

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

For

**INGENICO**

9 Avenue de la Gare-Rolvatain TGV, BP 25156, Valence Cedex 9, France

**FCC ID: XKB-L2500CL3GWIBT**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Link/2500
<b>Report Number:</b> RXM160823052-00E	
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<b>Reviewed By:</b>	Dean Liu RF Engineer <i>Dean Liu</i>
<b>Approved By:</b>	Jerry Zhang EMC Manager <i>Jerry Zhang</i>
<b>Test Laboratory:</b> Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industrial Zone, Tangxia, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 <a href="http://www.baclcorp.com.cn">www.baclcorp.com.cn</a>	

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## GENERAL INFORMATION

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

The *INGENICO*'s product, model number: *LINK/2500 CL/3G/WiFi/BT (FCC ID: XKB-L2500CL3GWIBT)* (the "EUT") in this report was a *Link/2500*, which was measured approximately: 12.8 cm (L) x 7.0 cm (W) x 1.7cm (H), rated input voltage: DC 3.7V from rechargeable Li-ion battery or DC 5V from adapter. The device used Gemalto M2M GmbH's Wireless module EHS6, FCC ID: QIPEHS6, which support GPRS/EDGE/WCDMA 850 (1900) band, all of the other functions eg.GSM, and other band were disabled by software.

Adapter information:

MODEL: PSA105R-050QL6

INPUT: 100-240V ~ 0.3A 50-60Hz 11-15VA

OUTPUT: DC 5V, 1.0A MAX

*All measurement and test data in this report was gathered from production sample serial number: 160823052 (Assigned by BACL, Dongguan). The EUT was received on 2016-08-25.*

### Objective

This report is prepared on behalf of *INGENICO*. 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)

FCC Part 15C DXX submissions with FCC ID: XKB-L2500CL3GWIBT.

FCC Part 15C DTS submissions with FCC ID: XKB-L2500CL3GWIBT.

FCC Part 15C DSS submissions with FCC ID: XKB-L2500CL3GWIBT.

FCC Part 15.407 NII submissions with FCC ID: XKB-L2500CL3GWIBT.

### 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 as well as the following parts:

Part 22 Subpart H - Public Mobile Services

Part 24 Subpart E - Personal Communication Services

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

All radiated and conducted emissions measurements were performed at Bay Area Compliance Laboratories Corp.(Dongguan).

## **Test Facility**

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industrial Zone, Tangxia, Dongguan, Guangdong, China

Test site at Bay Area Compliance Laboratories Corp. (Dongguan) has been fully described in reports submitted to the Federal Communications 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 February 06, 2015.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 273710. 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.

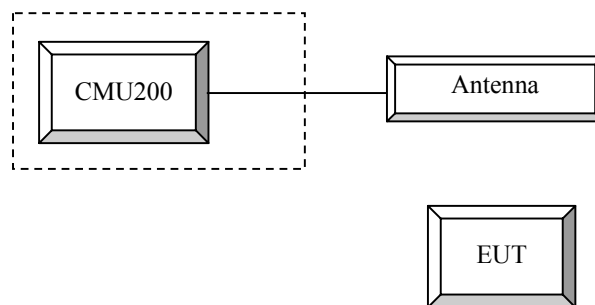
### Equipment Modifications

No modification was made to the EUT.

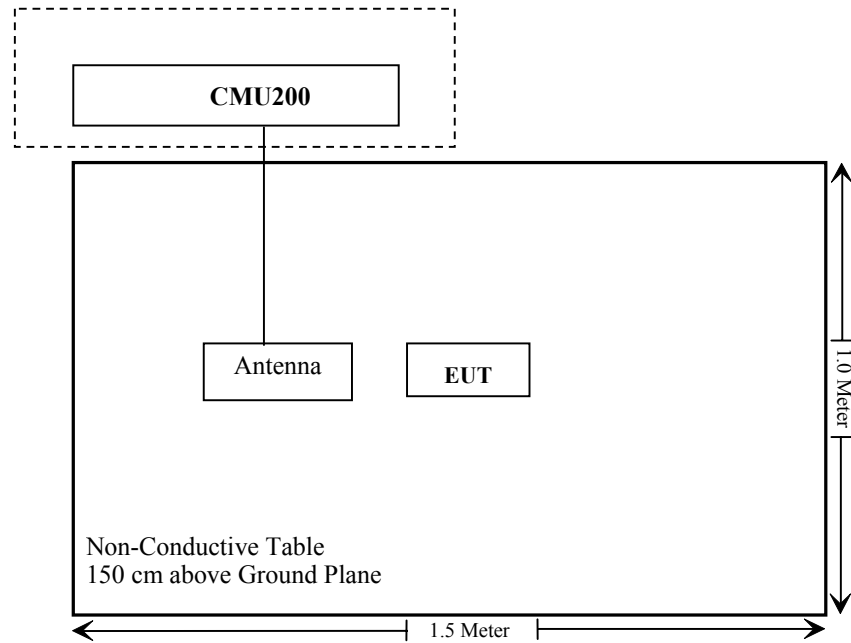
### Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
R&S	Universal Radio Communication Tester	CMU200	109038

### Configuration of Test Setup



## Block Diagram of Test Setup



**SUMMARY OF TEST RESULTS**

FCC Rules	Description of Test	Result
§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

Test time: 2016.09.02~2016.09.07



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

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### **Applicable Standard**

FCC§1.1310 and §2.1093.

### **Test Result**

Compliant, please refer to the SAR report: RXM160823052-20.

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

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

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

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**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 Enter appropriate offsets for Ext. Att. Output and Ext. Att. Input  
 Connection Press Signal on to turn on the signal and change settings

### WCDMA-Release 99

The following tests were conducted according to the test requirements outlines in section 5.2 of the 3GPP TS34.121-1 specification. The EUT has a nominal maximum output power of 24dBm (+1.7/-3.7).

<b>WCDMA General Settings</b>	Loopback Mode	Test Mode 1
	Rel99 RMC	12.2kbps RMC
	Power Control Algorithm	Algorithm2
	$\beta_c / \beta_d$	8/15

### WCDMA HSDPA

The following tests were conducted according to the test requirements outlines in section 5.2 of the 3GPP TS34.121-1 specification.

	Mode	HSDPA	HSDPA	HSDPA	HSDPA
	Subset	1	2	3	4
<b>WCDMA General Settings</b>	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set1			
	Power Control Algorithm	Algorithm2			
	$\beta_c$	2/15	12/15	15/15	15/15
	$\beta_d$	15/15	15/15	8/15	4/15
	$\beta_d$ (SF)	64			
	$\beta_c / \beta_d$	2/15	12/15	15/8	15/4
	$\beta_{hs}$	4/15	24/15	30/15	30/15
	MPR(dB)	0	0	0.5	0.5
<b>HSDPA Specific Settings</b>	DACK	8			
	DNAK	8			
	DCQI	8			
	Ack-Nack repetition factor	3			
	CQI Feedback	4ms			
	CQI Repetition Factor	2			
	$A_{hs} = \beta_{hs} / \beta_c$	30/15			

**WCDMA HSUPA**

The following tests were conducted according to the test requirements outlines in section 5.2 of the 3GPP TS34.121-1 specification.

	<b>Mode</b>	<b>HSUPA</b>	<b>HSUPA</b>	<b>HSUPA</b>	<b>HSUPA</b>	<b>HSUPA</b>
	<b>Subset</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>WCDMA A General Settings</b>	Loopback Mode	Test Mode 1				
	Rel99 RMC	12.2kbps RMC				
	HSDPA FRC	H-Set1				
	HSUPA Test	HSUPA Loopback				
	Power Control Algorithm	Algorithm2				
	$\beta_c$	11/15	6/15	15/15	2/15	15/15
	$\beta_d$	15/15	15/15	9/15	15/15	0
	$\beta_{ec}$	209/225	12/15	30/15	2/15	5/15
	$\beta_c/\beta_d$	11/15	6/15	15/9	2/15	-
	$\beta_{hs}$	22/15	12/15	30/15	4/15	5/15
	CM(dB)	1.0	3.0	2.0	3.0	1.0
<b>HSDPA Specific Settings</b>	MPR(dB)	0	2	1	2	0
	DACK	8				
	DNAK	8				
	DCQI	8				
	Ack-Nack repetition factor	3				
	CQI Feedback	4ms				
	CQI Repetition Factor	2				
<b>HSUPA Specific Settings</b>	$A_{hs}=\beta_{hs}/\beta_c$	30/15				
	DE-DPCCH	6	8	8	5	7
	DHARQ	0	0	0	0	0
	AG Index	20	12	15	17	21
	ETFCI	75	67	92	71	81
	Associated Max UL Data Rate kbps	242.1	174.9	482.8	205.8	308.9
	Reference E_FCI	E-TFCI 11 E E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO23 E-TFCI 75 E-TFCI PO26 E-TFCI 81 E-TFCI PO 27	E-TFCI 11 E-TFCI PO4 E-TFCI 92 E-TFCI PO 18	E-TFCI 11 E E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO23 E-TFCI 75 E-TFCI PO26 E-TFCI 81 E-TFCI PO 27		

*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
R&S	EMI Test Receiver	ESCI	100224	2016-09-01	2017-09-01
Sunol Sciences	Antenna	JB3	A060611-3	2014-07-28	2017-07-27
HP	Amplifier	8447E	2434A02181	2016-09-01	2017-09-01
R&S	Spectrum Analyzer	FSP 38	100478	2015-11-23	2016-11-22
ETS LINDGREN	Horn Antenna	3115	000 527 35	2016-01-05	2019-01-04
Mini-Circuit	Amplifier	ZVA-213-S+	054201245	2016-02-19	2017-02-19
Giga	Signal Generator	1026	320408	2015-11-23	2016-11-22
EMCO	Adjustable Dipole Antenna	3121C	9109-753	N/A	N/A
TDK RF	Horn Antenna	HRN-0118	130 084	2015-09-06	2018-09-06
N/A	Coaxial Cable	14m	N/A	2016-05-06	2017-05-06
N/A	Coaxial Cable	8m	N/A	2016-05-06	2017-05-06
N/A	Coaxial Cable	0.1m	N/A	2016-05-06	2017-05-06
E-Microwave	DC Blocking	EMDCB-00036	0E01201047	2016-05-06	2017-05-06
NARDA	Attenuator	769-6	2754	2016/5/6	2017/5/6
Pasternack	RF <a href="#">Coaxial</a> Cable	RF-01	N/A	2016-05-06	2017-05-06
Pasternack	RF <a href="#">Coaxial</a> Cable	RF-02	N/A	2016-05-06	2017-05-06
N/A	Two-way Splitter	ODP-1-6-2S	OE0120142	2016-05-06	2017-05-06

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to National Primary Standards and International System of Units (SI).

**Test Data****Environmental Conditions**

<b>Temperature:</b>	29.2 °C
<b>Relative Humidity:</b>	44 %
<b>ATM Pressure:</b>	99.9 kPa

*The testing was performed by Lion Xiao on 2016-09-02.*

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

Band	Channel No.	Peak Output Power (dBm)								
		GSM	GPRS 1 TX Slot	GPRS 2 TX Slot	GPRS 3 TX Slot	GPRS 4 TX Slot	EDGE 1 TX Slot	EDGE 2 TX Slot	EDGE 3 TX Slot	EDGE 4 TX Slot
Cellular	128	/	32.25	30.60	29.03	27.63	26.38	24.77	23.39	21.60
	190	/	32.08	30.42	28.75	27.47	25.94	24.45	23.12	21.37
	251	/	32.05	30.38	28.73	27.39	25.86	24.37	23.07	21.21
PCS	512	/	29.22	27.55	26.07	24.41	25.12	23.56	22.06	20.77
	661	/	28.96	27.19	25.56	24.09	24.89	23.20	21.81	20.38
	810	/	28.73	26.97	25.24	23.83	24.76	23.05	21.64	21.12

