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FCC TEST REPORT

REPORT NO.: RF110907E02A-1 R1

MODEL NO.: AR5B22-SB

FCC ID: PPD-AR5B22SB

IC: 4104A-AR5B22SB

RECEIVED: Sep. 06, 2011

TESTED: Sep. 13 to Nov. 21, 2011

ISSUED: Jan. 19, 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

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF110907E02A-1	Original release	Dec. 19, 2011
RF110907E02A-1 R1	<ol style="list-style-type: none">1. Added "hopping function" mode on section 4.8.62. Separated DTS and DSSS test result in this test report.3. Revised test data of "Radiated emission (Above 1GHz) for transmitter part".4. Added detail information of combination mode on section 3.1.	Jan. 19, 2012



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1 CERTIFICATION

PRODUCT : PCIE 802.11b/g/n 2.4GHz + USB BT 4.0 card
BRAND NAME : Atheros
MODEL NO. : AR5B22-SB
TEST SAMPLE : R&D SAMPLE
APPLICANT : Qualcomm Atheros, Inc.
TESTED : Sep. 13 to Nov. 21, 2011
STANDARDS : FCC Part 15, Subpart C (Section 15.247)
ANSI C63.4-2003
ANSI C63.10-2009
Canada RSS-210 Issue 8 (2010-12)
Canada RSS-Gen Issue 3 (2010-12)

The above equipment (Model: AR5B22-SB) 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 : *Midoli Peng*, **DATE:** Jan. 19, 2012
(Midoli Peng, Specialist)

APPROVED BY : *May Chen*, **DATE:** Jan. 19, 2012
(May Chen, Deputy Manager)



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2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart C, Canada RSS-210/ RSS-GEN

Standard Section			Test Type and Limit	Result	REMARK
RSS-210	RSS-Gen	FCC Part 15			
-	7.2.4	15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit Minimum passing margin is -11.61dB at 0.185MHz
A8.1(d)	-	15.247(a)(1) (I)-(ii)	Number of Hopping Frequency Used Spec.: At least 15 channels	PASS	Meet the requirement of limit
A8.1(d)	-	15.247(a)(1) (ii)	Dwell Time on Each Channel Spec. : Max. 0.4 second within 30 second	PASS	Meet the requirement of limit
A8.1(b)	-	15.247(a)(1) (I)-(ii)	Hopping Channel Separation Spec. : Min. 25 kHz or two-thirds of 20 dB bandwidth, which ever is greater	PASS	Meet the requirement of limit
-	4.6	15.247(a)(2)	Spectrum Bandwidth of a Frequency Hopping Spread Spectrum System	PASS	Meet the requirement of limit
A8.4(2)	-	15.247(b)	Maximum Peak Output Power Spec.: max. 125mW	PASS	Meet the requirement of limit
A8.2(b)	-	15.247(e)	Power Spectral Density Limit: max. 8dBm	PASS	Meet the requirement of limit
A8.5	4.9	15.247(c)	Transmitter Radiated Emissions FCC Limit: Table 15.209 RSS-Gen Limit: Table 5, 6	PASS	Meet the requirement of limit Minimum passing margin is -1.9dB at 199.91MHz
-	6.1	-	Receiver Radiated Emissions RSS-Gen Limit: Table 2	PASS	Meet the requirement of limit Minimum passing margin is -1.9dB at 199.91MHz
A8.5	-	15.247(c)	Conducted Out-Band Emission Measurement	PASS	Meet the requirement of limit
	7.1.4	15.203	Antenna Requirement	PASS	Antenna connector is IPEX not a standard connector.



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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)	3.89 dB
Radiated emissions (1GHz -18GHz)	2.19 dB
Radiated emissions (18GHz -40GHz)	2.56 dB



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3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	PCIE 802.11b/g/n 2.4GHz + USB BT 4.0 card
MODEL NO.	AR5B22-SB
FCC ID	PPD-AR5B22SB
IC	4104A-AR5B22SB
POWER SUPPLY	DC 3.3V from host equipment
MODULATION TYPE	GFSK, $\pi/4$ -DQPSK, 8DPSK, GFSK(LE mode)
MODULATION TECHNOLOGY	For LE mode: DTS & FHSS Others: FHSS
OPERATING FREQUENCY	2402MHz ~ 2480MHz
NUMBER OF CHANNEL	For Bluetooth 2.1+ EDR: 79 For Bluetooth LE: 40 (37 hopping + 3 advertising channel)
MAXIMUM OUTPUT POWER	GFSK: 2.5 mW 8DPSK: 4.8 mW GFSK(LE mode): 2.5 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. "RF110907E02A R1 ">
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 b/g only, chain 0 is used for BT and chain 1 is used for WLAN)



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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	78	FHSS	8DPSK

5. For radiated : The EUT's antenna was pre-tested under the following modes:

Test Mode	Description
Mode A	X-Y axis
Mode B	Y-Z axis
Mode C	X-Z axis

From the above modes, the worst case was found in **Mode A**. Therefore only the test data of the mode was recorded in this report.

6. 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>	Cable Loss(dB)	Cable Length(mm)
1&2	WNC	81.EBJ15.005	PIFA	IPEX	3.62	1.15	300

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



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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		

For Bluetooth LE: 40 (37 hopping + 3 advertising channel)

Forty channels are provided to this EUT.

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480



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3.4 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL:

EUT CONFIGURE MODE	APPLICABLE TO					DESCRIPTION
	PLC	RE < 1G	RE \geq 1G	APCM	OB	
-	✓	✓	✓	✓	✓	-

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

RE \geq 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	78	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).
- Radiated Emission Test Below 1GHz: The receiving mode has shown equal or better performance than Tx mode during the pre-scan and hence the Tx mode data is re-used for.
- 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	78	FHSS	8DPSK	DH5
0 to 39	39	FHSS	GFSK (LE mode)	DH1



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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
0 to 39	0, 19, 39	FHSS	GFSK (LE mode)	DH1
Receiver	0, 39, 78	FHSS	-	-

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
0 to 39	0, 39	FHSS	GFSK (LE mode)	DH1

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 39	0, 19, 39	FHSS	GFSK (LE mode)	DH1



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TEST CONDITION:

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (SYSTEM)	TESTED BY
PLC	27deg. C, 62%RH	120Vac, 60Hz	Mike Hsieh
RE ³ 1G	24deg. C, 64%RH	120Vac, 60Hz	Amos Chuang
RE<1G	23deg. C, 69%RH	120Vac, 60Hz	Evan Huang
APCM	25deg. C, 60%RH	120Vac, 60Hz	Rex Huang
OB	25deg. C, 60%RH	120Vac, 60Hz	Rex Huang



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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. (15.247)

ANSI C63.4-2003

ANSI C63.10-2009

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.

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



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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	PP21L	CN-0GD366-70166-5B3-09ZX	QDS-BRCM1016
2	PRINTER	EPSON	LQ-300+II	G88Y074083	FCC DoC
3	iPod shuffle	Apple	MC749TA/A	CC4DN25WDFDM	FCC DoC
4	MOUSE	DELL	MOC5UO	I14066PK	FCC DoC
5	extension card	Atheros	NA	NA	NA

For other test items					
No.	Product	Brand	Model No.	Serial No.	FCC ID
1	NOTEBOOK COMPUTER	DELL	PP19L	CN-OHC416-70166-5CA-0448	PIW632500516610
2	EXTENSION CARD	Atheros	NA	NA	NA

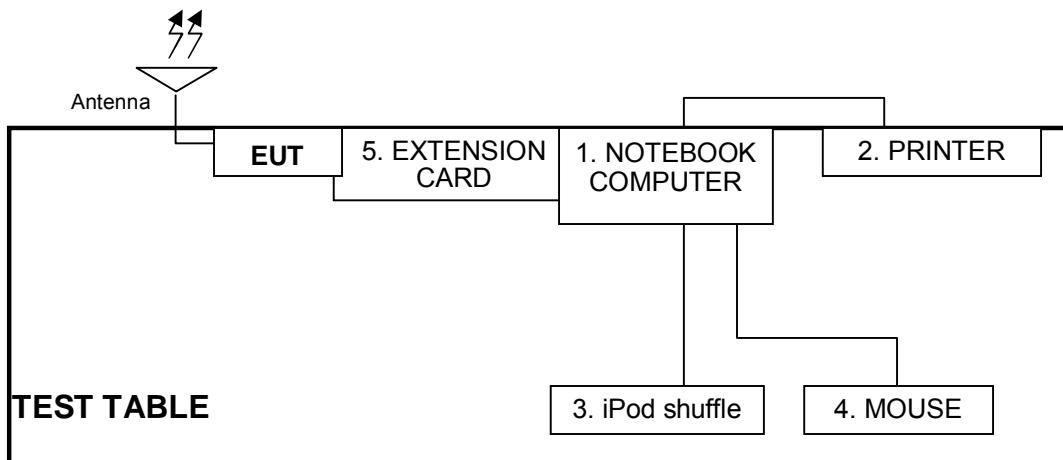
For conducted emission test					
No.	Signal cable description	1	2	3	4
1	NA				
2	USB cable(1.8m)				
3	USB cable(0.1m)				
4	USB cable(1.8m)				
5	NA				

For other test items					
No.	Signal cable description	1	2	3	4
1	NA				
2	NA				

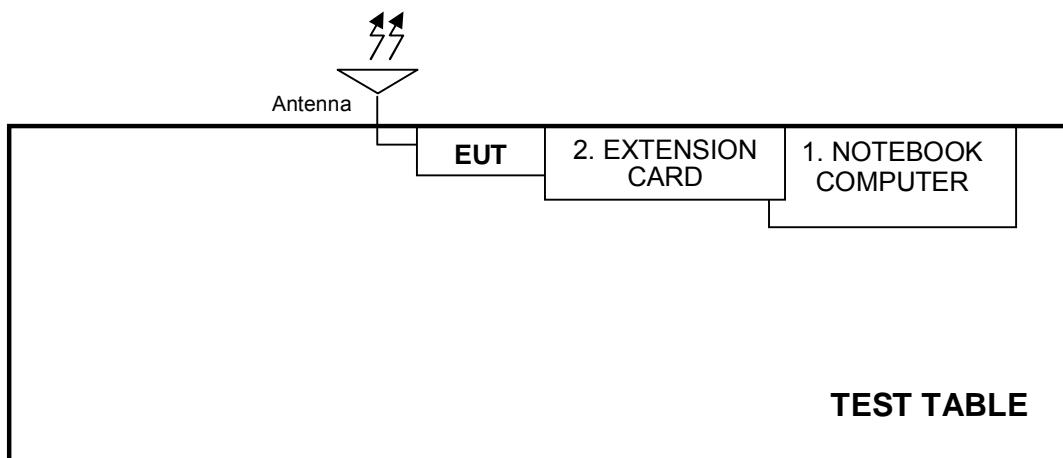
Note: The power cords of the above support units were unshielded (1.8m).

3.7 CONFIGURATION OF SYSTEM UNDER TEST

For conducted emission test



For other test items





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4 TEST PROCEDURES AND RESULTS(FHSS)

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dB μ V)	
0.15-0.5 0.5-5 5-30	Quasi-peak	Average
	66 to 56	56 to 46
	56	46
	60	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: Oct. 11, 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)	NSLK8127	8127-522	Sep. 07, 2011	Sep. 06, 2012
Line-Impedance Stabilization Network (for Peripheral)	ESH3-Z5	848773/004	Nov. 03, 2010	Nov. 02, 2011
RF Cable (JYEBAO)	5DFB	COCCAB-002	Aug. 29, 2011	Aug. 28, 2012
50 ohms Terminator	50	3	Nov. 03, 2010	Nov. 02, 2011
Software	BV ADT_Cond_V7.3.7	NA	NA	NA

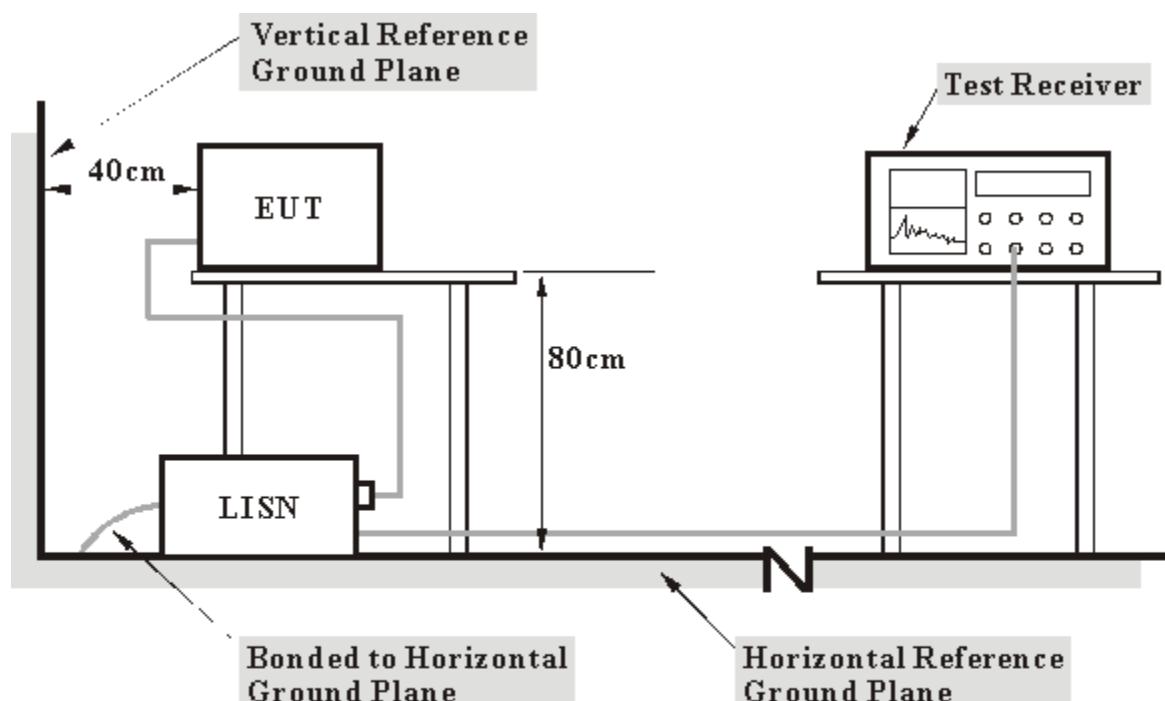
Note:

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.



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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.

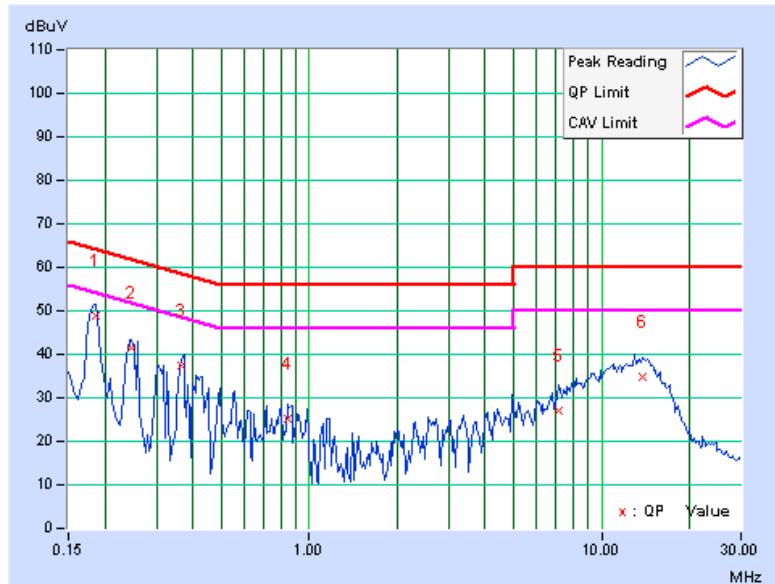
4.1.6 TEST RESULTS

PHASE	Line (L)	6dB BANDWIDTH	9 kHz
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No	Freq. [MHz]	Corr. (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]	[dB (uV)]	[dB (uV)]	[dB (uV)]	[dB (uV)]	[dB (uV)]	[dB (uV)]	[dB (uV)]
1	0.185	0.10	48.71	42.54	48.81	42.64	64.25	54.25	-15.44	-11.61
2	0.245	0.10	41.26	33.76	41.36	33.86	61.93	51.93	-20.56	-18.06
3	0.363	0.11	37.36	33.81	37.47	33.92	58.66	48.66	-21.19	-14.74
4	0.849	0.14	25.18	22.56	25.32	22.70	56.00	46.00	-30.68	-23.30
5	7.125	0.44	26.71	17.05	27.15	17.49	60.00	50.00	-32.85	-32.51
6	13.863	0.64	34.15	27.62	34.79	28.26	60.00	50.00	-25.21	-21.74

REMARKS:

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

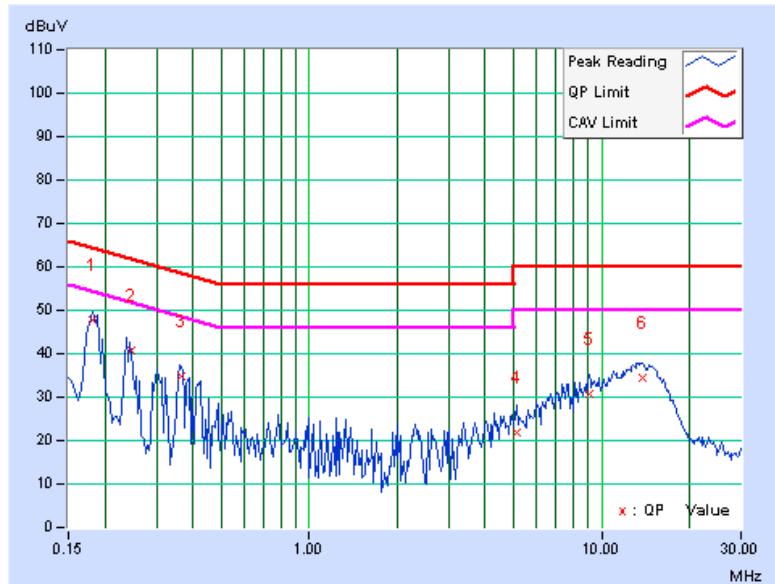


PHASE	Neutral (N)	6dB BANDWIDTH	9 kHz
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No	Freq.	Corr.	Reading Value		Emission Level		Limit		Margin	
	Factor	[dB (uV)]	[dB (uV)]	[dB (uV)]	[dB (uV)]	[dB (uV)]	(dB)			
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.181	0.08	47.69	41.77	47.77	41.85	64.43	54.43	-16.65	-12.57
2	0.246	0.09	40.83	34.56	40.92	34.65	61.90	51.90	-20.98	-17.25
3	0.367	0.11	34.85	31.84	34.96	31.95	58.57	48.57	-23.61	-16.62
4	5.148	0.27	21.45	8.93	21.72	9.20	60.00	50.00	-38.28	-40.80
5	9.078	0.38	30.25	21.46	30.63	21.84	60.00	50.00	-29.37	-28.16
6	13.883	0.51	33.91	26.95	34.42	27.46	60.00	50.00	-25.58	-22.54

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.





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4.2 RADIATED EMISSION MEASUREMENT

4.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

For transmitter part:

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209(RSS-Gen table 5, 6) 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. 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.
4. Section 15.205 restricted bands of operation shall compliance with the limits in Section 15.209.



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For receiver part:

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in RSS-Gen table 2 as following:

Frequencies (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

NOTE:

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



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4.2.2 TEST INSTRUMENTS

Below 1GHz<Test date: Sep. 13, 2011>

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
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
SPACEK LABS	SLKKa-48-6	9K16	Nov. 16, 2010	Nov. 15, 2011
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	Oct. 08, 2010	Oct. 07, 2011
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.



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Above 1GHz<Test date: Oct. 20, 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
SPACEK LABS	SLKKa-48-6	9K16	Nov. 16, 2010	Nov. 15, 2011
SCHWARZBECK Trilog Broadband Antenna	VULB 9168	9168-360	Apr. 14, 2011	Apr. 13, 2012
AISI Horn_Antenna	AIH.8018	0000320091110	Nov. 22, 2010	Nov. 21, 2011
SCHWARZBECK Horn_Antenna	BBHA 9170	9170-424	Oct. 07, 2011	Oct. 06, 2012
RF CABLE	NA	RF104-201 RF104-203 RF104-204	Dec. 27, 2010	Dec. 26, 2011
RF Cable	NA	CHGCAB_001	Oct. 07, 2011	Oct. 06, 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. 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.



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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 10 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to 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.

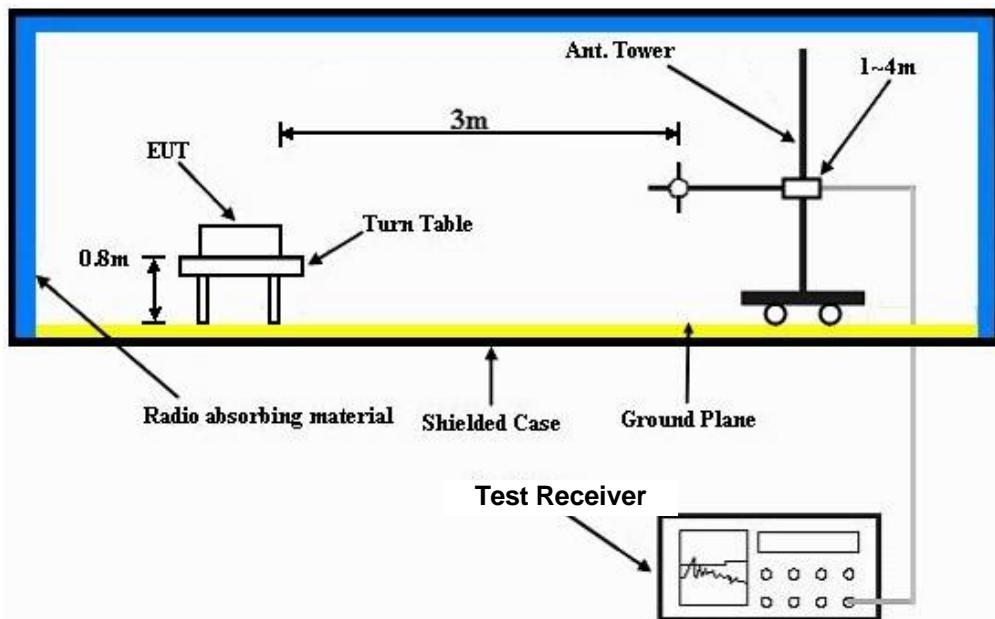
NOTE:

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 is 1MHz and video bandwidth of test receiver/spectrum analyzer 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.



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4.2.6 TEST RESULTS (FOR TRANSMITTER PART)

4.2.6.1 TEST RESULTS (GFSK / 8DPSK)

BELOW 1GHz WORST-CASE DATA : 8DPSK MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		Channel 78		FREQUENCY RANGE
INPUT POWER (SYSTEM)		120Vac, 60 Hz		DETECTOR FUNCTION
ENVIRONMENTAL CONDITIONS		23deg. C, 69%RH		TESTED BY
				Even Huang

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	99.99	39.2 QP	43.5	-4.3	2.00 H	113	29.93	9.31
2	199.91	41.6 QP	43.5	-1.9	1.00 H	46	30.41	11.22
3	300.00	37.6 QP	46.0	-8.4	1.00 H	328	22.38	15.18
4	497.65	34.1 QP	46.0	-11.9	1.00 H	211	14.64	19.48
5	600.32	40.3 QP	46.0	-5.7	1.00 H	243	18.69	21.60
6	799.87	38.8 QP	46.0	-7.2	1.00 H	13	14.36	24.48
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	35.92	34.7 QP	40.0	-5.3	1.00 V	282	21.22	13.45
2	99.99	32.4 QP	43.5	-11.1	2.00 V	243	23.12	9.31
3	199.94	36.2 QP	43.5	-7.3	2.00 V	267	25.02	11.21
4	299.89	34.3 QP	46.0	-11.7	1.00 V	212	19.13	15.18
5	799.87	38.7 QP	46.0	-7.3	1.00 V	133	14.19	24.48
6	939.01	40.5 QP	46.0	-5.5	1.00 V	167	14.28	26.24

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.



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ABOVE 1GHz WORST-CASE DATA :

GFSK MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		Channel 0		FREQUENCY RANGE 1 ~ 25GHz
INPUT POWER (SYSTEM)		120Vac, 60 Hz		DETECTOR FUNCTION Peak (PK)
ENVIRONMENTAL CONDITIONS		24deg. C, 69%RH		TESTED BY Amos Chuang

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	52.0 PK	74.0	-22.0	1.00 H	109	20.12	31.88
2	2390.00	28.7 AV	54.0	-25.3	1.00 H	109	-3.18	31.88
3	*2402.00	96.2 PK			1.00 H	109	64.28	31.92
4	*2402.00	72.9 AV			1.00 H	109	40.98	31.92
5	4804.00	49.0 PK	74.0	-25.0	1.10 H	104	7.83	41.17
6	4804.00	25.7 AV	54.0	-28.3	1.10 H	104	-15.47	41.17
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	52.9 PK	74.0	-21.1	1.00 V	259	21.02	31.88
2	2390.00	29.6 AV	54.0	-24.4	1.00 V	259	-2.28	31.88
3	*2402.00	97.9 PK			1.00 V	256	65.98	31.92
4	*2402.00	74.6 AV			1.00 V	256	42.68	31.92
5	4804.00	48.6 PK	74.0	-25.4	1.05 V	115	7.43	41.17
6	4804.00	25.3 AV	54.0	-28.7	1.05 V	115	-15.87	41.17

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 average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:

$$20 \log (\text{Duty cycle}) = 20 \log (3.4 * 2 \text{ ms} / 100 \text{ ms}) = -23.3 \text{ dB}$$

Please see page 33 for plotted duty.



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EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		FREQUENCY RANGE		1 ~ 25GHz
INPUT POWER (SYSTEM)		DETECTOR FUNCTION		Peak (PK)
ENVIRONMENTAL CONDITIONS		TESTED BY		Amos Chuang

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	100.7 PK			1.12 H	144	68.65	32.05
2	*2441.00	77.4 AV			1.12 H	144	45.35	32.05
3	4882.00	48.6 PK	74.0	-25.4	1.00 H	95	7.22	41.38
4	4882.00	25.3 AV	54.0	-28.7	1.00 H	95	-16.08	41.38
5	7323.00	52.3 PK	74.0	-21.7	1.00 H	72	6.60	45.70
6	7323.00	29.0 AV	54.0	-25.0	1.00 H	72	-16.70	45.70

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	100.3 PK			1.01 V	169	68.25	32.05
2	*2441.00	77.0 AV			1.01 V	169	44.95	32.05
3	4882.00	47.7 PK	74.0	-26.3	1.06 V	115	6.32	41.38
4	4882.00	24.4 AV	54.0	-29.6	1.06 V	115	-16.98	41.38
5	7323.00	55.5 PK	74.0	-18.5	1.00 V	189	9.80	45.70
6	7323.00	32.2 AV	54.0	-21.8	1.00 V	189	-13.50	45.70

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 average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:

$$20 \log (\text{Duty cycle}) = 20 \log (3.4 * 2 \text{ ms} / 100 \text{ ms}) = -23.3 \text{ dB}$$

Please see page 33 for plotted duty.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 78	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK)
ENVIRONMENTAL CONDITIONS	24deg. C, 69%RH	TESTED BY	Amos Chuang

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	95.1 PK			1.08 H	113	62.92	32.18
2	*2480.00	71.8 AV			1.08 H	113	39.62	32.18
3	2483.50	53.3 PK	74.0	-20.7	1.08 H	114	21.11	32.19
4	2483.50	30.0 AV	54.0	-24.0	1.08 H	114	-2.19	32.19
5	4960.00	48.9 PK	74.0	-25.1	1.06 H	88	7.35	41.55
6	4960.00	25.6 AV	54.0	-28.4	1.06 H	88	-15.95	41.55
7	7440.00	52.5 PK	74.0	-21.5	1.04 H	88	6.43	46.07
8	7440.00	29.2 AV	54.0	-24.8	1.04 H	88	-16.87	46.07
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	99.6 PK			1.00 V	169	67.42	32.18
2	*2480.00	76.3 AV			1.00 V	169	44.12	32.18
3	2483.50	53.9 PK	74.0	-20.1	1.00 V	169	21.71	32.19
4	2483.50	30.6 AV	54.0	-23.4	1.00 V	169	-1.59	32.19
5	4960.00	48.3 PK	74.0	-25.7	1.08 V	119	6.75	41.55
6	4960.00	25.0 AV	54.0	-29.0	1.08 V	119	-16.55	41.55
7	7440.00	55.3 PK	74.0	-18.7	1.00 V	198	9.23	46.07
8	7440.00	32.0 AV	54.0	-22.0	1.00 V	198	-14.07	46.07

REMARKS:

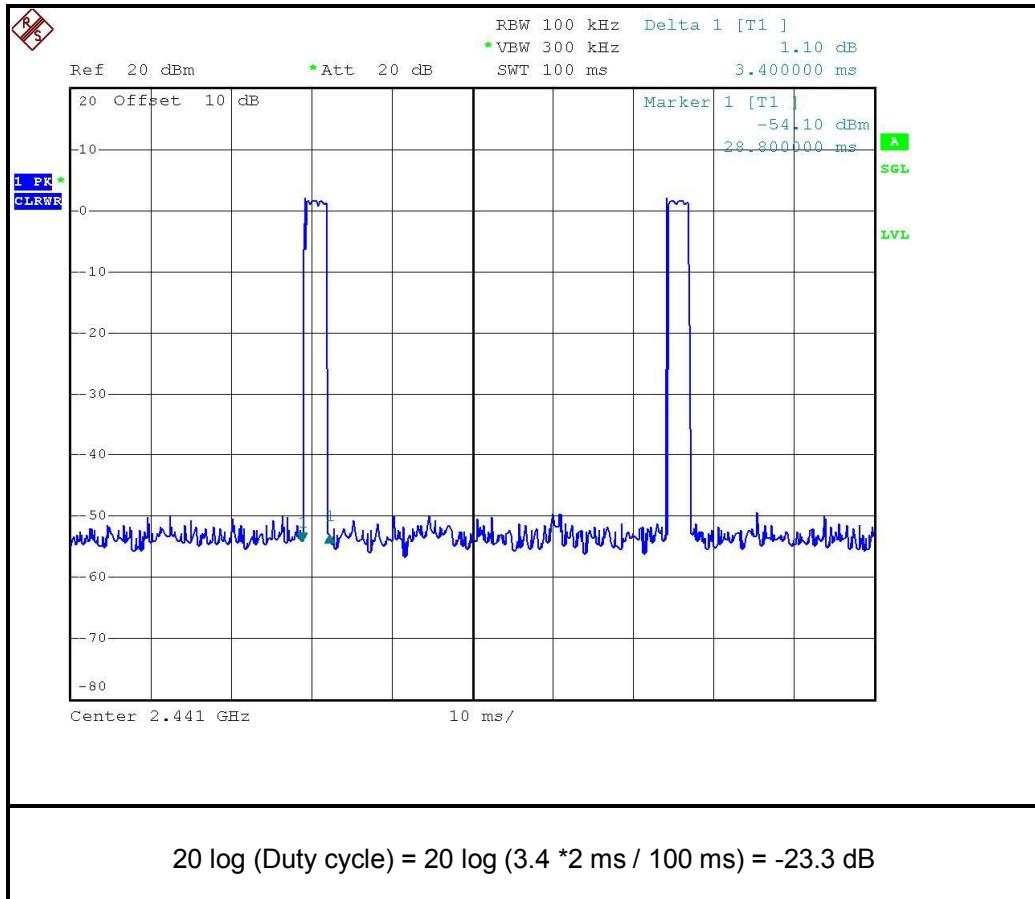
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. “*”: Fundamental frequency.
6. The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:

$$20 \log (\text{Duty cycle}) = 20 \log (3.4 * 2 \text{ ms} / 100 \text{ ms}) = -23.3 \text{ dB}$$

Please see page 33 for plotted duty.



