



FCC TEST REPORT (FOR WIRELESS LAN & BLUETOOTH)

REPORT NO.: RF980122L07

MODEL NO.: H-15AJ

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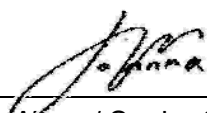
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1. CERTIFICATION

PRODUCT: Handy Terminal
MODEL: H-15AJ
BRAND: OPTICON
APPLICANT: OPTOELECTRONICS Co., Ltd.
TESTED: Feb. 23 ~ Feb. 26, 2009
TEST SAMPLE: ENGINEERING SAMPLE
STANDARDS: **FCC Part 15, Subpart C (Section 15.247)**
ANSI C63.4-2003

The above equipment (model: H-15AJ) has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

PREPARED BY :  , **DATE** : Mar. 03, 2009
Joanna Wang / Senior Specialist

TECHNICAL ACCEPTANCE :  , **DATE** : Mar. 03, 2009
Responsible for RF Long Chen / Senior Engineer

APPROVED BY :  , **DATE** : Mar. 03, 2009
Gary Chang / Assistant Manager

2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

FOR WIRELESS LAN FUNCTION

APPLIED STANDARD: FCC Part 15, Subpart C			
Standard Section	Test Type and Limit	Result	Remark
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -5.51dB at 0.416MHz.
15.247(a)(2)	Spectrum Bandwidth of a Direct Sequence Spread Spectrum System Limit: min. 500kHz	PASS	Meet the requirement of limit.
15.247(b)	Maximum Peak Output Power Limit: max. 30dBm	PASS	Meet the requirement of limit.
15.247(d)	Radiated Emissions Limit: Table 15.209	PASS	Meet the requirement of limit. Minimum passing margin is -6.53dB at 183.500MHz.
15.247(e)	Power Spectral Density Limit: max. 8dBm	PASS	Meet the requirement of limit.
15.247(d)	Band Edge Measurement Limit: 20dB less than the peak value of fundamental frequency	PASS	Meet the requirement of limit.

FOR BLUETOOTH FUNCTION

APPLIED STANDARD: FCC Part 15, Subpart C			
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT	REMARK
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -7.24dB at 0.525MHz.
15.247(a)(1)(iii)	Number of Hopping Frequency Used Spec.: At least 15 channels	PASS	Meet the requirement of limit.
15.247(a)(1)(iii)	Dwell Time on Each Channel Spec.: Max. 0.4 second within 31.6 second	PASS	Meet the requirement of limit.
15.247(a)(1)	1. Hopping Channel Separation Spec. : Min. 25 kHz or $\frac{2}{3} \times 20$ dB bandwidth, whichever is greater 2. Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	PASS	Meet the requirement of limit.
15.247(b)	Maximum Peak Output Power Spec.: max. 21dBm	PASS	Meet the requirement of limit.
15.247(d)	Transmitter Radiated Emissions Spec.: Table 15.209	PASS	Meet the requirement of limit. Minimum passing margin is -5.42dB at 1628.000MHz.
15.247(d)	Band Edge Measurement	PASS	Meet the requirement of limit.

NOTE: If The Frequency Hopping System operating in 2400-2483.5MHz band and the output power less than 125mW. The hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of hopping channel whichever is greater.

2.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

MEASUREMENT	FREQUENCY	UNCERTAINTY
Conducted emissions	9kHz~30MHz	2.44dB
Radiated emissions	30MHz ~ 200MHz	3.34dB
	200MHz ~1000MHz	3.35dB
	1GHz ~ 18GHz	2.26dB
	18GHz ~ 40GHz	1.94dB

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

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Handy Terminal
MODEL NO.	H-15AJ
FCC ID	UFOH15AJ
POWER SUPPLY	3.7Vdc from rechargeable li-ion battery 6.0Vdc from adapter
MODULATION TYPE	Wireless LAN: CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM Bluetooth: GFSK, $\pi/4$ -DQPSK, 8DPSK for FHSS
MODULATION TECHNOLOGY	Wireless LAN: DSSS, OFDM Bluetooth: FHSS
TRANSFER RATE	Wireless LAN: 802.11b: 11/5.5/2/1Mbps 802.11g: 54/48/36/24/18/12/9/6Mbps Bluetooth: 1/2/3Mbps
FREQUENCY RANGE	Wireless LAN: 2412MHz ~ 2462MHz Bluetooth: 2402MHz ~ 2480MHz
NUMBER OF CHANNEL	Wireless LAN: 11 Bluetooth: 79
MAXIMUM OUTPUT POWER	Wireless LAN: 11.429mW Bluetooth: 1.950mW
ANTENNA TYPE	Wireless LAN: PIFA antenna with 2.24dBi gain Bluetooth: PIFA antenna with 2.74dBi gain
I/O PORTS	Refer to user's manual
DATA CABLE	1m shielded USB cable with one core
ACCESSORY DEVICES	Adapter, battery, cradle (brand: OPTICON, model: CRD-15)

NOTE:

1. The EUT is a Handy Terminal with wireless LAN and Bluetooth functions.
2. The EUT was powered by the following adapter and battery.

ADAPTER	
BRAND:	Powertron Electronics Corp.
MODEL:	PA1015-1I
INPUT:	100-240Vac, 50-60Hz, 0.4A
OUTPUT:	6Vdc, 2.0A, 12W
POWER LINE:	1.6m non-shielded cable with two cores

BATTERY	
BRAND:	OPTICON
MODEL:	BTR0500
RATING:	3.7Vdc, 1840mA

3. The EUT has communication function when charging.
4. The above EUT information was declared by the manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

3.2 DESCRIPTION OF TEST MODES

FOR WIRELESS LAN FUNCTION

Eleven channels are provided to this EUT:

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
1	2412MHz	7	2442MHz
2	2417MHz	8	2447MHz
3	2422MHz	9	2452MHz
4	2427MHz	10	2457MHz
5	2432MHz	11	2462MHz
6	2437MHz		

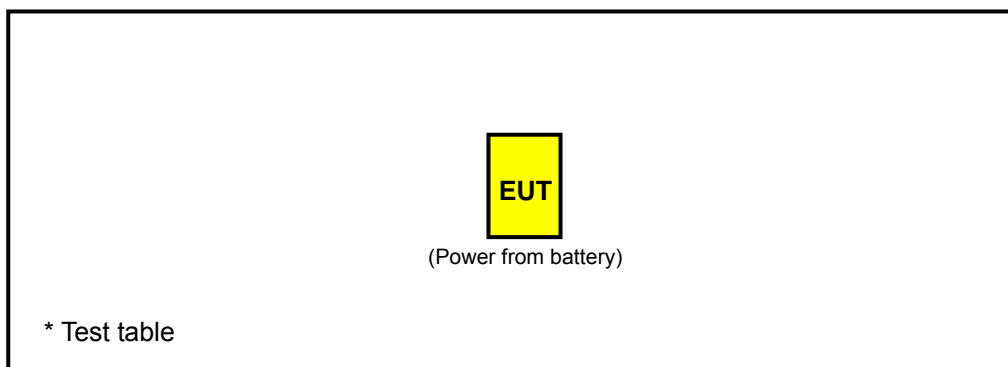
FOR BLUETOOTH FUNCTION

79 channels are provided to this EUT:

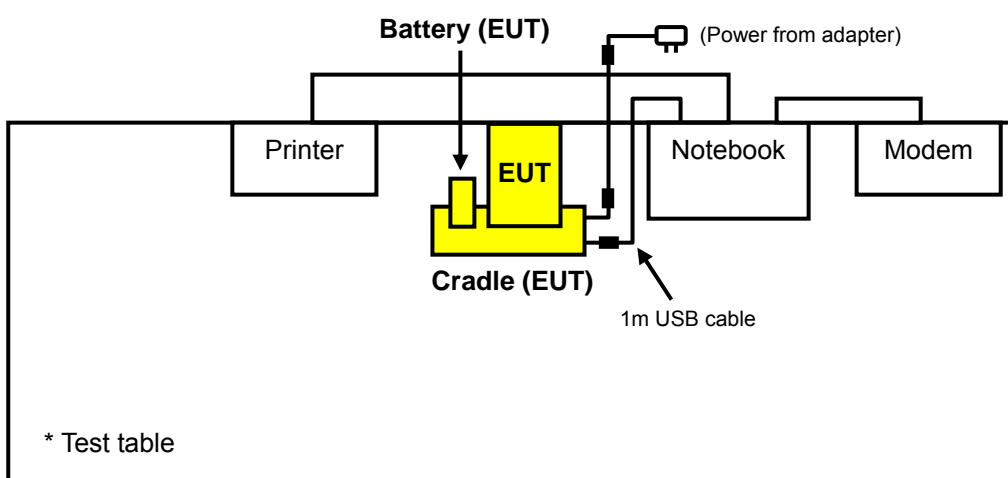
CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)	CHANNEL	FREQ. (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461		

3.2.1 CONFIGURATION OF SYSTEM UNDER TEST

TEST MODE A



TEST MODE B



3.2.2 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL FOR WIRELESS LAN FUNCTION

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE \geq 1G	RE<1G	PLC	APCM	
A	√	√	NOTE 1	√	Power from battery
B	NOTE 2	√	√	NOTE 2	Power from adapter

Where **PLC**: Power Line Conducted Emission **RE<1G**: Radiated Emission below 1GHz
RE \geq 1G: Radiated Emission above 1GHz **APCM**: Antenna Port Conducted Measurement
NOTE: 1. No need to concern of Conducted Emission due to the EUT is powered by battery.
2. "-" means no effect.

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, XYZ axis and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)	AXIS
A	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1	X
	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6	

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, XYZ axis and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)	AXIS
A	802.11b	1 to 11	6	DSSS	DBPSK	1	X
B	802.11b	1 to 11	6	DSSS	DBPSK	1	-

POWER LINE CONDUCTED EMISSION TEST:

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

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
B	802.11b	1 to 11	6	DSSS	DBPSK	1

BANDEDGE 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.

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)	AXIS
A	802.11b	1 to 11	1, 11	DSSS	DBPSK	1	X
	802.11g	1 to 11	1, 11	OFDM	BPSK	6	
B	802.11b	1 to 11	1, 11	DSSS	DBPSK	1	-
	802.11g	1 to 11	1, 11	OFDM	BPSK	6	

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.

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
A, B	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1
	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6

FOR BLUETOOTH FUNCTION

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE \geq 1G	RE $<$ 1G	PLC	APCM	
A	√	√	NOTE 1	√	Power from battery
B	NOTE 2	√	√	√	Power from adapter

Where **RE \geq 1G**: Radiated Emission above 1GHz

RE $<$ 1G: Radiated Emission below 1GHz

PLC: Power Line Conducted Emission

APCM: Antenna Port Conducted Measurement

NOTE: 1. No need to concern of Conducted Emission due to the EUT is powered by battery.

2. "-" means no effect.

RADIATED EMISSION TEST (ABOVE 1 GHz):

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

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE	AXIS
A	0 to 78	0, 39, 78	FHSS	GFSK	DH5	Z
	0 to 78	0, 39, 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, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and packet type.
- Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE	AXIS
A	0 to 78	0	FHSS	GFSK	DH5	Z
B	0 to 78	0	FHSS	GFSK	DH5	-

POWER LINE CONDUCTED EMISSION TEST:

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

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE
B	0 to 78	0	FHSS	GFSK	DH5

ANTENNA PORT CONDUCTED MEASUREMENT:

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

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

3.3 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

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

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

3.4 DESCRIPTION OF SUPPORT UNITS

TEST MODE A

The EUT has been tested as an independent unit.

TEST MODE B

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK COMPUTER	DELL	PP05L	12130898320	E2K24CLNS
2	PRINTER	EPSON	LQ-300+	DCGY054011	FCC DoC Approved
3	MODEM	ACEEX	1414V/3	0401008253	IFAXDM1414

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA
2	1.8m braid shielded wire, DB25 connector, w/o core.
3	1.2m braid shielded wire, DB25 & DB9 connector, w/o core.

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

4. TEST TYPES AND RESULTS (FOR WIRELESS LAN FUNCTION)

4.1 RADIATED EMISSION MEASUREMENT

4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT

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

FREQUENCIES (MHz)	FIELD STRENGTH (microvolts/meter)	MEASUREMENT DISTANCE (meters)
0.009 ~ 0.490	2400 / F(kHz)	300
0.490 ~ 1.705	24000 / F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.



4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESI7	100033	Jun. 30, 2008	Jun. 29, 2009
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100041	Apr. 22, 2008	Apr. 21, 2009
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	May 02, 2008	May 01, 2009
HORN Antenna SCHWARZBECK	9120D	9120D-209	Jun. 24, 2008	Jun. 23, 2009
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170243	Dec. 25, 2008	Dec. 24, 2009
Preamplifier Agilent	8447D	2944A10633	Nov. 03, 2008	Nov. 02, 2009
Preamplifier Agilent	8449B	3008A01964	Oct. 23, 2008	Oct. 22, 2009
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	238141/4	May 20, 2008	May 19, 2009
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	12738/6	May 20, 2008	May 19, 2009
Software ADT.	ADT_Radiated_ V7.6.15.9.2	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	NA	NA
Antenna Tower Controller inn-co GmbH	CO2000	017303	NA	NA
Turn Table ADT.	TT100.	TT93021703	NA	NA
Turn Table Controller ADT.	SC100.	SC93021703	NA	NA

- NOTE:**
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 2. The test was performed in HwaYa Chamber 3.
 3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
 4. The FCC Site Registration No. is 988962.
 5. The IC Site Registration No. is IC 7450F-3.

4.1.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meters semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

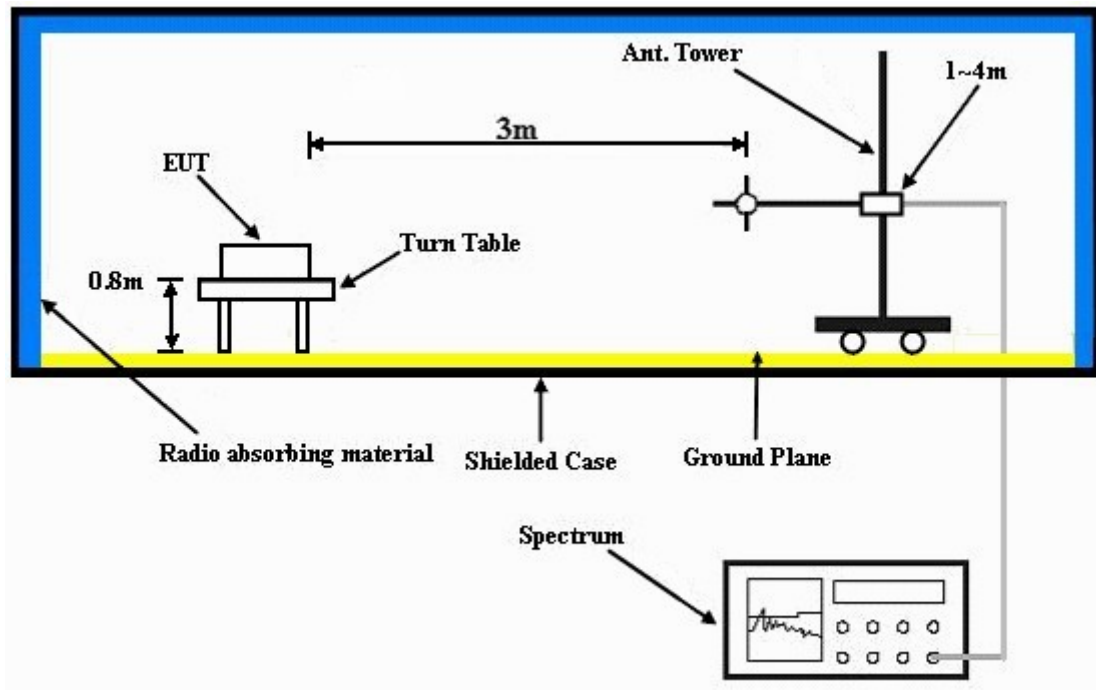
NOTE:

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

4.1.4 DEVIATION FROM TEST STANDARD

No deviation.

4.1.5 TEST SETUP



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

4.1.6 EUT OPERATING CONDITIONS

TEST MODE A

Placed the EUT on the testing table and set it under transmission condition continuously at specific channel frequency.

TEST MODE B

- a. Connected the EUT to the notebook system via USB cable and set it under transmission condition continuously at specific channel frequency.
- b. The necessary accessories enable the EUT in full functions.



4.1.7 TEST RESULTS

802.11b DSSS MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 1	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	3.7Vdc	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 67%RH 1013hPa	TESTED BY	Antony Lee
TEST MODE	A		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	55.79 PK	74.00	-18.21	1.00 H	3	23.35	32.44
2	2390.00	46.60 AV	54.00	-7.40	1.00 H	3	14.16	32.44
3	*2412.00	102.28 PK			1.02 H	2	69.76	32.52
4	*2412.00	98.03 AV			1.02 H	2	65.51	32.52
5	4824.00	49.19 PK	74.00	-24.81	1.02 H	234	10.89	38.30
6	4824.00	36.05 AV	54.00	-17.95	1.02 H	234	-2.25	38.30
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	57.67 PK	74.00	-16.33	1.01 V	173	25.23	32.44
2	2390.00	45.82 AV	54.00	-8.18	1.01 V	173	13.38	32.44
3	*2412.00	97.02 PK			1.00 V	174	64.50	32.52
4	*2412.00	92.23 AV			1.00 V	174	59.71	32.52
5	4824.00	49.59 PK	74.00	-24.41	1.00 V	47	11.29	38.30
6	4824.00	36.07 AV	54.00	-17.93	1.00 V	47	-2.23	38.30

- REMARKS:**
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
 2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.
 5. “ * “: Fundamental frequency.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 6	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	3.7Vdc	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 67%RH 1013hPa	TESTED BY	Antony Lee
TEST MODE	A		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	102.79 PK			1.02 H	10	70.19	32.60
2	*2437.00	98.56 AV			1.02 H	10	65.96	32.60
3	4874.00	48.72 PK	74.00	-25.28	1.00 H	26	10.22	38.50
4	4874.00	36.46 AV	54.00	-17.54	1.00 H	26	-2.04	38.50
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	*2437.00	97.64 PK			1.25 V	183	65.04	32.60
2	*2437.00	92.81 AV			1.25 V	183	60.21	32.60
3	4874.00	49.28 PK	74.00	-24.72	1.01 V	53	10.78	38.50
4	4874.00	36.36 AV	54.00	-17.64	1.01 V	53	-2.14	38.50

- 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.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 11	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	3.7Vdc	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 67%RH 1013hPa	TESTED BY	Antony Lee
TEST MODE	A		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	103.29 PK			1.00 H	3	70.61	32.68
2	*2462.00	99.11 AV			1.00 H	3	66.43	32.68
3	2483.50	57.02 PK	74.00	-16.98	1.01 H	4	24.26	32.76
4	2483.50	46.88 AV	54.00	-7.12	1.01 H	4	14.12	32.76
5	4924.00	49.52 PK	74.00	-24.48	1.00 H	236	10.88	38.64
6	4924.00	36.33 AV	54.00	-17.67	1.00 H	236	-2.31	38.64
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	*2462.00	98.01 PK			1.90 V	191	65.33	32.68
2	*2462.00	93.28 AV			1.90 V	191	60.60	32.68
3	2483.50	56.47 PK	74.00	-17.53	1.89 V	193	23.71	32.76
4	2483.50	46.08 AV	54.00	-7.92	1.89 V	193	13.32	32.76
5	4924.00	49.25 PK	74.00	-24.75	1.00 V	52	10.61	38.64
6	4924.00	36.11 AV	54.00	-17.89	1.00 V	52	-2.53	38.64

- 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.



A D T

802.11g OFDM MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 1	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	3.7Vdc	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 67%RH 1013hPa	TESTED BY	Antony Lee
TEST MODE	A		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	56.71 PK	74.00	-17.29	1.01 H	2	24.27	32.44
2	2390.00	46.20 AV	54.00	-7.80	1.01 H	2	13.76	32.44
3	*2412.00	99.26 PK			1.01 H	0	66.74	32.52
4	*2412.00	89.01 AV			1.01 H	0	56.49	32.52
5	4824.00	49.42 PK	74.00	-24.58	1.00 H	36	11.12	38.30
6	4824.00	36.37 AV	54.00	-17.63	1.00 H	36	-1.93	38.30
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	56.24 PK	74.00	-17.76	1.55 V	181	23.80	32.44
2	2390.00	45.74 AV	54.00	-8.26	1.55 V	181	13.30	32.44
3	*2412.00	95.06 PK			1.54 V	179	62.54	32.52
4	*2412.00	85.31 AV			1.54 V	179	52.79	32.52
5	4824.00	49.03 PK	74.00	-24.97	1.02 V	130	10.73	38.30
6	4824.00	36.01 AV	54.00	-17.99	1.02 V	130	-2.29	38.30

- REMARKS:**
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
 2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.
 5. “ * “: Fundamental frequency.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 6	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	3.7Vdc	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 67%RH 1013hPa	TESTED BY	Antony Lee
TEST MODE	A		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	99.83 PK			1.02 H	3	67.23	32.60
2	*2437.00	89.57 AV			1.02 H	3	56.97	32.60
3	4874.00	49.31 PK	74.00	-24.69	1.00 H	49	10.81	38.50
4	4874.00	35.98 AV	54.00	-18.02	1.00 H	49	-2.52	38.50
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	*2437.00	95.62 PK			1.55 V	192	63.02	32.60
2	*2437.00	85.84 AV			1.55 V	192	53.24	32.60
3	4874.00	49.61 PK	74.00	-24.39	1.00 V	136	11.11	38.50
4	4874.00	36.25 AV	54.00	-17.75	1.00 V	136	-2.25	38.50

- 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.



A D T

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 11	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	3.7Vdc	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 67%RH 1013hPa	TESTED BY	Antony Lee
TEST MODE	A		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	100.46 PK			1.00 H	2	67.78	32.68
2	*2462.00	90.27 AV			1.00 H	2	57.59	32.68
3	2483.50	57.93 PK	74.00	-16.07	1.00 H	6	25.17	32.76
4	2483.50	46.81 AV	54.00	-7.19	1.00 H	6	14.05	32.76
5	4924.00	48.97 PK	74.00	-25.03	1.08 H	63	10.33	38.64
6	4924.00	36.23 AV	54.00	-17.77	1.08 H	63	-2.41	38.64
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	*2462.00	96.11 PK			1.57 V	195	63.43	32.68
2	*2462.00	86.38 AV			1.57 V	195	53.70	32.68
3	2483.50	55.93 PK	74.00	-18.07	1.56 V	198	23.17	32.76
4	2483.50	46.52 AV	54.00	-7.48	1.56 V	198	13.76	32.76
5	4924.00	48.95 PK	74.00	-25.05	1.00 V	43	10.31	38.64
6	4924.00	36.32 AV	54.00	-17.68	1.00 V	43	-2.32	38.64

- 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.



A D T

BELOW 1GHz WORST-CASE DATA : 802.11b DSSS MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 6	FREQUENCY RANGE	Below 1000MHz
INPUT POWER	3.7Vdc	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	24deg. C, 67%RH 1013hPa	TESTED BY	Antony Lee
TEST MODE	A		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	43.51	25.43 QP	40.00	-14.57	2.00 H	244	10.92	14.51
2	414.87	35.43 QP	46.00	-10.57	1.00 H	94	17.01	18.42
3	624.85	35.29 QP	46.00	-10.71	1.25 H	232	12.20	23.09
4	671.52	32.00 QP	46.00	-14.00	1.00 H	265	7.67	24.33
5	832.89	29.08 QP	46.00	-16.92	1.50 H	121	2.46	26.62
6	953.44	29.55 QP	46.00	-16.45	1.25 H	271	0.97	28.57
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	43.51	24.93 QP	40.00	-15.07	2.00 V	10	10.42	14.51
2	218.50	27.52 QP	46.00	-18.48	1.25 V	112	15.81	11.71
3	414.87	29.57 QP	46.00	-16.43	1.25 V	154	11.15	18.42
4	519.86	27.55 QP	46.00	-18.45	1.00 V	10	6.71	20.84
5	624.85	29.67 QP	46.00	-16.33	2.00 V	325	6.57	23.09
6	953.44	30.30 QP	46.00	-15.70	1.00 V	61	1.73	28.57

- 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 6	FREQUENCY RANGE	Below 1000MHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	24deg. C, 67%RH 1013hPa	TESTED BY	Antony Lee
TEST MODE	B		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	123.23	31.42 QP	43.50	-12.08	2.00 H	70	19.84	11.58
2	183.50	36.97 QP	43.50	-6.53	2.00 H	61	25.59	11.38
3	354.60	33.78 QP	46.00	-12.22	1.50 H	46	17.65	16.14
4	465.42	32.27 QP	46.00	-13.73	2.00 H	325	12.63	19.65
5	729.84	37.08 QP	46.00	-8.92	1.50 H	10	11.77	25.31
6	908.72	36.72 QP	46.00	-9.28	1.25 H	118	8.70	28.02
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	105.73	32.56 QP	43.50	-10.94	1.00 V	25	21.04	11.52
2	187.39	34.54 QP	43.50	-8.96	1.25 V	46	23.38	11.16
3	414.87	38.21 QP	46.00	-7.79	1.50 V	346	19.79	18.42
4	465.42	36.54 QP	46.00	-9.46	1.25 V	94	16.89	19.65
5	533.47	35.99 QP	46.00	-10.01	2.00 V	127	14.87	21.13
6	729.84	35.65 QP	46.00	-10.35	1.50 V	73	10.34	25.31

- 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.

4.2 CONDUCTED EMISSION MEASUREMENT

4.2.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

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

- NOTE:**
1. The lower limit shall apply at the transition frequencies.
 2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.
 3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESCS30	100288	Sep. 22, 2008	Sep. 21, 2009
RF signal cable Woken	5D-FB	Cable-HYCO2-01	Dec. 31, 2008	Dec. 30, 2009
LISN ROHDE & SCHWARZ	ESH2-Z5	100100	Dec. 29, 2008	Dec. 28, 2009
LISN ROHDE & SCHWARZ	ESH3-Z5	100311	Jul. 30, 2008	Jul. 29, 2009
Software ADT	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 HwaYa Shielded Room 2.
 3. The VCCI Site Registration No. is C-2047.

4.2.3 TEST PROCEDURES

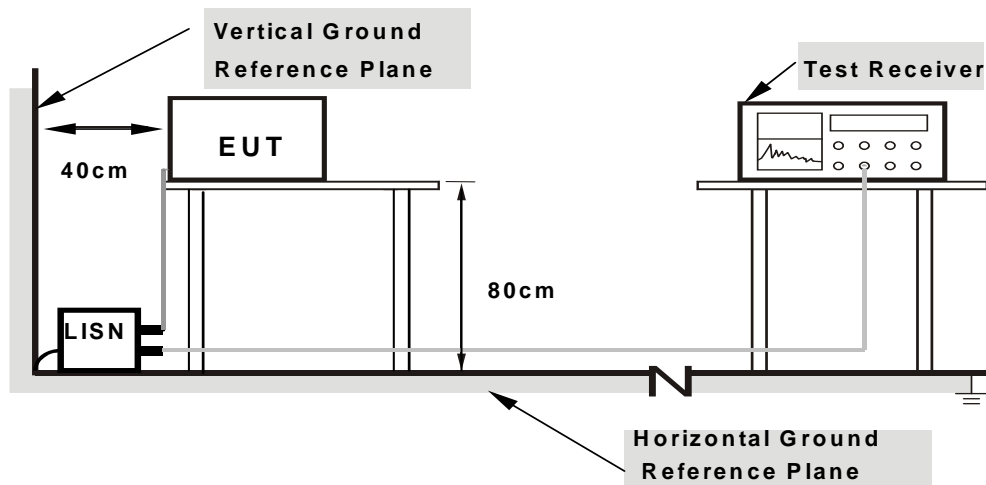
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling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

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

4.2.4 DEVIATION FROM TEST STANDARD

No deviation.

4.2.5 TEST SETUP



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

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

4.2.6 EUT OPERATING CONDITIONS

- a. Connected the EUT to the Notebook system via USB cable and placed on a testing table.
- b. The Notebook system ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.
- c. The necessary accessories enable the EUT in full functions.

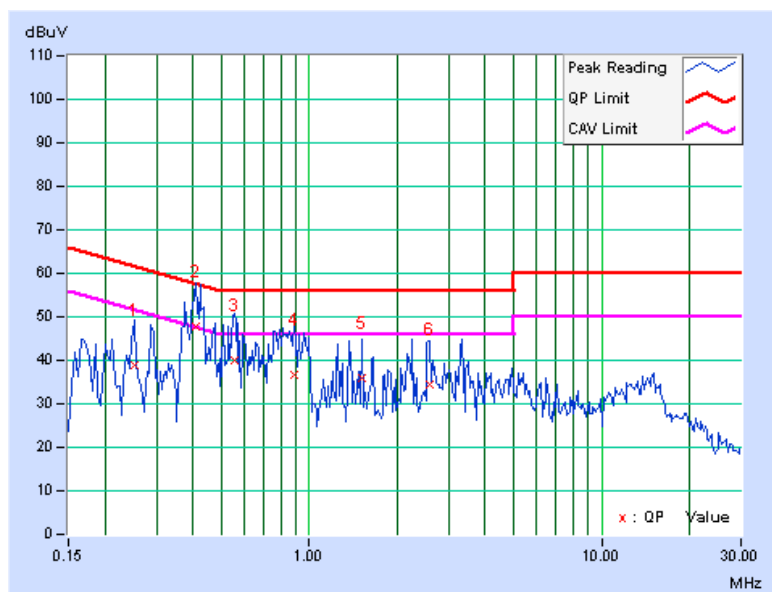
4.2.7 TEST RESULTS

CONDUCTED WORST-CASE DATA: 802.11b DSSSM MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 6	PHASE	Line 1
MODULATION TYPE	DBPSK	INPUT POWER	120Vac, 60Hz
TRANSFER RATE	1.0Mbps	6dB BANDWIDTH	9kHz
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH, 1012hPa	TESTED BY	Mark Liao
TEST MODE	B		

No	Freq. [MHz]	Corr. Factor [dB]	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.252	0.13	38.58	-	38.71	-	61.71	51.71	-22.99	-
2	0.408	0.14	47.76	34.40	47.90	34.54	57.69	47.69	-9.79	-13.15
3	0.556	0.15	39.71	-	39.86	-	56.00	46.00	-16.14	-
4	0.888	0.16	36.59	-	36.75	-	56.00	46.00	-19.25	-
5	1.516	0.18	35.67	-	35.85	-	56.00	46.00	-20.15	-
6	2.578	0.22	34.07	-	34.29	-	56.00	46.00	-21.71	-

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



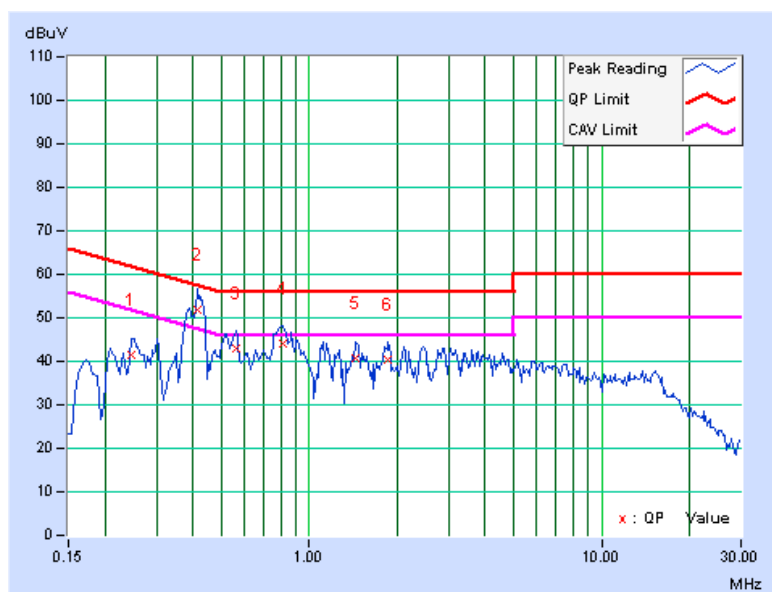


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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 6	PHASE	Line 2
MODULATION TYPE	DBPSK	INPUT POWER	120Vac, 60Hz
TRANSFER RATE	1.0Mbps	6dB BANDWIDTH	9kHz
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH, 1012hPa	TESTED BY	Mark Liao
TEST MODE	B		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
			1	0.248	0.13	41.20	-	41.33	-	61.84
2	0.416	0.15	51.71	41.87	51.86	42.02	57.54	47.54	-5.67	-5.51
3	0.564	0.16	42.94	-	43.10	-	56.00	46.00	-12.90	-
4	0.810	0.16	43.74	-	43.90	-	56.00	46.00	-12.10	-
5	1.445	0.18	40.53	-	40.71	-	56.00	46.00	-15.29	-
6	1.859	0.20	40.11	-	40.31	-	56.00	46.00	-15.69	-

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



4.3 6dB BANDWIDTH MEASUREMENT

4.3.1 LIMITS OF 6dB BANDWIDTH MEASUREMENT

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

4.3.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100041	Apr. 22, 2008	Apr. 21, 2009

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 PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100kHz RBW and 100kHz VBW. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

4.3.4 DEVIATION FROM TEST STANDARD

No deviation.

