FCC PART 27

FCC PART 22H, PART 24E

TEST REPORT

For

LiveFree Emergency Response, Inc.

3780 Woodhaven Lane, Idaho Falls, Idaho United States

FCC ID: XTX-LF200

Report Type:	**Product Type:**
Original Report	EZ button

Report Number:	RSZ160129011-00B
Report Date:	2016-11-21
Reviewed By:	Oscar Ye Engineer
Prepared By:	Bay Area Compliance Laboratories Corp. (Kunshan) Chenghu Road,Kunshan Development Zone No.248,Kunshan, Jiangsu, China Tel: +86-0512-86175000 Fax: +86-0512-88934268 www.baclcorp.com.cn

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.

TABLE OF CONTENTS

GENERAL INFORMATION 3
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) 3
OBJECTIVE 3
RELATED SUBMITTAL(S)/GRANT(S) 3
TEST METHODOLOGY 3
MEASUREMENT UNCERTAINTY 4
TEST FACILITY 4
SYSTEM TEST CONFIGURATION 5
DESCRIPTION OF TEST CONFIGURATION 5
EQUIPMENT MODIFICATIONS 5
SUPPORT EQUIPMENT LIST AND DETAILS 5
BLOCK DIAGRAM OF TEST SETUP 5
SUMMARY OF TEST RESULTS 6
TEST EQUIPMENT LIST 7
FCC §1.1307 & §2.1093 - RF EXPOSURE 8
APPLICABLE STANDARD 8
TEST RESULT 8
FCC §2.1047 - MODULATION CHARACTERISTIC 9
FCC § 2.1046, § 22.913 (A) & § 24.232 (C); §27.50 (D) - RF OUTPUT POWER 10
APPLICABLE STANDARD 10
TEST PROCEDURE 10
TEST DATA 10
FCC §2.1049, §22.917, §22.905 & §24.238 & §27.53 - OCCUPIED BANDWIDTH 18
APPLICABLE STANDARD 18
TEST PROCEDURE 18
TEST DATA 18
FCC §2.1051, §22.917(A) & §24.238(A) ; §27.53 (H) (M) - SPURIOUS EMISSIONS AT ANTENNA TERMINALS 27
APPLICABLE STANDARD 27
TEST PROCEDURE 27
TEST DATA 27
FCC § 2.1053; § 22.917 (A);§ 24.238 (A); §27.53 (H)(M) SPURIOUS RADIATED EMISSIONS 35
APPLICABLE STANDARD 35
TEST PROCEDURE 35
TEST DATA 35
FCC § 22.917 (A);§ 24.238 (A); §27.53 (H)(M) - BAND EDGES 38
APPLICABLE STANDARD 38
TEST PROCEDURE 38
TEST DATA 38
FCC § 2.1055; § 22.355; § 24.235; §27.54; - FREQUENCY STABILITY 52
APPLICABLE STANDARD 52
TEST PROCEDURE 52
TEST DATA 53

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *LiveFree Emergency Response, Inc.'s* product, model number: *LF200 (ID: XTX-LF200) in* this report is a *EZ button*, which was measured approximately: 6.8 cm (L) * 4.1 cm (W) *1.7 cm (H), rated with input voltage: DC 3.7V from battery.

** All measurement and test data in this report was gathered from production sample serial number: 1601331 (Assigned by BACL, Kunshan). The EUT supplied by the applicant was received on 2016-01-29.*

Objective

This test report is prepared on behalf of *LiveFree Emergency Response, Inc.* in accordance with Part 2-Subpart J, Part 22-Subpart H and Part 24-Subpart E of the Federal Communication Commissions rules.

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

Related Submittal(s)/Grant(s)

No Related Submittals.

Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2-Subpart J as well as the following parts:

Part 22 Subpart H - Public Mobile Services
Part 24 Subpart E - Personal Communication Services
Part 27 – Miscellaneous wireless communications services

Applicable Standards: TIA/EIA 603-D, ANSI C63.4-2014.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Kunshan). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Item		Uncertainty
AC Power Lines Conducted Emissions		±3.26 dB
RF conducted test with spectrum		±0.9dB
RF Output Power with Power meter		±0.5dB
Radiated emission	30MHz~1GHz	±5.91dB
	Above 1G	±4.92dB
Occupied Bandwidth		±0.5kHz
Temperature		±1.0℃
Humidity		±6%

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the Chenghu Lake Road, Kunshan Development Zone No.248,Kunshan, Jiangsu, China

Test site at Bay Area Compliance Laboratories Corp. (Kunshan) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on November 06, 2014. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 815570. 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

Description of Test Configuration

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

The final qualification test was performed with the EUT operating at normal mode.

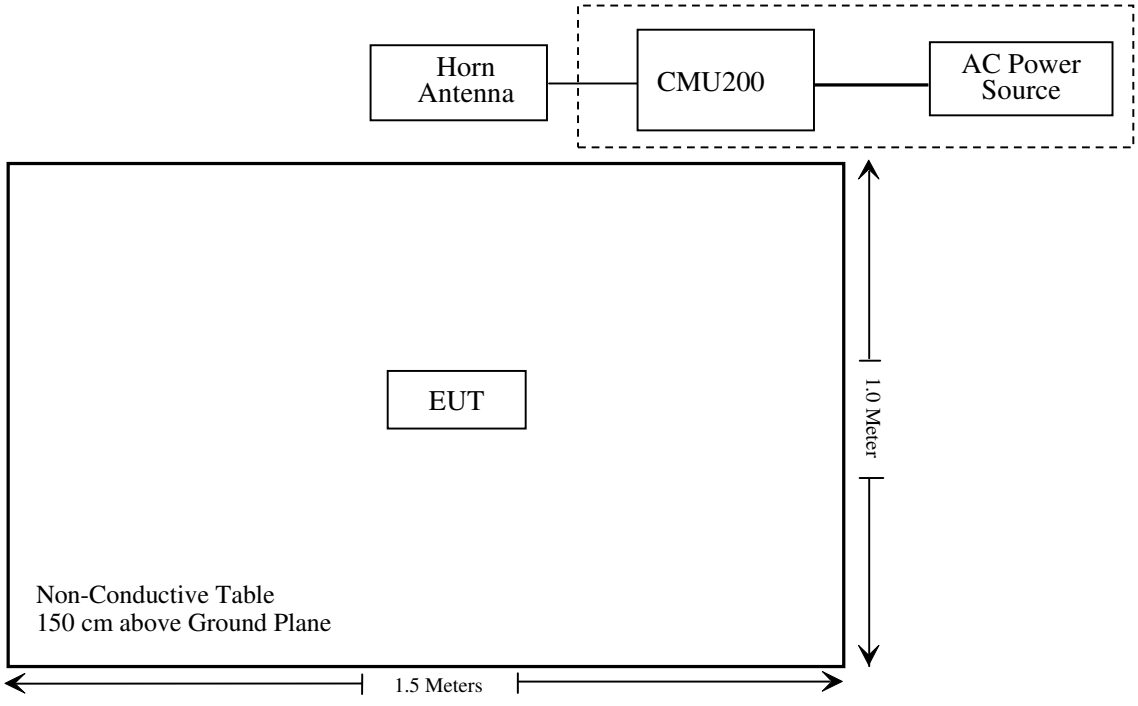
Equipment Modifications

No modification was made to the EUT.

Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	110605

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1307, §2.1093	RF Exposure (SAR)	Compliance*
§2.1046; § 22.913 (a); § 24.232 (c); §27.50 (c) (d) (h)	RF Output Power	Compliance
§ 2.1047	Modulation Characteristics	Not Applicable
§ 2.1049; § 22.905; § 22.917; § 24.238; §27.53	Occupied Bandwidth	Compliance
§ 2.1051; § 22.917 (a); § 24.238 (a); §27.53 (h)(m)	Spurious Emissions at Antenna Terminal	Compliance
§ 2.1053; § 22.917 (a); § 24.238 (a); §27.53 (h)(m)	Field Strength of Spurious Radiation	Compliance
§ 22.917 (a); § 24.238 (a); §27.53 (h)(m)	Band Edge	Compliance
§ 2.1055; § 22.355; § 24.235; §27.54;	Frequency stability	Compliance

Note: * Please refer to SAR report released by BACL, report number: RSZ160129011-20.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test					
Sonoma Instrunent	Amplifier	330	171377	2016-09-16	2017-09-16
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2016-11-25	2017-11-25
Sunol Sciences	Broadband Antenna	JB3	A090314-2	2016-11-07	2017-11-06
Sunol Sciences	Broadband Antenna	JB3	A090314-1	2016-11-07	2017-11-06
Mini	Pre-amplifier	ZVA-183-S+	857001418	2016-09-16	2017-09-16
EMCO	Horn Antenna	3116	9510-2384	2016-11-07	2017-11-06
Rohde & Schwarz	Signal Analyzer	FSIQ26	100048	2016-11-25	2017-11-25
ETS	Horn Antenna	3115	6229	2016-11-07	2017-11-06
ETS	Horn Antenna	3115	9311-4159	2016-11-07	2017-11-06
R&S	Auto test Software	EMC32	V 09.10.0	NCR	NCR
BACL	RF cable	KS-LAB-012	KS-LAB-012	2015-06-16	2016-12-15
BACL	RF cable	KS-LAB-010	KS-LAB-010	2015-12-16	2016-12-15
HP	Signal Generator	83172A	3339A00199	2016-11-11	2017-11-10
RF Conducted test					
BACL	TS 8997 Cable-01	T-KS-EMC086	T-KS-EMC086	2015-12-10	2016-12-09
BACL	RF cable	KS-LAB-012	KS-LAB-012	2015-12-16	2016-12-15
WEINSCHEL	3dB Attenuator	5326	N/A	2016-06-18	2017-06-18
Rohde & Schwarz	OSP120 BASE UNIT	OSP120	101247	2016-07-04	2017-07-03
Rohde & Schwarz	Signal Analyzer	FSIQ26	836131	2016-09-21	2017-09-21
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	110605	2015-11-25	2016-11-25
HONOVA	Power Splitter	ZFRSC-14-S+	019411452	2016-06-12	2017-06-12
WEINSCHEL	10dB Attenuator	5328	N/A	2016-06-18	2017-06-18

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

FCC §1.1307 & §2.1093 - RF EXPOSURE

Applicable Standard

FCC§1.1310 and §2.1093.

Test Result

Compliance, please refer to the SAR report: RSZ160129011-20.

FCC §2.1047 - MODULATION CHARACTERISTIC

According to FCC § 2.1047(d), Part 22H & 24E &27there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

FCC § 2.1046, § 22.913 (a) & § 24.232 (c); §27.50 (d) - 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.

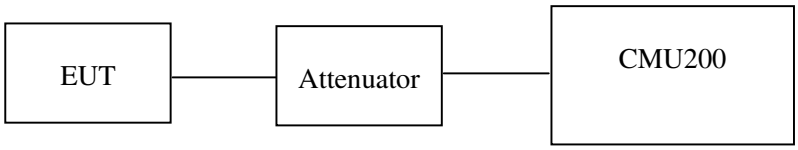
According to FCC §2.1046 and §24.232 (C), mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

According to §27.50(d), the maximum EIRP must not exceed 1Watts (30dBm) for 1710-1755MHz.
The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB.

Test Procedure

Conducted method:

The RF output of the transmitter was connected to the CMU200 through sufficient attenuation.



Radiated method:

TIA 603-D section 2.2.17

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Chris Wang on 2016-11-16.

Conducted Power

Cellular Band (Part 22H)

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)	Limit (dBm)
GSM	128	824.2	31.49	38.45
	190	836.6	31.56	38.45
	251	848.8	31.56	38.45

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)				Limit (dBm)
			1 slot	2 slots	3 slots	4 slots	
GPRS	128	824.2	31.50	30.38	28.60	27.72	38.45
	190	836.6	31.58	30.51	28.65	27.83	38.45
	251	848.8	31.58	30.55	28.72	27.86	38.45

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)				Limit (dBm)
			1 slot	2 slots	3 slots	4 slots	
EGPRS	128	824.2	27.60	26.41	26.19	24.82	38.45
	190	836.6	27.48	26.26	26.02	24.68	38.45
	251	848.8	27.34	26.12	25.88	24.51	38.45

Mode	Test Condition	Test Mode	3GPP Sub Test	Average Output Power (dBm)		
				Low Frequency	Middle Frequency	High Frequency
WCDMA (Band V)	Normal	RMC12.2k		22.70	22.75	22.23
		Rel 6 HSDPA	1	21.14	21.28	20.67
			2	21.02	21.22	20.63
			3	21.20	21.40	20.80
			4	21.05	21.18	20.56
		Rel 6 HSUPA	1	21.45	21.52	21.20
			2	21.40	21.47	21.12
			3	21.52	21.57	21.30
			4	21.41	21.46	21.13
			5	21.48	21.62	21.29

PCS Band (Part 24E)

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)	Limit (dBm)
GSM	512	1850.2	29.02	33
	661	1880.0	28.96	33
	810	1909.8	29.06	33

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)				Limit (dBm)
			1 slot	2 slots	3 slots	4 slots	
GPRS	512	1850.2	29.05	27.04	25.20	24.37	33
	661	1880.0	28.99	27.02	25.15	24.36	33
	810	1909.8	29.08	27.12	25.30	24.50	33

Mode	Channel	Frequency (MHz)	Average Output Power (dBm)				Limit (dBm)
			1 slot	2 slots	3 slots	4 slots	
EGPRS	512	1850.2	26.38	25.19	24.79	23.34	33
	661	1880.0	26.05	24.72	24.36	22.85	33
	810	1909.8	25.60	24.23	23.74	22.29	33

Mode	Test Condition	Test Mode	3GPP Sub Test	Average Output Power (dBm)		
				Low Frequency	Middle Frequency	High Frequency
WCDMA (Band II)	Normal	RMC12.2k		22.36	22.26	21.88
		Rel 6 HSDPA	1	20.74	20.74	20.30
			2	20.70	20.61	20.37
			3	20.79	20.87	20.34
			4	20.66	20.68	20.38
		Rel 6 HSUPA	1	20.89	20.41	20.76
			2	20.80	20.34	20.70
			3	21.00	20.47	20.88
			4	20.80	20.37	20.63
			5	20.96	20.52	20.81

AWS Band (Part 27)

Mode	Test Condition	Test Mode	3GPP Sub Test	Average Output Power (dBm)		
				Low Frequency	Middle Frequency	High Frequency
WCDMA (Band IV)	Normal	RMC		22.04	22.79	23.08
		HSDPA	1	20.51	21.13	21.52
			2	20.46	21.02	21.43
			3	20.54	21.19	21.61
			4	20.42	21.01	21.42
		HSUPA	1	20.86	21.23	20.95
			2	20.80	21.20	20.83
			3	20.95	21.33	21.08
			4	20.81	21.18	20.91
			5	20.90	21.27	21.00

Peak-to-average ratio (PAR)

Cellular Band

Mode	Channel	PAR (dB)	Limit (dB)
GSM	Low	0.39	13
	Middle	0.22	13
	High	0.39	13

Mode	Channel	PAR (dB)	Limit (dB)
EGPRS	Low	0.56	13
	Middle	0.42	13
	High	0.58	13

Mode	Channel	PAR (dB)	Limit (dB)
RMC (BPSK)	Low	3.12	13
	Middle	3.02	13
	High	3.15	13
HSDPA (16QAM)	Low	3.14	13
	Middle	3.05	13
	High	3.17	13
HSUPA (BPSK)	Low	3.16	13
	Middle	3.06	13
	High	3.18	13

PCS Band

Mode	Channel	PAR (dB)	Limit (dB)
GSM	Low	0.39	13
	Middle	0.28	13
	High	0.37	13

Mode	Channel	PAR (dB)	Limit (dB)
EGPRS	Low	0.57	13
	Middle	0.42	13
	High	0.59	13

Mode	Channel	PAR (dB)	Limit (dB)
RMC (BPSK)	Low	3.36	13
	Middle	3.23	13
	High	3.37	13
HSDPA (16QAM)	Low	3.34	13
	Middle	3.25	13
	High	3.39	13
HSUPA (BPSK)	Low	3.38	13
	Middle	3.27	13
	High	3.31	13

AWS Band

Mode	Channel	PAR (dB)	Limit (dB)
WCDMA (BPSK)	Low	3.25	13
	Middle	3.02	13
	High	3.27	13
HSDPA (16QAM)	Low	3.28	13
	Middle	3.07	13
	High	3.24	13
HSUPA (BPSK)	Low	3.29	13
	Middle	3.04	13
	High	3.23	13

Radiated Power

GSM Mode:

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)	S.G. Level (dBm)	Cable loss (dB)	Antenna Gain (dB)			
ERP for Cellular Band (Part 22H), Middle Channel										
836.6	96.51	152	1.5	H	25.5	0.46	4.75	29.79	38.45	8.66
836.6	83.52	105	1.8	V	12.5	0.46	4.75	16.79	38.45	21.66
EIRP for PCS Band (Part 24E), Middle Channel										
1880	78.44	229	1.4	H	17.6	0.31	10.4	27.69	33	5.31
1880	69.97	260	2.2	V	5.7	0.31	10.4	15.79	33	17.21

