

# TEST REPORT

**Applicant:** NAYAX LTD  
**Address:** 3 Arik Einstein St., Herzliya, 4659071, Israel  
**Equipment Type:** POS Payment Device  
**Model Name:** VPOSM S (refer to section 2.4)  
**Brand Name:** Nayax  
**FCC ID:** 2AK6L-VPOSMS  
**IC ID:** 10840A-VPOSMS  
**Test Standard:** 47 CFR Part 2  
RSS-Gen Issue 5  
(Others refer to chapter 3.1)  
**Sample Arrival Date:** Apr. 10, 2025  
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## ISSUED BY:

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### Revision History

Version	Issue Date	Revisions Content
<u>Rev. 01</u>	<u>Jun. 3, 2025</u>	<u>Initial Issue</u>

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# 1 GENERAL INFORMATION

## 1.1 Test Laboratory

Name	Shanghai Tejet Communications Technology Co., Ltd. Testing Center
Address	1-2/F., Building 1, No.222, Xuanlan Road, Xuanqiao, Pudong New District, Shanghai, China

## 1.2 Test Location

Name	Shanghai Tejet Communications Technology Co., Ltd. Testing Center
Location	1-2/F., Building 1, No.222, Xuanlan Road, Xuanqiao, Pudong New District, Shanghai, China
Accreditation Certificate	The laboratory is a testing organization accredited by FCC as a accredited testing laboratory.The designation number is CN1352. The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements.The company number is 29671 and CAB identifier number is CN0142.

## 2 PRODUCT INFORMATION

### 2.1 Applicant Information

Applicant	NAYAX LTD
Address	3 Arik Einstein St., 1st Floor, Herzliya, 4659071, Israel

### 2.2 Manufacturer Information

Manufacturer	NAYAX LTD
Address	3 Arik Einstein St., 1st Floor, Herzliya, 4659071, Israel

### 2.3 Factory Information

Factory	N/A
Address	N/A

### 2.4 General Description for Equipment under Test (EUT)

EUT Name	POS Payment Device			
Model Name Under Test	VPOSMS			
Series Model Name	VPOSMS-CLS,VPOSMS-FM			
Description of Model name differentiation	Model name	VPOSMS	VPOSMS-CLS	VPOSMS-FM
	Machine Head	Yellow	Yellow or Black	Yellow
	External charging board	VPOSMS	VPOSMS-CUBE	VPOSMS-CUBE
	Enclosure Structure	Structure1	Structure2	Structure3
Except for the above differences, all other information is the same (this information provided by the customer).				
Sample No	SC-SH2540026-S08			
Hardware Version	VPOSMSx415223xxxx			
Software Version	6202.30.xxxx.xxx.xxx			
Dimensions (Approx.)	N/A			
Weight (Approx.)	N/A			

## 2.5 Technical Information

Network and Wireless connectivity for EUT	2G Network GPRS/EDGE850/1900MHz 3G Network WCDMA/HSDPA/HSUPA Band2/4/5 4G Network FDD LTE Band 2/4/5/7/12/17 TDD LTE Band38/41 Bluetooth(BR+EDR+BLE+HS3.0) 2.4G WiFi 802.11b,802.11g,802.11n(HT20) 5G WiFi 802.11a,802.11n(HT20/40), 5.8G SRD,GPS, BeiDou, GLONASS, NFC
About the Product	The equipment is Smart POS Terminal, intended for used with information technology equipment.

The following is the technical information of the EUT tested frequency bands in this report.

Operating Bands	GSM/GPRS/EGPRS 850/1900 MHz WCDMA/HSDPA/HSUPA Band 2/4/5 FDD LTE Band 2/4/5/7/12/17 TDD LTE Band 38/41	
Modulation Type	GSM/GPRS	GMSK
	EGPRS	8PSK
	WCDMA	QPSK
	HSDPA	QPSK
	/HSUPA	16QAM
	LTE	QPSK/16QAM
Multislot Class	GPRS/EGPRS: 12	
Antenna Type	PIFA Antenna	
Antenna Gain	GSM/GPRS/EGPRS 850: -1.07 dBi GSM/GPRS/EGPRS 1900: -0.25 dBi WCDMA/HSDPA/HSUPA Band 2: 0.26 dBi WCDMA/HSDPA/HSUPA Band 4: -1.8 dBi WCDMA/HSDPA/HSUPA Band 5: -1.07 dBi FDD LTE Band 2: -0.26 dBi FDD LTE Band 4: -1.8 dBi FDD LTE Band 5: -1.07 dBi FDD LTE Band 7: 1.87 dBi FDD LTE Band 12: -1.87 dBi FDD LTE Band 17: -1.87 dBi TDD LTE Band 38: 2.56 dBi TDD LTE Band 41: 2.59 dBi	
The Max RF Output Power (EIRP/ERP)	GSM/GPRS/EGPRS 850: 30.83 dBm GSM/GPRS/EGPRS 1900: 31.66 dBm WCDMA/HSDPA/HSUPA Band 2: 23.28 dBm WCDMA/HSDPA/HSUPA Band 4: 21.10 dBm	

			WCDMA/HSDPA/HSUPA Band 5: 19.84 dBm FDD LTE Band 2: 23.87 dBm FDD LTE Band 4: 23.69 dBm FDD LTE Band 5: 23.31 dBm FDD LTE Band 7: 23.88 dBm FDD LTE Band 12: 23.43 dBm FDD LTE Band 17: 23.37 dBm TDD LTE Band 38: 24.47 dBm TDD LTE Band 41: 24.78 dBm	
Band	Power Class		Tx Frequency Range	Rx Frequency Range
	GMSK	8PSK		
GSM850	4	E2	824 MHz ~ 849 MHz	869 MHz ~ 894 MHz
GSM1900	1	E2	1850 MHz ~ 1910 MHz	1930 MHz ~ 1990 MHz
WCDMA B2	3		1850 MHz ~ 1910 MHz	1930 MHz ~ 1990 MHz
WCDMA B4	3		1710 MHz ~ 1755 MHz	2110 MHz ~ 2155 MHz
WCDMA B5	3		824 MHz ~ 849 MHz	869 MHz ~ 894 MHz
LTE B2	3		1850 MHz ~ 1910 MHz	1930 MHz ~ 1990 MHz
LTE B4	3		1710 MHz ~ 1755 MHz	2110 MHz ~ 2155 MHz
LTE B5	3		824 MHz ~ 849 MHz	869 MHz ~ 894 MHz
LTE B7	3		2500 MHz ~ 2570 MHz	2620 MHz ~ 2690 MHz
LTE B12	3		699 MHz ~ 716 MHz	729 MHz ~ 746 MHz
LTE B17	3		704 MHz ~ 716 MHz	734 MHz ~ 746 MHz
LTE B38	3		2570 MHz ~ 2620 MHz	2570 MHz ~ 2620 MHz
LTE B41	3		2496 MHz ~ 2690 MHz	2496 MHz ~ 2690 MHz

Note1: The EUT information provided by the applicant, except for The Max RF Conducted Power. For more detailed band specifications and features description, please refer to the manufacturer's specifications or user's manual.

### 3 SUMMARY OF TEST RESULTS

#### 3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 2	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
2	47 CFR Part 22 Subpart H	Cellular Radiotelephone Service
3	47 CFR Part 24 Subpart E	Broadband PCS
4	47 CFR Part 27	Miscellaneous Wireless Communications Services
5	RSS-Gen Issue5	General Requirements and Information for the Certification of Radio Apparatus
6	RSS-130 Issue2	Equipment Operating in the Frequency Bands 617-652 MHz, 663-698 MHz, 698-756 MHz and 777-787 MHz
7	RSS-132 Issue4	Cellular Telephone Systems Operating in the Bands 824-849 MHz and 869-894 MHz
8	RSS-133 Issue7	2 GHz Personal Communications Services
9	RSS-139 Issue4	Advanced Wireless Services (AWS) Equipment Operating in the Bands 1710-1780 MHz and 2110-2200 MHz
10	RSS-199 Issue4	Broadband Radio Service (BRS) Equipment Operating in the Band 2500-2690 MHz
11	ANSI C63.4-2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
12	ANSI C63.26-2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
13	KDB 971168 D01 v03	Measurement Guidance for Certification of Licensed Digital Transmitters



### 3.2 Test Verdict

No.	Test Description	FCC Part No.	ISED Part No.	Test Result	Test Verdict
1	Conducted RF Output Power	2.1046	RSS-Gen 6.12 RSS-130 4.6 RSS-132 5.4 RSS-133 5.5 RSS-139 5.5 RSS-199 4.4	Reporting only (ANNEX A.1)	Pass
2	Effective (Isotropic) Radiated Power	2.1046 22.913 24.232 27.50	RSS-Gen 6.12 RSS-130 4.6 RSS-132 5.4 RSS-133 5.5 RSS-139 5.5 RSS-199 4.4	ANNEX A.1	Pass
3	Peak to Average Ratio	2.1046 22.913 24.232(d) 27.50(d)	RSS-130 4.6 RSS-132 5.4 RSS-133 5.5 RSS-139 5.5 RSS-199 4.4	ANNEX A.2	Pass
4	Occupied Bandwidth	2.1049 22.917 24.238 27.53	RSS-Gen 6.7	ANNEX A.3	Pass
5	Frequency Stability	2.1055 22.355 24.235 27.54	RSS-Gen 6.11 RSS-130 4.5 RSS-132 5.3 RSS-133 5.4 RSS-139 5.4 RSS-199 4.3	ANNEX A.4	Pass
6	Spurious Emission at Antenna Terminals	2.1051 22.917 24.238 27.53	RSS-Gen 6.13 RSS-130 4.7 RSS-132 5.5 RSS-133 5.6 RSS-139 5.6 RSS-199 4.5	ANNEX A.5	Pass
7	Band Edge	2.1051 22.917 24.238 27.53	RSS-130 4.7 RSS-132 5.5 RSS-133 5.6 RSS-139 5.6 RSS-199 4.5	ANNEX A.6	Pass
8	Field Strength of Spurious Radiation	2.1053 22.917	RSS-Gen 6.13 RSS-130 4.7	ANNEX A.7	Pass

No.	Test Description	FCC Part No.	ISED Part No.	Test Result	Test Verdict
		24.238 27.53	RSS-132 5.5 RSS-133 5.6 RSS-139 5.6 RSS-199 4.5		
9	Receiver Spurious Emissions	N/A	RSS-Gen 7	ANNEX A.8	Pass
10	AC Power-line Conducted Emissions	N/A	RSS-Gen 8.8	N/A	N/A(Note2)

**Note :**

The device is not designed to directly or indirectly connect to public utility AC power network, hence AC Power-line Conducted Emissions is not tested.

