FCC TEST REPORT

Product Name:	NuStar 65 Portable Data Collector
Trade Mark:	3nStar
Model No.:	Nustar65
Report Number:	24081713266RFM-1
Test Standards:	FCC 47 CFR Part 22 Subpart H FCC 47 CFR Part 24 Subpart E
FCC ID:	2ATAN-NUSTAR65
Test Result:	PASS
Date of Issue:	October 23, 2024

Prepared for:

3nStar, Inc.
10813 NW 30th, Street, STE#110, Doral FL, 33172, USA

Prepared by:

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UnionTrust Laboratories *Seal*

Version

Version No.	Date	Description
V1.0	October 23, 2024	Original

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1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	3nStar, Inc.
Address of Applicant:	10813 NW 30th, Street, STE#110, Doral FL, 33172, USA
Manufacturer:	3nStar, Inc.
Address of Manufacturer:	10813 NW 30th, Street, STE#110, Doral FL, 33172, USA

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	NuStar 65 Portable Data Collector		
Model No.:	Nustar65		
Trade Mark:	3nStar		
DUT Stage:	Identical Prototype		
EUT Supports Function: (Provided by the customer)	GSM Bands:	GSM850/PCS 1900	
	UTRA Bands:	WCDMA Band II/ Band V	
	E-UTRA Bands:	FDD Band 2/ 4/ 5/ 7/ 26	
		TDD Band 38/ 41	
	2.4 GHz ISM Band:	IEEE 802.11b/g/n	
		Bluetooth 5.1	
	5 GHz U-NII Bands:	5 150 - 5 250 MHz	IEEE 802.11a/n/ac
		5 250 - 5 350 MHz	IEEE 802.11a/n/ac
		5 470 - 5 730 MHz	IEEE 802.11a/n/ac
		5 725 - 5 850 MHz	IEEE 802.11a/n/ac
	RNSS Band:	1559 - 1610 MHz	BDS/ GPS/ GLONASS/ Galileo
	NFC:	13.553 - 13.567 MHz	
Software Version:	S651-G1-SC6101-NU419-V3.01.240830 (Provided by the customer)		
Hardware Version:	S651_MA_B08D_V1.0 (Provided by the customer)		
Sample Received Date:	August 16, 2024		
Sample Tested Date:	August 21, 2024 to September 25, 2024		
Remark: The above EUT's information was provided by customer. Please refer to the specifications or user's manual for more detailed description.			

1.2.2 Description of Accessories

Adapter	
Model No.:	BI12T-050200-BdVU
Input:	100-240 V~50/60 Hz 0.5A
Output:	5.0 V ⎓ 2.0A

Battery	
Model No.:	BAT-655001
Battery Type:	Rechargeable Li-ion Battery
Rated Voltage:	3.87 Vdc
Limited Charge Voltage:	4.45 Vdc
Rated Capacity:	5050 mAh

Cable	
Description:	USB Type-C to USB 3.0 Type A Cable
Connector:	USB Type-C / USB 3.0 Type A
Cable Type:	Shielded without ferrite
Length:	1 Meter

Adapter (Desktop Cradle)	
Model No.:	BI24G-120200-AdU
Input:	100-240 V~50/60 Hz 0.8A
Output:	12 V ⎓ 2.0A

Desktop Cradle	
Model No.:	S65-HB
Input:	Input: 12.0 V ⎓ 2.0A
Output:	Output: 5.0 V ⎓ 3.0A and 4.4 V ⎓ 1.7A

1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

Support Networks:	GSM, GPRS, EDGE, WCDMA, HSDPA, HSUPA	
Type of Modulation:	GSM/GPRS:	GMSK
	EDGE:	GMSK, 8PSK
	WCDMA	BPSK
	HSDPA:	QPSK
	HSUPA:	QPSK
Frequency Range:	GSM/GPRS/EDGE 850:	824.2-848.8 MHz
	GSM/GPRS/EDGE 1900:	1850.2-1909.8 MHz
	WCDMA Band II:	1852.4-1907.6 MHz
	WCDMA Band V:	826.4-846.6 MHz
Max. ERP/EIRP:	GSM/GPRS 850:	28.21 dBm
	EDGE 850:	24.04 dBm
	GSM/GPRS 1900:	32.43 dBm
	EDGE 1900:	28.65 dBm
	WCDMA Band II:	26.04 dBm
	WCDMA Band V:	19.77 dBm
Emission Designator:	GSM/GPRS 850:	249KGXW
	EDGE 850:	251KG7W
	GSM/GPRS 1900:	246KGXW
	EDGE 1900:	258KG7W
	WCDMA Band II:	4M17F9W
	WCDMA Band V:	4M17F9W
Antenna Type: (Provided by the customer)	LDS Antenna	
Antenna Gain: (Provided by the customer)	GSM 850:	-1.71 dBi
	PCS 1900:	1.58 dBi
	WCDMA Band II:	1.58 dBi
	WCDMA Band V:	-1.71 dBi
GPRS/EDGE Class:	Class 12	
Sample No.:	Radiated: S202408164150-ZJA01/7	
	Conducted: S202408164150-ZJA04/7	
Normal Test Voltage:	3.85 Vdc	
Extreme Test Voltage:	3.6 to 4.3Vdc	
Extreme Test Temperature:	-20 °C to +50 °C	

1.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested with associated equipment below.

1) Support Equipment

Description	Manufacturer	Model No.	Serial Number	Supplied by
Dummy battery	N/A	N/A	N/A	UnionTek

2) Support Cable

Cable No.	Description	Connector	Length	Supplied by
1	Antenna Cable	SMA	0.3 Meter	UnionTek

1.5 TEST LOCATION

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, Longhua District, Shenzhen, China
Telephone: +86 (0) 755 2823 0888
Fax: +86 (0) 755 2823 0886

1.6 TEST FACILITY

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L9069
The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

A2LA-Lab Certificate No.: 4312.01
Shenzhen UnionTrust Quality and Technology Co., Ltd. has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

ISED Wireless Device Testing Laboratories
CAB identifier: CN0032

FCC Accredited Lab.
Designation Number: CN1194
Test Firm Registration Number: 259480

1.7 DEVIATION FROM STANDARDS

None.

