

FCC RF Test Report

APPLICANT : Sonim Technologies, Inc.
EQUIPMENT : Smart phone
BRAND NAME : Sonim
MODEL NAME : XP9900 (P14001)
FCC ID : WYPP14010
STANDARD : 47 CFR Part 2, 27
CLASSIFICATION : PCS Licensed Transmitter Held to Ear (PCE)
TEST DATE(S) : Aug. 24, 2023 ~ Aug. 29, 2023

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



Sporton International Inc. (Kunshan)

**No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300
People's Republic of China**



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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG371405C	Rev. 01	Initial issue of report	Nov. 02, 2023

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 (a)(3)	EIRP	EIRP < 250mW/5MHz	PASS	-
4.4	§2.1053 §27.53 (a)(4)	Radiated Spurious Emission	< 70+10log ₁₀ (P[Watts])	PASS	Under limit 6.57 dB at 6916.000 MHz

Note:

This is a variant report, the change note could be referred to the XP9900_ Class II Permissive Change letter which is exhibit separately. According to the change, only the related test cases of power and RSE from original test report (Report Number I22Z60589-WMD03) were verified for the differences.

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

Sonim Technologies, Inc.
 4445 Eastgate Mall, Suite 200, San Diego, CA 92121, USA

1.2 Manufacturer

Sonim Technologies, Inc.
 4445 Eastgate Mall, Suite 200, San Diego, CA 92121, USA

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Smart phone
Brand Name	Sonim
Model Name	XP9900 (P14001)
FCC ID	WYPP14010
IMEI Code	Conducted : 016188000785233 Radiation : 016188000788997
HW Version	V1.0
SW Version	10.0.0-01-12.0.0-10.60.10
EUT Stage	Identical Prototype

1.4 Product Specification of Equipment Under Test

Product Feature	
Tx Frequency	5G NR n30 : 2305 MHz ~ 2315 MHz
Rx Frequency	5G NR n30 : 2350 MHz ~ 2360 MHz
Bandwidth	5MHz / 10MHz
SCS	15kHz
Antenna Gain	<Ant. 1> : -0.01 dBi <Ant. 4> : -4.03 dBi
Type of Modulation	CP-OFDM: QPSK / 16QAM / 64QAM / 256QAM DFT-s-OFDM: PI/2 BPSK / QPSK / 16QAM / 64QAM / 256QAM

Remark:

1. 5G NR n30 supports SA and NSA mode. According to the maximum power between SA and NSA mode, SA covers NSA mode for conducted test items.
2. The EN-DC mode combination could be referred to the product spec.
3. For NSA mode of all EN-DC combination, we only show the combination of the maximum power among all NSA combinations in the report.

1.5 Modification of EUT

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

1.6 Maximum EIRP and Emission Designator

5G NR n30		PI/2 BPSK	QPSK	16QAM / 64QAM / 256QAM
BW (MHz)	Frequency Range (MHz)	Maximum EIRP(W)	Maximum EIRP(W)	Maximum EIRP(W)
5	2307.5 ~ 2312.5	0.1932	0.2000	0.1607
10	2310.0	0.2014	0.2004	0.1626

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.
	03CH03-KS TH01-KS	CN1257	314309

1.8 Test Software

Item	Site	Manufacture	Name	Version
1.	TH01-KS	Tonscend	JS1120-3 test system China_210602	3.3.10
2.	03CH03-KS	AUDIX	E3	210616



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(D)
- ♦ 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

