EMC
TEST REPORT

Report No. : **150400345TWN-001R1**
Model No. : **UMC-I210C**
Issued Date : **Sep. 03, 2015**

Applicant: **Wistron Neweb Corporation**
Address: **20 Park Avenue II, Hsinchu Science Park, Hsinchu 308, Taiwan**

Test Method/ Standard: **47 CFR FCC Part 27**
47 CFR FCC Part 2
ANSI/TIA-603-C-2004
KDB 971168 D01 Power Meas License Digital Systems v02r02

Test By: **Intertek Testing Services Taiwan Ltd.**
Address: **No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li, Shiang-Shan District, Hsinchu City, Taiwan**

The test report was prepared by: Sign on File
Candy Liu/ Assistant

These measurements were taken by: Sign on File
Terry Hsu/ Engineer

The test report was reviewed by: Jimmy Yang

Name Jimmy Yang
Title Senior Engineer

Table of Contents

1. Summary of Test Data

Test Requirement	Applicable Rule	Limit	Result
Effective Radiated Power (Band 13)	27.50(b)(10)	ERP < 3 Watts	Pass
Effective Isotropic Radiated Power (Band 4)	27.50(d)(4)	EIRP < 1 Watts	Pass
Radiated Spurious Emissions	2.1053 27.53	< 43+10log10(P[Watts])	Pass

2. General Information

2.1 Identification of the EUT

Product:	Integrate with certified module-End product
Model No:	UMC-I210C
FCC ID:	NKR-CB1GI210C
Manufacturer:	Wistron Neweb Corporation
Address:	20 Park Avenue II, Hsinchu Science Park, Hsinchu 308, Taiwan
TX Frequency:	LTE Band 4: 1710.7 MHz ~ 1754.3 MHz LTE Band 13: 779.5 MHz ~ 784.5 MHz
RX Frequency:	LTE Band 4: 2110.7 MHz ~ 2154.3 MHz LTE Band 13: 748.5MHz ~ 753.5 MHz
Bandwidth:	1.4MHz / 3MHz / 5MHz / 10MHz / 15MHz / 20MHz (Band 4) 5MHz / 10MHz (Band 13)
Modulation:	LTE Band 4: QPSK, 16QAM LTE Band 13: QPSK, 16QAM
Rated Power:	DC 5 V from adapter
Power Cord:	N/A
Sample Received:	Aug. 25, 2015
Sample condition:	Workable
Test Date(s):	Aug. 30, 2015
Note 1:	This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.
Note 2:	When determining the test conclusion, the Measurement Uncertainty of test has been considered.

2.2 Description of EUT

Product SW/HW version :	3.1.0
Radio SW/HW version :	N/A
Test SW Version :	N/A

2.3 Antenna description

The EUT uses a permanently connected antenna.

Antenna Gain : 5.0 dBi max (Band 4), 2.5 dBi max (Band 13)
Antenna Type : PCB antenna
Connector Type : I-PEX

2.4 Adapter information

The EUT will be supplied with a power supply from below list:

No.	Brand	Model no.	Specification
Adapter	Ktec	KSAS0120500200HU	I/P: 100-240V~, 50-60Hz, 0.4A, O/P: 5.0Vdc, 2.0A

The above EUT information is declared by Wistron Neweb Corporation and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

2.5 Applied test modes

Conducted	Test items	Band	Bandwidth	Modulation	RB #	Test Channel
	Max. Output Power	4	15MHz	QPSK	1/Half/Full	High
		13	10MHz	QPSK	1/Half/Full	Middle
Radiated	E.I.R.P / E.R.P	4	15MHz	QPSK	1RB/0RB Offset	High
		13	10MHz	QPSK	1RB/0RB Offset	Middle
	Radiated Spurious Emission	4	15MHz	QPSK	1RB/37RB Offset	High
		13	10MHz	QPSK	1RB/49RB Offset	Middle

Note: The couducted output power in the above mode are the highest value in the specific LTE band.We considerate the above mode as the worst case.

