Partial FCC Test Report

Report No.:	RFBURR-WTW-P21040075-3
FCC ID:	S4L4FIC1
Contains module FCC ID:	QIPELS61-US
Test Model:	4FIC1
Series Model:	4FIC0 (refer to item 3.1 for more details)
Received Date:	May 07, 2021
Test Date:	May 08 ~ Jun. 17, 2021
Issued Date:	Jun. 17, 2021
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 (1):	No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN
Test Location (2):	B2F., No.215, Sec. 3, Beixin Rd., Xindian Dist., New Taipei City 231, Taiwan
FCC Registration / Designation Number (1):	788550 / TW0003
FCC Registration / Designation Number (2):	427177 / TW0011

Testing Laboratory
2021

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Release Control Record

Issue No.	Description	Date Issued
RFBURR-WTW-P21040075-3	Original release	Jun. 17, 2021

1 Certificate of Conformity

Product:	TomTom BRIDGE Hub
Brand:	TOMTOM
Test Model:	4FIC1
Series Model:	4FIC0 (refer to item 3.1 for more details)
Sample Status:	Pre-MFB build sample
Applicant:	TomTom International B.V.
Test Date:	May 08 ~ Jun. 17, 2021
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.247) ANSI C63.10:2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

Prepared by : Celine Chou , **Date:** Jun. 17, 2021

Celine Chou / Senior Specialist

Approved by : Bruce Chen , **Date:** Jun. 17, 2021

Bruce Chen / Senior Project Engineer

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	NA	Refer to Note 1
15.247(a)(1)(iii)	Number of Hopping Frequency Used	NA	Refer to Note 1
15.247(a)(1)(iii)	Dwell Time on Each Channel	NA	Refer to Note 1
15.247(a)(1)	1. Hopping Channel Separation 2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	NA	Refer to Note 1
15.247(a)(1)	Maximum Peak Output Power	Pass	Meet the requirement of limit.
15.205 & 209 & 15.247(d)	Radiated Emissions & Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -7.76dB at 55.11MHz.
15.247(d)	Antenna Port Emission	NA	Refer to Note 1
15.203	Antenna Requirement	Pass	No antenna connector is used.

Note:

1. The Conducted Output Power and Radiated Emission test items 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. 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	2.0153 dB
	200MHz ~1000MHz	2.0224 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	1.0121 dB
	18GHz ~ 40GHz	1.1508 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	TomTom BRIDGE Hub
Brand	TOMTOM
Test Model	4FIC1
Series Model	4FIC0
Model Difference	Refer to note
Sample Status	Pre-MFB build sample
Power Supply Rating	12-24Vdc, 2.0A
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	1.807mW
Antenna Type	Chip antenna with 1.69dBi gain
Antenna Connector	NA
Accessory Device	Refer to note
Cable Supplied	Refer to note

Note:

1. This report is prepared for FCC class II permissive change. The difference compared with the original report (BV CPS report no.: RF171003C10-4) is updated LTE module from rel1 to rel2 (the part number is not changed). Therefore, only the Conducted Output Power and Radiated Emission have been tested for this addendum. Other testing data please refer to the original test report.
2. All models are listed as below.

Brand	Model	GNSS/WLAN/BT	LTE	WOIP/CAN Bus/HDMI/CVBS
TOMTOM	4FIC0	O	O	X
	4FIC1	O	O	O

Note: “O” means support, “X” means no support.

* The model of the 4FIC1 was chosen for final test.

3. The EUT contains the following accessories.

Item	Brand	Model	Specification	Remark
Car Charger	TomTom	CLA 4FIC0, 4FIC.000.02	Input: 12/24Vdc, 2A Output: 12/24Vdc, 2A FUSE: 125V, 5A	Option
InCube Power Cable	TomTom	4FIC.000.01	2m non-shielded power cable without core	Accessory
InCube CLA Car Charger Cable	TomTom	4FIC.000.02	2m non-shielded power cable without core	Option
InCube Full Power Cable (Harnessed)	TomTom	4FIC.000.03	2m non-shielded power cable without core	Option

4. The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

5. The WWAN module (model no.: ELS61-US, brand name: GEMALTO, FCC ID: QIPELS61-US) is collocated in this EUT.
6. WLAN (2.4GHz or 5GHz), BT (BT EDR or BT LE) and WWAN technology can transmit simultaneously.
7. Spurious emission of the simultaneous operation (WLAN (2.4GHz or 5GHz), BT (BT EDR or BT LE) and WWAN) has been evaluated and no non-compliance was found.

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	Power	
-	√	√	√	-

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

Note: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**.

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
-	0 to 78	0, 39, 78	FHSS	GFSK	DH5
-	0 to 78	0, 39, 78	FHSS	8DPSK	3DH5

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
-	0 to 78	39	FHSS	8DPSK	3DH5

Conducted Output Power Measurement:

☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒ Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Pakcet Type
-	0 to 78	0, 39, 78	FHSS	GFSK	DH5
-	0 to 78	0, 39, 78	FHSS	8DPSK	3DH5

Test Condition:

Applicable to	Environmental Conditions	Input Power	Tested by
RE≥1G	25 deg. C, 65% RH	12Vdc	Karl Lee
RE<1G	25 deg. C, 65% RH	12Vdc	Karl Lee
Power	25 deg. C, 60% RH	12Vdc	Ivan Tseng

3.3 Duty Cycle of Test Signal

Duty cycle = 2.891/100 = 0.02891, Duty factor = 20 * log(0.02891) = -30.78

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.

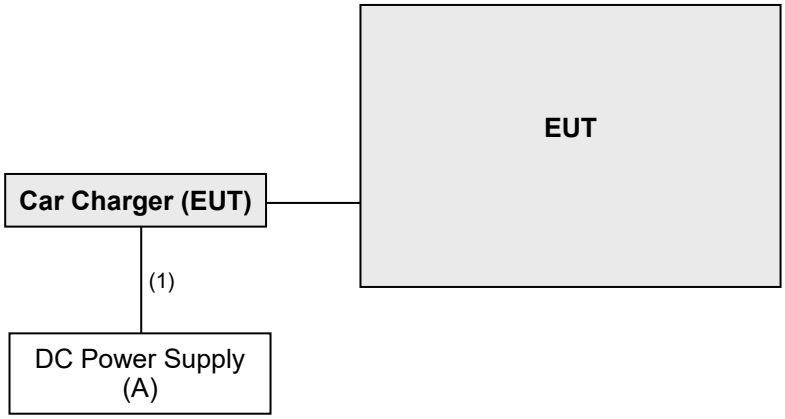
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	DC Power Supply	Topward	33010D	807748	NA	-

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item A was placed under the test table.