### 3.3 Measurement Uncertainty

Test Case	Uncertainty
Conducted RF Output Power	0.68dB
Effective (Isotropic) Radiated Power	2.50dB
Peak to Average Ratio	0.015%
Occupied Bandwidth	1.4/3MHz: 30kHz 5/10MHz: 100KHZ 15/20MHz: 300kHz
Frequency Stability	12Hz
Spurious Emission at Antenna Terminal0073	2.56dB
Band Edge	1.48dB
Field Strength of Spurious Radiation	4.55dB

### 3.4 Decision Rule

☐ No Need

☒ Use General conformity decision rule (Consider uncertainty or not ☒ No ☐ Yes)

☐ Use Special Conformity Decision Rule (Consider uncertainty or not ☐ No ☐ Yes)

## 4 GENERAL TEST CONFIGURATIONS

### 4.1 Test Environments

During the measurement, the environmental conditions were within the listed ranges:

Relative Humidity		25% to 75%
Test Voltage of the EUT	NV (Normal Voltage)	24V
	LV (Low Voltage)	12V
	HV (High Voltage)	42V
Test Temperature of the EUT	NT (Normal Temperature)	15 °C to 35 °C
	LT (Low Temperature)	-30 °C
	HT (High Temperature)	+65 °C

### 4.2 Test Equipment List

Description	Manufacturer	Model	Equipment No.	Software /Firmware Version	Cal. Date	Cal. Due
<b>BL410 2G/3G/4G/5G RF Test System</b>						
Wideband Radio Communication Tester	R&S	CMW 500	BH-EMC-L06 4	V3.7.60	2025/2/12	2026/2/12
PSA Spectrum Analyzer	Agilent	E4440A	TJEMC013	A.11.07	2025/4/6	2026/4/6
Signal Generator	Keysight	N5173B	BH-EMC-L07 4	B.01.90	2025/2/12	2026/2/12
DC Power Supply	ITECH	IT6863A	BH-EMC-L11 3	N/A	2025/2/12	2026/2/12
Filter unit	BALUN	SU319F	BH-EMC-L07 7	N/A	N/A	N/A
Filter unit	BALUN	SU319F	BH-EMC-L07 8	N/A	N/A	N/A
Filter unit	BALUN	SU319F	BH-EMC-L12 2	N/A	N/A	N/A
Switch unit	BALUN	SU319	BH-EMC-L07 6	N/A	N/A	N/A
Wireless Communication Comprehensive Tester	Starpoint	SP9500-CTS	BH-EMC-L09 3	NA	2025/2/12	2026/2/12
Test Software	BALUN	BL410R	NA	V3.0.1.539	N/A	N/A
<b>Radiated Test System</b>						

Test Antenna-Bi-Log	SCHWARZBECK	VULB 9163	BH-EMC-L008	NA	2024/3/11	2027/3/10
Test Antenna-Horn	Schwarzbeck	BBHA 9120D	BH-EMC-L044	NA	2024/3/11	2027/3/10
Anechoic Chamber	YIHENG	9m*6m*6m	BH-EMC-L001	NA	2024/4/14	2027/4/13
EMI Receiver	KEYSIGHT	N9038A	BH-EMC-L015	A.21.06	2024/7/9	2025/7/9
Wideband Radio Communication Tester	R&S	CMW 500	BH-EMC-L094	V3.7.172	2025/2/12	2026/2/11
Radio Communication Analyzer	Anritsu	MT8000A	TJOTA080	N/A	2025/4/23	2026/4/23
Test Software	BALUN	BL410-E	NA	V21.919	N/A	N/A

### 4.3 Test Configurations

Test Items	Test Mode	Test Channel		
		LCH	MCH	HCH
Effective (Isotropic) Radiated Power	GSM 850	v	v	v
	GSM 1900	v	v	v
	GPRS 850	v	v	v
	GPRS 1900	v	v	v
	EGPRS 850	v	v	v
	EGPRS 1900	v	v	v
	WCDMA Band 2	v	v	v
	WCDMA Band 4	v	v	v
	WCDMA Band 5	v	v	v
	HSDPA Band 2	v	v	v
	HSDPA Band 4	v	v	v
	HSDPA Band 5	v	v	v
	HSUPA Band 2	v	v	v
	HSUPA Band 4	v	v	v
	HSUPA Band 5	v	v	v
Peak to Average Ratio	WCDMA Band 2	v	v	v
	WCDMA Band 4	v	v	v
	WCDMA Band 5	v	v	v
Occupied Bandwidth	GSM 850	v	v	v
	GSM 1900	v	v	v
	EGPRS 850	v	v	v
	EGPRS 1900	v	v	v
	WCDMA Band 2	v	v	v
	WCDMA Band 4	v	v	v
	WCDMA Band 5	v	v	v
Frequency Stability	GSM 850	v	v	v
	GSM 1900	v	v	v
	GPRS 850	v	v	v
	GPRS 1900	v	v	v
	EGPRS 850	v	v	v
	EGPRS 1900	v	v	v
	WCDMA Band 2	v	v	v
	WCDMA Band 4	v	v	v
	WCDMA Band 5	v	v	v
Spurious Emission at Antenna Terminals	GSM 850	v	v	v
	GSM 1900	v	v	v
	EGPRS 850	v	v	v
	EGPRS 1900	v	v	v
	WCDMA Band 2	v	v	v

Test Items	Test Mode	Test Channel		
		LCH	MCH	HCH
	WCDMA Band 4	v	v	v
	WCDMA Band 5	v	v	v
Band Edge	GSM 850	v	--	v
	GSM 1900	v	--	v
	EGPRS 850	v	--	v
	EGPRS 1900	v	--	v
	WCDMA Band 2	v	--	v
	WCDMA Band 4	v	--	v
	WCDMA Band 5	v	--	v
Field Strength of Spurious Radiation	GSM 850	v	v	v
	GSM 1900	v	v	v
	EGPRS 850	v	v	v
	EGPRS 1900	v	v	v
	WCDMA Band 2	v	v	v
	WCDMA Band 4	v	v	v
	WCDMA Band 5	v	v	v
Note 1: The mark "v" means that this configuration is chosen for testing.				

Test Mode	UL Channel	UL Channel No.	UL Frequency (MHz)
GSM/GPRS/EGPRS 850	Low Channel	128	824.2
	Middle Channel	190	836.6
	High Channel	251	848.8
GSM/GPRS/EGPRS 1900	Low Channel	512	1850.2
	Middle Channel	661	1880.0
	High Channel	810	1909.8
WCDMA Band 2	Low Channel	9262	1852.4
	Middle Channel	9400	1880.0
	High Channel	9538	1907.6
WCDMA Band 4	Low Channel	1312	1712.4
	Middle Channel	1412	1732.4
	High Channel	1513	1752.
WCDMA Band 5	Low Channel	4132	826.4
	Middle Channel	4182	836.4
	High Channel	4233	846.6

LTE Band	Bandwidth (MHz)						Modulation Type		RB#			Test Channel		
	1.4	3	5	10	15	20	QPSK	16-QAM	1	Half	Full	LCH	MCH	HCH
Effective (Isotropic) Radiated Power														
2	v	v	v	v	v	v	v	v	v	v	v	v	v	v
4	v	v	v	v	v	v	v	v	v	v	v	v	v	v
5	v	v	v	v	n	n	v	v	v	v	v	v	v	v
7	n	n	v	v	v	v	v	v	v	v	v	v	v	v
12	v	v	v	v	n	n	v	v	v	v	v	v	v	v
17	n	n	v	v	n	n	v	v	v	v	v	v	v	v
38	n	n	v	v	v	v	v	v	v	v	v	v	v	v
41	n	n	v	v	v	v	v	v	v	v	v	v	v	v
Peak to Average Ratio														
2	--	--	--	--	--	v	v	v	v	--	v	v	v	v
4	--	--	--	--	--	v	v	v	v	--	v	v	v	v
5	--	--	--	v	n	n	v	v	v	--	v	v	v	v
7	n	n	--	--	--	v	v	v	v	--	v	v	v	v
12	--	--	--	v	n	n	v	v	v	--	v	v	v	v
17	n	n	--	v	n	n	v	v	v	--	v	v	v	v
38	n	n	--	--	--	v	v	v	v	--	v	v	v	v
41	n	n	--	--	--	v	v	v	v	--	v	v	v	v
Occupied Bandwidth														
2	v	v	v	v	v	v	v	v	--	--	v	v	v	v
4	v	v	v	v	v	v	v	v	--	--	v	v	v	v
5	v	v	v	v	n	n	v	v	--	--	v	v	v	v
7	n	n	v	v	v	v	v	v	--	--	v	v	v	v
12	v	v	v	v	n	n	v	v	--	--	v	v	v	v
17	n	n	v	v	n	n	v	v	--	--	v	v	v	v
38	n	n	v	v	v	v	v	v	--	--	v	v	v	v
41	n	n	v	v	v	v	v	v	--	--	v	v	v	v
Frequency Stability														
2	--	--	v	--	--	--	v	v	--	--	v	--	v	--
4	--	--	v	--	--	--	v	v	--	--	v	--	v	--
5	--	--	v	--	n	n	v	v	--	--	v	--	v	--
7	n	n	v	--	--	--	v	v	--	--	v	--	v	--
12	--	--	v	--	n	n	v	v	--	--	v	--	v	--
17	n	n	v	--	n	n	v	v	--	--	v	--	v	--
38	n	n	v	--	--	--	v	v	--	--	v	--	v	--
41	n	n	v	--	--	--	v	v	--	--	v	--	v	--
Spurious Emission at Antenna Terminals														
2	v	v	v	v	v	v	v	v	v	--	--	v	v	v
4	v	v	v	v	v	v	v	v	v	--	--	v	v	v
5	v	v	v	v	n	n	v	v	v	--	--	v	v	v
7	n	n	v	v	v	v	v	v	v	--	--	v	v	v

LTE Band	Bandwidth (MHz)						Modulation Type		RB#			Test Channel		
	1.4	3	5	10	15	20	QPSK	16-QAM	1	Half	Full	LCH	MCH	HCH
12	v	v	v	v	n	n	v	v	v	--	--	v	v	v
17	n	n	v	v	n	n	v	v	v	--	--	v	v	v
38	n	n	v	v	v	v	v	v	v	--	--	v	v	v
41	n	n	v	v	v	v	v	v	v	--	--	v	v	v
Band Edge														
2	v	v	v	v	v	v	v	v	v	--	v	v	--	v
4	v	v	v	v	v	v	v	v	v	--	v	v	--	v
5	v	v	v	v	n	n	v	v	v	--	v	v	--	v
7	n	n	v	v	v	v	v	v	v	--	v	v	--	v
12	v	v	v	v	n	n	v	v	v	--	v	v	--	v
17	n	n	v	v	n	n	v	v	v	--	v	v	--	v
38	n	n	v	v	v	v	v	v	v	--	v	v	--	v
41	n	n	v	v	v	v	v	v	v	--	v	v	--	v
Field Strength of Spurious Radiation														
2	Worst case													
4	Worst case													
5	Worst case													
7	Worst case													
12	Worst case													
17	Worst case													
38	Worst case													
41	Worst case													
Note 1: The mark “v” means that this configuration is chosen for testing.														
Note 2: The mark “n” means that this bandwidth is not supported.														

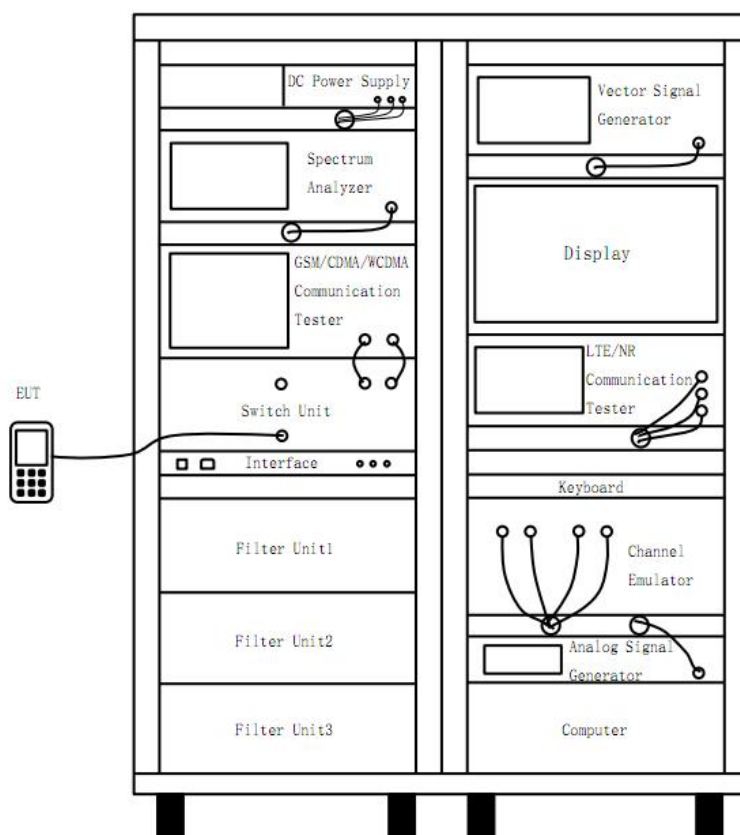


Test Mode	UL Channel	Channel Bandwidth (MHz)	UL Channel No.	UL Frequency (MHz)
LTE Band 2	Low Range	1.4	18607	1850.7
		3	18615	1851.5
		5	18625	1852.5
		10	18650	1855
		15	18675	1857.5
		20	18700	1860
	Middle Range	1.4/3/5/10/15/20	18900	1880
	High Range	1.4	19193	1909.3
		3	19185	1908.5
		5	19175	1907.5
		10	19150	1905
		15	19125	1902.5
		20	19100	1900
LTE Band 4	Low Range	1.4	19957	1710.7
		3	19965	1711.5
		5	19975	1712.5
		10	20000	1715
		15	20025	1717.5
		20	20050	1720
	Middle Range	1.4/3/5/10/15/20	20175	1732.5
	High Range	1.4	20393	1754.3
		3	20385	1753.5
		5	20375	1752.5
		10	20350	1750
		15	20325	1747.5
		20	20300	1745
LTE Band 5	Low Range	1.4	20407	824.7
		3	20415	825.5
		5	20425	826.5
		10	20450	829
	Middle Range	1.4/3/5/10	20525	836.5
	High Range	1.4	20643	848.3
		3	20635	847.5
		5	20625	846.5
		10	20600	844
LTE Band 7	Low Range	5	20775	2502.5
		10	20800	2505
		15	20825	2507.5
		20	20850	2510
	Middle Range	5/10/15/20	21100	2535
	High Range	5	21425	2567.5

