

FCC TEST REPORT

REPORT NO.: RF150505C12

MODEL NO.: DA01

FCC ID: MSQDA01

RECEIVED: May 05, 2015

TESTED: May 12, 2015 ~ May 27, 2015

ISSUED: Jun. 09, 2015

APPLICANT: ASUSTek COMPUTER INC.

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TAIWAN

ISSUED BY: Bureau Veritas Consumer Products Services (H.K.)
Ltd., Taoyuan Branch

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TEST LOCATION: No. 19, Hwa Ya 2nd Rd, Wen Hwa Vil., Kwei Shan
Dist., Taoyuan City 33383, Taiwan (R.O.C.)

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TABLE OF CONTENTS

RELEASE CONTROL RECORD	4
1. CERTIFICATION	5
2. SUMMARY OF TEST RESULTS	6
2.1 MEASUREMENT UNCERTAINTY	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	12
4. TEST TYPES AND RESULTS (FOR BLUETOOTH)	13
4.1 RADIATED EMISSION AND BANDEDGE MEASUREMENT	13
4.1.1 LIMITS OF RADIATED EMISSION AND BANDEDGE MEASUREMENT	13
4.1.2 TEST INSTRUMENTS	14
4.1.3 TEST PROCEDURES	15
4.1.4 DEVIATION FROM TEST STANDARD	15
4.1.5 TEST SETUP	16
4.1.6 EUT OPERATING CONDITIONS	16
4.1.7 TEST RESULTS	17
4.2 CONDUCTED EMISSION MEASUREMENT	31
4.2.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT	31
4.2.2 TEST INSTRUMENTS	31
4.2.3 TEST PROCEDURES	32
4.2.4 DEVIATION FROM TEST STANDARD	32
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 LIMIT OF HOPPING FREQUENCY USED	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	36
4.4 DWELL TIME ON EACH CHANNEL	38
4.4.1 LIMITS OF DWELL TIME USED	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	44
4.5.1 LIMITS OF CHANNEL BANDWIDTH	44
4.5.2 TEST SETUP	44
4.5.3 TEST INSTRUMENTS	44
4.5.4 TEST PROCEDURE	44
4.5.5 DEVIATION FROM TEST STANDARD	44
4.5.6 EUT OPERATING CONDITION	44
4.5.7 TEST RESULTS	45
4.6 HOPPING CHANNEL SEPARATION	46
4.6.1 LIMITS OF HOPPING CHANNEL SEPARATION	46



A D T

4.6.2	TEST SETUP	46
4.6.3	TEST INSTRUMENTS	46
4.6.4	TEST PROCEDURE	46
4.6.5	DEVIATION FROM TEST STANDARD	46
4.6.6	TEST RESULTS.....	47
4.7	MAXIMUM OUTPUT POWER	49
4.7.1	LIMITS OF MAXIMUM OUTPUT POWER MEASUREMENT	49
4.7.2	TEST SETUP	49
4.7.3	TEST INSTRUMENTS	49
4.7.4	TEST PROCEDURE	49
4.7.5	DEVIATION FROM TEST STANDARD	49
4.7.6	EUT OPERATING CONDITION.....	49
4.7.7	TEST RESULTS.....	50
4.8	CONDUCTED OUT OF BAND EMISSION MEASUREMENT	51
4.8.1	LIMITS OF CONDUCTED OUT OF BAND EMISSION MEASUREMENT	51
4.8.2	TEST INSTRUMENTS.....	51
4.8.3	TEST PROCEDURE	51
4.8.4	DEVIATION FROM TEST STANDARD	51
4.8.5	EUT OPERATING CONDITION.....	51
4.8.6	TEST RESULTS.....	51
5.	PHOTOGRAPHS OF THE TEST CONFIGURATION.....	56
6.	INFORMATION ON THE TESTING LABORATORIES	57
7.	APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB	58



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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF150505C12	Original release	Jun. 09, 2015

1. CERTIFICATION

PRODUCT: Mobile Dock

MODEL NO.: DA01

BRAND: ASUS

APPLICANT: ASUSTek COMPUTER INC.

TESTED: May 12, 2015 ~ May 27, 2015

TEST SAMPLE: Identical Prototype

STANDARDS: **FCC Part 15, Subpart C (Section 15.247)**

ANSI C63.10-2009

The above equipment (model: DA01) 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 : Evonne Liu , **DATE :** Jun. 09, 2015
Evonne Liu / Specialist

APPROVED BY : Sam Chen , **DATE :** Jun. 09, 2015
Sam Chen / Senior Project Engineer

2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart C (Bluetooth)			
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT	REMARK
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -13.31dB at 0.48235MHz.
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.
15.247(d)	Transmitter Radiated Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -3.04dB at 7206MHz.
15.247(d)	Band Edge Measurement	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	No antenna connector is used.

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	UNCERTAINTY
Conducted emissions	9kHz~30MHz	2.44 dB
Radiated emissions	30MHz ~ 200MHz	2.93 dB
	200MHz ~1000MHz	2.95 dB
	1GHz ~ 18GHz	2.26 dB
	18GHz ~ 40GHz	1.94 dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

EUT	Mobile Dock
MODEL NO.	DA01
POWER SUPPLY	5.2Vdc (adapter) 3.8Vdc (Li-ion battery)
MODULATION TYPE	Mode A: GFSK Mode B: GFSK, $\pi/4$ -DQPSK, 8DPSK
TRANSFER RATE	Mode A: 1Mbps Mode B: 1/2/3Mbps
OPERATING FREQUENCY	2402 ~ 2480MHz
NUMBER OF CHANNEL	79
CHANNEL SPACING	1MHz
OUTPUT POWER	Mode A: 2.065mW Mode B: 2.710mW
ANTENNA TYPE	Mode A: PIFA antenna Mode B: Monopole antenna
ANTENNA GAIN	Mode A: 2.83dBi Mode B: 2.96dBi
ANTENNA CONNECTOR	NA
DATA CABLE	Refer to Note as below
I/O PORTS	Refer to user's manual
ACCESSORY DEVICES	Refer to Note as below

NOTE:

1. The EUT contains following accessory devices.

ITEM	BRAND	MODEL	SPECIFICATION
Battery	ASUS	C11P1503	3.8Vdc, 6Wh
Main Board	ASUS	Z300_DOCK (DA01)	--
BT Module (BT KB)	Broadcom	BCM20730A1KFGB	--
BT Module (BT Speaker)	Broadcom	BCM20771A0KWFBG	--

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

3.2 DESCRIPTION OF TEST MODES

Bluetooth:

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	√	√	√	√	Bluetooth module with keyboard
B	√	√	√	√	Bluetooth module with speaker
C	√	√	-	-	co-location

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

NOTE: 1. For Radiated emission test, pre-tested GFSK, $\pi/4$ -DQPSK, 8DPSK modulation type and found GFSK for Mode A, 8DPSK for Mode B was the worse, therefore chosen for the final test and presented in the test report.
2. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**.

RADIATED EMISSION TEST (ABOVE 1GHz):

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

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TYPE	PACKET TYPE
A	0 to 78	0, 39, 78	GFSK	DH5
B	0 to 78	0, 39, 78	8DPSK	DH5
C	0 to 78	0+78	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 TYPE	PACKET TYPE
A	0 to 78	0	GFSK	DH5
B	0 to 78	78	8DPSK	DH5
C	0 to 78	0	8DPSK	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 TYPE	PACKET TYPE
A	0 to 78	0	GFSK	DH5
B	0 to 78	78	8DPSK	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 TYPE	PACKET TYPE
A	0 to 78	0, 39, 78	GFSK	DH5
B	0 to 78	0, 39, 78	GFSK	DH5
	0 to 78	0, 39, 78	$\pi/4$ -DQPSK	DH5
	0 to 78	0, 39, 78	8DPSK	DH5
	0 to 78	0, 39, 78	8DPSK	DH5

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE $\geq$ 1G	25deg. C, 65%RH	120Vac, 60Hz	Charles Hsiao, Will Chen
RE<1G	25deg. C, 65%RH	120Vac, 60Hz	Charles Hsiao, Will Chen
PLC	25deg. C, 65%RH	120Vac, 60Hz	Toby Tian
APCM	25deg. C, 65%RH	3.8Vdc	Taylor Liu

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.

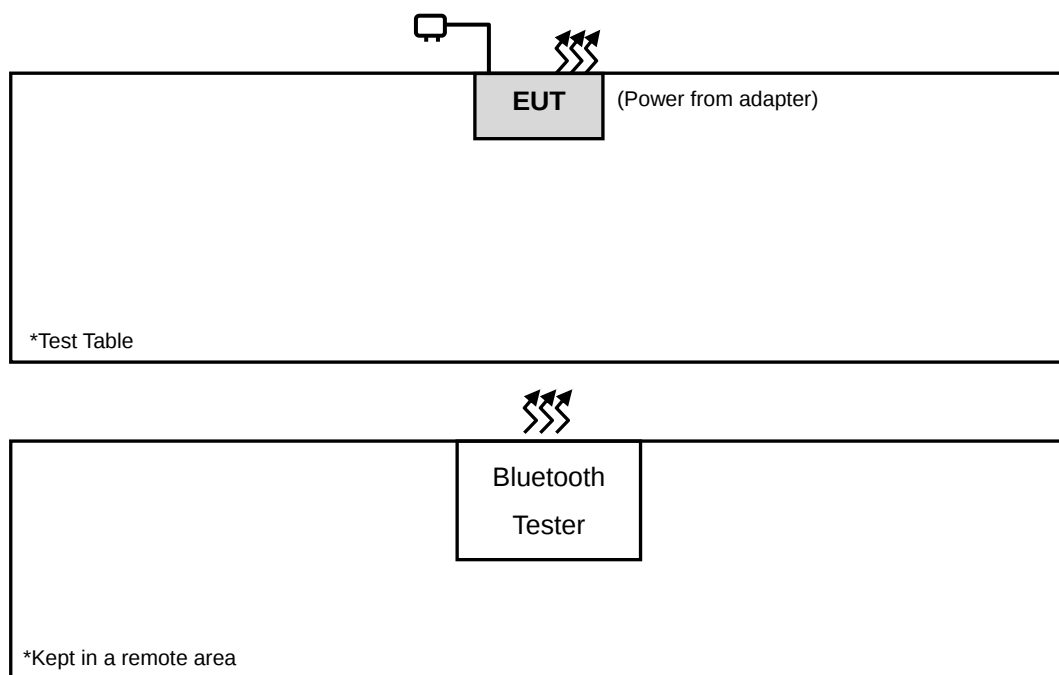
NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	Bluetooth Tester	R&S	CBT	100870	N/A
2	Adapter	ASUS	PA-1070-07	N/A	N/A
3	USB Cable	ASUS	CUBB04M	N/A	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	N/A
2	N/A
3	N/A

NOTE:

1. All power cords of the above support units are non-shielded (1.8m).
2. Items 1 acted as communication partners to transfer data.
3. Items 2-3 were provided by client.

3.3.1 CONFIGURATION OF SYSTEM UNDER TEST





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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 C63.10-2009

FCC Public Notice DA 00-705

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

NOTE: The EUT has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

4. TEST TYPES AND RESULTS (FOR BLUETOOTH)

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.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver Agilent	N9038A	MY51210203	Jan.21, 2015	Jan.21, 2016
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Dec. 10, 2014	Dec. 09, 2015
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Feb. 04, 2015	Feb. 04, 2016
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-969	Feb. 09, 2015	Feb. 09, 2016
HORN Antenna SCHWARZBECK	BBHA 9170	9170-480	Feb. 04, 2015	Feb. 04, 2016
Loop Antenna	EM-6879	269	Aug.13, 2014	Aug.12, 2015
Preamplifier EMCI	EMC 012645	980115	Dec. 12, 2014	Dec. 11, 2015
Preamplifier EMCI	EMC 184045	980116	Jan. 09, 2015	Jan. 08, 2016
Preamplifier EMCI	EMC 330H	980112	Dec. 27, 2014	Dec. 26, 2015
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	309219/4 2950114	Oct. 18, 2014	Oct. 17, 2015
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	250130/4	Oct. 18, 2014	Oct. 17, 2015
RF Coaxial Cable Worken	8D-FB	Cable-Ch10-01	Nov. 07, 2014	Nov. 06, 2015
Software BV ADT	E3 6.120103	NA	NA	NA
Antenna Tower MF	MFA-440H	NA	NA	NA
Turn Table MF	MFT-201SS	NA	NA	NA
Antenna Tower & Turn Table Controller MF	MF-7802	NA	NA	NA
Bluetooth Tester	CBT	100980	Feb. 10, 2015	Feb. 09, 2016
Power Meter	ML2495A	1232002	Sep. 17, 2014	Sep. 16, 2015
Power Sensor	MA2411B	1207325	Sep. 17, 2014	Sep. 16, 2015

- 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 calibration interval of the loop antenna is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. The test was performed in HwaYa Chamber 10.
4. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
5. The FCC Site Registration No. is 690701.
6. The IC Site Registration No. is IC 7450F-10.

