TEST REPORT

No. I20N02478-RF-GSM

for

TCL Communication Ltd.

GSM/UMTS/LTE Mobile phone

Model Name: 5007S

FCC ID: 2ACCJH130

with

Hardware Version: 03

Software Version: v2D23UZ31

Issued Date: 2020-10-16

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 SAICT.

Test Laboratory:

SAICT, Shenzhen Academy of Information and Communications Technology

Building G, Shenzhen International Innovation Center, No.1006 Shennan Road, Futian District, Shenzhen, Guangdong, P. R. China 518026.

Tel:+86(0)755-33322000, Fax:+86(0)755-33322001

Email: yewu@caict.ac.cn. www.saict.ac.cn

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I20N02478-RF-GSM	Rev.0	1st edition	2020-10-16

Note: the latest revision of the test report supersedes all previous version.

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1. SUMMARY OF TEST REPORT

1.1. Test Items

Description	GSM/UMTS/LTE Mobile phone
Model Name	5007S
Applicant's name	TCL Communication Ltd.
Manufacturer's Name	TCL Communication Ltd.

1.2. Test Standards

FCC Part 2/22/24	10-1-19 Edition
ANSI C63.26	2015
KDB971168 D01	v03r01
ANSI/TIA-603-E	2016

1.3. Test Result

All test items are pass. Please refer to "6 Summary of Test Results" for detail.

1.4. Testing Location

Address: Building G, Shenzhen International Innovation Center, No.1006 Shennan Road, Futian District, Shenzhen, Guangdong, P. R. China 518026

1.5. Project Data

Testing Start Date: 2020-09-07 Testing End Date: 2020-09-22

1.6. Signature

Lai Minghua
(Prepared this test report)

Huang Qiuqin
(Reviewed this test report)

Zhang Hao
(Approved this test report)

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2. Client Information

2.1. Applicant Information

Company Name:	TCL Communication Ltd.
Address /Post:	5/F, Building 22E, 22 Science Park East Avenue, Hong Kong Science Park, Shatin, NT, Hong Kong
Contact:	Gong Zhizhou
Email:	zhizhou.gong@tcl.com
Telephone:	0086-755-36611722
Fax:	0086-755-36612000-81722

2.2. Manufacturer Information

Company Name:	TCL Communication Ltd.
Address /Post:	5/F, Building 22E, 22 Science Park East Avenue, Hong Kong Science Park, Shatin, NT, Hong Kong
Contact:	Gong Zhizhou
Email:	zhizhou.gong@tcl.com
Telephone:	0086-755-36611722
Fax:	0086-755-36612000-81722

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

3.1. About EUT

Description	GSM/UMTS/LTE Mobile phone
Model Name	5007S
FCC ID	2ACCJH130
Antenna	Embedded
Output power	28.66dBm maximum EIRP measured for PCS1900
Extreme vol. Limits	3.5VDC to 4.4VDC (nominal: 3.85VDC)
Extreme temp. Tolerance	-20°C to +60°C
Condition of EUT as received	No abnormality in appearance

3.2. Internal Identification of EUT used during the test

EUT ID*	IMEI	HW Version	SW Version	Date of receipt
UT02aa	015794000205337	03	v2D23UZ31	2020-09-07
UT01aa	015794000205394	03	v2D23UZ31	2020-09-07

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

3.3. Internal Identification of AE used during the test

AE ID*	Description
AE1	Battery

AE1

Model	TLp034G1
Manufacturer	BYD
Capacitance	3500mAh

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

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4. Reference Documents

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

Reference	Title	Version
FCC Part 22	PUBLIC MOBILE SERVICES	10-1-19 Edition
FCC Part 24	PERSONAL COMMUNICATIONS SERVICES	10-1-19 Edition
FCC Part 2	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS	10-1-19 Edition
ANSI/TIA-603-E	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards	2016
ANSI C63.26	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services	2015
KDB 971168 D01	MEASUREMENT GUIDANCE FOR CERTIFICATION OF LICENSED DIGITAL TRANSMITTERS	v03r01

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5. Laboratory Environment

Shielded room did not exceed following limits along the RF testing:

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. = 15 %, Max. = 75 %
Shielding effectiveness	0.014MHz-1MHz>60 dB; 1MHz-18000MHz>90 dB
Electrical insulation	>2 MΩ
Ground system resistance	< 4 Ω

Fully-anechoic chamber did not exceed following limits along the EMC testing

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. = 15 %, Max. = 75 %
Shielding effectiveness	0.014MHz-1MHz> 60 dB; 1MHz-18000MHz>90 dB
Electrical insulation	> 2MΩ
Ground system resistance	< 4 Ω
Voltage Standing Wave Ratio （VSWR）	≤ 6 dB, from 1 to 18 GHz，3 m distance
Uniformity of field strength	Between 0 and 6 dB, from 80 to 6000 MHz

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6. Summary Of Test Result

Abbreviations used in this clause:		
Verdict Column	P	Pass
	F	Fail
	NA	Not applicable
	NM	Not measured
Location Column	A/B/C/D	The test is performed in test location A, B, C or D which are described in section 1.1 of this report

GSM850

Items	List	Clause in FCC rules	Verdict
1	Output Power	22.913	P
2	Emission Limit	2.1051/22.917	P
3	Frequency Stability	2.1055	P
4	Occupied Bandwidth	2.1049	P
5	Emission Bandwidth	22.917	P
6	Band Edge Compliance	22.917	P
7	Conducted Spurious Emission	22.917	P

PCS1900

Items	List	Clause in FCC rules	Verdict
1	Output Power	24.232	P
2	Emission Limit	2.1051/24.238	P
3	Frequency Stability	2.1055	P
4	Occupied Bandwidth	2.1049	P
5	Emission Bandwidth	24.238	P
6	Band Edge Compliance	24.238	P
7	Conducted Spurious Emission	24.238	P
8	Peak-to-Average Power Ratio	24.232	P

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7. STATEMENT

Since the information of samples in this report is provided by the client, the laboratory is not respo nsible for the authenticity of sample information.

This report takes measured values as criterion of test conclusion. The test conlusion meets the li mit requirements.

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8. Test Equipments Utilized

NO.	Description	TYPE	Manufacture	series number	CAL DUE DATE
1	Test Receiver	ESR7	R&S	101676	2020-11-27
2	BiLog Antenna	3142E	ETS-lindgren	00224831	2021-05-17
3	Horn Antenna	3117	ETS-lindgren	00066577	2022-04-02
4	Horn Antenna	QSH-SL-18-26-S-20	Q-par	17013	2023-01-06
5	Antenna	BBHA 9120D	Schwarzbeck	1593	2022-12-05
6	Antenna	VUBA 9117	Schwarzbeck	207	2023-07-15
7	Antenna	QWH-SL-18-40-K-SG	Q-par	15979	2023-01-06
8	preamplifier	83017A	Agilent	MY39501110	/
9	Signal Generator	SMB100A	R&S	179725	2020-11-27
10	Fully Anechoic Chamber	FACT3-2.0	ETS-Lindgren	1285	2021-07-19
11	Spectrum Analyzer	FSV40	R&S	101192	2021-01-14
12	Universal Radio Communication Tester	CMU200	R&S	114545	2021-01-14
13	Universal Radio Communication Tester	CMU200	R&S	123210	2020-12-13
14	Spectrum Analyzer	FSU	R&S	101506	2020-12-13
15	Temperature Chamber	SH-241	ESPECs	92007516	2020-10-15
16	DC Power Supply	U3606A	Agilent Technologies	MY50450012	2020-11-13

Test software

Item	Name	Vesion
Radiated	EMC32	Version 10.01.00

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Annex A: Measurement Results

A.1 Output Power

A.1.1 Summary

During the process of testing, the EUT was controlled via communication tester to ensure max power transmission and proper modulation.

In all cases, output power is within the specified limits.

A.1.2 Conducted

A.1.2.1 Method of Measurements

The EUT was set up for the max output power with pseudo random data modulation.

These measurements were done at 3 frequencies (bottom, middle and top of operational frequency range) for each bandwidth.

A.1.2.2 Measurement Result

GSM850

GSM(GMSK)

Frequency (MHz)	Power Step	Output power (dBm)
824.2	5	30.67
836.6	5	30.09
848.8	5	29.46

GPRS(GMSK,1Slot)

Frequency (MHz)	Power Step	Output power (dBm)
824.2	3	30.70
836.6	3	30.12
848.8	3	29.51

EGPRS(8PSK,1Slot)

Frequency (MHz)	Power Step	Output power (dBm)
824.2	6	24.34
836.6	6	24.09
848.8	6	23.10

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PCS1900

GSM(GMSK)

Frequency (MHz)	Power Step	Output power (dBm)
1850.2	0	29.16
1880.0	0	29.02
1909.8	0	28.93

GPRS(GMSK,1Slot)

Frequency (MHz)	Power Step	Output power (dBm)
1850.2	3	29.01
1880.0	3	28.87
1909.8	3	28.80

EGPRS(8PSK,1Slot)

Frequency (MHz)	Power Step	Output power (dBm)
1850.2	5	25.23
1880.0	5	25.18
1909.8	5	25.34

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A.1.3 Radiated

A.1.3.1 Description

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

Part 22.913(a) specifies "The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts".

Part 24.232(c) specifies "Mobile and portable stations are limited to 2 watts EIRP".

A.1.3.2 Method of Measurement

NASI C63.26 chapter 5.2.5.5: when working in decibels (i.e., logarithmic scale), the ERP and EIRP represent the sum of the transmit antenna gain (in dBd or dBi, respectively) and the conducted RF output power (expressed in dB relative to watts or milliwatts).

The relevant equation for determining the maximum ERP or EIRP from the measured RF output power is given in Equation (1) as follows:

$$\text{ERP or EIRP} = P_{Mea} + G_T$$

Where

ERP or EIRP	effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as P_{Mea} , e.g., dBm or dBW)
P_{Mea}	measured transmitter output power or PSD, in dBm or dBW
G_T	gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

GSM 850-ERP

Limits

	Power Step	Burst Peak ERP (dBm)
GSM	5	≤38.45dBm (7W)
GPRS	3	≤38.45dBm (7W)
EGPRS	6	≤38.45dBm (7W)

Measurement result

GSM(GMSK)

Frequency (MHz)	Conducted output power (dBm)	G_T (dBi)	Radiated output power (dBm)
824.2	30.67	-3.9	24.62
836.6	30.09	-3.9	24.04
848.8	29.46	-3.9	23.41

GPRS(GMSK,1Slot)

Frequency (MHz)	Conducted output power (dBm)	G_T (dBi)	Radiated output power (dBm)
824.2	30.70	-3.9	24.65
836.6	30.12	-3.9	24.07
848.8	29.51	-3.9	23.46

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EGPRS(8PSK,1Slot)

Frequency (MHz)	Conducted output power (dBm)	G_T (dBi)	Radiated output power (dBm)
824.2	24.34	-3.9	18.29
836.6	24.09	-3.9	18.04
848.8	23.10	-3.9	17.05

PCS1900-EIRP

Limits

	Power Step	Burst Peak EIRP (dBm)
GSM	0	≤33dBm (2W)
GPRS	3	≤33dBm (2W)
EGPRS	5	≤33dBm (2W)

Measurement result

PCS1900

GSM(GMSK)

Frequency (MHz)	Conducted output power (dBm)	G_T (dBi)	Radiated output power (dBm)
1850.2	29.16	-0.5	28.66
1880.0	29.02	-0.5	28.52
1909.8	28.93	-0.5	28.43

GPRS(GMSK,1Slot)

Frequency (MHz)	Conducted output power (dBm)	G_T (dBi)	Radiated output power (dBm)
1850.2	29.01	-0.5	28.51
1880.0	28.87	-0.5	28.37
1909.8	28.80	-0.5	28.30

EGPRS(8PSK,1Slot)

Frequency (MHz)	Conducted output power (dBm)	G_T (dBi)	Radiated output power (dBm)
1850.2	25.23	-0.5	24.73
1880.0	25.18	-0.5	24.68
1909.8	25.34	-0.5	24.84

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A.2 Emission Limit

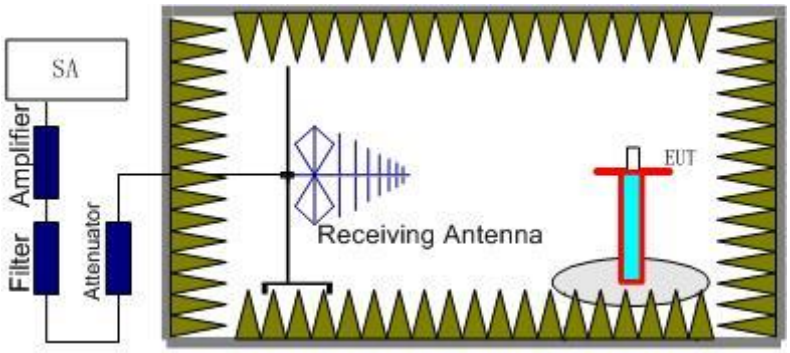
A.2.1 Measurement Method

The measurement procedures in TIA-603E-2016 are used.