EDGE Mode:

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)	S.G. Level (dBm)	Cable loss (dB)	Antenna Gain (dB)			
ERP, Cellular Band (Part 22H), Middle Channel										
836.6	91.52	124	1.9	H	20.5	0.46	4.75	24.79	38.45	13.66
836.6	82.24	254	1.7	V	11.2	0.46	4.75	15.49	38.45	22.96
EIRP, PCS Band (Part 24E), Middle Channel										
1880	74.24	162	1.3	H	13.4	0.31	10.4	23.49	33	9.51
1880	70.37	32	2.1	V	6.1	0.31	10.4	16.19	33	16.81

WCDMA Mode:

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)	S.G. Level (dBm)	Cable loss (dB)	Antenna Gain (dB)			
ERP for WCDMA Band V (Part 22H), Middle Channel										
836.60	87.50	145	1.7	H	16.5	0.46	4.75	20.79	38.45	17.66
836.60	81.50	212	1.8	V	10.5	0.46	4.75	14.79	38.45	23.66
EIRP for WCDMA Band II (Part 24E), Middle Channel										
1880	71.44	2	1.5	H	10.6	0.31	10.4	20.69	33	12.31
1880	69.27	75	1.2	V	5.0	0.31	10.4	15.09	33	17.91
EIRP for WCDMA Band IV (Part 27), Middle Channel										
1732.60	74.18	254	1.0	H	11.8	0.30	9.90	21.40	30	8.60
1732.60	70.84	321	2.2	V	6.0	0.30	9.90	15.60	30	14.40

Note:
All above data were tested with no amplifier.
Absolute Level = SG Level - Cable loss + Antenna Gain
Margin = Limit- Absolute Level

FCC §2.1049, §22.917, §22.905 & §24.238 & §27.53 - OCCUPIED BANDWIDTH

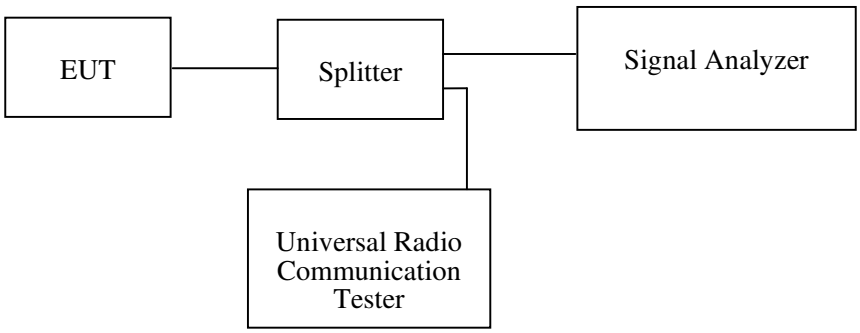
Applicable Standard

FCC 47 §2.1049, §22.917, §22.905, §24.238 and §27.53.

Test Procedure

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

The resolution bandwidth of the spectrum analyzer was set at 5 kHz (GSM) & 100 kHz (WCDMA) and the 26 dB & 99% bandwidth was recorded.



Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Chris Wang on 2016-11-17.

EUT operation mode: Transmitting

Test Result: Compliance. Please refer to the following tables and plots.

Cellular Band (Part 22H)

Mode	Frequency (MHz)	99% Occupied Bandwidth (kHz)	26 dB Emission Bandwidth (kHz)
GSM(GMSK)	836.6	244.5	316.6
EGPRS(8PSK)	836.6	268.5	332.7

Mode	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)
RMC (BPSK)	836.6	4.168	4.709
HSUPA (BPSK)	836.6	4.148	4.689
HSDPA (16QAM)	836.6	4.168	4.709

PCS Band (Part 24E)

Mode	Frequency (MHz)	99% Occupied Bandwidth (kHz)	26 dB Emission Bandwidth (kHz)
GSM(GMSK)	1880.0	248.5	312.6
EGPRS(8PSK)	1880.0	252.5	320.6

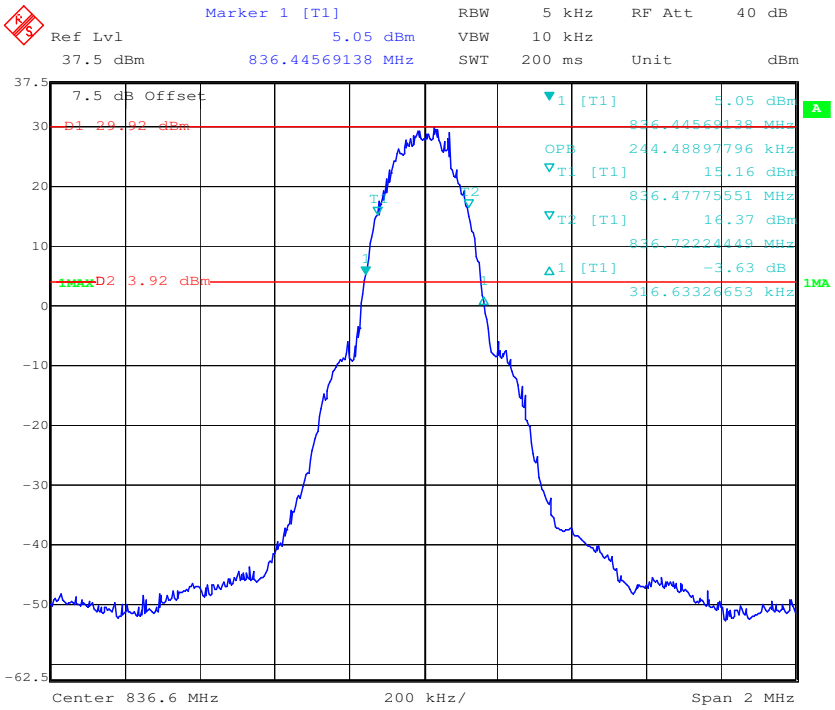
Mode	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)
RMC (BPSK)	1880.0	4.148	4.709
HSUPA (BPSK)	1880.0	4.168	4.709
HSDPA (16QAM)	1880.0	4.168	4.709

AWS Band (Part 27)

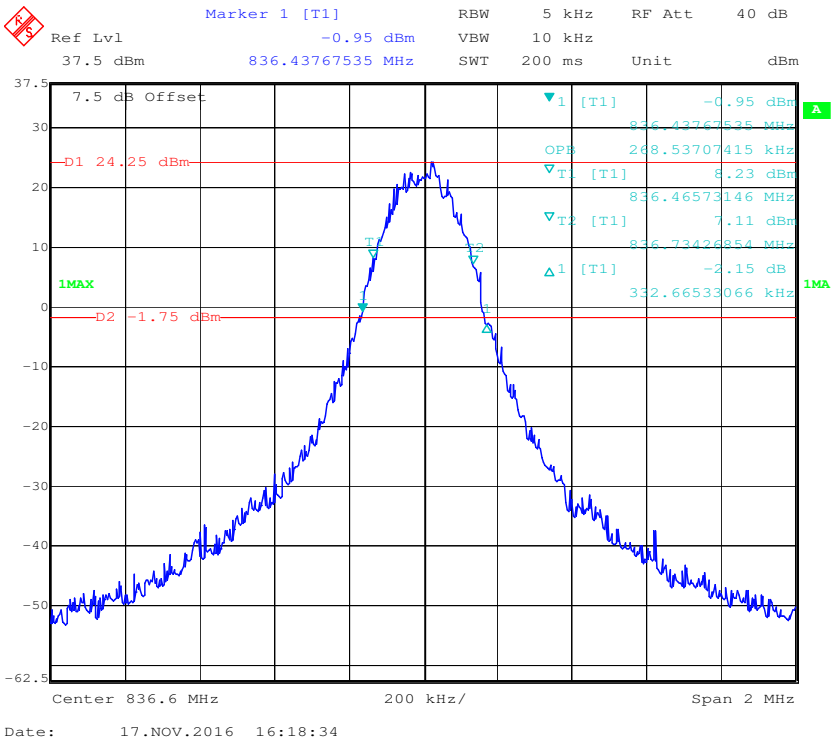
Mode	Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)
RMC (BPSK)	1732.6	4.168	4.729
HSUPA (BPSK)	1732.6	4.168	4.729
HSDPA (16QAM)	1732.6	4.168	4.729

Cellular Band (Part 22H)

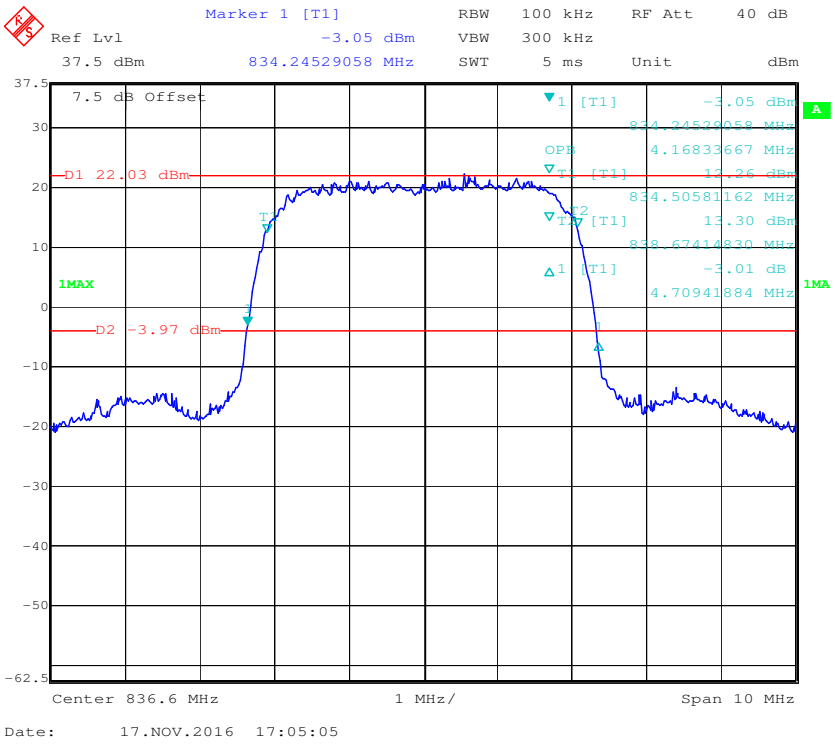
26 dB Emissions &99% Occupied Bandwidth for GSM (GMSK) Mode



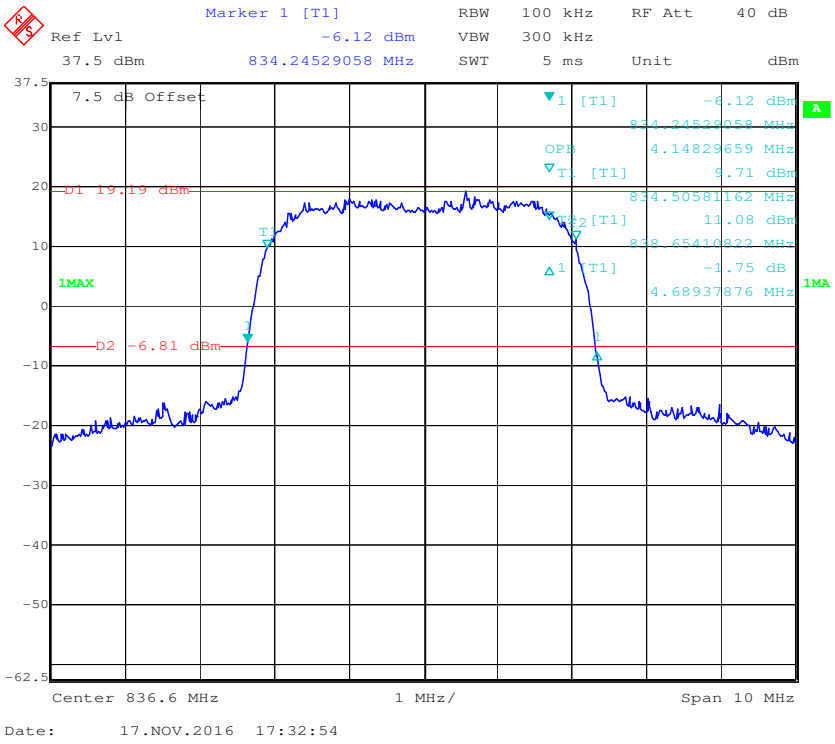
26 dB Emissions &99% Occupied Bandwidth for EDGE Mode



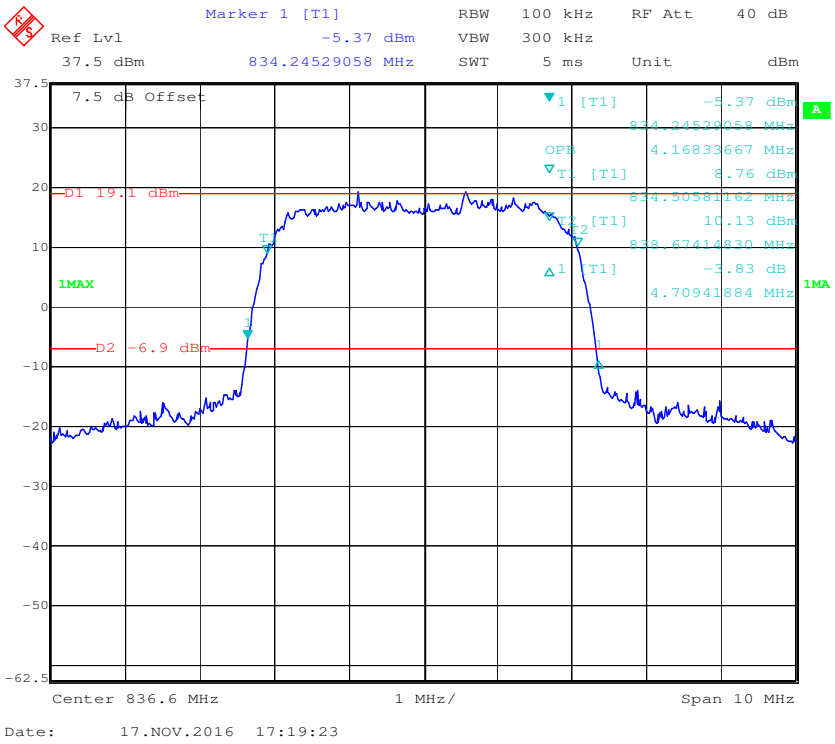
26 dB Emissions &99% Occupied Bandwidth for RMC (BPSK) Mode



26 dB Emissions &99% Occupied Bandwidth for HSUPA (BPSK) Mode

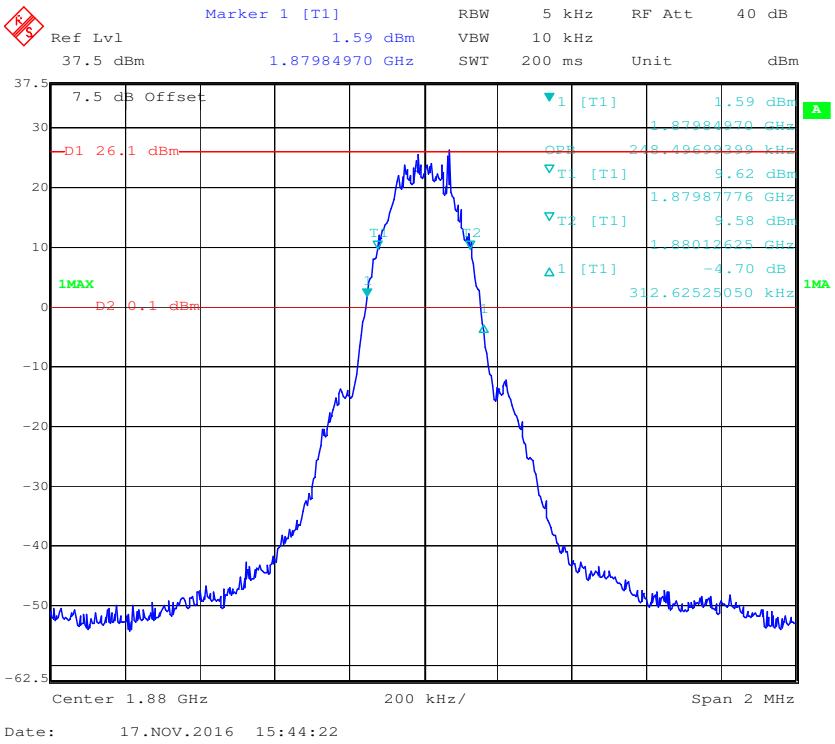


26 dB Emissions &99% Occupied Bandwidth for HSDPA (16QAM) Mode

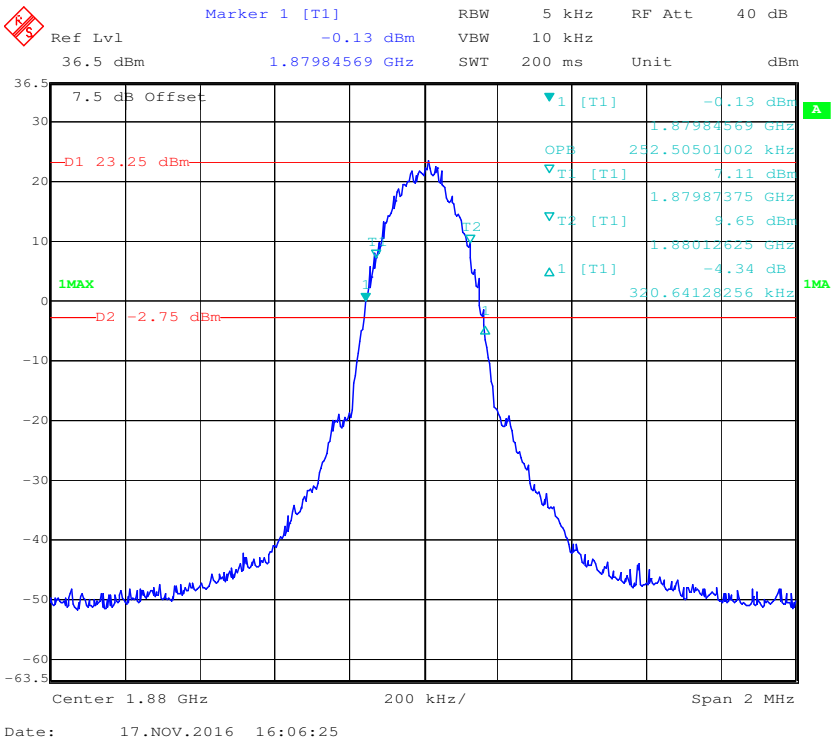


PCS Band (Part 24E)