4.1.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters (for below 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 antenna is a broadband antenna, and its height 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 Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

NOTE:

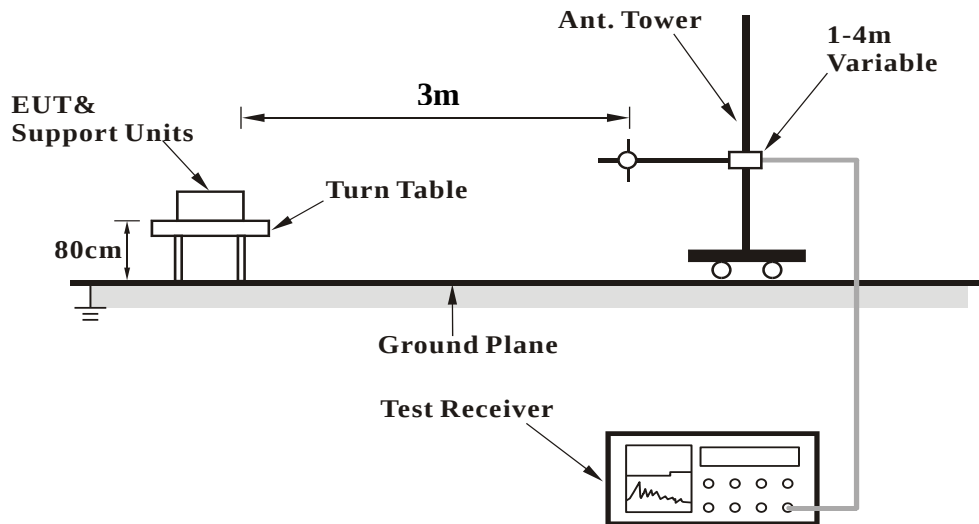
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz for Average detection (AV) at frequency above 1GHz.

4.1.4 DEVIATION FROM TEST STANDARD

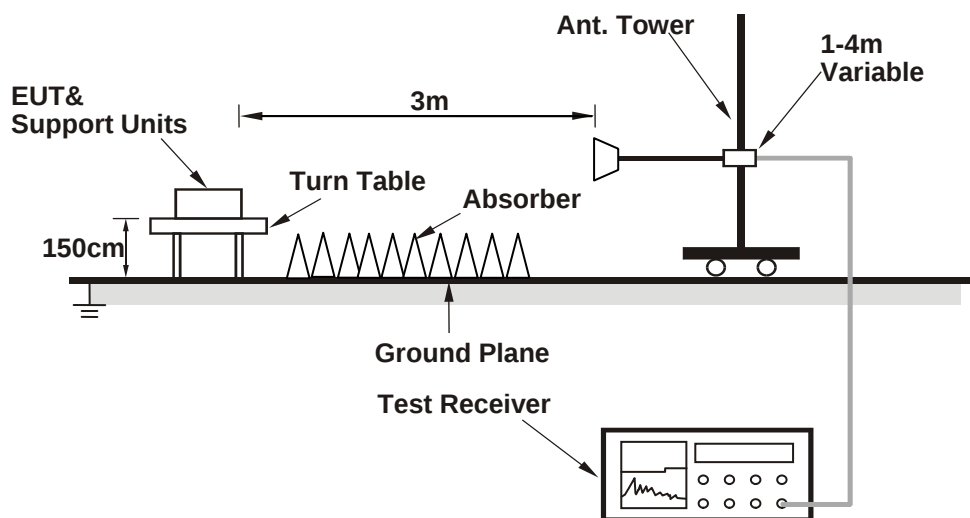
No deviation.

4.1.5 TEST SETUP

<Frequency Range 30MHz ~ 1GHz>



<Frequency Range above 1GHz>



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

4.1.6 EUT OPERATING CONDITIONS

- Placed the EUT on a testing table.
- Use the software to control the EUT under transmission condition continuously at specific channel frequency.

4.1.7 TEST RESULTS

ABOVE 1GHz WORST-CASE DATA

GFSK

MODE A

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	FREQUENCY RANGE	1GHz ~ 25GHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Charles Hsiao

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2376	30.36	28.7	54	-23.64	31.78	5.37	35.49	141	233	Average
2376	54.9	53.24	74	-19.1	31.78	5.37	35.49	141	233	Peak
2402	77.81	76.08			31.8	5.4	35.47	141	233	Average
2402	102.35	100.62			31.8	5.4	35.47	141	233	Peak
2488	30.72	28.71	54	-23.28	31.9	5.53	35.42	141	233	Average
2488	55.26	53.25	74	-18.74	31.9	5.53	35.42	141	233	Peak
4804	33.53	25.44	54	-20.47	33.96	8.25	34.12	106	263	Average
4804	58.07	49.98	74	-15.93	33.96	8.25	34.12	106	263	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2356	30.79	29.16	54	-23.21	31.76	5.37	35.5	102	7	Average
2356	55.33	53.7	74	-18.67	31.76	5.37	35.5	102	7	Peak
2402	76.38	74.65			31.8	5.4	35.47	102	7	Average
2402	100.92	99.19			31.8	5.4	35.47	102	7	Peak
2492	29.71	27.69	54	-24.29	31.9	5.53	35.41	102	7	Average
2492	54.25	52.23	74	-19.75	31.9	5.53	35.41	102	7	Peak
4804	39.77	31.68	54	-14.23	33.96	8.25	34.12	275	66	Average
4804	64.31	56.22	74	-9.69	33.96	8.25	34.12	275	66	Peak

REMARKS:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2402MHz: Fundamental frequency.
- The average values are :
Average = Peak value + 20log (Dwell Time/100ms)
Where the duty factor is calculated from following formula:
 $20\log (\text{Dwell Time}/100\text{ms}) = 20\log (0.0593) = -24.54$.
Please see as below for plotted duty.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 39	FREQUENCY RANGE	1GHz ~ 25GHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Charles Hsiao

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2382	30.68	28.99	54	-23.32	31.78	5.4	35.49	256	225	Average
2382	55.22	53.53	74	-18.78	31.78	5.4	35.49	256	225	Peak
2441	78.07	76.2			31.85	5.46	35.44	256	225	Average
2441	102.61	100.74			31.85	5.46	35.44	256	225	Peak
2484	30.23	28.27	54	-23.77	31.88	5.5	35.42	256	225	Average
2484	54.77	52.81	74	-19.23	31.88	5.5	35.42	256	225	Peak
4882	31.99	23.8	54	-22.01	33.98	8.27	34.06	140	17	Average
4882	56.53	48.34	74	-17.47	33.98	8.27	34.06	140	17	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2356	30.65	29.02	54	-23.35	31.76	5.37	35.5	117	5	Average
2356	55.19	53.56	74	-18.81	31.76	5.37	35.5	117	5	Peak
2441	75.53	73.66			31.85	5.46	35.44	117	5	Average
2441	100.07	98.2			31.85	5.46	35.44	117	5	Peak
2484	29.95	27.99	54	-24.05	31.88	5.5	35.42	117	5	Average
2484	54.49	52.53	74	-19.51	31.88	5.5	35.42	117	5	Peak
4882	37.27	29.08	54	-16.73	33.98	8.27	34.06	282	66	Average
4882	61.81	53.62	74	-12.19	33.98	8.27	34.06	282	66	Peak
7323	33.25	22.79	54	-20.75	35.53	9.95	35.02	206	329	Average
7323	57.79	47.33	74	-16.21	35.53	9.95	35.02	206	329	Peak

REMARKS:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2441MHz: Fundamental frequency.
- The average values are :
Average = Peak value + 20log (Dwell Time/100ms)
Where the duty factor is calculated from following formula:
 $20\log (\text{Dwell Time}/100\text{ms}) = 20\log (0.0593) = -24.54$.
Please see as below for plotted duty.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 78	FREQUENCY RANGE	1GHz ~ 25GHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Charles Hsiao

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2380	30.42	28.76	54	-23.58	31.78	5.37	35.49	107	216	Average
2380	54.96	53.3	74	-19.04	31.78	5.37	35.49	107	216	Peak
2480	77.82	75.86			31.88	5.5	35.42	107	216	Average
2480	102.36	100.4			31.88	5.5	35.42	107	216	Peak
2484	38.16	36.2	54	-15.84	31.88	5.5	35.42	107	216	Average
2484	62.7	60.74	74	-11.3	31.88	5.5	35.42	107	216	Peak
4960	30.59	22.32	54	-23.41	33.99	8.29	34.01	101	208	Average
4960	55.13	46.86	74	-18.87	33.99	8.29	34.01	101	208	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2348	31.11	29.54	54	-22.89	31.74	5.33	35.5	132	7	Average
2348	55.65	54.08	74	-18.35	31.74	5.33	35.5	132	7	Peak
2480	75.79	73.83			31.88	5.5	35.42	132	7	Average
2480	100.33	98.37			31.88	5.5	35.42	132	7	Peak
2484	35.78	33.82	54	-18.22	31.88	5.5	35.42	132	7	Average
2484	60.32	58.36	74	-13.68	31.88	5.5	35.42	132	7	Peak
4960	36.02	27.75	54	-17.98	33.99	8.29	34.01	239	72	Average
4960	60.56	52.29	74	-13.44	33.99	8.29	34.01	239	72	Peak
7440	33.02	22.66	54	-20.98	35.51	9.96	35.11	100	63	Average
7440	57.56	47.2	74	-16.44	35.51	9.96	35.11	100	63	Peak

REMARKS:

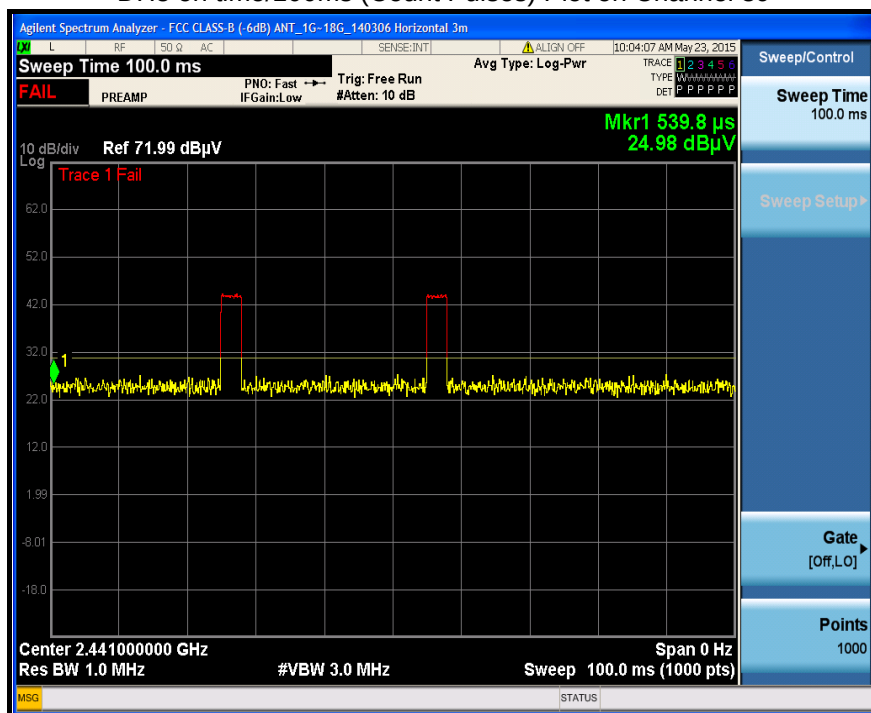
- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2480MHz: Fundamental frequency.
- The average values are :
Average = Peak value + 20log (Dwell Time/100ms)
Where the duty factor is calculated from following formula:
 $20\log (\text{Dwell Time}/100\text{ms}) = 20\log (0.0593) = -24.54$.
Please see as below for plotted duty.

