FCC RF Test Report

APPLICANT	:	Xiaomi Communications Co., Ltd.
EQUIPMENT	:	Mobile Phone
BRAND NAME	:	Redmi
MODEL NAME	:	A101XM
FCC ID	:	2AFZZK19KR
STANDARD	:	47 CFR Part 2, and 90(S)
CLASSIFICATION	:	PCS Licensed Transmitter Held to Ear (PCE)
TEST DATE(S)	:	Aug. 18, 2021

We, Sporton International (Kunshan) 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 (Kunshan) Inc., the test report shall not be reproduced except in full.

Reviewed by: Jason Jia / Supervisor

Approved by: Alex Wang / Manager

ACCREDITED Cert #5145.02

Sporton International (Kunshan) Inc.
No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300
People's Republic of China

TABLE OF CONTENTS

REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FW122708-01	Rev. 01	Initial issue of report	Sep. 22, 2021

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	§2.1046	Conducted Output Power	Reporting only	PASS	-
-	§2.1049 §90.209	Occupied Bandwidth and 26dB Bandwidth	Reporting only	PASS	1
-	§2.1051 §90.691	Emission masks – In-band emissions	< $50+10\log_{10}$(P[Watts])	PASS	1
-	§2.1051 §90.691	Emission masks – Out of band emissions	< $43+10\log_{10}$(P[Watts])	PASS	1
3.2	§2.1053 §90.691	Field Strength of Spurious Radiation	< $43+10\log_{10}$(P[Watts])	PASS	Under limit 43.00 dB at 3258.000 MHz
-	§2.1055 §90.213	Frequency Stability for Temperature & Voltage	< 2.5 ppm	PASS	-

Remark 1: Test items are performed on original report which can be referred to Sporton report number FW122708

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

Xiaomi Communications Co., Ltd.
#019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085

1.2 Manufacturer

Xiaomi Communications Co., Ltd.
#019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085

1.3 Feature of Equipment Under Test

Product Feature	
Equipment	Mobile Phone
Brand Name	Redmi
Model Name	A101XM
FCC ID	2AFZZK19KR
IMEI Code	Radiation : 860036050003550/860036050003568
HW Version	P0.1
SW Version	MIUI13
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 ~ 824 MHz
Rx Frequency	859 ~ 869 MHz
Bandwidth	1.4MHz / 3MHz / 5MHz / 10MHz / 15MHz
Maximum Output Power to Antenna	Ant 1: 24.60 dBm Ant 4: : 24.69 dBm
Type of Modulation	QPSK / 16QAM / 64QAM / 256QAM(Downlink only)

1.5 Modification of EUT

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

1.6 Maximum Conducted Power and Emission Designator

LTE Band 26		QPSK	16QAM/64QAM
BW (MHz)	Frequency Range (MHz)	Maximum Conducted power (W)	Maximum Conducted power (W)
15	821.5	0.2944	0.2393

1.7 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: A101XM, FCC ID: 2AFZZK19KR) is electrically identical to the reference device (Model: XIG02, FCC ID: 2AFZZK19JR) for the portions of the circuitry corresponding to the data being re-used. Based on their similarity, the FCC Part, 90, (equipment class: PCE) reuse the original model's result and do spot-check, following the FCC KDB 484596 D01 v01.

The applicant takes full responsibility that the test data as referenced in this report represent compliance for this FCC ID: 2AFZZK19KR .

1.7.2 Model Difference Information

The **main** difference between FCC ID: 2AFZZK19JR and FCC ID: 2AFZZK19KR is that the two models support different WWAN bands /NFC / WIFI 5G U-NII-3.
Other differences and all the details of similarity and difference can be found in the confidential documents (2AFZZK19KR_Operational Description of Product Equality Declaration).

1.7.3 Reference detail Section

Rule Part	Equipment Class	Frequency Band (MHz)	Reference FCC ID(Parent)	Type Grant/ Permissive Change	Reference Title	FCC ID Filling (Variant)	Report Title/Section
90s	PCE (LTE)	B26	2AFZZK19JR	Original Grant	FW122708	2AFZZK19KR	All sections applicable except Power and RSE

1.7.4 Spot Check Verification Data Section

Conducted power test against the variant model based on the worst-case condition from the original model was performed in this filing to demonstrate the test data from original model remains representative for the variant model

Summary for power spot check for each rule entry and technology is listed as below:

Test Item	Mode	2AFZZK19JR Worst Result	2AFZZK19KR Check Result	Difference (dB)
Conducted Power (dBm)	LTE Band 26	24.85	24.69	0.16

Conclusion:
Based on the spot check test result, the test data from the original model is representative for the variant model. The power level and RSE spot check are shown within expected level compliant to limit line.