2.6 Applied test axis

Pre-Scan has been executed only at X axis.

Radiated test item	Band	Axis
ERP/EIRP	LTE Band 4	X
	LTE Band 13	X
Radiated Spurious Emission	LTE Band 4	X
	LTE Band 13	X

2.7 Applied standards

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

FCC 47 CFR Part 2
FCC 47 CFR Part 27
ANSI/TIA-603-C-2004
FCC KDB 412172 D01 Determining ERP and EIRP v01
FCC KDB 971168 D01 Power Meas. License Digital Systems v02r02

3. Output Power Measurement

3.1 Test conditions

Temperature:	20	℃
Relative Humidity:	55	%
Atmospheric Pressure	1008	hPa

3.2 Limit for output power measurement

Fixed, mobile, and portable (hand-held) stations operating in the 1710–1755 MHz band are limited to 1 watt EIRP.
Portable stations (hand-held devices) operating in the 704-716 MHz band are limited to 3 watts ERP.
Portable stations (hand-held devices) operating in the 777-787MHz, 776-793 MHz band are limited to 3 watts ERP.

3.3 Test procedure

3.3.1 Conducted power measurement

1. The EUT was established communication with base station simulator and set up to transmit the maximum power.

2. Set the EUT to transmit at low, middle and high channel and record the power level on the base station simulator.

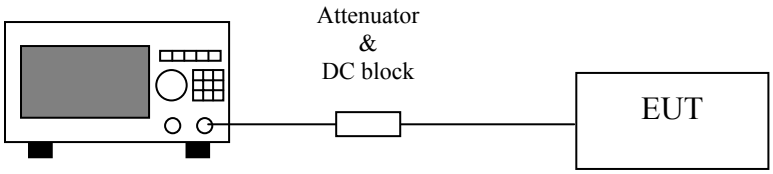
3,According to KDB 412172 D01 Power Approach

ERP/EIRP = $P_T + G_T – L_C$, ERP= EIRP-2.15 ,
where;

P_T=transmitter output power, in dBW, dBm
G_T= gain of the transmitting antenna, in dBi
L_C= signal attenuation in the connecting cable between the transmitter and antenna,in dB.

3.4 Test diagram

3.4.1 Conducted test setup



Base station simulator

3.5 Test results

3.5.1 Radiated output power

Average E.I.R.P. for LTE Band 4

Channel Bandwidth: 15MHz

Modulation: QPSK

Original data

Channel	Frequency (MHz)	Conducted Power	G_T (dB)	E.I.R.P. (dBm)
20325	1747.5	22.92	5	27.92

Note: Conducted Power = $P_T + L_C$

New test result

Channel	Frequency (MHz)	Conducted Power	G_T (dB)	E.I.R.P. (dBm)
20325	1747.5	23.53	5	28.53

Note: Conducted Power = $P_T + L_C$

Average E.R.P. for LTE Band 13

Channel Bandwidth: 10MHz

Modulation: QPSK

Original data

Channel	Frequency (MHz)	Conducted Power	G_T (dB)	E.R.P. (dBm)
23230	782	24.46	2.5	24.81

Note: Conducted Power = $P_T + L_C$

New test result

Channel	Frequency (MHz)	Conducted Power	G_T (dB)	E.R.P. (dBm)
23230	782	23.76	2.5	24.11

Note: Conducted Power = $P_T + L_C$

4. Radiated Emission Measurement

4.1 Test conditions

Temperature:	20	℃
Relative Humidity:	55	%
Atmospheric Pressure	1008	hPa

4.2 Limit for radiated emission measurement

The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least 43 +10 log10(P) dB. The limit of emission equal to –13dBm

For operations in the 746–763 MHz, 775–793 MHz, and 805–806 MHz bands, emissions in the band 1559–1610 MHz shall be limited to − 70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth.

4.3 Test procedure

1. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.

2. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the turn table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value" of step a. Record the power level of S.G

3. EIRP = Output power level of S.G –TX cable loss + Antenna gain of substitution horn.

4.E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.P.R power - 2.15dBi.

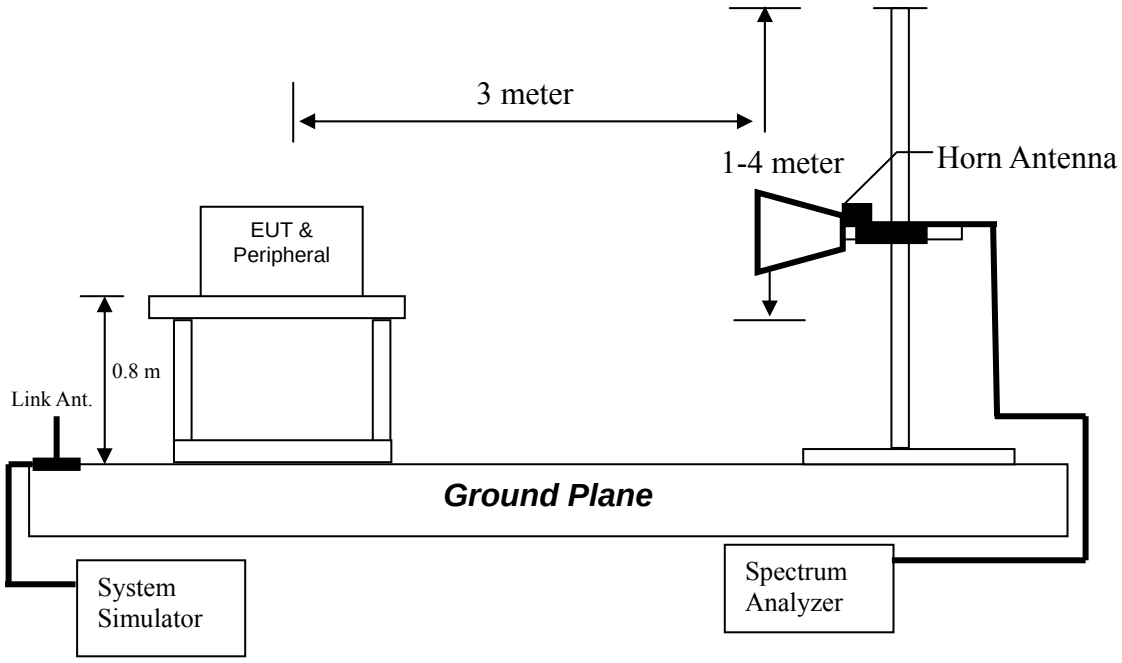
NOTE: The resolution bandwidth of spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz.