**WCDMA Band II**

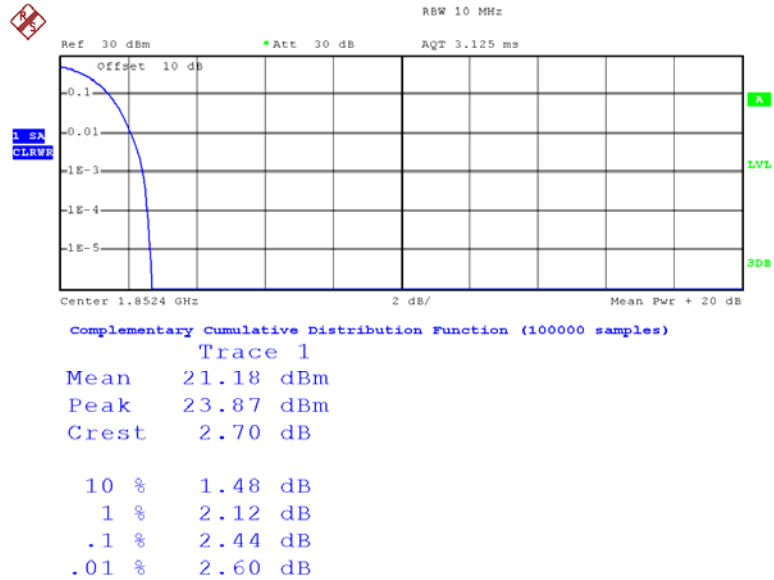
Mode	3GPP Sub Test	Average Output Power (dBm)					
		Low Channel (Ave. Power)	Low Channel (PAR)	Middle Channel (Ave. Power)	Middle Channel (PAR)	High Channel (Ave. Power)	High Channel (PAR)
Rel 99 (QPSK)	1	22.18	2.44	22.16	3.14	22.15	2.84
HSDPA (QPSK)	1	21.09	2.36	21.09	3.05	21.01	2.76
	2	21.05	2.41	21.02	3.20	21.06	2.88
	3	21.01	2.43	21.10	3.23	21.03	2.79
	4	21.00	2.39	21.05	3.21	21.96	2.85
HSUPA (QPSK)	1	20.94	2.35	21.01	3.15	21.02	2.87
	2	20.90	2.51	21.08	3.18	21.04	2.94
	3	20.82	2.44	21.03	3.20	20.99	2.89
	4	20.86	2.36	20.98	3.22	20.91	2.77
	5	20.79	2.53	20.95	3.10	20.94	2.91

**WCDMA Band V**

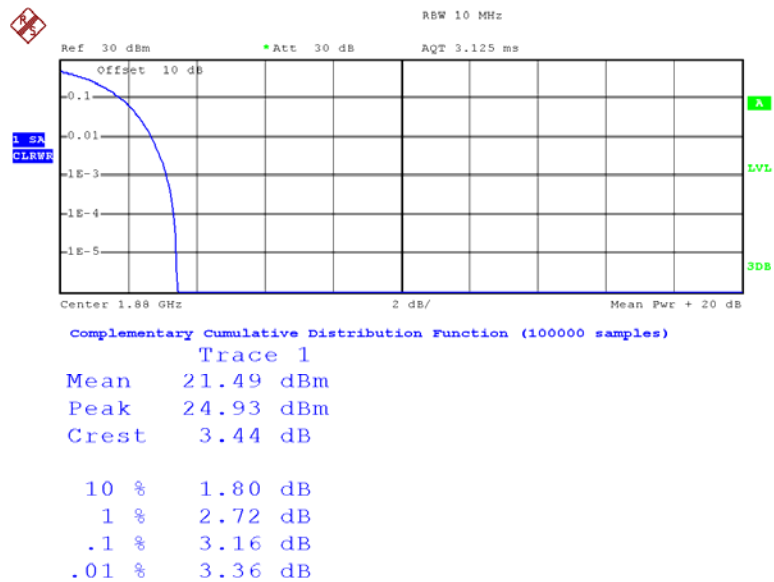
Mode	3GPP Sub Test	Average Output Power (dBm)					
		Low Channel (Ave. Power)	Low Channel (PAR)	Middle Channel (Ave. Power)	Middle Channel (PAR)	High Channel (Ave. Power)	High Channel (PAR)
Rel 99 (QPSK)	1	22.24	3.12	22.08	3.16	22.34	3.08
HSDPA (QPSK)	1	21.19	3.05	20.92	3.38	21.21	3.12
	2	21.15	3.10	20.87	3.36	21.19	3.15
	3	21.07	3.12	20.89	3.41	21.14	3.10
	4	21.12	3.07	20.96	3.30	21.10	3.02
HSUPA (QPSK)	1	21.09	3.02	20.83	3.27	20.98	3.07
	2	20.94	3.04	20.95	3.28	20.92	3.00
	3	20.97	3.09	20.91	3.34	20.97	3.13
	4	21.00	3.11	20.87	3.31	20.95	3.05



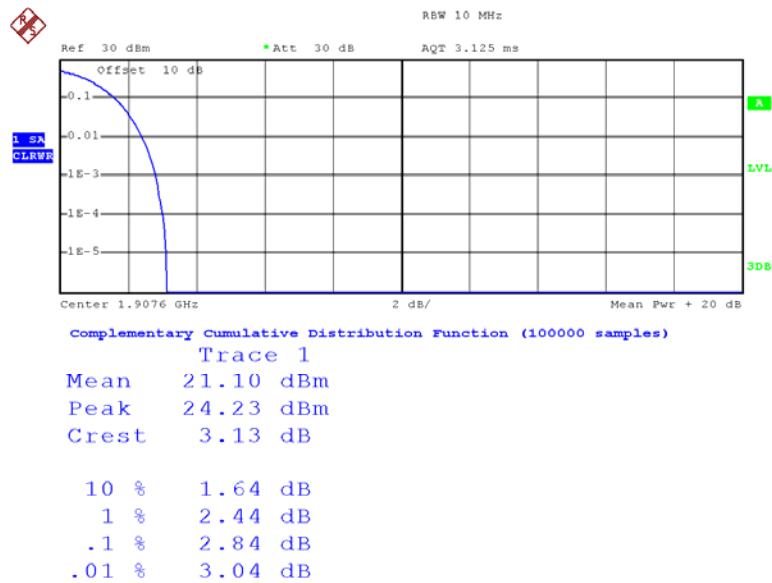
Peak-to-average ratio (PAR)

**WCDMA Band II****Low Channel**

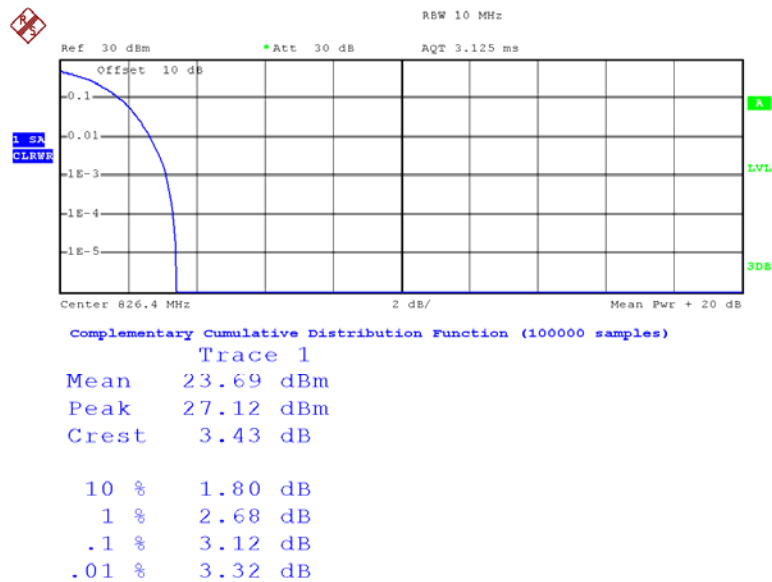
Date: 2.SEP.2016 21:10:09

**Middle Channel**

Date: 2.SEP.2016 21:09:41

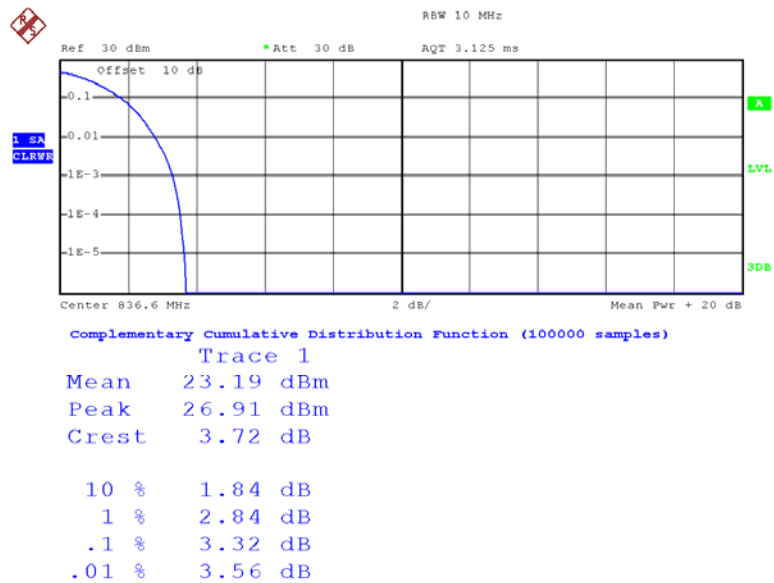
**High Channel**

Date: 2.SEP.2016 21:10:53

**WCDMA Band V****Low Channel**

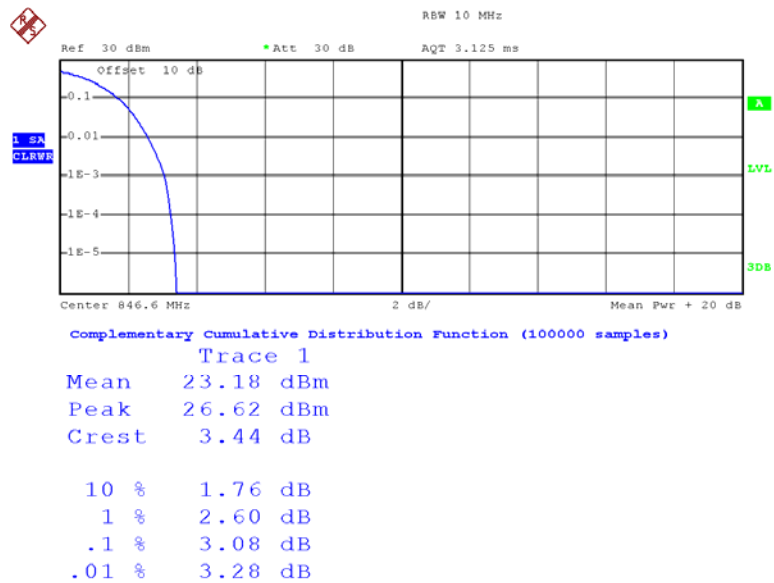
Date: 2.SEP.2016 21:09:02

### Middle Channel



Date: 2.SEP.2016 21:08:51

### High Channel



Date: 2.SEP.2016 21:08:36

## ERP &amp; EIRP

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)			
GPRS 850 Middle Channel								
836.600	H	96.30	21.4	0.0	1	20.4	38.5	18.1
836.600	V	102.45	30.7	0.0	1	29.7	38.5	8.8
EDGE 850 Middle Channel								
836.600	H	90.96	16	0.0	1	15.0	38.5	23.5
836.600	V	96.89	25.1	0.0	1	24.1	38.5	14.4
WCDMA Band V Middle Channel								
836.600	H	86.36	11.4	0.0	1	10.4	38.5	28.1
836.600	V	92.23	20.4	0.0	1	19.4	38.5	19.1
GPRS 1900 Middle Channel								
1880.000	H	89.93	18.3	11.7	1.4	28.6	33.0	4.4
1880.000	V	84.94	13.5	11.7	1.4	23.8	33.0	9.2
EDGE 1900 Middle Channel								
1880.000	H	84.67	13.1	11.7	1.4	23.4	33.0	9.6
1880.000	V	79.29	7.8	11.7	1.4	18.1	33.0	14.9
WCDMA Band II Middle Channel								
1880.000	H	81.39	9.8	11.7	1.4	20.1	33.0	12.9
1880.000	V	76.64	5.2	11.7	1.4	15.5	33.0	17.5

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

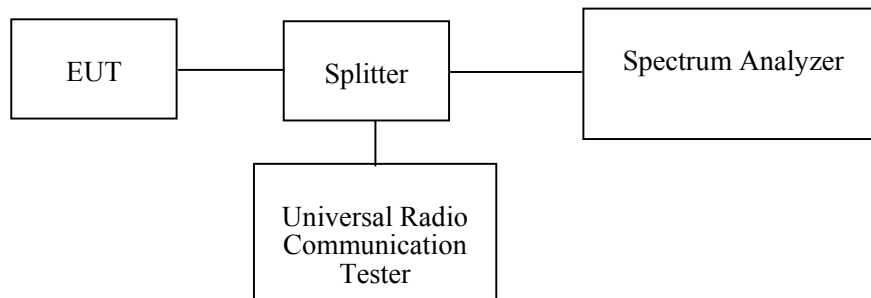
### Applicable Standard

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

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSP 38	100478	2015-11-23	2016-11-22
R&S	Spectrum Analyzer	FSEM	831259/019	2015-07-28	2016-07-27
R&S	Universal Radio Communication Tester	CMU200	109 038	2016-07-11	2017-07-11
N/A	Coaxial Cable	0.1m	N/A	2016-05-06	2017-05-06
E-Microwave	DC Blocking	EMDCB-00036	0E01201047	2016-05-06	2017-05-06
NARDA	Attenuator	769-6	2754	2016/5/6	2017/5/6
Pasternack	RF Coaxial Cable	RF-01	N/A	2016-05-06	2017-05-06
Pasternack	RF Coaxial Cable	RF-02	N/A	2016-05-06	2017-05-06
N/A	Two-way Splitter	ODP-1-6-2S	OE0120142	2016-05-06	2017-05-06

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to National Primary Standards and International System of Units (SI).

