



Variant FCC RF Test Report

APPLICANT : Motorola Mobility, Inc.
EQUIPMENT : GSM / EGPRS Mobile Phone
BRAND NAME : Motorola
MODEL NAME : EX223
GPPD NUMBER : 3034
FCC ID : IHDT56MK1
STANDARD : FCC 47 CFR Part 2, 22(H), 24(E)
CLASSIFICATION : PCS Licensed Transmitter Held to Ear (PCE)
Tx/Rx FREQUENCY RANGE : GSM850 : 824.2 ~ 848.8 MHz /
869.2 ~ 893.8 MHz
GSM1900 : 1850.2 ~ 1909.8 MHz /
1930.2 ~ 1989.8 MHz
MAX. ERP/EIRP POWER : GSM850 (GSM) : 0.53 W
GSM1900 (GSM) : 1.14 W

This is a variant report which is only valid together with the original test report. The product was received on Mar. 29, 2011 and completely tested on Apr. 02, 2011. We, SPORTON INTERNATIONAL Inc., would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI / TIA / EIA-603-C-2004 and shown 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:

Roy Wu / Manager



SPORTON INTERNATIONAL INC.

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



TABLE OF CONTENTS

REVISION HISTORY 3

SUMMARY OF TEST RESULT 4

1 GENERAL DESCRIPTION 5

 1.1 Applicant..... 5

 1.2 Manufacturer 5

 1.3 Feature of Equipment Under Test..... 5

 1.4 Testing Site..... 6

 1.5 Applied Standards 6

 1.6 Ancillary Equipment List 6

2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST 7

 2.1 Test Mode..... 7

 2.2 Connection Diagram of Test System 7

3 TEST RESULT 8

 3.1 Effective Radiated Power and Effective Isotropic Radiated Power Measurement 8

 3.2 Field Strength of Spurious Radiation Measurement 11

4 LIST OF MEASURING EQUIPMENT 17

5 UNCERTAINTY OF EVALUATION 18

APPENDIX A. PRODUCT EQUALITY DECLARATION

APPENDIX B. ORIGINAL REPORT



SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	§22.913(a)(2)	RSS-132(4.4) SRSP-503(5.1.3)	Effective Radiated Power	< 7 Watts	PASS	-
3.1	§24.232(c)	RSS-133 (6.4) SRSP-510(5.1.2)	Equivalent Isotropic Radiated Power	< 2 Watts	PASS	-
0	§2.1053 §22.917(a) §24.238(a)	RSS-132 (4.5.1) RSS-133 (6.5.1)	Field Strength of Spurious Radiation	$< 43 + 10 \log_{10}(P[\text{Watts}])$	PASS	Under limit 26.11 dB at 7520 MHz



1 General Description

1.1 Applicant

Motorola Mobility, Inc.

No. 1, Wang Jing East Road, Chao Yang District Beijing, China 100102

1.2 Manufacturer

Arima Communications Corp.

6F., No. 866, Jhongjheng Rd., Jhonghe Dist., New Taipei City 23586, Taiwan

1.3 Feature of Equipment Under Test

Product Feature & Specification	
Equipment	GSM / EGPRS Mobile Phone
Brand Name	Motorola
Model Name	EX223
FCC ID	IHDT56MK1
Tx Frequency	GSM850 : 824 MHz ~ 849 MHz GSM1900 : 1850 MHz ~ 1910 MHz
Rx Frequency	GSM850 : 869 MHz ~ 894 MHz GSM1900 : 1930 MHz ~ 1990 MHz
Maximum ERP/EIRP	GSM850 (GSM) : 0.53 W (27.25 dBm) GSM1900 (GSM) : 1.14 W (30.55 dBm)
Antenna Type	Fixed Internal Antenna
HW Version	P2
SW Version	BREA_G_02.0B.00R_D
Type of Modulation	GSM / GPRS : GMSK EDGE : 8PSK
EUT Stage	Production Unit

Remark:

1. For other wireless features of this EUT, the test report will be issued separately.
2. This test report recorded only product characteristics and test results of PCS Licensed Transmitter Held to Ear (PCE).
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: +886-3-327-3456 FAX: +886-3-328-4978	
Test Site No.	Sporton Site No.	FCC/IC Registration No.
	03CH07-HY	722060/4086B-1

