

FCC Test Report

Report No.: RFBFLF-WTW-P21010278-2

FCC ID: MSQI007D

Test Model: ASUS_I007D

Received Date: Jan. 12, 2021

Test Date: Feb. 22 ~ Mar. 30, 2021

Issued Date: Mar. 31, 2021

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
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Taiwan

FCC Registration / 788550 / TW0003
Designation Number(1):
FCC Registration / 723255 / TW2022
Designation Number(2):



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Release Control Record

Issue No.	Description	Date Issued
RFBFLF-WTW-P21010278-2	Original release	Mar. 31, 2021

1 Certificate of Conformity

Product: EXP21 Smartphone

Brand: ASUS

Test Model: ASUS_I007D

Sample Status: Engineering sample

Applicant: ASUSTeK COMPUTER INC.

Test Date: Feb. 22 ~ Mar. 30, 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 : Pettie Chen, **Date:** Mar. 31, 2021
Pettie Chen / Senior Specialist

Approved by : Bruce Chen, **Date:** Mar. 31, 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	Pass	Meet the requirement of limit. Minimum passing margin is -16.24dB at 0.1500MHz.
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.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -10.6dB at 2390.0MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	Antenna connector is Ipex not a standard connector.

Note:

1. 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. 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) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	1.9 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.1 dB
	30MHz ~ 1GHz	5.4 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	5.0 dB
	18GHz ~ 40GHz	5.3 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	EXP21 Smartphone
Brand	ASUS
Test Model	ASUS_I007D
Sample Status	Engineering sample
Power Supply Rating	7.74 Vdc (Battery) 5 Vdc / 9 Vdc / 12 Vdc / 15Vdc / 20Vdc (Adapter)
Modulation Type	GFSK, $\pi/4$ -DQPSK, 8DPSK
Modulation Technology	FHSS
Transfer Rate	1/2/3Mbps
Operating Frequency	2402~2480MHz
Number of Channel	79
Output Power	57.544mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Refer to Note
Cable Supplied	Refer to Note

Note:

1. The EUT contains following accessory devices.

Product	Brand	Model	Description
Battery	SCUD	C21P2002	Rating: 7.74 Vdc, 15.2 Wh
Adapter	AOHAI	A320Q-200325C-US	I/P: 100-240Vac, 50/60Hz, 1.5A O/P: 5 Vdc, 3 A; 9 Vdc, 3 A; 12 Vdc, 3A; 15 Vdc, 3 A; 20 Vdc, 3.25 A
Type A to Type C USB Cable	Luxshare	LA9U2026-CS-R	0.5m
Type C to Type C Cable	Luxshare	LA9UC006-CS-R	1.2m
Bluetooth Earphone	Bang & Olufsen	EQ Earbud R	FCC ID: TTUBEOPLAYEQR IC: 3775B-BEOPLAYEQR
		EQ Earbud L	FCC ID: TTUBEOPLAYEQL IC: 3775B-BEOPLAYEQL
Bluetooth Earphone Charging Case	Bang & Olufsen	EQ Charging case	I/P: 5Vdc/500mA O/P: 5Vdc/ R170mA; L170mA

2. The antenna used in this EUT is listed as below table:

Band	Freq. Range	Gain(dBi)			Antenna Type	Connector Type
		Ant 3 Gain (dBi)	Ant 4 Gain (dBi)	Ant 6 Gain (dBi)		
2.4GHz/BT	2400-2500MHz	-3.332	-0.958	0.5	PIFA	Ipex

3. 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.

4. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

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 $\geq$ 1G	RE<1G	PLC	APCM	
A	√	√	√	-	Ant. 4
B	√	√	√	√	Ant. 6

Where RE $\geq$ 1G: Radiated Emission above 1GHz & Bandedge Measurement
 RE<1G: Radiated Emission below 1GHz
 PLC: Power Line Conducted Emission
 APCM: Antenna Port Conducted Measurement

Note: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Y-plane (Test Mode A) and X-plane (Test Mode B)**.

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
A, B	0 to 78	0, 39, 78	FHSS	GFSK	DH5
A, B	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
A, B	0 to 78	0	FHSS	GFSK	DH5

Power Line Conducted Emission Test:

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

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

Antenna Port Conducted Measurement:

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

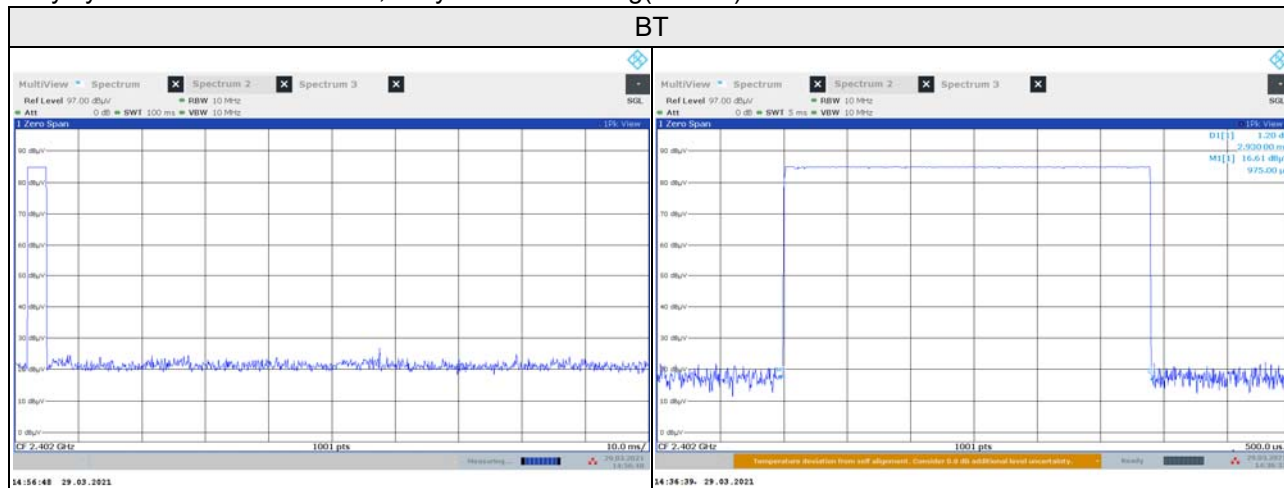
EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Pakcet Type
B	0 to 78	0, 39, 78	FHSS	GFSK	DH5
B	0 to 78	0, 39, 78	FHSS	8DPSK	3DH5

Test Condition:

Applicable to	Environmental Conditions	Input Power (System)	Tested by
RE $\geq$ 1G	25 deg. C, 68% RH	120Vac, 60Hz	Ryan Du
RE<1G	25 deg. C, 68% RH	120Vac, 60Hz	Tommy Yang
PLC	25 deg. C, 62% RH	120Vac, 60Hz	Sampson Chen
APCM	25 deg. C, 60% RH	120Vac, 60Hz	Chris Lin

3.3 Duty Cycle of Test Signal

Duty cycle = $2.93/100 = 0.0293$, Duty factor = $20 * \log(0.0293) = -30.7$

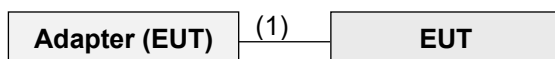


3.4 Description of Support Units

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	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	Type C to Type C Cable	1	0.5	Y	0	Accessory

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 Keysight	N9038A	MY54450088	July 06, 2020	July 05, 2021
Pre-Amplifier EMCI	EMC001340	980142	May 25, 2020	May 24, 2021
RF Cable	5D-FB	LOOPCAB-001	Jan. 07, 2021	Jan. 06, 2022
RF Cable	5D-FB	LOOPCAB-002	Jan. 07, 2021	Jan. 06, 2022
Pre-Amplifier Mini-Circuits	ZFL-1000VH2	QA0838008	Oct. 20, 2020	Oct. 19, 2021
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-361	Nov. 05, 2020	Nov. 04, 2021
RF Cable	8D	966-3-1	Mar. 17, 2020	Mar. 16, 2021
			Mar. 16, 2021	Mar. 15, 2022
RF Cable	8D	966-3-2	Mar. 17, 2020	Mar. 16, 2021
			Mar. 16, 2021	Mar. 15, 2022
RF Cable	8D	966-3-3	Mar. 17, 2020	Mar. 16, 2021
			Mar. 16, 2021	Mar. 15, 2022
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-3-01	Sep. 24, 2020	Sep. 23, 2021
Horn_Antenna SCHWARZBECK	BBHA9120-D	9120D-406	Nov. 22, 2020	Nov. 21, 2021
Pre-Amplifier EMCI	EMC12630SE	980384	Jan. 11, 2021	Jan. 10, 2022
RF Cable	EMC104-SM-SM-1 500	180504	Apr. 29, 2020	Apr. 28, 2021
RF Cable	EMC104-SM-SM-2 000	180601	Jun. 09, 2020	Jun. 08, 2021
RF Cable	EMC104-SM-SM-6 000	180602	Jun. 09, 2020	Jun. 08, 2021
USB Wideband Power Sensor KEYSIGHT	U2021XA	MY55050005/MY55190 004/MY55190007/MY55 210005	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 Hsinchu Chamber 3. (TAF No.: 2022)

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:

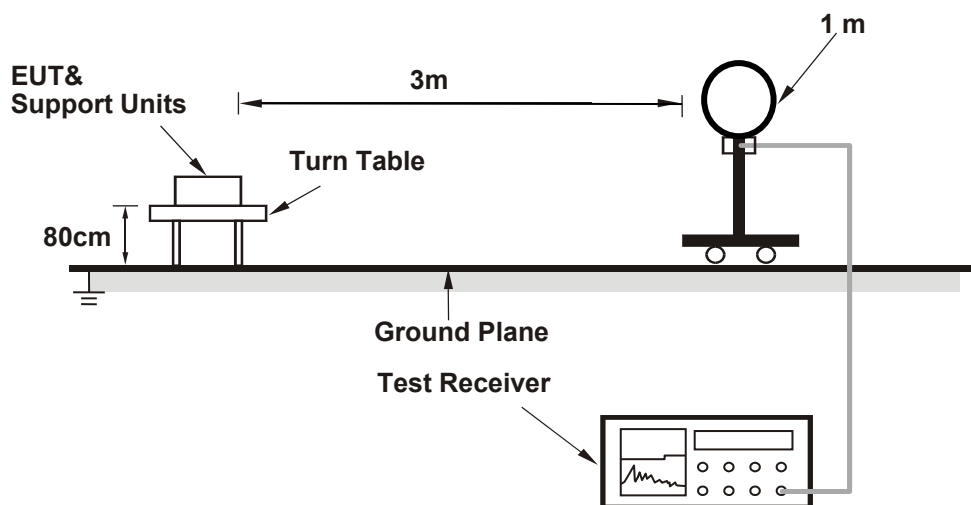
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (Duty cycle < 98%) or 10Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz. (RBW = 1 MHz, VBW = 1 kHz)
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