Test Mode	UL Channel	Channel Bandwidth (MHz)	UL Channel No.	UL Frequency (MHz)
		10	21400	2565
		15	21375	2562.5
		20	21350	2560
LTE Band 12	Low Range	1.4	23017	699.7
		3	23025	700.5
		5	23035	701.5
		10	23060	704
	Middle Range	1.4/3/5/10	23095	707.5
	High Range	1.4	23173	715.3
		3	23165	714.5
		5	23155	713.5
		10	23130	711
LTE Band 17	Low Range	5	23755	706.5
		10	23780	709
	Middle Range	5/10	23790	710
	High Range	5	23825	713.5
		10	23800	711
LTE Band 38	Low Range	5	37775	2572.5
		10	37800	2575
		15	37825	2577.5
		20	37850	2580
	Middle Range	5/10/15/20	38000	2595
	High Range	5	38225	2617.5
		10	38200	2615
		15	38175	2612.5
		20	38150	2610
LTE Band 41(full)	Low Range	5	39675	2498.5
		10	39700	2501
		15	39725	2503.5
		20	39750	2506
	Middle Range	5/10/15/20	40620	2593
	High Range	5	41565	2687.5
		10	41540	2685
		15	41515	2682.5
		20	41490	2680

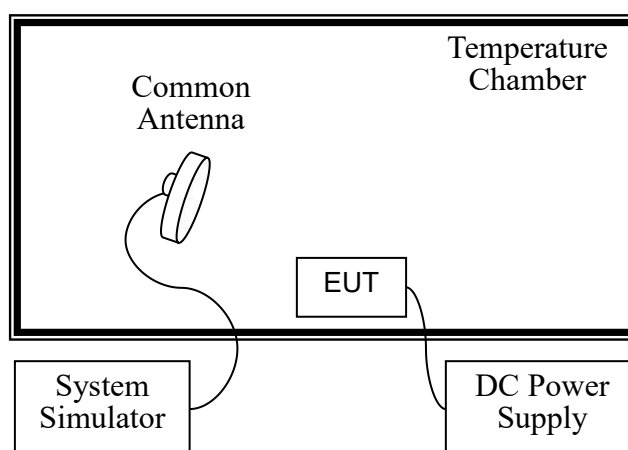
## 4.4 Test Setup

### 4.4.1 For Antenna Port Test



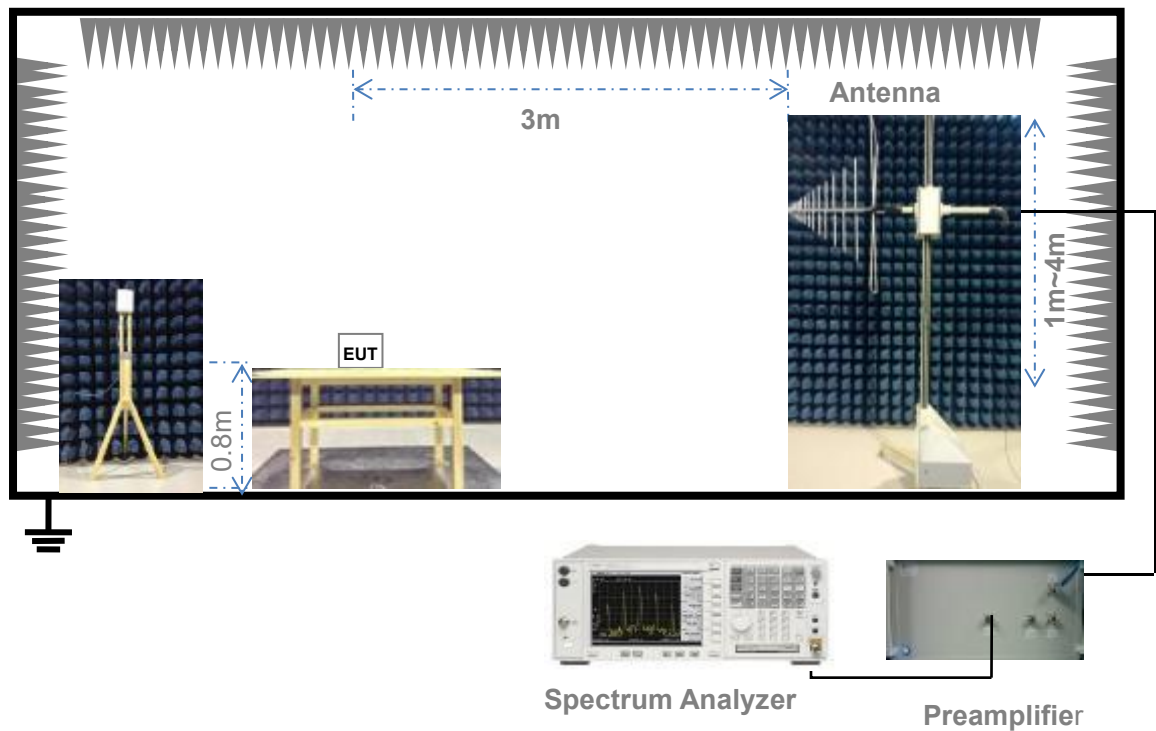
(Diagram 1)

### 4.4.2 For Frequency Stability Test



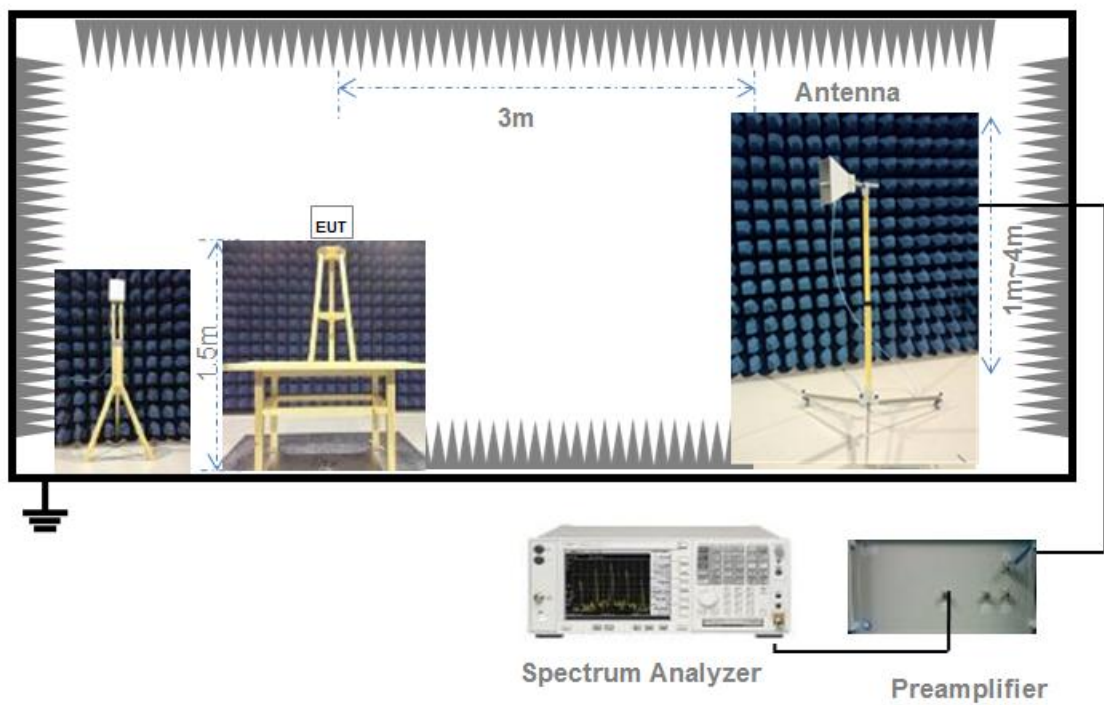
(Diagram 2)

#### 4.4.3 For Radiated Test (30 MHz ~ 1 GHz)



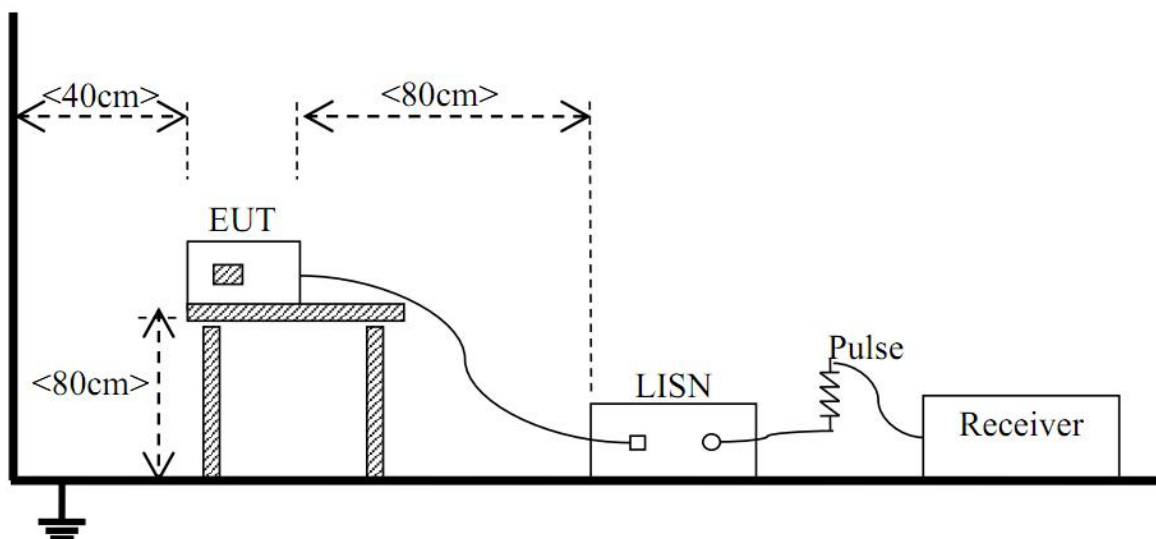
(Diagram 3)

#### 4.4.4 For Radiated Test (Above 1 GHz)



(Diagram 4)

## 4.4.5 For AC Power-line Conducted Emissions



(Diagram 5)

## 5 TEST ITEMS

### 5.1 Transmitter Radiated Power (EIRP/ERP)

#### 5.1.1 Limit

FCC § 2.1046 & 22.913(a) & 24.232(c) & 27.50(a) & 27.50(b) & 27.50(c) & 27.50(d) & 27.50(h) & 27.50(j) & 27.50(k)

According to FCC section 22.913(a) (5), the Effective Radiated Power (ERP) of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

According to FCC section 24.232(c), mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

According to FCC section 27.50(a) (3), for mobile and portable stations transmitting in the 2305-2315MHz band or the 2350-2360MHz 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. 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.