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



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 Agilent Technologies	N9038A	MY52260177	Aug. 24, 2020	Aug. 23, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Apr. 12, 2021	Apr. 11, 2022
HORN Antenna ETS-Lindgren	3117	00143293	Nov. 22, 2020	Nov. 21, 2021
BILOG Antenna SCHWARZBECK	VULB 9168	9168-616	Nov. 09, 2020	Nov. 08, 2021
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 13, 2021	Apr. 12, 2022
Bluetooth Tester	CBT	100980	Jul. 14, 2019	Jul. 13, 2021
Loop Antenna	EM-6879	269	Sep. 17, 2020	Sep. 16, 2021
Preamplifier Agilent	8447D	2944A10631	Jun. 08, 2020	Jun. 07, 2021
			Jun. 05, 2021	Jun. 04, 2022
Preamplifier Agilent	83017A	MY53270295	Jun. 08, 2020	Jun. 07, 2021
		MY53270297	Jun. 05, 2021	Jun. 04, 2022
Preamplifier EMCI	EMC 184045	980116	Oct. 07, 2020	Oct. 06, 2021
RF signal cable ETS-LINDGREN	5D-FB	Cable-CH1-01(RFC-SMS-100-SMS-120+RFC-SMS-100-SMS-400)	Jun. 17, 2020	Jun. 16, 2021
			Jun. 17, 2021	Jun. 16, 2022
RF signal cable ETS-LINDGREN	8D-FB	Cable-CH1-02(RFC-SMS-100-SMS-24)	Jun. 17, 2020	Jun. 16, 2021
			Jun. 17, 2021	Jun. 16, 2022
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Software BV ADT	E3 8.130425b	NA	NA	NA
Antenna Tower MF	NA	NA	NA	NA
Turn Table MF	NA	NA	NA	NA
Antenna Tower &Turn Table Controller MF	MF-7802	NA	NA	NA
USB Wideband Power Sensor KEYSIGHT	U2021XA	MY55050005/MY55190004/MY55190007/MY55210005	Jul. 13, 2020	Jul. 12, 2021

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 Xindian Chamber 1.

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:

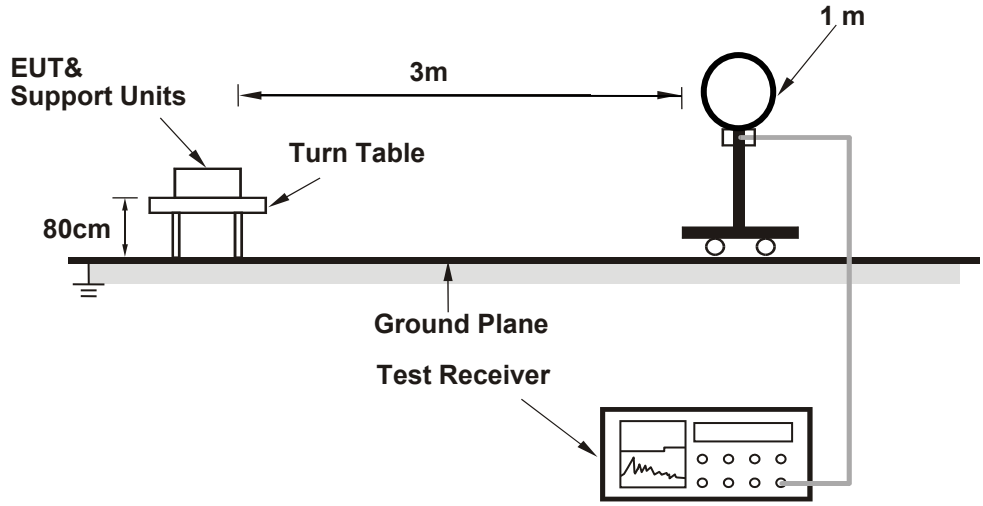
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. For Fundamental frequency and bandedge & harmonic:
   The average value of fundamental frequency is: average = peak value + 20log(Duty cycle) where the duty factor is calculated from following formula:
   20Log(Duty cycle) = 20 log (2.891ms/100) = -30.78dB, please refer to the plotted duty (see section 3.3)
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

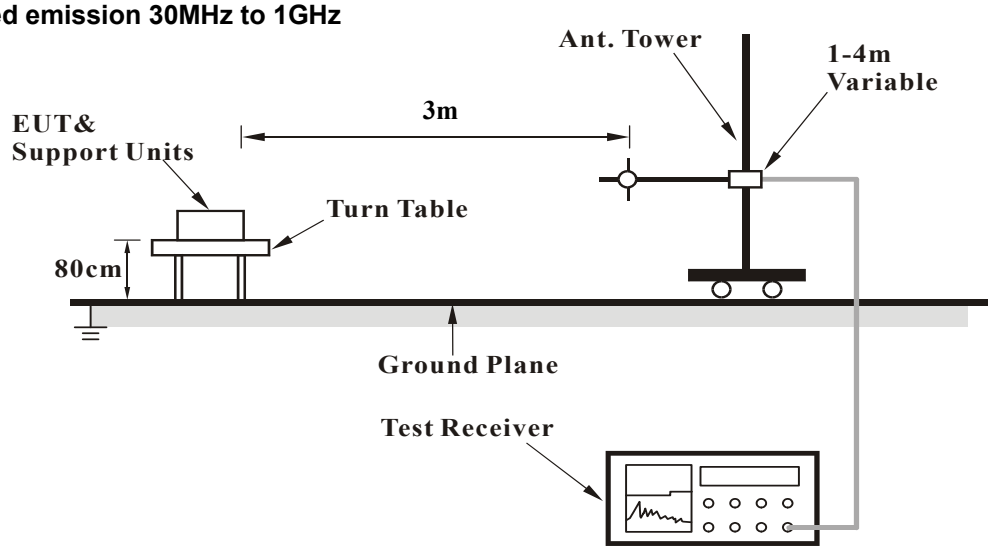
No deviation.

