RF MEASUREMENT REPORT

CERIFICATION OF COMPLIANCE

PRODUCT	:	Thermal Printer
MODEL/TYPE NO	:	PORTI-W40
FCC ID	:	QDDPORTI-W40
TRADE NAME	:	WOOSIM SYSTEMS INC.
APPLICANT	:	WOOSIM SYSTEMS INC. #501, Daerung Technotow 3th, 448, Gasan-Dong, Geumchun-Gu, Seoul, Korea Attn. : Mi-Kyung LEE / assistant
FCC CLASSIFICATION	:	DTS Part 15 Digital Transmission System
FCC RULE PART(S)	:	FCC Part 15 Subpart C Section 15.247
FCC PROCEDURE	:	Certification
DATES OF TEST	:	May 25 to June 14, 2006
DATES OF ISSUE	:	June 14, 2006
TEST REPORT No.	:	BWS-06-RF-0015
TEST LAB.	:	BWS TECH Inc. (Registration No. : 553281)

This Digital Transmission System has been tested in accordance with the measurement procedures specified in ANSI C63.4-2000 at the BWS TECH/EMC Test Laboratory and has been shown to be complied with the electromagnetic radiated emission limits specified in FCC Rule Part15 Subpart C Section 15.247.
I attest to the accuracy of data. All measurement herein was performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them. The results of testing in this report apply to the product/system, which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

06/14/2006
(Date)

Tested by EunJung, Yang

06/14/2006
(Date)

Reviewed by TaeHyun, Nam

BWS TECH Inc.
www.bws.co.kr
#611-1 Maesan-Ri, Mohyeon-Myeon, Cheoin-Gu, Yongin-Si, Gyeonggi-Do 449-853, Korea
TEL: +82 31 333 5997 FAX: +82 31 333 0017

FCC TEST REPORT

Scope – *Measurement and determination of electromagnetic emission(EME) of radio frequency devices including intentional radiators and/or unintentional radiators for compliance with the technical rules and regulations of the U.S Federal Communications Commission(FCC)*

1. General Information

Applicant

Company Name	:	WOOSIM SYSTEMS INC.
Company Address	:	#901 Dae Ryung Technotown VI 493-6 Gasan-Dong, Keumcheon-Gu, Seoul, Korea
Phone/Fax	:	Phone : 82-02-2107-3702 Fax : 82-02-2107-3707

Manufacturer

Company Name	:	WOOSIM SYSTEMS INC.
Company Address	:	#901 Dae Ryung Technotown VI 493-6 Gasan-Dong, Keumcheon-Gu, Seoul, Korea
Phone/Fax	:	Phone : 82-02-2107-3702 Fax : 82-02-2107-3707

- **EUT Type** : Thermal Printer
- **Model Number** : PORTI-W40
- **FCC Identifier** : QDDPORTI-W40
- **S/N** : Prototype
- **Freq. Range** : 2400MHz ~ 2483.5MHz
- **Number of Channels** : 79
- **Modulation Method** : FHSS (Frequency Hopping Spread Spectrum)
- **FCC Rule Part(s)** : Part 15 Subpart C Section 15.247
- **Test Procedure** : ANSI C63.4-2000
- **Dates of Tests** : May 25 to June 14, 2006
- **Place of Tests** : BWS TECH Inc.
  EMC Testing Lab (FCC Registration Number : 553281)
  #611-1 Maesan-Ri, Mohyeon-Myeon, Cheoin-Gu, Yongin-Si, Gyeonggi-Do 449-853, Korea
  TEL: +82 31 333 5997 FAX: +82 31 333 0017
- **Test Report No.** : BWS-06-RF-0015

2. Description of Test Facility

The measurement for radiated emission test were practiced at the open area test site of BWS TECH Inc. Measurement for conducted emission test were practiced at the semi EMC Anechoic Chamber test site of BWS TECH Inc. facility located at #611-1 Maesan-Ri, Mohyeon-Myeon, Cheoin-Gu, Yongin-Si, Gyeonggi-Do 449-853, Korea. The site is constructed in conformance with the requirements of the ANSI C63.4-2000 and CISPR Publication 16. The BWS TECH measurement facility has been filed to the Commission with the FCC for 3 and 10-meter site configurations. Detailed description of test facility was found to be in compliance with the requirements of Section 2.948 FCC Rules according to the ANSI C63.4-1992 and registered to the Federal Communications Commission (Registration Number : 553281).

The measurement procedure described in American National Standard for Method of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C.63.4-2000) was used in determining radiated emissions from the WOOSIM SYSTEMS INC. Model : PORTI-W40.

3. Product Information

3.1 Equipment Description

The Equipment Under Test (EUT) is RF transmitter by the WOOSIM SYSTEMS INC. Model : PORTI-W40. (FCC ID : QDDPORTI-W40).
The PORTI-W40 is suitable designed for use with a growing variety of mobile devices. IrDA/Serial or Bluetooth/Serial interfaces make the PORTI-W40 the perfect comrade for applications such as point of transaction warehousing, distribution, point of sales, hospitality, gaming and healthcare.

3.2 General Specification

Printing method	Direct thermal line printing	
Characters per line	92cpl	
Character size	Eng. : 9*24dots, 12*24dots Kor. : 16*24dots, [24*24dots]	
Resolution	203dpi, 8dots/mm	
Print width	4-inch (104mm, 832dots)	
Printing speed	40mm / sec	
Dimensions	138 * 88.5 * 45.2 mm (Standard model)	
Weight	446g (Including battery & roll paper)	
Interface	Serial(RS-232C), IrDA Ver1.0 (SIR) (Standard Model) Bluetooth(option)	
Paper supplied	Thermal roll paper (113mm wide, 38ø)	
Barcode supplied	PDF417(2-dimension), Code128, Code39, I2/5, Code93 UPC, EAN, KAN, JAN, CODABAR	
Receive buffer size	10K bytes	
Note	Printing speed may be slower, depending on the data transmission speed and the combination of control commands.	
Battery	Rechargeable 7.4V DC, 1400mAh(Li-ion)	
Battery duration	1 hour continuous printing	
AC adapter	Input (100~250VAC, 50~60Hz) Output(8.4VDC/0.8A), 4hours full charge time	
Environment Conditions	Temperature	-10 °C ~ 40 °C (operating) -10 °C ~ 70 °C (storage)
	Humidity	30% - 80% (operating) 10% - 90% (storage)
MCBF (Mean Cycle Between failure)	Mechanical	37,000,000 lines
	Head	Approximately 50 Km

4. Description of Tests

4.1 Conducted Emission Measurement

Conducted emissions measurements were made in accordance with section 11, "Measurement of Information Technology Equipment" of ANSI C63.4-2000. The measurement were performed over the frequency range of 0.15MHz to 30MHz using a 50Ω/50uH LISN as the input transducer to a Spectrum Analyzer or a Field Intensity Meter. The measurements were made with the detector set for "Peak" amplitude within a bandwidth of 10KHz or for "quasi-peak" within a bandwidth of 9KHz.

