

FCC Test Report

Report No.: RF150821C10G-3

FCC ID: ZQ6-AP6356SDXX

Test Model: AP6356SD

Series Model: AP6356SDPB_I (Refer to item 3.1 for more details)

Received Date: Aug. 21, 2015

Test Date: Dec. 24 ~ Dec. 26, 2015 (For test mode A)

Sep. 11, 2017 (For test mode B)

Issued Date: Oct. 02, 2017

Applicant: AMPAK Technology Inc.

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

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Table of Contents

Release Control Record	4
1 Certificate of Conformity	5
2 Summary of Test Results	6
2.1 Measurement Uncertainty	6
2.2 Modification Record	6
3 General Information	7
3.1 General Description of EUT	7
3.2 Description of Test Modes	8
3.2.1 Test Mode Applicability and Tested Channel Detail	9
3.3 Description of Support Units	11
3.3.1 Configuration of System under Test	11
3.4 General Description of Applied Standards	11
4 Test Types and Results	12
4.1 Radiated Emission and Bandedge Measurement	12
4.1.1 Limits of Radiated Emission and Bandedge Measurement	12
4.1.2 Test Instruments	13
4.1.3 Test Procedures	15
4.1.4 Deviation from Test Standard	15
4.1.5 Test Set Up	16
4.1.6 EUT Operating Conditions	17
4.1.7 Test Results	18
4.2 Conducted Emission Measurement	32
4.2.1 Limits of Conducted Emission Measurement	32
4.2.2 Test Instruments	32
4.2.3 Test Procedures	33
4.2.4 Deviation from Test Standard	33
4.2.5 Test Setup	33
4.2.6 EUT Operating Conditions	33
4.2.7 Test Results	34
4.3 Number of Hopping Frequency Used	36
4.3.1 Limits of Hopping Frequency Used Measurement	36
4.3.2 Test Setup	36
4.3.3 Test Instruments	36
4.3.4 Test Procedure	36
4.3.5 Deviation from Test Standard	36
4.3.6 Test Results	37
4.4 Dwell Time on Each Channel	38
4.4.1 Limits of Dwell Time on Each Channel Measurement	38
4.4.2 Test Setup	38
4.4.3 Test Instruments	38
4.4.4 Test Procedures	38
4.4.5 Deviation from Test Standard	38
4.4.6 Test Results	39
4.5 Channel Bandwidth	41
4.5.1 Limits of Channel Bandwidth Measurement	41
4.5.2 Test Setup	41
4.5.3 Test Instruments	41
4.5.4 Test Procedure	41
4.5.5 Deviation from Test Standard	41
4.5.6 EUT Operating Condition	41
4.5.7 Test Results	42
4.6 Hopping Channel Separation	43
4.6.1 Limits of Hopping Channel Separation Measurement	43

4.6.2	Test Setup	43
4.6.3	Test Instruments	43
4.6.4	Test Procedure	43
4.6.5	Deviation from Test Standard	43
4.6.6	Test Results	44
4.7	Maximum Output Power	45
4.7.1	Limits of Maximum Output Power Measurement	45
4.7.2	Test Setup	45
4.7.3	Test Instruments	45
4.7.4	Test Procedure	45
4.7.5	Deviation from Test Standard	45
4.7.6	EUT Operating Condition	45
4.7.7	Test Results	46
4.8	Conducted Out of Band Emission Measurement	47
4.8.1	Limits Of Conducted Out Of Band Emission Measurement	47
4.8.2	Test Instruments	47
4.8.3	Test Procedure	47
4.8.4	Deviation from Test Standard	47
4.8.5	EUT Operating Condition	47
4.8.6	Test Results	47
5	Pictures of Test Arrangements	50
	Appendix – Information on the Testing Laboratories	51

Release Control Record

Issue No.	Description	Date Issued
RF150821C10G-3	Original release	Oct. 02, 2017

1 Certificate of Conformity

Product: WLAN module for 802.11abgn(2x2) + 11ac + BT4.1

Brand: Ampak

Test Model: AP6356SD

Series Model: AP6356SDPB_I (Refer to item 3.1 for more details)

Sample Status: Engineering Sample

Applicant: AMPAK Technology Inc.

Test Date: Dec. 24 ~ Dec. 26, 2015 (For test mode A)
Sep. 11, 2017 (For test mode B)

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 EMC characteristics under the conditions specified in this report.

Prepared by : Celine Chou , **Date:** Oct. 02, 2017
Celine Chou / Specialist

Approved by : Ken Liu , **Date:** Oct. 02, 2017
Ken Liu / Senior Manager

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 -9.82dB at 1.06182MHz.
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 -0.8dB at 138.64MHz.
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: 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.

2.1 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	2.44 dB
Radiated Emissions up to 1 GHz	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	WLAN module for 802.11abgn(2x2) + 11ac + BT4.1
Brand	Ampak
Test Model	AP6356SD
Series Model	AP6356SDPB_I
Model Difference	Refer to note
Sample Status	Engineering Sample
Power Supply Rating	5Vdc (host equipment)
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	6.081mW
Antenna Type	PIFA antenna with 3.5dBi gain
Antenna Connector	IPEX
Accessory Device	NA
Data Cable Supplied	NA

Note:

1. This report is prepared for FCC class II permissive change, the difference compared with the original report (BV ADT report no.: RF150821C10-3) is adding model name. After evaluation, only the radiated emission of new model: AP6356SDPB_I test item had been an addendum test and the other data was kept in this report.
2. The following models are provided to this EUT. (New model name is marked in boldface)

Brand	Model	Description	
		Fixture	Crystal Temperature Operating Range
Ampak	AP6356SD	-	-10~65°C
	AP6356SDPB_I	AP12356_I	-40~85°C

* The model of the AP6356SD and AP6356SDPB_I was chosen for final test.

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	√	√	√	√	Model: AP6356SD
B	√	√	-	-	Model: AP6356SDPB_I with AP12356_I Platform

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. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Z-plane**.
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	PACKET TYPE
A, B	0 to 78	0, 39, 78	FHSS	GFSK	DH5
A, B	0 to 78	0, 39, 78	FHSS	8DPSK	DH5

Radiated Emission Test (Below 1GHz):

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

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET 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	PACKET TYPE
A	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	PACKET TYPE
A	0 to 78	0, 39, 78	FHSS	GFSK	DH5
A	0 to 78	0, 39, 78	FHSS	8DPSK	DH5

Test Condition:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (SYSTEM)	TESTED BY
RE \geq 1G	25deg. C, 65%RH 25deg. C, 66%RH	120Vac, 60Hz	Chris Lin James Yang
RE<1G	25deg. C, 65%RH 25deg. C, 66%RH	120Vac, 60Hz	Chris Lin James Yang
PLC	25deg. C, 65%RH	120Vac, 60Hz	Chris Lin
APCM	25deg. C, 60%RH	120Vac, 60Hz	Robert Cheng

3.3 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.

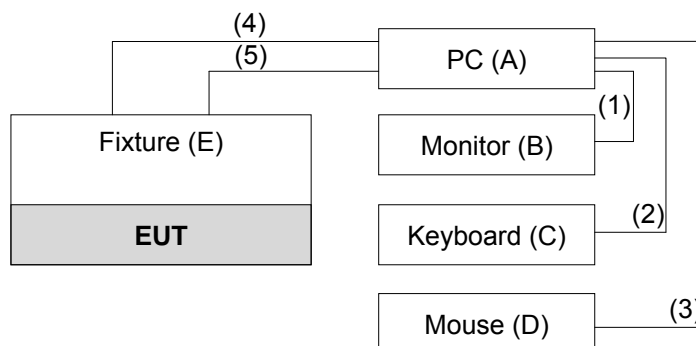
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	PC	Ampak	AC00301	NA	NA	Provided by manufacturer
B.	Monitor	Samsung	173v	NA	NA	-
C.	Keyboard	DELL	KB4021	CN-05V23T-71581-1A K-00IX-A01	FCC DoC Approved	-
D.	Mouse	DELL	MS111-P	CN-011D3V-71581-1C J-092J	FCC DoC Approved	-
E.	Fixture	NA	NA	NA	NA	Provided by manufacturer

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.	D-sub cable	1	1.8	Y	2	-
2.	USB cable	1	1.8	Y	0	-
3.	USB cable	1	1.8	Y	0	-
4.	Mini USB cable	2	1	Y	0	Provided by manufacturer
5.	Convertible cable	1	0.5	N	0	Provided by manufacturer

Note: The core(s) is(are) originally attached to the cable(s).

