



# TEST REPORT

## No. I19Z60845-WMD04

for

**Samsung Electronics Co Ltd**

**MULTI-BAND GSM/WCDMA/LTE PHONE WITH BLUETOOTH, WLAN**

**Model Name: SM-T295C**

**FCC ID: ZCASMT295C**

with

**Hardware Version: REV0.4**

**Software Version: T295CZCU0ASEA**

**Issued Date: 2019-07-17**



**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**

<b>Report Number</b>	<b>Revision</b>	<b>Description</b>	<b>Issue Date</b>
I19Z60845-WMD04	Rev.0	1st edition	2019-07-17



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## **1. Test Laboratory**

### **1.1. Introduction & Accreditation**

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2005 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. Testing Environment**

Normal Temperature: 15-35°C  
Relative Humidity: 20-80%

### **1.4. Project data**

Testing Start Date: 2019-05-19  
Testing End Date: 2019-07-16

### **1.5. Signature**



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Dong Yuan  
(Prepared this test report)



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Zhang Yufeng  
(Reviewed this test report)



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Zhao Hui Lin  
Deputy Director of the laboratory  
(Approved this test report)



## **2. Client Information**

### **2.1. Applicant Information**

Company Name: Samsung Electronics Co Ltd  
Address /Post: 19 Chapin Rd.,Building D Pine Brook, NJ 07058  
Contact Person: Jenni Chun  
Contact Email: NA  
Telephone: NA  
Fax: NA

### **2.2. Manufacturer Information**

Company Name: Jiaxing Yongrui Electron Technology Co., Ltd.  
Address /Post: NO.777 Yazhong Road, Daqiao Town, Nanhu District, Jiaxing  
City ,Zhejiang  
Contact Person: NA  
Contact Email: NA  
Telephone: NA  
Fax: NA

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

#### **3.1. About EUT**

Description	MULTI-BAND GSM/WCDMA/LTE PHONE WITH BLUETOOTH, WLAN
Model	SM-T295C
FCC ID	ZCASMT295C
Frequency	CDMA800MHz(BC0)
Antenna	Embedded
Extreme vol. Limits	3.6VDC to 4.2VDC (nominal: 3.8VDC)
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	356221100013095	REV0.4	T295CZCU0ASEA	2019-05-09

\*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	SWD-WT-N8
Manufacturer	Sunwoda Electronic Co., Ltd .
Capacitance	4980mAh

##### **AE2**

Model	SCUD-WT-N8
Manufacturer	SCUD(Fujian) Electronic Co., Ltd.
Capacitance	4980mAh

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

### **3.4. Normal Accessory setting**

Fully charged battery was used during the test.

### **3.5. General Description**

The Equipment Under Test (EUT) is a model of MULTI-BAND GSM/WCDMA/LTE PHONE WITH BLUETOOTH, WLAN with embedded antenna. It consists of Hand Telephone Set and normal options: lithium battery, charger.

Manual and specifications of the EUT were provided to fulfil the test.

Samples undergoing test were selected by the Client.

## **4. Reference Documents**

### **4.1. Reference Documents for testing**

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

<b>Reference</b>	<b>Title</b>	<b>Version</b>
FCC Part 22	PUBLIC MOBILE SERVICES	V10-1-18 Edition
FCC Part 2	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS;GENERAL RULES AND REGULATIONS	V10-1-18 Edition
ANSI/TIA-603-E	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards	2016
KDB 971168 D01	Measurement Guidance for Certification of Licensed Digital Transmitters	v03r01



## 5. LABORATORY ENVIRONMENT

**Shielding chamber** did not exceed following limits along the RF testing:

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. =20 %, Max. = 80 %



## 6. SUMMARY OF TEST RESULTS

Items	List	Clause in FCC rules	Verdict
1	Output Power	22.913(a)	Pass
2	Frequency Stability	2.1055/22.355	Pass
3	Occupied Bandwidth	2.1049(h)(i)	Pass
4	Emission Bandwidth	22.917(b)	Pass
5	Band Edge Compliance	22.917(b)	Pass
6	Conducted Spurious Emission	2.1057/22.917	Pass

## 7. Test Equipments Utilized

NO.	NAME	TYPE	SERIES NUMBER	PRODUCER	CALIBRATIO N INTERVAL	CAL DUE DATE
1	Spectrum Analyzer	FSV30	101576	R&S	1 Year	2020-05-03
2	Wireless Communications Test Set	8960(E5515C)	MY48360950	Agilent	2 Year	2020-08-29
3	Climatic chamber	SH-641	92009050	ESPEC	2 Years	2019-12-21

## **ANNEX A: MEASUREMENT RESULTS**

### **A.1 OUTPUT POWER**

#### **A.1.1 Summary**

During the process of testing, the EUT was controlled via Agilent Wireless Communications Test Set (8960(E5515C)) to ensure max power transmission and proper modulation.

This result is max output power conducted measurements for the EUT.

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.

The power was measured with Rhode & Schwarz Spectrum Analyzer FSV30 (average).

These measurements were done at 3 frequencies, 824.7MHz, 836.52MHz and 848.31MHz for CDMA 800 band (bottom, middle and top of operational frequency range) for 1x RTT and 1xEVDO .

The measurement method is from KDB 971168 D01:

- a) Set span to at least 1.5 times the OBW.
- b) Set RBW = 1-5% of the OBW, not to exceed 1 MHz.
- c) Set VBW  $\geq 3 \times$  RBW.
- d) Set number of points in sweep  $\geq 2 \times$  span / RBW.
- e) Sweep time = auto-couple.
- f) Detector = RMS (power averaging).
- g) If the EUT can be configured to transmit continuously (i.e., burst duty cycle  $\geq 98\%$ ), then set the trigger to free run.
- h) If the EUT cannot be configured to transmit continuously (i.e., burst duty cycle  $< 98\%$ ), then use a sweep trigger with the level set to enable triggering only on full power bursts and configure the EUT to transmit at full power for the entire duration of each sweep. Ensure that the sweep time is less than or equal to the transmission burst duration.
- i) Trace average at least 100 traces in power averaging (i.e., RMS) mode.
- j) Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function, with the band limits set equal to the OBW band edges. If the instrument does not have a band power function, then sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.



