FCC TEST REPORT

REPORT NO.:	RF120120E03-2 R2
MODEL NO.:	AR5BMD22
FCC ID:	PPD-AR5BMD22
IC:	4104A-AR5BMD22
RECEIVED:	Jan. 20, 2012
TESTED:	Feb. 06 to Apr. 14, 2012
ISSUED:	May 07, 2012

APPLICANT:	Qualcomm Atheros, Inc.
ADDRESS:	1700 Technology Drive, San Jose, CA 95110
ISSUED BY:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
LAB ADDRESS :	No. 81-1, Lu Liao Keng, 9th Ling, Wu Lung Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan, R.O.C.
TEST LOCATION (1):	No. 81-1, Lu Liao Keng, 9th Ling, Wu Lung Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan, R.O.C.
TEST LOCATION (2):	No. 49, Ln. 206, Wende Rd., Shangshan Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan, R.O.C.

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF120120E03-2	Original release	Apr. 17, 2012
RF120120E03-2 R1	Remove the Bluetooth(LE mode) test	May 03, 2012
RF120120E03-2 R2	Modify the version of the standard	May 07, 2012

1 CERTIFICATION

PRODUCT :	802.11 a/b/g/n + BT Combo Card
BRAND NAME :	Atheros
MODEL NO. :	AR5BMD22
TEST SAMPLE :	R&D SAMPLE
APPLICANT :	Qualcomm Atheros, Inc.
TESTED :	Feb. 06 to Apr. 17, 2012
STANDARDS :	FCC Part 15, Subpart C (Section 15.247)
	ANSI C63.4:2003
	Canada RSS-210 Issue 8 (2010-12)
	Canada RSS-Gen Issue 3 (2010-12)

The above equipment (Model: AR5BMD22) has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and was in 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 : _____ **DATE:** May 07, 2012
(Midoli Peng, Specialist)

APPROVED BY : _____ , **DATE:** May 07, 2012
(May Chen, Deputy Manager)

2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart C; RSS-210; RSS-Gen				
STANDARD SECTION		TEST TYPE AND LIMIT	RESULT	REMARK
FCC Part 15	RSS-Gen RSS-210			
15.207	RSS-Gen 7.2.4	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -14.73dB at 0.16475MHz.
15.247(a)(1) (iii)	RSS-210 A8.1(d)	Number of Hopping Frequency Used	PASS	Meet the requirement of limit.
15.247(a)(1) (iii)	RSS-210 A8.1(d)	Dwell Time on Each Channel	PASS	Meet the requirement of limit.
15.247(a)(1)	RSS-210 A8.1(b)	1. Hopping Channel Separation 2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	PASS	Meet the requirement of limit.
15.247(b)	RSS-210 A8.4(2)	Maximum Peak Output Power	PASS	Meet the requirement of limit.
15.247(d)	RSS-210 A8.5	Transmitter Radiated Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -1.1dB at 166.00MHz.
15.247(d)	RSS-210 A8.5	Conducted Out-Band Emission Measurement	PASS	Meet the requirement of limit.
15.247(e)	RSS-210 A8.2 (b)	Power Spectral Density	PASS	Meet the requirement of limit.
15.203	-	Antenna Requirement	PASS	Antenna connector is IPEX not a standard connector.

NOTE: 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:

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

Measurement	Value
Conducted emissions	2.45 dB
Radiated emissions (30MHz-1GHz)	4.32 dB
Radiated emissions (1GHz -6GHz)	4.81 dB
Radiated emissions (6GHz -18GHz)	5.24 dB
Radiated emissions (18GHz -40GHz)	5.37 dB

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	802.11 a/b/g/n + BT Combo Card
MODEL NO.	AR5BMD22
POWER SUPPLY	DC 3.3V from host equipment
MODULATION TYPE	GFSK, π/4-DQPSK, 8DPSK
MODULATION TECHNOLOGY	FHSS
OPRTAING FREQUENCY	2402MHz ~ 2480MHz
NUMBER OF CHANNEL	Bluetooth 2.1+ EDR: 79
MAXIMUM OUTPUT POWER	GFSK: 2.286 mW 8DPSK: 4.989 mW
ANTENNA TYPE	See item 3.2
ANTENNA CONNECTOR	See item 3.2
DATA CABLE	NA
I/O PORTS	NA
ASSOCIATED DEVICES	NA

NOTE:

1. There are Bluetooth technology and WLAN technology used for the EUT. < the WLAN test data please refer to Report No. "RF120120E03 R2 & RF120120E03-1 R2">
2. The Bluetooth supports version 4.0.
3. The device has three configurations (working mode)
   a. WLAN only (2x2 MIMO)
   b. BT+WLAN (2x2 MIMO) with reduced power on WLAN
   c. BT+WLAN (1x1 mode on a/b/g only, chain 0 is used for BT and chain 1 is used for WLAN)

4. Spurious Emission (radiated emission) of the simultaneous operation (WiFi & Bluetooth) have been evaluated and no non-compliance found. The detail combinations of transmitters / frequencies / modes as below table

Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type
2.4 GHz (802.11g) + Bluetooth	1 to 11	6	OFDM	BPSK
	0 to 78	0	FHSS	8DPSK
5 GHz (802.11a) + Bluetooth	149 to 165	149	OFDM	BPSK
	0 to 78	0	FHSS	8DPSK

5. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

3.2 DESCRIPTION OF ANTENNA

There is one set of antenna provided to this EUT, please refer to the following table:

No.	Brand	Model	Antenna Type	Connector	Antenna Gain (dBi)< included cable loss>			
					For 2.4GHz	For 5GHz (5.15~5.35)	For 5GHz (5.47~5.725)	For 5GHz (5.725~5.850)
1&2	WNC	81.EBJ15.005	PIFA	IPEX	3.62	3.08	4.76	4.76

Cable Loss:

No.	Brand	Model	Cable Loss(dB)				Cable Length
			For 2.4GHz	For 5GHz (5.15~5.35)	For 5GHz (5.47~5.725)	For 5GHz (5.725~5.850)	
1&2	WNC	81-EBJ15.005	1.15	1.70	1.74	1.79	300

Note: Above antenna gains of antenna are Total (H+V).

3.3 DESCRIPTION OF TEST MODES

For Bluetooth 2.1+ EDR: 79

Seventy-nine 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		

3.4 TEST MODE APPLICABLITY AND TESTED CHANNEL DETAIL:

EUT CONFIGURE MODE	APPLICABLE TO					DESCRIPTION
	PLC	RE < 1G	RE ³ 1G	APCM	OB	
-	√	√	√	√	√	-

Where **PLC:** Power Line Conducted Emission **RE < 1G:** Radiated Emission below 1GHz

RE ³ 1G: Radiated Emission above 1GHz **APCM:** Antenna Port Conducted Measurement

OB: Conducted Out-Band Emission Measurement

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

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.

Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
0 to 78	0	FHSS	8DPSK	DH5

Radiated Emission Test (Below 1 GHz):

☒ 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.

Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
0 to 78	0	FHSS	8DPSK	DH5

Radiated Emission Test (Above 1 GHz):

☒ 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.

Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
0 to 78	0, 39, 78	FHSS	GFSK	DH5
0 to 78	0, 39, 78	FHSS	8DPSK	DH5

Conducted Out-Band Measurement:

☒ 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.

Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
0 to 78	0, 78	FHSS	GFSK	DH5
0 to 78	0, 78	FHSS	8DPSK	DH5

Antenna Port Conducted Measurement:

☒ 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.

Available Channel	Tested Channel	Modulation Technology	Modulation Type	Packet Type
0 to 78	0, 39, 78	FHSS	GFSK	DH5
0 to 78	0, 39, 78	FHSS	8DPSK	DH5

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (SYSTEM)	TESTED BY
PLC	26deg. C, 72%RH	120Vac, 60Hz	Kyle Huang
RE≥1G	24deg. C, 70%RH	120Vac, 60Hz	Frank Liu
RE<1G	22deg. C, 64%RH	120Vac, 60Hz	Frank Liu
APCM	25deg. C, 60%RH	120Vac, 60Hz	Rex Huang
OB	25deg. C, 60%RH	120Vac, 60Hz	Rex Huang

3.5 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 (Section 15.247)

ANSI C63.4:2003

Canada RSS-210 Issue 8 (2010-12)

Canada RSS-Gen Issue 3 (2010-12)

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

3.6 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.

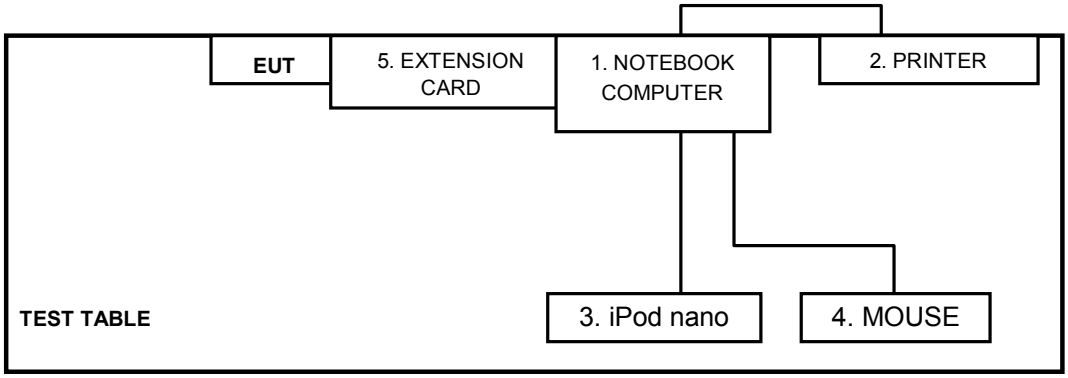
For conducted emission test					
No.	Product	Brand	Model No.	Serial No.	FCC ID
1	NOTEBOOK COMPUTER	DELL	E5420	CHHYLQ1	FCC DoC
2	PRINTER	EPSON	LQ-300+II	G88Y074086	FCC DoC
3	iPod nano	Apple	A1137	5K7170JBUPR	FCC DoC
4	MOUSE	DELL	MO56UO	349003988	NA
5	EXTENSION CARD	Atheros	NA	NA	NA
For other test items					
No.	Product	Brand	Model No.	Serial No.	FCC ID
1	NOTEBOOK COMPUTER	Lenovo	0769	L3-be248 08/01	FCC DoC
2	EXTENSION CARD	Atheros	NA	NA	NA

For conducted emission test	
No.	Signal cable description
1	NA
2	USB cable(1.8m)
3	USB cable(1m)
4	USB cable(1.8m)
5	NA
For other test items	
No.	Signal cable description
1	NA
2	NA

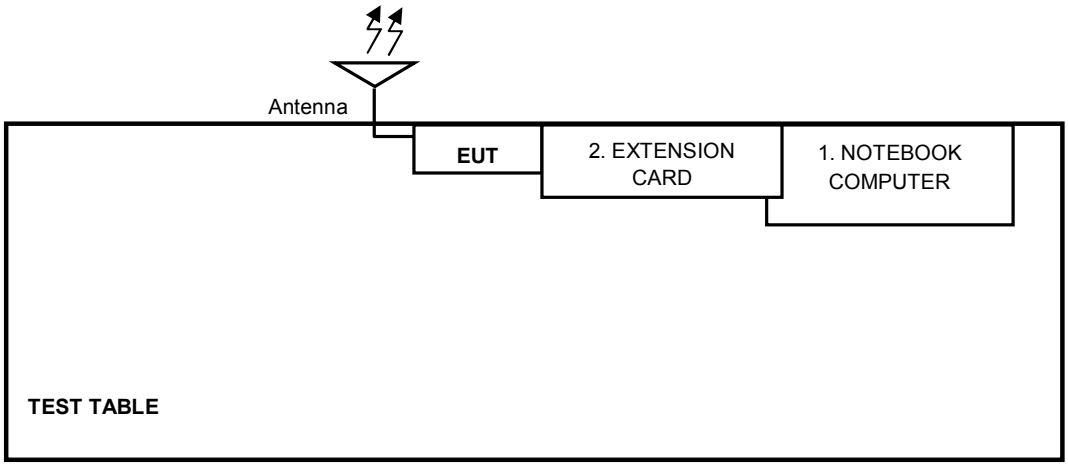
Note: The power cords of the above support units were unshielded (1.8m).

3.7 CONFIGURATION OF SYSTEM UNDER TEST

For conducted emission test



For other test items



4 TEST PROCEDURES AND RESULTS

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dBμV)	
	Quasi-peak	Average
0.15-0.5 0.5-5 5-30	66 to 56 56 60	56 to 46 46 50

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. All emanations from a class B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
ROHDE & SCHWARZ Test Receiver	ESCS 30	100287	Mar. 02, 2011	Mar. 01, 2012
Line-Impedance Stabilization Network (for EUT)	NSLK 8127	8127-523	Sep. 20, 2011	Sep. 19, 2012
Line-Impedance Stabilization Network (for Peripheral)	ENV-216	100072	June 10, 2011	June 09, 2012
RF Cable (JYEBAO)	5DFB	COACAB-002	Aug. 06, 2011	Aug. 05, 2012
50 ohms Terminator	50	3	Nov. 02, 2011	Nov. 01, 2012
Software	BV ADT_Cond_V7.3.7	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 Shielded Room No. A.
3 The VCCI Con A Registration No. is C-817.
4. Tested Date: Feb. 06, 2012

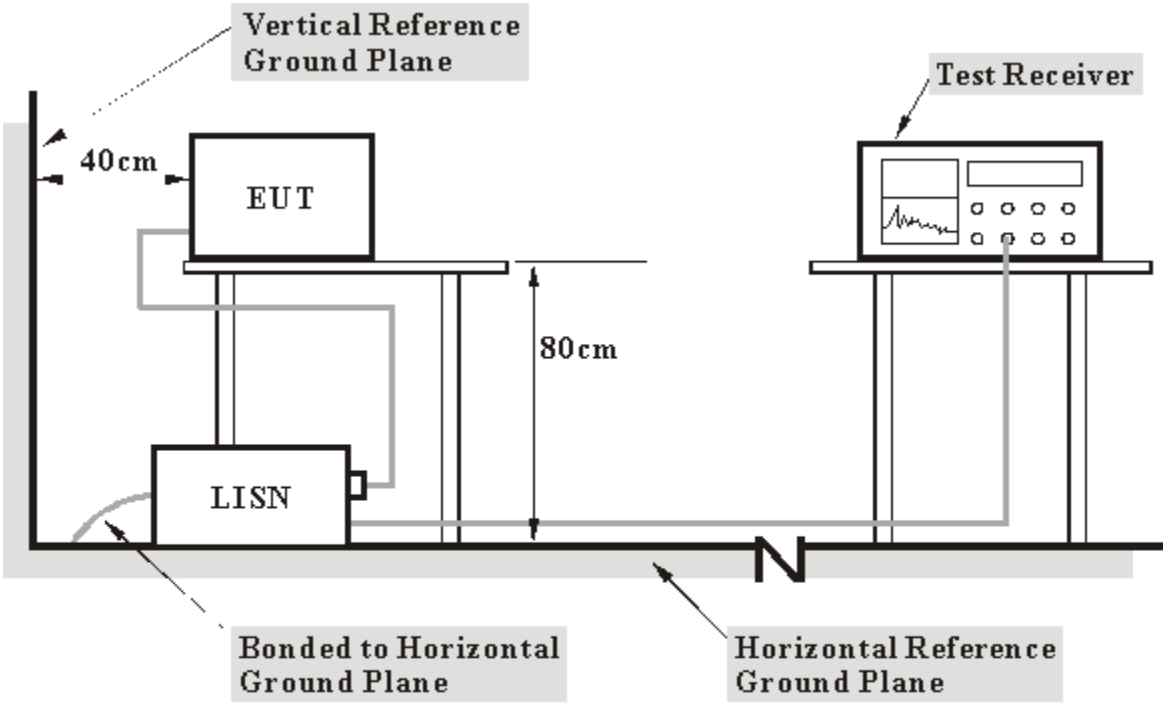
4.1.3 TEST PROCEDURES

a. The EUT/HOST was placed 0.4 meters from the conducting wall of the shielded room with EUT/HOST 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/HOST were checked for maximum conducted interference.

c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) were not recorded.

4.1.4 TEST SETUP



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

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

4.1.5 EUT OPERATING CONDITIONS

1. Connect the EUT with the support unit 1 (Notebook Computer) which is placed on a testing table.
2. The communication partner run test program “artgui.exe” to enable EUT under transmission/receiving condition continuously at specific channel frequency.

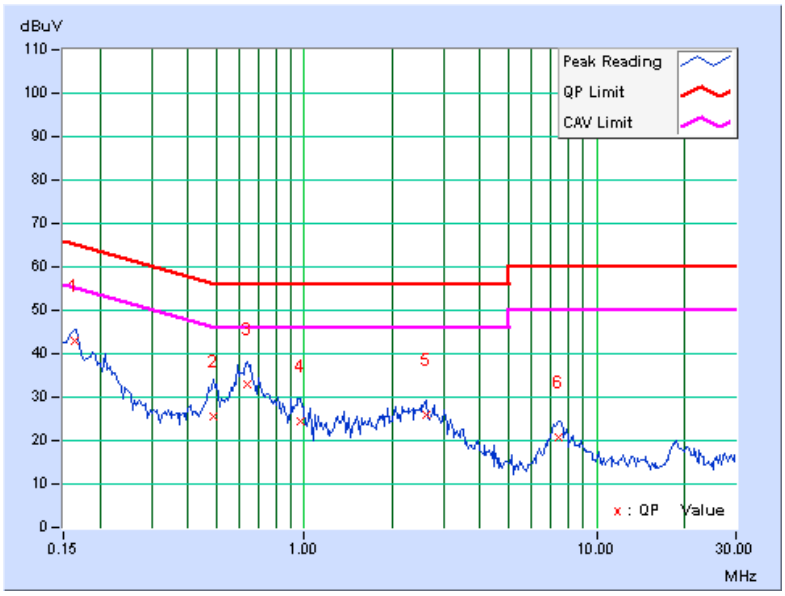
4.1.6 TEST RESULTS

PHASE	Line (L)	6dB BANDWIDTH	9 kHz

	Freq.	Corr.	Reading Value		Emission Level		Limit		Margin	
No		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	**0.16475**	**0.06**	**42.89**	**40.43**	**42.95**	**40.49**	**65.22**	**55.22**	**-22.27**	**-14.73**
2	0.48984	0.07	25.59	16.57	25.66	16.64	56.17	46.17	-30.51	-29.53
3	0.63828	0.08	32.95	20.58	33.03	20.66	56.00	46.00	-22.97	-25.34
4	0.97031	0.09	24.29	14.75	24.38	14.84	56.00	46.00	-31.62	-31.16
5	2.60547	0.21	25.67	19.70	25.88	19.91	56.00	46.00	-30.12	-26.09
6	7.43359	0.37	20.25	13.38	20.62	13.75	60.00	50.00	-39.38	-36.25

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.

