TEST REPORT

REPORT NUMBER: I22W00053-GSM-RF-Rev3

ON

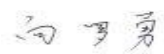
Type of Equipment:	LTE /HSPA/GSM/GNSS MODULE
Type of Designation:	A7608SA-H /A7608SA-H miniPCIE
Brand Name:	SIMCom
Manufacturer:	SIMCom Wireless Solutions Limited
FCC ID:	2AJYU-8BAE006

ACCORDING TO

FCC CFR Part 2, FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS，e-CFR
PART 22, PUBLIC MOBILE SERVICES，e-CFR
PART 24, PERSONAL COMMUNICATIONS SERVICES，e-CFR
ANSI C63.26-2015 American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services

Chongqing Academy of Information and Communications Technology

Month date, year
Oct, 13, 2022
Signature



Xiang Luoyong
Director

Note:
The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of Chongqing Academy of Information and Communications Technology.

Revision Version

Report Number	Revision	Date	Memo
I22W00053-GSM-RF	00	2022-08-11	Initial creation of test report
I22W00053-GSM-RF-Rev1	01	2022-09-09	First change of test report
I22W00053-GSM-RF-Rev2	2	2022-09-29	--
I22W00053-GSM-RF-Rev3	3	2022-10-13	--

CONTENTS

1. Test Laboratory

1.1. Testing Location

Name:	Chongqing Academy of Information and Communications Technology
FCC Registration Number:	CN1239
Address:	No.19 East Road, Xiantao Big-data Valley, Yubei District, Chongqing, People's Republic of China
Postal Code:	401336
Telephone:	0086-23-88069965
Fax:	0086-23-88608777

1.2. Testing Environment

Normal Temperature:	15-35℃
Relative Humidity:	30-60%

1.3. Project data

Testing Start Date:	2022-07-05
Testing End Date:	2022-09-08

1.4. Signature

	2022-10-13
Dong Junxin **(Prepared this test report)**	**Date**
	2022-10-13
Li Xu **(Reviewed this test report)**	**Date**
	2022-10-13
Xiang Luoyong **Director of the laboratory** **(Approved this test report)**	**Date**

2. Client Information

2.1. Applicant Information

Company name:	SIMCom Wireless Solutions Limited
Address /Post:	Building 3,No. 289, Linhong Road, Changning District, Shanghai, P.R.China
City:	Shanghai
Country:	China
Telephone:	15902149520
Fax:	--
Email:	yue.hai@simcom.com
Contact Person:	Haiyue

2.2. Manufacturer Information

Company Name:	SIMCom Wireless Solutions Limited
Address /Post:	Building 3,No. 289, Linhong Road, Changning District, Shanghai, P.R.China
City:	Shanghai
Country:	China
Telephone:	15902149520
Fax:	--
Email:	yue.hai@simcom.com
Contact Person:	Haiyue

3. Equipment under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

EUT Description	LTE /HSPA/GSM/GNSS MODULE
Model name	A7608SA-H /A7608SA-H miniPCIE
Brand name	SIMCom
GSM Frequency Band	2/5
WCDMA Frequency Band	2/5
LTE Frequency Band	2/4/5/41/66
Type of modulation	GMSK/8PSK/QPSK/16QAM
Extreme Temperature	-40/+85℃
Nominal Voltage	3.8
Extreme High Voltage	4.2
Extreme Low Voltage	3.4

Note: Photographs of EUT are shown in ANNEX A of this test report.
Note: High and low voltage values in extreme condition test are given by manufacturer.

3.2. Internal Identification of EUT used during the test

EUT ID	SN or IMEI	HW Version	SW Version	Date of receipt
S1	IMEI:862733060028209	V1.02	A7600M7_V5.0	2022-07-05
S2	IMEI:862733060027151	V1.02	A7600M7_V5.0	2022-07-05

*EUT ID: is used to identify the test sample in the lab internally.

3.3. Outline of Equipment under Test

Technology	Band	UL Freq.(MHz)	DL Freq.(MHz)	Note
GSM	B2	1850.2-1909.8	1930.2-1989.8	--
	B5	824.2-848.8	869.2-893.8	--
WCDMA	B2	1852.4-1907.6	1932.4-1987.6	--
	B5	826.4-846.6	871.4-891.6	--
LTE	B2	1850-1910	1930-1990	--
	B4	1710-1755	2110-2155	--
	B5	824-849	869-894	--
	B41	2496-2690	2496-2690	--
	B66	1710-1780	2110-2200	--

3.4. Internal Identification of AE used during the test

*AE ID: is used to identify the test sample in the lab internally.

AE ID	Instrument	Manufacturer	Model
AE1	XXX-EVB	SIMCOM	--
AE2	Power Adapter	Something High	P-050B-B2152
AE3	USB Cable	shenzhenshishunqinkejiyouxiangongsi	USB 2.0 A+MICRO Connectors
AE4	Antenna	SPEED	MF25D-black

AE info are provided customer.

4. Reference Documents

4.1. Documents supplied by applicant

PICS/PIXIT, referring to Annex B for detailed information, is supplied by the client or manufacturer, which is the basis of testing.

4.2. Reference Documents for testing

The following documents listed in this section are referred for testing.

Reference	Title	Version
FCC CFR Part 2	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS，e-CFR	--
FCC CFR Part 22	PUBLIC MOBILE SERVICES	--
FCC CFR Part 24	PERSONAL COMMUNICATIONS SERVICES，e-CFR	--
ANSI C63.26	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services	2015

5. Test Equipments Utilized

5.1. RF Test System

No.	Equipment	Model	SN	HW Version	SW Version	Manufacture	Cal.Due Date
1	spectrum analyzer	FSQ 26	201137/026	--	--	R&S	2023-06-29
2	DC Power Supply	3303D	801128	--	--	Topward	2023-06-29
3	Universal Radio Communication Tester	CMW500	152395	--	--	R&S	2023-06-29

5.2. RSE Test System

No.	Equipment	Model	SN	HW Version	SW Version	Manufacture	Cal.Due Date
1	Test Receiver	ESU40	100350	01	4.43 SP3	R&S	2023-06-29
2	Ultra-wideband Log Periodic Antenna	VULB 9163	9163-586	--	--	Schwarzbeck	2022-11-11
3	Double Ridged Guide Antenna	9120D	9120D-1103	--	--	Schwarzbeck	2024-05-05
4	Universal Radio Communication Tester	CMW500	128181	--	--	R&S	2023-06-29
5	Double Ridged Guide Antenna	HF907	100356	--	--	R&S	2023-07-07
6	Generator	SMU 200A	104517	--	--	R&S	2023-06-29
7	Ultra-wideband Log Periodic Antenna	VULB 9163	00995	--	--	R&S	2023-04-03
8	Amplifier1	SCU-08F1	8320027	--	--	R&S	--
9	Amplifier2	SCU-08F1	180093	--	--	R&S	--

5.3. Climate Chamber

No.	Name	Type	SN	Manufacture	Cal.Due Date
1	Climate chamber	SH-241	92010759	ESPEC	2023-06-29
2	Fully anechoic chamber	FAC-5	--	TDK	2024-08-30

5.4. Vibration table

No.	Name	Type	SN	Manufacture	Cal.Due Date
--	--	--	--	--	--

5.5. Test software

No.	Name	version	SN	Manufacture
1	EMC32	V 9.26.01	--	R&S
2	T-RFS500	V2.0	--	Manufacturer:Beijing Zhiwang Xince Technology Co., Ltd.

6. Test Results

6.1. Summary of Test Results

A brief summary of the tests carried out is shown as following.

FCC Rules	Name of Test	Result
2.1046,22.913(a),24.232(c)	Conducted RF Power Output	Pass
2.1046,22.913(a),24.232(c)	ERP and EIRP	Pass
2.1049,22.917(b), 24.238(b)	Occupied Bandwidth	*Note 1
2.1051,24.238,2.1053,22.917	Conducted spurious emissions	Pass
2.1051,24.238,2.1053,22.917	Radiated Spurious Emission	Pass
2.1051,24.238, 2.1053, 22.917	Band Edge	Pass
2.1055, 22.355,24.235	Frequency Stability	Pass
24.232	Peak to Average Ratio	Pass
Note 1: No applicable performance criteria. Note 2：Explanation of worst-case configuration The worst-case scenario for all measurements is based on the conducted output power. Output power was measured on GMSK,8PSK modulations. It was found that GMSK was the worst case. All testing was performed using GMSK modulations to represent the worst case unless otherwise stated. The test results shown in the following sections represent the worst case emission.		

6.2. Conducted RF Power Output

Specifications:	FCC Part 2.1046, 22.913(a), 24.232(c)
DUT Serial Number:	862733060028209
Test conditions:	Ambient Temperature:15℃-35℃ Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Limit Level Construction:

According to Part 22.913(a), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

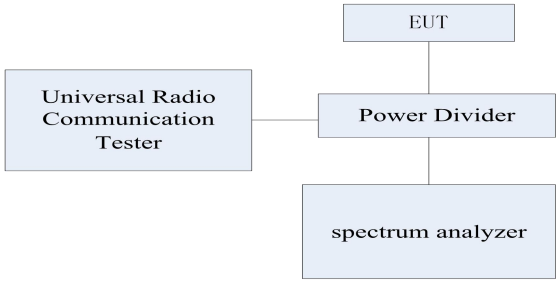
According to Part24.232(c), mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

Measurement Uncertainty:

Item	Uncertainty
Expanded Uncertainty	0.62 dB (k=2)

Test Setup:

During the test, the EUT was controlled via the Wireless Telecommunications Test Set to ensure max power transmission and proper modulation and measured by spectrum analyzer.



Test Method:

1) The EUT was coupled to the spectrum analyzer and the Wireless Telecommunications Test Set through a power divider. The loss of the RF cables of the test system is calibrated to correct the readings.

2) For RMS power test, the spectrum analyzer was set to RMS Detector function and Maximum hold mode.

3) For Peak power test, the spectrum analyzer was set to Maxpeak Detector function and Maximum hold mode.

4) The resolution Bandwidth of the spectrum analyzer was comparable to the emission Bandwidth.

Note: --

6.2.1 Conducted RF Power Output Results

GSM850

GSM(GMSK)

Frequency (MHz)	Power Step	Slot	Avg power (dBm)	Peak power (dBm)
824.2	5	1TS	31.77	31.77
836.6	5	1TS	31.79	31.79
848.8	5	1TS	31.95	31.95

GSM850

GPRS(GMSK)

Frequency (MHz)	Power Step	Slot	Avg power (dBm)	Peak power (dBm)
824.2	3	1TS	31.79	31.79
824.2	3	2TS	31.80	31.81
824.2	3	3TS	30.51	30.52
824.2	3	4TS	28.79	28.80
836.6	3	1TS	31.86	31.86
836.6	3	2TS	31.89	31.89
836.6	3	3TS	30.62	30.63
836.6	3	4TS	28.85	28.85
848.8	3	1TS	32.10	32.10
848.8	3	2TS	32.10	32.11
848.8	3	3TS	30.81	30.82
848.8	3	4TS	29.03	29.03

GSM850

EGPRS(8PSK)

Frequency (MHz)	Power Step	Slot	Avg power (dBm)	Peak power (dBm)
824.2	6	1TS	26.29	26.31
824.2	6	2TS	24.63	24.68
824.2	6	3TS	22.52	26.71
824.2	6	4TS	20.37	20.45
836.6	6	1TS	25.72	25.74
836.6	6	2TS	24.13	24.13
836.6	6	3TS	23.46	22.10
836.6	6	4TS	19.96	20.06
848.8	6	1TS	25.42	25.44
848.8	6	2TS	23.62	23.65
848.8	6	3TS	21.50	21.55
848.8	6	4TS	22.12	19.25

PCS1900

GSM(GMSK)

Frequency (MHz)	Power Step	Slot	Avg power (dBm)	Peak power (dBm)
1850.2	0	1TS	28.19	28.20
1880	0	1TS	28.08	28.08
1909.8	0	1TS	28.37	28.39

PCS1900

GPRS(GMSK)

Frequency (MHz)	Power Step	Slot	Avg power (dBm)	Peak power (dBm)
1850.2	3	1TS	28.18	28.18
1850.2	3	2TS	28.23	28.23
1850.2	3	3TS	27.07	27.08
1850.2	3	4TS	25.25	25.26
1880	3	1TS	28.16	28.16
1880	3	2TS	28.18	28.18
1880	3	3TS	26.99	26.99
1880	3	4TS	25.06	25.06
1909.8	3	1TS	28.51	28.52
1909.8	3	2TS	28.52	28.53
1909.8	3	3TS	27.32	27.32
1909.8	3	4TS	25.38	25.38

PCS1900

EGPRS(8PSK)

Frequency (MHz)	Power Step	Slot	Avg power (dBm)	Peak power (dBm)
1850.2	5	1TS	25.28	25.33
1850.2	5	2TS	23.65	23.73
1850.2	5	3TS	21.34	21.42
1850.2	5	4TS	19.19	19.33
1880	5	1TS	25.06	25.08
1880	5	2TS	23.80	23.45
1880	5	3TS	21.14	25.09
1880	5	4TS	18.93	19.06
1909.8	5	1TS	24.60	24.61
1909.8	5	2TS	23.10	25.32
1909.8	5	3TS	20.76	20.81
1909.8	5	4TS	18.59	18.75

6.3. ERP and EIRP

Limit Level Construction:

This is the test for the maximum radiated power from the EUT.

According to Part 24.232(c),"Mobile/portable stations are limited to 2 watts e.i.r.p. Peak power"and 24.232(c) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage."

According to 22.913(a), The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts."

Method of Measurement

Conducted RF Power+Antenna Gain(dBi)=EIRP

Conducted RF Power+Antenna Gain(dBd)=ERP

Antenna Gain(dBd)= Antenna Gain(dBi)-2.15

Note:Antenna Gain is supplied by customer.

