

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

For

Shenzhen Topwell Wireless Communication Co Ltd

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FCC ID: 2AHDDPCDPH3501

Report Type: Original Report	Product Type: smart phone
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Report Number: RDG160316008-00A	
Report Date: 2016-03-22	
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Note: This test report is 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. (Dongguan).

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Shenzhen Topwell Wireless Communication Co Ltd*'s product, model number: *PCD PH3501* (FCC ID: *2AHDDPCDPH3501*) (the "EUT") in this report was a *smart phone*, which was measured approximately: 11.9cm (L) x 6.2cm (W) x 1.0cm (H), rated input voltage: DC 3.7V rechargeable Li-ion battery or DC 5V charging from adapter.

Adapter information:

MODELO: PCD PH3501

INPUT: AC 100-240V~ 50/60Hz 0.15A

OUTPUT: DC 5V, 500mA

All measurement and test data in this report was gathered from production sample serial number: 160316008 (Assigned by BACL, Dongguan). The EUT was received on 2016-03-17.

Objective

This report is prepared on behalf of *Shenzhen Topwell Wireless Communication 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)

FCC Part 15B JBP submissions with FCC ID: 2AHDDPCDPH3501.

FCC Part 15C DSS submissions with FCC ID: 2AHDDPCDPH3501.

FCC Part 15C DTS submissions with FCC ID: 2AHDDPCDPH3501.

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.

FINAL

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.

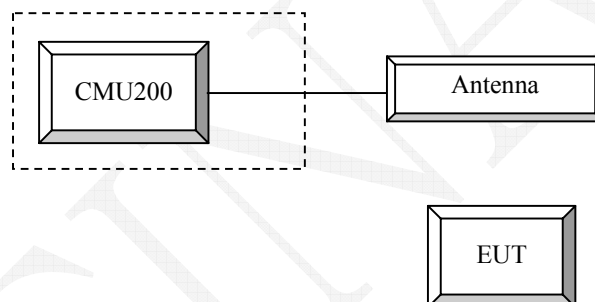
Equipment Modifications

No modification was made to the EUT.

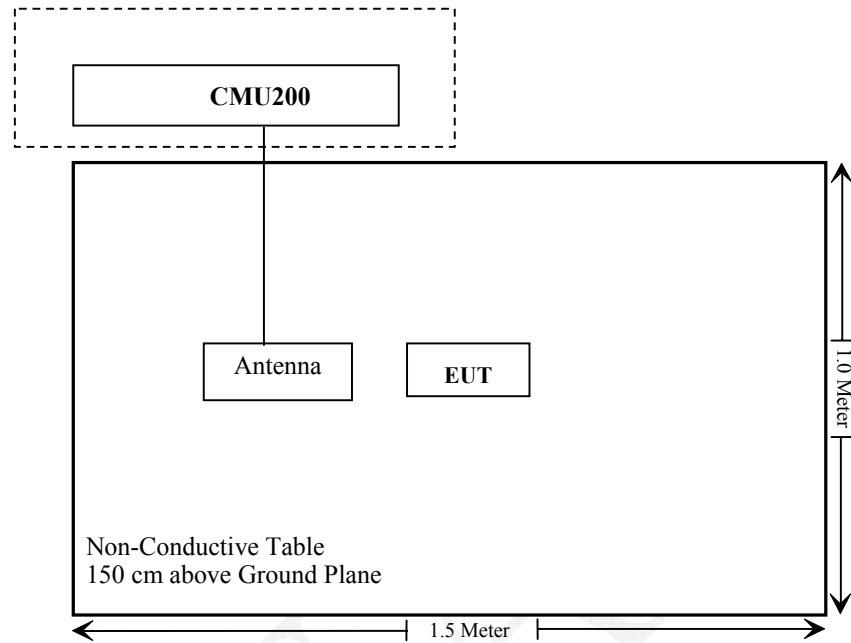
Support Equipment List and Details

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

FCC §1.1310 & §2.1093- RF EXPOSURE

Applicable Standard

FCC§1.1310 and §2.1093.

Test Result

Compliant, please refer to the SAR report: RDG160316008-20.

FINAL

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.

FINAL

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 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).

WCDMA General Settings	Loopback Mode	Test Mode 1
	Rel99 RMC	12.2kbps RMC
	Power Control Algorithm	Algorithm2
	β_c / β_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 Subset	HSDPA 1	HSDPA 2	HSDPA 3	HSDPA 4
WCDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set1			
	Power Control Algorithm	Algorithm2			
	β_c	2/15	12/15	15/15	15/15
	β_d	15/15	15/15	8/15	4/15
	β_d (SF)	64			
	β_c / β_d	2/15	12/15	15/8	15/4
	β_{hs}	4/15	24/15	30/15	30/15
	MPR(dB)	0	0	0.5	0.5
HSDPA Specific Settings	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.

	Mode	HSUPA	HSUPA	HSUPA	HSUPA	HSUPA
	Subset	1	2	3	4	5
WCDMA A General Settings	Loopback Mode	Test Mode 1				
	Rel99 RMC	12.2kbps RMC				
	HSDPA FRC	H-Set1				
	HSUPA Test	HSUPA Loopback				
	Power Control Algorithm	Algorithm2				
	β_c	11/15	6/15	15/15	2/15	15/15
	β_d	15/15	15/15	9/15	15/15	0
	β_{ec}	209/225	12/15	30/15	2/15	5/15
	β_c/β_d	11/15	6/15	15/9	2/15	-
	β_{hs}	22/15	12/15	30/15	4/15	5/15
	CM(dB)	1.0	3.0	2.0	3.0	1.0
	MPR(dB)	0	2	1	2	0
HSDPA Specific Settings	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				
HSUPA Specific Settings	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	

HSPA+

The following tests were conducted according to the test requirements in Table C.11.1.4 of 3GPP TS 34.121-1

Sub-test	β_c (Note 3)	β_d	β_{HS} (Note 1)	β_{ec}	β_{ed} (2xSF2) (Note 4)	β_{ed} (2xSF4) (Note 4)	CM (dB) (Note 2)	MPR (dB) (Note 2)	AG Index (Note 4)	E-TFCI (Note 5)	E-TFCI (boost)
1	1	0	30/15	30/15	β_{ed1} : 30/15 β_{ed2} : 30/15	β_{ed3} : 24/15 β_{ed4} : 24/15	3.5	2.5	14	105	105

Note 1: Δ_{ACK} , Δ_{NACK} and $\Delta_{CQI} = 30/15$ with $\beta_{hs} = 30/15 * \beta_c$.

Note 2: CM = 3.5 and the MPR is based on the relative CM difference, MPR = MAX(CM-1,0).

Note 3: DPDCH is not configured, therefore the β_c is set to 1 and $\beta_d = 0$ by default.

Note 4: β_{ed} can not be set directly; it is set by Absolute Grant Value.

Note 5: All the sub-tests require the UE to transmit 2SF2+2SF4 16QAM EDCH and they apply for UE using E-DPDCH category 7. E-DCH TTI is set to 2ms TTI and E-DCH table index = 2. To support these E-DCH configurations DPDCH is not allocated. The UE is signalled to use the extrapolation algorithm.

DC-HSDPA

The following tests were conducted according to the test requirements in Table C.8.1.12 of 3GPP TS 34.121-1

Table C.8.1.12: Fixed Reference Channel H-Set 12

Parameter	Unit	Value
Nominal Avg. Inf. Bit Rate	kbps	60
Inter-TTI Distance	TTI's	1
Number of HARQ Processes	Processes	6
Information Bit Payload (N_{INF})	Bits	120
Number Code Blocks	Blocks	1
Binary Channel Bits Per TTI	Bits	960
Total Available SML's in UE	SML's	19200
Number of SML's per HARQ Proc.	SML's	3200
Coding Rate		0.15
Number of Physical Channel Codes	Codes	1
Modulation		QPSK
Note 1: The RMC is intended to be used for DC-HSDPA mode and both cells shall transmit with identical parameters as listed in the table.		
Note 2: Maximum number of transmission is limited to 1, i.e., retransmission is not allowed. The redundancy and constellation version 0 shall be used.		

Radiated method:

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	2015-08-03	2016-08-02
Sunol Sciences	Antenna	JB3	A060611-3	2014-11-06	2017-11-05
HP	Amplifier	8447E	2434A02181	2015-09-01	2016-09-01
Agilent	Spectrum Analyzer	E4440A	SG43360054	2015-11-23	2016-11-22
ETS LINDGREN	Horn Antenna	3115	000 527 35	2013-09-06	2016-09-06
Mini-Circuit	Amplifier	ZVA-213-S+	054201245	2016-02-19	2017-02-19
Giga	Signal Generator	1026	320408	2015-05-09	2016-05-09
EMCO	Adjustable Dipole Antenna	3121C	9109-753	N/A	N/A
TDK RF	Horn Antenna	HRN-0118	130 084	2013-09-06	2016-09-06
N/A	Coaxial Cable	14m	N/A	2015-05-06	2016-05-06
N/A	Coaxial Cable	8m	N/A	2015-05-06	2016-05-06
N/A	Coaxial Cable	0.1m	N/A	2015-05-06	2016-05-06
E-Microwave	DC Blocking	EMDCB-00036	0E01201047	2015-05-06	2016-05-06
E-Microwave	Attenuator(10dB)	EMCA10-5RN	OE01203239	2015-05-08	2016-05-08
Pasternack	RF Coaxial Cable	RF-01	N/A	2015-05-06	2016-05-06
Pasternack	RF Coaxial Cable	RF-02	N/A	2015-05-06	2016-05-06
N/A	Two-way Splitter	ODP-1-6-2S	OE0120142	2015-05-06	2016-05-06

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

Test Data**Environmental Conditions**

Temperature:	24.4 °C
Relative Humidity:	68 %
ATM Pressure:	100.9 kPa

The testing was performed by Dean Liu on 2016-03-21.

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	32.00	32.03	30.91	28.93	28.13	28.49	27.22	25.07	23.80
	190	31.80	31.82	30.72	28.73	27.87	28.41	27.19	24.97	23.62
	251	32.00	31.97	30.92	28.97	28.06	28.20	26.98	24.69	23.36
PCS	512	29.00	29.08	27.74	25.62	24.82	24.59	23.36	21.06	19.52
	661	28.90	28.87	27.56	25.46	24.69	24.27	22.95	20.62	19.10
	810	28.60	28.61	27.34	25.16	24.25	23.76	22.43	20.04	18.59

WCDMA Band II (PART 24E)

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	21.84	2.84	21.95	3.12	21.59	2.96
HSDPA	1	20.62	2.76	20.75	3.18	20.48	2.98
	2	20.72	2.81	20.78	3.14	20.55	3.02
	3	20.76	2.86	20.81	3.07	20.46	2.91
	4	20.58	2.78	20.74	3.11	20.36	2.93
HSUPA	1	20.69	2.75	20.76	3.09	20.56	2.98
	2	20.73	2.82	20.67	3.12	20.58	3.01
	3	20.61	2.87	20.81	3.16	20.62	3.00
	4	20.74	2.83	20.70	3.15	20.54	2.95
	5	20.62	2.77	20.77	3.08	20.70	2.92
DC-HSDPA	1	20.8	2.80	20.83	3.19	20.54	2.97
	2	20.58	2.84	20.87	3.14	20.60	3.03
	3	20.56	2.81	20.69	3.06	20.47	2.92
	4	20.78	2.88	20.75	3.10	20.43	3.05
HSPA+	1	20.61	2.86	20.83	3.13	20.53	2.95

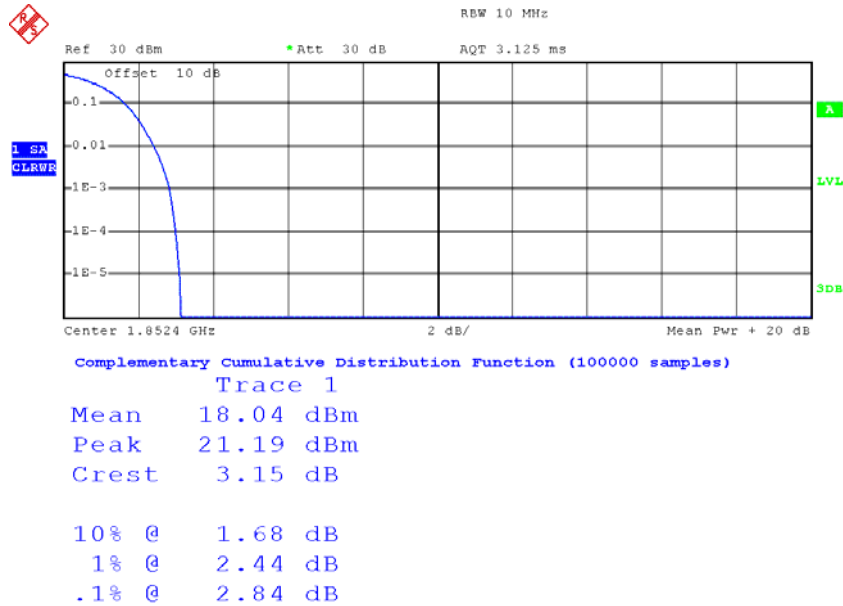
WCDMA Band V (PART 22H)

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	21.88	3.24	22.14	3.36	21.89	3.36
HSDPA	1	20.95	3.31	21.06	3.42	20.75	3.39
	2	20.92	3.24	21.12	3.39	20.66	3.35
	3	20.97	3.20	20.92	3.31	20.78	3.32
	4	21.00	3.28	21.05	3.38	20.69	3.42
HSUPA	1	20.96	3.26	21.03	3.32	20.73	3.35
	2	20.97	3.19	20.93	3.29	20.75	3.31
	3	20.95	3.25	21.07	3.35	20.67	3.40
	4	20.92	3.27	20.89	3.34	20.59	3.27
	5	21.05	3.17	21.14	3.37	20.74	3.33
DC-HSDPA	1	21.08	3.26	21.03	3.31	20.66	3.41
	2	20.99	3.23	21.15	3.35	20.75	3.37
	3	21.06	3.21	21.05	3.34	20.83	3.35
	4	20.96	3.20	21.10	3.41	20.73	3.38
HSPA+	1	21.06	3.28	21.08	3.37	20.80	3.36

Note: peak-to-average ratio (PAR) <13 dB.

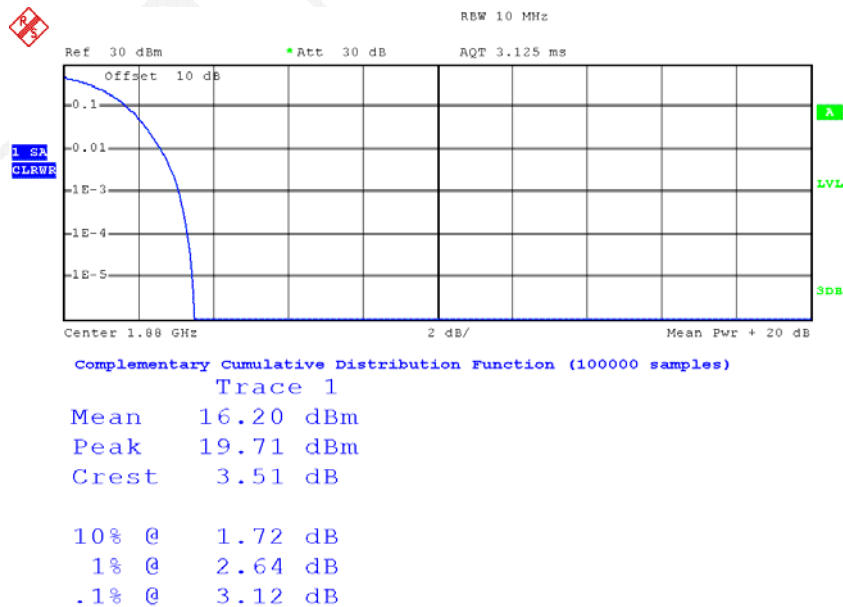
Peak-to-average ratio (PAR)
WCDMA Band II (PART 24E)

Low Channel



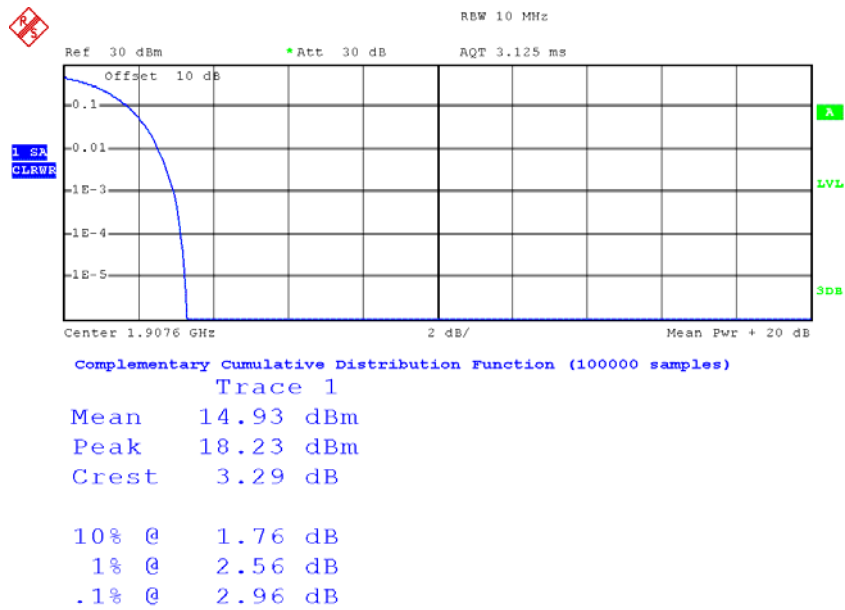
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Middle Channel

