

FCC Test Report

Report No.: RFBCIB-WTW-P22010514-3

FCC ID: 2AA3N-TTR03

Test Model: PLTN-TTR01-3

Received Date: Jan. 14, 2022

Test Date: Jan. 28 ~ Apr. 28, 2022

Issued Date: May 19, 2022

Applicant: Peloton Interactive Inc.

Address: 125 W 25th Street, 11th Floor, New York, NY, 10001, USA

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

Lab Address: No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

Test Location: No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City
33383, TAIWAN

FCC Registration / 788550 / TW0003
Designation Number:



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Release Control Record

Issue No.	Description	Date Issued
RFBCIB-WTW-P22010514-3	Original release	May 19, 2022

1 Certificate of Conformity

Product: Peloton Tablet

Brand: PELOTON

Test Model: PLTN-TTR01-3

Sample Status: Engineering sample

Applicant: Peloton Interactive Inc.

Test Date: Jan. 28 ~ Apr. 28, 2022

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 : , **Date:** May 19, 2022
Polly Chien / Specialist

Approved by : , **Date:** May 19, 2022
Jeremy Lin / 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 -12.73dB at 1.44421MHz.
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)(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 -5.5dB at 493.66MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	Antenna connector is i-pex(MHF) 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	2.79 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.04 dB
	30MHz ~ 200MHz	3.59 dB
	200MHz ~ 1000MHz	3.60 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Peloton Tablet
Brand	PELTON
Test Model	PLTN-TTR01-3
Sample Status	Engineering sample
Power Supply Rating	20Vdc from 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	21.135mW
Antenna Type	PIFA antenna with -0.19dBi gain
Antenna Connector	i-pex(MHF)
Accessory Device	Adapter, Exercise Bike
Cable Supplied	NA

Note:

1. The EUT consumes power from the following adapters (Support units).

Adapter 1	
Brand	PELTON
Model	FSP065-APDC8R01
Input Power	100-240Vac, 50-60Hz, 1.7A
Output Power	5Vdc, 3A or 9Vdc, 3A or 20Vdc, 3.25A, 65W Max.
Power Line	AC: 1.7m non-shielded power cable without core DC: 1.5m non-shielded power cable without core attached on adapter

Adapter 2	
Brand	PELTON
Model	A20-065N5A
Input Power	100-240Vac, 50-60Hz, 1.7A
Output Power	5Vdc, 3A or 9Vdc, 3A or 20Vdc, 3.25A, 65W Max.
Power Line	AC: 1.7m non-shielded power cable without core DC: 1.5m non-shielded power cable without core attached on adapter

* After the pretesting, the adapter 1 is found to be the worst case test mode and chosen for final test.

2. Spurious emission of the simultaneous operation mode as below and the test data please refer to report no.: RFBCIB-WTW-P22010514 -6.

No	Mode
1	WLAN 2.4GHz + WLAN 5GHz
2	BT + WLAN 5GHz
3	ANT+ + WLAN 5GHz

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.

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	√	√	√	√	EUT + Adapter
B	-	√	√	-	EUT + Exercise Bike + Adapter

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:

1. For radiated emission (below 1GHz) and power line conducted emission test items chosen the worst maximum fundamental emission level channel.
2. "-" means no effect.

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

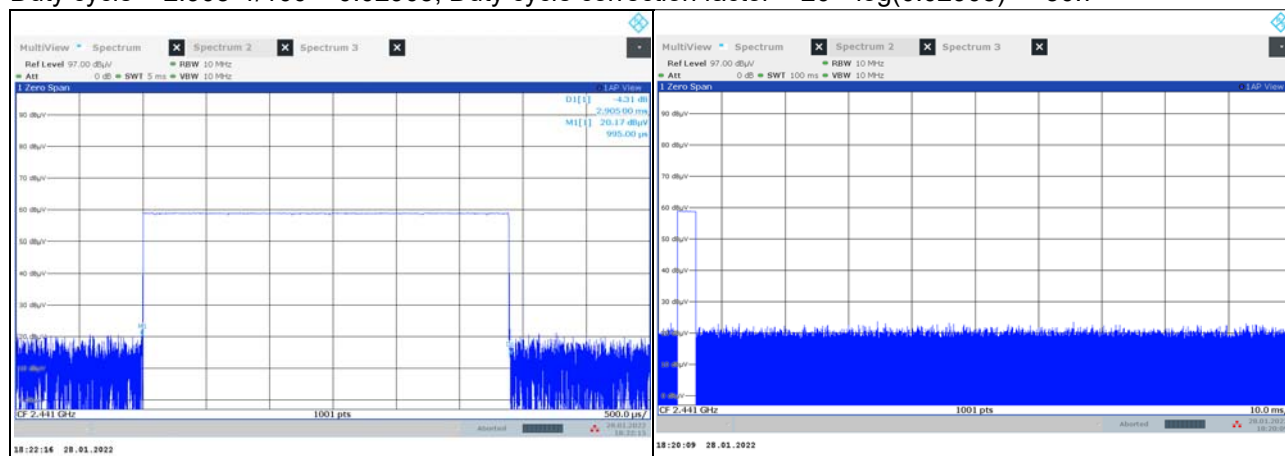
EUT Configure Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Pakcet Type
A	0 to 78	0, 39, 78	FHSS	GFSK	DH5
A	0 to 78	0, 39, 78	FHSS	8DPSK	3DH5

Test Condition:

Applicable to	Environmental Conditions	Input Power	Tested by
RE $\geq$ 1G	21 deg. C, 67% RH	120Vac, 60Hz	Greg Lin
RE<1G	21 deg. C, 67% RH	120Vac, 60Hz	Jones Chang, Rex Wang
PLC	22 deg. C, 65% RH, 25 deg. C, 75% RH	120Vac, 60Hz	Jones Chang, Rex Wang
APCM	25 deg. C, 60% RH	120Vac, 60Hz	Ivan Tseng

3.1 Duty Cycle of Test Signal

Duty cycle = $2.905 \times 1/100 = 0.02905$, Duty cycle correction factor = $20 \times \log(0.02905) = -30.7$



3.2 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.

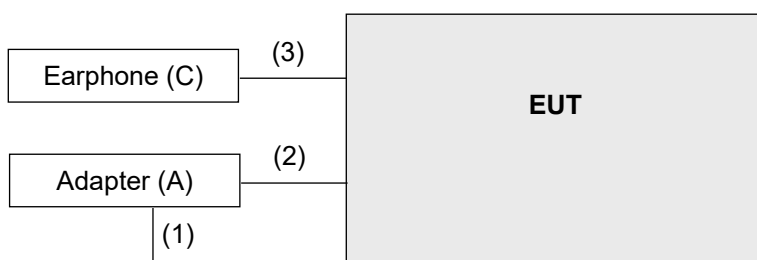
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Adapter	PELTON	FSP065-APDC8R01	NA	NA	Provided by manufacturer
B.	Peloton Bike	PELTON	PL-02	NA	NA	Provided by manufacturer
C.	Earphone	APPLE	MB770FEB	NA	NA	-

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

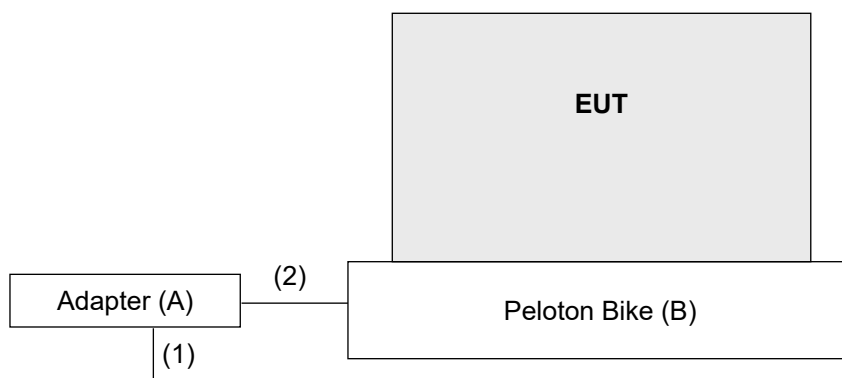
ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	AC Power cable	1	1.7	N	0	Provided by manufacturer
2.	DC Power cable	1	1.5	N	0	Provided by manufacturer
3.	Earphone cable	1	1.2	Y	0	-

3.2.1 Configuration of System under Test

Test Mode A



Test Mode B



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

Test Standard:

FCC Part 15, Subpart C (15.247)

ANSI C63.10:2013

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

References Test Guidance:

KDB 558074 D01 15.247 Meas Guidance v05r02

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

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

Note:

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

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver KEYSIGHT	N9038A	MY55420137	Apr. 09, 2021	Apr. 08, 2022
			Apr. 27, 2022	Apr. 26, 2023
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100039	Jun. 10, 2021	Jun. 09, 2022
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Oct. 28, 2021	Oct. 27, 2022
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Nov. 14, 2021	Nov. 13, 2022
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Oct. 26, 2021	Oct. 25, 2022
Loop Antenna TESEQ	HLA 6121	45745	Jul. 21, 2021	Jul. 20, 2022
Preamplifier Agilent (Below 1GHz)	8447D	2944A10638	Jun. 05, 2021	Jun. 04, 2022
Preamplifier Agilent (Above 1GHz)	8449B	3008A01962	Oct. 05, 2021	Oct. 04, 2022
RF signal cable HUBER+SUHNER&EMCI	SUCOFLEX 104 & EMC104-SM-SM8000	CABLE-CH9-02 (248780+171006)	Jan. 15, 2022	Jan. 14, 2023
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-(250795 /4)	Jan. 15, 2022	Jan. 14, 2023
RF signal cable Woken	8D-FB	Cable-CH9-01	Jun. 05, 2021	Jun. 04, 2022
Software BV ADT	ADT_Radiated_ V7.6.15.9.5	NA	NA	NA
Antenna Tower & Turn BV ADT	AT100	AT93021705	NA	NA
Turn Table BV ADT	TT100	TT93021705	NA	NA
Turn Table Controller BV ADT	SC100	SC93021705	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Peak Power Analyzer KEYSIGHT	8990B	MY51000485	Jan. 18, 2022	Jan. 17, 2023
Wideband Power Sensor KEYSIGHT	N1923A	MY58020002	Jan. 17, 2022	Jan. 16, 2023

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 HwaYa Chamber 9.