**Test Data****Environmental Conditions**

<b>Temperature:</b>	29.2 °C
<b>Relative Humidity:</b>	44 %
<b>ATM Pressure:</b>	99.9 kPa

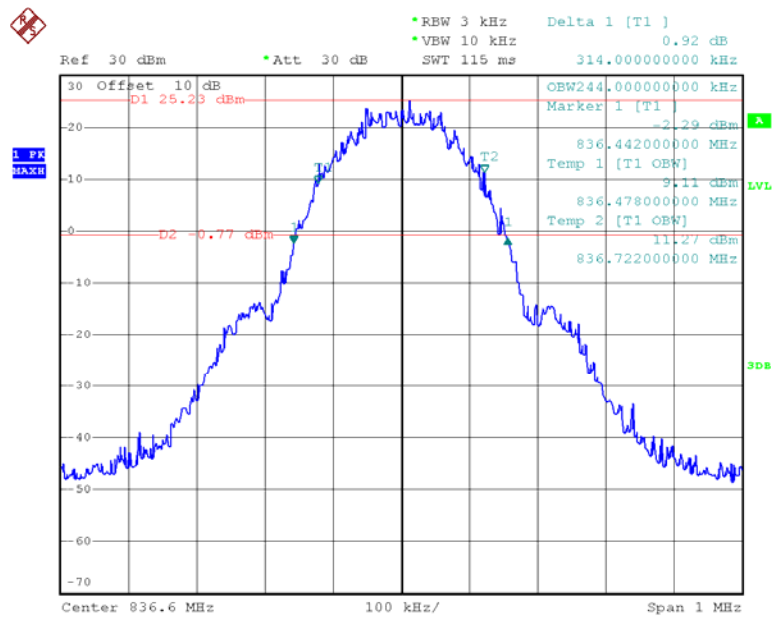
*The testing was performed by Lion Xiao on 2016-09-02.*

*Test Mode: Transmitting*

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

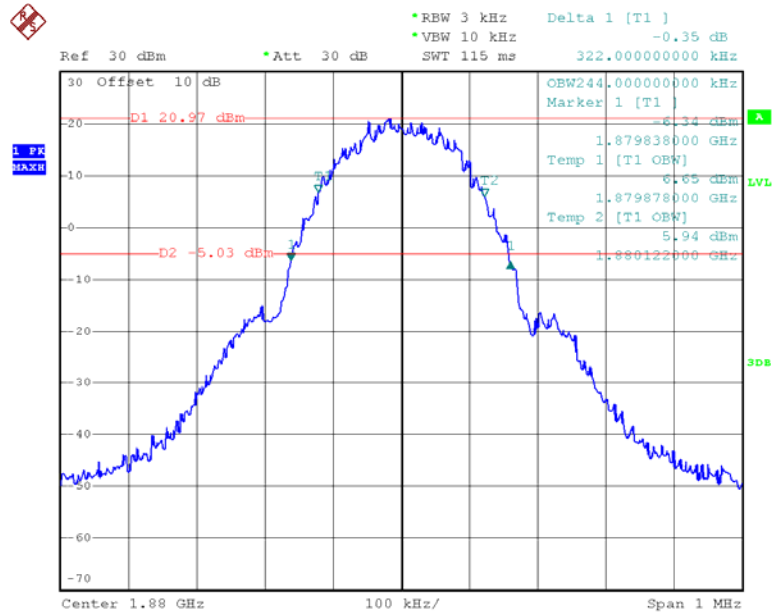
Band	Test Channel	Mode	99% Occupied Bandwidth (kHz)	26 dB Occupied Bandwidth (kHz)
Cellular	M	GPRS	244	314
		EDGE	236	304
PCS		GPRS	244	322
		EDGE	254	332
WCDMA Band II		Rel 99	4060	4640
		HSDPA	4080	4640
		HSUPA	4080	4640
WCDMA Band V		Rel 99	4080	4640
		HSDPA	4080	4640
		HSUPA	4060	4640

