FCC RADIO TEST REPORT

FCC ID: 2BC47-P7

Sample : GPS Tracker

Trade Name : N/A

Main Model : P7

Additional Model : Additional model see the table in page 8.

Report No. : 23091205ER-61

Prepared for

Shenzhen Qianxun IoT Technology Co., Ltd

2nd Floor, No. 568-4 Bulong Road, Yangmei Community,
Bantian Street, Longgang, Shenzhen, China

Prepared by

Global United Technology Services Co. Ltd.

No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102

TEST RESULT CERTIFICATION

Applicant..............................: Shenzhen Qianxun IoT Technology Co., Ltd

Address ....: 2nd Floor, No. 568-4 Bulong Road, Yangmei Community, Bantian Street, Longgang, Shenzhen, China

Manufacturer........................: Shenzhen Qianxun IoT Technology Co., Ltd

Address ....: 2nd Floor, No. 568-4 Bulong Road, Yangmei Community, Bantian Street, Longgang, Shenzhen, China

Product description

Product......................................: GPS Tracker

Trade Name...........................: N/A

Model Name ....: P7, Additional model see the table in page 8.

Test Methods........................: FCC Part 22H & 24E Rules

This device described above has been tested by Global United Technology Services Co. Ltd., and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Date of Test

Date (s) of performance of tests.............: Sep. 12, 2023 ~ Sep. 25, 2023

Date of Issue...: Sep. 28, 2023

Test Result..: Pass

Prepared By: [signature] ***Date:*** *2023-9-28*

Project Engineer

Check By: [signature] ***Date:*** *2023-9-28*

Reviewer

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1 TEST SUMMARY

1.1 TEST PROCEDURES AND RESULTS

The tests were performed according to following standards:

FCC Part 22 Public Mobile Services.

FCC Part 24 Personal Communications Services.

FCC Part 2 Frequency allocations and radio treaty matters, general rules and regulations.

TIA/EIA 603 E: March 2016 Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

ANSI-C63.26:2015 American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services

KDB971168 D01 v03r01 Measurement Guidance For Certification Of Licensed Digital Transmitters

DESCRIPTION OF TEST	STANDARD	RESULT
Occupied Bandwidth	§2.1049	Pass
Band Edge / Spurious and Harmonic Emissions at Antenna Terminal	§2.1051, §22.917(a), §24.238(a)	Pass
Conducted Output Power	§2.1046	Pass
Frequency stability / variation of ambient temperature	§2.1053, §22.917(a), §24.238(a)	Pass
Peak- to- Average Ratio	§24.232(d)	Pass
Effective Radiated Power	§22.913(a)(5)	Pass
Equivalent Isotropic Radiated Power	§24.232(c)	Pass
Radiated Spurious and Harmonic Emissions	§2.1051, §22.917(a), §24.238(a)	Pass

1.2 TEST FACILITY

Test Firm	:	Global United Technology Services Co. Ltd.
Address	:	No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102

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

● FCC—Registration No.: 381383

Designation Number: CN5029

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission.

The acceptance letter from the FCC is maintained in files.

● IC —Registration No.: 9079A

CAB identifier: CN0091

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

● NVLAP (LAB CODE:600179-0)

Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).

1.3 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement y ± U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

A. Conducted Measurement:

Test Site	Method	Measurement Frequency Range	U, (dB)
UNI	ANSI	9kHz ~ 150kHz	2.96
		150kHz ~ 30MHz	2.44

B. Radiated Measurement:

Test Site	Method	Measurement Frequency Range	U, (dB)
UNI	ANSI	9kHz ~ 30MHz	2.50
		30MHz ~ 1000MHz	4.80
		Above 1000MHz	4.13

C. RF Conducted Method:

Item	**Measurement Uncertainty**
Uncertainty of total RF power, conducted	U_c = ±0.8 dB
Uncertainty of RF power density, conducted	U_c = ±2.6 dB
Uncertainty of spurious emissions, conducted	U_c = ±2 %
Uncertainty of Occupied Channel Bandwidth	U_c = ±2 %

1.4 ENVIRONMENTAL CONDITIONS

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

Temperature:	15~35 ℃
Relative Humidity:	30~60 %
Air Pressure:	950~1050 hPa

2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Product	GPS Tracker	
Trade Name	N/A	
Main Model	P7	
Additional Model	Q1, Q2, Q3, Q4, Q5, Q6, Q7, Q8, Q9, Q10, Q11, Q12, Q13, Q14, Q15, Q16, Q17, Q18, Q19, Q20, P1, P2, P3, P4, P5, P6, PG01, PG02, PG03, PG04, PG05, PG06, PG07, PG08, PG09, PG10, PG11, PG12, PG13, PG14, PG15, PG16, PG17, PG18, PG19, PG20, PG21, PG22, PG23, PG24, PG25, M1, M2, M3, M4, M5, M6, M7, M8, M9, M10, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, GF07, GF08, GF09, GF10, GF11, GF12, GF13, GF14, GF15, GF16, GF17, GF18, GF19, GF20, GF21, GF22, GF23, GF24, GF25, GF26, GF27, GF28, GF29, GF30, A5, A6, A7, A8, A9, A10, A11, A12, A13, A14, A15, A16, A17, A18, A19, A20	
Model Difference	All model's the function, software and electric circuit are the same, only with a product color and model named different. Test sample model: P7.	
FCC ID	2BC47-P7	
Antenna Type	FPC Antenna	
Frequency Bands	☒GSM 850	☒PCS1900 (U.S. Bands)
	☐GSM 900	☐DCS 1800 (Non-U.S. Bands)
Operation Band:	GPRS/EGPRS850: UL: 824MHz~849MHz GPRS/EGPRS1900: UL: 1850MHz~1910MHz	
Supported Type:	GPRS/EGPRS	
Modulation Type:	GMSK for GPRS, 8PSK for EGPRS	
Antenna gain	GPRS/EDGE850: 1.69dBi	GPRS/EDGE1900: 2.02dBi
Single Card	GSM Card Slot	
Battery	DC 3.7V	
Power Source	DC 3.7V from Li-battery DC 5.0V from adapter with AC 120(240)V/60Hz	
Adapter	N/A	

Note:1.The maximum power levels are GSM for MCS-4: GMSK link, only these modes were used for all tests.

2. We found out the test mode with the highest power level after we analyze all the data rates. So we chose worst case as a representative.

GSM Card 1 Slot :

	Maximum ERP/EIRP (dBm)	Max. Average Burst Power (dBm)
GSM 850	25.71	30.99
PCS 1900	25.33	29.27

2.2 DESCRIPTION OF TEST MODES AND TEST FREQUENCY

The EUT has been tested under typical operating condition. The CMW500 used to control the EUT staying in continuous transmitting and receiving mode for testing.

Test Frequency:

GPRS/EDGE850		GPRS/EDGE1900	
Channel	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**
128	824.20	512	1850.20
190	836.60	661	1880.00
251	848.80	810	1909.80

2.3 DESCRIPTION OF THE TEST MODES

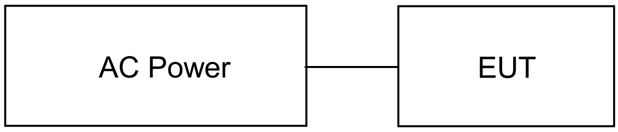
During the measurement the environmental conditions were within the listed ranges:

Voltage	Normal Voltage	DC 3.7V
	High Voltage	DC 4.07V
	Low Voltage	DC 3.33V
Other	Normal Temperature	24℃
	Relative Humidity	55 %
	Air Pressure	989 hPa

Note: All modes were test at Normal Voltage, High Voltage, and Low Voltage, only the worst results of Normal Voltage was reported in the test report.

2.4 TEST SETUP

Operation of EUT during Conducted and Radiation testing:



2.5 DESCRIPTION TEST PERIPHERAL AND EUT PERIPHERAL

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Model No.	Cable Length(cm)	Remark
1	GPS Tracker	P7	--	EUT
2	Adapter	Xiaomi	--	AE

Note:

1. The support equipment was authorized by Declaration of Confirmation.
2. All the above equipment/cables were placed in worse case positions to maximize emission signals during emission test.

2.6 MEASUREMENT INSTRUMENTS LIST

Radiated Emission:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	June 23, 2021	June 22, 2024
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	April 14, 2023	April 13, 2024
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9168	GTS640	March 19, 2023	March 18, 2025
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	April 17, 2023	April 16, 2025
6	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
7	Coaxial Cable	GTS	N/A	GTS213	April 21, 2023	April 20, 2024
8	Coaxial Cable	GTS	N/A	GTS211	April 21, 2023	April 20, 2024
9	Coaxial cable	GTS	N/A	GTS210	April 21, 2023	April 20, 2024
10	Coaxial Cable	GTS	N/A	GTS212	April 21, 2023	April 20, 2024
11	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	April 14, 2023	April 13, 2024
12	Loop Antenna	ZHINAN	ZN30900A	GTS534	Nov. 29, 2022	Nov. 28, 2023
13	Broadband Preamplifier	SCHWARZBECK	BBV9718	GTS535	April 14, 2023	April 13, 2024
14	Amplifier(1GHz-26.5GHz)	HP	8449B	GTS601	April 14, 2023	April 13, 2024
15	Horn Antenna (18-26.5GHz)	/	UG-598A/U	GTS664	Oct. 30, 2022	Oct. 29, 2023
16	Horn Antenna (26.5-40GHz)	A.H Systems	SAS-573	GTS665	Oct. 30, 2022	Oct. 29, 2023
17	FSV·Signal Analyzer (10Hz-40GHz)	Keysight	FSV-40-N	GTS666	March 13, 2023	March 12, 2024
18	Amplifier	/	LNA-1000-30S	GTS650	April 14, 2023	April 13, 2024
19	CDNE M2+M3-16A	HCT	30MHz-300MHz	GTS668	Dec. 20, 2022	Dec.19, 2023
20	Thermo meter	JINCHUANG	GSP-8A	GTS643	April 19, 2023	April 18, 2024

Conducted Emission						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Shielding Room	ZhongYu Electron	7.3(L)x3.1(W)x2.9(H)	GTS252	July 12, 2022	July 11, 2027
2	EMI Test Receiver	R&S	ESCI 7	GTS552	April 14, 2023	April 13, 2024
3	LISN	ROHDE & SCHWARZ	ENV216	GTS226	April 14, 2023	April 13, 2024
4	Coaxial Cable	GTS	N/A	GTS227	N/A	N/A
5	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
6	Thermo meter	JINCHUANG	GSP-8A	GTS642	April 19, 2023	April 18, 2024
7	Absorbing clamp	Elektronik-Feinmechanik	MDS21	GTS229	April 14, 2023	April 13, 2024
8	ISN	SCHWARZBECK	NTFM 8158	GTS565	April 14, 2023	April 13, 2024
9	High voltage probe	SCHWARZBECK	TK9420	GTS537	April 14, 2023	April 13, 2024
10	Antenna end assembly	Weinschel	1870A	GTS560	April 14, 2023	April 13, 2024

RF Conducted Test:						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	MXA Signal Analyzer	Agilent	N9020A	GTS566	April 14, 2023	April 13, 2024
2	EMI Test Receiver	R&S	ESCI 7	GTS552	April 14, 2023	April 13, 2024
3	PSA Series Spectrum Analyzer	Agilent	E4440A	GTS536	April 14, 2023	April 13, 2024
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	April 14, 2023	April 13, 2024
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	April 14, 2023	April 13, 2024
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	April 14, 2023	April 13, 2024
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	April 14, 2023	April 13, 2024
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	April 14, 2023	April 13, 2024
9	Thermo meter	JINCHUANG	GSP-8A	GTS641	April 19, 2023	April 18, 2024

3 ERP AND EIRP

3.1 PROVISIONS APPLICABLE

The radiation test is carried out in a semi-anechoic chamber.

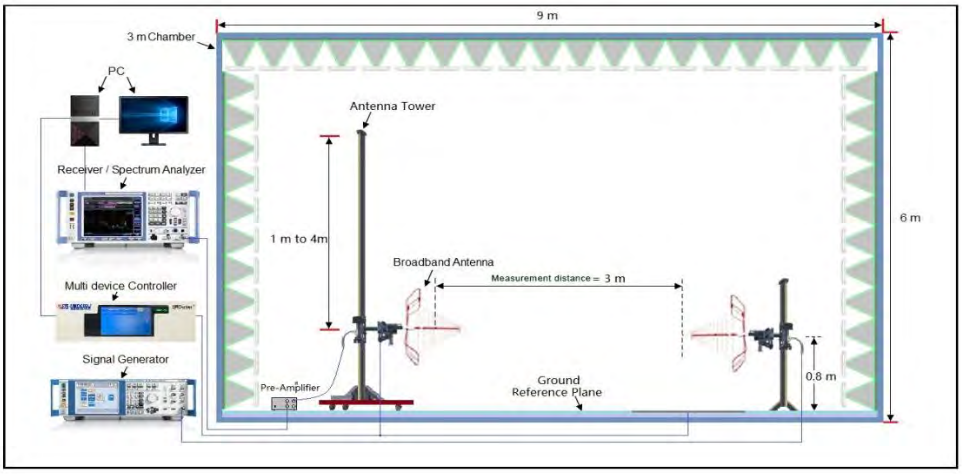
According to the test, put the device under test on a non-conductive platform 3 meters away from the receiving antenna (ANSI/TIA-603-E-2016 Article 2.2.17).

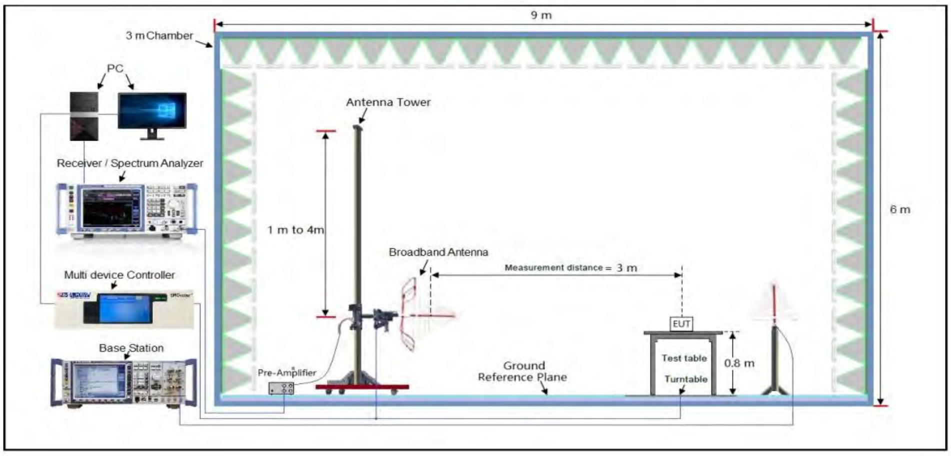
The following rules are for the maximum radiated power limit requirements of the product:

Mode	Nominal Peak Power
GSM 850	<=38.45dBm (7W). ERP
GSM 1900	<=33dBm (2W). EIRP

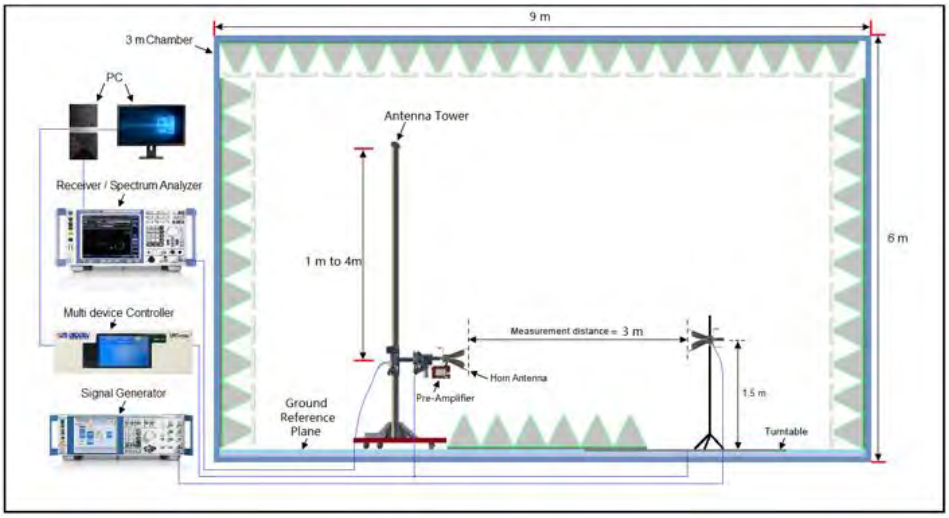
3.2 TEST CONFIGURATION

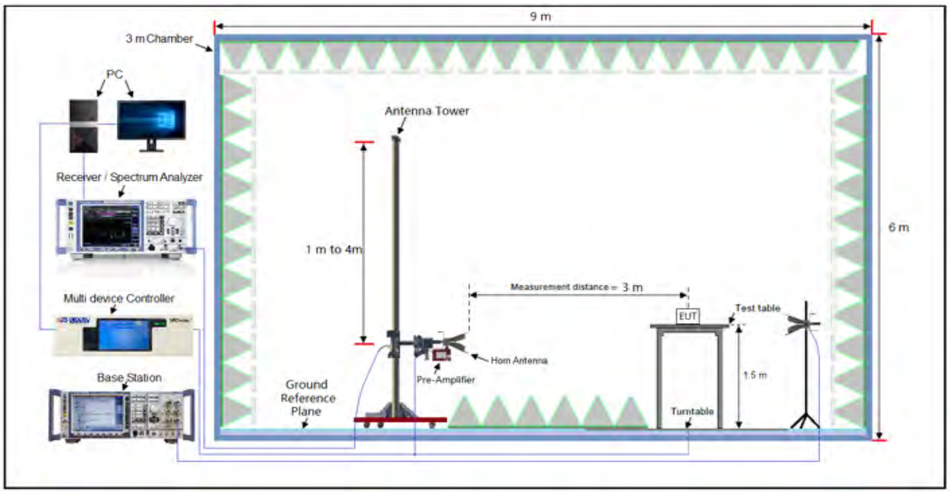
Radiated Power 30MHz to 1GHz Test setup





Radiated Power Above 1GHz Test setup





Conducted Power Test setup

3.3 TEST PROCEDURE

Radiated Test:

1. Place the EUT in the center of the turntable.
   a) For radiated emissions measurements performed at frequencies less than or equal to 1 GHz, the EUT shall be placed on a RF-transparent table at a nominal height of 80 cm above the reference ground plane
   b) For radiated measurements performed at frequencies above 1 GHz, the EUT shall be placed on an RF transparent table at a nominal height of 1.5 m above the ground plane.
2. Unless the EUT uses an integral antenna, the EUT shall be terminated with a non-radiating transmitter load. In cases where the EUT uses an adjustable antenna, the antenna shall be adjusted through typical positions and lengths to maximize emissions levels.
3. The EUT shall be tested while operating on the frequency per manufacturer specification. Set the transmitter to operate in continuous transmit mode.
4. Receiver or Spectrum set as follow:
   Below 1GHz, RBW=100kHz, VBW=300kHz, Detector=Peak, Sweep time=Auto
   Above 1GHz, RBW=1MHz, VBW=3MHz, Detector=Peck, Sweep time=Auto
5. Each emission under consideration shall be evaluated:
   a) Raise and lower the measurement antenna from 1 m to 4 m, as necessary to enable detection of the maximum emission amplitude relative to measurement antenna height.
   b) Rotate the EUT through 360° to determine the maximum emission level relative to the axial position.
   c) Return the turntable to the azimuth where the highest emission amplitude level was observed.
   d) Vary the measurement antenna height again through 1 m to 4 m again to find the height associated with the maximum emission amplitude.
   e) Record the measured emission amplitude level and frequency

8. Maintain the previous measurement instrument settings and test set-up, with the exception that the EUT is removed and replaced by the substitution antenna.
9. Connect a signal generator to the substitution antenna; locate the signal generator so as to minimize any potential influences on the measurement results. Set the signal generator to the frequency where emissions are detected, and set an output power level such that the radiated signal can be detected by the measurement instrument, with sufficient dynamic range relative to the noise floor.
10. For each emission that was detected and measured in the initial test
   a) Vary the measurement antenna height between 1 m to 4 m to maximize the received (measured) signal amplitude.

b) Adjust the signal generator output power level until the amplitude detected by the measurement instrument equals the amplitude level of the emission previously measured directly in step 5 and step 6.

c) Record the output power level of the signal generator when equivalence is achieved in step b).

11. Repeat step 8 through step 10 with the measurement antenna oriented in the opposite polarization.

12. Calculate the emission power in dBm referenced to a half-wave dipole using the following equation:

Pe = Ps(dBm) − cable loss (dB) + antenna gain (dBd)

where

Pe = equivalent emission power in dBm

Ps = source (signal generator) power in dBm

NOTE—dBd refers to the measured antenna gain in decibels relative to a half-wave dipole.

13. Correct the antenna gain of the substitution antenna if necessary to reference the emission power to a half-wave dipole. When using measurement antennas with the gain specified in dBi, the equivalent dipole-referenced gain can be determined from:

gain (dBd) = gain (dBi) − 2.15 dB.

If necessary, the antenna gain can be calculated from calibrated antenna factor information

14.Provide the complete measurement results as a part of the test report.

Conducted Test:

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 was used to establish communication with the EUT , Its parameters were 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 measurements were performed on all modes at 3 typical channels(the Top Channel, the Middle Channel and the Bottom Channel) for each band.

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW ≥ 3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points > 2 x span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto".
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10.The trace was allowed to stabilize.

3.4 TEST RESULT

Conducted Test:

Band	Channel	PCL	Slot	Power(dBm)	Limit(dBm)	Result
GPRS850	128	5	1	30.86	38.5	PASS
GPRS850	128	5	2	29.80	38.5	PASS
GPRS850	128	5	3	27.92	38.5	PASS
GPRS850	128	5	4	26.07	38.5	PASS
GPRS850	190	5	1	30.89	38.5	PASS
GPRS850	190	5	2	29.83	38.5	PASS
GPRS850	190	5	3	27.91	38.5	PASS
GPRS850	190	5	4	26.87	38.5	PASS
GPRS850	251	5	1	**30.99**	38.5	PASS
GPRS850	251	5	2	29.65	38.5	PASS
GPRS850	251	5	3	28.01	38.5	PASS
GPRS850	251	5	4	26.68	38.5	PASS
GPRS1900	512	0	1	29.11	33	PASS
GPRS1900	512	0	2	28.07	33	PASS
GPRS1900	512	0	3	26.54	33	PASS
GPRS1900	512	0	4	25.21	33	PASS
GPRS1900	661	0	1	**29.27**	33	PASS
GPRS1900	661	0	2	28.20	33	PASS
GPRS1900	661	0	3	26.19	33	PASS
GPRS1900	661	0	4	25.80	33	PASS
GPRS1900	810	0	1	29.26	33	PASS
GPRS1900	810	0	2	28.23	33	PASS
GPRS1900	810	0	3	26.24	33	PASS
GPRS1900	810	0	4	25.66	33	PASS

Band	Channel	PCL	Slot	Power(dBm)	Limit(dBm)	Result
EGPRS850	128	8	1	**29.51**	38.5	PASS
EGPRS850	128	8	2	29.32	38.5	PASS
EGPRS850	128	8	3	27.45	38.5	PASS
EGPRS850	128	8	4	25.37	38.5	PASS
EGPRS850	190	8	1	29.33	38.5	PASS
EGPRS850	190	8	2	29.22	38.5	PASS
EGPRS850	190	8	3	27.43	38.5	PASS
EGPRS850	190	8	4	25.28	38.5	PASS
EGPRS850	251	8	1	29.28	38.5	PASS
EGPRS850	251	8	2	29.20	38.5	PASS
EGPRS850	251	8	3	27.36	38.5	PASS
EGPRS850	251	8	4	25.21	38.5	PASS
EGPRS1900	512	2	1	**29.04**	33	PASS
EGPRS1900	512	2	2	27.56	33	PASS
EGPRS1900	512	2	3	25.69	33	PASS
EGPRS1900	512	2	4	23.75	33	PASS
EGPRS1900	661	2	1	28.80	33	PASS
EGPRS1900	661	2	2	27.24	33	PASS
EGPRS1900	661	2	3	25.39	33	PASS
EGPRS1900	661	2	4	23.50	33	PASS
EGPRS1900	810	2	1	28.82	33	PASS
EGPRS1900	810	2	2	27.34	33	PASS
EGPRS1900	810	2	3	25.43	33	PASS
EGPRS1900	810	2	4	23.39	33	PASS

Radiated Test:

Mode	Ch./ Freq.		Substitute LEVEL (dBm)	Ant. Gain (dBd)	C.L	Pol.	Limit	ERP	
	channel	Freq. (MHz)					W	W	dBm
GSM850 (GPRS)	128	824.2	27.38	-0.46	1.21	H	< 7.00	0.372	**25.71**
	190	836.6	26.62	-0.46	1.25	H		0.310	24.91
	251	848.8	26.51	-0.46	1.24	H		0.303	24.81
	128	824.2	24.33	-0.46	1.21	V		0.185	22.66
	190	836.6	24.76	-0.46	1.25	V		0.202	23.05
	251	848.8	24.65	-0.46	1.24	V		0.197	22.95

Mode	Ch./ Freq.		Substitute LEVEL (dBm)	Ant. Gain (dBi)	C.L	Pol.	Limit	EIRP	
	channel	Freq. (MHz)					W	W	dBm
PCS1900 (GPRS)	512	1850.2	27.57	-0.13	2.11	H	< 2.00	0.341	**25.33**
	661	1880.0	27.54	-0.13	2.15	H		0.336	25.26
	810	1909.8	27.35	-0.13	2.15	H		0.321	25.07
	512	1850.2	25.23	-0.13	2.11	V		0.199	22.99
	661	1880.0	25.06	-0.13	2.15	V		0.190	22.78
	810	1909.8	25.64	-0.13	2.15	V		0.217	23.36

Mode	Ch./ Freq.		Substitute LEVEL (dBm)	Ant. Gain (dBd)	C.L	Pol.	Limit	ERP	
	channel	Freq. (MHz)					W	W	dBm
GSM850 (EGPRS)	128	824.2	27.33	-0.46	1.21	H	< 7.00	0.368	**25.66**
	190	836.6	26.66	-0.46	1.25	H		0.313	24.95
	251	848.8	26.55	-0.46	1.24	H		0.305	24.85
	128	824.2	24.33	-0.46	1.21	V		0.185	22.66
	190	836.6	24.72	-0.46	1.25	V		0.200	23.01
	251	848.8	24.66	-0.46	1.24	V		0.198	22.96

Mode	Ch./ Freq.		Substitute LEVEL (dBm)	Ant. Gain (dBi)	C.L	Pol.	Limit	EIRP	
	channel	Freq. (MHz)					W	W	dBm
PCS1900 (EGPRS)	512	1850.2	27.55	-0.13	2.11	H	< 2.00	0.340	**25.31**
	661	1880.0	27.53	-0.13	2.15	H		0.335	25.25
	810	1909.8	27.32	-0.13	2.15	H		0.319	25.04
	512	1850.2	25.26	-0.13	2.11	V		0.200	23.02
	661	1880.0	25.07	-0.13	2.15	V		0.190	22.79
	810	1909.8	25.65	-0.13	2.15	V		0.217	23.37

Note:1. EIRP/ERP = Substitute LEVEL (dBm) + Ant. Gain – C.L (Cable Loss)

2. All polarizations and modes have been tested, only the worst mode is recorded in the report

4 PEAK-TO-AVERAGE POWER RATIO

4.1 PROVISIONS APPLICABLE

This is the test for the Peak-to-Average Ratio from the EUT.

Power Complementary Cumulative Distribution Function (CCDF) curves provide a means for characterizing the power peaks of a digitally modulated signal on a statistical basis. A CCDF curve depicts the probability of the peak signal amplitude exceeding the average power level. Most contemporary measurement instrumentation include the capability to produce CCDF curves for an input signal provided that the instrument's resolution bandwidth can be set wide enough to accommodate the entire input signal bandwidth. 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.

4.2 MEASUREMENT METHOD

① **CCDF Procedure for PAPR :**

1. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Set the measurement interval as follows:

-for continuous transmissions, set to 1 ms,

-or 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.

4. Record the maximum PAPR level associated with a probability of 0.1%.

② **Alternate Procedure for PAPR:**

Use one of the procedures presented in 5.2(ANSI C63.26-2015) to measure the total peak power and record as PPk. Use one of the applicable procedures presented 5.2(ANSI C63.26-2015) to measure the total average power and recordas PAvg. Determine the P.A.R. from:

PAPR(dB) = PPk (dBm) – PAvg (dBm) (PAvg = Average Power + Duty cycle Factor)

Allow trace to fully stabilize.

Use the peak marker function to determine the peak amplitude level.

Test Settings(Peak Power):

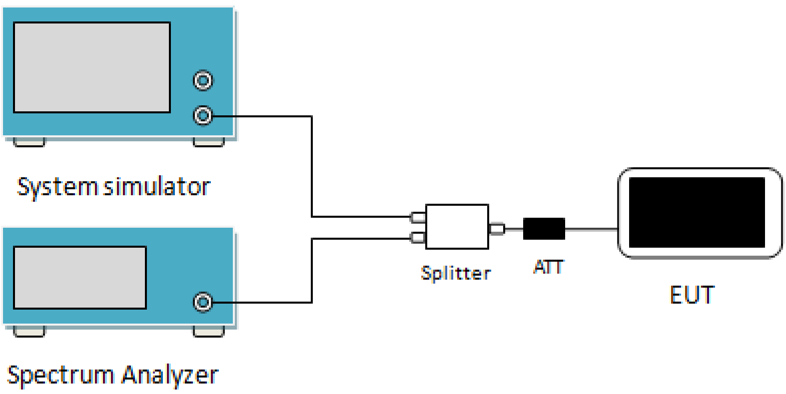
The measurement instrument must have a RBW that is greater than or equal to the OBW of the signal to be measured and a VBW ≥ 3 × RBW.

1. Set the RBW ≥ OBW.
2. Set VBW ≥ 3 × RBW.
3. Set span ≥ 2 × OBW.
4. Sweep time ≥ 10 × (number of points in sweep) × (transmission symbol period).
5. Detector = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use the peak marker function to determine the peak amplitude level.

Test Settings(Average Power)

1. Set span to 2 × to 3 × the OBW.
2. Set RBW ≥ OBW.
3. Set VBW ≥ 3 × RBW.
4. Set number of measurement points in sweep ≥ 2 × span / RBW.
5. Sweep time: Set ≥ [10 × (number of points in sweep) × (transmission period)] for single sweep (automation-compatible) measurement. The transmission period is the (on + off) time.
6. Detector = power averaging (rms).
7. Set sweep trigger to "free run."
8. Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple. (To accurately determine the average power over the on and off period of the transmitter, it can be necessary to increase the number of traces to be averaged above 100 or, if using a manually configured sweep time, increase the sweep time.)
9. Use the peak marker function to determine the maximum amplitude level.
10. Add [10 log (1/duty cycle)] to the measured maximum power level to compute the average power during continuous transmission. For example, add [10 log (1/0.25)] = 6 dB if the duty cycle is a constant 25%.