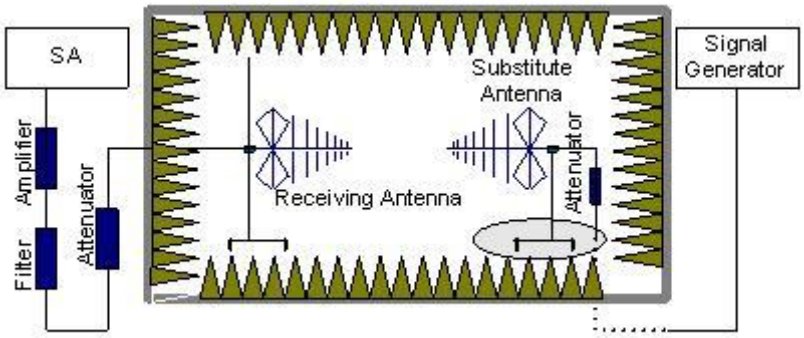
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment. The resolution bandwidth is set as outlined in Part 24.238 and Part 22.917. The spectrum is scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of PCS1900 and GSM850.

The procedure of radiated spurious emissions is as follows:

1. EUT was placed on a 1.5-meter-high non-conductive stand at a 3-meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all non-harmonic and harmonics of the transmit frequency through the 10th harmonic were measured with peak detector.



2. The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as (Pr).
3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.



In the chamber, a substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the

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substitution antenna and adjusts the level of the signal generator output until the value of the receiver reach the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

4. The Path loss (P_{pl}) between the Signal Source with the Substitution Antenna and the Substitution Antenna Gain (G_a) should be recorded after test.
   A amplifier should be connected in for the test.
   The Path loss (P_{pl}) is the summation of the cable loss and the gain of the amplifier.
   The measurement results are obtained as described below:
   Power (EIRP) = P_{Mea} - P_{pl} - G_a
5. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
6. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.15dBi.

A.2.2 Measurement Limit

Part 22.917 and Part 24.238 specify that 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.

A.2.3 Measurement Results

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the PCS1900 band (1850.2 MHz, 1880 MHz and 1909.8 MHz) and GSM850 band (824.2MHz, 836.6MHz, 848.8MHz). It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the PCS1900 ,GSM850 into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

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A.2.4 Measurement Results Table

Frequency	Channel	Frequency Range	Result
GSM 850MHz	Low	30MHz-10GHz	Pass
	Middle	30MHz-10GHz	Pass
	High	30MHz-10GHz	Pass
GSM 1900MHz	Low	30MHz-20GHz	Pass
	Middle	30MHz-20GHz	Pass
	High	30MHz-20GHz	Pass

A.2.5 Sweep Table

Working Frequency	Subrange (GHz)	RBW	VBW	Sweep time (s)
850MHz	0.03~1	100KHz	300KHz	10
	1-2	1 MHz	3 MHz	2
	2~5	1 MHz	3 MHz	3
	5~8	1 MHz	3 MHz	3
	8~10	1 MHz	3 MHz	3
1900MHz	0.03~1	100KHz	300KHz	10
	1-2	1 MHz	3 MHz	2
	2~5	1 MHz	3 MHz	3
	5~8	1 MHz	3 MHz	3
	8~11	1 MHz	3 MHz	3
	11~14	1 MHz	3 MHz	3
	14~18	1 MHz	3 MHz	3
	18~20	1 MHz	3 MHz	2

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GSM Mode Channel 128/824.2MHz

Frequency (MHz)	P_{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Correction (dB)	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1648.01	-54.45	3.56	5.23	2.15	-54.93	-13.00	41.90	H
2472.00	-35.64	4.59	6.02	2.15	-36.36	-13.00	23.40	H
3297.02	-47.97	5.29	7.71	2.15	-47.70	-13.00	34.70	H
4123.02	-54.23	6.04	9.02	2.15	-53.40	-13.00	40.40	V
4949.01	-50.73	6.69	9.85	2.15	-49.72	-13.00	36.70	H
5774.01	-53.96	7.23	10.55	2.15	-52.79	-13.00	39.80	V

GSM Mode Channel 190/836.6MHz

Frequency (MHz)	P_{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Correction (dB)	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1674.01	-43.60	3.58	5.19	2.15	-44.14	-13.00	31.10	V
2510.00	-32.49	4.63	6.12	2.15	-33.15	-13.00	20.10	H
3347.02	-49.34	5.32	7.83	2.15	-48.98	-13.00	36.00	H
4184.02	-52.21	6.17	9.08	2.15	-51.45	-13.00	38.40	V
5023.01	-50.98	6.56	9.93	2.15	-49.76	-13.00	36.80	H
5862.01	-50.83	7.27	10.53	2.15	-49.72	-13.00	36.70	H

GSM Mode Channel 251/848.8MHz

Frequency (MHz)	P_{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Correction (dB)	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1698.01	-33.48	3.60	5.14	2.15	-34.09	-13.00	21.10	H
2546.00	-29.08	4.66	6.18	2.15	-29.71	-13.00	16.70	H
3396.02	-49.48	5.36	7.95	2.15	-49.04	-13.00	36.00	H
4250.02	-49.31	6.24	9.15	2.15	-48.55	-13.00	35.50	H
5104.01	-54.10	6.78	10.05	2.15	-52.98	-13.00	40.00	H
5946.01	-45.38	7.47	10.51	2.15	-44.49	-13.00	31.50	H

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GSM Mode Channel 512/1850.2MHz

Frequency (MHz)	P_{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3700.02	-55.52	6.43	8.48	-53.47	-13.00	40.47	V
5555.02	-27.65	7.19	10.59	-24.25	-13.00	11.25	H
7401.01	-53.01	8.12	12.08	-49.05	-13.00	36.05	H
9257.01	-46.73	9.06	13.25	-42.54	-13.00	29.54	H
11102.01	-51.15	9.83	13.18	-47.80	-13.00	34.80	V
12952.01	-48.60	10.49	13.47	-45.62	-13.00	32.62	V

GSM Mode Channel 661/1880.0MHz

Frequency (MHz)	P_{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3760.02	-52.23	6.26	8.56	-49.93	-13.00	36.93	H
5641.02	-34.41	7.27	10.57	-31.11	-13.00	18.11	V
7507.01	-54.52	8.36	12.21	-50.67	-13.00	37.67	V
9411.01	-46.71	9.09	13.35	-42.45	-13.00	29.45	H
11285.01	-49.60	9.91	13.14	-46.37	-13.00	33.37	V
13156.01	-48.81	10.69	13.72	-45.78	-13.00	32.78	H

GSM Mode Channel 810/1909.8MHz

Frequency (MHz)	P_{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3820.02	-55.67	6.08	8.65	-53.10	-13.00	40.10	V
5735.02	-37.20	7.29	10.55	-33.94	-13.00	20.94	H
7640.01	-54.70	8.15	12.31	-50.54	-13.00	37.54	V
9551.01	-49.67	9.36	13.35	-45.68	-13.00	32.68	H
11465.01	-49.43	9.90	13.11	-46.22	-13.00	33.22	V
13372.01	-48.67	10.57	14.02	-45.22	-13.00	32.22	V

Note: Expanded measurement uncertainty is U = 5.16 dB, k = 2.

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A.3 Frequency Stability

A.3.1 Method of Measurement

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 F_L and F_H 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 CMU200.

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 CMU200 and in a simulated call on mid channel of each 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 1/2 hours at each temperature, unpowered, before making measurements.
5. Remeasure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments remeasuring carrier frequency at each voltage. Pause at nominal voltage for 1 1/2 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 CMU200 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.
8. Repeat the above measurements at 10℃ increments from -30℃ to +50℃. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.
9. At all temperature levels hold the temperature to +/- 0.5℃ during the measurement procedure.

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. As this transceiver is considered "Hand carried, battery powered equipment" Section 2.1055(d)(2) applies. This requires that the lower voltage for frequency stability testing be specified by the manufacturer. This transceiver is specified to operate with an input voltage of the lower, higher and nominal voltage. Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress.

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A.3.2 Measurement results

GSM 850

Frequency Error vs Temperature

Temperature(℃)	Voltage(V)	F_L(MHz)	F_H(MHz)	Offset(Hz)	Frequency error(ppm)
20	3.85	824.029	848.973	0.32	0.0004
50				6.78	0.0081
40				6.26	0.0075
30				3.61	0.0043
10				2.52	0.0030
0				-17.82	0.0213
-10				-14.40	0.0172
-20				-15.24	0.0182
-30					

Frequency Error vs Voltage

Voltage(V)	Temperature(℃)	F_L(MHz)	F_H(MHz)	Offset(Hz)	Frequency error(ppm)
3.5	20	824.029	848.973	-0.84	0.0010
4.4				3.16	0.0038

PCS 1900

Frequency Error vs Temperature

Temperature(℃)	Voltage(V)	F_L(MHz)	F_H(MHz)	Offset(Hz)	Frequency error(ppm)
20	3.85	1850.040	1909.965	-1.36	0.0007
50				6.00	0.0032
40				0.77	0.0004
30				5.62	0.0030
10				0.58	0.0003
0				-12.85	0.0068
-10				-2.39	0.0013
-20				-10.20	0.0054
-30					

Frequency Error vs Voltage

Voltage(V)	Temperature(℃)	F_L(MHz)	F_H(MHz)	Offset(Hz)	Frequency error(ppm)
3.5	20	1850.040	1909.965	-2.58	0.0014
4.4				2.32	0.0012

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A.4 Occupied Bandwidth

Occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequency. The table below lists the measured 99% BW. Spectrum analyzer plots are included on the following pages.
The measurement method is from ANSI C63.26:
a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts.
b) The nominal IF filter 3 dB bandwidth (RBW) shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set ≥ 3 × RBW.
c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation.
d) Set the detection mode to peak, and the trace mode to max-hold.

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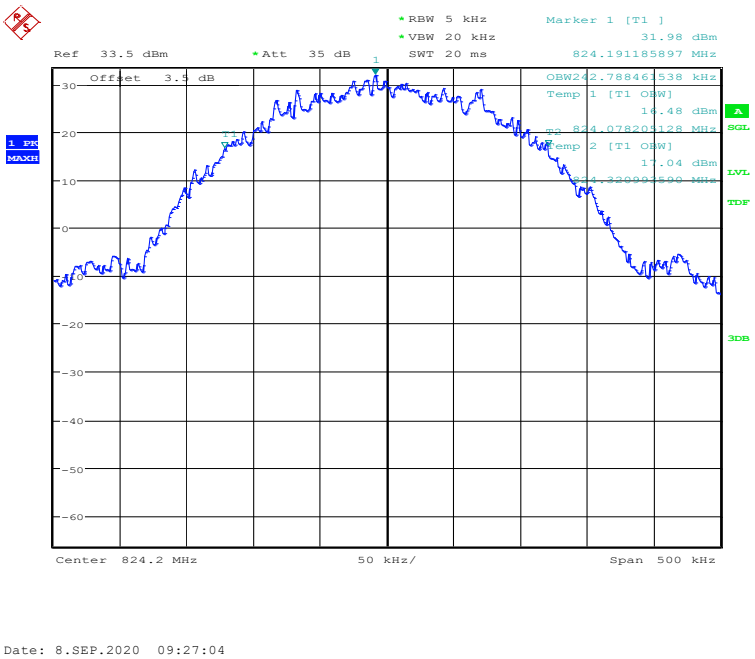
GSM 850(99% BW)

Frequency (MHz)	Occupied Bandwidth (99% BW) (kHz)
824.2	242.79
836.6	250.00
848.8	246.79

GSM 850

Channel 128-Occupied Bandwidth (99% BW)



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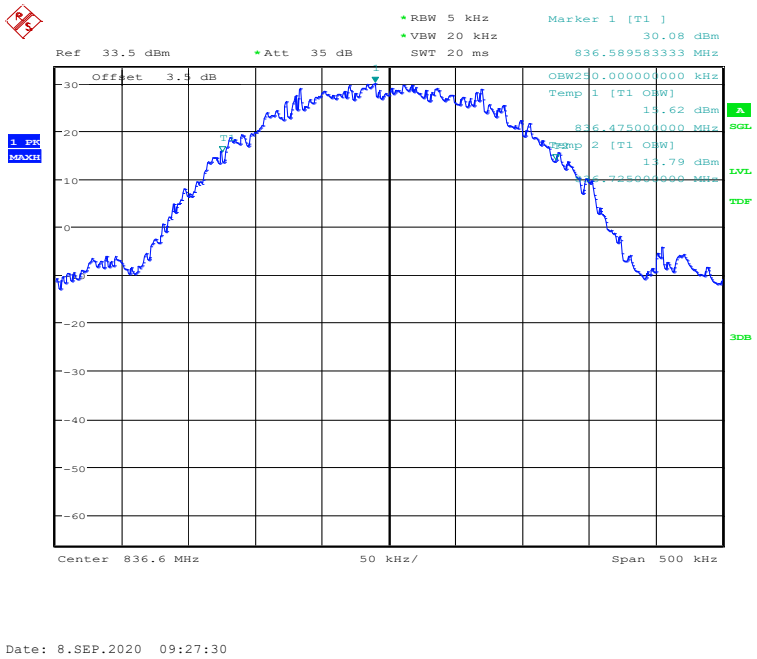
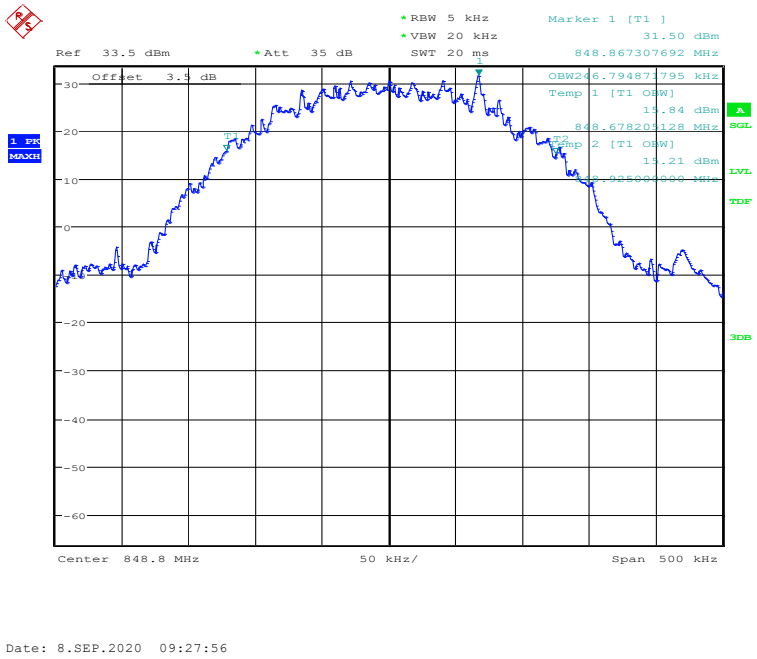
Channel 190-Occupied Bandwidth (99% BW)



