

FCC TEST REPORT

for

47 CFR, Part 15, Subpart C

Equipment : Remote Control

Model No. : TX4313RS

FCC ID : IXVTX4313RS

Filing Type : Certification

Applicant : **AutoMicro TECHNOLOGY INC.**
No. 6, Alley 8, Lane 214, Pao-Ping Road, Young-Ho
City, Taipei Hsien, 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.

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History of this test report

Original Report Issue Date: Jan. 16, 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 : Remote Control
Model No. : TX4313RS
FCC ID : IXVTX4313RS
Filing Type : Certification
Applicant : **AutoMicro TECHNOLOGY INC.**
No. 6, Alley 8, Lane 214, Pao-Ping Road, Young-Ho
City, Taipei Hsien, 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 Dec. 25, 2002 at **SPORTON International Inc. LAB.**


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

AutoMicro TECHNOLOGY INC.

No. 6, Alley 8, Lane 214, Pao-Ping Road, Young-Ho City, Taipei Hsien, Taiwan, R.O.C.

1.2. Manufacturer

Same as 1.1

1.3. Basic Description of Equipment under Test

Equipment	: Remote Control
Model No.	: TX4313RS
FCC ID	: IXVTX4313RS
Trade Name	: AutoMicro
Power Supply Type	: From Battery (12V)
AC Power Cord	: N/A

1.4. Feature of Equipment under Test

- Power: 0.5 mW
- Frequency: 433.92MHz
- Current: 4 mA
- Voltage: 12 V

2. Test Configuration of Equipment under Test

2.1. Test Manner

- a. The EUT has been associated with peripherals pursuant to ANSI C63.4-1992 and configuration operated in a manner which tended to maximize its emission characteristics in a typical application.
- b. Frequency range investigated: conduction 150 KHz to 30 MHz, radiation 30 MHz to 5000MHz.
- c. The radiated emissions testing was made by rotating three orthogonal axes.
- d. The EUT employs a switch that will automatically deactivate the transmitter within no more than 5 seconds of being released.
- e. The EUT has no periodic transmission at regular predetermined interval.
- f. There are four products in this report. The design of them are the same except for the button number. The most complex product which has four buttons was selected as the test sample.
- g. 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.

The carrier frequency of EUT is 433.893MHz

$433.893\text{MHz} * 0.25\% = 1084.733\text{KHz}$

The test result is 442KHz (as shown in section 2.4 of this test report), which is less than 1084.733KHz.

The EUT meet the 20dB point bandwidth requirement.

