



# FCC PART 22H, PART 24E MEASUREMENT AND TEST REPORT

For

## Quanzhou Tesunho Electronics Co., Ltd

2#, 5F E-19# Phase 2 Xunmei, Quanzhou, Fujian, China

**FCC ID: 2AKS9TH388**

<b>Report Type:</b> Original Report	<b>Product Name:</b> IP Trunking Radio
<b>Test Engineer:</b> <u>Kevin Hu</u>	<i>Kevin hu</i>
<b>Report Number:</b> <u>RXM161209050B</u>	
<b>Report Date:</b> <u>2017-01-10</u>	
<b>Reviewed By:</b> <u>Henry Ding</u> EMC Leader	<i>Henry Ding</i>
<b>Test Laboratory:</b>	Bay Area Compliance Laboratories Corp. (Chengdu) 5040, HuiLongWan Plaza, No. 1, ShaWan Road, JinNiu District, ChengDu, China Tel: 028-65523123, Fax: 028-65525125 www.baclcorp.com

**Note:** This test report was prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Chengdu). Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. This report was valid only with a valid digital signature.

## TABLE OF CONTENTS

<b>GENERAL INFORMATION .....</b>	<b>4</b>
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) .....	4
OBJECTIVE .....	4
RELATED SUBMITTAL(S)/GRANT(S) .....	4
TEST METHODOLOGY .....	4
TEST FACILITY .....	5
<b>SYSTEM TEST CONFIGURATION .....</b>	<b>6</b>
JUSTIFICATION .....	6
EQUIPMENT MODIFICATIONS .....	6
SUPPORT EQUIPMENT LIST AND DETAILS .....	6
CONFIGURATION OF TEST SETUP .....	6
BLOCK DIAGRAM OF TEST SETUP .....	7
<b>SUMMARY OF TEST RESULTS .....</b>	<b>8</b>
<b>FCC §1.1310 &amp; §2.1093- RF EXPOSURE .....</b>	<b>9</b>
APPLICABLE STANDARD .....	9
TEST RESULT .....	9
<b>FCC §2.1047 - MODULATION CHARACTERISTIC .....</b>	<b>10</b>
<b>FCC § 2.1046, § 22.913 (A) &amp; § 24.232 (C) - RF OUTPUT POWER .....</b>	<b>11</b>
APPLICABLE STANDARD .....	11
TEST PROCEDURE .....	11
TEST EQUIPMENT LIST AND DETAILS .....	12
TEST DATA .....	13
<b>FCC §2.1049, §22.917, §22.905 &amp; §24.238 - OCCUPIED BANDWIDTH .....</b>	<b>16</b>
APPLICABLE STANDARD .....	16
TEST PROCEDURE .....	16
TEST EQUIPMENT LIST AND DETAILS .....	16
TEST DATA .....	17
<b>FCC §2.1051, §22.917(A) &amp; §24.238(A) - SPURIOUS EMISSIONS AT ANTENNA TERMINALS .....</b>	<b>23</b>
APPLICABLE STANDARD .....	23
TEST PROCEDURE .....	23
TEST EQUIPMENT LIST AND DETAILS .....	23
TEST DATA .....	24
<b>FCC §2.1053, §22.917 &amp; §24.238 - SPURIOUS RADIATED EMISSIONS .....</b>	<b>29</b>
APPLICABLE STANDARD .....	29
TEST PROCEDURE .....	29
TEST EQUIPMENT LIST AND DETAILS .....	30
TEST DATA .....	30
<b>FCC §22.917(A) &amp; §24.238(A) - BAND EDGES .....</b>	<b>33</b>
APPLICABLE STANDARD .....	33
TEST PROCEDURE .....	33
TEST EQUIPMENT LIST AND DETAILS .....	33
TEST DATA .....	34

<b>FCC §2.1055, §22.355 &amp; §24.235 - FREQUENCY STABILITY .....</b>	<b>45</b>
APPLICABLE STANDARD .....	45
TEST PROCEDURE .....	45
TEST EQUIPMENT LIST AND DETAILS .....	46
TEST DATA.....	46

## **GENERAL INFORMATION**

---

### **Product Description for Equipment under Test (EUT)**

The **Quanzhou Tesunho Electronics Co., Ltd**'s product, model number: **TH-388 (FCC ID: 2AKS9TH388)** (the "EUT") in this report was an **IP Trunking Radio**, which was measured approximately: 12 cm (L) × 6 cm (W) × 4 cm (H), rated input voltage: DC3.63V rechargeable Li-ion battery or DC12V from adapter.

Adapter Information:

Model: CG-D120050

Input: AC 100-240V, 50/60Hz, 0.3A Max

Output: DC 12.0V, 500mA

*\*All measurement and test data in this report was gathered from final production sample, serial number: 161209050 (assigned by the BAACL, Chengdu). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2016-12-13, and EUT conformed to test requirement.*

### **Objective**

This report is prepared on behalf of **Quanzhou Tesunho Electronics Co., Ltd** in accordance with: Part 2-Subpart J, Part 22-Subpart H, and Part 24-Subpart E of the Federal Communications Commission's rules.

The objective is to determine compliance with FCC rules for output power, modulation characteristic, occupied bandwidth, spurious emissions at antenna terminal, spurious radiated emission, frequency stability and band edge.

### **Related Submittal(s)/Grant(s)**

No related submittal.

### **Test Methodology**

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-part J, Part 22 Subpart H, Part 24 Subpart E.

Applicable Standards: TIA/EIA 603-D-2010.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Chengdu).

## **Test Facility**

The test site used by BACL to collect test data is located in the 5040, HuiLongWan Plaza, No. 1, ShaWan Road, JinNiu District, ChengDu, China.

Test site at BACL has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on April 24, 2015. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 560332. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

## SYSTEM TEST CONFIGURATION

---

### Justification

The EUT was configured for testing according to TIA/EIA-603-D 2010.

The test items were performed with the EUT operating at testing mode.

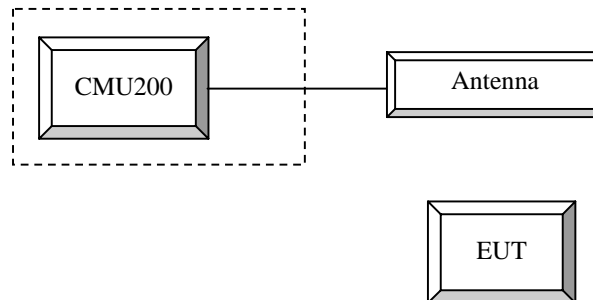
### Equipment Modifications

No modification was made to the EUT.

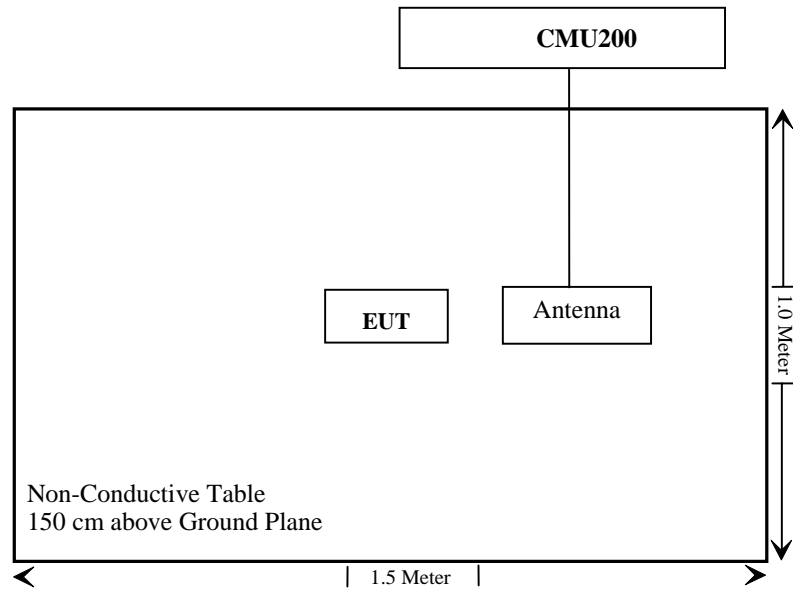
### Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
R&S	Universal Radio Communication Tester	CMU200	11-9435686-111

### Configuration of Test Setup



### Block Diagram of Test Setup



## **SUMMARY OF TEST RESULTS**

---

<b>FCC Rules</b>	<b>Description of Test</b>	<b>Result</b>
§1.1310, §2.1093	RF Exposure	Compliance
§2.1046; § 22.913 (a); § 24.232 (c)	RF Output Power	Compliance
§ 2.1047	Modulation Characteristics	Not Applicable
§ 2.1049; § 22.905 § 22.917; § 24.238	Occupied Bandwidth	Compliance
§ 2.1051, § 22.917 (a); § 24.238 (a)	Spurious Emissions at Antenna Terminal	Compliance
§ 2.1053 § 22.917 (a); § 24.238 (a)	Field Strength of Spurious Radiation	Compliance
§ 22.917 (a); § 24.238 (a)	Out of band emission, Band Edge	Compliance
§ 2.1055 § 22.355; § 24.235	Frequency stability vs. temperature Frequency stability vs. voltage	Compliance



## **FCC §1.1310 & §2.1093- RF EXPOSURE**

---

### **Applicable Standard**

FCC§1.1310 and §2.1093.

### **Test Result**

Compliant, please refer to the SAR report: RXM161209050-20.

## **FCC §2.1047 - MODULATION CHARACTERISTIC**

---

According to FCC § 2.1047(d), Part 22H & 24E, there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

## **FCC § 2.1046, § 22.913 (a) & § 24.232 (c) - RF OUTPUT POWER**

---

### **Applicable Standard**

According to FCC §2.1046 and §22.913 (a), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

According to FCC §2.1046 and §24.232 (C), mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications..

According to §24.232 (d) Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of §24.51. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

### **Test Procedure**

#### **GSM/GPRS/EGPRS**

Function: Menu select > GSM Mobile Station > GSM 850/1900

Press Connection control to choose the different menus

Press RESET > choose all the reset all settings

Connection Press Signal Off to turn off the signal and change settings

Network Support > GSM + GPRS or GSM + EGSM

Main Service > Packet Data

Service selection > Test Mode A – Auto Slot Config. off

MS Signal Press Slot Config Bottom on the right twice to select and change the number of time slots and power setting

> Slot configuration > Uplink/Gamma

> 33 dBm for GPRS 850

> 30 dBm for GPRS 1900

> 27 dBm for EGPRS 850

> 26 dBm for EGPRS 1900

BS Signal Enter the same channel number for TCH channel (test channel) and BCCH channel

Frequency Offset > + 0 Hz

Mode > BCCH and TCH

BCCH Level > -85 dBm (May need to adjust if link is not stable)

BCCH Channel > choose desire test channel [Enter the same channel number for TCH channel (test channel) and BCCH channel]

Channel Type > Off

P0 > 4 dB  
 Slot Config > Unchanged (if already set under MS signal)  
 TCH > choose desired test channel  
 Hopping > Off  
 Main Timeslot > 3  
 Network Coding Scheme > CS4 (GPRS) and MCS5 (EGPRS)

Bit Stream > 2E9-1 PSR Bit Stream  
 AF/RF Connection Enter appropriate offsets for Ext. Att. Output and Ext. Att. Input  
 Press Signal on to turn on the signal and change settings

*Radiated method:*

ANSI/TIA-603-D section 2.2.17

**Test Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2016-12-02	2017-12-01
Sunol Sciences	Broadband Antenna	JB3	A101808	2016-04-10	2019-04-09
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2016-12-02	2017-12-01
ETS	Horn Antenna	3115	003-6076	2016-12-02	2017-12-01
ETS	Horn Antenna	3115	6751	2014-06-16	2017-06-15
EMCO	Adjustable Dipole Antenna	3121C	9109-258	N/A	N/A
HP	Signal Generator	8648C	3623A04150	2016-05-23	2017-05-22
WILTRON	SWEPT FREQUENCY SYNTHESIZER	6737	213001	2016-05-23	2017-05-22
EMCT	Semi-Anechoic Chamber	966	N/A	2015-04-24	2018-04-23
N/A	RF Cable (below 1GHz)	NO.1	N/A	2016-11-10	2017-11-09
N/A	RF Cable (below 1GHz)	NO.4	N/A	2016-11-10	2017-11-09
N/A	RF Cable (above 1GHz)	NO.2	N/A	2016-11-10	2017-11-09
R&S	Universal Radio Communication Tester	CMU200	11-9435686-111	2016-07-28	2017-07-27

\* **Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

**Test Data**

**Environmental Conditions**

<b>Temperature:</b>	25.7 °C
<b>Relative Humidity:</b>	32%
<b>ATM Pressure:</b>	101.8kPa

The testing was performed by Kevin Hu on 2016-12-29.