4.1.5 Test Setup

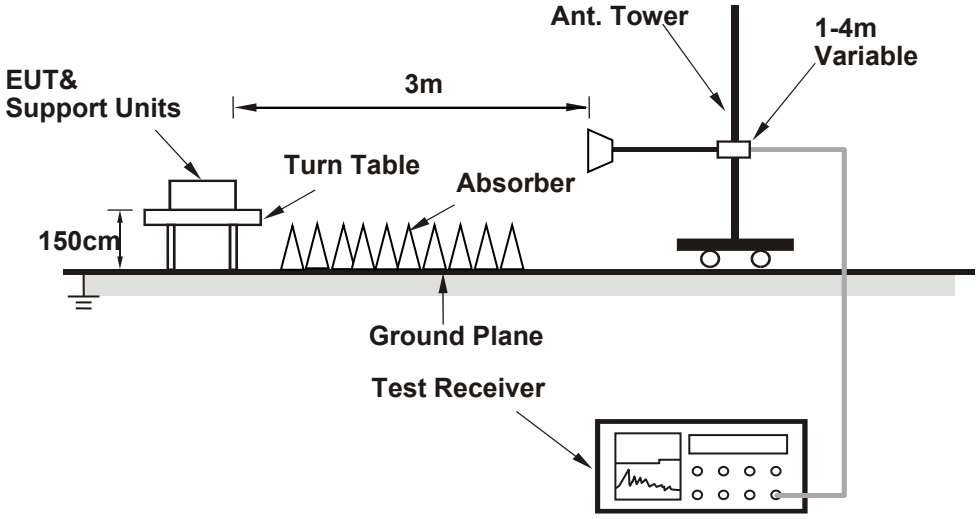
For Radiated emission below 30MHz



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:

GFSK

EUT Test Condition		Measurement Detail	
Channel	Channel 0	**Frequency Range**	1 GHz ~ 25 GHz
Input Power	12Vdc	**Detector Function**	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	**Tested By**	Karl Lee

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	**Emission Level (dBuV/m)**	**Read Level (dBuV)**	**Factor (dB/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (cm)**	**Table Angle (Degree)**	**Remark**
2390.00	40.33	35.83	4.50	54.00	-13.67	201	235	Average
2390.00	51.71	47.21	4.50	74.00	-22.29	201	235	Peak
2402.00	59.24	54.72	4.52			201	235	Average
2402.00	90.02	85.50	4.52			201	235	Peak
4804.00	18.10	7.75	10.35	54.00	-35.90	142	313	Average
4804.00	48.88	38.53	10.35	74.00	-25.12	142	313	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	**Emission Level (dBuV/m)**	**Read Level (dBuV)**	**Factor (dB/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (cm)**	**Table Angle (Degree)**	**Remark**
2390.00	41.41	36.91	4.50	54.00	-12.59	186	355	Average
2390.00	51.14	46.64	4.50	74.00	-22.86	186	355	Peak
2402.00	66.68	62.16	4.52			186	355	Average
2402.00	97.46	92.94	4.52			186	355	Peak
4804.00	18.47	8.12	10.35	54.00	-35.53	304	176	Average
4804.00	49.25	38.90	10.35	74.00	-24.75	304	176	Peak

Remarks:

1. Emission Level = Read Level + Factor
   Margin value = Emission level – Limit value
2. 2402 MHz: Fundamental frequency.
3. The emission levels of other frequencies were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 39	**Frequency Range**	1 GHz ~ 25 GHz
Input Power	12Vdc	**Detector Function**	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	**Tested By**	Karl Lee

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	**Emission Level (dBuV/m)**	**Read Level (dBuV)**	**Factor (dB/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (cm)**	**Table Angle (Degree)**	**Remark**
2390.00	41.42	36.92	4.50	54.00	-12.58	186	355	Average
2390.00	51.57	47.07	4.50	74.00	-22.43	186	355	Peak
2441.00	66.36	61.78	4.58			186	355	Average
2441.00	97.14	92.56	4.58			186	355	Peak
2483.50	21.38	16.72	4.66	54.00	-32.62	186	355	Average
2483.50	52.16	47.50	4.66	74.00	-21.84	186	355	Peak
4882.00	17.93	7.72	10.21	54.00	-36.07	174	268	Average
4882.00	48.71	38.50	10.21	74.00	-25.29	174	268	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	**Emission Level (dBuV/m)**	**Read Level (dBuV)**	**Factor (dB/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (cm)**	**Table Angle (Degree)**	**Remark**
2390.00	41.25	36.75	4.50	54.00	-12.75	201	235	Average
2390.00	51.58	47.08	4.50	74.00	-22.42	201	235	Peak
2441.00	60.08	55.50	4.58			201	235	Average
2441.00	90.86	86.28	4.58			201	235	Peak
2483.50	21.36	16.70	4.66	54.00	-32.64	201	235	Average
2483.50	52.14	47.48	4.66	74.00	-21.86	201	235	Peak
4882.00	18.06	7.85	10.21	54.00	-35.94	196	273	Average
4882.00	48.84	38.63	10.21	74.00	-25.16	196	273	Peak

Remarks:

1. Emission Level = Read Level + Factor
   Margin value = Emission level – Limit value
2. 2441 MHz: Fundamental frequency.
3. The emission levels of other frequencies were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 78	**Frequency Range**	1 GHz ~ 25 GHz
Input Power	12Vdc	**Detector Function**	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	**Tested By**	Karl Lee

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	**Emission Level (dBuV/m)**	**Read Level (dBuV)**	**Factor (dB/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (cm)**	**Table Angle (Degree)**	**Remark**
2480.00	66.94	62.30	4.64			186	355	Average
2480.00	97.72	93.08	4.64			186	355	Peak
2483.50	21.23	16.57	4.66	54.00	-32.77	186	355	Average
2483.50	52.01	47.35	4.66	74.00	-21.99	186	355	Peak
4960.00	17.77	7.41	10.36	54.00	-36.23	236	172	Average
4960.00	48.55	38.19	10.36	74.00	-25.45	236	172	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	**Emission Level (dBuV/m)**	**Read Level (dBuV)**	**Factor (dB/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (cm)**	**Table Angle (Degree)**	**Remark**
2480.00	61.21	56.57	4.64			201	235	Average
2480.00	91.99	87.35	4.64			201	235	Peak
2483.50	21.13	16.47	4.66	54.00	-32.87	201	235	Average
2483.50	51.91	47.25	4.66	74.00	-22.09	201	235	Peak
4960.00	17.30	6.94	10.36	54.00	-36.70	138	109	Average
4960.00	48.08	37.72	10.36	74.00	-25.92	138	109	Peak

Remarks:

1. Emission Level = Read Level + Factor
   Margin value = Emission level – Limit value
2. 2480 MHz: Fundamental frequency.
3. The emission levels of other frequencies were very low against the limit.

