

Report No.: EF/2006/60008 Issue Date: Jun. 21, 2006

Page: 1 of 31

# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

# INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

*OF* 

scala-driver Driver **Product Name:** 

**Brand Name:** scala

**Model Name:** scala-driver Driver

**FCC ID: O95ER02** 

EF/2006/60008 **Report No.:** 

**Issue Date:** May. 31, 2006

**§15.249 FCC Rule Part:** 

Prepared for Cardo Systems Inc.

100 High Tower St., Pittsburgh PA 15205,

USA

Prepared by SGS Taiwan Ltd.

No. 134, Wu Kung Rd., Wuku Industrial

Zone, Taipei County, Taiwan.





0513

**Note:** This report shall not be reproduced except in full, without the written approval of SGS Taiwan Ltd. This document may be altered or revised by SGS Taiwan Ltd. personnel only, and shall be noted in the revision section of the document.

Any unauthorized alteration, forgery or falsification of the content or appearance of this report is unlawful and offenders may be prosecuted to the fullest extent of the law. 對本報告內容或外觀之任何未經授權之變更、偽造、竄改皆屬非法,違犯者將會被依法追訴。



Report No.: EF/2006/60008 Issue Date: Jun. 21, 2006

Page: 2

### VERIFICATION OF COMPLIANCE

Cardo Systems Inc. **Applicant:** 

100 High Tower St., Pittsburgh PA 15205, USA

**Product Description:** scala-driver Driver

**Brand Name:** scala

**FCC ID Number:** Q95ER02

Model No.: scala-driver Driver

N/A **Model Difference:** 

File Number: EF/2006/60008

Date of test: Apr. 17, 2006 ~ May 30, 2006

**Date of EUT Received:** Apr. 17, 2006

# We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (2003) and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.249.

The test results of this report relate only to the tested sample identified in this report.

Test By:	Danny Yeh	Date	Jun. 21, 2006
-	Danny Yeh	_	
Prepared By:	Evaloro	Date	Jun. 21, 2006
	Eva Kao		
Approved By:	Timent Su	Date	Jun. 21, 2006
<del>-</del>	Vincent Su		



Report No.: EF/2006/60008 Issue Date: Jun. 21, 2006

Page: 3

# Version

Version No.	Date
00	May 31, 2006
01	Jun. 21, 2006



Report No.: EF/2006/60008 Issue Date: Jun. 21, 2006

Page: 4

# **Table of Contents**

1.	GENERAL INFORMATION	5
1.1	PRODUCT DESCRIPTION	5
1.2	RELATED SUBMITTAL(S) / GRANT (S)	
1.3	TEST METHODOLOGY	5
1.4	TEST FACILITY	6
1.5	SPECIAL ACCESSORIES	6
1.6	EQUIPMENT MODIFICATIONS	6
2.	SYSTEM TEST CONFIGURATION	7
2.1	EUT CONFIGURATION	7
2.2	EUT Exercise	7
2.3	TEST PROCEDURE.	7
2.4	LIMITATION	8
2.5	CONFIGURATION OF TESTED SYSTEM	10
3.	SUMMARY OF TEST RESULTS	11
4.	CONDUCTED EMISSIONS TEST	12
4.1	MEASUREMENT PROCEDURE:	12
4.2	TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	12
4.3	MEASUREMENT EQUIPMENT USED:	12
4.4	MEASUREMENT RESULT:	13
5.	RADIATED EMISSION TEST	16
5.1	MEASUREMENT PROCEDURE	16
5.2	TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	16
5.3	MEASUREMENT EQUIPMENT USED:	17
5.4	FIELD STRENGTH CALCULATION	17
5.5	MEASUREMENT RESULT	18
6.	26 DB BAND WIDTH MEASUREMENT	21
6.1	MEASUREMENT PROCEDURE	30
6.2	TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	30
6.3	MEASUREMENT EQUIPMENT USED:	30
6.4	MEASUREMENT RESULTS:	30



Report No.: EF/2006/60008 FCC ID: Q95ER02 Issue Date: Jun. 21, 2006

Page: 5

#### 1. GENERAL INFORMATION

### 1.1 Product Description

The Cardo Systems Inc., Model: scala-driver Driver (referred to as the EUT in this report) is Bluetooth Headset.

A major technical descriptions of EUT is described as following:

#### Bluetooth:

- A). Operation Frequency: 2402 2480MHz, 79 channels
- B). Rated output power: 3.41 dBm
- C). Modulation type: Frequency Hopping Spread Spectrum (GFSK)
- D). Antenna Designation: Micro-strip Antenna, 2 dBi, Non-User Replaceable (Fixed)
- E). Power Supply: 9Vdc from AC/DC power adaptor, model: KSCFB0900030W1US or
- 3.7 Vdc from re-chargeable battery.

#### 24GHz

- A). Operation Frequency: 2402MHz, 1 channel
- B). Modulation Type: TDMA
- C). Power Supply: 9Vdc from AC/DC power adaptor, model: KSCFB0900030W1US or
- 3.7 Vdc from re-chargeable battery.

#### 1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: **Q95ER02** filing to comply with Section 15.249 of the FCC Part 15, Subpart C Rules. The composite system (digital device) is compliance with Subpart B is authorized under a verification procedure.

#### 1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 (2003). Radiated testing was performed at an antenna to EUT distance 3 meters.