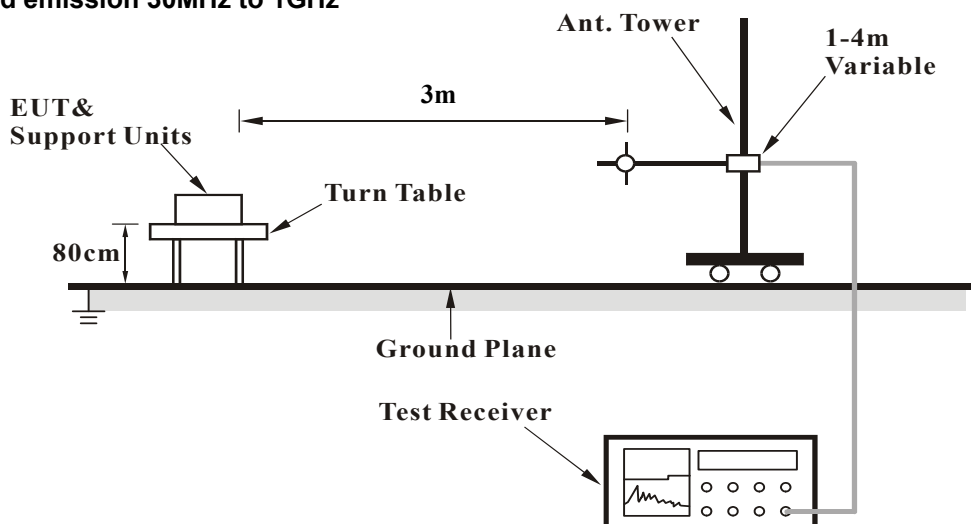
No deviation.

4.1.5 Test Setup

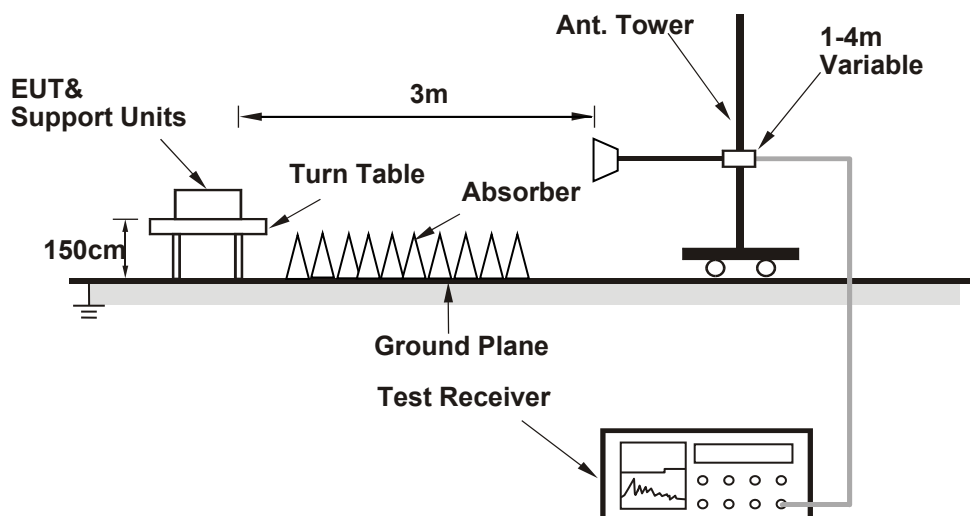
For Radiated emission below 30MHz



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:

Test Mode A

GFSK

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2384.75	55.4 PK	74.0	-18.6	1.57 H	321	56.3	-0.9
2	2384.75	42.8 AV	54.0	-11.2	1.57 H	321	43.7	-0.9
3	*2402.00	101.0 PK			1.57 H	321	101.9	-0.9
4	*2402.00	70.3 AV			1.57 H	321	71.2	-0.9
5	4804.00	39.3 PK	74.0	-34.7	1.51 H	218	35.2	4.1
6	4804.00	8.6 AV	54.0	-45.4	1.51 H	218	4.5	4.1
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	2329.96	55.1 PK	74.0	-18.9	2.06 V	265	55.8	-0.7
2	2329.96	43.0 AV	54.0	-11.0	2.06 V	265	43.7	-0.7
3	*2402.00	107.9 PK			2.06 V	265	108.8	-0.9
4	*2402.00	77.2 AV			2.06 V	265	78.1	-0.9
5	4804.00	38.7 PK	74.0	-35.3	1.57 V	52	34.6	4.1
6	4804.00	8.0 AV	54.0	-46.0	1.57 V	52	3.9	4.1

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

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

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	100.5 PK			1.60 H	291	101.4	-0.9
2	*2441.00	69.8 AV			1.60 H	291	70.7	-0.9
3	4882.00	39.3 PK	74.0	-34.7	1.47 H	220	35.1	4.2
4	4882.00	8.6 AV	54.0	-45.4	1.47 H	220	4.4	4.2
5	7323.00	43.2 PK	74.0	-30.8	1.50 H	343	32.9	10.3
6	7323.00	12.5 AV	54.0	-41.5	1.50 H	343	2.2	10.3
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	108.1 PK			2.19 V	213	109.0	-0.9
2	*2441.00	77.4 AV			2.19 V	213	78.3	-0.9
3	4882.00	38.7 PK	74.0	-35.3	1.46 V	26	34.5	4.2
4	4882.00	8.0 AV	54.0	-46.0	1.46 V	26	3.8	4.2
5	7323.00	43.9 PK	74.0	-30.1	1.60 V	47	33.6	10.3
6	7323.00	13.2 AV	54.0	-40.8	1.60 V	47	2.9	10.3

Remarks:

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

CHANNEL	TX Channel 78	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

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	*2480.00	100.8 PK			1.55 H	306	101.6	-0.8
2	*2480.00	70.1 AV			1.55 H	306	70.9	-0.8
3	2484.54	55.7 PK	74.0	-18.3	1.55 H	306	56.5	-0.8
4	2484.54	25.0 AV	54.0	-29.0	1.55 H	306	25.8	-0.8
5	4960.00	39.2 PK	74.0	-34.8	1.52 H	220	34.7	4.5
6	4960.00	8.5 AV	54.0	-45.5	1.52 H	220	4.0	4.5
7	7440.00	43.7 PK	74.0	-30.3	1.50 H	354	33.4	10.3
8	7440.00	13.0 AV	54.0	-41.0	1.50 H	354	2.7	10.3

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	*2480.00	107.9 PK			2.16 V	227	108.7	-0.8
2	*2480.00	77.2 AV			2.16 V	227	78.0	-0.8
3	2494.94	55.3 PK	74.0	-18.7	2.16 V	227	56.1	-0.8
4	2494.94	24.6 AV	54.0	-29.4	2.16 V	227	25.4	-0.8
5	4960.00	38.8 PK	74.0	-35.2	1.52 V	30	34.3	4.5
6	4960.00	8.1 AV	54.0	-45.9	1.52 V	30	3.6	4.5
7	7440.00	43.6 PK	74.0	-30.4	1.56 V	42	33.3	10.3
8	7440.00	12.9 AV	54.0	-41.1	1.56 V	42	2.6	10.3

Remarks:

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

8DPSK

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2384.10	55.9 PK	74.0	-18.1	1.54 H	292	56.8	-0.9
2	2384.10	43.2 AV	54.0	-10.8	1.54 H	292	44.1	-0.9
3	*2402.00	96.6 PK			1.54 H	292	97.5	-0.9
4	*2402.00	65.9 AV			1.54 H	292	66.8	-0.9
5	4804.00	38.5 PK	74.0	-35.5	1.56 H	224	34.4	4.1
6	4804.00	7.8 AV	54.0	-46.2	1.56 H	224	3.7	4.1
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	2363.62	54.7 PK	74.0	-19.3	1.61 V	317	55.5	-0.8
2	2363.62	42.9 AV	54.0	-11.1	1.61 V	317	43.7	-0.8
3	*2402.00	106.3 PK			1.61 V	317	107.2	-0.9
4	*2402.00	75.6 AV			1.61 V	317	76.5	-0.9
5	4804.00	39.0 PK	74.0	-35.0	1.49 V	42	34.9	4.1
6	4804.00	8.3 AV	54.0	-45.7	1.49 V	42	4.2	4.1

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

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

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	97.1 PK			1.49 H	298	98.0	-0.9
2	*2441.00	66.4 AV			1.49 H	298	67.3	-0.9
3	4882.00	38.9 PK	74.0	-35.1	1.50 H	229	34.7	4.2
4	4882.00	8.2 AV	54.0	-45.8	1.50 H	229	4.0	4.2
5	7323.00	44.4 PK	74.0	-29.6	1.54 H	352	34.1	10.3
6	7323.00	13.7 AV	54.0	-40.3	1.54 H	352	3.4	10.3
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	106.4 PK			1.61 V	331	107.3	-0.9
2	*2441.00	75.7 AV			1.61 V	331	76.6	-0.9
3	4882.00	38.7 PK	74.0	-35.3	1.51 V	31	34.5	4.2
4	4882.00	8.0 AV	54.0	-46.0	1.51 V	31	3.8	4.2
5	7323.00	43.0 PK	74.0	-31.0	1.60 V	58	32.7	10.3
6	7323.00	12.3 AV	54.0	-41.7	1.60 V	58	2.0	10.3

Remarks:

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

CHANNEL	TX Channel 78	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

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	*2480.00	96.8 PK			1.54 H	297	97.6	-0.8
2	*2480.00	66.1 AV			1.54 H	297	66.9	-0.8
3	2494.91	55.9 PK	74.0	-18.1	1.54 H	297	56.7	-0.8
4	2494.91	25.2 AV	54.0	-28.8	1.54 H	297	26.0	-0.8
5	4960.00	39.4 PK	74.0	-34.6	1.50 H	230	34.9	4.5
6	4960.00	8.7 AV	54.0	-45.3	1.50 H	230	4.2	4.5
7	7440.00	43.6 PK	74.0	-30.4	1.51 H	348	33.3	10.3
8	7440.00	12.9 AV	54.0	-41.1	1.51 H	348	2.6	10.3
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	*2480.00	106.9 PK			1.97 V	137	107.7	-0.8
2	*2480.00	76.2 AV			1.97 V	137	77.0	-0.8
3	2485.57	54.5 PK	74.0	-19.5	1.97 V	137	55.3	-0.8
4	2485.57	23.8 AV	54.0	-30.2	1.97 V	137	24.6	-0.8
5	4960.00	39.3 PK	74.0	-34.7	1.55 V	29	34.8	4.5
6	4960.00	8.6 AV	54.0	-45.4	1.55 V	29	4.1	4.5
7	7440.00	44.0 PK	74.0	-30.0	1.53 V	31	33.7	10.3
8	7440.00	13.3 AV	54.0	-40.7	1.53 V	31	3.0	10.3