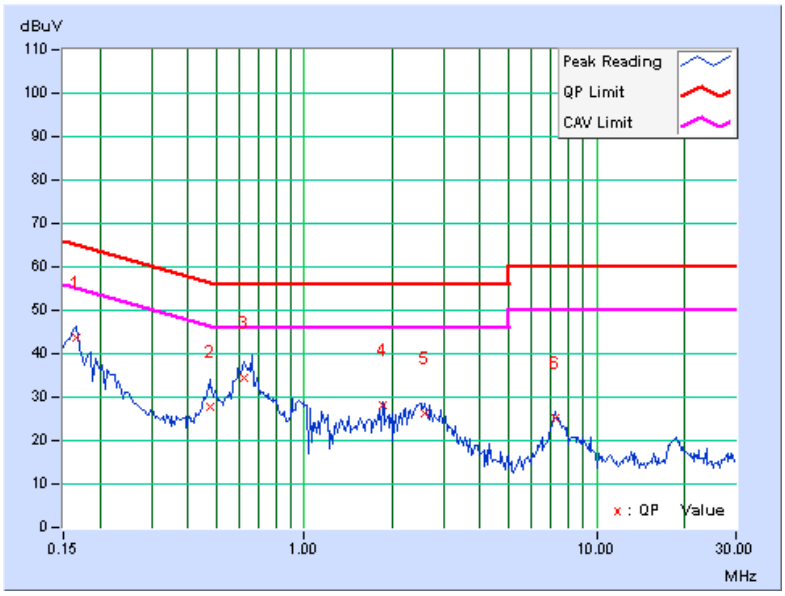


PHASE	Neutral (N)	6dB BANDWIDTH	9 kHz

	Freq.	Corr.	Reading Value		Emission Level		Limit		Margin	
No		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16562	0.07	43.57	40.29	43.64	40.36	65.18	55.18	-21.54	-14.82
2	0.47422	0.08	27.81	18.57	27.89	18.65	56.44	46.44	-28.55	-27.79
3	0.61875	0.08	34.21	22.66	34.29	22.74	56.00	46.00	-21.71	-23.26
4	1.84766	0.16	27.88	17.97	28.04	18.13	56.00	46.00	-27.96	-27.87
5	2.59766	0.20	26.02	20.74	26.22	20.94	56.00	46.00	-29.78	-25.06
6	7.19141	0.34	24.96	18.60	25.30	18.94	60.00	50.00	-34.70	-31.06

REMARKS:

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



4.2 RADIATED EMISSION MEASUREMENT

4.2.1 LIMITS OF RADIATED EMISSION 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. As shown in 15.35(b), 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.

4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Agilent Spectrum Analyzer	E4446A	MY48250253	Aug. 29, 2011	Aug. 28, 2012
Agilent Pre-Selector	N9039A	MY46520310	Aug. 29, 2011	Aug. 28, 2012
Agilent Signal Generator	N5181A	MY49060347	July 25, 2011	July 24, 2012
Mini-Circuits Pre-Amplifier	ZFL-1000VH2B	AMP-ZFL-04	Nov. 15, 2011	Nov. 14, 2012
Agilent Pre-Amplifier	8449B	3008A02465	Feb. 27, 2012	Feb. 26, 2013
SPACEK LABS	SLKKa-48-6	9K16	Nov. 15, 2011	Nov. 14, 2012
SCHWARZBECK Trilog Broadband Antenna	VULB 9168	9168-361	Apr. 06, 2012	Apr. 05, 2013
AISI Horn_Antenna	AIH.8018	0000220091110	Nov. 23, 2011	Nov. 22, 2012
SCHWARZBECK Horn_Antenna	BBHA 9170	9170-424	Oct. 07, 2011	Oct. 06, 2012
RF CABLE	NA	RF104-205 RF104-207 RF104-202	Dec. 27, 2011	Dec. 26, 2012
RF Cable	NA	CHHCAB_001	Oct. 08, 2011	Oct. 07, 2012
Software	ADT_Radiated_ V8.7.05	NA	NA	NA
CT Antenna Tower & Turn Table	NA	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 horn antenna, preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in 966 Chamber No. H.
4. The FCC Site Registration No. is 797305.
5. The CANADA Site Registration No. is IC 7450H-3.
6. Tested Date: Apr. 10 to 14, 2012

4.2.3 TEST PROCEDURES

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. 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.

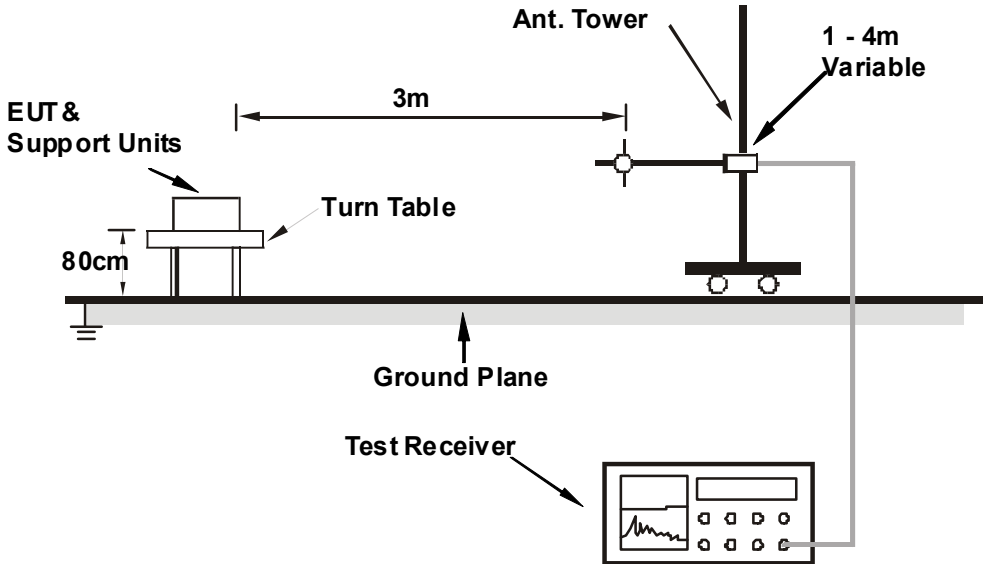
NOTE:

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 10 Hz for Average detection (AV) at frequency above 1GHz.
4. 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



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

4.2.6 TEST RESULTS

BELOW 1GHz WORST-CASE DATA

BT_8DPSK

CHANNEL	TX Channel 0	**DETECTOR FUNCTION**	Quasi-Peak (QP)
FREQUENCY RANGE	Below 1GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	**FREQ. (MHz)**	**EMISSION LEVEL (dBuV/m)**	**LIMIT (dBuV/m)**	**MARGIN (dB)**	**ANTENNA HEIGHT (m)**	**TABLE ANGLE (Degree)**	**RAW VALUE (dBuV)**	**CORRECTION FACTOR (dB/m)**
1	**166.00**	**42.4 QP**	**43.5**	**-1.1**	**1.64 H**	**163**	**28.19**	**14.18**
2	358.62	35.1 QP	46.0	-10.9	2.00 H	254	18.19	16.93
3	398.29	43.4 QP	46.0	-2.6	1.00 H	212	25.24	18.19
4	697.07	43.8 QP	46.0	-2.2	1.83 H	229	19.82	23.99
5	796.67	40.4 QP	46.0	-5.6	1.00 H	244	14.48	25.89
6	896.14	41.3 QP	46.0	-4.7	1.00 H	153	13.62	27.66
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	145.90	38.8 QP	43.5	-4.7	1.66 V	219	24.47	14.36
2	168.00	37.3 QP	43.5	-6.2	1.48 V	337	23.17	14.09
3	304.63	41.5 QP	46.0	-4.5	1.56 V	23	26.25	15.29
4	320.00	34.2 QP	46.0	-11.8	1.84 V	213	18.48	15.75
5	360.10	37.6 QP	46.0	-8.4	1.90 V	43	20.65	16.98
6	400.13	43.2 QP	46.0	-2.8	1.24 V	343	24.95	18.24

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).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.

ABOVE 1GHz DATA

BT_GFSK

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

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	2321.80	57.5 PK	74.0	-16.5	1.10 H	136	26.47	31.03
2	2321.80	46.2 AV	54.0	-7.8	1.10 H	136	15.17	31.03
3	*2402.00	100.5 PK			1.10 H	136	69.25	31.25
4	*2402.00	92.7 AV			1.10 H	136	61.45	31.25
5	4804.00	48.0 PK	74.0	-26.0	1.41 H	23	8.65	39.35
6	4804.00	35.4 AV	54.0	-18.6	1.41 H	23	-3.95	39.35
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	2322.00	58.0 PK	74.0	-16.0	1.00 V	177	26.97	31.03
2	2322.00	48.6 AV	54.0	-5.4	1.00 V	177	17.57	31.03
3	*2402.00	100.2 PK			1.00 V	177	68.95	31.25
4	*2402.00	92.1 AV			1.00 V	177	60.85	31.25
5	4804.00	48.3 PK	74.0	-25.7	1.17 V	278	8.95	39.35
6	4804.00	35.2 AV	54.0	-18.8	1.17 V	278	-4.15	39.35

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

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

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	99.5 PK			1.05 H	119	68.15	31.35
2	*2441.00	91.6 AV			1.05 H	119	60.25	31.35
3	4882.00	47.9 PK	74.0	-26.1	1.46 H	26	8.25	39.65
4	4882.00	35.6 AV	54.0	-18.4	1.46 H	26	-4.05	39.65
5	7323.00	52.1 PK	74.0	-21.9	1.30 H	183	7.98	44.12
6	7323.00	42.8 AV	54.0	-11.2	1.30 H	183	-1.32	44.12
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	98.5 PK			1.00 V	185	67.15	31.35
2	*2441.00	90.3 AV			1.00 V	185	58.95	31.35
3	4882.00	48.8 PK	74.0	-25.2	1.16 V	289	9.15	39.65
4	4882.00	35.4 AV	54.0	-18.6	1.16 V	289	-4.25	39.65
5	7323.00	52.5 PK	74.0	-21.5	1.23 V	325	8.38	44.12
6	7323.00	41.5 AV	54.0	-12.5	1.23 V	325	-2.62	44.12

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).
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) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

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	98.9 PK			1.09 H	132	67.45	31.45
2	*2480.00	90.9 AV			1.09 H	132	59.45	31.45
3	2494.90	57.0 PK	74.0	-17.0	1.09 H	132	25.51	31.49
4	2494.90	44.9 AV	54.0	-9.1	1.09 H	132	13.41	31.49
5	4960.00	48.1 PK	74.0	-25.9	1.41 H	20	8.13	39.97
6	4960.00	35.9 AV	54.0	-18.1	1.41 H	20	-4.07	39.97
7	7440.00	52.4 PK	74.0	-21.6	1.34 H	193	8.16	44.24
8	7440.00	42.1 AV	54.0	-11.9	1.34 H	193	-2.14	44.24
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	98.1 PK			1.00 V	199	66.65	31.45
2	*2480.00	89.8 AV			1.00 V	199	58.35	31.45
3	2494.90	56.9 PK	74.0	-17.1	1.00 V	199	25.41	31.49
4	2494.90	44.6 AV	54.0	-9.4	1.00 V	199	13.11	31.49
5	4960.00	48.9 PK	74.0	-25.1	1.21 V	291	8.93	39.97
6	4960.00	35.3 AV	54.0	-18.7	1.21 V	291	-4.67	39.97
7	7440.00	52.8 PK	74.0	-21.2	1.29 V	341	8.56	44.24
8	7440.00	41.3 AV	54.0	-12.7	1.29 V	341	-2.94	44.24

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

BT_8DPSK

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

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	2321.80	57.3 PK	74.0	-16.7	1.11 H	145	26.27	31.03
2	2321.80	45.3 AV	54.0	-8.7	1.11 H	145	14.27	31.03
3	*2402.00	99.8 PK			1.11 H	145	68.55	31.25
4	*2402.00	89.1 AV			1.11 H	145	57.85	31.25
5	4804.00	48.6 PK	74.0	-25.4	1.43 H	14	9.25	39.35
6	4804.00	35.6 AV	54.0	-18.4	1.43 H	14	-3.75	39.35
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	2321.80	57.0 PK	74.0	-17.0	1.00 V	199	25.97	31.03
2	2321.80	46.0 AV	54.0	-8.0	1.00 V	199	14.97	31.03
3	*2402.00	101.0 PK			1.00 V	199	69.75	31.25
4	*2402.00	90.2 AV			1.00 V	199	58.95	31.25
5	4804.00	48.8 PK	74.0	-25.2	1.17 V	301	9.45	39.35
6	4804.00	35.3 AV	54.0	-18.7	1.17 V	301	-4.05	39.35

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

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2441.00	100.1 PK			1.12 H	136	68.75	31.35
2	*2441.00	88.8 AV			1.12 H	136	57.45	31.35
3	4882.00	48.6 PK	74.0	-25.4	1.39 H	5	8.95	39.65
4	4882.00	35.8 AV	54.0	-18.2	1.39 H	5	-3.85	39.65
5	7323.00	52.8 PK	74.0	-21.2	1.36 H	194	8.68	44.12
6	7323.00	43.6 AV	54.0	-10.4	1.36 H	194	-0.52	44.12
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	101.1 PK			1.00 V	190	69.75	31.35
2	*2441.00	89.8 AV			1.00 V	190	58.45	31.35
3	4882.00	48.6 PK	74.0	-25.4	1.13 V	292	8.95	39.65
4	4882.00	35.6 AV	54.0	-18.4	1.13 V	292	-4.05	39.65
5	7323.00	53.1 PK	74.0	-20.9	1.24 V	311	8.98	44.12
6	7323.00	43.2 AV	54.0	-10.8	1.24 V	311	-0.92	44.12

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).
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) Average (AV)
FREQUENCY RANGE	1GHz ~ 25GHz		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	100.0 PK			1.32 H	121	68.55	31.45
2	*2480.00	87.9 AV			1.32 H	121	56.45	31.45
3	2494.80	55.8 PK	74.0	-18.2	1.32 H	120	24.31	31.49
4	2494.80	44.5 AV	54.0	-9.5	1.32 H	120	13.01	31.49
5	4960.00	48.3 PK	74.0	-25.7	1.33 H	6	8.33	39.97
6	4960.00	35.7 AV	54.0	-18.3	1.33 H	6	-4.27	39.97
7	7440.00	53.0 PK	74.0	-21.0	1.40 H	188	8.76	44.24
8	7440.00	43.8 AV	54.0	-10.2	1.40 H	188	-0.44	44.24
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	101.0 PK			1.00 V	202	69.55	31.45
2	*2480.00	89.9 AV			1.00 V	202	58.45	31.45
3	2494.70	56.8 PK	74.0	-17.2	1.00 V	202	25.31	31.49
4	2494.70	44.3 AV	54.0	-9.7	1.00 V	202	12.81	31.49
5	4960.00	48.3 PK	74.0	-25.7	1.08 V	305	8.33	39.97
6	4960.00	35.5 AV	54.0	-18.5	1.08 V	305	-4.47	39.97
7	7440.00	52.9 PK	74.0	-21.1	1.23 V	295	8.66	44.24
8	7440.00	43.4 AV	54.0	-10.6	1.23 V	295	-0.84	44.24

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

4.3 NUMBER OF HOPPING FREQUENCY USED

4.3.1 LIMIT OF HOPPING FREQUENCY USED

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

4.3.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S Spectrum Analyzer	FSP 40	100036	Dec 14, 2011	Dec 13, 2012

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. Tested date: Apr. 12, 2012

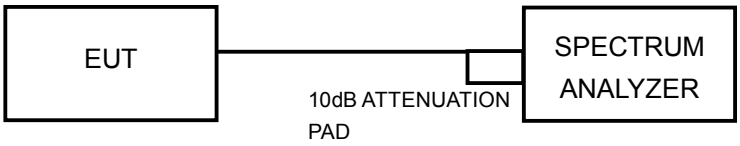
4.3.3 TEST PROCEDURES

a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
b. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
c. 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.
d. Set the SA on View mode and then plot the result on SA screen.
e. Repeat above procedures until all frequencies measured were complete.

