

FCC TEST REPORT

for

47 CFR, Part 15, Subpart C

Equipment : Outdoor Bridge

Model No. : NWH9200 Outdoor Bridge Solution Kit,
NWH9210 Outdoor Bridge, NWH9210 Outdoor AP,
NWH9210 Outdoor WEC,
NWH9210 Outdoor Workgroup Bridge,
AAP-2401 Outdoor Bridge, AAP-2401 Outdoor AP,
AAP-2401 Outdoor WEC,
AAP-2401 Outdoor Workgroup Bridge

FCC ID. : IOU9210S01

Filing Type : Certification

Applicant : **National Datacomm Corporation**
4F, No. 24-2, Industry East 4th Road,
Science Park, Hsinchu, Taiwan, R.O.C.

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SPORTON International Inc.

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History of this test report

Original Report Issue Date: Aug. 28, 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 : Outdoor Bridge

Model No. : NWH9200 Outdoor Bridge Solution Kit,
NWH9210 Outdoor Bridge, NWH9210 Outdoor AP, NWH9210
Outdoor WEC, NWH9210 Outdoor Workgroup Bridge,
AAP-2401 Outdoor Bridge, AAP-2401 Outdoor AP,
AAP-2401 Outdoor WEC, AAP-2401 Outdoor Workgroup Bridge

FCC ID. : IOU9210S01

Filing Type : Certification

Applicant : **National Datacomm Corporation**
4F, No. 24-2, Industry East 4th Road,
Science Park, Hsinchu, 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 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 Aug. 26, 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

National Datacomm Corporation
4F, No. 24-2, Industry East 4th Road,
Science Park, Hsinchu, Taiwan, R.O.C.

1.2. Manufacturer

Same as 1.1

1.3. Basic Description of Equipment under Test

Equipment	: Outdoor Bridge
Model No.	: NWH9200 Outdoor Bridge Solution Kit, NWH9210 Outdoor Bridge, NWH9210 Outdoor AP, NWH9210 Outdoor WEC, NWH9210 Outdoor Workgroup Bridge, AAP-2401 Outdoor Bridge, AAP-2401 Outdoor AP, AAP-2401 Outdoor WEC, AAP-2401 Outdoor Workgroup Bridge
Trade Name	: NDC, ALCON
Trade Name	: NDC, ALCON
N Type RF Cable	: Shielded, 1.5 m
RJ45 Cable	: Non-Shielded, 1 m
DOU Cable	: Non-Shielded, 30 m
Power Supply Type	: Switching
AC Power Cord	: Wall-mount, 2 pin
DC Power Cable	: Non-Shielded, 1.8 m

1.4. Feature of Equipment under Test

Host/Radio Interface	DSSS		
Type of Modulation	DBPSK,DQPSK and CCK		
Number of Channels	USA/Canada:11	V	European: 13
	Japan: 13, 14		Other:
Frequency Band	2400~2483.5 MHz		
Carrier Frequency of each channel	2412MHz+(n-1)5MHz, n=channel no.		
Bandwidth of each channel	22MHz		
Maximum Output Power of Antenna	18.95dBm		
IF & L.O. frequency	Intermediate Frequency: 374MHz Local Oscillator: 2038-2098MHz		
Type of Antenna Connector (Ex: SMA, TNC, MCX, MMCX, UFC.....etc)	Reverse N-type		
Type of Antenna	PATCH ANTENNA		
Antenna Gain	≤ 8 dBi, 18 dBi		
Function Type	Transceiver		
Power Rating (DC/AC , Voltage)	DC 3.3V/ - Transmit mode : 350mA - Received mode : 250mA		
Basic function of product	Data transmitting		
Temperature Range (Operating)	-10 to 50 °C		
Humidity	85%		

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 COMPAQ NOTEBOOK, VIEWSONIC Monitor, COMPAQ PS/2 Keyboard, LOGITECH USB Mouse, HP Printer and EUT for EMI test.
- c. Vertical polarity of RF antenna generates worse case, so the following test modes were tested with vertical:
Mode 1: CH01 (2412MHz)
Mode 2: CH06 (2437MHz)
Mode 3: CH11 (2462MHz)
- b. Frequency range investigated: conduction 150 KHz to 30 MHz, radiation 30 MHz to 24620MHz.

2.2. Description of Test System

Support Unit 1. – Notebook (COMPAQ)

FCC ID	: N/A
Model No.	: PRESARIO 1500
Power Supply Type	: Switching
Power Cord	: Non-Shielded
Serial No.	: SP0037
Remark	: This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

Support Unit 2. -- Monitor (VIEWSONIC)

FCC ID	: N/A
Model No.	: VCDTS21553-3P
Power Supply Type	: Switching
Power Cord	: Non-Shielded
Serial No.	: SP0052
Data Cable	: Shielded, 1.5m
Remark	: This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

Support Unit 3. -- PS/2 Keyboard (COMPAQ)

FCC ID	: N/A
Model No.	: 6511-VA
Serial No.	: SP0054
Data Cable	: Shielded, 360 degree via metal backshells, 1.5m
Remark	: This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

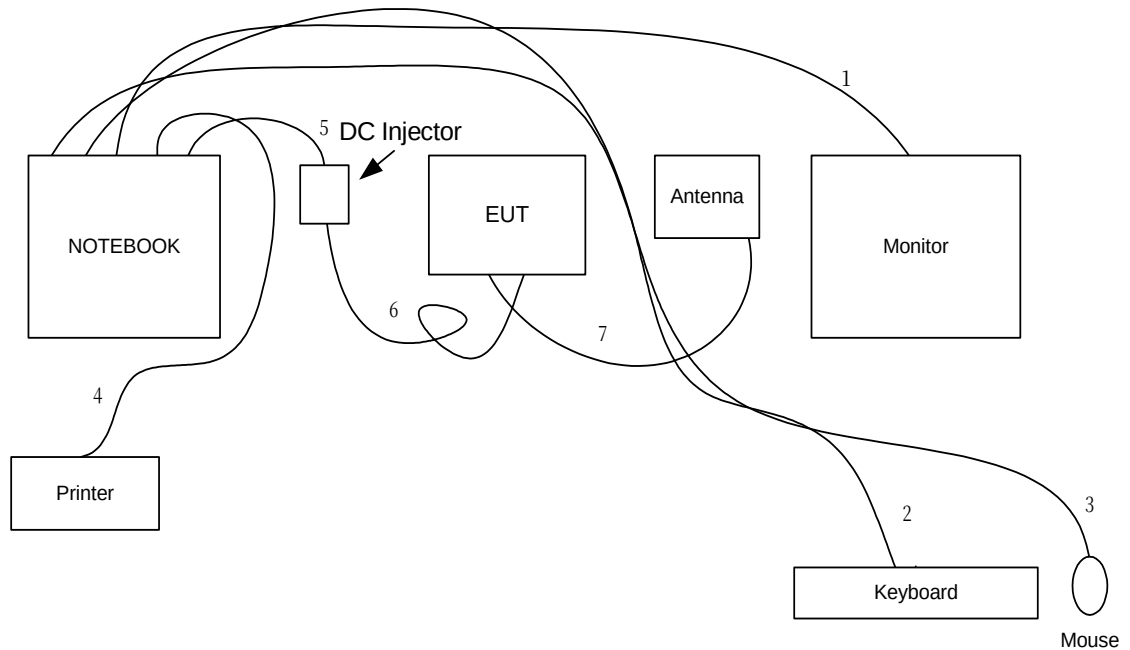
Support Unit 4. -- USB Mouse (LOGITECH)