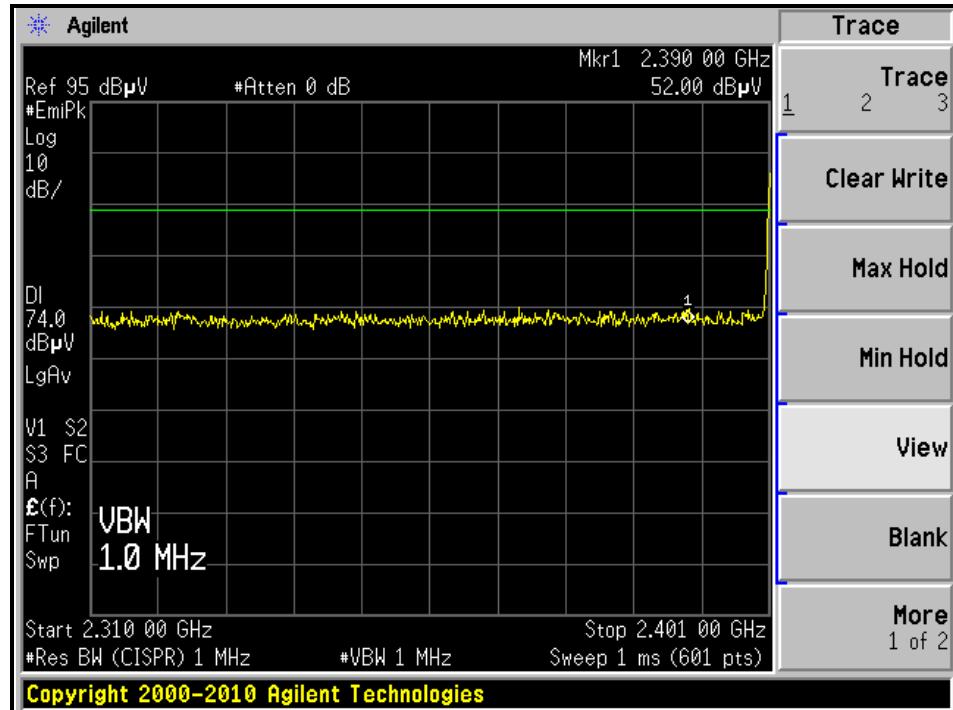
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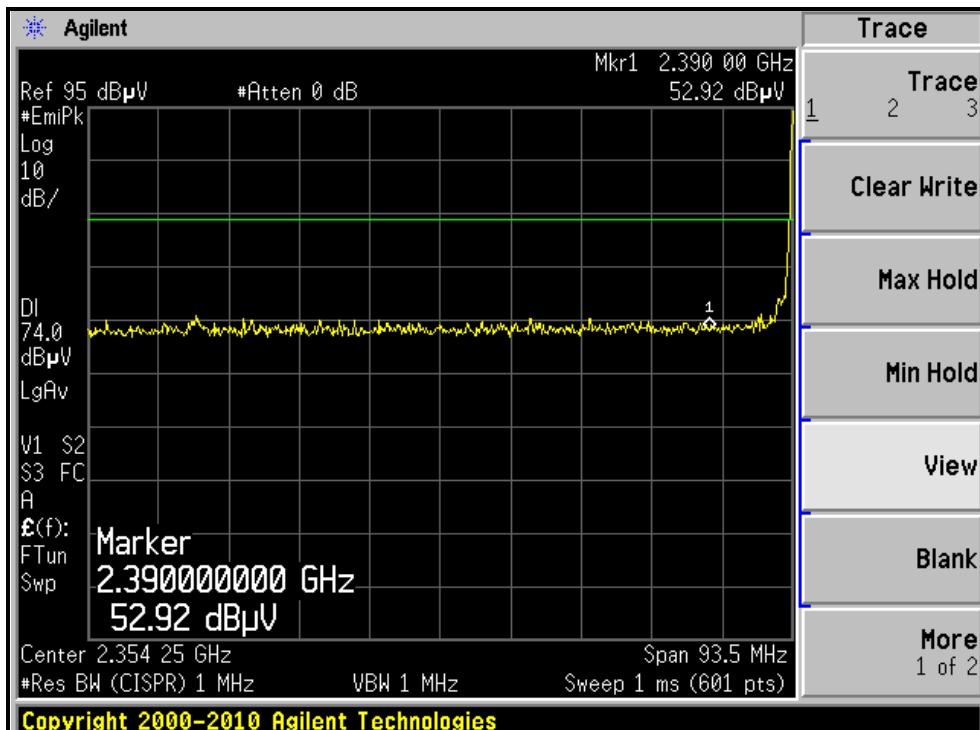


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RESTRICTED BANDEDGE (GFSK MODE, CH0, HORIZONTAL)



RESTRICTED BANDEDGE (GFSK MODE, CH0, VERTICAL)

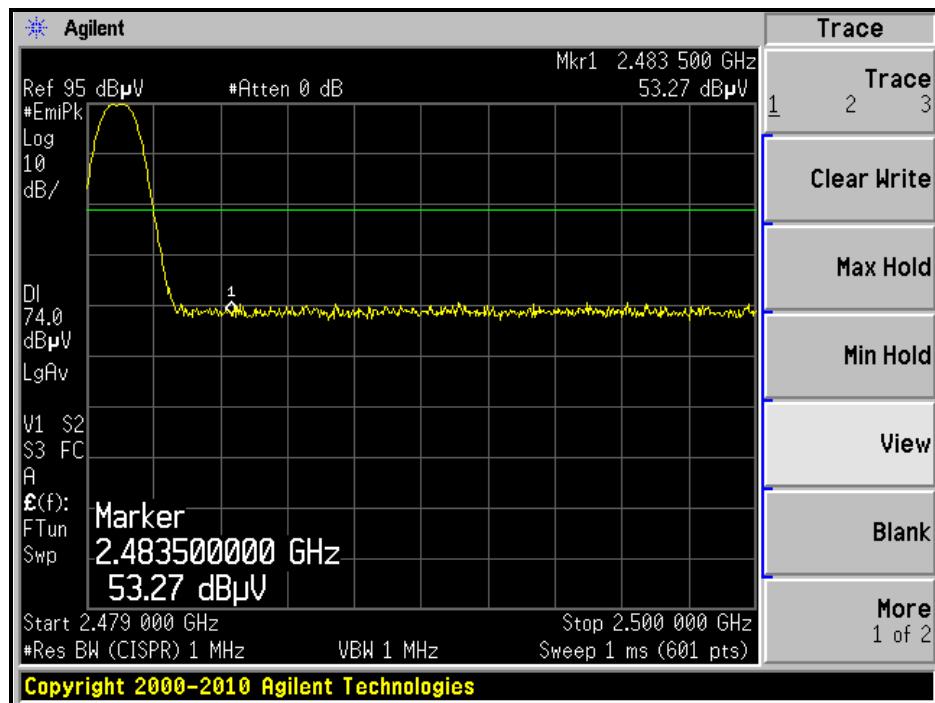


* The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle).
And it meets the requirement of limit.

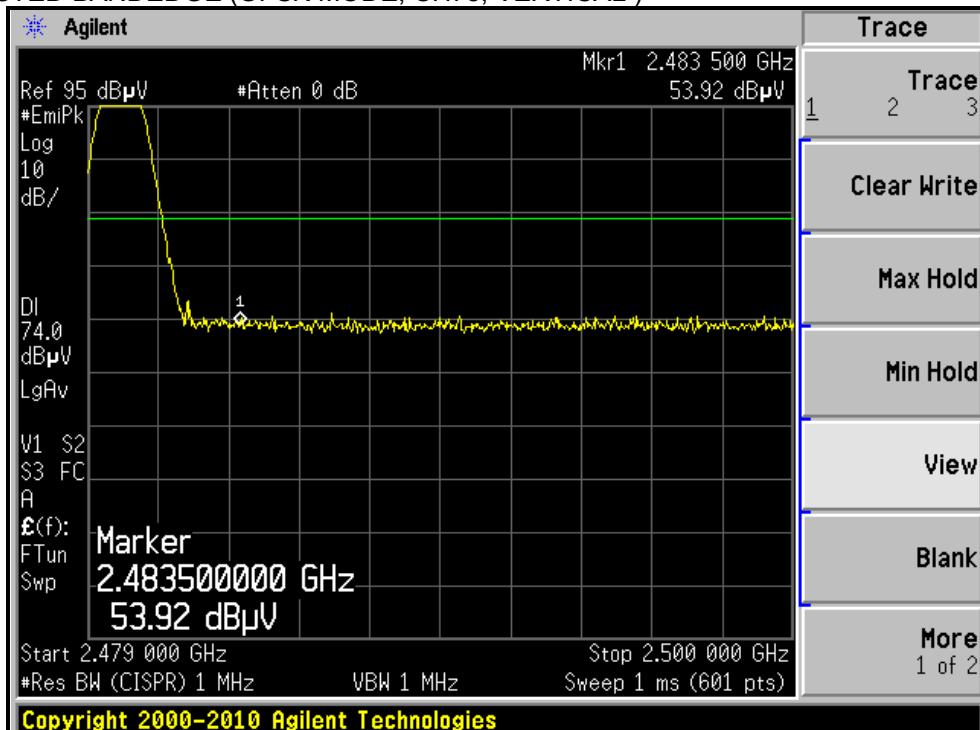


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RESTRICTED BANDEDGE (GFSK MODE, CH78, HORIZONTAL)



RESTRICTED BANDEDGE (GFSK MODE, CH78, VERTICAL)



- * The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle). And it meets the requirement of limit.



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8DPSK MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		Channel 0		FREQUENCY RANGE 1 ~ 25GHz
INPUT POWER (SYSTEM)		120Vac, 60 Hz		DETECTOR FUNCTION Peak (PK)
ENVIRONMENTAL CONDITIONS		24deg. C, 69%RH		TESTED BY Amos Chuang

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	52.9 PK	74.0	-21.1	1.14 H	145	21.02	31.88
2	2390.00	29.6 AV	54.0	-24.4	1.14 H	145	-2.28	31.88
3	*2402.00	102.6 PK			1.14 H	146	70.68	31.92
4	*2402.00	79.3 AV			1.14 H	146	47.38	31.92
5	4804.00	47.8 PK	74.0	-26.2	1.00 H	91	6.63	41.17
6	4804.00	24.5 AV	54.0	-29.5	1.00 H	91	-16.67	41.17

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	53.4 PK	74.0	-20.6	1.00 V	179	21.52	31.88
2	2390.00	30.1 AV	54.0	-23.9	1.00 V	179	-1.78	31.88
3	*2402.00	101.0 PK			1.00 V	180	69.08	31.92
4	*2402.00	77.7 AV			1.00 V	180	45.78	31.92
5	4804.00	48.2 PK	74.0	-25.8	1.00 V	122	7.03	41.17
6	4804.00	24.9 AV	54.0	-29.1	1.00 V	122	-16.27	41.17

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 average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:

$$20 \log (\text{Duty cycle}) = 20 \log (3.4 * 2 \text{ ms} / 100 \text{ ms}) = -23.3 \text{ dB}$$

Please see page 39 for plotted duty.



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EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		FREQUENCY RANGE		1 ~ 25GHz
INPUT POWER (SYSTEM)		DETECTOR FUNCTION		Peak (PK)
ENVIRONMENTAL CONDITIONS		TESTED BY		Amos Chuang

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	101.9 PK			1.13 H	143	69.85	32.05
2	*2441.00	78.6 AV			1.13 H	143	46.55	32.05
3	4882.00	47.9 PK	74.0	-26.1	1.00 H	85	6.52	41.38
4	4882.00	24.6 AV	54.0	-29.4	1.00 H	85	-16.78	41.38
5	7323.00	51.8 PK	74.0	-22.2	1.00 H	60	6.10	45.70
6	7323.00	28.5 AV	54.0	-25.5	1.00 H	60	-17.20	45.70

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	101.4 PK			1.00 V	168	69.35	32.05
2	*2441.00	78.1 AV			1.00 V	168	46.05	32.05
3	4882.00	48.4 PK	74.0	-25.6	1.00 V	106	7.02	41.38
4	4882.00	25.1 AV	54.0	-28.9	1.00 V	106	-16.28	41.38
5	7323.00	50.3 PK	74.0	-23.7	1.00 V	93	4.60	45.70
6	7323.00	27.0 AV	54.0	-27.0	1.00 V	93	-18.70	45.70

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 average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:

$$20 \log (\text{Duty cycle}) = 20 \log (3.4 * 2 \text{ ms} / 100 \text{ ms}) = -23.3 \text{ dB}$$

Please see page 39 for plotted duty.



A D T

EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		FREQUENCY RANGE		1 ~ 25GHz
INPUT POWER (SYSTEM)		DETECTOR FUNCTION		Peak (PK)
ENVIRONMENTAL CONDITIONS		TESTED BY		Amos Chuang

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	101.9 PK			1.12 H	152	69.72	32.18
2	*2480.00	78.6 AV			1.12 H	152	46.42	32.18
3	2483.50	57.2 PK	74.0	-16.8	1.11 H	153	25.01	32.19
4	2483.50	33.9 AV	54.0	-20.1	1.11 H	153	1.71	32.19
5	4960.00	48.0 PK	74.0	-26.0	1.00 H	95	6.45	41.55
6	4960.00	24.7 AV	54.0	-29.3	1.00 H	95	-16.85	41.55
7	7440.00	52.5 PK	74.0	-21.5	1.00 H	72	6.43	46.07
8	7440.00	29.2 AV	54.0	-24.8	1.00 H	72	-16.87	46.07
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	100.9 PK			1.00 V	177	68.72	32.18
2	*2480.00	77.6 AV			1.00 V	177	45.42	32.18
3	2483.50	55.5 PK	74.0	-18.5	1.00 V	176	23.31	32.19
4	2483.50	32.2 AV	54.0	-21.8	1.00 V	176	0.01	32.19
5	4960.00	47.8 PK	74.0	-26.2	1.06 V	115	6.25	41.55
6	4960.00	24.5 AV	54.0	-29.5	1.06 V	115	-17.05	41.55
7	7440.00	55.4 PK	74.0	-18.6	1.00 V	189	9.33	46.07
8	7440.00	32.1 AV	54.0	-21.9	1.00 V	189	-13.97	46.07

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 average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:

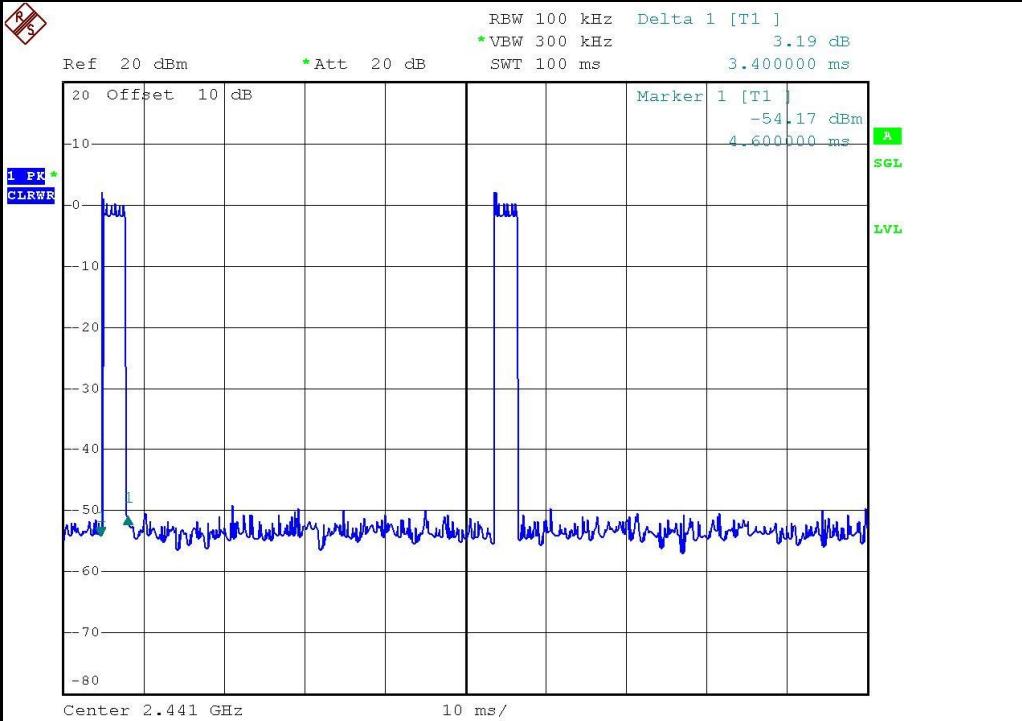
$$20 \log (\text{Duty cycle}) = 20 \log (3.4 * 2 \text{ ms} / 100 \text{ ms}) = -23.3 \text{ dB}$$

Please see page 39 for plotted duty.



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R
3

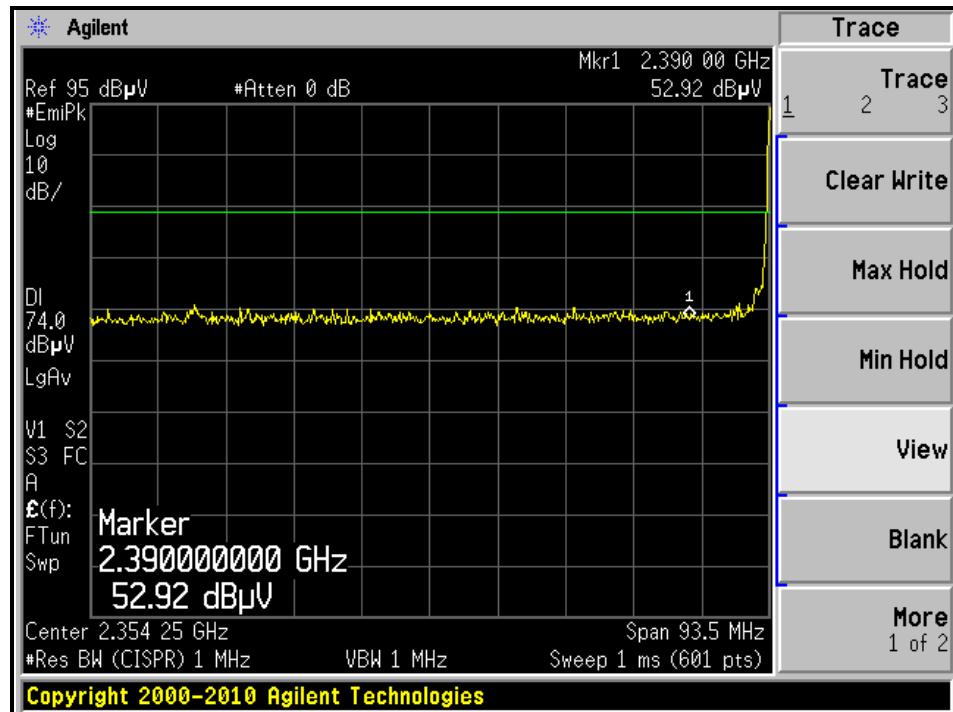


$$20 \log (\text{Duty cycle}) = 20 \log (3.4 * 2 \text{ ms} / 100 \text{ ms}) = -23.3 \text{ dB}$$

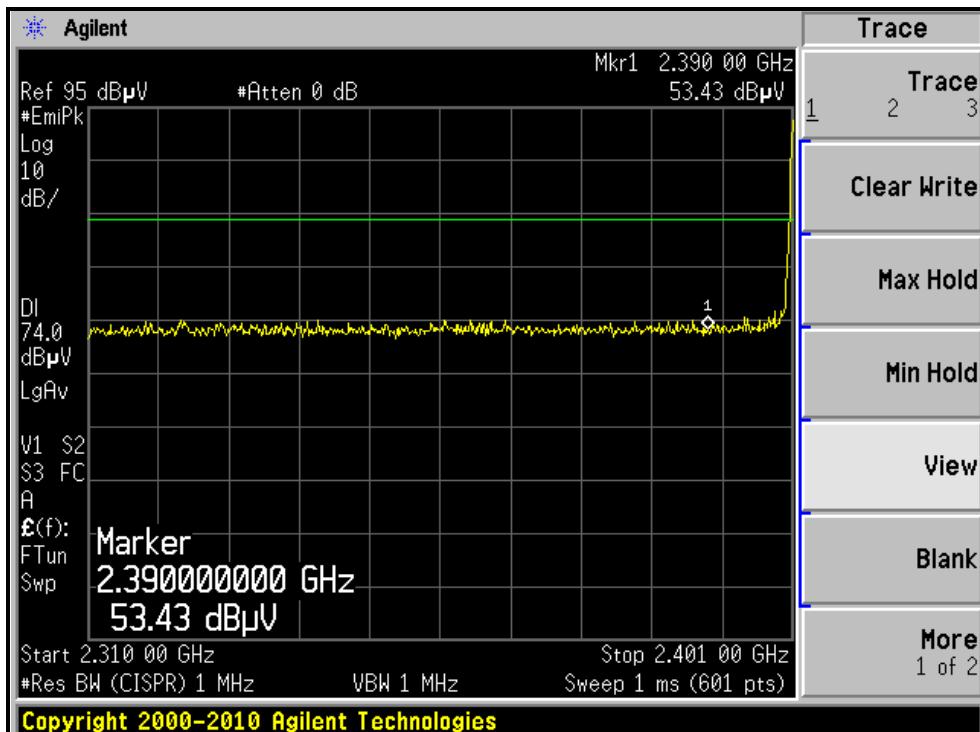


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RESTRICTED BANDEDGE (8DPSK MODE, CH0, HORIZONTAL)



RESTRICTED BANDEDGE (8DPSK MODE, CH0, VERTICAL)

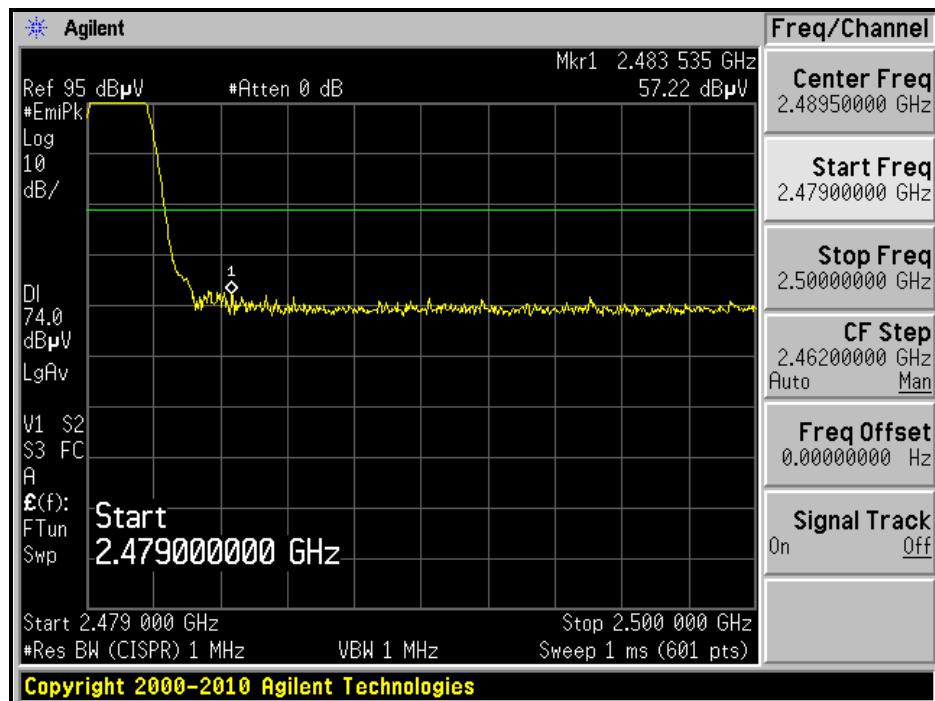


* The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle).
And it meets the requirement of limit.

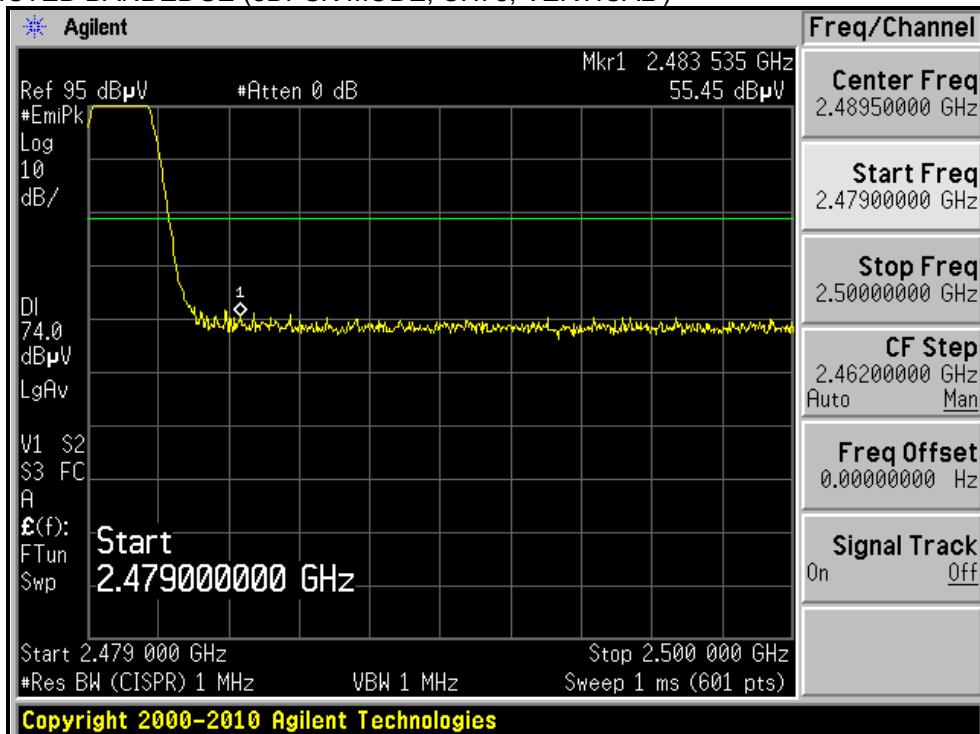


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RESTRICTED BANDEDGE (8DPSK MODE, CH78, HORIZONTAL)



RESTRICTED BANDEDGE (8DPSK MODE, CH78, VERTICAL)



* The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle).
And it meets the requirement of limit.



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4.2.6.2 TEST RESULTS (GFSK (LE mode))

BELOW 1GHz WORST-CASE DATA :

EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		FREQUENCY RANGE		Below 1000MHz
INPUT POWER (SYSTEM)		DETECTOR FUNCTION		Quasi-Peak
ENVIRONMENTAL CONDITIONS		TESTED BY		Evan Huang

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	99.99	39.71 QP	43.50	-3.79	2.00 H	150	30.40	9.31
2	199.93	40.14 QP	43.50	-3.36	1.50 H	113	28.92	11.22
3	300.00	37.38 QP	46.00	-8.62	1.75 H	344	22.20	15.18
4	497.60	35.43 QP	46.00	-10.57	1.00 H	177	15.95	19.48
5	600.32	41.63 QP	46.00	-4.37	1.25 H	84	20.03	21.60
6	799.98	40.02 QP	46.00	-5.98	1.00 H	303	15.54	24.48
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	35.95	36.41 QP	40.00	-3.59	1.00 V	153	22.96	13.45
2	100.00	33.97 QP	43.50	-9.53	1.25 V	312	24.66	9.31
3	199.98	36.15 QP	43.50	-7.35	1.00 V	114	24.94	11.21
4	299.99	35.33 QP	46.00	-10.67	1.00 V	54	20.15	15.18
5	799.98	37.65 QP	46.00	-8.35	1.50 V	76	13.17	24.48
6	939.02	42.20 QP	46.00	-3.80	2.00 V	328	15.96	26.24

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.



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ABOVE 1GHz WORST-CASE DATA :

EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		Channel 0		FREQUENCY RANGE 1 ~ 25GHz
INPUT POWER (SYSTEM)		120Vac, 60 Hz		DETECTOR FUNCTION Peak (PK)
ENVIRONMENTAL CONDITIONS		24deg. C, 69%RH		TESTED BY Amos Chuang

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	54.0 PK	74.0	-20.0	1.29 H	66	22.12	31.88
2	2390.00	15.6 AV	54.0	-38.4	1.29 H	66	-16.28	31.88
3	*2402.00	101.2 PK			1.24 H	79	69.28	31.92
4	*2402.00	62.8 AV			1.24 H	79	30.88	31.92
5	4804.00	47.2 PK	74.0	-26.8	1.00 H	113	6.03	41.17
6	4804.00	8.8 AV	54.0	-45.2	1.00 H	113	-32.37	41.17

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	2389.85	54.4 PK	74.0	-19.6	1.00 V	196	22.52	31.88
2	2389.85	16.0 AV	54.0	-38.0	1.00 V	196	-15.88	31.88
3	*2402.00	100.8 PK			1.00 V	184	68.88	31.92
4	*2402.00	62.4 AV			1.00 V	184	30.48	31.92
5	4804.00	48.4 PK	74.0	-25.6	1.00 V	131	7.23	41.17
6	4804.00	10.0 AV	54.0	-44.0	1.00 V	131	-31.17	41.17

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 average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:

$$20 \log (\text{Duty cycle}) = 20 \log (1.2 \text{ ms} / 100 \text{ ms}) = -38.4 \text{ dB}$$

Please see page 46 for plotted duty.



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EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		FREQUENCY RANGE		1 ~ 25GHz
INPUT POWER (SYSTEM)		DETECTOR FUNCTION		Peak (PK)
ENVIRONMENTAL CONDITIONS		TESTED BY		Amos Chuang

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	*2440.00	101.7 PK			1.21 H	73	69.65	32.05
2	*2440.00	63.3 AV			1.21 H	73	31.25	32.05
3	4880.00	47.3 PK	74.0	-26.7	1.00 H	85	5.92	41.38
4	4880.00	8.9 AV	54.0	-45.1	1.00 H	85	-32.48	41.38
5	7320.00	51.9 PK	74.0	-22.1	1.00 H	73	6.21	45.69
6	7320.00	13.5 AV	54.0	-40.5	1.00 H	73	-32.19	45.69

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	*2440.00	100.6 PK			1.00 V	181	68.55	32.05
2	*2440.00	62.2 AV			1.00 V	181	30.15	32.05
3	4880.00	48.9 PK	74.0	-25.1	1.00 V	101	7.52	41.38
4	4880.00	10.5 AV	54.0	-43.5	1.00 V	101	-30.88	41.38
5	7320.00	51.2 PK	74.0	-22.8	1.00 V	73	5.51	45.69
6	7320.00	12.8 AV	54.0	-41.2	1.00 V	73	-32.89	45.69

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.
6. The average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:

$$20 \log (\text{Duty cycle}) = 20 \log (1.2 \text{ ms} / 100 \text{ ms}) = -38.4 \text{ dB}$$
Please see page 46 for plotted duty.



