

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C AND CANADA RSS-210 REQUIREMENT

OF

Product Name: 2.4GHz Wireless Digital Transceiver Module
Brand Name: N/A
Model Name: For FCC: DRF-TR001
For IC: LW2602
Model Difference: Different model For different customer
FCC ID: UDRX0738CSF
IC: 0976B-L0738CSF
Report No.: ER/2009/10022~23
Issue Date: Feb. 23, 2009
FCC Rule Part: §15.249
IC Rule Part: RSS-210 issue 7:2007, Annex 2.9
Prepared for: Opcom Inc.
8F-5, No.6 Lane 609, Sec. 5, Chung Hsing Rd.
Sanchung City, Tape Hsien, Taiwan
Prepared by: SGS Taiwan Ltd.
Electronics & Communication Laboratory
No. 134, Wu Kung Rd., Wuku Industrial Zone,
Taipei County, Taiwan.



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VERIFICATION OF COMPLIANCE

Applicant: Opcom Inc.
8F-5, No.6 Lane 609, Sec. 5, Chung Hsing Rd. Sanchung City, Tapei Hsien, Taiwan

Product Description: 2.4GHz Wireless Digital Transceiver Module

FCC ID: UDRX0738CSF

IC: 0976B-L0738CSF

Brand Name: N/A

Model No.: For FCC: DRF-TR001
For IC: LW2602

Model Difference: Different model For different customer

File Number: ER/2009/10022~23

Date of test: Jan. 19, 2009 ~ Feb. 17, 2009

Date of EUT Received: Jan. 19, 2009

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd., Electronics & Communication Laboratory. 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 and RSS-210 issue 7: 2007 Annex 2.9.

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

Test By:



Date:

Feb. 23, 2009

Brian Chang / Engineer

Prepared By:



Date:

Feb. 23, 2009

Eva Kao / Asst. Supervisor

Approved By:



Date:

Feb. 23, 2009

Vincent Su / Manager

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Version

Version No.	Date	Description
00	Feb. 23, 2009	Initial creation of document

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1. GENERAL INFORMATION

1.1. Product Description

The Opcom Inc., Model: DRF-TR001, LW2602 (referred to as the EUT in this report) is a 2.4GHz Wireless Digital Transceiver Module.

A major technical descriptions of EUT is described as following:

A) Transition Frequency: 2402~2478MHz, 77 channels

B) Modulation Type: FSK

C) Power Supply: 3.3Vdc

D) Antenna Designation: Dipole Antenna with reversed SAM type, 1.8dBi. Please see EUT photo for details.

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

This submittal(s) (test report) is intended for FCC ID: **UDRX0738CSF** filing to comply with Section 15.249 of the FCC Part 15, Subpart C Rules and IC: **0976B-L0738CSF** filing to comply with Industry Canada RSS-210 issue 7: 2007 Annex 2.9.

1.3. Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 (2003) and RSS-Gen: 2007. Radiated testing was performed at an antenna to EUT distance 3 meters.

1.4. Test Facility

The measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei Country, Taiwan which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2003. FCC Registration Number are: 990257 and 236194, Canada Registration Number: 4620A.

The 10 m Open Area Test Sites located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No. 29, Pau-Tou-Tsuo Valley Chia-Pau Tsuen, Linkou Hsiang, Taipei county, which is constructed and calibrated to meet the CISPR 22/EN 55022 requirements. SGS Site No. 1(3 &10 meters) and FCC Registration Number: 94644.

1.5. Special Accessories

Not available for this EUT intended for grant.

1.6. Equipment Modifications

Not available for this EUT intended for grant.

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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 at 2402, 2440 and 2478MHz which were for the purpose of the measurements.

2.3. Test Procedure

2.3.1 Conducted 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 and RSS-Gen: 2007. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and Average detector mode.

2.3.2 Radiated 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 and RSS-Gen:2007.

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2.4. Limitation

(1) Conducted Emission

According to section 15.207(a) and RSS-Gen §7.2.2 Conducted Emission Limits is as following.

Frequency (MHz)	Conducted Limit (dBuV)	
	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) and RSS-210 issue 7,§A2.9(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 (94dBuV/m)	500 uV/m (54dBuV/m)	3
2400 – 2483.5	50 mV/m (94dBuV/m)	500 uV/m (54dBuV/m)	3
5725 – 5875	50 mV/m (94dBuV/m)	500 uV/m (54dBuV/m)	3

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(3) Radiated Emission 15.249 (d) and RSS-210 issue 7,§A2.9(b)

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 and RSS-210 issue 7,§A2.9(a) as below, whichever is the lesser attenuation.

Frequency (MHz)	Field strength μV/m	Distance (m)	Field strength at 3m 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) and RSS-210 issue 7

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 § 15.205
4. Emission spurious frequency which appearing within the Restricted Bands specified in provision of §15.205, then the general radiated emission limits in § 15.209 apply.

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2.5. Configuration of Tested System

Fig. 2-1 Configuration of TX

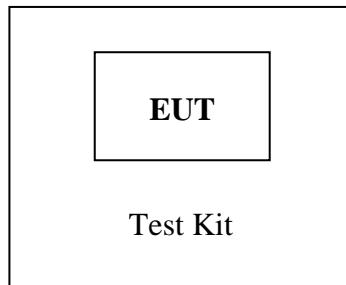


Table 2-2 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/ Type No.	FCC ID	Series No.	Data Cable	Power Cord
1.	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.

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3. SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207/ RSS-Gen §7.2.2	Conducted Emission	N/A
§15.249(a)(d) RSS-210 issue 7,§A2.9(a)	Field Strength Measurement	Compliant
§15.249(e) RSS-210 issue 7,§A2.9(b)	TX Spurious Emission	Compliant
§15.249(d)	26dB band width Measurement	Compliant
RSS-Gen §4.4.1	99% Power Bandwidth	Compliant

Description of test modes

The EUT has been tested under operating condition.

Test program used to control the EUT for staying in continuous transmitting mode is programmed.

Channel low (2402MHz)、mid (2440MHz) and high (2478MHz) with highest data rate are chosen for full testing.

