FCC TEST REPORT

CATEGORY	:	Portable
PRODUCT NAME	:	GPS 10; GPS10 Deluxe
FCC ID.	:	SPO-00855
FILING TYPE	:	Certification
BRAND NAME	:	GARMIN
MODEL NAME	:	GPS 10 (011-01088-0X) GPS 10 Deluxe (011-01088-0X)
APPLICANT	:	**GARMIN CORP.** No. 68, Jangshu 2nd Rd., Shijr, Taipei County, Taiwan, R.O.C.
MANUFACTURER	:	**GARMIN CORP.** No. 68, Jangshu 2nd Rd., Shijr, Taipei County, Taiwan, R.O.C.
ISSUED BY	:	**SPORTON INTERNATIONAL INC.** 6F, No. 106, Sec. 1, Hsin Tai Wu Rd., His Chih, Taipei Hsien, Taiwan, R.O.C.

Statements:

The test result in this report refers exclusively to the presented test model / sample.
Without written approval of SPORTON International Inc., the test report shall not be reproduced except in full.

Certificate or Test Report could not be used by the applicant to claim the product endorsement by CNLA, NVLAP or any agency of U.S. government.

The test equipment used to perform the test are calibrated and traceable to NML/ROC or NIST/USA.

Dr. Alan Lane
Vice General Manager
SPORTON International Inc.

NVLAP®
Lab Code: 200079-0

Table of Contents

History of this test report

Original Report Issue Date: Dec. 13, 2004

Report No.: FR4O2709-01

■ No additional attachment.

☐ Additional attachment were issued as following record:

Attachment No.	Issue Date	Description

CERTIFICATE OF COMPLIANCE

with

47 CFR FCC Part 15 Subpart C (Section 15.247)

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MANUFACTURER	:	**GARMIN CORP.** No. 68, Jangshu 2nd Rd., Shijr, Taipei County, Taiwan, R.O.C.

I **HEREBY** CERTIFY THAT:

The measurements shown in this test report were made in accordance with the procedures given in ANSI C63.4 - 2003 and all test are performed according to 47 CFR FCC Part 15. Testing was carried out on Dec. 10, 2004 at SPORTON International Inc. LAB.

Dr. Alan Lane
Vice General Manager
SPORTON International Inc.

1. General Description of Equipment under Test

1.1. Applicant

GARMIN CORP.
No. 68, Jangshu 2nd Rd., Shijr, Taipei County, Taiwan, R.O.C.

1.2. Manufacturer

GARMIN CORP.
No. 68, Jangshu 2nd Rd., Shijr, Taipei County, Taiwan, R.O.C.

1.3. Basic Description of Equipment under Test

This product is a GPS with Bluetooth wireless solution. The technical data has been listed on section " Features of Equipment under Test ".

1.4. Features of Equipment under Test

Items		Description
Type of Modulation	:	GFSK
Number of Channels	:	79
Frequency Band	:	2400MHz ~ 2483.5MHz
Carrier Frequency	:	See section 1.6 for details
Data Rate	:	1Mbps
Channel Bandwidth	:	1MHz
Conducted Peak Power	:	1.61dBm
Antenna Type	:	See section 1.5 for details
Testing Duty Cycle	:	45.60%
Power Rating (DC/AC, Voltage)	:	5 VDC from 100~240 VAC power adapter
Test Power Source	:	110.00V AC
Temperature Range (Operating)	:	-10 ~ 55 ℃

1.5. Antenna Description

1 types of antenna are filed in this project.

No.	Antenna Type	Gain (dBi)
1	Ceramic Antenna	2.50dBi

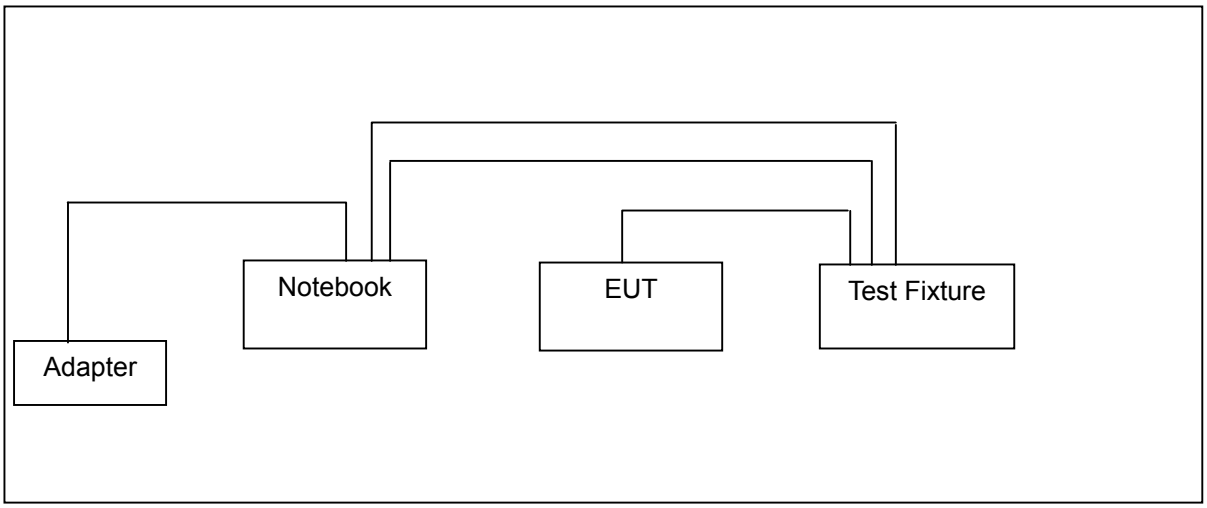
1.6. Table for Carrier Frequencies

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
00	2402 MHz	20	2422 MHz	40	2442 MHz	60	2462 MHz
01	2403 MHz	21	2423 MHz	41	2443 MHz	61	2463 MHz
02	2404 MHz	22	2424 MHz	42	2444 MHz	62	2464 MHz
03	2405 MHz	23	2425 MHz	43	2445 MHz	63	2465 MHz
04	2406 MHz	24	2426 MHz	44	2446 MHz	64	2466 MHz
05	2407 MHz	25	2427 MHz	45	2447 MHz	65	2467 MHz
06	2408 MHz	26	2428 MHz	46	2448 MHz	66	2468 MHz
07	2409 MHz	27	2429 MHz	47	2449 MHz	67	2469 MHz
08	2410 MHz	28	2430 MHz	48	2450 MHz	68	2470 MHz
09	2411 MHz	29	2431 MHz	49	2451 MHz	69	2471 MHz
10	2412 MHz	30	2432 MHz	50	2452 MHz	70	2472 MHz
11	2413 MHz	31	2433 MHz	51	2453 MHz	71	2473 MHz
12	2414 MHz	32	2434 MHz	52	2454 MHz	72	2474 MHz
13	2415 MHz	33	2435 MHz	53	2455 MHz	73	2475 MHz
14	2416 MHz	34	2436 MHz	54	2456 MHz	74	2476 MHz
15	2417 MHz	35	2437 MHz	55	2457 MHz	75	2477 MHz
16	2418 MHz	36	2438 MHz	56	2458 MHz	76	2478 MHz
17	2419 MHz	37	2439 MHz	57	2459 MHz	77	2479 MHz
18	2420 MHz	38	2440 MHz	58	2460 MHz	78	2480 MHz
19	2421 MHz	39	2441 MHz	59	2461 MHz		

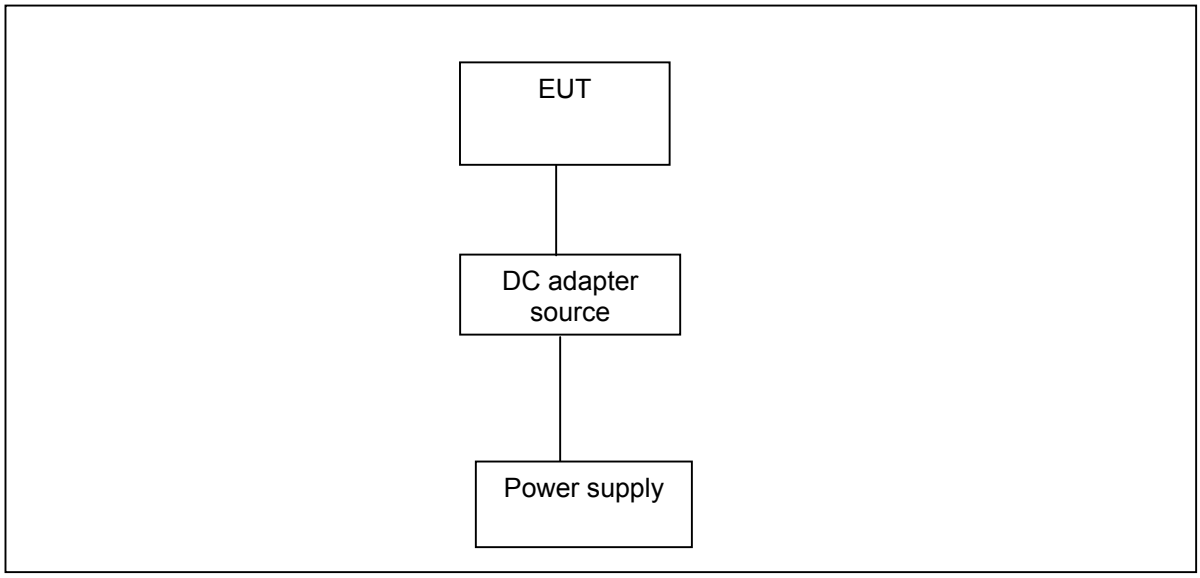
2. Test Configuration of the Equipment under Test

2.1. Connection Diagram of Test System

<Powered by adapter>



<Powered by DC adapter source>



2.2. The Test Mode Description

Spurious emission below 1GHz is independent of channel selection, so only channel 78 with GFSK modulation was tested.