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EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		Channel 39		FREQUENCY RANGE 1 ~ 25GHz
INPUT POWER (SYSTEM)		120Vac, 60 Hz		DETECTOR FUNCTION Peak (PK)
ENVIRONMENTAL CONDITIONS		24deg. C, 69%RH		TESTED BY Amos Chuang

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	102.0 PK			1.24 H	70	69.82	32.18
2	*2480.00	63.6 AV			1.24 H	70	31.42	32.18
3	2483.50	53.9 PK	74.0	-20.1	1.21 H	71	21.71	32.19
4	2483.50	15.5 AV	54.0	-38.5	1.21 H	71	-16.69	32.19
5	4960.00	47.0 PK	74.0	-27.0	1.00 H	133	5.45	41.55
6	4960.00	8.6 AV	54.0	-45.4	1.00 H	133	-32.95	41.55
7	7440.00	52.4 PK	74.0	-21.6	1.00 H	69	6.33	46.07
8	7440.00	14.0 AV	54.0	-40.0	1.00 H	69	-32.07	46.07
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	100.9 PK			1.00 V	197	68.72	32.18
2	*2480.00	62.5 AV			1.00 V	197	30.32	32.18
3	2483.50	54.9 PK	74.0	-19.1	1.00 V	183	22.71	32.19
4	2483.50	16.5 AV	54.0	-37.5	1.00 V	183	-15.69	32.19
5	4960.00	47.2 PK	74.0	-26.8	1.00 V	113	5.65	41.55
6	4960.00	8.8 AV	54.0	-45.2	1.00 V	113	-32.75	41.55
7	7440.00	54.3 PK	74.0	-19.7	1.00 V	179	8.23	46.07
8	7440.00	15.9 AV	54.0	-38.1	1.00 V	179	-30.17	46.07

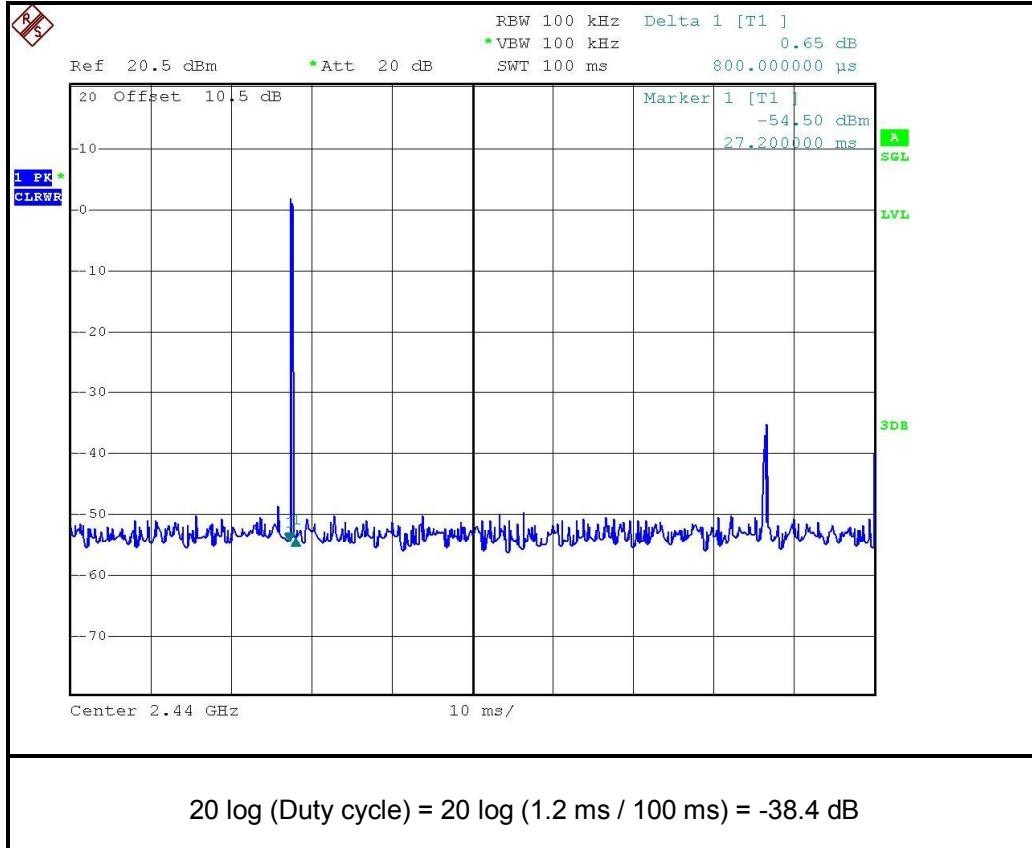
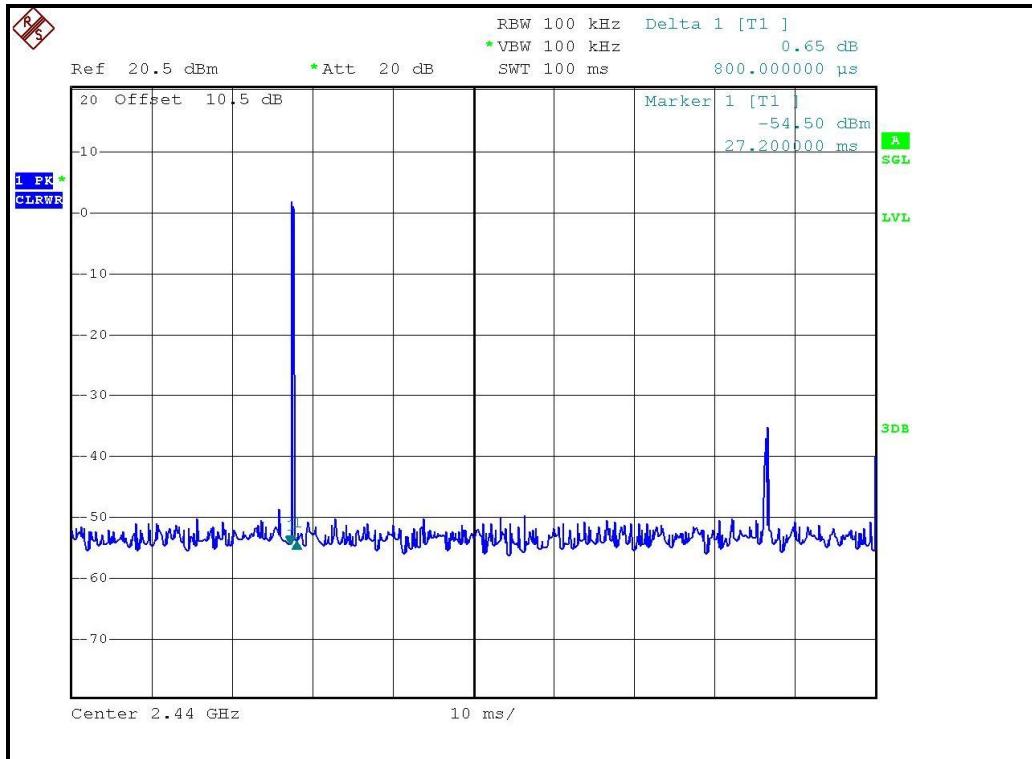
REMARKS:

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 average value of fundamental frequency is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:

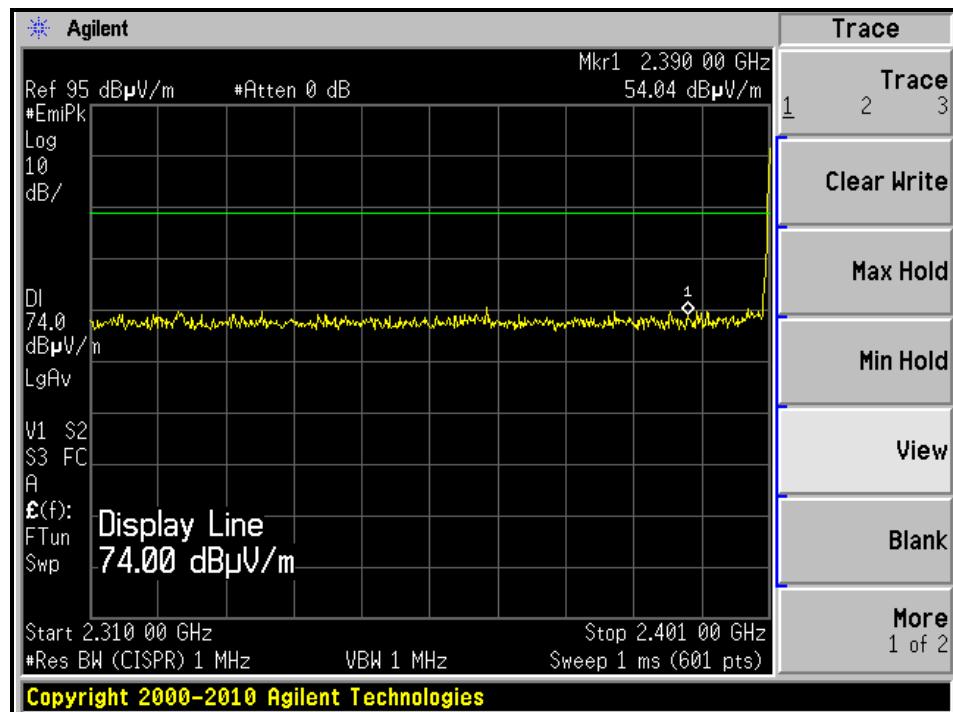
$$20 \log (\text{Duty cycle}) = 20 \log (1.2 \text{ ms} / 100 \text{ ms}) = -38.4 \text{ dB}$$
Please see page 46 for plotted duty.



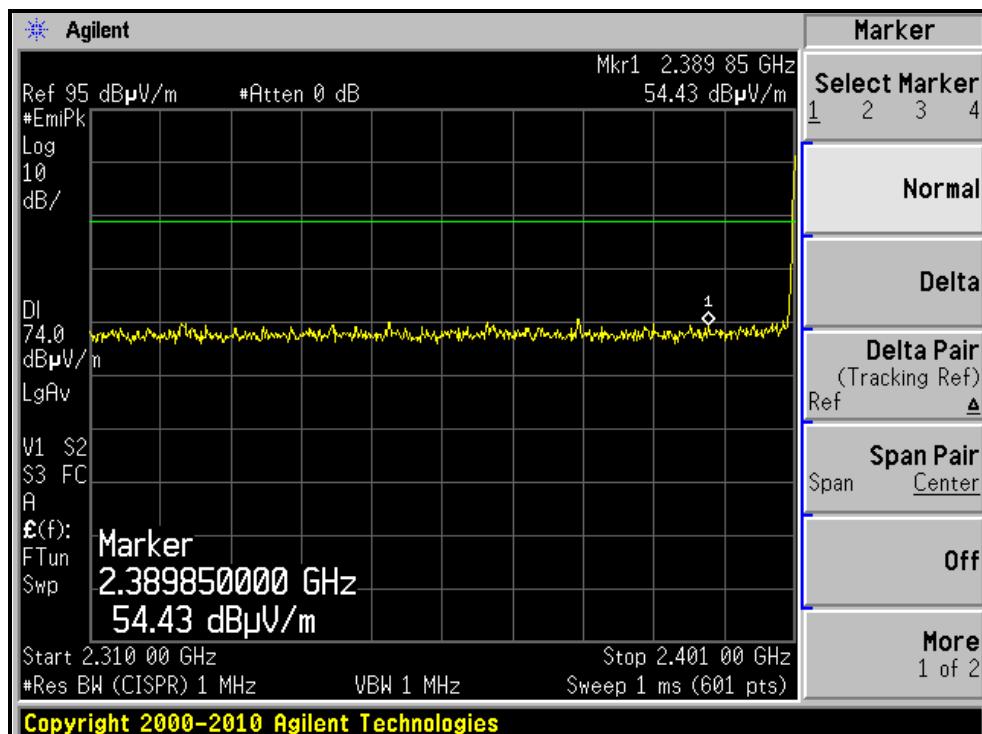
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RESTRICTED BANDEDGE (GFSK(LE mode) MODE, CH0, HORIZONTAL)



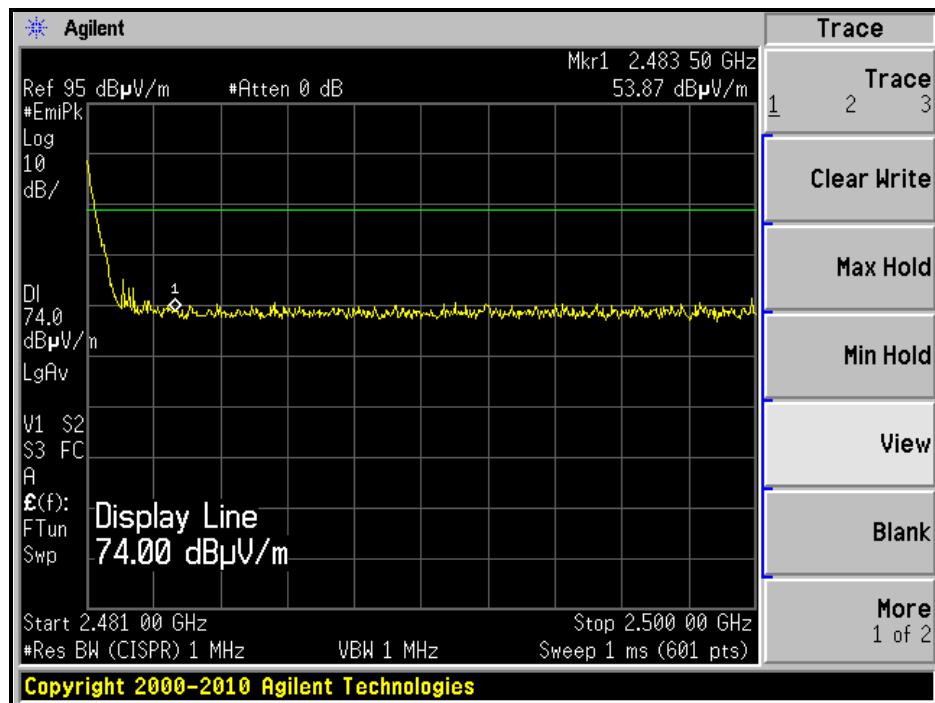
RESTRICTED BANDEDGE (GFSK(LE mode) MODE, CH0, VERTICAL)



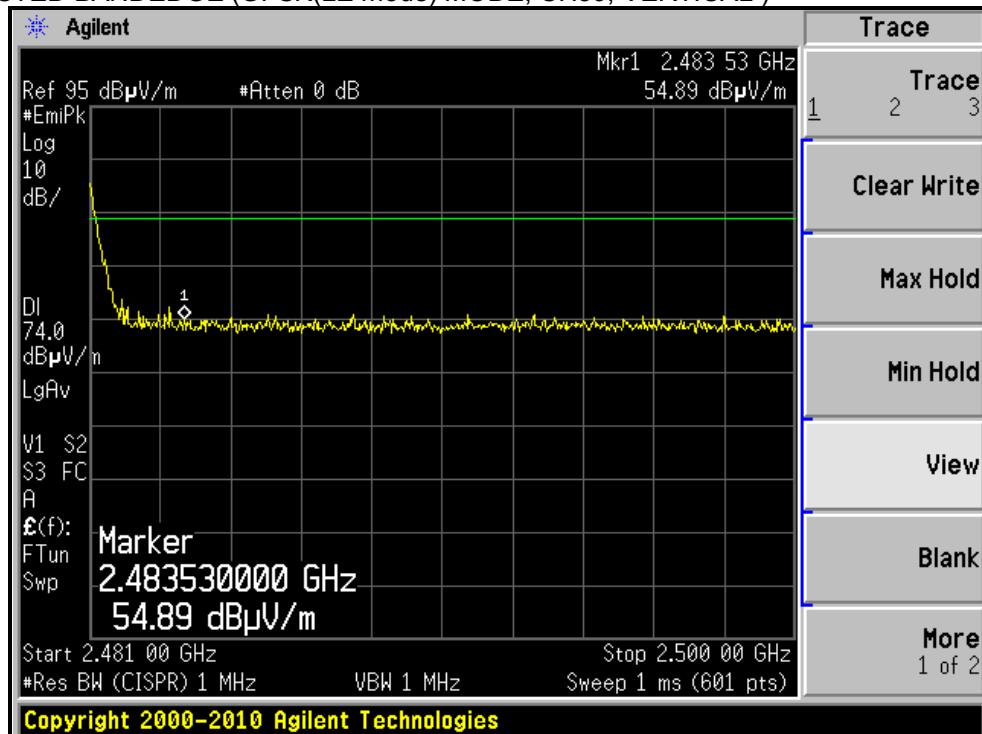


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RESTRICTED BANDEDGE (GFSK(LE mode) MODE, CH39, HORIZONTAL)



RESTRICTED BANDEDGE (GFSK(LE mode) MODE, CH39, VERTICAL)





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4.2.7 TEST RESULTS (FOR RECEIVER PART)

BELOW 1GHz WORST-CASE DATA :

EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		Channel 78		FREQUENCY RANGE Below 1000MHz
INPUT POWER (SYSTEM)		120Vac, 60 Hz		DETECTOR FUNCTION Quasi-Peak
ENVIRONMENTAL CONDITIONS		23deg. C, 69%RH		TESTED BY Even Huang

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	99.99	39.2 QP	43.5	-4.3	2.00 H	113	29.93	9.31
2	199.91	41.6 QP	43.5	-1.9	1.00 H	46	30.41	11.22
3	300.00	37.6 QP	46.0	-8.4	1.00 H	328	22.38	15.18
4	497.65	34.1 QP	46.0	-11.9	1.00 H	211	14.64	19.48
5	600.32	40.3 QP	46.0	-5.7	1.00 H	243	18.69	21.60
6	799.87	38.8 QP	46.0	-7.2	1.00 H	13	14.36	24.48
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	35.92	34.7 QP	40.0	-5.3	1.00 V	282	21.22	13.45
2	99.99	32.4 QP	43.5	-11.1	2.00 V	243	23.12	9.31
3	199.94	36.2 QP	43.5	-7.3	2.00 V	267	25.02	11.21
4	299.89	34.3 QP	46.0	-11.7	1.00 V	212	19.13	15.18
5	799.87	38.7 QP	46.0	-7.3	1.00 V	133	14.19	24.48
6	939.01	40.5 QP	46.0	-5.5	1.00 V	167	14.28	26.24

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.



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ABOVE 1GHZ WORST-CASE DATA :

EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		Channel 0		FREQUENCY RANGE 1 ~ 7.5GHz
INPUT POWER (SYSTEM)		120Vac, 60 Hz		DETECTOR FUNCTION Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS		24deg. C, 69%RH		TESTED BY Amos Chuang

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	1601.30	43.5 PK	74.0	-30.5	1.00 H	20	14.60	28.90
2	1601.30	29.1 AV	54.0	-24.9	1.00 H	20	0.20	28.90
3	3202.60	41.7 PK	74.0	-32.3	1.00 H	0	7.26	34.44
4	3202.60	29.3 AV	54.0	-24.7	1.00 H	0	-5.14	34.44
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	1601.30	43.2 PK	74.0	-30.8	1.00 V	221	14.30	28.90
2	1601.30	30.7 AV	54.0	-23.3	1.00 V	221	1.80	28.90
3	3202.60	41.9 PK	74.0	-32.1	1.00 V	0	7.46	34.44
4	3202.60	29.3 AV	54.0	-24.7	1.00 V	0	-5.14	34.44

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.



A D T

EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		Channel 39		FREQUENCY RANGE 1 ~ 7.5GHz
INPUT POWER (SYSTEM)		120Vac, 60 Hz		DETECTOR FUNCTION Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS		24deg. C, 69%RH		TESTED BY Amos Chuang

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	1627.30	43.2 PK	74.0	-30.8	1.01 H	20	14.18	29.02
2	1627.30	28.7 AV	54.0	-25.3	1.01 H	20	-0.32	29.02
3	3254.60	41.4 PK	74.0	-32.6	1.05 H	10	6.83	34.57
4	3254.60	29.1 AV	54.0	-24.9	1.05 H	10	-5.47	34.57
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	1627.30	43.0 PK	74.0	-31.0	1.06 V	226	13.98	29.02
2	1627.30	30.6 AV	54.0	-23.4	1.06 V	226	1.58	29.02
3	3254.60	42.4 PK	74.0	-31.6	1.00 V	9	7.83	34.57
4	3254.60	29.7 AV	54.0	-24.3	1.00 V	9	-4.87	34.57

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.



A D T

EUT TEST CONDITION		MEASUREMENT DETAIL		
CHANNEL		Channel 78		FREQUENCY RANGE 1 ~ 7.5GHz
INPUT POWER (SYSTEM)		120Vac, 60 Hz		DETECTOR FUNCTION Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS		24deg. C, 69%RH		TESTED BY Amos Chuang

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	1653.30	43.2 PK	74.0	-30.8	1.00 H	9	14.05	29.15
2	1653.30	28.8 AV	54.0	-25.2	1.00 H	9	-0.35	29.15
3	3306.60	41.6 PK	74.0	-32.4	1.04 H	11	6.90	34.70
4	3306.60	29.2 AV	54.0	-24.8	1.04 H	11	-5.50	34.70
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	1653.30	42.3 PK	74.0	-31.7	1.02 V	226	13.15	29.15
2	1653.30	30.7 AV	54.0	-23.3	1.02 V	226	1.55	29.15
3	3306.60	42.6 PK	74.0	-31.4	1.00 V	11	7.90	34.70
4	3306.60	30.1 AV	54.0	-23.9	1.00 V	11	-4.60	34.70

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.



A D T

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: Nov. 21, 2011

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S Spectrum Analyzer	FSP 40	100060	May 11, 2011	May 10, 2012

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.

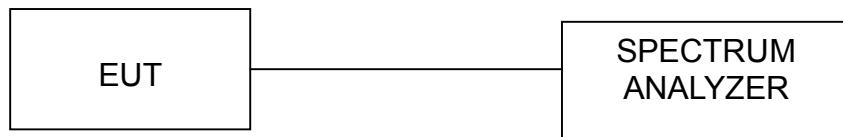
4.3.4 DEVIATION FROM TEST STANDARD

No deviation



A D T

4.3.5 TEST SETUP



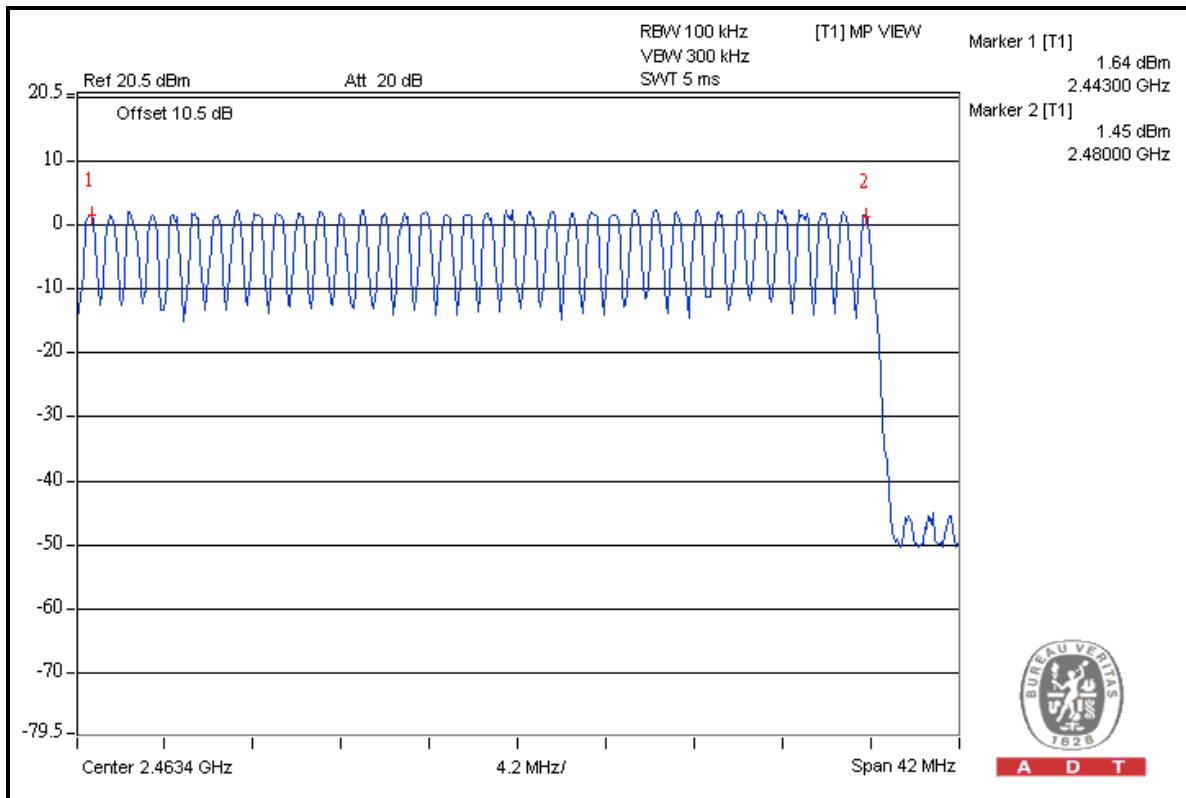
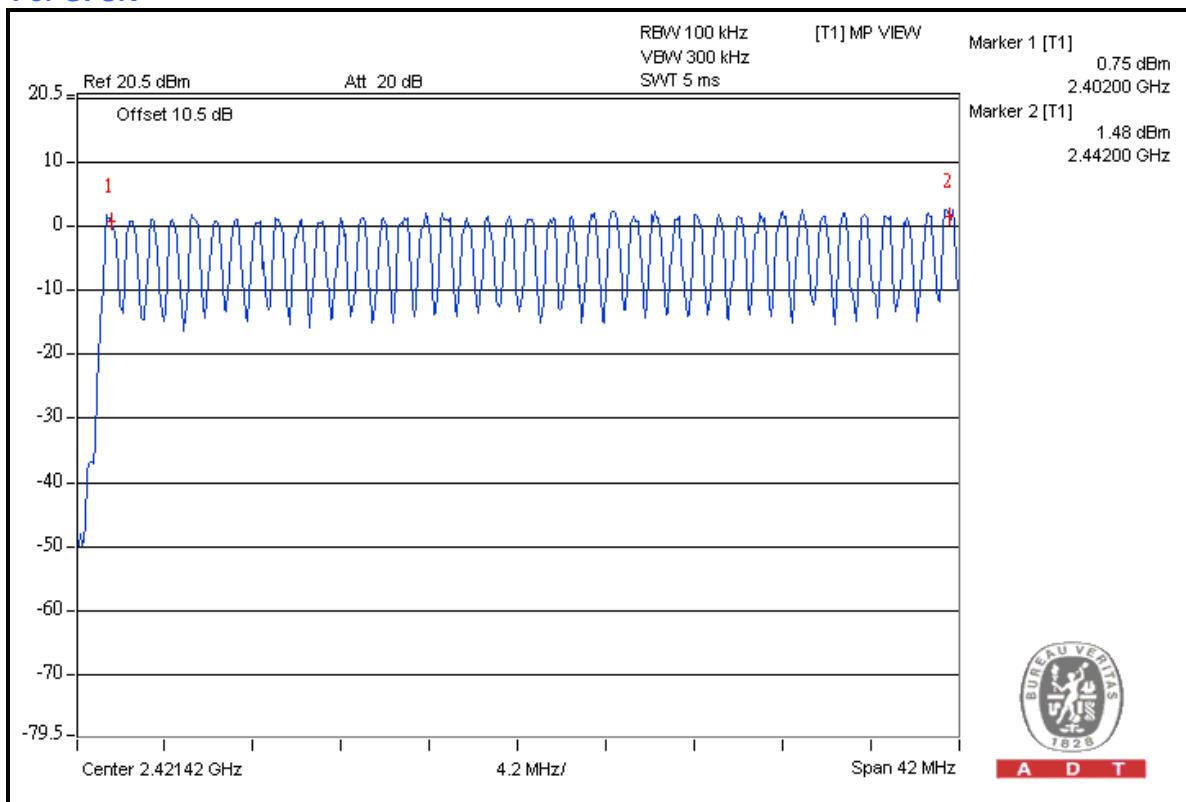
4.3.6 TEST RESULTS

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.



A D T

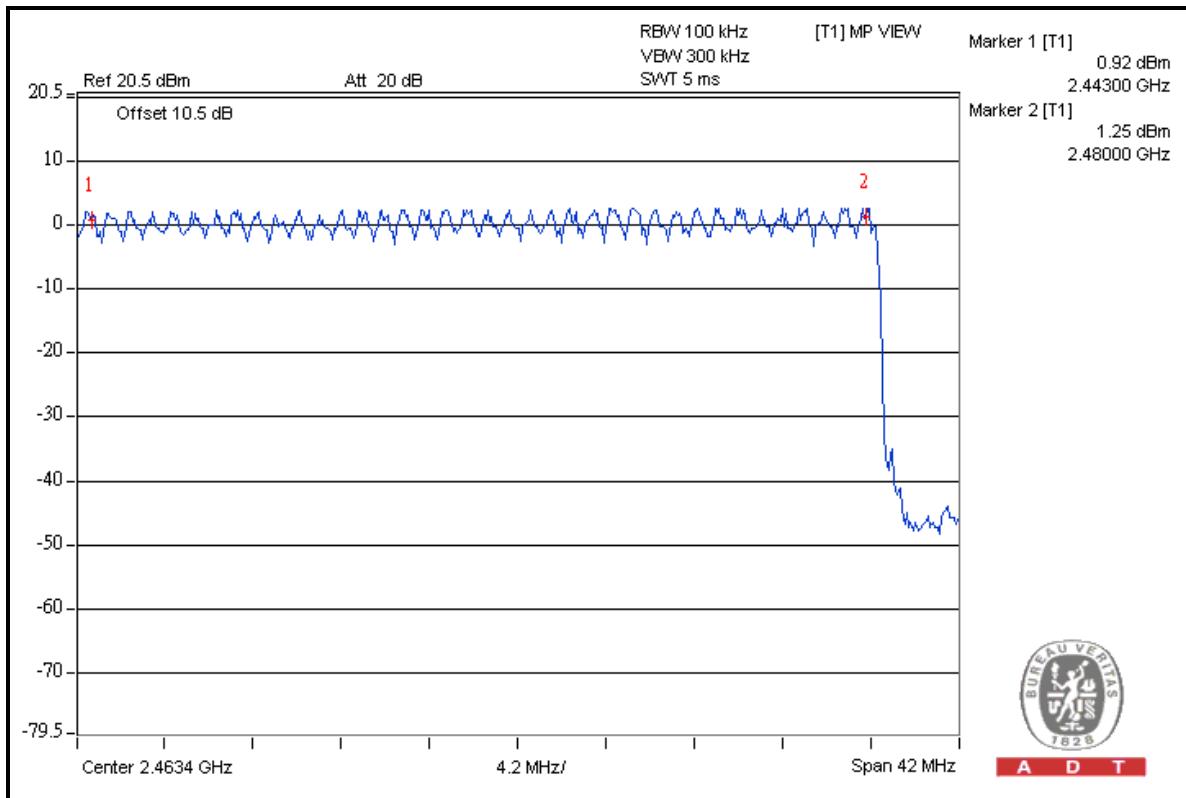
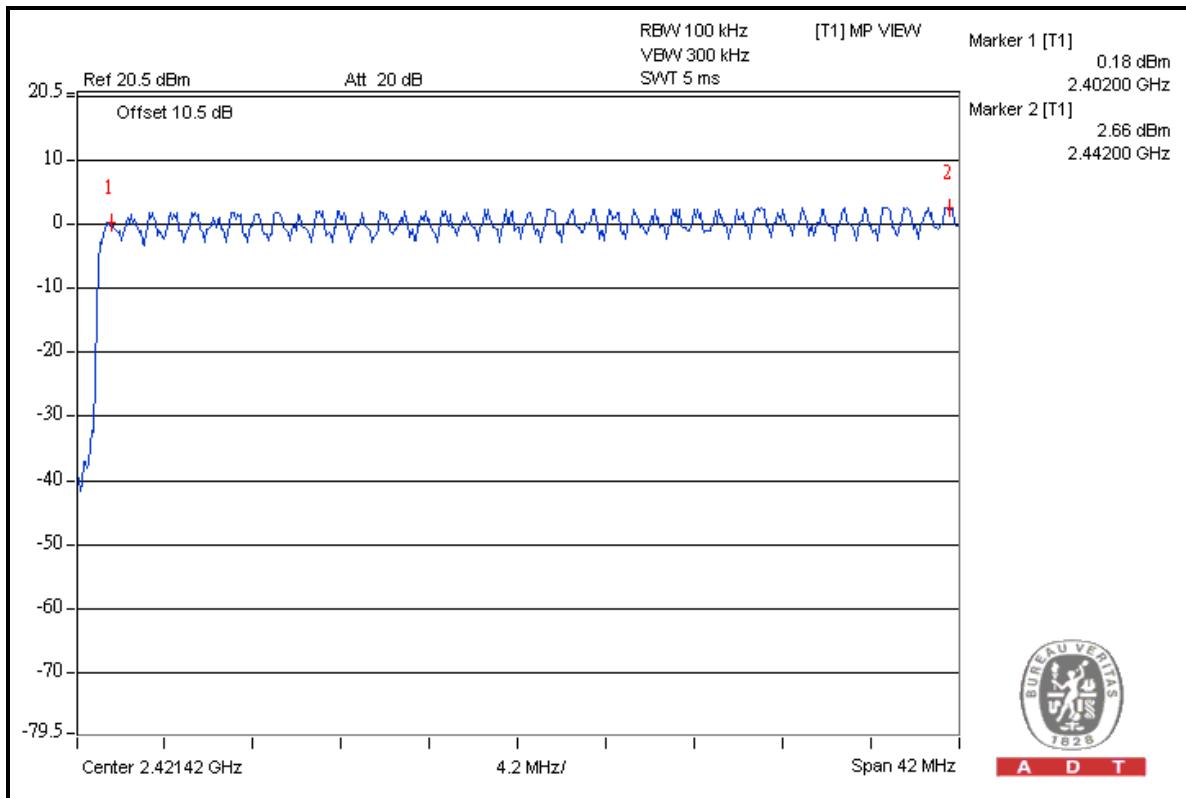
For GFSK





A D T

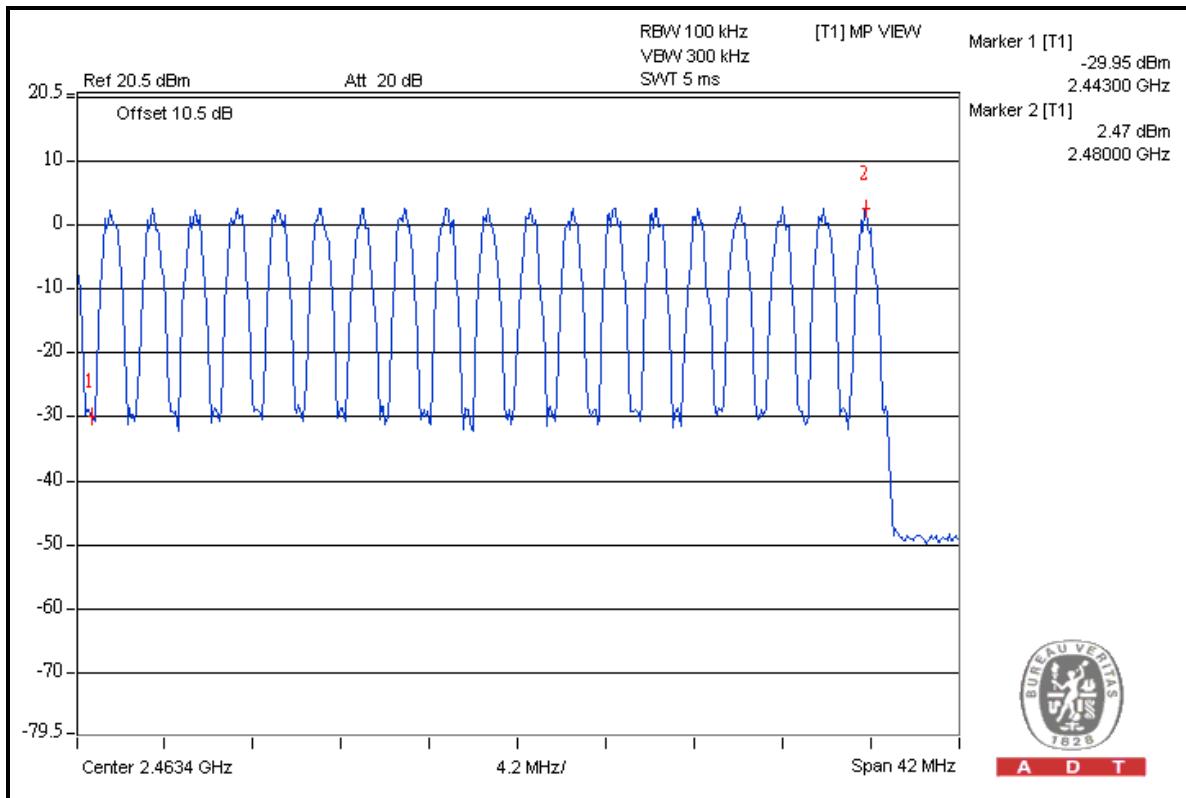
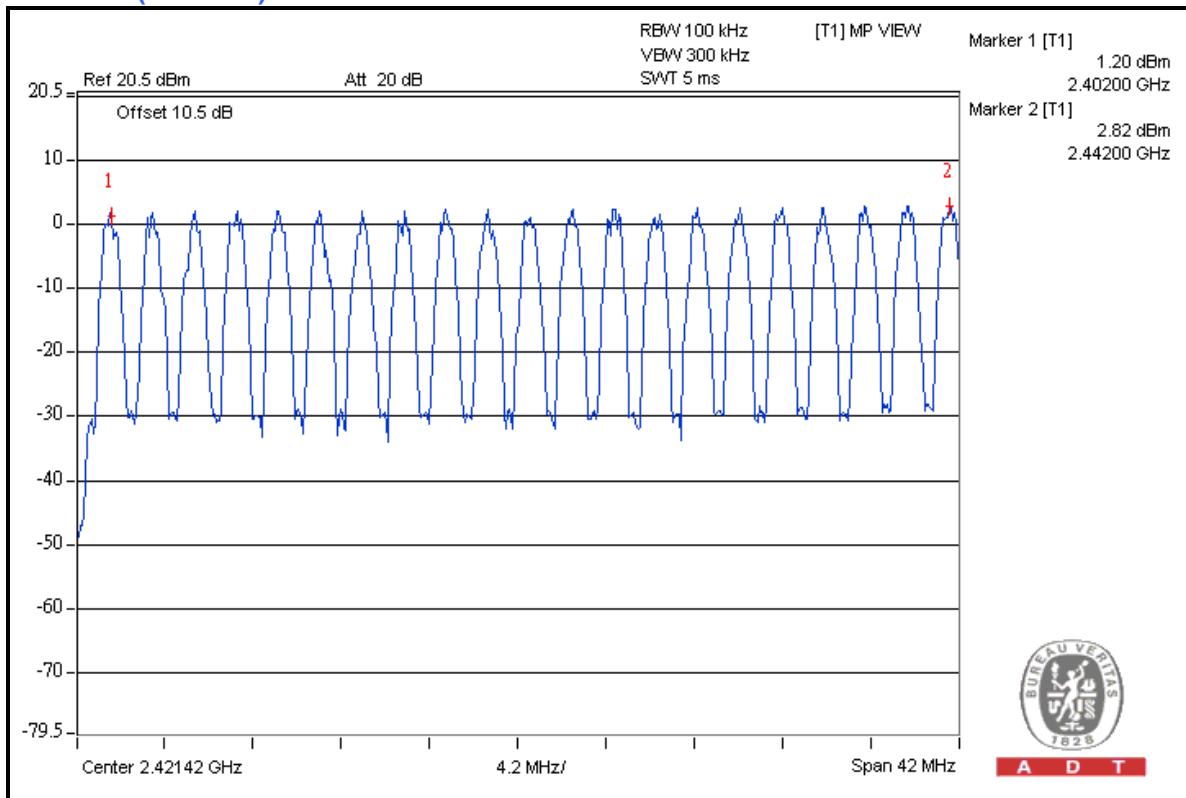
For 8DPSK





A D T

For GFSK(LE mode):





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.