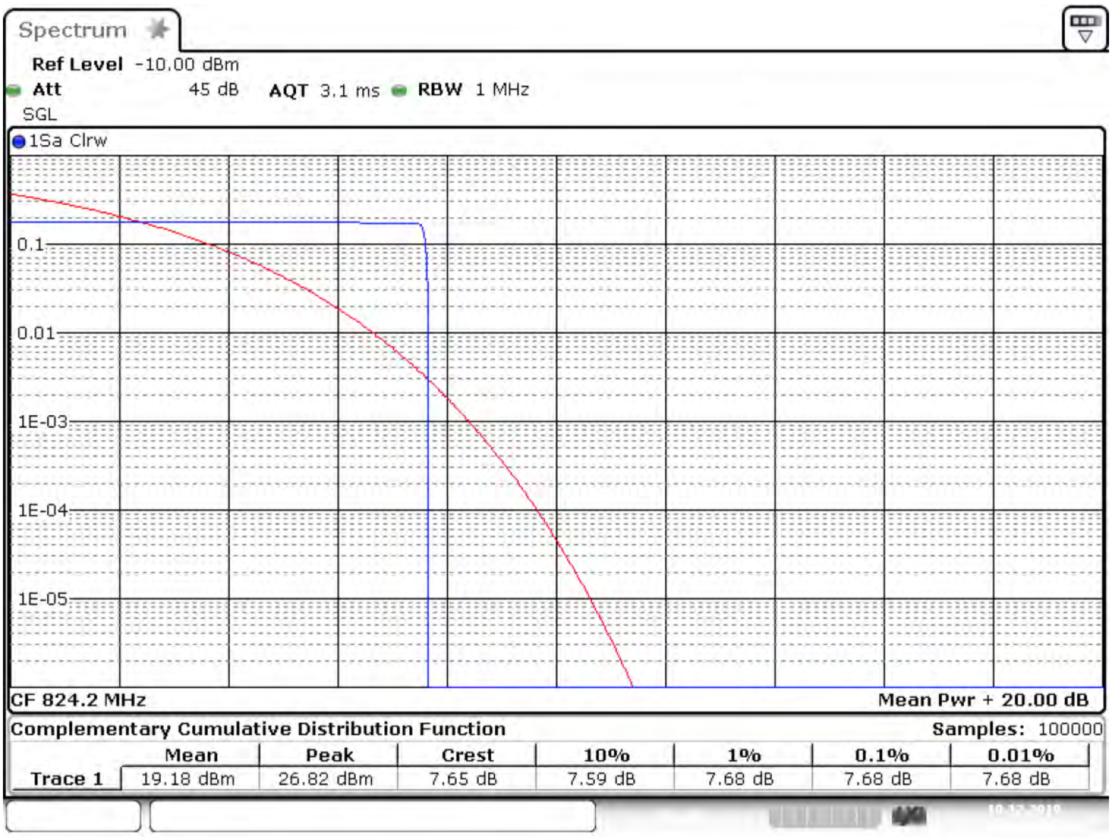
4.3 MEASUREMENT SETUP



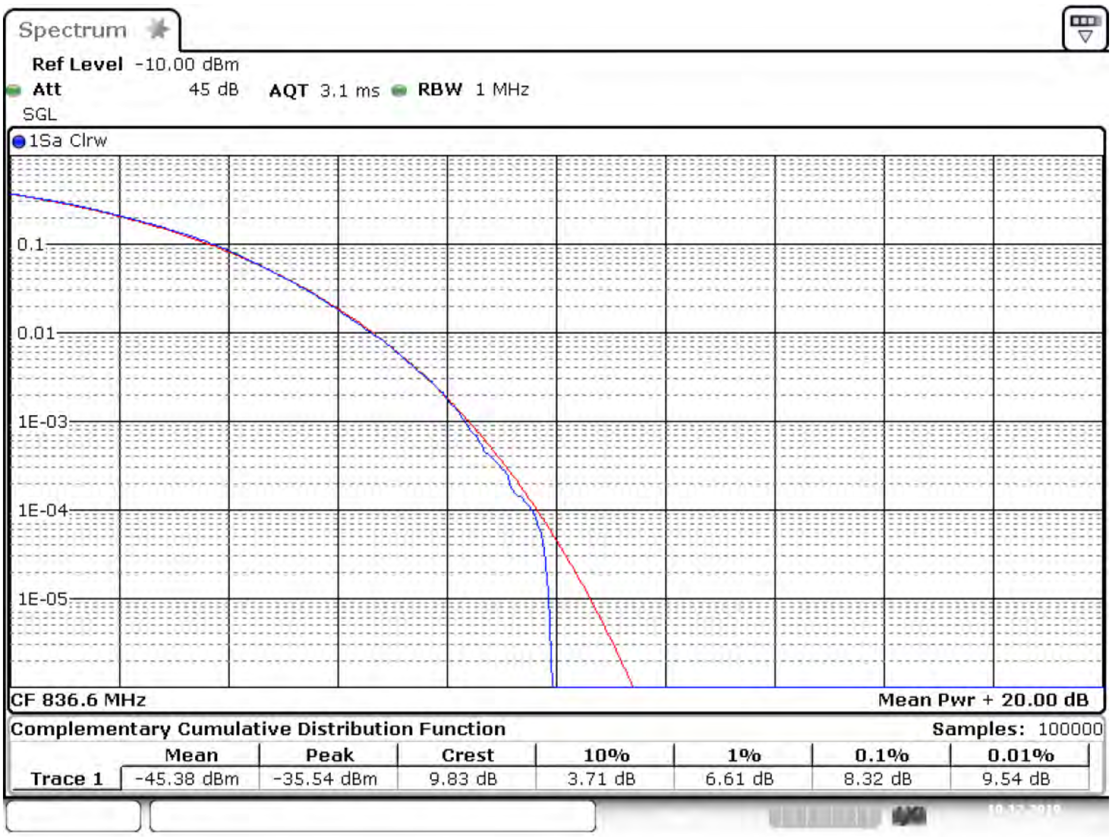
4.4 TEST RESULT

Band	Channel	Peak-to-Average Ratio(dB)	Limit(dBm)	Result
GPRS850	128	7.68	13	PASS
GPRS850	190	8.32	13	PASS
GPRS850	251	7.71	13	PASS
EGPRS850	128	8.43	13	PASS
EGPRS850	190	12.90	13	PASS
EGPRS850	251	10.58	13	PASS
GPRS1900	512	8.35	13	PASS
GPRS1900	661	10.55	13	PASS
GPRS1900	810	7.68	13	PASS
EGPRS1900	512	8.35	13	PASS
EGPRS1900	661	10.55	13	PASS
EGPRS1900	810	10.26	13	PASS

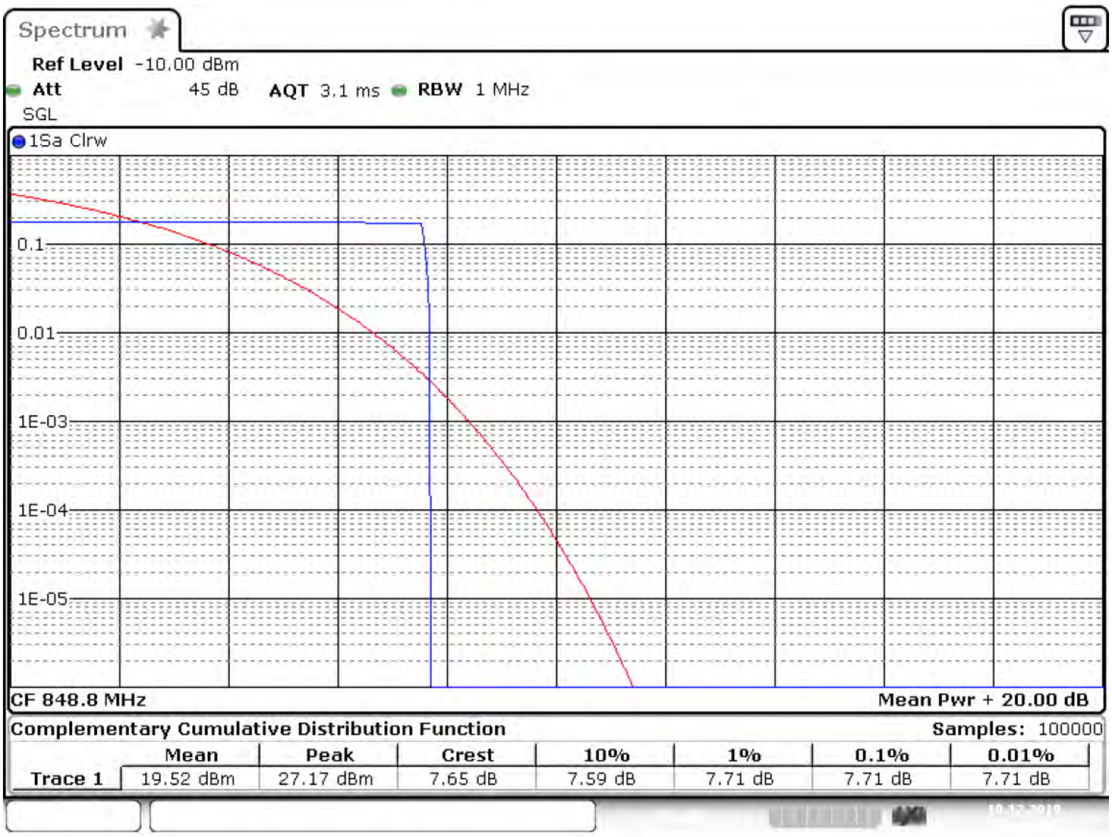
Test Case: GPRS (Spectrum)Peak-to-Average Ratio		
Band: 850	Channel: 128	PCL: 5
Voltage: VN	Temperature: TN	Value:CCDF:7.68



Test Case: GPRS (Spectrum)Peak-to-Average Ratio		
Band: 850	Channel: 190	PCL: 5
Voltage: VN	Temperature: TN	Value:CCDF:8.32



Test Case: GPRS (Spectrum)Peak-to-Average Ratio		
Band: 850	Channel: 251	PCL: 5
Voltage: VN	Temperature: TN	Value:CCDF:7.71



Test Case: EGPRS (Spectrum)Peak-to-Average Ratio		
Band: 850	Channel: 128	PCL: 8
Voltage: VN	Temperature: TN	Value:CCDF:8.43

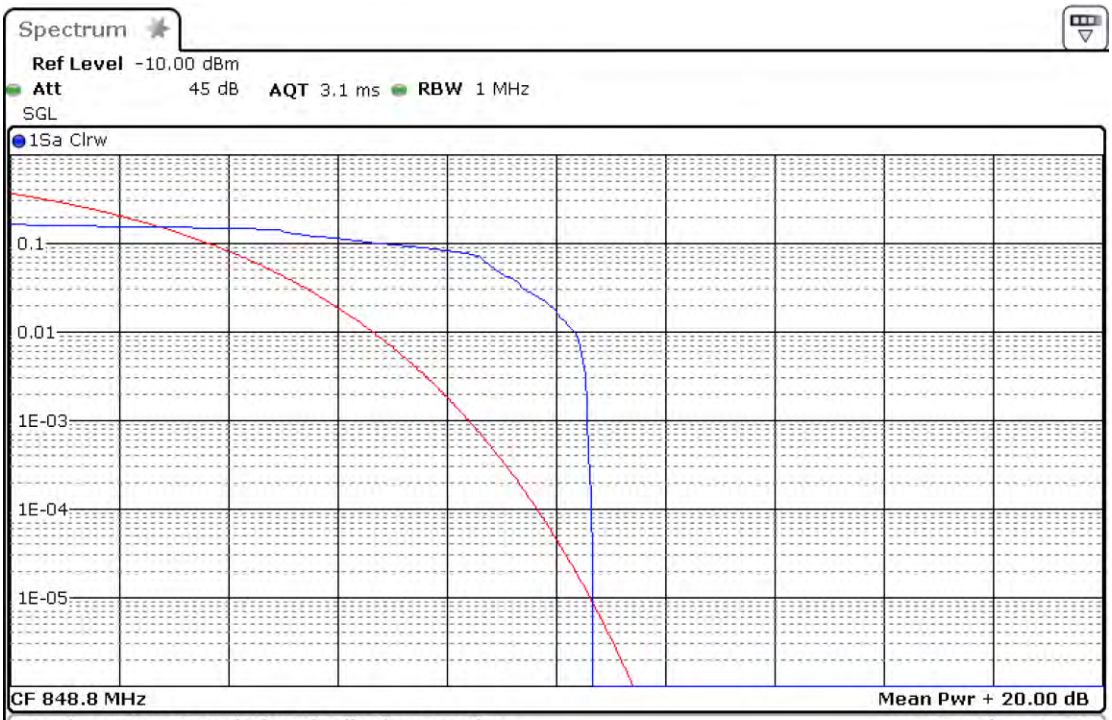
	Mean	Peak	Crest	10%	1%	0.1%	0.01%
Trace 1	-45.35 dBm	-35.28 dBm	10.07 dB	3.62 dB	6.72 dB	8.43 dB	9.54 dB

Test Case: EGPRS (Spectrum)Peak-to-Average Ratio		
Band: 850	Channel: 190	PCL: 8
Voltage: VN	Temperature: TN	Value:CCDF:12.90

Complementary Cumulative Distribution Function Samples: 100000

	Mean	Peak	Crest	10%	1%	0.1%	0.01%
Trace 1	12.45 dBm	25.35 dBm	12.90 dB	0.00 dB	12.70 dB	12.90 dB	12.96 dB

Test Case: EGPRS (Spectrum)Peak-to-Average Ratio		
Band: 850	Channel: 251	PCL: 8
Voltage: VN	Temperature: TN	Value:CCDF:10.58



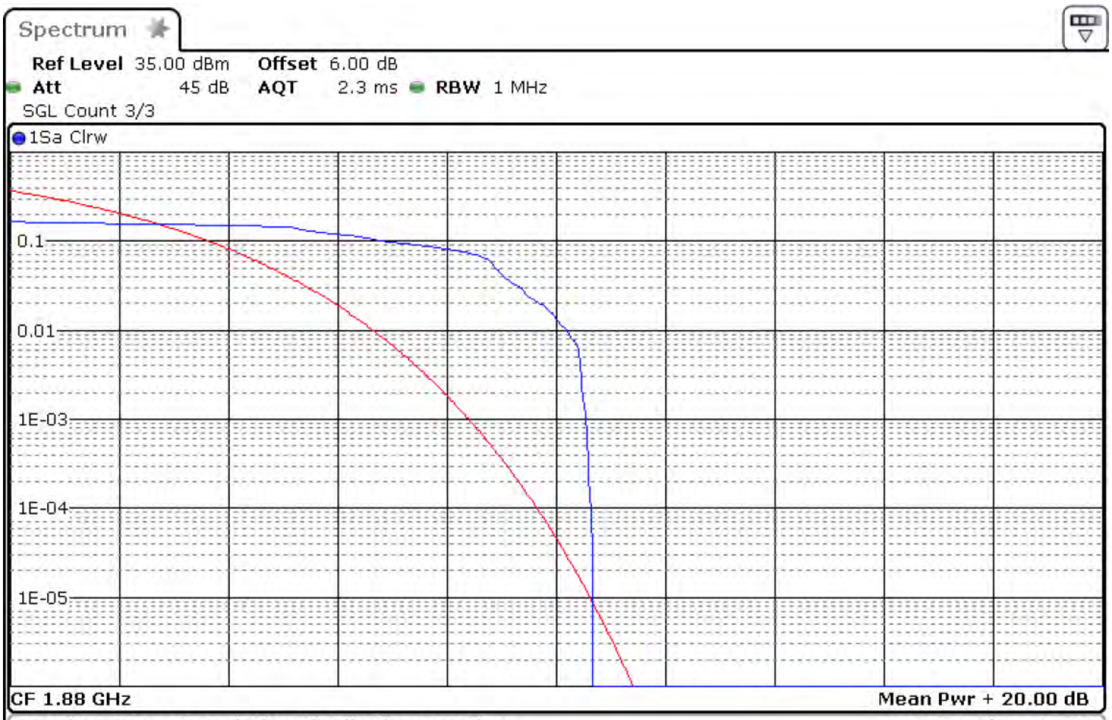
	Mean	Peak	Crest	10%	1%	0.1%	0.01%
Trace 1	14.77 dBm	25.38 dBm	10.61 dB	6.78 dB	10.32 dB	10.58 dB	10.67 dB

Test Case: GPRS (Spectrum)Peak-to-Average Ratio		
Band: 1900	Channel: 512	PCL: 0
Voltage: VN	Temperature: TN	Value:CCDF:8.35

Complementary Cumulative Distribution Function Samples: 100000

	Mean	Peak	Crest	10%	1%	0.1%	0.01%
Trace 1	-38.11 dBm	-28.73 dBm	9.37 dB	3.65 dB	6.70 dB	8.35 dB	9.22 dB

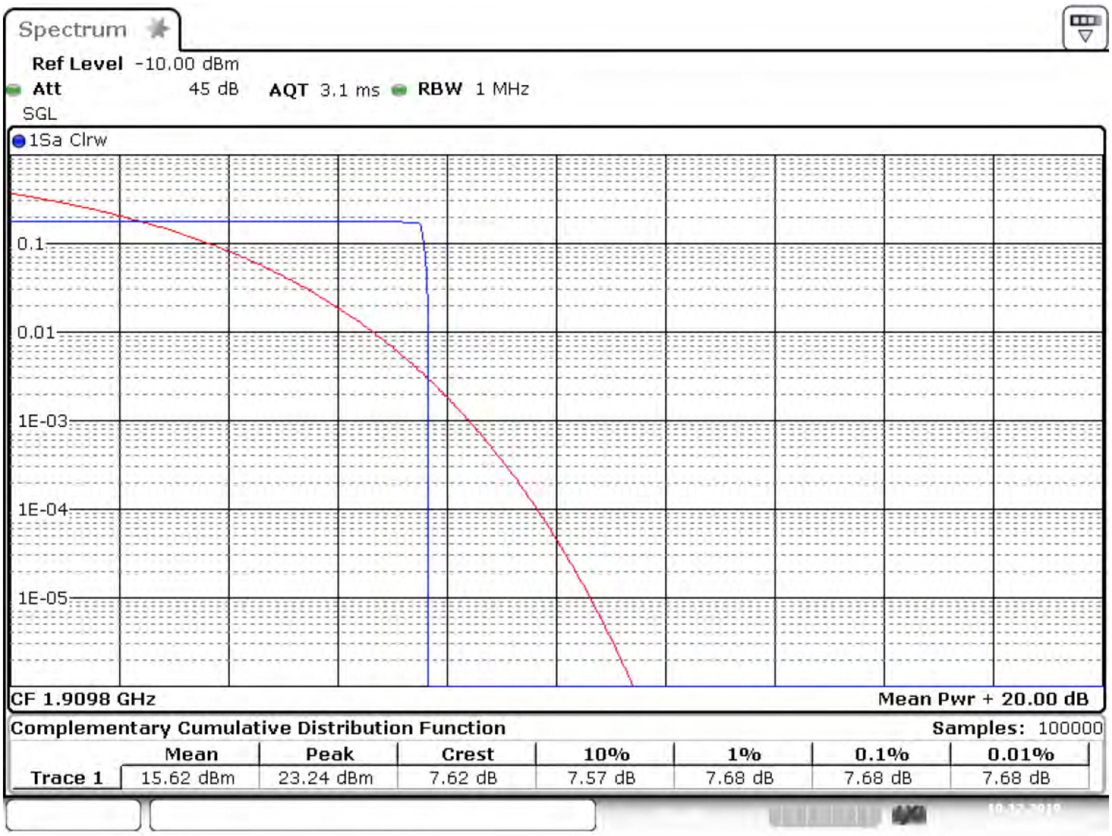
Test Case: GPRS (Spectrum)Peak-to-Average Ratio		
Band: 1900	Channel: 661	PCL: 0
Voltage: VN	Temperature: TN	Value:CCDF:10.55



