FCC RF Test Report

APPLICANT	:	**Quectel Wireless Solutions Co., Ltd.**
EQUIPMENT	:	**5G Sub-6 GHz LGA Module**
BRAND NAME	:	**Quectel**
MODEL NAME	:	**RG500L-LA**
FCC ID	:	**XMR2023RG500LLA**
STANDARD	:	**47 CFR Part 2, Part 27 Subpart Q**
CLASSIFICATION	:	**PCS Licensed Transmitter (PCB)**
TEST DATE(S)	:	**May 18, 2024 ~ May 20, 2024**

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

Jason Jia

Approved by: Jason Jia

ACCREDITED Cert #5145.02

Sporton International Inc. (Kunshan)
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
FG2D0201-02B	Rev. 01	Initial issue of report	May 31, 2024

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.4	§2.1046	Conducted Output Power	—	Report Only	-
3.5	§27.50 (k)(3)	EIRP	EIRP < 1W (30dBm)	PASS	-
4.4	§2.1053 §27.53 (n)(2)	Radiated Spurious Emission	-13dBm/MHz	PASS	Under limit 47.79 dB at 13824.000 MHz

Note: This is a variant report for RG500L-LA. The change note could be referred to the RG500L-LA_Operational Description of Product Equality Declaration which is exhibit separately. According to the change, only the related test cases were verified from original spot check report 2D0201-01 (Reference report FG2D0201N, FCC ID: XMR2023RG500LNA).

Conformity Assessment Condition:
1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account. 2. The measurement uncertainty please refer to each test result in the section “Measurement Uncertainty”
Disclaimer:
The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

1 General Description

1.1 Applicant

Quectel Wireless Solutions Co., Ltd.
Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai 200233, China

1.2 Manufacturer

Quectel Wireless Solutions Co., Ltd.
Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai 200233, China

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	5G Sub-6 GHz LGA Module
Brand Name	Quectel
Model Name	RG500L-LA
FCC ID	XMR2023RG500LLA
IMEI Code	863221060013925
HW Version	R1.0
SW Version	RG500LLA00AAR01A05E8_OCPU
EUT Stage	Identical Prototype

1.4 Product Specification of Equipment Under Test

Product Feature	
Tx/Rx Frequency	5G NR n78: 3450 MHz ~ 3550 MHz
SCS	30kHz
Bandwidth	n78: 10 / 15 / 20 / 25 / 30 / 40 / 50 / 60 / 80 / 90 / 100MHz
Antenna Gain	Ant.0: n78: 6.5 dBi Ant.6: n78: 4.4 dBi
Type of Modulation	CP-OFDM: QPSK / 16QAM / 64QAM / 256QAM DFT-s-OFDM: PI/2 BPSK / QPSK / 16QAM / 64QAM / 256QAM

Remark:

1. 5G NR n78 support UL MIMO mode for Antenna port (0+6).
2. 5G NR n78 SISO mode only support Antenna port 0, not support Antenna port 6.
3. 5G NR n78 UL_MIMO mode only supports CP-OFDM Modulation, the MIMO mode is completely uncorrelated, so the directional gain is selected the maximum gain among all antennas.
4. The device supports HPUE mode for 5G NR n78 SISO mode.
5. The EN-DC mode combination could be referred to the product spec.

1.5 Modification of EUT

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

1.6 Maximum Conducted Power

5G NR n78		PI/2 BPSK / QPSK		16QAM/64QAM/256QAM	
BW (MHz)	Frequency Range (MHz)	Maximum Conducted power (W)	Emission Designator (99%OBW)	Maximum Conducted power (W)	Emission Designator (99%OBW)
10	3455.01 ~ 3544.98	0.1663	-	0.1300	-
15	3457.50 ~ 3542.49	0.1656	-	0.1291	-
20	3460.02 ~ 3540.00	0.1629	-	0.1282	-
25	3462.51 ~ 3537.48	0.1589	-	0.1303	-
30	3465.00 ~ 3534.99	0.1556	-	0.1285	-
40	3470.01 ~ 3529.98	0.1531	-	0.1262	-
50	3475.02 ~ 3525.00	0.1637	-	0.1355	-
60	3480.00 ~ 3519.99	0.1570	-	0.1312	-
80	3490.02 ~ 3510.00	0.1528	-	0.1191	-
90	3495.00 ~ 3504.99	0.1449	-	0.1140	-
100	3500.01	0.1671	-	0.1324	-

5G NR n78 UL MIMO		QPSK		16QAM/64QAM/256QAM	
BW (MHz)	Frequency Range (MHz)	Maximum Conducted power (W)	Emission Designator (99%OBW)	Maximum Conducted power (W)	Emission Designator (99%OBW)
10	3455.01 ~ 3544.98	0.1325	-	0.1145	-
15	3457.50 ~ 3542.49	0.1335	-	0.1144	-
20	3460.02 ~ 3540.00	0.1320	-	0.1128	-
25	3462.51 ~ 3537.48	0.1296	-	0.1121	-
30	3465.00 ~ 3534.99	0.1267	-	0.1103	-
40	3470.01 ~ 3529.98	0.1240	-	0.1078	-
50	3475.02 ~ 3525.00	0.1342	-	0.1163	-
60	3480.00 ~ 3519.99	0.1256	-	0.1165	-
80	3490.02 ~ 3510.00	0.1226	-	0.1139	-
90	3495.00 ~ 3504.99	0.1196	-	0.1102	-
100	3500.01	0.1349	-	0.1156	-

Note: All modulations have been tested, and only the worst test results of PSK & QAM are shown in the

report.