4.3.5 TEST SETUP



4.3.6 EUT OPERATING CONDITIONS

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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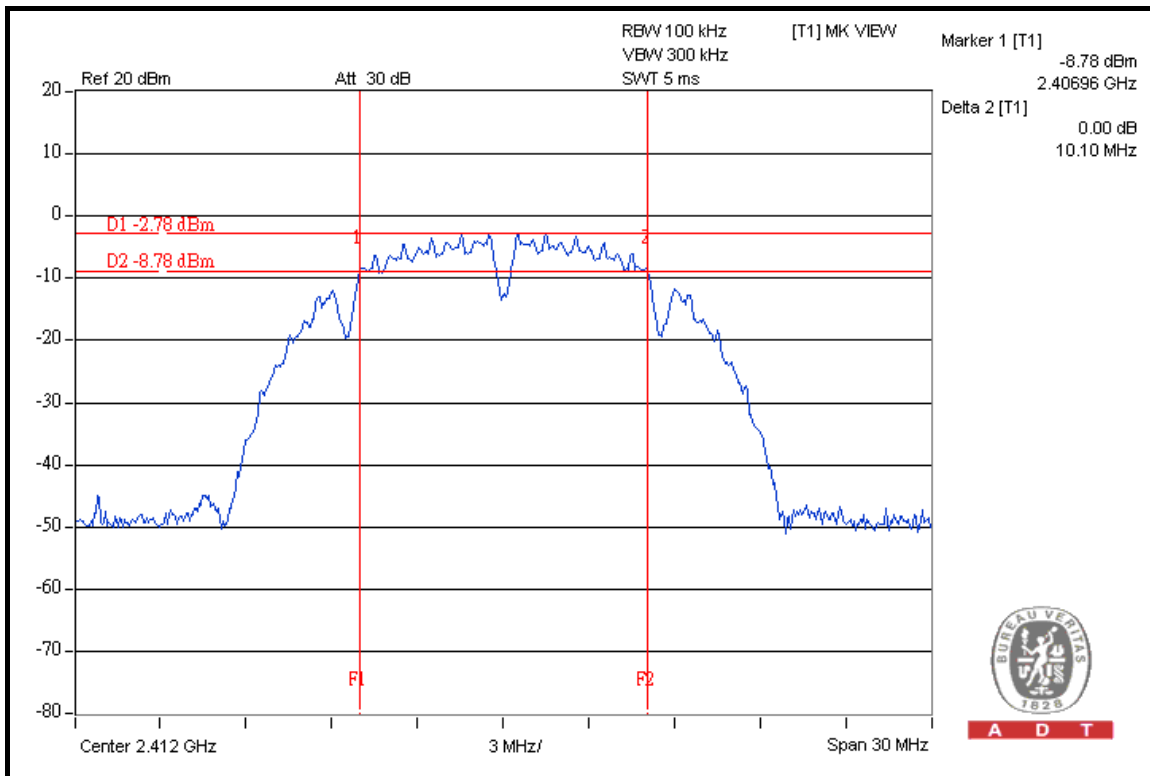
4.3.7 TEST RESULTS

802.11b DSSS MODULATION

MODULATION TYPE	DBPSK	TRANSFER RATE	1.0Mbps
INPUT POWER	3.7Vdc	ENVIRONMENTAL CONDITIONS	25deg.C, 65%RH, 1017hPa
TEST MODE	A	TESTED BY	Mark Liao

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
1	2412	10.10	0.5	PASS
6	2437	10.11	0.5	PASS
11	2462	10.10	0.5	PASS

CH 1

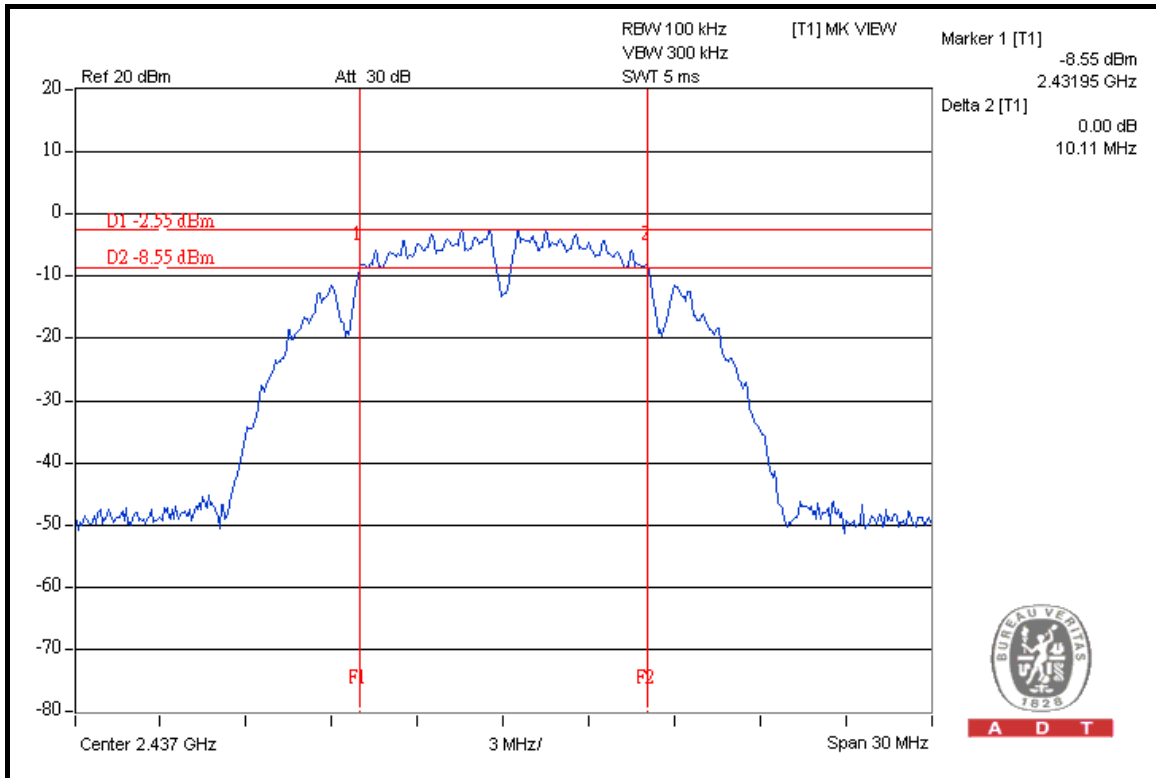


A D T

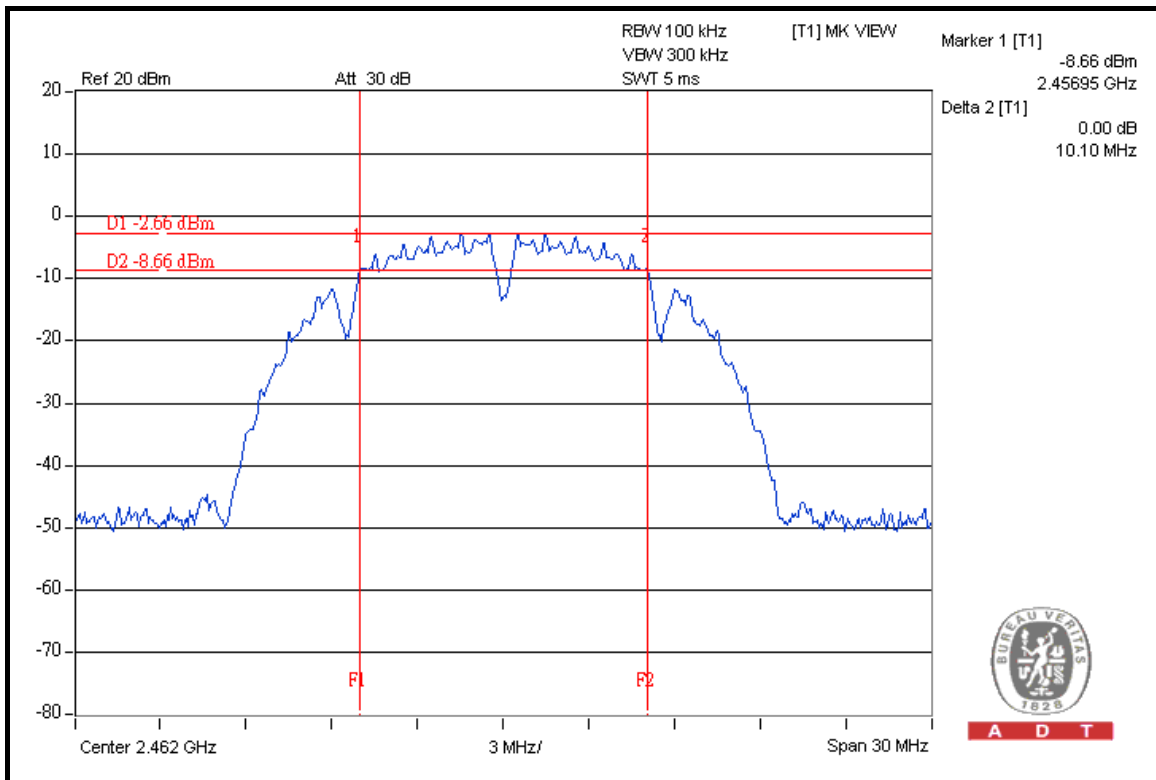


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CH 6



CH 11





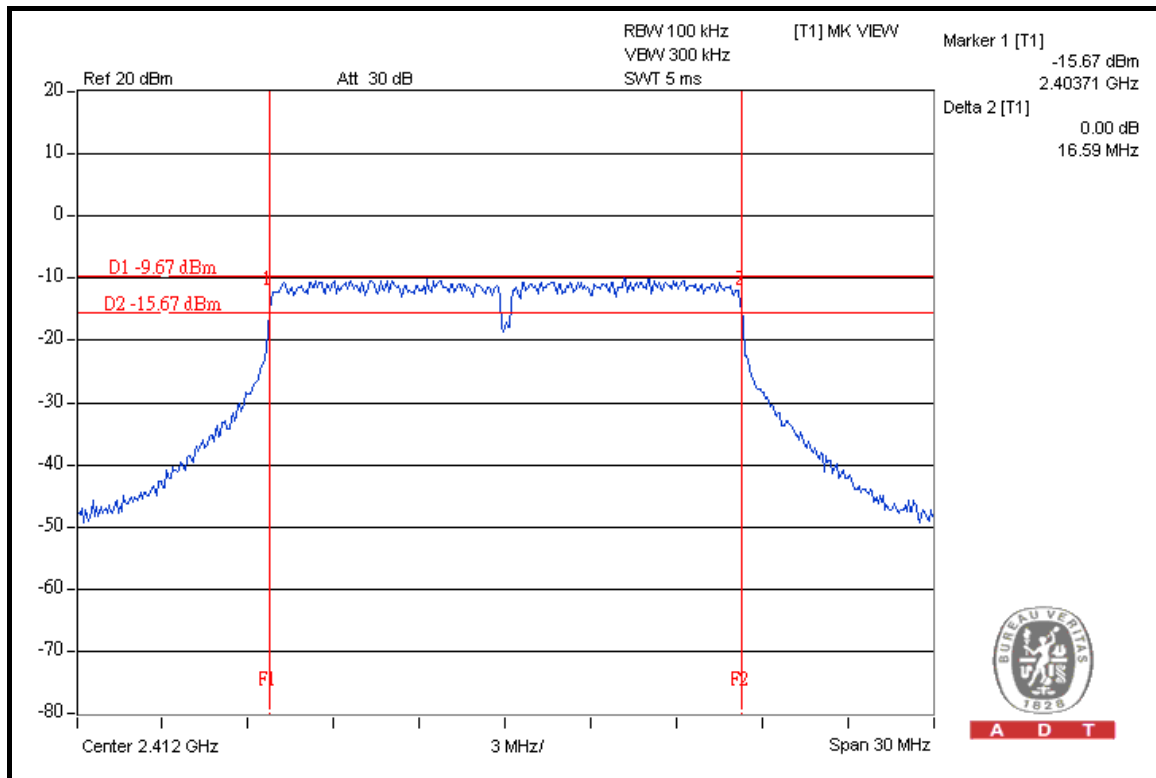
A D T

802.11g OFDM MODULATION

MODULATION TYPE	BPSK	TRANSFER RATE	6.0Mbps
INPUT POWER	3.7Vdc	ENVIRONMENTAL CONDITIONS	25deg.C, 65%RH, 1017hPa
TEST MODE	A	TESTED BY	Mark Liao

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
1	2412	16.59	0.5	PASS
6	2437	16.65	0.5	PASS
11	2462	16.62	0.5	PASS

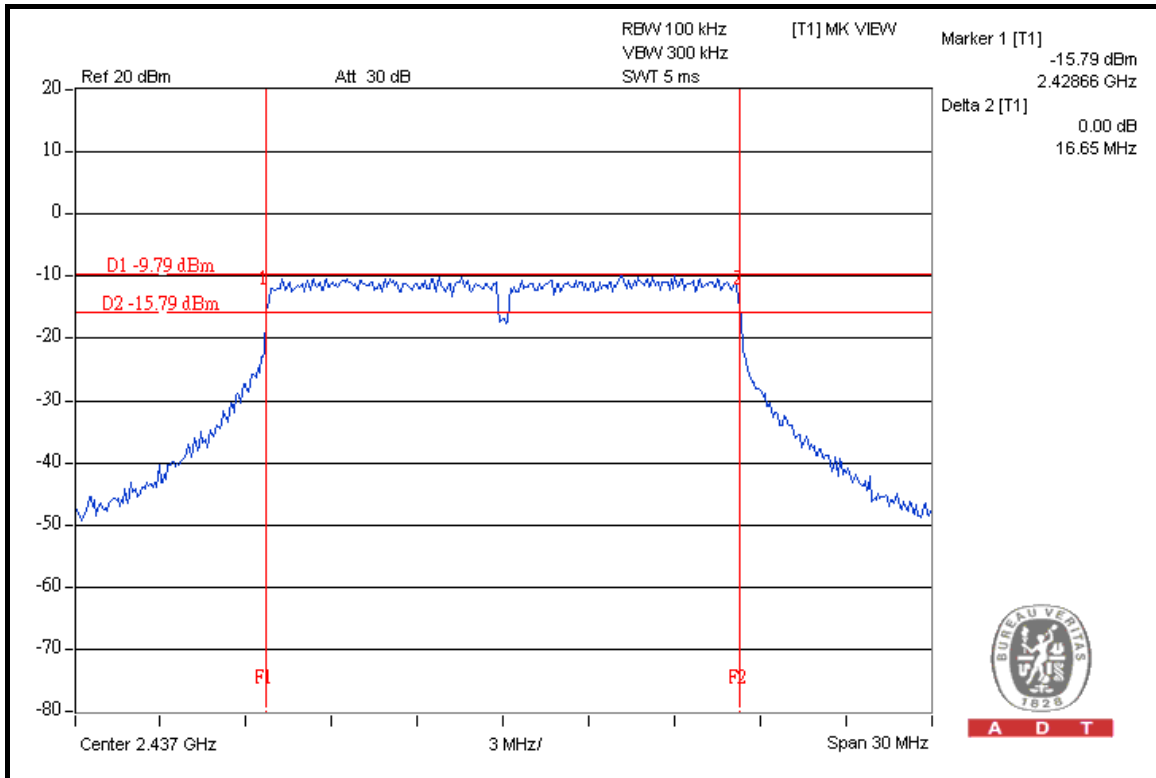
CH 1





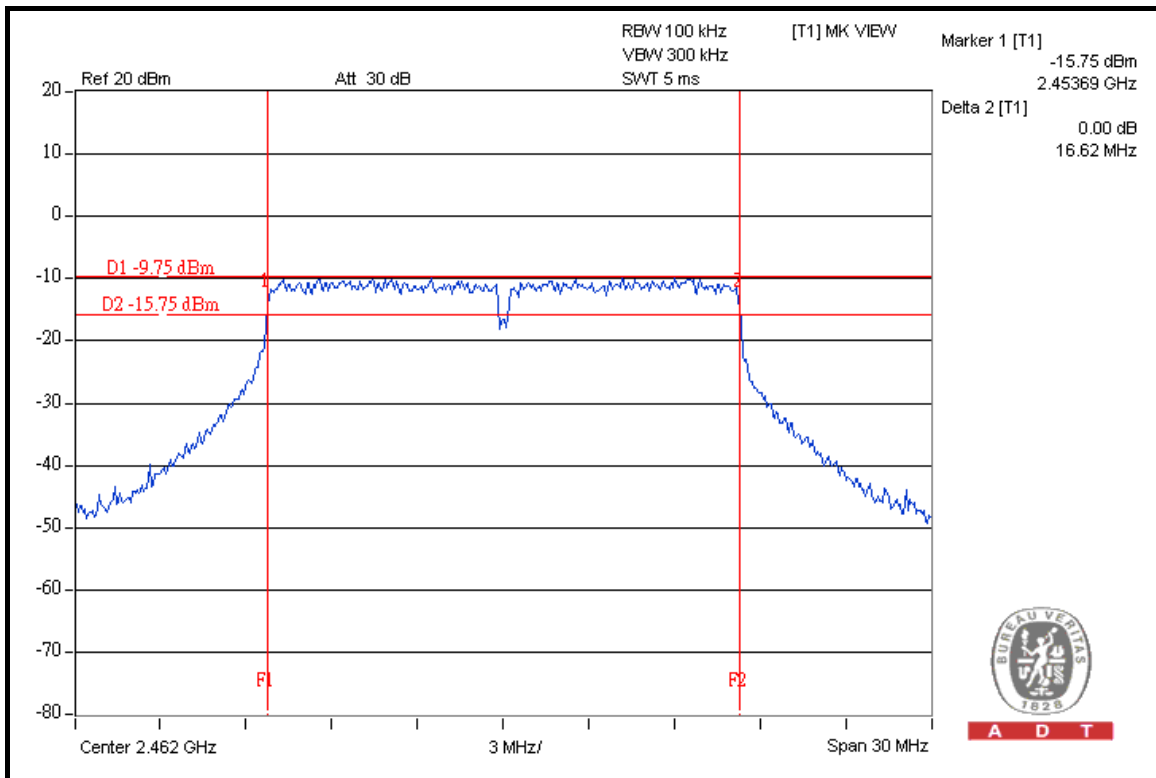
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CH 6



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CH 11



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4.4 MAXIMUM PEAK OUTPUT POWER

4.4.1 LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT

The Maximum Peak Output Power Measurement is 30dBm.

4.4.2 INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100041	Apr. 21, 2009	Apr. 21, 2009
AGILENT SYNTHESIZED SIGNAL GENERATOR	E8257C	MY43320668	Dec. 31, 2008	Dec. 30, 2009
DIGITAL RT OSCILLOSCOPE	TDS1012	C037299	Nov. 18, 2008	Nov. 17, 2009
NARDA DETECTOR	4503A	FSCM99899	NA	NA

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

4.4.3 TEST PROCEDURES

1. A detector was used on the output port of the EUT. An oscilloscope was used to read the response of the detector.
2. Replaced the EUT by the signal generator. The center frequency of the S.G was adjusted to the center frequency of the measured channel.
3. Adjusted the power to have the same reading on oscilloscope. Record the power level.

4.4.4 DEVIATION FROM TEST STANDARD

No deviation.

4.4.5 TEST SETUP



4.4.6 EUT OPERATING CONDITIONS

Same as Item 4.3.6.

4.4.7 TEST RESULTS

802.11b DSSS MODULATION

MODULATION TYPE	DBPSK	TRANSFER RATE	1.0Mbps
INPUT POWER	3.7Vdc	ENVIRONMENTAL CONDITIONS	25deg.C, 65%RH, 1017hPa
TEST MODE	A	TESTED BY	Mark Liao

CHAN	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (dBm)	PASS/FAIL
1	2412	11.272	10.52	30	PASS
6	2437	11.376	10.56	30	PASS
11	2462	11.324	10.54	30	PASS

802.11g OFDM MODULATION

MODULATION TYPE	BPSK	TRANSFER RATE	6.0Mbps
INPUT POWER	3.7Vdc	ENVIRONMENTAL CONDITIONS	25deg.C, 65%RH, 1017hPa
TEST MODE	A	TESTED BY	Mark Liao

CHAN	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (dBm)	PASS/FAIL
1	2412	11.324	10.54	30	PASS
6	2437	11.429	10.58	30	PASS
11	2462	11.298	10.53	30	PASS



4.5 POWER SPECTRAL DENSITY MEASUREMENT

4.5.1 LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT

The Maximum of Power Spectral Density Measurement is 8dBm.

4.5.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100041	Apr. 22, 2008	Apr. 21, 2009

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

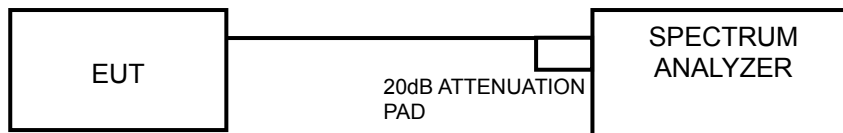
The transmitter output was connected to the spectrum analyzer through an attenuator, the bandwidth of the fundamental frequency was measured with the spectrum analyzer using 3kHz RBW and 30kHz VBW, set sweep time = span/3kHz. The power spectral density was measured and recorded.

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

4.5.4 DEVIATION FROM TEST STANDARD

No deviation.

4.5.5 TEST SETUP



4.5.6 EUT OPERATING CONDITION

Same as Item 4.3.6.

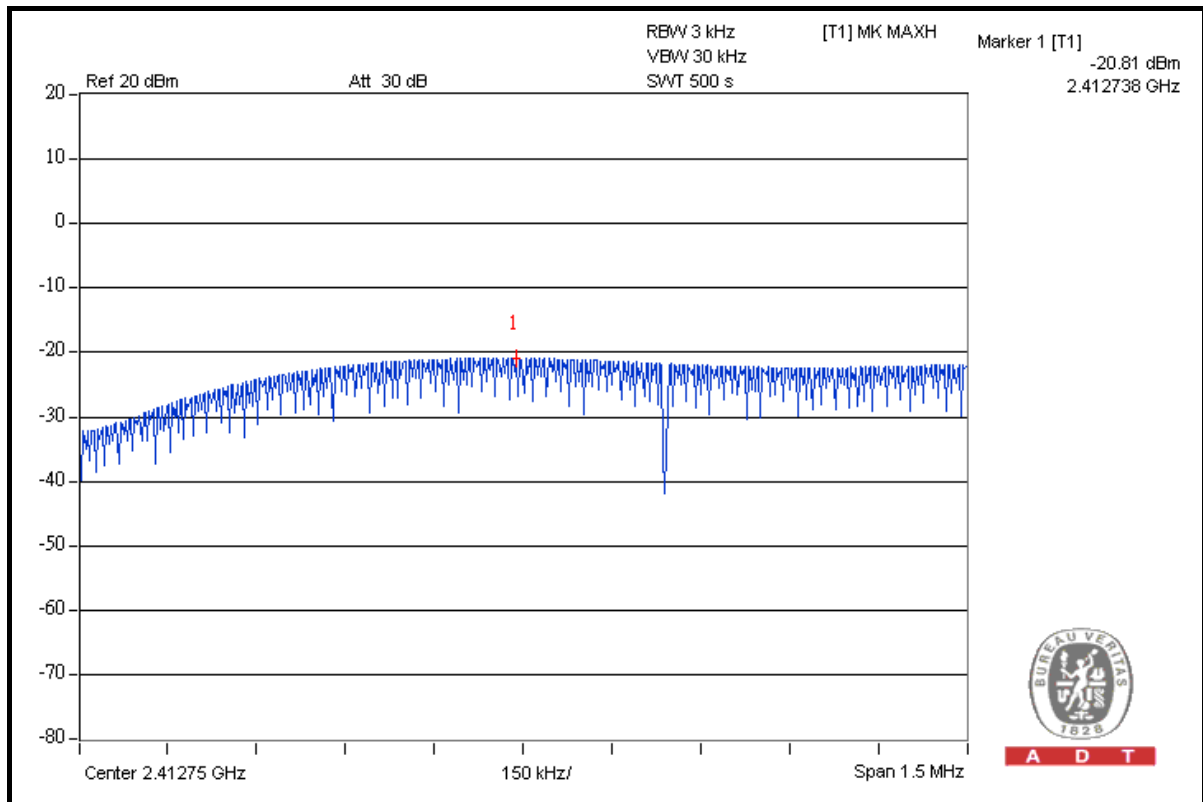
4.5.7 TEST RESULTS

802.11b DSSS MODULATION

MODULATION TYPE	DBPSK	TRANSFER RATE	1.0Mbps
INPUT POWER	3.7Vdc	ENVIRONMENTAL CONDITIONS	25deg.C, 65%RH, 1017hPa
TEST MODE	A	TESTED BY	Mark Liao

CHANNEL	CHANNEL FREQUENCY (MHz)	RF POWER LEVEL IN 3 kHz BW (dBm)	MAXIMUM LIMIT (dBm)	PASS/FAIL
1	2412	-20.81	8	PASS
6	2437	-20.71	8	PASS
11	2462	-20.82	8	PASS

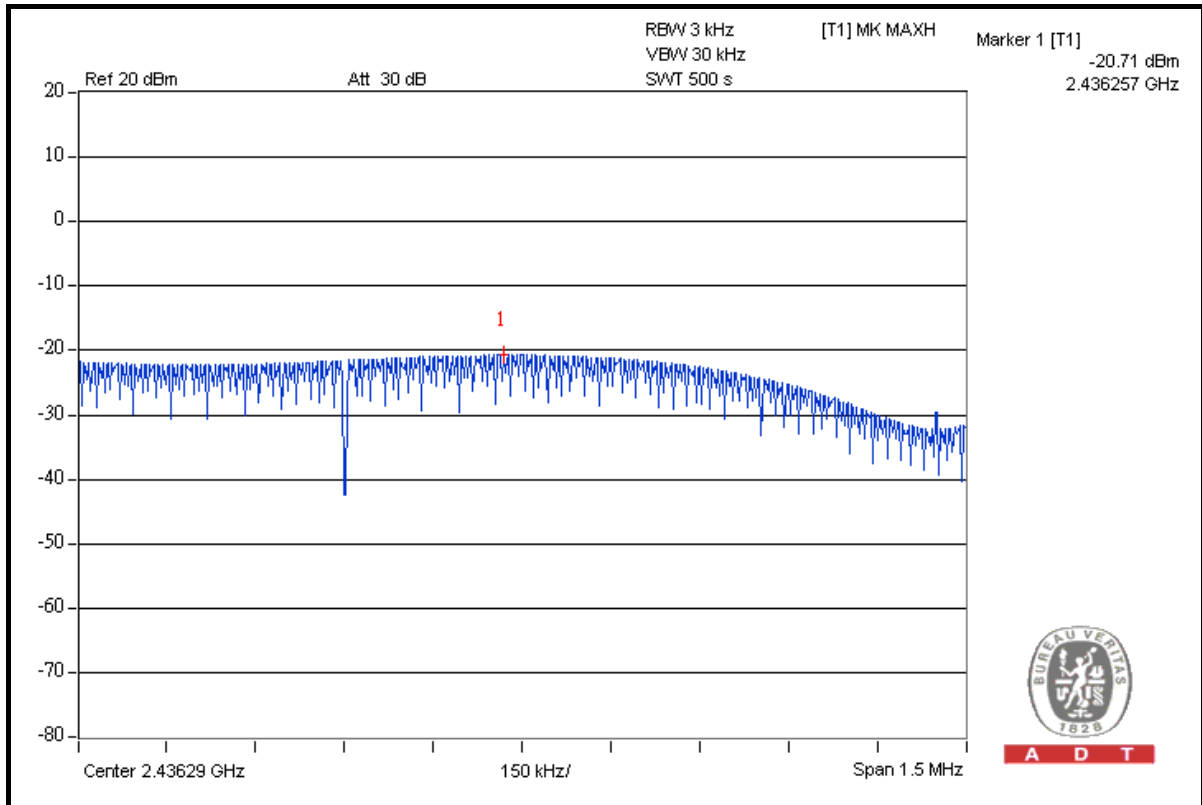
CH 1



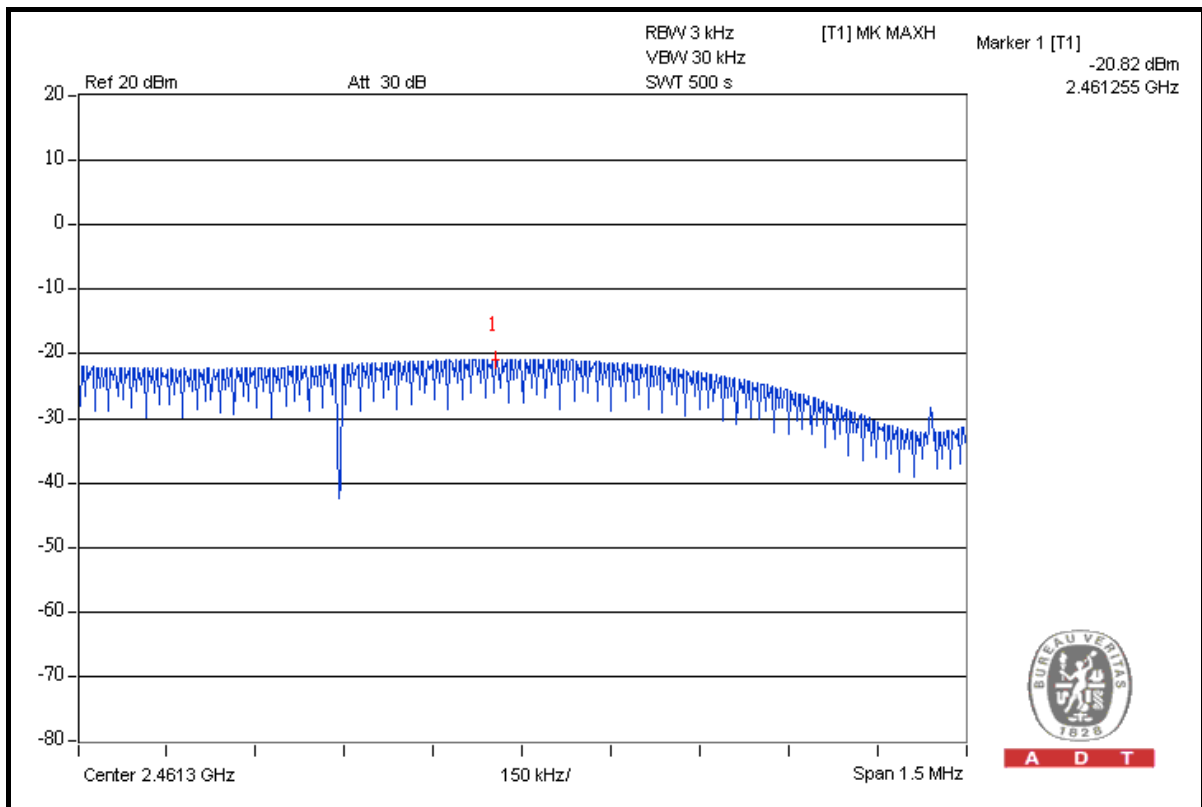


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CH 6



CH 11





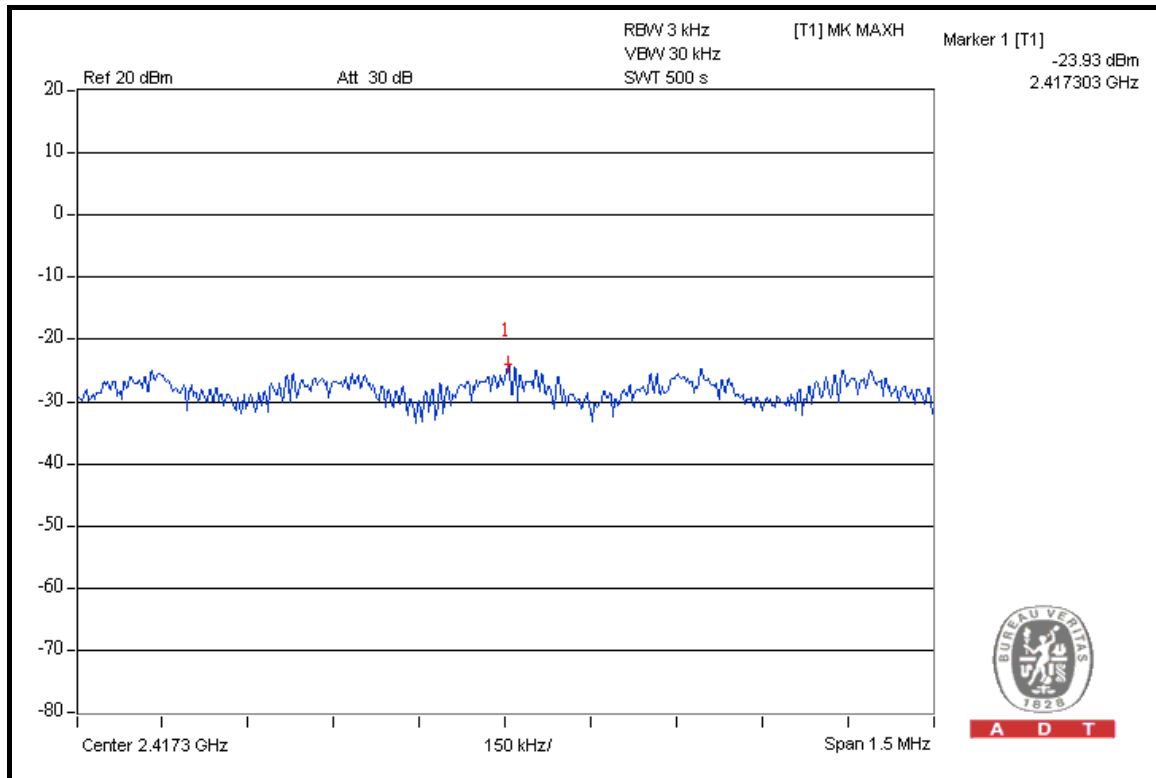
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802.11g OFDM MODULATION

MODULATION TYPE	BPSK	TRANSFER RATE	6.0Mbps
INPUT POWER	3.7Vdc	ENVIRONMENTAL CONDITIONS	25deg.C, 65%RH, 1017hPa
TEST MODE	A	TESTED BY	Mark Liao

CHANNEL	CHANNEL FREQUENCY (MHz)	RF POWER LEVEL IN 3 kHz BW (dBm)	MAXIMUM LIMIT (dBm)	PASS/FAIL
1	2412	-23.93	8	PASS
6	2437	-24.06	8	PASS
11	2462	-23.98	8	PASS

CH 1

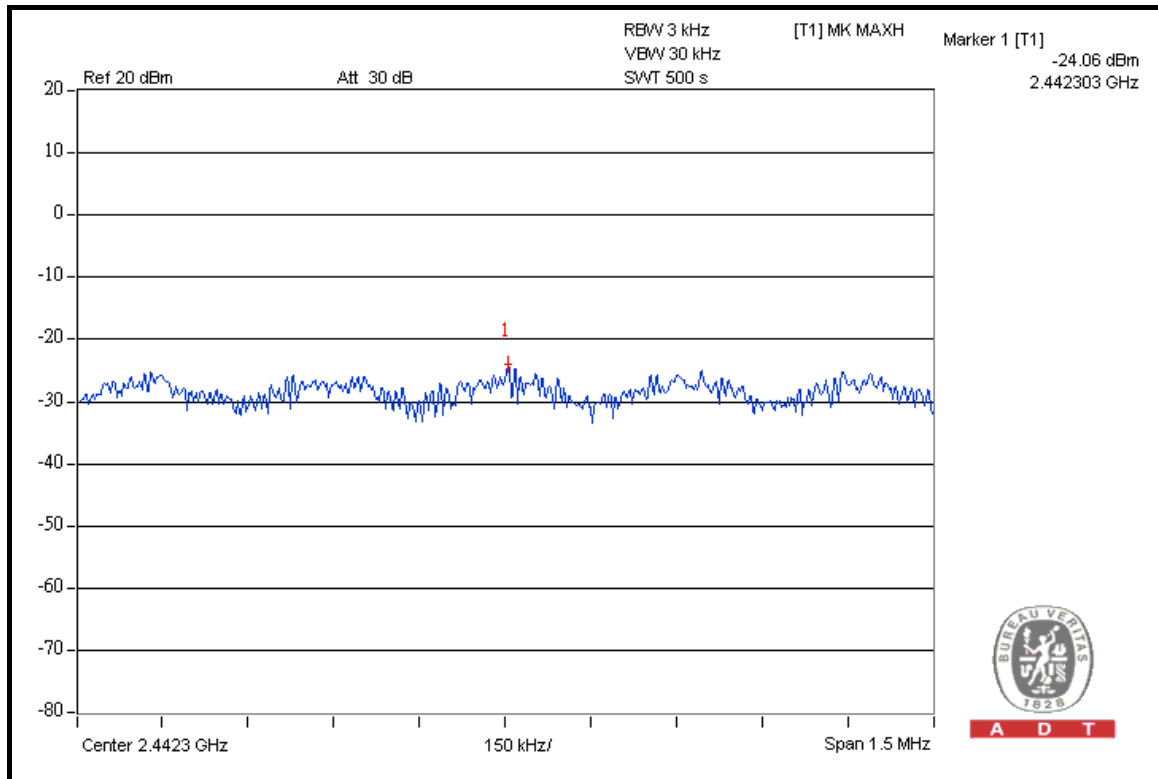


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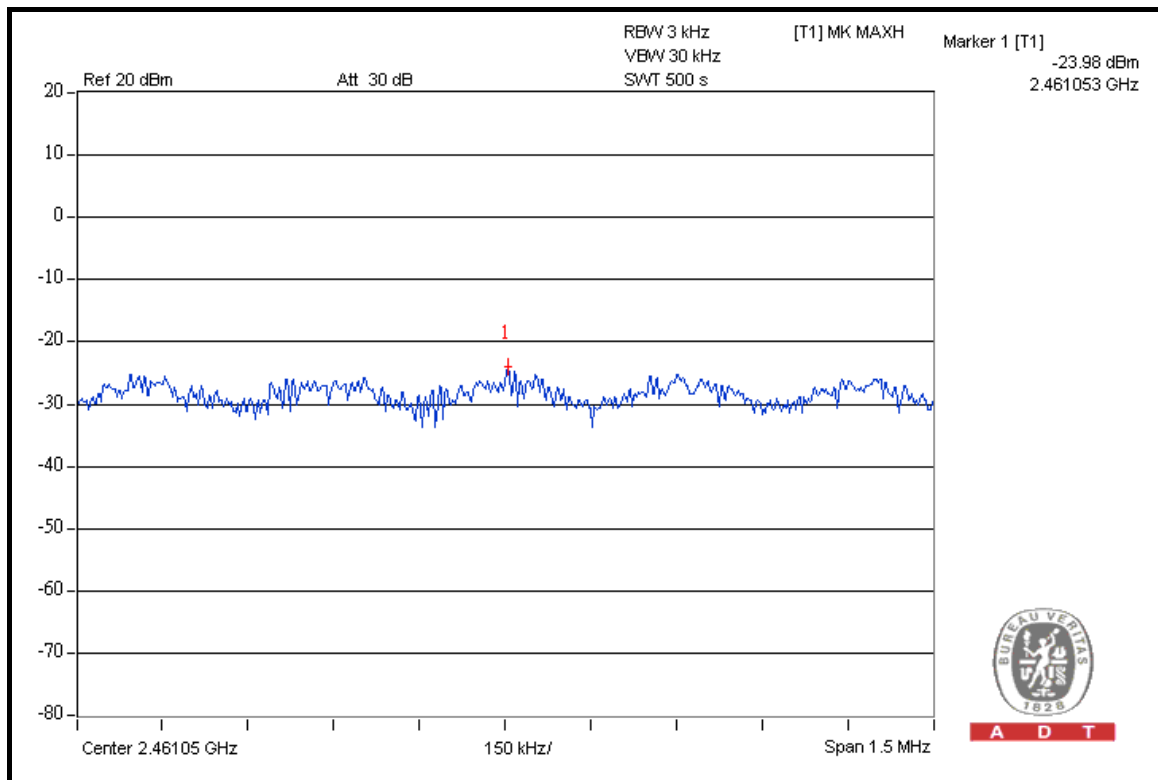


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CH 6



CH 11





4.6 BAND EDGES MEASUREMENT

4.6.1 LIMITS OF BAND EDGES MEASUREMENT

Below -20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

4.6.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100041	Apr. 22, 2008	Apr. 21, 2009

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 PROCEDURE

The transmitter output was connected to the spectrum analyzer via a low loss cable. Set both RBW and VBW of spectrum analyzer to 100kHz and 300kHz with suitable frequency span including 100MHz bandwidth from band edge. The band edges was measured and recorded.