## GPRS 850 Cellular Band



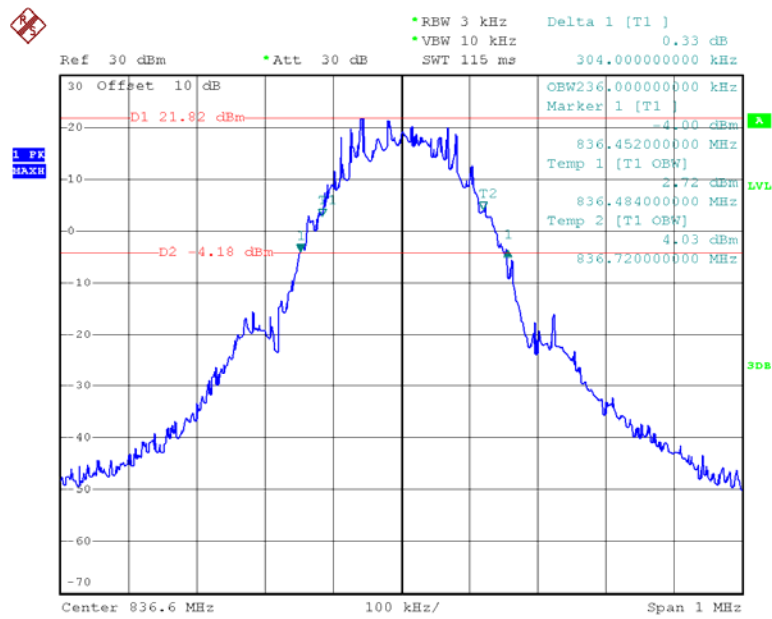
Date: 2.SEP.2016 21:48:15

## GPRS PCS Band



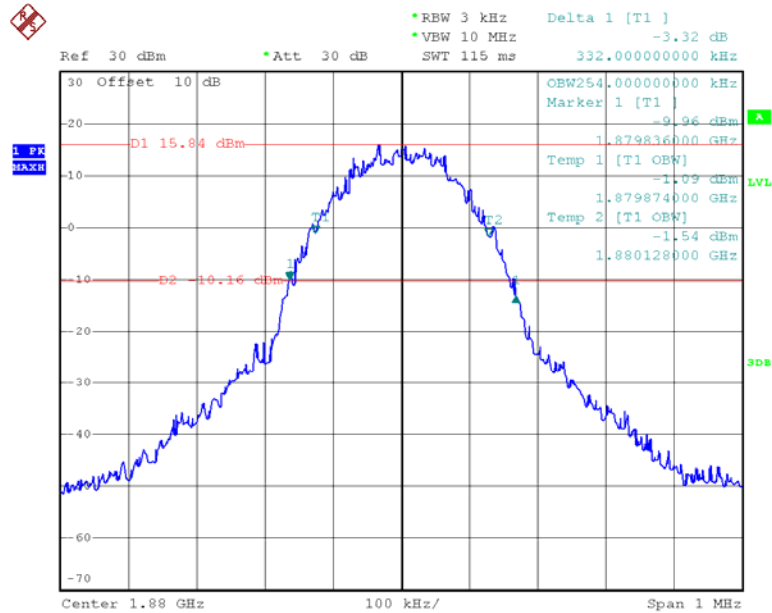
Date: 2.SEP.2016 22:08:45

## EDGE 850 Cellular Band



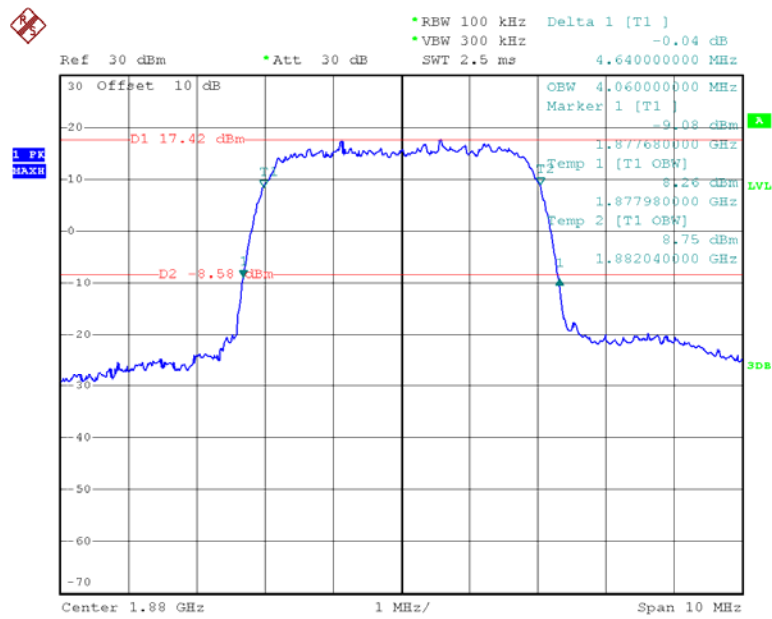
Date: 2.SEP.2016 21:57:12

## EDGE PCS Band

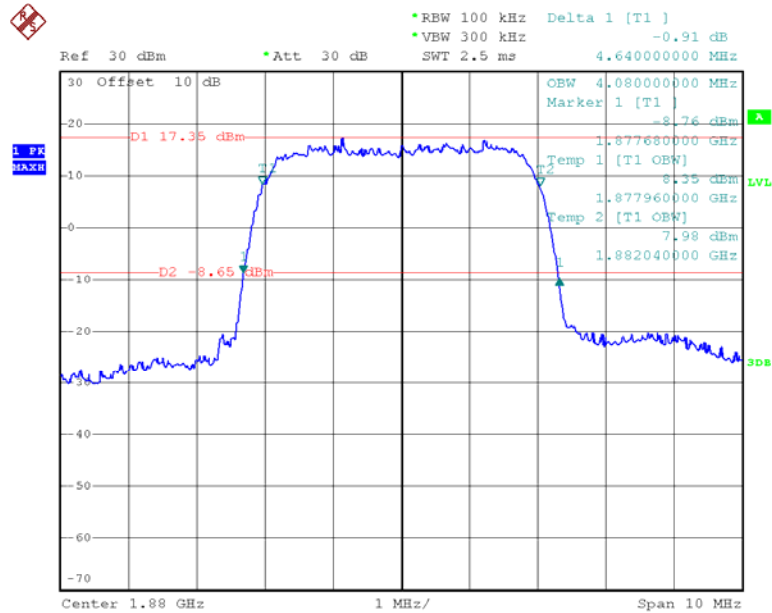


Date: 2.SEP.2016 22:09:37

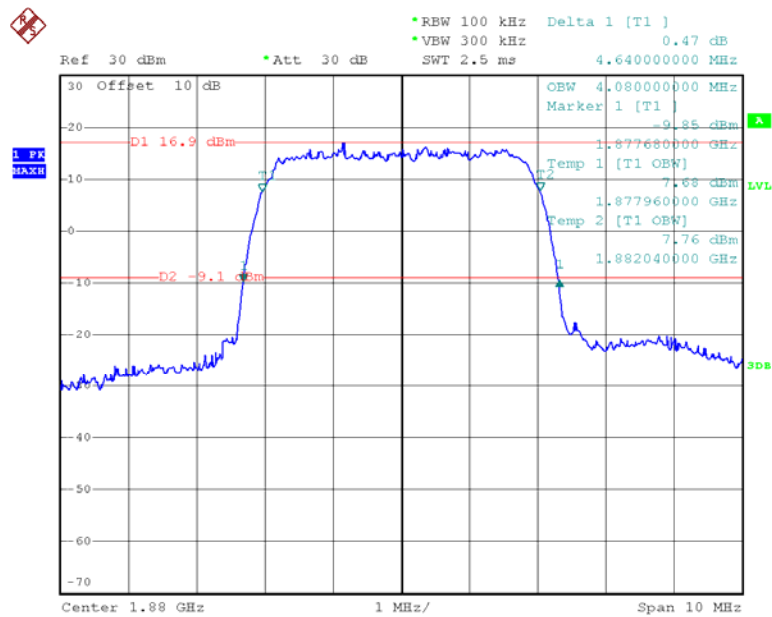


**REL99 Band II**

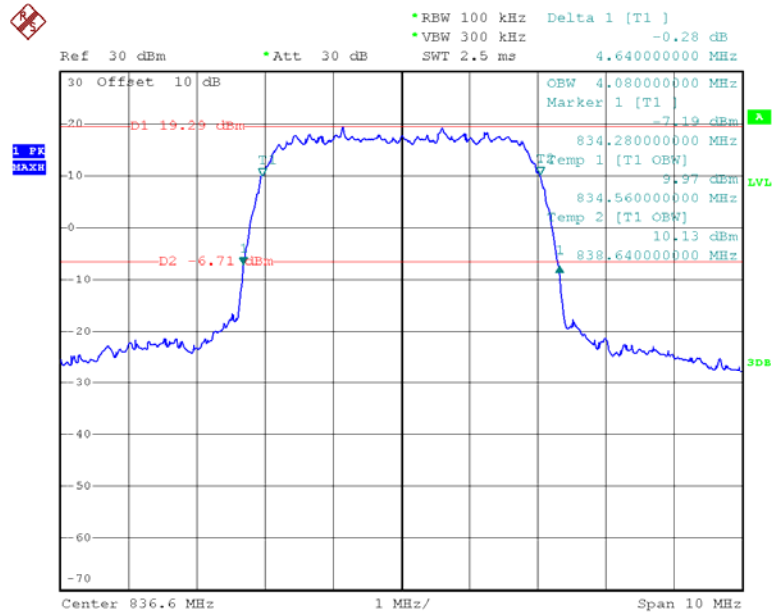
Date: 2.SEP.2016 21:28:58

**HSDPA Band II**

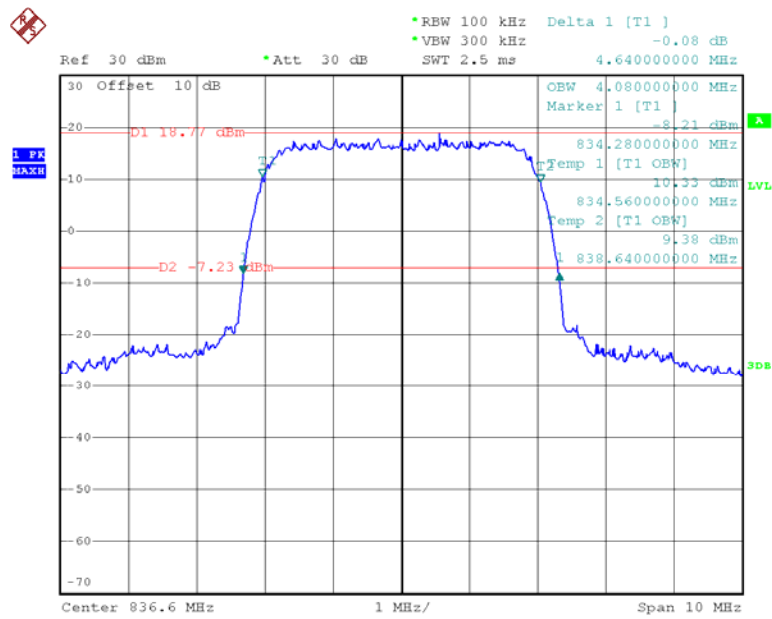
Date: 2.SEP.2016 21:30:11

**HSUPA Band II**

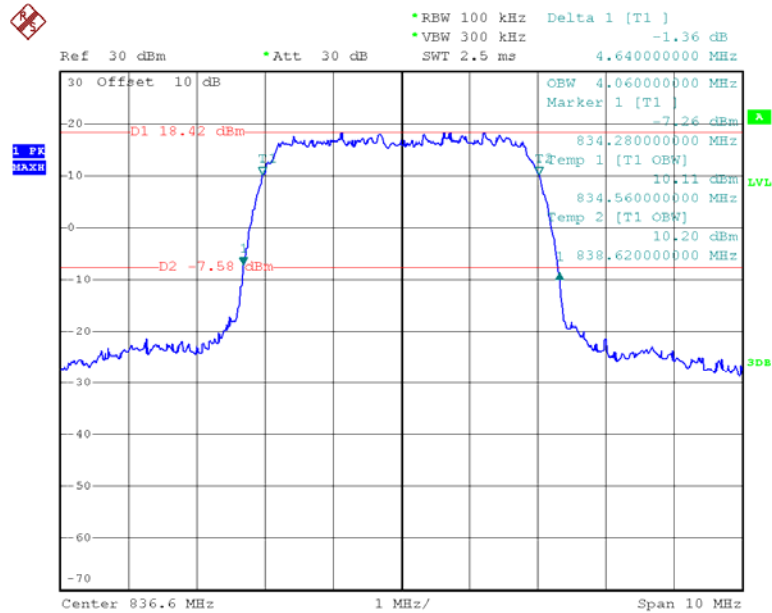
Date: 2.SEP.2016 21:25:11

**REL99 Band V**

Date: 2.SEP.2016 20:39:18

**HSDPA Band V**

Date: 2.SEP.2016 20:35:49

**HSUPA Band V**

Date: 2.SEP.2016 20:42:51

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

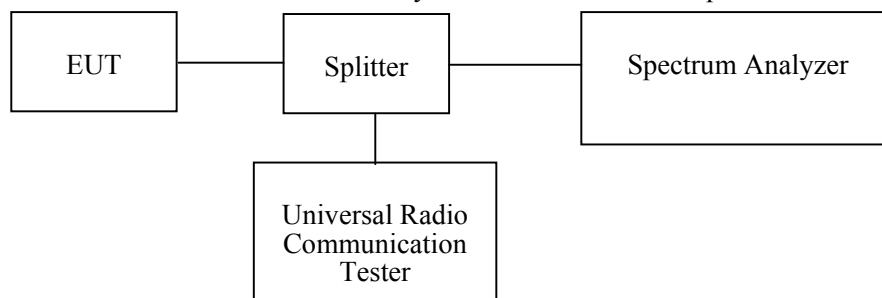
### Applicable Standard

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
R&S	Spectrum Analyzer	FSP 38	100478	2015-11-23	2016-11-22
R&S	Spectrum Analyzer	FSEM	831259/019	2015-07-28	2016-07-27
R&S	Universal Radio Communication Tester	CMU200	109 038	2016-07-11	2017-07-11
N/A	Coaxial Cable	0.1m	N/A	2016-05-06	2017-05-06
E-Microwave	DC Blocking	EMDCB-00036	0E01201047	2016-05-06	2017-05-06
NARDA	Attenuator	769-6	2754	2016/5/6	2017/5/6
Pasternack	RF Coaxial Cable	RF-01	N/A	2016-05-06	2017-05-06
Pasternack	RF Coaxial Cable	RF-02	N/A	2016-05-06	2017-05-06
N/A	Two-way Splitter	ODP-1-6-2S	OE0120142	2016-05-06	2017-05-06

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to National Primary Standards and International System of Units (SI).

## Test Data

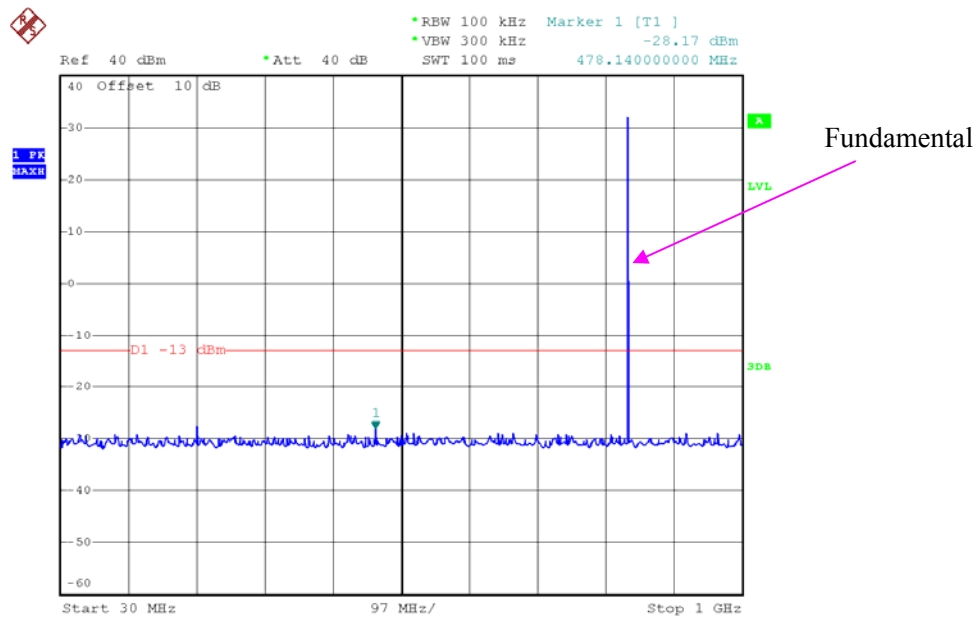
### Environmental Conditions

Temperature:	29.2 °C
Relative Humidity:	44 %
ATM Pressure:	99.9 kPa

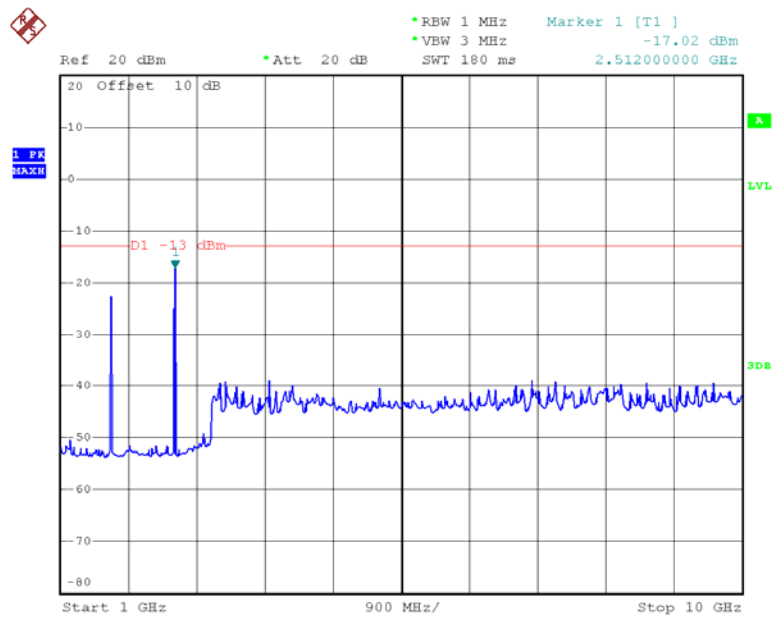
The testing was performed by Lion Xiao on 2016-09-02.

Please refer to the following plots.