1.7 Testing Site

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

Test Firm	Sporton International Inc. (Kunshan)		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	03CH04-KS TH01-KS	CN1257	314309

1.8 Test Software

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

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, Part 27 Subpart Q
- ANSI C63.26-2015
- FCC KDB 971168 Power Meas License Digital Systems D01 v03r01
- FCC KDB 412172 D01 Determining ERP and EIRP v01r01

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

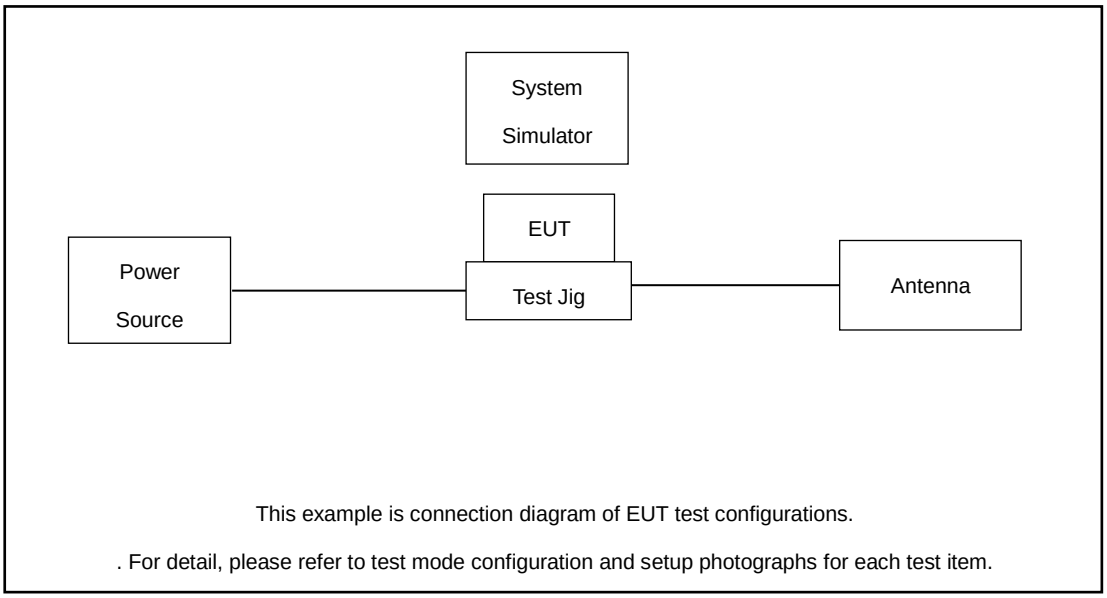
Antenna port conducted and radiated test items listed below are performed according to KDB 971168 D01 Power Meas. License Digital Systems v03r01 with maximum output power.

Radiated measurements are performed by rotating the EUT in three different orthogonal test planes to find the maximum emission.

Test Cases	Band	Bandwidth (MHz)	Modulation	RB #	Test Channel
		eg. 5M, 10M, 15M, 20M	eg. PI/2 BPSK, QPSK, 16QAM, 64QAM, 256QAM	1RB, Full RB	L/M/H
Max. Output Power	5G n78	10M, 15M, 20M, 25M, 30M, 40M, 50M, 60M, 80M, 90M ,100M	All Modulations	1RB, Full RB	L, M, H
E.I.R.P	5G n78	10M, 15M, 20M, 25M, 30M, 40M, 50M, 60M, 80M, 90M ,100M	All Modulations	1RB, Full RB	L, M, H
Radiated Spurious Emission	5G n78	Worst case from maximum power			M

Note:
1. 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. Frequency Stability: Normal Voltage = 3.8V ; Low Voltage =3.3V.; High Voltage =4.3V.

2.2 Connection Diagram of Test System



This example is connection diagram of EUT test configurations.

. For detail, please refer to test mode configuration and setup photographs for each test item.

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.	Base Station	Anritsu	MT8820/8821	N/A	N/A	Unshielded, 1.8 m
3.	Adapter	N/A	N/A	N/A	N/A	N/A
4.	Test Jig	N/A	N/A	N/A	N/A	N/A
5.	Antenna	N/A	N/A	N/A	N/A	N/A

2.4 Frequency List of Low/Middle/High Channels

5G n78 Channel and Frequency List for SCS 30kHz				
BW [MHz]	**Channel/Frequency(MHz)**	**Lowest**	**Middle**	**Highest**
100	Channel	-	633334	-
	Frequency	-	3500.01	-
90	Channel	633000	633334	633666
	Frequency	3495	3500.01	3504.99
80	Channel	632668	633334	634000
	Frequency	3490.02	3500.01	3510
60	Channel	632000	633334	634666
	Frequency	3480	3500.01	3519.99
50	Channel	631668	633334	635000
	Frequency	3475.02	3500.01	3525
40	Channel	631334	633334	635332
	Frequency	3470.01	3500.01	3529.98
30	Channel	631000	633334	635666
	Frequency	3465	3500.01	3534.99
25	Channel	630834	633334	635832
	Frequency	3462.51	3500.01	3537.48
20	Channel	630668	633334	636000
	Frequency	3460.02	3500.01	3540
15	Channel	630500	633334	636166
	Frequency	3457.5	3500.01	3542.49
10	Channel	630334	633334	636332
	Frequency	3455.01	3500.01	3544.98

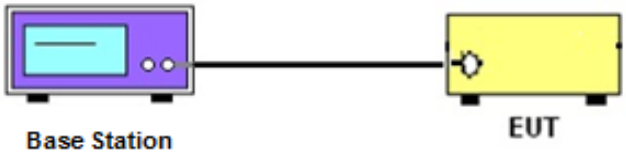
3 Conducted Test Items

3.1 Measuring Instruments

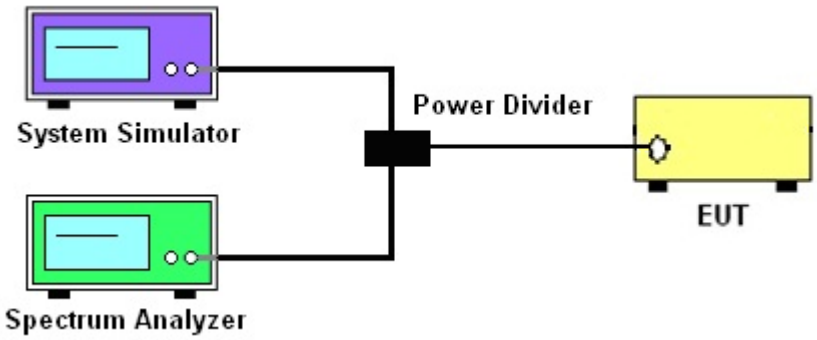
See list of measuring instruments of this test report.

3.2 Test Setup

3.2.1 Conducted Output Power



3.2.2 EIRP



3.3 Test Result of Conducted Test

Please refer to Appendix A.

