FCC PART 15 SUBPART C

EMI MEASUREMENT AND TEST REPORT

For

smartBridges Pte Ltd

10 Anson Road #22-14
International Plaza
Singapore 079903

FCC ID: PWGDOLPHIN

July 29, 2002

This Report Concerns:	**Equipment Type:**
☒ Original Report	Wireless airPoint PRO Outdoor & airBridge Outdoor

Test Engineer:	Jeff Lee
Test Date:	July 11, 2002
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1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

The s*martBridges Pte Ltd*'s product, FCC ID: PWGDOLPHIN or the "EUT" as referred to in this report is a Wireless airPoint PRO outdoor & airBridge outdoor which provides instant high speed wireless network connectivity to Wireless Access Point. The EUT provides a complete solution to customers who require mobility and freedom in a wireless Local Area Network and wireless internet connectivity through a gateway.

The EUT provides the following feature(s):

- Dimension: Approximately 4.5"L x 1.5"W x 4.5"H.
- S/N: 00-30-1A-00-D7-62
- Chipset: LSI L802251B

The EUT utilized Electronic Sales Ltd.'s power adapter, M/N: SMA210-2112C, S/N: 00000148.

1.2 Objective

This type approval report is prepared on behalf of. s*martBridges Pte Ltd* in accordance with Part 2, Subpart J, Part 15, Subparts A, B and C of the Federal Communication Commissions rules.

The objective of the manufacturer is to demonstrate compliance with FCC rules for Output Power, Antenna Requirements, and Spurious Radiated Emission.

1.3 Related Submittal(s)/Grant(s)

This Class II Permissive Change device has been originally granted on 2/21/02. The device was intended to use with the following antennas:

- 13dBi Panel Antenna: 15.1"L x 14.0"W x 1.8"H
- 18dBi Panel Antenna: 8.0"L x 8.9"W x 1.5"H
- 19dBi Parabolic grid antenna: 23.5"L x 16.9"W x 7.0"H
- 14dBi Sectorised Antenna: 5.5"L x 5.5"W x 3.6"H

Also, this Class II Permissive Change has different cosmetic design from the original one.

1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2000, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory Corporation. The radiated testing was performed at an antenna-to-EUT distance of 3 Meters.

1.5 Test Facility

The Open Area Test site used by Bay Area Compliance Laboratory Corporation to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Sunnyvale, California, USA.

Test site at Bay Area Compliance Laboratory Corporation has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI).

The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2000.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratory Corporation is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (NVLAP). The scope of the accreditation covers the FCC Method - 47 CFR Part 15 - Digital Devices, IEC/CISPR 22: 1998, and AS/NZS 3548: Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment test methods under NVLAP Lab Code 200167-0.

1.6 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Due Date
HP	Spectrum Analyzer	8568B	2610A02165	12/6/02
HP	Spectrum Analyzer	8593B	2919A00242	12/20/02
HP	Amplifier	8349B	2644A02662	12/20/02
HP	Quasi-Peak Adapter	85650A	917059	12/6/02
HP	Amplifier	8447E	1937A01046	12/6/02
A.H. System	Horn Antenna	SAS0200/571	261	12/27/02
Com-Power	Log Periodic Antenna	AL-100	16005	11/2/02
Com-Power	Biconical Antenna	AB-100	14012	11/2/02
Solar Electronics	LISN	8012-50-R-24-BNC	968447	12/28/02
Com-Power	LISN	LI-200	12208	12/20/02
Com-Power	LISN	LI-200	12005	12/20/02
BACL	Data Entry Software	DES1	0001	12/20/02

Statement of Traceability: Bay Area Compliance Laboratory Corp. certifies that all calibration has been performed using suitable standards traceable to national institute of standard and technology (NIST).

1.7 Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number	FCC ID
eMachine	Desktop	GD38B-100-27852	QD388-100-27852	DOC
KDS	Monitor	EVOKD-1731	0891265478	DOC
Microsoft	KB	PCVA-KB1P/UA	0000348	DOC
Microsoft	Mouse	MUS3P	None	JKGMUS3P01
EVEREX	Modem	EV-945	None	E3E5UVEV-945
HP	Printer	2225C	2821S14783	DOC

1.8 Host System Configuration List and Details

Manufacturer	Description	Model	Serial Number	FCC ID
Intel	MB	None	KB0610285	DOC
NEC	Floppy Drive	FD1231T	D9WL01MB3634	DOC
Maxtor	HD	54098U8	K806D1SC	DOC
Compaq	P/S	PS-7201-2C	00614854	DOC
Compaq	CD-ROM	CTN-485	201019006824	DOC
BACL	Chassis	None	None	None

1.9 External I/O Cabling List and Details

Cable Description	Length (M)	Port/From	To
Shielded KB Cable	1.6	KB Port/Host	KB
Shielded Mouse Cable	1.5	Mouse Port/Host	Mouse
Shielded Serial Cable	1.5	Serial Port/Host	Modem
Shielded Parallel Cable	2.0	Parallel Port/Host	Printer
Shielded VGA Cable	1.8	VGA/Host	Monitor
Shielded RJ45 Cable	1.0	RJ45 Port/Host	EUT
Shielded Antenna Cable	0.8	Antenna Port/EUT	Antenna

2 - SYSTEM TEST CONFIGURATION

2.1 Justification

The host system was configured for testing in a typical fashion (as a normally used by a typical user).