Report No.: EF/2006/60008 Issue Date: Jun. 21, 2006

Page: 6

### 1.4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the address of SGS Taiwan Ltd. No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei Country, Taiwan. The Open Area Test Sites and the Line Conducted labs are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2003 and CISPR 22/EN 55022 requirements. Site No. 1(3 &10 meters) Registration Number: 94644, Both OATS and Anechoic chamber (3 meters) was accredited by CNLA (0513).

### 1.5 Special Accessories

Not available for this EUT intended for grant.

### 1.6 Equipment Modifications

Not available for this EUT intended for grant.



Report No.: EF/2006/60008 FCC ID: Q95ER02 Issue Date: Jun. 21, 2006

Page: 7

# 2. System Test Configuration

### 2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

#### 2.2 EUT Exercise

The Transmitter was operated in the engineering operating mode. the Tx frequency was fixed which was for the purpose of the measurements.

#### 2.3 Test Procedure

#### 2.3.1Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 7 and 13 of ANSI C63.4-2003. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and Average detector mode.

#### 2.3.2Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 8 and 13 of ANSI C63.4-2003.



Report No.: EF/2006/60008 Issue Date: Jun. 21, 2006

Page: 8

### 2.4 Limitation

### (1) Conducted Emission

According to section 15.207(a) Conducted Emission Limits is as following.

Frequency	Conducted Limit (dBuV)				
(MHz)	Quasi-Peak	Average			
0.15 - 0.5	66 - 56	56 - 46			
0.5 - 5	56	46			
5 - 30	60	50			

# (2) Radiated Emission 15.249(a)

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following.

Frequency (MHz)	Field strength of Fundamental	Field strength of Harmonics	Distance (m)
902 - 928	50 mV/m	500 uV/m	3
	(94dBuV/m)	(54dBuV/m)	
2400 – 2483.5	50 mV/m	500 uV/m	3
	(94dBuV/m)	(54dBuV/m)	
5725 – 5875	50 mV/m	500 uV/m	3
	(94dBuV/m)	(54dBuV/m)	
24.0 – 24.25 GHz	250 mV/m	2500 uV/m	3
	(107.95dBuV/m)	(67.95dBuV/m)	



Report No.: EF/2006/60008 Issue Date: Jun. 21, 2006

Page: 9

## (3) Radiated Emission15.249 (d)

Emission Radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in Section 15.209 as below, whichever is the lesser attenuation.

Frequency	requency Field strength		Field strength at 3m
(MHz)	μV/m		dBμV/m
1.705-30	30	30	69.54
30-88	100	3	40
88-216	150	3	43.5
216-960	200	3	46
Above 960	500	3	54

### (4) Radiated Emission 15.249(e)

For frequencies above 1000MHz, the above field strength limits are based on average limits. The peak filed strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20dB under any condition of modulation.

Remark: 1. Emission level in dBuV/m=20 log (uV/m)

- 2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
- 3. Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of  $\xi$  15.205
- 4. Emission spurious frequency which appearing within the Restricted Bands specified in provision of  $\xi$ 15.205, then the general radiated emission limits in  $\xi$ 15.209 apply.

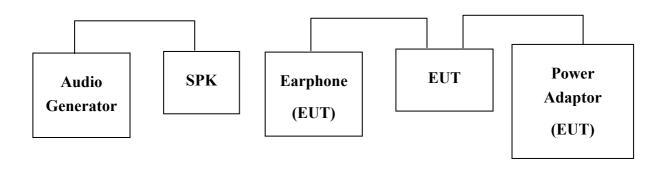


Report No.: EF/2006/60008 Issue Date: Jun. 21, 2006

Page: 10

### 2.5 Configuration of Tested System

Fig. 2-1 Configuration of TX



**Table 2-2 Equipment Used in Tested System** 

Item	Equipment	Mfr/Brand	Model/ Type No.	FCC ID	Series No.	Data Cable	Power Cord
1.	Adaptor	YALITONG	YLT-TCA	N/A	N/A	NA/	N/A
2.	Earphone	N/A	PRO.2	N/A	N/A	N/A	N/A
3.	Audio Generator	TOPWARD	TFG-8104	N/A	853330	N/A	N/A
4.	Speaker	GENIUNE	GS2240	N/A	AK11369169 31208	N/A	N/A

Note: All the above equipment/cables were placed in worse case positions to maximize emission signals during emission test.

Grounding: Grounding was in accordance with the manufacturer's requirements and conditions for the intended use.



Report No.: EF/2006/60008 Issue Date: Jun. 21, 2006

Page: 11

# 3. Summary Of Test Results

FCC Rules	<b>Description Of Test</b>	Result
§15.207	Conducted Emission	Compliant
§15.249(a)(e)	Radiated Emission	Compliant
§15.249(d)	26dB band width Measurement	Compliant

### **Description of test modes**

The EUT has been tested under normal operating mode with 1kHz audio signal.

Frequency 2402MHz is chosen for full testing.

The X, Y and Z-axis of EUT were pre-test; X mode is the worst case and reported.

The field strength of co-located spurious radiation emission was measured as worst case of EUT at X position at 2.4GHz transmitter with BT channel 2402MHz and 2480MHz modes were reported.

The field strength of co-located spurious radiation emission was measured as worst case of EUT at E2 position at channel of BT and 2.4GHz were reported.

