



FCC RF Test Report

APPLICANT : Sierra Wireless, Inc.
EQUIPMENT : Wireless Module
BRAND NAME : AirPrime
MODEL NAME : EM7690
FCC ID : N7NEM76
STANDARD : 47 CFR Part 2, and 90(S)
CLASSIFICATION : PCS Licensed Transmitter (PCB)

The product was received on Jun. 30, 2020 and completely tested on Jul. 18, 2020. We, Sporton International (ShenZhen) Inc., would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.26-2015 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 (ShenZhen) Inc., the test report shall not be reproduced except in full.

Reviewed by: Derreck Chen / Supervisor

Approved by: Eric Shih / Manager



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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FW021501-03	Rev. 01	Initial issue of report	Sep. 16, 2020



SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	§2.1053 §90.691	Field Strength of Spurious Radiation	$< 43 + 10 \log_{10}(P[\text{Watts}])$	PASS	Under limit 44.57 dB at 3277.000 MHz

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.



1 General Description

1.1 Applicant

Sierra Wireless, Inc.
13811 Wireless Way, Richmond, BC, Canada V6A 3A4

1.2 Manufacturer

Sierra Wireless, Inc.
13811 Wireless Way, Richmond, BC, Canada V6A 3A4

1.3 Feature of Equipment Under Test

Product Feature	
Equipment	Wireless Module
Brand Name	AirPrime
Model Name	EM7690
FCC ID	N7NEM76
EUT supports Radios application	WCDMA/LTE/GNSS
IMEI Code	Conducted/ Radiation: 352175380000030
HW Version	1.0
SW Version	SWIX55C_00.16.04.00
EUT Stage	Identical Prototype

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

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 / 15MHz
Antenna Gain	2.0 dBi
Type of Modulation	QPSK / 16QAM / 64QAM / 256QAM

1.5 Modification of EUT

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



1.6 Re-use of Measured Data

1.7.1 Introduction Section

This application re-uses data collected on a similar device. The subject device of this application (Model: EM7690, FCC ID: N7NEM76) is electrically identical to the reference device (Model: EM9190, FCC ID: N7NEM91) for the portions of the circuitry corresponding to the data being re-used, as treated by KDB Publication 484596 D01.

1.7.2 Difference Section

For details concerning the similarity with respect to component placement, mechanical/electrical design etc., please refer to the Product Equality Declaration.

The re-used RF data includes the following bands provided in Appendix C (Sporton RF Report No. FW021501 for the reference device Model: EM9190, FCC ID: N7NEM91).

1.7.3 Reference detail Section:

Equipment Class	Reference FCC ID	Folder Test	Report Title/Section
PCE (LTE)	N7NEM91	Part90S (FW021501)	All Conducted sections applicable

1.7.4 Spot Check Verification Data Section

In order to confirm hardware similarity of the subject device with the reference device, spot check measurements were performed on the subject device for the following test items, the test result were consistent with FCC ID: N7NEM91.

Assertions concerning the similarity of these devices are based on representations by the applicant. The applicant accepts full responsibility for the validity of the similarity claim, and for the determination that verification test data are sufficient to support it.

Test Item	Mode	N7NEM91 Worst Result	N7NEM76 Worst Result	Difference (dB)
Average Conducted Power (dBm)	LTE Band 26	23.09	22.46	-0.63

1.7 Testing Site

Sporton International (Shenzhen) Inc. is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.01.

Test Firm	Sporton International (Shenzhen) Inc.		
Test Site Location	No. 3 Bldg the third floor of south, Shahe River west, Fengzeyuan Warehouse, Nanshan Shenzhen, 518055 People's Republic of China TEL: +86-755-33202398		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	03CH01-SZ	CN1256	421272

1.8 Test Software

Item	Site	Manufacture	Name	Version
1.	03CH01-SZ	AUDIX	E3	6.2009-8-24

1.9 Applied Standards

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

- 47 CFR Part 2, 90(S)
- ANSI C63.26-2015
- FCC KDB 971168 D01 Power Meas. License Digital Systems v03r01
- FCC KDB 971168 D02 Misc Rev Approv License Devices v02r01

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, recorded in a separate test report.