Frequency Band	AntennaGain (dBi)
GSM Band2	3.00
GSM Band5	2.00

GSM Band 5

Limits 38.45dBm(7w)

GSM(GMSK)

Frequency (MHz)	Power Step	Slot	Avg power (dBm)	ERP(dBm) G_T= 2.00dBi/-0.15dBd
824.2	5	1TS	31.77	31.62
836.6	5	1TS	31.79	31.64
848.8	5	1TS	31.95	31.80

GPRS(GMSK)

Frequency (MHz)	Power Step	Slot	Avg power (dBm)	ERP(dBm) G_T= 2.00dBi/-0.15dBd
824.2	3	1TS	31.79	31.64
824.2	3	2TS	31.80	31.65
824.2	3	3TS	30.51	30.36
824.2	3	4TS	28.79	28.64
836.6	3	1TS	31.86	31.71
836.6	3	2TS	31.89	31.74
836.6	3	3TS	30.62	30.47
836.6	3	4TS	28.85	28.70
848.8	3	1TS	32.10	31.95
848.8	3	2TS	32.10	31.95
848.8	3	3TS	30.81	30.66
848.8	3	4TS	29.03	28.88

EGPRS(8PSK)

Frequency (MHz)	Power Step	Slot	Avg power (dBm)	ERP(dBm) G_T= 2.00dBi/-0.15dBd
824.2	6	1TS	26.29	26.14
824.2	6	2TS	24.63	24.48
824.2	6	3TS	22.52	22.37
824.2	6	4TS	20.37	20.22
836.6	6	1TS	25.72	25.57
836.6	6	2TS	24.13	23.98
836.6	6	3TS	23.46	23.31
836.6	6	4TS	19.96	19.81
848.8	6	1TS	25.42	25.27
848.8	6	2TS	23.62	23.47
848.8	6	3TS	21.50	21.35
848.8	6	4TS	22.12	21.97

GSM Band 2

Limits 33.0dBm(2w)

GSM(GMSK)

Frequency (MHz)	Power Step	Slot	Avg power (dBm)	EIRP(dBm) G_T= 3.00dBi
1850.2	0	1TS	28.19	31.19
1880	0	1TS	28.08	31.08
1909.8	0	1TS	28.37	31.37

PCS1900

GPRS(GMSK)

Frequency (MHz)	Power Step	Slot	Avg power (dBm)	EIRP(dBm) GT= 3.00dBi
1850.2	3	1TS	28.18	31.18
1850.2	3	2TS	28.23	31.23
1850.2	3	3TS	27.07	30.07
1850.2	3	4TS	25.25	28.25
1880	3	1TS	28.16	31.16
1880	3	2TS	28.18	31.18
1880	3	3TS	26.99	29.99
1880	3	4TS	25.06	28.06
1909.8	3	1TS	28.51	31.51
1909.8	3	2TS	28.52	31.52
1909.8	3	3TS	27.32	30.32
1909.8	3	4TS	25.38	28.38

PCS1900

EGPRS(8PSK)

Frequency (MHz)	Power Step	Slot	Avg power (dBm)	EIRP(dBm) G_T= 3.00dBi
1850.2	5	1TS	25.28	28.28
1850.2	5	2TS	23.65	26.65
1850.2	5	3TS	21.34	24.34
1850.2	5	4TS	19.19	22.19
1880	5	1TS	25.06	28.06
1880	5	2TS	23.80	26.80
1880	5	3TS	21.14	24.14
1880	5	4TS	18.93	21.93
1909.8	5	1TS	24.60	27.60

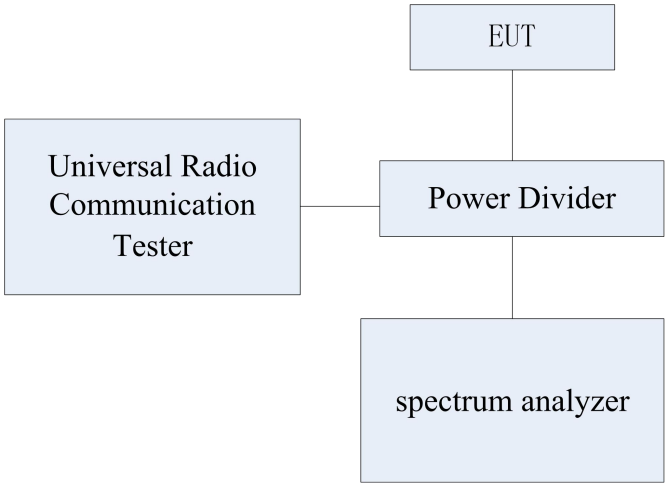
1909.8	5	2TS	23.10	26.10
1909.8	5	3TS	20.76	23.76
1909.8	5	4TS	18.59	21.59

6.4. Occupied Bandwidth

Specifications:	FCC Part 2.1049, 22.917(b), 24.238(b)
DUT Serial Number:	862733060028209
Test conditions:	Ambient Temperature:15℃-35℃ Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	--

Test Setup

During the test, the EUT was controlled via the Wireless Communications Test Set to ensure max power transmission and proper modulation and measured by spectrum analyzer.



Measurement Uncertainty:

Item	Uncertainty
Expanded Uncertainty	500 kHz (k=2)

Test Method

The 99% occupied Bandwidth was calculated from the spectrum analyzer. Markers in the spectrum analyzer were then placed between the calculated frequencies to show the calculated 99% power Band. The 26dB Bandwidth was also measured and recorded.

Note: --

6.4.1 occupied bandwidth Results

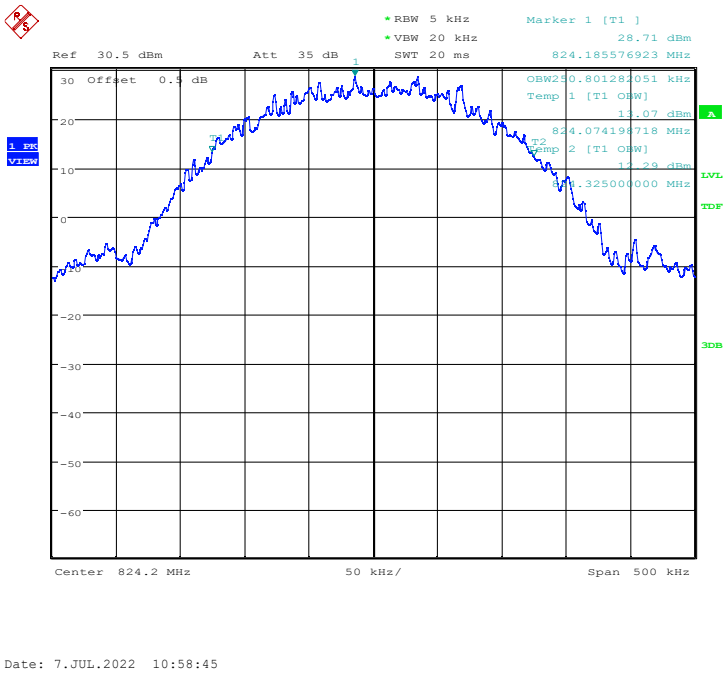
GSM850 (99 %)

GSM

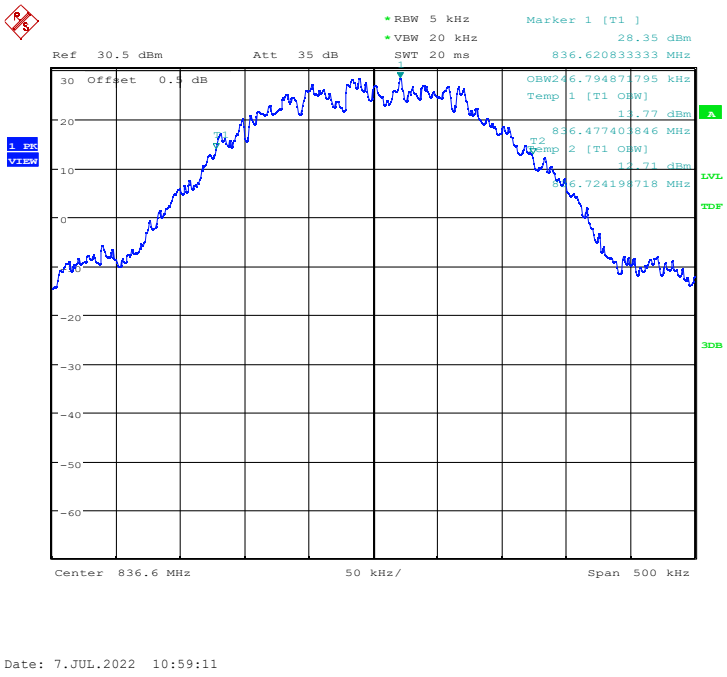
Frequency (MHz)	Occupied Bandwidth (99%) (kHz)
824.2	250.801
836.6	246.795
848.8	250.801

GSM850

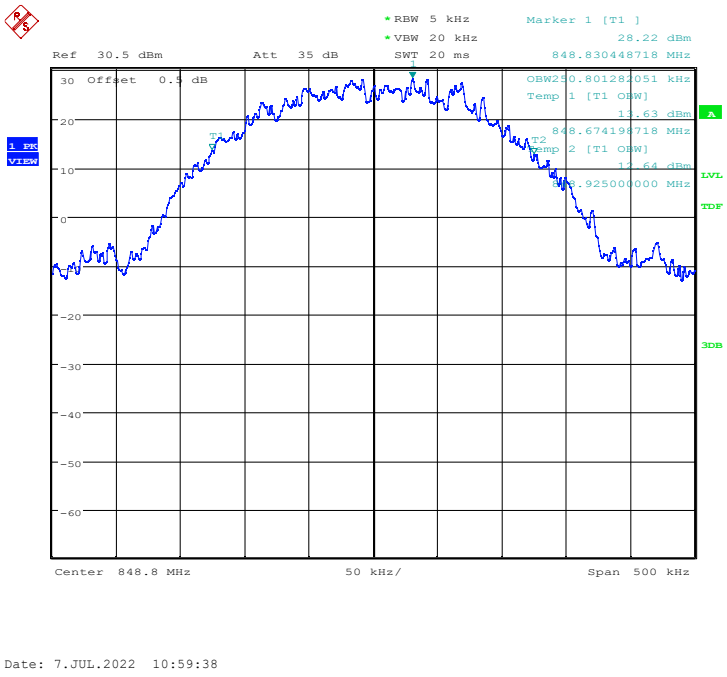
Channel 128-Occupied Bandwidth (99% BW)



Channel 190-Occupied Bandwidth (99% BW)



Channel 251-Occupied Bandwidth (99% BW)



GSM850 (99 %)

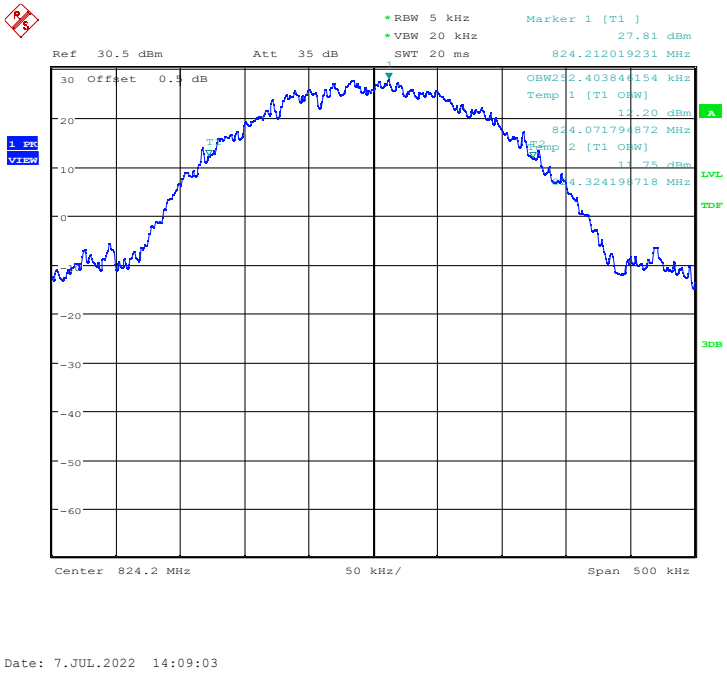
GPRS

Frequency (MHz)	Occupied Bandwidth (99%) (kHz)
824.2	252.404
836.6	247.596

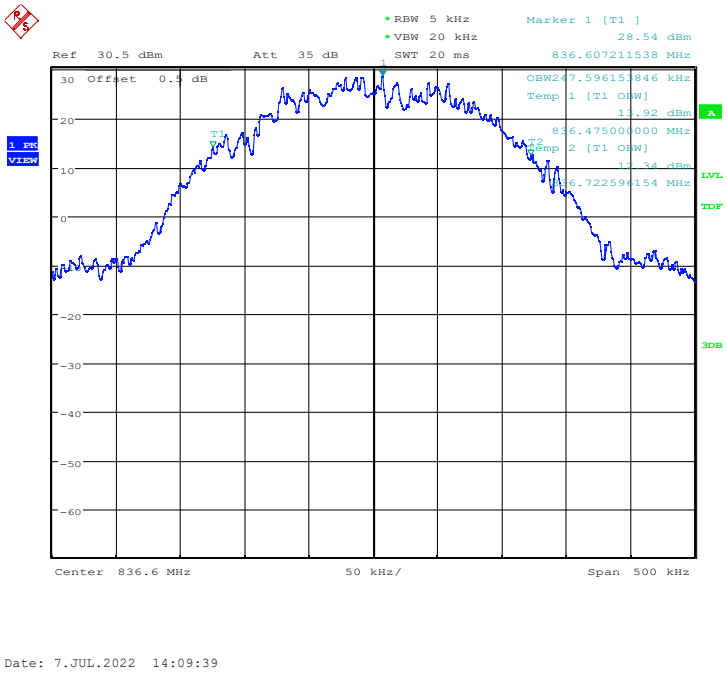
848.8	250.000

GSM850

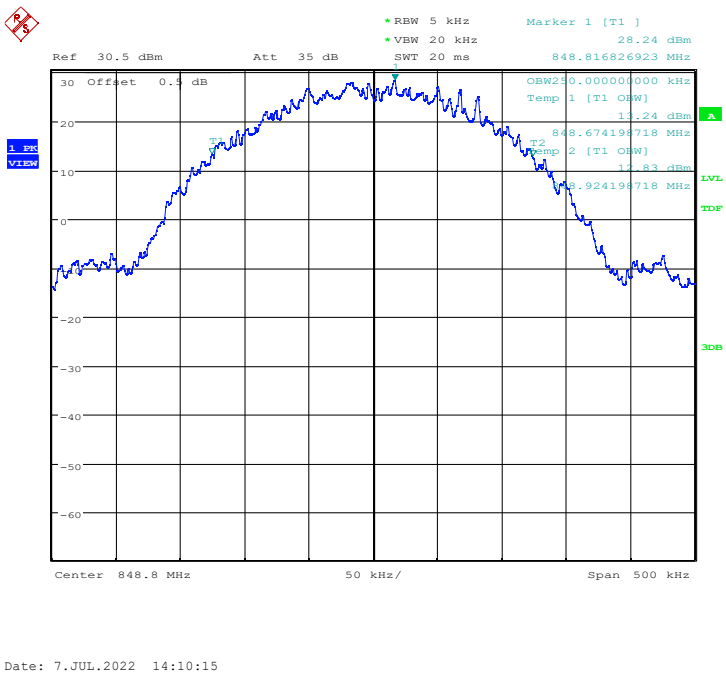
Channel 128-Occupied Bandwidth (99% BW)



Channel 190-Occupied Bandwidth (99% BW)



Channel 251-Occupied Bandwidth (99% BW)



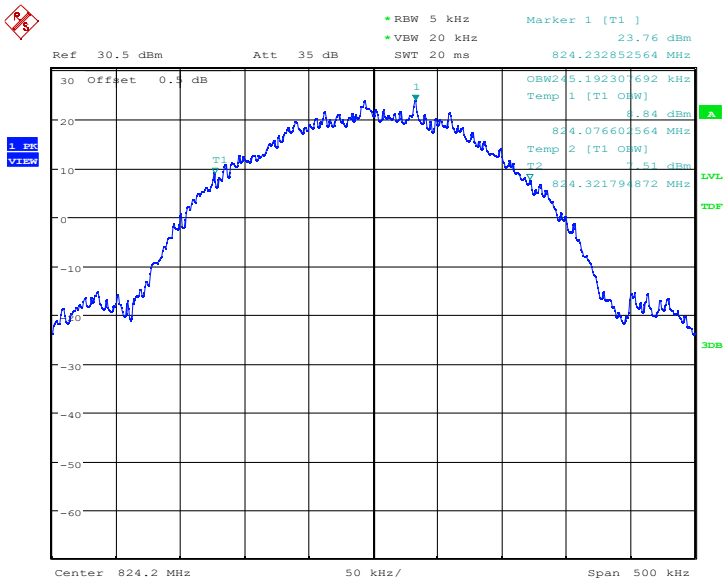
GSM850 (99 %)

