FCC RF Test Report

APPLICANT	: Wistron Corporation
EQUIPMENT	: Notebook Computer
BRAND NAME	: Lenovo
MODEL NAME	: TP00076BUC
FCC ID	: PU5-TP00076BUC
STANDARD	: FCC 47 CFR Part 2, 90(S)
CLASSIFICATION	: PCS Licensed Transmitter (PCB)

Equipment: AriPrime EM7455 and Intel 8260NGW tested inside of Lenovo Notebook PC.
This is a partial report which is included the conducted output power and radiated test items.
The product was received on Nov. 25, 2015 and completely tested on Feb. 13, 2016. 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-D-2010 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: 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.

TABLE OF CONTENTS

REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FW5O1701-03	Rev. 01	Initial issue of report	Jan. 25, 2016

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	§2.1046	Conducted Output Power	Reporting only	PASS	-
4	§2.1053 §90.691	Radiated Spurious Emission	< $43+10\log_{10}$(P[Watts])	PASS	Under limit 19.34 dB at 1630.000 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	TP00076BUC
FCC ID	PU5-TP00076BUC
Integrated WWAN Module	Brand Name: Sierra Model Name: EM7455
Integrated WLAN Module	Brand Name: Intel Model Name: 8260NGW
EUT supports Radios application	WCDMA/HSPA/LTE WLAN 11a/b/g/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80 Bluetooth v4.1 EDR/LE
EUT Stage	Production Unit

Remark: Equipment: AriPrime EM7455 and Intel 8260NGW tested inside of Lenovo Notebook PC.

EM7455			**3G & LTE**
Manufacturer	Jieng Tai	Peak gain	3.67
P/N	025.900AG.0011	Type	PIFA Antenna

1.4 Product Specification subjective to this standard

Product Specification subjective to this standard	
Tx Frequency	814.7 ~ 823.3 MHz
Rx Frequency	859.7 ~ 868.3 MHz
Bandwidth	1.4MHz / 3MHz / 5MHz / 10MHz
Maximum Output Power to Antenna	LTE Band 26 : 22.37 dBm
Type of Modulation	QPSK / 16QAM

1.5 Testing Site

Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd Rd., Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C. TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	**Sporton Site No.**
	03CH12-HY

1.6 Applied Standards

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

- 47 CFR Part 2, Part 90(S)
- ANSI / TIA / EIA-603-D-2010
- FCC KDB 971168 Measurement Guidance of License Digital Systems v02r02

