

FCC TEST REPORT

for

47 CFR, Part 15, Subpart C

Equipment : Server

Model No. : MAAT, IT-100

FCC ID. : EUN-R02501

Filing Type : Certification

**Applicant : First International Computer, Inc.
No. 300, Yang Guang St.,
NeiHu, Taipei, Taiwan, 114**

- 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.

Table of Contents

History of this test reportii

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 3

2. Test Configuration of Equipment under Test 4

 2.1. Test Manner 4

 2.2. Description of Test System 4

 2.3. Connection Diagram of Test System 6

3. Test Software 7

4. General Information of Test..... 8

 4.1. Test Voltage 8

 4.2. Standard for Methods of Measurement..... 8

 4.3. Test in Compliance with 8

 4.4. Frequency Range Investigated 8

 4.5. Test Distance 8

5. Report of Measurements and Examinations 9

 5.1. List of Measurements and Examinations 9

 5.2. 6dB Bandwidth 10

 5.3. Peak Output Power 11

 5.4. Power Spectral Density 12

 5.5. Test of Conducted Emission 13

 5.6. Test of Radiated Emission 17

 5.7. Band Edges Measurement..... 28

 5.8. Antenna Requirements 29

 5.9. RF Exposure 30

6. EMI Suppression Component List..... 32

7. Antenna Factor & Cable Loss 33

8. List of Measuring Equipments Used 34

9. Uncertainty of Test Site 35

History of this test report

Original Report Issue Date: Sep. 09, 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 : Server

Model No. : MAAT, IT-100

FCC ID. : EUN-R02501

Filing Type : Certification

Applicant : **First International Computer, Inc.**
No. 300, Yang Guang St.,
NeiHu, Taipei, Taiwan, 114

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 equipment under test was **passed** all test items required in FCC Part 15 subpart C, relative to the equipment under test. Testing was carried out on Sep. 08, 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

First International Computer, Inc.
No. 300, Yang Guang St.,
NeiHu, Taipei, Taiwan, 114

1.2. Manufacturer

1. First International Computer, Inc.
118, Nan-Lin Rd, Taishan Hsiang, Taipei, Taiwan, R.O.C.
2. First International Computer, Inc.
122, Nan-Lin Rd, Taishan Hsiang, Taipei, Taiwan, R.O.C.

1.3. Basic Description of Equipment under Test

Equipment	: Server
Model No.	: MAAT, IT-100
TP Cable	: Non-Shielded, 1 m
TP Cable	: Non-Shielded, 13 m
Power Supply Type	: Switching
AC Power Cord	: Non-Shielded, 1.8 m, 3 pin
DC Power Cable	: Shielded, 1.8 m, 2 pin

1.4. Feature of Equipment under Test

Dimension	246 mm * 56 mm * 240 mm
CPU	Transmeta Crusoe TM5600 500MHz
Memory	One 144 pin SODIMM slot, can support SDRAM 64 / 128 / 256 / 512MB
Storage	2.5 " IDE HDD, support 20GB capacity HDD CompactFlash™ Memory Card, support 16 / 32 / 64 / 128 /256MB Module
Network	4 10/100 Fast Ethernet NIC One 10/100 Mbps Fast Ethernet Up-Link Port Software Driver for Wireless LAN Card (AP) 802.11b
Power Supply	External 60W/12V AC Power Adaptor
LED Display	Power LED System LED Ethernet Network LED WAN LED Wireless LAN AP LED
Expansion Port	2 USB Port (Support USB 1.1) 1 Parallel Port 1 COM Port/RS-232 DB-9 Port (Console Port) 1 Power Switch/Reset Button 1 AC Power Adaptor Socket 4 Ethernet Port (RJ45) 1 WAN Port (RJ45)
Material of Box	Metal and Plastic Case Fanless
HDD	IBM / IC25N020ATCS04-0, 20GB
ADAPTOR	DELTA / ADP-60WB, AC 100~240V, 1.5A, DC 12V 5A

2. Test Configuration of Equipment under Test

2.1. Test Manner

- a. The EUT has been associated with notebook and 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 remote COMPAQ NOTEBOOK, COMPAQ NOTEBOOK, VIEWSONIC Monitor, LOGITECH USB Mouse, EPSON Printer, ACEEX Modem, Gateway USB Keyboard and EUT for EMI test.
- c. The EUT can operate on eleven channels from 2412.0MHz to 2462.0MHz. (as listed in section 1.4). According to 15.31(m), three channels (one near top, one near middle and one near bottom) were performed as following:
 Mode 1: 2412MHz (Channel 01)
 Mode 2: 2437MHz (Channel 06)
 Mode 3: 2462MHz (Channel 11)
- b. Frequency range investigated: conduction 150 KHz to 30 MHz, radiation 30 MHz to 25000MHz.