4.3.4 DEVIATION FROM TEST STANDARD

No deviation

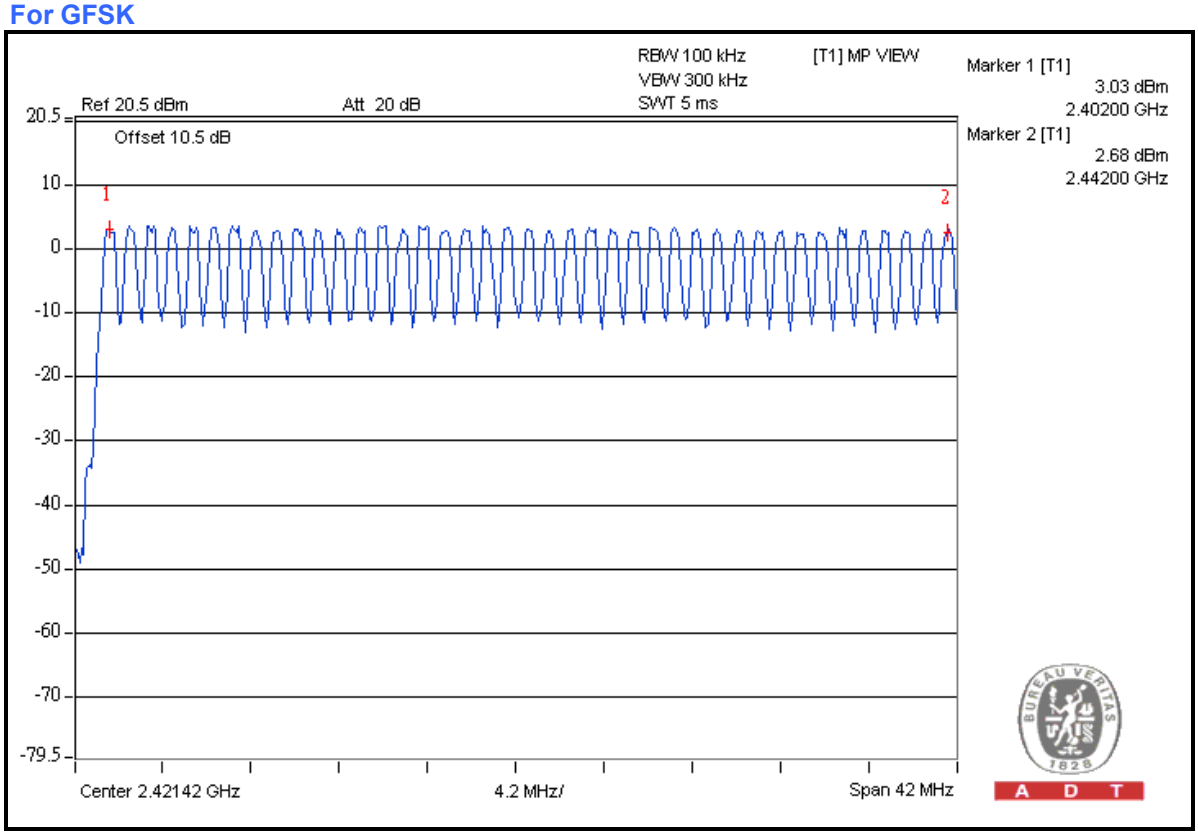
4.3.5 TEST SETUP

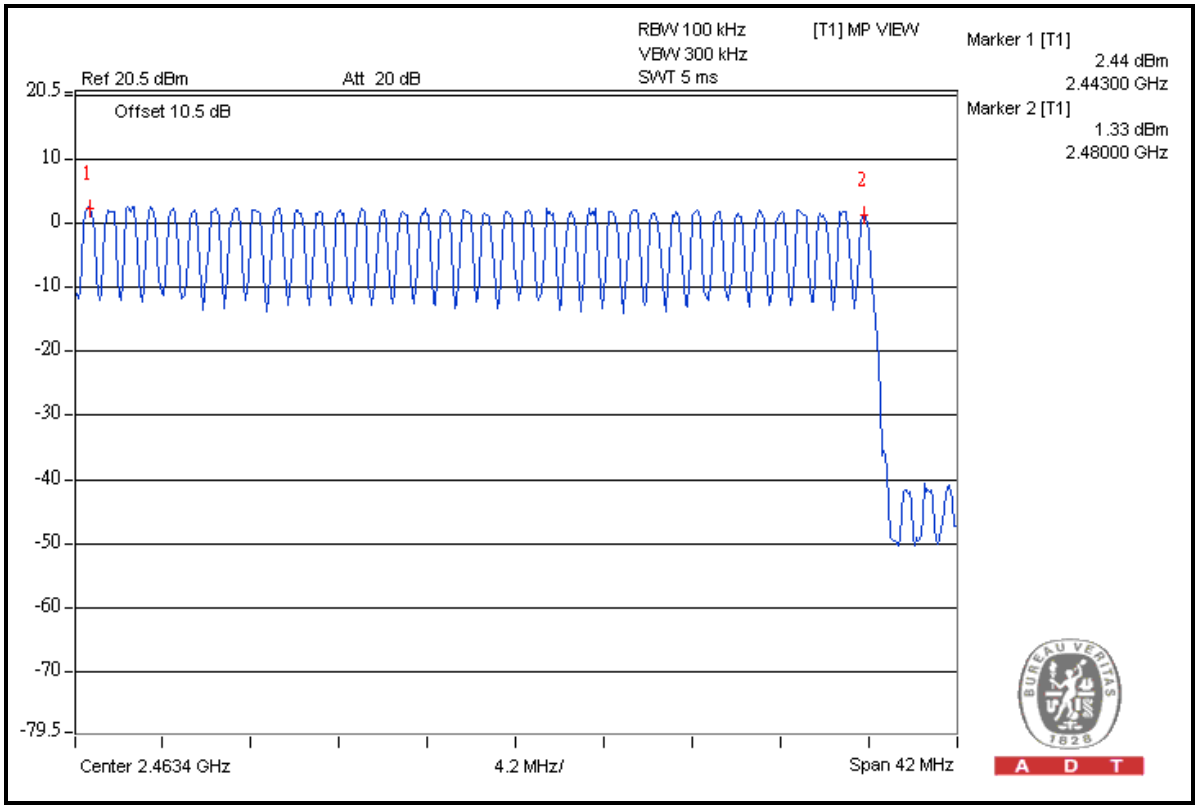


4.3.6 TEST RESULTS

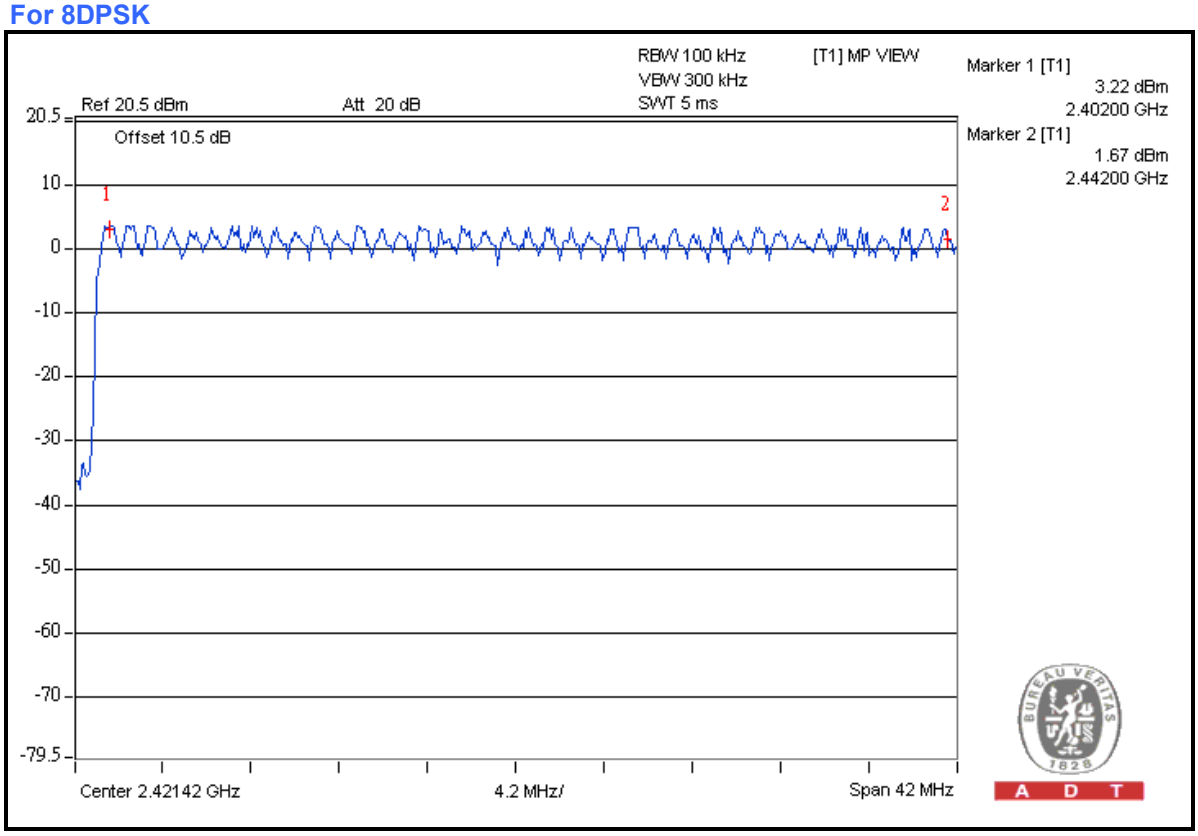
There are 79 hopping frequencies for Bluetooth 2.1+ EDR and 40 hopping frequencies for Bluetooth 4.0 in the hopping mode. Please refer to next pages for the test result. On the plots, it shows that the hopping frequencies are equally spaced.

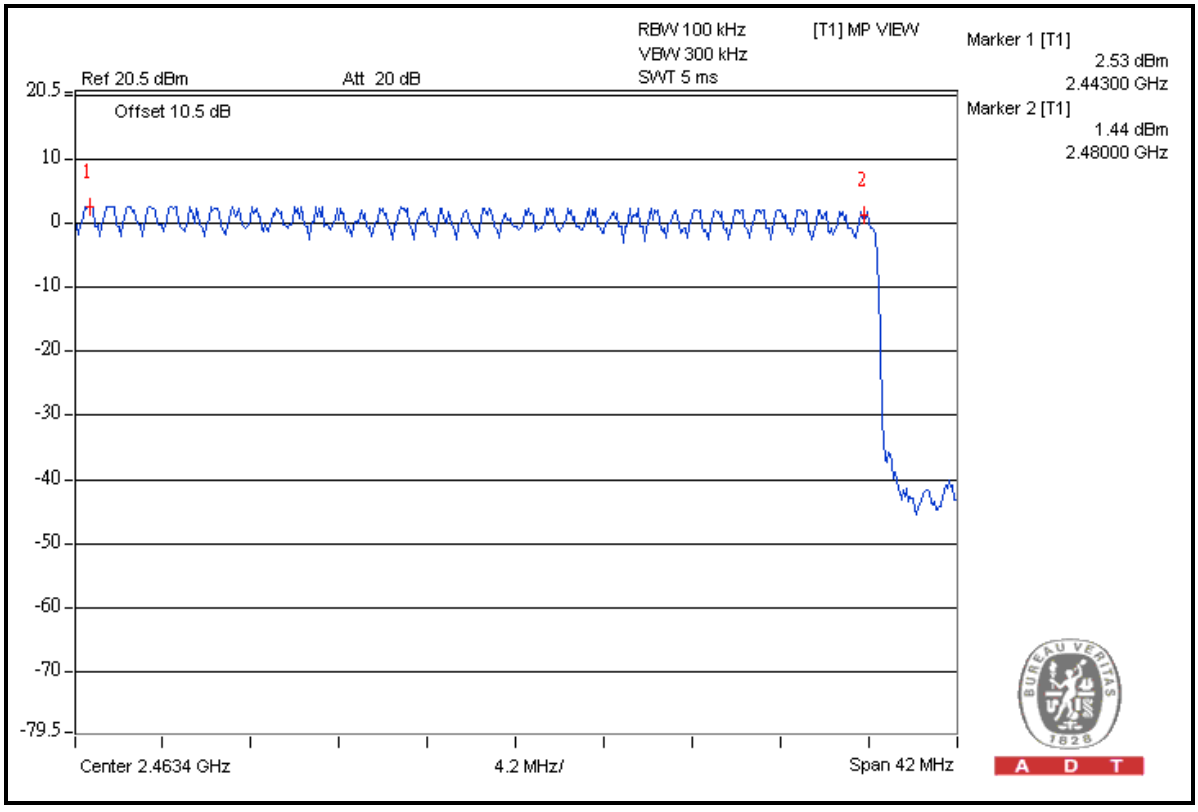
For GFSK


RBW 100 kHz
VBW 300 kHz
SWT 5 ms
[T1] MP VIEW
Marker 1 [T1]
3.03 dBm
2.40200 GHz
Marker 2 [T1]
2.68 dBm
2.44200 GHz
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
Center 2.42142 GHz
4.2 MHz/
Span 42 MHz


RBW 100 kHz
VBW 300 kHz
SWT 5 ms
[T1] MP VIEW
Marker 1 [T1]
2.44 dBm
2.44300 GHz
Marker 2 [T1]
1.33 dBm
2.48000 GHz
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
Center 2.4634 GHz
4.2 MHz/
Span 42 MHz

For 8DPSK


RBW 100 kHz
VBW 300 kHz
SWT 5 ms
[T1] MP VIEW
Marker 1 [T1]
3.22 dBm
2.40200 GHz
Marker 2 [T1]
1.67 dBm
2.44200 GHz
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
Center 2.42142 GHz
4.2 MHz/
Span 42 MHz


RBW 100 kHz
VBW 300 kHz
SWT 5 ms
[T1] MP VIEW
Marker 1 [T1]
2.53 dBm
2.44300 GHz
Marker 2 [T1]
1.44 dBm
2.48000 GHz
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
Center 2.4634 GHz
4.2 MHz/
Span 42 MHz

4.4 DWELL TIME ON EACH CHANNEL

4.4.1 LIMIT OF DWELL TIME USED

For FHSS, 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 INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S Spectrum Analyzer	FSP 40	100036	Dec 14, 2011	Dec 13, 2012

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. Tested date: Apr. 12, 2012

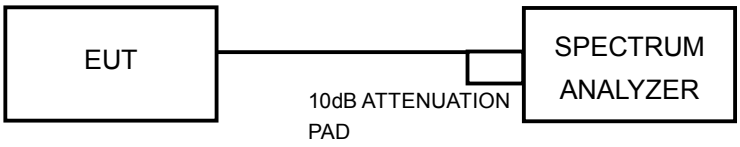
4.4.3 TEST PROCEDURES

a. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
b. Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
c. Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
d. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
e. Repeat above procedures until all different time-slot modes have been completed.

4.4.4 DEVIATION FROM TEST STANDARD

No deviation

4.4.5 TEST SETUP



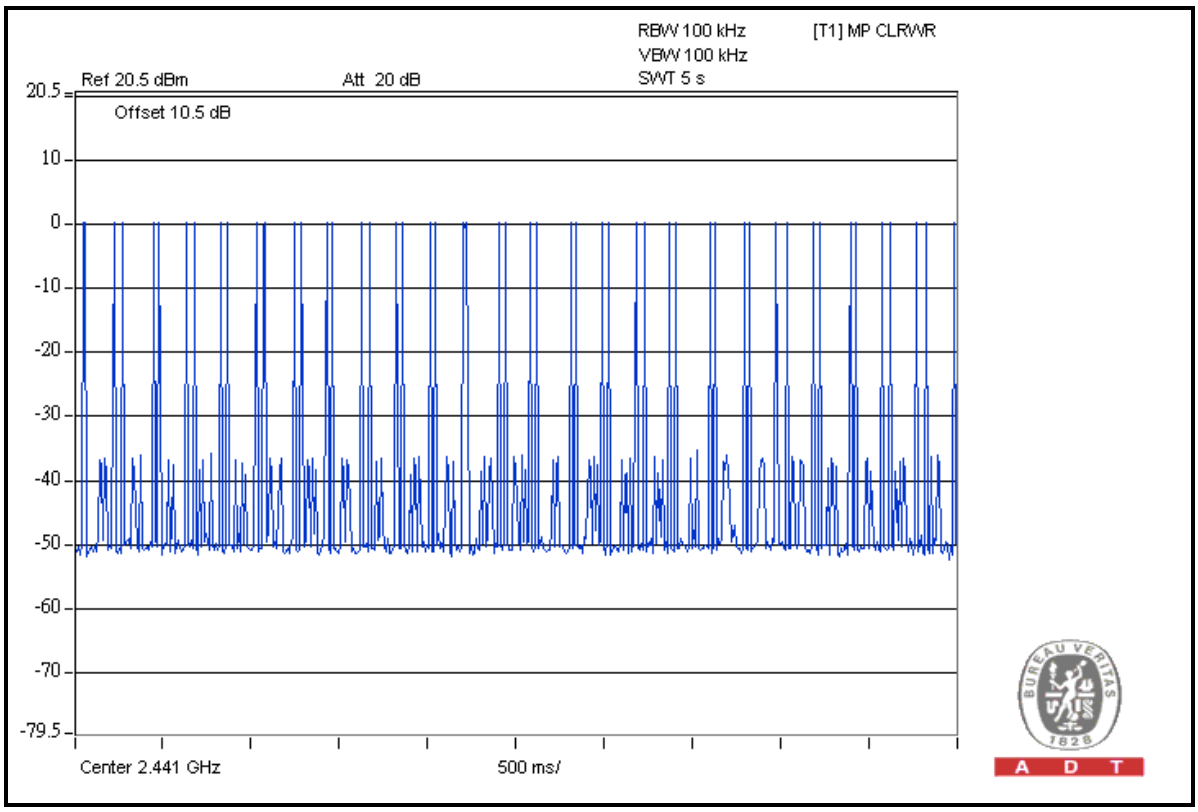
4.4.6 TEST RESULTS

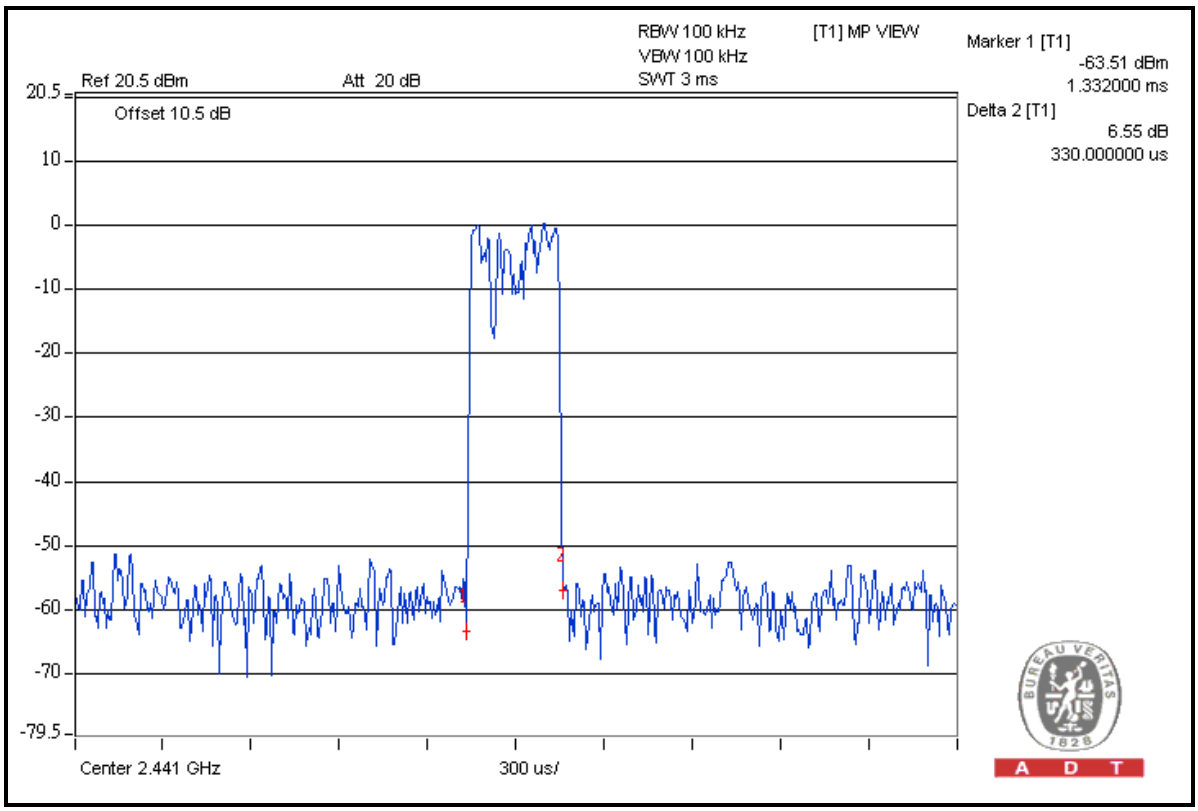
For GFSK:

Mode	Number of transmission in a 31.6 (79Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (msec)
DH1	50 (times / 5 sec) *6.32=316 times	0.33	104.28	400
DH3	25 (times / 5 sec) *6.32=158.0 times	1.74	274.92	400
DH5	16 (times / 5 sec) *6.32=101.12 times	3.01	304.37	400

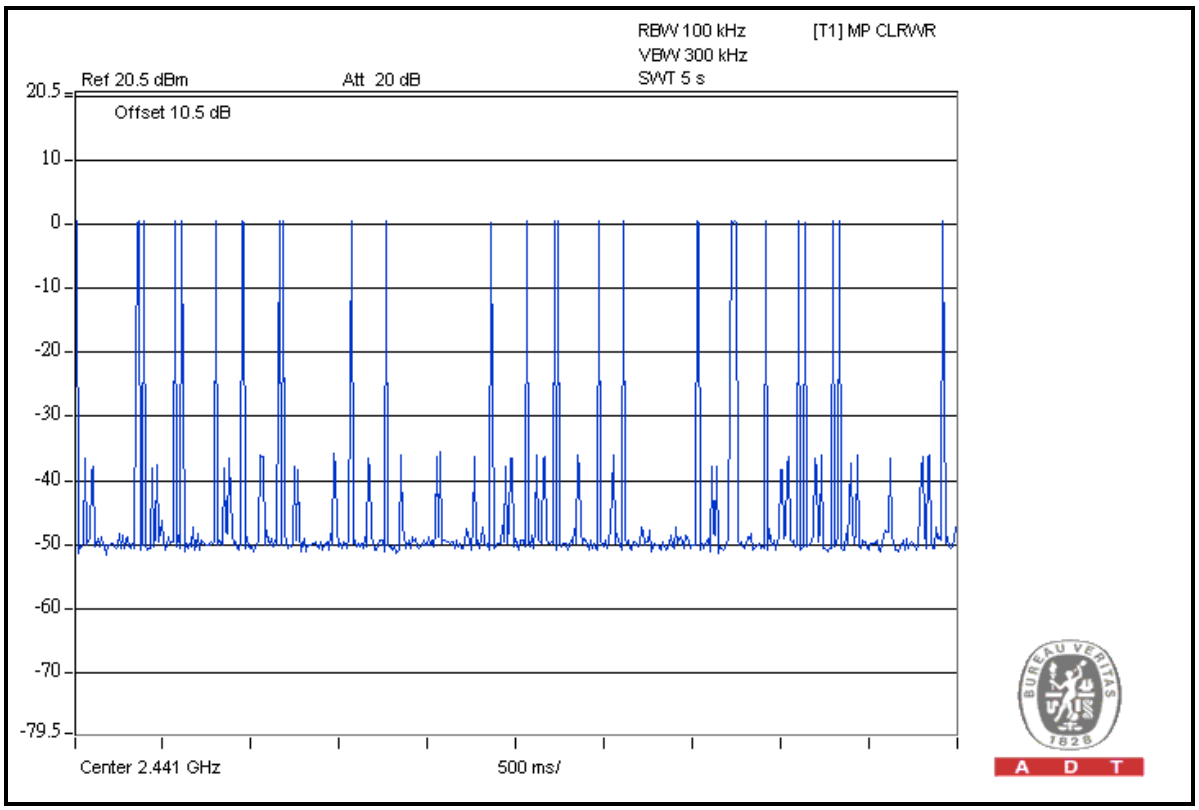
NOTE: Test plots of the transmitting time slot are shown on next 3 pages.

