TEST REPORT
No. I22Z61606-WMD01

for

TCL Communication Ltd.

GSM/UMTS/LTE /NR Mobile phone

Model Name: T609DL

FCC ID: 2ACCJH168

with

Hardware Version: 04

Software Version: JSS8

Issued Date: 2022-12-27

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 CTTL.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S.Government.

Test Laboratory:

CTTL, Telecommunication Technology Labs, CAICT

No. 52, Huayuan North Road, Haidian District, Beijing, P. R. China 100191.

Tel: +86(0)10-62304633-2512, Fax: +86(0)10-62304633-2504

Email: cttl_terminals@caict.ac.cn, website: www.caict.ac.cn

REPORT HISTORY

Report Number	Revision	Description	Issue Date
I22Z61606-WMD01	Rev.0	1st edition	2022-12-12
I22Z61606-WMD01	Rev.1	2nd edition Applicant Information and manufacturer Information updated	2022-12-27

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

CONTENTS

1. Test Laboratory

1.1. Introduction & Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2017 accredited test laboratory under NATIONAL VOLUNTARY LABORATORY ACCREDITATION PROGRAM (NVLAP) with lab code 600118-0 and is also an FCC accredited test laboratory (CN5017), and ISED accredited test laboratory (CN0066). The detail accreditation scope can be found on NVLAP website.

1.2. Testing Location

Location 1: CTTL (huayuan North Road)

Address: No. 52, Huayuan North Road, Haidian District, Beijing, P. R. China 100191

1.3. <u>Testing Environment</u>

Normal Temperature:　　15-35℃

Relative Humidity:　　　20-75%

1.4. <u>Project Data</u>

Testing Start Date:　　　2022-09-16

Testing End Date:　　　　2022-12-08

1.5. <u>Signature</u>

_____

Dong Yuan

(Prepared this test report)

_____

Zhou Yu

(Reviewed this test report)

_____

Zhao Hui Lin

Deputy Director of the laboratory

(Approved this test report)

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:	Annie Jiang
Email:	nianxiang.jiang@tcl.com
Telephone:	+86 755 3661 1621
Fax:	+86 755 3661 2000-81722

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:	Annie Jiang
Email:	nianxiang.jiang@tcl.com
Telephone:	+86 755 3661 1621
Fax:	+86 755 3661 2000-81722

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

3.1. About EUT

Description	GSM/UMTS/LTE /NR Mobile phone
Model Name	T609DL
FCC ID	2ACCJH168
Antenna	Embedded
Extreme vol. Limits	3.6VDC to 4.4VDC (nominal: 3.85VDC)
Extreme temp. Tolerance	-10°C to +55°C

Note: Components list, please refer to documents of the manufacturer; it is also included in the original test record of CTTL.

3.2. Internal Identification of EUT used during the test

EUT ID*	IMEI	HW Version	SW Version	Date of receipt
UT34a	016320000011894/01	04	JSS8	2022-09-16

*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	TLp048D7
Manufacturer	VEKEN
Capacitance	5000mAh

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

4. Reference Documents

4.1. Documents supplied by applicant

EUT parameters are supplied by the customer, which are the bases of testing. CAICT is not responsible for the accuracy of customer supplied technical information that may affect the test results (for example, antenna gain and loss of customer supplied cable).

4.2. Reference Documents for testing

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

Reference	Title	Version
FCC Part 22	PUBLIC MOBILE SERVICES	10-1-21 Edition
FCC Part 24	PERSONAL COMMUNICATIONS SERVICES	10-1-21 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

5. Summary Of Test Result

GSM850

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

PCS1900

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

Terms used in Verdict column

P	Pass. The EUT complies with the essential requirements in the standard.
NP	Not Performed. The test was not performed by CTTL.
NA	Not Applicable. The test was not applicable.
BR	Re-use test data from basic model report.
F	Fail. The EUT does not comply with the essential requirements in the standard.

All the test results are based on normal power.

Explanation of worst-case configuration

The worst-case scenario for all measurements is based on the conducted output power measurement investigation results unless otherwise stated. The test results shown in the following sections represent the worst case emission.

6. Test Equipments Utilized

Description	Type	Series Number	Manufacture	Cal Due Date	Calibration Interval
Universal Radio Communication Tester	CMU200	108646	R&S	2023-01-17	25 months
Spectrum Analyzer	FSU	200030	R&S	2023-05-25	1 year
Climate chamber	SH-242	93008556	ESPEC	2023-12-23	3 years

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 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.

The results below include a correction factor for cable loss that is provided by the customer.

A.1.3 Measurement Result

GSM850

GSM(GMSK)

Frequency (MHz)	Power Step	Output power (dBm)
824.2	5	31.31
836.6	5	31.15
848.8	5	31.46

GPRS(GMSK,1Slot)

Frequency (MHz)	Power Step	Output power (dBm)
824.2	3	31.36
836.6	3	31.19
848.8	3	31.51

EGPRS(8PSK,1Slot)

Frequency (MHz)	Power Step	Output power (dBm)
824.2	6	28.39
836.6	6	28.10
848.8	6	28.24

PCS1900
GSM(GMSK)

Frequency (MHz)	Power Step	Output power (dBm)
1850.2	0	29.25
1880.0	0	29.17
1909.8	0	28.97

GPRS(GMSK,1Slot)

Frequency (MHz)	Power Step	Output power (dBm)
1850.2	3	29.24
1880.0	3	29.17
1909.8	3	29.00

EGPRS(8PSK,1Slot)

Frequency (MHz)	Power Step	Output power (dBm)
1850.2	5	25.42
1880.0	5	25.20
1909.8	5	25.26

Note: Expanded measurement uncertainty is U = 0.578 dB, k = 2.

A.2 Frequency Stability

A.2.1 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 1.5 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 1.5 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 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℃ decrements 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.

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.

A.2.2 Measurement results

GSM 850

Frequency Error vs Temperature

Temperature(℃)	Voltage(V)	F_L(MHz)	F_H(MHz)	Offset(Hz)	Frequency error(ppm)
20					
50				1.22	0.0015
40				3.16	0.0038
30				3.42	0.0041
10	3.85	824.032	848.968	2.39	0.0029
0				0.32	0.0004
-10				-4.84	0.0058
-20				-5.62	0.0067
-30				-6.27	0.0075

Frequency Error vs Voltage

Voltage(V)	Temperature(℃)	F_L(MHz)	F_H(MHz)	Offset(Hz)	Frequency error(ppm)
3.6	20	824.032	848.968	2.58	0.0031
4.4				0.64	0.0008

PCS 1900

Frequency Error vs Temperature

Temperature(℃)	Voltage(V)	F_L(MHz)	F_H(MHz)	Offset(Hz)	Frequency error(ppm)
20					
50				-1.04	0.0006
40				4.00	0.0021
30				1.16	0.0006
10	3.85	1850.035	1909.965	1.55	0.0008
0				-2.07	0.0011
-10				-25.64	0.0136
-20				-22.60	0.0120
-30				-22.80	0.0121

Frequency Error vs Voltage

Voltage(V)	Temperature(℃)	F_L(MHz)	F_H(MHz)	Offset(Hz)	Frequency error(ppm)
3.6	20	1850.035	1909.965	-2.59	0.0014
4.4				-2.72	0.0014

Note: Expanded measurement uncertainty is U = 0.01 PPM, k = 2.

A.3 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.

GSM 850 (99%)

Frequency (MHz)	Occupied Bandwidth (99%)(kHz)
824.2	247.60
836.6	246.79
848.8	246.79

GSM 850 (99%)

Channel 128-Occupied Bandwidth (99% BW)
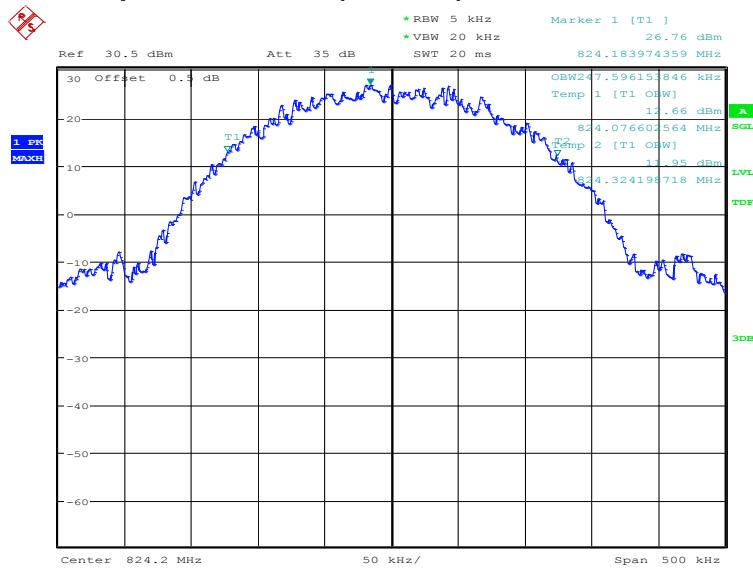
Date: 21.SEP.2022 08:41:00

Channel 190-Occupied Bandwidth (99% BW)
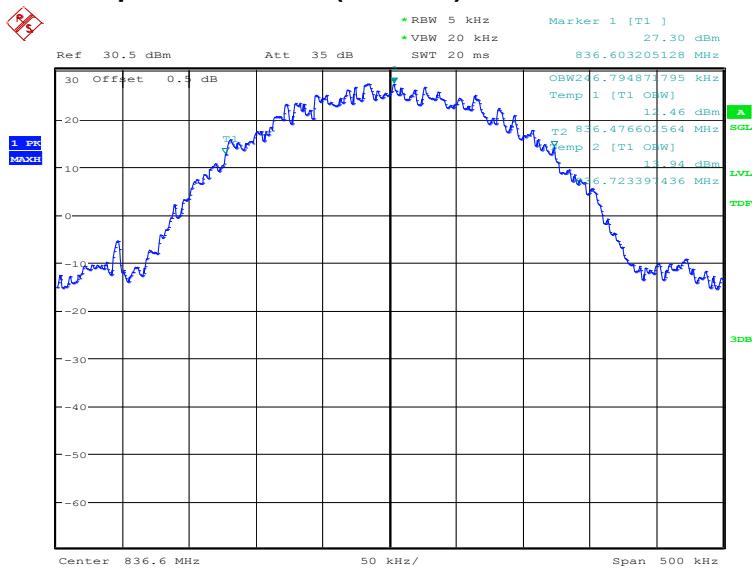
Date: 21.SEP.2022 08:41:27

