

FCC TEST REPORT

for

47 CFR, Part 15, Subpart C

Equipment : Industrial Radio Remote Controller

Model No. : F-23

FCC ID : LWNF-23

Filing Type : Certification

Applicant : **LEE'S HI-TECH ENTERPRISE CO., LTD.**
#2, Lane 80, Jen Ai Rd, Chung Chuang, Taliao,
Kaohsiung, Taiwan, R.O.C.

- The test result refers exclusively to the test 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 must not be used by the applicant to claim the product in this test report endorsement by NVLAP or any agency of U.S. government.

SPORTON International Inc.

6F, No.106, Sec. 1, Hsin Tai Wu Rd., Hsi Chih, Taipei Hsien, Taiwan, R.O.C.

SPORTON International Inc.

TEL : 886-2-2696-2468

FAX : 886-2-2696-2255

Table of Contents

History of this test report.....	ii
CERTIFICATE OF COMPLIANCE	1
1. General Description of Equipment under Test	2
1.1. Applicant.....	2
1.2. Manufacturer	2
1.3. Basic Description of Equipment under Test	2
1.4. Feature of Equipment under Test	2
2. Test Configuration of Equipment under Test	3
2.1. Test Manner	3
2.2. Description of Test System	3
2.3. Connection Diagram of Test System	4
2.4. A plot shows the EUT meet the requirement of 15.231(c)	5
3. Test Software	7
4. General Information of Test.....	8
4.1. Test Facility	8
4.2. Test Voltage	8
4.3. Standard for Methods of Measurement.....	8
4.4. Test in Compliance with	8
4.5. Frequency Range Investigated	8
4.6. Test Distance	8
5. Test of Conducted Powerline	9
6. Test of Radiated Emission.....	10
6.1. Major Measuring Instruments.....	10
6.2. Test Procedures.....	11
6.3. Typical Test Setup Layout of Radiated Emission.....	12
6.4. Test Result of Radiated Emission	13
7. Antenna Factor & Cable Loss	31
8. EMI Suppression Component List.....	32
9. List of Measuring Equipments Used	33
10. Uncertainty of Test Site	34

History of this test report

Original Report Issue Date: Oct. 21, 2003

- ☒ No additional attachment.
☐ Additional attachment were issued as following record:

Attachment No.	Issue Date	Description

CERTIFICATE OF COMPLIANCE

for

47 CFR, Part 15, Subpart C

Equipment : Industrial Radio Remote Controller
Model No. : F-23
FCC ID : LWNF-23
Filing Type : Certification
Applicant : **LEE'S HI-TECH ENTERPRISE CO., LTD.**
#2, Lane 80, Jen Ai Rd, Chung Chuang, Taliao,
Kaohsiung, 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 - 2001** and the energy emitted by this equipment was ***passed*** both radiated and conducted emission limits. Testing was carried out on Oct. 01, 2003 at **SPORTON International Inc. LAB.**



Alex Chen
Manager

SPORTON International Inc.

6F, No.106, Sec. 1, Hsin Tai Wu Rd., Hsi Chih, Taipei Hsien, Taiwan, R.O.C.

1. General Description of Equipment under Test

1.1. Applicant

LEE'S HI-TECH ENTERPRISE CO., LTD.
#2, Lane 80, Jen Ai Rd, Chung Chuang, Taliao,
Kaohsiung, Taiwan, R.O.C.

1.2. Manufacturer

Same as 1.1.

1.3. Basic Description of Equipment under Test

Equipment : Industrial Radio Remote Controller
Model No. : F-23
FCC ID : LWNF-23
Trade Name : TELECRANE
Power Supply Type : From Battery 3V
AC Power Cord : N/A

1.4. Feature of Equipment under Test

Product Feature & Specification	
1. Type of Modulation	F.S.K.
2. Number of Channels	34
3. Frequency Band	310.0325~318.860MHz
4. Antenna Type / Class and Gain	Helix / 1.5dBi
5. Function Type	Transmitter

2. Test Configuration of Equipment under Test

2.1. Test Manner

- a. The EUT has been associated with peripherals pursuant to ANSI C63.4-2001 and configuration operated in a manner which tended to maximize its emission characteristics in a typical application.
- b. The complete test system included EUT for EMI test.
- c. The following test modes were performed:
 - Mode 1: CH01 (310.03MHz), X axes
 - Mode 2: CH01 (310.03MHz), Y axes
 - Mode 3: CH01 (310.03MHz), Z axes
 - Mode 4: CH34 (318.86MHz), X axes
 - Mode 5: CH34 (318.86MHz), Y axes
 - Mode 6: CH34 (318.86MHz), Z axes
- d. Frequency range investigated: radiation 30 MHz to 4000MHz.
- e. The EUT employs a switch that will automatically deactivate the transmitter within no more than 5 seconds of being released.
- f. Pursuant to 15.231(c) of Part 15. Subpart C, the bandwidth of the emission at the 20dB point shall be no wider than 0.25% of the center frequency for EUT.
 - For CH01, The carrier frequency of EUT is 310.060MHz
 - $310.060\text{MHz} * 0.25\% = 775.15\text{KHz}$
 - The test result is 590KHz (as shown in section 2.4 of this test report), which is less than 775.15KHz. The EUT meet the 20dB point bandwidth requirement.
 - For CH34, The carrier frequency of EUT is 318.890MHz
 - $318.890\text{MHz} * 0.25\% = 797.225\text{KHz}$
 - The test result is 590KHz (as shown in section 2.4 of this test report), which is less than 797.225KHz. The EUT meet the 20dB point bandwidth requirement.

2.2. Description of Test System

The EUT was tested alone. No support device is needed for testing.

