TEST REPORT

No. I21Z61621-WMD01

for

TCL Communication Ltd.

GSM/UMTS/LTE Mobile phone

Model Name: A509DL

FCC ID: 2ACCJH131

with

Hardware Version: PIO

Software Version: vL73

Issued Date: 2021-09-30

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.

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I21Z61621-WMD01	Rev.0	1st edition	2021-09-02
I21Z61621-WMD01	Rev.1	2nd edition Delete the data of initial model.	2021-09-14
I21Z61621-WMD01	Rev.2	3rd edition Update the results in A.1.	2021-09-29
I21Z61621-WMD01	Rev.3	4th edition Update the table in Chapter 6.	2021-09-30

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

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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

Location 2: CTTL(Shouxiang)

Address: Shouxiang Building, No.51 Xueyan Road, Haidian District, Beijing 100191, P.R. China

1.3. Testing Environment

Normal Temperature: 15-35℃

Relative Humidity: 20-75%

1.4. Project Data

Testing Start Date: 2020-11-24

Testing End Date: 2021-09-29

1.5. Signature

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:	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

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

3.1. About EUT

Description	GSM/UMTS/LTE Mobile phone
Model Name	A509DL
FCC ID	2ACCJH131
Antenna	Embedded
Output power	27.45dBm maximum EIRP measured for PCS1900
Extreme vol. Limits	3.5VDC 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
UT16a	015858000011746	PIO	vL73	2021-08-13
UT13a	015858000011852	PIO	vL73	2021-08-18

*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
AE2	Battery

AE1

Model	CAB2880000C7
Manufacturer	VEKEN
Capacitance	3000mAh

AE2

Model	CAB2880001C1
Manufacturer	BYD
Capacitance	3000mAh

*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 client or manufacturer, which are the bases of testing.

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	10-1-20 Edition
FCC Part 24	PERSONAL COMMUNICATIONS SERVICES	10-1-20 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. Laboratory Environment

Fully-anechoic chamber FAC-3 (9 meters×6.5 meters×4 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ˚C, Max. = 35 ˚C
Relative humidity	Min. = 15 %, Max. = 75 %
Shielding effectiveness	0.014MHz - 1MHz, >60dB; 1MHz - 1000MHz, >90dB.
Electrical insulation	> 2 MΩ
Ground system resistance	< 4 Ω
Site voltage standing-wave ratio (S_{VSWR})	Between 0 and 6 dB, from 1GHz to 18GHz
Uniformity of field strength	Between 0 and 6 dB, from 80 to 6000 MHz

6. Summary Of Test Result

GSM850

Items	List	Clause in FCC rules	Verdict
1	Output Power	22.913	P
2	Emission Limit	22.917	P
3	Band Edge Compliance	22.917	P

PCS1900

Items	List	Clause in FCC rules	Verdict
1	Output Power	24.232	P
2	Emission Limit	24.238	P
3	Band Edge Compliance	24.238	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.

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.

The Equipment Under Test (EUT) is a Class 2 Permissive Change to A509DL (FCC ID: 2ACCJH131), Output Power, Emission Limit and Band Edge Compliance are tested.

For detail differences between two models please refer the Declaration of Changes document.

7. Test Equipments Utilized

Description	Type	Series Number	Manufacture	Cal Due Date	Calibration Interval
Universal Radio Communication Tester	CMU200	108646	R&S	2021-12-17	1 year
Spectrum Analyzer	FSU	200030	R&S	2022-06-02	1 year
Climate chamber	SH-242	93008556	ESPEC	2023-12-23	3 years
Test Receiver	E4440A	MY48250642	Agilent	2022-03-04	1 year
Universal Radio Communication Tester	CMW500	143008	R&S	2021-12-01	1 year
EMI Antenna	VULB9163	9163-235	Schwarzbeck	2022-04-07	1 year
Signal Generator	N5183A	MY49060052	Agilent	2022-07-11	1 year
EMI Antenna	3117	00058889	ETS-Lindgren	2021-09-22	1 year
EMI Antenna	3117	00119021	ETS-Lindgren	2022-01-14	1 year

Note: The test dates were before the calibration due dates of equipment used (the EMI Antenna which series number is 3117).

