TEST REPORT

Product Name:	Smart Phone
Trade Mark:	ecom
Model No. / HVIN:	Smart-Ex 02
Add. Model No. / HVIN:	N/A
Report Number:	190518039RFM-1
Test Standards:	FCC 47 CFR Part 22 Subpart H, FCC 47 CFR Part 24 Subpart E, FCC 47 CFR Part 27 Subpart L, RSS-132 Issue 3, RSS-133 Issue 6 RSS-139 Issue 3, RSS-Gen Issue 5
FCC ID:	XAM500079GR01
IC:	8311A-500079GR01
Test Result:	PASS
Date of Issue:	July 20, 2019

Prepared for:

ecom instruments GmbH
Industriestrasse 2, Assamstadt, 97959, Germany

Prepared by:

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Date: July 20, 2019

Version

Version No.	Date	Description
V1.0	July 20, 2019	Original

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1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	ecom instruments GmbH
Address of Applicant:	Industriestrasse 2, Assamstadt, 97959, Germany
Manufacturer:	Pepperl+Fuchs GmbH
Address of Manufacturer:	Lilienthalstrasse 200, 68307 Mannheim, Germany

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	Smart Phone		
Model No. / HVIN:	Smart-Ex 02		
Add. Model No. / HVIN:	N/A		
Trade Mark:	ecom		
DUT Stage:	Identical Prototype		
EUT Supports Function:	GSM Bands:	GSM 850/ PCS 1900	
	UTRA Bands:	Band II/ Band IV/ Band V	
	E-UTRA Bands:	FDD Band 2/ Band 4/ Band 5/ Band 7/ Band 12/ Band 13/ Band 25/ Band 26/ Band 66/ Band 71	
		TDD Band 38/ Band 41	
	2.4 GHz ISM Band:	IEEE 802.11b/g/n	
		Bluetooth V4.2	
	5 GHz U-NII Bands:	5 150 MHz to 5 250 MHz	IEEE 802.11a/n/ac
		5 250 MHz to 5 350 MHz	IEEE 802.11a/n/ac
		5 470 MHz to 5 725 MHz	IEEE 802.11a/n/ac
		5 725 MHz to 5 850 MHz	IEEE 802.11a/n/ac
	RNSS Bands:	1559 MHz to 1610 MHz	GPS/ GLONASS/ BDS/ Galileo
	NFC:	13.553 MHz to 13.567 MHz	
Sample Received Date:	May 20, 2019		
Sample Tested Date:	May 29, 2019 to July 20, 2019		

1.2.2 Description of Accessories

Adapter	
Model No.:	S008ACM0500200
Input:	100-240 V~50/60 Hz 0.3 A Max
Output:	5.0 V ⎓ 2 A
AC Cable:	N/A
DC Cable:	N/A

Battery (1)	
Model No.:	EX-BP S02
Battery Type:	Lithium-ion Rechargeable Battery
Rated Voltage:	3.7 Vdc
Rated Capacity:	4400 mAh

Battery (2)	
Model No.:	EX-BP S02C
Battery Type:	Lithium-ion Rechargeable Battery
Rated Voltage:	3.7 Vdc
Rated Capacity:	3920 mAh

Cable	
Description:	USB Changing Cable
Cable Type:	Shielded without ferrite
Length:	1.2 Meter

1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

Support Networks:	GSM, GPRS, EDGE, WCDMA, HSDPA, HSUPA, DC-HSDPA	
Type of Modulation:	GSM/GPRS:	GMSK
	EDGE:	GMSK, 8PSK
	WCDMA	BPSK
	HSDPA/DC-HSDPA:	QPSK
	HSUPA:	QPSK
	DC-HSDPA:	64QAM
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 IV:	1712.4-1752.6 MHz
	WCDMA Band V:	826.4-846.6 MHz
Max RF Output Power:	GSM/GPRS 850:	32.77dBm
	EDGE 850:	26.82dBm
	GSM/GPRS 1900:	30.63dBm
	EDGE 1900:	25.04dBm
	WCDMA Band II:	23.27dBm
	WCDMA Band IV:	24.35dBm
	WCDMA Band V:	23.82dBm
Emission Designator:	GSM/GPRS 850:	244KGXW
	EDGE 850:	245KG7W
	GSM/GPRS 1900:	246KGXW
	EDGE 1900:	248KG7W
	WCDMA Band II:	4M18F9W
	WCDMA Band IV:	4M13F9W
	WCDMA Band V:	4M16F9W
Antenna Type:	Integral Antenna	
Antenna Gain:	GSM 850:	-6.47 dBi
	PCS 1900:	-4.89 dBi
	WCDMA Band II:	-4.89 dBi
	WCDMA Band IV:	-3.21 dBi
	WCDMA Band V:	-6.47 dBi
GPRS/EDGE Class:	Class 33	

Normal Test Voltage:	3.7 Vdc
Extreme Test Voltage:	3.5 to 4.2Vdc
Extreme Test Temperature:	-30 °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
--	--	--	--	--

2) Support Cable

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

1.5 TEST LOCATION

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China 518109
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/EN 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: 2005 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 emission 9KHz-150KHz	±3.8 dB
2	Conducted emission 150KHz-30MHz	±3.4 dB
3	Radiated emission 9KHz-30MHz	±4.9 dB
4	Radiated emission 30MHz-1GHz	±4.7 dB
5	Radiated emission 1GHz-18GHz	±5.1 dB
6	Radiated emission 18GHz-26GHz	±5.2 dB
7	Radiated emission 26GHz-40GHz	±5.2 dB

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) RSS-132 Issue 3, Section 5.4	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) RSS-132 Issue 3, Section 5.4	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Peak-to-average ratio	FCC 47 CFR Part 22.913(a) RSS-132 Issue 3, Section 5.4	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
99%&26dB Bandwidth	FCC 47 CFR Part 2.1049(h) RSS-Gen Issue 5, Section 6.7	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) RSS-132 Issue 3, Section 5.5	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) RSS-132 Issue 3, Section 5.5	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) RSS-132 Issue 3, Section 5.5	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Frequency stability	FCC 47 CFR Part 2.1055 & FCC 47 CFR Part 22.355 RSS-132 Issue 3, Section 5.3	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) RSS-133 Issue 6, Section 6.4	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) RSS-133 Issue 6, Section 6.4	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Peak-to-average ratio	FCC 47 CFR Part 24.232(d) RSS-133 Issue 6, Section 6.4	KDB 971168 D01v03r01	PASS
99%&26dB Bandwidth	FCC 47 CFR Part 2.1049(h) & FCC 47 CFR Part 24.238(b) RSS-Gen Issue 5, Section 6.7	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) RSS-133 Issue 6, Section 6.5	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) RSS-133 Issue 6, Section 6.5	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) RSS-133 Issue 6, Section 6.5	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Frequency stability	FCC 47 CFR Part 2.1055 & FCC 47 CFR Part 24.235 RSS-133 Issue 6, Section 6.3	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS

FCC 47 CFR Part 27 Subpart L 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 27.50(d)(4) RSS-139 Issue 3, Section 6.5	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Conducted Output Power	FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 27.50(d)(4) RSS-139 Issue 3, Section 6.5	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Peak-to-average ratio	FCC 47 CFR Part 27.50(d)(5) RSS-139 Issue 3, Section 6.5	KDB 971168 D01v03r01	PASS
99%&26dB Bandwidth	FCC 47 CFR Part 2.1049(h) FCC 47 CFR Part 27.53(h) RSS-Gen Issue 5, Section 6.7	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Band Edge at antenna terminals	FCC 47 CFR Part 27.53(h)(1) RSS-139 Issue 3, Section 6.6	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Spurious emissions at antenna terminals	FCC 47 CFR Part 2.1051 & FCC 47 CFR Part 27.53(h) RSS-139 Issue 3, Section 6.6	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Field strength of spurious radiation	FCC 47 CFR Part 2.1053 & FCC 47 CFR Part 27.53(h) RSS-139 Issue 3, Section 6.6	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS
Frequency stability	FCC 47 CFR Part 2.1055 & FCC 47 CFR Part 27.54 RSS-139 Issue 3, Section 6.4	ANSI C63.26-2015 & KDB 971168 D01v03r01	PASS

3. EQUIPMENT LIST

Radiated Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm dd, yyyy)	Cal. Due date (mm dd, yyyy)
☒	3M Chamber & Accessory Equipment	ETS-LINDGREN	3M	N/A	Dec. 03, 2018	Dec. 03, 2021
☒	Receiver	R&S	ESIB26	100114	Nov. 24, 2018	Nov. 24, 2019
☒	Loop Antenna	ETS-LINDGREN	6502	00202525	Dec. 03, 2018	Dec. 03, 2019
☒	Broadband Antenna	ETS-LINDGREN	3142E	00201566	Dec. 08, 2018	Dec. 08, 2019
☒	6dB Attenuator	Talent	RA6A5-N-18	18103001	Dec. 08, 2018	Dec. 08, 2019
☒	Preamplifier	HP	8447F	2805A02960	Nov. 24, 2018	Nov. 24, 2019
☐	Broadband Antenna (Pre-amplifier)	ETS-LINDGREN	3142E-PA	00201891	May 18, 2019	May 18, 2020
☐	6dB Attenuator	Talent	RA6A5-N-18	18103002	Nov. 24, 2018	Nov. 24, 2019
☐	Horn Antenna	ETS-LINDGREN	3117	00164202	Dec. 08, 2018	Dec. 08, 2019
☒	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201874	May 18, 2019	May 18, 2020
☐	Horn Antenna	ETS-LINDGREN	3116C	00200180	Jun. 23, 2019	Jun. 23, 2020
☒	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3116C-PA	00202652	Jan. 05, 2019	Jan. 05, 2020
☒	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
☒	Test Software	Audix	e3	Software Version: 9.160333		

