FCC TEST REPORT (BLUETOOTH)

REPORT NO.:	RF110708E01
MODEL NO.:	A-00032
FCC ID:	DZLA00032
RECEIVED:	July 08, 2011
TESTED:	July 13 to 19, 2011
ISSUED:	Aug. 01, 2011
APPLICANT:	Logitech Inc.
ADDRESS:	6505 Kaiser Drive, Fremont, CA 94555 USA
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
TEST LOCATION (1):	No. 81-1, Lu Liao Keng, 9th Ling,Wu Lung Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan
TEST LOCATION (2):	No.49, Ln. 206, Wende Rd., Shangshan Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF110708E01	Original release	Aug. 01, 2011

1 CERTIFICATION

PRODUCT :	Nano Receiver
BRAND NAME :	Logitech
MODEL NO. :	A-00032
TEST SAMPLE :	ENGINEERING SAMPLE
APPLICANT :	Logitech Inc.
TESTED DATE :	July 13 to 19, 2011
STANDARDS :	FCC Part 15, Subpart C (Section 15.247) ANSI C63.4-2003 ANSI C63.10-2009

The above equipment (Model: A-00032) 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 : _____, **DATE:** *Aug. 01, 2011*
(Midoli Peng, Specialist)

APPROVED BY : _____, **DATE:** *Aug. 01, 2011*
(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			
STANDARD SECTION	**TEST TYPE AND LIMIT**	**RESULT**	**REMARK**
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is –6.84dB at 0.158MHz.
15.247(a)(1)(iii)	Number of Hopping Frequency Used Spec.: At least 15 channels	PASS	Meet the requirement of limit.
15.247(a)(1)(iii)	Dwell Time on Each Channel Spec.: Max. 0.4 second within 31.6 second	PASS	Meet the requirement of limit.
15.247(a)(1)	1. Hopping Channel Separation Spec.: Min. 25 kHz or 20 dB bandwidth, whichever is greater 2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	PASS	Meet the requirement of limit.
15.247(b)	Maximum Peak Output Power Spec.: max. 21dBm	PASS	Meet the requirement of limit.
15.247(d)	Transmitter Radiated Emissions Spec.: Table 15.209	PASS	Meet the requirement of limit. Minimum passing margin is –6.9dB at 30.47MHz.
15.247(d)	Conducted Out-Band Emission 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 ME ASUREMENT 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)	3.89 dB
Radiated emissions (1GHz ~18GHz)	2.19 dB
Radiated emissions (18GHz ~40GHz)	2.56 dB

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Nano Receiver
MODEL NO.	A-00032
FCC ID	DZLA00032
POWER SUPPLY	DC 5V from host equipment
MODULATION TYPE	GFSK, π/4-DQPSK, 8DPSK
MODULATION TECHNOLOGY	FHSS
DATE RATE	1/2/3Mbps
FREQUENCY RANGE	2402MHz ~ 2480MHz
NUMBER OF CHANNEL	79
MAX. OUTPUT POWER	4.3mW
ANTENNA TYPE	PCB printed antenna with -4.83dBi antenna gain
DATA CABLE	NA
I/O PORTS	NA
ASSOCIATED DEVICES	NA

NOTE:

1. The above EUT information was declared by the manufacturer and for more detailed feature descriptions, please refer to the manufacturer's specifications or User's Manual.

3.2 DESCRIPTION OF TEST MODES

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		

3.3 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

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	39	FHSS	GFSK	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	39	FHSS	GFSK	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

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
0 to 78	0, 39, 78	FHSS	π/4-DQPSK	DH5

Conducted Out-Band Emission 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

TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (system)	TESTED BY
PLC	24deg. C, 54%RH	120Vac, 60 Hz	Andy Ho
RE<1G	23deg. C, 70%RH	120Vac, 60 Hz	Nelson Teng
RE≥1G	27deg. C, 65%RH	120Vac, 60 Hz	Nelson Teng
APCM	25deg. C, 60%RH	120Vac, 60 Hz	Rex Huang
OB	25deg. C, 60%RH	120Vac, 60 Hz	Rex Huang

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 C63.4-2003
ANSI C63.10-2009

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

NOTE: The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

3.5 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.

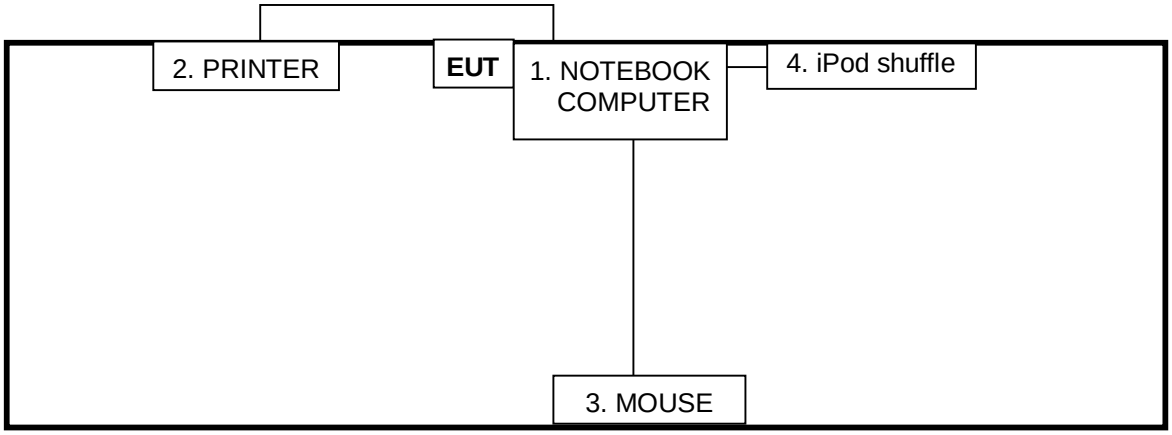
For Conducted test					
NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK COMPUTER	DELL	PP32LA	DSLB32S	FCC DoC
2	PRINTER	EPSON	LQ-300+II	G88Y074085	FCC DoC
3	MOUSE	DELL	MOC5UO	l1401LVG	FCC DoC
4	iPod shuffle	Apple	MC749TA/A	CC4DMFKUDFDM	FCC DoC
For other test items					
NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK COMPUTER	DELL	PP32LA	GSLB32S	FCC DoC
2	iPod shuffle	Apple	MC749TA/A	CC4DM9M8DFDM	FCC DoC

For Conducted test	
No.	Signal cable description of the above support units
1	NA
2	USB cable, 1.8m
3	USB cable, 1.8m
4	USB cable, 0.1m
For other test items	
NO.	Signal cable description of the above support units
1	NA
2	USB cable, 0.1m

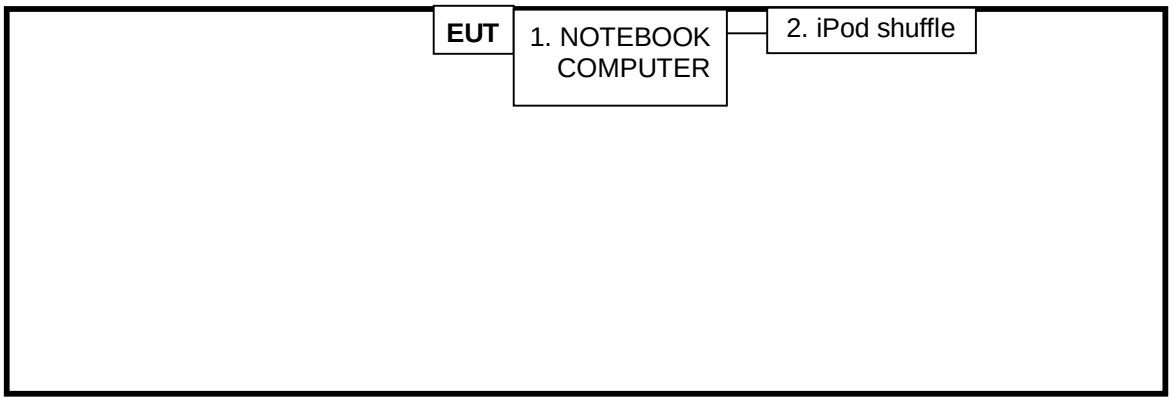
NOTE: All power cords of the above support units are non shielded (1.8m).

3.6 CONFIGURATION OF SYSTEM UNDER TEST

For Conducted 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

Test date: July 13, 2011

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver	ESCS 30	100375	Mar. 09, 2011	Mar. 08, 2012
Line-Impedance Stabilization Network (for EUT)	NSLK 8127	8127-522	Sep. 08, 2010	Sep. 07, 2011
Line-Impedance Stabilization Network (for Peripheral)	ESH3-Z5	848773/004	Nov. 03, 2010	Nov. 02, 2011
RF Cable (JYEBAO)	5DFB	COCCAB-002	Aug. 30, 2010	Aug. 29, 2011
50 ohms Terminator	50	3	Nov. 03, 2010	Nov. 02, 2011
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. C.
3 The VCCI Con C Registration No. is C-3611.

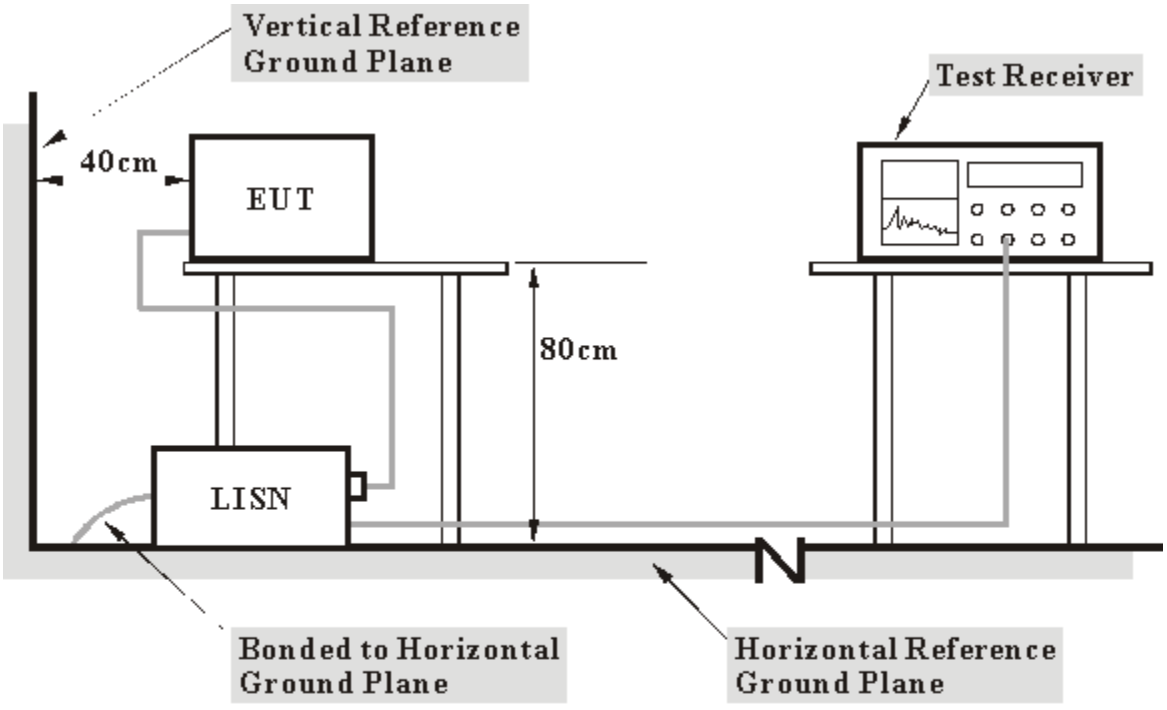
4.1.3 TEST PROCEDURES

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 150 kHz to 30 MHz was searched. Emission levels over 10dB under the prescribed limits could not be reported

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

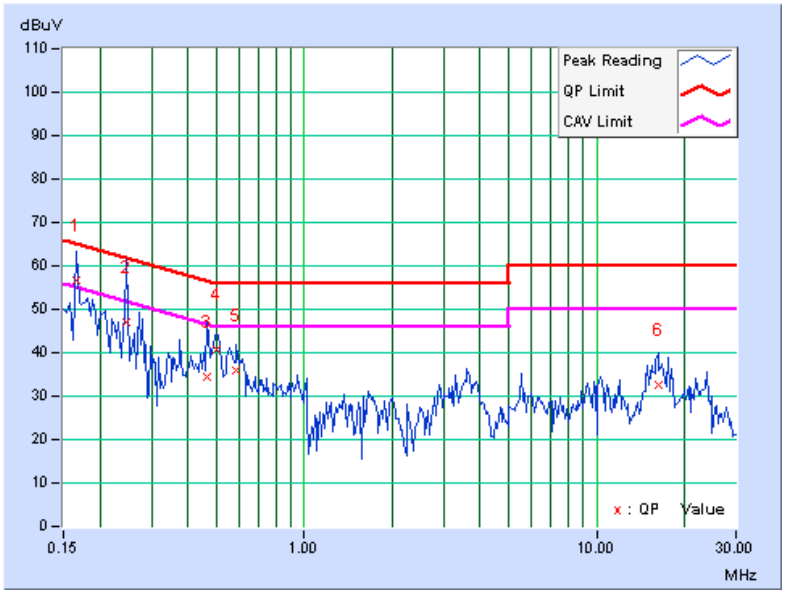
1. The EUT linked to support unit 1 (Notebook Computer) and which was placed on a testing table.
2. The support unit 1 (Notebook Computer) ran a test program “InstallBlueSuite2.2.ex Blue Test3” to enable EUT under transmission condition continuously at specific channel frequency.

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	0.166	0.11	56.71	33.34	56.82	33.45	65.18	55.18	-8.35	-21.72
2	0.248	0.13	46.79	-	46.92	-	61.84	51.84	-14.92	-
3	0.466	0.13	34.25	-	34.38	-	56.58	46.58	-22.20	-
4	0.500	0.13	40.73	-	40.86	-	56.00	46.00	-15.14	-
5	0.588	0.13	35.62	-	35.75	-	56.00	46.00	-20.25	-
6	16.254	0.59	31.95	-	32.54	-	60.00	50.00	-27.46	-

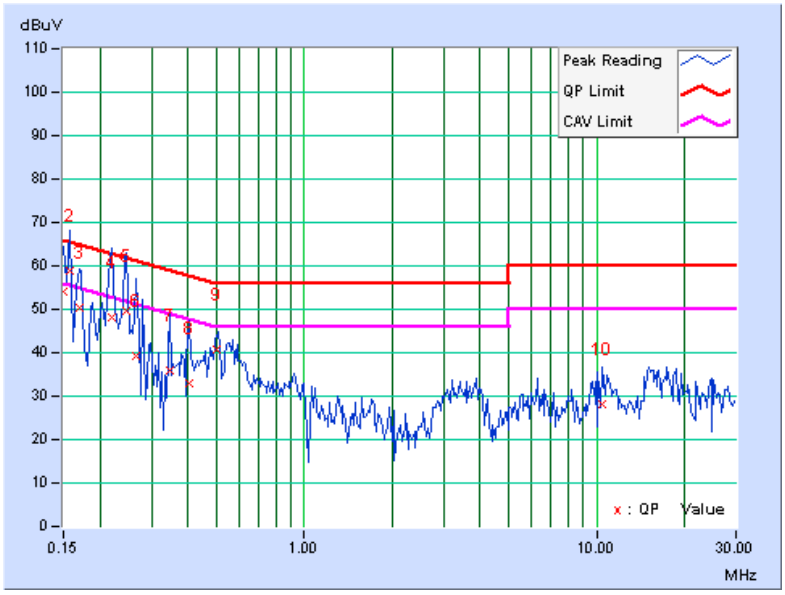
REMARKS: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission level - Limit value
5. Correction factor = Insertion loss + Cable loss
6. 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	0.150	0.12	53.87	-	53.99	-	66.00	56.00	-12.01	-
2	**0.158**	**0.12**	**58.62**	**33.54**	**58.74**	**33.66**	**65.58**	**55.58**	**-6.84**	**-21.92**
3	0.170	0.12	50.38	-	50.50	-	64.98	54.98	-14.48	-
4	0.220	0.14	47.86	-	48.00	-	62.81	52.81	-14.81	-
5	0.248	0.14	49.36	-	49.50	-	61.83	51.83	-12.33	-
6	0.267	0.14	39.14	-	39.28	-	61.21	51.21	-21.92	-
7	0.345	0.15	35.72	-	35.87	-	59.07	49.07	-23.21	-
8	0.404	0.15	32.64	-	32.79	-	57.77	47.77	-24.98	-
9	0.500	0.15	40.58	-	40.73	-	56.00	46.00	-15.27	-
10	10.438	0.86	27.36	-	28.22	-	60.00	50.00	-31.78	-

REMARKS: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission level - Limit value
5. Correction factor = Insertion loss + Cable loss
6. Emission Level = Correction Factor + Reading Value.



4.2 RADIATED EMISSION MEASUREMENT

4.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

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. Section 15.205 restricted bands of operation shall compliance with the limits in Section 15.209.

4.2.2 TEST INSTRUMENTS

Below 1GHz - Test date: July 13, 2011

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Agilent Spectrum Analyzer	E4446A	MY48250253	Aug. 23, 2010	Aug. 22, 2011
Agilent Pre-Selector	N9039A	MY46520310	Aug. 23, 2010	Aug. 22, 2011
Agilent Signal Generator	N5181A	MY49060347	July 30, 2010	July 29, 2011
LIG NEX1 Test Receiver	ER-265	L09068005	Oct. 25, 2010	Oct. 24, 2011
Mini-Circuits Pre-Amplifier	ZFL-1000VH2B	AMP-ZFL-04	Nov. 16, 2010	Nov. 15, 2011
Agilent Pre-Amplifier	8449B	3008A02465	Feb. 28, 2011	Feb. 27, 2012
Miteq Pre-Amplifier	AFS33-18002650-30-8P-44	881786	NA	NA
SCHWARZBECK Trilog Broadband Antenna	VULB 9168	9168-361	Apr. 14, 2011	Apr. 13, 2012
AISI Horn_Antenna	AIH.8018	0000220091110	Nov. 22, 2010	Nov. 21, 2011
SCHWARZBECK Horn_Antenna	BBHA 9170	9170-424	Oct. 08, 2010	Oct. 07, 2011
RF CABLE	NA	RF104-205 RF104-207 RF104-202	Dec. 28, 2010	Dec. 27, 2011
RF Cable	NA	CHHCAB_001	NA	NA
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.

Above 1GHz - Test date: July 18, 2011

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Agilent Spectrum Analyzer	E4446A	MY48250254	July 12, 2011	July 11, 2012
Agilent Pre-Selector	N9039A	MY46520311	July 12, 2011	July 11, 2012
Agilent Signal Generator	N5181A	MY49060517	July 12, 2011	July 11, 2012
Mini-Circuits Pre-Amplifier	ZFL-1000VH2B	AMP-ZFL-03	Nov. 16, 2010	Nov. 15, 2011
Agilent Pre-Amplifier	8449B	3008A02578	July 04, 2011	July 03, 2012
Miteq Pre-Amplifier	AFS33-18002650-30-8P-44	881786	NA	NA
SCHWARZBECK Trilog Broadband Antenna	VULB 9168	9168-360	Apr. 14, 2011	Apr. 13, 2012
AISI Horn_Antenna	AIH.8018	0000320091110	Nov. 12, 2010	Nov. 11, 2011
SCHWARZBECK Horn_Antenna	BBHA 9170	9170-424	Oct. 08, 2010	Oct. 07, 2011
RF CABLE	NA	RF104-201 RF104-203 RF104-204	Dec. 27, 2010	Dec. 26, 2011
RF Cable	NA	CHGCAB_001	NA	NA
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. G.
4. The FCC Site Registration No. is 966073.
5. The VCCI Site Registration No. is G-137.
6. The CANADA Site Registration No. is IC 7450H-2.

4.2.3 TEST PROCEDURES

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at 3 meters 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 detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.

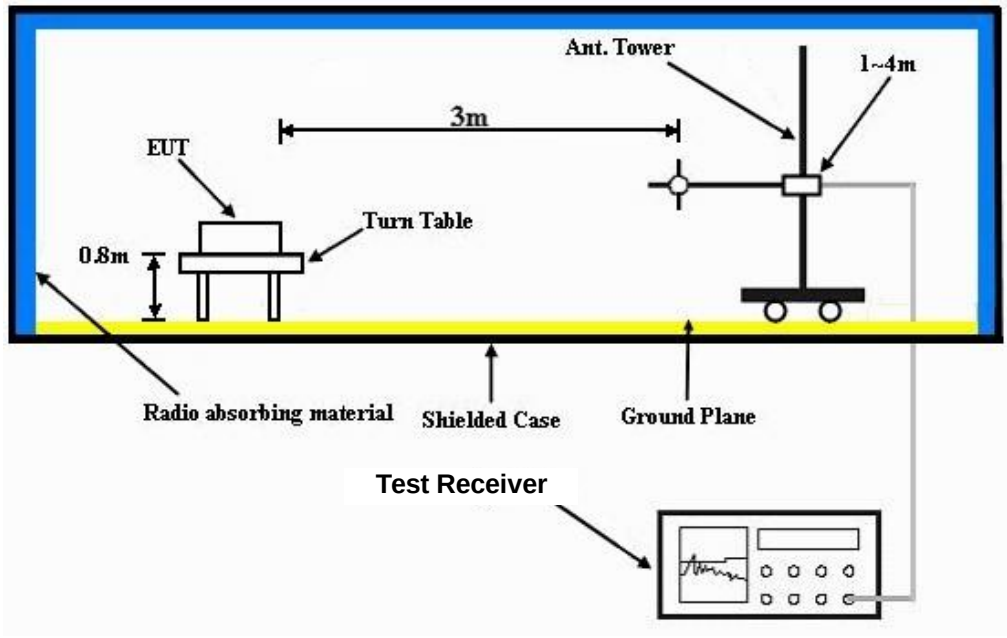
NOTE:

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 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.

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 EUT OPERATING CONDITIONS

Same as 4.1.5

4.2.7 TEST RESULTS

BELOW 1GHz WORST-CASE DATA：GFSK MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 39	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	23deg. C, 70%RH	TESTED BY	Nelson Teng

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	157.07	26.0 QP	43.5	-17.5	2.00 H	244	11.61	14.39
2	239.84	26.1 QP	46.0	-19.9	1.00 H	360	13.46	12.67
3	336.12	27.4 QP	46.0	-18.6	1.00 H	335	11.41	15.96
4	746.58	30.8 QP	46.0	-15.2	1.00 H	276	7.61	23.19
5	848.77	30.6 QP	46.0	-15.5	1.50 H	295	5.42	25.13
6	898.75	33.1 QP	46.0	-12.9	1.50 H	263	7.31	25.77
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	**30.47**	**33.1 QP**	**40.0**	**-6.9**	**1.00 V**	**165**	**20.13**	**12.98**
2	147.95	29.0 QP	43.5	-14.5	1.00 V	76	14.59	14.41
3	324.16	28.8 QP	46.0	-17.2	2.00 V	175	13.10	15.70
4	550.59	23.8 QP	46.0	-22.3	1.00 V	284	3.13	20.62
5	849.01	27.1 QP	46.0	-18.9	1.50 V	253	1.97	25.13
6	946.83	29.8 QP	46.0	-16.2	1.00 V	217	3.47	26.33

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.