2.2. Description of Test System

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

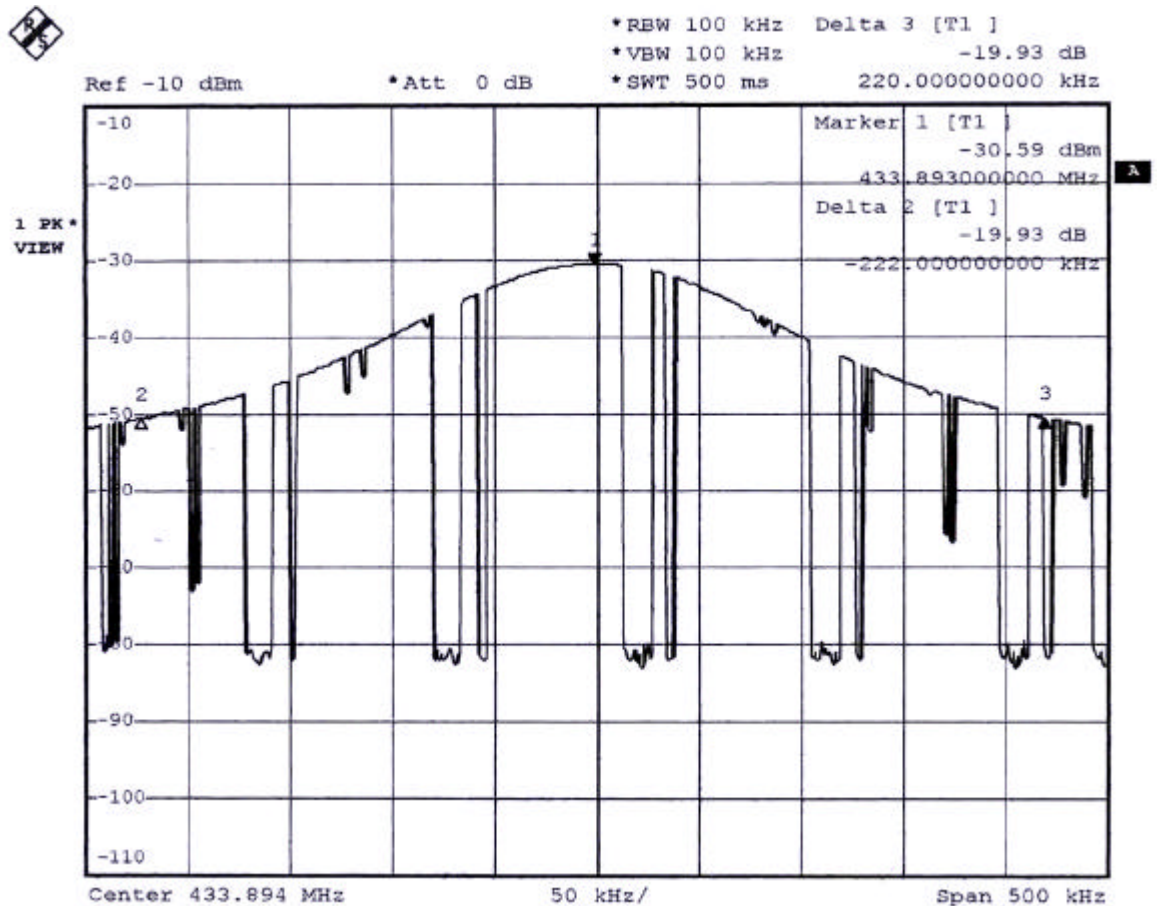
2.3. Connection Diagram of Test System



EUT

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

2.4.1 Test Procedures and Result



- User 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)= 442KHz

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 12V

4.3. Standard for Methods of Measurement

ANSI C63.4-1992

4.4. Test in Compliance with

FCC Part 15, Subpart C

4.5. Frequency Range Investigated

- a. Conduction: from 150 KHz to 30 MHz
- b. Radiation: from 30 MHz to 5000 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 supply of the EUT is from Battery.

So Conducted Powerline test is not applicable to this equipment.

6. Test of Radiated Emission

Radiated emissions from 30 MHz to 5000 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 C63.4-1992. The EUT was placed on a nonmetallic stand in the open-field site, 0.8 meter above the ground plane, as shown in section 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

6.1.1. From 30MHz to 1GHz

- Amplifier (HP 8447D)
 - RF Gain 30 dB
 - Signal Input 100 KHz to 1.3 GHz
- Spectrum Analyzer (R&S FSP)
 - Attenuation 10 dB
 - Start Frequency 30 MHz
 - Stop Frequency 1000 MHz
 - Resolution Bandwidth 120 KHz
 - Signal Input 9 KHz to 7 GHz