The line-conducted emission test is conducted inside a shielded anechoic chamber room with 1m x 1.5m x 0.8m wooden table, which is placed 40cm away from the vertical wall, and 1.5m away from the sidewall of the chamber room. Two LISNs are bonded to the shielded room. The EUT is powered from the PMM LISN and the support equipment is powered from the LISN. Power to the LISNs is filtered by a noise cut power line filters. All electrical cables are shielded by braided tinned steel tubing with inner ϕ 1.2cm. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and these supply lines will be connected to the LISN. All interconnecting cables more than 1m were shortened by non-inductive bundling (serpentine fashion) to a 1m length. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the Spectrum Analyzer to determine the frequency producing the max. Emission from the EUT. The frequency producing the max. Level was reexamined using the detector function set to the CISPR Quasi-Peak mode by manual, after scanned by automatic Peak mode from 0.45 to 30MHz. The bandwidth of the Spectrum Analyzer was set to 9kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was maximized by switching power lines, varying the mode of operation or resolution, clock or data exchange speed, if applicable, whichever determined the worst-case emission. Each emission reported was calibrated using self-calibrating mode.

Photographs of the worst-case emission can be seen in photographs of conducted emission test setup.

4.2 Radiated Emission Measurement

Preliminary measurements were made at indoors 3-meter semi EMC Anechoic Chamber using broadband antennas, broadband amplifier, and spectrum analyzer to determine the emission frequencies producing the maximum EME.

Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configurations, mode of operation, turntable azimuth with respect to the antenna were noted for each frequency found. The spectrum was scanned from 30 to 1000MHz using bi-log antenna and above 1000MHz, linearly polarized double ridge horn antennas were used. Above 1GHz, linearly polarized double ridge horn antennas were used. The measurements were performed with three frequencies, which were selected as bottom, middle, and top frequency in the operating band. Emission level from the EUT with various configurations was examined on the spectrum analyzer connected with the RF amplifier and plotted graphically.

Final measurements were made outdoors open site at 3-meter test range using biconical and log periodic, Horn antenna. The output from the antenna was connected, via a preselector or a preamplifier, to the input of the EMI Measuring Receiver and Spectrum analyzer (for above 25GHz). The detector function was set to the quasi-peak or peak mode as appropriate. The measurement bandwidth on the Field strength receiver was set to at least 120kHz (1MHz for measurement above 1GHz), with all post-detector filtering no less than 10 times the measurement bandwidth. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition.

Each frequency found during preliminary measurement was examined and investigated as the same set up and configuration which produced the maximum emission The EUT, support equipment and interconnecting cables were configured to the set-up producing the maximum emission for the frequency and were placed on top of a 0.8-meter high non-metallic 1m x 1.5 meter table. The turntable containing the system was rotated and the antenna height was varied 1 to 4 meters and stopped at the azimuth or height producing the maximum emission.

Varying the mode of operating frequencies of the EUT maximized each emission. The system was tested in all the three orthogonal planes and changing the polarity of the antenna. The worst-case emissions are recorded in the data tables. If necessary, the radiated emission measurement could be performed at a closer distance to ensure higher accuracy and the results were extrapolated to the specified distance using an inverse linear distance extrapolation factor (20dB/decade) as per section 15.31(f).

5. Test Condition

5.1 Test Configuration

The device was configured for testing in a typical fashion (as a customer would normally use it). During the tests, the EUT and the supported equipments were installed to meet FCC requirement and operated in a manner, which tends to maximize its emission level in a typical application.

Radiated Emission Test

Preliminary radiated emission tests were conducted using the procedure in ANSI C63.4/2000 Clause 8.3.1.1 to determine the worst operating condition. Final radiated emission tests were measured at 3-meter open field test site. To complete the test configuration required by the FCC, the EUT was tested in all three orthogonal planes.

5.2 EUT operation

EUT was tested according to the operation modes provided by the specifications given by the manufacturer, and reported the worst emissions.

6. TEST RESULTS

Summary of Test Results

The measurement results were obtained with the EUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum emission of the EUT are reported.

APPLIED STANDARD : 47 CFR Part 15, Subpart C			
FCC Rule	**Description of Test**	**Limit**	**Result**
15.207	Power Line Conducted Emission	Various	Pass
15.247(a)	20dB Bandwidth	Less than 1MHz	Pass
15.247(a)	Average time of occupancy	Less than 0.4 second	Pass
15.247(b)	Maximum Peak Output Power	Less than 30dBm	Pass
15.247(c)	Conducted Emission & 100kHz Bandwidth of Frequency Band Edges	More than 20dBc	Pass
15.247(c) 15.209	Radiated Emission	Various	Pass
15.247(a)	Minimum Hopping Channels	More than 75 channels	Pass
15.203	Antenna Requirement	Less than 6dBi	Pass

The data collected shows that the product complies with technical requirements of the Part 15.247 of the FCC Rules.

Note : Modification to EUT

The device tested is not modified anything, mechanical or circuits to improve EMI status during a measurement. No EMI suppression device(s) was added and/or modified.

6.1 Power Line Conducted Emission

Frequency Range of Test	:	150 kHz to 30 MHz
Test Standard	:	FCC Part15 Subpart C Section 15.207
Operating Condition	:	The EUT was operated at transmitting condition continuously during the test.
Temperature/Humidity	:	21 °C/ 51 %

The following table shows the highest levels of conducted emissions on both phase of Hot and Neutral line.

