

FCC TEST REPORT

for

47 CFR, Part 15, Subpart C

Equipment : RF Mouse

Model No. : Lynx KIV, Lynx KV, Lynx LV

FCC ID : F2QRFCOMPOTX

Filing Type : Certification

Applicant : **Qtronix Corporation**
9F, No.75, Sec. 1, Hsin Tai Wu Rd, Hsichih,
Taipei Hsien 221, Taiwan, R.O.C.

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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 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. Features 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. Band edge compliance plot per 15.227(b).....	6
2.4. Connection Diagram of Test System.....	8
3. General Information of Test	9
3.1. Test Facility	9
3.2. Standard for Methods of Measurement.....	9
3.3. Test in Compliance with.....	9
3.4. Frequency Range Investigated.....	9
3.5. Test Distance.....	9
4. Test of Conducted Powerline.....	10
5. Test of Radiated Emission	11
5.1. Major Measuring Instruments.....	11
5.2. Test Procedures	12
5.3. Typical Test Setup Layout of Radiated Emission	13
5.4. Test Result of Radiated Emission	14
6. EMI Suppression Component List.....	15
7. Antenna Factor & Cable Loss	16
8. List of Measuring Equipments Used	17
9. Uncertainty of Test Site.....	18

History of this test report

Original Report Issue Date: Nov. 23, 2002

☒ 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 : RF Mouse
Model No. : Lynx KIV, Lynx KV, Lynx LV
FCC ID : F2QRFCOMPOTX
Filing Type : Certification
Applicant : **Qtronix Corporation**
9F, No.75, Sec. 1, Hsin Tai Wu Rd, Hsichih, Taipei Hsien
221, 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 - 1992** and the energy emitted by this equipment was **passed** both radiated and conducted emission limits. Testing was carried out on Oct. 31, 2002 at **SPORTON International Inc.** LAB. in Lin Kou.


K. J. Lin
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

Otronix Corporatrion

9F, No.75, Sec. 1, Hsin Tai Wu Rd, Hsichih,
Taipei Hsien, Taiwan, R.O.C.

1.2. Manufacturer

Qtronix Computer (Suzhou) Co., Ltd.

Building 6, Fenhui Economic Development Zone, Lu Xu Town,
Wu Jiang City, Jiang Su Province, Post Code: 215211, P.R.C.

1.3. Basic Description of Equipment under Test

Equipment	: RF Mouse
Model No.	: Lynx KIV, Lynx KV, Lynx LV
FCC ID	: F2QRFCOMPOTX
Trade Name	: Qtronix
Power Supply Type	: From Battery
Power Cord	: N/A

1.4. Features of Equipment under Test

	Frequency	ID	Data Rate	Modulation	Effective Distance	
Mouse	27.042MHz	256	4.8K	FSK	1.5 M	
Performance specification / Mouse						
X,Y Encoder		Opto-Mechanical				
Scroll Encoder		Mechanical				
Switch Life		1,000,000 cycle life				
Scroll Encode Life		100,000 cycle life				
Hardware Resolution		400dpi				
Power Requirements						
Mouse	Working Mode	3V			10mA	
	Sleeping Mode	3V		3mA	0.2mA	0.16mA
	Operation voltage	3.5V~1.5V				
Body Weight & Dimension				Mouse		
Weight				100.5grams		
Length				130.1mm		
Width				73.1mm		
High				39.5 mm		
System Requirements						
Designed to work with IBM PC PS/2 Compatible Computer						
Perfected for using with Windows® 98 / 2000 / ME / XP.						

2. Test Configuration of Equipment under Test

2.1. Test Manner

- a. The EUT has been configured personal computer and operated pursuant to ANSI C63.4-1992 in a manner which tended to maximize its emission characteristics in a typical application.
- b. The complete test system included HP PC, HITACHI Monitor, HP Printer, ACEEX Modem, Qtronix RF Keyboard, Qtronix RF Receiver and EUT for EMI test.
- c. Frequency range investigated: conduction 150 KHz to 30 MHz, radiation 30 MHz to 1000MHz.