We confirm that the test data reuse policy of FCC KDB 484596 D01 Referencing Test Data v01 has been followed and the test data as referenced from the parent model report represents compliance with new FCC ID.

1.8 Testing Site

Sporton International (Kunshan) Inc. is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Test Firm	Sporton International (Kunshan) Inc.		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158 FAX : +86-512-57900958		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	03CH04-KS	CN1257	314309

1.9 Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH04-KS	AUDIX	E3	6.2009-8-24a

1.10 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

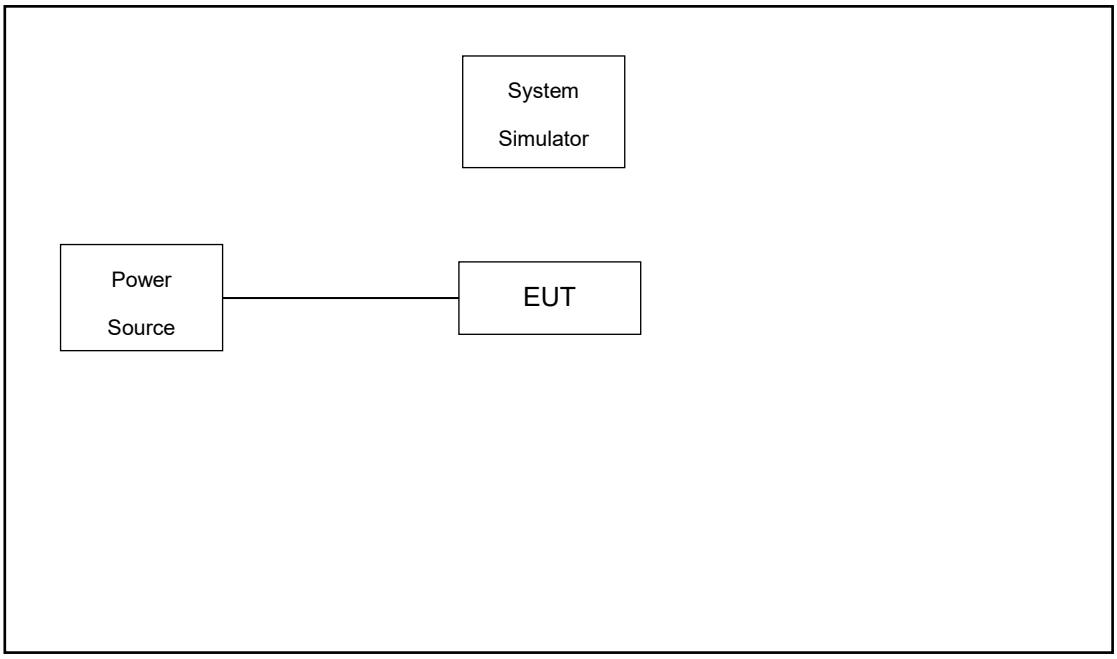
2.1 Test Mode

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
Max. Output Power	26	v	v	v	v	v	-	v	v	v	v	v	v	v	v	v
Radiated Spurious Emission	26	Worst case													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.	System Simulator	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m
2.	Power Supply	GWINSTEK	PSS-2002	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 Conducted Output Power Measurement

3.1.1 Description of the Conducted Output Power Measurement

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.

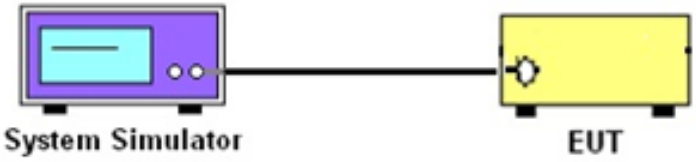
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

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

3.1.4 Test Setup



3.1.5 Test Result of Conducted Output Power

Please refer to Appendix A.