Remarks:

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

Test Mode B

GFSK

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	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	56.5 PK	74.0	-17.5	1.00 H	161	57.4	-0.9
2	2390.00	43.4 AV	54.0	-10.6	1.00 H	161	44.3	-0.9
3	*2402.00	110.2 PK			1.00 H	161	111.1	-0.9
4	*2402.00	79.5 AV			1.00 H	161	80.4	-0.9
5	4804.00	39.8 PK	74.0	-34.2	1.69 H	104	35.7	4.1
6	4804.00	9.1 AV	54.0	-44.9	1.69 H	104	5.0	4.1
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	55.6 PK	74.0	-18.4	1.55 V	284	56.5	-0.9
2	2390.00	43.3 AV	54.0	-10.7	1.55 V	284	44.2	-0.9
3	*2402.00	100.3 PK			1.55 V	284	101.2	-0.9
4	*2402.00	69.6 AV			1.55 V	284	70.5	-0.9
5	4804.00	38.0 PK	74.0	-36.0	1.45 V	45	33.9	4.1
6	4804.00	7.3 AV	54.0	-46.7	1.45 V	45	3.2	4.1

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

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

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	110.8 PK			1.07 H	179	111.7	-0.9
2	*2441.00	80.1 AV			1.07 H	179	81.0	-0.9
3	4882.00	39.5 PK	74.0	-34.5	1.70 H	89	35.3	4.2
4	4882.00	8.8 AV	54.0	-45.2	1.70 H	89	4.6	4.2
5	7323.00	43.7 PK	74.0	-30.3	1.89 H	200	33.4	10.3
6	7323.00	13.0 AV	54.0	-41.0	1.89 H	200	2.7	10.3
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	100.0 PK			1.54 V	289	100.9	-0.9
2	*2441.00	69.3 AV			1.54 V	289	70.2	-0.9
3	4882.00	37.9 PK	74.0	-36.1	1.40 V	33	33.7	4.2
4	4882.00	7.2 AV	54.0	-46.8	1.40 V	33	3.0	4.2
5	7323.00	43.5 PK	74.0	-30.5	1.68 V	96	33.2	10.3
6	7323.00	12.8 AV	54.0	-41.2	1.68 V	96	2.5	10.3

Remarks:

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

CHANNEL	TX Channel 78	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

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	*2480.00	110.9 PK			1.04 H	168	111.7	-0.8
2	*2480.00	80.2 AV			1.04 H	168	81.0	-0.8
3	2483.50	56.0 PK	74.0	-18.0	1.04 H	168	56.8	-0.8
4	2483.50	25.3 AV	54.0	-28.7	1.04 H	168	26.1	-0.8
5	4960.00	38.9 PK	74.0	-35.1	1.69 H	99	34.4	4.5
6	4960.00	8.2 AV	54.0	-45.8	1.69 H	99	3.7	4.5
7	7440.00	44.0 PK	74.0	-30.0	1.85 H	193	33.7	10.3
8	7440.00	13.3 AV	54.0	-40.7	1.85 H	193	3.0	10.3
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	*2480.00	100.0 PK			1.54 V	286	100.8	-0.8
2	*2480.00	69.3 AV			1.54 V	286	70.1	-0.8
3	2483.50	55.0 PK	74.0	-19.0	1.54 V	286	55.8	-0.8
4	2483.50	24.3 AV	54.0	-29.7	1.54 V	286	25.1	-0.8
5	4960.00	38.4 PK	74.0	-35.6	1.43 V	45	33.9	4.5
6	4960.00	7.7 AV	54.0	-46.3	1.43 V	45	3.2	4.5
7	7440.00	43.6 PK	74.0	-30.4	1.73 V	86	33.3	10.3
8	7440.00	12.9 AV	54.0	-41.1	1.73 V	86	2.6	10.3

Remarks:

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

8DPSK

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	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	55.8 PK	74.0	-18.2	1.02 H	164	56.7	-0.9
2	2390.00	43.3 AV	54.0	-10.7	1.02 H	164	44.2	-0.9
3	*2402.00	107.5 PK			1.02 H	164	108.4	-0.9
4	*2402.00	76.8 AV			1.02 H	164	77.7	-0.9
5	4804.00	39.6 PK	74.0	-34.4	1.67 H	123	35.5	4.1
6	4804.00	8.9 AV	54.0	-45.1	1.67 H	123	4.8	4.1
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	55.0 PK	74.0	-19.0	1.48 V	286	55.9	-0.9
2	2390.00	42.8 AV	54.0	-11.2	1.48 V	286	43.7	-0.9
3	*2402.00	98.9 PK			1.48 V	286	99.8	-0.9
4	*2402.00	68.2 AV			1.48 V	286	69.1	-0.9
5	4804.00	38.5 PK	74.0	-35.5	1.40 V	61	34.4	4.1
6	4804.00	7.8 AV	54.0	-46.2	1.40 V	61	3.7	4.1

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

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

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	108.3 PK			1.01 H	152	109.2	-0.9
2	*2441.00	77.6 AV			1.01 H	152	78.5	-0.9
3	4882.00	39.2 PK	74.0	-34.8	1.65 H	97	35.0	4.2
4	4882.00	8.5 AV	54.0	-45.5	1.65 H	97	4.3	4.2
5	7323.00	44.1 PK	74.0	-29.9	1.84 H	193	33.8	10.3
6	7323.00	13.4 AV	54.0	-40.6	1.84 H	193	3.1	10.3
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	96.2 PK			1.61 V	267	97.1	-0.9
2	*2441.00	65.5 AV			1.61 V	267	66.4	-0.9
3	4882.00	38.3 PK	74.0	-35.7	1.37 V	36	34.1	4.2
4	4882.00	7.6 AV	54.0	-46.4	1.37 V	36	3.4	4.2
5	7323.00	43.9 PK	74.0	-30.1	1.68 V	97	33.6	10.3
6	7323.00	13.2 AV	54.0	-40.8	1.68 V	97	2.9	10.3

Remarks:

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

CHANNEL	TX Channel 78	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

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	*2480.00	108.9 PK			1.02 H	170	109.7	-0.8
2	*2480.00	78.2 AV			1.02 H	170	79.0	-0.8
3	2483.50	55.3 PK	74.0	-18.7	1.02 H	170	56.1	-0.8
4	2483.50	24.6 AV	54.0	-29.4	1.02 H	170	25.4	-0.8
5	4960.00	38.7 PK	74.0	-35.3	1.67 H	101	34.2	4.5
6	4960.00	8.0 AV	54.0	-46.0	1.67 H	101	3.5	4.5
7	7440.00	43.8 PK	74.0	-30.2	1.90 H	206	33.5	10.3
8	7440.00	13.1 AV	54.0	-40.9	1.90 H	206	2.8	10.3
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	*2480.00	96.5 PK			1.50 V	284	97.3	-0.8
2	*2480.00	65.8 AV			1.50 V	284	66.6	-0.8
3	2483.50	54.9 PK	74.0	-19.1	1.50 V	284	55.7	-0.8
4	2483.50	24.2 AV	54.0	-29.8	1.50 V	284	25.0	-0.8
5	4960.00	38.9 PK	74.0	-35.1	1.41 V	49	34.4	4.5
6	4960.00	8.2 AV	54.0	-45.8	1.41 V	49	3.7	4.5
7	7440.00	43.8 PK	74.0	-30.2	1.69 V	93	33.5	10.3
8	7440.00	13.1 AV	54.0	-40.9	1.69 V	93	2.8	10.3

Remarks:

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

Below 1GHz worst-case data:

Test Mode A

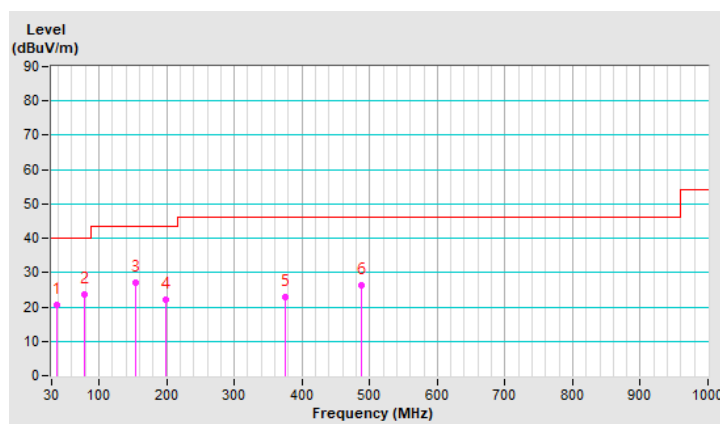
GFSK

CHANNEL	TX Channel 0	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 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	38.05	20.7 QP	40.0	-19.3	3.00 H	20	29.6	-8.9
2	78.11	23.6 QP	40.0	-16.4	2.00 H	0	36.1	-12.5
3	154.38	27.0 QP	43.5	-16.5	2.00 H	267	34.5	-7.5
4	198.34	22.0 QP	43.5	-21.5	1.00 H	110	32.6	-10.6
5	374.52	22.9 QP	46.0	-23.1	1.50 H	320	27.3	-4.4
6	488.42	26.2 QP	46.0	-19.8	1.00 H	0	27.6	-1.4

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

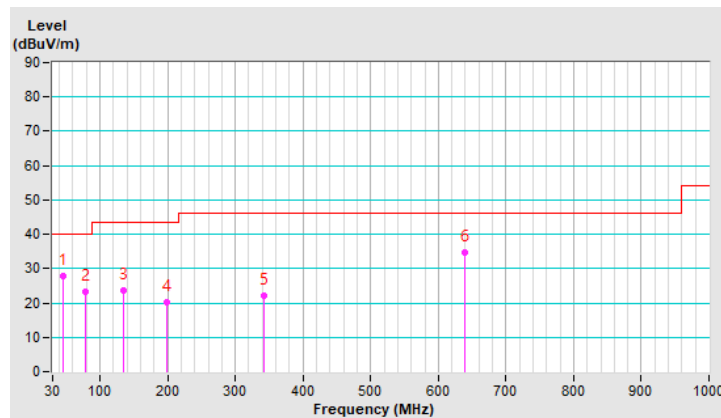


CHANNEL	TX Channel 0	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

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	44.62	27.9 QP	40.0	-12.1	1.50 V	360	36.2	-8.3
2	78.26	23.1 QP	40.0	-16.9	1.00 V	105	35.6	-12.5
3	134.15	23.7 QP	43.5	-19.8	1.00 V	40	32.0	-8.3
4	199.56	20.2 QP	43.5	-23.3	2.00 V	260	30.8	-10.6
5	341.39	22.2 QP	46.0	-23.8	1.00 V	11	27.5	-5.3
6	639.94	34.8 QP	46.0	-11.2	1.00 V	360	32.5	2.3

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
4. Margin value = Emission Level – Limit value
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20dB below the permissible value to be report.