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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)

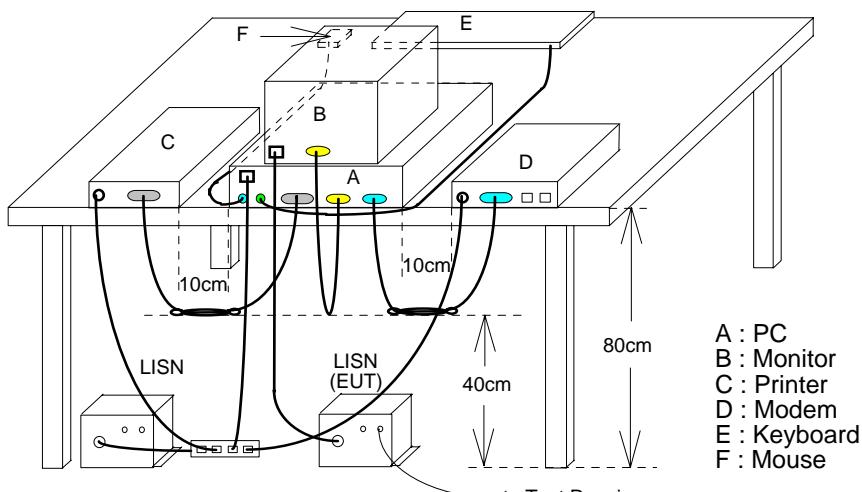


Fig. 2

4.3 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCS30	828985/004	09/16/2008	09/15/2009
LISN	Rolf-Heine	NNB-2/16Z	99012	04/28/2008	04/27/2009
LISN	FCC	FCC-LISN-50/250-25-2-01	04034	04/28/2008	04/27/2009
Coaxial Cables	N/A	WK CE Cable	N/A	10/30/2008	10/29/2009

4.4 Measurement Result:

N/A, this application is modular approval and the power supply is 3.3Vdc.

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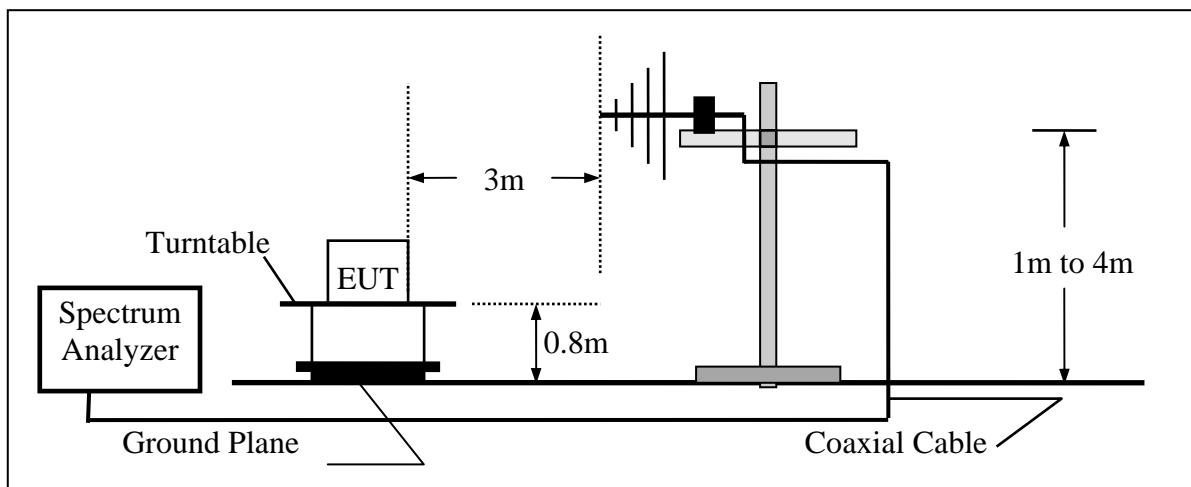
5. RADIATED EMISSION TEST

5.1 Measurement Procedure

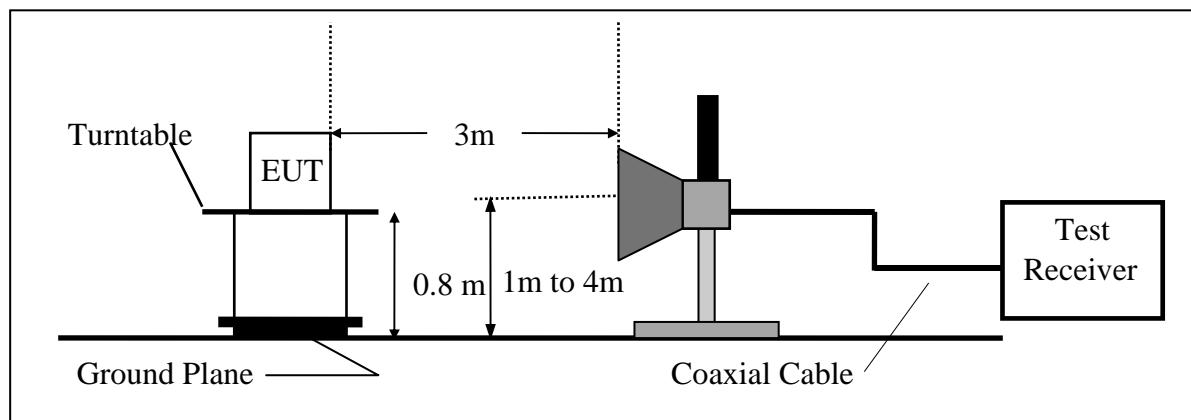
1. The EUT was placed on a turntable that is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above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



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5.3 Measurement Equipment Used:

966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	R&S	FSP 40	100034	02/12/2009	02/11/2010
Loop antenna	MESSTECH	FLA30	03/10086	06/06/2007	06/05/2009
Bilog Antenna	SCHWAZBECK	VULB9160	9160-3136	11/15/2008	11/14/2009
Horn antenna	SCHWAZBECK	BBHA 9120D	9120D-320	03/14/2008	03/13/2009
Pre-Amplifier	Agilent	8447D	1937A02834	11/30/2008	11/29/2009
Pre-Amplifier	Agilent	8449B	3008A01973	01/05/2009	01/04/2010
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	01/05/2009	01/04/2010
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	01/05/2009	01/04/2010

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	

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5.5 Measurement Result

Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode	TX CH Low	Test Date	Jan. 06, 2009
Fundamental Frequency	2402MHz	Test By	Bondi
Temperature	25 °C	Pol	Ver./Hor
Humidity	65 %		