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

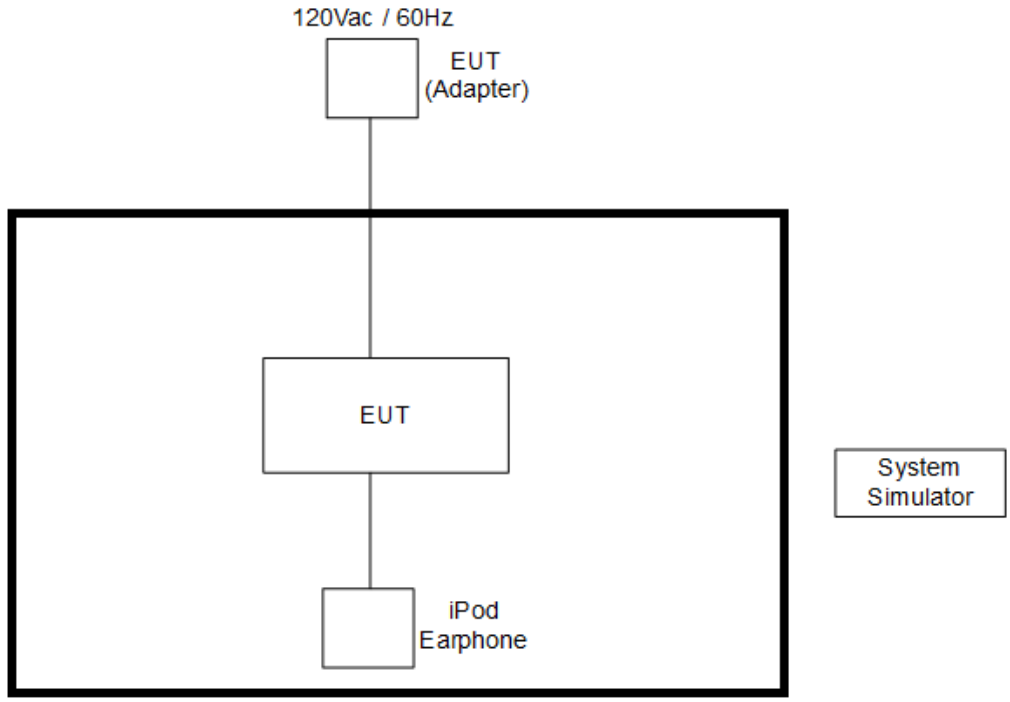
2.1 Test Mode

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.

Frequency range investigated for radiated emission: 30MHz to 10th harmonic.

Conducted Test Cases	Band	Bandwidth (MHz)						Modulation		RB #			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	1	Half	Full	L	M	H
Max. Output Power	26	v	v	v	v	v	-	v	v	v	v	v	v	v	v
Radiated Spurious Emission	26	v	v	v	v	v	-	v	v	v	v	v	v	v	v
Note	1. The mark "v " means that this configuration is chosen for testing 2. The mark "-" means that this bandwidth is not supported. 3. The device is investigated from 30MHz to 10 times of fundamental signal for radiated spurious emission test under different RB size/offset and modulations in exploratory test. Subsequently, only the worst case emissions are reported.														

2.2 Connection Diagram of Test System



2.3 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model No.	FCC ID	Data Cable	Power Cord
1.	LTE Base Station	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m

3 Conducted Test Items

3.1 Conducted Output Power

3.1.1 Description of the Conducted Output Power Measurement

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

3.1.2 Test Procedures

1. The transmitter output port was connected to base station.
2. Set EUT at maximum power through base station.
3. Select lowest, middle, and highest channels for each band and different modulation.
4. Measure and record the power level from the system simulator.