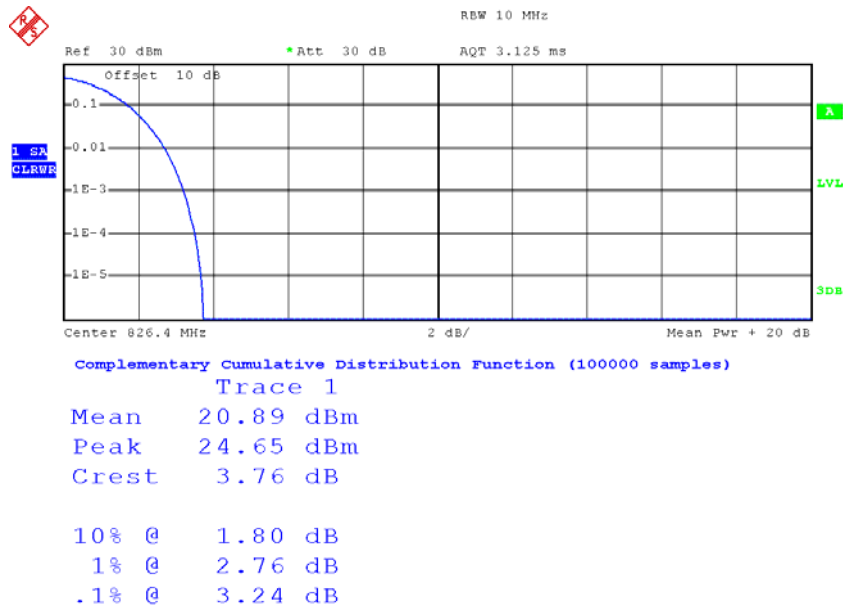


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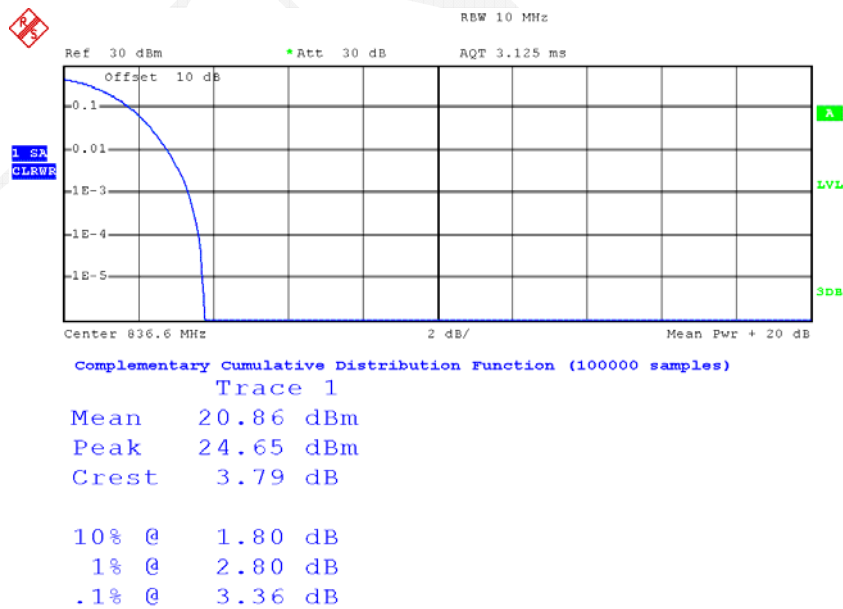
High Channel



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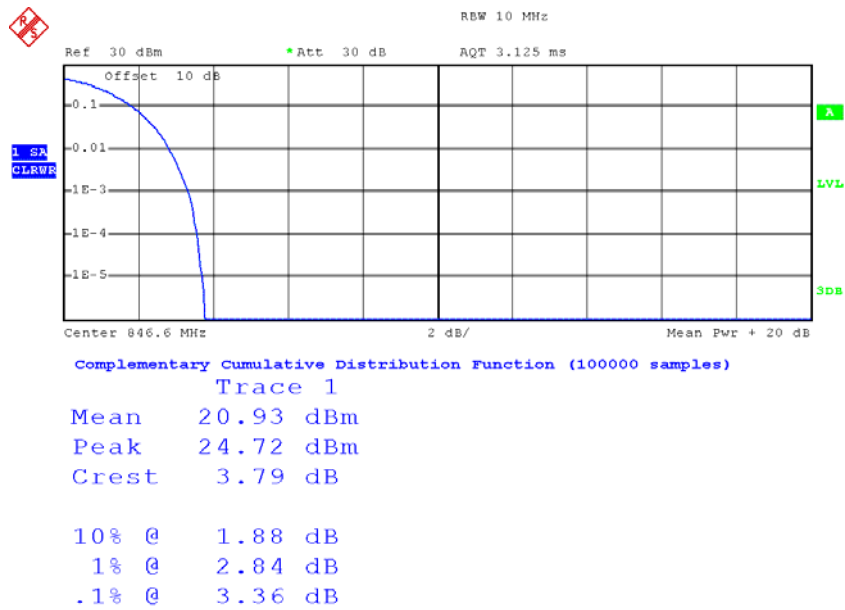
WCDMA Band V (PART 22H)**Low Channel**

Date: 21.MAR.2016 19:11:58

Middle Channel

Date: 21.MAR.2016 19:11:20

High Channel



Date: 21.MAR.2016 19:12:39

ERP & EIRP

Part 22H

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)			
GSM 850_Middle Channel								
836.600	H	89.87	14.9	0.0	1	13.9	38.45	24.6
836.600	V	104.22	32.4	0.0	1	31.4	38.45	7.1
EGPRS 850 Middle Channel								
836.600	H	84.61	9.7	0.0	1	8.7	38.45	29.8
836.600	V	98.36	26.6	0.0	1	25.6	38.45	12.9
WCDMA Band V Middle Channel								
836.600	H	81.06	6.1	0.0	1	5.1	38.45	33.35
836.600	V	93.19	21.4	0.0	1	20.4	38.45	18.05

Part 24E

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)			
PCS 1900_Middle Channel								
1880.000	H	93.92	22.3	11.7	1.4	32.6	33.0	0.4
1880.000	V	91.68	20.2	11.7	1.4	30.5	33.0	2.5
EGPRS 1900 Middle Channel								
1880.000	H	85.64	14	11.7	1.4	24.3	33.0	8.7
1880.000	V	83.51	12.1	11.7	1.4	22.4	33.0	10.6
WCDMA Band II Middle Channel								
1880.000	H	86.21	14.6	11.7	1.4	24.9	33.0	8.1
1880.000	V	84.04	12.6	11.7	1.4	22.9	33.0	10.1

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

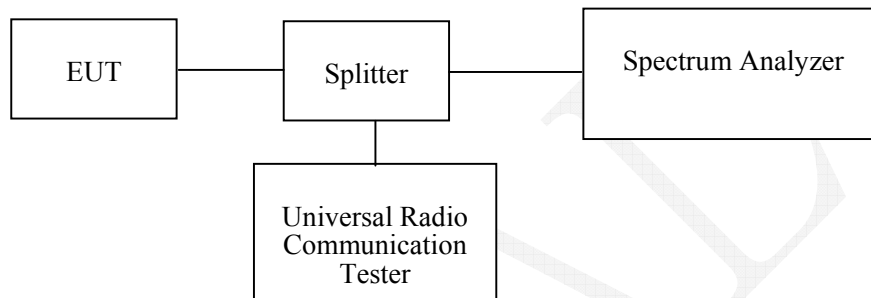
Applicable Standard

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	2015-05-09	2016-05-09
R&S	Universal Radio Communication Tester	CMU200	109 038	2015-07-28	2016-07-27
N/A	Coaxial Cable	0.1m	N/A	2015-05-06	2016-05-06
E-Microwave	DC Blocking	EMDCB-00036	0E01201047	2015-05-06	2016-05-06
E-Microwave	Attenuator(10dB)	EMCA10-5RN	0E01203239	2015-05-08	2016-05-08
Pasternack	RF Coaxial Cable	RF-01	N/A	2015-05-06	2016-05-06
Pasternack	RF Coaxial Cable	RF-02	N/A	2015-05-06	2016-05-06
N/A	Two-way Splitter	ODP-1-6-2S	0E0120142	2015-05-06	2016-05-06

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

Test Data**Environmental Conditions**

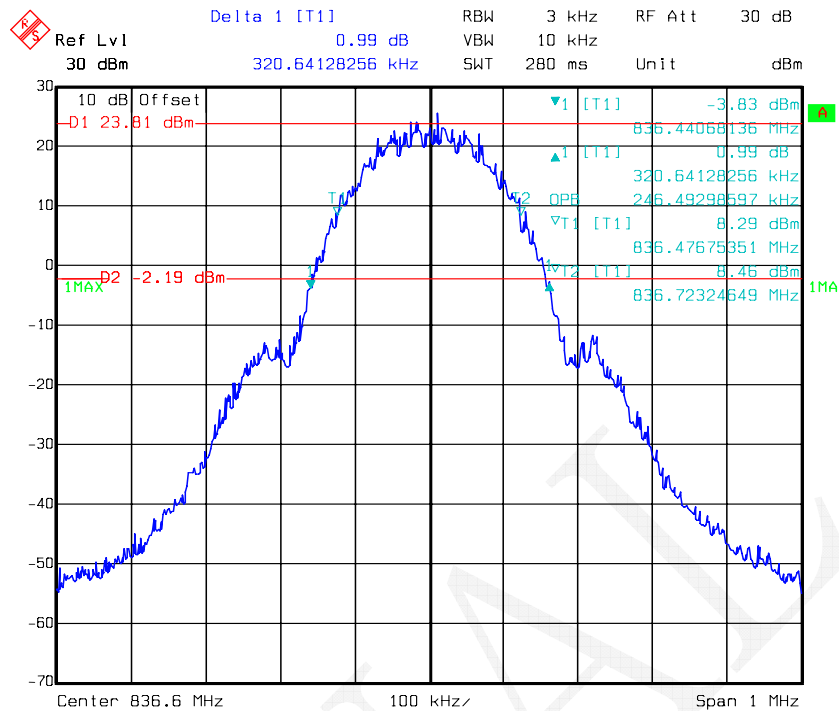
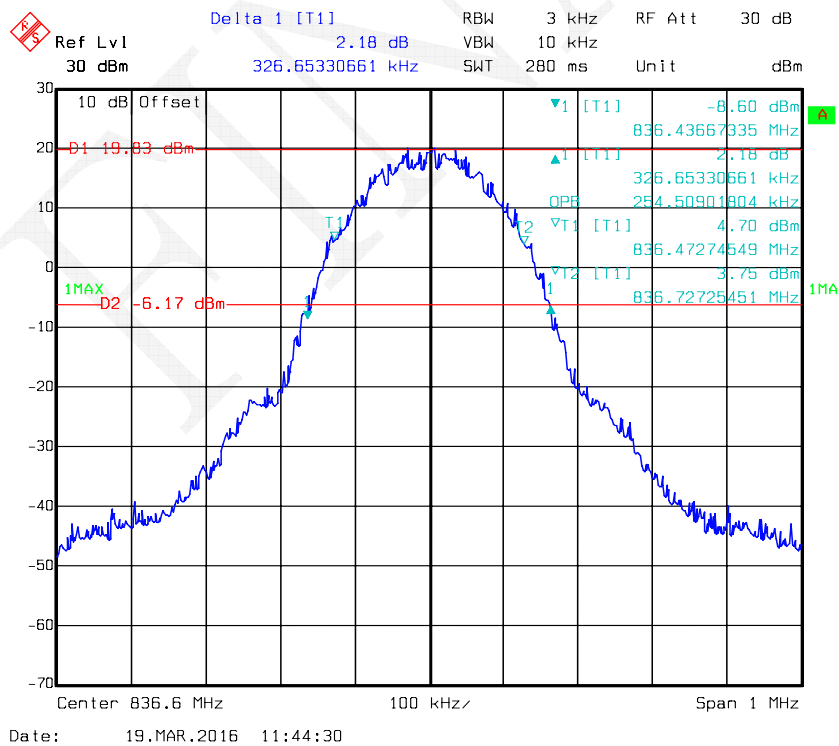
Temperature:	24.4 °C
Relative Humidity:	63 %
ATM Pressure:	100.6 kPa

The testing was performed by Dean Liu on 2016-03-19.

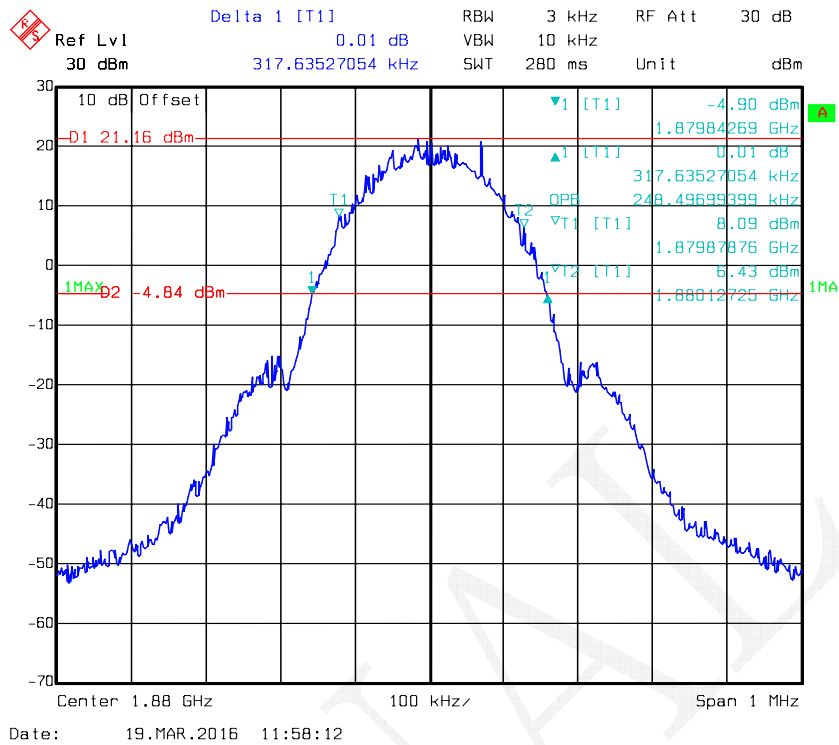
Test Mode: Transmitting

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

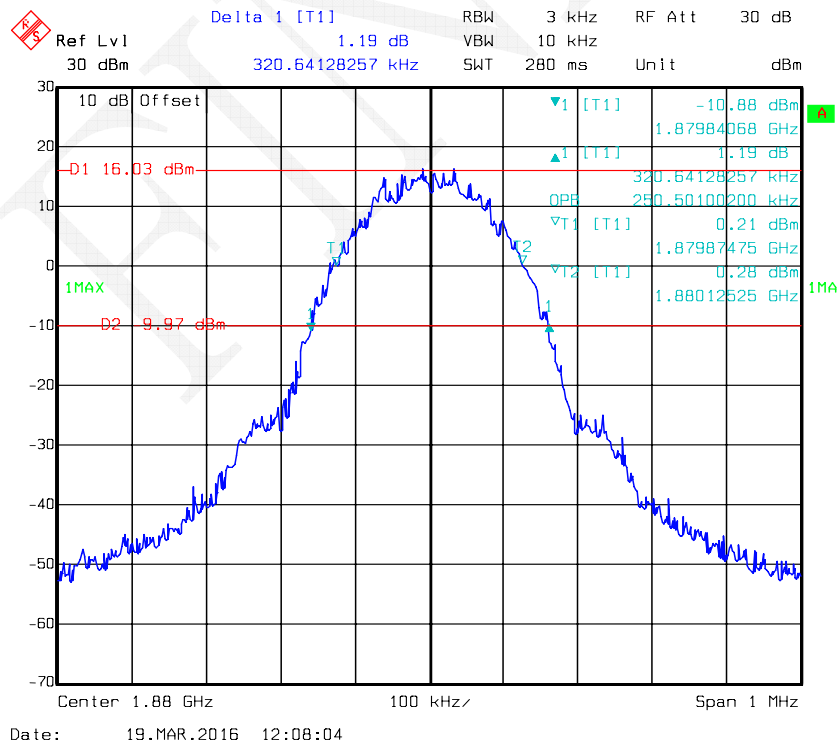
Band	Channel No.	Mode	99% Occupied Bandwidth	26 dB Occupied Bandwidth
			kHz	kHz
Cellular	190	GSM	246.493	320.641
		EDGE	254.509	326.653
PCS	661	PCS	248.497	317.635
		EDGE	250.501	320.641
WCDMA Band II	9400	Rel 99	4188.38	4709.42
	9400	HSDPA	4168.34	4699.4
	9400	HSUPA	4168.34	4699.4
WCDMA Band V	4175	Rel 99	4148.3	4689.4
	4175	HSDPA	4148.3	4709.42
	4175	HSUPA	4168.34	4709.42

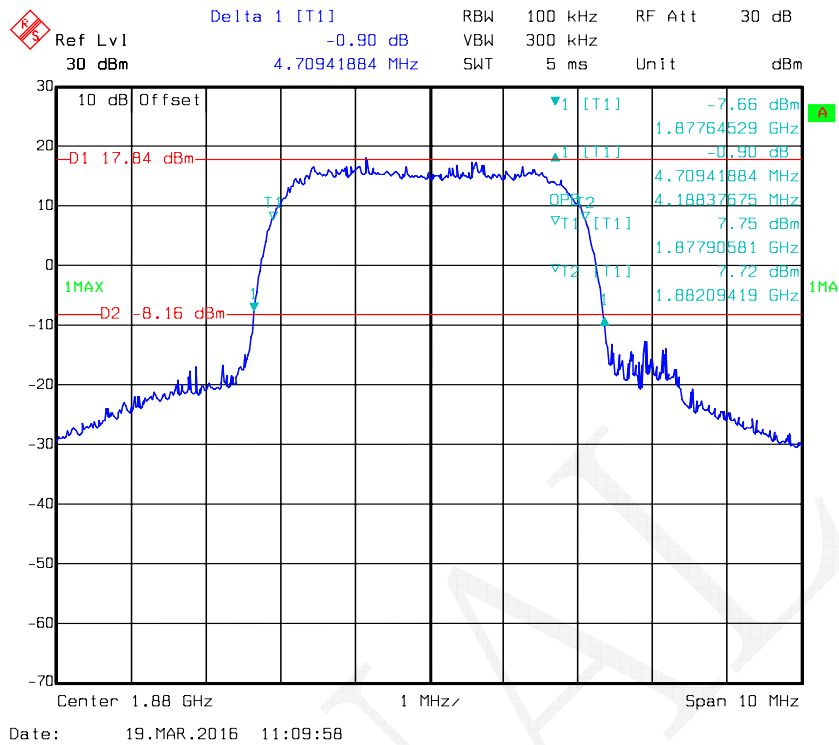
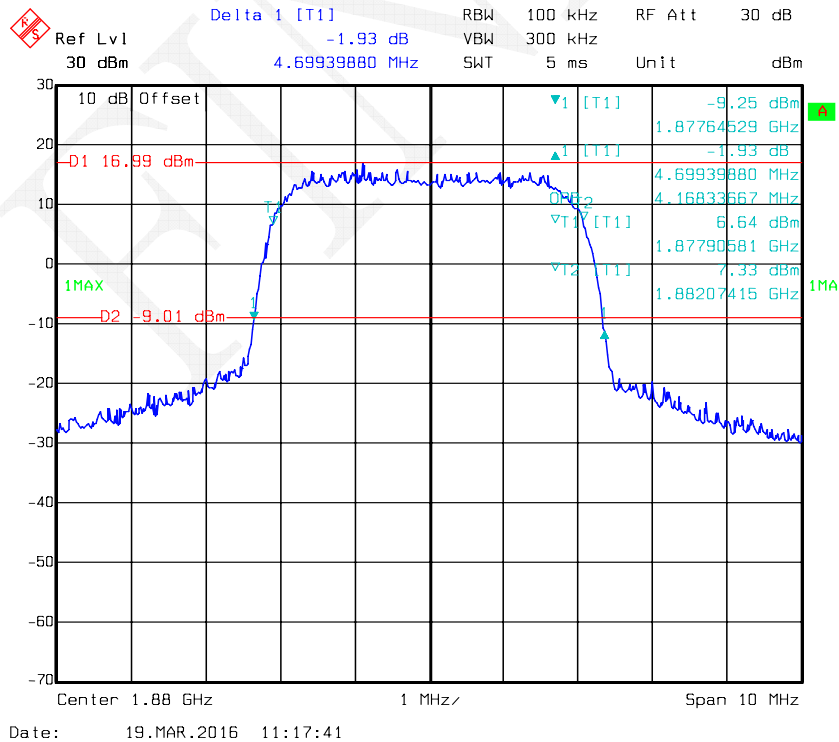
GMSK 850 Cellular Band**EDGE 850 Cellular Band**