4.1.3 Test Procedures

For Radiated emission below 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

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

For Radiated emission above 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

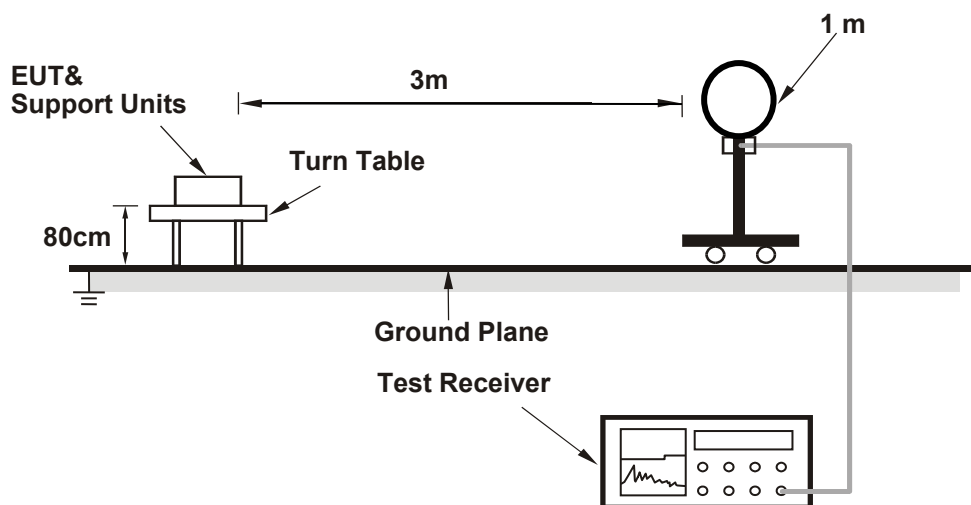
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) and Average detection (AV) at frequency above 1GHz. For fundamental and harmonic signal measurement, according to ANSI C63.10 section 7.5, the average value = peak value + duty cycle correction factor. The duty cycle correction factor refer to Chapter 3.3 of this report.
3. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

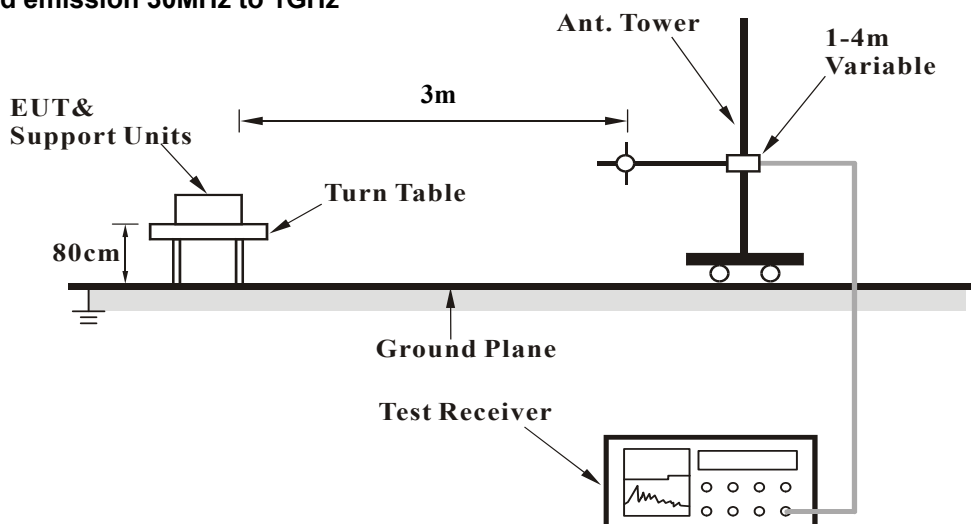
No deviation.

4.1.5 Test Setup

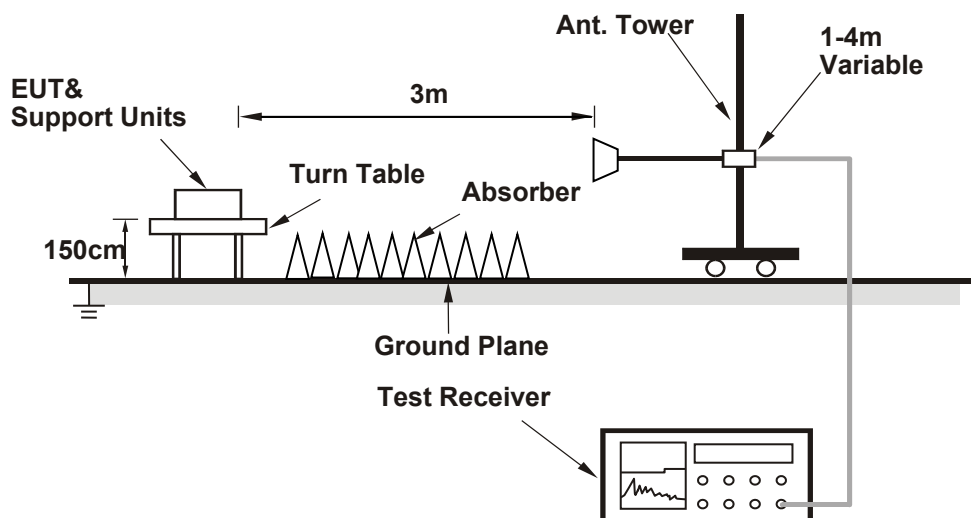
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



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

4.1.6 EUT Operating Conditions

- a. Set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

Above 1GHz data:

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

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	57.2 PK	74.0	-16.8	3.18 H	66	24.4	32.8
2	2390.00	45.1 AV	54.0	-8.9	3.18 H	66	12.3	32.8
3	*2402.00	110.0 PK			3.18 H	66	77.2	32.8
4	*2402.00	79.3 AV			3.18 H	66	46.5	32.8
5	4804.00	48.4 PK	74.0	-25.6	3.32 H	234	42.6	5.8
6	4804.00	17.7 AV	54.0	-36.3	3.32 H	234	11.9	5.8
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	57.1 PK	74.0	-16.9	1.76 V	154	24.3	32.8
2	2390.00	45.0 AV	54.0	-9.0	1.76 V	154	12.2	32.8
3	*2402.00	108.2 PK			1.76 V	154	75.4	32.8
4	*2402.00	77.5 AV			1.76 V	154	44.7	32.8
5	4804.00	47.7 PK	74.0	-26.3	1.36 V	194	41.9	5.8
6	4804.00	17.0 AV	54.0	-37.0	1.36 V	194	11.2	5.8

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. for Fundamental frequency and bandedge & harmonic:
The average value of fundamental frequency is :average = peak value + 20log(Duty cycle)
where the duty cycle correction factor is calculated from following formula:
 $20\text{Log}(\text{Duty cycle}) = 20 \log (2.905\text{ms} \times 1/100) = -30.7\text{dB}$ please refer to the plotted duty
(see section 3.3)

RF Mode	TX BT_GFSK	Channel	CH 39 : 2441 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2441.00	110.4 PK			3.12 H	64	77.6	32.8
2	*2441.00	79.7 AV			3.12 H	64	46.9	32.8
3	4882.00	48.2 PK	74.0	-25.8	3.41 H	242	42.7	5.5
4	4882.00	17.5 AV	54.0	-36.5	3.41 H	242	12.0	5.5
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2441.00	108.8 PK			1.75 V	154	76.0	32.8
2	*2441.00	78.1 AV			1.75 V	154	45.3	32.8
3	4882.00	47.6 PK	74.0	-26.4	1.39 V	197	42.1	5.5
4	4882.00	16.9 AV	54.0	-37.1	1.39 V	197	11.4	5.5