EGPRS

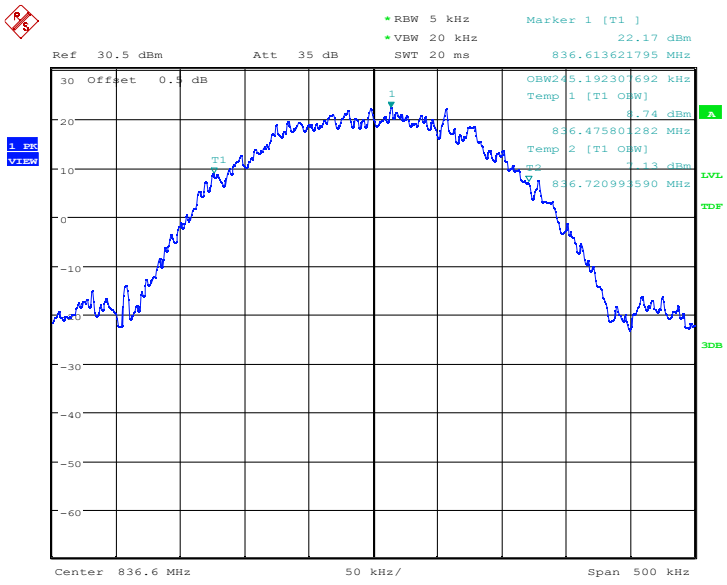
Frequency (MHz)	Occupied Bandwidth (99%) (kHz)
824.2	245.192
836.6	245.192
848.8	245.192

GSM850

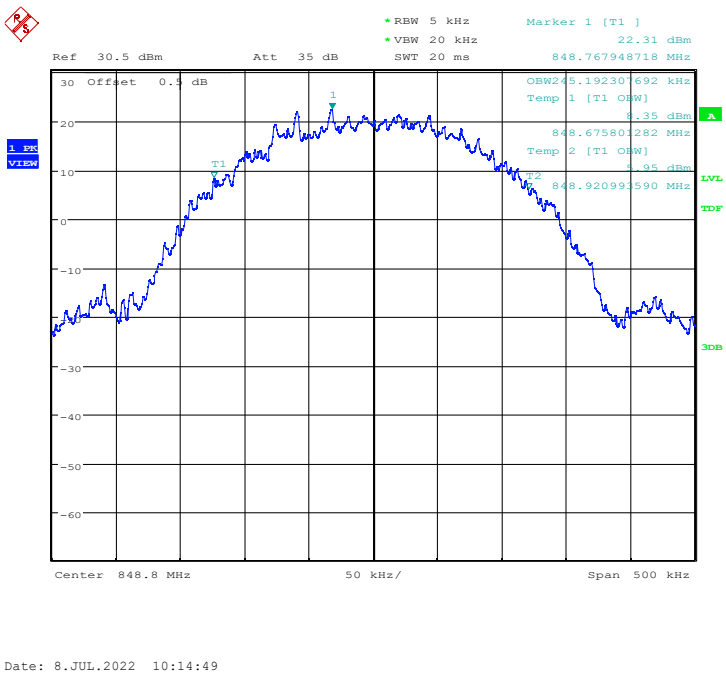
Channel 128-Occupied Bandwidth (99% BW)



Channel 190-Occupied Bandwidth (99% BW)



Channel 251-Occupied Bandwidth (99% BW)



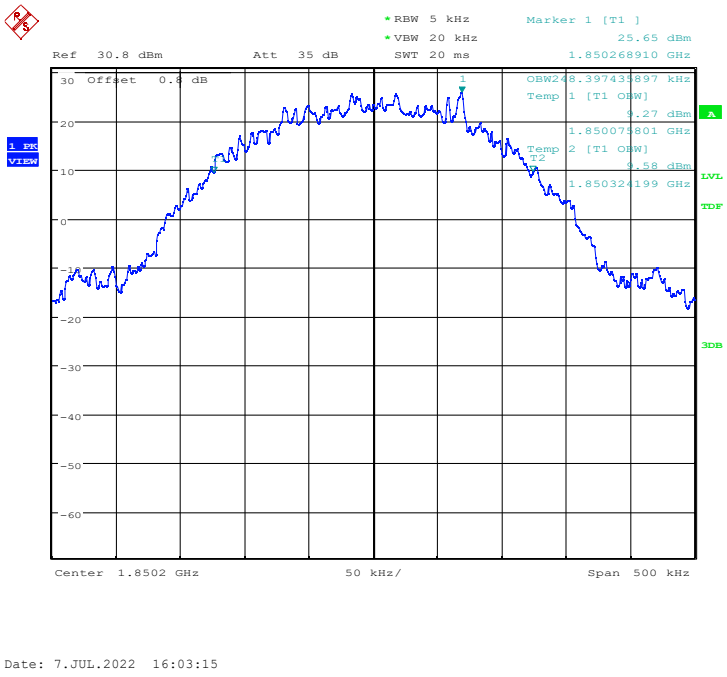
PCS1900 (99 %)

GSM

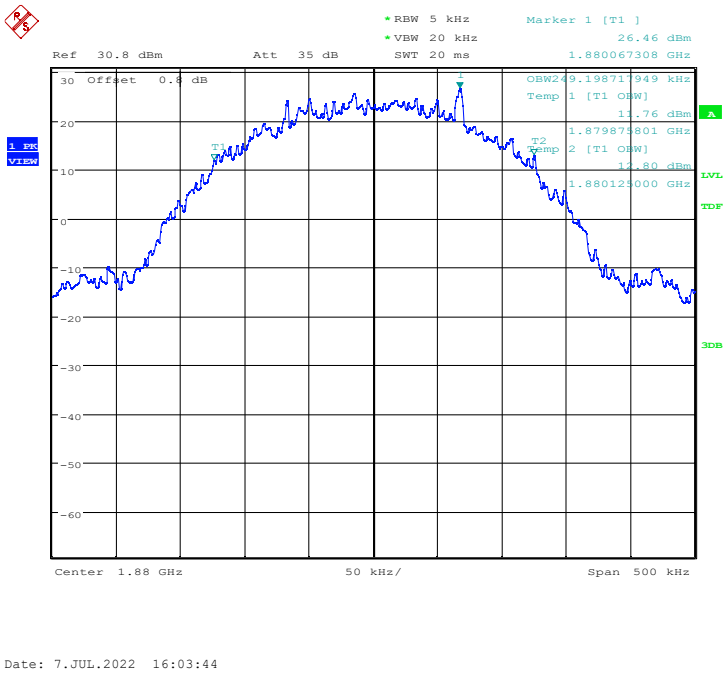
Frequency (MHz)	Occupied Bandwidth (99%) (kHz)
1850.2	248.397
1880	249.199
1909.8	248.397

PCS1900

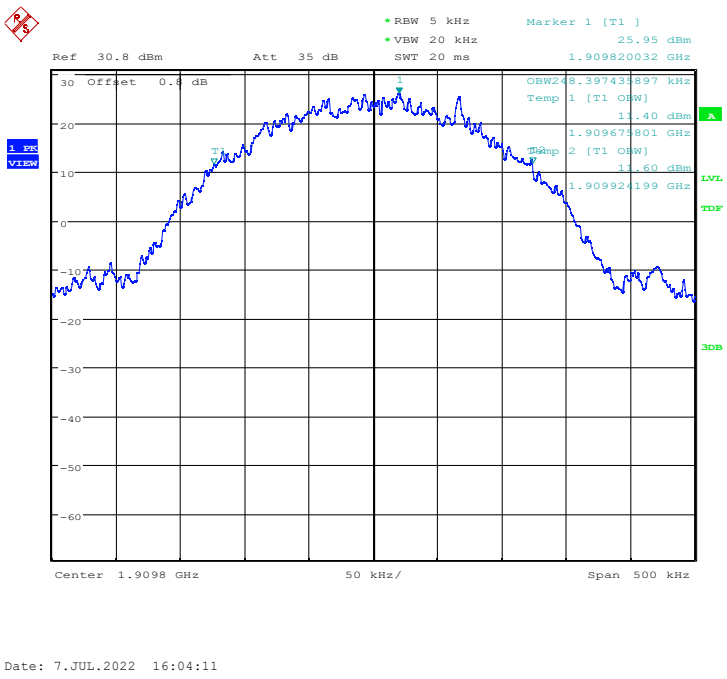
Channel 512-Occupied Bandwidth (99% BW)



Channel 661-Occupied Bandwidth (99% BW)



Channel 810-Occupied Bandwidth (99% BW)



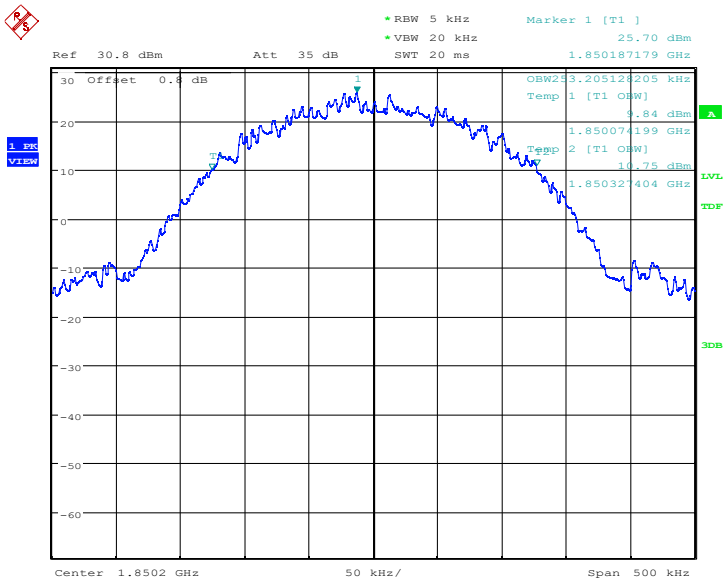
PCS1900 (99 %)

GPRS

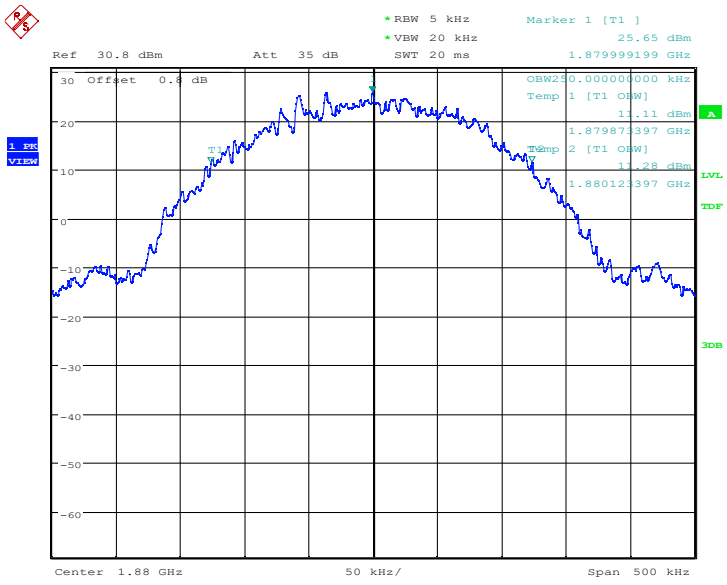
Frequency (MHz)	Occupied Bandwidth (99%) (kHz)
1850.2	253.205
1880	250.000
1909.8	247.596

PCS1900

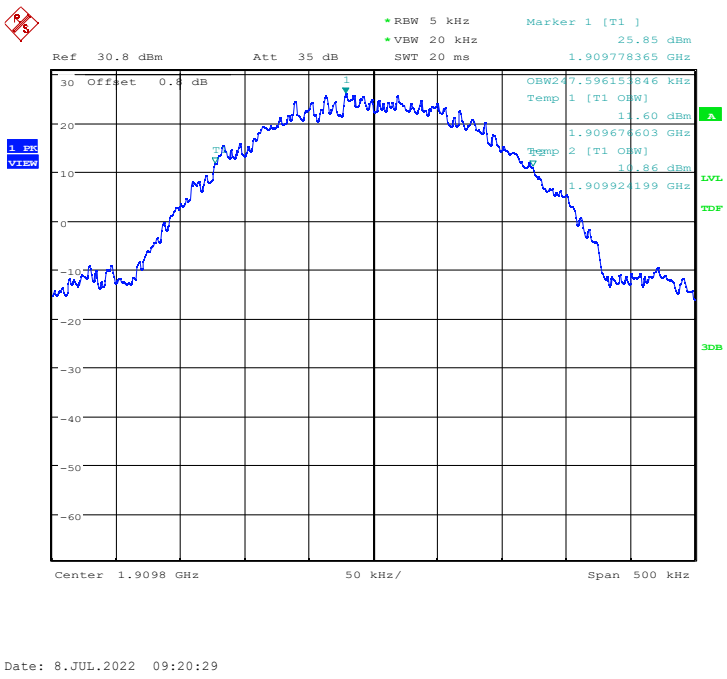
Channel 512-Occupied Bandwidth (99% BW)



Channel 661-Occupied Bandwidth (99% BW)



Channel 810-Occupied Bandwidth (99% BW)



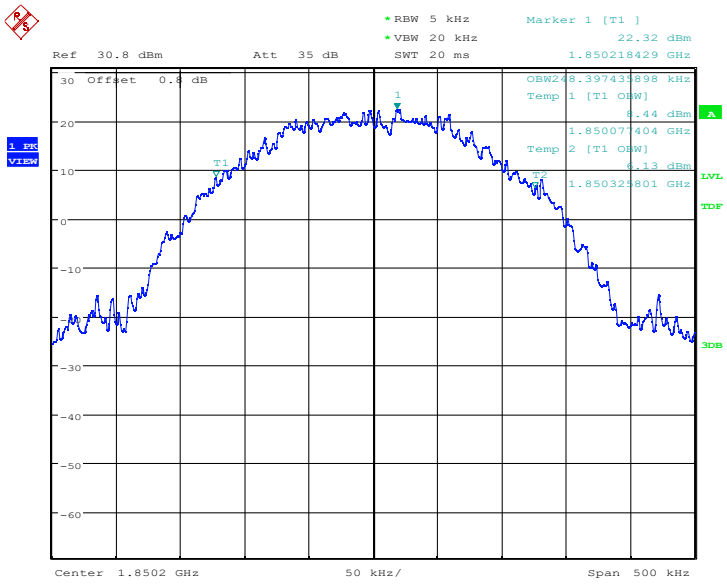
PCS1900 (99 %)

EGPRS

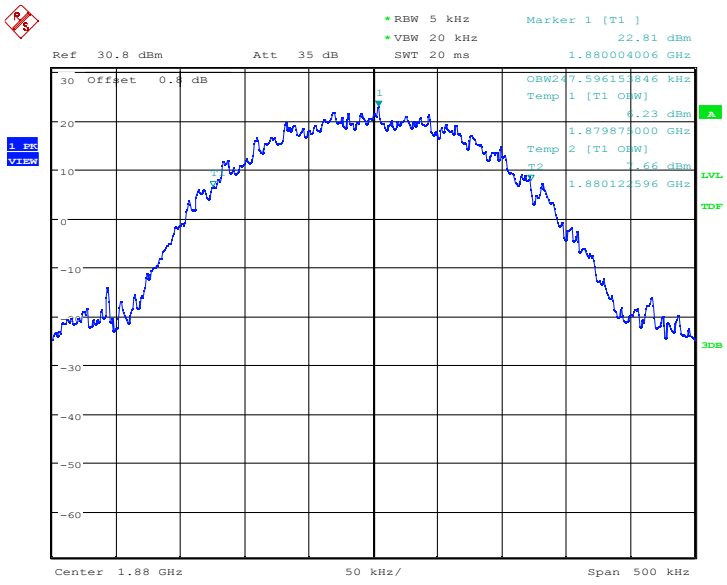
Frequency (MHz)	Occupied Bandwidth (99%) (kHz)
1850.2	248.397
1880	247.596
1909.8	244.391