Channel 251-Occupied Bandwidth (99% BW)



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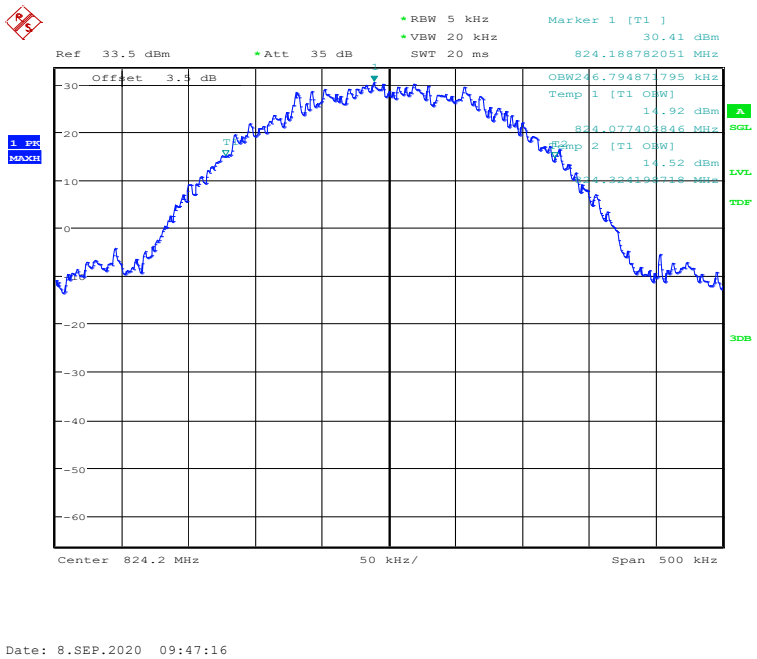
GPRS 850(99% BW)

Frequency (MHz)	Occupied Bandwidth (99% BW) (kHz)
824.2	246.79
836.6	248.40
848.8	246.79

GPRS 850

Channel 128-Occupied Bandwidth (99% BW)



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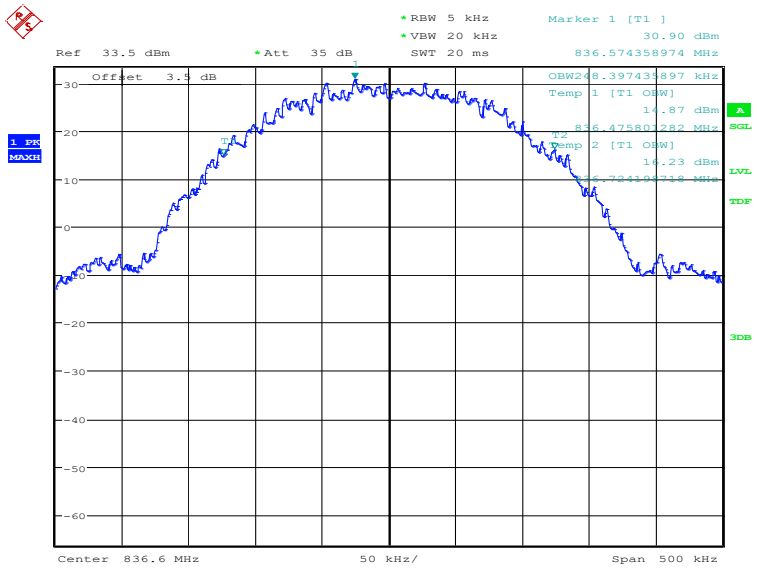
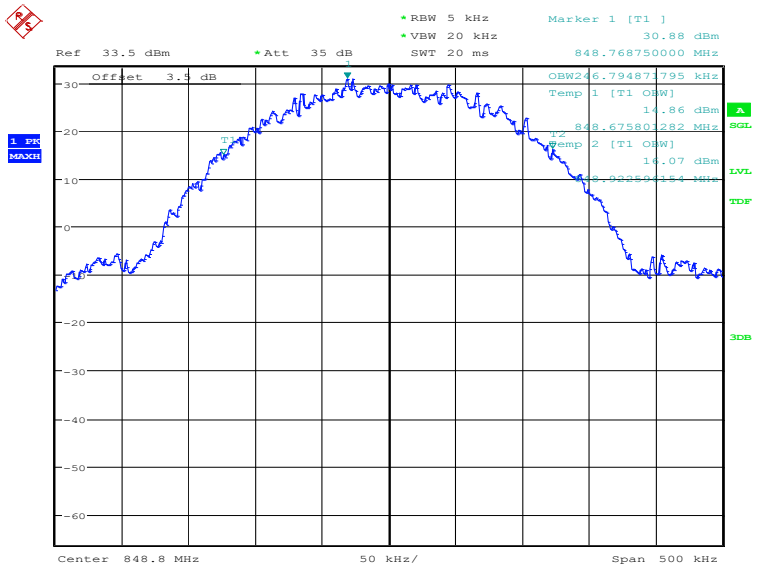
Channel 190-Occupied Bandwidth (99% BW)



Date: 8.SEP.2020 09:47:41

Channel 251-Occupied Bandwidth (99% BW)



Date: 8.SEP.2020 09:48:07

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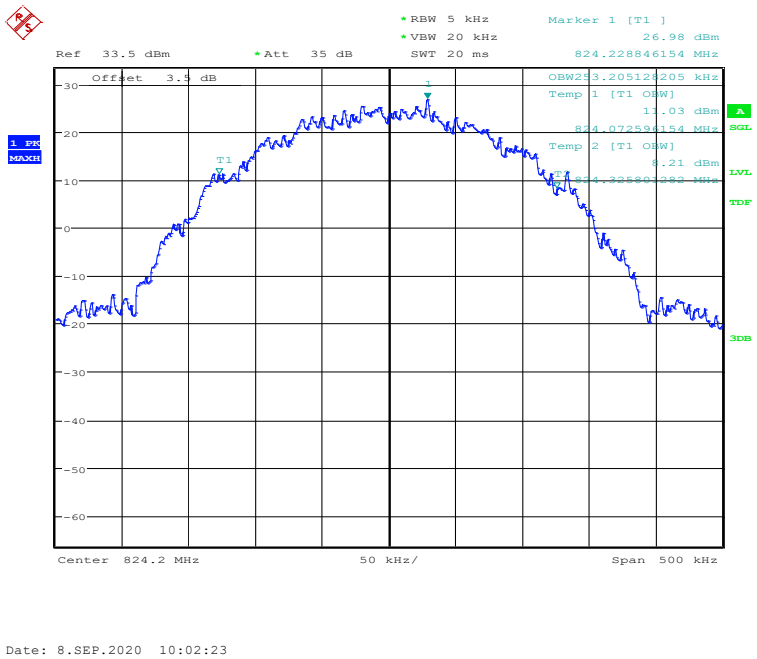
EGPRS 850-8PSK (99% BW)

Frequency (MHz)	Occupied Bandwidth (99% BW) (kHz)
824.2	253.21
836.6	254.81
848.8	251.60

EGPRS 850-8PSK

Channel 128-Occupied Bandwidth (99% BW)



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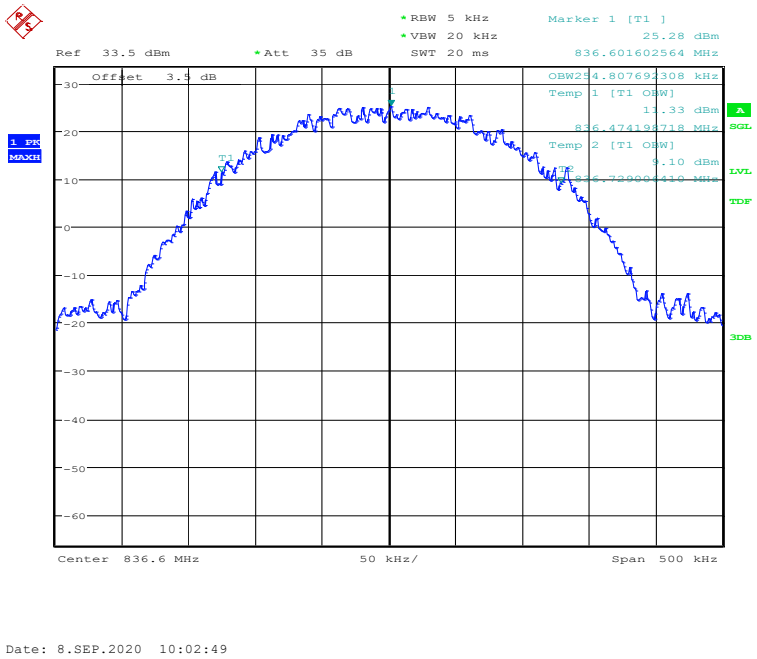
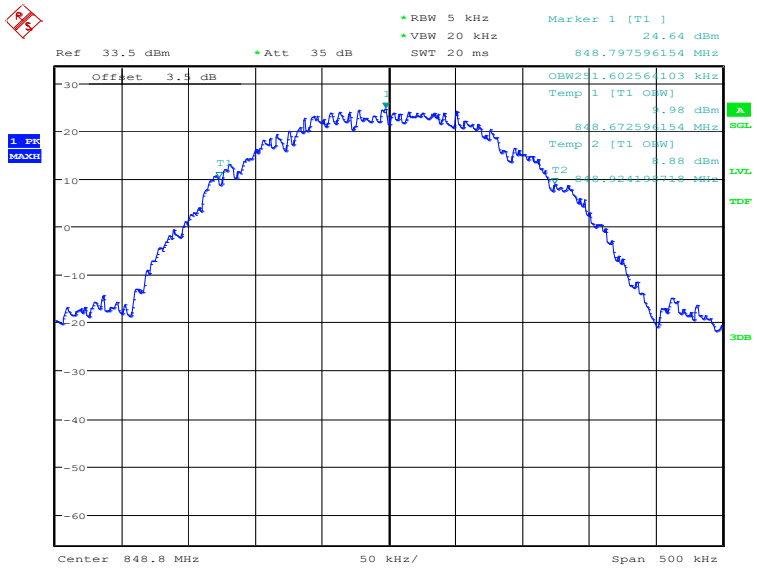
Channel 190-Occupied Bandwidth (99% BW)



Date: 8.SEP.2020 10:02:49

Channel 251-Occupied Bandwidth (99% BW)



Date: 8.SEP.2020 10:03:15

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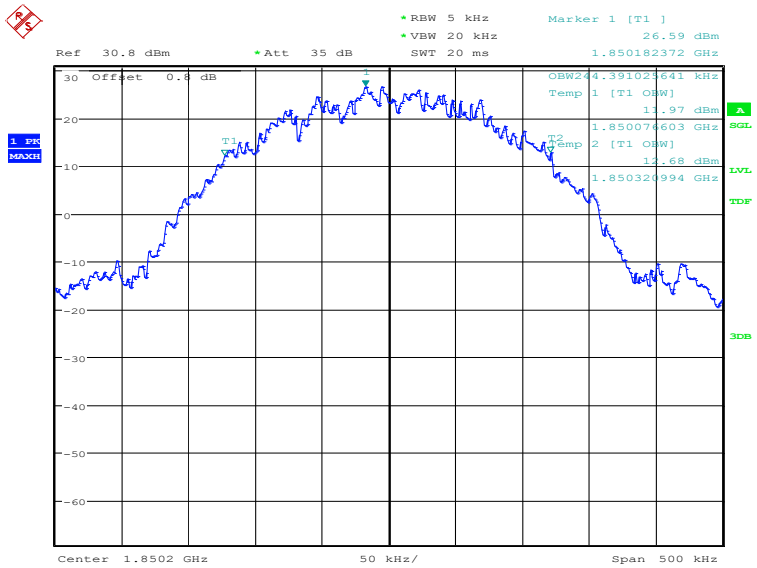
PCS 1900 (99% BW)

