FCC TEST REPORT

for

47 CFR, Part 15, Subpart C

Equipment	:	Astarte/SoftGate
Model No.	:	ASW2301, ANW2302
FCC ID	:	ROL-ASW2301
Filing Type	:	Certification
Applicant	:	Astarte Technology Co., Ltd. 11F, No.116, Dah-Yeh Rd., Peitou 112 Taipei, 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: Nov. 29, 2003

■ No additional attachment.

☐ Additional attachment were issued as following record:

Attachment No.	Issue Date	Description

Certificate No. : F3N1711

CERTIFICATE OF COMPLIANCE

for

47 CFR, Part 15, Subpart C

Equipment : Astarte/SoftGate

Model No. : ASW2301, ANW2302

FCC ID : ROL-ASW2301

Filing Type : Certification

Applicant : Astarte Technology Co., Ltd.
11F, NO.116, Dah-Yeh RD., Peitou 112 Taipei, 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 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 Nov. 26.2003 at **SPORTON International Inc.** LAB.

Joe Yang
Director

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

Astarte Technology Co., Ltd.

11F, NO.116, Dah-Yeh RD., Peitou 112 Taipei, Taiwan, R.O.C.

1.2. Manufacturer

Same as 1.1

1.3. Basic Description of Equipment under Test

Equipment	: Astarte/SoftGate
Model No.	: ASW2301, ANW2302
FCC ID	: ROL-ASW2301
Trade Name	: Astarte
Power Supply Type	: Switching (from system)
AC Power Cord	: AC 110V, 0.8meter, 3pin (from system)

1.4. Feature of Equipment under Test

1. Host/Radio Interface	Meet 802.11b specification
2. Type of Modulation	DBPSK,DQPSK, CCK
3. Number of Channels	11
4. Frequency Band	2400~2483.5 MHz
5. Carrier Frequency of each channel	2412+N*5 MHz,.N=0~10
6. Bandwidth of each channel	22 MHz
7. Maximum Output Power to Antenna	16.49 dBm
8. IF & L.O. frequency	374 MHz, 2038+N*5 MHz, N=0~10
9. Type of Antenna Connector	Reverse SMA connector
10. Antenna Type / Class and Gain	Dipole Antenna / 2dBi
11. Function Type	Transceiver
12. Power Rating (DC/AC , Voltage)	DC, 3.3V 450mA
13. Duty Cycle	N/A
14. Basic function of product	802.11b PCI card

2. Test Configuration of Equipment under Test

2.1. Test Manner

a. The EUT has been associated with personal computer and 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. The complete test system included COMPAQ NOTE BOOK, VIEWSONIC MONITOR, COMPAQ (PS2) KEYBOARD, COMPAQ (PS2) MOUSE, EPSON PRINTER, ACEEX MODEM and EUT for EMI test.

c. The following test modes were performed for conduction test:

Mode 1: CH01（2412MHz）

Mode 2: CH06（2437MHz）

Mode 3: CH11（2462MHz）

d. The following test modes were performed for radiation test:

Mode 1: CH01（2412MHz）

Mode 2: CH06（2437MHz）

Mode 3: CH11（2462MHz）

e. Frequency range investigated: conduction 150 KHz to 30 MHz, radiation 30 MHz to 24835 MHz.

2.2. Description of Test System

Support Unit 1. – PC (COMPAQ)

FCC ID	: N/A
Model No.	: D380MX
Serial No.	: SP0054
Data Cable	: Shielded
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
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 3. – KEYBOARD (COMPAQ)

FCC ID	: N/A
Model No.	: 6511-VA
Serial No.	: SP0048
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 4. – (PS2) MOUSE (COMPAQ)

FCC ID	: N/A
Model No.	: M-S69
Serial No.	: SP0051
Data Cable	: Shielded, 1.7m
Remark	: This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

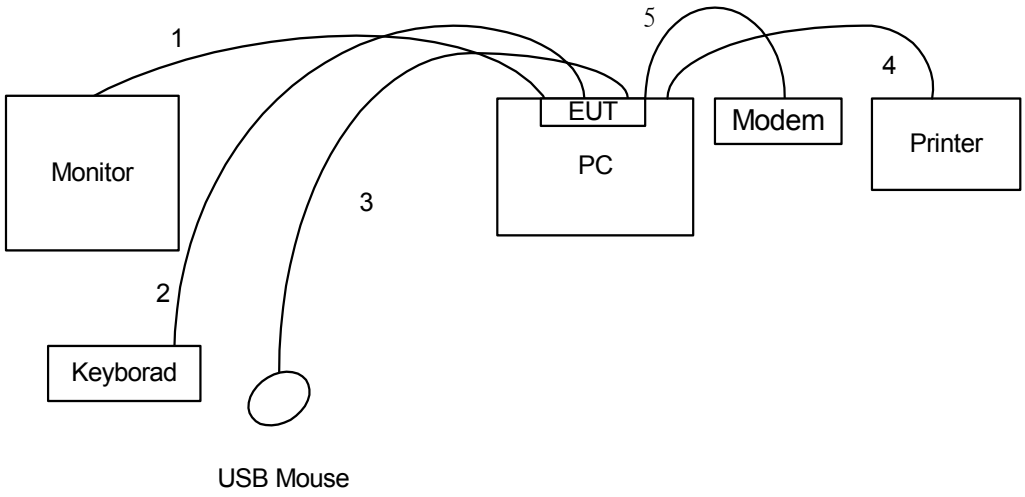
Support Unit 5. – PRINTER (EPSON)

FCC ID	: N/A
Model No.	: STYLUS COLOR 680
Power Supply Type	: Switching
Power Cord	: Non-Shielded
Serial No.	: SP0257
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 6. – MODEM (ACEEX)

FCC ID	: IFAXDM141
Model No.	: DM141
Power Cord	: Non-Shielded
Data Cable	: Shielded,1.35m
Serial No.	: SP0257
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 I/O cable is connected from PC to the support unit 2.
2. The I/O cable is connected from PC to the support unit 3.
3. The I/O cable is connected from PC to the support unit 4.
4. The I/O cable is connected from PC to the support unit 5.
5. The I/O cable is connected from PC to the support unit 6.