Channel 251-Occupied Bandwidth (99% BW)
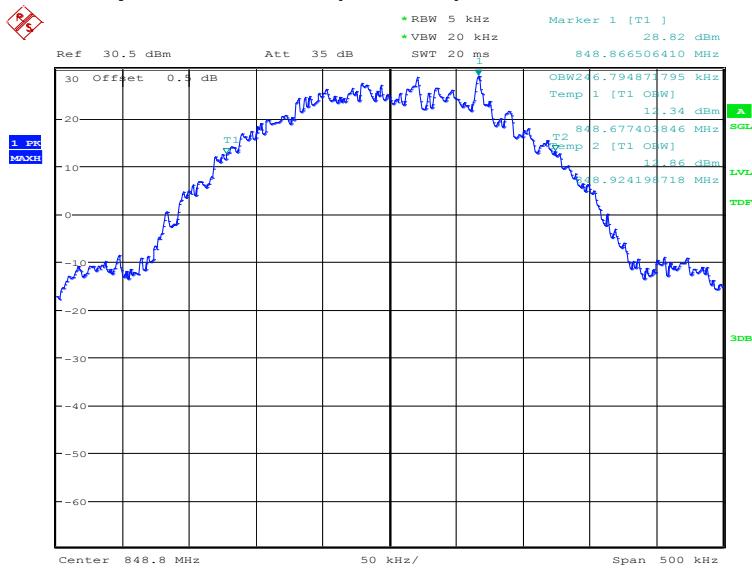
Date: 21.SEP.2022 08:41:55

GPRS 850 (99%)

Frequency (MHz)	Occupied Bandwidth (99%)(kHz)
824.2	245.99
836.6	245.19
848.8	244.39

GPRS 850 (99%)

Channel 128-Occupied Bandwidth (99% BW)
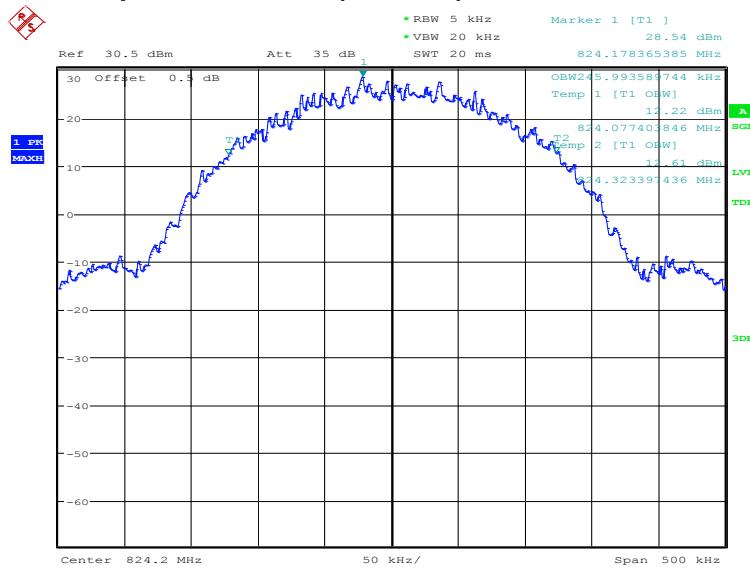
Date: 21.SEP.2022 09:19:40

Channel 190-Occupied Bandwidth (99% BW)
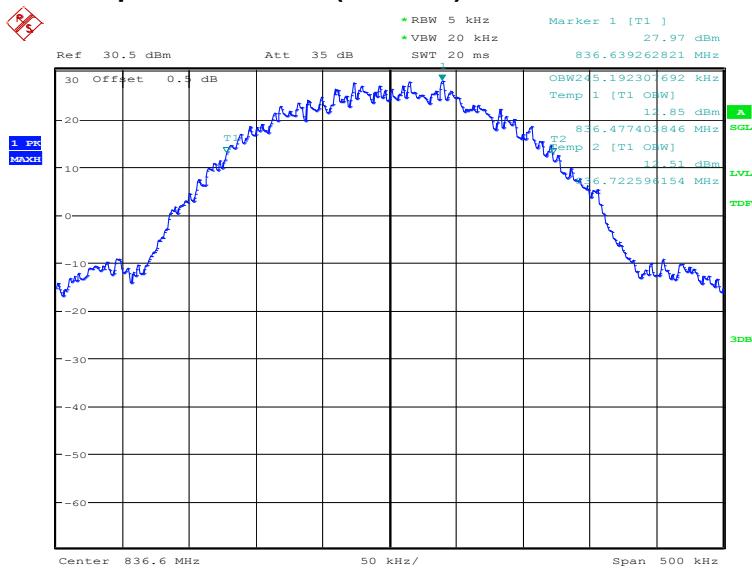
Date: 21.SEP.2022 09:20:07

Channel 251-Occupied Bandwidth (99% BW)
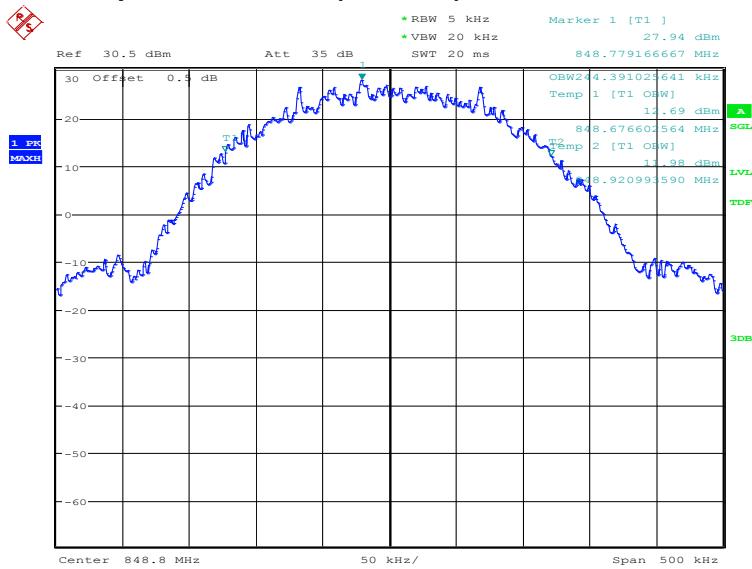
Date: 21.SEP.2022 09:20:35

EGPRS 850-8PSK (99%)

Frequency (MHz)	Occupied Bandwidth (99%)(kHz)
824.2	255.61
836.6	256.41
848.8	254.81

EGPRS 850-8PSK (99%)

Channel 128-Occupied Bandwidth (99% BW)
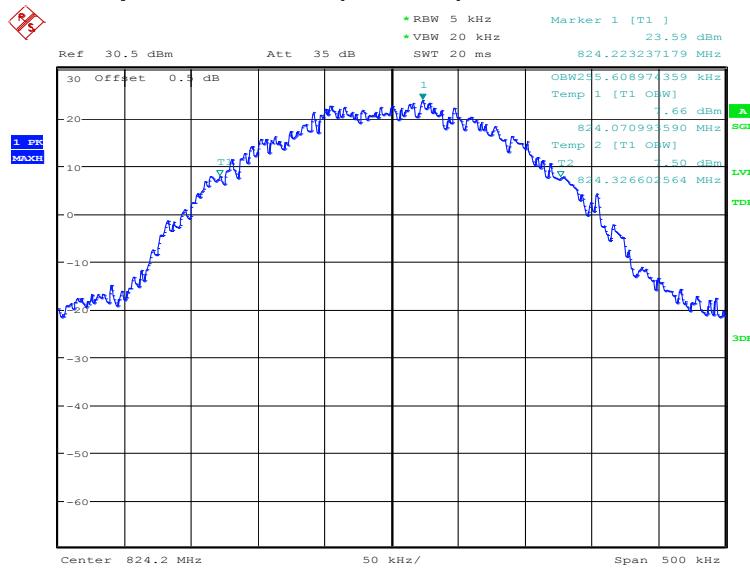
Date: 21.SEP.2022 09:40:18

Channel 190-Occupied Bandwidth (99% BW)
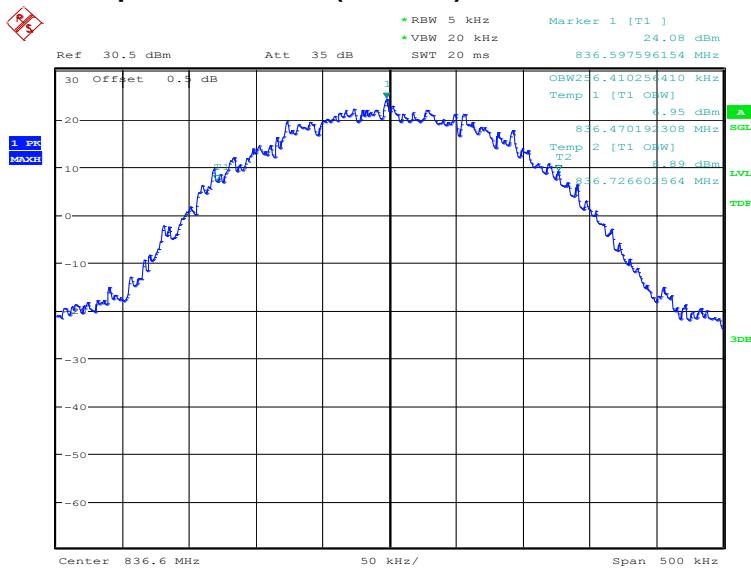
Date: 21.SEP.2022 09:40:46

Channel 251-Occupied Bandwidth (99% BW)
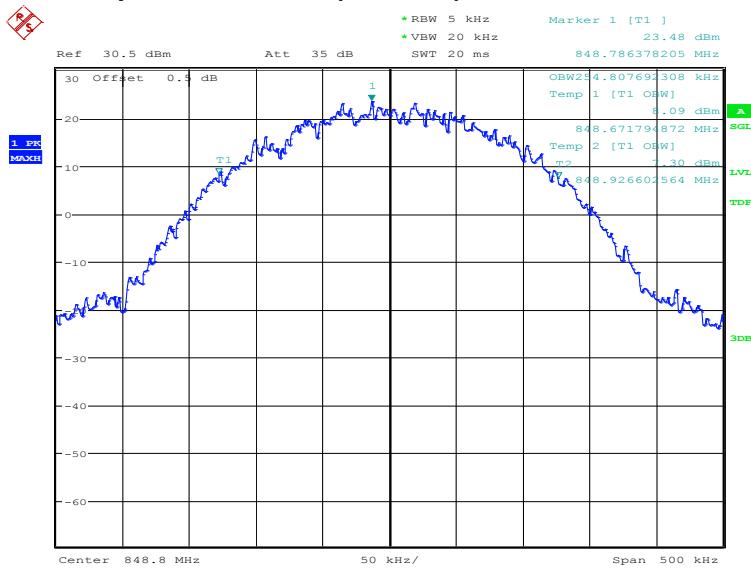
Date: 21.SEP.2022 09:41:13