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	32.31
836.6	5	32.27
848.8	5	32.15

GPRS(GMSK,1Slot)

Frequency (MHz)	Power Step	Output power (dBm)
824.2	3	32.31
836.6	3	32.27
848.8	3	32.13

EGPRS(8PSK,1Slot)

Frequency (MHz)	Power Step	Output power (dBm)
824.2	6	26.81
836.6	6	26.55
848.8	6	26.35

PCS1900

GSM(GMSK)

Frequency (MHz)	Power Step	Output power (dBm)
1850.2	0	28.65
1880.0	0	29.03
1909.8	0	29.47

GPRS(GMSK,1Slot)

Frequency (MHz)	Power Step	Output power (dBm)
1850.2	3	28.71
1880.0	3	29.07
1909.8	3	29.51

EGPRS(8PSK,1Slot)

Frequency (MHz)	Power Step	Output power (dBm)
1850.2	5	25.64
1880.0	5	25.77
1909.8	5	25.68

A.1.3 Radiated

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

According to KDB 412172 D01 and ANSI C63.26 the relevant equation for determining the maximum ERP or EIRP from the measured RF output power is given in Equation as follows:

ERP or EIRP = $P_T + G_T – L_C$, ERP = EIRP -2.15, 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_T = transmitter output power in dBm;

G_T = gain of the transimitting antenna, in dBd(ERP) or dBi(EIRP);

1. L_C = signal attenuation in the connecting cable between the transmitter and antenna, in dB.

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)	Power Step	Output power Conducted (dBm)	Output power Radiated(dBm) (G_T – L_C = -4.6)
824.2	5	32.31	25.56
836.6	5	32.27	25.52
848.8	5	32.15	25.40

GPRS(GMSK,1Slot)

Frequency (MHz)	Power Step	Output power Conducted (dBm)	Output power Radiated(dBm) (G_T – L_C = -4.6)
824.2	3	32.31	25.56
836.6	3	32.27	25.52
848.8	3	32.13	25.38

EGPRS(8PSK,1Slot)

Frequency (MHz)	Power Step	Output power Conducted (dBm)	Output power Radiated(dBm) (G_T – L_C = -4.6)
824.2	6	26.81	20.06
836.6	6	26.55	19.80
848.8	6	26.35	19.60

PCS1900-EIRP

Limits

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

Measurement result

GSM

Frequency (MHz)	Power Step	Output power Conducted (dBm)	Output power Radiated(dBm) (G_T – L_C = -1.3)
1850.2	0	28.65	27.35
1880.0	0	29.03	27.73
1909.8	0	29.47	28.17

GPRS

Frequency (MHz)	Power Step	Output power Conducted (dBm)	Output power Radiated(dBm) (G_T – L_C = -1.3)
1850.2	3	28.71	27.41
1880.0	3	29.07	27.77
1909.8	3	29.51	28.21

EGPRS-8PSK

Frequency (MHz)	Power Step	Output power Conducted (dBm)	Output power Radiated(dBm) (G_T – L_C = -1.3)
1850.2	5	25.64	24.34
1880.0	5	25.77	24.47
1909.8	5	25.68	24.38