3. Operation of Equipment under Test

An executive program, EMCTEST.EXE under WIN2000, 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 e.

At the same time, the following programs were executed:

- Executed the Wpdiag and the EUT was keeping transmitting signals at fixed frequency.

4. General Information of Test

4.1. 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

4.2. Test Voltage

110V/60HZ

4.3. Standard for Methods of Measurement

FCC Part 15, Subpart C

4.4. Test in Compliance with

ANSI C63.4-2001 for conducted power line test and radiated emission test,
"Guidance on Measurements for Direct Sequence Spread Spectrum Systems" for test of 6dB Bandwidth
"Guidance on Measurements for Direct Sequence Spread Spectrum Systems" for test of Maximum Peak Output Power
"Guidance on Measurements for Direct Sequence Spread Spectrum Systems" for test of 100kHz Bandwidth of Frequency Band Edges
"Guidance on Measurements for Direct Sequence Spread Spectrum Systems" for test of Power Spectral Density

4.5. Frequency Range Investigated

a. Conduction: from 150 KHz to 30 MHz
b. Radiation: from 30 MHz to 24835MHz

4.6. 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
15.247(a)(2)	6dB Bandwidth	Pass
15.247(b((3)	Maximum Peak Output Power	Pass
15.209	Radiated Emission	Pass
15.247(c)	100kHz Bandwidth of Frequency Band Edges	Pass
15.247(a)	Power Spectral Density	Pass
15.203	Antenna Requirement	Pass
1.1307 1.1310 2.1091 2.1093	RF Exposure Compliance	Pass

5.2. 6dB Bandwidth

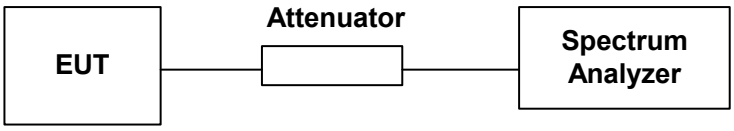
Measuring Instruments：

As described in chapter 7 of this test report.

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.

Test Setup Layout：



Test Result：The spectrum analyzer plots are attached as below

- Temperature : 26 °C
- Relative Humidity : 64%
- Antenna Gain: 3 dBi

Channel	Frequency (MHz)	6dB Emission bandwidth (MHz)	Limits (MHz)	Plot Ref. No.
01	2412	10.36 MHz	0.5	1
06	2437	10.56 MHz	0.5	2
11	2462	10.64 MHz	0.5	3

5.3. Maximum Peak Output Power

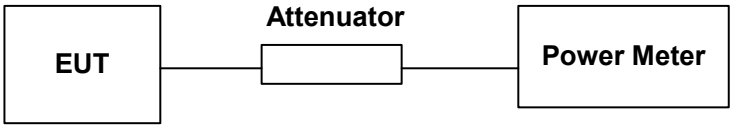
Measuring Instruments：

As described in chapter 7 of this test report.

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.

Test Setup Layout：



Test Result：See spectrum analyzer plots below

- Temperature : 26°C
- Relative Humidity :64 %
- Antenna Gain: 3 dBi

Channel	Frequency (MHz)	Measured Output Power (mWatt)	Measured Output Power (dBm)	Limits (Watt/dBm)
01	2412	44.566	16.49	1W/30 dBm
06	2437	41.210	16.15	1W/30 dBm
11	2462	37.411	15.73	1W/30 dBm

5.4. Power Spectral Density

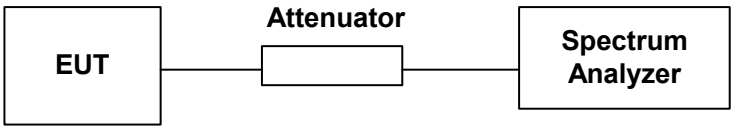
Measuring Instruments：

As described in chapter 6 of this test report.

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.

Test Setup Layout：



Test Result：See spectrum analyzer plots below

- Temperature : 26°C
- Relative Humidity : 64 %

Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limits (dBm)	Plot Ref. No.
01	2412	-5.35	8	4
06	2437	-3.99	8	5
11	2462	-4.74	8	6

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 C63.4-1992 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：

- Frequency Range of Test : from 150KHz to 30 MHz. 6dB Bandwidth : 9KHz
- Test Mode : Mode 1
- Temperature : 24°C
- Relative Humidity : 54 %

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

Site : C001-HY
Condition : CNS/VCCI/CISPR-B 2003 2001/008 LINE
EUT : Astarte / SoftGate
Power : AV 110 V / 60 Hz
Model : ASW2301
Memo : TX CH01

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.164	33.85	-21.41	55.26	33.59	0.10	0.16	Average
2	0.164	36.43	-28.83	65.26	36.17	0.10	0.16	QP
3	0.167	33.07	-22.03	55.10	32.81	0.10	0.16	Average
4	0.167	35.99	-29.11	65.10	35.73	0.10	0.16	QP
5	0.748	21.59	-34.41	56.00	21.44	0.10	0.05	QP
6	0.748	21.70	-24.30	46.00	21.55	0.10	0.05	Average
7	7.563	26.08	-33.92	60.00	25.67	0.17	0.24	QP
8	7.563	23.98	-26.02	50.00	23.57	0.17	0.24	Average
9	11.286	32.51	-27.49	60.00	32.01	0.20	0.30	QP
10	11.286	30.13	-19.87	50.00	29.63	0.20	0.30	Average
11	17.767	30.70	-29.30	60.00	30.05	0.26	0.39	QP
12	17.767	25.83	-24.17	50.00	25.18	0.26	0.39	Average

Site : C001-HY
Condition : CNS/VCCI/CISPR-B 2003 2001/008 NEUTRAL
EUT : Astarte / SoftGate
Power : AV 110 V / 60 Hz
Model : ASW2301
Memo : TX CH01