The spectrum plots (Peak RBW = 100kHz, VBW = 300kHz; Average RBW = 1MHz, VBW = 10Hz) are attached on the following pages.

4.6.4 DEVIATION FROM TEST STANDARD

No deviation.

4.6.5 EUT OPERATING CONDITION

Same as Item 4.3.6.

4.6.6 TEST RESULTS

The spectrum plots are attached on the following 12 images. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement in part 15.247(d).

802.11b DSSS MODULATION

NOTE 1: The band edge emission plot on the next page shows 45.44dBc between carrier maximum power and local maximum emission in restrict band (2.36720GHz). The emission of carrier strength list in the test result of channel 1 at the item 4.1.7 is 102.28dBuV/m (Peak), so the maximum field strength in restrict band is $102.28 - 45.44 = 56.84$ dBuV/m which is under 74dBuV/m limit.

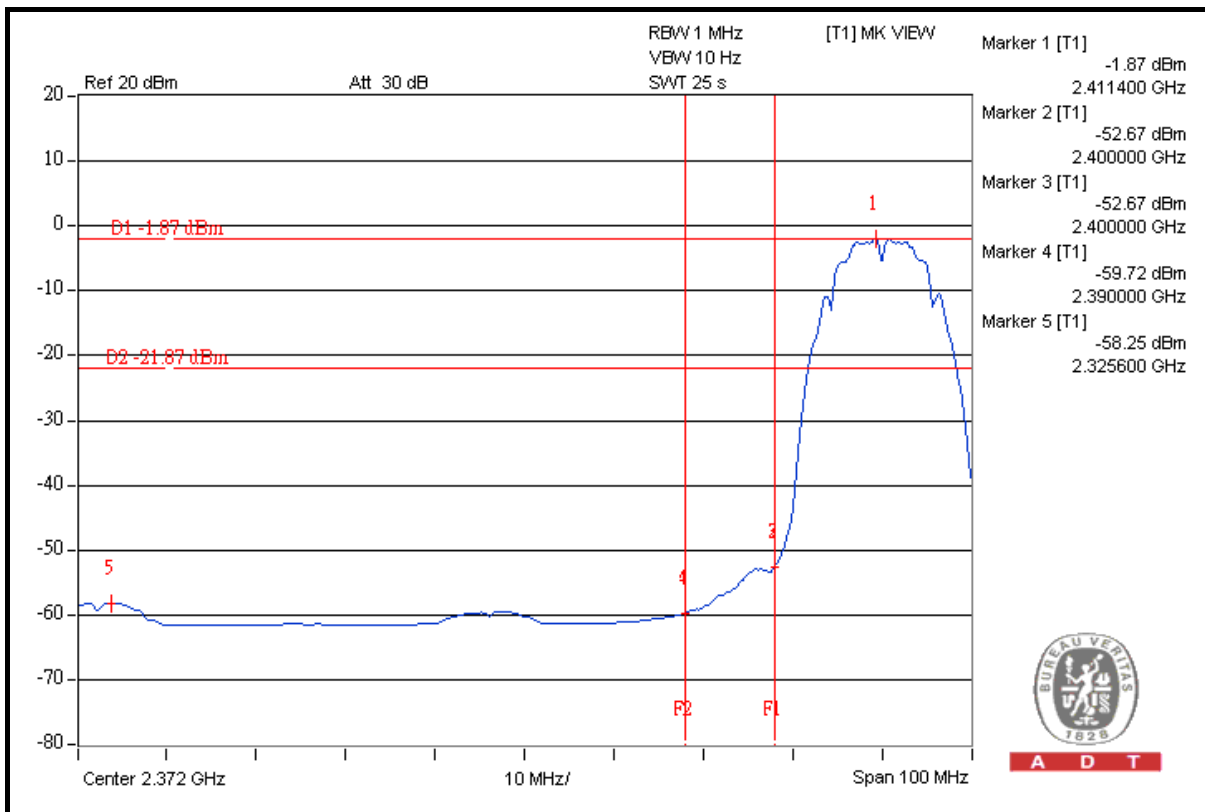
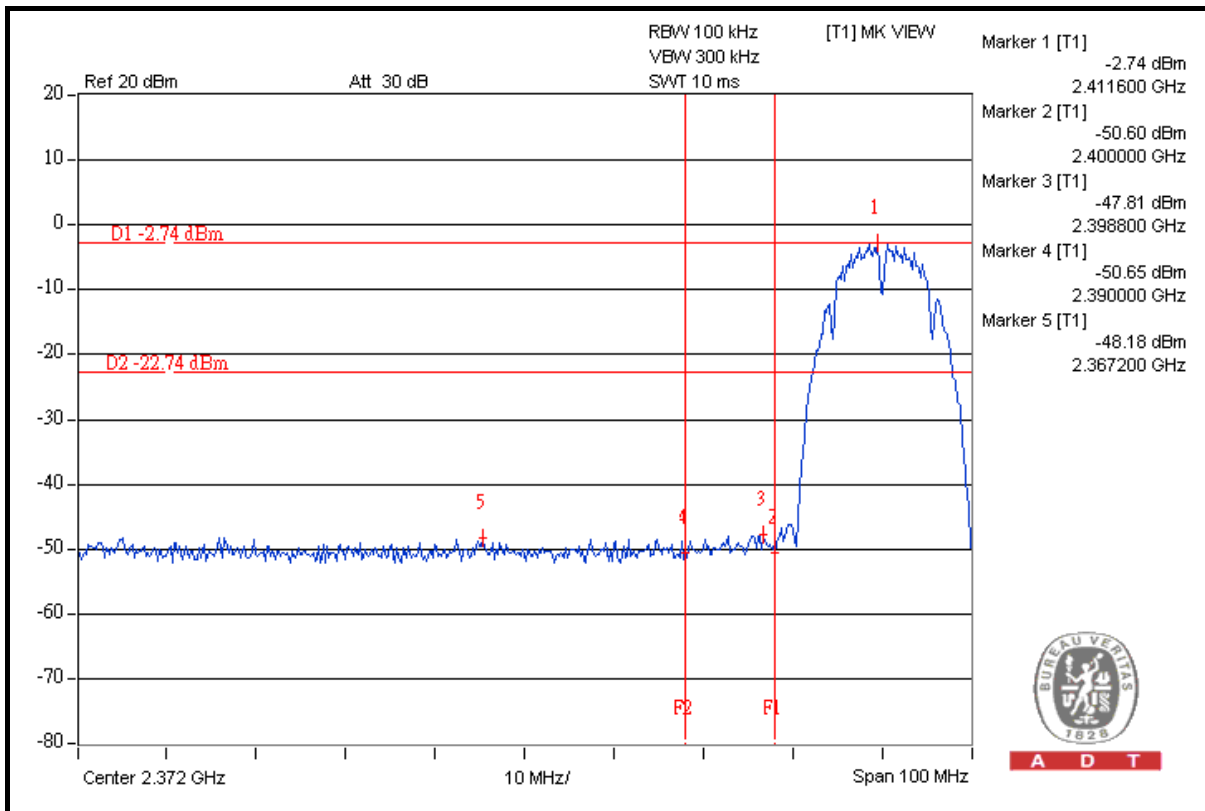
The band edge emission plot on the next page shows 56.38dBc between carrier maximum power and local maximum emission in restrict band (2.32560GHz). The emission of carrier strength list in the test result of channel 1 at the item 4.1.7 is 98.03dBuV/m (Average), so the maximum field strength in restrict band is $98.03 - 56.38 = 41.65$ dBuV/m which is under 54dBuV/m limit.

NOTE 2: The band edge emission plot on the next second page shows 45.38dBc between carrier maximum power and local maximum emission in restrict band (2.48820GHz). The emission of carrier strength list in the test result of channel 11 at the item 4.1.7 is 103.29dBuV/m (Peak), so the maximum field strength in restrict band is $103.29 - 45.38 = 57.91$ dBuV/m which is under 74dBuV/m limit.

The band edge emission plot on the next third page shows 57.70dBc between carrier maximum power and local maximum emission in restrict band (2.48350GHz). The emission of carrier strength list in the test result of channel 11 at the item 4.1.7 is 99.11dBuV/m (Average), so the maximum field strength in restrict band is $99.11 - 57.70 = 41.41$ dBuV/m which is under 54dBuV/m limit.

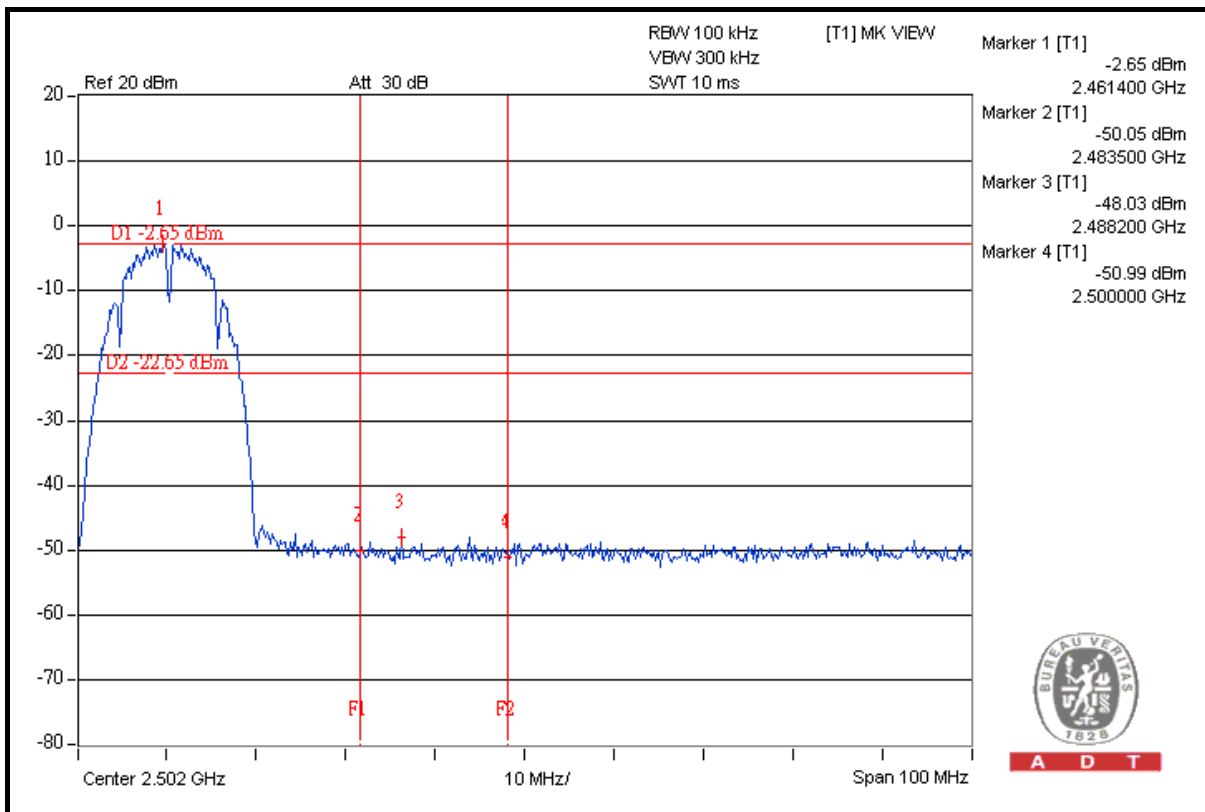
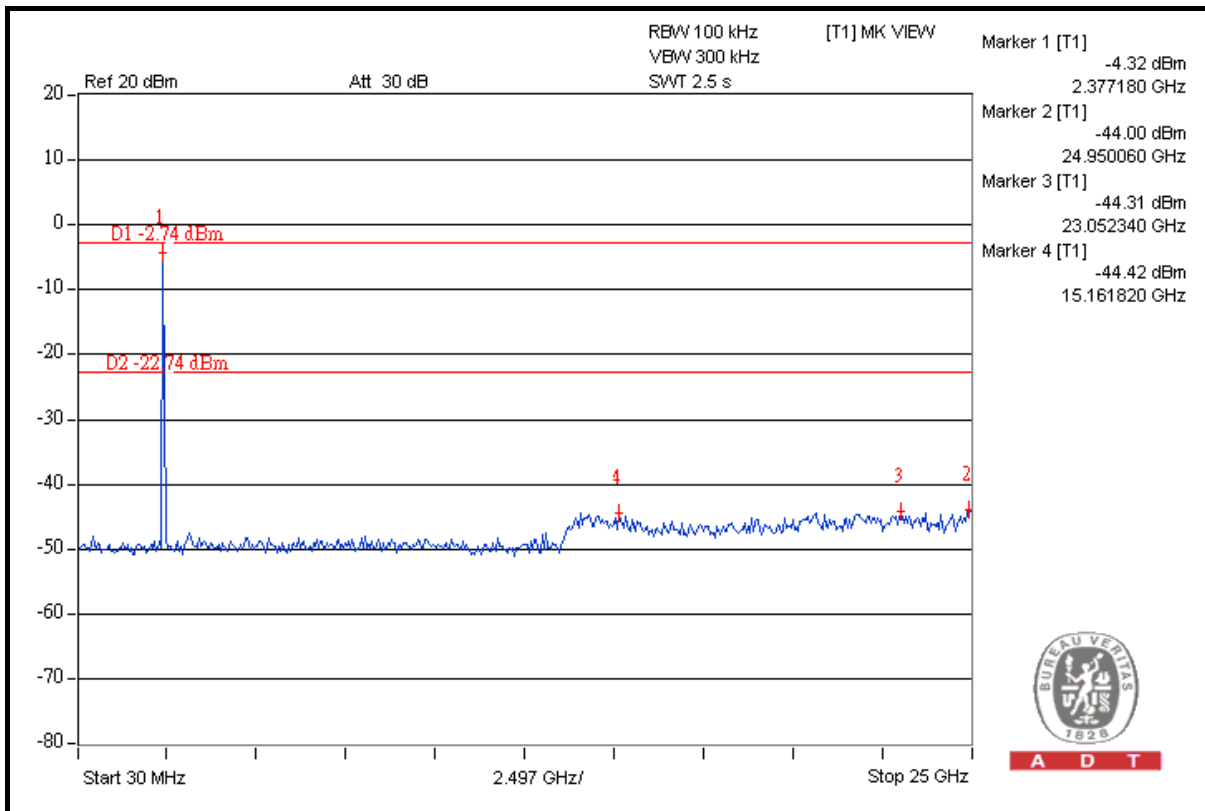


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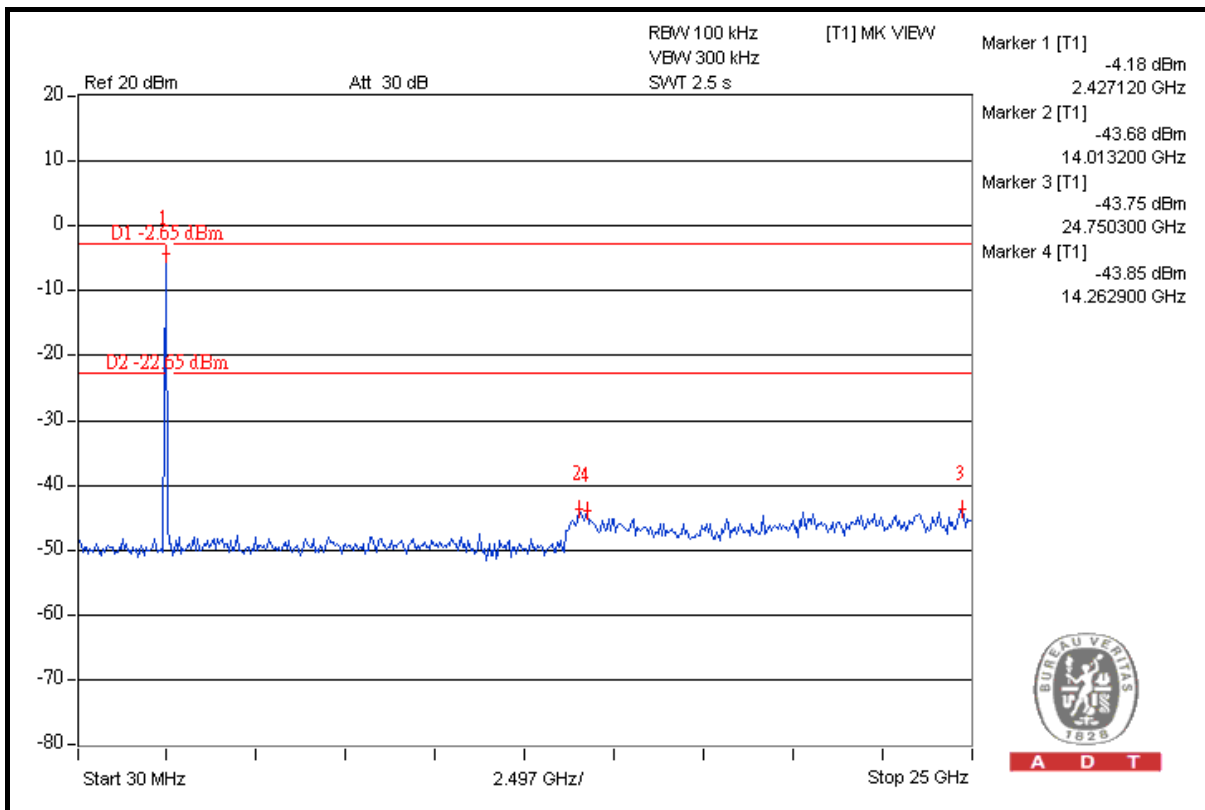
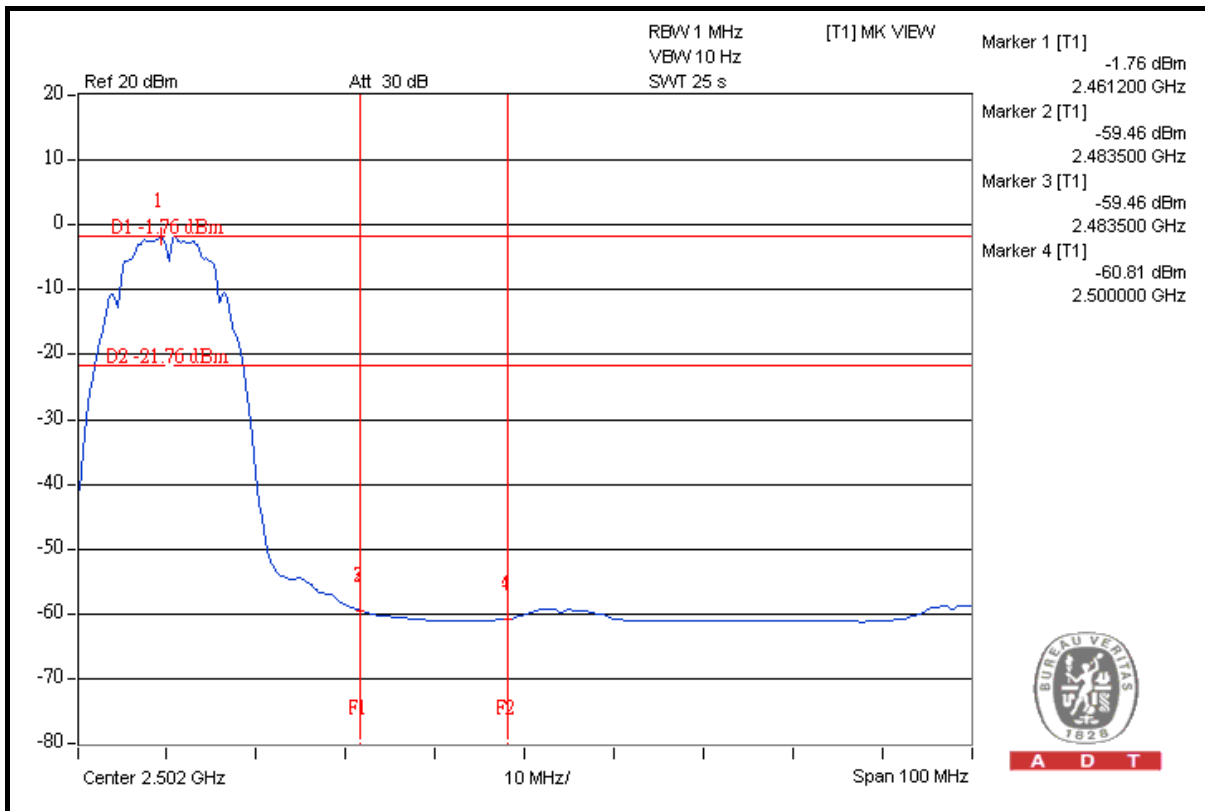


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802.11g OFDM MODULATION

NOTE 1: The band edge emission plot on the next page shows 38.02dBc between carrier maximum power and local maximum emission in restrict band (2.36260GHz). The emission of carrier strength list in the test result of channel 1 at the item 4.1.7 is 99.26dBuV/m (Peak), so the maximum field strength in restrict band is $99.26 - 38.02 = 61.24$ dBuV/m which is under 74dBuV/m limit.

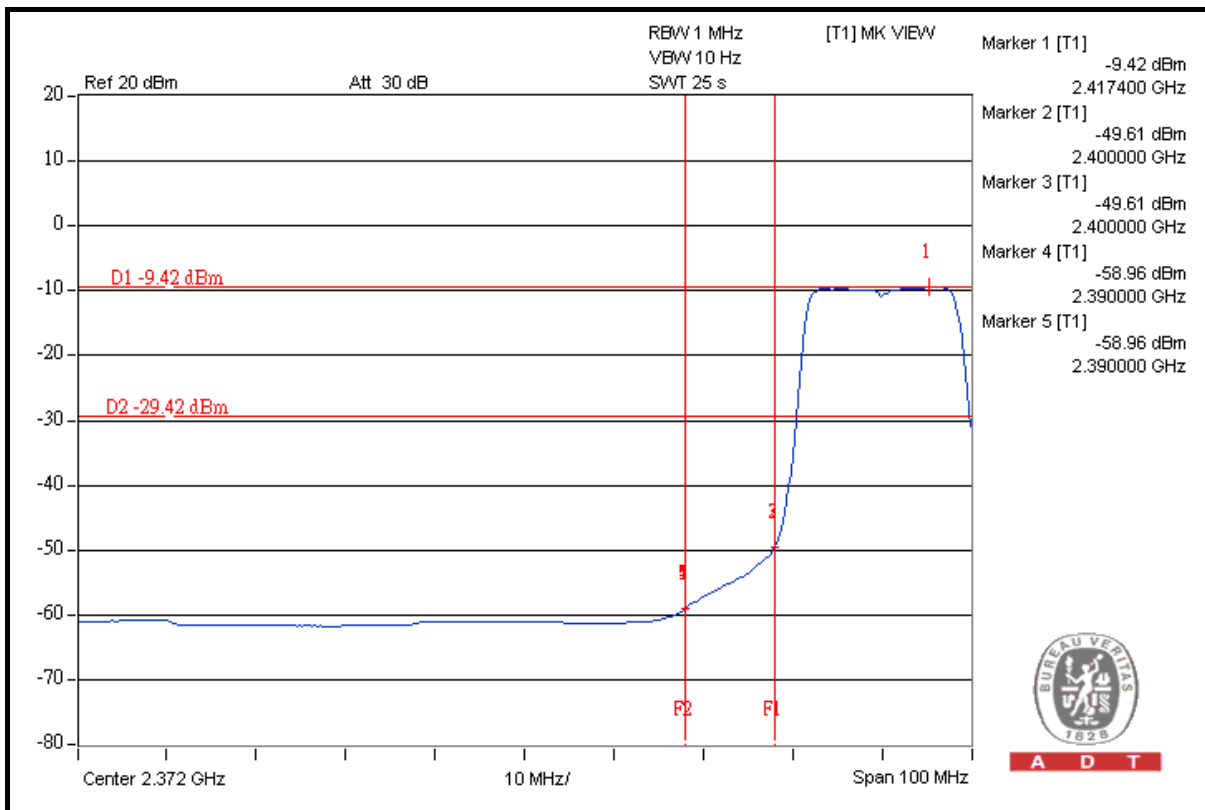
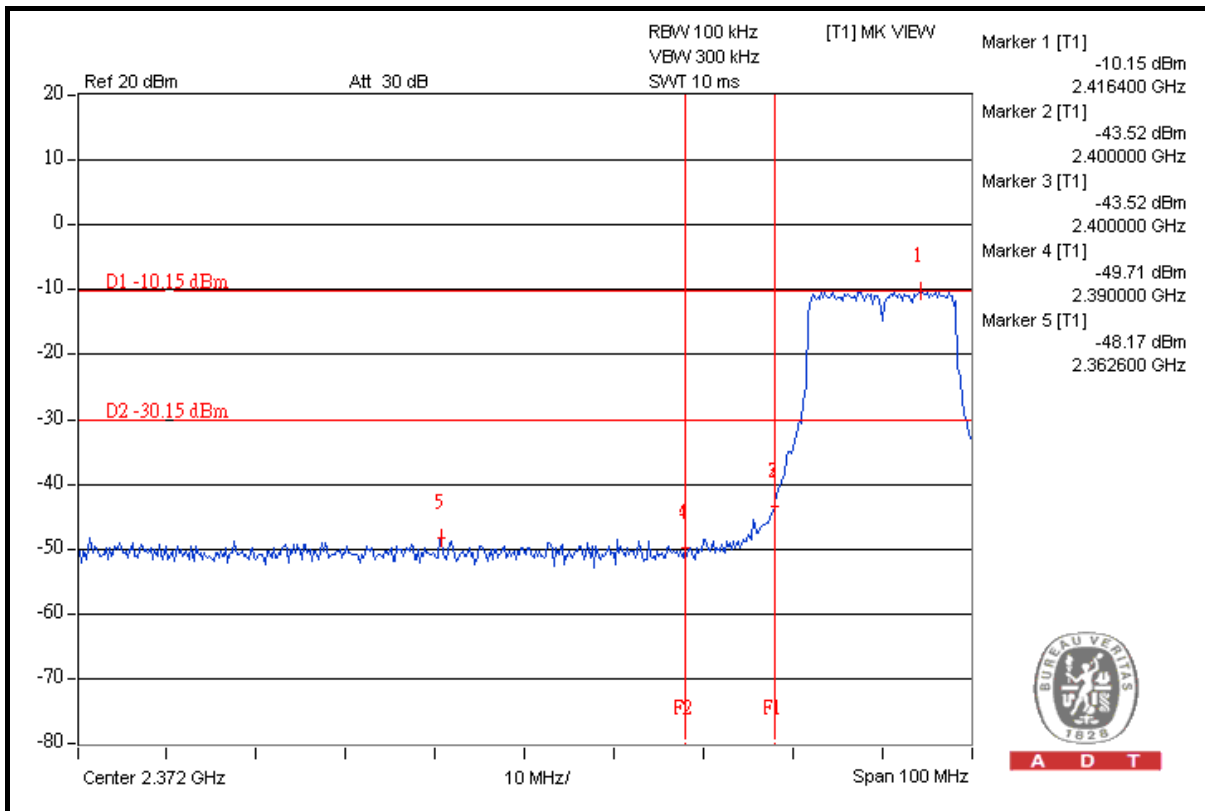
The band edge emission plot on the next page shows 49.54dBc between carrier maximum power and local maximum emission in restrict band (2.39000GHz). The emission of carrier strength list in the test result of channel 1 at the item 4.1.7 is 89.01dBuV/m (Average), so the maximum field strength in restrict band is $89.01 - 49.54 = 39.47$ dBuV/m which is under 54dBuV/m limit.

NOTE 2: The band edge emission plot on the next second page shows 38.48dBc between carrier maximum power and local maximum emission in restrict band (2.49440GHz). The emission of carrier strength list in the test result of channel 11 at the item 4.1.7 is 100.46dBuV/m (Peak), so the maximum field strength in restrict band is $100.46 - 38.48 = 61.98$ dBuV/m which is under 74dBuV/m limit.

The band edge emission plot on the next third page shows 49.20dBc between carrier maximum power and local maximum emission in restrict band (2.48350GHz). The emission of carrier strength list in the test result of channel 11 at the item 4.1.7 is 90.27dBuV/m (Average), so the maximum field strength in restrict band is $90.27 - 49.20 = 41.07$ dBuV/m which is under 54dBuV/m limit.