1.5 Applied Standards

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

- ♦ Preliminary Guidance for Receiving Applications for Certification of 3G Device. May 9, 2006.
- ♦ FCC 47 CFR Part 2, 22(H), 24(E)
- ♦ ANSI / TIA / EIA-603-C-2004
- ♦ IC RSS-132 Issue 2
- ♦ IC RSS-133 Issue 5

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 No.	FCC ID	Data Cable	Power Cord
1.	System Simulator	R&S	CMU200	N/A	N/A	Unshielded, 1.8 m

2 Test Configuration of Equipment Under Test

2.1 Test Mode

During all testing, EUT is in link mode with base station emulator at maximum power level. The spurious emission measurements were carried out in semi-anechoic chamber with 3-meter test range, and EUT is rotated on three test planes to find out the worst emission.

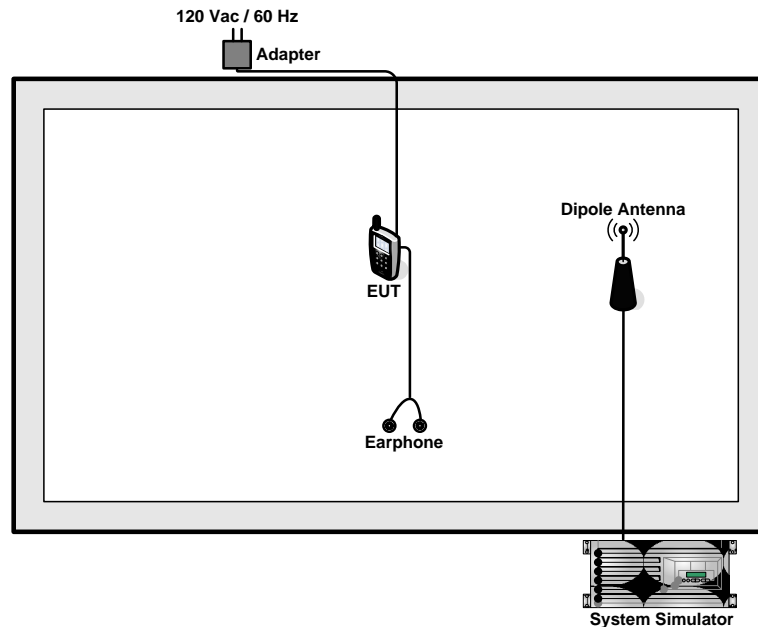
Frequency range investigated for radiated emission is as follows:

1. 30 MHz to 9000 MHz for GSM850.
2. 30 MHz to 19000 MHz for GSM1900.

Test Modes	
Band	Radiated TCs
GSM 850	■ GSM Link
GSM 1900	■ GSM Link

Note: Because there are individual antennas for each WWAN and Bluetooth, the co-location test modes are not required.

2.2 Connection Diagram of Test System





3 Test Result

3.1 Effective Radiated Power and Effective Isotropic Radiated Power Measurement

3.1.1 Description of the ERP/EIRP Measurement

ERP/EIRP is measured by substitution method according to ANSI / TIA / EIA-603-C-2004. The ERP of mobile transmitters must not exceed 7 Watts and the EIRP of mobile transmitters are limited to 2 Watts.

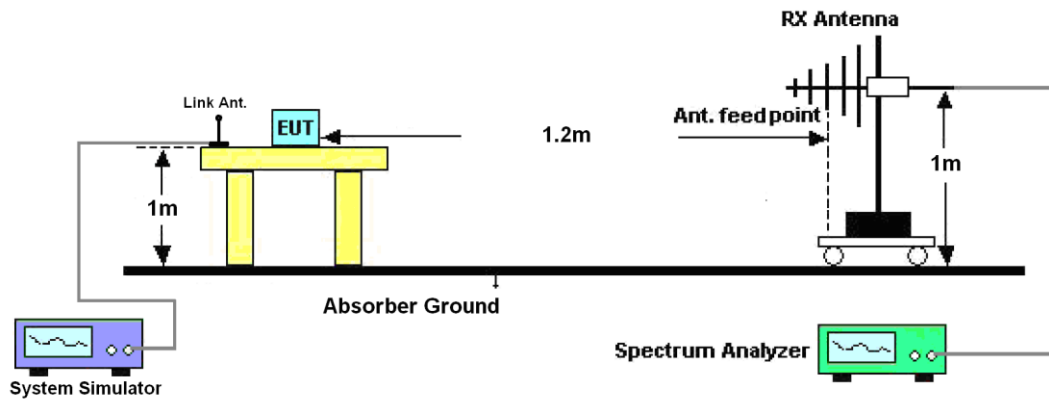
3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