1.8 ABNORMALITIES FROM STANDARD CONDITIONS

None.

1.9 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

1.10 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

No.	Item	Measurement Uncertainty
1	Conducted Output Power	±0.7 dB
2	99%&26dB Bandwidth	±1.86 %
3	Emission Mask	±2.7 dBm
4	Spurious emissions at antenna terminals	±2.7 dBm
5	Field strength of spurious radiation	30 MHz-1 GHz: ±4.9 dB 1 GHz-18 GHz: ±4.8 dB 18 GHz-40 GHz: ±5.1 dB
6	Frequency stability	±6.5 x 10^{-8}
7	Humidity	±3.9 %
8	Temperature	±0.62 ℃
9	DC Voltages	±0.68 %

2. TEST SUMMARY

FCC 47 CFR Part 22 Subpart H Test Cases			
Test Item	**Test Requirement**	**Test Method**	**Result**
Effective Radiated Power (ERP)	FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 22.913(a)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Conducted Output Power	FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 22.913(a)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Peak-to-average ratio	FCC 47 CFR Part 22.913(a)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
99%&26dB Bandwidth	FCC 47 CFR Part 2.1049(h)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Band Edge at antenna terminals	FCC 47 CFR Part 2.1051 & FCC 47 CFR Part 22.917(a)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Spurious emissions at antenna terminals	FCC 47 CFR Part 2.1051 & FCC 47 CFR Part 22.917(a)(b)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Field strength of spurious radiation	FCC 47 CFR Part 2.1053 & FCC 47 CFR Part 22.917(a)(b)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Frequency stability	FCC 47 CFR Part 2.1055 & FCC 47 CFR Part 22.355	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS

FCC 47 CFR Part 24 Subpart E Test Cases			
Test Item	**Test Requirement**	**Test Method**	**Result**
Equivalent Isotropic Radiated Power (EIRP)	FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 24.232(c)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Conducted Output Power	FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 24.232(c)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Peak-to-average ratio	FCC 47 CFR Part 24.232(d)	KDB 971168 D01v03r01	PASS
99%&26dB Bandwidth	FCC 47 CFR Part 2.1049(h) & FCC 47 CFR Part 24.238(b)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Band Edge at antenna terminals	FCC 47 CFR Part 2.1051 & FCC 47 CFR Part 24.238(a)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Spurious emissions at antenna terminals	FCC 47 CFR Part 2.1051 & FCC 47 CFR Part 24.238(a)(b)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Field strength of spurious radiation	FCC 47 CFR Part 2.1053 & FCC 47 CFR Part 24.238(a)(b)	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Frequency stability	FCC 47 CFR Part 2.1055 & FCC 47 CFR Part 24.235	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS

Disclaimer and Explanations:
The declared of product specification and data (e.g. antenna gain, RF specification, etc) for EUT presented in the report are provided by the customer, and the customer takes all the responsibilities for the accuracy of product specification.

3. EQUIPMENT LIST

Radiated Emission Test Equipment List						
Used	**Equipment**	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date**	**Cal. Due date**
☑	3m SAC	ETS-LINDGREN	3M	Euroshiedpn-CT001270-1317	11-Nov-2023	10-Nov-2026
☑	Receiver	R&S	ESIB26	100114	27-Oct-2023	26-Oct-2024
☑	Broadband Antenna	ETS-LINDGREN	3142E	00201566	30-Oct-2023	29-Oct-2024
☑	6dB Attenuator	Talent	RA6A5-N-18	18103001	30-Oct-2023	29-Oct-2024
☑	Preamplifier	HP	8447F	2805A02960	31-Oct-2023	30-Oct-2024
☑	Double-Ridged Waveguide Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201541	01-Apr-2024	31-Mar-2025
☑	Pre-amplifier	ETS-LINDGREN	00118385	00201874	31-Oct-2023	30-Oct-2024
☑	Double-Ridged Waveguide Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3116C-PA	00202652	30-Oct-2023	29-Oct-2024
☑	Pre-amplifier	ETS-LINDGREN	00118384	00202652	30-Oct-2023	29-Oct-2024
☑	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
☑	Test Software	Audix	e3	Software Version: 9.160323		

RF Conducted Test Equipment List						
Used	**Equipment**	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date**	**Cal. Due date**
☑	EXA Signal Analyzer	KEYSIGHT	N9010B	MY62060155	29-Mar-2024	28-Mar-2025
☑	DC Source	KIKUSUI	PWR400L	LK003024	19-July-2024	18-July-2025
☑	Digital multimeter	FLUKE	15B+	30701460WS15	31-Oct-2023	30-Oct-2024
☑	Temp & Humidity chamber	Votisch	VT4002	58566133290020	29-Mar-2024	28-Mar-2025
☑	Wideband Radio Communication Tester	R&S	CMW500	119583	29-Mar-2024	28-Mar-2025
☐	Wideband Radio Communication Tester	R&S	CMW500	120932	29-Mar-2024	28-Mar-2025

4. TEST CONFIGURATION

4.1 ENVIRONMENTAL CONDITIONS FOR TESTING

Test Environment	Selected Values During Tests		
Test Condition	Ambient		
	Temperature (°C)	Voltage (V)	Relative Humidity (%)
TN/VN	+15 to +35	3.85	20 to 75
TL/VL	-20	3.6	20 to 75
TH/VL	+50	3.6	20 to 75
TL/VH	-20	4.3	20 to 75
TH/VH	+50	4.3	20 to 75