**Conducted Output Power**

**Cellular Band (Part 22H) & PCS Band (Part 24E)**

Band	Channel No.	Peak Output Power (dBm)					
		GPRS 1 TX Slot	GPRS 2 TX Slot	EDGE 1 TX Slot	EDGE 2 TX Slot	EDGE 3 TX Slot	EDGE 4 TX Slot
Cellular	128	31.95	31.86	26.12	25.93	25.76	25.21
	190	32.13	32.08	26.14	26.12	25.91	25.38
	251	32.04	31.97	26.04	26.02	25.84	25.32
PCS	512	29.09	29.07	25.19	25.18	25.01	24.52
	661	29.20	29.15	25.27	25.26	25.12	24.61
	810	29.93	29.88	25.96	25.94	25.79	25.26

**WCDMA Band II**

Mode	3GPP Sub Test	Average Output Power (dBm)					
		Low Channel (Ave. Power)	Low Channel (PAR)	Middle Channel (Ave. Power)	Middle Channel (PAR)	High Channel (Ave. Power)	High Channel (PAR)
Rel 99	1	22.1	3.32	22.71	3.40	22.32	3.40
HSDPA (QPSK)	1	21.53	3.24	22.17	3.36	21.77	3.42
	2	21.50	3.36	22.22	3.41	21.73	3.46
	3	21.55	3.38	22.24	3.45	21.82	3.44
	4	21.53	3.23	22.23	3.44	21.84	3.46
HSUPA (QPSK)	1	21.50	3.27	22.25	3.33	21.79	3.35
	2	21.57	3.44	22.2	3.41	21.85	3.39
	3	21.52	3.22	22.23	3.50	21.80	3.42
	4	21.60	3.41	22.19	3.29	21.74	3.43
	5	21.51	3.33	22.11	3.42	21.85	3.39
DC-HSDPA (QPSK)	1	21.46	3.3	22.18	3.39	21.7	3.28
	2	21.55	3.32	22.14	3.42	21.83	3.48
	3	21.51	3.37	22.11	3.46	21.82	3.29
	4	21.61	3.19	22.17	3.41	21.72	3.35
HSPA+ (16QAM)	1	21.57	3.44	22.24	3.48	21.73	3.27

**WCDMA Band V**

Mode	3GPP Sub Test	Average Output Power (dBm)					
		Low Channel (Ave. Power)	Low Channel (PAR)	Middle Channel (Ave. Power)	Middle Channel (PAR)	High Channel (Ave. Power)	High Channel (PAR)
Rel 99	1	22.22	3.08	22.14	3.08	22.19	3.16
HSDPA (QPSK)	1	21.71	2.97	21.62	3.15	21.63	3.16
	2	21.67	3.05	21.61	3.07	21.65	3.19
	3	21.70	2.98	21.66	2.98	21.63	3.21
	4	21.78	2.99	21.70	3.05	21.58	3.06
HSUPA (QPSK)	1	21.66	3	21.66	3.16	21.71	3.13
	2	21.78	3.18	21.57	3.12	21.61	3.19
	3	21.73	3.15	21.59	3.04	21.71	3.17
	4	21.76	3.16	21.58	3.06	21.69	3.14
	5	21.69	3.10	21.59	2.97	21.61	3.09
DC-HSDPA (QPSK)	1	21.77	3.05	21.57	3.08	21.67	3.07
	2	21.76	3.12	21.67	3.03	21.59	3.03
	3	21.71	2.95	21.70	3.11	21.70	3.09
	4	21.69	3.11	21.60	3.06	21.67	3.14
HSPA+ (16QAM)	1	21.68	3.00	21.55	3.04	21.59	3.07

Peak-to-average ratio (PAR) < 13dB

EIRP/ERP:

Frequency (MHz)	Polar (H/V)	Receiver Reading (dB $\mu$ V)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			S.G. Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
<b>GSM 850 Middle Channel</b>								
836.600	H	98.27	21.2	0.0	0.6	20.6	38.5	17.9
836.600	V	105.16	30.2	0.0	0.6	29.6	38.5	8.9
<b>EDGE 850 Middle Channel</b>								
836.600	H	95.42	18.3	0.0	0.6	17.7	38.5	20.8
836.600	V	102.38	27.4	0.0	0.6	26.8	38.5	11.7
<b>Band V Middle Channel</b>								
836.600	H	89.09	12	0.0	0.6	11.4	38.5	27.1
836.600	V	95.98	21	0.0	0.6	20.4	38.5	18.1
<b>PCS 1900 Middle Channel</b>								
1880.000	H	90.32	16.7	8.0	0.9	23.8	33.0	9.2
1880.000	V	95.75	23.4	8.0	0.9	30.5	33.0	2.5
<b>EDGE 1900 Middle Channel</b>								
1880.000	H	86.15	12.5	8.0	0.9	19.6	33.0	13.4
1880.000	V	91.59	19.2	8.0	0.9	26.3	33.0	6.7
<b>Band II Middle Channel</b>								
1880.000	H	84.17	10.6	8.0	0.9	17.7	33.0	15.3
1880.000	V	89.56	17.2	8.0	0.9	24.3	33.0	8.7

Note:

- 1) The unit of Antenna Gain is dBd for frequency below 1GHz, and the unit of Antenna Gain is dBi for frequency above 1GHz.
- 2) Absolute Level = SG Level - Cable loss + Antenna Gain
- 3) Margin = Limit-Absolute Level

## **FCC §2.1049, §22.917, §22.905 & §24.238 - OCCUPIED BANDWIDTH**

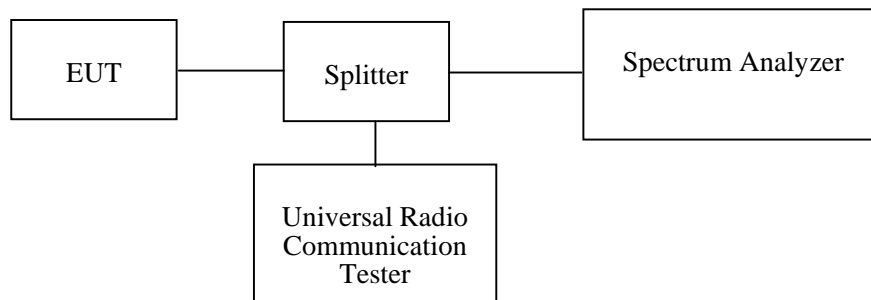
### **Applicable Standard**

FCC §2.1049, §22.917 and §22.905, §24.238.

### **Test Procedure**

The RF output of the transmitter was connected to the simulator and the spectrum analyzer through sufficient attenuation.

The 26 dB & 99% bandwidth was recorded.



### **Test Equipment List and Details**

<b>Manufacturer</b>	<b>Description</b>	<b>Model</b>	<b>Serial Number</b>	<b>Calibration Date</b>	<b>Calibration Due Date</b>
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2016-12-02	2017-12-01
N/A	RF Cable	N/A	N/A	Each Time	/
N/A	Two-way Splitter	N/A	OE0120121	Each Time	/

\* **Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).



## Test Data

### Environmental Conditions

<b>Temperature:</b>	26.3°C
<b>Relative Humidity:</b>	34%
<b>ATM Pressure:</b>	101.8kPa

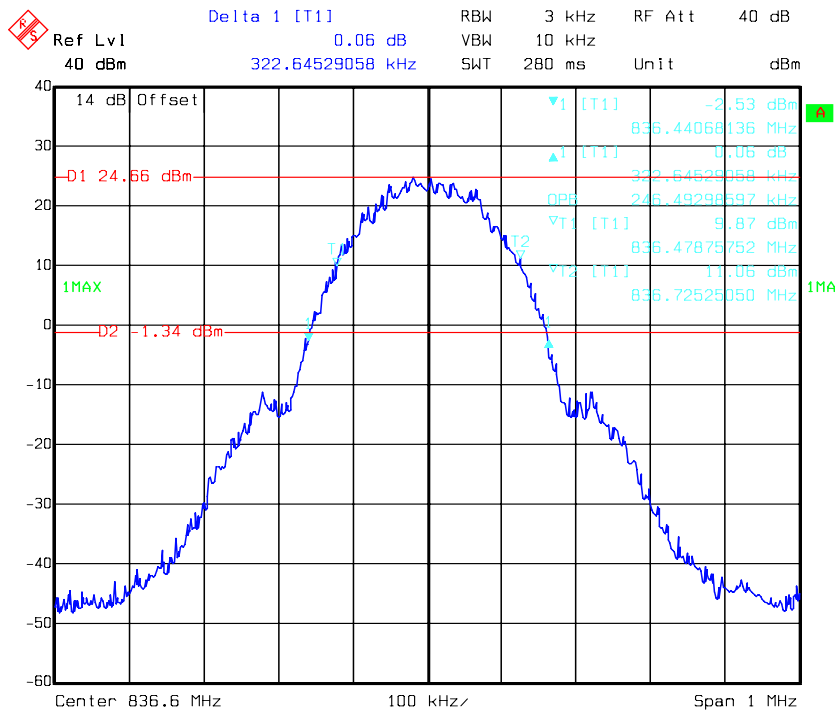
The testing was performed by Kevin Hu on 2016-12-28.

Test Mode: Transmitting

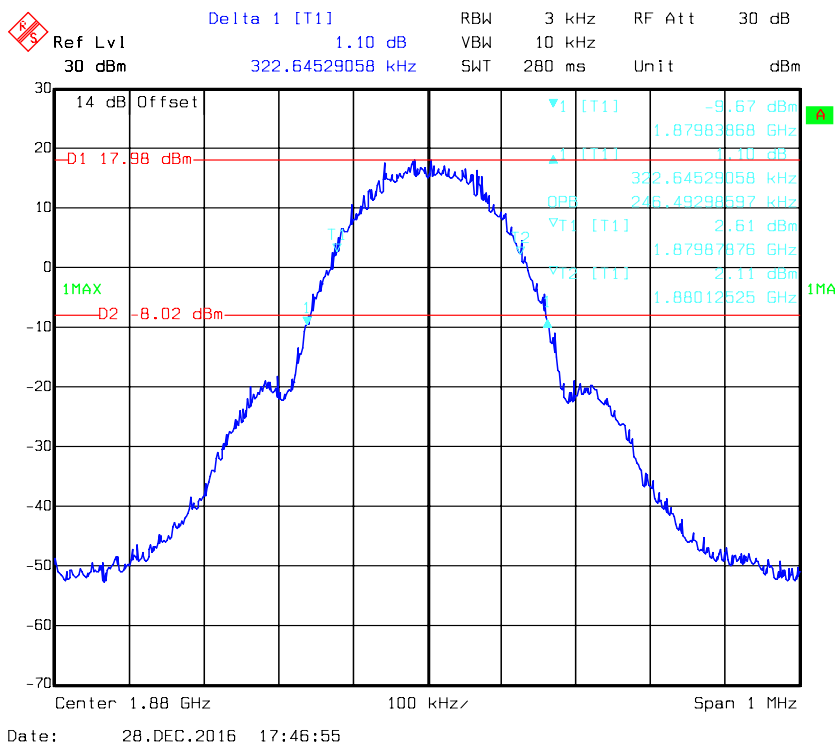
Test Result: Compliant. Please refer to the following table and plots.

Band	Test Channel	Mode	99% Occupied Bandwidth (MHz)	26 dB Occupied Bandwidth (MHz)
Cellular	M	GPRS	0.246	0.323
		EDGE	0.244	0.315
PCS		GPRS	0.246	0.323
		EDGE	0.246	0.317
WCDMA Band II		Rel 99	4.709	4.148
		HSDPA	4.709	4.188
		HSUPA	4.709	4.188
WCDMA Band V		Rel 99	4.709	4.168
		HSDPA	4.729	4.168
		HSUPA	4.729	4.188