GFSK MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	27deg. C, 65%RH	TESTED BY	Nelson Teng

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	54.3 PK	74.0	-19.7	1.16 H	154	22.64	31.66
2	2390.00	24.2 AV	54.0	-29.8	1.16 H	154	-7.46	31.66
3	*2402.00	100.3 PK			1.15 H	153	68.60	31.70
4	*2402.00	70.2 AV			1.15 H	153	38.50	31.70
5	4804.00	48.5 PK	74.0	-25.5	1.11 H	162	9.60	38.90
6	4804.00	18.4 AV	54.0	-35.6	1.11 H	162	-20.50	38.90
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	53.6 PK	74.0	-20.4	1.05 V	231	21.94	31.66
2	2390.00	23.5 AV	54.0	-30.5	1.05 V	231	-8.16	31.66
3	*2402.00	99.1 PK			1.04 V	230	67.40	31.70
4	*2402.00	69.0 AV			1.04 V	230	37.30	31.70
5	4804.00	48.1 PK	74.0	-25.9	1.06 V	262	9.20	38.90
6	4804.00	18.0 AV	54.0	-36.0	1.06 V	262	-20.90	38.90

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.
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 * 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to: 20log(3.125 / 100)= -30.1 dB.
7. Average value = peak reading + 20log(duty cycle).

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 39	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	27deg. C, 65%RH	TESTED BY	Nelson Teng

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	102.2 PK			1.15 H	145	70.37	31.83
2	*2441.00	72.1 AV			1.15 H	145	40.27	31.83
3	4882.00	48.6 PK	74.0	-25.4	1.13 H	162	9.43	39.17
4	4882.00	18.5 AV	54.0	-35.5	1.13 H	162	-20.67	39.17
5	7323.00	52.1 PK	74.0	-21.9	1.64 H	107	5.47	46.63
6	7323.00	22.0 AV	54.0	-32.0	1.64 H	107	-24.63	46.63
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2441.00	100.5 PK			1.30 V	213	68.67	31.83
2	*2441.00	70.4 AV			1.30 V	213	38.57	31.83
3	4882.00	48.1 PK	74.0	-25.9	1.39 V	261	8.93	39.17
4	4882.00	18.0 AV	54.0	-36.0	1.39 V	261	-21.17	39.17
5	7323.00	51.8 PK	74.0	-22.2	1.10 V	200	5.17	46.63
6	7323.00	21.7 AV	54.0	-32.3	1.10 V	200	-24.93	46.63

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.

6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 * 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to: 20log(3.125 / 100)= -30.1 dB.

7. Average value = peak reading + 20log(duty cycle).

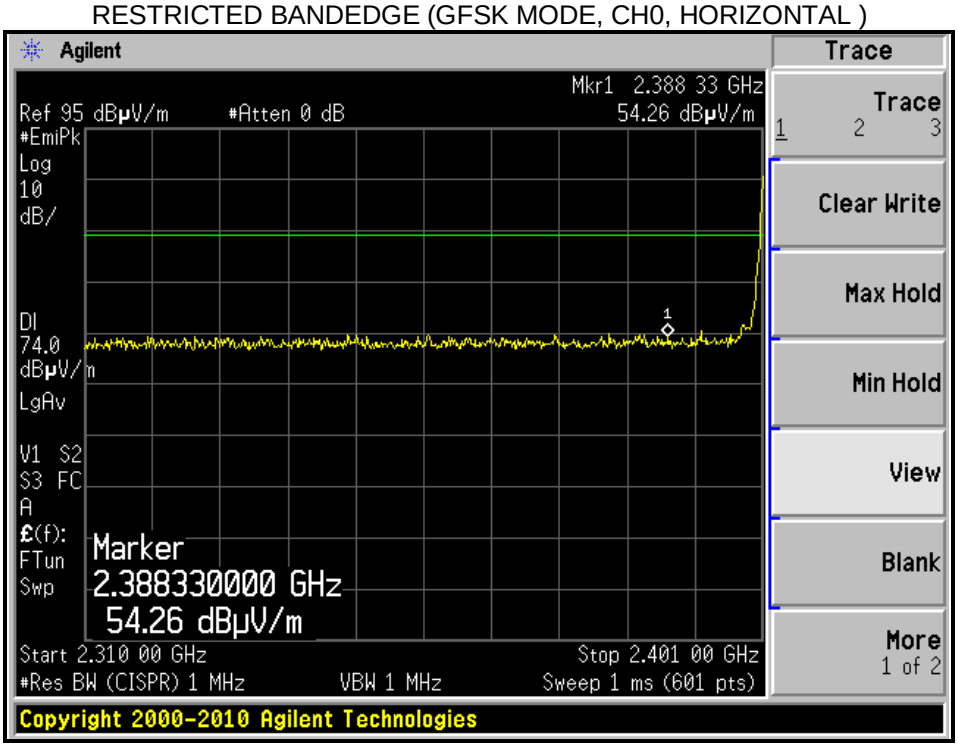
EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 78	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	27deg. C, 65%RH	TESTED BY	Nelson Teng

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	101.2 PK			1.10 H	146	69.25	31.95
2	*2480.00	71.1 AV			1.10 H	146	39.15	31.95
3	2483.50	56.7 PK	74.0	-17.3	1.10 H	147	24.73	31.97
4	2483.50	26.6 AV	54.0	-27.4	1.10 H	147	-5.37	31.97
5	4960.00	48.9 PK	74.0	-25.1	1.00 H	194	9.48	39.42
6	4960.00	18.8 AV	54.0	-35.2	1.00 H	194	-20.62	39.42
7	7440.00	53.4 PK	74.0	-20.6	1.58 H	115	6.84	46.56
8	7440.00	23.3 AV	54.0	-30.7	1.58 H	115	-23.26	46.56
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	99.5 PK			1.00 V	234	67.55	31.95
2	*2480.00	69.4 AV			1.00 V	234	37.45	31.95
3	2483.50	56.0 PK	74.0	-18.0	1.00 V	234	24.03	31.97
4	2483.50	25.9 AV	54.0	-28.1	1.00 V	234	-6.07	31.97
5	4960.00	48.2 PK	74.0	-25.8	1.00 V	113	8.78	39.42
6	4960.00	18.1 AV	54.0	-35.9	1.00 V	113	-21.32	39.42
7	7440.00	52.8 PK	74.0	-21.2	1.00 V	74	6.24	46.56
8	7440.00	22.7 AV	54.0	-31.3	1.00 V	74	-23.86	46.56

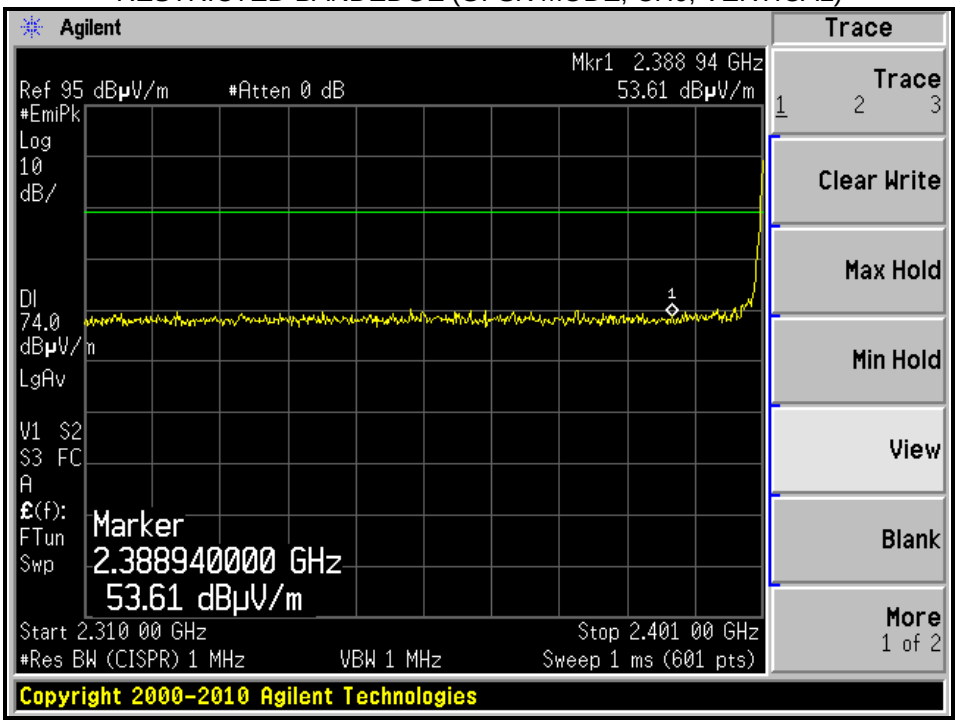
REMARKS: 1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).

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.
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 * 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to: 20log(3.125 / 100)= -30.1 dB.
7. Average value = peak reading + 20log(duty cycle).

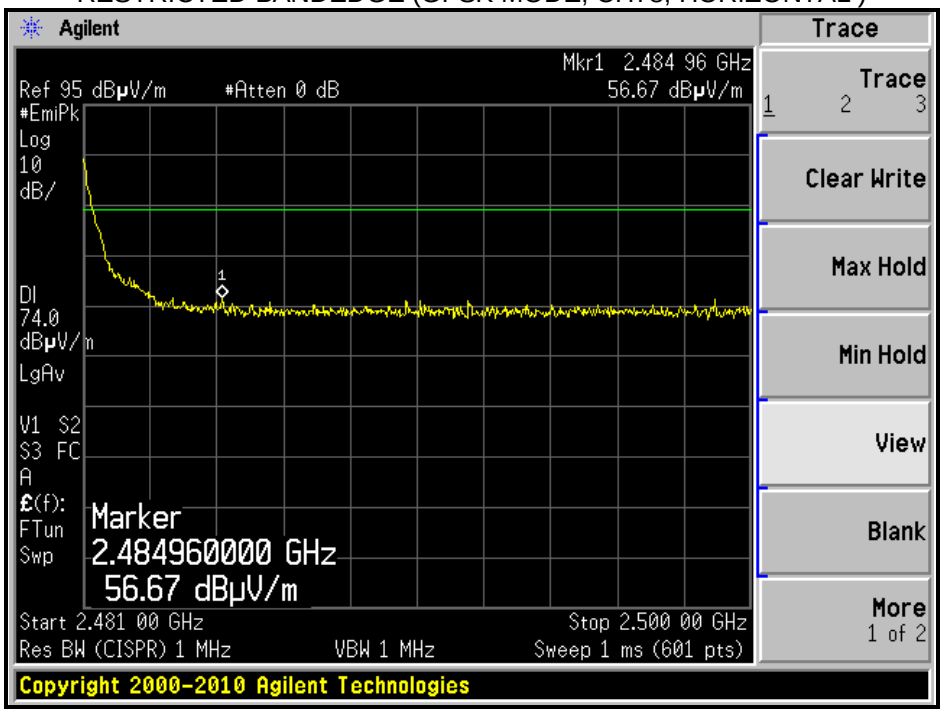
RESTRICTED BANDEDGE (GFSK MODE, CH0, HORIZONTAL)



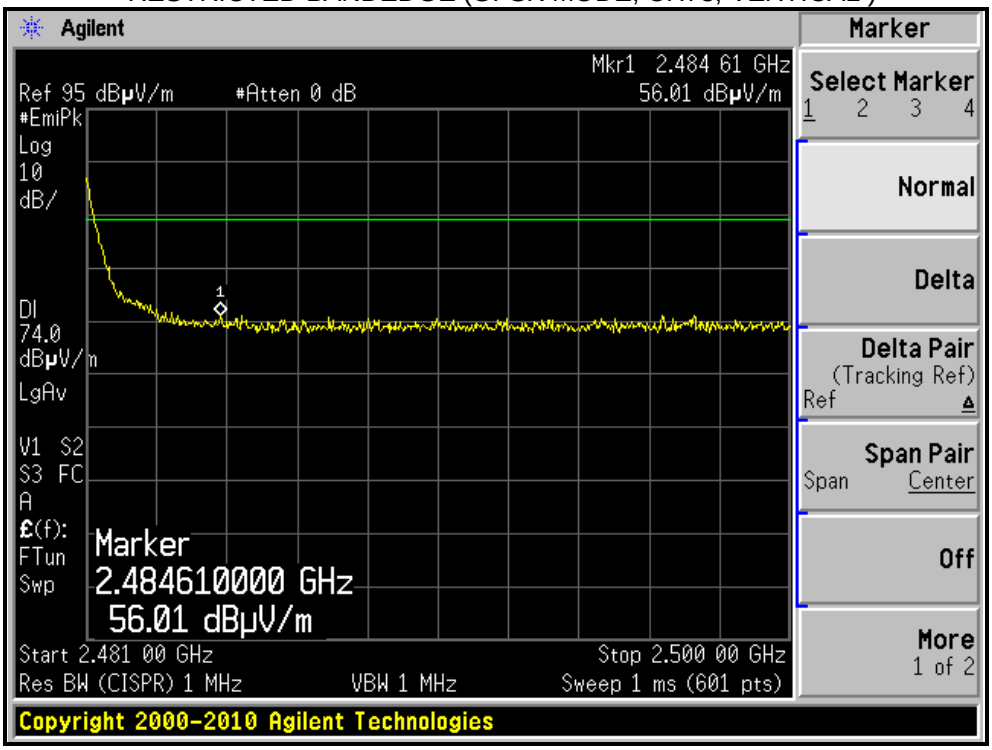
RESTRICTED BANDEDGE (GFSK MODE, CH0, VERTICAL)



RESTRICTED BANDEDGE (GFSK MODE, CH78, HORIZONTAL)



RESTRICTED BANDEDGE (GFSK MODE, CH78, VERTICAL)



The average value is Average value = peak reading + 20log(duty cycle). And it meets the requirement of limit.

8DPSK MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	27deg. C, 65%RH	TESTED BY	Nelson Teng

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	55.3 PK	74.0	-18.7	1.11 H	149	23.64	31.66
2	2390.00	25.2 AV	54.0	-28.8	1.11 H	149	-6.46	31.66
3	*2402.00	97.7 PK			1.11 H	149	66.00	31.70
4	*2402.00	67.6 AV			1.11 H	149	35.90	31.70
5	4804.00	47.9 PK	74.0	-26.1	1.02 H	93	9.00	38.90
6	4804.00	17.8 AV	54.0	-36.2	1.02 H	93	-21.10	38.90
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	54.6 PK	74.0	-19.4	1.07 V	222	22.94	31.66
2	2390.00	24.5 AV	54.0	-29.5	1.07 V	222	-7.16	31.66
3	*2402.00	96.8 PK			1.08 V	220	65.10	31.70
4	*2402.00	66.7 AV			1.08 V	220	35.00	31.70
5	4804.00	47.6 PK	74.0	-26.4	1.01 V	67	8.70	38.90
6	4804.00	17.5 AV	54.0	-36.5	1.01 V	67	-21.40	38.90

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.
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 * 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to: 20log(3.125 / 100)= -30.1 dB.
7. Average value = peak reading + 20log(duty cycle).

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 39	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	27deg. C, 65%RH	TESTED BY	Nelson Teng

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	98.7 PK			1.12 H	143	66.87	31.83
2	*2441.00	68.6 AV			1.12 H	143	36.77	31.83
3	4882.00	47.9 PK	74.0	-26.1	1.13 H	98	8.73	39.17
4	4882.00	17.8 AV	54.0	-36.2	1.13 H	98	-21.37	39.17
5	7323.00	52.0 PK	74.0	-22.0	1.02 H	122	5.37	46.63
6	7323.00	21.9 AV	54.0	-32.1	1.02 H	122	-24.73	46.63
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	97.0 PK			1.05 V	218	65.17	31.83
2	*2441.00	66.9 AV			1.05 V	218	35.07	31.83
3	4882.00	47.8 PK	74.0	-26.2	1.05 V	76	8.63	39.17
4	4882.00	17.7 AV	54.0	-36.3	1.05 V	76	-21.47	39.17
5	7323.00	51.9 PK	74.0	-22.1	1.07 V	65	5.27	46.63
6	7323.00	21.8 AV	54.0	-32.2	1.07 V	65	-24.83	46.63

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.
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 * 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to: 20log(3.125 / 100)= -30.1 dB.
7. Average value = peak reading + 20log(duty cycle).

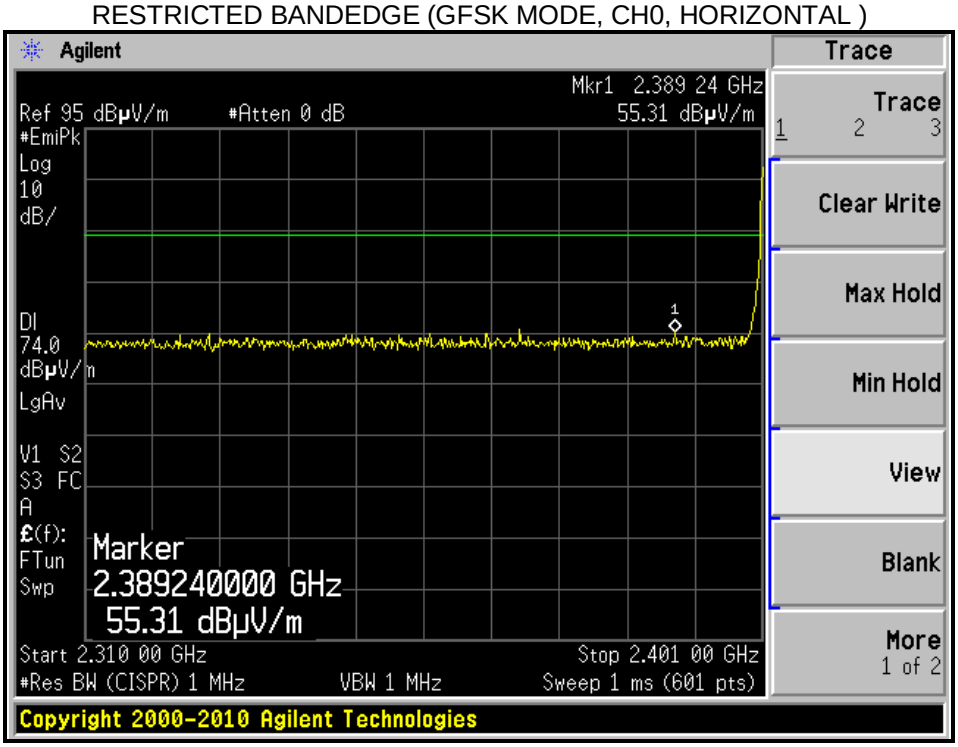
EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 78	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	27deg. C, 65%RH hPa	TESTED BY	Nelson Teng

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	97.7 PK			1.08 H	166	65.75	31.95
2	*2480.00	67.6 AV			1.08 H	166	35.65	31.95
3	2483.50	56.4 PK	74.0	-17.6	1.08 H	167	24.43	31.97
4	2483.50	26.3 AV	54.0	-27.7	1.08 H	167	-5.67	31.97
5	4960.00	47.4 PK	74.0	-26.6	1.08 H	97	7.98	39.42
6	4960.00	17.3 AV	54.0	-36.7	1.08 H	97	-22.12	39.42
7	7440.00	52.4 PK	74.0	-21.6	1.01 H	111	5.84	46.56
8	7440.00	22.3 AV	54.0	-31.7	1.01 H	111	-24.26	46.56
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	96.5 PK			1.00 V	234	64.55	31.95
2	*2480.00	66.4 AV			1.00 V	234	34.45	31.95
3	2483.50	55.6 PK	74.0	-18.4	1.00 V	232	23.63	31.97
4	2483.50	25.5 AV	54.0	-28.5	1.00 V	232	-6.47	31.97
5	4960.00	47.2 PK	74.0	-26.8	1.02 V	68	7.78	39.42
6	4960.00	17.1 AV	54.0	-36.9	1.02 V	68	-22.32	39.42
7	7440.00	52.1 PK	74.0	-21.9	1.02 V	69	5.54	46.56
8	7440.00	22.0 AV	54.0	-32.0	1.02 V	69	-24.56	46.56

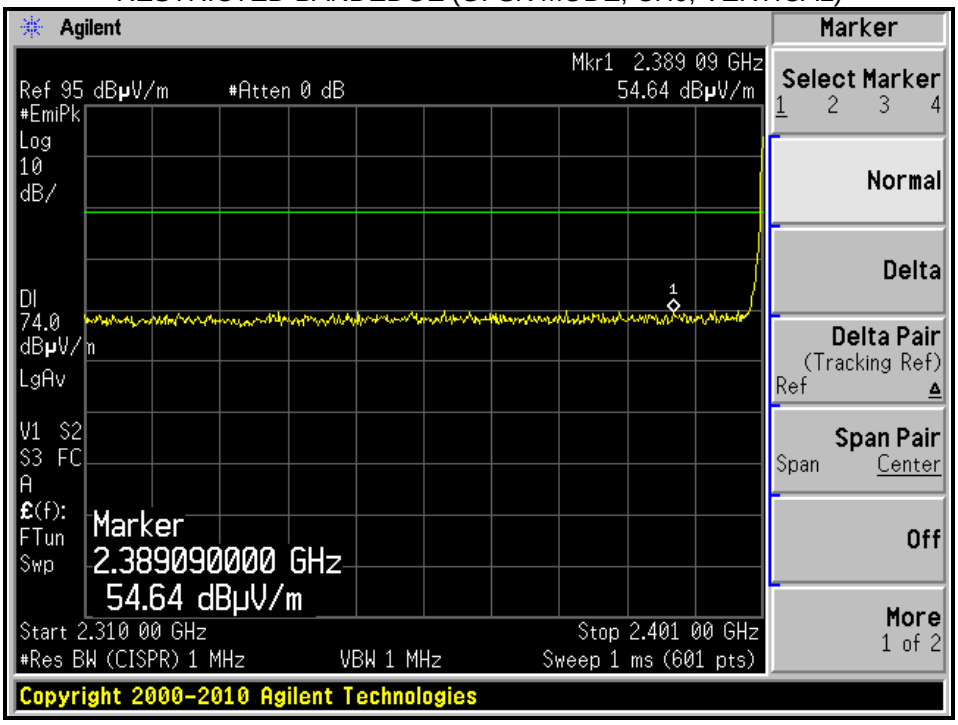
REMARKS: 1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).

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.
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 * 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to: 20log(3.125 / 100)= -30.1 dB.
7. Average value = peak reading + 20log(duty cycle).