2.4GHz TX	BT TX	
2402MHz	2402MHz	
2402MHz	2415MHz	
2402MHz	2443MHz	



Report No.: EF/2006/60008 FCC ID: Q95ER02 Issue Date: Jun. 21, 2006

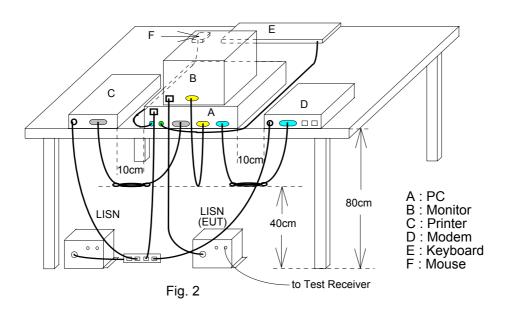
Page: 12

### 4. Conducted Emissions Test

### 4.1 Measurement Procedure:

- 1. The EUT was placed on a table which is 0.8m above ground plane.
- 2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 3. Repeat above procedures until all frequency measured were complete.

## 4.2 Test SET-UP (Block Diagram of Configuration)



#### 4.3 **Measurement Equipment Used:**

Conducted Emission Test Site									
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.				
TYPE		NUMBER	NUMBER	CAL.					
EMC Analyzer	НР	8594EM	3624A00203	09/02/2005	09/03/2006				
EMI Test Receiver	R&S	ESCS30	828985/004	06/09/2005	06/10/2006				
Transient Limiter	HP	11947A	3107A02062	09/02/2005	09/03/2006				
LISN	Rolf-Heine	NNB-2/16Z	99012	12/31/2005	12/30/2006				
LISN	Rolf-Heine	NNB-2/16Z	99013	12/24/2005	12/23/2006				
Coaxial Cables	N/A	No. 3, 4	N/A	12/01/2005	12/01/2206				

This Test Report is issued by the Company subject to its General Conditions of Service printed overleaf. Attention is drawn to the limitations of liability, indemnification, and Jurisdictional issued defined therein. The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company. 此報告是遵循本公司訂定之通用服務條款所製作發放。請注意此條款列印於背面,將本公司之義務,免責,管轄 權皆明確規範之。此報告結果除非另有說明僅對檢驗之樣品負責。本報告未經本公司書面許可,不可部份複製

SGS Taiwan Ltd. No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei Country, Taiwan. / 台北縣五股工業區五工路134號 f (886-2) 2298-2698 www.sas.com.tw

台灣檢驗科技股份有限公司 t (886-2) 2299-3939



Report No.: EF/2006/60008 Issue Date: Jun. 21, 2006

Page: 13

### 4.4 Measurement Result:

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

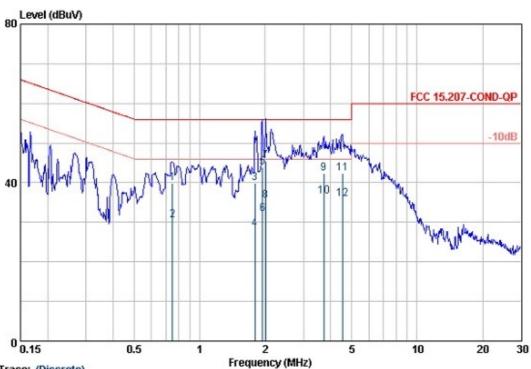


Report No.: EF/2006/60008 Issue Date: Jun. 21, 2006

Page: 14

### AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	OPERATION & CHARGE MODE			Test Date:	May. 10, 2006
Temperature:	25 ℃	Humidity:	65%	Test By:	Danny



Trace: (Discrete)

Site

Condition : FCC 15.207-COND-QP NNB-2/16Z(99012) LINE

Project No. : EF-2006-40013 Applicant : CARDO SYSTEM EUT Description : SCALA-DRIVER DRIVER EUT Model : SCALA-DRIVER DRIVER

Test Mode : operation(bt stby,2.4g on) and charge

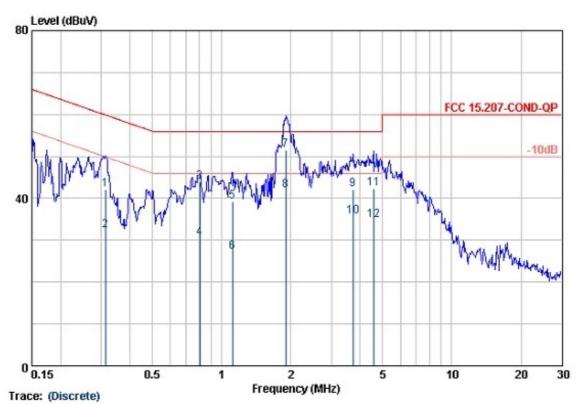
Temp./Humid. : 25/65 Operator : denny

	Freq	Pol/Phase	Read Level	Factor	Level	Limit Line	Over Limit	Remark
<del></del>	MHz		dBu∀	dB	dBuV	dBu₹	dB	
1 2 3 4 5 6 7 8 9	0.75 1.80 1.80 1.95 1.95 2.01 2.01 3.72 3.72	LINE LINE LINE LINE LINE LINE LINE LINE	39.59 30.22 39.66 28.08 43.76 31.80 45.35 35.14 42.02 36.30		39.80 30.43 39.88 28.30 43.98 32.02 45.57 35.36 42.35 36.63	56.00 56.00 56.00 56.00 56.00 56.00 56.00 56.00	-16.12 -27.70 -12.02 -23.98 -10.43 -20.64 -13.65 -19.37	ÄVERAGE QP AVERAGE QP AVERAGE QP AVERAGE QP AVERAGE
11 12		LINE	41.93 35.51	0.35	42.28 35.86		-13.72 -20.14	AVERAGE