AC conduction emission is independent of channel selection, so only channel 78 with GFSK modulation was tested.

The EUT could be powered by adapter and DC adapter source. So, an extra test mode for spurious emission below 1GHz was performed.

2.3. Description of Test Supporting Units

Support unit	Brand	Model No.	Serial No.	FCC ID	Data cable (m)
Notebook	DELL	PP10L	SP0031	DoC	-

3. General Information of Test

3.1. Test Facility

Test Site Location : No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiag, Tao Yuan Hsien, Taiwan, R.O.C.
: TEL 886-3-327-3456
: FAX 886-3-318-0055

Test Site No : 03CH03-HY / TH01-HY

3.2. Test Conditions

Normal Voltage	: 110.00V (power adapter)
Extreme Voltages	: 126.50V and 93.5V (power adapter)
Normal Temperature	: 20℃
Extreme Temperature	: -10 ℃ and 55 ℃

3.3. Standards for Methods of Measurement

Here is the list of the standards followed in this test report.
ANSI C63.4-2003
47 CFR Part 15 Subpart C (Section 15.247)

3.4. DoC Statement

This EUT is also classified as a device of computer peripheral Class B which DoC has to be followed. It has been verified according to the rule of 47 CFR part 15 Subpart B, and found that all the requirements has been fulfilled.

3.5. Frequency Range Investigated

Radiated emission test: from 30 MHz to 10th carrier harmonic

3.6. Test Distance

The test distance of radiated emission (30MHz~1GHz) test from antenna to EUT is 3 M.
The test distance of radiated emission (1GHz~10th carrier harmonic) test from antenna to EUT is 3 M.

3.7. Test Software

During testing, Channel & Power Controlling Software: This was provided by the manufacturer and is able to let the test engineer select the operating channel as well as the RF output power. The parameters for channel selection is trying to offer the test engineer the ability to fix the operating channel for testing, both normal data and continuously transmitting modes are allowed, and that for RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

4. List of Measurements

4.1. Summary of the Test Results

Applied Standard: 47 CFR Part 15 and Part 2

Paragraph	FCC Rule	Description of Test	Result
5.1	15.247	Hopping Channel Bandwidth	Pass
5.2	15.247	Hopping Channel Separation	Pass
5.3	15.247	Number of Hopping Frequency Used	Pass
5.4	15.247	Dwell Time of Each Frequency	Pass
5.5	15.247	Maximum Peak Output Power	Pass
5.6	15.247	Band Edges Emission	Pass
5.7	15.207	AC Power Line Conducted Emission	Pass
5.8	15.209/15.247	Spurious Radiated Emission	Pass
0	15.203/15.247	Antenna Requirement	Pass
5.10	2.1091	Maximum Permissible Exposure	Pass

5. Test Result

5.1. Test of Hopping Channel Bandwidth

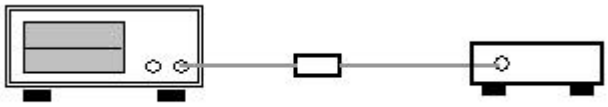
5.1.1. Measuring Instruments

Item 18 of the table is on section 6.

5.1.2. Test Procedures

1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. Set RBW of spectrum analyzer to 30KHz and VBW to 100KHz.
3. The spectrum width with level higher than 20dB below the peak level.
4. Repeat above 1~3 points for the middle and highest channel of the EUT.

5.1.3. Test Setup Layout



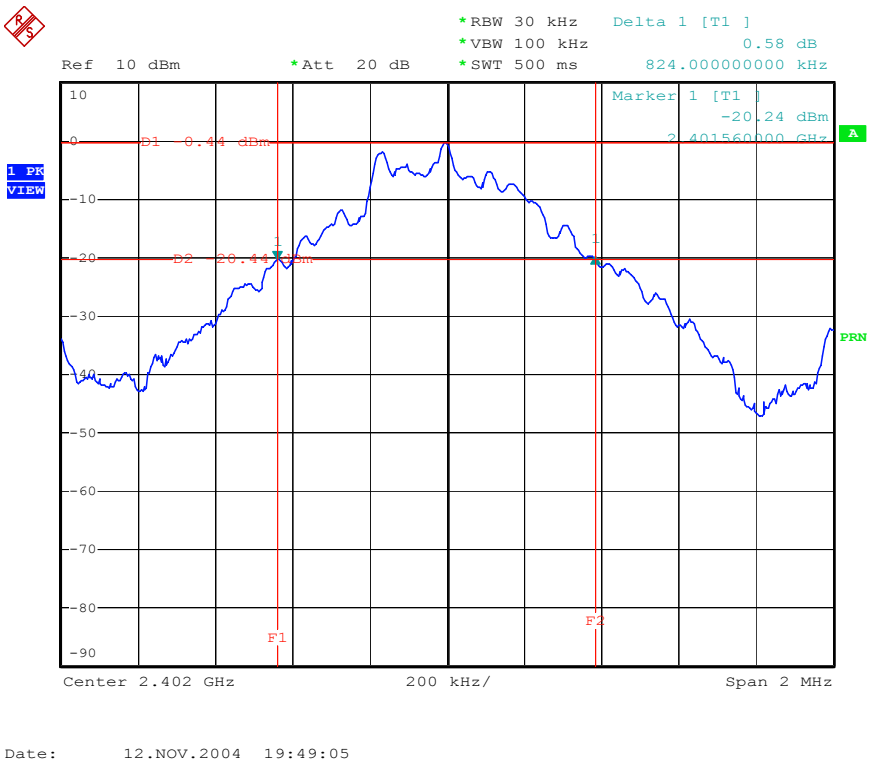
Spectrum Analyzer **EUT**

5.1.4. Test Result: See spectrum analyzer plots below

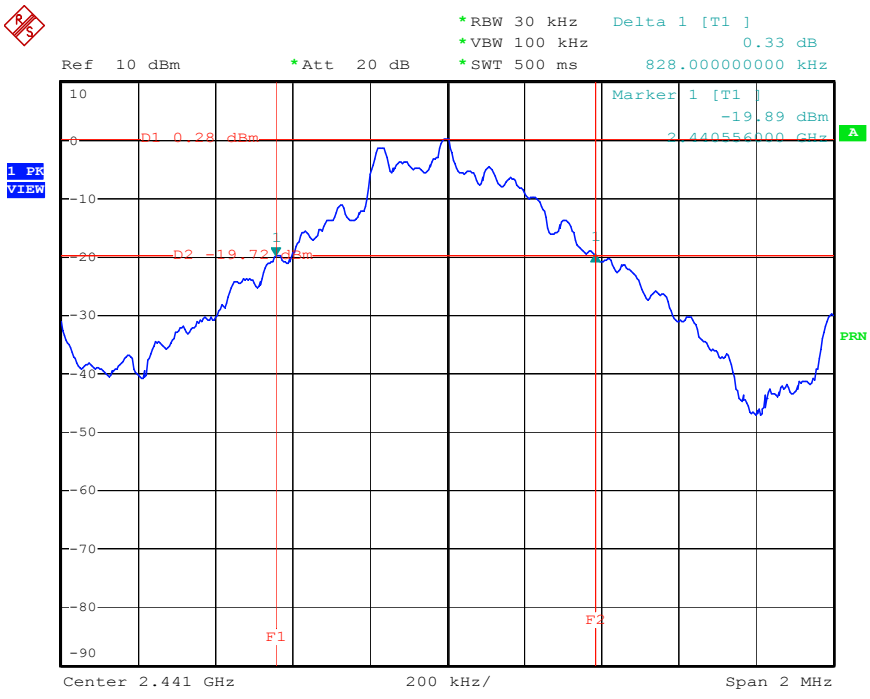
Temperature: 26°C
Relative Humidity: 64%
Duty Cycle of the Equipment During the Test: 45.60%
Test Engineer: Sam Lee