4 Radiated Spurious Emission

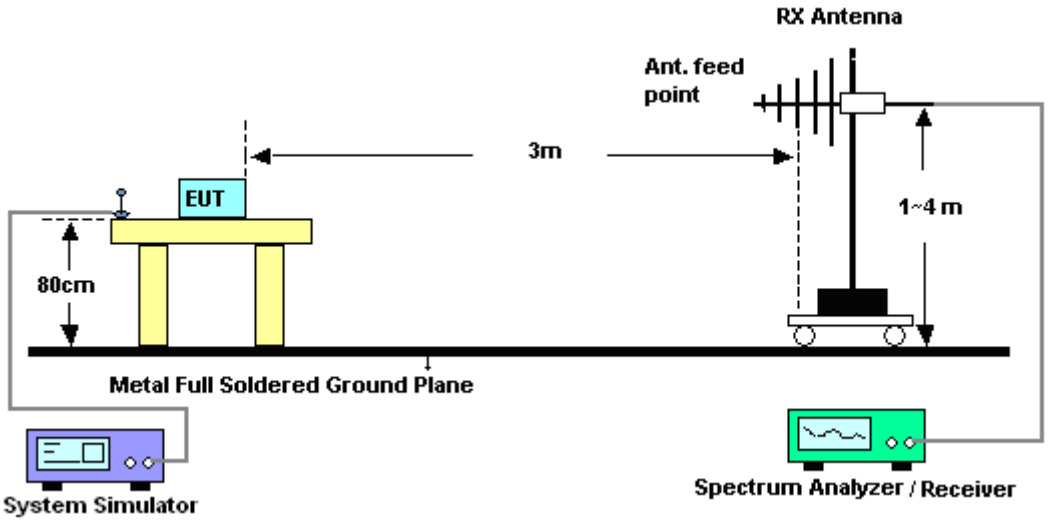
4.1 Radiated Test Items

4.1.1 Measuring Instruments

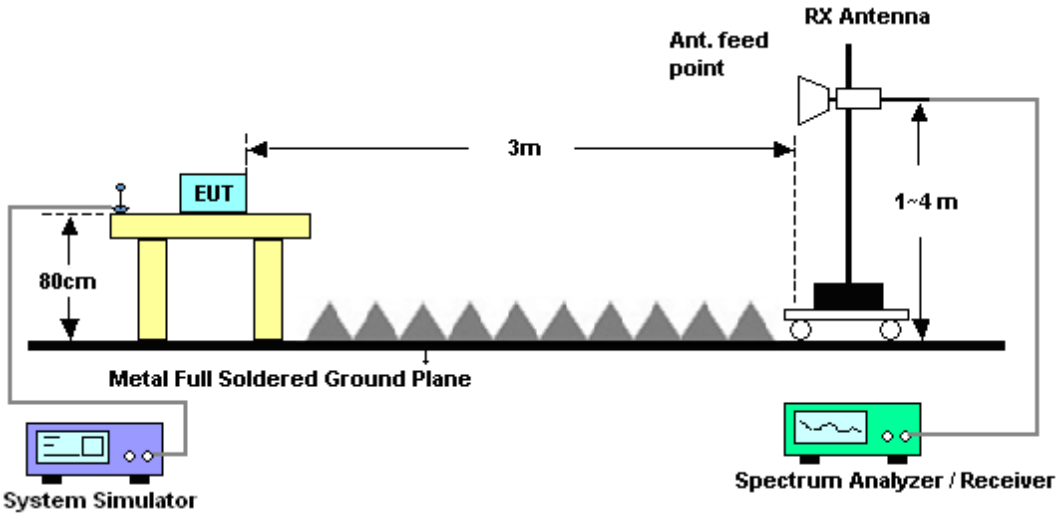
See list of measuring instruments of this test report.

4.1.2 Test Setup

For radiated test from 30MHz to 1GHz



For radiated test above 1GHz



4.1.3 Test Result of Radiated Test

Please refer to Appendix B.

4.2 Radiated Spurious Emission Measurement

4.2.1 Description of Radiated Spurious Emission

The radiated spurious emission was measured by substitution method according to ANSI / TIA / EIA-603-D-2010.

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.

For operations in the 758-775 MHz and 788-805 MHz bands, all emissions including harmonics 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. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

4.2.2 Test Procedures

1. The EUT was placed on a rotatable wooden table with 0.8 meter above 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. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
    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.
11. EIRP (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain
    ERP (dBm) = EIRP – 2.15