Report No.: EF/2006/60008 Issue Date: Jun. 21, 2006

Page: 15



Site : RF Site

: FCC 15.207-COND-QP NNB-2/16Z(99012) NEUTRAL Condition

: EF-2006-40013 Project No. Applicant : CARDO SYSTEM EUT Description : SCALA-DRIVER DRIVER EUT Model : SCALA-DRIVER DRIVER

Test Mode : operation(bt stby,2.4g on) and charge

Temp./Humid. : 25/65 Operator : denny

73	Freq	Pol/Phase	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz		dBu₹	dB	dBuV	dBu₹	dB	
1 2 3 4 5 6 7 8 9	0.31 0.80 0.80 1.12 1.12 1.90 1.90 3.72	NEUTRAL	41.81 32.13 43.72 30.24 38.95 27.08 51.33 41.64 41.86 35.27	0.21	42.01 32.33 43.93 30.45 39.16 27.29 51.55 41.86 42.19 35.60	59.88 56.00 56.00 56.00 56.00 56.00 56.00	-12.07 -25.55 -16.84 -28.71 -4.45 -14.14 -13.81	ÄVERAGE QP AVERAGE QP AVERAGE QP AVERAGE
11 12		NEUTRAL NEUTRAL	42.01 34.45	0.36	42.37 34.81		-13.63 -21.19	QP AVERAGE



Report No.: EF/2006/60008 Issue Date: Jun. 21, 2006

Page: 16

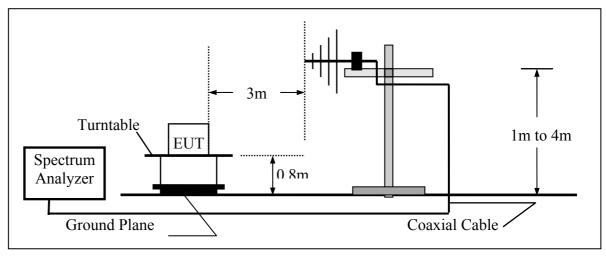
### 5. Radiated Emission Test

#### **5.1** Measurement Procedure

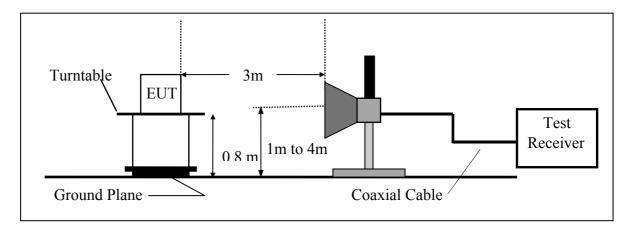
- 1. The EUT was placed on a turntable that is 0.8m above ground plane.
- 2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 4. Repeat above procedures until all frequency measured were complete.

### 5.2 Test SET-UP (Block Diagram of Configuration)

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



### (B) Radiated Emission Test Set-UP Frequency Over 1 GHz



This Test Report is issued by the Company subject to its General Conditions of Service printed overleaf. Attention is drawn to the limitations of liability, indemnification, and Jurisdictional issued defined therein. The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company. 此報告是遵循本公司訂定之通用服務條款所製作發放。請注意此條款列印於背面,將本公司之義務,発責,管轄權皆明確規範之。此報告結果除非另有說明僅對檢驗之樣品負責。本報告未經本公司書面許可,不可部份複製。

 SGS Taiwan Ltd.
 No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei Country, Taiwan. / 台北縣五股工業區五工路134號台灣檢驗科技股份有限公司
 ★ (886-2) 2299-3939
 ★ (886-2) 2298-2698
 www.sgs.com.tw



Report No.: EF/2006/60008 Issue Date: Jun. 21, 2006

Page: 17

### 5.3 Measurement Equipment Used:

	9	66 Chamber			
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.
TYPE		NUMBER	NUMBER	CAL.	
Spectrum Analyzer	Agilent	E4446A	MY43360126	03/29/2006	03/28/2007
Spectrum Analyzer	Agilent	E7405A	US41160416	08/27/2005	08/26/2006
Bilog Antenna	SCHWAZBECK	VULB9163	152	06/03/2005	06/02/2006
Horn antenna	Schwarzbeck	BBHA 9120D	309/320	08/16/2005	08/15/2006
Horn antenna	Schwarzbeck	BBHA 9170	184/185	07/04/2005	07/03/2006
Pre-Amplifier	HP	8447D	2944A09469	07/19/2005	07/18/2006
Pre-Amplifier	HP	8449B	3008A00578	02/26/2006	02/25/2007
Turn Table	HD	DT420	N/A	N.C.R	N.C.R
Antenna Tower	HD	MA240-N	240/657	N.C.R	N.C.R
Controller	HD	HD100	N/A	N.C.R	N.C.R
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA-10M	10m	10/09/2005	10/08/2006
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	10/09/2005	10/08/2006
Site NSA	SGS	966 chamber	N/A	11/17/2005	11/16/2006

### 5.4 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	



Report No.: EF/2006/60008 Issue Date: Jun. 21, 2006

Page: 18

#### 5.5 Measurement Result

### Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode TX Test Date Apr. 26, 2006

Fundamental Frequency 2402MHz Test By Danny
Temperature 25 °C Pol Ver./Hor

Humidity 65 %

Freq.	Ant.Pol.	Detector Mode	Reading	Factor	Actual FS	Limit3m	Safe Margin
(MHz)	H/V	(PK/QP)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
33.88	V	Peak	46.21	-27.00	19.21	40.00	-20.79
56.19	V	Peak	47.14	-14.95	32.19	40.00	-7.81
33.88	Н	Peak	40.86	-15.12	25.74	40.00	-14.26

- (1) Measuring frequencies from 30 MHz to the 1GHz •
- (2) Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak/QP detector mode.
- (3) Datas of measurement within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (4) The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz, VBW=300KHz.