3.4 Conducted Output Power Measurement

3.4.1 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.

3.4.2 Test Procedures

1. The testing follows ANSI C63.26 Section 5.2
2. The transmitter output port was connected to the system simulator.
3. Set EUT at maximum power through the system simulator.
4. Select lowest, middle, and highest channels for each band and different modulation.
5. Measure and record the power level from the system simulator.

3.5 EIRP

3.5.1 Description of EIRP Limit

§ 27.50 (k)(3)

Mobile devices are limited to 1Watt (30 dBm) EIRP. Mobile devices operating in these bands must employ a means for limiting power to the minimum necessary for successful communications

3.5.2 Test Procedures

1. According to KDB 412172 D01 Power Approach,
2. 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

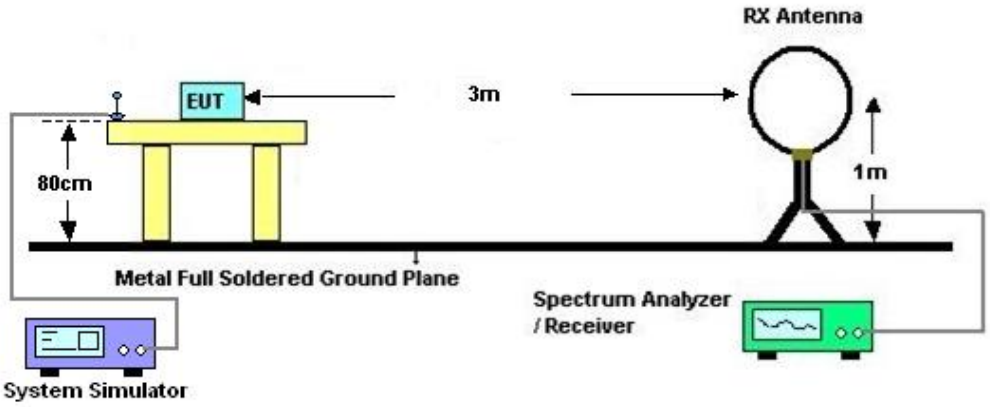
4 Radiated Test Items

4.1 Measuring Instruments

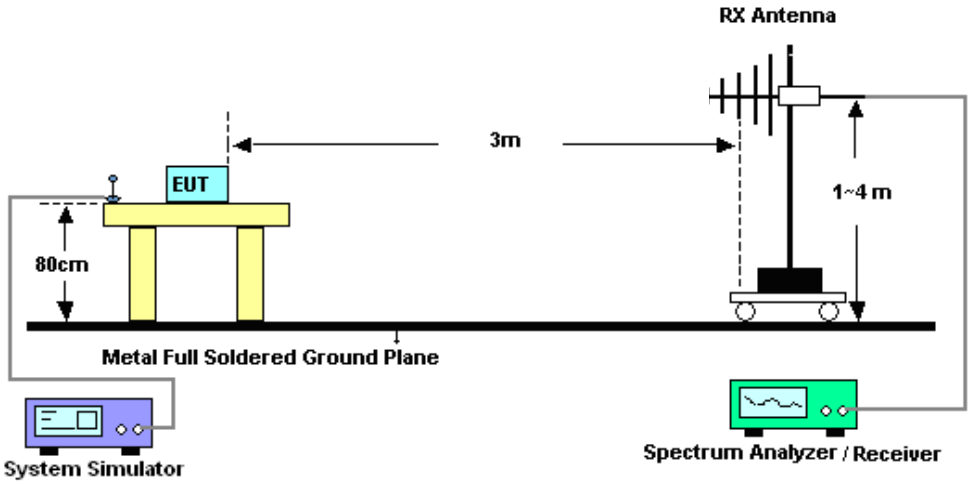
See list of measuring instruments of this test report.

4.2 Test Setup

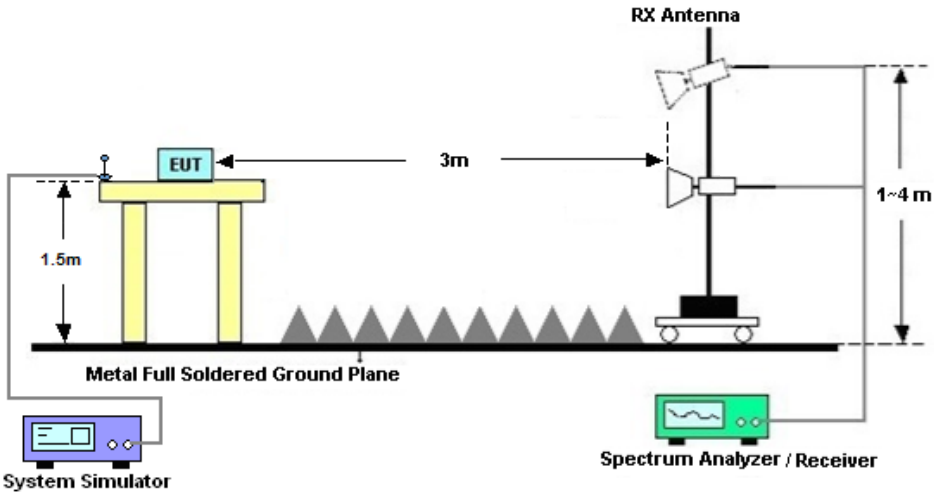
4.2.1 For radiated test below 30MHz



4.2.2 For radiated test from 30MHz to 1GHz



4.2.3 For radiated test above 1GHz



4.3 Test Result of Radiated Test

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.

4.4 Radiated Spurious Emission Measurement

4.4.1 Description of Radiated Spurious Emission

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

The power of any emission outside of the authorized operating frequency ranges shall not exceed −13 dBm/MHz.