Power Line Conducted Emission Test Data

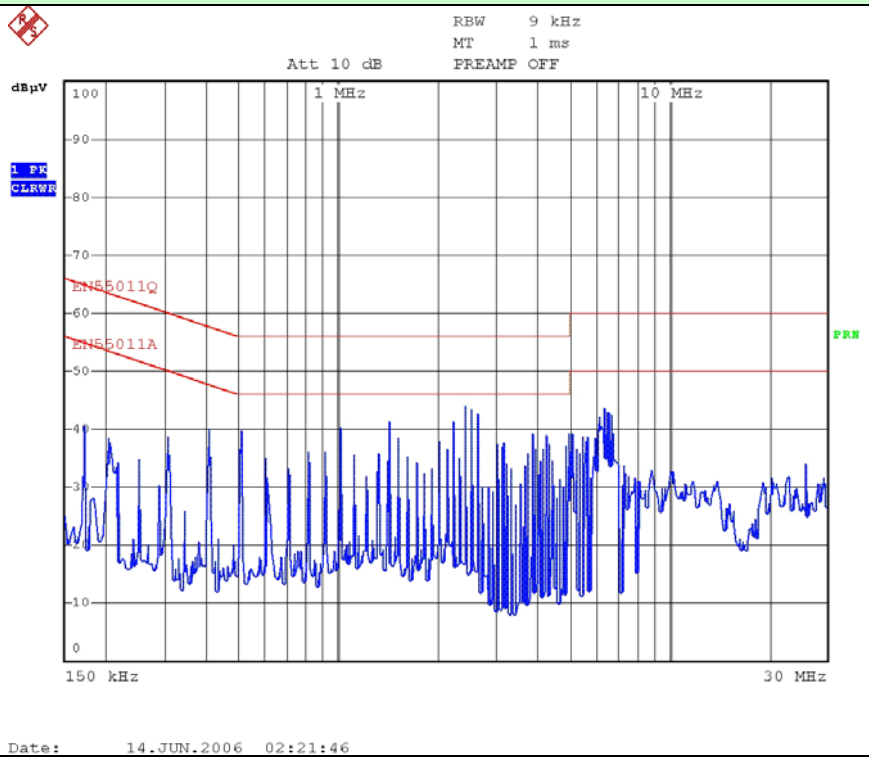
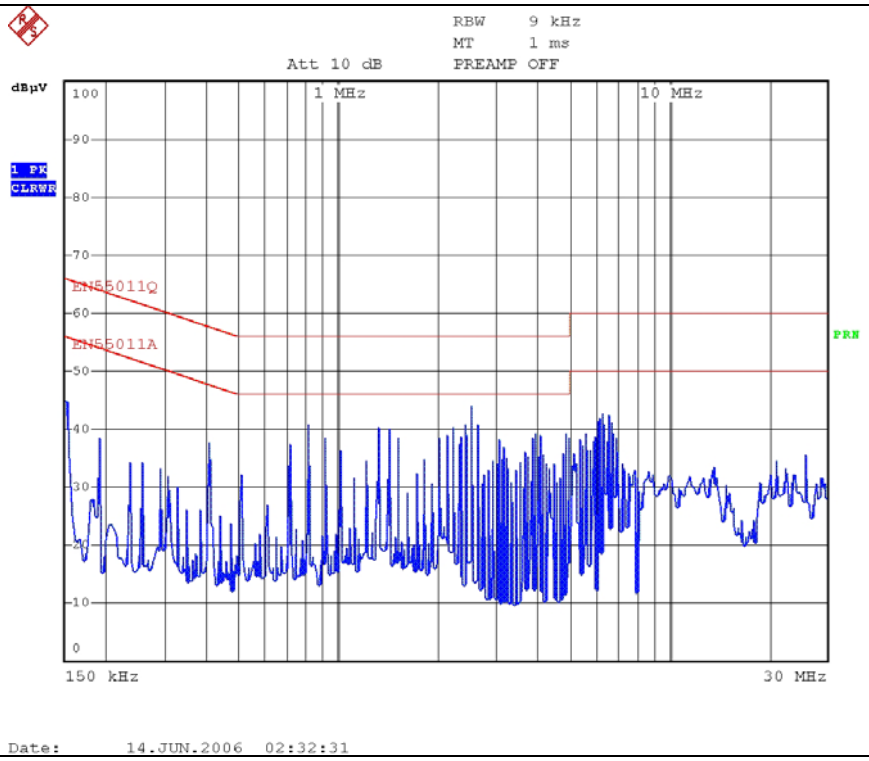
Detector Mode ; CISPR Quasi Peak mode (6dB Bandwidth : 9kHz)

Freq [MHz]	Correction		Phase [H/N]	Quasi-Peak Mode				Average Mode			
	AMN	C.L		Limit	Reading	Emission Level	Margin	Limit	Reading	Emission Level	Margin
				[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]
0.154	0.06	0.03	N	66.00	44.64	44.73	21.27	56.00	-	-	-
0.202	0.07	0.10	H	64.60	38.49	38.66	25.94	54.60	-	-	-
0.250	0.07	0.16	H	63.10	34.78	35.01	28.09	53.10	-	-	-
0.306	0.08	0.22	H	61.60	38.76	39.06	22.54	51.60	-	-	-
0.346	0.08	0.22	N	56.00	25.99	26.29	29.71	46.00	-	-	-
0.406	0.08	0.26	H		40.13	40.47	15.53		-	-	-
0.510	0.07	0.30	H		39.63	40.00	16.00		-	-	-
1.014	0.04	0.40	H		39.39	39.83	16.17		-	-	-
1.426	0.03	0.46	H		41.27	41.76	18.24		-	-	-
2.442	0.03	0.57	H		43.92	44.52	15.48		-	-	-
3.154	0.04	0.63	H		37.65	38.32	21.68		-	-	-
3.862	0.03	0.74	H		39.22	39.99	20.01		-	-	-
5.082	0.05	0.87	H	60.00	39.21	40.13	19.87	50.00	-	-	-
6.410	0.05	0.93	H		43.72	44.70	15.30		-	-	-
8.850	0.06	1.00	H		32.83	33.89	26.11		-	-	-
14.046	0.07	1.22	N		31.63	32.92	27.08		-	-	-
19.130	0.07	1.35	H		30.87	32.29	27.71		-	-	-
22.674	0.08	1.45	N		32.50	34.03	25.97		-	-	-

NOTES :

1. *H : Hot Line , N :Neutral Line*
2. *Emission Level = Reading + Correction Factor*
3. *Measurements were performed at the AC Power Inlet of the host PC with the EUT plugged in the frequency band of 150kHz ~30MHz*