Report No.: EF/2006/60008 Issue Date: Jun. 21, 2006

Page: 19

### Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode: TX Test Date: Apr. 26, 2006

Fundamental Frequency: 2402MHz

Temperature: 25 °C

Test By: Danny

Pol: Vertical

Humidity: 65 %

		Peak	$\mathbf{A}\mathbf{V}$		Actual	Actual	Peak Limit	AV Limit		
Freq.	Ant.Pol	Reading	Reading	Factor	Peak FS	AV FS	at 3 m	at 3 m	Margin	
(M H z)	H/V	(dBuV)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m	(dBuV/m)	(dBuV/m)	(dB)	
2402.0	V	87.64		-3.40	84.24		114.00	94.00	-9.76	F
2400.0	V	55.23		-3.40	51.83		74.00	54.00	-2.17	S
2345.5	V	56.25		-3.63	52.62		74.00	54.00	-1.38	S
2423.5	V	54.25		-3.26	50.99		74.00	54.00	-3.01	S
2456.0	V	46.10		-3.12	42.98		74.00	54.00	-11.02	S
4804.0	V	59.88	33.82	2.96	62.84	36.78	74.00	54.00	-17.22	Н
7206.0	V						74.00	54.00		Н
9608.0	V						74.00	54.00		Н
12010.0	V						74.00	54.00		Н
14412.0	V						74.00	54.00		Н
16814.0	V						74.00	54.00		Н
19216.0	V						74.00	54.00		Н
21618.0	V						74.00	54.00		Н
24020.0	V						74.00	54.00		Н

#### Remark:

- (1) Measuring frequencies from 30MHz to the 10tth of fundamental frequency •
- Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB
- (3) "F" denotes fundamental frequency; "H" denotes harmonics frequency. "S" denotes spurious frequency.
- (4) Datas of measurement within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (5) Spectrum Peak mode IF bandwidth Setting: 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- (6) Spectrum AV mode IF B bandwidth Setting: 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.



Report No.: EF/2006/60008 Issue Date: Jun. 21, 2006

Page: 20

# Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode: TX Test Date: Apr. 26, 2006

Fundamental Frequency: 2402MHz

Test By: Danny
Temperature: 25 °C

Pol: Horizontal

Humidity: 68 %

		Peak	AV		Actual	Actual	Peak Limit	AV Limit		
Freq.	Ant.Pol.	Reading	Reading	Factor	Peak FS	AV FS	at 3 m	at 3 m	Margin	
(MHz)	H/V	(dBuV)	(dBuV)	(dB)	(dBuV/m)	dBuV/m	(dBuV/m)	(dBuV/m)	(dB)	
2402.0	Н	90.60		-3.40	87.20		114.00	94.00	-6.80	F
2400.0	Н	54.75		-3.40	51.35		74.00	54.00	-2.65	S
2358.5	Н	50.71		-3.58	47.13		74.00	54.00	-6.87	S
2423.5	Н	64.25	32.55	-3.26	60.99	29.29	74.00	54.00	-24.71	S
2456.0	Н	48.45		-3.12	45.33		74.00	54.00	-8.67	S
4804.0	Н	58.22	33.73	2.95	61.17	36.68	74.00	54.00	-17.32	Η
7206.0	Н	39.28		9.27	48.55		74.00	54.00	-5.45	Н
9608.0	Н						74.00	54.00		Η
12010.0	Н						74.00	54.00		Η
14412.0	Н						74.00	54.00		Η
16814.0	Н						74.00	54.00		Η
19216.0	Н						74.00	54.00		Η
21618.0	Н						74.00	54.00		Н
24020.0	Н						74.00	54.00		Н

### Remark:

- (1) Measuring frequencies from 30MHz to the 10tth of fundamental frequency •
- (2) Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB
- (3) "F" denotes fundamental frequency; "H" denotes harmonics frequency. "S" denotes spurious frequency.
- (4) Datas of measurement within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (5) Spectrum Peak mode IF bandwidth Setting: 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- (6) Spectrum AV mode IF B bandwidth Setting: 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.



Report No.: EF/2006/60008 Issue Date: Jun. 21, 2006

Page: 21

### Radiated Spurious Emission Measurement Result (below 1GHz) (Co-Location)

Operation Mode Bluetooth TX CH Low / 2.4GHz Test Date Apr. 26, 2006

Fundamental Frequency 2402 MHz / 2402 MHz Test By Danny Temperature  $25 \, ^{\circ}\text{C}$  Pol Ver./Hor

Humidity 65 %

Freq.	Ant.Pol.	Detector Mode	Reading	Factor	Actual FS	Limit3m	Safe Margin
(MHz)	H/V	(PK/QP)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
48.43	V	Peak	40.94	-14.69	26.25	40.00	-13.75
90.14	V	Peak	43.78	-17.89	25.89	43.50	-17.61
293.84	V	Peak	36.46	-13.63	22.83	46.00	-23.17
33.88	Н	Peak	43.32	-15.12	28.20	40.00	-11.80
288.99	Н	Peak	36.09	-13.82	22.27	46.00	-23.73

- 1 Measuring frequencies from 30 MHz to the 1GHz •
- 2 Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak/QP detector mode.
- 3 Datas of measurement within this frequency range shown " " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 4 The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz.