Modulation Type	Channel	Frequency (MHz)	20dB Bandwidth (kHz)	Min. Limit (kHz)
GFSK	00	2402 MHz	824.00	25
GFSK	39	2441 MHz	828.00	25
GFSK	78	2480 MHz	832.00	25

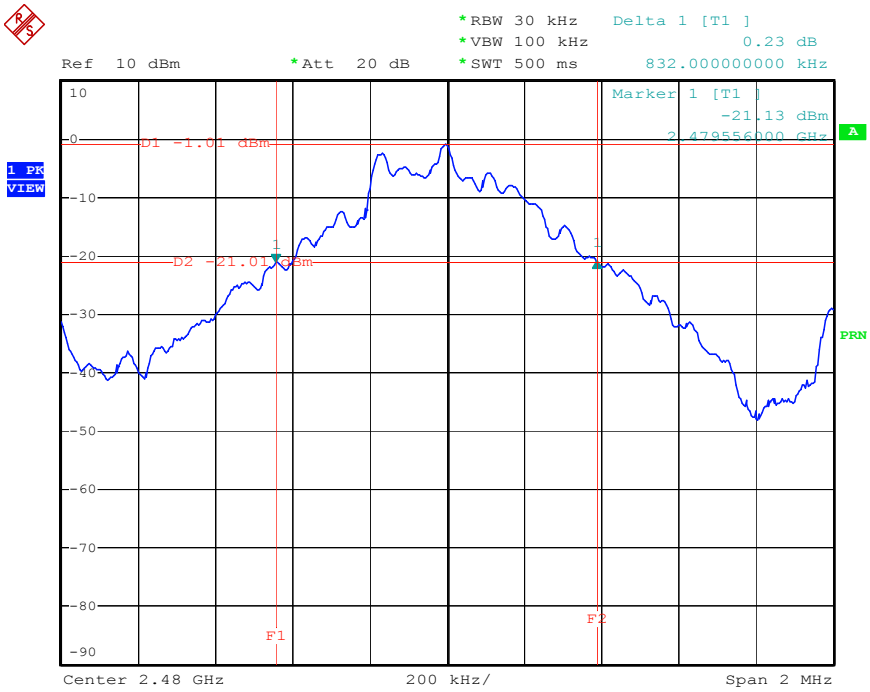
Modulation Type: GFSK (Channel 00) :



Modulation Type: GFSK (Channel 39) :



Modulation Type: GFSK (Channel 78)：



5.2. Test of Hopping Channel Separation

5.2.1. Measuring Instruments

Item 18 of the table is on section 6.

5.2.2. Test Procedures

1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. Set RBW of spectrum analyzer to 100KHz and VBW to 300KHz.
3. The Hopping Channel Separation is defined as the separation between 2 neighboring hopping frequencies.
4. Repeat above 1~3 points for the middle and highest channel of the EUT.

5.2.3. Test Setup Layout

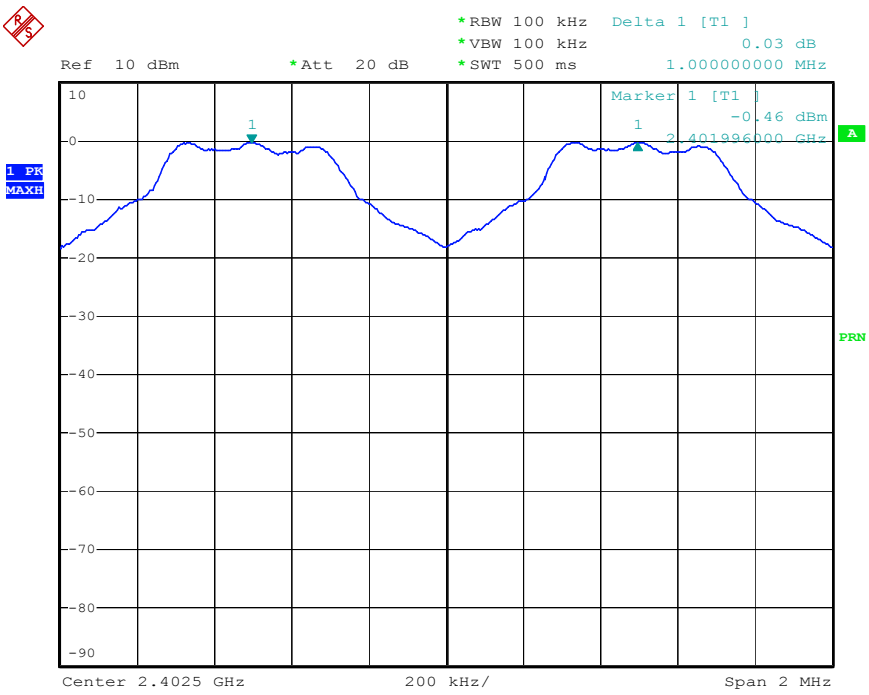
Spectrum Analyzer **EUT**

5.2.4. Test Result: See spectrum analyzer plots below

- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 45.60%
- Test Engineer: Sam Lee

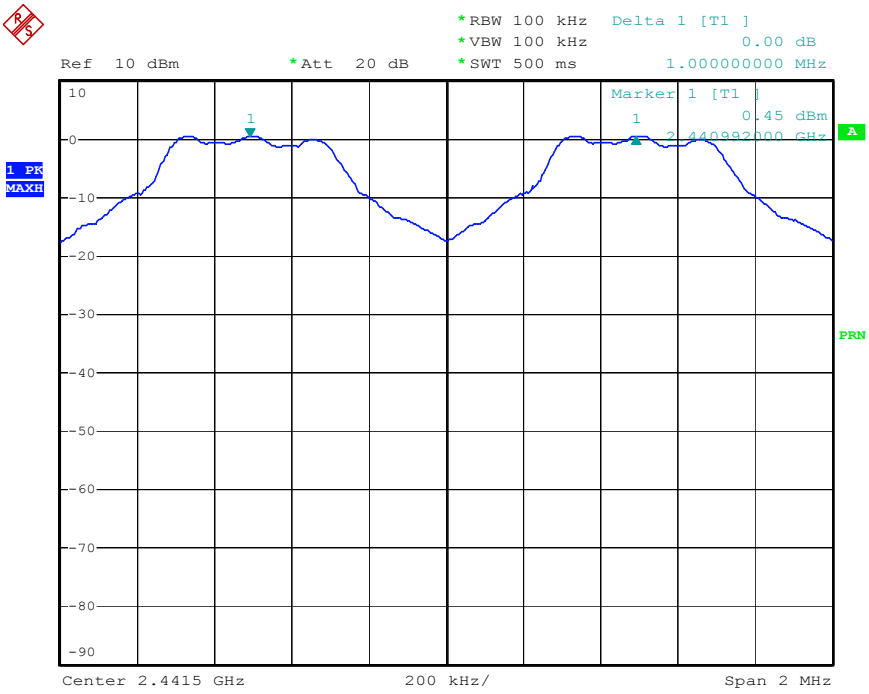
Modulation Type	Channel	Frequency (MHz)	Hopping Channel Separation (kHz)	Min. Limit (kHz)
GFSK	00	2402 MHz	1000	824.00
GFSK	39	2441 MHz	1000	828.00
GFSK	78	2480 MHz	1000	832.00

Modulation Type: GFSK (Channel 00) :



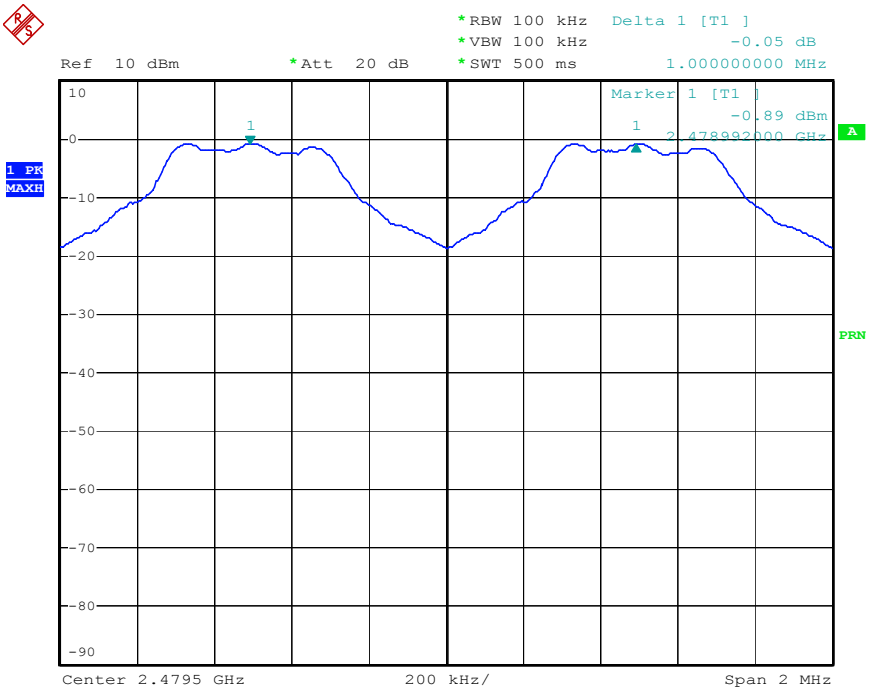
Date: 12.NOV.2004 19:54:32

Modulation Type: GFSK (Channel 39) :



Date: 12.NOV.2004 19:55:31

Modulation Type: GFSK (Channel 78)：



5.3. Test of Number of Hopping Frequency

5.3.1. Measuring Instruments

Item 18 of the table is on section 6.