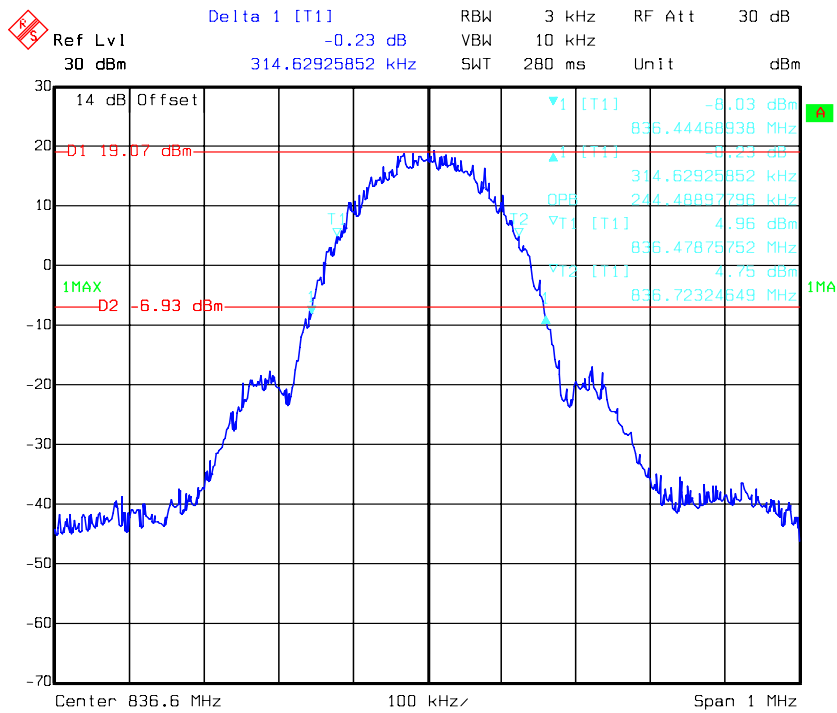
### GMSK 850 Cellular Band



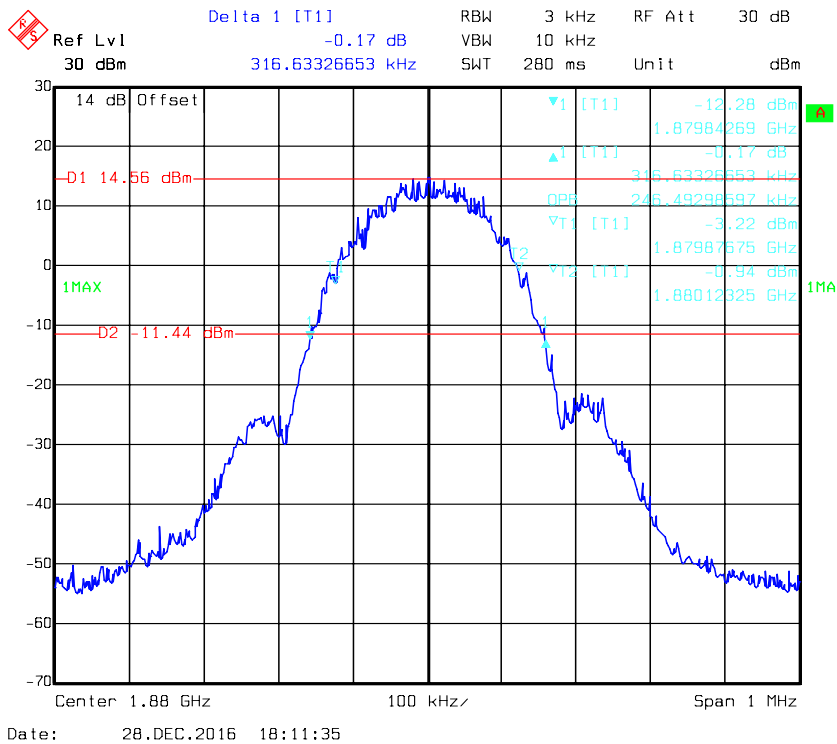
### GMSK PCS Band



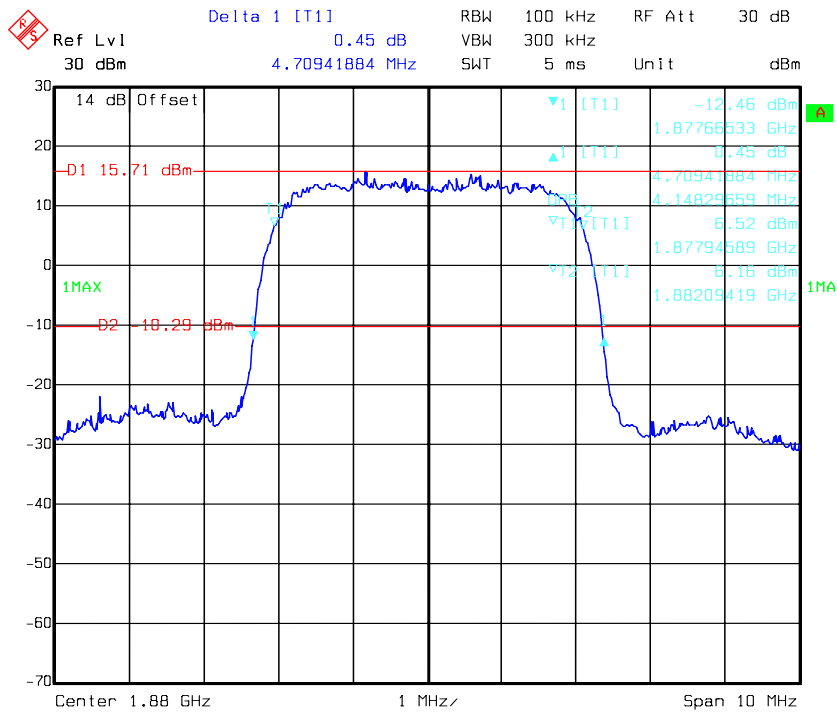
### EDGE 850 Cellular Band



### EDGE PCS Band

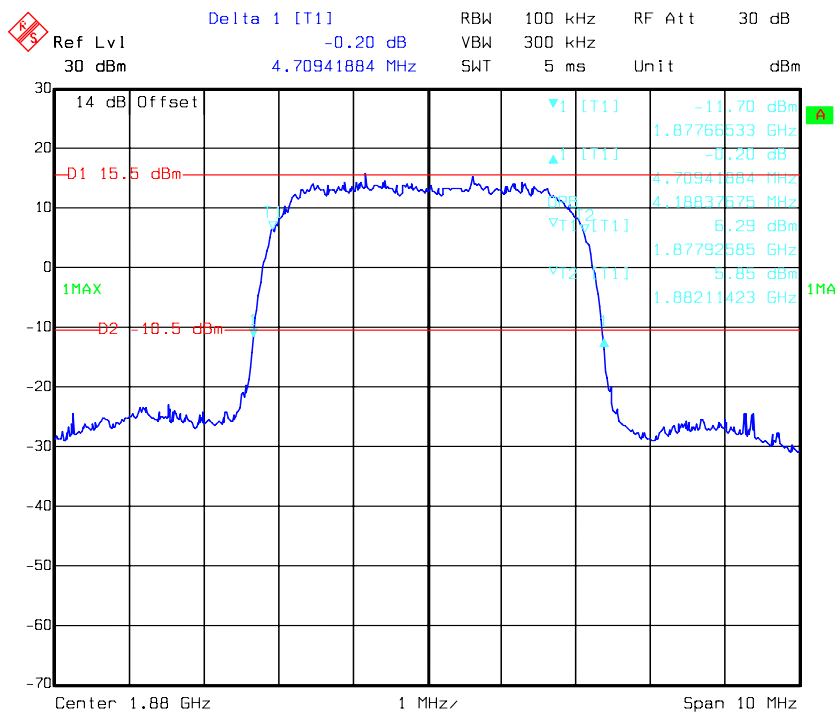


### REL99 Band II



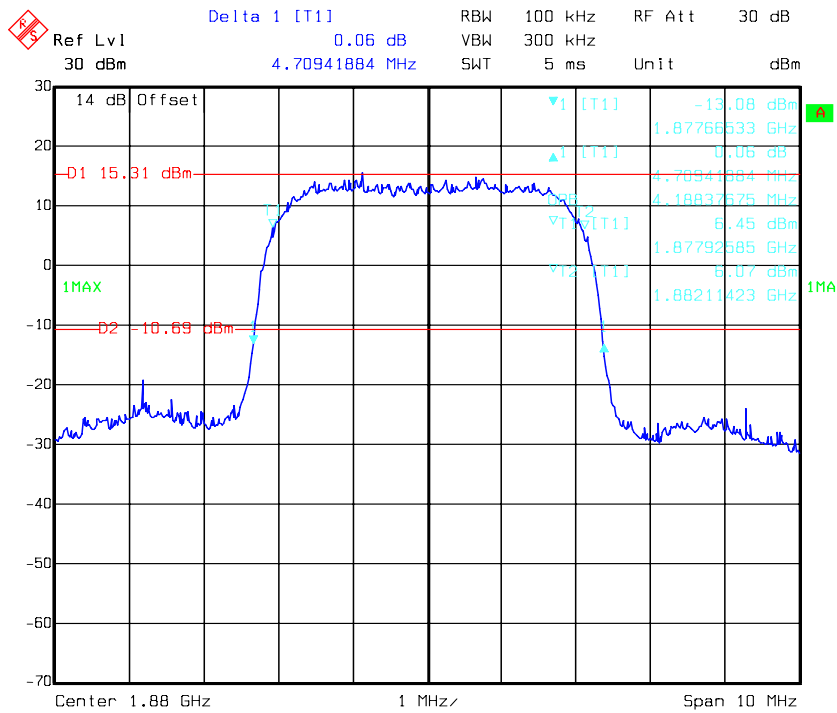
Date: 28.DEC.2016 18:45:11

### HSDPA Band II



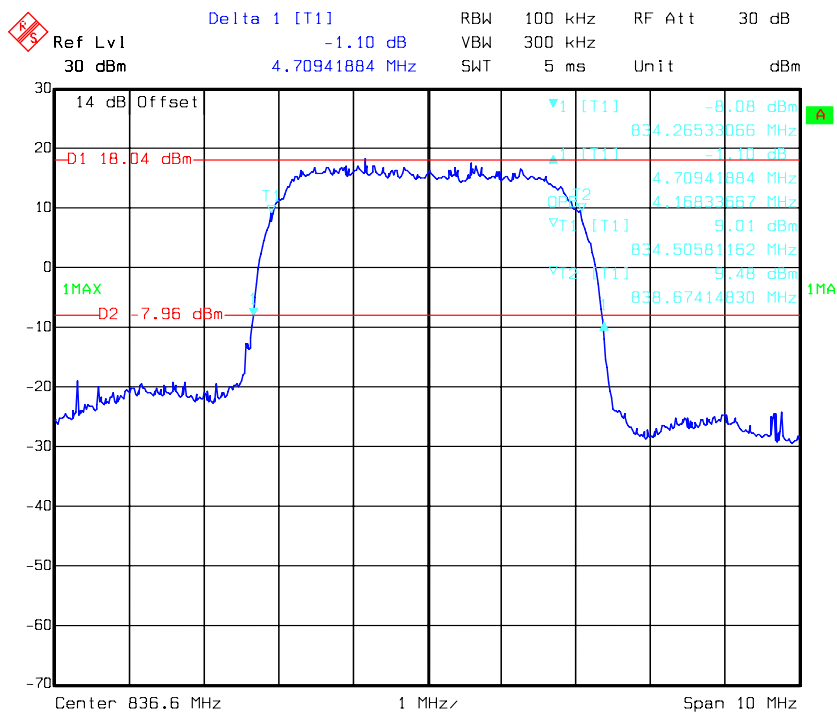
Date: 28.DEC.2016 18:46:40

### HSUPA Band II



Date: 28.DEC.2016 18:47:33

### REL99 Band V



Date: 28.DEC.2016 18:25:35



## FCC §2.1051, §22.917(a) & §24.238(a) - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

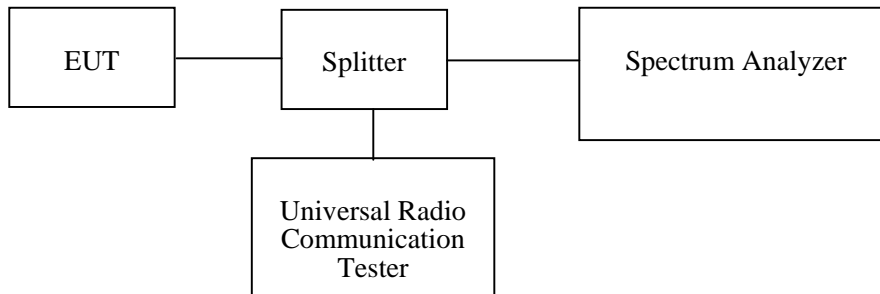
### Applicable Standard

FCC §2.1051, §22.917(a) and §24.238(a).

The spectrum was to be investigated to the tenth harmonics of the highest fundamental frequency as specified in § 2.1051.

### Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer and simulator through appropriate attenuation. Sufficient scans were taken to show any out of band emissions up to 10<sup>th</sup> harmonic.



### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2016-12-02	2017-12-01
N/A	RF Cable	N/A	N/A	Each Time	/
N/A	Two-way Splitter	N/A	OE0120121	Each Time	/

\* **Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

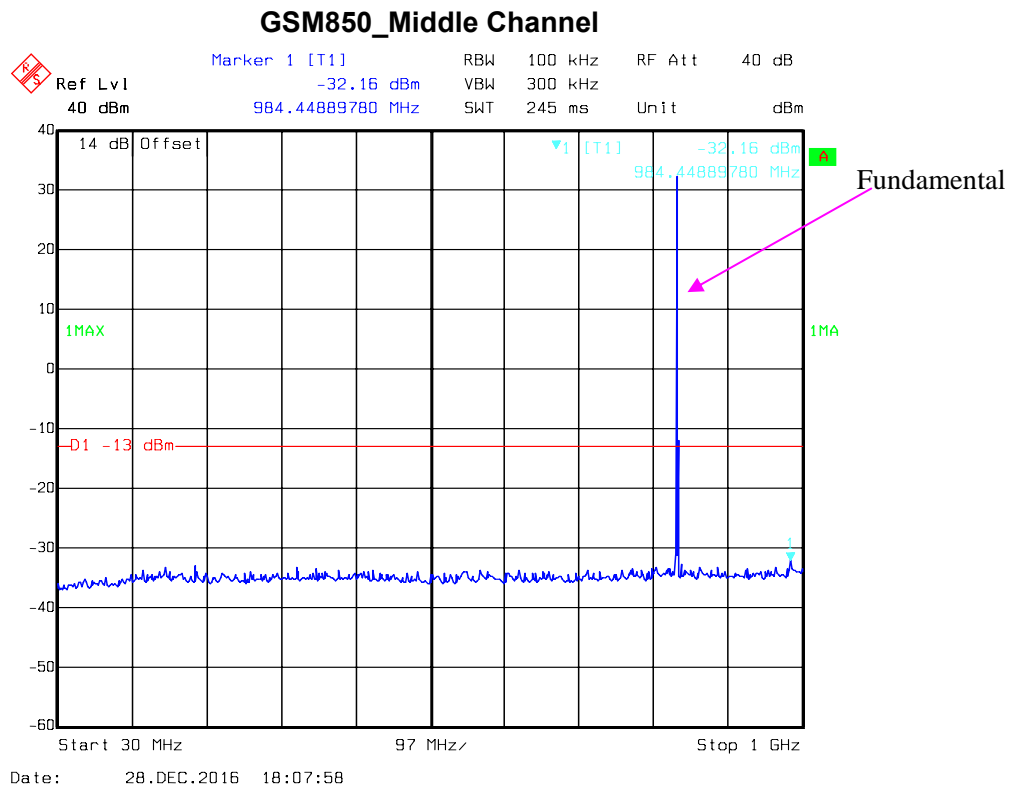
### Test Data

#### Environmental Conditions

Temperature:	26.3 °C
Relative Humidity:	34%
ATM Pressure:	101.8 kPa

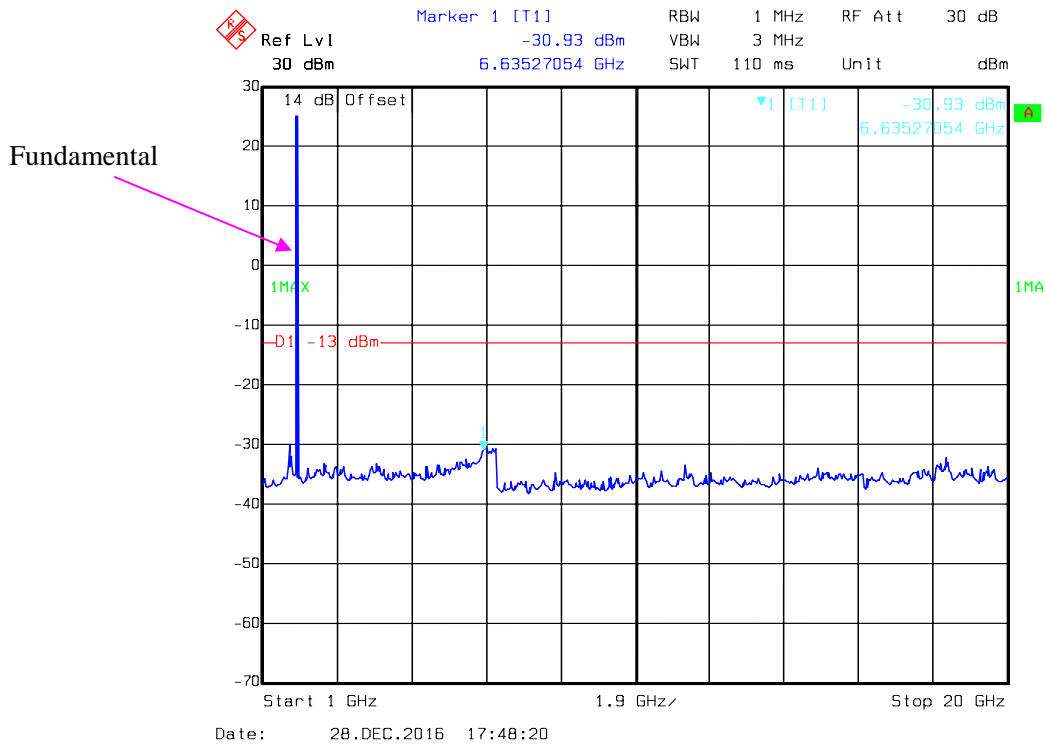
The testing was performed by Kevin Hu on 2016-12-28.

Please refer to the following plots.

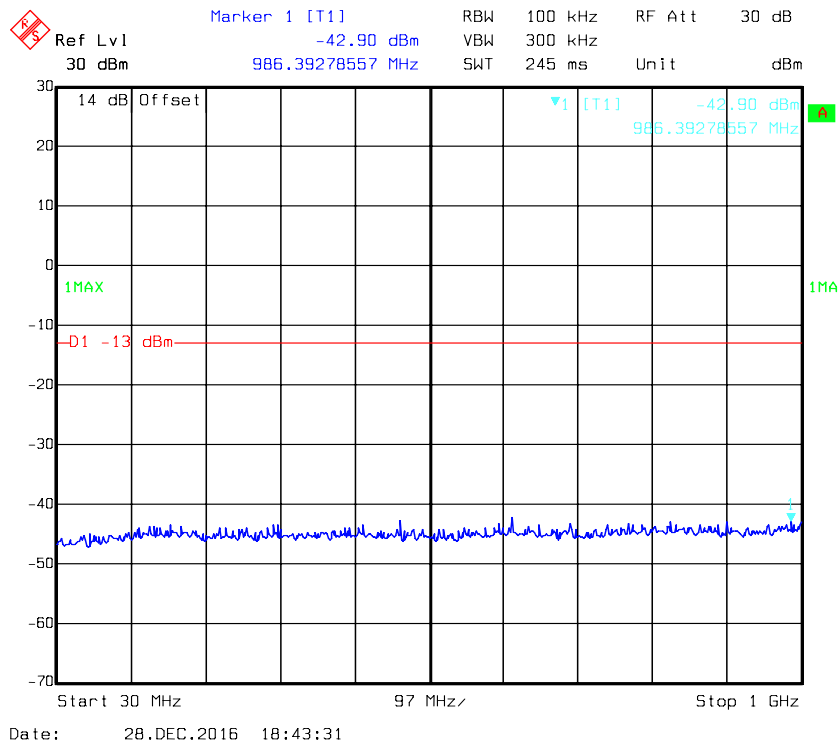


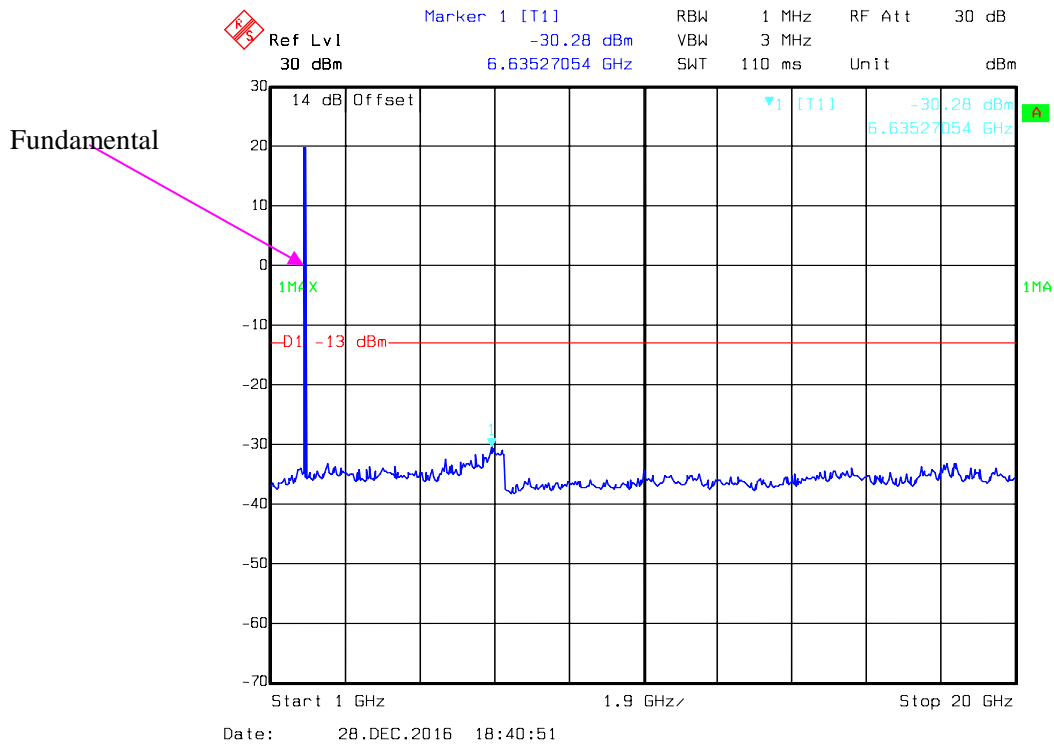




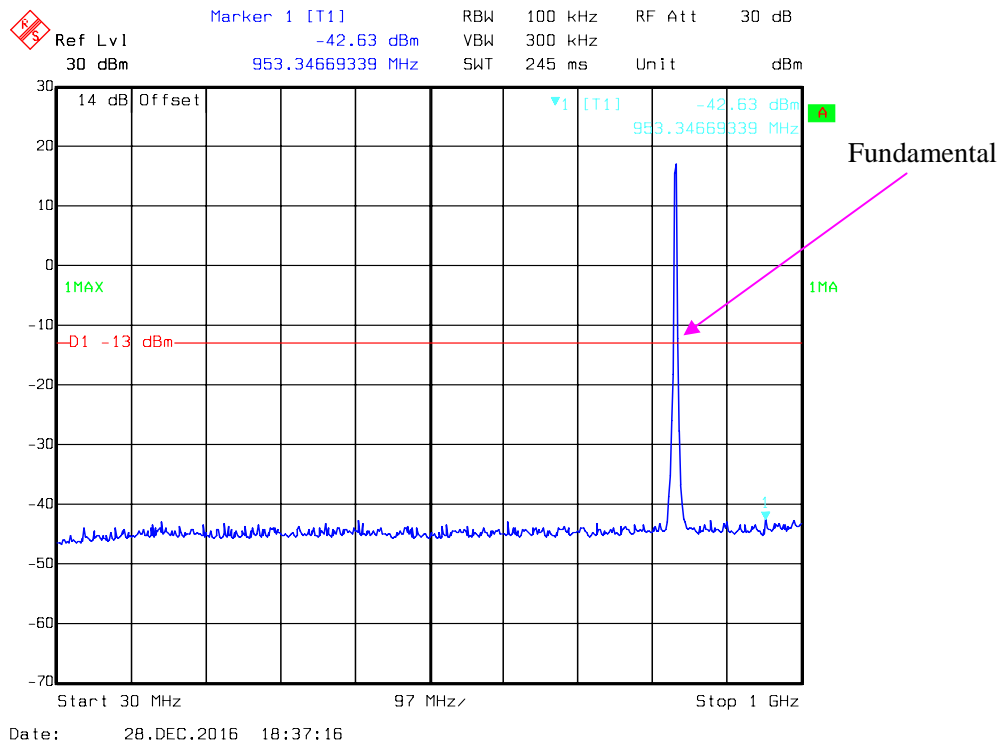


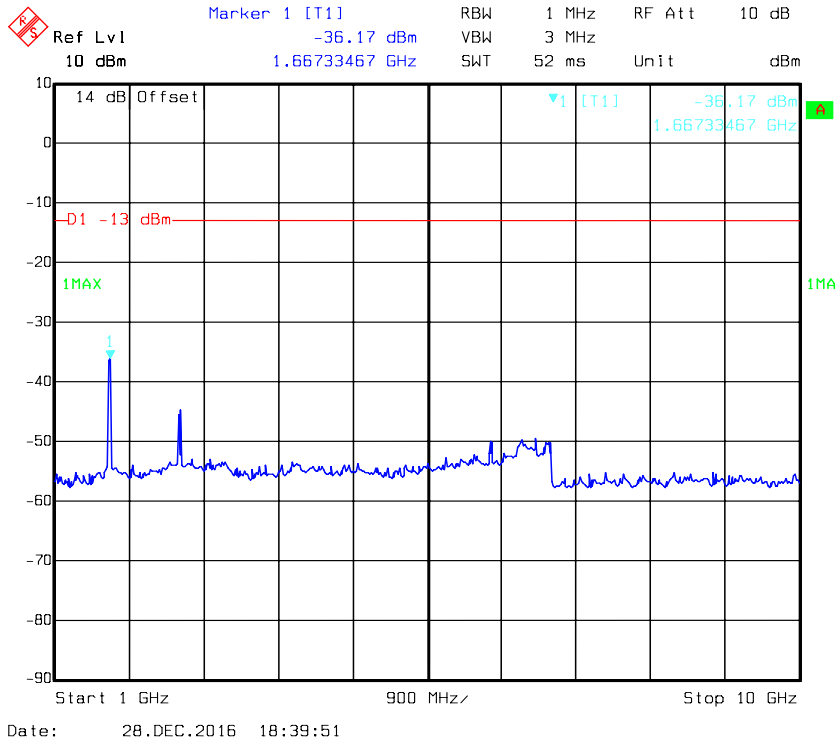
**REL99 Band II\_ Middle Channel**





REL99 Band V\_ Middle Channel





## **FCC §2.1053, §22.917 & §24.238 - SPURIOUS RADIATED EMISSIONS**

---

### **Applicable Standard**

FCC § 2.1053, §22.917 and § 24.238.