The EUT was tested in the normal operating mode to represent *worst-case* results during the final qualification test.

2.2 EUT Exercise Software

The EUT exercising program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. The test software, Atmel testing software, provided by the customer, is started the Windows 98 terminal program under the Windows 98 operating system. Once loaded, the program sequentially exercises each system component.

The sequence used is as follows:

1. Run the Change Mode utility from Start – Atmel Utilities – Change Mode Menu
2. Click on the Production Mode under SNMP Manager settings to make unit ready for RF tests, then click on Exit
3. Run the AP Configuration from the Start – Program – Atmel Utilities – AP Configuration Menu
4. Proceed to the Radio Menu & select the Radio Test sub-menu
5. Select the Continuous Tx with Modulation

This process is continuous throughout all tests.

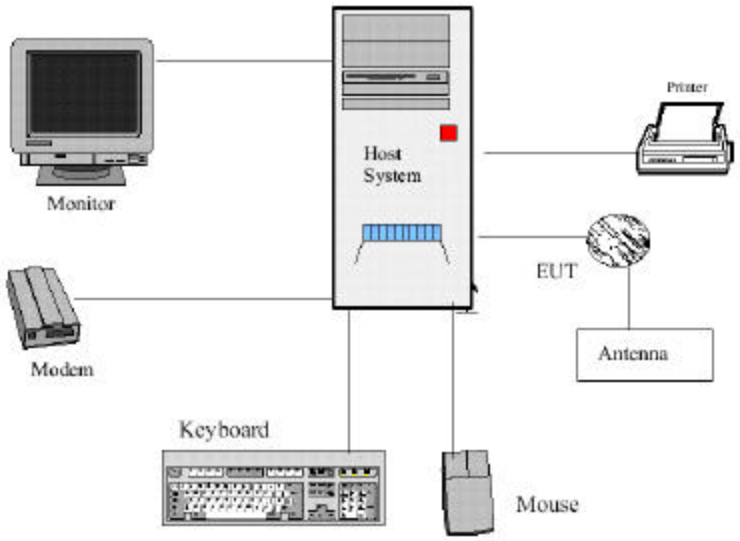
2.3 Special Accessories

As shown in section 2.5, all interface cables used for compliance testing are shielded as normally supplied by INMAC and their respective support equipment manufacturers.

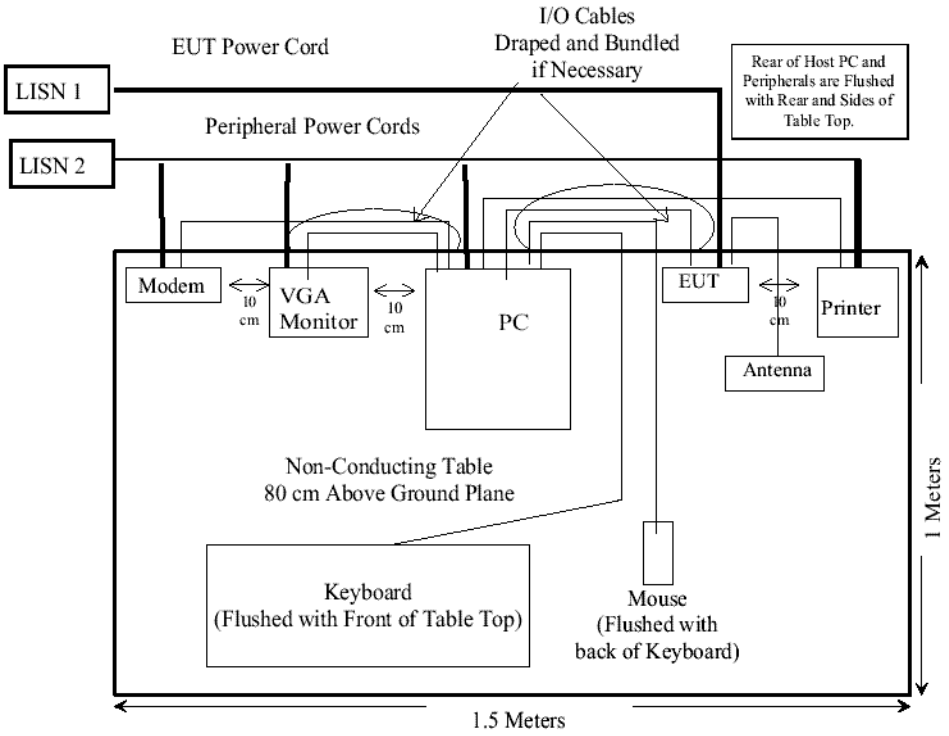
2.4 Equipment Modifications

No modifications were made by BACL Corporation to ensure the EUT to comply with the applicable limits and requirements.