2 Test Configuration of Equipment Under Test

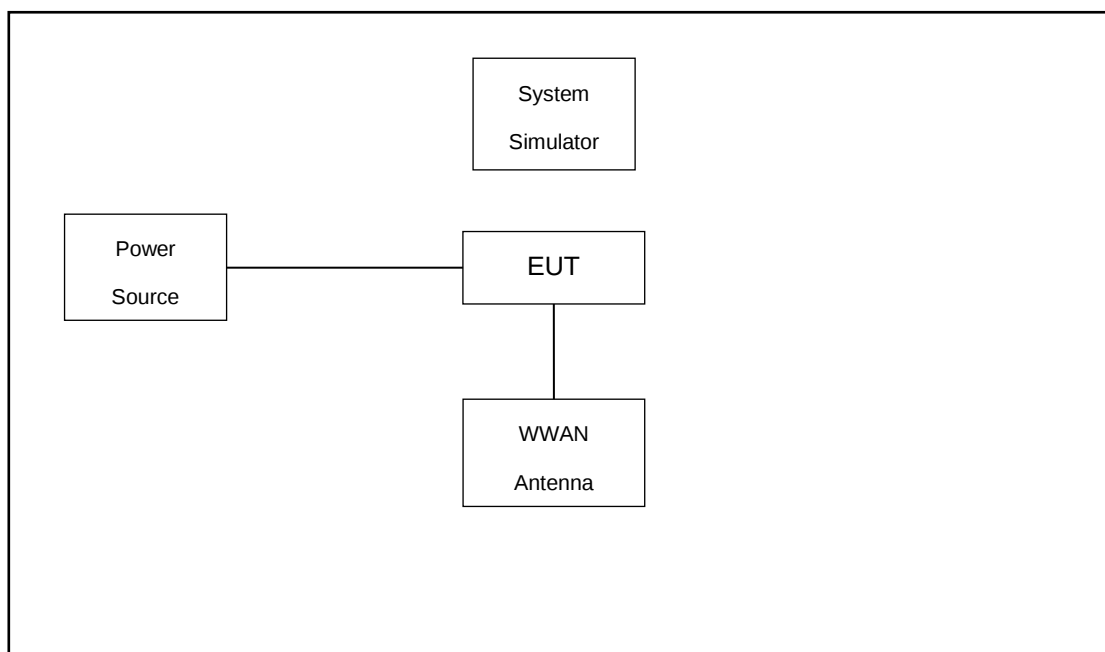
2.1 Test Mode

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 30 MHz to 9000 MHz.

Test Items	Band	Bandwidth (MHz)						Modulation			RB #			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	64QAM	1	Half	Full	L	M	H
Radiated Spurious Emission	26	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. LTE Band26 transmit frequency for part22 rule is 824MHz-849MHz, for part90 rule is 814MHz-824MHz. ERP over 15MHz bandwidth complies the ERP limit line of part22 rule, therefore ERP of the partial frequency spectrum which falls within part 22 also complies.															

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.	Power Supply	GWINSTEK	PSS-2002	N/A	N/A	Unshielded, 1.8 m
2.	LTE Base Station	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m

2.4 Frequency List of Low/Middle/High Channels

LTE Band 26 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
15	Channel	26765	-	-
	Frequency	821.5	-	-
10	Channel	-	26740	-
	Frequency	-	819	-
5	Channel	26715	26740	26765
	Frequency	816.5	819	821.5
3	Channel	26705	26740	26775
	Frequency	815.5	819	822.5
1.4	Channel	26697	26740	26783
	Frequency	814.7	819	823.3



3 Test Result

3.1 Field Strength of Spurious Radiation Measurement

3.1.1 Description of Field Strength of Spurious Radiated Measurement

The radiated spurious emission was measured by substitution method according to ANSI/TIA-603-E. The power of any emission FCC Part 90.691 on any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth at least $43 + 10 \log (P)$ dB. The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

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 $43 + 10 \log_{10}(P[\text{Watts}])$ dB. The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