GMSK PCS Band

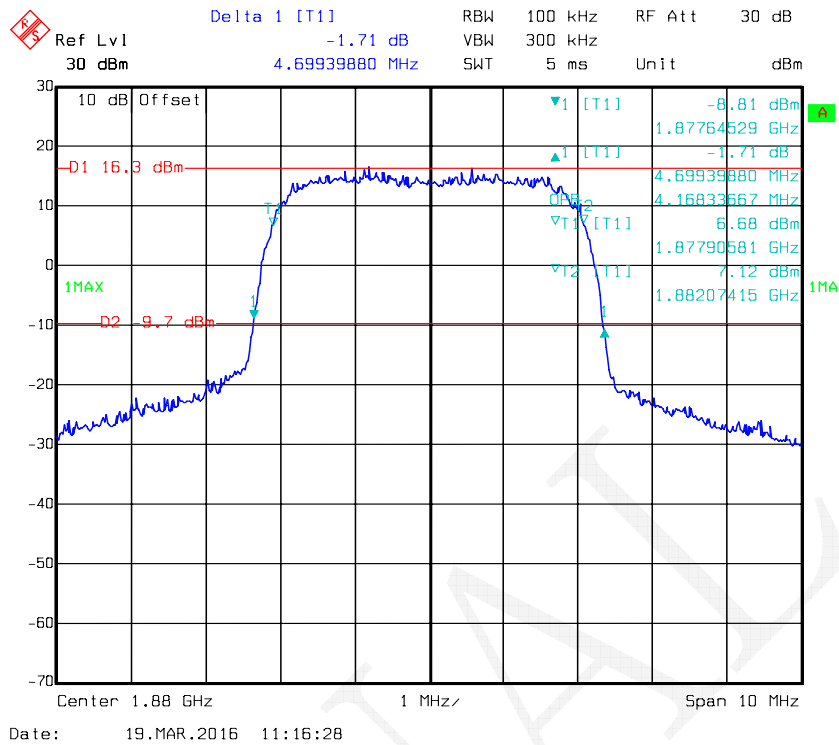


EDGE PCS Band

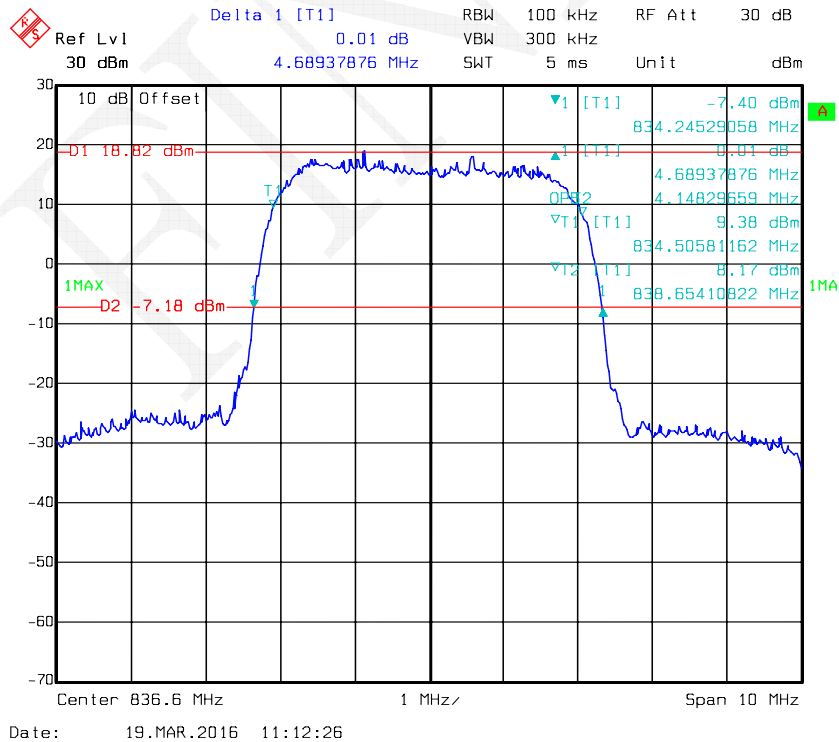


REL99 Band II**HSDPA Band II**

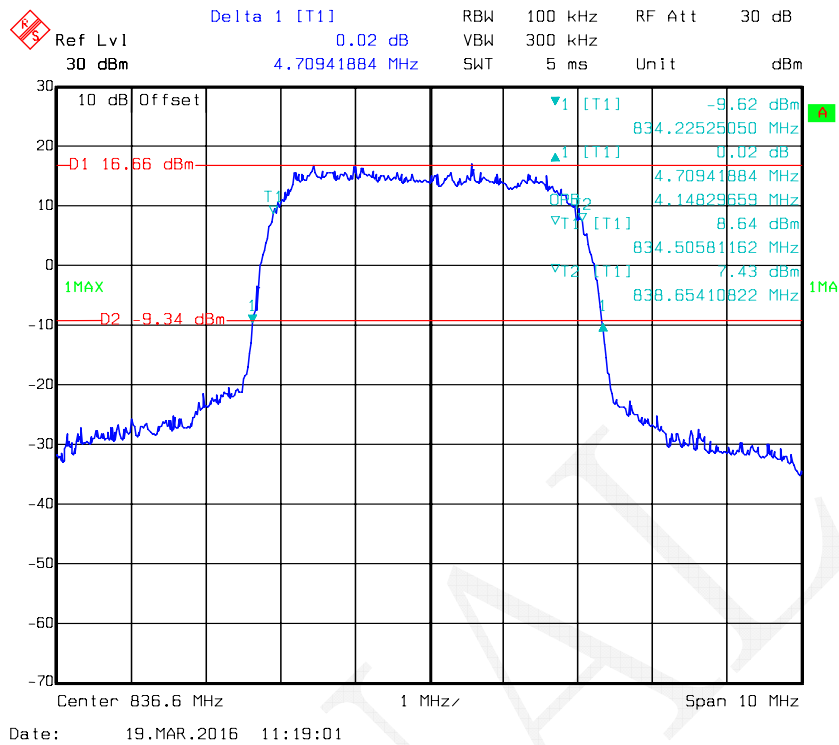
HSUPA Band II



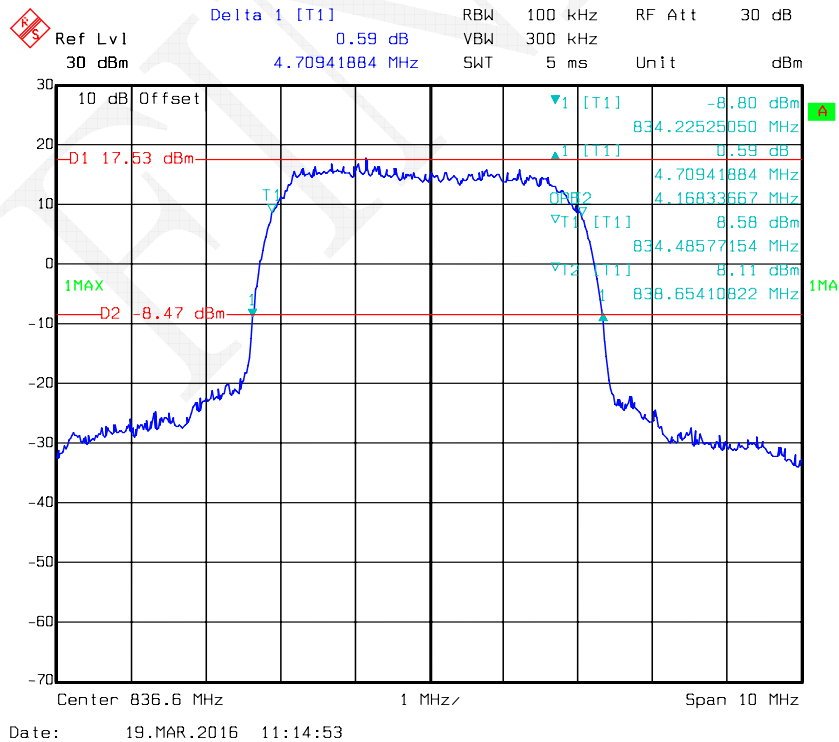
REL99 Band V



HSDPA Band V



HSUPA Band V



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

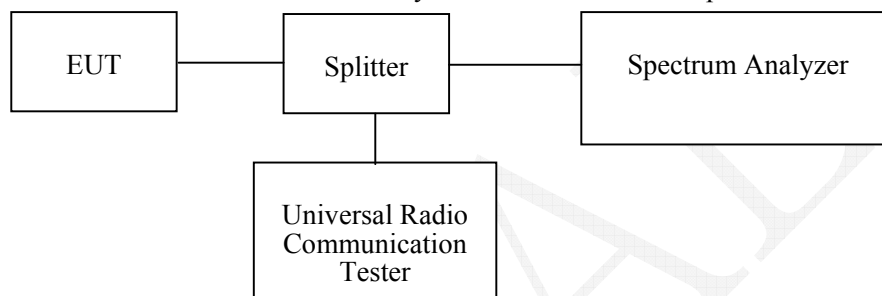
Applicable Standard

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 10th harmonic.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSP 38	100478	2015-05-09	2016-05-09
R&S	Universal Radio Communication Tester	CMU200	109 038	2015-07-28	2016-07-27
N/A	Coaxial Cable	0.1m	N/A	2015-05-06	2016-05-06
E-Microwave	DC Blocking	EMDCB-00036	0E01201047	2015-05-06	2016-05-06
E-Microwave	Attenuator(10dB)	EMCA10-5RN	0E01203239	2015-05-08	2016-05-08
Pasternack	RF Coaxial Cable	RF-01	N/A	2015-05-06	2016-05-06
Pasternack	RF Coaxial Cable	RF-02	N/A	2015-05-06	2016-05-06
N/A	Two-way Splitter	ODP-1-6-2S	0E0120142	2015-05-06	2016-05-06

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

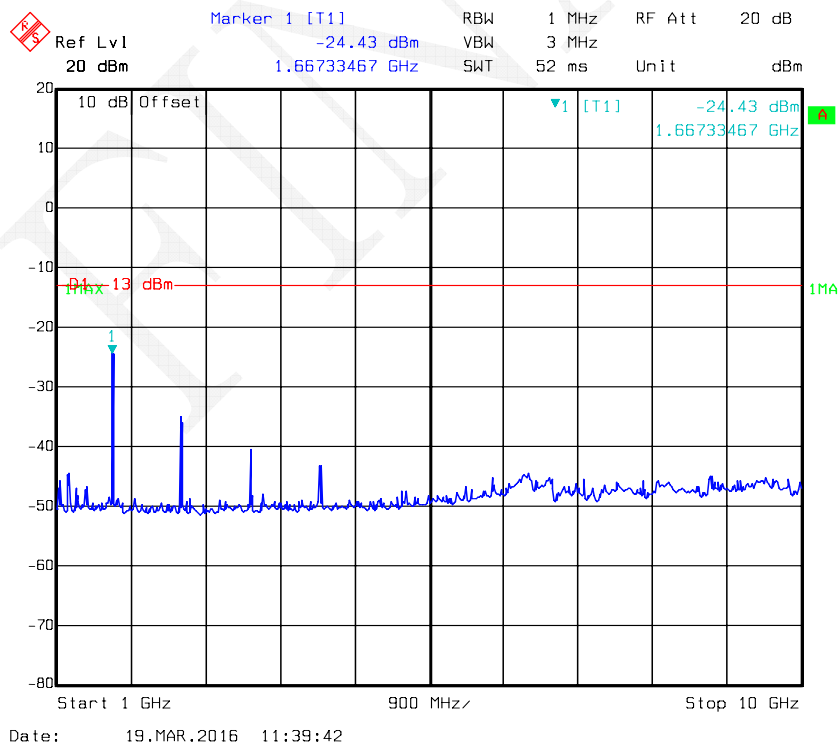
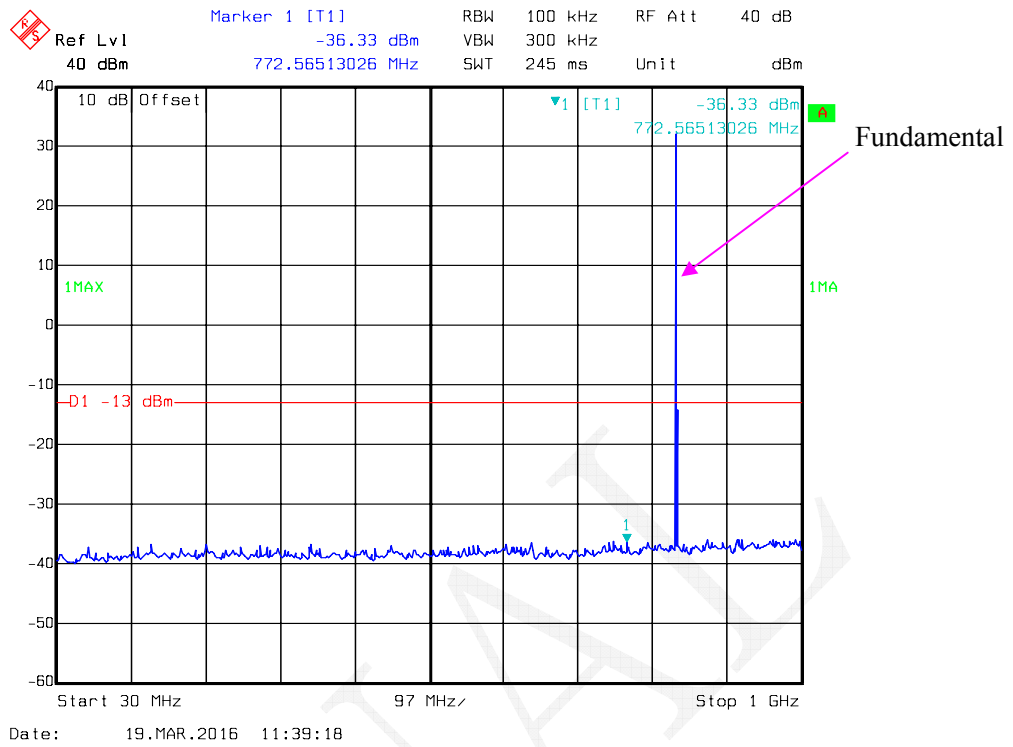
Test Data**Environmental Conditions**

Temperature:	24.4°C
Relative Humidity:	63 %
ATM Pressure:	100.6 kPa

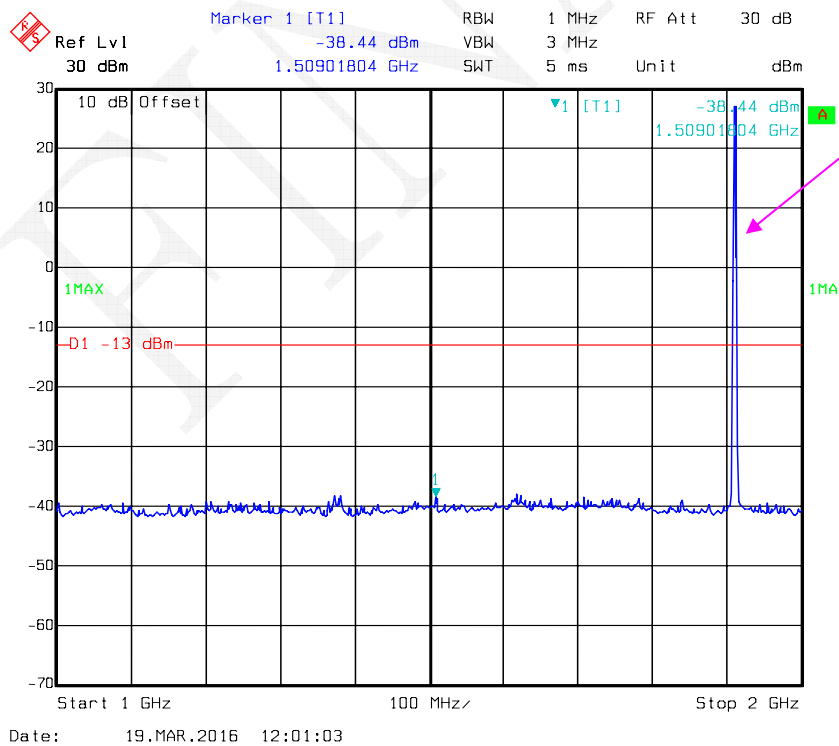
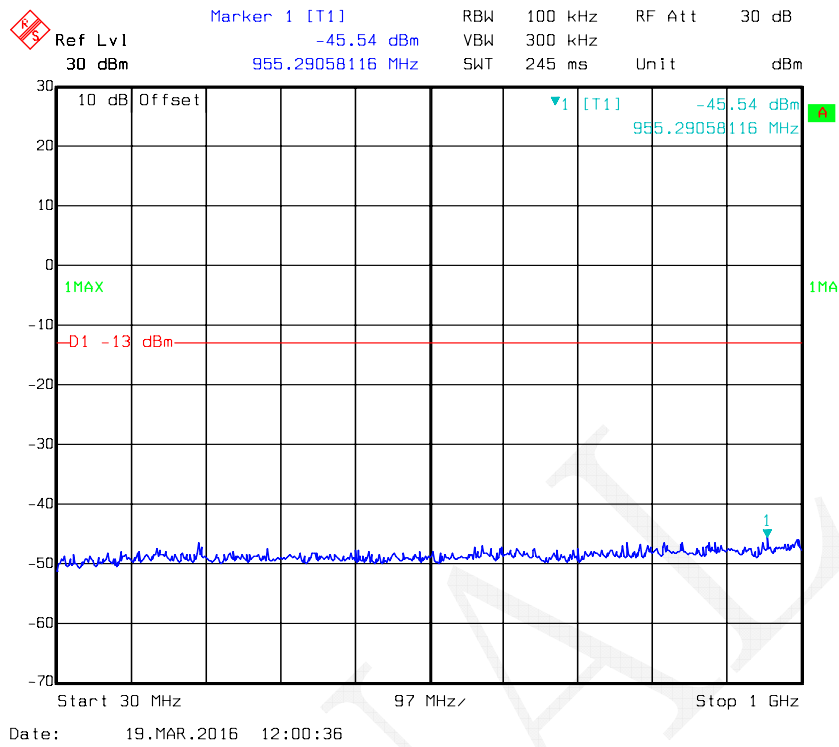
The testing was performed by Dean Liu on 2016-03-19.