### A1.3 Measurement results

#### CDMA 800

##### Measurement result

Channel	Frequency(MHz)	Channel power(dBm)		
		1x RTT	1xEVDO	
			Rel0	RevA
1013	824.70	24.73	24.54	24.68
384	836.52	24.78	24.50	24.57
777	848.31	24.80	24.56	24.69

## **A.2 FREQUENCY STABILITY**

### **A.2.1 Method of Measurement**

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 Agilent 8960(E5515C) Wireless Communications Test Set.

1. Measure the carrier frequency at room temperature.
2. Subject the EUT to overnight soak at -10°C.
3. With the EUT, powered via nominal voltage, connected to the 8960(E5515C) and in a simulated call on channel 384 for CDMA 800 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°C increments from -10°C to +50°C. 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°C.
7. With the EUT, powered via nominal voltage, connected to the 8960(E5515C) 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°C decrements from +50°C to -10°C. 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°C during the measurement procedure.

### **A.2.2 Measurement Limit**

#### **A.2.2.1 For Hand carried battery powered equipment**

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. 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 between 3.6VDC and 4.2VDC, with a nominal voltage of 3.8VDC. 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.

For CDMA800, according to section. 22.355, frequency tolerance can be maintained within 2.5ppm.

#### **A.2.2.2 For equipment powered by primary supply voltage**

According to the JTC standard the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. For this EUT

section 2.1055(d)(1) applies. This requires varying primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

For CDMA800, according to section. 22.355, frequency tolerance cab be maintained within 2.5ppm.

### A.2.3 Measurement results

#### CDMA 800

##### Frequency Error vs Voltage

Voltage(V)	Frequency error(Hz)	Frequency error(ppm)
3.55	2.03	0.0024
3.8	0.80	0.0010
4.35	1.04	0.0012

##### Frequency Error vs Temperature

temperature(°C)	Frequency error(Hz)	Frequency error(ppm)
-10	1.69	0.0020
0	1.66	0.0020
10	-0.69	0.0008
20	1.56	0.0019
30	1.22	0.0015
40	1.33	0.0016
50	-1.35	0.0016

### **A.3 OCCUPIED BANDWIDTH**

#### **A.3.1 Occupied Bandwidth Results**

Similar to conducted emissions; 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 frequencies of the CDMA frequency band. The table below lists the measured 99% BW. Spectrum analyzer plots are included on the following pages.

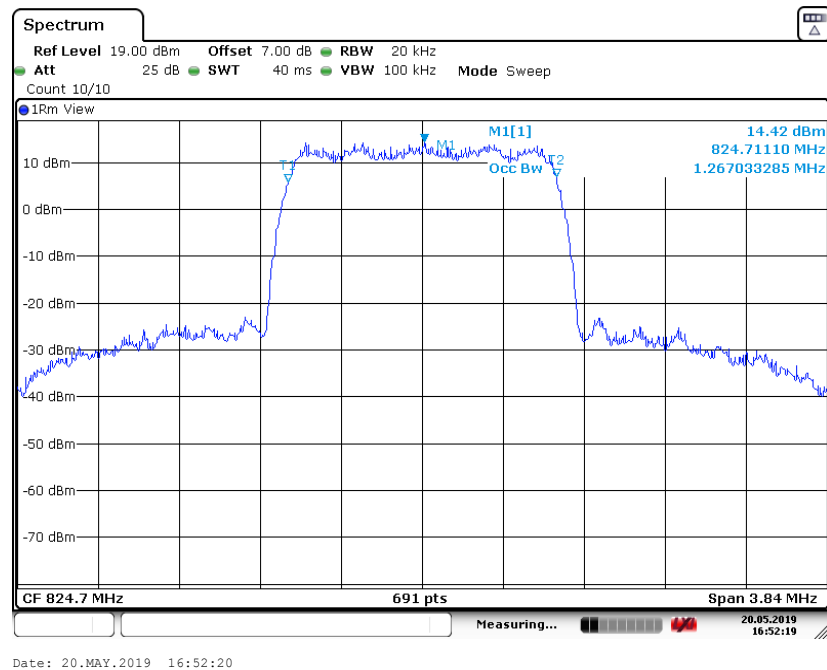
#### **CDMA 800 (99% BW)**

Channel	Occupied Bandwidth (99% BW)( MHz)
1013	1.267
384	1.278
777	1.278

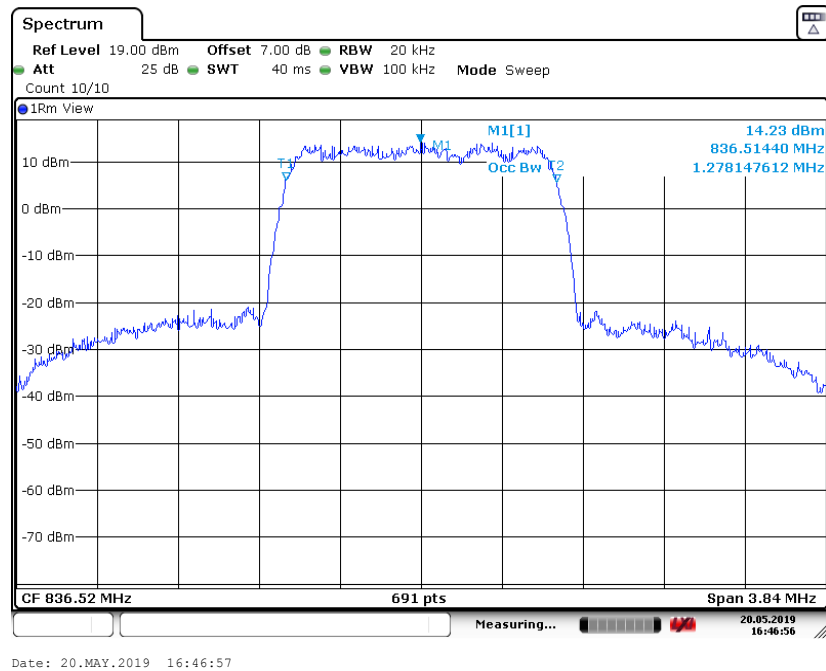
**ANALYZER SETTINGS: RBW=20 kHz, VBW=100 kHz**