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.164	36.91	-18.35	55.26	36.65	0.10	0.16	Average
2	0.164	38.67	-26.59	65.26	38.41	0.10	0.16	QP
3	0.178	40.18	-14.40	54.58	39.91	0.10	0.17	Average
4	0.178	41.71	-22.87	64.58	41.44	0.10	0.17	QP
5	0.214	25.08	-37.97	63.05	24.81	0.10	0.17	QP
6	0.214	18.38	-34.67	53.05	18.11	0.10	0.17	Average
7	0.605	23.14	-32.86	56.00	22.98	0.10	0.06	QP
8	0.605	23.45	-22.55	46.00	23.29	0.10	0.06	Average
9	10.746	33.63	-26.37	60.00	33.12	0.22	0.29	QP
10	10.746	32.38	-17.62	50.00	31.87	0.22	0.29	Average
11	16.267	32.57	-27.43	60.00	31.90	0.30	0.37	QP
12	16.267	28.33	-21.67	50.00	27.66	0.30	0.37	Average

Test Engineer : Kevin Yang

- Test Mode : Mode 2
- Temperature : 24 °C
- Relative Humidity : 54 %

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

Site : C001-HY
Condition : CNS/VCCI/CISPR-B 2003 2001/008 LINE
EUT : Astarte / SoftGate
Power : AV 110 V / 60 Hz
Model : ASW2301
Memo : TX CH06

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.164	36.99	-28.29	65.28	36.73	0.10	0.16	QP
2	0.164	34.30	-20.98	55.28	34.04	0.10	0.16	Average
3	0.180	35.97	-28.52	64.49	35.70	0.10	0.17	QP
4	0.180	33.16	-21.33	54.49	32.89	0.10	0.17	Average
5	0.239	22.21	-39.92	62.13	21.95	0.10	0.16	QP
6	0.239	19.75	-32.38	52.13	19.49	0.10	0.16	Average
7	0.605	21.65	-34.35	56.00	21.49	0.10	0.06	QP
8	0.605	21.81	-24.19	46.00	21.65	0.10	0.06	Average
9	10.744	33.81	-26.19	60.00	33.32	0.20	0.29	QP
10	10.744	32.64	-17.36	50.00	32.15	0.20	0.29	Average
11	16.267	32.50	-27.50	60.00	31.90	0.23	0.37	QP
12	16.267	28.98	-21.02	50.00	28.38	0.23	0.37	Average

Site : C001-HY
Condition : CNS/VCCI/CISPR-B 2003 2001/008 NEUTRAL
EUT : Astarte / SoftGate
Power : AV 110 V / 60 Hz
Model : ASW2301
Memo : TX CH06

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.164	38.71	-26.56	65.27	38.45	0.10	0.16	QP
2	0.164	36.97	-18.30	55.27	36.71	0.10	0.16	Average
3	0.177	41.73	-22.90	64.63	41.46	0.10	0.17	QP
4	0.177	40.18	-14.45	54.63	39.91	0.10	0.17	Average
5	0.248	24.47	-37.35	61.82	24.22	0.10	0.15	QP
6	0.248	23.80	-28.02	51.82	23.55	0.10	0.15	Average
7	8.765	32.56	-27.44	60.00	32.10	0.20	0.26	QP
8	8.765	31.10	-18.90	50.00	30.64	0.20	0.26	Average
9	11.466	32.80	-27.20	60.00	32.26	0.23	0.31	QP
10	11.466	29.81	-20.19	50.00	29.27	0.23	0.31	Average
11	16.206	28.79	-21.21	50.00	28.12	0.30	0.37	Average
12	16.206	32.23	-27.77	60.00	31.56	0.30	0.37	QP

Test Engineer : Kevin Yang

- Test Mode : Mode 3
- Temperature : 24°C
- Relative Humidity : 54%

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

Site : C001-HY
Condition : CNS/VCCI/CISPR-B 2003 2001/008 LINE
EUT : Astarte / SoftGate
Power : AV 110 V / 60 Hz
Model : ASW2301
Memo : TX CH11

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.162	36.69	-28.66	65.35	36.43	0.10	0.16	QP
2	0.162	33.42	-21.93	55.35	33.16	0.10	0.16	Average
3	0.181	35.65	-28.79	64.44	35.38	0.10	0.17	QP
4	0.181	32.75	-21.69	54.44	32.48	0.10	0.17	Average
5	0.750	21.83	-34.17	56.00	21.68	0.10	0.05	QP
6	0.750	21.97	-24.03	46.00	21.82	0.10	0.05	Average
7	8.763	32.77	-27.23	60.00	32.32	0.19	0.26	QP
8	8.763	31.02	-18.98	50.00	30.57	0.19	0.26	Average
9	10.745	33.79	-26.21	60.00	33.30	0.20	0.29	QP
10	10.745	32.70	-17.30	50.00	32.21	0.20	0.29	Average
11	16.929	26.87	-23.13	50.00	26.25	0.24	0.38	Average
12	16.929	30.33	-29.67	60.00	29.71	0.24	0.38	QP

Site : C001-HY
Condition : CNS/VCCI/CISPR-B 2003 2001/008 NEUTRAL
EUT : Astarte / SoftGate
Power : AV 110 V / 60 Hz
Model : ASW2301
Memo : TX CH11

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.163	38.85	-26.46	65.31	38.59	0.10	0.16	QP
2	0.163	36.84	-18.47	55.31	36.58	0.10	0.16	Average
3	0.182	39.80	-24.59	64.39	39.53	0.10	0.17	QP
4	0.182	37.93	-16.46	54.39	37.66	0.10	0.17	Average
5	0.321	23.98	-35.71	59.69	23.75	0.10	0.13	QP
6	0.321	23.94	-25.75	49.69	23.71	0.10	0.13	Average
7	9.303	32.32	-27.68	60.00	31.85	0.20	0.27	QP
8	9.303	28.95	-21.05	50.00	28.48	0.20	0.27	Average
9	10.743	33.27	-26.73	60.00	32.76	0.22	0.29	QP
10	10.743	32.21	-17.79	50.00	31.70	0.22	0.29	Average
11	16.206	28.88	-21.12	50.00	28.21	0.30	0.37	Average
12	16.206	32.57	-27.43	60.00	31.90	0.30	0.37	QP