FCC section 27.50(b) (10), portable stations (hand-held devices) transmitting in the 746-757MHz, 776-788MHz, and 805-806MHz bands are limited to 3 watts ERP.

FCC section 27.50(c) (10), portable stations (hand-held devices) in the 600MHz uplink band and the 698-746MHz band, and fixed and mobile stations in the 600MHz uplink band are limited to 3 watts ERP.

FCC section 27.50(d) (4), fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP. Fixed stations operating in the 1710-1755 MHz band are limited to a maximum antenna height of 10 meters above ground. Mobile and portable stations operating in these bands must employ a means for limiting power to the minimum necessary for successful communications.

(7) Fixed, mobile, and portable (hand-held) stations operating in the 2000-2020 MHz band are limited to 2 watts EIRP.

And FCC section 27.50(h) (2), for mobile and other user stations, mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

FCC section 27.50(j) (3), for mobile, and portable (hand-held) stations operating in the 3700-3980 MHz band are limited to 1 watt EIRP.

FCC section 27.50(k) (3), Mobile devices are limited to 1Watt (30 dBm) EIRP in the 3450-3550 MHz band.

RSS-Gen § 6.12 & RSS-130 § 4.6 & RSS-132 § 5.4 & RSS-133 § 5.5 & RSS-139& RSS-199 § 5.5

According to RSS-130 § 4.6.3, The e.r.p. shall not exceed 30 watts for mobile equipment and outdoor fixed subscriber equipment. The e.r.p. shall not exceed 3 watts for portable equipment and indoor fixed subscriber equipment.

According to RSS-132 § 5.4, The equivalent radiated power (e.r.p.) shall not exceed 7 watts for mobile equipment and 3 watts for portable equipment.

According to RSS-133 § 5.5 (SRSP 510), the EIRP for mobile stations and hand-held portables is limited to 2 watts/channel bandwidth.

According to RSS-139 § 5.5, the EIRP for mobile and portable transmitters shall not exceed 1 watt/channel bandwidth.

According to RSS-199 § 4.4, for mobile subscriber equipment, the EIRP shall not exceed 2 watts.

### 5.1.2 Test Setup

The section 4.4.1 (Diagram 1) test setup description is used for conducted test, and the section 4.4.3 and 4.4.4 (Diagram 3, 4) test setup description is used for radiated test. The photo of test setup please refer to ANNEX B.

### 5.1.3 Test Procedure

#### **Description of the Conducted Output Power Measurement**

The EUT is coupled to the SS with attenuator through power splitter; the RF load attached to EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. A system simulator is used to establish communication with the EUT, and its parameters are set to force the EUT transmitting at maximum output power. The measured power in the radio frequency on the transmitter output terminals shall be reported.

The relevant equation for determining the conducted measured value is:

Conducted Output Power Value (dBm) = Measured Value (dBm) + Path Loss (dB)

where:

Conducted Output Power Value = final conducted measured value in the conducted power test, in dBm;

Measured Value = measured conducted power received by spectrum analyzer or power meter, in dBm;

Path Loss = signal attenuation in the connecting cable between the transmitter and spectrum analyzer or power meter, including external cable loss, in dB;

During the test, the data of Path Loss (dB) is added in the spectrum analyzer or power meter, so Measured Value (dBm) is the final values which contains the data of Path Loss (dB).

For example:

In the conducted output power test, when measured value for GSM850 is 24.7 dBm, and path loss is 8.5 dB, then final conducted output power value is:

Conducted Output Power Value (dBm) = 24.7 dBm + 8.5 dB = 33.2 dBm

### **Description of the Transmitter Radiated Power Measurement**

In many cases, the RF output power limits for licensed digital transmission devices is specified in terms of effective radiated power (ERP) or equivalent isotropic radiated power (EIRP). Typically, ERP is specified when the operating frequency is less than or equal to 1 GHz and EIRP is specified when the operating frequency is greater than 1 GHz. Both are determined by adding the transmit antenna gain to the conducted RF output power with the primary difference between the two being that when determining the ERP, the transmit antenna gain is referenced to a dipole antenna (i.e., dBd) whereas when determining the EIRP, the transmit antenna gain is referenced to an isotropic antenna (dBi).

Final measurement calculation as below:

The relevant equation for determining the ERP or EIRP from the conducted RF output power measured using the guidance provided above is:

$$\text{ERP/EIRP} = P_{\text{Meas}} + \text{GT} - \text{LC}$$

where:

ERP/EIRP = effective or equivalent radiated power, respectively (expressed in the same units as  $P_{\text{Meas}}$ , typically dBW or dBm);

$P_{\text{Meas}}$  = measured transmitter output power or PSD, in dBm or dBW;

GT = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP);

dBd (ERP)=dBi (EIRP) -2.15 dB

LC = signal attenuation in the connecting cable between the transmitter and antenna, in dB.

For devices utilizing multiple antennas, KDB 662911 provides guidance for determining the effective array transmit antenna gain term to be used in the above equation.

For example:

In the EIRP test, when  $P_{\text{Meas}}$  value for GSM1900 is 30.2 dBm, LC is 0.6 dB, and GT is -3.4 dB, then final EIRP value is:

$$\text{EIRP for GSM1900} = 30.2 \text{ dBm} - 3.4 \text{ dBi} - 0.6 \text{ dB} = 26.2 \text{ dBm}$$

The relevant equation for determining the ERP/EIRP from the radiated RF output power is:

$$\text{ERP/EIRP (dBm)} = \text{SA Read Value (dBm)} + \text{Correction Factor (dB)}$$

where:

ERP/EIRP = effective or equivalent radiated power, in dBm;

SA Read Value = measured transmitter power received by EMI receiver or spectrum analyzer, in dBm;

Correction Factor = total correction factor including cable loss, in dB;



During the test, the data of Correction Factor (dB) is added in the EMI receiver or spectrum analyzer, so SA Read Value (dBm) is the final values which contains the data of Correction Factor (dB).

For example:

In the ERP test, when SA read value for GSM850 is 21dBm, and correction factor is 8dB, then final ERP value for GSM850 is:

$$\text{ERP (dBm)} = 21\text{dBm} + 8\text{dB} = 29\text{dBm}$$

#### 5.1.4 Test Result

Please refer to ANNEX A.1.

## 5.2 Peak to Average Ratio

### 5.2.1 Limit

FCC § 2.1046 & 22.913(d) & 24.232(d) & 27.50(d) & 27.50(j) & 27.50(k)

In addition, when the transmitter power is measured in terms of average value, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time using a signal corresponding to the highest PAPR during periods of continuous transmission.

According to 22.913(d), Measurement of the ERP of Cellular base transmitters and repeaters must be made using an average power measurement technique. The peak-to-average ratio (PAR) of the transmission must not exceed 13 dB.

According to FCC section 24.232(d), power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with 24.232 (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of § 24.51. 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.

FCC section 24.232(e), peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel.

According to FCC section 27.50(d) (5) & 27.50(j) & 27.50(k), in measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13dB.

RSS-130 § 4.6 & RSS-132 § 5.4 & RSS-133 § 5.5 & RSS-139 § 5.5 & RSS-199

According to RSS-130 § 4.6.1, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time and shall use a signal corresponding to the highest PAPR during periods of continuous transmission.

According to RSS-132 § 5.4, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time using a signal corresponding to the highest PAPR during periods of continuous transmission.

According to RSS-133 § 5.5, the peak-to-average power ratio (PAPR) of the equipment shall not exceed 13 dB for more than 0.1% of the time using a signal corresponding to the highest PAPR during periods of continuous transmission.

According to RSS-139 § 5.5, the peak to average power ratio (PAPR) of the equipment shall not exceed 13 dB for more than 0.1% of the time, using a signal that corresponds to the highest PAPR during periods of continuous transmission.

### 5.2.2 Test Setup

The section 4.4.1 (Diagram 1) test setup description is used for this test. The photo of test setup please refer to ANNEX B.

### 5.2.3 Test Procedure

Here the lowest, middle and highest channels are selected to perform testing to verify the peak-to-average ratio.

According to KDB 971168 D01, there is CCDF procedure for PAPR:

- a) Refer to instrument's analyzer instruction manual for details on how to use the power statistics/CCDF function;
- b) Set resolution/measurement bandwidth  $\geq$  signal's occupied bandwidth;
- c) Set the number of counts to a value that stabilizes the measured CCDF curve;
- d) Set the measurement interval as follows:
  - 1) for continuous transmissions, set to 1 ms,
  - 2) for burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize and set the measurement interval to a time that is less than or equal to the burst duration.
- e) Record the maximum PAPR level associated with a probability of 0.1%.

Alternate procedure for PAPR:

Use one of the procedures presented in 4.1 to measure the total peak power and record as  $P_{PK}$ . Use one of the applicable procedures presented 4.2 to measure the total average power and record as  $P_{Avg}$ . Both the peak and average power levels must be expressed in the same logarithmic units (e.g., dBm). Determine the PAPR from:

$$PAPR (dB) = P_{PK} (dBm) - P_{Avg} (dBm).$$

### 5.2.4 Test Result

Please refer to ANNEX A.2.

## 5.3 Occupied Bandwidth

### 5.3.1 Limit

FCC § 2.1049

RSS-Gen § 6.7

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

Many of the individual rule parts specify a relative OBW in lieu of the 99% OBW. In such cases, the OBW is defined as the width of the signal between two points, one below the carrier center frequency and on above the carrier center frequency, outside of which all emissions are attenuated by at least X dB below the transmitter power, where the value of X is typically specified as 26.

### 5.3.2 Test Setup

The section 4.4.1 (Diagram 1) test setup description is used for this test. The photo of test setup please refer to ANNEX B.

### 5.3.3 Test Procedure

The following procedure shall be used for measuring power bandwidth.

- a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts (i.e., two to five times the anticipated OBW).
- b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1 to 5 % of the anticipated OBW, and the VBW shall be at least 3 times the RBW.
- c) Set the reference level of the instrument as required to keep the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope must be at least 10log (OBW / RBW) below the reference level.
- d) NOTE—Steps a) through c) may require iteration to adjust within the specified tolerances.
- e) For -26 dB OBW, the dynamic range of the spectrum analyzer at the selected RBW shall be at least 10dB below the target “-X dB down” requirement, e.g. -26 dB OBW, the spectrum analyzer noise floor at the selected RBW shall be 36dB below the reference value.
- f) Set the detection mode to peak, and the trace mode to max hold.
- g) For 99% OBW, use the 99 % power bandwidth function of the spectrum analyzer (if available) and report the measured bandwidth.

If the instrument does not have a 99 % power bandwidth function, the trace data points are to be recovered and directly summed in linear power terms. The recovered amplitude data points, beginning at

the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99 % power bandwidth is the difference between these two frequencies.

h) For -26 dB OBW, determine the reference value: Set the EUT to transmit a modulated signal. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value).

Determine the “-X dB down amplitude” as equal to (reference value -X). Alternatively, this calculation can be performed by the analyzer by using the marker-delta function.

Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display such that each marker is at or slightly below “-X dB down amplitude” determined in step g). If a marker is below this “-X dB down amplitude” value it shall be placed as close as possible to this value. The OBW is the positive frequency difference between the two markers.

i) The OBW shall be reported by providing plot(s) of the measuring instrument display. The frequency and amplitude axes and scale shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

j) Change variable modulations, coding, or channel bandwidth settings, then repeat above test procedures.

#### 5.3.4 Test Result

Please refer to ANNEX A.3.

## 5.4 Frequency Stability

### 5.4.1 Limit

FCC § 2.1055 & 22.355 & 24.235 & 27.54

RSS-Gen § 6.11 & RSS-130 § 4.5 & RSS-132 § 5.3 & RSS-133 § 5.4 & RSS-139 & RSS-199 § 5.4

RSS-Gen § 6.11

The frequency stability shall be measured with variation of ambient temperature as follows:

- (1) The temperature is varied from -30°C to +60°C.
- (2) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10°C through the range.