5.3.2. Test Procedures

1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. Set RBW of spectrum analyzer to 100KHz and VBW to 100KHz.
3. The spectrum width with level higher than 20dB below the peak level.
4. Repeat above 1~3 points for the middle and highest channel of the EUT.

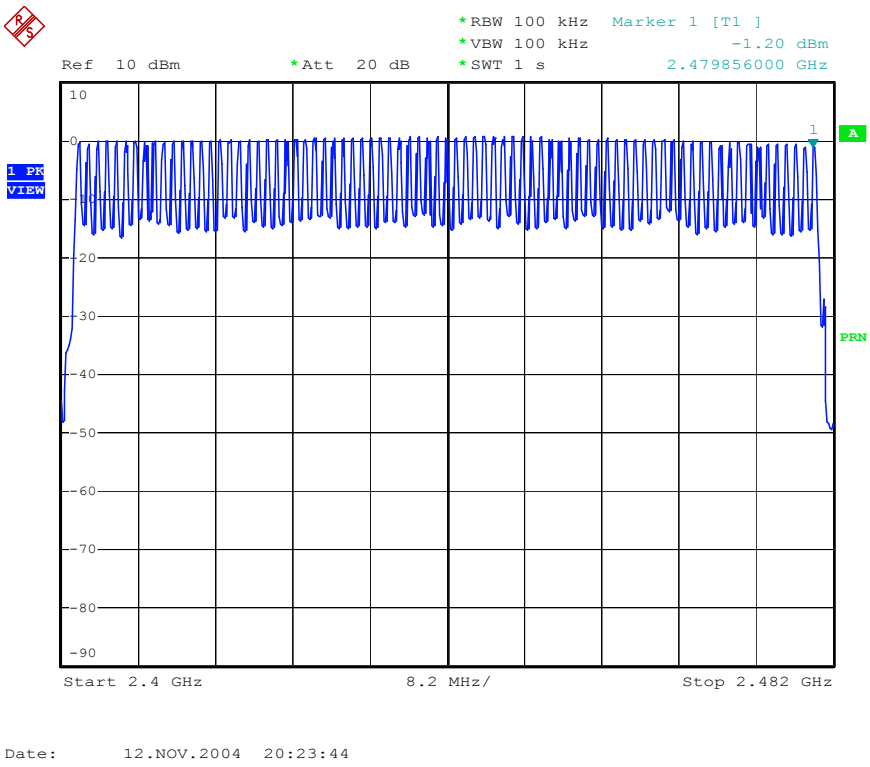
5.3.3. Test Setup Layout

5.3.4. Test Result: See spectrum analyzer plots below

- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 45.60%
- Test Engineer: Sam Lee

Modulation Type	Channel	Frequency (MHz)	Number of Hopping Ch. (Channels)	Min. Limit (Channels)
GFSK	00 ~ 78	2402 MHz ~ 2480 MHz	79	75

Modulation Type: GFSK (Channel 00 ~ Channel 78) :



5.4. Test of Dwell Time of Each Frequency

5.4.1. Measuring Instruments

Item 18 of the table is on section 6.

5.4.2. Test Procedures

1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. Set RBW of spectrum analyzer to 1000kHz and VBW to 1000kHz.
3. Set the center frequency on any frequency would be measure and set the frequency span to zero span.
4. Set the EUT for DH5, DH3 and DH1 packet transmitting.
5. Measure the maximum time duration, t , of one single pulse.
6. DH5 Packet permit maximum 3.37 hops per second in each channel. So, the dwell time is the time duration of the pulse times 106.6 within 31.6 seconds.
7. DH3 Packet permit maximum 5.06 hops per second in each channel. So, the dwell time is the time duration of the pulse times 160 within 31.6 seconds.
8. DH1 Packet permit maximum 10.12 hops per second in each channel. So, the dwell time is the time duration of the pulse times 320 within 31.6 seconds.

5.4.3. Test Setup Layout

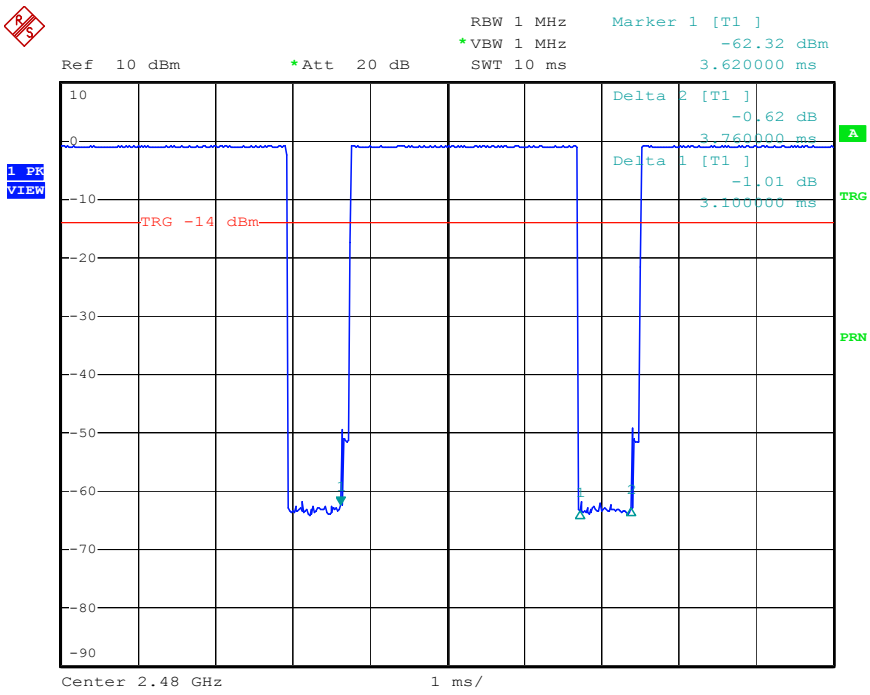
Spectrum Analyzer **EUT**

5.4.4. Test Result : See spectrum analyzer plots below

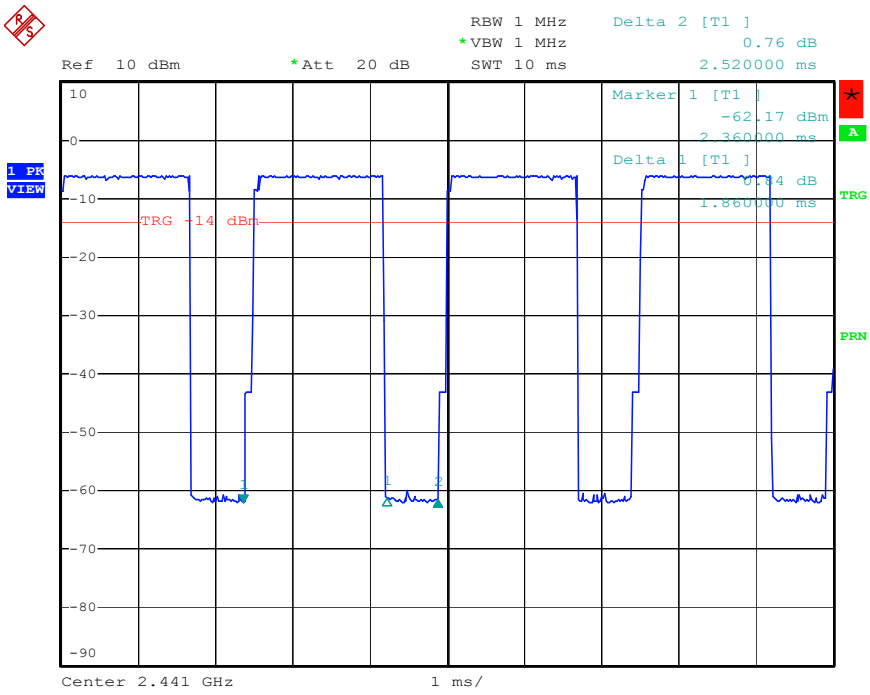
- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 45.60%
- Test Engineer: Sam Lee