The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

4.4.2 Test Procedures

1. The testing follows ANSI C63.26 Section 5.5
1. The EUT was placed on a turntable with 0.8 meter height for frequency below 1GHz and 1.5 meter height for frequency above 1GHz respectively above ground.
2. The EUT was set 3 meters from the receiving antenna 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 1m to 4m to search the maximum spurious emission for both horizontal and vertical polarizations.
5. During the measurement, the system simulator parameters were set to force the EUT transmitting at maximum output power.
6. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking the 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.
   EIRP (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain
   ERP (dBm) = EIRP - 2.15
9. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

5 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. 11, 2023	May 20, 2024	Oct. 10, 2024	Conducted (TH01-KS)
Power divider	STI	STI08-0055	-	0.5~40GHz	NCR	May 20, 2024	NCR	Conducted (TH01-KS)
Temperature & humidity chamber	Hongzhan	LP-150U	H2014011440	-40~+150°C 20%~95%RH	Jul. 06, 2023	May 20, 2024	Jul. 05, 2024	Conducted (TH01-KS)
EXA Spectrum Analyzer	Keysight	N9010B	MY57471079	10Hz-44G,MAX 30dB	Oct. 10, 2023	May 18, 2024	Oct. 09, 2024	Radiation (03CH04-KS)
Bilog Antenna	TeseQ	CBL6111D	59913	30MHz-1GHz	Aug. 19, 2023	May 18, 2024	Aug. 18, 2024	Radiation (03CH04-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00251694	1GHz~18GHz	Jul. 12, 2023	May 18, 2024	Jul. 11, 2024	Radiation (03CH04-KS)
SHF-EHF Horn	Com-power	AH-840	101070	18GHz~40GHz	Jan. 05, 2024	May 18, 2024	Jan. 04, 2025	Radiation (03CH04-KS)
Amplifier	SONOMA	310N	380827	9KHz-1GHz	Jul. 06, 2023	May 18, 2024	Jul. 05, 2024	Radiation (03CH04-KS)
Amplifier	MITEQ	EM18G40GGA	060728	18~40GHz	Jan. 05, 2024	May 18, 2024	Jan. 04, 2025	Radiation (03CH04-KS)
high gain Amplifier	EM	EM01G18GA	060840	1Ghz-18Ghz	Oct. 10, 2023	May 18, 2024	Oct. 09, 2024	Radiation (03CH04-KS)
Amplifier	Agilent	8449B	3008A02370	1Ghz-18Ghz	Oct. 10, 2023	May 18, 2024	Oct. 09, 2024	Radiation (03CH04-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	May 18, 2024	NCR	Radiation (03CH04-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	May 18, 2024	NCR	Radiation (03CH04-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	May 18, 2024	NCR	Radiation (03CH04-KS)

NCR: No Calibration Required

6 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 Conducted Measurement

Test Item	Uncertainty
Conducted Power	±0.46 dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	3.82 dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	3.56 dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	3.54 dB

---------- THE END ----------

Appendix A. Test Results of Conducted Test

Test Engineer :	Smile Wang	Temperature :	22~23℃
		Relative Humidity :	40~42%

Conducted Output Power(Average power) and EIRP

5G NR n78

NR Band	SCS	BandWidth	Arfcn	Freq(MHz)	Modulation	RB	Conducted Power(dBm)	EIRP(dBm)	EIRP(W)
78	30	10	630334	3455.01	DFT-s-OFDM PI/2 BPSK	1@1	22.17	28.67	0.7362
78	30	10	630334	3455.01	DFT-s-OFDM QPSK	1@1	22.17	28.67	0.7362
78	30	10	630334	3455.01	DFT-s-OFDM 16 QAM	1@1	21.09	27.59	0.5741
78	30	10	633334	3500.01	DFT-s-OFDM PI/2 BPSK	1@1	22.15	28.65	0.7328
78	30	10	633334	3500.01	DFT-s-OFDM QPSK	1@1	22.1	28.6	0.7244
78	30	10	633334	3500.01	DFT-s-OFDM 16 QAM	1@1	21.07	27.57	0.5715
78	30	10	636332	3544.98	DFT-s-OFDM PI/2 BPSK	1@1	22.21	28.71	0.7430
78	30	10	636332	3544.98	DFT-s-OFDM QPSK	1@1	22.15	28.65	0.7328
78	30	10	636332	3544.98	DFT-s-OFDM 16 QAM	1@1	21.14	27.64	0.5808
78	30	15	630500	3457.5	DFT-s-OFDM PI/2 BPSK	1@1	22.16	28.66	0.7345
78	30	15	630500	3457.5	DFT-s-OFDM QPSK	1@1	22.12	28.62	0.7278
78	30	15	630500	3457.5	DFT-s-OFDM 16 QAM	1@1	21.08	27.58	0.5728
78	30	15	633334	3500.01	DFT-s-OFDM PI/2 BPSK	1@1	22.13	28.63	0.7295
78	30	15	633334	3500.01	DFT-s-OFDM QPSK	1@1	22.14	28.64	0.7311
78	30	15	633334	3500.01	DFT-s-OFDM 16 QAM	1@1	21.09	27.59	0.5741
78	30	15	636166	3542.49	DFT-s-OFDM PI/2 BPSK	1@1	22.17	28.67	0.7362
78	30	15	636166	3542.49	DFT-s-OFDM QPSK	1@1	22.19	28.69	0.7396
78	30	15	636166	3542.49	DFT-s-OFDM 16 QAM	1@1	21.11	27.61	0.5768
78	30	20	630668	3460.02	DFT-s-OFDM PI/2 BPSK	1@1	22.12	28.62	0.7278
78	30	20	630668	3460.02	DFT-s-OFDM QPSK	1@1	22.08	28.58	0.7211
78	30	20	630668	3460.02	DFT-s-OFDM 16 QAM	1@1	21.08	27.58	0.5728
78	30	20	633334	3500.01	DFT-s-OFDM PI/2 BPSK	1@1	22.08	28.58	0.7211
78	30	20	633334	3500.01	DFT-s-OFDM QPSK	1@1	22.1	28.6	0.7244
78	30	20	633334	3500.01	DFT-s-OFDM 16 QAM	1@1	21.05	27.55	0.5689
78	30	20	636000	3540	DFT-s-OFDM PI/2 BPSK	1@1	22.12	28.62	0.7278
78	30	20	636000	3540	DFT-s-OFDM QPSK	1@1	22.04	28.54	0.7145
78	30	20	636000	3540	DFT-s-OFDM 16 QAM	1@1	21.04	27.54	0.5675
78	30	25	630834	3462.51	DFT-s-OFDM PI/2 BPSK	1@1	22.01	28.51	0.7096
78	30	25	630834	3462.51	DFT-s-OFDM QPSK	1@1	21.99	28.49	0.7063
78	30	25	630834	3462.51	DFT-s-OFDM 16 QAM	1@1	21.13	27.63	0.5794
78	30	25	633334	3500.01	DFT-s-OFDM PI/2 BPSK	1@1	22.01	28.51	0.7096
78	30	25	633334	3500.01	DFT-s-OFDM QPSK	1@1	22.01	28.51	0.7096
78	30	25	633334	3500.01	DFT-s-OFDM 16 QAM	1@1	21.14	27.64	0.5808