#### **CDMA 800**

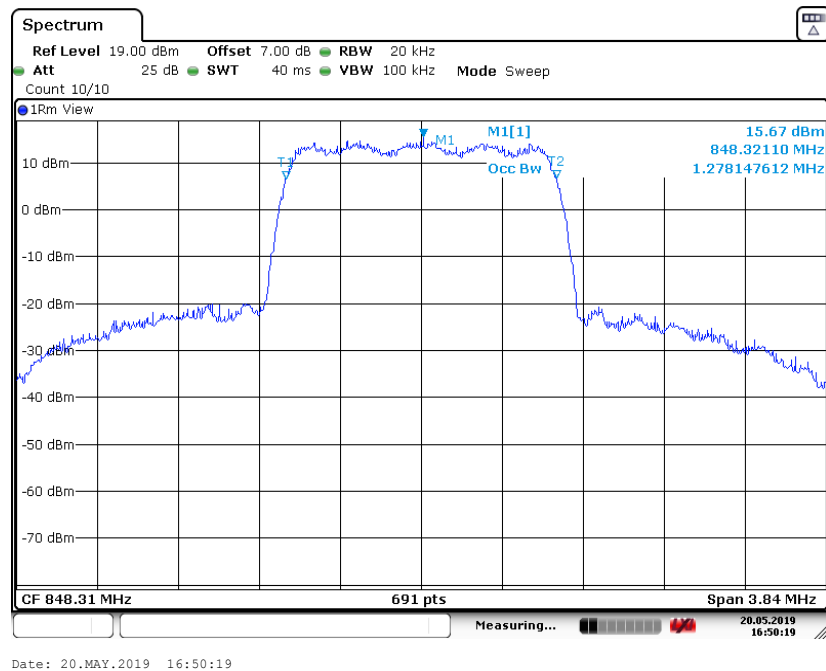
#### **Channel 1013-Occupied Bandwidth (99% BW)**



### Channel 384-Occupied Bandwidth (99% BW)



### Channel 777-Occupied Bandwidth (99% BW)



## A.4 EMISSION BANDWIDTH

### A.4.1 Emission Bandwidth Results

Similar to conducted emissions; Emission 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 frequencies of the CDMA 800, and CDMA 1900 band. Table below lists the measured -26dBc BW. Spectrum analyzer plots are included on the following pages.

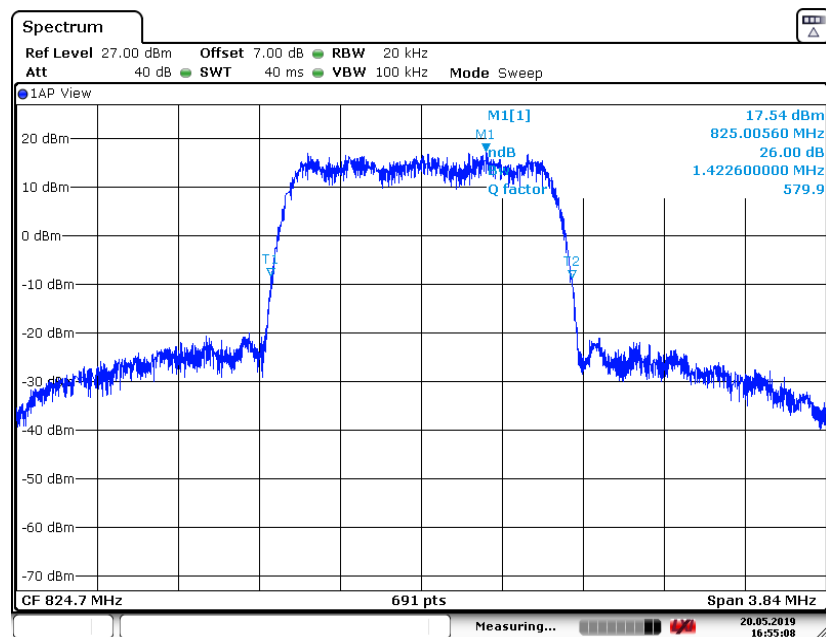
#### CDMA 800 (-26dBc BW)

Channel	Emission Bandwidth (-26dBc BW)( MHz)
1013	1.423
384	1.423
777	1.423

**ANALYZER SETTINGS: RBW=20 kHz, VBW=100 kHz**

#### CDMA 800

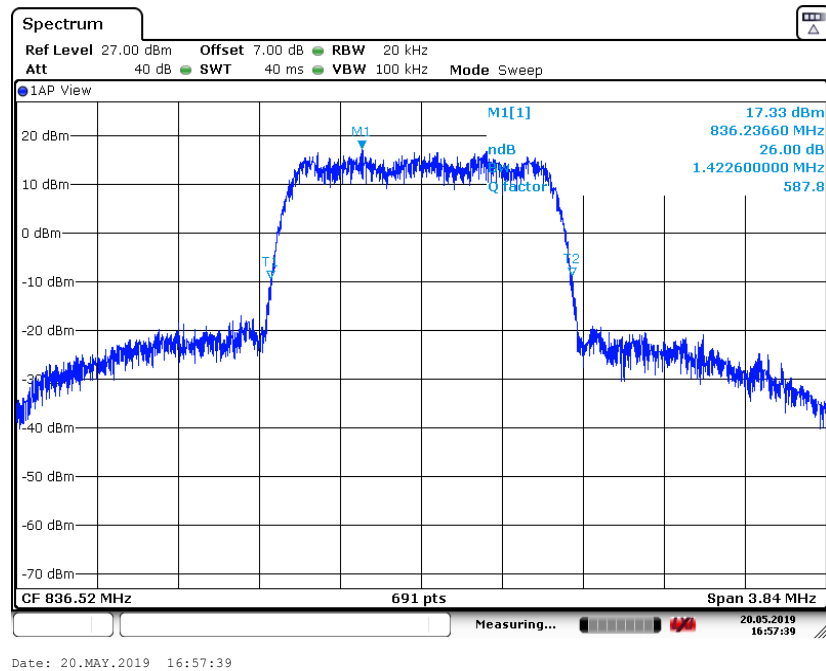
#### Channel 1013-Emission Bandwidth (-26dBc BW)



