Variant FCC RF Test Report

APPLICANT	:	Motorola Mobility, Inc.
EQUIPMENT	:	Mobile Phone
BRAND NAME	:	MOTOROLA
MODEL NAME	:	XT311
GPPD NUMBER	:	3036
FCC ID	:	IHDT56ML3
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 May 13, 2011 and completely tested on May 25, 2011. 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:

Jones Tsai

Jones Tsai / Manager

Testing Laboratory 1190

TABLE OF CONTENTS

REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR130415-02A	Rev. 01	This is a variant report which can be referred to Product Equality Declaration as Appendix A. All the test cases were performed on original report which can be referred to Sporton Report Number FR130415A as appendix B. Based on the original report, only worst case of Radiation Emission was verified.	Jun. 08, 2011

SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.247(d)	A8.5	Frequency Band Edges	≤ 20dBc	Pass	-
3.2	15.247(d)	A8.5	Transmitter Radiated Emission	15.209(a) & 15.247(d)	Pass	Under limit 9.23 dB at 4804 MHz
3.3	15.203 & 15.247(b)	A8.4	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

Motorola Mobility, Inc.
8F., No. 9, Songgao Rd., Taipei 110, Taiwan, R.O.C.

1.2 Manufacturer

Chi Mei Communication Systems, Inc.
No. 4, Mingsheng Street, Tucheng District, New Taipei City, 23678, Taiwan

1.3 Feature of Equipment Under Test

Product Feature & Specification	
Equipment	Mobile Phone
Brand Name	MOTOROLA
Model Name	XT311
FCC ID	IHDT56ML3
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 1.42 dBi
HW Version	V2.0
SW Version	V3.23F
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 1st 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	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:

- FCC Part 15 Subpart C §15.247
- FCC Public Notice DA 00-705
- ANSI C63.4-2003
- IC RSS-210 Issue 8

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

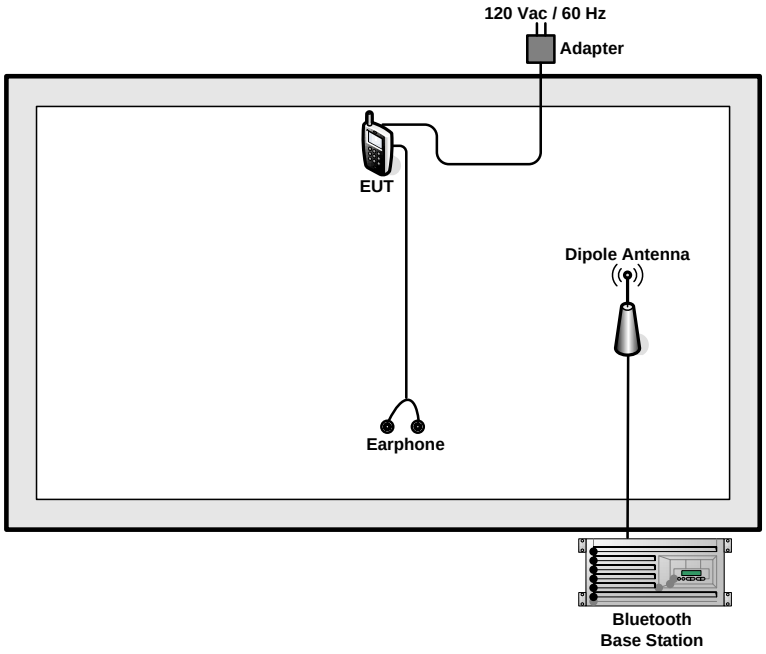
2.1 Test Mode

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).

Pre-scanned tests were conducted to determine the final configuration from all possible combinations. 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 1Mbps GFSK	Bluetooth EDR 2Mbps π/4-DQPSK	Bluetooth EDR 3Mbps 8-DPSK
Radiated TCs	Mode 1: CH00_2402 MHz + TC	N/A	N/A
Remark: TC stands for Test Configuration, and consists of earphone and adapter.			

2.2 Connection Diagram of Test System



2.3 RF Utility

For Bluetooth function, the RF utility, "＊＃＊＃767＃＊＃＊" was installed in EUT which was programmed in order to make the EUT into the engineering modes to 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.