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. for Fundamental frequency and bandedge & harmonic:
The average value of fundamental frequency is :average = peak value + 20log(Duty cycle)
where the duty cycle correction factor is calculated from following formula:
 $20\text{Log}(\text{Duty cycle}) = 20 \log (2.905\text{ms} \times 1/100) = -30.7\text{dB}$ please refer to the plotted duty
(see section 3.3)

RF Mode	TX BT_GFSK	Channel	CH 78 : 2480 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	109.8 PK			3.05 H	75	76.9	32.9
2	*2480.00	79.1 AV			3.05 H	75	46.2	32.9
3	2483.50	57.4 PK	74.0	-16.6	3.05 H	75	58.9	-1.5
4	2483.50	26.7 AV	54.0	-27.3	3.05 H	75	28.2	-1.5
5	4960.00	48.1 PK	74.0	-25.9	3.34 H	238	42.4	5.7
6	4960.00	17.4 AV	54.0	-36.6	3.34 H	238	11.7	5.7
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	108.6 PK			1.83 V	152	75.7	32.9
2	*2480.00	77.9 AV			1.83 V	152	45.0	32.9
3	2483.50	57.0 PK	74.0	-17.0	1.83 V	152	58.5	-1.5
4	2483.50	26.3 AV	54.0	-27.7	1.83 V	152	27.8	-1.5
5	4960.00	47.5 PK	74.0	-26.5	1.43 V	206	41.8	5.7
6	4960.00	16.8 AV	54.0	-37.2	1.43 V	206	11.1	5.7

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. for Fundamental frequency and bandedge & harmonic:
The average value of fundamental frequency is :average = peak value + 20log(Duty cycle)
where the duty cycle correction factor is calculated from following formula:
 $20\text{Log}(\text{Duty cycle}) = 20 \log (2.905\text{ms} \times 1/100) = -30.7\text{dB}$ please refer to the plotted duty
(see section 3.3)

RF Mode	TX BT_8DPSK	Channel	CH 0 : 2402 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	57.5 PK	74.0	-16.5	3.00 H	62	24.7	32.8
2	2390.00	45.3 AV	54.0	-8.7	3.00 H	62	12.5	32.8
3	*2402.00	109.5 PK			3.00 H	62	76.7	32.8
4	*2402.00	78.8 AV			3.00 H	62	46.0	32.8
5	4804.00	48.7 PK	74.0	-25.3	3.37 H	215	42.9	5.8
6	4804.00	18.0 AV	54.0	-36.0	3.37 H	215	12.2	5.8
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	57.2 PK	74.0	-16.8	1.88 V	152	24.4	32.8
2	2390.00	45.1 AV	54.0	-8.9	1.88 V	152	12.3	32.8
3	*2402.00	108.2 PK			1.88 V	152	75.4	32.8
4	*2402.00	77.5 AV			1.88 V	152	44.7	32.8
5	4804.00	47.6 PK	74.0	-26.4	1.36 V	198	41.8	5.8
6	4804.00	16.9 AV	54.0	-37.1	1.36 V	198	11.1	5.8

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. for Fundamental frequency and bandedge & harmonic:
The average value of fundamental frequency is :average = peak value + 20log(Duty cycle)
where the duty cycle correction factor is calculated from following formula:
 $20\text{Log}(\text{Duty cycle}) = 20 \log (2.905\text{ms} \times 1/100) = -30.7\text{dB}$ please refer to the plotted duty
(see section 3.3)

RF Mode	TX BT_8DPSK	Channel	CH 39 : 2441 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2441.00	109.7 PK			3.02 H	67	76.9	32.8
2	*2441.00	79.0 AV			3.02 H	67	46.2	32.8
3	4882.00	48.6 PK	74.0	-25.4	3.34 H	219	43.1	5.5
4	4882.00	17.9 AV	54.0	-36.1	3.34 H	219	12.4	5.5
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2441.00	108.5 PK			1.93 V	158	75.7	32.8
2	*2441.00	77.8 AV			1.93 V	158	45.0	32.8
3	4882.00	48.0 PK	74.0	-26.0	1.46 V	187	42.5	5.5
4	4882.00	17.3 AV	54.0	-36.7	1.46 V	187	11.8	5.5

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. for Fundamental frequency and bandedge & harmonic:
The average value of fundamental frequency is :average = peak value + 20log(Duty cycle)
where the duty cycle correction factor is calculated from following formula:
 $20\text{Log}(\text{Duty cycle}) = 20 \log (2.905\text{ms} \times 1/100) = -30.7\text{dB}$ please refer to the plotted duty
(see section 3.3)

RF Mode	TX BT_8DPSK	Channel	CH 78 : 2480 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	107.7 PK			3.07 H	76	74.8	32.9
2	*2480.00	77.0 AV			3.07 H	76	44.1	32.9
3	2483.50	58.8 PK	74.0	-15.2	3.07 H	76	60.3	-1.5
4	2483.50	28.1 AV	54.0	-25.9	3.07 H	76	29.6	-1.5
5	4960.00	48.4 PK	74.0	-25.6	3.12 H	236	42.7	5.7
6	4960.00	17.7 AV	54.0	-36.3	3.12 H	236	12.0	5.7
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2480.00	106.4 PK			1.76 V	161	73.5	32.9
2	*2480.00	75.7 AV			1.76 V	161	42.8	32.9
3	2483.50	58.4 PK	74.0	-15.6	1.76 V	161	59.9	-1.5
4	2483.50	37.7 AV	54.0	-16.3	1.76 V	161	39.2	-1.5
5	4960.00	47.9 PK	74.0	-26.1	1.47 V	196	42.2	5.7
6	4960.00	17.2 AV	54.0	-36.8	1.47 V	196	11.5	5.7

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.
6. for Fundamental frequency and bandedge & harmonic:
The average value of fundamental frequency is :average = peak value + 20log(Duty cycle)
where the duty cycle correction factor is calculated from following formula:
 $20\text{Log}(\text{Duty cycle}) = 20 \log (2.905\text{ms} \times 1/100) = -30.7\text{dB}$ please refer to the plotted duty (see section 3.3)

Below 1GHz worst-case data:

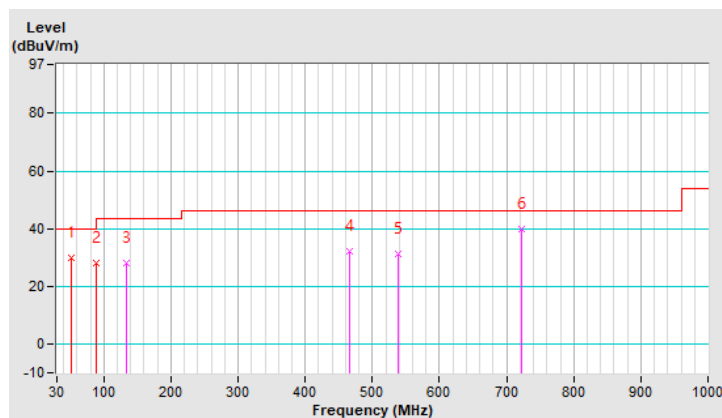
GFSK

CHANNEL	TX Channel 78	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz	TEST MODE	A

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	50.70	29.9 QP	40.0	-10.1	1.50 H	135	38.9	-9.0
2	88.85	28.3 QP	43.5	-15.2	1.50 H	135	43.0	-14.7
3	133.79	28.3 QP	43.5	-15.2	1.50 H	197	38.1	-9.8
4	466.50	32.1 QP	46.0	-14.0	1.50 H	6	35.2	-3.2
5	538.28	31.3 QP	46.0	-14.7	1.50 H	12	33.1	-1.8
6	721.61	39.8 QP	46.0	-6.2	1.50 H	231	38.5	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 20 dB below the permissible value to be report

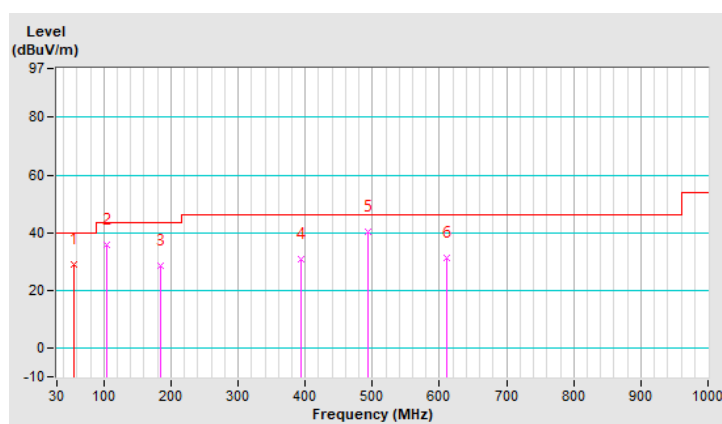


CHANNEL	TX Channel 78	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz	TEST MODE	A