2.5 Configuration of Test System



2.6 Test Setup Block Diagram



3 - SUMMARY OF TEST RESULTS

FCC Rules	Description	Result
§ 15.205	Restricted Bands	Complied
§ 2.1091	RF Safety Requirements	Compliant
§15.209 (a)	Radiated Emission	Complied
§15.247 (b) (2)	Output Power	Compliant
§15.247 (d)	Peak Power Spectral Density	Compliant

Note: The test data was good for test sample only. It may have deviation for other product samples.

4 - CONDUCTED OUTPUT POWER MEASUREMENT

4.1 Standard Applicable

According to §15.247(b) (2), the maximum peak output power of the intentional radiator shall not exceed 1 Watt.

4.2 Measurement Procedure

1. Place the EUT on the turntable and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter.

4.3 Test Equipment

Manufacturer	Model No.	Serial No.	Calibration Due Date
Agilent	E4419b	GB40202891	4/8/03
Agilent	E4412a	US38486529	4/8/03

4.4 Test Result

Frequency (MHz)	Output Power in dBm	Output Power in W	Standard Limit	Result	Page Reference
Low	19.94	0.099	≤ 1W	Compliant	Page 10
Middle	19.92	0.098	≤ 1W	Compliant	Page 10
High	20.00	0.10	≤ 1W	Compliant	Page 10


Agilent
19.94dBm
No Sensor Cal


Agilent
19.92dBm
No Sensor Cal


Agilent
20.00dBm
No Sensor Cal

5 - SPURIOUS RADIATED EMISSION

5.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at BACL is ±4.0 dB.

5.2 EUT Setup

The radiated emission tests were performed in the open area 3-meter test site, using the setup in accordance with the ANSI C63.4-2000. The specification used was the FCC 15 Subpart C limits.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.

The host PC system was connected with 110Vac/60Hz power source.

5.3 Spectrum Analyzer Setup

According to FCC Rules, 47 CFR §15.33 (a) (1), the system was tested to 25GHz.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

Start Frequency	30 MHz
Stop Frequency	25GHz
Sweep Speed	Auto
IF Bandwidth	1 MHz
Video Bandwidth	1 MHz
Quasi-Peak Adapter Bandwidth	120 kHz
Quasi-Peak Adapter Mode	Normal
Resolution Bandwidth	1MHz

5.4 Test Procedure

For the radiated emissions test, the Host PC system and all support equipment power cords were connected to the AC floor outlet since the power supply used in the EUT did not provide an accessory power outlet.

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dBµV of specification limits), and are distinguished with a "**Qp**" in the data table.

5.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dBµV means the emission is 7dBµV below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. - Class B Limit

5.6 Summary of Test Results

According to the data in section 11.7, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.207, and 15.247, and had the worst margin of:

13dBi MP24013 Panel Antenna, 30MHz to 25GHz, 3 meters

-1.6 dBµV at 4824.13 MHz in the Horizontal polarization, Low Channel
-1.3 dBµV at 4876.74 MHz in the Horizontal polarization, Middle Channel
-1.8 dBµV at 4924.00 MHz in the Horizontal polarization, High Channel
-0.9 dBµV at 32.01 MHz in the Vertical polarization, Unwanted Emission

18dBi MP24018 Panel Antenna, 30MHz to 25GHz, 3 meters

-2.7 dBµV at 4824.13 MHz in the Vertical polarization, Low Channel
-4.3 dBµV at 4876.74 MHz in the Horizontal polarization, Middle Channel
-5.4 dBµV at 4924.00 MHz in the Horizontal polarization, High Channel
-2.9 dBµV at 351.99 MHz in the Horizontal polarization, Unwanted Emission

14dBi MSO24014 Sectorised Antenna, 30MHz to 25GHz, 3 meters

-1.4 dBµV at 4824.13 MHz in the Horizontal polarization, Low Channel
-1.6 dBµV at 4876.74 MHz in the Horizontal polarization, Middle Channel
-2.3 dBµV at 4924.00 MHz in the Horizontal polarization, High Channel
-1.3 dBµV at 255.95 MHz in the Horizontal polarization, Unwanted Emission

19dBi Parabolic Gird Antenna, 30MHz to 25GHz, 3 meters

-3.7 dBµV at 4824.13 MHz in the Vertical polarization, Low Channel
-0.8 dBµV at 4876.74 MHz in the Vertical polarization, Middle Channel
-4.0 dBµV at 4924.00 MHz in the Horizontal polarization, High Channel
-2.6 dBµV at 351.97 MHz in the Horizontal polarization, Unwanted Emission