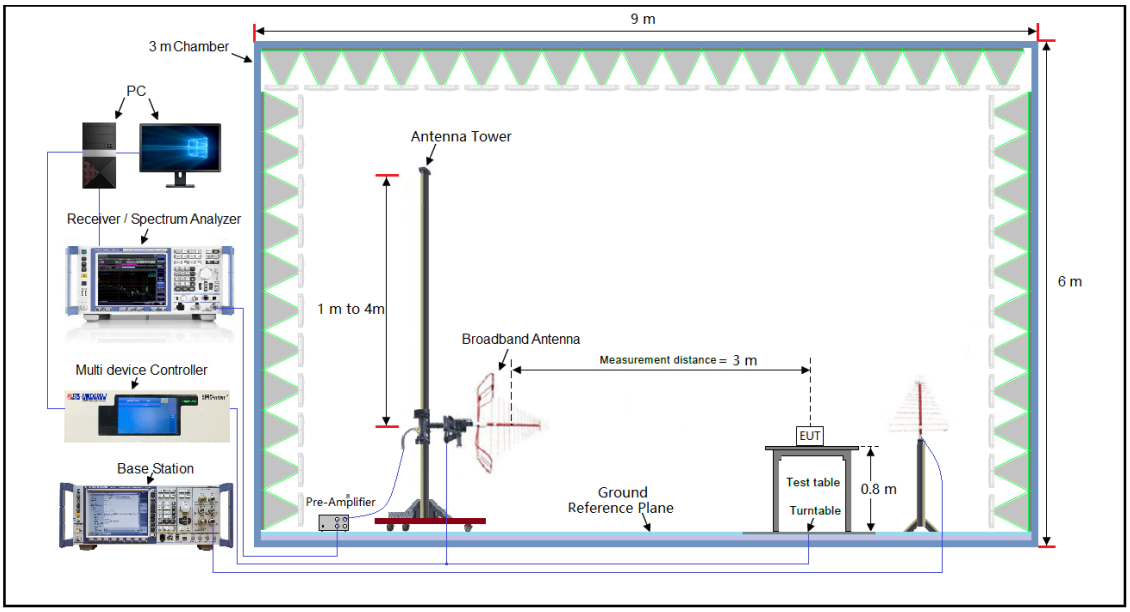
Remark:

1) The EUT just work in such extreme temperature of -20 °C to +50 °C and the extreme voltage of 3.6 V to 4.3 V, so here the EUT is tested in the temperature of -20 °C to +50 °C and the voltage of 3.6 V to 4.3 V.
2) VN: Normal Voltage; TN: Normal Temperature;
   TL: Low Extreme Test Temperature; TH: High Extreme Test Temperature;
   VL: Low Extreme Test Voltage; VH: High Extreme Test Voltage.

