



FCC RF Test Report

APPLICANT : Xiaomi Communications Co., Ltd.
EQUIPMENT : Mobile Phone
BRAND NAME : Redmi
MODEL NAME : 2201116SR
FCC ID : 2AFZZ16SR
STANDARD : 47 CFR Part 2, and 90(S)
CLASSIFICATION : PCS Licensed Transmitter Held to Ear (PCE)
Test Date(s) : Jan. 01, 2022

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.

Jason Jia

Reviewed by: Jason Jia / Supervisor

Alex Wang

Approved by: Alex Wang / Manager



Sporton International (Kunshan) Inc.

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TABLE OF CONTENTS

REVISION HISTORY	3
SUMMARY OF TEST RESULT	4
1 GENERAL DESCRIPTION	5
1.1 Applicant.....	5
1.2 Manufacturer	5
1.3 Feature of Equipment Under Test.....	5
1.4 Product Specification of Equipment Under Test	5
1.5 Modification of EUT	5
1.6 Re-use of Measured Data	6
1.7 Maximum Conducted Power and Emission Designator	7
1.8 Testing Site.....	7
1.9 Test Software	8
1.10 Applied Standards	8
2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST	9
2.1 Test Mode.....	9
2.2 Connection Diagram of Test System	10
2.3 Support Unit used in test configuration and system	10
2.4 Frequency List of Low/Middle/High Channels	11
3 TEST RESULT	12
3.1 Conducted Output Power Measurement.....	12
3.2 Field Strength of Spurious Radiation Measurement	13
4 LIST OF MEASURING EQUIPMENT	16
5 UNCERTAINTY OF EVALUATION	17
APPENDIX A. TEST RESULTS OF CONDUCTED TEST	
APPENDIX B. TEST RESULTS OF RADIATED TEST	
APPENDIX C. TEST SETUP PHOTOGRAPHS	
APPENDIX D. REFERENCE REPORT	



REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FW1N1013-03	Rev. 01	Initial issue of report	Jan. 06, 2022

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	§2.1046	Conducted Output Power	—	Report only	-
3.2	§2.1053 §90.691	Field Strength of Spurious Radiation	$< 43 + 10 \log_{10}(P[\text{Watts}])$	PASS	Under limit 50.02 dB at 3258.360 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

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	2201116SR
FCC ID	2AFZZ16SR
IMEI Code	Conducted: 861288050015360/861288050015378 Radiation: 861288050015741/861288050015758
HW Version	P1.1
SW Version	MIUI 13
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.0:24.35 dBm Ant 4:24.37 dBm
Type of Modulation	QPSK / 16QAM / 64QAM / 256QAM(Downlink Only)

Note: For Antenna 0/4, the higher Conducted power is showed in this report.

1.5 Modification of EUT

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



1.6 Re-use of Measured Data

1.6.1 Introduction Section

This application re-uses data collected on a similar device. The subject device of this application (Model: 2201116SR, FCC ID: 2AFZZ16SR) is electrically identical to the reference device (Model: 2201116SG, FCC ID: 2AFZZ16SG) for the portions of the circuitry corresponding to the data being re-used, as treated by KDB Publication 484596 D01.

1.6.2 Difference Section

The **main** difference between FCC ID: 2AFZZ16SG and FCC ID: 2AFZZ16SR is as below:

- Remove LTE Band 32/66 and 5G NR n66.
- Add LTE Band 42

Other differences and all the details of similarity and difference can be found in the confidential documents (2AFZZ16SR_Operational Description of Product Equality Declaration).

The re-used RF data includes the following bands provided in Appendix D (Sporton RF Report No. FW1N1013 for the reference device Model: 2201116SG, FCC ID: 2AFZZ16SG).

1.6.3 Reference detail Section:

Equipment Class	Reference FCC ID	Folder Test	Report Title/Section
PCE	2AFZZ16SG	Part90S (Report No. FW1N1013)	All conducted test sections applicable

1.6.4 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: 2AFZZ16SG.

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

Test Item	Mode	2AFZZ16SG Worst Result	2AFZZ16SR Worst Result	Difference (dB)
Average Conducted Power (dBm)	LTE Band 26_Ant0	24.35	24.35	0
	LTE Band 26_Ant4	24.37	24.37	0

Conclusion:

Based on the spot check test result, the test data from the original model is representative for the variant model. The power level 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.