Note:

The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 31.6 second period for traditional GFSK/($\pi/4$ -DQPSK) /8DPSK. The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 16 second period for GFSK(LE mode)

4.4.2 TEST INSTRUMENTS

Test date: Nov. 21, 2011

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S Spectrum Analyzer	FSP 40	100060	May 11, 2011	May 10, 2012

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



A D T

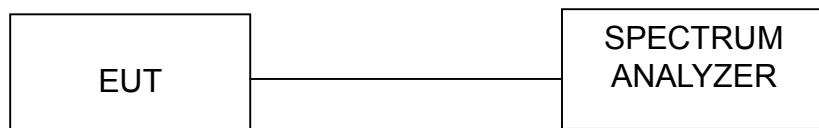
4.4.3 TEST PROCEDURES

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 to 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





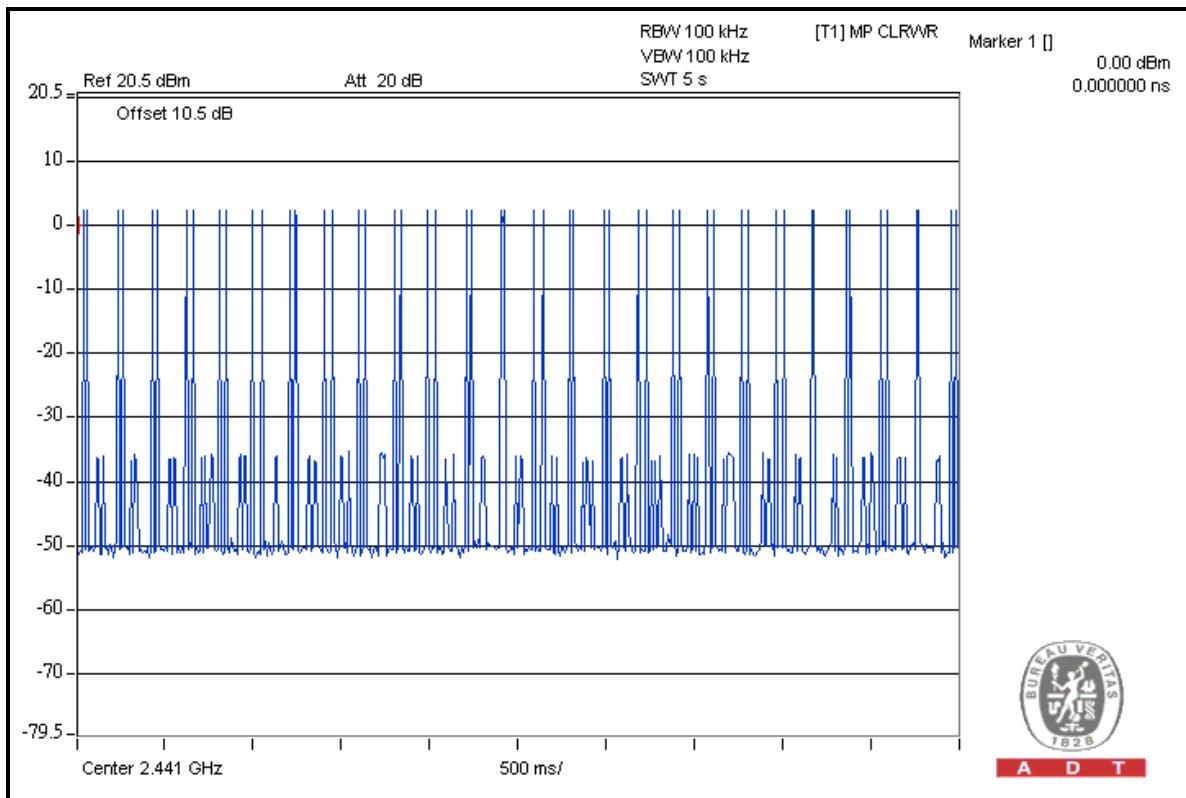
A D T

4.4.6 TEST RESULTS

For GFSK:

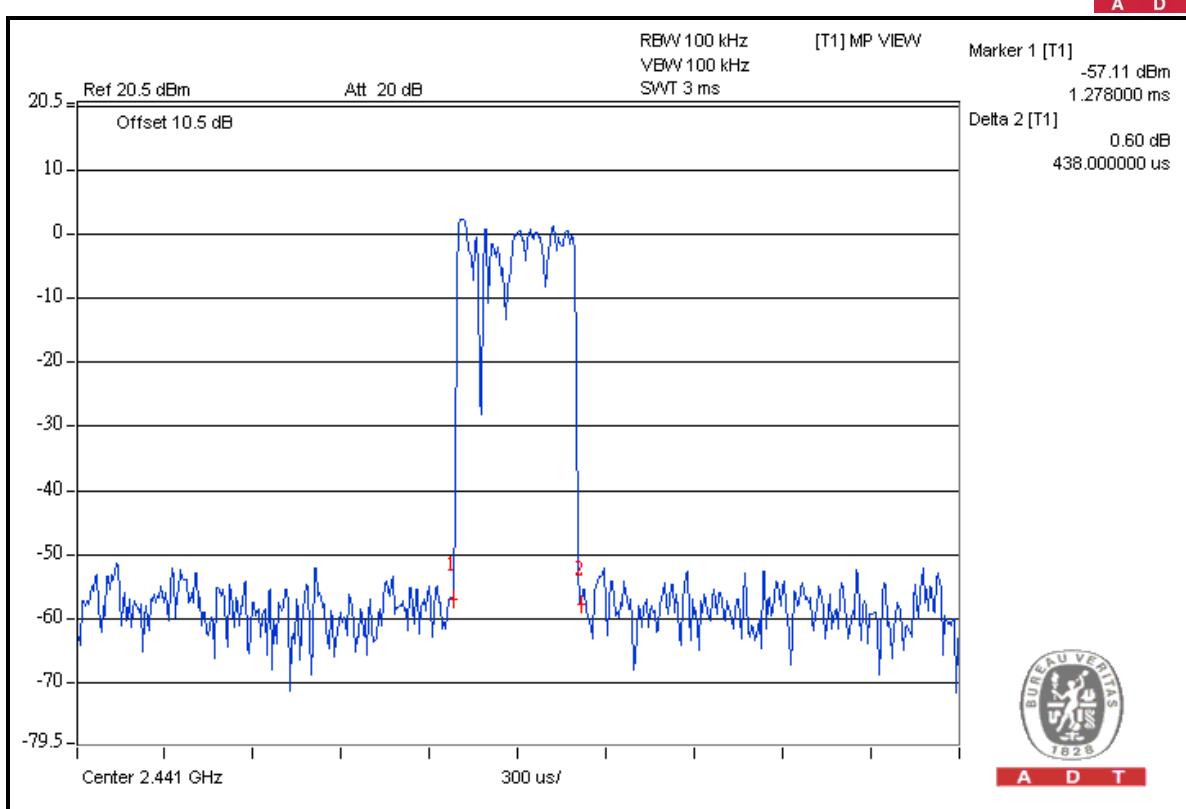
Mode	Number of transmission in a 31.6 (79Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (msec)
DH1	50 (times / 5 sec) *6.32=316 times	0.438	138.41	400
DH3	26 (times / 5 sec) *6.32=164.32 times	1.692	278.03	400
DH5	16 (times / 5 sec) *6.32=101.12 times	2.97	300.33	400

DH1





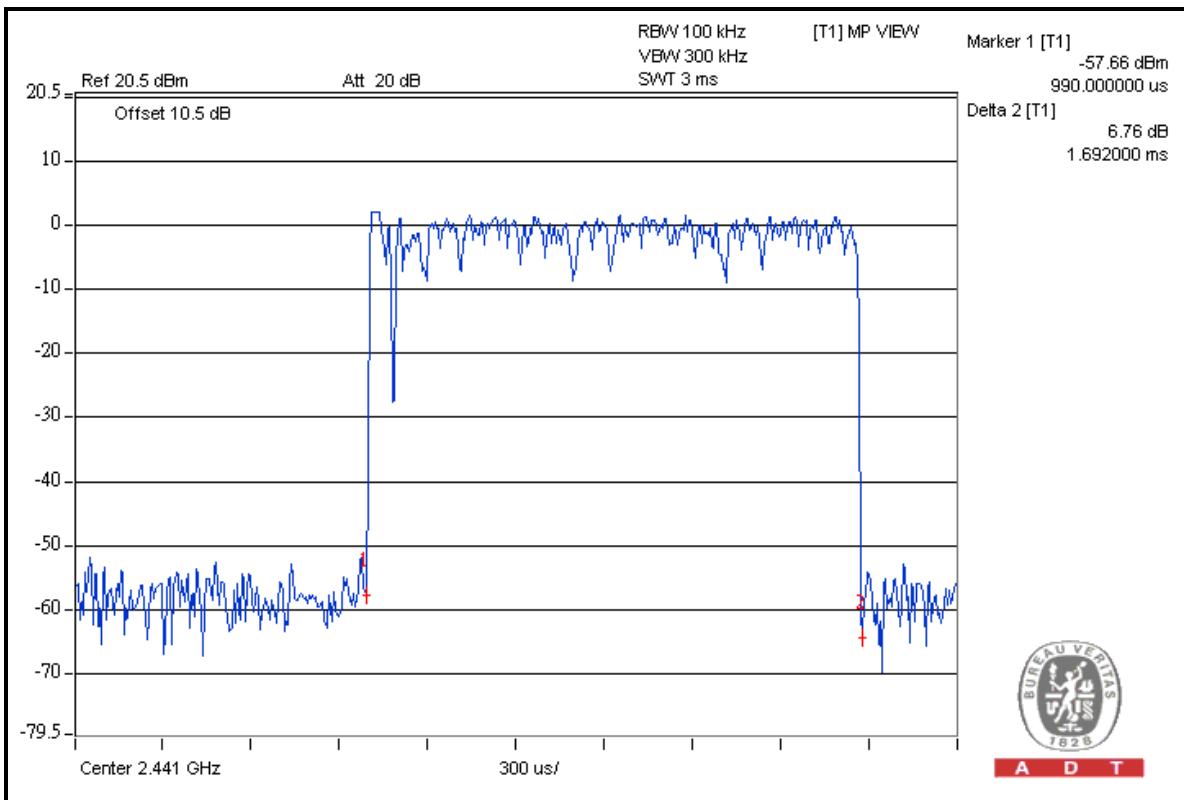
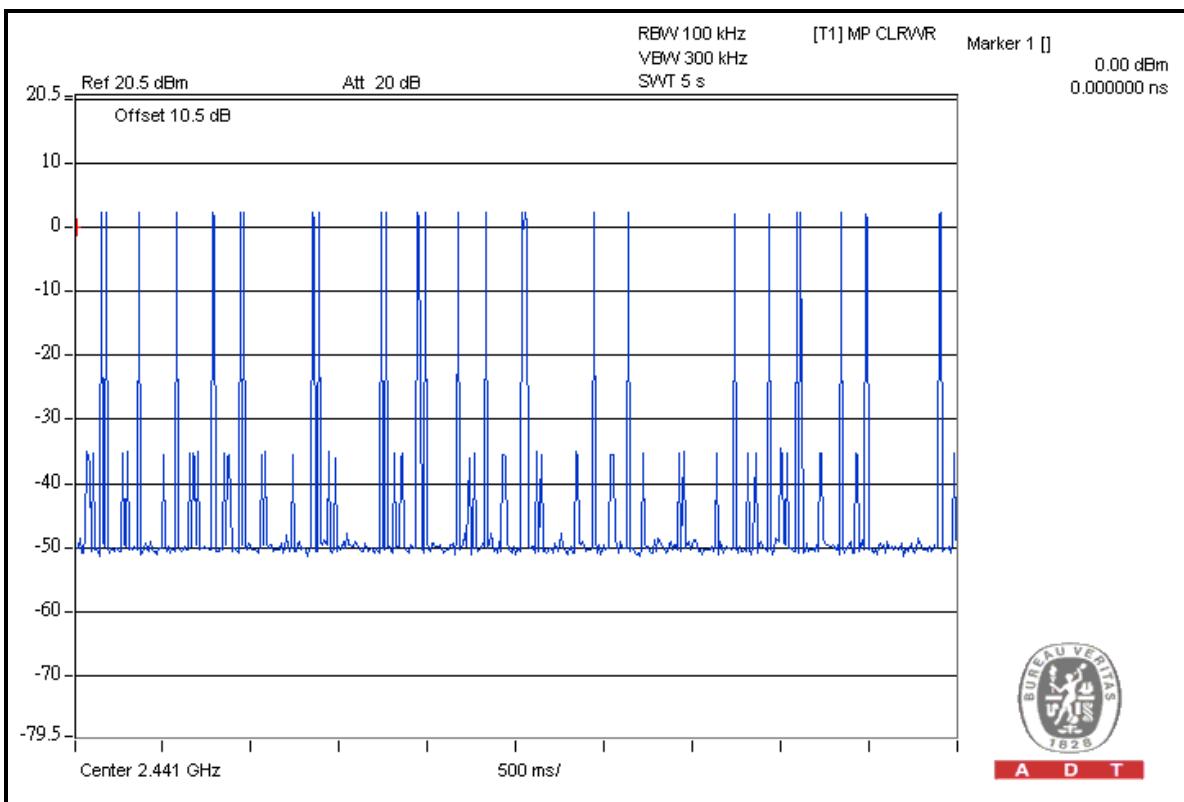
A D T





A D T

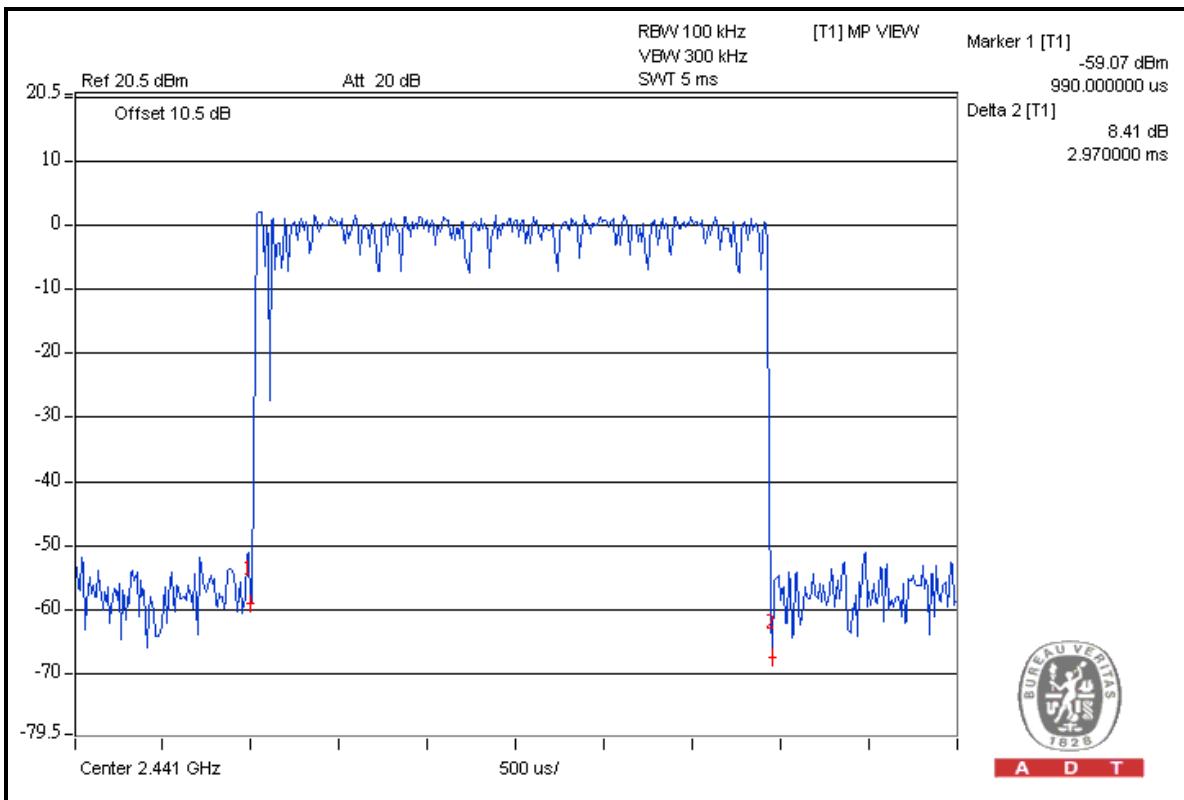
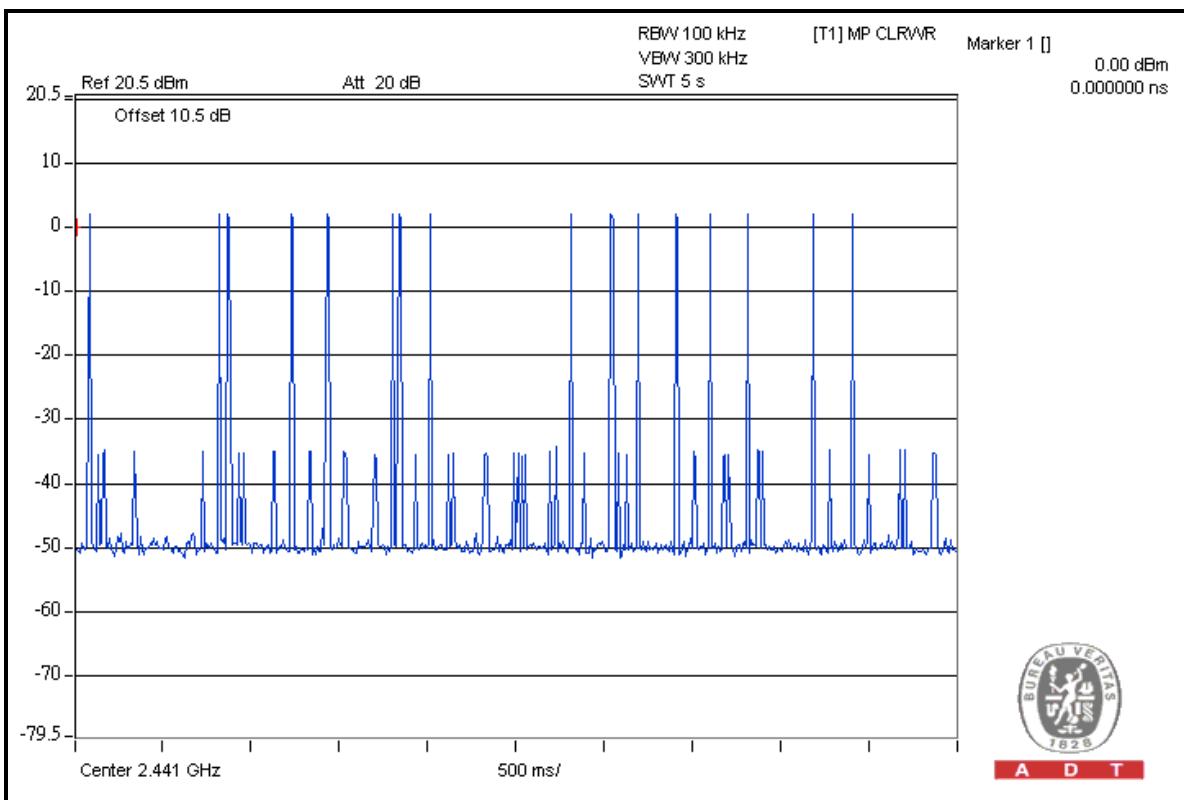
DH3





A D T

DH5



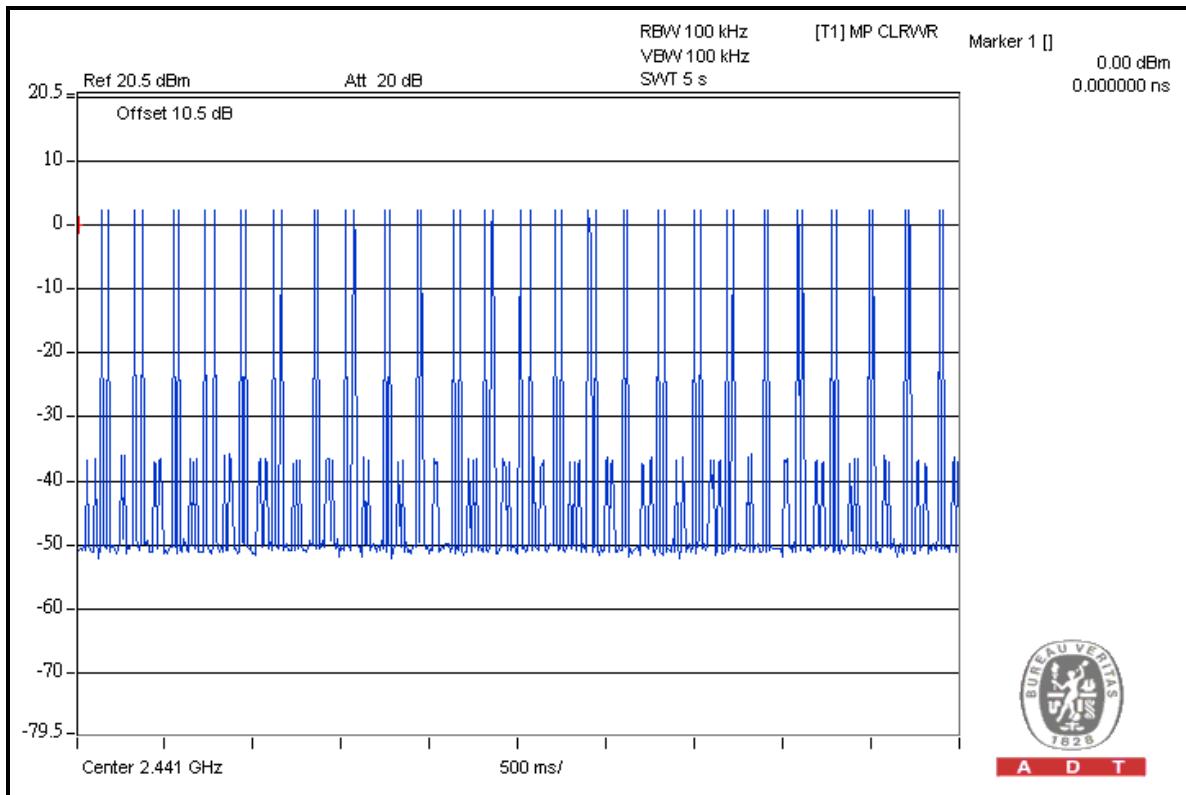


A D T

For 8DPSK :

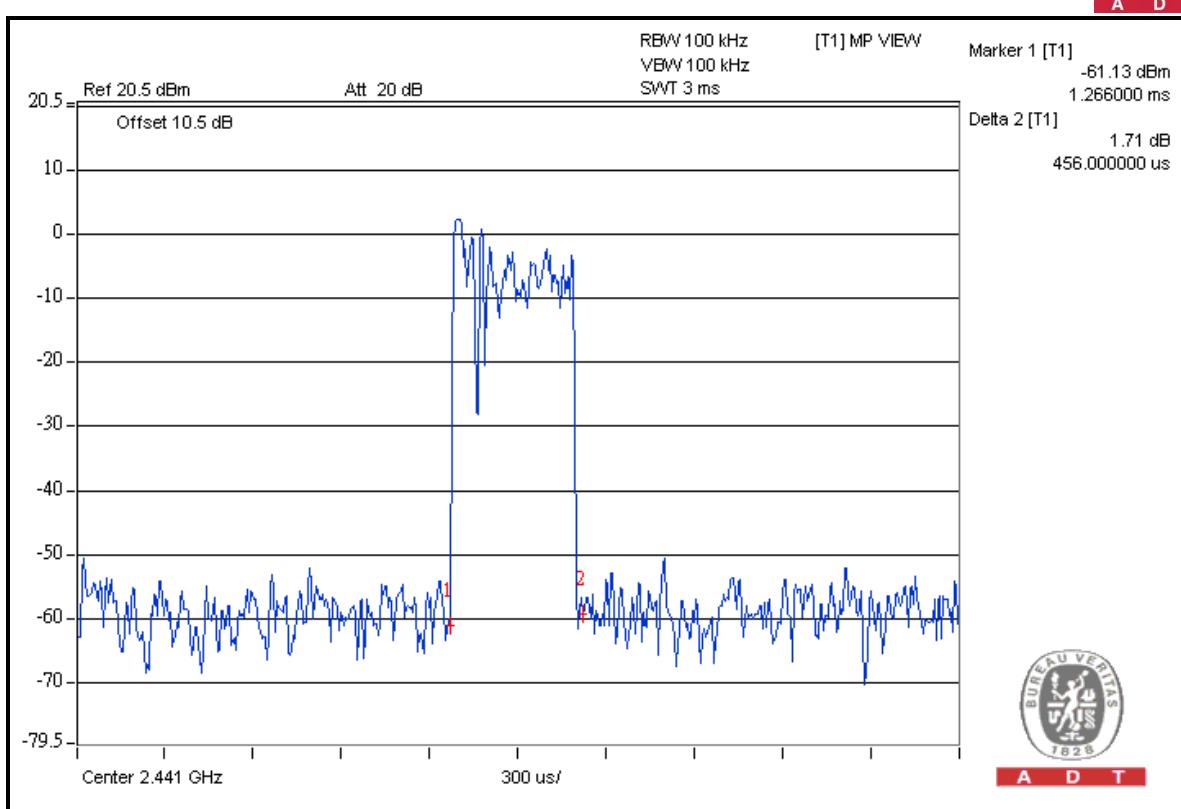
Mode	Number of transmission in a 31.6 (79Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (msec)
DH1	50 (times / 5 sec) *6.32=316 times	0.456	144.1	400
DH3	25 (times / 5 sec) *6.32=158 times	1.692	267.34	400
DH5	18 (times / 5 sec) *6.32=113.76 times	3.02	343.56	400