3.1.2 Measuring Instruments

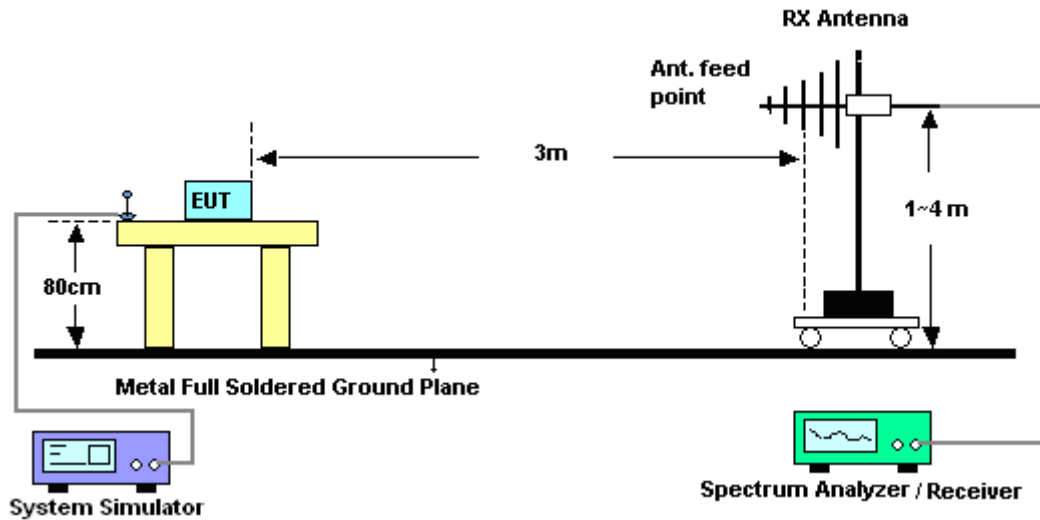
The measuring equipment is listed in the section 4 of this test report.

3.1.3 Test Procedures

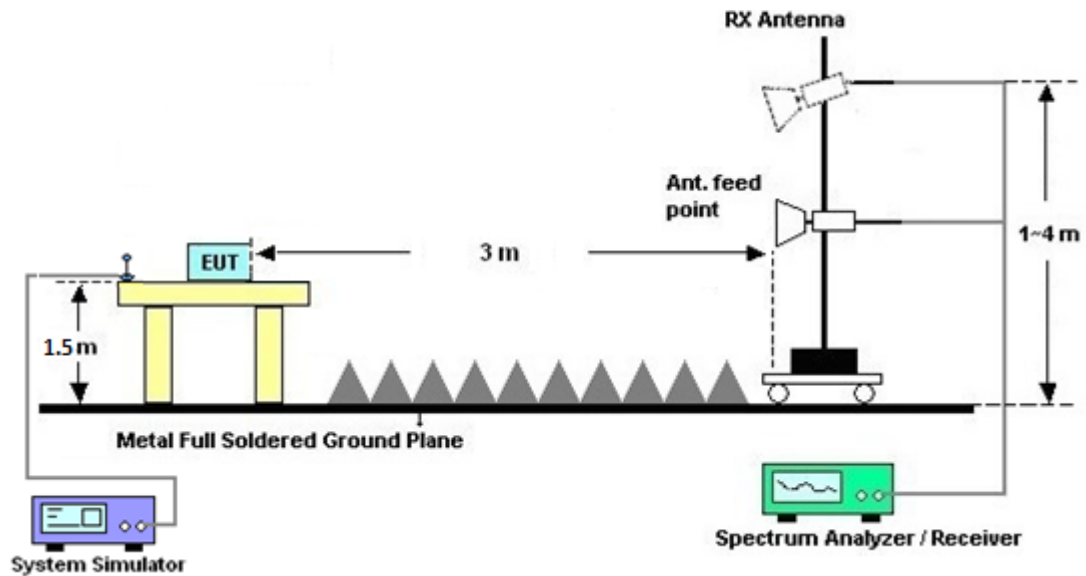
1. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
2. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. The table was rotated 360 degrees to determine the position 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. $\text{EIRP (dBm)} = \text{S.G. Power} - \text{Tx Cable Loss} + \text{Tx Antenna Gain}$
11. $\text{ERP (dBm)} = \text{EIRP} - 2.15$
12. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
13. The limit line is derived from $43 + 10 \log(P)$ dB below the transmitter power P(Watts)

3.1.4 Test Setup

For radiated test from 30MHz to 1GHz



For radiated test above 1GHz



3.1.5 Test Result of Field Strength of Spurious Radiated

Please refer to Appendix A.