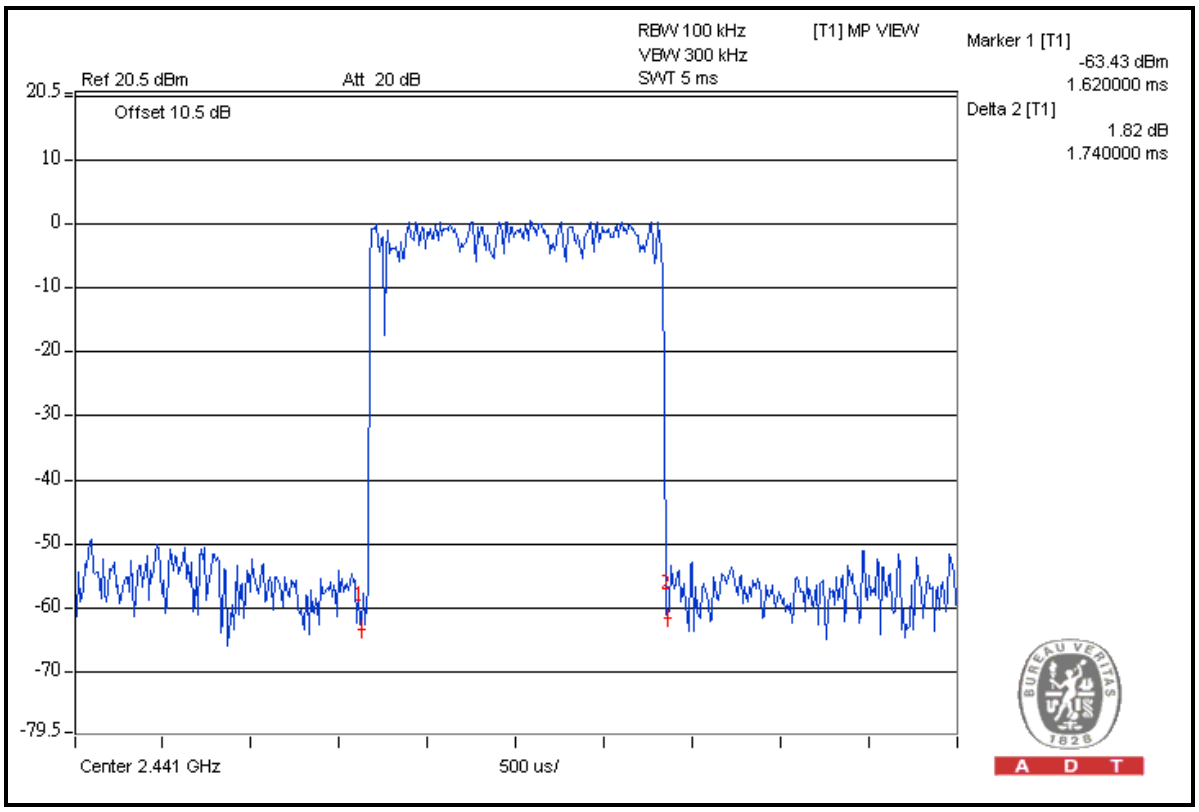
DH1


RBW 100 kHz
VBW 100 kHz
SWT 5 s
[T1] MP CLRWR
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
Center 2.441 GHz
500 ms/

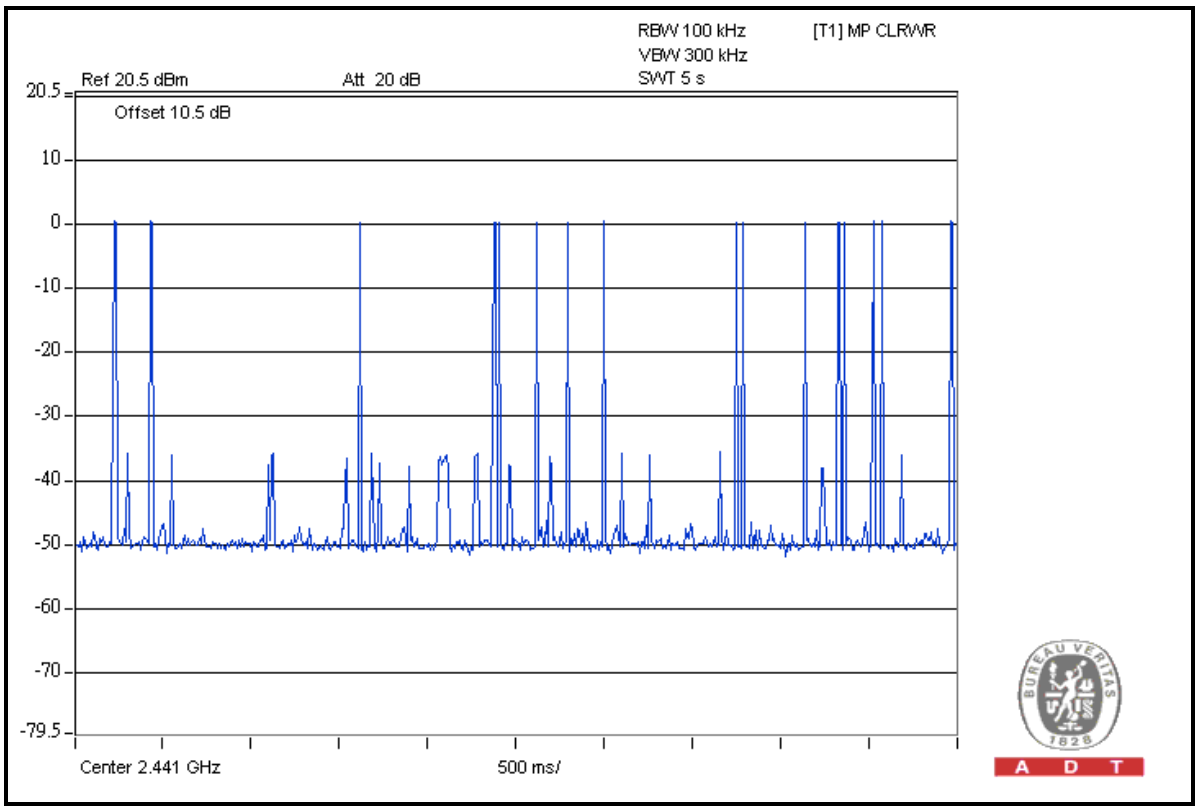

RBW 100 kHz
VBW 100 kHz
SWT 3 ms
[T1] MP VIEW
Marker 1 [T1]
-63.51 dBm
1.332000 ms
Delta 2 [T1]
6.55 dB
330.000000 us
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
Center 2.441 GHz
300 us/

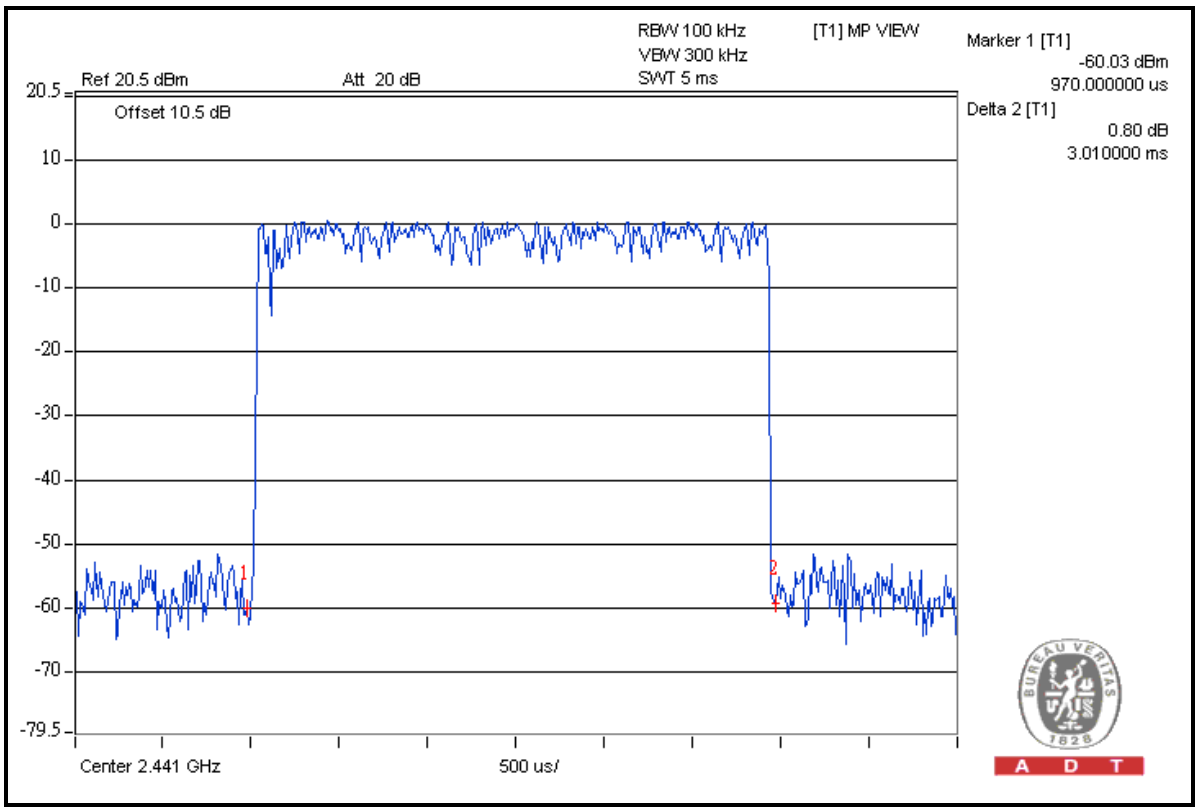
DH3


RBW 100 kHz
VBW 300 kHz
SWT 5 s
[T1] MP CLRWR
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
Center 2.441 GHz
500 ms/


RBW 100 kHz
VBW 300 kHz
SWT 5 ms
[T1] MP VIEW
Marker 1 [T1]
-63.43 dBm
1.620000 ms
Delta 2 [T1]
1.82 dB
1.740000 ms
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
Center 2.441 GHz
500 us/

DH5


RBW 100 kHz
VBW 300 kHz
SWT 5 s
[T1] MP CLRWR
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
Center 2.441 GHz
500 ms/

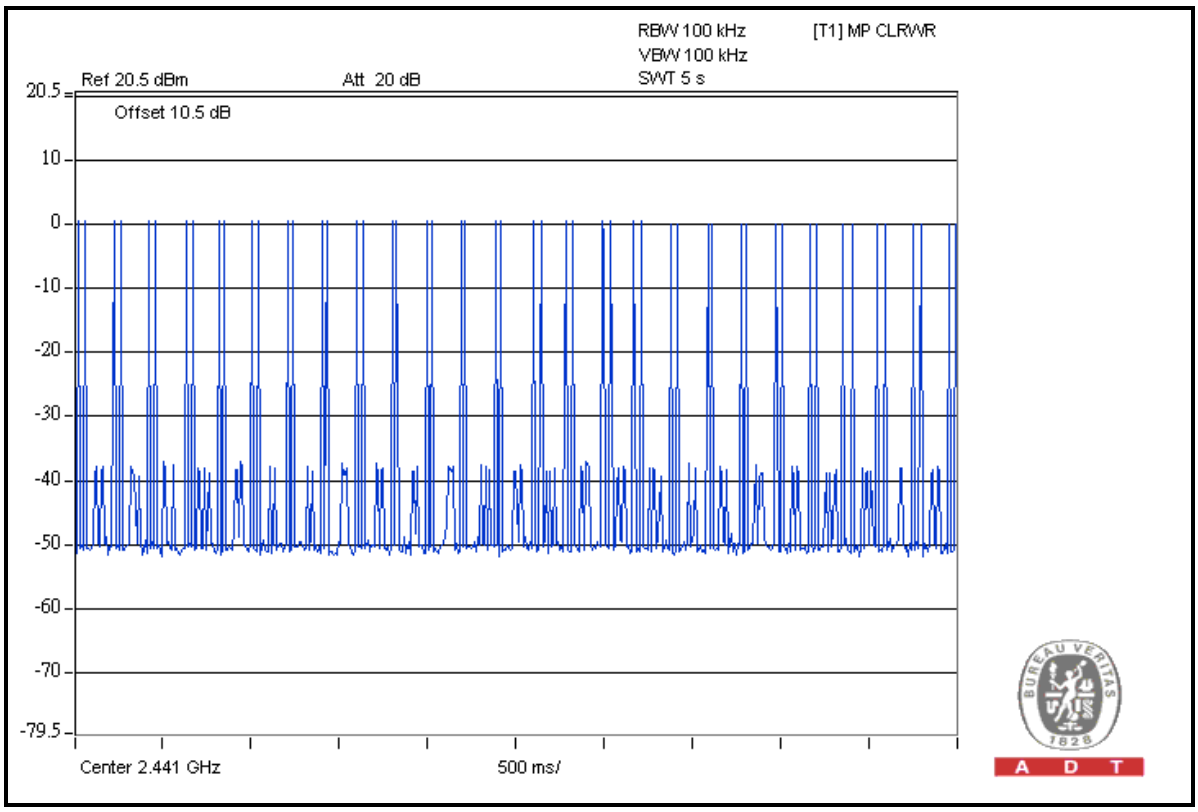

RBW 100 kHz
VBW 300 kHz
SWT 5 ms
[T1] MP VIEW
Marker 1 [T1]
-60.03 dBm
970.000000 us
Delta 2 [T1]
0.80 dB
3.010000 ms
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
Center 2.441 GHz
500 us/

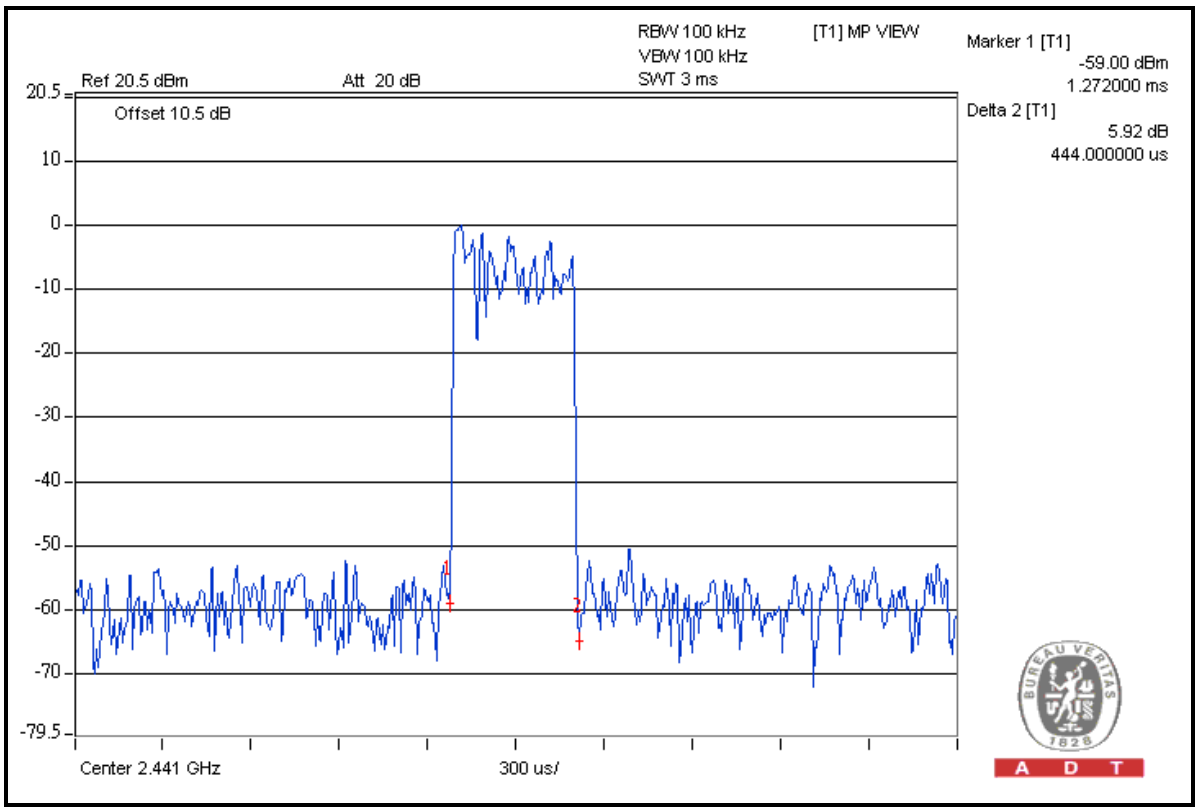
For 8DPSK

Mode	Number of transmission in a 31.6 (79Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (msec)
DH1	51 (times / 5 sec) *6.32=322.32 times	0.444	143.11	400
DH3	26 (times / 5 sec) *6.32=164.32 times	1.69	277.7	400
DH5	18 (times / 5 sec) *6.32=113.76 times	2.97	337.87	400

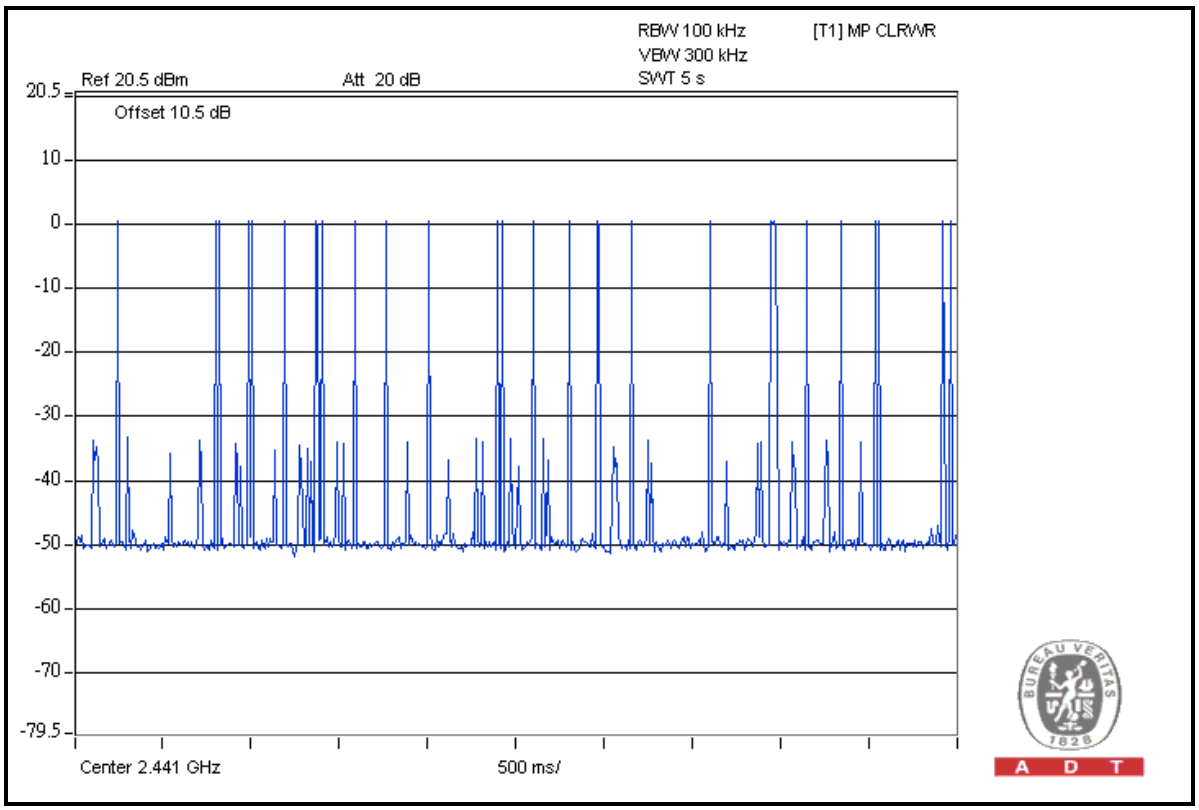
NOTE: Test plots of the transmitting time slot are shown on next 3 pages.

