 & EMC104-SM-SM8000	CABLE-CH9-02 (248780+171006)	Jan. 15, 2022	Jan. 14, 2023
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-(250795/4)	Jan. 15, 2022	Jan. 14, 2023
RF signal cable Woken	8D-FB	Cable-CH9-01	May 14, 2022	May 13, 2023
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower &Turn BV ADT	AT100	AT93021705	NA	NA
Turn Table BV ADT	TT100	TT93021705	NA	NA
Turn Table Controller BV ADT	SC100	SC93021705	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HY - 966 chamber 4.

4.1.3 Test Procedures

For Radiated emission below 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. 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. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case 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 Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 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 height of antenna 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 quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

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) and Average detector (AV) at frequency above 1GHz. For fundamental and harmonic signal measurement, according to ANSI C63.10 section 7.5, the average value = peak value + duty cycle correction factor. The duty cycle correction factor refer to Chapter 3.3 of this report.

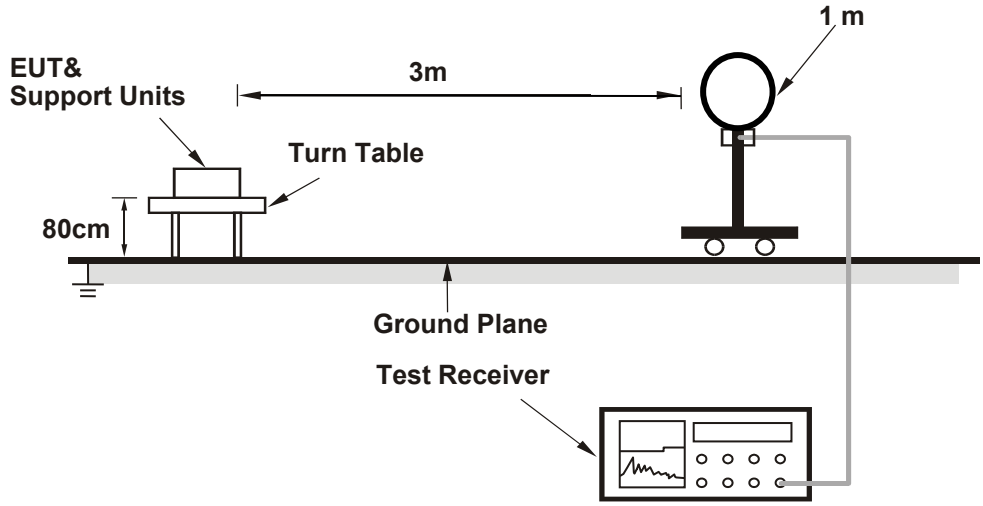
3. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

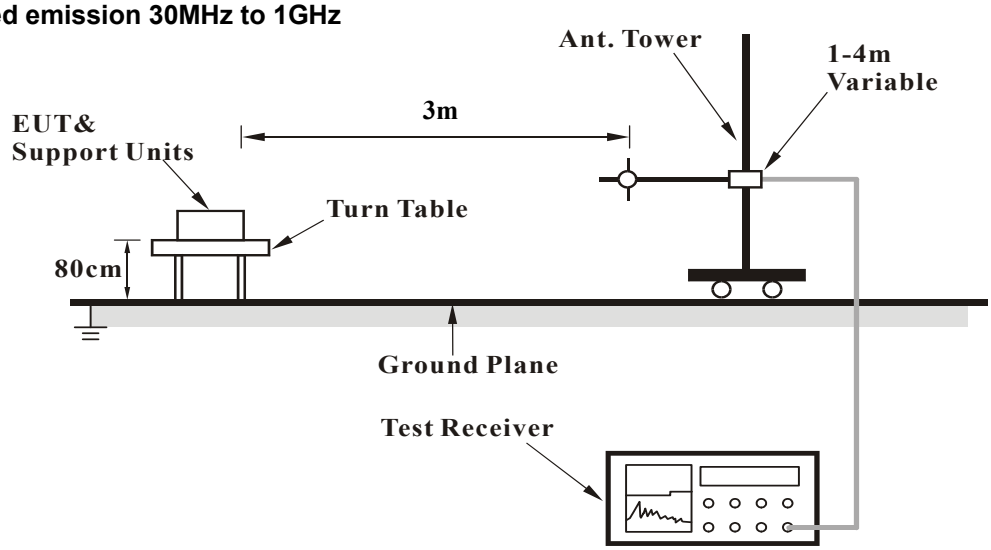
No deviation.