2.3. Connection Diagram of Test System

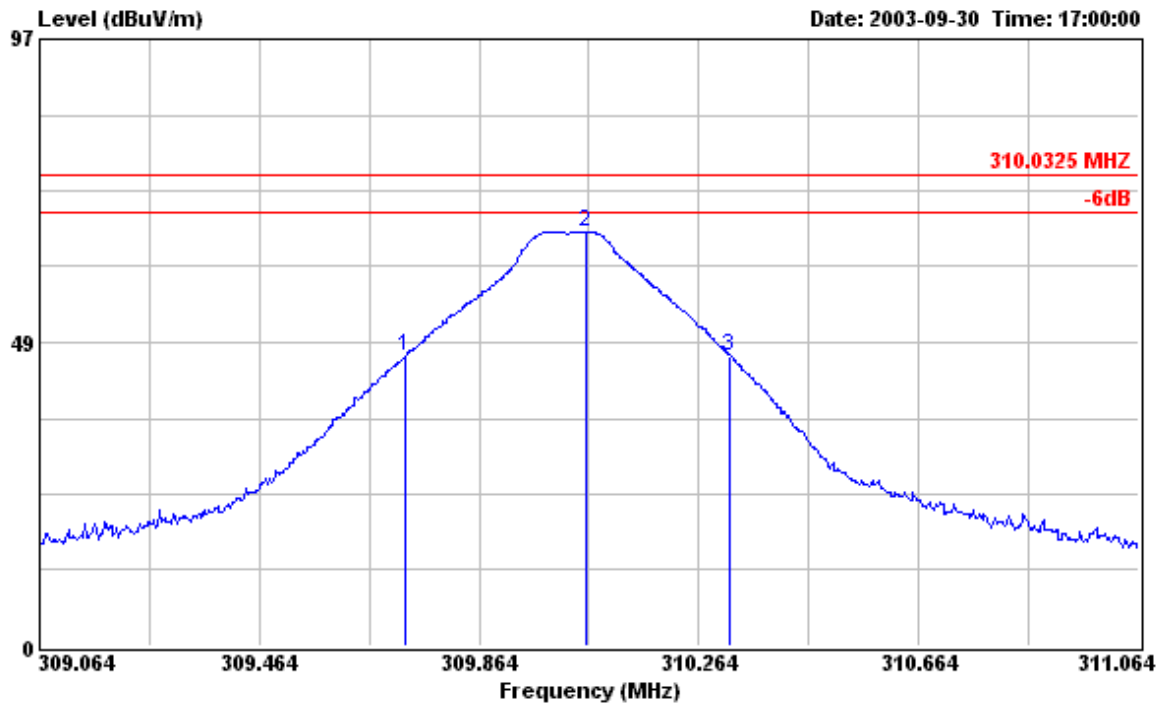


EUT

2.4. A plot shows the EUT meet the requirement of 15.231(c)

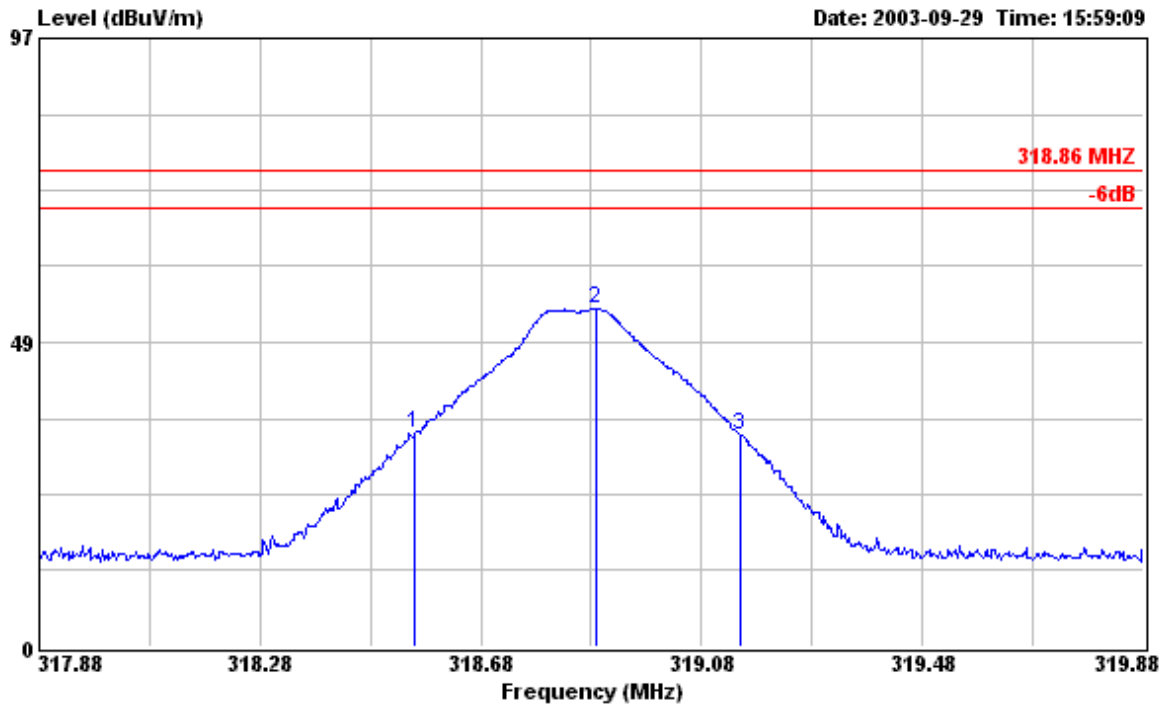
2.4.1 Test Procedures and Result

<CH01>



- Use the Radiated method
- Set RBW of spectrum analyzer to 100KHz and VBW to 100KHz.
- The 20 dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20 dB.
- 20dB bandwidth= (Delta 3) - (Delta 2)= 590KHz

<CH34>



- a. Use the Radiated method
- b. Set RBW of spectrum analyzer to 100KHz and VBW to 100KHz.
- c. The 20 dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20 dB.
- d. 20dB bandwidth= (Delta 3) - (Delta 2)= 590KHz

3. Test Software

No test software was used during testing.

4. General Information of Test

4.1. Test Facility

Test Site Location : No. 52, Hwa Ya 1St Road, Hwa Ya Technology Park,
Kwei-Shan Hsiang, TaoYuan Hsien, Taiwan, R.O.C.
TEL : 886-3-3273456
FAX : 886-3-3180055
Test Site No. : 03CH03-HY

4.2. Test Voltage

DC 3V

4.3. Standard for Methods of Measurement

ANSI C63.4-2001

4.4. Test in Compliance with

FCC Part 15, Subpart C 15.231

4.5. Frequency Range Investigated

- a. Conduction: from 150 KHz to 30 MHz
- b. Radiation: from 30 MHz to 4000 MHz

4.6. Test Distance

The test distance of radiated emission from antenna to EUT is 3 M.

5. Test of Conducted Powerline

The power is from Battery.

Conduction Powerline test is not applicable for this EUT.

6. Test of Radiated Emission

Radiated emissions from 30 MHz to 4000 MHz were measured with a bandwidth of 120 kHz for 30MHz to 1 GHz and 1MHz for above 1GHz according to the methods defines in ANSI C63.4-2001. The EUT was placed on a nonmetallic stand, 0.8 meter above the ground plane, as shown in section 6.3. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions.

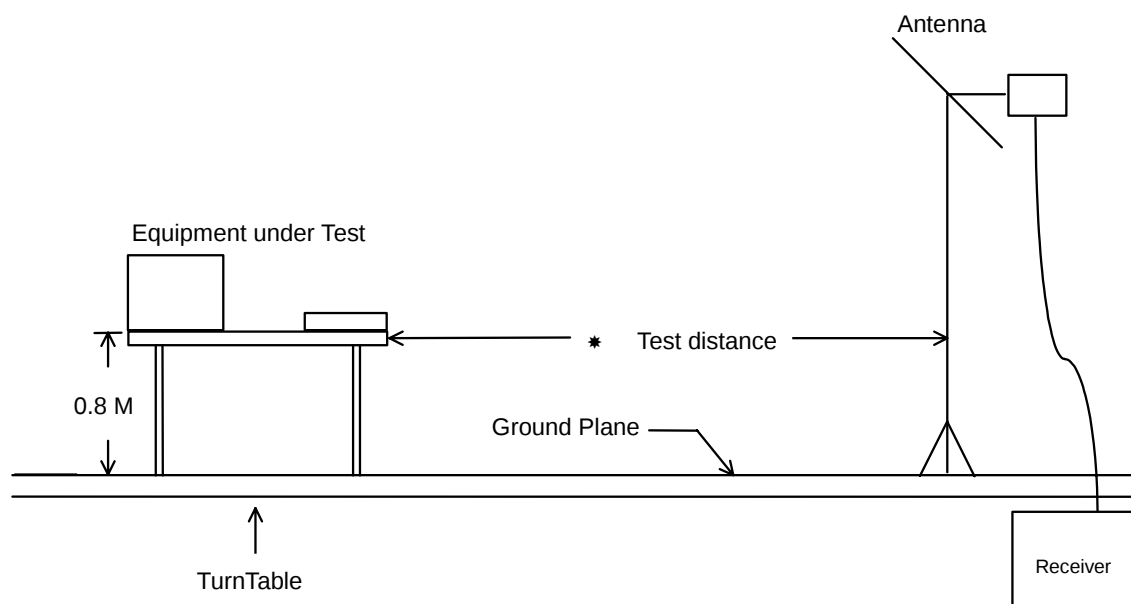
6.1. Major Measuring Instruments

- Amplifier (HP 8447D)
 - RF Gain 30 dB
 - Signal Input 100 KHz to 1.3 GHz
- Amplifier (MITEQ AFS44)
 - RF Gain 40 dB
 - Signal Input 100 MHz to 26.5 GHz
- Spectrum analyzer (R&S FSP40)
 - Attenuation 10 dB
 - Start Frequency 1 GHz
 - Stop Frequency 4 GHz
 - Resolution Bandwidth 1 MHz
 - Video Bandwidth 1 MHz
 - Signal Input 9 KHz to 40 GHz
- Test Receiver (SCHAFFNER SCR3501)
 - Resolution Bandwidth 120 KHz
 - Frequency Band 9 K – 1 GHz
 - Quasi-Peak Detector ON for Quasi-Peak Mode
OFF for Peak Mode

6.2. Test Procedures

- a. The EUT was placed on a rotatable table top 0.8 meter above ground.
- b. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
- c. The table was rotated 360 degrees to determine the position of the highest radiation.
- d. The antenna is a half wave dipole and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
- e. For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
- f. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 3 dB lower than the 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 and reported.
- h. For testing above 1GHz, the emission level of the EUT in peak mode was more 20dB lower 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.

6.3. Typical Test Setup Layout of Radiated Emission



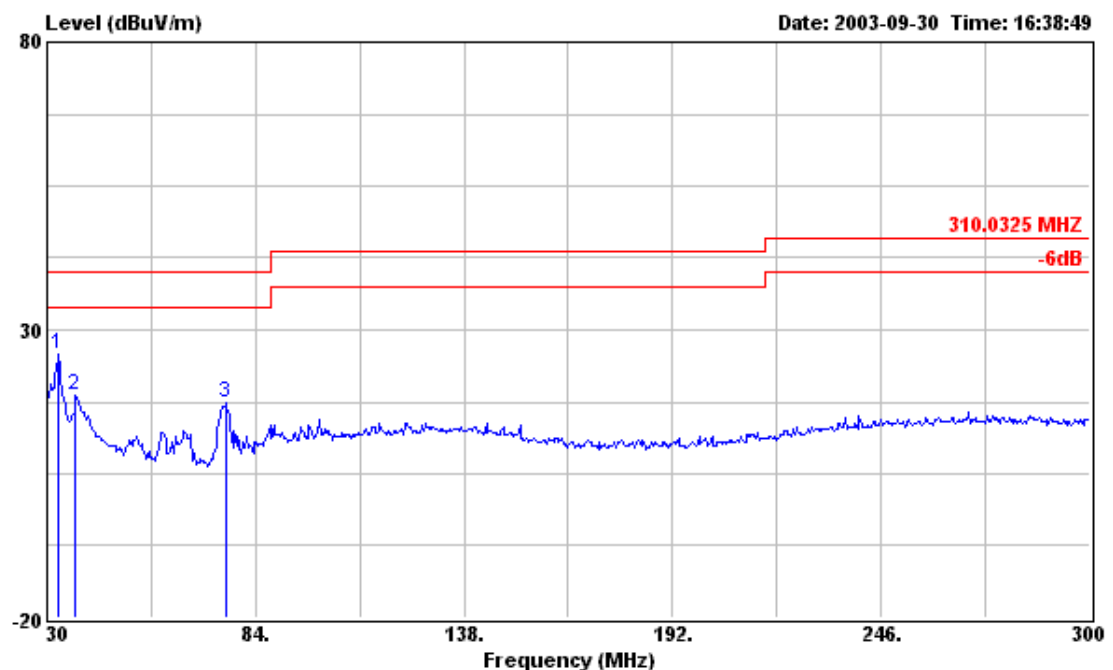
6.4. Test Result of Radiated Emission

6.4.1. Test Mode: Mode 1

- Test Distance: 3 M
- Temperature: 27°C
- Relative Humidity: 60 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level