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
EMI Test Receiver&SA	Agilent	N9038A	MY52260185	20Hz~26.5GHz	Jul. 22, 2019	Jul. 18, 2020	Jul. 21, 2020	Radiation (03CH01-SZ)
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY55150213	10Hz~44GHz	Apr. 17, 2020	Jul. 18, 2020	Apr. 16, 2021	Radiation (03CH01-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	May. 28, 2020	Jul. 18, 2020	May. 27, 2022	Radiation (03CH01-SZ)
Bilog Antenna	TeseQ	CBL6112D	35407	30MHz~2GHz	Jul. 19, 2019	Jul. 18, 2020	Jul. 18, 2020	Radiation (03CH01-SZ)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00119436	1GHz~18GHz	Aug. 27, 2019	Jul. 18, 2020	Aug. 26, 2020	Radiation (03CH01-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18Ghz~40GHz	Apr. 17, 2020	Jul. 18, 2020	Apr. 16, 2021	Radiation (03CH01-SZ)
LF Amplifier	Burgeon	BPA-530	102209	0.01~3000Mhz	Apr. 17, 2020	Jul. 18, 2020	Apr. 16, 2021	Radiation (03CH01-SZ)
HF Amplifier	MITEQ	AMF-7D-00 101800-30-1	1943528	1GHz~18GHz	Oct. 18, 2019	Jul. 18, 2020	Oct. 17, 2020	Radiation (03CH01-SZ)
HF Amplifier	KEYSIGHT	83017A	MY53270104	0.5GHz~26.5Ghz	Dec. 27, 2019	Jul. 18, 2020	Dec. 26, 2020	Radiation (03CH01-SZ)
HF Amplifier	MITEQ	TTA1840-35 -HG	1871923	18GHz~40GHz	Jul. 22, 2019	Jul. 18, 2020	Jul. 21, 2020	Radiation (03CH01-SZ)

NCR: No Calibration Required

5 Uncertainty of Evaluation

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.26-2015. All the measurement uncertainty value were shown with a coverage $K=2$ to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.48dB
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Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	3.53dB
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Uncertainty of Radiated Emission Measurement (18 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.02dB
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Appendix A. Test Results of Radiated Test

Radiated Spurious Emission

LTE Band 26 / 1.4MHz / QPSK									
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	1628.14	-66.29	-13	-53.29	-76.98	-69.52	3.98	9.36	H
	2442.21	-60.33	-13	-47.33	-78.40	-63.88	4.85	10.55	H
	3256.28	-59.48	-13	-46.48	-79.60	-64.41	5.50	12.58	H
	1628.14	-65.72	-13	-52.72	-77.01	-68.95	3.98	9.36	V
	2442.21	-60.17	-13	-47.17	-78.68	-63.72	4.85	10.55	V
	3256.28	-58.36	-13	-45.36	-79.75	-63.29	5.50	12.58	V
Middle	1636.74	-65.90	-13	-52.90	-76.59	-69.15	4.00	9.40	H
	2455.11	-60.75	-13	-47.75	-78.95	-64.32	4.88	10.60	H
	3273.48	-59.58	-13	-46.58	-79.79	-64.51	5.52	12.60	H
	1636.74	-65.37	-13	-52.37	-76.66	-68.62	4.00	9.40	V
	2455.11	-60.28	-13	-47.28	-78.87	-63.85	4.88	10.60	V
	3273.48	-57.94	-13	-44.94	-79.24	-62.87	5.52	12.60	V
Highest	1645.34	-66.82	-13	-53.82	-77.57	-69.99	4.10	9.42	H
	2468.01	-60.98	-13	-47.98	-79.18	-64.56	4.90	10.63	H
	3290.68	-59.70	-13	-46.70	-80.01	-64.62	5.55	12.62	H
	1645.34	-65.54	-13	-52.54	-76.93	-68.71	4.10	9.42	V
	2468.01	-60.46	-13	-47.46	-79.05	-64.04	4.90	10.63	V
	3290.68	-59.34	-13	-46.34	-80.54	-64.26	5.55	12.62	V