3.2 Field Strength of Spurious Radiation Measurement

3.2.1 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 $43+10\log_{10}(P[Watts])$ dB. The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

3.2.2 Measuring Instruments

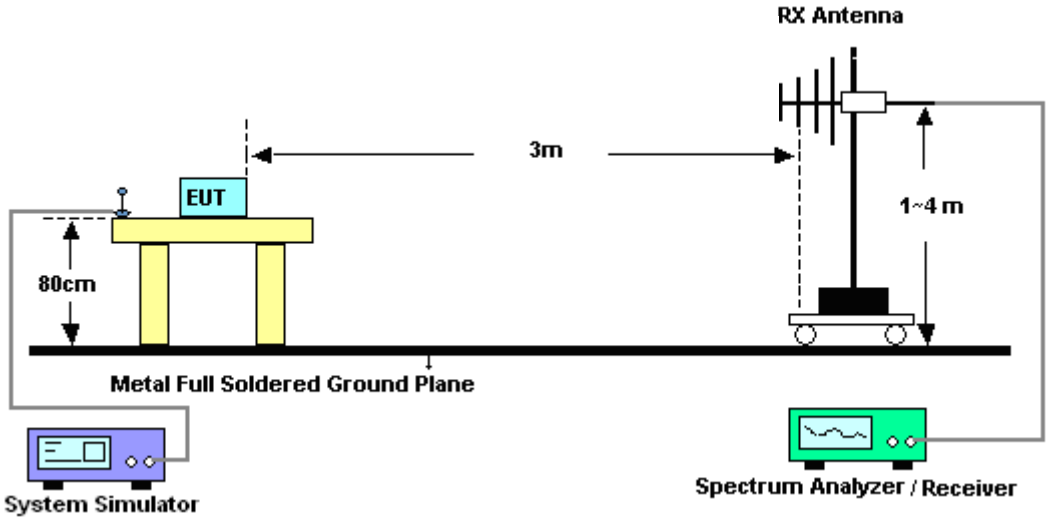
The measuring equipment is listed in the section 4 of this test report.

3.2.3 Test Procedures

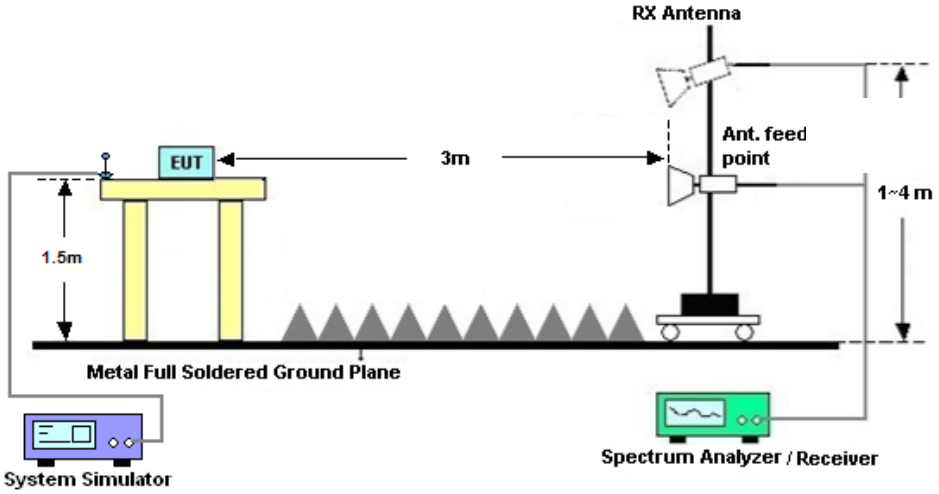
1. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
2. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. The table was rotated 360 degrees to determine the position 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. EIRP (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain
11. ERP (dBm) = 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 + 10log(P) dB below the transmitter power P(Watts)

3.2.4 Test Setup

For radiated test from 30MHz to 1GHz



For radiated test above 1GHz



3.2.5 Test Result of Field Strength of Spurious Radiated

Please refer to Appendix B.