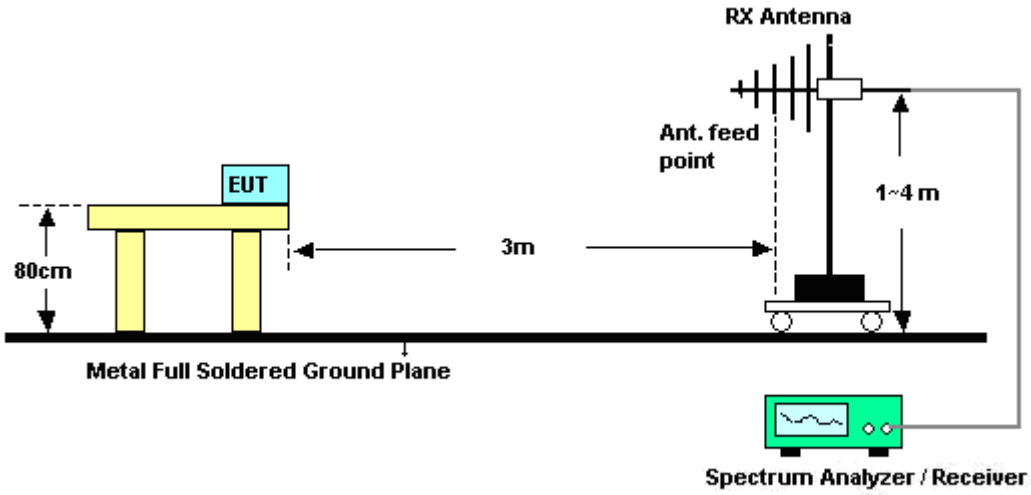
3.1.2 Measuring Instruments

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) ≥ 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 1	Temperature :	24~25°C
Test Channel :	00	Relative Humidity :	48~49%
		Test Engineer :	Hayden Wu

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
2388.85	55.48	-18.52	74	52.57	31.9	5.4	34.39	127	349	Peak
2388.85	33.92	-20.08	54	31.01	31.9	5.4	34.39	127	349	Average

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
2376.69	59.61	-14.39	74	56.76	31.88	5.37	34.4	100	323	Peak
2376.69	38.37	-15.63	54	35.52	31.88	5.37	34.4	100	323	Average

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

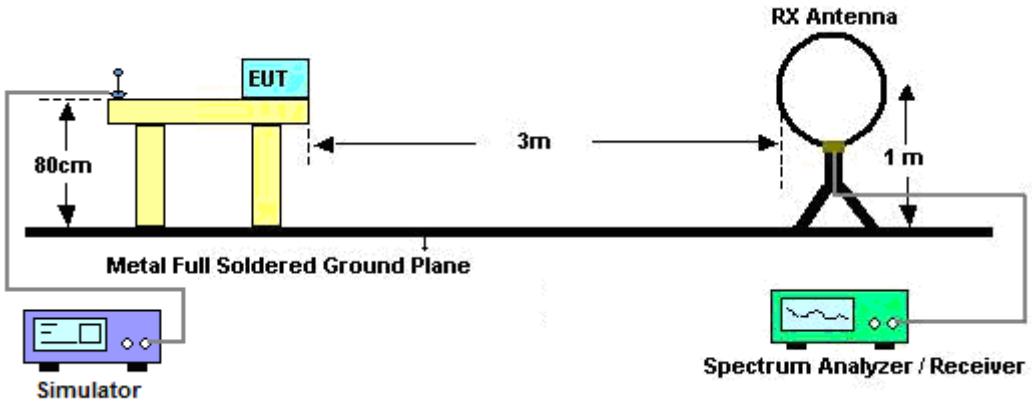
See list of measuring instruments of this test report.