1.7 Maximum Conducted Power and Emission Designator

LTE Band 26		QPSK		16QAM/64QAM	
BW (MHz)	Frequency Range (MHz)	Maximum Conducted power (W)	Emission Designator (99%OBW)	Maximum Conducted power (W)	Emission Designator (99%OBW)
15	821.5	0.2735	-	0.2382	-

Note:

1. All modulations have been tested, and only the worst test results of PSK & QAM are shown in the report .
2. Based on engineering evaluation, only the maximum bandwidth and the worst modulation test results are shown in the report.

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.
	03CH05-KS TH01-KS	CN1257	314309

1.9 Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH05-KS	AUDIX	E3	6.2009-8-24al

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

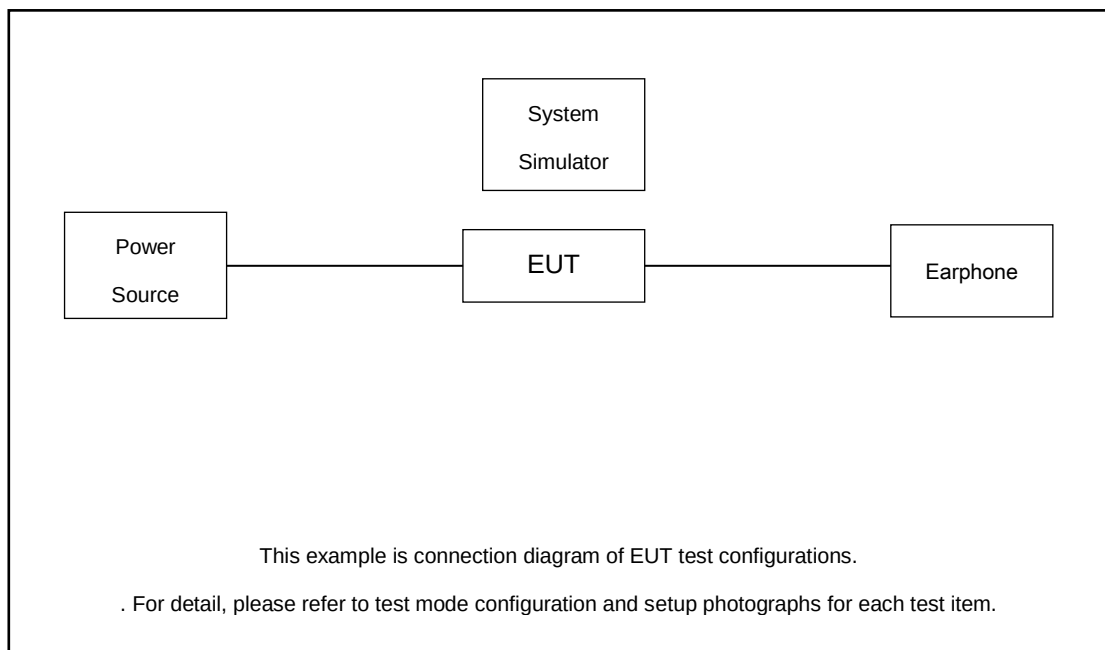
2.1 Test Mode

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
3.	Earphone	MI	N/A	N/A	Unshielded,1.2m	N/A



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.

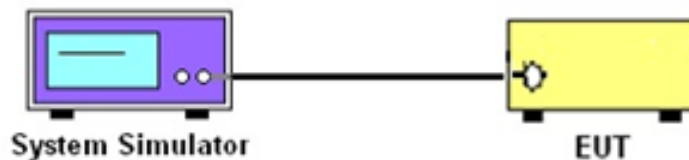
3.1.2 Measuring Instruments

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

3.2.2 Measuring Instruments

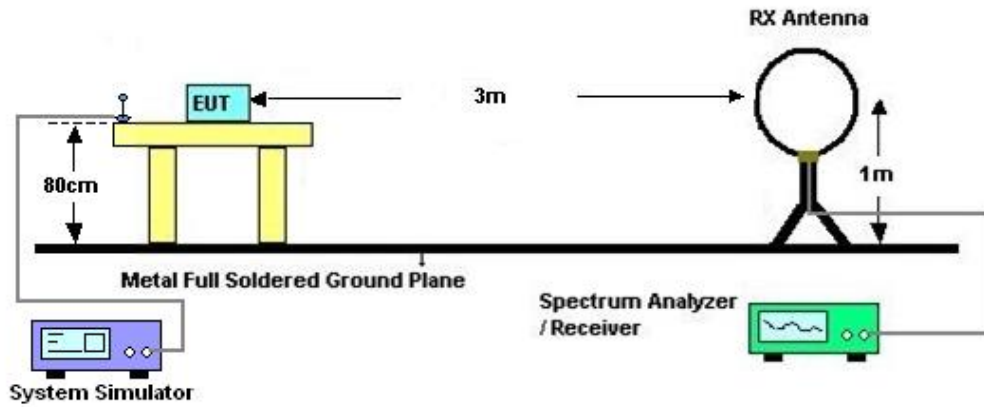
The measuring equipment is listed in the section 4 of this test report.