PCS 1900 (99%)

Frequency (MHz)	Occupied Bandwidth (99%)(kHz)
1850.2	246.79
1880.0	247.60
1909.8	241.19

PCS 1900 (99%)

Channel 512-Occupied Bandwidth (99% BW)
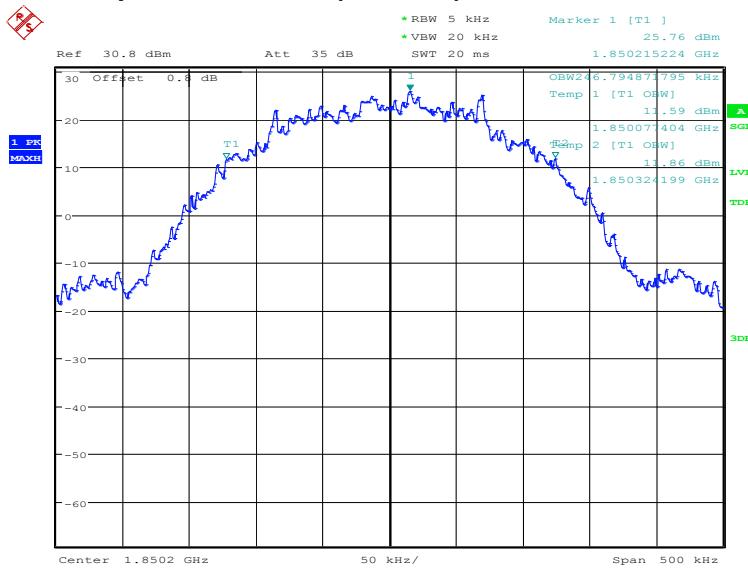
Date: 20.SEP.2022 16:54:44

Channel 661-Occupied Bandwidth (99% BW)
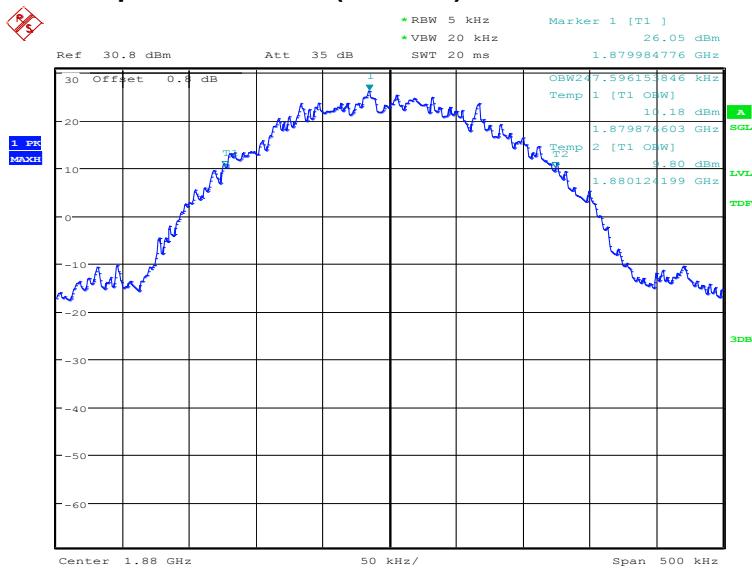
Date: 20.SEP.2022 16:55:12

Channel 810-Occupied Bandwidth (99% BW)
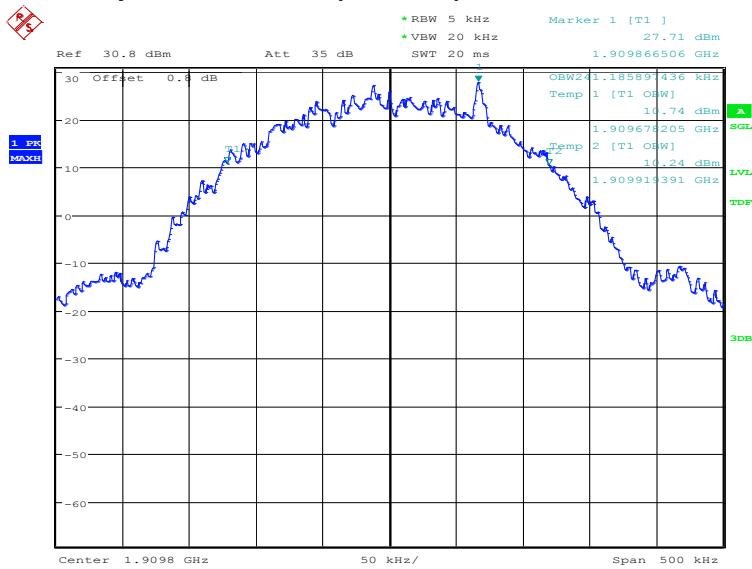
Date: 20.SEP.2022 16:55:39

GPRS 1900 (99%)

Frequency (MHz)	Occupied Bandwidth (99%)(kHz)
1850.2	244.39
1880.0	247.60
1909.8	245.99

GPRS 1900 (99%)

Channel 512-Occupied Bandwidth (99% BW)
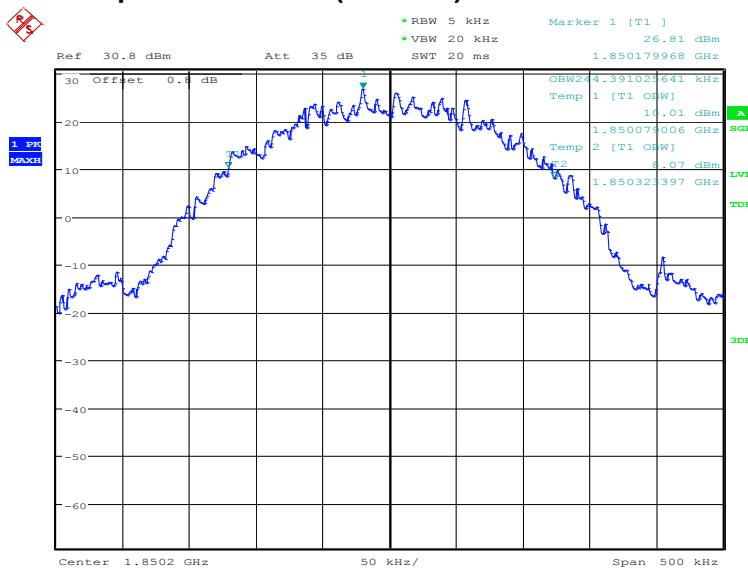
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Channel 661-Occupied Bandwidth (99% BW)
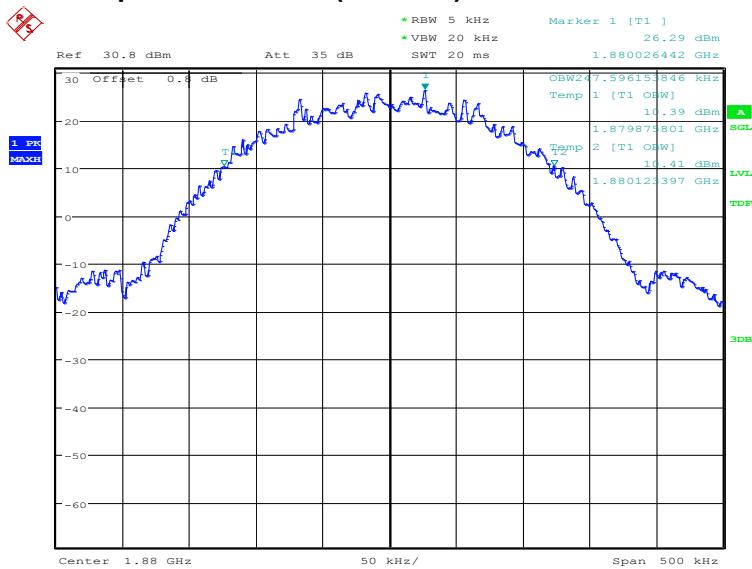
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Channel 810-Occupied Bandwidth (99% BW)
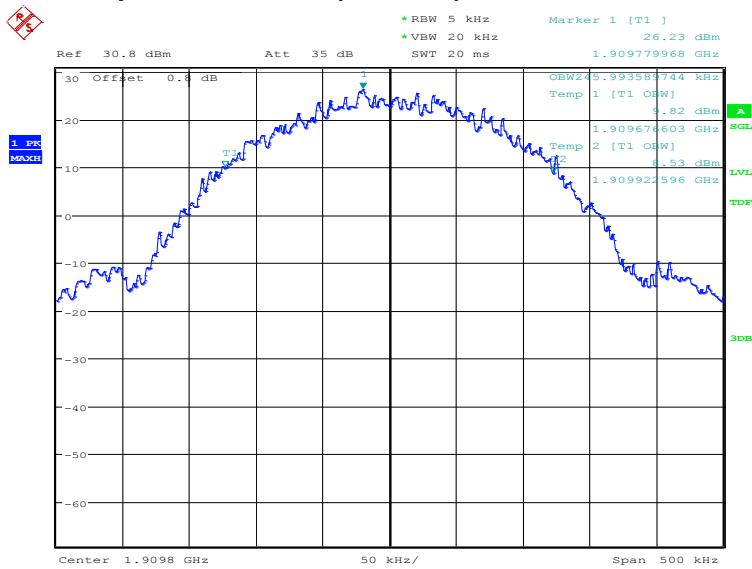
Date: 20.SEP.2022 17:34:22

EGPRS 1900-8PSK (99%)

Frequency (MHz)	Occupied Bandwidth (99%)(kHz)
1850.2	246.79
1880.0	250.80
1909.8	246.79

EGPRS 1900-8PSK (99%)

Channel 512-Occupied Bandwidth (99% BW)