PCS1900

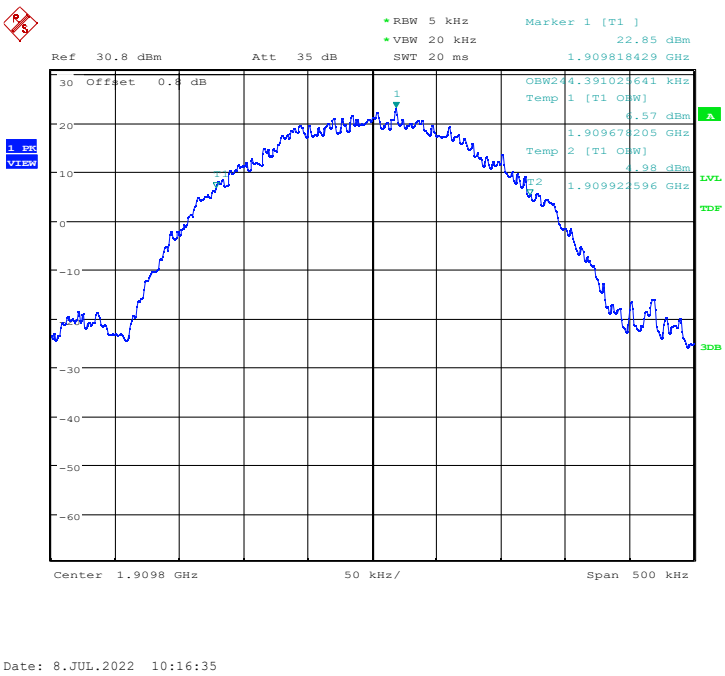
Channel 512-Occupied Bandwidth (99% BW)



Channel 661-Occupied Bandwidth (99% BW)



Channel 810-Occupied Bandwidth (99% BW)



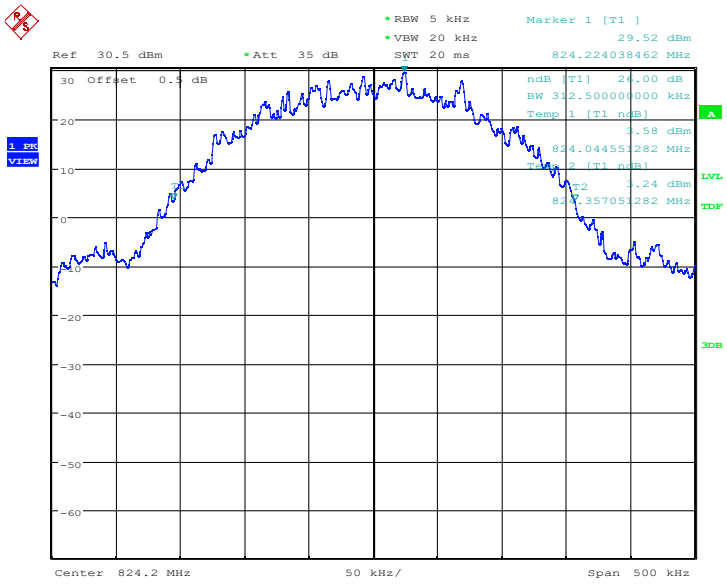
GSM850 (-26dBc)

GSM

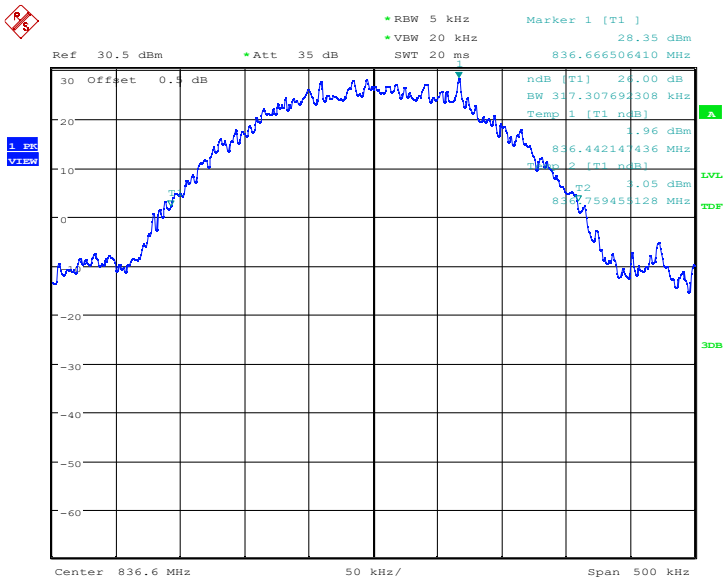
Frequency (MHz)	Emission Bandwidth (-26dBc)(kHz)
824.2	312.500
836.6	317.308
848.8	317.308

GSM850

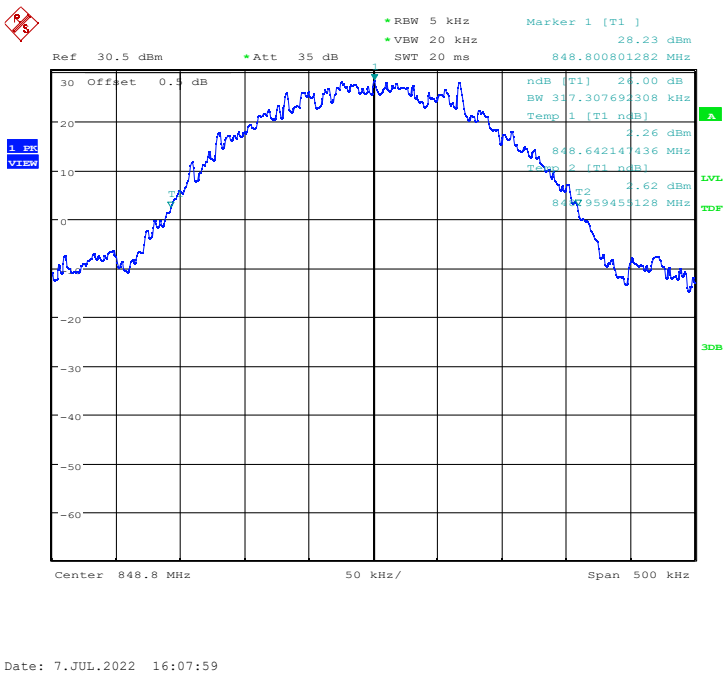
Channel 128-Emission Bandwidth (-26dBc BW)



Channel 190-Emission Bandwidth (-26dBc BW)



Channel 251-Emission Bandwidth (-26dBc BW)



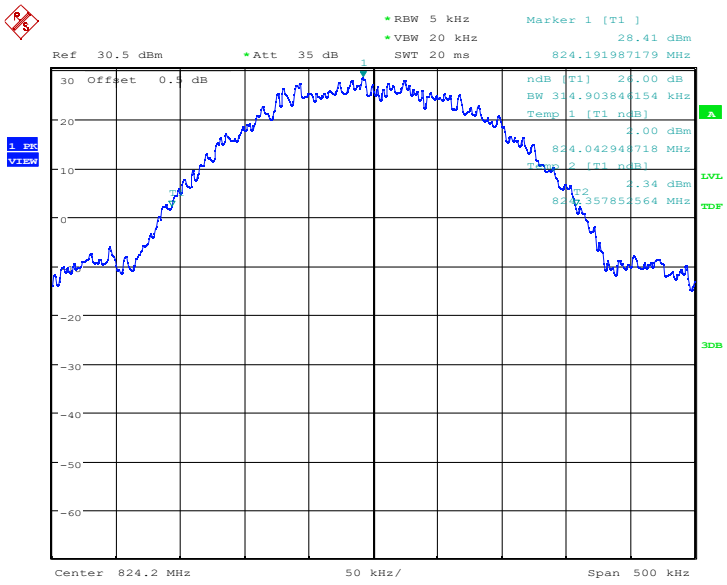
GSM850 (-26dBc)

GPRS

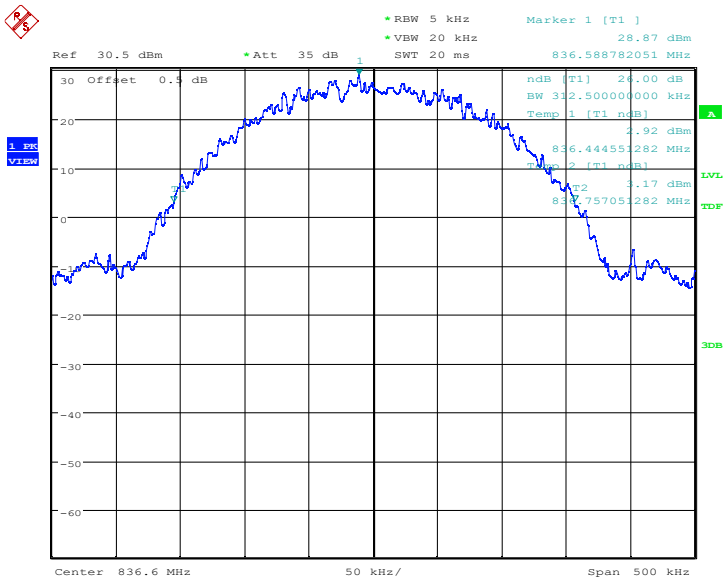
Frequency (MHz)	Emission Bandwidth (-26dBc)(kHz)
824.2	314.904
836.6	312.500
848.8	318.910

GSM850

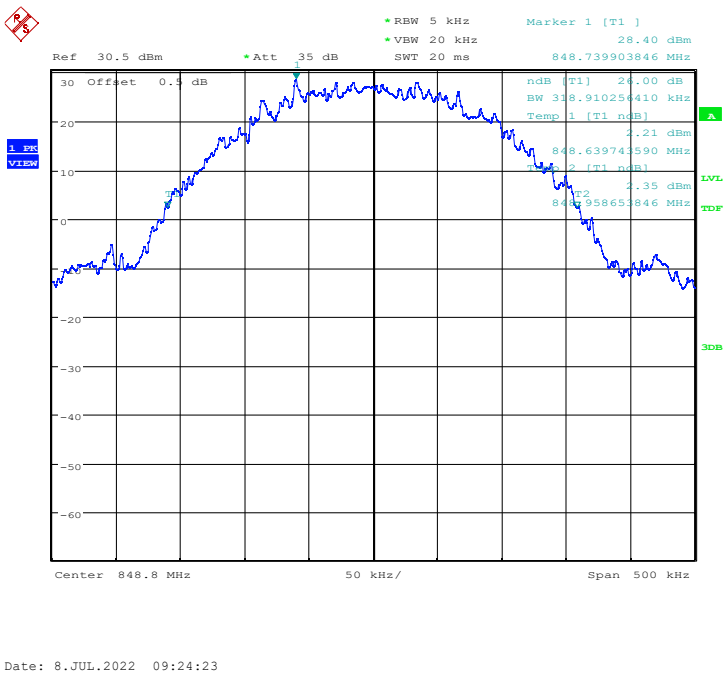
Channel 128-Emission Bandwidth (-26dBc BW)



Channel 190-Emission Bandwidth (-26dBc BW)



Channel 251-Emission Bandwidth (-26dBc BW)



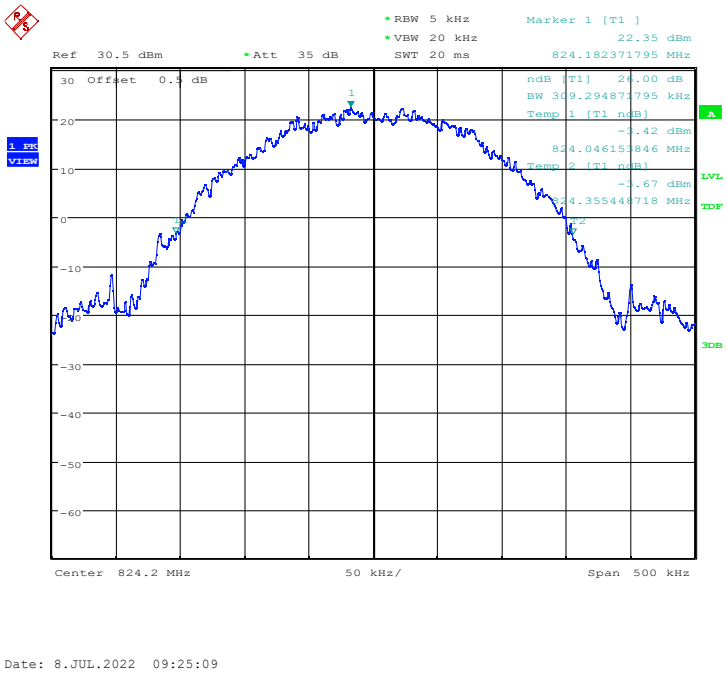
GSM850 (-26dBc)

EGPRS

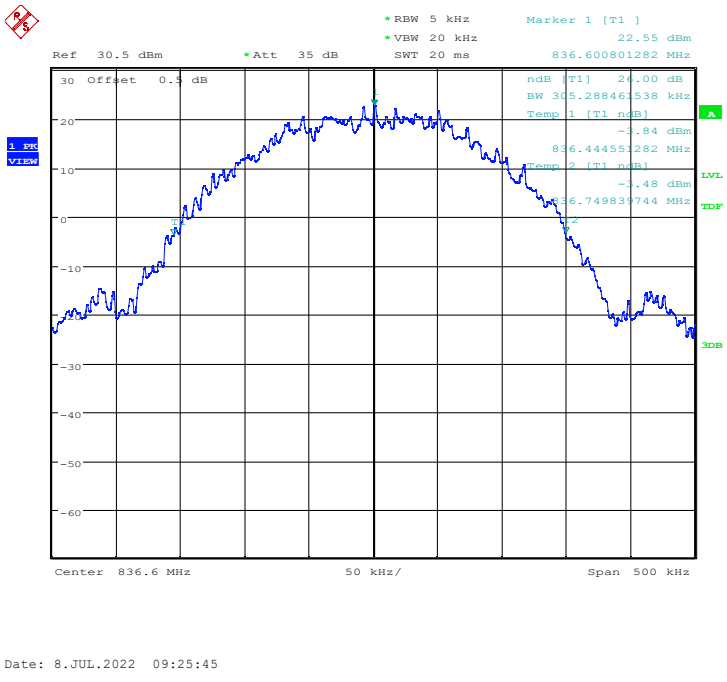
Frequency (MHz)	Emission Bandwidth (-26dBc)(kHz)
824.2	309.295
836.6	305.288
848.8	296.474

