FCC TEST REPORT

REPORT NO.:	RF980803H03
MODEL NO.:	TR-2473A, TR-2473
RECEIVED:	Aug. 03, 2009
TESTED:	Sep. 05 to 15, 2009
ISSUED:	Sep. 25, 2009
APPLICANT:	JOSEFINA PAN PACIFIC LIMITED
ADDRESS:	2F NO. 1~35, Kuojian Rd., Chinajen Dist., Kaohsiung, Taiwan, R.O.C
ISSUED BY:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
LAB LOCATION:	No. 81-1, Lu Liao Keng, 9th Ling, Wu Lung Tsuen, Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan

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1 CERTIFICATION

PRODUCT :	2.4GHz Digital Wireless Transmitter/Receiver
BRAND NAME :	JOSEFINA
MODEL NO. :	TR-2473A, TR-2473
APPLICANT :	JOSEFINA PAN PACIFIC LIMITED
TESTED DATE :	Sep. 05 to 15, 2009
TEST SAMPLE :	ENGINEERING SAMPLE
STANDARDS :	47 CFR Part 15, Subpart C (Section 15.247), ANSI C63.4-2003

The above equipment (Model: TR-2473A) 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 : Sunny Wen , **DATE:** *Sep. 25, 2009*
(Sunny Wen, Specialist)

TECHNICAL ACCEPTANCE : , **DATE:** *Sep. 25, 2009*
Responsible for RF
(Hank Chung, Deputy Manager)

APPROVED BY : , **DATE:** *Sep. 25, 2009*
(May Chen, Deputy Manager)

2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: 47 CFR Part 15, Subpart C			
Standard Section	**Test Type and Limit**	**Result**	**REMARK**
15.207	AC Power Conducted Emission	NA	Not Applicable
15.247(a)(1)(I)-(ii)	Number of Hopping Frequency Used Spec.: At least 15 channels	PASS	Meet the requirement of limit
15.247(a)(1)(ii)	Dwell Time on Each Channel Spec.: Max. 0.4 second within 31.6 second	PASS	Meet the requirement of limit
15.247(a)(1)(I)-(ii)	Hopping Channel Separation Spec. : Min. 25 kHz or 20 dB bandwidth, which ever is greater	PASS	Meet the requirement of limit
15.247(a)(2)	Spectrum Bandwidth of a Frequency Hopping Sequence Spread Spectrum System	PASS	Report reference
15.247(b)	Maximum Peak Output Power Spec.: max. 125mW	PASS	Meet the requirement of limit
15.247(c)	Transmitter Radiated Emissions Spec.: Table 15.209	PASS	Meet the requirement of limit Minimum passing margin is -0.55dB at 2390.00MHz
15.247(c)	Conducted Out-Band Emissions Measurement	PASS	Meet the requirement of limit

2.1 MEASUREMENT UNCERTAINTY

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

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

Measurement	Value
Conducted emissions	2.44 dB
Radiated emissions (30MHz-1GHz)	3.94 dB
Radiated emissions (1GHz ~18GHz)	2.49 dB
Radiated emissions (18GHz ~20GHz)	2.70 dB

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	2.4GHz Digital Wireless Transmitter/Receiver
MODEL NO.	TR-2473A, TR-2473
FCC ID	XSJ16037094
POWER SUPPLY	DC 12~24V from car charge
MODULATION TYPE	GFSK
MODULATION TECHNOLOGY	FHSS
FREQUENCY RANGE	2402MHz ~ 2480MHz
NUMBER OF CHANNEL	40
OUTPUT POWER	82.414mW
ANTENNA TYPE	Dipole antenna with SMA reverse connecter (antenna Gain: 3.0dBi)
DATA CABLE	**Model on.: TR-2473A** **TX:** 3 in 1 - Camera Video input / Camera Audio input / Camera power cable (unshielded, 0.55m) **RX:** 2 in 1 - Video output / Audio output (unshielded, 0.55m) DC input cable (unshielded, 1.3m)
	Model on.: TR-2473 **TX:** 2 in 1 - Camera Video input / Camera power cable (unshielded, 0.55m) **RX:** 2 in 1 - Video output 1 / Video output 2 / (unshielded, 0.55m) DC input cable (unshielded, 1.3m)

INTER FACE	**Model on.: TR-2473A** **TX:** Camera Video input x 1 Camera Audio input x 1 Camera power x 1 **RX:** Video output x 1 Audio output x 1	**Model on.: TR-2473** **TX:** Camera Video input x 1 Camera power x 1 **RX:** Video output x 2
ASSOCIATED DEVICES	Car charge x 2	

NOTE:

1. A set of the EUT include transmitter and receiver. This report covers transmitter only. The receiver is covered in another test report which report no. is FD980803H03.

2. The EUT has two model names, which are identical to each other in all aspects except for the following:

Brand	Model No.	Difference
JOSEFINA	TR-2473A	1. With audio function 2. Data cable and interface different
	TR-2473	1. Without audio function 2. Data cable and interface different

From the above models, model: **TR-2473A** was selected as representative model for the test and its data was recorded in this report.

3. The EUT must be supplied with a car charge as following:

Brand:	NA
Model No.:	209-247300-00
Rating :	DC12~24V, 2A DC output cable (Unshielded, 1.3m)

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

Forty channels are provided to this EUT.

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
1	2402	11	2422	21	2442	31	2462
2	2404	12	2424	22	2444	32	2464
3	2406	13	2426	23	2446	33	2466
4	2408	14	2428	24	2448	34	2468
5	2410	15	2430	25	2450	35	2470
6	2412	16	2432	26	2452	36	2472
7	2414	17	2434	27	2454	37	2474
8	2416	18	2436	28	2456	38	2476
9	2418	19	2438	29	2458	39	2478
10	2420	20	2440	30	2460	40	2480

3.3 TEST MODE APPLICABLITY AND TESTED CHANNEL DETAIL:

EUT configure mode	Applicable to				Description
	PLC	RE<1G	RE≥1G	APCM	
-	-	√	√	√	-

Where PLC: Power Line Conducted Emission RE<1G RE: Radiated Emission below 1GHz
RE≥1G: Radiated Emission above 1GHz APCM: Antenna Port Conducted Measurement

Radiated Emission Test (Below 1 GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

Available Channel	Tested Channel	Modulation Technology	Modulation Type
1 to 40	1	FHSS	GFSK

Radiated Emission Test (Above 1 GHz):

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

Available Channel	Tested Channel	Modulation Technology	Modulation Type
1 to 40	1, 20, 40	FHSS	GFSK

Conducted Out-Band Measurement:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

Available Channel	Tested Channel	Modulation Technology	Modulation Type
1 to 40	1, 40	FHSS	GFSK

Antenna Port Conducted Measurement:

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

Available Channel	Tested Channel	Modulation Technology	Modulation Type
1 to 40	1, 20, 40	FHSS	GFSK

3.4 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a 2.4GHz Digital Wireless Transmitter/Receiver. 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.