5.7 Final Test Result

MP24013, 13dBi Panel Antenna, 30MHz to 25GHz, 3 meters

Indicated			Table	Antenna		Correction Factor			FCC Subpart C		
Freqency	Ampl.	Direction	Height	Polar	Antenna	Cable Loss	Amp.	Corr. Ampl.	Limit	Margin	Mode
MHz	dBµV/m	Degree	Meter	H/V	dBµV/m	dBµV/m	dB	dBµV/m	dBµV/m	dB	
Low Channel											
2411.94	108.5	135	1.0	V	28.1	3.4	30.0	110.0			FUND.
2411.94	115.2	90	1.2	H	28.1	3.4	30.0	116.7			FUND.
4824.13	45.0	90	1.2	H	32.5	4.9	30.0	52.4	54	-1.6	AVG
4824.13	43.2	135	1.0	V	32.5	4.9	30.0	50.6	54	-3.4	AVG
4824.13	54.6	90	1.2	H	32.5	4.9	30.0	62.0	74	-12.0	PEAK
4824.13	50.7	135	1.0	V	32.5	4.9	30.0	58.1	74	-15.9	PEAK
Middle Channel											
2438.26	113.0	90	1.5	H	28.1	3.4	30.0	114.5			FUND
2438.26	109.5	315	2.0	V	28.1	3.4	30.0	111.0			FUND
4876.74	45.3	90	1.5	H	32.5	4.9	30.0	52.7	54	-1.3	AVG
4876.74	43.7	315	2.0	V	32.5	4.9	30.0	51.1	54	-2.9	AVG
4876.74	53.0	90	1.5	H	32.5	4.9	30.0	60.4	74	-13.6	PEAK
4876.74	49.8	315	2.0	V	32.5	4.9	30.0	57.2	74	-16.8	PEAK
High Channel											
2463.60	114.6	270	1.3	H	28.1	3.4	30.0	116.1			FUND
2463.60	108.9	90	1.5	V	28.1	3.4	30.0	110.4			FUND
4924.00	44.8	270	1.3	H	32.5	4.9	30.0	52.2	54	-1.8	AVG
4924.00	43.1	90	1.5	V	32.5	4.9	30.0	50.5	54	-3.5	AVG
4924.00	52.8	270	1.3	H	32.5	4.9	30.0	60.2	74	-13.8	PEAK
4924.00	48.5	90	1.5	V	32.5	4.9	30.0	55.9	74	-18.1	PEAK
Unintentional Emission											
32.01	48.4	135	1.0	V	14.9	0.8	25.0	39.1	40	-0.9	
160.00	52.1	315	1.0	V	12.9	1.8	25.0	41.8	43.5	-1.7	
223.96	54.1	45	1.7	H	11.8	2.2	25.0	43.1	46	-2.9	
351.00	50.0	180	1.3	H	15.5	2.3	25.0	42.8	46	-3.2	
192.02	49.4	270	1.0	V	13.7	2.1	25.0	40.2	43.5	-3.3	
255.96	51.3	225	1.4	H	13.3	2.2	25.0	41.8	46	-4.2	
447.92	44.6	180	1.2	H	16.9	2.9	25.0	39.4	46	-6.6	
127.99	47.7	225	1.2	V	11.9	1.6	25.0	36.1	43.5	-7.4	

MP24018, 18dBi Panel Antenna, 30MHz to 25GHz, 3 meters

Indicated			Table	Antenna		Correction Factor			FCC Subpart C		
Freqency	Ampl.	Direction	Height	Polar	Antenna	Cable Loss	Amp.	Corr. Ampl.	Limit	Margin	Mode
MHz	dBµV/m	Degree	Meter	H/V	dBµV/m	dBµV/m	dB	dBµV/m	dBµV/m	dB	
Low Channel											
2411.94	112.5	135	1.2	V	28.1	3.4	30.0	114.0			FUND.
2411.94	110.0	180	1.5	H	28.1	3.4	30.0	111.5			FUND.
4824.13	43.9	135	1.2	V	32.5	4.9	30.0	51.3	54	-2.7	AVG
4824.13	42.4	180	1.5	H	32.5	4.9	30.0	49.8	54	-4.2	AVG
4824.13	55.6	135	1.2	V	32.5	4.9	30.0	63.0	74	-11.0	PEAK
4824.13	53.1	180	1.5	H	32.5	4.9	30.0	60.5	74	-13.5	PEAK
Middle Channel											
2438.26	109.8	360	1.6	H	28.1	3.4	30.0	111.3			FUND
2438.26	108.7	270	1.6	V	28.1	3.4	30.0	110.2			FUND
4876.74	42.3	360	1.6	H	32.5	4.9	30.0	49.7	54	-4.3	AVG
4876.74	40.0	270	1.6	V	32.5	4.9	30.0	47.4	54	-6.6	AVG
4876.74	50.9	360	1.6	H	32.5	4.9	30.0	58.3	74	-15.7	PEAK
4876.74	48.7	270	1.6	V	32.5	4.9	30.0	56.1	74	-17.9	PEAK
High Channel											
2463.60	108.3	180	1.0	V	28.1	3.4	30.0	109.8			FUND
2463.60	107.8	0	1.0	H	28.1	3.4	30.0	109.3			FUND
4924.00	41.2	0	1.0	H	32.5	4.9	30.0	48.6	54	-5.4	AVG
4924.00	40.3	180	1.0	V	32.5	4.9	30.0	47.7	54	-6.3	AVG
4924.00	51.5	0	1.0	H	32.5	4.9	30.0	58.9	74	-15.1	PEAK
4924.00	49.4	180	1.0	V	32.5	4.9	30.0	56.8	74	-17.2	PEAK
Unintentional Emission											
351.99	50.3	180	1.0	H	15.5	2.3	25.0	43.1	46	-2.9	
223.99	53.9	45	1.5	H	11.8	2.2	25.0	42.9	46	-3.1	
225.96	53.5	225	1.5	H	11.8	2.2	25.0	42.5	46	-3.5	
192.03	47.6	270	1.0	V	13.7	2.1	25.0	38.4	43.5	-5.1	
959.99	38.2	45	1.0	H	23.3	4.3	25.0	40.8	46	-5.2	
575.90	42.6	225	1.0	H	19.3	3.0	25.0	39.9	46	-6.1	
128.00	47.1	45	1.0	V	11.9	1.6	25.0	35.5	43.5	-8.0	