RF Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm dd, yyyy)	Cal. Due date (mm dd, yyyy)
☒	Receiver	R&S	ESR7	1316.3003K07-101181-K3	Nov. 24, 2018	Nov. 24, 2019
☒	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	Nov. 24, 2018	Nov. 24, 2019
☒	EXA Spectrum Analyzer	KEYSIGHT	N9010B	MY57471561	Nov. 24, 2018	Nov. 24, 2019
☒	Wideband Radio Communication Tester	R&S	CMW500	119583	Jun. 07, 2019	Jun. 07, 2020
☐	Universal Radio Communication Tester	R&S	CMU200	114713	Nov. 24, 2018	Nov. 24, 2019
☒	DC Source	KIKUSUI	PWR400L	LK003024	Sep. 18, 2018	Sep. 18, 2019
☒	Temp & Humidity chamber	Votisch	VT4002	58566133290020	Jun. 05, 2018	Jun. 05, 2020

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	**3.7**	20 to 75
TL/VL	-30	3.5	20 to 75
TH/VL	+50	3.5	20 to 75
TL/VH	-30	4.2	20 to 75
TH/VH	+50	4.2	20 to 75

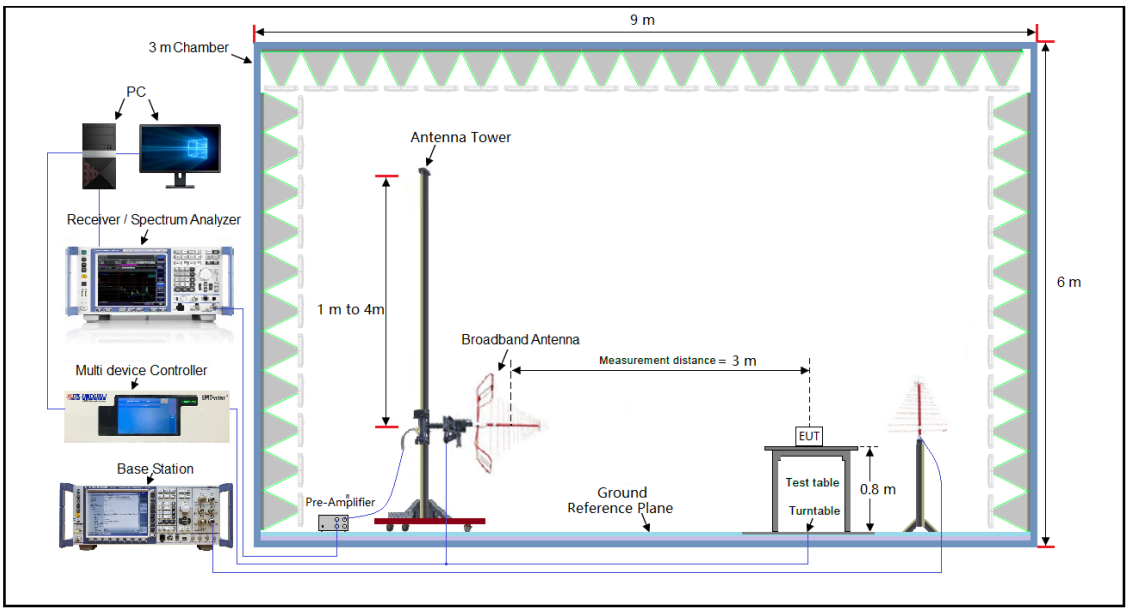
Remark:

1) The EUT just work in such extreme temperature of -30 °C to +50 °C and the extreme voltage of 3.5 V to 4.2 V, so here the EUT is tested in the temperature of -30 °C to +50 °C and the voltage of 3.5 V to 4.2 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.