Test Mode B

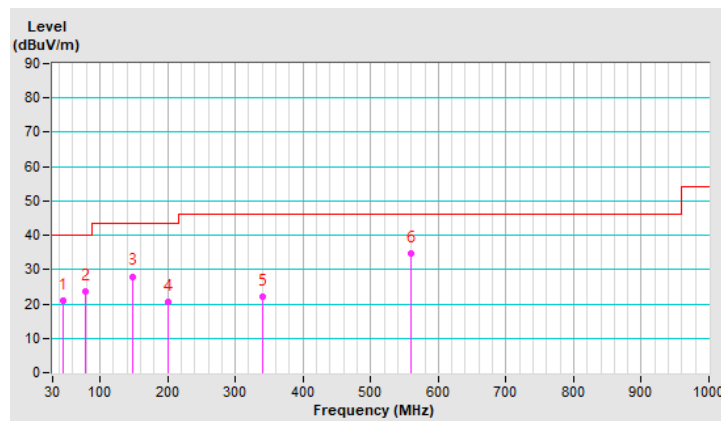
GFSK

CHANNEL	TX Channel 0	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 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	45.13	21.1 QP	40.0	-18.9	3.00 H	360	29.3	-8.2
2	77.99	23.7 QP	40.0	-16.3	3.00 H	360	36.2	-12.5
3	148.41	28.0 QP	43.5	-15.5	2.00 H	277	35.6	-7.6
4	200.04	20.7 QP	43.5	-22.8	1.50 H	360	31.3	-10.6
5	341.01	22.2 QP	46.0	-23.8	3.00 H	16	27.5	-5.3
6	559.98	34.5 QP	46.0	-11.5	1.50 H	62	34.4	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. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
4. Margin value = Emission Level – Limit value
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20dB below the permissible value to be report.

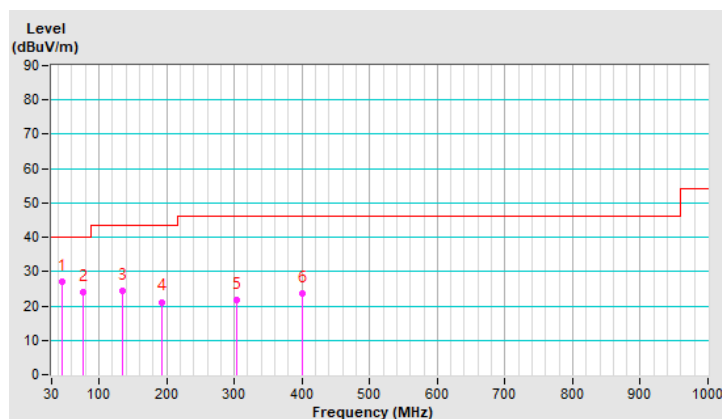


CHANNEL	TX Channel 0	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz		

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	45.25	27.2 QP	40.0	-12.8	1.50 V	345	35.4	-8.2
2	77.43	23.8 QP	40.0	-16.2	1.00 V	110	36.2	-12.4
3	134.06	24.2 QP	43.5	-19.3	1.00 V	186	32.6	-8.4
4	192.23	21.2 QP	43.5	-22.3	1.00 V	10	31.6	-10.4
5	304.24	21.8 QP	46.0	-24.2	2.00 V	350	28.2	-6.4
6	399.81	23.5 QP	46.0	-22.5	1.50 V	283	27.3	-3.8

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



4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver R&S	ESCS 30	847124/029	Oct. 20, 2020	Oct. 19, 2021
Line-Impedance Stabilization Network (for EUT) R&S	ESH3-Z5	848773/004	Oct. 27, 2020	Oct. 26, 2021
Line-Impedance Stabilization Network (for Peripheral) R&S	ESH3-Z5	835239/001	Mar. 19, 2020	Mar. 18, 2021
50 ohms Terminator	50	3	Oct. 26, 2020	Oct. 25, 2021
RF Cable	5D-FB	COCCAB-001	Sep. 26, 2020	Sep. 25, 2021
Fixed attenuator EMCI	STI02-2200-10	005	Aug. 29, 2020	Aug. 28, 2021
Software BVADT	BVADT_Cond_ V7.3.7.4	NA	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 Hsinchu Conduction 1. (TAF No.: 2022)
 3. Test Date: Mar. 03, 2021

4.2.3 Test Procedures

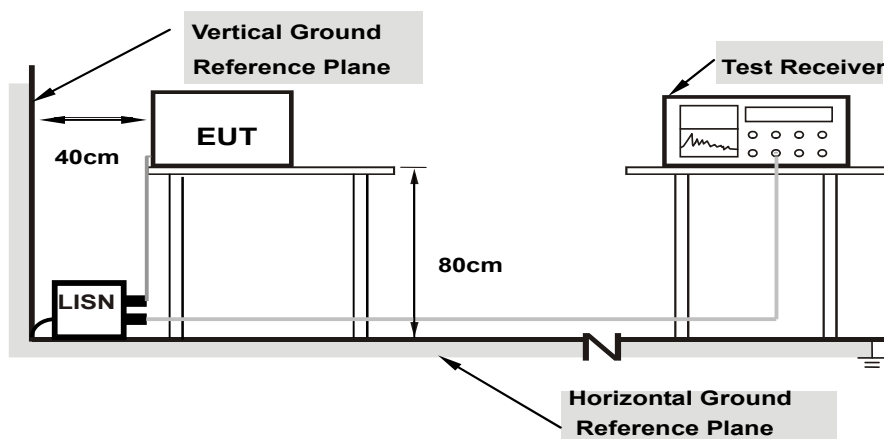
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50 uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit – 20 dB) was not recorded.

Note: The resolution bandwidth and video bandwidth of test receiver is 9 kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15 MHz – 30 MHz.

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



Note: 1.Support units were connected to second LISN.

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

4.2.6 EUT Operating Conditions

Same as 4.1.6.

4.2.7 Test Results

Worst-case data:

Test Mode A

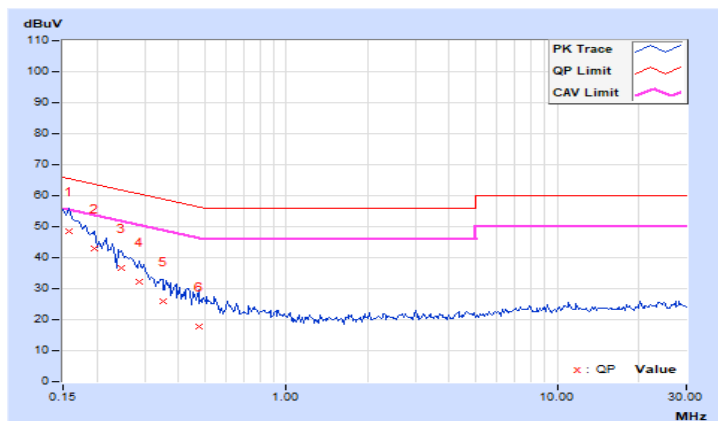
GFSK

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
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No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15781	9.96	38.59	16.87	48.55	26.83	65.58	55.58	-17.03	-28.75
2	0.19687	9.99	32.90	12.18	42.89	22.17	63.74	53.74	-20.85	-31.57
3	0.24766	10.00	26.77	6.96	36.77	16.96	61.84	51.84	-25.07	-34.88
4	0.28672	10.00	22.13	2.74	32.13	12.74	60.62	50.62	-28.49	-37.88
5	0.34922	10.01	15.76	-1.79	25.77	8.22	58.98	48.98	-33.21	-40.76
6	0.47422	10.02	7.94	-5.27	17.96	4.75	56.44	46.44	-38.48	-41.69

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

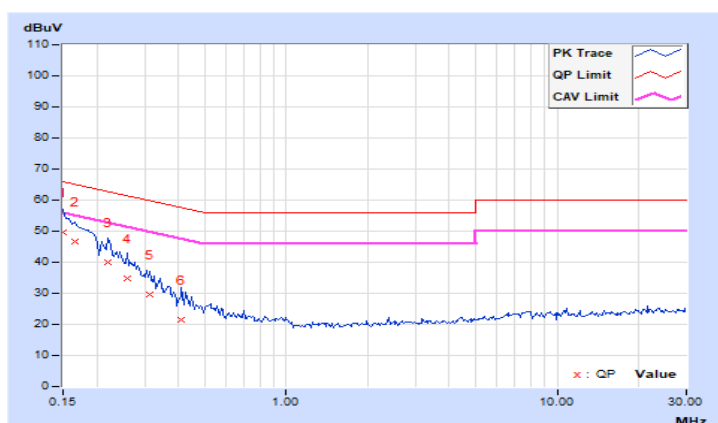


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
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No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	9.94	39.82	17.90	49.76	27.84	66.00	56.00	-16.24	-28.16
2	0.16562	9.95	36.78	15.85	46.73	25.80	65.18	55.18	-18.45	-29.38
3	0.22031	9.98	30.11	10.10	40.09	20.08	62.81	52.81	-22.72	-32.73
4	0.25938	9.99	24.77	5.22	34.76	15.21	61.45	51.45	-26.69	-36.24
5	0.31406	10.00	19.52	1.11	29.52	11.11	59.86	49.86	-30.34	-38.75
6	0.41172	10.01	11.50	-3.83	21.51	6.18	57.61	47.61	-36.10	-41.43

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.