78	30	25	635832	3537.48	DFT-s-OFDM PI/2 BPSK	1@1	21.99	28.49	0.7063
78	30	25	635832	3537.48	DFT-s-OFDM QPSK	1@1	21.99	28.49	0.7063
78	30	25	635832	3537.48	DFT-s-OFDM 16 QAM	1@1	21.15	27.65	0.5821
78	30	30	631000	3465	DFT-s-OFDM PI/2 BPSK	1@1	21.92	28.42	0.6950
78	30	30	631000	3465	DFT-s-OFDM QPSK	1@1	21.9	28.4	0.6918
78	30	30	631000	3465	DFT-s-OFDM 16 QAM	1@1	21.06	27.56	0.5702
78	30	30	633334	3500.01	DFT-s-OFDM PI/2 BPSK	1@1	21.91	28.41	0.6934
78	30	30	633334	3500.01	DFT-s-OFDM QPSK	1@1	21.92	28.42	0.6950
78	30	30	633334	3500.01	DFT-s-OFDM 16 QAM	1@1	21.09	27.59	0.5741
78	30	30	635666	3534.99	DFT-s-OFDM PI/2 BPSK	1@1	21.92	28.42	0.6950
78	30	30	635666	3534.99	DFT-s-OFDM QPSK	1@1	21.91	28.41	0.6934
78	30	30	635666	3534.99	DFT-s-OFDM 16 QAM	1@1	21.05	27.55	0.5689
78	30	40	631334	3470.01	DFT-s-OFDM PI/2 BPSK	1@1	21.8	28.3	0.6761
78	30	40	631334	3470.01	DFT-s-OFDM QPSK	1@1	21.77	28.27	0.6714
78	30	40	631334	3470.01	DFT-s-OFDM 16 QAM	1@1	20.94	27.44	0.5546
78	30	40	633334	3500.01	DFT-s-OFDM PI/2 BPSK	1@1	21.82	28.32	0.6792
78	30	40	633334	3500.01	DFT-s-OFDM QPSK	1@1	21.84	28.34	0.6823
78	30	40	633334	3500.01	DFT-s-OFDM 16 QAM	1@1	20.97	27.47	0.5585
78	30	40	635332	3529.98	DFT-s-OFDM PI/2 BPSK	1@1	21.85	28.35	0.6839
78	30	40	635332	3529.98	DFT-s-OFDM QPSK	1@1	21.84	28.34	0.6823
78	30	40	635332	3529.98	DFT-s-OFDM 16 QAM	1@1	21.01	27.51	0.5636
78	30	50	631668	3475.02	DFT-s-OFDM PI/2 BPSK	1@1	22.05	28.55	0.7161
78	30	50	631668	3475.02	DFT-s-OFDM QPSK	1@1	22.09	28.59	0.7228
78	30	50	631668	3475.02	DFT-s-OFDM 16 QAM	1@1	21.27	27.77	0.5984
78	30	50	633334	3500.01	DFT-s-OFDM PI/2 BPSK	1@1	22.1	28.6	0.7244
78	30	50	633334	3500.01	DFT-s-OFDM QPSK	1@1	22.05	28.55	0.7161
78	30	50	633334	3500.01	DFT-s-OFDM 16 QAM	1@1	21.26	27.76	0.5970
78	30	50	635000	3525	DFT-s-OFDM PI/2 BPSK	1@1	22.13	28.63	0.7295
78	30	50	635000	3525	DFT-s-OFDM QPSK	1@1	22.14	28.64	0.7311
78	30	50	635000	3525	DFT-s-OFDM 16 QAM	1@1	21.32	27.82	0.6053
78	30	60	632000	3480	DFT-s-OFDM PI/2 BPSK	1@1	21.91	28.41	0.6934
78	30	60	632000	3480	DFT-s-OFDM QPSK	1@1	21.93	28.43	0.6966
78	30	60	632000	3480	DFT-s-OFDM 16 QAM	1@1	21.1	27.6	0.5754
78	30	60	633334	3500.01	DFT-s-OFDM PI/2 BPSK	1@1	21.89	28.39	0.6902
78	30	60	633334	3500.01	DFT-s-OFDM QPSK	1@1	21.94	28.44	0.6982
78	30	60	633334	3500.01	DFT-s-OFDM 16 QAM	1@1	21.1	27.6	0.5754
78	30	60	634666	3519.99	DFT-s-OFDM PI/2 BPSK	1@1	21.96	28.46	0.7015
78	30	60	634666	3519.99	DFT-s-OFDM QPSK	1@1	21.95	28.45	0.6998
78	30	60	634666	3519.99	DFT-s-OFDM 16 QAM	1@1	21.18	27.68	0.5861
78	30	80	632668	3490.02	DFT-s-OFDM PI/2 BPSK	1@1	21.79	28.29	0.6745
78	30	80	632668	3490.02	DFT-s-OFDM QPSK	1@1	21.74	28.24	0.6668
78	30	80	632668	3490.02	DFT-s-OFDM 16 QAM	1@1	20.76	27.26	0.5321
78	30	80	633334	3500.01	DFT-s-OFDM PI/2 BPSK	1@1	21.77	28.27	0.6714
78	30	80	633334	3500.01	DFT-s-OFDM QPSK	1@1	21.71	28.21	0.6622