5 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Amplifier	Sonoma-Instrument	310 N	187282	10MHz~1GHz	Dec. 31, 2015	Jan. 11, 2016 ~ Feb. 13, 2016	Dec. 30, 2016	Radiation (03CH12-HY)
Bilog Antenna	TESEQ	CBL 6111D	37059	30MHz~1GHz	Dec. 29, 2015	Jan. 11, 2016 ~ Feb. 13, 2016	Dec. 28, 2016	Radiation (03CH12-HY)
EMI Test Receiver	Rohde & Schwarz	ESU26	100390	20Hz~26.5GHz	Dec. 21, 2015	Jan. 11, 2016 ~ Feb. 13, 2016	Dec. 20, 2016	Radiation (03CH12-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1328	1GHz ~ 18GHz	Nov. 02, 2015	Jan. 11, 2016 ~ Feb. 13, 2016	Nov. 01, 2016	Radiation (03CH12-HY)
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170584	18GHz- 40GHz	Nov. 02, 2015	Jan. 11, 2016 ~ Feb. 13, 2016	Nov. 01, 2016	Radiation (03CH12-HY)
Preamplifier	COM-POWER	PA-103A	161075	10MHz~1GHz	Apr. 09, 2015	Jan. 11, 2016 ~ Feb. 13, 2016	Apr. 08, 2016	Radiation (03CH12-HY)
Preamplifier	Agilent	8449B	3008A02375	1GHz~26.5GHz	Jan. 05, 2016	Jan. 11, 2016 ~ Feb. 13, 2016	Jan. 04, 2017	Radiation (03CH12-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1m~4m	N/A	Jan. 11, 2016 ~ Feb. 13, 2016	N/A	Radiation (03CH12-HY)
Turn Table	EMEC	TT2000	N/A	0-360 degre	N/A	Jan. 11, 2016 ~ Feb. 13, 2016	N/A	Radiation (03CH12-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1241	1GHz ~ 18GHz	Apr. 22, 2015	Jan. 11, 2016 ~ Feb. 13, 2016	Apr. 21, 2016	Radiation (03CH12-HY)
Signal Generator	Rohde & Schwarz	SMF100A	101107	100kHz~40GHz	May 22, 2015	Jan. 11, 2016 ~ Feb. 13, 2016	May 21, 2016	Radiation (03CH12-HY)
LTE Base Station	Anritsu	MT8820C	6201074414	400MHz~ 800MHz	Feb. 06, 2015	Jan. 28, 2016	Feb. 05, 2016	Conducted (TH05-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))	**2.54**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.72**

Appendix A. Test Results of Conducted Test

Conducted Output Power(Average power)

LTE Band 26 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
10	1	0	QPSK		22.37	
10	1	25			22.05	
10	1	49			22.03	
10	25	0			21.26	
10	25	12			21.15	
10	25	25			21.00	
10	50	0			21.24	
10	1	0	16-QAM		21.63	
10	1	25			21.31	
10	1	49			21.25	
10	25	0			20.17	
10	25	12			20.11	
10	25	25			19.92	
10	50	0			20.09	

LTE Band 26 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
5	1	0	QPSK	22.26	22.31	22.28
5	1	12		22.08	22.05	22.06
5	1	24		22.02	21.95	21.91
5	12	0		21.20	21.22	21.23
5	12	7		21.19	21.08	21.20
5	12	13		21.10	20.98	21.10
5	25	0		21.20	21.19	21.24
5	1	0	16-QAM	21.48	21.56	21.53
5	1	12		21.34	21.31	21.36
5	1	24		21.27	21.24	21.23
5	12	0		20.27	20.09	20.16
5	12	7		20.13	20.08	20.09
5	12	13		20.06	19.89	19.95
5	25	0		20.22	20.01	20.11
3	1	0	QPSK	22.21	22.25	22.22
3	1	8		22.08	22.04	22.04
3	1	14		22.01	21.95	21.92
3	8	0		21.15	21.14	21.17
3	8	4		21.12	21.04	21.12
3	8	7		21.06	20.90	21.05
3	15	0		21.13	21.11	21.14
3	1	0	16-QAM	21.47	21.53	21.51
3	1	8		21.27	21.21	21.32
3	1	14		21.21	21.20	21.14
3	8	0		20.20	20.01	20.16
3	8	4		20.04	20.07	20.04
3	8	7		20.04	20.06	19.95
3	15	0		20.21	19.99	20.03

LTE Band 26 Maximum Average Power [dBm]						
BW [MHz]	RB Size	RB Offset	Mod	Lowest	Middle	Highest
1.4	1	0	QPSK	22.18	22.19	22.12
1.4	1	3		21.99	22.01	21.97
1.4	1	5		21.92	21.90	21.87
1.4	3	0		22.11	22.12	22.16
1.4	3	1		22.05	21.94	22.08
1.4	3	3		22.04	21.88	21.95
1.4	6	0		21.11	21.04	21.05
1.4	1	0	16-QAM	21.47	21.52	21.45
1.4	1	3		21.20	21.14	21.23
1.4	1	5		21.17	21.14	21.09
1.4	3	0		21.13	20.98	21.14
1.4	3	1		21.01	20.97	20.99
1.4	3	3		20.98	21.05	20.94
1.4	6	0		20.11	19.90	20.03