3.3.1 Configuration of System under Test



3.4 General Description of Applied Standards

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

FCC Part 15, Subpart C (15.247)

ANSI C63.10-2013

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

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

Test Date: Dec. 24 ~ Dec. 26, 2015

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCI	100424	Oct. 12, 2015	Oct. 11, 2016
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100040	Jul. 08, 2015	Jul. 07, 2016
BILOG Antenna SCHWARZBECK	VULB9168	9168-155	Feb. 06, 2015	Feb. 05, 2016
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-1170	Feb. 05, 2015	Feb. 04, 2016
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Feb. 09, 2015	Feb. 08, 2016
Loop Antenna	EM-6879	269	Aug. 11, 2015	Aug. 10, 2016
Preamplifier Agilent	8449B	3008A01960	Aug. 09, 2015	Aug. 08, 2016
Preamplifier Agilent	8447D	2944A10631	Aug. 09, 2015	Aug. 08, 2016
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH4-02(295012+309220)	Aug. 09, 2015	Aug. 08, 2016
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH4-03(250724)	Aug. 09, 2015	Aug. 08, 2016
Software BV ADT	ADT_Radiated_V7.6.15.9.4	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	010303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021703	NA	NA
Turn Table BV ADT	TT100	TT93021703	NA	NA
Turn Table Controller BV ADT	SC100.	SC93021703	NA	NA
High Speed Peak Power Meter	ML2495A	0824011	Jul. 09, 2015	Jul. 08, 2016
Power Sensor	MA2411B	0738171	Jul. 09, 2015	Jul. 08, 2016

- 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 4.
 3. The horn antenna and preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
 4. The FCC Designation Number is TW0003. The number will be varied with the Lab location and scope as attached.
 5. The IC Site Registration No. is IC7450F-4.

Test Date: Sep. 11, 2017

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver KEYSIGHT	N9038A	MY55420137	Mar. 27, 2017	Mar. 26, 2018
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	May 11, 2017	May 10, 2018
BILOG Antenna SCHWARZBECK	VULB9168	9168-148	Dec. 28, 2016	Dec. 27, 2017
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Dec. 27, 2016	Dec. 26, 2017
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Dec. 14, 2016	Dec. 13, 2017
Loop Antenna EMCI	EM-6879	269	Aug. 11, 2017	Aug. 10, 2018
Preamplifier Agilent	8449B	3008A01638	Feb. 22, 2017	Feb. 21, 2018
Preamplifier Agilent	8447D	2944A10638	Aug. 08, 2017	Aug. 07, 2018
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-02 (248780+MY13377)	Aug. 08, 2017	Aug. 07, 2018
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-(250795/4)	Aug. 08, 2017	Aug. 07, 2018
RF signal cable Woken	8D-FB	Cable-CH9-01	Aug. 01, 2017	Jul. 31, 2018
Software BV ADT	ADT_Radiated_ V7.6.15.9.4	NA	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA	NA
Turn Table EMCO	2087-2.03	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

- 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.
3. The horn antenna and preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Designation Number is TW0003. The number will be varied with the Lab location and scope as attached.
5. The IC Site Registration No. is IC 7450F-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. Both X and Y axes 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:

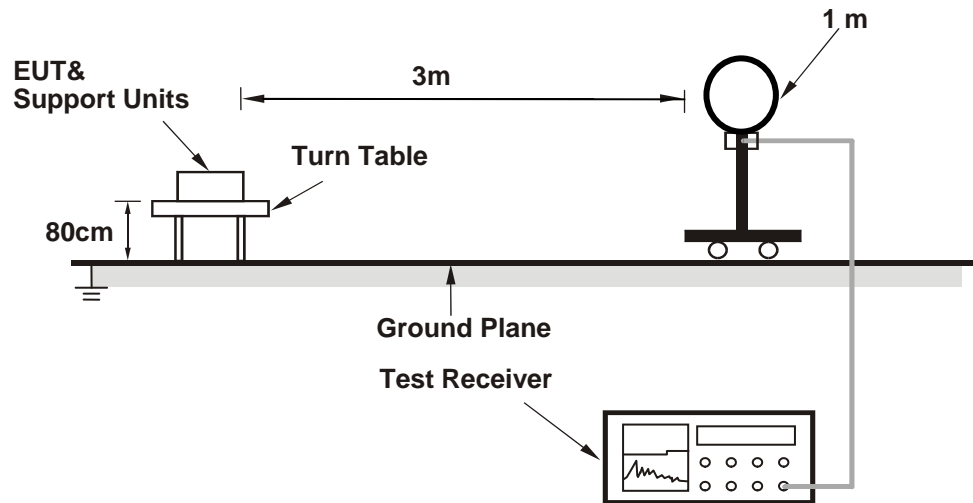
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

4.1.4 Deviation from Test Standard

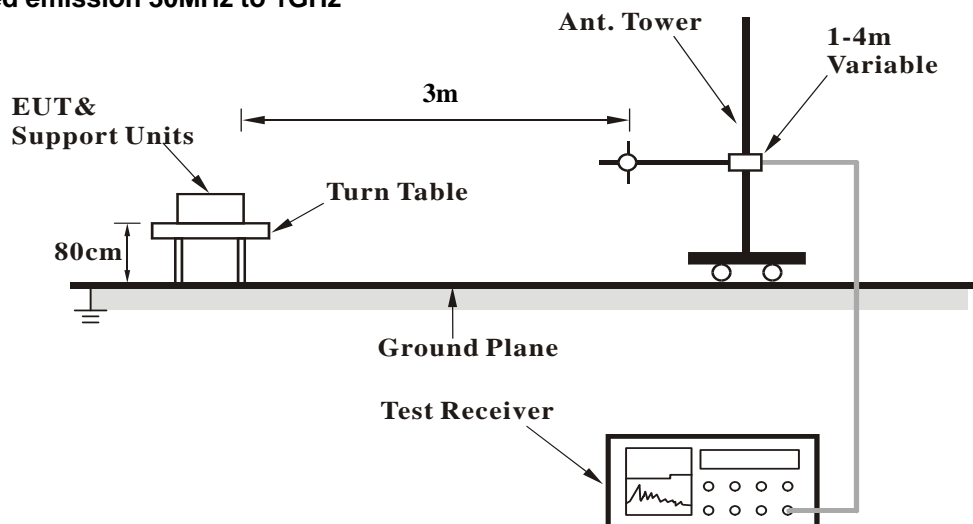
No deviation.

4.1.5 Test Set Up

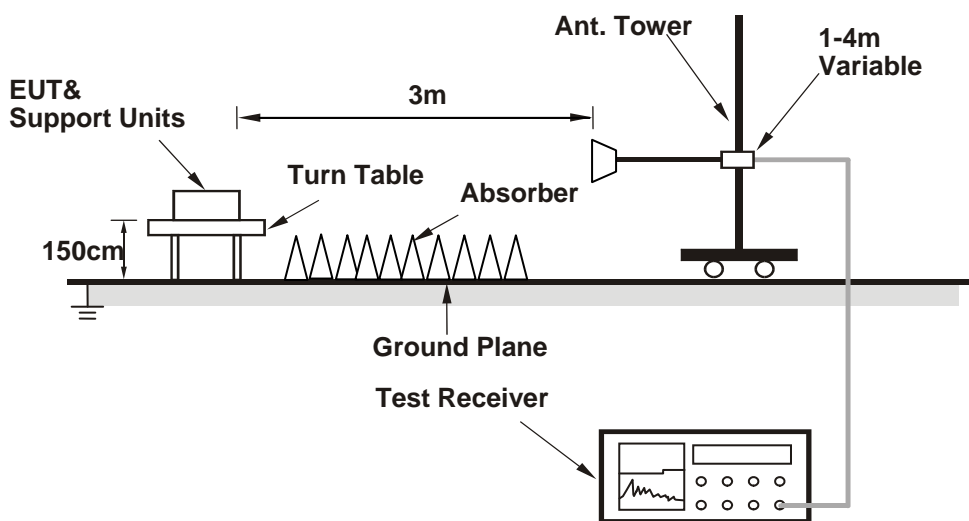
For Radiated emission below 30MHz



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

- Connected EUT with PC via Convertible Board through mini USB cable.
- Set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