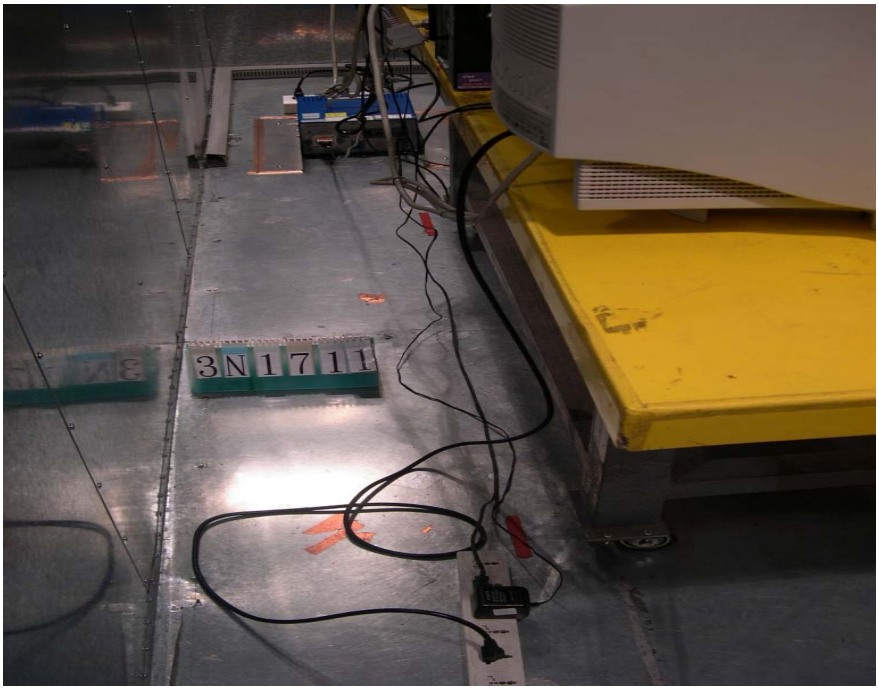
Test Engineer : Kevin Yang

5.5.4 Photographs of Conducted Emission Test Configuration

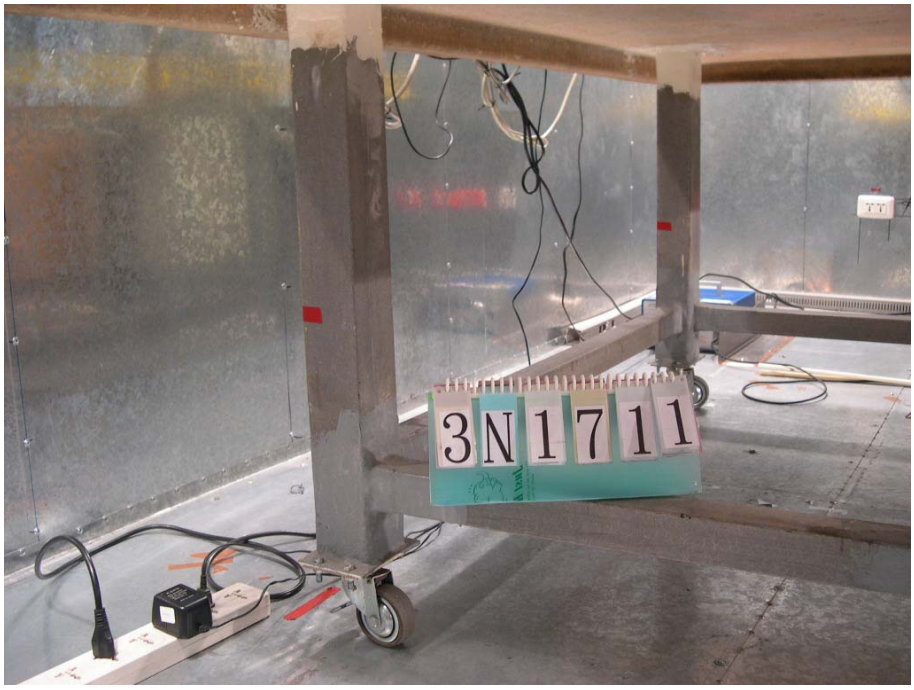
- The photographs show the configuration that generates the maximum emission.

FRONT VIEW

REAR VIEW



SIDE VIEW



5.6 Test of Radiated Emission

Radiated emissions from 30 MHz to 24.835 GHz were measured according to the methods defines in ANSI C63.4-2001. The EUT was placed, 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

5.6.1Major 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

5.6.2Test 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 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.

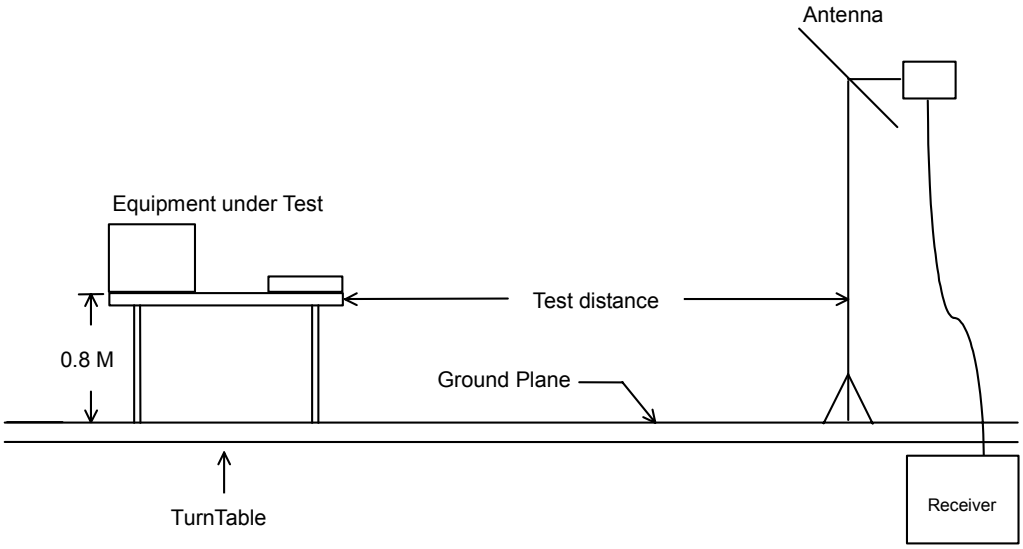
E. For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.