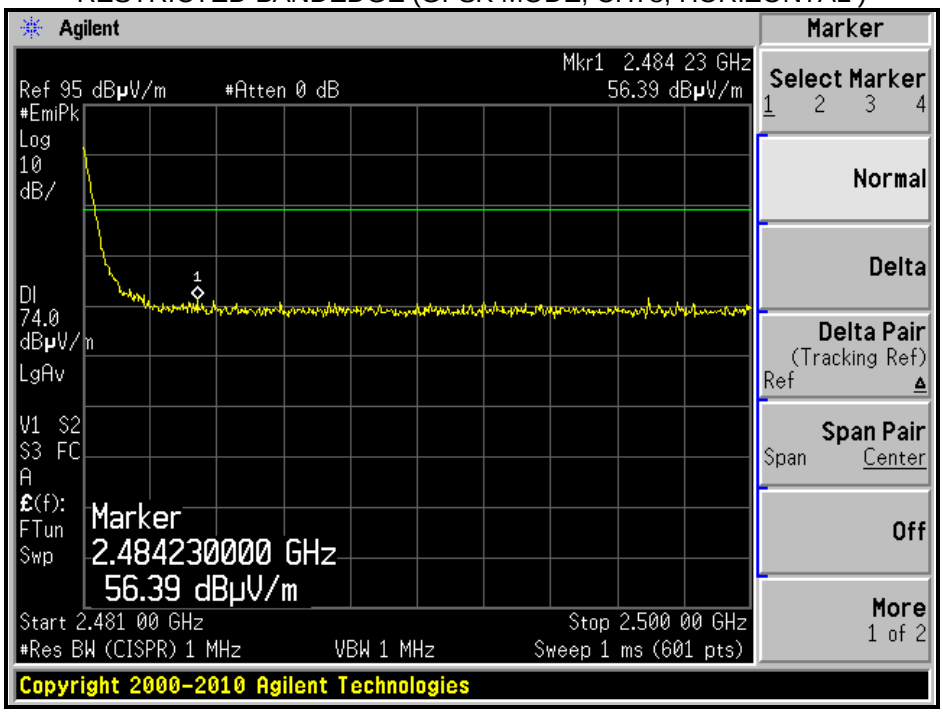
RESTRICTED BANDEDGE (GFSK MODE, CH0, HORIZONTAL)



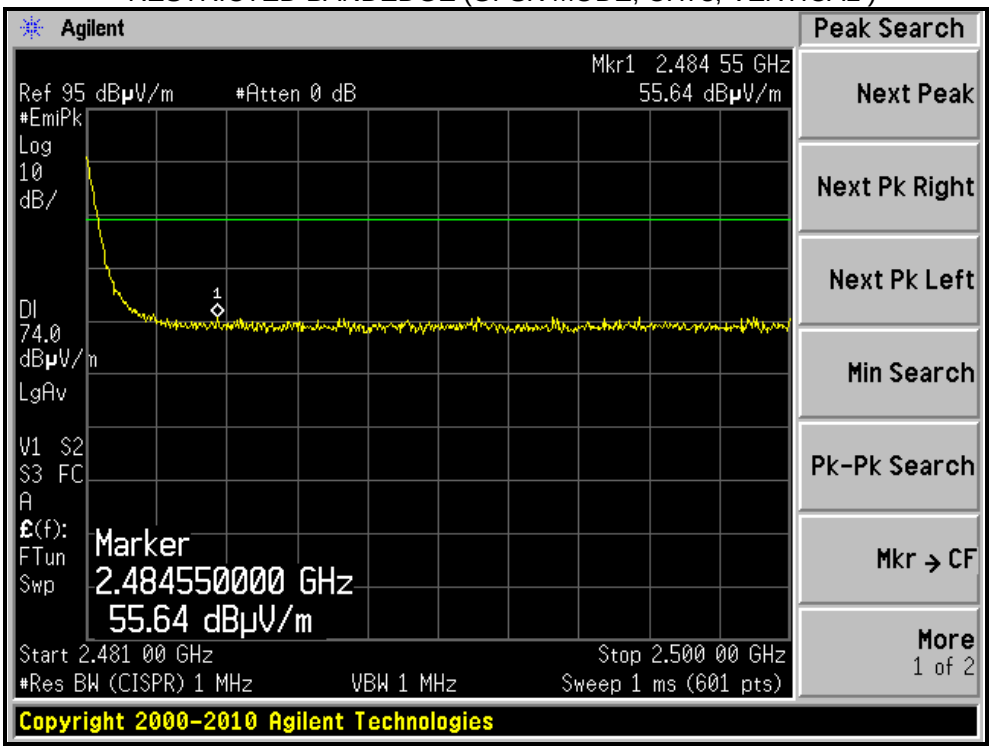
RESTRICTED BANDEDGE (GFSK MODE, CH0, VERTICAL)



RESTRICTED BANDEDGE (GFSK MODE, CH78, HORIZONTAL)



RESTRICTED BANDEDGE (GFSK MODE, CH78, VERTICAL)



* The average value is Average value = peak reading + 20log(duty cycle). And it meets the requirement of limit.

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

Test date: July 19, 2011

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100036	Dec. 08, 2010	Dec. 07, 2011

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

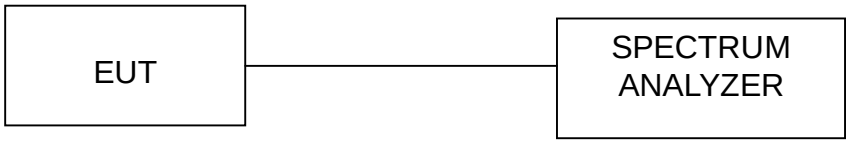
4.3.3 TEST PROCEDURES

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. 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.
3. 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.
4. Set the SA on View mode and then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

4.3.4 DEVIATION FROM TEST STANDARD

No deviation

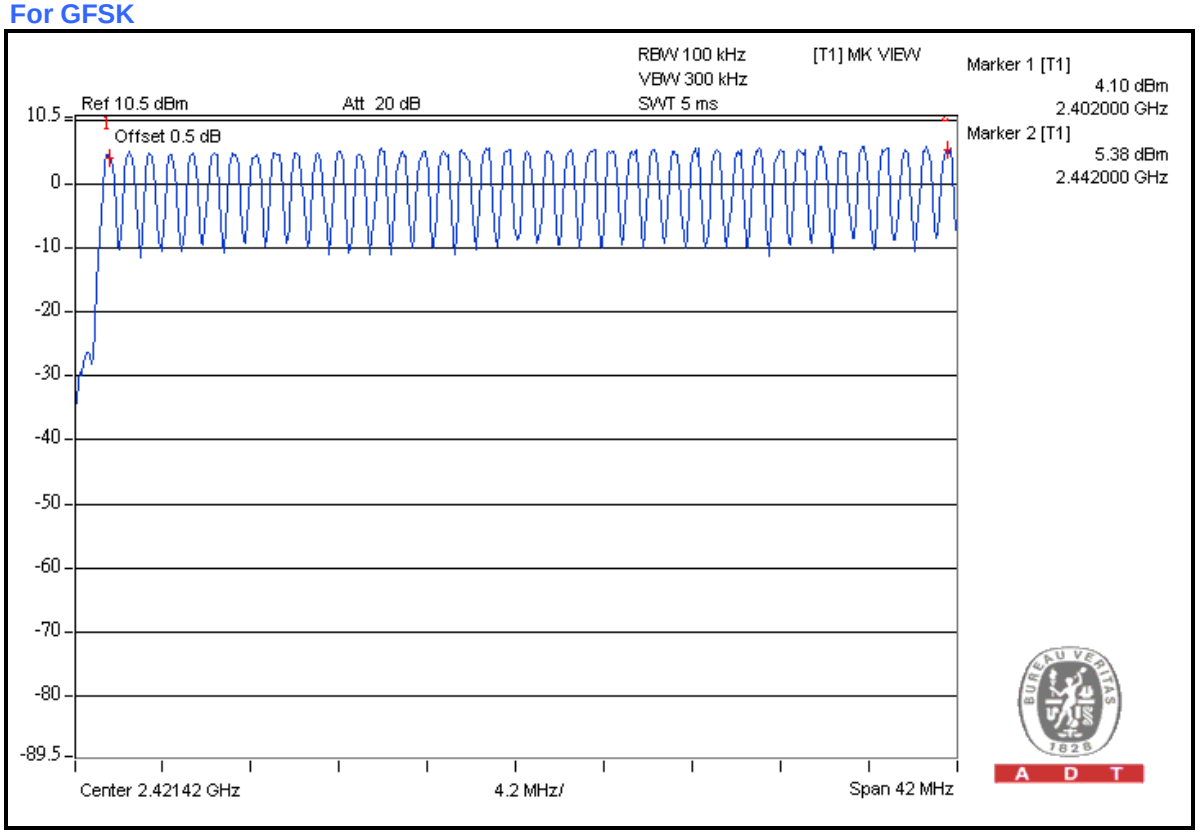
4.3.5 TEST SETUP

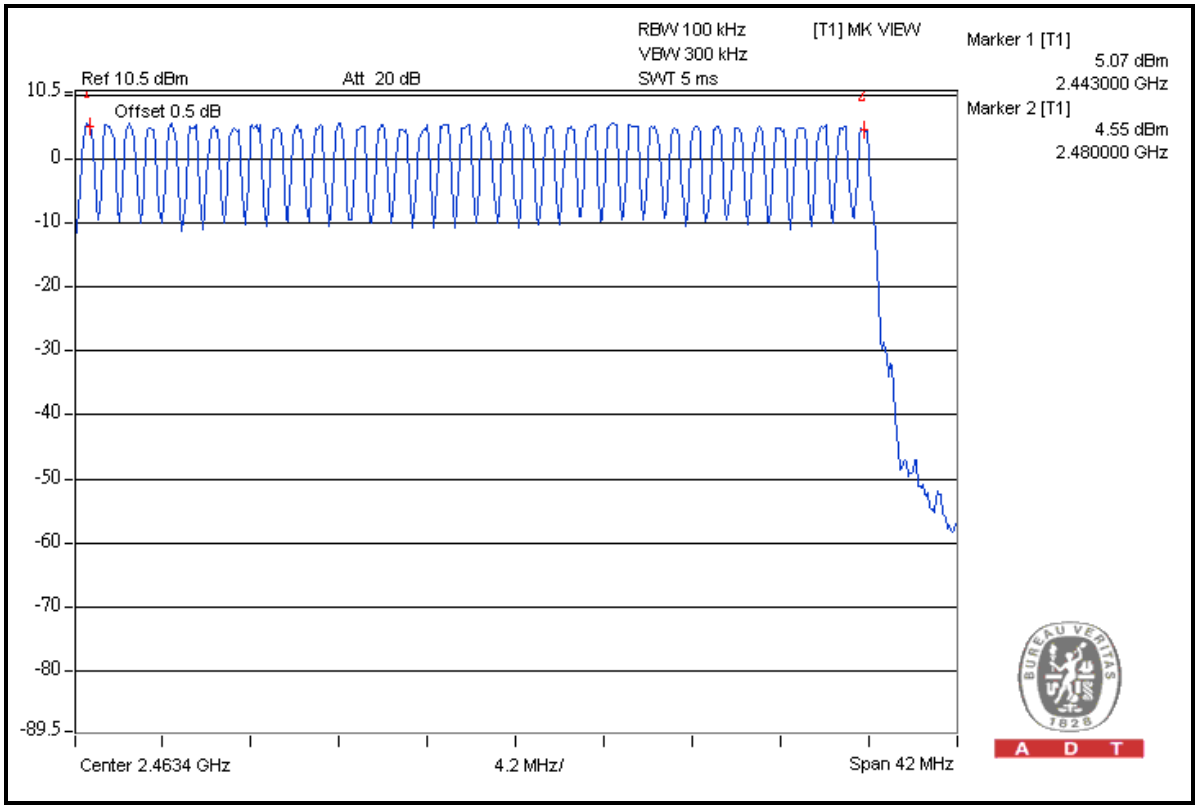


4.3.6 TEST RESULTS

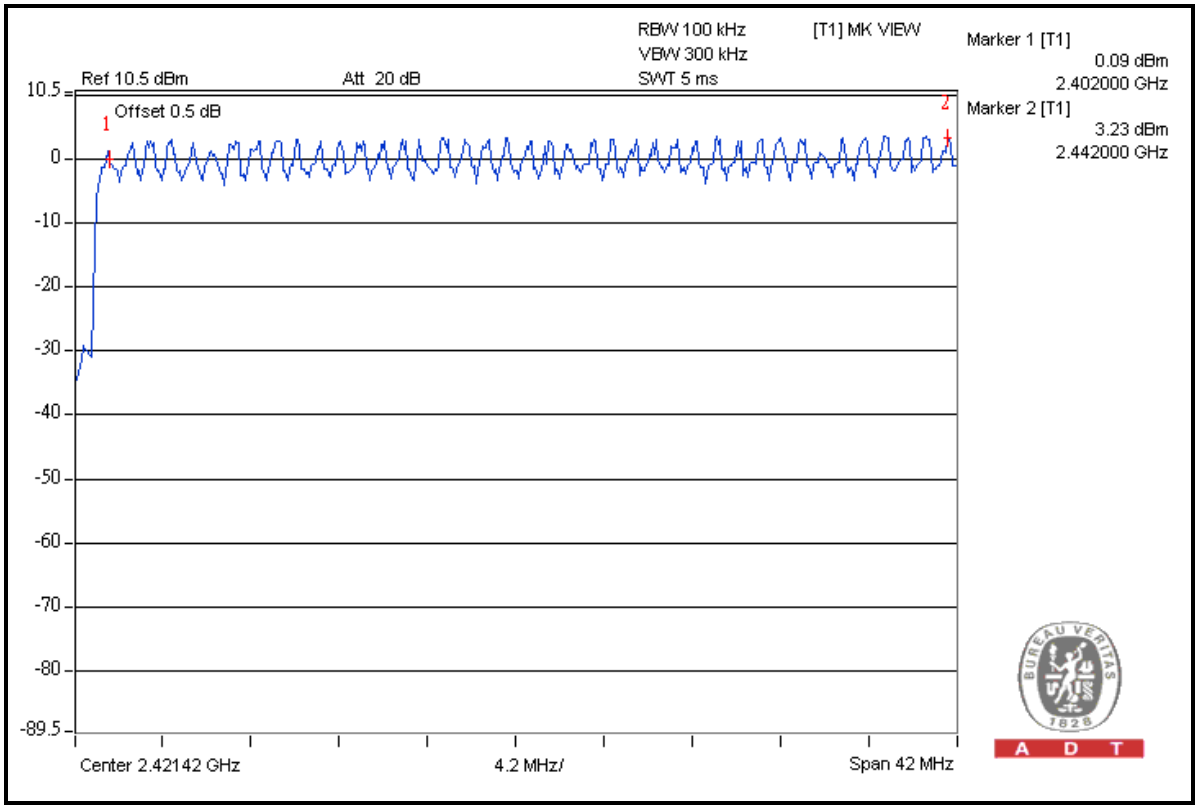
There are 79 hopping frequencies in the hopping mode. Please refer to next pages for the test result. On the plots, it shows that the hopping frequencies are equally spaced.

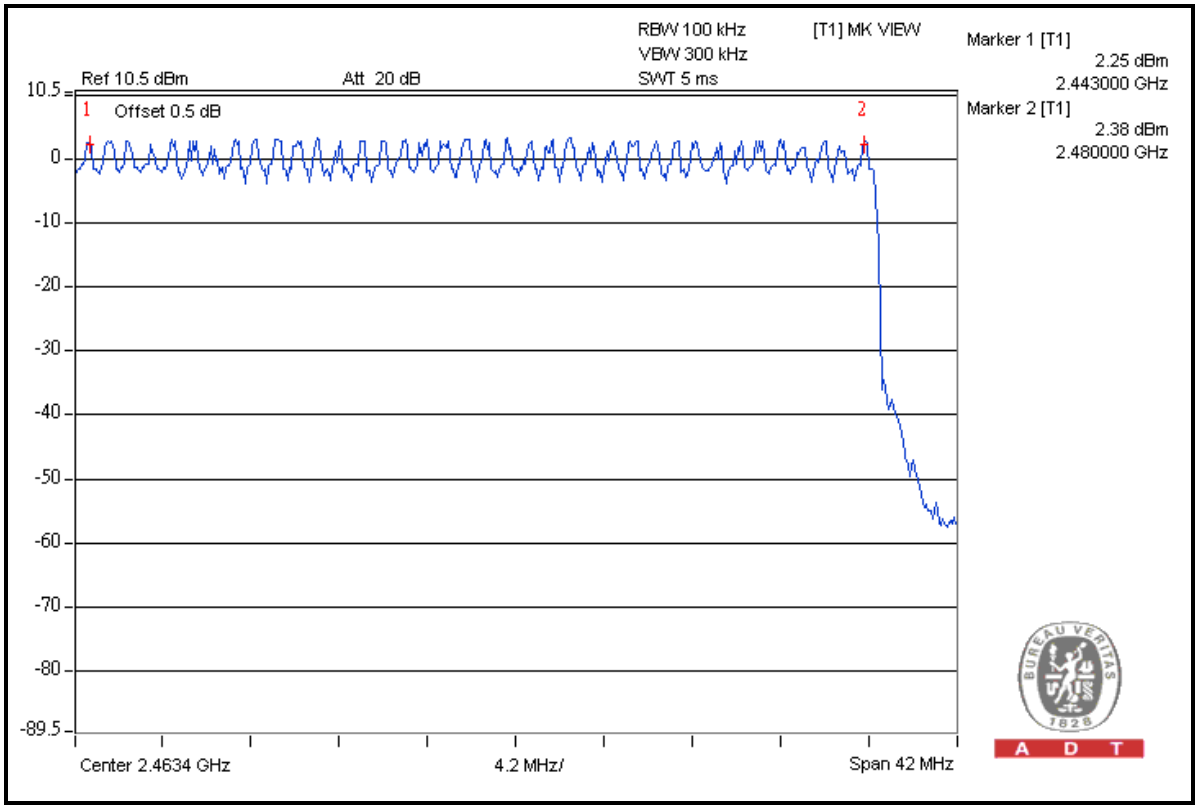
For GFSK


RBW 100 kHz
VBW 300 kHz
SWT 5 ms
[T1] MK VIEW
Marker 1 [T1]
4.10 dBm
2.402000 GHz
Marker 2 [T1]
5.38 dBm
2.442000 GHz
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
Center 2.42142 GHz
4.2 MHz/
Span 42 MHz

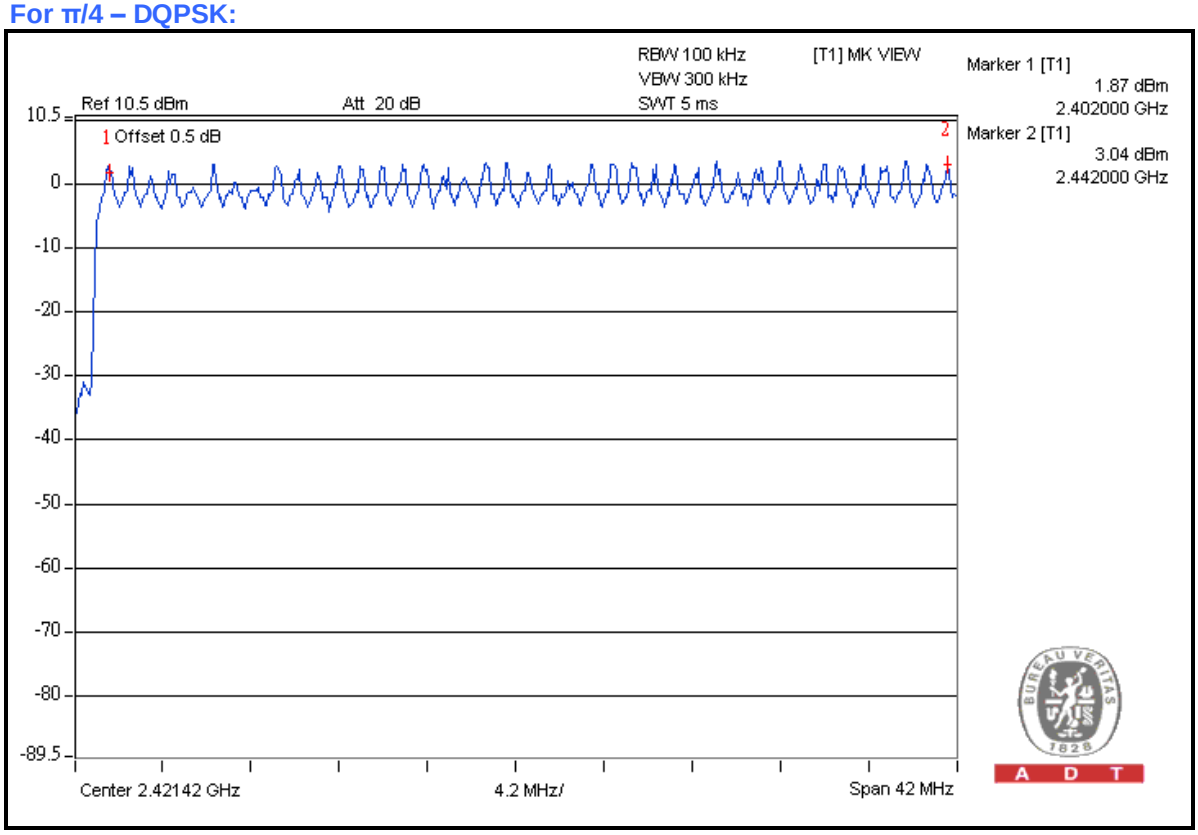

RBW 100 kHz
VBW 300 kHz
SWT 5 ms
[T1] MK VIEW
Marker 1 [T1]
5.07 dBm
2.443000 GHz
Marker 2 [T1]
4.55 dBm
2.480000 GHz
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
Center 2.4634 GHz
4.2 MHz/
Span 42 MHz

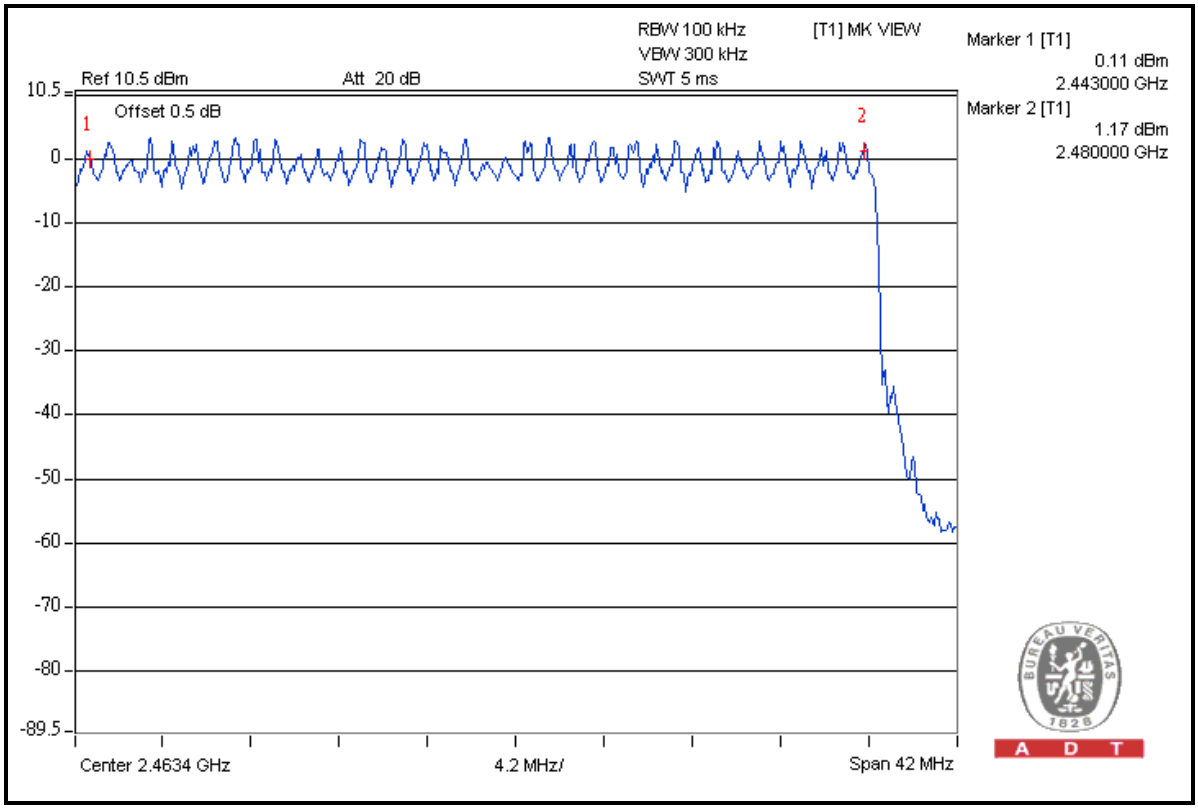
For 8DPSK


RBW 100 kHz
VBW 300 kHz
SWT 5 ms
[T1] MK VIEW
Marker 1 [T1]
0.09 dBm
2.402000 GHz
Marker 2 [T1]
3.23 dBm
2.442000 GHz
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
Center 2.42142 GHz
4.2 MHz/
Span 42 MHz


RBW 100 kHz
VBW 300 kHz
SWT 5 ms
[T1] MK VIEW
Marker 1 [T1]
2.25 dBm
2.443000 GHz
Marker 2 [T1]
2.38 dBm
2.480000 GHz
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
Center 2.4634 GHz
4.2 MHz/
Span 42 MHz

For π/4 – DQPSK:


RBW 100 kHz
VBW 300 kHz
SWT 5 ms
[T1] MK VIEW
Marker 1 [T1]
1.87 dBm
2.402000 GHz
Marker 2 [T1]
3.04 dBm
2.442000 GHz
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
Center 2.42142 GHz
4.2 MHz/
Span 42 MHz


RBW 100 kHz
VBW 300 kHz
SWT 5 ms
[T1] MK VIEW
Marker 1 [T1]
0.11 dBm
2.443000 GHz
Marker 2 [T1]
1.17 dBm
2.480000 GHz
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
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 frequency shall not be greater than 0.4 seconds within a 31.6 second period. For hybrid systems, the average time of occupancy on any frequency should not exceed 0.4 seconds within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4.