Test Mode B

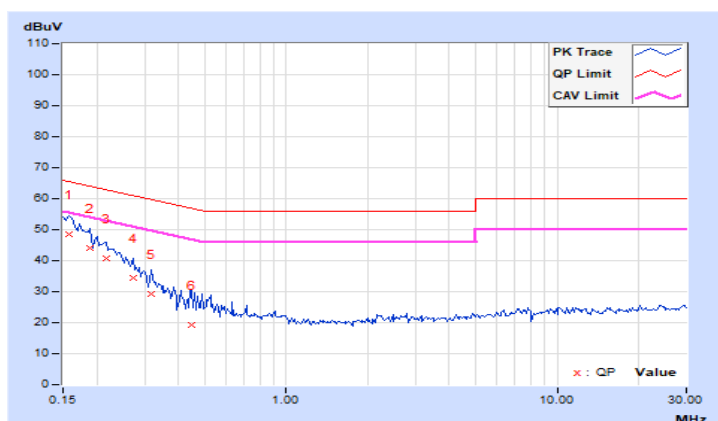
GFSK

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
-------	----------	-------------------	--------------------------------

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15781	9.96	38.73	17.15	48.69	27.11	65.58	55.58	-16.89	-28.47
2	0.18906	9.98	34.03	12.96	44.01	22.94	64.08	54.08	-20.07	-31.14
3	0.21641	9.99	30.68	10.22	40.67	20.21	62.96	52.96	-22.29	-32.75
4	0.27109	10.00	24.60	5.21	34.60	15.21	61.08	51.08	-26.48	-35.87
5	0.31797	10.01	19.29	0.58	29.30	10.59	59.76	49.76	-30.46	-39.17
6	0.44688	10.02	9.21	-5.86	19.23	4.16	56.93	46.93	-37.70	-42.77

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

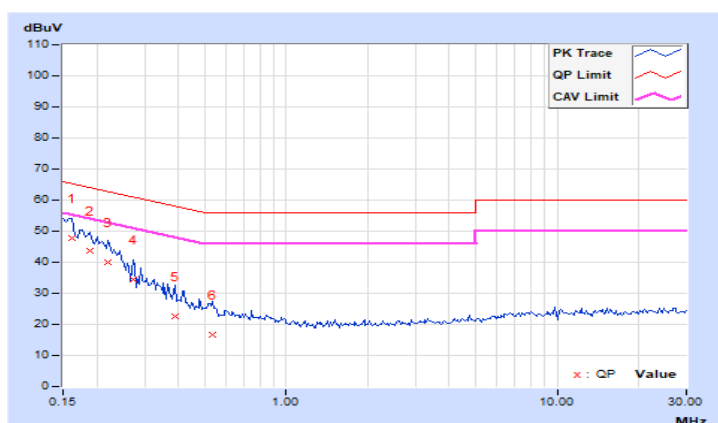


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
-------	-------------	-------------------	--------------------------------

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16172	9.95	37.73	16.33	47.68	26.28	65.38	55.38	-17.70	-29.10
2	0.18906	9.97	33.75	13.20	43.72	23.17	64.08	54.08	-20.36	-30.91
3	0.22031	9.98	30.11	10.08	40.09	20.06	62.81	52.81	-22.72	-32.75
4	0.27109	9.99	24.39	5.11	34.38	15.10	61.08	51.08	-26.70	-35.98
5	0.38828	10.01	12.75	-3.40	22.76	6.61	58.10	48.10	-35.34	-41.49
6	0.53672	10.02	6.65	-3.08	16.67	6.94	56.00	46.00	-39.33	-39.06

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.



4.3 Number of Hopping Frequency Used

4.3.1 Limits of Hopping Frequency Used Measurement

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

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

- Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- 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.
- 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.
- Set the SA on View mode and then plot the result on SA screen.
- Repeat above procedures until all frequencies measured were complete.

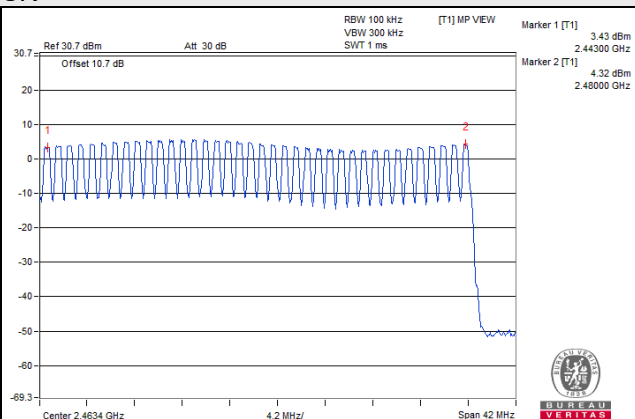
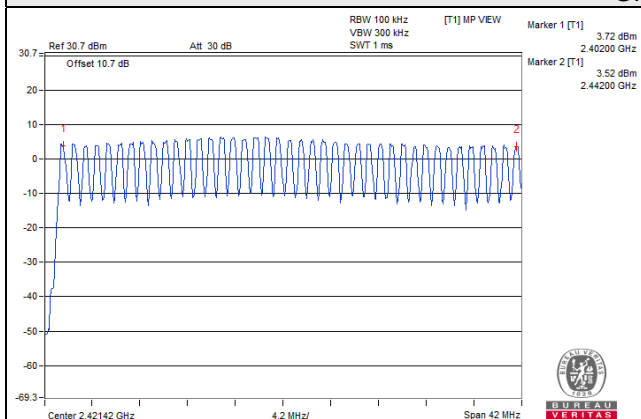
4.3.5 Deviation from Test Standard

No deviation.

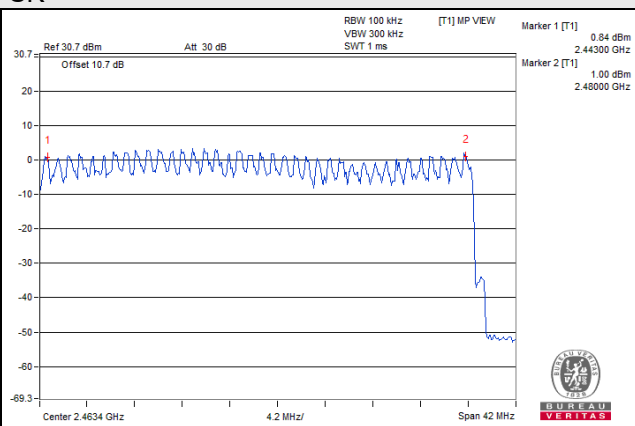
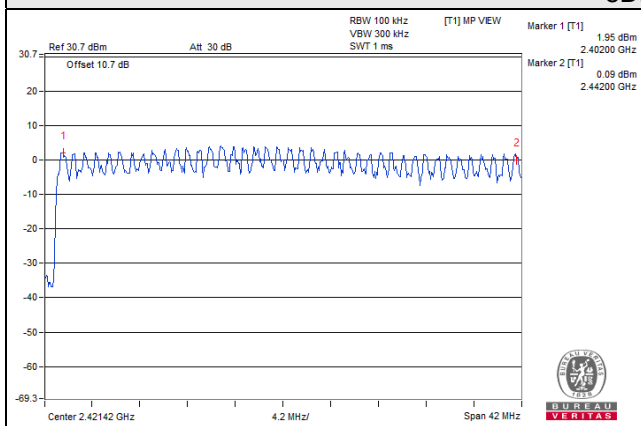
4.3.6 Test Results

There are 79 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



8DPSK



4.4 Dwell Time on Each Channel

4.4.1 Limits of Dwell Time on Each Channel Measurement

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.

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 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.

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 Test Results

GFSK

Mode	Number of transmission in a 31.6 (79Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (msec)
DH1	50 (times / 5 sec) * 6.32 = 316 times	0.42	132.72	400
DH3	26 (times / 5 sec) * 6.32 = 165 times	1.68	277.20	400
DH5	18 (times / 5 sec) * 6.32 = 114 times	2.94	335.16	400

Note: Test plots of the transmitting time slot are shown as below.



8DPSK

Mode	Number of transmission in a 31.6 (79Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (msec)
3DH1	51 (times / 5 sec) * 6.32 = 323 times	0.43	138.89	400
3DH3	25 (times / 5 sec) * 6.32 = 158 times	1.70	268.60	400
3DH5	16 (times / 5 sec) * 6.32 = 102 times	2.94	299.88	400

Note: Test plots of the transmitting time slot are shown as below.



4.5 Channel Bandwidth

4.5.1 Limits of Channel Bandwidth Measurement

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 shall be a minimum limit for the hopping channel separation.

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedure

- Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 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.
- Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
- Repeat above procedures until all frequencies measured were complete.

4.5.5 Deviation from Test Standard

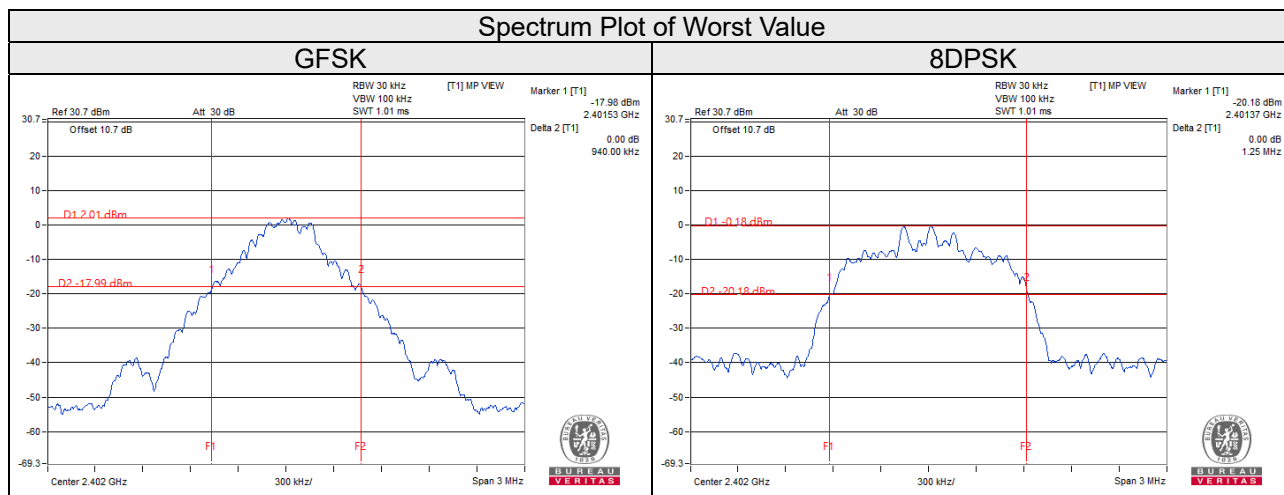
No deviation.

4.5.6 EUT Operating Condition

The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.5.7 Test Results

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	
		GFSK	8DPSK
0	2402	0.94	1.25
39	2441	0.94	1.25
78	2480	0.94	1.23



4.6 Hopping Channel Separation

4.6.1 Limits of Hopping Channel Separation Measurement

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

4.6.2 Test Setup



4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

Measurement Procedure REF

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

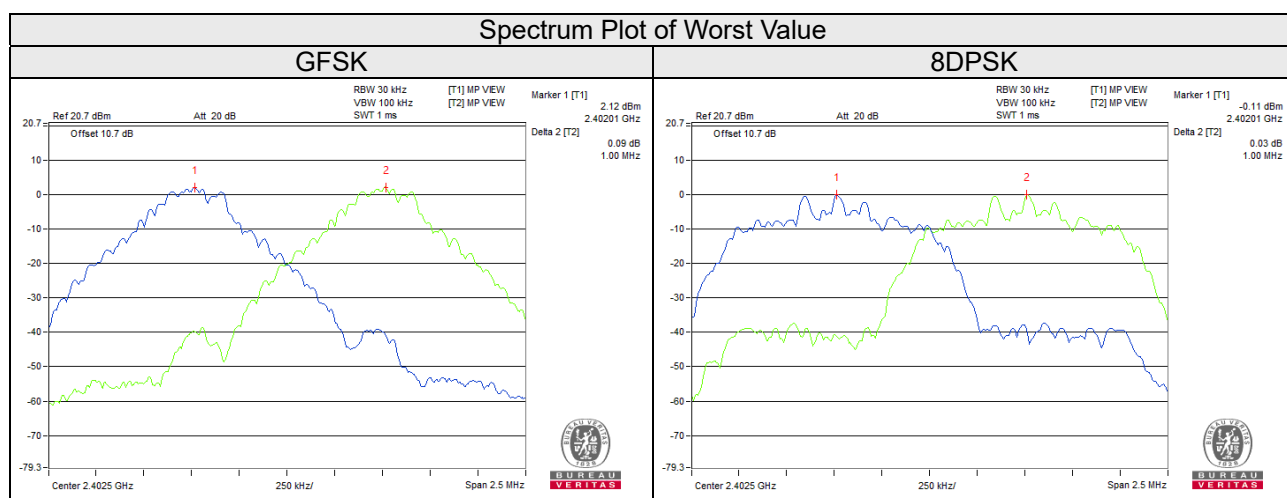
4.6.5 Deviation from Test Standard

No deviation.