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Margin (dB)
96.93	V	Peak	49.42	-17.16	32.26	43.50	-11.24
191.99	V	Peak	47.14	-15.23	31.91	43.50	-11.59
240.49	V	Peak	43.75	-14.11	29.64	46.00	-16.36
269.59	V	Peak	46.77	-13.55	33.22	46.00	-12.78
337.49	V	Peak	41.66	-12.05	29.61	46.00	-16.39
51.34	H	Peak	44.14	-14.19	29.95	40.00	-10.05
191.99	H	Peak	46.78	-15.23	31.55	43.50	-11.95
242.43	H	Peak	48.33	-14.06	34.27	46.00	-11.73
288.99	H	Peak	47.17	-13.23	33.94	46.00	-12.06
395.69	H	Peak	41.68	-10.15	31.53	46.00	-14.47

Remark:

- 1 No further spurious emissions detected from the lowest internal frequency and 30MHz.
- 2 Measuring frequencies from the lowest internal frequency to the 1GHz.
- 3 Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak / QP detector mode.
- 4 Measurement result 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 The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz, VBW=300KHz.

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Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode TX CH Mid
 Fundamental Frequency 2440MHz
 Temperature 25 °C
 Humidity 65 %

Test Date Jan. 06, 2009
 Test By Bondi
 Pol Ver./Hor

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Margin (dB)
96.93	V	Peak	50.04	-17.16	32.88	43.50	-10.62
191.99	V	Peak	47.35	-15.23	32.12	43.50	-11.38
264.74	V	Peak	46.84	-13.59	33.25	46.00	-12.75
320.03	V	Peak	42.07	-12.55	29.52	46.00	-16.48
51.34	H	Peak	43.94	-14.19	29.75	40.00	-10.25
191.99	H	Peak	46.41	-15.23	31.18	43.50	-12.32
240.49	H	Peak	51.36	-14.11	37.25	46.00	-8.75
288.99	H	Peak	47.35	-13.23	34.12	46.00	-11.88
415.90	H	Peak	40.34	-9.51	30.83	46.00	-15.17
824.43	H	Peak	33.83	-2.52	31.31	46.00	-14.69

Remark:

- 1 No further spurious emissions detected from the lowest internal frequency and 30MHz.
- 2 Measuring frequencies from the lowest internal frequency to the 1GHz.
- 3 Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak / QP detector mode.
- 4 Measurement result 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 The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz, VBW=300KHz.

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Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode	TX CH High	Test Date	Jan. 06, 2009
Fundamental Frequency	2478MHz	Test By	Bondi
Temperature	25 °C	Pol	Ver./Hor
Humidity	65 %		

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Margin (dB)
96.93	V	Peak	47.34	-17.16	30.18	43.50	-13.32
191.99	V	Peak	42.32	-15.23	27.09	43.50	-16.41
264.74	V	Peak	43.62	-13.59	30.03	46.00	-15.97
72.68	H	Peak	45.09	-16.62	28.47	40.00	-11.53
191.99	H	Peak	46.91	-15.23	31.68	43.50	-11.82
242.43	H	Peak	48.12	-14.06	34.06	46.00	-11.94
269.59	H	Peak	47.46	-13.55	33.91	46.00	-12.09
288.99	H	Peak	46.87	-13.23	33.64	46.00	-12.36
395.69	H	Peak	40.51	-10.15	30.36	46.00	-15.64

Remark:

- 1 No further spurious emissions detected from the lowest internal frequency and 30MHz.
- 2 Measuring frequencies from the lowest internal frequency to the 1GHz.
- 3 Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak / QP detector mode.
- 4 Measurement result 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 The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz, VBW=300KHz.

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Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode: TX CH Low
 Fundamental Frequency: 2402MHz
 Temperature : 25 °C
 Humidity : 65 %

Test Date : Jan. 06, 2009
 Test By: Bondi
 Pol: Vertical

Freq. (MHz)	Ant.Pol. H/V	Peak	AV	Factor	Actual	Actual	Peak Limit	AV Limit	Margin
		Reading (dBuV)	Reading (dBuV)		Peak FS (dBuV/m)	AV FS (dBuV/m)	at 3m (dBuV/m)	at 3m (dBuV/m)	
2402.0	V	99.38	87.33	-1.36	98.02	85.97	114.00	94.00	-8.03 F
1481.0	V	73.53	41.87	-6.00	67.53	35.87	74.00	54.00	-18.13 S
2976.0	V	64.86	38.64	0.32	65.18	38.96	74.00	54.00	-15.04 S
4804.0	V	46.00	--	5.99	51.99	--	74.00	54.00	-2.01 H
7206.0	V	--	--			--	74.00	54.00	H
9608.0	V	--	--			--	74.00	54.00	H
12010.0	V	--	--			--	74.00	54.00	H
14412.0	V	--	--			--	74.00	54.00	H
16814.0	V	--	--			--	74.00	54.00	H
19216.0	V	--	--			--	74.00	54.00	H
21618.0	V	--	--			--	74.00	54.00	H
24020.0	V	--	--			--	74.00	54.00	H

Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th 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 Measurement of data 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 bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode: TX CH Low
 Fundamental Frequency: 2402MHz
 Temperature : 25 °C
 Humidity : 65 %

Test Date : Jan. 06, 2009
 Test By: Bondi
 Pol: Horizontal

Freq. (MHz)	Ant.Pol. H/V	Peak	AV	Factor	Actual	Actual	Peak Limit	AV Limit	Margin (dB)
		Reading (dBuV)	Reading (dBuV)		Peak FS (dBuV/m)	AV FS (dBuV/m)	at 3m (dBuV/m)	at 3m (dBuV/m)	
2402.0	H	89.50	--	-1.36	88.14	--	114.00	94.00	-5.86 F
1481.0	H	76.01	38.45	-6.00	70.01	32.45	74.00	54.00	-21.55 S
2976.0	H	60.69	39.28	0.32	61.01	39.60	74.00	54.00	-14.40 S
4804.0	H	41.24	--	5.99	47.23	--	74.00	54.00	-6.77 H
7206.0	H	--	--			--	74.00	54.00	H
9608.0	H	--	--			--	74.00	54.00	H
12010.0	H	--	--			--	74.00	54.00	H
14412.0	H	--	--			--	74.00	54.00	H
16814.0	H	--	--			--	74.00	54.00	H
19216.0	H	--	--			--	74.00	54.00	H
21618.0	H	--	--			--	74.00	54.00	H
24020.0	H	--	--			--	74.00	54.00	H

Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th 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 Measurement of data 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 bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode: TX CH Mid
 Fundamental Frequency: 2440MHz
 Temperature : 25 °C
 Humidity : 65 %

Test Date : Jan. 06, 2009
 Test By: Bondi
 Pol: Vertical

Freq. (MHz)	Ant.Pol. H/V	Peak	AV	Factor	Actual	Actual	Peak Limit	AV Limit	Margin (dB)
		Reading (dBuV)	Reading (dBuV)		Peak FS (dBuV/m)	AV FS (dBuV/m)	at 3m (dBuV/m)	at 3m (dBuV/m)	
2440.0	V	98.19	86.48	-1.13	97.06	85.35	114.00	94.00	-8.65 F
1481.0	V	74.52	39.83	-6.00	68.52	33.83	74.00	54.00	-20.17 S
2976.0	V	67.94	39.25	0.32	68.26	39.57	74.00	54.00	-14.43 S
4880.0	V	44.75	--	6.17	50.92	--	74.00	54.00	-3.08 H
7320.0	V	--	--			--	74.00	54.00	H
9760.0	V	--	--			--	74.00	54.00	H
12200.0	V	--	--			--	74.00	54.00	H
14640.0	V	--	--			--	74.00	54.00	H
17080.0	V	--	--			--	74.00	54.00	H
19520.0	V	--	--			--	74.00	54.00	H
21960.0	V	--	--			--	74.00	54.00	H
24400.0	V	--	--			--	74.00	54.00	H

Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th 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 Measurement of data 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 bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode: TX CH Mid
 Fundamental Frequency: 2440MHz
 Temperature : 25 °C
 Humidity : 65 %

Test Date : Jan. 06, 2009
 Test By: Bondi
 Pol: Horizontal

Freq. (MHz)	Ant.Pol. H/V	Peak	AV	Factor	Actual	Actual	Peak Limit	AV Limit	Margin (dB)
		Reading (dBuV)	Reading (dBuV)		Peak FS (dBuV/m)	AV FS (dBuV/m)	at 3m (dBuV/m)	at 3m (dBuV/m)	
2440.0	H	88.91	--	-1.13	87.78	--	114.00	94.00	-6.22 F
1481.0	H	79.50	39.87	-6.00	73.50	33.87	74.00	54.00	-20.13 S
2976.0	H	55.85	38.79	0.32	56.17	39.11	74.00	54.00	-14.89 S
4880.0	H	42.37	--	6.17	48.54	--	74.00	54.00	-5.46 H
7320.0	H	--	--			--	74.00	54.00	H
9760.0	H	--	--			--	74.00	54.00	H
12200.0	H	--	--			--	74.00	54.00	H
14640.0	H	--	--			--	74.00	54.00	H
17080.0	H	--	--			--	74.00	54.00	H
19520.0	H	--	--			--	74.00	54.00	H
21960.0	H	--	--			--	74.00	54.00	H
24400.0	H	--	--			--	74.00	54.00	H

Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th 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 Measurement of data 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 bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode: TX CH High
 Fundamental Frequency: 2478MHz
 Temperature : 25 °C
 Humidity : 65 %

Test Date : Jan. 06, 2009
 Test By: Bondi
 Pol: Vertical

Freq. (MHz)	Ant.Pol. H/V	Peak	AV	Actual Factor	Actual	Actual	Peak Limit	AV Limit	Margin (dB)
		Reading (dBuV)	Reading (dBuV)		Peak FS (dBuV/m)	AV FS (dBuV/m)	at 3m (dBuV/m)	at 3m (dBuV/m)	
2478.0	V	97.48	85.28	-0.92	96.56	84.36	114.00	94.00	-9.64
1481.0	V	69.16	39.90	-6.00	63.16	33.90	74.00	54.00	-20.10
2976.0	V	67.13	39.14	0.32	67.45	39.46	74.00	54.00	-14.54
4956.0	V	42.05	--	6.36	48.41	--	74.00	54.00	-5.59
7434.0	V	--	--			--	74.00	54.00	H
9912.0	V	--	--			--	74.00	54.00	H
12390.0	V	--	--			--	74.00	54.00	H
14868.0	V	--	--			--	74.00	54.00	H
17346.0	V	--	--			--	74.00	54.00	H
19824.0	V	--	--			--	74.00	54.00	H
22302.0	V	--	--			--	74.00	54.00	H
24780.0	V	--	--			--	74.00	54.00	H

Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th 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 Measurement of data 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 bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode: TX CH High
 Fundamental Frequency: 2478MHz
 Temperature : 25 °C
 Humidity : 65 %

Test Date : Jan. 06, 2009
 Test By: Bondi
 Pol: Horizontal

Freq. (MHz)	Ant.Pol. H/V	Peak	AV	Factor	Actual	Actual	Peak Limit	AV Limit	Margin (dB)
		Reading (dBuV)	Reading (dBuV)		Peak FS (dBuV/m)	AV FS (dBuV/m)	at 3m (dBuV/m)	at 3m (dBuV/m)	
2478.0	H	86.90	--	-0.92	85.98	--	114.00	94.00	-8.02 F
1481.0	H	79.62	39.91	-6.00	73.62	33.91	74.00	54.00	-20.09 S
2976.0	H	58.67	38.87	0.32	58.99	39.19	74.00	54.00	-14.81 S
4956.0	H	38.43	--	6.36	44.79	--	74.00	54.00	-9.21 H
7434.0	H	--	--			--	74.00	54.00	H
9912.0	H	--	--			--	74.00	54.00	H
12390.0	H	--	--			--	74.00	54.00	H
14868.0	H	--	--			--	74.00	54.00	H
17346.0	H	--	--			--	74.00	54.00	H
19824.0	H	--	--			--	74.00	54.00	H
22302.0	H	--	--			--	74.00	54.00	H
24780.0	H	--	--			--	74.00	54.00	H

Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th 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 Measurement of data 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 bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode	RX CH Low	Test Date	Jan. 06, 2009
Fundamental Frequency	2402MHz	Test By	Bondi
Temperature	25 °C	Pol	Ver./Hor
Humidity	65 %		

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Margin (dB)
51.34	V	Peak	45.74	-14.19	31.55	40.00	-8.45
90.14	V	Peak	51.36	-17.62	33.74	43.50	-9.76
191.99	V	Peak	45.53	-15.23	30.30	43.50	-13.20
264.74	V	Peak	44.60	-13.59	31.01	46.00	-14.99
383.08	V	Peak	42.19	-10.57	31.62	46.00	-14.38
814.73	V	Peak	33.59	-2.70	30.89	46.00	-15.11
51.34	H	Peak	43.34	-14.19	29.15	40.00	-10.85
288.99	H	Peak	50.08	-13.23	36.85	46.00	-9.15
383.08	H	Peak	43.00	-10.57	32.43	46.00	-13.57

Remark:

- 1 No further spurious emissions detected from the lowest internal frequency and 30MHz.
- 2 Measuring frequencies from the lowest internal frequency to the 1GHz.
- 3 Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak / QP detector mode.
- 4 Measurement result 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 The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz, VBW=300KHz.