MSO24014 Sectorised antenna, 30MHz to 25GHz, 3 meters

Indicated			Table	Antenna		Correction Factor			FCC Subpart C		
Freqency	Ampl.	Direction	Height	Polar	Antenna	Cable Loss	Amp.	Corr. Ampl.	Limit	Margin	Mode
MHz	dBµV/m	Degree	Meter	H/V	dBµV/m	dBµV/m	dB	dBµV/m	dBµV/m	dB	
Low Channel											
2411.94	117.6	90	2.0	H	28.1	3.4	30.0	119.1			FUND.
2411.94	111.2	45	1.5	V	28.1	3.4	30.0	112.7			FUND.
4824.13	45.2	90	2.0	H	32.5	4.9	30.0	52.6	54	-1.4	AVG
4824.13	42.0	45	1.5	V	32.5	4.9	30.0	49.4	54	-4.6	AVG
4824.13	54.6	90	2.0	H	32.5	4.9	30.0	62.0	74	-12.0	PEAK
4824.13	51.8	45	1.5	V	32.5	4.9	30.0	59.2	74	-14.8	PEAK
Middle Channel											
2438.26	118.2	90	1.7	H	28.1	3.4	30.0	119.7			FUND
2438.26	107.0	45	2.0	V	28.1	3.4	30.0	108.5			FUND
4876.74	45.0	90	1.7	H	32.5	4.9	30.0	52.4	54	-1.6	AVG
4876.74	40.5	45	2.0	V	32.5	4.9	30.0	47.9	54	-6.1	AVG
4876.74	55.1	90	1.7	H	32.5	4.9	30.0	62.5	74	-11.5	PEAK
4876.74	50.5	45	2.0	V	32.5	4.9	30.0	57.9	74	-16.1	PEAK
High Channel											
2463.60	109.4	45	2.0	H	28.1	3.4	30.0	110.9			FUND
2463.60	118.0	270	1.4	V	28.1	3.4	30.0	119.5			FUND
4924.00	44.3	45	2.0	H	32.5	4.9	30.0	51.7	54	-2.3	AVG
4924.00	43.5	270	1.4	V	32.5	4.9	30.0	50.9	54	-3.1	AVG
4924.00	54.6	45	2.0	H	32.5	4.9	30.0	62.0	74	-12.0	PEAK
4924.00	51.0	270	1.4	V	32.5	4.9	30.0	58.4	74	-15.6	PEAK
Unintentional Emission											
255.95	54.2	90	1.2	H	13.3	2.2	25.0	44.7	46	-1.3	
351.98	50.2	360	1.8	H	15.5	2.3	25.0	43.0	46	-3.0	
223.95	53.6	315	1.2	H	11.8	2.2	25.0	42.6	46	-3.4	
192.02	47.4	270	1.0	V	13.7	2.1	25.0	38.2	43.5	-5.3	
127.99	47.8	45	1.0	V	11.9	1.6	25.0	36.2	43.5	-7.3	
575.91	39.3	45	1.0	H	19.3	3.0	25.0	36.6	46	-9.4	
447.91	42.2	45	1.8	H	16.9	2.9	25.0	37.0	46	-9.0	