DH1





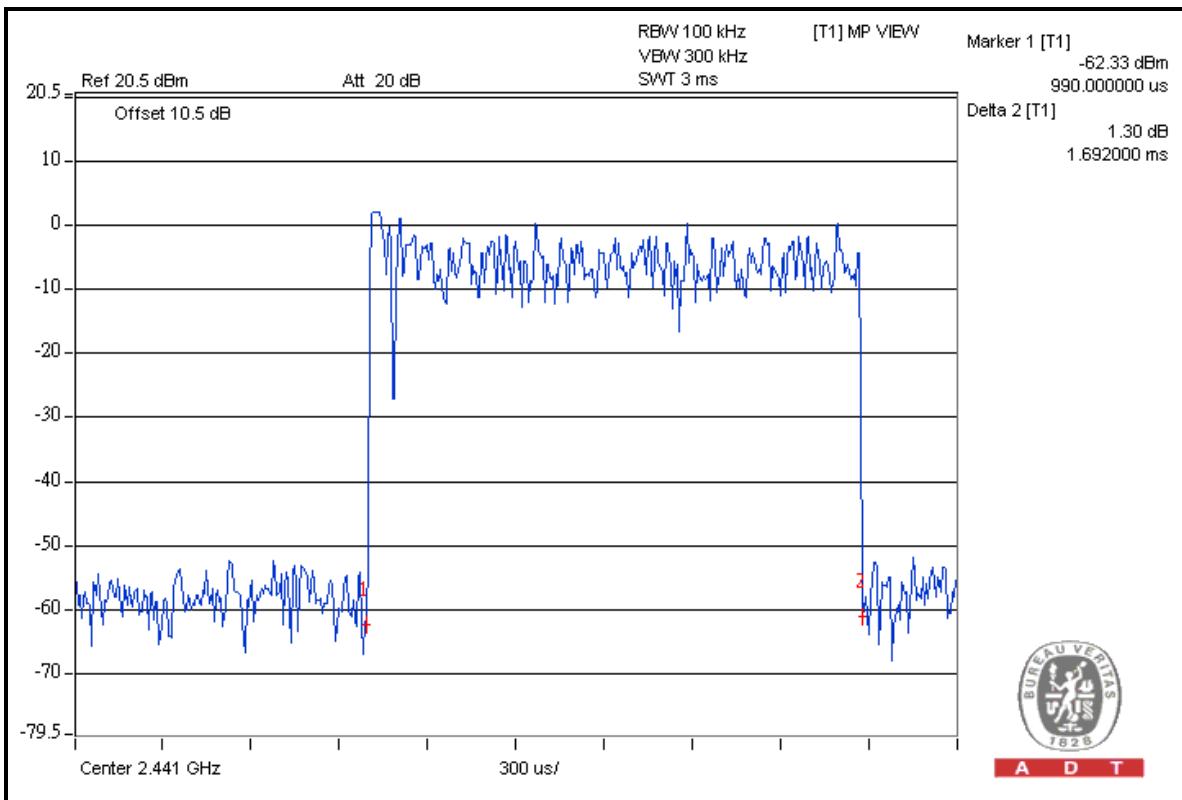
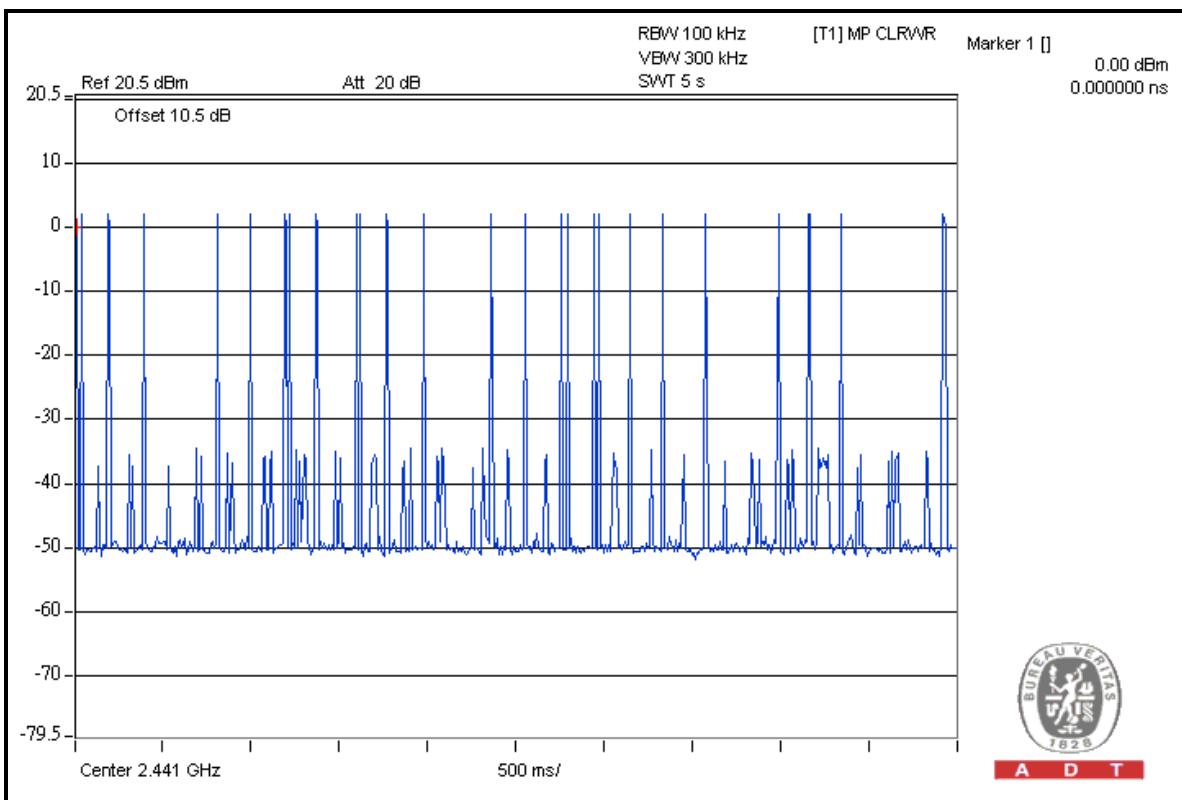
A D T





A D T

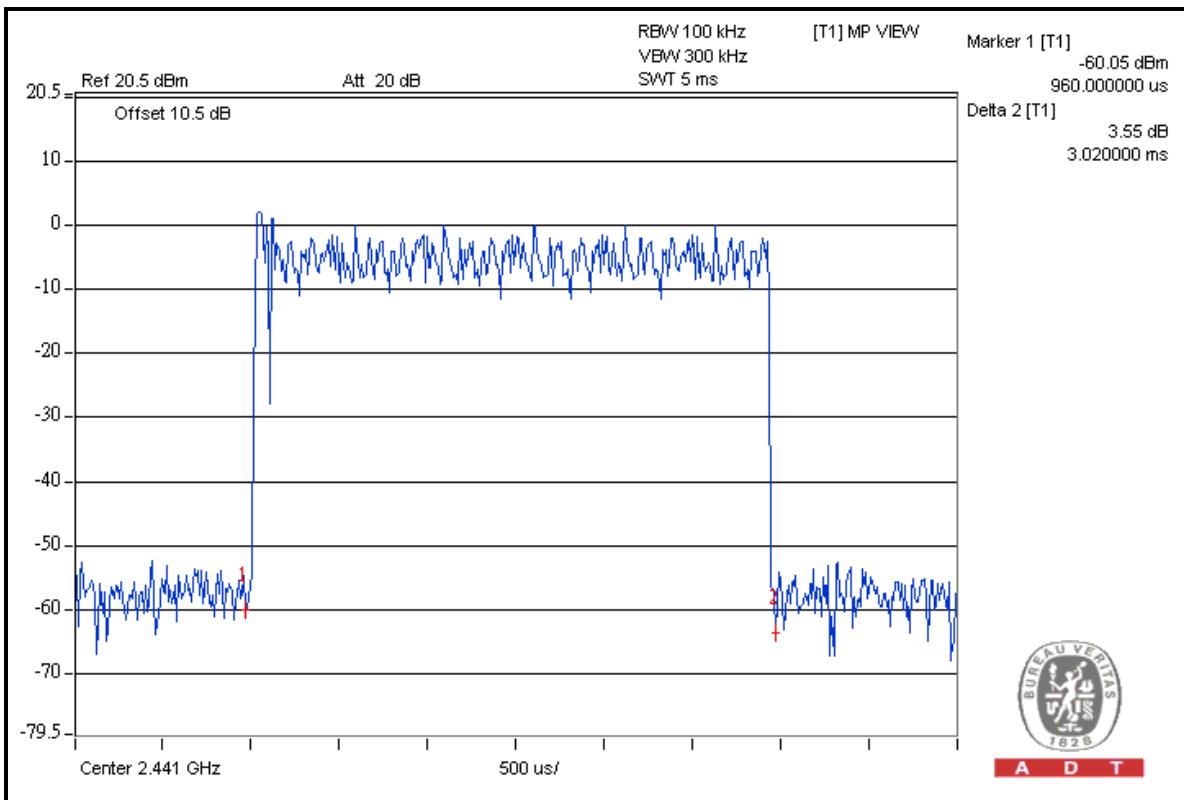
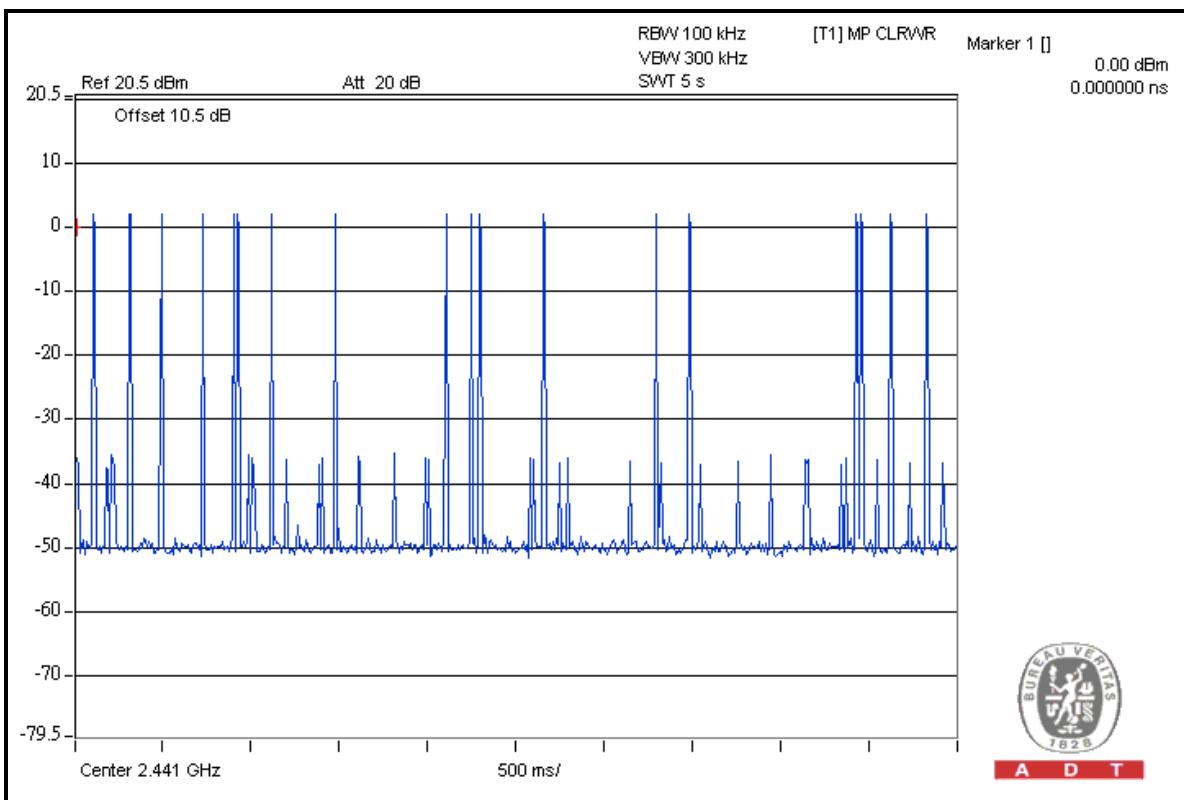
DH3





A D T

DH5



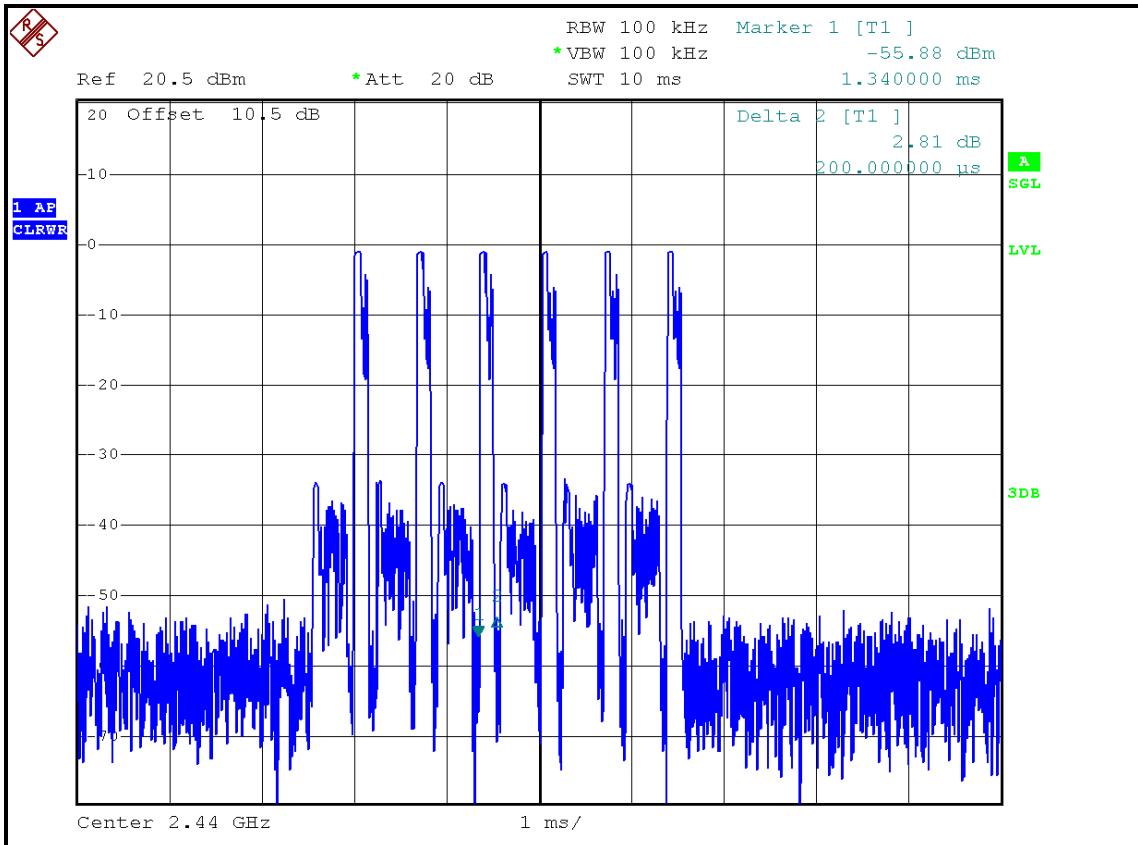
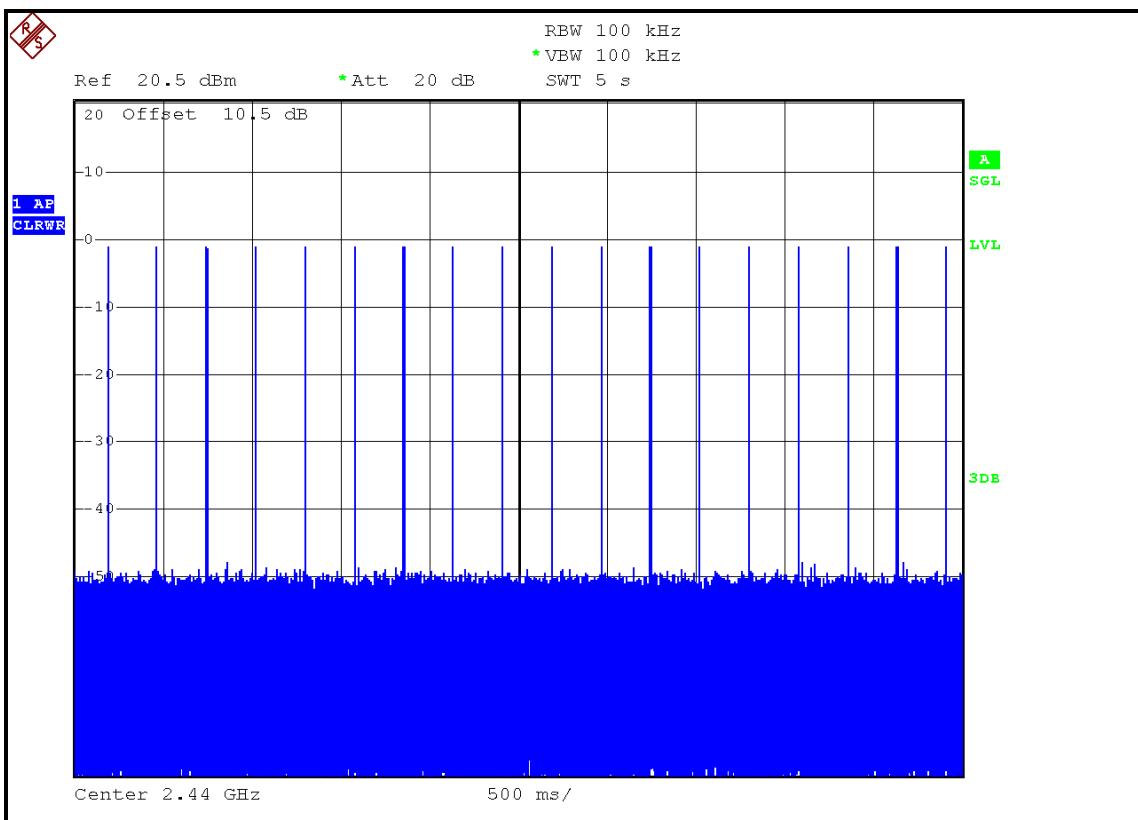


A D T

For GFSK(LE mode):

Mode	Number of transmission in a 16 (40Hopping*0.4)	Length of transmission time (msec)*	Result (msec)	Limit (msec)
DH1	18 (times / 5 sec) *3.2=57.6 times	1.2	69.12	400

*There are two burst signal during transmission time period.

DH1




A D T

4.5 20dB BANDWIDTH MEASUREMENT

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 shall be a minimum limit for the hopping channel separation.

4.5.2 TEST INSTRUMENTS

Test date: Nov. 21, 2011

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S Spectrum Analyzer	FSP 40	100060	May 11, 2011	May 10, 2012

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



A D T

4.5.5 TEST SETUP



4.5.6 EUT OPERATING CONDITION

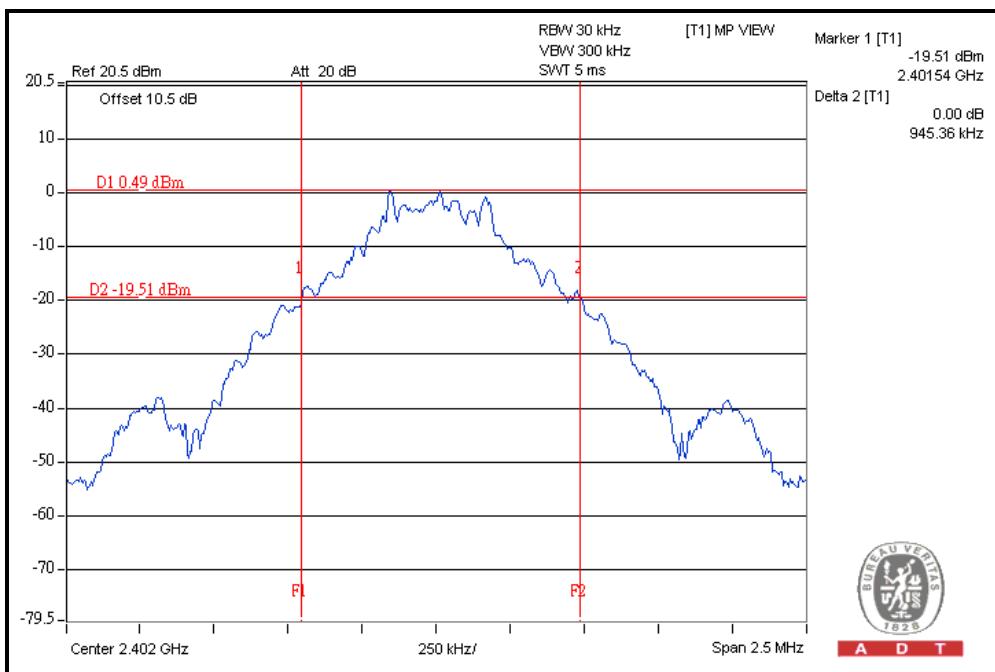
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

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

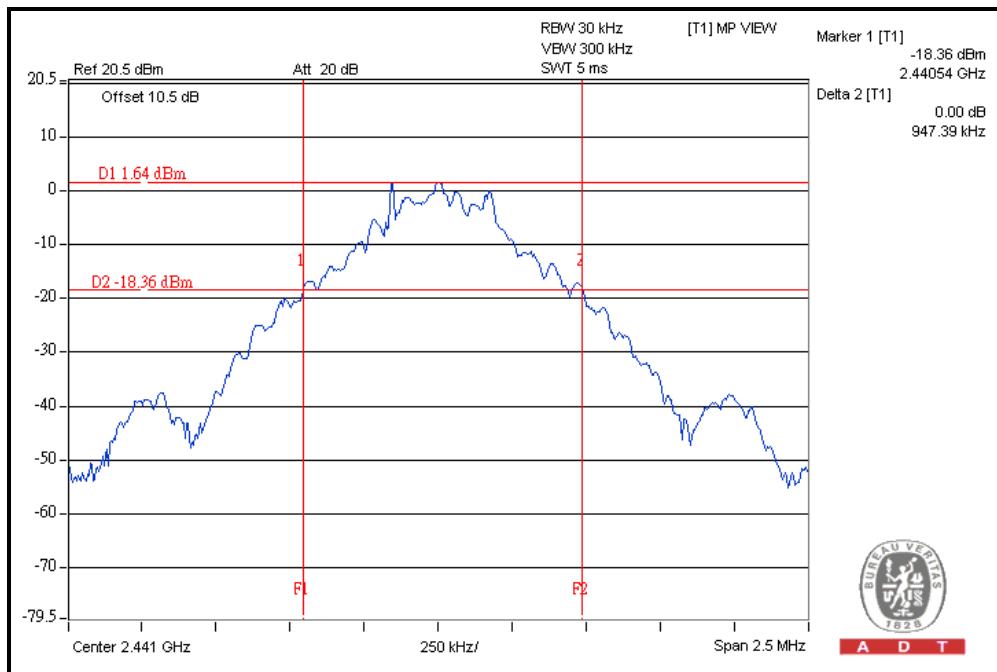
CH 0



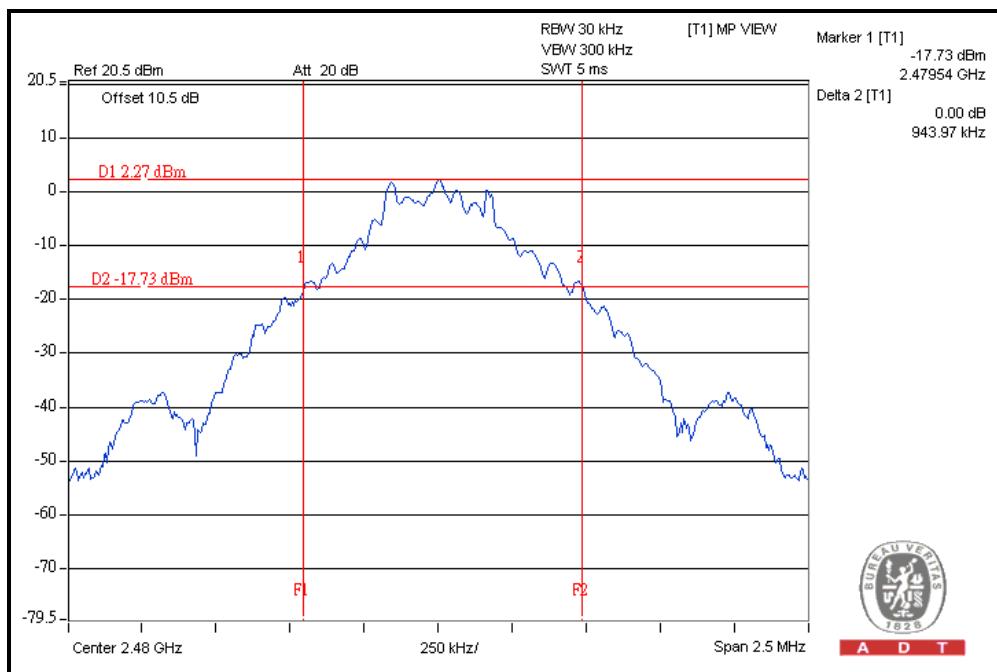


A D T

CH 39



CH 78



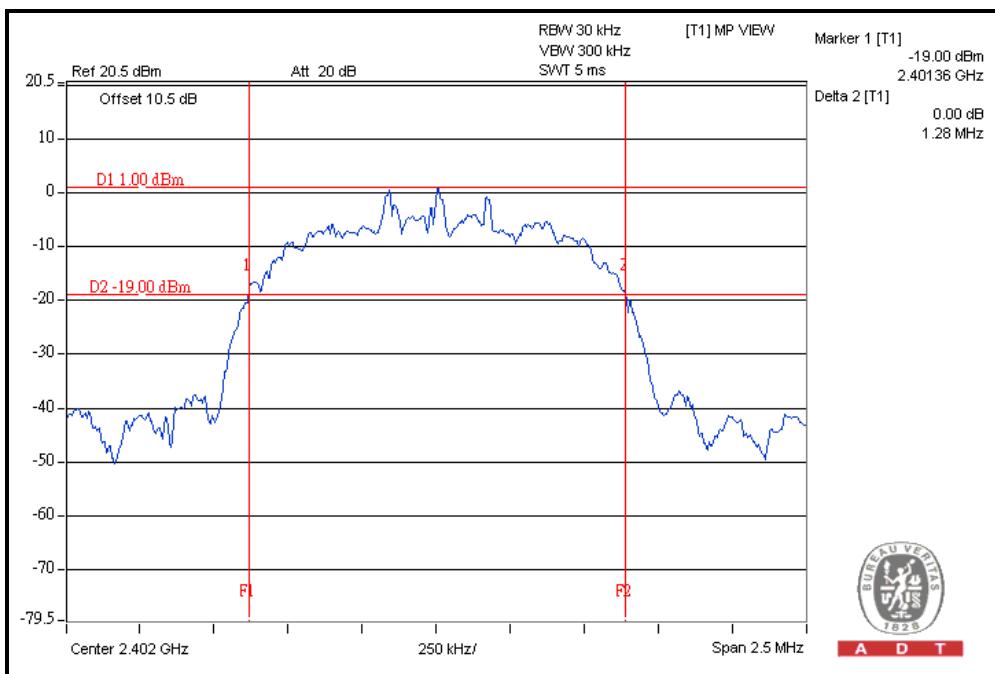


A D T

For 8DPSK:

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
0	2402	1.28
39	2441	1.27
78	2480	1.29

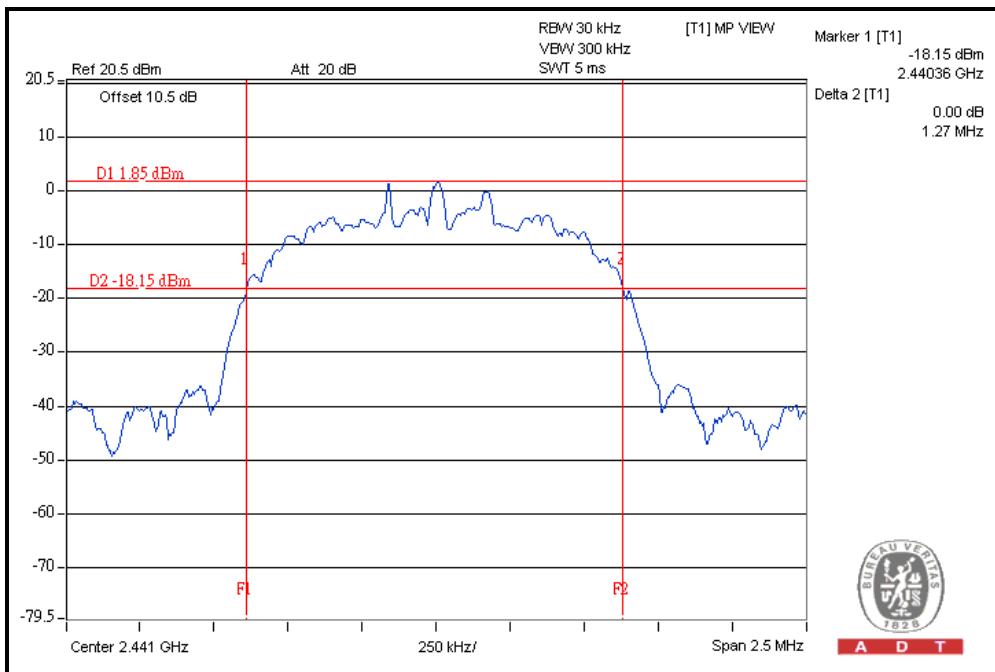
CH 0



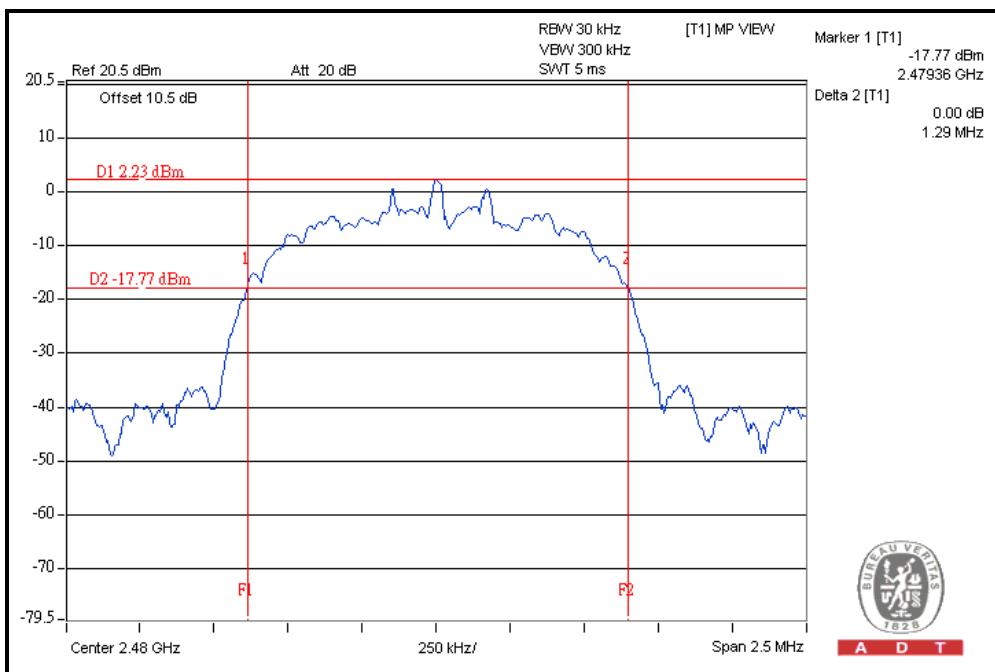


A D T

CH 39



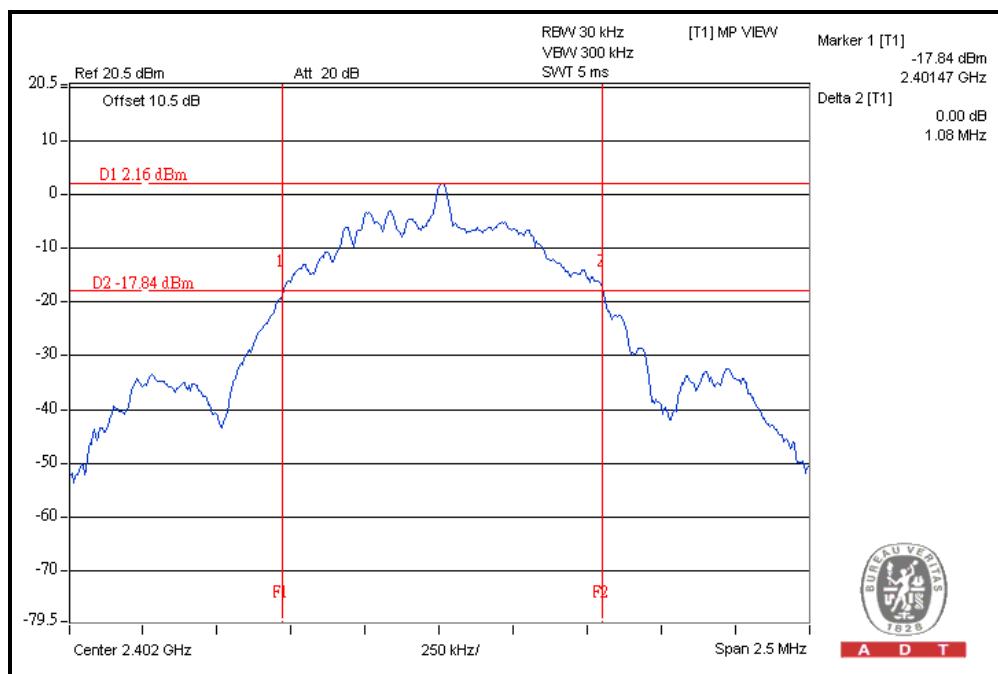
CH 78



For GFSK(LE mode):

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
0	2402	1.08
19	2440	1.08
39	2480	1.08

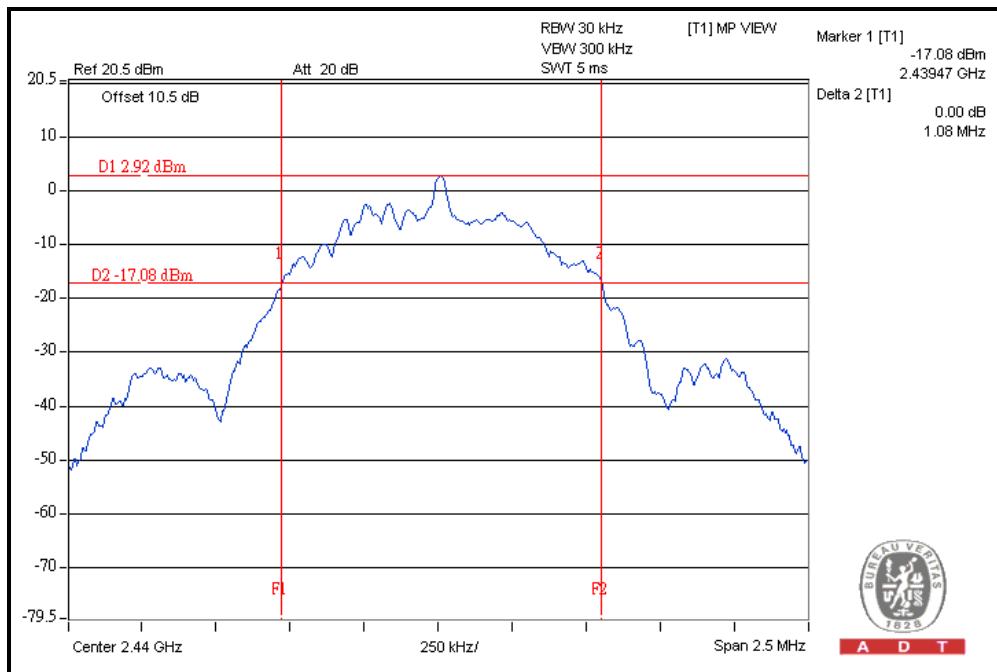
CH 0



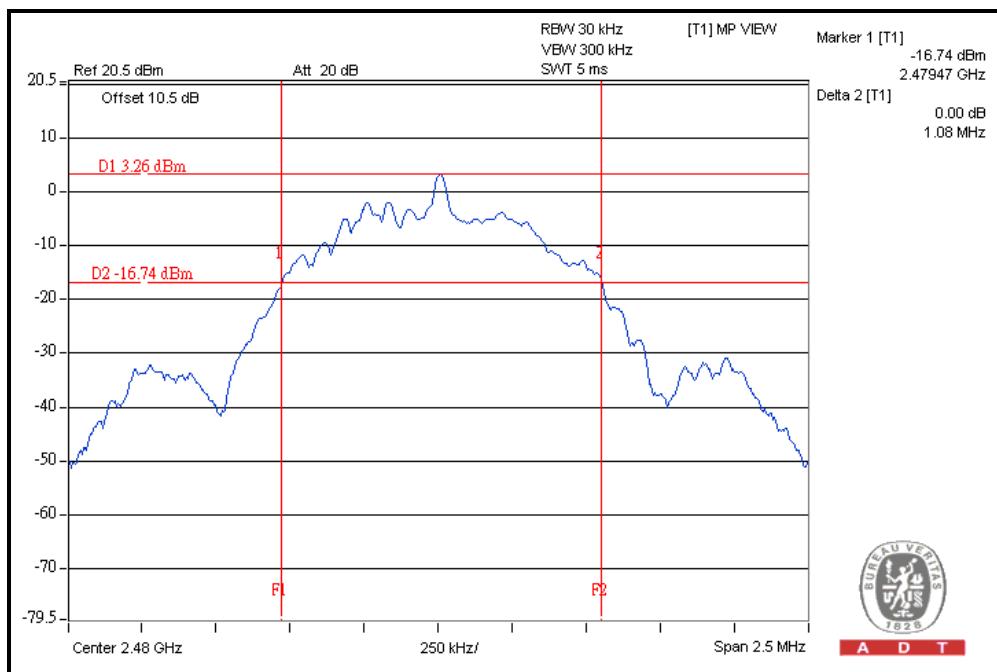


A D T

CH 19



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: Oct. 18, 2011

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S Spectrum Analyzer	FSP 40	100060	May 11, 2011	May 10, 2012

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.