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 5. --Printer (HP)

FCC ID	: B94C2642X
Model No.	: DJ 400
Power Supply Type	: Linear
Power Cord	: Non-Shielded
Serial No.	: SP0048
Data Cable	: Shielded, 360 degree via metal backshells, 1.35m

2.3. Connection Diagram of Test System



1. The I/O cable is connected from NOTEBOOK to the support unit 2.
2. The I/O cable is connected from NOTEBOOK to the support unit 3.
3. The I/O cable is connected from NOTEBOOK to the support unit 4.
4. The I/O cable is connected from NOTEBOOK to the support unit 5
5. The TP cable is connected from NOTEBOOK to the DC Injector
6. The DOU cable is connected from EUT to the DC Injector
7. The N Type RF cable is connected from EUT to the Antenna.

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 internal Hard Disk, and the Hard Disk reads and writes the message.
- f. Repeat the steps from c to d.

At the same time, executed "lwns. exe" 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
FCC 97-114 for test of RF Antenna Conducted Radiated Measurement

4.3. Test in Compliance with

FCC Part 15, Subpart C

4.4. Frequency Range Investigated

- a. Conduction: from 150 KHz to 30 MHz
- b. Radiation: from 30 MHz to 24620MHz

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

5.2. 6dB Bandwidth

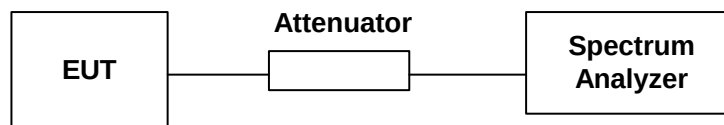
5.2.1. Measuring Instruments :

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 :

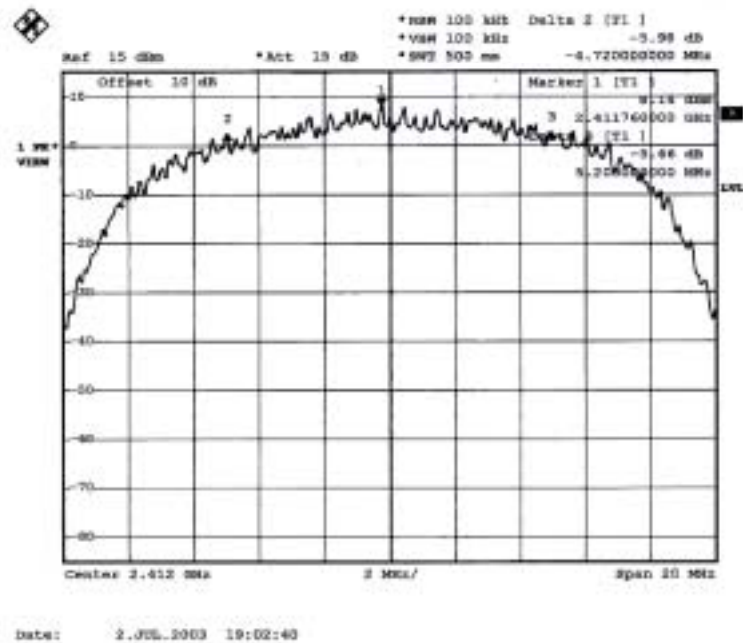


5.2.4. Test Result : The spectrum analyzer plots are attached as below

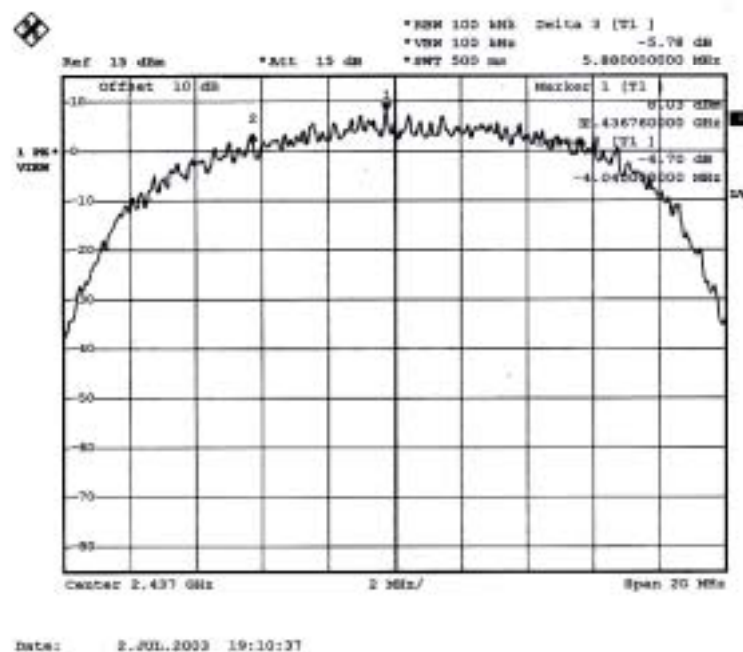
- Temperature : 26°C
- Relative Humidity : 68 %

Channel	Frequency (MHz)	6dB Emission bandwidth (MHz)	Limits (MHz)	Plot Ref. No.
1	2412	9.92	0.5	1
6	2437	9.92	0.5	2
11	2462	9.20	0.5	3