3.5 DESCRIPTION OF SUPPORT UNITS

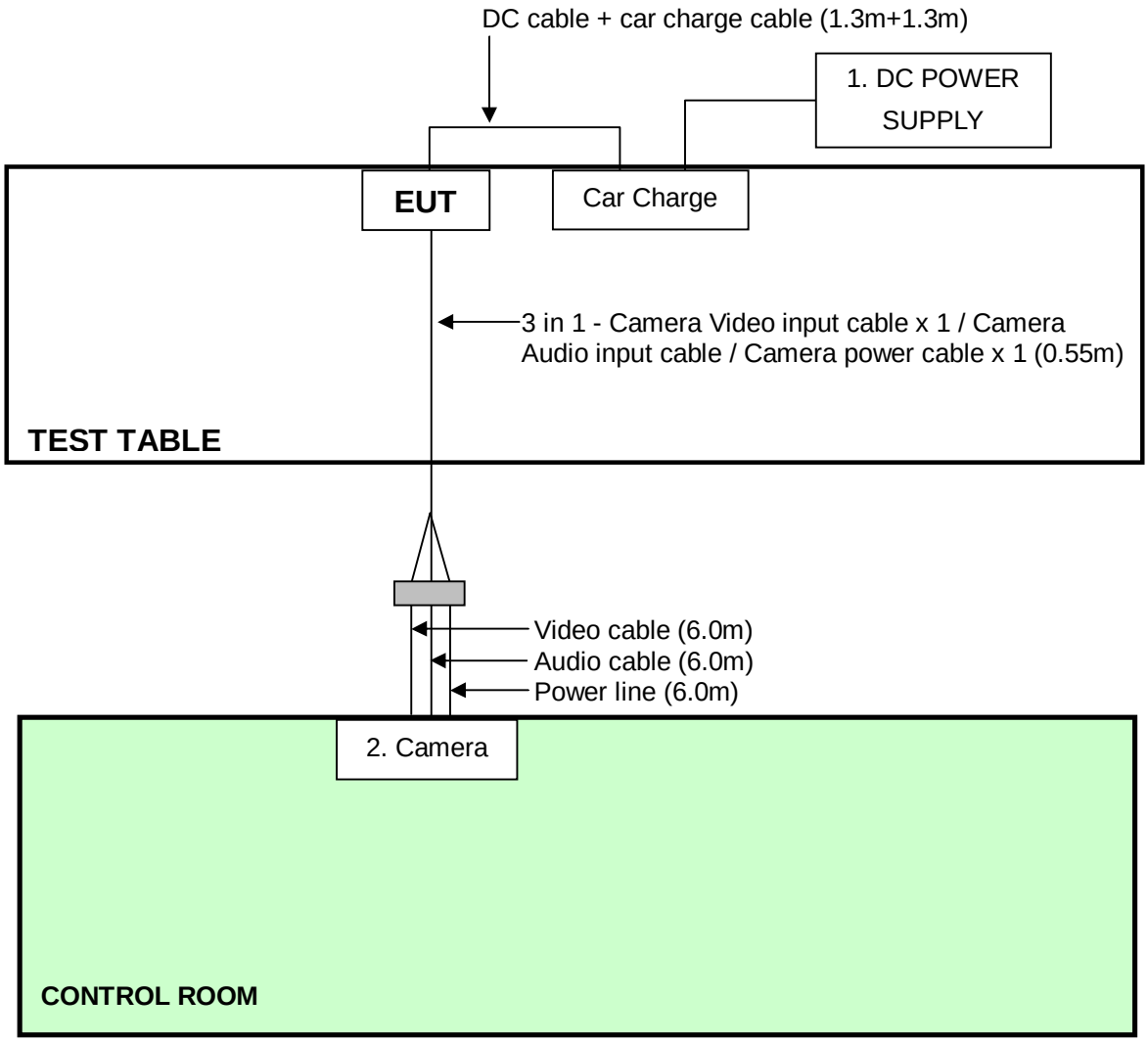
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Product	Brand	Model No.	Serial No.	FCC ID
1	DC POWER SUPPLY	GOOD WILL INSTRUMENT CO., LTD.	GPC-3030D	7700087	NA
2	Camera	JOSEFINA	NA	NA	NA

No.	Signal cable description
1	NA
2	NA

Note: 1. All power cords of the above support units are unshielded (1.8m).

3.6 CONFIGURATION OF SYSTEM UNDER TEST



4 TEST PROCEDURES AND RESULTS

4.1 NUMBER OF HOPPING FREQUENCY USED

4.1.1 LIMIT OF HOPPING FREQUENCY USED

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

4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100037	Aug. 09, 2009	Aug. 08, 2010

NOTE:

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

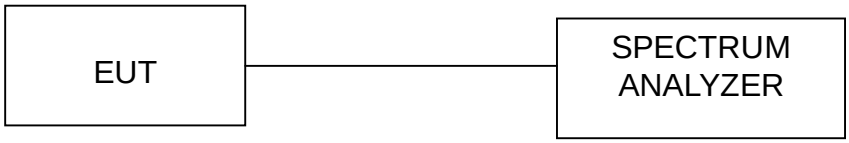
4.1.3 TEST PROCEDURES

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

4.1.4 DEVIATION FROM TEST STANDARD

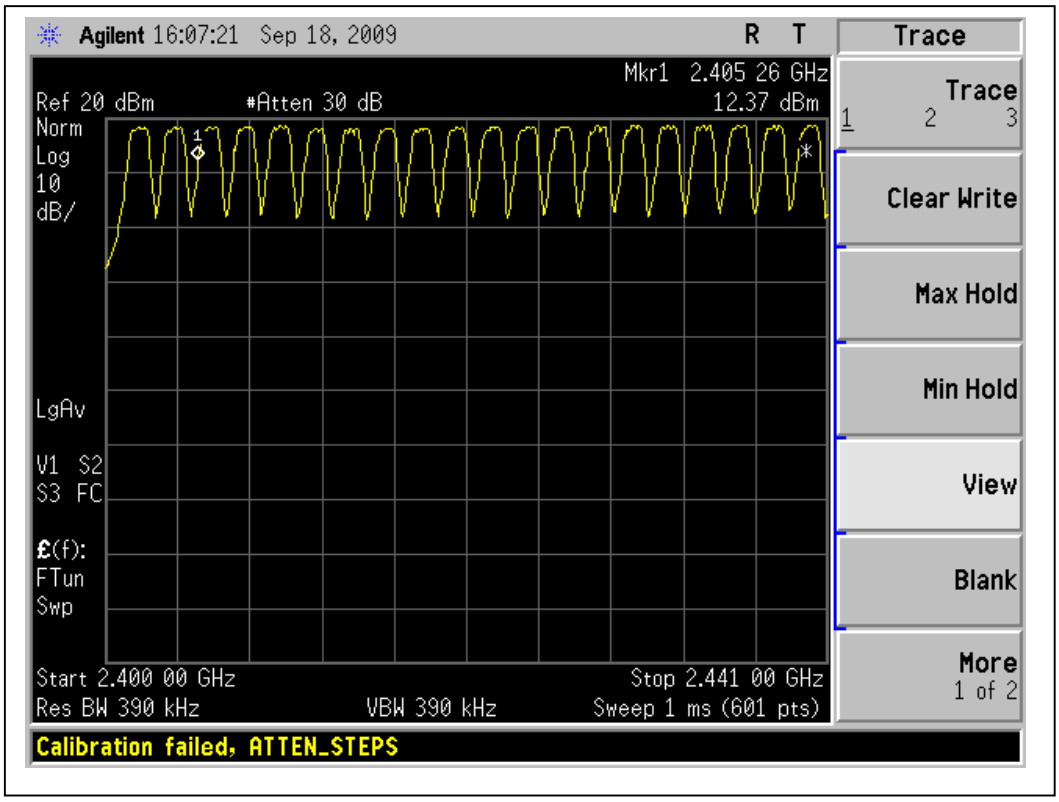
No deviation

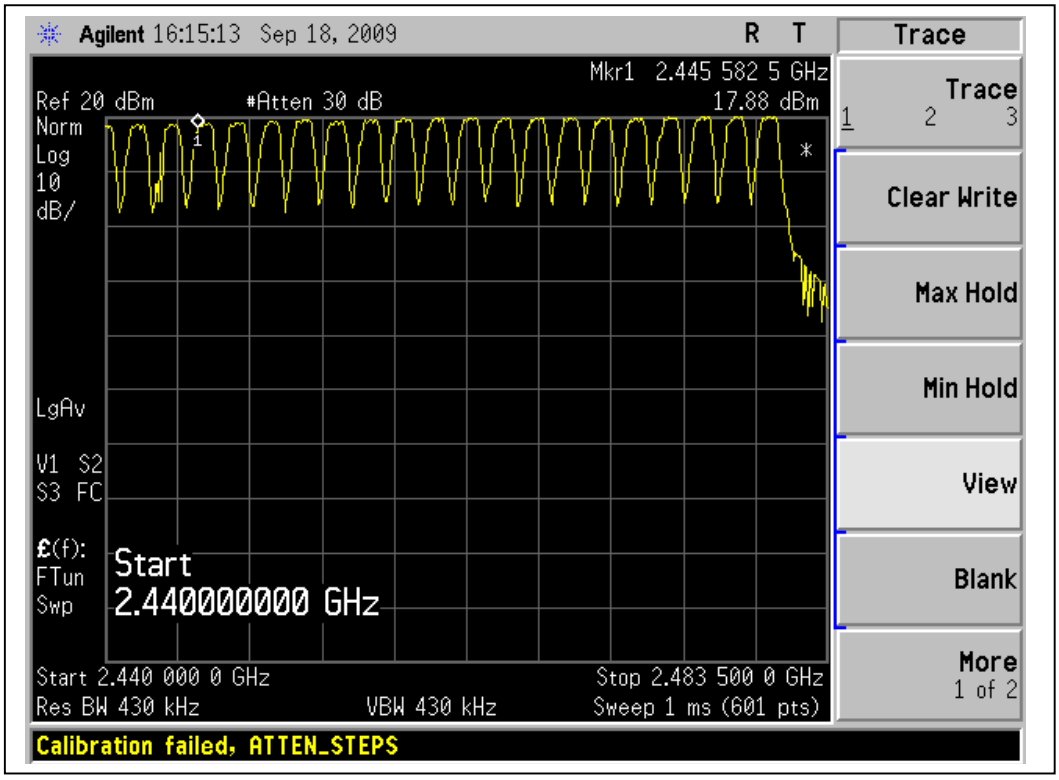
4.1.5 TEST SETUP



4.1.6 TEST RESULTS

There are 40 hopping frequencies in the hopping mode. Please refer to next pages for the test result. On the plots, it shows that the hopping frequencies are equally spaced.