Frequency (MHz)	Occupied Bandwidth (99% BW) (kHz)
1850.2	244.39
1880.0	244.39
1909.8	246.79

PCS 1900

Channel 512-Occupied Bandwidth (99% BW)



Date: 7.SEP.2020 17:05:55

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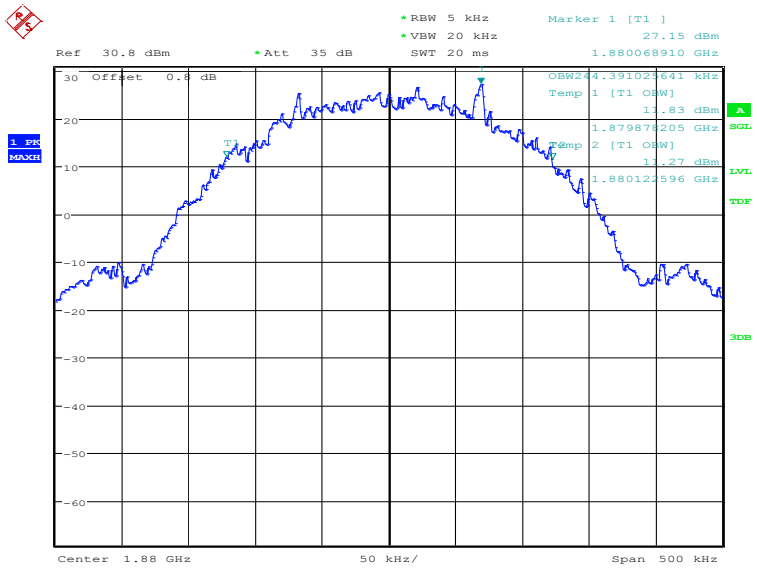
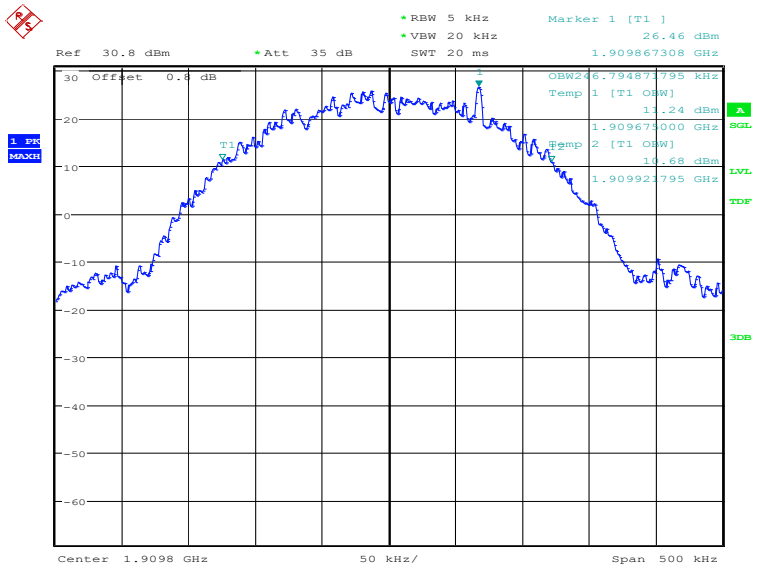
Channel 661-Occupied Bandwidth (99% BW)



Date: 7.SEP.2020 17:06:21

Channel 810-Occupied Bandwidth (99% BW)



Date: 7.SEP.2020 17:06:47

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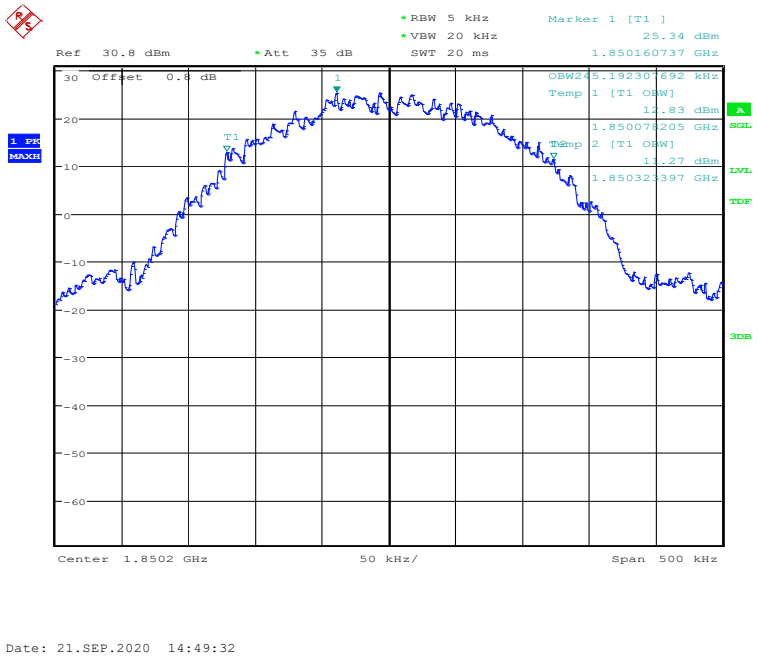
GPRS 1900(99% BW)

Frequency (MHz)	Occupied Bandwidth (99% BW) (kHz)
1850.2	245.19
1880.0	245.99
1909.8	243.59

GPRS 1900

Channel 512-Occupied Bandwidth (99% BW)



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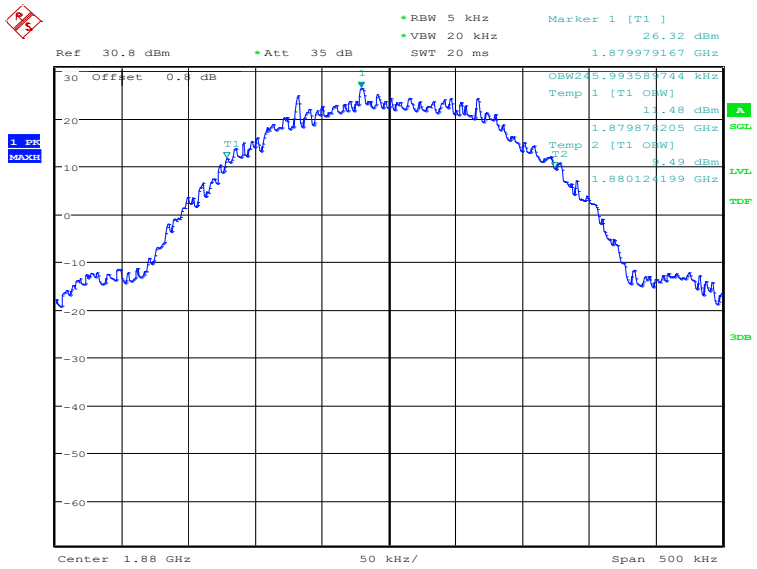
Channel 661-Occupied Bandwidth (99% BW)



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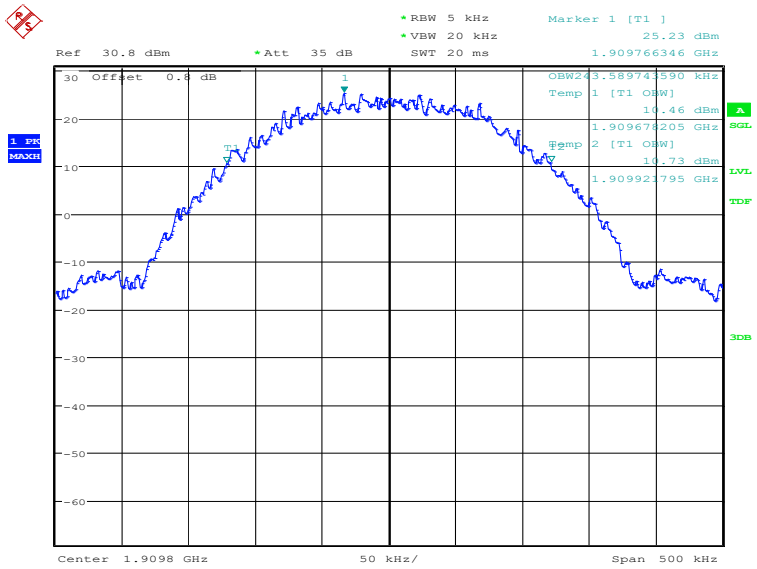
Channel 810-Occupied Bandwidth (99% BW)



Date: 21.SEP.2020 14:50:23

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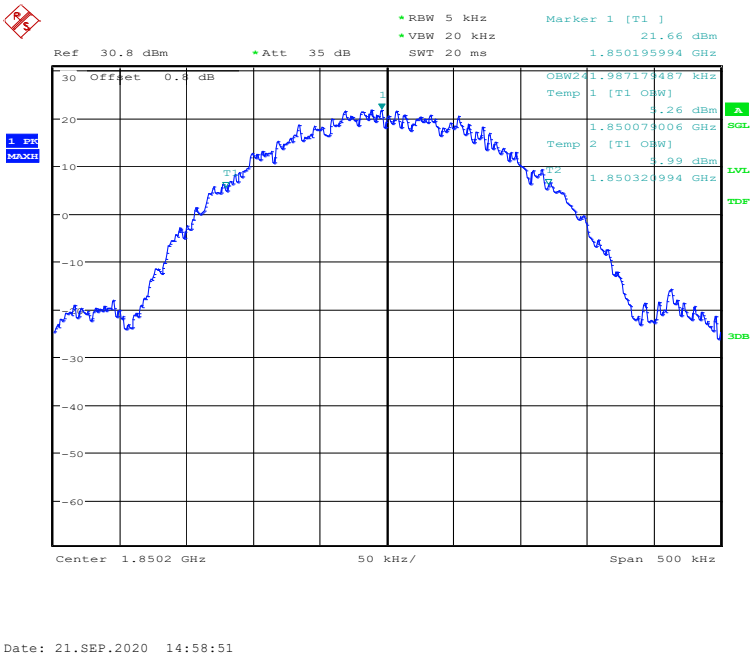
EGPRS 1900-8PSK (99% BW)

Frequency (MHz)	Occupied Bandwidth (99% BW) (kHz)
1850.2	241.99
1880.0	244.39
1909.8	243.59

EGPRS 1900-8PSK

Channel 512-Occupied Bandwidth (99% BW)



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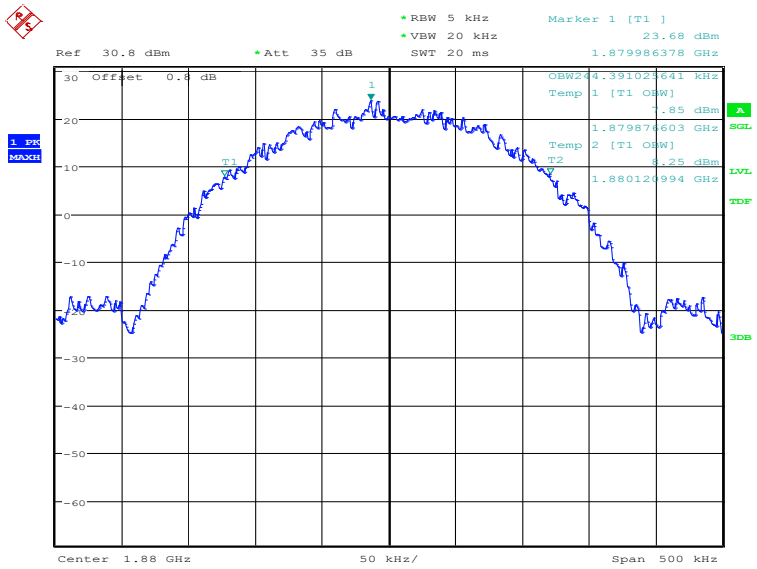
Channel 661-Occupied Bandwidth (99% BW)



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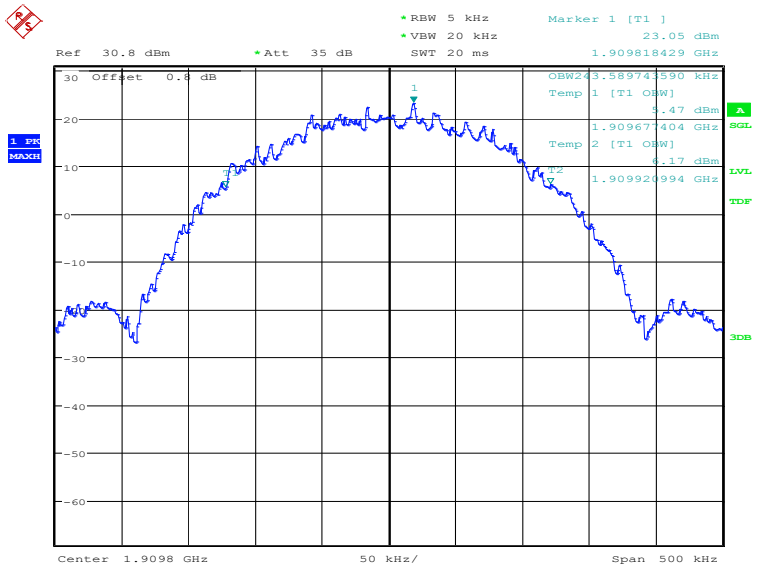
Channel 810-Occupied Bandwidth (99% BW)



Date: 21.SEP.2020 14:59:42

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A.5 Emission Bandwidth

The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.
The measurement method is from ANSI C63.26:
a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be wide enough to see sufficient roll off of the signal to make the measurement.
b) The nominal RBW shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set ≥ 3 × RBW.
c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation.
d) The dynamic range of the spectrum analyzer at the selected RBW shall be more than 10 dB below the target "−X dB" requirement, i.e., if the requirement calls for measuring the −26 dB OBW, the spectrum analyzer noise floor at the selected RBW shall be at least 36 dB below the reference level.
e) Set spectrum analyzer detection mode to peak, and the trace mode to max hold.