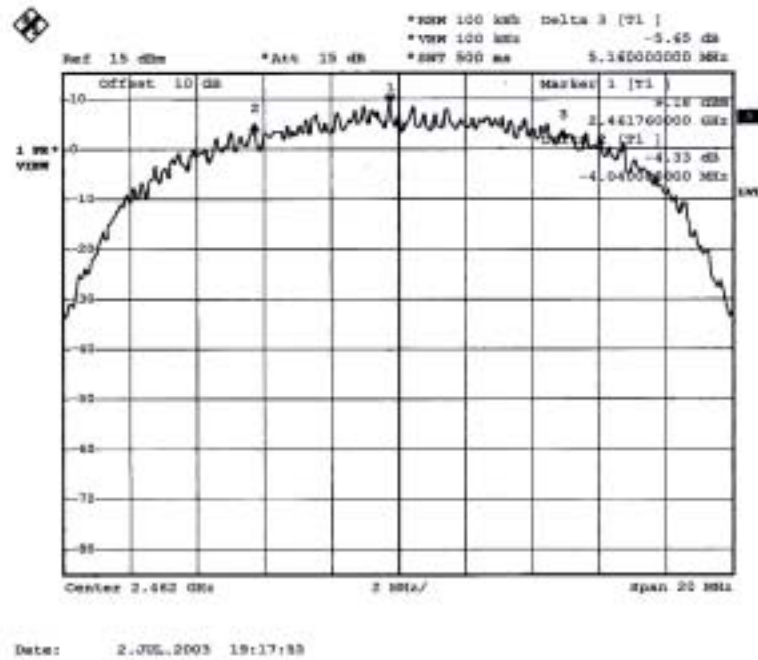
Plot1(Channel 1) :



Plot2(Channel 6) :



Plot3(Channel 11) :



Comments : 6dB Emission bandwidth>500kHz

5.3. Peak Output Power

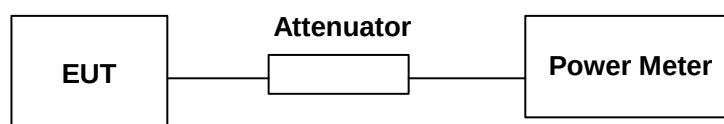
5.3.1. Measuring Instruments :

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 : 26°C
- Relative Humidity : 68 %
- Antenna Gain: **18** dBi

Channel	Frequency (MHz)	Measured Output Power (dBm)	Measured Output Power (mW)	Limits (Watt/dBm)
1	2412	17.91	61.8	0.398W/26 dBm
6	2437	18.90	77.6	0.398W/26 dBm
11	2462	18.95	78.5	0.398W/26 dBm

Remark:

the EUT is an outdoor fixed antenna use radiator and the antenna gain is 18dBi, according to 15.247(b)(i), the maximum peak output power should not exceed 26dBm.

(30 dBm (1 watt) – (18-3)/3 = 26 dBm0)

- Comments : Maximum Peak Output Power < **26**dBm (**0.398**Watt)

5.4. Power Spectral Density

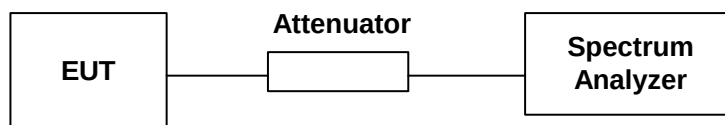
5.4.1. Measuring Instruments :

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 :

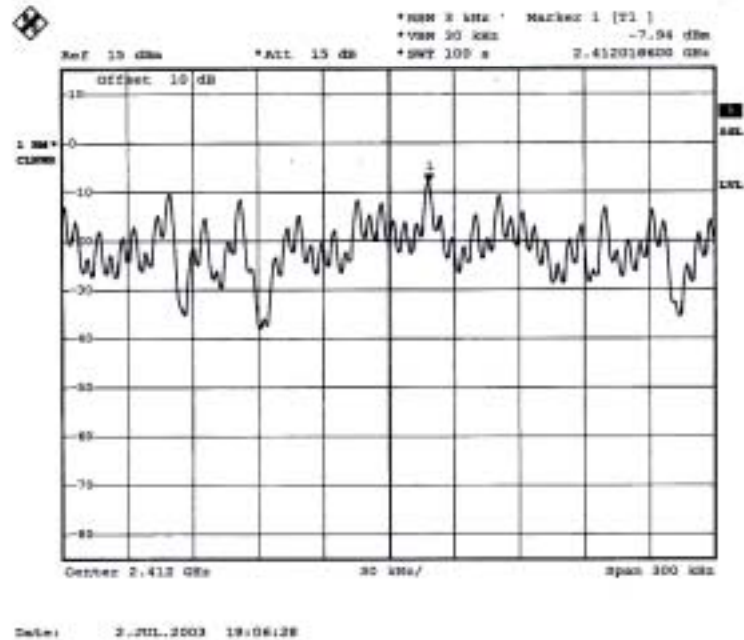


5.4.4. Test Result : See spectrum analyzer plots below

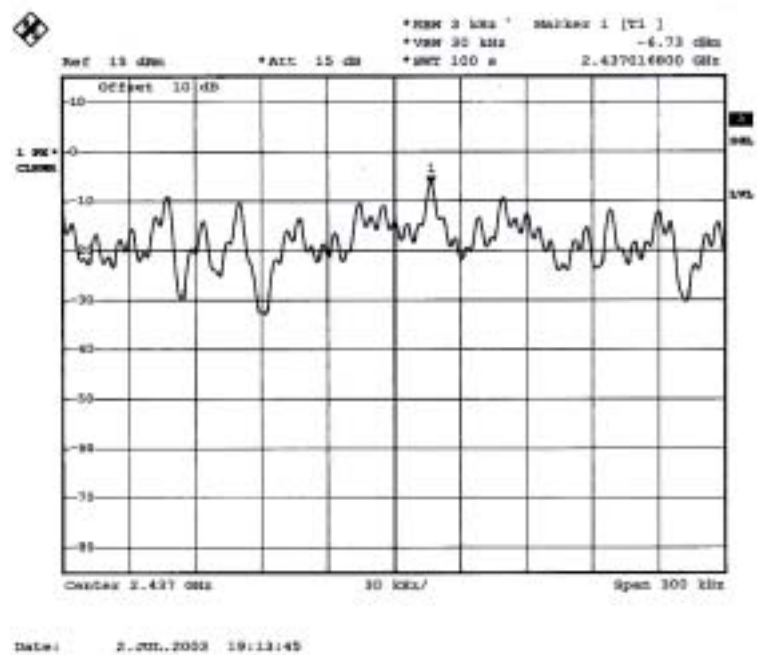
- Temperature : 26°C
- Relative Humidity : 68 %

Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limits (dBm)	Plot Ref. No.
1	2412	-7.94	8	1
6	2437	-6.73	8	2
11	2462	-5.21	8	3

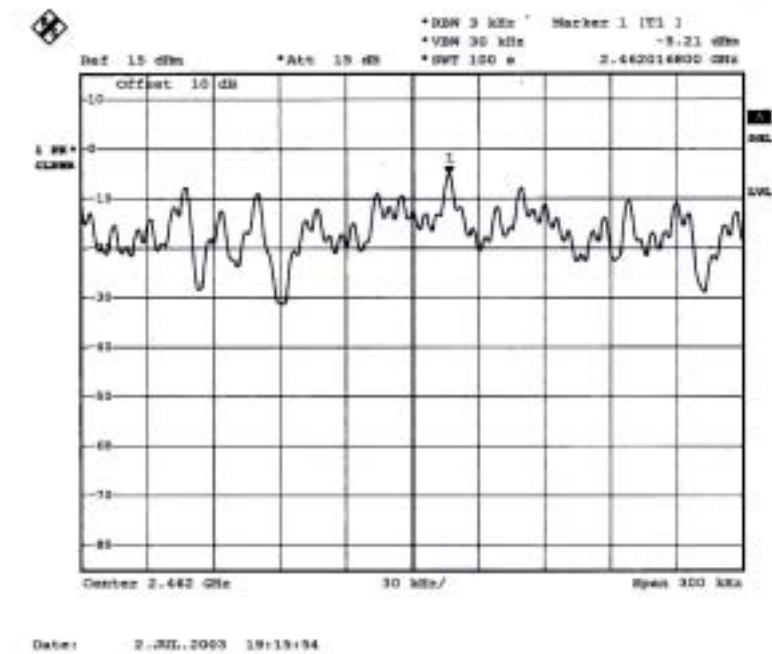
Plot1(Channel 1):



Plot2(Channel 6):



Plot3(Channel 11):



5.5. Test of RF Antenna Conducted Radiated Measurement

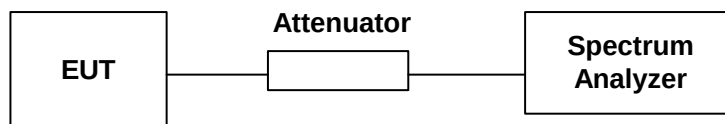
5.5.1. Measuring Instruments :

As described in chapter 7 of this test report.

5.5.2. 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 frequencies measured were from the fundamental frequency to harmonic frequencies, up to 10th harmonic

5.5.3. Test Setup Layout :



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

- Temperature : 26°C
- Relative Humidity : 68 %

Channel NO.	Frequency	Level	difference	Limit
1	2412	8.7		
	4824	-62.79	71.49	20
	-	-	-	
6	2436	8.37		
	4876	-62.49	70.86	20
	-	-	-	
11	2464	8.35		
	4924	-61.19	69.54	20
	-	-	-	

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

5.6. 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.

5.6.1. 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

5.6.2. 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.

5.6.3. Test Result of Conducted Emission :

- Test Mode: Mode 1
- Frequency Range of Test: from 150KHz to 30 MHz
- 6dB Bandwidth: 9KHz
- Temperature: 26°C
- Relative Humidity: 72 %

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

Site : C001-HY
 Condition : CISPR CLASS-B 2003 2001/008 LINE
 EUT : Outdoor Bridge
 Power : 110V/60Hz
 Model : XXX
 Memo :
 Memo : F352805
 Memo : TX CH01 2412MHz

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.164	18.26	-37.01	55.27	18.08	0.10	0.08	Average
2	0.164	42.95	-22.42	65.27	42.67	0.10	0.08	QP
3	0.208	32.56	-20.72	53.28	32.42	0.10	0.04	Average
4	0.208	39.65	-23.63	63.28	39.81	0.10	0.04	QP
5	0.309	19.10	-30.91	50.01	18.95	0.10	0.05	Average
6	0.309	32.90	-27.03	60.01	32.03	0.10	0.05	QP
7	0.416	28.17	-29.36	57.53	28.01	0.10	0.06	QP
8	0.416	18.05	-29.48	47.53	17.89	0.10	0.06	Average
9	0.727	27.60	-28.32	56.00	27.51	0.10	0.07	QP
10	0.727	21.56	-24.44	46.00	21.39	0.10	0.07	Average
11	1.026	18.86	-27.14	46.00	18.69	0.10	0.07	Average
12	1.026	28.17	-27.82	56.00	28.00	0.10	0.07	QP

Site : C001-HY
 Condition : CISPR CLASS-B 2003 2001/008 NEUTRAL
 EUT : Outdoor Bridge
 Power : 110V/60Hz
 Model : XXX
 Memo :
 Memo : F352805
 Memo : TX CH01 2412MHz

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.157	16.29	-39.31	55.60	16.10	0.10	0.09	Average
2	0.157	45.47	-20.13	65.60	45.28	0.10	0.09	QP
3	0.205	27.08	-26.31	53.39	26.94	0.10	0.04	Average
4	0.205	40.98	-22.41	63.39	40.84	0.10	0.04	QP
5	0.297	41.14	-19.19	60.33	40.99	0.10	0.05	Peak
6	0.301	33.04	-27.17	60.21	32.89	0.10	0.05	QP
7	0.301	11.00	-39.21	50.21	10.85	0.10	0.05	Average
8	0.414	27.15	-30.42	57.57	26.99	0.10	0.06	QP
9	0.414	18.05	-29.52	47.57	17.89	0.10	0.06	Average
10	0.616	23.27	-32.73	56.00	23.11	0.10	0.06	QP
11	0.616	15.05	-30.95	46.00	14.89	0.10	0.06	Average
12	1.540	13.40	-32.52	46.00	13.34	0.10	0.04	Average
13	1.540	24.25	-31.75	56.00	24.11	0.10	0.04	QP

Test Engineer : 

Jay Zhong

- Test Mode: Mode 2
- Frequency Range of Test: from 150KHz to 30 MHz
- 6dB Bandwidth: 9KHz
- Temperature: 26°C
- Relative Humidity: 72 %

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

Site : C001-HY
 Condition : CISPR CLASS-B 2003 2001/008 LINE
 EUT : Outdoor Bridge
 Power : 110V/60Hz
 Model : XXX
 Memo :
 Memo : F352805
 : TX CH06 2437MHz