2.2. Description of Test System

Support Unit 1. – Notebook (COMPAQ) – for local and remote workstation

FCC ID	: N/A
Model No.	: PRESARIO 1500
Power Supply Type	: Switching
Power Cord	: Non-Shielded
Serial No.	: SP0039
Remark	: This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

Support Unit 2. -- Monitor (VIEWSONIC) – for local workstation

FCC ID	: N/A
Model No.	: VCDTS21553-3P
Power Supply Type	: Switching
Power Cord	: Non-Shielded
Serial No.	: SP0050
Data Cable	: Shielded, 1.7m
Remark	: This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

Support Unit 3. -- USB Mouse (LOGITECH) – for local workstation

FCC ID : N/A
Model No. : M-BE58
Serial No. : SP0041
Data Cable : Shielded, 1.7m
Remark : This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

Support Unit 4. -- Printer (EPSON) – for local workstation

FCC ID : N/A
Model No. : STYLUS COLRO 680
Power Supply Type : Linear
Power Cord : Non-Shielded
Serial No. : SP0048
Data Cable : Shielded, 1.35m
Remark : This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

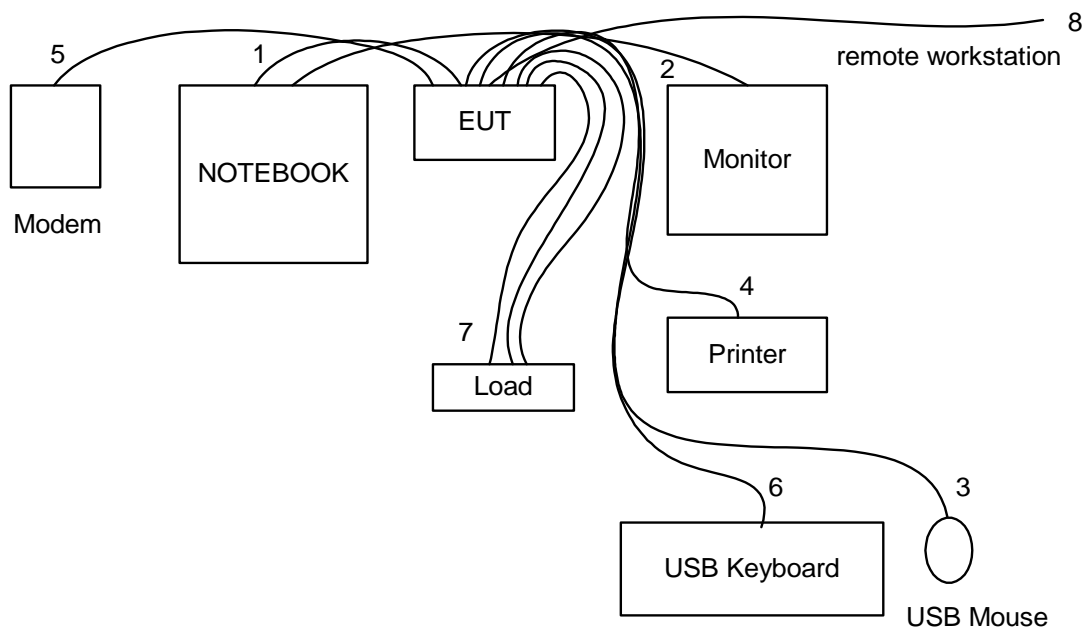
Support Unit 5. -- Modem (ACEEX) – for local workstation

FCC ID : IFAXDM1414
Model No. : DM1414
Power Supply Type : Linear
Power Cord : Non-Shielded
Serial No. : SP0015
Data Cable : Shielded, 1.15m

Support Unit 6. – USB Keyboard (Gateway) – for local workstation

FCC ID : N/A
Model No. : SK9925
Serial No. : SP0001
Data Cable : Shielded, 1.8m
Remark : This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

2.3. Connection Diagram of Test System



1. The TP cable is connected from EUT to the support unit 1.
2. The I/O cable is connected from NOTEBOOK to the support unit 2.
3. The I/O cable is connected from EUT to the support unit 3.
4. The I/O cable is connected from EUT to the support unit 4.
5. The I/O cable is connected from EUT to the support unit 5.
6. The I/O cable is connected from EUT to the support unit 6.
7. These are loop-back TP cables.
8. The TP cable is connected from EUT to the remote workstation.

3. Test Software

An executive program, EMCTEST.EXE under WIN XP, which generates a complete line of continuously repeating " H " pattern was used as the test software.

The program was executed as follows:

- a. Turn on the power of all equipment.
- b. The PC reads the test program from the hard disk drive and runs it.
- c. The PC sends " H " messages to the monitor, and the monitor displays " H " patterns on the screen.
- d. The PC sends " H " messages to the printer, then the printer prints them on the paper.
- e. The PC sends " H " messages to the modem.
- f. The PC sends " H " messages to the internal Hard Disk, and the Hard Disk reads and writes the message.
- g. Repeat the steps from c to f.

At the same time, "Prism test appliance.exe" was executed to keep transmitting signals at fixed frequency.

4. General Information of Test

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 : CO01-HY, 03CH03-HY

4.1. Test Voltage

110V/60Hz

4.2. Standard for Methods of Measurement

ANSI C63.4-2001 for conducted power line test and radiated emission test,
FCC 97-114 for test of 6dB Bandwidth
FCC 97-114 for test of Maximum Peak Output Power
FCC 97-114 for test of 100kHz Bandwidth of Frequency Band Edges
FCC 97-114 for test of Power Spectral Density

4.3. Test in Compliance with

FCC Part 15, Subpart C 15.247

4.4. Frequency Range Investigated

- a. Conduction: from 150 KHz to 30 MHz
- b. Radiation: from 30 MHz to 25000MHz

4.5. Test Distance

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

5. Report of Measurements and Examinations

5.1. List of Measurements and Examinations

FCC Rule	Description of Test	Result
<u>15.247(a)(2)</u>	6dB Bandwidth	Pass
<u>15.247(b)</u>	Maximum Peak Output Power	Pass
<u>15.247(d)</u>	Power Spectral Density	Pass
15.207	Conducted Emission	Pass
15.209	Radiated Emission	Pass
<u>15.247(c)</u>	100kHz Bandwidth of Frequency Band Edges	Pass
<u>15.203</u>	Antenna Requirement	Pass
1.1307 1.1310 2.1091 2.1093	RF Exposure Compliance	Pass