3.2.3 Test Procedures

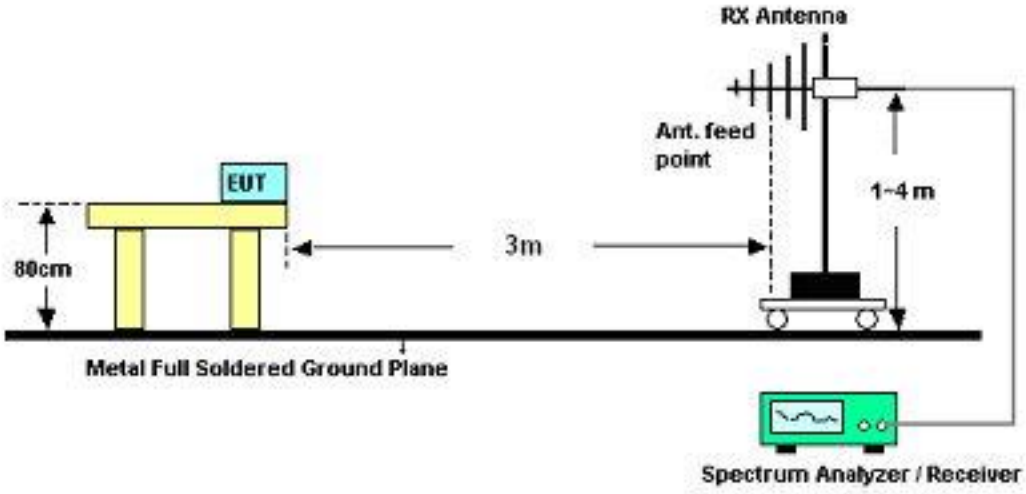
1. The testing follows the guidelines in FCC Public Notice DA 00-705 Measurement Guidelines.
2. Use the following spectrum analyzer settings:
   (1) Span = wide enough to fully capture the emission being measured; RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold.
   (2) 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 (specific distance [3m] / test distance [1m]) (dB)
1. 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.
2. Measured average value for the peak value is greater than 54 dBuv/m

3.2.4 Test Setup

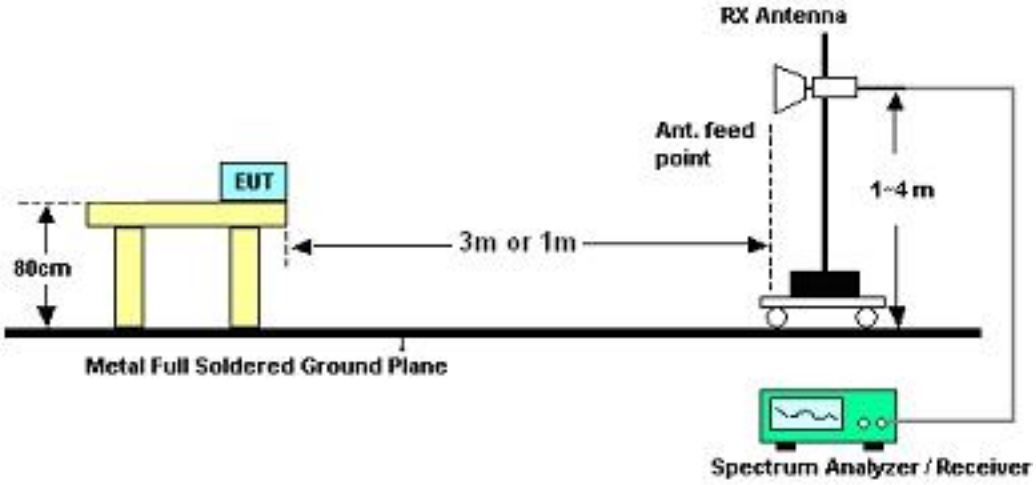
<For radiated emissions below 30MHz>



<For radiated emissions from 30MHz to 1GHz>



<For radiated emissions above 1GHz>



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

Test Engineer :	Hayden Wu	Temperature :	24~25°C
		Relative Humidity :	48~49%

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 (specific distance / 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 :	24~25°C
Test Channel :	00	Relative Humidity :	48~49%
Test Engineer :	Hayden Wu	Polarization :	Horizontal
Remark :	2402 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
92.64	19.73	-23.77	43.5	40.72	9.56	1.16	31.71	-	-	Peak
150.69	19.47	-24.03	43.5	39	10.7	1.46	31.69	-	-	Peak
199.83	27.55	-15.95	43.5	48.19	9.35	1.66	31.65	105	11	Peak
320.3	23.01	-22.99	46	38.56	13.93	2.13	31.61	-	-	Peak
465.9	21.43	-24.57	46	33.6	17.11	2.55	31.83	-	-	Peak
638.8	29.67	-16.33	46	39.39	19.26	3.02	32	-	-	Peak
2388.85	33.92	-20.08	54	31.01	31.9	5.4	34.39	127	349	Average
2388.85	55.48	-18.52	74	52.57	31.9	5.4	34.39	127	349	Peak
2402	87.26	-	-	84.34	31.91	5.4	34.39	127	349	Average
2402	104.2	-	-	101.28	31.91	5.4	34.39	127	349	Peak
2486	45.31	-28.69	74	42.18	31.98	5.52	34.37	127	349	Peak
2486	32.48	-21.52	54	29.35	31.98	5.52	34.37	127	349	Average
4804	51.88	-22.12	74	65.95	34.41	7.96	56.44	102	10	Peak
4804	44.77	-9.23	54	58.84	34.41	7.96	56.44	102	10	Average