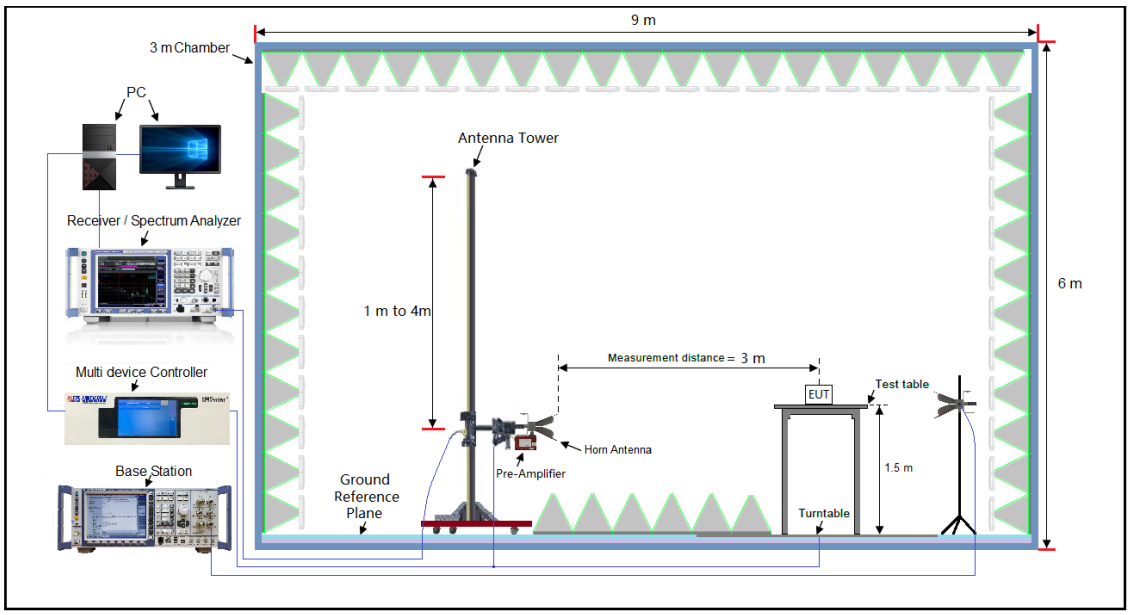
4.2 TEST SETUP

4.2.1 For Radiated Emissions test setup

Radiated Emissions 30MHz to 1GHz Test setup

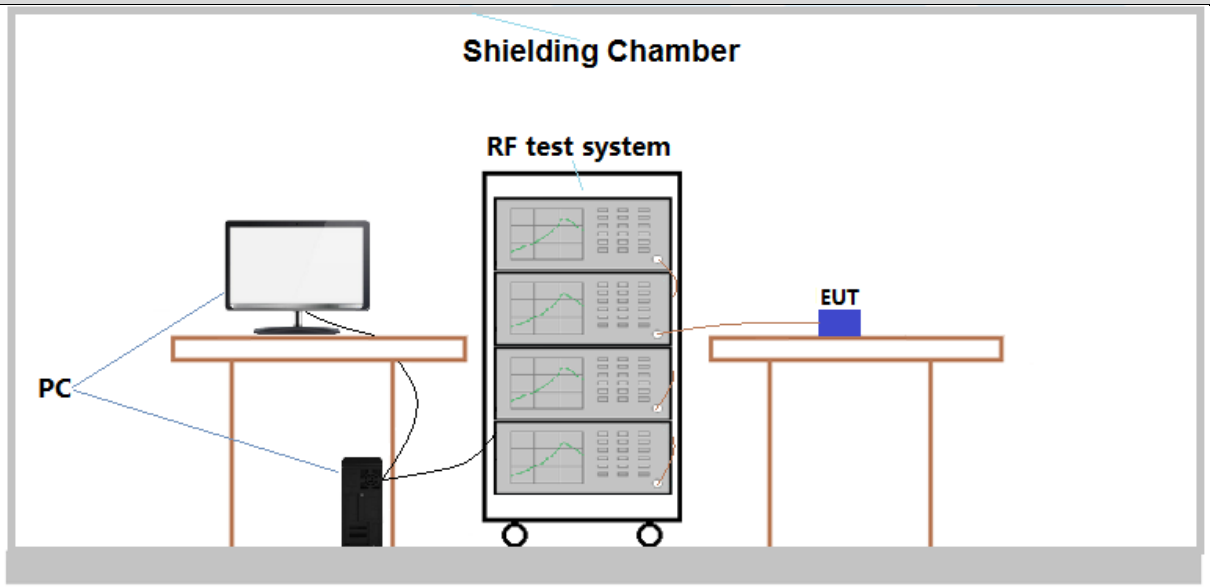


Radiated Emissions Above 1GHz Test setup

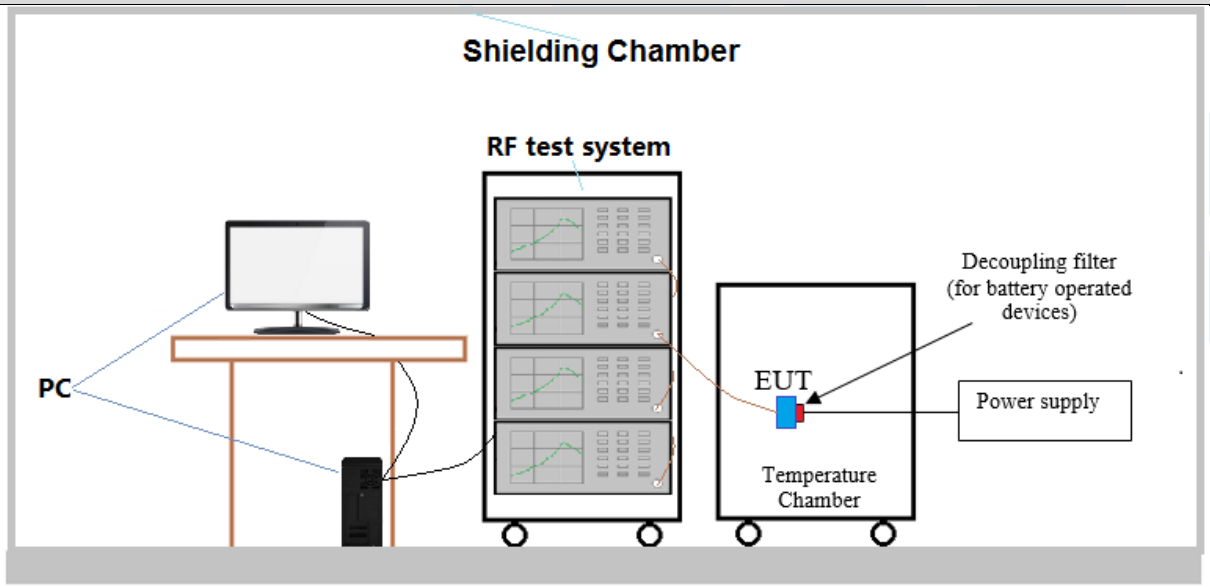


4.2.2 For Conducted RF test setup

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

Bands	Tx/Rx Frequency	RF Channel		
		Low(L)	Middle(M)	High(H)
WCDMA Band IV	Tx (1710 MHz-1755 MHz)	Channel 1312	Channel 1412	Channel 1513
		1712.4 MHz	1732.4 MHz	1752.6 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 3.7V 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.
The worst case was found when positioned as the table below.

Bands	Mode	Antenna Port	Worst-case axis positioning
GSM 850	1TX	Chain 0	Y axis
PCS 1900	1TX	Chain 0	Y axis
WCDMA Band II	1TX	Chain 0	Y axis
WCDMA Band IV	1TX	Chain 0	Y axis
WCDMA Band V	1TX	Chain 0	Y axis

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)	**32.77**	32.75	32.70
GPRS (GMSK, 1Tx-slot)	32.75	32.73	32.69
GPRS (GMSK, 2Tx-slot)	30.15	30.25	30.02
GPRS (GMSK, 3Tx-slot)	28.05	28.21	28.36
GPRS (GMSK, 4Tx-slot)	26.77	26.87	26.85
EDGE (8PSK, 1Tx-slot)	26.78	26.75	26.82
EDGE (8PSK, 2Tx-slot)	23.72	23.77	23.79
EDGE (8PSK, 3Tx-slot)	23.37	23.58	23.51
EDGE (8PSK, 4Tx-slot)	21.94	22.06	22.14

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)	30.23	30.56	**30.63**
GPRS (GMSK, 1Tx-slot)	30.21	30.53	30.61
GPRS (GMSK, 2Tx-slot)	27.74	27.82	27.93
GPRS (GMSK, 3Tx-slot)	25.90	26.02	26.18
GPRS (GMSK, 4Tx-slot)	24.69	24.87	24.95
EDGE (8PSK, 1Tx-slot)	24.71	24.96	25.04
EDGE (8PSK, 2Tx-slot)	21.71	21.96	22.05
EDGE (8PSK, 3Tx-slot)	19.82	19.73	19.77
EDGE (8PSK, 4Tx-slot)	18.67	18.81	18.95

WCDMA Band II Maximum Average Power (dBm)			
Channel	**9262**	**9400**	**9538**
Frequency(MHz)	**1852.4 MHz**	**1880.0 MHz**	**1907.6 MHz**
RMC 12.2kbps	23.26	**23.27**	23.09
HSDPA Subtest-1	22.53	22.95	22.36
HSDPA Subtest-2	22.61	22.97	22.29
HSDPA Subtest-3	22.30	22.61	21.84
HSDPA Subtest-4	22.33	22.44	21.73
HSUPA Subtest-1	22.64	22.93	21.90
HSUPA Subtest-2	22.18	22.49	21.48
HSUPA Subtest-3	22.52	22.77	21.85
HSUPA Subtest-4	22.67	22.90	22.31
HSUPA Subtest-5	22.25	22.53	21.58
DC-HSDPA Subtest-1	22.49	22.83	22.18
DC-HSDPA Subtest-2	22.47	22.81	22.19
DC-HSDPA Subtest-3	22.17	22.45	21.68
DC-HSDPA Subtest-4	22.16	22.44	21.67

WCDMA Band IV Maximum Average Power (dBm)			
Channel	**1312**	**1412**	**1513**
Frequency(MHz)	**1712.4 MHz**	**1732.4 MHz**	**1752.6 MHz**
RMC 12.2kbps	**24.35**	24.10	24.06
HSDPA Subtest-1	23.30	23.55	23.07
HSDPA Subtest-2	23.45	23.58	23.07
HSDPA Subtest-3	23.08	23.02	22.55
HSDPA Subtest-4	22.96	23.06	22.63
HSUPA Subtest-1	**24.35**	24.10	24.06
HSUPA Subtest-2	23.41	23.37	23.37
HSUPA Subtest-3	22.94	22.96	22.85
HSUPA Subtest-4	23.44	23.33	23.31
HSUPA Subtest-5	23.41	23.34	23.33
DC-HSDPA Subtest-1	23.25	23.39	23.03
DC-HSDPA Subtest-2	23.41	23.43	22.99
DC-HSDPA Subtest-3	22.92	22.95	22.43
DC-HSDPA Subtest-4	22.92	22.94	22.45

WCDMA Band V Maximum Average Power (dBm)			
Channel	**4132**	**4182**	**4233**
Frequency(MHz)	**826.4 MHz**	**836.4 MHz**	**846.6 MHz**
RMC 12.2kbps	23.43	23.37	**23.82**
HSDPA Subtest-1	22.77	22.50	22.60
HSDPA Subtest-2	22.62	22.59	22.61
HSDPA Subtest-3	22.18	22.13	22.02
HSDPA Subtest-4	22.29	22.15	22.06
HSUPA Subtest-1	22.63	22.48	22.67
HSUPA Subtest-2	21.85	21.57	21.79
HSUPA Subtest-3	22.57	22.19	22.35
HSUPA Subtest-4	22.47	22.16	22.33
HSUPA Subtest-5	21.91	21.56	21.83
DC-HSDPA Subtest-1	22.60	22.50	22.54
DC-HSDPA Subtest-2	22.59	22.47	22.48
DC-HSDPA Subtest-3	22.09	21.98	21.95
DC-HSDPA Subtest-4	22.10	21.96	21.93

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/IVV	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 27	Miscellaneous Wireless Communications Services
4	FCC 47 CFR Part 24	Personal Communications Services
5	RSS-Gen Issue 5	General Requirements for Compliance of Radio Apparatus
6	RSS-132 Issue 3	Cellular Telephone Systems Operating in the Bands 824-849 MHz and 869-894 MHz
7	RSS-133 Issue 6	2 GHz Personal Communications Services Aussi disponible
8	RSS-139 Issue 3	Advanced Wireless Services (AWS) Equipment Operating in the Bands 1710-1780 MHz and 2110-2180 MHz
9	ANSI C63.26-2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
10	KDB 971168 D01	KDB 971168 D01 Power Meas License Digital Systems v03r01

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),
FCC 47 CFR Part 27.50(d)(4)
RSS-132 Issue 3, Section 5.4,
RSS-133 Issue 6, Section 6.4,
RSS-139 Issue 3, Section 6.5

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.

FCC 47 CFR Part 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.

RSS-132 Issue 3, Section 5.4,
The transmitter output power shall be measured in terms of average power. The equivalent isotropically radiated power (e.i.r.p.) for mobile equipment shall not exceed 11.5 watts.

RSS-133 Issue 6, Section 6.4
The equivalent isotropically radiated power (e.i.r.p.) for transmitters shall not exceed the limits given in SRSP-510. Moreover, base station transmitters operating in the band 1930-1995 MHz shall not have output power exceeding 100 watts.

RSS-139 Issue 3, Section 6.5
The equivalent isotropically radiated power (e.i.r.p.) for mobile and portable transmitters shall not exceed one watt. The e.i.r.p. for fixed and base stations in the band 1710-1780 MHz shall not exceed one watt.