4.6.6 Test Results

Channel	Frequency (MHz)	Adjacent Channel Separation (MHz)		20dB Bandwidth (MHz)		Minimum Limit (MHz)		Pass / Fail
		GFSK	8DPSK	GFSK	8DPSK	GFSK	8DPSK	
0	2402	1.00	1.00	0.94	1.25	0.63	0.84	Pass
39	2441	1.00	1.00	0.94	1.25	0.63	0.84	Pass
78	2480	1.00	1.00	0.94	1.23	0.63	0.82	Pass

Note: The minimum limit is two-third 20dB bandwidth.

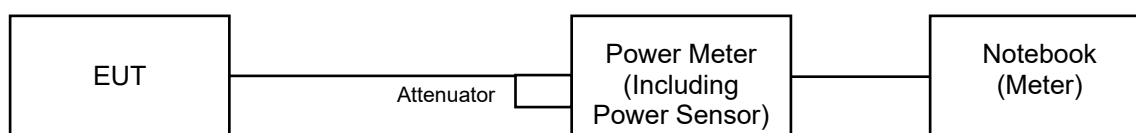


4.7 Maximum Output Power

4.7.1 Limits of Maximum Output Power Measurement

Refer to Regulation 15.247 (a) (1), the Maximum Output Power Measurement is 125mW.

4.7.2 Test Setup



4.7.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.7.4 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.

4.7.5 Deviation from Test Standard

No deviation.

4.7.6 EUT Operating Condition

The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.7.7 Test Results

For Peak Power

Channel	Frequency (MHz)	Peak Power (mW)		Peak Power (dBm)		Power Limit (mW)	Pass / Fail
		GFSK	8DPSK	GFSK	8DPSK		
0	2402	57.544	45.709	17.60	16.60	125	Pass
39	2441	56.885	45.186	17.55	16.55	125	Pass
78	2480	56.234	44.668	17.50	16.50	125	Pass

For Average Power

Channel	Frequency (MHz)	Average Power (mW)		Average Power (dBm)	
		GFSK	8DPSK	GFSK	8DPSK
0	2402	55.335	35.727	17.43	15.53
39	2441	54.325	35.318	17.35	15.48
78	2480	53.703	34.914	17.30	15.43

4.8 Conducted Out of Band Emission Measurement

4.8.1 Limits Of Conducted Out Of Band Emission Measurement

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

4.8.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.8.3 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 and 300 kHz with suitable frequency span including 100 MHz bandwidth from band edge. The band edges was measured and recorded.

4.8.4 Deviation from Test Standard

No deviation.

4.8.5 EUT Operating Condition

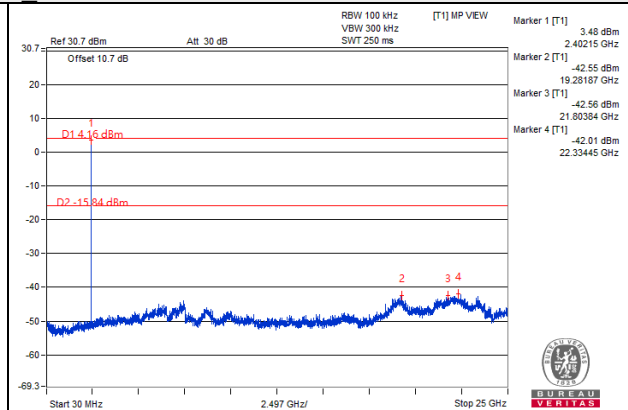
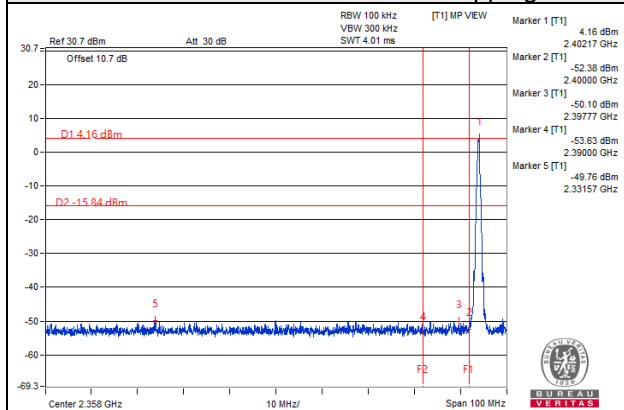
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.8.6 Test Results

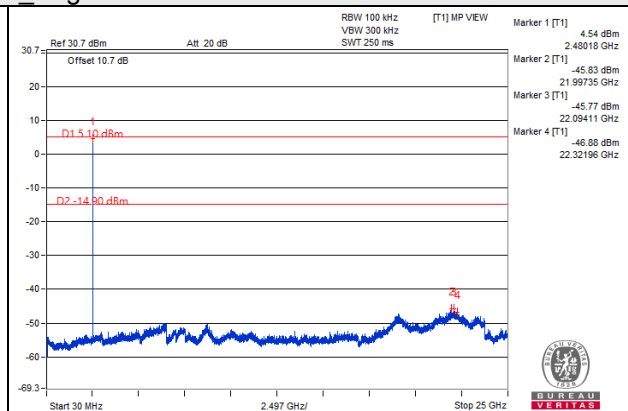
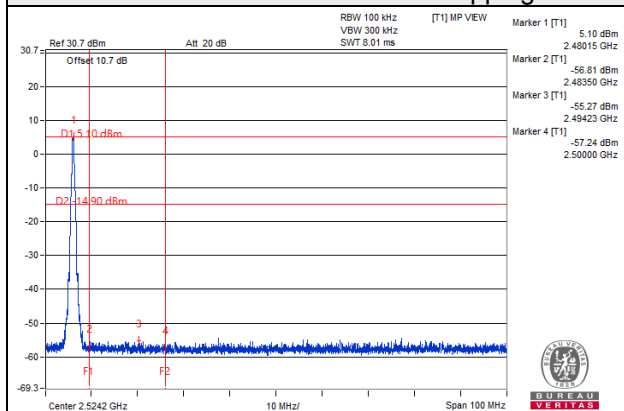
The spectrum plots are attached on the following images. D1 line indicates the highest level, D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

GFSK

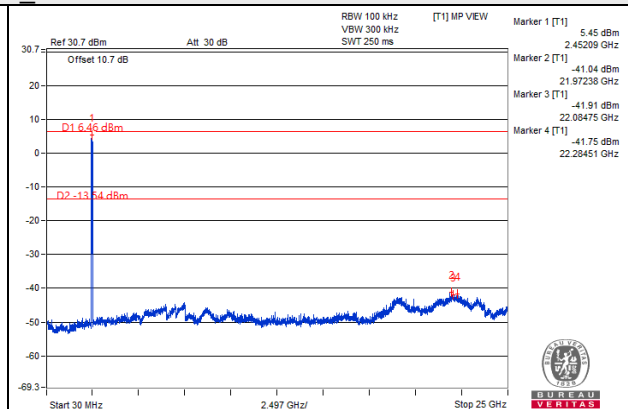
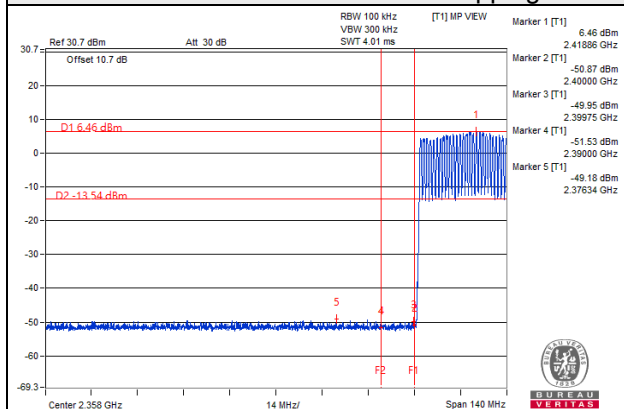
Hopping disabled Low Channel



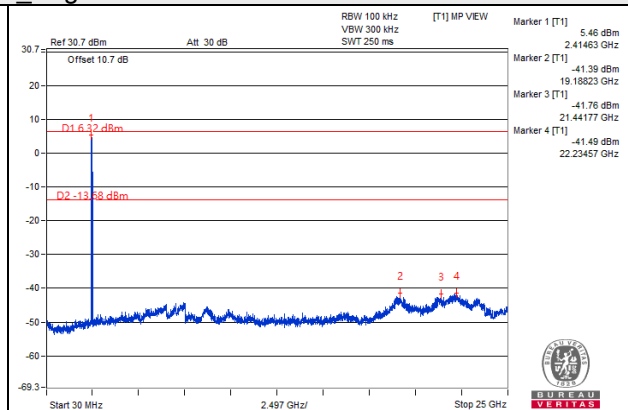
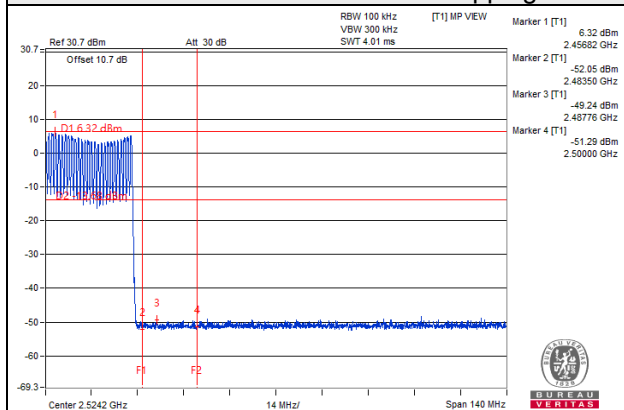
Hopping disabled High Channel

