

Variant FCC RF Test Report

APPLICANT : Kyocera Communications, Inc.
EQUIPMENT : Cellular/PCS WCDMA/GSM/GPRS/EDGE
phone with Bluetooth
BRAND NAME : Kyocera
MODEL NAME : C4700
FCC ID : OVF-C4700
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : Digital Spread Spectrum (DSS)

This is a variant report which is only valid together with the original test report.

The product was received on Oct. 01, 2010 and completely tested on Oct. 18, 2010. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.4-2003 and shown the compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by:



Anderson Chiu / Deputy Manager



SPORTON INTERNATIONAL INC.

No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.



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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR072003-01	Rev. 01	Verified Radiated Emission tests for the changing of WCDMA Band II duplexer, touch screen controller, SIM socket, GPS antenna, Bluetooth antenna, and WWAN antenna and adding 2nd battery and IC MCP. The original report can be referred to Sporton report number FR072003 as appendix C.	Oct. 20, 2010

SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.247(d)	A8.5	Frequency Band Edges	$\leq 20\text{dBc}$	Pass	-
3.2	15.247(d)	A8.5	Transmitter Radiated Emission	15.209(a) & 15.247(d)	Pass	Under limit 1.33 dB at 31.08 MHz
3.3	15.203 & 15.247(b)	A8.4	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

Kyocera Communications, Inc.

10300 Campus Point Drive, San Diego, CA 92121

1.2 Manufacturer

Compal Communication, INC.

No. 385, Yangguang Street, Neihu, Taipei (114), Taiwan, R.O.C.

1.3 Feature of Equipment Under Test

Product Feature & Specification	
Equipment	Cellular/PCS WCDMA/GSM/GPRS/EDGE phone with Bluetooth
Brand Name	Kyocera
Model Name	C4700
FCC ID	OVF-C4700
Tx/Rx Frequency Range	2400 MHz ~ 2483.5 MHz
Number of Channels	79
Carrier Frequency of Each Channel	2402+n*1 MHz; n=0~78
Channel Spacing	1 MHz
Antenna Type	PIFA Antenna with gain -3.82 dBi
HW Version	0C
SW Version	1.0.29
Type of Modulation	Bluetooth (1Mbps) : GFSK Bluetooth EDR (2Mbps) : π /4-DQPSK Bluetooth EDR (3Mbps) : 8-DPSK
EUT Stage	Identical Prototype

Remark:

1. For other wireless features of this EUT, test report will be issued separately.
2. This test report recorded only product characteristics and test results of Digital Spread Spectrum (DSS).
3. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4 Testing Site

Test Site	SPORTON INTERNATIONAL INC.	
Test Site Location	No. 52, Hwa Ya 1 st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL: +886-3-3273456 / FAX: +886-3-3284978	
Test Site No.	Sporton Site No.	FCC/IC Registration No.
	03CH06-HY	TW1022/4086B-1

1.5 Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart C §15.247
- FCC Public Notice DA 00-705
- ANSI C63.4-2003
- IC RSS-210 Issue 7

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B (DoC), recorded in a separate test report.

1.6 Ancillary Equipment List

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Bluetooth Base Station	R&S	CBT32	N/A	N/A	Unshielded, 1.8 m

2 Test Configuration of Equipment Under Test

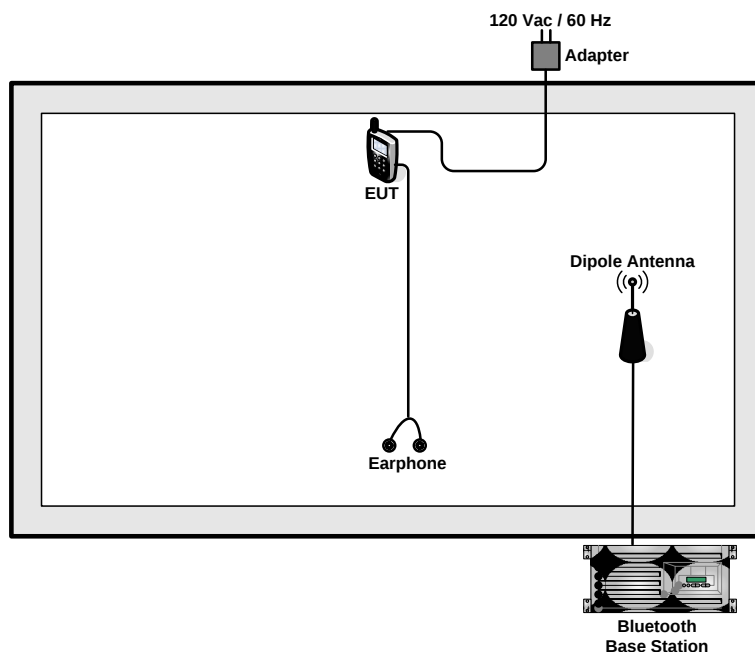
2.1 Test Mode

The EUT has been associated with peripherals pursuant to ANSI C63.4-2003 and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

The following tables are showing the test modes as the worst cases and recorded in this report.

Test Cases	
Test Item	Data Rate / Modulation
	Bluetooth EDR 3Mbps / 8-DPSK
Radiated TCs	Mode 1: CH78_2480 MHz
Remark: The test matrix was based on the worst case in Sporton report number FR072003 shown in appendix C.	

2.2 Connection Diagram of Test System



2.3 RF Utility

For Bluetooth function, key in “#2801#” to make the EUT contact with Bluetooth base station for transmitting and receiving signals continuously.