Test Procedure:

$$\text{ERP or EIRP} = P_{Meas} + G_T - L_C$$

where:
ERP or EIRP = effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as PMeas, typically dBW or dBm);

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

Bands	Modulation	Channel	Max. Conducted Avg. Power	Ant. Gain	FCC Limit	RSS Limit	ERP		Result
			(dBm)	(dBi)	(W)	(W)	(dBm)	(W)	
GSM 850 (824-849 MHz)	GPRS	Low	32.77	-6.47	7.0	11.5	26.30	0.426580	Pass
		Mid	32.75				26.28	0.424620	Pass
		High	32.70				26.23	0.419759	Pass
	EDGE	Low	26.78				20.31	0.107399	Pass
		Mid	26.75				20.28	0.106660	Pass
		High	26.82				20.35	0.108393	Pass
WCDMA Band V (824-849 MHz)	RMC 12.2kbps	Low	23.43	-6.47	7.0	11.5	16.96	0.049659	Pass
		Mid	23.37				16.90	0.048978	Pass
		High	23.82				17.35	0.054325	Pass
	HSUPA	Low	22.63				16.16	0.041305	Pass
		Mid	22.48				16.01	0.039902	Pass
		High	22.67				16.20	0.041687	Pass
	HSDPA	Low	22.77				16.30	0.042658	Pass
		Mid	22.50				16.03	0.040087	Pass
		High	22.60				16.13	0.041020	Pass

Bands	Modulation	Channel	Max. Conducted Avg. Power	Ant. Gain	FCC Limit	RSS Limit	EIRP		Result
			(dBm)	(dBi)	(W)	(W)	(dBm)	(W)	
PCS 1900 (1850-1910 MHz)	GPRS	Low	30.23	-6.47	2.0	2.0	23.76	0.237684	Pass
		Mid	30.56				24.09	0.256448	Pass
		High	30.63				24.16	0.260615	Pass
	EDGE	Low	24.71				18.24	0.066681	Pass
		Mid	24.96				18.49	0.070632	Pass
		High	25.04				18.57	0.071945	Pass
WCDMA Band II (1850-1910 MHz)	RMC 12.2kbps	Low	23.26	-4.89	2.0	2.0	18.37	0.068707	Pass
		Mid	23.27				18.38	0.068865	Pass
		High	23.09				18.20	0.066069	Pass
	HSUPA	Low	22.64				17.75	0.059566	Pass
		Mid	22.93				18.04	0.063680	Pass
		High	21.90				17.01	0.050234	Pass
	HSDPA	Low	22.53				17.64	0.058076	Pass
		Mid	22.95				18.06	0.063973	Pass
		High	22.36				17.47	0.055847	Pass
WCDMA Band IV (1710-1755 MHz)	RMC 12.2kbps	Low	24.35	-3.21	1.0	1.0	21.14	0.130017	Pass
		Mid	24.10				20.89	0.122744	Pass
		High	24.06				20.85	0.121619	Pass
	HSUPA	Low	24.35				21.14	0.130017	Pass
		Mid	24.10				20.89	0.122744	Pass
		High	24.06				20.85	0.121619	Pass
	HSDPA	Low	23.30				20.09	0.102094	Pass
		Mid	23.55				20.34	0.108143	Pass
		High	23.07				19.86	0.096828	Pass

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),
FCC 47 CFR Part 27.50(d)(4),
RSS-132 Issue 3, Section 5.4,
RSS-133 Issue 6, Section 6.4,
RSS-139 Issue 3, Section 6.5

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.

FCC 47 CFR Part 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.

RSS-132 Issue 3, Section 5.4,
The transmitter output power shall be measured in terms of average power. The equivalent isotropically radiated power (e.i.r.p.) for mobile equipment shall not exceed 11.5 watts.

RSS-133 Issue 6, Section 6.4
The equivalent isotropically radiated power (e.i.r.p.) for transmitters shall not exceed the limits given in SRSP-510. Moreover, base station transmitters operating in the band 1930-1995 MHz shall not have output power exceeding 100 watts.

RSS-139 Issue 3, Section 6.5
The equivalent isotropically radiated power (e.i.r.p.) for mobile and portable transmitters shall not exceed one watt. The e.i.r.p. for fixed and base stations in the band 1710-1780 MHz shall not exceed one watt.

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), FCC 47 CFR Part 27.50(d)(5), RSS-132 Issue 3, Section 5.4, RSS-133 Issue 6, Section 6.4, RSS-139 Issue 3, Section 6.5

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: Pass

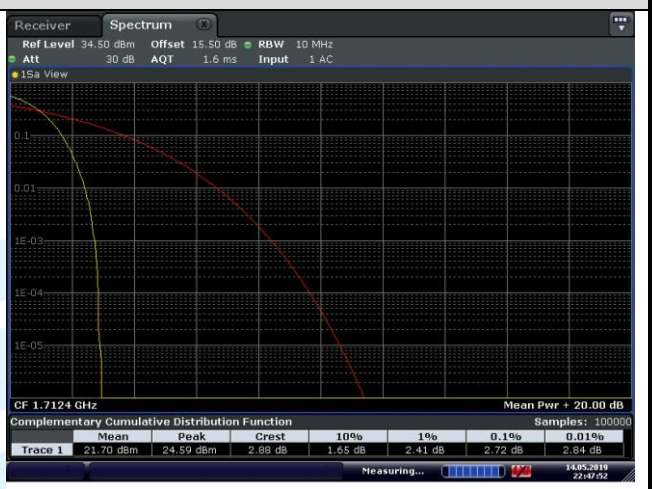
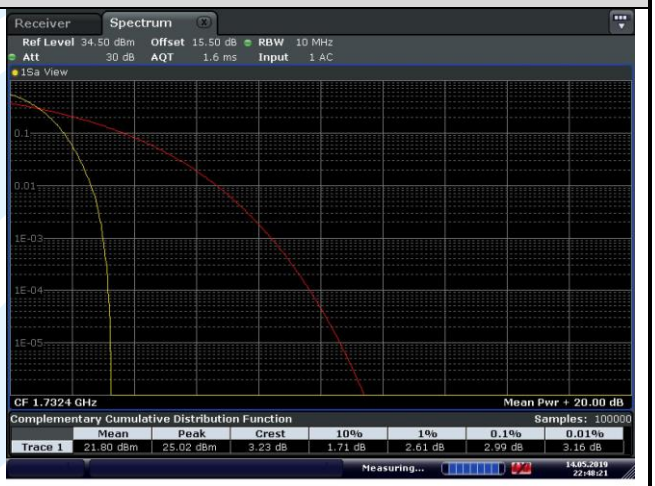
Test Data: See table below

Bands	Modulation	Peak-to-average ratio (dB)			Limit	Result
		Lowest	Middle	Highest	(dBm)	
GSM 850	GPRS	0.70	0.01	1.65	13	Pass
	EDGE	3.18	3.23	3.17	13	Pass
PCS 1900	GPRS	0.68	1.22	0.52	13	Pass
	EDGE	2.84	2.93	2.78	13	Pass
WCDMA Band II	RMC 12.2kbps	2.46	2.09	2.29	13	Pass
WCDMA Band IV	RMC 12.2kbps	2.72	2.99	3.01	13	Pass
WCDMA Band V	RMC 12.2kbps	3.07	2.32	2.52	13	Pass

The test plots as follows:

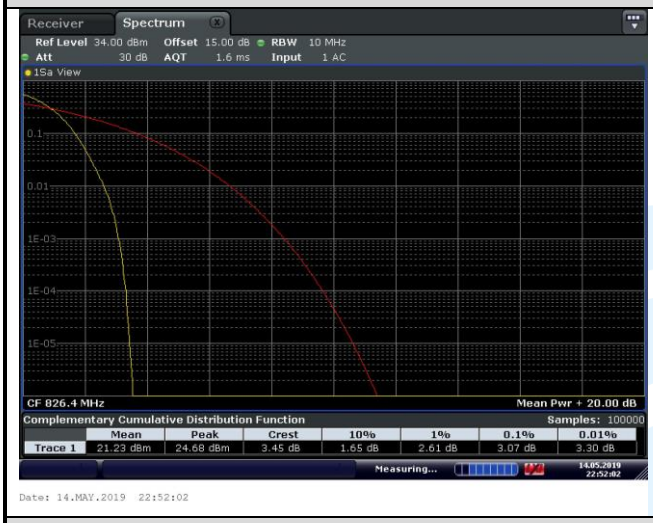
GSM 850	
GPRS	EDGE
Lowest Channel	
Middle Channel	
Highest Channel	