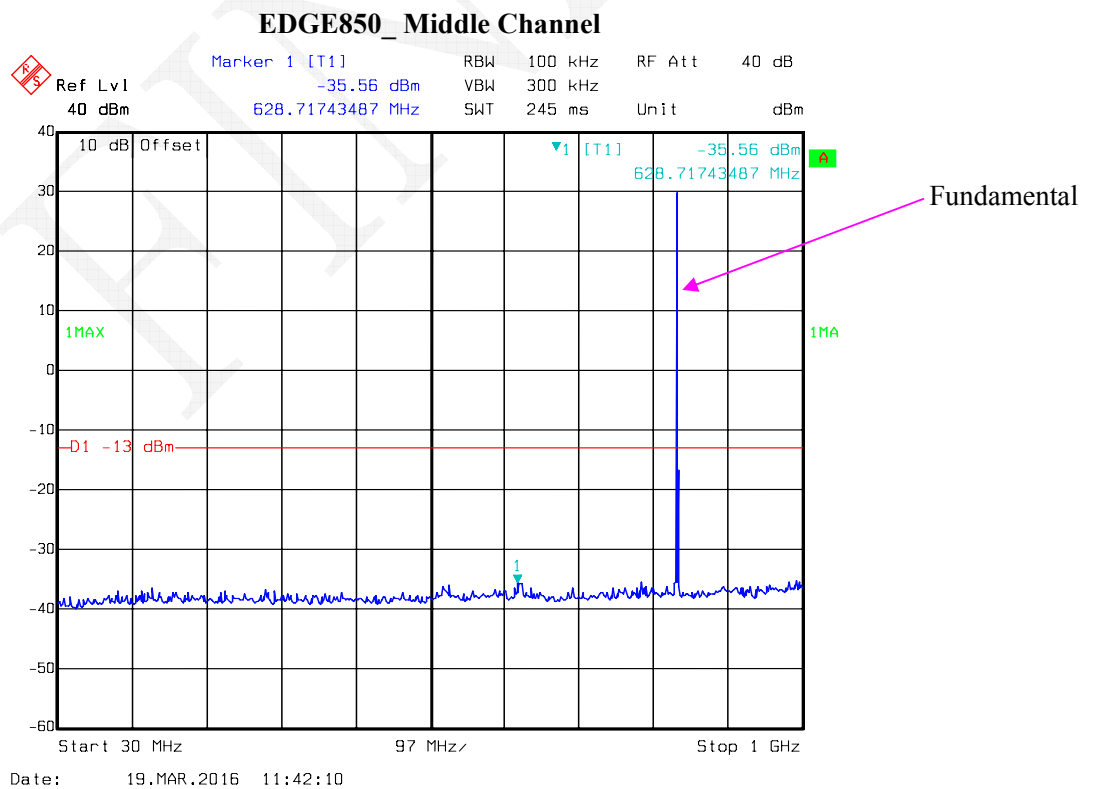
Please refer to the following plots.

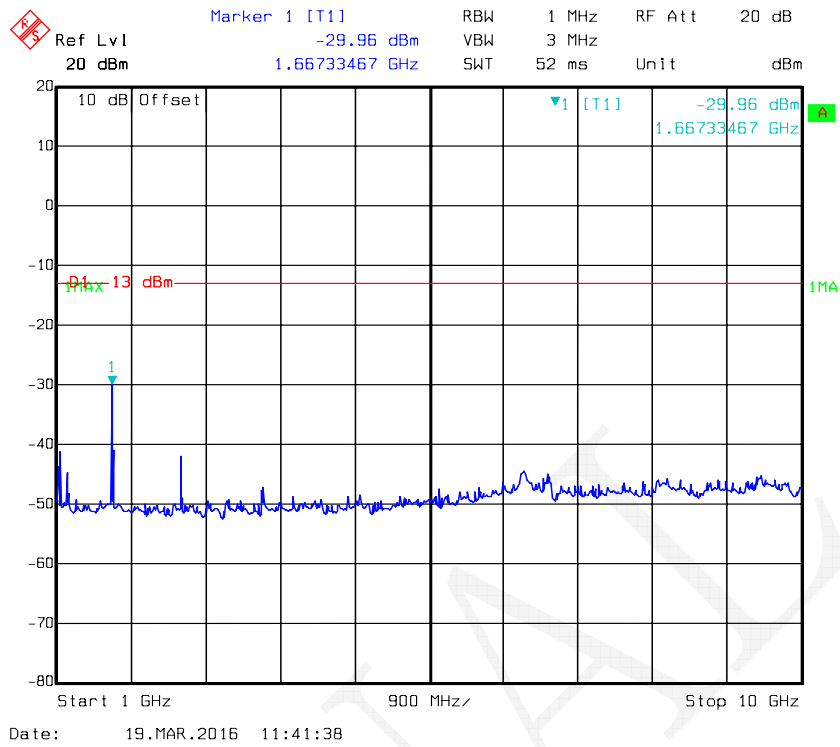
GSM850_Middle Channel



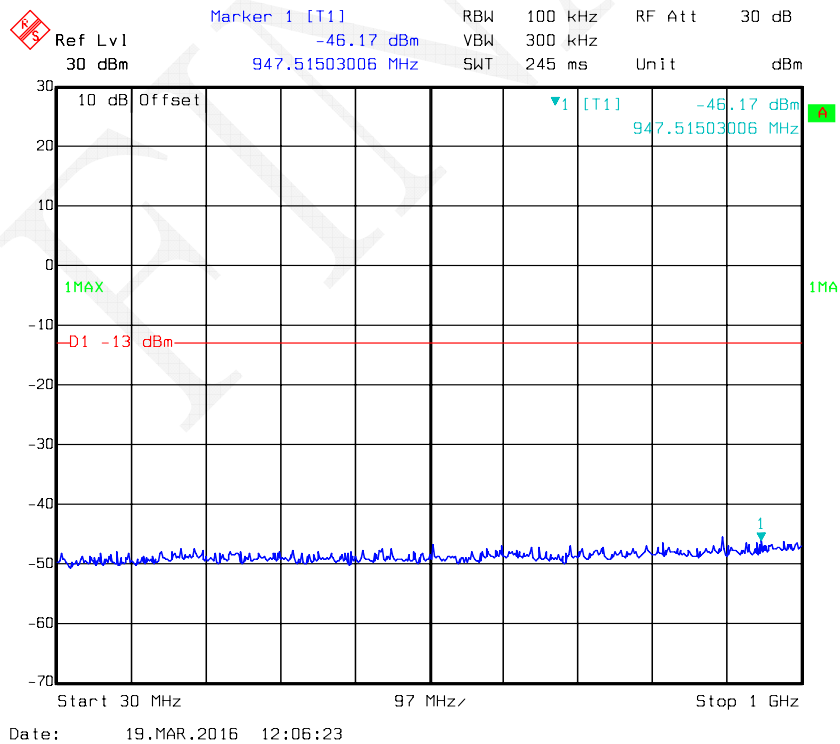
PCS 1900_ Middle Channel

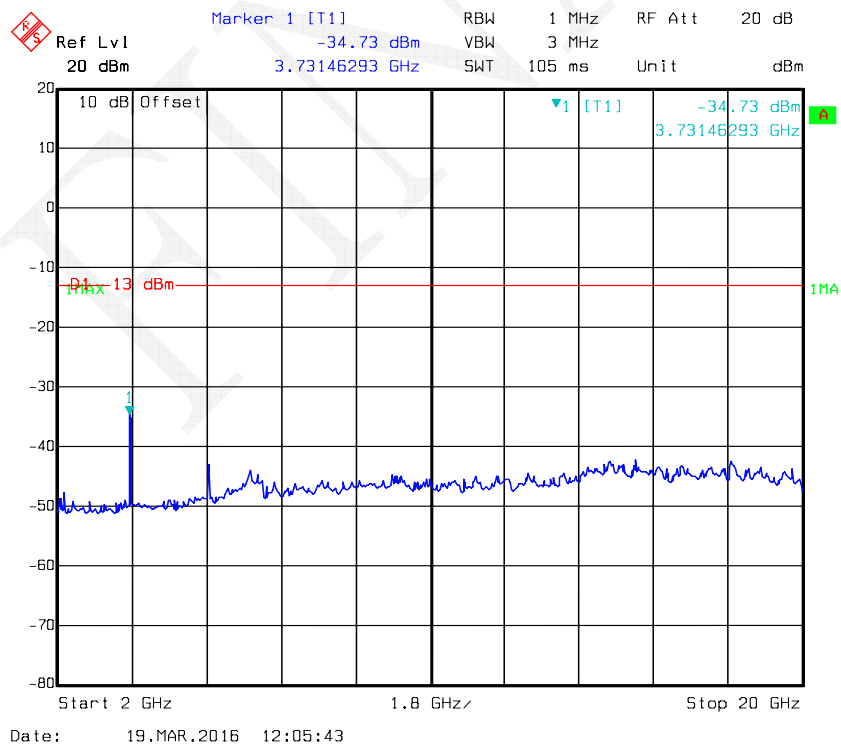
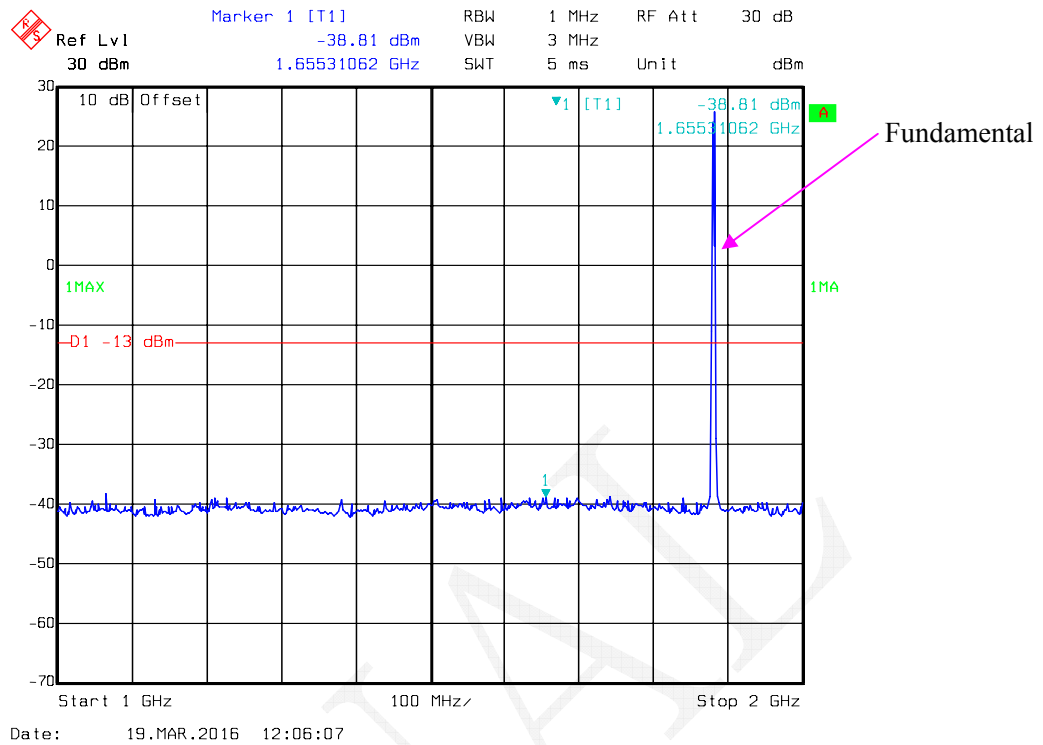




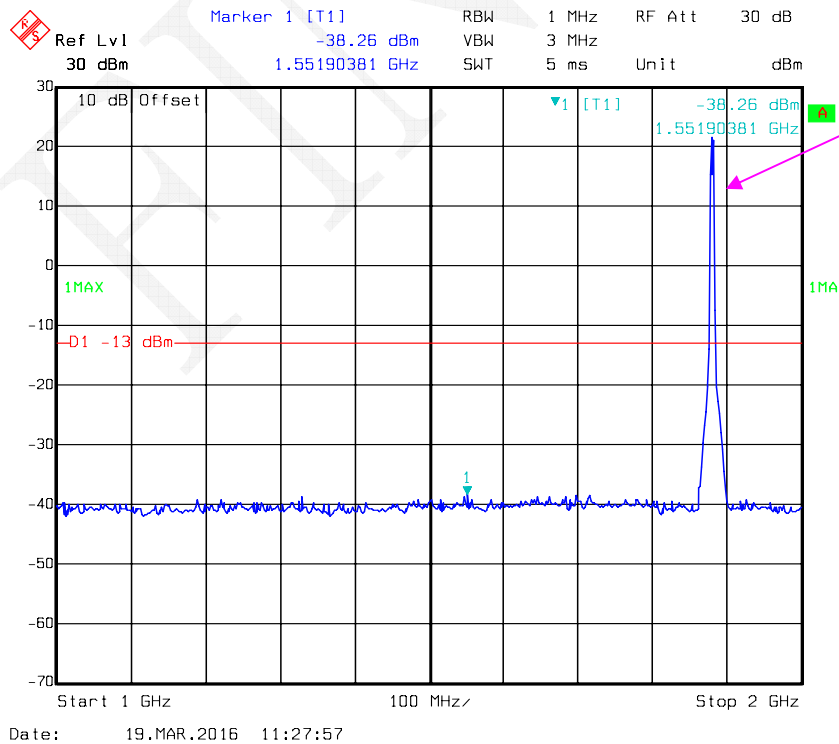
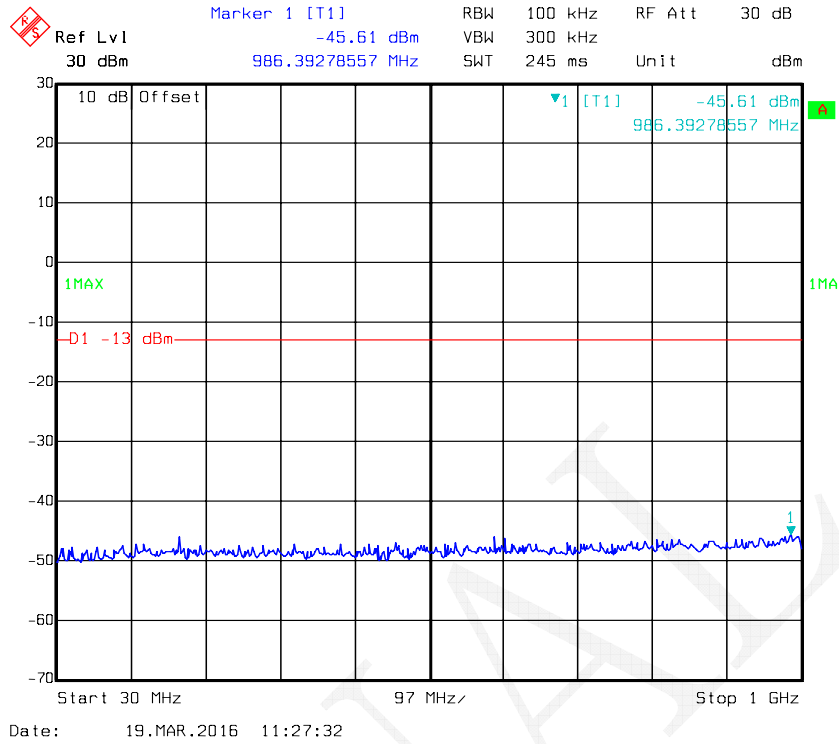