Above 1GHz Worst-case 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	2390.00	47.9 PK	74.0	-26.1	1.26 H	335	50.60	-2.70
2	2390.00	37.5 AV	54.0	-16.5	1.26 H	335	40.20	-2.70
3	#2400.00	39.6 PK	74.0	-34.4	1.29 H	334	42.10	-2.50
4	#2400.00	9.6 AV	54.0	-44.4	1.29 H	334	12.10	-2.50
5	*2402.00	84.6 PK			1.25 H	334	52.80	31.80
6	*2402.00	54.5 AV			1.25 H	334	22.70	31.80
7	4804.00	46.3 PK	74.0	-27.7	1.26 H	97	41.30	5.00
8	4804.00	16.2 AV	54.0	-37.8	1.26 H	97	11.20	5.00
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	49.2 PK	74.0	-24.8	1.06 V	150	51.90	-2.70
2	2390.00	37.0 AV	54.0	-17.0	1.06 V	150	39.70	-2.70
3	#2400.00	39.9 PK	74.0	-34.1	1.05 V	150	42.40	-2.50
4	#2400.00	9.9 AV	54.0	-44.1	1.05 V	150	12.40	-2.50
5	*2402.00	84.9 PK			1.01 V	147	53.10	31.80
6	*2402.00	54.8 AV			1.01 V	147	23.00	31.80
7	4804.00	47.3 PK	74.0	-26.7	1.26 V	98	42.30	5.00
8	4804.00	17.2 AV	54.0	-36.8	1.26 V	98	12.20	5.00

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.
6. " # ": The radiated frequency is out of the restricted band.

CHANNEL	TX Channel 39	DETECTOR	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz	FUNCTION	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	86.4 PK			1.39 H	140	54.50	31.90
2	*2441.00	56.3 AV			1.39 H	140	24.40	31.90
3	4882.00	47.6 PK	74.0	-26.4	1.38 H	54	42.60	5.00
4	4882.00	17.5 AV	54.0	-36.5	1.38 H	54	12.50	5.00
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	86.2 PK			1.29 V	145	54.30	31.90
2	*2441.00	56.1 AV			1.29 V	145	24.20	31.90
3	4882.00	46.2 PK	74.0	-27.8	1.36 V	98	41.20	5.00
4	4882.00	16.1 AV	54.0	-37.9	1.36 V	98	11.10	5.00

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	85.9 PK			1.55 H	345	53.90	32.00
2	*2480.00	55.8 AV			1.55 H	345	23.80	32.00
3	2483.50	40.9 PK	74.0	-33.1	1.56 H	350	43.30	-2.40
4	2483.50	10.8 AV	54.0	-43.2	1.56 H	350	13.20	-2.40
5	4960.00	47.6 PK	74.0	-26.4	1.36 H	97	42.30	5.30
6	4960.00	17.5 AV	54.0	-36.5	1.36 H	97	12.20	5.30
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	86.6 PK			1.12 V	146	54.60	32.00
2	*2480.00	56.5 AV			1.12 V	146	24.50	32.00
3	2483.50	41.6 PK	74.0	-32.4	1.15 V	150	44.00	-2.40
4	2483.50	11.5 AV	54.0	-42.5	1.15 V	150	13.90	-2.40
5	4960.00	46.5 PK	74.0	-27.5	1.36 V	97	41.20	5.30
6	4960.00	16.5 AV	54.0	-37.5	1.36 V	97	11.20	5.30

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	47.9 PK	74.0	-26.1	1.10 H	340	50.60	-2.70
2	2390.00	37.8 AV	54.0	-16.2	1.10 H	340	40.50	-2.70
3	#2400.00	38.4 PK	74.0	-35.6	1.10 H	340	40.90	-2.50
4	#2400.00	8.4 AV	54.0	-45.6	1.10 H	340	10.90	-2.50
5	*2402.00	84.4 PK			1.06 H	337	52.60	31.80
6	*2402.00	54.3 AV			1.06 H	337	22.50	31.80
7	4804.00	46.6 PK	74.0	-27.4	1.16 H	345	41.60	5.00
8	4804.00	16.5 AV	54.0	-37.5	1.16 H	345	11.50	5.00
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	47.9 PK	74.0	-26.1	1.10 V	152	50.60	-2.70
2	2390.00	36.3 AV	54.0	-17.7	1.10 V	152	39.00	-2.70
3	#2400.00	37.3 PK	74.0	-36.7	1.10 V	152	39.80	-2.50
4	#2400.00	7.2 AV	54.0	-46.8	1.10 V	152	9.70	-2.50
5	*2402.00	83.3 PK			1.05 V	150	51.50	31.80
6	*2402.00	53.2 AV			1.05 V	150	21.40	31.80
7	4804.00	46.6 PK	74.0	-27.4	1.19 V	85	41.60	5.00
8	4804.00	16.5 AV	54.0	-37.5	1.19 V	85	11.50	5.00

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.
6. " # ": The radiated frequency is out of the restricted band.

CHANNEL	TX Channel 39	DETECTOR	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz	FUNCTION	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	84.2 PK			1.41 H	336	52.30	31.90
2	*2441.00	54.1 AV			1.41 H	336	22.20	31.90
3	4882.00	46.5 PK	74.0	-27.5	1.36 H	98	41.50	5.00
4	4882.00	16.4 AV	54.0	-37.6	1.36 H	98	11.40	5.00
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	83.8 PK			1.35 V	143	51.90	31.90
2	*2441.00	53.7 AV			1.35 V	143	21.80	31.90
3	4882.00	46.1 PK	74.0	-27.9	1.52 V	63	41.10	5.00
4	4882.00	16.0 AV	54.0	-38.0	1.52 V	63	11.00	5.00

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	83.9 PK			1.22 H	345	51.90	32.00
2	*2480.00	53.8 AV			1.22 H	345	21.80	32.00
3	2483.50	37.9 PK	74.0	-36.1	1.25 H	340	40.30	-2.40
4	2483.50	7.8 AV	54.0	-46.2	1.25 H	340	10.20	-2.40
5	4960.00	46.9 PK	74.0	-27.1	1.18 H	74	41.60	5.30
6	4960.00	16.8 AV	54.0	-37.2	1.18 H	74	11.50	5.30
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	83.2 PK			1.50 V	142	51.20	32.00
2	*2480.00	53.1 AV			1.50 V	142	21.10	32.00
3	2483.50	37.2 PK	74.0	-36.8	1.55 V	156	39.60	-2.40
4	2483.50	7.1 AV	54.0	-46.9	1.55 V	156	9.50	-2.40
5	4960.00	45.9 PK	74.0	-28.1	1.32 V	96	40.60	5.30
6	4960.00	15.8 AV	54.0	-38.2	1.32 V	96	10.50	5.30

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	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz	FUNCTION	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	57.7 PK	74.0	-16.3	1.55 H	323	24.3	33.4
2	2390.00	45.4 AV	54.0	-8.6	1.55 H	323	12.0	33.4
3	#2400.00	44.1 PK	74.0	-29.9	1.54 H	320	47.5	-3.4
4	#2400.00	14.0 AV	54.0	-40.0	1.54 H	320	17.4	-3.4
5	*2402.00	93.3 PK			1.54 H	320	59.8	33.5
6	*2402.00	63.2 AV			1.54 H	320	29.7	33.5
7	4804.00	47.4 PK	74.0	-26.6	1.58 H	334	43.7	3.7
8	4804.00	17.3 AV	54.0	-36.7	1.58 H	334	13.6	3.7
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	57.4 PK	74.0	-16.6	2.46 V	137	24.0	33.4
2	2390.00	45.3 AV	54.0	-8.7	2.46 V	137	11.9	33.4
3	#2400.00	43.9 PK	74.0	-30.1	1.77 V	246	47.3	-3.4
4	#2400.00	13.8 AV	54.0	-40.2	1.77 V	246	17.2	-3.4
5	*2402.00	90.6 PK			1.77 V	246	57.1	33.5
6	*2402.00	60.5 AV			1.77 V	246	27.0	33.5
7	4804.00	47.1 PK	74.0	-26.9	1.28 V	44	43.4	3.7
8	4804.00	17.0 AV	54.0	-37.0	1.28 V	44	13.3	3.7

Remarks:

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

CHANNEL	TX Channel 39	DETECTOR	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz	FUNCTION	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	92.4 PK			1.68 H	319	58.8	33.6
2	*2441.00	62.3 AV			1.68 H	319	28.7	33.6
3	4882.00	47.8 PK	74.0	-26.2	2.63 H	240	43.8	4.0
4	4882.00	17.7 AV	54.0	-36.3	2.63 H	240	13.7	4.0
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	90.7 PK			1.96 V	244	57.1	33.6
2	*2441.00	60.6 AV			1.96 V	244	27.0	33.6
3	4882.00	46.5 PK	74.0	-27.5	2.88 V	146	42.5	4.0
4	4882.00	16.4 AV	54.0	-37.6	2.88 V	146	12.4	4.0

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	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz	FUNCTION	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	91.7 PK			1.66 H	324	57.8	33.9
2	*2480.00	61.6 AV			1.66 H	324	27.7	33.9
3	2483.50	64.5 PK	74.0	-9.5	1.67 H	330	30.6	33.9
4	2483.50	45.9 AV	54.0	-8.1	1.67 H	330	12.0	33.9
5	4960.00	46.1 PK	74.0	-27.9	2.56 H	337	41.9	4.2
6	4960.00	16.0 AV	54.0	-38.0	2.56 H	337	11.8	4.2
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	90.0 PK			2.62 V	170	56.1	33.9
2	*2480.00	59.9 AV			2.62 V	170	26.0	33.9
3	2483.50	57.2 PK	74.0	-16.8	2.60 V	174	23.3	33.9
4	2483.50	45.8 AV	54.0	-8.2	2.60 V	174	11.9	33.9
5	4960.00	47.3 PK	74.0	-26.7	2.40 V	118	43.1	4.2
6	4960.00	17.2 AV	54.0	-36.8	2.40 V	118	13.0	4.2

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.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

8DPSK

CHANNEL	TX Channel 0	DETECTOR	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz	FUNCTION	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	56.6 PK	74.0	-17.4	2.73 H	221	23.2	33.4
2	2390.00	46.5 AV	54.0	-7.5	2.73 H	221	13.1	33.4
3	#2400.00	40.4 PK	74.0	-33.6	2.76 H	212	43.8	-3.4
4	#2400.00	10.3 AV	54.0	-43.7	2.76 H	212	13.7	-3.4
5	*2402.00	82.6 PK			2.76 H	212	49.1	33.5
6	*2402.00	52.5 AV			2.76 H	212	19.0	33.5
7	4804.00	46.9 PK	74.0	-27.1	2.49 H	223	43.2	3.7
8	4804.00	16.7 AV	54.0	-37.3	2.49 H	223	13.0	3.7
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	57.2 PK	74.0	-16.8	2.51 V	312	23.8	33.4
2	2390.00	45.8 AV	54.0	-8.2	2.51 V	312	12.4	33.4
3	#2400.00	41.9 PK	74.0	-32.1	2.56 V	300	45.3	-3.4
4	#2400.00	11.8 AV	54.0	-42.2	2.56 V	300	15.2	-3.4
5	*2402.00	83.3 PK			2.56 V	300	49.8	33.5
6	*2402.00	53.2 AV			2.56 V	300	19.7	33.5
7	4804.00	47.6 PK	74.0	-26.4	2.76 V	143	43.9	3.7
8	4804.00	17.5 AV	54.0	-36.5	2.76 V	143	13.8	3.7

Remarks:

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

CHANNEL	TX Channel 39	DETECTOR	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz	FUNCTION	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	84.6 PK			2.58 H	197	51.0	33.6
2	*2441.00	54.5 AV			2.58 H	197	20.9	33.6
3	4882.00	46.9 PK	74.0	-27.1	2.68 H	175	42.9	4.0
4	4882.00	16.8 AV	54.0	-37.2	2.68 H	175	12.8	4.0
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	85.4 PK			2.81 V	300	51.8	33.6
2	*2441.00	55.3 AV			2.81 V	300	21.7	33.6
3	4882.00	47.5 PK	74.0	-26.5	3.11 V	272	43.5	4.0
4	4882.00	17.4 AV	54.0	-36.6	3.11 V	272	13.4	4.0

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	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz	FUNCTION	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	82.5 PK			1.95 H	195	48.6	33.9
2	*2480.00	52.4 AV			1.95 H	195	18.5	33.9
3	2483.50	57.3 PK	74.0	-16.7	2.11 H	208	23.4	33.9
4	2483.50	45.9 AV	54.0	-8.1	2.11 H	208	12.0	33.9
5	4960.00	46.7 PK	74.0	-27.3	2.76 H	218	42.5	4.2
6	4960.00	16.6 AV	54.0	-37.4	2.76 H	218	12.4	4.2
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	84.2 PK			3.07 V	297	50.3	33.9
2	*2480.00	54.1 AV			3.07 V	297	20.2	33.9
3	2483.50	58.4 PK	74.0	-15.6	3.11 V	312	24.5	33.9
4	2483.50	46.0 AV	54.0	-8.0	3.11 V	312	12.1	33.9
5	4960.00	47.2 PK	74.0	-26.8	2.31 V	197	43.0	4.2
6	4960.00	17.1 AV	54.0	-36.9	2.31 V	197	12.9	4.2

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.
4. Margin value = Emission Level – Limit value
5. " * ": Fundamental frequency.

Below 1GHz worst-case data:

GFSK

CHANNEL	TX Channel 0	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	117.22	38.7 QP	43.5	-4.8	1.00 H	12	55.00	-16.30
2	190.95	40.2 QP	43.5	-3.3	1.50 H	243	56.50	-16.30
3	299.62	43.9 QP	46.0	-2.1	1.25 H	248	56.60	-12.70
4	433.50	34.2 QP	46.0	-11.8	1.00 H	121	44.40	-10.20
5	635.30	36.8 QP	46.0	-9.2	1.50 H	309	43.00	-6.20
6	794.42	40.6 QP	46.0	-5.4	1.25 H	351	43.70	-3.10
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	165.73	38.7 QP	43.5	-4.8	1.25 V	176	52.70	-14.00
2	367.53	42.9 QP	46.0	-3.1	1.00 V	266	54.50	-11.60
3	433.50	42.3 QP	46.0	-3.7	1.50 V	186	52.50	-10.20
4	565.45	37.8 QP	46.0	-8.2	1.25 V	50	46.10	-8.30
5	792.48	42.9 QP	46.0	-3.1	1.00 V	52	46.00	-3.10
6	873.97	38.0 QP	46.0	-8.0	1.50 V	152	40.10	-2.10

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.

CHANNEL	TX Channel 0	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	138.64	42.7 QP	43.5	-0.8	1.99 H	338	56.8	-14.1
2	216.24	39.2 QP	46.0	-6.8	1.00 H	12	55.3	-16.1
3	480.08	38.1 QP	46.0	-7.9	1.49 H	257	47.7	-9.6
4	596.48	38.3 QP	46.0	-7.7	1.00 H	308	45.9	-7.6
5	769.14	44.4 QP	46.0	-1.6	1.00 H	308	48.9	-4.5
6	961.20	46.4 QP	54.0	-7.6	1.00 H	273	48.1	-1.7
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	49.40	36.8 QP	40.0	-3.2	1.99 V	339	50.8	-14.0
2	140.58	36.9 QP	43.5	-6.6	1.00 V	102	50.8	-13.9
3	379.20	32.3 QP	46.0	-13.7	1.00 V	172	41.6	-9.3
4	596.48	38.3 QP	46.0	-7.7	1.00 V	206	42.2	-3.9
5	769.14	40.8 QP	46.0	-5.2	1.00 V	313	40.7	0.1
6	864.20	43.3 QP	46.0	-2.7	1.00 V	313	41.3	2.0

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.

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

Test Date: Dec. 24 ~ Dec. 26, 2015

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Nov. 16, 2015	Nov. 15, 2016
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond1-01	Dec. 26, 2014	Dec. 25, 2015
			Dec. 26, 2015	Dec. 25, 2016
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Feb. 26, 2015	Feb. 25, 2016
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Jul. 24, 2015	Jul. 23, 2016
Software ADT	BV ADT_Conf_ V7.3.7.3	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 1.
3. The VCCI Site Registration No. is C-2040.