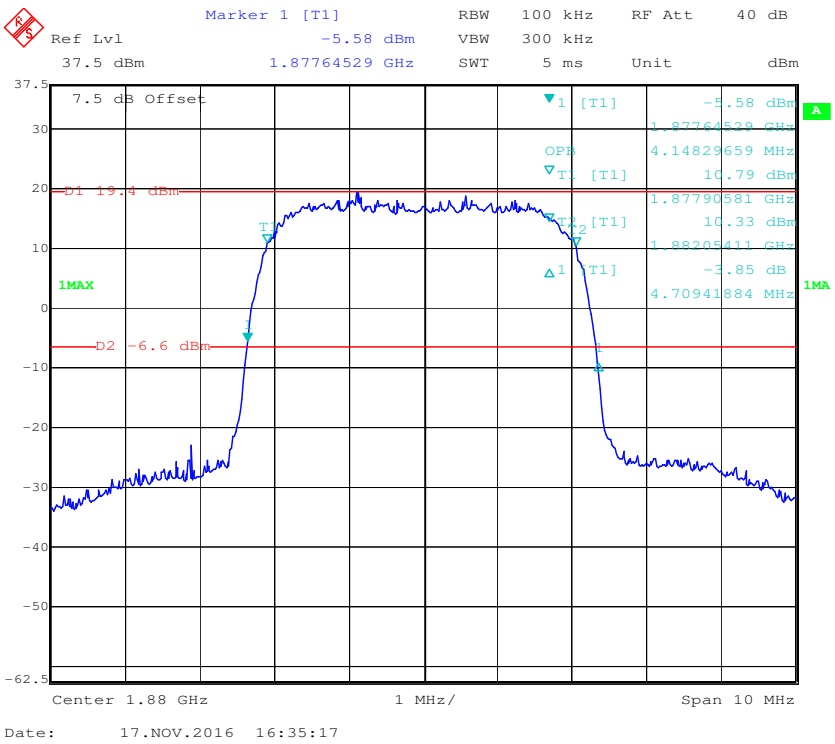
26 dB Emissions &99% Occupied Bandwidth for GSM (GMSK) Mode



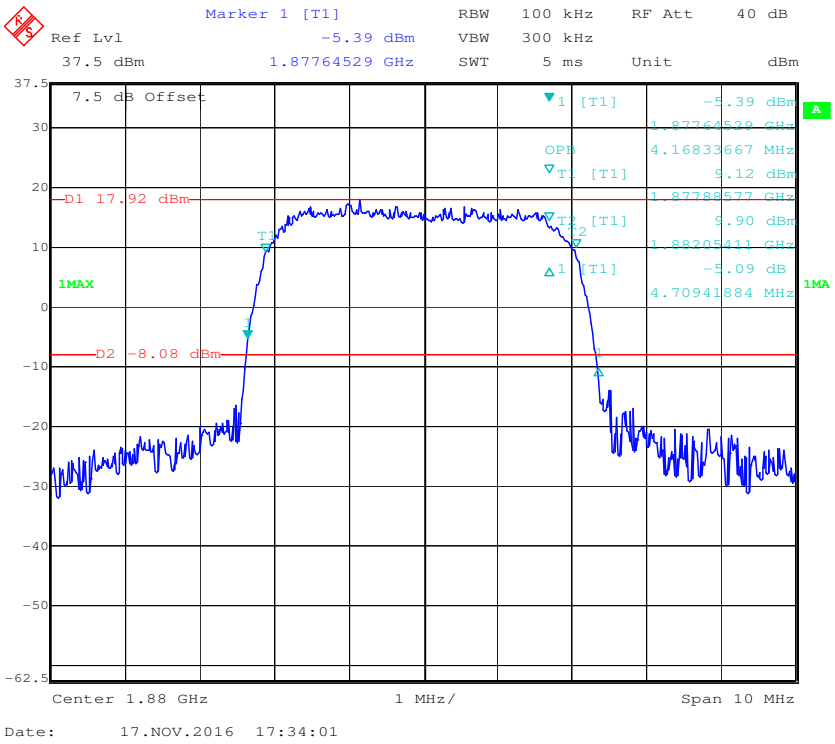
26 dB Emissions &99% Occupied Bandwidth for EDGE Mode



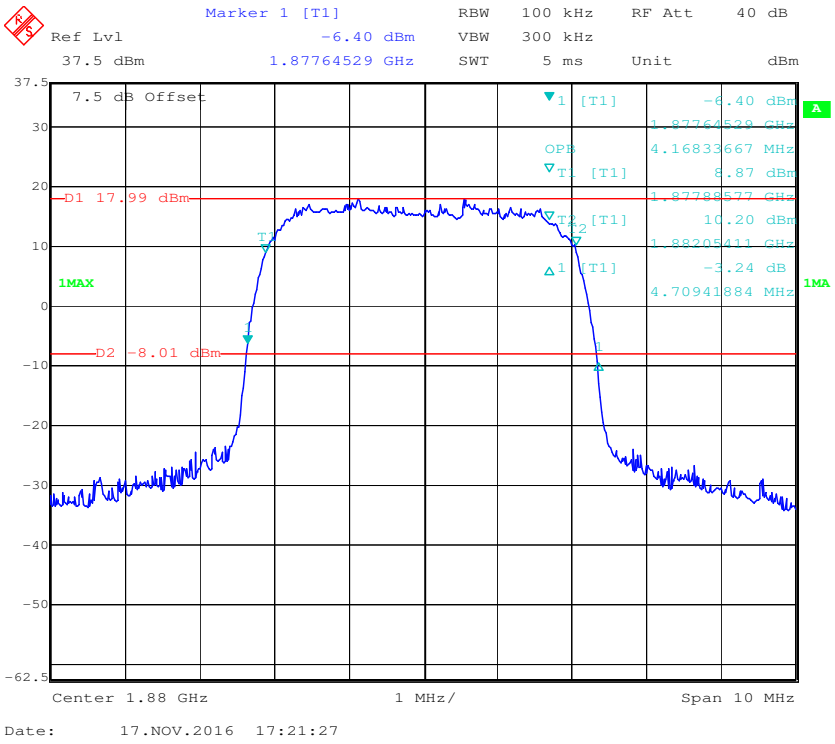
26 dB Emissions &99% Occupied Bandwidth for RMC (BPSK) Mode



26 dB Emissions &99% Occupied Bandwidth for HSUPA (BPSK) Mode

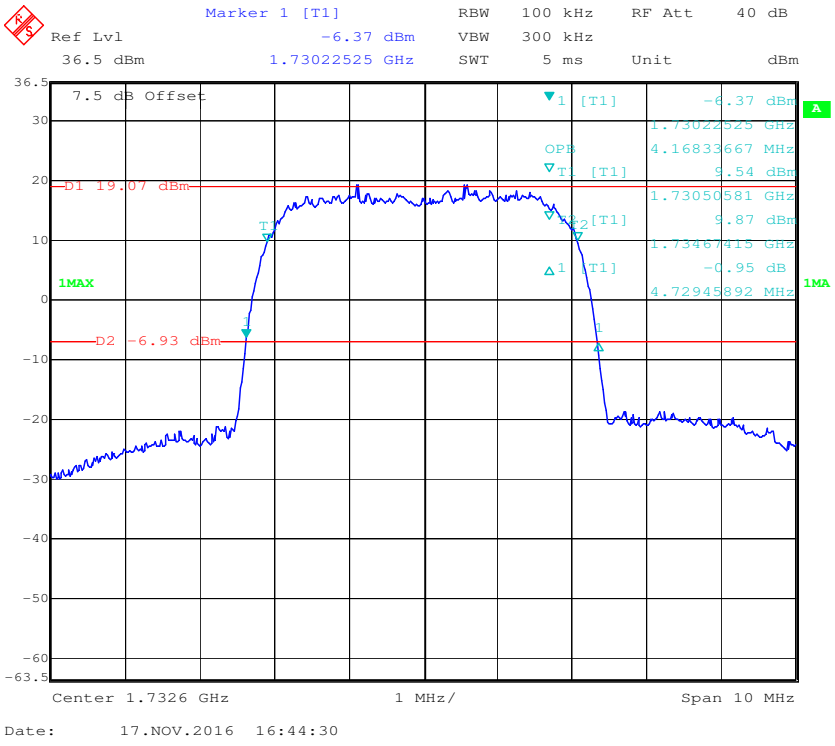


26 dB Emissions &99% Occupied Bandwidth for HSDPA (16QAM) Mode

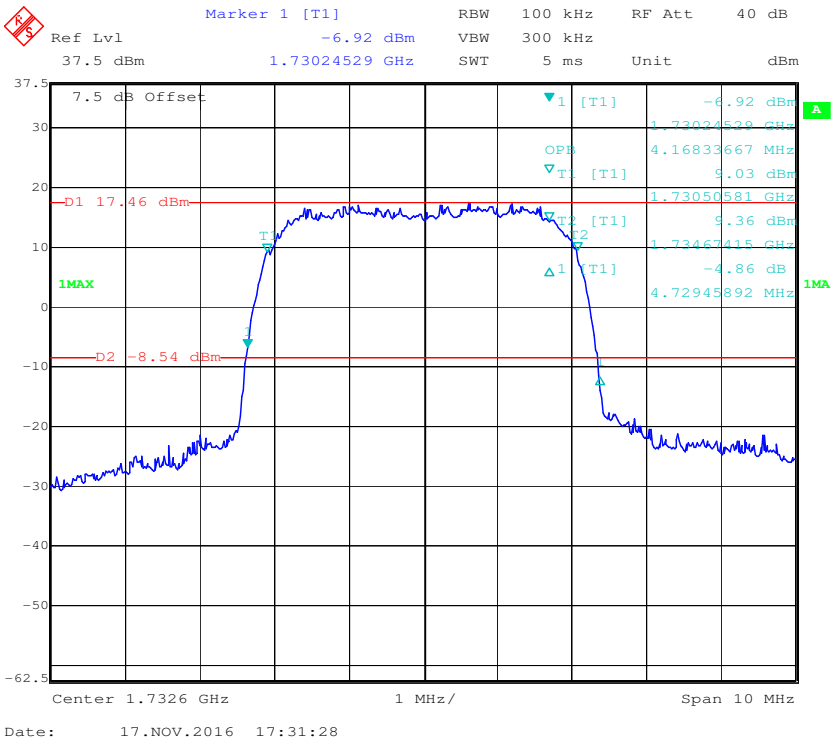


AWS Band (Part 27)

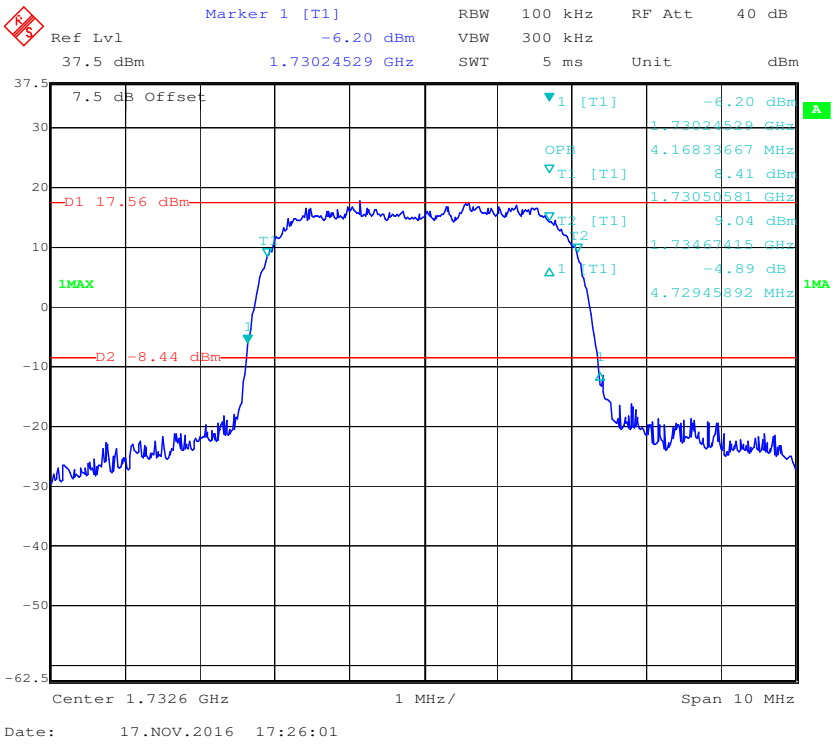
26 dB Emissions &99% Occupied Bandwidth for RMC (BPSK) Mode



26 dB Emissions &99% Occupied Bandwidth for HSUPA (BPSK) Mode



26 dB Emissions &99% Occupied Bandwidth for HSDPA (16QAM) Mode



FCC §2.1051, §22.917(a) & §24.238(a) ; §27.53 (h) (m) - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

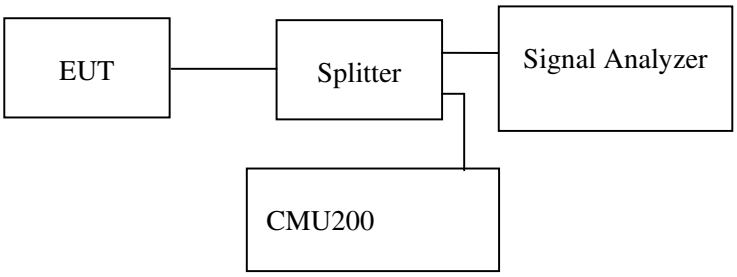
Applicable Standard

FCC §2.1051, §22.917(a) and §24.238(a) and §27.53(h) (m).

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. The resolution bandwidth of the spectrum analyzer was set at 100kHz for below 1GHz and 1MHz for above 1GHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.



Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

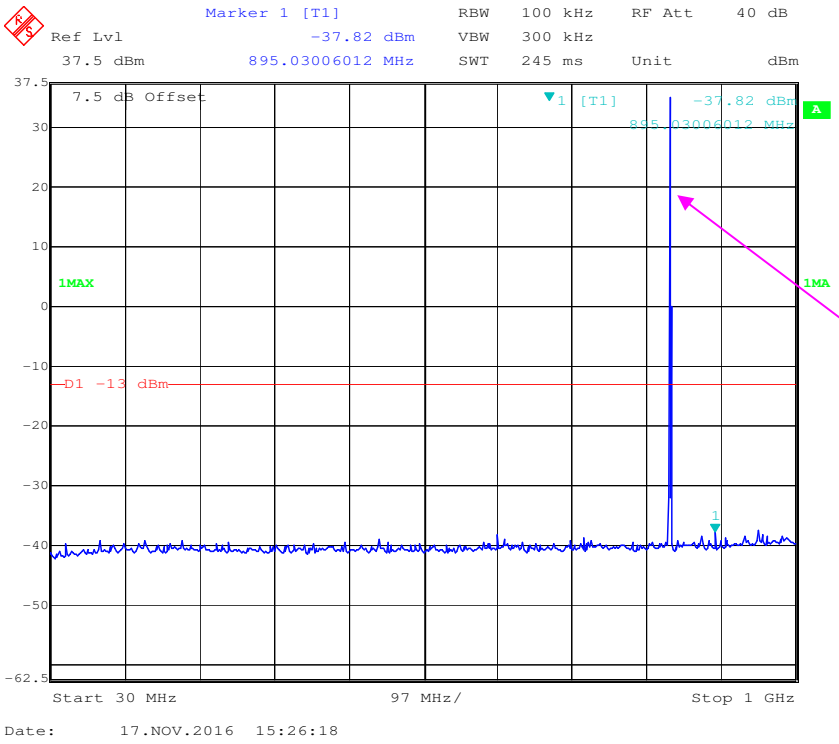
The testing was performed by Chris Wang on 2016-11-17.