Complementary Cumulative Distribution Function — Samples: 100000

	Mean	Peak	Crest	10%	1%	0.1%	0.01%
Trace 1	17.94 dBm	28.53 dBm	10.59 dB	6.84 dB	10.17 dB	10.55 dB	10.64 dB

Test Case: GPRS (Spectrum)Peak-to-Average Ratio		
Band: 1900	Channel: 810	PCL: 0
Voltage: VN	Temperature: TN	Value:CCDF:7.68



Test Case: EGPRS (Spectrum)Peak-to-Average Ratio		
Band: 1900	Channel: 512	PCL: 2
Voltage: VN	Temperature: TN	Value:CCDF:8.35

Complementary Cumulative Distribution Function Samples: 100000

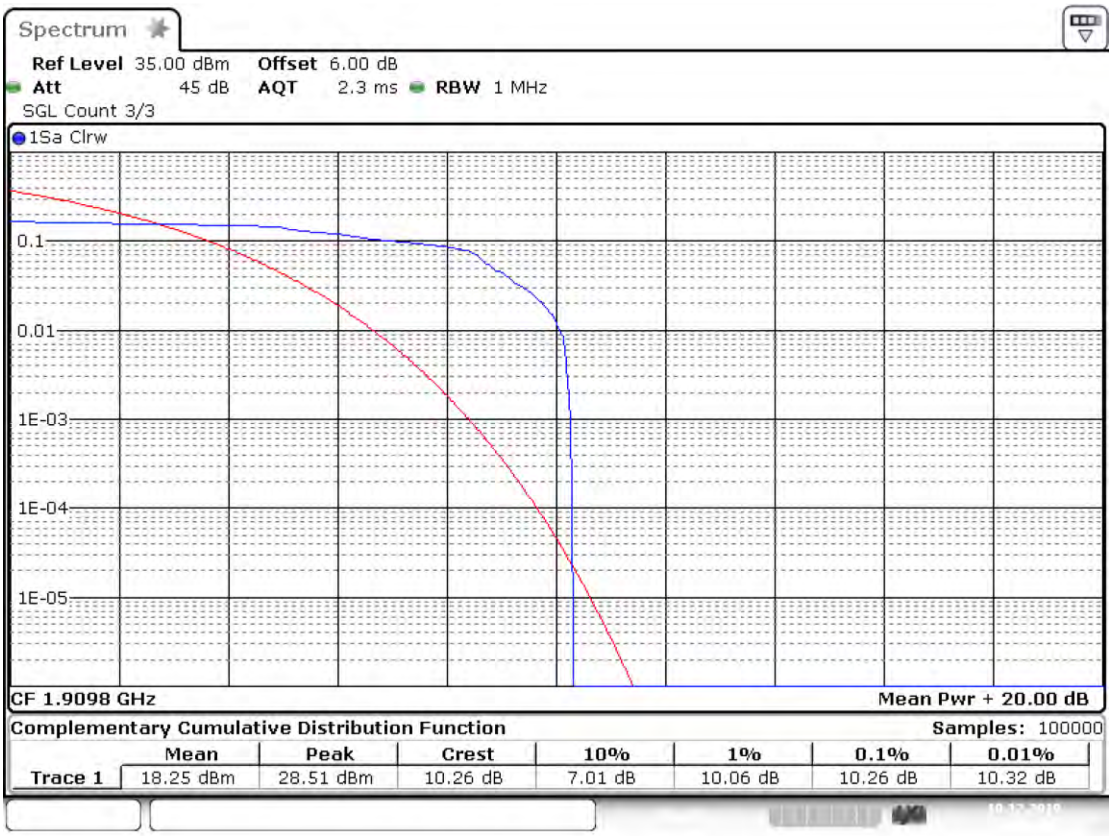
	Mean	Peak	Crest	10%	1%	0.1%	0.01%
Trace 1	-38.11 dBm	-28.73 dBm	9.37 dB	3.65 dB	6.70 dB	8.35 dB	9.22 dB

Test Case: EGPRS (Spectrum)Peak-to-Average Ratio		
Band: 1900	Channel: 661	PCL: 2
Voltage: VN	Temperature: TN	Value:CCDF:10.55

Complementary Cumulative Distribution Function Samples: 100000

	Mean	Peak	Crest	10%	1%	0.1%	0.01%
Trace 1	17.94 dBm	28.53 dBm	10.59 dB	6.84 dB	10.17 dB	10.55 dB	10.64 dB

Test Case: EGPRS (Spectrum)Peak-to-Average Ratio		
Band: 1900	Channel: 810	PCL: 2
Voltage: VN	Temperature: TN	Value:CCDF:10.26



5 OCCUPY BANDWIDTH

5.1 PROVISIONS APPLICABLE

The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.

The EUT makes a call to the communication simulator.

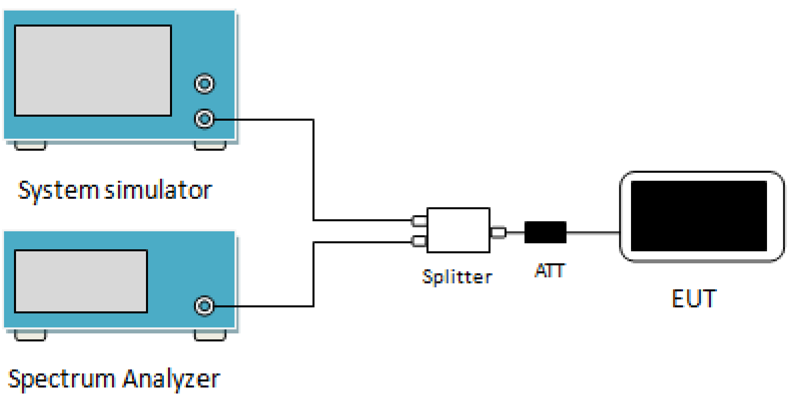
The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth

5.2 MEASUREMENT METHOD

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW ≥ 3 x RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1-5% of the 99% occupied bandwidth observed in Step 7

5.3 MEASUREMENT SETUP



5.4 TEST RESULT

Test Band	Test Mode	Test Channel	Occupied Bandwidth (KHz)	Emission Bandwidth (KHz)	Verdict
GSM 850	GPRS	LCH	247.2	311	PASS
		MCH	246.5	314	PASS
		HCH	246.6	314	PASS
	EGPRS	LCH	252.8	305	PASS
		MCH	251.2	302	PASS
		HCH	245.9	306	PASS

Test Band	Test Mode	Test Channel	Occupied Bandwidth (KHz)	Emission Bandwidth (KHz)	Verdict
PCS1900	GPRS	LCH	247.3	313	PASS
		MCH	245.3	309	PASS
		HCH	245.7	314	PASS
	EGPRS	LCH	251.0	310	PASS
		MCH	251.1	318	PASS
		HCH	252.3	311	PASS

<table>
<tr><th>GSM 850(GPRS)</th><th>PCS 1900(GPRS)</th></tr>
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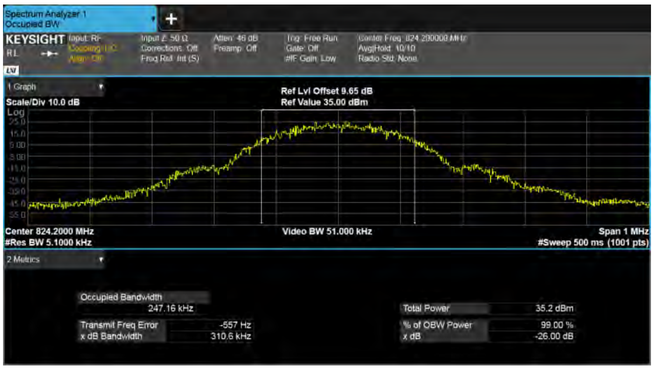
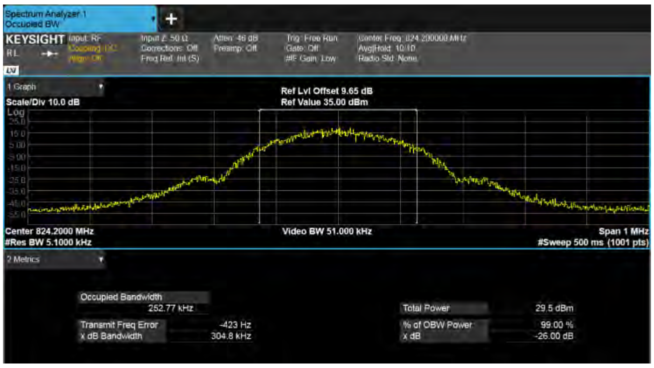
<tr><td>
</td><td>
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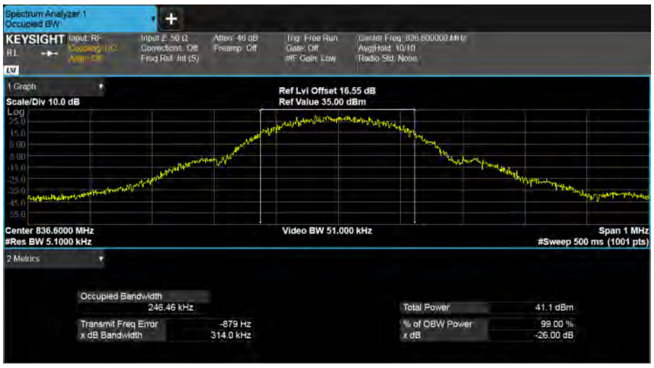
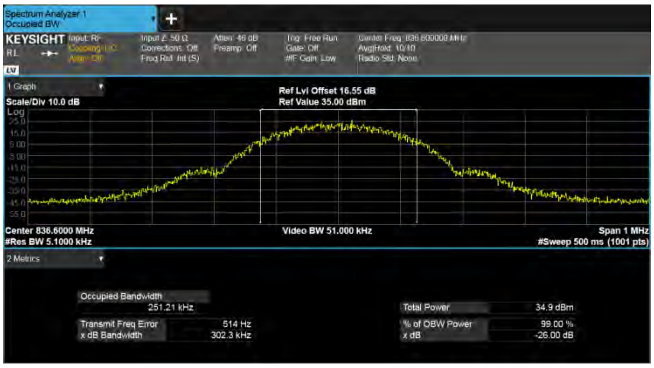
<tr><td>
</td><td>
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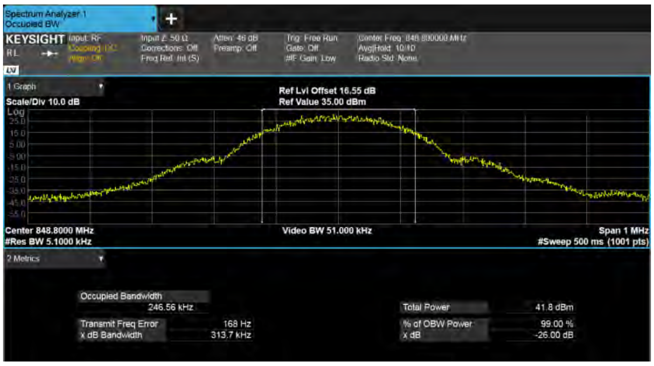
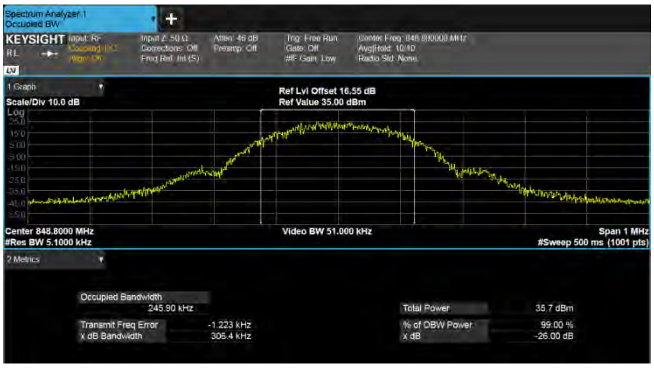
<tr><td>
</td><td>
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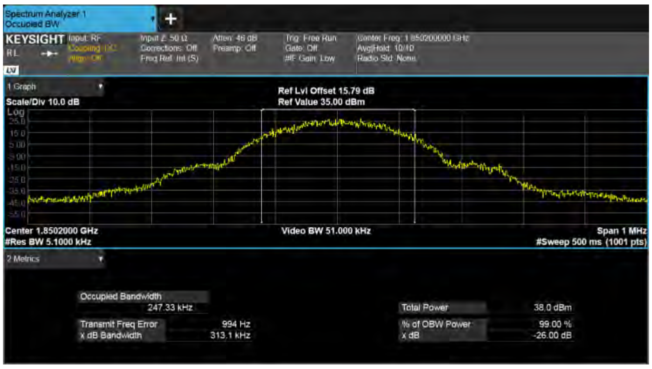
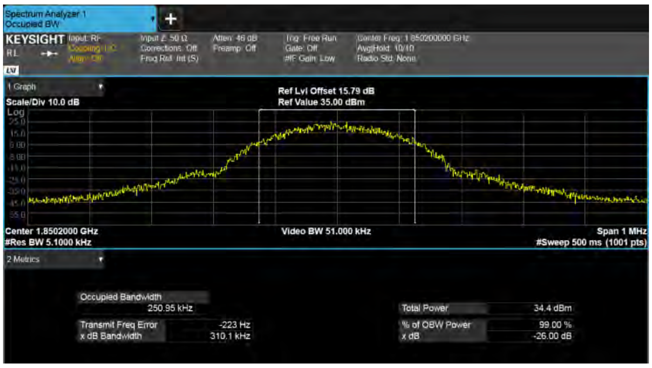
GSM 850(EGPRS)	PCS 1900(EGPRS)
GSM 850_LCH	PCS 1900_LCH

GSM 850_LCH

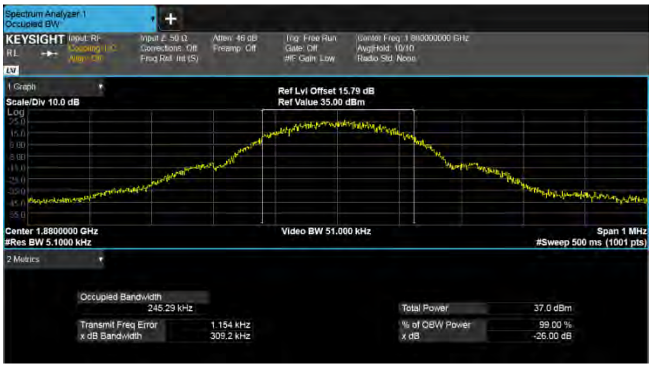


PCS 1900_LCH



GSM 850_MCH	PCS 1900_MCH

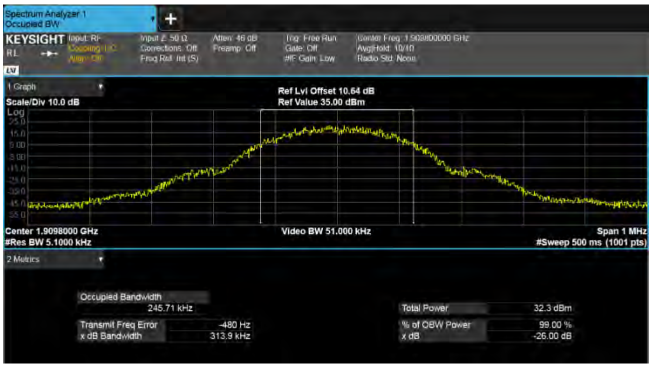
GSM 850_MCH



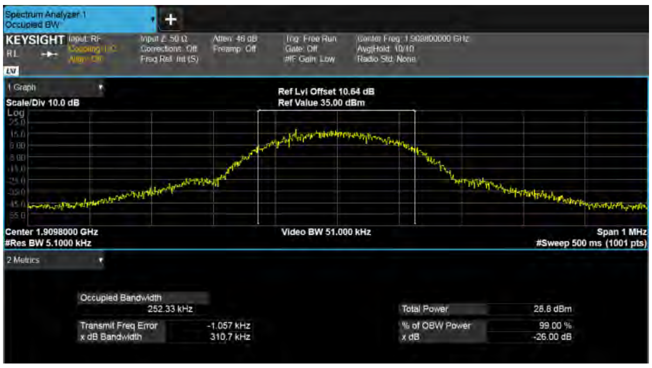
PCS 1900_MCH

GSM 850_HCH	PCS 1900_HCH

GSM 850_HCH



PCS 1900_HCH



6 MODULATION CHARACTERISTIC

According to FCC § 2.1047(d), Part 22H & 24E there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

