FCC RF Test Report

APPLICANT	:	Wistron Corporation
EQUIPMENT	:	Notebook Computer
BRAND NAME	:	Lenovo
MODEL NAME	:	TP00076C
FCC ID	:	PU5-TP00076CUC
STANDARD	:	FCC 47 CFR Part 2, 22(H), 24(E), 27(L)
CLASSIFICATION	:	PCS Licensed Transmitter (PCB)

Equipment: Sierra Wireless EM7455 and Intel 8265NGW tested inside of Lenovo Notebook Computer.

This is a partial report which is included the conducted output power, ERP/EIRP, and radiated test items. The product was received on Nov. 03, 2016 and testing was completed on Nov. 23, 2016. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI / TIA / EIA-603-D-2010 and has been in 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: Joseph Lin / Supervisor

Approved by: Jones Tsai / Manager

Testing Laboratory 1190

SPORTON INTERNATIONAL INC.
No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C.

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG6N0303-01A	Rev. 01	Initial issue of report	Dec. 19, 2016

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.4	§2.1046	Conducted Output Power	Reporting Only	PASS	-
	§22.913(a)(2)	Effective Radiated Power	< 7 Watts	PASS	-
	§24.232(c)	Equivalent Isotropic Radiated Power	< 2 Watts	PASS	-
	§27.50(d)(4)	Equivalent Isotropic Radiated Power	< 1 Watts	PASS	-
4.4	§2.1053 §22.917(a) §24.238(a) §27.53(h)	Field Strength of Spurious Radiation	< 43+10log10(P[Watts])	PASS	Under limit 29.29 dB at 1696.000 MHz

1 General Description

1.1 Applicant

Wistron Corporation
21F, No. 88, Sec. 1, Hsin Tai Wu Rd., Hsichih Dist, New Taipei City 221,Taiwan R.O.C.

1.2 Manufacturer

Wistron Corporation
21F, No. 88, Sec. 1, Hsin Tai Wu Rd., Hsichih Dist, New Taipei City 221,Taiwan R.O.C.

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Notebook Computer
Brand Name	Lenovo
Model Name	TP00076C
FCC ID	PU5-TP00076CUC
Integrated WWAN Module	Brand Name: Sierra Model Name: EM7455 FCC ID: N7NEM7455
Integrated WLAN Module	Brand Name: Intel Model Name: 8265NGW FCC ID: PD98265NG
EUT supports Radios application	WCDMA/HSPA/LTE WLAN 11a/b/g/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE
EUT Stage	Production Unit

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx Frequency	**WCDMA:** Band V: 826.4 MHz ~ 846.6 MHz Band II: 1852.4 MHz ~ 1907.6 MHz Band IV: 1712.4 MHz ~ 1752.6 MHz
Rx Frequency	**WCDMA:** Band V: 871.4 MHz ~ 891.6 MHz Band II: 1932.4 MHz ~ 1987.6 MHz Band IV: 2112.4 MHz ~ 2152.6 MHz
Maximum Output Power to Antenna	**WCDMA:** Band V: 22.46 dBm Band II: 22.96 dBm Band IV: 22.99 dBm
Type of Modulation	WCDMA: BPSK (Uplink) HSDPA: 64QMA (Downlink) HSUPA: QPSK (Uplink)

1.5 Modification of EUT

No modifications are made to the EUT during all test items.

1.6 Maximum ERP/EIRP Power

FCC Rule	System	Type of Modulation	Maximum ERP/EIRP (W)
Part 22	WCDMA Band V RMC 12.2Kbps	BPSK	0.0991
Part 24	WCDMA Band II RMC 12.2Kbps	BPSK	0.1879
Part 27	WCDMA Band IV RMC 12.2Kbps	BPSK	0.1517

1.7 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW1022 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978
Test Site No.	**Sporton Site No.**
	TH02-HY

Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd Rd. Guishan Dist, Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	**Sporton Site No.**
	03CH10-HY

1.8 Applicable Standards

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

- 47 CFR Part 2, 22(H), 24(E), 27(L)
- ANSI / TIA / EIA-603-D-2010
- FCC KDB 971168 D01 Power Meas. License Digital Systems v02r02
- FCC KDB 412172 D01 Determining ERP and EIRP v01r01

Remark: All test items were verified and recorded according to the standards and without any deviation during the test.