Test result: Compliance,

please refer to the following plots.

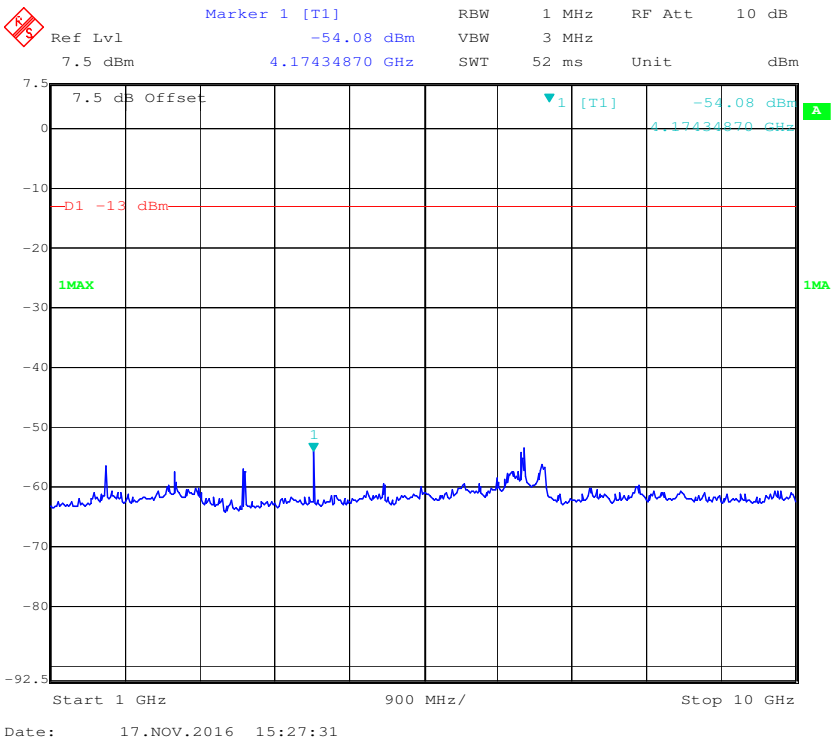
Cellular Band (Part 22H)

30 MHz – 1 GHz (GSM Mode)

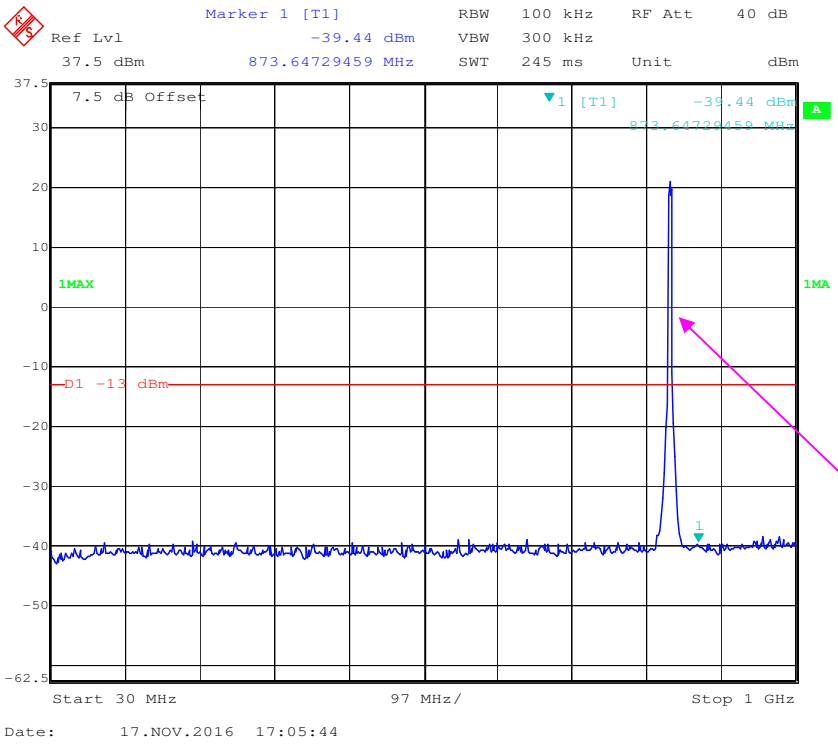


Fundamental test

1 GHz – 10 GHz (GSM Mode)

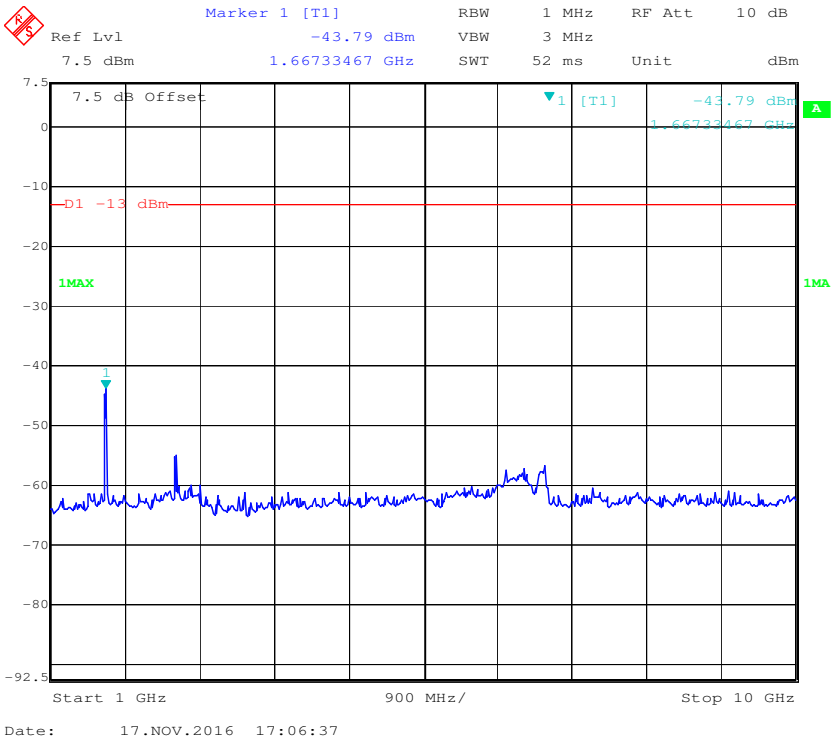


30 MHz – 1 GHz (WCDMA Mode)



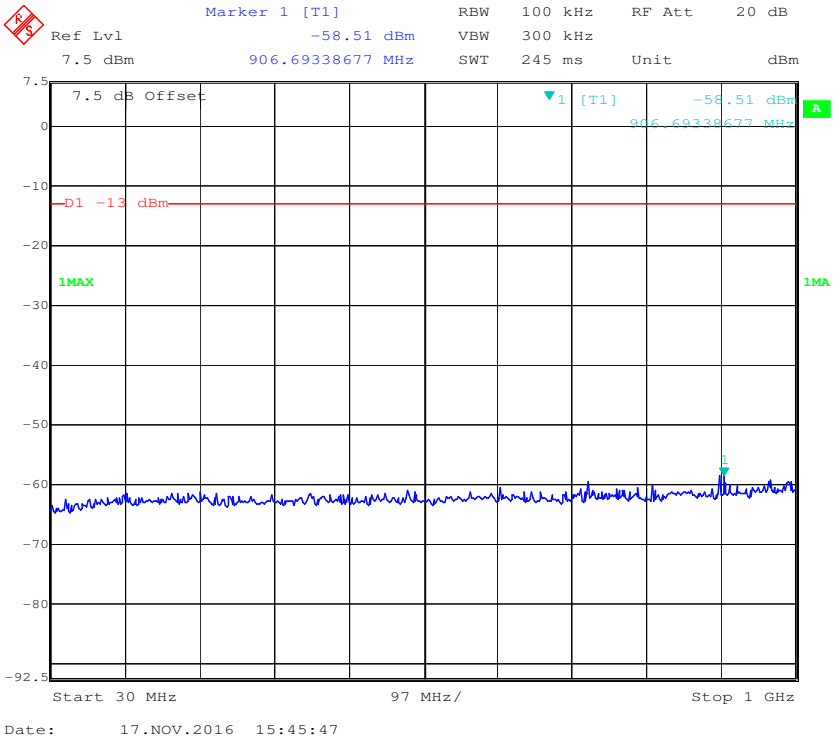
Fundamental test

1 GHz – 10 GHz (WCDMA Mode)

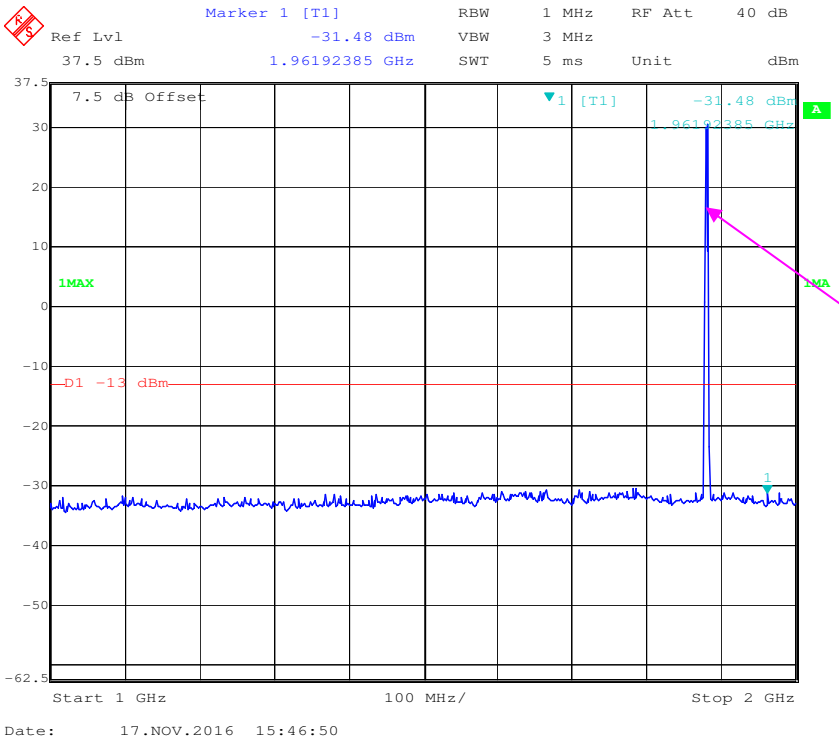


PCS Band (Part 24E)

30 MHz – 1 GHz (GSM Mode)

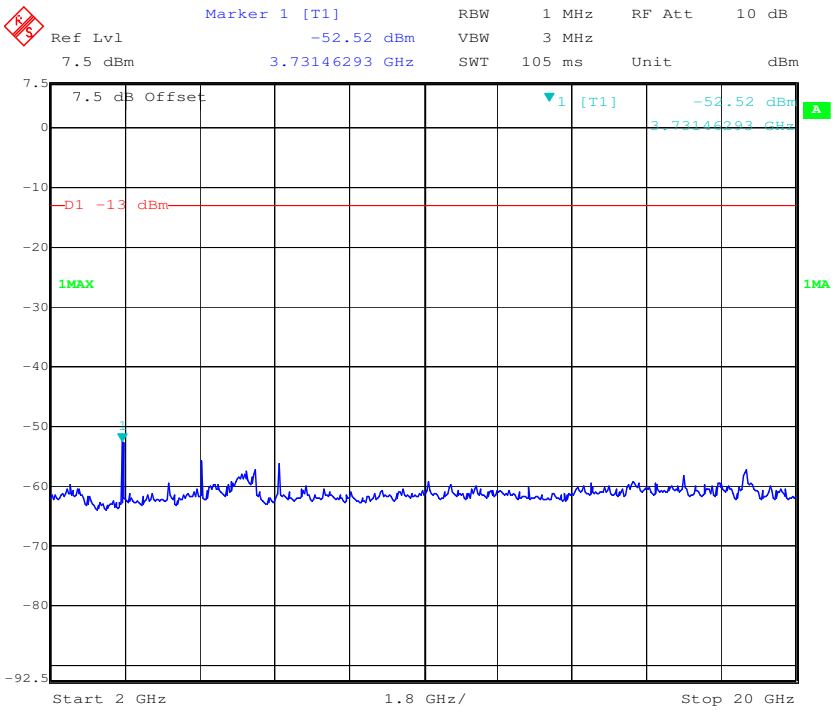


1 GHz – 2 GHz (GSM Mode)

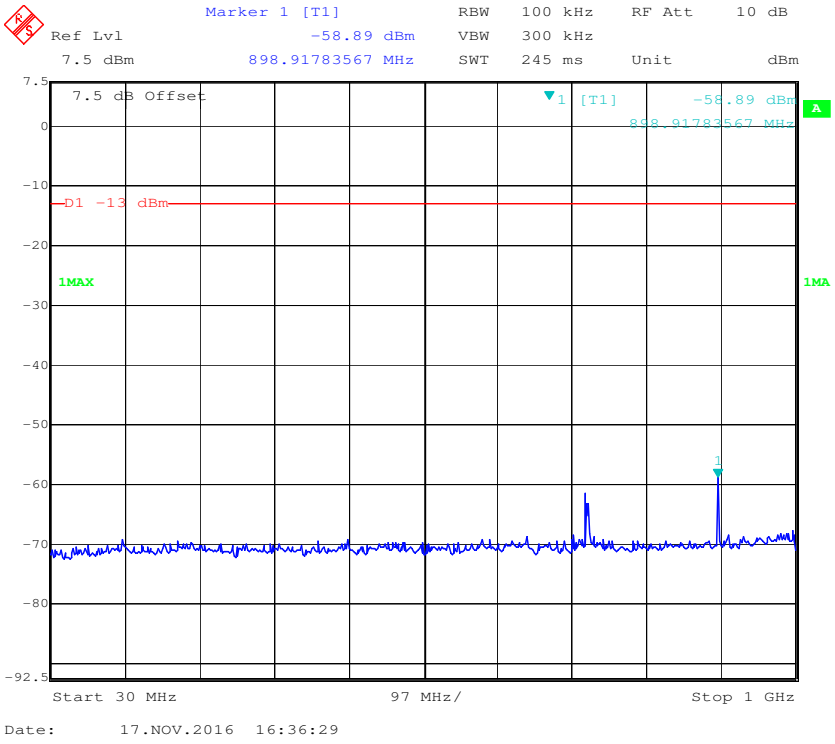


Fundamental test

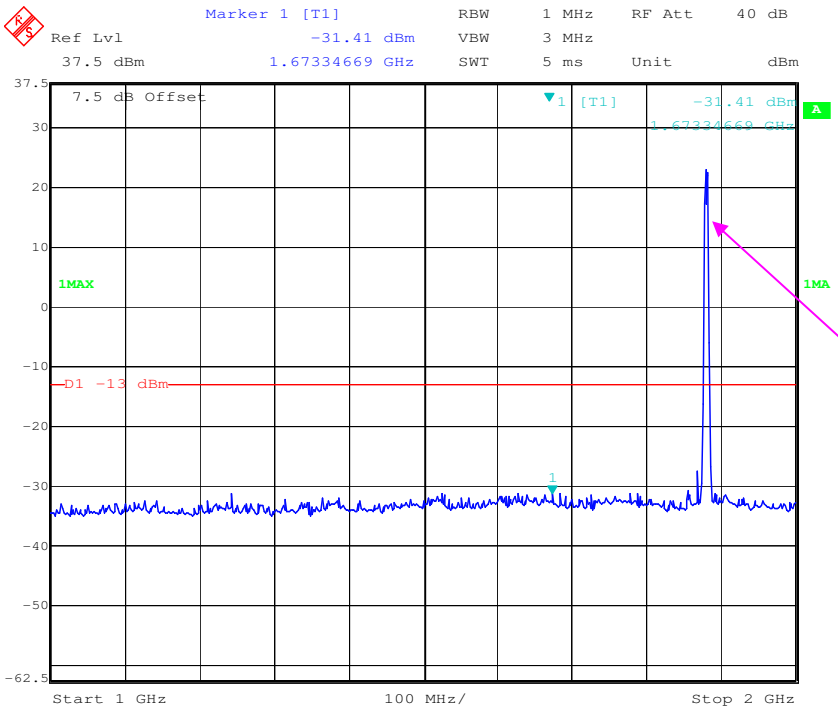
2 GHz – 20 GHz (GSM Mode)