<Duty cycle correction factor>

DH5 on time/100ms (One Pulse) Plot on Channel 39



DH5 on time/100ms (Count Pulses) Plot on Channel 39



Note: Dwell Time = 2 * 2.965 = 5.93

Duty cycle correction factor = 20 log (Dwell Time/100ms) = -24.54dB

MODE B

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	FREQUENCY RANGE	1GHz ~ 25GHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Charles Hsiao

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2390	30	28.27	54	-24	31.8	5.4	35.47	105	250	Average
2390	54.69	52.96	74	-19.31	31.8	5.4	35.47	105	250	Peak
2402	79	77.27			31.8	5.4	35.47	105	250	Average
2402	103.69	101.96			31.8	5.4	35.47	105	250	Peak
2488	29.47	27.46	54	-24.53	31.9	5.53	35.42	105	250	Average
2488	54.16	52.15	74	-19.84	31.9	5.53	35.42	105	250	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2336	29.78	28.23	54	-24.22	31.74	5.33	35.52	100	84	Average
2336	54.47	52.92	74	-19.53	31.74	5.33	35.52	100	84	Peak
2402	73.89	72.16			31.8	5.4	35.47	100	84	Average
2402	98.58	96.85			31.8	5.4	35.47	100	84	Peak
2492	29.54	27.52	54	-24.46	31.9	5.53	35.41	100	84	Average
2492	54.23	52.21	74	-19.77	31.9	5.53	35.41	100	84	Peak

REMARKS:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2402MHz: Fundamental frequency.
- The average values are :
Average = Peak value + 20log (Dwell Time/100ms)
Where the duty factor is calculated from following formula:
 $20\log (\text{Dwell Time}/100\text{ms}) = 20\log (0.0583) = -24.69$.
Please see as below for plotted duty.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 39	FREQUENCY RANGE	1GHz ~ 25GHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Charles Hsiao

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2366	29.91	28.27	54	-24.09	31.76	5.37	35.49	103	252	Average
2366	54.6	52.96	74	-19.4	31.76	5.37	35.49	103	252	Peak
2441	79.25	77.38			31.85	5.46	35.44	103	252	Average
2441	103.94	102.07			31.85	5.46	35.44	103	252	Peak
2494	29.73	27.71	54	-24.27	31.9	5.53	35.41	103	252	Average
2494	54.42	52.4	74	-19.58	31.9	5.53	35.41	103	252	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2360	30.39	28.76	54	-23.61	31.76	5.37	35.5	100	0	Average
2360	55.08	53.45	74	-18.92	31.76	5.37	35.5	100	0	Peak
2441	74.22	72.35			31.85	5.46	35.44	100	0	Average
2441	98.91	97.04			31.85	5.46	35.44	100	0	Peak
2484	30.31	28.35	54	-23.69	31.88	5.5	35.42	100	0	Average
2484	55	53.04	74	-19	31.88	5.5	35.42	100	0	Peak

REMARKS:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2441MHz: Fundamental frequency.
- The average values are :
Average = Peak value + 20log (Dwell Time/100ms)
Where the duty factor is calculated from following formula:
 $20\log (\text{Dwell Time}/100\text{ms}) = 20\log (0.0583) = -24.69$.
Please see as below for plotted duty.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 78	FREQUENCY RANGE	1GHz ~ 25GHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Charles Hsiao

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2324	30.33	28.82	54	-23.67	31.73	5.3	35.52	100	253	Average
2324	55.02	53.51	74	-18.98	31.73	5.3	35.52	100	253	Peak
2480	78.75	76.79			31.88	5.5	35.42	100	253	Average
2480	103.44	101.48			31.88	5.5	35.42	100	253	Peak
2484	31.75	29.79	54	-22.25	31.88	5.5	35.42	100	253	Average
2484	56.44	54.48	74	-17.56	31.88	5.5	35.42	100	253	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2344	30.44	28.87	54	-23.56	31.74	5.33	35.5	100	0	Average
2344	55.13	53.56	74	-18.87	31.74	5.33	35.5	100	0	Peak
2480	73.84	71.88			31.88	5.5	35.42	100	0	Average
2480	98.53	96.57			31.88	5.5	35.42	100	0	Peak
2484	30.46	28.5	54	-23.54	31.88	5.5	35.42	100	0	Average
2484	55.15	53.19	74	-18.85	31.88	5.5	35.42	100	0	Peak

REMARKS:

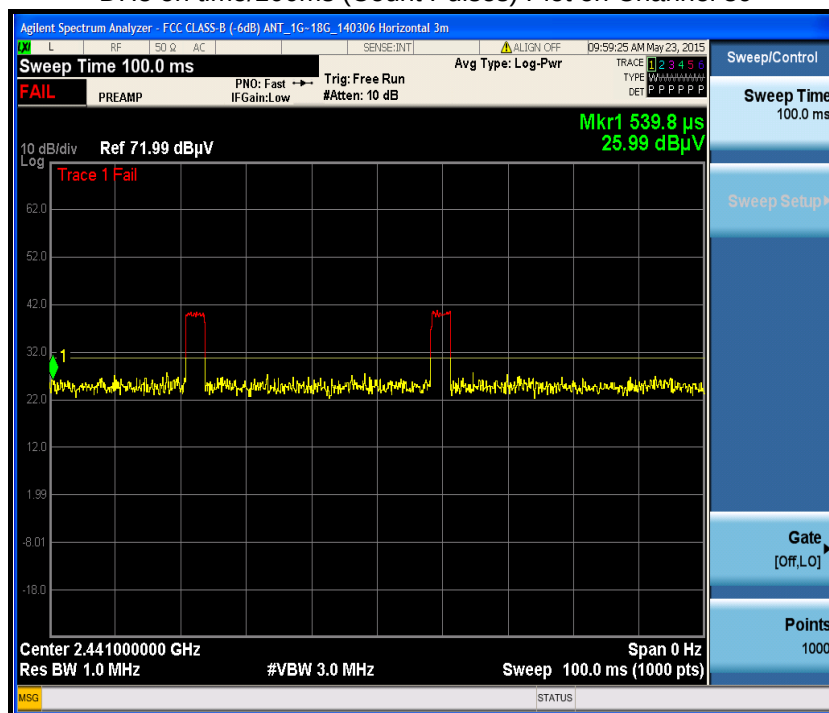
- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2480MHz: Fundamental frequency.
- The average values are :
Average = Peak value + 20log (Dwell Time/100ms)
Where the duty factor is calculated from following formula:
 $20\log (Dwell\ Time/100ms) = 20\log (0.0583) = -24.69$.
Please see as below for plotted duty.

<Duty cycle correction factor>

DH5 on time/100ms (One Pulse) Plot on Channel 39



DH5 on time/100ms (Count Pulses) Plot on Channel 39



Note: Dwell Time = 2 * 2.915 = 5.83

Duty cycle correction factor = 20 log (Dwell Time/100ms) = -24.69dB



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MODE C

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0+78	FREQUENCY RANGE	1GHz ~ 25GHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Charles Hsiao

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2324	36.03	34.52	54	-17.97	31.73	5.3	35.52	157	155	Average
2324	60.57	59.06	74	-13.43	31.73	5.3	35.52	157	155	Peak
2402	75.82	74.09			31.8	5.4	35.47	157	155	Average
2402	100.36	98.63			31.8	5.4	35.47	157	155	Peak
2480	75.1	73.14			31.88	5.5	35.42	117	272	Average
2480	99.64	97.68			31.88	5.5	35.42	117	272	Peak
2484	32.66	30.7	54	-21.34	31.88	5.5	35.42	117	272	Average
2484	57.2	55.24	74	-16.8	31.88	5.5	35.42	117	272	Peak
4804	42.36	34.27	54	-11.64	33.96	8.25	34.12	100	358	Average
4804	66.9	58.81	74	-7.1	33.96	8.25	34.12	100	358	Peak
7206	47.16	36.58	55.82	-8.66	35.56	9.94	34.92	118	285	Average
7206	71.7	61.12	80.36	-8.66	35.56	9.94	34.92	118	285	Peak
9608	37.39	24.21	55.82	-18.43	36.34	11.55	34.71	109	266	Average
9608	61.93	48.75	80.36	-18.43	36.34	11.55	34.71	109	266	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
2326	36.55	35.04	54	-17.45	31.73	5.3	35.52	104	17	Average
2326	61.09	59.58	74	-12.91	31.73	5.3	35.52	104	17	Peak
2402	72.11	70.38			31.8	5.4	35.47	104	17	Average
2402	96.65	94.92			31.8	5.4	35.47	104	17	Peak
2480	71.3	69.34			31.88	5.5	35.42	100	21	Average
2480	95.84	93.88			31.88	5.5	35.42	100	21	Peak
2484	31.68	29.72	54	-22.32	31.88	5.5	35.42	100	21	Average
2484	56.22	54.26	74	-17.78	31.88	5.5	35.42	100	21	Peak
4804	43.45	35.36	54	-10.55	33.96	8.25	34.12	101	123	Average
4804	67.99	59.9	74	-6.01	33.96	8.25	34.12	101	123	Peak
7206	49.07	38.49	52.11	-3.04	35.56	9.94	34.92	107	119	Average
7206	73.61	63.03	76.65	-3.04	35.56	9.94	34.92	107	119	Peak
9608	40.71	27.53	52.11	-11.4	36.34	11.55	34.71	113	57	Average
9608	65.25	52.07	76.65	-11.4	36.34	11.55	34.71	113	57	Peak



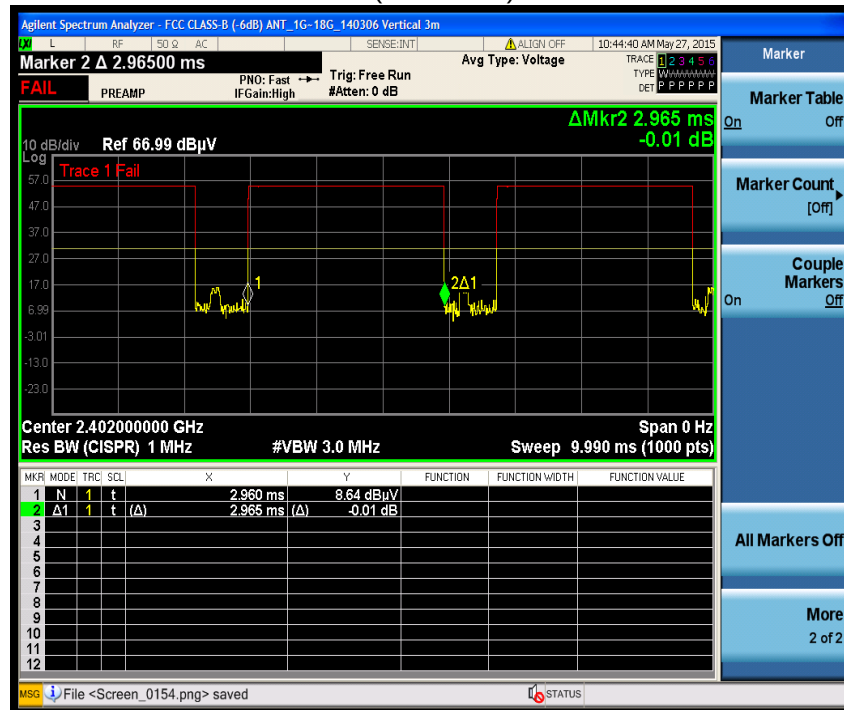
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REMARKS:

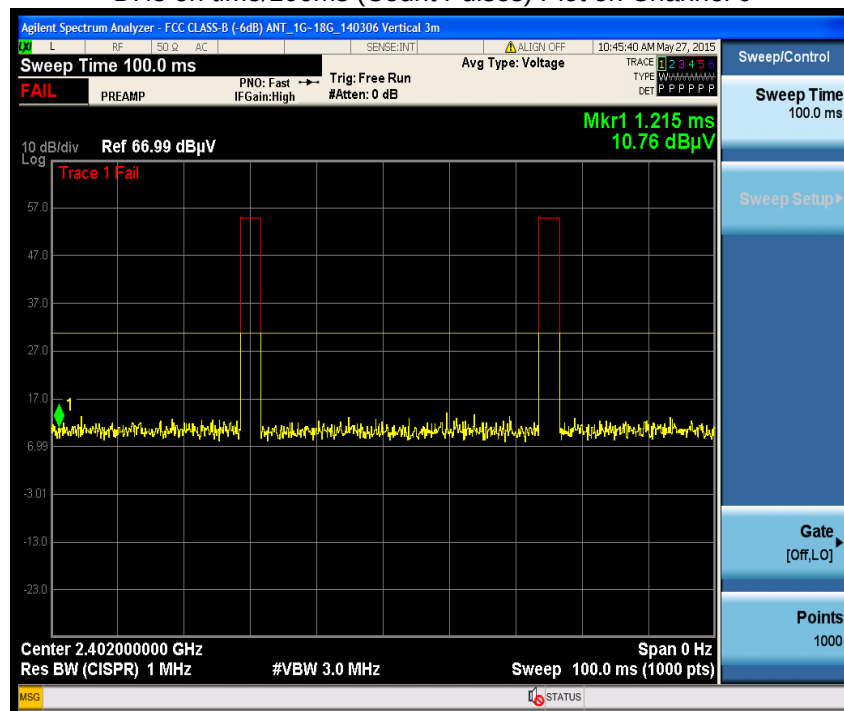
1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
2. 2402MHz & 2480MHz: Fundamental frequency.
3. 7206MHz & 9608MHz: Out of restricted band
4. The average values are :
Average = Peak value + $20\log(\text{Dwell Time}/100\text{ms})$
Where the duty factor is calculated from following formula:
 $20\log(\text{Dwell Time}/100\text{ms}) = 20\log(0.0593) = -24.54$.
Please see as below for plotted duty.