2 Test Configuration of Equipment Under Test

2.1 Test Mode

Antenna port conducted and radiated test items were performed according to KDB 971168 D01 Power Meas. License Digital Systems v02r02 with maximum output power.

Radiated emissions were investigated as following frequency range:

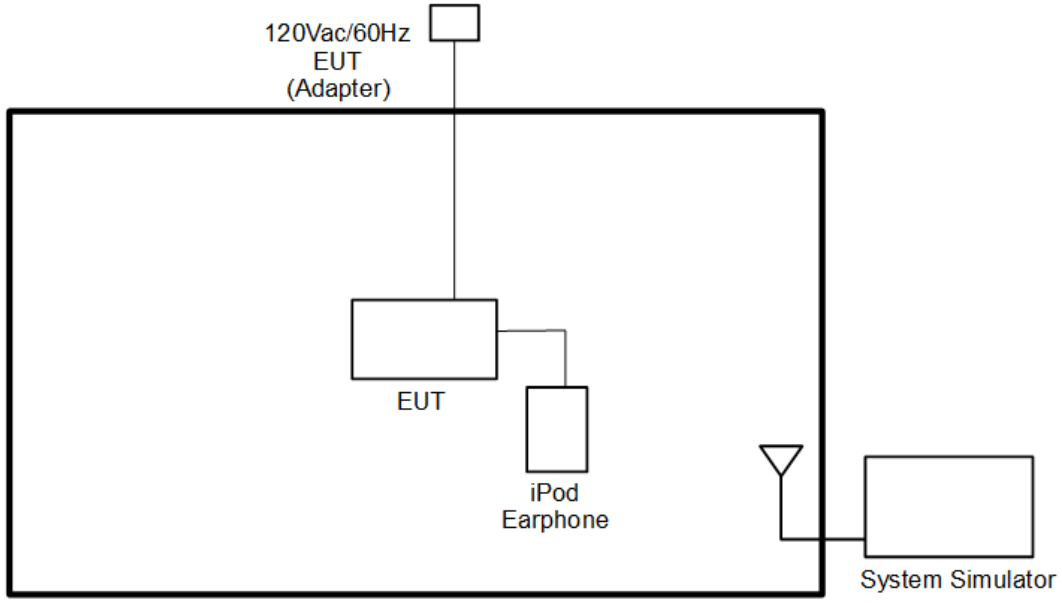
1. 30 MHz to 9000 MHz for WCDMA Band V.
2. 30 MHz to 18000 MHz for WCDMA Band IV.
3. 30 MHz to 19100 MHz for WCDMA Band II.

All modes and data rates and positions were investigated.

Test modes are chosen to be reported as the worst case configuration below:

Test Modes	
Band	**Radiated TCs**
WCDMA Band V	■ RMC 12.2Kbps Link
WCDMA Band II	■ RMC 12.2Kbps Link
WCDMA Band IV	■ RMC 12.2Kbps Link

2.2 Connection Diagram of Test System



2.3 Support Unit used in test configuration

Item	Equipment	Trade Name	Model No.	FCC ID	Data Cable	Power Cord
1.	System Simulator	R&S	CMU 200	N/A	N/A	Unshielded, 1.8 m
2.	iPod Earphone	Apple	N/A	Verification	Unshielded, 1.0 m	N/A

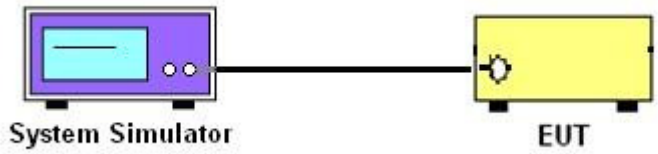
3 Conducted Test Result

3.1 Measuring Instruments

See list of measuring instruments of this test report.

3.2 Test Setup

3.2.1 Conducted Output Power



3.3 Test Result of Conducted Test

Please refer to Appendix A.

3.4 Conducted Output Power and ERP/EIRP

3.4.1 Description of the Conducted Output Power and ERP/EIRP

A system simulator was used to establish communication with the EUT. Its parameters were set to enforce EUT transmitting at the maximum power. The measured power in the radio frequency on the transmitter output terminals shall be reported.