5.2. 6dB Bandwidth

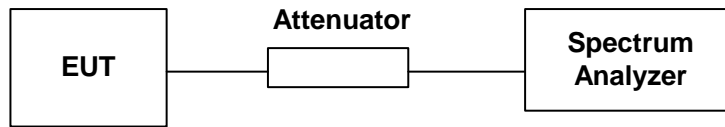
5.2.1. Measuring Instruments :

As described in chapter 7 of this test report.

5.2.2. Test Procedure :

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 6 dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6 dB.

5.2.3. Test Setup Layout :



5.2.4. Test Result : The spectrum analyzer plots are attached as below

- Temperature : 27°C
- Relative Humidity : 62 %

Channel	Frequency (MHz)	6dB Emission bandwidth (MHz)	Limits (MHz)	Plot Ref. No.
1	2412	11.60	0.5	1
6	2437	11.64	0.5	2
11	2462	11.64	0.5	3

5.3. Peak Output Power

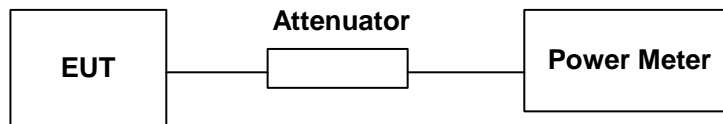
5.3.1. Measuring Instruments :

As described in chapter 7 of this test report.

5.3.2. Test Procedure :

The antenna port (RF output) of the EUT was connected to the input (RF input) of a power meter. Power was read directly from the meter and cable loss connection was added to the reading to obtain power at the EUT antenna terminal. The EUT Output Power was set to maximum to produce the worse case test result.

5.3.3. Test Setup Layout :



5.3.4. Test Result : See spectrum analyzer plots below

- Temperature: 27°C
- Relative Humidity: 62 %
- Antenna Gain: 3 dBi

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (mW)	Limits (Watt/dBm)
1	2412	14.61	28.90679882	1W/30 dBm
6	2437	14.20	26.30267992	1W/30 dBm
11	2462	13.99	25.06109253	1W/30 dBm

- Comments : Maximum Peak Output Power < 30dBm (1Watt)

5.4. Power Spectral Density

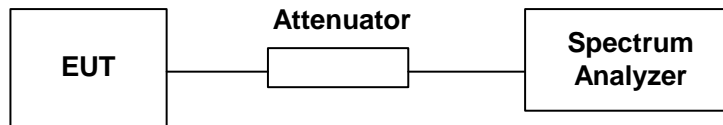
5.4.1. Measuring Instruments :

As described in chapter 7 of this test report.

5.4.2. Test Procedure :

1. The transmitter output was connected to spectrum analyzer through an attenuator.
2. The spectrum analyzer's resolution bandwidth were set at 3KHz RBW and 30KHz VBW as that of the fundamental frequency. Set the sweep time=span/3KHz.
3. The power spectral density was measured and recorded.
4. The Sweep time is allowed to be longer than span/3KHz for a full response of the mixer in the spectrum analyzer.

5.4.3. Test Setup Layout :



5.4.4. Test Result : See spectrum analyzer plots below

- Temperature: 27°C
- Relative Humidity: 62 %

Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limits (dBm)	Plot Ref. No.
1	2412	-13.97	8	1
6	2437	-14.10	8	2
11	2462	-14.62	8	3

5.5. Test of Conducted Emission

Conducted Emissions were measured from 150 KHz to 30 MHz with a bandwidth of 9 KHz and return leads of the EUT according to the methods defined in ANSI C63.4-2001 Section 3.1. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position produced maximum conducted emissions.

5.5.1. Major Measuring Instruments :

● Test Receiver	(R&S ESCS 30)
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 KHz

5.5.2. Test Procedures :

- a. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
- b. Connect EUT to the power mains through a line impedance stabilization network (LISN).
- c. All the support units are connect to the other LISN.
- d. The LISN provides 50 ohm coupling impedance for the measuring instrument.
- e. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
- f. Both sides of AC line were checked for maximum conducted interference.
- g. The frequency range from 150 KHz to 30 MHz was searched.
- h. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.


5.5.3. Test Result of Conducted Emission :

- Test Mode: Mode 1
- Frequency Range of Test: from 150KHz to 30 MHz
- 6dB Bandwidth: 9KHz
- Temperature: 27.6 °C
- Relative Humidity: 58 %

The test was passed at the minimum margin that marked under gray area in the following table