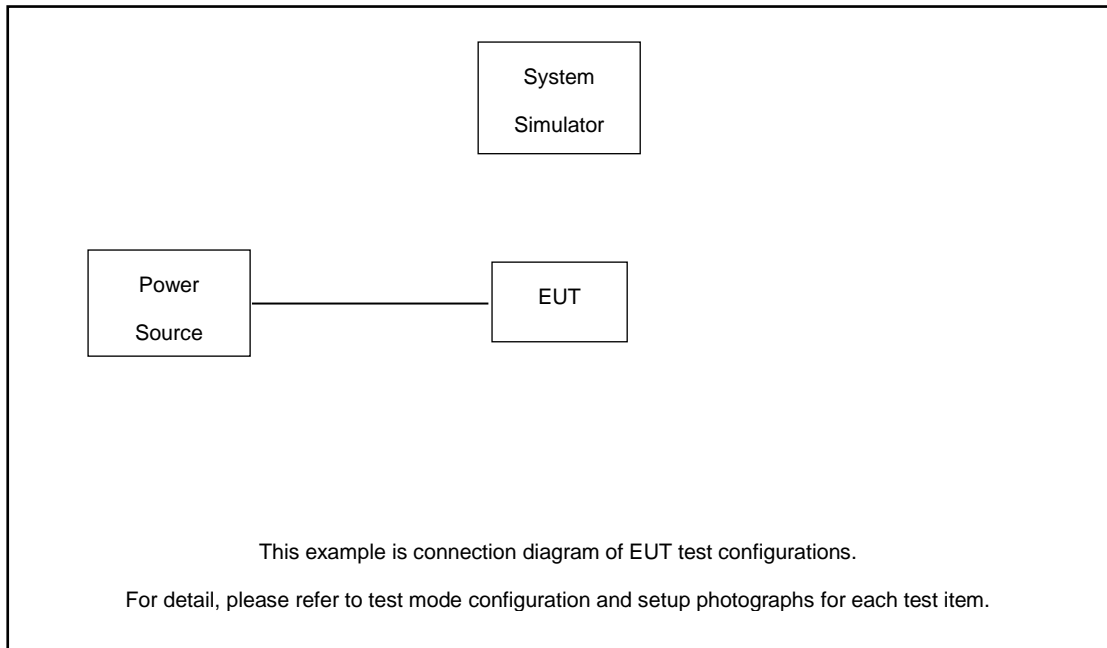
2.1 Test Mode

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. (X-Plane)

Conducted Test Cases	Band	Bandwidth (MHz)						Modulation					RB #			Test Channel		
		1.4	3	5	10	15	20	PI/2 BPSK	QPSK	16QAM	64QAM	256QAM	1	Half	Full	L	M	H
Max. Output Power	n30	-	-	v		-	-	v	v	v	v	v	v		v	v	v	v
		-	-		v	-	-	v	v	v	v	v	v		v		v	
E.I.R.P	n30	-	-	v		-	-	v	v	v	v	v	v		v	v	v	v
		-	-		v	-	-	v	v	v	v	v	v		v		v	
Radiated Spurious Emission	n30	Worst Case													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. 4. Frequency Stability : Normal Voltage = 3.9V ; Low Voltage =3.60V. ; High Voltage =4.45V																	

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.	NR Base Station	Anritsu	MT8000A	N/A	N/A	Unshielded, 1.8 m

2.4 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 5.9 dB and 20dB attenuator.

Example :

$$\begin{aligned} \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)}. \\ &= 5.9 + 10 = 25.9 \text{ (dB)} \end{aligned}$$



2.5 Frequency List of Low/Middle/High Channels

5G NR n30 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
10	Channel	-	27710	-
	Frequency	-	2310	-
5	Channel	27685	27710	27735
	Frequency	2307.5	2310	2312.5

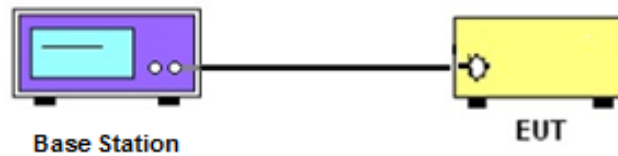
3 Conducted Test Items

3.1 Measuring Instruments

See list of measuring instruments of this test report.

3.2 Test Setup

3.2.1 Conducted Output Power



3.3 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

For mobile and portable stations transmitting in the 2305-2315 MHz band or the 2350-2360 MHz band, the average EIRP must not exceed 50 milliwatts within any 1 megahertz of authorized bandwidth, *except that* for mobile and portable stations compliant with 3GPP LTE standards or another advanced mobile broadband protocol that avoids concentrating energy at the edge of the operating band the average EIRP must not exceed 250 milliwatts within any 5 megahertz of authorized bandwidth but may exceed 50 milliwatts within any 1 megahertz of authorized bandwidth. For mobile and portable stations using time division duplexing (TDD) technology, the duty cycle must not exceed 38 percent in the 2305-2315 MHz and 2350-2360 MHz bands. Mobile and portable stations using FDD technology are restricted to transmitting in the 2305-2315 MHz band. Power averaging shall not include intervals in which the transmitter is off.