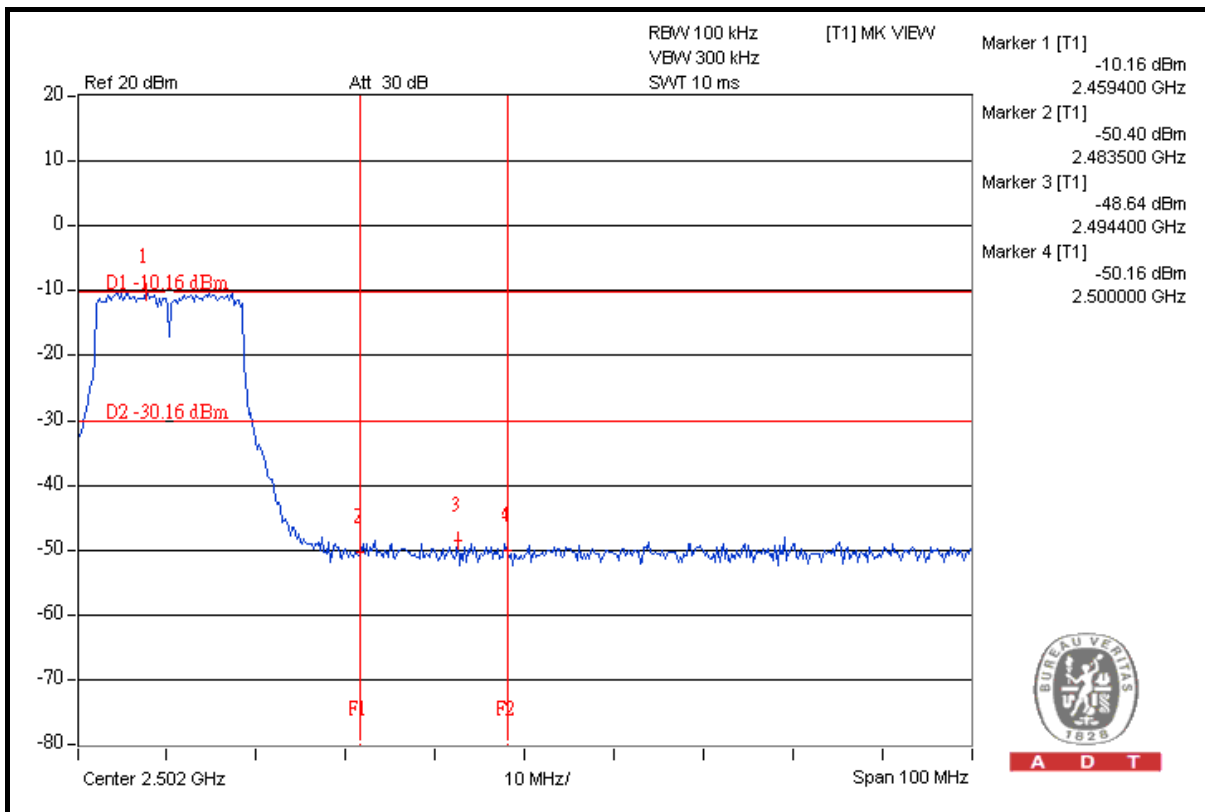
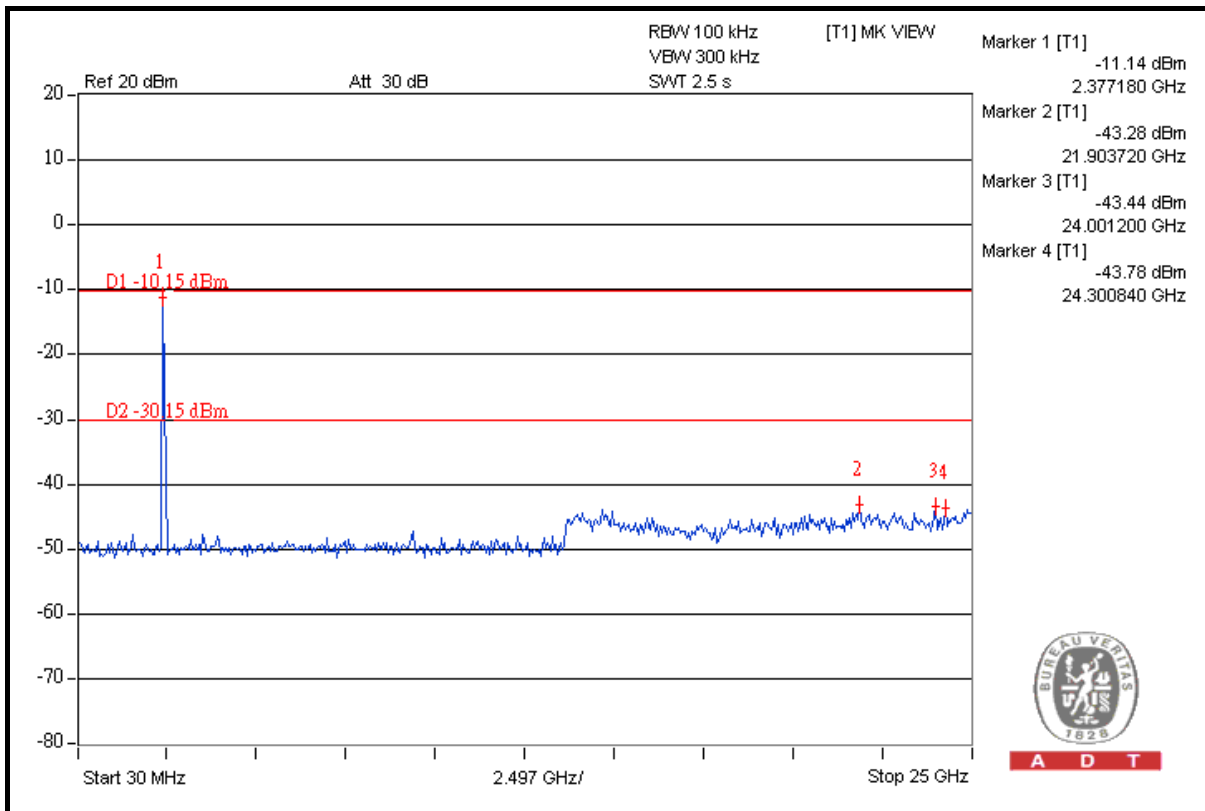


A D T



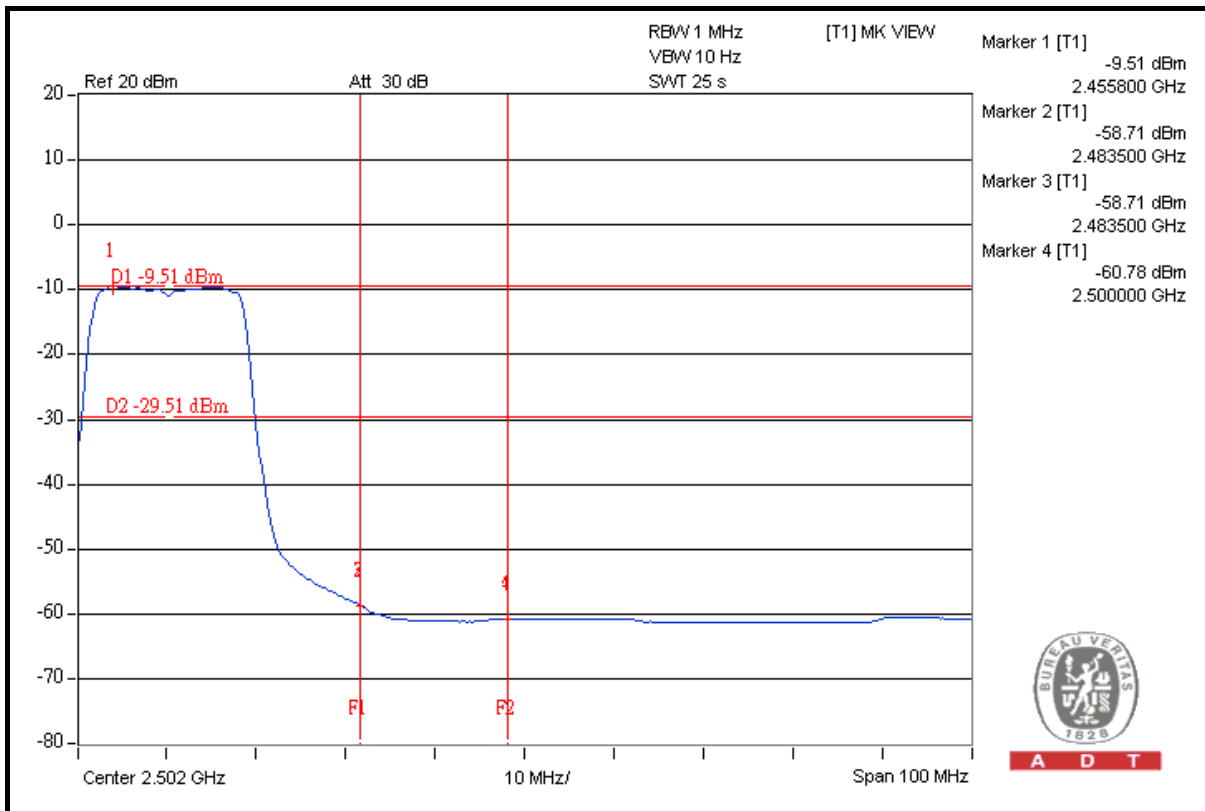


A D T

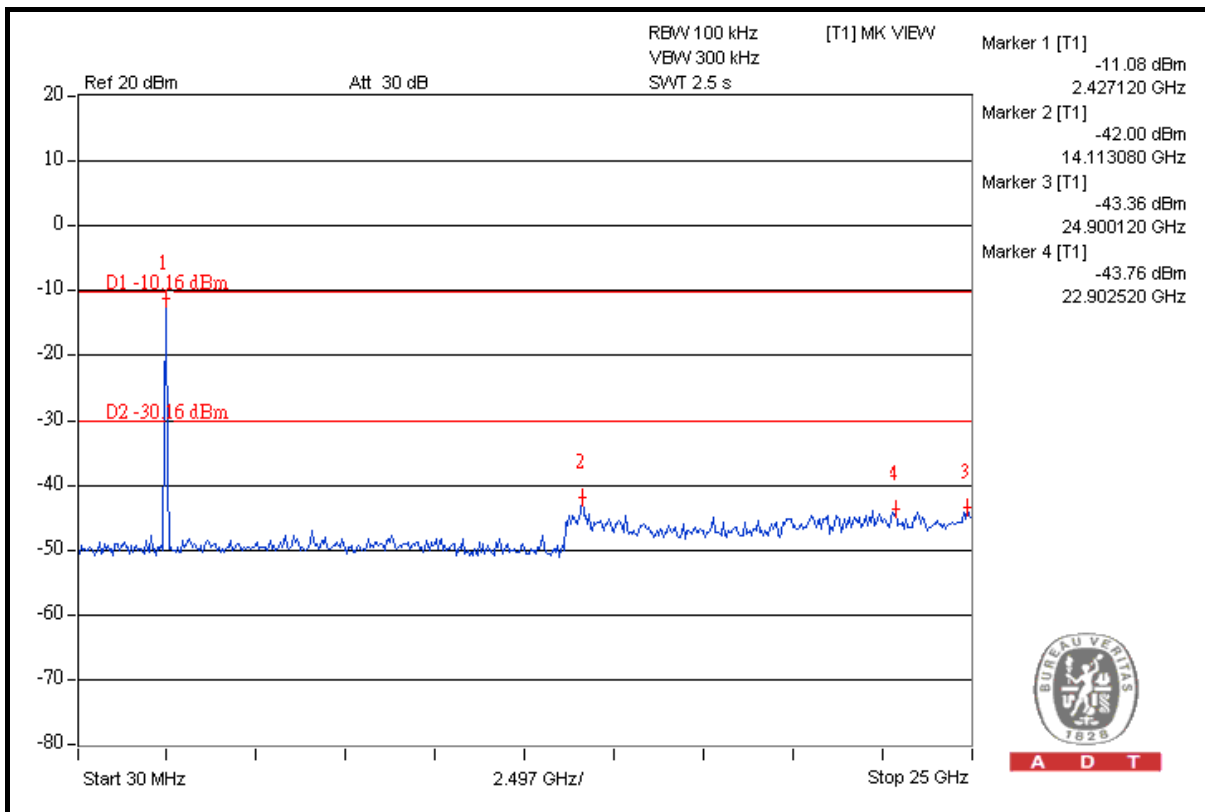




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4.7 ANTENNA REQUIREMENT

4.7.1 STANDARD APPLICABLE

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

4.7.2 ANTENNA CONNECTED CONSTRUCTION

The antenna used in this product is PIFA antenna with U.FL-R-SMT antenna connector. The maximum Gain of the antenna is 2.24dBi.

5. TEST TYPES AND RESULTS (FOR BLUETOOTH FUNCTION)

5.1 RADIATED EMISSION MEASUREMENT

5.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT

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

FREQUENCIES (MHz)	FIELD STRENGTH (microvolts/meter)	MEASUREMENT DISTANCE (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

5.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESI7	100033	Jun. 30, 2008	Jun. 29, 2009
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100041	Apr. 22, 2008	Apr. 21, 2009
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	May 02, 2008	May 01, 2009
HORN Antenna SCHWARZBECK	9120D	9120D-209	Jun. 24, 2008	Jun. 23, 2009
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170243	Dec. 25, 2008	Dec. 24, 2009
Preamplifier Agilent	8447D	2944A10633	Nov. 03, 2008	Nov. 02, 2009
Preamplifier Agilent	8449B	3008A01964	Oct. 23, 2008	Oct. 22, 2009
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	238141/4	May 20, 2008	May 19, 2009
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	12738/6	May 20, 2008	May 19, 2009
Software ADT.	ADT_Radiated_ V7.6.15.9.2	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	NA	NA
Antenna Tower Controller inn-co GmbH	CO2000	017303	NA	NA
Turn Table ADT.	TT100.	TT93021703	NA	NA
Turn Table Controller ADT.	SC100.	SC93021703	NA	NA

- NOTE:**
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 2. The test was performed in HwaYa Chamber 3.
 3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
 4. The FCC Site Registration No. is 988962.
 5. The IC Site Registration No. is IC 7450F-3.

5.1.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

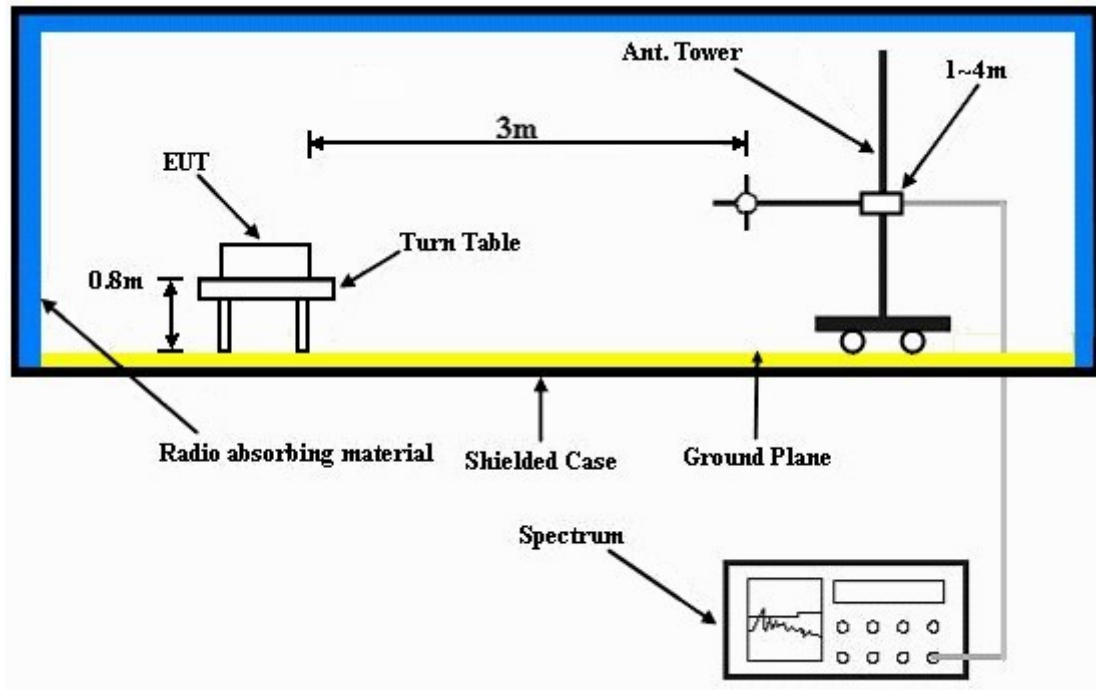
NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. All modes of operation were investigated and the worst-case emissions are reported.

5.1.4 DEVIATION FROM TEST STANDARD

No deviation.

5.1.5 TEST SETUP



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

5.1.6 EUT OPERATING CONDITIONS

Same as 4.1.6.



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5.1.7 TEST RESULTS

RADIATED WORST CASE DATA: ABOVE 1GHz:
GFSK MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	3.7Vdc	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 67%RH 1013hPa	TESTED BY	Mark Liao
TEST MODE	A		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1602.00	51.16 PK	74.00	-22.84	1.78 H	171	20.63	30.53
2	1602.00	48.23 AV	54.00	-5.77	1.78 H	171	17.70	30.53
3	2376.00	49.67 PK	74.00	-24.33	1.33 H	310	17.28	32.39
4	2376.00	44.91 AV	54.00	-9.09	1.33 H	310	12.52	32.39
5	2400.00	56.03 PK	74.00	-17.97	1.35 H	306	23.55	32.48
6	2400.00	25.93 AV	54.00	-28.07	1.35 H	306	-6.55	32.48
7	*2402.00	100.06 PK			1.35 H	306	67.57	32.49
8	*2402.00	69.96 AV			1.35 H	306	37.47	32.49
9	4804.00	49.31 PK	74.00	-24.69	1.26 H	358	11.09	38.22
10	4804.00	19.21 AV	54.00	-34.79	1.26 H	358	-19.01	38.22
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	1602.00	50.54 PK	74.00	-23.46	1.11 V	285	20.01	30.53
2	1602.00	48.12 AV	54.00	-5.88	1.11 V	285	17.59	30.53
3	2376.00	44.50 PK	74.00	-29.50	1.50 V	333	12.11	32.39
4	2376.00	35.59 AV	54.00	-18.41	1.50 V	333	3.20	32.39
5	2400.00	54.72 PK	74.00	-19.28	1.50 V	332	22.24	32.48
6	2400.00	24.62 AV	54.00	-29.38	1.50 V	332	-7.86	32.48
7	*2402.00	98.75 PK			1.50 V	332	66.26	32.49
8	*2402.00	68.65 AV			1.50 V	332	36.16	32.49
9	4804.00	50.16 PK	74.00	-23.84	1.23 V	20	11.94	38.22
10	4804.00	20.06 AV	54.00	-33.94	1.23 V	20	-18.16	38.22

- REMARKS:**
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
 2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.
 5. “ * “: Fundamental frequency.
 6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 * 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to: $20\log(3.125 / 100) = -30.1$ dB.
 7. Average value = peak reading + $20\log(\text{duty cycle})$.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 39	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	3.7Vdc	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 67%RH 1013hPa	TESTED BY	Mark Liao
TEST MODE	A		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1628.00	51.23 PK	74.00	-22.77	1.73 H	333	20.67	30.56
2	1628.00	48.58 AV	54.00	-5.42	1.73 H	333	18.02	30.56
3	*2441.00	99.00 PK			1.03 H	207	66.38	32.62
4	*2441.00	68.90 AV			1.03 H	207	36.28	32.62
5	4882.00	49.90 PK	74.00	-24.10	1.03 H	26	11.37	38.53
6	4882.00	19.80 AV	54.00	-34.20	1.03 H	26	-18.73	38.53
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	1628.00	50.32 PK	74.00	-23.68	1.07 V	286	19.76	30.56
2	1628.00	46.07 AV	54.00	-7.93	1.07 V	286	15.51	30.56
3	*2441.00	97.63 PK			1.12 V	20	65.01	32.62
4	*2441.00	67.53 AV			1.12 V	20	34.91	32.62
5	4882.00	49.59 PK	74.00	-24.41	1.17 V	316	11.06	38.53
6	4882.00	19.49 AV	54.00	-34.51	1.17 V	316	-19.04	38.53

- REMARKS:**
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
 2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.
 5. “ * “: Fundamental frequency.
 6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 * 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to: $20\log(3.125 / 100) = -30.1$ dB.
 7. Average value = peak reading + $20\log(\text{duty cycle})$.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 78	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	3.7Vdc	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 67%RH 1013hPa	TESTED BY	Mark Liao
TEST MODE	A		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1654.00	49.73 PK	74.00	-24.27	1.15 H	311	19.14	30.59
2	1654.00	46.32 AV	54.00	-7.68	1.15 H	311	15.73	30.59
3	*2480.00	96.04 PK			1.00 H	210	63.30	32.74
4	*2480.00	65.94 AV			1.00 H	210	33.20	32.74
5	2483.50	46.45 PK	74.00	-27.55	1.00 H	210	13.69	32.76
6	2483.50	16.35 AV	54.00	-37.65	1.00 H	210	-16.41	32.76
7	4960.00	50.55 PK	74.00	-23.45	1.07 H	94	11.84	38.71
8	4960.00	20.45 AV	54.00	-33.55	1.07 H	94	-18.26	38.71
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	1654.00	50.13 PK	74.00	-23.87	1.11 V	260	19.54	30.59
2	1654.00	47.07 AV	54.00	-6.93	1.11 V	260	16.48	30.59
3	*2480.00	94.65 PK			1.11 V	327	61.91	32.74
4	*2480.00	64.55 AV			1.11 V	327	31.81	32.74
5	2483.50	45.27 PK	74.00	-28.73	1.11 V	327	12.51	32.76
6	2483.50	15.17 AV	54.00	-38.83	1.11 V	327	-17.59	32.76
7	4960.00	50.47 PK	74.00	-23.53	1.14 V	185	11.76	38.71
8	4960.00	20.37 AV	54.00	-33.63	1.14 V	185	-18.34	38.71

- REMARKS:**
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
 2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.
 5. “ * “: Fundamental frequency.
 6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 * 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to: $20\log(3.125 / 100) = -30.1$ dB.
 7. Average value = peak reading + $20\log(\text{duty cycle})$.



8DPSK MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	3.7Vdc	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 67%RH 1013hPa	TESTED BY	Mark Liao
TEST MODE	A		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1602.00	49.63 PK	74.00	-24.37	1.16 H	115	19.10	30.53
2	1602.00	46.46 AV	54.00	-7.54	1.16 H	115	15.93	30.53
3	2376.00	45.31 PK	74.00	-28.69	1.08 H	316	12.92	32.39
4	2376.00	35.50 AV	54.00	-18.50	1.08 H	316	3.11	32.39
5	2400.00	48.51 PK	74.00	-25.49	1.08 H	316	16.03	32.48
6	2400.00	18.41 AV	54.00	-35.59	1.08 H	316	-14.07	32.48
7	*2402.00	95.29 PK			1.08 H	316	62.80	32.49
8	*2402.00	65.19 AV			1.08 H	316	32.70	32.49
9	4804.00	49.76 PK	74.00	-24.24	1.06 H	54	11.54	38.22
10	4804.00	19.66 AV	54.00	-34.34	1.06 H	54	-18.56	38.22
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	1602.00	50.50 PK	74.00	-23.50	1.12 V	239	19.97	30.53
2	1602.00	42.06 AV	54.00	-11.94	1.12 V	239	11.53	30.53
3	2376.00	45.01 PK	74.00	-28.99	1.37 V	62	12.62	32.39
4	2376.00	34.04 AV	54.00	-19.96	1.37 V	62	1.65	32.39
5	2400.00	47.88 PK	74.00	-26.12	1.37 V	62	15.40	32.48
6	2400.00	17.78 AV	54.00	-36.22	1.37 V	62	-14.70	32.48
7	*2402.00	94.66 PK			1.37 V	62	62.17	32.49
8	*2402.00	64.56 AV			1.37 V	62	32.07	32.49
9	4804.00	49.56 PK	74.00	-24.44	1.12 V	175	11.34	38.22
10	4804.00	19.46 AV	54.00	-34.54	1.12 V	175	-18.76	38.22

- REMARKS:**
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
 2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.
 5. “ * “: Fundamental frequency.
 6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 * 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to: $20\log(3.125 / 100) = -30.1$ dB.
 7. Average value = peak reading + $20\log(\text{duty cycle})$.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 39	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	3.7Vdc	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 67%RH 1013hPa	TESTED BY	Mark Liao
TEST MODE	A		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1628.00	48.68 PK	74.00	-25.32	1.66 H	312	18.12	30.56
2	1628.00	44.69 AV	54.00	-9.31	1.66 H	312	14.13	30.56
3	*2441.00	94.11 PK			1.33 H	255	61.49	32.62
4	*2441.00	64.01 AV			1.33 H	255	31.39	32.62
5	4882.00	49.94 PK	74.00	-24.06	1.07 H	35	11.41	38.53
6	4882.00	19.86 AV	54.00	-34.14	1.07 H	35	-18.67	38.53
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	1628.00	49.10 PK	74.00	-24.90	1.08 V	285	18.54	30.56
2	1628.00	46.06 AV	54.00	-7.94	1.08 V	285	15.50	30.56
3	*2441.00	93.43 PK			1.13 V	21	60.81	32.62
4	*2441.00	63.33 AV			1.13 V	21	30.71	32.62
5	4882.00	49.62 PK	74.00	-24.38	1.22 V	310	11.09	38.53
6	4882.00	19.52 AV	54.00	-34.48	1.22 V	310	-19.01	38.53

- REMARKS:**
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
 2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.
 5. “ * “: Fundamental frequency.
 6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 * 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to: $20\log(3.125 / 100) = -30.1$ dB.
 7. Average value = peak reading + $20\log(\text{duty cycle})$.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 78	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER	3.7Vdc	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	24deg. C, 67%RH 1013hPa	TESTED BY	Mark Liao
TEST MODE	A		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	1654.00	48.78 PK	74.00	-25.22	1.63 H	354	18.19	30.59
2	1654.00	45.67 AV	54.00	-8.33	1.63 H	354	15.08	30.59
3	*2480.00	91.02 PK			1.26 H	45	58.28	32.74
4	*2480.00	60.92 AV			1.26 H	45	28.18	32.74
5	2483.50	45.68 PK	74.00	-28.32	1.12 H	88	12.92	32.76
6	2483.50	15.58 AV	54.00	-38.42	1.12 H	88	-17.18	32.76
7	4960.00	50.74 PK	74.00	-23.26	1.12 H	88	12.03	38.71
8	4960.00	20.64 AV	54.00	-33.36	1.12 H	88	-18.07	38.71
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	1654.00	47.20 PK	74.00	-26.80	1.62 V	82	16.61	30.59
2	1654.00	42.41 AV	54.00	-11.59	1.62 V	82	11.82	30.59
3	*2480.00	89.33 PK			1.10 V	326	56.59	32.74
4	*2480.00	59.23 AV			1.10 V	326	26.49	32.74
5	2483.50	43.99 PK	74.00	-30.01	1.10 V	326	11.23	32.76
6	2483.50	13.89 AV	54.00	-40.11	1.10 V	326	-18.87	32.76
7	4960.00	50.53 PK	74.00	-23.47	1.19 V	181	11.82	38.71
8	4960.00	20.43 AV	54.00	-33.57	1.19 V	181	-18.28	38.71

- REMARKS:**
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
 2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.
 5. “ * “: Fundamental frequency.
 6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 * 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to: $20\log(3.125 / 100) = -30.1$ dB.
 7. Average value = peak reading + $20\log(\text{duty cycle})$.



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BELOW 1GHz WORST-CASE DATA : GFSK MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	FREQUENCY RANGE	Below 1000MHz
INPUT POWER	3.7Vdc	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	24deg. C, 67%RH 1013hPa	TESTED BY	Antony Lee
TEST MODE	A		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	39.62	25.99 QP	40.00	-14.01	1.25 H	106	10.90	15.09
2	414.87	27.53 QP	46.00	-18.47	1.50 H	217	9.11	18.42
3	624.85	24.70 QP	46.00	-21.30	1.00 H	43	1.61	23.09
4	685.13	26.01 QP	46.00	-19.99	1.00 H	274	1.34	24.67
5	897.05	28.53 QP	46.00	-17.47	1.25 H	121	0.68	27.85
6	945.66	29.37 QP	46.00	-16.63	1.00 H	211	0.86	28.50
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	414.87	36.89 QP	46.00	-9.11	1.00 V	184	18.47	18.42
2	519.86	27.80 QP	46.00	-18.20	1.00 V	271	6.96	20.84
3	624.85	33.51 QP	46.00	-12.49	1.50 V	202	10.42	23.09
4	671.52	31.23 QP	46.00	-14.77	2.00 V	298	6.90	24.33
5	832.89	32.96 QP	46.00	-13.04	1.00 V	10	6.35	26.62
6	963.16	30.49 QP	54.00	-23.51	1.00 V	313	1.88	28.62

- 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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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	FREQUENCY RANGE	Below 1000MHz
INPUT POWER	120Vac, 60 Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	24deg. C, 67%RH 1013hPa	TESTED BY	Antony Lee
TEST MODE	B		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	132.95	30.86 QP	43.50	-12.64	1.50 H	91	18.50	12.36
2	176.19	25.98 QP	43.50	-17.52	1.23 H	85	13.02	12.96
3	199.96	31.24 QP	43.50	-12.26	1.23 H	29	20.77	10.46
4	414.87	35.48 QP	46.00	-10.52	1.00 H	91	17.06	18.42
5	665.68	37.95 QP	46.00	-8.05	1.25 H	196	13.77	24.18
6	729.84	36.83 QP	46.00	-9.17	1.50 H	79	11.52	25.31
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	101.84	35.04 QP	43.50	-8.46	1.00 V	19	23.47	11.58
2	187.39	35.57 QP	43.50	-7.93	1.00 V	13	24.41	11.16
3	220.44	35.99 QP	46.00	-10.01	1.25 V	46	24.15	11.84
4	414.87	38.75 QP	46.00	-7.25	1.25 V	37	20.33	18.42
5	463.48	37.24 QP	46.00	-8.76	1.25 V	133	17.63	19.61
6	832.89	36.98 QP	46.00	-9.02	1.00 V	133	10.36	26.62

- 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.

5.2 CONDUCTED EMISSION MEASUREMENT

5.2.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

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

- NOTE:**
1. The lower limit shall apply at the transition frequencies.
 2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.
 3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

5.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESCS30	100288	Sep. 22, 2008	Sep. 21, 2009
RF signal cable Woken	5D-FB	Cable-HYCO2-01	Dec. 31, 2008	Dec. 30, 2009
LISN ROHDE & SCHWARZ	ESH2-Z5	100100	Dec. 29, 2008	Dec. 28, 2009
LISN ROHDE & SCHWARZ	ESH3-Z5	100311	Jul. 30, 2008	Jul. 29, 2009
Software ADT	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 HwaYa Shielded Room 2.
 3. The VCCI Site Registration No. is C-2047.

5.2.3 TEST PROCEDURES

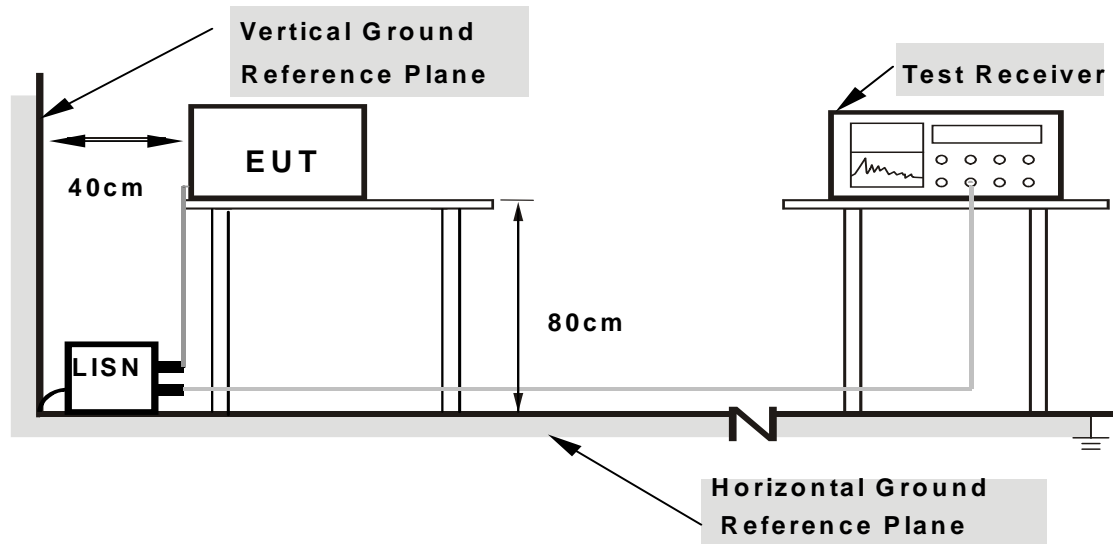
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling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

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

5.2.4 DEVIATION FROM TEST STANDARD

No deviation.

5.2.5 TEST SETUP



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

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

5.2.6 EUT OPERATING CONDITIONS

Same as 4.2.6.

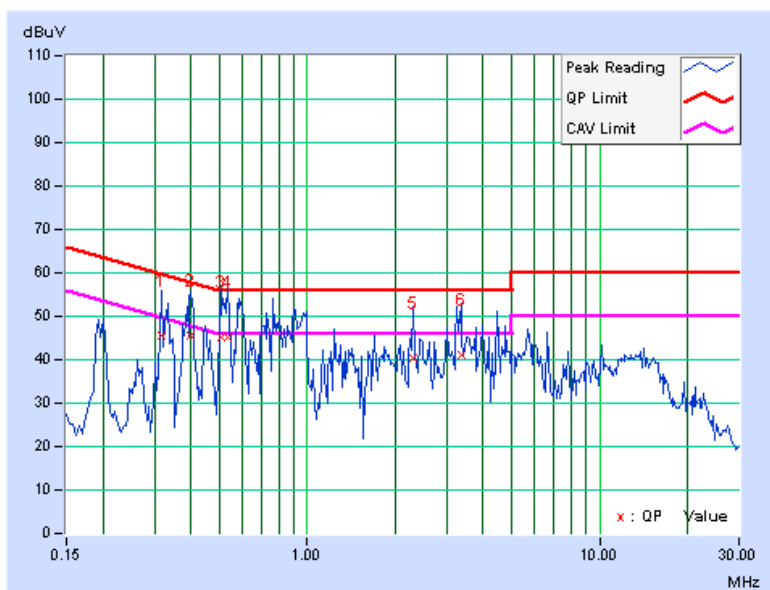
5.2.7 TEST RESULTS

CONDUCTED WORST CASE DATA: GFSK MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	PHASE	Line 1
MODULATION TYPE	GFSK	6dB BANDWIDTH	9 kHz
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH, 1012hPa	INPUT POWER	120Vac, 60 Hz
TEST MODE	B	TESTED BY	Mark Liao

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.318	0.14	45.42	-	45.56	-	59.76	49.76	-14.20	-
2	0.400	0.14	45.29	-	45.43	-	57.85	47.85	-12.42	-
3	0.511	0.15	44.94	-	45.09	-	56.00	46.00	-10.91	-
4	0.533	0.15	45.18	-	45.33	-	56.00	46.00	-10.67	-
5	2.309	0.20	40.00	-	40.20	-	56.00	46.00	-15.80	-
6	3.359	0.25	40.70	-	40.95	-	56.00	46.00	-15.05	-

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



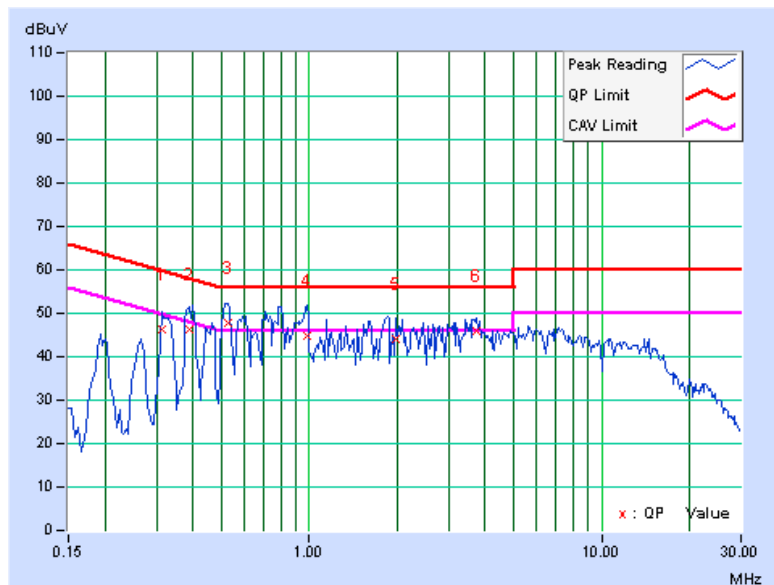


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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 0	PHASE	Line 2
MODULATION TYPE	GFSK	6dB BANDWIDTH	9 kHz
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH, 1012hPa	INPUT POWER	120Vac, 60 Hz
TEST MODE	B	TESTED BY	Mark Liao

No	Freq. [MHz]	Corr. Factor [dB]	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.314	0.14	46.23	-	46.37	-	59.86	49.86	-13.49	-
2	0.388	0.15	45.98	-	46.13	-	58.10	48.10	-11.97	-
3	0.525	0.15	47.70	38.61	47.85	38.76	56.00	46.00	-8.15	-7.24
4	0.982	0.17	44.82	-	44.99	-	56.00	46.00	-11.01	-
5	1.973	0.20	43.76	-	43.96	-	56.00	46.00	-12.04	-
6	3.727	0.29	45.52	-	45.81	-	56.00	46.00	-10.19	-

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



5.3 NUMBER OF HOPPING FREQUENCY USED

5.3.1 LIMIT OF HOPPING FREQUENCY USED

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

5.3.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
R&S SPECTRUM ANALYZER	FSP40	100041	Apr. 22, 2008	Apr. 21, 2009

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

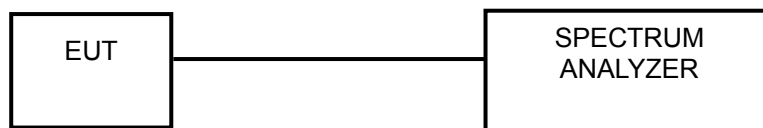
5.3.3 TEST PROCEDURES

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

5.3.4 DEVIATION FROM TEST STANDARD

No deviation.