4.2.3 Test Procedures

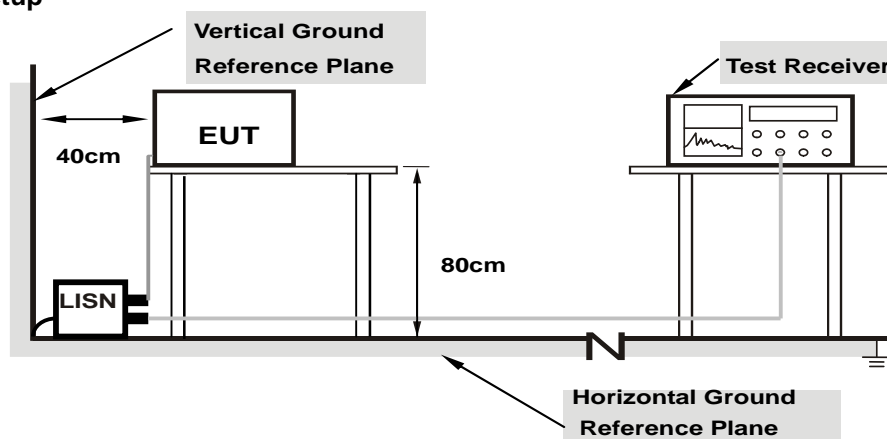
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance 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.

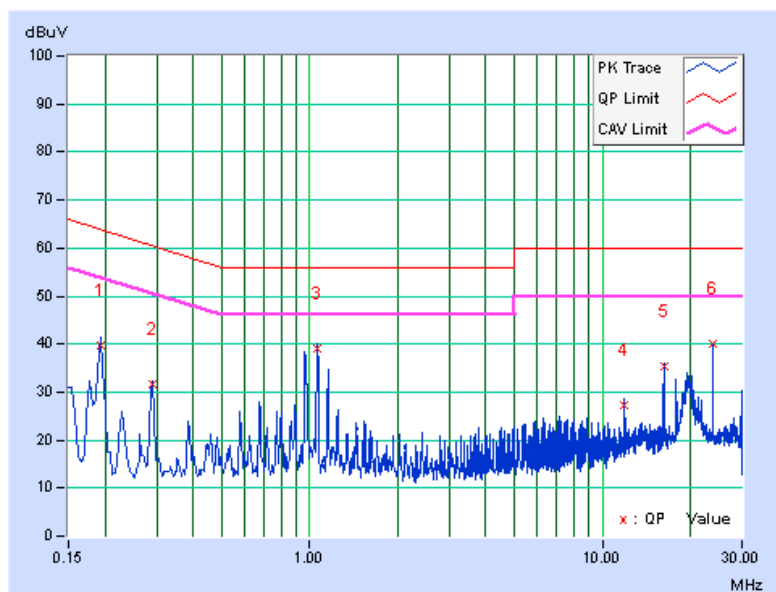
4.2.7 Test Results

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	0.19305	9.84	29.81	28.96	39.65	38.80	63.90	53.90	-24.26	-15.11
2	0.29043	9.86	21.83	21.51	31.69	31.37	60.51	50.51	-28.82	-19.14
3	1.06182	9.93	29.21	26.25	39.14	36.18	56.00	46.00	-16.86	-9.82
4	11.92718	10.62	16.71	16.20	27.33	26.82	60.00	50.00	-32.67	-23.18
5	16.20055	10.87	24.44	20.95	35.31	31.82	60.00	50.00	-24.69	-18.18
6	23.85633	11.24	28.88	28.43	40.12	39.67	60.00	50.00	-19.88	-10.33

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.

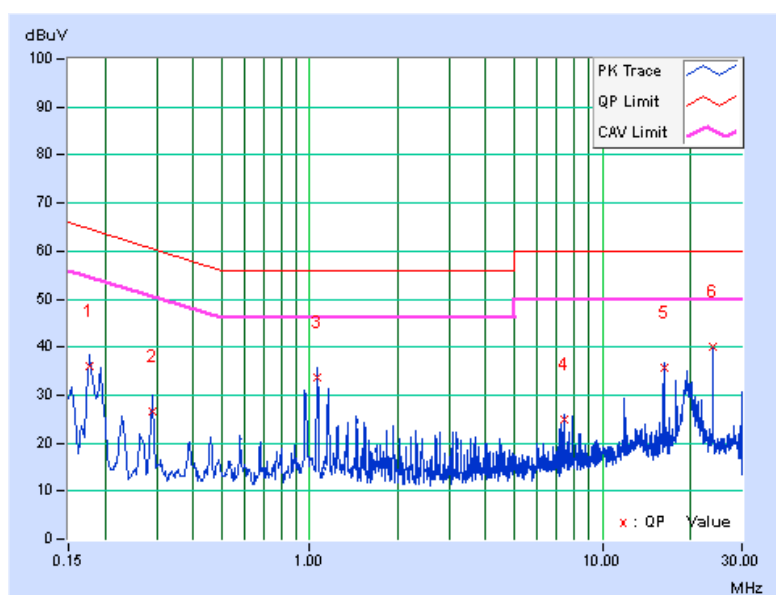


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
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No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.17744	9.83	26.03	25.46	35.86	35.29	64.60	54.60	-28.75	-19.32
2	0.29076	9.85	16.69	15.27	26.54	25.12	60.50	50.50	-33.96	-25.38
3	1.06182	9.93	23.67	21.15	33.60	31.08	56.00	46.00	-22.40	-14.92
4	7.42651	10.33	14.45	4.69	24.78	15.02	60.00	50.00	-35.22	-34.98
5	16.20055	10.76	24.97	21.47	35.73	32.23	60.00	50.00	-24.27	-17.77
6	23.85633	11.01	28.89	28.70	39.90	39.71	60.00	50.00	-20.10	-10.29

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.

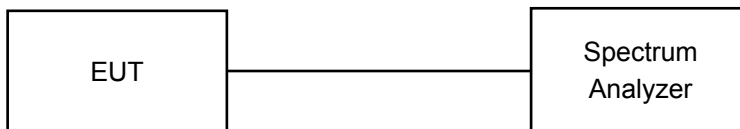


4.3 Number of Hopping Frequency Used

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

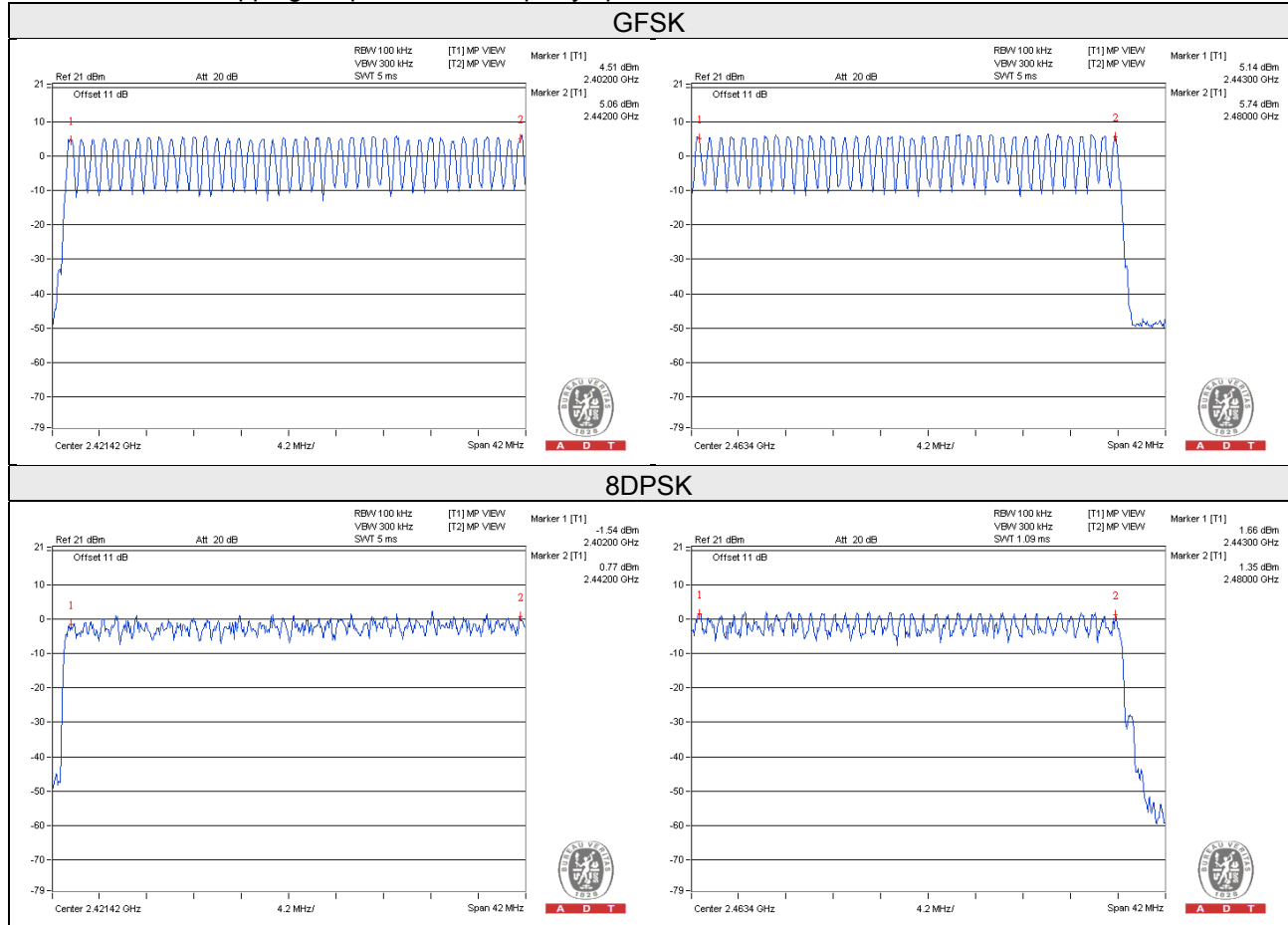
- Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make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