GSM850

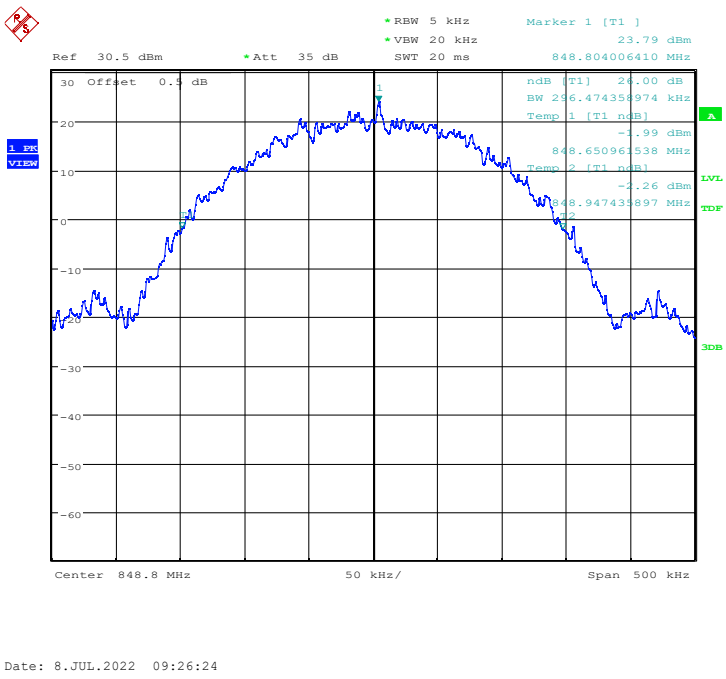
Channel 128-Emission Bandwidth (-26dBc BW)



Channel 190-Emission Bandwidth (-26dBc BW)



Channel 251-Emission Bandwidth (-26dBc BW)



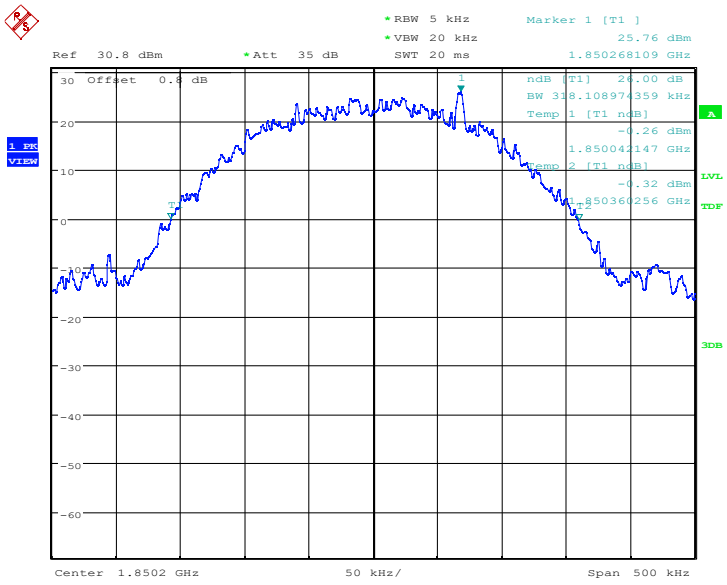
PCS1900 (-26dBc)

GSM

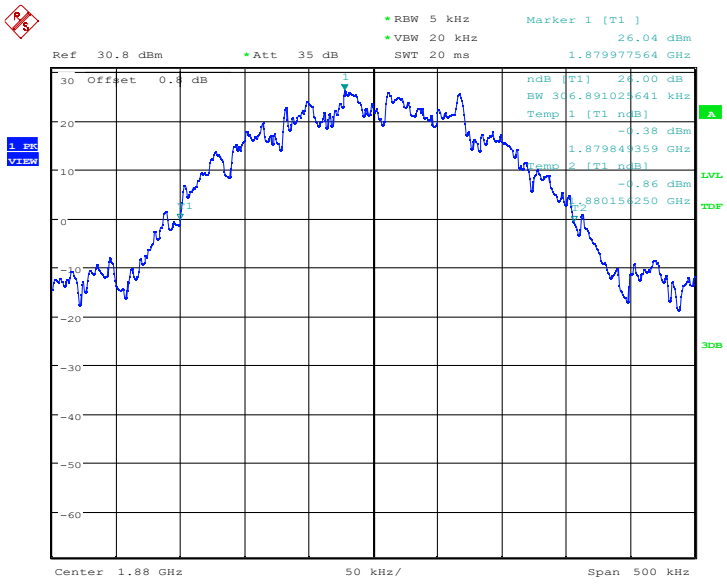
Frequency (MHz)	Emission Bandwidth (-26dBc)(kHz)
1850.2	318.109
1880	306.891
1909.8	312.500

PCS1900

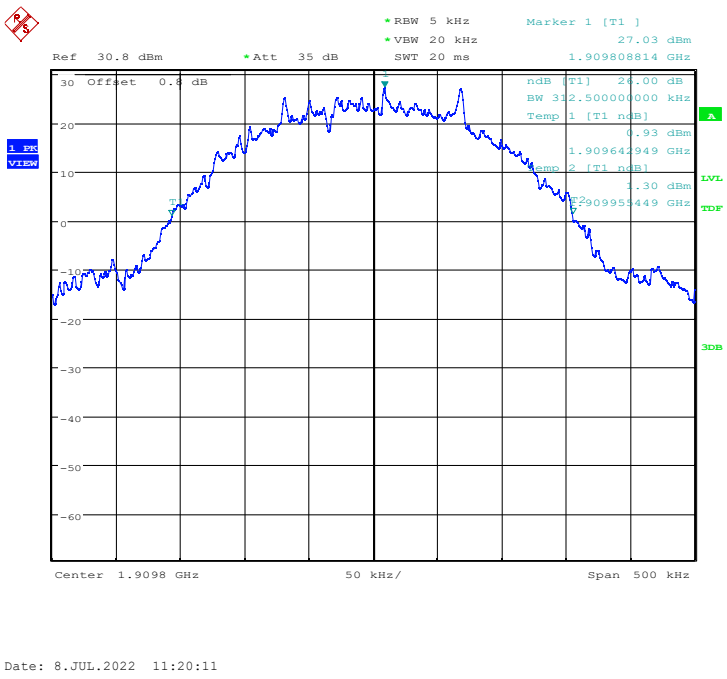
Channel 512-Emission Bandwidth (-26dBc BW)



Channel 661-Emission Bandwidth (-26dBc BW)



Channel 810-Emission Bandwidth (-26dBc BW)



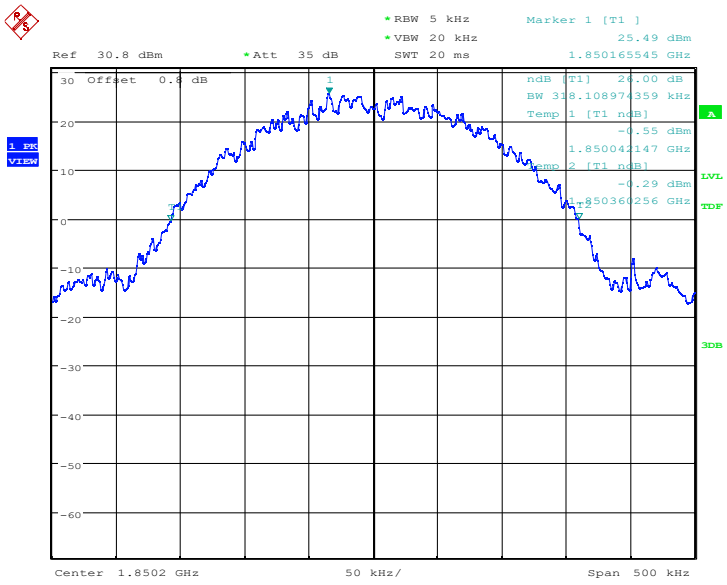
PCS1900 (-26dBc)

GPRS

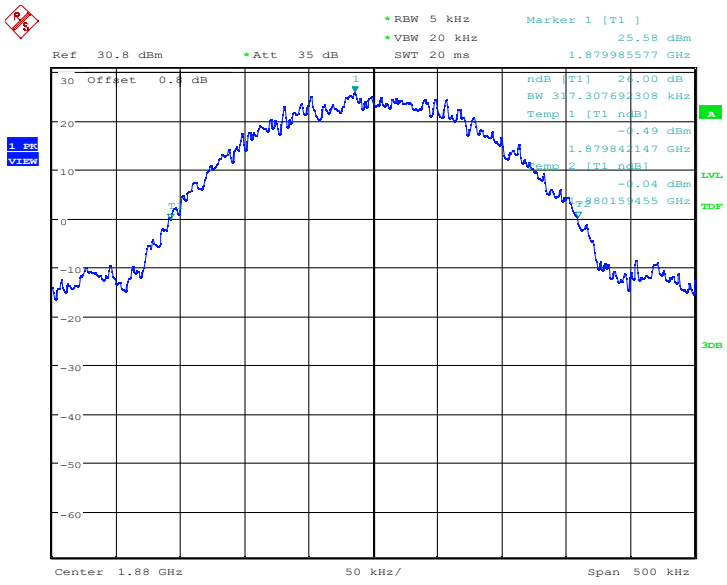
Frequency (MHz)	Emission Bandwidth (-26dBc)(kHz)
1850.2	318.109
1880	317.308
1909.8	315.705

PCS1900

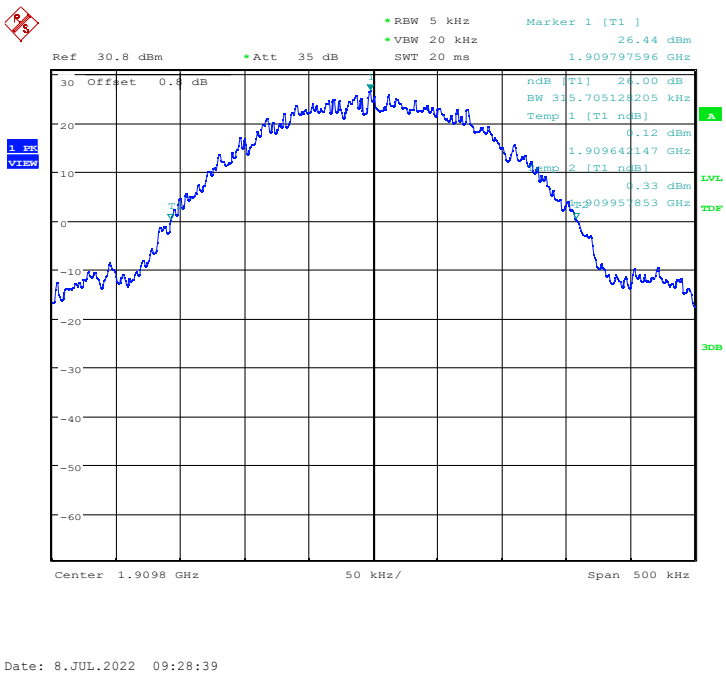
Channel 512-Emission Bandwidth (-26dBc BW)



Channel 661-Emission Bandwidth (-26dBc BW)



Channel 810-Emission Bandwidth (-26dBc BW)



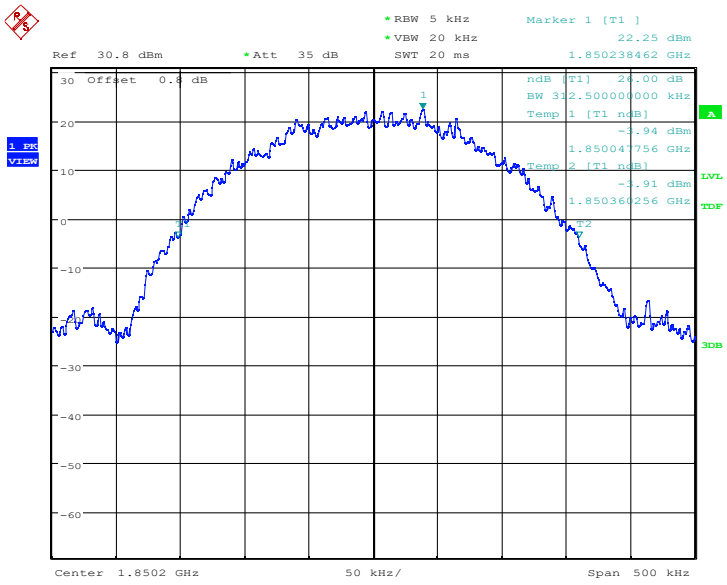
PCS1900 (-26dBc)

EGPRS

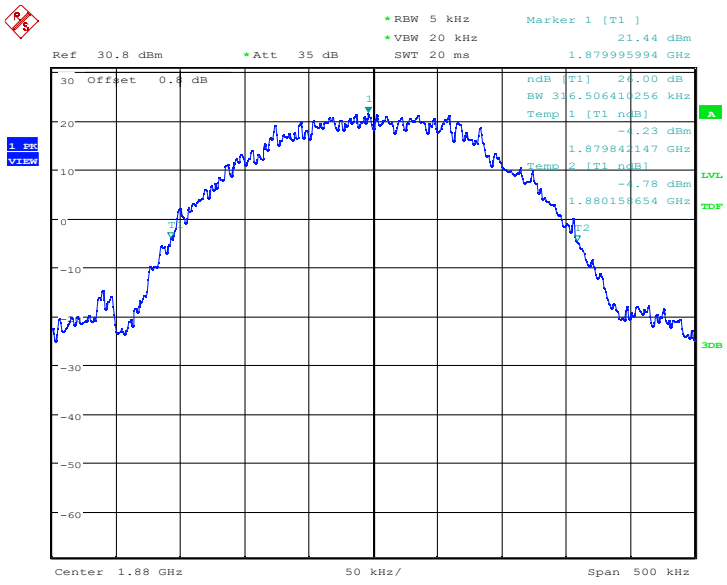
Frequency (MHz)	Emission Bandwidth (-26dBc)(kHz)
1850.2	312.500
1880	316.506
1909.8	306.891

PCS1900

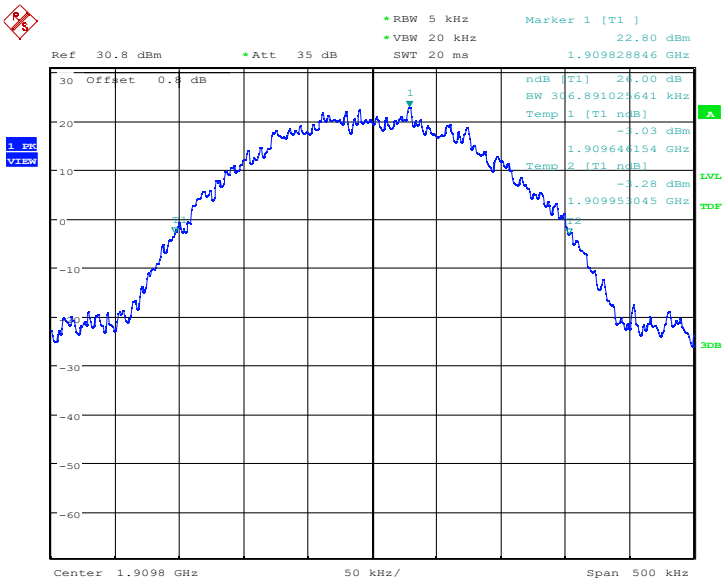
Channel 512-Emission Bandwidth (-26dBc BW)



Channel 661-Emission Bandwidth (-26dBc BW)



Channel 810-Emission Bandwidth (-26dBc BW)


RBW 5 kHz
VBW 20 kHz
SWT 20 ms
Marker 1 [T1]
22.80 dBm
1.909828846 GHz
Ref 30.8 dBm
Att 35 dB
Offset 0.8 dB
ndB [T1] 26.00 dB
BW 306.891025641 kHz
Temp 1 [T1 ndB]
-3.03 dBm
1.909646154 GHz
Temp 2 [T1 ndB]
-3.28 dBm
1.909953045 GHz
1 PK VIEW
A
LVL
TDF
3DB
Center 1.9098 GHz
50 kHz/
Span 500 kHz
Date: 8.JUL.2022 09:30:47

6.5. Conducted spurious emissions

Specifications:	FCC Part 2.1051, 24.238, 2.1053, 22.917
DUT Serial Number:	862733060028209
Test conditions:	Ambient Temperature:15℃-35℃ Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Limit Level Construction:

According to Part 22.917 (a), i.e., Out of Band emissions. 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.