The ERP of mobile transmitters must not exceed 7 Watts for GSM850 and WCDMA Band V.

The EIRP of mobile transmitters must not exceed 2 Watts for GSM1900 and WCDMA Band II.

The EIRP of mobile transmitters must not exceed 1 Watts for WCDMA Band IV.

According to KDB 412172 D01 Power Approach,

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

P_T = transmitter output power in 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

3.4.2 Test Procedures

1. The transmitter output port was connected to the system simulator.
2. Set EUT at maximum power through system simulator.
3. Select lowest, middle, and highest channels for each band and different modulation.
4. Measure the maximum burst average power for GSM and maximum average power for other modulation signal.

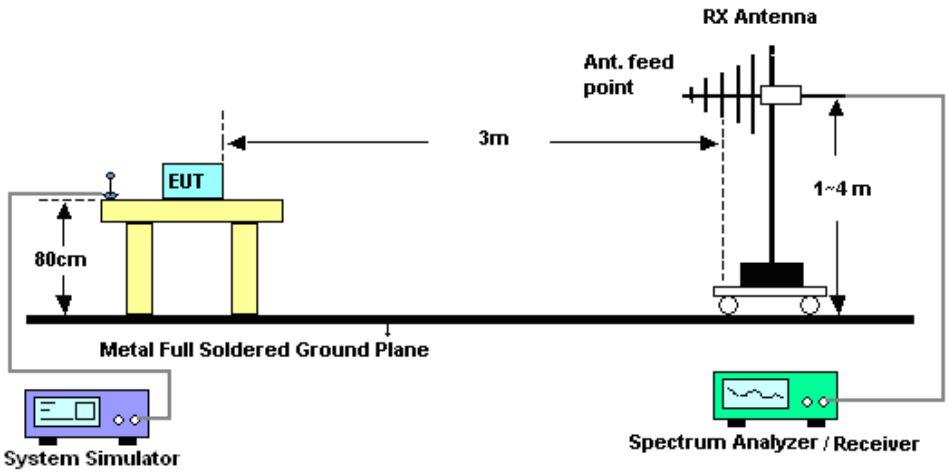
4 Radiated Test Items

4.1 Measuring Instruments

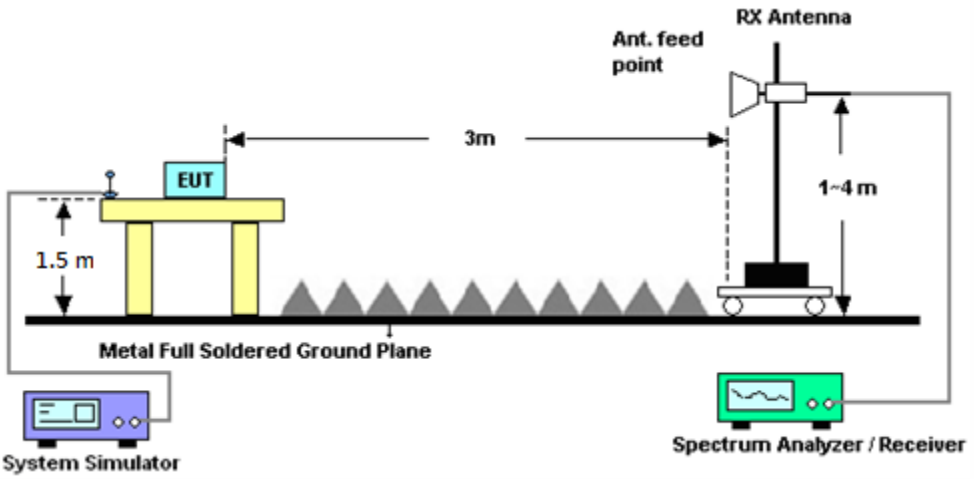
See list of measuring instruments of this test report.

4.2 Test Setup

4.2.1 For radiated test from 30MHz to 1GHz



4.2.2 For radiated test above 1GHz



4.3 Test Result of Radiated Test

Please refer to Appendix B.

4.4 Field Strength of Spurious Radiation Measurement

4.4.1 Description of Field Strength of Spurious Radiated Measurement

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.