5.3.5 TEST SETUP



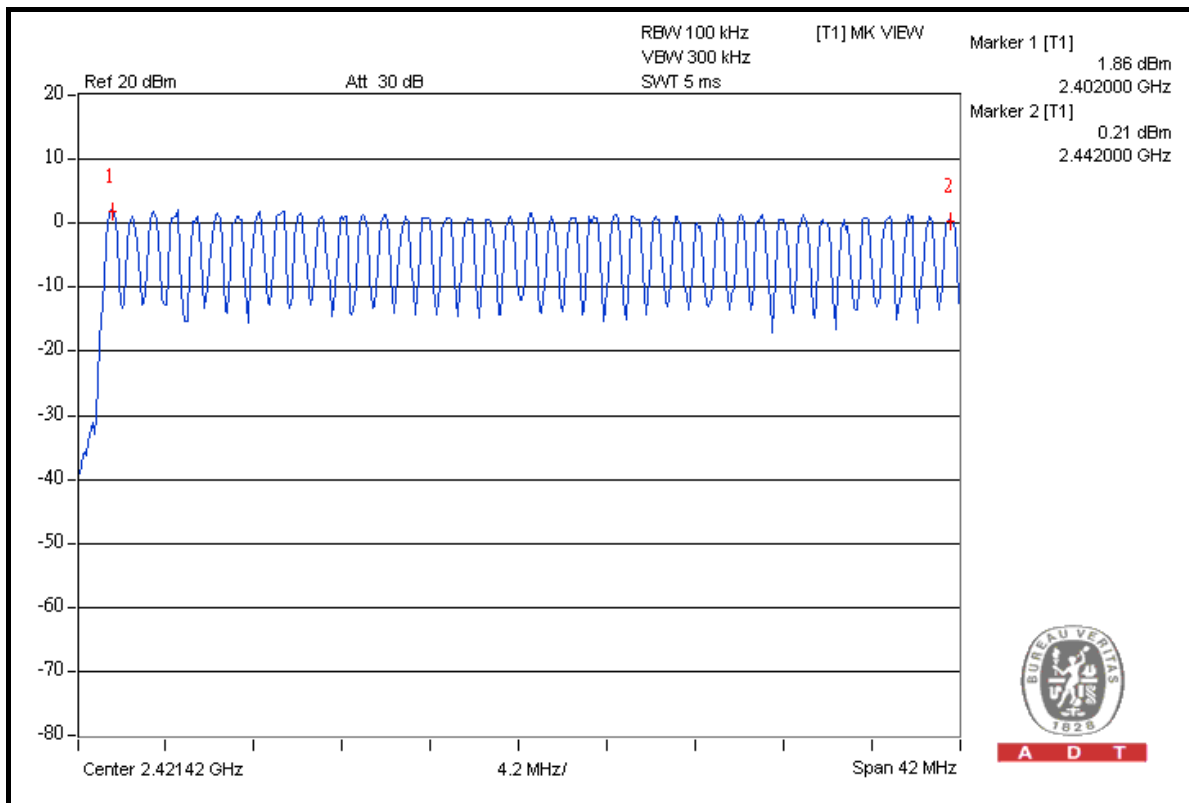
5.3.6 TEST RESULTS

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

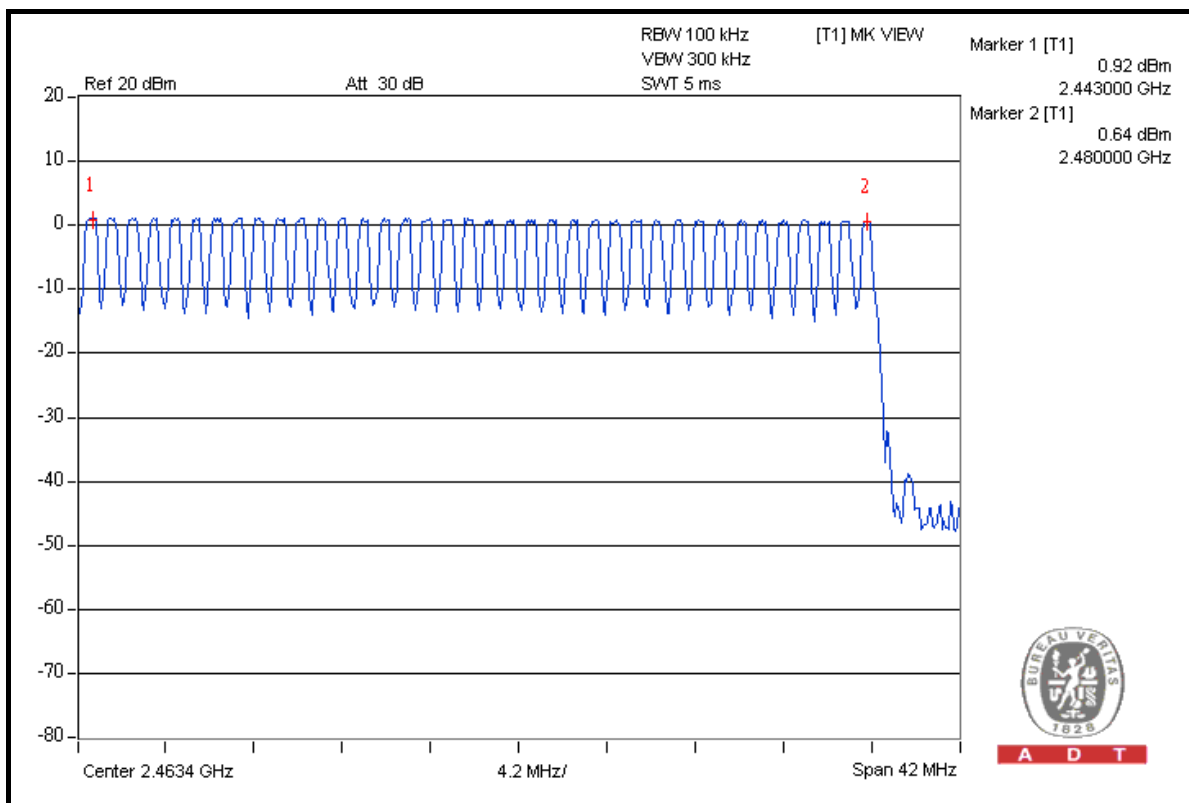


A D T

GFSK MODULATION



A D T

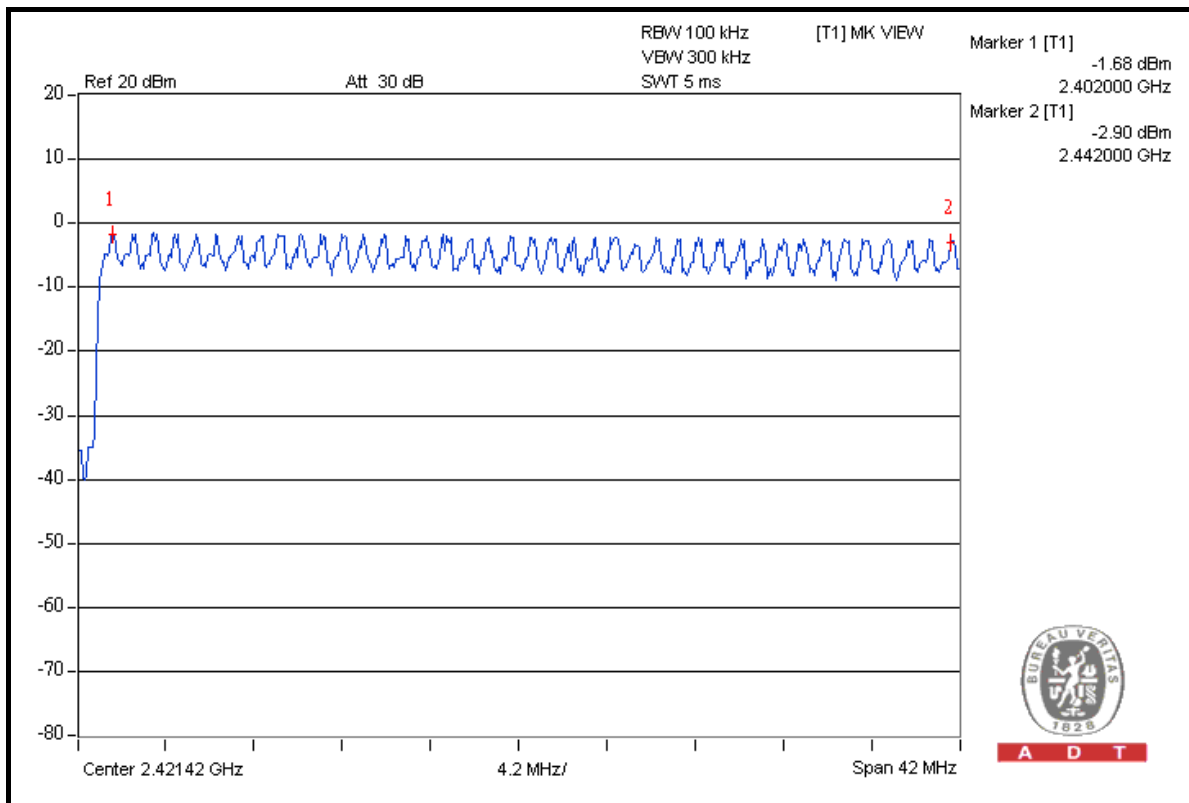


A D T

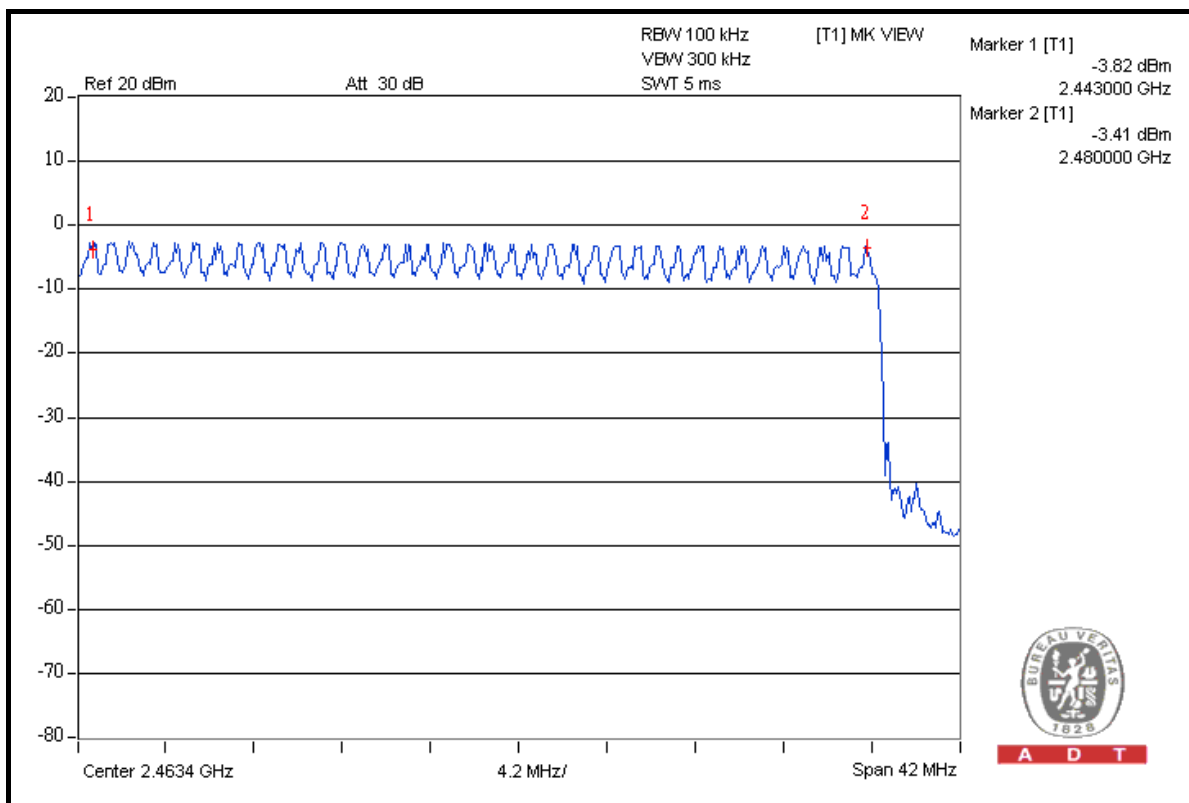


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8DPSK MODULATION



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5.4 DWELL TIME ON EACH CHANNEL

5.4.1 LIMIT OF DWELL TIME USED

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

5.4.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
R&S SPECTRUM ANALYZER	FSP40	100041	Apr. 22, 2008	Apr. 21, 2009

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

5.4.3 TEST PROCEDURES

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

5.4.4 DEVIATION FROM TEST STANDARD

No deviation.

5.4.5 TEST SETUP

Same as 5.3.5.

5.4.6 TEST RESULTS

GFSK MODULATION

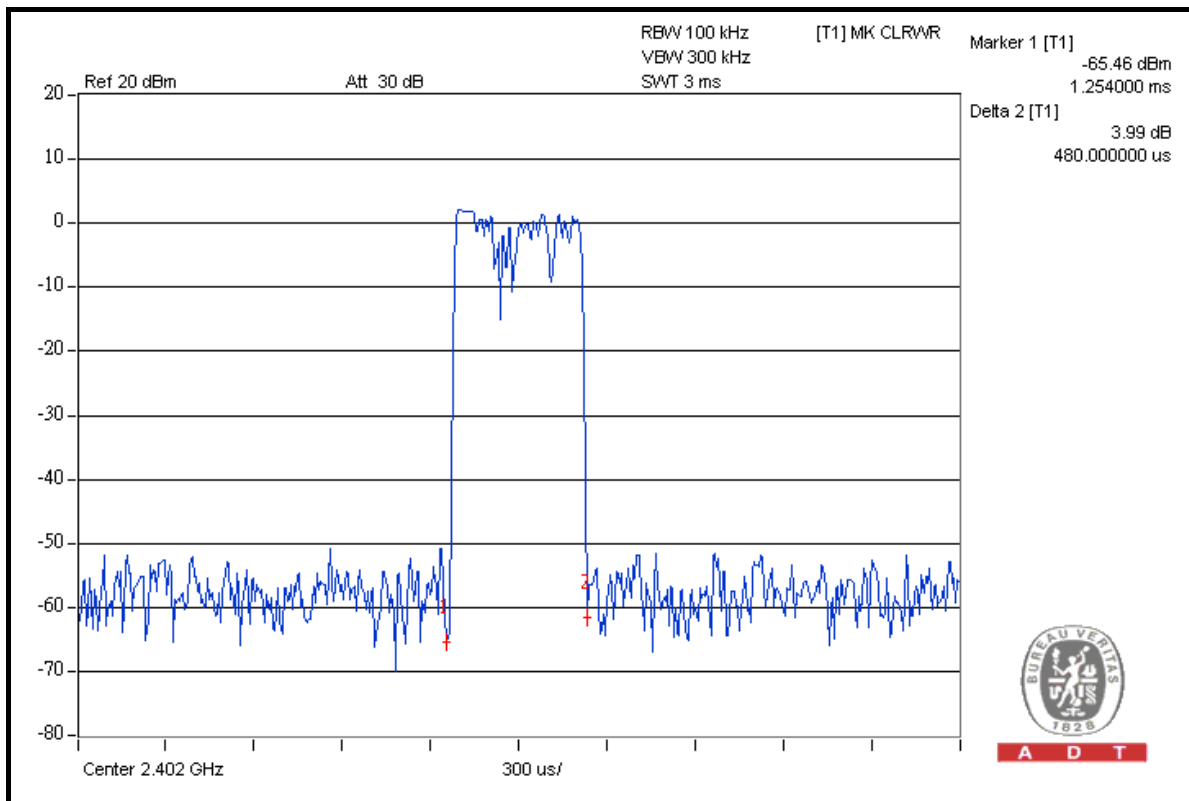
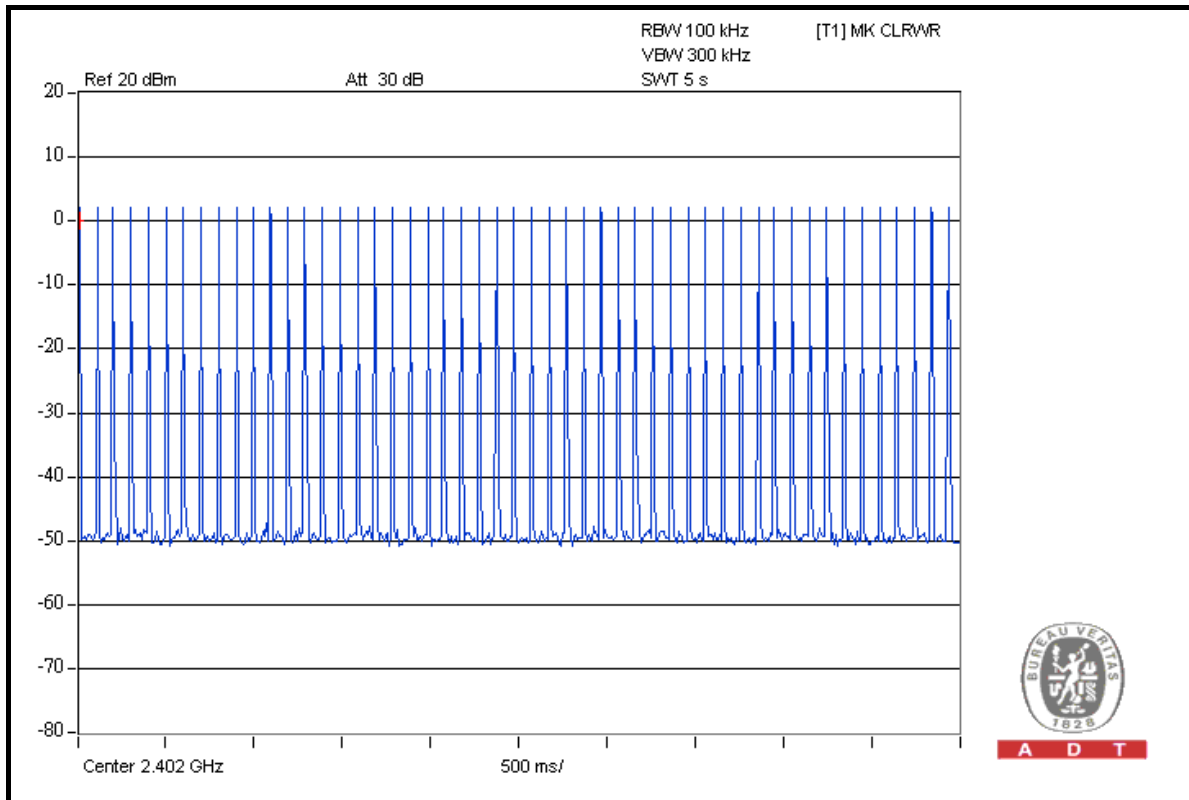
Mode	Number of transmission in a 31.6 (79Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (msec)
DH1	50 (times / 5 sec) * 6.32 = 316.00 times	0.480	151.680	400
DH3	26 (times / 5 sec) * 6.32 = 164.32 times	1.752	287.889	400
DH5	17 (times / 5 sec) * 6.32 = 107.44times	3.050	327.692	400

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



A D T

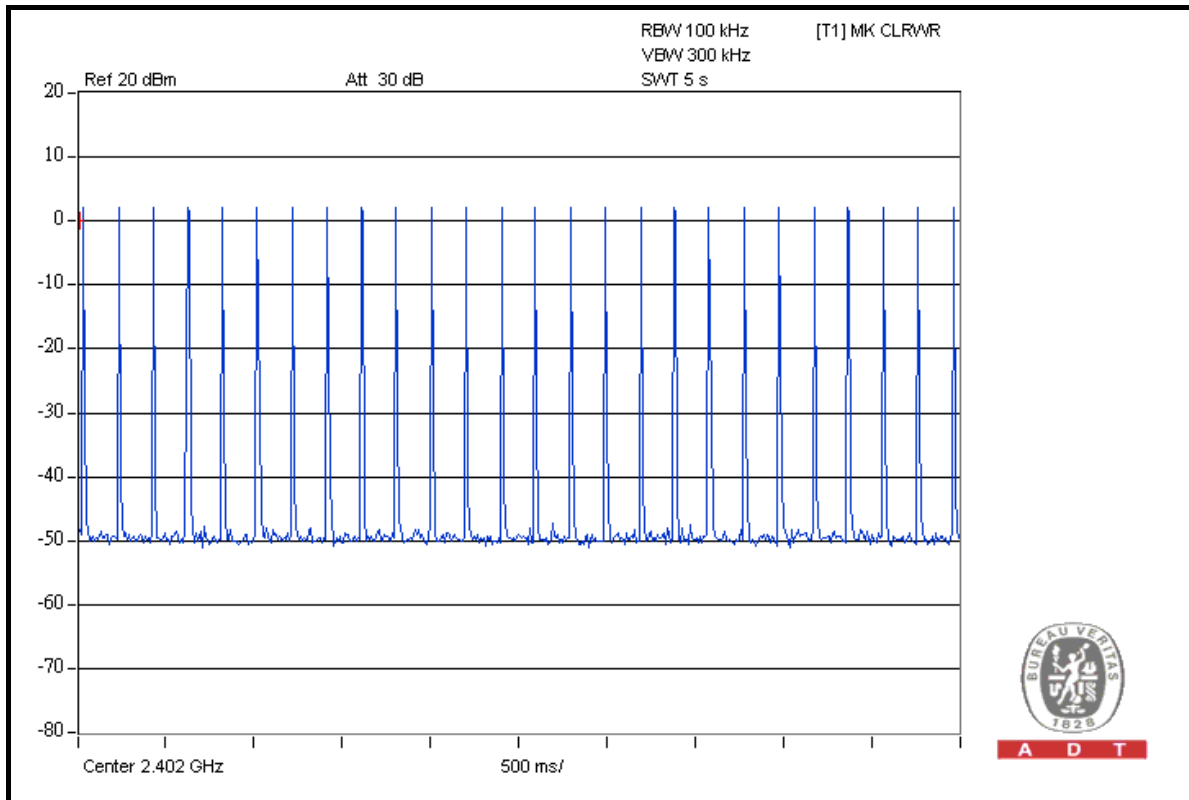
DH1



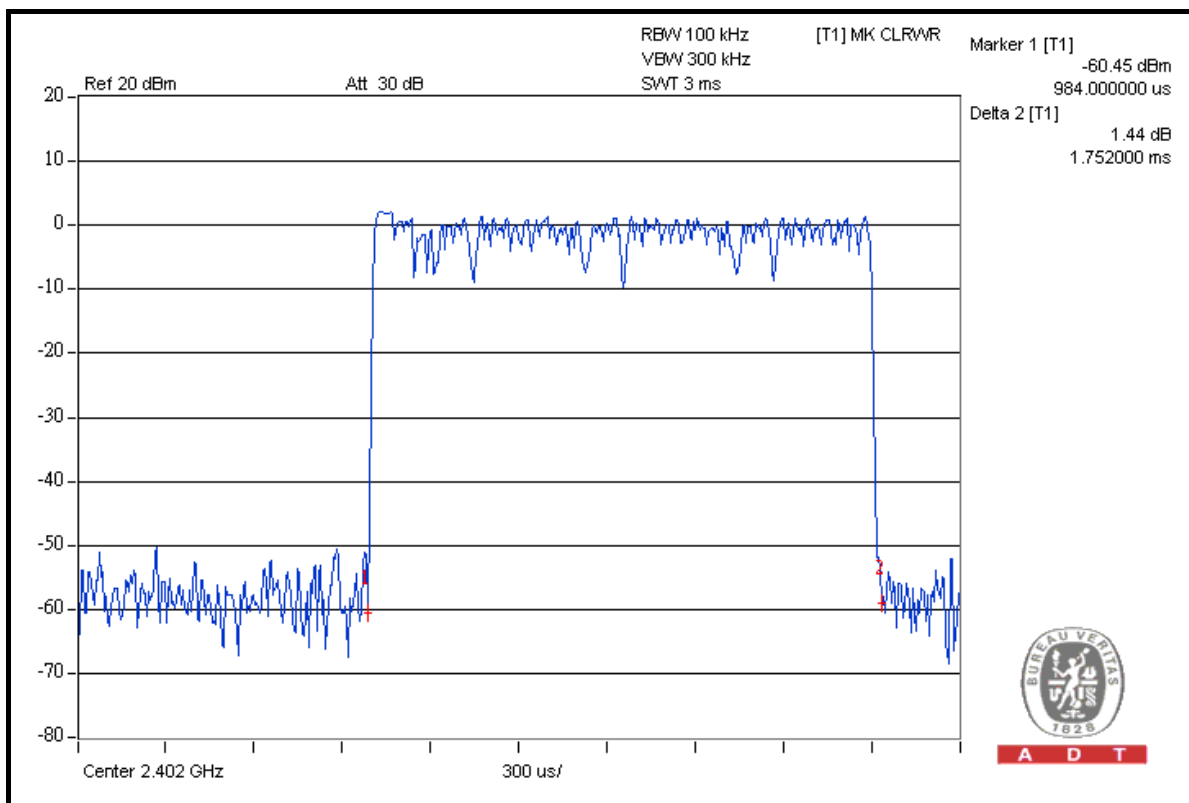


A D T

DH3



A D T

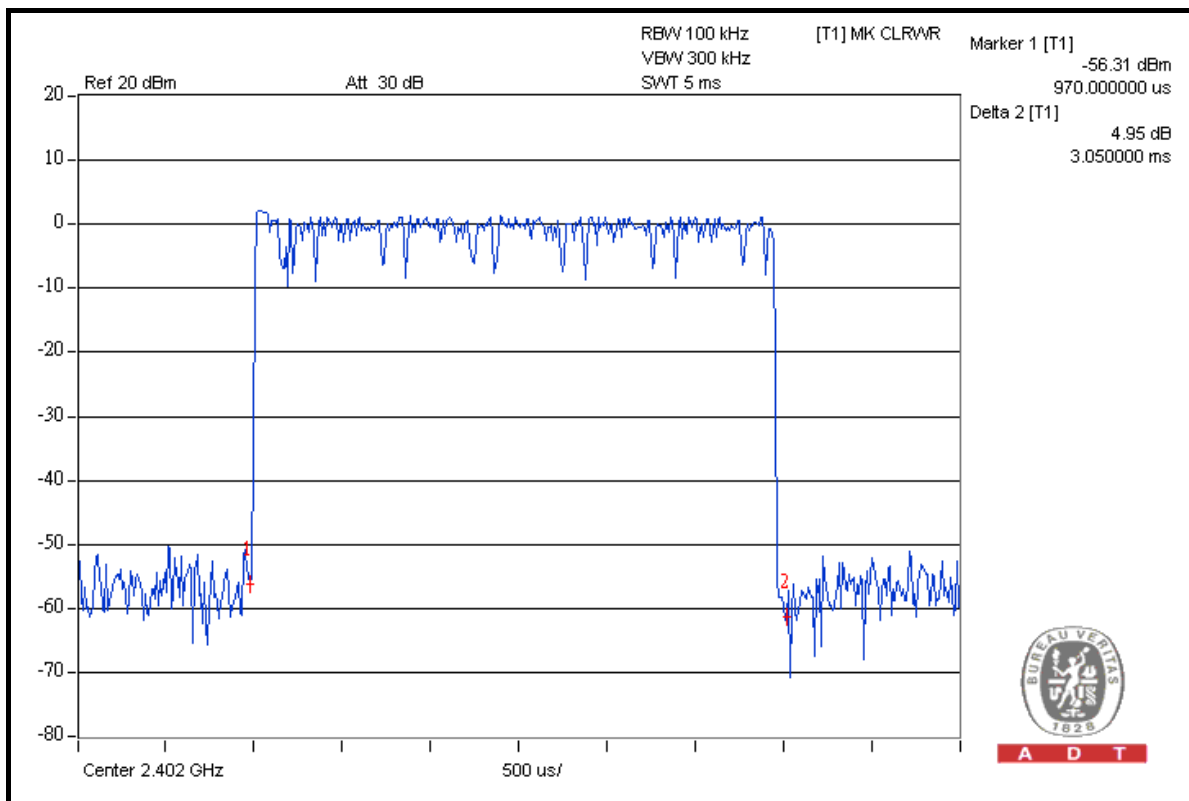
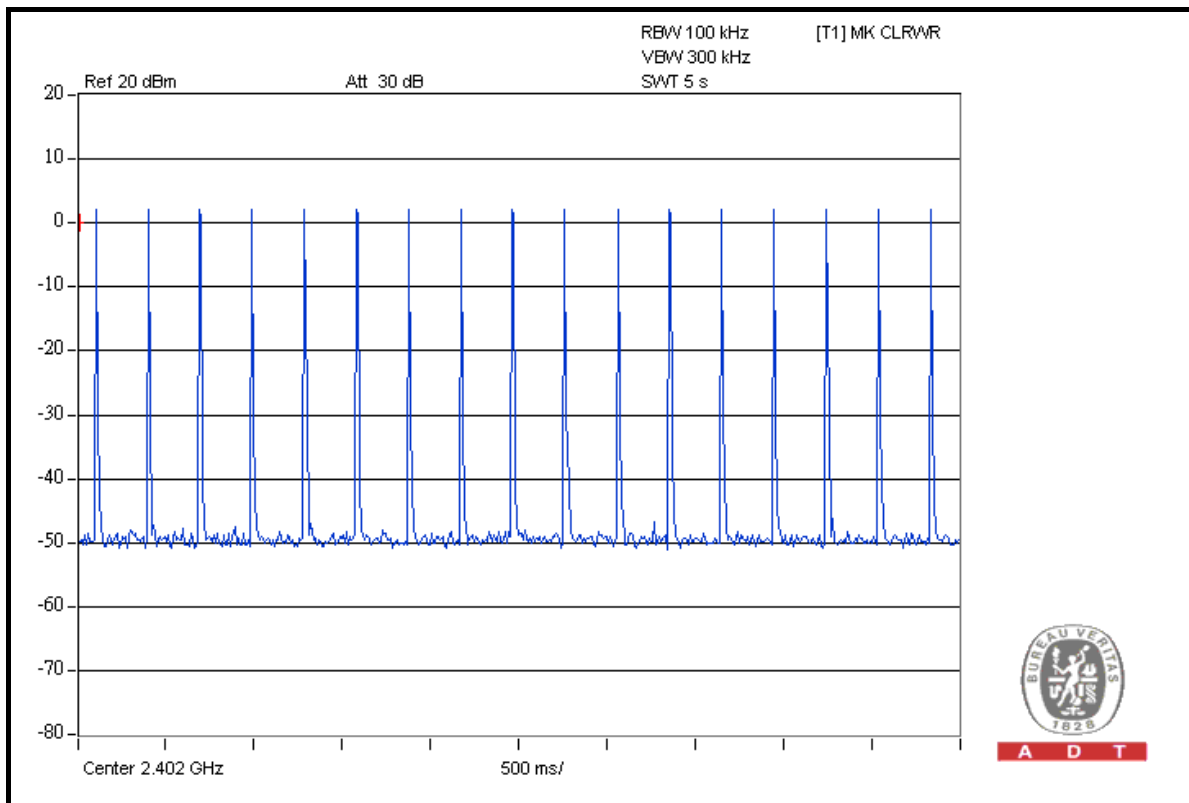