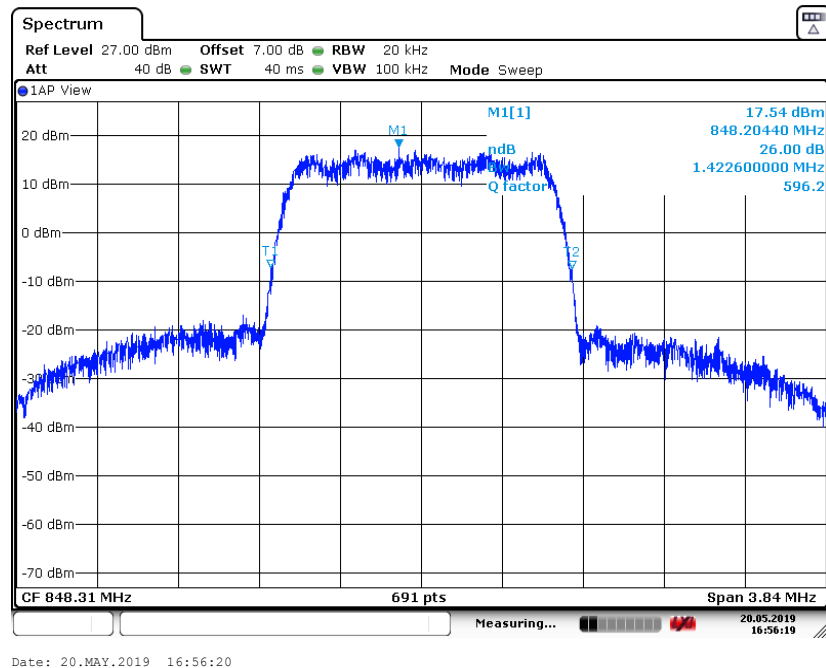
Date: 20.MAY.2019 16:55:09



### Channel 384-Emission Bandwidth (-26dBc BW)



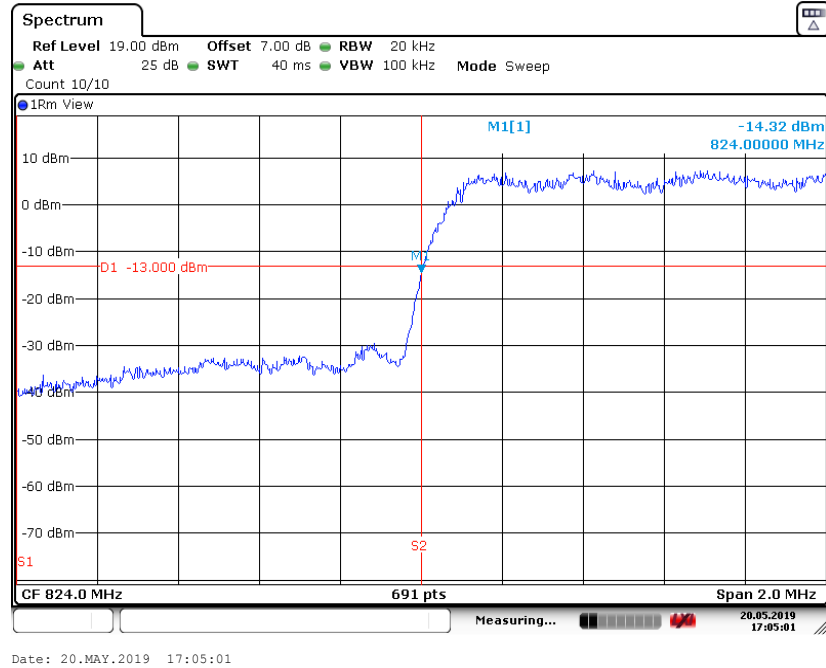
### Channel 777-Emission Bandwidth (-26dBc BW)



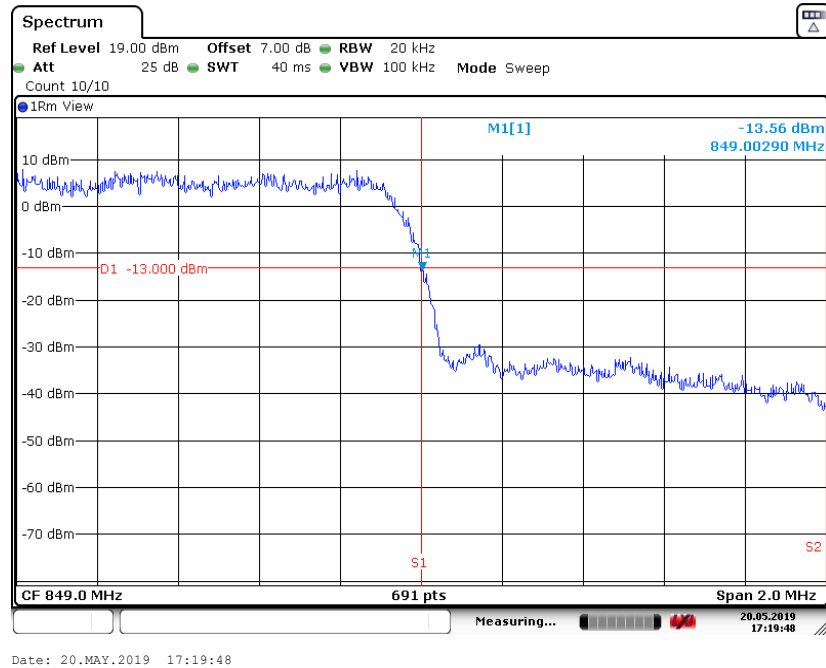
## A.5 BAND EDGE COMPLIANCE

### CDMA 800

#### BAND EDGE BLOCK-Channel 1013



#### BAND EDGE BLOCK-Channel 777



## **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. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency.
2. Determine EUT transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

#### **CDMA 800 Transmitter**

Channel	Frequency (MHz)
1013	824.70
384	836.52
777	848.31

#### **CDMA 1900 Transmitter**

Channel	Frequency (MHz)
25	1851.25
600	1880.00
1175	1909.75

### **A. 6.2 Measurement Limit**

On any frequency outside frequency band of the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least  $43+10\log(P)$  dB. For all power levels +30 dBm to 0 dBm, this becomes a constant specification limit of -13 dBm.