Frequency (MHz)	Line or Neutral	Meter Reading		Limits		Margin	
		Q.P. (dBuV)	A.V. (dBuV)	Q.P. (dBuV)	A.V. (dBuV)	Q.P. (dB)	A.V. (dB)
0.200	L	50.79	39.51	63.61	53.61	-12.82	-14.10
0.264	L	43.38	34.28	61.30	51.30	-17.92	-17.02
0.332	L	39.24	31.63	59.40	49.40	-20.16	-17.77
0.402	L	33.38	28.15	57.81	47.81	-24.43	-19.66
0.471	L	25.71	23.52	56.50	46.50	-30.79	-22.98
0.601	L	28.59	25.91	56.00	46.00	-27.41	-20.09
0.201	N	49.94	39.08	63.57	53.57	-13.63	-14.49
0.266	N	43.90	34.91	61.24	51.24	-17.34	-16.33
0.332	N	39.42	32.26	59.40	49.40	-19.98	-17.14
0.402	N	34.94	29.76	57.81	47.81	-22.87	-18.05
0.466	N	31.84	28.98	56.58	46.58	-24.74	-17.60
0.601	N	29.89	27.99	56.00	46.00	-26.11	-18.01

Test Engineer :




John Huang

- Test Mode: Mode 2
- Frequency Range of Test: from 150KHz to 30 MHz
- 6dB Bandwidth: 9KHz
- Temperature: 27.6 °C
- Relative Humidity: 58 %

The test was passed at the minimum margin that marked under gray area in the following table


Frequency (MHz)	Line or Neutral	Meter Reading		Limits		Margin	
		Q.P. (dBuV)	A.V. (dBuV)	Q.P. (dBuV)	A.V. (dBuV)	Q.P. (dB)	A.V. (dB)
0.201	L	49.16	38.02	63.57	53.57	-14.41	-15.55
0.267	L	42.61	33.92	61.21	51.21	-18.60	-17.29
0.336	L	36.82	29.30	59.30	49.30	-22.48	-20.00
0.402	L	32.80	27.63	57.81	47.81	-25.01	-20.18
0.465	L	30.03	28.16	56.60	46.60	-26.57	-18.44
0.532	L	29.48	28.28	56.00	46.00	-26.52	-17.72
0.201	N	49.46	38.62	63.57	53.57	-14.11	-14.95
0.266	N	43.62	34.74	61.24	51.24	-17.62	-16.50
0.332	N	39.32	32.20	59.40	49.40	-20.08	-17.20
0.402	N	34.86	29.76	57.81	47.81	-22.95	-18.05
0.466	N	31.62	28.98	56.58	46.58	-24.96	-17.60
0.601	N	29.95	28.14	56.00	46.00	-26.05	-17.86

Test Engineer : 
 John Huang

- Test Mode: Mode 3
- Frequency Range of Test: from 150KHz to 30 MHz
- 6dB Bandwidth: 9KHz
- Temperature: 27.6 °C
- Relative Humidity: 58 %

The test was passed at the minimum margin that marked under gray area in the following table

Frequency (MHz)	Line or Neutral	Meter Reading		Limits		Margin	
		Q.P. (dBuV)	A.V. (dBuV)	Q.P. (dBuV)	A.V. (dBuV)	Q.P. (dB)	A.V. (dB)
0.201	L	48.96	38.02	63.57	53.57	-14.61	-15.55
0.267	L	42.57	33.87	61.21	51.21	-18.64	-17.34
0.336	L	36.70	29.30	59.30	49.30	-22.60	-20.00
0.402	L	32.68	27.63	57.81	47.81	-25.13	-20.18
2.267	L	25.35	23.47	56.00	46.00	-30.65	-22.53
2.799	L	27.79	23.40	56.00	46.00	-28.21	-22.60
0.202	N	45.14	37.68	63.53	53.53	-18.39	-15.85
0.266	N	43.18	34.41	61.24	51.24	-18.06	-16.83
0.334	N	38.65	31.69	59.35	49.35	-20.70	-17.66
0.399	N	35.28	30.43	57.87	47.87	-22.59	-17.44
0.601	N	29.47	27.76	56.00	46.00	-26.53	-18.24
2.865	N	31.41	25.47	56.00	46.00	-24.59	-20.53

Test Engineer : 
 John Huang

5.6. Test of Radiated Emission

Radiated emissions from 30 MHz to 25 GHz were measured 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 5.6.3. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions

5.6.1. Major Measuring Instruments

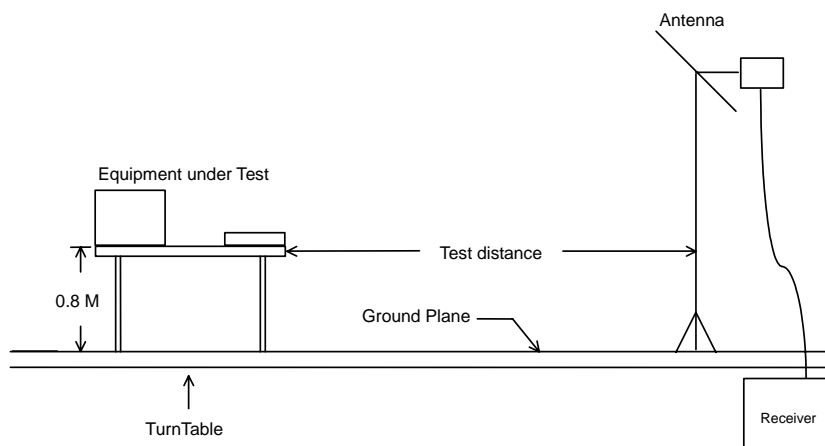
- Amplifier (MITEQ AFS44)
 - RF Gain 40 dB
 - Signal Input 100 MHz to 26.5 GHz

- Spectrum analyzer (R&S FSP40)
 - Attenuation 10 dB
 - Start Frequency 1 GHz
 - Stop Frequency 25 GHz
 - Resolution Bandwidth 1 MHz
 - Video Bandwidth 1 MHz
 - Signal Input 9 KHz to 40 GHz

5.6.2. Test Procedures

1. The EUT was placed on a rotatable table top 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna is a broadband antenna 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.
5. 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.
6. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function and specified bandwidth with Maximum Hold Mode.
7. 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.
8. For testing above 1GHz, the emission level of the EUT in peak mode was 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.