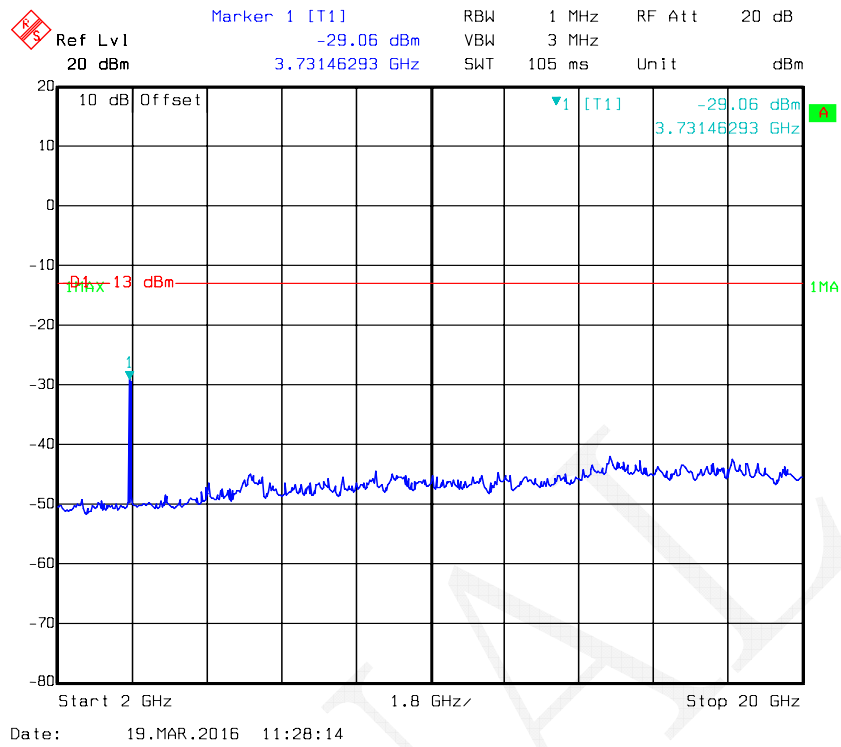
EDGE1900_Middle Channel



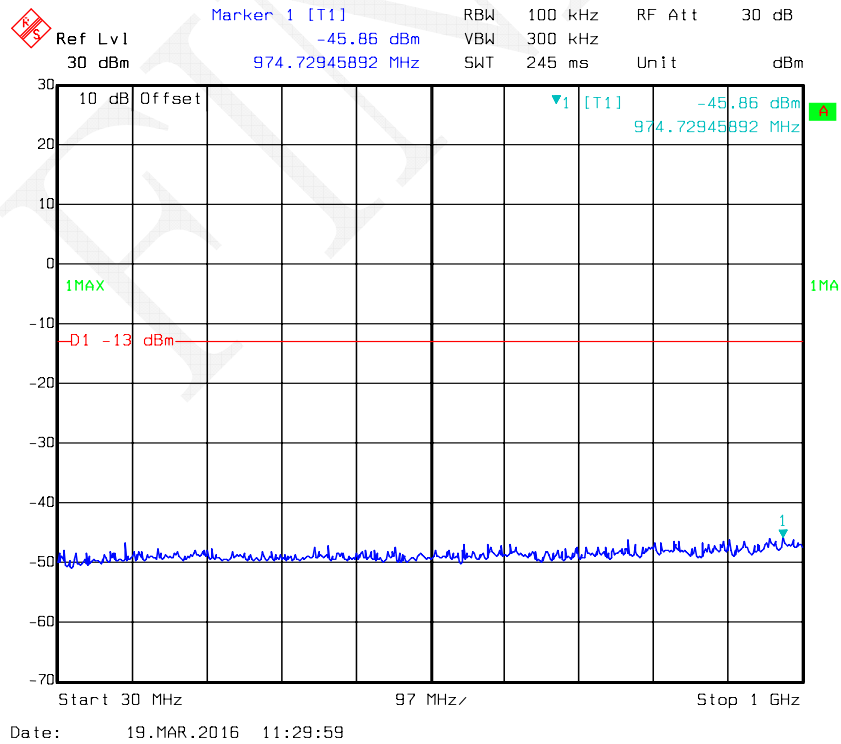


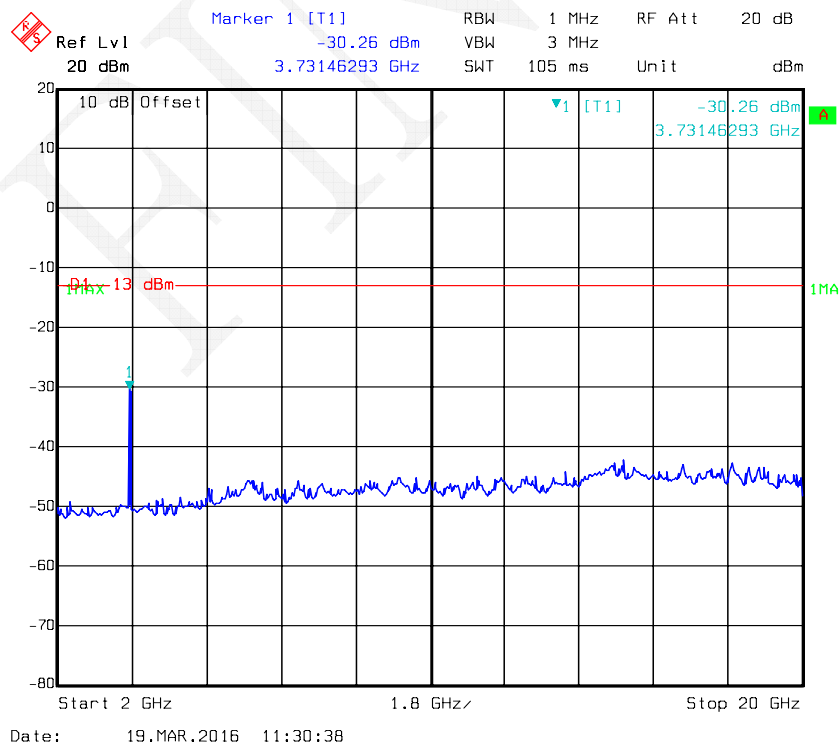
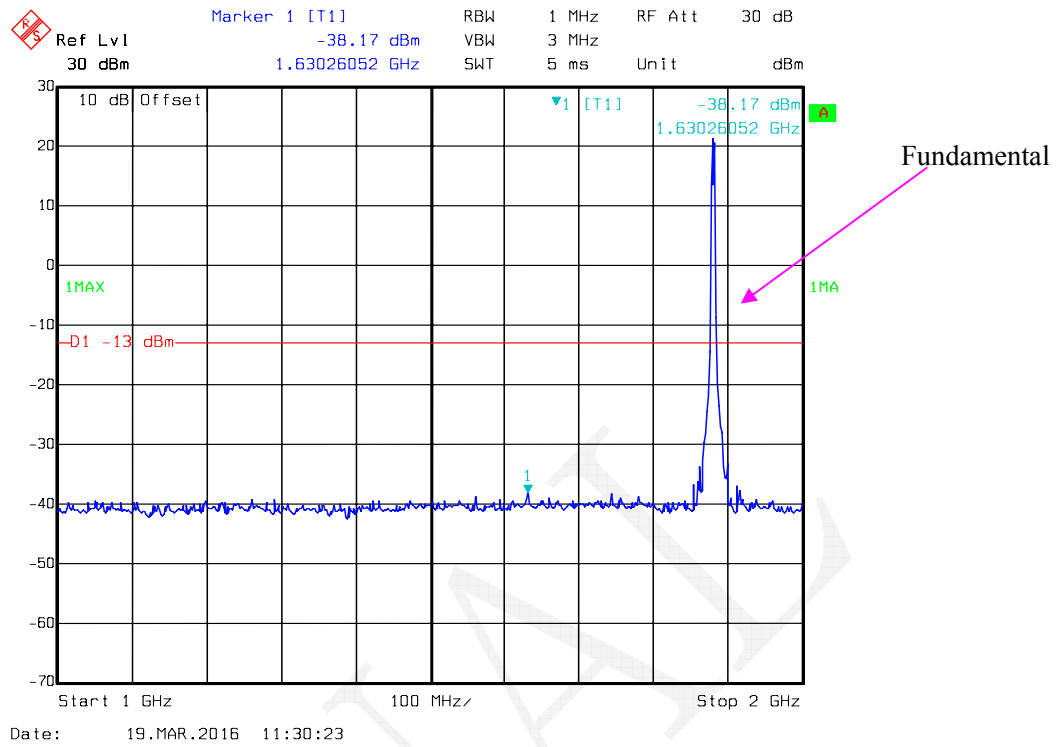
REL99 Band II_ Middle Channel



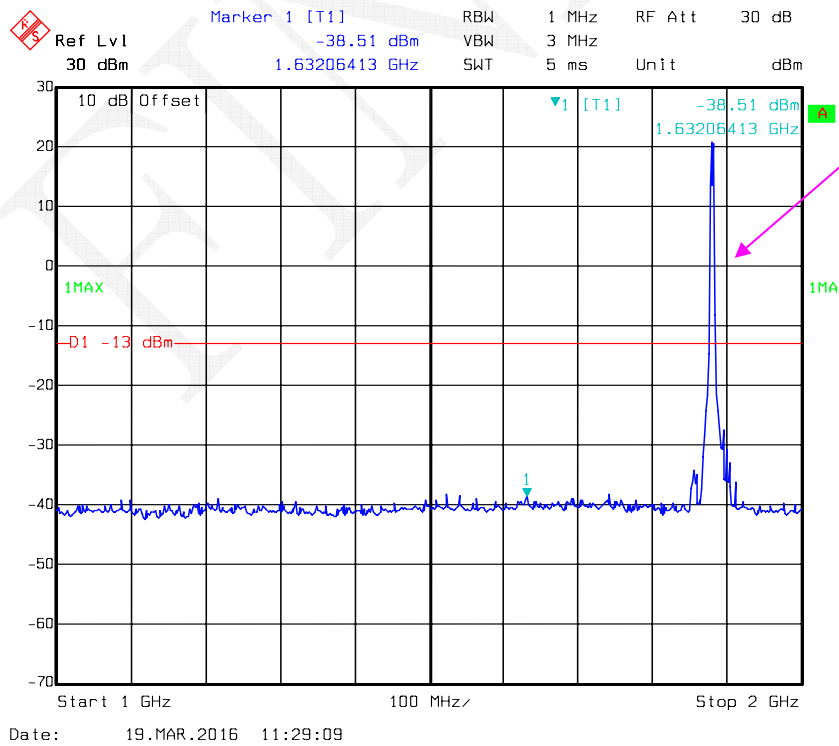
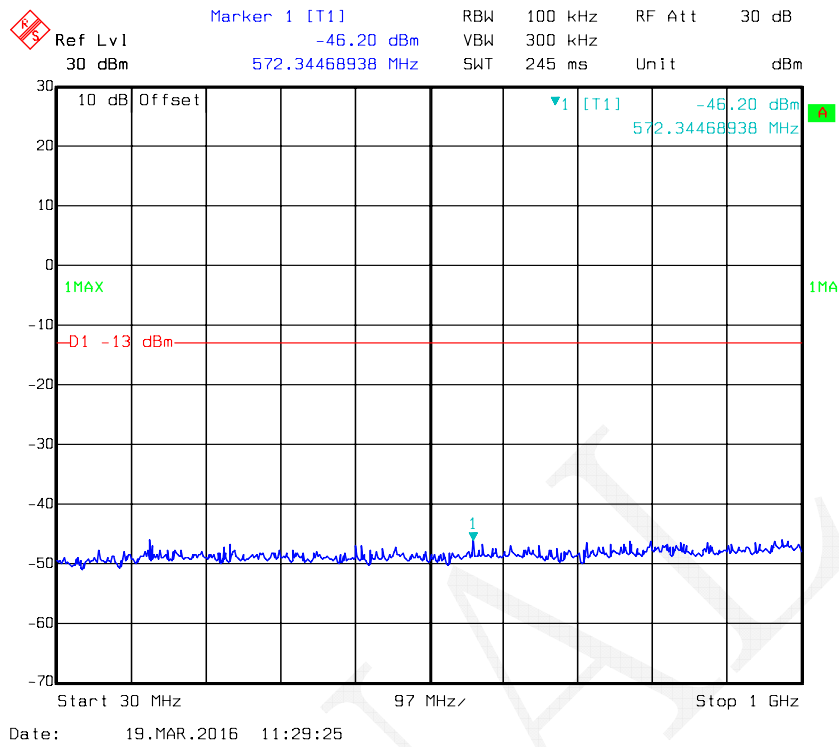