4.1.5 Test Setup

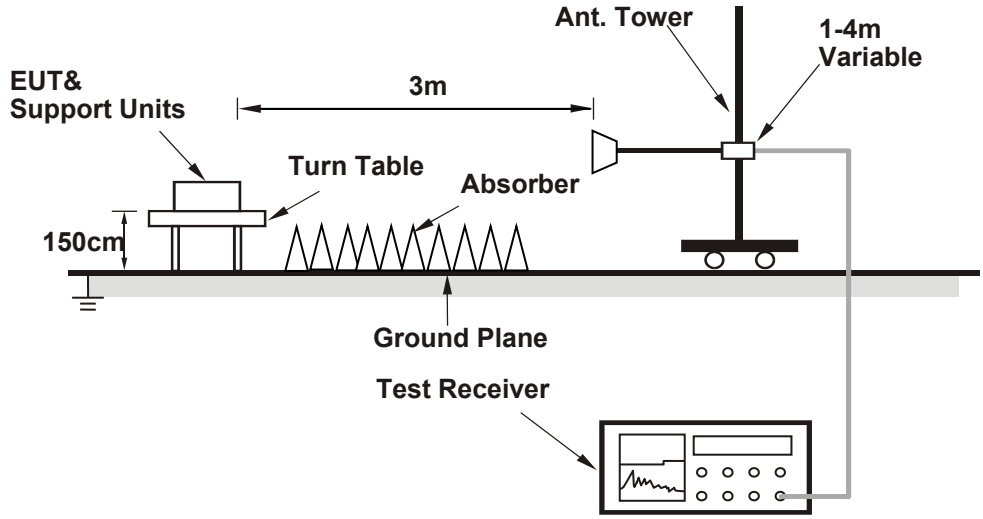
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



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 transmission condition continuously at specific channel frequency.

4.1.7 Test Results

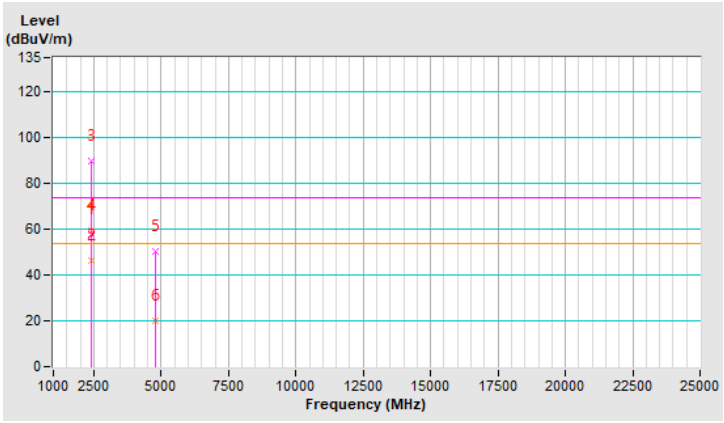
Above 1GHz Data:

RF Mode	TX BT_GFSK	Channel	CH 0：2402 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (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	57.5 PK	74.0	-16.5	1.00 H	256	24.7	32.8
2	2390.00	46.3 AV	54.0	-7.7	1.00 H	256	13.5	32.8
3	*2402.00	90.0 PK			1.00 H	256	57.2	32.8
4	*2402.00	59.5 AV			1.00 H	256	26.7	32.8
5	4804.00	50.3 PK	74.0	-23.7	2.52 H	223	44.5	5.8
6	4804.00	19.8 AV	54.0	-34.2	2.52 H	223	14.0	5.8