78	30	80	633334	3500.01	DFT-s-OFDM 16 QAM	1@1	20.75	27.25	0.5309
78	30	80	634000	3510	DFT-s-OFDM PI/2 BPSK	1@1	21.84	28.34	0.6823
78	30	80	634000	3510	DFT-s-OFDM QPSK	1@1	21.76	28.26	0.6699
78	30	80	634000	3510	DFT-s-OFDM 16 QAM	1@1	20.76	27.26	0.5321
78	30	90	633000	3495	DFT-s-OFDM PI/2 BPSK	1@1	21.6	28.1	0.6457
78	30	90	633000	3495	DFT-s-OFDM QPSK	1@1	21.6	28.1	0.6457
78	30	90	633000	3495	DFT-s-OFDM 16 QAM	1@1	20.55	27.05	0.5070
78	30	90	633334	3500.01	DFT-s-OFDM PI/2 BPSK	1@1	21.57	28.07	0.6412
78	30	90	633334	3500.01	DFT-s-OFDM QPSK	1@1	21.53	28.03	0.6353
78	30	90	633334	3500.01	DFT-s-OFDM 16 QAM	1@1	20.52	27.02	0.5035
78	30	90	633666	3504.99	DFT-s-OFDM PI/2 BPSK	1@1	21.61	28.11	0.6471
78	30	90	633666	3504.99	DFT-s-OFDM QPSK	1@1	21.6	28.1	0.6457
78	30	90	633666	3504.99	DFT-s-OFDM 16 QAM	1@1	20.57	27.07	0.5093
78	30	100	633334	3500.01	DFT-s-OFDM PI/2 BPSK	135@67	22.2	28.7	0.7413
78	30	100	633334	3500.01	DFT-s-OFDM PI/2 BPSK	1@1	21.42	27.92	0.6194
78	30	100	633334	3500.01	DFT-s-OFDM PI/2 BPSK	1@271	21.21	27.71	0.5902
78	30	100	633334	3500.01	DFT-s-OFDM QPSK	135@67	22.23	28.73	0.7464
78	30	100	633334	3500.01	DFT-s-OFDM QPSK	1@1	21.47	27.97	0.6266
78	30	100	633334	3500.01	DFT-s-OFDM QPSK	1@271	21.2	27.7	0.5888
78	30	100	633334	3500.01	DFT-s-OFDM 16 QAM	135@67	21.22	27.72	0.5916
78	30	100	633334	3500.01	DFT-s-OFDM 16 QAM	1@1	20.36	26.86	0.4853
78	30	100	633334	3500.01	DFT-s-OFDM 16 QAM	1@271	20.14	26.64	0.4613
78	30	100	633334	3500.01	DFT-s-OFDM 64 QAM	135@67	19.89	26.39	0.4355
78	30	100	633334	3500.01	DFT-s-OFDM 64 QAM	1@1	19.18	25.68	0.3698
78	30	100	633334	3500.01	DFT-s-OFDM 64 QAM	1@271	18.92	25.42	0.3483
78	30	100	633334	3500.01	DFT-s-OFDM 256 QAM	135@67	17.84	24.34	0.2716
78	30	100	633334	3500.01	DFT-s-OFDM 256 QAM	1@1	17.36	23.86	0.2432
78	30	100	633334	3500.01	DFT-s-OFDM 256 QAM	1@271	17.09	23.59	0.2286
78	30	100	633334	3500.01	CP-OFDM QPSK	137@68	20.86	27.36	0.5445
78	30	100	633334	3500.01	CP-OFDM QPSK	1@1	20.27	26.77	0.4753
78	30	100	633334	3500.01	CP-OFDM QPSK	1@271	20.09	26.59	0.4560

5G NR n78 UL MIMO

NR Band	SCS	BandWidth	Arfcn	Freq(MHz)	Modulation	RB	ANT0 Power(dBm)	ANT6 Power(dBm)	Conducted Power(dBm)	EIRP(dBm)	EIRP(W)
78	30	10	630334	3455.01	CP-OFDM QPSK	1@1	17.64	18.68	21.20	27.70	0.5890
78	30	10	630334	3455.01	CP-OFDM 16 QAM	1@1	17.03	18.05	20.58	27.08	0.5105
78	30	10	630334	3455.01	CP-OFDM 64 QAM	1@1	15.7	16.46	19.11	25.61	0.3637
78	30	10	633334	3500.01	CP-OFDM QPSK	1@1	17.61	18.72	21.21	27.71	0.5903
78	30	10	633334	3500.01	CP-OFDM 16 QAM	1@1	17.02	18.03	20.56	27.06	0.5087
78	30	10	633334	3500.01	CP-OFDM 64 QAM	1@1	15.69	16.47	19.11	25.61	0.3637
78	30	10	636332	3544.98	CP-OFDM QPSK	1@1	17.64	18.72	21.22	27.72	0.5921
78	30	10	636332	3544.98	CP-OFDM 16 QAM	1@1	16.93	18.14	20.59	27.09	0.5114
78	30	10	636332	3544.98	CP-OFDM 64 QAM	1@1	15.77	16.59	19.21	25.71	0.3724
78	30	15	630500	3457.5	CP-OFDM QPSK	1@1	17.61	18.65	21.17	27.67	0.5850
78	30	15	630500	3457.5	CP-OFDM 16 QAM	1@1	16.99	18.06	20.57	27.07	0.5091
78	30	15	630500	3457.5	CP-OFDM 64 QAM	1@1	15.72	16.46	19.12	25.62	0.3644
78	30	15	633334	3500.01	CP-OFDM QPSK	1@1	17.59	18.72	21.20	27.70	0.5891
78	30	15	633334	3500.01	CP-OFDM 16 QAM	1@1	16.94	18.08	20.56	27.06	0.5079
78	30	15	633334	3500.01	CP-OFDM 64 QAM	1@1	15.63	16.5	19.10	25.60	0.3628
78	30	15	636166	3542.49	CP-OFDM QPSK	1@1	17.65	18.77	21.26	27.76	0.5965
78	30	15	636166	3542.49	CP-OFDM 16 QAM	1@1	16.96	18.11	20.58	27.08	0.5109
78	30	15	636166	3542.49	CP-OFDM 64 QAM	1@1	15.74	16.52	19.16	25.66	0.3679
78	30	20	630668	3460.02	CP-OFDM QPSK	1@1	17.54	18.65	21.14	27.64	0.5809
78	30	20	630668	3460.02	CP-OFDM 16 QAM	1@1	16.88	17.98	20.48	26.98	0.4983
78	30	20	630668	3460.02	CP-OFDM 64 QAM	1@1	15.65	16.41	19.06	25.56	0.3595
78	30	20	633334	3500.01	CP-OFDM QPSK	1@1	17.58	18.72	21.20	27.70	0.5885
78	30	20	633334	3500.01	CP-OFDM 16 QAM	1@1	16.91	18.04	20.52	27.02	0.5037
78	30	20	633334	3500.01	CP-OFDM 64 QAM	1@1	15.63	16.51	19.10	25.60	0.3633
78	30	20	636000	3540	CP-OFDM QPSK	1@1	17.57	18.74	21.20	27.70	0.5895
78	30	20	636000	3540	CP-OFDM 16 QAM	1@1	16.88	18.06	20.52	27.02	0.5035
78	30	20	636000	3540	CP-OFDM 64 QAM	1@1	15.56	16.46	19.04	25.54	0.3584
78	30	25	630834	3462.51	CP-OFDM QPSK	1@1	17.48	18.56	21.06	27.56	0.5707
78	30	25	630834	3462.51	CP-OFDM 16 QAM	1@1	16.93	17.91	20.46	26.96	0.4964
78	30	25	630834	3462.51	CP-OFDM 64 QAM	1@1	15.57	16.31	18.97	25.47	0.3520
78	30	25	633334	3500.01	CP-OFDM QPSK	1@1	17.51	18.65	21.13	27.63	0.5791
78	30	25	633334	3500.01	CP-OFDM 16 QAM	1@1	16.85	18.04	20.50	27.00	0.5007
78	30	25	633334	3500.01	CP-OFDM 64 QAM	1@1	15.54	16.46	19.03	25.53	0.3577
78	30	25	635832	3537.48	CP-OFDM QPSK	1@1	17.44	18.63	21.09	27.59	0.5736
78	30	25	635832	3537.48	CP-OFDM 16 QAM	1@1	16.78	18.02	20.45	26.95	0.4960
78	30	25	635832	3537.48	CP-OFDM 64 QAM	1@1	15.59	16.38	19.01	25.51	0.3559
78	30	30	631000	3465	CP-OFDM QPSK	1@1	17.41	18.5	21.00	27.50	0.5623
78	30	30	631000	3465	CP-OFDM 16 QAM	1@1	16.75	17.83	20.33	26.83	0.4824
78	30	30	631000	3465	CP-OFDM 64 QAM	1@1	15.48	16.27	18.90	25.40	0.3470
78	30	30	633334	3500.01	CP-OFDM QPSK	1@1	17.41	18.55	21.03	27.53	0.5659
78	30	30	633334	3500.01	CP-OFDM 16 QAM	1@1	16.81	17.95	20.43	26.93	0.4929
78	30	30	633334	3500.01	CP-OFDM 64 QAM	1@1	15.44	16.37	18.94	25.44	0.3500