5.6.3. Typical Test Setup Layout of Radiated Emission



5.6.4. Test Result of Radiated Emission

- Test Mode: Mode 1
- Test Distance: 3M
- Temperature: 27 °C
- Relative Humidity: 62 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading: Antenna Factor + Cable Loss + Reading = Emission

The Radiated Emission test was passed at minimum margin

The test was passed at the minimum margin that marked under gray area in the following table, and its antenna height is 1 m, turn table degree is 188 °

- Spurious Emission
- For 30MHz to 1GHz

Frequency (MHz)	Antenna Polarity	Cable Factor	Reading Loss	Limits	Emission Level	Margin	Detect			
(dBuV)	(dB/m)	(dB)	(dBuV)	(dBuV/m)	(uV/m)	(dB)	Mode			
399.400	H	14.60	3.51	26.77	46.00	199.53	44.88	175.39	-1.12	QP
500.200	H	16.03	3.81	24.78	46.00	199.53	44.62	170.22	-1.38	QP
592.600	H	17.20	4.20	20.64	46.00	199.53	42.04	126.47	-3.96	Peak
32.970	V	13.80	1.03	19.87	40.00	100.00	34.70	54.33	-5.30	Peak
399.400	V	14.60	3.51	24.68	46.00	199.53	42.79	137.88	-3.21	QP
598.900	V	17.28	4.22	20.40	46.00	199.53	41.90	124.45	-4.10	Peak

▪ For 1GHz to 5GHz

Frequency (MHz)	Antenna Polarity	Cable Factor (dB/m)	Reading Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	Emission (uV/m)	Level (dBuV/m)	Margin (uV/m)	Detect (dB)	Mode
1196.000	H	24.60	4.24	18.81	74.00	5011.87	47.65	241.27	-26.35	Peak
1196.000	H	24.60	4.24	0.22	54.00	501.19	29.06	28.38	-24.94	A.V.
2260.000	H	27.94	6.02	21.66	74.00	5011.87	55.62	603.95	-18.38	Peak
2260.000	H	27.94	6.02	6.88	54.00	501.19	40.84	110.15	-13.16	A.V.
2372.000	H	28.16	6.17	15.94	74.00	5011.87	50.27	326.21	-23.73	Peak
2372.000	H	28.16	6.17	4.34	54.00	501.19	38.67	85.80	-15.33	A.V.
2452.000	H	28.33	6.28	14.86	74.00	5011.87	49.47	297.51	-24.53	Peak
2452.000	H	28.33	6.28	1.44	54.00	501.19	36.05	63.46	-17.95	A.V.
2564.000	H	28.64	6.46	17.16	74.00	5011.87	52.26	410.20	-21.74	Peak
2564.000	H	28.64	6.46	4.93	54.00	501.19	40.03	100.35	-13.97	A.V.
3958.000	H	32.52	9.26	15.78	74.00	5011.87	57.56	755.09	-16.44	Peak
3958.000	H	32.52	9.26	8.64	54.00	501.19	50.42	331.89	-3.58	A.V.
2260.000	V	27.94	6.02	14.66	74.00	5011.87	48.62	269.77	-25.38	Peak
3748.000	V	31.93	8.74	16.59	74.00	5011.87	57.26	729.46	-16.74	Peak
3748.000	V	31.93	8.74	9.67	54.00	501.19	50.34	328.85	-3.66	A.V.

➤ For 5GHz ~ 25GHz

Remark: Frequency from 5000MHz to 25000MHz, the emission emitted by the EUT is too low to be measured

■ Field strength of fundamental and harmonics

Frequency (MHz)	Antenna Polarity	Cable Factor (dB/m)	Reading Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	Emission (uV/m)	Level (dBuV/m)	Margin (uV/m)	Detect (dB)	Mode
2412.000	H	28.24	6.22	56.80	-	-	91.26	36559.48		A.V.
2412.000	H	28.24	6.22	69.02	-	-	103.48	149279.44		Peak
2412.000	V	28.24	6.22	64.56	-	-	99.02	89330.55		Peak
2412.000	V	28.24	6.22	52.22	-	-	86.68	21577.44		A.V.
4824.000	V/H						-			Peak, A.V.
7236.000	V/H						-			Peak, A.V.
9648.000	V/H						-			Peak, A.V.
12060.000	V/H						-			Peak, A.V.
14472.000	V/H						-			Peak, A.V.
16884.000	V/H						-			Peak, A.V.
19296.000	V/H						-			Peak, A.V.
21708.000	V/H						-			Peak, A.V.
24120.000	V/H						-			Peak, A.V.