F. Set the test-receiver system to Peak 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.

H. 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 (2412MHz)
- Test Distance : 3 M
- Temperature : 24.5 °C
- Relative Humidity : 51%
- 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 table

■ Spurious Emission

Site : 03CH03-HY
Condition : 3m 03CH03-MAT VERTICAL
EUT : Astarte/SoftGate
Power : 110V/60Hz
MODEL : ASW2301
MEMO : TX CH01 2412MHz

	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 !	30.000	38.06	-1.94	40.00	49.84	15.35	0.92	28.05	Peak	100	43
2	30.000	33.17	-6.83	40.00	44.95	15.35	0.92	28.05	QP	100	43
3	66.180	33.87	-6.13	40.00	55.53	4.69	1.62	27.97	Peak	102	40
4	240.060	38.45	-7.55	46.00	52.40	10.92	2.67	27.54	Peak	100	59

Site : 03CH03-HY
Condition : 3m 03CH03-MAT VERTICAL
EUT : Astarte/SoftGate
Power : 110V/60Hz
MODEL : ASW2301
MEMO : TX CH01 2412MHz

	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	335.000	34.86	-11.14	46.00	46.67	12.52	3.15	27.48	Peak	104	36
2	430.900	34.87	-11.13	46.00	44.21	15.07	3.66	28.07	Peak	101	51
3	503.000	36.15	-9.85	46.00	44.79	16.07	3.99	28.70	Peak	102	49

Site : 03CH03-HY
Condition : 3m 03CH03-MAT HORIZONTAL
EUT : Astarte/SoftGate
Power : 110V/60Hz
MODEL : ASW2301
MEMO : TX CH01 2412MHz

	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	240.060	39.95	-6.05	46.00	53.90	10.92	2.67	27.54	Peak	108	42
2	268.140	39.75	-6.25	46.00	52.64	11.66	2.88	27.43	Peak	105	37
3	299.730	35.15	-10.85	46.00	48.10	11.36	2.99	27.30	Peak	109	49

Site : 03CH03-HY
Condition : 3m 03CH03-MAT HORIZONTAL
EUT : Astarte/SoftGate

Site : 03CH03-HY
Condition : 3m 03CH03-MAT HORIZONTAL
EUT : Astarte/SoftGate
Power : 110V/60Hz
MODEL : ASW2301
MEMO : TX CH01 2412MHz

	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	240.060	39.95	-6.05	46.00	53.90	10.92	2.67	27.54	Peak	108	42
2	268.140	39.75	-6.25	46.00	52.64	11.66	2.88	27.43	Peak	105	37

Site : 03CH03-HY
Condition : 3m HORN-ANT-6741 VERTICAL
EUT : Astarte/SoftGate
Power : 110V/60Hz
MODEL : ASW2301
MEMO : TX CH01 2412MHz

	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
3 !	2788.000	49.39	-4.61	54.00	49.18	29.34	6.86	35.99	Average	100	31
4	2788.000	59.76	-14.24	74.00	59.55	29.34	6.86	35.99	Peak	100	31

Site : 03CH03-HY
Condition : 3m HORN-ANT-6741 HORIZONTAL
EUT : Astarte/SoftGate
Power : 110V/60Hz
MODEL : ASW2301
MEMO : TX CH01 2412MHz

	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
3 !	2785.600	48.69	-5.31	54.00	48.49	29.33	6.86	35.99	Average	100	45
4	2785.600	58.23	-15.77	74.00	58.03	29.33	6.86	35.99	Peak	100	45

- For 2.786GHz ~ 24.835GHz

  Remark: Frequency from 2786MHz to 24835MHz, the emission emitted by the EUT is too low to be measured

■ Field strength of fundamental and harmonics

Frequency (MHz)	Polarity	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	Limits (uV/m)	Emission Level (dBuV/m)	Emission Level (uV/m)	Margin (dB)	Detect Mode
2411.460	V	28.24	6.22	69.03	-	-	103.49	149451.40	-	AV
24.11.920	V	28.24	6.22	76.96	-	-	111.42	372391.71	-	Peak
2411.300	H	28.24	6.22	69.04	-	-	103.50	149623.57	-	AV
2411.920	H	28.24	6.22	77.02	-	-	111.48	374973.00	-	Peak
4824.000	V/H	-	-	-	-	-	-	-	-	AV/Peak
7236.000	V/H	-	-	-	-	-	-	-	-	AV/Peak
9648.000	V/H	-	-	-	-	-	-	-	-	AV/Peak
12060.000	V/H	-	-	-	-	-	-	-	-	AV/Peak
14472.000	V/H	-	-	-	-	-	-	-	-	AV/Peak
16884.000	V/H	-	-	-	-	-	-	-	-	AV/Peak
19296.000	V/H	-	-	-	-	-	-	-	-	AV/Peak
21708.000	V/H	-	-	-	-	-	-	-	-	AV/Peak
24120.000	V/H	-	-	-	-	-	-	-	-	AV/Peak

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

Test Engineer : Kevin Yang

Kevin Yang

- Test Mode: Mode 2 (2437 MHz)
- Test Distance : 3 M
- Temperature : 24.5°C
- Relative Humidity : 51 %
- 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 table

■ Spurious Emission

Site : 03CH03-HY
Condition : 3m 03CH03-MAT VERTICAL
EUT : Astarte/SoftGate
Power : 110V/60Hz
MODEL : ASW2301
MEMO : TX CH06 2437MHz

	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 !	30.000	38.43	-1.57	40.00	50.21	15.35	0.92	28.05	Peak	105	46
2	30.000	33.23	-6.77	40.00	45.01	15.35	0.92	28.05	QP	105	46
3	62.940	31.98	-8.02	40.00	53.70	4.94	1.31	27.97	Peak	105	37
4	240.060	39.05	-6.95	46.00	53.00	10.92	2.67	27.54	Peak	102	30
5	266.250	34.00	-12.00	46.00	46.87	11.68	2.88	27.43	Peak	110	47

Site : 03CH03-HY
Condition : 3m 03CH03-MAT VERTICAL
EUT : Astarte/SoftGate
Power : 110V/60Hz
MODEL : ASW2301
MEMO : TX CH06 2437MHz