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
EXA Spectrum Analyzer	Keysight	N9010A	MY55150244	10Hz-44G,MAX 30dB	Apr. 13, 2021	Aug. 18, 2021	Apr. 12, 2022	Radiation (03CH04-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Nov. 01, 2020	Aug. 18, 2021	Oct. 31, 2021	Radiation (03CH04-KS)
Bilog Antenna	TeseQ	CBL6111D	49922	30MHz-1GHz	May 30, 2021	Aug. 18, 2021	May 29, 2022	Radiation (03CH04-KS)
Horn Antenna	Schwarzbeck	BBHA9120 D	1356	1GHz~18GHz	Apr. 18, 2021	Aug. 18, 2021	Apr. 17, 2022	Radiation (03CH04-KS)
SHF-EHF Horn	Com-power	AH-840	101115	18GHz~40GHz	Jan. 06, 2021	Aug. 18, 2021	Jan. 05, 2022	Radiation (03CH04-KS)
Amplifier	SONOMA	310N	187289	9KHz-1GHz	Jan. 06, 2021	Aug. 18, 2021	Jan. 05, 2022	Radiation (03CH04-KS)
Amplifier	MITEQ	EM18G40G GA	060728	18~40GHz	Jan. 07, 2021	Aug. 18, 2021	Jan. 06, 2022	Radiation (03CH04-KS)
high gain Amplifier	MITEQ	AMF-7D-00 101800-30-10P	2025788	1Ghz-18Ghz	Jan. 06, 2021	Aug. 18, 2021	Jan.05, 2022	Radiation (03CH04-KS)
Amplifier	Keysight	83017A	MY57280106	500MHz~26.5GHz	Oct. 14, 2020	Aug. 18, 2021	Oct. 13, 2021	Radiation (03CH04-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Aug. 18, 2021	NCR	Radiation (03CH04-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Aug. 18, 2021	NCR	Radiation (03CH04-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Aug. 18, 2021	NCR	Radiation (03CH04-KS)

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))	**3.3dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.8dB**

Appendix A. Test Results of Conducted Test

Conducted Output Power (Average power)

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.
Channel				26765		
Frequency (MHz)				821.5		
15	QPSK	1	0	24.69		
15	QPSK	1	37	24.41		
15	QPSK	1	74	24.51		
15	QPSK	36	0	23.53		
15	QPSK	36	20	23.61		
15	QPSK	36	39	23.49		
15	QPSK	75	0	23.40		
15	16QAM	1	0	23.76		
15	16QAM	1	37	23.68		
15	16QAM	1	74	23.79		
15	16QAM	36	0	22.67		
15	16QAM	36	20	22.67		
15	16QAM	36	39	22.58		
15	16QAM	75	0	22.68		
15	16QAM	1	0	22.70		
15	16QAM	1	37	22.75		
15	16QAM	1	74	22.74		
15	16QAM	36	0	21.92		
15	16QAM	36	20	21.99		
15	16QAM	36	39	21.88		
15	16QAM	75	0	21.54		
Channel					26740	
Frequency (MHz)					819	
10	QPSK	1	0		24.67	
10	QPSK	1	25		24.50	
10	QPSK	1	49		24.35	
10	QPSK	25	0		23.60	
10	QPSK	25	12		23.46	
10	QPSK	25	25		23.59	
10	QPSK	50	0		23.59	
10	16QAM	1	0		23.78	
10	16QAM	1	25		23.68	
10	16QAM	1	49		23.66	
10	16QAM	25	0		22.66	
10	16QAM	25	12		22.59	