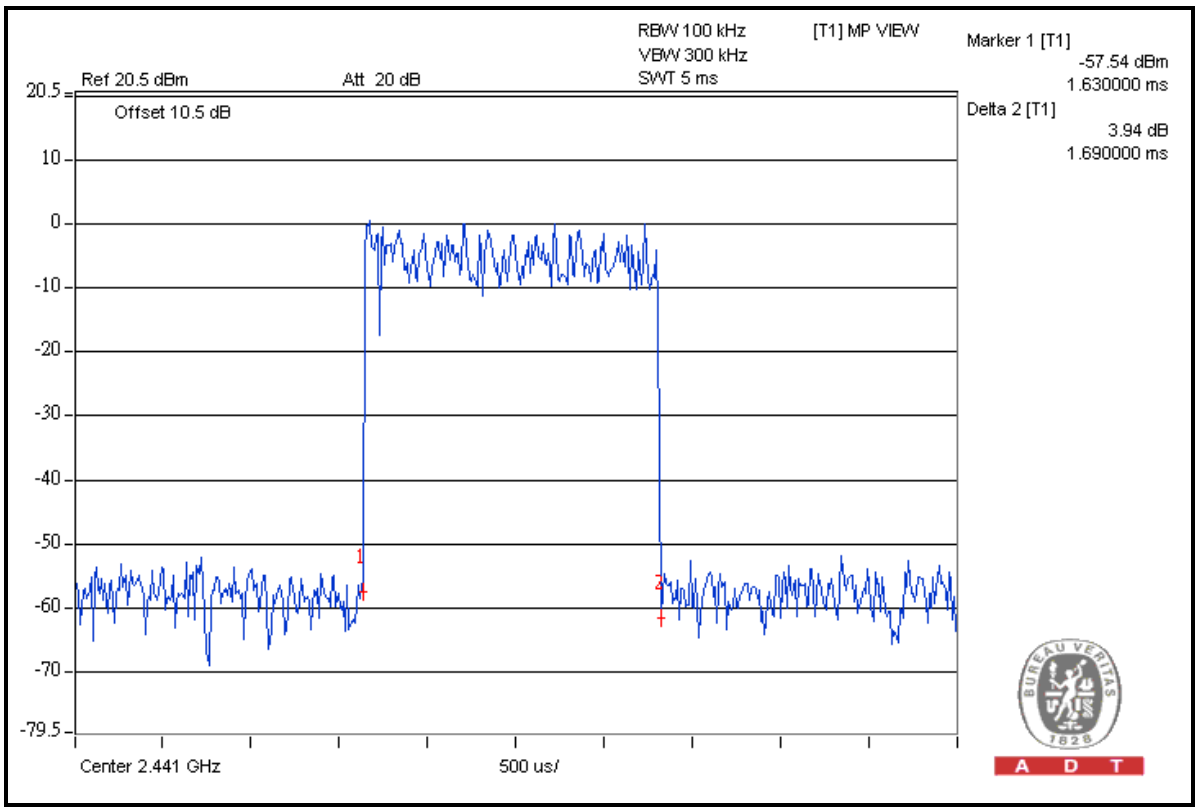
DH1


RBW 100 kHz
VBW 100 kHz
SWT 5 s
[T1] MP CLRWR
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
Center 2.441 GHz
500 ms/

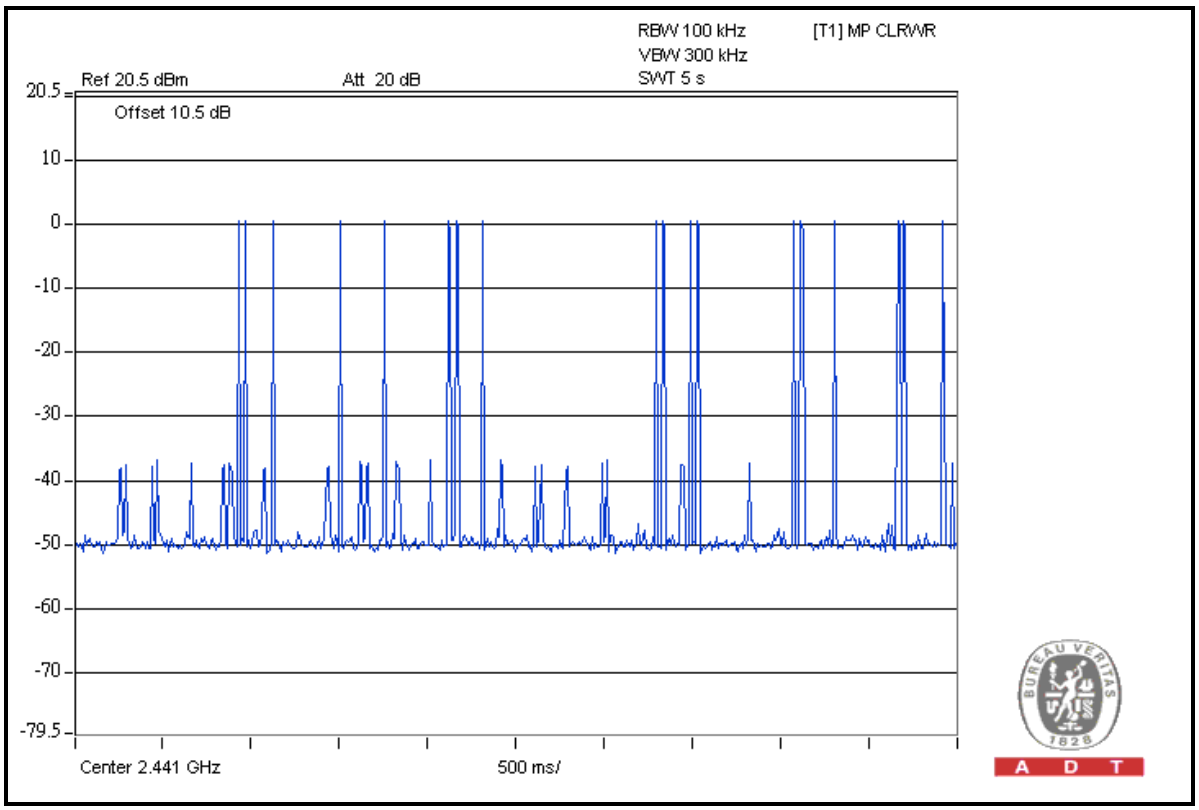

RBW 100 kHz
VBW 100 kHz
SWT 3 ms
[T1] MP VIEW
Marker 1 [T1]
-59.00 dBm
1.272000 ms
Delta 2 [T1]
5.92 dB
444.000000 us
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
Center 2.441 GHz
300 us/

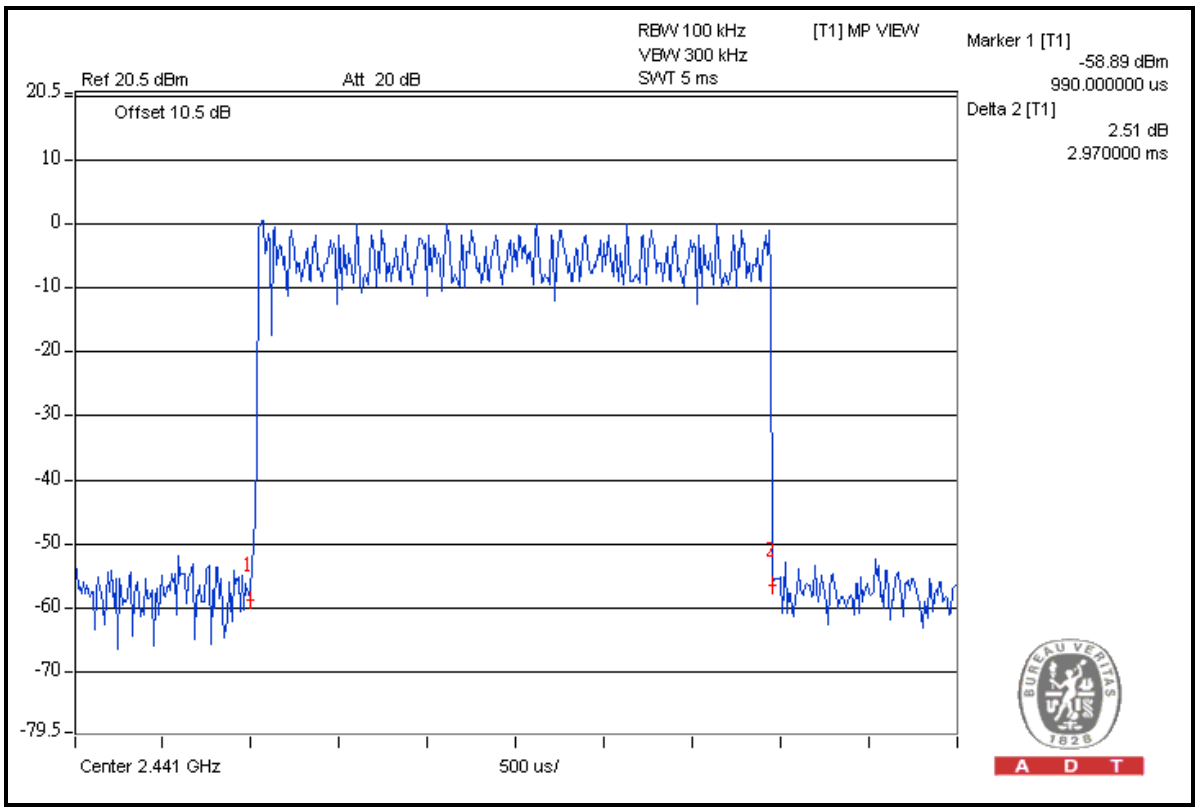
DH3


RBW 100 kHz
VBW 300 kHz
SWT 5 s
[T1] MP CLRWR
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
Center 2.441 GHz
500 ms/


RBW 100 kHz
VBW 300 kHz
SWT 5 ms
[T1] MP VIEW
Marker 1 [T1]
-57.54 dBm
1.630000 ms
Delta 2 [T1]
3.94 dB
1.690000 ms
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
Center 2.441 GHz
500 us/

DH5


RBW 100 kHz
VBW 300 kHz
SWT 5 s
[T1] MP CLRWR
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
Center 2.441 GHz
500 ms/


RBW 100 kHz
VBW 300 kHz
SWT 5 ms
[T1] MP VIEW
Marker 1 [T1]
-58.89 dBm
990.000000 us
Delta 2 [T1]
2.51 dB
2.970000 ms
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
Center 2.441 GHz
500 us/

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 20dBbandwidth of hopping channel shell be a minimum limit for the hopping channel separation.

4.5.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S Spectrum Analyzer	FSP 40	100036	Dec. 14, 2011	Dec. 13, 2012

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. Tested: Apr. 12, 2012

4.5.3 TEST PROCEDURE

a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

b. 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.

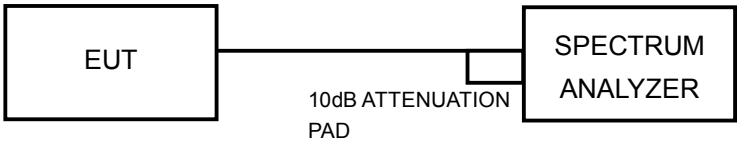
c. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.

d. Repeat above procedures until all frequencies measured were complete.

4.5.4 DEVIATION FROM TEST STANDARD

No deviation

4.5.5 TEST SETUP



4.5.6 EUT OPERATING CONDITION

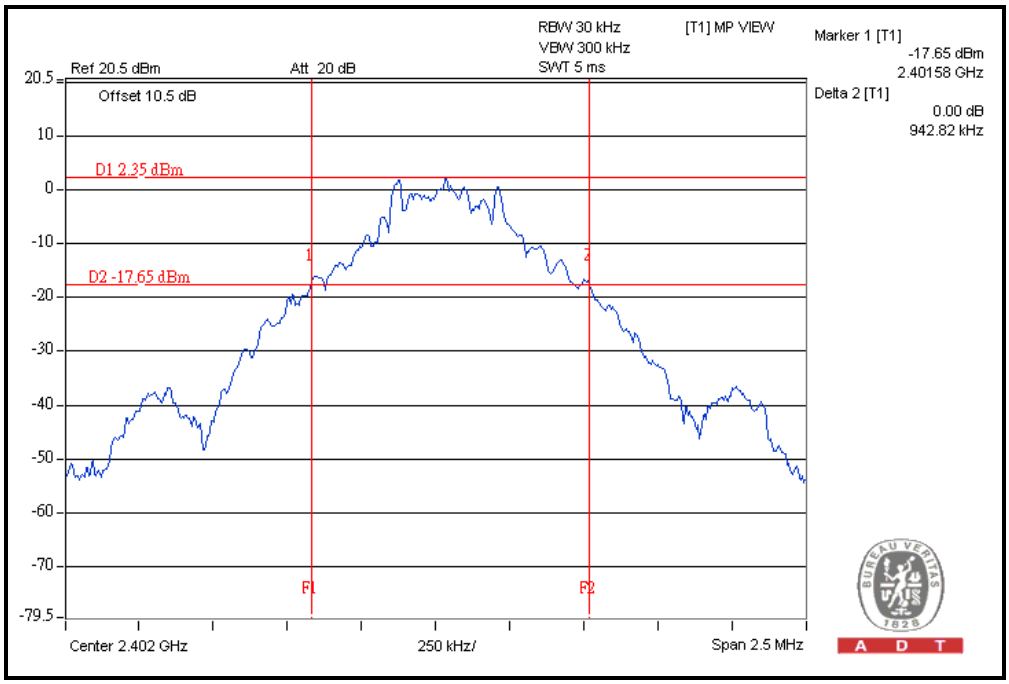
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.5.7 TEST RESULTS

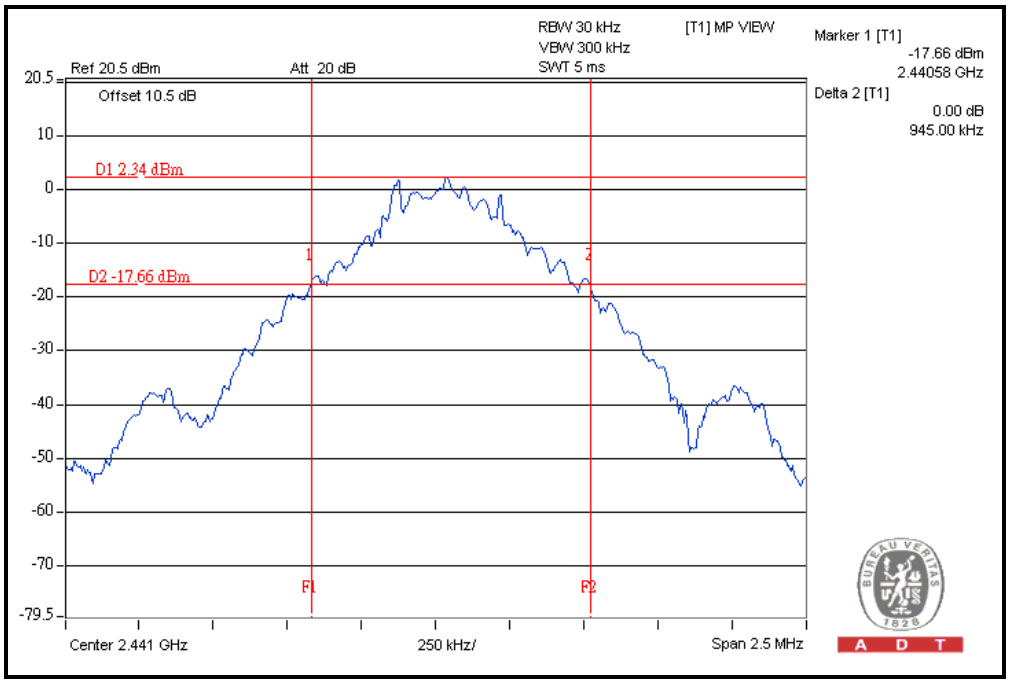
For GFSK

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
0	2402	0.94
39	2441	0.94
78	2480	0.94

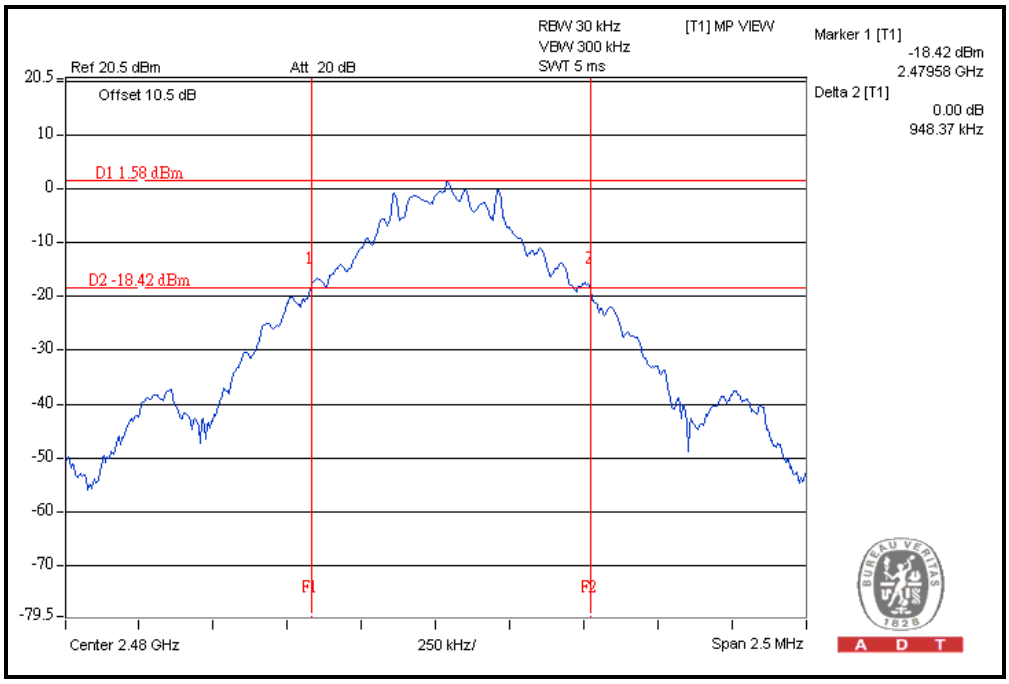
CH 0



CH 39


RBW 30 kHz
VBW 300 kHz
SWT 5 ms
[T1] MP VIEW
Marker 1 [T1]
-17.66 dBm
2.44058 GHz
Delta 2 [T1]
0.00 dB
945.00 kHz
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
D1 2.34 dBm
D2 -17.66 dBm
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
F1
F2
Center 2.441 GHz
250 kHz/
Span 2.5 MHz