Data Packet	Frequency (MHz)	Pulse Duration (ms)	Dwell Time (s)	Limits (s)
DH5	2480 MHz	3.1000	0.3307	0.4
DH3	2441 MHz	1.8600	0.2976	0.4
DH1	2402 MHz	0.5700	0.1824	0.4

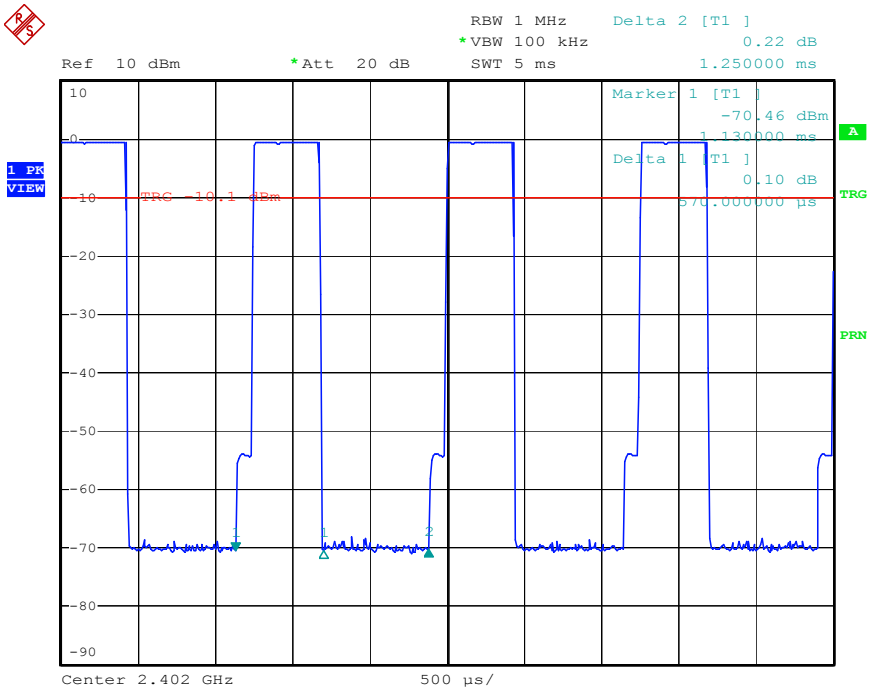
DH 5 Modulation Type: GFSK (Channel78)：



DH3 Modulation Type: GFSK (Channel 39)：



DH1 Modulation Type: GFSK (Channel 00)：



5.5. Maximum Peak Output Power

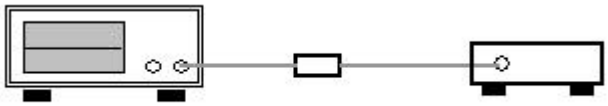
5.5.1. Measuring Instruments

Item 19, 21 of the table is on section 6.

5.5.2. Test Procedures

1. The transmitter output was connected to the peak power meter and recorded the peak value.
2. Repeated the 1~4 for the middle and highest channel of the EUT.

5.5.3. Test Setup Layout



Power Meter **EUT**

5.5.4. Test Result of Conducted Peak Power

- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 45.60%
- Test Engineer: Sam Lee

Modulation Type	Channel	Frequency (MHz)	Output Power (dBm)	Limits (dBm)
GFSK	00	2402 MHz	1.10	30
GFSK	39	2441 MHz	1.61	30
GFSK	78	2480 MHz	0.50	30

The max output power : GFSK modulation is 1.61 dBm.

5.5.5. Test Result of EIRP Power

- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 45.60%
- Test Engineer: Sam Lee

Antenna No.	Gain (dBi)	Modulation Type	Channel	Frequency (MHz)	Output Power (dBm)	Limits (dBm)
1	2.50	GFSK	00	2402 MHz	3.60	36
1	2.50	GFSK	39	2441 MHz	4.11	36
1	2.50	GFSK	78	2480 MHz	3.00	36

5.6. Test of Band Edges Emission

5.6.1. Measuring Instruments

Item 18 of the table is on section 6.

5.6.2. Test Procedures

1. The transmitter is set to the lowest channel.
2. The transmitter output was connected to the spectrum analyzer via a cable and cable loss is used as the offset of the spectrum analyzer.
3. Set both RBW and VBW of spectrum analyzer to 100KHz with convenient frequency span including 100MHz bandwidth from lower band edge.
4. The lowest band edges emission was measured and recorded.
5. The transmitter set to the highest channel and repeated 2~4.

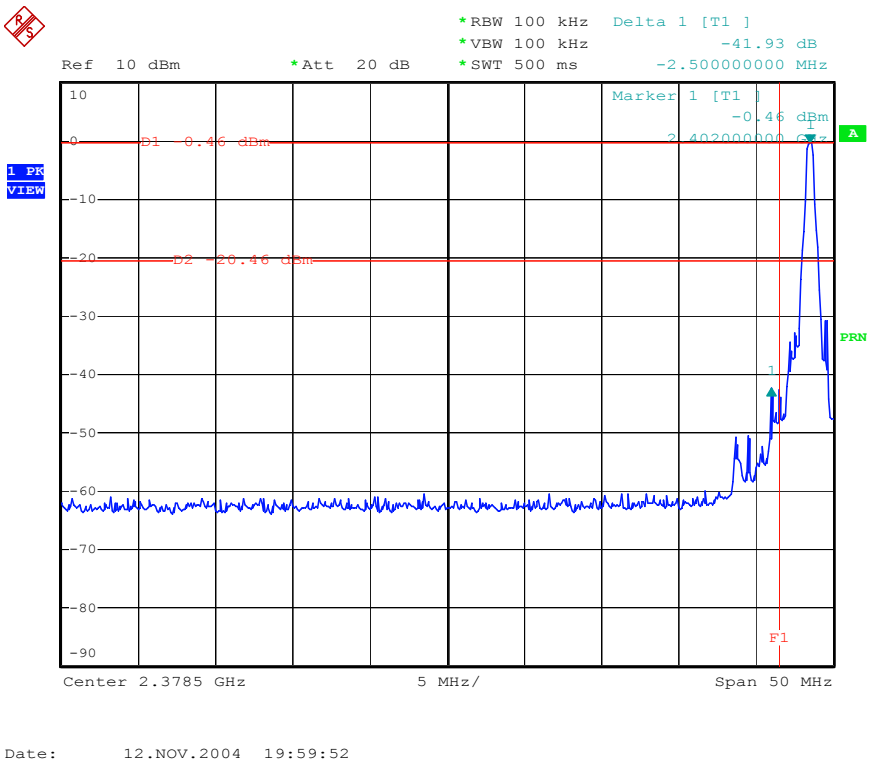
5.6.3. Test Result:

- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 45.60%
- Test Engineer: Sam Lee

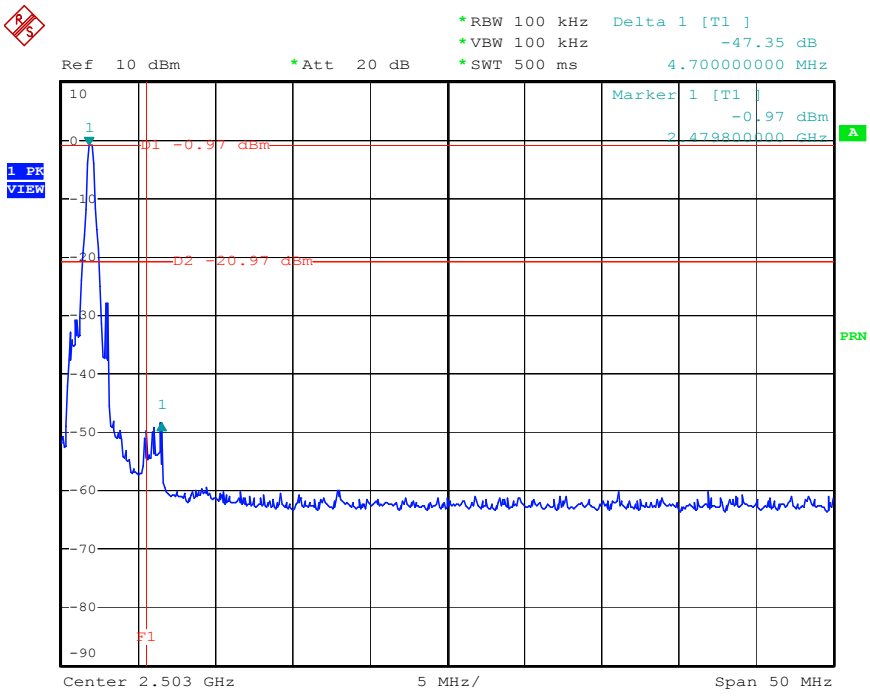
Modulation Type	Test Channel	Freq. (MHz)	Level* (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Trace (PK/AV)
GFSK	00	2364.34	55.31	-18.69	74	PK
GFSK	00	2390.50	42.68	-11.32	54	AV
GFSK	78	2483.66	57.42	-16.58	74	PK
GFSK	78	2483.66	47.39	-6.61	54	AV

Level* : The max field strength in the restricted bands.