Agilent 16:07:21 Sep 18, 2009
R T
Trace
Mkr1 2.405 26 GHz
Ref 20 dBm
#Atten 30 dB
12.37 dBm
Norm
Log
10
dB/
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank
More
1 of 2
LgAv
V1 S2
S3 FC
£(f):
FTun
Swp
Start 2.400 00 GHz
Stop 2.441 00 GHz
Res BW 390 kHz
VBW 390 kHz
Sweep 1 ms (601 pts)
Calibration failed, ATTEN_STEPS


Agilent 16:15:13 Sep 18, 2009
R T
Trace
Mkr1 2.445 582 5 GHz
Ref 20 dBm
#Atten 30 dB
17.88 dBm
Norm
Log
10
dB/
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank
More
1 of 2
LgAv
V1 S2
S3 FC
£(f):
FTun
Swp
Start
2.440000000 GHz
Start 2.440 000 0 GHz
Stop 2.483 500 0 GHz
Res BW 430 kHz
VBW 430 kHz
Sweep 1 ms (601 pts)
Calibration failed, ATTEN_STEPS

4.2 DWELL TIME ON EACH CHANNEL

4.2.1 LIMIT OF DWELL TIME USED

For FHSS, the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 31.6 second period. For hybrid systems, the average time of occupancy on any frequency should not exceed 0.4 seconds within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4.

4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100037	Aug. 09, 2009	Aug. 08, 2010

NOTE:

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

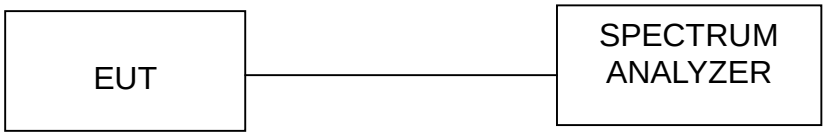
4.2.3 TEST PROCEDURES

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

4.2.4 DEVIATION FROM TEST STANDARD

No deviation

4.2.5 TEST SETUP

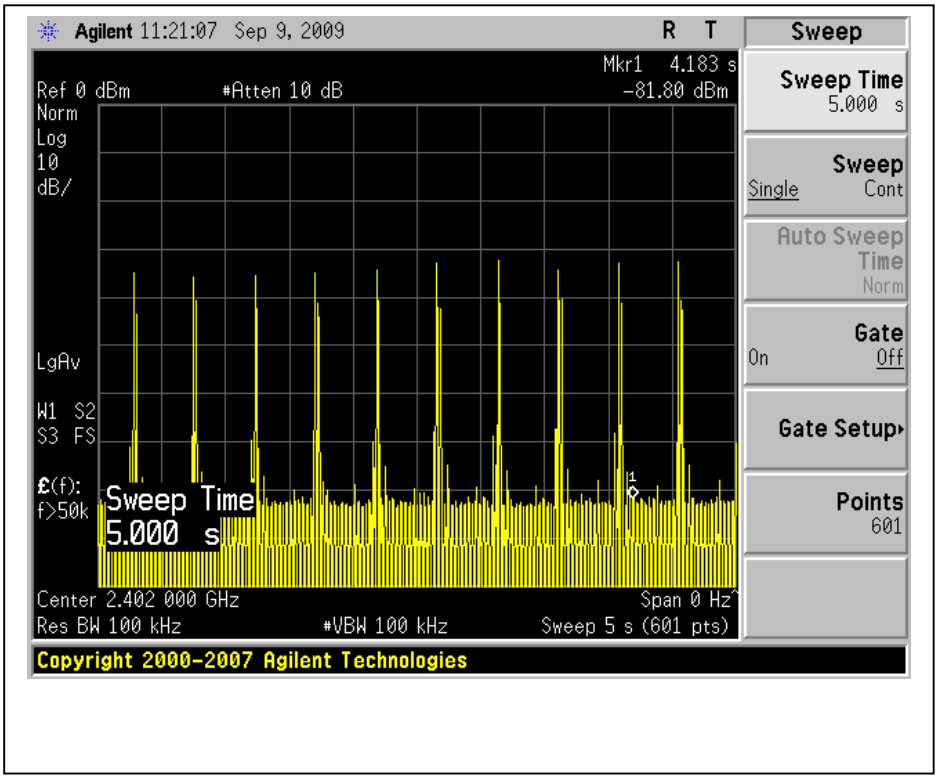


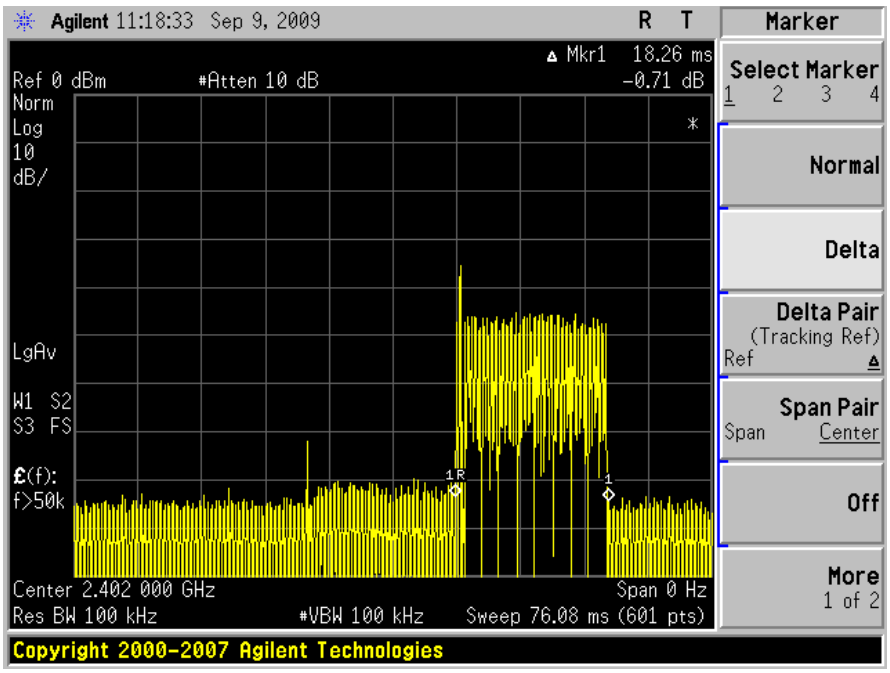
4.2.6 TEST RESULTS

Number of transmission in a 8 (20 Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (msec)
10 (times / 5 sec) *1.6=16 times	18.26	292.2	400

There are forty channels in this device totally. But it always hops in twenty channels by random within forty channels.

Test plot of the transmitting time slot is shown on next page.


Agilent 11:21:07 Sep 9, 2009
R T
Sweep
Mkr1 4.183 s
Ref 0 dBm
#Atten 10 dB
-81.80 dBm
Norm
Log
10
dB/
LgAv
W1 S2
S3 FS
£(f):
f>50k
Sweep Time
5.000 s
Sweep Time
5.000 s
Sweep
Single Cont
Auto Sweep Time
Norm
Gate
On Off
Gate Setup
Points
601
Center 2.402 000 GHz
Span 0 Hz
Res BW 100 kHz
#VBW 100 kHz
Sweep 5 s (601 pts)
Copyright 2000-2007 Agilent Technologies


Agilent 11:18:33 Sep 9, 2009
R T
Marker
Δ Mkr1 18.26 ms
Ref 0 dBm
#Atten 10 dB
-0.71 dB
Norm
Log
10
dB/
LgAv
W1 S2
S3 FS
£(f):
f>50k
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Δ
Span Pair
Span Center
Off
More
1 of 2
Center 2.402 000 GHz
Span 0 Hz
Res BW 100 kHz
#VBW 100 kHz
Sweep 76.08 ms (601 pts)
Copyright 2000-2007 Agilent Technologies

4.3 CHANNEL BANDWIDTH

4.3.1 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, 20dBbandwidth of hopping channel shell be a minimum limit for the hopping channel separation.

4.3.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100037	Aug. 09, 2009	Aug. 08, 2010

NOTE:

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

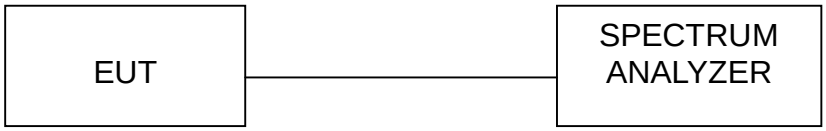
4.3.3 TEST PROCEDURE

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

4.3.4 DEVIATION FROM TEST STANDARD

No deviation

4.3.5 TEST SETUP



4.3.6 EUT OPERATING CONDITION

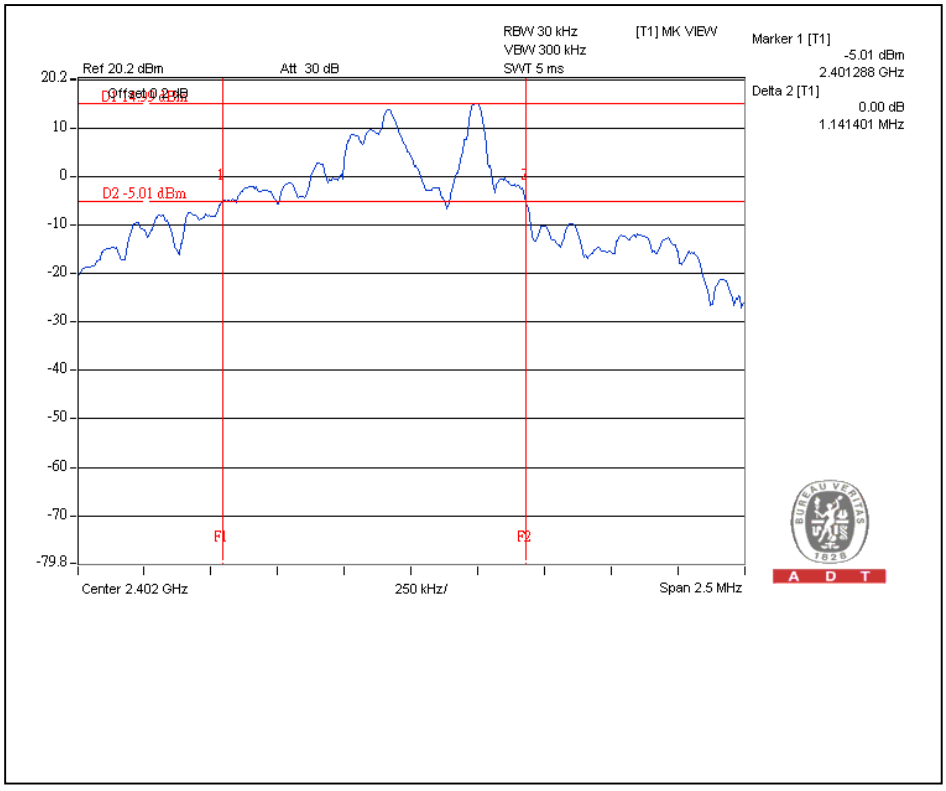
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.3.7 TEST RESULTS

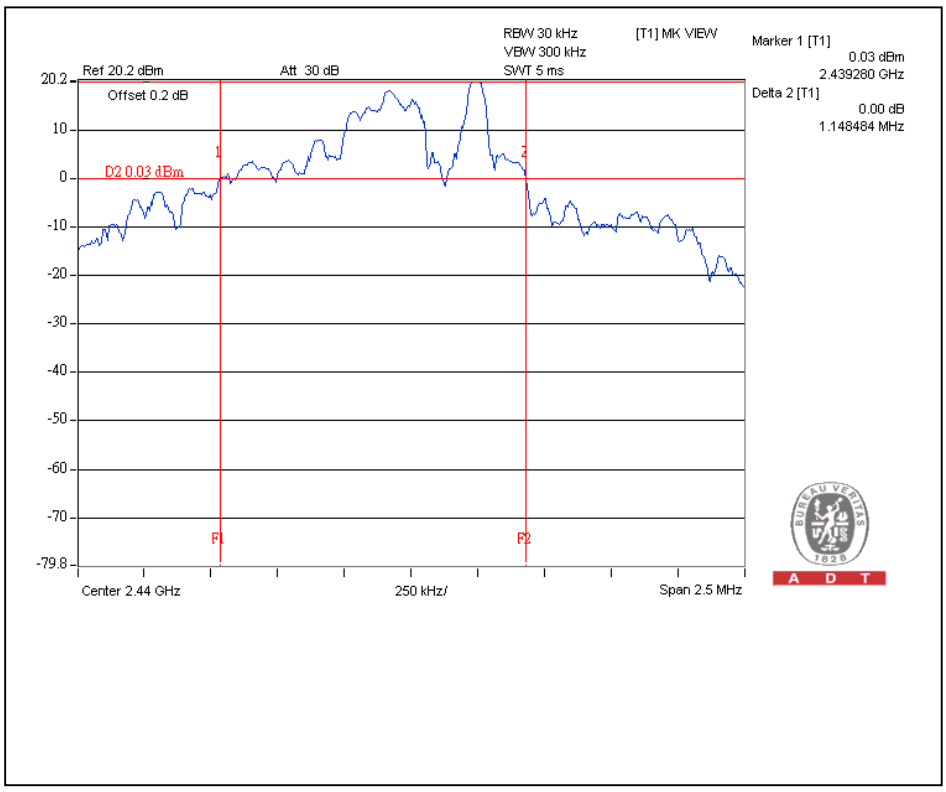
MODULATION TYPE	GFSK	**INPUT POWER (SYSTEM)**	120Vac, 60 Hz
ENVIRONMENTAL CONDITIONS	25deg. C, 60%RH, 965 hPa	**TESTED BY**	Moris Lin

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (kHz)
1	2402	1141
20	2441	1148
40	2480	1153

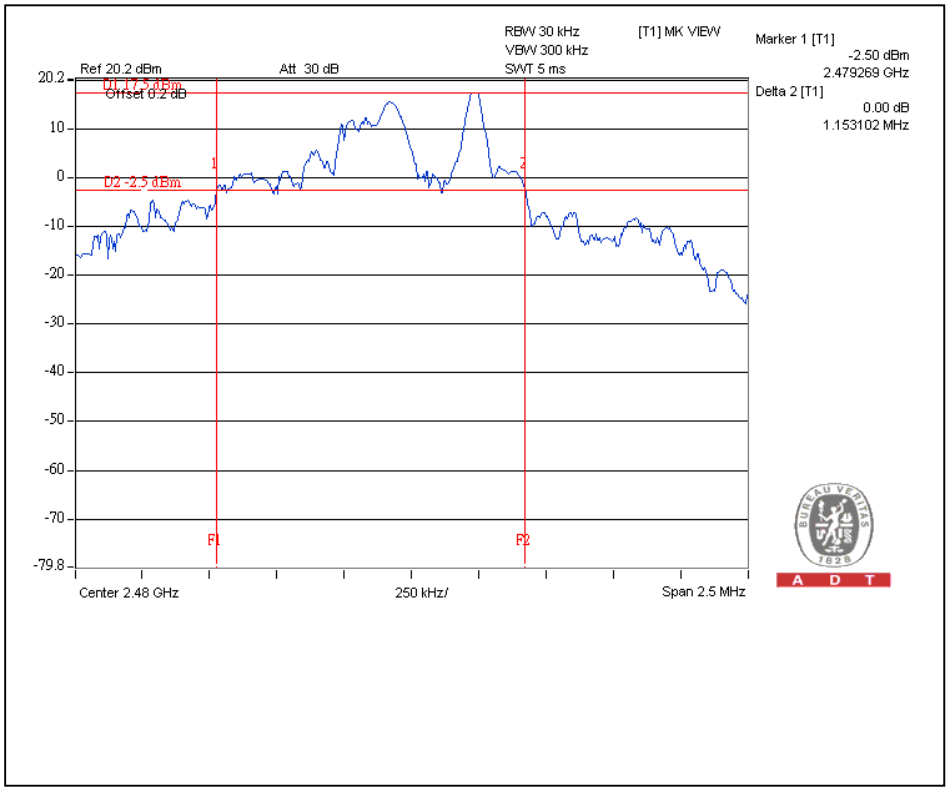
Channel 1



Channel 20



Channel 40



4.4 HOPPING CHANNEL SEPARATION

4.4.1 LIMIT OF HOPPING CHANNEL SEPARATION

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

4.4.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100037	Aug. 09, 2009	Aug. 08, 2010

NOTE:

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

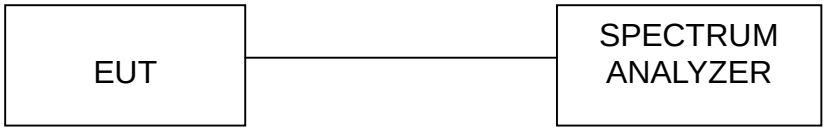
4.4.3 TEST PROCEDURES

1. Check the calibration of the measuring instrument 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 Max Hold function record the separation of two adjacent channels.
4. Measure the frequency difference of these two adjacent channels by SA MARK function. And then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