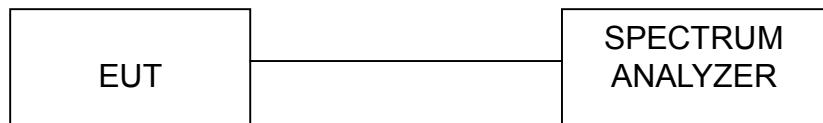


A D T

4.6.4 DEVIATION FROM TEST STANDARD

No deviation

4.6.5 TEST SETUP





A D T

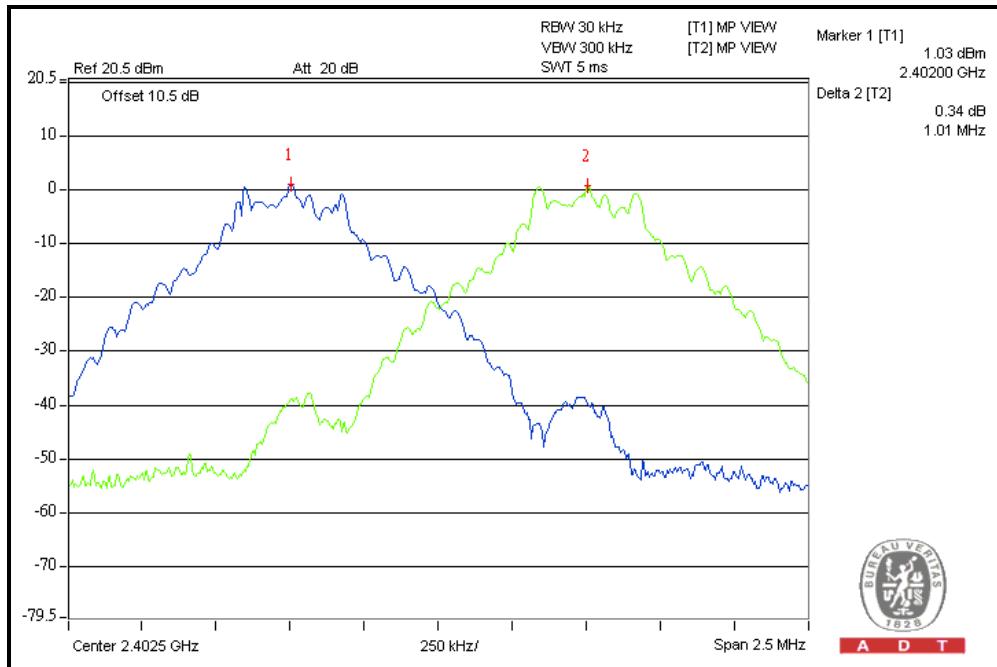
4.6.6 TEST RESULTS

For GFSK

Channel	Frequency (MHz)	Adjacent Channel Separation (MHz)	Minimum Limit (MHz)	Pass / Fail
0	2402	1.010	0.63	PASS
39	2441	1.010	0.94	PASS
78	2480	1.010	0.94	PASS

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

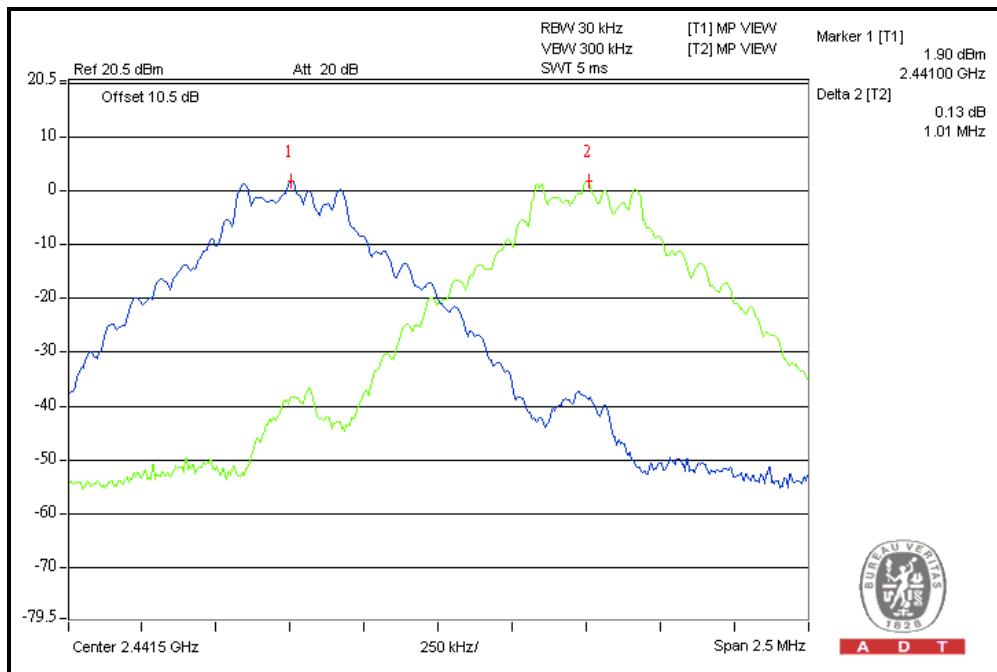
CH 0



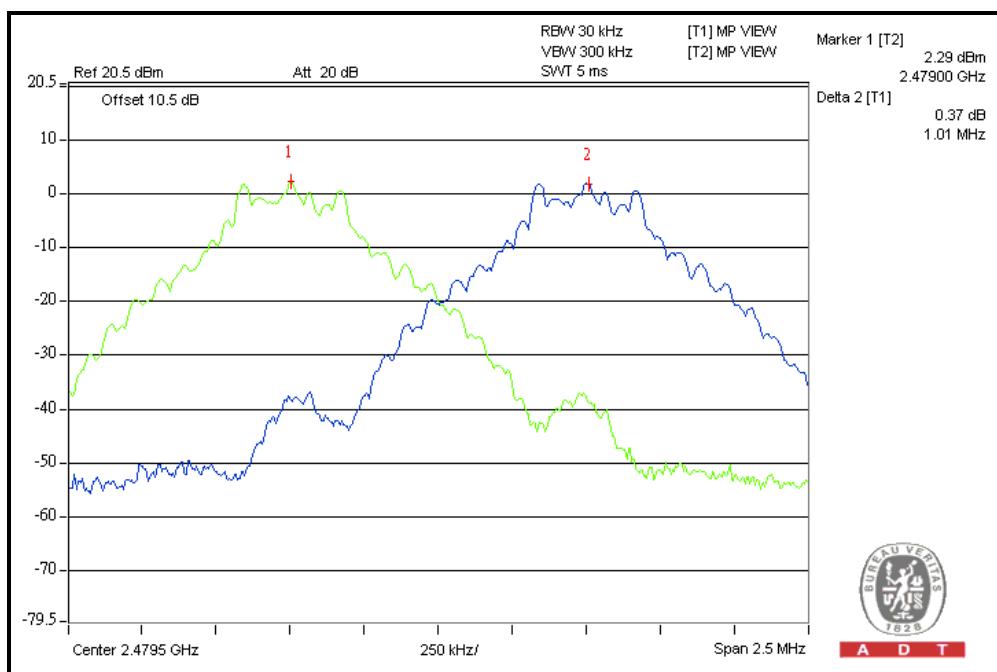


A D T

CH 39



CH 78





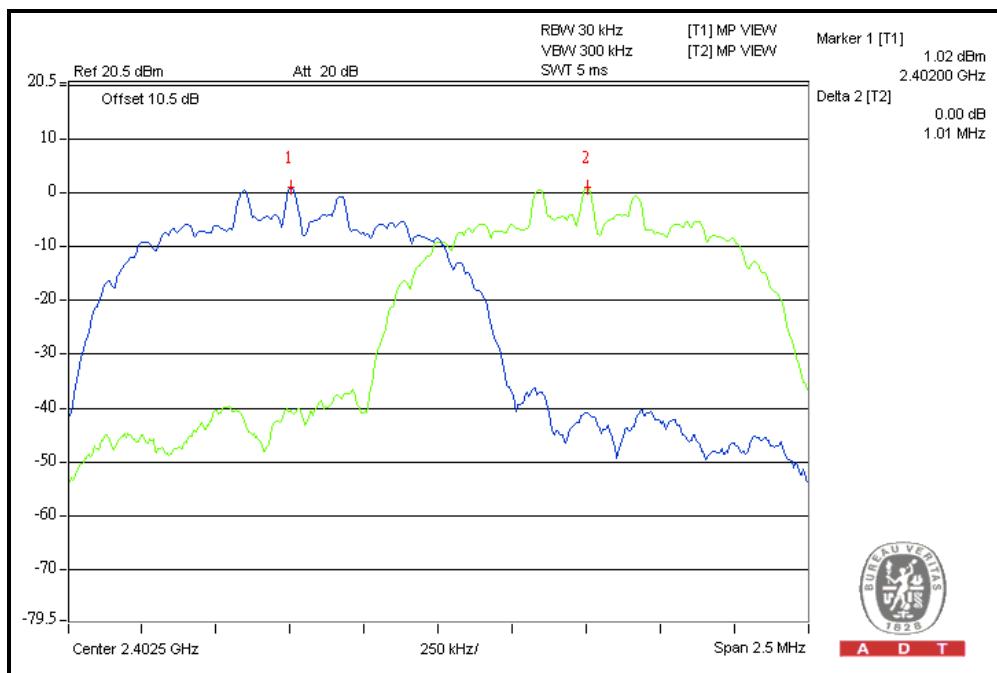
A D T

For 8DPSK

Channel	Frequency (MHz)	Adjacent Channel Separation (MHz)	Minimum Limit (MHz)	Pass / Fail
0	2402	1.010	0.85	PASS
39	2441	1.000	0.85	PASS
78	2480	1.000	0.86	PASS

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

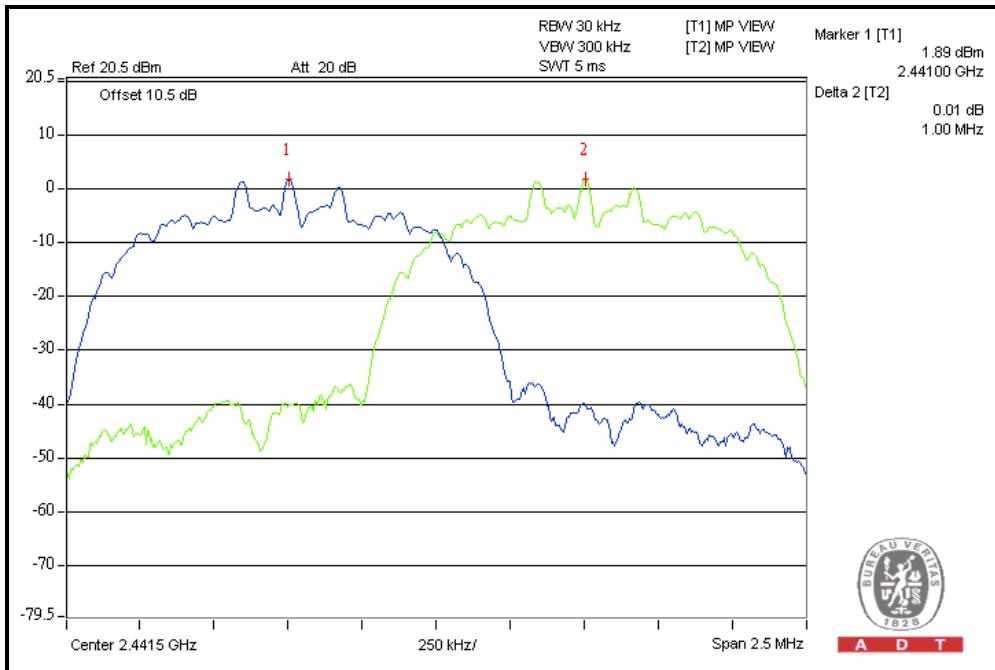
CH 0



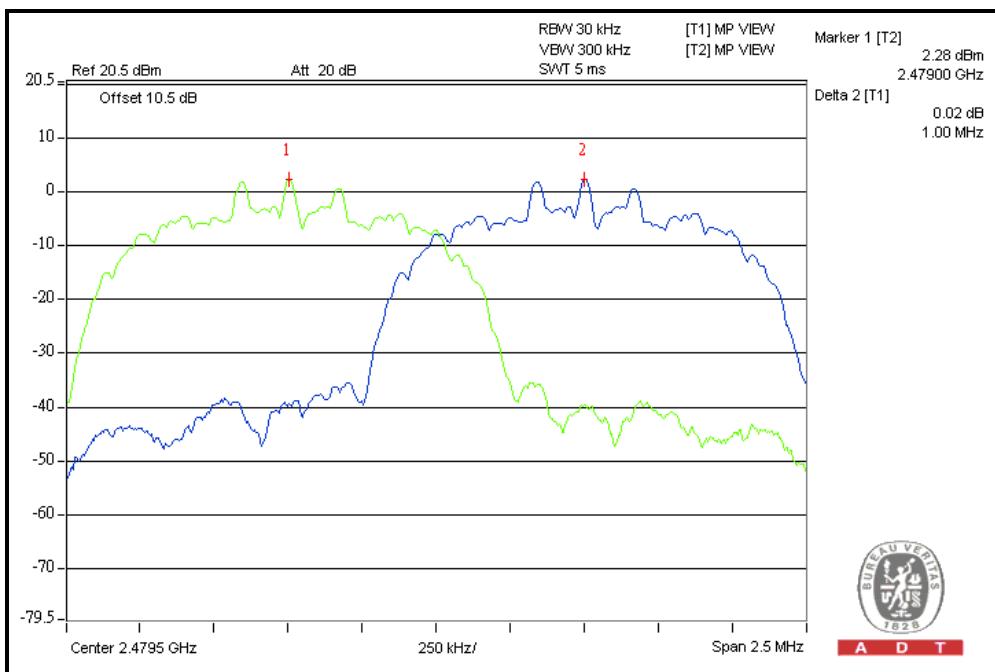


A D T

CH 39



CH 78





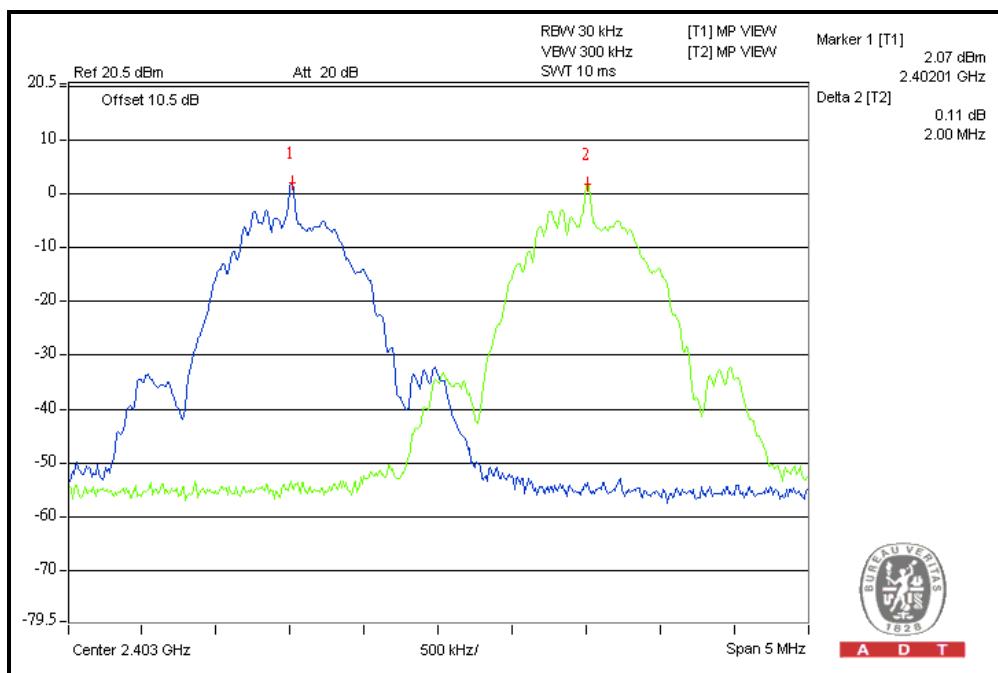
A D T

For GFSK(LE mode)

Channel	Frequency (MHz)	Adjacent Channel Separation (MHz)	Minimum Limit (MHz)	Pass / Fail
0	2402	2.000	0.72	PASS
19	2440	2.000	0.72	PASS
39	2480	2.010	0.72	PASS

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

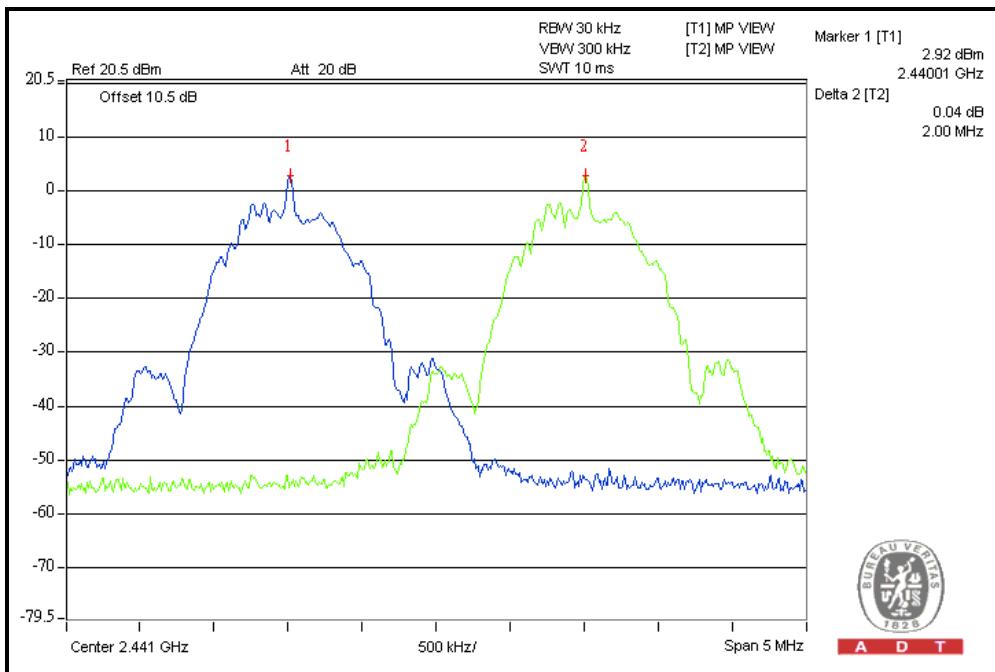
CH 0



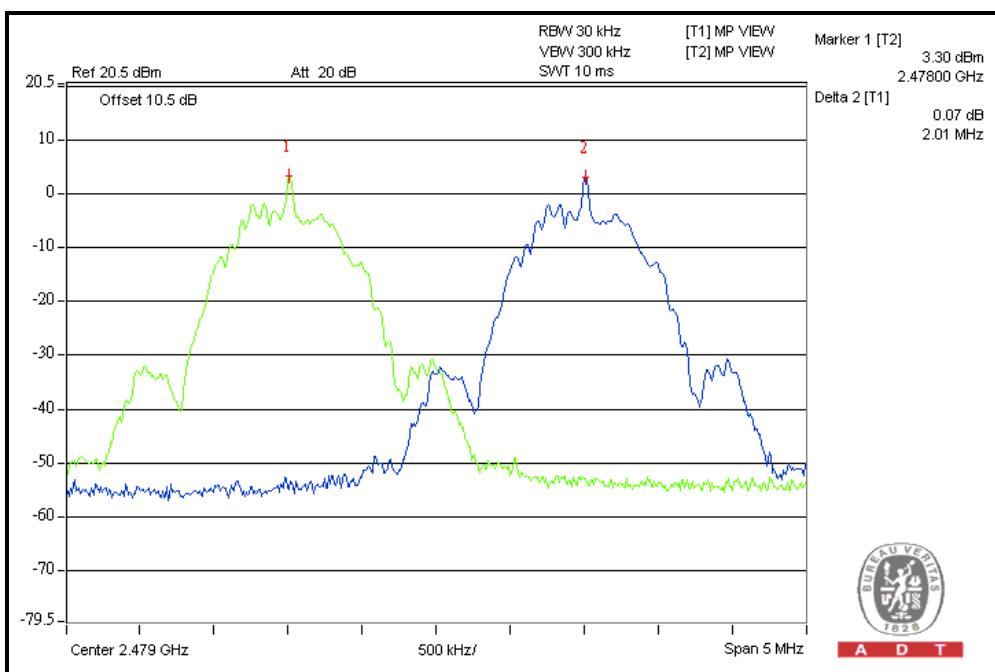


A D T

CH 39



CH 78





A D T

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: Nov. 04, 2011

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S Spectrum Analyzer	FSP 40	100060	May 11, 2011	May 10, 2012

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



A D T

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.



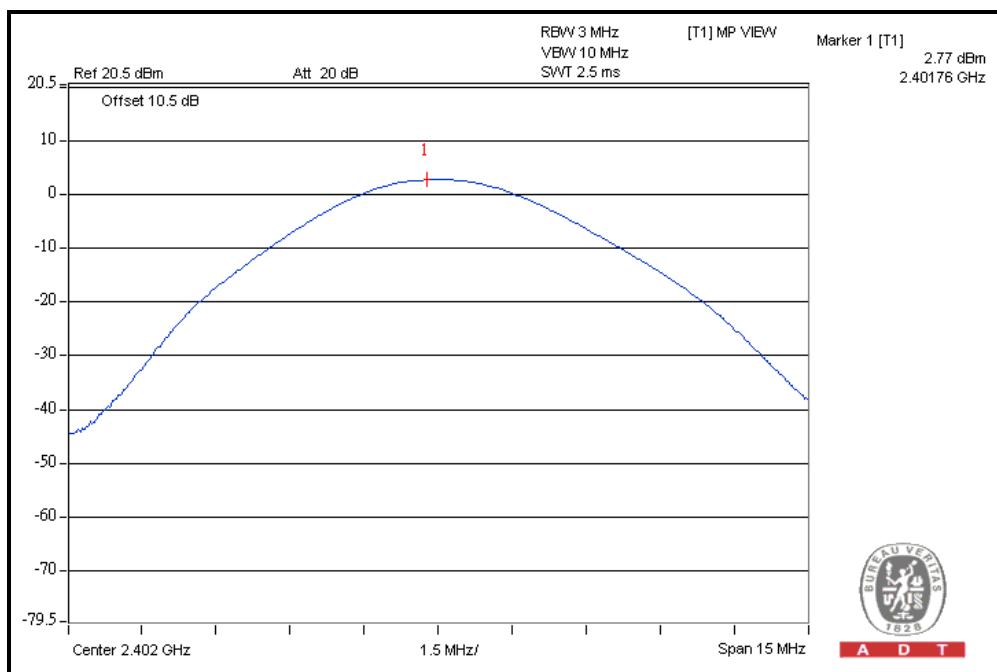
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4.7.7 TEST RESULTS

For GFSK

CHANNEL	CHANNEL FREQUENCY (MHz)	POWER OUTPUT (dBm)	POWER OUTPUT (mW)	POWER LIMIT (mW)	PASS/FAIL
0	2402	2.8	1.9	125	PASS
39	2441	3.4	2.2	125	PASS
78	2480	4.0	2.5	125	PASS

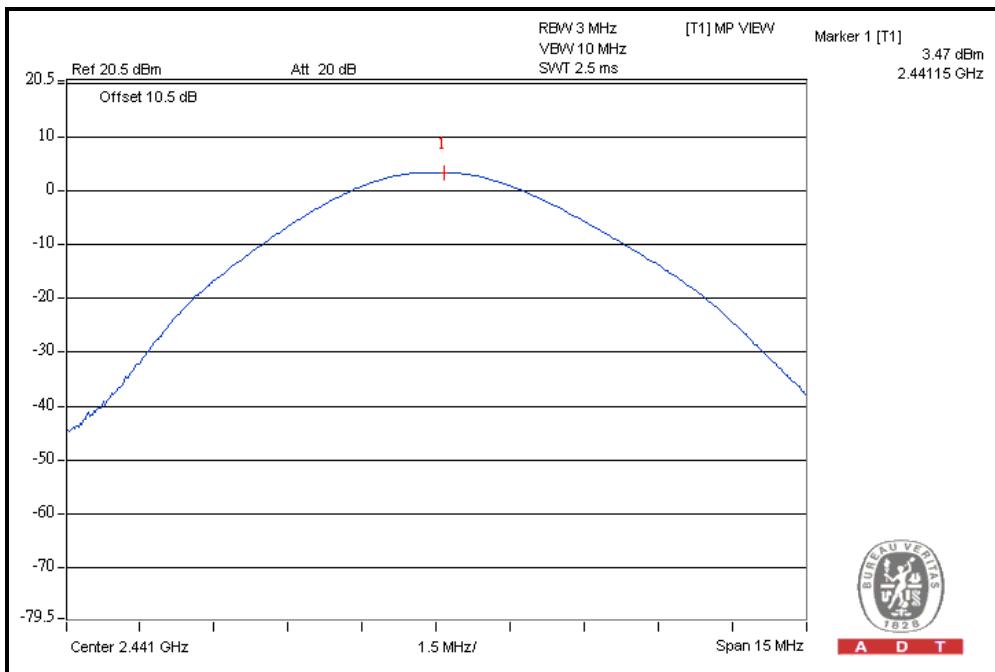
CH 0



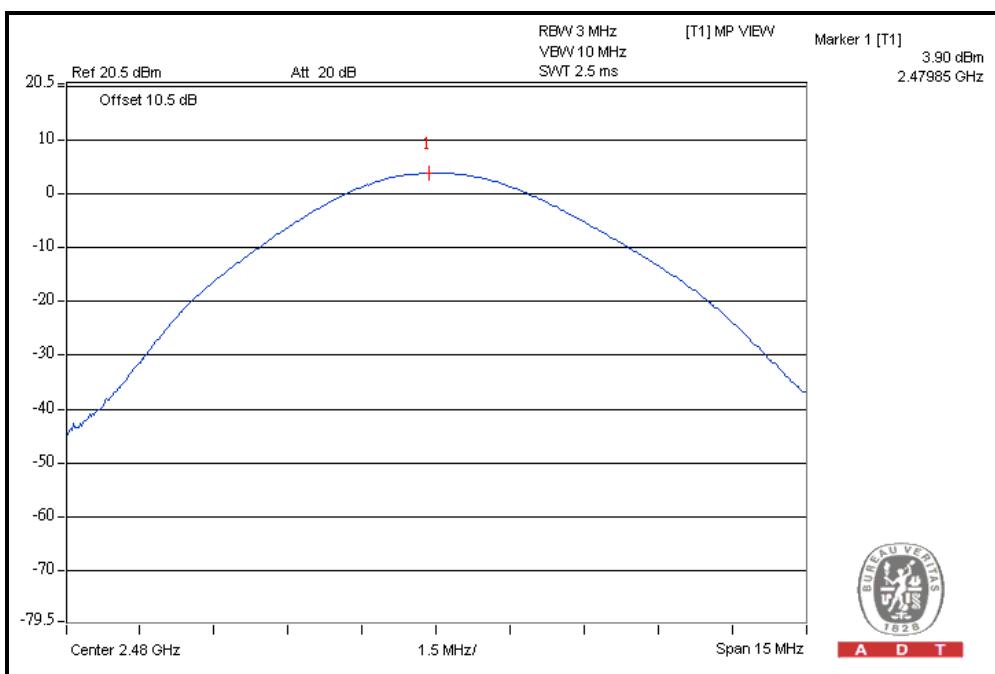


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CH 78



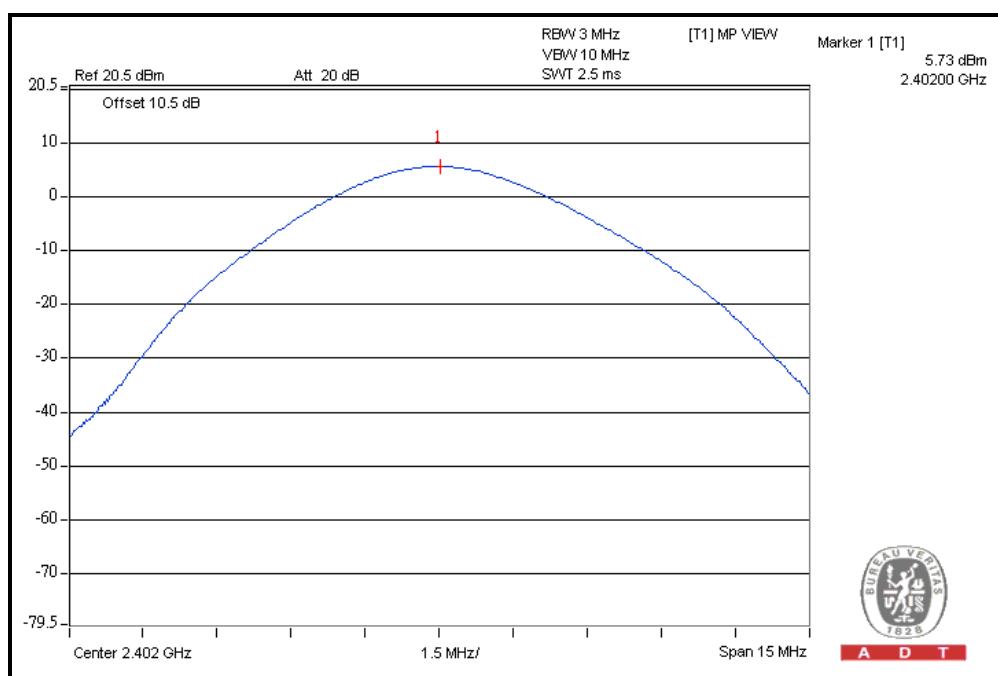


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For 8DPSK

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	6.4	4.4	125	PASS
78	2480	6.8	4.8	125	PASS