Modulation Type: GFSK (Channel 00) :



Modulation Type: GFSK (Channel 78) :



5.7. Test of AC Power Line Conducted Emission

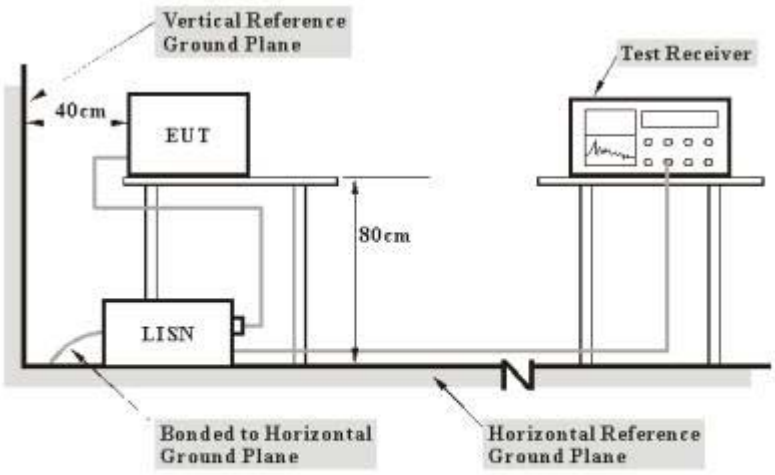
5.7.1. Measuring Instruments

Please reference item 1~5 in chapter 6 for the instruments used for testing.

5.7.2. Test Procedures

1. Configure the EUT according to ANSI C63.4.
2. The EUT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.
3. Connect EUT to the power mains through a line impedance stabilization network (LISN)
4. All the support units are connected to the other LISNs. The LISN should provides 50uH/50ohms coupling impedance.
5. The frequency range from 150 KHz to 30 MHz was searched.
6. Use the Channel & Power Controlling software to make the EUT working on selected channel and expected output power, then use the “H” Patter Generator software to make the supporting equipments stay on working condition.
7. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
8. The measurement has to be done between each power line and ground at the power terminal for each RF channel. Only one RF channel has to be investigated since this test is independent with the RF channel selection.

5.7.3. Test Setup Layout



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

5.7.4. Test Result of Conducted Emission

- Temperature: 26°C
- Relative Humidity: 64%
- Test Engineer: Hikaru Chan

Line to Ground

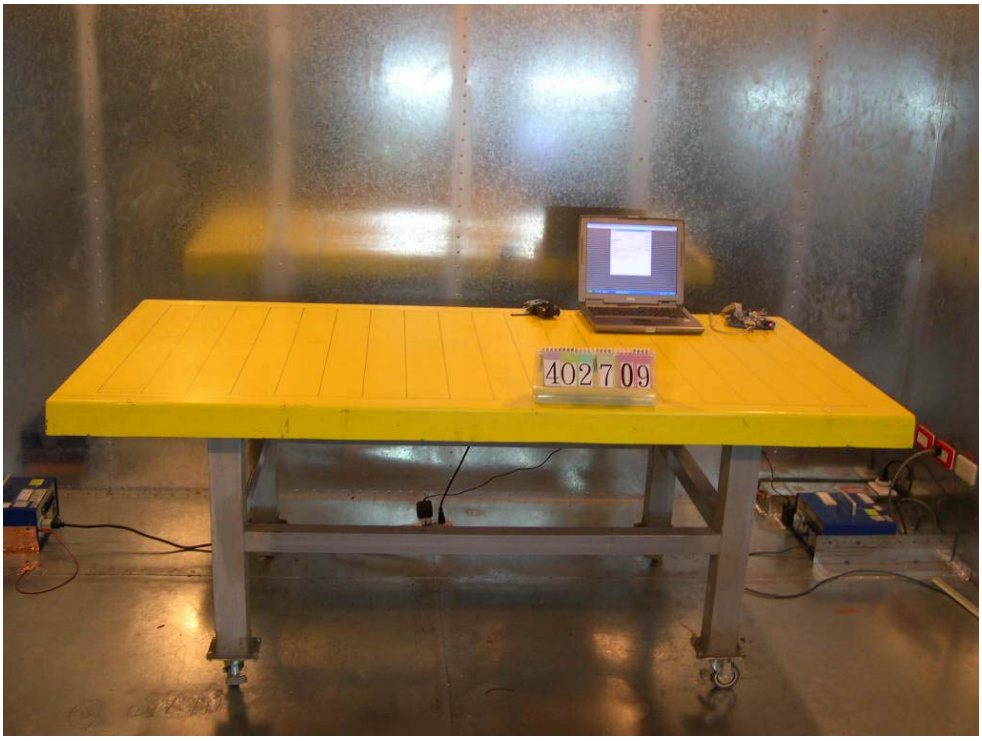
	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.2740690	48.86	-12.13	60.99	48.67	0.10	0.09	QP
2	@0.2740690	45.74	-5.25	50.99	45.55	0.10	0.09	Average
3	0.5401500	45.61	-10.39	56.00	45.39	0.10	0.12	QP
4	0.5401500	36.90	-9.10	46.00	36.68	0.10	0.12	Average
5	0.8382990	30.57	-15.43	46.00	29.98	0.10	0.49	Average
6	0.8382990	41.76	-14.24	56.00	41.17	0.10	0.49	QP
7	1.393	39.01	-16.99	56.00	38.67	0.10	0.24	QP
8	1.393	28.05	-17.95	46.00	27.71	0.10	0.24	Average
9	1.653	41.40	-14.60	56.00	41.16	0.10	0.14	QP
10	1.653	27.74	-18.26	46.00	27.50	0.10	0.14	Average
11	2.557	30.47	-25.53	56.00	30.29	0.13	0.05	QP
12	2.557	19.96	-26.04	46.00	19.78	0.13	0.05	Average

Neutral to Ground

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	@0.2925340	46.62	-3.83	50.45	46.41	0.10	0.11	Average
2	0.2925340	49.09	-11.36	60.45	48.88	0.10	0.11	QP
3	@0.5792340	39.30	-6.70	46.00	38.97	0.10	0.23	Average
4	0.5792340	46.70	-9.30	56.00	46.37	0.10	0.23	QP
5	0.8809420	42.15	-13.85	56.00	41.57	0.10	0.48	QP
6	0.8809420	36.35	-9.65	46.00	35.77	0.10	0.48	Average
7	1.451	36.93	-19.07	56.00	36.61	0.10	0.22	QP
8	1.451	24.53	-21.47	46.00	24.21	0.10	0.22	Average
9	1.772	41.25	-14.75	56.00	41.06	0.10	0.09	QP
10	1.772	30.94	-15.06	46.00	30.75	0.10	0.09	Average
11	2.034	22.66	-23.34	46.00	22.54	0.10	0.02	Average
12	2.034	34.73	-21.27	56.00	34.61	0.10	0.02	QP

5.7.5. Photographs of Conducted Emission Test Configuration

FRONT VIEW



REAR VIEW

5.8. Test of Spurious Radiated Emission

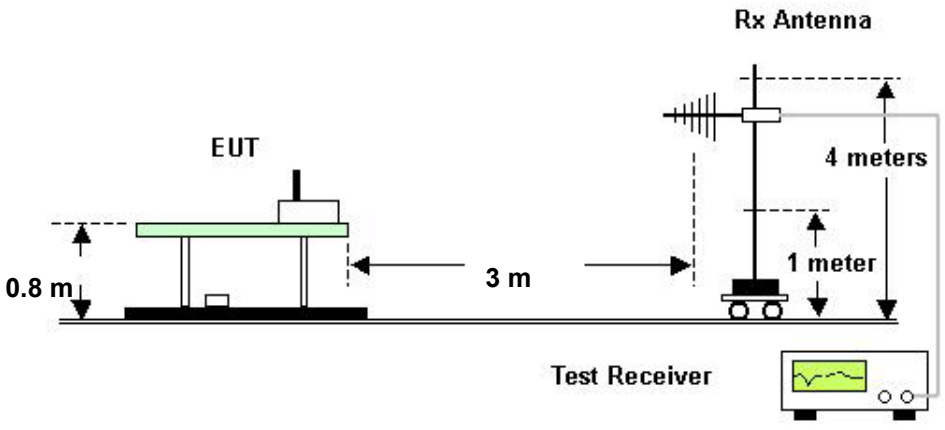
5.8.1. Measuring Instruments

Please reference item 6~17 in chapter 6 for the instruments used for testing.