4.4.2 Test Procedures

1. The testing follows FCC KDB 971168 D01 v02r02 Section 5.8 and ANSI / TIA-603-D-2010 Section 2.2.12.
2. The EUT was placed on a rotatable wooden table 0.8 meters for frequency below 1GHz and 1.5 meter for frequency above 1GHz above the ground.
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
4. The table was rotated 360 degrees to determine the position of the highest spurious emission.
5. The height of the receiving antenna is varied between one meter and four meters to search for the maximum spurious emission for both horizontal and vertical polarizations.
6. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking record of maximum spurious emission.
7. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
8. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
9. Taking the record of output power at antenna port.
10. Repeat step 7 to step 8 for another polarization.
11. EIRP (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain
12. ERP (dBm) = EIRP - 2.15
13. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
14. The limit line is derived from 43 + 10log(P) dB below the transmitter power P(Watts)

    = P(W) - [43 + 10log(P)] (dB)

    = [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB)

    = -13dBm.

5 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Base Station (Measure)	Rohde & Schwarz	CMW500	116160	MIMO/LTE(FDD TDD with 42 43)	Mar. 02, 2016	Nov. 17, 2016 ~ Nov. 23, 2016	Mar. 01, 2017	Conducted (TH02-HY)
Amplifier	SONOMA	310N	187311	9kHz~1GHz	Oct. 26, 2016	Nov. 17, 2016 ~ Nov. 23, 2016	Oct. 25, 2017	Radiation (03CH10-HY)
Bilog Antenna	TESEQ	CBL 6111D&00800N	35413&02	30MHz~1GHz	Jan. 13, 2016	Nov. 17, 2016 ~ Nov. 23, 2016	Jan. 12, 2017	Radiation (03CH10-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1325	1GHz ~ 18GHz	Sep. 30, 2016	Nov. 17, 2016 ~ Nov. 23, 2016	Sep. 29, 2017	Radiation (03CH10-HY)
Preamplifier	Keysight	83017A	MY53270078	1GHz~26.5GHz	Oct. 26, 2016	Nov. 17, 2016 ~ Nov. 23, 2016	Oct. 25, 2017	Radiation (03CH10-HY)
Spectrum Analyzer	Keysight	N9010A	MY54200485	10Hz ~ 44GHz	Oct. 17, 2016	Nov. 17, 2016 ~ Nov. 23, 2016	Oct. 16, 2017	Radiation (03CH10-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1~4m	N/A	Nov. 17, 2016 ~ Nov. 23, 2016	N/A	Radiation (03CH10-HY)
Turn Table	EMEC	TT 2200	N/A	0~360 Degree	N/A	Nov. 17, 2016 ~ Nov. 23, 2016	N/A	Radiation (03CH10-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170576	18GHz - 40GHz	Apr. 15, 2016	Nov. 17, 2016 ~ Nov. 23, 2016	Apr. 14, 2017	Radiation (03CH10-HY)
Preamplifier	MITEQ	JS44-18004000 -33-8P	1840917	18GHz- 40GHz	Jun. 14, 2016	Nov. 17, 2016 ~ Nov. 23, 2016	Jun. 13, 2017	Radiation (03CH10-HY)
Signal Generator	Anritsu	MG3694C	163401	0.1Hz~40GHz	Aug. 19, 2016	Nov. 17, 2016 ~ Nov. 23, 2016	Aug. 18, 2017	Radiation (03CH10-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170584	18GHz- 40GHz	Nov. 08, 2016	Nov. 17, 2016 ~ Nov. 23, 2016	Nov. 07, 2017	Radiation (03CH10-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1522	1G~18GHz	Mar. 31, 2016	Nov. 17, 2016 ~ Nov. 23, 2016	Mar. 30, 2017	Radiation (03CH10-HY)

6 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.6**

Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.9**

Uncertainty of Radiated Emission Measurement (18 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.2**

Appendix A. Test Results of Conducted Test

Conducted Output Power(Average power)