4.4 Test diagram

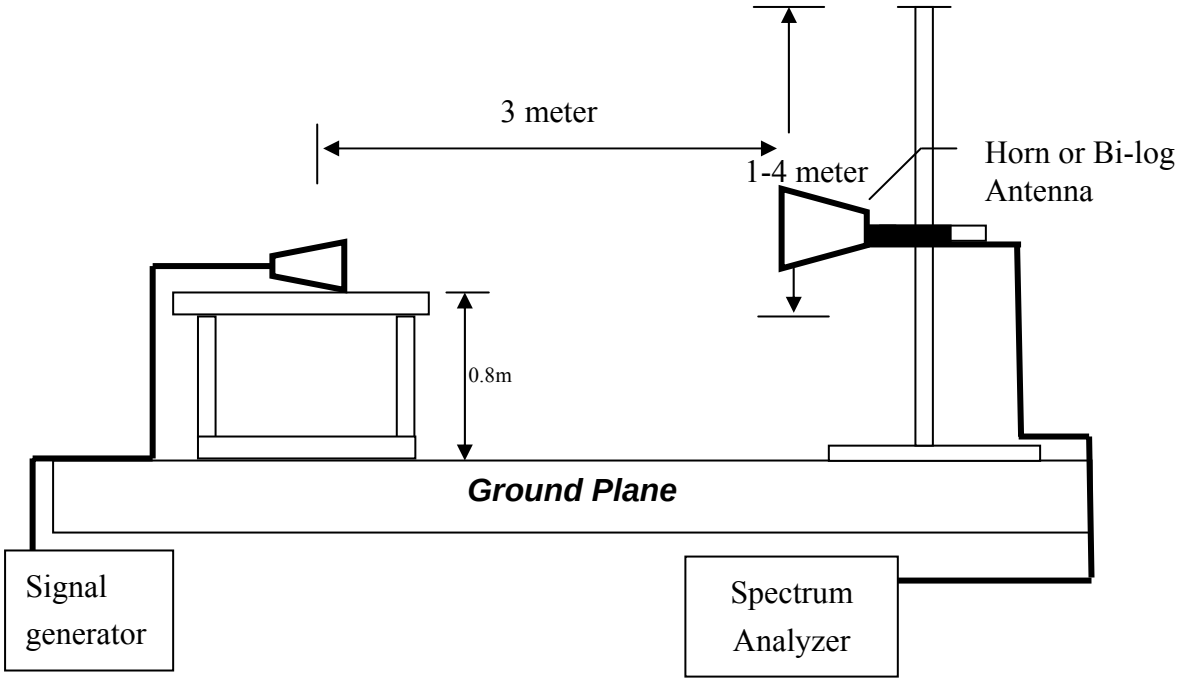
The EUT can only placement in one orthogonal axes.
The final test data was executed under this configuration.

4.5 Test configuration

4.5.1 Radiated emission above 1GHz using Horn Antenna



4.5.2 Radiated emission with Substitution Antenna



4.6 Test results

4.6.1 Measurement results: frequency below 1GHz

EUT : UMC-I210C
Worst Case : LTE band 4, CH 20325, BW=15MHz

Polarization (circle)	Frequency (MHz)	Detector	Corr. Factor (dB/m)	Reading (dBμV)	Calculated level (dBμV/m)	Limit @ 3m (dBμV/m)	Margin (dB)
Vertical	49.40	QP	17.06	21.78	38.84	40.00	-1.16
Vertical	161.92	QP	16.35	10.85	27.20	43.50	-16.30
Vertical	272.50	QP	16.58	8.69	25.27	46.00	-20.73
Vertical	400.54	QP	19.92	8.18	28.10	46.00	-17.90
Vertical	594.54	QP	24.12	9.29	33.41	46.00	-12.59
Vertical	751.68	QP	26.57	9.00	35.57	46.00	-10.43

Polarization (circle)	Frequency (MHz)	Detector	Corr. Factor (dB/m)	Reading (dBμV)	Calculated level (dBμV/m)	Limit @ 3m (dBμV/m)	Margin (dB)
Horizontal	49.40	QP	13.51	11.42	24.93	40.00	-15.07
Horizontal	128.94	QP	14.91	10.74	25.65	43.50	-17.85
Horizontal	200.72	QP	16.17	10.10	26.27	43.50	-17.23
Horizontal	270.56	QP	17.39	12.76	30.15	46.00	-15.85
Horizontal	400.54	QP	19.67	10.25	29.92	46.00	-16.08
Horizontal	491.72	QP	21.27	9.14	30.41	46.00	-15.59

4.6.2 Measurement results: frequency above 1GHz

Average E.I.R.P. for LTE Band 4

Channel Bandwidth: 15MHz

Original data

RB	Mode	Channel	Vertical		Horizontal		Ant Gain (dBi)	Cable Loss (dB)	Result		Margin		Limit
			Freq. (MHz)	S.G. Value (dBm)	Freq. (MHz)	S.G. Value (dBm)			Ver	Hor	Ver	Hor	
1-37	QPSK	High	3490	-47.63	3490	-54.25	9.80	3.70	-41.53	-48.15	-28.53	-35.15	-13
			5240	-54.67	5240	-60.53	10.95	6.84	-50.56	-56.42	-37.56	-43.42	-13
			6990	-59.51	6990	-62.00	11.81	5.97	-53.67	-56.16	-40.67	-43.16	-13