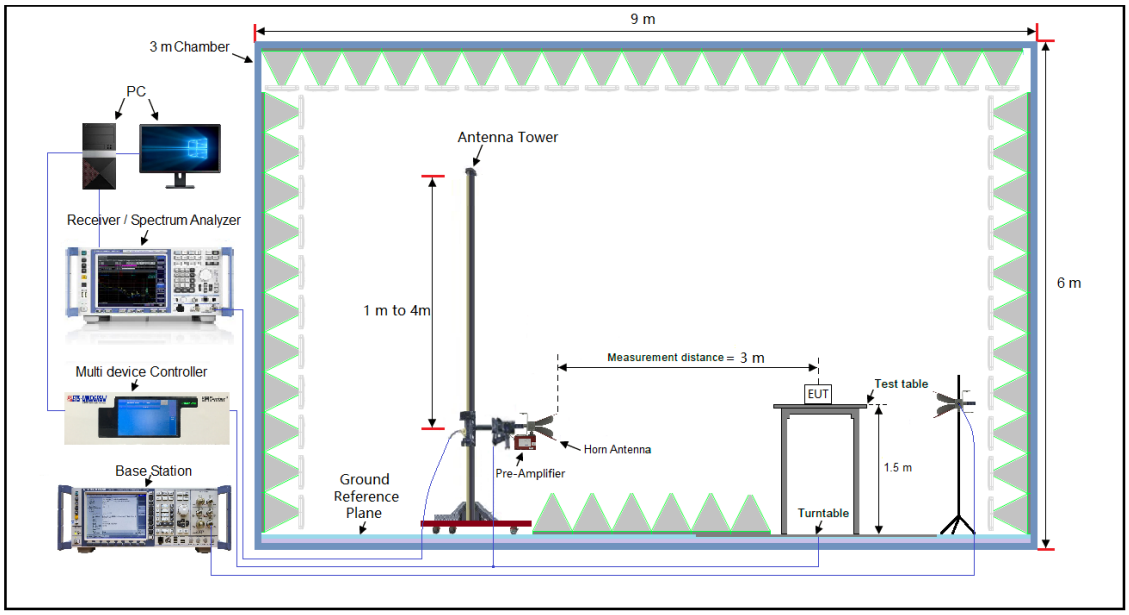
4.2 TEST SETUP

4.2.1 For Radiated Emissions test setup

Radiated Emissions 30MHz to 1GHz Test setup

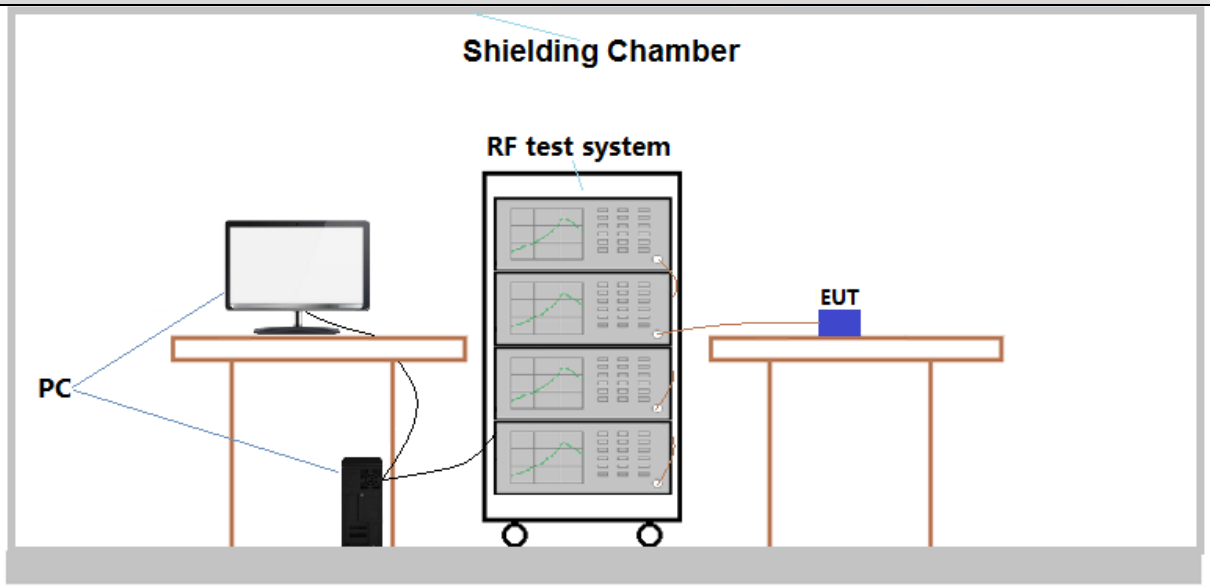


Radiated Emissions Above 1GHz Test setup

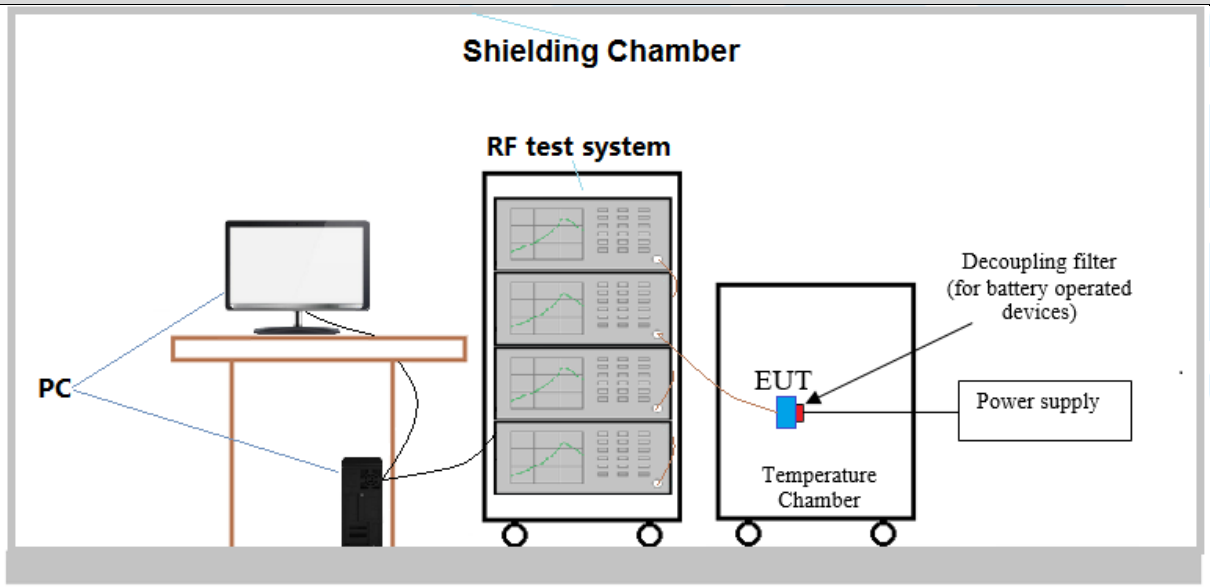


4.2.2 For Conducted RF test setup

Normal Environment



Extreme Environment



4.3 TEST CHANNELS

Bands	Tx/Rx Frequency	RF Channel		
		Low(L)	Middle(M)	High(H)
GSM/GPRS/ EDGE850	Tx (824 MHz ~ 849 MHz)	Channel 128	Channel 190	Channel 251
		824.2 MHz	836.6 MHz	848.8 MHz
WCDMA band V	Tx (824 MHz ~ 849 MHz)	Channel 4132	Channel 4182	Channel 4233
		826.4 MHz	836.4 MHz	846.6 MHz

Bands	Tx/Rx Frequency	RF Channel		
		Low(L)	Middle(M)	High(H)
GSM/GPRS/ EDGE1900	Tx (1850 MHz-1910 MHz)	Channel 512	Channel 661	Channel 810
		1850.2 MHz	1880.0 MHz	1909.8 MHz
WCDMA Band II	Tx (1850 MHz-1910 MHz)	Channel 9262	Channel 9400	Channel 9538
		1852.4 MHz	1880.0 MHz	1907.6 MHz

4.4 SYSTEM TEST CONFIGURATION

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, radiated emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario. It was powered by a 3.87Vdc battery. Only the worst case data were recorded in this test report.

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, X/Y/Z axis, and antenna ports.

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000MHz. The resolution is 1 MHz or greater for frequencies above 1000MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

Radiated emission measurement were performed from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

4.5 PRE-SCAN

Pre-scan under all rate at lowest middle and highest channel, find the transmitter power as below:

SIM 1 Card Conducted transmitter power measurement result.

GSM 850 Maximum Average Power (dBm)			
Channel	**128**	**190**	**251**
Frequency(MHz)	**824.2 MHz**	**836.6 MHz**	**848.8 MHz**
GSM (GMSK, 1Tx-slot)	32.06	31.90	31.81
GPRS (GMSK, 1Tx-slot)	**32.07**	31.84	31.75
GPRS (GMSK, 2Tx-slot)	31.36	31.17	31.07
GPRS (GMSK, 3Tx-slot)	30.15	29.97	29.86
GPRS (GMSK, 4Tx-slot)	29.61	29.43	29.32
EDGE (8PSK, 1Tx-slot)	27.90	27.44	27.14
EDGE (8PSK, 2Tx-slot)	26.54	26.27	25.99
EDGE (8PSK, 3Tx-slot)	24.15	23.91	23.62
EDGE (8PSK, 4Tx-slot)	22.83	22.59	22.22

PCS 1900 Maximum Average Power (dBm)			
Channel	**512**	**661**	**810**
Frequency(MHz)	**1850.2 MHz**	**1880.0 MHz**	**1909.8 MHz**
GSM (GMSK, 1Tx-slot)	30.65	**30.85**	30.83
GPRS (GMSK, 1Tx-slot)	30.63	30.77	30.74
GPRS (GMSK, 2Tx-slot)	29.69	29.86	29.84
GPRS (GMSK, 3Tx-slot)	28.22	28.40	28.38
GPRS (GMSK, 4Tx-slot)	27.68	27.86	27.84
EDGE (8PSK, 1Tx-slot)	27.07	26.87	26.97
EDGE (8PSK, 2Tx-slot)	25.93	25.90	25.94
EDGE (8PSK, 3Tx-slot)	23.95	23.93	24.04
EDGE (8PSK, 4Tx-slot)	22.74	22.87	22.86