A.2 Emission Limit

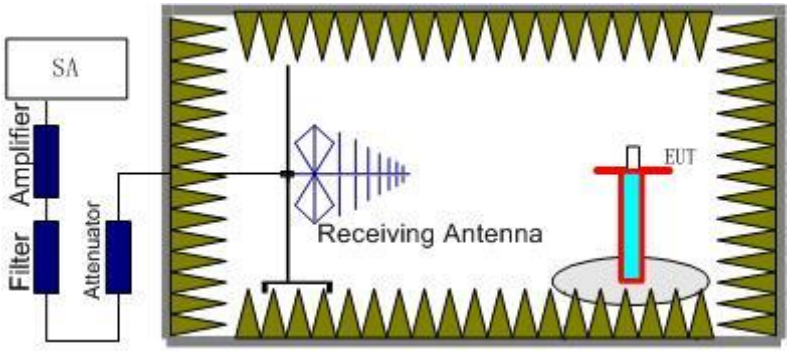
A.2.1 Measurement Method

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

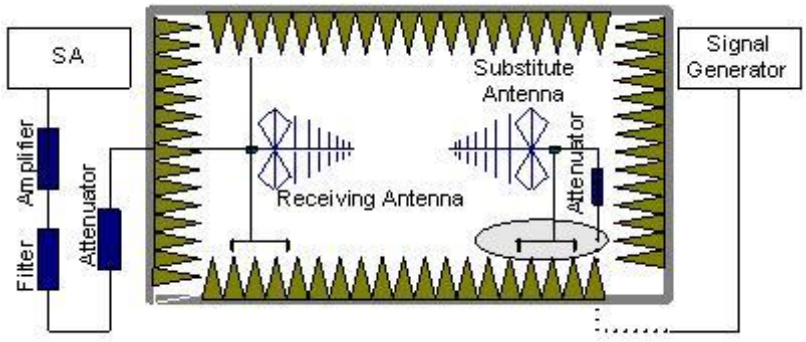
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment. The resolution bandwidth is set as outlined in Part 24.238 and Part 22.917. The spectrum is scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and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

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

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	-42.03	3.56	5.23	2.15	-42.51	-13.00	29.50	V
2472.00	-30.20	4.59	6.02	2.15	-30.92	-13.00	17.90	H
3297.02	-44.49	5.29	7.71	2.15	-44.22	-13.00	31.20	H
4126.02	-49.01	6.04	9.03	2.15	-48.17	-13.00	35.20	H
4949.01	-49.97	6.69	9.85	2.15	-48.96	-13.00	36.00	H
5774.01	-31.75	7.23	10.55	2.15	-30.58	-13.00	17.60	H

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
1678.01	-60.04	3.58	5.18	2.15	-60.59	-13.00	47.60	H
2510.00	-29.89	4.63	6.12	2.15	-30.55	-13.00	17.60	H
3346.02	-48.81	5.31	7.83	2.15	-48.44	-13.00	35.40	H
4187.02	-50.03	6.18	9.09	2.15	-49.27	-13.00	36.30	H
5031.01	-53.63	6.58	9.94	2.15	-52.42	-13.00	39.40	V
5858.01	-42.16	7.26	10.53	2.15	-41.04	-13.00	28.00	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	-42.95	3.60	5.14	2.15	-43.56	-13.00	30.60	H
2546.00	-28.08	4.66	6.18	2.15	-28.71	-13.00	15.70	H
3395.02	-48.99	5.36	7.95	2.15	-48.55	-13.00	35.60	V
4248.02	-41.93	6.24	9.15	2.15	-41.17	-13.00	28.20	V
5095.01	-53.36	6.76	10.03	2.15	-52.24	-13.00	39.20	H
5945.01	-40.93	7.47	10.51	2.15	-40.04	-13.00	27.00	H

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	-47.41	6.43	8.48	-45.36	-13.00	32.36	H
5554.02	-35.79	7.19	10.59	-32.39	-13.00	19.39	H
7405.01	-41.28	8.13	12.09	-37.32	-13.00	24.32	H
9257.01	-37.49	9.06	13.25	-33.30	-13.00	20.30	H
11111.01	-49.64	9.79	13.18	-46.25	-13.00	33.25	V
12961.01	-47.30	10.48	13.48	-44.30	-13.00	31.30	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	-45.84	6.26	8.56	-43.54	-13.00	30.54	V
5646.02	-39.40	7.27	10.57	-36.10	-13.00	23.10	H
7526.01	-34.48	8.28	12.22	-30.54	-13.00	17.54	H
9412.01	-38.97	9.10	13.35	-34.72	-13.00	21.72	H
11289.01	-46.02	9.93	13.14	-42.81	-13.00	29.81	V
13173.01	-44.63	10.62	13.74	-41.51	-13.00	28.51	V

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
3819.02	-48.99	6.08	8.65	-46.42	-13.00	33.42	H
5734.02	-40.89	7.29	10.55	-37.63	-13.00	24.63	H
7644.01	-38.47	8.17	12.32	-34.32	-13.00	21.32	H
9557.01	-33.86	9.34	13.34	-29.86	-13.00	16.86	H
11467.01	-48.36	9.90	13.11	-45.15	-13.00	32.15	V
13377.01	-48.86	10.57	14.03	-45.40	-13.00	32.40	V

Note1: Expanded measurement uncertainty is U = 5.16 dB, k = 2.