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	55.23	28.8 QP	40.0	-11.2	1.00 V	33	38.0	-9.2
2	104.69	35.6 QP	43.5	-7.9	1.00 V	176	48.5	-12.9
3	185.20	28.3 QP	43.5	-15.2	1.00 V	30	39.2	-10.8
4	394.72	30.8 QP	46.0	-15.2	1.50 V	350	35.8	-5.0
5	493.66	40.5 QP	46.0	-5.5	1.50 V	7	43.2	-2.7
6	610.06	31.1 QP	46.0	-14.9	1.50 V	6	31.2	-0.2

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. 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 20 dB below the permissible value to be report

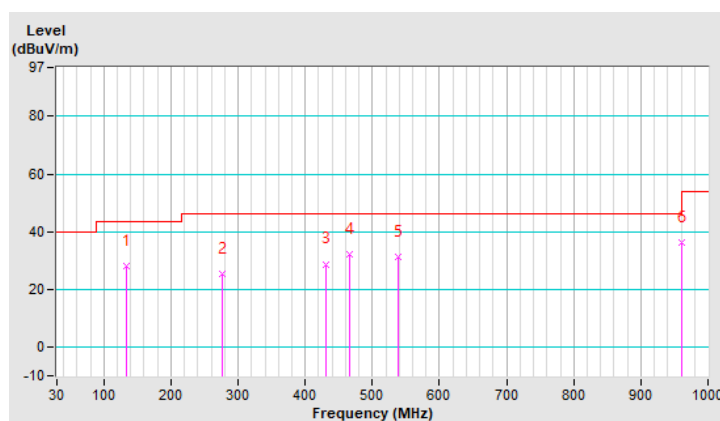


CHANNEL	TX Channel 78	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz	TEST MODE	B

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	133.79	28.3 QP	43.5	-15.2	1.00 H	197	38.1	-9.8
2	277.35	25.5 QP	46.0	-20.5	1.50 H	185	33.0	-7.5
3	430.61	28.8 QP	46.0	-17.2	1.50 H	333	32.7	-3.9
4	466.50	32.1 QP	46.0	-13.9	1.00 H	6	35.3	-3.2
5	538.28	31.3 QP	46.0	-14.7	2.00 H	12	33.1	-1.8
6	961.20	36.1 QP	54.0	-17.9	1.50 H	345	29.7	6.4

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. 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 20 dB below the permissible value to be report

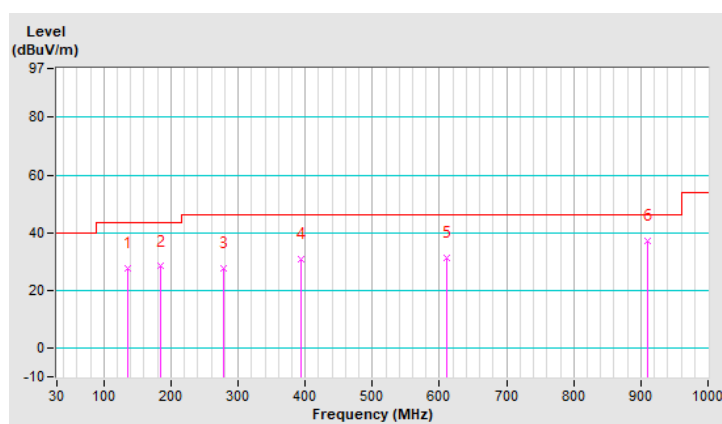


CHANNEL	TX Channel 78	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	9kHz ~ 1GHz	TEST MODE	B

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	135.73	27.6 QP	43.5	-15.9	1.00 V	321	37.3	-9.7
2	185.20	28.3 QP	43.5	-15.2	1.50 V	30	39.2	-10.9
3	279.29	27.7 QP	46.0	-18.3	1.25 V	103	35.2	-7.5
4	394.72	30.8 QP	46.0	-15.2	2.00 V	350	35.9	-5.1
5	610.06	31.1 QP	46.0	-14.9	1.25 V	6	31.3	-0.2
6	909.79	37.1 QP	46.0	-8.9	1.50 V	178	31.5	5.6

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 20 dB 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

Note: 1. The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESR3	102412	Jan. 22, 2022	Jan. 21, 2023
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond2-01	Sep. 04, 2021	Sep. 03, 2022
LISN/AMN ROHDE & SCHWARZ (EUT)	ESH3-Z5	100312	Sep. 17, 2021	Sep. 16, 2022
LISN/AMN ROHDE & SCHWARZ (Peripheral)	ENV216	101196	Apr. 26, 2021	Apr. 25, 2022
Software ADT	BV ADT_Conc_ 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 HwaYa Shielded Room 2 (Conduction 2).

3. The VCCI Site Registration No. is C-12047.

4. Teste date: Jan. 31 ~ Feb. 28, 2022

4.2.3 Test Procedures

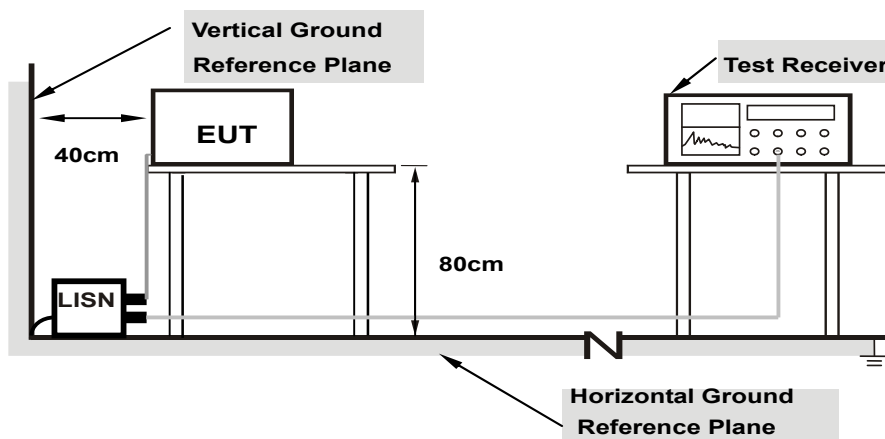
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

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

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:

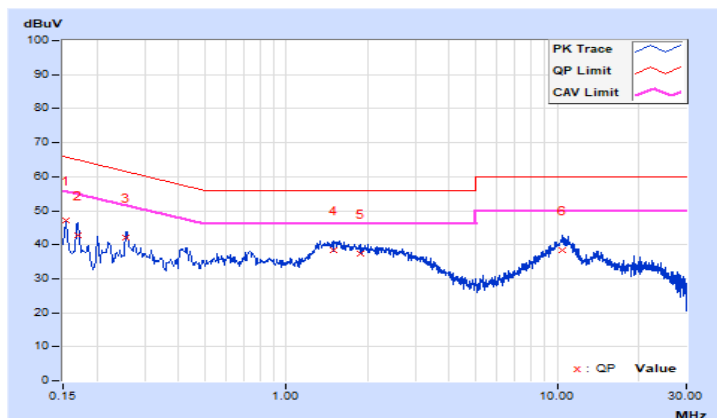
GFSK

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

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	0.15391	9.69	37.51	26.00	47.20	35.69	65.79	55.79	-18.59	-20.10
2	0.16955	9.69	33.20	20.76	42.89	30.45	64.98	54.98	-22.09	-24.53
3	0.25557	9.69	32.45	23.66	42.14	33.35	61.57	51.57	-19.43	-18.22
4	1.50286	9.70	28.80	23.11	38.50	32.81	56.00	46.00	-17.50	-13.19
5	1.87431	9.71	27.51	21.73	37.22	31.44	56.00	46.00	-18.78	-14.56
6	10.51541	9.79	28.60	22.95	38.39	32.74	60.00	50.00	-21.61	-17.26

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.

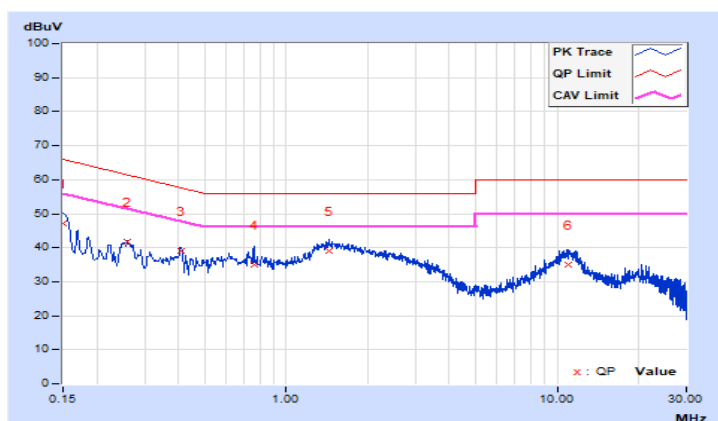


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	A		

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	9.69	37.52	25.79	47.21	35.48	66.00	56.00	-18.79	-20.52
2	0.25932	9.69	32.14	24.03	41.83	33.72	61.45	51.45	-19.62	-17.73
3	0.40693	9.68	29.23	23.04	38.91	32.72	57.71	47.71	-18.80	-14.99
4	0.75984	9.69	25.41	19.50	35.10	29.19	56.00	46.00	-20.90	-16.81
5	1.44421	9.71	29.20	23.56	38.91	33.27	56.00	46.00	-17.09	-12.73
6	10.98852	9.81	25.34	19.47	35.15	29.28	60.00	50.00	-24.85	-20.72

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.