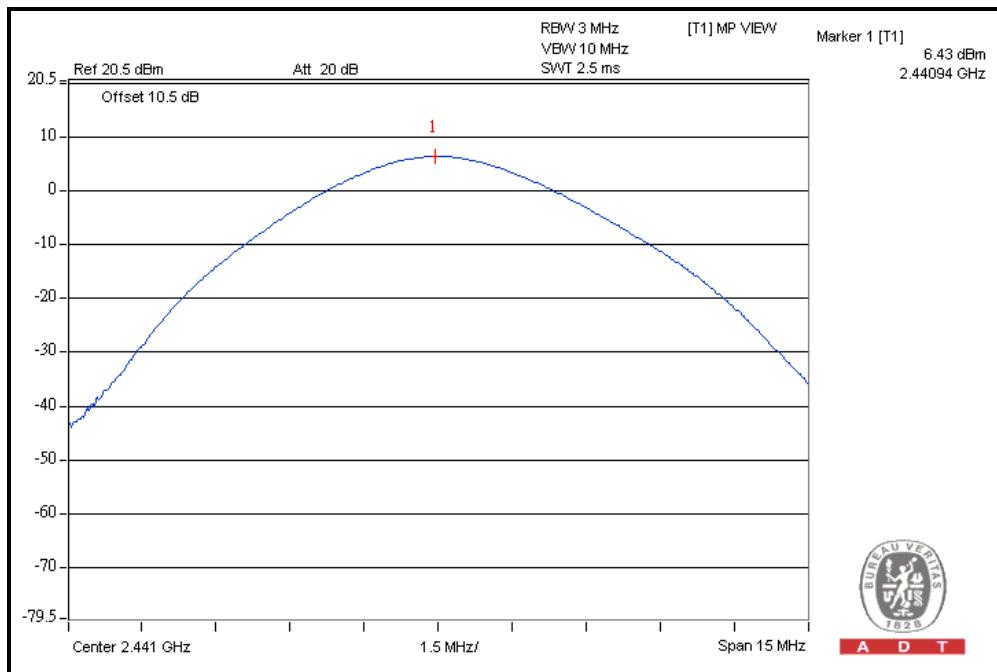
CH 0



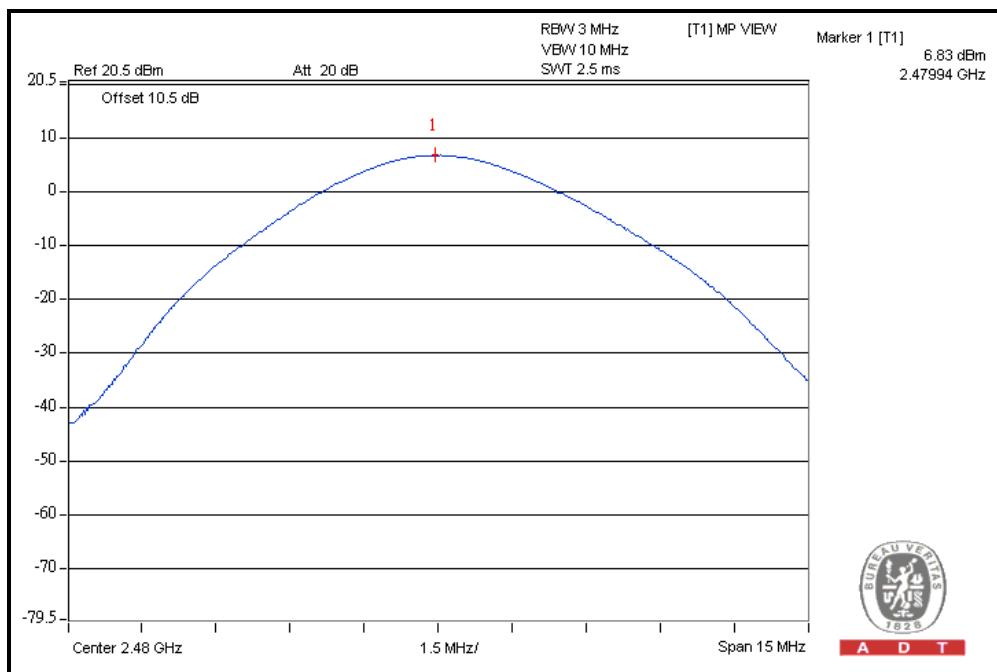


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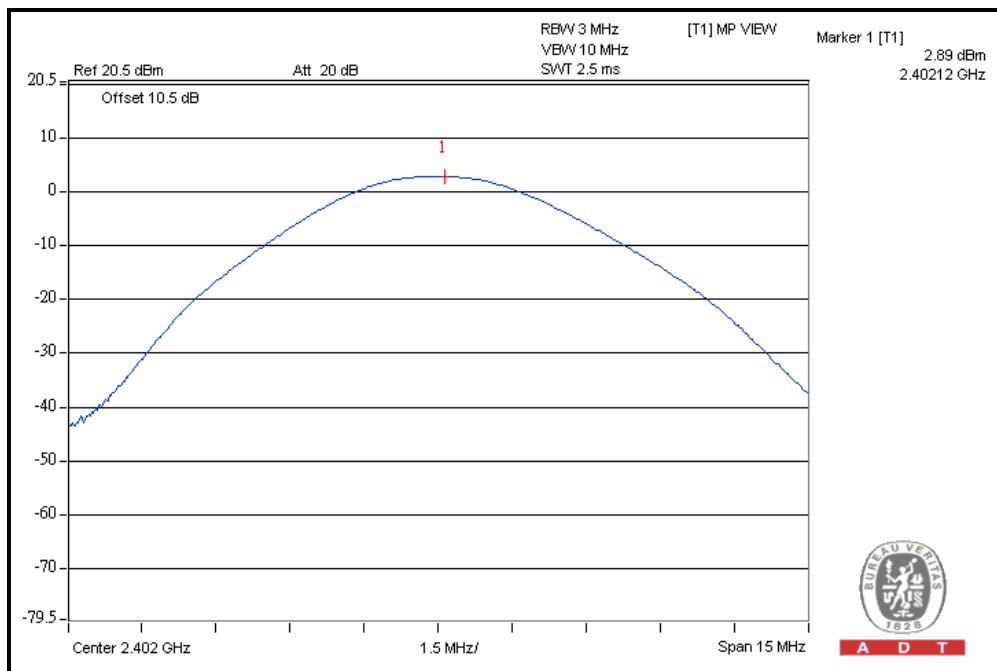


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For GFSK(LE mode)

CHANNEL	CHANNEL FREQUENCY (MHz)	POWER OUTPUT (dBm)	POWER OUTPUT (mW)	POWER LIMIT (mW)	PASS/FAIL
0	2402	3.0	2.0	125	PASS
19	2440	3.6	2.3	125	PASS
39	2480	4.0	2.5	125	PASS

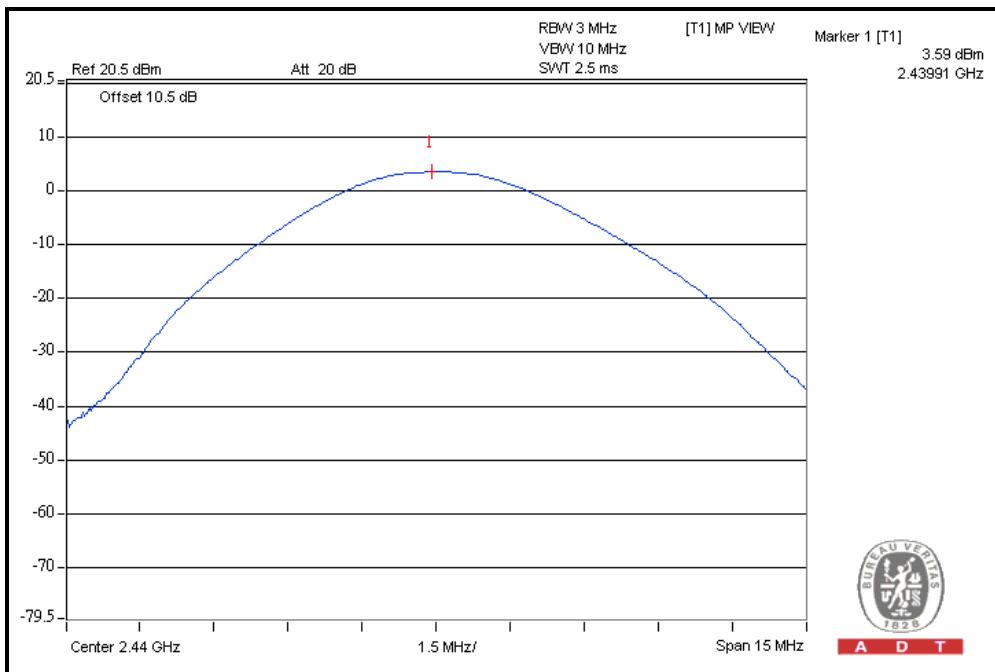
CH 0



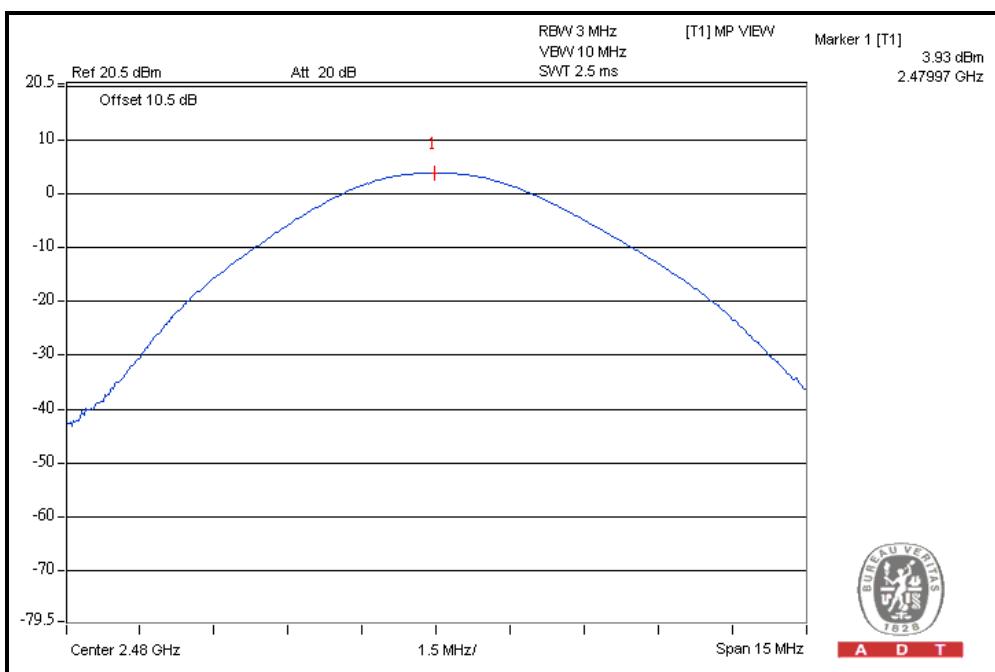


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4.8 AVERAGE OUTPUT POWER

4.8.1 FOR REFERENCE.

4.8.2 INSTRUMENTS

Test date: Nov. 18, 2011

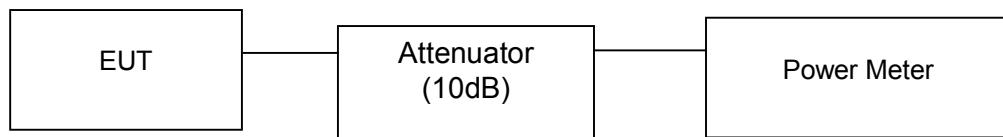
DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Peak Power Meter	ML2495A	0824006	May 04, 2011	May 03, 2012
Power Sensor	MA2411B	0738172	May 03, 2011	May 02, 2012

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 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.



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4.8.6 TEST RESULTS

For GFSK

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER OUTPUT (dBm)
0	2402	3.0
39	2441	3.6
78	2480	4.1

For 8DPSK

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER OUTPUT (dBm)
0	2402	3.2
39	2441	3.9
78	2480	4.4

For GFSK(LE mode)

CHANNEL	CHANNEL FREQUENCY (MHz)	AVERAGE POWER OUTPUT (dBm)
0	2402	2.9
19	2440	3.6
39	2480	4.1



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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

Test date: Nov. 04, 2011

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S Spectrum Analyzer	FSP 40	100060	May 11, 2011	May 10, 2012

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 loss 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

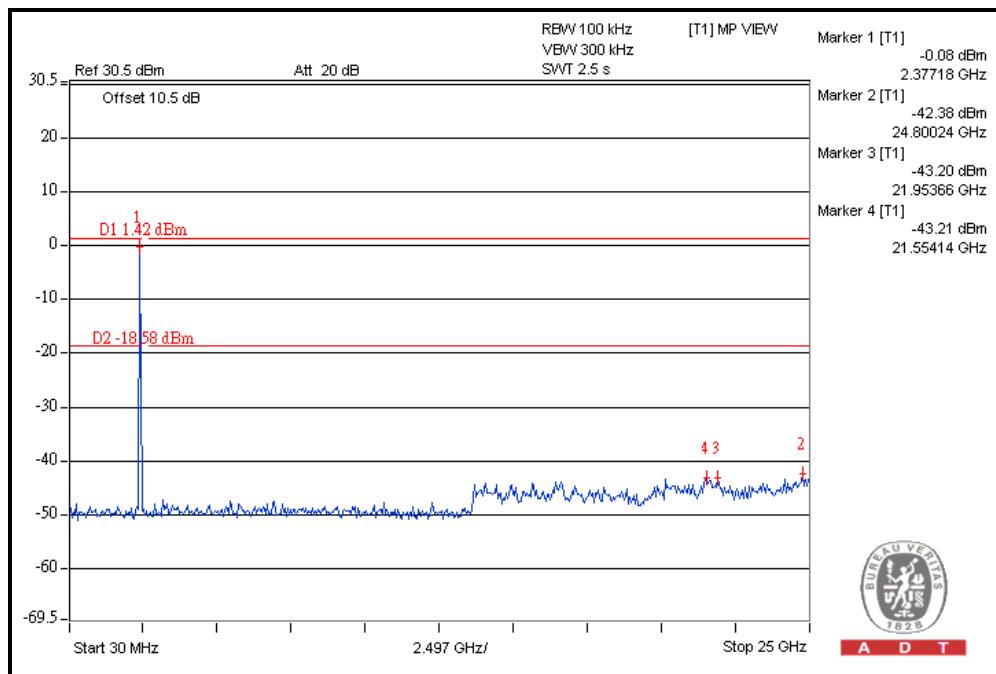
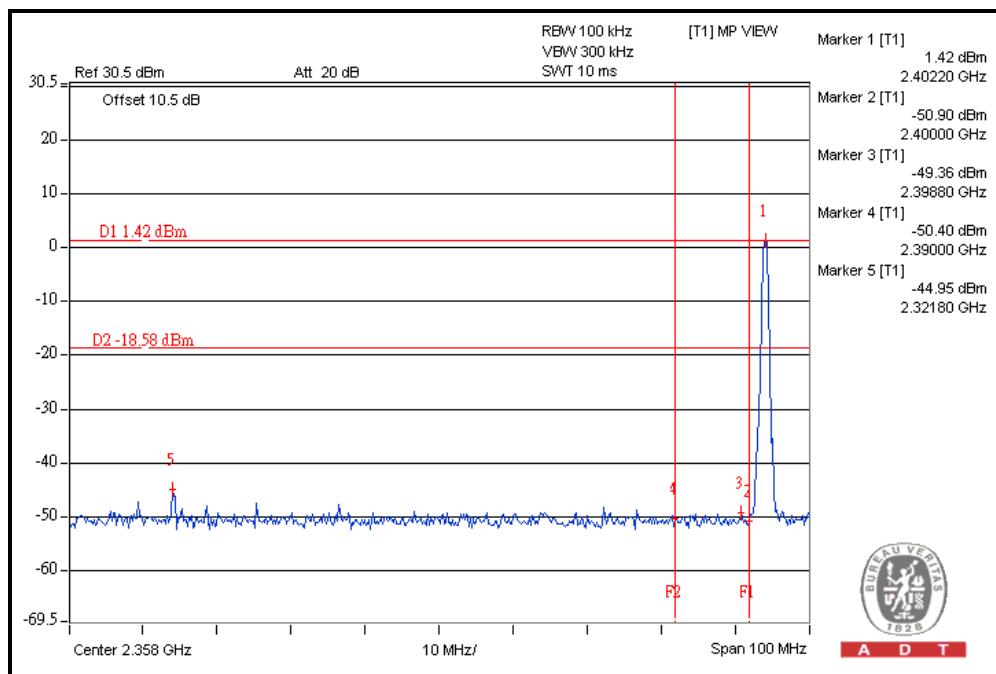
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.8.6 TEST RESULTS

Emissions radiated outside of the specified frequency bands, please refer following pages for met the requirement of the general radiated emission limits in § 15.209.

For GFSK Modulation Type:

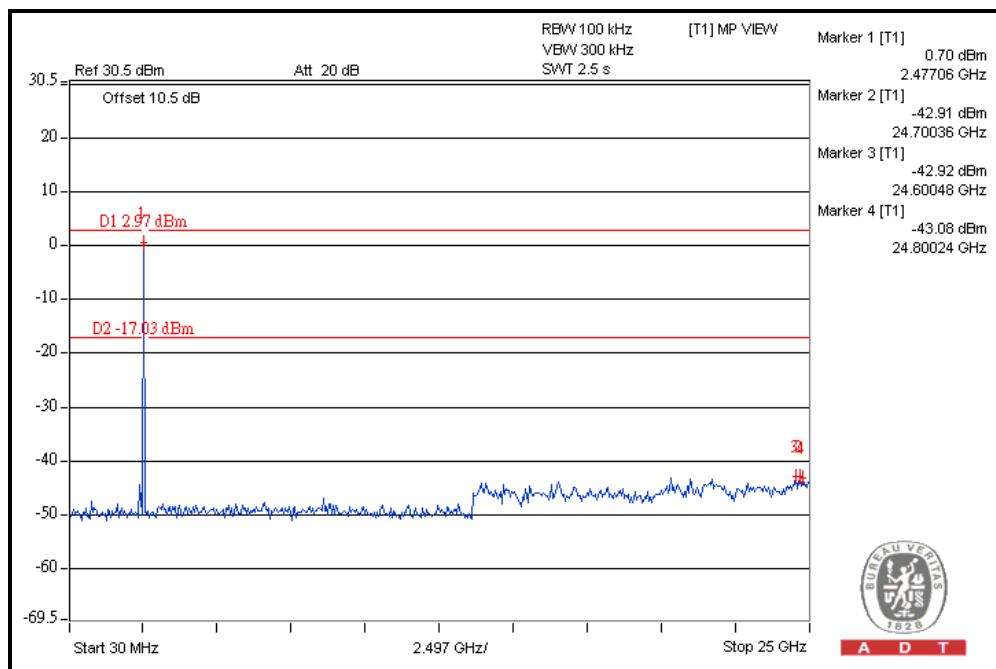
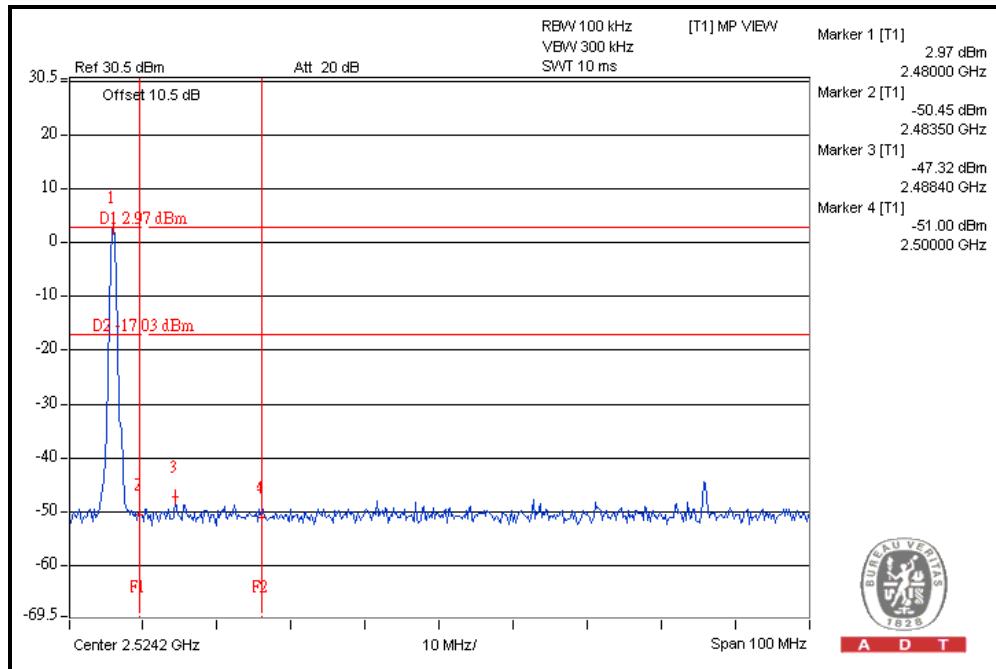
CH 0





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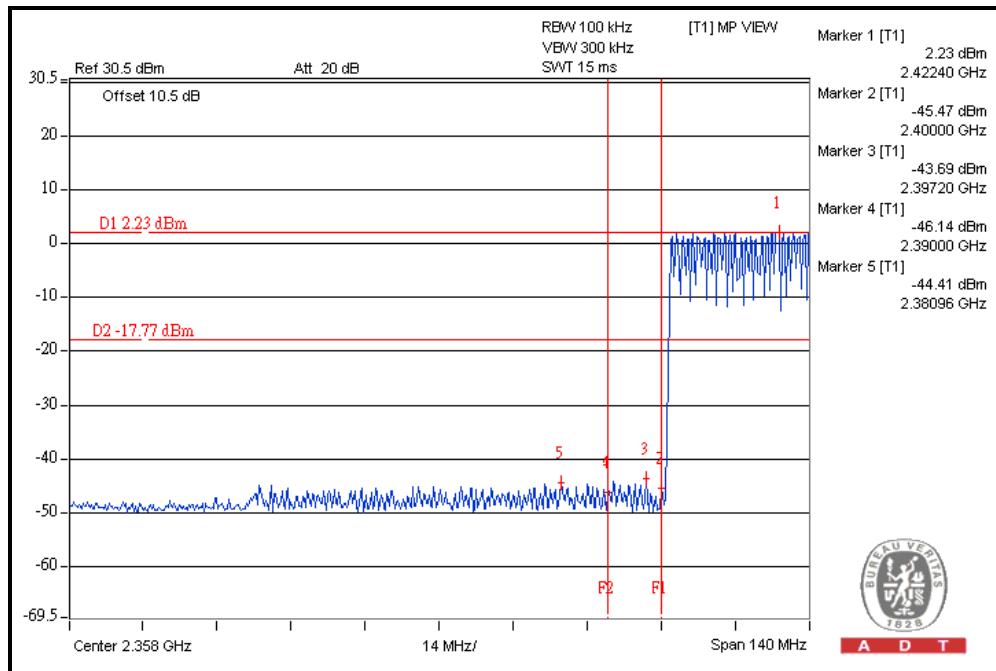
CH 78



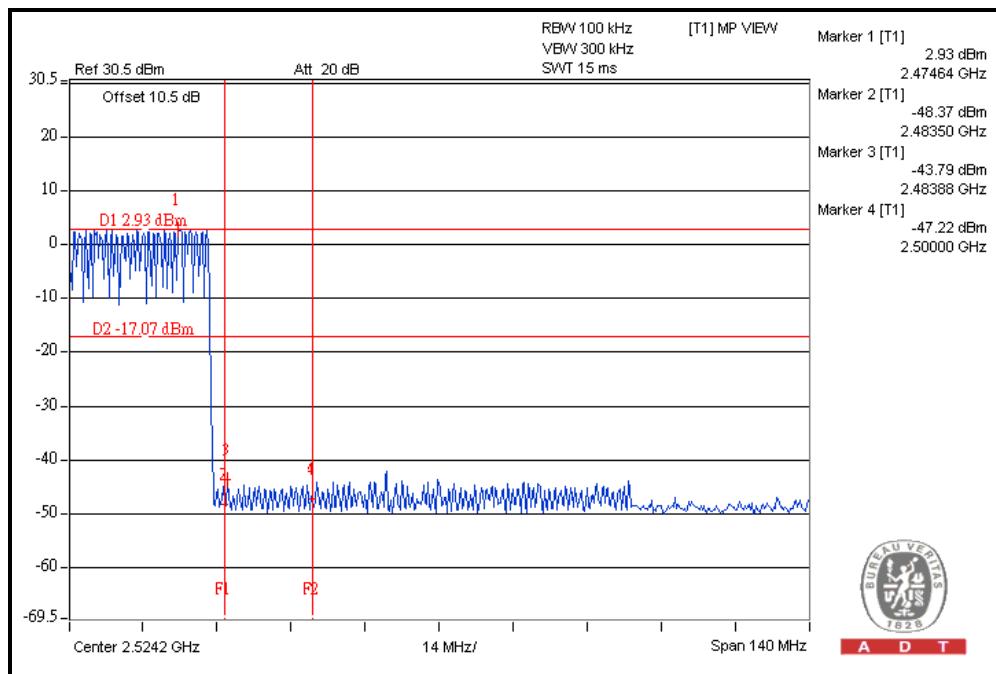


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CH 0



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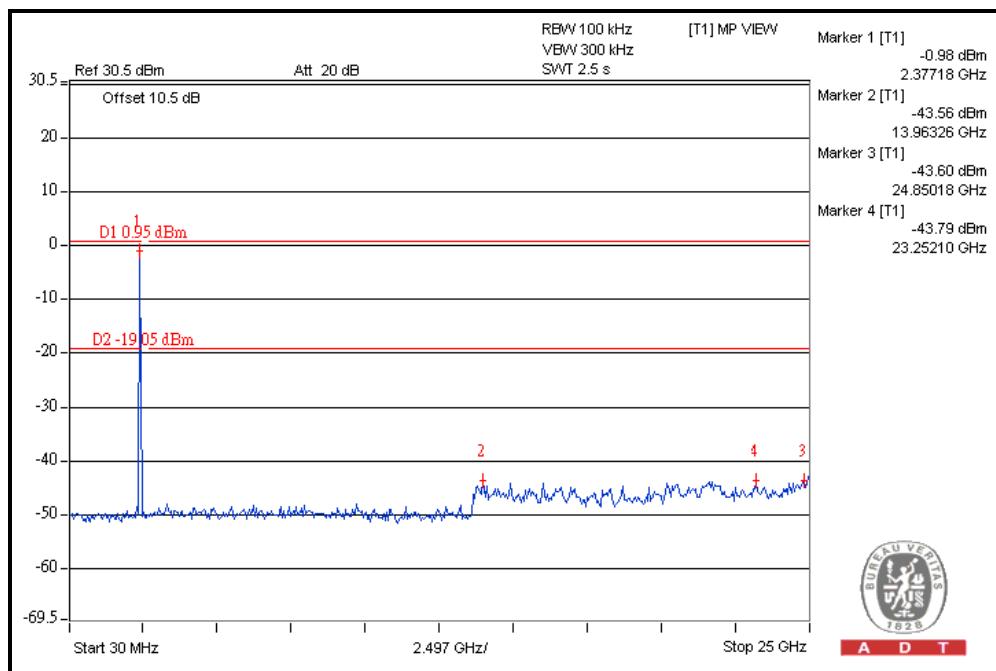
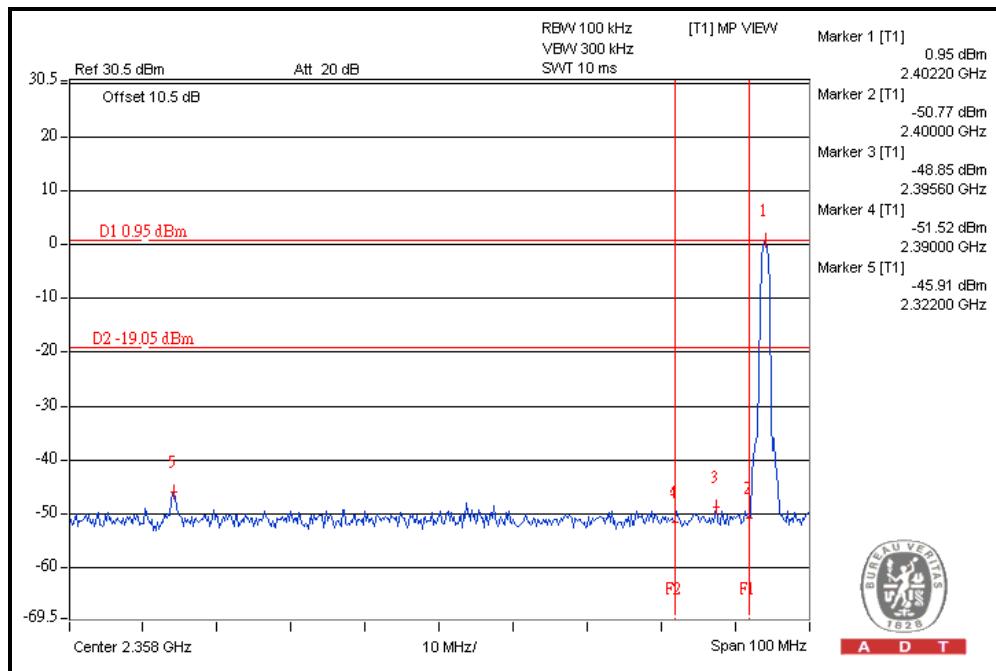




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For 8DPSK Modulation Type:

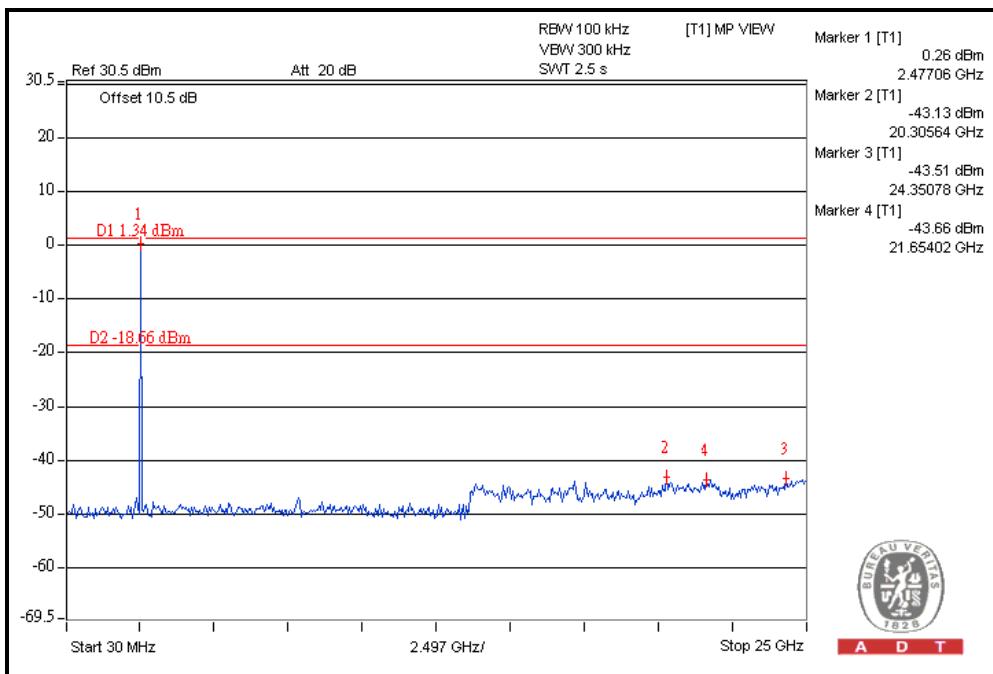
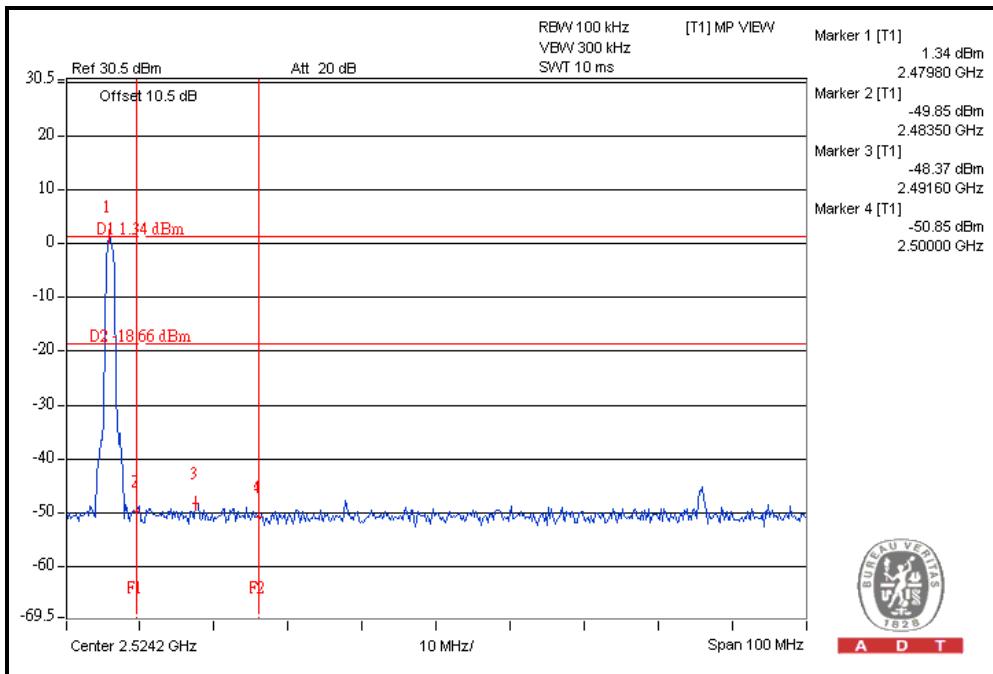
CH 0