30 MHz – 1 GHz (WCDMA Mode)

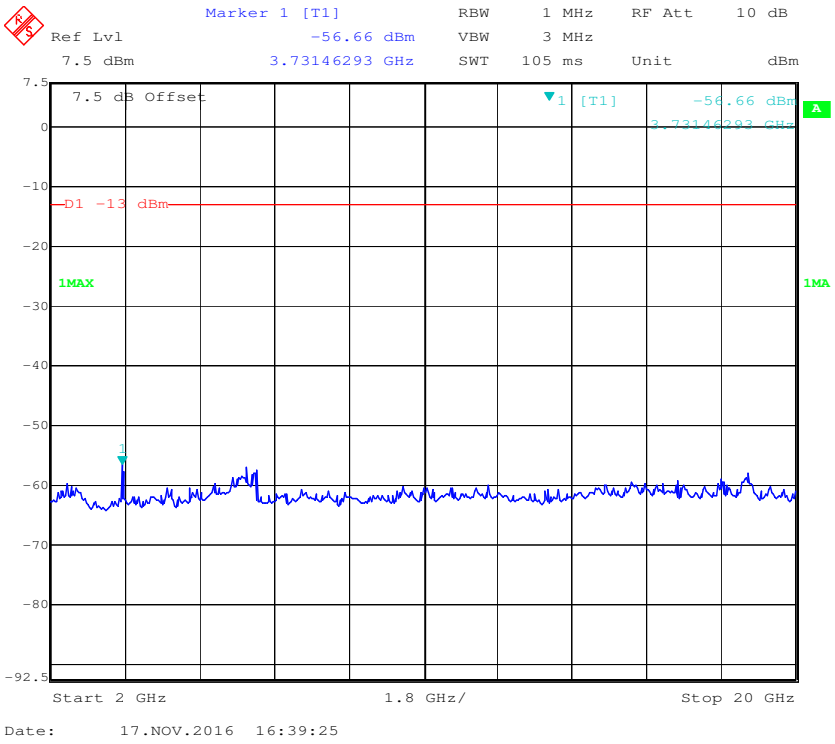


1 GHz – 2 GHz (WCDMA Mode)



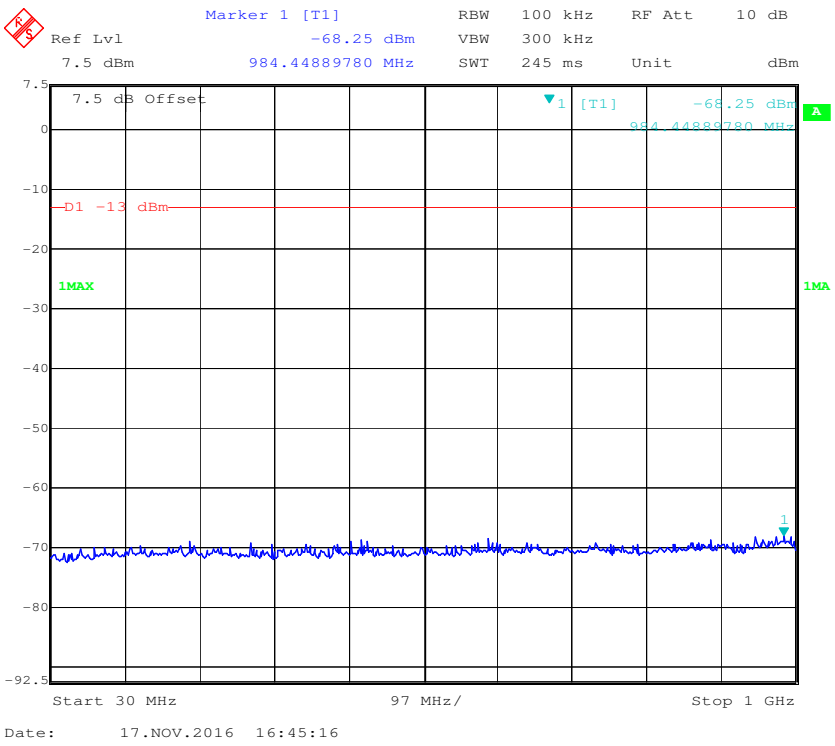
Fundamental test

2 GHz – 20 GHz (WCDMA Mode)

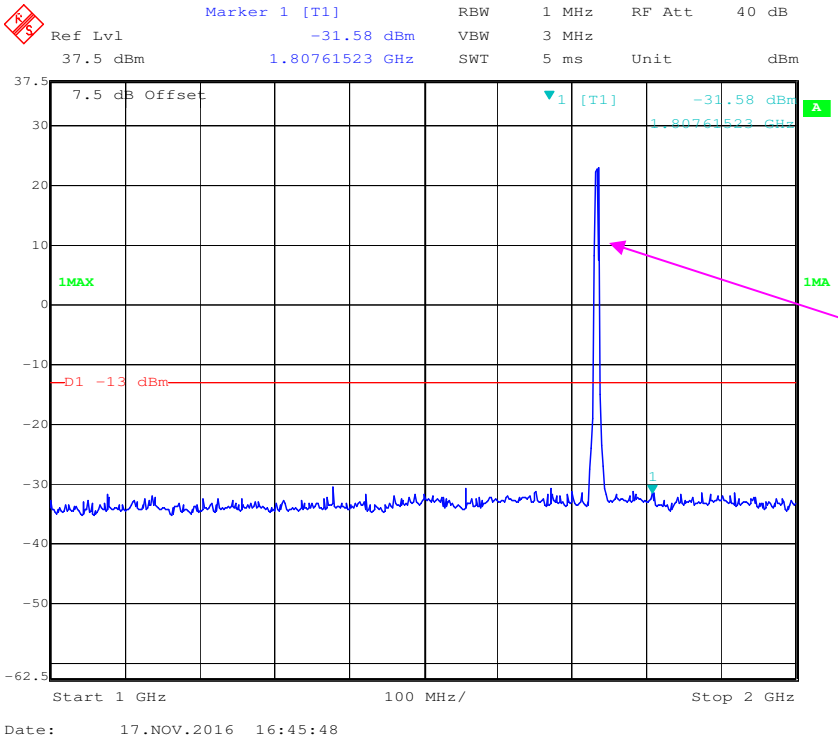


AWS Band (Part 27)

30 MHz – 1 GHz (WCDMA Mode)

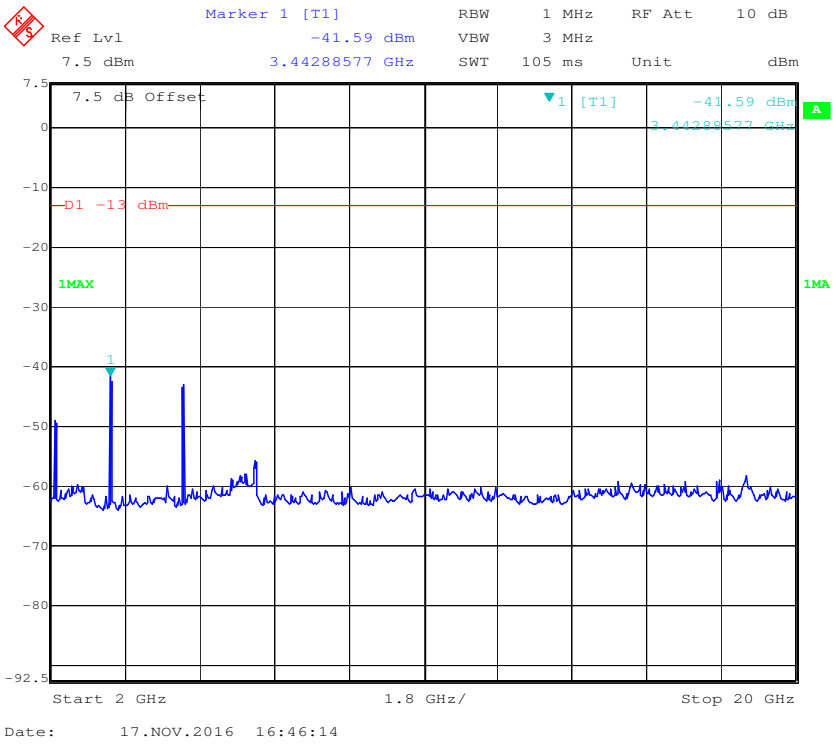


1 GHz – 2 GHz (WCDMA Mode)



Fundamental test

2 GHz – 20 GHz (WCDMA Mode)



FCC § 2.1053; § 22.917 (a);§ 24.238 (a); §27.53 (h)(m) SPURIOUS RADIATED EMISSIONS

Applicable Standard

FCC § 2.1053, §22.917(a) and § 24.238(a) and § 27.53(h)(m)

For mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

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 receiving 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 (TX pwr in Watts/0.001) – the absolute level

Spurious attenuation limit in dB = 43 + 10 Log_{10} (power out in Watts)

Spurious attenuation limit in dB = 55 + 10 Log_{10} (power out in Watts)

Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Chris Wang on 2016-11-26.

EUT operation mode: Transmitting

Pre-scan with Low, Middle and High channel, the worst case as below:

30 MHz ~ 10 GHz:

Cellular Band (Part 22H)

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)	SG Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)			
GSM Mode, Middle channel										
235.11	36.52	55	1.4	H	-60.5	0.28	2.05	-58.73	-13	45.73
235.11	35.84	2	2.2	V	-61.2	0.28	2.05	-59.43	-13	46.43
1673.20	60.33	52	1.1	H	-43.6	0.30	9.40	-34.50	-13	21.50
1673.20	62.22	67	1.5	V	-43.2	0.30	9.40	-34.10	-13	21.10
WCDMA Mode, Middle channel										
235.11	36.68	332	1.2	H	-60.3	0.28	2.05	-58.53	-13	45.53
235.11	35.51	337	1.0	V	-61.5	0.28	2.05	-59.73	-13	46.73
1673.20	65.53	51	1.7	H	-38.4	0.30	9.40	-29.30	-13	16.30
1673.20	59.22	15	1.0	V	-46.2	0.30	9.40	-37.10	-13	24.10

30 MHz ~ 20 GHz:

PCS Band (Part 24E)

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)	SG Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)			
GSM Mode, Middle channel										
235.11	36.47	318	2.0	H	-60.5	0.28	2.05	-58.73	-13	45.73
235.11	35.34	111	1.4	V	-61.7	0.28	2.05	-59.93	-13	46.93
3760.0	50.63	128	1.4	H	-43.1	2.42	12.60	-32.92	-13	19.92
3760.0	50.63	179	2.1	V	-42.1	2.42	12.60	-31.92	-13	18.92
WCDMA Mode, Middle channel										
235.11	36.74	41	1.8	H	-60.3	0.28	2.05	-58.53	-13	45.53
235.11	35.42	164	1.5	V	-61.6	0.28	2.05	-59.83	-13	46.83
3760.0	58.33	248	1.2	H	-35.4	2.42	12.60	-25.22	-13	12.22
3760.0	53.13	287	1.3	V	-39.6	2.42	12.60	-29.42	-13	16.42

30 MHz ~ 18 GHz:

AWS Band (Part 27)

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)	SG Level (dBm)	Cable Loss (dB)	Antenna Gain (dB)			
WCDMA Mode										
235.11	36.64	199	1.8	H	-60.4	0.28	2.05	-58.63	-13	45.63
235.11	35.57	273	1.5	V	-61.4	0.28	2.05	-59.63	-13	46.63
3465.20	41.97	37	1.7	H	-52.6	2.34	12.40	-42.54	-13	29.54
3465.20	39.31	23	2.5	V	-53.2	2.34	12.40	-43.14	-13	30.14

Note:
1) Absolute Level = SG Level - Cable loss + Antenna Gain
2) Margin = Limit- Absolute Level

FCC § 22.917 (a);§ 24.238 (a); §27.53 (h)(m) - 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.

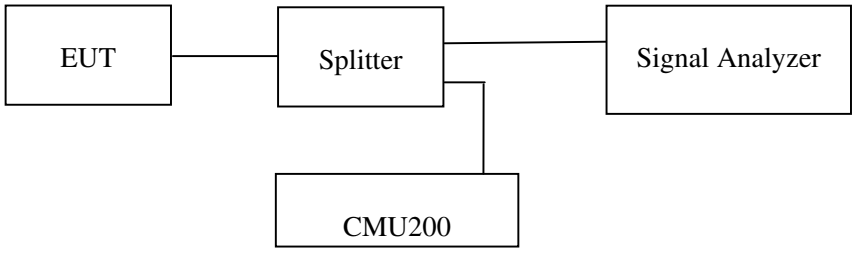
According to FCC §27.53 (h)(m), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

For mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

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 Data

Environmental Conditions

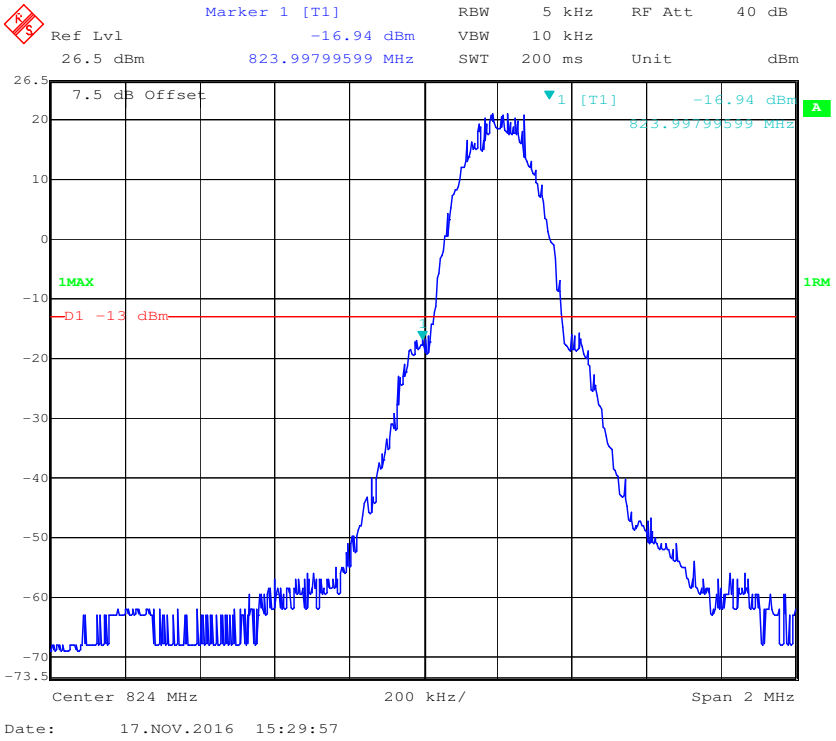
Temperature:	25℃
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Chris Wang on 2016-11-17.