### **Test Procedure**

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB =  $10 \lg(\text{TXpwr in Watts}/0.001)$  – the absolute level

Spurious attenuation limit in dB =  $43 + 10 \text{Log}_{10}(\text{power out in Watts})$

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Amplifier	8447D	2944A10442	2016-12-02	2017-12-01
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2016-12-02	2017-12-01
Sunol Sciences	Broadband Antenna	JB3	A101808	2016-04-10	2019-04-09
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2016-12-02	2017-12-01
ETS	Horn Antenna	3115	003-6076	2016-12-02	2017-12-01
ETS	Horn Antenna	3115	6751	2014-06-16	2017-06-15
EMCO	Adjustable Dipole Antenna	3121C	9109-258	N/A	N/A
HP	Signal Generator	8648C	3623A04150	2016-05-23	2017-05-22
WILTRON	SWEPT FREQUENCY SYNTHESIZER	6737	213001	2016-05-23	2017-05-22
Mini-circuits	Amplifier	ZVA-183-S+	771001215	2016-05-20	2017-05-19
HP	Amplifier	8449B	3008A00277	2016-12-02	2017-12-01
EMCT	Semi-Anechoic Chamber	966	N/A	2015-04-24	2018-04-23
N/A	RF Cable (below 1GHz)	NO.1	N/A	2016-11-10	2017-11-09
N/A	RF Cable (below 1GHz)	NO.4	N/A	2016-11-10	2017-11-09
N/A	RF Cable (above 1GHz)	NO.2	N/A	2016-11-10	2017-11-09
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-01 1315	2016-08-18	2017-08-18
Ducommun Technologies	Horn Antenna	ARH-2823-02	1007726-01 1312	2016-08-18	2017-08-18

\* **Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

### Test Data

#### Environmental Conditions

<b>Temperature:</b>	25.7 °C
<b>Relative Humidity:</b>	32%
<b>ATM Pressure:</b>	101.8 kPa

*The testing was performed by Kevin Hu on 2016-12-29.*

EUT Operation Mode: Transmitting

**Cellular Band (PART 22H)**

**30 MHz-10 GHz:**

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBµV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			S.G. Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
GSM850, Frequency:836.600 MHz								
1673.200	H	66.08	-37	7.9	0.8	-29.9	-13.0	16.9
1673.200	V	60.68	-40.7	7.9	0.8	-33.6	-13.0	20.6
2509.800	H	45.30	-54.5	8.9	1.3	-46.9	-13.0	33.9
2509.800	V	46.32	-51.2	8.9	1.3	-43.6	-13.0	30.6
147.520	H	41.67	-73	0.0	0.2	-73.2	-13.0	60.2
147.520	V	40.73	-68.2	0.0	0.2	-68.4	-13.0	55.4
WCDMA Band V R99, Frequency:836.600 MHz								
1673.200	H	55.59	-47.5	7.9	0.8	-40.4	-13.0	27.4
1673.200	V	48.81	-52.6	7.9	0.8	-45.5	-13.0	32.5
2509.800	H	38.63	-61.1	8.9	1.3	-53.5	-13.0	40.5
2509.800	V	36.88	-60.7	8.9	1.3	-53.1	-13.0	40.1
147.520	H	41.35	-73.3	0.0	0.2	-73.5	-13.0	60.5
147.520	V	40.57	-68.3	0.0	0.2	-68.5	-13.0	55.5

**PCS Band (PART 24E)**

**30 MHz-20 GHz:**

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			S.G. Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
GSM1900, Frequency:1880.000 MHz								
3760.000	H	46.82	-48.1	8.8	1.4	-40.7	-13.0	27.7
3760.000	V	42.72	-52.2	8.8	1.4	-44.8	-13.0	31.8
5640.000	H	36.49	-56.6	10.3	1.8	-48.1	-13.0	35.1
5640.000	V	32.83	-60.3	10.3	1.8	-51.8	-13.0	38.8
7520.000	H	48.53	-41.1	10.3	2.3	-33.1	-13.0	20.1
7520.000	V	40.21	-50.7	10.3	2.3	-42.7	-13.0	29.7
147.520	H	41.23	-73.4	0.0	0.2	-73.6	-13.0	60.6
147.520	V	40.63	-68.3	0.0	0.2	-68.5	-13.0	55.5
WCDMA Band II, R99, Frequency:1880.000 MHz								
3760.000	H	45.73	-49.1	8.8	1.4	-41.7	-13.0	28.7
3760.000	V	42.00	-52.9	8.8	1.4	-45.5	-13.0	32.5
5640.000	H	34.79	-58.3	10.3	1.8	-49.8	-13.0	36.8
5640.000	V	34.71	-58.4	10.3	1.8	-49.9	-13.0	36.9
147.520	H	41.39	-73.3	0.0	0.2	-73.5	-13.0	60.5
147.520	V	40.25	-68.7	0.0	0.2	-68.9	-13.0	55.9

Note:

- 1) The unit of Antenna Gain is dBd for frequency below 1GHz, and the unit of Antenna Gain is dBi for frequency above 1GHz.
- 2) Absolute Level = SG Level - Cable loss + Antenna Gain
- 3) Margin = Limit-Absolute Level



## FCC §22.917(a) & §24.238(a) - BAND EDGES

### Applicable Standard

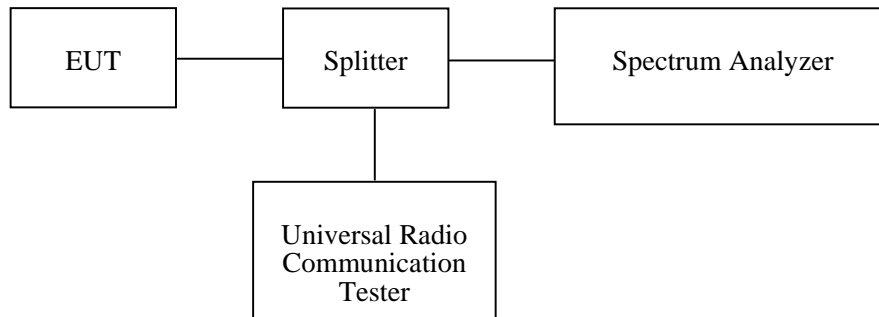
According to § 22.917(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

According to §24.238(a), the power of any emissions 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.

### Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

The center of the spectrum analyzer was set to block edge frequency.



### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2016-12-02	2017-12-01
N/A	RF Cable	N/A	N/A	Each Time	/
N/A	Two-way Splitter	N/A	OE0120121	Each Time	/

\* **Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Test Data

### Environmental Conditions

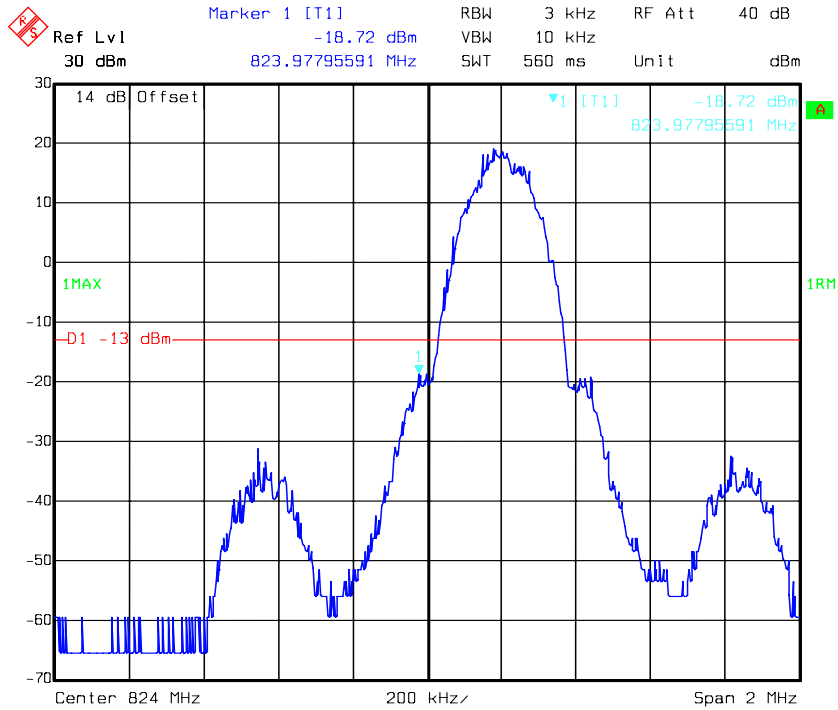
<b>Temperature:</b>	26.3 °C
<b>Relative Humidity:</b>	34%
<b>ATM Pressure:</b>	101.8kPa