Note2: The measurement results showed here are worst cases

A.3 Band Edge Compliance

A.3.1 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.

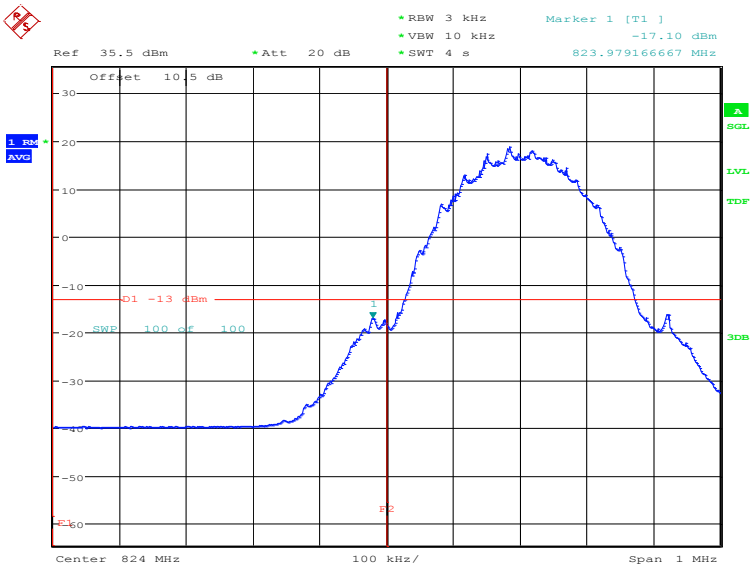
According to KDB 971168, a relaxation of the reference bandwidth is often provided for measurements within a specified frequency range at the edge of the authorized frequency block/band. This is often implemented by permitting the use of a narrower RBW (typically limited to a minimum RBW of 1% of the 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.