Remark: The emission emitted by the EUT is too low to be measured except the emission listed above

Test Engineer : Steve
Steve Chen

- Test Mode: Mode 2
- Test Distance: 3M
- Temperature: 27 °C
- Relative Humidity: 62 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading: Antenna Factor + Cable Loss + Reading = Emission

The Radiated Emission test was passed at minimum margin

The test was passed at the minimum margin that marked under gray area in the following table, and its antenna height is 1_m, turn table degree is 200°

- Spurious Emission
 - For 30MHz to 1GHz

Frequency (MHz)	Antenna Polarity	Cable Factor	Reading Loss	Limits (dBuV)	Emission (dBuV/m)	Level (uV/m)	Margin (dB)	Detect Mode		
394.500	H	14.45	3.51	27.38	46.00	199.53	45.34	184.93	-0.66	QP
497.400	H	15.99	3.80	23.79	46.00	199.53	43.58	151.01	-2.42	QP
598.900	H	17.28	4.22	20.38	46.00	199.53	41.88	124.17	-4.12	Peak
32.970	V	13.80	1.03	20.23	40.00	100.00	35.06	56.62	-4.94	Peak
399.400	V	14.60	3.51	24.48	46.00	199.53	42.59	134.74	-3.41	QP
592.600	V	17.20	4.20	20.25	46.00	199.53	41.65	120.92	-4.35	Peak

• For 1GHz to 5GHz

Frequency (MHz)	Antenna Polarity	Cable Factor (dB/m)	Reading Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	Emission (uV/m)	Level (dBuV/m)	Margin (uV/m)	Detect (dB)	Mode
2286.000	H	27.99	6.06	23.52	74.00	5011.87	57.57	755.96	-16.43	Peak
2286.000	H	27.99	6.06	13.40	54.00	501.19	47.45	235.78	-6.55	A.V.
2398.000	H	28.22	6.21	16.15	74.00	5011.87	50.58	338.06	-23.42	Peak
2398.000	H	28.22	6.21	4.92	54.00	501.19	39.35	92.79	-14.65	A.V.
2590.000	H	28.72	6.51	16.96	74.00	5011.87	52.19	406.91	-21.81	Peak
2590.000	H	28.72	6.51	4.53	54.00	501.19	39.76	97.27	-14.24	A.V.
3972.000	H	32.56	9.30	15.62	74.00	5011.87	57.48	748.17	-16.52	Peak
3972.000	H	32.56	9.30	8.35	54.00	501.19	50.21	323.97	-3.79	A.V.
1460.000	V	25.24	4.64	15.25	74.00	5011.87	45.13	180.51	-28.87	Peak
1460.000	V	25.24	4.64	1.67	54.00	501.19	31.55	37.80	-22.45	A.V.
1596.000	V	25.75	4.89	16.16	74.00	5011.87	46.80	218.78	-27.20	Peak
1596.000	V	25.75	4.89	2.46	54.00	501.19	33.10	45.19	-20.90	A.V.
2286.000	V	27.99	6.06	24.03	74.00	5011.87	58.08	801.68	-15.92	Peak
2286.000	H	27.99	6.06	13.55	54.00	501.19	47.60	239.88	-6.40	A.V.
2398.000	V	28.22	6.21	17.83	74.00	5011.87	52.26	410.20	-21.74	Peak
2398.000	V	28.22	6.21	9.21	54.00	501.19	43.64	152.05	-10.36	A.V.
2590.000	V	28.72	6.51	17.17	74.00	5011.87	52.40	416.87	-21.60	Peak
2590.000	V	28.72	6.51	6.65	54.00	501.19	41.88	124.17	-12.12	A.V.
4094.000	V	32.56	9.26	15.34	74.00	5011.87	57.16	721.11	-16.84	Peak
4094.000	V	32.56	9.26	8.50	54.00	501.19	50.32	328.10	-3.68	A.V.

➤ For 5GHz ~ 25GHz

Remark: Frequency from 5000MHz to 25000MHz, 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 (dBuV)	Emission (dBuV/m)	Level (uV/m)	Margin (dB)	Detect Mode	
2438.000	H	28.30	6.26	66.81	-	-	101.37	117084.66	Peak
2438.000	H	28.30	6.26	58.42	-	-	92.98	44565.62	A.V.
2436.000	V	28.29	6.26	68.45	-	-	103.00	141253.75	Peak
2436.000	V	28.29	6.26	61.37	-	-	95.92	62517.27	A.V.
4874.000	V/H						-		Peak, A.V.
7311.000	V/H						-		Peak, A.V.
9748.000	V/H						-		Peak, A.V.
12185.000	V/H						-		Peak, A.V.
14622.000	V/H						-		Peak, A.V.
17059.000	V/H						-		Peak, A.V.
19496.000	V/H						-		Peak, A.V.
21933.000	V/H						-		Peak, A.V.
24370.000	V/H						-		Peak, A.V.

Remark: The emission emitted by the EUT is too low to be measured except the emission listed above

Test Engineer : Steve
Steve Chen

- Test Mode: Mode 3
- Test Distance: 3M
- Temperature: 27 °C
- Relative Humidity: 62 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading: Antenna Factor + Cable Loss + Reading = Emission

The Radiated Emission test was passed at minimum margin

The test was passed at the minimum margin that marked under gray area in the following table, and its antenna height is 1_m, turn table degree is 201°

- Spurious Emission
 - For 30MHz to 1GHz

Frequency (MHz)	Antenna Polarity	Cable Factor	Reading Loss	Limits (dBuV)	Emission (dBuV/m)	Level (uV/m)	Margin (dB)	Detect Mode		
187.140	H	7.46	2.18	29.41	43.50	149.62	39.05	89.64	-4.45	Peak
399.400	H	14.60	3.51	26.72	46.00	199.53	44.83	174.38	-1.17	QP
500.200	H	16.03	3.81	24.99	46.00	199.53	44.83	174.38	-1.17	QP
601.000	H	17.30	4.24	19.91	46.00	199.53	41.45	118.17	-4.55	Peak
399.400	V	14.60	3.51	23.83	46.00	199.53	41.94	125.03	-4.06	QP
598.200	V	17.27	4.22	20.84	46.00	199.53	42.33	130.77	-3.67	Peak