Appendix B. Test Results of Radiated Test

Radiated Spurious Emission

LTE Band 26 / 1.4MHz / QPSK									
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	1624	-36.97	-13	-23.97	-46.6	-38.81	0.97	4.95	H
	2440	-36.97	-13	-23.97	-50.44	-38.77	1.27	5.22	H
	3256	-51.10	-13	-38.10	-67.5	-54.35	1.53	6.93	H
	4072	-54.25	-13	-41.25	-71.97	-58.91	1.80	8.61	H
	1624	-37.07	-13	-24.07	-46.08	-38.91	0.97	4.95	V
	2440	-38.55	-13	-25.55	-51.89	-40.35	1.27	5.22	V
	3256	-54.46	-13	-41.46	-70.71	-57.71	1.53	6.93	V
	4072	-55.38	-13	-42.38	-72.89	-60.04	1.80	8.61	V
Middle	1640	-41.17	-13	-28.17	-50.8	-42.95	0.97	4.91	H
	2456	-43.90	-13	-30.90	-55.37	-45.74	1.28	5.27	H
	3272	-55.19	-13	-42.19	-71.45	-58.5	1.53	7.00	H
	1640	-41.32	-13	-28.32	-50.41	-43.1	0.97	4.91	V
	2456	-38.80	-13	-25.80	-52.12	-40.64	1.28	5.27	V
	3272	-56.78	-13	-43.78	-72.99	-60.09	1.53	7.00	V
Highest	1648	-38.25	-13	-25.25	-47.92	-40.01	0.98	4.89	H
	2464	-44.45	-13	-31.45	-57.92	-46.31	1.28	5.29	H
	3288	-54.42	-13	-41.42	-70.53	-57.8	1.54	7.07	H
	1648	-38.50	-13	-25.50	-47.64	-40.26	0.98	4.89	V
	2464	-44.50	-13	-31.50	-54.82	-46.36	1.28	5.29	V
	3288	-46.14	-13	-33.14	-72.21	-49.52	1.54	7.07	V

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

LTE Band 26 / 3MHz / QPSK									
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	1624	-36.88	-13	-23.88	-46.52	-38.72	0.97	4.95	H
	2440	-35.91	-13	-22.91	-49.4	-37.71	1.27	5.22	H
	3256	-52.36	-13	-39.36	-68.78	-55.61	1.53	6.93	H
	4072	-53.93	-13	-40.93	-71.7	-58.59	1.80	8.61	H
	1624	-37.11	-13	-24.11	-46.17	-38.95	0.97	4.95	V
	2440	-41.39	-13	-28.39	-54.73	-43.19	1.27	5.22	V
	3256	-54.40	-13	-41.40	-70.66	-57.65	1.53	6.93	V
Middle	1632	-37.40	-13	-24.40	-47	-39.21	0.97	4.93	H
	2456	-36.20	-13	-23.20	-49.67	-38.04	1.28	5.27	H
	3272	-52.49	-13	-39.49	-68.75	-55.8	1.53	7.00	H
	4088	-54.65	-13	-41.65	-72.35	-59.31	1.81	8.62	H
	1632	-37.74	-13	-24.74	-46.78	-39.55	0.97	4.93	V
	2456	-35.78	-13	-22.78	-49.09	-37.62	1.28	5.27	V
	3272	-53.60	-13	-40.60	-70.82	-56.91	1.53	7.00	V
	4088	-55.70	-13	-42.70	-73.3	-60.36	1.81	8.62	V
Highest	1640	-38.14	-13	-25.14	-47.84	-39.92	0.97	4.91	H
	2464	-38.14	-13	-25.14	-51.6	-40	1.28	5.29	H
	3288	-53.73	-13	-40.73	-69.82	-57.11	1.54	7.07	H
	4104	-55.05	-13	-42.05	-72.76	-59.7	1.82	8.62	H
	1640	-37.73	-13	-24.73	-46.86	-39.51	0.97	4.91	V
	2464	-38.14	-13	-25.14	-51.38	-40	1.28	5.29	V
	3288	-55.88	-13	-42.88	-71.91	-59.26	1.54	7.07	V
	4104	-56.05	-13	-43.05	-73.6	-60.7	1.82	8.62	V