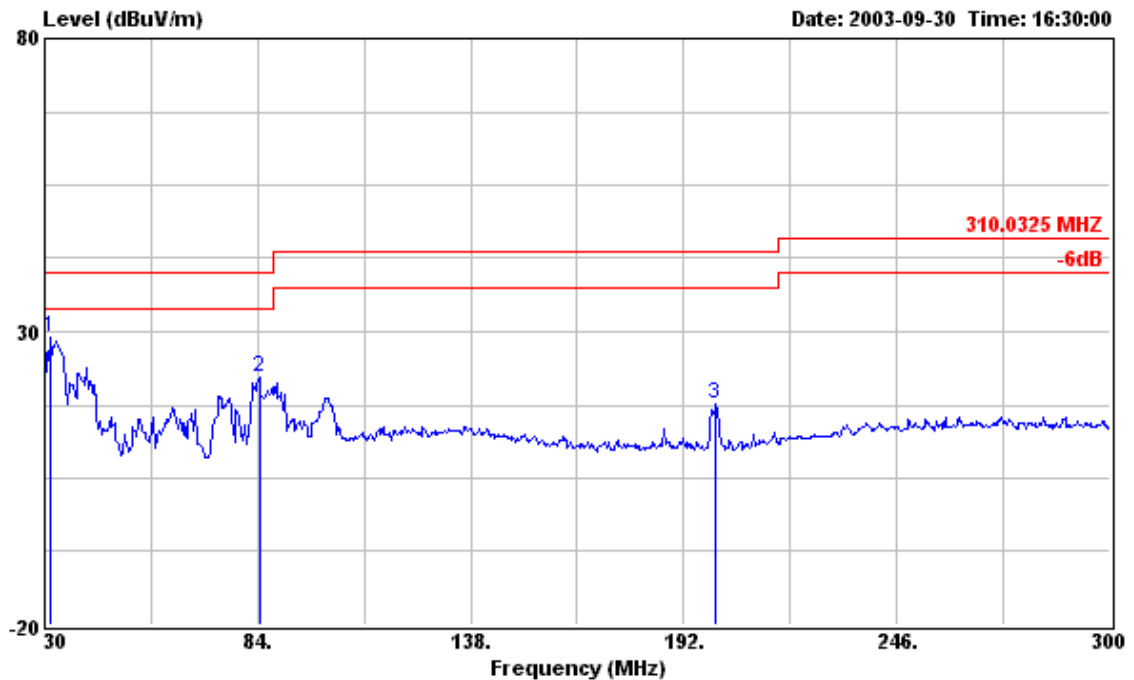
■ The test was passed at the minimum margin that marked by the frame in the following test record

- Spurious Emissions



Site : 03CH03-HY
 Condition : 3m 03CH03-MAT HORIZONTAL
 EUT : Remote controller
 Power : DC 3V
 MODEL : F-23
 MEMO : CH 01 310.0325MHz
 : X
 : F391804

	Freq	Level	Over	Limit	Read	Probe	Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Pos	Pos
			dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	32.970	25.84	-14.16	40.00	38.11	13.80	1.03	27.10	Peak	---	---
2	37.290	18.68	-21.32	40.00	32.75	11.96	1.07	27.10	Peak	---	---
3	76.170	17.31	-22.69	40.00	37.39	5.42	1.55	27.05	Peak	---	---



Site : 03CH03-HY
 Condition : 3m 03CH03-MAT VERTICAL
 EUT : Remote controller
 Power : DC 3V
 MODEL : F-23
 MEMO : CH 01 310.0325MHz
 : X
 : F391804

	Freq	Level	Over	Limit	Read	Probe	Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Pos	Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	31.620	29.01	-10.99	40.00	40.69	14.40	1.02	27.10	Peak	100	200
2	84.540	22.08	-17.92	40.00	40.09	7.40	1.62	27.03	Peak	---	---
3	200.100	17.77	-25.73	43.50	34.80	7.28	2.29	26.60	Peak	---	---

➤ For 1GHz ~ 4GHz

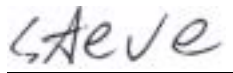
Remark: Frequency from 1000MHz to 4000MHz, the emission emitted by the EUT is too low to be measured

Field strength of fundamental and harmonics

Frequency (MHz)	Antenna Polarity	Cable Factor	Reading Loss		Limits		Emission Level	Margin	Detect
		(dB/m)	(dB)	(dBuV)	(dBuV/m)	(uV/m)	(dBuV/m) (uV/m)	(dB)	Mode
310.060	H	11.71	2.99	51.45	75.32	5834.45	66.15 2030.02	-9.17	Peak
620.010	H	17.44	4.39	15.85	55.32	583.45	37.68 76.56	-17.64	Peak
930.180	H	19.52	5.72	21.80	55.32	583.45	47.04 224.91	-8.28	Peak
1240.260	H	24.68	4.30	13.63	55.31	582.77	42.61 135.05	-12.70	Peak
1550.300	H						-		Peak
1860.430	H	26.84	5.41	12.83	55.32	583.45	45.08 179.47	-10.24	Peak
2169.900	H	27.74	5.89	10.66	55.32	583.45	44.29 163.87	-11.03	Peak
310.050	V	11.71	2.99	38.98	75.32	5834.45	53.68 483.06	-21.64	Peak
620.120	V	17.44	4.39	17.12	55.32	583.45	38.95 88.61	-16.37	Peak
930.170	V	19.52	5.72	16.64	55.32	583.45	41.88 124.17	-13.44	Peak
1240.230	V	24.68	4.30	15.80	55.31	582.77	44.78 173.38	-10.53	Peak
1550.300	V						-		Peak
1860.070	V	26.84	5.41	12.51	55.32	583.45	44.76 172.98	-10.56	Peak
2170.420	V						-		Peak
2480.480	H/V						-		Peak
2790.540	H/V						-		Peak
3100.600	H/V						-		Peak

Remark " - ": Except for the above listed emission, the emission of the EUT is too low to be measured. "

Test Engineer:

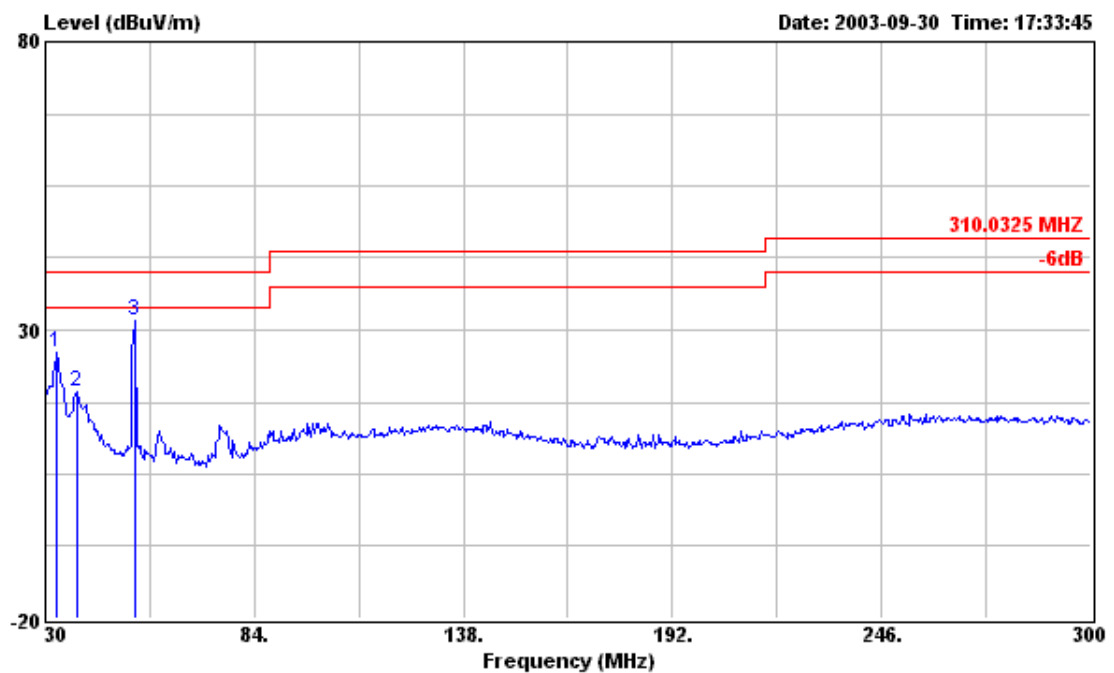

Steve Chen

6.4.2. Test Mode: Mode 2

- Test Distance: 3 M
- Temperature: 27°C
- Relative Humidity: 60 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level