4.4.4 DEVIATION FROM TEST STANDARD

No deviation

4.4.5 TEST SETUP

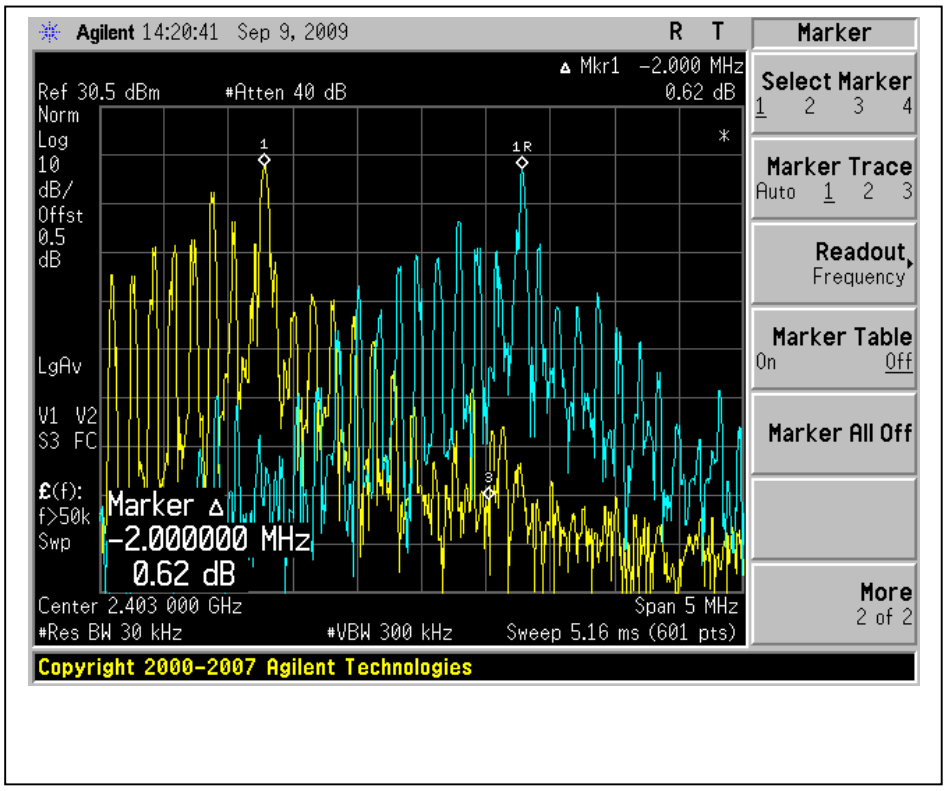


4.4.6 TEST RESULTS

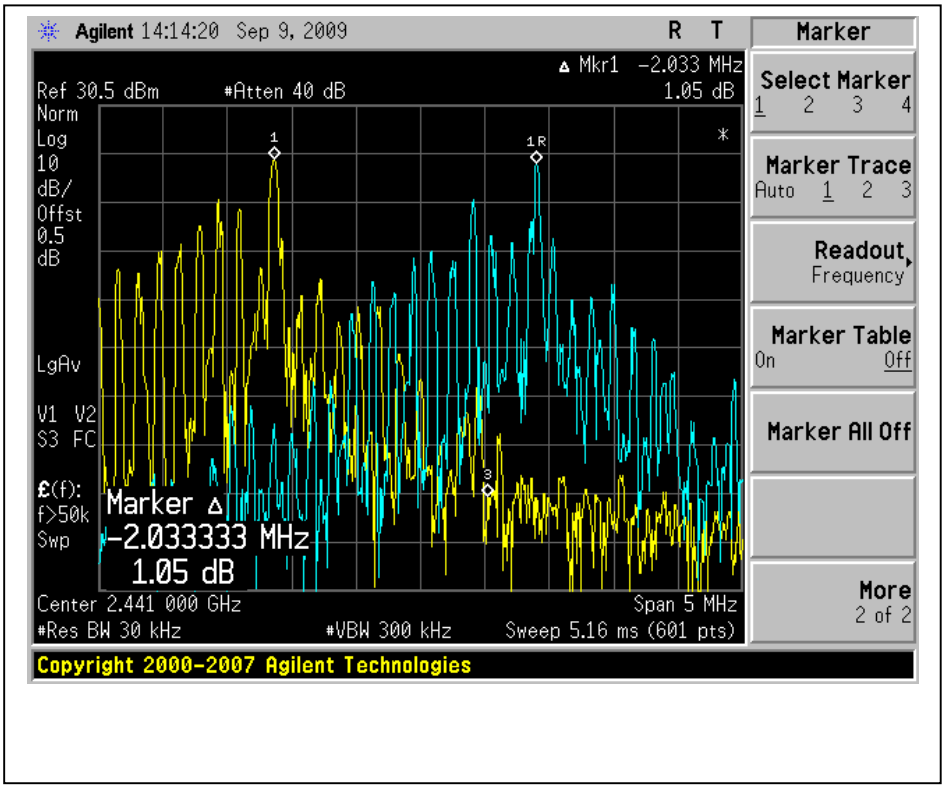
MODULATION TYPE	GFSK	INPUT POWER (SYSTEM)	120Vac, 60 Hz
ENVIRONMENTAL CONDITIONS	25deg. C, 60%RH, 965 hPa	TESTED BY	Rex Huang

Channel	Frequency (MHz)	Adjacent Channel Separation (kHz)	Minimum Limit (kHz)	Pass / Fail
0	2402	2000	1141	PASS
39	2441	2033	1148	PASS
78	2480	2017	1153	PASS

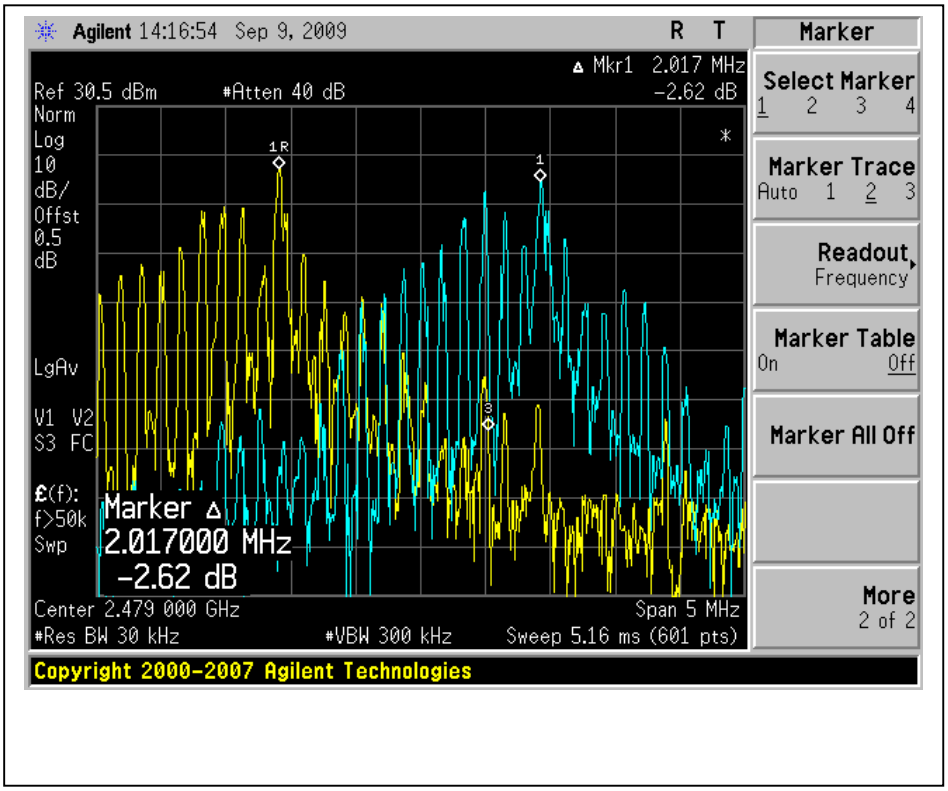
Channel 1



Channel 20



Channel 40



4.5 MAXIMUM PEAK OUTPUT POWER

4.5.1 LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT

The Maximum Peak Output Power Measurement is 125mW.

4.5.2 INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100037	Aug. 09, 2009	Aug. 08, 2010

NOTE:

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

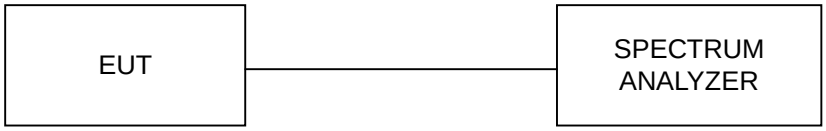
4.5.3 TEST PROCEDURES

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

4.5.4 DEVIATION FROM TEST STANDARD

No deviation

4.5.5 TEST SETUP



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

4.5.6 EUT OPERATING CONDITION

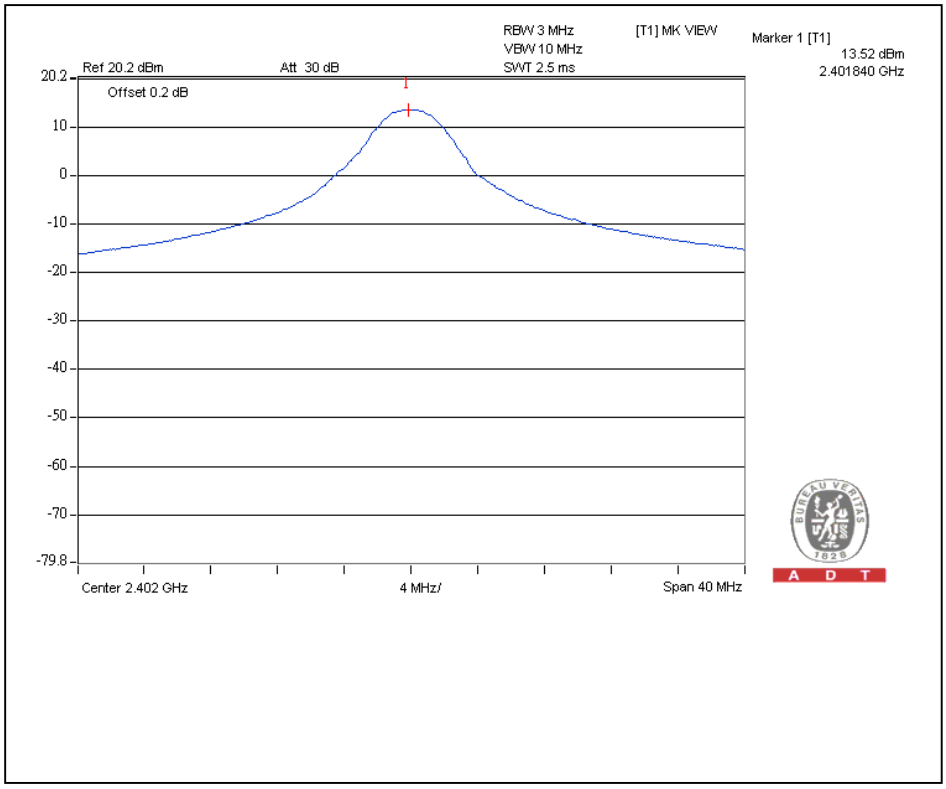
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.5.7 TEST RESULTS