The frequency stability shall be measured with variation of primary supply voltage as follows:

- (1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than carried battery equipment.
- (2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating and point which shall be specified by the manufacture.
- (3) The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided.

RSS-199 § 4.3

The frequency stability shall be sufficient to ensure that the occupied bandwidth stays within the operating frequency block when tested to the temperature and supply voltage variations specified in RSS-Gen.

FCC § 22.355

Except as otherwise provided in this part, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table C-1 of this section.

**Table C-1—Frequency Tolerance for Transmitters in the Public Mobile Services**

Frequency range (MHz)	Base, fixed (ppm)	Mobile > 3 watts (ppm)	Mobile ≤ 3 watts (ppm)
25 to 50	20.0	20.0	50.0
50 to 450	5.0	5.0	50.0
450 to 512	2.5	5.0	5.0
821 to 896	1.5	2.5	2.5
928 to 929	5.0	n/a	n/a
929 to 960	1.5	n/a	n/a
2110 to 2220	10.0	n/a	n/a

FCC § 24.235

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

#### FCC § 27.54

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

#### RSS-130 § 4.5

The frequency stability shall be sufficient to ensure that the occupied bandwidth remains within each frequency block range when tested at the temperature and supply voltage variations specified in RSS-Gen.

#### RSS-132 § 5.3

The carrier frequency shall not depart from the reference frequency in excess of  $\pm 2.5$  ppm for mobile stations and  $\pm 1.5$  ppm for base stations.

#### RSS-133 § 5.4

The frequency stability shall be sufficient to ensure that the occupied bandwidth stays within the operating frequency block or frequency block group when tested to the temperature and supply voltage variations specified in RSS-Gen.

#### RSS-139 § 5.4

The frequency stability shall be sufficient to ensure that the occupied bandwidth stays within the operating frequency block when tested to the temperature and supply voltage variations specified in RSS-Gen.

### 5.4.2 Test Setup

The section 4.4.2 (Diagram 2) test setup description is used for this test. The photo of test setup please refer to ANNEX B.

### 5.4.3 Test Procedure

1. The EUT is placed in a temperature chamber.
2. The temperature is set to 25°C and allowed to stabilize. After sufficient soak time, the transmitting frequency error is measured.
3. The temperature is increased by not more than 10 degrees, allowed to stabilize and soak, and then repeat the frequency error measurement.

4. Repeat procedure 3 until +60°C and -30°C is reached.
5. Change supply voltage, and repeat measurement until extreme voltage is reached.

#### 5.4.4 Test Result

Please refer to ANNEX A.4.



## 5.5 Spurious Emission at Antenna Terminals

### 5.5.1 Limit

FCC § 2.1051 & 22.917(a) & 24.238(a) & 27.53(a) & 27.53(c) & 27.53(f) & 27.53(g) & 27.53(h) & 27.53(l) & 27.53(m) & 27.53(n)

RSS-Gen § 6.13 & RSS-130 § 4.7 & RSS-132 § 5.5 & RSS-133 § 5.6 & RSS-139 § 5.6 & RSS-199

In the 1 MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

FCC § 22.917(a) & 24.238(a) & RSS-132 § 5.5 & RSS-133 § 6.5

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. This is calculated to be -13 dBm.

FCC § 27.53(a) (4)

For mobile and portable stations operating in the 2305-2315MHz and 2350-2360MHz bands:

(1) By a factor of not less than:  $43 + 10 \log(P)$  dB on all frequencies between 2305 and 2320MHz and on all frequencies between 2345 and 2360MHz that are outside the licensed band(s) of operation, not less than  $55 + 10 \log(P)$  dB on all frequencies between 2320 and 2324MHz and on all frequencies between 2341 and 2345MHz, not less than  $61 + 10 \log(P)$  dB on all frequencies between 2324 and 2328MHz and on all frequencies between 2337 and 2341MHz, and not less than  $67 + 10 \log(P)$  dB on all frequencies between 2328 and 2337MHz.

(2) By a factor of not less than  $43 + 10 \log(P)$  dB on all frequencies between 2300 and 2305MHz,  $55 + 10 \log(P)$  dB on all frequencies between 2296 and 2300MHz,  $61 + 10 \log(P)$  dB on all frequencies between 2292 and 2296MHz,  $67 + 10 \log(P)$  dB on all frequencies between 2288 and 2292MHz, and  $70 + 10 \log(P)$  dB below 2288MHz.

(3) By a factor of not less than  $43 + 10 \log(P)$  dB on all frequencies between 2360 and 2365MHz, and not less than  $70 + 10 \log(P)$  dB above 2365MHz.

FCC § 27.53(c)

For operations in the 746–758 MHz band and the 776–788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On any frequency outside the 746–758 MHz band, the power of any emission shall be attenuated outside the

band below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB;

(2) On any frequency outside the 776–788 MHz band, the power of any emission shall be attenuated outside the

band below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB;

(3) On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than  $76 + 10 \log (P)$  dB in a 6.25 kHz band segment, for base and fixed stations;

(4) On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than  $65 + 10 \log (P)$  dB in a 6.25 kHz band segment, for mobile and portable stations;

(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater.

However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth

of at least 30 kHz may be employed;

(6) Compliance with the provisions of paragraphs (c)(3) and (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

#### FCC § 27.53(f)

For operations in the 746–758 MHz, 775–788 MHz, and 805–806 MHz bands, emissions in the band 1559–1610 MHz shall be limited to - 70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

#### FCC § 27.53(g)

For operations in the 600MHz band and the 698-746MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least  $43+10*\log(P)$  dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

#### FCC § 27.53(h) (1)

Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log_{10} (P)$  dB.

#### FCC § 27.53(l) (2)

For mobile operations in the 3700-3980 MHz band, the conducted power of any emission outside the

licensee's authorized bandwidth shall not exceed  $-13$  dBm/MHz.

FCC § 27.53(m) (4)

For mobile digital stations (BRS and EBS stations), the attenuation factor shall be not less than:

- $40+10\log P$  dB ( $-10$  dBm,  $100$  nW) on all frequencies between the channel edge and  $5$  MHz from the channel edge.
- $43+10\log P$  dB ( $-13$  dBm,  $50$  nW) on all frequencies between  $5$  MHz and  $X$  MHz from the channel edge,
- $55+10\log P$  dB ( $-25$  dBm,  $3$  nW) on all frequencies more than  $X$  MHz from the channel edge, where  $X$  is the greater of  $6$  MHz or the actual emission bandwidth ( $26$  dB).

In addition, the attenuation factor shall not be less than  $43 + 10 \log (P)$  dB on all frequencies between  $2490.5$  MHz and  $2496$  MHz and  $55 + 10 \log (P)$  dB at or below  $2490.5$  MHz. Mobile Satellite Service licensees operating on frequencies below  $2495$  MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

FCC § 27.53(n) (2)

For mobile operations in the  $3450$ - $3550$  MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed  $-13$  dBm/MHz.

RSS-132 § 5.5 & RSS-133 § 5.6

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. This is calculated to be  $-13$  dBm.

RSS-139 § 5.6

Except as otherwise specified below, for operations in the  $1695$ - $1710$  MHz,  $1710$ - $1755$  MHz,  $1755$ - $1780$  MHz,  $1915$ - $1920$  MHz,  $1995$ - $2000$  MHz,  $2000$ - $2020$  MHz,  $2110$ - $2155$  MHz,  $2155$ - $2180$  MHz, and  $2180$ - $2200$  bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power ( $P$ ) in watts by at least  $43 + 10 \log_{10} (P)$  dB.

RSS-130 § 4.7

The unwanted emissions in any  $100$  kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power,  $P$  (dBW), by at least  $43 + 10\log_{10}(P)$  (watts), dB. However, in the  $100$  kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of  $30$  kHz may be employed.

In addition to the limit outlined above, equipment operating in the frequency bands  $746$ - $756$  MHz and  $777$ - $787$  MHz shall also comply with the following restrictions:

- (a) The power of any unwanted emissions in any  $6.25$  kHz bandwidth for all frequencies between  $763$ - $775$  MHz and  $793$ - $806$  MHz shall be attenuated below the transmitter power,  $P$  (dBW), by at least:
- (i)  $76 + 10 \log_{10} p$  (watts), dB, for base and fixed equipment and
  - (ii)  $65 + 10 \log_{10} p$  (watts), dB, for mobile and portable equipment

(b) The e.i.r.p. in the band 1559-1610 MHz shall not exceed -70 dBW/MHz for wideband signal and -80 dBW for discrete emission with bandwidth less than 700 Hz.

### 5.5.2 Test Setup

The section 4.4.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

### 5.5.3 Test Procedure

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log(P)$  dB. Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency blocks a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

1. The EUT is coupled to the system simulator and spectrum analyzer; the RF load attached to EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading.
2. Base Station is used to establish communication with the EUT, and its parameters are set to force the EUT transmitting at maximum output power.
3. The RF output of the transmitter is connected to the input of the spectrum analyzer through sufficient attenuation.
4. Spurious emissions are tested with 0.001MHz RBW for frequency less than 150kHz, 0.01MHz RBW for frequency less than 30MHz, 0.1MHz RBW for frequency less than 1GHz, and 1MHz RBW for frequency above 1GHz. And sweep point number are at least 401, referring to following formula.

Sweep point number = Span/RBW

VBW=3\*RBW

Detector Mode=mean or average power

5. Record the frequencies and levels of spurious emissions.

### 5.5.4 Test Result

Please refer to ANNEX A.5.

## 5.6 Band Edge

### 5.6.1 Limit

FCC § 2.1051 & 22.917(a) & 24.238(a) & 27.53(a) & 27.53(c) & 27.53(g) & 27.53(h) & 27.53(l) & 27.53(m) & 27.53(n)

RSS-Gen § 6.13 & RSS-130 § 4.7 & RSS-132 § 5.5 & RSS-133 § 5.6 & RSS-139 § 5.6 & RSS-199

In the 1 MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

FCC § 22.917(a) & 24.238(a) & RSS-132 § 5.5 & RSS-133 § 5.6

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. This is calculated to be -13 dBm.

FCC § 27.53(a) (4)

For mobile and portable stations operating in the 2305-2315MHz and 2350-2360MHz bands:

(1) By a factor of not less than:  $43 + 10 \log(P)$  dB on all frequencies between 2305 and 2320MHz and on all frequencies between 2345 and 2360MHz that are outside the licensed band(s) of operation, not less than  $55 + 10 \log(P)$  dB on all frequencies between 2320 and 2324MHz and on all frequencies between 2341 and 2345MHz, not less than  $61 + 10 \log(P)$  dB on all frequencies between 2324 and 2328MHz and on all frequencies between 2337 and 2341MHz, and not less than  $67 + 10 \log(P)$  dB on all frequencies between 2328 and 2337MHz.

(2) By a factor of not less than  $43 + 10 \log(P)$  dB on all frequencies between 2300 and 2305MHz,  $55 + 10 \log(P)$  dB on all frequencies between 2296 and 2300MHz,  $61 + 10 \log(P)$  dB on all frequencies between 2292 and 2296MHz,  $67 + 10 \log(P)$  dB on all frequencies between 2288 and 2292MHz, and  $70 + 10 \log(P)$  dB below 2288MHz.

(3) By a factor of not less than  $43 + 10 \log(P)$  dB on all frequencies between 2360 and 2365MHz, and not less than  $70 + 10 \log(P)$  dB above 2365MHz.

FCC § 27.53(c)

For operations in the 746–758 MHz band and the 776–788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On any frequency outside the 746–758 MHz band, the power of any emission shall be attenuated outside the

band below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB;

(2) On any frequency outside the 776–788 MHz band, the power of any emission shall be attenuated outside the

band below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB;

(3) On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than  $76 + 10 \log (P)$  dB in a 6.25 kHz band segment, for base and fixed stations;

(4) On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than  $65 + 10 \log (P)$  dB in a 6.25 kHz band segment, for mobile and portable stations;

(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater.