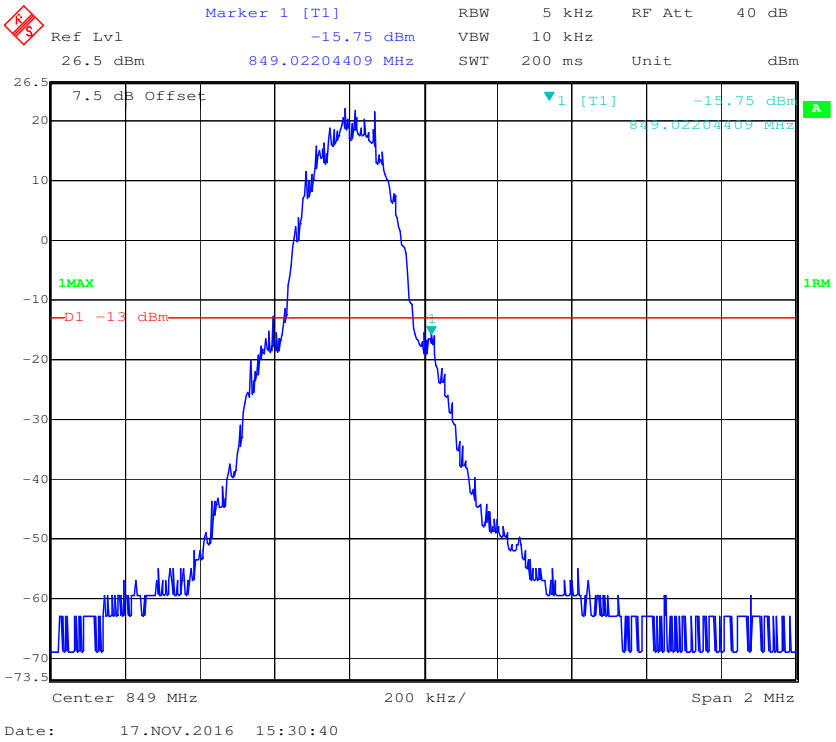
EUT operation mode: Transmitting

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

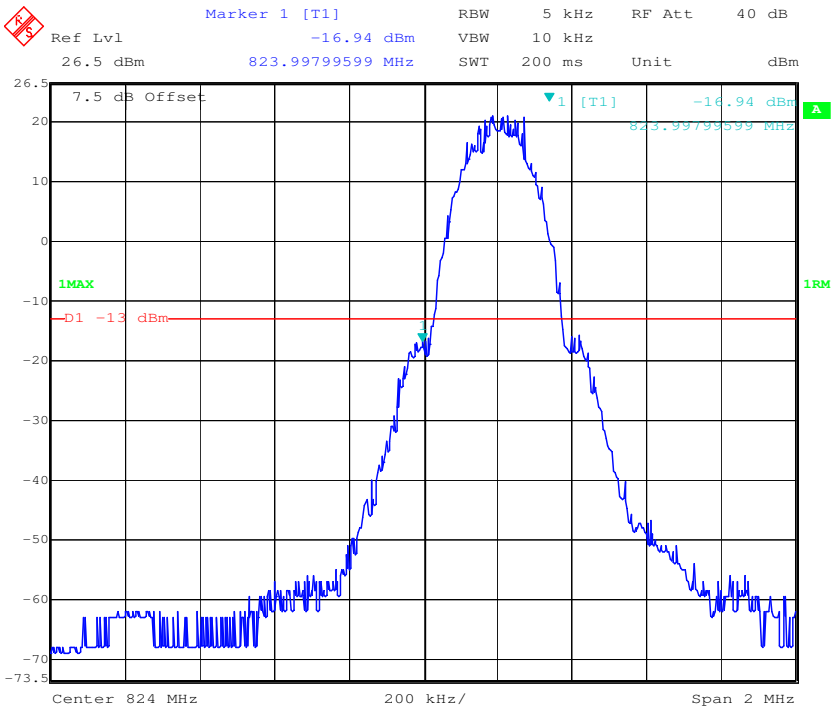
Cellular Band, Left Band Edge for GSM (GMSK) Mode



Cellular Band, Right Band Edge for GSM (GMSK) Mode

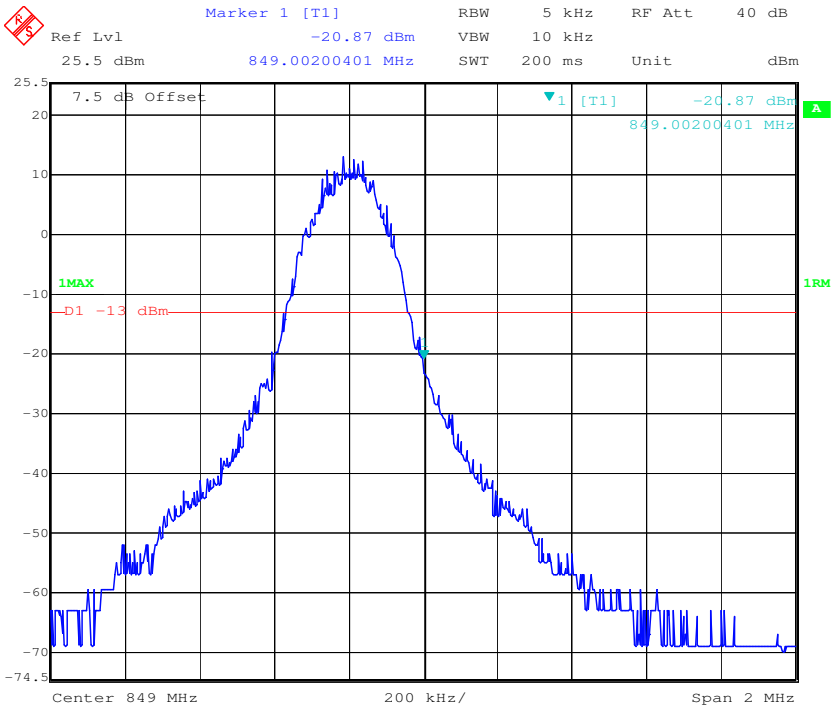


Cellular Band, Left Band Edge for EDGE Mode



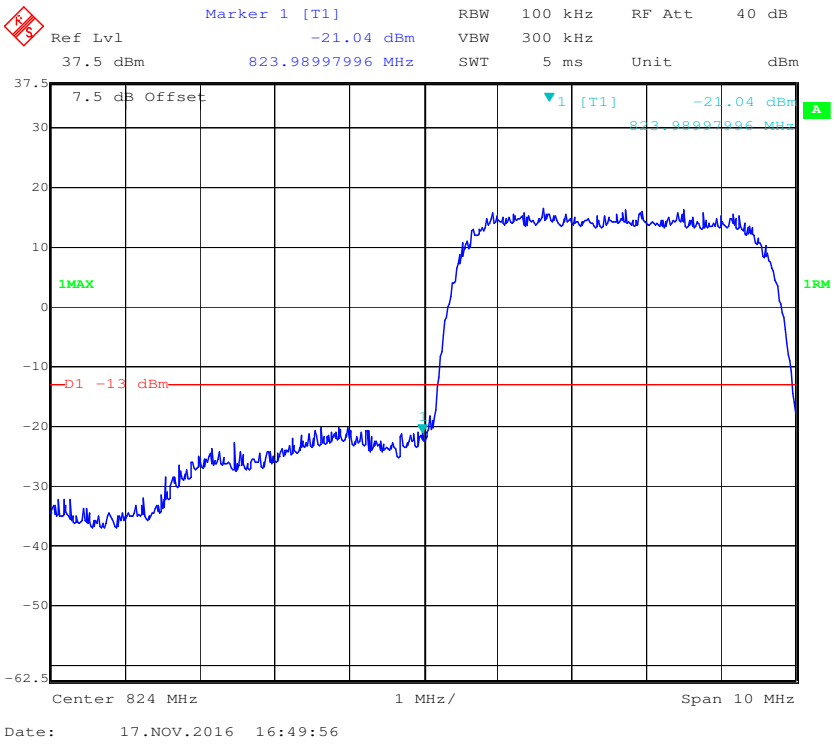
Date: 17.NOV.2016 15:29:57

Cellular Band, Right Band Edge for EDGE Mode

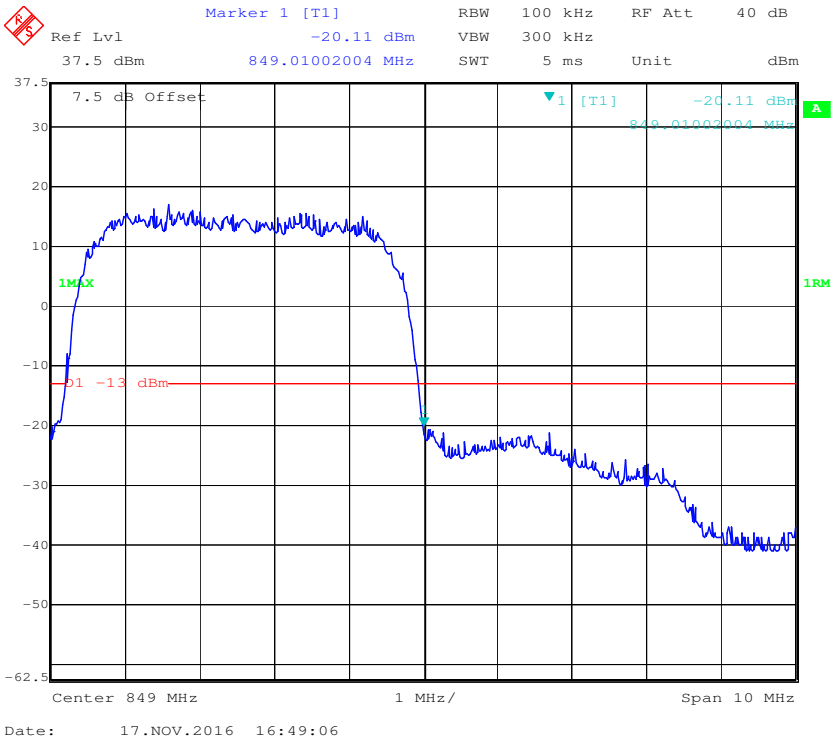


Date: 17.NOV.2016 16:23:47

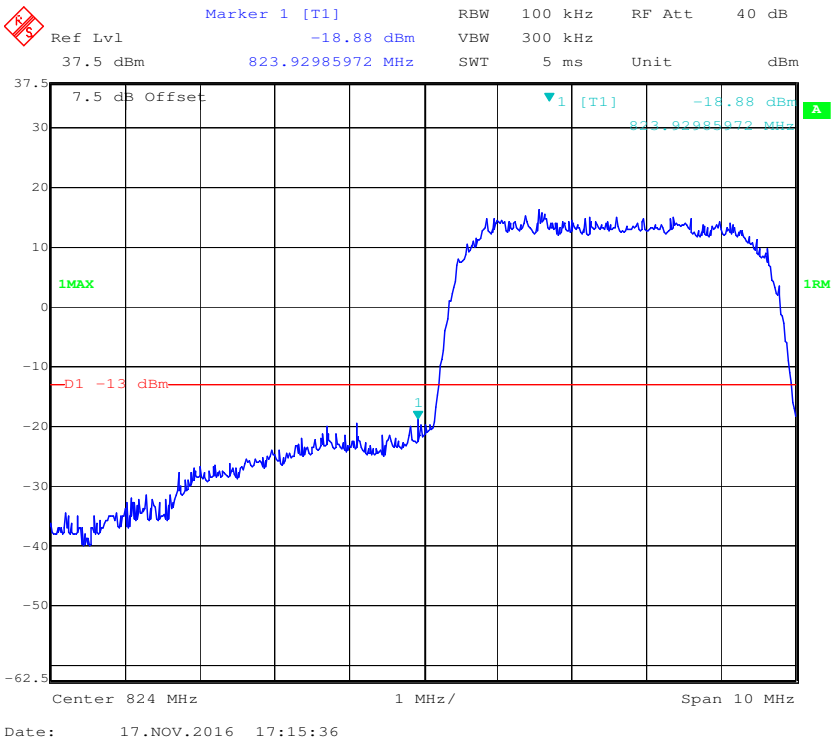
Cellular Band, Left Band Edge for WCDMA (BPSK) Mode



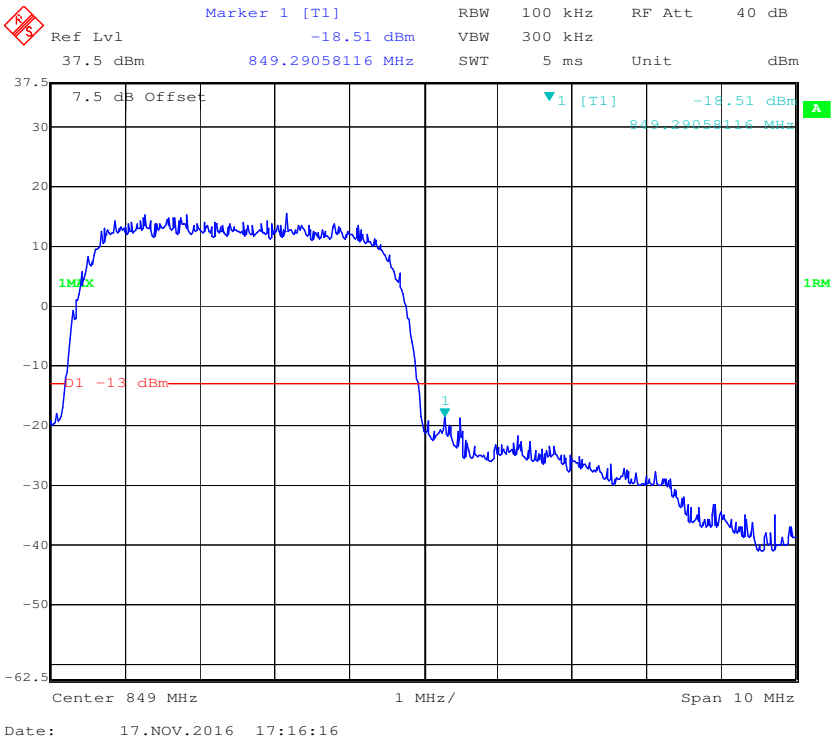
Cellular Band, Right Band Edge for WCDMA (BPSK) Mode



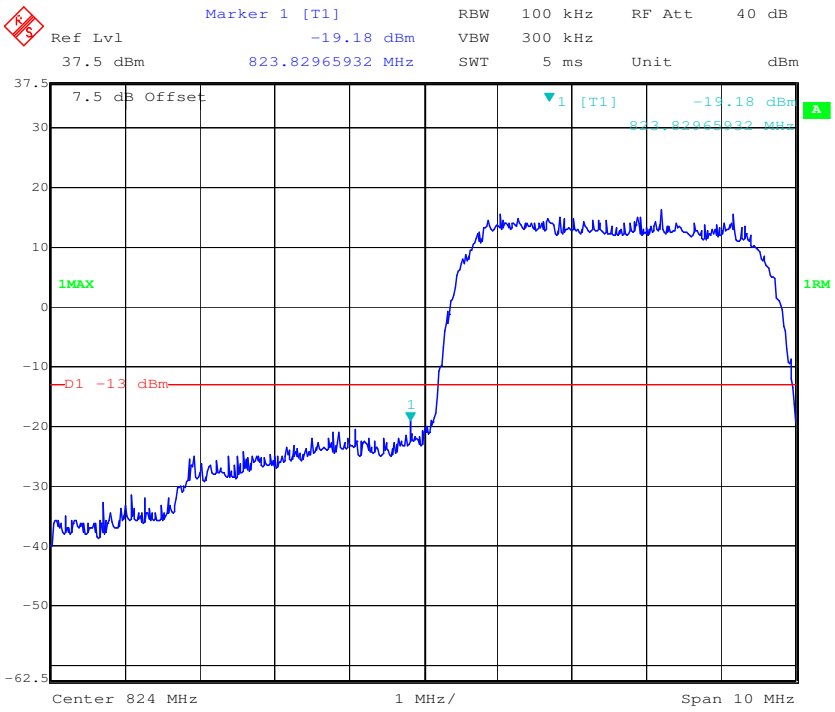
Cellular Band, Left Band Edge for HSDPA (16QAM) Mode



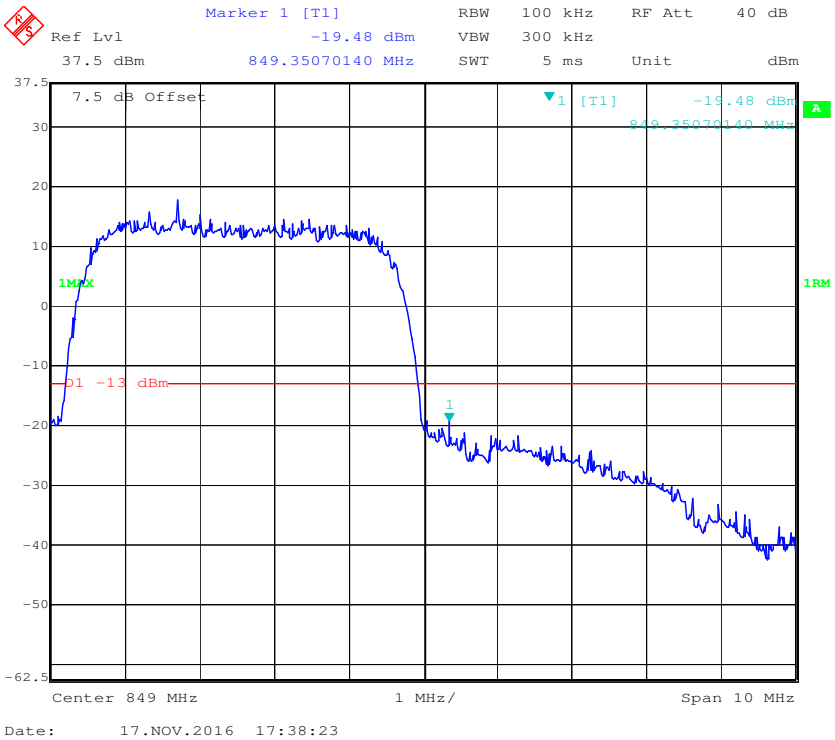
Cellular Band, Right Band Edge for HSDPA (16QAM) Mode