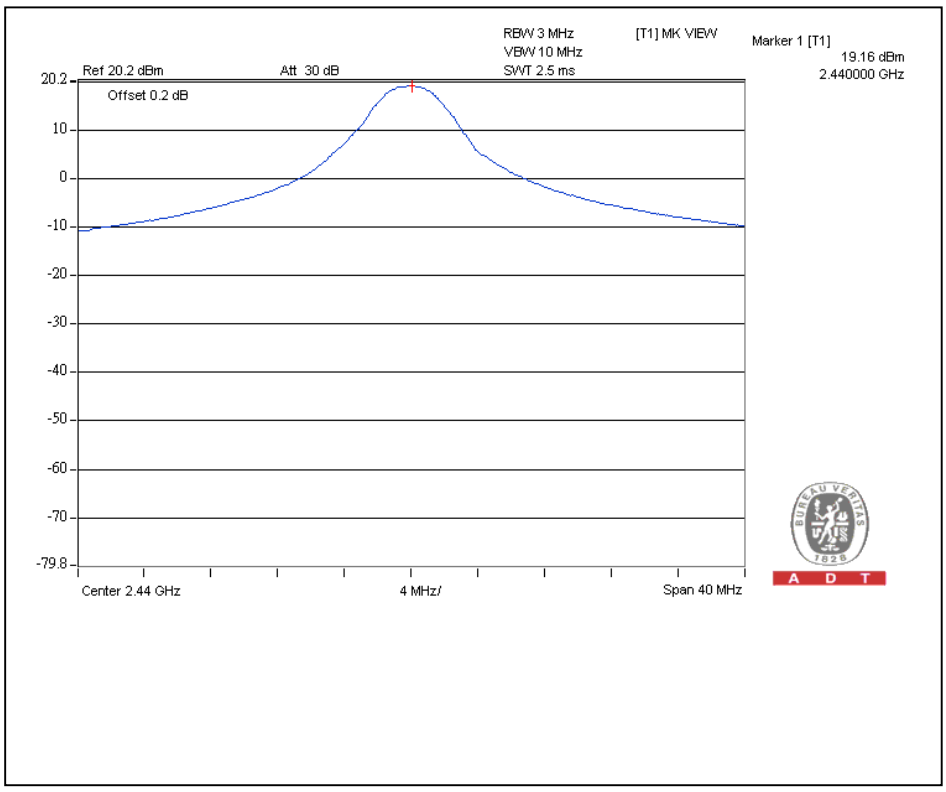
MODULATION TYPE	GFSK	INPUT POWER (SYSTEM)	120Vac, 60 Hz
ENVIRONMENTAL CONDITIONS	25deg. C, 60%RH, 965 hPa	TESTED BY	Rex Huang

CHANNEL	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (mW)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (mW)	PASS/FAIL
1	2402	22.491	13.52	125	PASS
20	2440	82.414	19.16	125	PASS
40	2480	57.677	17.61	125	PASS

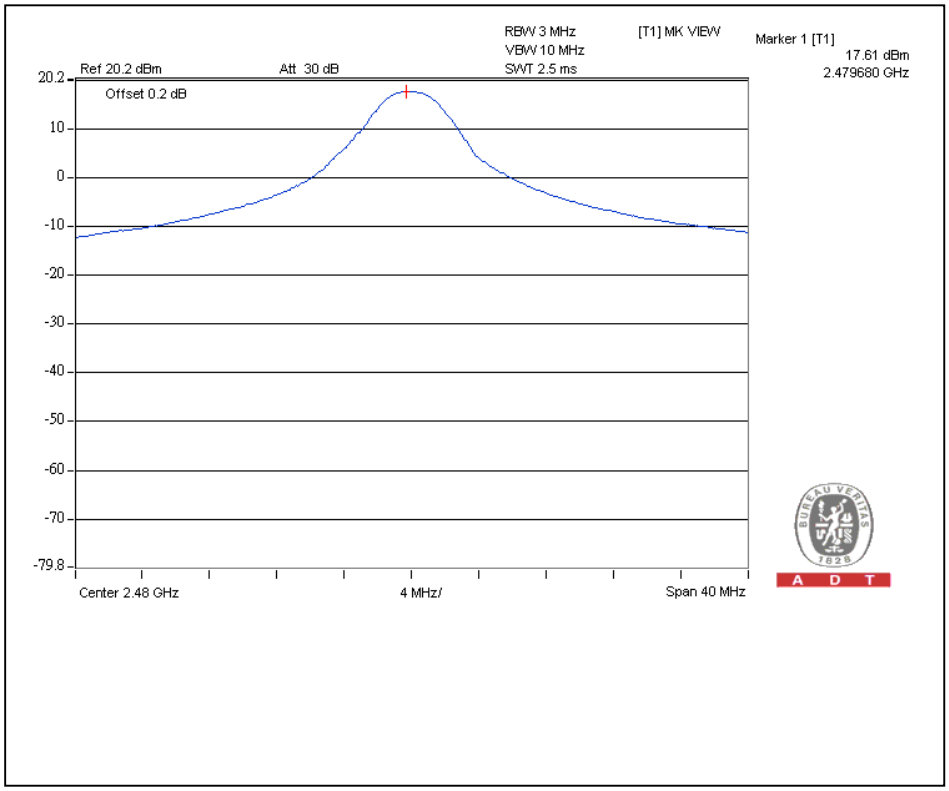
Channel 1



Channel 20



Channel 40



4.6 RADIATED EMISSION MEASUREMENT

4.6.1 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

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.

4.6.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
ROHDE & SCHWARZ Spectrum Analyzer	FSP40	100036	Dec. 09, 2008	Dec. 08, 2009
Agilent PSA Spectrum Analyzer	E4446A	MY46180622	Apr. 24 , 2009	Apr. 23 , 2010
HP Pre_Amplifier	8449B	3008A01923	Nov. 10, 2008	Nov. 09, 2009
ROHDE & SCHWARZ Test Receiver	ESCS30	847124/029	Aug. 28, 2009	Aug. 27, 2010
SCHWARZBECK TRILOG Broadband Antenna	VULB 9168	138	April 29, 2009	April 28, 2010
Schwarzbeck Horn_Antenna	BBHA9120	D124	Dec. 09, 2008	Dec. 08, 2009
Schwarzbeck Horn_Antenna	BBHA 9170	BBHA9170153	Jan. 22, 2009	Jan. 21, 2010
RF Switches	EMH-011	08009	Oct. 07, 2008	Oct. 06, 2009
RF CABLE (Chaintek)	Sucoflex 106	28077	Aug. 15, 2009	Aug. 14, 2010
RF Cable	8DFB	STCCAB-30M-1GHz	Oct. 07, 2008	Oct. 06, 2009
Software	ADT_Radiated_V7.6.15.9.2	NA	NA	NA
CT Antenna Tower & Turn Table	NA	NA	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The horn antenna, HP preamplifier (model: 8449B) and Spectrum Analyzer (model: FSP40) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in Open Site No. C.
4. The FCC Site Registration No. is 656396.
5. The VCCI Site Registration No. is R-1626.
6. The CANADA Site Registration No. is IC 7450G-3.