However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth

of at least 30 kHz may be employed;

(6) Compliance with the provisions of paragraphs (c)(3) and (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

#### FCC § 27.53(g)

For operations in the 600MHz band and the 698-746MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least  $43+10*\log(P)$  dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

#### FCC § 27.53(h) (1) & RSS-139 § 5.6

Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log_{10} (P)$  dB.

#### FCC § 27.53(l) (2)

For mobile operations in the 3700-3980 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed  $-13$  dBm/MHz.

#### FCC § 27.53(m) (4)

For mobile digital stations (BRS and EBS stations), the attenuation factor shall be not less than:

- $40+10\log P$  dB ( $-10$  dBm, 100 nW) on all frequencies between the channel edge and 5 MHz from the channel edge.

- $43+10\log P$  dB ( $-13$  dBm,  $50$  nW) on all frequencies between  $5$  MHz and  $X$  MHz from the channel edge,
- $55+10\log P$  dB ( $-25$  dBm,  $3$  nW) on all frequencies more than  $X$  MHz from the channel edge, where  $X$  is the greater of  $6$  MHz or the actual emission bandwidth ( $26$  dB).

In addition, the attenuation factor shall not be less than  $43 + 10 \log (P)$  dB on all frequencies between  $2490.5$  MHz and  $2496$  MHz and  $55 + 10 \log (P)$  dB at or below  $2490.5$  MHz. Mobile Satellite Service licensees operating on frequencies below  $2495$  MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

#### FCC § 27.53(n) (2)

For mobile operations in the  $3450$ - $3550$  MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed  $-13$  dBm/MHz.

#### RSS-132 § 5.5 & RSS-133 § 5.6

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. This is calculated to be  $-13$  dBm.

#### RSS-139 § 5.6

Except as otherwise specified below, for operations in the  $1695$ - $1710$  MHz,  $1710$ - $1755$  MHz,  $1755$ - $1780$  MHz,  $1915$ - $1920$  MHz,  $1995$ - $2000$  MHz,  $2000$ - $2020$  MHz,  $2110$ - $2155$  MHz,  $2155$ - $2180$  MHz, and  $2180$ - $2200$  bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power ( $P$ ) in watts by at least  $43 + 10 \log_{10} (P)$  dB.

#### RSS-130 § 4.7

The unwanted emissions in any  $100$  kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power,  $P$  (dBW), by at least  $43 + 10\log_{10}(P)$  (watts), dB. However, in the  $100$  kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of  $30$  kHz may be employed.

In addition to the limit outlined above, equipment operating in the frequency bands  $746$ - $756$  MHz and  $777$ - $787$  MHz shall also comply with the following restrictions:

- The power of any unwanted emissions in any  $6.25$  kHz bandwidth for all frequencies between  $763$ - $775$  MHz and  $793$ - $806$  MHz shall be attenuated below the transmitter power,  $P$  (dBW), by at least:
  - $76 + 10 \log_{10} p$  (watts), dB, for base and fixed equipment and
  - $65 + 10 \log_{10} p$  (watts), dB, for mobile and portable equipment
- The e.i.r.p. in the band  $1559$ - $1610$  MHz shall not exceed  $-70$  dBW/MHz for wideband signal and  $-80$  dBW for discrete emission with bandwidth less than  $700$  Hz.



### 5.6.2 Test Setup

The section 4.4.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

### 5.6.3 Test Procedure

The EUT, which is powered by the Battery, is coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50 Ohm; the path loss as the factor is calibrated to correct the reading.

1. The EUT is coupled to the system simulator and spectrum analyzer; the RF load attached to EUT antenna terminal is 50 Ohm; the path loss as the factor is calibrated to correct the reading.

2. Base Station is used to establish communication with the EUT, and its parameters are set to force the EUT transmitting at maximum output power.

3. The RF output of the transmitter is connected to the input of the spectrum analyzer through sufficient attenuation.

4. The center of the spectrum analyzer was set to block edge frequency.

5. Band edge are tested with 1%\*cBW (RBW), and sweep point number referred to following formula.

$$\text{Sweep point number} = 2 * \text{Span} / \text{RBW}$$

$$\text{VBW} = 3 \text{RBW}$$

6. Record the frequencies and levels of spurious emissions.

For mobile and portable stations, on all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than  $65 + 10 \log(P)$  dB in a 6.25 kHz band segment. Since it was not possible to set the resolution bandwidth to 6.25 kHz with the available equipment, a bandwidth of 10 kHz was used instead to show compliance. By using a 10 kHz bandwidth on the spectrum analyzer.

$$10 * \log(10 \text{ kHz} / 6.25 \text{ kHz}) = 2.04 \text{ dB}$$

$$\text{Limit Line} = -35 \text{ dBm} + 2.04 \text{ dB} = -32.96 \text{ dBm}$$

### 5.6.4 Test Result

Please refer to ANNEX A.6.



## 5.7 Field Strength of Spurious Radiation

### 5.7.1 Limit

FCC § 2.1053 & 22.917(a) & 24.238(a) & 27.53(a) & 27.53(c) & 27.53(f) & 27.53(g) & 27.53(h) & 27.53(l) & 27.53(m) & 27.53(n)

RSS-Gen § 6.13 & RSS-130 § 4.7 & RSS-132 § 5.5 & RSS-133 § 5.6 & RSS-139 § 5.6 & RSS-199

In the 1 MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

FCC § 22.917(a) & 24.238(a) & RSS-132 § 5.5 & RSS-133 § 5.6

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. This is calculated to be -13 dBm.

FCC § 27.53(a) (4)

For mobile and portable stations operating in the 2305-2315MHz and 2350-2360MHz bands:

(1) By a factor of not less than:  $43 + 10 \log(P)$  dB on all frequencies between 2305 and 2320MHz and on all frequencies between 2345 and 2360MHz that are outside the licensed band(s) of operation, not less than  $55 + 10 \log(P)$  dB on all frequencies between 2320 and 2324MHz and on all frequencies between 2341 and 2345MHz, not less than  $61 + 10 \log(P)$  dB on all frequencies between 2324 and 2328MHz and on all frequencies between 2337 and 2341MHz, and not less than  $67 + 10 \log(P)$  dB on all frequencies between 2328 and 2337MHz.

(2) By a factor of not less than  $43 + 10 \log(P)$  dB on all frequencies between 2300 and 2305MHz,  $55 + 10 \log(P)$  dB on all frequencies between 2296 and 2300MHz,  $61 + 10 \log(P)$  dB on all frequencies between 2292 and 2296MHz,  $67 + 10 \log(P)$  dB on all frequencies between 2288 and 2292MHz, and  $70 + 10 \log(P)$  dB below 2288MHz.

(3) By a factor of not less than  $43 + 10 \log(P)$  dB on all frequencies between 2360 and 2365MHz, and not less than  $70 + 10 \log(P)$  dB above 2365MHz.

FCC § 27.53(c)

For operations in the 746–758 MHz band and the 776–788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On any frequency outside the 746–758 MHz band, the power of any emission shall be attenuated outside the

band below the transmitter power (P) by at least  $43 + 10 \log(P)$  dB;

(2) On any frequency outside the 776–788 MHz band, the power of any emission shall be attenuated outside the

band below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB;

(3) On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than  $76 + 10 \log (P)$  dB in a 6.25 kHz band segment, for base and fixed stations;

(4) On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than  $65 + 10 \log (P)$  dB in a 6.25 kHz band segment, for mobile and portable stations;

(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater.

However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth

of at least 30 kHz may be employed;

(6) Compliance with the provisions of paragraphs (c)(3) and (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

#### FCC § 27.53(f)

For operations in the 746–758 MHz, 775–788 MHz, and 805–806 MHz bands, emissions in the band 1559–1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

#### FCC § 27.53(g)

For operations in the 600MHz band and the 698-746MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least  $43+10*\log(P)$  dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

#### FCC § 27.53(h) (1)

Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log_{10} (P)$  dB.

#### FCC § 27.53(l) (2)

For mobile operations in the 3700-3980 MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed -13 dBm/MHz.

#### FCC § 27.53(m) (4)

For mobile digital stations (BRS and EBS stations), the attenuation factor shall be not less than:

- $40+10\log P$  dB ( $-10$  dBm,  $100$  nW) on all frequencies between the channel edge and  $5$  MHz from the channel edge.
- $43+10\log P$  dB ( $-13$  dBm,  $50$  nW) on all frequencies between  $5$  MHz and  $X$  MHz from the channel edge,
- $55+10\log P$  dB ( $-25$  dBm,  $3$  nW) on all frequencies more than  $X$  MHz from the channel edge, where  $X$  is the greater of  $6$  MHz or the actual emission bandwidth ( $26$  dB).

In addition, the attenuation factor shall not be less than  $43 + 10 \log (P)$  dB on all frequencies between  $2490.5$  MHz and  $2496$  MHz and  $55 + 10 \log (P)$  dB at or below  $2490.5$  MHz. Mobile Satellite Service licensees operating on frequencies below  $2495$  MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

#### FCC § 27.53(n) (2)

For mobile operations in the  $3450$ - $3550$  MHz band, the conducted power of any emission outside the licensee's authorized bandwidth shall not exceed  $-13$  dBm/MHz.

#### RSS-132 § 5.5 & RSS-133 § 5.6

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. This is calculated to be  $-13$  dBm.

#### RSS-139 § 5.6

Except as otherwise specified below, for operations in the  $1695$ - $1710$  MHz,  $1710$ - $1755$  MHz,  $1755$ - $1780$  MHz,  $1915$ - $1920$  MHz,  $1995$ - $2000$  MHz,  $2000$ - $2020$  MHz,  $2110$ - $2155$  MHz,  $2155$ - $2180$  MHz, and  $2180$ - $2200$  bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power ( $P$ ) in watts by at least  $43 + 10 \log_{10} (P)$  dB.

#### RSS-130 § 4.7

The unwanted emissions in any  $100$  kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power,  $P$  (dBW), by at least  $43 + 10\log_{10}(P)$  (watts), dB. However, in the  $100$  kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of  $30$  kHz may be employed.

In addition to the limit outlined above, equipment operating in the frequency bands  $746$ - $756$  MHz and  $777$ - $787$  MHz shall also comply with the following restrictions:

- (a) The power of any unwanted emissions in any  $6.25$  kHz bandwidth for all frequencies between  $763$ - $775$  MHz and  $793$ - $806$  MHz shall be attenuated below the transmitter power,  $P$  (dBW), by at least:
  - (i)  $76 + 10 \log_{10} p$  (watts), dB, for base and fixed equipment and
  - (ii)  $65 + 10 \log_{10} p$  (watts), dB, for mobile and portable equipment
- (b) The e.i.r.p. in the band  $1559$ - $1610$  MHz shall not exceed  $-70$  dBW/MHz for wideband signal and  $-80$  dBW for discrete emission with bandwidth less than  $700$  Hz.

### 5.7.2 Test Setup

The section 4.4.3 and 4.4.4 (Diagram 3, 4) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

### 5.7.3 Test Procedure

1. On a test site, the EUT shall be placed at 80cm height on a turn table, and in the position close to normal use as declared by the applicant.
2. The test antenna shall be oriented initially for vertical polarization located 3 m from EUT to correspond to the fundamental frequency of the transmitter.
3. The output of the test antenna shall be connected to the measuring receiver and the peak detector is used for the measurement.
4. During the measurement of the EUT, the resolution bandwidth was to 1 MHz and the average bandwidth  
was set to 1 MHz.
5. The transmitter shall be switched on; the measuring receiver shall be tuned to the frequency of the transmitter under test.
6. The test antenna shall be raised and lowered through the specified range of height until the maximum signal level is detected by the measuring receiver.
7. The transmitter shall be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
8. The test antenna shall be raised and lowered again through the specified range of height until the maximum signal level is detected by the measuring receiver.
9. The maximum signal level detected by the measuring receiver shall be noted.
10. The EUT was replaced by half-wave dipole (824 ~ 849 MHz) or horn antenna (1 850 ~ 1 910 MHz) connected to a signal generator.
11. In necessary, the input attenuator setting on the measuring receiver shall be adjusted in order to increase  
the sensitivity of the measuring receiver.
12. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
13. The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring received, which is equal to the level noted while the transmitter radiated

power was measured, corrected for the change of input attenuator setting of the measuring receiver.