2.2. Description of Test System

Support Unit 1. -- Personal Computer (HP)

FCC ID	: N/A
Model No.	: VECTRA VL420 DT
Power Supply Type	: Switching
Power Cord	: Non-Shielded
Serial No.	: SP0052
Data Cable	: Shielded, 360 degree via metal backshells
Remark	: This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

Support Unit 2. -- Monitor (HITACHI)

FCC ID	: N/A
Model No.	: CM823F
Power Supply Type	: Switching
Power Cord	: Non-Shielded
Serial No.	: SP0067
Data Cable	: Shielded, 360 degree via metal backshells, 1.7m
Remark	: This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

Support Unit 3. -- RF Keyboard (Qtronix)

FCC ID	: F2QRFCOMPOTX
Model No.	: Scorpius KIV
Serial No.	: NA

Support Unit 4. -- Printer (HP)

FCC ID	: B94C2642X
Model No.	: DJ 400
Power Supply Type	: Linear
Power Cord	: Non-Shielded
Serial No.	: SP0077
Data Cable	: Shielded, 360 degree via metal backshells, 1.35m

Support Unit 5. -- Modem (ACEEX)

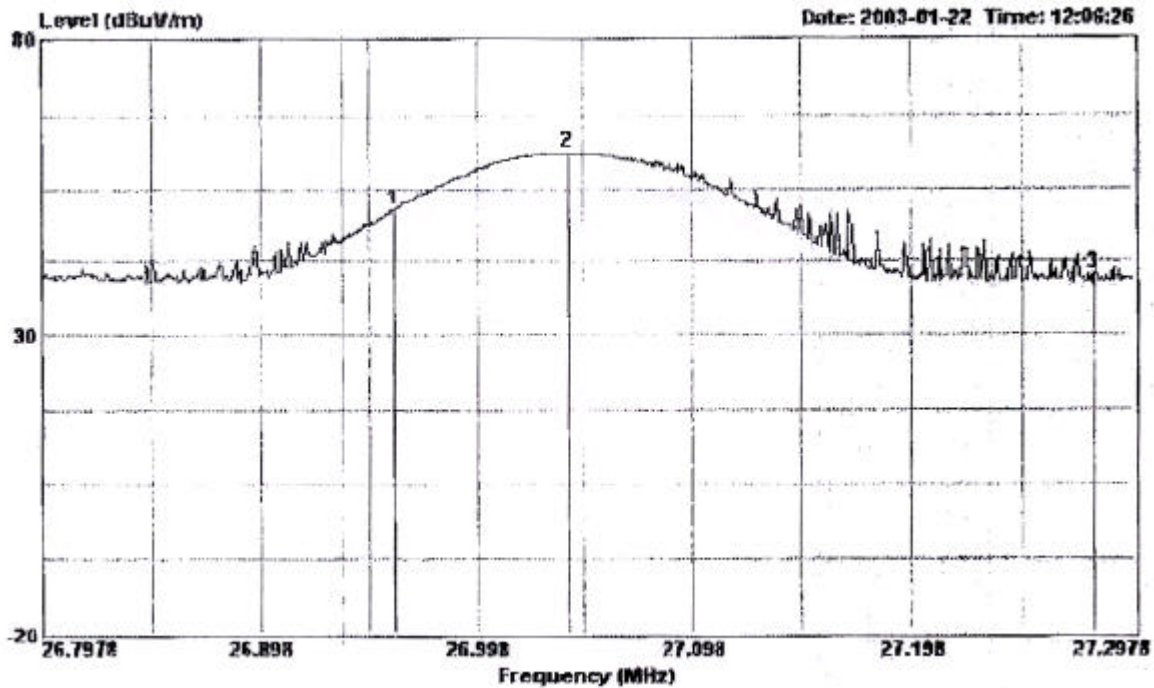
FCC ID	: IFAXDM1414
Model No.	: DM1414
Power Supply Type	: Linear
Power Cord	: Non-Shielded
Serial No.	: SP0015
Data Cable	: Shielded, 360 degree via metal backshells, 1.15m

Support Unit 6. -- RF Receiver (Qtronix)

FCC ID	: Receiver
Model No.	: ReceiverKI

2.3. Band edge compliance plot per 15.227(b).

Horizontal:



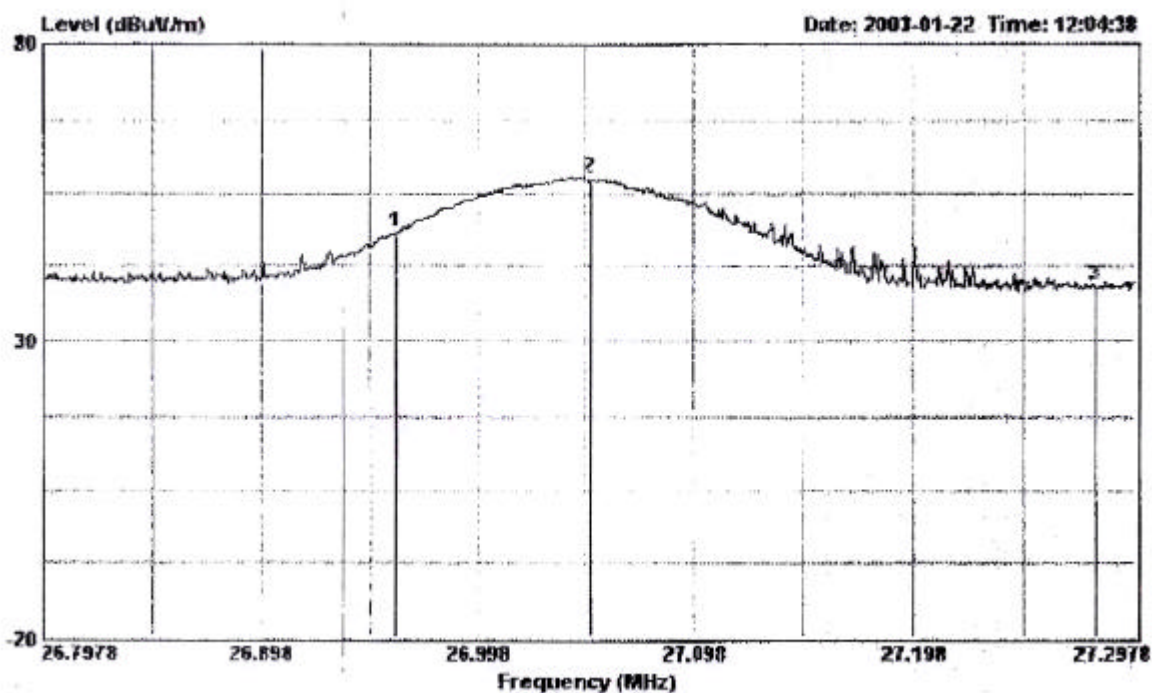
Mark 1 : 26.96MHz

Mark 3 : 27.28MHz

Conformation of the fundamental frequency

Frequency (MHz)	Polarity	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	Emission (uV/m)	Level (dBuV/m)	Margin (dB)
26.960	H	15.40	0.93	21.20	46.00	200	37.53	-8.47
27.280	H	15.40	0.93	9.85	40.00	100	26.18	-13.82

Vertical:



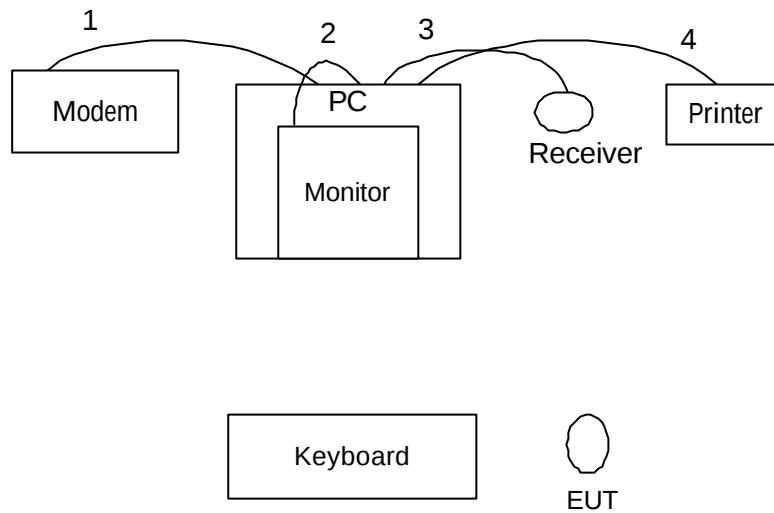
Mark 1 : 26.96MHz

Mark 3 : 27.28MHz

Conformation of the fundamental frequency

Frequency (MHz)	Polarity	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m) (uV/m)	Emission (dBuV/m) (uV/m)	Level	Margin
26.960	V	15.40	0.93	17.82	46.00 200	34.15	50.99	-11.85
27.280	V	15.40	0.93	8.79	40.00 100	25.12	18.03	-14.88

2.4. Connection Diagram of Test System



1. The I/O cable is connected from PC to the support unit 5.
2. The I/O cable is connected from PC to the support unit 2.
3. The I/O cable is connected from PC to the support unit 6.
4. The I/O cable is connected from PC to the support unit 4.