Plots of Power Line Conducted Emission

Mode	Plot
Hot	
Neutral	

6.2 20 dB Bandwidth

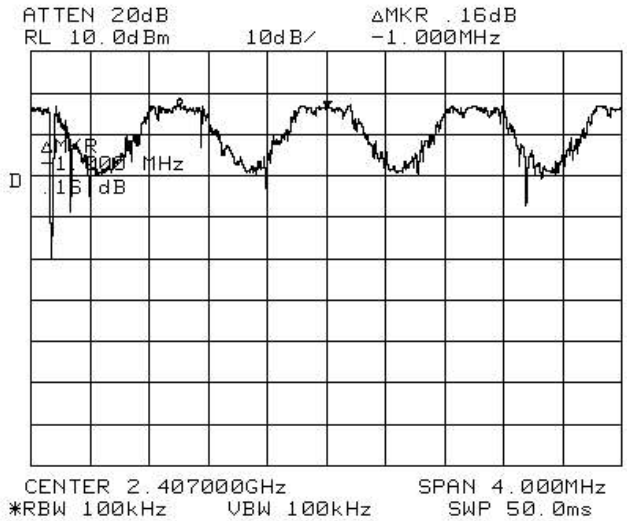
Test Standard	:	FCC Part15 Subpart C Section 15.247(a)(1)
Operating Condition	:	The EUT was operated at transmitting condition continuously during the test.
Temperature/Humidity	:	26 °C/ 69 %

20 dB Bandwidth Test Data

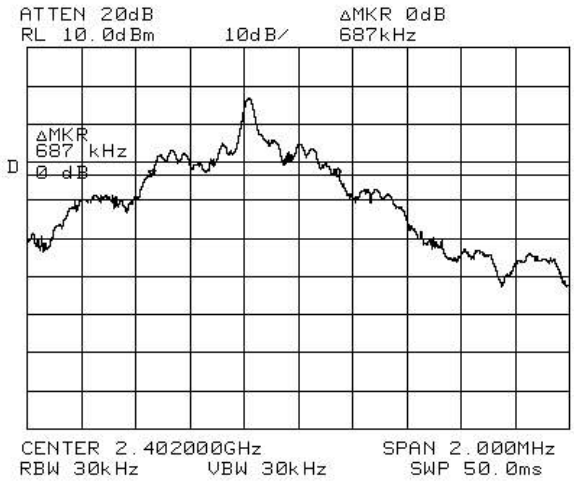
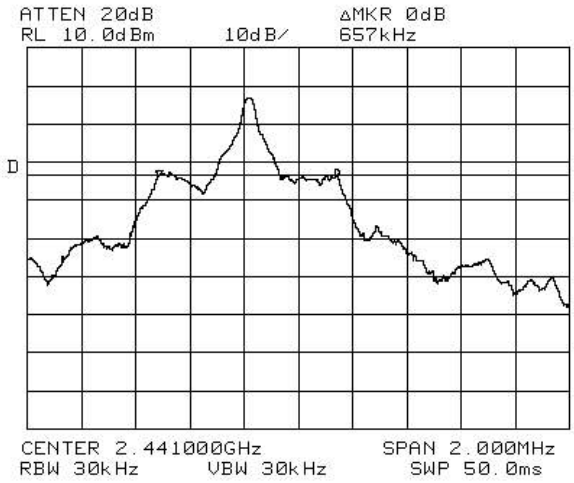
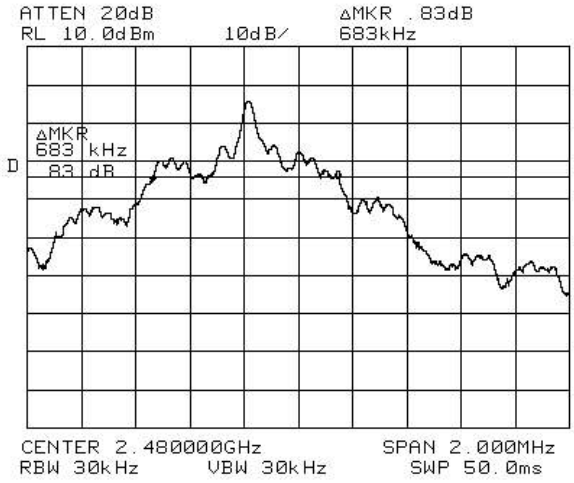
Frequency (MHz)	20 dB Bandwidth (kHz)	Limit
2402	687	Less than 1 MHz
2441	657	
2480	683	

NOTES :

1. *Measure conducted 20 dB bandwidth of relevant channel using Spectrum Analyzer.*
2. *RBW 30kHz, VBW 30kHz, Sweep Time 50ms.*
3. *20 dB less than both bandwidth than maximum peak power.*



Plots of 20 dB Bandwidth

Frequency	20 dB Bandwidth measured conducted
2402 MHz 687 kHz	
2441 MHz 657 kHz	
2480 MHz 683 kHz	

6.3 Average time of occupancy

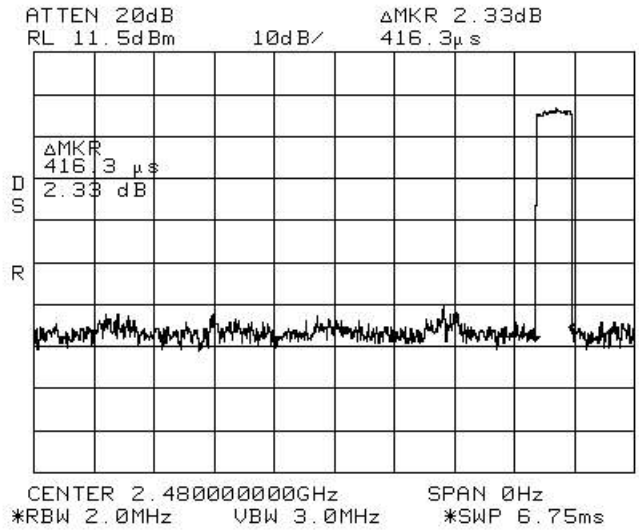
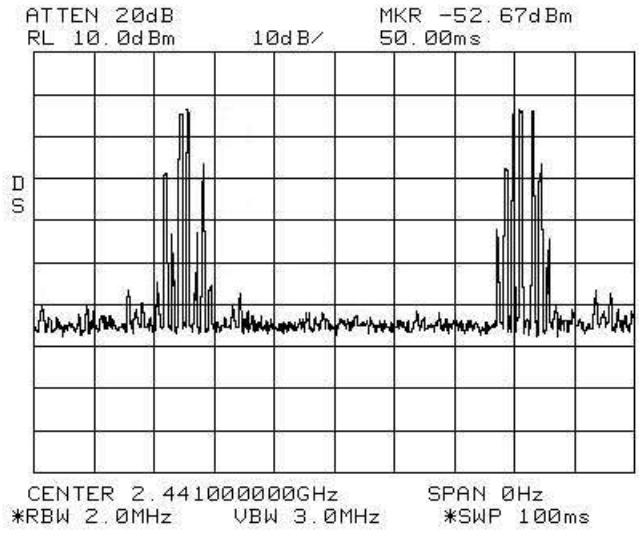
Test Standard	:	FCC Part15 Subpart C Section 15.247(a)(1)(iii)
Operating Condition	:	The EUT was operated in normal operation.
Temperature/Humidity	:	26 °C/ 69 %