4.4.2 TEST INSTRUMENTS

Test date: July 19, 2011

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100036	Dec. 08, 2010	Dec. 07, 2011

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

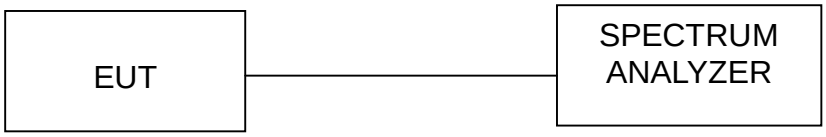
4.4.3 TEST PROCEDURES

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. 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.
3. 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.
4. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
5. Repeat above procedures until all frequencies measured were complete.

4.4.4 DEVIATION FROM TEST STANDARD

No deviation

4.4.5 TEST SETUP



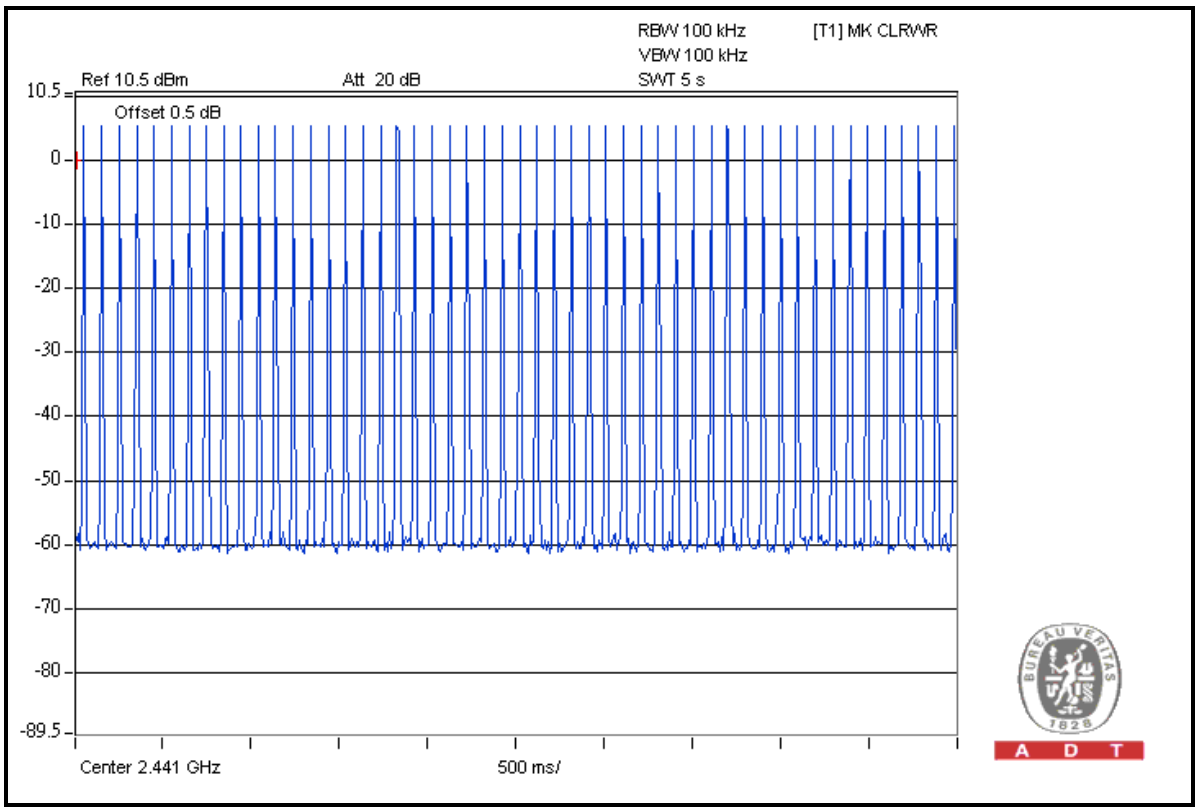
4.4.6 TEST RESULTS

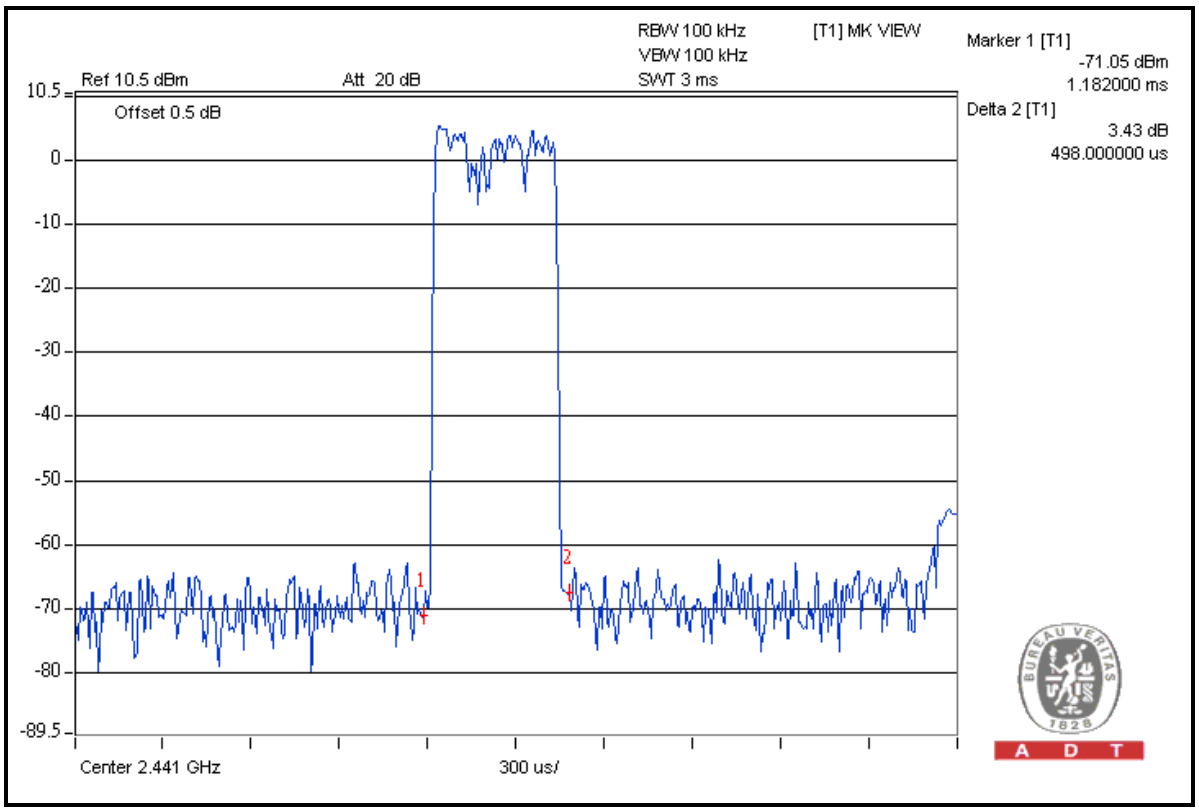
For GFSK:

Mode	Number of transmission in a 31.6 (79Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (msec)
DH1	51 (times / 5 sec) *6.32=322.32 times	0.498	160.51	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	2.97	300.32	400

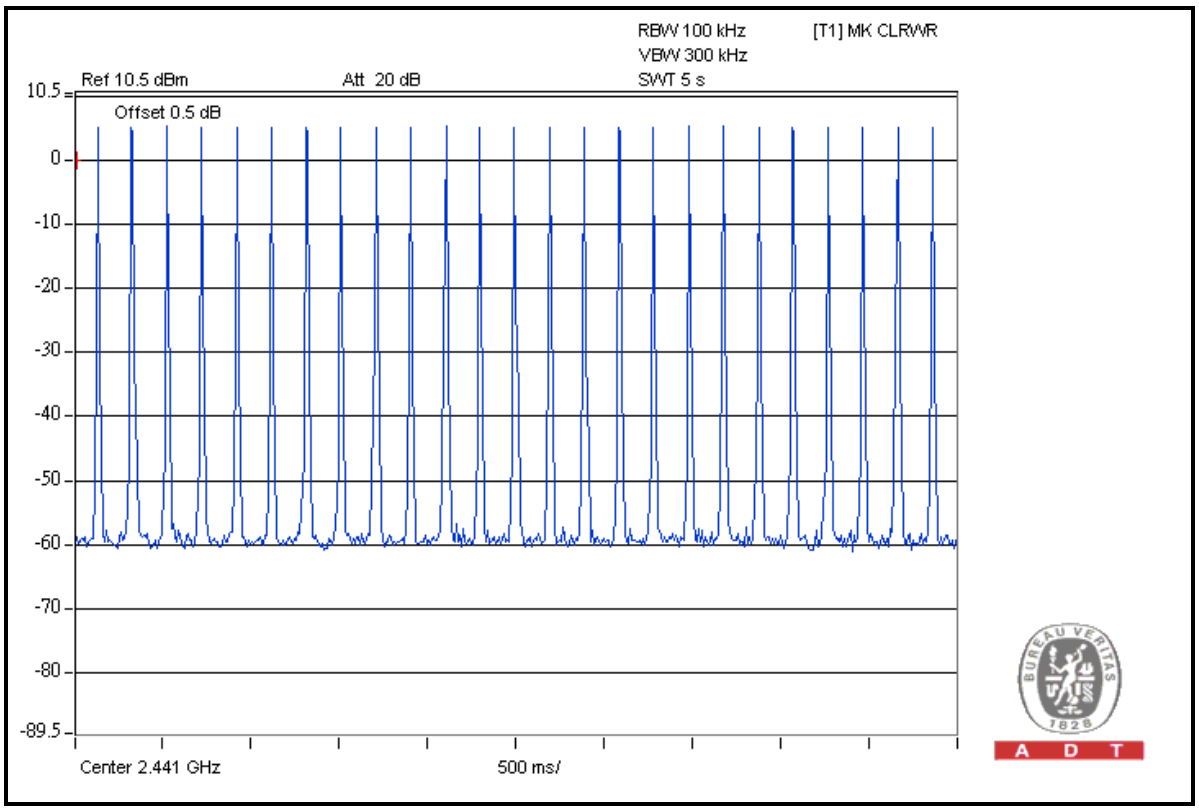
NOTE: Test plots of the transmitting time slot are shown on next 3 pages.

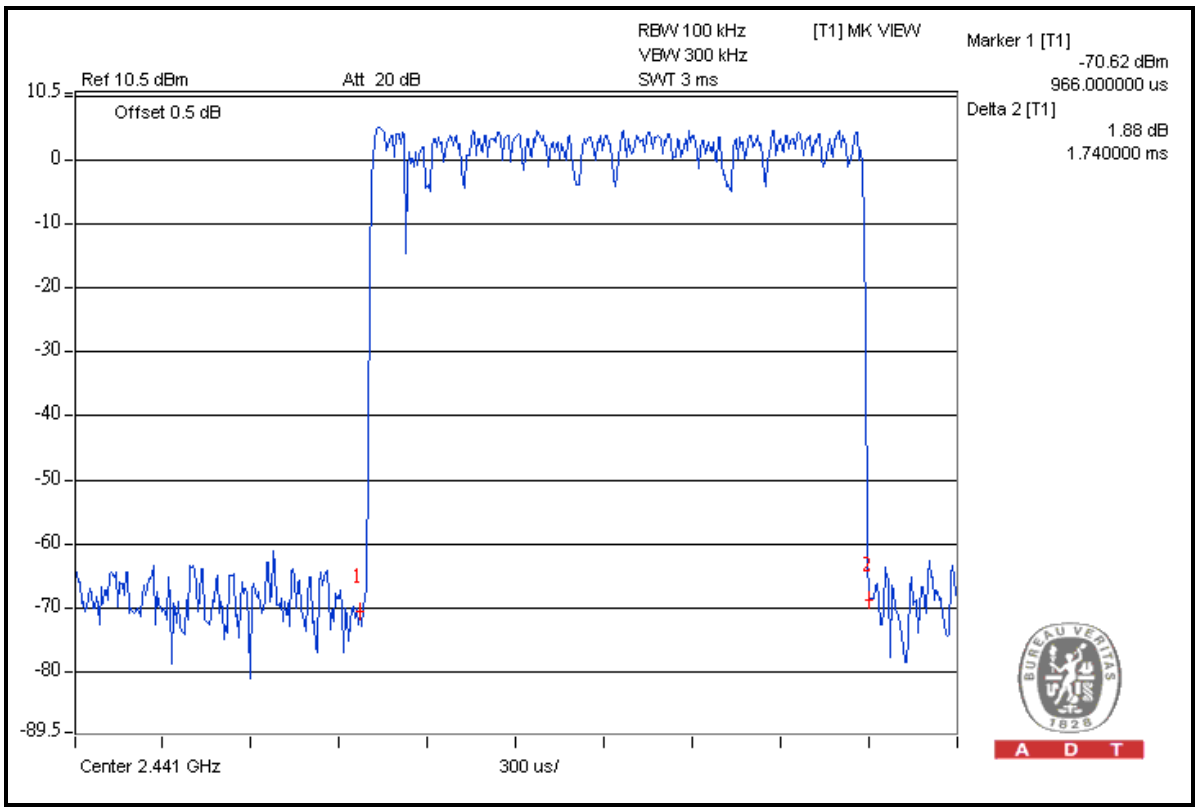
DH1


RBW 100 kHz
VBW 100 kHz
SWT 5 s
[T1] MK CLRWR
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
Center 2.441 GHz
500 ms/

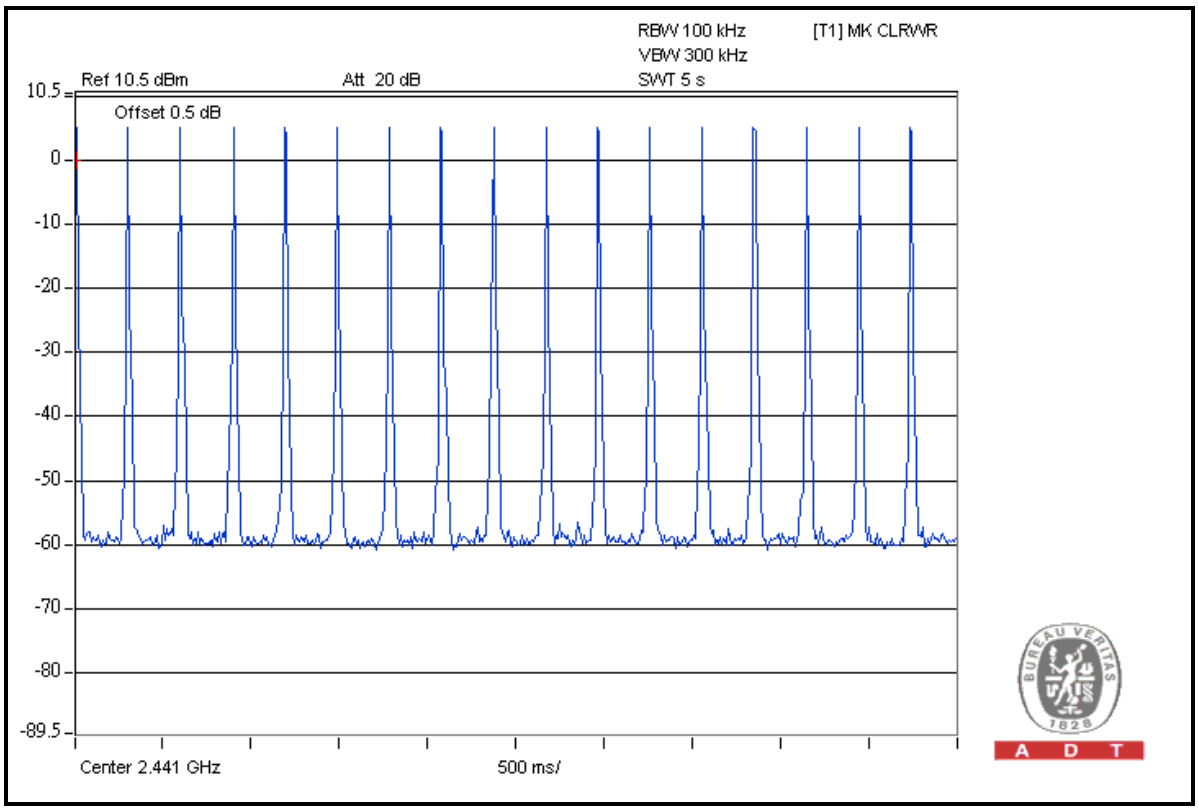

RBW 100 kHz
VBW 100 kHz
SWT 3 ms
[T1] MK VIEW
Marker 1 [T1]
-71.05 dBm
1.182000 ms
Delta 2 [T1]
3.43 dB
498.000000 us
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
1
2
Center 2.441 GHz
300 us/

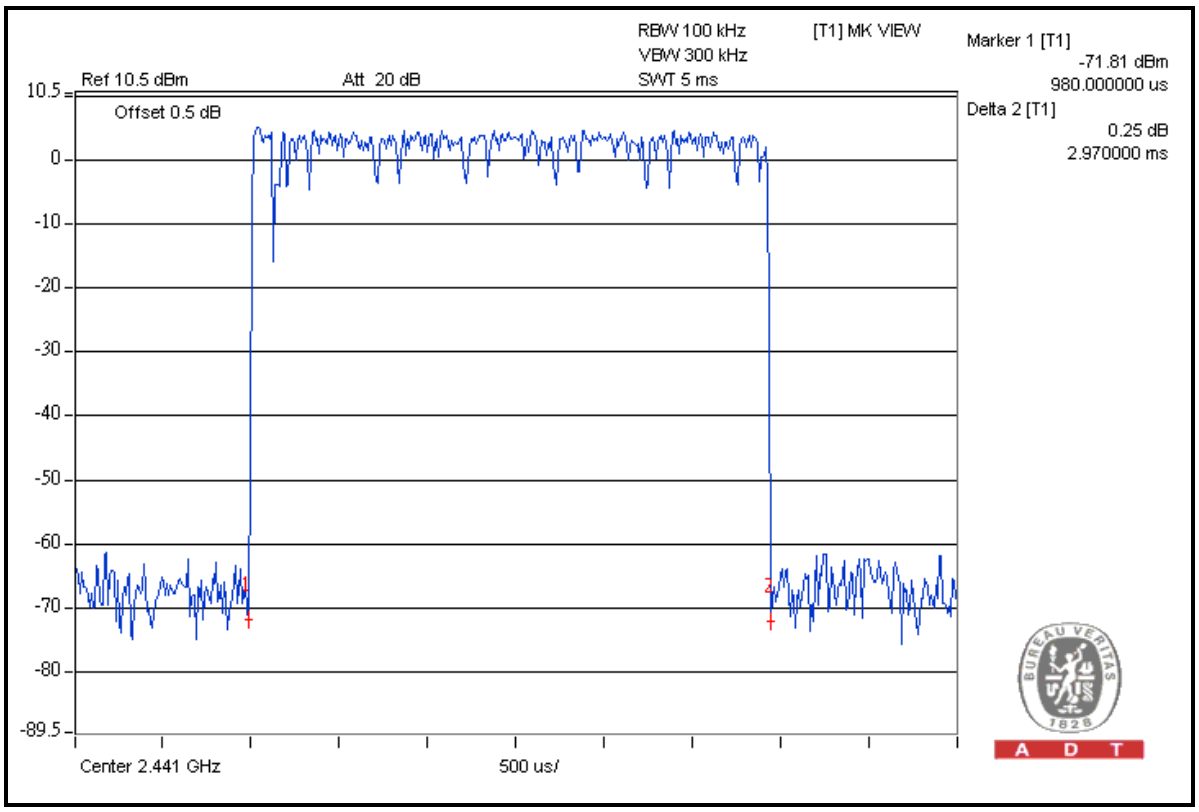
DH3


RBW 100 kHz
VBW 300 kHz
SWT 5 s
[T1] MK CLRWR
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
Center 2.441 GHz
500 ms/


RBW 100 kHz
VBW 300 kHz
SWT 3 ms
[T1] MK VIEW
Marker 1 [T1]
-70.62 dBm
966.000000 us
Delta 2 [T1]
1.88 dB
1.740000 ms
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
1
2
Center 2.441 GHz
300 us/

DH5


RBW 100 kHz
VBW 300 kHz
SWT 5 s
[T1] MK CLRWR
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
Center 2.441 GHz
500 ms/

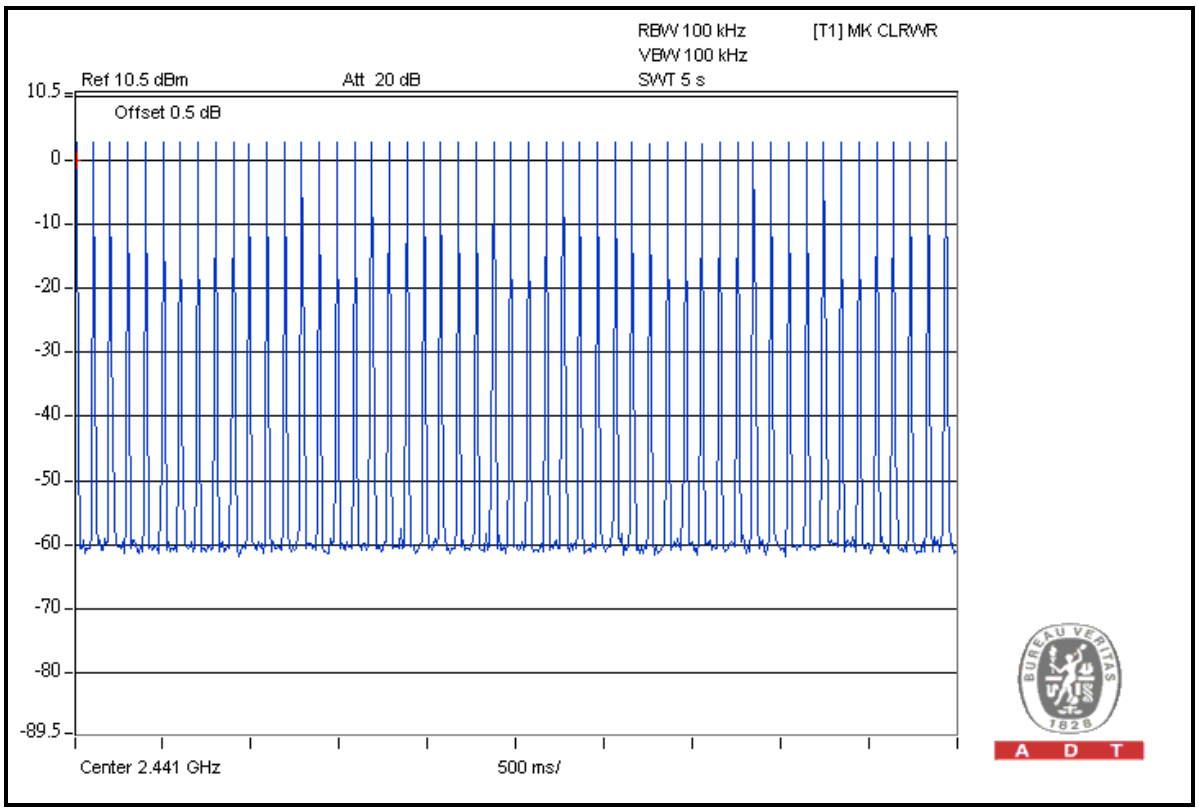

RBW 100 kHz
VBW 300 kHz
SWT 5 ms
[T1] MK VIEW
Marker 1 [T1]
-71.81 dBm
980.000000 us
Delta 2 [T1]
0.25 dB
2.970000 ms
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
Center 2.441 GHz
500 us/