3.2.3 Test Procedures

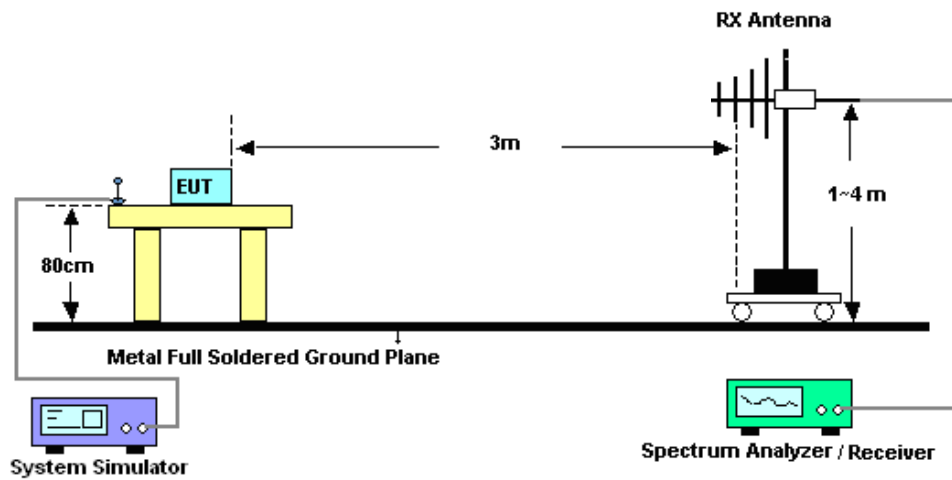
1. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
2. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. The table was rotated 360 degrees to determine the position 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. $\text{EIRP (dBm)} = \text{S.G. Power} - \text{Tx Cable Loss} + \text{Tx Antenna Gain}$
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)

3.2.4 Test Setup

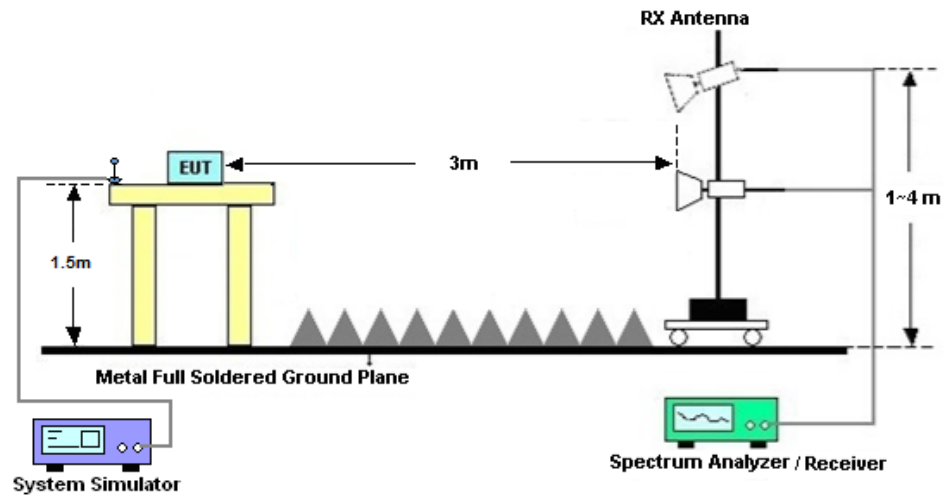
For radiated test from 30MHz



For radiated test from 30MHz to 1GHz



For radiated test above 1GHz



3.2.5 Test Result of Field Strength of Spurious Radiated

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

Please refer to Appendix B.