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

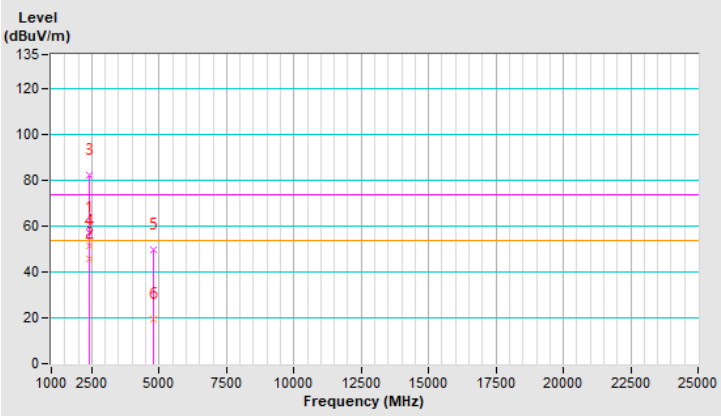


RF Mode	TX BT_GFSK	Channel	CH 0：2402 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (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	57.3 PK	74.0	-16.7	1.12 V	106	24.5	32.8
2	2390.00	45.8 AV	54.0	-8.2	1.12 V	106	13.0	32.8
3	*2402.00	82.2 PK			1.12 V	106	49.4	32.8
4	*2402.00	51.7 AV			1.12 V	106	18.9	32.8
5	4804.00	49.9 PK	74.0	-24.1	1.06 V	262	44.1	5.8
6	4804.00	19.4 AV	54.0	-34.6	1.06 V	262	13.6	5.8

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



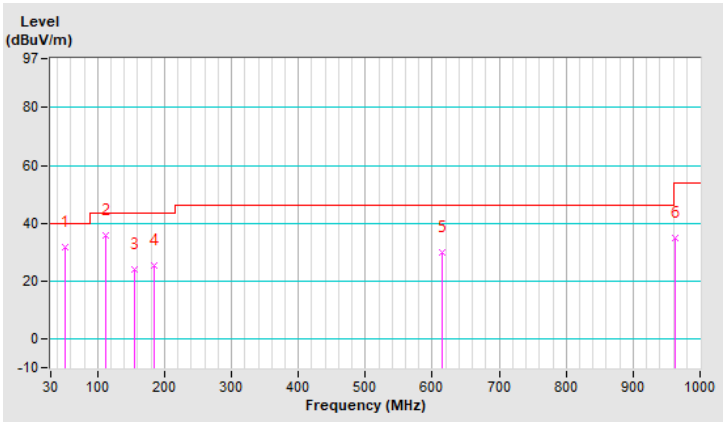
Below 1GHz worst-case data:

RF Mode	TX BT_GFSK	Channel	CH 0：2402 MHz
Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)
Test Mode	A		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	51.34	31.6 QP	40.0	-8.4	1.00 H	342	40.6	-9.0
2	112.45	36.0 QP	43.5	-7.5	1.00 H	262	47.9	-11.9
3	155.13	24.2 QP	43.5	-19.3	1.50 H	275	32.9	-8.7
4	184.23	25.5 QP	43.5	-18.0	1.50 H	328	36.2	-10.7
5	613.94	29.7 QP	46.0	-16.3	1.00 H	130	29.8	-0.1
6	962.17	35.1 QP	54.0	-18.9	1.25 H	31	28.7	6.4

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. Margin value = Emission Level – Limit value.
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

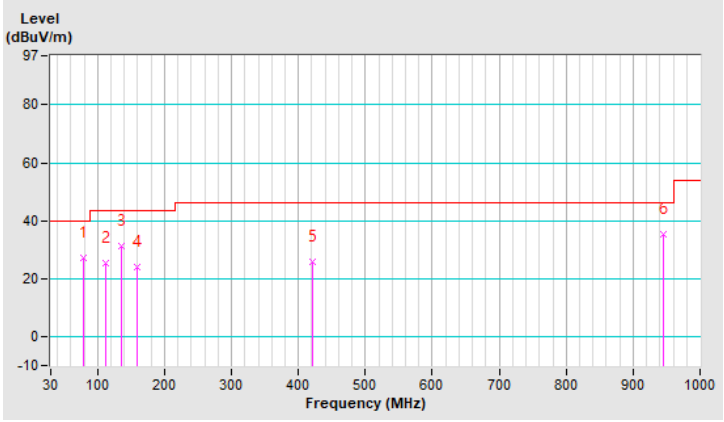


RF Mode	TX BT_GFSK	Channel	CH 0：2402 MHz
Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)
Test Mode	A		