7 BAND EDGE EMISSION AT ANTENNA TERMINALS

7.1 PROVISIONS APPLICABLE

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

7.2 MEASUREMENT METHOD

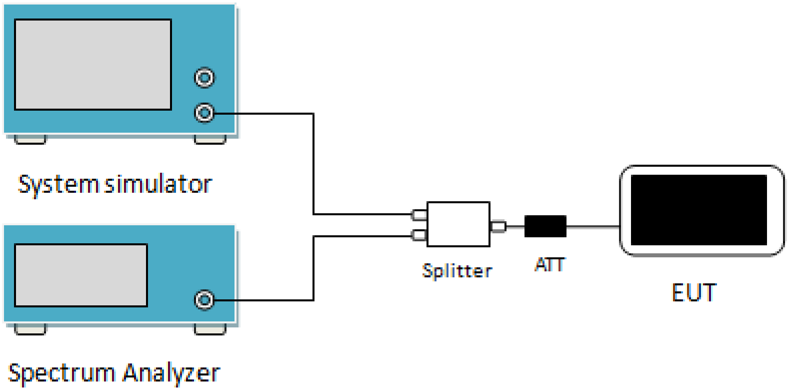
1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW > 1% of the emission bandwidth
4. VBW > 3 x RBW
5. Detector = RMS
6. Number of sweep points ≥ 2 x Span/RBW
7. Trace mode = trace average
8. Sweep time = auto couple
9. The trace was allowed to stabilize

TEST NOTE

According to FCC 22.917, 24.238, 27.53 specified that 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.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. All measurements were done at 2 channels(low and high operational frequency range.)

The band edge measurement used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

7.3 MEASUREMENT SETUP



7.4 TEST RESULT

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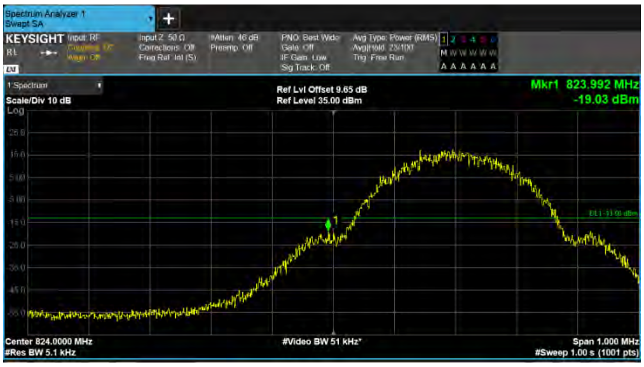
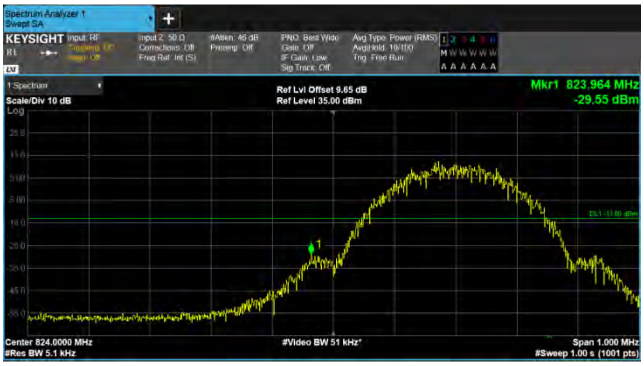
<tr><td>
</td><td>
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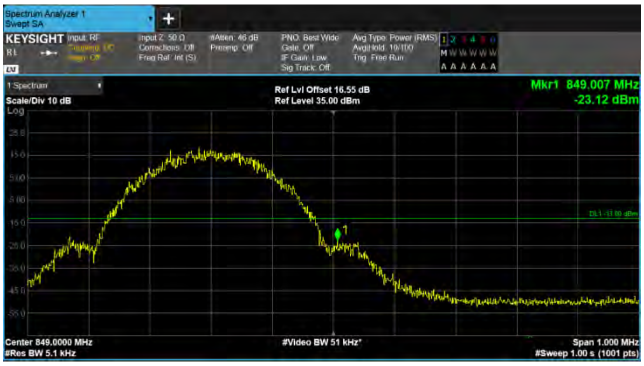
</td><td>
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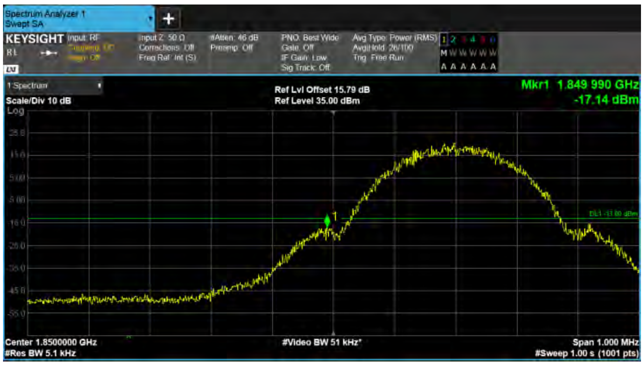
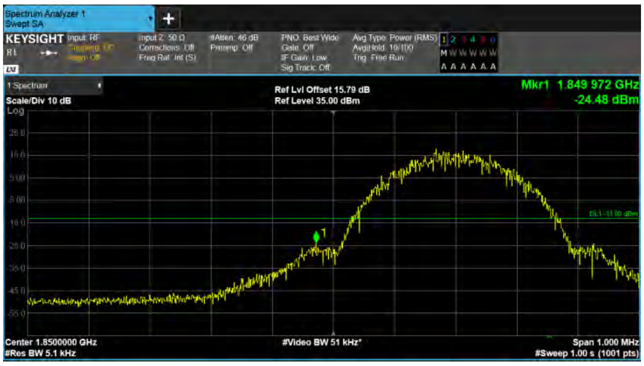
<tr><td>
</td><td>
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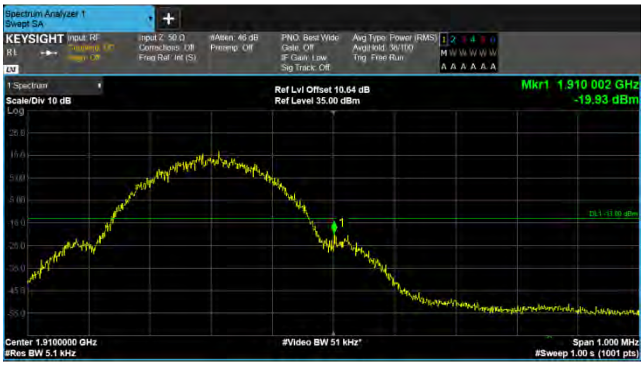
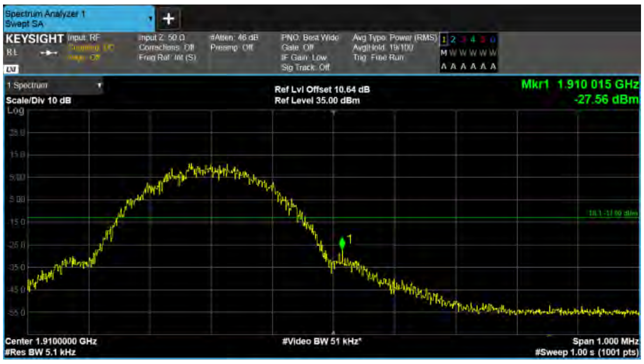
<tr><td>
</td><td>
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8 FIELD STRENGTH OF SPURIOUS RADIATION MEASUREMENT

8.1 PROVISIONS APPLICABLE

(A) On any frequency outside a licensee's frequency block (e.g. A, D, B, etc.) within the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log(P) dB. The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm.

At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

(B) For specific criteria, please refer to the description in section 9.2 of the report for corresponding evaluation.

8.2 MEASUREMENT PROCEDURE

1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum values.

8.If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.

9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High - Low scan is not required in this case.

11. For spurious emissions above 1GHz, a horn antenna is substituted in place of the EUT.
The substitute antenna is driven by a signal generator and the previously recorded signal was duplicated.
The spurious emissions is calculated by the following formula;

Result(dBm) = Pg(dBm) +Factor(dB)

Factor(dB) = Ant Gain(dB)-Cable Loss(dB) + Power Splitter(dB) (Above 1GHz)

Factor(dB) = Ant Gain(dB)-Cable Loss(dB) (Below 1GHz)

Where: Pgis the generator output power into the substitution antenna.
If the fundalmatal frequency is below 1GHz, RF output power has been converted to EIRP.

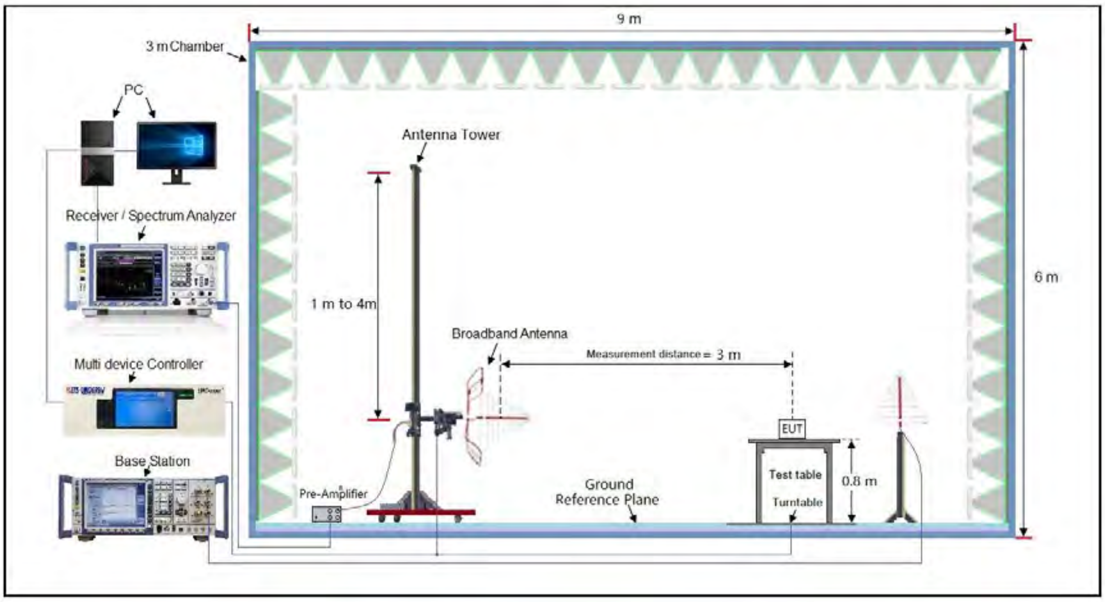
EIRP(dBm) = ERP(dBm) + 2.15

12. Examples of Factor parameters for testing radiation spurious:

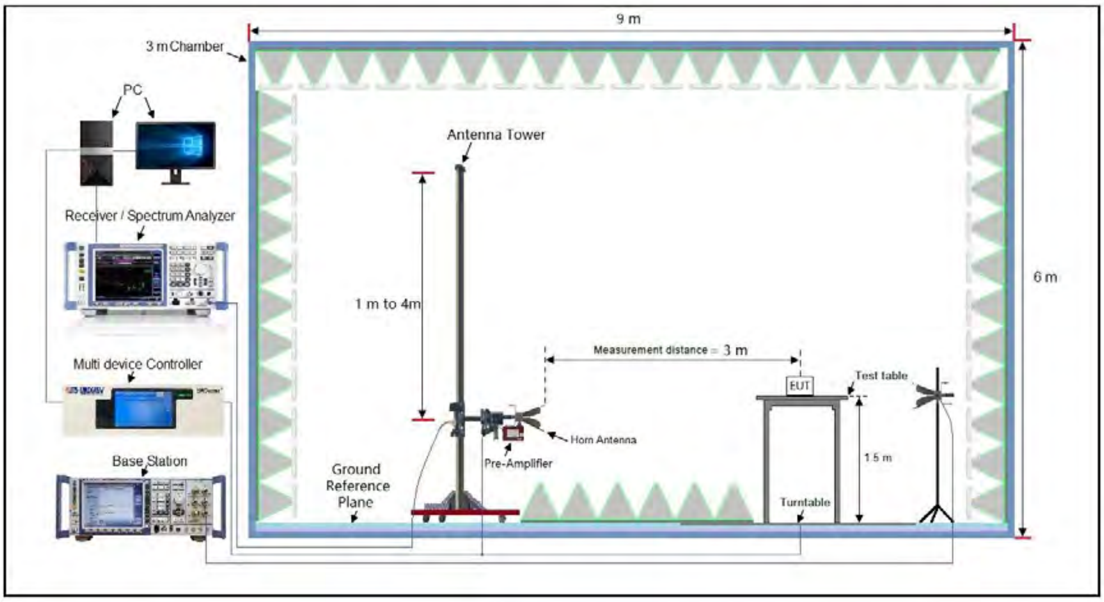
Frequency Range(MHz)	Factor(dB)
30-500	6.18
500-1000	9.37
1000-1500	27.56
1500-2000	28.27
2000-3000	29.45
3000-5000	30.15
5000-10000	31.26
10000-15000	32.78
15000-20000	33.99
Above 20GHz	35.04

8.3 MEASUREMENT SETUP

Radiated Emissions 30MHz to 1GHz Test setup



Radiated Emissions Above 1GHz Test setup



8.4 TEST RESULT

The measurement Below 1GHz data as follows:

Remark：

1. The emission levels of below 1 GHz are very lower than the limit above10dB and not show in test report.

The measurement Above 1GHz data as follows:

GSM 850(GPRS)							
No.	Frequency (MHz)	SA Reading (dBm)	Correction factor (dB/m)	EIRP Result (dBm)	Limit (dBm)	Margin (dB)	Ant. Pol.
Lowest Channel							
1	1648.8	-83.01	31.09	-51.92	-13.00	-38.92	Horizontal
2	2473.2	-89.23	34.14	-55.09	-13.00	-42.09	Horizontal
3	1648.8	-81.07	33.13	-47.94	-13.00	-34.94	Vertical
4	2473.2	-85.60	32.66	-52.94	-13.00	-39.94	Vertical
Middle Channel							
1	1673.2	-79.53	31.09	-48.44	-13.00	-35.44	Horizontal
2	2509.8	-88.05	34.14	-53.91	-13.00	-40.91	Horizontal
3	1673.2	-79.76	33.13	-46.63	-13.00	-33.63	Vertical
4	2509.8	-84.44	32.66	-51.78	-13.00	-38.78	Vertical
Highest Channel							
1	1697.6	-82.70	31.09	-51.61	-13.00	-38.61	Horizontal
2	2546.4	-85.85	34.14	-51.71	-13.00	-38.71	Horizontal
3	1697.6	-82.56	33.13	-49.43	-13.00	-36.43	Vertical
4	2546.4	-83.27	32.66	-50.61	-13.00	-37.61	Vertical

GSM 850(EGPRS)							
No.	Frequency	SA Reading	Correction factor	EIRP Result	Limit	Margin	Ant. Pol.
	(MHz)	(dBm)	(dB/m)	(dBm)	(dBm)	(dB)	
Lowest Channel							
1	1648.8	-89.94	32.11	-57.83	-13.00	-44.83	Horizontal
2	2473.2	-87.78	33.21	-54.57	-13.00	-41.57	Horizontal
3	1648.8	-90.35	32.09	-58.26	-13.00	-45.26	Vertical
4	2473.2	-87.46	34.03	-53.43	-13.00	-40.43	Vertical
Middle Channel							
1	1673.2	-89.23	32.11	-57.12	-13.00	-44.12	Horizontal
2	2509.8	-86.75	33.21	-53.54	-13.00	-40.54	Horizontal
3	1673.2	-90.00	32.09	-57.91	-13.00	-44.91	Vertical
4	2509.8	-86.44	34.03	-52.41	-13.00	-39.41	Vertical
Highest Channel							
1	1697.6	-89.56	32.11	-57.45	-13.00	-44.45	Horizontal
2	2546.4	-86.42	33.21	-53.21	-13.00	-40.21	Horizontal
3	1697.6	-89.35	32.09	-57.26	-13.00	-44.26	Vertical
4	2546.4	-85.77	34.03	-51.74	-13.00	-38.74	Vertical