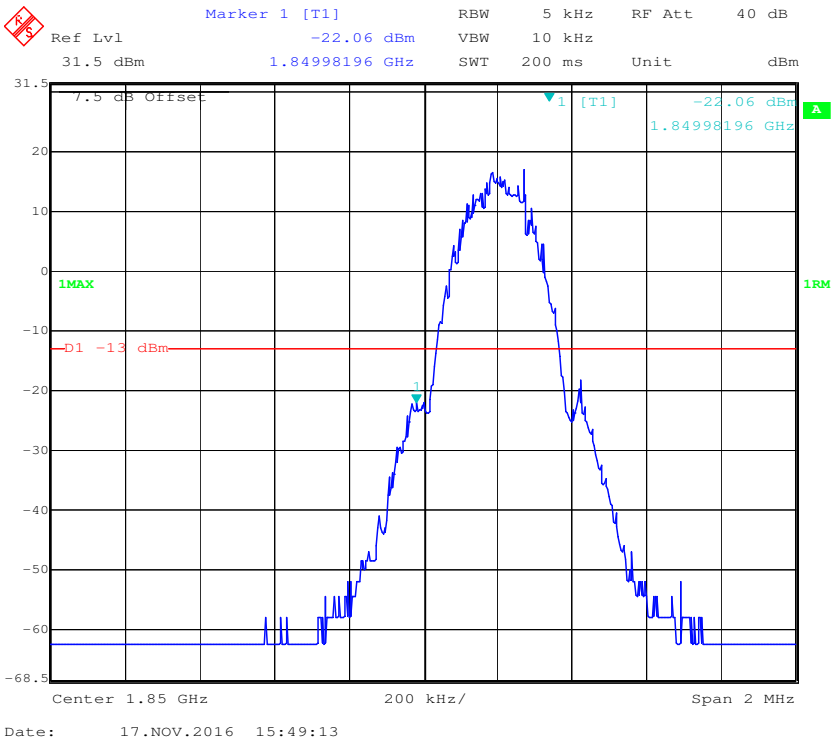
Cellular Band, Left Band Edge for HSUPA (BPSK) Mode



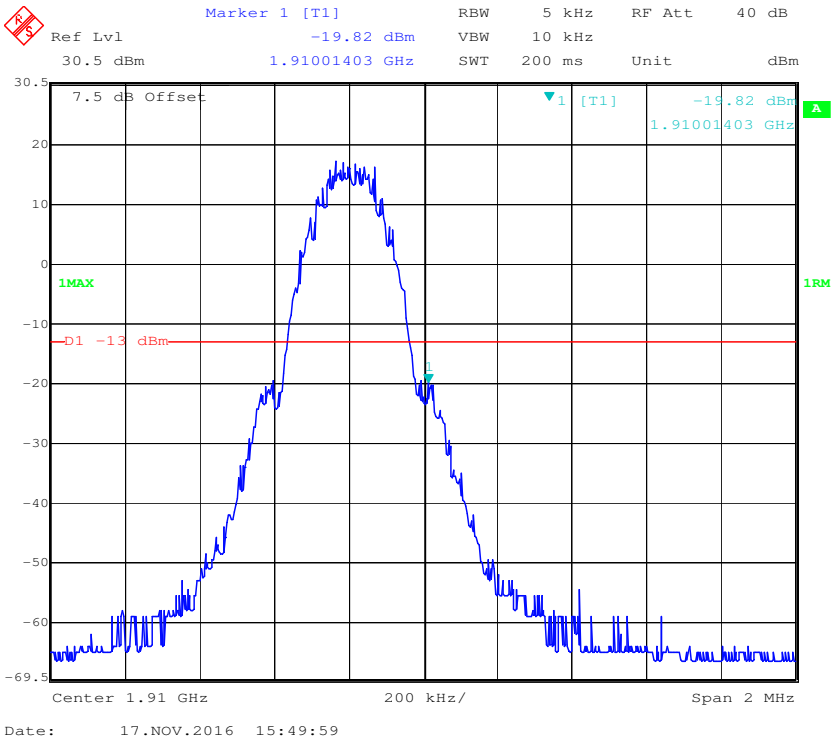
Cellular Band, Right Band Edge for HSUPA (BPSK) Mode



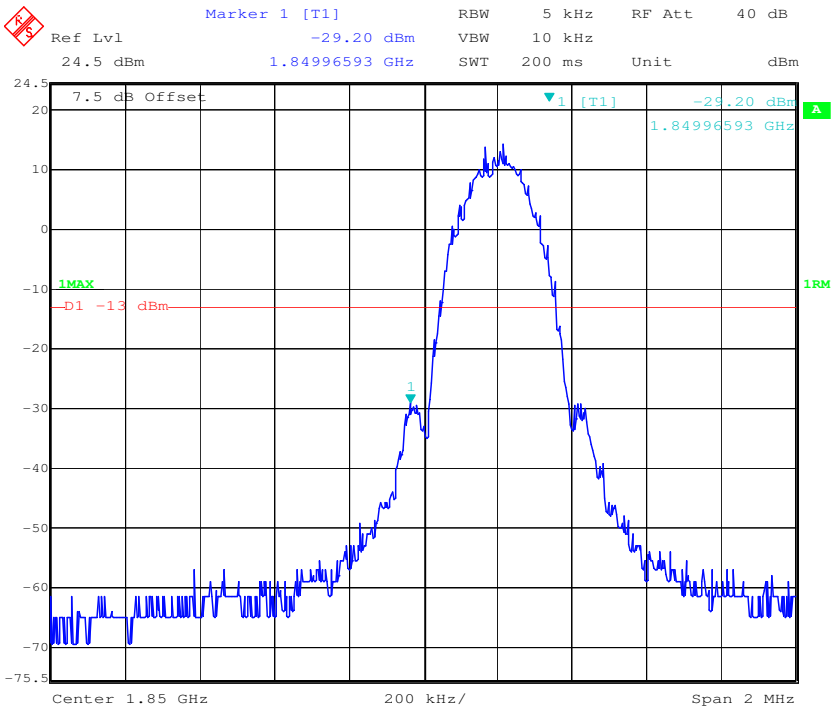
PCS Band, Left Band Edge for GSM (GMSK) Mode



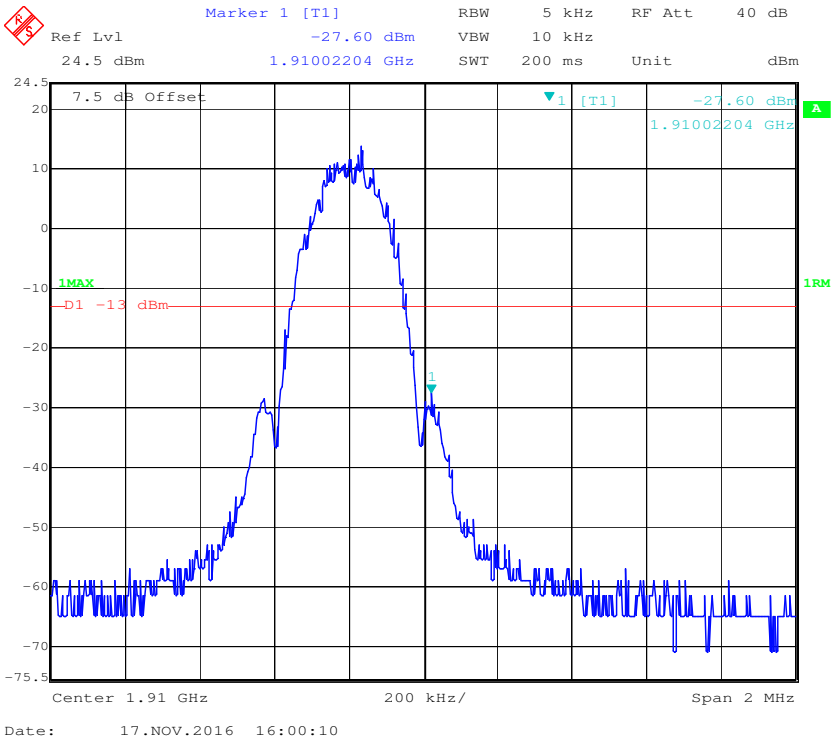
PCS Band, Right Band Edge for GSM (GMSK) Mode



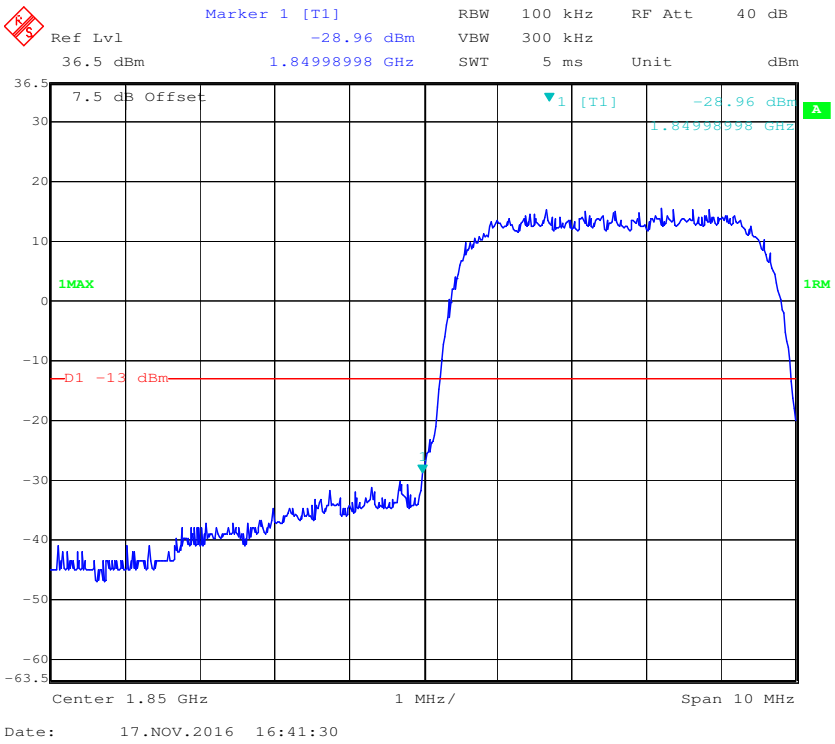
PCS Band, Left Band Edge for EDGE Mode



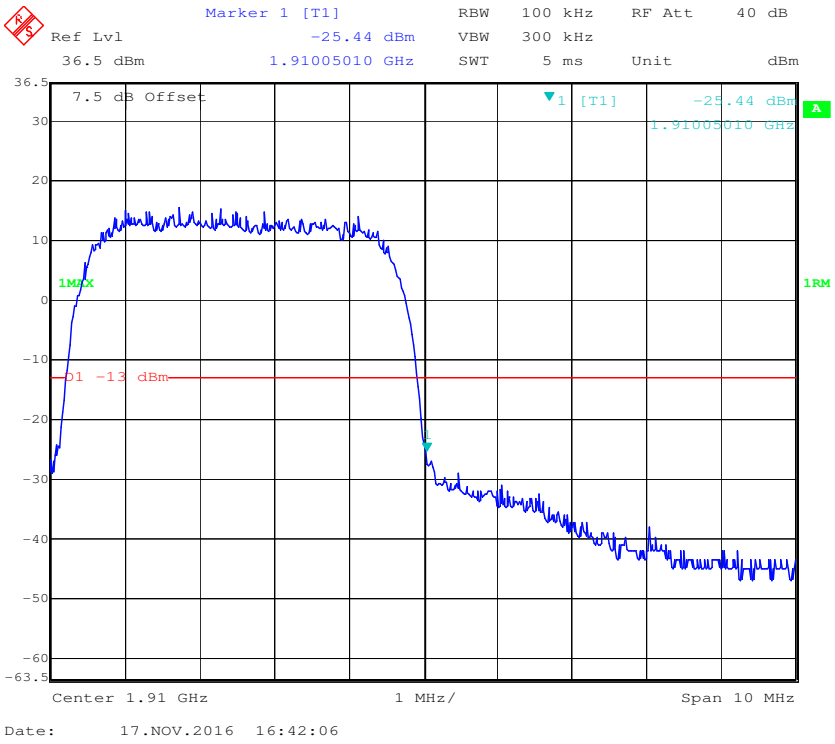
PCS Band, Right Band Edge for EDGE Mode



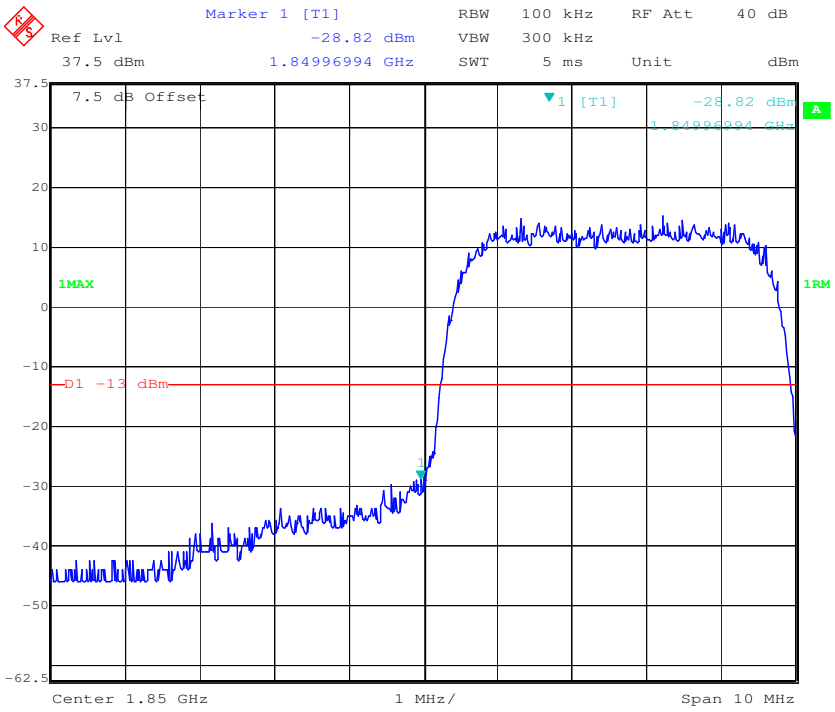
PCS Band, Left Band Edge for WCDMA (BPSK) Mode



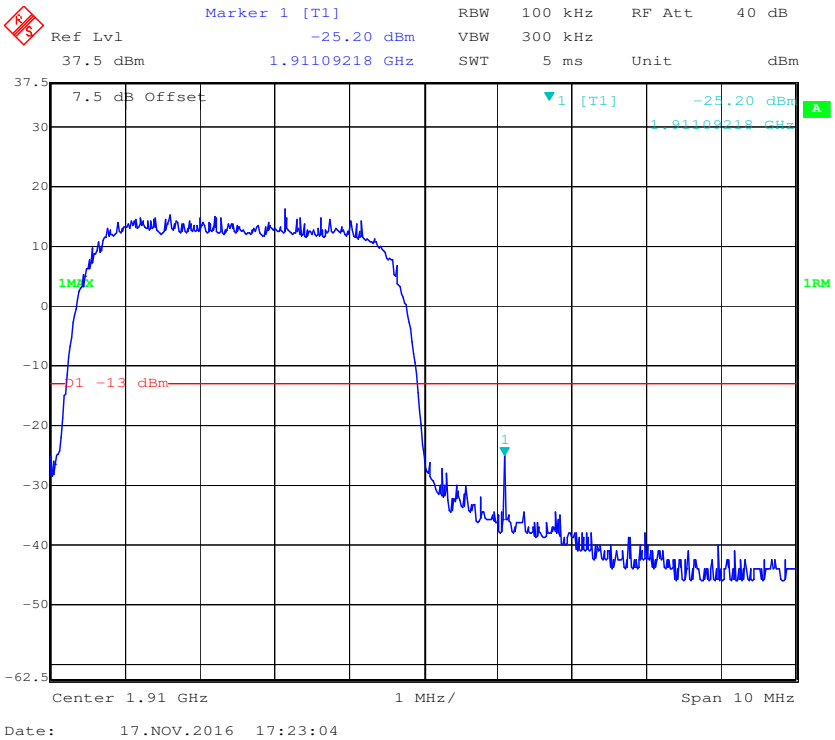
PCS Band, Right Band Edge for WCDMA (BPSK) Mode



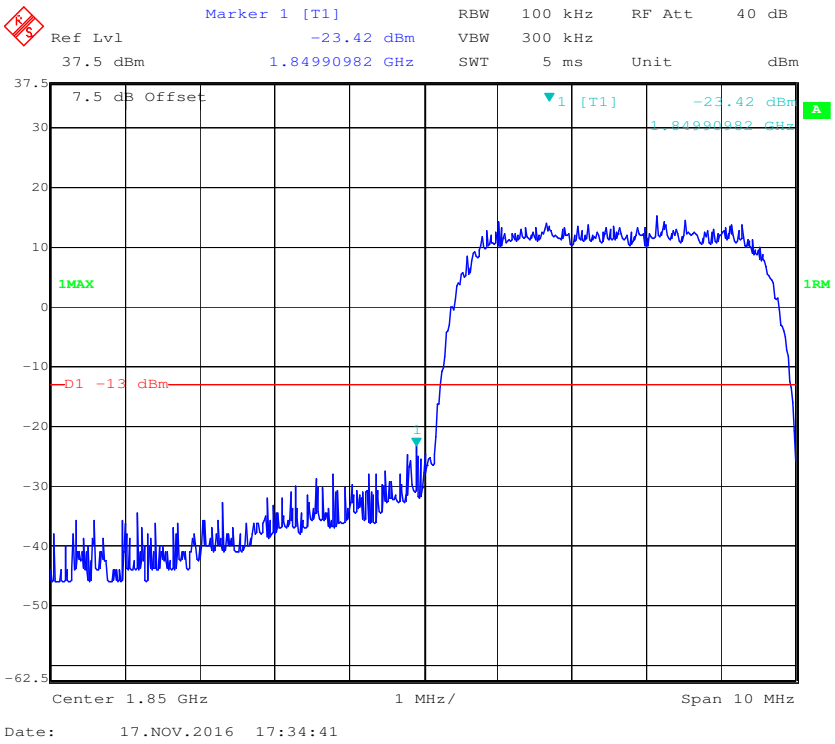
PCS Band, Left Band Edge for HSDPA (16QAM) Mode