3 Test Result

3.1 Band Edges Measurement

3.1.1 Limit of Band Edges

In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

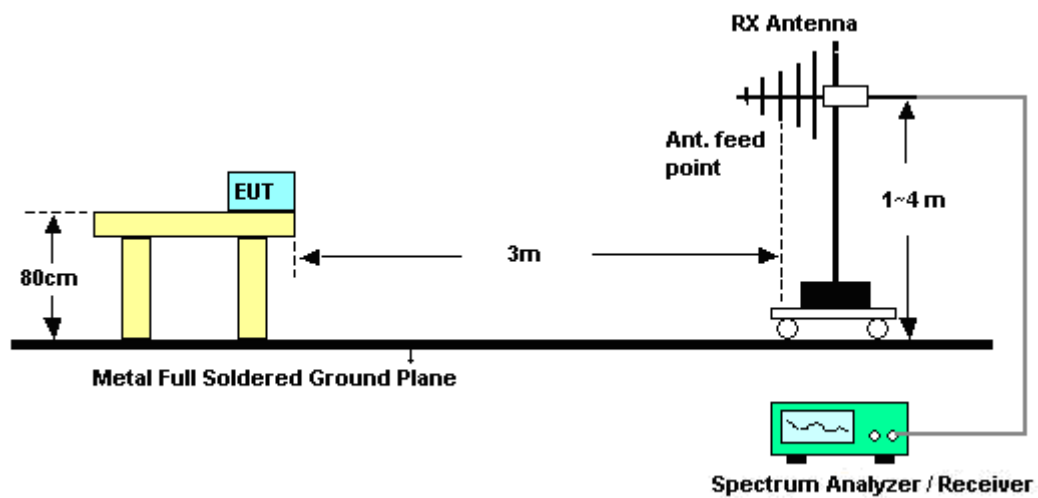
3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

3.1.3 Test Procedures

1. The testing follows the guidelines in ANSI C63.4-2003 and FCC Public Notice DA 00-705 Measurement Guidelines.
2. RF antenna conducted test: Set RBW = 300kHz, Video bandwidth (VBW) $\geq$ RBW. Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 300k Hz RBW. Note: If the device complies with the use of power option 2 the attenuation under this paragraph shall be 30 dB instead of 20 dB.
3. Radiated emission test: Applies to band edge emissions that fall in the restricted bands listed in FCC Section 15.205. The maximum permitted average field strength is listed in FCC Section 15.209. A pre-amp is necessary for this measurement. For measurements above 1 GHz, set RBW = 1MHz, VBW = 1MHz, Sweep: Auto for Peak; set RBW = 1MHz, VBW = 10 Hz, Sweep: Auto for Average. If the emission is pulsed, modify the unit for continuous operation; use the settings shown above, then correct the reading by subtracting the peak-average correction factor, derived from the appropriate duty cycle calculation. See FCC Section 15.35(b) and (c).
4. In case the emission is fail due to the used RBW / VBW is too wide, marker-delta method of FCC Public Notice DA 00-705 will be followed.

3.1.4 Test Setup



3.1.5 Test Result of Radiated Band Edges

Test Mode :	Mode 3	Temperature :	23~25°C
Test Channel :	78	Relative Humidity :	46~48%
		Test Engineer :	Kai Wang

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.50	67.68	-6.32	74.00	65.42	32.58	4.05	34.37	106	351	Peak
2483.50	31.06	-22.94	54.00	28.80	32.58	4.05	34.37	106	351	Average

Summary results of marker-delta method:

Test mode	Maximum field strength of the fundamental emission (dBμV/m)	Delta Result (dB)	Average Result (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)	Result
Single Carrier Mode	86.62	55.56	31.06	54	-22.94	Pass
Hopping Mode	86.62	56.25	30.37	54	-23.63	Pass

Note : Average result = Maximum field strength – Delta result

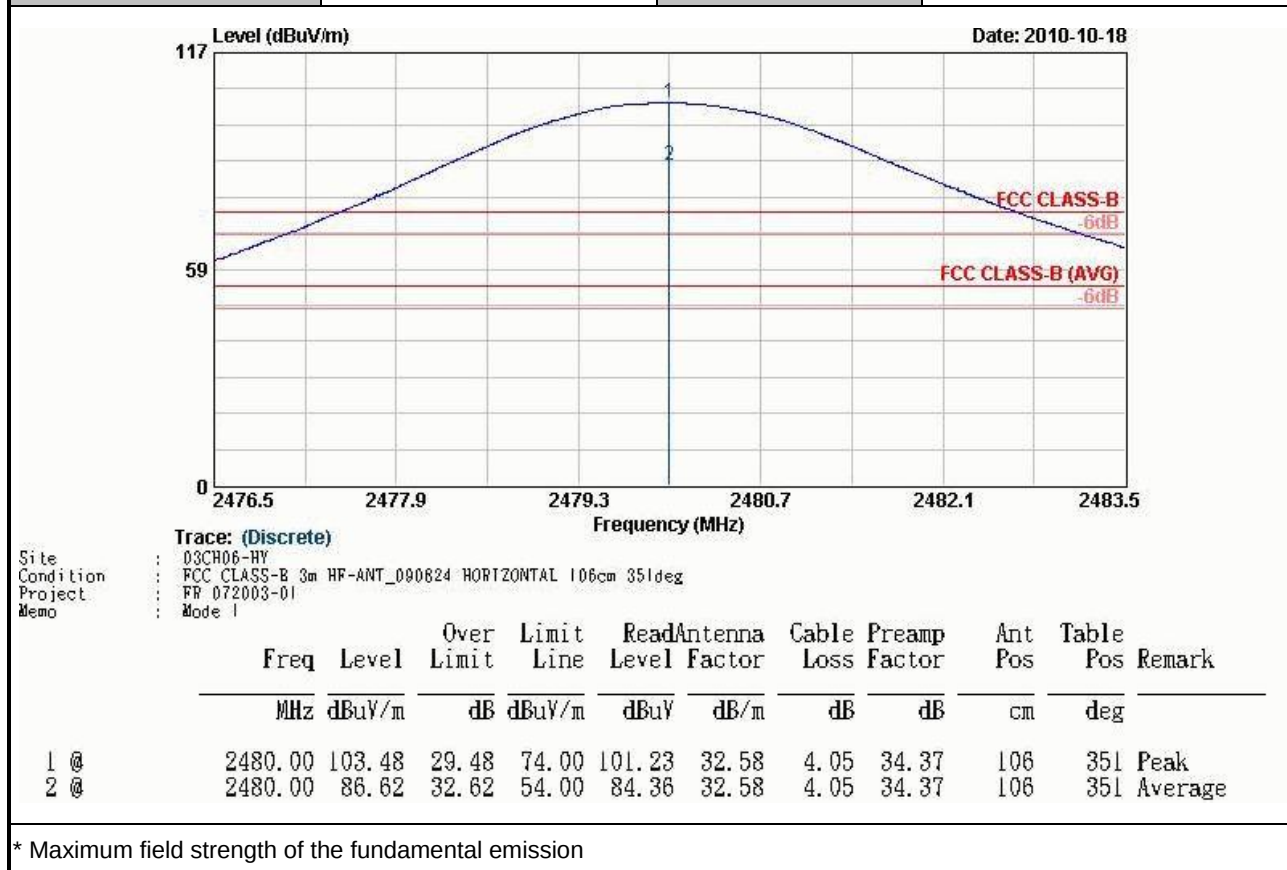
ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.50	65.65	-8.35	74.00	63.39	32.58	4.05	34.37	158	27	Peak
2483.50	29.96	-24.04	54.00	27.70	32.58	4.05	34.37	158	27	Average