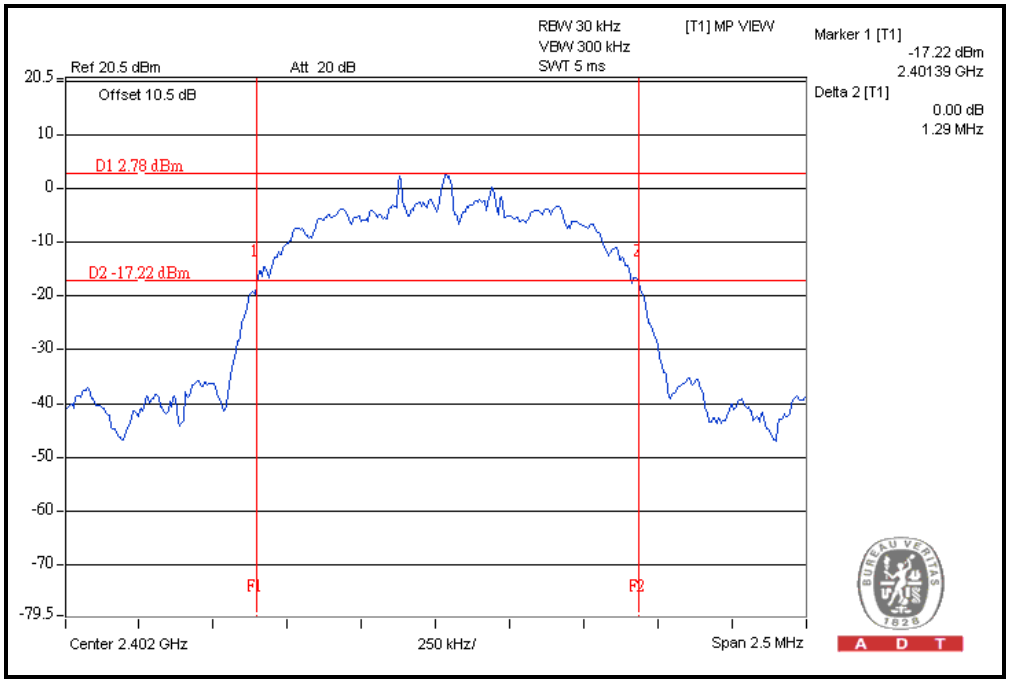
CH 78


RBW 30 kHz
VBW 300 kHz
SWT 5 ms
[T1] MP VIEW
Marker 1 [T1]
-18.42 dBm
2.47958 GHz
Delta 2 [T1]
0.00 dB
948.37 kHz
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
D1 1.58 dBm
D2 -18.42 dBm
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
F1
F2
Center 2.48 GHz
250 kHz/
Span 2.5 MHz

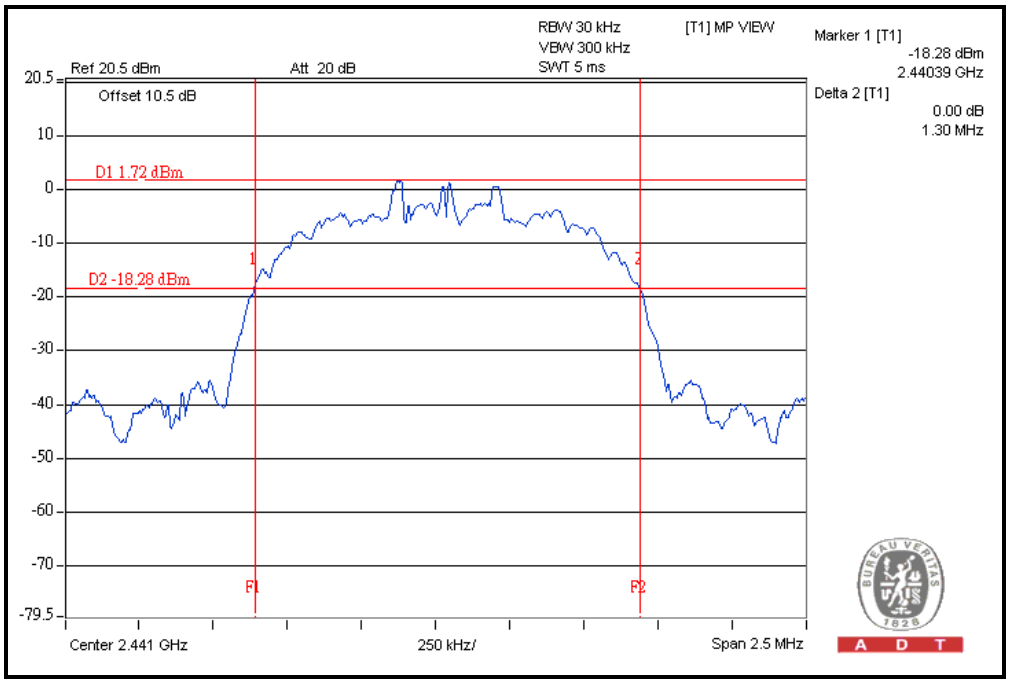
For 8DPSK

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
0	2402	1.29
39	2441	1.30
78	2480	1.30

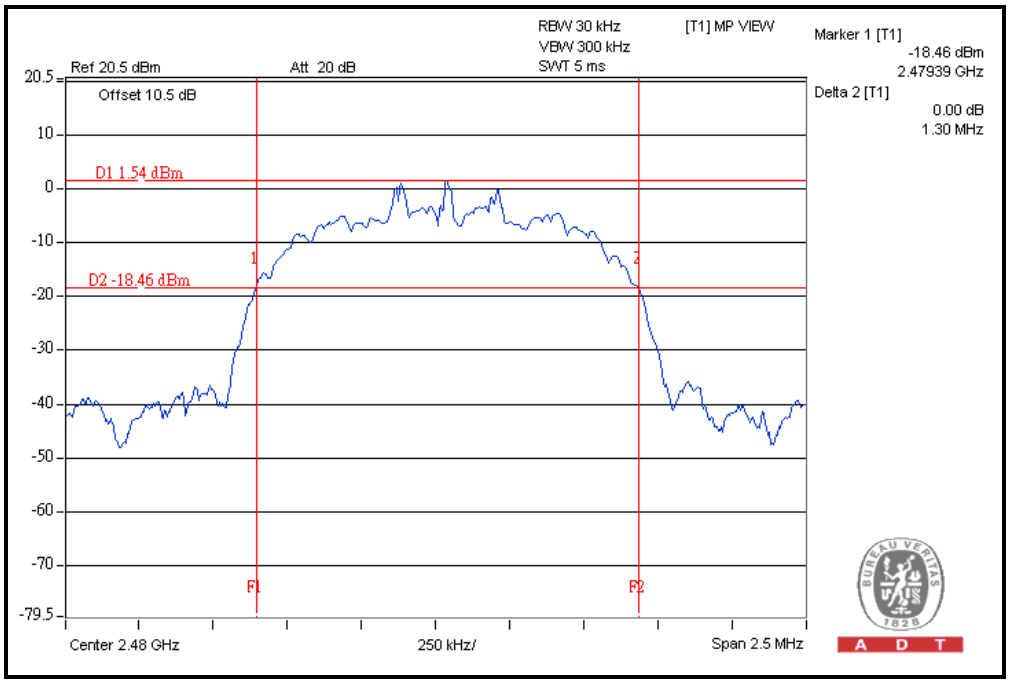
CH 0



CH 39


RBW 30 kHz
VBW 300 kHz
SWT 5 ms
[T1] MP VIEW
Marker 1 [T1]
-18.28 dBm
2.44039 GHz
Delta 2 [T1]
0.00 dB
1.30 MHz
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
D1 1.72 dBm
D2 -18.28 dBm
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
F1
F2
Center 2.441 GHz
250 kHz/
Span 2.5 MHz

CH 78


RBW 30 kHz
VBW 300 kHz
SWT 5 ms
[T1] MP VIEW
Marker 1 [T1]
-18.46 dBm
2.47939 GHz
Delta 2 [T1]
0.00 dB
1.30 MHz
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
D1 1.54 dBm
D2 -18.46 dBm
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
F1
F2
Center 2.48 GHz
250 kHz/
Span 2.5 MHz

4.6 HOPPING CHANNEL SEPARATION

4.6.1 LIMIT OF HOPPING CHANNEL SEPARATION

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

4.6.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S Spectrum Analyzer	FSP 40	100036	Dec. 14, 2011	Dec. 13, 2012

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. Tested date: Apr. 12, 2012

4.6.3 TEST PROCEDURES

a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.

c. By using the MaxHold function record the separation of two adjacent channels.

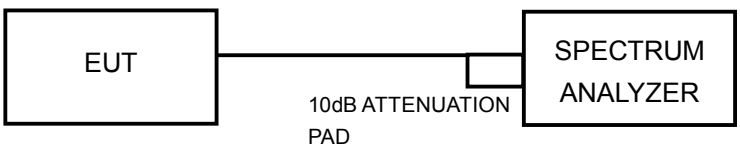
d. Measure the frequency difference of these two adjacent channels by SA MARK function. And then plot the result on SA screen.

e. Repeat above procedures until all frequencies measured were complete.

4.6.4 DEVIATION FROM TEST STANDARD

No deviation

4.6.5 TEST SETUP



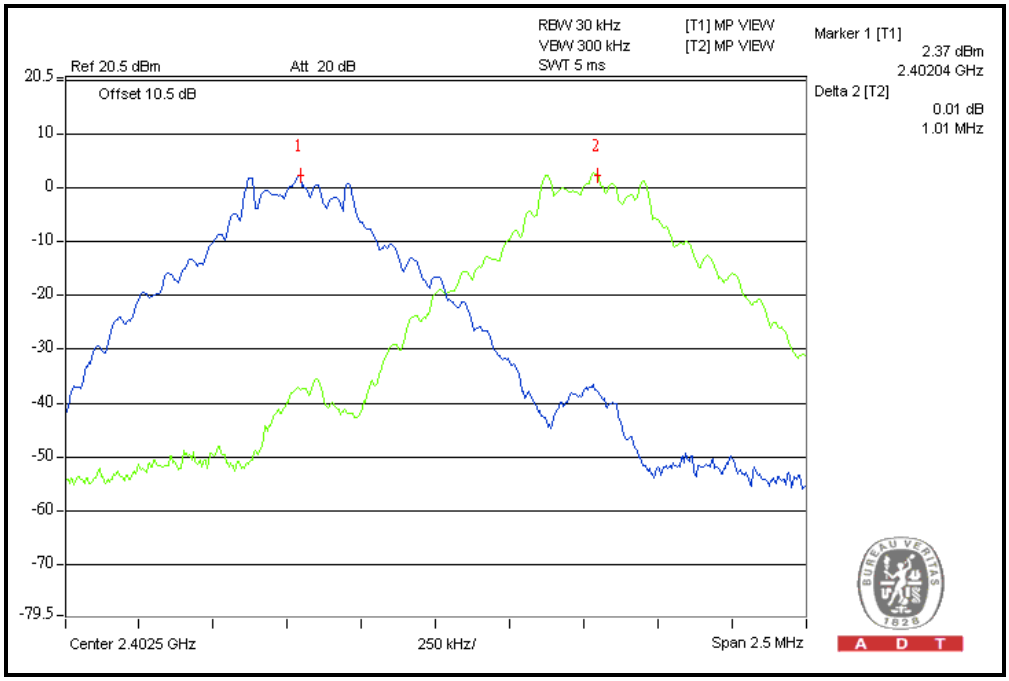
4.6.6 TEST RESULTS

For GFSK

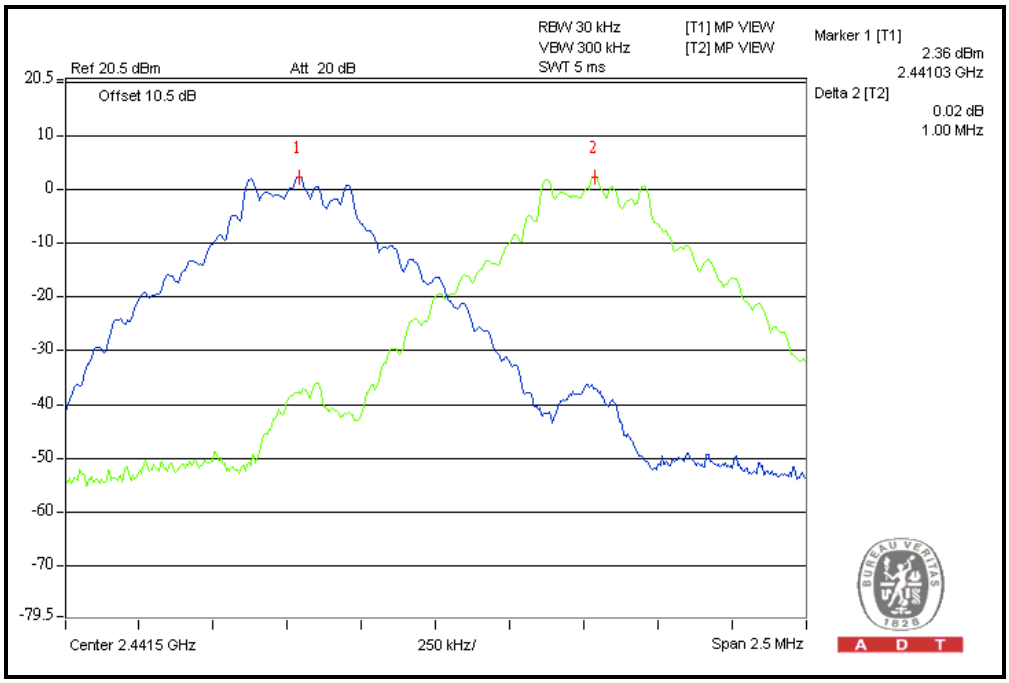
Channel	Frequency (MHz)	Adjacent Channel Separation (MHz)	Minimum Limit (MHz)	Pass / Fail
0	2402	1.01	0.63	PASS
39	2441	1.00	0.63	PASS
78	2480	1.01	0.63	PASS

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

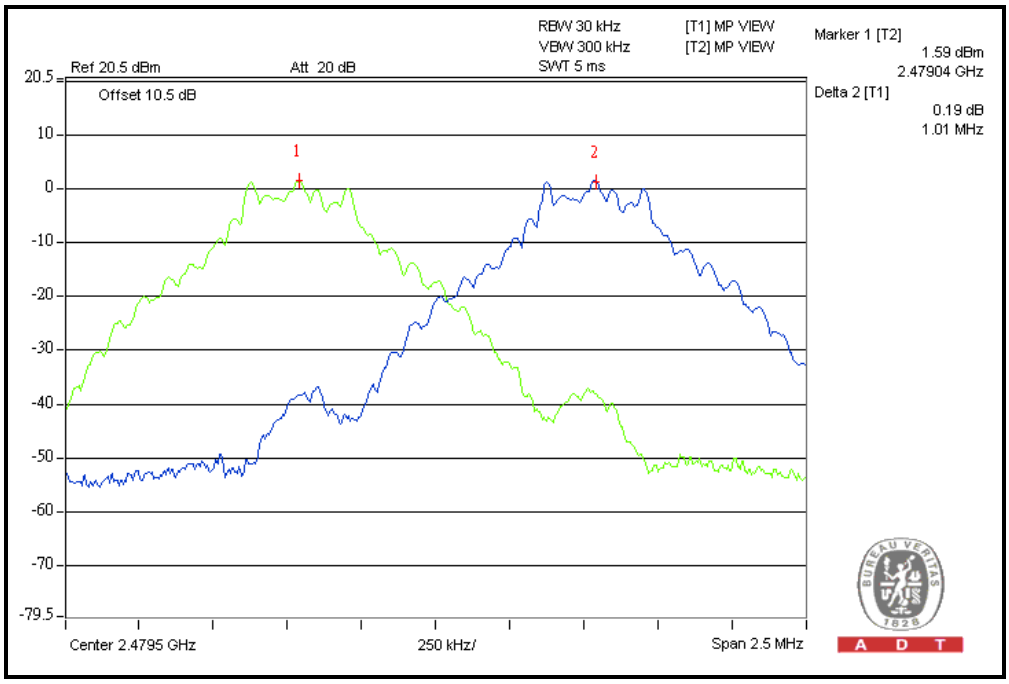
CH 0



CH 39


RBW 30 kHz
VBW 300 kHz
SWT 5 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
2.36 dBm
2.44103 GHz
Delta 2 [T2]
0.02 dB
1.00 MHz
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
Center 2.4415 GHz
250 kHz/
Span 2.5 MHz

CH 78

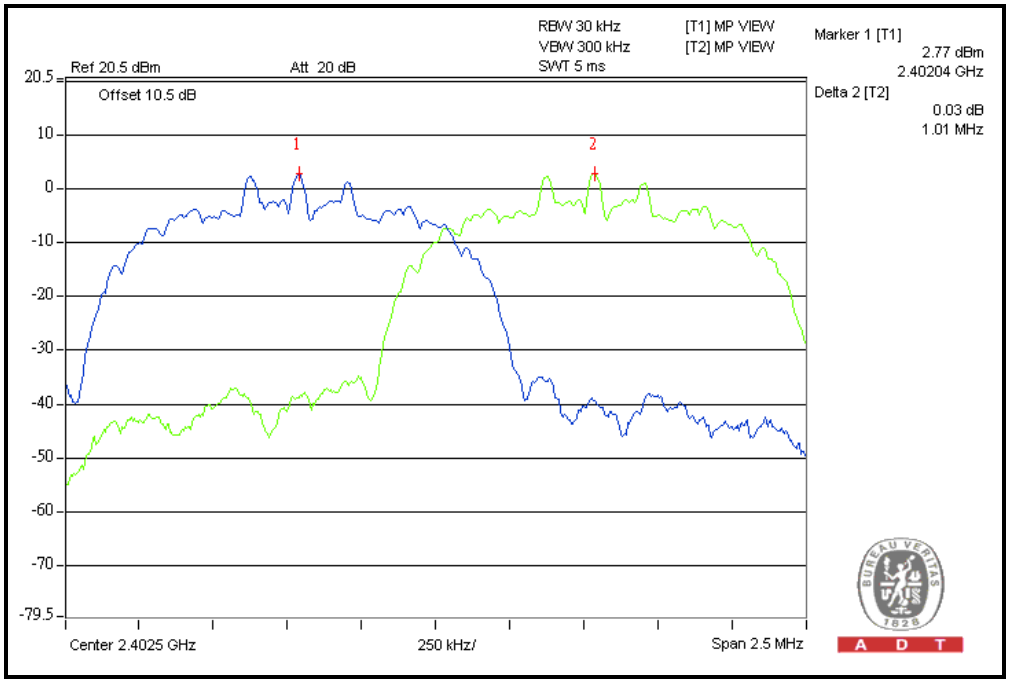

RBW 30 kHz
VBW 300 kHz
SWT 5 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T2]
1.59 dBm
2.47904 GHz
Delta 2 [T1]
0.19 dB
1.01 MHz
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
Center 2.4795 GHz
250 kHz/
Span 2.5 MHz