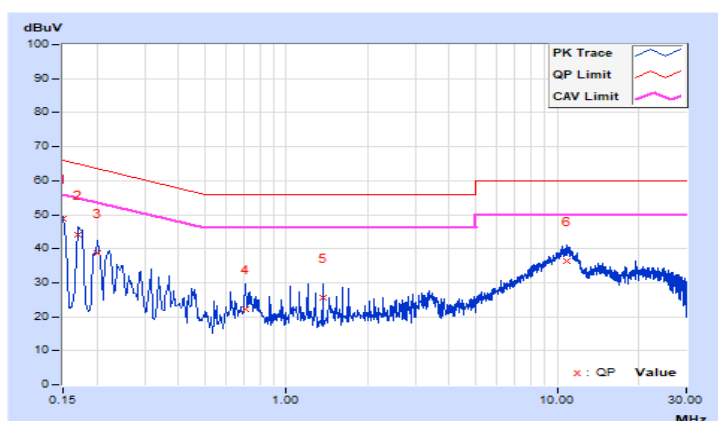


Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B		

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	9.71	39.05	25.86	48.76	35.57	66.00	56.00	-17.24	-20.43
2	0.17000	9.71	34.48	19.94	44.19	29.65	64.96	54.96	-20.77	-25.31
3	0.20200	9.72	29.04	18.50	38.76	28.22	63.53	53.53	-24.77	-25.31
4	0.70600	9.77	12.53	6.51	22.30	16.28	56.00	46.00	-33.70	-29.72
5	1.36200	9.78	15.74	3.19	25.52	12.97	56.00	46.00	-30.48	-33.03
6	10.81400	9.87	26.52	21.44	36.39	31.31	60.00	50.00	-23.61	-18.69

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.

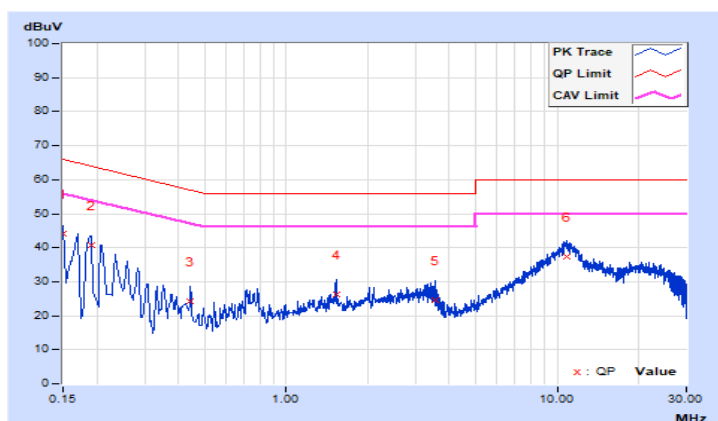


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
Test Mode	B		

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	9.76	34.35	23.23	44.11	32.99	66.00	56.00	-21.89	-23.01
2	0.19000	9.78	31.02	14.89	40.80	24.67	64.04	54.04	-23.24	-29.37
3	0.44200	9.82	14.55	5.98	24.37	15.80	57.02	47.02	-32.65	-31.22
4	1.52600	9.84	16.36	7.71	26.20	17.55	56.00	46.00	-29.80	-28.45
5	3.56600	9.87	14.60	7.23	24.47	17.10	56.00	46.00	-31.53	-28.90
6	10.87800	9.95	27.45	22.31	37.40	32.26	60.00	50.00	-22.60	-17.74

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.

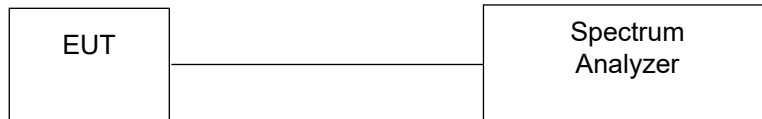


4.3 Number of Hopping Frequency Used

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

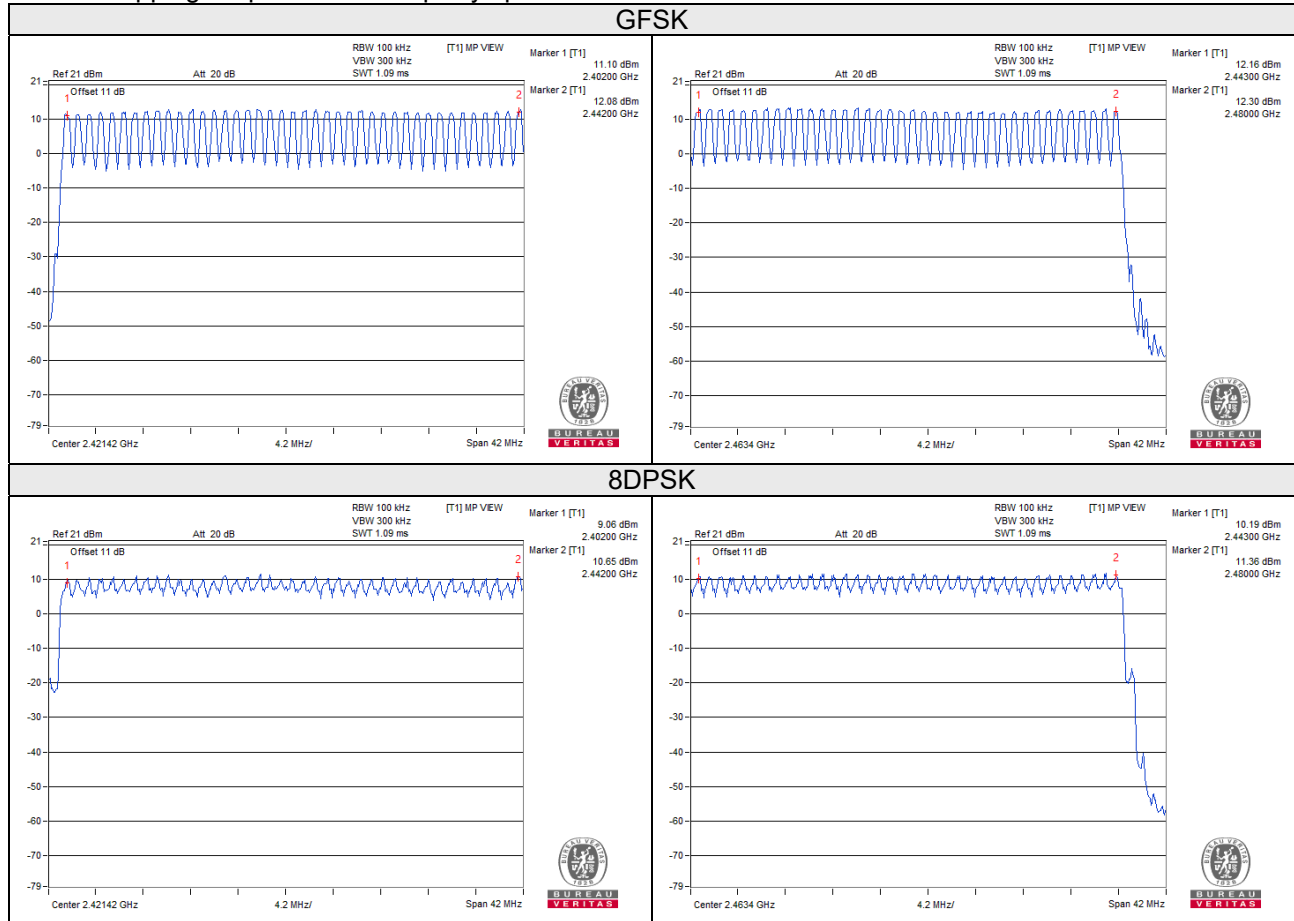
- Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make 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 the test result. On the plots, it shows that the hopping frequencies are equally spaced.