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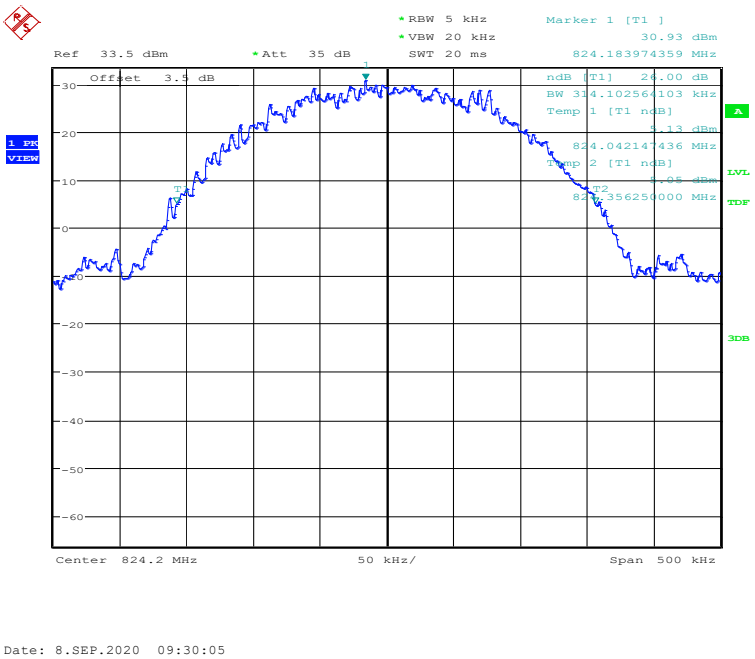
GSM 850

Frequency (MHz)	Emission Bandwidth (kHz)
824.2	314.10
836.6	310.10
848.8	314.10

GSM 850

Channel 128-Emission Bandwidth



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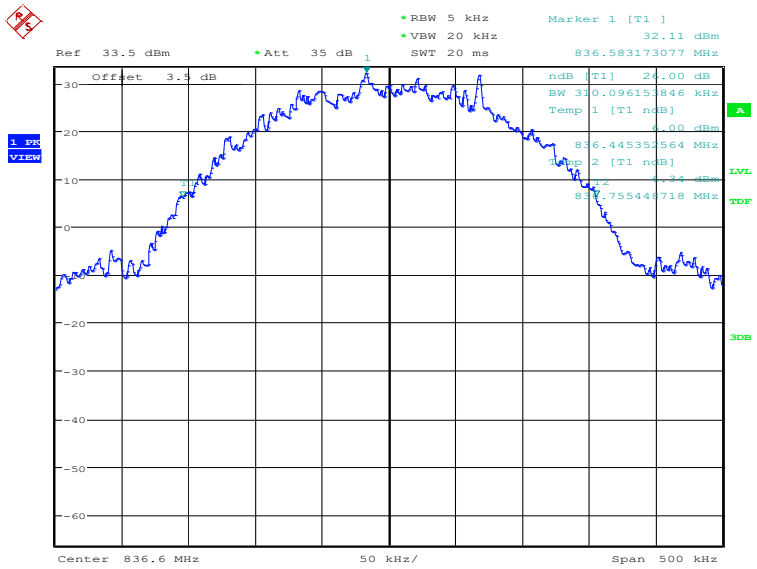
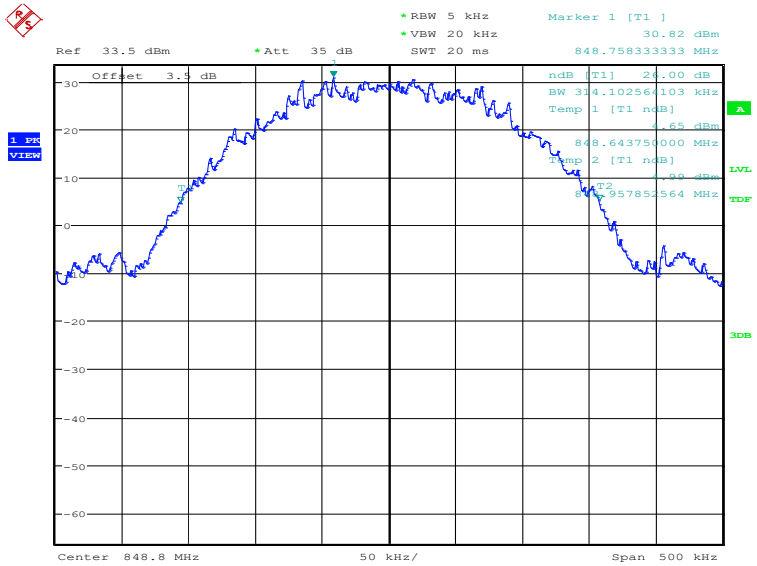
Channel 190-Emission Bandwidth



Date: 8.SEP.2020 09:30:31

Channel 251-Emission Bandwidth



Date: 8.SEP.2020 09:30:57

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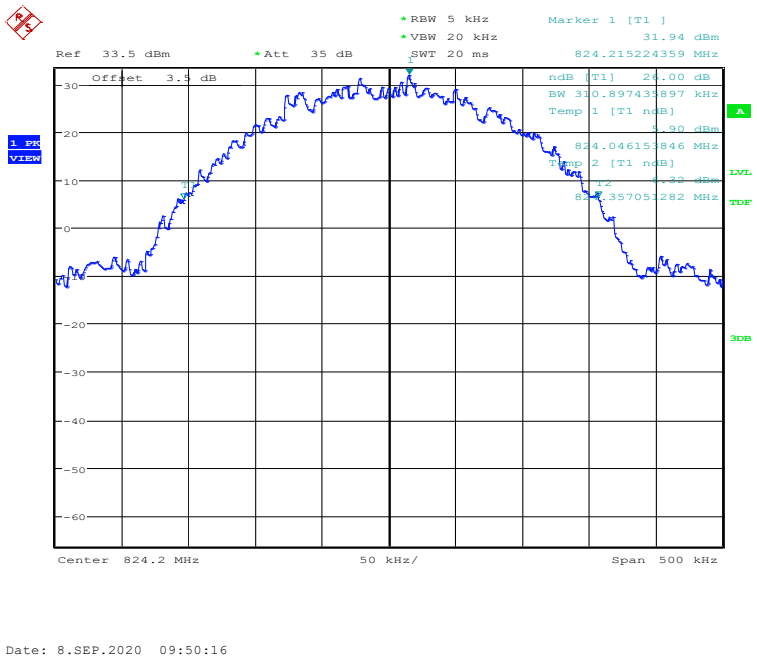
GPRS 850

Frequency (MHz)	Emission Bandwidth (kHz)
824.2	310.90
836.6	317.31
848.8	312.50

GPRS 850

Channel 128-Emission Bandwidth



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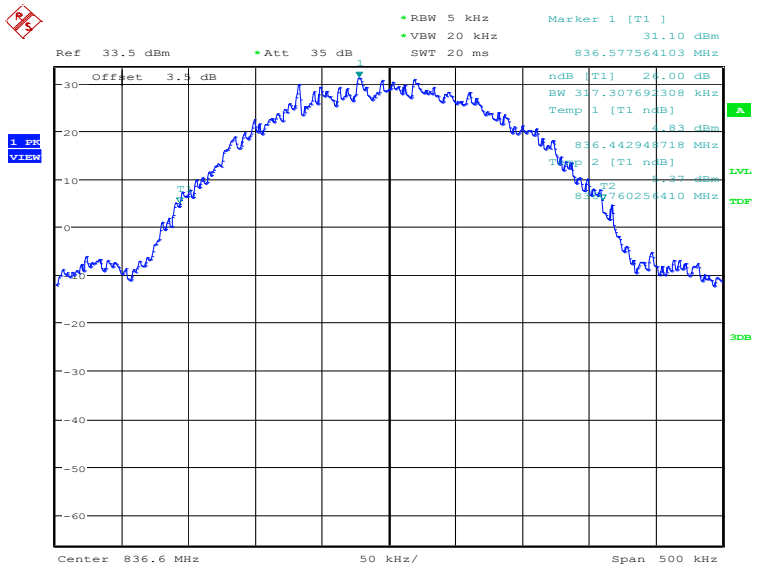
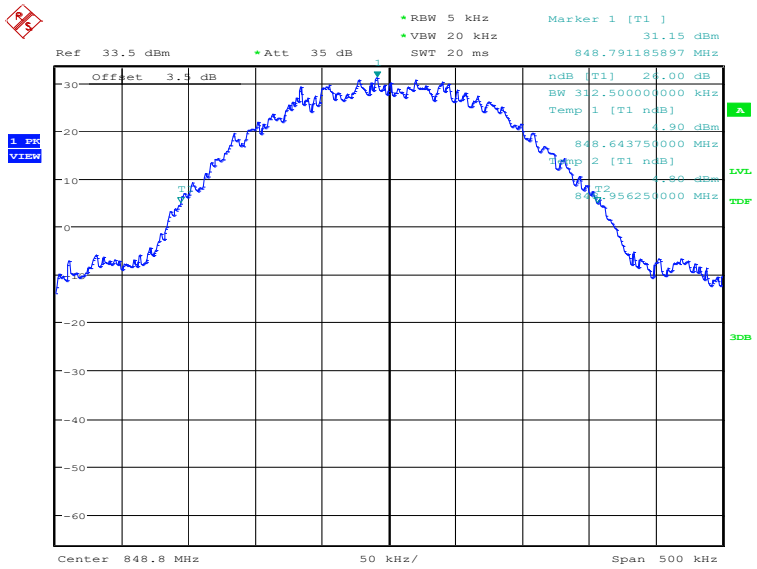
Channel 190-Emission Bandwidth



Date: 8.SEP.2020 09:50:42

Channel 251-Emission Bandwidth



Date: 8.SEP.2020 09:51:08

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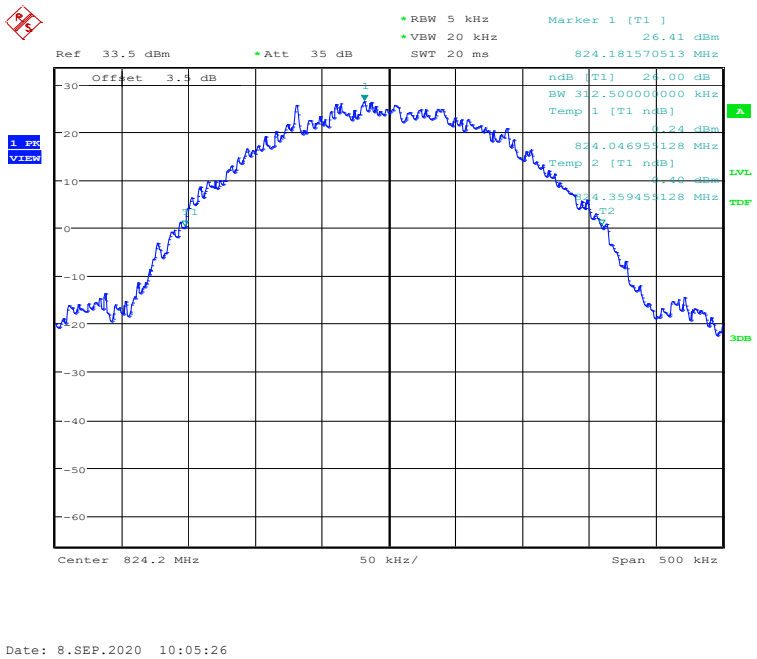
EGPRS 850-8PSK