3.1.3 Test Procedures

1. The EUT was placed on a turntable with 1.0 meter height in a fully anechoic chamber.
2. The EUT was set at 1.2 meters from the receiving antenna, which was mounted on the antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiated power.
4. The height of the receiving antenna is adjusted to look for the maximum ERP/EIRP.
5. Taking the record of maximum ERP/EIRP.
6. A dipole antenna was substituted in place of the EUT and was driven by a signal generator.
7. The conducted power at the terminal of the dipole antenna is measured.
8. Repeat step 3 to step 5 to get the maximum ERP/EIRP of the substitution antenna.
9. $ERP/EIRP = P_s + E_t - E_s + G_s = P_s + R_t - R_s + G_s$
Ps (dBm) : Input power to substitution antenna.
Gs (dBi or dBd) : Substitution antenna Gain.
 $E_t = R_t + AF$
 $E_s = R_s + AF$
AF (dB/m) : Receive antenna factor
Rt : The highest received signal in spectrum analyzer for EUT.
Rs : The highest received signal in spectrum analyzer for substitution antenna.

3.1.4 Test Setup





3.1.5 Test Result of ERP

GSM850 (GSM) Radiated Power ERP						
Horizontal Polarization						
Frequency (MHz)	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBd)	ERP (dBm)	ERP (W)
824.20	-20.71	-48.12	0.00	-1.08	26.33	0.43
836.40	-20.36	-48.28	0.00	-0.93	26.99	0.50
848.80	-20.34	-48.35	0.00	-0.76	27.25	0.53
Vertical Polarization						
Frequency (MHz)	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBd)	ERP (dBm)	ERP (W)
824.20	-27.49	-47.97	0.00	-1.08	19.40	0.09
836.40	-27.19	-48.01	0.00	-0.93	19.89	0.10
848.80	-27.26	-48.05	0.00	-0.76	20.03	0.10

3.1.6 Test Result of EIRP

GSM1900 (GSM) Radiated Power EIRP						
Horizontal Polarization						
Frequency (MHz)	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBi)	EIRP (dBm)	EIRP (W)
1850.20	-24.74	-51.88	0.00	1.96	29.10	0.81
1880.00	-25.62	-52.99	0.00	2.00	29.37	0.86
1909.80	-26.52	-54.28	0.00	1.98	29.74	0.94
Vertical Polarization						
Frequency (MHz)	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBi)	EIRP (dBm)	EIRP (W)
1850.20	-23.54	-52.13	0.00	1.96	30.55	1.14
1880.00	-25.13	-53.17	0.00	2.00	30.04	1.01
1909.80	-26.17	-54.13	0.00	1.98	29.94	0.99



3.2 Field Strength of Spurious Radiation Measurement

3.2.1 Description of Field Strength of Spurious Radiated Measurement

The radiated spurious emission was measured by substitution method according to ANSI / TIA / EIA-603-C-2004. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB. The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