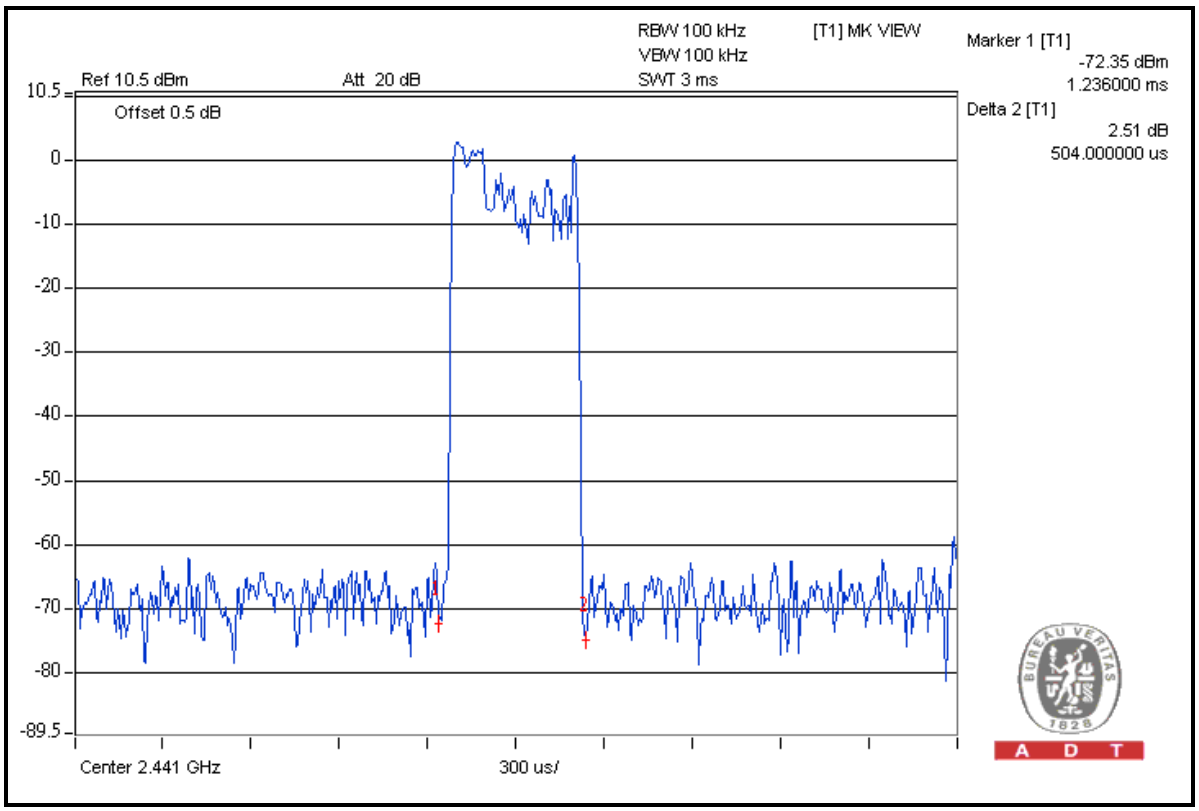
For 8DPSK :

Mode	Number of transmission in a 31.6 (79Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (msec)
DH1	50 (times / 5 sec) *6.32=316 times	0.504	159.26	400
DH3	25 (times / 5 sec) *6.32=158 times	1.728	273.02	400
DH5	17 (times / 5 sec) *6.32=107.44 times	2.980	320.17	400

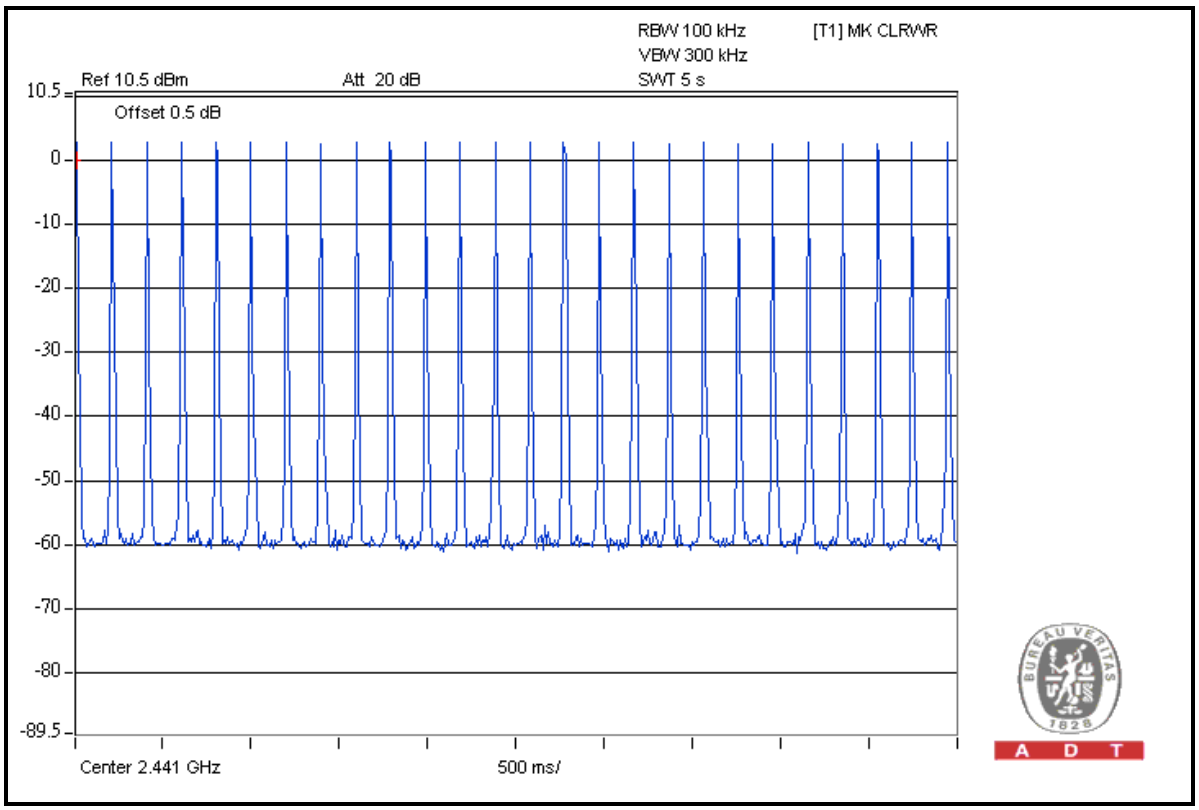
NOTE: Test plots of the transmitting time slot are shown on next 3 pages.

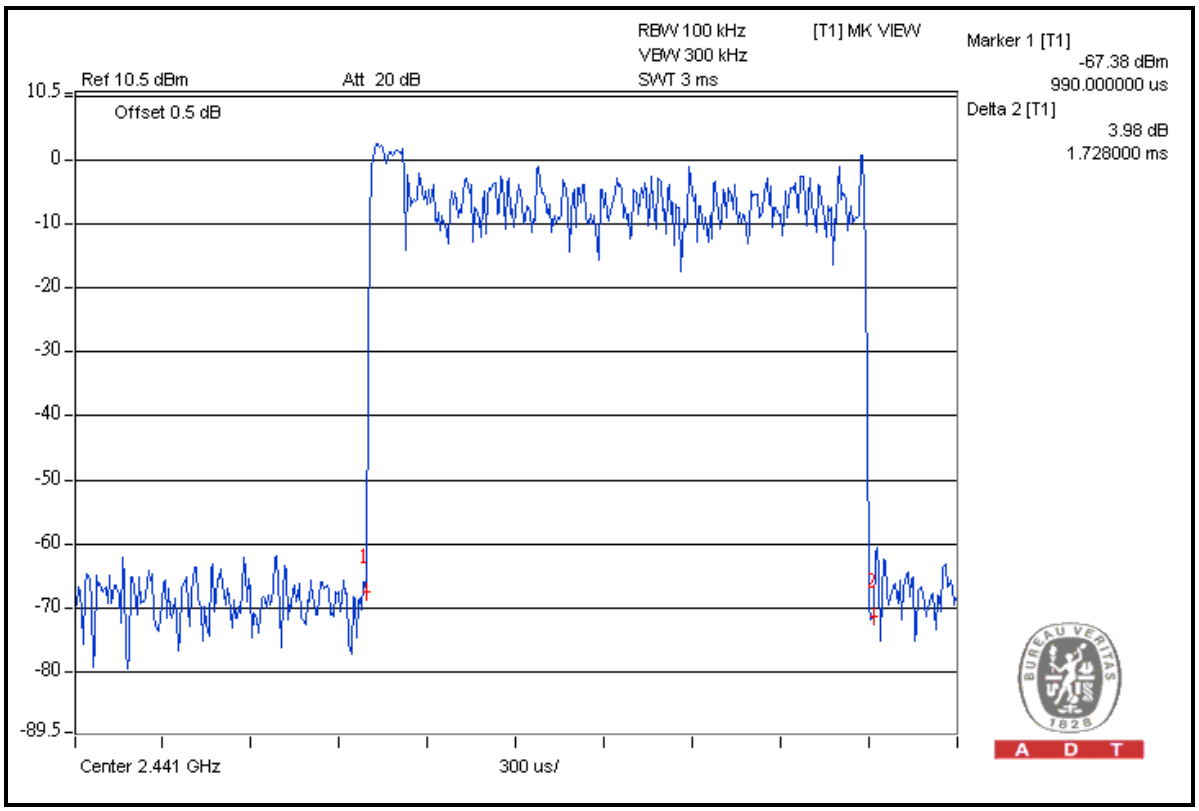
DH1


RBW 100 kHz
VBW 100 kHz
SWT 5 s
[T1] MK CLRWR
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
Center 2.441 GHz
500 ms/

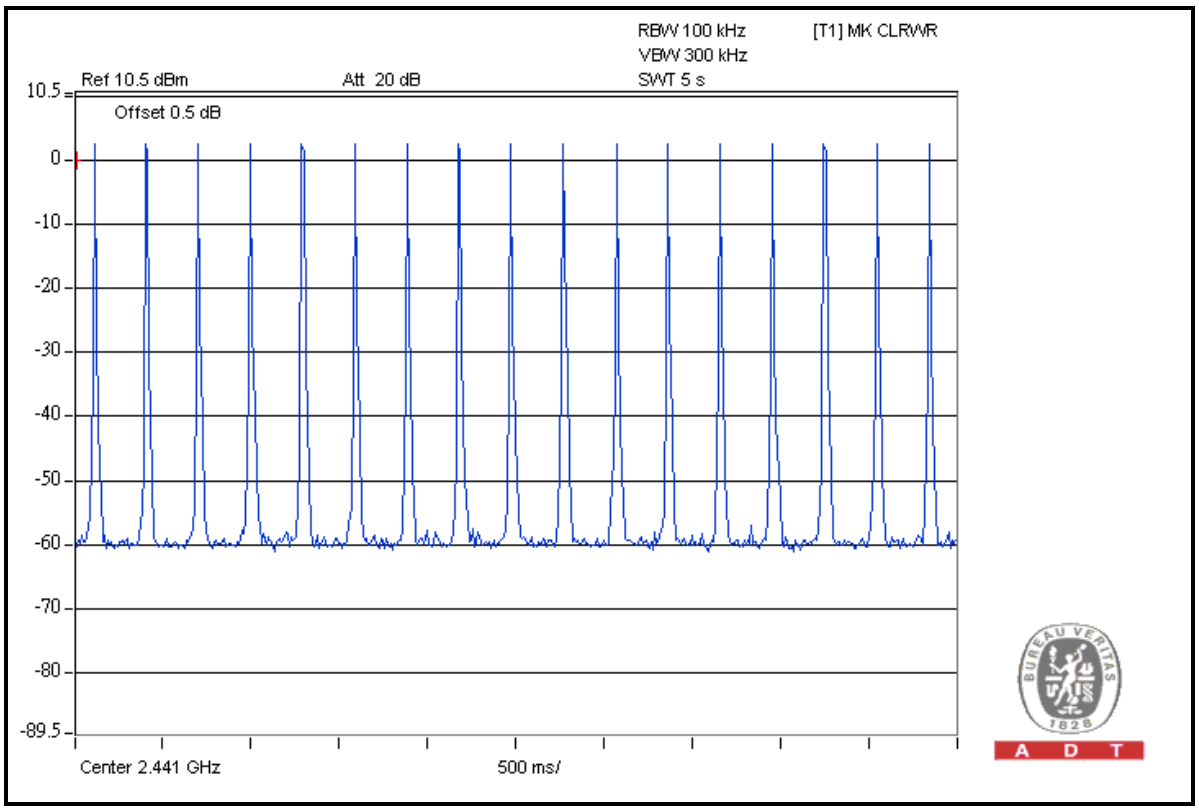

RBW 100 kHz
VBW 100 kHz
SWT 3 ms
[T1] MK VIEW
Marker 1 [T1]
-72.35 dBm
1.236000 ms
Delta 2 [T1]
2.51 dB
504.000000 us
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
Center 2.441 GHz
300 us/

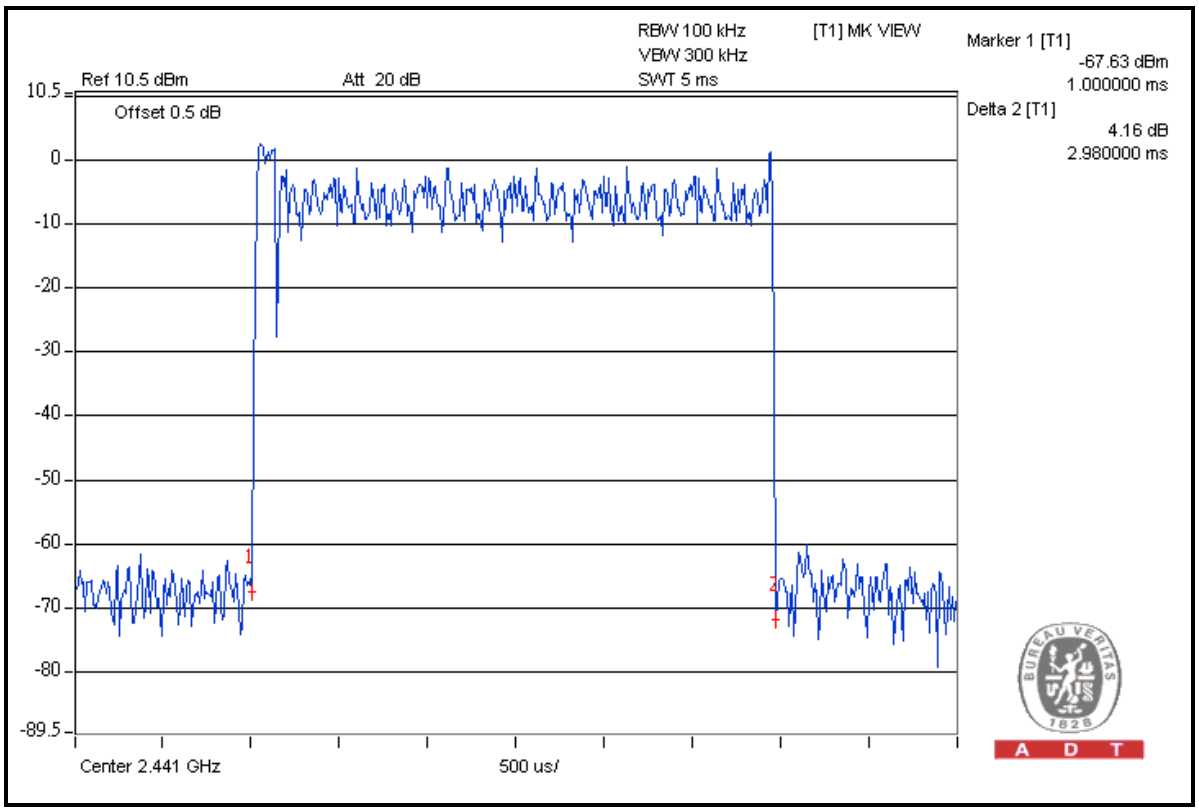
DH3


RBW 100 kHz
VBW 300 kHz
SWT 5 s
[T1] MK CLRWR
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
Center 2.441 GHz
500 ms/


RBW 100 kHz
VBW 300 kHz
SWT 3 ms
[T1] MK VIEW
Marker 1 [T1]
-67.38 dBm
990.000000 us
Delta 2 [T1]
3.98 dB
1.728000 ms
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
Center 2.441 GHz
300 us/

DH5


RBW 100 kHz
VBW 300 kHz
SWT 5 s
[T1] MK CLRWR
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
Center 2.441 GHz
500 ms/

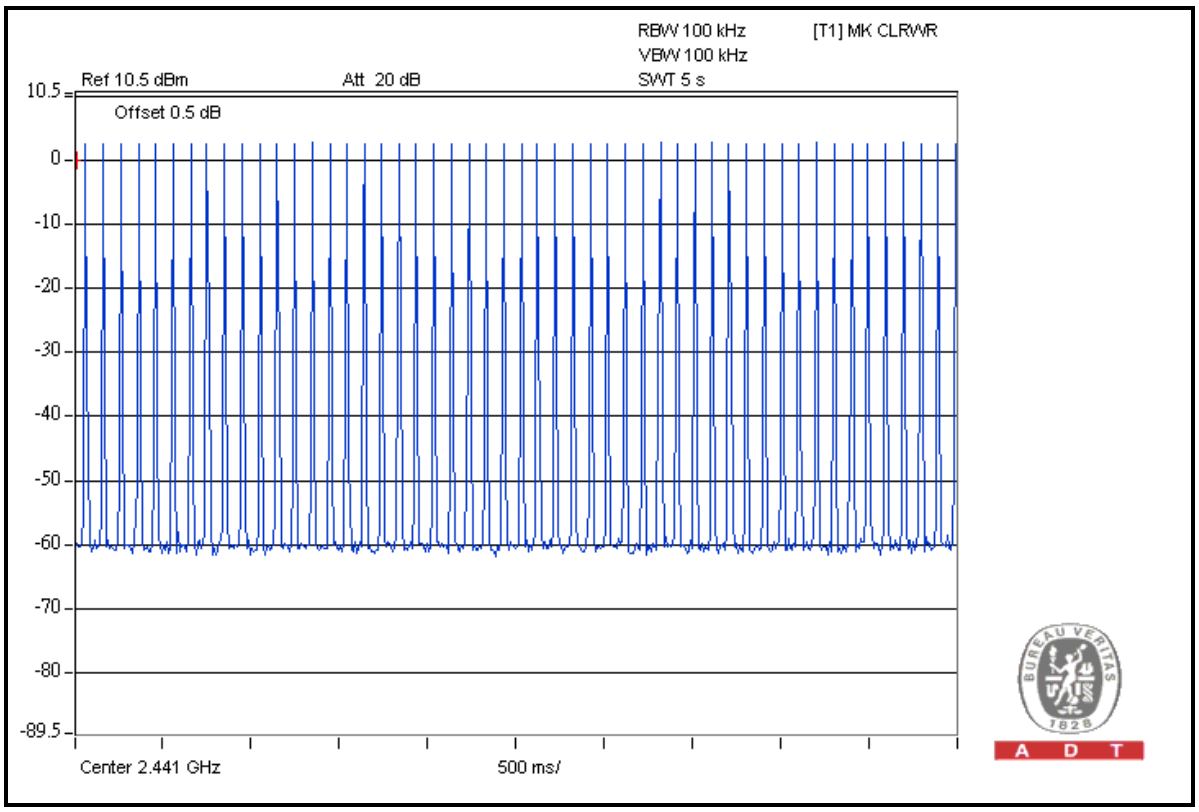

RBW 100 kHz
VBW 300 kHz
SWT 5 ms
[T1] MK VIEW
Marker 1 [T1]
-67.63 dBm
1.000000 ms
Delta 2 [T1]
4.16 dB
2.980000 ms
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
Center 2.441 GHz
500 us/

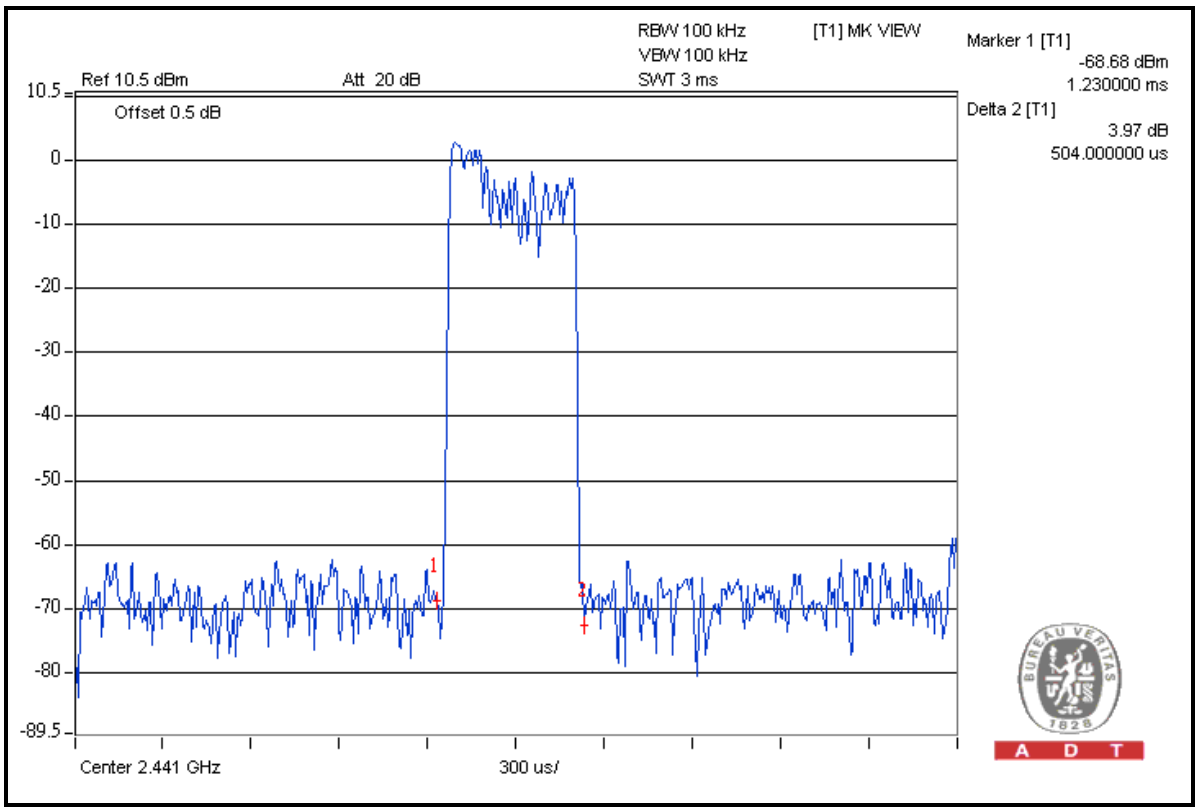
For $\pi/4$ – DQPSK :

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	0.504	159.26	400
DH3	25 (times / 5 sec) *6.32=158 times	1.704	269.23	400
DH5	17 (times / 5 sec) *6.32=107.44 times	3	322.32	400

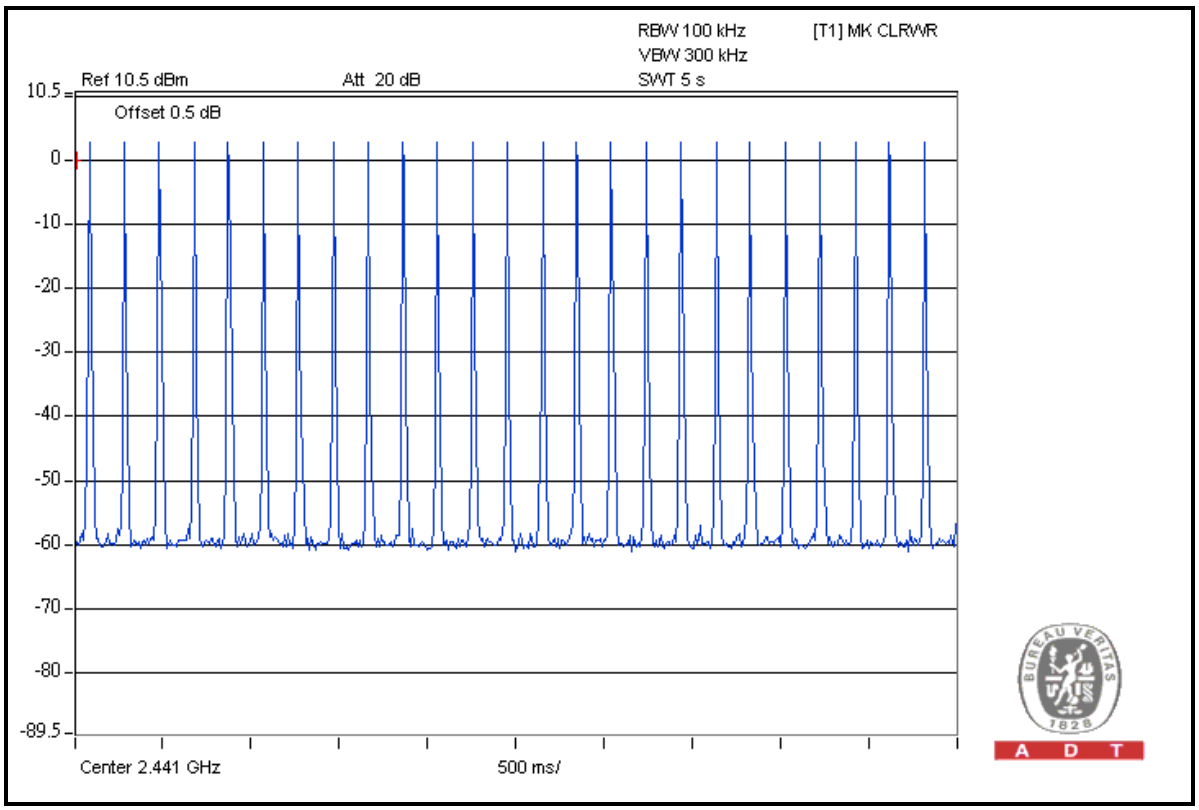
NOTE: Test plots of the transmitting time slot are shown on next 3 pages.