• For 1GHz to 5GHz

Frequency (MHz)	Antenna Polarity	Cable Factor (dB/m)	Reading Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	Emission (uV/m)	Level (dBuV/m)	Margin (uV/m)	Detect (dB)	Mode
2310.000	H	28.04	6.09	22.70	74.00	5011.87	56.83	694.22	-17.17	Peak
2310.000	H	28.04	6.09	6.41	54.00	501.19	40.54	106.41	-13.46	A.V.
2422.000	H	28.27	6.24	15.43	74.00	5011.87	49.94	314.05	-24.06	Peak
2422.000	H	28.27	6.24	4.11	54.00	501.19	38.62	85.31	-15.38	A.V.
2614.000	H	28.79	6.55	14.98	74.00	5011.87	50.32	328.10	-23.68	Peak
2614.000	H	28.79	6.55	6.50	54.00	501.19	41.84	123.59	-12.16	A.V.
4012.000	H	32.59	9.34	15.25	74.00	5011.87	57.18	722.77	-16.82	Peak
4012.000	H	32.59	9.34	8.56	54.00	501.19	50.49	334.58	-3.51	A.V.
1596.000	V	25.75	4.89	16.40	74.00	5011.87	47.04	224.91	-26.96	Peak
1596.000	V	25.75	4.89	1.60	54.00	501.19	32.24	40.93	-21.76	A.V.
2308.000	V	28.03	6.09	24.03	74.00	5011.87	58.15	808.16	-15.85	Peak
2308.000	V	28.03	6.09	7.07	54.00	501.19	41.19	114.68	-12.81	A.V.
2422.000	V	28.27	6.24	15.99	74.00	5011.87	50.50	334.97	-23.50	Peak
2422.000	V	28.27	6.24	3.91	54.00	501.19	38.42	83.37	-15.58	A.V.
2500.000	V	28.44	6.34	13.79	74.00	5011.87	48.57	268.23	-25.43	Peak
2500.000	V	28.44	6.34	1.46	54.00	501.19	36.24	64.86	-17.76	A.V.
2620.000	V	28.81	6.56	14.68	74.00	5011.87	50.05	318.05	-23.95	Peak
2620.000	V	28.81	6.56	3.06	54.00	501.19	38.43	83.46	-15.57	A.V.
4054.000	V	32.57	9.30	15.13	74.00	5011.87	57.00	707.95	-17.00	Peak
4054.000	V	32.57	9.30	8.49	54.00	501.19	50.36	329.61	-3.64	A.V.

➤ For 5GHz ~ 25GHz

Remark: Frequency from 5000MHz to 25000MHz, the emission emitted by the EUT is too low to be measured

■ Field strength of fundamental and harmonics

Frequency (MHz)	Antenna Polarity	Cable Factor	Cable Loss	Reading (dBuV)	Limits (dBuV/m)	Emission (uV/m)	Level (dBuV/m)	Margin (uV/m)	Detect (dB)	Mode
2462.000	H	28.35	6.29	66.19	-	-	100.83	110027.18		Peak
2462.000	H	28.35	6.29	55.38	-	-	90.02	31695.67		A.V.
2462.000	V	28.35	6.29	67.33	-	-	101.97	125458.47		Peak
2462.000	V	28.35	6.29	56.00	-	-	90.64	34040.82		A.V.
4924.000	V/H						-			Peak, A.V.
7386.000	V/H						-			Peak, A.V.
9848.000	V/H						-			Peak, A.V.
12310.000	V/H						-			Peak, A.V.
14772.000	V/H						-			Peak, A.V.
17234.000	V/H						-			Peak, A.V.
19696.000	V/H						-			Peak, A.V.
22158.000	V/H						-			Peak, A.V.
24620.000	V/H						-			Peak, A.V.

Remark: The emission emitted by the EUT is too low to be measured except the emission listed above

Test Engineer : Steve
Steve Chen

5.7. Band Edges Measurement

5.7.1. Measuring Instruments :

As described in chapter 7 of this test report.

5.7.2. Test Procedure :

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

5.7.3. Test Result :

- Test Result in lower band (Channel 1) : PASS
- Test Result in higher band(Channel 11) : PASS

5.7.4. Note on Band edge Emission

The band edge emission plot on page B8. shows 54.80dB delta between carrier maximum power and local maximum emission in the restricted band (2.4835GHz).

Polarity	The emission of carrier power strength (dB μ V/m)	The maximum field strength in restrict band (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
H	100.83	46.03	74.00	-27.97	Peak
H	90.02	35.22	54.00	-18.78	Average
V	101.97	47.17	74.00	-26.83	Peak
V	90.64	35.84	54.00	-18.16	Average

* The maximum field strength in restricted band is the emission of carrier power strength subtract to the delta between carrier maximum power and local maximum emission in the restricted band.

5.8. Antenna Requirements

The EUT use a undetachable antenna via U.FL external connector. It is considered meet antenna requirement of FCC.