Test Mode :	Mode 1	Temperature :	24~25°C
Test Channel :	00	Relative Humidity :	48~49%
Test Engineer :	Hayden Wu	Polarization :	Vertical
Remark :	2402 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	18.62	-21.38	40	31.71	17.91	0.72	31.72	-	-	Peak
100.74	23.84	-19.66	43.5	43.53	10.76	1.23	31.68	-	-	Peak
151.23	30.46	-13.04	43.5	50.05	10.64	1.46	31.69	100	15	Peak
320.3	22.33	-23.67	46	37.88	13.93	2.13	31.61	-	-	Peak
460.3	20	-26	46	32.3	17.01	2.54	31.85	-	-	Peak
638.8	22.82	-23.18	46	32.54	19.26	3.02	32	-	-	Peak
2376.69	38.37	-15.63	54	35.52	31.88	5.37	34.4	100	323	Average
2376.69	59.61	-14.39	74	56.76	31.88	5.37	34.4	100	323	Peak
2402	92.78	-	-	89.86	31.91	5.4	34.39	100	323	Average
2402	104.88	-	-	101.96	31.91	5.4	34.39	100	323	Peak
2494	45.27	-28.73	74	42.12	32	5.52	34.37	100	323	Peak
2494	37.25	-16.75	54	34.1	32	5.52	34.37	100	323	Average
4804	50.03	-23.97	74	64.1	34.41	7.96	56.44	100	32	Peak
4804	42.49	-11.51	54	56.56	34.41	7.96	56.44	100	32	Average

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	R&S	FSP40	100057	9KHz-40GHz	Oct. 25, 2010	Oct. 24, 2011	Radiation (03CH06-HY)
EMI TEST RECEIVER	R&S	ESCI 7	100724	9kHz~7GHz	Aug.19, 2010	Aug.19, 2011	Radiation (03CH06-HY)
Bilog Antenna	SCHAFFNER	CBL6112B	2885	30MHz -2GHz	Oct. 31, 2010	Oct. 31, 2011	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	Oct. 20, 2010	Oct. 19, 2011	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. 14, 2011	Apr. 13, 2012	Radiation (03CH06-HY)
Amplifier	Agilent	310N	186713	9KHz~1GHz	Apr. 14, 2011	Apr. 13, 2012	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	100522	N/A	Jan.13, 2011	Jan.13, 2013	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 Uc(y)	**1.27**		
Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(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 Γ1 = 0.197 Antenna VSWR Γ2 = 0.194 Uncertainty = 20Log(1-Γ1*Γ2)	+0.34 / -0.35	U-Shape	0.244	1	0.244
Combined Standard Uncertainty Uc(y)	**2.36**				
Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.72**				

Appendix A. Product Equality Declaration

Chi Mei Communication System Inc.
Tel: 886-2-2268-5511; Fax: 886-2-2269-2922

Date: June 7, 2011

Product Equality Declaration

We, Chi Mei Communication System Inc., declare on our sole responsibility for the product of XT311 as below:

The difference between XT311 and XT316 is:

- WCDMA Band difference : from Band I & V to Band I & VIII.
- XT311 use OMTP type earphone.
- Schematics is the same with XT316 (850/2100) . Only BOM difference listed below.

Reference #	Parent Model XT316 (850/2100)	Current Model XT311 (900/2100)
R1722	SR000000252	NA
R1723	SR000000252	NA
R1724	NA	SR000000252
R1725	NA	SR000000252
U2001	SF25836M0A1	SF1X897M0A1
U2002	SA077704170	SA077705170
U2003	SF2X881M020	S09P1GWQ000
C2015	SI268J20881	NA

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,

Contact Person: Charlene Tsai
Applicant: Chi Mei Communication System Inc.
Tel: 886-2-2268-5511
Fax: 886-2-2269-2922
E-Mail: CharleneTsai@fih-foxconn.com

Appendix B. Original Report

Please refer to Sporton report number FR130415A as below.