4.6.3 TEST PROCEDURES

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

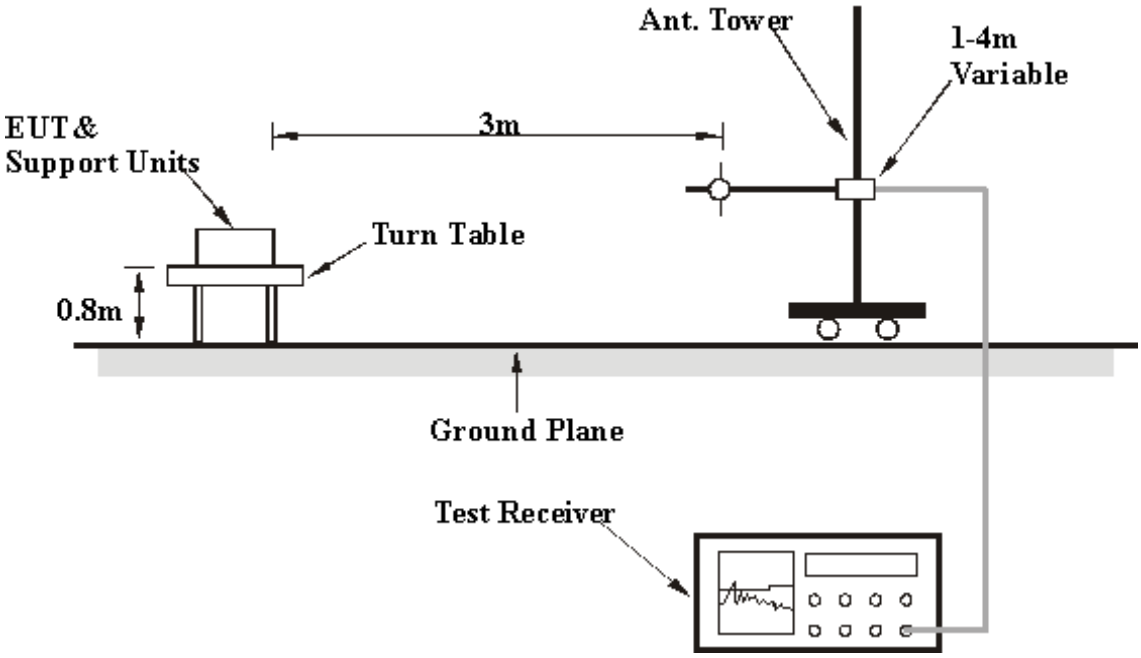
NOTE:

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 is 1MHz and video bandwidth of test receiver/spectrum analyzer is 3MHz for Peak detection at frequency above 1GHz.

4.6.4 DEVIATION FROM TEST STANDARD

No deviation

4.6.5 TEST SETUP



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

4.6.6 TEST RESULTS

BELOW 1GHz WORST-CASE DATA：GFSK MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 1	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	28deg. C, 70%RH 965 hPa	TESTED BY	Moris Lin

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	52.70	29.33 QP	40.00	-10.67	2.98 H	118	15.26	14.07
2	433.02	38.20 QP	46.00	-7.80	2.48 H	71	17.90	20.30
3	489.02	35.40 QP	46.00	-10.60	2.35 H	79	13.65	21.75
4	541.70	39.60 QP	46.00	-6.40	1.75 H	224	16.42	23.18
5	649.03	34.77 QP	46.00	-11.23	1.35 H	47	9.57	25.20
6	960.02	34.62 QP	54.00	-19.38	1.08 H	134	4.38	30.24
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	53.60	35.70 QP	40.00	-4.30	1.00 V	145	21.67	14.03
2	196.01	33.48 QP	43.50	-10.02	1.15 V	203	21.01	12.47
3	433.08	36.41 QP	46.00	-9.59	1.97 V	13	16.11	20.30
4	541.02	38.46 QP	46.00	-7.54	2.62 V	318	15.30	23.16
5	720.04	37.26 QP	46.00	-8.74	2.67 V	229	10.94	26.32
6	960.01	30.73 QP	54.00	-23.27	2.44 V	184	0.49	30.24

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

ABOVE 1GHz WORST-CASE DATA：GFSK MODULATION

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 1	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	26deg. C, 60%RH 965 hPa	TESTED BY	Moris Lin

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	2326.00	51.75 PK	74.00	-22.25	1.79 H	127	21.70	30.05
2	2326.00	40.97 AV	54.00	-13.03	1.79 H	127	10.92	30.05
3	2390.00	67.40 PK	74.00	-6.60	1.79 H	127	37.12	30.28
4	2390.00	42.28 AV	54.00	-11.72	1.79 H	127	12.00	30.28
5	*2402.00	102.45 PK			1.79 H	127	72.12	30.33
6	*2402.00	82.59 AV			1.79 H	127	52.26	30.33
7	4804.00	49.46 PK	74.00	-24.54	1.71 H	141	12.73	36.73
8	4804.00	36.21 AV	54.00	-17.79	1.71 H	141	-0.52	36.73
9	#7206.00	48.76 PK	82.45	-33.69	1.50 H	22	5.62	43.14
10	#7206.00	36.98 AV	62.59	-25.61	1.50 H	22	-6.16	43.14
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	2326.00	57.86 PK	74.00	-16.14	1.00 V	149	27.81	30.05
2	2326.00	46.34 AV	54.00	-7.66	1.00 V	149	16.29	30.05
3	**2390.00**	**73.45 PK**	**74.00**	**-0.55**	**1.00 V**	**149**	**43.17**	**30.28**
4	2390.00	42.71 AV	54.00	-11.29	1.00 V	149	12.43	30.28
5	*2402.00	110.70 PK			1.00 V	96	80.37	30.33
6	*2402.00	91.60 AV			1.00 V	96	61.27	30.33
7	4804.00	54.59 PK	74.00	-19.41	1.45 V	356	17.86	36.73
8	4804.00	36.88 AV	54.00	-17.12	1.45 V	356	0.15	36.73
9	#7206.00	50.41 PK	90.70	-40.29	1.25 V	194	7.27	43.14
10	#7206.00	38.42 AV	71.60	-33.18	1.25 V	194	-4.72	43.14

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

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

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 20	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	26deg. C, 60%RH 965 hPa	TESTED BY	Moris Lin

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2440.00	108.29 PK			1.71 H	128	77.82	30.47
2	*2440.00	90.14 AV			1.71 H	128	59.67	30.47
3	4880.00	48.20 PK	74.00	-25.80	1.75 H	150	11.26	36.94
4	4880.00	34.90 AV	54.00	-19.10	1.75 H	150	-2.04	36.94
5	7320.00	50.30 PK	74.00	-23.70	1.49 H	23	7.17	43.13
6	7320.00	38.20 AV	54.00	-15.80	1.49 H	23	-4.93	43.13
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2440.00	118.61 PK			1.00 V	201	88.14	30.47
2	*2440.00	95.86 AV			1.00 V	201	65.39	30.47
3	4880.00	52.79 PK	74.00	-21.21	1.43 V	355	15.85	36.94
4	4880.00	36.90 AV	54.00	-17.10	1.43 V	355	-0.04	36.94
5	7320.00	54.60 PK	74.00	-19.40	1.18 V	197	11.47	43.13
6	7320.00	40.20 AV	54.00	-13.80	1.18 V	197	-2.93	43.13

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

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

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 40	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	26deg. C, 60%RH 965 hPa	TESTED BY	Moris Lin

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	104.69 PK			1.74 H	126	74.07	30.62
2	*2480.00	88.06 AV			1.74 H	126	57.44	30.62
3	2483.50	60.48 PK	74.00	-13.52	1.74 H	126	29.85	30.63
4	2483.50	43.85 AV	54.00	-10.15	1.74 H	126	13.22	30.63
5	4960.00	47.26 PK	74.00	-26.74	1.90 H	153	10.11	37.15
6	4960.00	35.48 AV	54.00	-18.52	1.90 H	153	-1.67	37.15
7	7440.00	53.43 PK	74.00	-20.57	1.43 H	25	10.31	43.12
8	7440.00	40.90 AV	54.00	-13.10	1.43 H	25	-2.22	43.12
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480.00	115.30 PK			1.00 V	95	84.68	30.62
2	*2480.00	93.87 AV			1.00 V	95	63.25	30.62
3	2483.50	71.09 PK	74.00	-2.91	1.00 V	95	40.46	30.63
4	2483.50	49.66 AV	54.00	-4.34	1.00 V	95	19.03	30.63
5	4960.00	50.82 PK	74.00	-23.18	1.41 V	360	13.67	37.15
6	4960.00	36.85 AV	54.00	-17.15	1.41 V	360	-0.30	37.15
7	7440.00	55.78 PK	74.00	-18.22	1.14 V	203	12.66	43.12
8	7440.00	43.25 AV	54.00	-10.75	1.14 V	203	0.13	43.12

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

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

4.7 CONDUCTED OUT-BAND EMISSION MEASUREMENT

4.8.1 LIMITS OF CONDUCTED OUT-BAND EMISSION MEASUREMENT

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

4.8.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100037	Aug. 09, 2009	Aug. 08, 2010

NOTE:

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

4.8.3 TEST PROCEDURE

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

4.8.4 DEVIATION FROM TEST STANDARD

No deviation

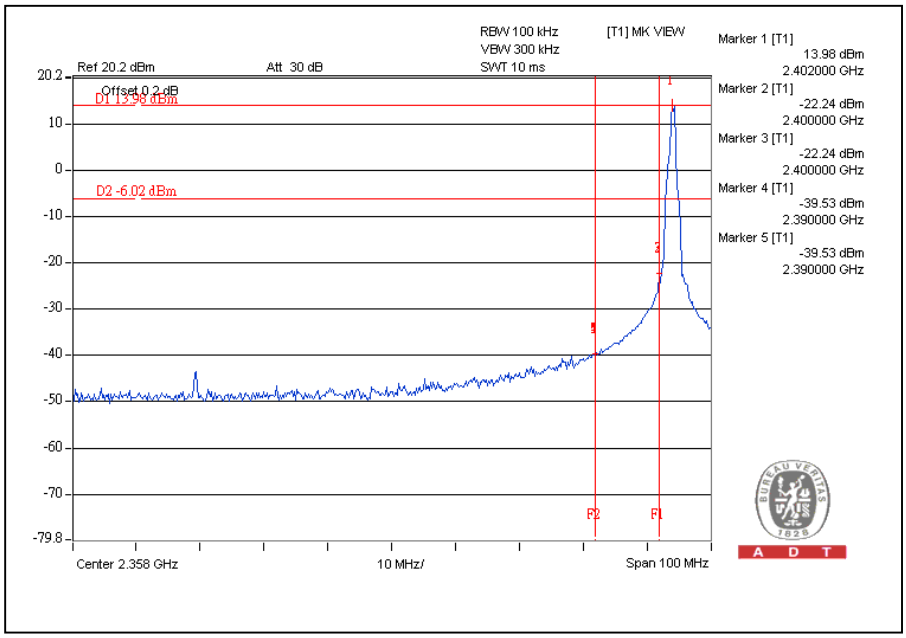
4.8.5 EUT OPERATING CONDITION

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

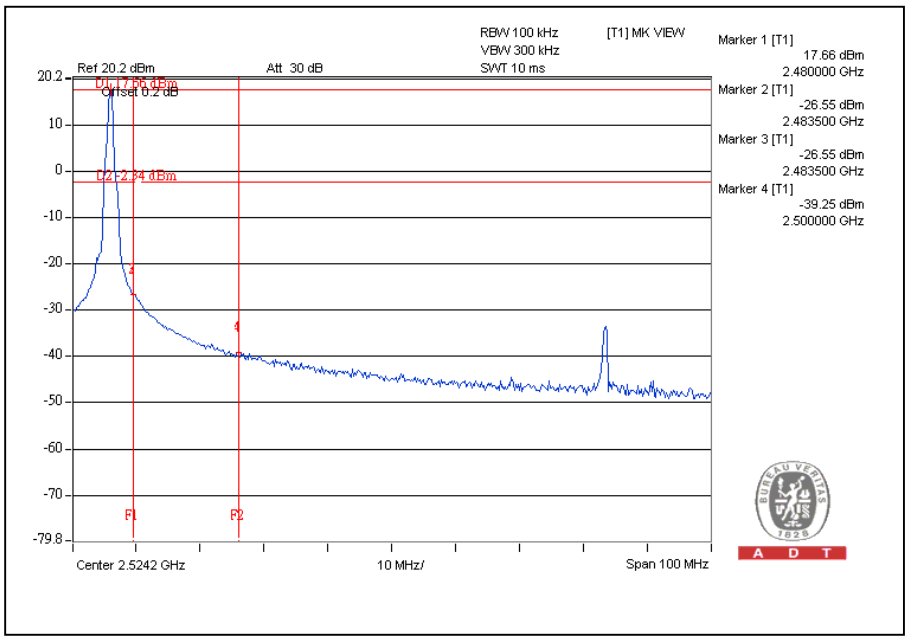
4.8.6 TEST RESULTS

Emissions radiated outside of the specified frequency bands, please refer pages form 42 to 44 for met the requirement of the general radiated emission limits in § 15.209.

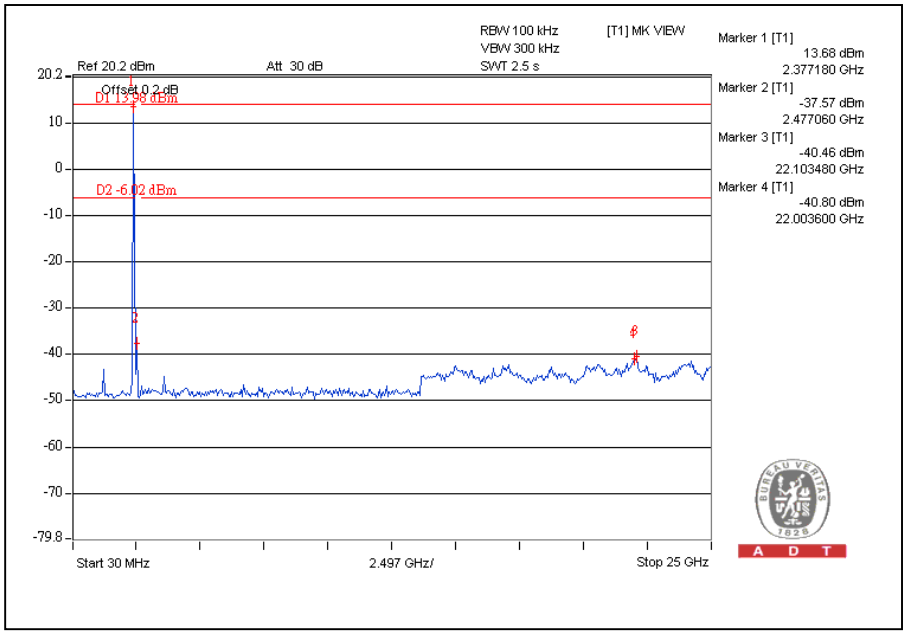
CH1



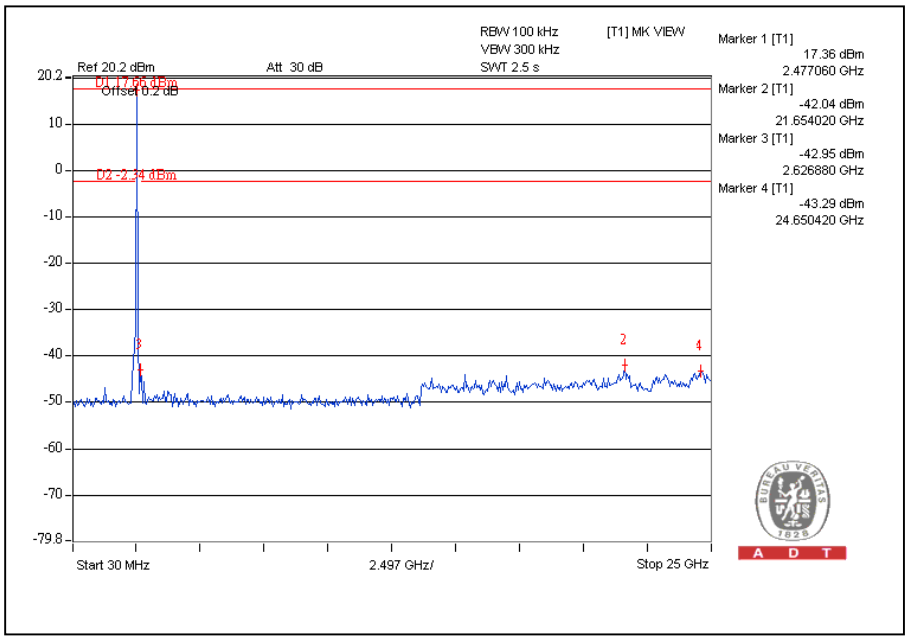
CH40



CH1


RBW 100 kHz
VBW 300 kHz
SWT 2.5 s
[T1] MK VIEW
Ref 20.2 dBm
Att 30 dB
Offset 0.2 dB
D1 13.88 dBm
D2 -6.12 dBm
Marker 1 [T1]
13.68 dBm
2.377180 GHz
Marker 2 [T1]
-37.57 dBm
2.477060 GHz
Marker 3 [T1]
-40.46 dBm
22.103480 GHz
Marker 4 [T1]
-40.80 dBm
22.003600 GHz
20.2
10
0
-10
-20
-30
-40
-50
-60
-70
-79.8
Start 30 MHz
2.497 GHz/
Stop 25 GHz

CH40


RBW 100 kHz
VBW 300 kHz
SWT 2.5 s
[T1] MK VIEW
Ref 20.2 dBm
Att 30 dB
Offset 0.2 dB
D1 17.56 dBm
D2 -2.44 dBm
Marker 1 [T1]
17.36 dBm
2.477060 GHz
Marker 2 [T1]
-42.04 dBm
21.654020 GHz
Marker 3 [T1]
-42.95 dBm
2.626880 GHz
Marker 4 [T1]
-43.29 dBm
24.650420 GHz
20.2
10
0
-10
-20
-30
-40
-50
-60
-70
-79.8
Start 30 MHz
2.497 GHz/
Stop 25 GHz

4.9 ANTENNA REQUIREMENT

4.9.1 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 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

4.9.2 ANTENNA CONNECTED CONSTRUCTION

The antenna used in this product is Dipole antenna with SMA reverse connector. The maximum Gain of the antenna is 3.0dBi.

5 INFORMATION ON THE TESTING LABORATORIES

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved 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: 886-2-26052943

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

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

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

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

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

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

--- END ---