78	30	30	635666	3534.99	CP-OFDM QPSK	1@1	17.36	18.52	20.99	27.49	0.5609
78	30	30	635666	3534.99	CP-OFDM 16 QAM	1@1	16.8	17.87	20.38	26.88	0.4873
78	30	30	635666	3534.99	CP-OFDM 64 QAM	1@1	15.45	16.26	18.88	25.38	0.3455
78	30	40	631334	3470.01	CP-OFDM QPSK	1@1	17.3	18.34	20.86	27.36	0.5447
78	30	40	631334	3470.01	CP-OFDM 16 QAM	1@1	16.67	17.76	20.26	26.76	0.4742
78	30	40	631334	3470.01	CP-OFDM 64 QAM	1@1	15.34	16.17	18.79	25.29	0.3377
78	30	40	633334	3500.01	CP-OFDM QPSK	1@1	17.3	18.47	20.93	27.43	0.5539
78	30	40	633334	3500.01	CP-OFDM 16 QAM	1@1	16.71	17.85	20.33	26.83	0.4817
78	30	40	633334	3500.01	CP-OFDM 64 QAM	1@1	15.41	16.25	18.86	25.36	0.3436
78	30	40	635332	3529.98	CP-OFDM QPSK	1@1	17.31	18.39	20.89	27.39	0.5488
78	30	40	635332	3529.98	CP-OFDM 16 QAM	1@1	16.71	17.76	20.28	26.78	0.4761
78	30	40	635332	3529.98	CP-OFDM 64 QAM	1@1	15.36	16.2	18.81	25.31	0.3397
78	30	50	631668	3475.02	CP-OFDM QPSK	1@1	17.59	18.65	21.16	27.66	0.5838
78	30	50	631668	3475.02	CP-OFDM 16 QAM	1@1	16.97	18.07	20.57	27.07	0.5087
78	30	50	631668	3475.02	CP-OFDM 64 QAM	1@1	15.6	16.53	19.10	25.60	0.3631
78	30	50	633334	3500.01	CP-OFDM QPSK	1@1	17.61	18.73	21.22	27.72	0.5911
78	30	50	633334	3500.01	CP-OFDM 16 QAM	1@1	17.02	18.19	20.65	27.15	0.5193
78	30	50	633334	3500.01	CP-OFDM 64 QAM	1@1	15.65	16.58	19.15	25.65	0.3673
78	30	50	635000	3525	CP-OFDM QPSK	1@1	17.71	18.76	21.28	27.78	0.5994
78	30	50	635000	3525	CP-OFDM 16 QAM	1@1	17.04	18.18	20.66	27.16	0.5197
78	30	50	635000	3525	CP-OFDM 64 QAM	1@1	13.16	14.22	16.73	23.23	0.2105
78	30	60	632000	3480	CP-OFDM QPSK	1@1	12.78	18.42	19.47	25.97	0.3952
78	30	60	632000	3480	CP-OFDM 16 QAM	1@1	16.88	18.09	20.54	27.04	0.5055
78	30	60	632000	3480	CP-OFDM 64 QAM	1@1	15.36	16.33	18.88	25.38	0.3453
78	30	60	633334	3500.01	CP-OFDM QPSK	1@1	17.29	18.45	20.92	27.42	0.5519
78	30	60	633334	3500.01	CP-OFDM 16 QAM	1@1	16.89	18.22	20.62	27.12	0.5148
78	30	60	633334	3500.01	CP-OFDM 64 QAM	1@1	12.93	16.38	18.00	24.50	0.2818
78	30	60	634666	3519.99	CP-OFDM QPSK	1@1	17.34	18.54	20.99	27.49	0.5613
78	30	60	634666	3519.99	CP-OFDM 16 QAM	1@1	17	18.22	20.66	27.16	0.5204
78	30	60	634666	3519.99	CP-OFDM 64 QAM	1@1	15.44	16.45	18.98	25.48	0.3536
78	30	80	632668	3490.02	CP-OFDM QPSK	1@1	12.8	18.23	19.32	25.82	0.3823
78	30	80	632668	3490.02	CP-OFDM 16 QAM	1@1	16.84	18.04	20.49	26.99	0.5002
78	30	80	632668	3490.02	CP-OFDM 64 QAM	1@1	15.37	16.21	18.82	25.32	0.3405
78	30	80	633334	3500.01	CP-OFDM QPSK	1@1	17.28	18.23	20.79	27.29	0.5359
78	30	80	633334	3500.01	CP-OFDM 16 QAM	1@1	16.83	18.09	20.52	27.02	0.5030
78	30	80	633334	3500.01	CP-OFDM 64 QAM	1@1	15.36	16.22	18.82	25.32	0.3405
78	30	80	634000	3510	CP-OFDM QPSK	1@1	17.34	18.35	20.88	27.38	0.5476
78	30	80	634000	3510	CP-OFDM 16 QAM	1@1	16.85	18.16	20.56	27.06	0.5087
78	30	80	634000	3510	CP-OFDM 64 QAM	1@1	15.44	16.36	18.93	25.43	0.3495
78	30	90	633000	3495	CP-OFDM QPSK	1@1	11.11	12.28	14.74	21.24	0.1332
78	30	90	633000	3495	CP-OFDM 16 QAM	1@1	10.96	17.94	18.73	25.23	0.3337
78	30	90	633000	3495	CP-OFDM 64 QAM	1@1	15.19	16.16	18.71	25.21	0.3321
78	30	90	633334	3500.01	CP-OFDM QPSK	1@1	17.13	18.3	20.76	27.26	0.5327
78	30	90	633334	3500.01	CP-OFDM 16 QAM	1@1	16.7	17.87	20.33	26.83	0.4825