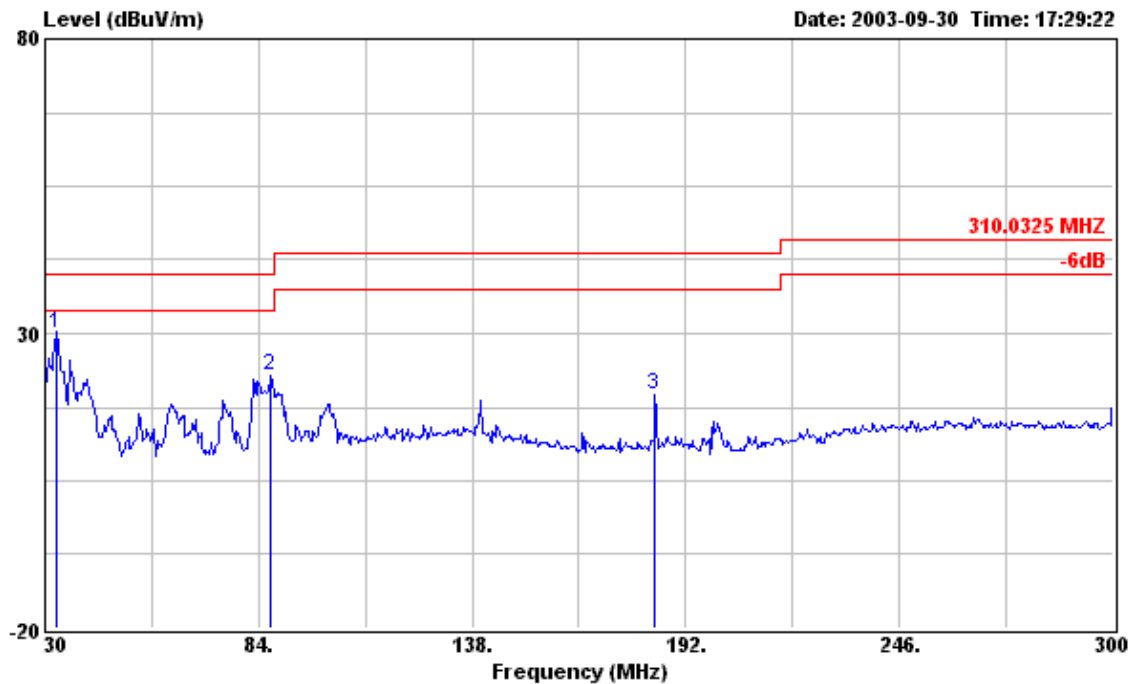
■ The test was passed at the minimum margin that marked by the frame in the following test record

- Spurious Emissions



Site : 03CH03-HY
 Condition : 3m 03CH03-MAT HORIZONTAL
 EUT : Remote controller
 Power : DC 3V
 MODEL : F-23
 MEMO : CH 01 310.0325MHz
 : Y
 : F391804

	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	32.970	26.26	-13.74	40.00	38.53	13.80	1.03	27.10	Peak	---	---
2	38.100	19.23	-20.77	40.00	33.61	11.64	1.08	27.10	Peak	---	---
3	52.950	31.61	-8.39	40.00	51.21	6.08	1.41	27.09	Peak	100	195



Site : 03CH03-HY
 Condition : 3m 03CH03-MAT VERTICAL
 EUT : Remote controller
 Power : DC 3V
 MODEL : F-23
 MEMO : CH 01 310.0325MHz
 : Y
 : F391804

	Freq	Level	Over	Limit	Read	Probe	Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Pos	Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	32.700	30.16	-9.84	40.00	42.29	13.94	1.03	27.10	Peak	---	---
2	86.970	22.99	-17.01	40.00	40.38	8.10	1.54	27.03	Peak	---	---
3	184.170	19.69	-23.81	43.50	36.68	7.51	2.16	26.66	Peak	---	---

➤ For 1GHz ~ 4GHz

Remark: Frequency from 1000MHz to 4000MHz, the emission emitted by the EUT is too low to be measured

Field strength of fundamental and harmonics

Frequency	Antenna	Cable	Reading	Limits		Emission Level		Margin	Detect	
	Polarity	Factor	Loss							
(MHz)		(dB/m)	(dB)	(dBuV)	(dBuV/m)	(uV/m)	(dBuV/m)	(uV/m)	(dB)	Mode
310.000	H	11.71	2.99	30.99	75.32	5834.45	45.69	192.53	-29.63	Peak
620.100	H	17.44	4.39	11.24	55.32	583.45	33.07	45.03	-22.25	Peak
930.180	H	19.52	5.72	13.17	55.32	583.45	38.41	83.27	-16.91	Peak
1240.040	H	24.70	4.30	11.02	55.31	582.77	40.02	100.23	-15.29	Peak
1550.300	H						-			Peak
1860.300	H	26.84	5.41	11.14	55.32	583.45	43.39	147.74	-11.93	Peak
2170.060	H	27.74	5.89	12.55	55.32	583.45	46.18	203.70	-9.14	Peak
310.060	V	11.71	2.99	47.54	75.32	5834.45	62.24	1294.20	-13.08	Peak
620.130	V	17.44	4.39	20.13	55.32	583.45	41.96	125.31	-13.36	Peak
930.200	V	19.52	5.72	20.22	55.32	583.45	45.46	187.50	-9.86	Peak
1240.200	V	24.71	4.30	11.88	55.31	582.77	40.89	110.79	-14.42	Peak
1550.300	V						-			Peak
1860.380	V	26.84	5.41	13.88	55.32	583.45	46.13	202.53	-9.19	Peak
2170.040	V	27.74	5.89	11.47	55.32	583.45	45.10	179.89	-10.22	Peak
2480.480	H/V						-			Peak
2790.540	H/V						-			Peak
3100.600	H/V						-			Peak

Remark " - ": Except for the above listed emission, the emission of the EUT is too low to be measured. "

Test Engineer:



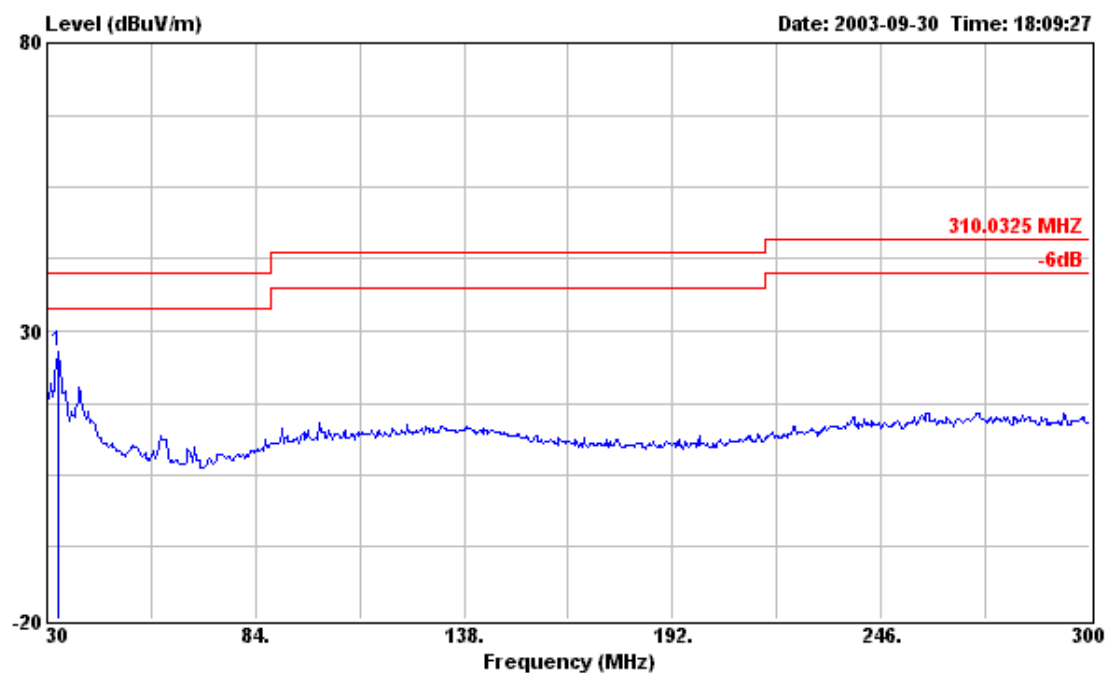
Steve Chen

6.4.3. Test Mode: Mode 3

- Test Distance: 3 M
- Temperature: 27°C
- Relative Humidity: 60 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level