The average time of occupancy is 0.416(ms)×2×316 = 263 ms

NOTES :

1. Average 0.4 seconds maximum occupancy in 30 seconds, 2400 ~ 2483.5 MHz.

*2. '316' indicates 31.6 seconds period. (100ms * 316 = 31.6 seconds period.)*

Duration	
In 100 ms period	

6.4 Maximum Peak Output Power

Test Standard	:	FCC Part15 Subpart C Section 15.247(b)(1)
Operating Condition	:	The EUT was operated at transmitting condition continuously during the test.
Temperature/Humidity	:	22.0 °C/ 41 %

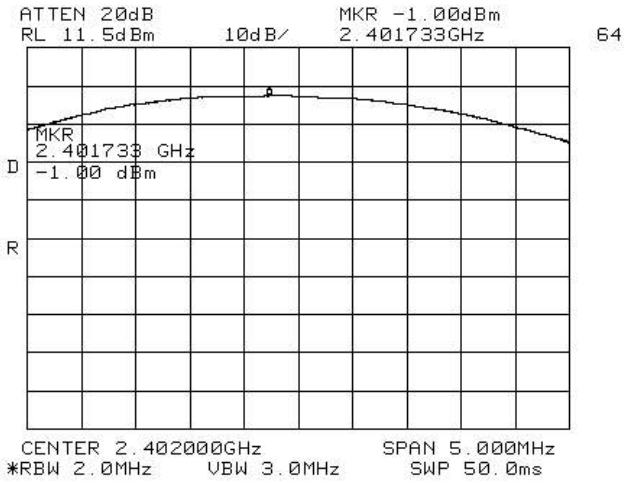
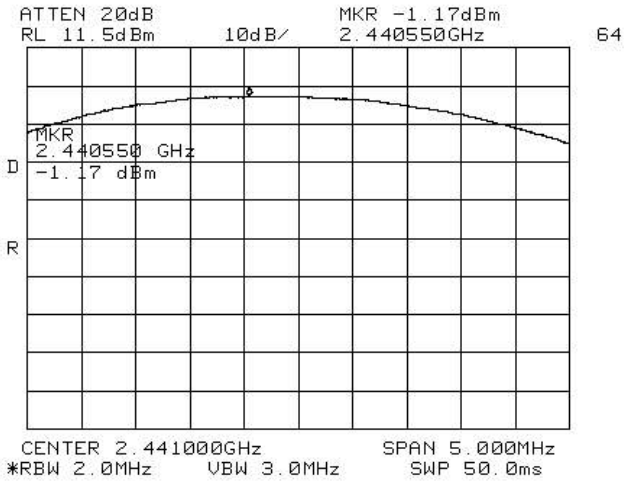
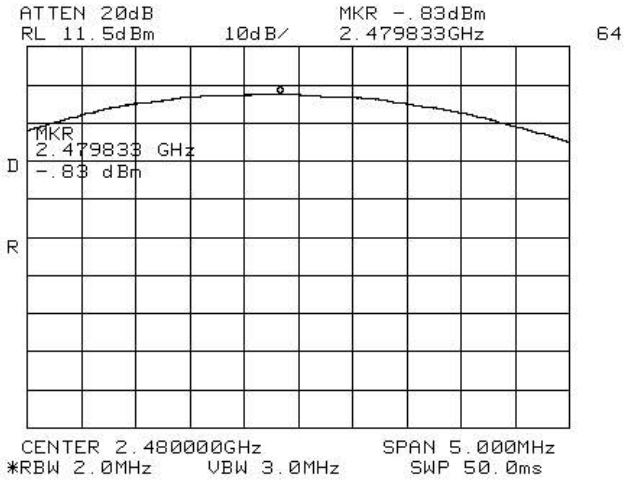
Maximum Peak Output Power Test Data

Frequency (MHz)	Maximum Peak Output Power (dBm)	Limit
2402	-1.00	Less than 30 dBm
2440	-1.17	
2480	-0.83	

NOTES :

1. *Measure conducted Maximum Peak Output of relevant channel using Spectrum analyzer.*
2. *RBW 2 MHz, VBW 3 MHz, Sweep Time 4ms.*

Plots of Maximum Peak Output Power

Frequency	Maximum Peak Output Power measured conducted
2402 MHz -1.00 dBm	
2441 MHz -1.17 dBm	
2480 MHz -0.83 dBm	

6.5 Conducted Emission

& 100 kHz Bandwidth of Frequency Band Edges

Test Standard	:	FCC Part15 Subpart C Section 15.247(c)
Operating Condition	:	The EUT was operated at transmitting condition continuously during the test.
Temperature/Humidity	:	22.0 °C/ 41 %