10	16QAM	25	25		22.60	
10	16QAM	50	0		22.66	
10	16QAM	1	0		22.70	
10	16QAM	1	25		22.68	
10	16QAM	1	49		22.74	
10	16QAM	25	0		21.61	
10	16QAM	25	12		21.91	
10	16QAM	25	25		21.56	
10	16QAM	50	0		21.63	
Channel				26715	26740	26765
Frequency (MHz)				816.5	819	821.5
5	QPSK	1	0	24.63	24.59	24.59
5	QPSK	1	12	24.58	24.40	24.37
5	QPSK	1	24	24.46	24.35	24.44
5	QPSK	12	0	23.65	23.66	23.61
5	QPSK	12	7	23.57	23.56	23.40
5	QPSK	12	13	23.58	23.62	23.53
5	QPSK	25	0	23.55	23.60	23.49
5	16QAM	1	0	23.79	23.71	23.77
5	16QAM	1	12	23.69	23.68	23.68
5	16QAM	1	24	23.68	23.68	23.44
5	16QAM	12	0	22.70	22.65	22.58
5	16QAM	12	7	22.77	22.70	22.58
5	16QAM	12	13	22.71	22.76	22.66
5	16QAM	25	0	22.80	22.74	22.69
5	16QAM	1	0	22.80	22.75	22.77
5	16QAM	1	12	22.70	22.82	22.94
5	16QAM	1	24	22.70	22.82	22.85
5	16QAM	12	0	21.77	21.67	21.60
5	16QAM	12	7	21.88	21.82	21.79
5	16QAM	12	13	21.91	21.69	21.74
5	16QAM	25	0	21.58	21.62	21.70
Channel				26705	26740	26775
Frequency (MHz)				815.5	819	822.5
3	QPSK	1	0	24.51	24.61	24.62
3	QPSK	1	8	24.41	24.47	24.47
3	QPSK	1	14	24.51	24.42	24.43
3	QPSK	8	0	23.53	23.59	23.59
3	QPSK	8	4	23.61	23.49	23.48
3	QPSK	8	7	23.49	23.64	23.59
3	QPSK	15	0	23.40	23.51	23.62
3	16QAM	1	0	23.76	23.70	23.78
3	16QAM	1	8	23.68	23.53	23.72
3	16QAM	1	14	23.79	23.57	23.51
3	16QAM	8	0	22.67	22.65	22.77

3	16QAM	8	4	22.67	22.58	22.62
3	16QAM	8	7	22.58	22.67	22.69
3	16QAM	15	0	22.68	22.62	22.66
3	16QAM	1	0	22.70	22.73	22.76
3	16QAM	1	8	22.75	22.85	22.81
3	16QAM	1	14	22.74	22.84	22.82
3	16QAM	8	0	21.92	21.59	21.63
3	16QAM	8	4	21.99	21.90	21.71
3	16QAM	8	7	21.88	21.59	21.56
3	16QAM	15	0	21.54	21.71	21.78
Channel				26697	26740	26783
Frequency (MHz)				814.7	819	823.3
1.4	QPSK	1	0	24.26	24.23	24.35
1.4	QPSK	1	3	24.30	24.32	24.22
1.4	QPSK	1	5	24.38	24.29	24.27
1.4	QPSK	3	0	24.45	24.19	24.29
1.4	QPSK	3	1	24.44	24.46	24.24
1.4	QPSK	3	3	24.36	24.21	24.21
1.4	QPSK	6	0	23.32	23.20	23.22
1.4	16QAM	1	0	23.48	23.25	23.33
1.4	16QAM	1	3	23.51	23.47	23.48
1.4	16QAM	1	5	23.43	23.41	23.44
1.4	16QAM	3	0	23.48	23.20	23.17
1.4	16QAM	3	1	23.51	23.44	23.24
1.4	16QAM	3	3	23.23	23.37	23.17
1.4	16QAM	6	0	22.53	22.35	22.32
1.4	16QAM	1	0	22.36	22.31	22.46
1.4	16QAM	1	3	22.51	22.42	22.26
1.4	16QAM	1	5	22.27	22.42	22.14
1.4	16QAM	3	0	22.31	22.22	22.16
1.4	16QAM	3	1	22.48	22.35	22.32
1.4	16QAM	3	3	22.51	22.42	22.21
1.4	16QAM	6	0	21.46	21.35	21.29

Appendix B. Test Results of Radiated Test

Radiated Spurious Emission

LTE Band 26 / 10MHz / QPSK								
Channel	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)
Middle	1630	-63.79	-13	-50.79	-70.76	1.58	10.70	H
	2444	-59.60	-13	-46.60	-68.09	1.86	12.50	H
	3258	-58.92	-13	-45.92	-68.46	2.21	13.90	H
	4074	-59.42	-13	-46.42	-67.88	2.69	13.30	H
	1630	-63.25	-13	-50.25	-70.22	1.58	10.70	V
	2444	-58.71	-13	-45.71	-67.20	1.86	12.50	V
	3258	-56.00	-13	-43.00	-65.54	2.21	13.90	V
	4074	-60.04	-13	-47.04	-68.50	2.69	13.30	V

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

Appendix D. Reference Report

Please refer to Sporton report number FW122708 which is issued separately.