Date: 20.SEP.2022 17:54:09
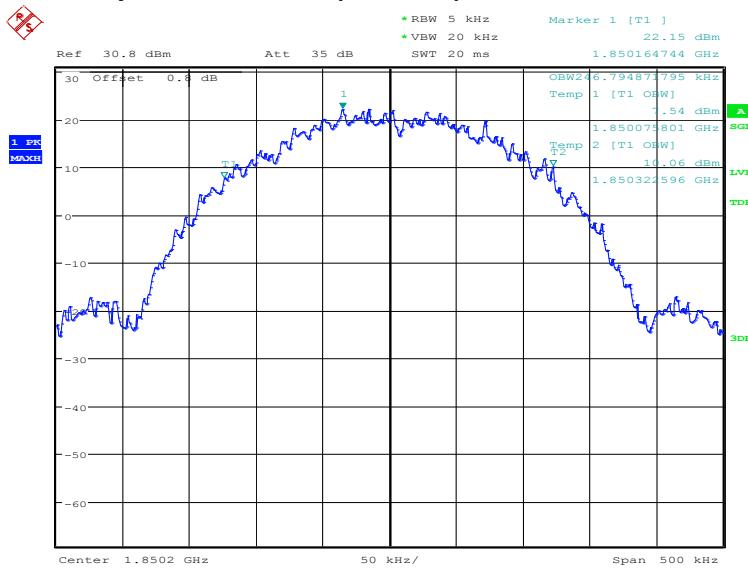
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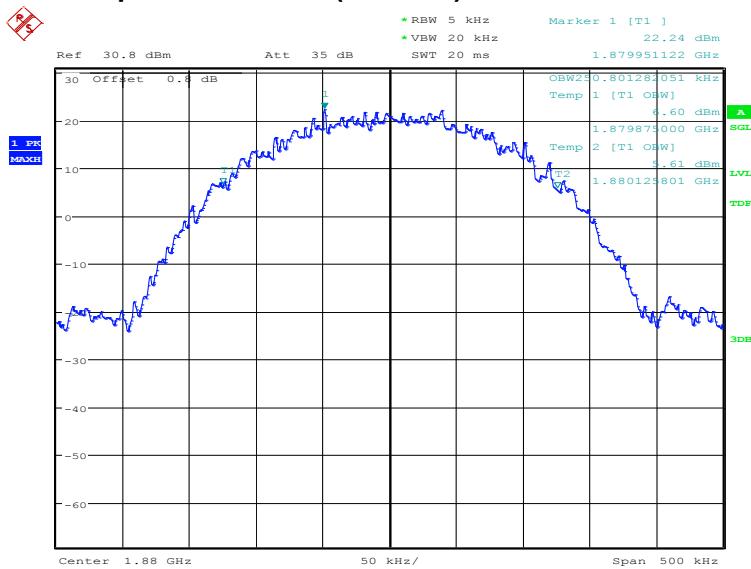
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Channel 810-Occupied Bandwidth (99% BW)
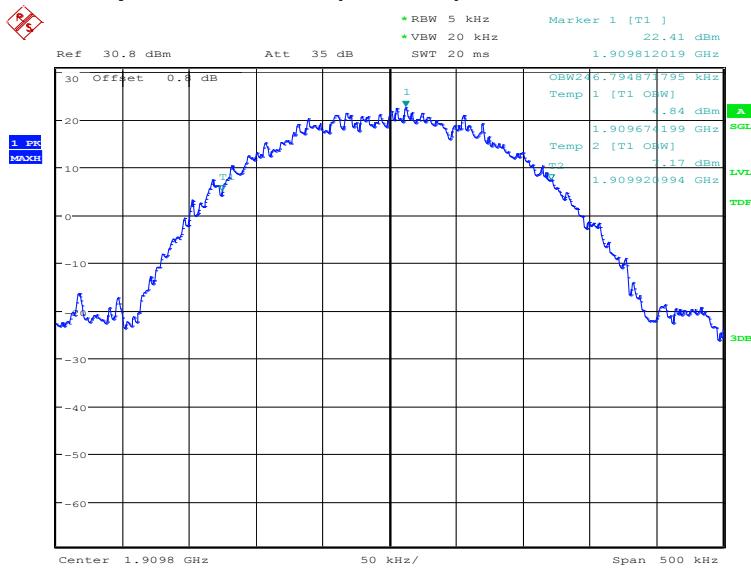
Date: 20.SEP.2022 17:55:05

Note: Expanded measurement uncertainty is U = 3428 Hz, k = 2.

A.4 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.

GSM 850 (-26dBc)

Frequency (MHz)	Emission Bandwidth (-26dBc)(kHz)
824.2	313.30
836.6	312.50
848.8	307.69

GSM 850 (-26dBc)

Channel 128-Emission Bandwidth (-26dBc BW)
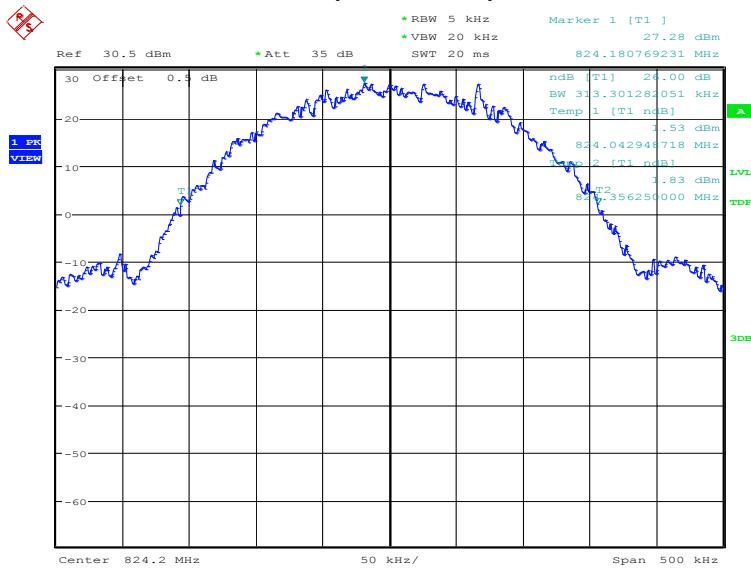
Date: 21.SEP.2022 08:43:13

Channel 190-Emission Bandwidth (-26dBc BW)
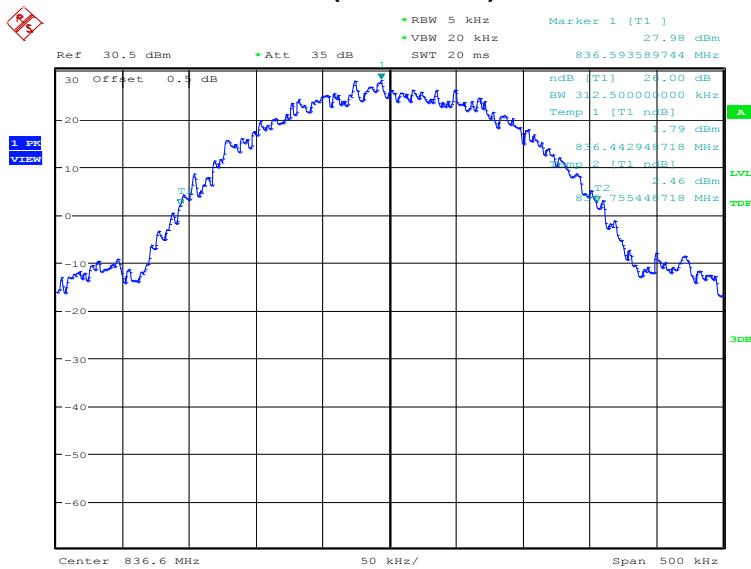
Date: 21.SEP.2022 08:43:40

Channel 251-Emission Bandwidth (-26dBc BW)
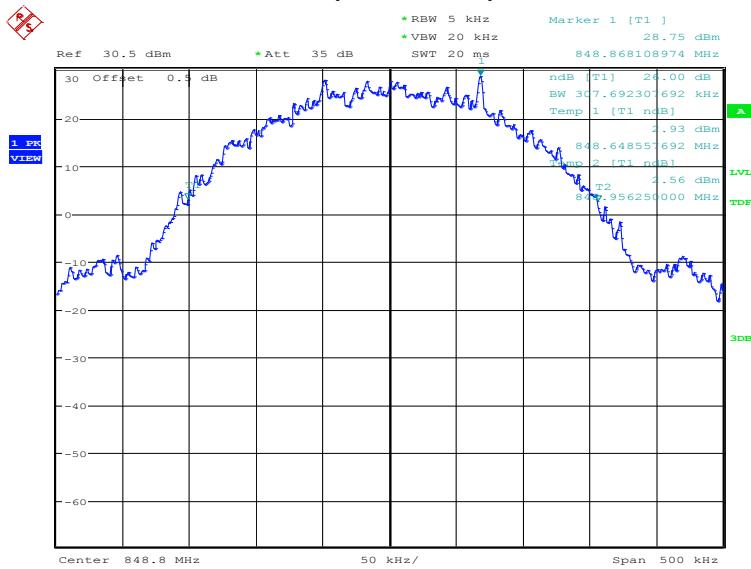
Date: 21.SEP.2022 08:44:08

GPRS 850 (-26dBc)

| Frequency (MHz)	Emission Bandwidth (-26dBc)(kHz)
824.2	314.90
836.6	317.31
848.8	313.30

GPRS 850 (-26dBc)