	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	335.000	34.36	-11.64	46.00	46.17	12.52	3.15	27.48	Peak	107	40
2	430.900	35.51	-10.49	46.00	44.85	15.07	3.66	28.07	Peak	104	35
3	503.000	36.64	-9.36	46.00	45.28	16.07	3.99	28.70	Peak	107	42
4	528.200	35.79	-10.21	46.00	44.12	16.33	4.07	28.73	Peak	105	37

Site : 03CH03-HY
Condition : 3m 03CH03-MAT HORIZONTAL
EUT : Astarte/SoftGate
Power : 110V/60Hz
MODEL : ASW2301
MEMO : TX CH06 2437MHz

	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	240.060	39.70	-6.30	46.00	53.65	10.92	2.67	27.54	Peak	105	37
2	266.250	39.74	-6.26	46.00	52.61	11.68	2.88	27.43	Peak	107	34
3	299.730	35.84	-10.16	46.00	48.79	11.36	2.99	27.30	Peak	110	41

Site : 03CH03-HY
Condition : 3m 03CH03-MAT HORIZONTAL
EUT : Astarte/SoftGate
Power : 110V/60Hz
MODEL : ASW2301
MEMO : TX CH06 2437MHz

	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	335.000	38.20	-7.80	46.00	50.01	12.52	3.15	27.48	Peak	107	45
2	430.900	37.35	-8.65	46.00	46.69	15.07	3.66	28.07	Peak	106	40
3	528.200	38.73	-7.27	46.00	47.06	16.33	4.07	28.73	Peak	104	35

Site : 03CH03-HY
Condition : 3m HORN-ANT-6741 VERTICAL
EUT : Astarte/SoftGate
Power : 110V/60Hz
MODEL : ASW2301
MEMO : TX CH06 2437MHz

	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	2351.080	56.70	-17.30	74.00	58.68	28.12	6.14	36.24	Peak	105	10
2	2351.080	44.92	-9.08	54.00	46.90	28.12	6.14	36.24	Average	105	10
5 !	2811.000	50.38	-3.62	54.00	50.04	29.41	6.90	35.97	Average	100	45
6	2811.000	59.75	-14.25	74.00	59.41	29.41	6.90	35.97	Peak	100	45

Site : 03CH03-HY
Condition : 3m HORN-ANT-6741 HORIZONTAL
EUT : Astarte/SoftGate
Power : 110V/60Hz
MODEL : ASW2301
MEMO : TX CH06 2437MHz

	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	2354.320	59.92	-14.08	74.00	61.88	28.13	6.15	36.24	Peak	104	9
2	2354.320	46.24	-7.76	54.00	48.20	28.13	6.15	36.24	Average	104	9
5 !	2811.100	50.23	-3.77	54.00	49.89	29.41	6.90	35.97	Average	100	53
6	2811.100	60.60	-13.40	74.00	60.26	29.41	6.90	35.97	Peak	100	53

- For 2.812GHz ~ 24.850GHz

  Remark: Frequency from 2812MHz to 24850MHz, the emission emitted by the EUT is too low to be measured

■ Field strength of fundamental and harmonics

Frequency (MHz)	Polarity	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	Limits (uV/m)	Emission Level (dBuV/m)	Emission Level (uV/m)	Margin (dB)	Detect Mode
2436.460	V	28.12	6.14	75.70	-	-	109.96	314774.83	-	Peak
2436.460	V	28.12	6.14	67.96	-	-	102.22	129121.93	-	AV
2436.500	H	28.29	6.26	74.53	-	-	109.08	284446.11	-	Peak
2436.500	H	28.29	6.26	66.93	-	-	101.48	118576.87	-	AV
4874.000	V/H	-	-	-	-	-	-	-	-	AV/Peak
7311.000	V/H	-	-	-	-	-	-	-	-	AV/Peak
9748.000	V/H	-	-	-	-	-	-	-	-	AV/Peak
12185.000	V/H	-	-	-	-	-	-	-	-	AV/Peak
14622.000	V/H	-	-	-	-	-	-	-	-	AV/Peak
17059.000	V/H	-	-	-	-	-	-	-	-	AV/Peak
19496.000	V/H	-	-	-	-	-	-	-	-	AV/Peak
21933.000	V/H	-	-	-	-	-	-	-	-	AV/Peak
24370.000	V/H	-	-	-	-	-	-	-	-	AV/Peak

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

Test Engineer : Kevin Yang

Kevin Yang

- Test Mode: Mode 3 (2462 MHz)
- Test Distance : 3 M
- Temperature : 24.5°C
- Relative Humidity :51 %
- 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 table

■ Spurious Emission

Site : 03CH03-HY
Condition : 3m 03CH03-MAT VERTICAL
EUT : Astarte/SoftGate
Power : 110V/60Hz
MODEL : ASW2301
MEMO : TX CH11 2462MHz

	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 !	30.000	38.20	-1.80	40.00	49.98	15.35	0.92	28.05	Peak	102	60
2	30.000	33.33	-6.67	40.00	45.11	15.35	0.92	28.05	QP	102	60
3	62.940	32.24	-7.76	40.00	53.96	4.94	1.31	27.97	Peak	102	57
4	240.060	39.28	-6.72	46.00	53.23	10.92	2.67	27.54	Peak	107	54
5	268.140	35.25	-10.75	46.00	48.14	11.66	2.88	27.43	Peak	110	47

Site : 03CH03-HY
Condition : 3m 03CH03-MAT VERTICAL
EUT : Astarte/SoftGate
Power : 110V/60Hz
MODEL : ASW2301
MEMO : TX CH11 2462MHz

	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	335.000	34.35	-11.65	46.00	46.16	12.52	3.15	27.48	Peak	107	40
2	430.900	35.88	-10.12	46.00	45.22	15.07	3.66	28.07	Peak	105	40
3	503.000	35.74	-10.26	46.00	44.38	16.07	3.99	28.70	Peak	108	54
4	528.200	35.48	-10.52	46.00	43.81	16.33	4.07	28.73	Peak	100	42

Site : 03CH03-HY
Condition : 3m 03CH03-MAT HORIZONTAL
EUT : Astarte/SoftGate
Power : 110V/60Hz
MODEL : ASW2301
MEMO : TX CH11 2462MHz