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Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode	RX CH Mid	Test Date	Jan. 06, 2009
Fundamental Frequency	2440MHz	Test By	Bondi
Temperature	25 °C	Pol	Ver./Hor
Humidity	65 %		

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Margin (dB)
90.14	V	Peak	50.47	-17.62	32.85	43.50	-10.65
102.75	V	Peak	46.72	-16.78	29.94	43.50	-13.56
191.99	V	Peak	46.08	-15.23	30.85	43.50	-12.65
264.74	V	Peak	44.82	-13.59	31.23	46.00	-14.77
383.08	V	Peak	42.06	-10.57	31.49	46.00	-14.51
814.73	V	Peak	32.92	-2.70	30.22	46.00	-15.78
240.49	H	Peak	46.21	-14.11	32.10	46.00	-13.90
288.99	H	Peak	49.76	-13.23	36.53	46.00	-9.47
383.08	H	Peak	41.68	-10.57	31.11	46.00	-14.89

Remark:

- 1 No further spurious emissions detected from the lowest internal frequency and 30MHz.
- 2 Measuring frequencies from the lowest internal frequency to the 1GHz.
- 3 Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak / QP detector mode.
- 4 Measurement result 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 The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz, VBW=300KHz.

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Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode	RX CH High	Test Date	Jan. 06, 2009
Fundamental Frequency	2478MHz	Test By	Bondi
Temperature	25 °C	Pol	Ver./Hor
Humidity	65 %		

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Margin (dB)
51.34	V	Peak	45.38	-14.19	31.19	40.00	-8.81
90.14	V	Peak	50.20	-17.62	32.58	43.50	-10.92
191.99	V	Peak	45.89	-15.23	30.66	43.50	-12.84
264.74	V	Peak	44.59	-13.59	31.00	46.00	-15.00
383.08	V	Peak	41.73	-10.57	31.16	46.00	-14.84
814.73	V	Peak	33.93	-2.70	31.23	46.00	-14.77
67.83	H	Peak	42.73	-15.60	27.13	40.00	-12.87
240.49	H	Peak	46.72	-14.11	32.61	46.00	-13.39
288.99	H	Peak	49.93	-13.20	36.73	46.00	-9.27
383.08	H	Peak	42.97	-10.57	32.40	46.00	-13.60
814.73	H	Peak	34.00	-2.70	31.30	46.00	-14.70

Remark:

- 1 No further spurious emissions detected from the lowest internal frequency and 30MHz.
- 2 Measuring frequencies from the lowest internal frequency to the 1GHz.
- 3 Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak / QP detector mode.
- 4 Measurement result 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 The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz, VBW=300KHz.

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Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode: RX CH Low
 Fundamental Frequency: 2402MHz
 Temperature : 25 °C
 Humidity : 65 %

Test Date : Jan. 06, 2009
 Test By: Bondi
 Pol: V/H

Freq. (MHz)	Ant.Pol. H/V	Peak	AV	Factor	Actual	Actual	Peak Limit	AV Limit	Margin (dB)
		Reading (dBuV)	Reading (dBuV)		Peak FS (dBuV/m)	AV FS (dBuV/m)	at 3m (dBuV/m)	at 3m (dBuV/m)	
2748.5	V	37.50	--	-0.19	37.31	--	74.00	54.00	-16.69 S
4804.0	V	--	--			--	74.00	54.00	H
7206.0	V	--	--			--	74.00	54.00	H
9608.0	V	--	--			--	74.00	54.00	H
12010.0	V	--	--			--	74.00	54.00	H
2963.0	H	36.59	--	0.29	36.88	--	74.00	54.00	-17.12 S
4804.0	H	--	--			--	74.00	54.00	H
7206.0	H	--	--			--	74.00	54.00	H
9608.0	H	--	--			--	74.00	54.00	H
12010.0	H	--	--			--	74.00	54.00	H

Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th 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 Measurement of data 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 bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode: RX CH Mid
 Fundamental Frequency: 2440MHz
 Temperature : 25 °C
 Humidity : 65 %

Test Date : Jan. 06, 2009
 Test By: Bondi
 Pol: V/H

Freq. (MHz)	Ant.Pol. H/V	Peak	AV	Factor	Actual	Actual	Peak Limit	AV Limit	Margin (dB)
		Reading (dBuV)	Reading (dBuV)		Peak FS (dBuV/m)	AV FS (dBuV/m)	at 3m (dBuV/m)	at 3m (dBuV/m)	
2963.0	H	37.21	--	0.29	37.50	--	74.00	54.00	-16.50 S
4880.0	V	--	--			--	74.00	54.00	H
7320.0	V	--	--			--	74.00	54.00	H
9760.0	V	--	--			--	74.00	54.00	H
12200.0	V	--	--			--	74.00	54.00	H
4880.0	H	--	--			--	74.00	54.00	H
7320.0	H	--	--			--	74.00	54.00	H
9760.0	H	--	--			--	74.00	54.00	H
12200.0	H	--	--			--	74.00	54.00	H

Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th 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 Measurement of data 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 bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode: RX CH High
Fundamental Frequency: 2478MHz
Temperature : 25 °C
Humidity : 65 %

Test Date : Jan. 06, 2009
Test By: Bondi
Pol: V/H

Freq. (MHz)	Ant.Pol. H/V	Peak	AV	Actual Factor	Actual	Actual	Peak Limit	AV Limit	Margin
		Reading (dBuV)	Reading (dBuV)		Peak FS (dBuV/m)	AV FS (dBuV/m)	at 3m (dBuV/m)	at 3m (dBuV/m)	
4956.0	V	--	--			--	74.00	54.00	H
7434.0	V	--	--			--	74.00	54.00	H
9912.0	V	--	--			--	74.00	54.00	H
12390.0	V	--	--			--	74.00	54.00	H
4956.0	H	--	--			--	74.00	54.00	H
7434.0	H	--	--			--	74.00	54.00	H
9912.0	H	--	--			--	74.00	54.00	H
12390.0	H	--	--			--	74.00	54.00	H

Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th 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 Measurement of data 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 bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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6. 20 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 = 100kHz, VBW = 300kHz, Span =3MHz.
4. Set SPA Max hold. Mark peak, -20dB.