WCDMA Band II Maximum Average Power (dBm)			
Channel	**9262**	**9400**	**9538**
Frequency (MHz)	**1852.4 MHz**	**1880.0 MHz**	**1907.6 MHz**
RMC 12.2K	**24.46**	24.28	24.25
HSDPA Subtest-1	23.47	23.33	23.23
HSDPA Subtest-2	23.06	22.70	22.79
HSDPA Subtest-3	23.05	22.73	22.85
HSDPA Subtest-4	22.99	22.81	22.75
HSUPA Subtest-1	21.46	21.28	21.27
HSUPA Subtest-2	20.51	20.30	20.25
HSUPA Subtest-3	22.48	22.27	22.26
HSUPA Subtest-4	21.01	20.82	20.81
HSUPA Subtest-5	22.48	22.28	22.29

WCDMA Band V Maximum Average Power (dBm)			
Channel	**4132**	**4182**	**4233**
Frequency (MHz)	**826.4 MHz**	**836.4 MHz**	**846.6 MHz**
RMC 12.2K	**23.63**	23.31	23.22
HSDPA Subtest-1	22.65	22.36	22.24
HSDPA Subtest-2	22.16	21.79	21.75
HSDPA Subtest-3	22.12	21.78	21.70
HSDPA Subtest-4	22.11	21.88	21.78
HSUPA Subtest-1	20.67	20.38	20.26
HSUPA Subtest-2	20.70	20.38	20.26
HSUPA Subtest-3	21.64	20.37	21.25
HSUPA Subtest-4	20.21	19.90	19.78
HSUPA Subtest-5	21.59	21.39	21.27

Pre-scan all bandwidth and RB, find worse case mode are chosen to the report, the worse mode applicability and tested channel detail as below:

Band	Radiated	Conducted
GSM/GPRS/ EDGE 850/1900	1) GSM (GMSK, 1Tx-slot) Link 2) GPRS (GMSK, 1Tx-slot) Link 3) EDGE (8PSK, 1Tx-slot) Link	1) GSM (GMSK,1Tx-slot) Link 2) GPRS (GMSK, 1Tx-slot) Link 3) EDGE (8PSK, 1Tx-slot) Link
WCDMA Band II/IV/V	RMC 12.2kbps Link	RMC 12.2kbps Link

5. RADIO TECHNICAL REQUIREMENTS SPECIFICATION

5.1 REFERENCE DOCUMENTS FOR TESTING

No.	Identity	Document Title
1	FCC 47 CFR Part 2	Frequency allocations and radio treaty matters; general rules and regulations
2	FCC 47 CFR Part 22	Public Mobile Services
3	FCC 47 CFR Part 24	Personal Communications Services
4	ANSI C63.26-2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
5	KDB 971168 D01	KDB 971168 D01 Power Meas License Digital Systems v03r01
6	KDB 412172 D01 Determining ERP and EIRP v01r01	Guidelines for determining the effective radiated power (ERP) and isotropically radiated power (EIRP) of an RF transmitting system

5.2 MAXIMUM ERP/EIRP

Test Requirement: FCC 47 CFR Part 2.1046(a),
FCC 47 CFR Part 22.913(a),
FCC 47 CFR Part 24.232(c),

Test Method: KDB 971168 D01v03r01 Section 5.6 & ANSI C63.26-2015

Limit:

FCC 47 CFR Part 22.913(a)

The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

FCC 47 CFR Part 24.232(c)

Mobile and portable stations are limited to 2 watts EIRP.

Test Procedure:

According to KDB 412172 D01 Power Approach,

- **ERP or EIRP = $P_T + G_T - L_C$**
- **ERP = EIRP -2.15**

where

- **P_T** = transmitter output power, expressed in dBW, dBm, or PSD;
- **G_T** = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP);
- **L_C** = signal attenuation in the connecting cable between the transmitter and antenna, in dB.

Test Setup: Refer to section 4.2.1 for details.

Instruments Used: Refer to section 3 for details

Test Mode: Link mode

Test Results: Pass

Test Data: See table below

Band		Ant. Gain (dBi)	Maximum ERP/EIRP (dBm)				Maximum ERP/EIRP (W)				Result
			Low	Mid	High	Limit (dBm)	Low	Mid	High	Limit (W)	
PCS 1900	GSM	1.58	32.23	32.43	32.41	33.01	1.6711	1.7498	1.7418	2	Pass
	GPRS		32.21	32.35	32.32	33.01	1.6634	1.7179	1.7061	2	Pass
	EGPRS		28.65	28.45	28.55	33.01	0.7328	0.6998	0.7161	2	Pass
GSM 850	GSM	-1.71	28.20	28.04	27.95	38.45	0.6607	0.6368	0.6237	7	Pass
	GPRS		28.21	27.98	27.89	38.45	0.6622	0.6281	0.6152	7	Pass
	EGPRS		24.04	23.58	23.28	38.45	0.2535	0.2280	0.2128	7	Pass

Band		Ant. Gain (dBi)	Maximum ERP/EIRP (dBm)				Maximum ERP/EIRP (W)				Result
			Low	Mid	High	Limit (dBm)	Low	Mid	High	Limit (W)	
WCDMA Band II	RMC 12.2K	1.58	26.04	25.86	25.83	33.01	0.4018	0.3855	0.3828	2	Pass
	HSDPA		25.05	24.91	24.81	33.01	0.3199	0.3097	0.3027	2	Pass
	HSUPA		24.06	23.86	23.87	33.01	0.2547	0.2432	0.2438	2	Pass
WCDMA Band V	RMC 12.2K	-1.71	19.77	19.45	19.36	38.45	0.0948	0.0881	0.0863	7	Pass
	HSDPA		18.79	18.50	18.38	38.45	0.0757	0.0708	0.0689	7	Pass
	HSUPA		17.78	17.53	17.41	38.45	0.0600	0.0566	0.0551	7	Pass

Note: The maximum ERP/EIRP is calculated from max output power and antenna gain, the antenna gain provided by the customer, and the customer takes all the responsibilities for the accuracy of antenna gain.