6.5.1 Conducted Emission Test

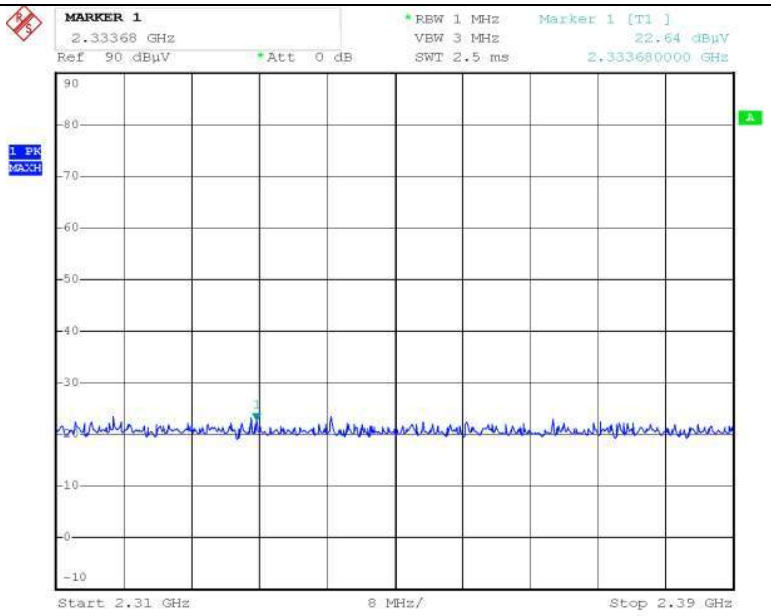
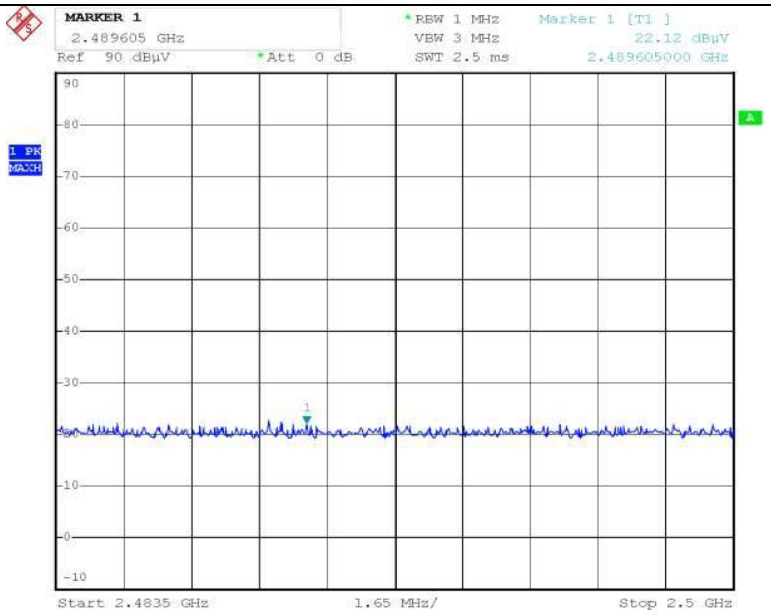
Result : Please refer to the attached Plots for details :

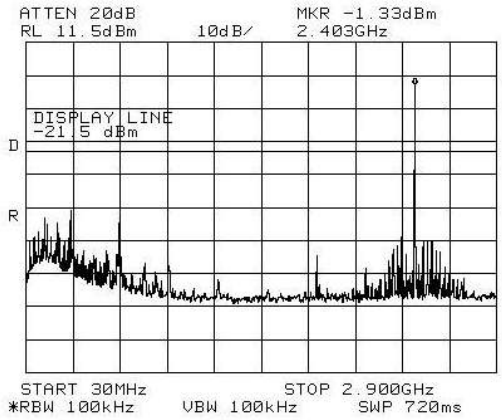
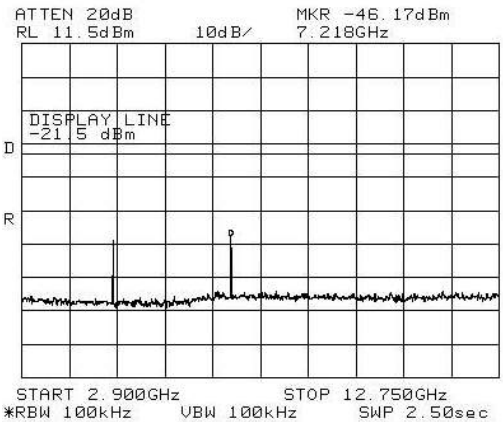
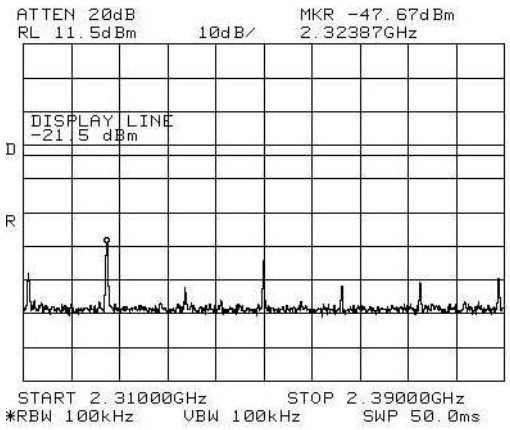
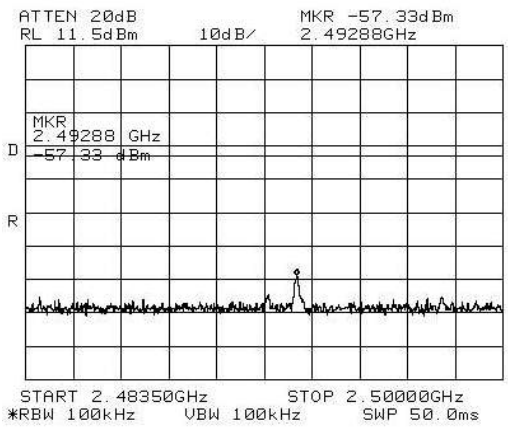
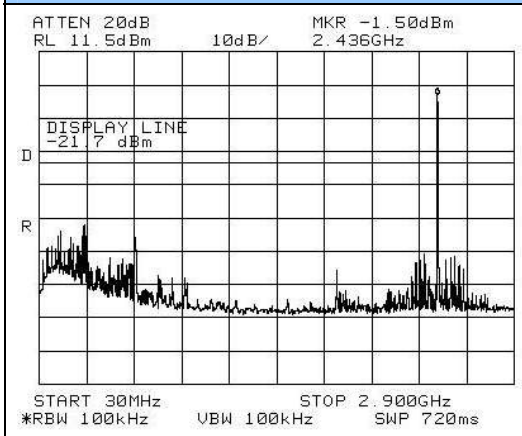
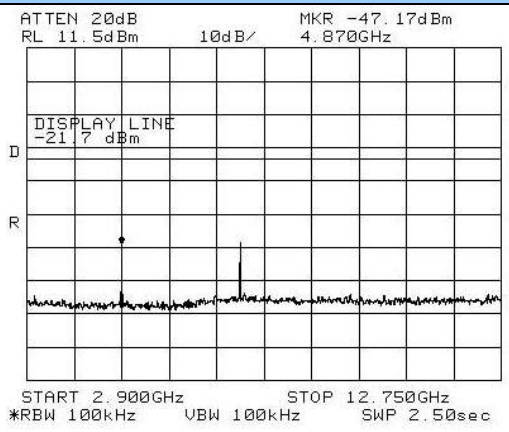
2402 MHz	Plots 6.6.1.1 ~ 6.6.1.6
2441 MHz	Plots 6.6.2.1 ~ 6.6.2.5
2480 MHz	Plots 6.6.3.1 ~ 6.6.3.6