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

- 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.
- 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.
- Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
- 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	0.450	142.200	400
DH3	25 (times / 5 sec) * 6.32 = 158 times	1.770	279.660	400
DH5	18 (times / 5 sec) * 6.32 = 114 times	3.072	350.208	400

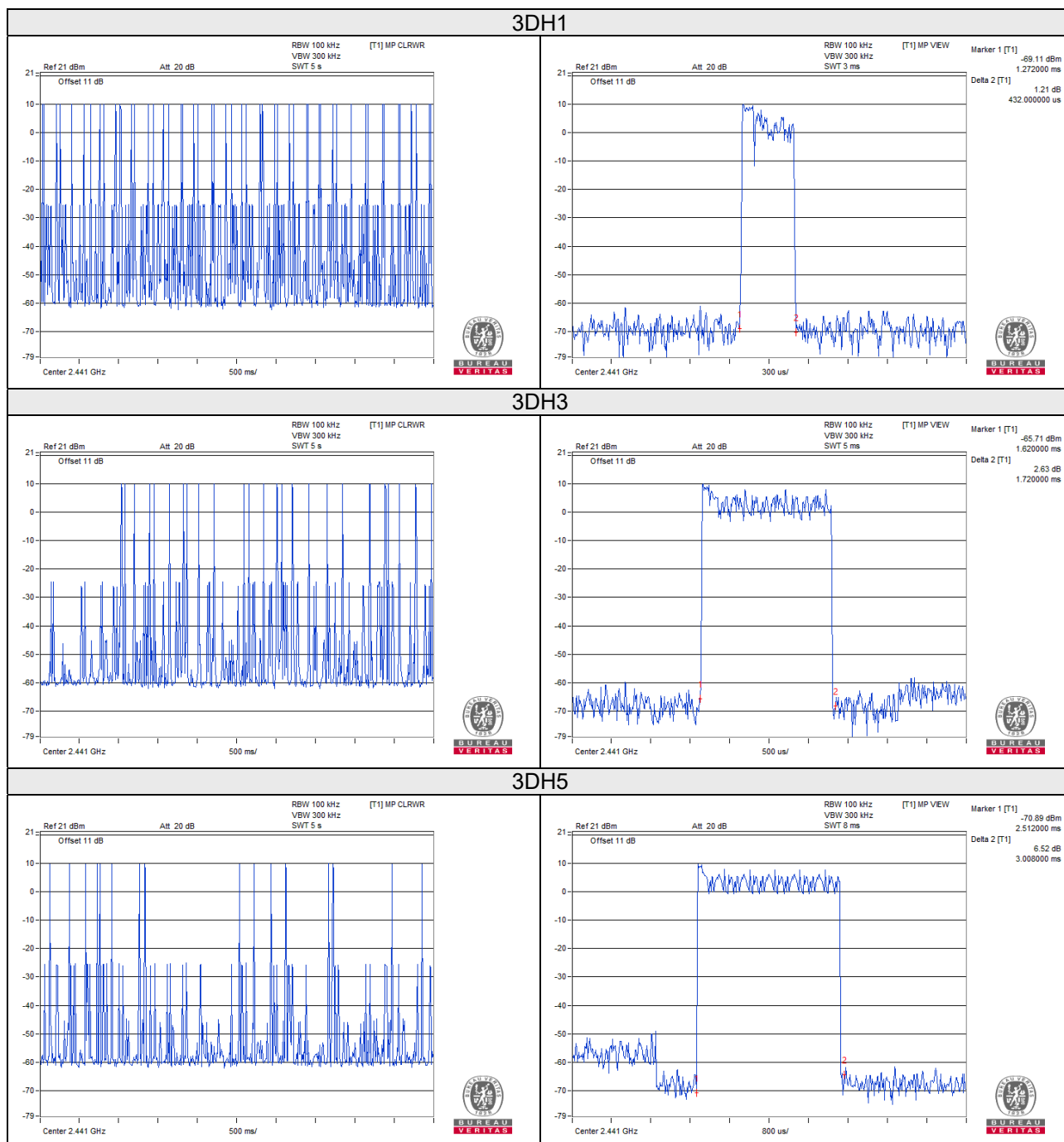
Note: Test plots of the transmitting time slot are shown as below.



8DPSK

Mode	Number of transmission in a 31.6 (79Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (msec)
3DH1	50 (times / 5 sec) * 6.32 = 316 times	0.432	136.512	400
3DH3	25 (times / 5 sec) * 6.32 = 158 times	1.720	271.760	400
3DH5	16 (times / 5 sec) * 6.32 = 102 times	3.008	306.816	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

Maximum bandwidth is not specified.

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

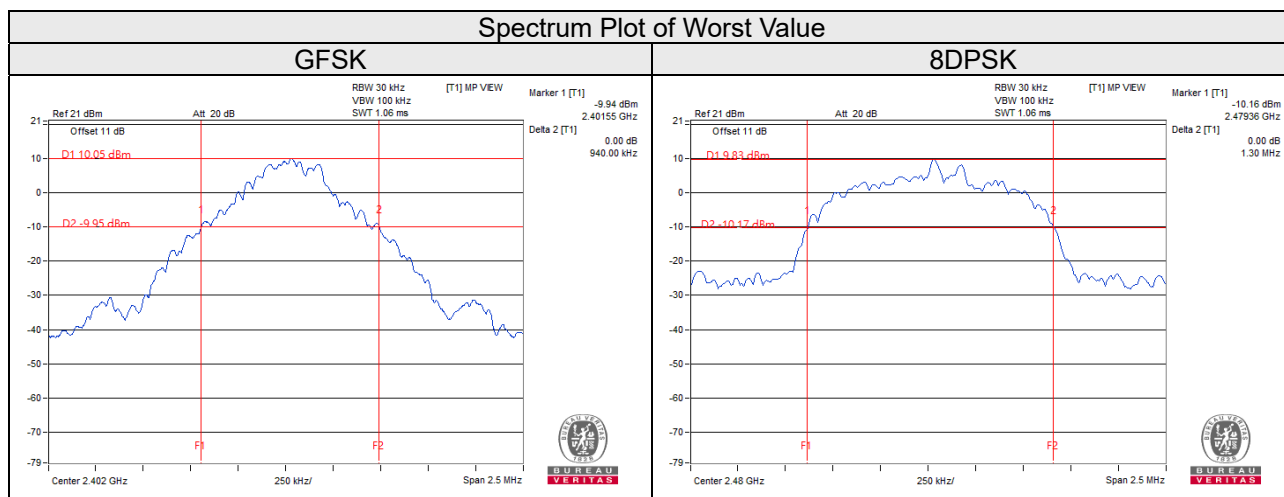
No deviation.

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	1.30
39	2441	0.94	1.30
78	2480	0.94	1.30

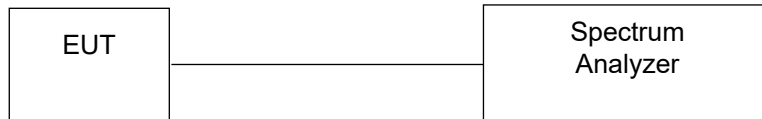


4.6 Hopping Channel Separation

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.

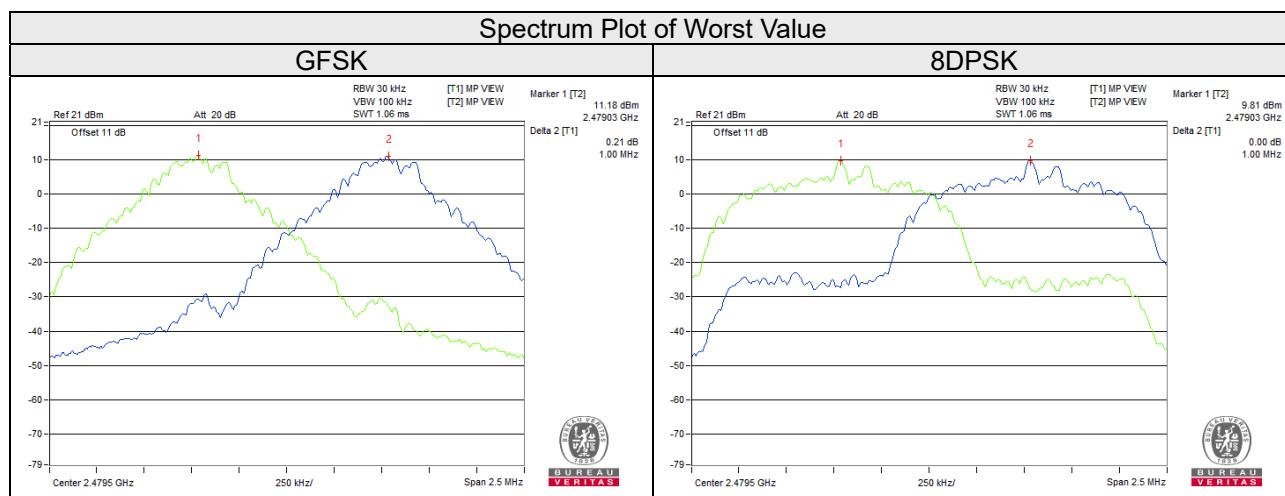
4.6.5 Deviation from Test Standard

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	1.30	0.63	0.87	Pass
39	2441	1.00	1.00	0.94	1.30	0.63	0.87	Pass
78	2480	1.00	1.00	0.94	1.30	0.63	0.87	Pass

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



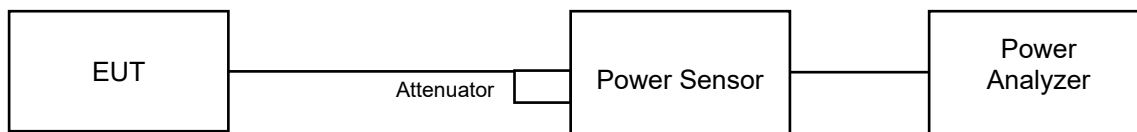
4.7 Maximum Output Power

4.7.1 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.