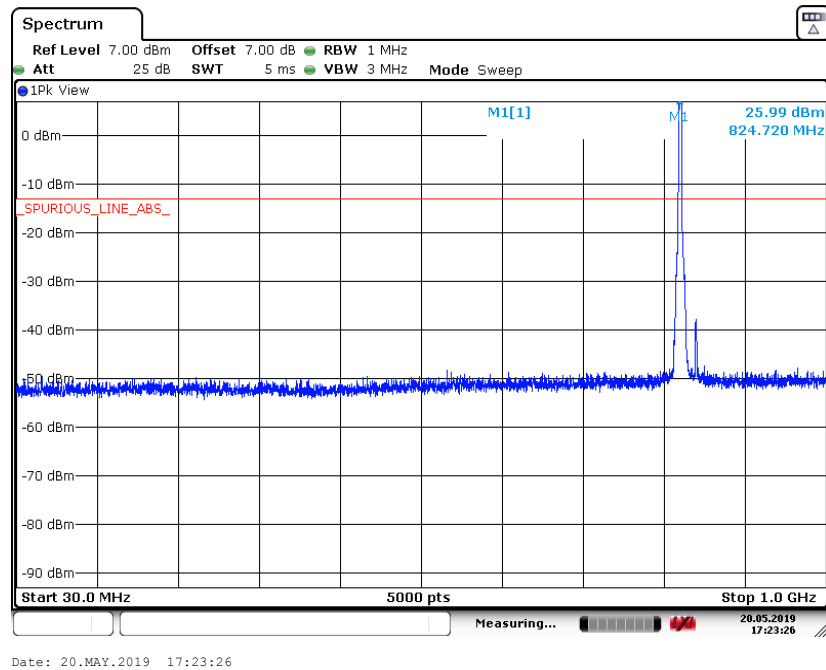
### A. 6.3 Measurement result

#### CDMA 800

##### A. 6.3.19 Channel 1013: 30MHz –1GHz

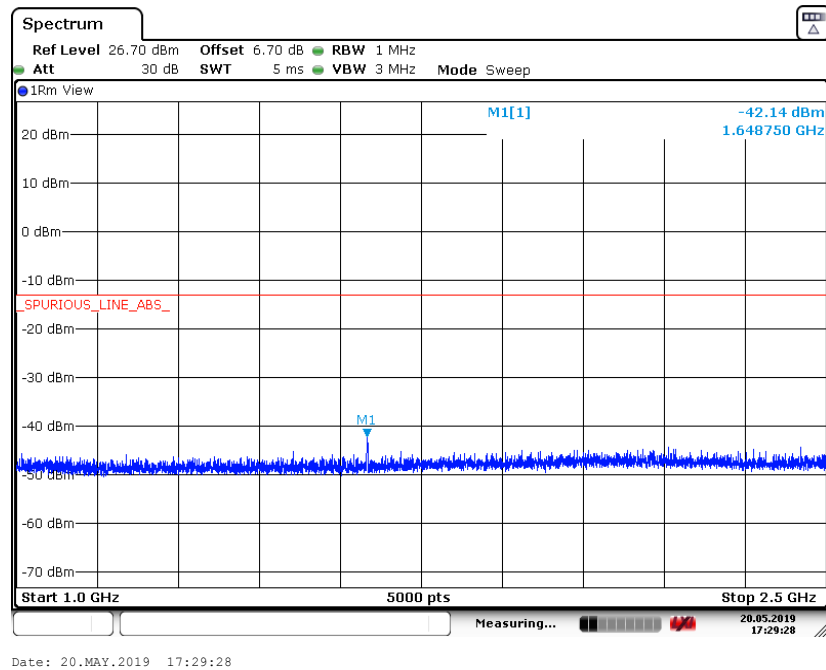
Spurious emission limit –13dBm.

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



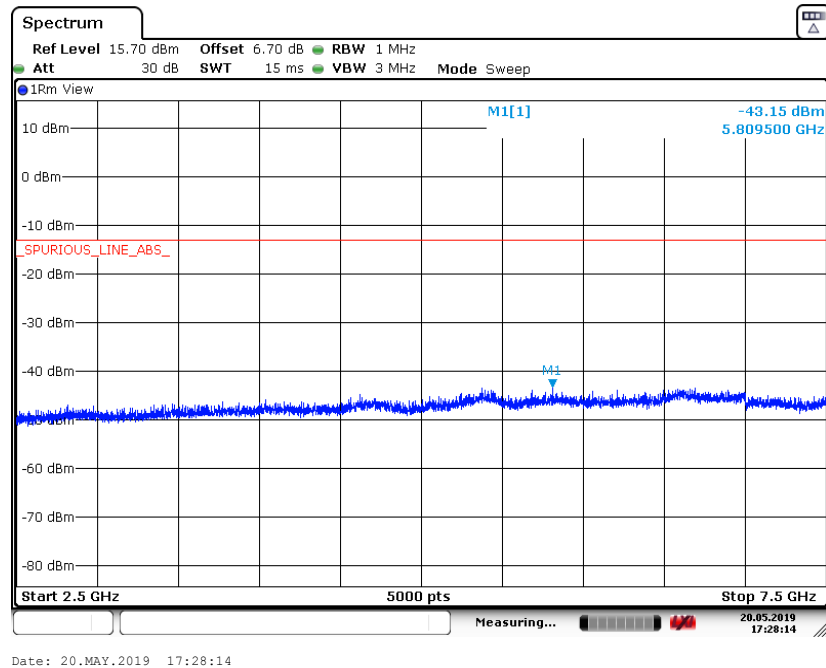
##### A. 6.3.20 Channel 1013: 1GHz – 2.5GHz

Spurious emission limit –13dBm.