**Channel 128-Emission Bandwidth (-26dBc BW)**
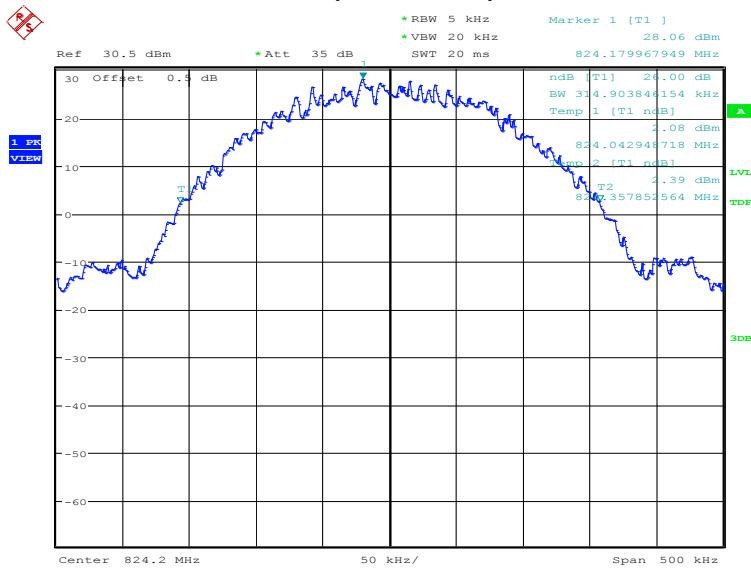
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Channel 190-Emission Bandwidth (-26dBc BW)
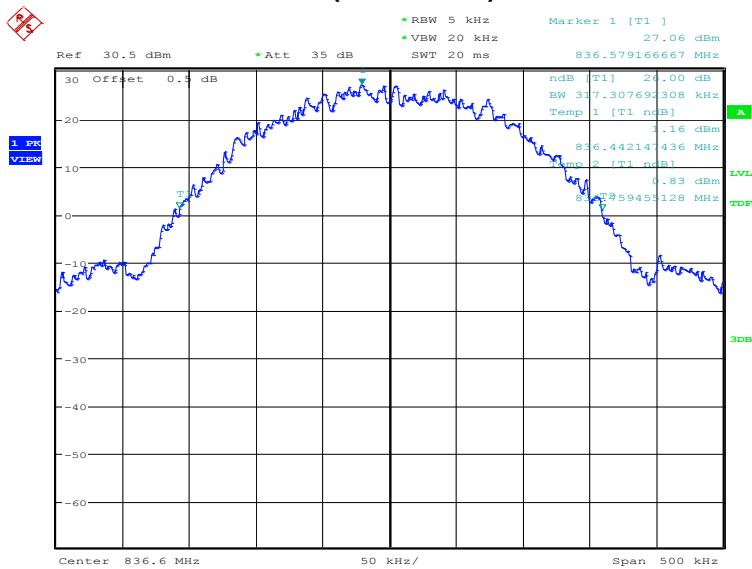
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Channel 251-Emission Bandwidth (-26dBc BW)
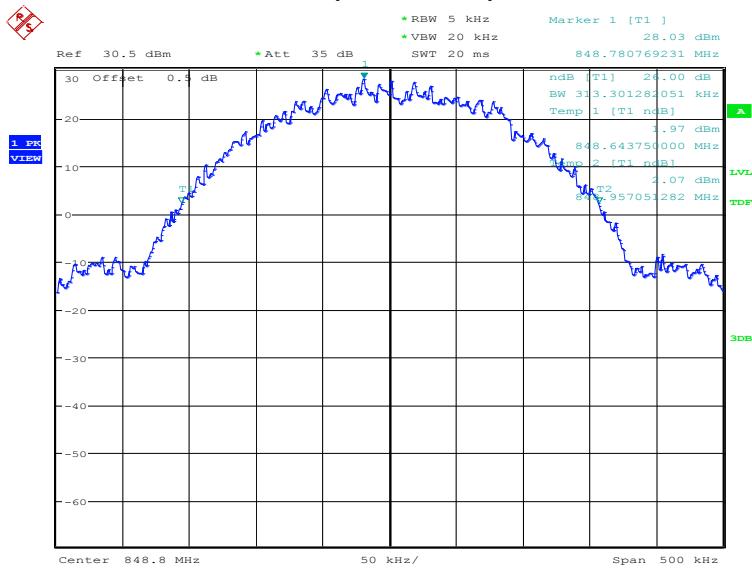
Date: 21.SEP.2022 09:22:48

EGPRS 850-8PSK (-26dBc)

Frequency (MHz)	Emission Bandwidth (-26dBc)(kHz)
824.2	318.11
836.6	320.51
848.8	314.10

EGPRS 850-8PSK (-26dBc)

Channel 128-Emission Bandwidth (-26dBc BW)
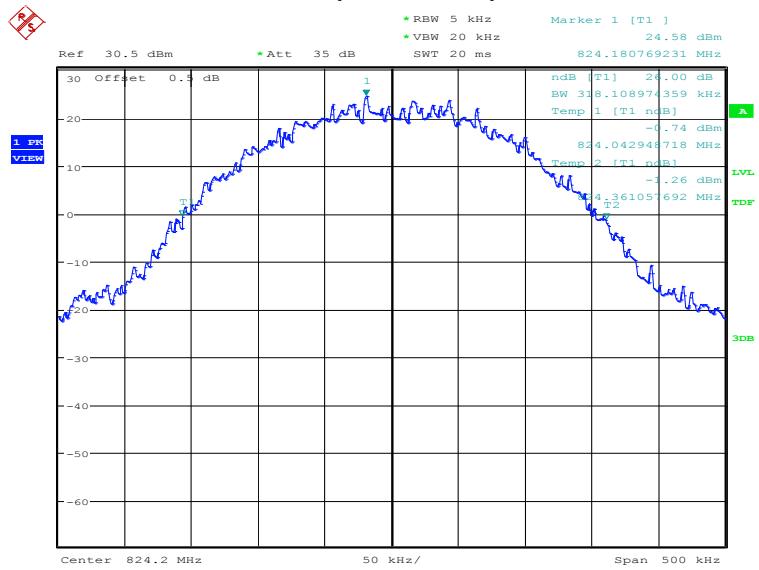
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Channel 190-Emission Bandwidth (-26dBc BW)
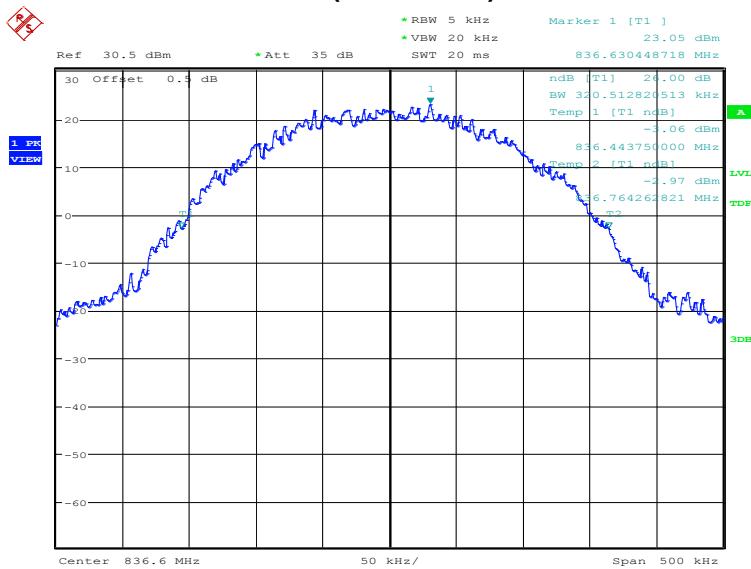
Date: 21.SEP.2022 09:42:58

Channel 251-Emission Bandwidth (-26dBc BW)
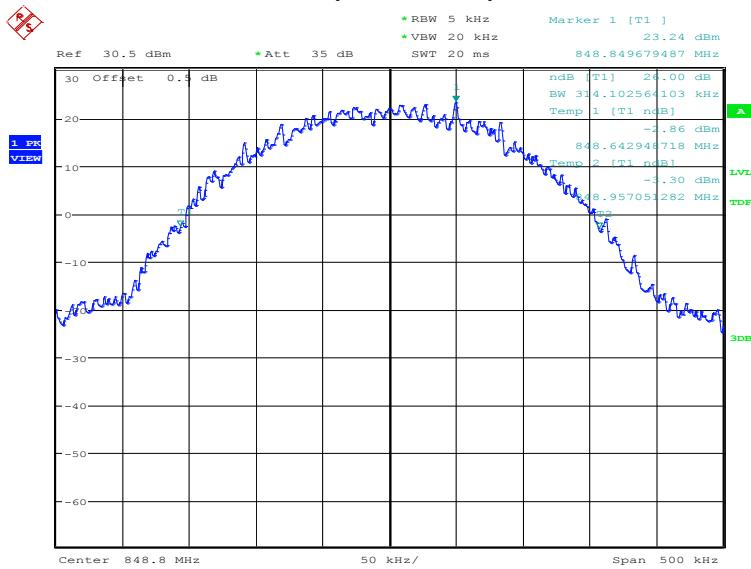
Date: 21.SEP.2022 09:43:26

PCS 1900 (-26dBc)

| Frequency (MHz)	Emission Bandwidth (-26dBc)(kHz)
1850.2	305.29
1880.0	318.11
1909.8	311.70

PCS 1900 (-26dBc)

Channel 512-Emission Bandwidth (-26dBc BW)
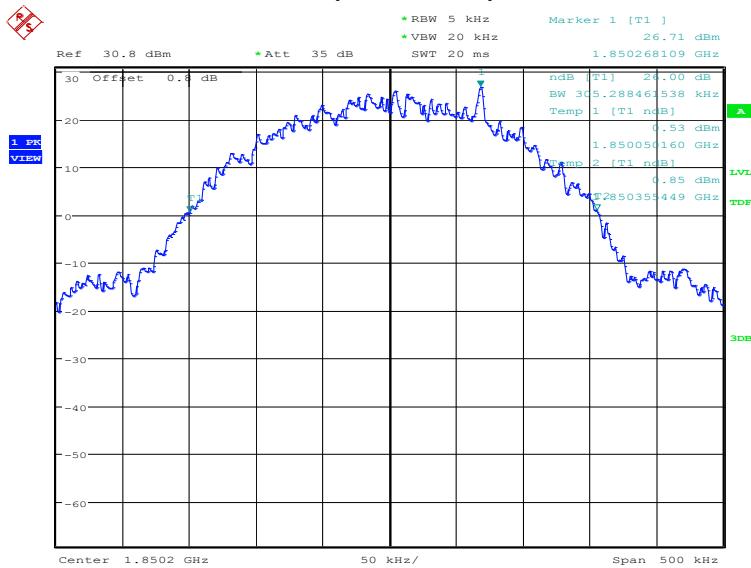

Date: 20.SEP.2022 16:56:58

Channel 661-Emission Bandwidth (-26dBc BW)
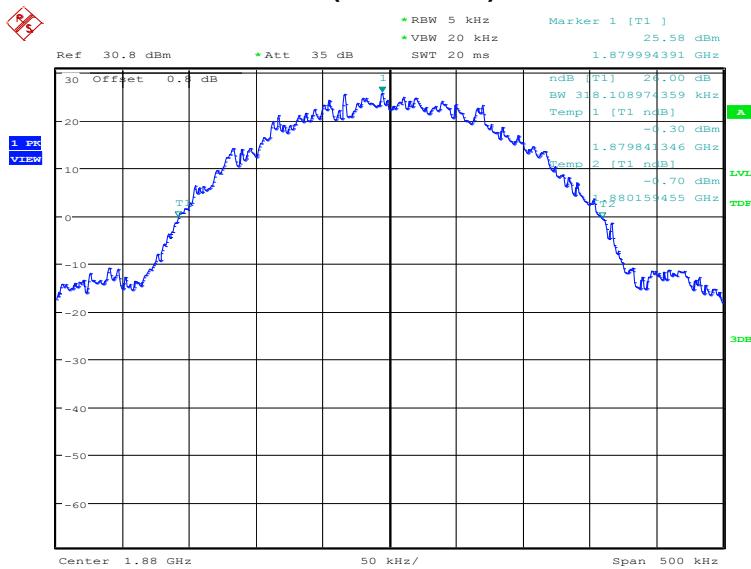
Date: 20.SEP.2022 16:57:26