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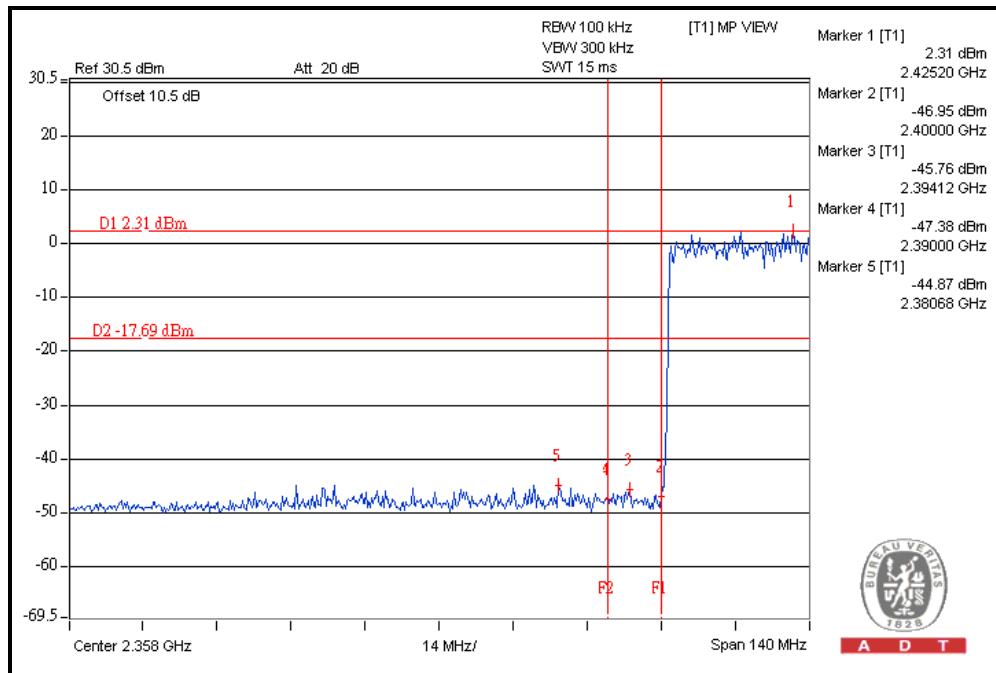
CH 78



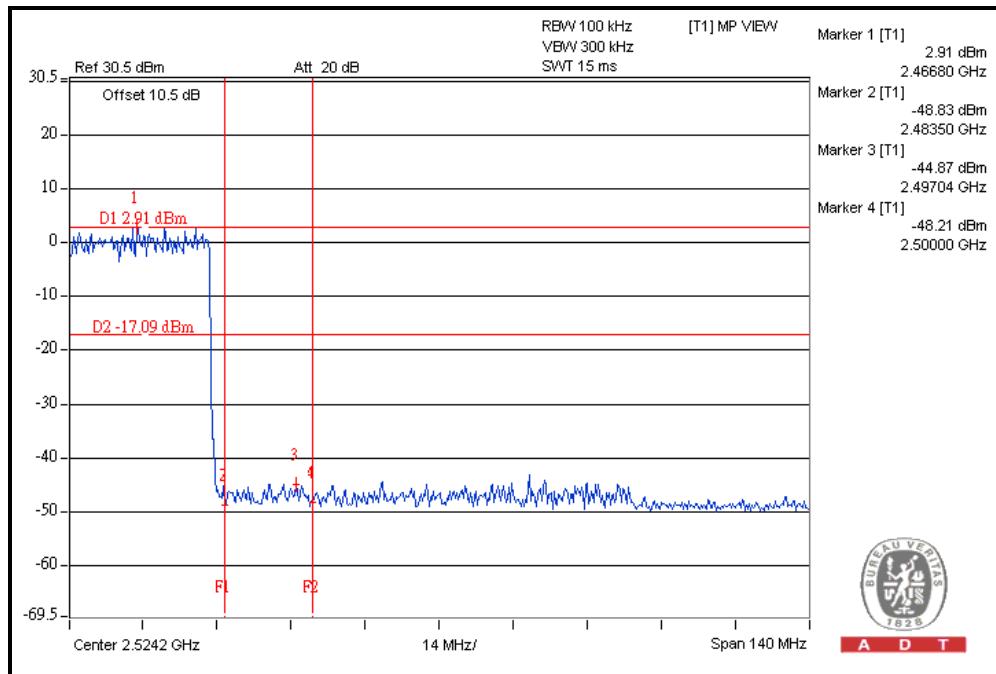


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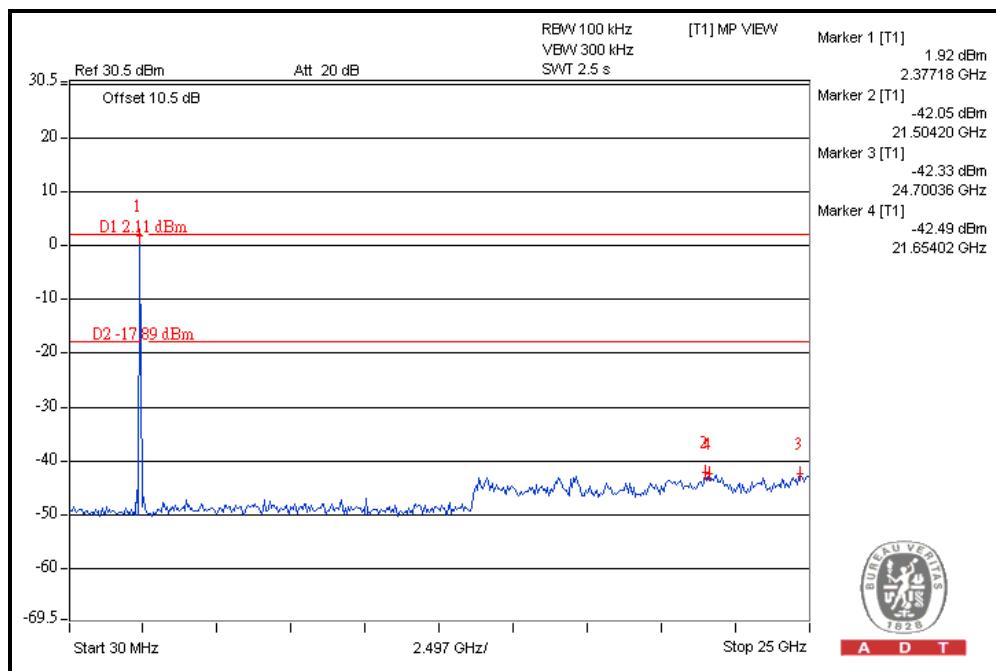
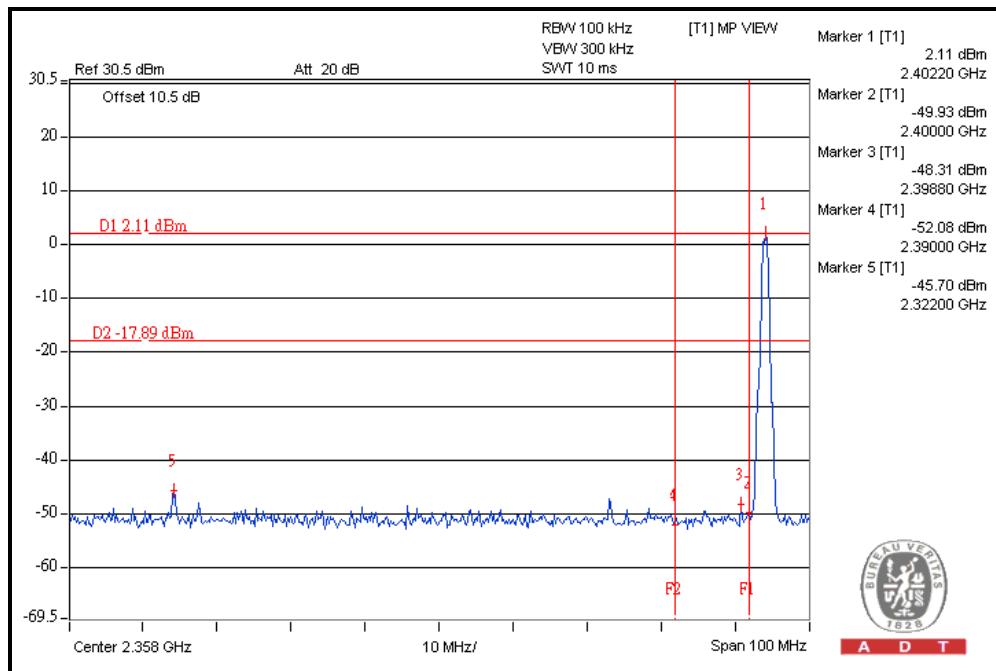


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For GFSK(LE mode) Modulation Type:

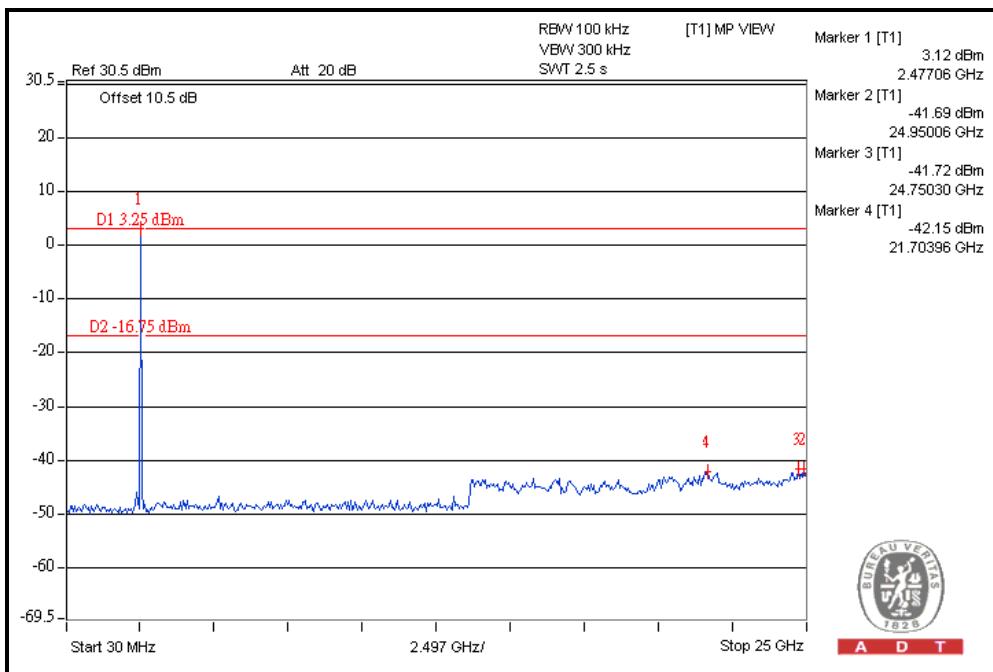
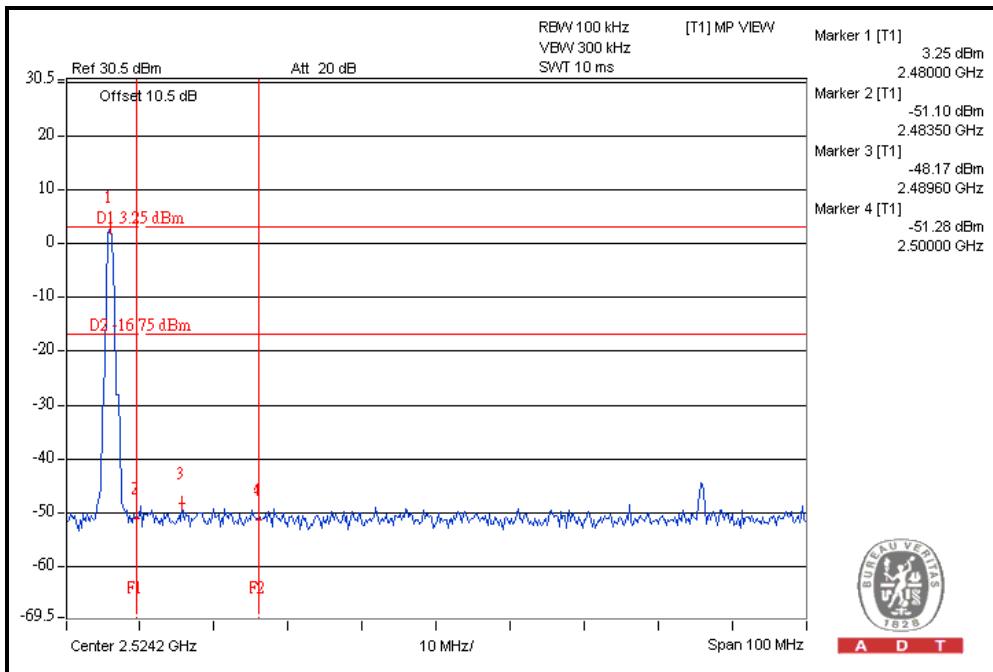
CH 0





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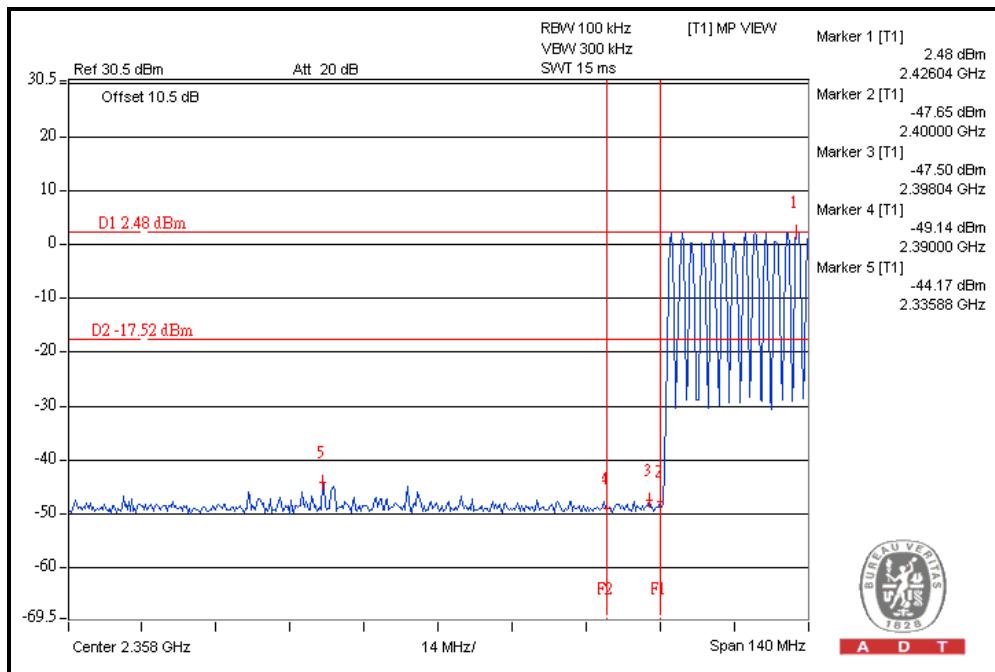
CH 39



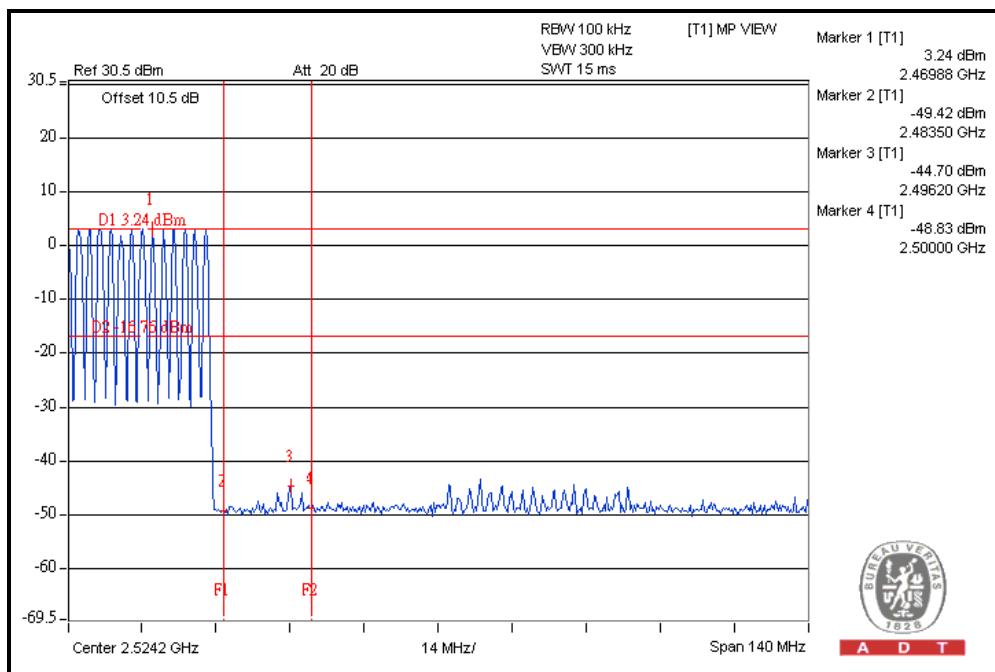


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5 TEST PROCEDURES AND RESULTS(DTS)

5.1 6dB BANDWIDTH MEASUREMENT

5.1.1 LIMITS OF 6DB BANDWIDTH MEASUREMENT

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

5.1.2 TEST PROCEDURE

The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100 kHz RBW and 300kHz VBW. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

5.1.3 DEVIATION FROM TEST STANDARD

No deviation.

5.1.4 TEST SETUP

The test Setup has been constructed as the normal test conditions. In case of conducted measurements the transmitter shall be connected to the measuring equipment. Controlling software (artgui.exe) has been activated to set the EUT on specific status.

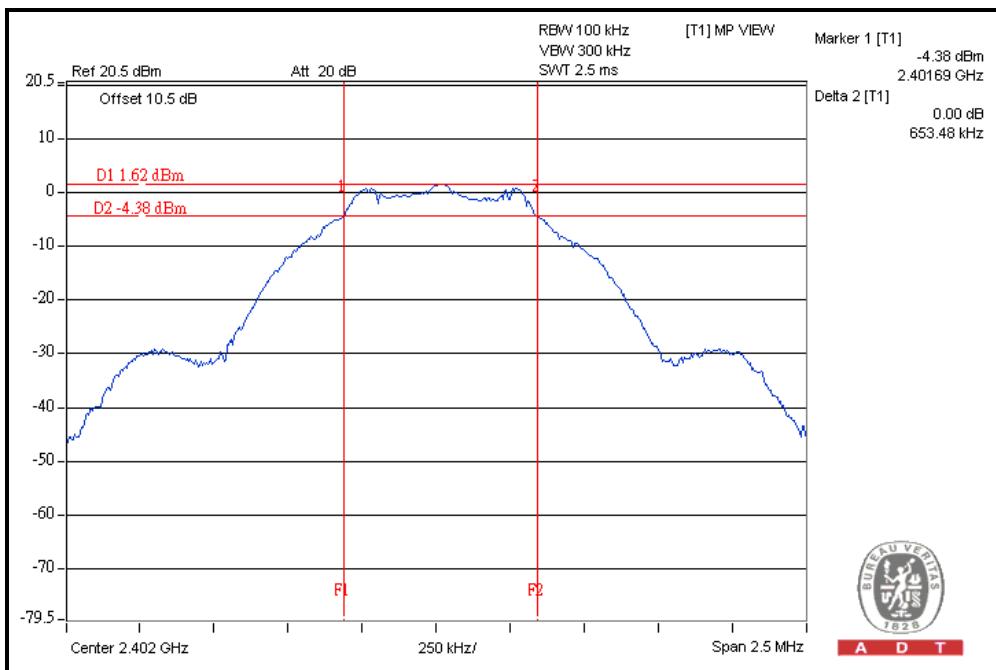


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5.1.5 TEST RESULTS For GFSK(LE mode):

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)
0	2402	0.65
19	2440	0.65
39	2480	0.65

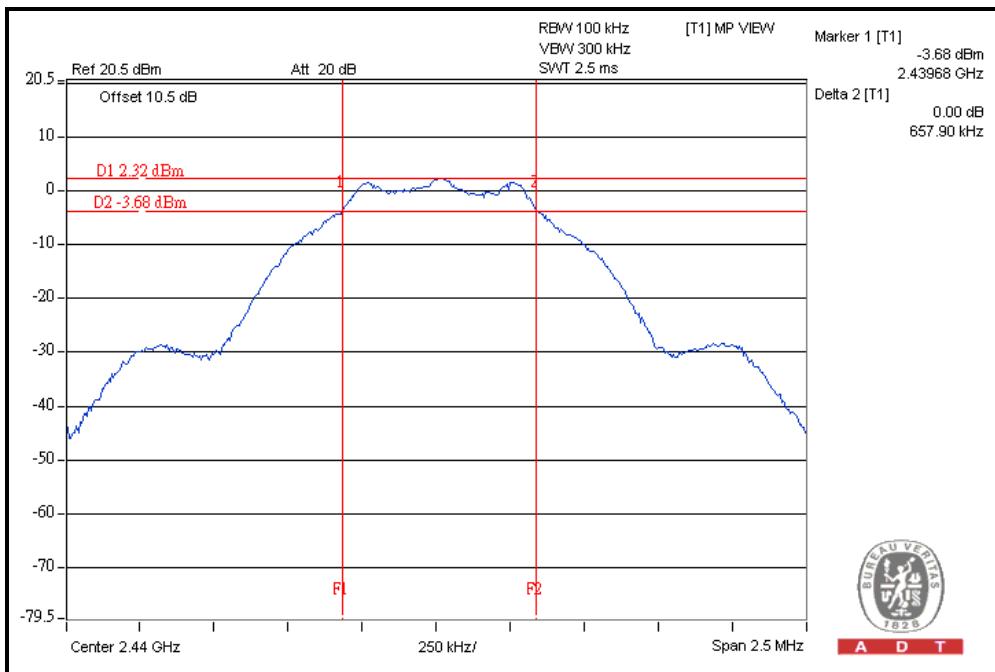
CH 0



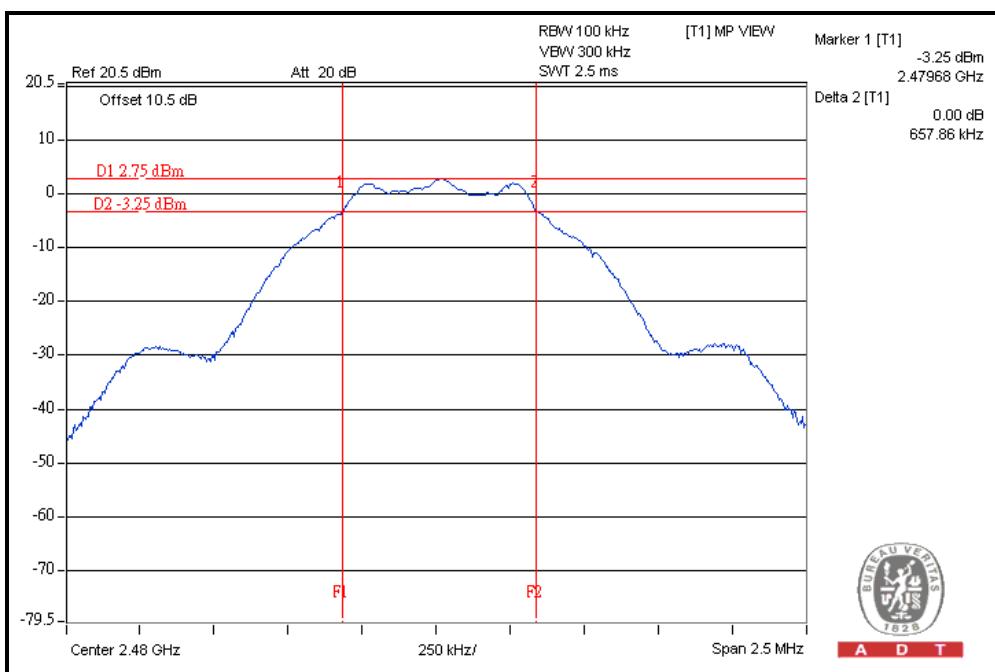


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5.2 POWER SPECTRAL DENSITY MEASUREMENT

5.2.1 LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT

The Maximum of Power Spectral Density Measurement is 8dBm.

5.2.2 TEST INSTRUMENTS

Test date: Nov. 04, 2011

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S Spectrum Analyzer	FSP 40	100060	May 11, 2011	May 10, 2012

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

5.2.3 TEST PROCEDURE

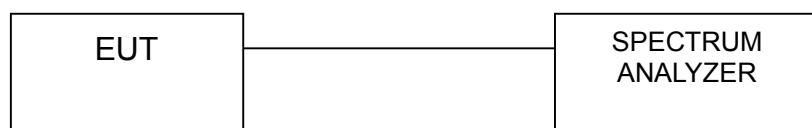
The transmitter output was connected to the spectrum analyzer through an attenuator, the bandwidth of the fundamental frequency was measured with the spectrum analyzer using 3kHz RBW and 30kHz VBW, set sweep time = span/3kHz. The power spectral density was measured and recorded.

The sweep time is allowed to be longer than span/3kHz for a full response of the mixer in the spectrum analyzer.

5.2.4 DEVIATION FROM TEST STANDARD

No deviation

5.2.5 TEST SETUP



5.2.6 EUT OPERATING CONDITION

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.



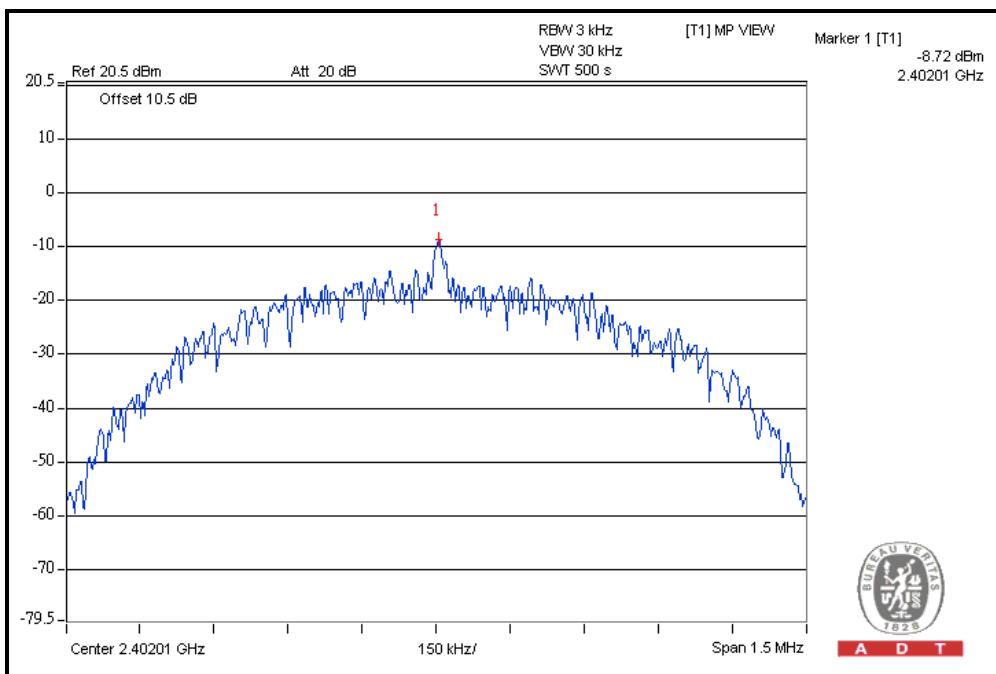
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5.2.7 TEST RESULTS

For GFSK(LE mode)

CHANNEL	CHANNEL FREQUENCY (MHz)	PSD (dBm/3kHz)	MAXIMUM LIMIT (dBm)	PASS / FAIL
0	2402	-8.7	8	PASS
19	2440	-8.1	8	PASS
39	2480	-7.6	8	PASS

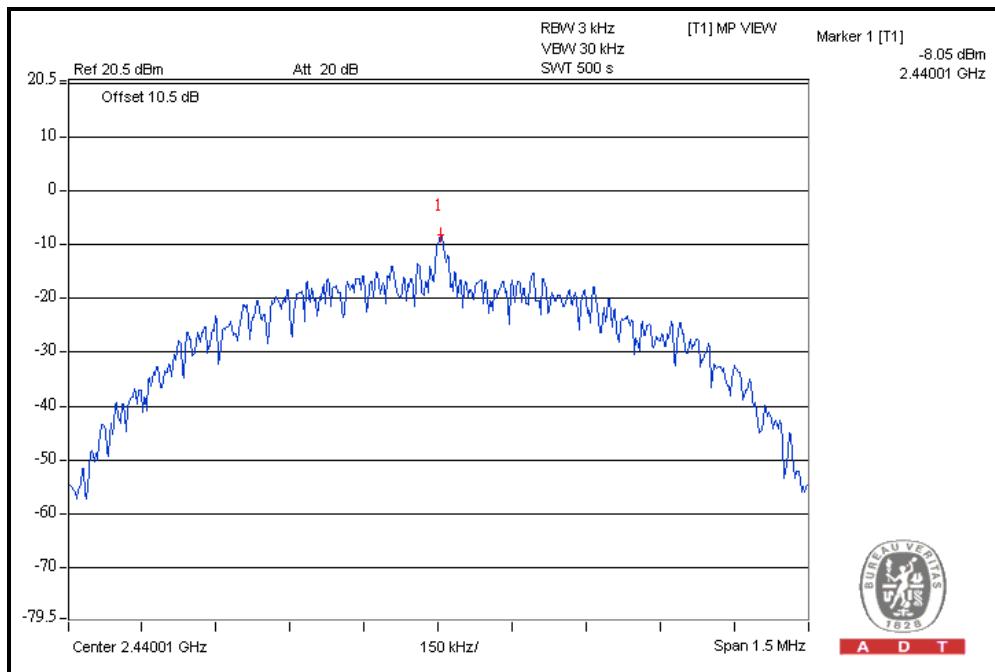
CH 0



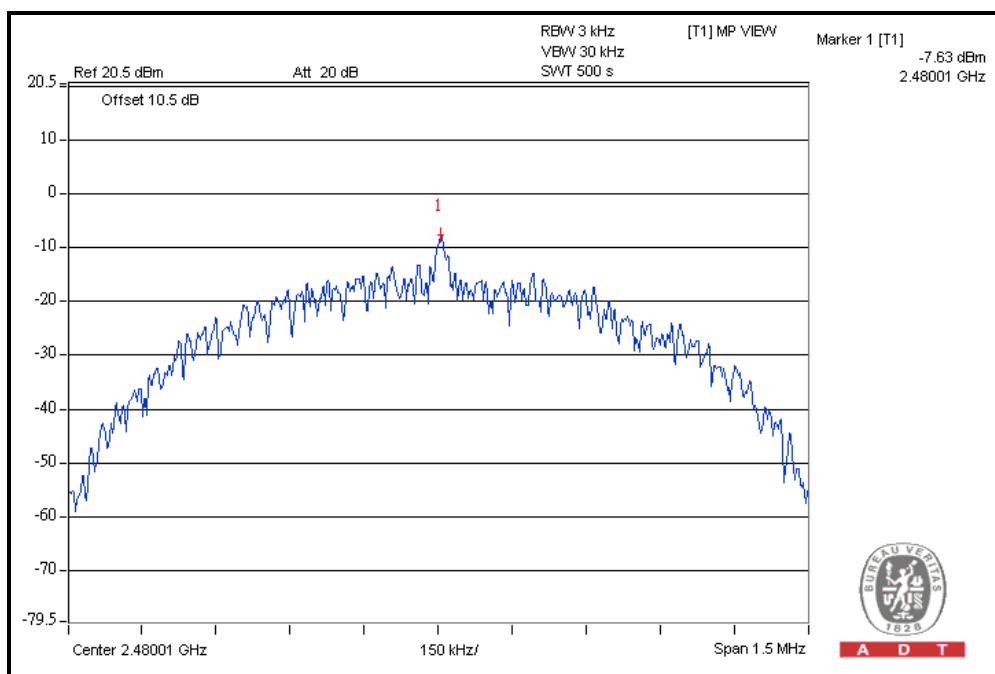


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6 INFORMATION ON THE TESTING LABORATORIES

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:

Tel: 886-3-3183232

Fax: 886-3-3185050

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.



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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 ---