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.208	32.85	-20.43	53.28	32.71	0.10	0.04	Average
2	0.208	41.18	-22.10	63.28	41.04	0.10	0.04	QP
3	0.415	28.13	-29.43	57.56	27.97	0.10	0.06	QP
4	0.415	18.98	-28.58	47.56	18.82	0.10	0.06	Average
5	0.725	21.71	-24.29	46.00	21.54	0.10	0.07	Average
6	0.725	27.48	-28.52	56.00	27.31	0.10	0.07	QP
7	0.922	27.52	-28.48	56.00	27.35	0.10	0.07	QP
8	0.922	19.42	-26.58	46.00	19.25	0.10	0.07	Average
9	1.026	19.32	-26.68	46.00	19.15	0.10	0.07	Average
10	1.026	28.13	-27.87	56.00	27.96	0.10	0.07	QP
11	1.845	27.66	-28.34	56.00	27.53	0.10	0.03	QP
12	1.845	14.11	-31.89	46.00	13.98	0.10	0.03	Average

Site : C001-HY
 Condition : CISPR CLASS-B 2003 2001/008 NEUTRAL
 EUT : Outdoor Bridge
 Power : 110V/60Hz
 Model : XXX
 Memo :
 Memo : F352805
 : TX CH06 2437MHz

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.207	33.66	-19.68	53.34	33.52	0.10	0.04	Average
2	0.207	41.50	-21.84	63.34	41.36	0.10	0.04	QP
3	0.417	17.18	-30.33	47.51	17.02	0.10	0.06	Average
4	0.417	28.64	-28.87	57.51	28.48	0.10	0.06	QP
5	0.727	27.96	-28.04	56.00	27.79	0.10	0.07	QP
6	0.727	21.40	-24.60	46.00	21.23	0.10	0.07	Average
7	0.919	19.55	-26.45	46.00	19.38	0.10	0.07	Average
8	0.919	27.60	-28.40	56.00	27.43	0.10	0.07	QP
9	1.025	28.11	-27.89	56.00	27.94	0.10	0.07	QP
10	1.025	19.12	-26.88	46.00	18.95	0.10	0.07	Average
11	1.848	14.11	-31.89	46.00	13.98	0.10	0.03	Average
12	1.848	27.68	-28.32	56.00	27.55	0.10	0.03	QP

Test Engineer : 
 Jay Zhong

- Test Mode: Mode 3
- Frequency Range of Test: from 150KHz to 30 MHz
- 6dB Bandwidth: 9KHz
- Temperature: 26°C
- Relative Humidity: 72 %

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

Site : C001-HY
 Condition : CISPR CLASS-B 2003 2001/008 LIME
 EUT : Outdoor Bridge
 Power : 110V/60Hz
 Model : XXX
 Memo :
 Memo : F352805
 Memo : TX CH11 2462MHz

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.208	40.86	-22.42	63.28	40.72	0.10	0.04	QP
2	0.208	33.02	-20.26	53.28	32.88	0.10	0.04	Average
3	0.310	33.05	-26.92	59.97	32.90	0.10	0.05	QP
4	0.310	19.09	-30.88	49.97	18.94	0.10	0.05	Average
5	0.413	28.11	-29.48	57.59	27.95	0.10	0.06	QP
6	0.413	19.62	-27.97	47.59	19.46	0.10	0.06	Average
7	0.724	27.56	-28.44	56.00	27.39	0.10	0.07	QP
8	0.724	21.50	-24.50	46.00	21.33	0.10	0.07	Average
9	1.026	19.05	-26.95	46.00	18.88	0.10	0.07	Average
10	1.026	28.07	-27.93	56.00	27.90	0.10	0.07	QP
11	1.844	14.11	-31.89	46.00	13.98	0.10	0.03	Average
12	1.844	27.78	-28.22	56.00	27.65	0.10	0.03	QP

Site : C001-HY
 Condition : CISPR CLASS-B 2003 2001/008 NEUTRAL
 EUT : Outdoor Bridge
 Power : 110V/60Hz
 Model : XXX
 Memo :
 Memo : F352805
 Memo : TX CH11 2462MHz

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.208	41.14	-22.15	63.29	41.00	0.10	0.04	QP
2	0.208	32.51	-20.78	53.29	32.37	0.10	0.04	Average
3	0.416	18.12	-29.41	47.53	17.96	0.10	0.06	Average
4	0.416	28.11	-29.42	57.53	27.95	0.10	0.06	QP
5	0.727	27.68	-28.32	56.00	27.51	0.10	0.07	QP
6	0.727	21.66	-24.34	46.00	21.49	0.10	0.07	Average
7	0.914	18.68	-27.32	46.00	18.51	0.10	0.07	Average
8	0.914	27.88	-28.12	56.00	27.71	0.10	0.07	QP
9	1.027	28.13	-27.87	56.00	27.96	0.10	0.07	QP
10	1.027	18.86	-27.14	46.00	18.69	0.10	0.07	Average
11	1.844	14.05	-31.95	46.00	13.92	0.10	0.03	Average
12	1.844	27.74	-28.26	56.00	27.61	0.10	0.03	QP

Test Engineer : 
 Jay Zhong

5.7. Test of Radiated Emission

Radiated emissions from 30 MHz to 24.62 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 4.6.3. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions

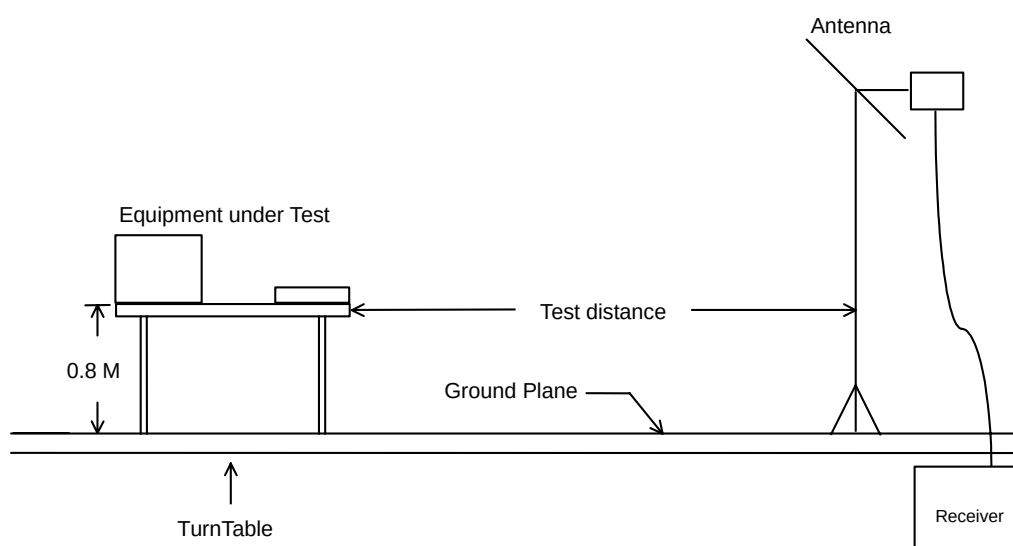
5.7.1. Major Measuring Instruments

● Amplifier	(MITEQ AFS44)
RF Gain	40 dB
Signal Input	100 MHz to 26.5 GHz
● Amplifier	(HP 8447D)
RF Gain	30 dB
Signal Input	100 KHz to 1.3 GHz
● Spectrum analyzer	(R&S FSP40)
Attenuation	10 dB
Start Frequency	30 MHz
Stop Frequency	24 GHz
Resolution Bandwidth	120KHz / 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

5.7.2. 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.

5.7.3. Typical Test Setup Layout of Radiated Emission



5.7.4. Test Result of Radiated Emission

- Test Mode: Mode 1
- Test Distance: 3 M
- Temperature: 27 °C
- Relative Humidity: 63 %
- 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 Emission

Site : 03CH03-HY
 Condition : 3m 03CH03-MAT HORIZONTAL
 EUT : Outdoor Bridge
 Power : 110V/60Hz
 Model : NWH9210
 MEMO : TX CH01 2412MHz
 MEMO : 18dbi Antenna
 MEMO : F352805

	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	88.860	43.09	-0.41	43.50	60.01	8.65	1.45	27.02	QP	100	96
2	147.450	31.53	-11.97	43.50	46.64	9.62	2.08	26.81	Peak	---	---
3	170.940	29.50	-14.00	43.50	46.64	7.45	2.12	26.71	Peak	---	---

Site : 03CH03-HY
 Condition : 3m 03CH03-MAT HORIZONTAL
 EUT : Outdoor Bridge
 Power : 110V/60Hz
 Model : NWH9210
 MEMO : TX CH01 2412MHz
 MEMO : 18dbi Antenna
 MEMO : F352805

	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	307.000	30.11	-15.89	46.00	42.21	11.59	2.95	26.64	Peak	---	---
2	343.400	26.98	-19.02	46.00	37.65	12.79	3.40	26.86	Peak	---	---
3	786.500	28.92	-17.08	46.00	33.21	18.68	5.03	28.00	Peak	---	---

Site : 03CH03-HY
 Condition : 3m 03CH03-MAT VERTICAL
 EUT : Outdoor Bridge
 Power : 110V/60Hz
 Model : NWH9210
 MEMO : TX CH01 2412MHz
 MEMO : 18dbi Antenna
 MEMO : F352805

	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	88.860	41.74	-1.76	43.50	58.66	8.65	1.45	27.02	QF	---	---
2	167.970	28.26	-15.24	43.50	45.33	7.54	2.12	26.73	Peak	---	---
3	228.180	26.31	-19.69	46.00	40.56	9.88	2.47	26.60	Peak	---	---

Site : 03CH03-HY
 Condition : 3m 03CH03-MAT VERTICAL
 EUT : Outdoor Bridge
 Power : 110V/60Hz
 Model : NWH9210
 MEMO : TX CH01 2412MHz
 MEMO : 18dbi Antenna
 MEMO : F352805

	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	441.400	30.64	-15.36	46.00	39.30	15.21	3.54	27.41	Peak	---	---
2	786.500	31.74	-14.26	46.00	36.03	18.68	5.03	28.00	Peak	---	---
3	957.300	36.11	-9.89	46.00	38.27	19.61	5.86	27.63	Peak	---	---

➤ For 1GHz ~ 25GHz

Remark: Frequency from 1000MHz to 25000MHz, 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	
2414.000	H	28.25	6.23	72.33	-	-	106.81	219028.18	Peak	
2414.000	H	28.25	6.23	63.90	-	-	98.38	82985.08	A.V.	
2414.000	V	28.25	6.23	84.97	-	-	119.45	938642.04	Peak	
2414.000	V	28.25	6.23	76.84	-	-	111.32	368128.97	A.V.	
4020.000	H	32.59	9.34	9.23	74.00	5011.87	51.16	361.41	-22.84	Peak
4020.000	H	32.59	9.34	8.82	54.00	501.19	50.75	344.75	-3.25	A.V.
4964.000	V	33.35	9.14	8.53	74.00	5011.87	51.02	355.63	-22.98	Peak
4964.000	V	33.35	9.14	8.29	54.00	501.19	50.78	345.94	-3.22	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 : 

Murray Lu

- Test Mode: Mode 2
- Test Distance: 3 M
- Temperature: 27 °C
- Relative Humidity: 63 %
- 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 Emission

Site : 03CH03-HY
 Condition : 3m 03CH03-MAT HORIZONTAL
 EUT : Outdoor Bridge
 Power : 110V/60Hz
 Model : NWH9210
 MEMO : TX CH06 2437MHz
 MEMO : 18dbi Antenna
 MEMO : F352805

	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 !	89.130	40.48	-3.02	43.50	57.32	8.74	1.44	27.02	QP	---	---
2	147.180	31.19	-12.31	43.50	46.27	9.65	2.08	26.81	Peak	---	---
3	240.330	30.93	-15.07	46.00	44.05	10.93	2.55	26.60	Peak	---	---

Site : 03CH03-HY
 Condition : 3m 03CH03-MAT HORIZONTAL
 EUT : Outdoor Bridge
 Power : 110V/60Hz
 Model : NWH9210
 MEMO : TX CH06 2437MHz
 MEMO : 18dbi Antenna
 MEMO : F352805

	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	343.400	29.49	-16.51	46.00	40.16	12.79	3.40	26.86	Peak	---	---
2	786.500	28.45	-17.55	46.00	32.74	18.68	5.03	28.00	Peak	---	---
3	957.300	39.19	-6.81	46.00	41.35	19.61	5.86	27.63	Peak	---	---

Site : 03CH03-HY
 Condition : 3m 03CH03-MAT VERTICAL
 EUT : Outdoor Bridge
 Power : 110V/60Hz
 Model : NWH9210
 MEMO : TX CH06 2437MHz
 MEMO : 18dbi Antenna
 MEMO : F352805