Conducted Power (*Unit: dBm)						
Band	WCDMA Band V			WCDMA Band II		
Channel	4132	4182	4233	9262	9400	9538
Frequency	826.4	836.4	846.6	1852.4	1880	1907.6
RMC 12.2K	22.43	**22.46**	22.43	22.85	**22.96**	22.88
HSDPA Subtest-1	22.01	22.07	22.12	22.47	22.38	22.26
HSDPA Subtest-2	22.10	22.01	22.02	22.32	22.50	22.37
HSDPA Subtest-3	21.58	21.48	21.81	22.10	21.94	21.69
HSDPA Subtest-4	21.51	21.45	21.82	21.84	21.86	21.70
HSUPA Subtest-1	22.07	22.12	22.05	22.41	22.36	22.34
HSUPA Subtest-2	20.88	20.76	20.70	21.67	21.71	21.57
HSUPA Subtest-3	20.99	20.94	21.35	21.32	21.32	21.30
HSUPA Subtest-4	21.25	20.93	21.43	21.57	21.80	21.52
HSUPA Subtest-5	22.11	22.14	22.36	22.32	22.39	22.16

Conducted Power (*Unit: dBm)			
Band	WCDMA Band V		
Channel	1312	1413	1513
Frequency	1712.4	1732.6	1752.6
RMC 12.2K	22.95	**22.99**	22.84
HSDPA Subtest-1	22.06	22.13	22.10
HSDPA Subtest-2	22.04	22.09	22.22
HSDPA Subtest-3	21.54	21.80	21.57
HSDPA Subtest-4	21.63	21.93	21.57
HSUPA Subtest-1	22.05	22.41	22.16
HSUPA Subtest-2	20.63	20.96	20.55
HSUPA Subtest-3	21.07	21.49	21.19
HSUPA Subtest-4	20.68	20.93	20.64
HSUPA Subtest-5	22.23	22.56	22.33

Appendix B. Test Results of ERP/EIRP and Radiated Test

ERP/EIRP

Channel	Mode	Conducted		ERP	
		Power (dBm)	Power (Watts)	ERP(dBm)	ERP(W)
Lowest	WCDMA Band V	22.43	0.1750	19.93	0.0984
Middle	RMC 12.2Kbps	22.46	0.1762	19.96	0.0991
Highest	GT - LC = -0.35 dB	22.43	0.1750	19.93	0.0984
Limit	ERP < 7W	Result		PASS	

Channel	Mode	Conducted		EIRP	
		Power (dBm)	Power (Watts)	EIRP(dBm)	EIRP(W)
Lowest	WCDMA Band II	22.85	0.1928	22.63	0.1832
Middle	RMC 12.2Kbps	22.96	0.1977	22.74	0.1879
Highest	GT - LC = -0.22 dB	22.88	0.1941	22.66	0.1845
Limit	EIRP < 2W	Result		PASS	

Channel	Mode	Conducted		EIRP	
		Power (dBm)	Power (Watts)	EIRP(dBm)	EIRP(W)
Lowest	WCDMA Band IV	22.95	0.1972	21.77	0.1503
Middle	RMC 12.2Kbps	22.99	0.1991	21.81	0.1517
Highest	GT - LC = -1.18 dB	22.84	0.1923	21.66	0.1466
Limit	EIRP < 1W	Result		PASS	

Radiated Spurious Emission

WCDMA Band V(RMC 12.2Kbps)									
Channel	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)
Lowest	1656	-49.18	-13	-36.18	-59.03	-50.91	0.98	4.86	H
	2480	-51.25	-13	-38.25	-64.95	-53.16	1.28	5.34	H
	3306	-54.16	-13	-41.16	-70.14	-57.61	1.54	7.15	H
	1656	-48.58	-13	-35.58	-58.37	-50.31	0.98	4.86	V
	2480	-54.06	-13	-41.06	-67.8	-55.97	1.28	5.34	V
	3306	-52.76	-13	-39.76	-68.7	-56.21	1.54	7.15	V
Middle	1672	-45.30	-13	-32.30	-55.2	-46.98	0.99	4.82	H
	2512	-49.63	-13	-36.63	-63.48	-51.6	1.29	5.41	H
	3345	-53.69	-13	-40.69	-69.72	-57.3	1.56	7.32	H
	1672	-45.23	-13	-32.23	-55.07	-46.91	0.99	4.82	V
	2512	-51.44	-13	-38.44	-65.31	-53.41	1.29	5.41	V
	3345	-54.15	-13	-41.15	-70.19	-57.76	1.56	7.32	V
Highest	1696	-44.18	-13	-31.18	-54.17	-45.78	1.00	4.75	H
	2544	-49.46	-13	-36.46	-63.43	-51.44	1.30	5.44	H
	3386	-53.20	-13	-40.20	-69.27	-56.98	1.57	7.50	H
	1696	-42.29	-13	-29.29	-52.22	-43.89	1.00	4.75	V
	2536	-51.74	-13	-38.74	-65.66	-53.72	1.30	5.43	V
	3386	-53.47	-13	-40.47	-69.61	-57.25	1.57	7.50	V