### GPRS 850\_Middle Channel

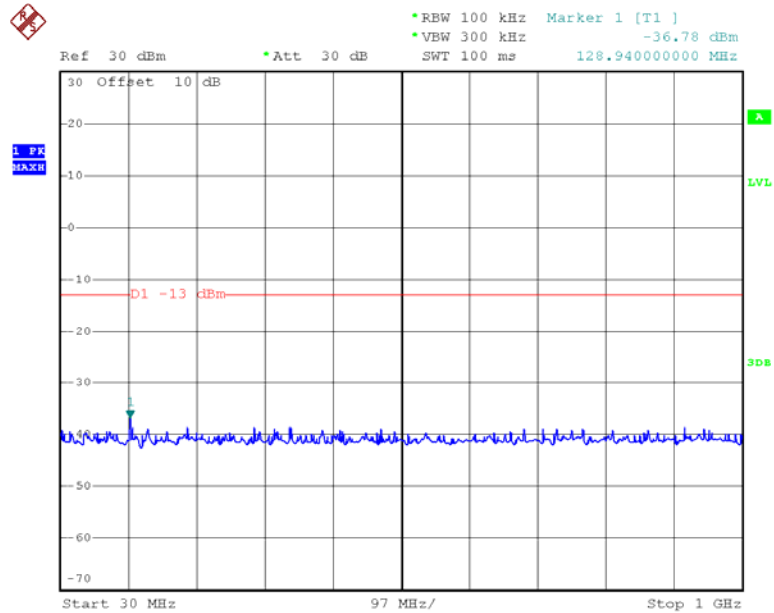


Date: 2.SEP.2016 21:48:54

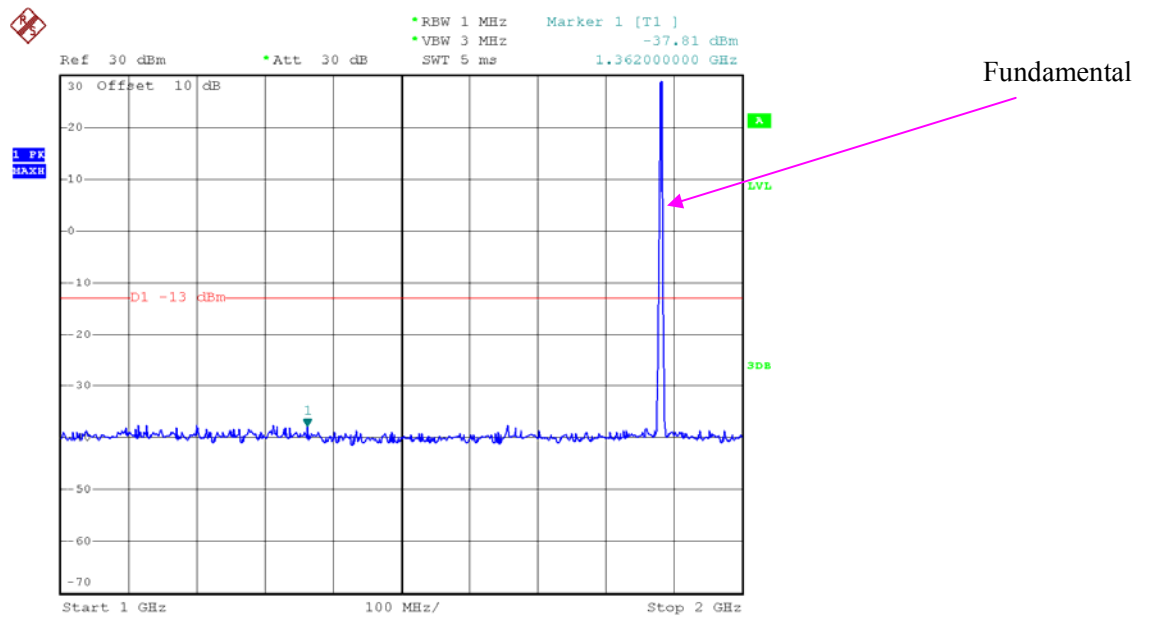


Date: 2.SEP.2016 21:49:39

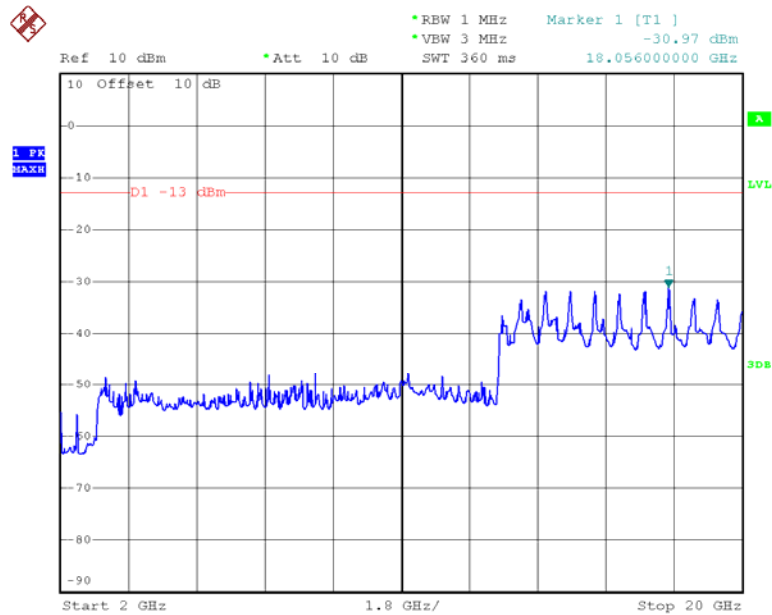
### GPRS 1900\_Middle Channel



Date: 2.SEP.2016 22:04:49

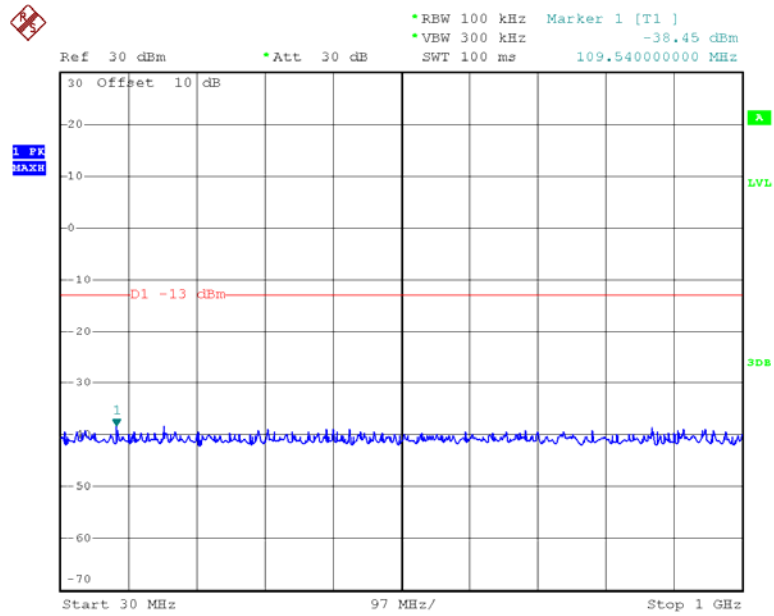


Date: 2.SEP.2016 22:06:33

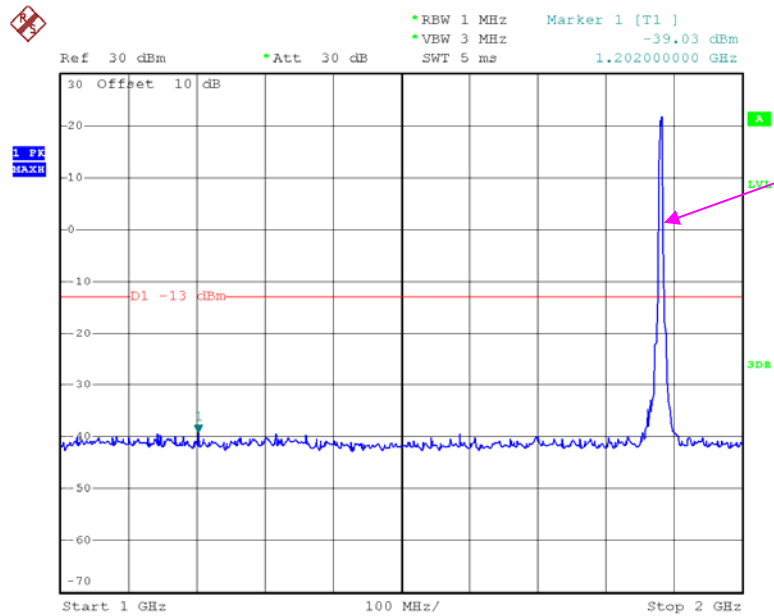


Date: 2.SEP.2016 22:07:52

### REL99 Band II\_ Middle Channel

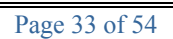


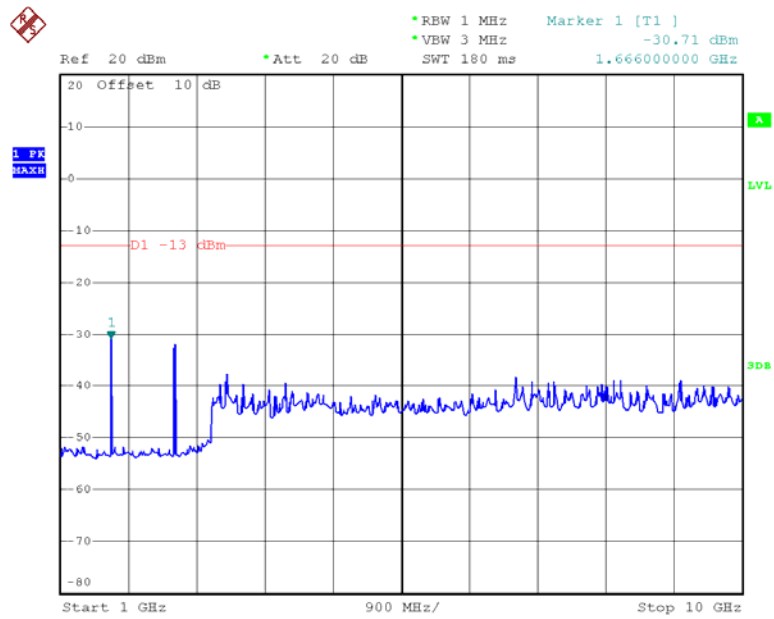
Date: 2.SEP.2016 21:40:18



Date: 2.SEP.2016 21:44:29







Date: 2.SEP.2016 20:45:49

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

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**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
R&S	EMI Test Receiver	ESCI	100224	2016-09-01	2017-09-01
Sunol Sciences	Antenna	JB3	A060611-3	2014-07-28	2017-07-27
HP	Amplifier	8447E	2434A02181	2016-09-01	2017-09-01
R&S	Spectrum Analyzer	FSEM	DE31388	2016-05-09	2017-05-09
ETS LINDGREN	Horn Antenna	3115	000 527 35	2016-01-05	2019-01-04
Mini-Circuit	Amplifier	ZVA-213-S+	054201245	2016-02-19	2017-02-19
Giga	Signal Generator	1026	320408	2015-11-23	2016-11-22
EMCO	Adjustable Dipole Antenna	3121C	9109-753	N/A	N/A
TDK RF	Horn Antenna	HRN-0118	130 084	2015-09-06	2018-09-06
N/A	Coaxial Cable	14m	N/A	2016-05-06	2017-05-06
N/A	Coaxial Cable	8m	N/A	2016-05-06	2017-05-06
N/A	Coaxial Cable	2m	N/A	2016-05-06	2017-05-06
Mini Circuit	High Pass Filter	VHF-3100+	31251	2016-05-06	2017-05-06
Mini Circuit	High Pass Filte	VHF-1200+	N/A	2016-05-06	2017-05-06

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to National Primary Standards and International System of Units (SI).

**Test Data****Environmental Conditions**

<b>Temperature:</b>	27.5°C
<b>Relative Humidity:</b>	64 %
<b>ATM Pressure:</b>	100 kPa

*The testing was performed by Lion Xiao on 2016-09-07.*

*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	41.23	-59.8	10.6	1.5	-50.7	-13.0	37.7
1673.200	V	47.58	-53.8	10.6	1.5	-44.7	-13.0	31.7
2509.800	H	39.95	-58.1	13.1	2.8	-47.8	-13.0	34.8
2509.800	V	43.67	-53.4	13.1	2.8	-43.1	-13.0	30.1
289.500	H	37.41	-70.2	0.0	0.5	-70.7	-13.0	57.7
301.100	V	36.78	-68	0.0	0.5	-68.5	-13.0	55.5
WCDMA Band V R99,Frequency:836.600 MHz								
1673.200	H	40.65	-60.4	10.6	1.5	-51.3	-13.0	38.3
1673.200	V	43.83	-57.5	10.6	1.5	-48.4	-13.0	35.4
289.500	H	37.09	-70.5	0.0	0.5	-71.0	-13.0	58.0
301.100	V	36.24	-68.6	0.0	0.5	-69.1	-13.0	56.1

**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	44.65	-49.6	13.8	2.9	-38.7	-13.0	25.7
3760.000	V	38.58	-54.5	13.8	2.9	-43.6	-13.0	30.6
319.200	H	37.41	-67.7	0.0	0.5	-68.2	-13.0	55.2
346.900	V	36.84	-62.4	0.0	0.6	-63.0	-13.0	50.0
WCDMA Band II, R99, Frequency:1880.000 MHz								
3760.000	H	41.82	-52.5	13.8	2.9	-41.6	-13.0	28.6
3760.000	V	38.54	-54.5	13.8	2.9	-43.6	-13.0	30.6
319.200	H	37.67	-67.4	0.0	0.5	-67.9	-13.0	54.9
346.900	V	36.29	-62.9	0.0	0.6	-63.5	-13.0	50.5

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

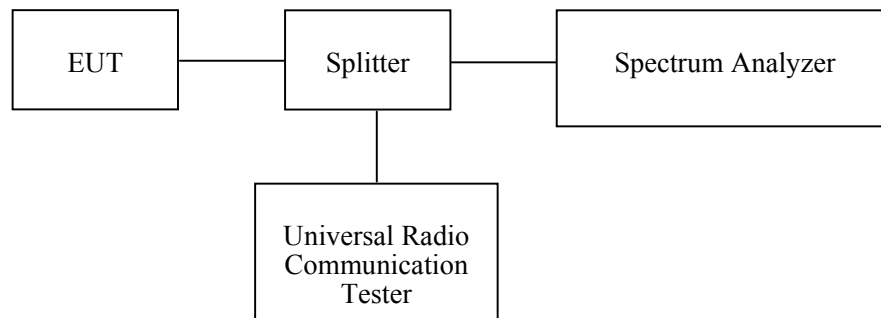
According to § 22.917(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

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
R&S	Spectrum Analyzer	FSEM	831259/019	2016-07-11	2017-07-11
R&S	Universal Radio Communication Tester	CMU200	109 038	2016-07-11	2017-07-11
N/A	Coaxial Cable	0.1m	N/A	2016-05-06	2017-05-06
E-Microwave	DC Blocking	EMDCB-00036	0E01201047	2016-05-06	2017-05-06
NARDA	Attenuator	769-6	2754	2016/5/6	2017/5/6
Pasternack	RF Coaxial Cable	RF-01	N/A	2016-05-06	2017-05-06
Pasternack	RF Coaxial Cable	RF-02	N/A	2016-05-06	2017-05-06
N/A	Two-way Splitter	ODP-1-6-2S	OE0120142	2016-05-06	2017-05-06

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to National Primary Standards and International System of Units (SI).