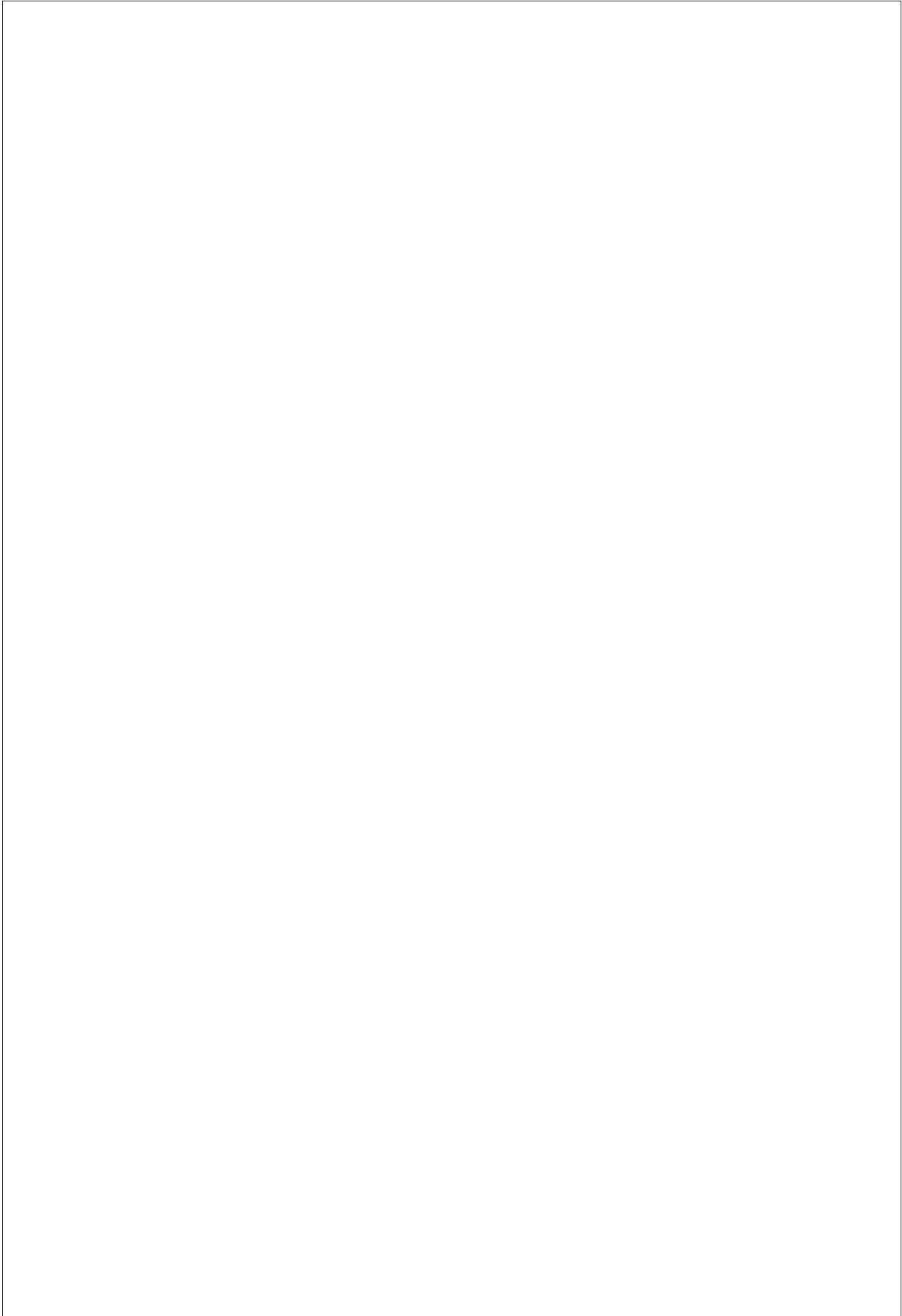


Hopping enabled Low Channel



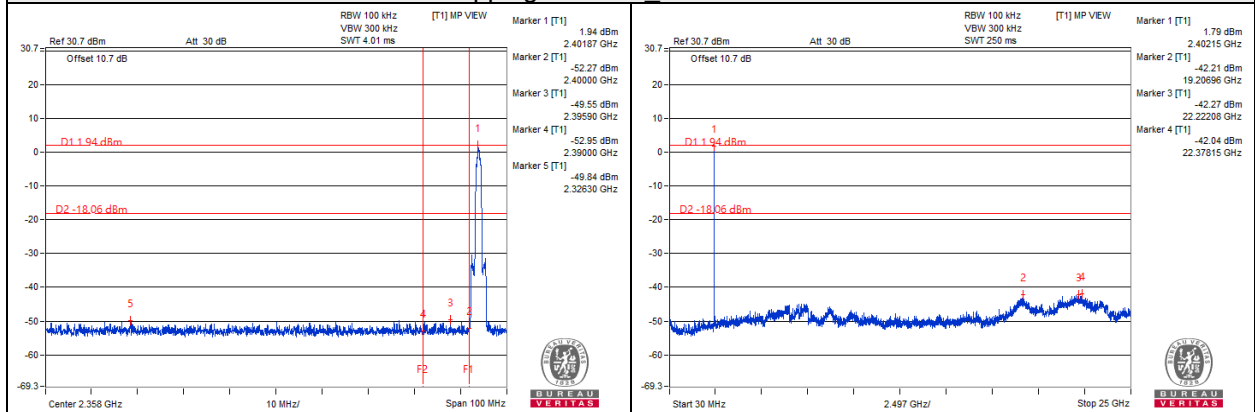
Hopping enabled High Channel



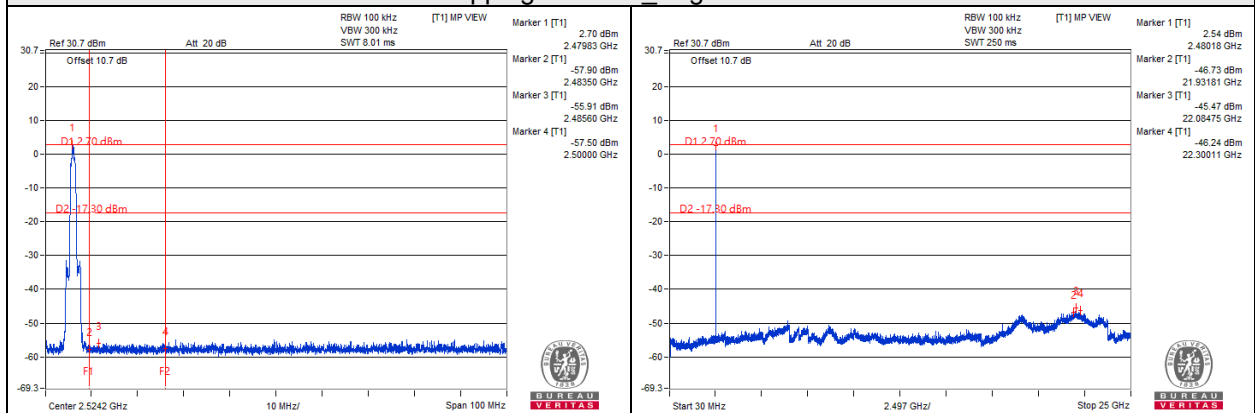


8DPSK

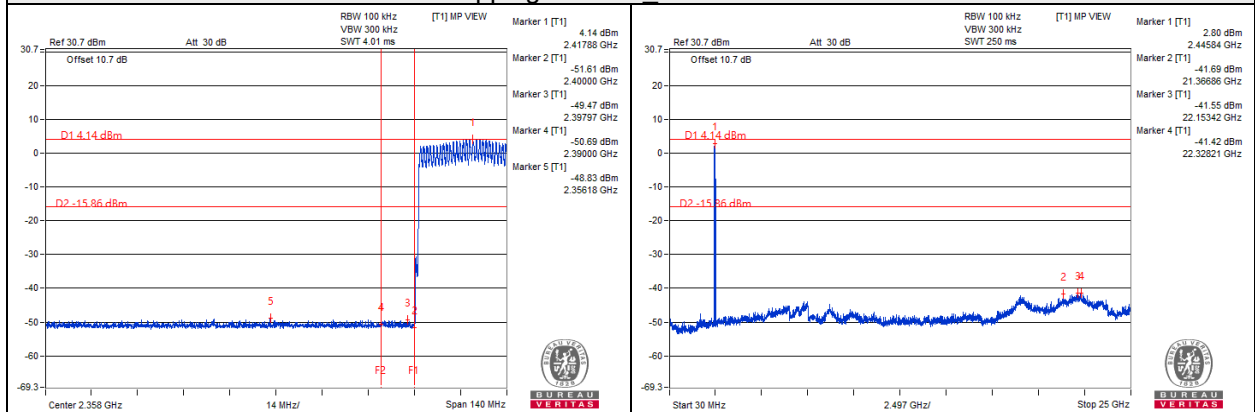
Hopping disabled Low Channel



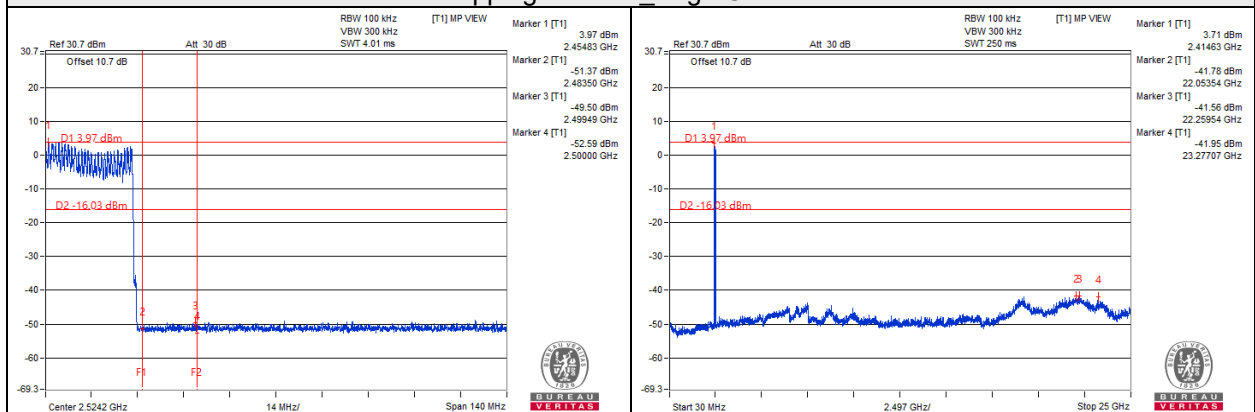
Hopping disabled High Channel



Hopping enabled Low Channel



Hopping enabled High Channel





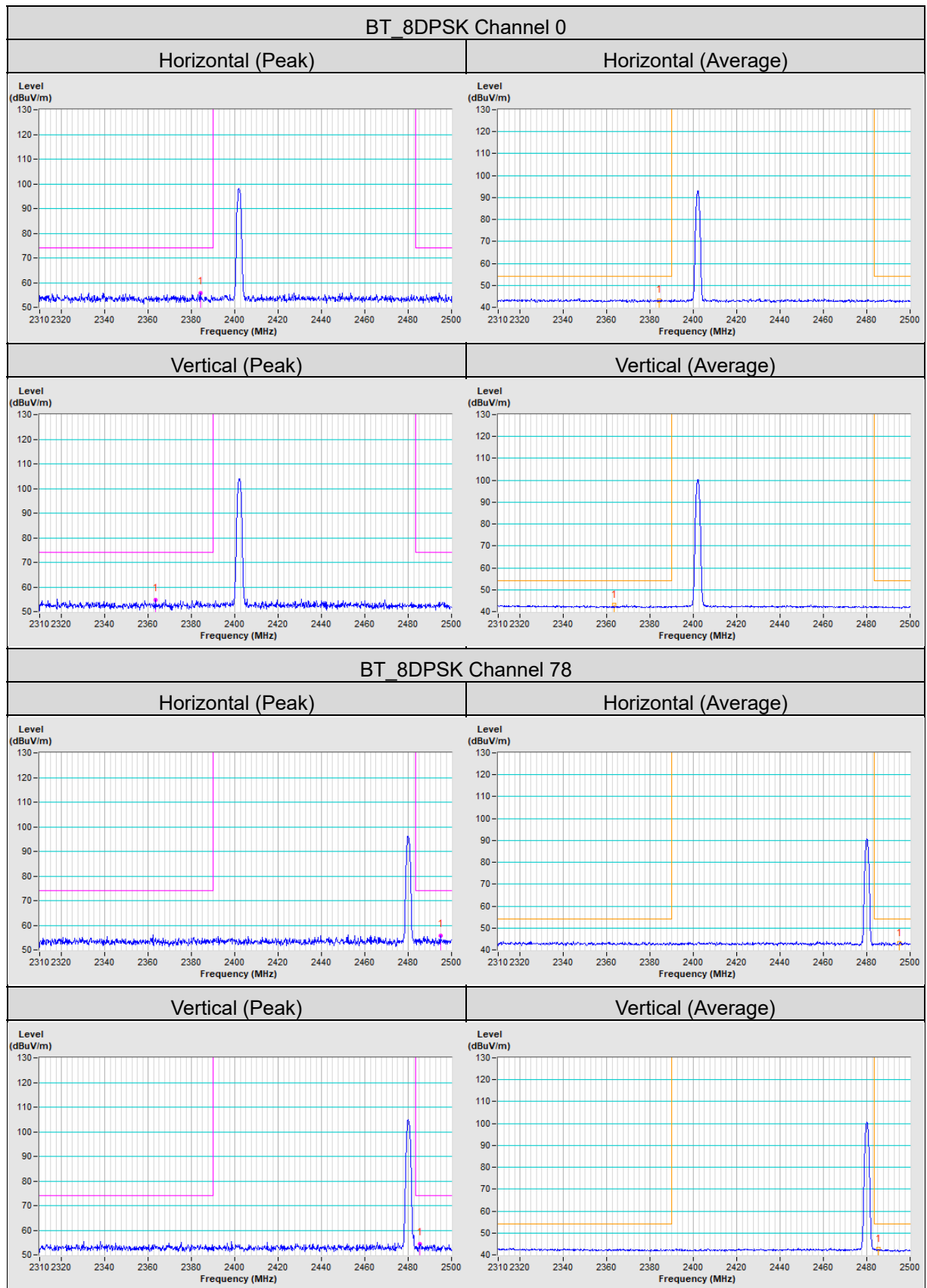