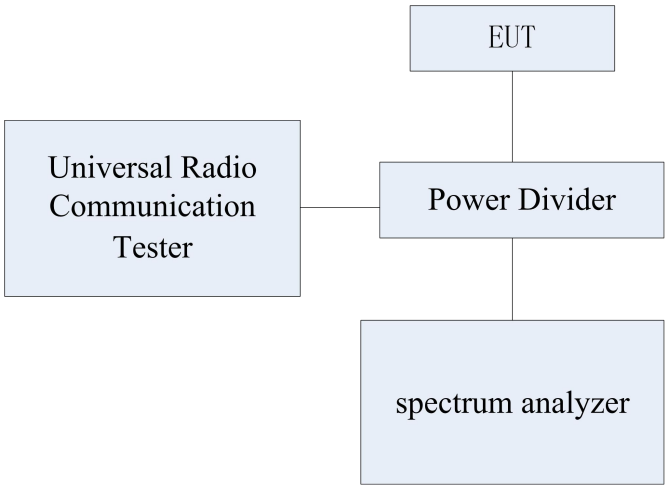
According to Part 24.238 (a), i.e., Out of Band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB, so the limit level is: P(dBm)– (43 + 10 log(P)) dB= -13dBm.

Measurement Uncertainty:

Item	Uncertainty	
Expanded Uncertainty	9kHz < f≤4GHz	0.71 dB (k=2)
	4GHz≤f < 12.75GHz	0.74 dB (k=2)
	12.75GHz≤f < 26GHz	2.70 dB (k=2)

Test Setup:

During the test, the EUT was controlled via the Wireless Communications Test Set to ensure max power transmission and proper modulation and measured by spectrum analyzer.



Test Method:

The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-Band emissions, if any, up to 10th harmonic. The EUT was scanned for spurious emissions from 30MHz to 20GHz with sufficient Bandwidth and video resolution. The spectrum analyzer was set to Maximum hold mode to ensure that the worst-case emissions were captured.

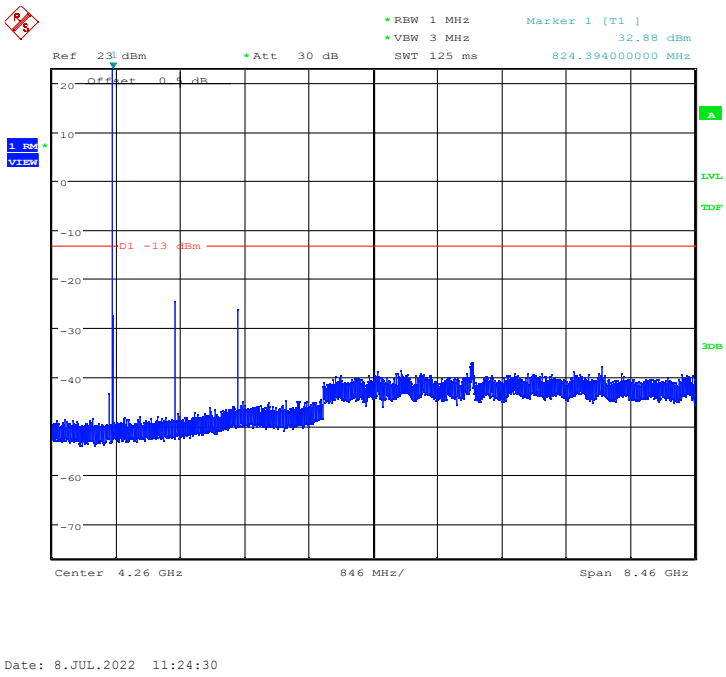
Note: --

6.5.1 Conducted Spurious Emission Results

GSM850

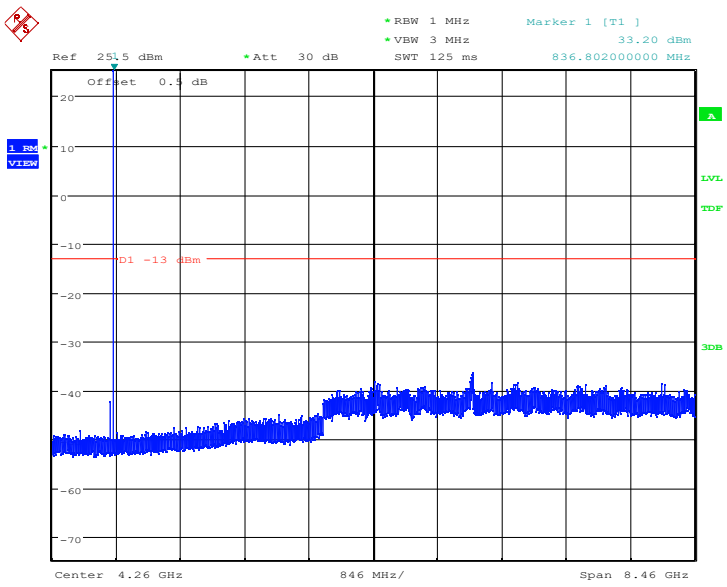
Channel 128:30MHZ - 8490MHZ

NOTE: peak above the limit line is the carrier frequency.



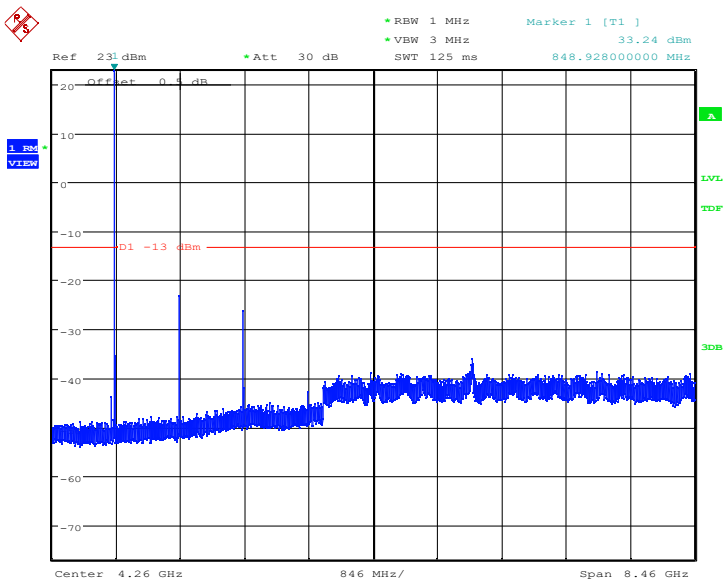
Channel 190:30MHZ - 8490MHZ

NOTE: peak above the limit line is the carrier frequency.



Channel 251:30MHZ - 8490MHZ

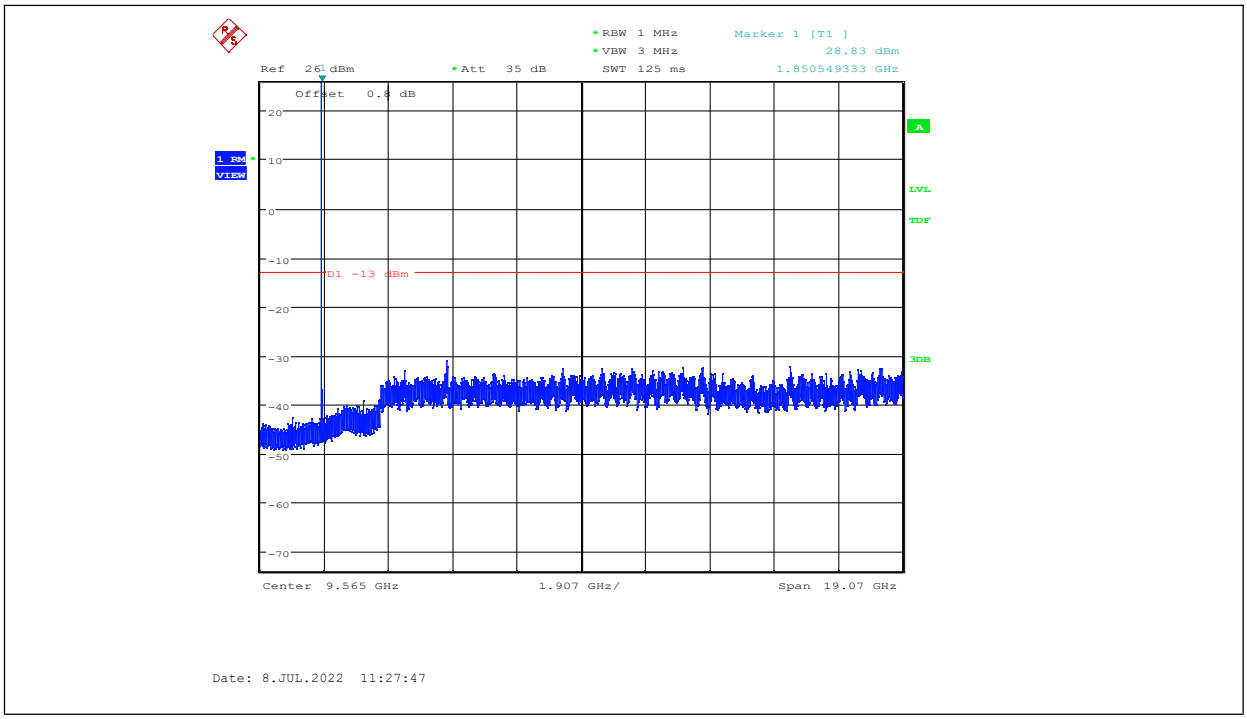
NOTE: peak above the limit line is the carrier frequency.



PCS1900

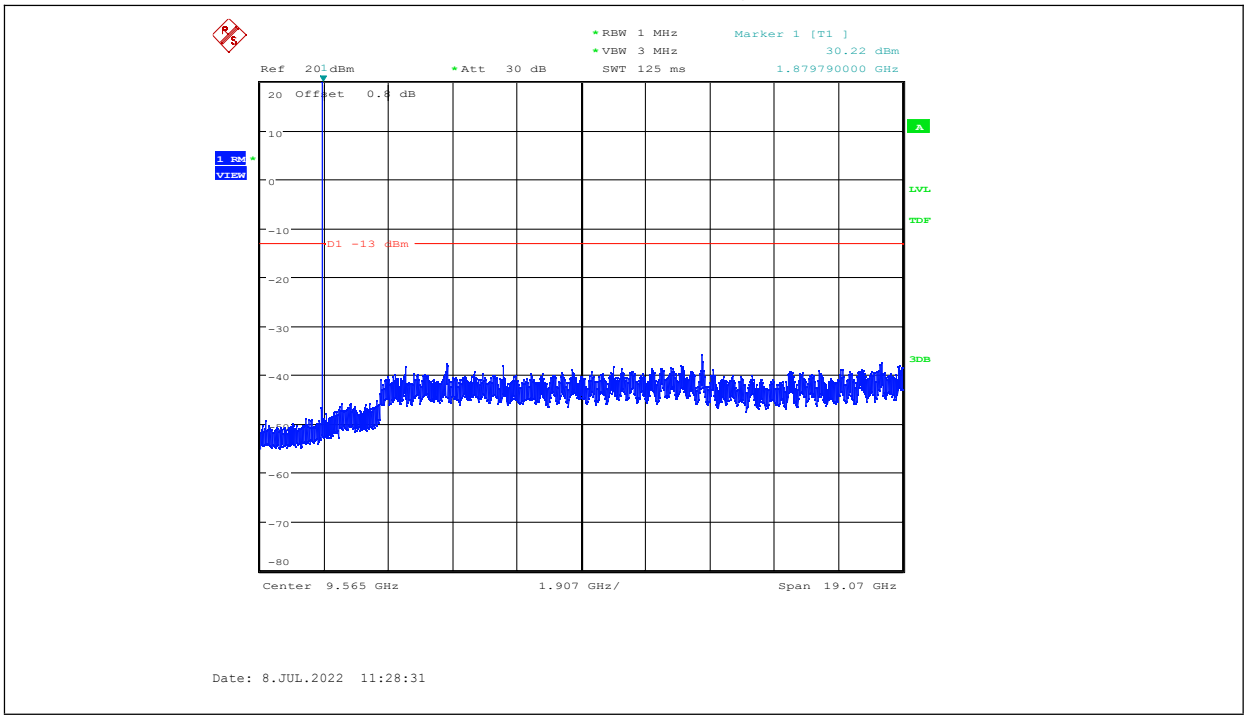
Channel 512:30MHZ - 19100MHZ

NOTE: peak above the limit line is the carrier frequency.



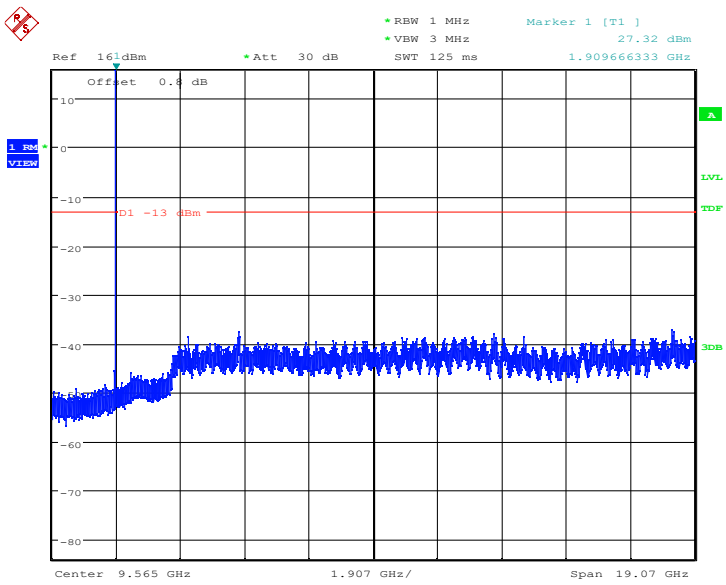
Channel 661:30MHZ - 19100MHZ

NOTE: peak above the limit line is the carrier frequency.



Channel 810:30MHZ - 19100MHZ

NOTE: peak above the limit line is the carrier frequency.



6.6. Radiated Spurious Emission

Specifications:	FCC Part 2.1051, 2.1053, 24.238, 22.917
DUT Serial Number:	IMEI:862733060027151
Test conditions:	Ambient Temperature:24.1℃-26.2℃ Relative Humidity:52.0%-55.0% Air pressure: 97.2-97.4kPa
Test Results:	Pass

Limit Level Construction:

According to Part 22.917 (a), i.e., Out of Band emissions. 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.

According to Part 24.238 (a), i.e., Out of Band emissions. 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, so the limit level is: P(dBm)– (43 + 10 log(P)) dB= -13dBm.