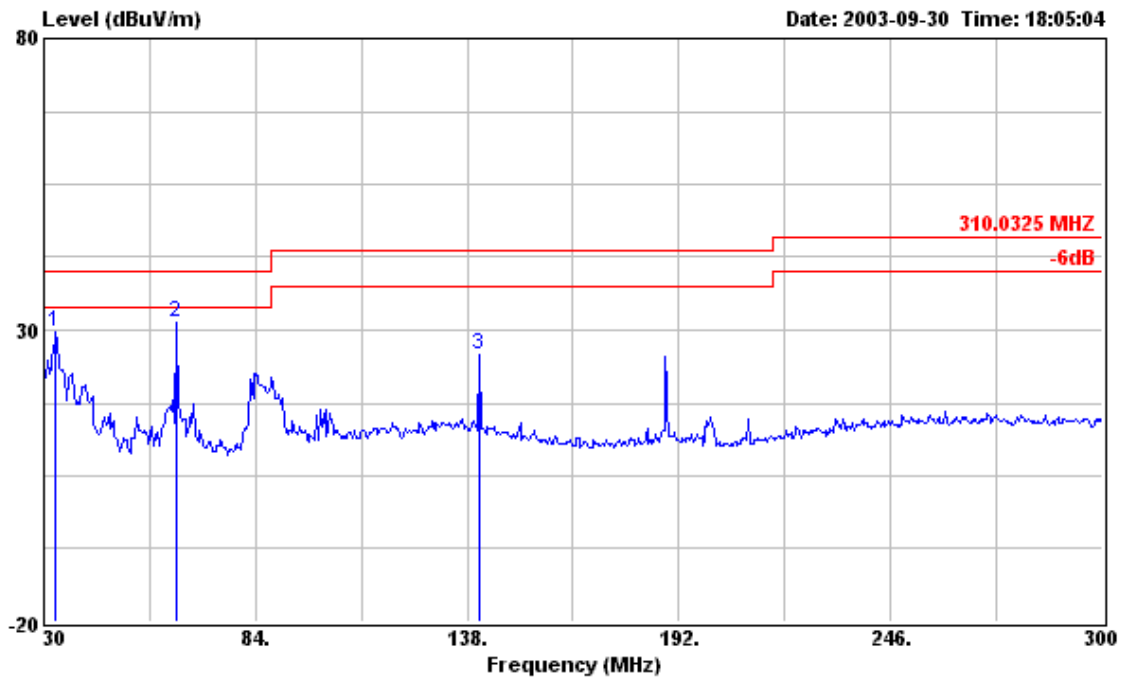
■ The test was passed at the minimum margin that marked by the frame in the following test record

- Spurious Emissions



Site : 03CH03-HY
 Condition : 3m 03CH03-MAT HORIZONTAL
 EUT : Remote controller
 Power : DC 3V
 MODEL : F-23
 MEMO : CH 01 310.0325MHz
 : Z
 : F391804

	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	32.700	26.47	-13.53	40.00	38.60	13.94	1.03	27.10	Peak	---	---



Site : 03CH03-HY
 Condition : 3m 03CH03-MAT VERTICAL
 EUT : Remote controller
 Power : DC 3V
 MODEL : F-23
 MEMO : CH 01 310.0325MHz
 : Z
 : F391804

	Freq	Level	Over	Limit	Read	Probe	Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Pos	Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	32.970	29.79	-10.21	40.00	42.06	13.80	1.03	27.10	Peak	---	---
2	64.020	31.46	-8.54	40.00	52.24	4.86	1.43	27.07	Peak	100	205
3	140.970	25.89	-17.61	43.50	40.48	10.18	2.07	26.84	Peak	---	---

➤ For 1GHz ~ 4GHz

Remark: Frequency from 1000MHz to 4000MHz, the emission emitted by the EUT is too low to be measured

Field strength of fundamental and harmonics

Frequency	Antenna	Cable	Reading	Limits		Emission Level		Margin	Detect	
	Polarity	Factor	Loss							
(MHz)		(dB/m)	(dB)	(dBuV)	(dBuV/m)	(uV/m)	(dBuV/m)	(uV/m)	(dB)	Mode
309.990	H	11.71	2.99	31.42	75.32	5834.45	46.12	202.30	-29.20	Peak
620.130	H	17.44	4.39	12.10	55.32	583.45	33.93	49.72	-21.39	Peak
930.160	H	19.52	5.71	12.93	55.32	583.45	38.16	80.91	-17.16	Peak
1240.040	H	24.70	4.30	12.11	55.31	582.77	41.11	113.63	-14.20	Peak
1550.300	H						-			Peak
1859.900	H	26.84	5.41	11.89	55.32	583.45	44.14	161.06	-11.18	Peak
2170.500	H	24.74	5.89	17.74	55.32	583.45	48.37	262.12	-6.95	Peak
310.070	V	11.71	2.99	47.66	75.32	5834.45	62.36	1312.20	-12.96	Peak
619.980	V	17.43	4.39	19.54	55.32	583.45	41.36	116.95	-13.96	Peak
930.180	V	19.52	5.72	18.70	55.32	583.45	43.94	157.40	-11.38	Peak
1239.940	V	24.70	4.30	11.13	55.31	582.77	40.13	101.51	-15.18	Peak
1550.300	V						-			Peak
1859.740	V	26.84	5.41	11.40	55.32	583.45	43.65	152.23	-11.67	Peak
2170.260	V	27.74	5.89	11.20	55.32	583.45	44.83	174.38	-10.49	Peak
2480.480	H/V						-			Peak
2790.540	H/V						-			Peak
3100.600	H/V						-			Peak

Remark " - ": Except for the above listed emission, the emission of the EUT is too low to be measured. "

Test Engineer:

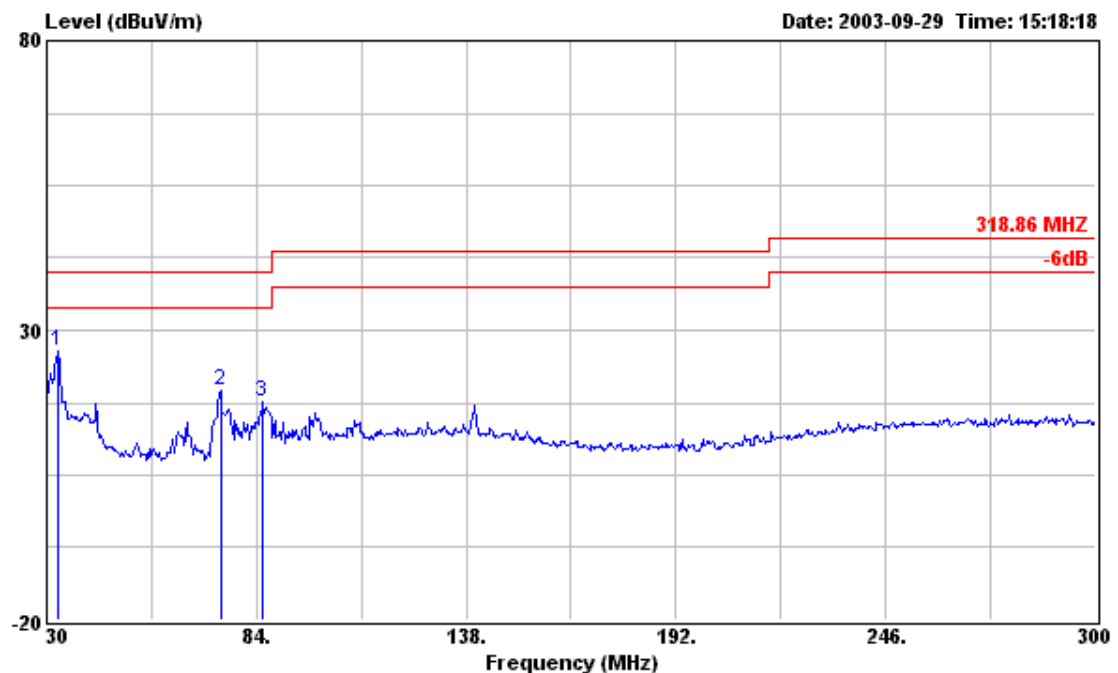
Steve Chen

Steve Chen

6.4.4. Test Mode: Mode 4

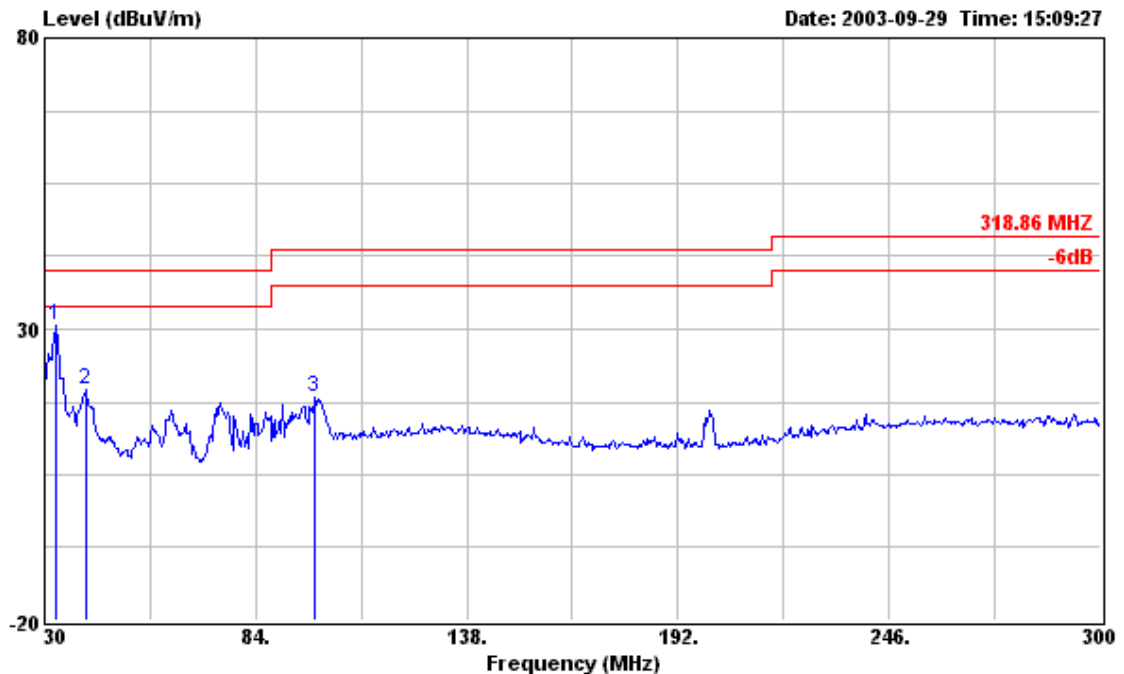
- Test Distance: 3M
- Temperature: 27°C
- Relative Humidity: 60 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level

■ The test was passed at the minimum margin that marked by the frame in the following test record



Site : 03CH03-HY
 Condition : 3m 03CH03-MAT HORIZONTAL
 EUT : Remote controller
 Power : DC 3V
 MODEL : F-23
 MEMO : CH 34 318.86MHz
 : X
 : F391804

	Freq	Level	Over	Limit	Read	Probe	Cable	Preamp	Remark	Ant	Table
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor		Pos	Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	32.700	26.59	-13.41	40.00	38.72	13.94	1.03	27.10	Peak	---	---
2	74.820	19.67	-20.33	40.00	39.96	5.21	1.55	27.05	Peak	---	---
3	85.620	17.61	-22.39	40.00	35.35	7.70	1.59	27.03	Peak	---	---



Site : 03CH03-HY
 Condition : 3m 03CH03-MAT VERTICAL
 EUT : Remote controller
 Power : DC 3V
 MODEL : F-23
 MEMO : CH 34 318.86MHz
 : X
 : F391804

	Freq	Level	Over	Limit	Read	Probe	Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Pos	Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	32.700	30.67	-9.33	40.00	42.80	13.94	1.03	27.10	Peak	100	205
2	40.530	19.46	-20.54	40.00	34.88	10.55	1.13	27.10	Peak	---	---
3	98.850	18.40	-25.10	43.50	34.41	9.29	1.70	27.00	Peak	---	---

➤ For 1GHz ~ 4GHz

Remark: Frequency from 1000MHz to 4000MHz, the emission emitted by the EUT is too low to be measured

▪ Field strength of fundamental and harmonics

Frequency	Antenna	Cable	Reading	Limits		Emission Level		Margin	Detect	
	Polarity	Factor	Loss							
(MHz)		(dB/m)	(dB)	(dBuV)	(dBuV/m)	(uV/m)	(dBuV/m)	(uV/m)	(dB)	Mode
318.890	H	12.01	3.10	38.59	75.85	6201.55	53.70	484.17	-22.15	Peak
637.760	H	17.56	4.54	15.37	55.85	620.15	37.47	74.73	-18.38	Peak
956.480	H	19.61	5.86	15.53	55.85	620.15	41.00	112.20	-14.85	Peak
1275.240	H	24.79	4.35	16.39	55.85	620.15	45.53	189.02	-10.32	Peak
1594.450	H						-			Peak
1912.880	H	27.05	5.51	11.67	55.85	620.15	44.23	162.74	-11.62	Peak
2232.230	H						-			Peak
318.890	V	12.01	3.10	38.64	75.85	6201.55	53.75	486.97	-22.10	Peak
637.650	V	17.56	4.54	13.82	55.85	620.15	35.92	62.52	-19.93	Peak
956.680	V	19.61	5.86	15.66	55.85	620.15	41.13	113.89	-14.72	Peak
1275.440	V	24.79	4.35	12.82	55.85	620.15	41.96	125.31	-13.89	Peak
1594.450	V						-			Peak
1913.400	V	27.05	5.51	10.76	55.85	620.15	43.32	146.55	-12.53	Peak
2231.560	V	27.88	5.98	13.82	55.85	620.15	47.68	242.10	-8.17	Peak
2551.120	H/V						-			Peak
2870.010	H/V						-			Peak
3188.900	H/V						-			Peak

Remark " - ": Except for the above listed emission, the emission of the EUT is too low to be measured. "

Test Engineer:

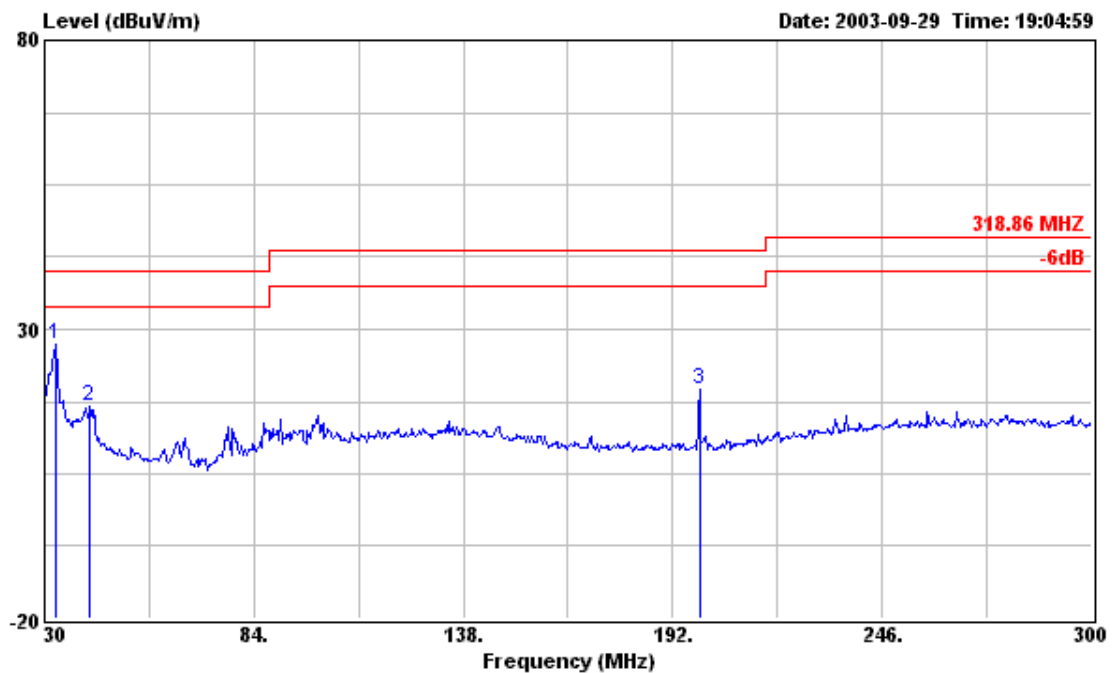


Steve Chen

6.4.5. Test Mode: Mode 4

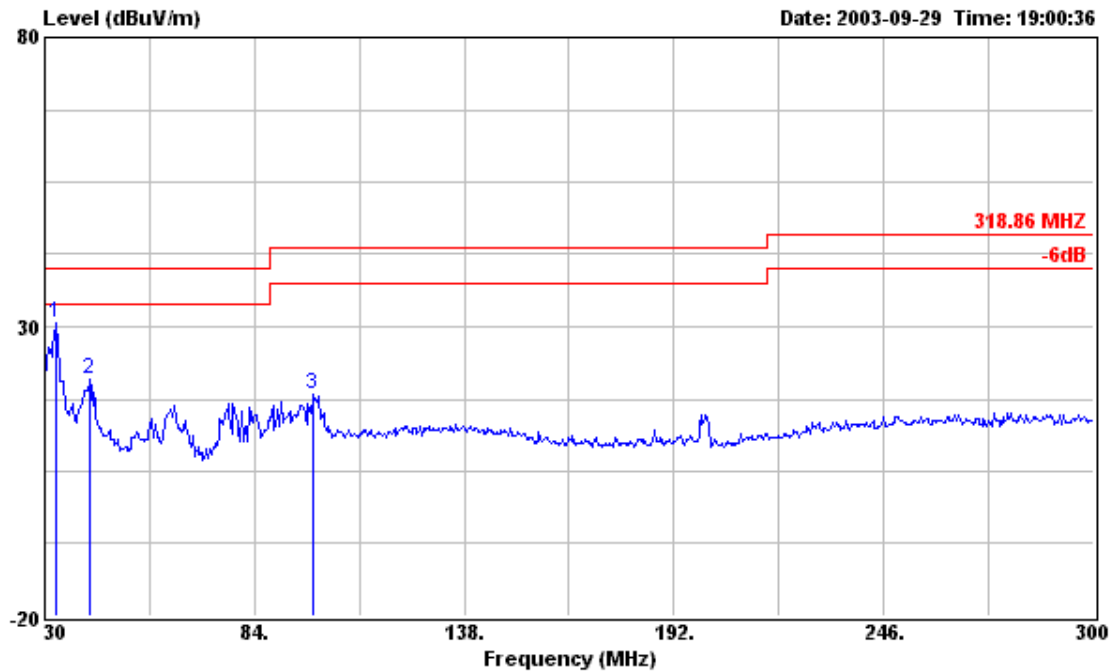
- Test Distance: 3M
- Temperature: 27°C
- Relative Humidity: 60 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level