Summary results of marker-delta method:

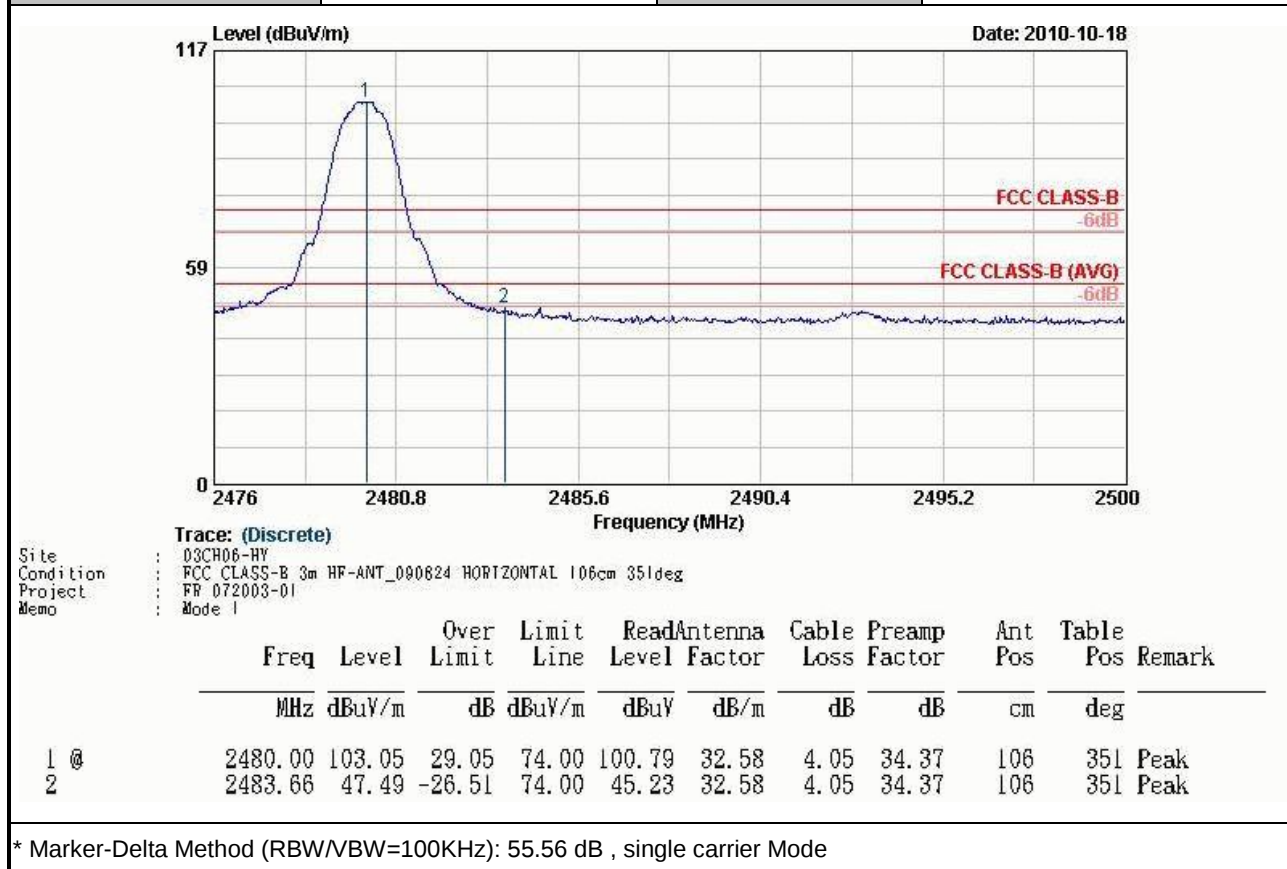
Test mode	Maximum field strength of the fundamental emission (dBμV/m)	Delta Result (dB)	Average Result (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)	Result
Single Carrier Mode	85.19	55.40	29.79	54	-24.21	Pass
Hopping Mode	85.19	55.23	29.96	54	-24.04	Pass