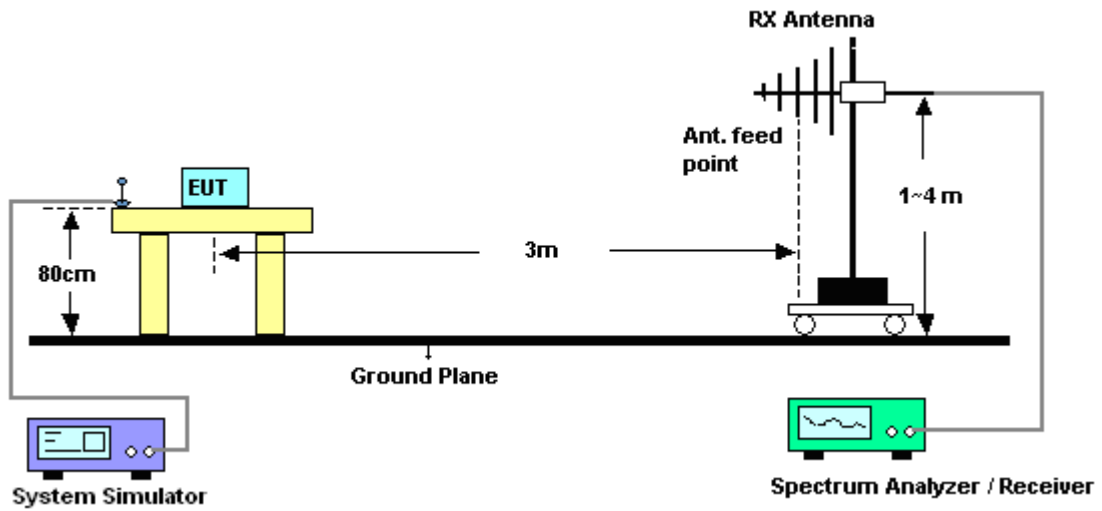
3.2.2 Measuring Instruments

See list of measuring instruments of this test report.

3.2.3 Test Procedures

1. The EUT was placed on a rotatable wooden table with 0.8 meter about ground.
2. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest spurious emission.
4. The height of the receiving antenna is varied between one meter and four meters to search the maximum spurious emission for both horizontal and vertical polarizations.
5. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, Sweep = 500ms, Taking the record of maximum spurious emission.
6. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
7. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
8. Taking the record of output power at antenna port.
9. Repeat step 7 to step 8 for another polarization.
10. $EIRP \text{ (dBm)} = S.G. \text{ Power} - Tx \text{ Cable Loss} + Tx \text{ Antenna Gain}$
11. $ERP \text{ (dBm)} = EIRP - 2.15$

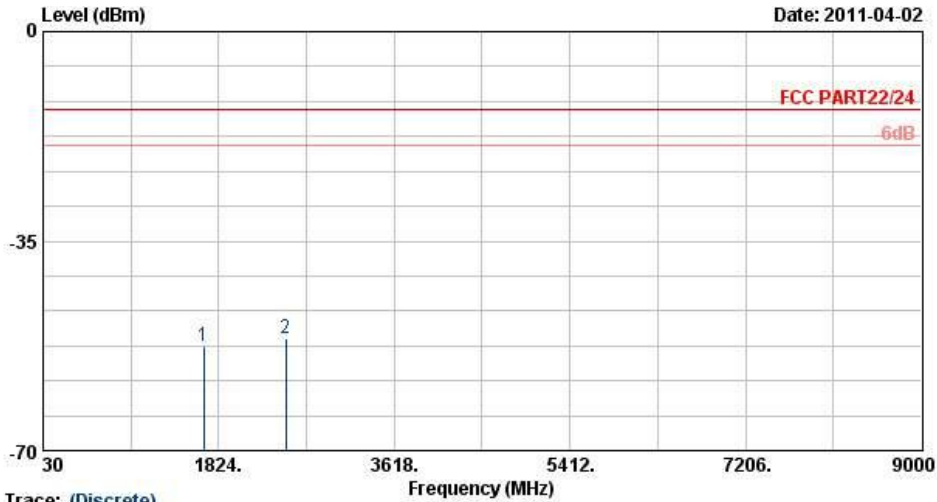
3.2.4 Test Setup





3.2.5 Test Result of Field Strength of Spurious Radiated

Band :	GSM850	Temperature :	22~26°C
Test Mode :	GSM Link	Relative Humidity :	53~60%
Test Engineer :	Wii Chang	Polarization :	Horizontal
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		