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	78.50	27.0 QP	40.0	-13.0	1.50 V	189	40.2	-13.2
2	112.45	25.4 QP	43.5	-18.1	1.50 V	15	37.3	-11.9
3	135.73	31.3 QP	43.5	-12.2	1.00 V	191	41.0	-9.7
4	159.98	24.1 QP	43.5	-19.4	1.50 V	222	32.7	-8.6
5	421.88	25.9 QP	46.0	-20.1	1.00 V	86	30.2	-4.3
6	945.68	35.5 QP	46.0	-10.5	1.25 V	157	29.3	6.2

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. Margin value = Emission Level – Limit value.
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

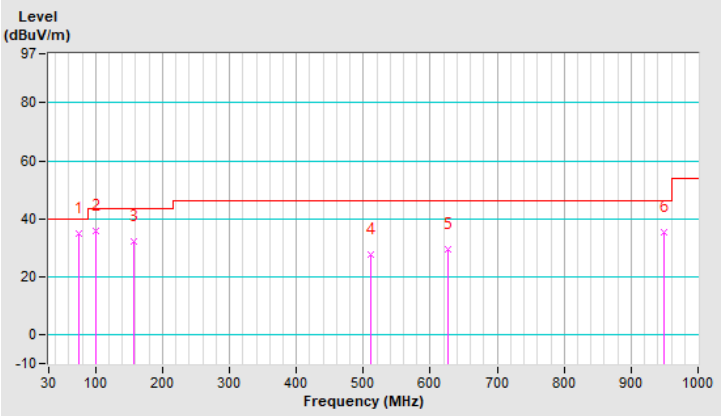


RF Mode	TX BT_GFSK	Channel	CH 0：2402 MHz
Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)
Test Mode	B		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	74.62	34.7 QP	40.0	-5.3	2.00 H	148	46.9	-12.2
2	100.81	36.0 QP	43.5	-7.5	1.00 H	157	49.4	-13.4
3	157.07	32.2 QP	43.5	-11.3	1.00 H	91	40.9	-8.7
4	511.12	27.8 QP	46.0	-18.2	1.50 H	183	30.0	-2.2
5	625.58	29.3 QP	46.0	-16.7	1.25 H	9	29.3	0.0
6	948.59	35.3 QP	46.0	-10.7	1.00 H	18	29.2	6.1

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. Margin value = Emission Level – Limit value.
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

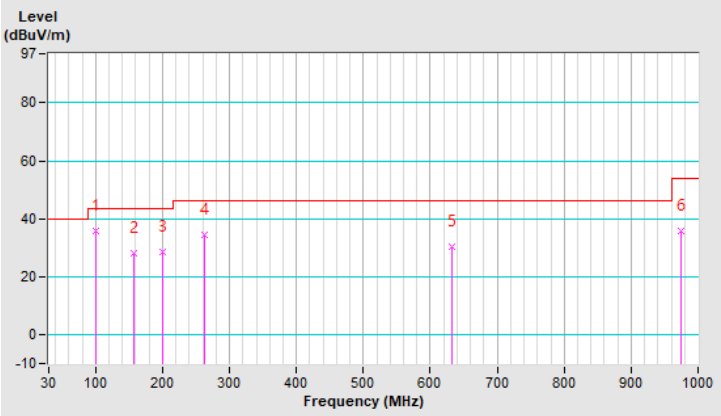


RF Mode	TX BT_GFSK	Channel	CH 0：2402 MHz
Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)
Test Mode	B		