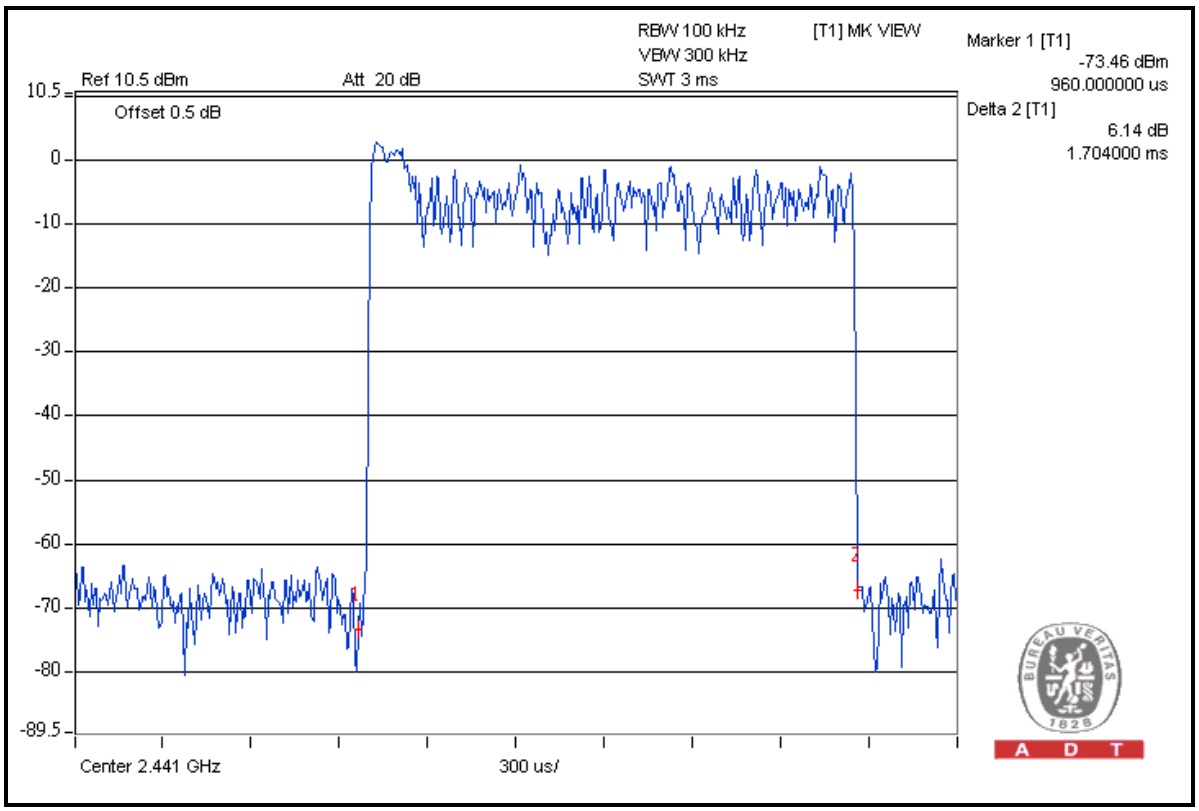
DH1


RBW 100 kHz
VBW 100 kHz
SWT 5 s
[T1] MK CLRWR
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
Center 2.441 GHz
500 ms/

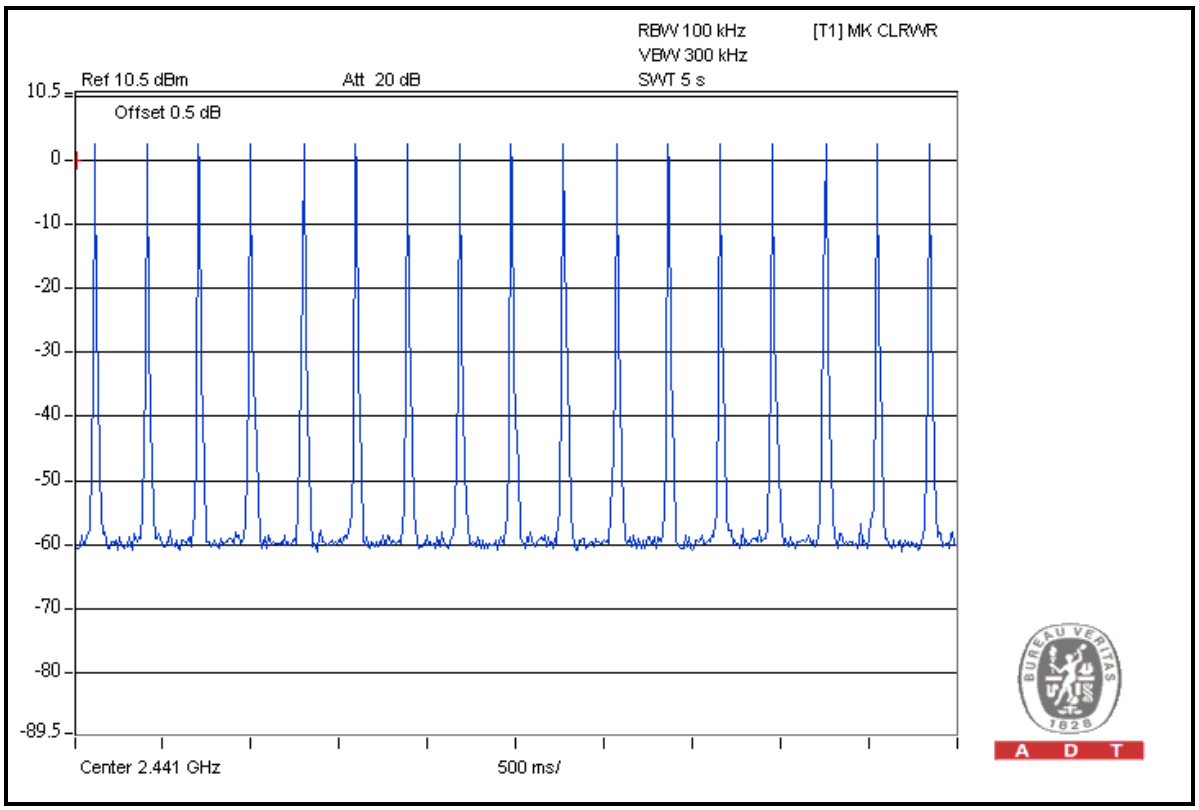

RBW 100 kHz
VBW 100 kHz
SWT 3 ms
[T1] MK VIEW
Marker 1 [T1]
-68.68 dBm
1.230000 ms
Delta 2 [T1]
3.97 dB
504.000000 us
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
Center 2.441 GHz
300 us/

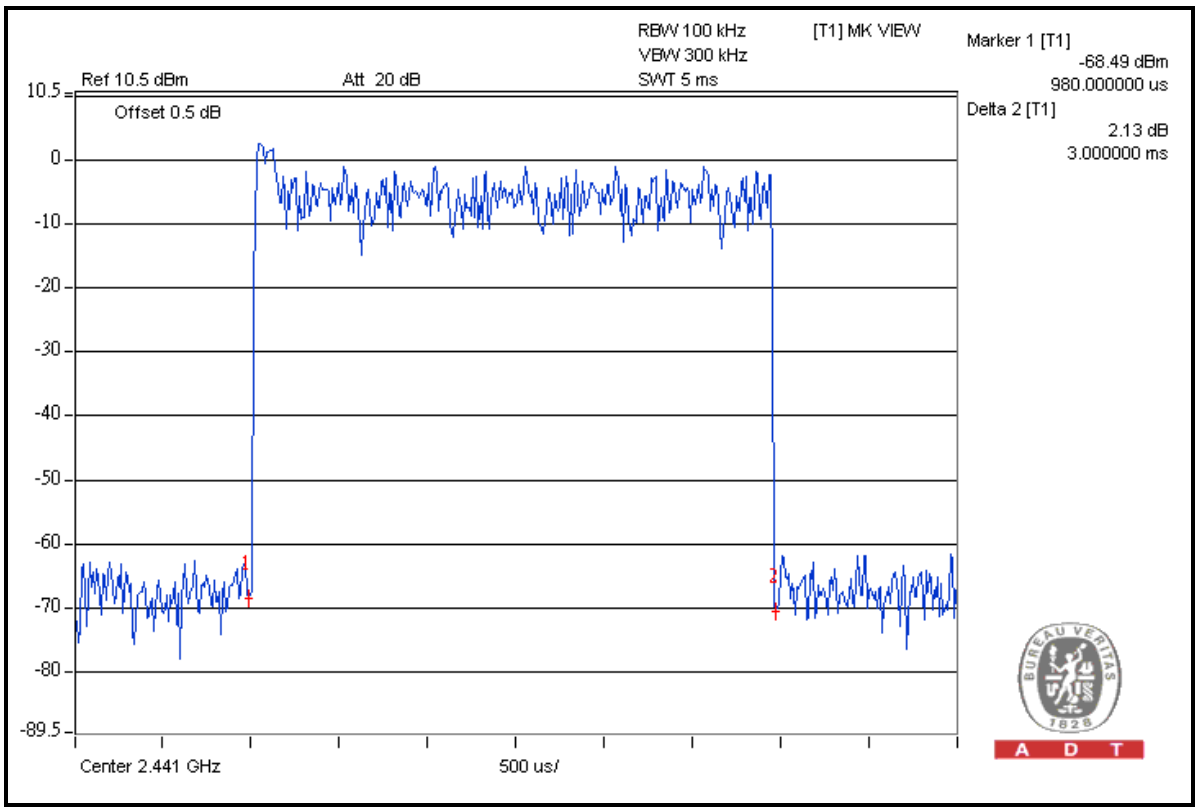
DH3


RBW 100 kHz
VBW 300 kHz
SWT 5 s
[T1] MK CLRWR
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
Center 2.441 GHz
500 ms/


RBW 100 kHz
VBW 300 kHz
SWT 3 ms
[T1] MK VIEW
Marker 1 [T1]
-73.46 dBm
960.000000 us
Delta 2 [T1]
6.14 dB
1.704000 ms
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
Center 2.441 GHz
300 us/

DH5


RBW 100 kHz
VBW 300 kHz
SWT 5 s
[T1] MK CLRWR
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
Center 2.441 GHz
500 ms/


RBW 100 kHz
VBW 300 kHz
SWT 5 ms
[T1] MK VIEW
Marker 1 [T1]
-68.49 dBm
980.000000 us
Delta 2 [T1]
2.13 dB
3.000000 ms
Ref 10.5 dBm
Att 20 dB
Offset 0.5 dB
10.5
0
-10
-20
-30
-40
-50
-60
-70
-80
-89.5
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 two-thirds 20dB bandwidth of hopping channel is greater than 25kHz, two-thirds 20dB bandwidth of hopping channel shell be a minimum limit for the hopping channel separation.

4.5.2 TEST INSTRUMENTS

Test date: July 19, 2011

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100036	Dec. 08, 2010	Dec. 07, 2011

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

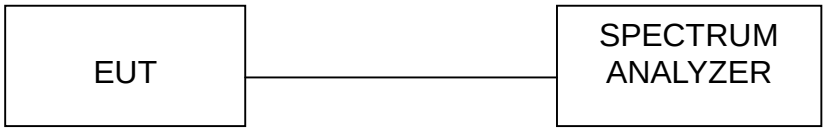
4.5.3 TEST PROCEDURE

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. 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.
3. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
4. 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

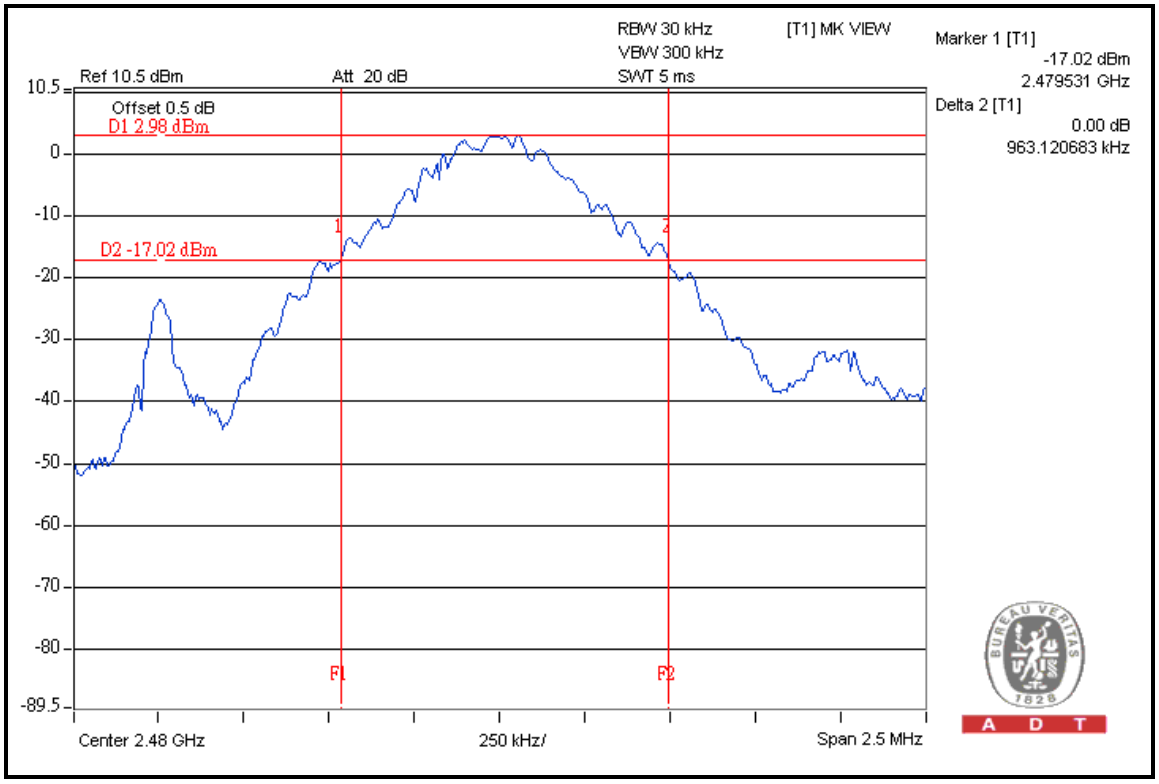
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.5.7 TEST RESULTS

For GFSK:

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
0	2402	0.94
39	2441	0.95
78	2480	0.96

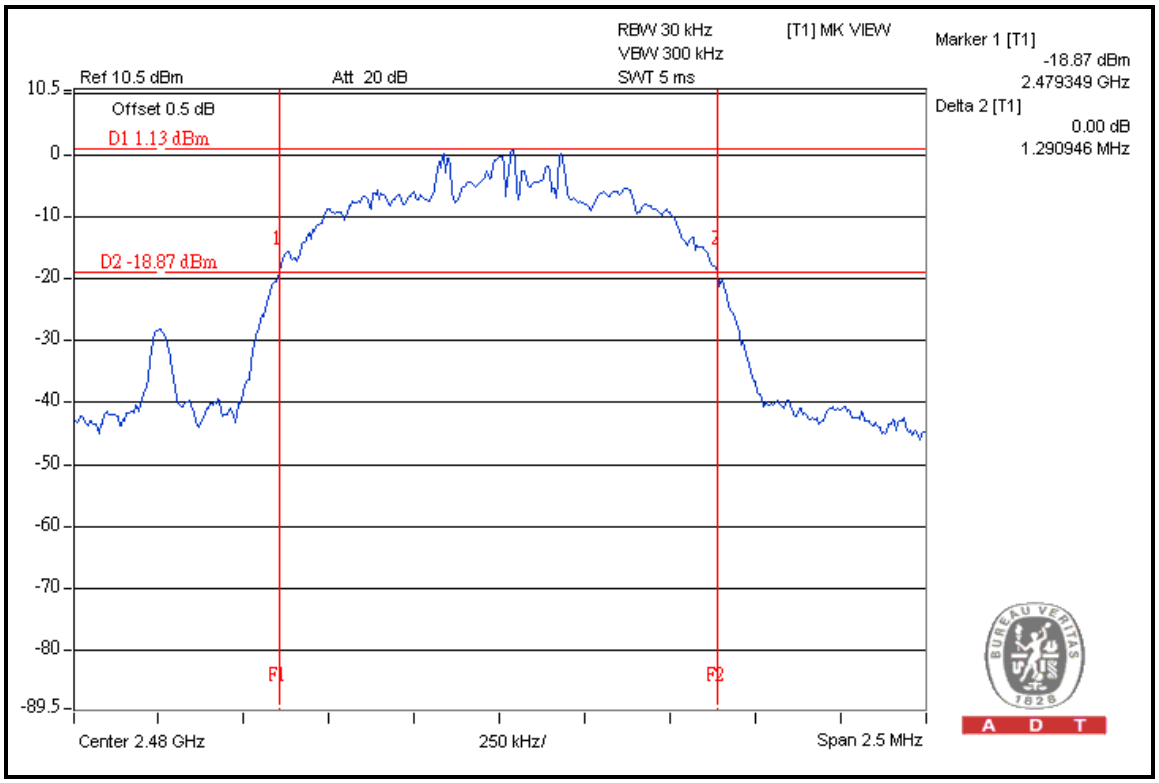
CH 78



For 8DPSK:

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
0	2402	1.27
39	2441	1.27
78	2480	1.29

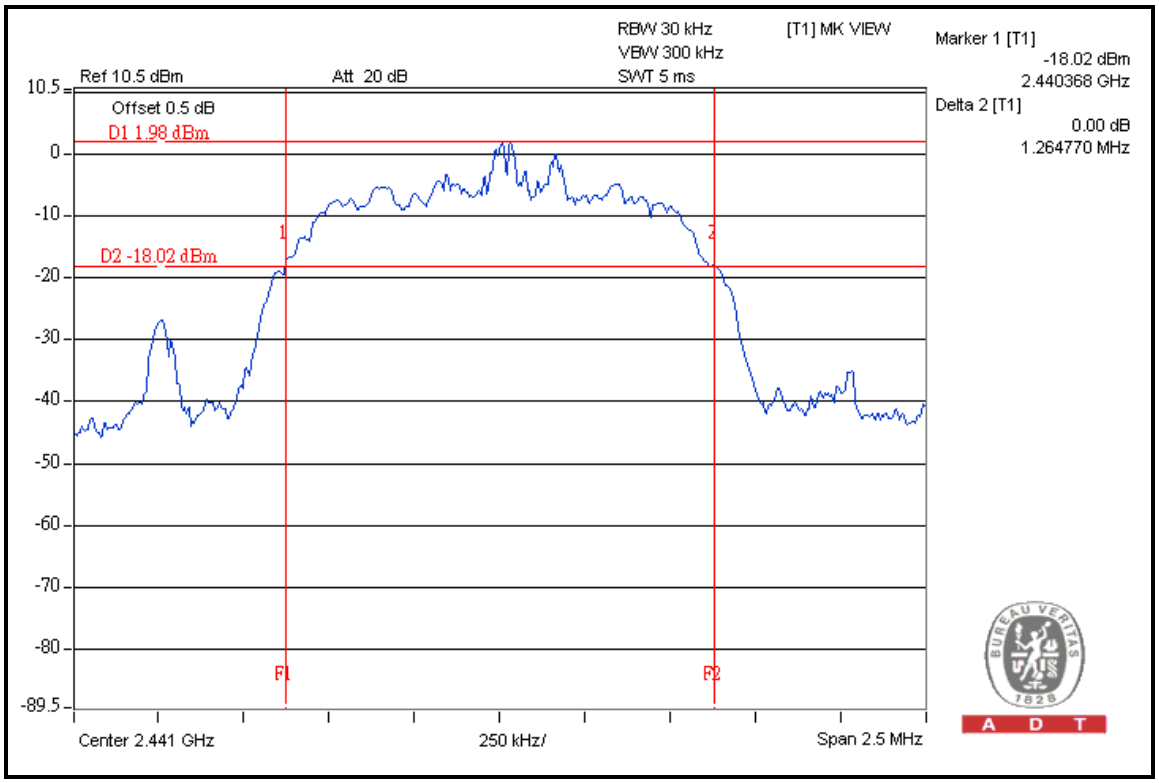
CH 78



For π/4-DQPSK:

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
0	2402	1.26
39	2441	1.26
78	2480	1.23

CH 39



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

Test date: July 19, 2011

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100036	Dec. 08, 2010	Dec. 07, 2011