5.3 CONDUCTED OUTPUT POWER

Test Requirement: FCC 47 CFR Part 2.1046(a),
FCC 47 CFR Part 22.913(a),
FCC 47 CFR Part 24.232(c)

Test Method: KDB 971168 D01v03r01 & ANSI C63.26-2015

Limit:

FCC 47 CFR Part 22.913(a)

The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

FCC 47 CFR Part 24.232(c)

Mobile and portable stations are limited to 2 watts EIRP.

Test Procedure:

The EUT was set up for the maximum power with GSM, GPRS, EDGE, WCDMA, CDMA2000, and LTE link data modulation and link up with simulator. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup: Refer to section 4.2.2 for details.

Instruments Used: Refer to section 3 for details

Test Mode: Link mode

Test Results: Pass

Test Data: The full result refer to section 4.5 for details.

5.4 PEAK-TO-AVERAGE RATIO

Test Requirement:	FCC 47 CFR Part 22.913(a), FCC 47 CFR Part 24.232(c)
Test Method:	KDB 971168 D01v03r01 Section 5.7
Limit:	In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB

Test Procedure:

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer.

a) Set resolution/measurement bandwidth ≥ signal's occupied bandwidth
b) Set the number of counts to a value that stabilizes the measured CCDF curve
c) Record the maximum PAPR level associated with a probability of 0.1 %

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup:	Refer to section 4.2.2 for details.
Instruments Used:	Refer to section 3 for details
Test Mode:	Link mode
Test Results:	**Please refer to Appendix A1&B1**

5.5 99%&26DB BANDWIDTH

Test Requirement:	FCC 47 CFR Part 2.1049(h), FCC 47 CFR Part 22.917(b), FCC 47 CFR Part 24.238(b)
Test Method:	ANSI C63.26-2015 & KDB 971168 D01v03r01 Section 4
Limit:	No Limit, for reporting purposes only.

Test Procedure:

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at the low, middle and high channel in each band. The 99% and -26dB bandwidths was also measured and recorded.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup:	Refer to section 4.2.2 for details.
Instruments Used:	Refer to section 3 for details
Test Mode:	Link mode
Test Results:	**Please refer to Appendix A2&B2**

5.6 BAND EDGE AT ANTENNA TERMINALS

Test Requirement: FCC 47 CFR Part 2.1051,
FCC 47 CFR Part 22.917(a),
FCC 47 CFR Part 24.238(a)

Test Method: ANSI C63.26-2015 & KDB 971168 D01v03r01

Limit:

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. The emission limit equal to -13 dBm.

Test Procedure:

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer.

For each band edge measurement:

1) Set the spectrum analyzer span to include the block edge frequency.
2) Set a marker to point the corresponding band edge frequency in each test case.
3) Set display line at -13 dBm
4) Set resolution bandwidth to at least 1% of emission bandwidth.
5) Set spectrum analyzer with RMS detector.
6) Record the max trace plot into the test report

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup: Refer to section 4.2.2 for details.

Instruments Used: Refer to section 3 for details

Test Mode: Link mode

Test Results: **Please refer to Appendix A3&B3**

5.7 SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Test Requirement: FCC 47 CFR Part 2.1051,
FCC 47 CFR Part 22.917(a)(b),
FCC 47 CFR Part 24.238(a)(b)

Test Method: ANSI C63.26-2015 & KDB 971168 D01v03r01

Limit:

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. The emission limit equal to -13 dBm.

Test Procedure:

The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range. b. Measuring frequency range is from 30 MHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower. Set RBW & VBW to 100 kHz for the measurement below 1 GHz, and 1 MHz for the measurement above 1 GHz.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup: Refer to section 4.2.2 for details.

Instruments Used: Refer to section 3 for details

Test Mode: Link mode

Test Results: **Please refer to Appendix A4&B4**

5.8 FIELD STRENGTH OF SPURIOUS RADIATION

Test Requirement: FCC 47 CFR Part 2.1053,
FCC 47 CFR Part 22.917(a)(b),
FCC 47 CFR Part 24.238(a)(b)

Test Method: ANSI C63.26-2015 & KDB 971168 D01v03r01 Section 7

Limits:

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. The emission limit equal to -13 dBm.

Test Setup: Refer to section 4.2.1 for details.

Test Procedures: KDB 971168 D01v03r01 Section 7

Equipment Used: Refer to section 3 for details.

Test Result: Pass

The worst measurement data as follows:

GSM 850							
No.	Frequency (MHz)	SA Reading (dBm)	Correction factor (dB/m)	EIRP Result (dBm)	Limit (dBm)	Margin (dB)	Ant. Pol.
Lowest Channel							
1	689.051	-74.45	40.41	-34.04	-13.00	-21.04	Horizontal
2	781.961	-74.46	41.30	-33.16	-13.00	-20.16	Horizontal
3	992.997	-75.26	44.47	-30.79	-13.00	-17.79	Horizontal
4	1648.400	-59.40	-0.30	-59.70	-13.00	-46.70	Horizontal
5	2472.600	-54.83	3.46	-51.37	-13.00	-38.37	Horizontal
6	749.676	-74.67	40.95	-33.72	-13.00	-20.72	Vertical
7	781.961	-73.95	41.30	-32.65	-13.00	-19.65	Vertical
8	986.044	-75.47	44.36	-31.11	-13.00	-18.11	Vertical
9	1648.400	-59.32	-0.30	-59.62	-13.00	-46.62	Vertical
10	2472.600	-53.67	3.46	-50.21	-13.00	-37.21	Vertical
Middle Channel							
1	674.677	-75.34	39.82	-35.52	-13.00	-22.52	Horizontal
2	739.214	-74.84	40.87	-33.97	-13.00	-20.97	Horizontal
3	992.997	-74.96	44.47	-30.49	-13.00	-17.49	Horizontal
4	1673.200	-58.68	-0.11	-58.79	-13.00	-45.79	Horizontal
5	2509.800	-56.73	3.58	-53.15	-13.00	-40.15	Horizontal
6	642.292	-74.82	39.15	-35.67	-13.00	-22.67	Vertical
7	781.961	-74.17	41.30	-32.87	-13.00	-19.87	Vertical
8	972.283	-74.45	43.98	-30.47	-13.00	-17.47	Vertical
9	1673.200	-58.29	-0.11	-58.40	-13.00	-45.40	Vertical
10	2509.800	-60.25	3.58	-56.67	-13.00	-43.67	Vertical
Highest Channel							
1	684.226	-75.31	40.19	-35.12	-13.00	-22.12	Horizontal
2	749.676	-75.23	40.95	-34.28	-13.00	-21.28	Horizontal
3	965.474	-74.85	43.86	-30.99	-13.00	-17.99	Horizontal
4	1679.600	-59.09	-0.08	-59.17	-13.00	-46.17	Horizontal
5	2546.400	-55.15	3.73	-51.42	-13.00	-38.42	Horizontal
6	660.602	-75.90	39.43	-36.47	-13.00	-23.47	Vertical
7	723.793	-75.36	40.89	-34.47	-13.00	-21.47	Vertical
8	992.997	-73.99	44.47	-29.52	-13.00	-16.52	Vertical
9	1679.600	-59.38	-0.08	-59.46	-13.00	-46.46	Vertical
10	2546.400	-55.89	3.73	-52.16	-13.00	-39.16	Vertical