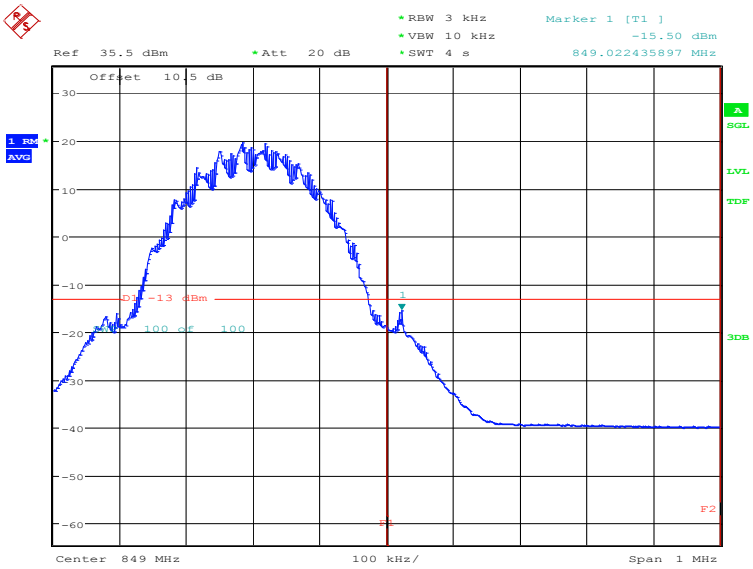
A.6.2 Measurement result

GSM 850

Channel 128

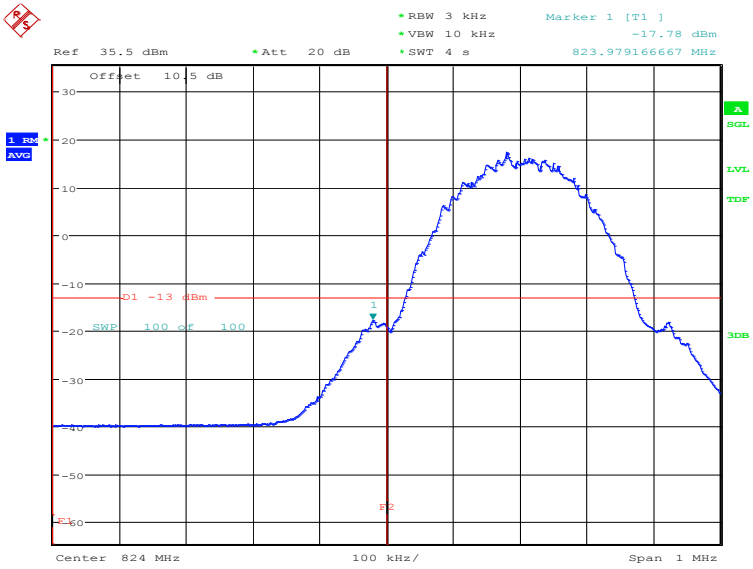


Channel 251



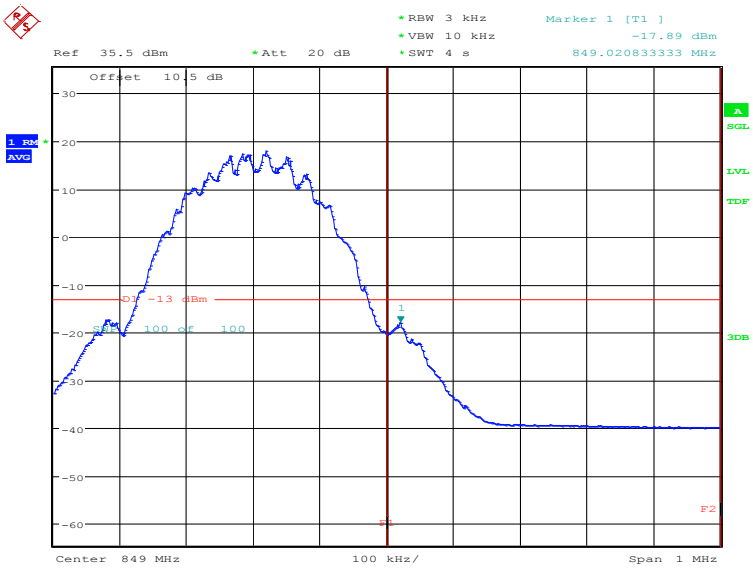
GPRS 850

Channel 128



Date: 24.AUG.2021 15:18:23

Channel 251



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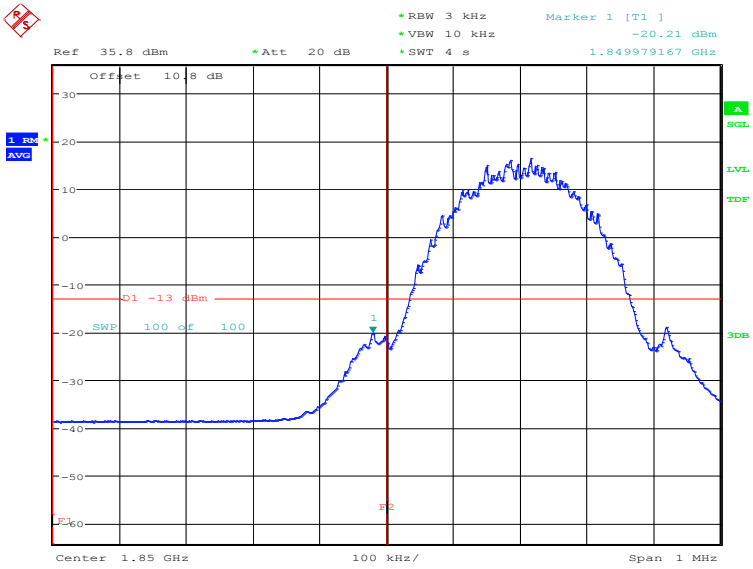
PCS 1900