A D T



A D T

DH5



8DPSK MODULATION

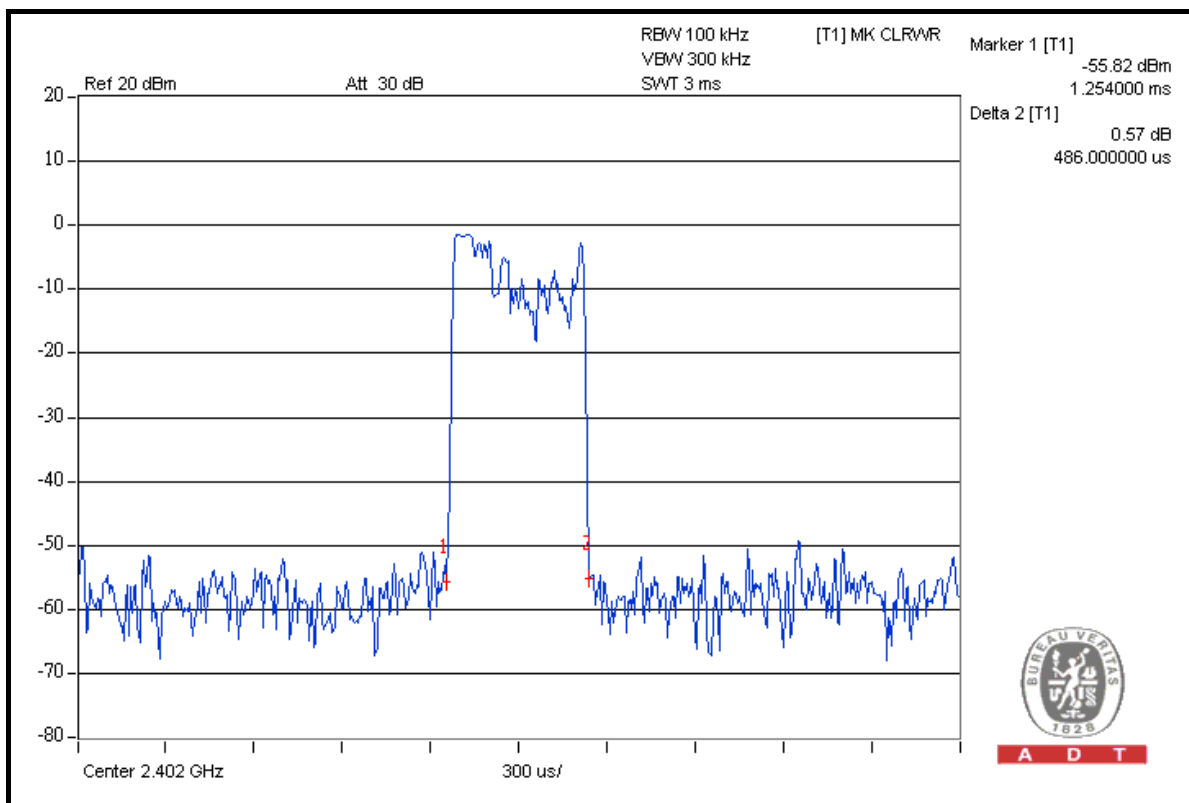
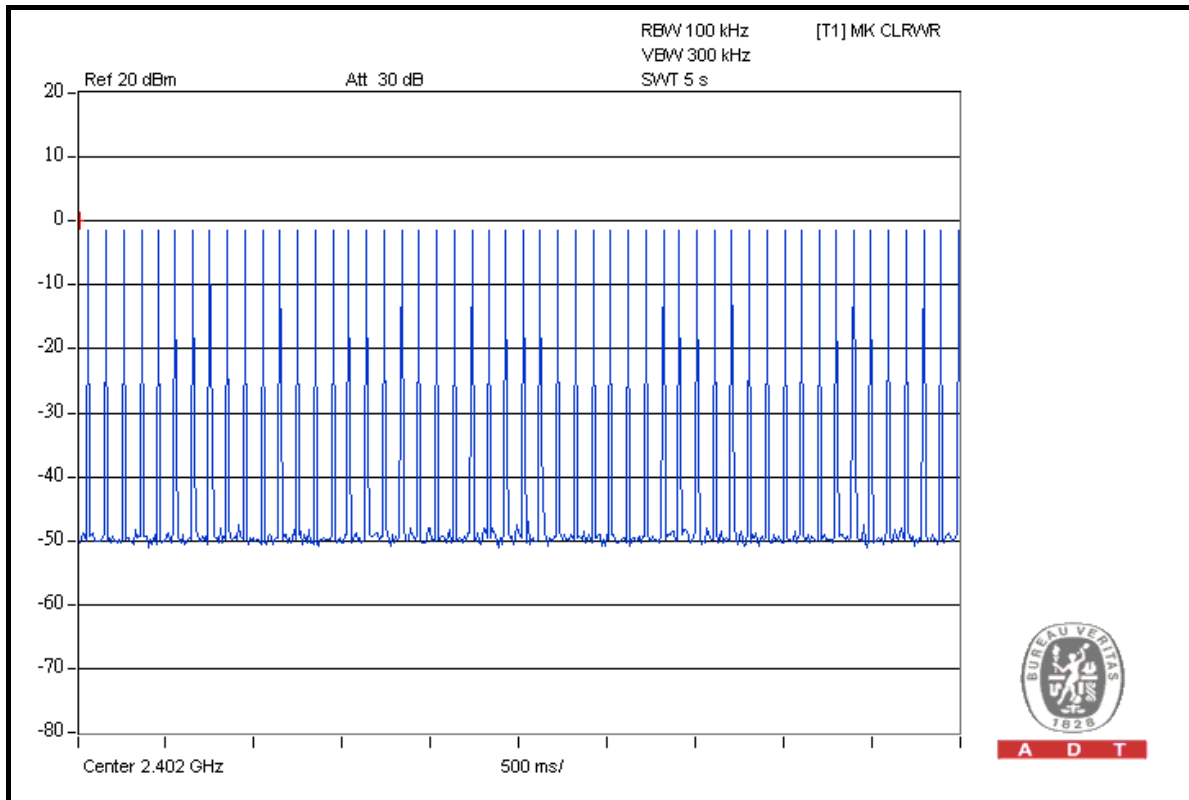
Mode	Number of transmission in a 31.6 (79Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (msec)
DH1	$50 \text{ (times / 5 sec)} * 6.32 = 316.00 \text{ times}$	0.486	153.576	400
DH3	$25 \text{ (times / 5 sec)} * 6.32 = 158.00 \text{ times}$	1.752	276.816	400
DH5	$17 \text{ (times / 5 sec)} * 6.32 = 107.44 \text{ times}$	3.010	323.394	400

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



A D T

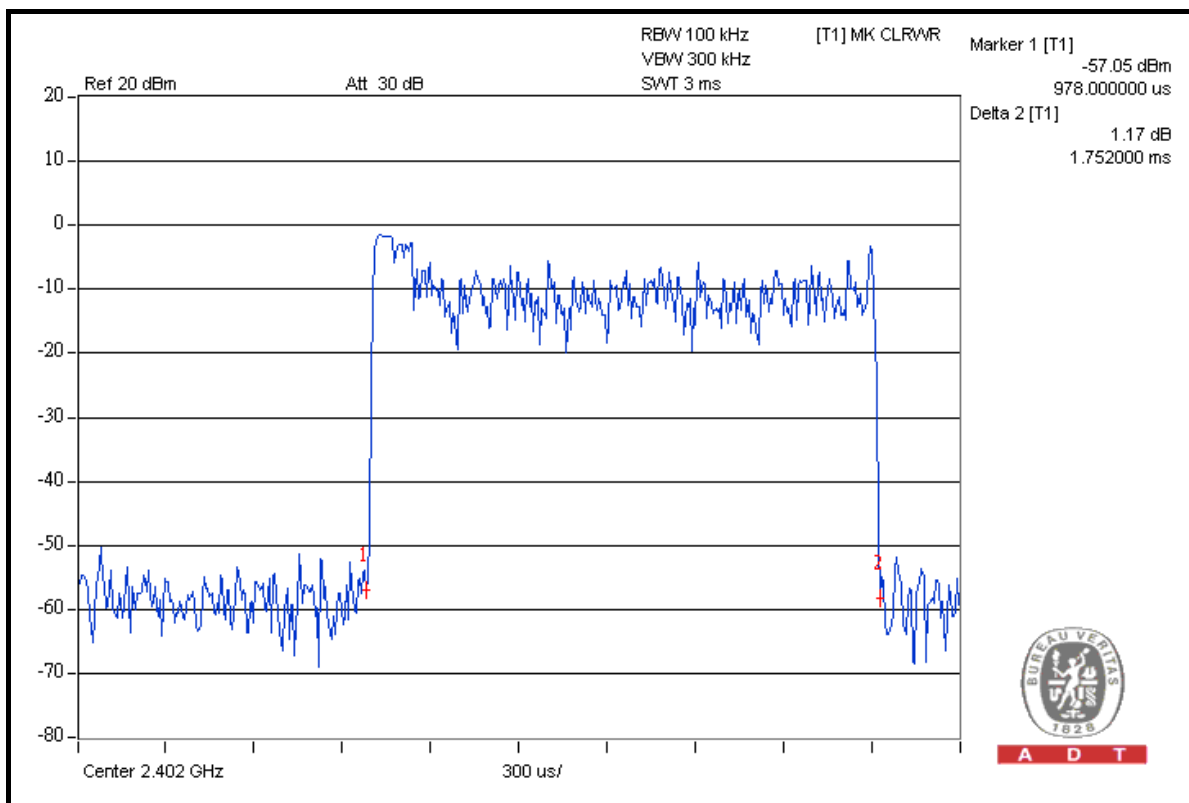
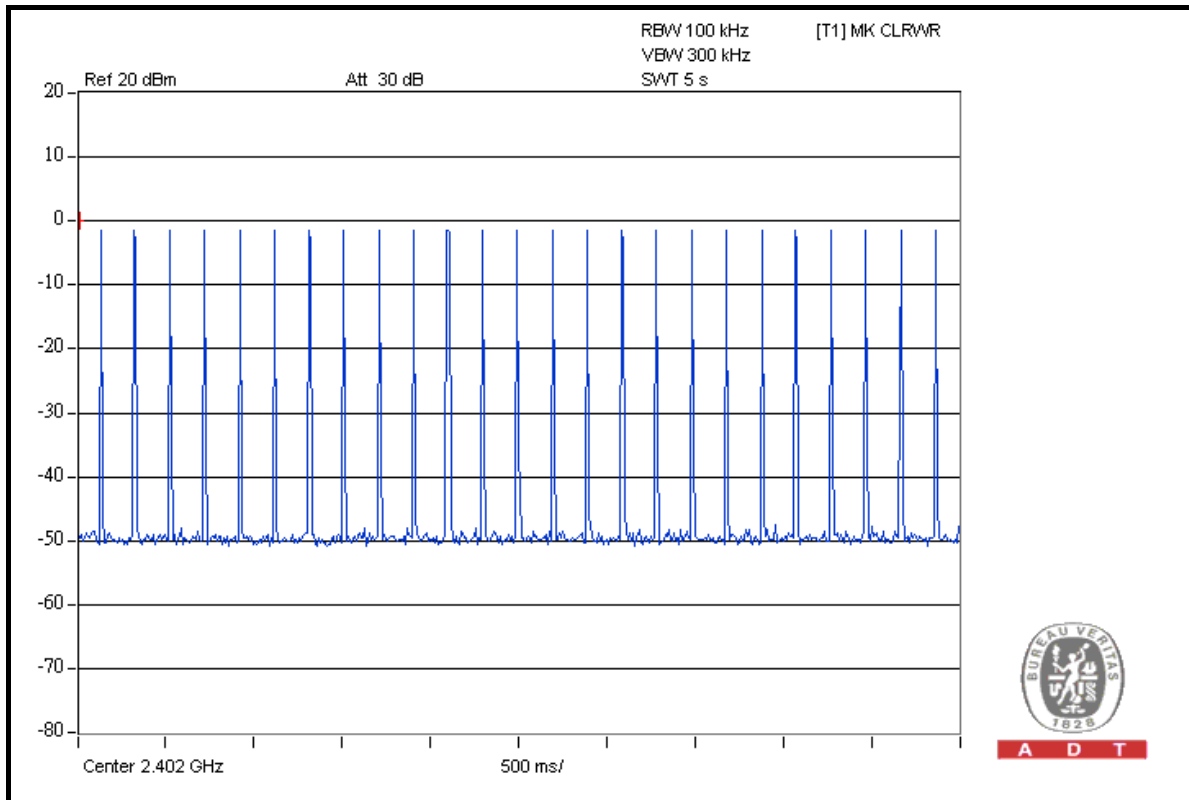
DH1





A D T

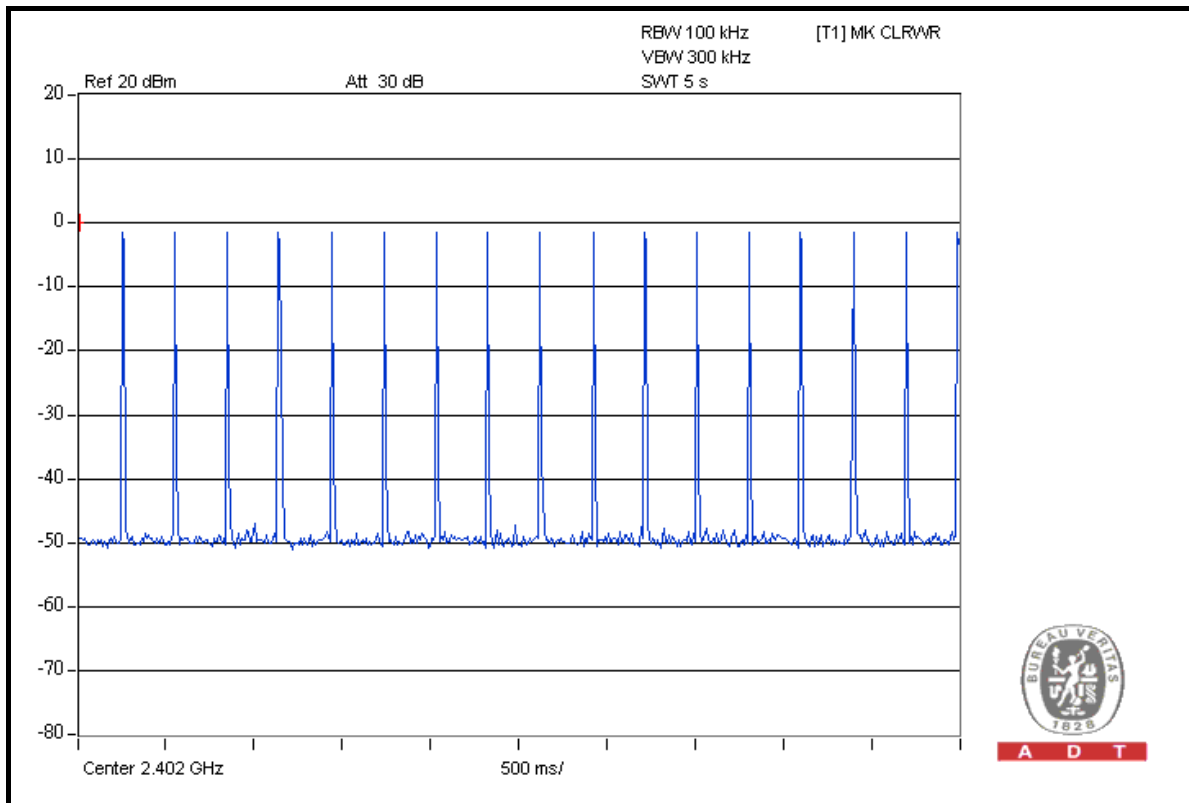
DH3



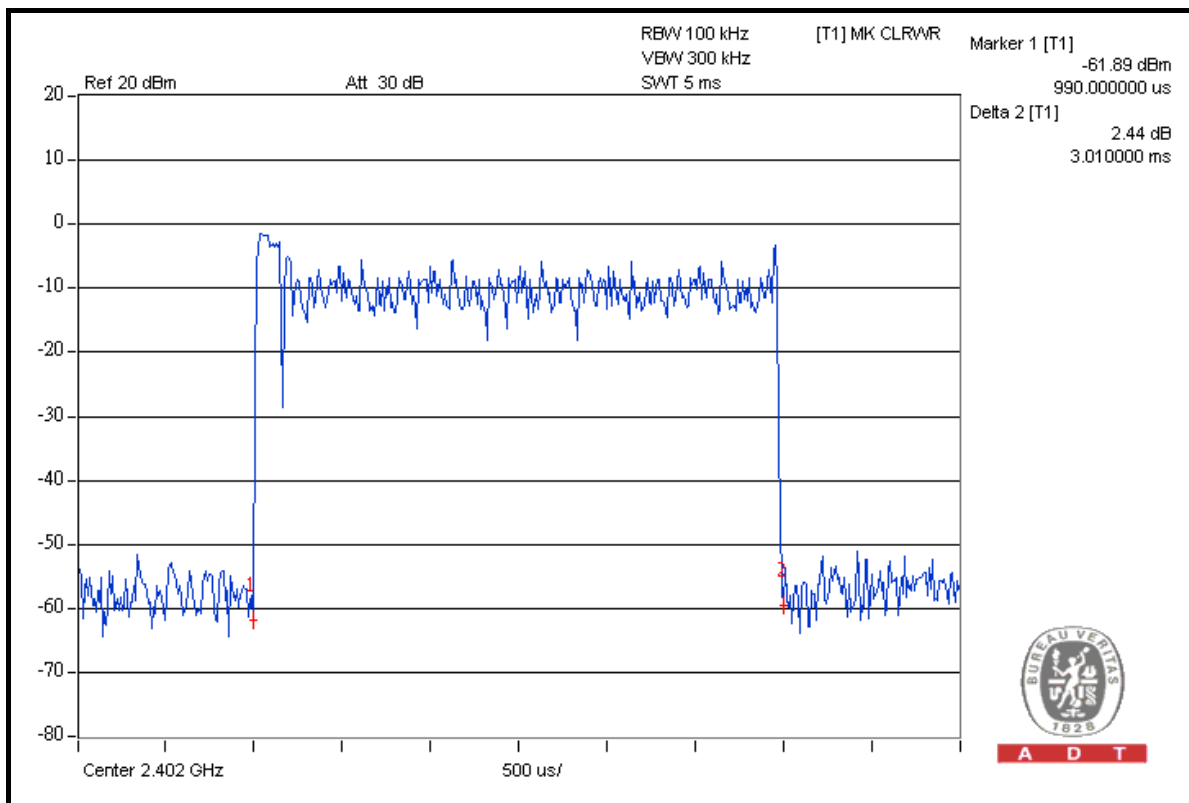


A D T

DH5



A D T



A D T



5.5 CHANNEL BANDWIDTH

5.5.1 LIMITS OF CHANNEL BANDWIDTH

For frequency hopping system operating in the 2400-2483.5MHz, If the 20dB bandwidth of hopping channel is greater than 25kHz, two-thirds 20dB bandwidth of hopping channel shall be a minimum limit for the hopping channel separation.

5.5.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
R&S SPECTRUM ANALYZER	FSP40	100041	Apr. 22, 2008	Apr. 21, 2009

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

5.5.3 TEST PROCEDURE

- a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- c. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
- d. Repeat above procedures until all frequencies measured were complete.

5.5.4 DEVIATION FROM TEST STANDARD

No deviation.

5.5.5 TEST SETUP

Same as 5.3.5.

5.5.6 EUT OPERATING CONDITION

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

5.5.7 TEST RESULTS

GFSK MODULATION

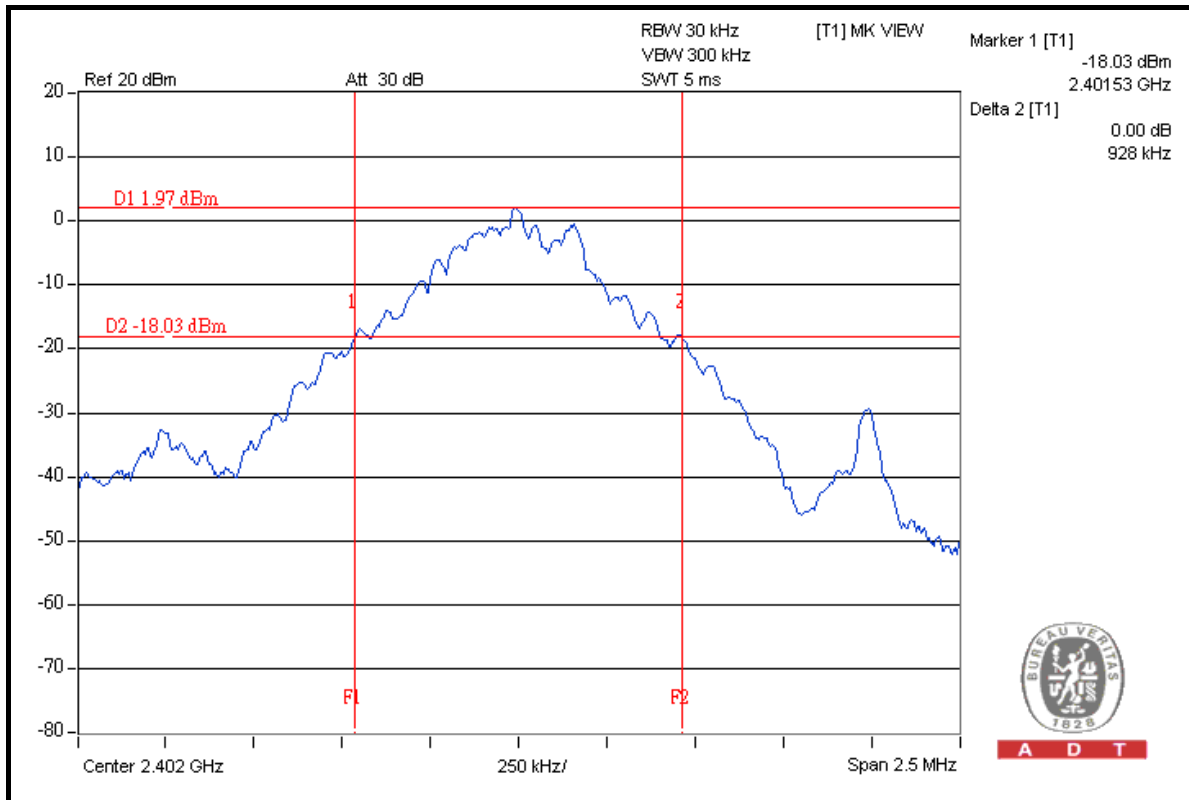
MODULATION TYPE	GFSK	ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH, 1017hPa
INPUT POWER	3.7Vdc	TESTED BY	Mark Liao
TEST MODE	A		

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
0	2402	0.928
39	2441	0.930
78	2480	0.930

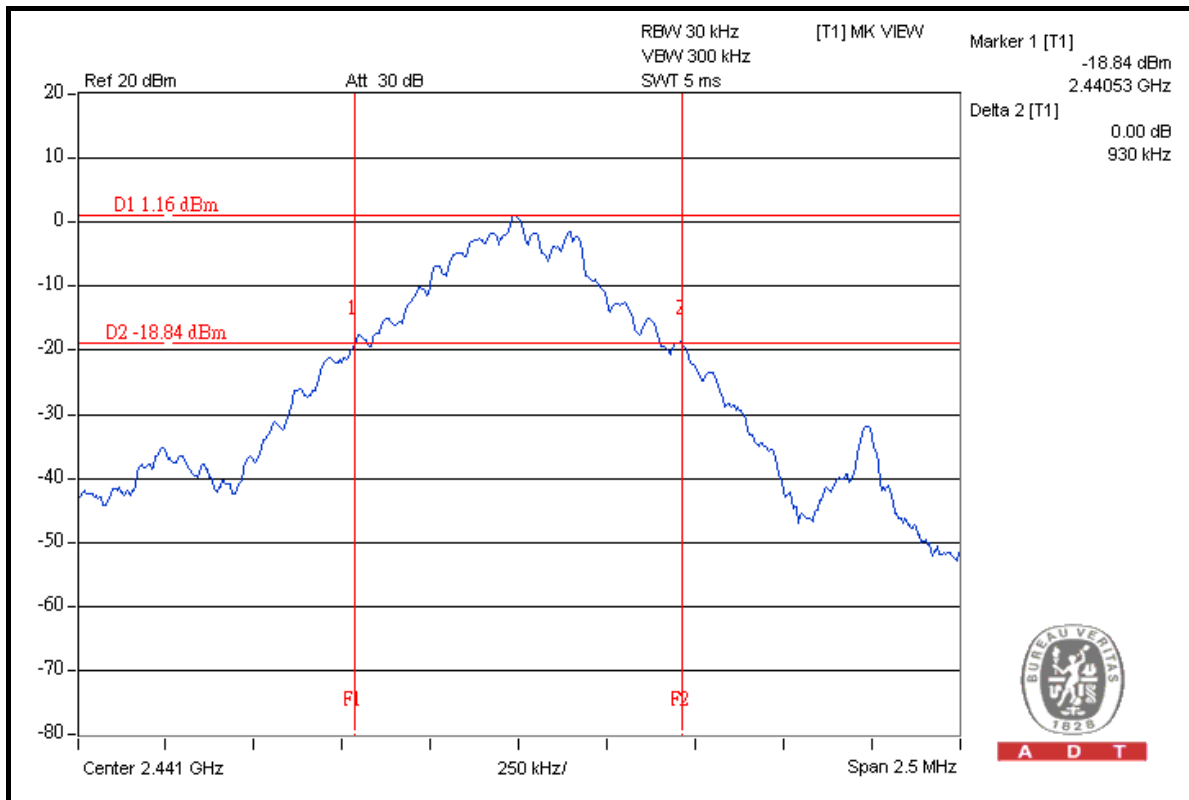


A D T

CH 0



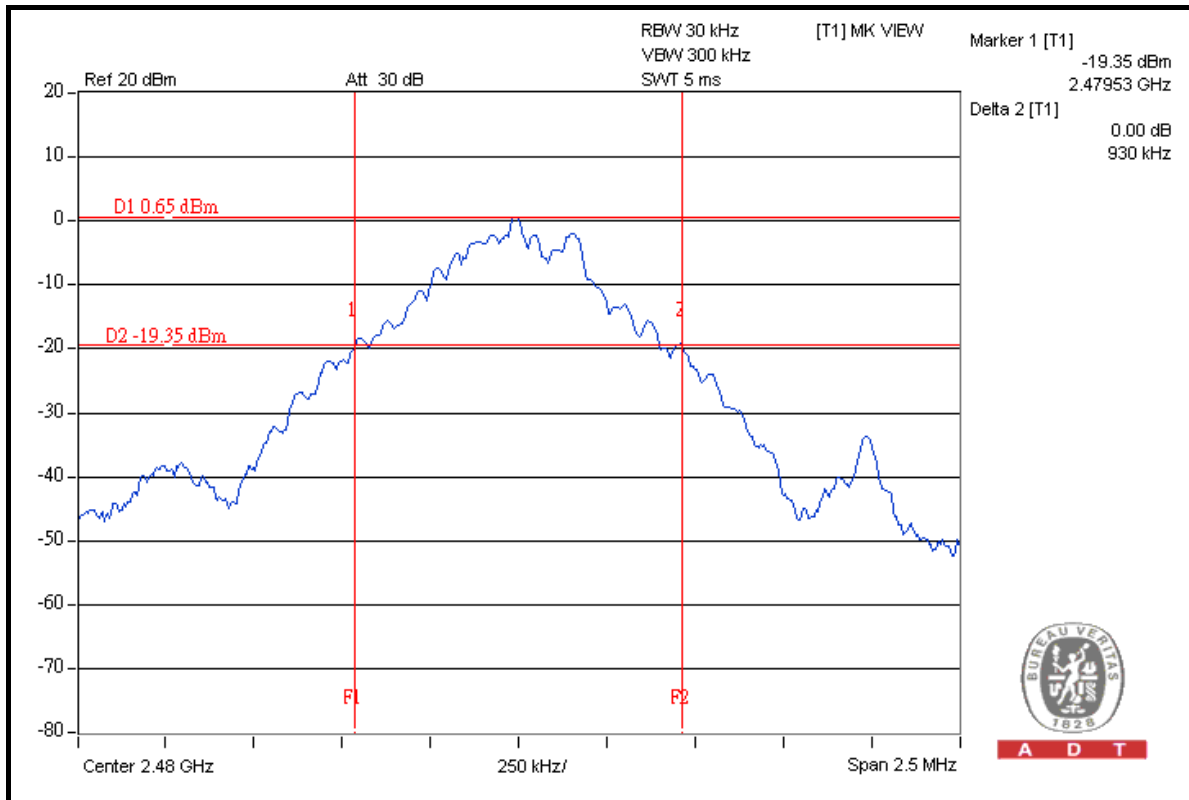
CH 39





A D T

CH 78





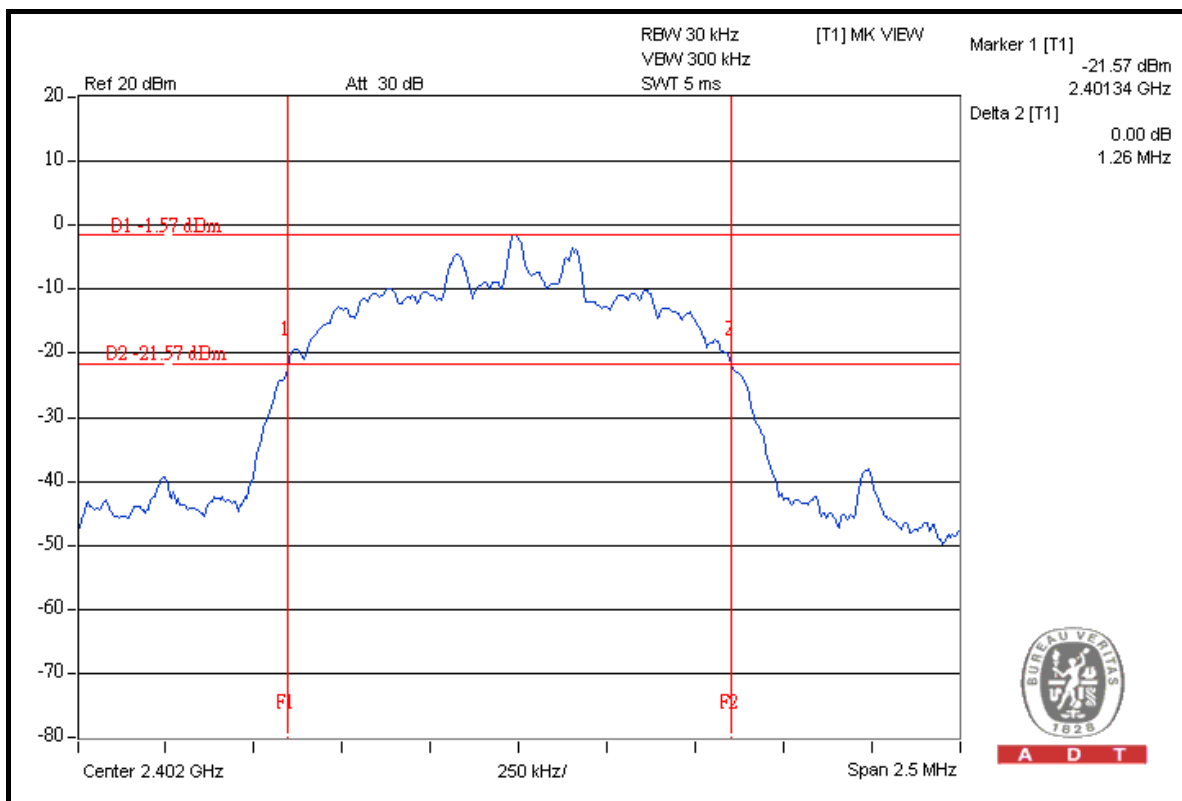
A D T

8DPSK MODULATION

MODULATION TYPE	8DPSK	ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH, 1017hPa
INPUT POWER	3.7Vdc	TESTED BY	Mark Liao
TEST MODE	A		

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
0	2402	1.260
39	2441	1.260
78	2480	1.260

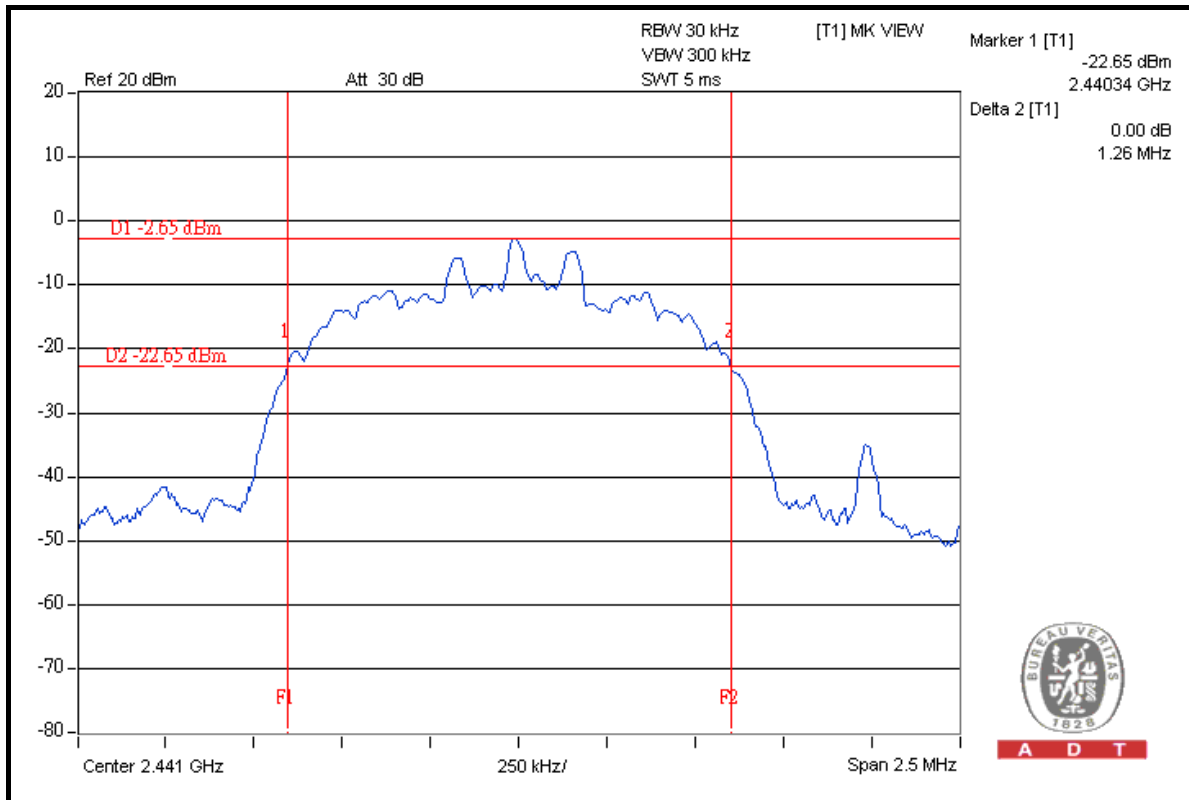
CH 0





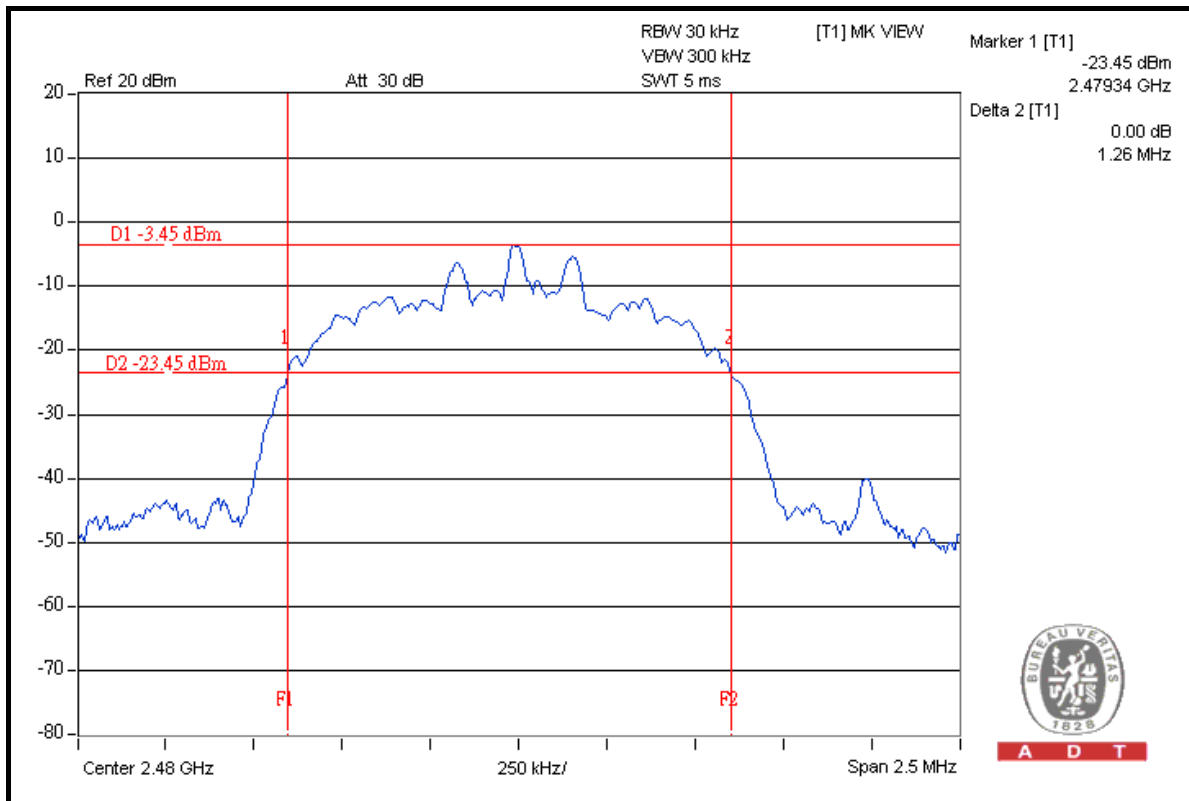
A D T

CH 39



A D T

CH 78



A D T

5.6 HOPPING CHANNEL SEPARATION

5.6.1 LIMIT OF HOPPING CHANNEL SEPARATION

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

5.6.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
R&S SPECTRUM ANALYZER	FSP40	100041	Apr. 22, 2008	Apr. 21, 2009

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

5.6.3 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.