PCS 1900							
No.	Frequency (MHz)	SA Reading (dBm)	Correction factor (dB/m)	EIRP Result (dBm)	Limit (dBm)	Margin (dB)	Ant. Pol.
Lowest Channel							
1	827.179	-75.42	13.16	-62.26	-13.00	-49.26	Horizontal
2	887.398	-74.91	14.17	-60.74	-13.00	-47.74	Horizontal
3	958.714	-74.87	14.93	-59.94	-13.00	-46.94	Horizontal
4	3700.400	-59.48	7.45	-52.03	-13.00	-39.03	Horizontal
5	5550.600	-59.88	10.97	-48.91	-13.00	-35.91	Horizontal
6	821.387	-75.01	13.20	-61.81	-13.00	-48.81	Vertical
7	906.304	-74.90	14.53	-60.37	-13.00	-47.37	Vertical
8	986.044	-74.27	15.44	-58.83	-13.00	-45.83	Vertical
9	3700.400	-59.17	7.45	-51.72	-13.00	-38.72	Vertical
10	5550.600	-58.43	10.97	-47.46	-13.00	-34.46	Vertical
Middle Channel							
1	827.179	-75.15	13.16	-61.99	-13.00	-48.99	Horizontal
2	925.613	-74.58	14.46	-60.12	-13.00	-47.12	Horizontal
3	958.714	-73.96	14.93	-59.03	-13.00	-46.03	Horizontal
4	3760.000	-61.18	7.73	-53.45	-13.00	-40.45	Horizontal
5	5640.000	-59.63	11.18	-48.45	-13.00	-35.45	Horizontal
6	804.252	-75.12	12.75	-62.37	-13.00	-49.37	Vertical
7	938.714	-74.68	14.52	-60.16	-13.00	-47.16	Vertical
8	992.997	-74.79	15.56	-59.23	-13.00	-46.23	Vertical
9	3760.000	-60.83	7.73	-53.10	-13.00	-40.10	Vertical
10	5640.000	-60.02	11.18	-48.84	-13.00	-35.84	Vertical
Highest Channel							
1	689.051	-74.97	11.04	-63.93	-13.00	-50.93	Horizontal
2	760.287	-74.35	11.63	-62.72	-13.00	-49.72	Horizontal
3	958.714	-74.01	14.93	-59.08	-13.00	-46.08	Horizontal
4	3819.600	-59.95	8.00	-51.95	-13.00	-38.95	Horizontal
5	5729.400	-59.36	11.40	-47.96	-13.00	-34.96	Horizontal
6	771.047	-74.06	11.94	-62.12	-13.00	-49.12	Vertical
7	899.958	-74.84	14.32	-60.52	-13.00	-47.52	Vertical
8	986.044	-74.79	15.44	-59.35	-13.00	-46.35	Vertical
9	3819.600	-59.33	8.00	-51.33	-13.00	-38.33	Vertical
10	5729.400	-58.90	11.40	-47.50	-13.00	-34.50	Vertical

WCDMA Band II							
No.	Frequency (MHz)	SA Reading (dBm)	Correction factor (dB/m)	EIRP Result (dBm)	Limit (dBm)	Margin (dB)	Ant. Pol.
RMC 12.2kbps _ Lowest Channel							
1	821.387	-74.78	13.20	-61.58	-13.00	-48.58	Horizontal
2	899.958	-74.58	14.32	-60.26	-13.00	-47.26	Horizontal
3	965.474	-74.79	14.91	-59.88	-13.00	-46.88	Horizontal
4	3704.800	-58.04	7.47	-50.57	-13.00	-37.57	Horizontal
5	5557.200	-59.24	10.99	-48.25	-13.00	-35.25	Horizontal
6	708.694	-74.72	11.44	-63.28	-13.00	-50.28	Vertical
7	862.802	-76.85	13.74	-63.11	-13.00	-50.11	Vertical
8	952.000	-76.52	14.82	-61.70	-13.00	-48.70	Vertical
9	3704.800	-59.08	7.47	-51.61	-13.00	-38.61	Vertical
10	5557.200	-59.40	10.99	-48.41	-13.00	-35.41	Vertical
RMC 12.2kbps _ Middle Channel							
1	693.910	-75.05	11.17	-63.88	-13.00	-50.88	Horizontal
2	838.887	-74.37	13.30	-61.07	-13.00	-48.07	Horizontal
3	938.714	-74.46	14.52	-59.94	-13.00	-46.94	Horizontal
4	3760.000	-60.85	7.73	-53.12	-13.00	-40.12	Horizontal
5	5640.000	-60.50	11.18	-49.32	-13.00	-36.32	Horizontal
6	804.252	-74.49	12.75	-61.74	-13.00	-48.74	Vertical
7	868.886	-74.50	13.80	-60.70	-13.00	-47.70	Vertical
8	979.139	-75.32	15.25	-60.07	-13.00	-47.07	Vertical
9	3760.000	-60.82	7.73	-53.09	-13.00	-40.09	Vertical
10	5640.000	-59.73	11.18	-48.55	-13.00	-35.55	Vertical
RMC 12.2kbps _ Highest Channel							
1	776.485	-74.94	11.90	-63.04	-13.00	-50.04	Horizontal
2	893.656	-75.17	14.20	-60.97	-13.00	-47.97	Horizontal
3	945.334	-74.86	14.69	-60.17	-13.00	-47.17	Horizontal
4	3815.200	-59.06	7.98	-51.08	-13.00	-38.08	Horizontal
5	5722.800	-59.20	11.39	-47.81	-13.00	-34.81	Horizontal
6	856.760	-75.13	13.67	-61.46	-13.00	-48.46	Vertical
7	952.000	-74.56	14.82	-59.74	-13.00	-46.74	Vertical
8	992.997	-74.36	15.56	-58.80	-13.00	-45.80	Vertical
9	3815.200	-58.92	7.98	-50.94	-13.00	-37.94	Vertical
10	5722.800	-58.84	11.39	-47.45	-13.00	-34.45	Vertical