Report No.: EF/2006/60008 Issue Date: Jun. 21, 2006

Page: 22

### Radiated Spurious Emission Measurement Result (above 1GHz) (Co-Location)

Operation Mode Bluetooth TX CH Low / 2.4GHz Test Date Apr. 26, 2006

Fundamental Frequency 2402 MHz / 2402 MHz Test By Danny Temperature  $25~^{\circ}\text{C}$  Pol Ver.

Humidity 65 %

	Peak	$\mathbf{AV}$		Actu	al FS	Peak	$\mathbf{AV}$		
Freq.	Reading	Reading	Ant./CL	Peak	$\mathbf{AV}$	Limit	Limit	Margin	
(MHz)	(dBuV)	(dBuV)	CF(dB)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)	_
2402.0	93.70		-3.40	90.30		114.00	94.00	-3.70	Peak
2400.0	56.24		-3.40	52.84		74.00	54.00	-1.16	Peak
2358.5	53.21		-3.58	49.63		74.00	54.00	-4.37	Peak
2399.0	40.78		-3.40	37.38		74.00	54.00	-16.62	Peak
4804.0	54.73	40.83	2.96	57.69	43.79	74.00	54.00	-10.21	AV
7206.0									
9608.0									
12010.0									
14412.0									
16814.0									
19216.0									
21618.0									
24020.0									

#### Remark:

- (1) Measuring frequencies scanned from 1GHz to the 10th harmonic of highest fundamental frequency  $\circ$
- (2) Datas of measurement within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column  $\circ$
- (4) Spectrum Peak Setting: 1GHz-26GHz, RBW=1MHz, VBW=3MHz, Sweep time=200 ms.
- (5) Spectrum AV Setting: 1GHz-26GHz, RBW=1MHz, VBW=10Hz, Sweep time=200 ms.



Report No.: EF/2006/60008 Issue Date: Jun. 21, 2006

Page: 23

### Radiated Spurious Emission Measurement Result (above 1GHz) (Co-Location)

Operation Mode Bluetooth TX CH Low / 2.4GHz Test Date Apr. 26, 2006

Fundamental Frequency 2402 MHz / 2402 MHz Test By Danny Temperature  $25~^{\circ}\text{C}$  Pol Hor

Humidity 65 %

	Peak	$\mathbf{AV}$		Actu	al FS	Peak	AV		
Freq.	Reading	Reading	Ant./CL	Peak	$\mathbf{AV}$	Limit	Limit	Margin	
(MHz)	(dBuV)	(dBuV)	CF(dB)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)	-
2402.0	95.01		-3.40	91.61		114.00	94.00	-2.39	Peak
2400.0	55.95		-3.40	52.55		74.00	54.00	-1.45	Peak
2358.5	50.24		-3.58	46.66		74.00	54.00	-7.34	Peak
2399.0	43.10		-3.40	39.70		74.00	54.00	-14.30	Peak
2423.5	56.36	32.54	-3.26	53.10	29.28	74.00	54.00	-24.72	AV
4804.0	58.61	39.75	2.96	61.57	42.71	74.00	54.00	-11.29	AV
7206.0									
9608.0									
12010.0									
14412.0									
16814.0									
19216.0									
21618.0									
24020.0									

### Remark:

- (1) Measuring frequencies scanned from 1GHz to the 10th harmonic of highest fundamental frequency  $\circ$
- (2) Datas of measurement within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column  $\circ$
- (4) Spectrum Peak Setting: 1GHz-26GHz, RBW=1MHz, VBW=3MHz, Sweep time=200 ms.
- (5) Spectrum AV Setting: 1GHz-26GHz, RBW=1MHz, VBW=10Hz, Sweep time=200 ms.



Report No.: EF/2006/60008 Issue Date: Jun. 21, 2006

Page: 24

### Radiated Spurious Emission Measurement Result (above 1GHz) (Co-Location)

Operation Mode Bluetooth TX CH High / 2.4GHz Test Date Apr. 26, 2006

Fundamental Frequency 2480 MHz / 2402 MHz Test By Danny Temperature  $25 \,^{\circ}\text{C}$  Pol Ver

Humidity 65 %

	Peak	AV		Actu	<b>Actual FS</b>		AV		
Freq.	Reading	Reading	Ant./CL	Peak	$\mathbf{AV}$	Limit	Limit	Margin	
(MHz)	(dBuV)	(dBuV)	CF(dB)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)	_
2402.0	97.18		-3.40	93.78		114.00	94.00	-0.22	Peak
2480.0	92.21		-3.04	89.17		114.00	94.00	-4.83	Peak
2400.0	56.24		-3.40	52.84		74.00	54.00	-1.16	Peak
2423.5	62.75	32.68	-3.26	59.49	29.42	74.00	54.00	-24.58	AV
2484.8	35.37		-3.04	32.33		74.00	54.00	-21.67	Peak
4804.0	56.39	33.67	2.96	59.35	36.63	74.00	54.00	-17.37	AV
7206.0									
9608.0									
12010.0									
4960.0	49.23		3.40	52.63		74.00	54.00	-1.37	Peak
7440.0									
9920.0									
12400.0									

#### Remark:

- (1) Measuring frequencies scanned from 1GHz to the 10th harmonic of highest fundamental frequency  $\circ$
- (2) Datas of measurement within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column o
- (4) Spectrum Peak Setting: 1GHz-26GHz, RBW=1MHz, VBW=3MHz, Sweep time=200 ms.
- (5) Spectrum AV Setting: 1GHz-26GHz, RBW=1MHz, VBW=10Hz, Sweep time=200 ms.