New test result

RB	Mode	Channel	Vertical		Horizontal		Ant Gain (dBi)	Cable Loss (dB)	Result		Margin		Limit
			Freq. (MHz)	S.G. Value (dBm)	Freq. (MHz)	S.G. Value (dBm)			Ver	Hor	Ver	Hor	
1-37	QPSK	High	3490	-48.75	3490	-55.58	9.80	1.16	-40.11	-46.94	-27.11	-33.94	-13
			5240	-58.33	5240	-64.82	10.95	1.67	-49.05	-55.54	-36.05	-42.54	-13
			6990	-63.55	6990	-66.93	11.81	2.70	-54.44	-57.82	-41.44	-44.82	-13

Average E.R.P. for LTE Band 13

Channel Bandwidth: 10MHz

Original data

RB	Mode	Channel	Vertical		Horizontal		Ant	Cable	Result		Margin		Limit
			Frequency (MHz)	S.G. Value (dBm)	Frequency (MHz)	S.G. Value (dBm)	Gain (dBi)	Loss (dB)	Ver	Hor	Ver	Hor	
1-49	QPSK	Middle	1567	-69.10	1567	-66.71	8.65	2.56	-63.00	-60.61	-23.00	-20.61	-40
			2358	-61.83	2358	-64.00	9.57	2.91	-55.17	-57.34	-42.17	-44.34	-13
			3128	-64.65	3128	-67.53	9.65	3.89	-58.89	-61.77	-45.89	-48.77	-13

New test result

RB	Mode	Channel	Vertical		Horizontal		Ant	Cable	Result		Margin		Limit
			Frequency (MHz)	S.G. Value (dBm)	Frequency (MHz)	S.G. Value (dBm)	Gain (dBi)	Loss (dB)	Ver	Hor	Ver	Hor	
1-49	QPSK	Middle	1567	-70.59	1567	-69.74	8.65	0.49	-62.42	-61.57	-22.42	-21.57	-40
			2358	-60.94	2358	-64.73	9.57	2.79	-54.16	-57.95	-41.16	-44.95	-13
			3128	-67.96	3128	-69.49	9.65	1.08	-59.39	-60.92	-46.39	-47.92	-13

Appendix A: Test equipments list

Equipment	Brand	Model No.	Serial No.	Calibration Date	Next Calibration Date
Spectrum Analyzer	Rohde & Schwarz	FSP30	100137	2015/08/18	2016/08/16
Horn Antenna (1-18G)	Schwarzbeck	BBHA 9120 D	9120D-456	2014/08/29	2017/08/27
Horn Antenna (14-42G)	SHWARZBECK	BBHA 9170	BBHA9170159	2014/09/16	2017/09/14
Pre-Amplifier	MITEQ	AFS44-00102650--42-10P-44	1495287	2013/10/27	2015/10/26
Pre-Amplifier	MITEQ	JS4-26004000--27-8A	828825	2014/09/15	2015/09/14
Simulator	Rohde & Schwarz	CMW 500	124781	2014/10/03	2015/10/02
Spectrum Analyzer	Agilent	N9030A	MY51380492	2014/09/19	2015/09/18
Brand		Software		Version	
ADT		Radiated test system		7.5.14	

Appendix B: Measurement Uncertainty

Measurement uncertainty was calculated in accordance with TR 100 028-1.

Parameter	Uncertainty		
Radiated Emission	Below 1 GHz	Vertical	3.90 dB
		Horizontal	3.86 dB
	1G~18GHz	Vertical	4.19 dB
		Horizontal	4.30 dB
	18GHz~40GHz	Vertical	2.92 dB
		Horizontal	2.90 dB
Conducted Output power	0.86 dB		
Conducted Spurious Emission	0.84 dB		

This uncertainty represents an expanded uncertainty expressed at approximately the 95 %