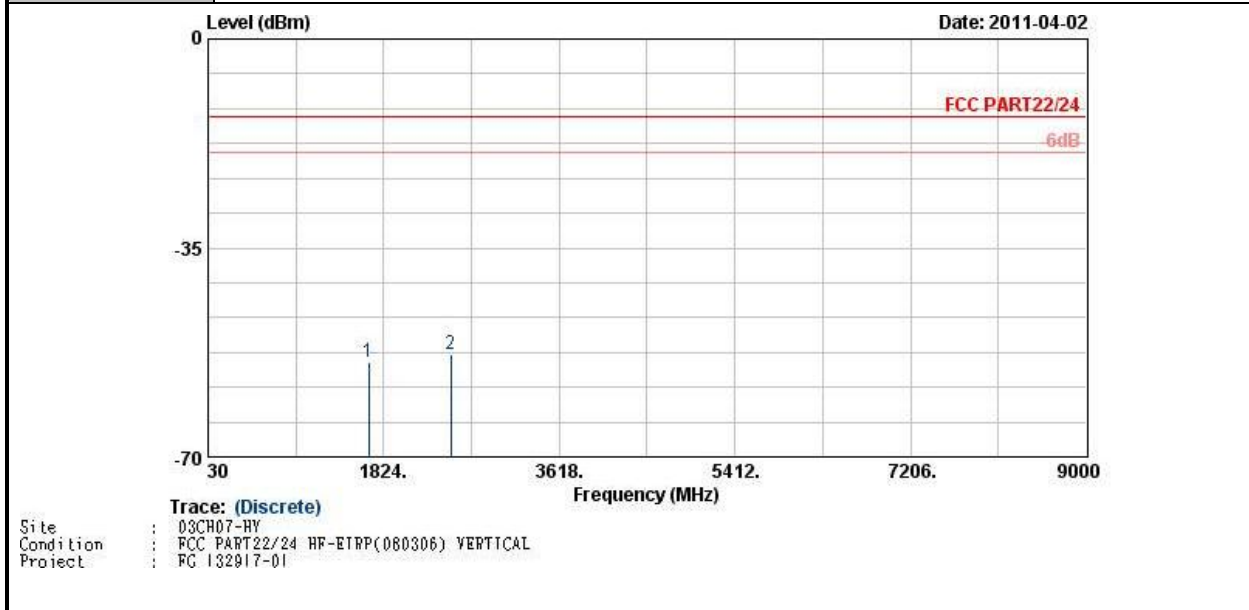


Trace: (Discrete)
 Site : 03CH07-RY
 Condition : FCC PART22/24 HF-ETRP(080306) HORIZONTAL
 Project : RG 132917-01

Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
1669	-52.49	-13	-39.49	-60.18	-54.21	1.62	5.49	H	Pass
2509	-51.16	-13	-38.16	-63.30	-53.13	2.10	6.22	H	Pass



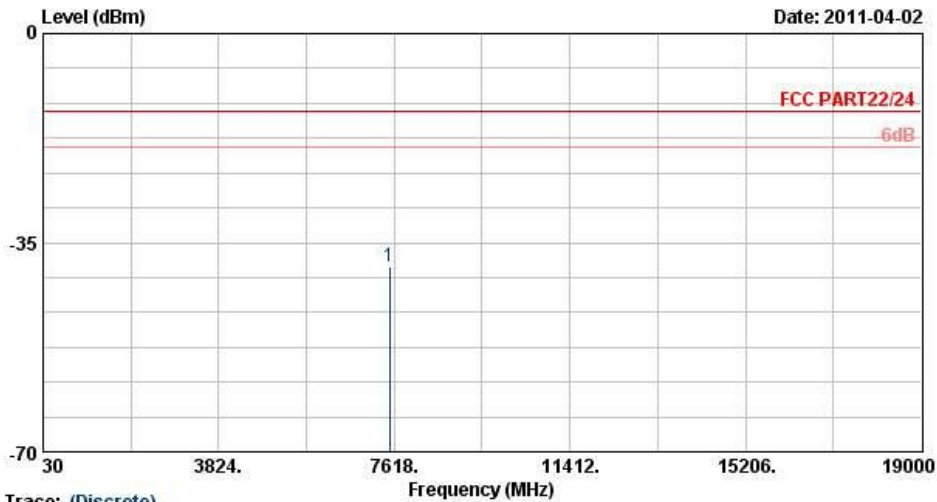
Band :	GSM850	Temperature :	22~26°C
Test Mode :	GSM Link	Relative Humidity :	53~60%
Test Engineer :	Wii Chang	Polarization :	Vertical
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		



Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
1669	-54.2	-13	-41.20	-64.12	-55.92	1.62	5.49	V	Pass
2509	-52.75	-13	-39.75	-65.34	-54.72	2.10	6.22	V	Pass



Band :	GSM1900	Temperature :	22~26°C
Test Mode :	GSM Link	Relative Humidity :	53~60%
Test Engineer :	Wii Chang	Polarization :	Horizontal
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		



Trace: (Discrete)
 Site : 03CH07-HY
 Condition : FCC PART22/24 HF-EIRP(080306) HORIZONTAL
 Project : FG 132917-01

Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
7520	-39.11	-13	-26.11	-67.38	-47.64	3.59	12.12	H	Pass



Band :	GSM1900	Temperature :	22~26°C
Test Mode :	GSM Link	Relative Humidity :	53~60%
Test Engineer :	Wii Chang	Polarization :	Vertical
Remark :	1. Spurious emissions within 30-1000MHz were found more than 20dB below limit line. 2. Spurious emissions within 1000MHz ~ 10th harmonic were not found any signals.		



Site : 03CH07-RV
Condition : FCC PART22/24 HF-ETRP(080306) VERTICAL
Project : FG 132917-01



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Due Date	Remark
Bilog Antenna	SCHAFFNER	CBL6111C	2726	30MHz ~ 1GHz	Oct. 31, 2010	Oct. 30, 2011	Radiation (03CH07-HY)
Spectrum Analyzer	R&S	FSP	101067	9KHz ~ 30GHz	Dec. 03, 2010	Dec. 02, 2011	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	00075962	1GHz ~ 18GHz	Aug. 19, 2010	Aug. 18, 2011	Radiation (03CH07-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA917025 1	15GHz- 40GHz	Oct. 18, 2010	Oct. 17, 2011	Radiation (03CH07-HY)
Pre Amplifier	Agilent	8449B	3008A02362	1GHz~ 26.5GHz	Dec. 06, 2010	Dec. 05, 2011	Radiation (03CH07-HY)
Pre Amplifier	COM-POWER	PA-103A	161241	10-1000MHz.32dB. GAIN	Mar. 29, 2011	Mar. 28, 2012	Radiation (03CH07-HY)
Loop Antenna	R&S	HFH2-Z2	860004/001	9 kHz~30 MHz	Jul. 29, 2010	Jul. 28, 2011	Radiation (03CH07-HY)
System Simulator	R&S	CMU200	117591	N/A	Oct. 18, 2010	Oct. 17, 2011	Radiation (03CH07-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 = $20\text{Log}(1-\Gamma_1*\Gamma_2)$	+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. Product Equality Declaration



Arima Communications Corp.
6F., No.866, Jhongheng Rd.,
Jhonghe Dist., New Taipei
City 23586, Taiwan.
<http://www.arimacomm.com.tw>

Date: 2011/4/11

GSM/GPRS Mobile phone

Subject: Product Equality Declaration

(Declaration of equality of a product variant with a previously assessed original product. To be signed in the name of the company that is responsible for the product variant.)

We, **Arima Communications Corp.** declare on our sole responsibility for the product of EX223(model name) as below:

The difference between EX223 and EX118 is:

- EX118:single sim wifi
- EX223:dual sim without Wifi

Except Listings above, the others are the same as previous version.

Should you have any questions or comments regarding this matter, please have my best attention.

Sincerely yours,

Signature



Michael Lu / Manager (Date: Apr 11, 2011)

Company: Arima Communications Corp.

Address: 6F., No.866, Jhongheng Rd., Jhonghe Dist., New Taipei City 23586, Taiwan.

Tel.: +886-2-8227-7755 ; Fax: +886-2-8227-5533

Copyright © Arima Communications Corporation All Rights Reserved.

Page 1 of 1



Appendix B. Original Report

Please refer to Sporton report number FG132917 as below.