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	100.81	35.7 QP	43.5	-7.8	1.00 V	203	49.1	-13.4
2	158.04	28.2 QP	43.5	-15.3	1.50 V	301	36.8	-8.6
3	199.75	28.7 QP	43.5	-14.8	1.00 V	24	40.2	-11.5
4	261.83	34.4 QP	46.0	-11.6	1.50 V	168	42.8	-8.4
5	632.37	30.3 QP	46.0	-15.7	1.00 V	178	30.2	0.1
6	974.78	35.8 QP	54.0	-18.2	2.00 V	83	29.6	6.2

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. Margin value = Emission Level – Limit value.
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

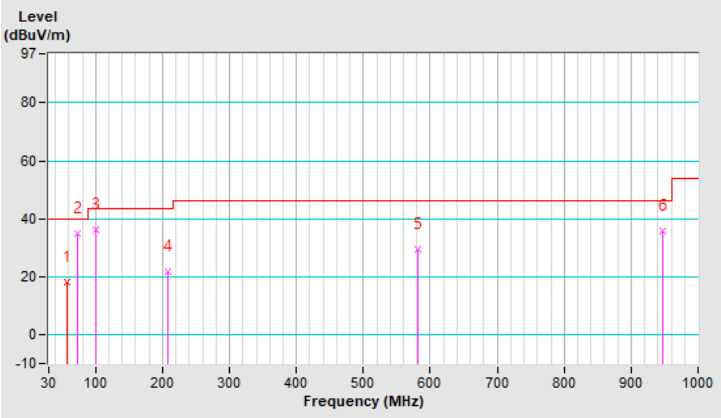


RF Mode	TX BT_GFSK	Channel	CH 0：2402 MHz
Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)
Test Mode	C		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	57.06	18.0 QP	40.0	-22.0	1.00 H	130	27.4	-9.4
2	72.68	34.9 QP	40.0	-5.1	1.00 H	131	46.7	-11.8
3	100.81	36.3 QP	43.5	-7.2	1.50 H	5	49.7	-13.4
4	208.48	21.8 QP	43.5	-21.7	1.25 H	4	33.2	-11.4
5	581.93	29.5 QP	46.0	-16.5	1.00 H	166	30.3	-0.8
6	946.65	35.6 QP	46.0	-10.4	1.50 H	5	29.5	6.1

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. Margin value = Emission Level – Limit value.
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

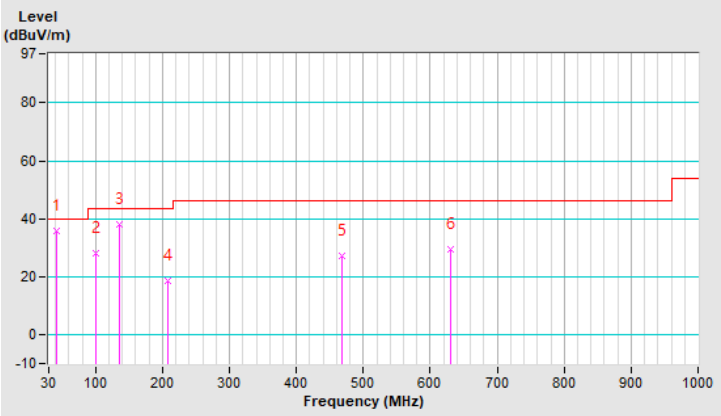


RF Mode	TX BT_GFSK	Channel	CH 0：2402 MHz
Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)
Test Mode	C		

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	42.61	35.7 QP	40.0	-4.3	1.00 V	4	45.1	-9.4
2	100.81	28.0 QP	43.5	-15.5	1.50 V	188	41.4	-13.4
3	135.73	37.9 QP	43.5	-5.6	1.50 V	88	47.6	-9.7
4	207.51	18.4 QP	43.5	-25.1	1.00 V	131	29.8	-11.4
5	468.44	27.0 QP	46.0	-19.0	1.25 V	102	30.1	-3.1
6	630.43	29.4 QP	46.0	-16.6	1.00 V	307	29.3	0.1

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. Margin value = Emission Level – Limit value.
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