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

LTE Band 26 / 5MHz / QPSK									
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	1624	-37.30	-13	-24.30	-46.94	-39.14	0.97	4.95	H
	2440	-33.64	-13	-20.64	-47.11	-35.44	1.27	5.22	H
	3256	-50.86	-13	-37.86	-67.22	-54.11	1.53	6.93	H
	4072	-52.50	-13	-39.50	-70.24	-57.16	1.80	8.61	H
	1624	-37.85	-13	-24.85	-46.93	-39.69	0.97	4.95	V
	2440	-34.15	-13	-21.15	-47.5	-35.95	1.27	5.22	V
	3256	-53.94	-13	-40.94	-70.2	-57.19	1.53	6.93	V
	4072	-52.85	-13	-39.85	-70.4	-57.51	1.80	8.61	V
Middle	1633	-44.75	-13	-31.75	-54.38	-46.56	0.97	4.93	H
	2450	-44.80	-13	-31.80	-58.27	-46.62	1.28	5.25	H
	3267	-56.23	-13	-43.23	-72.67	-59.52	1.53	6.97	H
	1632	-44.69	-13	-31.69	-53.75	-46.5	0.97	4.93	V
	2450	-46.85	-13	-33.85	-60.19	-48.67	1.28	5.25	V
	3267	-56.53	-13	-43.53	-72.85	-59.82	1.53	6.97	V
Highest	1640	-45.14	-13	-32.14	-54.75	-46.92	0.97	4.91	H
	2456	-52.07	-13	-39.07	-65.55	-53.91	1.28	5.27	H
	3277	-56.28	-13	-43.28	-72.53	-59.61	1.53	7.02	H
	1640	-43.79	-13	-30.79	-54.88	-45.57	0.97	4.91	V
	2456	-50.95	-13	-37.95	-64.31	-52.79	1.28	5.27	V
	3280	-57.00	-13	-44.00	-73.02	-60.35	1.54	7.03	V

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

LTE Band 26 / 10MHz / QPSK									
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)
Middle	1630	-32.34	-13	-19.34	-41.72	-34.16	0.97	4.94	H
	2443	-33.28	-13	-20.28	-46.6	-35.09	1.27	5.23	H
	3259	-50.58	-13	-37.58	-66.51	-53.84	1.53	6.94	H
	4070	-53.76	-13	-40.76	-71.16	-58.42	1.80	8.61	H
	1630	-34.65	-13	-21.65	-43.54	-36.47	0.97	4.94	V
	2443	-47.74	-13	-34.74	-61.11	-49.55	1.27	5.23	V
	3259	-51.79	-13	-38.79	-68.19	-55.05	1.53	6.94	V
	4070	-54.55	-13	-41.55	-71.63	-59.21	1.80	8.61	V

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

LTE Band 26 / 15MHz / QPSK									
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)
Middle	1630	-34.50	-13	-21.50	-44.14	-36.32	0.97	4.94	H
	2446	-34.80	-13	-21.80	-48.3	-36.61	1.27	5.24	H
	3259	-48.74	-13	-35.74	-65.11	-52	1.53	6.94	H
	4075	-50.80	-13	-37.80	-68.57	-55.46	1.80	8.62	H
	1630	-35.30	-13	-22.30	-44.35	-37.12	0.97	4.94	V
	2443	-37.14	-13	-24.14	-49.52	-38.95	1.27	5.23	V
	3259	-53.34	-13	-40.34	-69.53	-56.6	1.53	6.94	V
	4075	-53.96	-13	-40.96	-71.51	-58.62	1.80	8.62	V

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