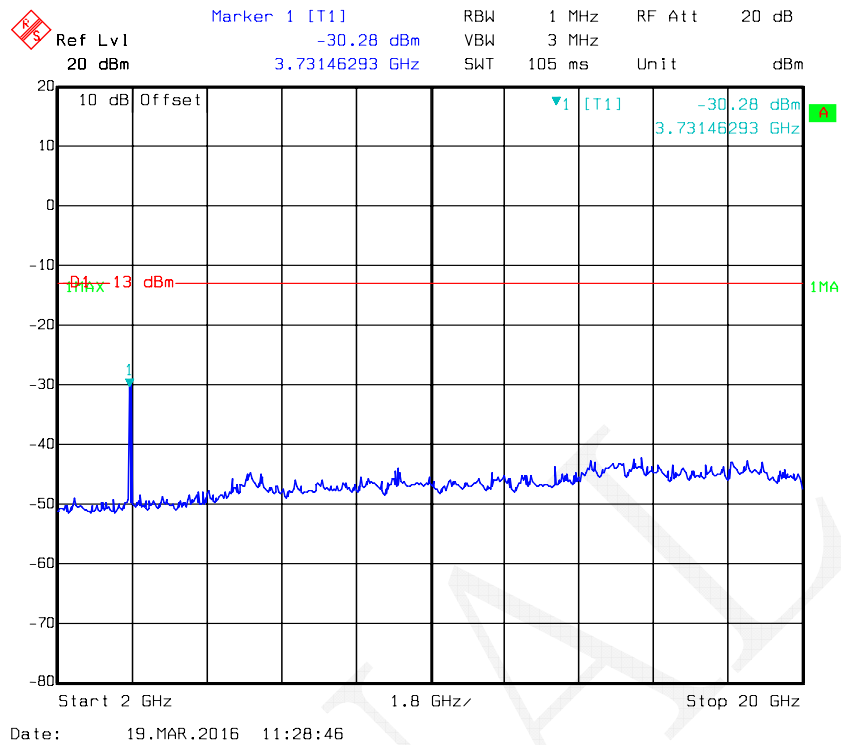
HSDPA Band II_Middle Channel



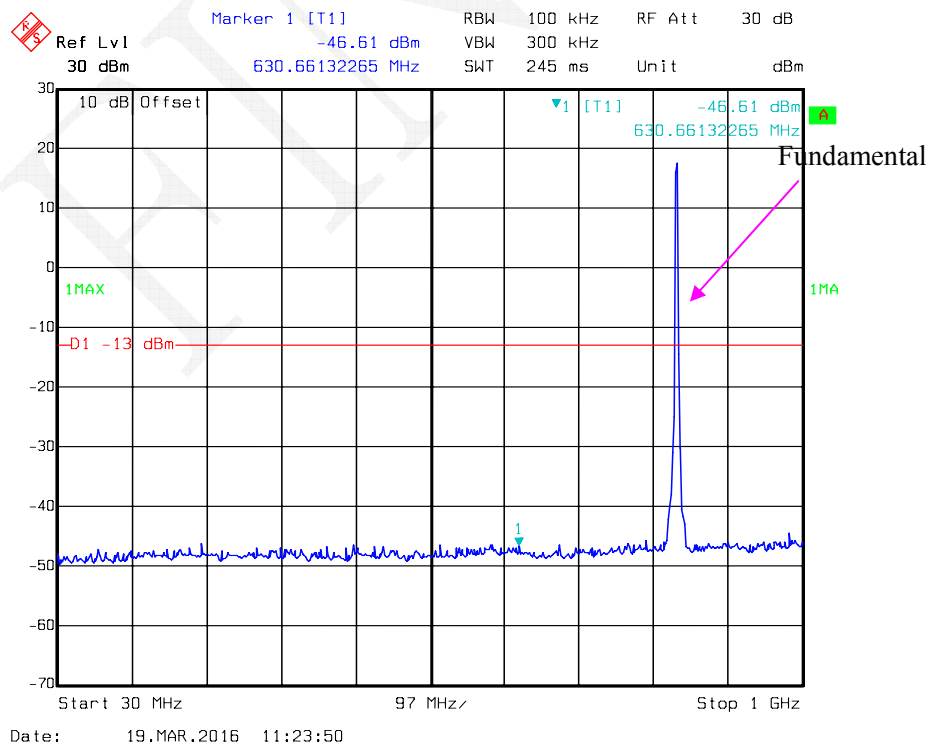


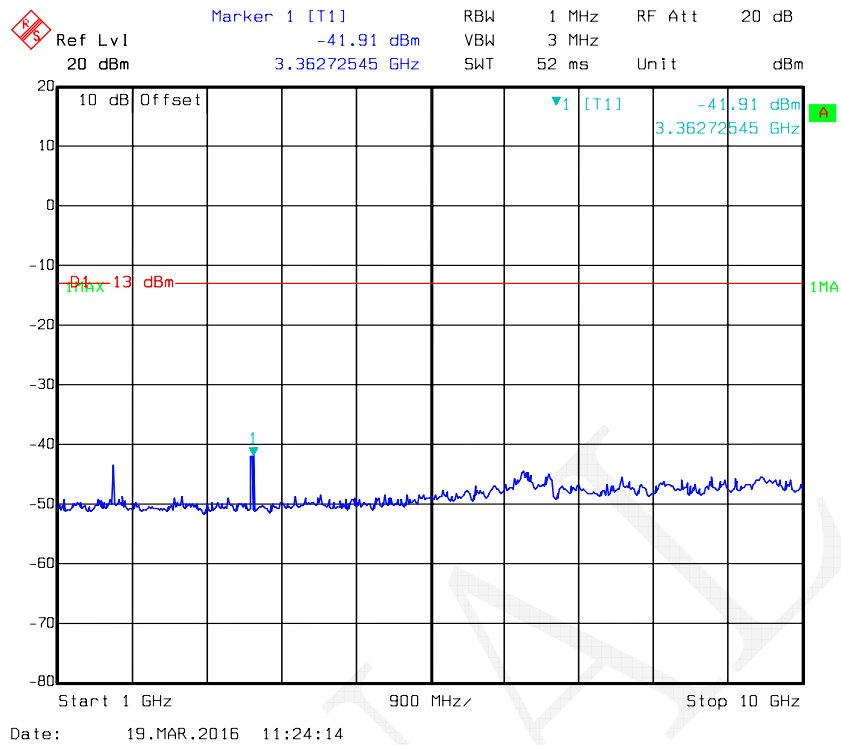
HSUPA Band II_ Middle Channel



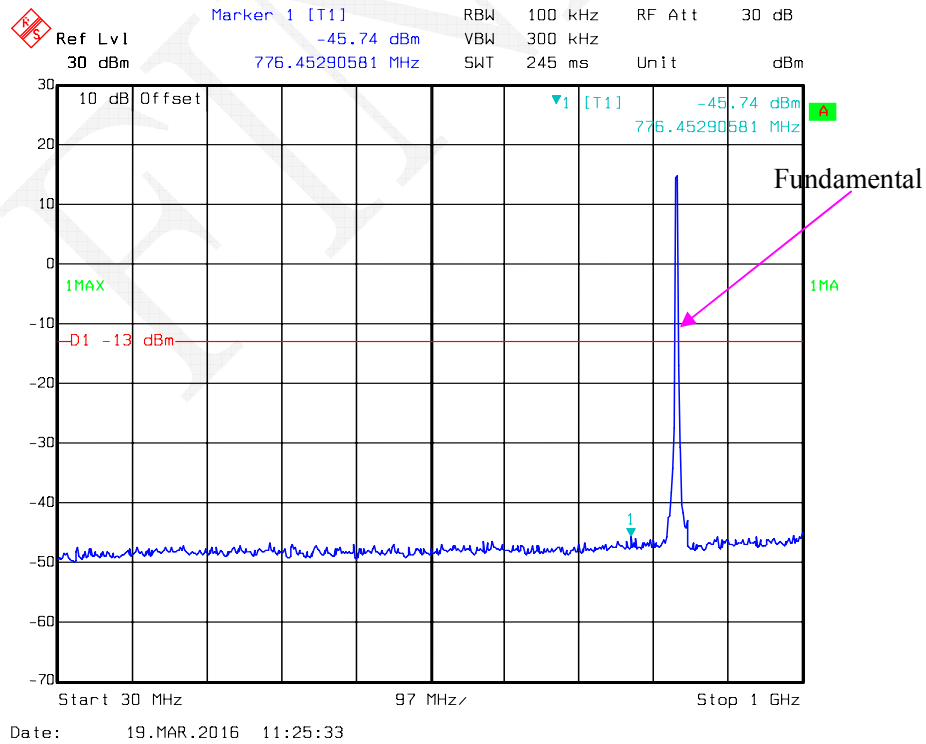


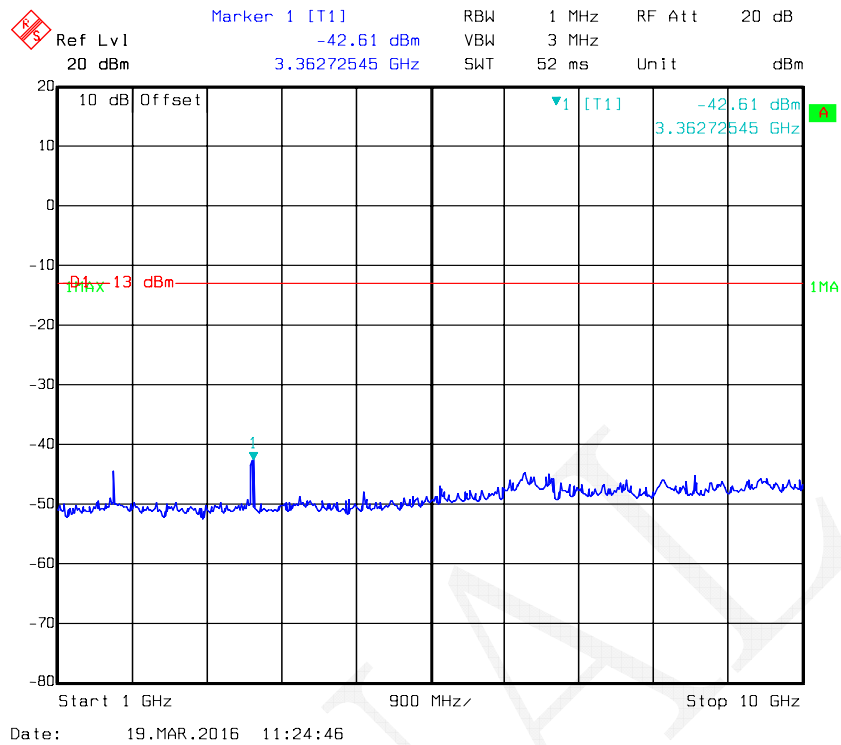
REL99 Band V_ Middle Channel



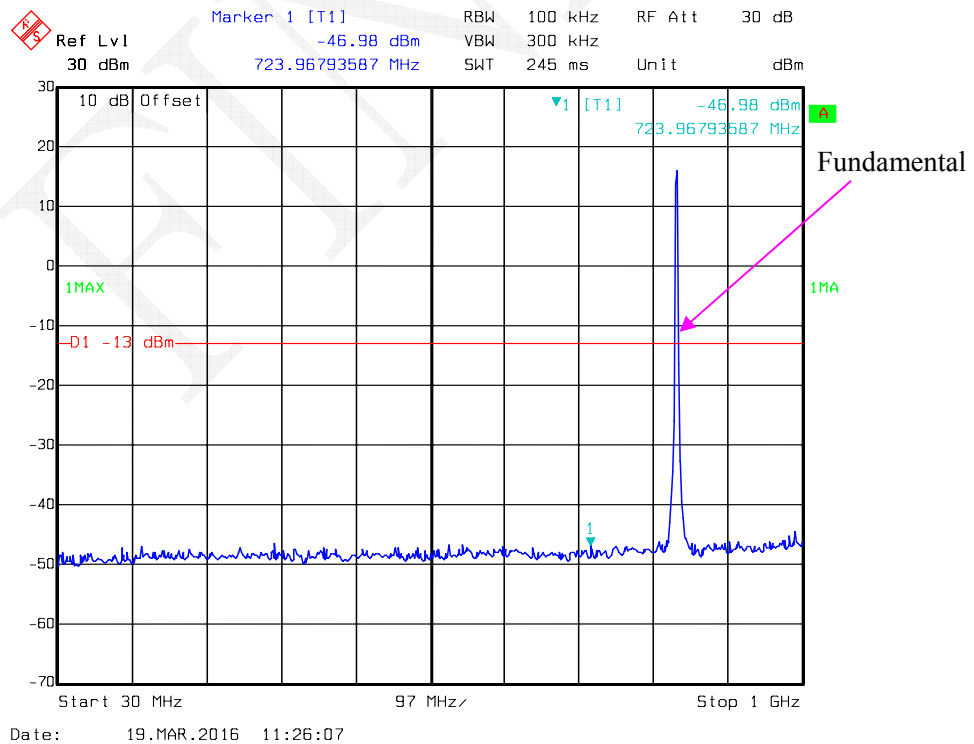


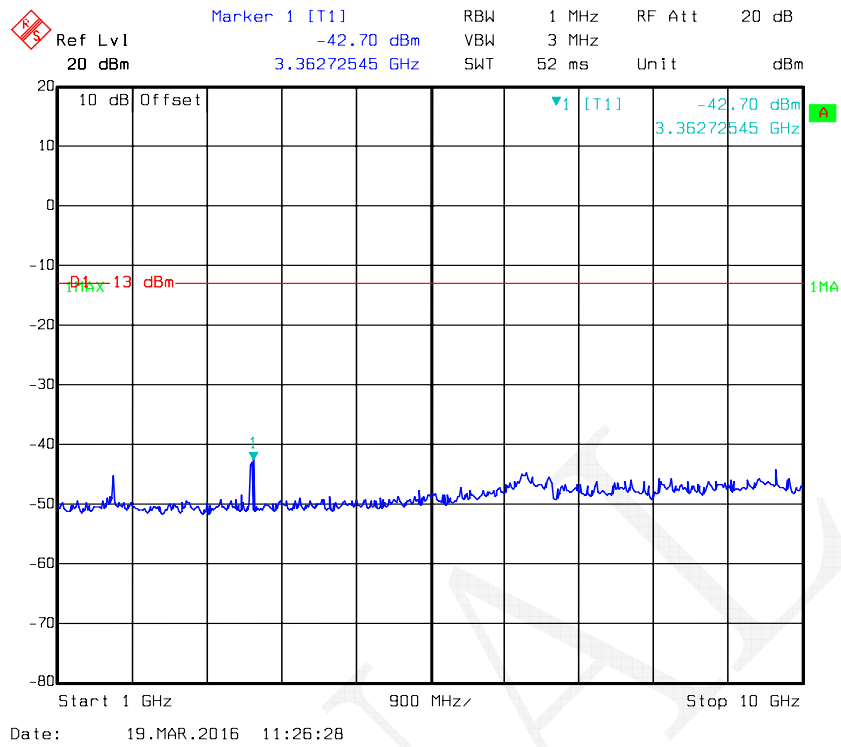
HSDPA Band V_Middle Channel





HSUPA 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 = $43 + 10 \log_{10}(\text{power out in Watts})$

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	100224	2015-08-03	2016-08-02
Sunol Sciences	Antenna	JB3	A060611-3	2014-11-06	2017-11-05
HP	Amplifier	8447E	2434A02181	2015-09-01	2016-09-01
Agilent	Spectrum Analyzer	E4440A	SG43360054	2015-11-23	2016-11-22
ETS-Lindgren	Horn Antenna	3115	9808-5557	2015-09-06	2018-09-06
Mini-Circuit	Amplifier	ZVA-213-S+	054201245	2016-02-19	2017-02-19
Giga	Signal Generator	1026	320408	2015-05-09	2016-05-09
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	2015-05-06	2016-05-06
N/A	Coaxial Cable	8m	N/A	2015-05-06	2016-05-06
N/A	Coaxial Cable	2m	N/A	2015-05-06	2016-05-06
Mini Circuit	High Pass Filter	VHF-3100+	31251	2015-05-06	2016-05-06

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

Test Data**Environmental Conditions**

Temperature:	24.4°C
Relative Humidity:	63 %
ATM Pressure:	100.6 kPa

The testing was performed by Dean Liu on 2016-03-19.

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)			
Frequency: 836.6 MHz								
1673.200	H	52.18	-48.9	10.6	1.5	-39.8	-13.0	26.8
1673.200	V	54.59	-46.8	10.6	1.5	-37.7	-13.0	24.7
2509.800	H	35.34	-62.7	13.1	2.8	-52.4	-13.0	39.4
2509.800	V	38.23	-58.9	13.1	2.8	-48.6	-13.0	35.6
3346.400	H	42.33	-55.1	13.8	1.7	-43.0	-13.0	30.0
3346.400	V	46.40	-50.7	13.8	1.7	-38.6	-13.0	25.6
251.800	H	32.41	-75.7	0.0	0.5	-76.2	-13.0	63.2
251.800	V	32.94	-72.8	0.0	0.5	-73.3	-13.0	60.3

WCDMA Band V (PART 22H)

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)			
Frequency: 836.6 MHz								
1673.200	H	45.58	-55.5	10.6	1.5	-46.4	-13.0	33.4
1673.200	V	46.64	-54.7	10.6	1.5	-45.6	-13.0	32.6
251.800	H	32.76	-75.4	0.0	0.5	-75.9	-13.0	62.9
251.800	V	32.89	-72.9	0.0	0.5	-73.4	-13.0	60.4

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)			
Frequency: 1880 MHz								
3760.000	H	49.65	-44.6	13.8	2.9	-33.7	-13.0	20.7
3760.000	V	46.34	-46.7	13.8	2.9	-35.8	-13.0	22.8
251.800	H	32.55	-75.6	0.0	0.5	-76.1	-13.0	63.1
251.800	V	32.86	-72.9	0.0	0.5	-73.4	-13.0	60.4

WCDMA Band II (PART 24E)

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)			
Frequency: 1880 MHz								
3760.000	H	54.26	-40	13.8	2.9	-29.1	-13.0	16.1
3760.000	V	50.67	-42.4	13.8	2.9	-31.5	-13.0	18.5
251.800	H	32.23	-75.9	0.0	0.5	-76.4	-13.0	63.4
251.800	V	32.75	-73	0.0	0.5	-73.5	-13.0	60.5

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

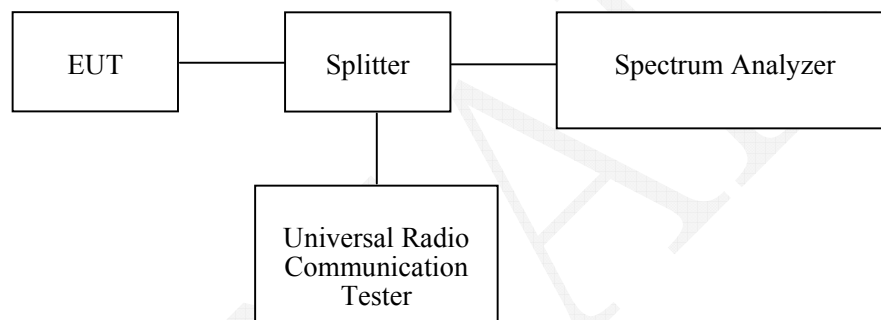
According to § 22.917(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

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	FSP 38	100478	2015-05-09	2016-05-09
R&S	Universal Radio Communication Tester	CMU200	109 038	2015-07-28	2016-07-27
N/A	Coaxial Cable	0.1m	N/A	2015-05-06	2016-05-06
E-Microwave	DC Blocking	EMDCB-00036	0E01201047	2015-05-06	2016-05-06
E-Microwave	Attenuator(10dB)	EMCA10-5RN	OE01203239	2015-05-08	2016-05-08
Pasternack	RF Coaxial Cable	RF-01	N/A	2015-05-06	2016-05-06
Pasternack	RF Coaxial Cable	RF-02	N/A	2015-05-06	2016-05-06
N/A	Two-way Splitter	ODP-1-6-2S	OE0120142	2015-05-06	2016-05-06

* **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:	24.4°C
Relative Humidity:	63 %
ATM Pressure:	100.6 kPa

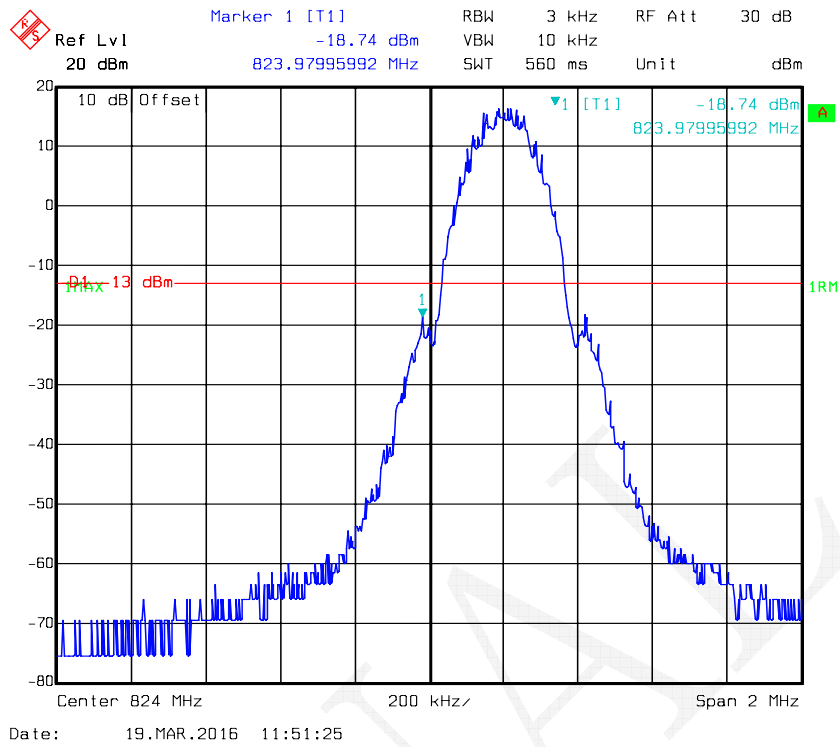
The testing was performed by Dean Liu on 2016-03-19.

Test Mode: Transmitting

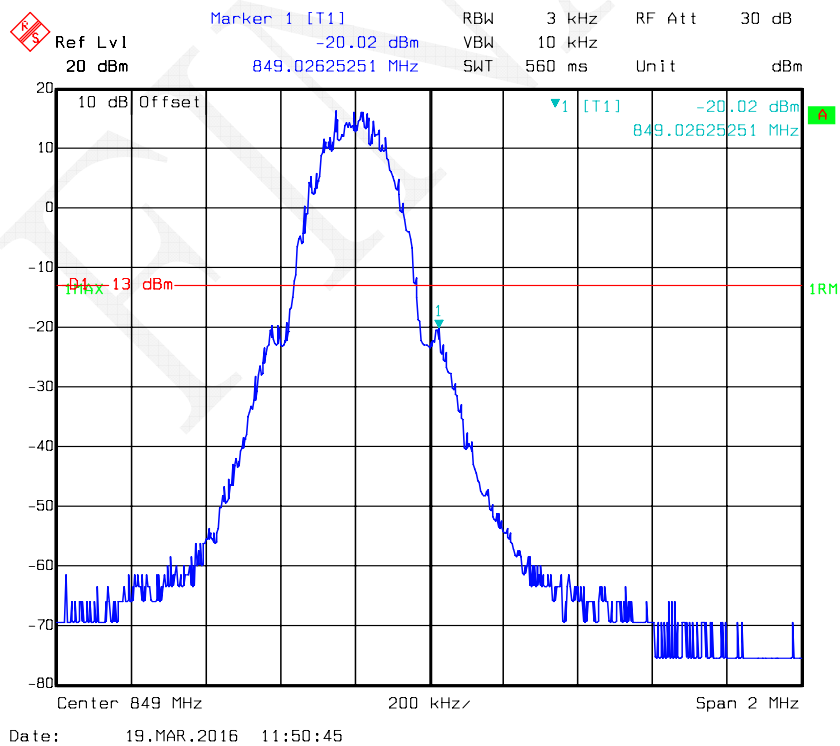
Test Result: Compliant. Please refer to the following plots.