5.8.1. Standard Applicable

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

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

5.8.2. Antenna Connected Construction

The maximum Gain antenna used in this product is dipole antenna. The antenna connector type is U.FL. The coaxial cable of the antenna is fixed to the antenna.

5.9. RF Exposure

FCC Rules and Regulations Part 1.1307,1.1310,2.1091,2.1093:

RF Exposure Compliance

5.9.1. Limit For Maximum Permissible Exposure (MPE)

(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

5.9.2. MPE Calculations

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \quad \text{Power Density: } Pd \text{ (mW/cm}^2\text{)} = \frac{E^2}{3770}$$

- E = Electric field (V/m)
- P = Peak output power (mW)
- G = Antenna numeric gain (numeric)
- d = Separation distance (m)

Because the EUT is belong to General Population/ Uncontrolled Exposure. So the Limit of Power Density is 1.0 mW/cm². We can change the formula to:

$$d = \sqrt{\frac{30 \times P \times G}{3770}}$$

Channel NO.	Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Calculated RF Exposure Separation Distance (cm)	Minimum RF Exposure Separation Distance (cm)
Channel 1	3.00	2.00	14.61	28.91	2.14	20
Channel 6	3.00	2.00	14.20	26.30	2.04	20
Channel 11	3.00	2.00	13.99	25.06	1.99	20

5.9.3. FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antenna shall not be less than 20cm (8 inches) during normal operation. Proposed RF exposure safety information to include in User's Manual.

6. EMI Suppression Component List

1. Add two cores on the DC output of power cable.
(As the External photo No. 5)

7. Antenna Factor & Cable Loss

Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)	Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)
30	15.35	1.01	1000	24.10	3.92
35	13.63	1.04	2000	27.40	5.66
40	11.11	1.09	3000	30.00	7.20
45	10.59	1.24	4000	32.60	9.36
50	6.47	1.43	5000	33.40	9.16
55	5.83	1.39	6000	34.20	10.70
60	5.18	1.59	7000	35.30	12.16
65	4.81	1.41	8000	36.90	13.12
70	4.43	1.43	9000	38.10	13.81
75	5.10	1.55	10000	39.00	14.83
80	5.91	1.56	11000	38.60	15.83
85	7.33	1.62	12000	39.50	17.11
90	8.74	1.41	13000	39.30	17.62
95	9.05	1.81	14000	41.60	18.37
100	9.36	1.68	15000	40.60	19.10
110	9.65	1.73	16000	37.20	19.72
120	9.97	1.79	17000	40.20	21.98
130	10.51	1.93	18000	48.90	21.22
140	10.32	2.06	19000	37.60	23.90
150	9.42	2.09	20000	37.30	24.07
160	8.09	2.12	21000	37.00	25.49
170	7.43	2.12	22000	38.00	24.92
180	7.60	2.12	23000	38.70	25.60
190	7.43	2.21	24000	38.60	25.70
200	7.26	2.29	25000	24.10	3.92
220	9.11	2.42	14000	27.40	5.66
240	10.88	2.54	15000	30.00	7.20
260	11.75	2.66	16000	32.60	9.36
280	11.55	2.76	17000	33.40	9.16
300	11.36	2.85	18000	34.20	10.70
320	12.03	3.10	19000	35.30	12.16
340	12.69	3.36	20000	36.90	13.12
360	13.33	3.49	21000	38.10	13.81
380	14.00	3.50	22000	39.00	14.83
400	14.63	3.51	23000	38.60	15.83
450	15.33	3.55	24000	39.50	17.11
500	16.03	3.81	25000	39.30	17.62
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			

8. List of Measuring Equipments Used

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMC Receiver	R&S	ESCS 30	100132	9 KHz – 2.75 GHz	Jun. 12, 2003	Conduction (CO01-HY)
LISN	MessTec	NNB-2/16Z	2001-008	9 KHz – 30 MHz	Apr. 29, 2003	Conduction (CO01-HY)
LISN	MessTec	NNB-2/16Z	2001-009	9 KHz – 30 MHz	Apr. 29, 2003	Conduction (CO01-HY)
EMI Filter	LINDGREN	LRE-2060	1004	< 450 Hz	N/A	Conduction (CO01-HY)
EMI Filter	LINDGREN	N6006	201052	0 ~ 60 Hz	N/A	Conduction (CO01-HY)
RF Cable-CON	Suhner Switzerland	RG223/U	CB029	9KHz~30MHz	Jan. 07, 2003	Conduction (CO01-HY)
50 ohm BNC type	NOBLE	50ohm	TM009	50 ohm	Apr. 24, 2003	Conduction (CO01-HY)
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)
Amplifier	MITEQ	AFS44	879981	100MHz~26.5GHz	Aug. 12, 2002	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)
RF Cable-HIGH	Jye Bao	RG142	CB030-HIGH	1GHz~29.5GHz	Mar. 14, 2003	Radiation (03CH03-HY)

Calibration Interval of instruments listed above is one year.

9. 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 $U_e(y)$	normal	±2.7
Measuring uncertainty for a level of confidence of 95% $U=2U_e(y)$	normal (k=2)	±5.4

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

$U = \{((1/2)^2 + (0.3/2)^2 + (2^2 + 3^2 + 2^2 + 0.25^2 + 2^2)/3 + (0.54)^2/2)\} = 2.7$ 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 $U_e(y)$	normal	±1.66
Measuring uncertainty for a level of confidence of 95% $U=2U_e(y)$	normal (k=2)	±3.32

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