<Duty cycle correction factor>

DH5 on time/100ms (One Pulse) Plot on Channel 0



DH5 on time/100ms (Count Pulses) Plot on Channel 0



Note: Dwell Time = 2 * 2.965 = 5.93

Duty cycle correction factor = 20 log (Dwell Time/100ms) = -24.54dB

BELOW 1GHz WORST-CASE DATA:
MODE A

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	FREQUENCY RANGE	30MHz ~ 1GHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Quasi-peak (QP)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Charles Hsiao

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
46.47	16.52	33.38	40	-23.48	14.46	0.9	32.22	197	79	Peak
109.11	15.04	33.98	43.5	-28.46	12.03	1.28	32.25	157	256	Peak
254.37	16.43	34.2	46	-29.57	12.39	1.94	32.1	178	192	Peak
515.6	22.31	35.19	46	-23.69	16.55	2.7	32.13	144	106	Peak
677.3	24.54	34.73	46	-21.46	18.88	3.05	32.12	171	247	Peak
908.3	28.29	34.68	46	-17.71	21.5	3.53	31.42	188	159	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
54.57	16.38	33.49	40	-23.62	14.22	0.9	32.23	118	317	Peak
95.88	14.74	33.75	43.5	-28.76	11.75	1.28	32.04	138	179	Peak
251.94	16.14	33.95	46	-29.86	12.35	1.94	32.1	174	331	Peak
512.1	21.39	34.31	46	-24.61	16.5	2.7	32.12	103	115	Peak
679.4	23.94	34.09	46	-22.06	18.91	3.05	32.11	187	182	Peak
883.1	28.15	34.9	46	-17.85	21.35	3.49	31.59	194	137	Peak

REMARKS: Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor

Margin value = Emission level – Limit value

MODE B

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 78	FREQUENCY RANGE	30MHz ~ 1GHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Quasi-peak (QP)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Charles Hsiao

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
45.12	16.75	33.66	40	-23.25	14.41	0.9	32.22	131	231	Peak
103.71	14.94	33.53	43.5	-28.56	12.39	1.28	32.26	105	345	Peak
203.88	15.62	35.14	43.5	-27.88	11.11	1.65	32.28	185	122	Peak
500.9	21.83	34.94	46	-24.17	16.36	2.63	32.1	132	238	Peak
735.4	25.52	34.83	46	-20.48	19.66	3.16	32.13	145	271	Peak
947.5	29.03	34.81	46	-16.97	21.73	3.62	31.13	193	152	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
47.82	15.84	32.65	40	-24.16	14.51	0.9	32.22	107	327	Peak
108.03	14.63	33.41	43.5	-28.87	12.19	1.28	32.25	132	112	Peak
243.84	16.47	34.57	46	-29.53	12.17	1.85	32.12	164	232	Peak
509.3	21.1	34.11	46	-24.9	16.47	2.63	32.11	143	78	Peak
689.2	24.32	34.29	46	-21.68	19.08	3.05	32.1	193	142	Peak
865.6	27.83	34.89	46	-18.17	21.2	3.44	31.7	129	279	Peak

REMARKS: Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor

Margin value = Emission level – Limit value

MODE C

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	FREQUENCY RANGE	30MHz ~ 1GHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Quasi-peak (QP)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Charles Hsiao

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
47.28	11.95	28.76	40	-28.05	14.51	0.9	32.22	129	229	Peak
102.63	10.49	29.11	43.5	-33.01	12.36	1.28	32.26	103	332	Peak
239.79	11.69	29.9	46	-34.31	12.08	1.85	32.14	182	155	Peak
535.2	17.07	29.73	46	-28.93	16.81	2.7	32.17	191	198	Peak
696.2	20.7	30.5	46	-25.3	19.18	3.11	32.09	193	311	Peak
855.8	23.13	30.35	46	-22.87	21.1	3.44	31.76	142	157	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
45.93	17.2	34.11	40	-22.8	14.41	0.9	32.22	121	111	Peak
109.65	10.93	29.87	43.5	-32.57	12.03	1.28	32.25	154	354	Peak
263.82	12.01	29.63	46	-33.99	12.55	1.94	32.11	178	176	Peak
493.9	17.37	30.58	46	-28.63	16.26	2.63	32.1	197	224	Peak
703.9	20.77	30.46	46	-25.23	19.29	3.11	32.09	134	197	Peak
904.8	23.6	30.04	46	-22.4	21.48	3.53	31.45	156	238	Peak

REMARKS: Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor

Margin value = Emission level – Limit value

4.2 CONDUCTED EMISSION MEASUREMENT

4.2.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dB μ V)	
	Quasi-peak	Average
0.15 ~ 0.5	66 to 56	56 to 46
0.5 ~ 5	56	46
5 ~ 30	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.
 3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Nov. 11, 2014	Nov. 10, 2015
RF signal cable Woken	5D-FB	Cable-HYC01-01	Dec. 26, 2014	Dec. 25, 2015
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Mar. 02, 2015	Mar. 01, 2016
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Jul. 21, 2014	Jul. 20, 2015
Software ADT	BV ADT_Cond_ 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

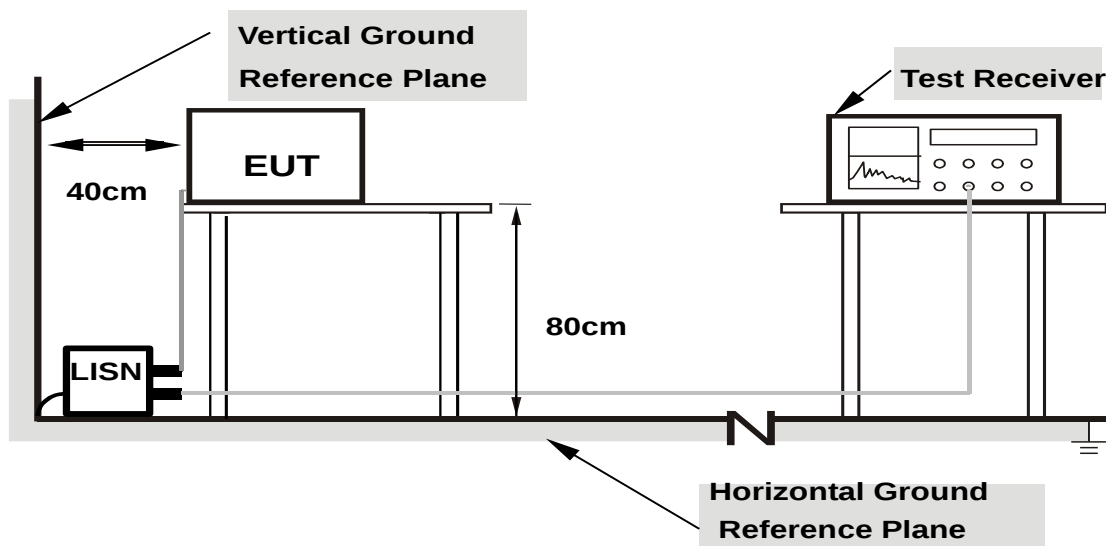
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling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

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

4.2.4 DEVIATION FROM TEST STANDARD

No deviation.

4.2.5 TEST SETUP



- Note:**
1. Support units were connected to second LISN.
 2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

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

4.2.6 EUT OPERATING CONDITIONS

Same as section 4.1.6.

4.2.7 TEST RESULTS

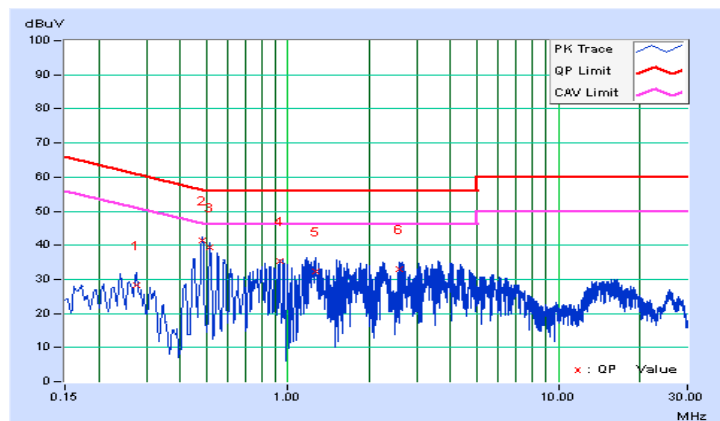
CONDUCTED WORST-CASE DATA :

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 65%RH
Tested by	Toby Tian	Test Date	2015/5/27

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.27512	0.06	28.07	9.17	28.13	9.23	60.96	50.96	-32.83	-41.73
2	0.48235	0.06	41.43	32.93	41.49	32.99	56.30	46.30	-14.81	-13.31
3	0.51754	0.06	39.23	30.36	39.29	30.42	56.00	46.00	-16.71	-15.58
4	0.93568	0.08	35.30	25.07	35.38	25.15	56.00	46.00	-20.62	-20.85
5	1.27217	0.09	32.39	18.11	32.48	18.20	56.00	46.00	-23.52	-27.80
6	2.57811	0.14	32.78	22.41	32.92	22.55	56.00	46.00	-23.08	-23.45

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

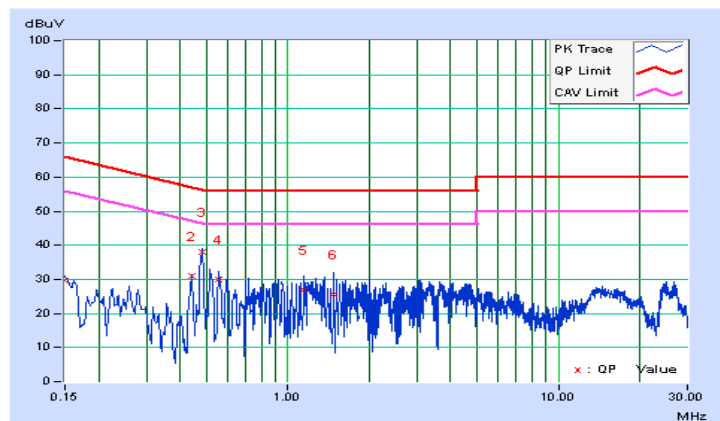


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	25°C, 65%RH
Tested by	Toby Tian	Test Date	2015/5/27

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	0.05	29.53	24.19	29.58	24.24	66.00	56.00	-36.42	-31.76
2	0.44325	0.06	30.89	25.54	30.95	25.60	57.00	47.00	-26.05	-21.40
3	0.48235	0.06	38.08	32.47	38.14	32.53	56.30	46.30	-18.16	-13.77
4	0.55664	0.07	29.80	22.80	29.87	22.87	56.00	46.00	-26.13	-23.13
5	1.14705	0.08	27.01	16.06	27.09	16.14	56.00	46.00	-28.91	-29.86
6	1.47549	0.09	25.42	17.28	25.51	17.37	56.00	46.00	-30.49	-28.63

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

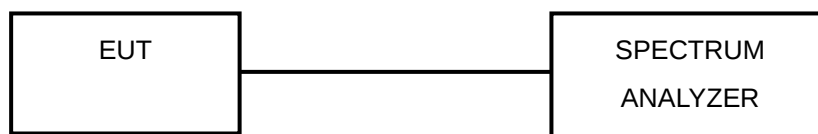


4.3 NUMBER OF HOPPING FREQUENCY USED

4.3.1 LIMIT OF HOPPING FREQUENCY USED

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

4.3.2 TEST SETUP



4.3.3 TEST INSTRUMENTS

Refer to section 4.1.2 to get information of above instrument.

4.3.4 TEST PROCEDURE

- Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
- Set the SA on MaxHold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.
- Set the SA on View mode and then plot the result on SA screen.
- Repeat above procedures until all frequencies measured were complete.

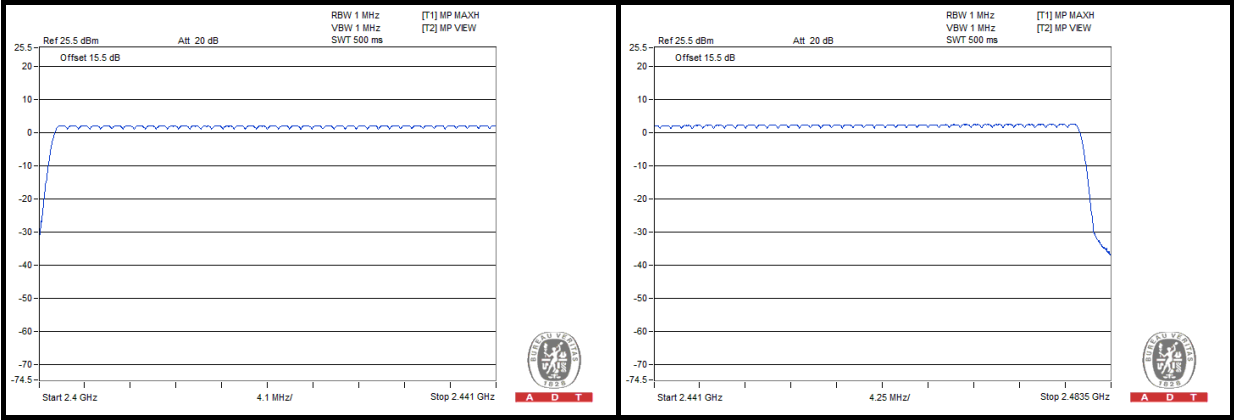
4.3.5 DEVIATION FROM TEST STANDARD

No deviation.

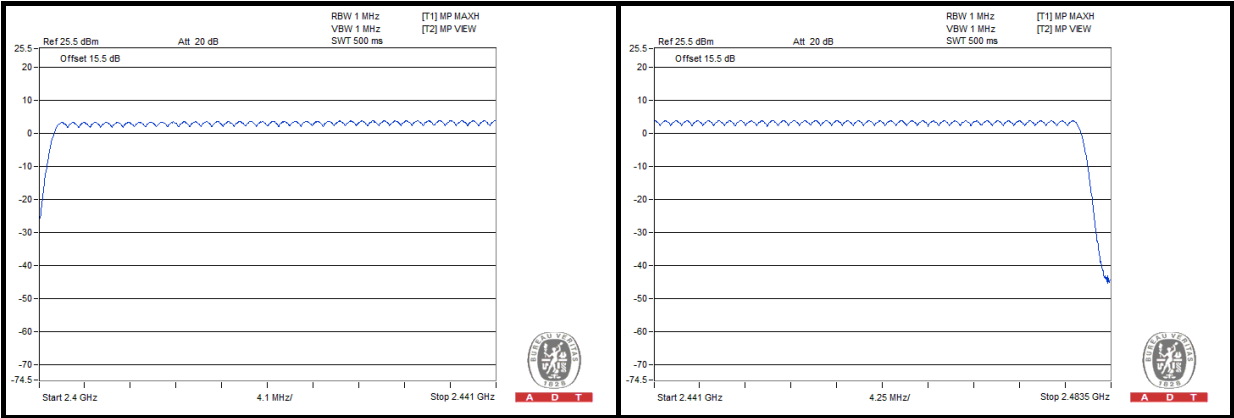
4.3.6 TEST RESULTS

There are 79 hopping frequencies in the hopping mode. Please refer to next page for the test result. On the plot, it shows that the hopping frequencies are equally spaced.