For 8DPSK

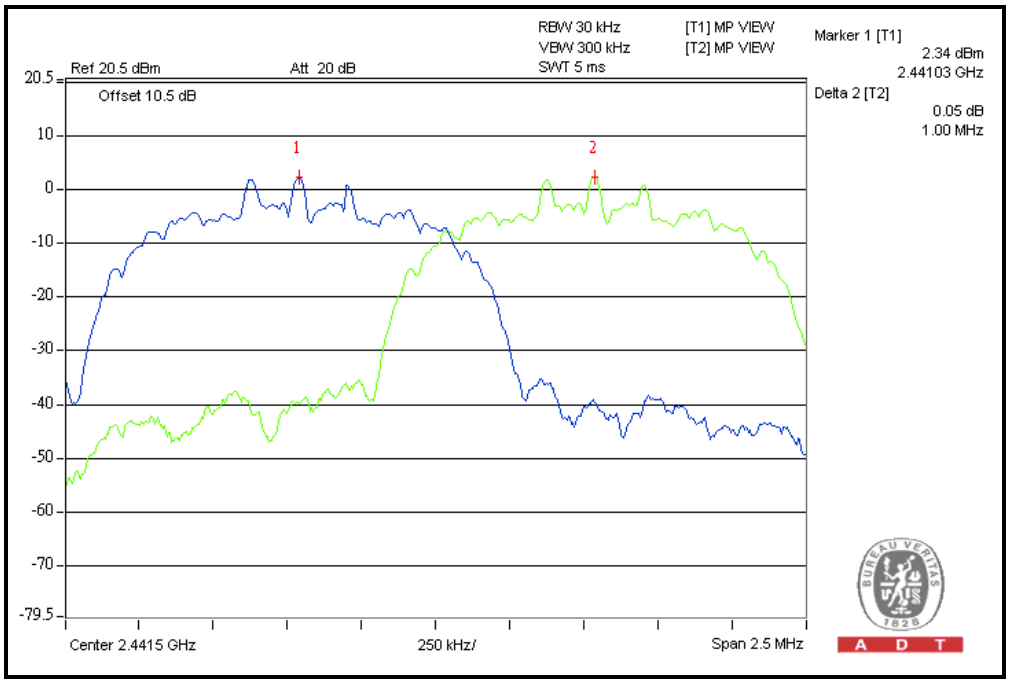
Channel	Frequency (MHz)	Adjacent Channel Separation (MHz)	Minimum Limit (MHz)	Pass / Fail
0	2402	1.01	0.86	PASS
39	2441	1.00	0.87	PASS
78	2480	1.00	0.87	PASS

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

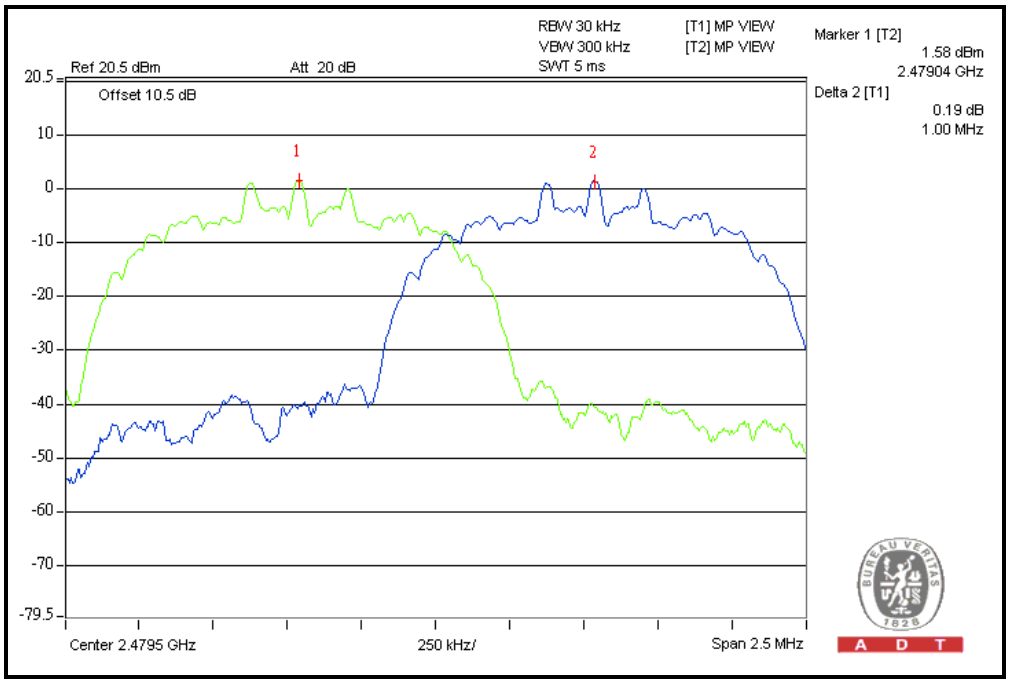
CH 0



CH 39


RBW 30 kHz
VBW 300 kHz
SWT 5 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T1]
2.34 dBm
2.44103 GHz
Delta 2 [T2]
0.05 dB
1.00 MHz
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
Center 2.4415 GHz
250 kHz/
Span 2.5 MHz

CH 78


RBW 30 kHz
VBW 300 kHz
SWT 5 ms
[T1] MP VIEW
[T2] MP VIEW
Marker 1 [T2]
1.58 dBm
2.47904 GHz
Delta 2 [T1]
0.19 dB
1.00 MHz
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
Center 2.4795 GHz
250 kHz/
Span 2.5 MHz

4.7 MAXIMUM PEAK OUTPUT POWER

4.7.1 LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT

The Maximum Peak Output Power Limit is 125mW.

4.7.2 INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S Spectrum Analyzer	FSP 40	100036	Dec. 14, 2011	Dec. 13, 2012

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. Tested date: Apr. 12, 2012

4.7.3 TEST PROCEDURES

a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

b. 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.

c. The center frequency of the spectrum analyzer is set to the fundamental frequency and using 3MHz RBW and 10 MHz VBW.

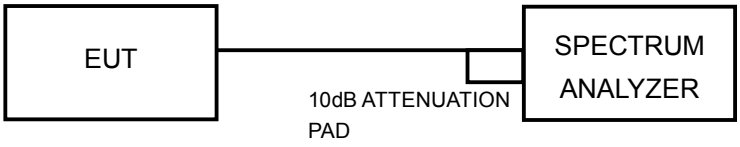
d. Measure the captured power within the band and recording the plot.

e. Repeat above procedures until all frequencies required were complete.

4.7.4 DEVIATION FROM TEST STANDARD

No deviation

4.7.5 TEST SETUP



For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

4.7.6 EUT OPERATING CONDITION

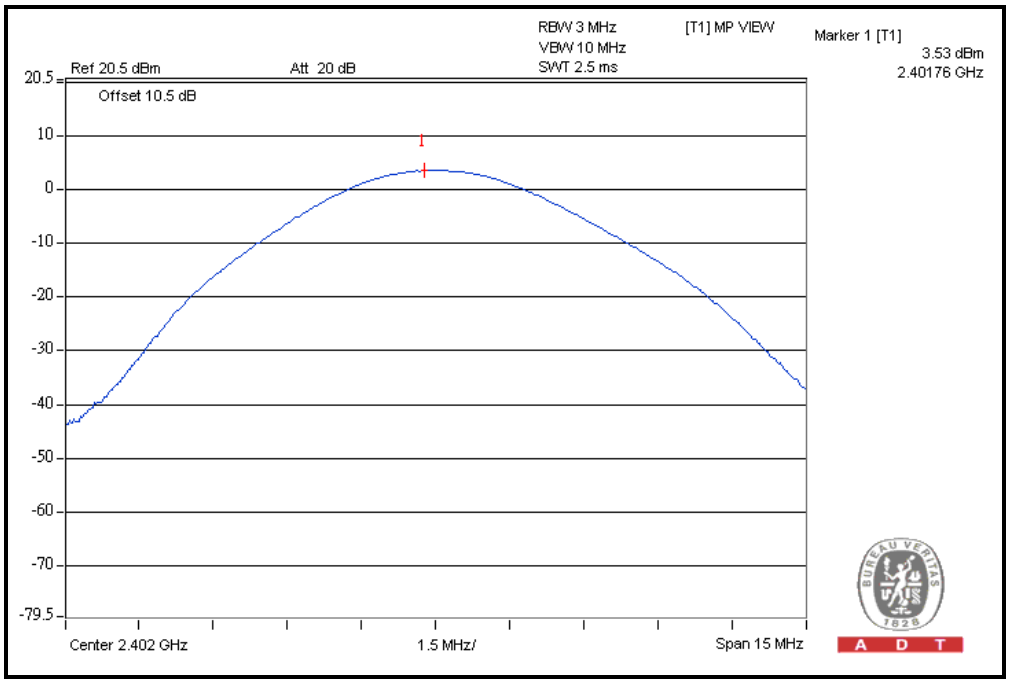
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.7.7 TEST RESULTS

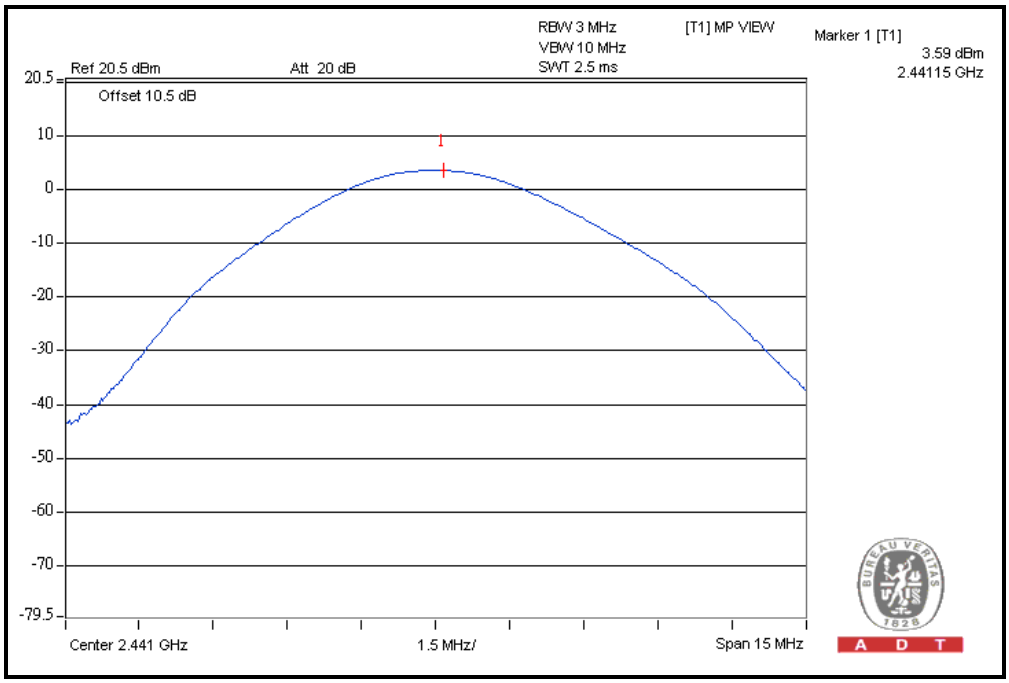
For GFSK

CHANNEL	CHANNEL FREQUENCY (MHz)	POWER OUTPUT (dBm)	POWER OUTPUT (mW)	POWER LIMIT (mW)	PASS/FAIL
0	2402	3.53	2.254	125	PASS
39	2441	3.59	2.286	125	PASS
78	2480	2.80	1.905	125	PASS

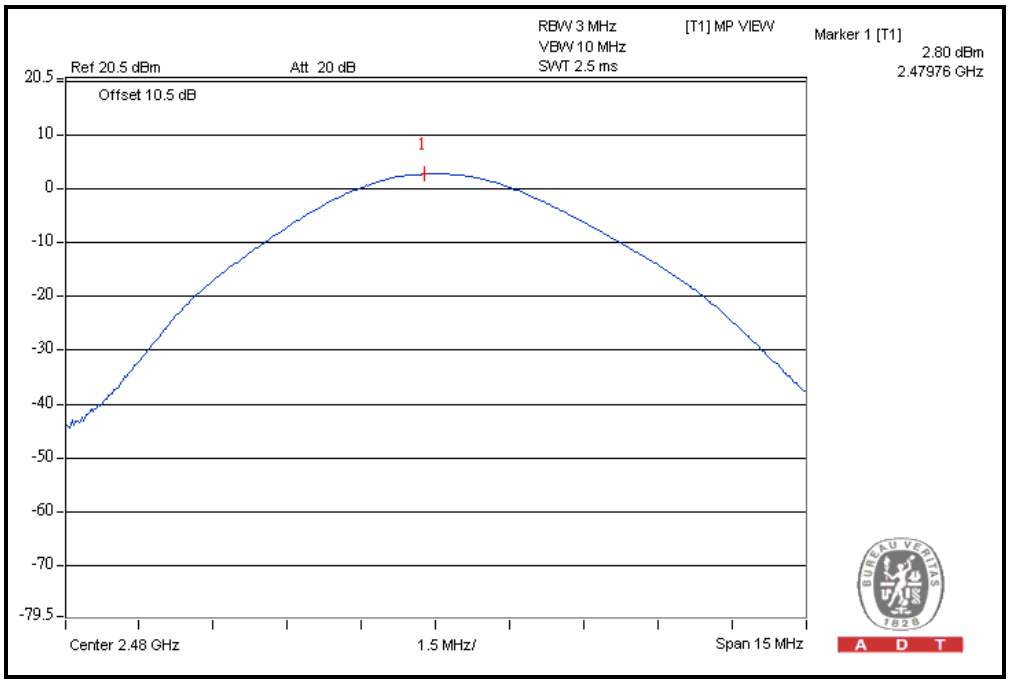
CH 0



CH 39


RBW 3 MHz
VBW 10 MHz
SWT 2.5 ms
[T1] MP VIEW
Marker 1 [T1]
3.59 dBm
2.44115 GHz
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
Center 2.441 GHz
1.5 MHz/
Span 15 MHz

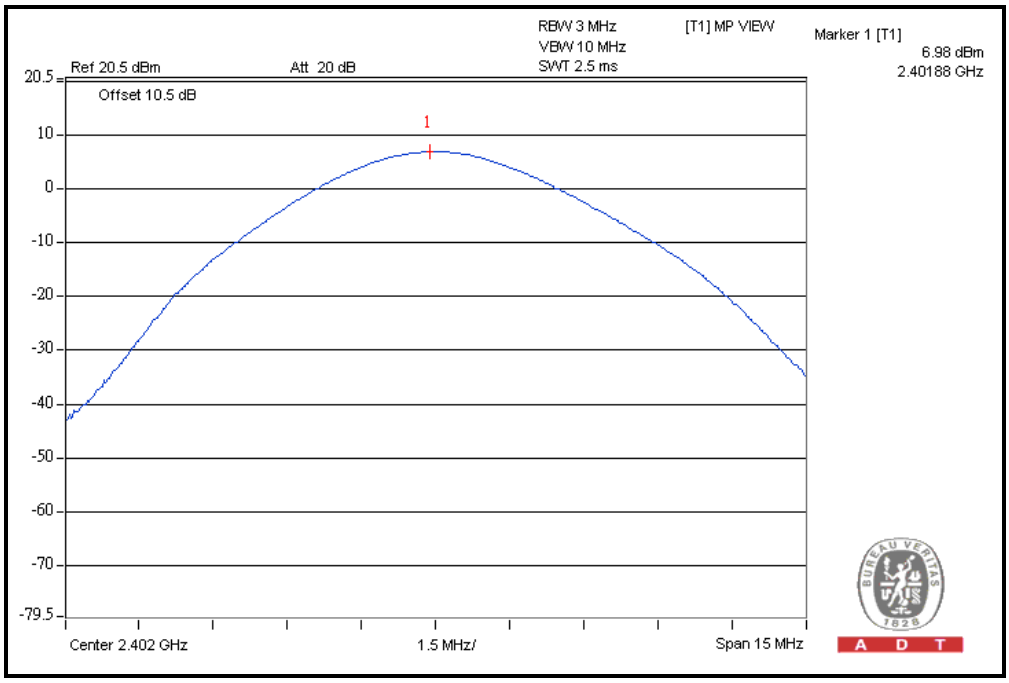
CH 78


RBW 3 MHz
VBW 10 MHz
SWT 2.5 ms
[T1] MP VIEW
Marker 1 [T1]
2.80 dBm
2.47976 GHz
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
Center 2.48 GHz
1.5 MHz/
Span 15 MHz

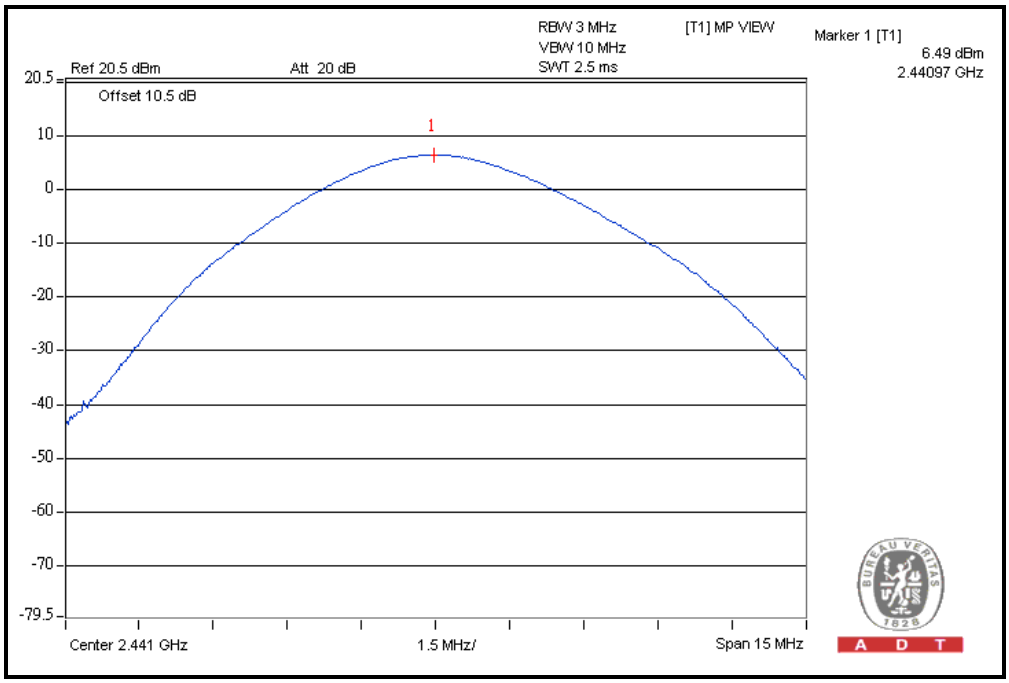
For 8DPSK

CHANNEL	CHANNEL FREQUENCY (MHz)	POWER OUTPUT (dBm)	POWER OUTPUT (mW)	POWER LIMIT (mW)	PASS/FAIL
0	2402	6.98	4.989	125	PASS
39	2441	6.49	4.457	125	PASS
78	2480	5.82	3.819	125	PASS