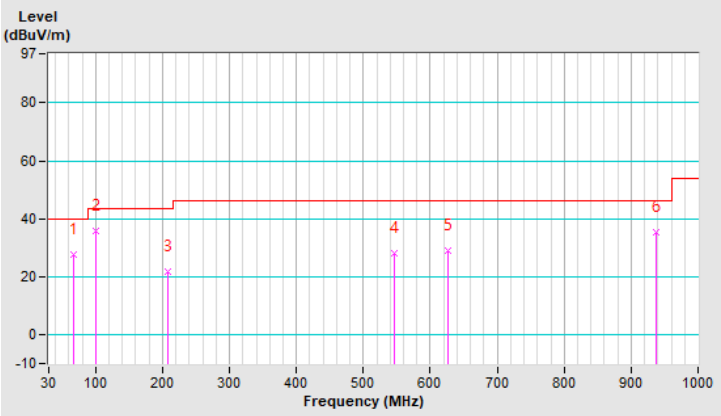


RF Mode	TX BT_GFSK	Channel	CH 0：2402 MHz
Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)
Test Mode	D		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	66.86	27.7 QP	40.0	-12.3	1.00 H	196	38.0	-10.3
2	100.81	35.7 QP	43.5	-7.8	1.50 H	96	49.1	-13.4
3	208.48	21.8 QP	43.5	-21.7	1.50 H	231	33.2	-11.4
4	547.01	28.1 QP	46.0	-17.9	1.00 H	181	29.7	-1.6
5	625.58	29.0 QP	46.0	-17.0	1.00 H	335	29.0	0.0
6	937.92	35.5 QP	46.0	-10.5	1.25 H	142	29.4	6.1

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. Margin value = Emission Level – Limit value.
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

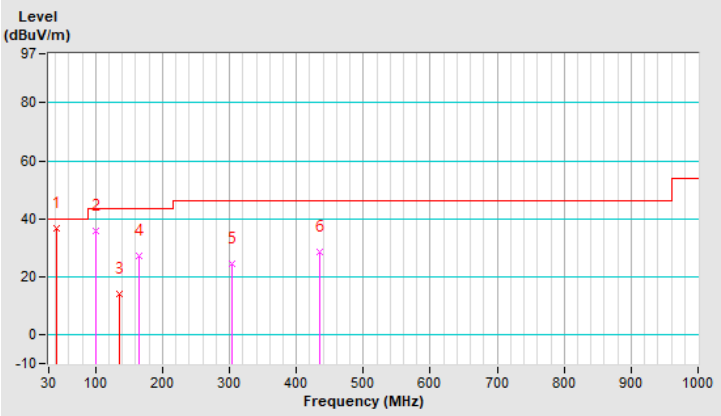


RF Mode	TX BT_GFSK	Channel	CH 0：2402 MHz
Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)
Test Mode	D		

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	42.60	36.5 QP	40.0	-3.5	1.00 V	359	45.9	-9.4
2	100.81	35.7 QP	43.5	-7.8	1.25 V	261	49.1	-13.4
3	135.73	14.0 QP	43.5	-29.5	1.00 V	18	23.7	-9.7
4	164.83	27.4 QP	43.5	-16.1	1.50 V	38	36.2	-8.8
5	303.54	24.4 QP	46.0	-21.6	1.50 V	19	31.2	-6.8
6	434.49	28.6 QP	46.0	-17.4	1.00 V	142	32.3	-3.7

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. Margin value = Emission Level – Limit value.
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