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.6.3 TEST PROCEDURES

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

4.6.4 DEVIATION FROM TEST STANDARD

No deviation

4.6.5 TEST SETUP

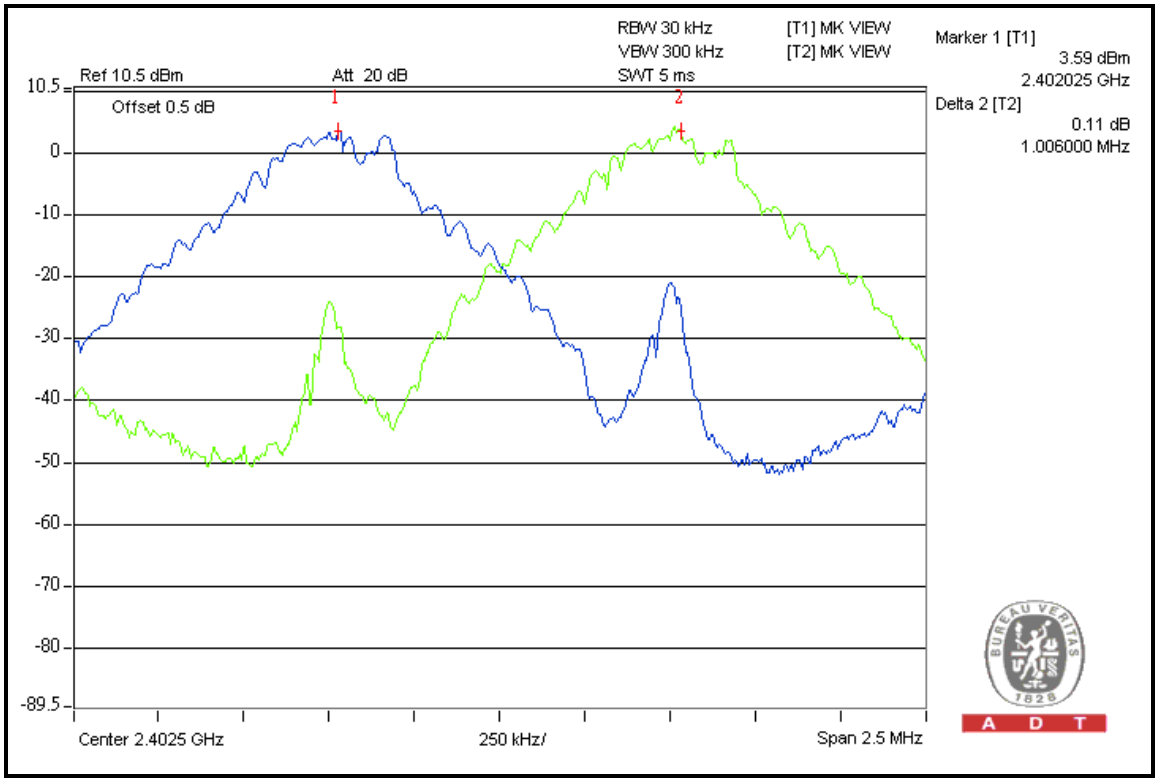
4.6.6 TEST RESULTS

For GFSK

Channel	Frequency (MHz)	Adjacent Channel Separation (MHz)	Minimum Limit (MHz)	Pass / Fail
0	2402	1.006	0.627	PASS
39	2441	1.001	0.633	PASS
78	2480	1.003	0.640	PASS

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

CH 0

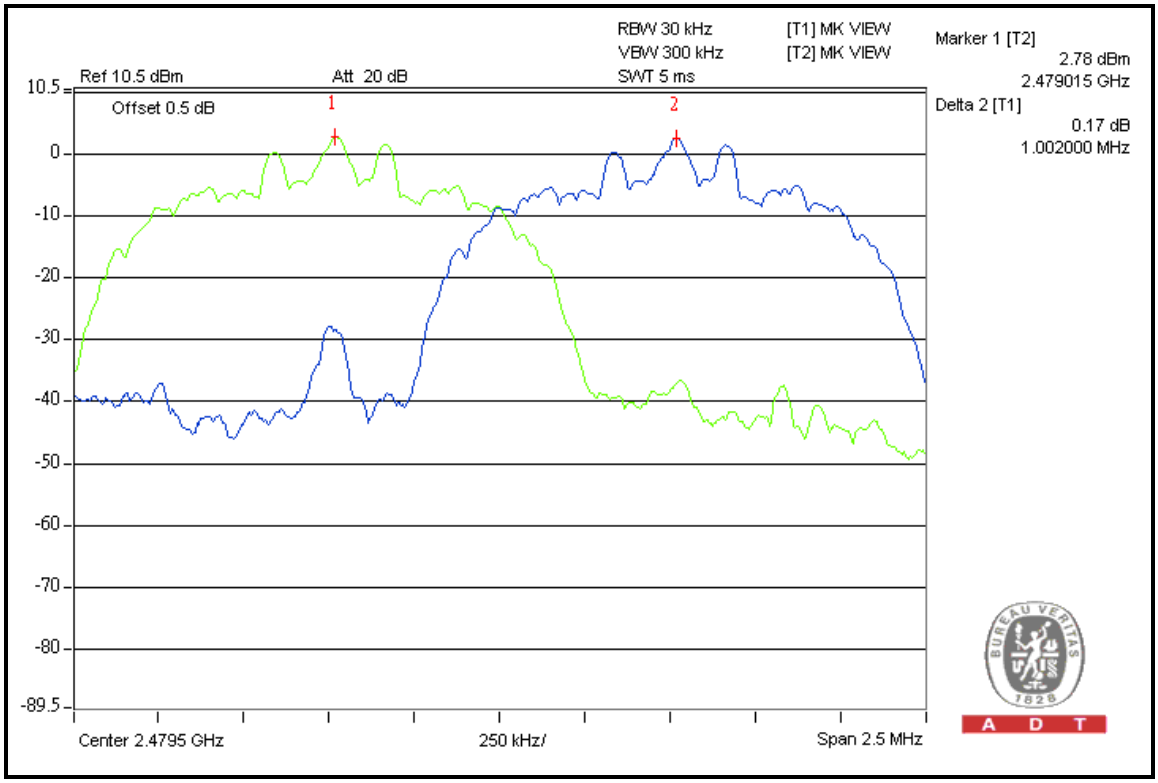


For 8DPSK

Channel	Frequency (MHz)	Adjacent Channel Separation (MHz)	Minimum Limit (MHz)	Pass / Fail
0	2402	1.001	0.847	PASS
39	2441	1.001	0.847	PASS
78	2480	1.002	0.860	PASS

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

CH 78

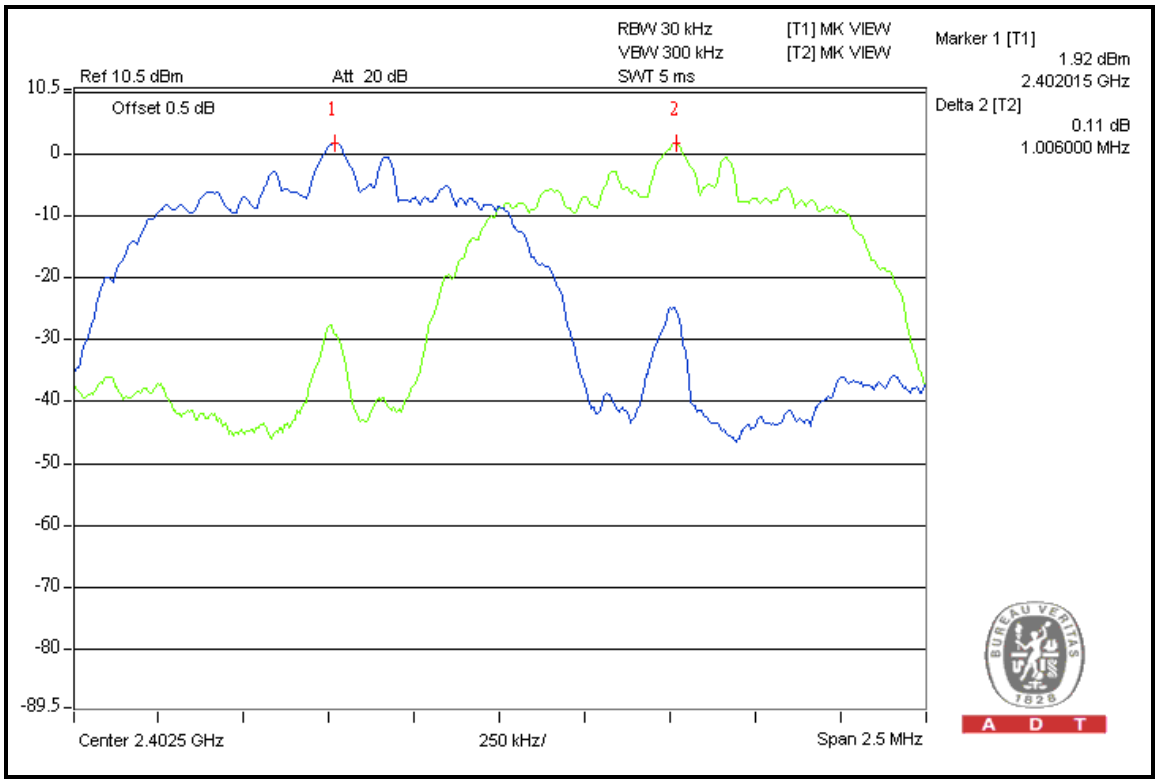


For π/4-DQPSK

Channel	Frequency (MHz)	Adjacent Channel Separation (MHz)	Minimum Limit (MHz)	Pass / Fail
0	2402	1.006	0.840	PASS
39	2441	1.006	0.840	PASS
78	2480	1.000	0.820	PASS

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

CH 0



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

Test date: July 19, 2011

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100036	Dec. 08, 2010	Dec. 07, 2011

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

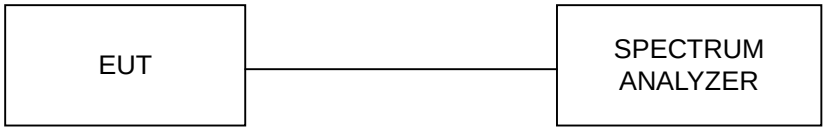
4.7.3 TEST PROCEDURES

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. 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.
3. The center frequency of the spectrum analyzer is set to the fundamental frequency and using 3 MHz RBW and 10 MHz VBW.
4. Measure the captured power within the band and recording the plot.
5. Repeat above procedures until all frequencies measured 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

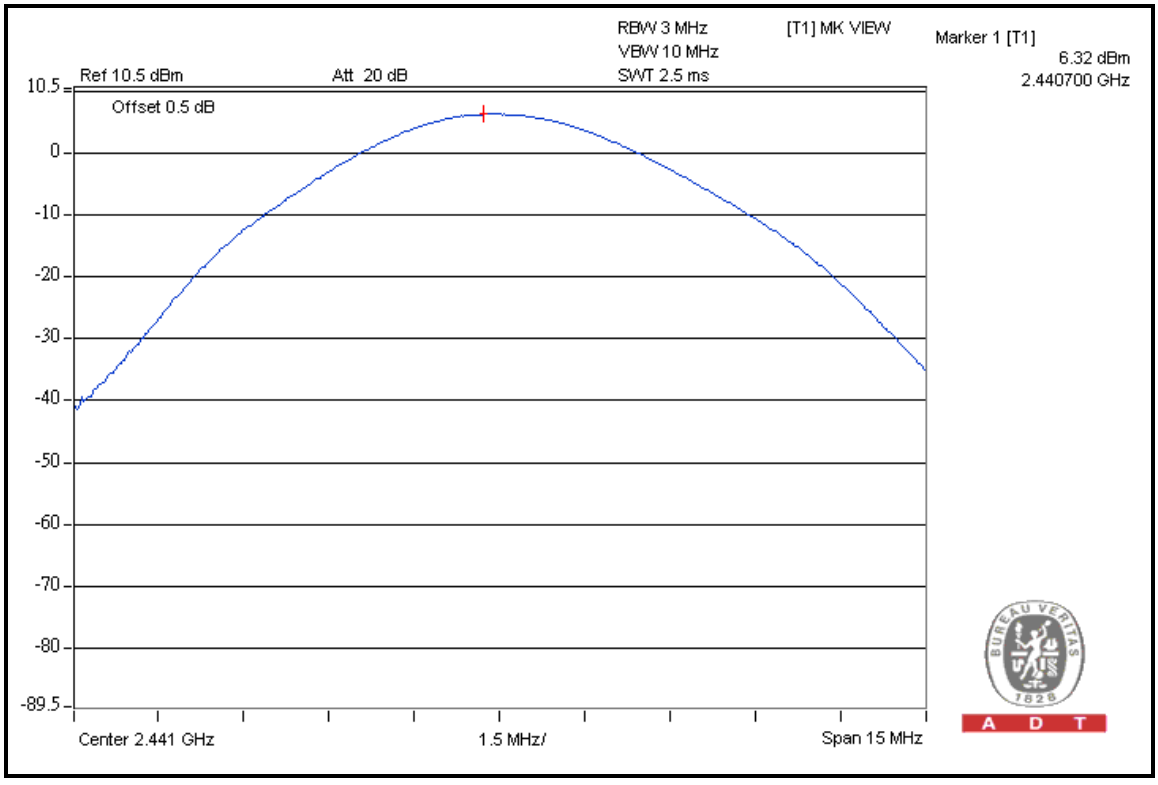
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.7.7 TEST RESULTS

GFSK

CHANNEL	CHANNEL FREQUENCY (MHz)	POWER OUTPUT (dBm)	POWER OUTPUT (mW)	POWER LIMIT (mW)	PASS/FAIL
0	2402	5.7	3.7	125	PASS
39	2441	6.3	4.3	125	PASS
78	2480	6.2	4.2	125	PASS

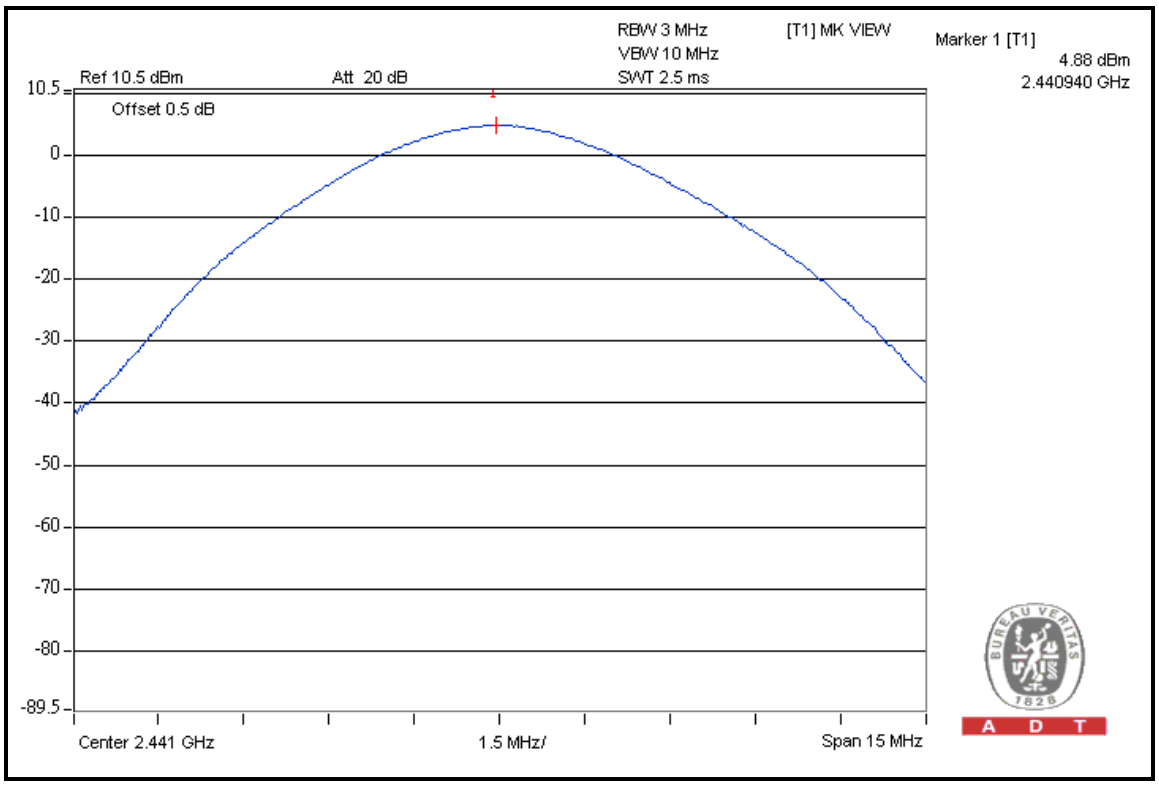
CH 39



For 8DPSK

CHANNEL	CHANNEL FREQUENCY (MHz)	POWER OUTPUT (dBm)	POWER OUTPUT (mW)	POWER LIMIT (mW)	PASS/FAIL
0	2402	4.4	2.8	125	PASS
39	2441	4.9	3.1	125	PASS
78	2480	4.8	3.0	125	PASS

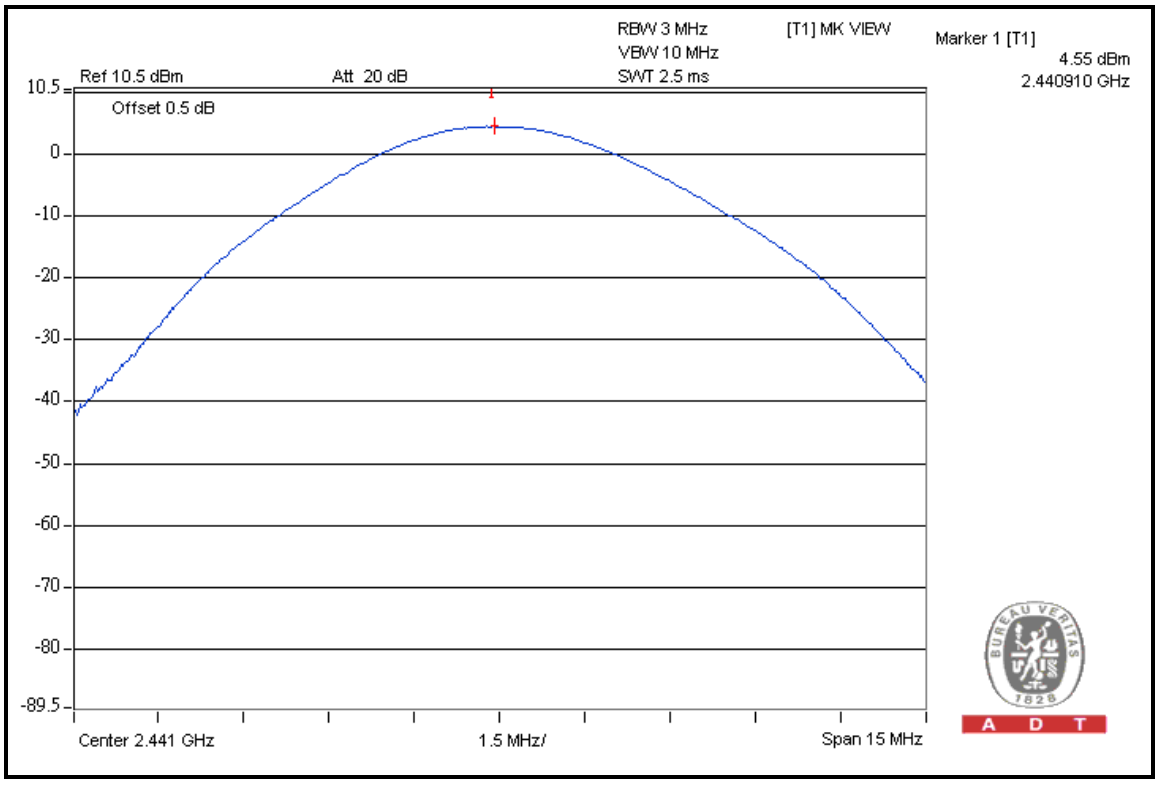
CH 39



For π/4-DQPSK

CHANNEL	CHANNEL FREQUENCY (MHz)	POWER OUTPUT (dBm)	POWER OUTPUT (mW)	POWER LIMIT (mW)	PASS/FAIL
0	2402	3.8	2.4	125	PASS
39	2441	4.6	2.9	125	PASS
78	2480	4.6	2.9	125	PASS

CH 39



4.8 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

Test date: July 19, 2011

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100036	Dec. 08, 2010	Dec. 07, 2011

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

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

4.8.5 EUT OPERATING CONDITION

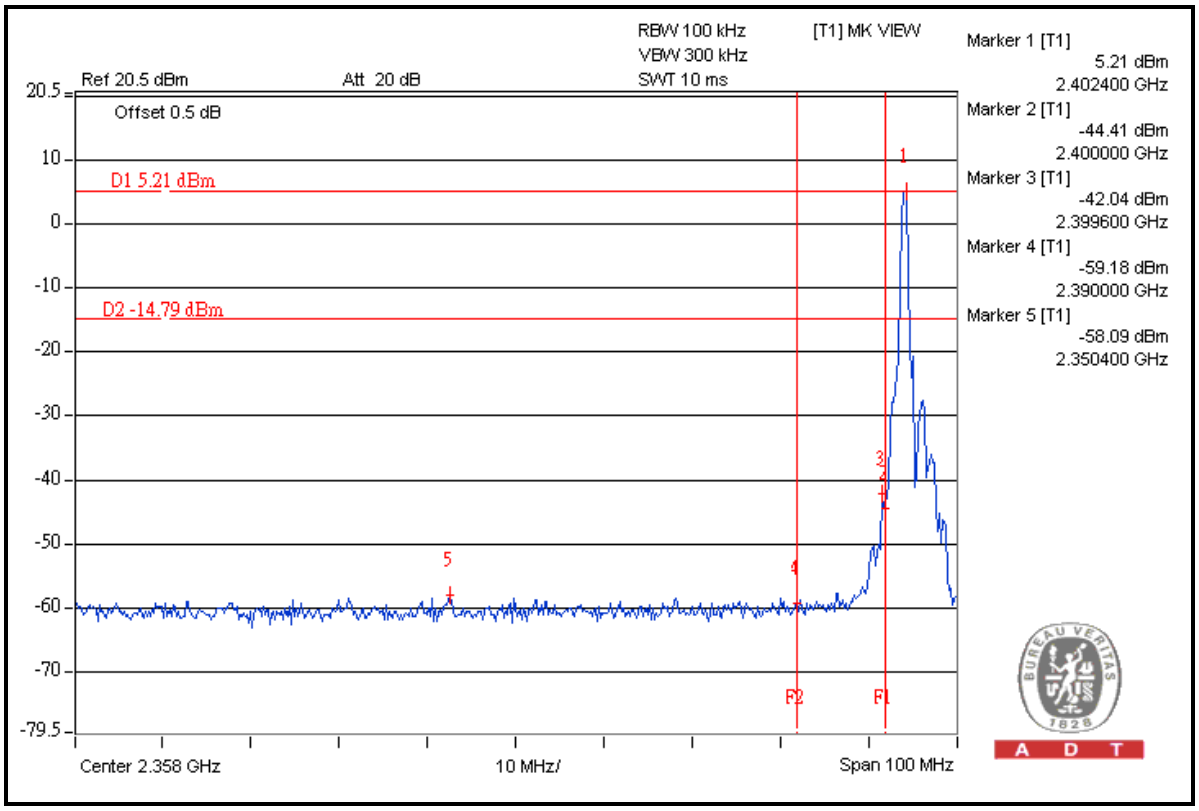
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

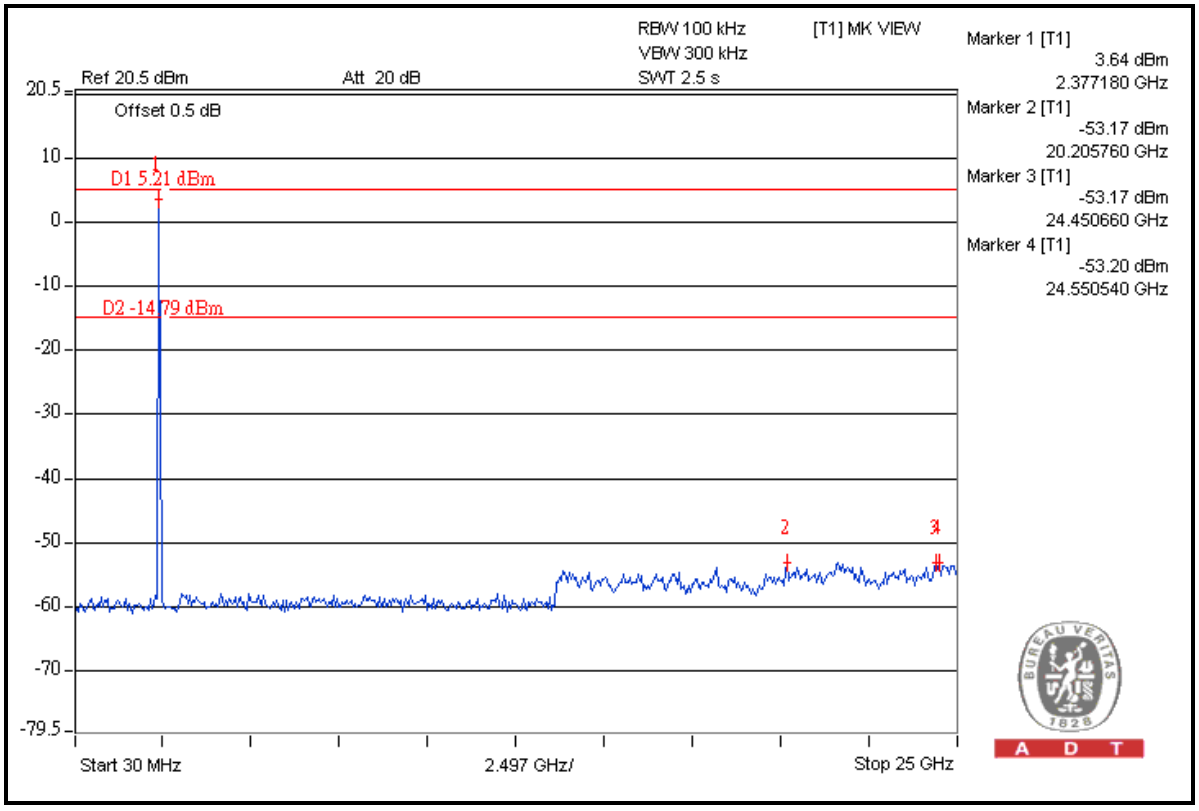
4.8.6 TEST RESULTS

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 in part 15.247(d).