PCS 1900	
GPRS	EDGE
Lowest Channel	
Middle Channel	
Highest Channel	

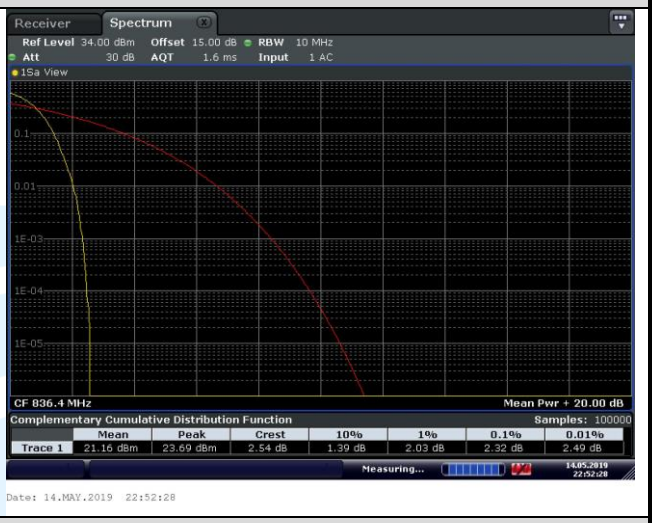
WCDMA Band II_RMC 12.2kbps	WCDMA Band IV_RMC 12.2kbps
Lowest Channel	
	
Middle Channel	
	
Highest Channel	

WCDMA Band V_RMC 12.2kbps

Lowest Channel



Middle Channel



Highest Channel

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),
FCC 47 CFR Part 27.53(h)
RSS-Gen Issue 5, Section 6.7

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

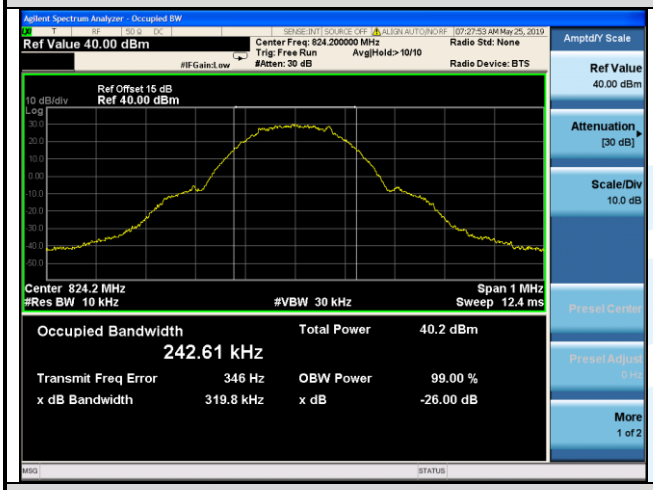
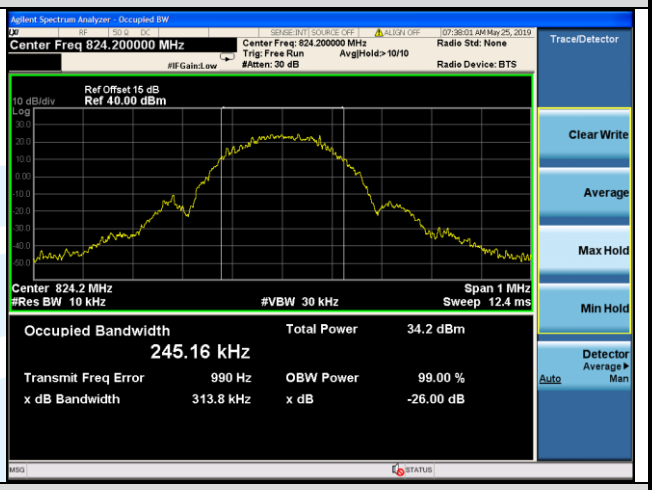
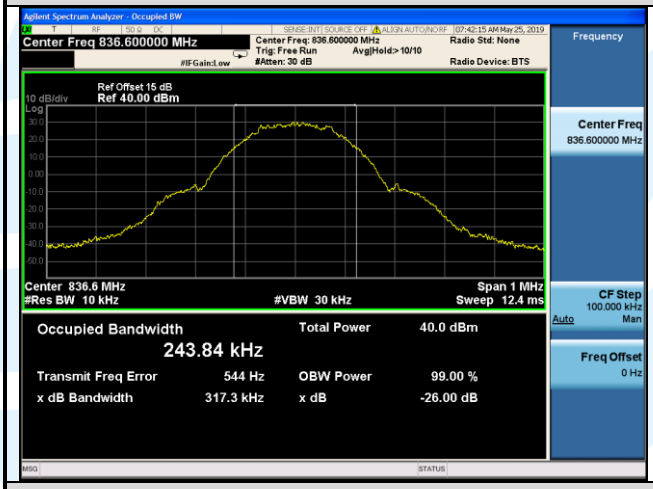
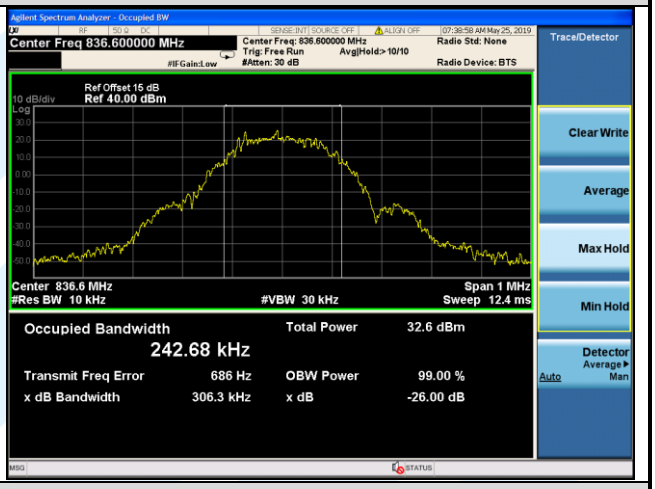
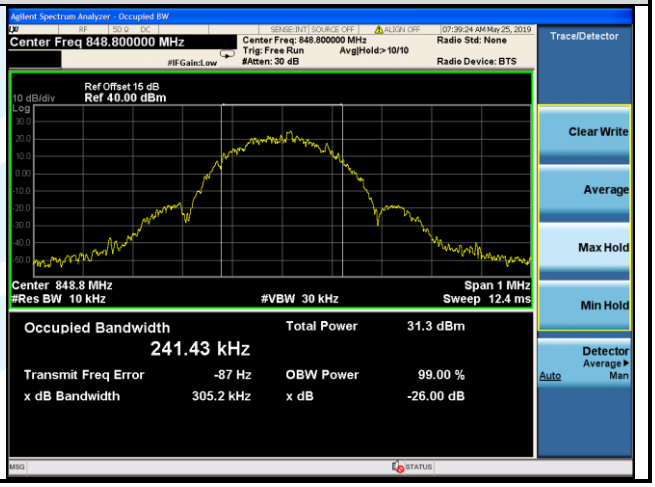
Test Results: Pass

Test Data: See table below

Bands	Modulation	Channel	Frequency (MHz)	26 dB BW (kHz)	99% BW (kHz)
GSM 850	GPRS	128	824.2	319.8	242.61
		190	836.6	317.3	243.84
		251	848.8	316.1	242.12
	EDGE	128	824.2	313.8	245.16
		190	836.6	306.3	242.68
		251	848.8	305.2	241.43
PCS 1900	GPRS	512	1850.2	314.1	242.36
		661	1880.0	314.5	243.69
		810	1909.8	321.6	245.84
	EDGE	512	1850.2	316.2	248.48
		661	1880.0	308.5	243.23
		810	1909.8	312.5	244.04

Bands	Modulation	Channel	Frequency (MHz)	26 dB BW (MHz)	99% BW (MHz)
WCDMA Band II	RMC 12.2kbps	9262	1852.4	4.753	4.1609
		9400	1880.0	4.784	4.1779
		9538	1907.6	4.759	4.1742
WCDMA Band IV	RMC 12.2kbps	1312	1712.4	4.721	4.1299
		1412	1732.4	4.711	4.1276
		1513	1752.6	4.696	4.1294
WCDMA Band V	RMC 12.2kbps	4132	826.4	4.705	4.1240
		4182	836.4	4.768	4.1568
		4233	846.6	4.734	4.1453

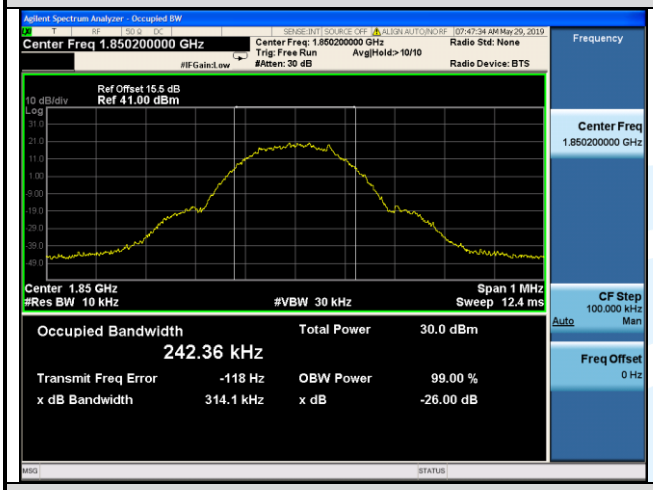
The test plots as follows:

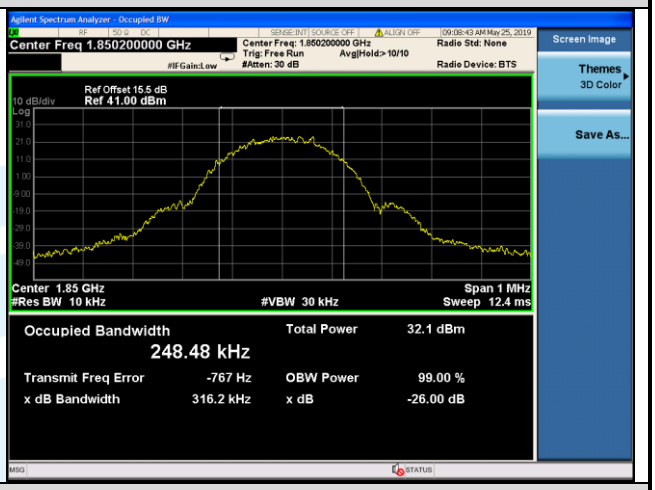
GSM 850	
GPRS	EDGE
Lowest Channel	
	
Middle Channel	
	
Highest Channel	
	

PCS 1900

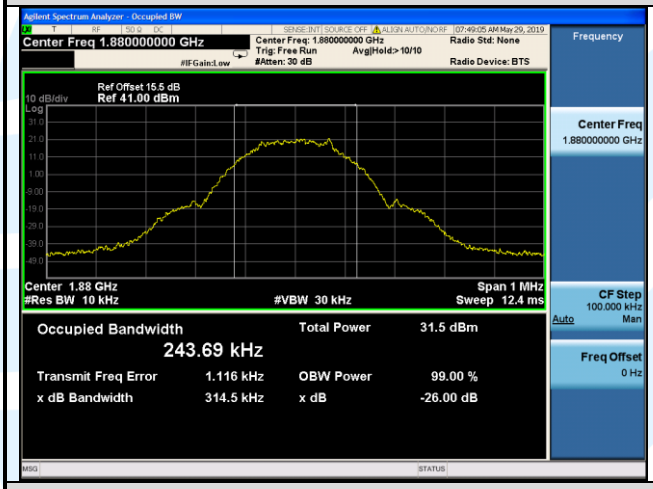
GPRS	EDGE

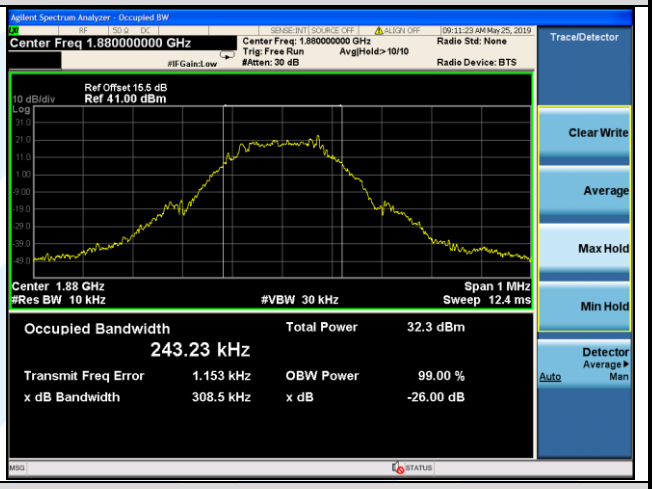
Lowest Channel



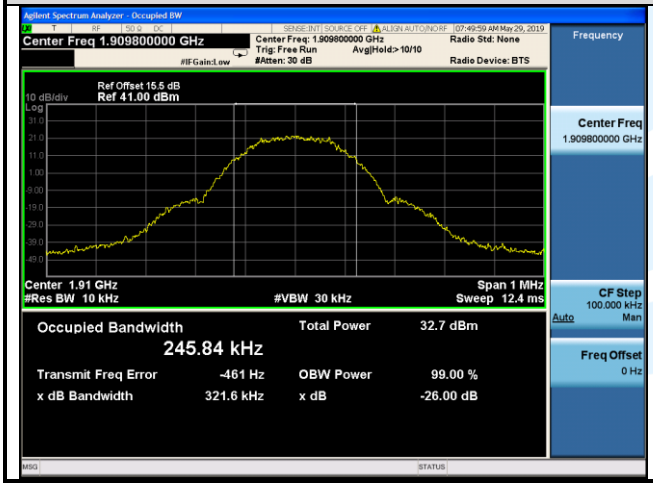


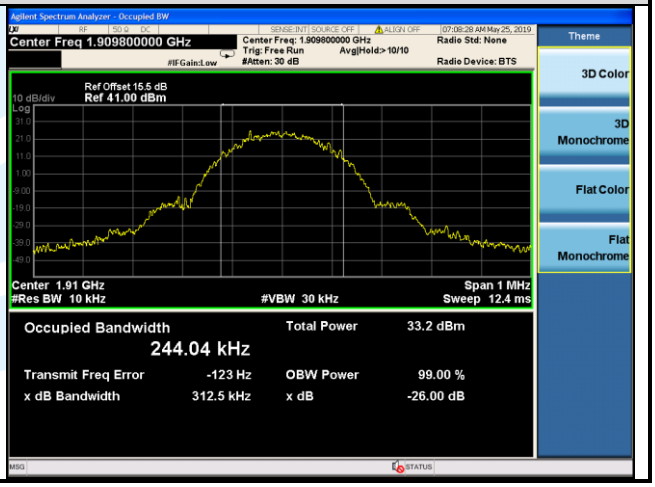
Middle Channel

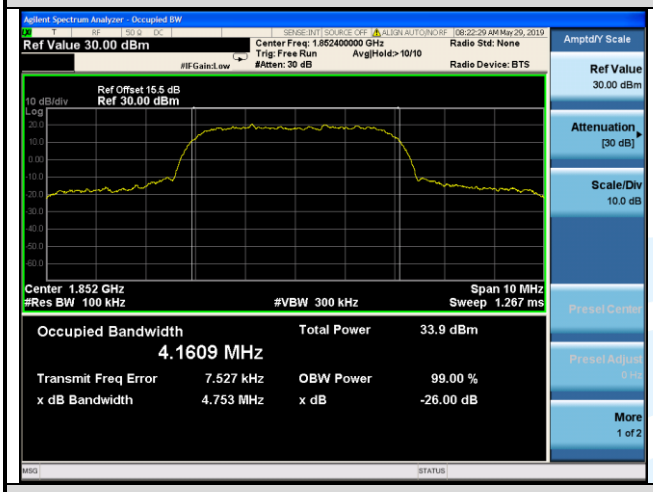
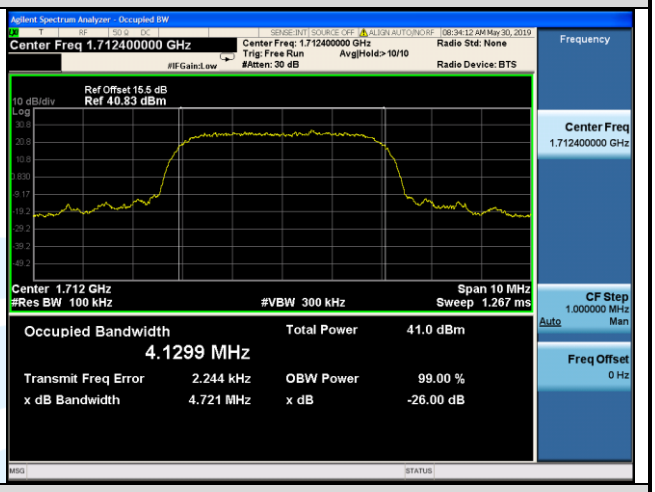
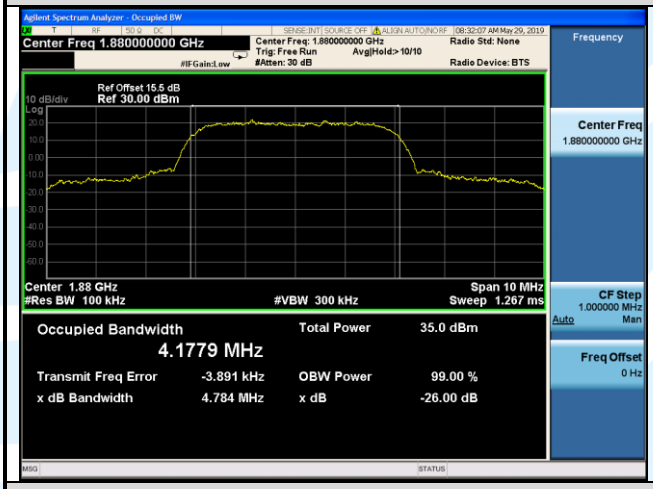
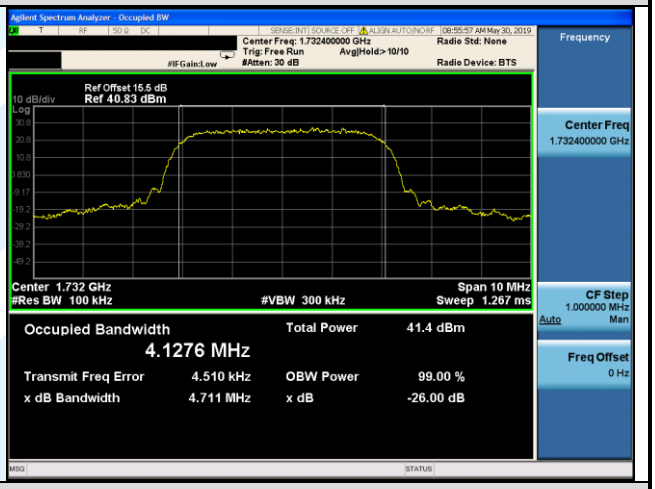
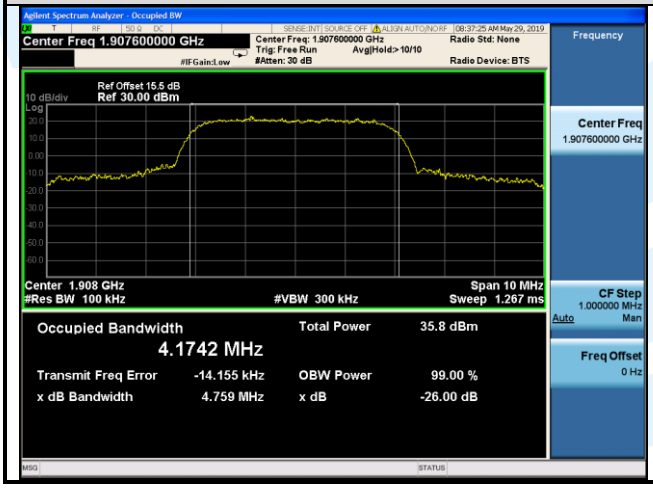
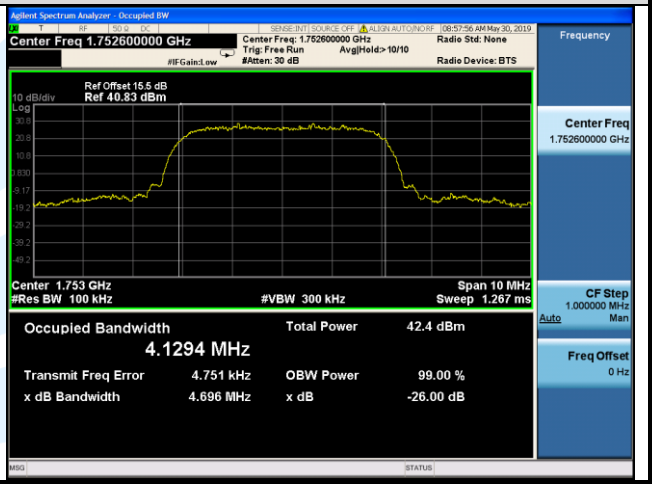