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:

2402 Channel = 2.068MHz

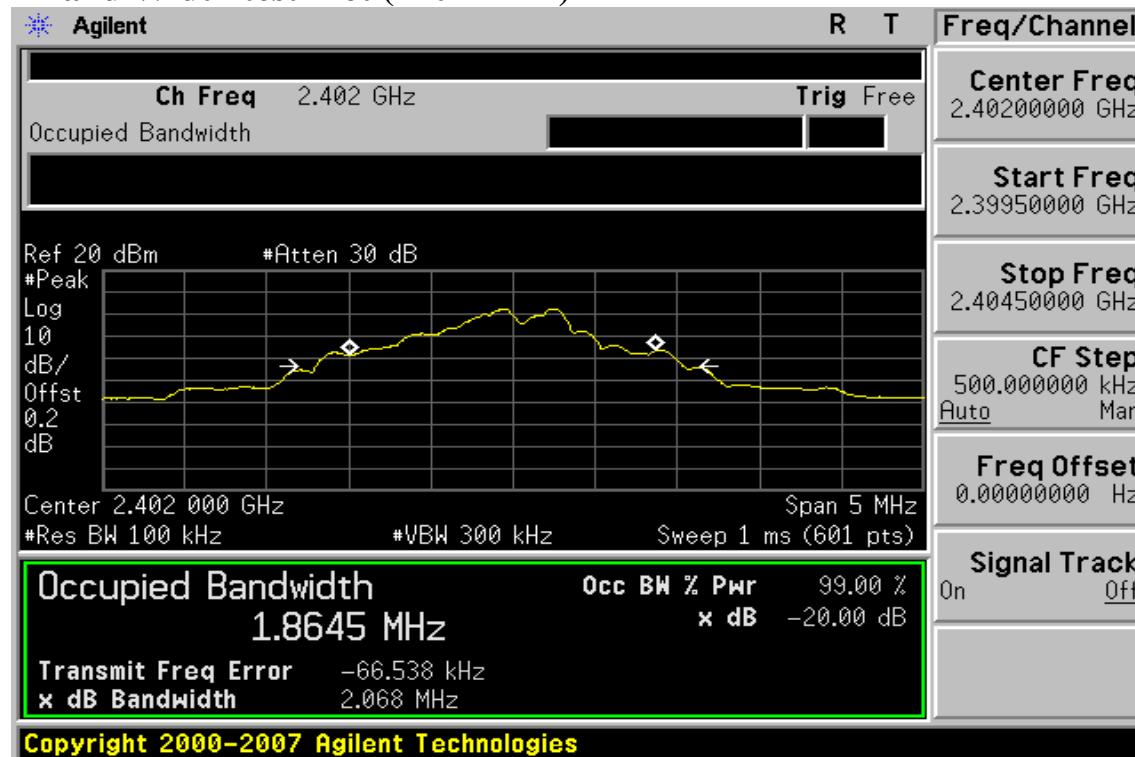
2440 Channel = 2.062MHz

2478 Channel = 2.046MHz

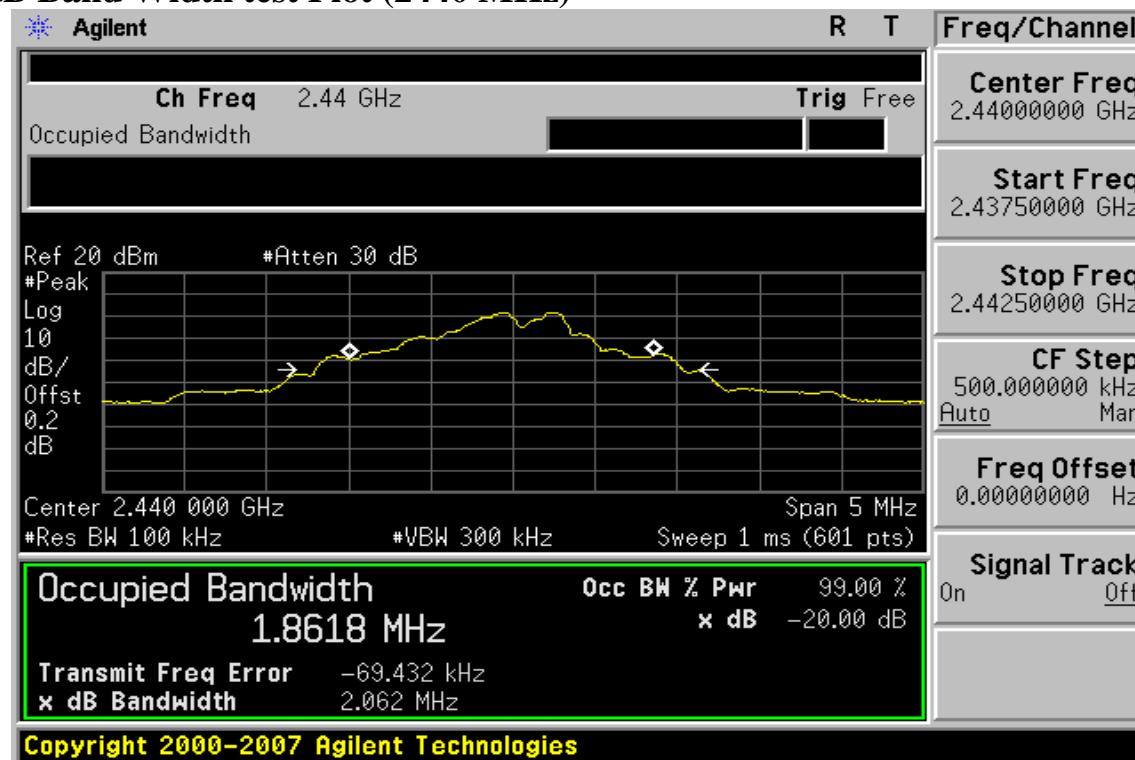
Refer to attached data chart.