Channel 512



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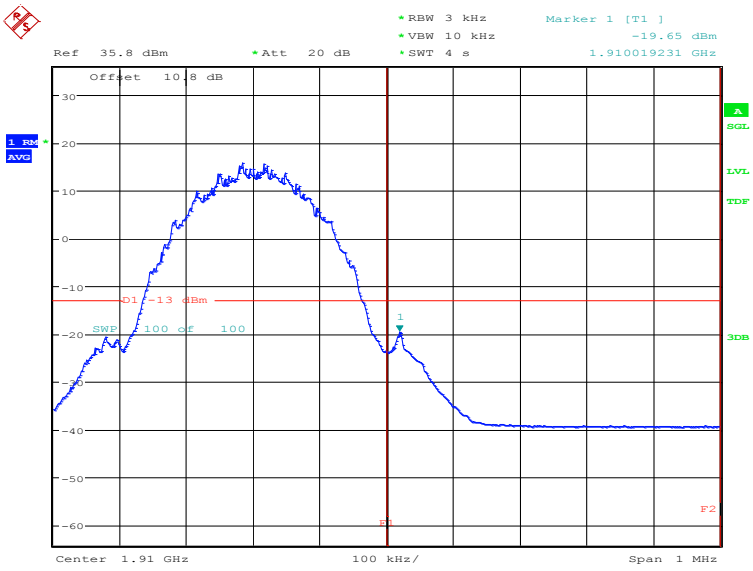
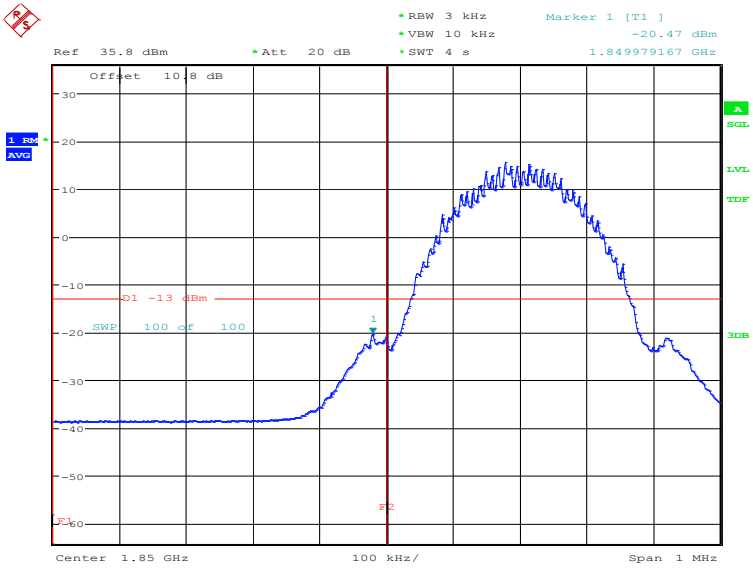
Channel 810



Date: 24.AUG.2021 15:02:39

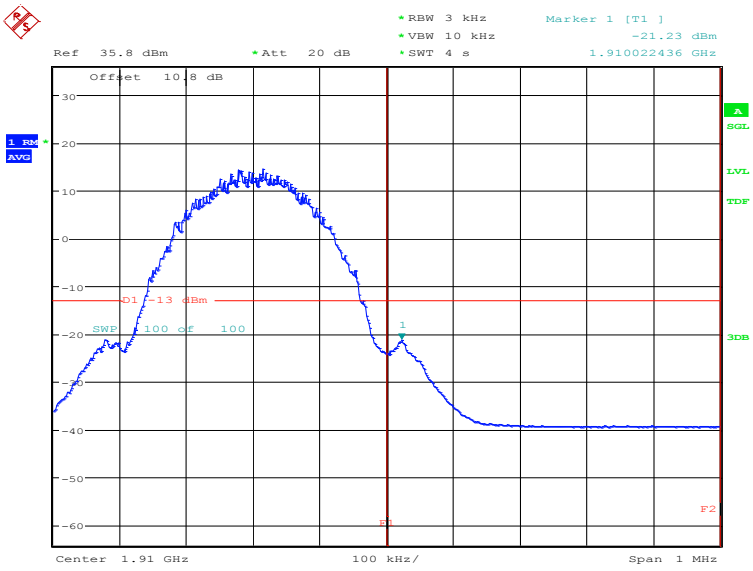
GPRS 1900

Channel 512



Date: 24.AUG.2021 15:35:12

Channel 810



Date: 24.AUG.2021 15:42:22

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).

2020-09-29 through 2021-09-30
Effective Dates

DEPARTMENT OF COMMERCE · UNITED STATES OF AMERICA

For the National Voluntary Laboratory Accreditation Program

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