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Oct. 14, 2021	Jan. 01, 2022	Oct. 13, 2022	Conducted (TH01-KS)
Power divider	STI	STI08-0055	-	0.5~40GHz	Aug. 26, 2021	Jan. 01, 2022	Aug. 25, 2022	Conducted (TH01-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55150244	10Hz~44G,MAX 30dB	Apr. 13, 2021	Jan. 01, 2022	Apr. 12, 2022	Radiation (03CH05-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 30, 2021	Jan. 01, 2022	Oct. 29, 2022	Radiation (03CH05-KS)
Bilog Antenna	TeseQ	CBL6111D	49922	30MHz-1GHz	Jun. 04, 2021	Jan. 01, 2022	Jun. 03, 2022	Radiation (03CH05-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00218652	1GHz~18GHz	Apr. 24, 2021	Jan. 01, 2022	Apr. 23, 2022	Radiation (03CH05-KS)
SHF-EHF Horn	Com-power	AH-840	101115	18GHz~40GHz	Nov. 09, 2021	Jan. 01, 2022	Nov. 08, 2022	Radiation (03CH05-KS)
Amplifier	SONOMA	310N	187289	9KHz-1GHz	Apr. 12, 2021	Jan. 01, 2022	Apr. 11, 2022	Radiation (03CH05-KS)
Amplifier	MITEQ	EM18G40G GA	060728	18~40GHz	Jan. 07, 2021	Jan. 01, 2022	Jan. 06, 2022	Radiation (03CH05-KS)
high gain Amplifier	MITEQ	AMF-7D-00 101800-30-1 OP	2012228	1Ghz-18Ghz	Oct. 16, 2021	Jan. 01, 2022	Oct. 15, 2022	Radiation (03CH05-KS)
Amplifier	Keysight	83017A	MY53270316	500MHz~26.5GHz	Oct. 16, 2021	Jan. 01, 2022	Oct. 15, 2022	Radiation (03CH05-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Jan. 01, 2022	NCR	Radiation (03CH05-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Jan. 01, 2022	NCR	Radiation (03CH05-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Jan. 01, 2022	NCR	Radiation (03CH05-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% ($U = 2Uc(y)$)	2.5dB
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Uncertainty of Radiated Emission Measurement (1 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.1dB
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Appendix A. Test Results of Conducted Test

Test Engineer :	Simle Wang	Temperature :	22~23°C
		Relative Humidity :	40~42%

Conducted Output Power (Average power)

For Ant 4:

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	24.34		
15	QPSK	1	37	24.36		
15	QPSK	1	74	24.37		
15	QPSK	36	0	23.52		
15	QPSK	36	20	23.30		
15	QPSK	36	39	23.31		
15	QPSK	75	0	23.42		
15	16QAM	1	0	23.77		
15	16QAM	1	37	23.24		
15	16QAM	1	74	23.29		
15	16QAM	36	0	22.44		
15	16QAM	36	20	22.40		
15	16QAM	36	39	22.35		
15	16QAM	75	0	22.42		
15	64QAM	1	0	22.80		
15	64QAM	1	37	22.21		
15	64QAM	1	74	22.33		
15	64QAM	36	0	21.43		
15	64QAM	36	20	21.33		
15	64QAM	36	39	21.36		
15	64QAM	75	0	21.32		
Channel					26740	
Frequency (MHz)					819	
10	QPSK	1	0		24.35	
10	QPSK	1	25		24.21	
10	QPSK	1	49		24.26	
10	QPSK	25	0		23.45	
10	QPSK	25	12		23.44	
10	QPSK	25	25		23.10	
10	QPSK	50	0		23.43	
10	16QAM	1	0		23.32	
10	16QAM	1	25		23.18	