*The testing was performed by Kevin Hu on 2016-12-28.*

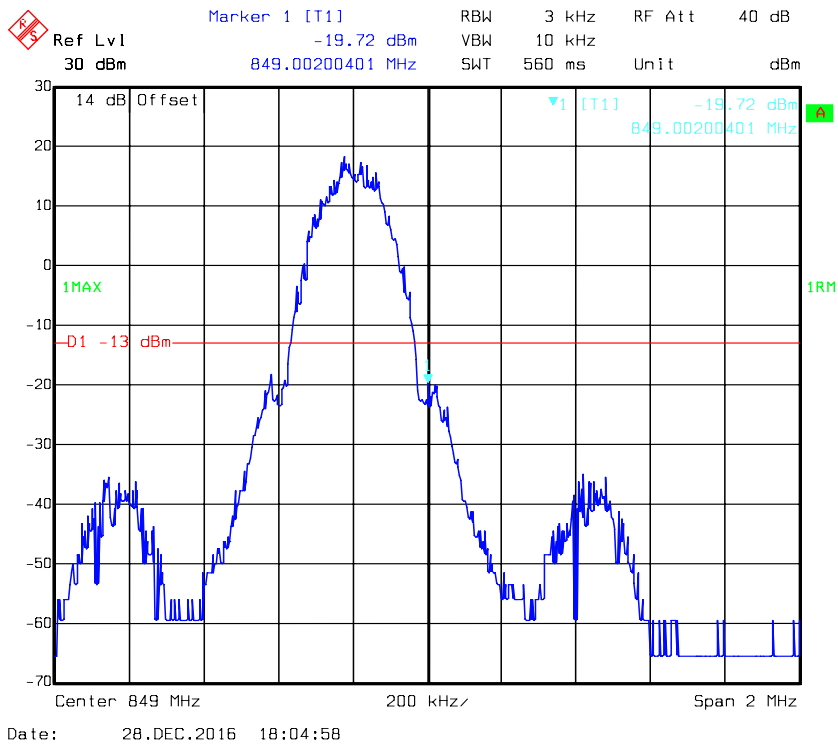
*Test Mode: Transmitting*

*Test Result: Compliant. Please refer to the following plots.*

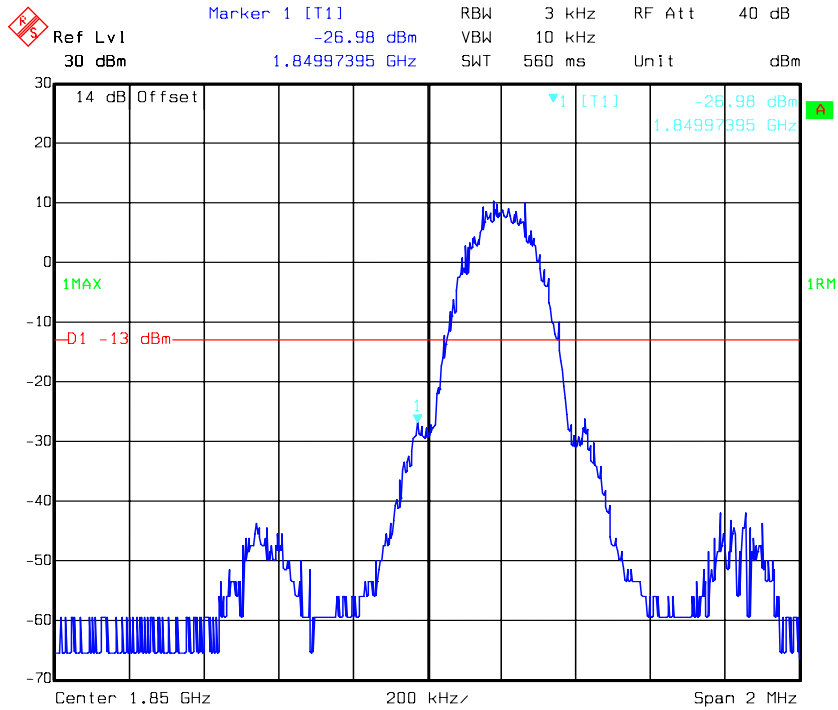
### GSM 850, Left Band Edge



### GSM 850, Right Band Edge

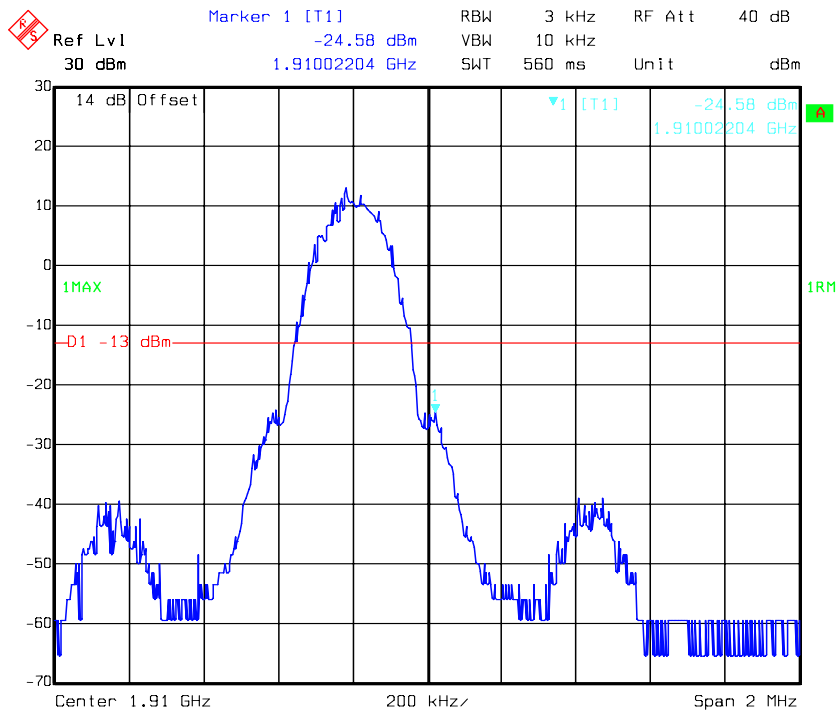


### GSM 1900, Left Band Edge



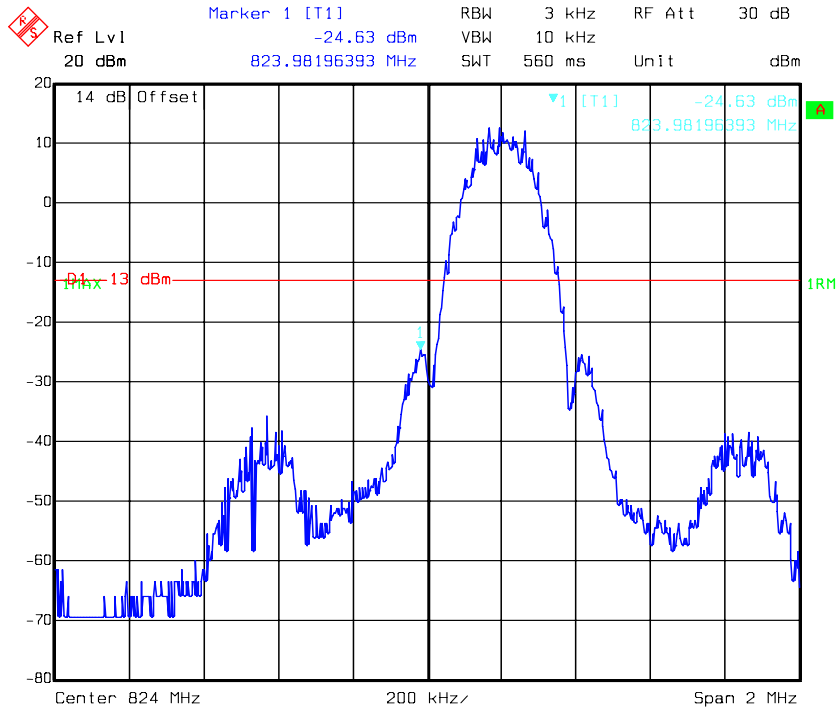
Date: 28.DEC.2016 18:01:37

### GSM 1900, Right Band Edge

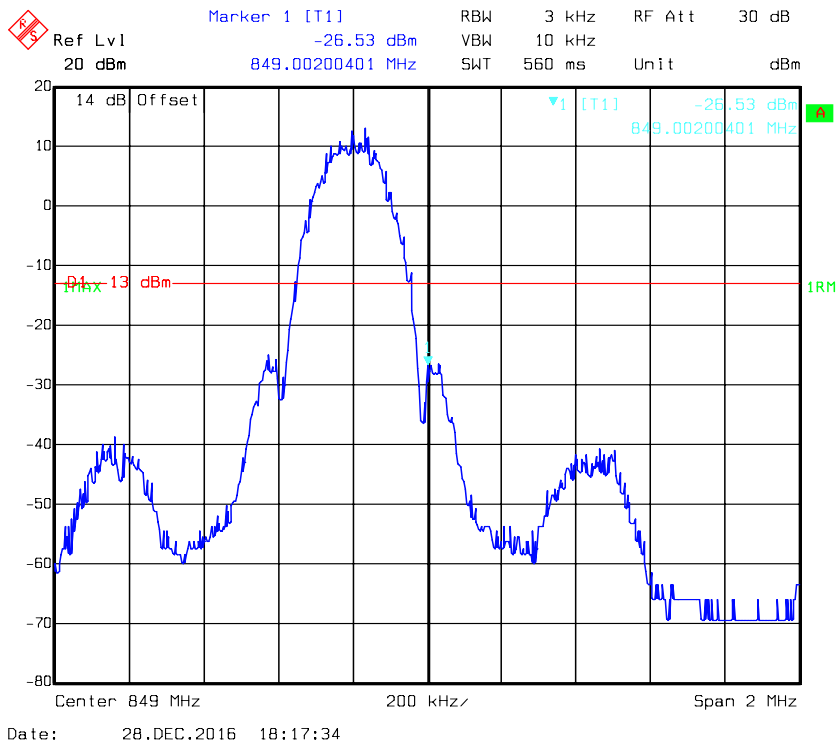


Date: 28.DEC.2016 18:00:35

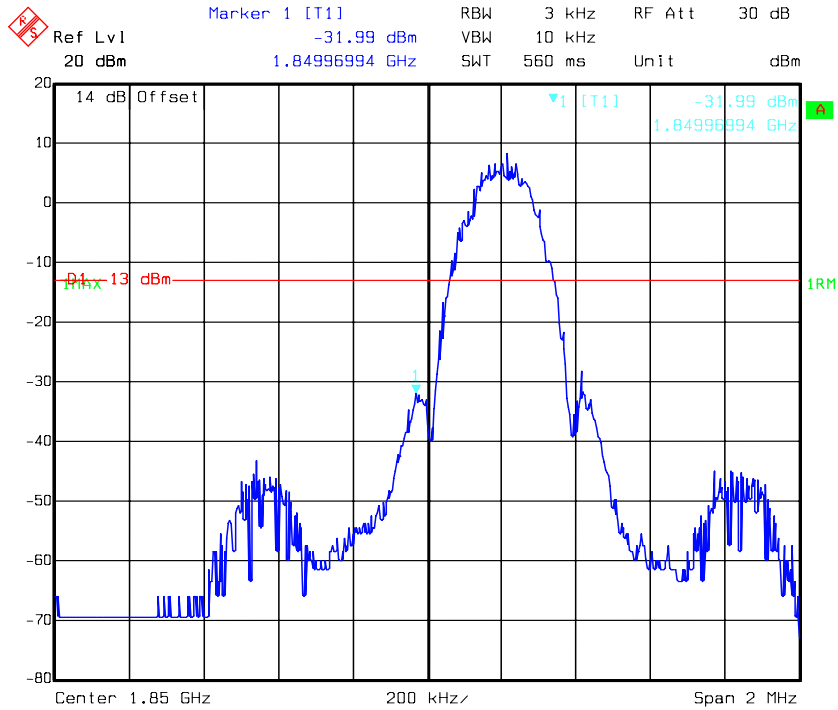
### EDGE 850, Left Band Edge



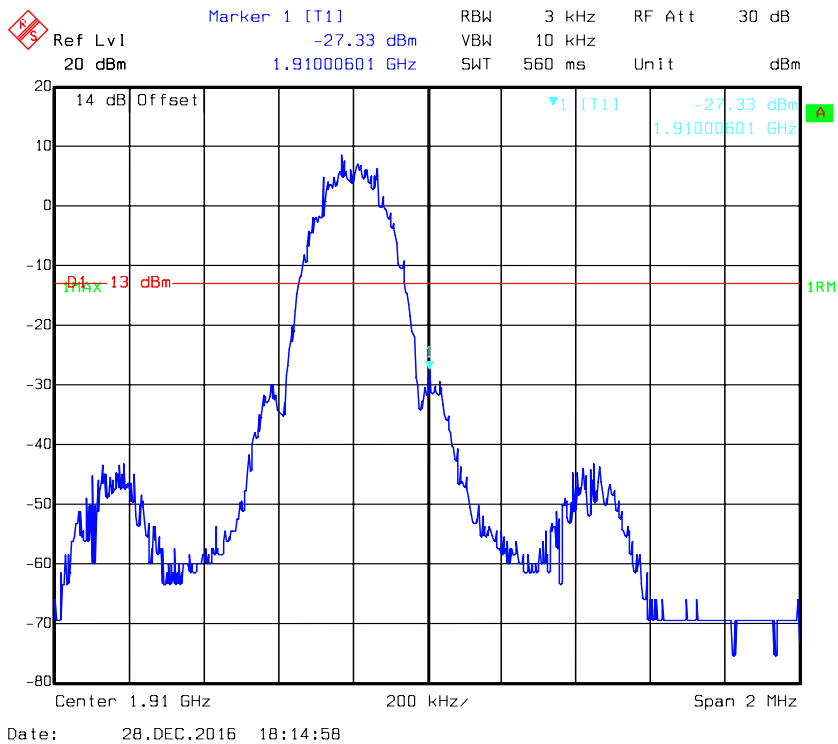
### EDGE 850, Right Band Edge



### EDGE 1900, Left Band Edge

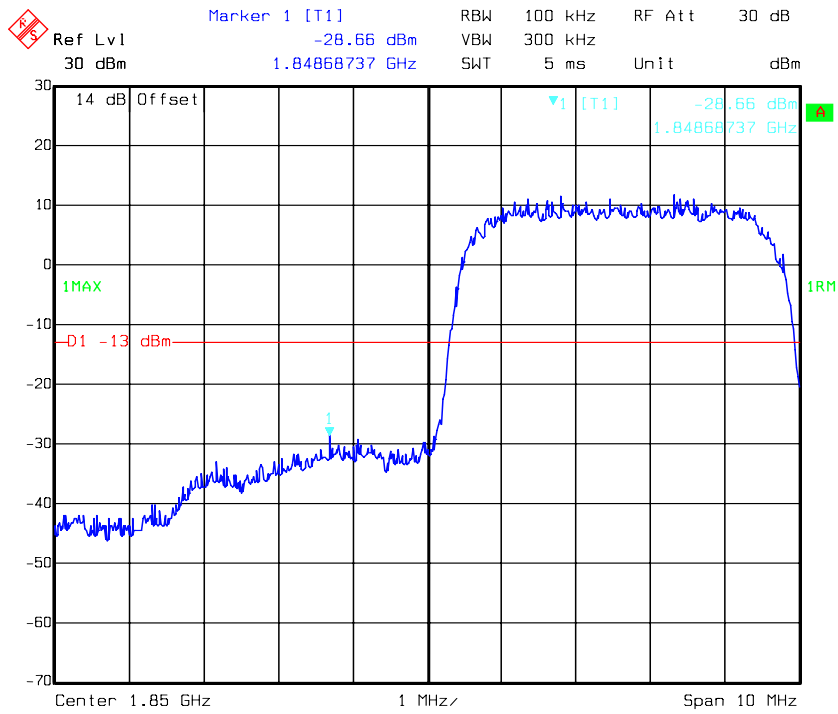


### EDGE 1900, Right Band Edge



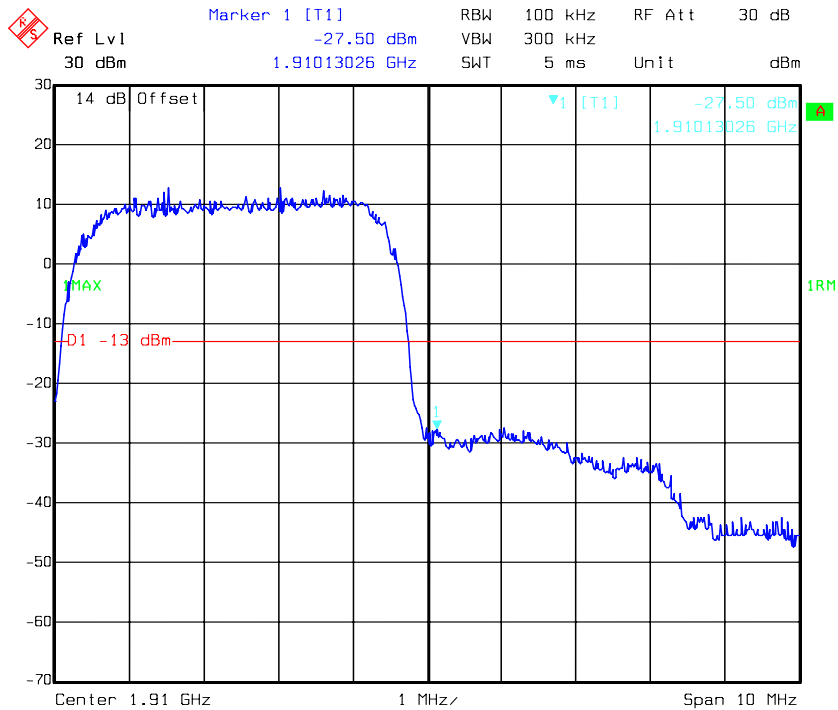
WCDMA Band II:

REL99 Band II, Left Band Edge



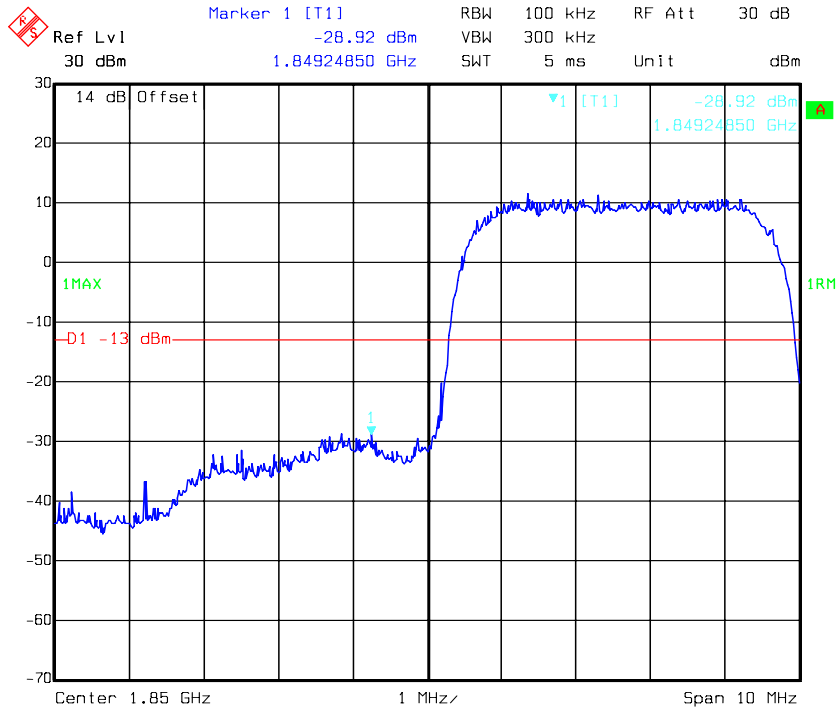
Date: 28.DEC.2016 18:51:33

REL99 Band II, Right Band Edge

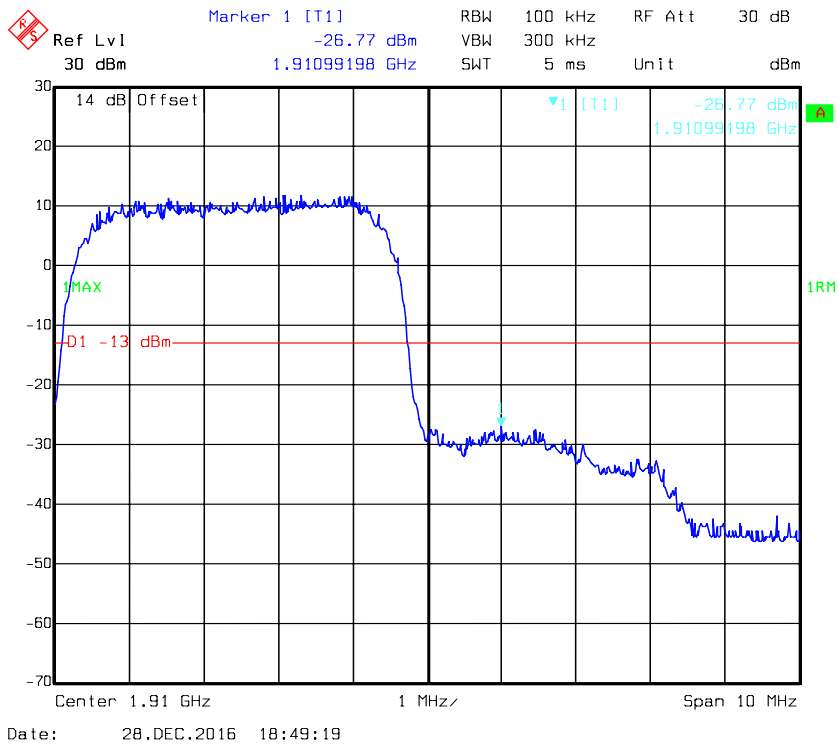


Date: 28.DEC.2016 18:52:10

### HSDPA Band II, Left Band Edge

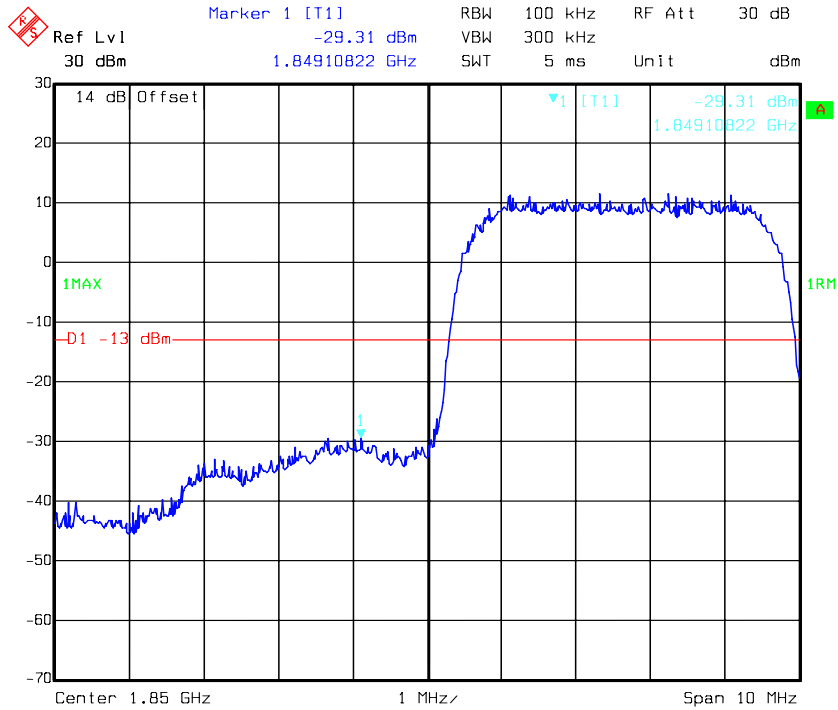


### HSDPA Band II, Right Band Edge

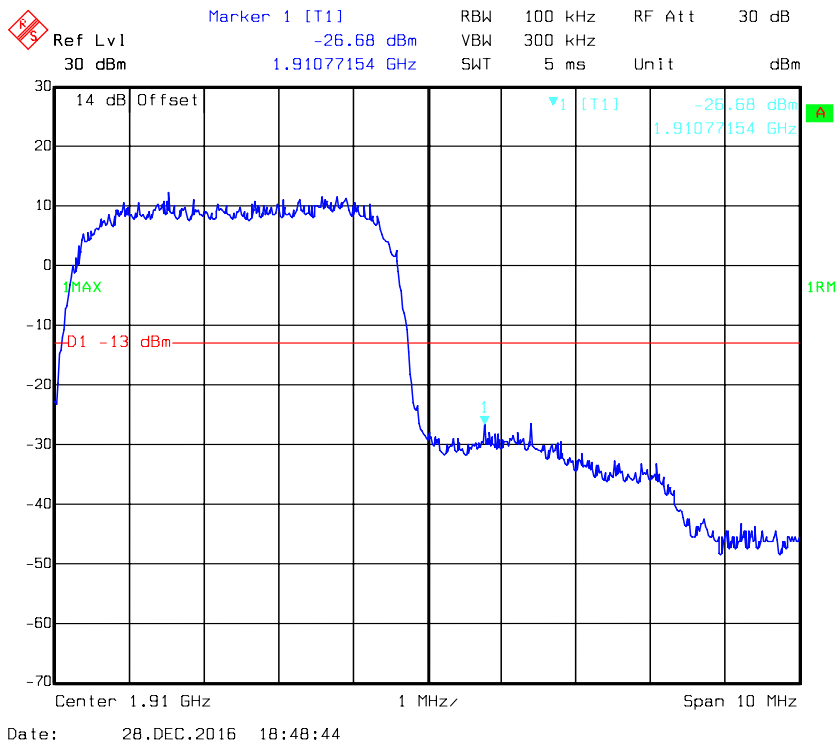




### HSUPA Band II, Left Band Edge

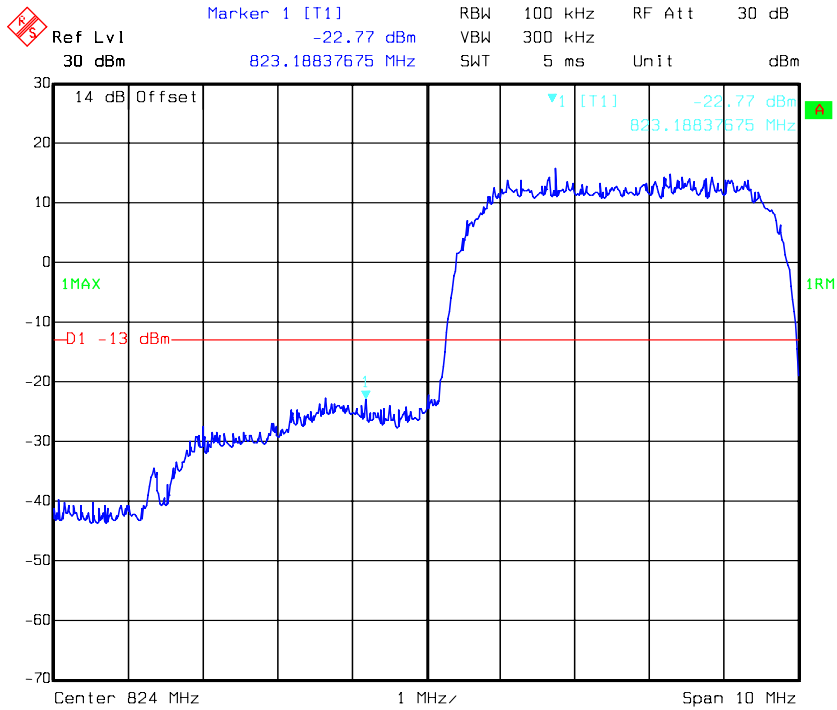


### HSUPA Band II, Right Band Edge



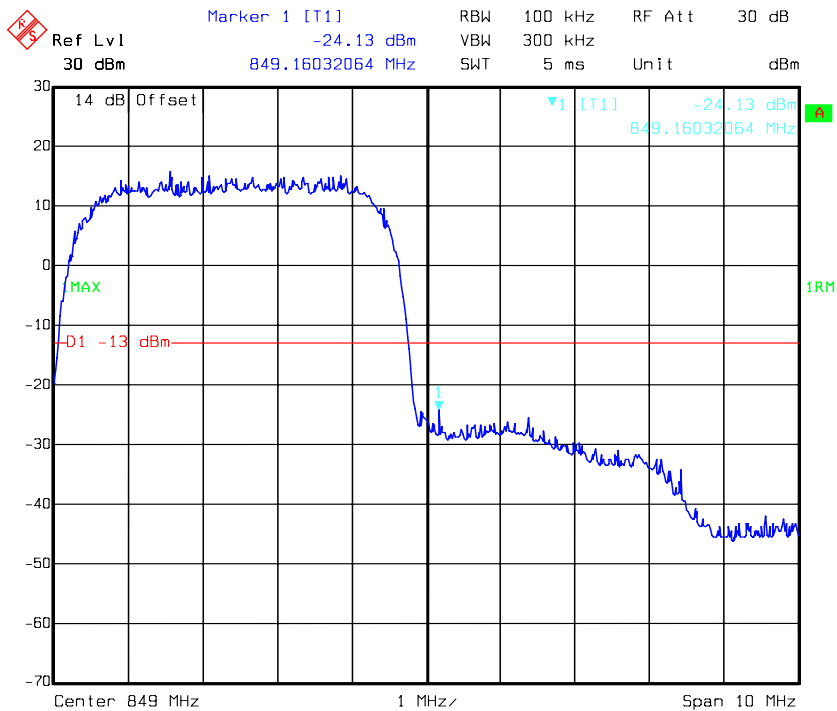
WCDMA Band V

REL99 Band V, Left Band Edge



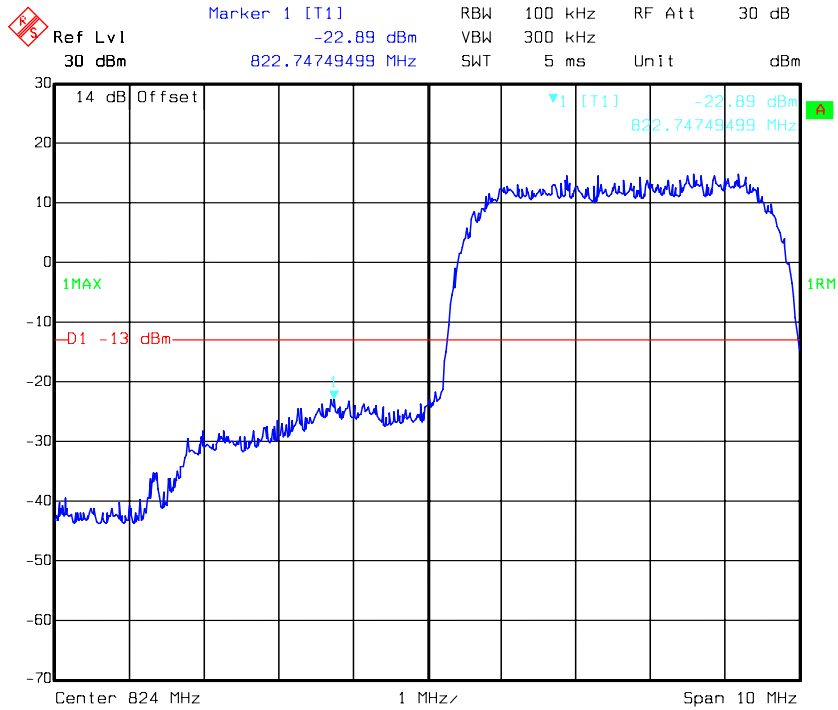
Date: 28.DEC.2016 18:33:17

REL99 Band V Right Band Edge



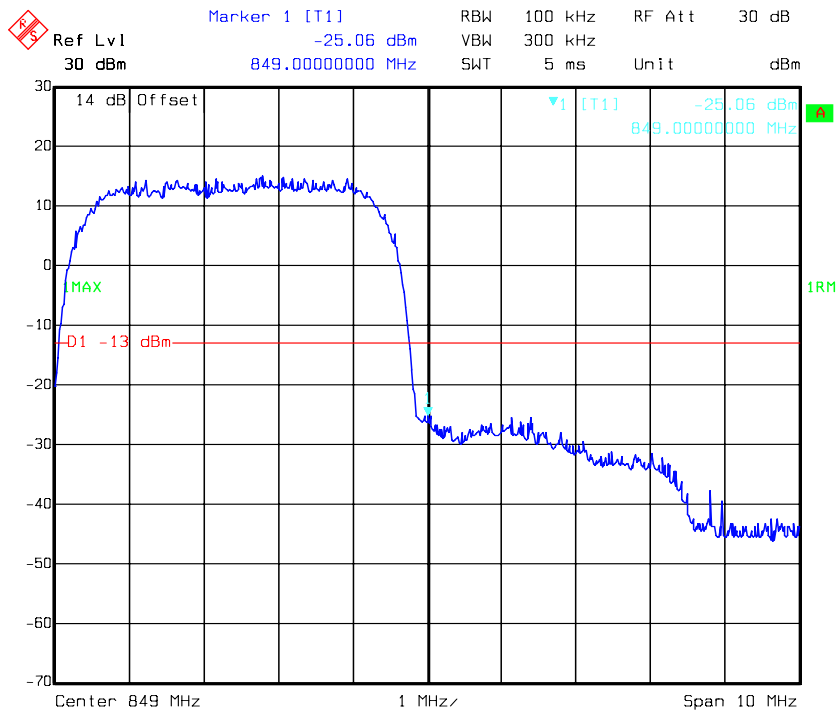
Date: 28.DEC.2016 18:34:04

### HSDPA Band V, Left Band Edge



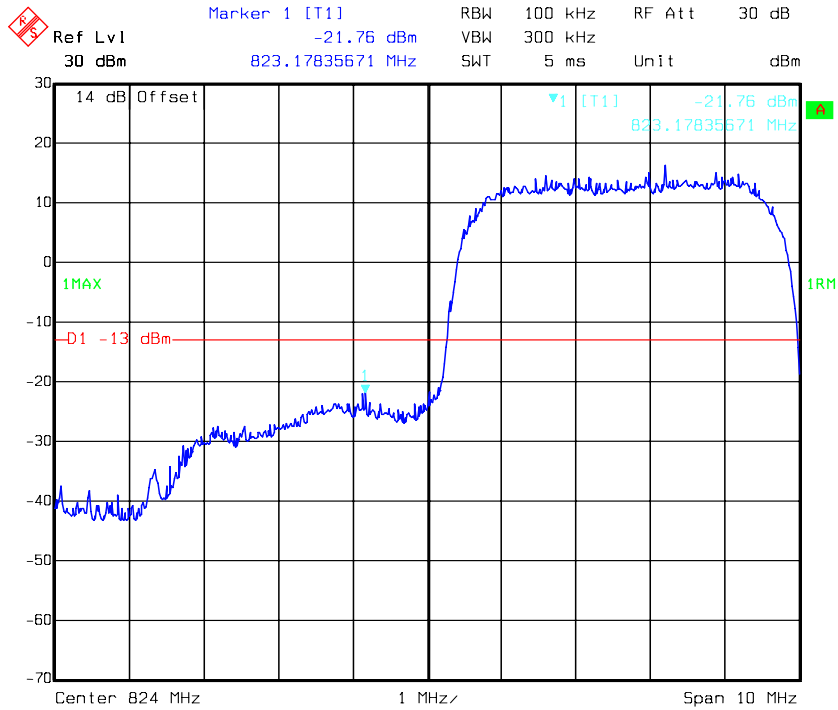
Date: 28.DEC.2016 18:32:37

### HSDPA Band V, Right Band Edge

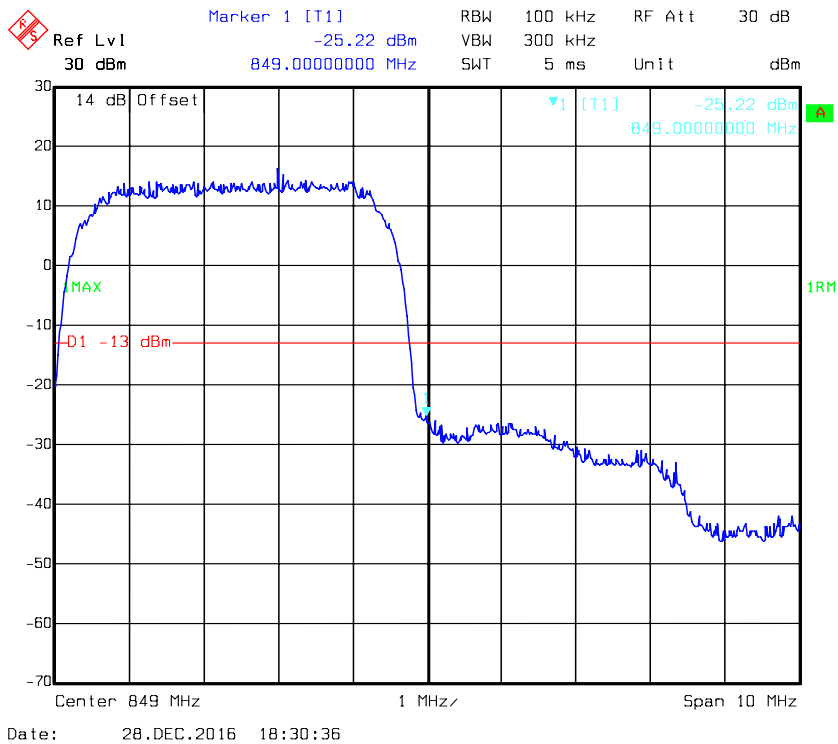


Date: 28.DEC.2016 18:31:54

### HSUPA Band V, Left Band Edge



### HSUPA Band V, Right Band Edge



## FCC §2.1055, §22.355 & §24.235 - FREQUENCY STABILITY

### Applicable Standard

FCC § 2.1055 (a), § 2.1055 (d), §22.355, §24.235

According to §22.355, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table below:

Frequency Tolerance for Transmitters in the Public Mobile Services

Frequency Range (MHz)	Base, fixed (ppm)	Mobile > 3 watts (ppm)	Mobile ≤ 3 watts (ppm)
25 to 50	20.0	20.0	50.0
50 to 450	5.0	5.0	50.0
450 to 512	2.5	5.0	5.0
821 to 896	1.5	2.5	2.5
928 to 929.	5.0	N/A	N/A
929 to 960.	1.5	N/A	N/A
2110 to 2220	10.0	N/A	N/A

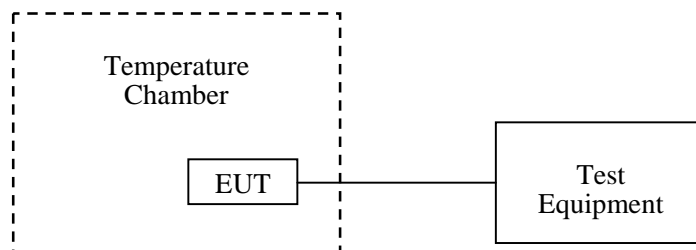
According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emissions stays within the authorized frequency block.

### Test Procedure

**Frequency Stability vs. Temperature:** The equipment under test was connected to an external DC power supply and the RF output was connected to communication test set via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the communication test set.

**Frequency Stability vs. Voltage:** An external variable DC power supply was connected to the battery terminals of the equipment under test. The voltage was set from 85% to 115% of the nominal value and was then decreased until the transmitter light no longer illuminated; i.e., the battery end point. The output frequency was recorded for each battery voltage.



### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
FLUKE	Multimeter	1587	27870099	2015-12-30	2016-12-29
BACL	High Temperature Test Chamber	BTH-150	30024	2016-12-02	2017-12-01