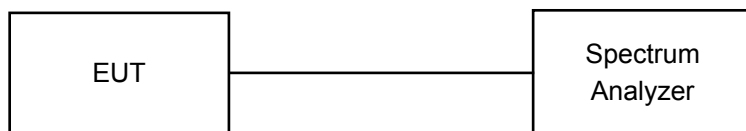


4.4 Dwell Time on Each Channel

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 = 316.00 times	0.456	144.10	400
DH3	25 (times / 5 sec) * 6.32 = 158.00 times	1.710	270.18	400
DH5	16 (times / 5 sec) * 6.32 = 101.12 times	3.040	307.40	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)
DH1	50 (times / 5 sec) * 6.32 = 316.00 times	0.450	142.20	400
DH3	27 (times / 5 sec) * 6.32 = 170.64 times	1.730	295.21	400
DH5	17 (times / 5 sec) * 6.32 = 107.44 times	2.992	321.46	400

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

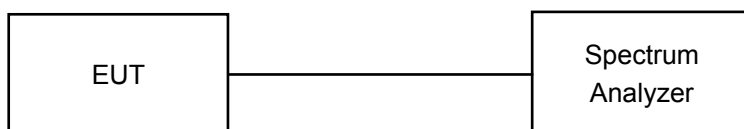


4.5 Channel Bandwidth

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

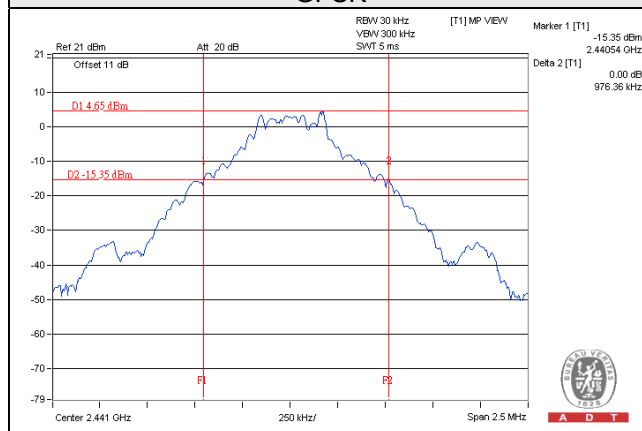
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.5.7 Test Results

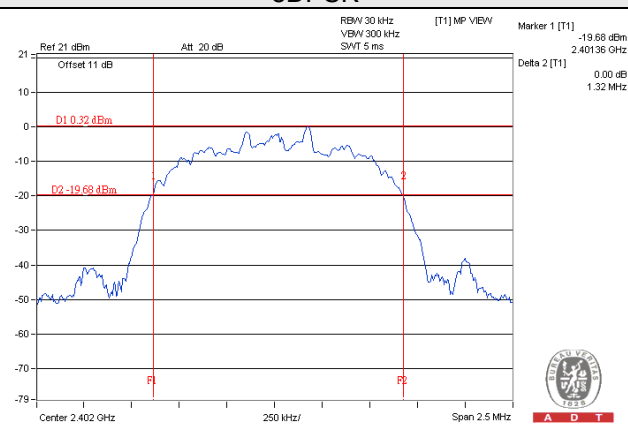
Channel	Frequency (MHz)	20dB Bandwidth (MHz)	
		GFSK	8DPSK
0	2402	0.950	1.320
39	2441	0.976	1.320
78	2480	0.973	1.310

SPECTRUM PLOT OF WORST VALUE

GFSK



8DPSK

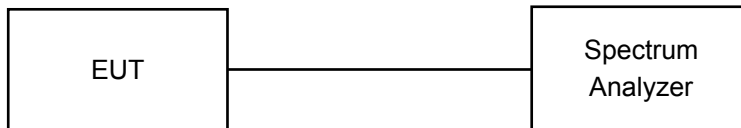


4.6 Hopping Channel Separation

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.

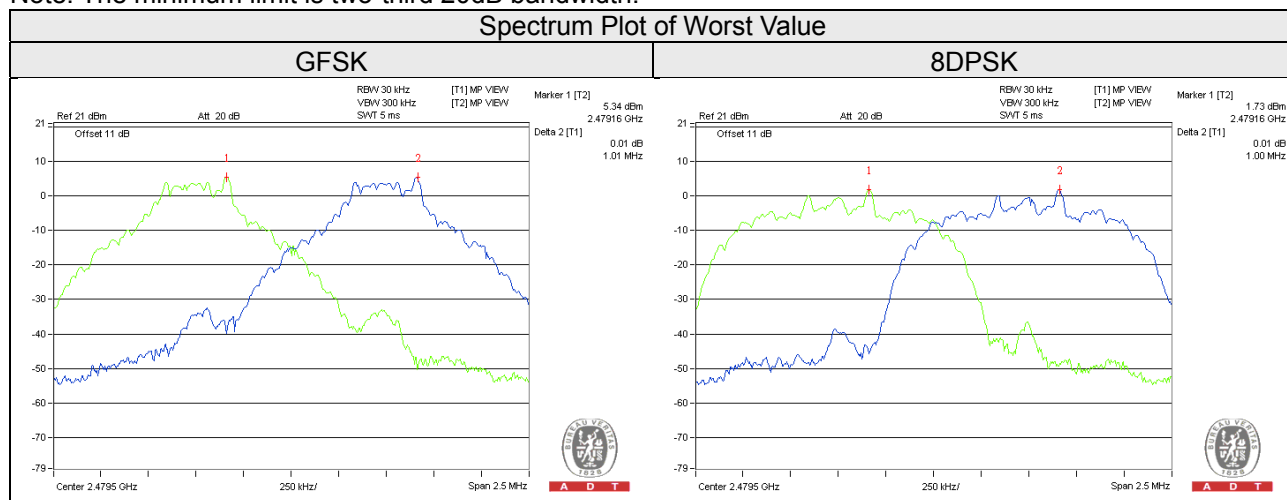
4.6.5 Deviation from Test Standard

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	0.950	1.320	0.64	0.88	Pass
39	2441	1.01	1.00	0.976	1.320	0.65	0.88	Pass
78	2480	1.01	1.00	0.973	1.310	0.65	0.88	Pass

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

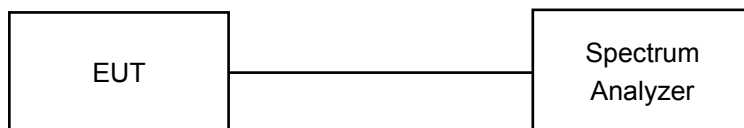


4.7 Maximum Output Power

4.7.1 Limits of Maximum Output Power Measurement

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

- 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.
- The center frequency of the spectrum analyzer is set to the fundamental frequency and using 3MHz RBW and 10 MHz VBW.
- Measure the captured power within the band and recording the plot.
- Repeat above procedures until all frequencies required were complete.