3. General Information of Test

3.1. 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 : SH04

3.2. Standard for Methods of Measurement

ANSI C63.4-1992

3.3. Test in Compliance with

FCC Part 15, Subpart C

3.4. Frequency Range Investigated

- a. Radiation : from 30 MHz to 1 GHz
- b. Conducted from 150 KHz to 30 MHz

3.5. Test Distance

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

4. Test of Conducted Powerline

The power supply of the EUT is from battery.

So the conducted powerline test is not applicable to the EUT.

5. Test of Radiated Emission

Radiated emissions from 30 MHz to 1 GHz were measured with a bandwidth of 120 kHz according to the methods defines in ANSI C63.4-1992. The EUT was placed on a nonmetallic stand in the open-field site, 0.8 meter above the ground plane, as shown in section 5.3. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions.

5.1. Major Measuring Instruments

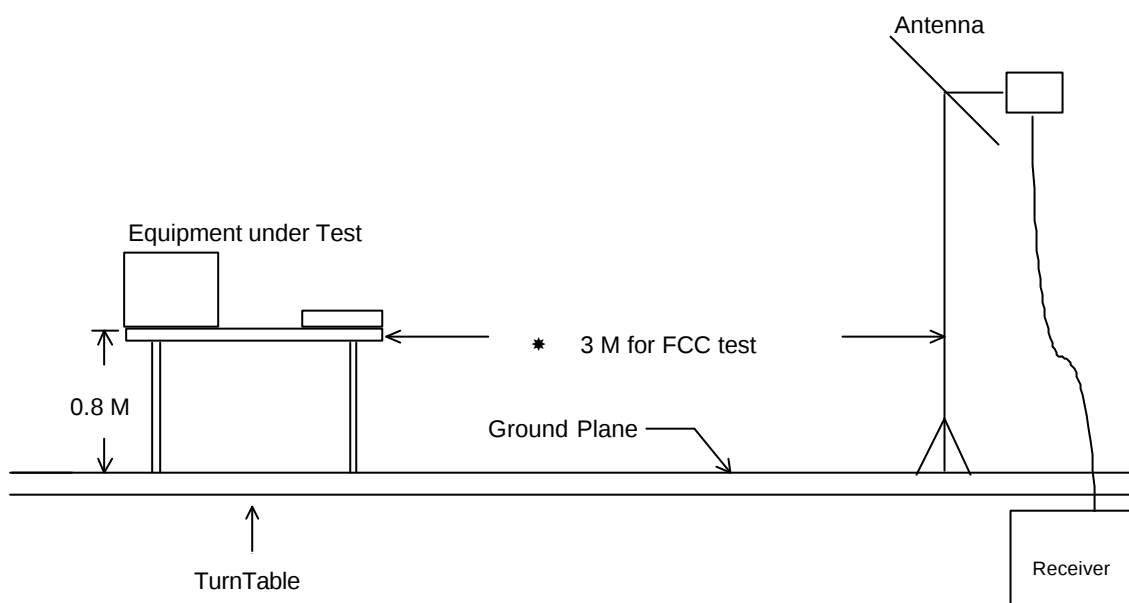
- Amplifier (HP 8447D)
 - RF Gain 30 dB
 - Signal Input 100 KHz to 1.3 GHz

- Spectrum Analyzer (RAHDE&SCHEARZ & FSP)
 - Attenuation 10 dB
 - Start Frequency 30 MHz
 - Stop Frequency 1000 MHz
 - Resolution Bandwidth 120 KHz
 - Signal Input 9 KHz to 7 GHz

5.2. Test Procedures

- a. The EUT was placed on a routable 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 adjust 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 or CISPR quasi-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.