4.7.2 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	21.135	15.346	13.25	11.86	125 / 1000 ^{Note}	Pass
39	2441	19.815	12.303	12.97	10.90	125 / 1000 ^{Note}	Pass
78	2480	20.606	15.276	13.14	11.84	125 / 1000 ^{Note}	Pass

Note: RF Output Power limit depends on the operating channel numbers, please refer to section 3.2 of the results.

For Average Power

Channel	Frequency (MHz)	Average Power (mW)		Average Power (dBm)	
		GFSK	8DPSK	GFSK	8DPSK
0	2402	20.749	14.894	13.17	11.73
39	2441	19.320	11.858	12.86	10.74
78	2480	20.230	14.928	13.06	11.74

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

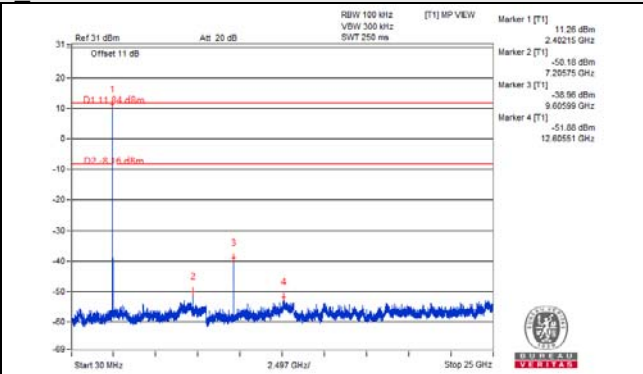
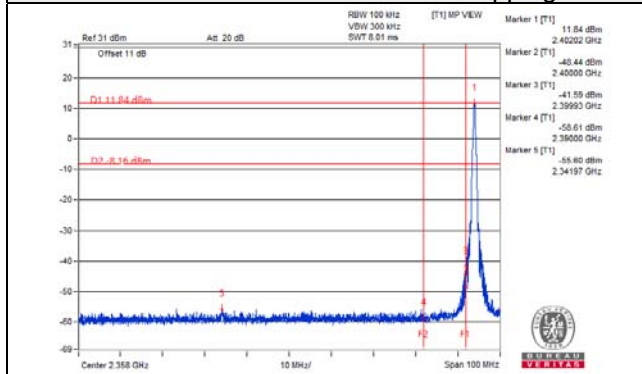
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.8.6 Test Results

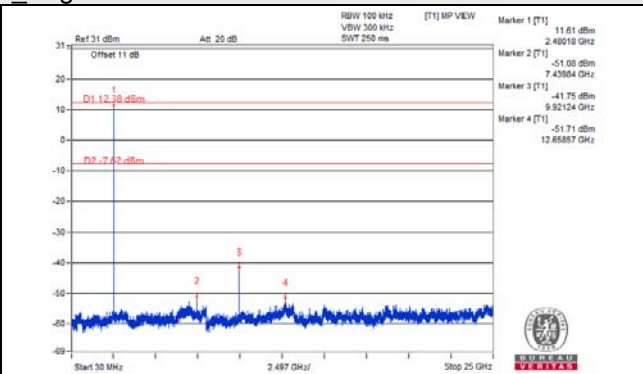
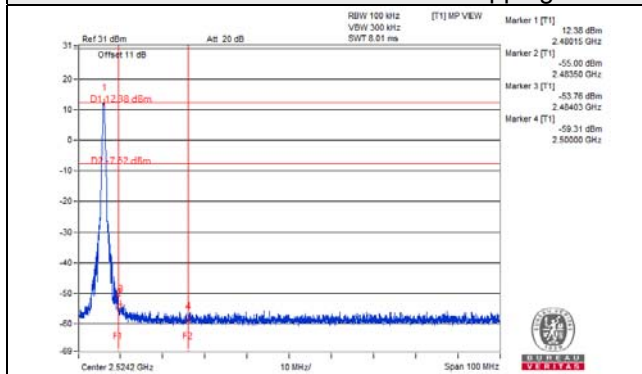
The spectrum plots are attached on the following images. D1 line indicates the highest level, D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

GFSK

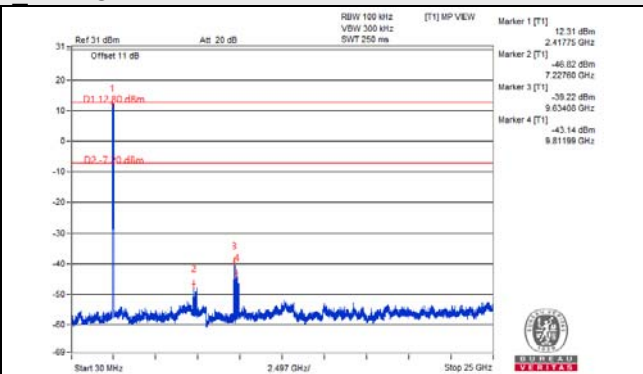
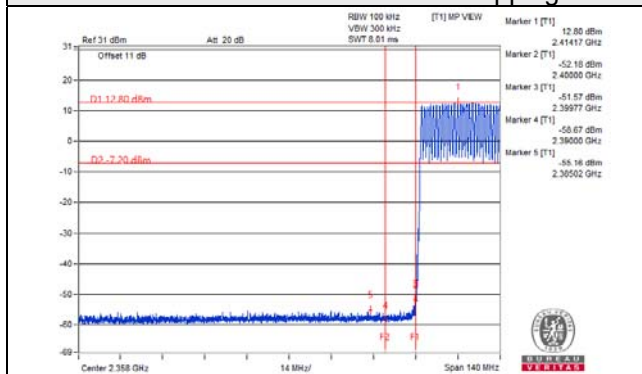
Hopping disabled Low Channel



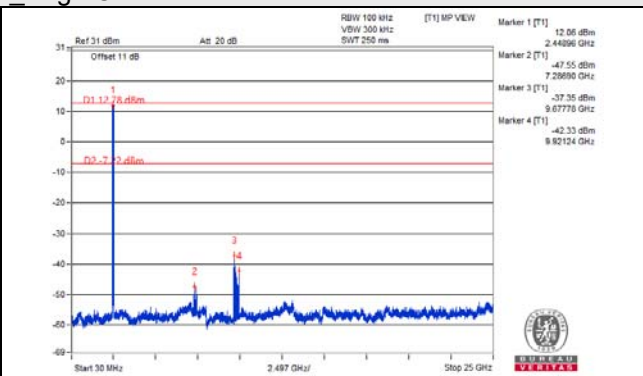
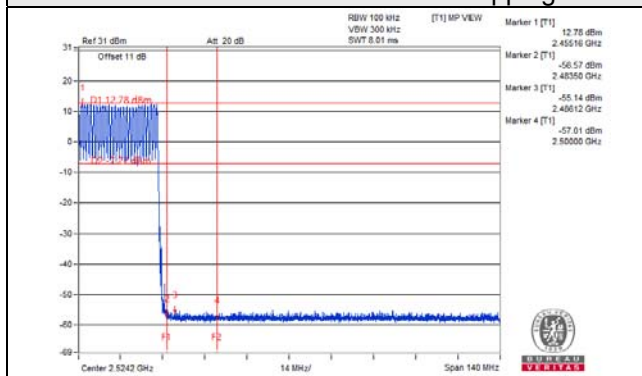
Hopping disabled High Channel



Hopping enabled Low Channel

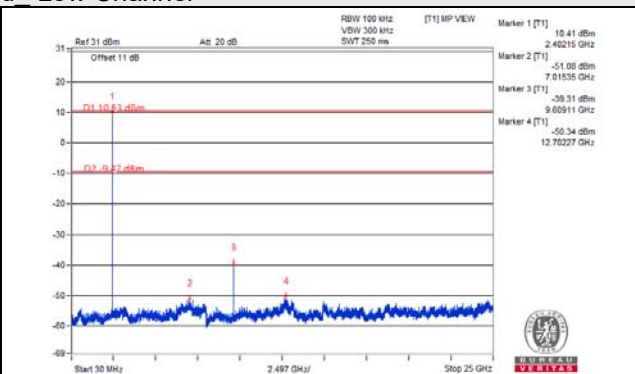
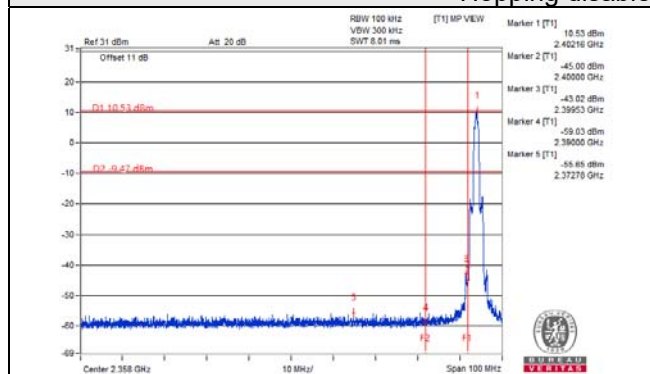