Note : Average result = Maximum field strength – Delta result

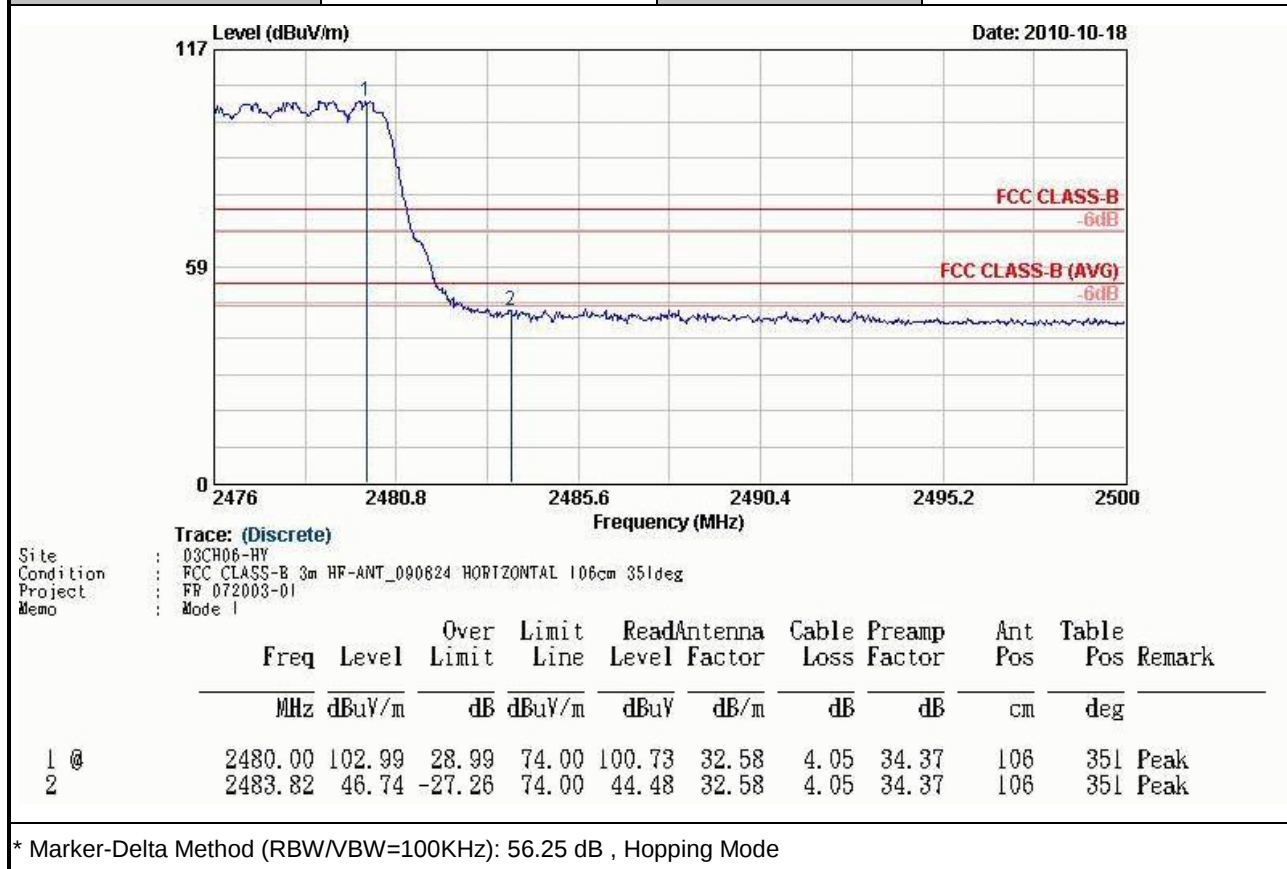
Test Mode :	Mode 3	Temperature :	23~25°C
Test Channel :	78	Relative Humidity :	46~48%
Test Engineer :	Kai Wang	Polarization :	Horizontal