4.7.5 Deviation from Test Standard

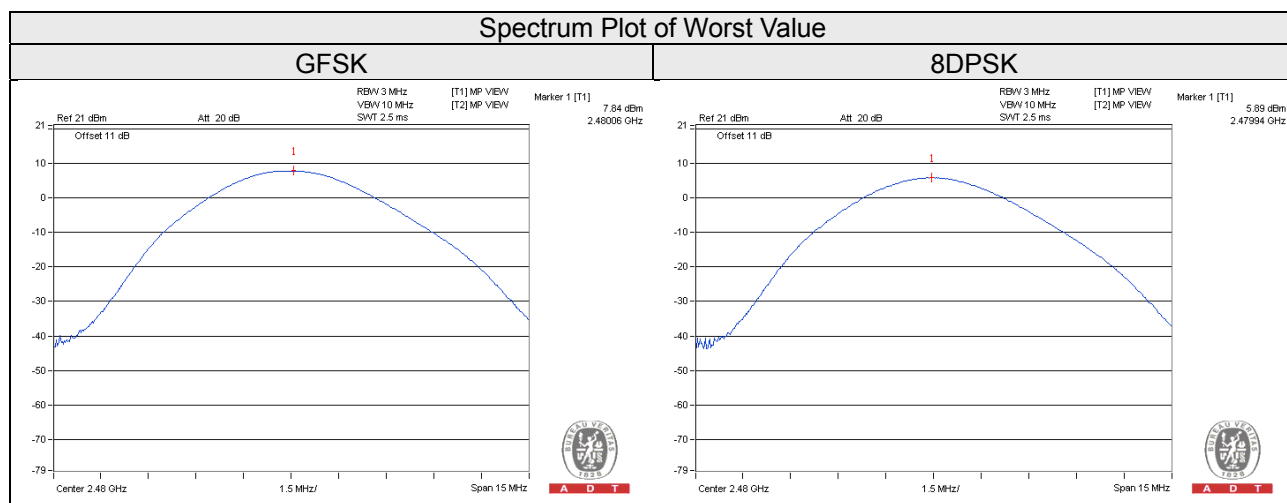
No deviation.

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

Channel	Frequency (MHz)	Output Power (mW)		Output Power (dBm)		Power Limit (mW)	Pass / Fail
		GFSK	8DPSK	GFSK	8DPSK		
0	2402	4.989	2.831	6.98	4.52	125	Pass
39	2441	5.702	3.420	7.56	5.34	125	Pass
78	2480	6.081	3.882	7.84	5.89	125	Pass



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

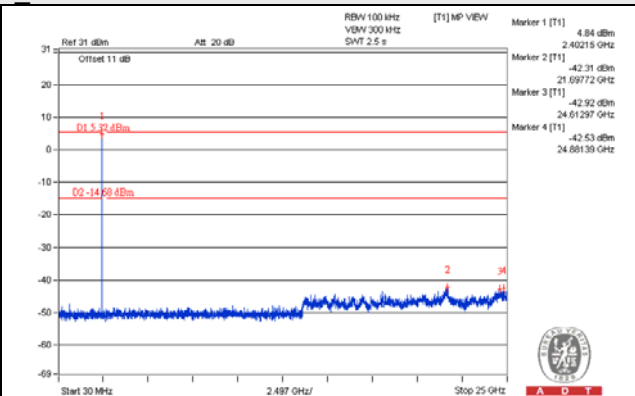
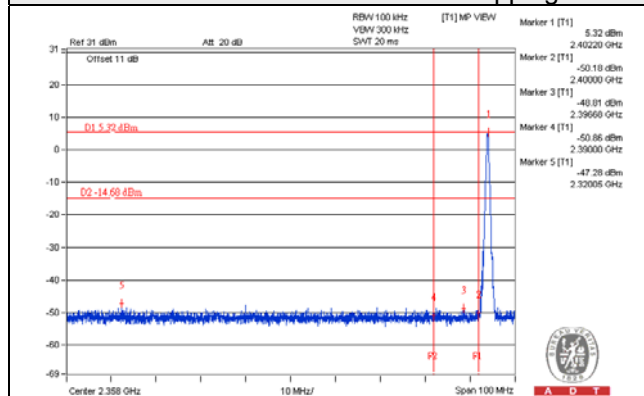
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.8.6 Test Results

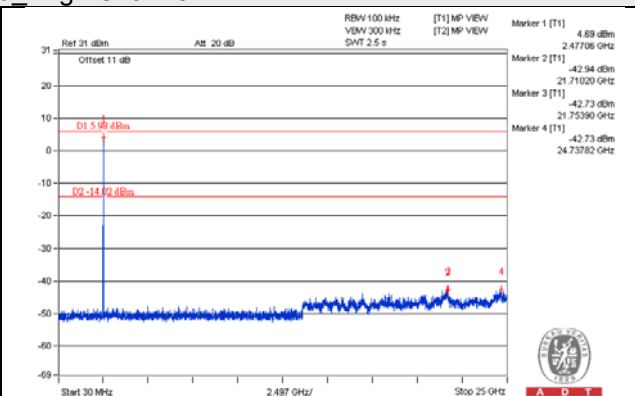
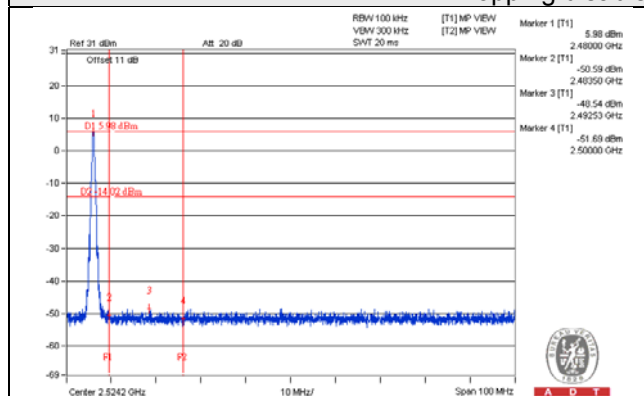
The spectrum plots are attached on the following images. D1 line indicates the highest level, D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

GFSK

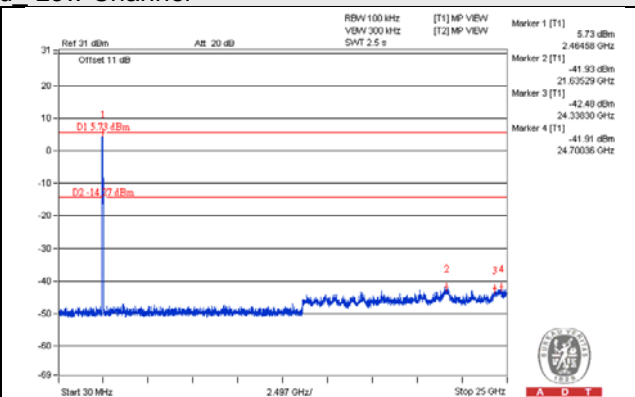
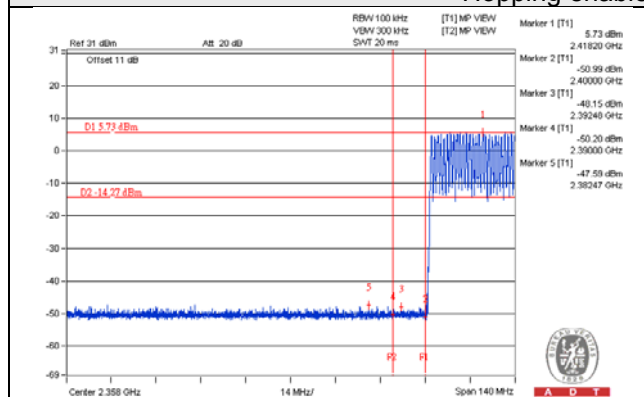
Hopping disabled Low Channel