Hopping enabled High Channel

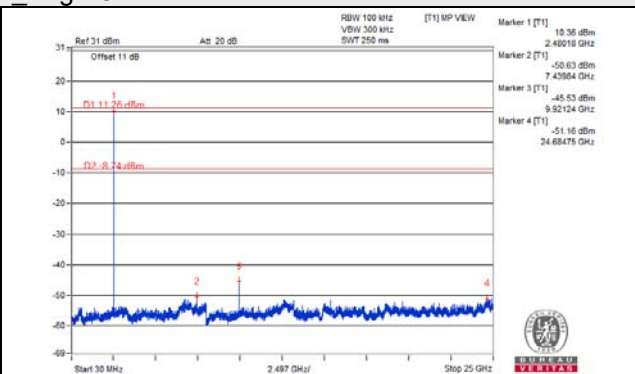
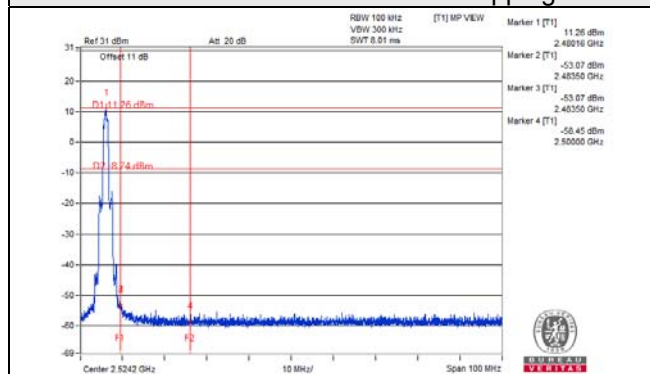


8DPSK

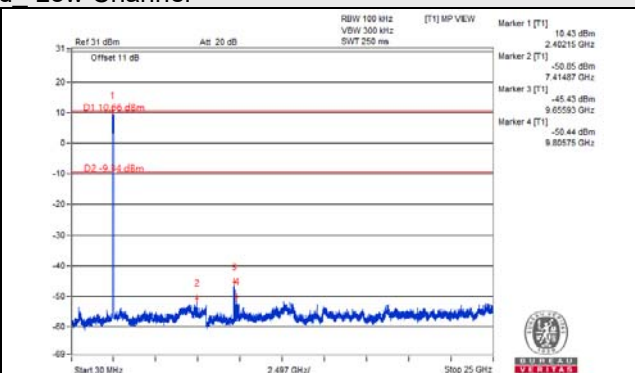
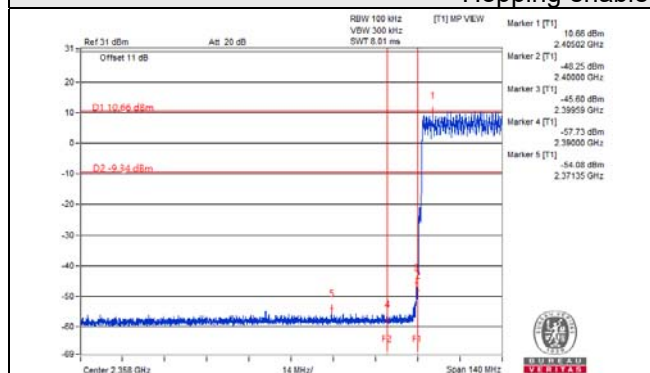
Hopping disabled Low Channel



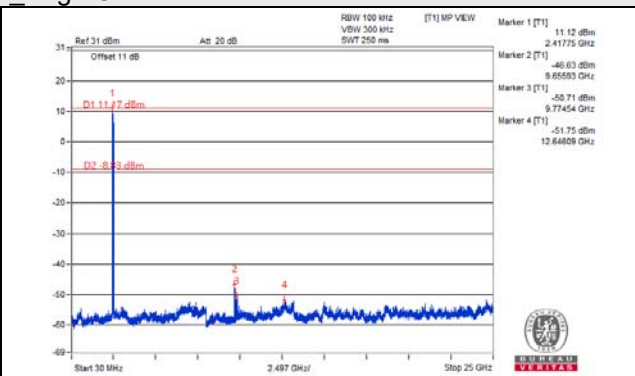
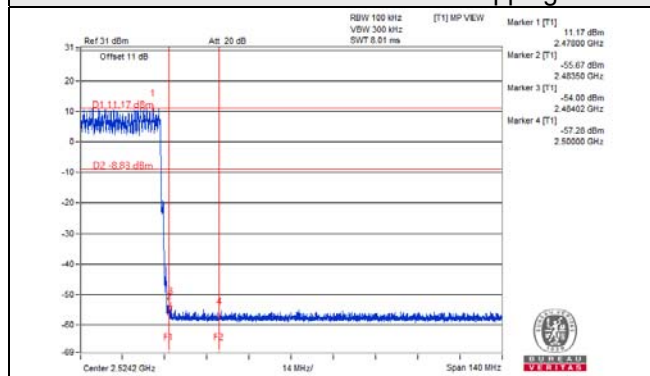
Hopping disabled High Channel



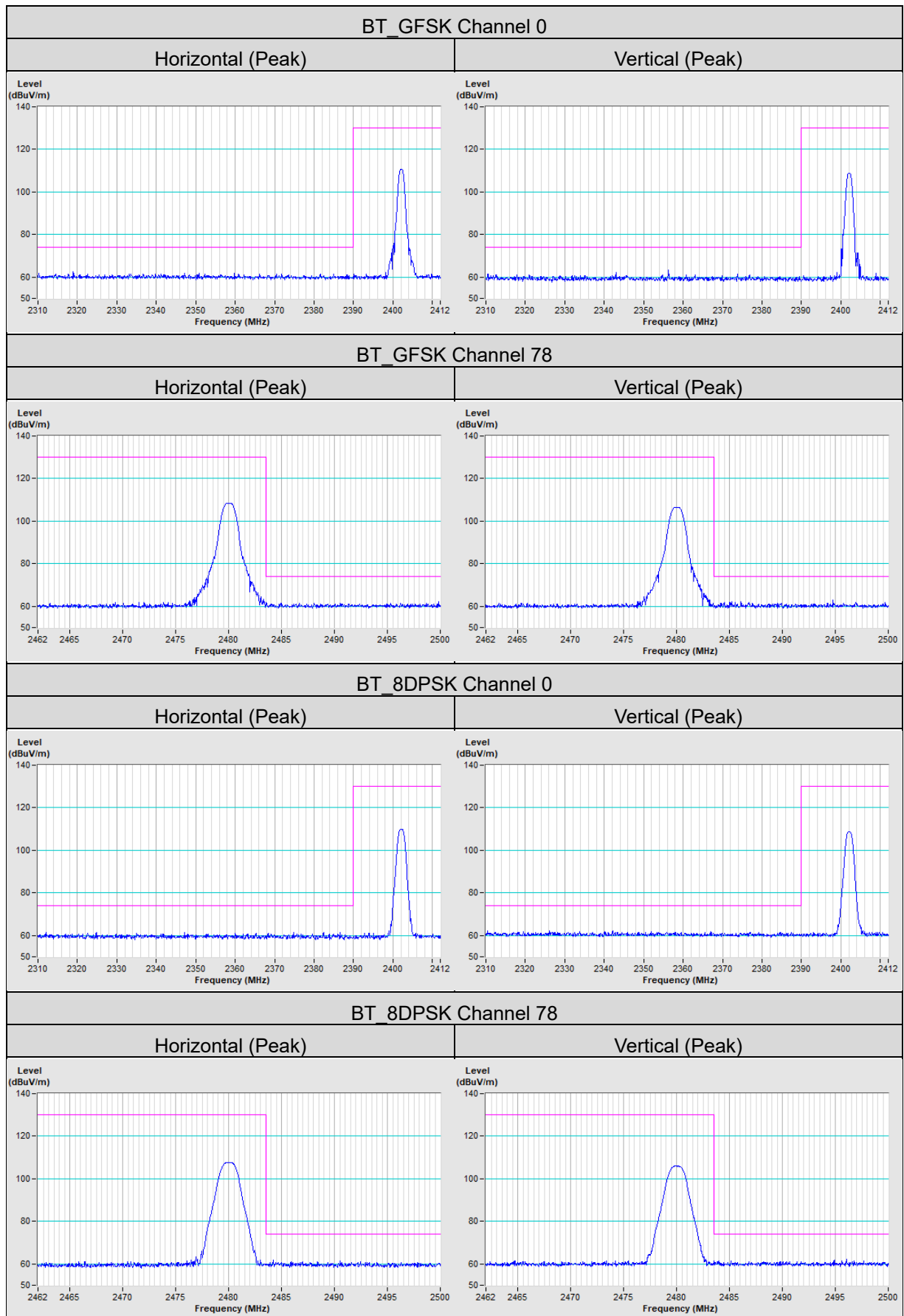
Hopping enabled Low Channel



Hopping enabled High Channel



Annex A- Band Edge Measurement



5 Pictures of Test Arrangements

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

Appendix – Information of the Testing Laboratories

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

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

Lin Kou EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab

Tel: 886-3-3183232

Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

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

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