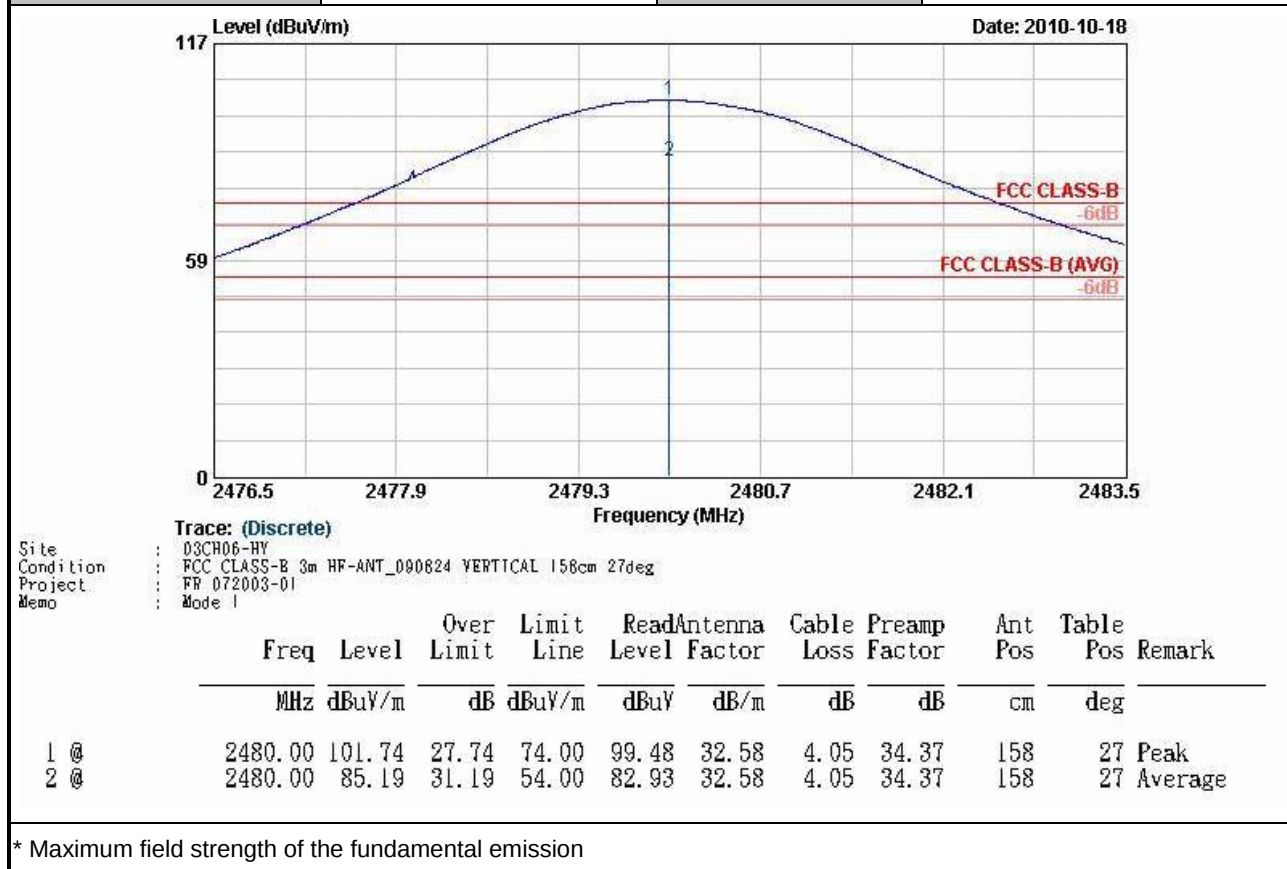
Test Mode :	Mode 3	Temperature :	23~25°C
Test Channel :	78	Relative Humidity :	46~48%
Test Engineer :	Kai Wang	Polarization :	Horizontal



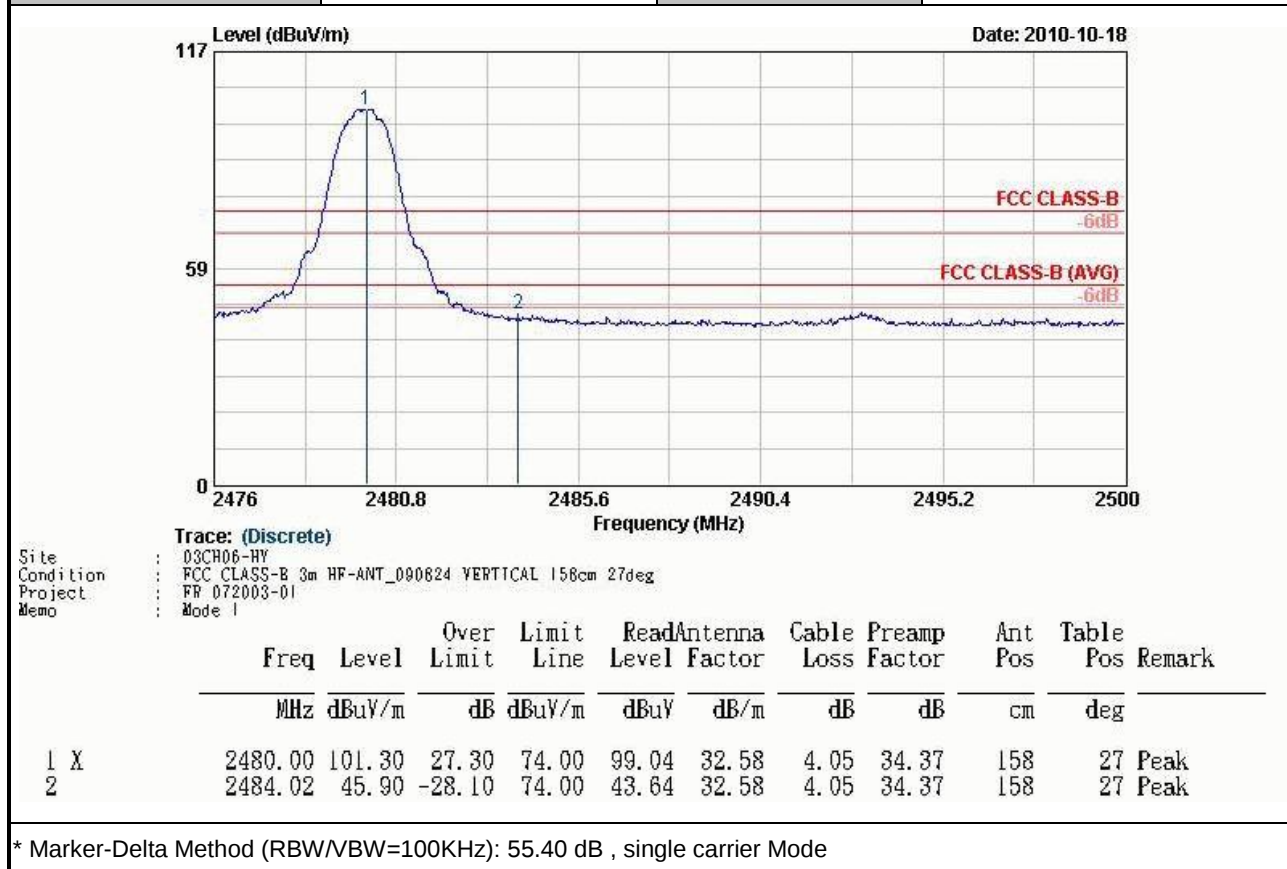
Test Mode :	Mode 3	Temperature :	23~25°C
Test Channel :	78	Relative Humidity :	46~48%
Test Engineer :	Kai Wang	Polarization :	Horizontal