Report No.: EF/2006/60008 Issue Date: Jun. 21, 2006

Page: 25

Radiated Spurious Emission Measurement Result (above 1GHz) (Co-Location)

Operation Mode Bluetooth TX CH High / 2.4GHz Test Date Apr. 26, 2006

Fundamental Frequency 2480 MHz / 2402 MHz Test By Danny Temperature  $25 \,^{\circ}\text{C}$  Pol Hor

Humidity 65 %

	Peak	$\mathbf{AV}$		Actu	al FS	Peak	$\mathbf{AV}$		
Freq.	Reading	Reading	Ant./CL	Peak	$\mathbf{AV}$	Limit	Limit	Margin	
(MHz)	(dBuV)	(dBuV)	CF(dB)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)	-
2402.0	95.79		-3.40	92.39		114.00	94.00	-1.61	Peak
2480.0	95.62		-3.04	92.58		114.00	94.00	-1.42	Peak
2400.0	56.24		-3.40	52.84		74.00	54.00	-1.16	Peak
2345.5	61.55	31.44	-3.63	57.92	27.81	74.00	54.00	-26.19	AV
2423.5	57.39	33.72	-3.26	54.13	30.46	74.00	54.00	-23.54	AV
2484.8	39.50		-3.04	36.46		74.00	54.00	-17.54	Peak
4804.0	55.57	33.91	2.96	58.53	36.87	74.00	54.00	-17.13	AV
7206.0									
9608.0									
12010.0									
4960.0	47.12		3.40	50.52		74.00	54.00	-3.48	Peak
7440.0									
9920.0									
12400.0									

### Remark:

- (1) Measuring frequencies scanned from 1GHz to the 10th harmonic of highest fundamental frequency  $\circ$
- (2) Datas of measurement within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column  $\circ$
- (4) Spectrum Peak Setting: 1GHz-26GHz, RBW=1MHz, VBW=3MHz, Sweep time=200 ms.
- (5) Spectrum AV Setting: 1GHz-26GHz, RBW=1MHz, VBW=10Hz, Sweep time=200 ms.



Report No.: EF/2006/60008 Issue Date: Jun. 21, 2006

Page: 26

### Radiated Spurious Emission Measurement Result (above 1GHz) (Co-Location)

Operation Mode Bluetooth TX / 2.4GHz Test Date Jun. 20, 2006

Fundamental Frequency 2415MHz / 2402MHz Test By Danny Temperature 25 °C Pol Ver

Humidity 65 %

		Peak	$\mathbf{AV}$		Actu	al FS	Peak	$\mathbf{AV}$		
	Freq.	Reading	Reading	Ant./CL	Peak	$\mathbf{AV}$	Limit	Limit	Margin	
	(MHz)	(dBuV)	(dBuV)	CF(dB)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)	
•										_'
	2331.52	60.49	37.84	-3.71	56.78	34.13	74.00	54.00	-19.87	AV
	2344.56	58.90	37.84	-3.63	55.27	34.21	74.00	54.00	-19.79	AV
	2369.12	59.14	37.49	-3.49	55.65	34.00	74.00	54.00	-20.00	AV
	2377.52	43.60		-3.49	40.11		74.00	54.00	-13.89	Peak
	2383.68	61.84	37.68	-3.49	58.35	34.19	74.00	54.00	-19.81	AV
	2389.00	54.18		-3.43	50.75		74.00	54.00	-3.25	Peak
	2396.34	62.96	38.07	-3.40	59.56	34.67	74.00	54.00	-19.33	AV

- (1) Measuring frequencies scanned from 1GHz to the 10th harmonic of highest fundamental frequency  $\circ$
- (2) Datas of measurement within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column  $\circ$
- (4) Spectrum Peak Setting: 1GHz-26GHz, RBW=1MHz, VBW=3MHz, Sweep time=200 ms.
- (5) Spectrum AV Setting: 1GHz-26GHz, RBW=1MHz, VBW=10Hz, Sweep time=200 ms.



Report No.: EF/2006/60008 Issue Date: Jun. 21, 2006

Page: 27

### Radiated Spurious Emission Measurement Result (above 1GHz) (Co-Location)

Operation Mode Bluetooth TX / 2.4GHz Test Date Jun. 20, 2006

Fundamental Frequency 2415MHz / 2402MHz Test By Danny Temperature 25 °C Pol Hor

Humidity 65 %

	Peak	$\mathbf{AV}$		<b>Actual FS</b>		Peak	$\mathbf{AV}$		
Freq.	Reading	Reading	Ant./CL	Peak	$\mathbf{AV}$	Limit	Limit	Margin	
(MHz)	(dBuV)	(dBuV)	CF(dB)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)	
2331.52	62.20	37.90	-3.71	58.49	34.19	74.00	54.00	-19.81	AV
2344.56	65.68	37.91	-3.63	62.05	34.28	74.00	54.00	-19.72	AV
2369.12	64.18	37.55	-3.49	60.69	34.06	74.00	54.00	-19.94	AV
2376.56	46.30		-3.49	42.81		74.00	54.00	-11.19	Peak
2383.64	64.15	37.86	-3.49	60.66	34.37	74.00	54.00	-19.63	AV
2389.00	56.48	38.86	-3.43	53.05	35.43	74.00	54.00	-18.57	AV
65.24	38.37	38.07	-3.40	34.97	34.67	74.00	40.00	-5.33	AV

- (1) Measuring frequencies scanned from 1GHz to the 10th harmonic of highest fundamental frequency  $\circ$
- (2) Datas of measurement within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column  $\circ$
- (4) Spectrum Peak Setting: 1GHz-26GHz, RBW=1MHz, VBW=3MHz, Sweep time=200 ms.
- (5) Spectrum AV Setting: 1GHz-26GHz, RBW=1MHz, VBW=10Hz, Sweep time=200 ms.