14. The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.

15. The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.

Final measurement calculation as below:

The relevant equation for determining the ERP/EIRP from the radiated RF output power is:

$$\text{ERP/EIRP (dBm)} = \text{SA Read Value (dBm)} + \text{Correction Factor (dB)}$$

where:

ERP/EIRP = effective or equivalent radiated power, in dBm;

SA Read Value = measured transmitter power received by EMI receiver or spectrum analyzer, in dBm;

Correction Factor = total correction factor including cable loss, in dB;

During the test, the data of Correction Factor (dB) is added in the EMI receiver or spectrum analyzer, so SA Read Value (dBm) is the final values which contains the data of Correction Factor (dB).

For example:

In the ERP test, when SA read value for GSM850 is 21dBm, and correction factor is 8dB, then final ERP value for GSM850 is:

$$\text{ERP (dBm)} = 21\text{dBm} + 8\text{dB} = 29\text{dBm}$$

#### 5.7.4 Test Result

Please refer to ANNEX A.7.

## 5.8 Receiver Spurious Emissions

### 5.8.1 Limit

RSS-Gen § 7.3/4

For emissions at frequencies below 1 GHz, measurements shall be performed using a CISPR quasi-peak detector and the related measurement bandwidth. At frequencies above 1 GHz, measurements shall be performed using a linear average detector with a minimum resolution bandwidth of 1 MHz.

As an alternative to CISPR quasi-peak or average measurements, compliance with the emission limit can be demonstrated using measuring equipment employing a peak detector function properly adjusted for factors such as pulse desensitization, as required, with a measurement bandwidth equal to, or greater than, the applicable CISPR quasi-peak bandwidth or 1 MHz bandwidth, respectively.

### Receiver Radiated Limits

Radiated emission measurements shall be performed with the receiver antenna connected to the receiver antenna ports. The search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is higher, to at least five times the highest tunable or local oscillator frequency, whichever is higher, without exceeding 40 GHz.

Spurious emissions from receivers shall not exceed the radiated emissions limits shown in Table 2 below.

**Table 2 –Receiver radiated emissions limits**

Frequency (MHz)	Field Strength ( $\mu\text{V/m}$ at 3 metres)
30 - 88	100
88 - 216	150
216 - 960	200
Above 960	500

### Receiver Conducted Limits

If the receiver has a detachable antenna of known impedance, an antenna-conducted spurious emissions measurement is permitted as an alternative to radiated measurement. However, the radiated method is preferred.

The antenna-conducted test shall be performed with the antenna disconnected and with the receiver antenna port connected to a measuring instrument having equal input impedance to that specified for the antenna. The RF cable connecting the receiver under test to the measuring instrument shall also have the same impedance to that specified for the receiver's antenna.

The spurious emissions from the receiver at any discrete frequency, measured at the antenna port by the antenna-conducted method, shall not exceed 2 nW in the frequency range 30-1000 MHz and 5 nW above

1 GHz.

### 5.8.2 Test Setup

The section 4.4.3 and 4.4.4 (Diagram 3, 4) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

### 5.8.3 Test Procedure

The test employing the methods of measurement described in the publication referenced in Section 3(b) (ANSI C63.4);

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

An initial pre-scan was performed in the chamber using the EMI Receiver in peak detection mode. Quasi-peak measurements were conducted based on the peak sweep graph. The EUT was measured by Bi-Log antenna with 2 orthogonal polarities.

### 5.8.4 Test Result

Please refer to ANNEX A.8.

## 5.9 AC Power-line Conducted Emissions

### 5.9.1 Limit

#### RSS-Gen § 8.8

For AC power-line conducted emissions, both quasi-peak and average detectors having the characteristics specified in CAN/CSA-CISPR 16-1-1:15 for the 150 kHz to 30 MHz frequency range shall be employed.

Unless stated otherwise in the applicable RSS, for radio apparatus that are designed to be connected to the public utility AC power network, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the range 150 kHz to 30 MHz shall not exceed the limits in table 3, as measured using a 50  $\mu$ H / 50  $\Omega$  line impedance stabilization network. This requirement applies for the radio frequency voltage measured between each power line and the ground terminal of each AC power-line mains cable of the EUT.

For an EUT that connects to the AC power lines indirectly, through another device, the requirement for compliance with the limits in table 3 shall apply at the terminals of the AC power-line mains cable of a representative support device, while it provides power to the EUT. The lower limit applies at the boundary between the frequency ranges. The device used to power the EUT shall be representative of typical applications.

**Table 3 –AC power-line conducted emissions limits**

Frequency (MHz)	Conducted limit (dB $\mu$ V)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 <sup>Note1</sup>	56 to 46 <sup>Note1</sup>
0.5 - 5	56	46
5 - 30	60	50

Note 1: The level decreases linearly with the logarithm of the frequency.

### 5.9.2 Test Setup

The section 4.4.5 (Diagram 5) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

### 5.9.3 Test Procedure

The test employing the methods of measurement described in the publication referenced in Section 3(b) (ANSI C63.4);



The EUT is connected to the power mains through a LISN which provides 50  $\Omega$ /50  $\mu$ H of coupling impedance for the measuring instrument. The test frequency range is from 150 kHz to 30 MHz. The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; the emission levels that are more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed.

Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz) for which the device is capable of operation. A device rated for 50/60 Hz operation need not be tested at both frequencies provided the radiated and line conducted emissions are the same at both frequencies.

#### 5.9.4 Test Result

N/A.

## ANNEX A TEST RESULTS

### A.1 Transmitter Radiated Power (EIRP/ERP)

Note1 : Not applicable.

### A.2 Peak to Average Ratio

Note1 : Not applicable.

### A.3 Occupied Bandwidth

Note1 : Not applicable.

### A.4 Frequency Stability

Note1 : Not applicable.

### A.5 Spurious Emission at Antenna Terminals

Note1 : Not applicable.

### A.6 Band Edge

Note1 : Not applicable.

### A.7 Field Strength of Spurious Radiation

Note 1: All modes have been tested, and only the worst case data are shown here.

Note 2: The frequencies of verdict which are marked by "N/A" should be ignored because they are UE carrier frequency.

Note 3: Test plots please refer to the document "Annex No.: BL-SH2540355-501 Data Part 1.pdf".

Note 4: The disturbance above 26.5GHz was very low, and the above harmonics were the highest point could be found when testing, so only the worst case data displayed in this report.

#### GSM and WCDMA Mode Test Verdict

Test Band	Test Channel	Refer to PlotNote3	Verdict
GSM 850	LCH	1.1	Pass
	MCH		Pass

Test Band	Test Channel	Refer to PlotNote3	Verdict
	HCH		Pass
GSM 1900	LCH	1.2	Pass
	MCH		Pass
	HCH		Pass
WCDMA Band 2	LCH	2.1	Pass
	MCH		Pass
	HCH		Pass
WCDMA Band 4	LCH	2.2	Pass
	MCH		Pass
	HCH		Pass
WCDMA Band 5	LCH	2.3	Pass
	MCH		Pass
	HCH		Pass

#### LTE Mode Test Verdict

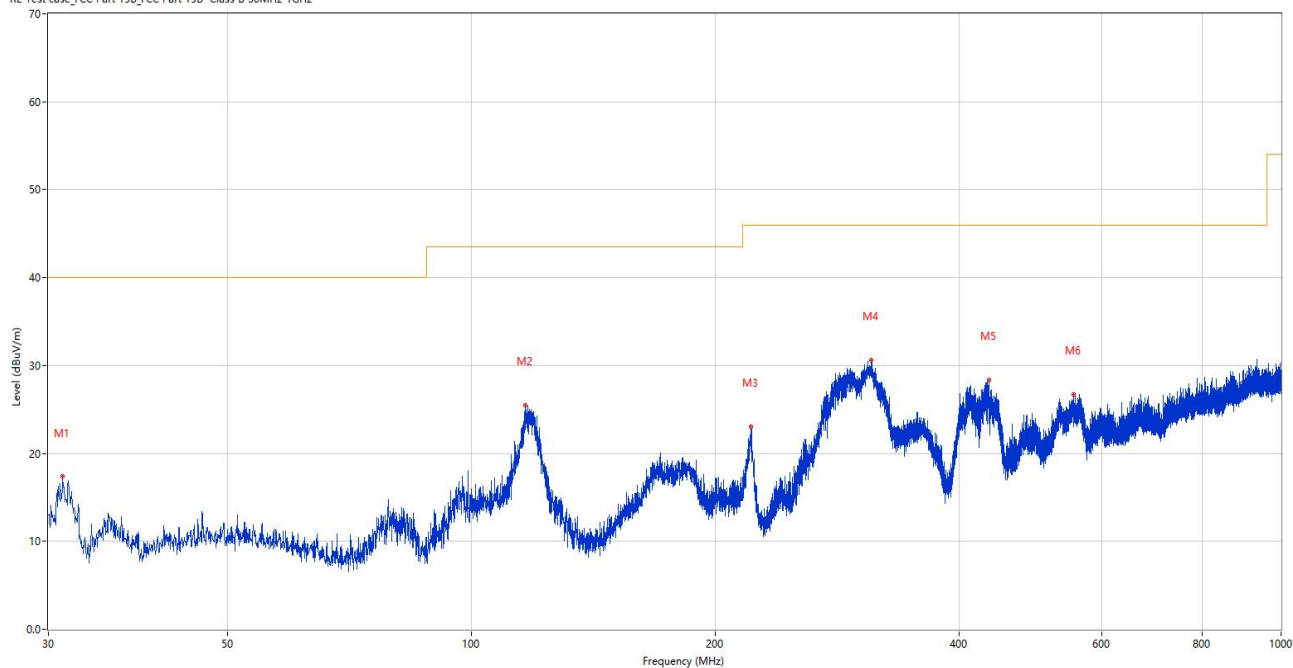
Test Band	Test Bandwidth	Test Channel	Refer to PlotNote3	Verdict
Band 2	1.4 MHz	18607	3.1	Pass
Band 4	10 MHz	20000	3.2	Pass
Band 5	1.4 MHz	20643	3.3	Pass
Band 7	5 MHz	21100	3.4	Pass
Band 12	1.4 MHz	23173	3.5	Pass
Band 17	10MHz	23780	3.6	Pass
Band 38	10 MHz	38200	3.7	Pass
Band 41	10 MHz	41190	3.8	Pass

## A.8 Receiver Spurious Emissions

Note: Only the worst test results were recorded in this report.