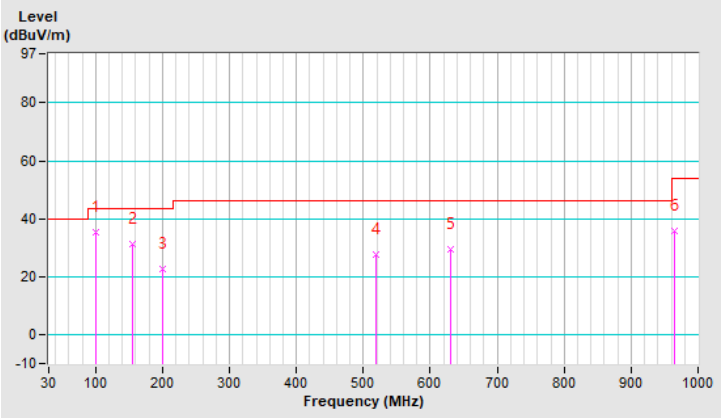


RF Mode	TX BT_GFSK	Channel	CH 0：2402 MHz
Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)
Test Mode	E		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	100.81	35.3 QP	43.5	-8.2	1.00 H	217	48.7	-13.4
2	155.13	31.3 QP	43.5	-12.2	1.00 H	117	40.0	-8.7
3	199.75	22.7 QP	43.5	-20.8	1.50 H	130	34.2	-11.5
4	518.88	27.5 QP	46.0	-18.5	1.25 H	310	29.6	-2.1
5	629.46	29.6 QP	46.0	-16.4	1.25 H	99	29.5	0.1
6	965.08	35.8 QP	54.0	-18.2	1.00 H	80	29.3	6.5

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. Margin value = Emission Level – Limit value.
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

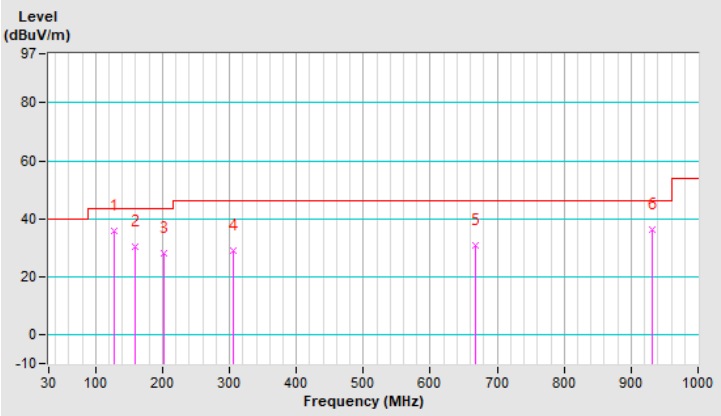


RF Mode	TX BT_GFSK	Channel	CH 0：2402 MHz
Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)
Test Mode	E		

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	127.97	35.8 QP	43.5	-7.7	1.00 V	303	46.2	-10.4
2	159.01	30.5 QP	43.5	-13.0	1.00 V	293	39.2	-8.7
3	201.69	28.3 QP	43.5	-15.2	1.50 V	108	39.8	-11.5
4	306.45	29.2 QP	46.0	-16.8	1.50 V	332	35.9	-6.7
5	668.26	30.9 QP	46.0	-15.1	1.00 V	254	30.5	0.4
6	931.13	36.1 QP	46.0	-9.9	1.25 V	119	30.0	6.1

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. Margin value = Emission Level – Limit value.
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

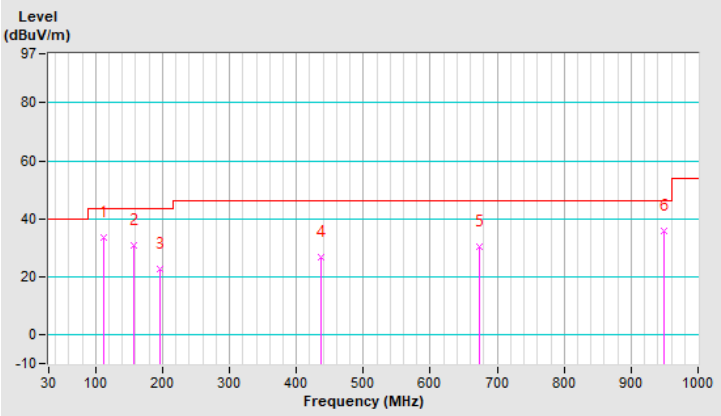


RF Mode	TX BT_GFSK	Channel	CH 0：2402 MHz
Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)
Test Mode	F		

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	112.45	33.4 QP	43.5	-10.1	1.25 H	315	45.3	-11.9
2	158.04	30.7 QP	43.5	-12.8	1.25 H	100	39.3	-8.6
3	195.87	22.6 QP	43.5	-20.9	1.00 H	138	34.3	-11.7
4	436.43	26.5 QP	46.0	-19.5	1.00 H	28	30.2	-3.7
5	674.08	30.2 QP	46.0	-15.8	1.50 H	148	29.7	0.5
6	949.56	35.7 QP	46.0	-10.3	1.00 H	277	29.6	6.1