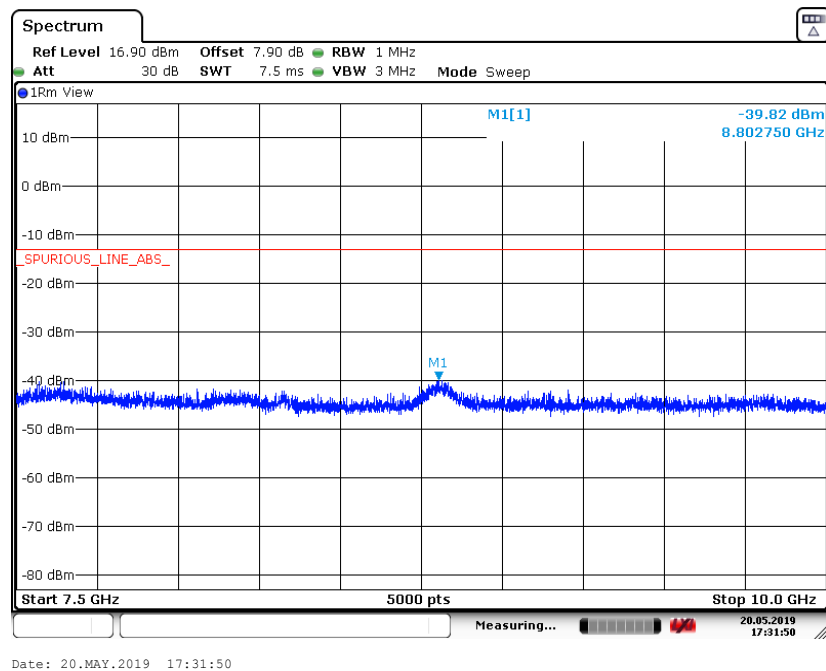
### A. 6.3.21 Channel 1013: 2.5GHz –7.5GHz

Spurious emission limit –13dBm.



### A. 6.3.22 Channel 1013: 7.5GHz – 10GHz

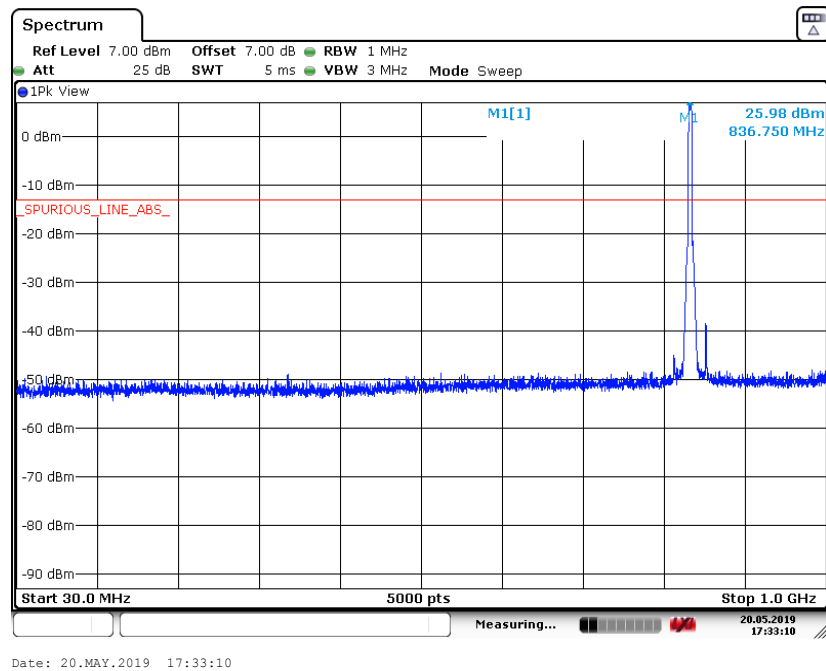
Spurious emission limit –13dBm.



### A. 6.3.23 Channel 384: 30MHz –1GHz

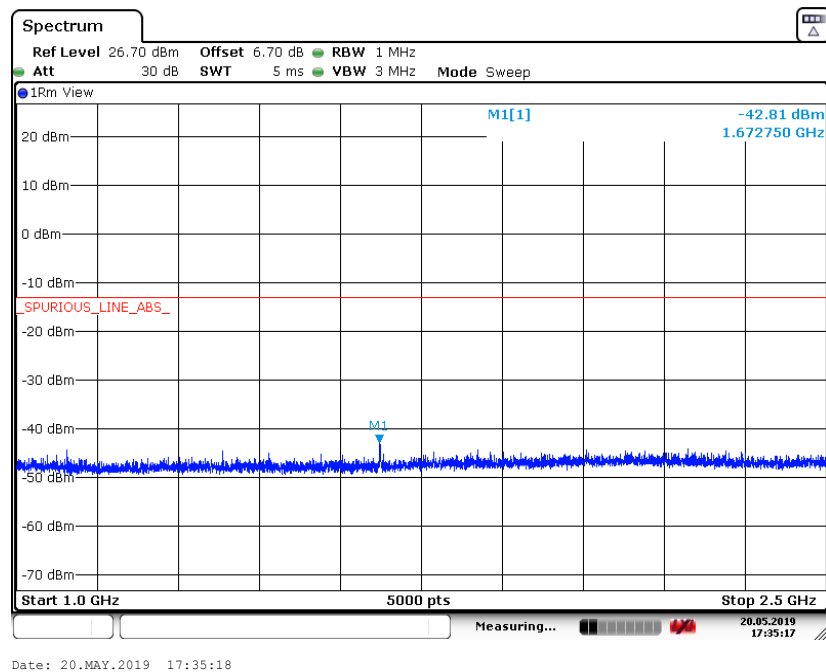
Spurious emission limit –13dBm.