MODE A



MODE B

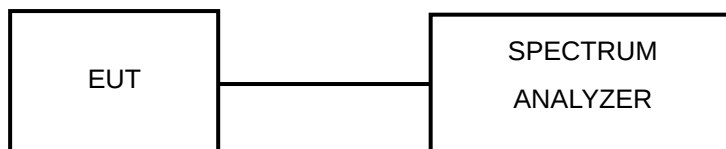


4.4 DWELL TIME ON EACH CHANNEL

4.4.1 LIMITS OF DWELL TIME USED

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

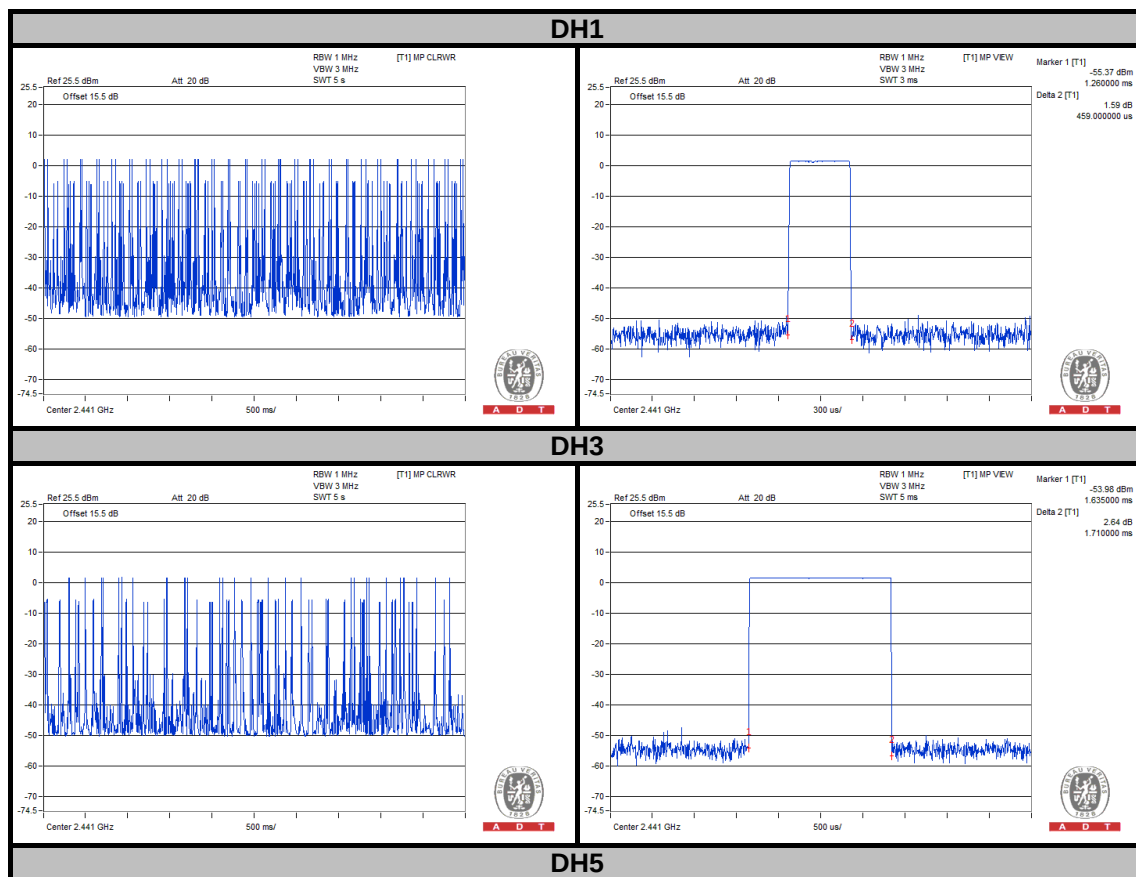
MODE A

GFSK

Mode	Average Hopping Channel	Package Transfer Time (usec)	Result (sec)	Limit (sec)
DH1	10.20	459.00	0.15	0.4
DH3	5.40	1710.00	0.29	0.4
DH5	3.20	2965.00	0.30	0.4

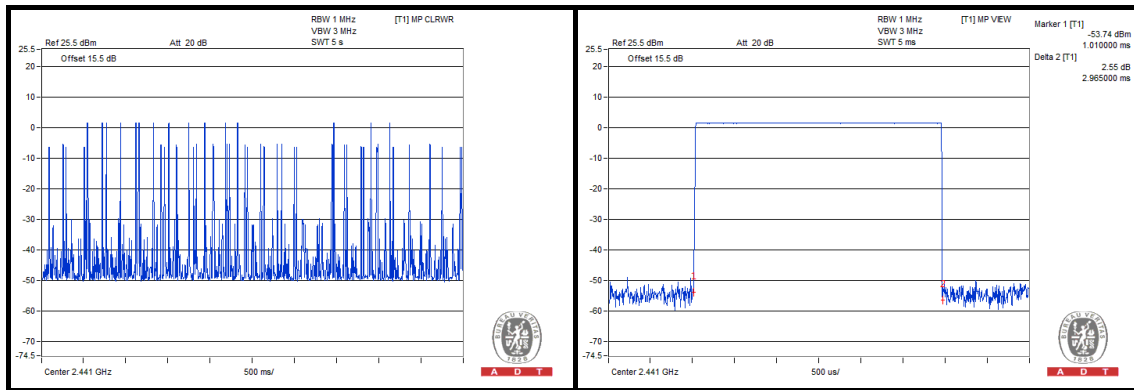
NOTE:

1. Dwell Time=79(channels) x 0.4(s) x average hopping channel x package transfer time
2. 79 channels come from the Hopping Channel number
3. Average Hopping Channel = hops/sweep time
4. t: Package Transfer Time(us)
5. Test plots of the transmitting time slot are shown as below.





A D T



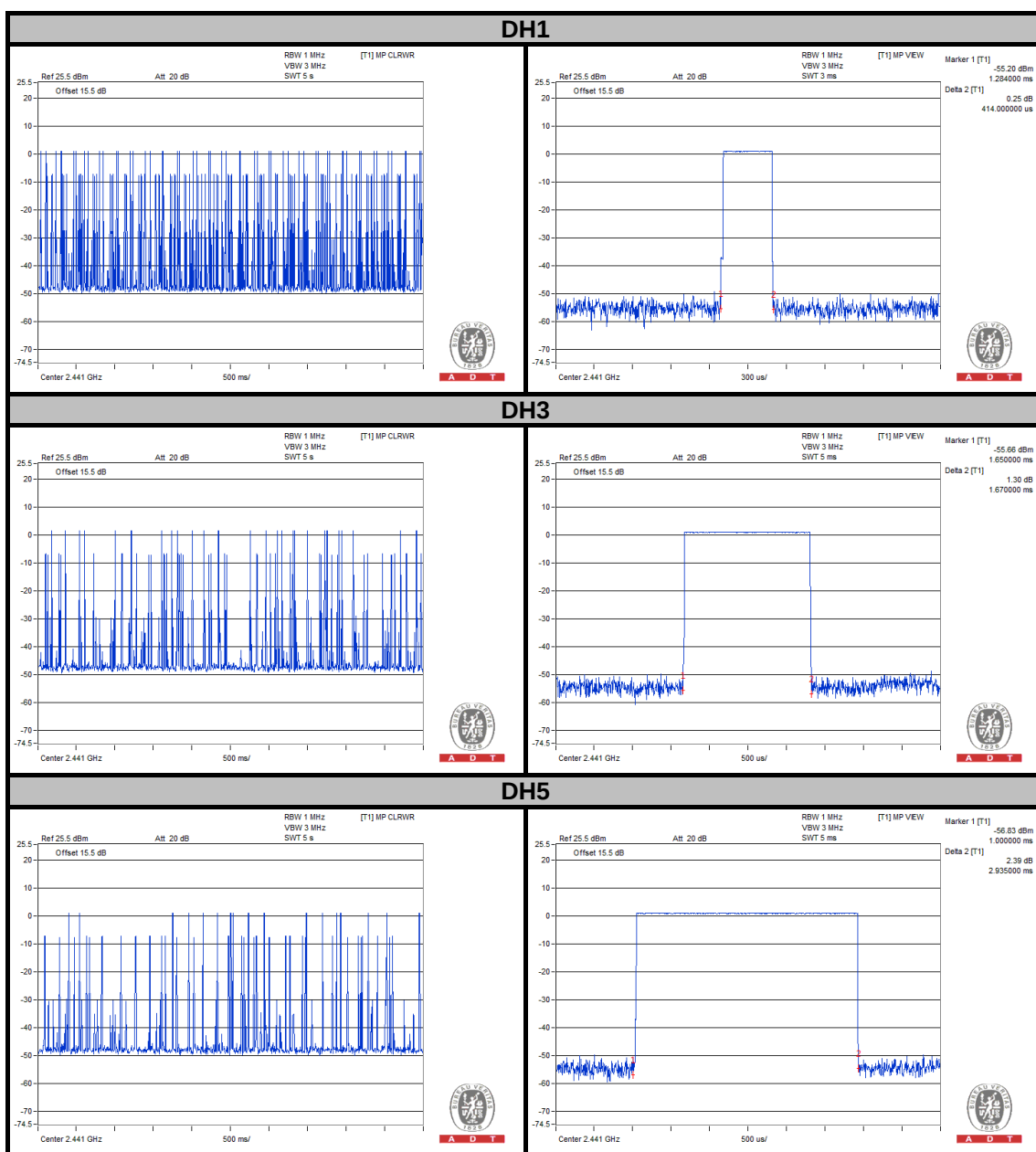
MODE B

GFSK

Mode	Average Hopping Channel	Package Transfer Time (usec)	Result (sec)	Limit (sec)
DH1	10.40	414.00	0.14	0.4
DH3	5.20	1670.00	0.27	0.4
DH5	3.40	2935.00	0.32	0.4

NOTE:

- Dwell Time=79(channels) x 0.4(s) x average hopping channel x package transfer time
- 79 channels come from the Hopping Channel number
- Average Hopping Channel = hops/sweep time
- t: Package Transfer Time(us)
- Test plots of the transmitting time slot are shown as below.



$\pi/4$ -DQPSK

Mode	Average Hopping Channel	Package Transfer Time (usec)	Result (sec)	Limit (sec)
2DH1	10.00	429.00	0.14	0.4
2DH3	5.00	1680.00	0.27	0.4
2DH5	3.20	2930.00	0.30	0.4

NOTE:

1. Dwell Time=79(channels) x 0.4(s) x average hopping channel x package transfer time
2. 79 channels come from the Hopping Channel number
3. Average Hopping Channel = hops/sweep time
4. t: Package Transfer Time(us)
5. Test plots of the transmitting time slot are shown as below.