### 30MHz to 1GHz, ANT H

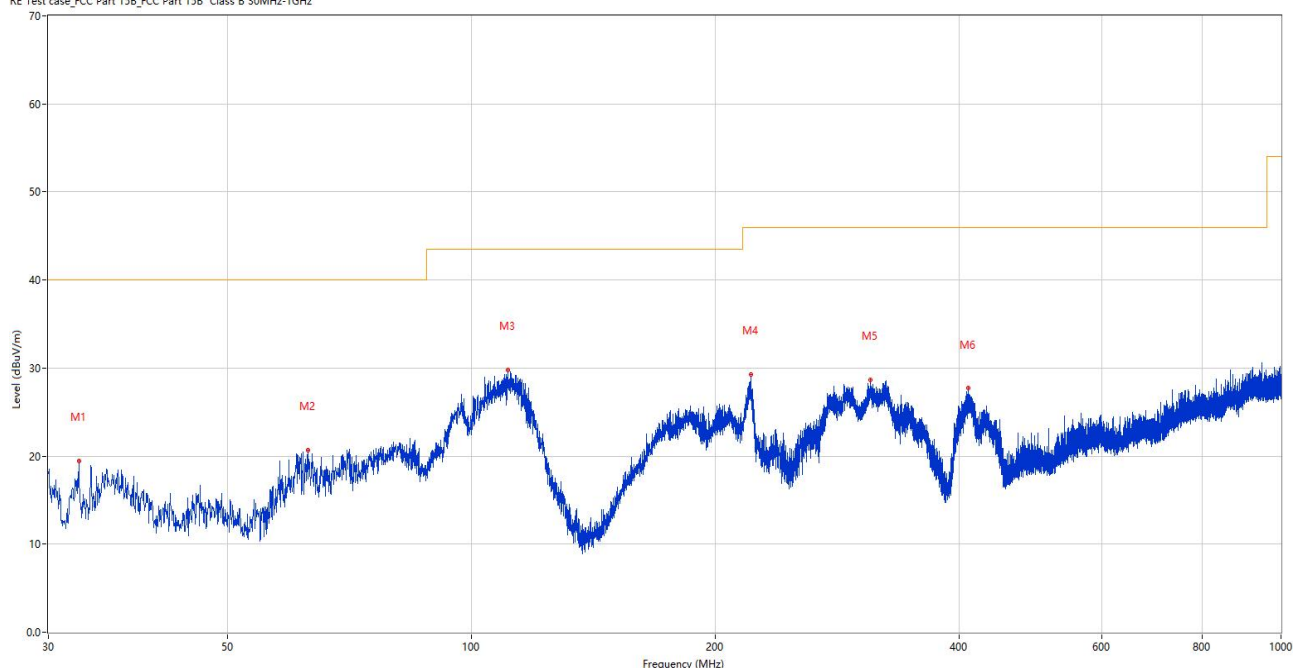
RE Test case\_FCC Part 15B\_FCC Part 15B Class B 30MHz-1GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	31.261	17.36	-30.30	40.0	22.64	Peak	3.00	100	Horizontal	Pass
2	116.427	25.48	-28.27	43.5	18.02	Peak	163.00	200	Horizontal	Pass
3	221.187	23.01	-26.52	46.0	22.99	Peak	182.00	100	Horizontal	Pass
4	311.542	30.60	-23.63	46.0	15.40	Peak	211.00	200	Horizontal	Pass
5	436.042	28.33	-20.03	46.0	17.67	Peak	241.00	100	Horizontal	Pass
6	554.770	26.75	-17.50	46.0	19.25	Peak	133.00	100	Horizontal	Pass

## 30MHz to 1GHz, ANT V

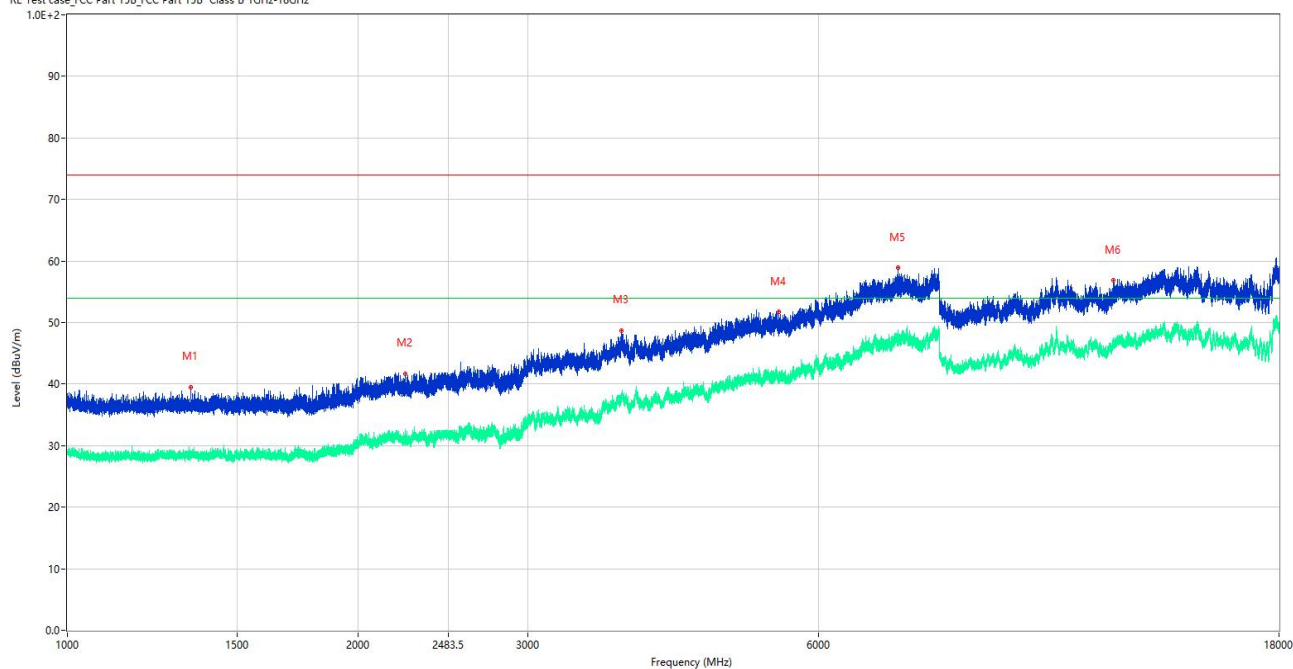
RE Test case\_FCC Part 15B\_FCC Part 15B Class B 30MHz-1GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	32.716	19.45	-29.81	40.0	20.55	Peak	3.00	100	Vertical	Pass
2	62.737	20.66	-27.30	40.0	19.34	Peak	331.00	100	Vertical	Pass
3	110.801	29.75	-27.55	43.5	13.75	Peak	248.00	100	Vertical	Pass
4	221.430	29.26	-26.51	46.0	16.74	Peak	283.00	100	Vertical	Pass
5	310.961	28.69	-23.64	46.0	17.31	Peak	0.00	100	Vertical	Pass
6	411.162	27.69	-20.58	46.0	18.31	Peak	116.00	100	Vertical	Pass

## 1GHz to 18GHz, ANT H

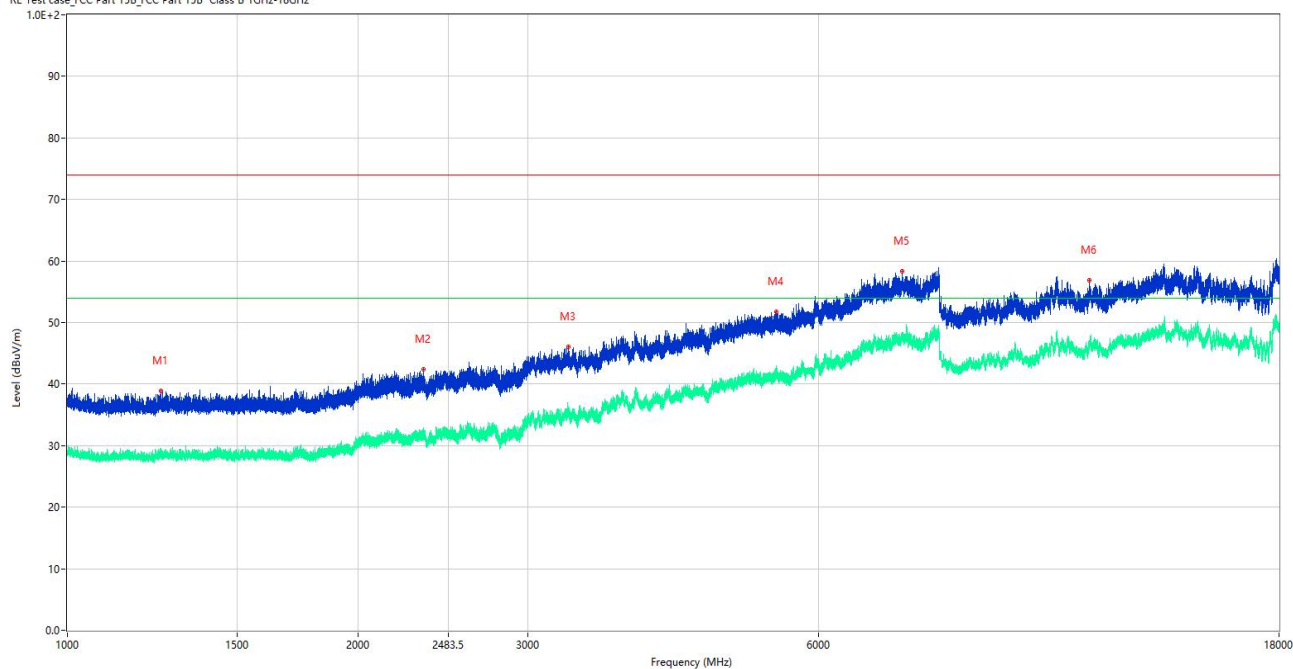
RE Test case\_FCC Part 15B\_FCC Part 15B Class B 1GHz-18GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1343.100	39.54	-15.94	74.0	34.46	Peak	0.00	100	Horizontal	Pass
1**	1343.100	28.66	-15.94	54.0	25.34	AV	0.00	100	Horizontal	Pass
2	2239.100	41.69	-13.09	74.0	32.31	Peak	306.00	100	Horizontal	Pass
2**	2239.100	30.77	-13.09	54.0	23.23	AV	306.00	100	Horizontal	Pass
3	3749.250	48.74	-3.27	74.0	25.26	Peak	12.00	100	Horizontal	Pass
3**	3749.250	37.43	-3.27	54.0	16.57	AV	12.00	100	Horizontal	Pass
4	5457.250	51.69	-0.54	74.0	22.31	Peak	256.00	100	Horizontal	Pass
4**	5457.250	41.08	-0.54	54.0	12.92	AV	256.00	100	Horizontal	Pass
5	7249.500	58.92	5.23	74.0	15.08	Peak	280.00	100	Horizontal	Pass
5**	7249.500	47.29	5.23	54.0	6.71	AV	280.00	100	Horizontal	Pass
6	12115.500	56.86	4.64	74.0	17.14	Peak	31.00	100	Horizontal	Pass
6**	12115.500	46.36	4.64	54.0	7.64	AV	31.00	100	Horizontal	Pass

## 1GHz to 18GHz, ANT V

RE Test case\_FCC Part 15B\_FCC Part 15B Class B 1GHz-18GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1250.600	38.83	-15.91	74.0	35.17	Peak	281.00	100	Vertical	Pass
1**	1250.600	28.88	-15.91	54.0	25.12	AV	281.00	100	Vertical	Pass
2	2339.400	42.41	-12.20	74.0	31.59	Peak	341.00	100	Vertical	Pass
2**	2339.400	31.68	-12.20	54.0	22.32	AV	341.00	100	Vertical	Pass
3	3303.000	46.09	-6.37	74.0	27.91	Peak	0.00	100	Vertical	Pass
3**	3303.000	35.52	-6.37	54.0	18.48	AV	0.00	100	Vertical	Pass
4	5424.500	51.69	0.11	74.0	22.31	Peak	263.00	100	Vertical	Pass
4**	5424.500	42.62	0.11	54.0	11.38	AV	263.00	100	Vertical	Pass
5	7329.000	58.34	5.72	74.0	15.66	Peak	44.00	100	Vertical	Pass
5**	7329.000	47.37	5.72	54.0	6.63	AV	44.00	100	Vertical	Pass
6	11460.000	56.90	4.29	74.0	17.10	Peak	91.00	100	Vertical	Pass
6**	11460.000	46.48	4.29	54.0	7.52	AV	91.00	100	Vertical	Pass

## **ANNEX B TEST SETUP PHOTOS**

Please refer to the document “BL-SH2540355-AR RF.PDF”.

## **ANNEX C EUT EXTERNAL PHOTOS**

Please refer to the document “BL-SH2540355-AW.PDF”.

## **ANNEX D EUT INTERNAL PHOTOS**

Please refer to the document “BL-SH2540355-AI.PDF”.



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