Channel 810-Emission Bandwidth (-26dBc BW)
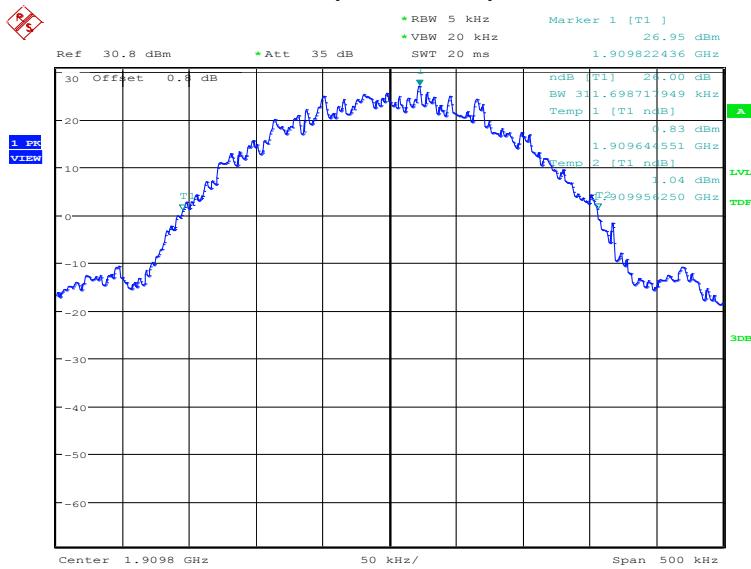
Date: 20.SEP.2022 16:57:53

GPRS 1900 (-26dBc)

Frequency (MHz)	Emission Bandwidth (-26dBc)(kHz)
1850.2	315.71
1880.0	302.08
1909.8	309.29

GPRS 1900 (-26dBc)

Channel 512-Emission Bandwidth (-26dBc BW)
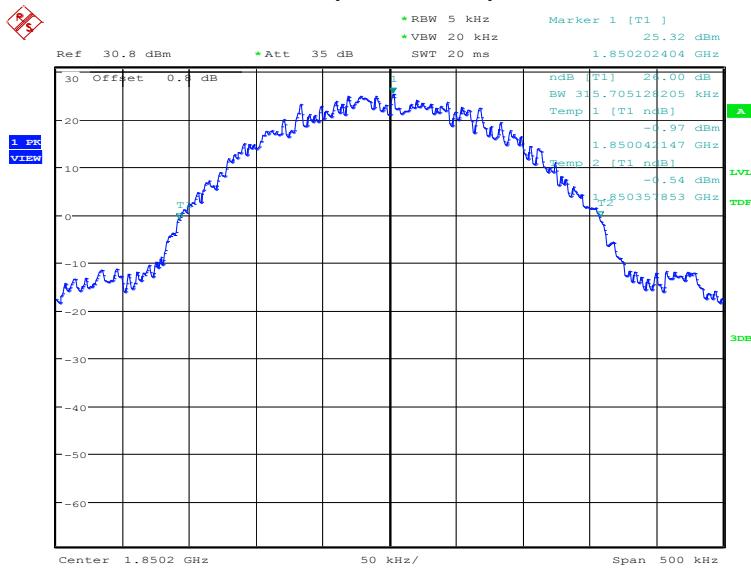
Date: 20.SEP.2022 17:35:40

Channel 661-Emission Bandwidth (-26dBc BW)
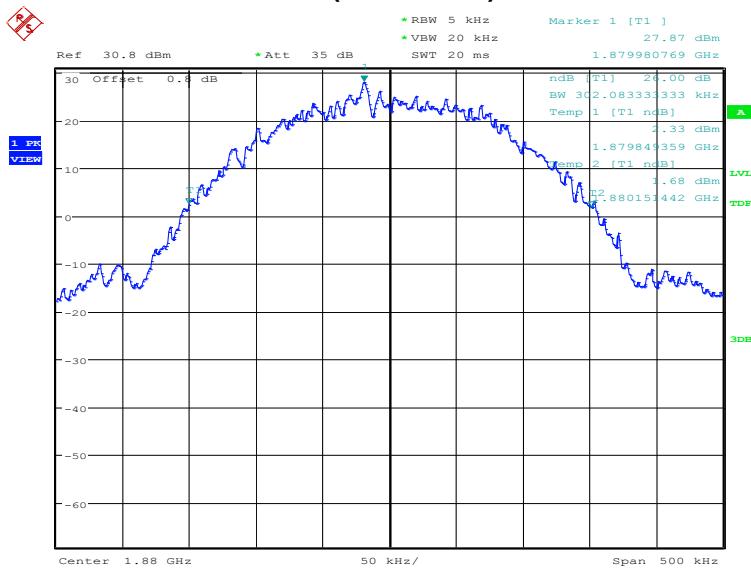
Date: 20.SEP.2022 17:36:08

Channel 810-Emission Bandwidth (-26dBc BW)
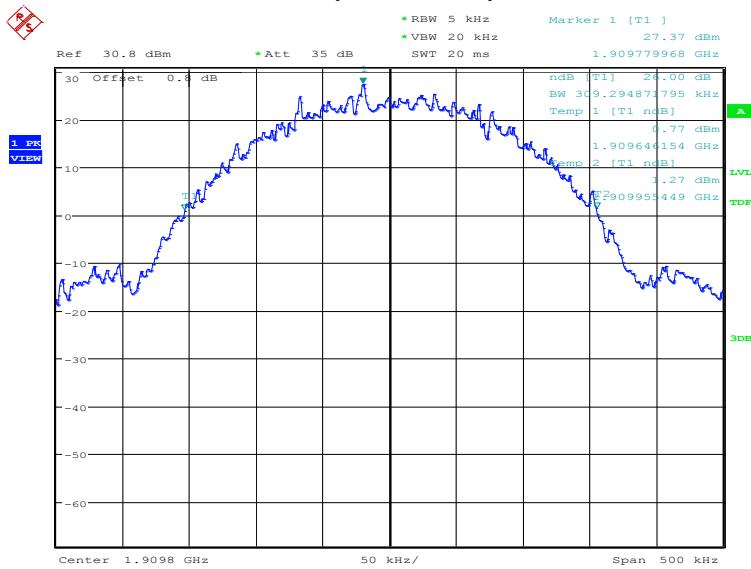
Date: 20.SEP.2022 17:36:35

EGPRS 1900-8PSK (-26dBc)

Frequency (MHz)	Emission Bandwidth (-26dBc)(kHz)
1850.2	312.50
1880.0	316.51
1909.8	306.09

EGPRS 1900-8PSK (-26dBc)

Channel 512-Emission Bandwidth (-26dBc BW)
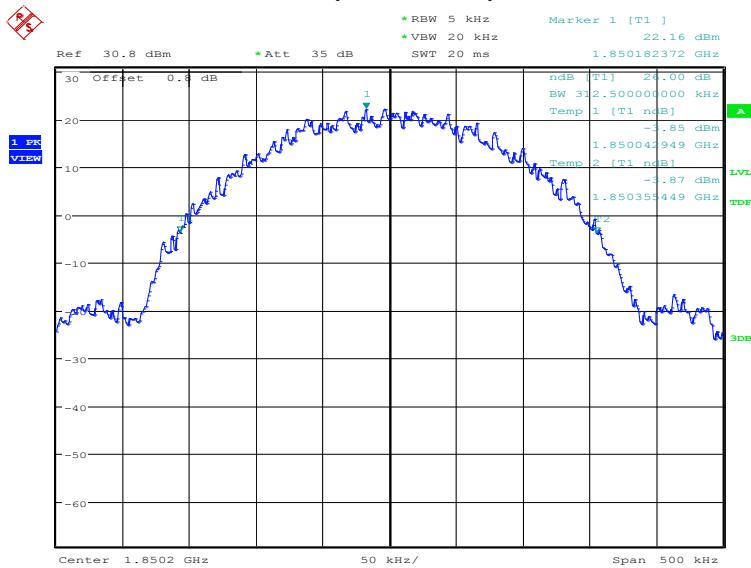
Date: 20.SEP.2022 17:56:23

Channel 661-Emission Bandwidth (-26dBc BW)

Date: 20.SEP.2022 17:56:50

Channel 810-Emission Bandwidth (-26dBc BW)

Date: 20.SEP.2022 17:57:18

Note: Expanded measurement uncertainty is U = 3428 Hz, k = 2.
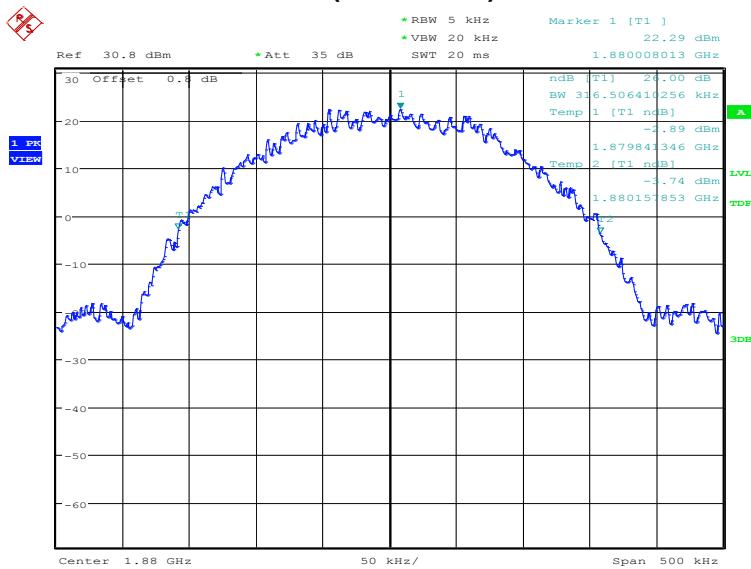
A.5 Band Edge Compliance

A.5.1 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.

The spectrum analyzer readings are corrected by [10 log (1/duty cycle)] for the non-continuous transmitting scenario.