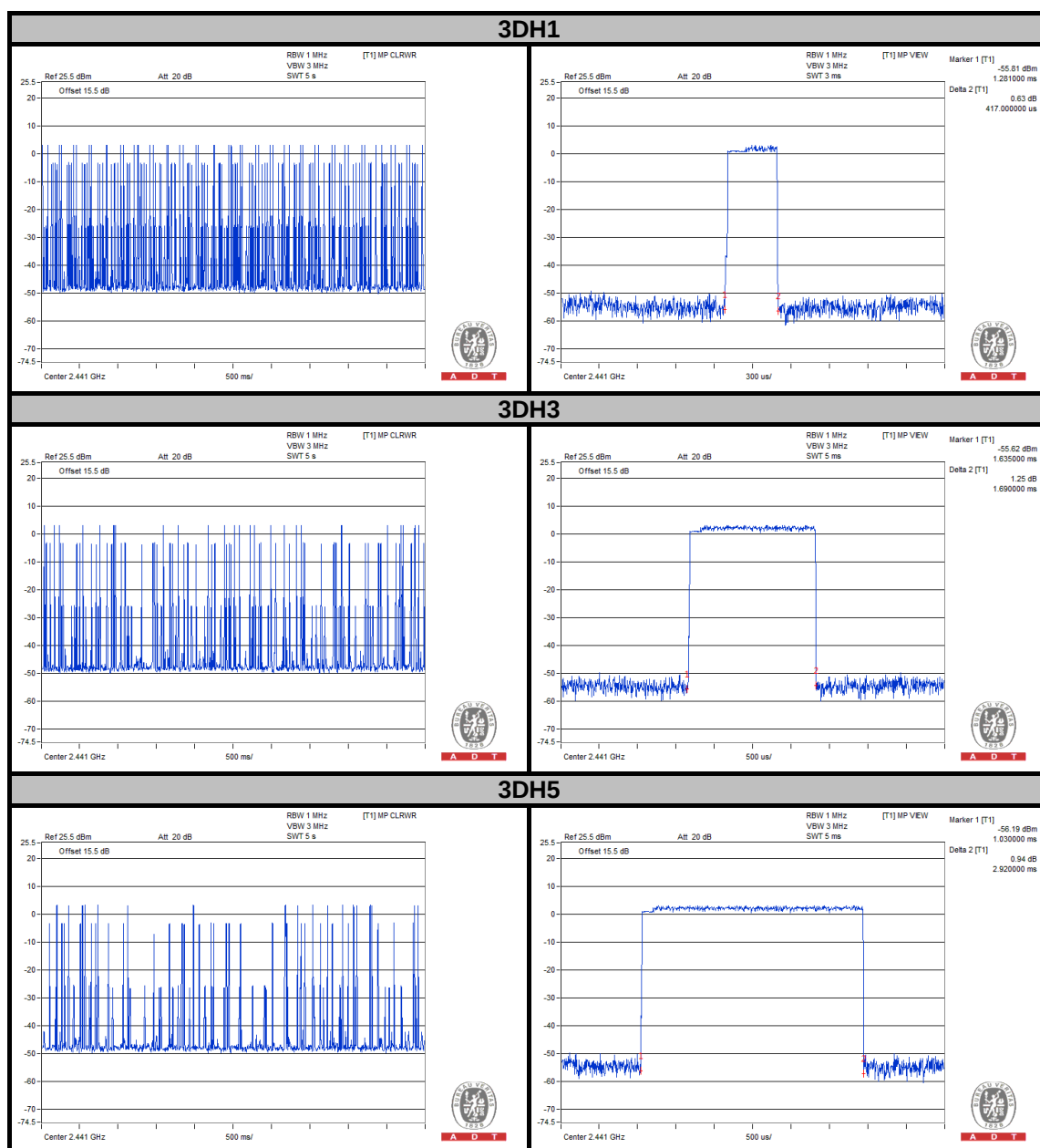


8DPSK

Mode	Average Hopping Channel	Package Transfer Time (usec)	Result (sec)	Limit (sec)
3DH1	10.00	417.00	0.13	0.4
3DH3	5.00	1690.00	0.27	0.4
3DH5	3.60	2920.00	0.33	0.4

NOTE:

1. Dwell Time=79(channels) x 0.4(s) x average hopping channel x package transfer time
2. 79 channels come from the Hopping Channel number
3. Average Hopping Channel = hops/sweep time
4. t: Package Transfer Time(us)
5. Test plots of the transmitting time slot are shown as below.

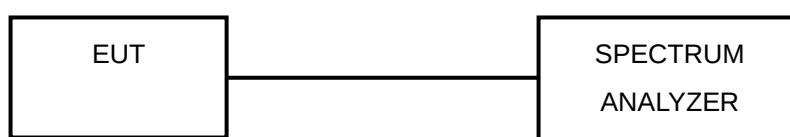


4.5 CHANNEL BANDWIDTH

4.5.1 LIMITS OF CHANNEL BANDWIDTH

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.

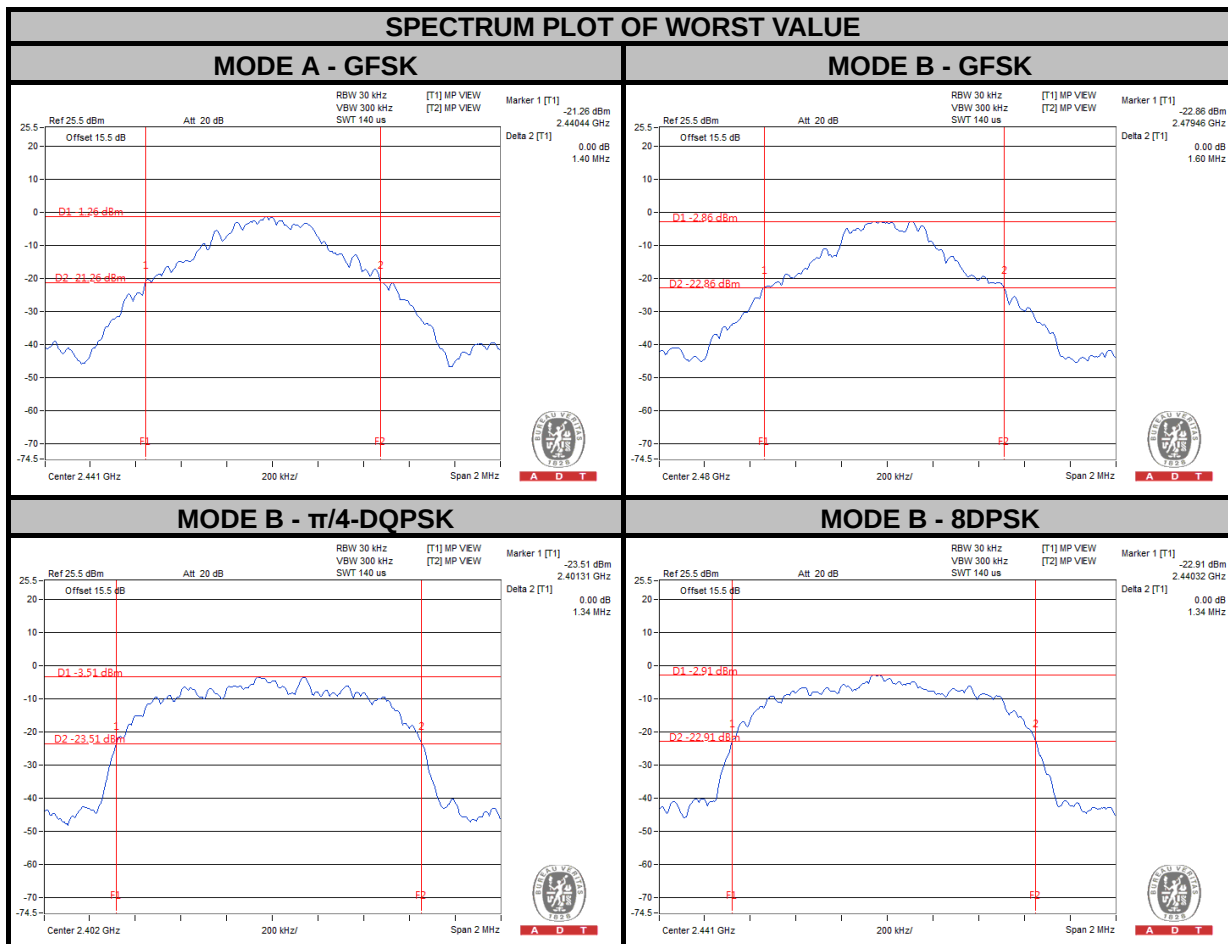
4.5.7 TEST RESULTS

MODE A

CHANNEL	FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
		GFSK
0	2402	1.10
39	2441	1.40
78	2480	1.40

MODE B

CHANNEL	FREQUENCY (MHz)	20dB BANDWIDTH (MHz)		
		GFSK	$\pi/4$ -DQPSK	8DPSK
0	2402	1.04	1.34	1.33
39	2441	1.10	1.34	1.34
78	2480	1.60	1.34	1.34

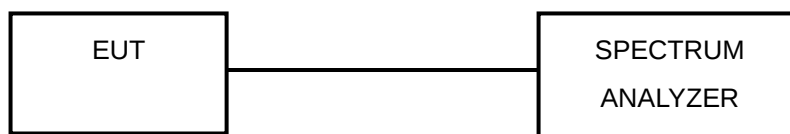


4.6 HOPPING CHANNEL SEPARATION

4.6.1 LIMITS OF HOPPING CHANNEL SEPARATION

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

- 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

MODE A

CHAN.	FREQ. (MHz)	ADJACENT CHANNEL SEPARATION (MHz)	20dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
0	2402	1.10	1.10	0.733	PASS
39	2441	1.00	1.40	0.933	PASS
78	2480	1.00	1.40	0.933	PASS

MODE B

CHAN.	FREQ. (MHz)	ADJACENT CHANNEL SEPARATION (MHz)			20dB BANDWIDTH (MHz)			MINIMUM LIMIT (MHz)			PASS / FAIL
		GFSK	$\pi/4$ -DQPSK	8DPSK	GFSK	$\pi/4$ -DQPSK	8DPSK	GFSK	$\pi/4$ -DQPSK	8DPSK	
0	2402	1.10	1.10	1.10	1.04	1.34	1.33	0.693	0.893	0.887	PASS
39	2441	1.10	1.00	1.10	1.10	1.34	1.34	0.733	0.893	0.893	PASS
78	2480	1.10	1.10	1.00	1.60	1.34	1.34	1.067	0.893	0.893	PASS

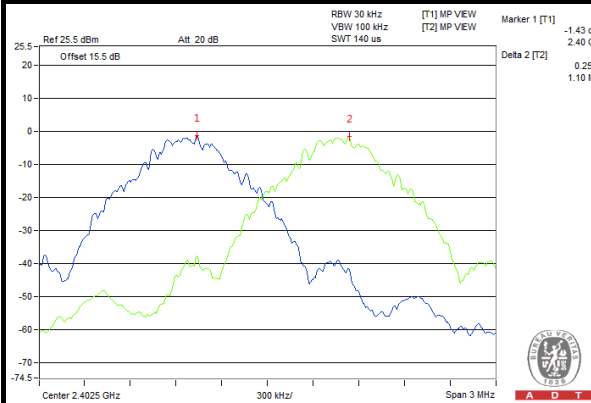
NOTE: The minimum limit is two-third 20dB bandwidth.



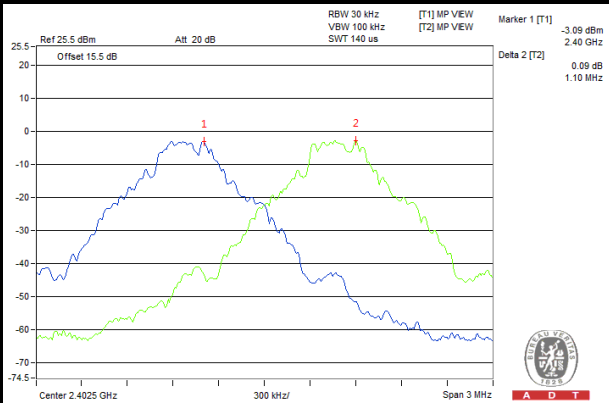
A D T

SPECTRUM PLOT OF WORST VALUE

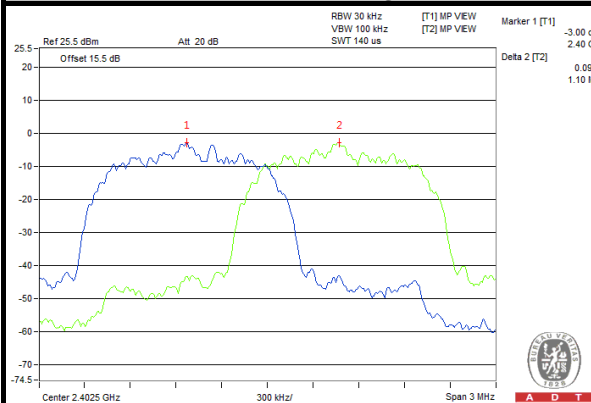
MODE A - GFSK



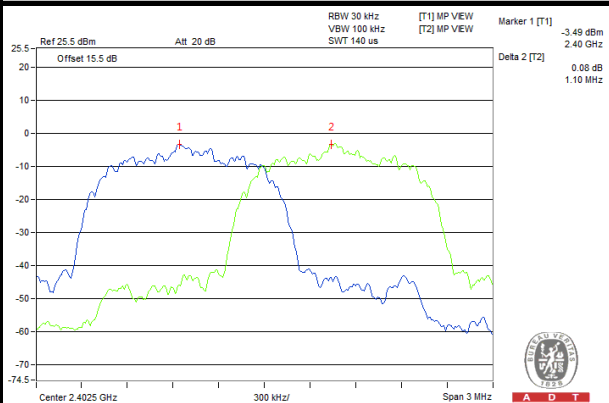
MODE B - GFSK



MODE B - $\pi/4$ -DQPSK



MODE B - 8DPSK

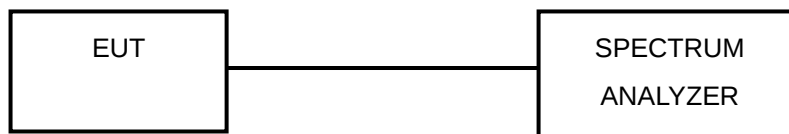


4.7 MAXIMUM OUTPUT POWER

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.