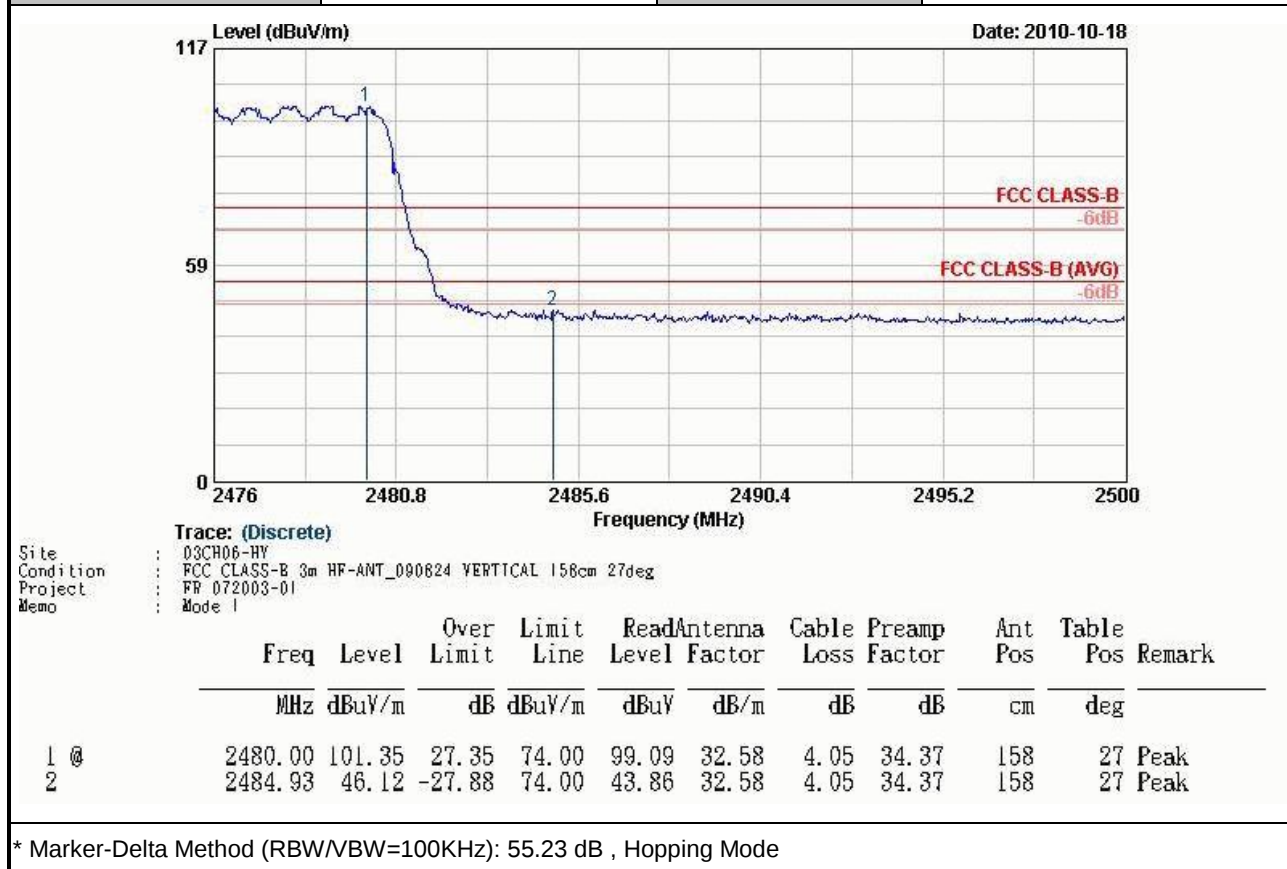
Test Mode :	Mode 3	Temperature :	23~25°C
Test Channel :	78	Relative Humidity :	46~48%
Test Engineer :	Kai Wang	Polarization :	Vertical



Test Mode :	Mode 3	Temperature :	23~25°C
Test Channel :	78	Relative Humidity :	46~48%
Test Engineer :	Kai Wang	Polarization :	Vertical



Test Mode :	Mode 3	Temperature :	23~25°C
Test Channel :	78	Relative Humidity :	46~48%
Test Engineer :	Kai Wang	Polarization :	Vertical



3.2 Radiated Emission Measurement

3.2.1 Limit of Radiated Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.2.2 Measuring Instruments

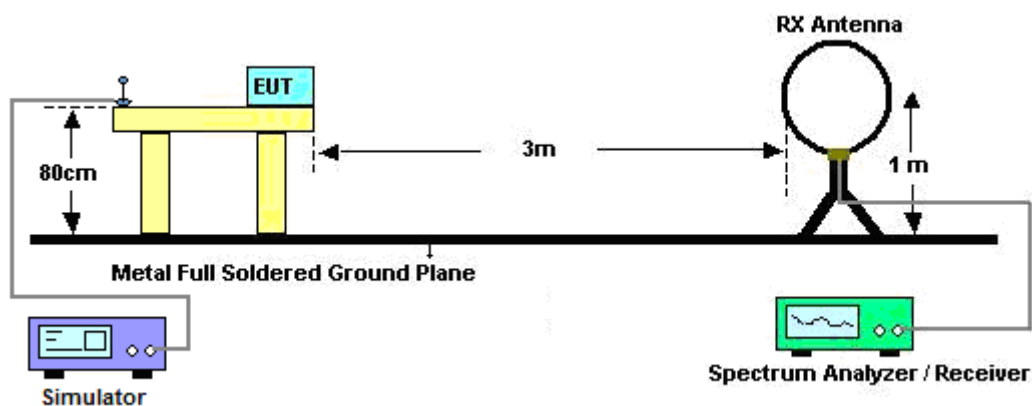
See list of measuring instruments of this test report.