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



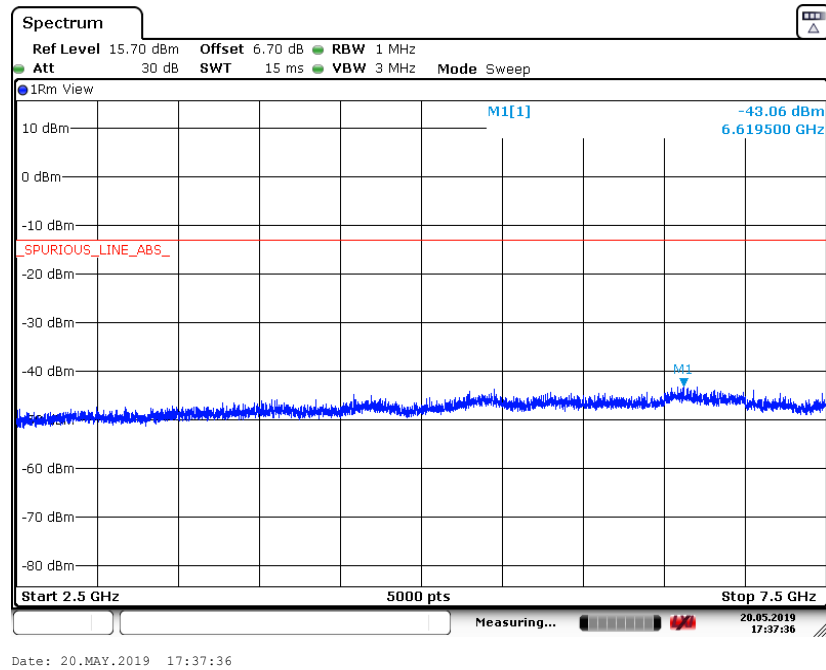
### A.6.3.24 Channel 384: 1GHz – 2.5GHz

Spurious emission limit –13dBm.



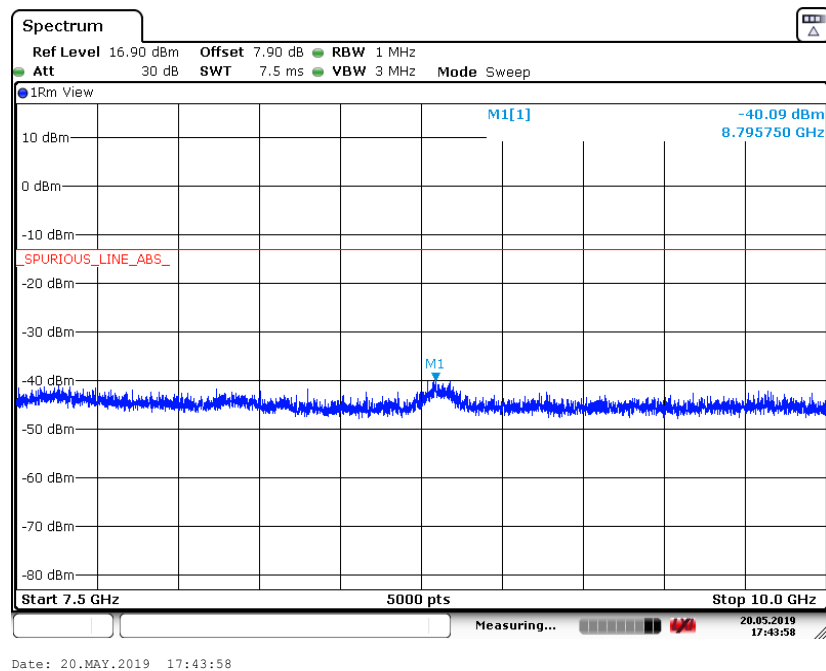
#### A. 6.3.25 Channel 384: 2.5GHz –7.5GHz

Spurious emission limit –13dBm.



#### A. 6.3.26 Channel 384: 7.5GHz – 10GHz

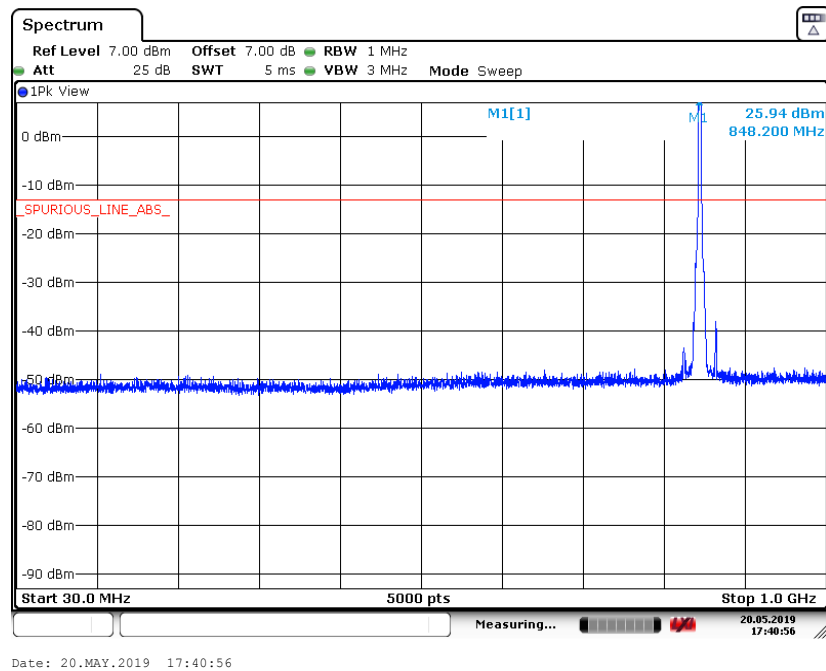
Spurious emission limit –13dBm.