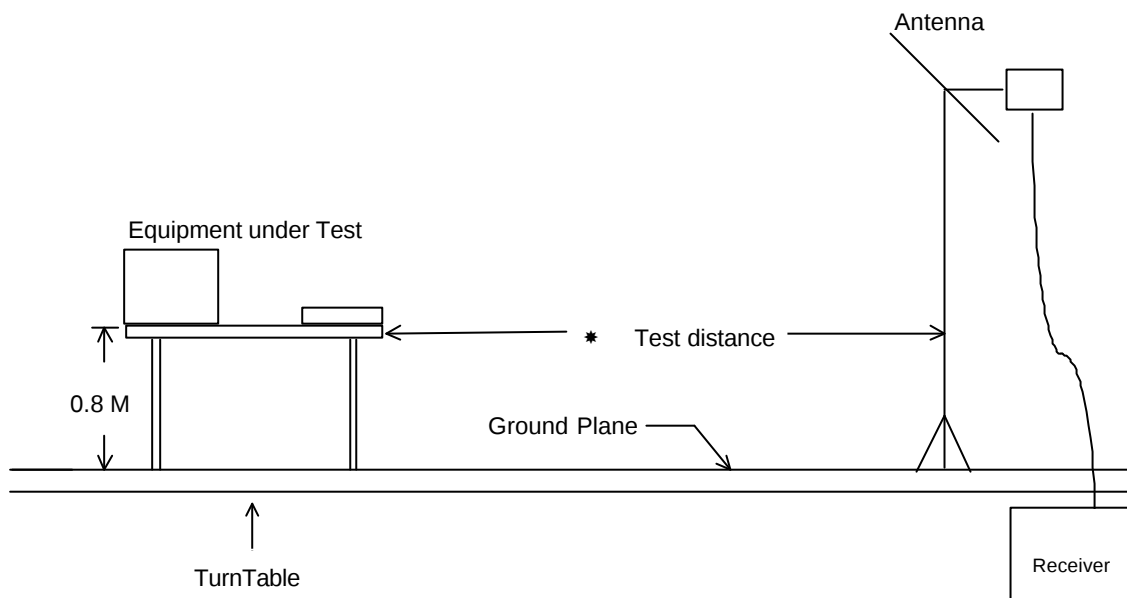
6.1.2. From 1GHz to 5GHz

- Spectrum analyzer (R&S FSP40)
 - Attenuation 10 dB
 - Start Frequency 1 GHz
 - Stop Frequency 5 GHz
 - Resolution Bandwidth 1 MHz
 - Video Bandwidth 1 MHz
 - Signal Input 9 KHz to 40 GHz
- Amplifier (MITEQ AFS44)
 - RF Gain 40 dB
 - Signal Input 100 MHz to 26.5GHz

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. Orthogonal axes: X

- Frequency range: 30 ~ 5000 MHz
- Test Distance: 3 M
- Temperature: 24
- Relative Humidity: 54
- Test Date: Dec. 25, 2002
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading: Antenna Factor + Cable Loss + Reading = Emission

31.890 / 21.75 (VERTICAL) Antenna Height 1 Meter, Turntable Degree 360 °.

- Spurious Emissions
- For 30MHz ~ 1GHz

Frequency (MHz)	Polarity	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	(uV/m)	Emission Level (dBuV/m)	(uV/m)	Margin (dB)	Detect Mode
39.450	H	13.19	1.09	6.11	40.00	100.00	20.39	10.46	-19.61	Peak
46.740	H	9.28	1.14	6.17	40.00	100.00	16.59	6.75	-23.41	Peak
82.650	H	7.45	1.56	5.23	40.00	100.00	14.24	5.15	-25.76	Peak
31.890	V	17.37	0.90	3.48	40.00	100.00	21.75	12.23	-18.25	Peak
53.490	V	6.75	1.28	5.80	40.00	100.00	13.83	4.91	-26.17	Peak
280.290	V	12.50	2.81	5.78	46.00	199.53	21.09	11.34	-24.91	Peak

- For 1GHz ~ 5GHz

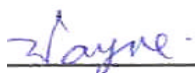
Remark: Frequency from 1GHz to 5GHz, the emission emitted by the EUT is too low to be measured

• 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
433.890	H	16.25	3.55	50.75	100.83	110027.18	70.55 3368.99	-30.28	Peak
433.900	V	16.25	3.55	39.13	100.83	110027.18	58.93 884.10	-41.90	Peak
867.790	H	20.30	5.04	18.14	80.83	11002.72	43.48 149.28	-37.35	Peak
867.900	V	20.30	5.04	8.43	80.83	11002.72	33.77 48.81	-47.06	Peak
1301.679	H/V						-		Peak
1735.572	H/V						-		Peak
2169.465	H/V						-		Peak
2603.358	H/V						-		Peak
3037.251	H/V						-		Peak
3471.144	H/V						-		Peak
3905.037	H/V						-		Peak
4338.930	H/V						-		Peak

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

Test Engineer:



Wayue Hsu

6.4.2. Orthogonal axes: Y

- Frequency range: 30 ~ 5000 MHz
- Test Distance: 3 M
- Temperature: 24
- Relative Humidity: 54
- Test Date: Dec. 25, 2002
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading: Antenna Factor + Cable Loss + Reading = Emission

38.910 / 28.17 (VERTICAL) Antenna Height 1 Meter, Turntable Degree 360 °.