8DPSK

EUT Test Condition		Measurement Detail	
Channel	Channel 0	**Frequency Range**	1 GHz ~ 25 GHz
Input Power	12Vdc	**Detector Function**	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	**Tested By**	Karl Lee

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	**Emission Level (dBuV/m)**	**Read Level (dBuV)**	**Factor (dB/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (cm)**	**Table Angle (Degree)**	**Remark**
2390.00	41.07	36.57	4.50	54.00	-12.93	301	36	Average
2390.00	51.49	46.99	4.50	74.00	-22.51	301	36	Peak
2402.00	67.87	63.35	4.52			301	36	Average
2402.00	98.65	94.13	4.52			301	36	Peak
4804.00	18.27	7.92	10.35	54.00	-35.73	192	184	Average
4804.00	49.05	38.70	10.35	74.00	-24.95	192	184	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	**Emission Level (dBuV/m)**	**Read Level (dBuV)**	**Factor (dB/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (cm)**	**Table Angle (Degree)**	**Remark**
2390.00	41.12	36.62	4.50	54.00	-12.88	118	113	Average
2390.00	51.28	46.78	4.50	74.00	-22.72	118	113	Peak
2402.00	60.77	56.25	4.52			118	113	Average
2402.00	91.55	87.03	4.52			118	113	Peak
4804.00	18.21	7.86	10.35	54.00	-35.79	139	267	Average
4804.00	48.99	38.64	10.35	74.00	-25.01	139	267	Peak

Remarks:

1. Emission Level = Read Level + Factor
   Margin value = Emission level – Limit value
2. 2402 MHz: Fundamental frequency.
3. The emission levels of other frequencies were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 39	**Frequency Range**	1 GHz ~ 25 GHz
Input Power	12Vdc	**Detector Function**	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	**Tested By**	Karl Lee

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	**Emission Level (dBuV/m)**	**Read Level (dBuV)**	**Factor (dB/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (cm)**	**Table Angle (Degree)**	**Remark**
2390.00	41.18	36.68	4.50	54.00	-12.82	301	36	Average
2390.00	51.54	47.04	4.50	74.00	-22.46	301	36	Peak
2441.00	67.84	63.26	4.58			301	36	Average
2441.00	98.62	94.04	4.58			301	36	Peak
2483.50	20.98	16.32	4.66	54.00	-33.02	301	36	Average
2483.50	51.76	47.10	4.66	74.00	-22.24	301	36	Peak
4882.00	17.47	7.26	10.21	54.00	-36.53	116	83	Average
4882.00	48.25	38.04	10.21	74.00	-25.75	116	83	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	**Emission Level (dBuV/m)**	**Read Level (dBuV)**	**Factor (dB/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (cm)**	**Table Angle (Degree)**	**Remark**
2390.00	41.17	36.67	4.50	54.00	-12.83	118	113	Average
2390.00	51.10	46.60	4.50	74.00	-22.90	118	113	Peak
2441.00	60.92	56.34	4.58			118	113	Average
2441.00	91.70	87.12	4.58			118	113	Peak
2483.50	21.72	17.06	4.66	54.00	-32.28	118	113	Average
2483.50	52.50	47.84	4.66	74.00	-21.50	118	113	Peak
4882.00	17.02	6.81	10.21	54.00	-36.98	198	125	Average
4882.00	47.80	37.59	10.21	74.00	-26.20	198	125	Peak

Remarks:

1. Emission Level = Read Level + Factor
   Margin value = Emission level – Limit value
2. 2441 MHz: Fundamental frequency.
3. The emission levels of other frequencies were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel	Channel 78	**Frequency Range**	1 GHz ~ 25 GHz
Input Power	12Vdc	**Detector Function**	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	**Tested By**	Karl Lee

Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	**Emission Level (dBuV/m)**	**Read Level (dBuV)**	**Factor (dB/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (cm)**	**Table Angle (Degree)**	**Remark**
2480.00	67.11	62.47	4.64			301	36	Average
2480.00	97.89	93.25	4.64			301	36	Peak
2483.50	21.38	16.72	4.66	54.00	-32.62	301	36	Average
2483.50	52.16	47.50	4.66	74.00	-21.84	301	36	Peak
4960.00	17.44	7.08	10.36	54.00	-36.56	182	204	Average
4960.00	48.22	37.86	10.36	74.00	-25.78	182	204	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	**Emission Level (dBuV/m)**	**Read Level (dBuV)**	**Factor (dB/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (cm)**	**Table Angle (Degree)**	**Remark**
2480.00	60.57	55.93	4.64			118	113	Average
2480.00	91.35	86.71	4.64			118	113	Peak
2483.50	21.36	16.70	4.66	54.00	-32.64	118	113	Average
2483.50	52.14	47.48	4.66	74.00	-21.86	118	113	Peak
4960.00	17.11	6.75	10.36	54.00	-36.89	151	248	Average
4960.00	47.89	37.53	10.36	74.00	-26.11	151	248	Peak

Remarks:

1. Emission Level = Read Level + Factor
   Margin value = Emission level – Limit value
2. 2480 MHz: Fundamental frequency.
3. The emission levels of other frequencies were very low against the limit.

9 kHz ~ 30 MHz Data:

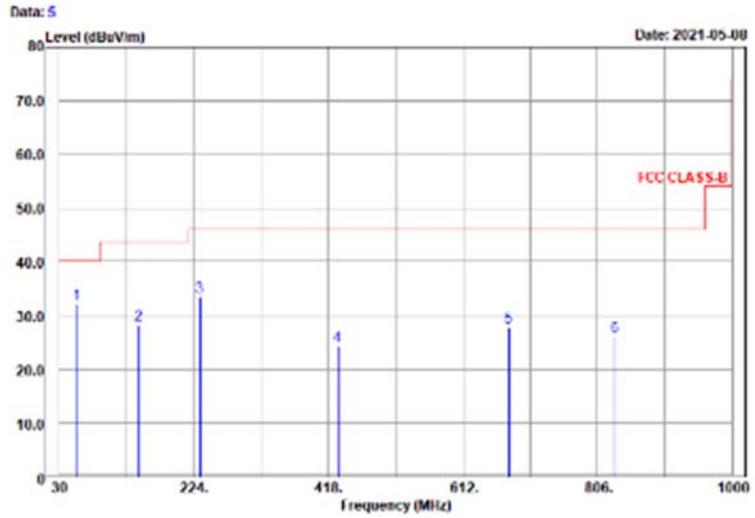
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

30 MHz ~ 1 GHz Worst-Case Data:

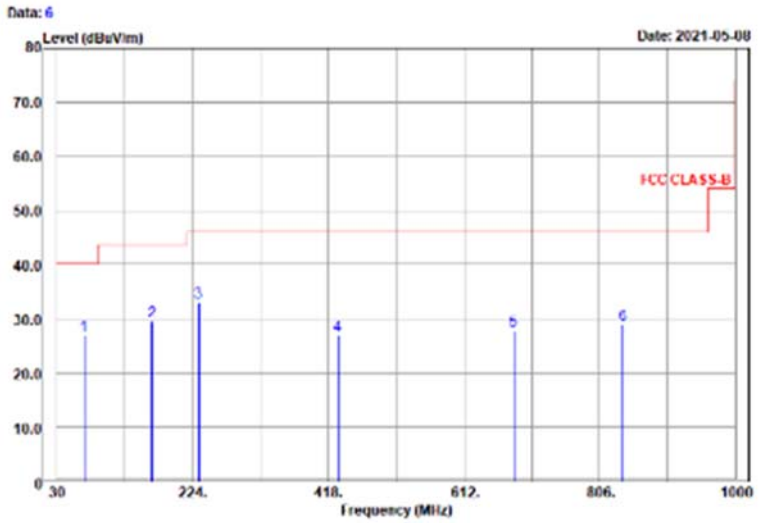
8DPSK

EUT Test Condition		Measurement Detail	
Channel	Channel 39	**Frequency Range**	30 MHz ~ 1 GHz
Input Power	12Vdc	**Detector Function**	Peak (PK) Quasi-peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	**Tested By**	Karl Lee