■ The test was passed at the minimum margin that marked by the frame in the following test record



Site : 03CH03-HY
 Condition : 3m 03CH03-MAT HORIZONTAL
 EUT : Remote controller
 Power : DC 3V
 MODEL : F-23
 MEMO : CH 34 318.86MHz
 : Y
 : F391804

	Freq	Level	Over	Limit	Read	Probe	Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Pos	Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	32.700	27.49	-12.51	40.00	39.62	13.94	1.03	27.10	Peak	---	---
2	41.610	16.76	-23.24	40.00	32.64	10.06	1.16	27.10	Peak	---	---
3	199.020	19.56	-23.94	43.50	36.59	7.28	2.29	26.60	Peak	---	---



Site : 03CH03-HY
 Condition : 3m 03CH03-MAT VERTICAL
 EUT : Remote controller
 Power : DC 3V
 MODEL : F-23
 MEMO : CH 34 318.86MHz
 : Y
 : F391804

	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	32.700	30.69	-9.31	40.00	42.82	13.94	1.03	27.10	Peak	100	200
2	41.610	20.99	-19.01	40.00	36.87	10.06	1.16	27.10	Peak	---	---
3	98.850	18.26	-25.24	43.50	34.27	9.29	1.70	27.00	Peak	---	---

➤ For 1GHz ~ 4GHz

Remark: Frequency from 1000MHz to 4000MHz, the emission emitted by the EUT is too low to be measured

▪ Field strength of fundamental and harmonics

Frequency	Antenna	Cable	Reading	Limits		Emission Level		Margin	Detect	
	Polarity	Factor	Loss							
(MHz)		(dB/m)	(dB)	(dBuV)	(dBuV/m)	(uV/m)	(dBuV/m)	(uV/m)	(dB)	Mode
318.890	H	12.01	3.10	29.87	75.85	6201.55	44.98	177.42	-30.87	Peak
637.770	H	17.56	4.54	10.24	55.85	620.15	32.34	41.40	-23.51	Peak
956.670	H	19.61	5.86	12.75	55.85	620.15	38.22	81.47	-17.63	Peak
1275.340	H	24.79	4.35	10.75	55.85	620.15	39.89	98.74	-15.96	Peak
1594.450	H						-			Peak
1912.860	H	27.05	5.51	10.01	55.85	620.15	42.57	134.43	-13.28	Peak
2231.900	H	27.88	5.98	12.27	55.85	620.15	46.13	202.53	-9.72	Peak
318.890	V	12.01	3.10	48.86	75.85	6201.55	63.97	1579.43	-11.88	Peak
637.640	V	17.55	4.54	20.61	55.85	620.15	42.70	136.46	-13.15	Peak
956.460	V	19.61	5.86	17.76	55.85	620.15	43.23	145.04	-12.62	Peak
1275.180	V	24.79	4.35	15.23	55.85	620.15	44.37	165.39	-11.48	Peak
1594.450	V						-			Peak
1912.980	V	27.05	5.51	11.55	55.85	620.15	44.11	160.51	-11.74	Peak
2231.580	V	27.88	5.98	10.77	55.85	620.15	44.63	170.41	-11.22	Peak
2551.120	H/V						-			Peak
2870.010	H/V						-			Peak
3188.900	H/V						-			Peak

Remark " - ": Except for the above listed emission, the emission of the EUT is too low to be measured. "

Test Engineer:

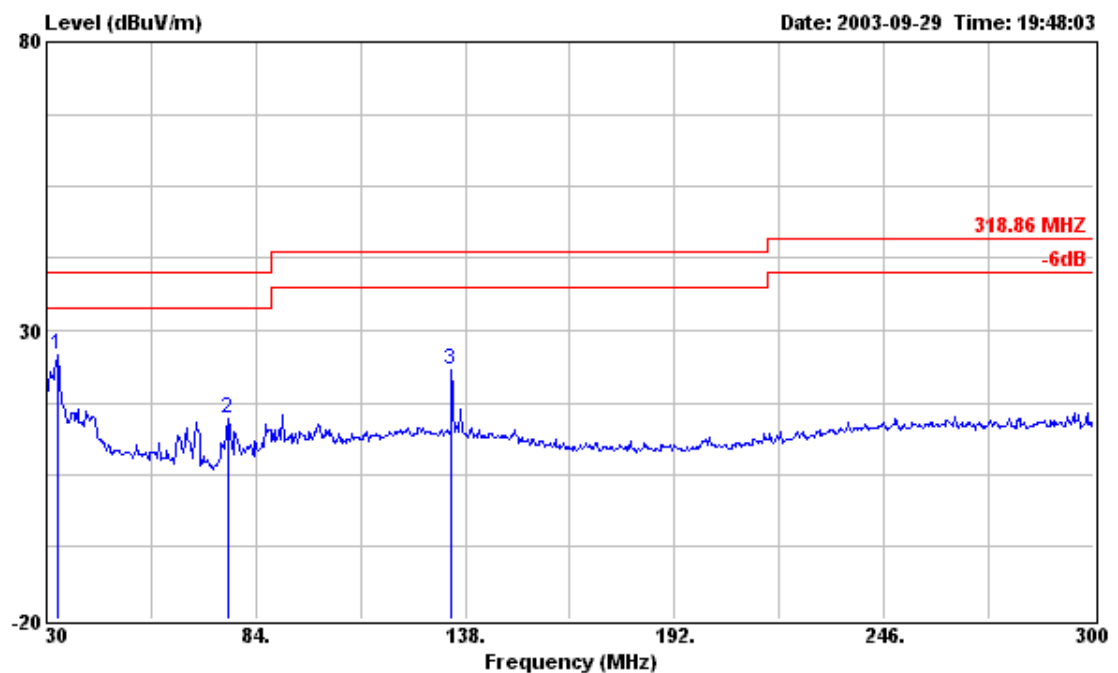
Steve Chen

Steve Chen

6.4.6. Test Mode: Mode 6

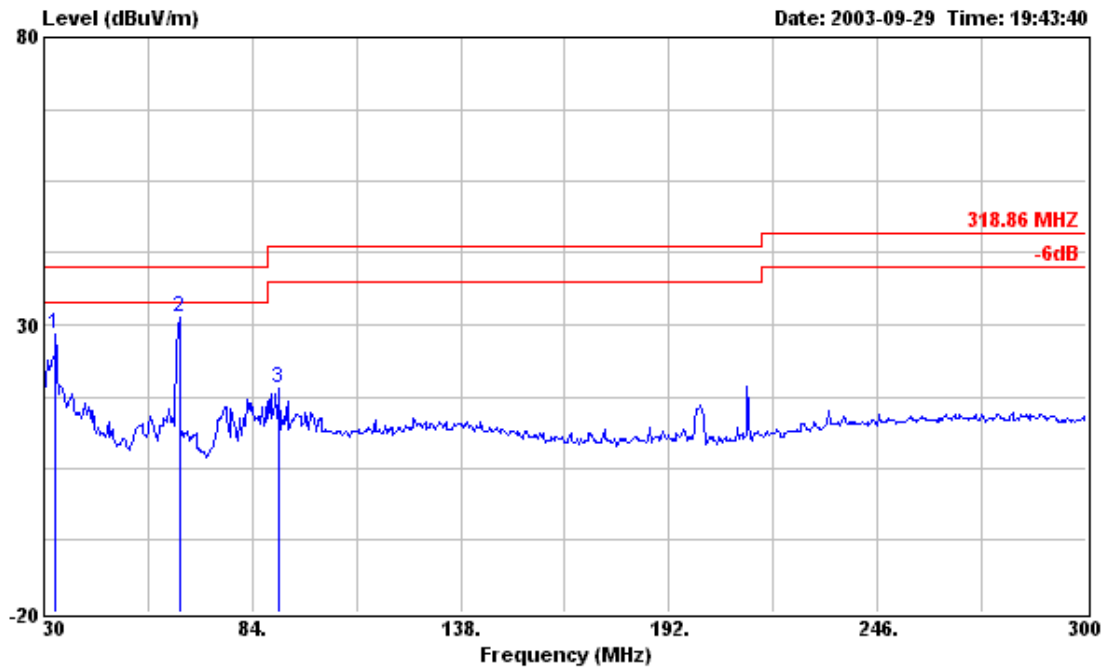
- Test Distance: 3M
- Temperature: 27°C
- Relative Humidity: 60 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level