PCS 1900(GPRS)							
No.	Frequency	SA Reading	Correction factor	EIRP Result	Limit	Margin	Ant. Pol.
	(MHz)	(dBm)	(dB/m)	(dBm)	(dBm)	(dB)	
Lowest Channel							
1	3700.4	-83.85	23.12	-60.73	-13.00	-47.73	Horizontal
2	5550.6	-85.93	28.47	-57.46	-13.00	-44.46	Horizontal
3	3700.4	-83.26	23.12	-60.14	-13.00	-47.14	Vertical
4	5550.6	-83.14	28.47	-54.67	-13.00	-41.67	Vertical
Middle Channel							
1	3760	-81.62	23.12	-58.50	-13.00	-45.5	Horizontal
2	5640	-83.66	28.47	-55.19	-13.00	-42.19	Horizontal
3	3760	-83.28	23.12	-60.16	-13.00	-47.16	Vertical
4	5640	-81.56	28.47	-53.09	-13.00	-40.09	Vertical
Highest Channel							
1	3819.6	-80.64	23.12	-57.52	-13.00	-44.52	Horizontal
2	5729.4	-82.09	28.47	-53.62	-13.00	-40.62	Horizontal
3	3819.6	-80.93	23.12	-57.81	-13.00	-44.81	Vertical
4	5729.4	-80.74	28.47	-52.27	-13.00	-39.27	Vertical

PCS 1900(EGPRS)							
No.	Frequency	SA Reading	Correction factor	EIRP Result	Limit	Margin	Ant. Pol.
	(MHz)	(dBm)	(dB/m)	(dBm)	(dBm)	(dB)	
Lowest Channel							
1	3700.4	-83.85	23.12	-60.73	-13.00	-47.73	Horizontal
2	5550.6	-85.93	28.47	-57.46	-13.00	-44.46	Horizontal
3	3700.4	-83.27	23.12	-60.15	-13.00	-47.15	Vertical
4	5550.6	-83.14	28.47	-54.67	-13.00	-41.67	Vertical
Middle Channel							
1	3760	-81.66	23.12	-58.54	-13.00	-45.54	Horizontal
2	5640	-83.64	28.47	-55.17	-13.00	-42.17	Horizontal
3	3760	-83.23	23.12	-60.11	-13.00	-47.11	Vertical
4	5640	-81.54	28.47	-53.07	-13.00	-40.07	Vertical
Highest Channel							
1	3819.6	-80.66	23.12	-57.54	-13.00	-44.54	Horizontal
2	5729.4	-82.07	28.47	-53.6	-13.00	-40.6	Horizontal
3	3819.6	-80.95	23.12	-57.83	-13.00	-44.83	Vertical
4	5729.4	-80.78	28.47	-52.31	-13.00	-39.31	Vertical

Note:

1.Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain, the value was added to Original Receiver Reading by the software automatically.

2.Result = Reading + Correct Factor.

3.Margin = Result – Limit

4.he device is investigated from 30MHz to 10 times of fundamental signal for radiated spurious emission test. Subsequently, only the worst case emissions are reported.

9 FREQUENCY STABILITY V.S. TEMPERATURE MEASUREMENT

9.1 PROVISIONS APPLICABLE

9.1.1 For Hand carried battery powered equipment

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-E-2016. The frequency stability of the transmitter is measured by:

a.) Temperature: The temperature is varied from -10°C to +40°C in 10°C increments using an environmental chamber.

b.) Primary Supply Voltage: The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried,battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

For Part 22, the frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5 ppm) of the center frequency. For Part 24 and Part 27, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

9.1.2 For equipment powered by primary supply voltage

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a "standby" condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -10°C to +40°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

9.2 MEASUREMENT METHOD

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a "call mode". This is accomplished with the use of R&S CMW500 DIGITAL RADIO COMMUNICATION TESTER.

1.Measure the carrier frequency at room temperature.

2.Subject the EUT to overnight soak at -10℃. With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on channel 20175 for LTE band 4 measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.

3.Repeat the above measurements at 10℃ increments from -10℃ to +40℃. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.

4.Re-measure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments re-measuring carrier frequency at each voltage. Pause at nominal voltage for 1 1/2 hours unpowered, to allow any self-heating to stabilize, before continuing.

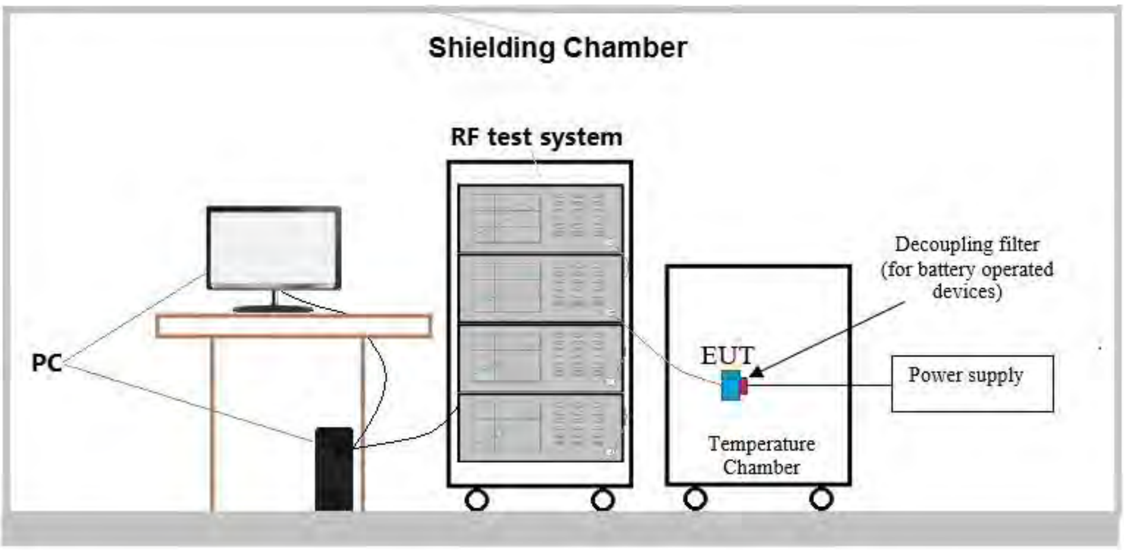
5.Subject the EUT to overnight soak at +50℃.

6.With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.

7.Repeat the above measurements at 10℃ increments from +50℃ to -20℃. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.

8.At all temperature levels hold the temperature to +/- 0.5℃ during the measurement procedure.

9.3 MEASUREMENT SETUP



9.4 TEST RESULT

Frequency Error vs. Voltage:

Test Band	Test Mode	Test Channel	Test Temp.	Test Volt.(V)	Freq.Error (Hz)	Freq.vs.rated (ppm)	Limit (ppm)	Verdict
GSM850	GPRS	LCH	TN	VL	0.71	0.000861	±2.5	PASS
			TN	VN	0.52	0.000631	±2.5	PASS
			TN	VH	2.20	0.002669	±2.5	PASS
		MCH	TN	VL	1.49	0.001781	±2.5	PASS
			TN	VN	4.13	0.004937	±2.5	PASS
			TN	VH	5.75	0.006873	±2.5	PASS
		HCH	TN	VL	2.78	0.003275	±2.5	PASS
			TN	VN	2.71	0.003193	±2.5	PASS
			TN	VH	4.52	0.005325	±2.5	PASS

Test Band	Test Mode	Test Channel	Test Temp.	Test Volt.(V)	Freq.Error (Hz)	Freq.vs.rated (ppm)	Verdict
GSM850	EGPRS	LCH	TN	VL	3.78	0.004586	PASS
			TN	VN	6.65	0.008068	PASS
			TN	VH	4.81	0.005836	PASS
		MCH	TN	VL	5.62	0.006718	PASS
			TN	VN	7.04	0.008415	PASS
			TN	VH	6.88	0.008224	PASS
		HCH	TN	VL	7.72	0.009095	PASS
			TN	VN	5.07	0.005973	PASS
			TN	VH	4.42	0.005207	PASS

Note: Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very samll. As such it is determined that channels at the band edge would remain in-band when the maximum measured frequency deviation noted duing the frequency stability tests is applied. Therefore the device is detemined to remain operating in band over the temperture and voltage range as tested.

Test Band	Test Mode	Test Channel	Test Temp.	Test Volt.(V)	Freq.Error (Hz)	Freq.vs.rated (ppm)	Limit (ppm)	Verdict
PCS1900	GPRS	LCH	TN	VL	15.11	0.008167	±2.5	PASS
			TN	VN	15.37	0.008307	±2.5	PASS
			TN	VH	16.92	0.009145	±2.5	PASS
		MCH	TN	VL	15.50	0.008245	±2.5	PASS
			TN	VN	16.40	0.008723	±2.5	PASS
			TN	VH	17.37	0.009239	±2.5	PASS
		HCH	TN	VL	15.63	0.008184	±2.5	PASS
			TN	VN	14.21	0.007441	±2.5	PASS
			TN	VH	13.95	0.007304	±2.5	PASS

Test Band	Test Mode	Test Channel	Test Temp.	Test Volt.(V)	Freq.Error (Hz)	Freq.vs.rated (ppm)	Verdict
PCS 1900	EGPRS	LCH	TN	VL	16.40	0.008864	PASS
			TN	VN	14.66	0.007923	PASS
			TN	VH	13.20	0.007134	PASS
		MCH	TN	VL	17.34	0.009223	PASS
			TN	VN	19.73	0.010495	PASS
			TN	VH	16.27	0.008654	PASS
		HCH	TN	VL	17.63	0.009231	PASS
			TN	VN	18.40	0.009635	PASS
			TN	VH	17.43	0.009127	PASS

Note: Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very samll. As such it is determined that channels at the band edge would remain in-band when the maximum measured frequency deviation noted duing the frequency stability tests is applied. Therefore the device is detemined to remain operating in band over the temperture and voltage range as tested.

Frequency Error vs. Temperature:

Test Band	Test Mode	Test Channel	Test Volt.	Test Temp	Freq.Error (Hz)	Freq.vs.rated (ppm)	Limit (ppm)	Verdict
GSM 850	GPRS	LCH	VN	-30	4.39	0.005326	±2.5	PASS
			VN	-20	3.62	0.004392	±2.5	PASS
			VN	-10	-0.32	-0.000388	±2.5	PASS
			VN	0	2.52	0.003058	±2.5	PASS
			VN	10	0.26	0.000315	±2.5	PASS
			VN	20	2.26	0.002742	±2.5	PASS
			VN	30	3.49	0.004234	±2.5	PASS
			VN	40	2.91	0.003531	±2.5	PASS
			VN	50	-0.97	-0.001177	±2.5	PASS
GSM 850	GPRS	MCH	VN	-30	2.97	0.003550	±2.5	PASS
			VN	-20	3.49	0.004172	±2.5	PASS
			VN	-10	2.91	0.003478	±2.5	PASS
			VN	0	4.71	0.005630	±2.5	PASS
			VN	10	4.13	0.004937	±2.5	PASS
			VN	20	4.26	0.005092	±2.5	PASS
			VN	30	6.46	0.007722	±2.5	PASS
			VN	40	5.10	0.006096	±2.5	PASS
			VN	50	3.29	0.003933	±2.5	PASS
GSM 850	GPRS	HCH	VN	-30	1.16	0.001367	±2.5	PASS
			VN	-20	4.00	0.004713	±2.5	PASS
			VN	-10	3.75	0.004418	±2.5	PASS
			VN	0	2.07	0.002439	±2.5	PASS
			VN	10	3.81	0.004489	±2.5	PASS
			VN	20	1.55	0.001826	±2.5	PASS
			VN	30	7.75	0.009131	±2.5	PASS
			VN	40	3.68	0.004336	±2.5	PASS
			VN	50	4.07	0.004795	±2.5	PASS

Test Band	Test Mode	Test Channel	Test Volt.	Test Temp	Freq.Error (Hz)	Freq.vs.rated (ppm)	Limit (ppm)	Verdict
GSM 850	EGPRS	LCH	VN	-30	4.94	0.005994	±2.5	PASS
			VN	-20	6.46	0.007838	±2.5	PASS
			VN	-10	6.23	0.007559	±2.5	PASS
			VN	0	6.13	0.007438	±2.5	PASS
			VN	10	6.97	0.008457	±2.5	PASS
			VN	20	6.65	0.008068	±2.5	PASS
			VN	30	7.10	0.008614	±2.5	PASS
			VN	40	5.49	0.006661	±2.5	PASS
			VN	50	7.20	0.008736	±2.5	PASS
GSM 850	EGPRS	MCH	VN	-30	6.78	0.008104	±2.5	PASS
			VN	-20	6.20	0.007411	±2.5	PASS
			VN	-10	16.21	0.019376	±2.5	PASS
			VN	0	18.76	0.022424	±2.5	PASS
			VN	10	16.98	0.020296	±2.5	PASS
			VN	20	15.34	0.018336	±2.5	PASS
			VN	30	13.56	0.016208	±2.5	PASS
			VN	40	14.79	0.017679	±2.5	PASS
			VN	50	11.98	0.014320	±2.5	PASS
GSM 850	EGPRS	HCH	VN	-30	6.78	0.007988	±2.5	PASS
			VN	-20	8.94	0.010533	±2.5	PASS
			VN	-10	8.59	0.010120	±2.5	PASS
			VN	0	9.46	0.011145	±2.5	PASS
			VN	10	9.07	0.010686	±2.5	PASS
			VN	20	10.27	0.012099	±2.5	PASS
			VN	30	6.78	0.008104	±2.5	PASS
			VN	40	6.20	0.007411	±2.5	PASS
			VN	50	16.21	0.019376	±2.5	PASS

Test Band	Test Mode	Test Channel	Test Volt.	Test Temp.	Freq.Error (Hz)	Freq.vs.rated (ppm)	Limit (ppm)	Verdict
PCS 1900	GPRS	LCH	VN	-30	16.21	0.008761	±2.5	PASS
			VN	-20	15.95	0.008621	±2.5	PASS
			VN	-10	16.79	0.009075	±2.5	PASS
			VN	0	15.69	0.008480	±2.5	PASS
			VN	10	18.14	0.009804	±2.5	PASS
			VN	20	18.85	0.010188	±2.5	PASS
			VN	30	20.60	0.011134	±2.5	PASS
			VN	40	23.31	0.012599	±2.5	PASS
			VN	50	20.08	0.010853	±2.5	PASS
PCS 1900	GPRS	MCH	VN	-30	14.66	0.007798	±2.5	PASS
			VN	-20	17.11	0.009101	±2.5	PASS
			VN	-10	13.30	0.007074	±2.5	PASS
			VN	0	19.31	0.010271	±2.5	PASS
			VN	10	18.08	0.009617	±2.5	PASS
			VN	20	23.76	0.012638	±2.5	PASS
			VN	30	23.50	0.012500	±2.5	PASS
			VN	40	24.02	0.012777	±2.5	PASS
			VN	50	26.35	0.014016	±2.5	PASS
PCS 1900	GPRS	HCH	VN	-30	14.21	0.007441	±2.5	PASS
			VN	-20	18.08	0.009467	±2.5	PASS
			VN	-10	15.37	0.008048	±2.5	PASS
			VN	0	15.63	0.008184	±2.5	PASS
			VN	10	13.56	0.007100	±2.5	PASS
			VN	20	19.11	0.010006	±2.5	PASS
			VN	30	18.73	0.009807	±2.5	PASS
			VN	40	20.99	0.010991	±2.5	PASS
			VN	50	20.66	0.010818	±2.5	PASS

Test Band	Test Mode	Test Channel	Test Volt.	Test Temp.	Freq.Error (Hz)	Freq.vs.rated (ppm)	Limit (ppm)	Verdict
PCS 1900	EGPRS	LCH	VN	-30	16.34	0.008831	±2.5	PASS
			VN	-20	12.91	0.006978	±2.5	PASS
			VN	-10	18.21	0.009842	±2.5	PASS
			VN	0	15.59	0.008426	±2.5	PASS
			VN	10	20.44	0.011047	±2.5	PASS
			VN	20	22.73	0.012285	±2.5	PASS
			VN	30	20.73	0.011204	±2.5	PASS
			VN	40	19.05	0.010296	±2.5	PASS
			VN	50	14.82	0.008010	±2.5	PASS
PCS 1900	EGPRS	MCH	VN	-30	19.60	0.010426	±2.5	PASS
			VN	-20	15.40	0.008191	±2.5	PASS
			VN	-10	17.53	0.009324	±2.5	PASS
			VN	0	19.18	0.010202	±2.5	PASS
			VN	10	13.59	0.007229	±2.5	PASS
			VN	20	13.79	0.007335	±2.5	PASS
			VN	30	17.66	0.009394	±2.5	PASS
			VN	40	19.44	0.010340	±2.5	PASS
			VN	50	19.63	0.010441	±2.5	PASS
PCS 1900	EGPRS	HCH	VN	-30	16.72	0.008755	±2.5	PASS
			VN	-20	18.50	0.009687	±2.5	PASS
			VN	-10	14.56	0.007624	±2.5	PASS
			VN	0	12.17	0.006372	±2.5	PASS
			VN	10	10.33	0.005409	±2.5	PASS
			VN	20	11.36	0.005948	±2.5	PASS
			VN	30	13.14	0.006880	±2.5	PASS
			VN	40	15.50	0.008116	±2.5	PASS
			VN	50	13.14	0.006880	±2.5	PASS

Note: Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very samll. As such it is determined that channels at the band edge would remain in-band when the maximum measured frequency deviation noted duing the frequency stability tests is applied. Therefore the device is detemined to remain operating in band over the temperture and voltage range as tested.