- Spurious Emissions
- For 30MHz ~ 1GHz

Frequency (MHz)	Polarity	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	(uV/m)	Emission Level (dBuV/m)	(uV/m)	Margin (dB)	Detect Mode
39.450	H	13.19	1.09	5.33	40.00	100.00	19.61	9.56	-20.39	Peak
46.740	H	9.28	1.14	6.70	40.00	100.00	17.12	7.18	-22.88	Peak
323.800	H	13.59	3.04	6.01	46.00	199.53	22.64	13.55	-23.36	Peak
38.910	V	13.48	1.07	13.62	40.00	100.00	28.17	25.62	-11.83	Peak
47.820	V	8.83	1.17	9.37	40.00	100.00	19.37	9.30	-20.63	Peak
82.650	V	7.45	1.56	13.06	40.00	100.00	22.07	12.69	-17.93	Peak

- For 1GHz ~ 5GHz

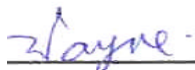
Remark: Frequency from 1GHz to 5GHz, the emission emitted by the EUT is too low to be measured

▪ 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
433.900	H	16.25	3.55	46.54	100.83	110027.18	66.34	2074.91	-34.49	Peak
433.900	V	16.26	3.55	45.17	100.83	110027.18	64.98	1774.19	-35.85	Peak
867.800	H	20.30	5.04	7.70	80.83	11002.72	33.04	44.87	-47.79	Peak
867.790	V	20.30	5.04	15.55	80.83	11002.72	40.89	110.79	-39.94	Peak
1301.679	H/V						-			Peak
1735.572	H/V						-			Peak
2169.465	H/V						-			Peak
2603.358	H/V						-			Peak
3037.251	H/V						-			Peak
3471.144	H/V						-			Peak
3905.037	H/V						-			Peak
4338.930	H/V						-			Peak

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

Test Engineer:



Wayue Hsu

6.4.3. Orthogonal axes: Z

- Frequency range: 30 ~ 5000 MHz
- Test Distance: 3 M
- Temperature: 24
- Relative Humidity: 54
- Test Date: Dec. 25, 2002
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading: Antenna Factor + Cable Loss + Reading = Emission

31.890 / 26.26 (VERTICAL) Antenna Height 1 Meter, Turntable Degree 360 °.

- Spurious Emissions
- For 30MHz ~ 1GHz

Frequency (MHz)	Polarity	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	(uV/m)	Emission Level (dBuV/m)	(uV/m)	Margin (dB)	Detect Mode
32.970	H	16.74	0.90	5.79	40.00	100.00	23.43	14.84	-16.57	Peak
39.450	H	13.19	1.09	7.00	40.00	100.00	21.28	11.59	-18.72	Peak
31.890	V	17.37	0.90	7.99	40.00	100.00	26.26	20.56	-13.74	Peak
39.180	V	13.33	1.08	9.76	40.00	100.00	24.17	16.16	-15.83	Peak
60.780	V	5.17	1.32	14.66	40.00	100.00	21.15	11.42	-18.85	Peak
85.890	V	8.07	1.60	11.87	40.00	100.00	21.54	11.94	-18.46	Peak

- For 1GHz ~ 5GHz

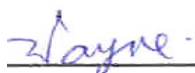
Remark: Frequency from 1GHz to 5GHz, the emission emitted by the EUT is too low to be measured

• 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
433.900	H	16.26	3.55	42.96	100.83	110027.18	62.77	1375.62	-38.06	Peak
433.900	V	16.26	3.55	46.91	100.83	110027.18	66.72	2167.70	-34.11	Peak
867.790	H	20.30	5.04	12.51	80.83	11002.72	37.85	78.07	-42.98	Peak
867.780	V	20.30	5.04	14.27	80.83	11002.72	39.61	95.61	-41.22	Peak
1301.679	H/V						-			Peak
1735.572	H/V						-			Peak
2169.465	H/V						-			Peak
2603.358	H/V						-			Peak
3037.251	H/V						-			Peak
3471.144	H/V						-			Peak
3905.037	H/V						-			Peak
4338.930	H/V						-			Peak

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

Test Engineer:



Wayue Hsu

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
1000	24.30	3.28
2000	31.10	4.69
3000	29.60	5.84
4000	30.80	6.87
5000	34.20	7.53

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
Spectrum Analyzer	R&S	FSP	838858/037	9KHz – 7GHz	Jan. 08, 2002	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)
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)
Half-wave dipole antenna	R&S	HZ12 HZ13	83924403 83924503	30MHz - 1GHz	Sep. 23, 2002	Radiation (03CH03-HY)
Horn Antenna	COM-POWER	AH-118	10094	1GHz – 18GHz	Apr. 09, 2002	Radiation
Spectrum analyzer	R&S	FSP40	100004/040	9KHZ~40GHZ	Aug. 07, 2002	Radiation
Amplifier	MITEQ	AFS44	879981	100MHz~26.5GHz	Aug. 12, 2002	Radiation

Calibration Interval of instruments listed above is one year.

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

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