Measurement Uncertainty:

Item	Uncertainty
Expanded Uncertainty（30MHz-150MHz）	5.15 dB (k=2)
Expanded Uncertainty（150MHz-1GHz）	4.09dB (k=2)
Expanded Uncertainty（1GHz-3GHz）	2.92dB (k=2)
Expanded Uncertainty（3GHz-6GHz）	2.93dB (k=2)
Expanded Uncertainty（3GHz-20GHz）	2.69dB (k=2)

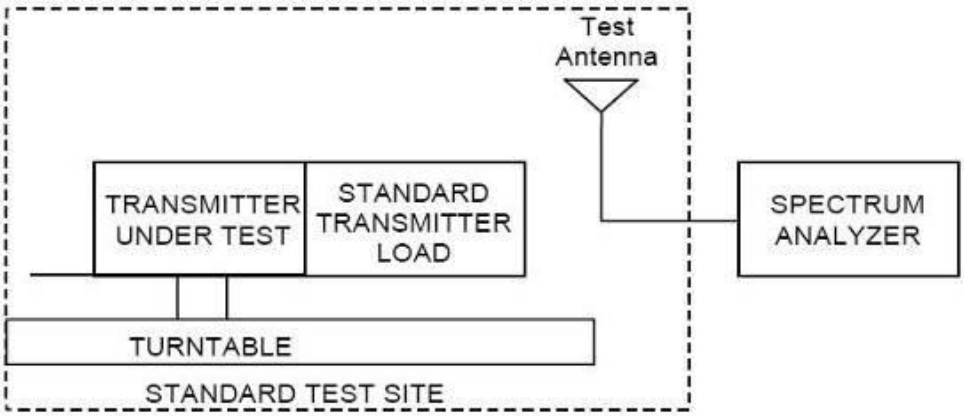
Test Setup:

The EUT was placed in an anechoic chamber. The Wireless Communications Test Set was used to set the TX channel and power level and modulate the TX signal with different bit patterns.

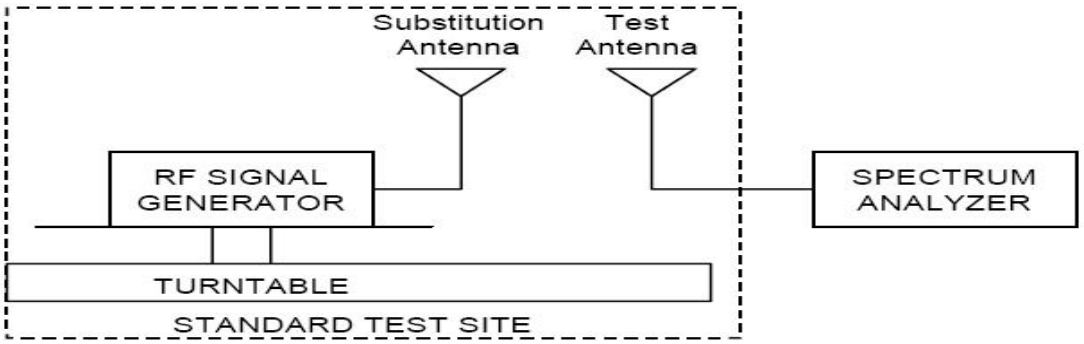
Test Method:

The measurement method is substitution method accordance with section 2.2.12 of ANSI/TIA-603-E: Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

(a) Connect the equipment as illustrated and measure the spurious emissions as the method as above. The distance from the device to the antenna is 3 m .



(b) Reconnect the equipment as illustrated.



(c) Remove the transmitter and replace it with a substitution antenna. The center of the substitution antenna should be approximately at the same location as the center of the transmitter.

(d) Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a non-radiating cable. With the antennas at both ends horizontally polarized, and with the signal generator tuned to a particular spurious frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output.

(e) Repeat step d) with both antennas vertically polarized for each spurious frequency.

(f) Calculate power in dBm into a reference ideal half-wave dipole antenna by reducing the readings obtained in steps d) and e) by the power loss in the cable between the generator and the antenna, and further corrected for the gain of the substitution antenna used relative to an ideal half-wave dipole antenna by the following formula:

P_d(dBm) = P_g(dBm) – cable loss (dB) + Antenna Gain (dB)

where:

Pd is the dipole equivalent power and Pg is the generator output power into the substitution antenna.

6.6.1 GSM Radiated Spurious Emission Results

GSM GMSK 850 Radiated Spurious Emission Results

Test Data （GSM GMSK Mode CH251）

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
1697.6	-62.1	1.0	8.0	-55.1	H
2546.4	-54.4	1.3	9.1	-46.6	H
3395.2	-60.1	1.5	9.0	-52.6	V
4244.0	-57.8	1.8	9.3	-50.3	V
5092.8	-57.1	2.0	9.8	-49.3	V
5941.6	-57.5	2.2	10.9	-48.8	V

GPRS GMSK 850 Radiated Spurious Emission Results

Test Data （GPRS GMSK Mode CH251）

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
1697.6	-58.9	1.0	8.0	-51.9	H
2546.4	-51.8	1.3	9.1	-44.0	V
3395.2	-68.4	1.5	9.0	-60.9	H
4244.0	-68.1	1.8	9.3	-60.6	H
5092.8	-64.6	2.0	9.8	-56.8	H
5941.6	-64.6	2.2	10.9	-55.9	H

Note：1.GSM 850 Radiated Spurious Emission test frequency is 30MHz-10GHz.

2.All modes were tested,only the worst case was reported.

GSM GMSK 1900 Radiated Spurious Emission Results

Test Data （GSM GMSK Mode CH810）

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
3819.6	-60.2	1.6	9.3	-52.5	V
5729.4	-60.4	2.2	10.3	-52.3	V
7639.2	-53.5	2.6	11.7	-44.4	V
9549.0	-53.9	3.0	12.4	-44.5	V
11458.8	-53.0	3.7	13.8	-42.9	V
13368.6	-51.0	4.1	14.0	-41.1	V

GPRS GMSK 1900 Radiated Spurious Emission Results

Test Data （GPRS GMSK Mode CH810）

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
3819.6	-65.6	1.6	9.3	-57.9	V
5729.4	-65.0	2.2	10.3	-56.9	H
7639.2	-60.7	2.6	11.7	-51.6	V
9549.0	-56.4	3.0	12.4	-47.0	V
11458.8	-56.2	3.7	13.8	-46.1	V
13368.6	-55.4	4.1	14.0	-45.5	V

Note：1.GSM 1900 Radiated Spurious Emission test frequency is 30MHz-20GHz.

2.All modes were tested,only the worst case was reported.

6.7. Band Edge

Specifications:	FCC Part 2.1051, 24.238, 2.1053, 22.917
DUT Serial Number:	862733060028209
Test conditions:	Ambient Temperature:15℃-35℃ Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Limit Level Construction:

According to Part 22.917 (a), i.e., Out of Band emissions. 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.

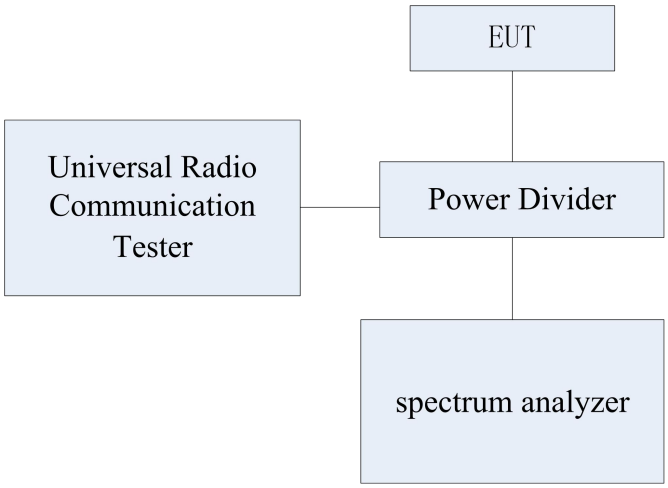
According to Part 24.238 (a), i.e., Out of Band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB, so the limit level is: P(dBm)– (43 + 10 log(P)) dB= -13dBm.

Measurement Uncertainty:

Item	Uncertainty	
Expanded Uncertainty	9kHz < f≤4GHz	0.71 dB (k=2)
	4GHz≤f < 12.75GHz	0.74 dB (k=2)
	12.75GHz≤f < 26GHz	2.70 dB (k=2)

Test Setup:

During the test, the EUT was controlled via the Wireless Communications Test Set to ensure max power transmission and proper modulation and measured by spectrum analyzer.



Test Method:

1) The EUT was coupled to the EMI test receiver analyzer mode and the base station simulator through a power divider. The lost of the cables the test system is calibrated to correct the readings.

2) The spectrum analyzer was set to Average Detector function and Maximum hold mode.

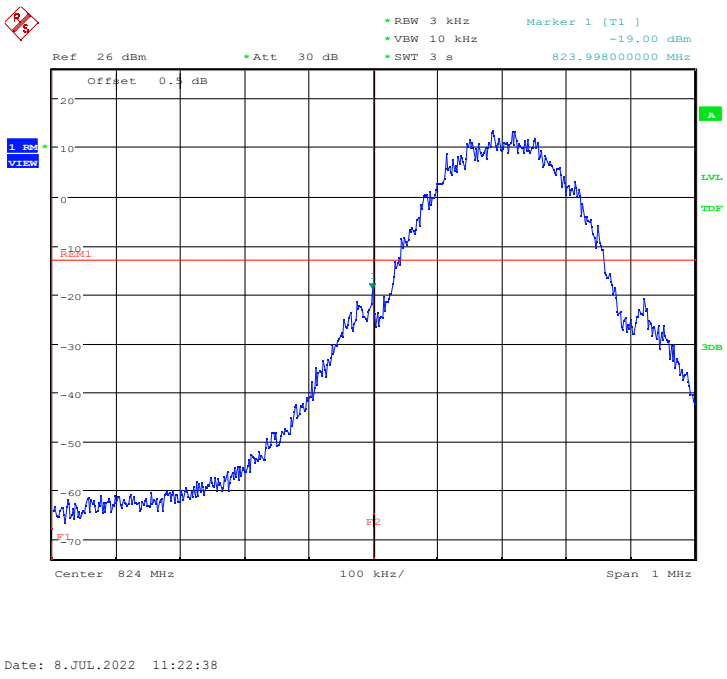
3) The resolution Bandwidth of the spectrum analyzer was a little greater than 1% of the 26dB emission Bandwidth.