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

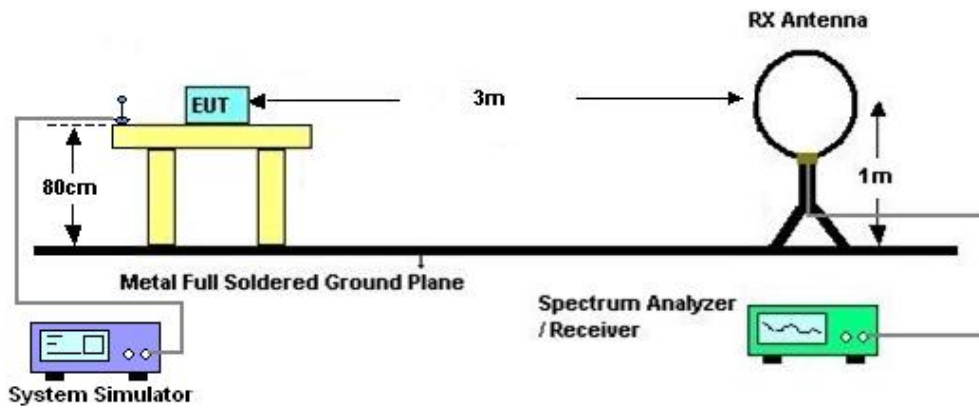
4 Radiated Test Items

4.1 Measuring Instruments

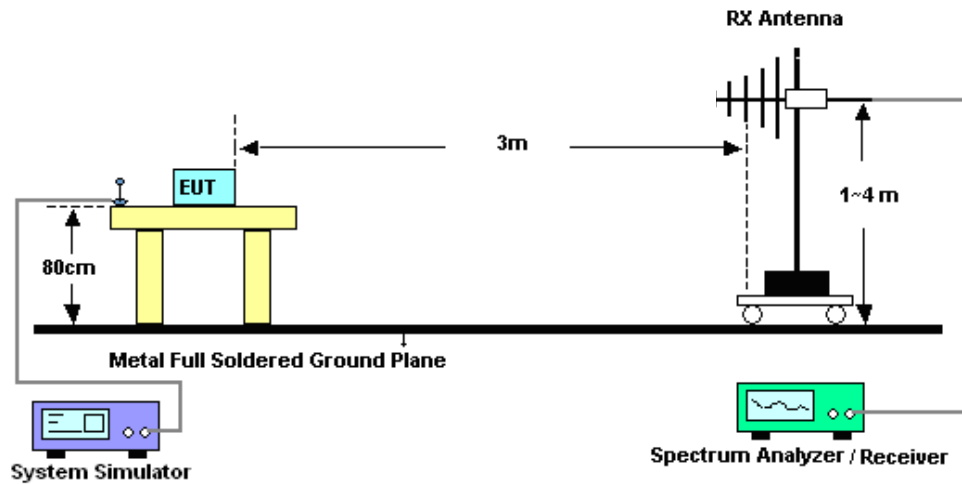
See list of measuring instruments of this test report.