Frequency (MHz)	Emission Bandwidth (kHz)
824.2	312.50
836.6	309.29
848.8	317.31

EGPRS 850-8PSK

Channel 128-Emission Bandwidth



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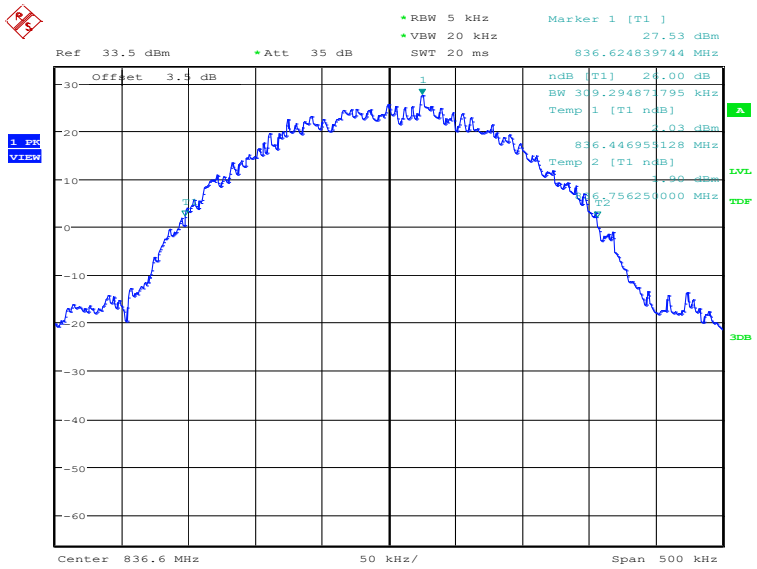
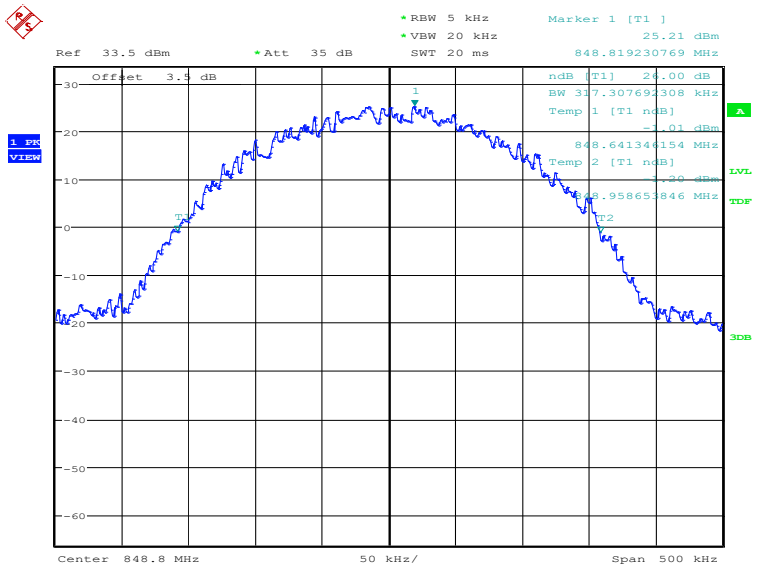
Channel 190-Emission Bandwidth



Date: 8.SEP.2020 10:05:52

Channel 251-Emission Bandwidth



Date: 8.SEP.2020 10:06:18

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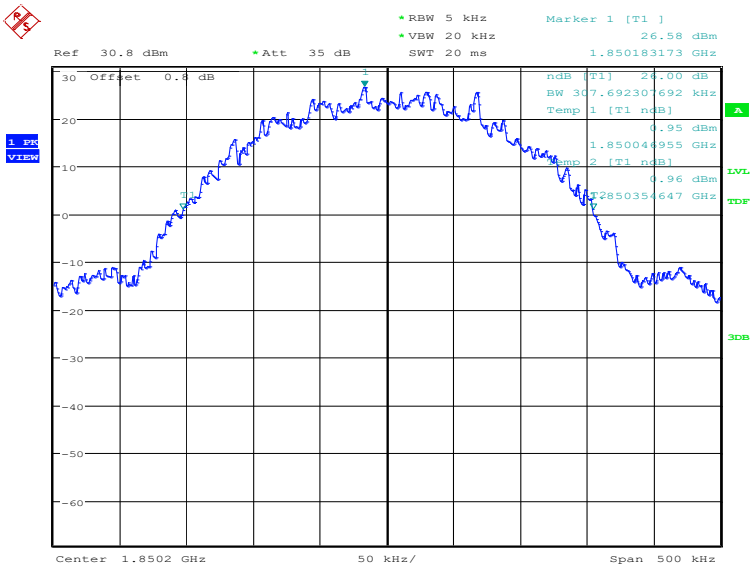
PCS 1900

Frequency (MHz)	Emission Bandwidth (kHz)
1850.2	307.69
1880.0	309.29
1909.8	316.51

PCS 1900

Channel 512-Emission Bandwidth



Date: 7.SEP.2020 17:08:39

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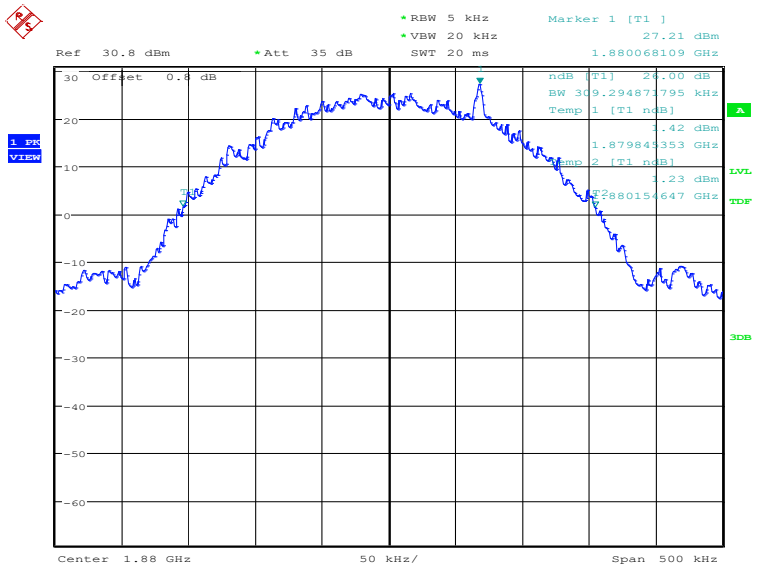
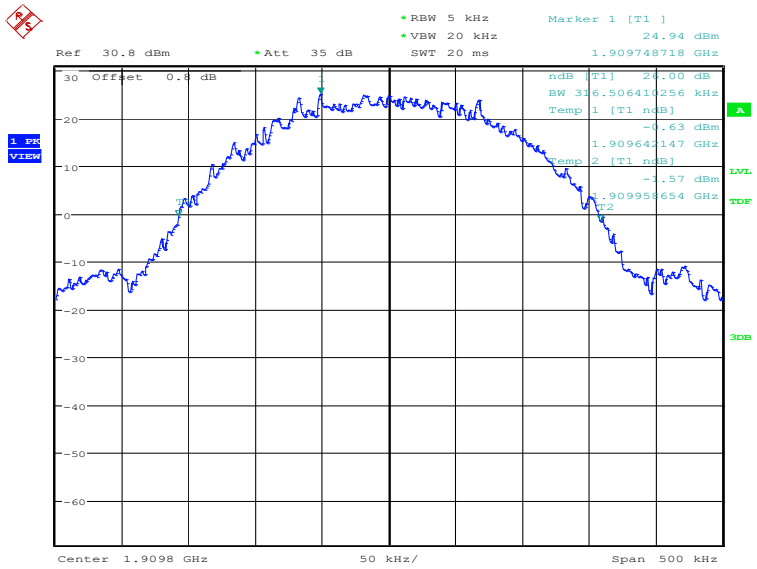
Channel 661-Emission Bandwidth



Date: 7.SEP.2020 17:09:05

Channel 810-Emission Bandwidth



Date: 7.SEP.2020 17:09:31

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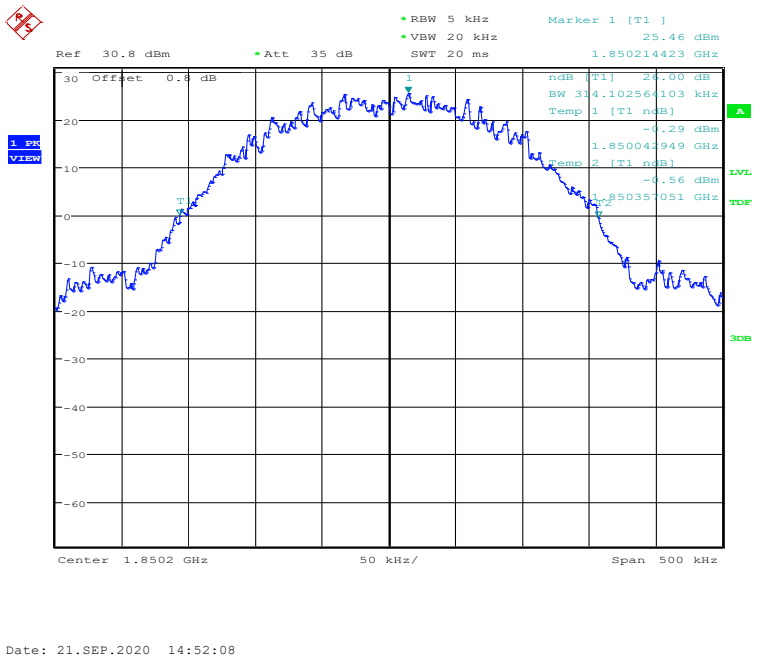
GPRS 1900

Frequency (MHz)	Emission Bandwidth (kHz)
1850.2	314.10
1880.0	318.11
1909.8	312.50

GPRS 1900

Channel 512-Emission Bandwidth



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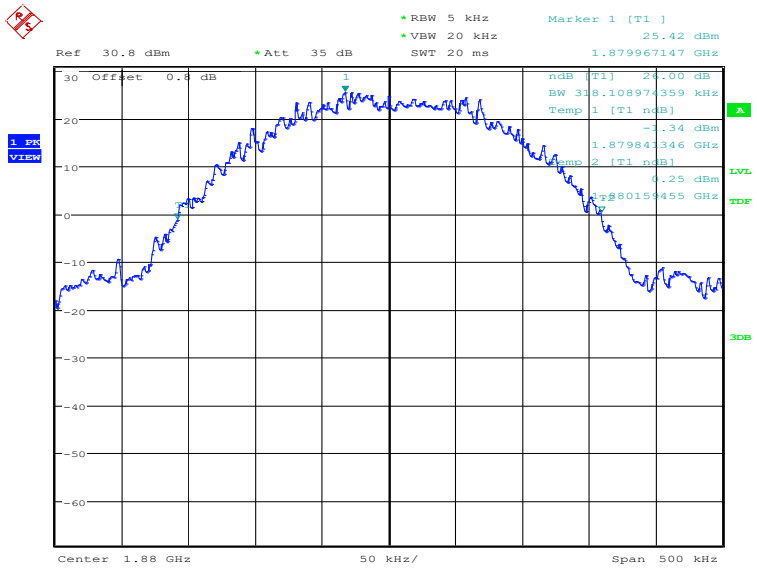
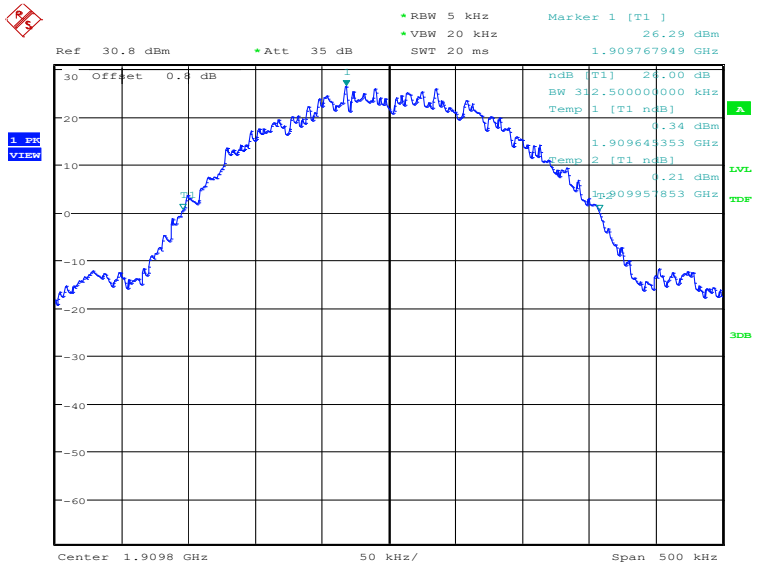
Channel 661-Emission Bandwidth



Date: 21.SEP.2020 14:52:35

Channel 810-Emission Bandwidth



Date: 21.SEP.2020 14:53:01

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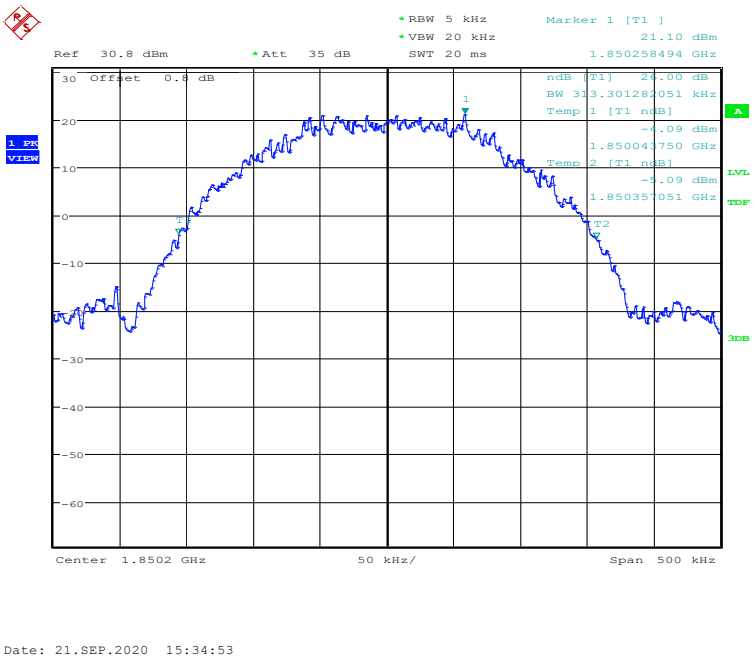
EGPRS 1900-8PSK