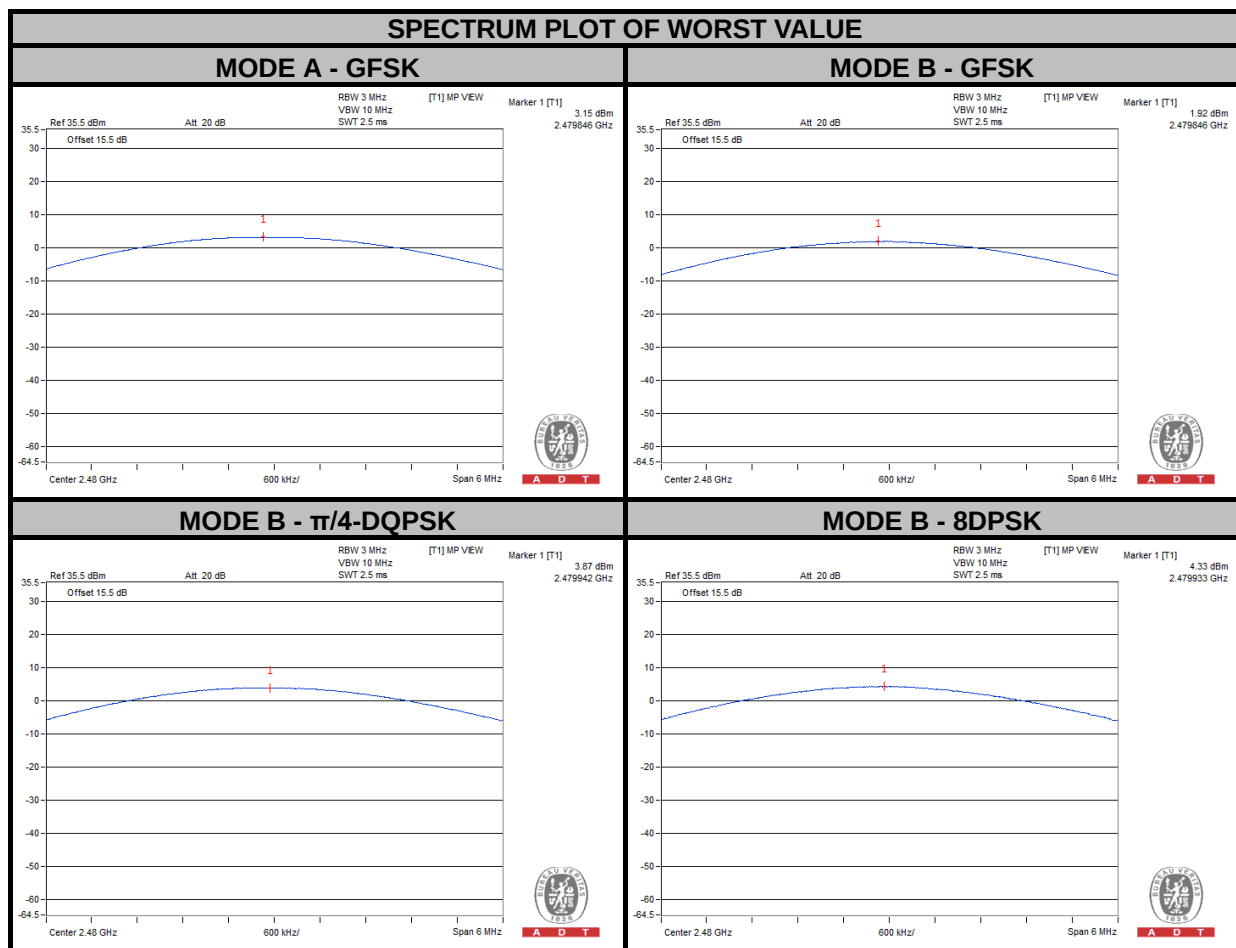
4.7.7 TEST RESULTS

MODE A

CHANNEL	FREQUENCY (MHz)	OUTPUT POWER (mW)	OUTPUT POWER (dBm)	POWER LIMIT (mW)	PASS / FAIL
0	2402	1.910	2.81	125	PASS
39	2441	2.023	3.06	125	PASS
78	2480	2.065	3.15	125	PASS

MODE B

CHANNEL	FREQUENCY (MHz)	OUTPUT POWER (mW)			OUTPUT POWER (dBm)			POWER LIMIT (mW)	PASS / FAIL
		GFSK	$\pi/4$ -DQPSK	8DPSK	GFSK	$\pi/4$ -DQPSK	8DPSK		
0	2402	1.327	2.084	2.366	1.23	3.19	3.74	125	PASS
39	2441	1.538	2.415	2.692	1.87	3.83	4.30	125	PASS
78	2480	1.556	2.438	2.710	1.92	3.87	4.33	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

1. Set RBW = 100 kHz.
2. Set VBW = 300 kHz.
3. Set span to encompass the spectrum to be examined.
4. Detector = peak.
5. Trace Mode = max hold.
6. Sweep = auto couple.

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 continuously.

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.

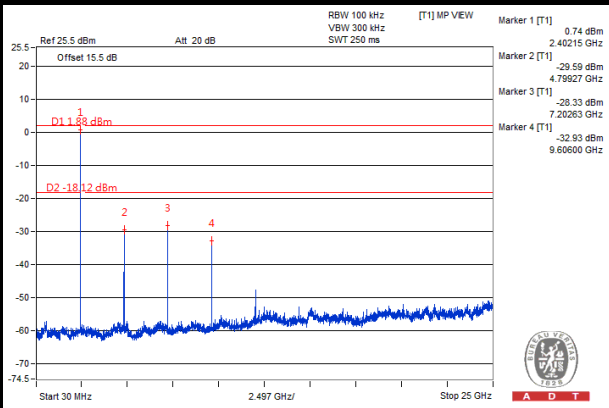
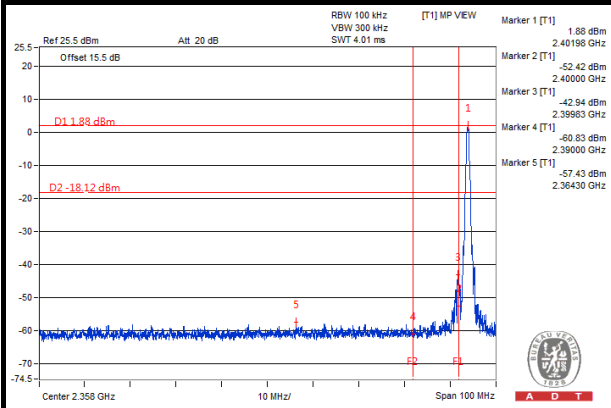


A D T

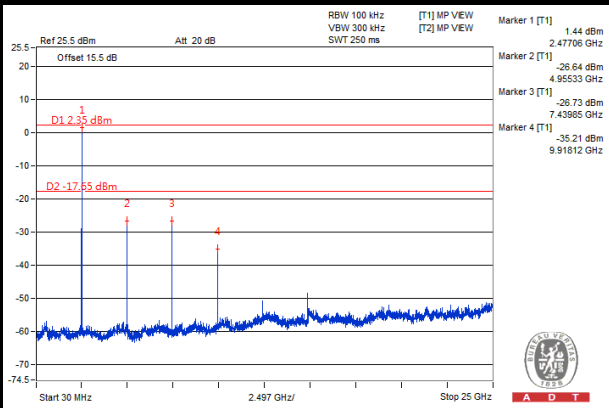
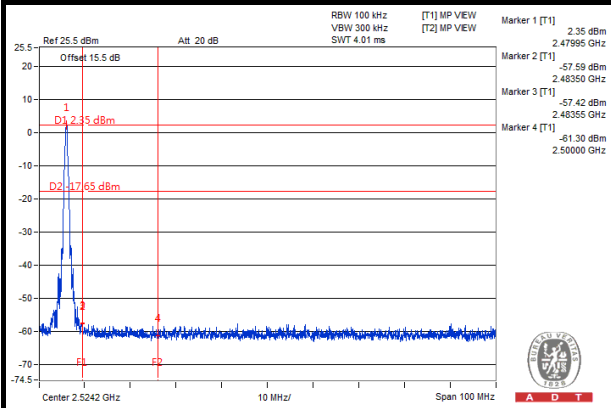
MODE A

GFSK

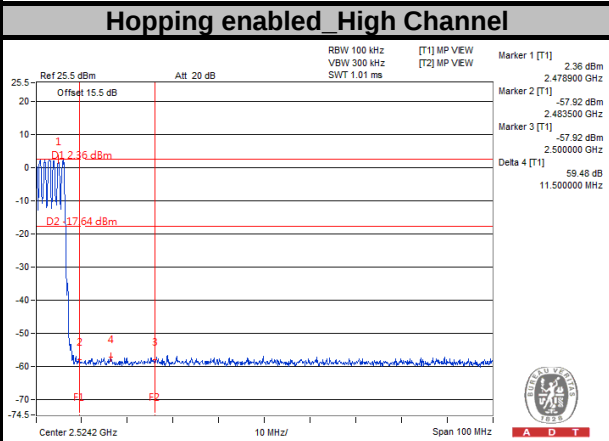
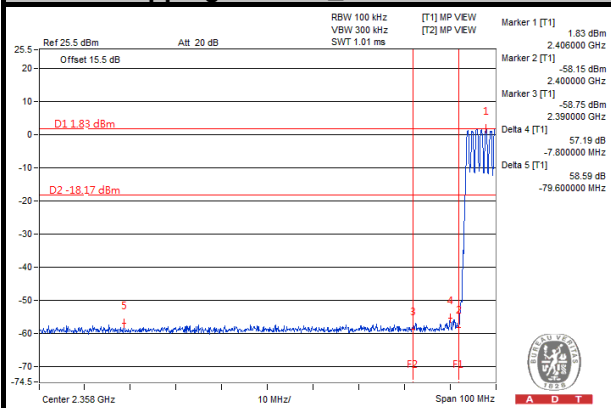
Hopping disabled Low Channel



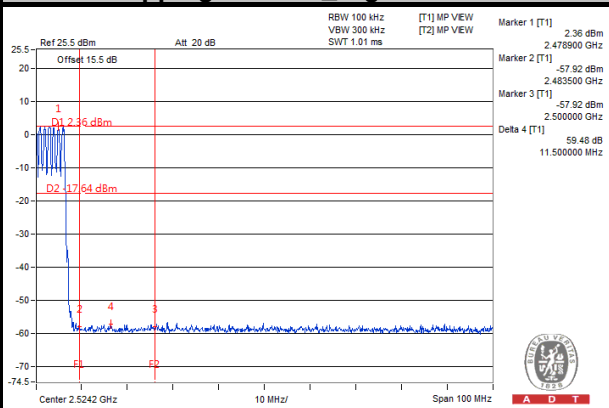
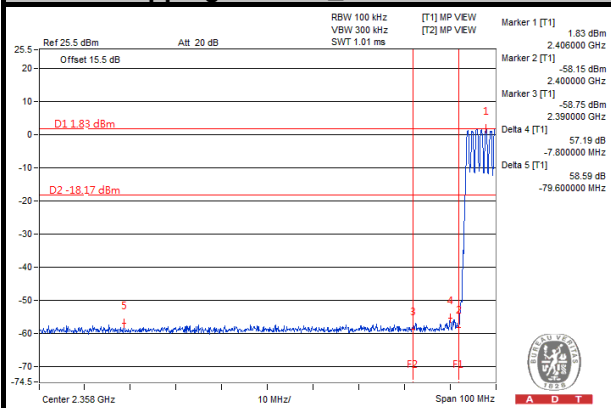
Hopping disabled High Channel



Hopping enabled Low Channel



Hopping enabled High Channel



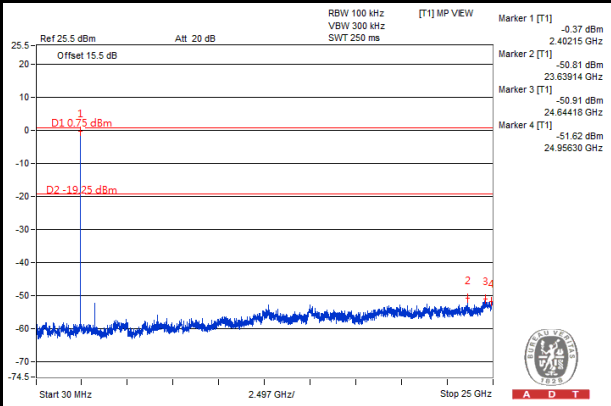
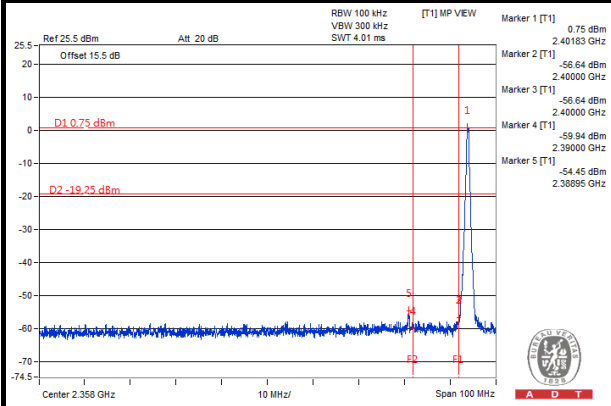


A D T

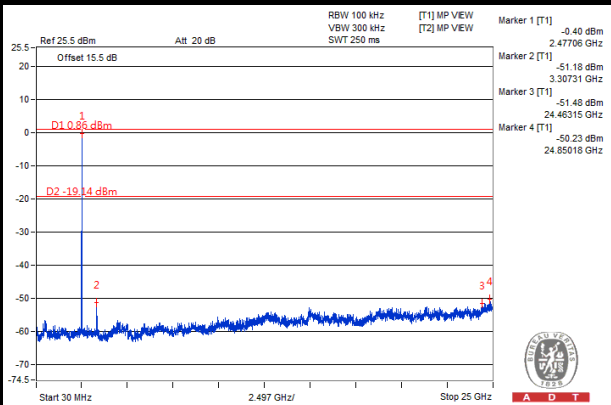
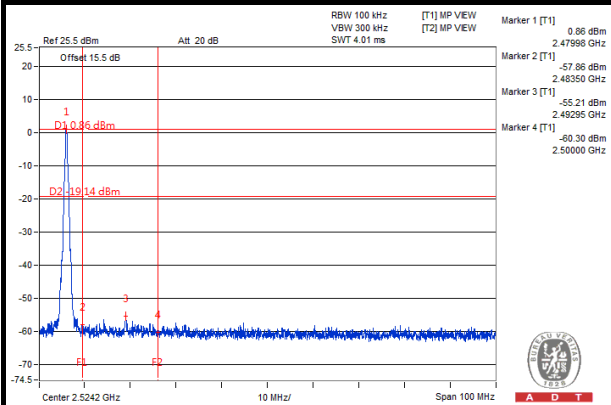
MODE B