4.2 Test Setup

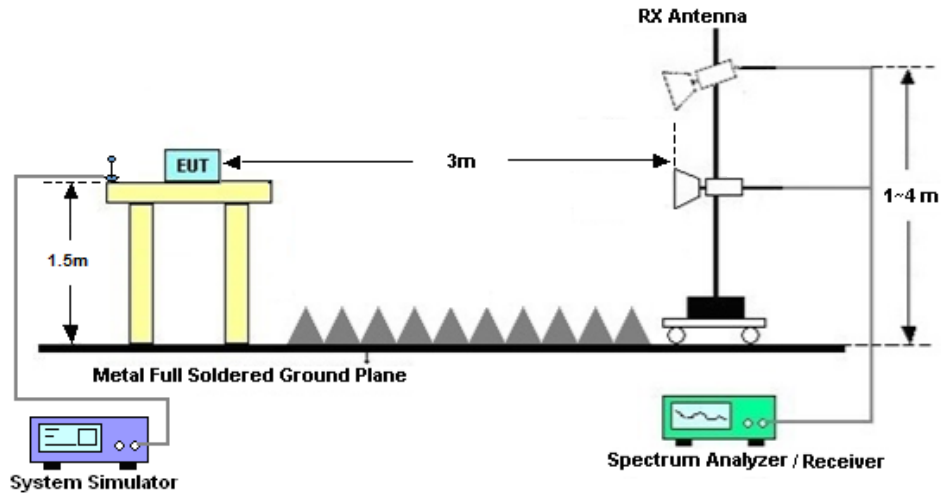
4.2.1 For radiated test below 30MHz



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 must be attenuated below the transmitter power (P) by a factor of at least $70 + 10 \log(P)$ dB.

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.

$$\text{EIRP (dBm)} = \text{S.G. Power} - \text{Tx Cable Loss} + \text{Tx Antenna Gain}$$

$$\text{ERP (dBm)} = \text{EIRP} - 2.15$$

9. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

The limit line is derived from $70 + 10\log(P)$ dB below the transmitter power P(Watts)

$$= P(W) - [70 + 10\log(P)] \text{ (dB)}$$

$$= [30 + 10\log(P)] \text{ (dBm)} - [70 + 10\log(P)] \text{ (dB)}$$

$$= -40\text{dBm.}$$



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. 12, 2022	Aug. 24, 2023	Oct. 11, 2023	Conducted (TH01-KS)
Power divider	STI	STI08-0055	-	0.5~40GHz	NCR	Aug. 24, 2023	NCR	Conducted (TH01-KS)
Temperature & humidity chamber	Hongzhan	LP-150U	H2014011440	-40~+150°C 20%~95%RH	Jul. 06, 2023	Aug. 24, 2023	Jul. 05, 2024	Conducted (TH01-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55150244	10Hz~44GHz	May 15, 2023	Aug. 29, 2023	May 14, 2024	Radiation (03CH03-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 16, 2022	Aug. 29, 2023	Oct. 15, 2023	Radiation (03CH03-KS)
Bilog Antenna	TeseQ	CBL6112D	23182	30MHz~1GHz	Dec. 23, 2022	Aug. 29, 2023	Dec. 22, 2023	Radiation (03CH03-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75957	1GHz~18GHz	Nov. 15, 2022	Aug. 29, 2023	Nov. 14, 2023	Radiation (03CH03-KS)
SHF-EHF Horn	com-power	AH-840	101116	18GHz~40GHz	Oct. 17, 2022	Aug. 29, 2023	Oct. 16, 2023	Radiation (03CH03-KS)
Amplifier	SONOMA	310N	413740	30MHz ~1000MHz	Jan. 05, 2023	Aug. 29, 2023	Jan. 04, 2024	Radiation (03CH03-KS)
Amplifier	EM	EM18G40G A	060851	18~40GHz	Jan. 05, 2023	Aug. 29, 2023	Jan. 04, 2024	Radiation (03CH03-KS)
high gain Amplifier	MITEQ	AMF-7D-00 101800-30-1 0P	2082394	1Ghz-18Ghz	Jan. 05, 2023	Aug. 29, 2023	Jan. 04, 2024	Radiation (03CH03-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Aug. 29, 2023	NCR	Radiation (03CH03-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Aug. 29, 2023	NCR	Radiation (03CH03-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Aug. 29, 2023	NCR	Radiation (03CH03-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))	3.76dB
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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))	3.65dB
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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))	3.57dB
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----- THE END -----