Frequency (MHz)	Emission Bandwidth (kHz)
1850.2	313.30
1880.0	312.50
1909.8	300.48

EGPRS 1900-8PSK

Channel 512-Emission Bandwidth



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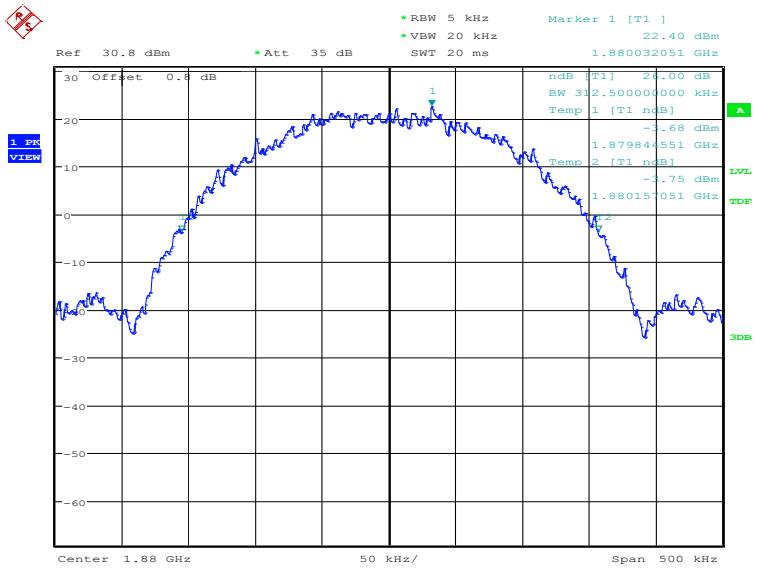
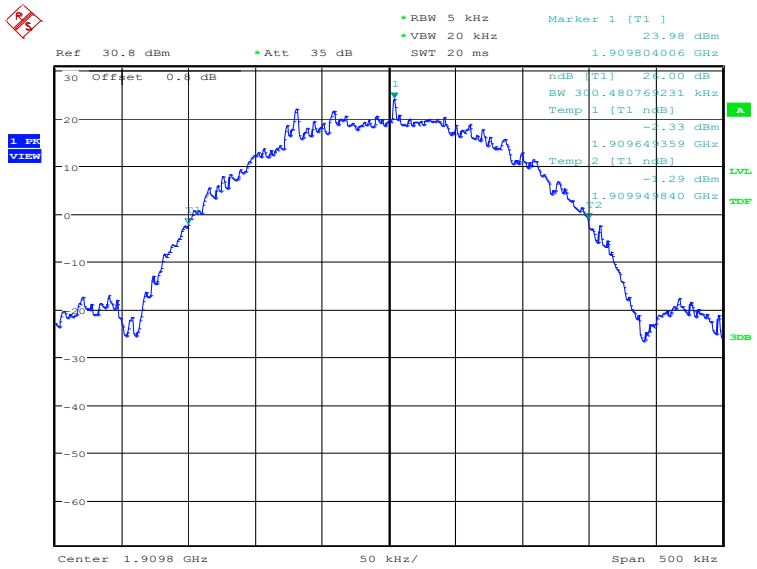
Channel 661-Emission Bandwidth



Date: 21.SEP.2020 15:35:20

Channel 810-Emission Bandwidth



Date: 21.SEP.2020 15:35:46

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A.6 Band Edge Compliance

A.6.1 Measurement limit

Part 22.917 and Part 24.238 specify that 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 KDB 971168, a relaxation of the reference bandwidth is often provided for measurements within a specified frequency range at the edge of the authorized frequency block/band. This is often implemented by permitting the use of a narrower RBW (typically limited to a minimum RBW of 1% of the OBW) for measuring the out-of-band emissions without a requirement to integrate the result over the full reference bandwidth.

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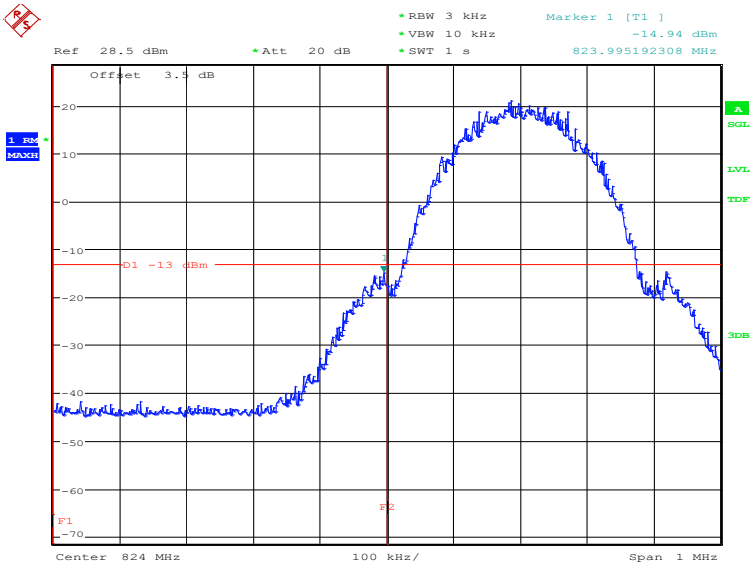
A.6.2 Measurement result

GSM 850

Channel 128



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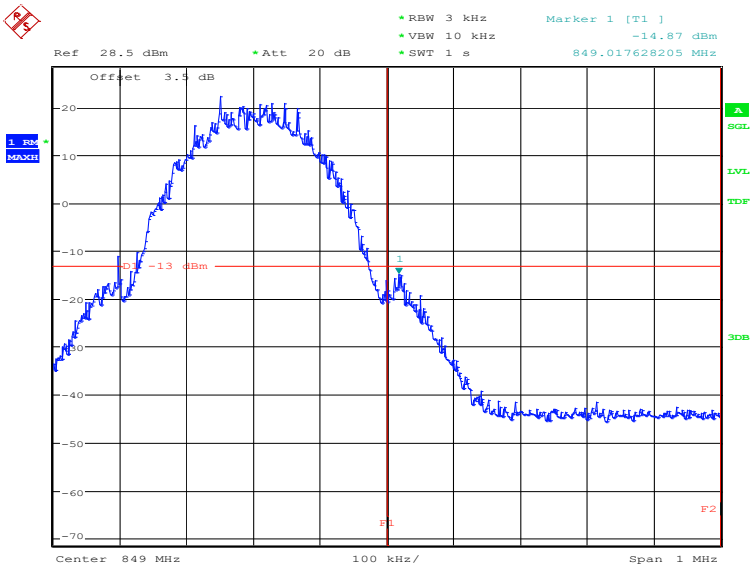
Channel 251



Date: 21.SEP.2020 15:17:15

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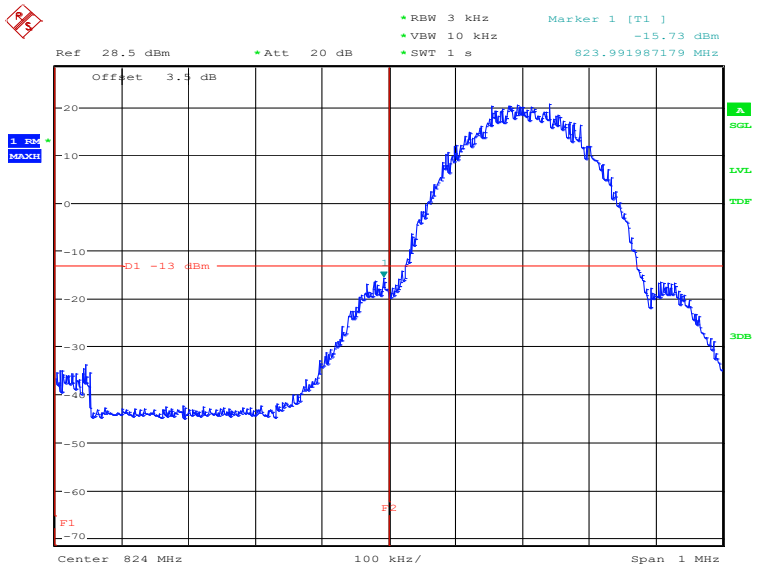
GPRS 850

Channel 128



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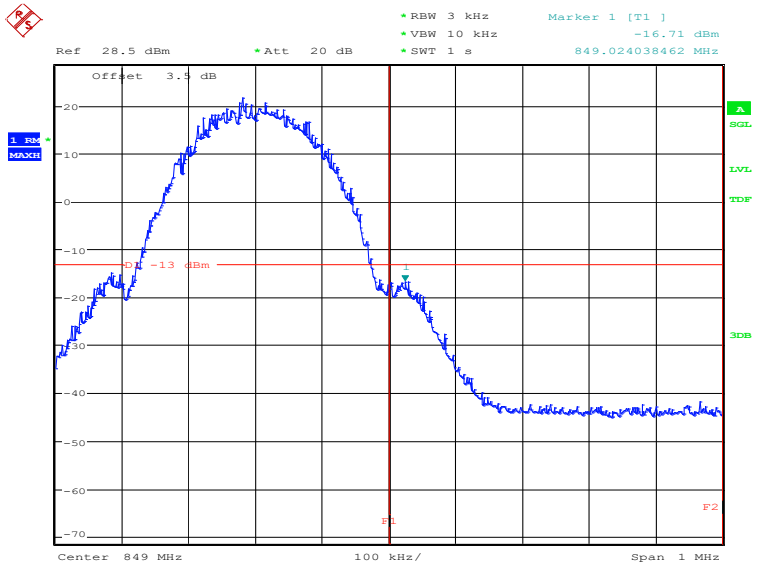
Channel 251



Date: 8.SEP.2020 09:55:11

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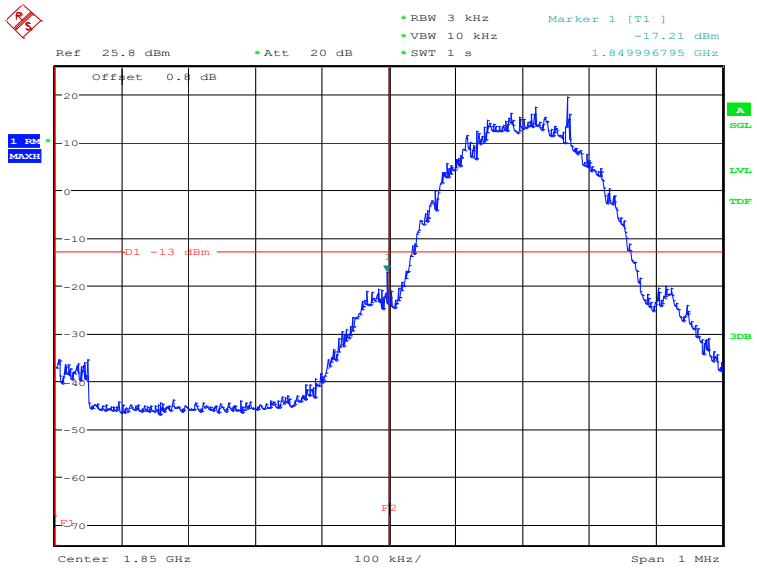
PCS 1900

Channel 512



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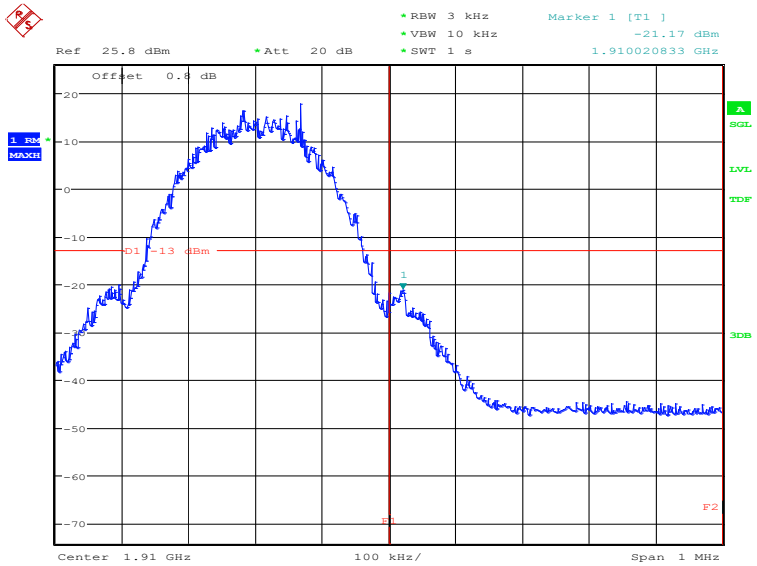
Channel 810