R&S	Universal Radio Communication Tester	CMU200	11-9435686-111	2016-07-28	2017-07-27
N/A	RF Cable	N/A	N/A	Each Time	/

\* **Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

### Test Data

#### Environmental Conditions

<b>Temperature:</b>	26.3 °C
<b>Relative Humidity:</b>	34%
<b>ATM Pressure:</b>	101.8kPa

*The testing was performed by Kevin Hu on 2016-12-28.*

**Cellular Band (Part 22H)**

<b>GMSK, Middle Channel, <math>f_c = 836.6</math> MHz</b>				
<b>Temperature</b>	<b>Voltage</b>	<b>Frequency Error</b>	<b>Frequency Error</b>	<b>Limit</b>
<b>°C</b>	<b>V<sub>DC</sub></b>	<b>Hz</b>	<b>ppm</b>	<b>ppm</b>
-30	3.63	-28	-0.033	2.5
-20		-13	-0.016	
-10		-15	-0.018	
0		-16	-0.019	
10		-18	-0.022	
20		-20	-0.024	
30		-28	-0.033	
40		-29	-0.035	
50		-13	-0.016	
20		3.5	-20	
20	4.2	-26	-0.031	

<b>EDGE, Middle Channel, <math>f_c = 836.6</math> MHz</b>				
<b>Temperature</b>	<b>Voltage</b>	<b>Frequency Error</b>	<b>Frequency Error</b>	<b>Limit</b>
<b>°C</b>	<b>V<sub>DC</sub></b>	<b>Hz</b>	<b>ppm</b>	<b>ppm</b>
-30	3.63	-9	-0.011	2.5
-20		-15	-0.018	
-10		-21	-0.025	
0		-16	-0.019	
10		-22	-0.026	
20		-15	-0.018	
30		-23	-0.027	
40		-24	-0.029	
50		-25	-0.030	
20		3.5	-16	
20	4.2	-18	-0.022	

**PCS Band (Part 24E)**

GMSK, Middle Channel, $f_c = 1880.0$ MHz				
Temperature	Voltage	Frequency Error	Frequency Error	Result
°C	V <sub>DC</sub>	Hz	ppm	
-30	3.63	-1	-0.001	Compliance
-20		7	0.004	
-10		-5	-0.003	
0		10	0.005	
10		7	0.004	
20		5	0.003	
30		10	0.005	
40		2	0.001	
50		3	0.002	
20		3.5	6	
20	4.2	4	0.002	

EDGE, Middle Channel, $f_c = 1880.0$ MHz				
Temperature	Voltage	Frequency Error	Frequency Error	Result
°C	V <sub>DC</sub>	Hz	ppm	
-30	3.63	38	0.020	Compliance
-20		35	0.019	
-10		25	0.013	
0		23	0.012	
10		31	0.016	
20		32	0.017	
30		29	0.015	
40		32	0.017	
50		25	0.013	
20		3.5	23	
20	4.2	32	0.017	



**WCDMA Band V: Re99**

Middle Channel, $f_c = 836.6$ MHz				
Temperature	Voltage	Frequency Error	Frequency Error	Limit
°C	V <sub>DC</sub>	Hz	ppm	ppm
-30	3.63	-10	-0.012	2.5
-20		-14	-0.017	
-10		-7	-0.008	
0		-6	-0.007	
10		-10	-0.012	
20		-7	-0.008	
30		-5	-0.006	
40		-4	-0.005	
50		-15	-0.018	
20		3.5	-2	
20	4.2	-11	-0.013	

**WCDMA Band II: Re99**

Middle Channel, $f_c = 1880.0$ MHz				
Temperature	Voltage	Frequency Error	Frequency Error	Result
°C	V <sub>DC</sub>	Hz	ppm	
-30	3.63	-8	-0.004	Compliance
-20		3	0.002	
-10		-7	-0.004	
0		2	0.001	
10		-11	-0.006	
20		-6	-0.003	
30		-4	-0.002	
40		-9	-0.005	
50		-3	-0.002	
20		3.5	-6	
20	4.2	-7	-0.004	

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