19dBi Parabolic grid antenna, 30MHz to 25GHz, 3 meters

Indicated			Table	Antenna		Correction Factor			FCC Subpart C		
Freqency	Ampl.	Direction	Height	Polar	Antenna	Cable Loss	Amp.	Corr. Ampl.	Limit	Margin	Mode
MHz	dBµV/m	Degree	Meter	H/V	dBµV/m	dBµV/m	dB	dBµV/m	dBµV/m	dB	
Low Channel											
2411.94	114.5	180	2.0	H	28.1	3.4	30.0	116.0			FUND.
2411.94	112.1	225	1.5	V	28.1	3.4	30.0	113.6			FUND.
4824.13	42.9	225	1.5	V	32.5	4.9	30.0	50.3	54	-3.7	AVG
4824.13	41.8	180	2.0	H	32.5	4.9	30.0	49.2	54	-4.8	AVG
4824.13	55.7	225	1.5	V	32.5	4.9	30.0	63.1	74	-10.9	PEAK
4824.13	52.2	180	2.0	H	32.5	4.9	30.0	59.6	74	-14.4	PEAK
Middle Channel											
2438.26	113.8	90	1.2	H	28.1	3.4	30.0	115.3			FUND
2438.26	112.0	0	1.0	V	28.1	3.4	30.0	113.5			FUND
4876.74	45.8	0	1.0	V	32.5	4.9	30.0	53.2	54	-0.8	AVG
4876.74	44.5	90	1.2	H	32.5	4.9	30.0	51.9	54	-2.1	AVG
4876.74	53.9	0	1.0	V	32.5	4.9	30.0	61.3	74	-12.7	PEAK
4876.74	51.8	90	1.2	H	32.5	4.9	30.0	59.2	74	-14.8	PEAK
High Channel											
2463.60	111.6	270	1.5	H	28.1	3.4	30.0	113.1			FUND
2463.60	109.5	360	1.2	V	28.1	3.4	30.0	111.0			FUND
4924.00	42.6	270	1.5	H	32.5	4.9	30.0	50.0	54	-4.0	AVG
4924.00	41.9	360	1.2	V	32.5	4.9	30.0	49.3	54	-4.7	AVG
4924.00	53.4	270	1.5	H	32.5	4.9	30.0	60.8	74	-13.2	PEAK
4924.00	48.7	360	1.2	V	32.5	4.9	30.0	56.1	74	-17.9	PEAK
Unintentional Emission											
351.97	50.6	180	1.3	H	15.5	2.3	25.0	43.4	46	-2.6	
319.97	50.6	180	1.2	H	15.1	2.3	25.0	43.0	46	-3.0	
223.96	52.5	315	2.0	H	11.8	2.2	25.0	41.5	46	-4.5	
191.99	48.8	45	1.0	V	13.7	2.1	25.0	39.6	43.5	-3.9	
639.91	42.2	315	1.8	H	20.0	3.0	25.0	40.2	46	-5.8	
127.99	47.6	45	1.0	V	11.9	1.6	25.0	36.0	43.5	-7.5	
415.95	43.2	180	1.3	H	16.4	2.6	25.0	37.2	46	-8.8	

6 - POWER DENSITY

6.1 Standard Applicable

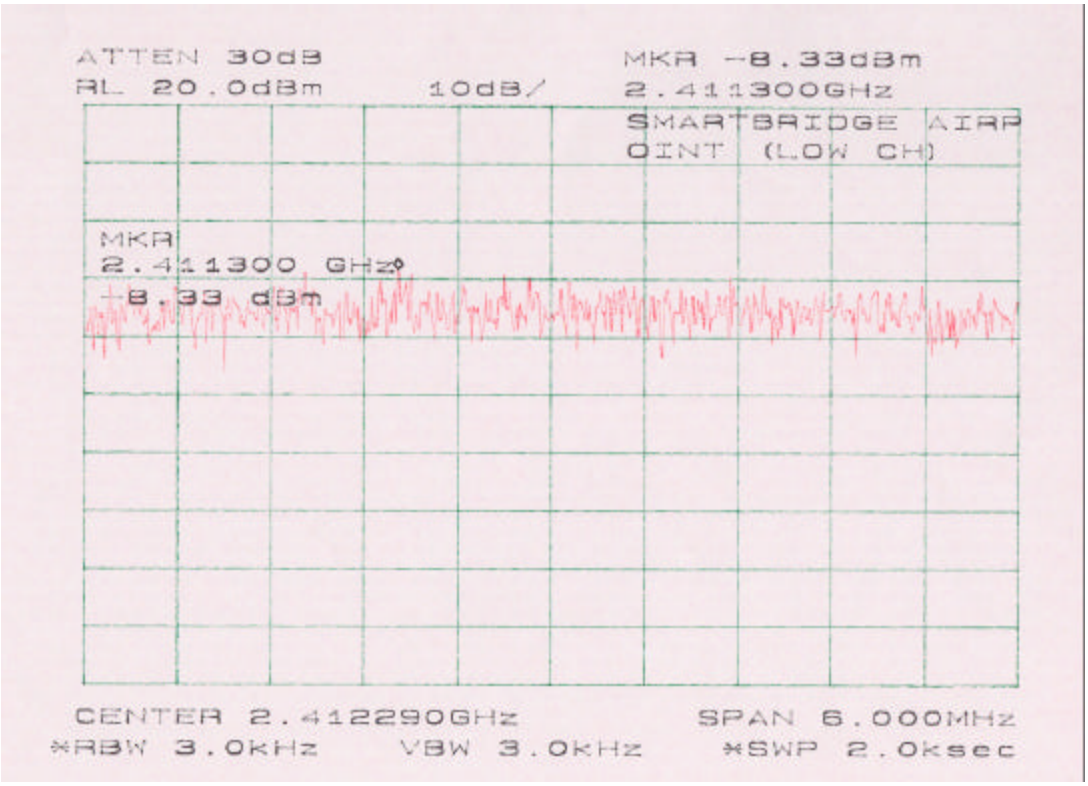
According to §15.247 (d), for direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