	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	240.060	39.86	-6.14	46.00	53.81	10.92	2.67	27.54	Peak	101	25
2	268.140	39.49	-6.51	46.00	52.38	11.66	2.88	27.43	Peak	104	35
3	299.730	34.98	-11.02	46.00	47.93	11.36	2.99	27.30	Peak	110	34

Site : 03CH03-HY
Condition : 3m 03CH03-MAT HORIZONTAL
EUT : Astarte/SoftGate
Power : 110V/60Hz
MODEL : ASW2301
MEMO : TX CH11 2462MHz

	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	335.000	38.18	-7.82	46.00	49.99	12.52	3.15	27.48	Peak	107	40
2	430.900	38.79	-7.21	46.00	48.13	15.07	3.66	28.07	Peak	104	37
3	528.200	38.99	-7.01	46.00	47.32	16.33	4.07	28.73	Peak	108	54

Site : 03CH03-HY
Condition : 3m HORN-ANT-6741 VERTICAL
EUT : Astarte/SoftGate
Power : 110V/60Hz
MODEL : ASW2301
MEMO : TX CH11 2462MHz

	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	2377.160	45.51	-8.49	54.00	47.39	28.18	6.18	36.24	Average	105	4
2	2377.160	59.27	-14.73	74.00	61.15	28.18	6.18	36.24	Peak	105	4
5	2836.000	57.93	-16.07	74.00	57.44	29.49	6.95	35.95	Peak	100	31
6 !	2836.100	49.54	-4.46	54.00	49.05	29.49	6.95	35.95	Average	100	31

```
Site      : 03CH03-HY
Condition : 3m HORN-ANT-6741 HORIZONTAL
EUT       : Astarte/SoftGate
Power     : 110V/60Hz
MODEL     : ASW2301
MEMO      : TX CH11 2462MHz
```

	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	2377.020	47.07	-6.93	54.00	48.95	28.18	6.18	36.24	Average	106	5
2	2377.020	60.38	-13.62	74.00	62.26	28.18	6.18	36.24	Peak	106	5
5 !	2836.000	49.45	-4.55	54.00	48.96	29.49	6.95	35.95	Average	105	62
6	2836.000	59.84	-14.16	74.00	59.35	29.49	6.95	35.95	Peak	105	62

- For 2.837GHz ~ 24.850GHz

Remark: Frequency from 2837MHz to 24850MHz, the emission emitted by the EUT is too low to be

■ Field strength of fundamental and harmonics

Frequency (MHz)	Polarity	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	Limits (uV/m)	Emission Level (dBuV/m)	Emission Level (uV/m)	Margin (dB)	Detect Mode
2463.300	V	28.35	6.29	76.90	-	-	111.54	377572.19	-	Peak
2463.300	V	28.35	6.29	68.95	-	-	103.59	151181.97	-	AV
2461.580	H	28.35	6.29	67.14	-	-	101.78	122743.92	-	AV
2461.580	H	28.35	6.29	74.44	-	-	109.08	284446.11	-	Peak
4924.000	V/H	-	-	-	-	-	-	-	-	AV/ Peak
7386.000	V/H	-	-	-	-	-	-	-	-	AV/ Peak
9848.000	V/H	-	-	-	-	-	-	-	-	AV/ Peak
12310.000	V/H	-	-	-	-	-	-	-	-	AV/ Peak
14772.000	V/H	-	-	-	-	-	-	-	-	AV/ Peak
17234.000	V/H	-	-	-	-	-	-	-	-	AV/ Peak
19696.000	V/H	-	-	-	-	-	-	-	-	AV/ Peak
22158.000	V/H	-	-	-	-	-	-	-	-	AV/ Peak
24620.000	V/H	-	-	-	-	-	-	-	-	AV/ Peak