Highest Channel

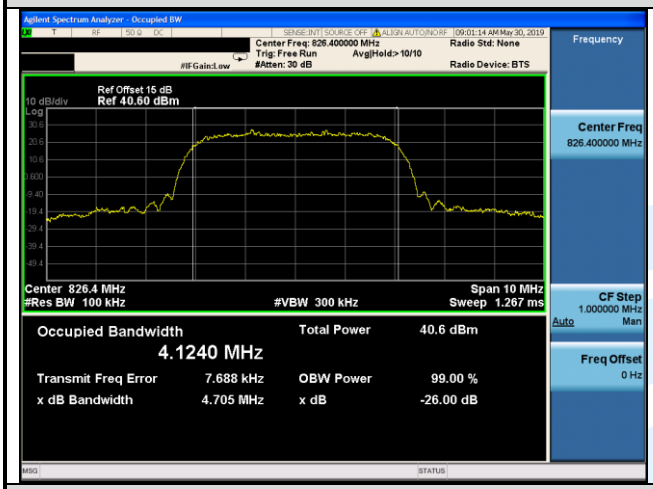




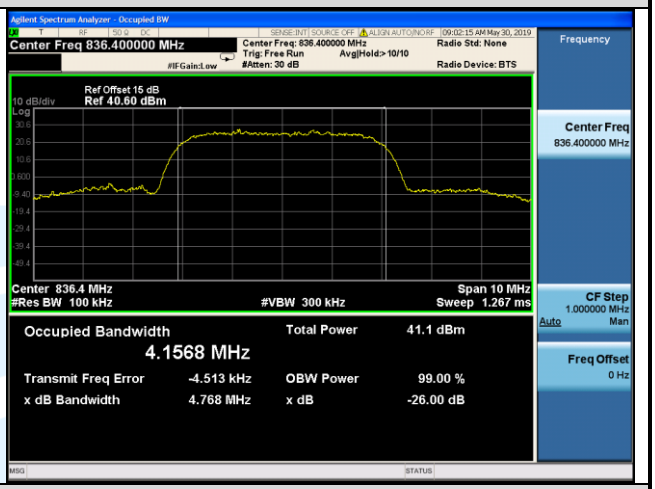
WCDMA Band II_RMC 12.2kbps	WCDMA Band IV_RMC 12.2kbps
Lowest Channel	
	
Middle Channel	
	
Highest Channel	
	

WCDMA Band V_RMC 12.2kbps

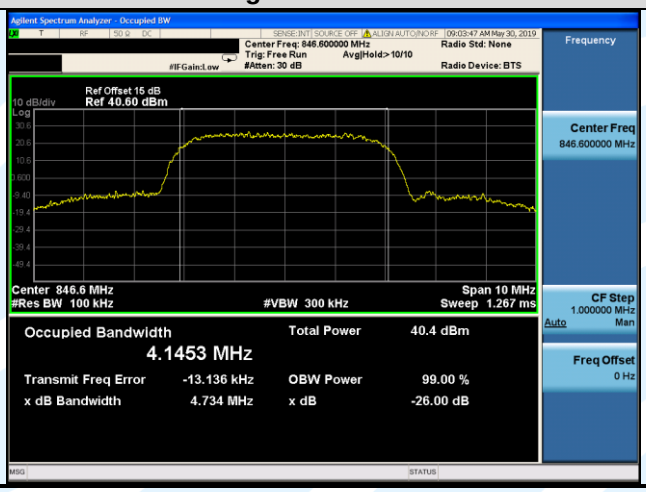
Lowest Channel



Middle Channel



Highest Channel



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),
FCC 47 CFR Part 27.53(h)(1),
RSS-132 Issue 3, Section 5.5,
RSS-133 Issue 6, Section 6.5,
RSS-139 Issue 3, Section 6.6

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

Limit:

FCC 47 CFR Part 22.917(a), FCC 47 CFR Part 24.238(a), FCC 47 CFR Part 27.53(h)(1),
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.

RSS-132 Issue 3, Section 5.5,
In the first 1.0 MHz band immediately outside and adjacent to each of the sub-bands specified in Section 5.1, the power of emissions per any 1% of the occupied bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 log10 p (watts).

After the first 1.0 MHz immediately outside and adjacent to each of the sub-bands, the power of emissions in any 100 kHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 log10 p (watts). If the measurement is performed using 1% of the occupied bandwidth, power integration over 100 kHz is required.

RSS-133 Issue 6, Section 6.5,
In the 1.0 MHz bands immediately outside and adjacent to the equipment's operating frequency block, the emission power per any 1% of the emission bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 log10 p(watts).

After the first 1.0 MHz, the emission power in any 1 MHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 log10 p(watts). If the measurement is performed using 1% of the emission bandwidth, power integration over 1.0 MHz is required.

RSS-139 Issue 3, Section 6.6,
In the first 1.0 MHz bands immediately outside and adjacent to the equipment's smallest operating frequency block,2 which can contain the equipment's occupied bandwidth, the emission power per any 1% of the emission bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least 43 + 10 log10 p (watts) dB.
After the first 1.0 MHz outside the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power in any 1 MHz bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least 43 + 10 log10 p (watts) 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.
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.