**Test Data****Environmental Conditions**

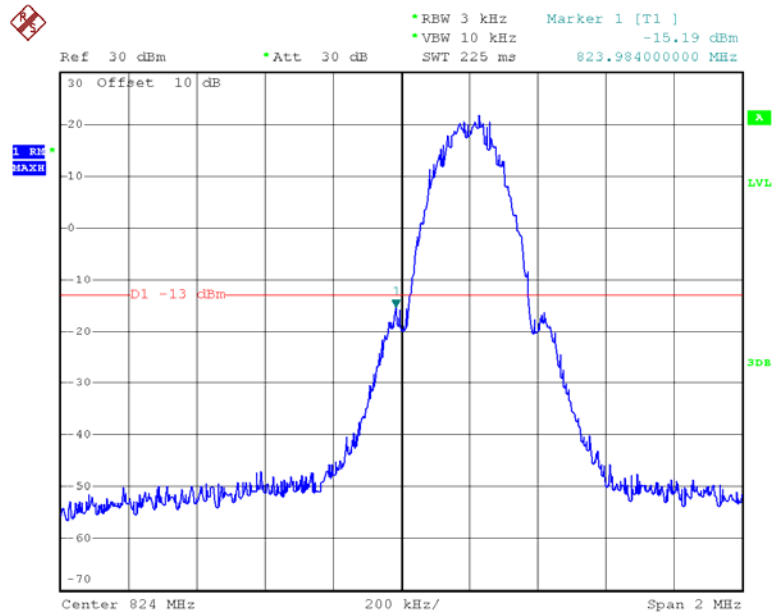
<b>Temperature:</b>	29.2 °C
<b>Relative Humidity:</b>	44 %
<b>ATM Pressure:</b>	99.9 kPa

*The testing was performed by Lion Xiao on 2016-09-02.*

*Test Mode: Transmitting*

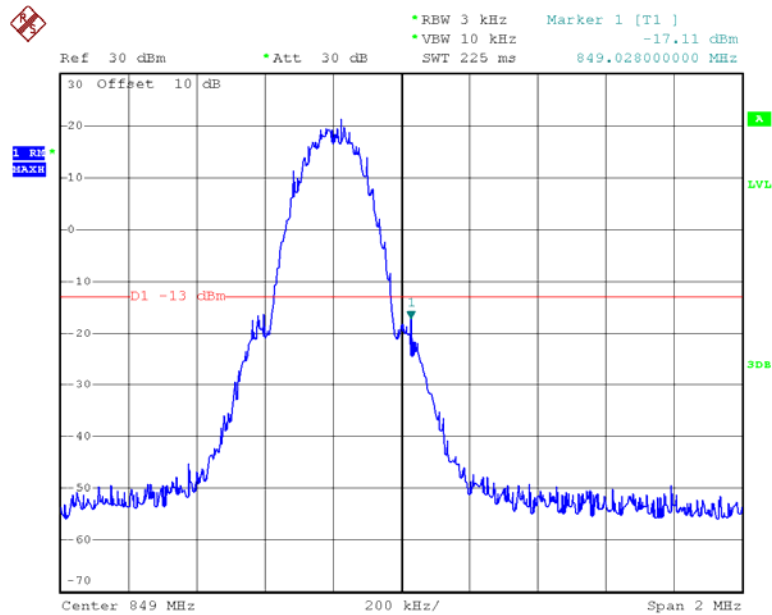
*Test Result: Compliant. Please refer to the following plots.*