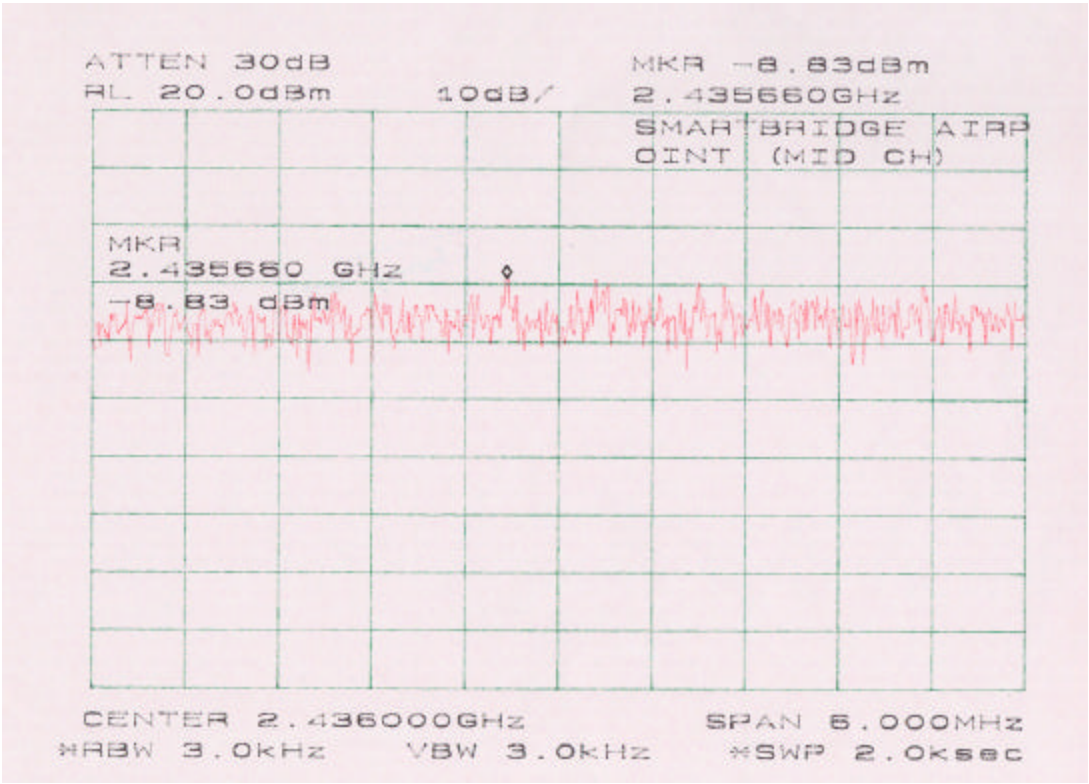
6.2 Measurement Procedure

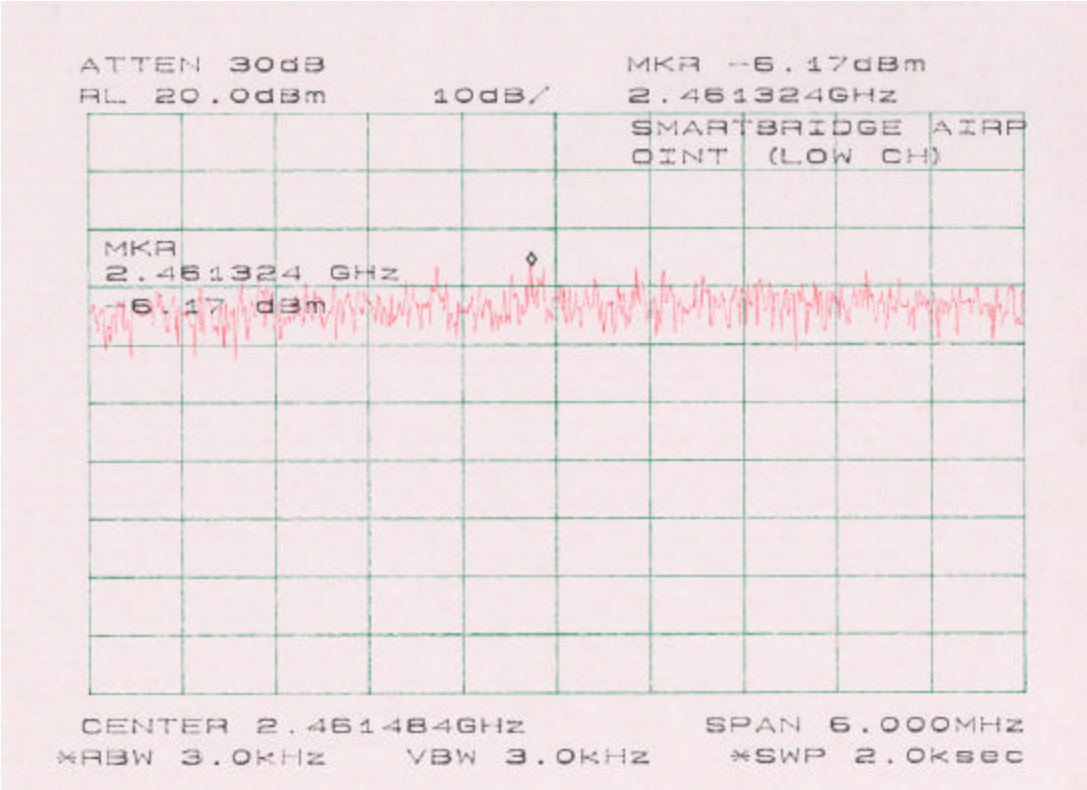
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Adjust the center frequency of SA on any frequency be measured and set SA to six span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
4. Repeat above procedures until all frequencies measured were complete.