A.5.2 Measurement result
GSM 850
## Channel 128
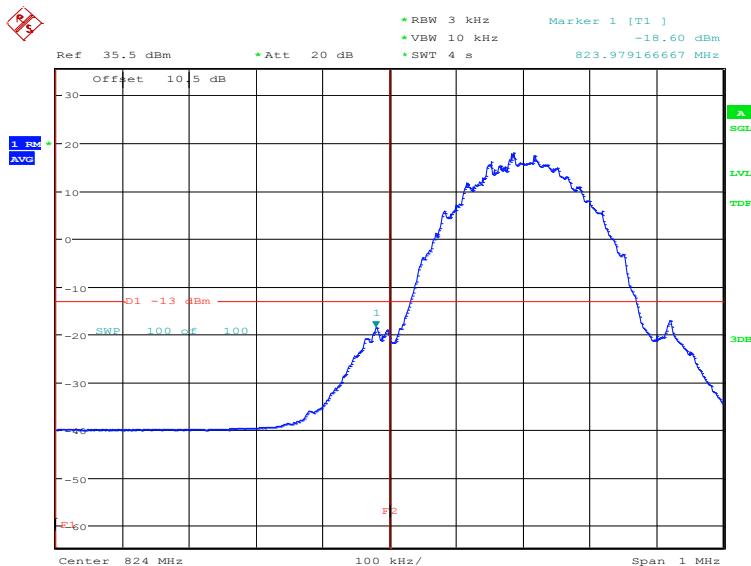
Date: 21.SEP.2022 08:52:09

Channel 251
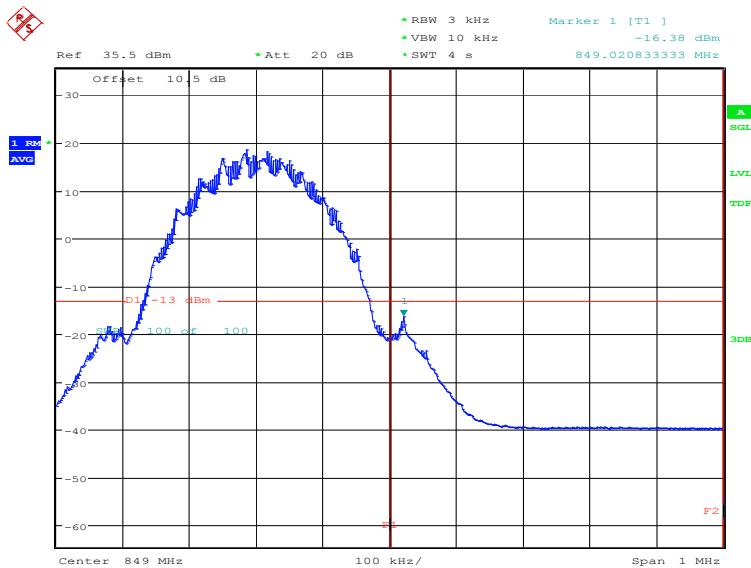
Date: 21.SEP.2022 09:07:07

GPRS 850

Channel 128
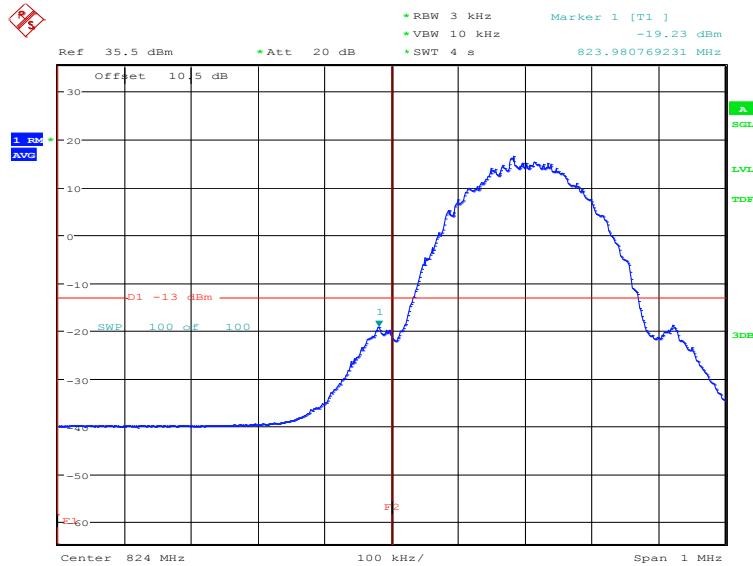
Date: 21.SEP.2022 09:30:48

Channel 251
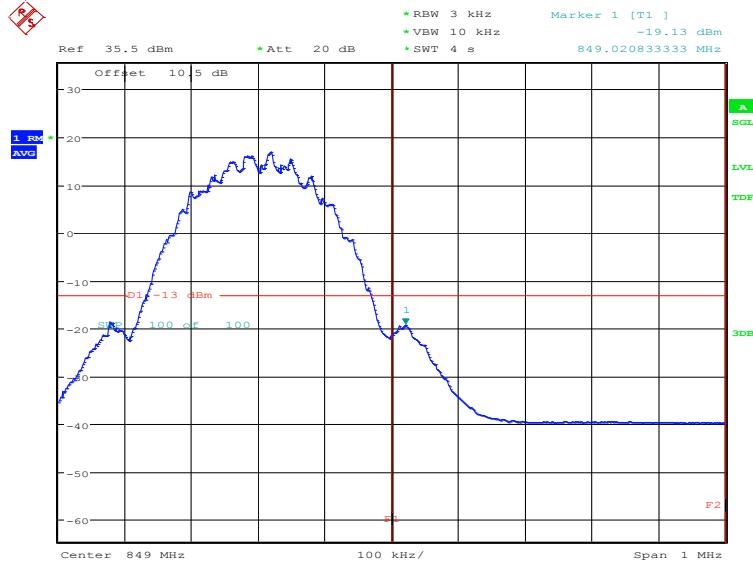
Date: 21.SEP.2022 09:37:58

PCS 1900

Channel 512
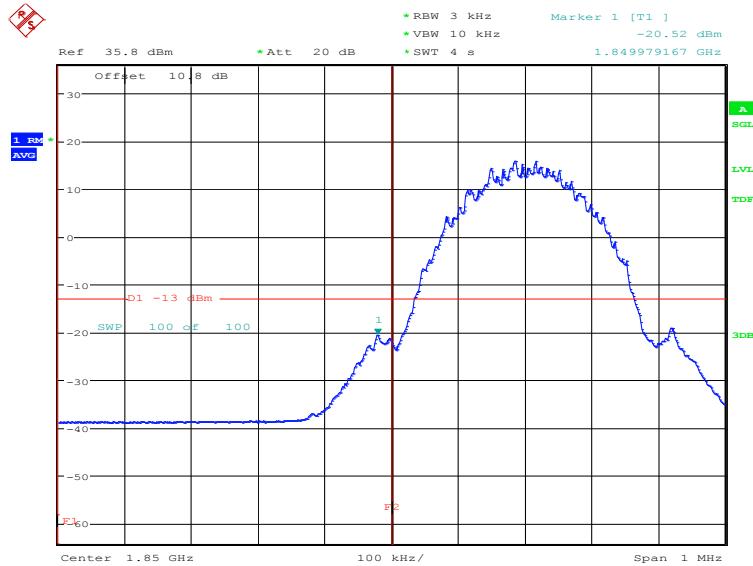
Date: 20.SEP.2022 17:05:54

Channel 810
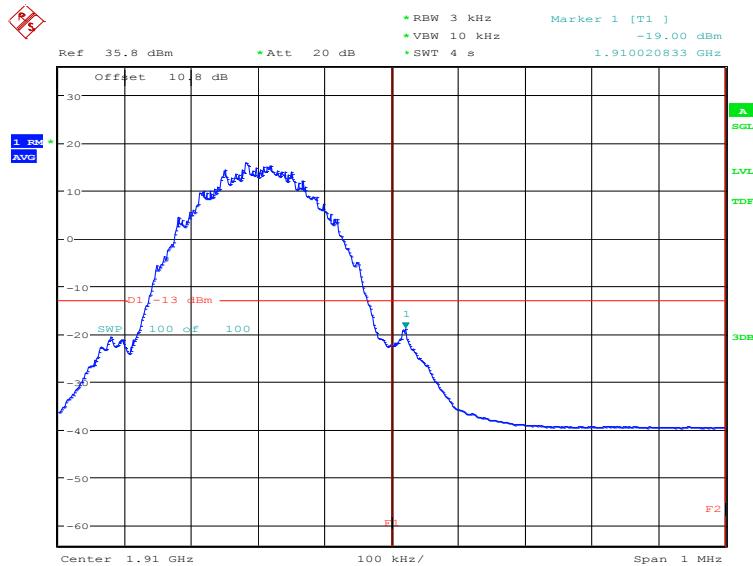
Date: 20.SEP.2022 17:20:54

GPRS 1900
Channel 512
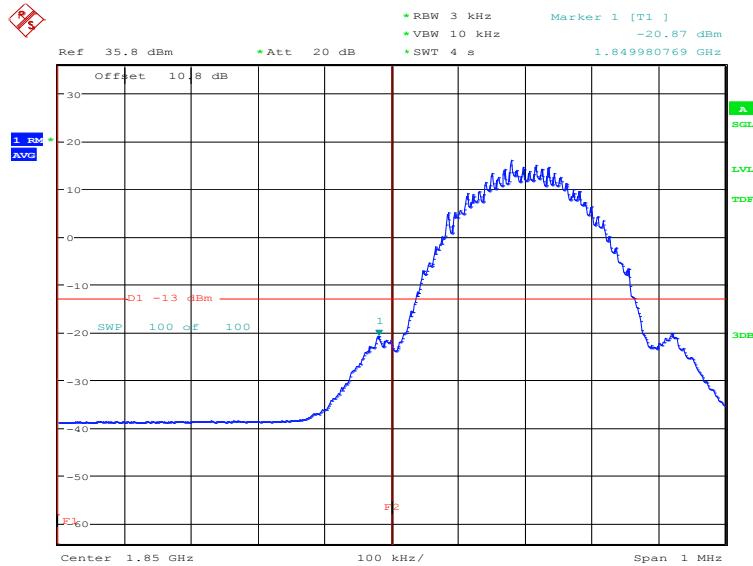
Date: 20.SEP.2022 17:44:36

Channel 810
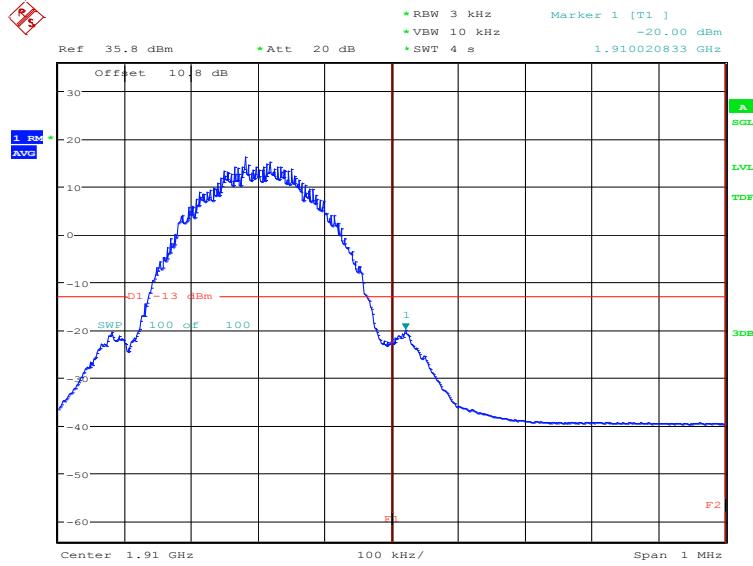
Date: 20.SEP.2022 17:51:46

Note: Expanded measurement uncertainty is U = 0.622 dB, k = 2.