Horizontal



Vertical



Antenna Polarity & Test Distance: Horizontal at 3 m								
Frequency (MHz)	**Emission Level (dBuV/m)**	**Read Level (dBuV)**	**Factor (dB/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (cm)**	**Table Angle (Degree)**	**Remark**
55.11	**32.24**	**47.73**	**-15.49**	**40.00**	**-7.76**	**170**	**121**	**Peak**
143.94	28.35	49.38	-21.03	43.50	-15.15	193	26	Peak
232.77	33.47	50.77	-17.30	46.00	-12.53	126	243	Peak
431.60	24.52	38.04	-13.52	46.00	-21.48	261	141	Peak
678.00	27.87	37.40	-9.53	46.00	-18.13	151	240	Peak
831.30	26.10	33.14	-7.04	46.00	-19.90	182	337	Peak
Antenna Polarity & Test Distance: Vertical at 3 m								
Frequency (MHz)	**Emission Level (dBuV/m)**	**Read Level (dBuV)**	**Factor (dB/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (cm)**	**Table Angle (Degree)**	**Remark**
69.42	27.14	46.69	-19.55	40.00	-12.86	163	23	Peak
166.08	29.63	50.06	-20.43	43.50	-13.87	162	233	Peak
232.77	33.05	50.35	-17.30	46.00	-12.95	259	241	Peak
431.60	26.95	40.47	-13.52	46.00	-19.05	205	142	Peak
683.60	27.93	37.38	-9.45	46.00	-18.07	104	178	Peak
839.70	29.09	36.06	-6.97	46.00	-16.91	196	316	Peak

Remarks:

1. Emission Level = Read Level + Factor
   Margin value = Emission level – Limit value
2. The emission levels of other frequencies were very low against the limit.

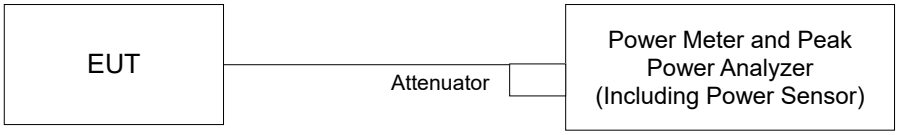
4.2 Maximum Output Power

4.2.1 Limits of Maximum Output Power Measurement

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels: 1 watt.

For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

4.2.2 Test Setup



4.2.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.2.4 Test Procedure

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

For Average Power
Average power sensor was used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

4.2.5 Deviation fromTest Standard

No deviation.

4.2.6 EUT Operating Condition

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

4.2.7 Test Results

For Peak Power

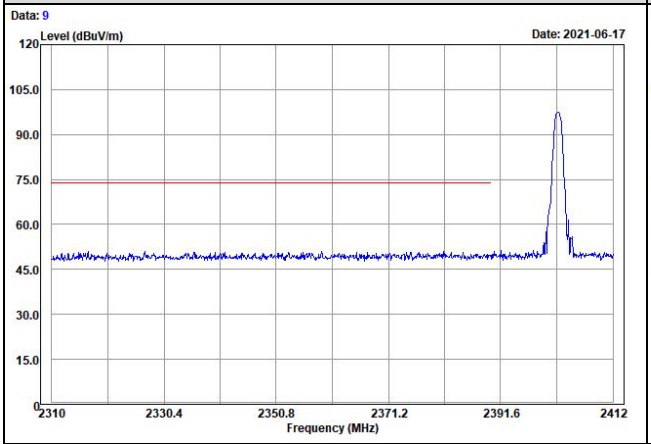
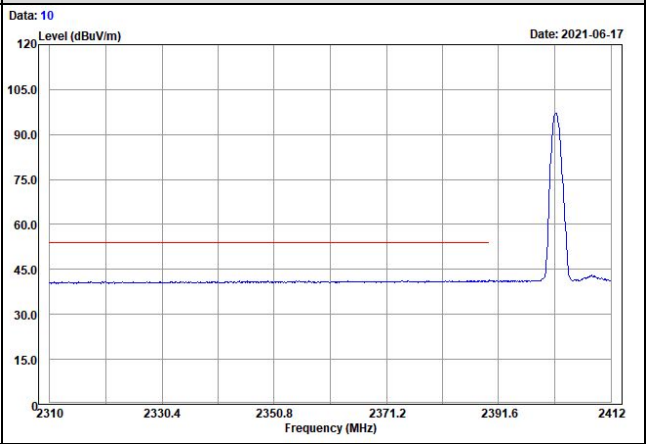
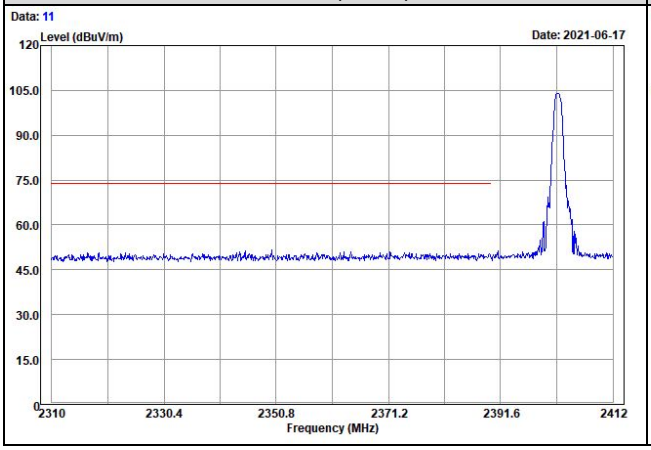
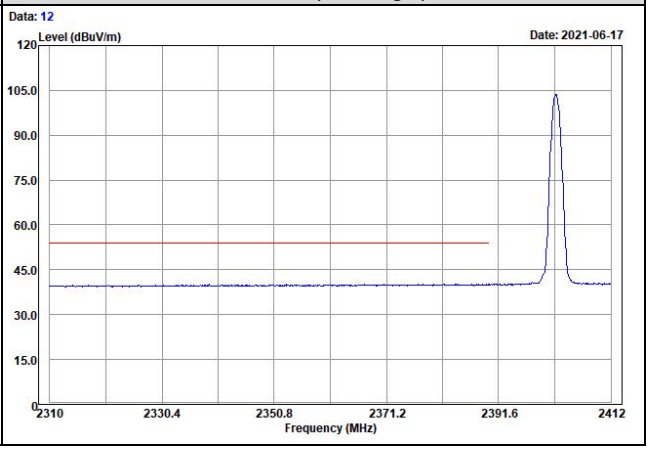
Channel	Frequency (MHz)	Output Power (mW)		Output Power (dBm)		Power Limit (mW)	Pass / Fail
		GFSK	8DPSK	GFSK	8DPSK		
0	2402	1.449	1.186	1.61	0.74	125.00	Pass
39	2441	1.750	**1.807**	2.43	2.57	125.00	Pass
78	2480	1.094	1.233	0.39	0.91	125.00	Pass