10	16QAM	1	49		23.32	
10	16QAM	25	0		22.18	
10	16QAM	25	12		22.28	
10	16QAM	25	25		22.19	
10	16QAM	50	0		22.36	
10	64QAM	1	0		22.39	
10	64QAM	1	25		22.27	
10	64QAM	1	49		22.33	
10	64QAM	25	0		21.38	
10	64QAM	25	12		21.16	
10	64QAM	25	25		21.28	
10	64QAM	50	0		21.43	
Channel				26715	26740	26765
Frequency (MHz)				816.5	819	821.5
5	QPSK	1	0	24.32	24.35	24.22
5	QPSK	1	12	24.29	24.24	24.36
5	QPSK	1	24	24.25	24.20	24.20
5	QPSK	12	0	23.35	23.54	23.22
5	QPSK	12	7	23.29	23.45	23.32
5	QPSK	12	13	23.16	23.19	23.29
5	QPSK	25	0	23.30	23.37	23.54
5	16QAM	1	0	23.24	23.32	23.36
5	16QAM	1	12	23.22	23.34	23.32
5	16QAM	1	24	23.12	23.33	23.12
5	16QAM	12	0	22.30	22.41	22.28
5	16QAM	12	7	22.40	22.33	22.12
5	16QAM	12	13	22.20	22.25	22.08
5	16QAM	25	0	22.49	22.30	22.23
5	64QAM	1	0	22.31	22.51	22.44
5	64QAM	1	12	22.27	22.31	22.23
5	64QAM	1	24	22.20	22.38	22.25
5	64QAM	12	0	21.34	21.43	21.49
5	64QAM	12	7	21.32	21.32	21.40
5	64QAM	12	13	21.32	21.33	21.11
5	64QAM	25	0	21.22	21.40	21.48
Channel				26705	26740	26775
Frequency (MHz)				815.5	819	822.5
3	QPSK	1	0	24.35	24.33	24.36
3	QPSK	1	8	24.21	24.14	24.35
3	QPSK	1	14	24.36	24.33	24.10
3	QPSK	8	0	23.43	23.41	23.31
3	QPSK	8	4	23.21	23.49	23.12
3	QPSK	8	7	23.21	23.34	23.25
3	QPSK	15	0	23.30	23.30	23.33
3	16QAM	1	0	23.23	23.32	23.32



3	16QAM	1	8	23.13	23.34	23.34
3	16QAM	1	14	23.24	23.35	23.22
3	16QAM	8	0	22.38	22.30	22.20
3	16QAM	8	4	22.28	22.18	22.07
3	16QAM	8	7	22.28	22.24	22.17
3	16QAM	15	0	22.46	22.36	22.31
3	64QAM	1	0	22.22	22.37	22.40
3	64QAM	1	8	22.26	22.23	22.13
3	64QAM	1	14	22.34	22.36	22.22
3	64QAM	8	0	21.40	21.41	21.55
3	64QAM	8	4	21.19	21.21	21.22
3	64QAM	8	7	21.43	21.28	21.24
3	64QAM	15	0	21.34	21.40	21.43
Channel				26697	26740	26783
Frequency (MHz)				814.7	819	823.3
1.4	QPSK	1	0	24.32	24.36	24.31
1.4	QPSK	1	3	24.25	24.29	24.28
1.4	QPSK	1	5	24.23	24.32	24.10
1.4	QPSK	3	0	24.32	24.33	24.28
1.4	QPSK	3	1	24.27	24.31	24.26
1.4	QPSK	3	3	24.30	24.33	24.15
1.4	QPSK	6	0	23.52	23.34	23.28
1.4	16QAM	1	0	23.33	23.35	23.15
1.4	16QAM	1	3	23.17	23.20	23.16
1.4	16QAM	1	5	23.02	23.21	23.06
1.4	16QAM	3	0	23.23	23.25	23.21
1.4	16QAM	3	1	23.26	23.32	23.06
1.4	16QAM	3	3	23.31	23.18	23.06
1.4	16QAM	6	0	22.47	22.23	22.18
1.4	64QAM	1	0	22.33	22.40	22.42
1.4	64QAM	1	3	22.33	22.27	22.17
1.4	64QAM	1	5	22.26	22.38	22.04
1.4	64QAM	3	0	22.39	22.36	22.38
1.4	64QAM	3	1	22.34	22.45	22.26
1.4	64QAM	3	3	22.42	22.30	22.17
1.4	64QAM	6	0	21.51	21.28	21.18



Appendix B. Test Results of Radiated Test

Radiated Spurious Emission

Test Engineer :	Chris Chen	Temperature :	22~23°C
		Relative Humidity :	41~42%

LTE Band 26/ 10MHz / 16QAM Ant 4								
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	1629.18	-65.50	-13	-52.50	-72.47	1.58	10.70	H
	2443.77	-64.13	-13	-51.13	-72.38	2.102	12.50	H
	3256	-64.28	-13	-51.28	-73.17	2.856	13.90	H
	1632	-66.78	-13	-53.78	-73.75	1.58	10.70	V
	2443.77	-63.71	-13	-50.71	-71.96	2.10	12.50	V
	3258.36	-63.02	-13	-50.02	-71.91	2.86	13.90	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 FW1N1013 which is issued separately.