Report No.: EF/2006/60008 Issue Date: Jun. 21, 2006

Page: 28

### Radiated Spurious Emission Measurement Result (above 1GHz) (Co-Location)

Operation Mode Bluetooth TX / 2.4GHz Test Date Jun. 20, 2006

Fundamental Frequency 2443 MHz / 2402 MHz Test By Danny Temperature  $25 \,^{\circ}\text{C}$  Pol Ver

Humidity 65 %

	Peak	Peak AV		Actual FS		Peak	AV		
Fre q.	Reading	Reading	Ant./CL	Peak	AV	Limit	Limit	Margin	
(MHz)	(dBuV)	(dBuV)	CF(dB)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)	
2331.52	63.82	37.69	-3.71	60.11	33.98	74.00	54.00	-20.02	AV
2344.38	65.71	37.89	-3.63	62.08	34.26	74.00	54.00	-19.74	AV
2360.76	54.45		-3.58	50.87		74.00	54.00	-3.13	Peak
2383.53	63.65	37.79	-3.49	60.16	34.30	74.00	54.00	-19.70	AV
2384.36	48.74		-3.04	45.70		74.00	54.00	-8.30	Peak

- (1) Measuring frequencies scanned from 1GHz to the 10th harmonic of highest fundamental frequency  $\circ$
- (2) Datas of measurement within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column  $\circ$
- (4) Spectrum Peak Setting: 1GHz-26GHz, RBW=1MHz, VBW=3MHz, Sweep time=200 ms.
- (5) Spectrum AV Setting: 1GHz-26GHz, RBW=1MHz, VBW=10Hz, Sweep time=200 ms.



Report No.: EF/2006/60008 Issue Date: Jun. 21, 2006

Page: 29

### Radiated Spurious Emission Measurement Result (above 1GHz) (Co-Location)

Operation Mode Bluetooth TX / 2.4GHz Test Date Jun. 20, 2006

Fundamental Frequency 2443 MHz / 2402 MHz Test By Danny Temperature  $25 \, ^{\circ}\text{C}$  Pol Hor

Humidity 65 %

		Peak	$\mathbf{AV}$		<b>Actual FS</b>		Peak	$\mathbf{AV}$		
	Freq.	U	Reading			AV	Limit	Limit	Margin	
•	(MHz)	(dBuV)	(dBuV)	CF(dB)	(dBuV/m)	(aBuV/m)	(aBuv/m)	(dBuV/m)	(dB)	1
	2331.51	62.56	37.28	-3.71	58.85	33.57	74.00	54.00	-20.43	AV
	2344.38	60.60	37.82	-3.63	56.97	34.19	74.00	54.00	-19.81	AV
	2361.03	50.20		-3.58	46.62		74.00	54.00	-7.38	Peak
	2383.53	61.18	36.97	-3.49	57.69	33.48	74.00	54.00	-20.52	AV
	2484.03	57.29	7.71	-3.04	54.25	4.67	74.00	54.00	-49.33	AV

- (1) Measuring frequencies scanned from 1GHz to the 10th harmonic of highest fundamental frequency  $\circ$
- (2) Datas of measurement within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column  $\circ$
- (4) Spectrum Peak Setting: 1GHz-26GHz, RBW=1MHz, VBW=3MHz, Sweep time=200 ms.
- (5) Spectrum AV Setting: 1GHz-26GHz, RBW=1MHz, VBW=10Hz, Sweep time=200 ms.



Report No.: EF/2006/60008 FCC ID: Q95ER02 Issue Date: Jun. 21, 2006

Page: 30

### 6. 26 dB Band Width Measurement

### **6.1** Measurement Procedure

- 1. The EUT was placed on a turn table which is 0.8m above ground plane.
- 2. Set ETU normal operating mode.
- 3. Set SPA Center Frequency = fundamental frequency, RBW, VBW = 100KHz, Span = 3MHz.
- 4. Set SPA Max hold. Mark peak, -26dB.

### 6.2 Test SET-UP (Block Diagram of Configuration)

Same as 4.2 Radiated Emission Measurement.

### 6.3 Measurement Equipment Used:

Same as 4.2 Radiated Emission Measurement.

### **6.4** Measurement Results:

26dB Bandwidth = 1.274MHz Co-Location with 2402GHz = 1.379MHz

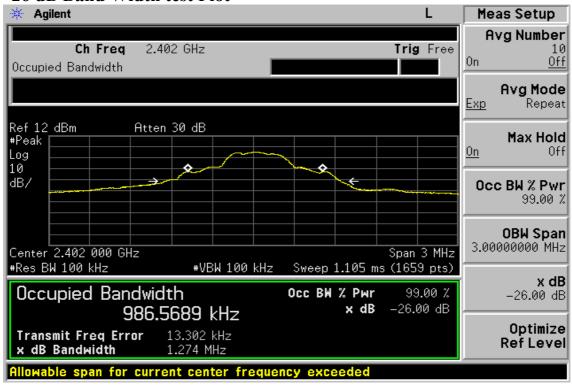
Refer to attached data chart.



Report No.: EF/2006/60008 Issue Date: Jun. 21, 2006

Page: 31

### 26 dB Band Width test Plot



## 26 dB Band Width test Plot (Co-Location BT Low / 2.4GHz)