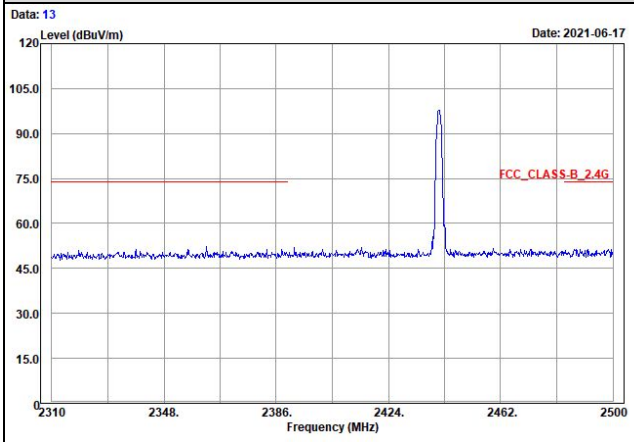
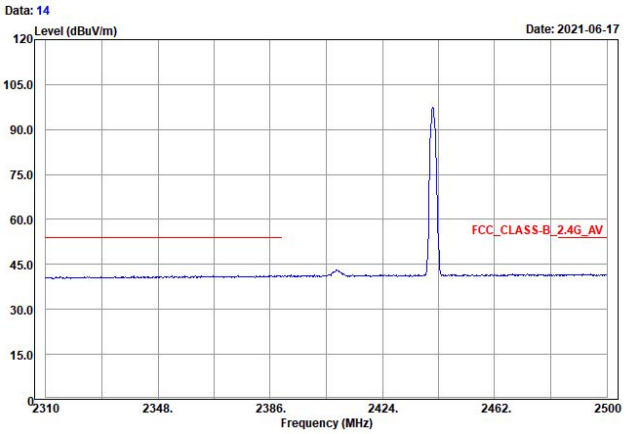
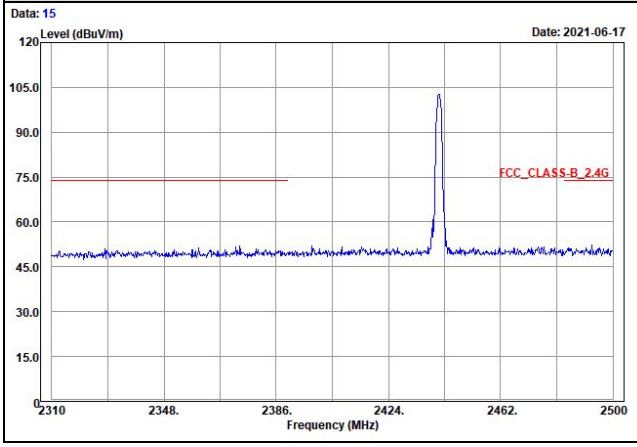
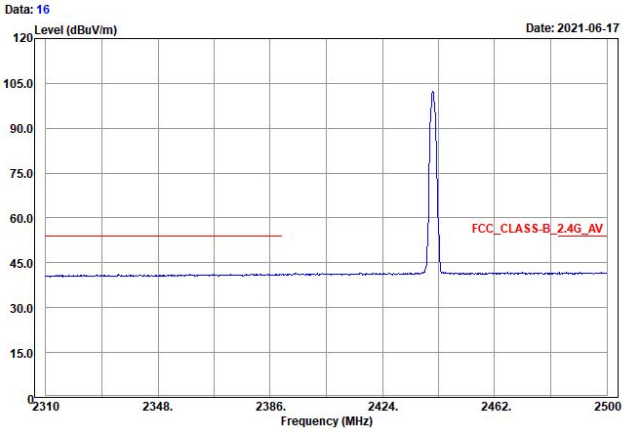
For Average Power

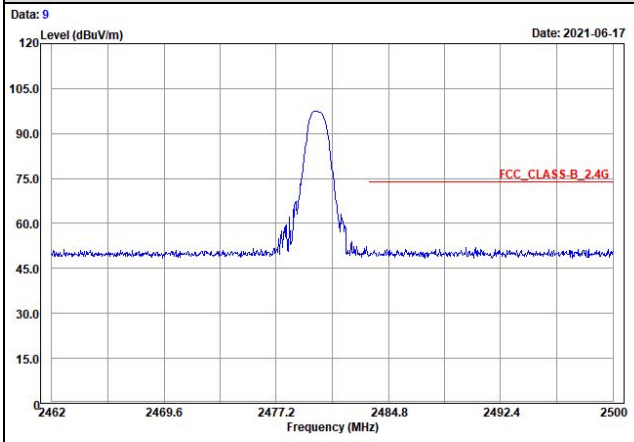
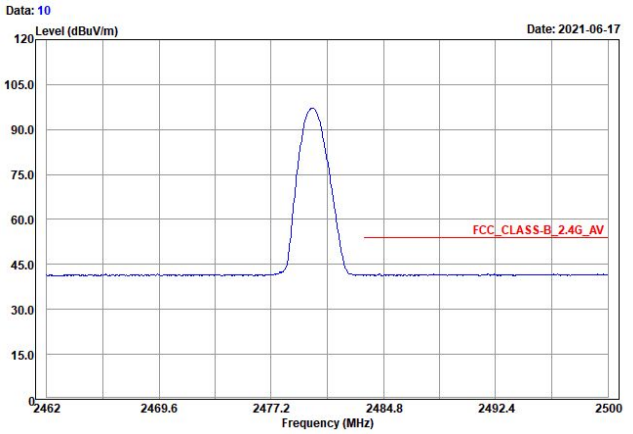
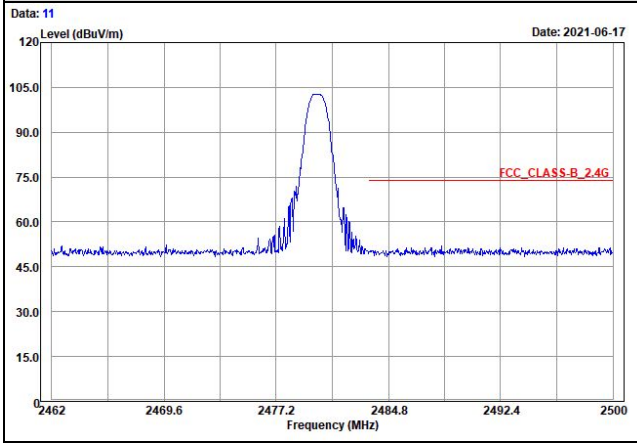
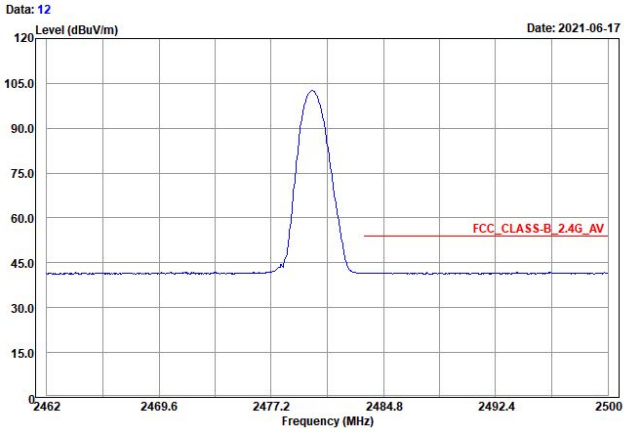
Channel	Frequency (MHz)	Output Power (mW)		Output Power (dBm)	
		GFSK	8DPSK	GFSK	8DPSK
0	2402	1.358	1.107	1.33	0.44
39	2441	1.637	1.227	2.14	0.89
78	2480	1.028	0.736	0.12	-1.33