WCDMA Band V							
No.	Frequency (MHz)	SA Reading (dBm)	Correction factor (dB/m)	EIRP Result (dBm)	Limit (dBm)	Margin (dB)	Ant. Pol.
RMC 12.2kbps _ Lowest Channel							
1	651.383	-74.50	39.27	-35.23	-13.00	-22.23	Horizontal
2	703.731	-74.64	40.80	-33.84	-13.00	-20.84	Horizontal
3	979.139	-74.85	44.18	-30.67	-13.00	-17.67	Horizontal
4	1645.658	-53.73	-0.32	-54.05	-13.00	-41.05	Horizontal
5	2479.200	-60.36	3.48	-56.88	-13.00	-43.88	Horizontal
6	739.214	-75.06	40.87	-34.19	-13.00	-21.19	Vertical
7	781.961	-73.65	41.30	-32.35	-13.00	-19.35	Vertical
8	979.139	-74.76	44.18	-30.58	-13.00	-17.58	Vertical
9	1645.658	-56.00	-0.32	-56.32	-13.00	-43.32	Vertical
10	2479.200	-59.39	3.48	-55.91	-13.00	-42.91	Vertical
RMC 12.2kbps _ Middle Channel							
1	698.804	-75.51	40.79	-34.72	-13.00	-21.72	Horizontal
2	781.961	-74.84	41.30	-33.54	-13.00	-20.54	Horizontal
3	958.714	-74.91	43.89	-31.02	-13.00	-18.02	Horizontal
4	1674.504	-55.70	-0.11	-55.81	-13.00	-42.81	Horizontal
5	2509.200	-60.02	3.58	-56.44	-13.00	-43.44	Horizontal
6	718.725	-75.48	40.83	-34.65	-13.00	-21.65	Vertical
7	771.047	-74.63	41.18	-33.45	-13.00	-20.45	Vertical
8	986.044	-75.17	44.36	-30.81	-13.00	-17.81	Vertical
9	1664.833	-56.96	-0.17	-57.13	-13.00	-44.13	Vertical
10	2509.200	-60.10	3.58	-56.52	-13.00	-43.52	Vertical
RMC 12.2kbps _ Highest Channel							
1	607.181	-79.29	38.51	-40.78	-13.00	-27.78	Horizontal
2	718.725	-80.28	40.83	-39.45	-13.00	-26.45	Horizontal
3	986.044	-80.13	44.36	-35.77	-13.00	-22.77	Horizontal
4	1684.232	-54.07	-0.04	-54.11	-13.00	-41.11	Horizontal
5	2539.800	-59.49	3.71	-55.78	-13.00	-42.78	Horizontal
6	607.181	-79.62	38.51	-41.11	-13.00	-28.11	Vertical
7	718.725	-79.31	40.83	-38.48	-13.00	-25.48	Vertical
8	979.139	-80.95	44.18	-36.77	-13.00	-23.77	Vertical
9	1684.232	-56.66	-0.04	-56.70	-13.00	-43.70	Vertical
10	2539.800	-59.57	3.71	-55.86	-13.00	-42.86	Vertical

Remark:

1. Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain, the value was added to Original Receiver Reading by the software automatically.
2. Result = Reading + Correct Factor.
3. Margin = Result – Limit
4. For Radiated Emission above 3GHz or 6GHz, there was not any unwanted emission detected, so only the results of second and third harmonics are recorded in the report.

5.9 FREQUENCY STABILITY

Test Requirement: FCC 47 CFR Part 2.1055 &
FCC 47 CFR Part 22.355 &
FCC 47 CFR Part 24.235

Test Method: ANSI C63.26-2015 & KDB 971168 D01v03r01

Limits:

FCC 47 CFR Part 22.355,

The carrier frequency shall not depart from the reference frequency in excess of ±2.5 ppm for mobile stations.

FCC 47 CFR Part 24.235

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Setup: Refer to section 4.2.2 for details.

Test Procedures:

1) Use CMW 500 with Frequency Error measurement capability.
   a) Temp. = −30° to + 50°C
   b) Voltage =low voltage, 3.6 Vdc, Normal, 3.85 Vdc and High voltage, 4.3 Vdc.
2) Frequency Stability vs Temperature:

The EUT is place inside a temperature chamber. The temperature is set to 20ºC and allowed to stabilize. After sufficient soak time, the transmitting frequency error is measured. The temperature is increased by 10 degrees, allowed to stabilize and soak, and then the measurement is repeated. This is repeated until +50ºC is reached.

3) Frequency Stability vs Voltage:

The peak frequency error is recorded (worst-case).

Equipment Used: Refer to section 3 for details.

Test Results: **Please refer to Appendix A5&B5**

APPENDIX 1 PHOTOS OF TEST SETUP

See test photos attached in Appendix 1 for the actual connections between Product and support equipment.

APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS

Refer to Appendix 2 for EUT external and internal photos.

*** End of Report ***

The test report is effective only with both signature and specialized stamp. The result(s) shown in this report refer only to the sample(s) tested. Without written approval of UnionTrust, this report can't be reproduced except in full.