10 FREQUENCY STABILITY V.S. VOLTAGE MEASUREMENT

10.1 MEASUREMENT SETUP

Refer to 9.3

10.2 TEST PROCEDURE

1. Set chamber temperature to 25℃. Use a variable DC power source to power the EUT and set the voltage to rated voltage.
2. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency. Reduce the input voltage to specify extreme voltage variation (+/- 15%) and endpoint, record the maximum frequency change.

10.3 TEST RESULT

Refer to 9.4

11 SPURIOUS EMISSIONS AT ANTENNA TERMINAL

11.1 PROVISIONS APPLICABLE

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. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

11.2 MEASUREMENT METHOD

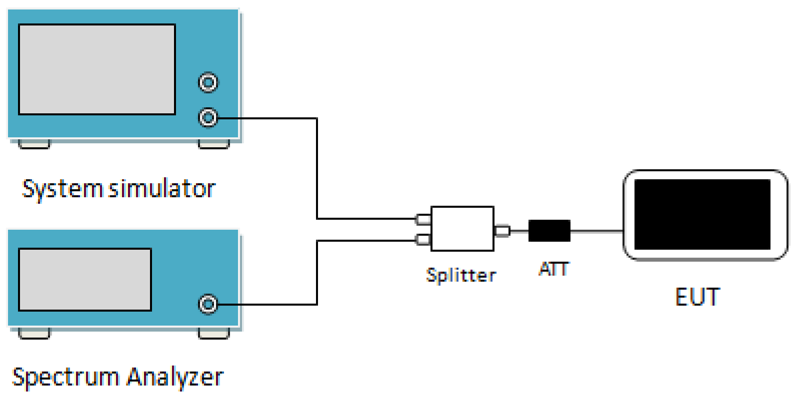
Test Settings (GSM)

1. RBW = 1 MHz
2. VBW ≥ 3 MHz
3. Detector = Peak
4. Trace Mode = max hold
5. Sweep time = auto
6. Number of points in sweep ≥ 2 x Span / RBW

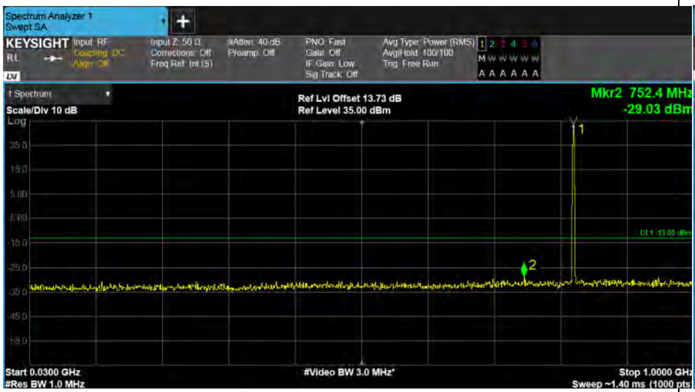
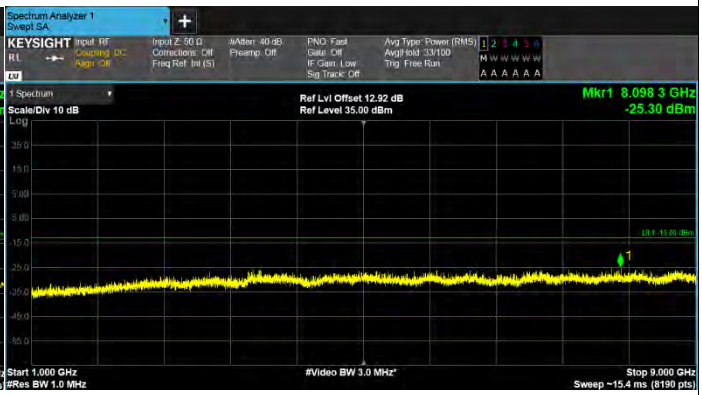
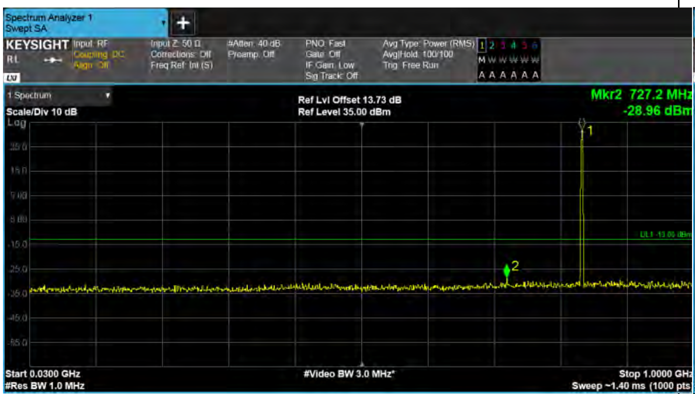
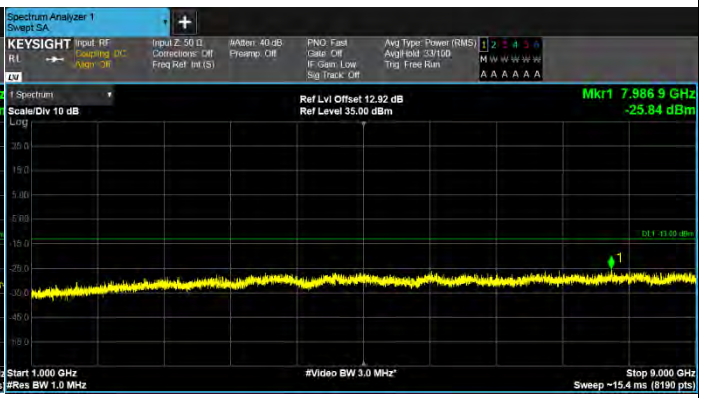
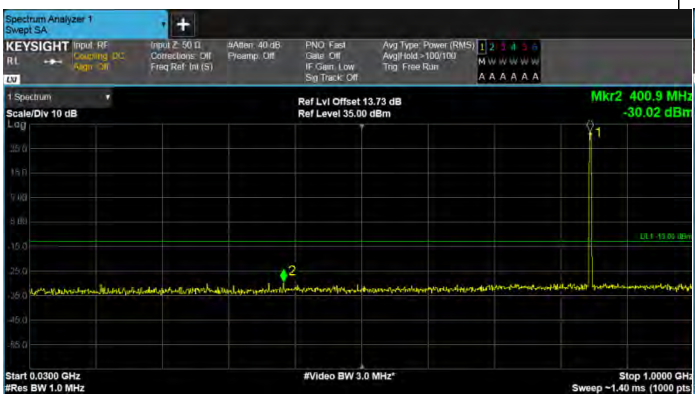
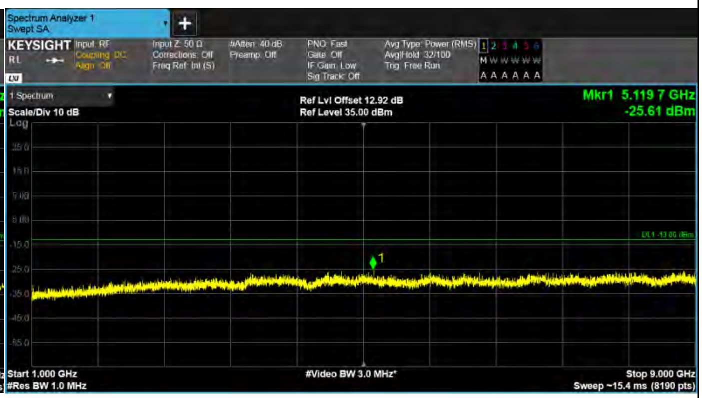
Test Settings (WCDMA)

1. RBW = 1 MHz
2. VBW ≥ 3 MHz
3. Detector = RMS
4. Trace Mode = trace average
5. Sweep time = auto
6. Number of points in sweep ≥ 2 x Span / RBW

11.3 MEASUREMENT SETUP



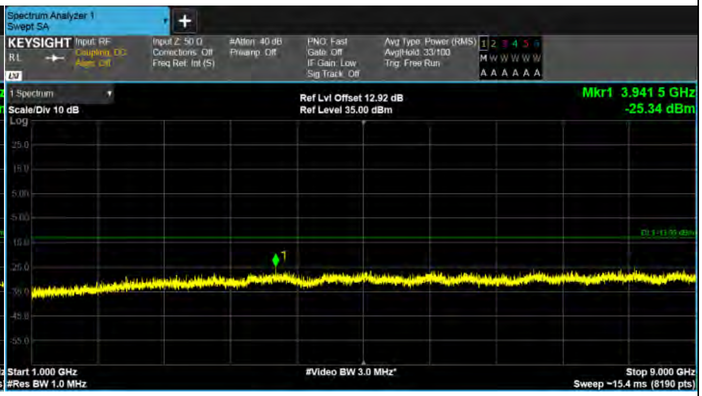
11.4 TEST RESULT

GSM 850(GPRS)	
GSM 850 _LCH	GSM 850_LCH
	
GSM 850 _MCH	GSM 850_MCH
	
GSM 850 _HCH	GSM 850_HCH
	

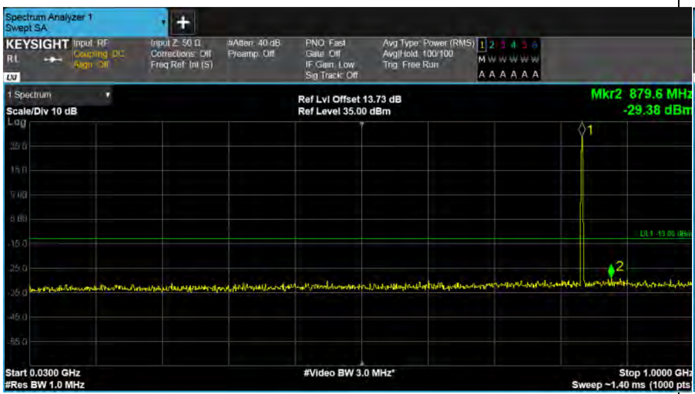
GSM 850(EGPRS)

GSM 850 _LCH

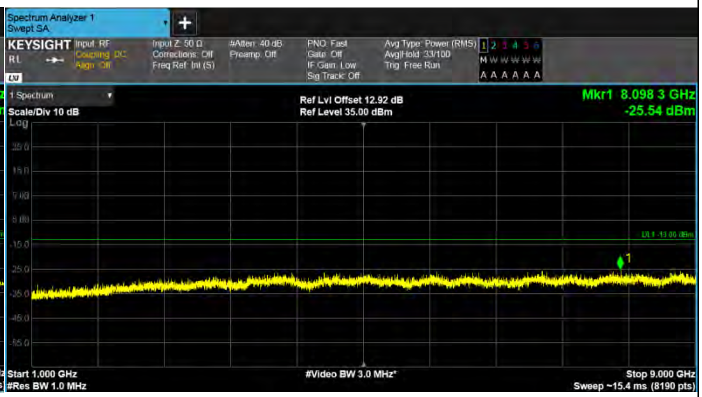
GSM 850_LCH



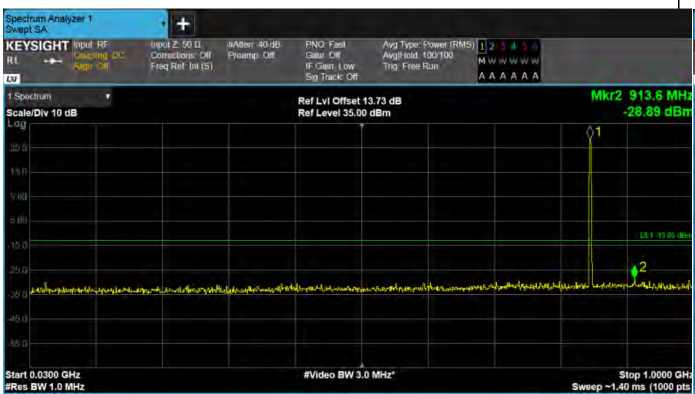
GSM 850 _MCH



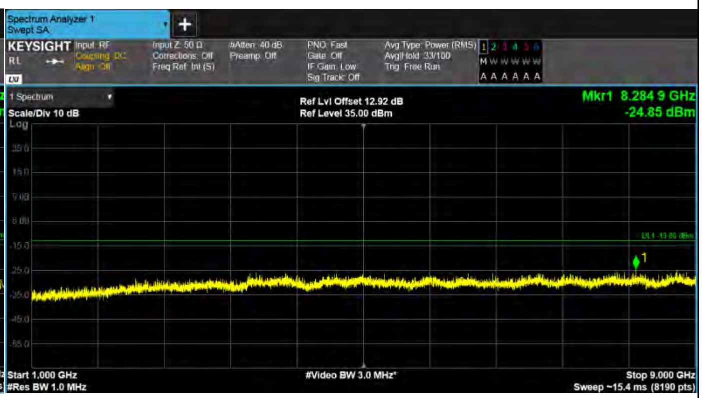
GSM 850_MCH



GSM 850 _HCH

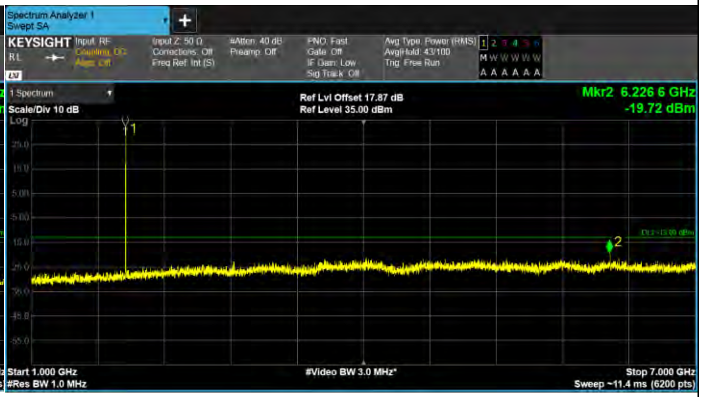


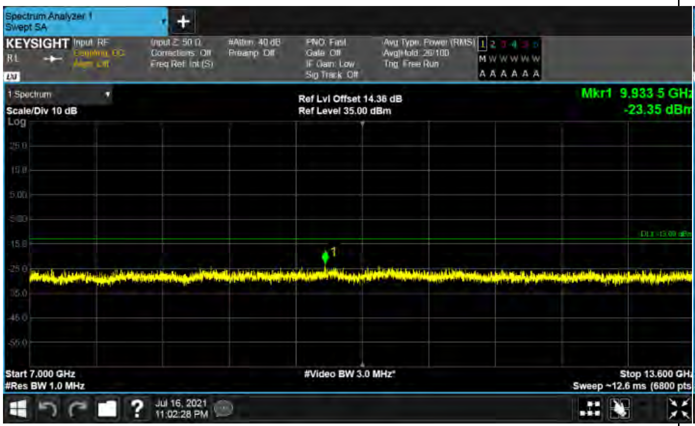
GSM 850_HCH

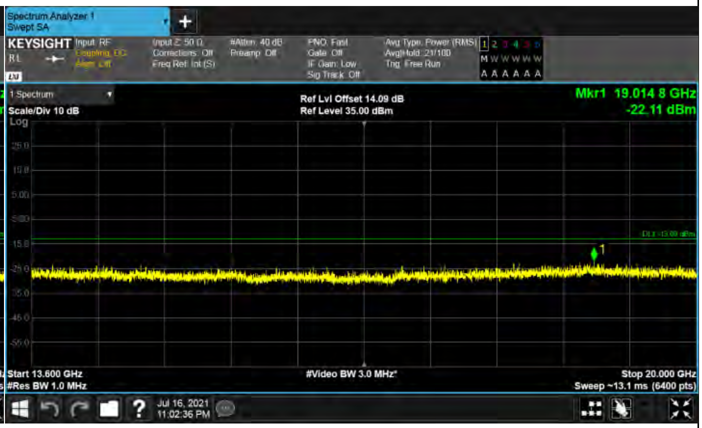


PCS 1900(GPRS)