Annex A - Band Edge Measurement

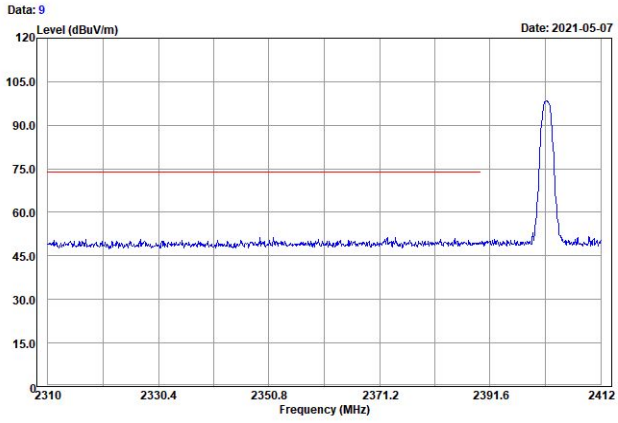
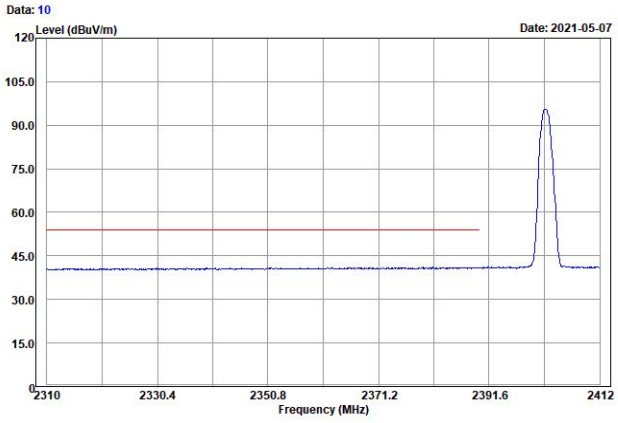
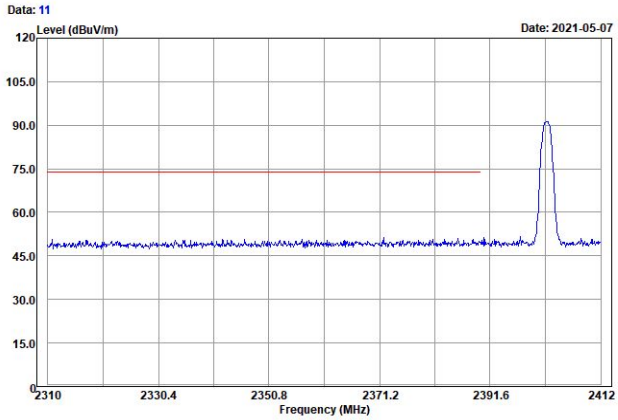
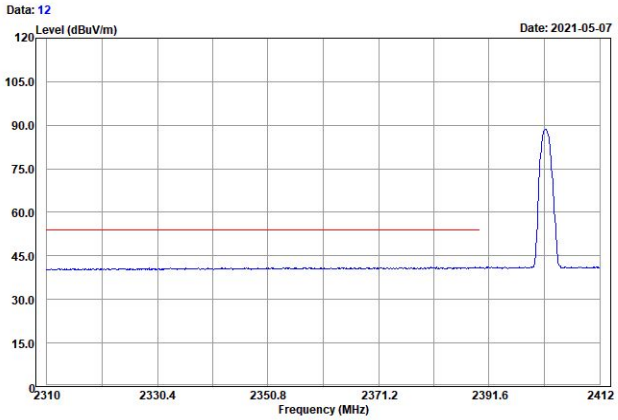
GFSK