Date: 7.SEP.2020 17:14:22

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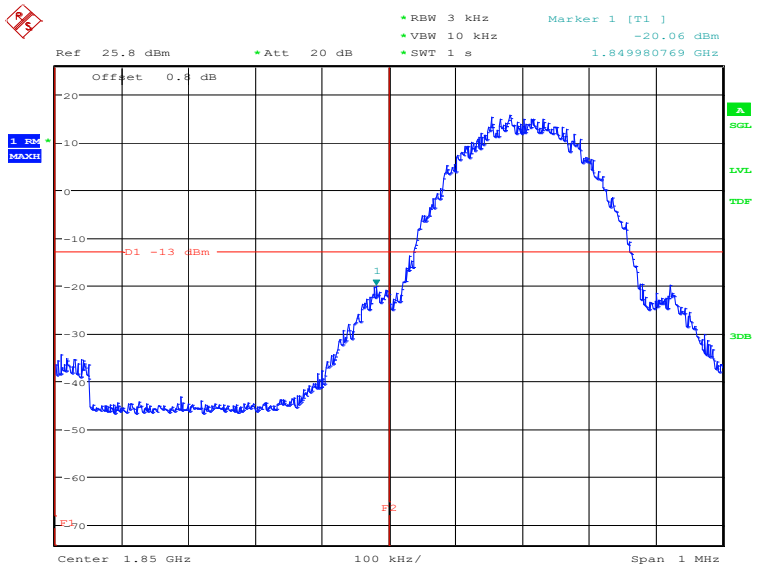
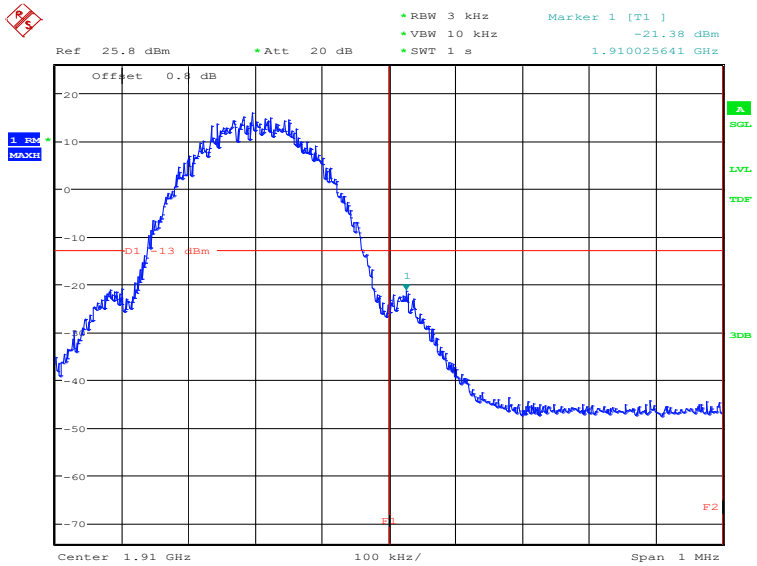
GPRS 1900

Channel 512



Date: 21.SEP.2020 14:55:43

Channel 810



Date: 21.SEP.2020 14:56:52

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A.7 Conducted Spurious Emission

A.7.1 Measurement Method

The following steps outline the procedure used to measure the conducted emissions from the EUT.

1. In measuring unwanted emissions, the spectrum shall be investigated from 30 MHz or the lowest radio frequency signal generated in the equipment, whichever is lower, without going below 9 kHz, up to at least the frequency given below:
   (a) If the equipment operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
   (b) If the equipment operates at or above 10 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.
2. Determine EUT transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.
3. The number of sweep points of spectrum analyzer is set to 30001 which is greater than span/RBW.

A. 7.2 Measurement Limit

Part 22.917 and Part 24.238 specify that 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.

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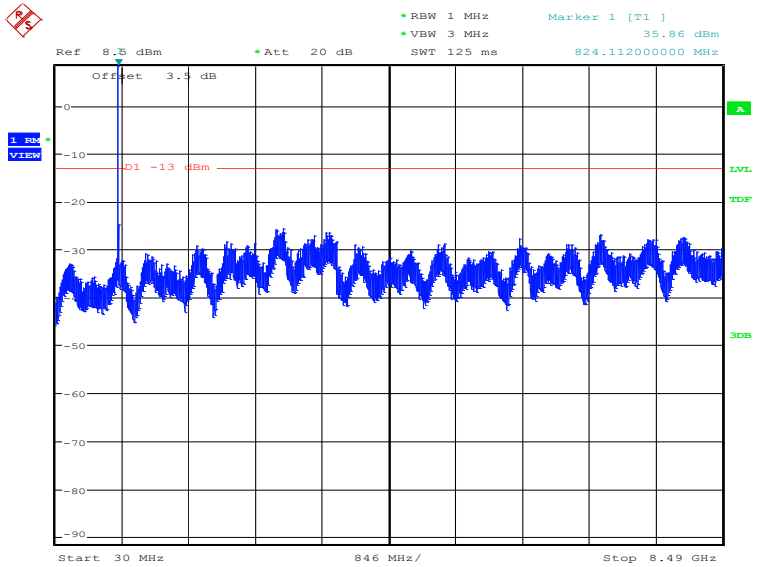
A.7.3 Measurement result

GSM850

Channel 128: 30MHz – 8.49GHz

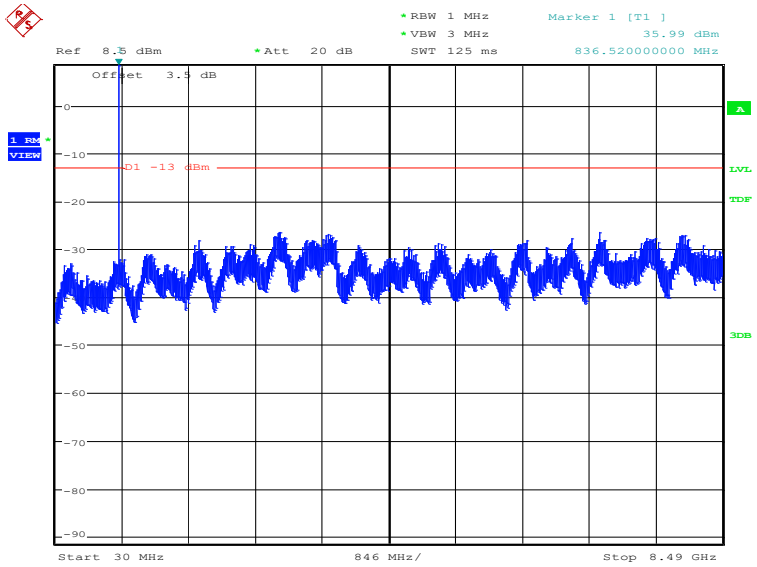
NOTE: peak above the limit line is the carrier frequency.



Date: 8.SEP.2020 09:39:18

Channel 190: 30MHz – 8.49GHz

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



Date: 8.SEP.2020 09:39:47

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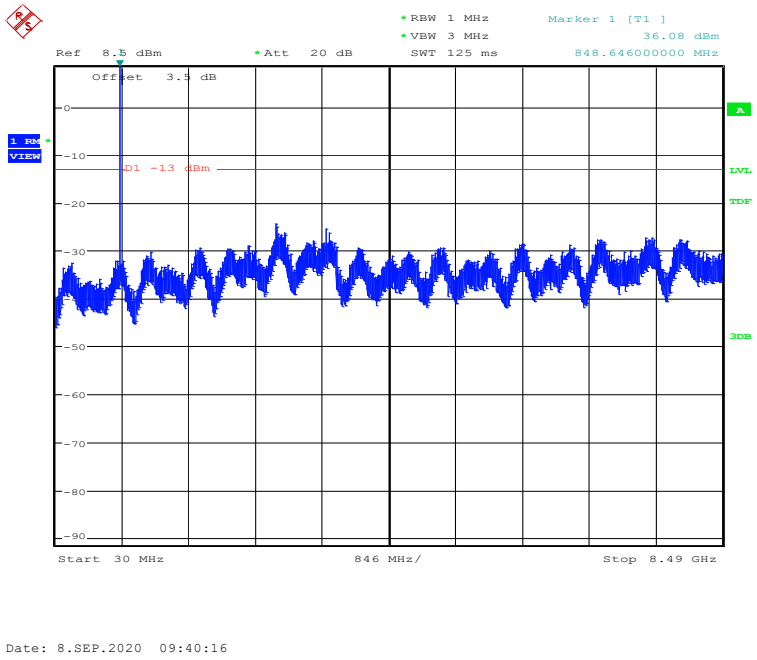
Channel 251: 30MHz – 8.49GMHz

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



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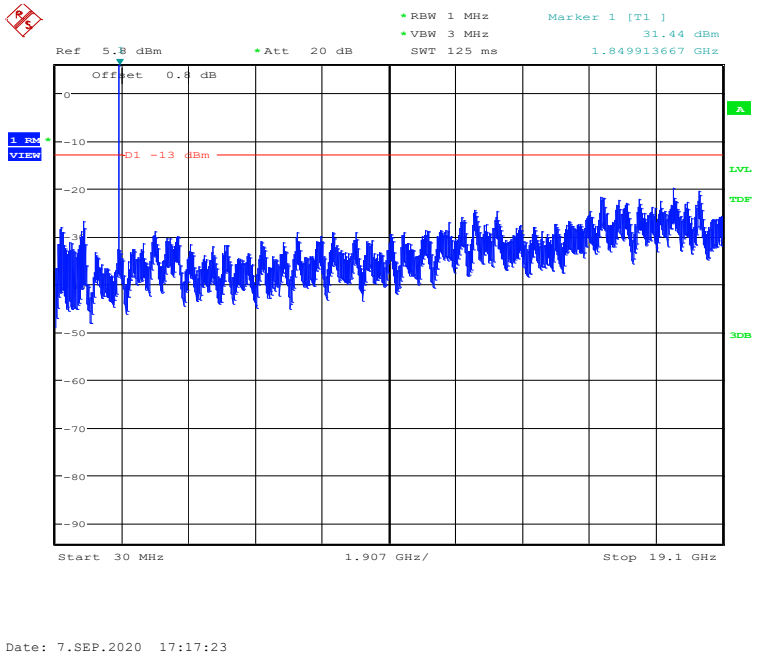
PCS1900

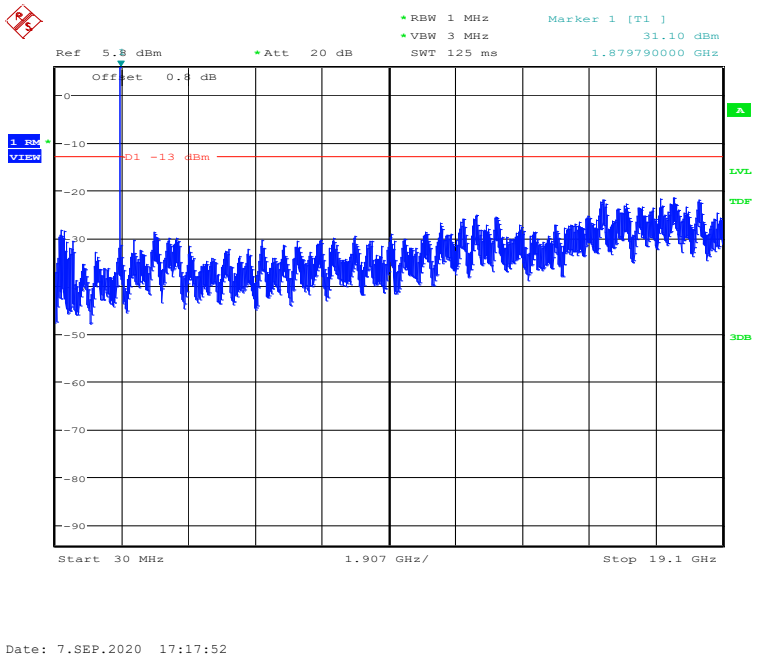
Channel 512: 30MHz – 19.10GHz

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



Channel 661: 30MHz – 19.10GHz

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



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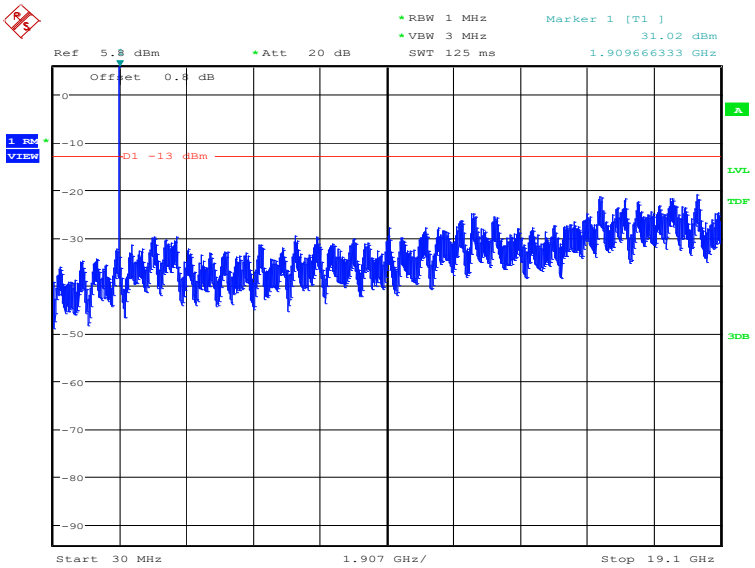
Channel 810: 30MHz – 19.10GHz

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



Date: 7.SEP.2020 17:18:21

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A.8 Peak-to-Average Power Ratio

The peak-to-average ratio (PAR) of the transmission may not exceed 13 dB

a) Refer to instrument's analyzer instruction manual for details on how to use the power statistics/CCDF function;

b) Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;

c) Set the number of counts to a value that stabilizes the measured CCDF curve;

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

Measurement results

	Frequency (MHz)	PAPR (dB)
PCS1900	1880.0	7.72
GPRS1900	1880.0	7.69
EGPRS1900(8PSK)	1880.0	10.48

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

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