3.2.3 Test Procedures

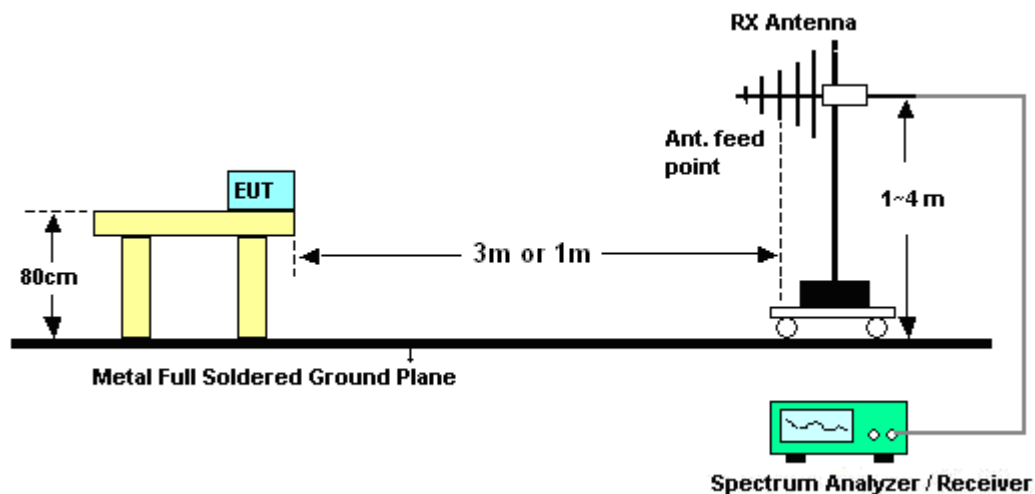
- The testing follows the guidelines in FCC Public Notice DA 00-705 Measurement Guidelines.
- Use the following spectrum analyzer settings:
 - Span = wide enough to fully capture the emission being measured; RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz; VBW $\geq$ RBW; Sweep = auto; Detector function = peak; Trace = max hold.
 - Above 18 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from 3m to 1m.
 Distance extrapolation factor = $20 \log (\text{specific distance [3m]} / \text{test distance [1m]})$ (dB)
- Follow the guidelines in ANSI C63.4-2003 with respect to maximizing the emission by rotating the EUT, measuring the emission for three EUT orthogonal planes, and adjusting the measurement antenna height and polarization. A pre-amp and a high pass filter are used for this test in order to get the good signal level.

3.2.4 Test Setup

For radiated emissions below 30MHz



For radiated emissions above 30MHz



3.2.5 Test Results of Radiated Emissions (9 kHz ~ 30 MHz)

Test Engineer :	Kai Wang	Temperature :	23~25°C	
		Relative Humidity :	46~48%	

Frequency (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Remark
-	-	-	-	See Note

Note:

The amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

3.2.6 Test Result of Radiated Emission (30 MHz ~ 10th Harmonic)

Test Mode :	Mode 1	Temperature :	23~25°C
Test Channel :	78	Relative Humidity :	46~48%
Test Engineer :	Kai Wang	Polarization :	Horizontal
Remark :	2480 MHz is Fundamental Signals which can be ignored.		

Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
30.54	22.92	-17.08	40.00	35.88	17.98	0.72	31.66	100	58	Peak
48.63	14.72	-25.28	40.00	34.60	10.91	0.84	31.63	-	-	Peak
83.73	18.74	-21.26	40.00	41.38	7.84	1.10	31.58	-	-	Peak
598.90	22.07	-23.93	46.00	32.15	18.70	2.92	31.70	-	-	Peak
757.80	23.81	-22.19	46.00	32.34	19.72	3.35	31.60	-	-	Peak
906.90	25.96	-20.04	46.00	32.34	20.76	3.76	30.90	-	-	Peak
2390.00	48.20	-25.80	74.00	46.19	32.48	3.92	34.39	106	351	Peak
2390.00	36.39	-17.61	54.00	34.38	32.48	3.92	34.39	106	351	Average
2480.00	103.46	-	-	101.20	32.58	4.05	34.37	106	351	Peak
2480.00	86.62	-	-	84.36	32.58	4.05	34.37	106	351	Average
2483.50	67.68	-6.32	74.00	65.42	32.58	4.05	34.37	106	351	Peak
2483.50	31.06	-22.94	54.00	28.80	32.58	4.05	34.37	106	351	Average
4960.00	55.60	-18.40	74.00	48.61	34.90	5.87	33.78	100	319	Peak
4960.00	45.72	-8.28	54.00	38.73	34.90	5.87	33.78	100	319	Average
7416.00	51.92	-22.08	74.00	42.53	36.13	7.24	33.98	100	25	Peak
7416.00	39.20	-14.80	54.00	29.81	36.13	7.24	33.98	100	25	Average
9920.00	50.95	-32.51	83.46	62.53	37.23	8.07	56.88	100	0	Peak

Test Mode :	Mode 1	Temperature :	23~25°C
Test Channel :	78	Relative Humidity :	46~48%
Test Engineer :	Kai Wang	Polarization :	Vertical
Remark :	2480 MHz is Fundamental Signals which can be ignored.		

Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
31.08	38.67	-1.33	40.00	51.63	17.98	0.72	31.66	100	215	QP
48.63	24.85	-15.15	40.00	44.73	10.91	0.84	31.63	-	-	Peak
84.54	21.08	-18.92	40.00	43.56	7.99	1.10	31.57	-	-	Peak
600.30	22.16	-23.84	46.00	32.22	18.72	2.92	31.70	-	-	Peak
775.30	23.20	-22.80	46.00	31.54	19.86	3.36	31.56	-	-	Peak
878.90	25.01	-20.99	46.00	31.80	20.59	3.67	31.05	-	-	Peak
2316.00	48.16	-25.84	74.00	46.38	32.37	3.82	34.41	158	27	Peak
2316.00	36.13	-17.87	54.00	34.35	32.37	3.82	34.41	158	27	Average
2480.00	101.80	-	-	99.54	32.58	4.05	34.37	158	27	Peak
2480.00	85.19	-	-	82.93	32.58	4.05	34.37	158	27	Average
2483.50	65.65	-8.35	74.00	63.39	32.58	4.05	34.37	158	27	Peak
2483.50	29.96	-24.04	54.00	27.70	32.58	4.05	34.37	158	27	Average
4960.00	53.23	-20.77	74.00	46.24	34.90	5.87	33.78	141	27	Peak
4960.00	43.50	-10.50	54.00	36.51	34.90	5.87	33.78	141	27	Average
7392.00	51.65	-22.35	74.00	42.25	36.14	7.23	33.97	100	291	Peak
7392.00	39.02	-14.98	54.00	29.62	36.14	7.23	33.97	100	291	Average
9920.00	52.30	-29.50	81.80	63.88	37.23	8.07	56.88	100	0	Peak



3.3 Antenna Requirements

3.3.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the FCC rule.

3.3.2 Antenna Connected Construction

The antennas type used in this product is PIFA Antenna without connector and it is considered to meet antenna requirement.

3.3.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Due Date	Remark
Spectrum Analyzer	Agilent	E4408B	MY44211030	9KHz-26.5GHz	Oct. 23, 2009	Oct. 22, 2010	Radiation (03CH06-HY)
Spectrum Analyzer	R&S	FSP40	100057	9KHz-40GHz	Oct. 20, 2009	Oct. 19, 2010	Radiation (03CH06-HY)
EMI Test Receiver	R&S	ESVS10	834468/003	20MHz-1000MHz	Apr. 28, 2010	Apr. 27, 2011	Radiation (03CH06-HY)
Bilog Antenna	SCHAFFNER	CBL6112B	2885	30MHz -2GHz	Oct. 31, 2009	Oct. 31, 2010	Radiation (03CH06-HY)
Double Ridge Horn Antenna	EMCO	3117	00066583	1GHz~18GHz	Aug. 02, 2010	Aug. 01, 2011	Radiation (03CH06-HY)
Double Ridge Horn Antenna	Training Research	AH-0801	95119	8GHz~18GHz	Nov. 02, 2009	Nov. 01, 2010	Radiation (03CH06-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	15GHz- 40GHz	Oct. 18, 2010	Oct. 17, 2011	Radiation (03CH06-HY)
Pre Amplifier	Agilent	8449B	3008A01917	1GHz- 26.5GHz	Apr. 15, 2010	Apr. 14, 2011	Radiation (03CH06-HY)
Amplifier	Agilent	310N	186713	9KHz~1GHz	Apr. 15, 2010	Apr. 14, 2011	Radiation (03CH06-HY)
Loop Antenna	R&S	HFH2-Z2	860004/001	9 kHz~30 MHz	Jul. 29, 2010	Jul. 28, 2011	Radiation (03CH06-HY)
Bluetooth Base Station	R&S	CBT32	100519	N/A	May 12, 2009	May 11, 2011	Radiation (03CH06-HY)

5 Uncertainty of Evaluation

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Contribution	Uncertainty of X_i		$u(X_i)$
	dB	Probability Distribution	
Receiver Reading	0.41	Normal (k=2)	0.21
Antenna Factor Calibration	0.83	Normal (k=2)	0.42
Cable Loss Calibration	0.25	Normal (k=2)	0.13
Pre-Amplifier Gain Calibration	0.27	Normal (k=2)	0.14
RCV/SPA Specification	2.50	Rectangular	0.72
Antenna Factor Interpolation for Frequency	1.00	Rectangular	0.29
Site Imperfection	1.43	Rectangular	0.83
Mismatch	+0.39 / -0.41	U-Shape	0.28
Combined Standard Uncertainty $U_c(y)$	1.27		
Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	2.54		

Uncertainty of Radiated Emission Measurement (1 GHz ~ 40 GHz)

Contribution	Uncertainty of X_i		$u(X_i)$	C_i	$C_i * u(X_i)$
	dB	Probability Distribution			
Receiver Reading	± 0.10	Normal (k=2)	0.10	1	0.10
Antenna Factor Calibration	± 1.70	Normal (k=2)	0.85	1	0.85
Cable Loss Calibration	± 0.50	Normal (k=2)	0.25	1	0.25
Receiver Correction	± 2.00	Rectangular	1.15	1	1.15
Antenna Factor Directional	± 1.50	Rectangular	0.87	1	0.87
Site Imperfection	± 2.80	Triangular	1.14	1	1.14
Mismatch Receiver VSWR $\Gamma_1 = 0.197$ Antenna VSWR $\Gamma_2 = 0.194$ Uncertainty = $20\log(1-\Gamma_1\Gamma_2)$	+0.34 / -0.35	U-Shape	0.244	1	0.244
Combined Standard Uncertainty $U_c(y)$	2.36				
Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	4.72				



Appendix A. Photographs of EUT

Please refer to Sporton report number EP072003-01.



Appendix C. Original Report

Please refer to Sporton report number FR072003 as below.