Appendix A. Test Results of Conducted Test

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

Transmitter Conducted Output Power And EIRP, (GT-LC)=-0.01dB

NR Band	SCS (kHz)	Bandwidth (MHz)	Arfcn	Freq (MHz)	Modulation	RB	Conducted Power (dBm)	EIRP (dBm)	EIRP (W)
30	15	10	462000	2310	DFT-s-OFDM PI/2 BPSK	25@12	23	22.99	0.1991
30	15	10	462000	2310	DFT-s-OFDM PI/2 BPSK	1@1	23.05	23.04	0.2014
30	15	10	462000	2310	DFT-s-OFDM PI/2 BPSK	1@50	22.82	22.81	0.1910
30	15	10	462000	2310	DFT-s-OFDM QPSK	25@12	22.97	22.96	0.1977
30	15	10	462000	2310	DFT-s-OFDM QPSK	1@1	22.87	22.86	0.1932
30	15	10	462000	2310	DFT-s-OFDM QPSK	1@50	23.03	23.02	0.2004
30	15	10	462000	2310	DFT-s-OFDM 16 QAM	25@12	21.97	21.96	0.1570
30	15	10	462000	2310	DFT-s-OFDM 16 QAM	1@1	22.12	22.11	0.1626
30	15	10	462000	2310	DFT-s-OFDM 16 QAM	1@50	22.05	22.04	0.1600
30	15	10	462000	2310	DFT-s-OFDM 64 QAM	25@12	20.54	20.53	0.1130
30	15	10	462000	2310	DFT-s-OFDM 64 QAM	1@1	20.66	20.65	0.1161
30	15	10	462000	2310	DFT-s-OFDM 64 QAM	1@50	20.61	20.6	0.1148
30	15	10	462000	2310	DFT-s-OFDM 256 QAM	25@12	18.38	18.37	0.0687
30	15	10	462000	2310	DFT-s-OFDM 256 QAM	1@1	18.04	18.03	0.0635
30	15	10	462000	2310	DFT-s-OFDM 256 QAM	1@50	18.08	18.07	0.0641
30	15	10	462000	2310	CP-OFDM QPSK	26@13	21.42	21.41	0.1384
30	15	10	462000	2310	CP-OFDM QPSK	1@1	21.5	21.49	0.1409
30	15	10	462000	2310	CP-OFDM QPSK	1@50	21.45	21.44	0.1393
30	15	5	461500	2307.5	DFT-s-OFDM PI/2 BPSK	1@1	22.8	22.79	0.1901
30	15	5	461500	2307.5	DFT-s-OFDM QPSK	1@1	22.88	22.87	0.1936
30	15	5	461500	2307.5	DFT-s-OFDM 16 QAM	1@1	21.95	21.94	0.1563
30	15	5	462000	2310	DFT-s-OFDM PI/2 BPSK	1@1	22.84	22.83	0.1919
30	15	5	462000	2310	DFT-s-OFDM QPSK	1@1	22.98	22.97	0.1982
30	15	5	462000	2310	DFT-s-OFDM 16 QAM	1@1	22.07	22.06	0.1607
30	15	5	462500	2312.5	DFT-s-OFDM PI/2 BPSK	1@1	22.87	22.86	0.1932
30	15	5	462500	2312.5	DFT-s-OFDM QPSK	1@1	23.02	23.01	0.2000
30	15	5	462500	2312.5	DFT-s-OFDM 16 QAM	1@1	21.99	21.98	0.1578



Appendix B. Test Results of Radiated Test

Radiated Spurious Emission

Test Engineer :	Chris Chen	Temperature :	23~25°C
		Relative Humidity :	41~42%

Note: Pre-scanned harmonic for the different antenna combinations, we choose the worst antenna mode to perform final test.

SA n30 / NR 10MHz / QPSK / Ant.1								
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	4612	-63.75	-40	-23.75	-75.21	2.84	14.30	H
	6916	-46.88	-40	-6.88	-56.82	3.49	13.43	H
	9220	-57.98	-40	-17.98	-68.22	3.85	14.09	H
	4612	-59.31	-40	-19.31	-70.77	2.84	14.30	V
	6916	-46.57	-40	-6.57	-56.51	3.49	13.43	V
	9220	-58.39	-40	-18.39	-68.63	3.85	14.09	V

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