5 Pictures of Test Arrangements

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

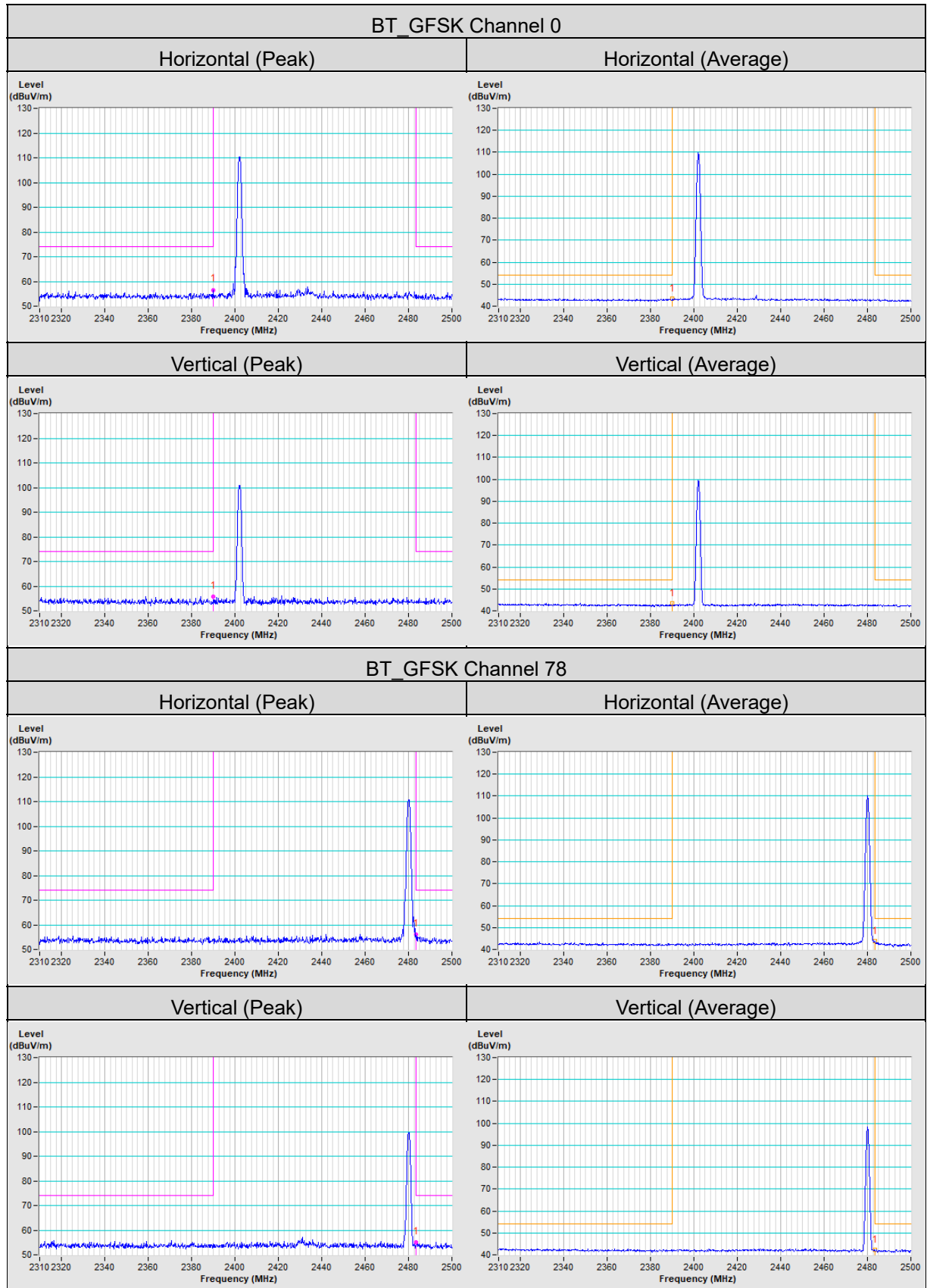
Annex A- Band-edge Measurement

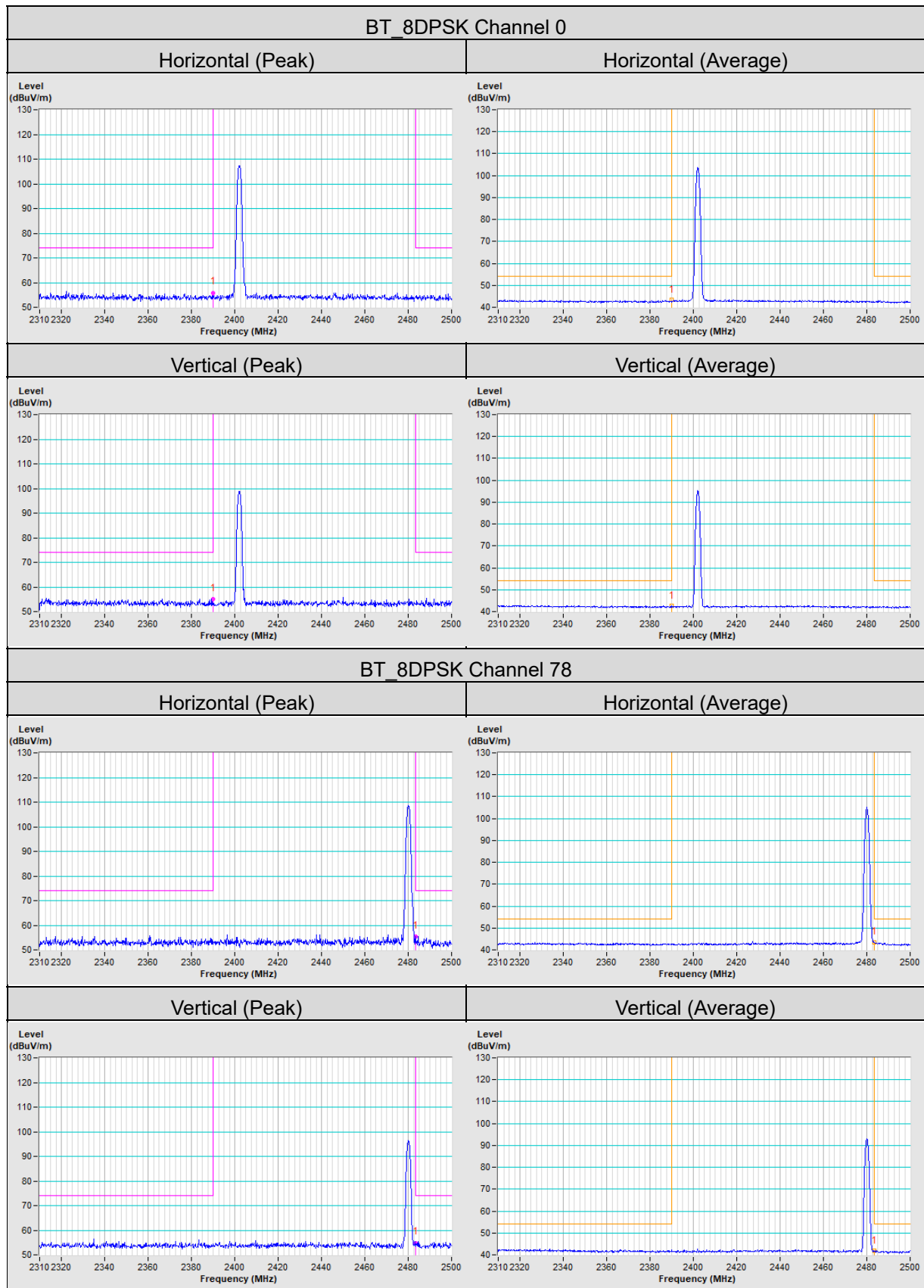
Test Mode A





Test Mode B





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.

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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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