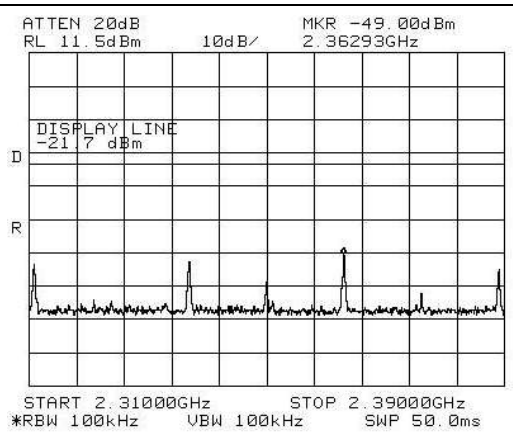
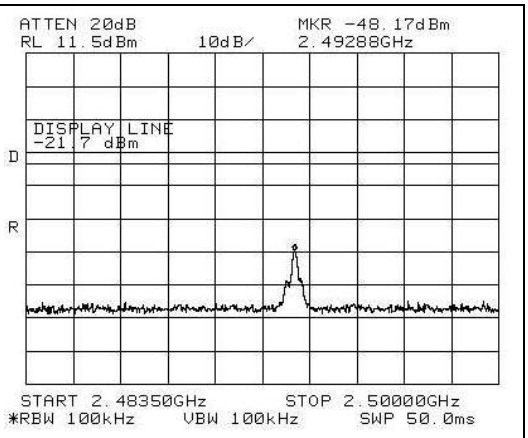
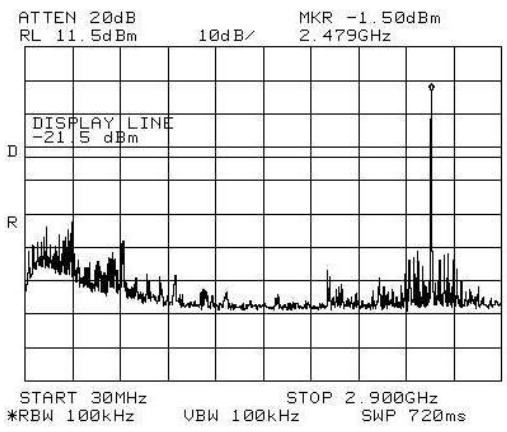
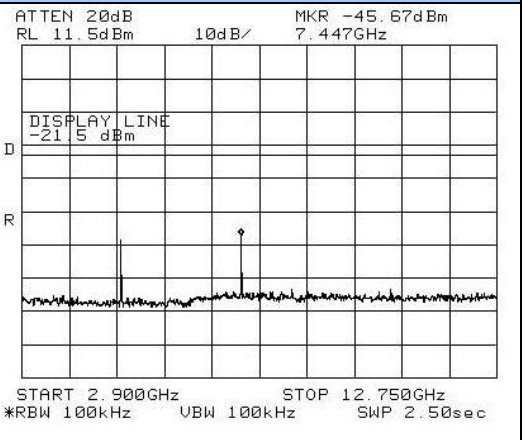
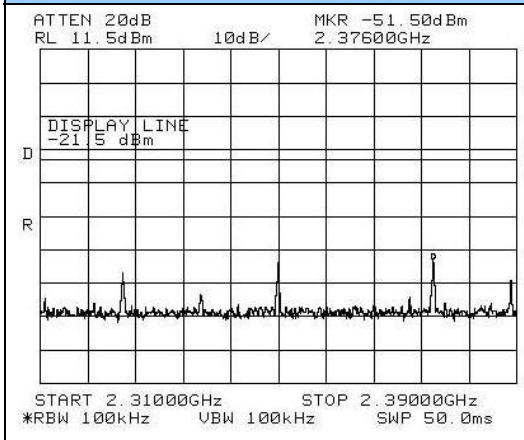
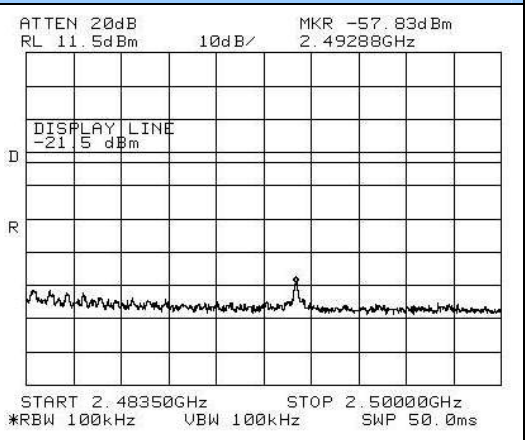
6.5.2 100 kHz Bandwidth of Frequency Band Edges

The test was performed to make a direct field strength measurement at the bandedge frequencies.
Radiated emissions which fall in the restricted bands, as defined in Section 15.205, must also comply with the radiated emission limits specified in Section 15.209. There is a restricted band starting at 2483.5 MHz and another restricted band from 2310 - 2390 MHz.

All emissions below noise floor of 20 dBuV/m.