5.6.4 DEVIATION FROM TEST STANDARD

No deviation.

5.6.5 TEST SETUP

Same as 5.3.5.

5.6.6 TEST RESULTS

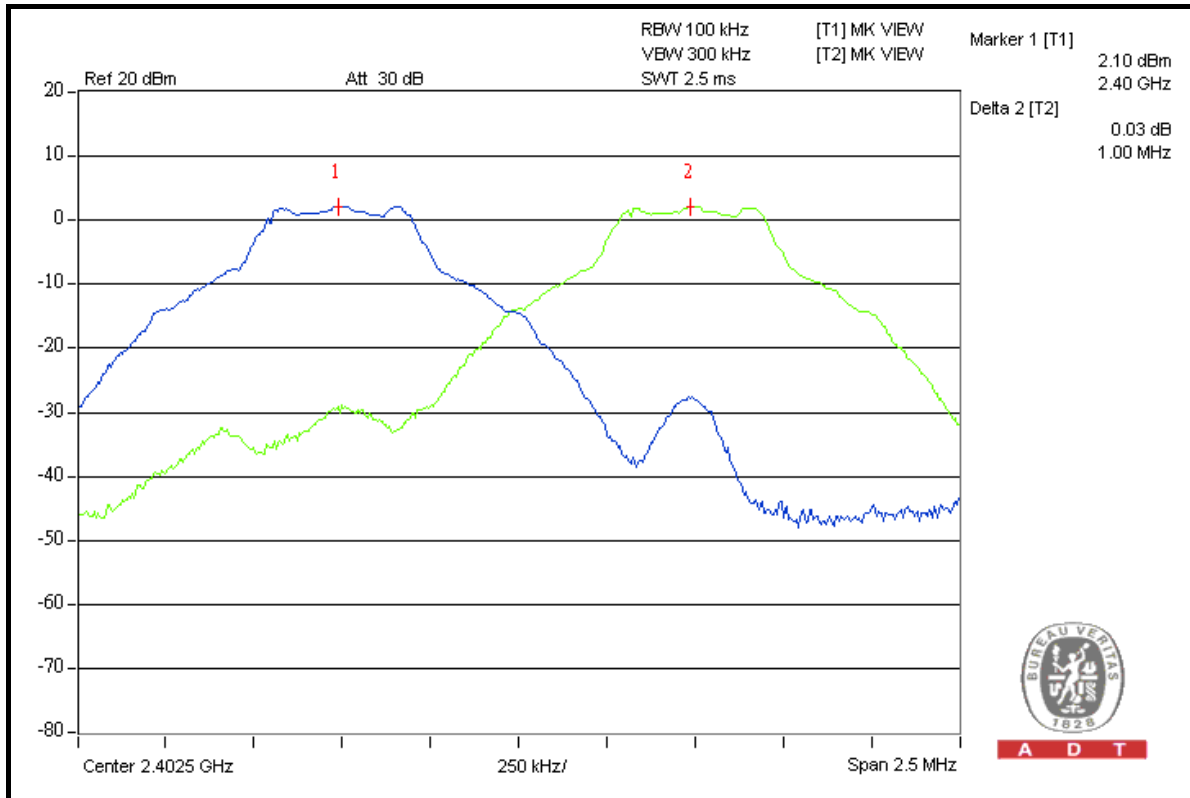
GFSK MODULATION

MODULATION TYPE	GFSK	ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH, 1017hPa
INPUT POWER	3.7Vdc	TESTED BY	Mark Liao
TEST MODE	A		

CHANNEL	FREQUENCY (MHz)	ADJACENT CHANNEL SEPARATION (MHz)	20dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
0	2402	1.000	0.928	0.619	PASS
39	2441	1.000	0.930	0.620	PASS
78	2480	1.000	0.930	0.620	PASS

NOTE: The minimum limit is two-third 20dB bandwidth. Test results please refer to next two pages.

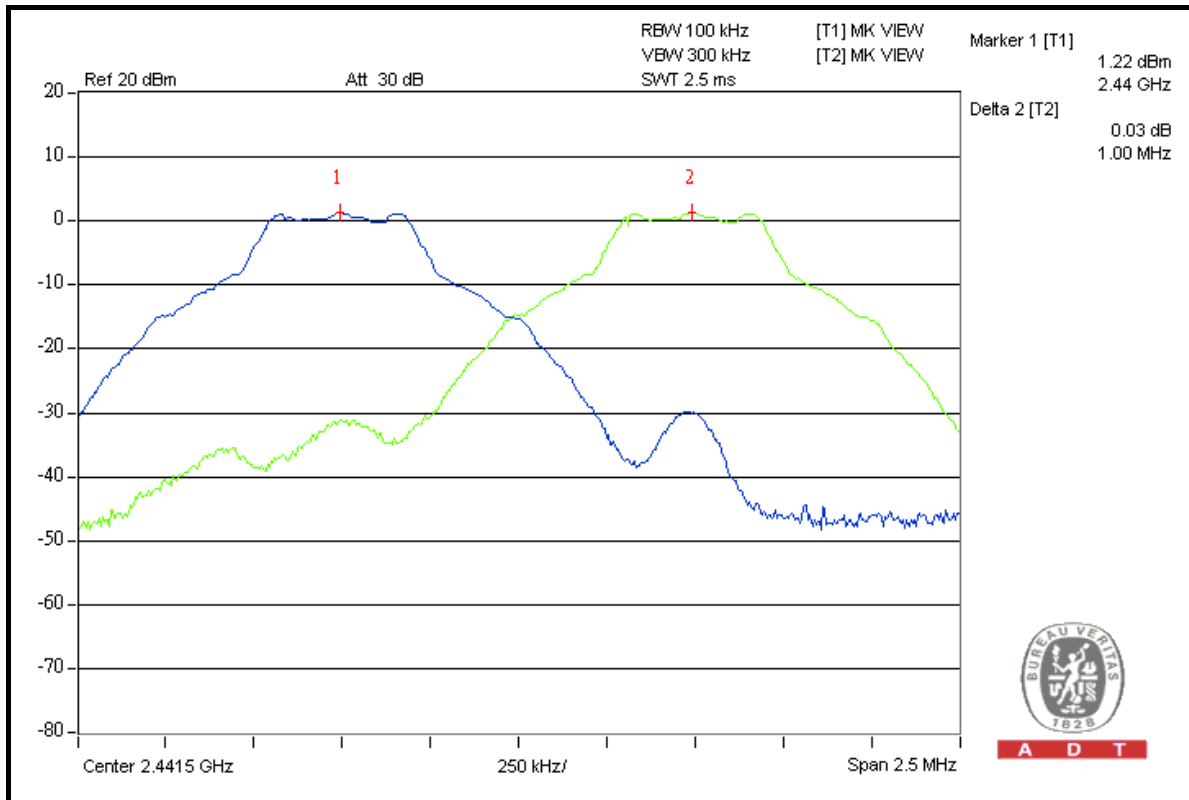
CH 0





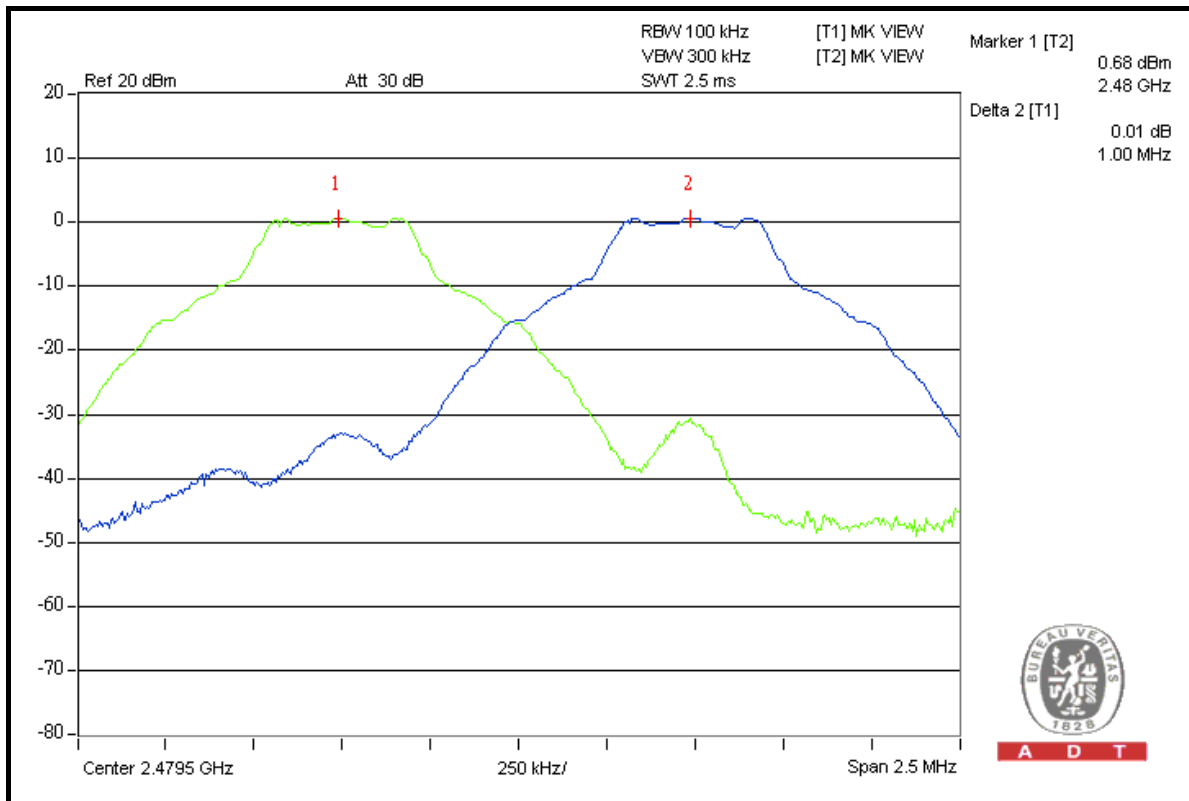
A D T

CH 39



A D T

CH 78



A D T



A D T

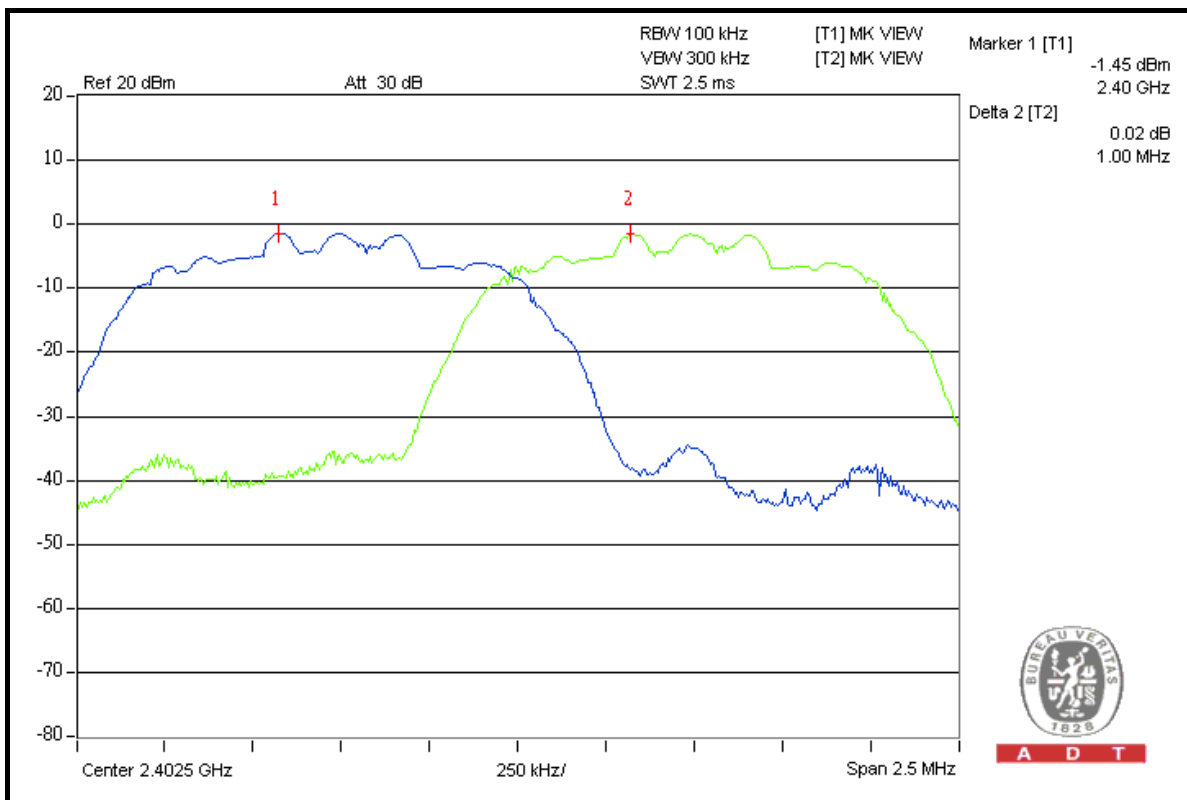
8DPSK MODULATION

MODULATION TYPE	8DPSK	ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH, 1017hPa
INPUT POWER	3.7Vdc	TESTED BY	Mark Liao
TEST MODE	A		

CHANNEL	FREQUENCY (MHz)	ADJACENT CHANNEL SEPARATION (MHz)	20dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
0	2402	1.000	1.260	0.840	PASS
39	2441	1.000	1.260	0.840	PASS
78	2480	1.010	1.260	0.840	PASS

NOTE: The minimum limit is two-third 20dB bandwidth. Test results please refer to next two pages.

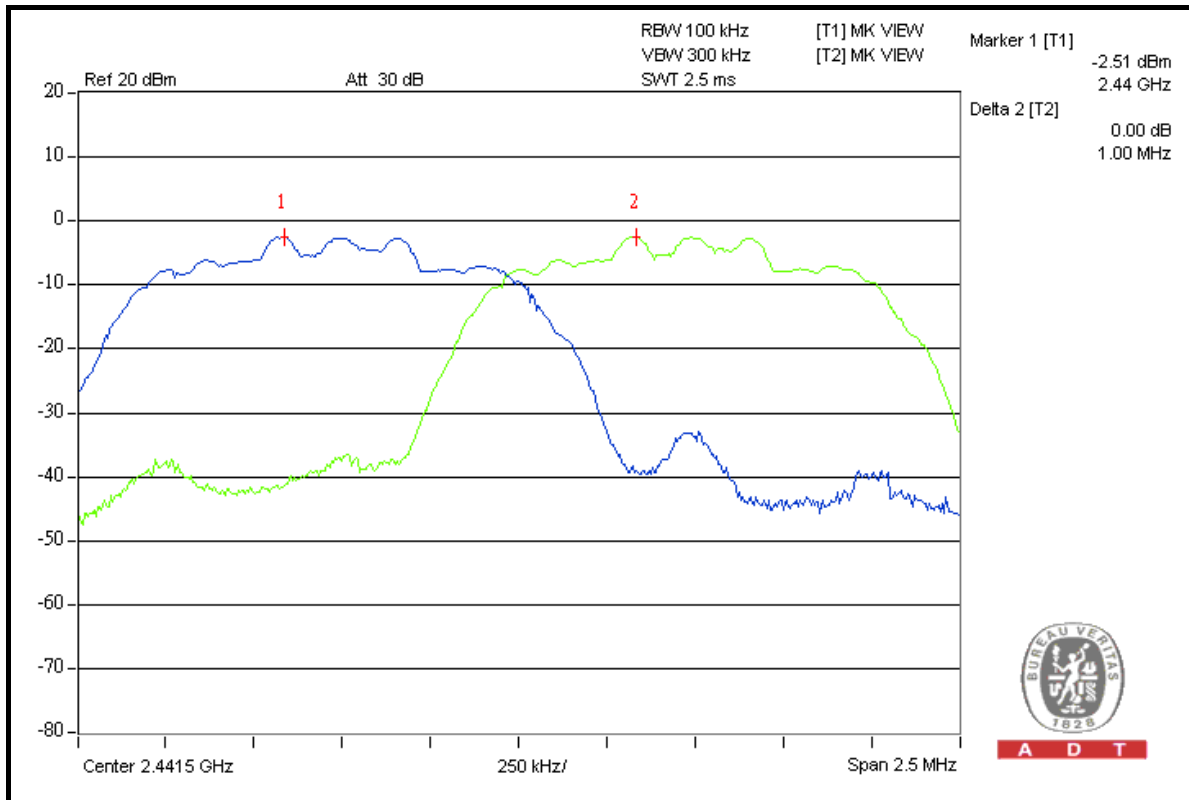
CH 0





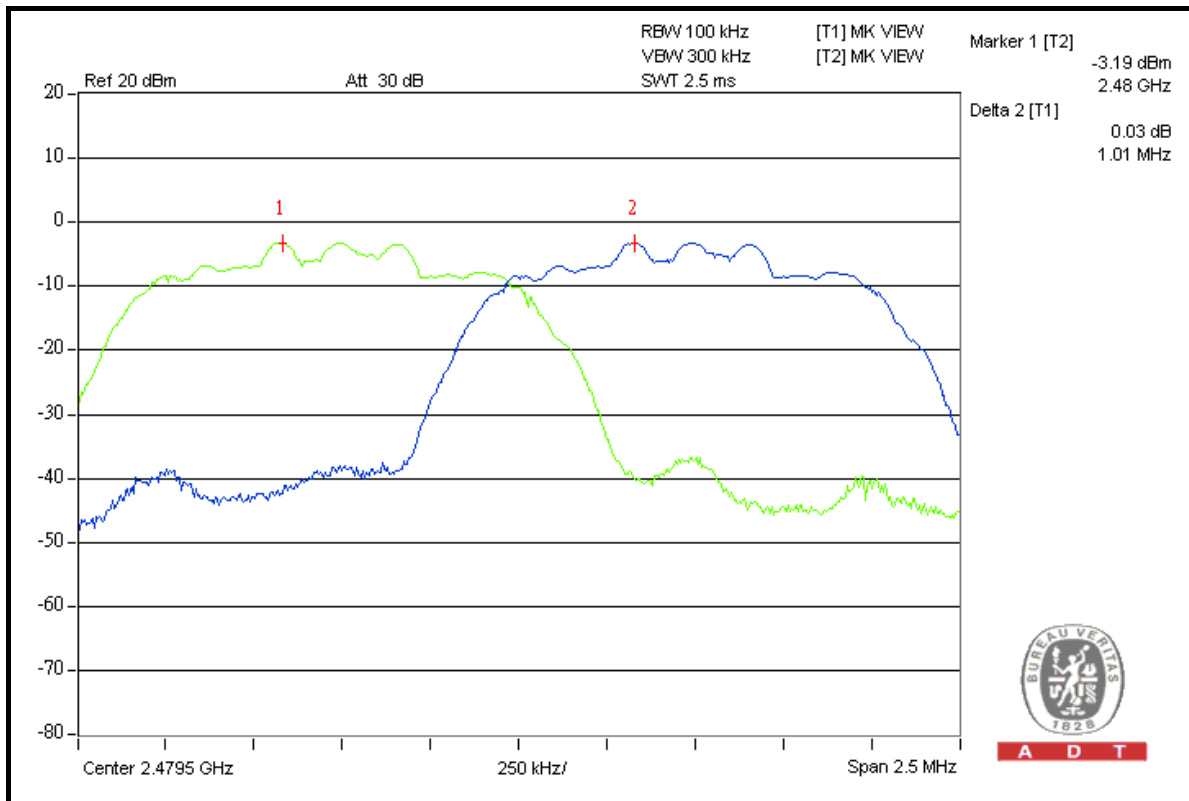
A D T

CH 39



A D T

CH 78



A D T

5.7 MAXIMUM PEAK OUTPUT POWER

5.7.1 LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT

The Maximum Peak Output Power Measurement is 125mW.

5.7.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
R&S SPECTRUM ANALYZER	FSP40	100041	Apr. 22, 2008	Apr. 21, 2009

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

5.7.3 TEST PROCEDURES

- a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- c. The center frequency of the spectrum analyzer is set to the fundamental frequency and using 3MHz RBW and 10 MHz VBW.
- d. Measure the captured power within the band and recording the plot.
- e. Repeat above procedures until all frequencies required were complete.

5.7.4 DEVIATION FROM TEST STANDARD

No deviation.

5.7.5 TEST SETUP

Same as 5.3.5.

5.7.6 EUT OPERATING CONDITION

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

5.7.7 TEST RESULTS

GFSK MODULATION

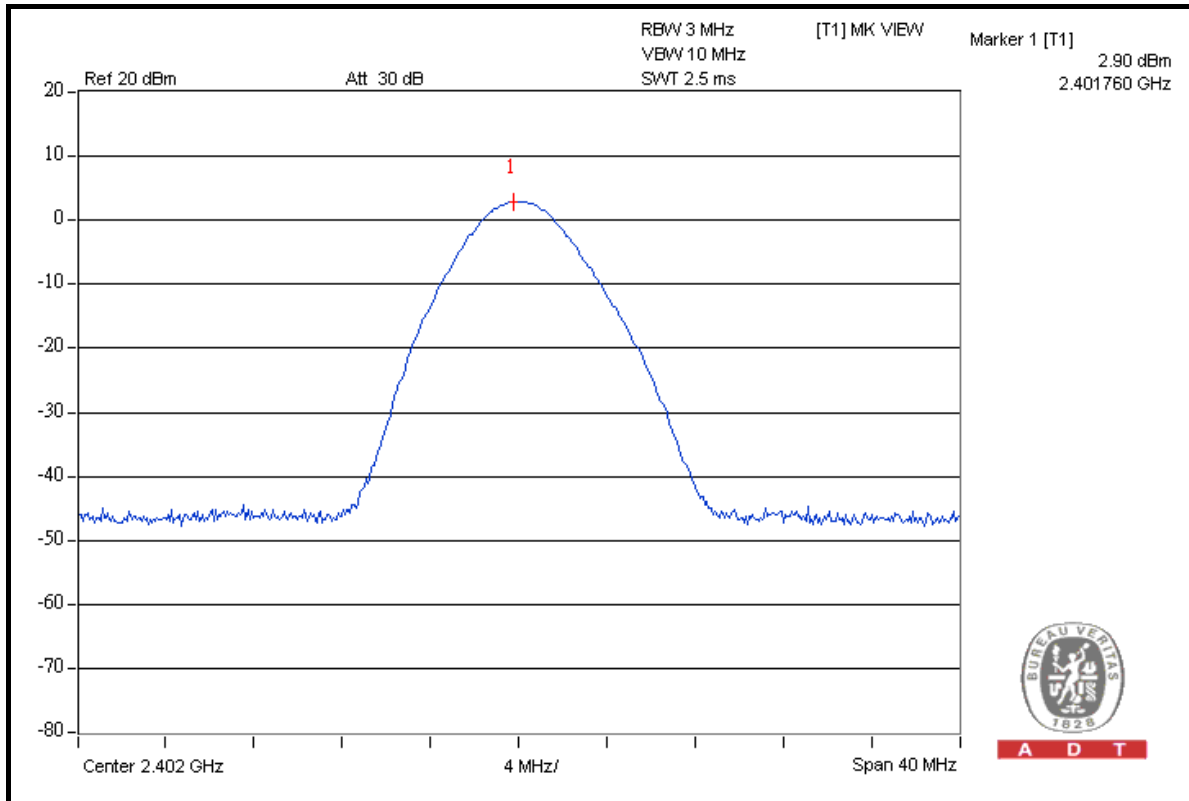
MODULATION TYPE	GFSK	ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH, 1017hPa
INPUT POWER	3.7Vdc	TESTED BY	Mark Liao
TEST MODE	A		

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (mW)	PASS/FAIL
0	2402	1.950	2.90	125	PASS
39	2441	1.603	2.05	125	PASS
78	2480	1.403	1.47	125	PASS

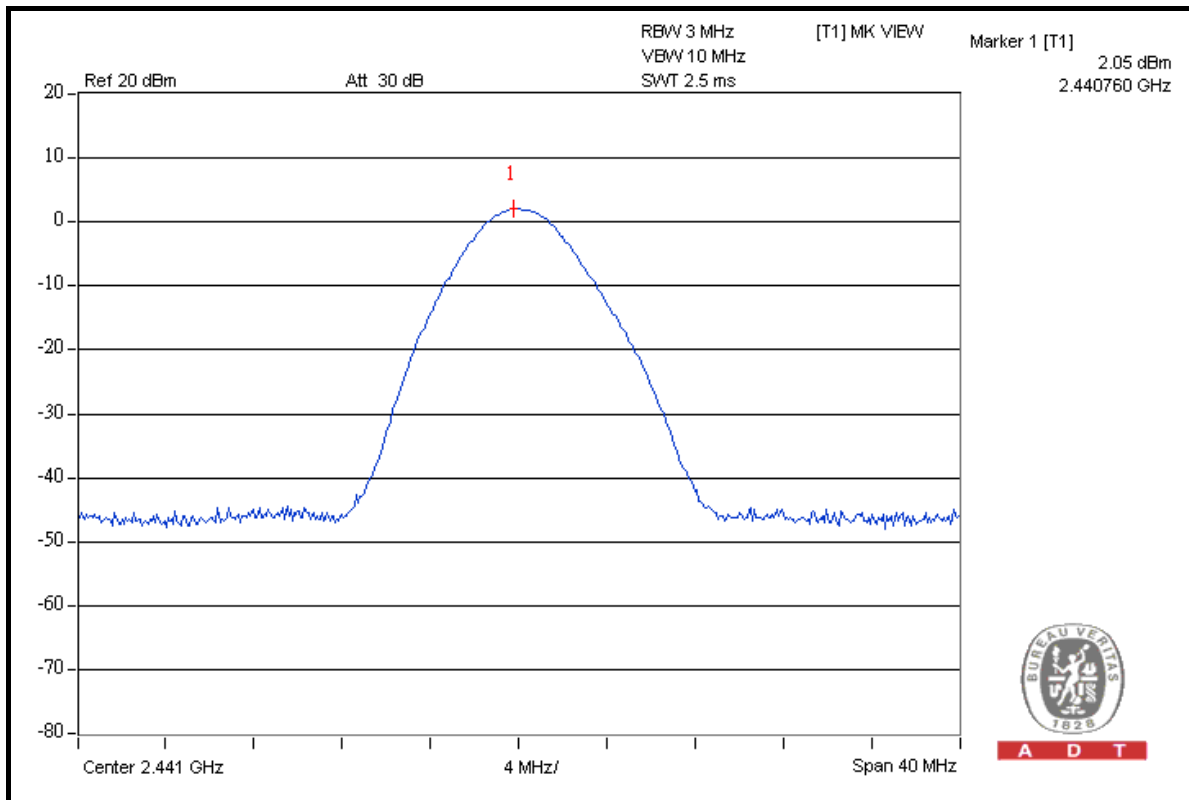


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CH 0



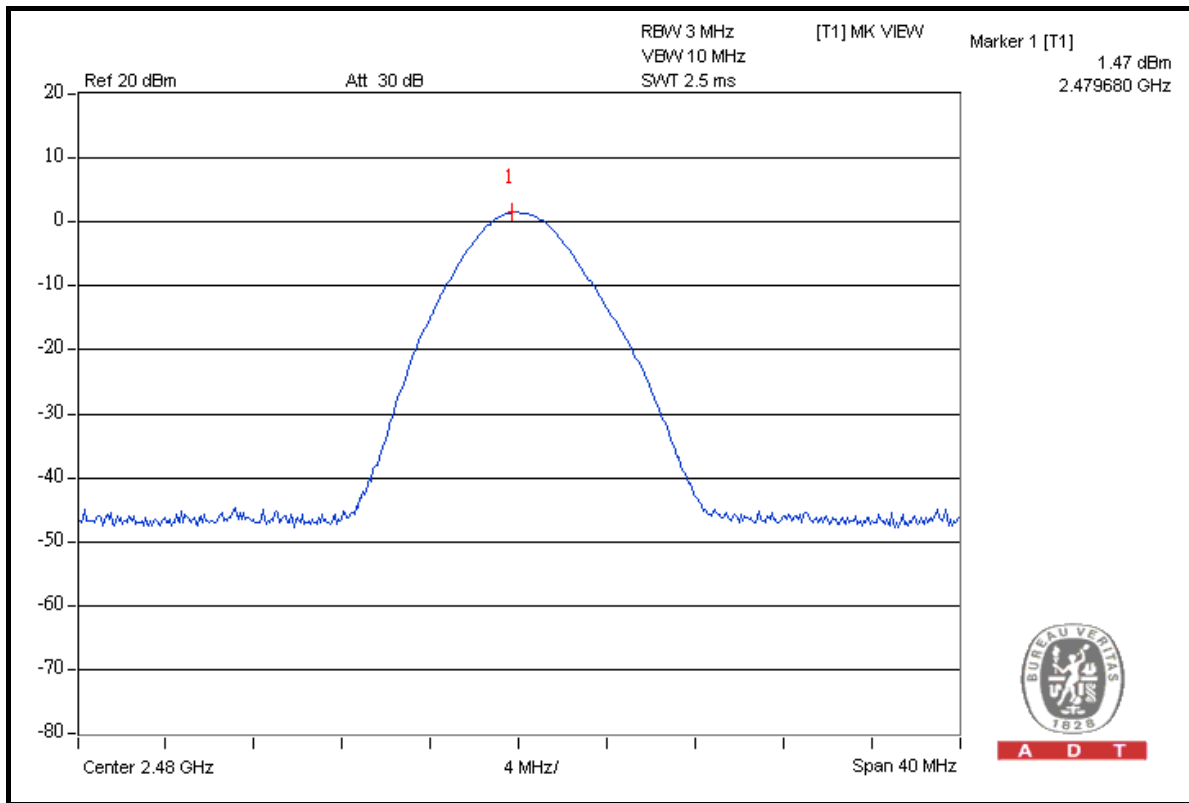
CH 39





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CH 78



A D T



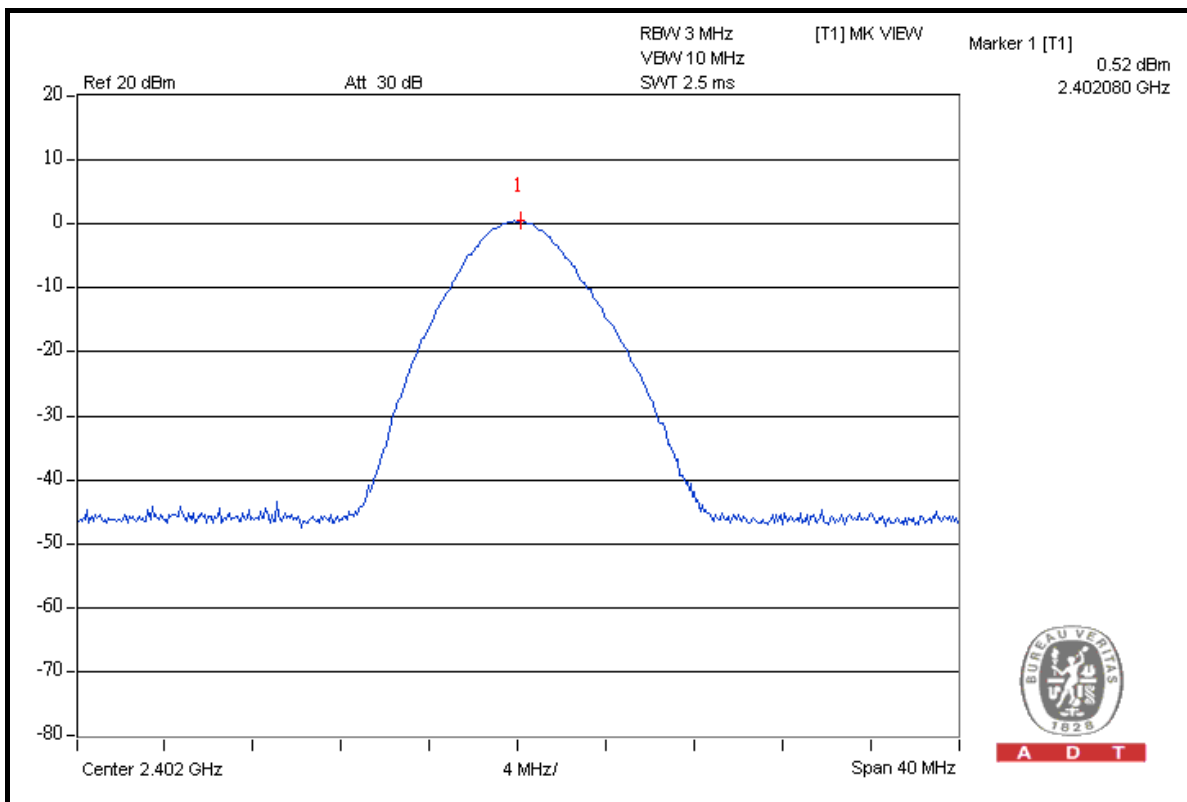
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8DPSK MODULATION