5.8.2. Test Procedures

1. Configure the EUT according to ANSI C63.4.
2. The EUT was placed on the top of the turn table 0.8 meter above ground.
3. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turn table.
4. Power on the EUT and all the supporting units.
5. The turn table was rotated by 360 degrees to determine the position of the highest radiation.
6. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of both horizontal and vertical polarization.
7. For each suspected emission, the antenna tower was scan (from 1 M to 4 M) and then the turn table was rotated (from 0 degree to 360 degrees) to find the maximum reading.
8. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
9. For emission above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.
10. If the emission level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz and average method for above the 1GHz. the reported.
11. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB higher than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

5.8.3. Test Setup Layout



5.8.4. Test Results for CH 78 / 2480 MHz (for emission below 1GHz)

- Test Mode: Powered by adapter
- Modulation Type: GFSK
- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 45.60%
- Test Engineer: Steve Chen

(A) Polarization: Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	95.790	32.12	-11.38	43.50	48.88	8.79	1.68	27.23	Peak	---	---
2	128.260	27.26	-16.24	43.50	40.04	12.29	2.07	27.14	Peak	---	---
3	160.390	37.07	-6.43	43.50	49.18	12.66	2.31	27.08	Peak	---	---
1	666.400	35.73	-10.27	46.00	38.68	20.60	4.65	28.20	Peak	---	---
2	835.200	32.39	-13.61	46.00	32.83	21.83	5.25	27.52	Peak	---	---
3	1000.000	36.53	-17.47	54.00	34.34	23.90	5.69	27.40	Peak	---	---

(B) Polarization: Vertical

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	61.110	33.64	-6.36	40.00	49.41	10.43	1.31	27.51	Peak	---	---
2	69.100	33.79	-6.21	40.00	49.97	9.86	1.41	27.45	Peak	125	187
3	95.790	35.15	-8.35	43.50	51.91	8.79	1.68	27.23	Peak	---	---
1	666.400	37.94	-8.06	46.00	40.89	20.60	4.65	28.20	Peak	---	---
2	828.800	32.08	-13.92	46.00	32.61	21.84	5.19	27.56	Peak	---	---
3	998.400	32.76	-21.24	54.00	30.61	23.86	5.69	27.40	Peak	---	---

Note:
Emission level (dBuV/m) = 20 log Emission level (uV/m)
Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level

5.8.5. Test Results for CH 78 / 2480 MHz (for emission below 1GHz)

- Test Mode: Powered by DC adapter source
- Modulation Type: GFSK
- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 45.60%
- Test Engineer: Steve Chen

(A) Polarization: Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1 !	48.870	35.34	-4.66	40.00	50.12	11.64	1.17	27.59	Peak	---	---
2	91.030	27.47	-16.03	43.50	44.56	8.55	1.63	27.27	Peak	---	---
3	144.070	19.96	-23.54	43.50	32.64	12.31	2.12	27.11	Peak	---	---
1	300.800	26.39	-19.61	46.00	36.00	13.82	3.08	26.51	Peak	---	---
2	490.400	21.98	-24.02	46.00	30.12	16.07	3.85	28.06	Peak	---	---
3	957.600	29.08	-16.92	46.00	27.79	22.96	5.65	27.32	Peak	---	---

(B) Polarization: Vertical

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1 !	48.870	35.81	-4.19	40.00	50.59	11.64	1.17	27.59	QP	---	---
2	76.750	32.18	-7.82	40.00	48.47	9.60	1.49	27.38	Peak	---	---
3	196.430	21.47	-22.03	43.50	30.43	15.52	2.53	27.01	Peak	---	---
1	300.800	22.23	-23.77	46.00	31.84	13.82	3.08	26.51	Peak	---	---
2	471.200	19.37	-26.63	46.00	27.32	16.23	3.81	27.99	Peak	---	---
3	957.600	29.28	-16.72	46.00	27.99	22.96	5.65	27.32	Peak	---	---

Note:

Emission level (dBuV/m) = 20 log Emission level (uV/m)

Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level

5.8.6. Test Results for CH 00 / 2402 MHz (for emission above 1GHz)

- Modulation Type: GFSK
- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 45.60%
- Test Engineer: Steve Chen

(A) Polarization: Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	1332.000	48.73	-25.27	74.00	61.76	24.82	1.35	39.20	Peak	---	---
2	4804.000	40.34	-33.66	74.00	45.13	32.93	2.42	40.14	Peak	---	---
3	7204.000	46.15	-27.85	74.00	47.36	35.67	2.61	39.49	Peak	---	---

(B) Polarization: Vertical

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	1996.000	46.77	-27.23	74.00	57.51	27.40	1.51	39.65	Peak	---	---
2	4804.000	42.44	-31.56	74.00	47.23	32.93	2.42	40.14	Peak	---	---
3	7204.000	46.61	-27.39	74.00	47.82	35.67	2.61	39.49	Peak	---	---

Note:
Emission level (dBuV/m) = 20 log Emission level (uV/m)
Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level

5.8.7. Test Results for CH 39 / 2441 MHz (for emission above 1GHz)

- Modulation Type: GFSK
- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 45.60%
- Test Engineer: Steve Chen

(A) Polarization: Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	1332.000	47.00	-27.00	74.00	60.03	24.82	1.35	39.20	Peak	---	---
2	4884.000	40.91	-33.09	74.00	45.43	33.11	2.51	40.14	Peak	---	---
3	7324.000	46.24	-27.76	74.00	46.59	36.13	2.97	39.45	Peak	---	---

(B) Polarization: Vertical

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	1996.000	47.30	-26.70	74.00	58.04	27.40	1.51	39.65	Peak	---	---
2	4882.000	41.63	-32.37	74.00	46.15	33.11	2.51	40.14	Peak	---	---
3	7324.000	46.39	-27.61	74.00	46.74	36.13	2.97	39.45	Peak	---	---

Note:
Emission level (dBuV/m) = 20 log Emission level (uV/m)
Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level

5.8.8. Test Results for CH 78 / 2480 MHz (for emission above 1GHz)

- Modulation Type: GFSK
- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 45.60%
- Test Engineer: Steve Chen

(A) Polarization: Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	1332.000	45.89	-28.11	74.00	58.92	24.82	1.35	39.20	Peak	---	---
2	4956.000	41.23	-32.77	74.00	45.70	33.24	2.44	40.15	Peak	---	---
3	7432.000	46.32	-27.68	74.00	46.45	36.39	2.90	39.42	Peak	---	---

(B) Polarization: Vertical

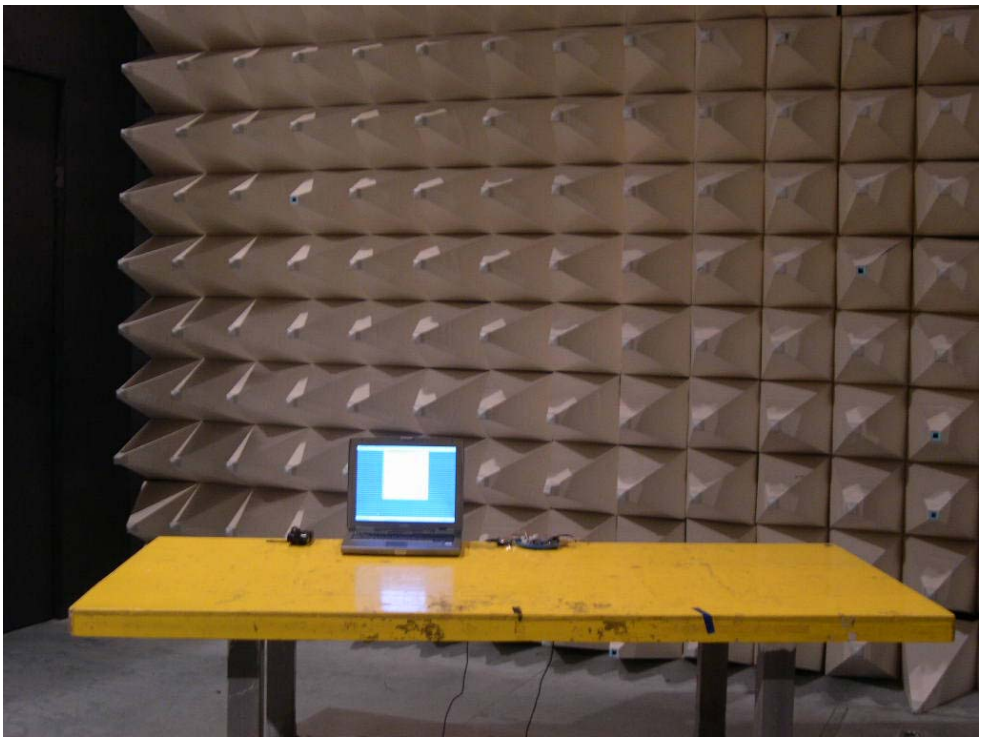
	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	2000.000	46.48	-27.52	74.00	57.22	27.40	1.51	39.65	Peak	---	---
2	4956.000	41.64	-32.36	74.00	46.11	33.24	2.44	40.15	Peak	---	---
3	7436.000	46.68	-27.32	74.00	46.81	36.39	2.90	39.42	Peak	---	---