6.3 Test Results

The plot(s) of power density was presented hereinafter as reference.


ATTEN 30dB
RL 20.0dBm
10dB/
MKR -8.33dBm
2.411300GHz
SMARTBRIDGE AIRP
OINT (LOW CH)
MKR
2.411300 GHz
-8.33 dBm
CENTER 2.412290GHz
SPAN 6.000MHz
*RBW 3.0kHz
VBW 3.0kHz
*SWP 2.0ksec


ATTEN 30dB
RL 20.0dBm
10dB/
MKR -8.83dBm
2.435660GHz
SMART BRIDGE AIRP
OINT (MID CH)
MKR
2.435660 GHz
-8.83 dBm
CENTER 2.436000GHz
SPAN 6.000MHz
*RBW 3.0kHz
VBW 3.0kHz
*SWP 2.0ksec


ATTEN 30dB
RL 20.0dBm
10dB/
MKR -6.17dBm
2.461324GHz
SMARTBRIDGE AIRP
OINT (LOW CH)
MKR
2.461324 GHz
-6.17 dBm
CENTER 2.461484GHz
SPAN 6.000MHz
*RBW 3.0kHz
VBW 3.0kHz
*SWP 2.0ksec

7 - RF EXPOSURE

According to §15.247(b)(4) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

According to §1.1310 and §2.1093 RF exposure is calculated.

Limits for Maximum Permissive Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minute)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-15000	/	/	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

MPE Prediction

Predication of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$S = PG/4\pi R^2$

Where: S = power density
P = power input to antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

Maximum peak output power at antenna input terminal: 20.00 (dBm)
Maximum peak output power at antenna input terminal: 100 (mW)
Prediction distance: 20 (cm)
Predication frequency: 2400 (MHz)

1. MP24013 Panel Antenna, Antenna Gain (typical): 13 (dBi)
   Maximum antenna gain: 19.95 (numeric)
   Power density at predication frequency at 20 cm: 0.40 (mW/cm^2)
   MPE distance at maximum power density (1 mW/cm^2): 12.60 cm
2. MP24018 Panel Antenna, Antenna Gain (typical): 18 (dBi)
   Maximum antenna gain: 63.10 (numeric)
   Power density at predication frequency at 20 cm: 1.26 (mW/cm^2)
   MPE distance at maximum power density (1 mW/cm^2) : 22.41 cm
3. MS02401490 Sectorised Antenna, Antenna Gain (typical): 14 (dBi)
   Maximum antenna gain: 25.12 (numeric)
   Power density at predication frequency at 20 cm : 0.50 (mW/cm^2)
   MPE distance at maximum power density (1 mW/cm^2): 14.14 cm
4. Parabolic Grid Antenna, Antenna Gain (typical): 19 (dBi)
   Maximum antenna gain: 63.10 (numeric)
   Power density at predication frequency at 20 cm: 1.26 (mW/cm^2)
   MPE distance at maximum power density (1 mW/cm^2): 22.41 cm

MPE limit for uncontrolled exposure at prediction frequency: 1 (mW/cm^2)

Test Result

The predicted power density level and MPE calculated distance are as following:

1. MP24013, 13 dBi Panel Antenna: predicted power density level at 20 cm is 0.40 mW/cm², MPE distance at maximum power density (1mW/cm^2) is 12.6cm
2. MP24018, 18 dBi Panel Antenna: predicted power density level at 20 cm is 1.26 mW/cm², MPE distance at maximum power density (1mW/cm^2) is 22.41cm
3. MS02401490, 14 dBi Sectorised Antenna: predicted power density level at 20 cm is 0.50 mW/cm², MPE distance at maximum power density (1mW/cm^2) is 14.14cm
4. 19 dBi Parabolic Grid Antenna: predicted power density level at 20 cm is 1.26 mW/cm², MPE distance at maximum power density (1mW/cm^2) is 22.41 cm.

These are below the uncontrolled exposure limit of 1mW/cm² at 2400 MHz.

The EUT is used at least 20cm away from user's body, so it is determined as mobile equipment.