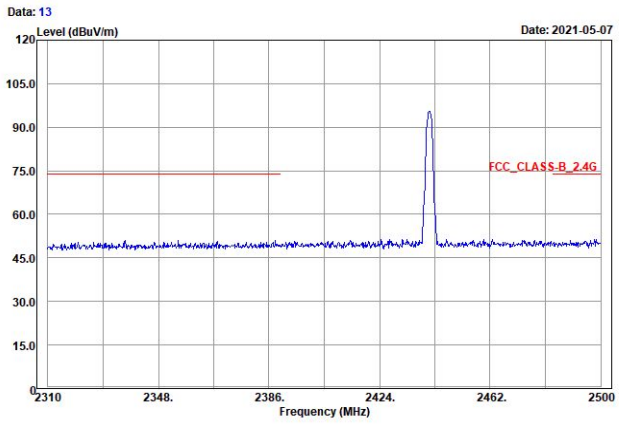
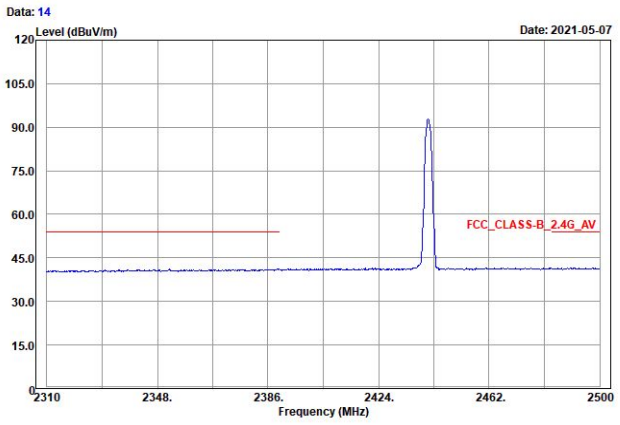
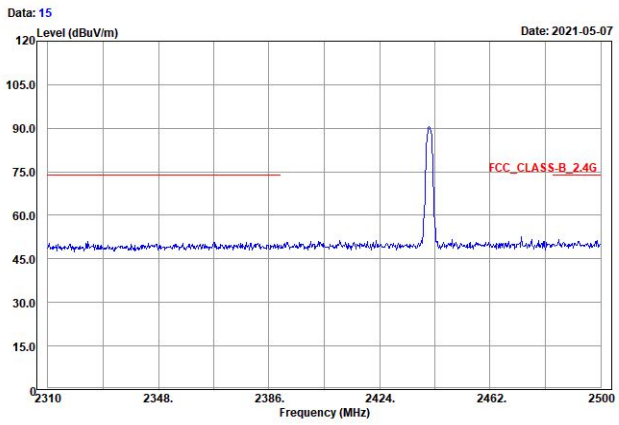
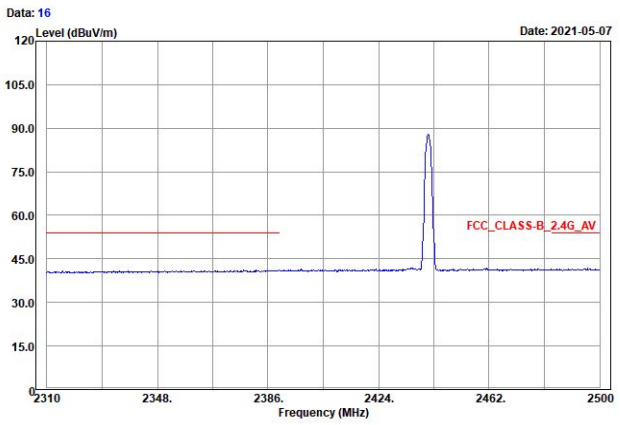
Channel 0	
Horizontal (Peak)	Horizontal (Average)
	
Vertical (Peak)	Vertical (Average)
	

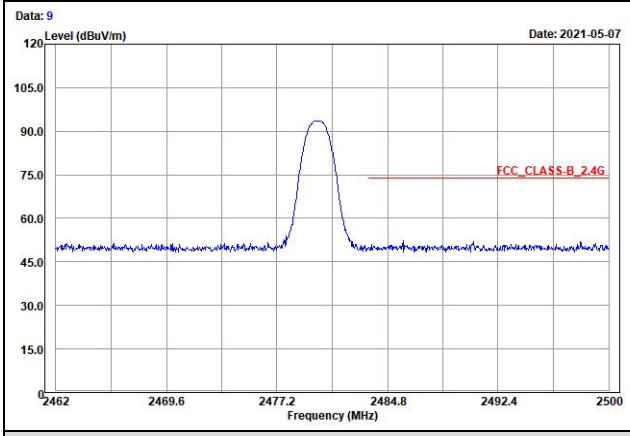
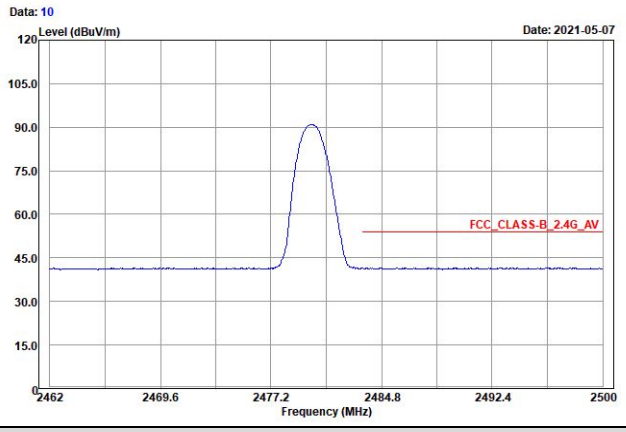
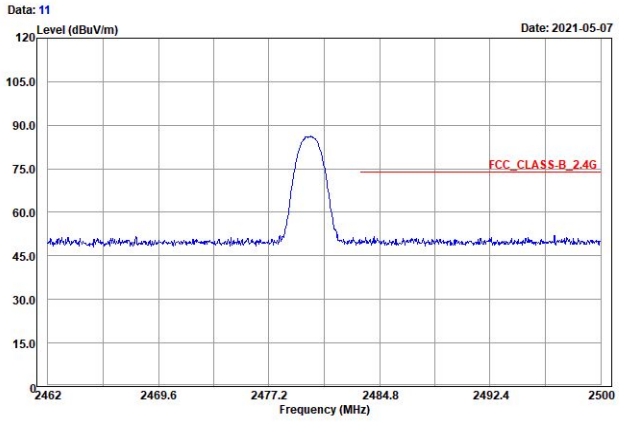
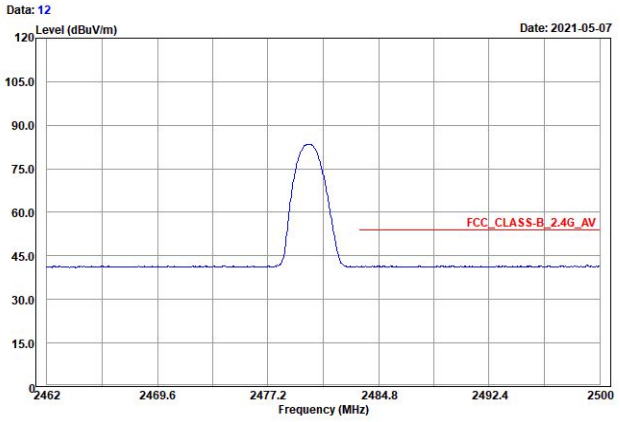
Channel 39	
Horizontal (Peak)	Horizontal (Average)
	
Vertical (Peak)	Vertical (Average)
	

Channel 79	
Horizontal (Peak)	Horizontal (Average)
	
Vertical (Peak)	Vertical (Average)
	

8DPSK

Channel 0	
Horizontal (Peak)	Horizontal (Average)
	
Vertical (Peak)	Vertical (Average)
	

Channel 39	
Horizontal (Peak)	Horizontal (Average)
	
Vertical (Peak)	Vertical (Average)
	

Channel 79	
Horizontal (Peak)	Horizontal (Average)
	
Vertical (Peak)	Vertical (Average)
	

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:

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Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab
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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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