Note:
Emission level (dBuV/m) = 20 log Emission level (uV/m)
Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level

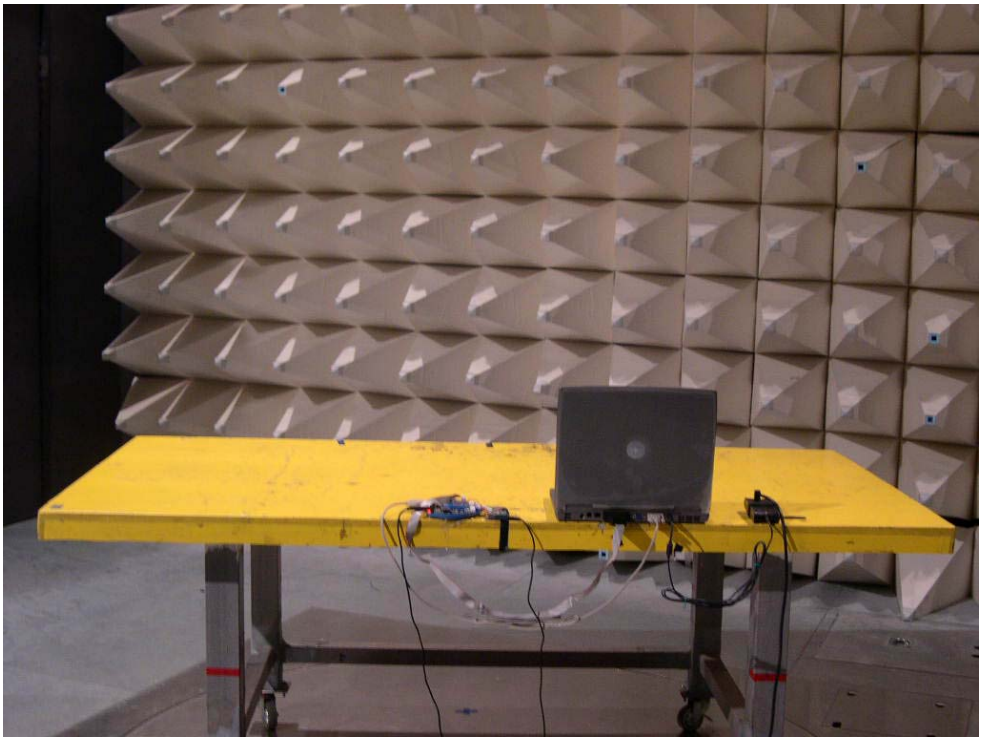
5.8.9. Photographs of Radiated Emission Test Configuration

Powered by adapter

FRONT VIEW



REAR VIEW



Powered by DC adapter source

FRONT VIEW

REAR VIEW

5.9. Antenna Requirements

5.9.1. Standard Applicable

47 CFR Part15 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.
47 CFR Part15 Section 15.247 (b):
If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
If the intentional radiator is used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

5.9.2. Antenna Connected Construction

There is no antenna connector for integral ceramic antenna.

5.10. RF Exposure

5.10.1. Limit For Maximum Permissible Exposure (MPE)

This product can be classified as mobile device, so the 20cm separation distance warning is required. In this section, the power density at 20cm location is calculated to examine if it is lower than the limit.

(A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm^2)	Averaging Time $\|E\|^2$,$\|H\|^2$ or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100,000			5	6

(B) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $\|E\|^2$,$\|H\|^2$ or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100,000			1.0	30

F = frequency in MHz

*Plane-wave equivalent power density

5.10.2. MPE Calculation Method

E (V/m) = $\frac{\sqrt{30 \times P \times G}}{d}$ Power Density= *Pd* (mW/cm^2) = $\frac{E^2}{377}$

E = Electric field (V/m)

P = Peak RF output power (mW)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

$Pd = \frac{30 \times P \times G}{377 \times d^2}$

From the peak EUT RF output power, the minimum mobile separation distance, d=20cm, as well as the gain

of the used antenna, the RF power density can be obtained.

5.10.3. Calculated Result and Limit

- Modulation Type: GFSK
- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 45.60%
- Test Engineer: Steve Chen

Channel No.	Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm^2)	Limit of Power Density (S) (mW/cm^2)
00	2.50	1.78	1.10	1.29	0.0005	1
39	2.50	1.78	1.61	1.45	0.0005	1
78	2.50	1.78	0.50	1.12	0.0004	1

6. List of Measuring Equipments Used

Items	Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
1	EMC Receiver	R&S	ESCS 30	100174	9 KHz – 2.75 GHz	Feb. 16, 2004	Conduction (CO04-HY)
2	LISN	MessTec	NNB-2/16Z	2001/004	9 KHz – 30 MHz	Jun. 09, 2004	Conduction (CO04-HY)
3	LISN (Support Unit)	MessTec	NNB-2/16Z	99041	9 KHz – 30 MHz	Apr. 27, 2004	Conduction (CO04-HY)
4	EMI Filter	LINDGREN	LRE-2030	2651	< 450 Hz	N/A	Conduction (CO04-HY)
5	RF Cable-CON	UTIFLEX	3102-26886-4	CB044	9KHz~30MHz	Apr. 21, 2004	Conduction (CO04-HY)
6	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30MHz~1GHz 3m	Jun. 21, 2004	Radiation (03CH03-HY)
7	Spectrum analyzer	R&S	FSP40	100004	9KHZ~40GHz	Aug. 31, 2004	Radiation (03CH03-HY)
8	Amplifier	HP	8447D	2944A09072	100KHz – 1.3GHz	Nov. 04, 2004	Radiation (03CH03-HY)
9	Biconical Antenna	SCHWARZBECK	VHBB 9124	301	30MHz –200MHz	Jul. 28, 2004	Radiation (03CH03-HY)
10	Log Antenna	SCHWARZBECK	VUSLP 9111	221	200MHz -1GHz	Jul. 28, 2004	Radiation (03CH03-HY)
11	RF Cable-R03m	Jye Bao	RG142	CB021	30MHz~1GHz	Dec. 02, 2004	Radiation (03CH03-HY)
12	Amplifier	MITEQ	AFS44	849984	100MHz~26.5GHz	Mar. 26, 2004	Radiation (03CH03-HY)
13	Horn Antenna	EMCO	3115	6741	1GHz – 18GHz	Apr. 07, 2004	Radiation (03CH03-HY)
14	Turn Table	HD	DS 420	420/650/00	0 ~ 360 degree	N/A	Radiation (03CH03-HY)
15	Antenna Mast	HD	MA 240	240/560/00	1 m - 4 m	N/A	Radiation (03CH03-HY)
16	Horn Antenna	Schwarzbeck	BBHA9170	154	18GHz~40GHz	Jun. 09, 2004	Radiation (03CH03-HY)
17	RF Cable-HIGH	Jye Bao	RG142	CB030-HIGH	1GHz~29.5GHz	Dec. 04, 2004	Radiation (03CH03-HY)

※ Calibration Interval of instruments listed above is one year.

Items	Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
18	Spectrum analyzer	R&S	FSP7	838858/014	9KHZ~7GHZ	Sep. 02, 2004	Conducted (TH01-HY)
19	Power meter	R&S	NRVS	100444	DC~40GHz	Jun. 15, 2004	Conducted (TH01-HY)
20	Power sensor	R&S	NRV-Z55	100049	DC~40GHz	Jun. 15, 2004	Conducted (TH01-HY)
21	Power Sensor	R&S	NRV-Z32	100057	30MHz-6GHz	Jun. 15, 2004	Conducted (TH01-HY)
22	AC power source	HPC	HPA-500W	HPA-9100024	AC 0~300V	Jun. 16, 2004	Conducted (TH01-HY)
23	AC power source	G.W.	GPC-6030D	C671845	DC 1V~60V	Nov. 05, 2004	Conducted (TH01-HY)
24	Temp. and Humidity Chamber	KSON	THS-C3L	612	N/A	Sep. 30, 2004	Conducted (TH01-HY)
25	RF CABLE-1m	Jye Bao	RG142	CB034-1m	20MHz~7GHz	Jan. 01, 2004	Conducted (TH01-HY)
26	RF CABLE-2m	Jye Bao	RG142	CB035-2m	20MHz~1GHz	Jan. 01, 2004	Conducted (TH01-HY)

※ Calibration Interval of instruments listed above is one year.