	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	87.780	39.00	-1.00	40.00	56.21	8.32	1.49	27.02	QP	100	87
2	115.050	28.15	-15.35	43.50	43.51	9.82	1.76	26.94	Peak	---	---
3	132.330	27.80	-15.70	43.50	42.26	10.45	1.96	26.87	Peak	---	---

Site : 03CH03-HY
 Condition : 3m 03CH03-MAT VERTICAL
 EUT : Outdoor Bridge
 Power : 110V/60Hz
 Model : NWH9210
 MEMO : TX CH06 2437MHz
 MEMO : 18dbi Antenna
 MEMO : F352805

	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	441.400	28.21	-17.79	46.00	36.87	15.21	3.54	27.41	Peak	---	---
2	786.500	28.47	-17.53	46.00	32.76	18.68	5.03	28.00	Peak	---	---
3	957.300	38.54	-7.46	46.00	40.70	19.61	5.86	27.63	Peak	---	---

➤ For 1GHz ~ 25GHz

Remark: Frequency from 1000MHz to 25000MHz, 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	
2438.000	H	28.30	6.26	73.20	-	-	107.76	244343.06	Peak	
2438.000	H	28.30	6.26	63.05	-	-	97.61	75945.14	A.V.	
2438.000	V	28.30	6.26	86.65	-	-	121.21	1149476.24	Peak	
2438.000	V	28.30	6.26	78.10	-	-	112.66	429536.43	A.V.	
4876.000	H	33.17	9.09	9.80	74.00	5011.87	52.06	400.87	-21.94	Peak
4876.000	H	33.17	9.09	-1.90	54.00	501.19	40.36	104.23	-13.64	A.V.
4876.000	V	33.17	9.09	13.21	74.00	5011.87	55.47	593.61	-18.53	Peak
4876.000	V	33.17	9.09	0.65	54.00	501.19	42.91	139.80	-11.09	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 : 

Murray Lu

- Test Mode: Mode 3
- Test Distance: 3 M
- Temperature: 27 °C
- Relative Humidity: 63 %
- 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 Emission

Site : 03CH03-HY
 Condition : 3m 03CH03-MAT HORIZONTAL
 EUT : Outdoor Bridge
 Power : 110V/60Hz
 Model : NWH9210
 MEMO : TX CH11 2462MHz
 MEMO : 18dbi Antenna
 MEMO : F352805

	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	31.890	31.79	-8.21	40.00	43.58	14.29	1.02	27.10	Peak	---	---
2	88.860	40.18	-3.32	43.50	57.10	8.65	1.45	27.02	QP	---	---
3	147.180	32.38	-11.12	43.50	47.46	9.65	2.08	26.81	Peak	---	---

Site : 03CH03-HY
 Condition : 3m 03CH03-MAT HORIZONTAL
 EUT : Outdoor Bridge
 Power : 110V/60Hz
 Model : NWH9210
 MEMO : TX CH11 2462MHz
 MEMO : 18dbi Antenna
 MEMO : F352805

	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	436.500	36.90	-9.10	46.00	45.60	15.14	3.54	27.38	Peak	---	---
2	786.500	28.78	-17.22	46.00	33.07	18.68	5.03	28.00	Peak	---	---
3	957.300	37.24	-8.76	46.00	39.40	19.61	5.86	27.63	Peak	---	---

Site : 03CH03-HY
 Condition : 3m 03CH03-MAT VERTICAL
 EUT : Outdoor Bridge
 Power : 110V/60Hz
 Model : NWH9210
 MEMO : TX CH11 2462MHz
 MEMO : 18dbi Antenna
 MEMO : F352805

	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	38.370	27.64	-12.36	40.00	42.13	11.53	1.00	27.10	Peak	---	---
2	87.780	38.89	-1.11	40.00	56.10	8.32	1.49	27.02	QF	100	167
3	167.970	28.13	-15.87	43.50	45.20	7.54	2.12	26.73	Peak	---	---

Site : 03CH03-HY
 Condition : 3m 03CH03-MAT VERTICAL
 EUT : Outdoor Bridge
 Power : 110V/60Hz
 Model : NWH9210
 MEMO : TX CH11 2462MHz
 MEMO : 18dbi Antenna
 MEMO : F352805

	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	441.400	27.64	-18.36	46.00	36.30	15.21	3.54	27.41	Peak	---	---
2	786.500	27.74	-18.26	46.00	32.03	18.68	5.03	28.00	Peak	---	---
3	957.300	37.11	-8.89	46.00	39.27	19.61	5.86	27.63	Peak	---	---

➤ For 1GHz ~ 25GHz

Remark: Frequency from 1000MHz to 25000MHz, 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
2462.000	H	28.35	6.29	74.96	-	-	109.60	301995.17 Peak
2462.000	H	28.35	6.29	67.55	-	-	102.19	128676.73 A.V.
2462.000	V	28.35	6.29	86.74	-	-	121.38	1172195.37 Peak
2462.000	V	28.35	6.29	77.38	-	-	112.02	399024.90 A.V.
4846.000	H	33.11	9.07	8.69	74.00	5011.87	50.87	349.54 -23.13 Peak
4846.000	H	33.11	9.07	8.48	54.00	501.19	50.66	341.19 -3.34 A.V.
4926.000	V	33.28	9.12	11.83	74.00	5011.87	54.23	514.64 -19.77 Peak
4926.000	V	33.28	9.12	-0.56	54.00	501.19	41.84	123.59 -12.16 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 : 

Murray Lu

5.8. Band Edges Measurement

5.8.1. Measuring Instruments :

As described in chapter 7 of this test report.

5.8.2. 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.

5.8.3. Test Result :

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

5.8.4. Note on Band edge Emission

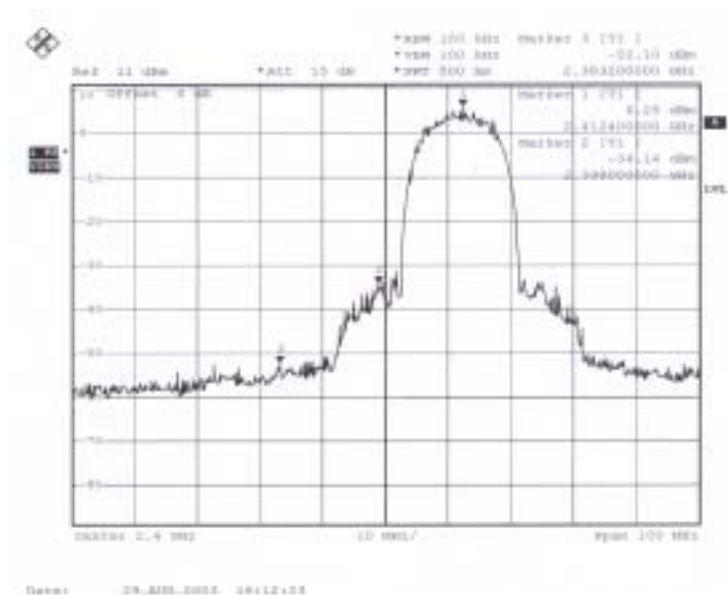
The band edge emission plot on page 61. shows **58.34dB** delta between carrier maximum power and local maximum emission in the restricted band (2.4835GHz).