GFSK

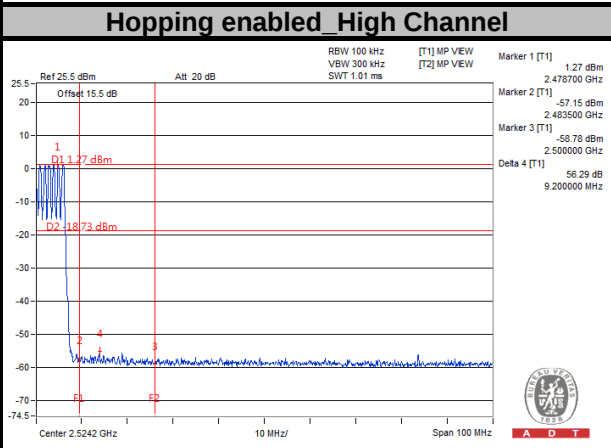
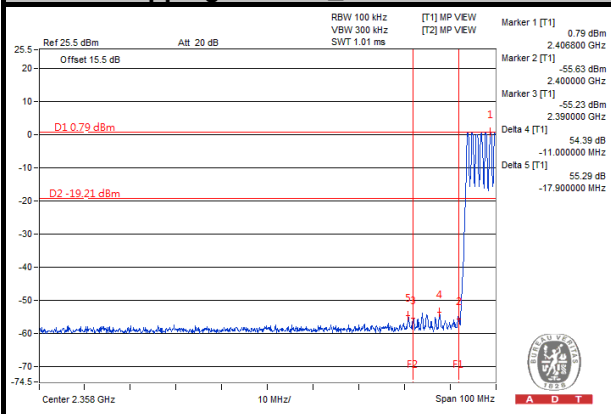
Hopping disabled_Low Channel



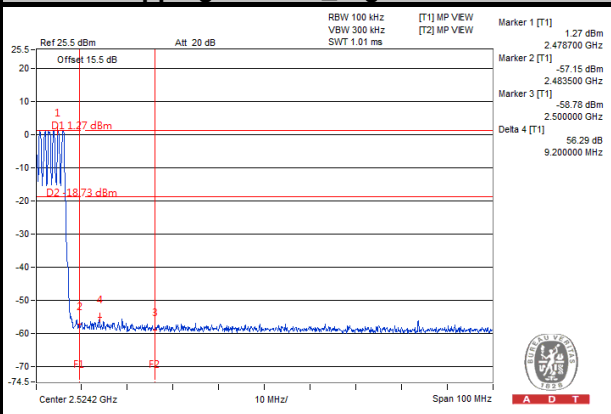
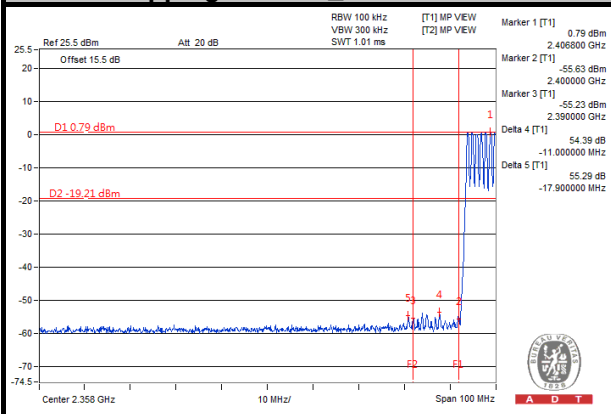
Hopping disabled_High Channel



Hopping enabled_Low Channel



Hopping enabled_High Channel

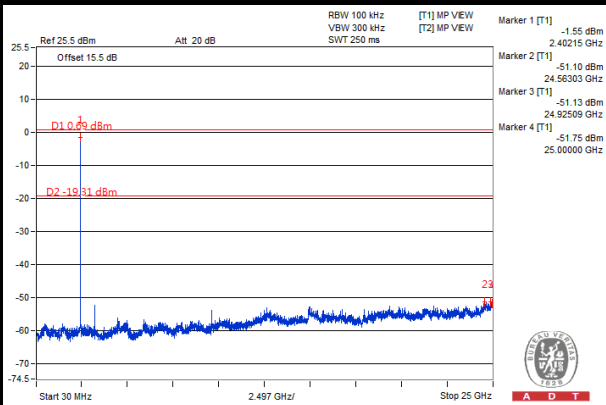
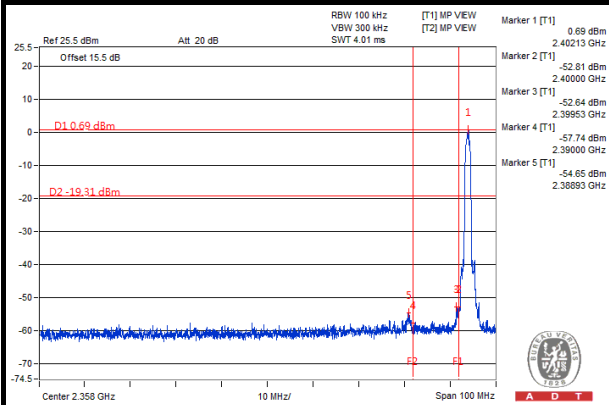




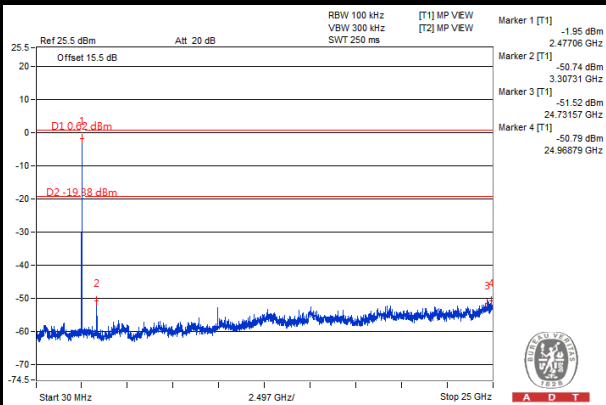
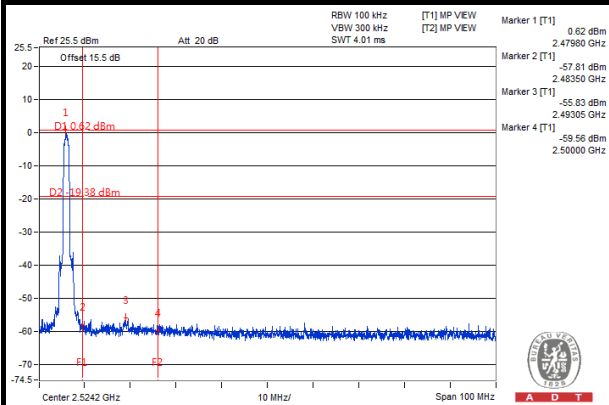
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 $\pi/4$ -DQPSK

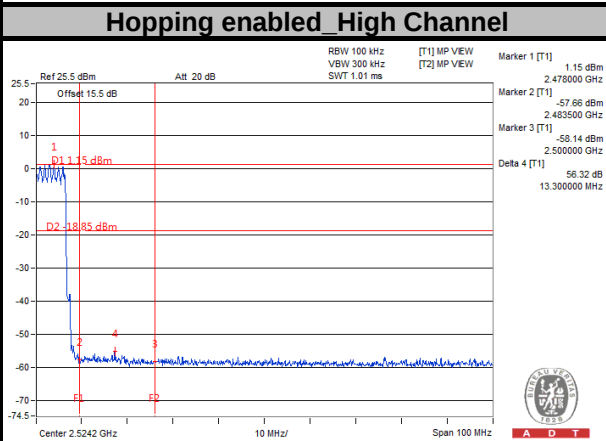
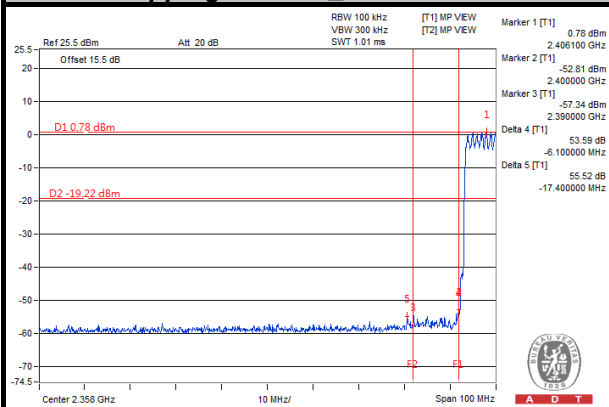
Hopping disabled_Low Channel



Hopping disabled_High Channel



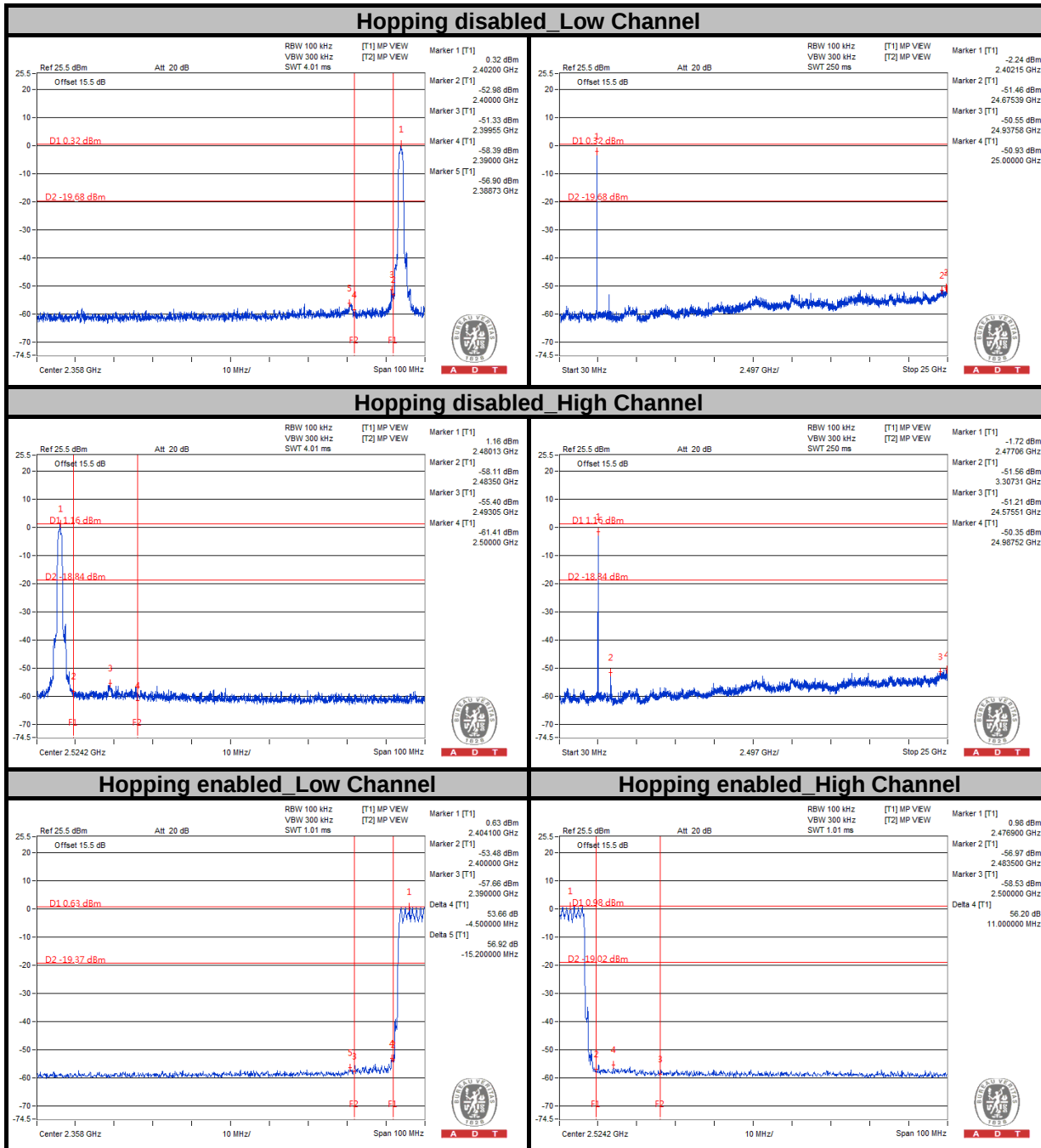
Hopping enabled_Low Channel





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8DPSK





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5. PHOTOGRAPHS OF THE TEST CONFIGURATION

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

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



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7. APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EUT by the lab during the test.

---END---