### A. 6.3.27 Channel 777: 30MHz –1GHz

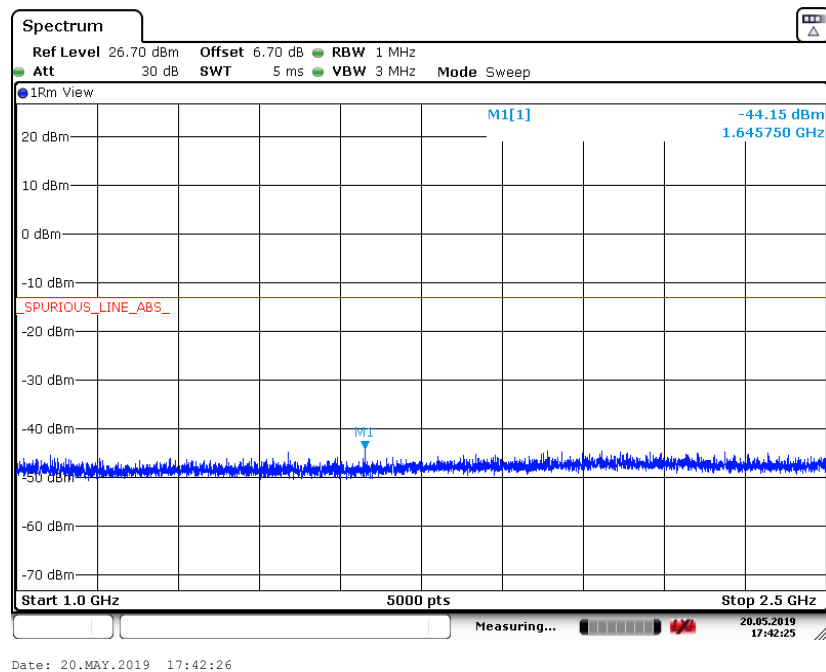
Spurious emission limit –13dBm.

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



### A. 6.3.28 Channel 777: 1GHz – 2.5GHz

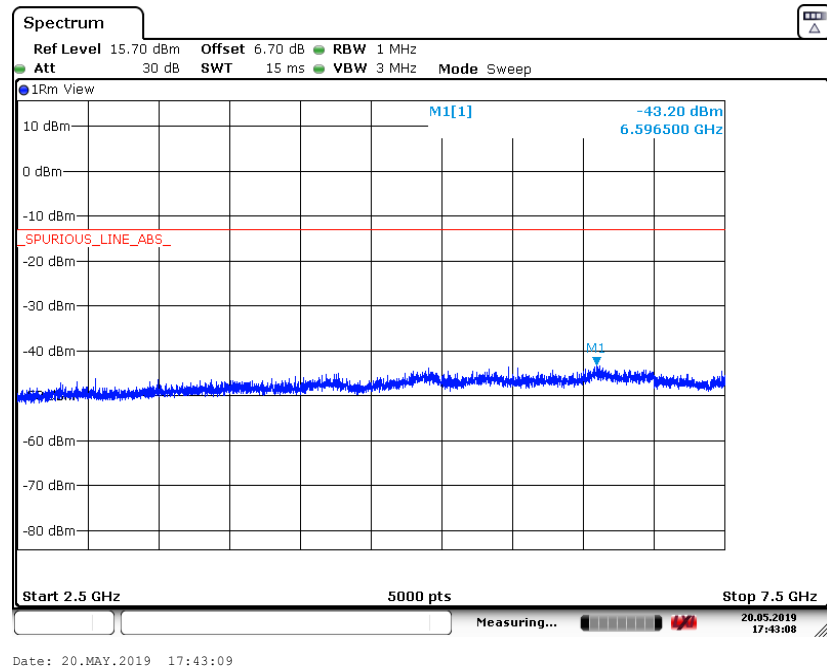
Spurious emission limit –13dBm.





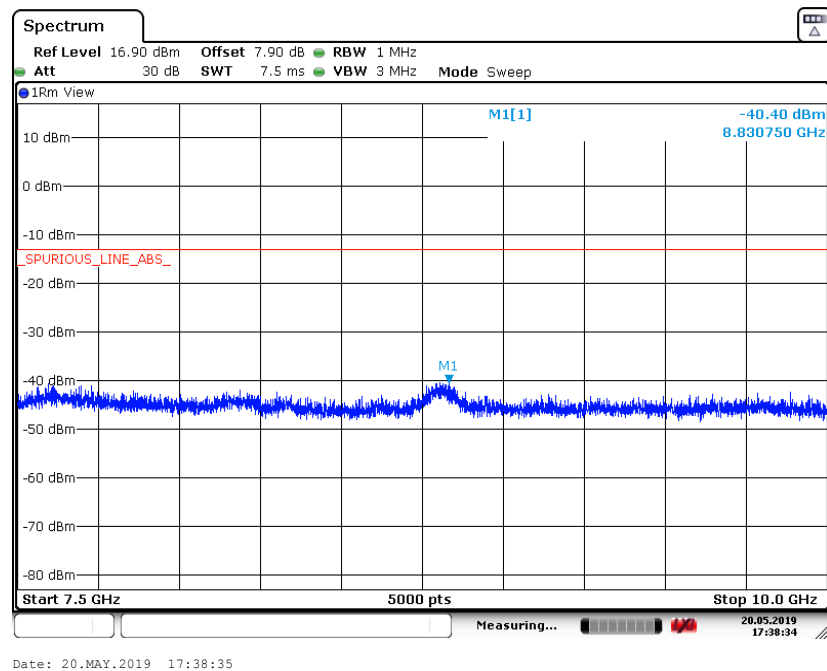
### A. 6.3.29 Channel 777: 2.5GHz –7.5GHz

Spurious emission limit –13dBm.



### A. 6.3.30 Channel 777: 7.5GHz – 10GHz

Spurious emission limit –13dBm.



## **ANNEX B: Accreditation Certificate**

<p>United States Department of Commerce National Institute of Standards and Technology</p> <p><b>NVLAP<sup>®</sup></b></p> <hr/> <p><b>Certificate of Accreditation to ISO/IEC 17025:2005</b></p> <hr/> <p>NVLAP LAB CODE: 600118-0</p> <p><b>Telecommunication Technology Labs, CAICT</b> Beijing China</p> <p><i>is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:</i></p> <p><b>Electromagnetic Compatibility &amp; Telecommunications</b></p> <p><i>This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. 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).</i></p> <table><tr><td><p>2018-09-28 through 2019-09-30 <i>Effective Dates</i></p></td><td></td><td><p> <i>For the National Voluntary Laboratory Accreditation Program</i></p></td></tr></table>		<p>2018-09-28 through 2019-09-30 <i>Effective Dates</i></p>		<p> <i>For the National Voluntary Laboratory Accreditation Program</i></p>
<p>2018-09-28 through 2019-09-30 <i>Effective Dates</i></p>		<p> <i>For the National Voluntary Laboratory Accreditation Program</i></p>		

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