6.7.1 Band Edge Results

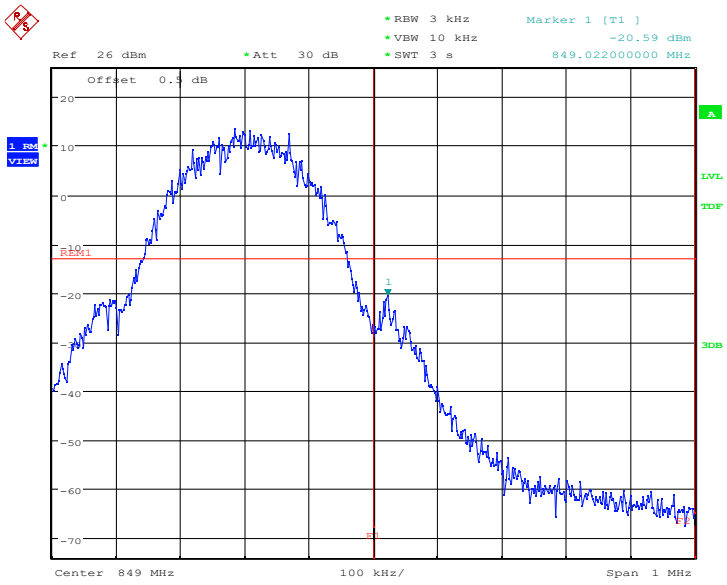
GSM850

GSM

Channel 128



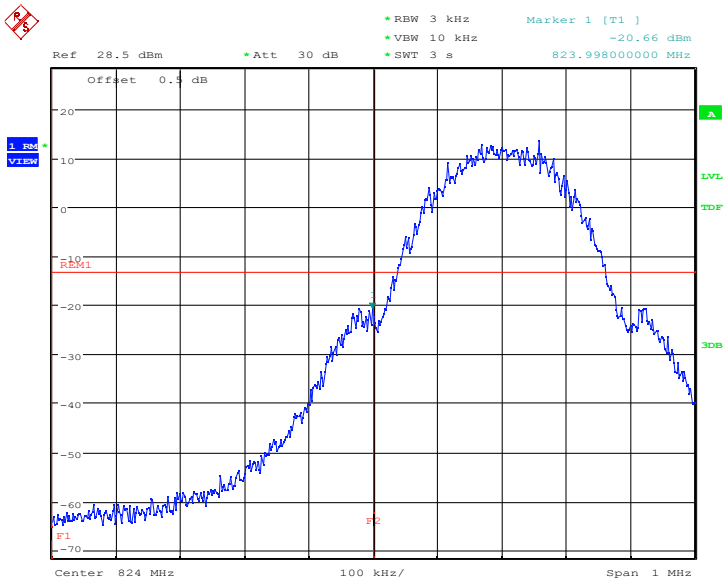
Channel 251



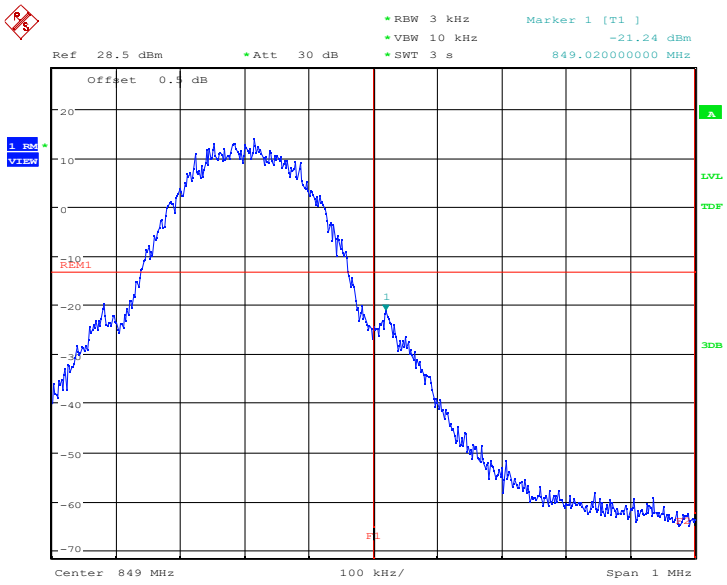
GSM850

GPRS

Channel 128



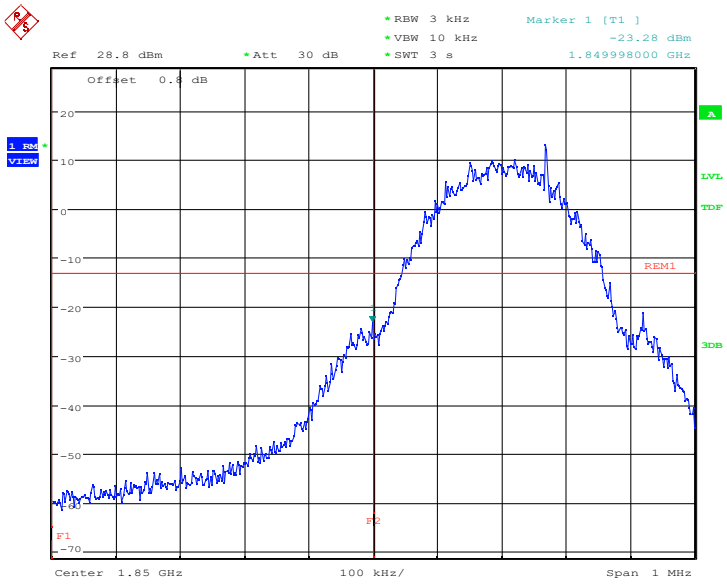
Channel 251



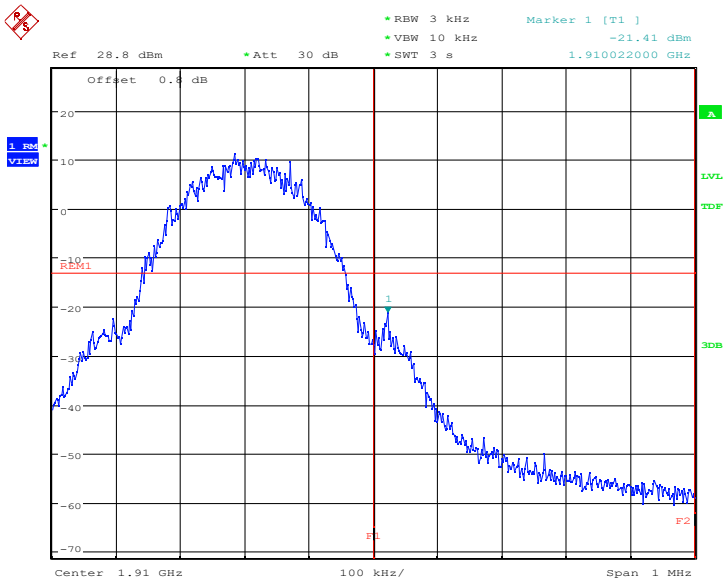
PCS1900

GSM

Channel 512



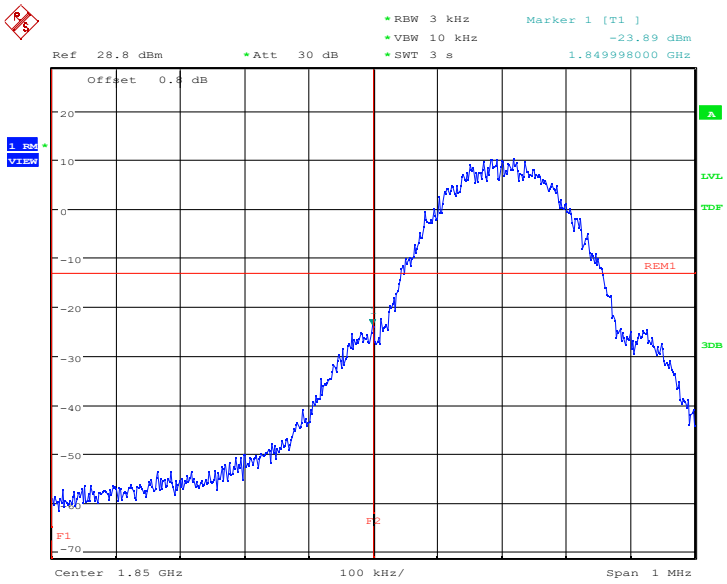
Channel 810



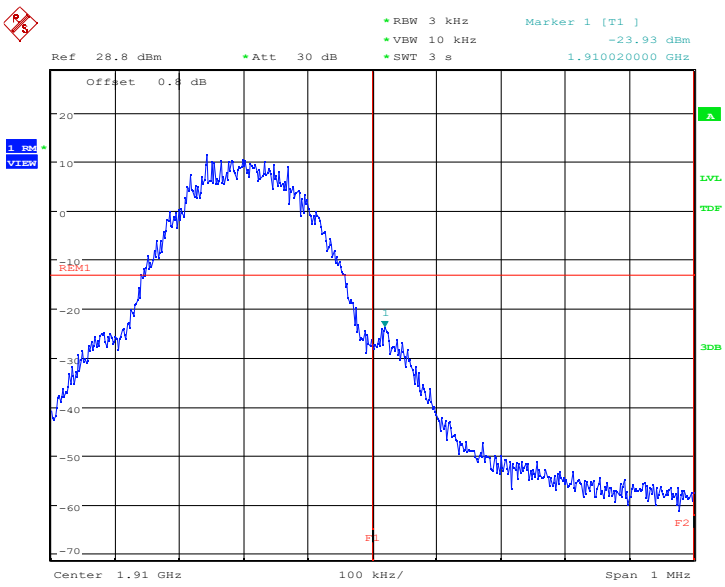
PCS1900

GPRS

Channel 512



Channel 810


RBW 3 kHz
VBW 10 kHz
SWT 3 s
Marker 1 [T1]
-23.93 dBm
1.910020000 GHz
Ref 28.8 dBm
Att 30 dB
Offset 0.8 dB
1 RM VIEW
A
LVL
TDF
3DB
RBW1
1
F1
F2
Center 1.91 GHz
100 kHz/
Span 1 MHz
Date: 8.JUL.2022 10:21:17

6.8. Frequency Stability

Specifications:	FCC Part 2.1055, 22.355, 24.235
DUT Serial Number:	862733060028209
Test conditions:	Ambient Temperature:15℃-35℃ Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Limit	
Frequency deviation [ppm]	±2.5

Measurement Uncertainty:

Item	Uncertainty
Expanded Uncertainty	1.54 Hz (k=2)

Test Method

Frequency stability is a measure of the frequency drift due to temperature and supply voltage variations, with reference to the frequency measured at +20 °C and rated supply voltage. Two reference points are established at the applicable unwanted emissions limit using a RBW equal to the RBW required by the unwanted emissions specification of the applicable regulatory standard. These reference points measured using the lowest and highest channel of operation shall be identified as FL and FH respectively.

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 CMW500.

1. Measure the carrier frequency at room temperature.
2. Subject the EUT to overnight soak at -30℃.
3. With the EUT, powered via nominal voltage, connected to the CMW500, and in a simulated call on middle channel for each LTE band, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
4. Repeat the above measurements at 10℃ increments from -30℃ to +50℃. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
5. 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 1.5 hours unpowered, to allow any

self-heating to stabilize, before continuing.
6. Subject the EUT to overnight soak at +50℃.
7. With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on the center channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
8. Repeat the above measurements at 10 ℃increments from +50℃ to -30℃. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5℃ during the measurement procedure.

6.8.1 Frequency Stability over Temperature Variation Results

GSM850

Frequency Error vs Temperature

Temperature(℃)	Voltage(V)	Center frequency(MHz)	Offset(Hz)	Frequency error(ppm)
20	3.8	836.6	4.36	0.0052
50			-8.30	-0.0099
40			10.95	0.0131
30			1.74	0.0021
10			12.50	0.0149
0			2.78	0.0033
-10			-1.36	-0.0016
-20			0.10	0.0001
-30			3.42	0.0041

Frequency Error vs Voltage

Voltage(V)	Temperature(℃)	Center frequency(MHz)	Offset(Hz)	Frequency error(ppm)
3.4	20	836.6	11.82	0.0141
4.2			6.17	0.0074

PCS1900

Frequency Error vs Temperature

Temperature(℃)	Voltage(V)	Center frequency(MHz)	Offset(Hz)	Frequency error(ppm)
20	3.8	1880	8.73	0.0046
50			16.98	0.0090
40			-16.76	-0.0089
30			-5.36	-0.0029

10			13.46	0.0072
0			-1.13	-0.0006
-10			7.01	0.0037
-20			9.72	0.0052
-30			16.79	0.0089

Frequency Error vs Voltage

Voltage(V)	Temperature(℃)	Center frequency(MHz)	Offset(Hz)	Frequency error(ppm)
3.4	20	1880	12.95	0.0069
4.2			-1.94	-0.0010

6.9. Peak to Average Ratio

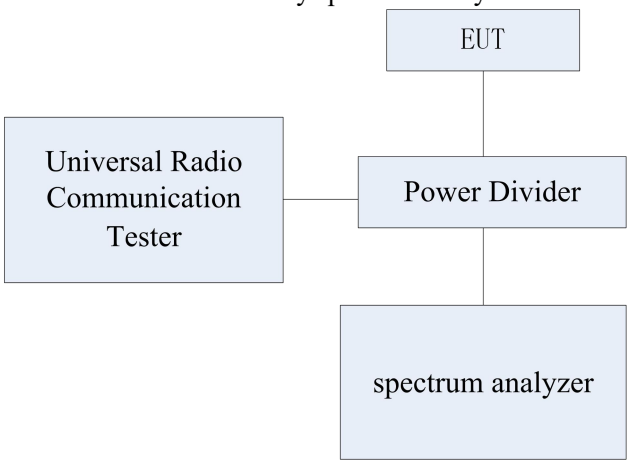
Specifications:	FCC Part 24.232
DUT Serial Number:	862733060028209
Test conditions:	Ambient Temperature:15℃-35℃ Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Limit

The EUT meets the requirement of having a peak to average ratio of less than 13dB.

Test Setup

During the test, the EUT was controlled via the Wireless Communications Test Set to ensure max power transmission and proper modulation and measured by spectrum analyzer.



Measurement Uncertainty:

Item	Uncertainty
Expanded Uncertainty	0.62 dB (k=2)

Test Method

The transmitter output was connected to a CMW500 through a coaxial RF cable and directional coupler, and configured to operate at maximum power. The peak to average ratio was measured at the required operating frequencies in each Band on the Spectrum Analyzer.

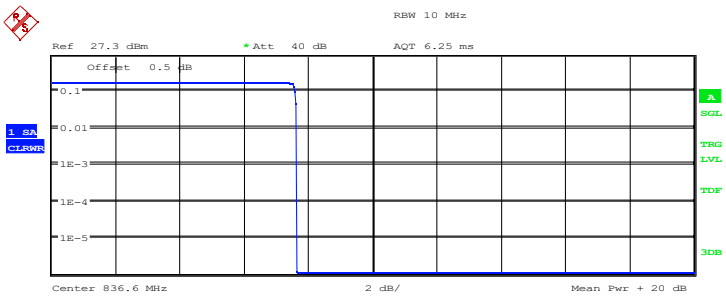
6.9.1 Peak to Average Ratio Results

GSM850

Measurement result

GSM850	Frequency (MHz)	PAPR (dB)
GSM	836.6	7.66
GPRS	836.6	7.66
EGPRS	836.6	10.71

Channel GSM-836.6MHz



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 11.2MHz

	Trace 1
Mean	25.38 dBm
Peak	33.02 dBm
Crest	7.65 dB
10 %	7.60 dB
1 %	7.66 dB
.1 %	7.66 dB
.01 %	7.66 dB

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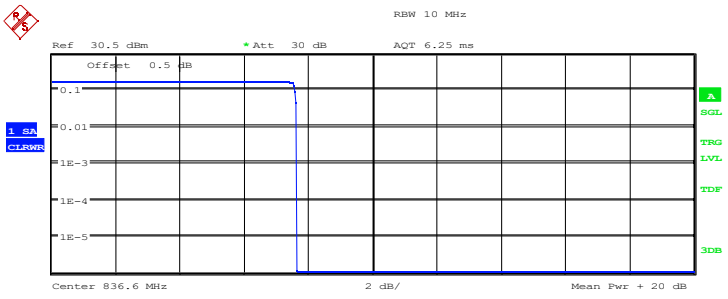
Channel GPRS-836.6MHz

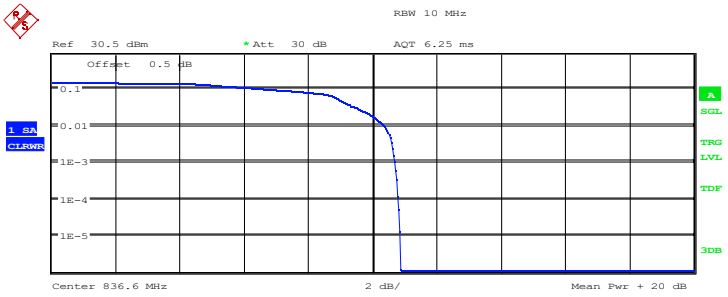


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 11.2MHz

	Trace 1
Mean	25.38 dBm
Peak	33.02 dBm
Crest	7.65 dB
10 %	7.60 dB
1 %	7.66 dB
.1 %	7.66 dB
.01 %	7.66 dB

Date: 8.JUL.2022 11:30:06

Channel EGPRS-836.6MHz



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 11.2MHz

	Trace 1
Mean	19.27 dBm
Peak	30.13 dBm
Crest	10.86 dB
10 %	6.76 dB
1 %	10.35 dB
.1 %	10.71 dB
.01 %	10.80 dB

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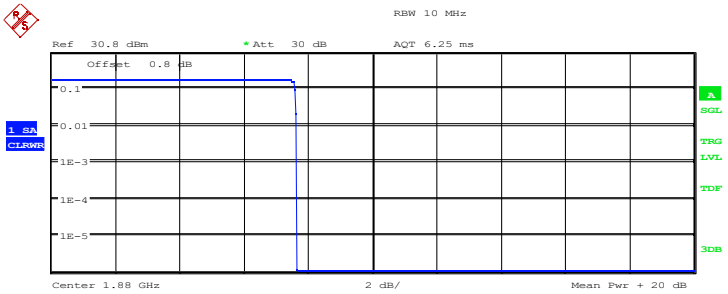
PCS1900

Measurement result

PCS1900	Frequency (MHz)	PAPR (dB)
GSM	1880	7.66
GPRS	1880	7.66
EGPRS	1880	10.32

Channel GSM-1880MHz



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 11.2MHz

	Trace 1
Mean	22.43 dBm
Peak	30.06 dBm
Crest	7.62 dB
10 %	7.60 dB
1 %	7.63 dB
.1 %	7.66 dB
.01 %	7.66 dB

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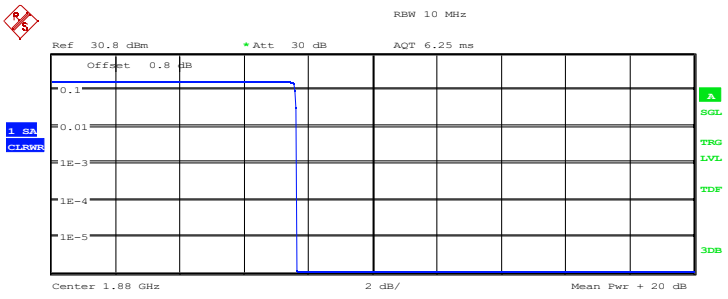
Channel GPRS-1880MHz

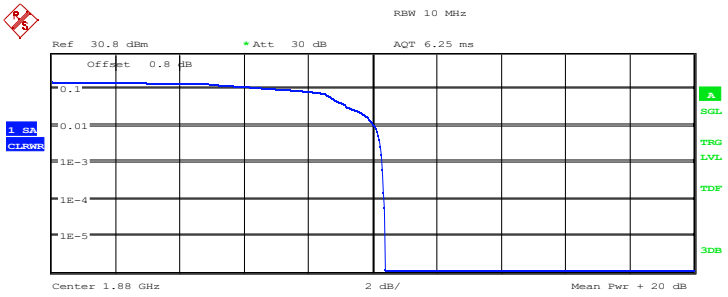


Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 11.2MHz

	Trace 1
Mean	22.43 dBm
Peak	30.06 dBm
Crest	7.63 dB
10 %	7.60 dB
1 %	7.66 dB
.1 %	7.66 dB
.01 %	7.66 dB

Date: 8.JUL.2022 11:31:38

Channel EGPRS-1880MHz



Complementary Cumulative Distribution Function
NOF samples: 100000, Usable BW: 11.2MHz

	Trace 1
Mean	19.39 dBm
Peak	29.78 dBm
Crest	10.39 dB
10 %	7.21 dB
1 %	10.06 dB
.1 %	10.32 dB
.01 %	10.35 dB

Date: 8.JUL.2022 11:32:17

Annex A EUT Photos

See the document" I22W00053-External Photos".
See the document" I22W00053-Internal Photos ".

ANNEX B Deviations from Prescribed Test Methods

No deviation from Prescribed Test Methods.

*****END OF REPORT*****