FINAL

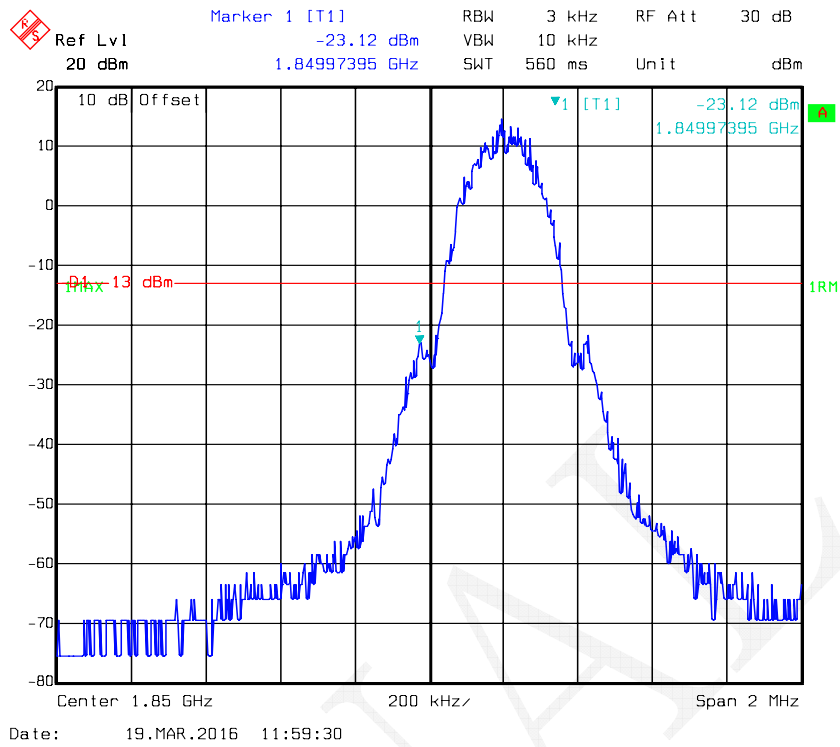
GSM 850, Left Band Edge



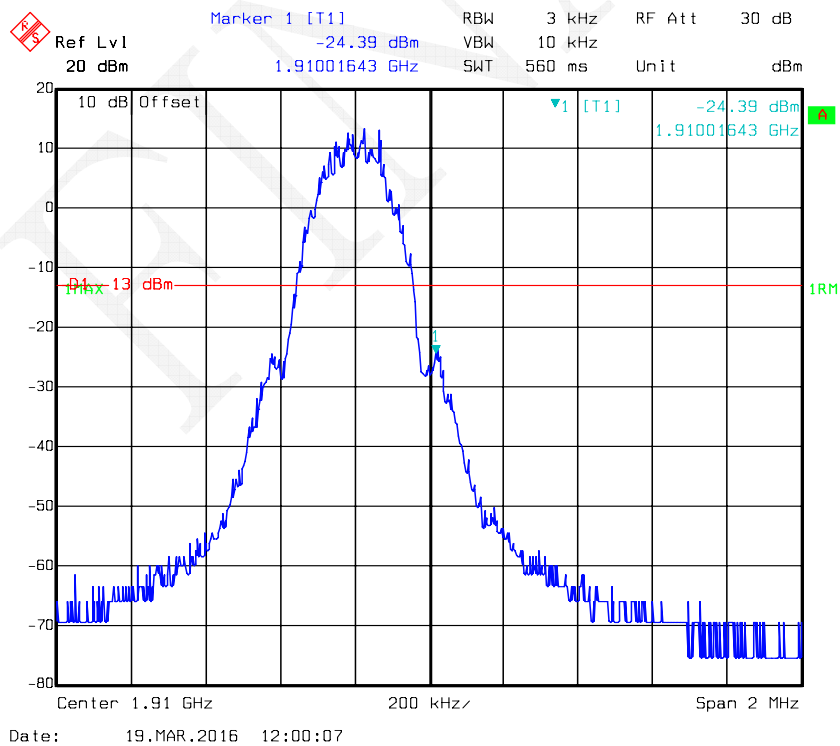
GSM 850, Right Band Edge



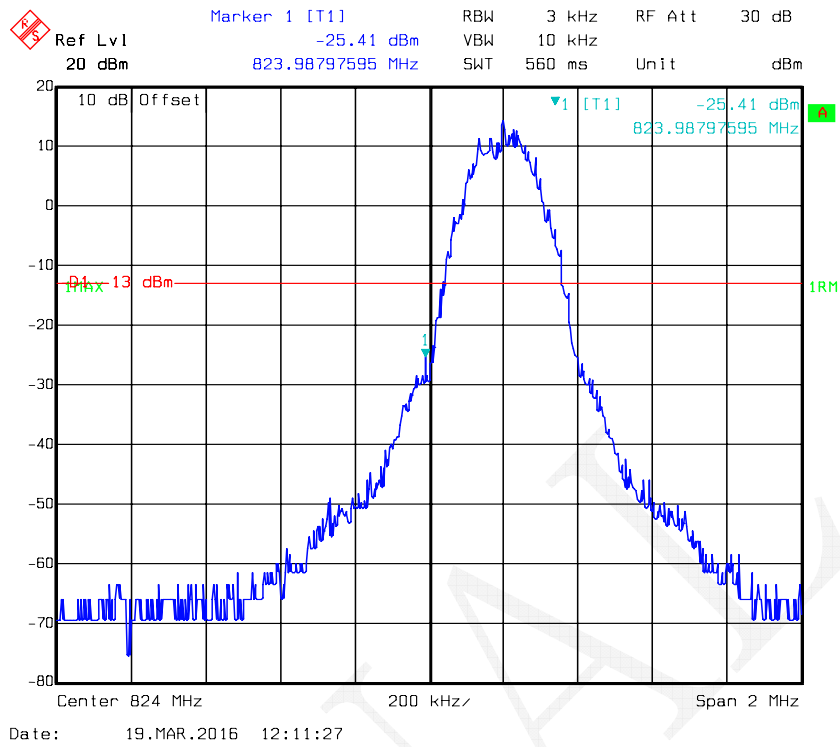
PCS 1900, Left Band Edge



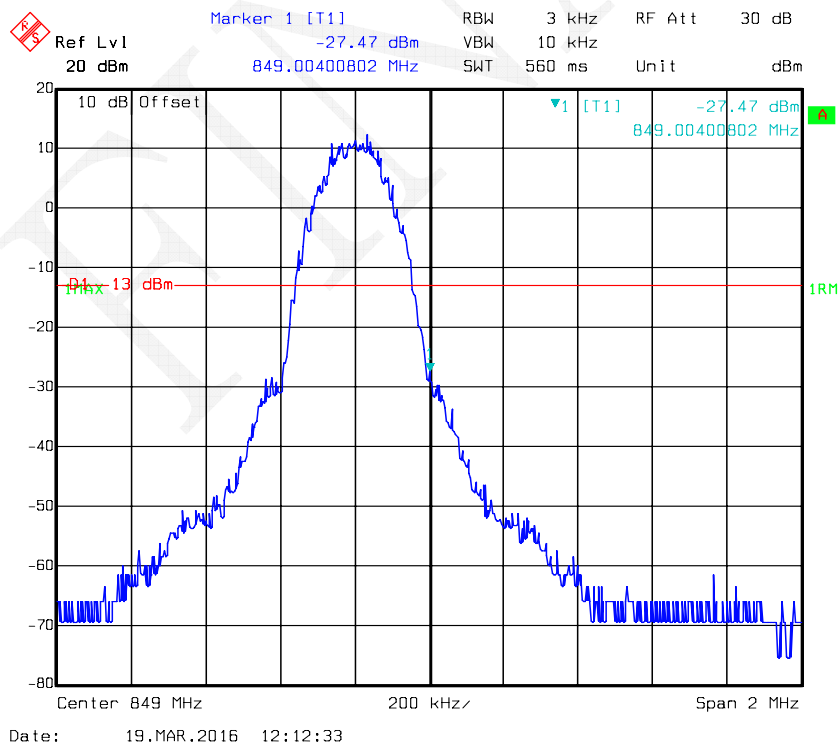
PCS 1900, Right Band Edge



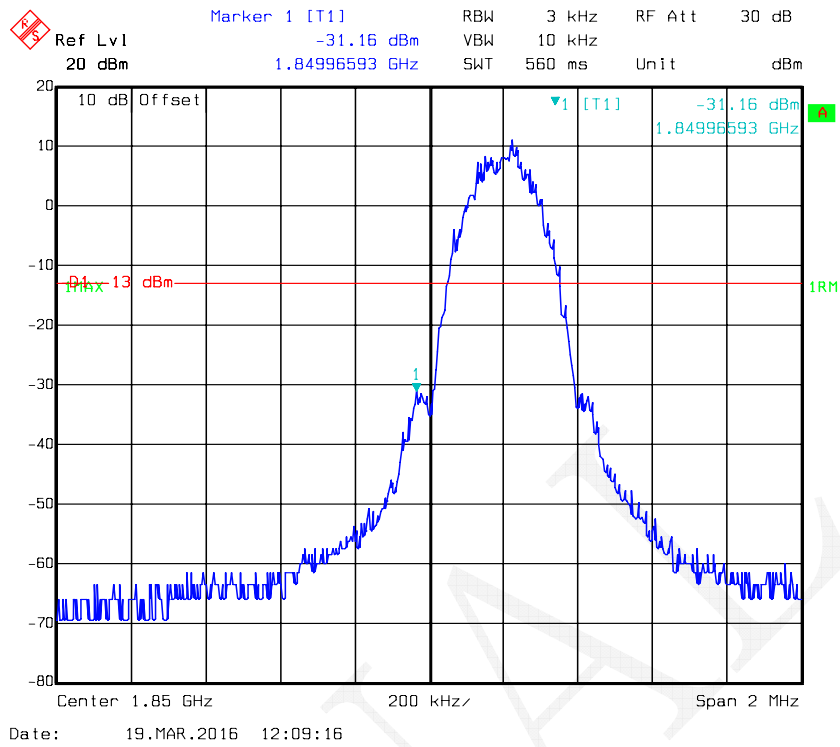
EDGE850, Left Band Edge



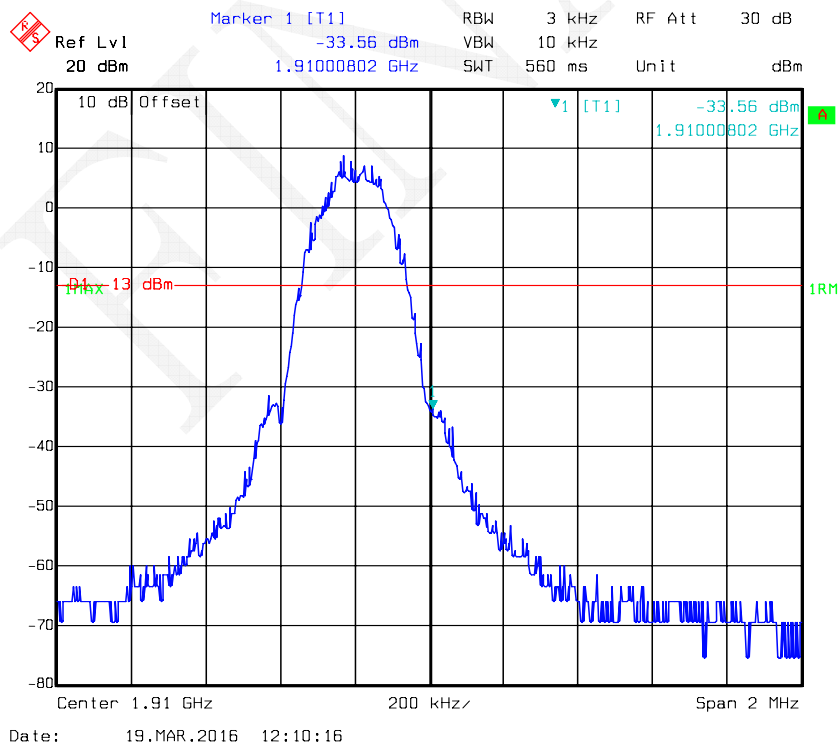
EDGE850, Right Band Edge



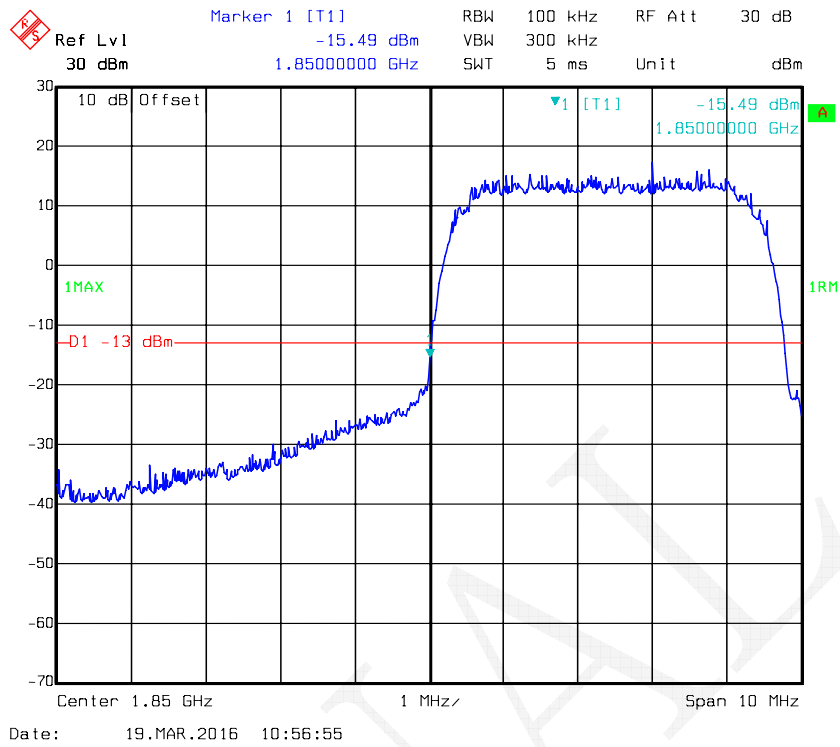
EDGE 1900, Left Band Edge



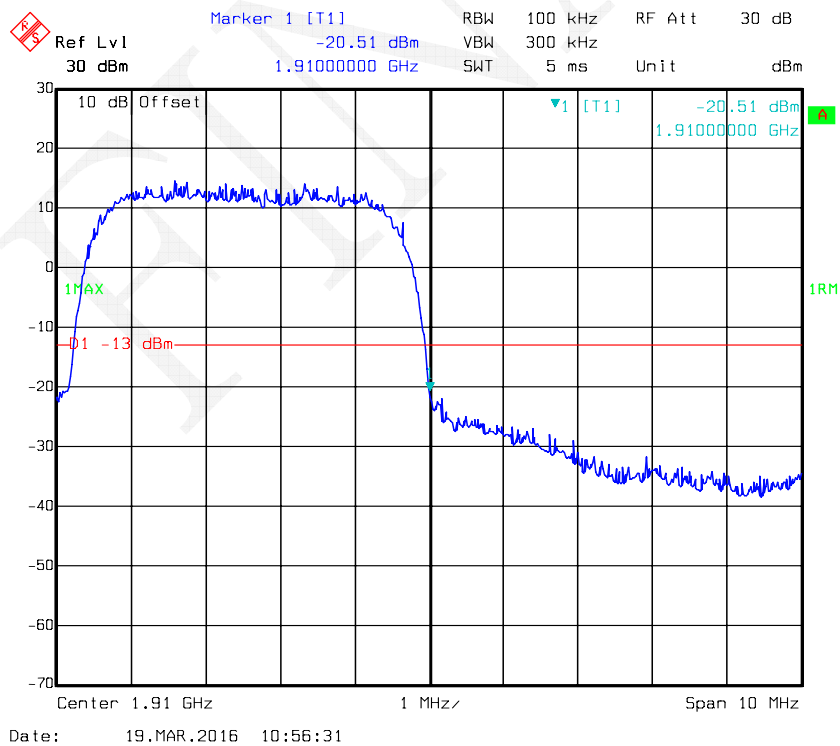
EDGE 1900, Right Band Edge



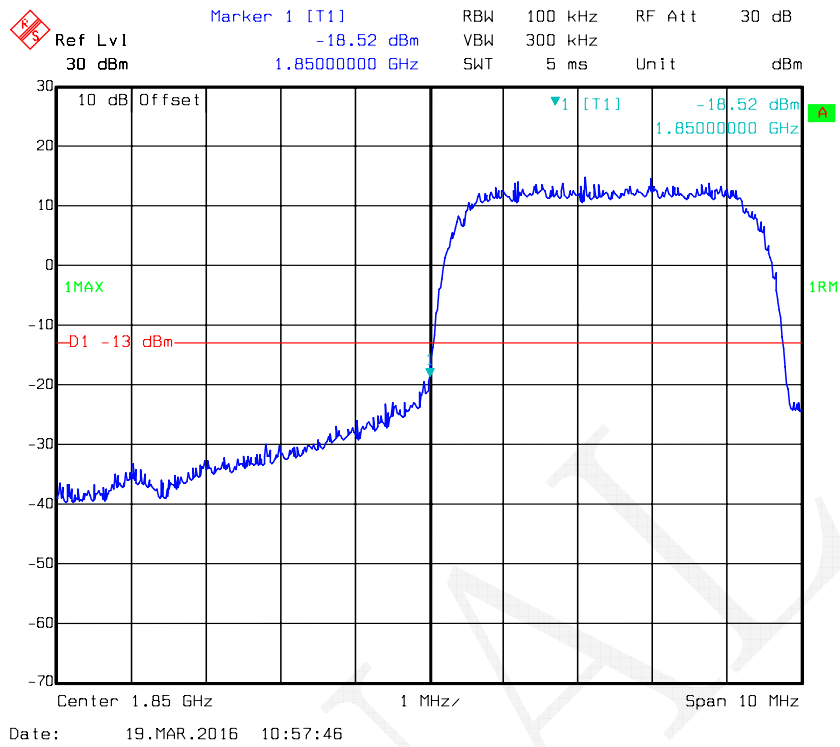
REL99 Band II, Left Band Edge



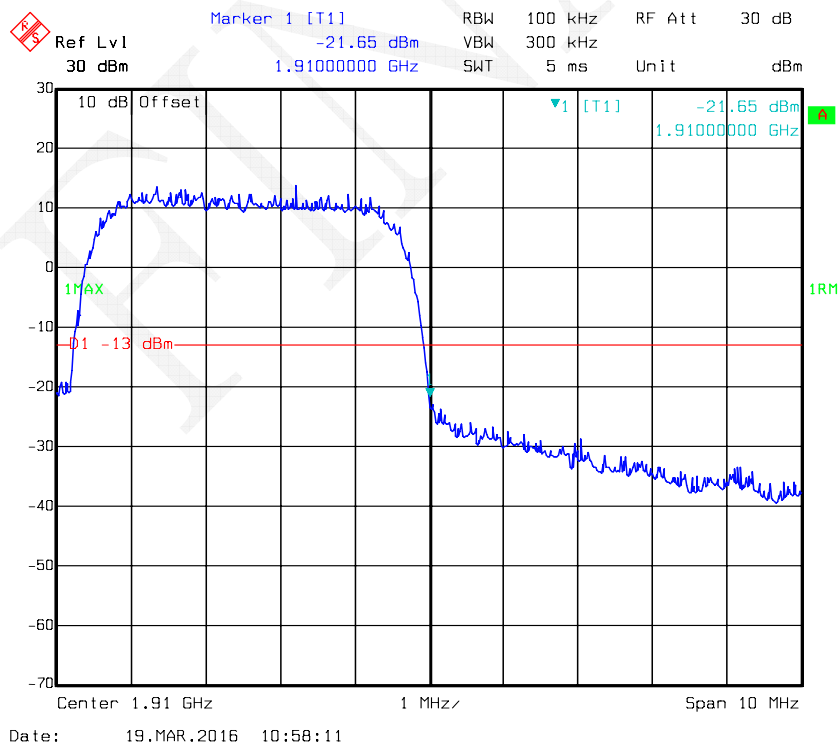
REL99 Band II Right Band Edge



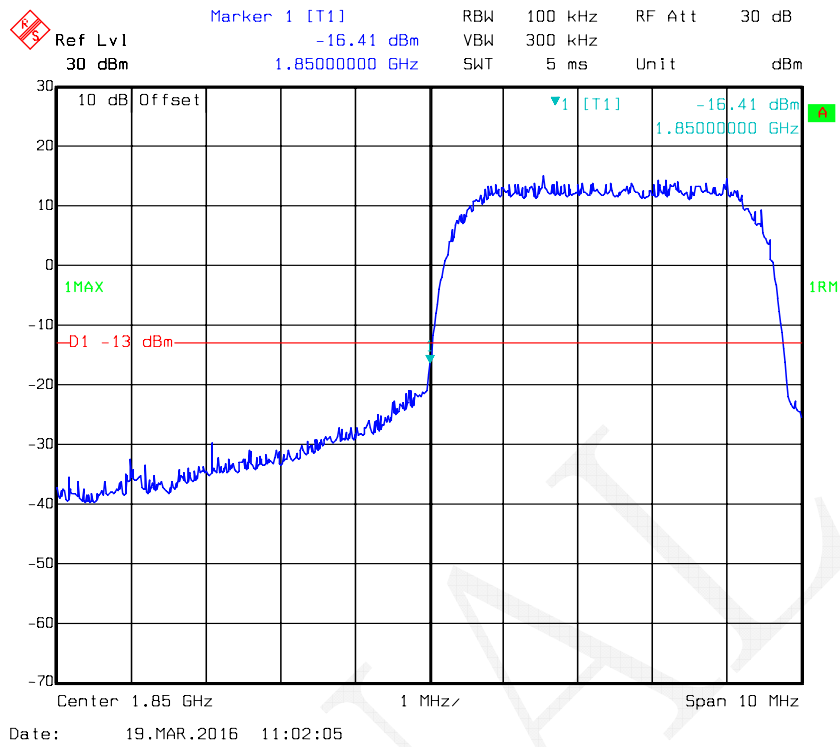
HSDPA Band II, Left Band Edge



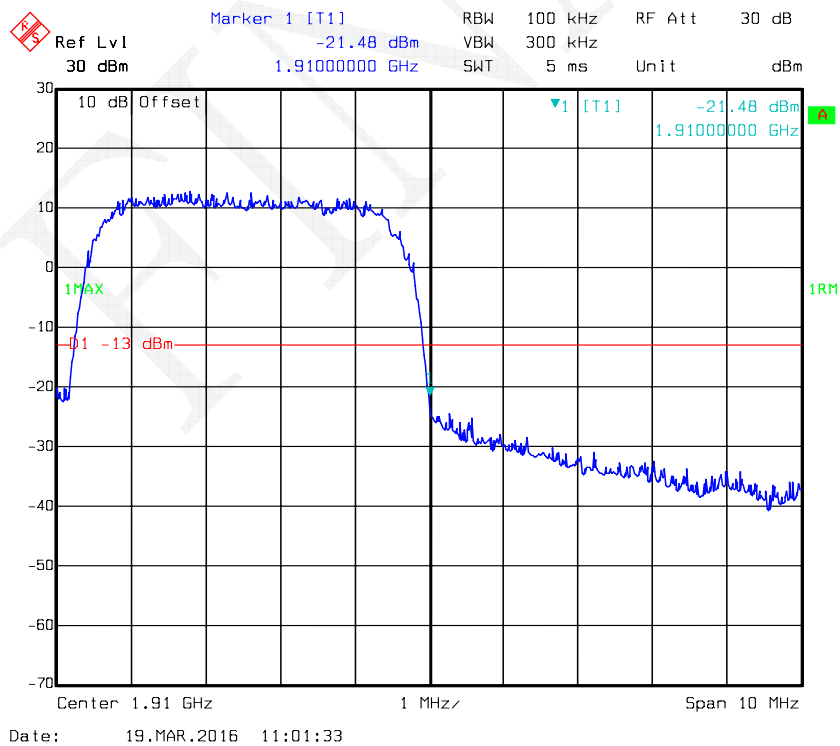
HSDPA Band II, Right Band Edge



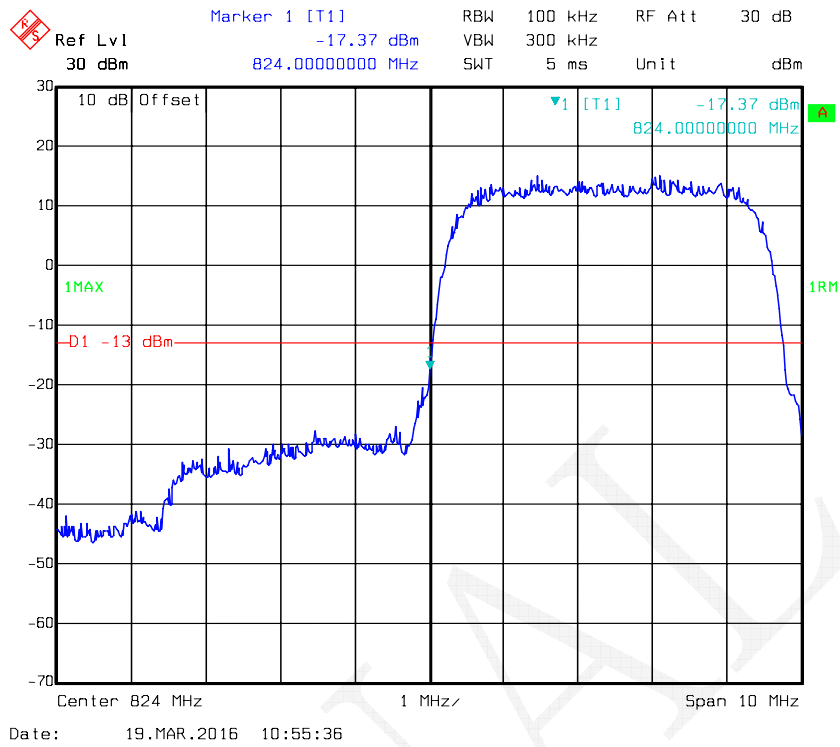
HSUPA Band II, Left Band Edge



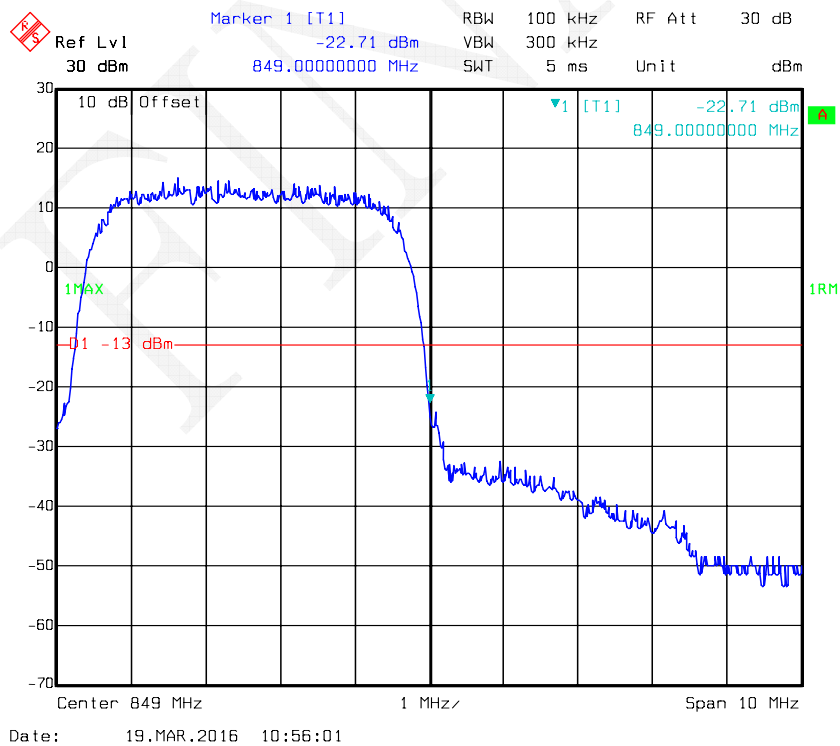
HSUPA Band II, Right Band Edge



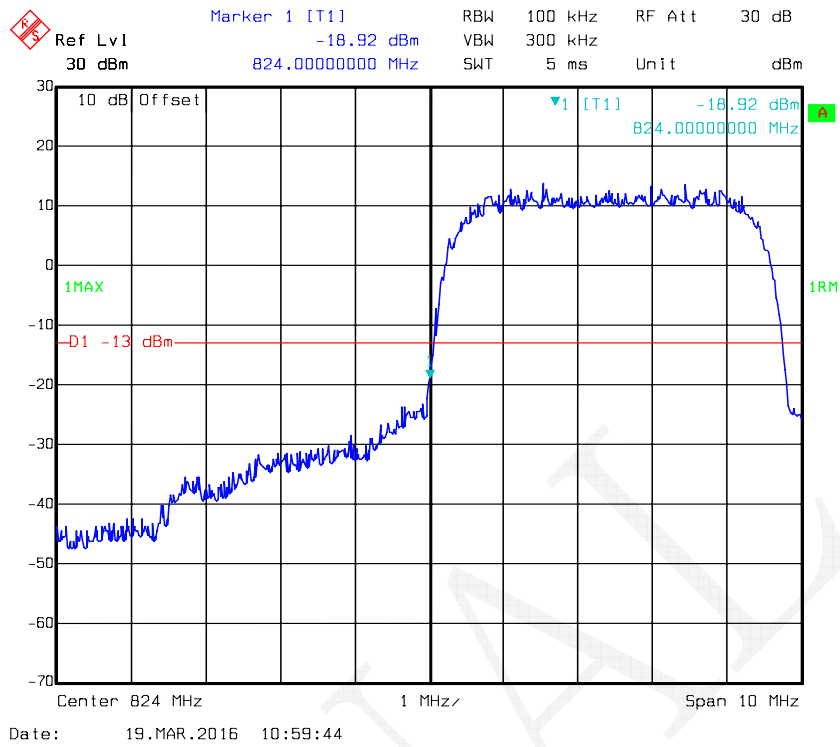
REL99 Band V, Left Band Edge



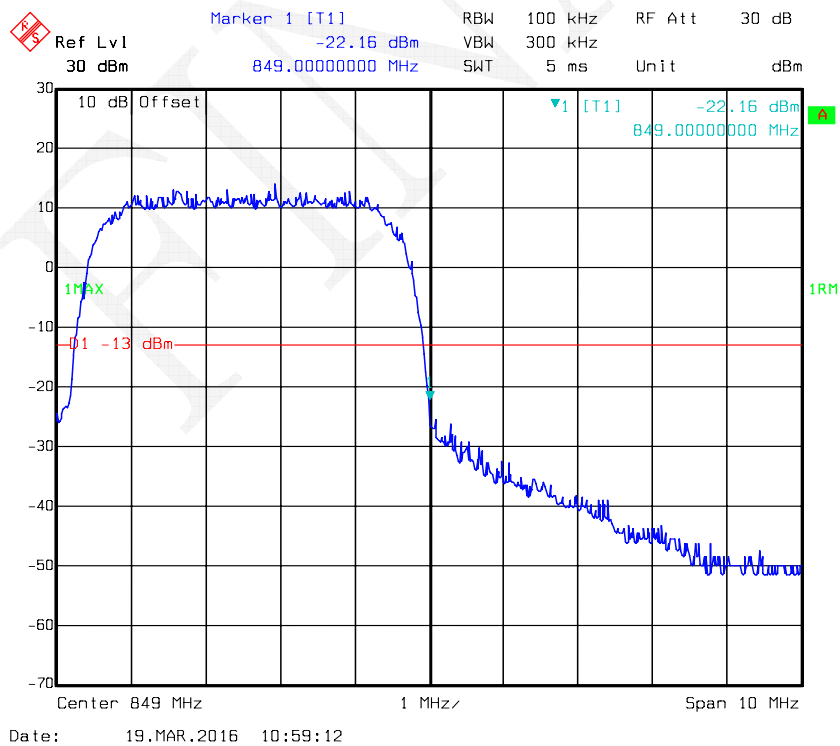
REL99 Band V Right Band Edge



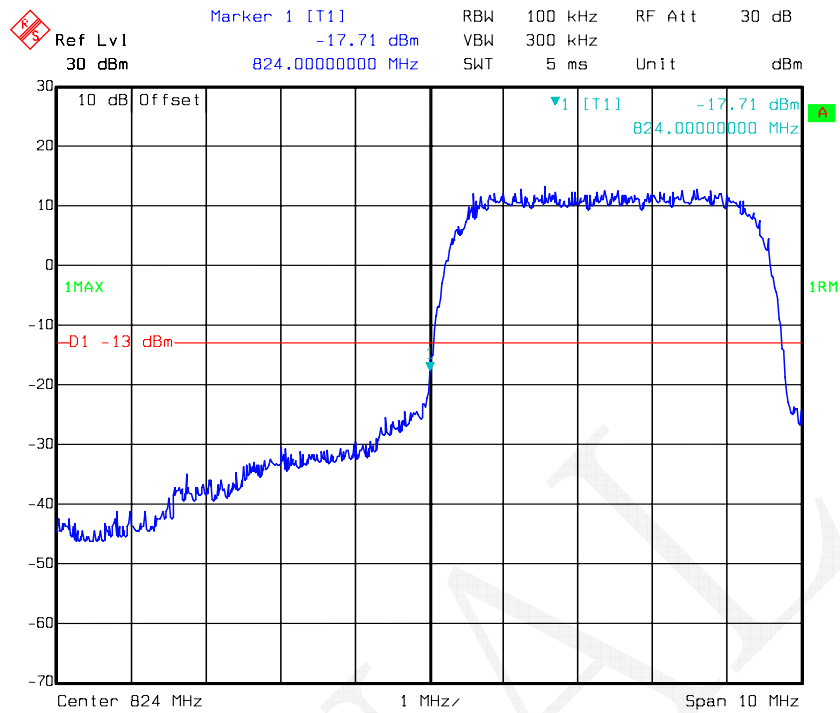
HSDPA Band V, Left Band Edge



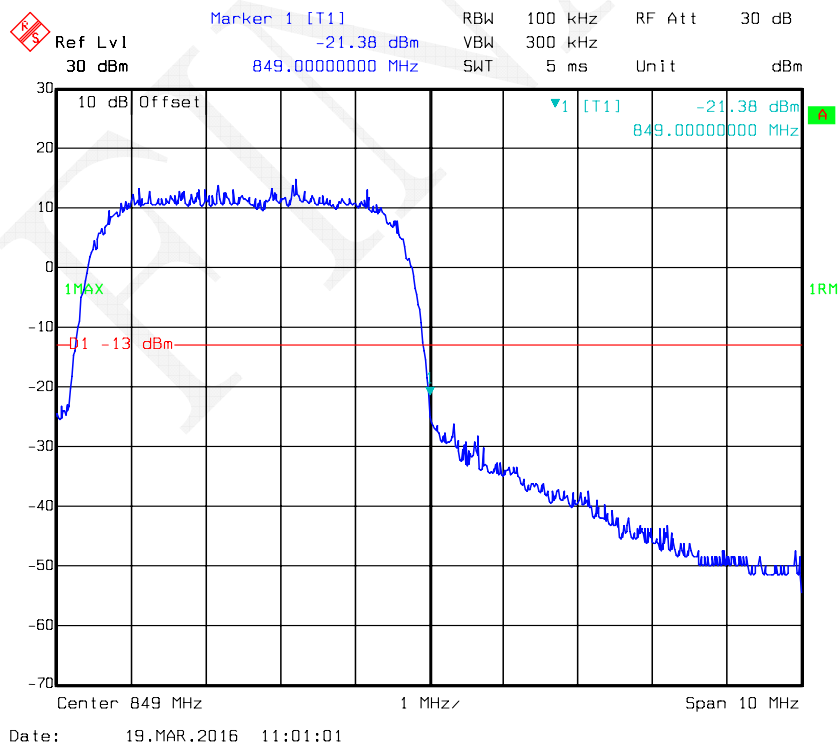
HSDPA Band V, Right Band Edge



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

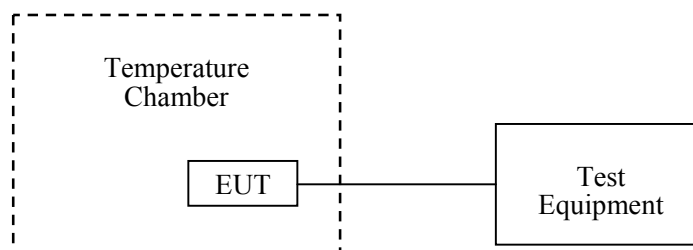
According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emissions stays within the authorized frequency block.

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
Dongzhixu	High Temperature Test Chamber	DP1000	201105083-3	2015-09-10	2016-09-09
R&S	Universal Radio Communication Tester	CMU200	109 038	2015-07-28	2016-07-27
UNI-T	Multimeter	UT39A	M130199938	2015-04-10	2016-04-10
Pasternack	RF Coaxial Cable	RF-01	/	2015-05-06	2016-05-06

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

Test Data**Environmental Conditions**

Temperature:	24.4°C
Relative Humidity:	63%
ATM Pressure:	100.6 kPa

The testing was performed by Dean Liu on 2016-03-19.

Cellular Band (Part 22H)

GMSK, Middle Channel, $f_c = 836.6$ MHz				
Temperature	Voltage	Frequency Error	Frequency Error	Limit
	V _{DC}	Hz	ppm	ppm
-30	3.7	-10	-0.012	2.5
-20		-11	-0.013	
-10		-14	-0.017	
0		-6	-0.007	
10		-12	-0.014	
20		-5	-0.006	
30		-7	-0.008	
40		-9	-0.011	
50		-3	-0.004	
25	3.5	-15	-0.018	
	4.3	-8	-0.010	

8PSK, Middle Channel, $f_c = 836.6$ MHz				
Temperature	Voltage	Frequency Error	Frequency Error	Limit
	V_{DC}	Hz	ppm	ppm
-30	3.7	3	0.000	2.5
-20		-5	0.006	
-10		-4	0.002	
0		10	-0.005	