78	30	90	633334	3500.01	CP-OFDM 64 QAM	1@1	12.71	13.89	16.35	22.85	0.1928
78	30	90	633666	3504.99	CP-OFDM QPSK	1@1	17.16	18.3	20.78	27.28	0.5343
78	30	90	633666	3504.99	CP-OFDM 16 QAM	1@1	16.92	17.85	20.42	26.92	0.4921
78	30	90	633666	3504.99	CP-OFDM 64 QAM	1@1	15	16.41	18.77	25.27	0.3367
78	30	100	633334	3500.01	CP-OFDM QPSK	137@68	17.75	18.77	21.30	27.80	0.6026
78	30	100	633334	3500.01	CP-OFDM QPSK	1@1	17.03	18.24	20.69	27.19	0.5233
78	30	100	633334	3500.01	CP-OFDM QPSK	1@271	16.77	17.74	20.29	26.79	0.4778
78	30	100	633334	3500.01	CP-OFDM 16 QAM	137@68	17.09	18.09	20.63	27.13	0.5163
78	30	100	633334	3500.01	CP-OFDM 16 QAM	1@1	16.39	17.59	20.04	26.54	0.4510
78	30	100	633334	3500.01	CP-OFDM 16 QAM	1@271	16.16	17.09	19.66	26.16	0.4131
78	30	100	633334	3500.01	CP-OFDM 64 QAM	137@68	15.55	16.55	19.09	25.59	0.3622
78	30	100	633334	3500.01	CP-OFDM 64 QAM	1@1	15.08	15.95	18.55	25.05	0.3197
78	30	100	633334	3500.01	CP-OFDM 64 QAM	1@271	14.81	15.48	18.17	24.67	0.2930
78	30	100	633334	3500.01	CP-OFDM 256 QAM	137@68	12.57	13.58	16.11	22.61	0.1826
78	30	100	633334	3500.01	CP-OFDM 256 QAM	1@1	12.04	13.23	15.69	22.19	0.1654
78	30	100	633334	3500.01	CP-OFDM 256 QAM	1@271	11.81	12.78	15.33	21.83	0.1525

Appendix B. Test Results of Radiated Test

Radiated Spurious Emission

Test Engineer :	Chris	Temperature :	23~25℃
		Relative Humidity :	41~42%

SA n78 / NR 100MHz / QPSK / Ant.0								
Channel	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)
Middle	6912	-64.47	-13	-51.47	-74.68	3.03	13.24	H
	10368	-61.76	-13	-48.76	-71.21	3.56	13.01	H
	13824	-60.92	-13	-47.92	-70.44	3.92	13.44	H
	6912	-63.98	-13	-50.98	-74.19	3.03	13.24	V
	10368	-61.98	-13	-48.98	-71.43	3.56	13.01	V
	13824	-60.91	-13	-47.91	-70.43	3.92	13.44	V

EN-DC_7A_n78A / LTE 10MHz + NR 100MHz / QPSK / ANT7 (LTE) & ANT0(NR)								
Channel	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)
Middle	6912	-65.05	-13	-52.05	-75.26	3.03	13.24	H
	10368	-61.94	-13	-48.94	-71.39	3.56	13.01	H
	13824	-61.55	-13	-48.55	-71.07	3.92	13.44	H
	6912	-64.80	-13	-51.80	-75.01	3.03	13.24	V
	10368	-62.60	-13	-49.60	-72.05	3.56	13.01	V
	13824	-61.67	-13	-48.67	-71.19	3.92	13.44	V

SA n78 UL_MIMO / NR 100MHz / QPSK / Ant.0+6								
Channel	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)
Middle	6912	-64.13	-13	-51.13	-74.34	3.03	13.24	H
	10368	-61.62	-13	-48.62	-71.07	3.56	13.01	H
	13824	-60.79	-13	-47.79	-70.31	3.92	13.44	H
	6912	-64.07	-13	-51.07	-74.28	3.03	13.24	V
	10368	-62.01	-13	-49.01	-71.46	3.56	13.01	V
	13824	-61.19	-13	-48.19	-70.71	3.92	13.44	V

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