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



LTE Band 26 / 3MHz / QPSK									
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	1628.3	-65.84	-13	-52.84	-76.53	-69.07	3.98	9.36	H
	2442.45	-60.37	-13	-47.37	-78.44	-63.92	4.85	10.55	H
	3256.6	-59.42	-13	-46.42	-79.54	-64.35	5.50	12.58	H
	1628.3	-65.42	-13	-52.42	-76.71	-68.65	3.98	9.36	V
	2442.45	-60.22	-13	-47.22	-78.73	-63.77	4.85	10.55	V
	3256.6	-57.93	-13	-44.93	-79.32	-62.86	5.50	12.58	V
Middle	1635.3	-66.09	-13	-53.09	-76.78	-69.34	4.00	9.40	H
	2452.95	-60.60	-13	-47.60	-78.67	-64.17	4.88	10.60	H
	3270.6	-59.68	-13	-46.68	-79.89	-64.61	5.52	12.60	H
	1635.3	-65.47	-13	-52.47	-76.76	-68.72	4.00	9.40	V
	2452.95	-60.13	-13	-47.13	-78.64	-63.70	4.88	10.60	V
	3270.6	-58.47	-13	-45.47	-79.77	-63.40	5.52	12.60	V
Highest	1642.3	-66.15	-13	-53.15	-76.90	-69.32	4.10	9.42	H
	2463.45	-60.60	-13	-47.60	-78.80	-64.18	4.90	10.63	H
	3284.6	-59.27	-13	-46.27	-79.48	-64.19	5.55	12.62	H
	1642.3	-65.29	-13	-52.29	-76.68	-68.46	4.10	9.42	V
	2463.45	-60.21	-13	-47.21	-78.80	-63.79	4.90	10.63	V
	3284.6	-58.58	-13	-45.58	-79.88	-63.50	5.55	12.62	V

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



LTE Band 26 / 5MHz / QPSK									
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	1628.5	-65.85	-13	-52.85	-76.54	-69.08	3.98	9.36	H
	2442.75	-60.61	-13	-47.61	-78.68	-64.16	4.85	10.55	H
	3257	-59.51	-13	-46.51	-79.63	-64.44	5.50	12.58	H
	1628.5	-65.68	-13	-52.68	-76.97	-68.91	3.98	9.36	V
	2442.75	-60.17	-13	-47.17	-78.68	-63.72	4.85	10.55	V
	3257	-58.10	-13	-45.10	-79.49	-63.03	5.50	12.58	V
Middle	1633.5	-65.68	-13	-52.68	-76.37	-68.93	4.00	9.40	H
	2450.25	-60.30	-13	-47.30	-78.37	-63.87	4.88	10.60	H
	3267	-58.99	-13	-45.99	-79.11	-63.92	5.52	12.60	H
	1633.5	-65.58	-13	-52.58	-76.87	-68.83	4.00	9.40	V
	2450.25	-59.81	-13	-46.81	-78.32	-63.38	4.88	10.60	V
	3267	-57.93	-13	-44.93	-79.32	-62.86	5.52	12.60	V
Highest	1638.5	-66.15	-13	-53.15	-76.90	-69.32	4.10	9.42	H
	2457.75	-60.75	-13	-47.75	-78.95	-64.33	4.90	10.63	H
	3277	-59.60	-13	-46.60	-79.81	-64.52	5.55	12.62	H
	1638.5	-65.51	-13	-52.51	-76.90	-68.68	4.10	9.42	V
	2457.75	-60.26	-13	-47.26	-78.85	-63.84	4.90	10.63	V
	3277	-57.57	-13	-44.57	-78.87	-62.49	5.55	12.62	V

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



LTE Band 26 / 10MHz / QPSK									
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)
Middle	1629	-65.54	-13	-52.54	-76.23	-68.79	4.00	9.40	H
	2443.5	-60.46	-13	-47.46	-78.53	-64.03	4.88	10.60	H
	3258	-58.88	-13	-45.88	-79.00	-63.81	5.52	12.60	H
	1629	-64.79	-13	-51.79	-76.08	-68.04	4.00	9.40	V
	2443.5	-59.83	-13	-46.83	-78.34	-63.40	4.88	10.60	V
	3258	-57.86	-13	-44.86	-79.25	-62.79	5.52	12.60	V

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

LTE Band 26 / 15MHz / QPSK									
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)
Middle	1629.5	-65.83	-13	-52.83	-76.52	-69.08	4.00	9.40	H
	2444.25	-60.27	-13	-47.27	-78.34	-63.84	4.88	10.60	H
	3259	-59.30	-13	-46.30	-79.42	-64.23	5.52	12.60	H
	1629.5	-65.41	-13	-52.41	-76.70	-68.66	4.00	9.40	V
	2444.25	-59.88	-13	-46.88	-78.39	-63.45	4.88	10.60	V
	3259	-57.91	-13	-44.91	-79.30	-62.84	5.52	12.60	V

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



Appendix C. Reference Report

Please refer to Sporton report number FW021501 which is issued separately.