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

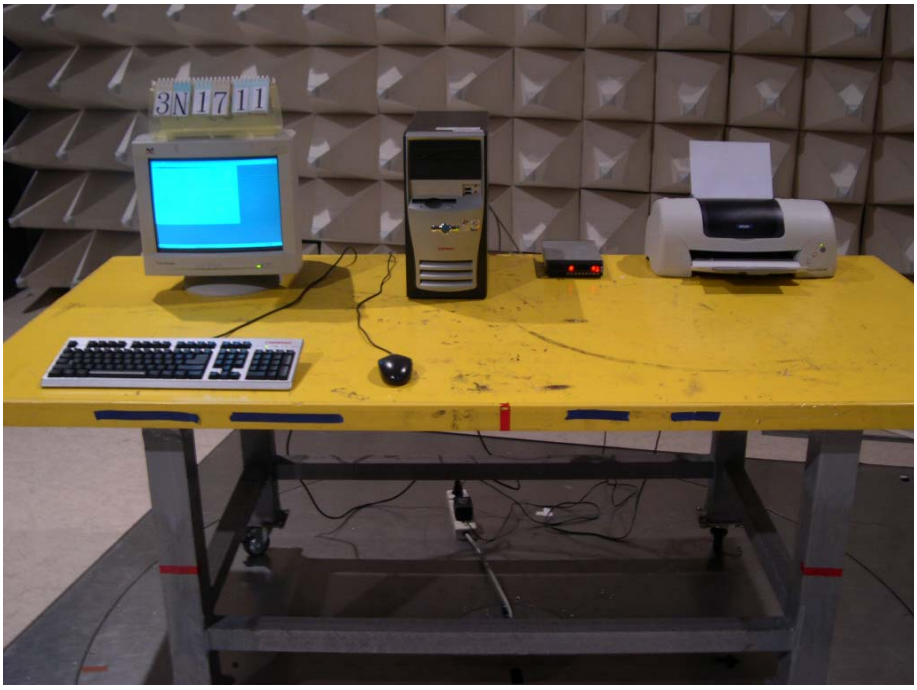
Test Engineer : Kevin Yang

Kevin Yang

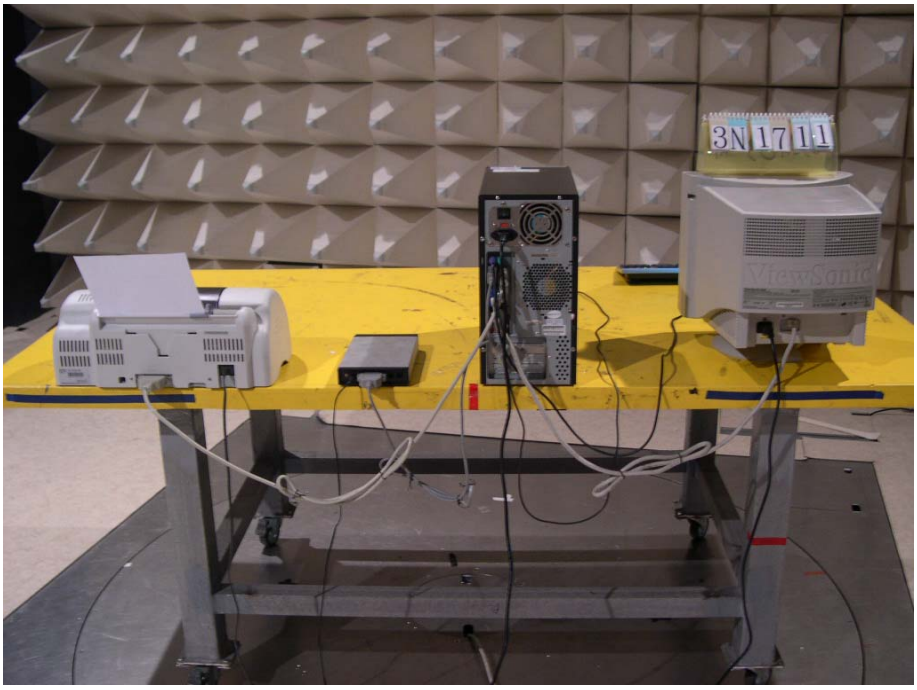
5.6.5 Photographs of Radiated Emission Test Configuration

- The photographs show the configuration that generates the maximum emission.

FRONT VIEW



REAR VIEW



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

Note on Band edge Emission

The band edge emission plot on appendix B page B7. shows 51.80 dB delta between carrier maximum power and local maximum emission in the restricted band (2.390GHz).

The band edge emission plot on appendix B page B8. shows 49.89 dB delta between carrier maximum power and local maximum emission in the restricted band (2.4835GHz).

Polarity	The emission of carrier power strength (dBμV/m)	The maximum field strength in restrict band (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
H	111.48	59.68	74.00	-14.32	Peak
H	109.08	59.19	74.00	-14.81	Peak
H	103.50	51.70	54.00	-2.30	Average
H	101.78	51.89	54.00	-2.11	Average
V	111.42	59.62	74.00	-14.38	Peak
V	111.54	61.65	74.00	-12.35	Peak
V	103.49	51.69	54.00	-2.31	Average
V	103.59	53.70	54.00	-0.30	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 unique detachable antenna via reverse SMA connector. It is considered to 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. 3Q[100]

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 of the antenna used in this product is peak gain 2 dBi of dipole antenna . The antenna connector type is reverse SMA connector .

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 (V/m) $= \dfrac{\sqrt{30 \times P \times G}}{d}$ Power Density: Pd (mW/cm^2) $= \dfrac{E^2}{377}$

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/cm^2. We can change the formula to:

d＝$\sqrt{\dfrac{30 \times P \times G}{377}}$

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 01	2	1.58	16.49	44.5656	2.3708	20
Channel 06	2	1.58	16.15	41.2098	2.2798	20
Channel 11	2	1.58	15.73	37.4111	2.1722	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. Antenna Factor & Cable Loss

Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)	Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)
30	15.35	0.92	1000	24.10	3.92
35	13.63	1.05	2000	27.40	5.66
40	11.11	1.08	3000	30.00	7.20
45	10.59	1.15	4000	32.60	9.36
50	6.47	1.29	5000	33.40	9.16
55	5.83	1.63	6000	34.20	10.70
60	5.18	1.30	7000	35.30	12.16
65	4.81	1.36	8000	36.90	13.12
70	4.43	1.43	9000	38.10	13.81
75	5.10	1.48	10000	39.00	14.83
80	5.91	1.53	11000	38.60	15.83
85	7.33	1.61	12000	39.50	17.11
90	8.74	1.69	13000	39.30	17.62
95	9.05	1.67	14000	41.60	18.37
100	9.36	1.76	15000	40.60	19.10
110	9.65	1.80	16000	37.20	19.72
120	9.97	1.90	17000	40.20	21.98
130	10.51	1.61	18000	48.90	21.22
140	10.32	2.14	19000	37.60	23.90
150	9.42	2.16	20000	37.30	24.07
160	8.09	2.16	21000	37.00	25.49
170	7.43	1.99	22000	38.00	24.92
180	7.60	2.39	23000	38.70	25.60
190	7.43	2.38	24000	38.60	25.70
200	7.26	2.46	25000	24.10	3.92
220	9.11	2.59	14000	27.40	5.66
240	10.88	2.68	15000	30.00	7.20
260	11.75	2.91	16000	32.60	9.36
280	11.55	2.92	17000	33.40	9.16
300	11.36	2.99	18000	34.20	10.70
320	12.03	3.03	19000	35.30	12.16
340	12.69	3.22	20000	36.90	13.12
360	13.33	3.28	21000	38.10	13.81
380	14.00	3.80	22000	39.00	14.83
400	14.63	3.80	23000	38.60	15.83
450	15.33	3.69	24000	39.50	17.11
500	16.03	3.93	25000	39.30	17.62
550	16.65	3.56			
600	17.29	4.15			
650	17.64	4.58			
700	18.00	4.73			
750	18.39	4.71			
800	18.79	4.99			
850	19.10	5.24			
900	19.42	5.38			
950	19.58	5.57			
1000	19.75	5.62			

7. 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 (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	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	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)
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, except for Horn Antenna, BBHA9170.

8. 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 Γ1=0.09 Antenna VSWR Γ2=0.67 Uncertainty=20log(1-Γ1*Γ2)	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 Γ1=0.09 LISN VSWR Γ2=0.33 Uncertainty=20log(1-Γ1*Γ2)	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

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