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. Margin value = Emission Level – Limit value.
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

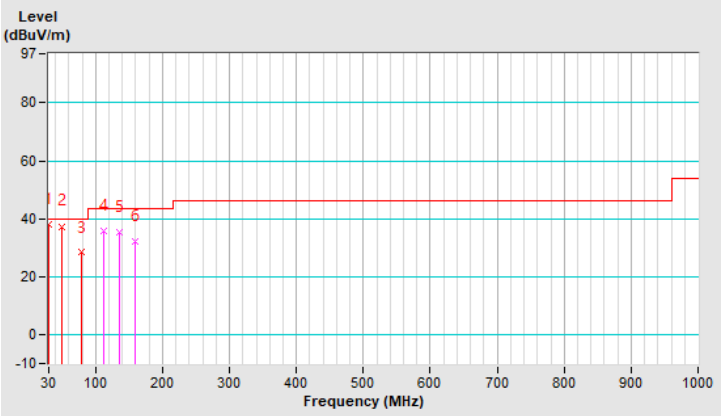


RF Mode	TX BT_GFSK	Channel	CH 0：2402 MHz
Frequency Range	30MHz ~ 1GHz	Detector Function	Quasi-Peak (QP)
Test Mode	F		

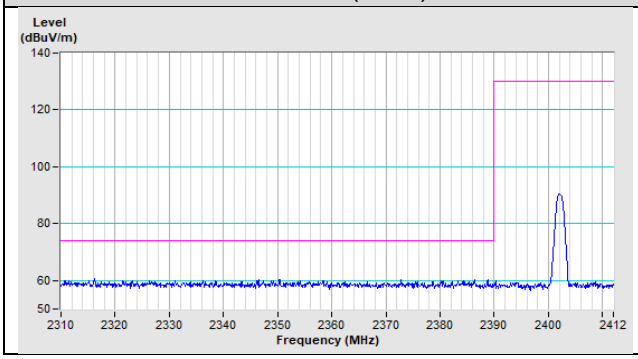
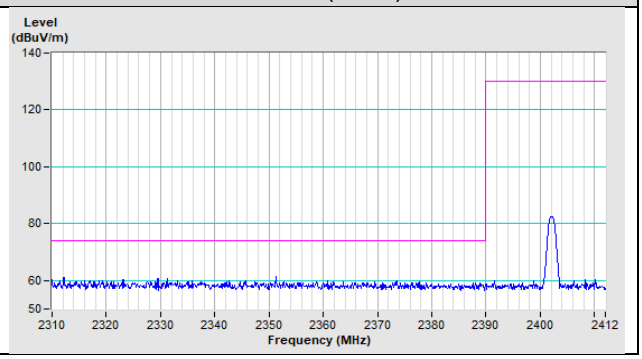
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	**30.97**	**37.9 QP**	**40.0**	**-2.1**	**1.00 V**	**290**	**48.5**	**-10.6**
2	49.40	37.4 QP	40.0	-2.6	1.00 V	39	46.4	-9.0
3	78.50	28.3 QP	40.0	-11.7	1.00 V	205	41.5	-13.2
4	112.45	36.0 QP	43.5	-7.5	1.00 V	4	47.9	-11.9
5	135.73	35.5 QP	43.5	-8.0	1.50 V	130	45.2	-9.7
6	159.01	32.2 QP	43.5	-11.3	1.50 V	39	40.9	-8.7

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. Margin value = Emission Level – Limit value.
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



Annex A - Band Edge Measurement

BT_GFSK Channel 0	
Horizontal (Peak)	Vertical (Peak)
	

5 Pictures of Test Arrangements

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

Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

Lin Kou EMC/RF Lab
Tel: 886-2-26052180
Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab
Tel: 886-3-6668565
Fax: 886-3-6668323

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Tel: 886-3-3183232
Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com
Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

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