A.6 Conducted Spurious Emission

A.6.1 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 greater than $2 \times$ span/RBW.

A.6.2 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.6.3 Measurement result

GSM850

**Channel 128: 30MHz – 8.49GHz**

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

Date: 21.SEP.2022 09:16:18
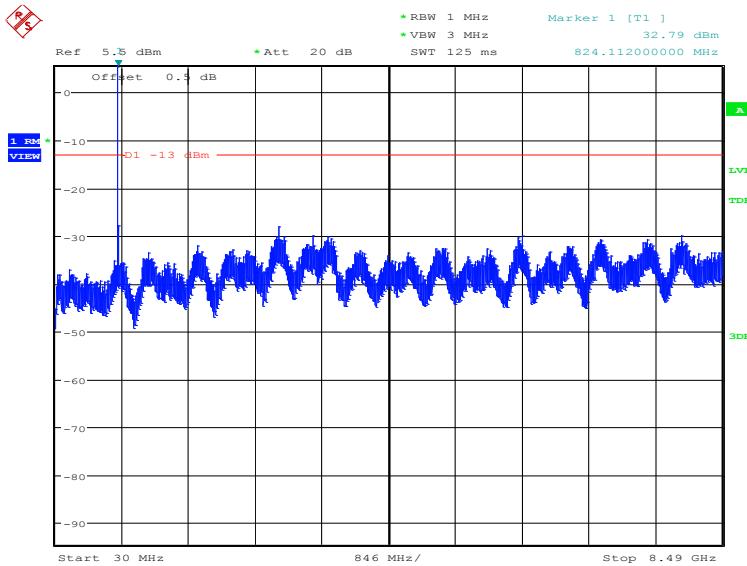
Channel 190: 30MHz – 8.49GHz

NOTE: peak above the limit line is the carrier frequency.
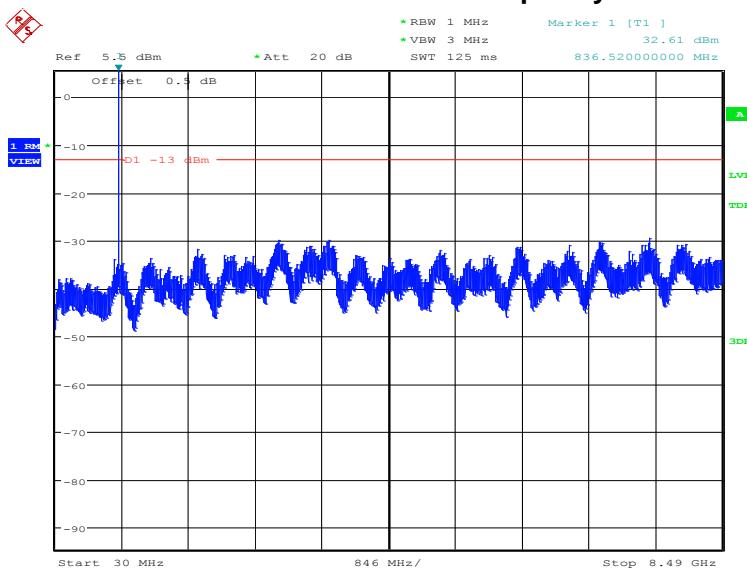
Date: 21.SEP.2022 09:16:49

Channel 251: 30MHz – 8.49GMHz

**NOTE: peak above the limit line is the carrier frequency.**
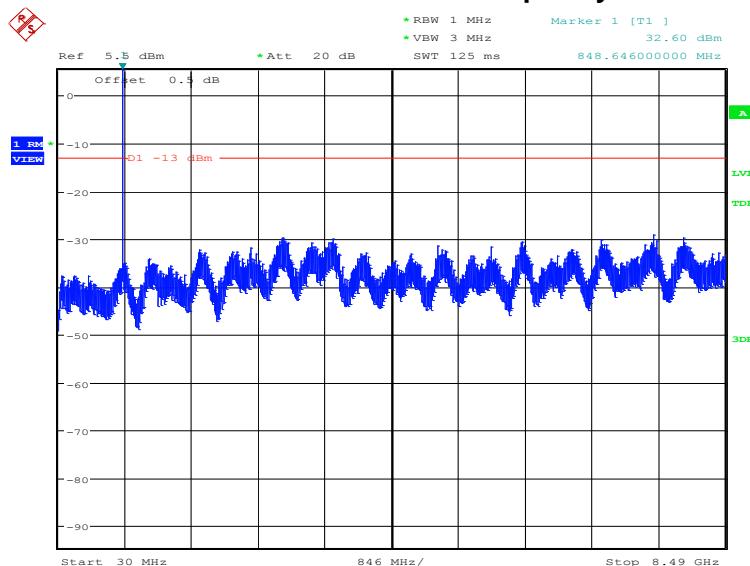
Date: 21.SEP.2022 09:17:19

PCS1900

**Channel 512: 30MHz – 19.10GHz**

NOTE: peak above the limit line is the carrier frequency.
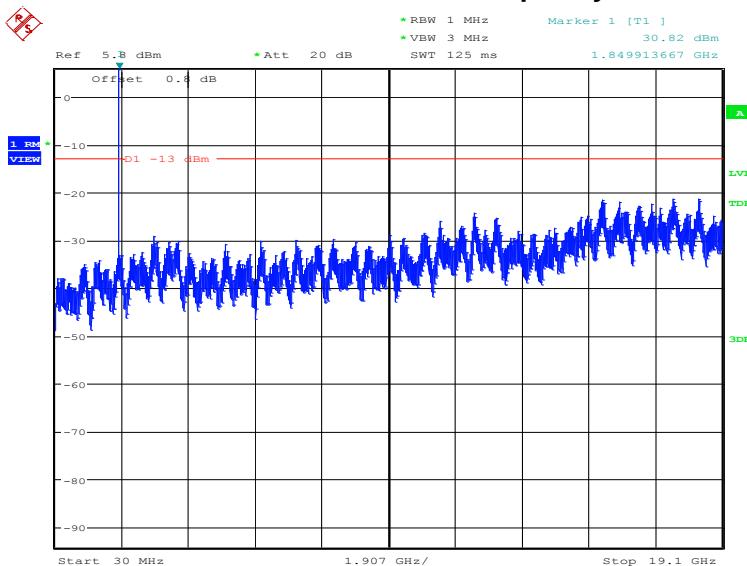
Date: 20.SEP.2022 17:30:05

Channel 661: 30MHz – 19.10GHz

NOTE: peak above the limit line is the carrier frequency.
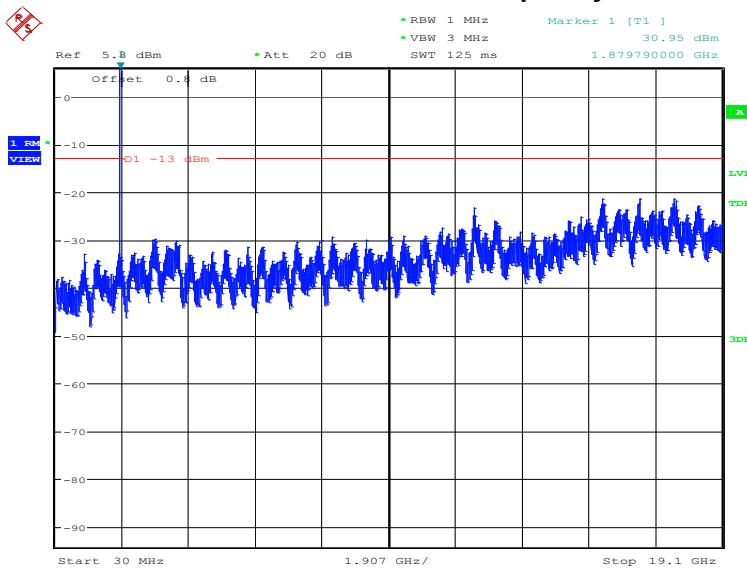
Date: 20.SEP.2022 17:30:36

Channel 810: 30MHz – 19.10GHz

NOTE: peak above the limit line is the carrier frequency.
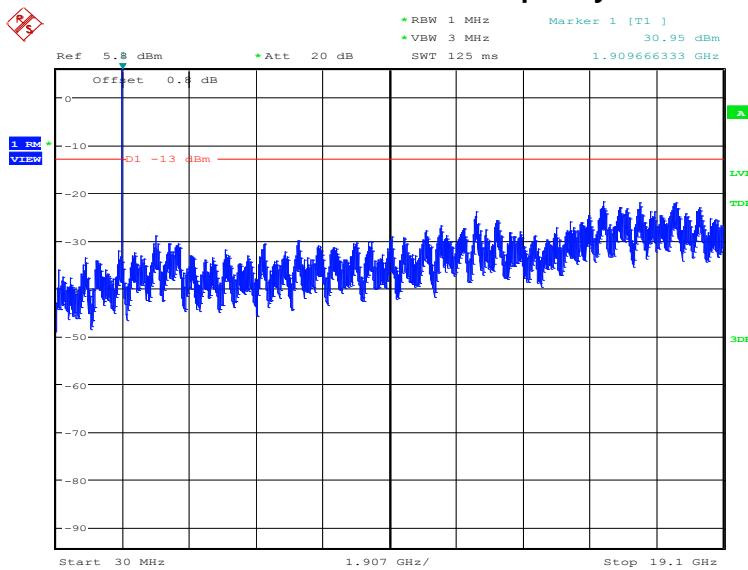
Date: 20.SEP.2022 17:31:07

Note: Expanded measurement uncertainty is U = 0.622 dB, k = 2.

A.7 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	7.72
EGPRS1900(8PSK)	1880.0	10.38

Note: Expanded measurement uncertainty is U = 0.578 dB, k = 2.

Annex B: Accreditation Certificate

United States Department of Commerce
National Institute of Standards and Technology

NVLAP

ilac-MRA
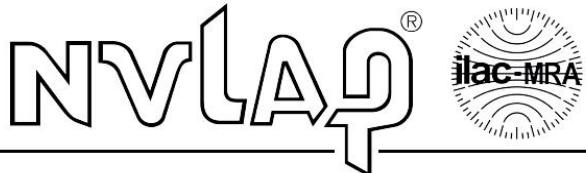
Certificate of Accreditation to ISO/IEC 17025:2017

NVLAP LAB CODE: 600118-0

Telecommunication Technology Labs, CAICT
Beijing
China

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Electromagnetic Compatibility & Telecommunications

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2022-10-01 through 2023-09-30
Effective Dates

For the National Voluntary Laboratory Accreditation Program

END OF REPORT