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	109.60	51.26	74.00	-22.74	Peak
H	102.19	43.85	54.00	-10.15	Average
V	121.38	63.04	74.00	-10.96	Peak
V	112.02	53.68	54.00	-0.32	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.

The spectrum analyzer plots are attached as below :

Plot1 (Channel 1) :



Plot2 (Channel 11) :



Comments : All emissions in any 100kHz bandwidth outside the band edge are attenuated more then 20dB from the carrier.

5.9. Antenna Requirements

The EUT use a undetachable antenna via **Inverse-N** external connector. It is considered meet antenna requirement of FCC.

5.9.1. 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.

5.9.2. Antenna Connected Construction

The maximum Gain antenna used in this product is dipole antenna. The antenna connector type is **Inverse-N**. The coaxial cable of the antenna is fixed to the antenna.

5.10. RF Exposure

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

RF Exposure Compliance

5.10.1. 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

5.10.2. 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 (W)

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 10.0 W/m². 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 (W)	Calculated RF Exposure Separation Distance (m)	Minimum RF Exposure Separation Distance (m)
Channel 1	18.00	63.10	17.91	0.0618	0.1762	0.20
Channel 6	18.00	63.10	18.90	0.0776	0.1974	0.20
Channel 11	18.00	63.10	18.95	0.0785	0.1986	0.20

5.10.3. FCC Radiation Exposure Statement

This equipment is an outdoor fixed antenna use radiator. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antenna shall not be less than 0.198 meters during normal operation.

Proposed RF exposure safety information to include in User's Manual.

5.11. De facto EIRP test

5.11.1. Test procedure

1. The EUT was placed on a rotatable table.
2. 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.
3. Replaced the EUT by antenna and use Signal generator as signal source.
4. Adjust the output rating of signal generator until the receiver receive the same signal as the signal emitted by EUT with maximum emission.
5. Record the power value (P) of signal generator.
6. $EIRP = P - \text{cable loss (of transmitter)} + \text{antenna gain (replaced antenna)} - 2.15$

5.11.2. Test result

Frequency (MHz)	Reading (dBuV/m)		EIRP (dBm)	Limit (dBm)	Margin (dB)
	H	V			
2414.000	106.8	---	7.1	36.0	-28.9
2414.000	---	119.5	20.5	36.0	-15.5
2438.000	107.8	---	8.1	36.0	-27.9
2438.000	---	121.2	22.3	36.0	-13.7
2462.000	109.6	---	9.9	36.0	-26.1
2462.000	---	121.4	22.4	36.0	-13.6

6. EMI Suppression Component List

1. Add ferrite core to each cable of main unit. (Part No. RH7.5*7.5*2.4)
(As the Internal photo No.3)

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	24.30	3.89
35	13.63	1.04	2000	31.10	5.41
40	11.11	1.09	3000	29.60	6.92
45	10.59	1.24	4000	30.80	8.24
50	6.47	1.43	5000	34.20	9.22
55	5.83	1.39	6000	33.30	10.25
60	5.18	1.59	7000	37.80	11.61
65	4.81	1.41	8000	39.40	11.78
70	4.43	1.43	9000	38.40	12.59
75	5.10	1.55	10000	38.90	13.84
80	5.91	1.56	11000	41.10	14.64
85	7.33	1.62	12000	42.70	14.12
90	8.74	1.41	13000	43.90	16.01
95	9.05	1.81	14000	43.70	13.76
100	9.36	1.68	15000	43.40	14.30
110	9.65	1.73	16000	40.90	15.16
120	9.97	1.79	17000	44.40	15.88
130	10.51	1.93	18000	47.10	16.09
140	10.32	2.06	19000	37.60	16.98
150	9.42	2.09	20000	37.30	16.21
160	8.09	2.12	21000	37.00	20.13
170	7.43	2.12	22000	38.00	19.24
180	7.60	2.12	23000	38.70	19.64
190	7.43	2.21	24000	38.60	20.54
200	7.26	2.29	25000	38.90	20.14
220	9.11	2.42	14000	43.70	13.76
240	10.88	2.54	15000	43.40	14.30
260	11.75	2.66	16000	40.90	15.16
280	11.55	2.76	17000	44.40	15.88
300	11.36	2.85	18000	47.10	16.09
320	12.03	3.10	19000	37.60	16.98
340	12.69	3.36	20000	37.30	16.21
360	13.33	3.49	21000	37.00	20.13
380	14.00	3.50	22000	38.00	19.24
400	14.63	3.51	23000	38.70	19.64
450	15.33	3.55	24000	38.60	20.54
500	16.03	3.81	25000	38.90	20.14
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	100174	9 KHz – 2.75 GHz	Dec. 12, 2002	Conduction (CO01-HY)
LISN	MessTec	NNB-2/16Z	2001-008	9 KHz – 30 MHz	Apr. 29, 2003	Conduction (CO01-HY)
LISN (Support Unit)	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 Terminal	NOBLE	50ohm	TM013	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)
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	May 09, 2003	Radiation (03CH03-HY)
RF Cable-HIGH	Jye Bao	RG142	CB030-HIGH	1GHz~29.5GHz	Mar. 14, 2003	Radiation (03CH03-HY)
Power meter	R&S	NRVS	100444	DC~40GHz	May 28, 2003	Conducted
Power sensor	R&S	NRV-Z55	100049	DC~40GHz	May 28, 2003	Conducted
Power Sensor	R&S	NRV-Z32	100057	30MHz-6GHz	May 28, 2003	Conducted
AC power source	HPC	HPA-500W	HPA-9100024	AC 0~300V	May 27, 2003	Conducted
Temp. and Humidity Chamber	KSON	THS-C3L	612	N/A	Oct. 02, 2002	Conducted

※ 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

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