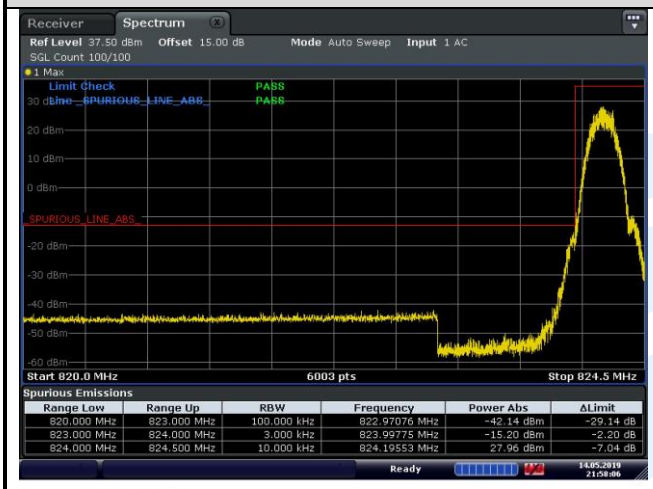
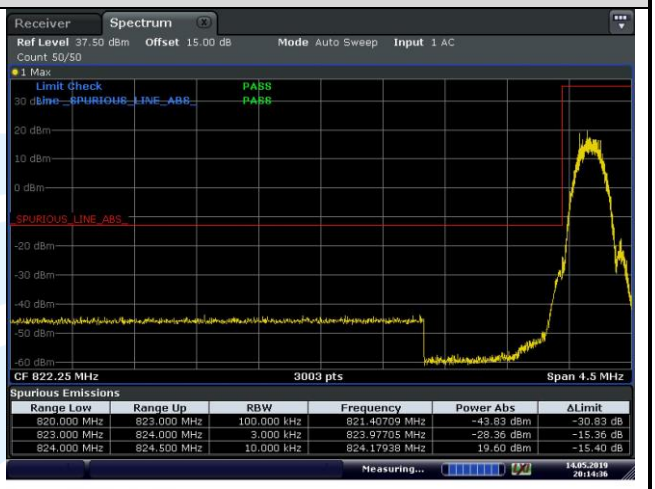
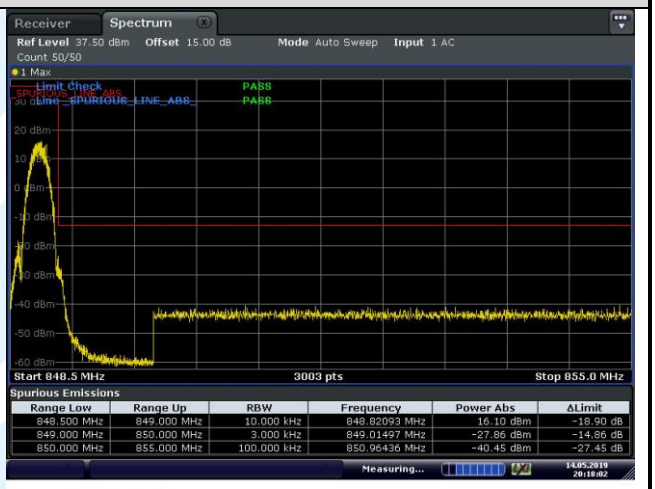
Test Setup: Refer to section 4.2.2 for details.

Instruments Used: Refer to section 3 for details

Test Mode: Link mode

Test Results: Pass

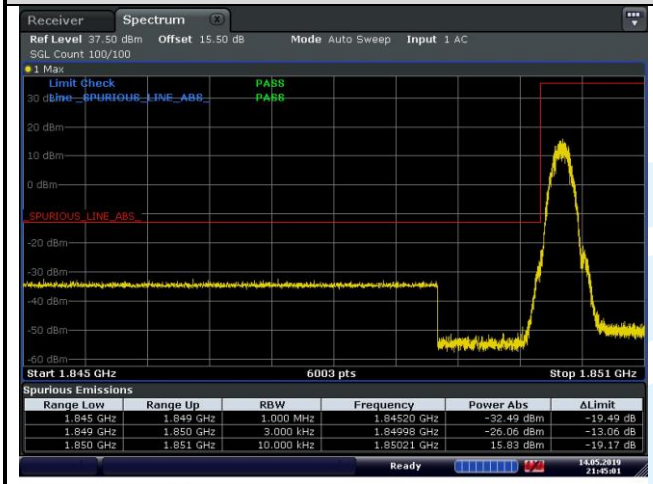
The test plots as follows:

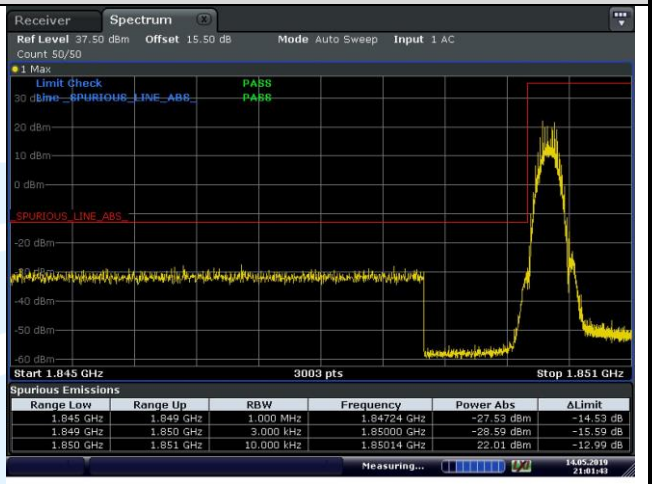
GSM 850	
GPRS	EDGE
Lowest Channel	
	
Highest Channel	
	

PCS 1900

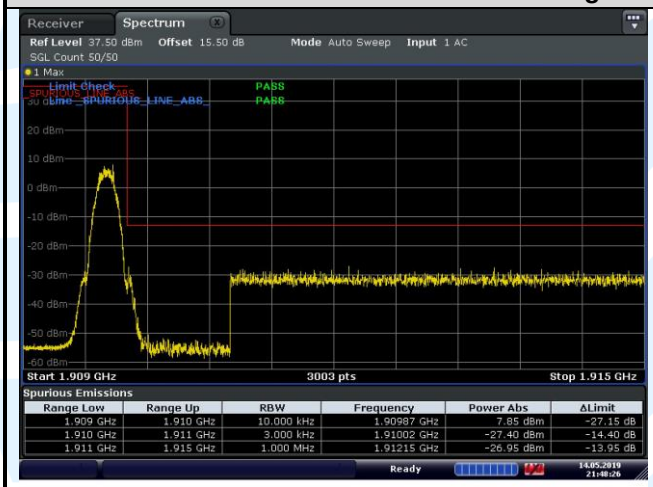
GPRS	EDGE

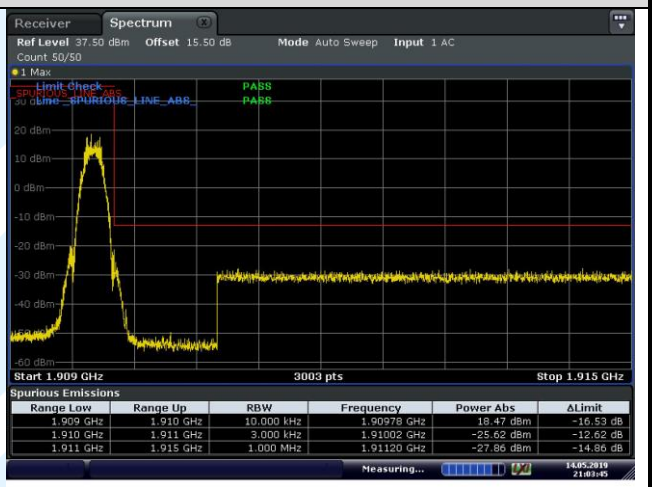
Lowest Channel





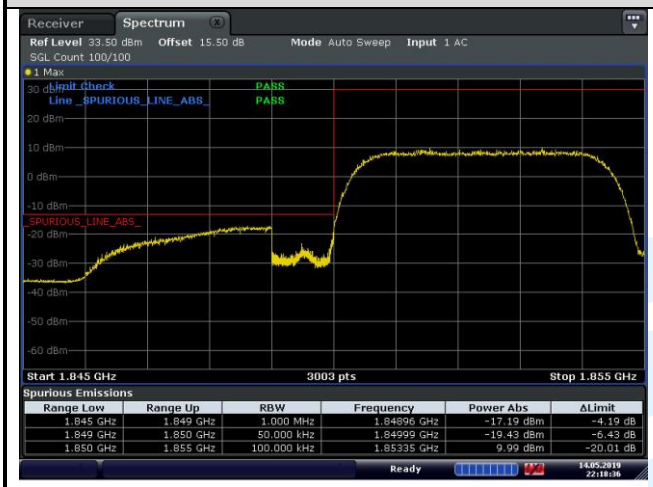
Highest Channel





WCDMA Band II_RMC 12.2kbps

Lowest Channel



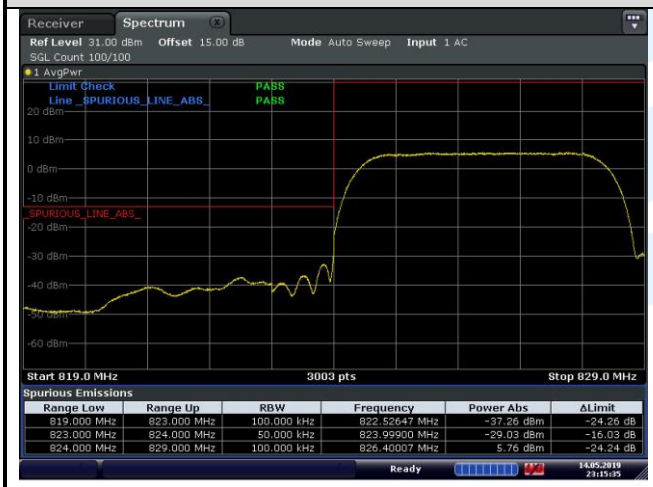
WCDMA Band IV_RMC 12.2kbps

Lowest Channel

Highest Channel

WCDMA Band V_RMC 12.2kbps

Lowest Channel



Highest Channel

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),
FCC 47 CFR Part 27.53(h)(1),
RSS-132 Issue 3, Section 5.5,
RSS-133 Issue 6, Section 6.5,
RSS-139 Issue 3, Section 6.6

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

Limit:

FCC 47 CFR Part 22.917(a), FCC 47 CFR Part 24.238(a), FCC 47 CFR Part 27.53(h)(1),
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.

RSS-132 Issue 3, Section 5.5, RSS-133 Issue 6, Section 6.6, RSS-139 Issue 3, Section 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. 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: Pass