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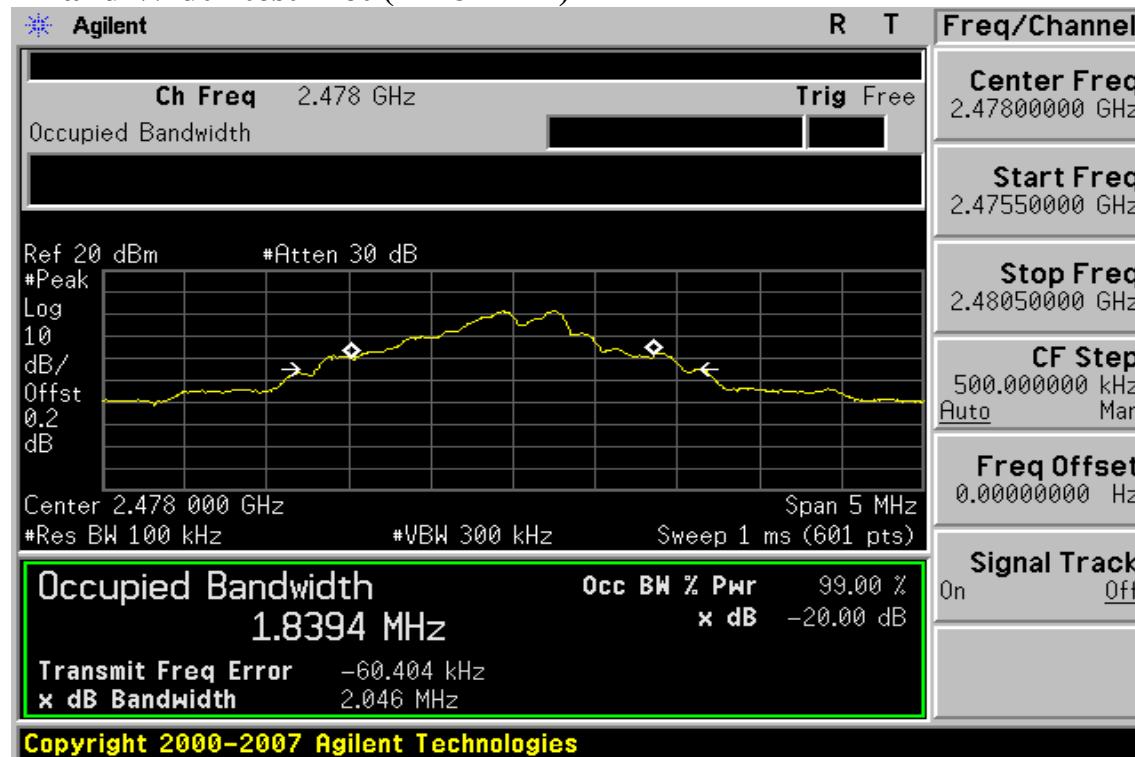
26dB Band Width test Plot (2402 MHz)



26dB Band Width test Plot (2440 MHz)



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26dB Band Width test Plot (2478 MHz)

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7. 99% BAND WIDTH MEASUREMENT

7.1 Measurement Procedure

- 1 Place the EUT on the table 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 spectrum analyzer.
- 3 Set the spectrum analyzer as RBW=1% of the approximate emission bandwidth, VBW = 3 times RBW, Span= approximately 20dB below the peak level. Sweep=auto
- 4 Turn on the 99% bandwidth function, max reading..
- 5 Repeat above procedures until all frequency measured were complete.

7.2 Test SET-UP (Block Diagram of Configuration)

Same as 4.2 Radiated Emission Measurement.

7.3 Measurement Equipment Used:

Same as 4.2 Radiated Emission Measurement.

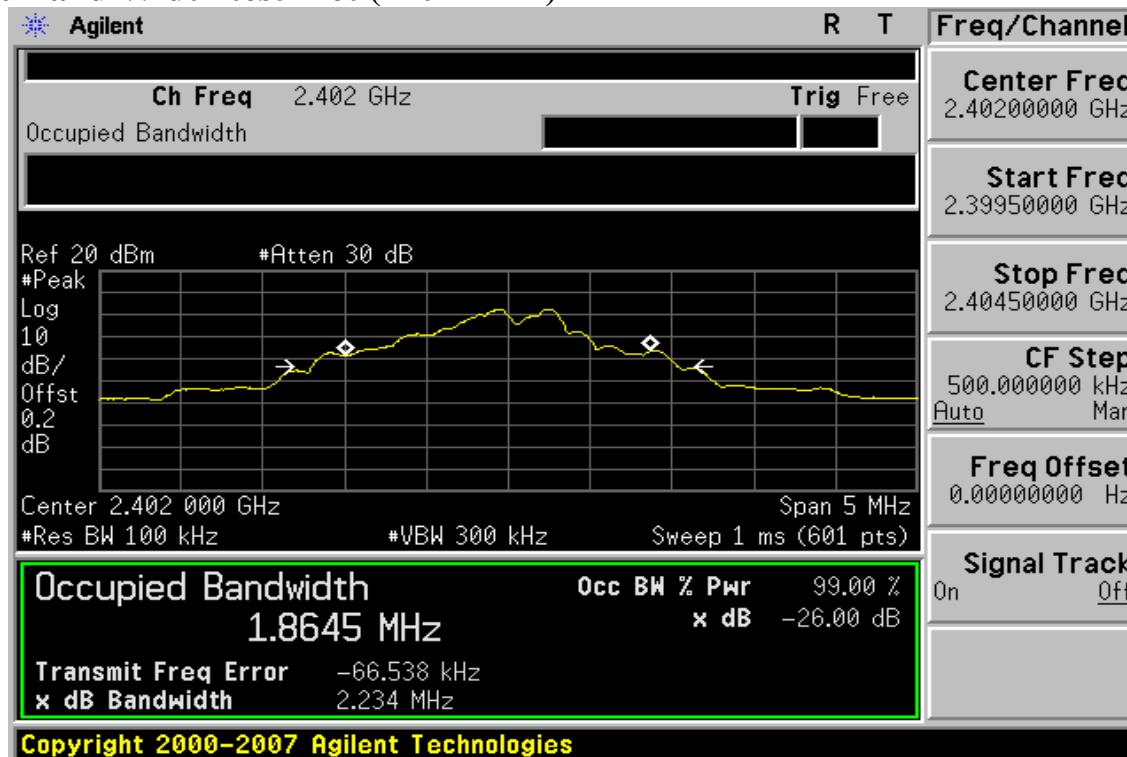
7.4 Measurement Results:

2402 Channel = 1.8645MHz
2440 Channel = 1.8618MHz
2478 Channel = 1.8394MHz

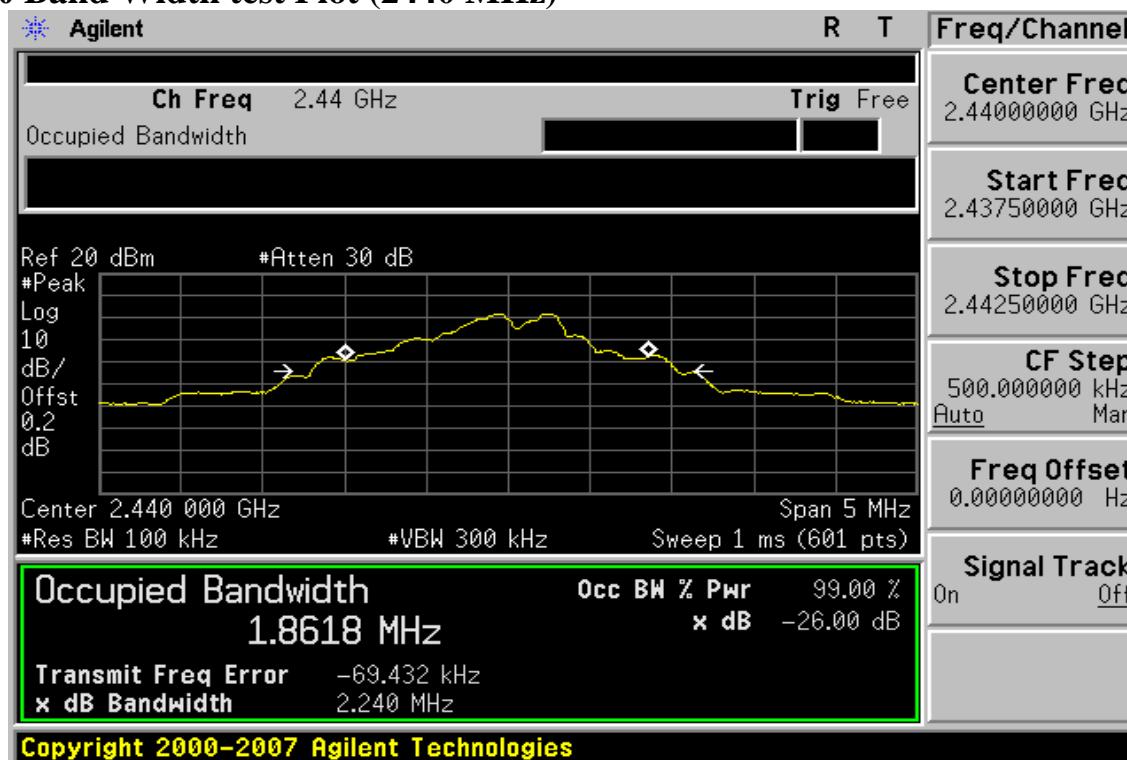
Refer to attached data chart.

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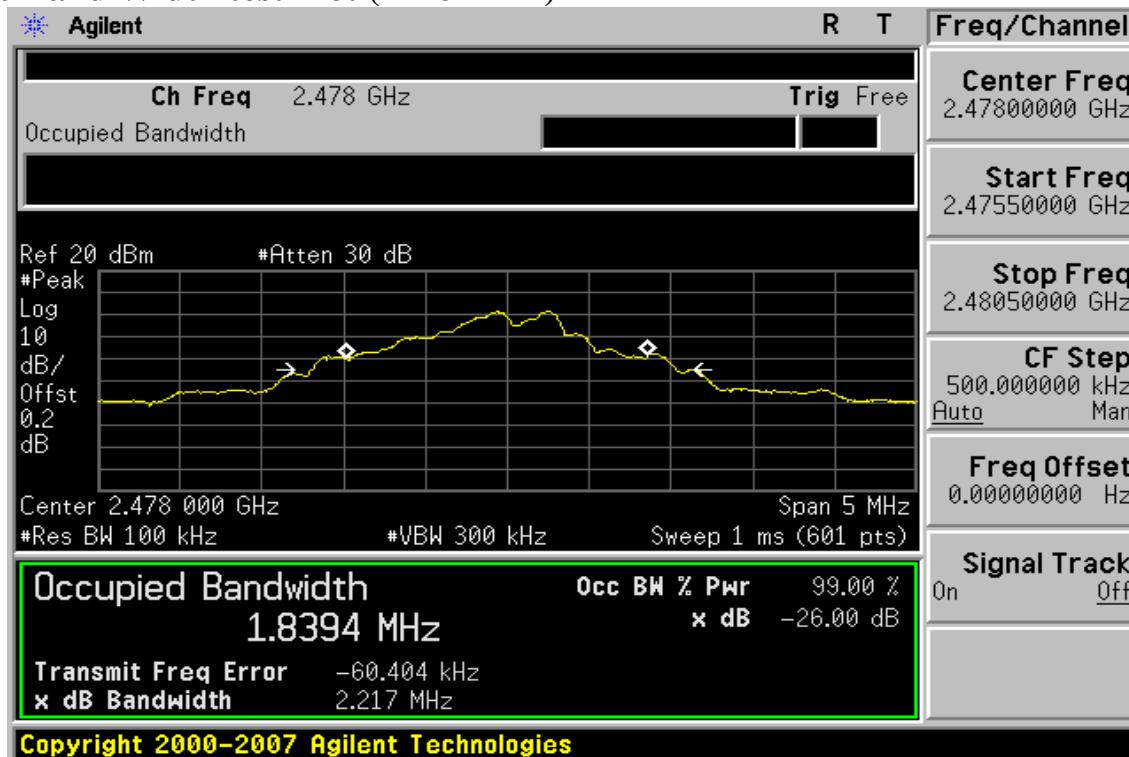
99% Band Width test Plot (2402 MHz)



99% Band Width test Plot (2440 MHz)



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99% Band Width test Plot (2478 MHz)

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