10		8	0.004	
20		2	-0.005	
30		-3	-0.004	
40		-2	-0.006	
50		-3	0.006	
25	3.5	-4	0.010	
	4.3	3	0.012	

WCDMA Band V: Re199

Middle Channel, $f_c = 836.6$ MHz				
Temperature	Voltage	Frequency Error	Frequency Error	Limit
	V_{DC}	Hz	ppm	ppm
-30	3.7	1	0.001	2.5
-20		4	0.005	
-10		9	0.011	
0		6	0.007	
10		8	0.010	
20		-5	-0.006	
30		-4	-0.005	
40		10	0.012	
50		-5	-0.006	
25	3.5	-2	-0.002	
	4.3	-3	-0.004	

WCDMA Band V: HSDPA

Middle Channel, $f_c = 836.6$ MHz				
Temperature	Voltage	Frequency Error	Frequency Error	Limit
	V _{DC}	Hz	ppm	ppm
-30	3.7	3	0.004	2.5
-20		8	0.010	
-10		0	0.000	
0		6	0.007	
10		10	0.012	
20		3	0.004	
30		9	0.011	
40		2	0.002	
50		-3	-0.004	
25	3.5	5	0.006	
	4.3	13	0.016	

WCDMA Band V: HSUPA

Middle Channel, $f_c = 836.6$ MHz				
Temperature	Voltage	Frequency Error	Frequency Error	Limit
	V _{DC}	Hz	ppm	ppm
-30	3.7	-2	-0.002	2.5
-20		6	0.007	
-10		4	0.005	
0		10	0.012	
10		0	0.000	
20		9	0.011	
30		-1	-0.001	
40		5	0.006	
50		2	0.002	
25	3.5	-6	-0.007	
	4.3	7	0.008	

PCS Band (Part 24E)

GMSK, Middle Channel, $f_c = 1880$ MHz				
Temperature	Voltage	Frequency Error	Frequency Error	Result
	V _{DC}	Hz	ppm	
-30	3.7	-6	-0.003	Pass
-20		-1	-0.001	
-10		-8	-0.004	
0		-2	-0.001	
10		-11	-0.006	
20		-10	-0.005	
30		0	0.000	
40		-13	-0.007	
50		0	0.000	
25	3.5	-9	-0.005	
	4.3	-8	-0.004	

8PSK, Middle Channel, $f_c = 1880.0$ MHz				
Temperature	Voltage	Frequency Error	Frequency Error	Result
	V _{DC}	Hz	ppm	
-30	3.7	3	0.000	Pass
-20		4	0.003	
-10		0	0.001	
0		10	-0.002	
10		1	0.002	
20		5	-0.002	
30		-1	-0.002	
40		-4	-0.003	
50		-3	0.003	
25	3.5	10	0.004	
	4.3	0	0.005	

WCDMA Band II: Re199

Middle Channel, $f_c = 836.6$ MHz				
Temperature	Voltage	Frequency Error	Frequency Error	Limit
	V_{DC}	Hz	ppm	ppm
-30	3.7	0	0.000	2.5
-20		5	0.003	
-10		2	0.001	
0		-4	-0.002	
10		3	0.002	
20		-4	-0.002	
30		-3	-0.002	
40		-5	-0.003	
50		5	0.003	
25	3.5	8	0.004	
	4.3	10	0.005	

WCDMA Band V: HSDPA

Middle Channel, $f_c = 836.6$ MHz				
Temperature	Voltage	Frequency Error	Frequency Error	Limit
	V_{DC}	Hz	ppm	ppm
-30	3.7	2	0.001	2.5
-20		1	0.001	
-10		0	0.000	
0		-1	-0.001	
10		7	0.004	
20		9	0.005	
30		-6	-0.003	
40		1	0.001	
50		4	0.002	
25	3.5	6	0.003	
	4.3	-3	-0.002	

WCDMA Band V: HSUPA

Middle Channel, $f_c = 836.6$ MHz				
Temperature	Voltage	Frequency Error	Frequency Error	Limit
	V_{DC}	Hz	ppm	ppm
-30	3.7	0	0.000	2.5
-20		-2	-0.001	
-10		2	0.001	
0		10	0.005	
10		1	0.001	
20		-1	-0.001	
30		15	0.008	
40		9	0.005	
50		-5	-0.003	
25	3.5	6	0.003	
	4.3	7	0.004	

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