■ The test was passed at the minimum margin that marked by the frame in the following test record



Site : 03CH03-HY
 Condition : 3m 03CH03-MAT HORIZONTAL
 EUT : Remote controller
 Power : DC 3V
 MODEL : F-23
 MEMO : CH 34 318.86MHz
 : Z
 : F391804

	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	32.700	25.82	-14.18	40.00	37.95	13.94	1.03	27.10	Peak	---	---
2	76.980	14.89	-25.11	40.00	34.85	5.54	1.55	27.05	Peak	---	---
3	134.490	23.13	-20.37	43.50	37.59	10.41	1.99	26.86	Peak	---	---



Site : 03CH03-HY
 Condition : 3m 03CH03-MAT VERTICAL
 EUT : Remote controller
 Power : DC 3V
 MODEL : F-23
 MEMO : CH 34 318.86MHz
 : Z
 : F391804

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamplifier Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	32.970	28.25	-11.75	40.00	40.52	13.80	1.03	27.10	Peak	---	---
2	65.100	31.25	-8.75	40.00	52.13	4.78	1.41	27.07	Peak	100	205
3	91.020	18.96	-24.54	43.50	35.63	8.84	1.51	27.02	Peak	---	---

➤ For 1GHz ~ 4GHz

Remark: Frequency from 1000MHz to 4000MHz, the emission emitted by the EUT is too low to be measured

▪ Field strength of fundamental and harmonics

Frequency	Antenna	Cable	Reading	Limits		Emission Level		Margin	Detect	
	Polarity	Factor	Loss							
(MHz)		(dB/m)	(dB)	(dBuV)	(dBuV/m)	(uV/m)	(dBuV/m)	(uV/m)	(dB)	Mode
318.890	H	12.01	3.10	31.58	75.85	6201.55	46.69	216.02	-29.16	Peak
637.650	H	17.56	4.54	10.84	55.85	620.15	32.94	44.36	-22.91	Peak
956.670	H	19.61	5.86	13.12	55.85	620.15	38.59	85.02	-17.26	Peak
1275.460	H	24.79	4.35	11.53	55.85	620.15	40.67	108.02	-15.18	Peak
1594.450	H						-			Peak
1913.820	H	27.05	5.51	12.12	55.85	620.15	44.68	171.40	-11.17	Peak
2232.230	H						-			Peak
318.890	V	12.01	3.10	46.93	75.85	6201.55	62.04	1264.74	-13.81	Peak
637.640	V	17.55	4.54	22.39	55.85	620.15	44.48	167.49	-11.37	Peak
956.670	V	19.61	5.86	17.96	55.85	620.15	43.43	148.42	-12.42	Peak
1275.280	V	24.79	4.35	15.19	55.85	620.15	44.33	164.63	-11.52	Peak
1594.450	V						-			Peak
1912.740	V	27.05	5.51	11.88	55.85	620.15	44.44	166.72	-11.41	Peak
2231.740	V	27.88	5.98	10.84	55.85	620.15	44.70	171.79	-11.15	Peak
2551.120	H/V						-			Peak
2870.010	H/V						-			Peak
3188.900	H/V						-			Peak

Remark " - ": Except for the above listed emission, the emission of the EUT is too low to be measured. "

Test Engineer:



Steve Chen

7. Antenna Factor & Cable Loss

Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)
30	15.35	1.01
35	13.63	1.04
40	11.11	1.09
45	10.59	1.24
50	6.47	1.43
55	5.83	1.39
60	5.18	1.59
65	4.81	1.41
70	4.43	1.43
75	5.10	1.55
80	5.91	1.56
85	7.33	1.62
90	8.74	1.41
95	9.05	1.81
100	9.36	1.68
110	9.65	1.73
120	9.97	1.79
130	10.51	1.93
140	10.32	2.06
150	9.42	2.09
160	8.09	2.12
170	7.43	2.12
180	7.60	2.12
190	7.43	2.21
200	7.26	2.29
220	9.11	2.42
240	10.88	2.54
260	11.75	2.66
280	11.55	2.76
300	11.36	2.85
320	12.03	3.10
340	12.69	3.36
360	13.33	3.49
380	14.00	3.50
400	14.63	3.51
450	15.33	3.55
500	16.03	3.81
550	16.65	4.05
600	17.29	4.23
650	17.64	4.63
700	18.00	4.74
750	18.39	4.95
800	18.79	5.06
850	19.10	5.18
900	19.42	5.40
950	19.58	5.91
1000	19.75	5.58
1000	24.10	3.92
2000	27.40	5.66
3000	30.00	7.20
4000	32.60	9.36

8. EMI Suppression Component List

No EMI suppression components.

9. List of Measuring Equipments Used

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30MHz~1GHz 3m	Jun. 21, 2003	Radiation (03CH03-HY)
Spectrum analyzer	R&S	FSP40	100004	9KHZ~40GHz	Aug. 07, 2003	Radiation (03CH03-HY)
Receiver	SCHAFFNER	SCR 3501	417	9 KHz ~1GHz	Feb. 20, 2003	Radiation (03CH03-HY)
Amplifier	HP	8447D	2944A09072	100KHz ~ 1.3GHz	Oct. 21, 2002	Radiation (03CH03-HY)
Bilog Antenna	SCHAFFNER	CBL6112B	2687	30MHz ~2GHz	Dec. 21, 2002	Radiation (03CH03-HY)
RF Cable-R03m	Jye Bao	RG142	CB021	30MHz~1GHz	Jan. 02, 2003	Radiation (03CH03-HY)
Amplifier	MITEQ	AFS44	879981	100MHz~26.5GHz	Jul. 23, 2003	Radiation (03CH03-HY)
Horn Antenna	COM-POWER	AH-118	10094	1GHz ~ 18GHz	Apr. 10, 2003	Radiation (03CH03-HY)
Turn Table	HD	DS 420	420/650/00	0 ~ 360 degree	N/A	Radiation (03CH03-HY)
Antenna Mast	HD	MA 240	240/560/00	1 m - 4 m	N/A	Radiation (03CH03-HY)
Horn Antenna	Schwarzbeck	BBHA9170	BBHA9170154	15GHz~40GHz	Jun. 02, 2003	Radiation (03CH03-HY)

Calibration Interval of instruments listed above is one year, except for Horn Antenna, BBHA9170.

10. Uncertainty of Test Site

Uncertainty of Radiated Emission Measurement

Contribution	Probability Distribution	3m
Antenna factor calibration	normal(k=2)	±1
cable loss calibration	normal(k=2)	±0.3
RCV/SPA specification	rectangular	±2
Antenna Directivity	rectangular	±3
Antenna Factor V.S. Height	rectangular	±2
Antenna Factor Interpolation for Frequency	rectangular	±0.25
site imperfection	rectangular	±2
Mismatch Receiver VSWR $\Gamma_1=0.09$ Antenna VSWR $\Gamma_2=0.67$ Uncertainty= $20\log(1-\Gamma_1\Gamma_2)$	U-shaped	±0.54
combined standard uncertainty Ue(y)	normal	±2.7
Measuring uncertainty for a level of confidence of 95% U=2Ue(y)	normal (k=2)	±5.4

$U = \sqrt{\{(1/2)^2 + (0.3/2)^2 + (2^2 + 0.5^2 + 2^2 + 0.25^2 + 2^2)/3 + (0.54)^2/2\}} = 2.2$ for 10m test distance

$U = \sqrt{\{(1/2)^2 + (0.3/2)^2 + (2^2 + 3^2 + 2^2 + 0.25^2 + 2^2)/3 + (0.54)^2/2\}} = 2.7$ for 3m test distance

Uncertainty of Conducted Emission Measurement

Contribution	Probability Distribution	150KHz – 30MHz
Cable and I/P attenuator calibration	normal(k=2)	±0.3
RCV/SPA specification	rectangular	±2
LISN coupling specification	rectangular	±1.5
Transducer factor frequency interpolation	rectangular	±0.2
Mismatch Receiver VSWR $\Gamma_1=0.09$ LISN VSWR $\Gamma_2=0.33$ Uncertainty= $20\log(1-\Gamma_1\Gamma_2)$	U-shaped	0.2
combined standard uncertainty Ue(y)	normal	±1.66
Measuring uncertainty for a level of confidence of 95% U=2Ue(y)	normal (k=2)	±3.32

$U = \sqrt{\{(0.3/2)^2 + (2^2 + 1.5^2 + 0.2^2)/3 + (0.2)^2/2\}} = 1.66$