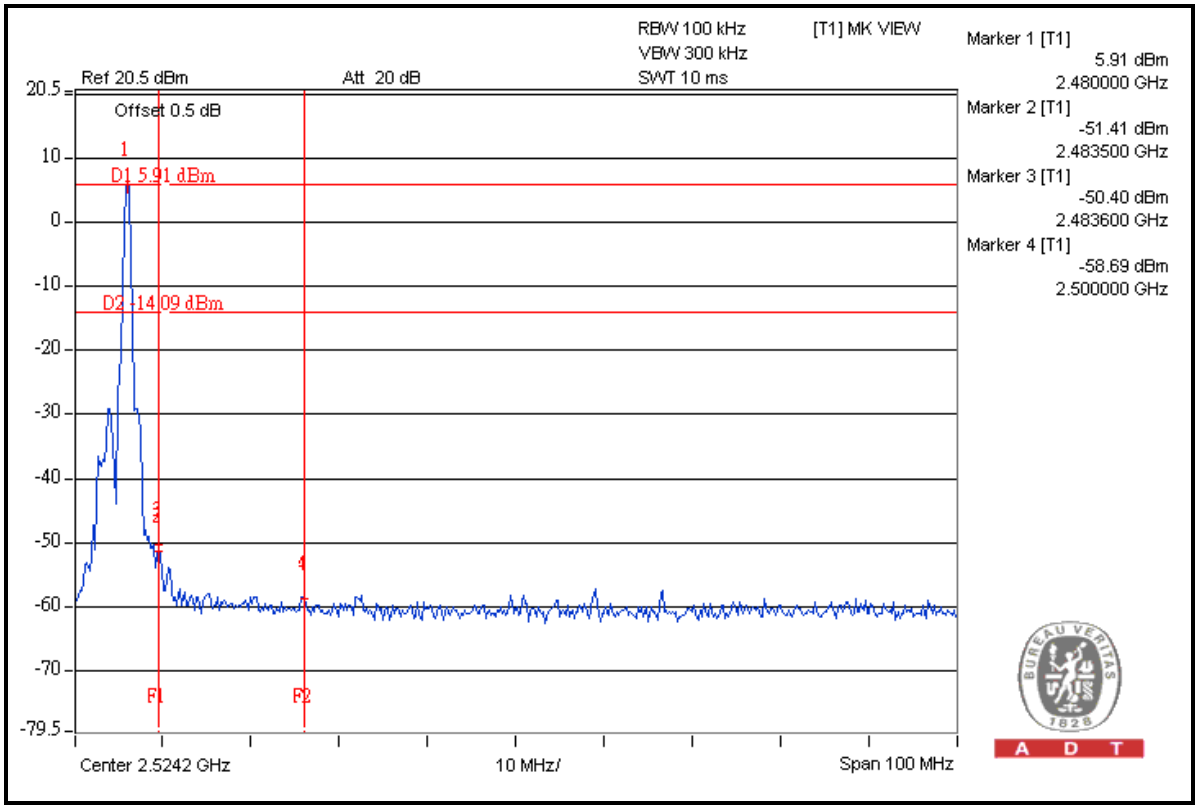
For GFSK Modulation Type:

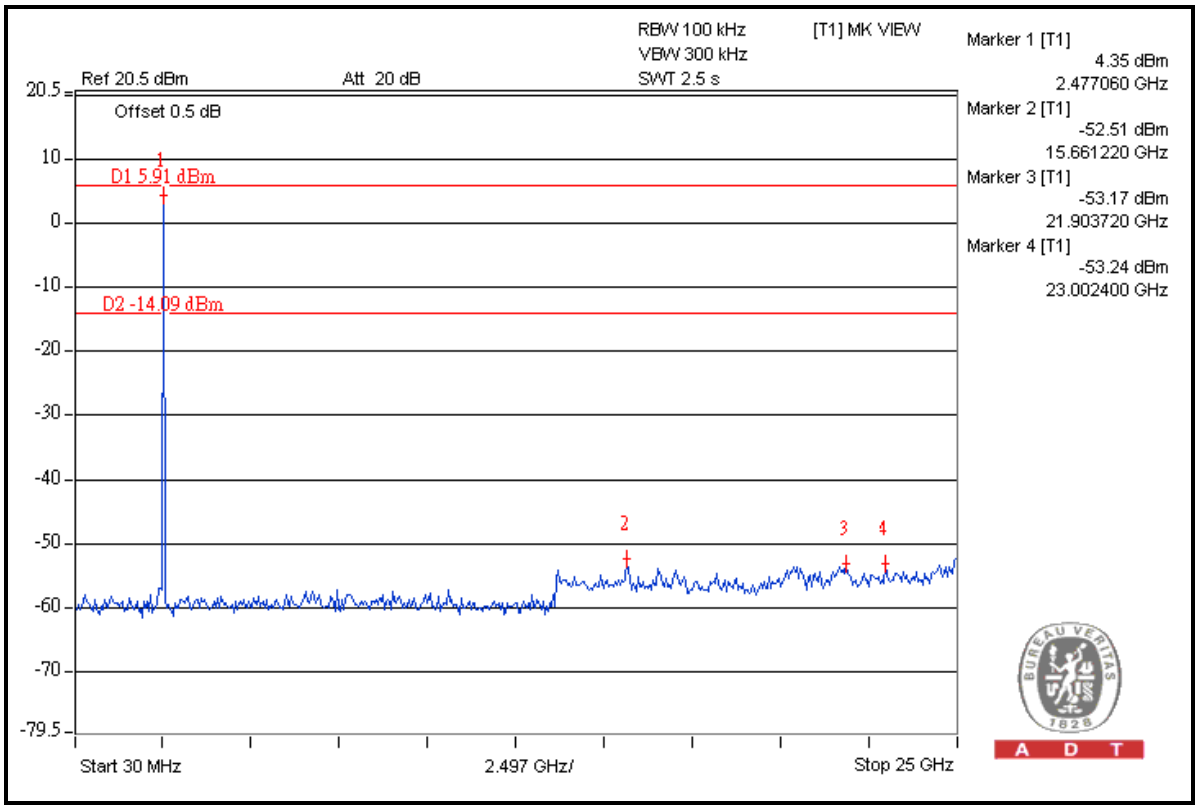
CH 0





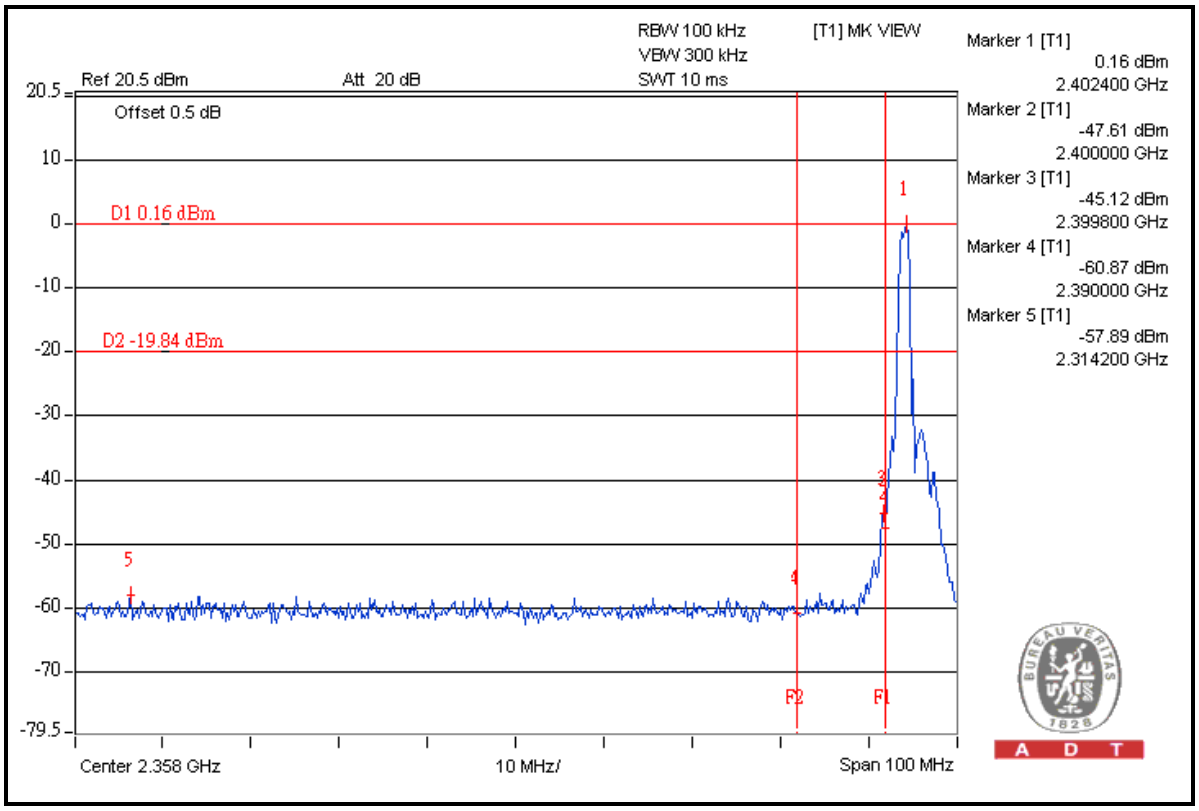
CH 78

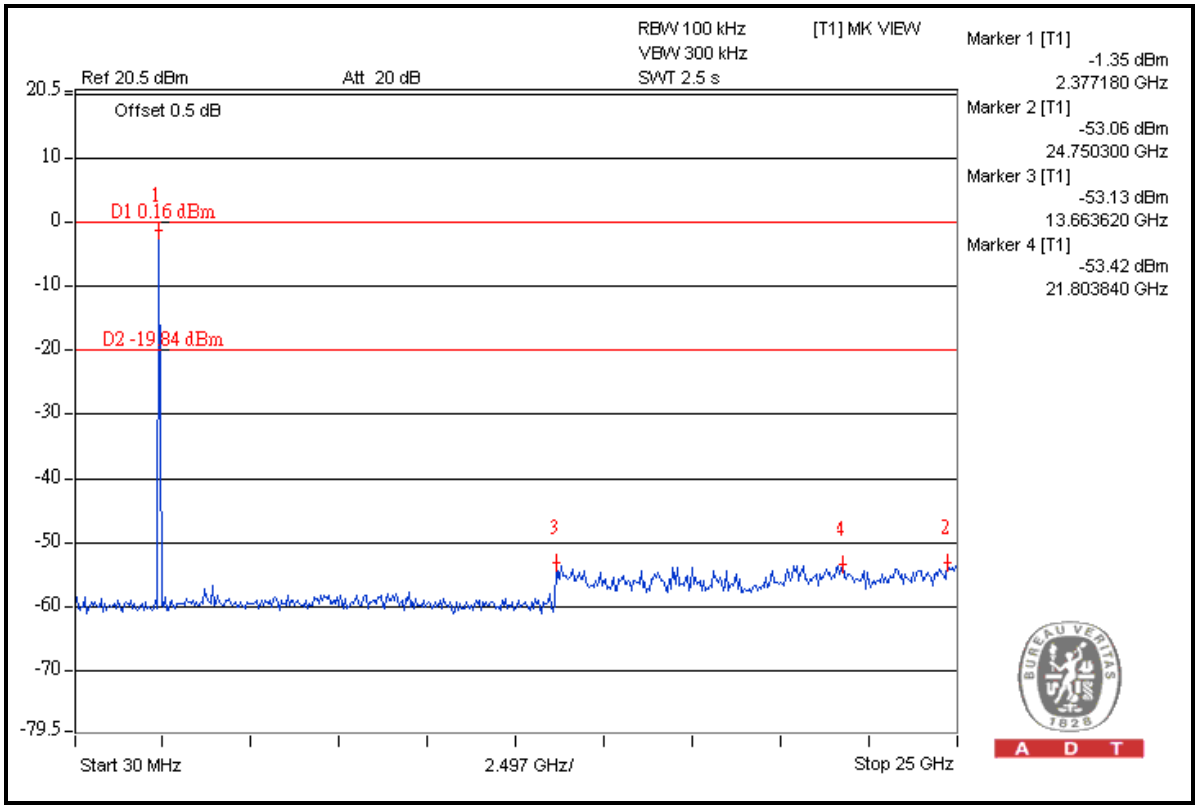

RBW 100 kHz
VBW 300 kHz
SWT 10 ms
[T1] MK VIEW
Ref 20.5 dBm
Att 20 dB
Offset 0.5 dB
D1 5.91 dBm
D2 -14.09 dBm
Marker 1 [T1]
5.91 dBm
2.480000 GHz
Marker 2 [T1]
-51.41 dBm
2.483500 GHz
Marker 3 [T1]
-50.40 dBm
2.483600 GHz
Marker 4 [T1]
-58.69 dBm
2.500000 GHz
Center 2.5242 GHz
10 MHz/
Span 100 MHz


RBW 100 kHz
VBW 300 kHz
SWT 2.5 s
[T1] MK VIEW
Ref 20.5 dBm
Att 20 dB
Offset 0.5 dB
D1 5.91 dBm
D2 -14.09 dBm
Marker 1 [T1]
4.35 dBm
2.477060 GHz
Marker 2 [T1]
-52.51 dBm
15.661220 GHz
Marker 3 [T1]
-53.17 dBm
21.903720 GHz
Marker 4 [T1]
-53.24 dBm
23.002400 GHz
Start 30 MHz
2.497 GHz/
Stop 25 GHz

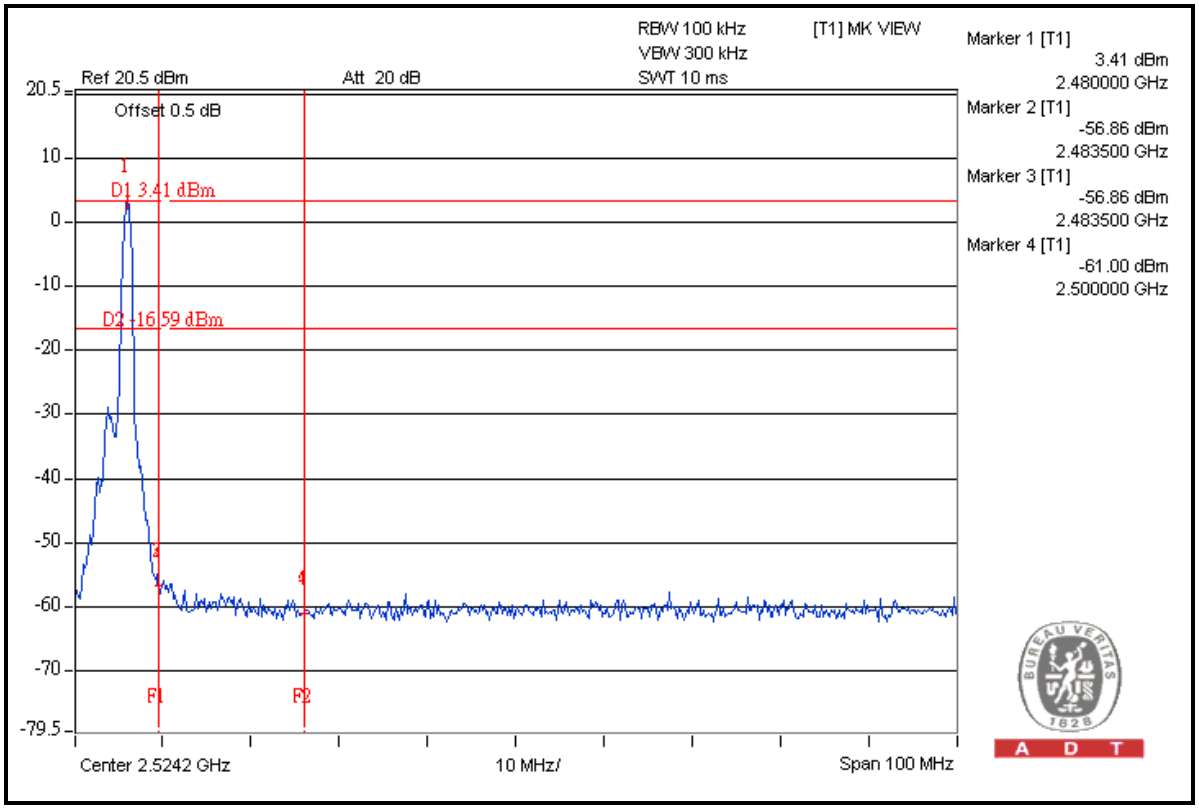
For 8DPSK Modulation Type:

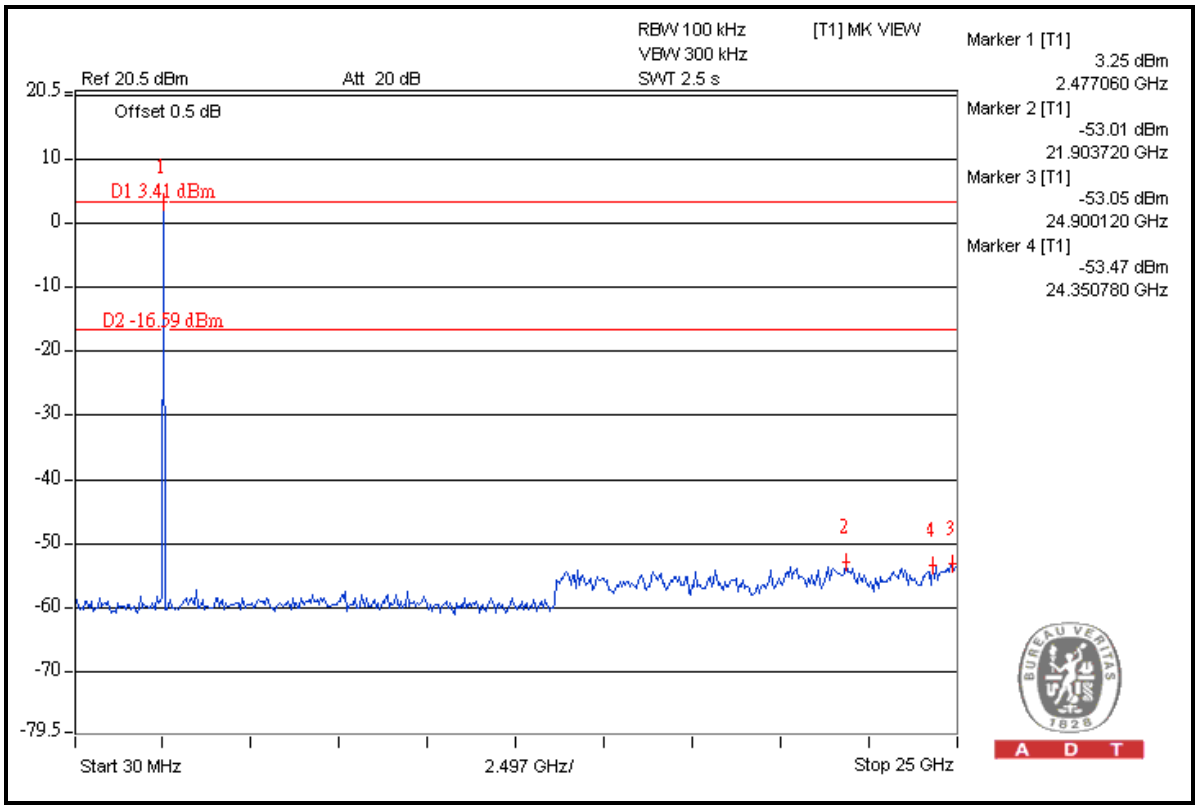
CH 0





CH 78


RBW 100 kHz
VBW 300 kHz
SWT 10 ms
[T1] MK VIEW
Ref 20.5 dBm
Att 20 dB
Offset 0.5 dB
D1 3.41 dBm
D2 -16.59 dBm
F1
F2
Center 2.5242 GHz
10 MHz/
Span 100 MHz
Marker 1 [T1]
3.41 dBm
2.480000 GHz
Marker 2 [T1]
-56.86 dBm
2.483500 GHz
Marker 3 [T1]
-56.86 dBm
2.483500 GHz
Marker 4 [T1]
-61.00 dBm
2.500000 GHz


RBW 100 kHz
VBW 300 kHz
SWT 2.5 s
[T1] MK VIEW
Ref 20.5 dBm
Att 20 dB
Offset 0.5 dB
D1 3.41 dBm
D2 -16.59 dBm
Start 30 MHz
2.497 GHz/
Stop 25 GHz
Marker 1 [T1]
3.25 dBm
2.477060 GHz
Marker 2 [T1]
-53.01 dBm
21.903720 GHz
Marker 3 [T1]
-53.05 dBm
24.900120 GHz
Marker 4 [T1]
-53.47 dBm
24.350780 GHz

5 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 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
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Hwa Ya EMC/RF/Safety/Telecom Lab:
Tel: 886-3-3183232
Fax: 886-3-3185050

Email: service.adt@tw.bureauveritas.com
Web Site: www.adt.com.tw

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

6 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 ---