2402 MHz	
2480 MHz	

2402 MHz	**30 MHz ~ 2.900 GHz**	**2.900 GHz ~ 12.75 GHz**
		
	Plot 6.6.1.1	**Plot 6.6.1.2**
	2.310 GHz ~ 2.390 GHz	**2.4835 GHz ~ 2.5 GHz**
		
	Plot 6.6.1.3	**Plot 6.6.1.4**
2441 MHz	**30 MHz ~ 2.900 GHz**	**2.900 GHz ~ 12.75 GHz**
		
	Plot 6.6.2.1	**Plot 6.6.2.2**
	2.39 GHz ~ 2.40 GHz	**2.4835 GHz ~ 2.5 GHz**

2441 MHz		
	Plot 6.6.2.3	**Plot 6.6.2.4**
2480 MHz	**30 MHz ~ 2.31 GHz**	**2.31 GHz ~ 2.39 GHz**
		
	Plot 6.6.3.1	**Plot 6.6.3.2**
	2.39 GHz ~ 2.40 GHz	**2.4835 GHz ~ 2.5 GHz**
		
	Plot 6.6.3.3	**Plot 6.6.3.4**

6.6 Radiated Emission

Test Standard	:	FCC Part15 Subpart C Section 15.247(c)
Operating Condition	:	The EUT was operated at transmitting condition continuously during the test.
Temperature/Humidity	:	22.0 °C/ 41 %

Radiated Emission Test Data(below 1 GHz)

Frequency [MHz]	Frequency [MHz]	Reading [dBμV]	Polarization [*H/**V]	A.F [dB]	C.L [dB]	Limit [dBμV/m]	Emission Level [dBμV/m]	Margin [dB]
2402.00	240.52	17.32	H	12.14	2.82	46.00	32.28	-13.72
	245.14	20.42	H	12.50	2.85	46.00	35.77	-10.23
	258.10	23.94	H	12.72	2.89	46.00	39.55	-6.45
2480.00	232.09	19.74	H	12.13	2.81	46.00	34.68	-11.32
	245.20	21.20	H	12.50	2.85	46.00	36.55	-9.45
	258.05	25.54	H	12.72	2.89	46.00	41.15	-4.85

Radiated Emission Test Data(above 1 GHz)

All emissions below noise floor of 20 dBuV/m.

NOTES :

1. *All modes of operation were investigated and the worst-case emissions are reported.*
2. *AF = Antenna Factor CL = Cable Loss F/S = Field Strength*
3. *POL H = Horizontal POL V = Vertical*

6.7 Minimum Hopping Channels

Test Standard	:	FCC Part15 Subpart C Section 15.247(a)(1)
Operating Condition	:	The EUT was operated at transmitting condition continuously during the test.
Temperature/Humidity	:	22.0 °C/ 41 %

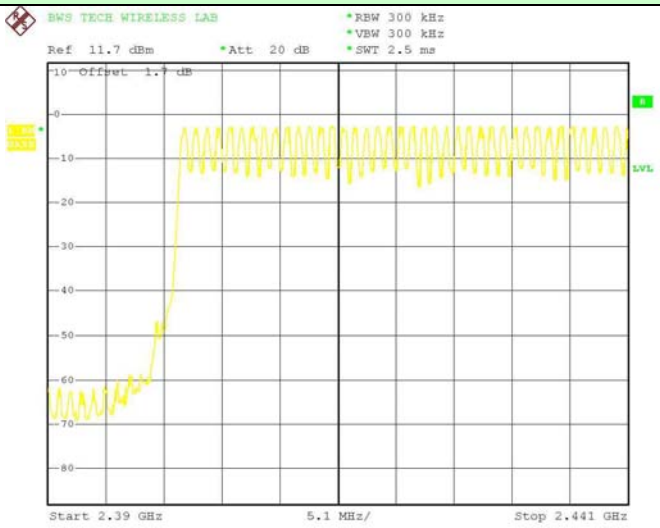
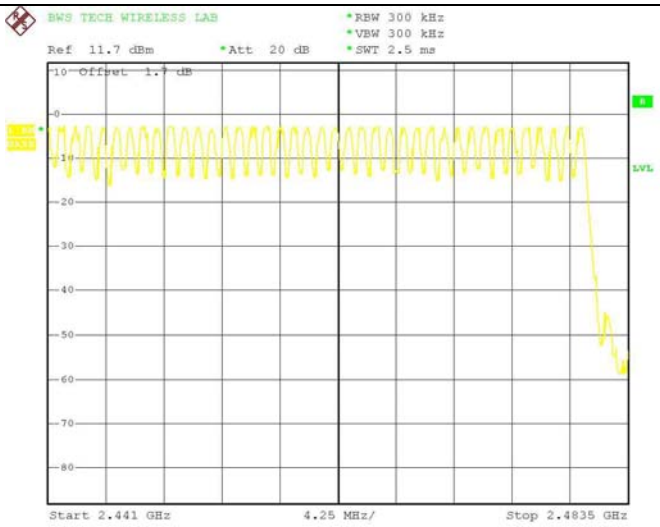
Minimum Hopping Channels Test Data

Number of hopping channels	Limit
79	More than 75 channels

NOTES :

1. *Minimum Hopping Channels using Spectrum Analyzer.*
2. *With the analyzer set to MAX HOLD readings were taken for 1 ~ 2 minutes in each band.*

Plots of Minimum Hopping Channels

Channels	Minimum Hopping Channels
39 channels	
40 channels	

7. TEST EQUIPMENTS LIST

The listing below denotes the test equipments utilized for the test(s).

	EQUIPMENT	MODEL	MANUFACTURE	SERIAL NUMBER	Calibration Due date
1	Receiver	FSPI	ROHDE & SCHWARZ	100012	02/23/07
2	Receiver	8594E	HP	3911A08040	11/15/06
3	Spectrum analyzer	8563EC	HP	3946A00348	11/15/06
4	Shield Room (7m x 4m x 3m)	N/A	SJEMC	0004	N/A
5	Turn Table	OSC-30	N/A	BWS-01	N/A
6	ANTENNA MAST	JAC-3	DAIL EMC	N/A	N/A
7	Temperature & Humidity chanber	EN-GLMP-54	ENEX	N/A	03/22/07
8	Bilog Antenna	VULB9161	SCHWARZBECK	VULB9161-4067	11/14/06
9	Bilog Antenna	VULB9161	SCHWARZBECK	VULB9161-4068	11/14/06
10	HORN ANTENNA	BBHA 9120 D	SCHWARZBECK	BBHA 9120 D 234	02/07/07
11	HORN ANTENNA	BBHA 9170	SCHWARZBECK	BBHA9170157	02/07/07
12	POWER METER	E4418A	HP	GB38272621	02/22/07
13	POWER SENSOR	E9301B	HP	US40010238	12/15/06
14	Power supply	IPS-30B03DD	INTERACT	42052	03/10/07