MODULATION TYPE	8DPSK	ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH, 1017hPa
INPUT POWER	3.7Vdc	TESTED BY	Mark Liao
TEST MODE	A		

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (mW)	PASS/FAIL
0	2402	1.127	0.52	125	PASS
39	2441	0.899	-0.46	125	PASS
78	2480	0.771	-1.13	125	PASS

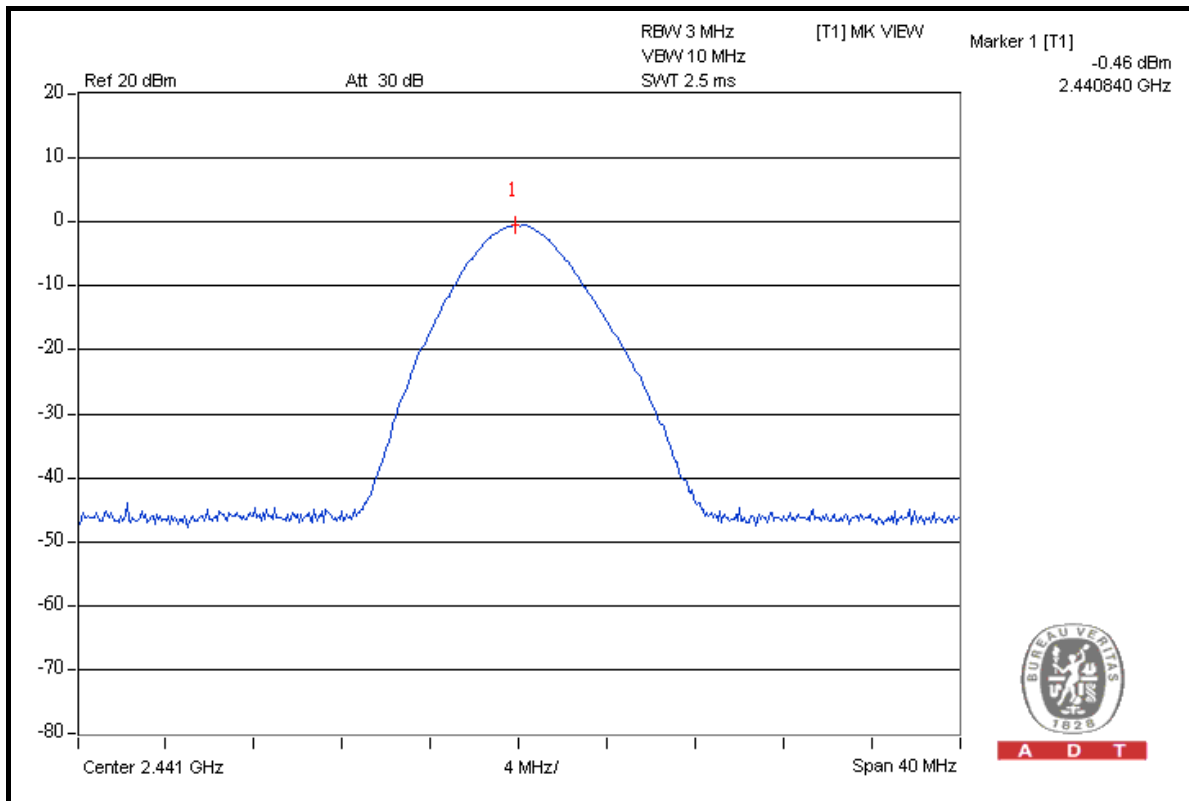
CH 0



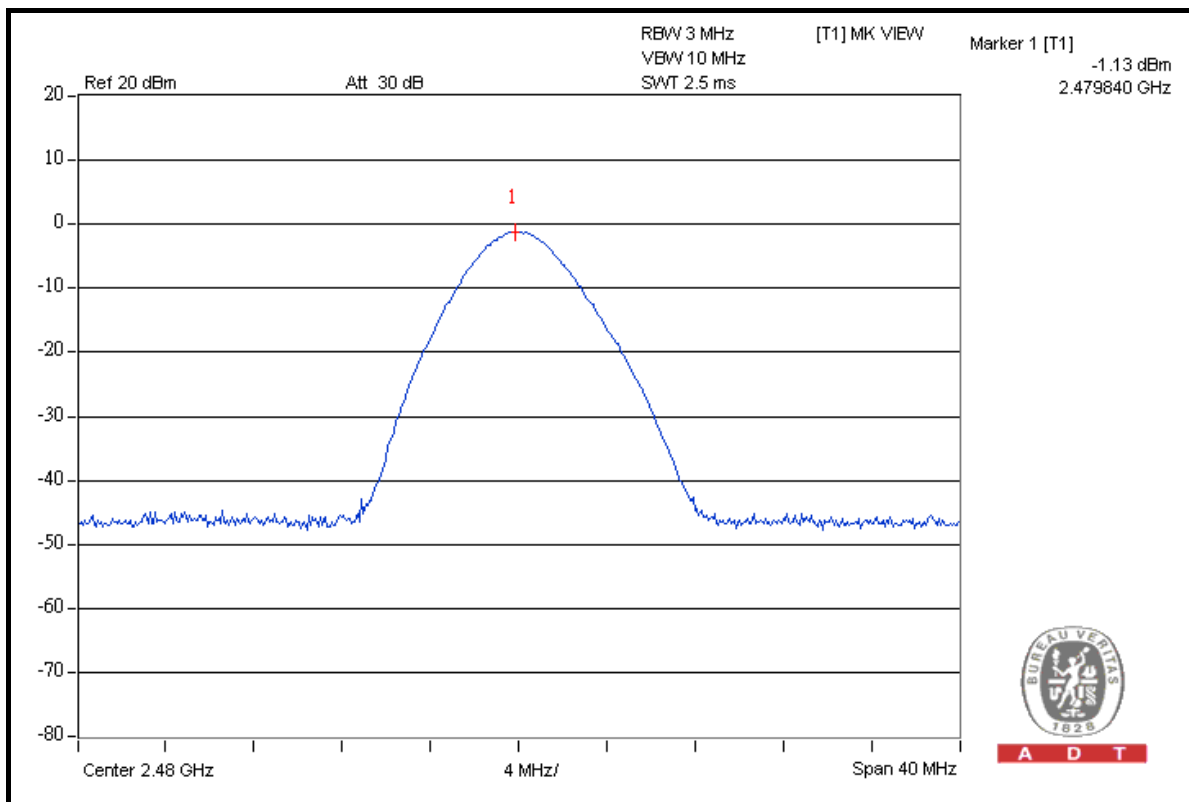


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CH 39



CH 78



5.8 BAND EDGES MEASUREMENT

5.8.1 LIMITS OF BAND EDGES MEASUREMENT

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

5.8.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
R&S SPECTRUM ANALYZER	FSP40	100041	Apr. 22, 2008	Apr. 21, 2009

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

5.8.3 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer via a low lose cable. Set both RBW and VBW of spectrum analyzer to 100 kHz with suitable frequency span including 100 MHz bandwidth from band edge. The band edges was measured and recorded.

5.8.4 DEVIATION FROM TEST STANDARD

No deviation.

5.8.5 EUT OPERATING CONDITION

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

5.8.6 TEST RESULTS

The spectrum plots are attached on the following 8 images. D1 line indicates the highest level, D2 line indicates the 20dB offset below D1. It shows compliance with the requirement in part 15.247(d).

GFSK MODULATION

NOTE 1: The band edge emission plot on the next page shows 49.54dBc between carrier maximum power and local maximum emission in restrict band (2.35200GHz). The emission of carrier strength list in the test result of channel 0 at the item 5.1.7 is 100.06dBuV/m (Peak), so the maximum field strength in restrict band is $100.06 - 49.54 = 50.52$ dBuV/m, which is under 74dBuV/m limit.

Average value = $50.52 - 30.10 = 20.42$ dBuV/m, which is under 54dBuV/m limit.

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

Average value = peak reading – 30.1

NOTE 2: The band edge emission plot on the next second page shows 44.74dBc between carrier maximum power and local maximum emission in restrict band (2.48400GHz). The emission of carrier strength list in the test result of channel 78 at the item 5.1.7 is 96.04 dBuV/m (Peak), so the maximum field strength in restrict band is $96.04 - 44.74 = 51.30$ dBuV/m, which is under 74 dBuV/m limit.

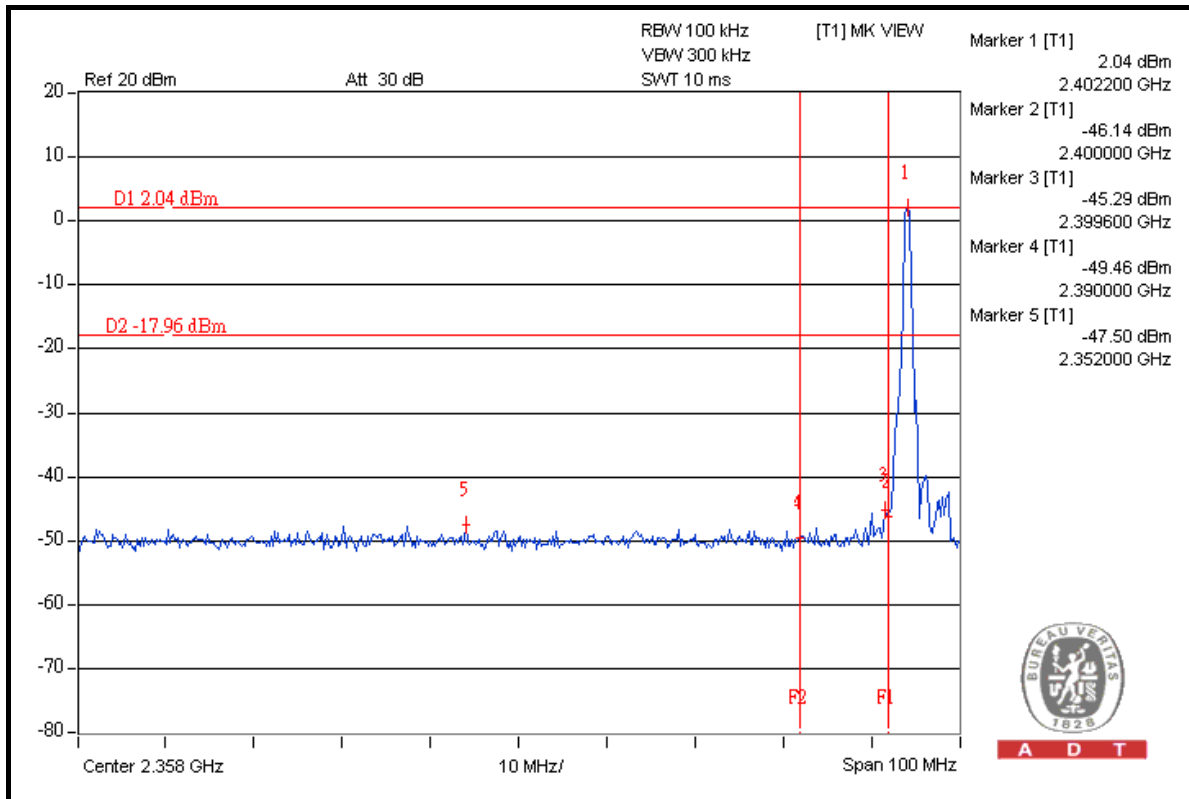
Average value = $51.30 - 30.10 = 21.20$ dBuV/m, which is under 54dBuV/m limit.

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

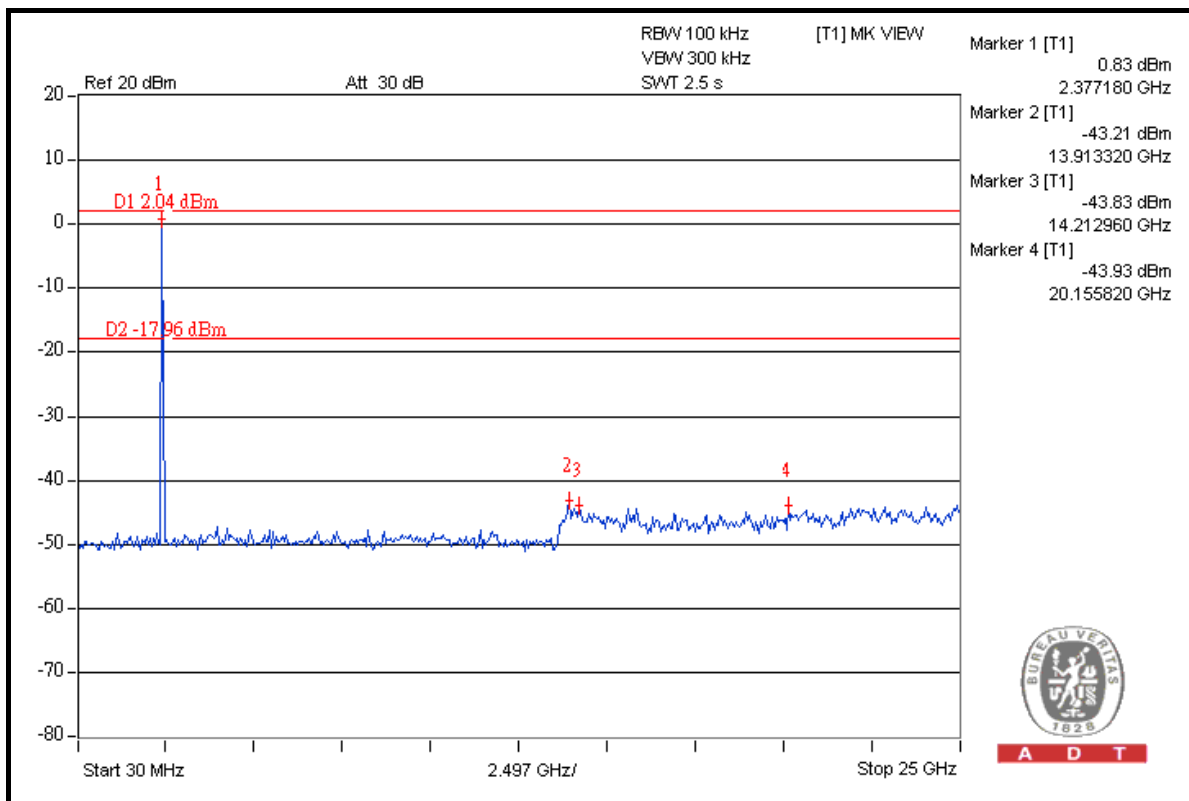
Average value = peak reading – 30.1



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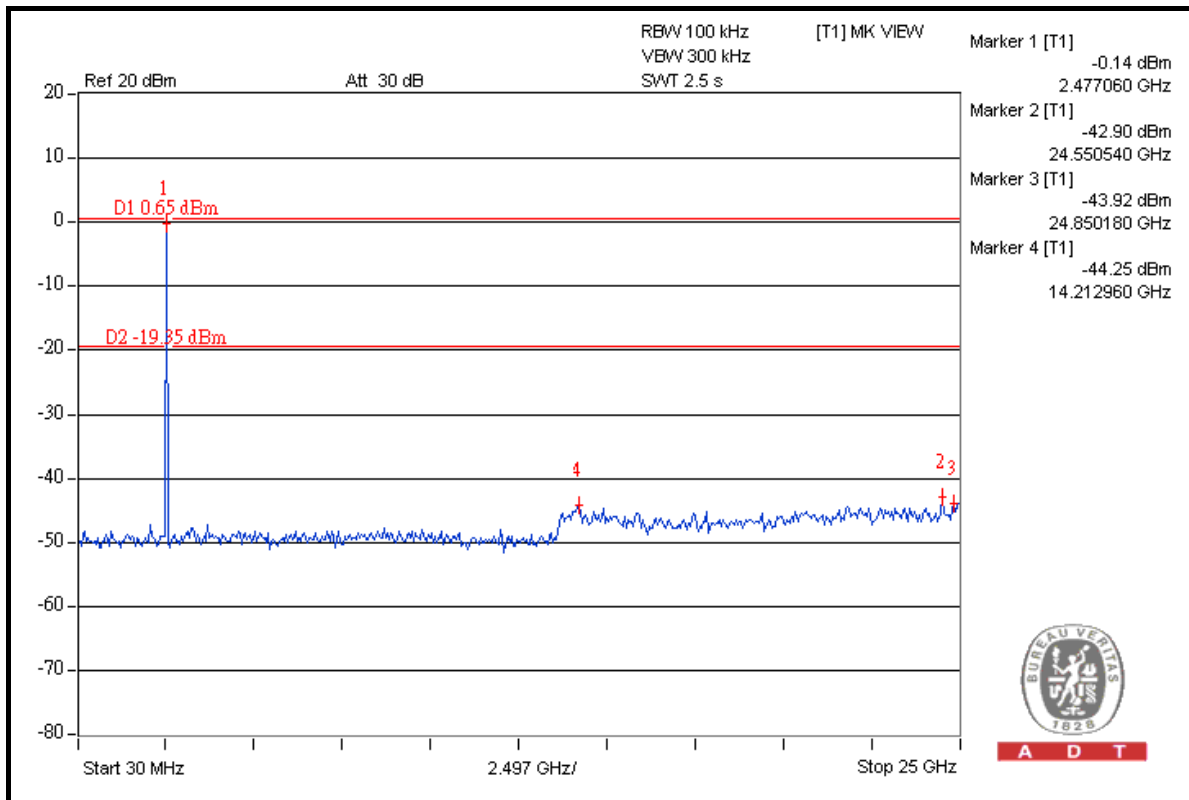
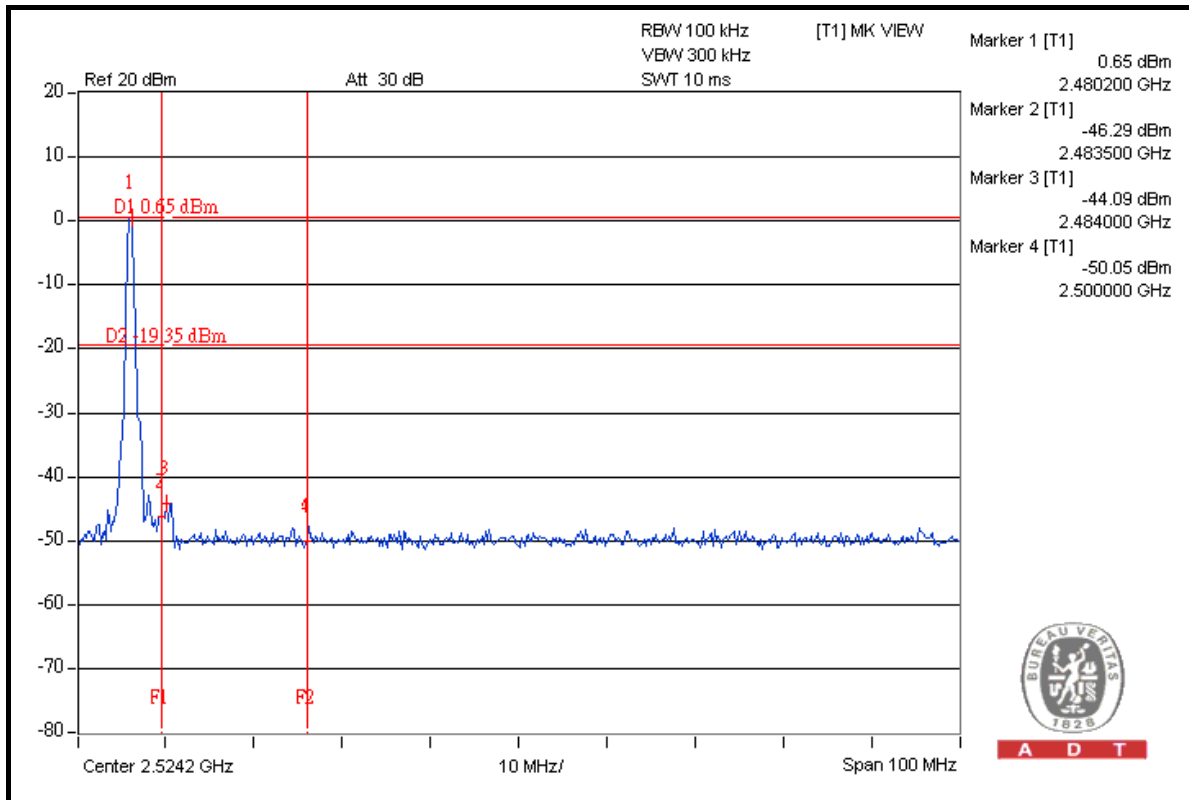
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A D T



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8DPSK MODULATION

NOTE 1: The band edge emission plot on the next page shows 46.43dBc between carrier maximum power and local maximum emission in restrict band (2.37980GHz). The emission of carrier strength list in the test result of channel 0 at the item 5.1.7 is 95.29dBuV/m (Peak), so the maximum field strength in restrict band is $95.29 - 46.43 = 48.86$ dBuV/m, which is under 74 dBuV/m limit.

Average value = $48.86 - 30.10 = 18.76$ dBuV/m, which is under 54dBuV/m limit.

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

Average value = peak reading – 30.1

NOTE 2: The band edge emission plot on the next second page shows 41.66dBc between carrier maximum power and local maximum emission in restrict band (2.48350GHz). The emission of carrier strength list in the test result of channel 78 at the item 5.1.7 is 91.02dBuV/m (Peak), so the maximum field strength in restrict band is $91.02 - 41.66 = 49.36$ dBuV/m, which is under 74 dBuV/m limit.

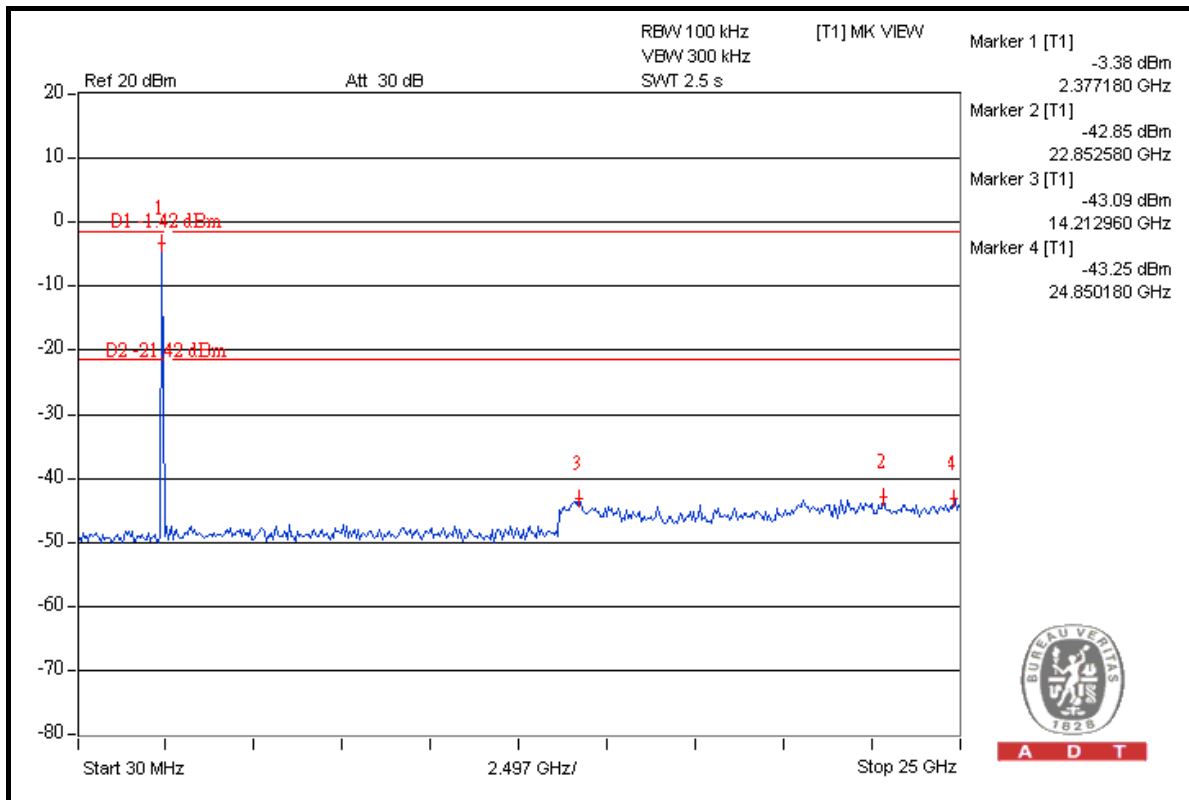
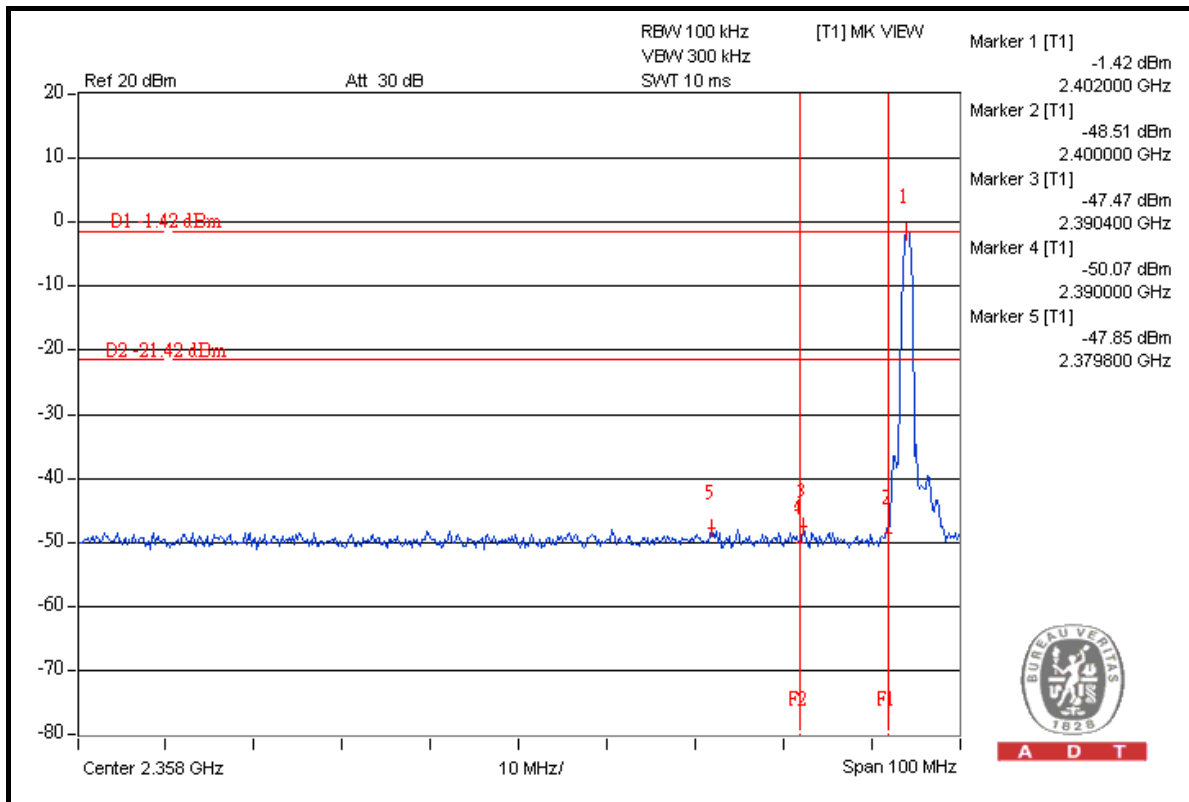
Average value = $49.36 - 30.10 = 19.26$ dBuV/m, which is under 54dBuV/m limit.

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

Average value = peak reading – 30.1

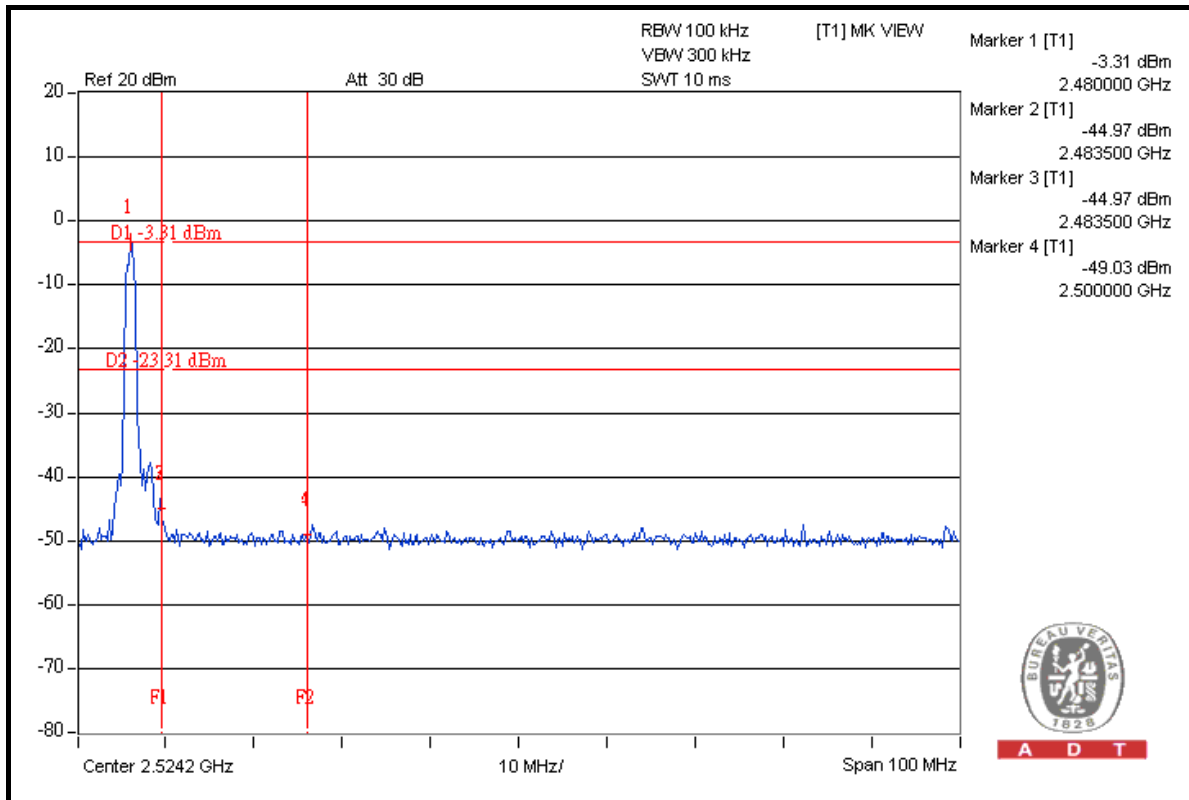


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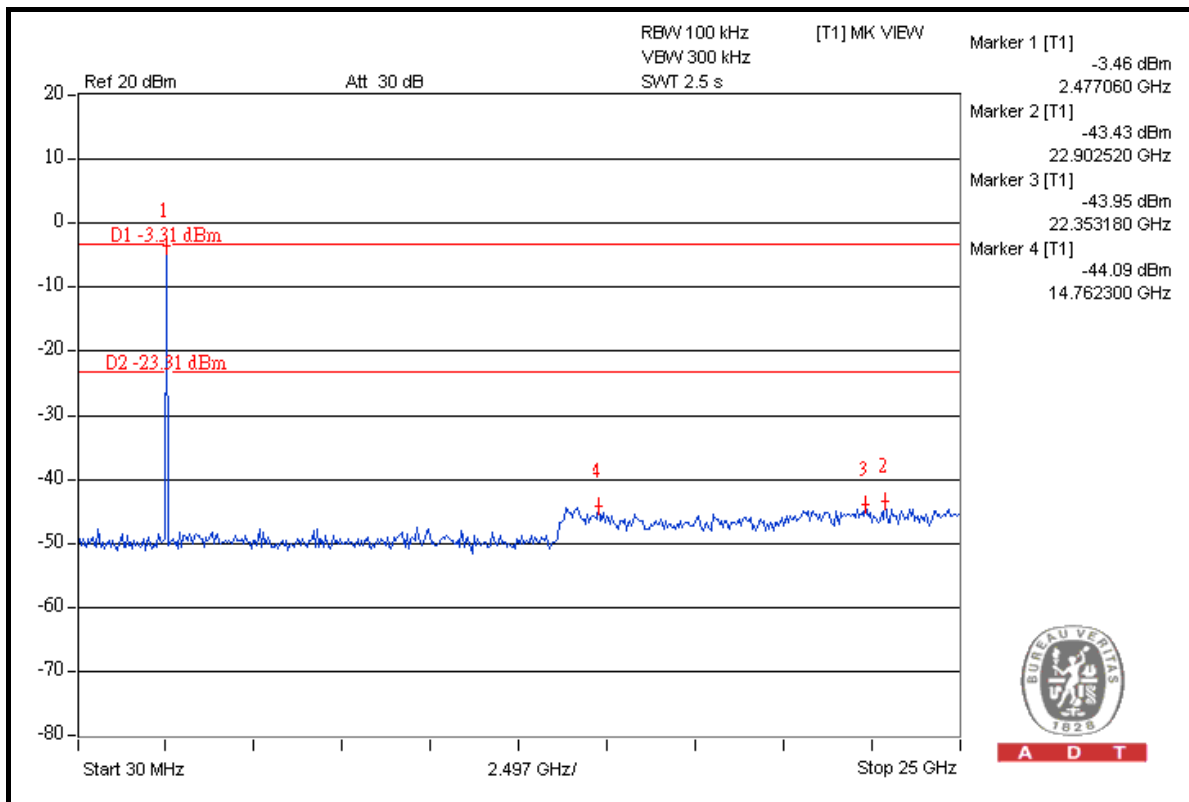




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5.9 ANTENNA REQUIREMENT

5.9.1 STANDARD APPLICABLE

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

5.9.2 ANTENNA CONNECTED CONSTRUCTION

The antenna used in this product is PIFA antenna that without antenna connector. The maximum gain of this antenna is 2.74dBi.

6. PHOTOGRAPHS OF THE TEST CONFIGURATION

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



7. 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 by the following approval agencies according to ISO/IEC 17025.

USA	FCC, NVLAP
Germany	TUV Rheinland
Japan	VCCI
Norway	NEMKO
Canada	INDUSTRY CANADA , CSA
R.O.C.	TAF, BSMI, NCC
Netherlands	Telefication
Singapore	GOST-ASIA(MOU)
Russia	CERTIS(MOU)

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

Linko EMC/RF Lab:

Tel: 886-2-26052180

Fax: 886-2-26051924

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

Web Site: www.adt.com.tw

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

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

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

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