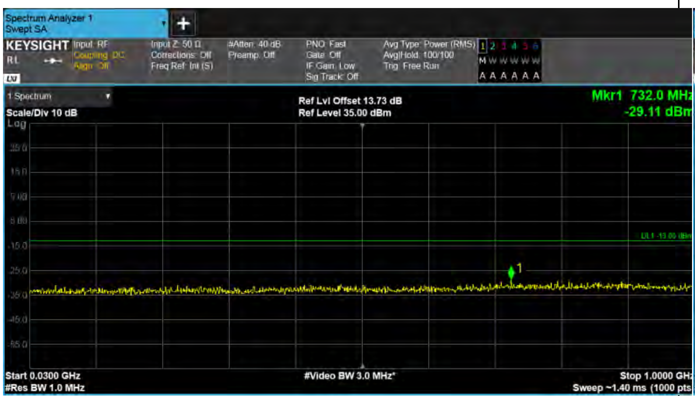
PCS 1900 _LCH

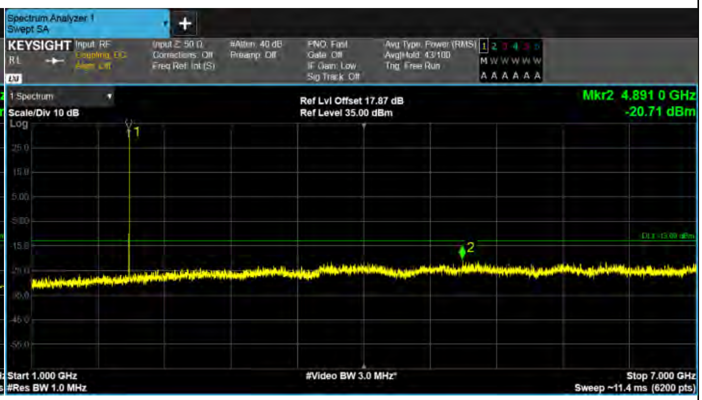




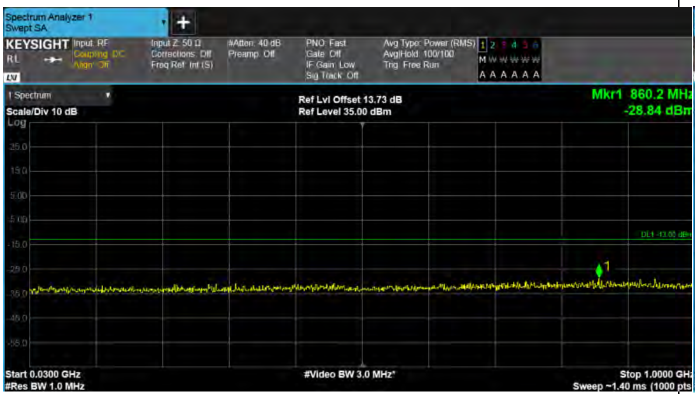


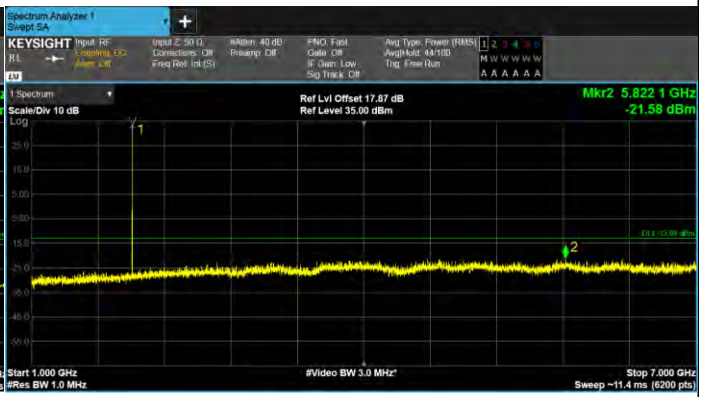
PCS 1900 _MCH

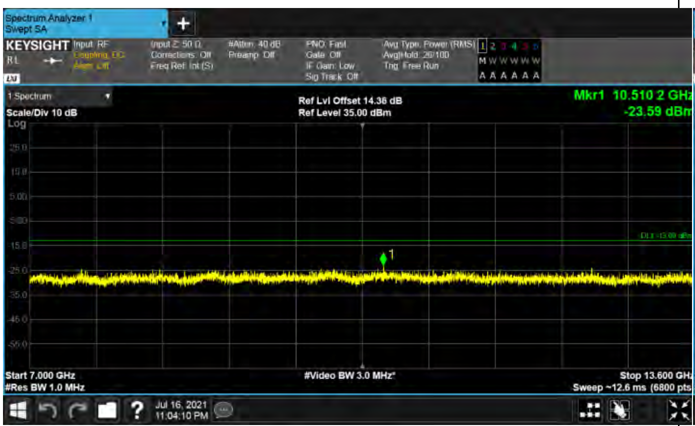


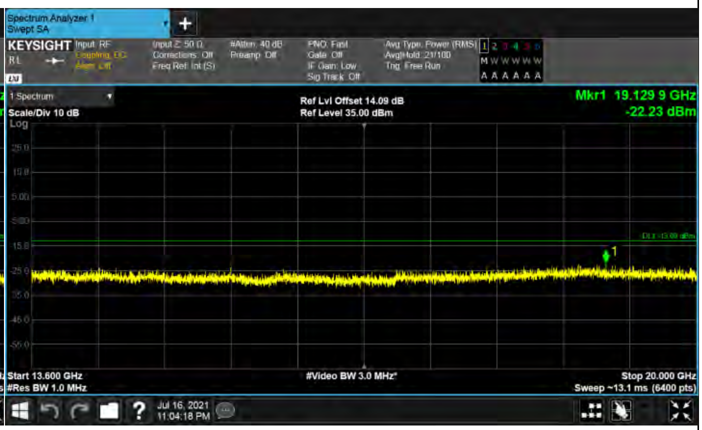


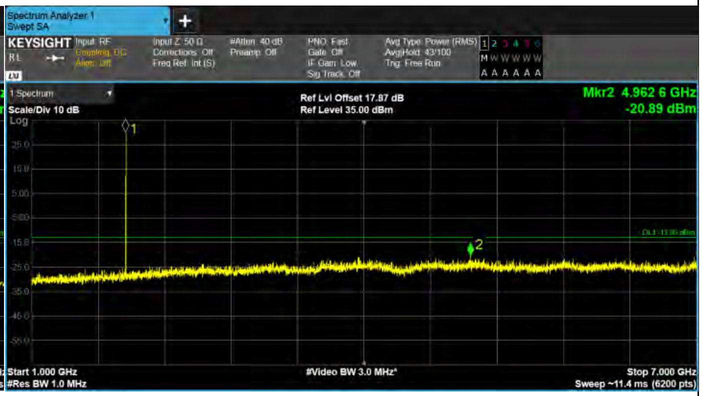
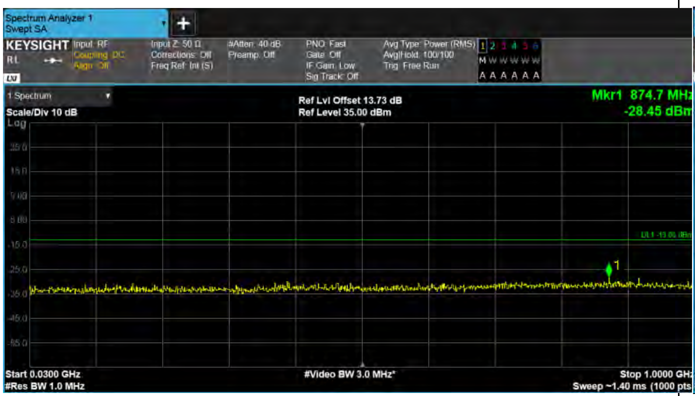
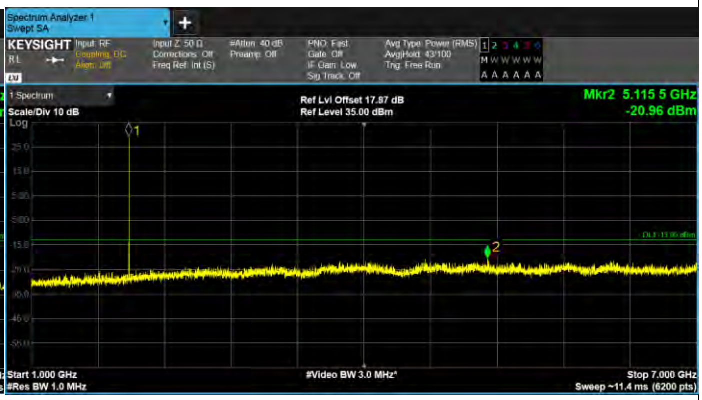
PCS 1900 _HCH	PCS 1900_HCH



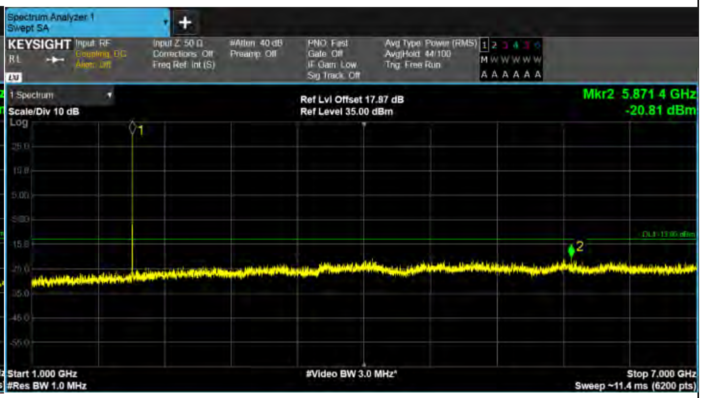


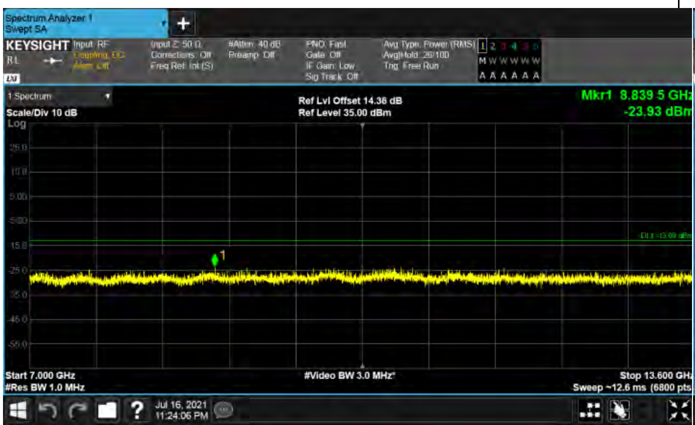


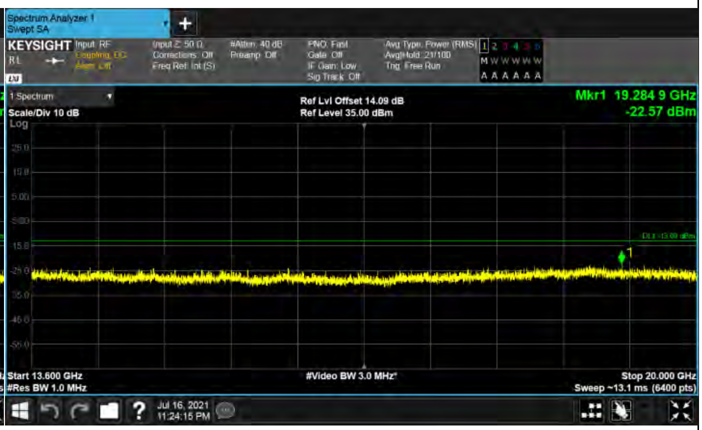


PCS 1900(EGPRS)	
PCS 1900 _LCH	PCS 1900_LCH
	
	
PCS 1900 _MCH	PCS 1900_MCH
	

PCS 1900 _HCH	PCS 1900_HCH



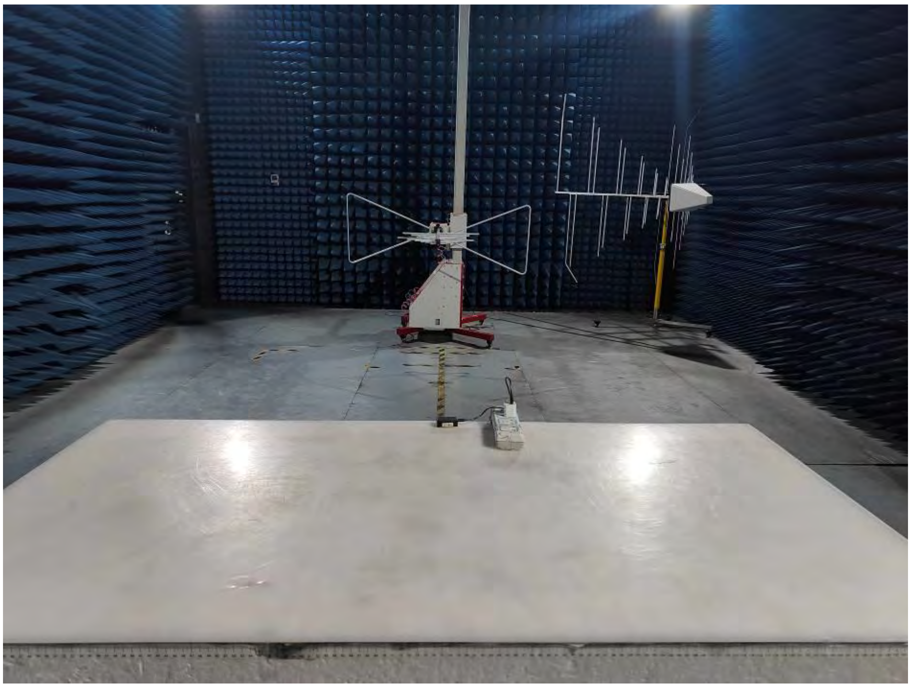




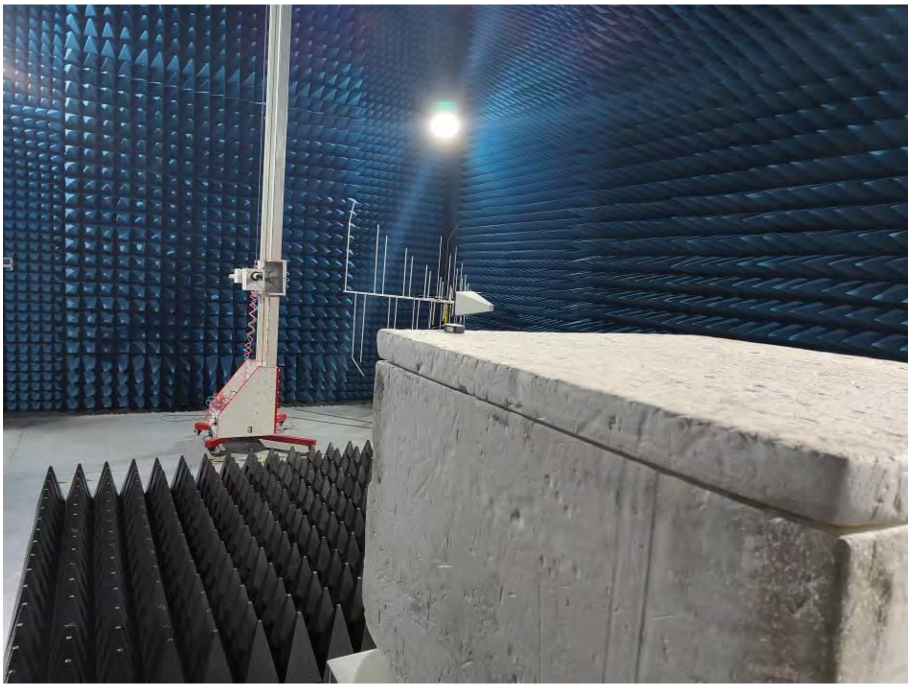
Note:1. Below 30MHZ no Spurious found and Above is the worst mode data.
2. As no emission found in standby or receive mode, no recording in this report.

12 PHOTO OF TEST

12.1 RADIATED EMISSION



30MHz-1000MHz



Above 1GHz

End of Report