5.3. Typical Test Setup Layout of Radiated Emission



5.4. Test Result of Radiated Emission

- Test Distance : 3 M
- Temperature : 26°C
- Relative Humidity : 54 %
- Test Date : OCT.31, 2002
- 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

351.800 MHz /40.90 dBuV/m (HORIZONTAL) Antenna Height 1.23 Meter, Turntable Degree 67 °.

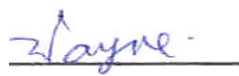
- Spurious Emissions:

Frequency (MHz)	Polarity	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	(uV/m)	Emission (dBuV/m)	Level (uV/m)	Margin (dB)	Detect Mode
108.300	H	11.14	1.85	44.46	43.50	150	26.87	22.05	-16.63	Peak
270.570	H	12.50	3.33	45.37	46.00	200	31.00	35.48	-15.00	Peak
297.570	H	12.90	3.17	45.79	46.00	200	31.79	38.86	-14.21	Peak
323.800	H	13.59	3.56	51.22	46.00	200	38.30	82.22	-7.70	Peak
351.800	H	14.19	3.35	53.43	46.00	200	40.90	110.92	-5.10	Peak
377.700	H	14.67	3.72	47.09	46.00	200	35.51	59.63	-10.49	Peak
53.490	V	6.85	1.10	44.12	40.00	100	21.36	11.70	-18.64	Peak
108.300	V	11.14	1.85	39.79	43.50	150	22.20	12.88	-21.30	Peak
135.300	V	10.70	1.97	36.23	43.50	150	18.44	8.36	-25.06	Peak
351.800	V	14.19	3.35	42.38	46.00	200	29.85	31.08	-16.15	Peak
514.200	V	17.23	4.29	35.41	46.00	200	27.41	23.47	-18.59	Peak
945.400	V	20.44	5.68	29.52	46.00	200	27.03	22.467	-18.97	Peak

- Field strength of fundamental and harmonics

Frequency (MHz)	Polarity	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	(uV/m)	Emission (dBuV/m)	Level (uV/m)	Margin (dB)	Detect Mode
27.050	V	15.40	0.93	27.44	80.00	10000	43.77	154.35	-36.23	peak
27.040	H	15.40	0.93	30.99	80.00	10000	47.32	232.27	-32.68	peak

Test Engineer :


Wayne Hsu

6. EMI Suppression Component List

No EMI suppression components.

7. Antenna Factor & Cable Loss

Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)
30	18.10	0.90
35	16.00	0.90
40	13.19	1.09
45	10.57	1.10
50	8.00	1.21
55	6.30	1.30
60	5.30	1.30
65	4.95	1.40
70	5.19	1.40
75	6.05	1.49
80	6.86	1.50
85	7.94	1.60
90	8.60	1.60
95	9.70	1.60
100	10.26	1.69
110	11.19	1.70
120	11.60	1.81
130	11.42	1.90
140	10.92	1.99
150	10.20	2.00
160	9.20	2.11
170	9.00	2.20
180	8.60	2.29
190	8.70	2.30
200	8.10	2.40
220	8.86	2.51
240	10.70	2.60
260	13.10	2.71
280	12.50	2.80
300	13.00	2.90
320	13.51	3.00
340	13.90	3.10
360	14.43	3.30
380	14.79	3.30
400	15.80	3.40
450	16.37	3.59
500	17.40	3.80
550	18.57	3.90
600	18.50	4.20
650	18.93	4.40
700	19.03	4.40
750	19.84	4.71
800	19.82	4.90
850	20.30	5.00
900	20.32	5.11
950	20.82	5.60
1000	21.20	5.50

8. List of Measuring Equipments Used

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer	ROHDE & SCHWARZ	FSP	838858/037	9KHz – 7GHz	Jan. 08, 2002	Radiation (SH04)
Receiver	ROHDE & SCHWARZ	ESCS30	838251/002	9KHz – 2750MHz	Nov. 28, 2001	Radiation (SH04)
Amplifier	HP	8447D	3207A01441	100KHz – 1.3GHz	Aug. 13, 2002	Radiation (SH04)
Bilog Antenna	SCHAFFNER	CBL6112B	2687	30MHz – 2GHz	Dec. 23, 2001	Radiation (SH04)
Turn Table	HD	DS630	CH100011/683	0 ~ 360 degree	N/A	Radiation (SH04)
Antenna Mast	HD	MA240	MA240/559	1 m - 4 m	N/A	Radiation (SH04)

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

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

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

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

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