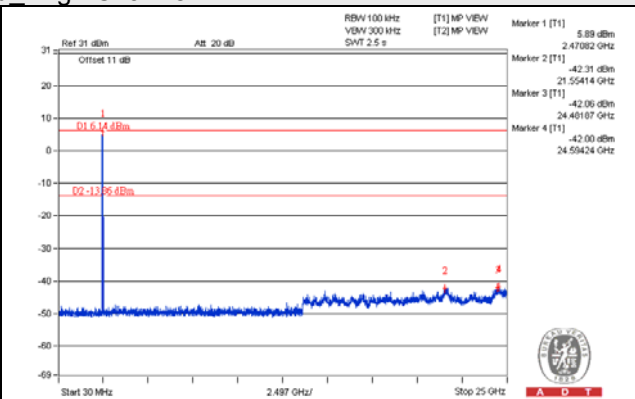
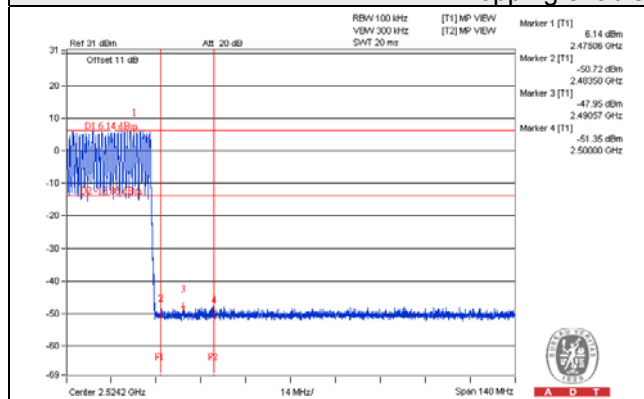
Hopping disabled High Channel



Hopping enabled Low Channel

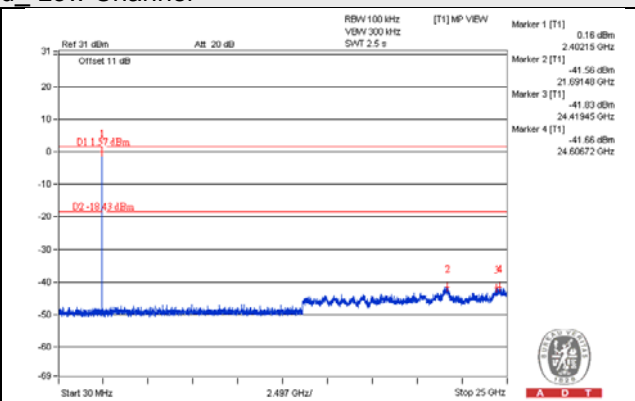
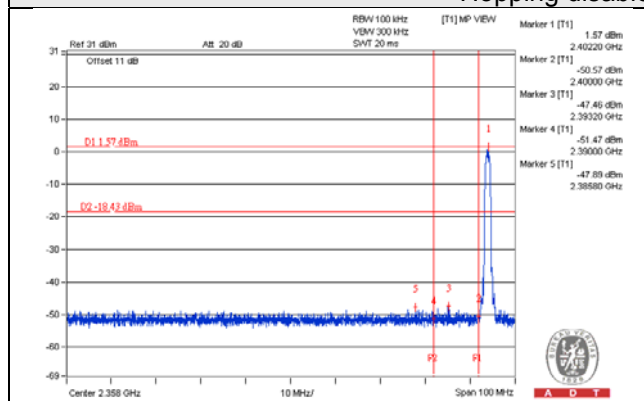


Hopping enabled High Channel

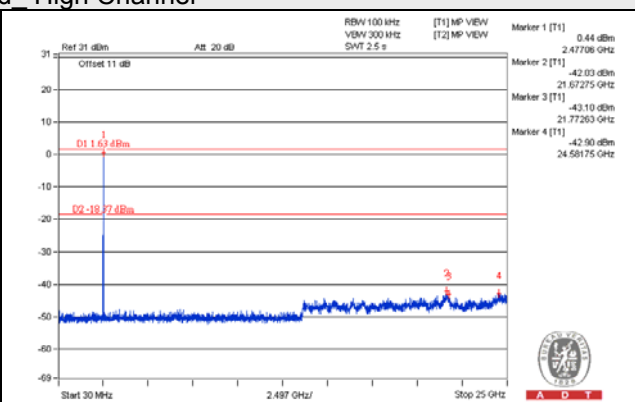
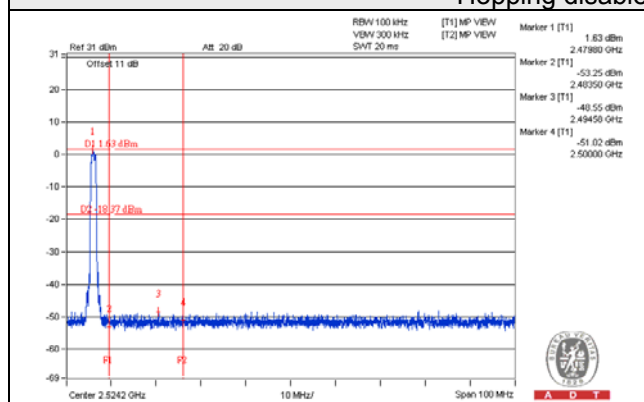


8DPSK

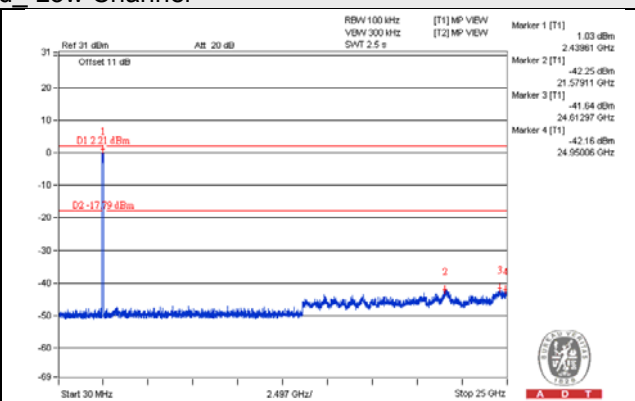
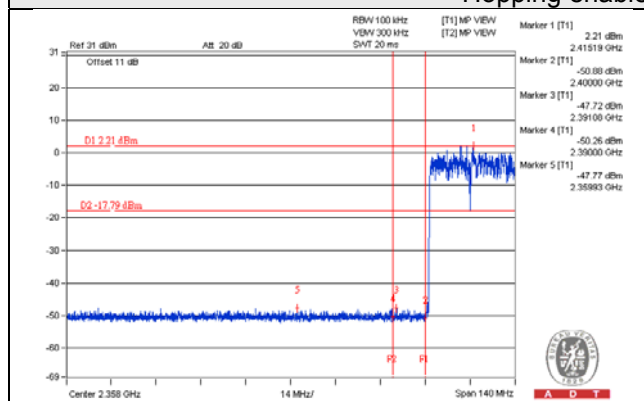
Hopping disabled Low Channel



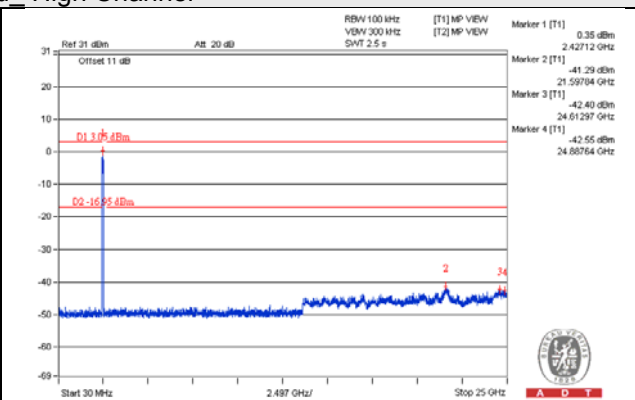
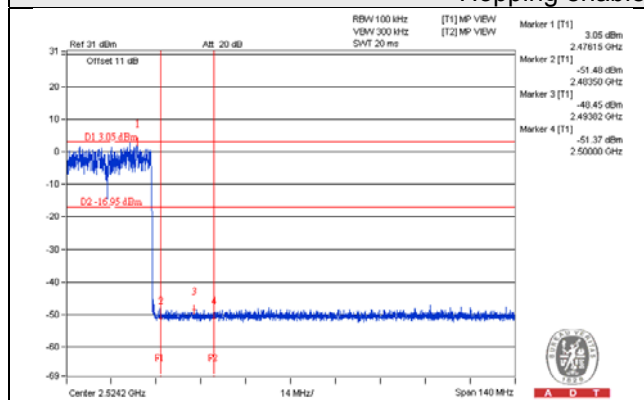
Hopping disabled High Channel



Hopping enabled Low Channel



Hopping enabled High Channel



5 Pictures of Test Arrangements

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

Appendix – Information on the Testing Laboratories

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

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

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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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