### GPRS 850, Left Band Edge



Date: 2.SEP.2016 21:51:12

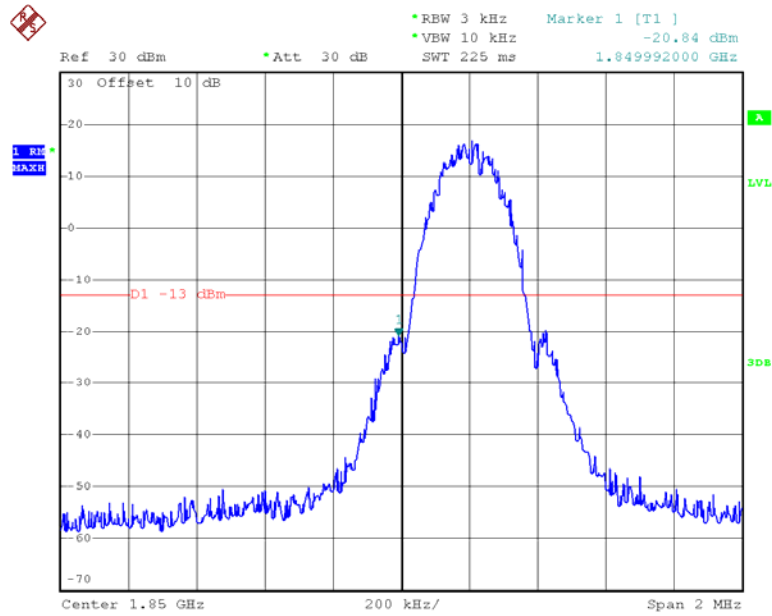
### GPRS 850, Right Band Edge



Date: 2.SEP.2016 21:51:55

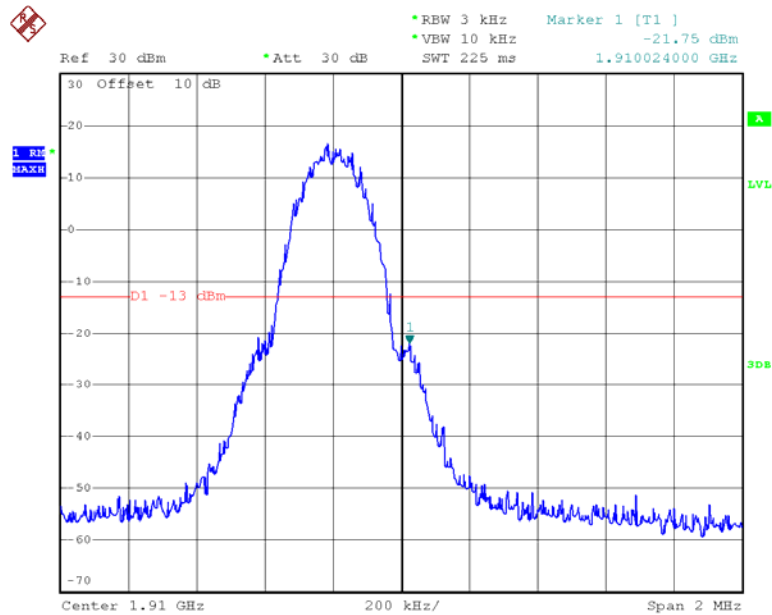


### GPRS 1900, Left Band Edge



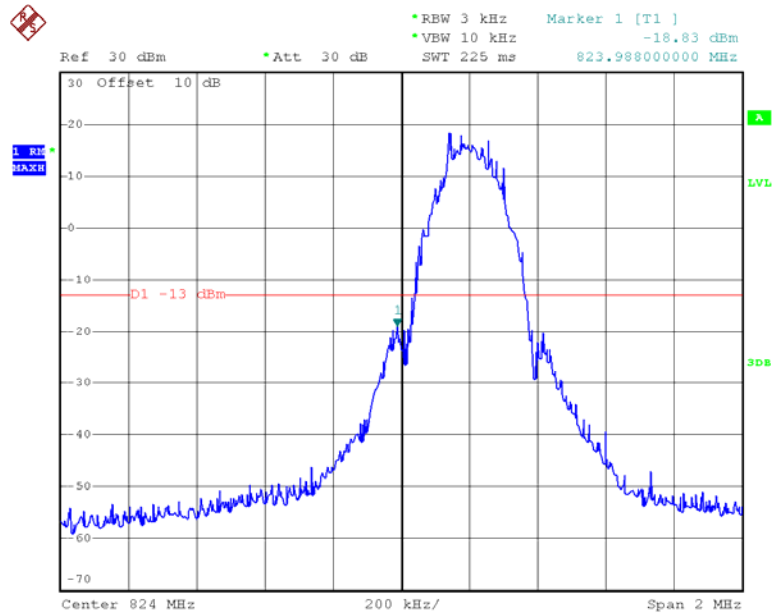
Date: 2.SEP.2016 22:12:27

### GPRS 1900, Right Band Edge



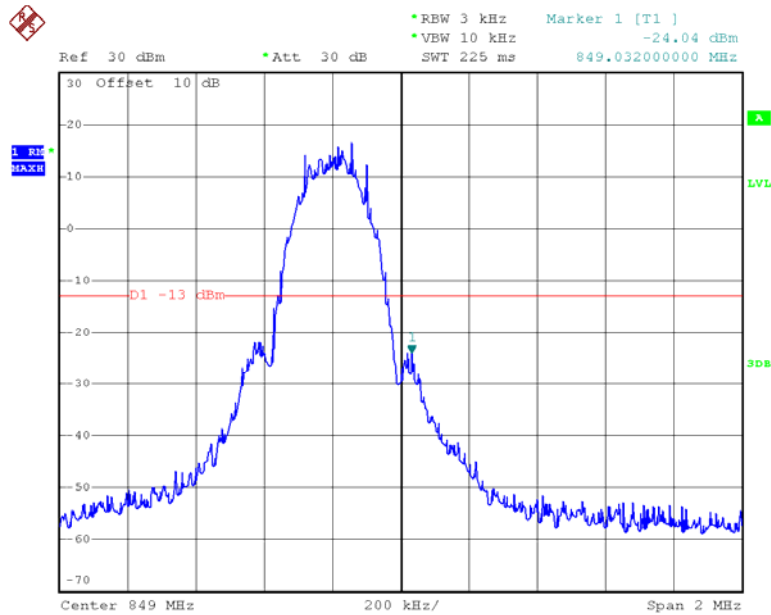
Date: 2.SEP.2016 22:11:14

### EDGE 850, Left Band Edge



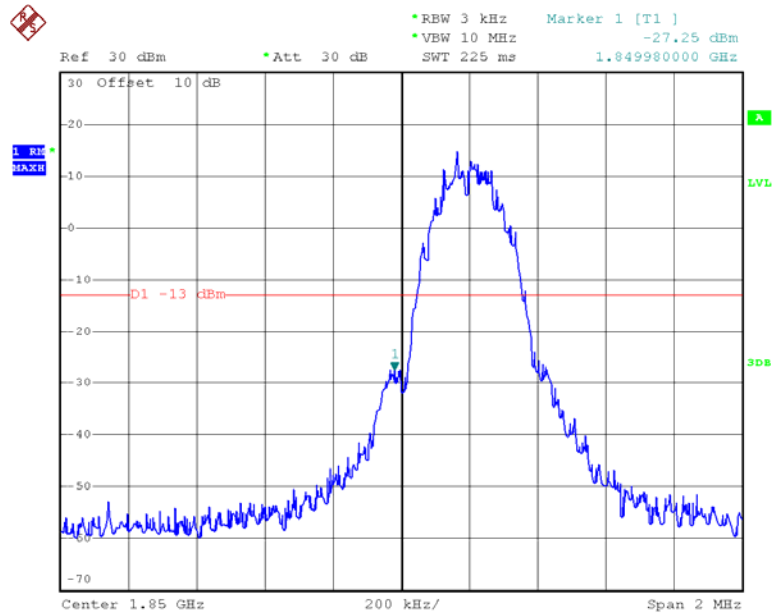
Date: 2.SEP.2016 22:01:45

### EDGE 850, Right Band Edge



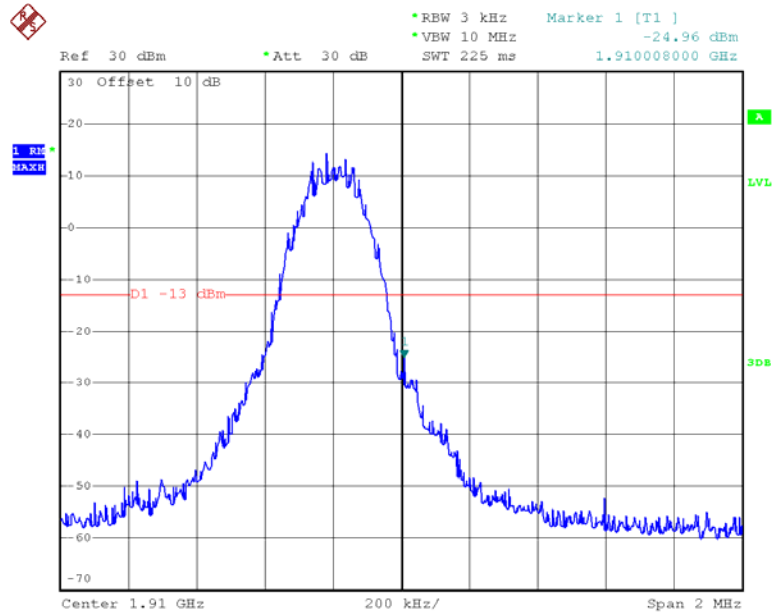
Date: 2.SEP.2016 22:03:01

### EDGE 1900, Left Band Edge



Date: 2.SEP.2016 22:10:43

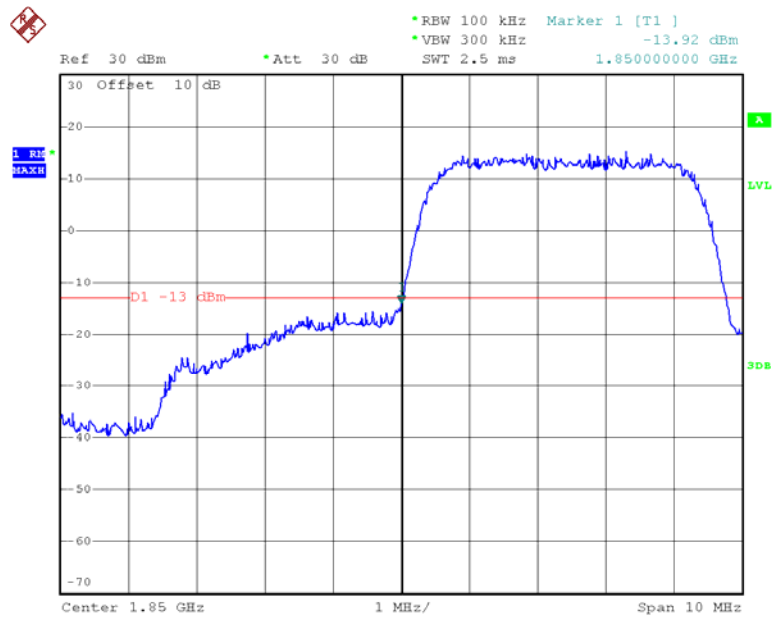
### EDGE 1900, Right Band Edge



Date: 2.SEP.2016 22:11:37

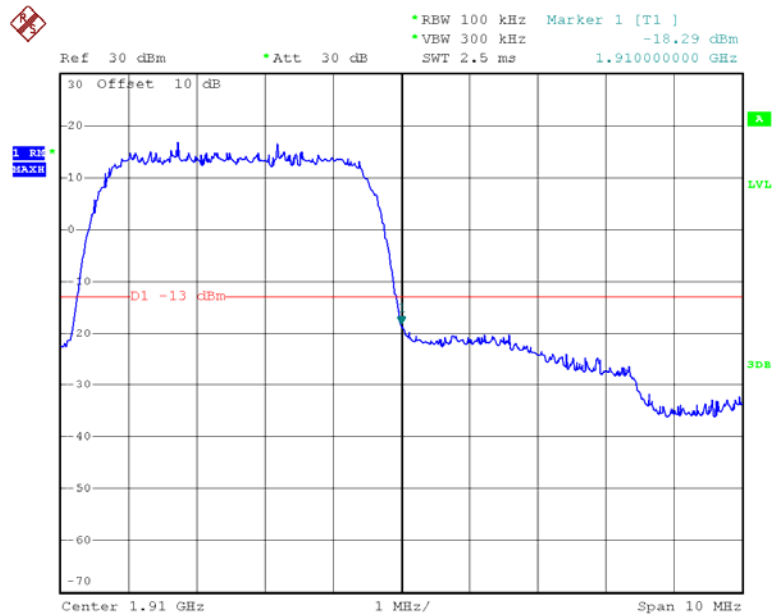
## WCDMA Band II:

## REL99 Band II, Left Band Edge



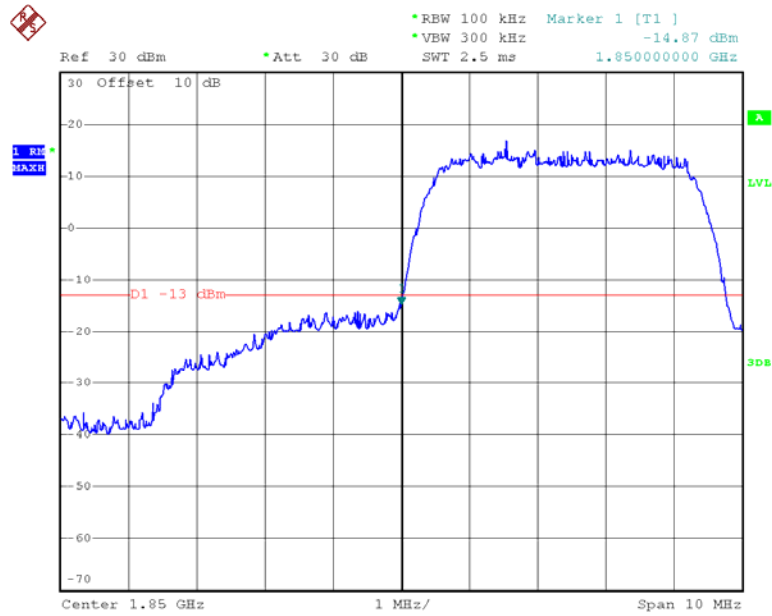
Date: 2.SEP.2016 21:24:04

## REL99 Band II, Right Band Edge



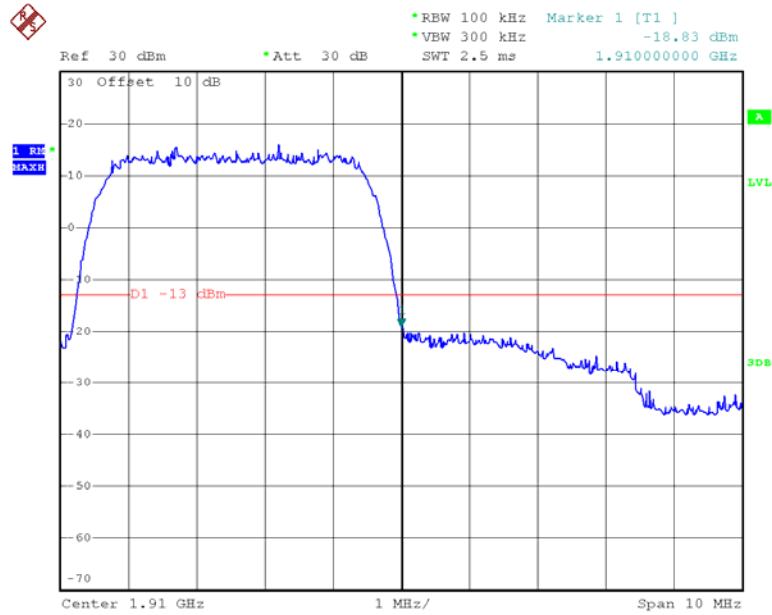
Date: 2.SEP.2016 21:12:04

### HSDPA Band II, Left Band Edge



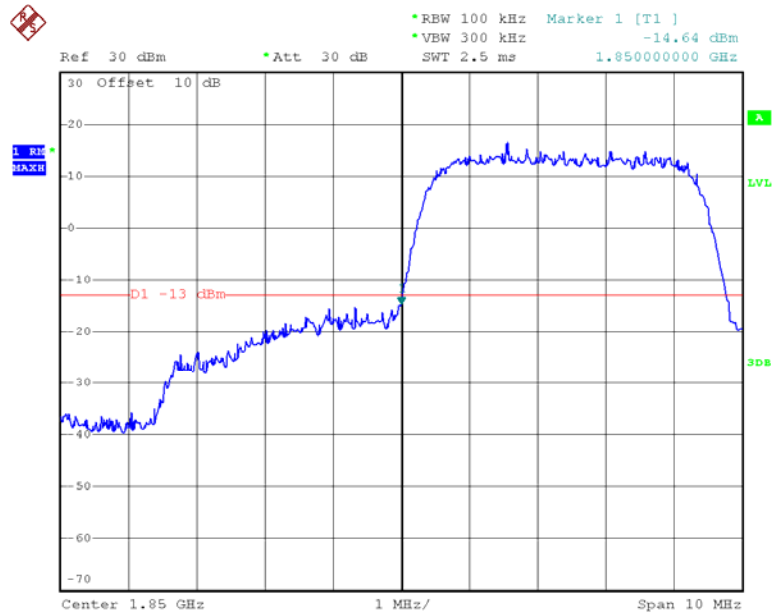
Date: 2.SEP.2016 21:18:25

### HSDPA Band II, Right Band Edge



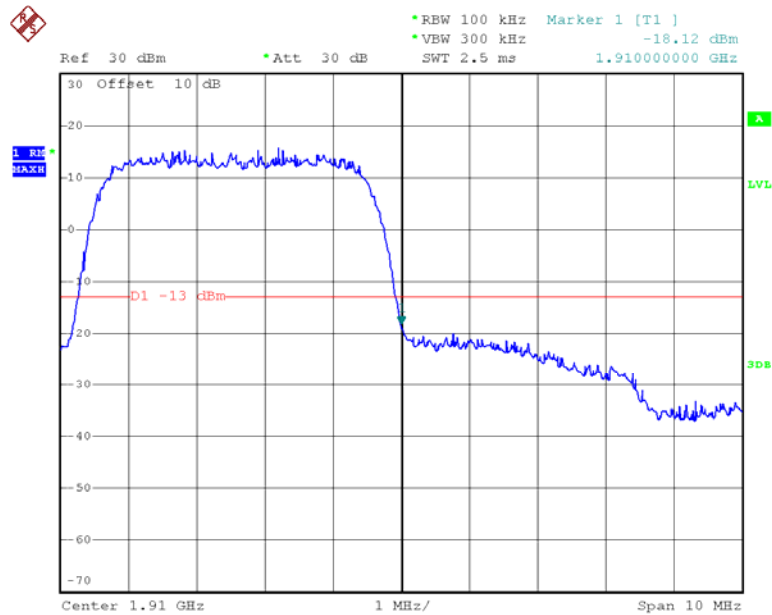
Date: 2.SEP.2016 21:14:29

### HSUPA Band II, Left Band Edge



Date: 2.SEP.2016 21:21:41

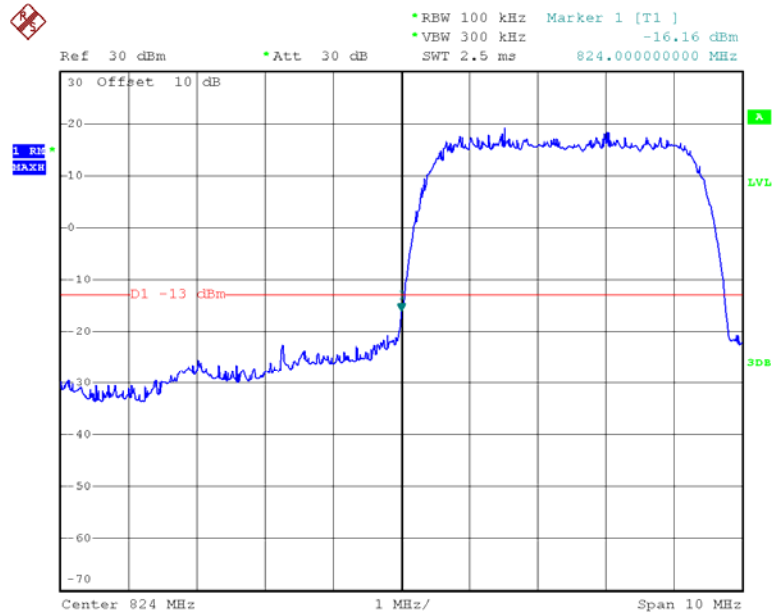
### HSUPA Band II, Right Band Edge



Date: 2.SEP.2016 21:17:46

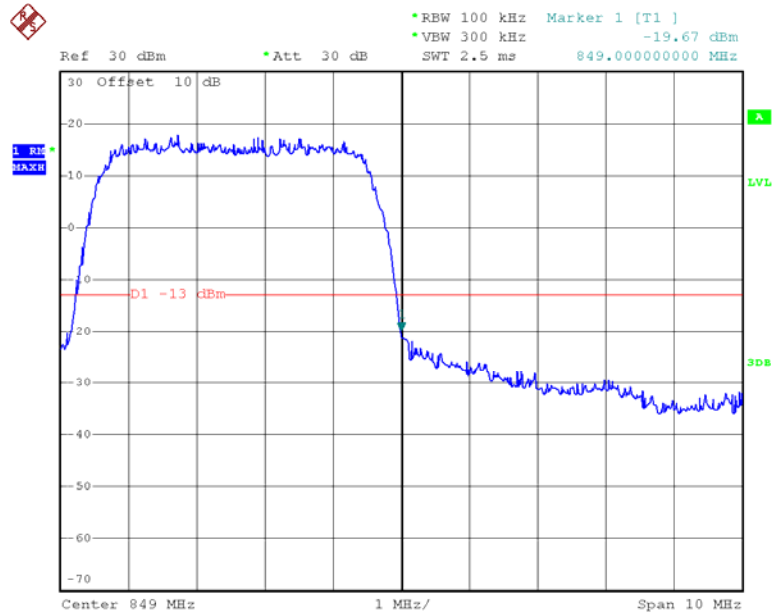
WCDMA Band V

REL99 Band V, Left Band Edge



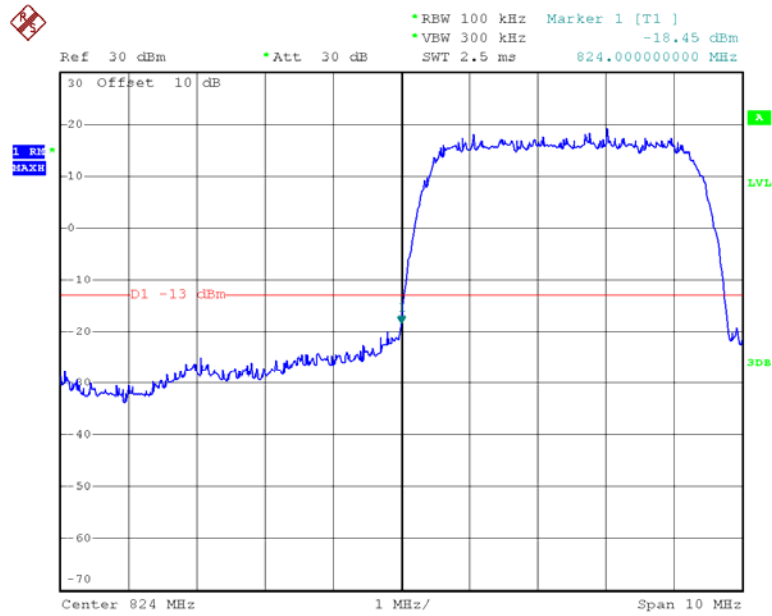
Date: 2.SEP.2016 21:01:30

REL99 Band V Right Band Edge



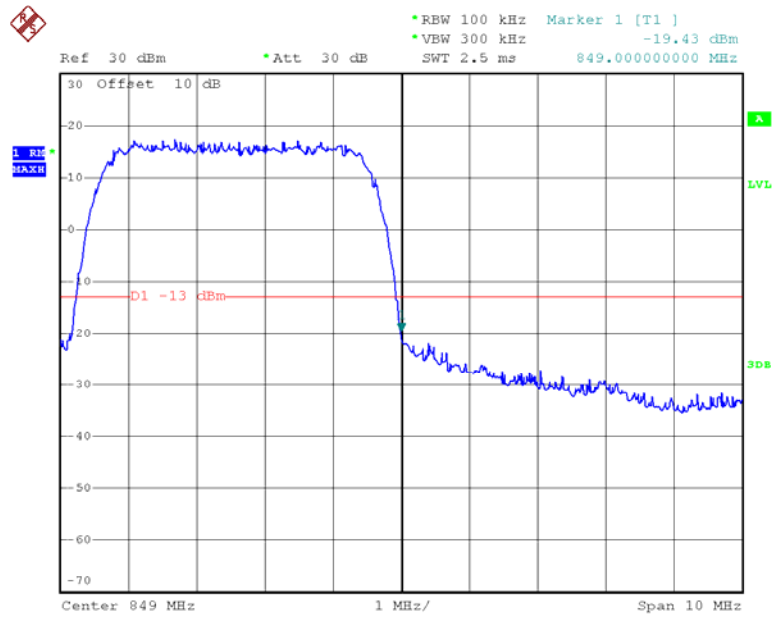
Date: 2.SEP.2016 21:02:07

### HSDPA Band V, Left Band Edge



Date: 2.SEP.2016 20:55:44

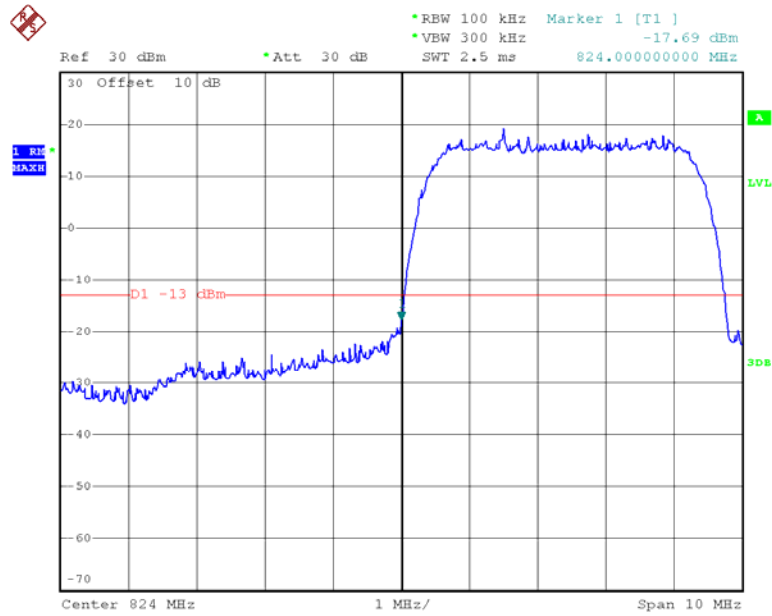
### HSDPA Band V, Right Band Edge



Date: 2.SEP.2016 21:04:28

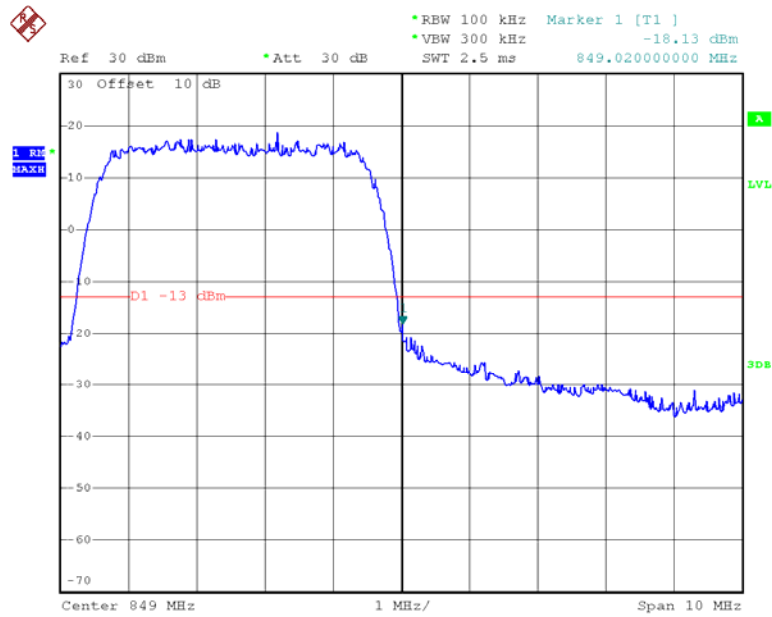


### HSUPA Band V, Left Band Edge



Date: 2.SEP.2016 20:58:06

### HSUPA Band V, Right Band Edge



Date: 2.SEP.2016 21:07:48

**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

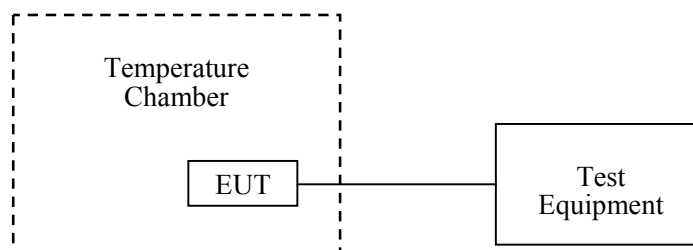
According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emissions stays within the authorized frequency block.

**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
Dongzhixu	High Temperature Test Chamber	DP1000	201105083-3	2016-09-10	2017-09-09
R&S	Universal Radio Communication Tester	CMU200	109 038	2016-07-11	2017-07-11
UNI-T	Multimeter	UT39A	M130199938	2016-04-02	2017-04-02
Pasternack	RF Coaxial Cable	RF-01	/	2016-05-06	2017-05-06

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to National Primary Standards and International System of Units (SI).

**Test Data****Environmental Conditions**

<b>Temperature:</b>	29.2 °C
<b>Relative Humidity:</b>	44 %
<b>ATM Pressure:</b>	99.9 kPa

*The testing was performed by Lion Xiao on 2016-09-02.*

**Cellular Band (Part 22H)**

GPRS, Middle Channel, $f_c = 836.6$ MHz				
Temperature	Voltage	Frequency Error	Frequency Error	Limit
°C	V <sub>DC</sub>	Hz	ppm	ppm
-30	3.7	-9	-0.011	2.5
-20		-12	-0.014	
-10		-8	-0.010	
0		-10	-0.012	
10		-15	-0.018	
20		-11	-0.013	
30		-14	-0.017	
40		-7	-0.008	
50		-12	-0.014	
25	3.5	-16	-0.019	
25	4.2	-6	-0.007	

EDGE, Middle Channel, $f_c = 836.6$ MHz				
Temperature	Voltage	Frequency Error	Frequency Error	Limit
°C	V <sub>DC</sub>	Hz	ppm	ppm
-30	3.7	16	0.019	2.5
-20		13	0.016	
-10		9	0.011	
0		5	0.006	
10		8	0.010	
20		10	0.012	
30		12	0.014	
40		12	0.014	
50		8	0.010	
25	3.5	7	0.008	
25	4.2	7	0.008	

**PCS Band (Part 24E)**

GPRS, Middle Channel, $f_c = 1880.0$ MHz				
Temperature	Voltage	Frequency Error	Frequency Error	Result
°C	V <sub>DC</sub>	Hz	ppm	
-30	3.7	-15	-0.008	Compliance
-20		-10	-0.005	
-10		-13	-0.007	
0		-16	-0.009	
10		-11	-0.006	
20		-14	-0.007	
30		-19	-0.010	
40		-12	-0.006	
50		-17	-0.009	
25	3.5	-15	-0.008	
25	4.2	-10	-0.005	

EDGE, Middle Channel, $f_c = 1880.0$ MHz				
Temperature	Voltage	Frequency Error	Frequency Error	Result
°C	V <sub>DC</sub>	Hz	ppm	
-30	3.7	17	0.009	Compliance
-20		17	0.009	
-10		22	0.012	
0		19	0.010	
10		18	0.010	
20		18	0.010	
30		18	0.010	
40		15	0.008	
50		17	0.009	
25	3.5	20	0.011	
25	4.2	23	0.012	

**WCDMA Band V: Re199**

Middle Channel, $f_c = 836.6$ MHz				
Temperature	Voltage	Frequency Error	Frequency Error	Limit
°C	V <sub>DC</sub>	Hz	ppm	ppm
-30	3.7	-16	-0.019	2.5
-20		-12	-0.014	2.5
-10		-19	-0.023	2.5
0		-15	-0.018	2.5
10		-11	-0.013	2.5
20		-17	-0.020	2.5
30		-13	-0.016	2.5
40		-18	-0.022	2.5
50		-10	-0.012	2.5
25	3.5	-19	-0.023	2.5
25	4.2	-23	-0.027	2.5

**WCDMA Band II: Re199**

Middle Channel, $f_c = 1880.0$ MHz				
Temperature	Voltage	Frequency Error	Frequency Error	Result
°C	V <sub>DC</sub>	Hz	ppm	
-30	3.7	7	0.004	Compliance
-20		3	0.002	
-10		9	0.005	
0		4	0.002	
10		8	0.004	
20		2	0.001	
30		6	0.003	
40		1	0.001	
50		8	0.004	
25	3.5	9	0.005	
25	4.2	5	0.003	

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