Remark: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

WCDMA Band II(RMC 12.2Kbps)									
Channel	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)
Lowest	3708	-46.85	-13	-33.85	-63.69	-53.43	1.67	8.25	H
	5557	-54.87	-13	-41.87	-77.52	-61.93	2.66	9.72	H
	7410	-50.24	-13	-37.24	-77.32	-59.4	2.46	11.62	H
	3708	-52.58	-13	-39.58	-69.58	-59.16	1.67	8.25	V
	5557	-55.09	-13	-42.09	-77.57	-62.15	2.66	9.72	V
	7410	-50.08	-13	-37.08	-77.21	-59.24	2.46	11.62	V
Middle	3762	-48.14	-13	-35.14	-65.14	-54.77	1.69	8.31	H
	5640	-54.52	-13	-41.52	-77.32	-61.57	2.71	9.76	H
	7520	-50.08	-13	-37.08	-77.37	-59.47	2.42	11.81	H
	3762	-55.47	-13	-42.47	-72.6	-62.1	1.69	8.31	V
	5640	-54.64	-13	-41.64	-77.28	-61.69	2.71	9.76	V
	7520	-49.86	-13	-36.86	-77.26	-59.25	2.42	11.81	V
Highest	3816	-51.42	-13	-38.42	-68.62	-58.1	1.70	8.38	H
	5722	-54.99	-13	-41.99	-77.93	-62.03	2.75	9.79	H
	7630	-49.58	-13	-36.58	-76.98	-59.07	2.39	11.88	H
	3816	-48.08	-13	-35.08	-65.37	-54.76	1.70	8.38	V
	5722	-55.04	-13	-42.04	-77.84	-62.08	2.75	9.79	V
	7630	-49.67	-13	-36.67	-77.15	-59.16	2.39	11.88	V

Remark: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.

WCDMA Band IV(RMC 12.2Kbps)									
Channel	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)
Lowest	3426	-52.04	-13	-39.04	-68.17	-58.13	1.58	7.67	H
	5137	-55.24	-13	-42.24	-76.72	-62.52	2.42	9.70	H
	6850	-51.49	-13	-38.49	-77.19	-59.47	2.64	10.62	H
	3426	-52.52	-13	-39.52	-68.79	-58.61	1.58	7.67	V
	5137	-54.97	-13	-41.97	-76.57	-62.25	2.42	9.70	V
	6850	-51.69	-13	-38.69	-77.16	-59.67	2.64	10.62	V
Middle	3468	-54.83	-13	-41.83	-71	-61.09	1.59	7.86	H
	5198	-55.80	-13	-42.80	-77.48	-63.05	2.45	9.70	H
	6930	-51.31	-13	-38.31	-77.29	-59.41	2.61	10.72	H
	3462	-53.54	-13	-40.54	-69.91	-59.78	1.59	7.83	V
	5198	-55.54	-13	-42.54	-77.28	-62.79	2.45	9.70	V
	6930	-51.59	-13	-38.59	-77.3	-59.69	2.61	10.72	V
Highest	3504	-58.30	-13	-45.30	-74.51	-64.7	1.61	8.00	H
	5257	-55.55	-13	-42.55	-77.38	-62.76	2.49	9.70	H
	7010	-50.93	-13	-37.93	-77.19	-59.16	2.59	10.82	H
	3510	-55.17	-13	-42.17	-71.67	-61.57	1.61	8.01	V
	5257	-55.51	-13	-42.51	-77.37	-62.72	2.49	9.70	V
	7010	-51.47	-13	-38.47	-77.44	-59.7	2.59	10.82	V

Remark: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.