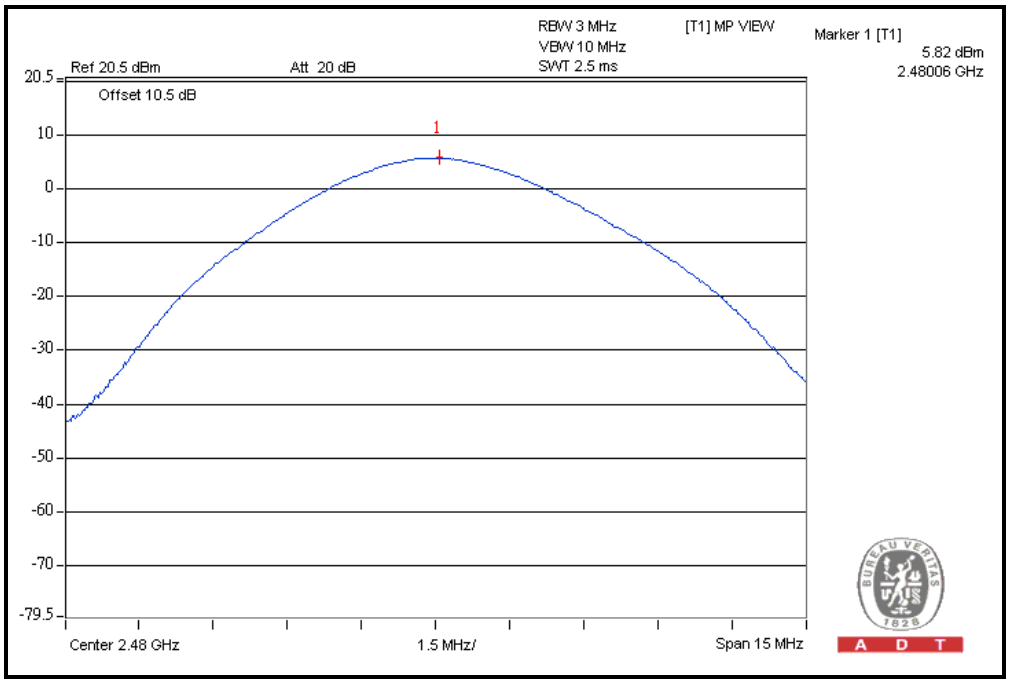
CH 0



CH 39


RBW 3 MHz
VBW 10 MHz
SWT 2.5 ms
[T1] MP VIEW
Marker 1 [T1]
6.49 dBm
2.44097 GHz
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
Center 2.441 GHz
1.5 MHz/
Span 15 MHz

CH 78


RBW 3 MHz
VBW 10 MHz
SWT 2.5 ms
[T1] MP VIEW
Marker 1 [T1]
5.82 dBm
2.48006 GHz
Ref 20.5 dBm
Att 20 dB
Offset 10.5 dB
20.5
10
0
-10
-20
-30
-40
-50
-60
-70
-79.5
Center 2.48 GHz
1.5 MHz/
Span 15 MHz

4.8 AVERAGE OUTPUT POWER

4.8.1 FOR REFERENCE.

4.8.2 INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Power Meter	ML2495A	0824006	May 04, 2011	May 03, 2012
Average Power Sensor	MA2411B	0738172	May 03, 2011	May 02, 2012

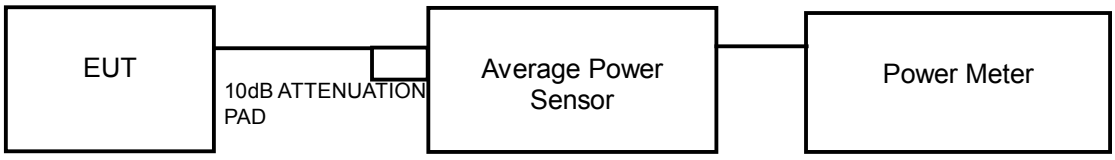
Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. Tested date : Apr. 12, 2012

4.8.3 TEST PROCEDURES

1. The transmitter output was connected to the power meter through an attenuator, the bandwidth of the fundamental frequency was measured with the power meter.
2. Record the average power level.

4.8.4 TEST SETUP



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

For GFSK

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER OUTPUT (dBm)
0	2402	3.63
39	2441	3.71
78	2480	2.91

For 8DPSK

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER OUTPUT (dBm)
0	2402	7.22
39	2441	6.55
78	2480	5.92

4.9 CONDUCTED OUT-BAND EMISSION MEASUREMENT

4.8.1 LIMITS OF CONDUCTED OUT-BAND EMISSION MEASUREMENT

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

4.8.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S Spectrum Analyzer	FSP 40	100036	Dec. 14, 2011	Dec. 13, 2012

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. Tested date: Apr. 12, 2012

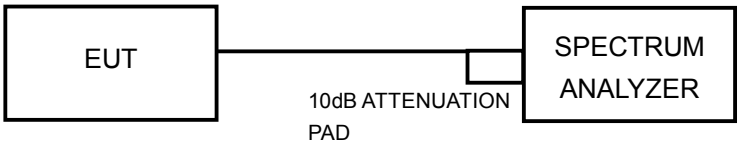
4.8.3 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer via a low lose cable. Set RBW a of spectrum analyzer to 100 kHz and VBW of spectrum analyzer to 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

4.9.1 TEST SETUP



4.8.5 EUT OPERATING CONDITION

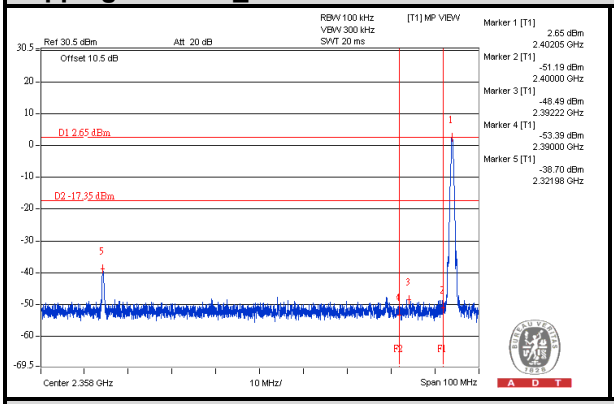
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

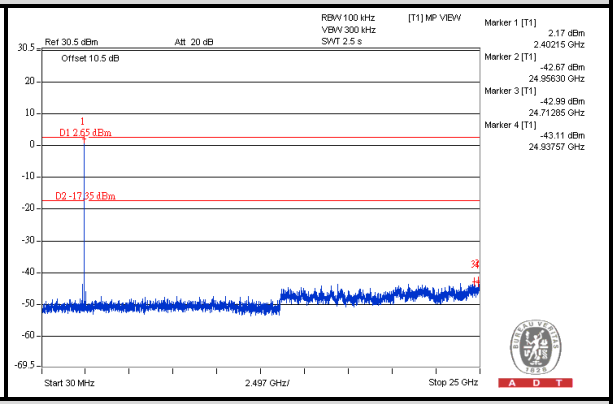
4.8.6 TEST RESULTS

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

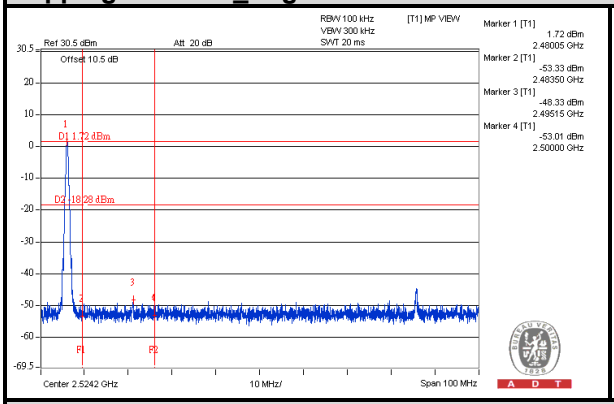
For GFSK

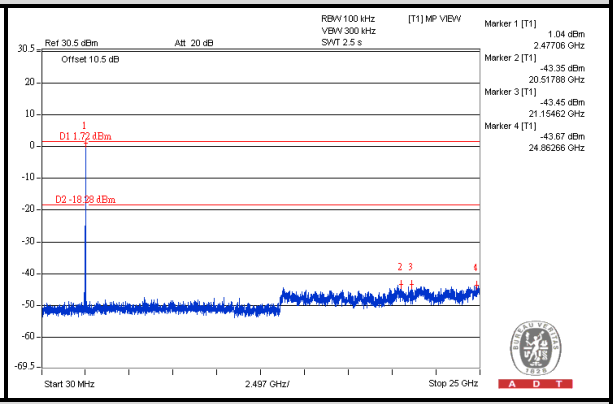
Hopping disabled_ Low Channel



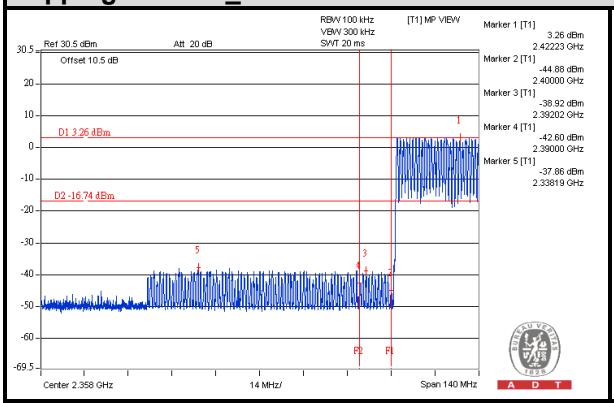


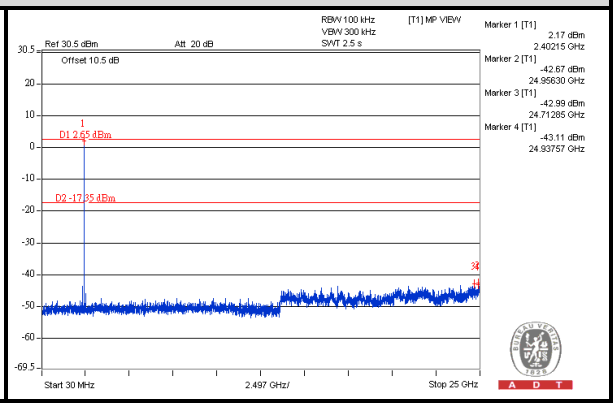
Hopping disabled_ High Channel



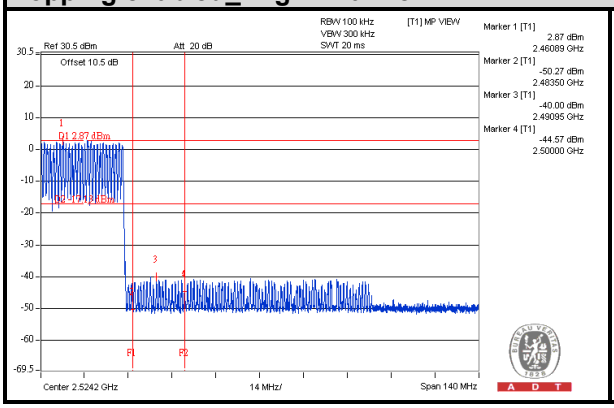


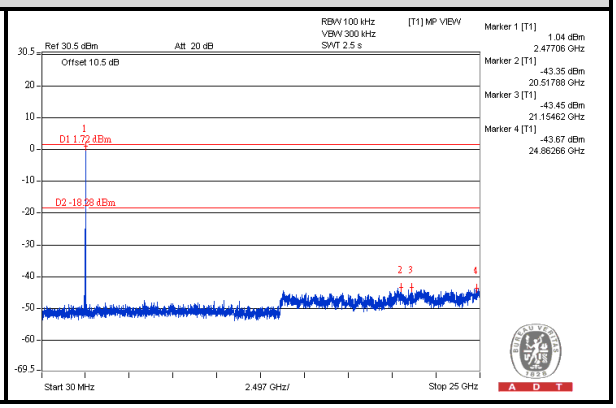
Hopping enabled_ Low Channel





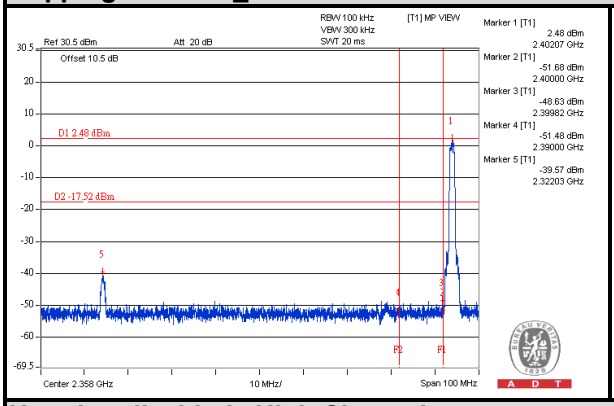
Hopping enabled_ High Channel

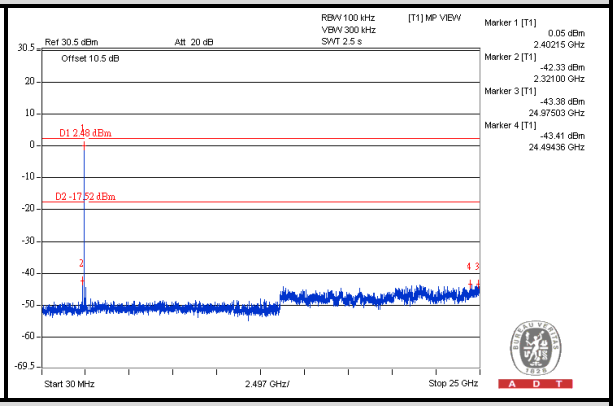




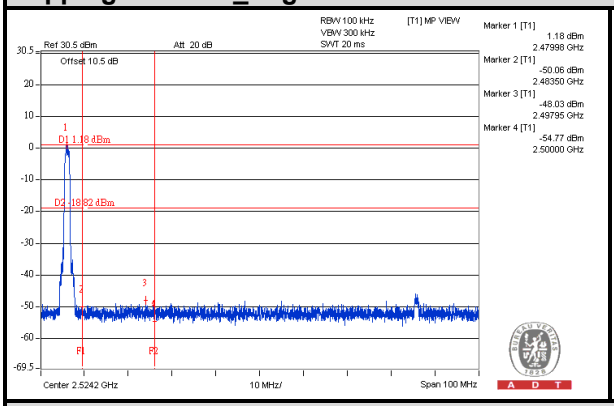
For 8DPSK

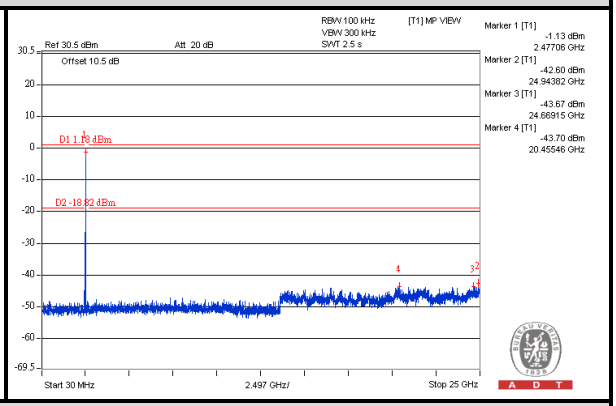
Hopping disabled_ Low Channel



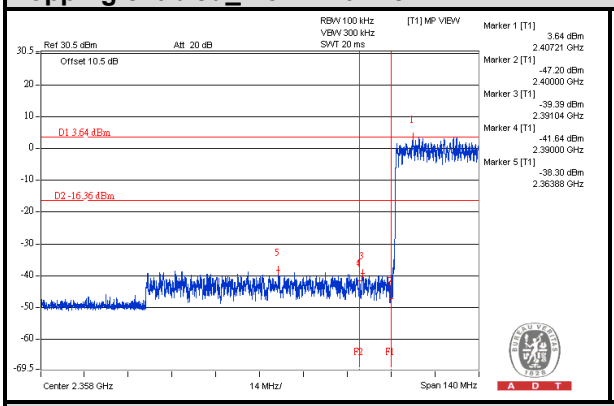


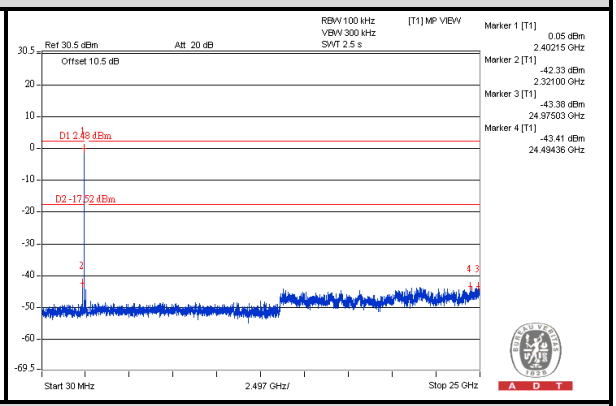
Hopping disabled_ High Channel



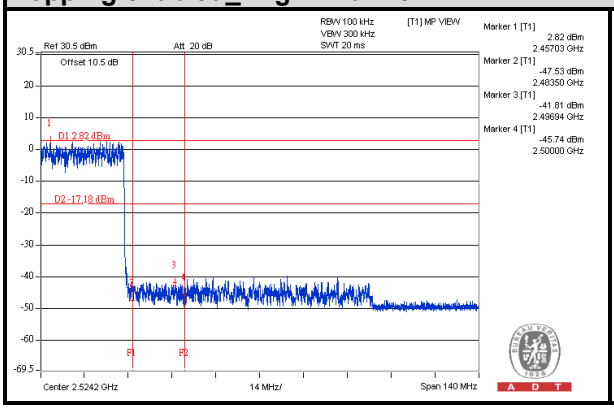


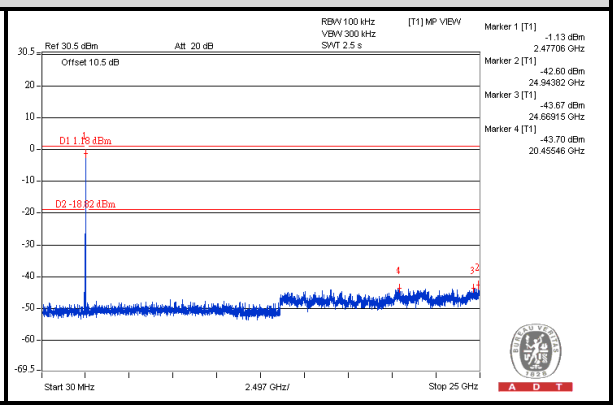
Hopping enabled_ Low Channel





Hopping enabled_ High Channel





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.

Copies of accreditation and authorization certificates of our laboratories obtained from approval agencies can be downloaded from our web site: www.adt.com.tw/index.5.phtml. If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab:
Tel: 886-2-26052180
Fax: 886-2-26052943

Hsin Chu EMC/RF Lab:
Tel: 886-3-5935343
Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety/Telecom Lab:
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Email: service@adt.com.tw
Web Site: www.adt.com.tw

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

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

No modifications were made to the EUT by the lab during the test.

--- END ---