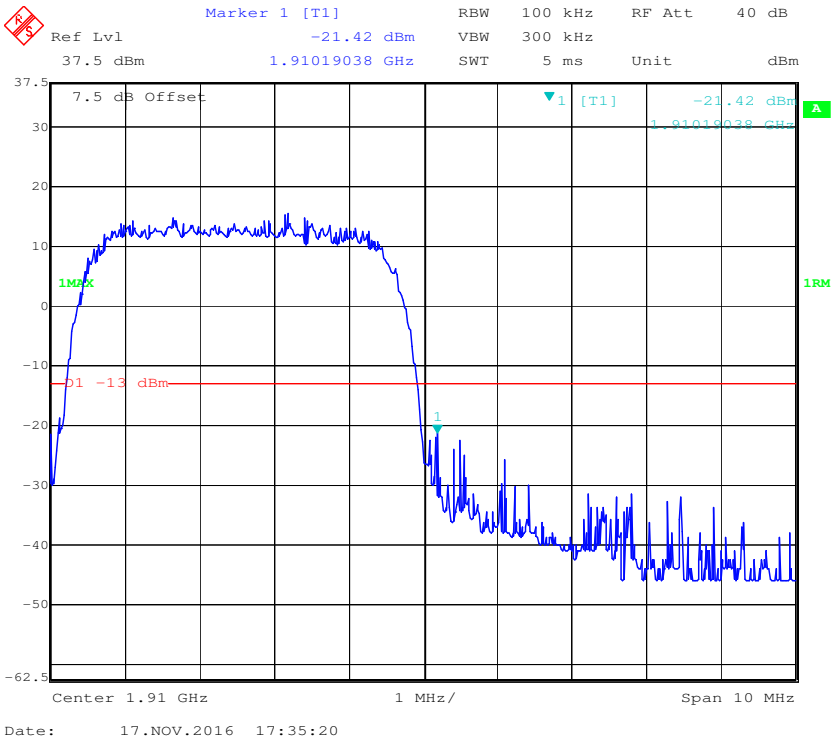
PCS Band, Right Band Edge for HSDPA (16QAM) Mode



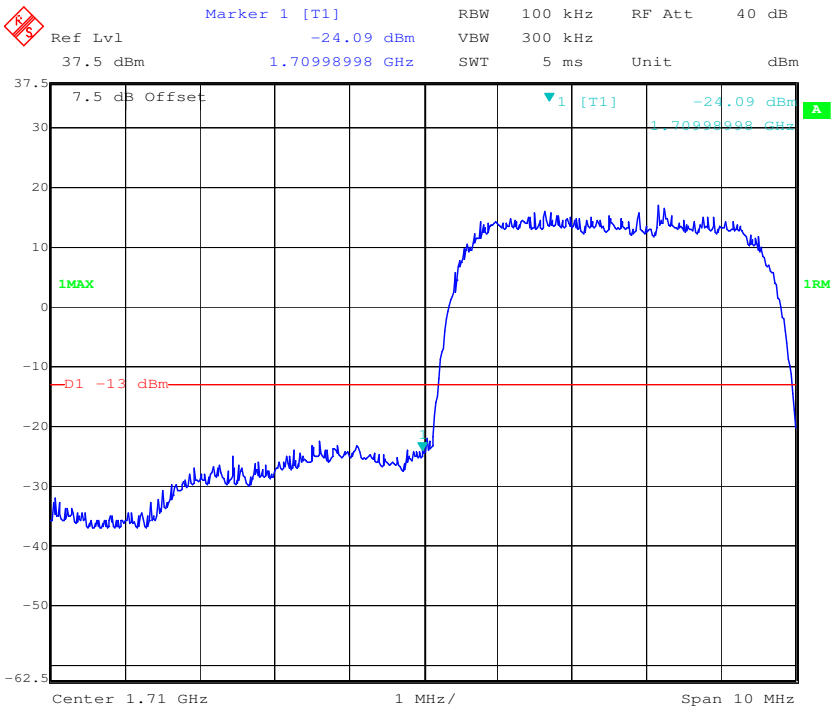
PCS Band, Left Band Edge for HSUPA (BPSK) Mode



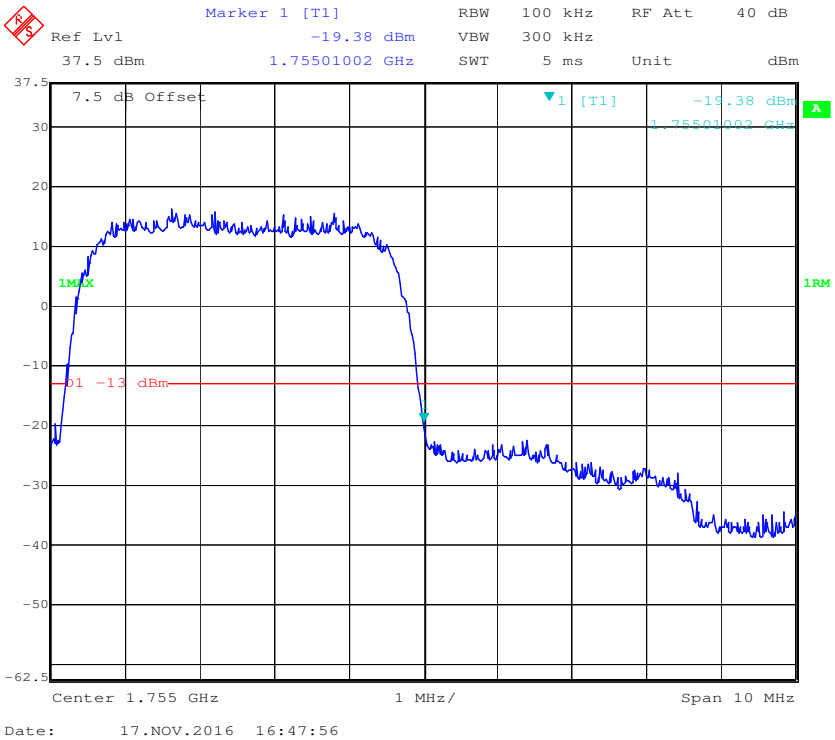
PCS Band, Right Band Edge for HSUPA (BPSK) Mode



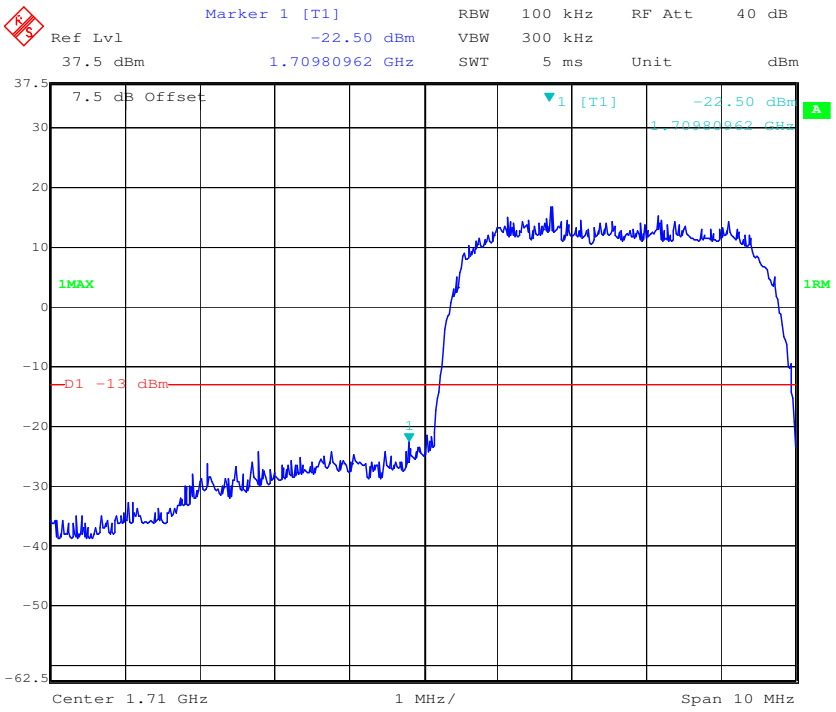
AWS Band, Left Band Edge for RMC (BPSK) Mode



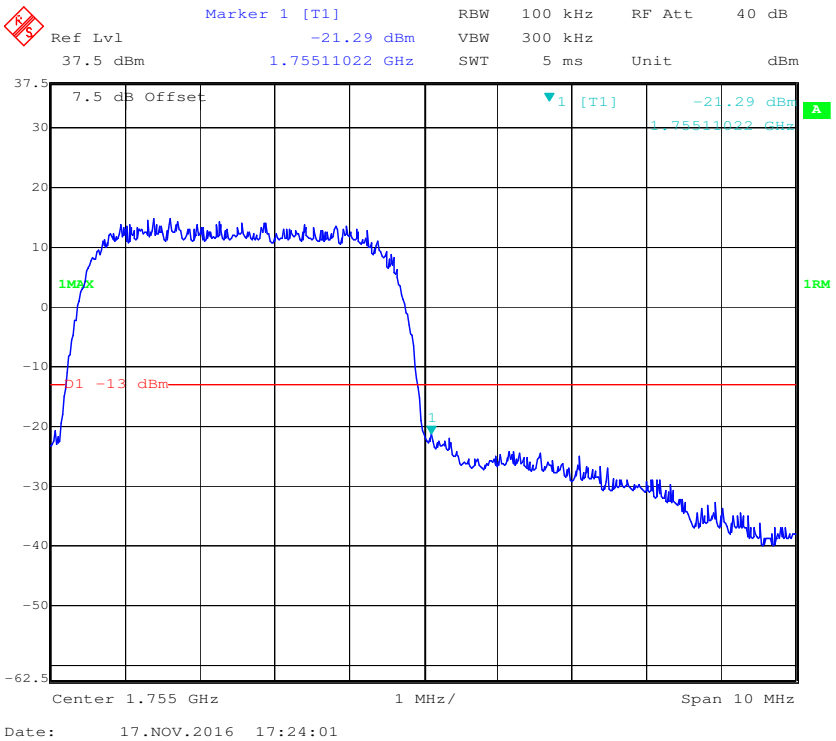
AWS Band, Right Band Edge for RMC (BPSK) Mode



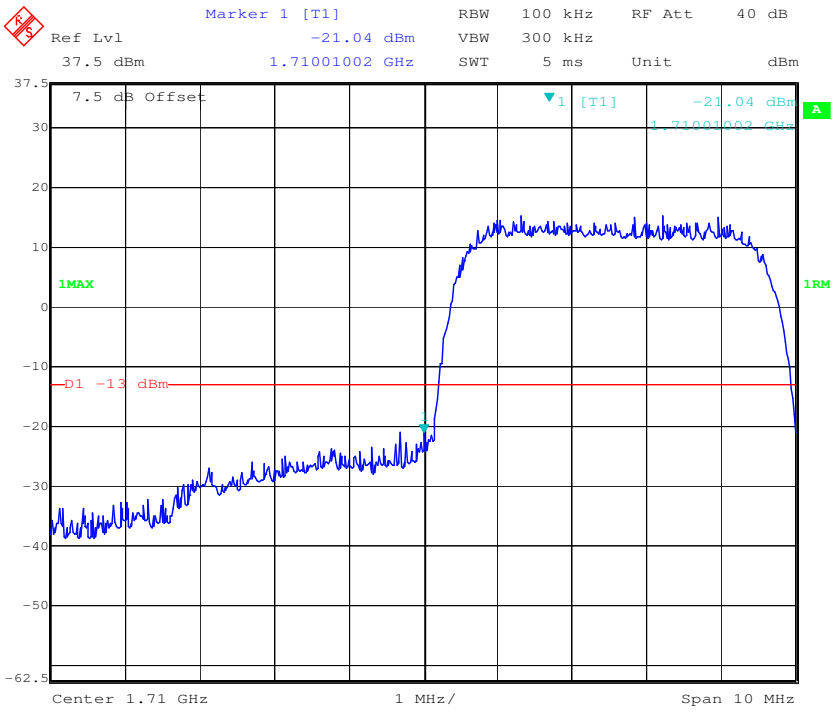
AWS Band, Left Band Edge for HSDPA (16QAM) Mode



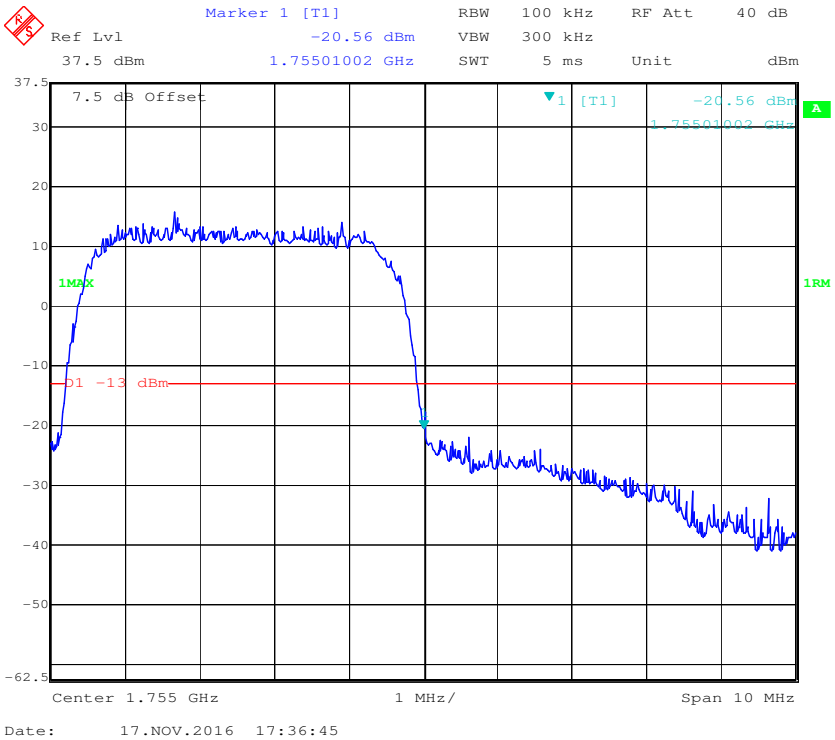
AWS Band, Right Band Edge for HSDPA (16QAM) Mode



AWS Band, Left Band Edge for HSUPA (BPSK) Mode



AWS Band, Right Band Edge for HSUPA (BPSK) Mode



FCC § 2.1055; § 22.355; § 24.235; §27.54; - FREQUENCY STABILITY

Applicable Standard

FCC § 2.1055, §22.355, §24.235 and & §27.54.

According to FCC §2.1055, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

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

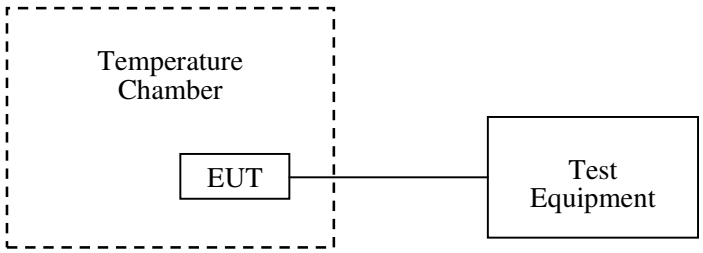
According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emissions stays within the authorized frequency block.

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: For hand carried, battery powered equipment; reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.



Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Chris Wang on 2016-11-17.

EUT operation mode: Transmitting

Test Result: Compliance. Please refer to the following tables.

Cellular Band (Part 22H)

GSM Mode

Middle Channel, f_o =836.6MHz				
Temperature (℃)	Power Supplied (V_{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-30	3.7	19	0.02271	2.5
-20		15	0.01793	2.5
-10		15	0.01793	2.5
0		13	0.01554	2.5
10		13	0.01554	2.5
20		11	0.01315	2.5
30		12	0.01434	2.5
40		12	0.01434	2.5
50		17	0.01673	2.5
25	V min.= 3.5	18	0.02152	2.5
25	V max.= 4.2	21	0.02510	2.5

EDGE Mode

Middle Channel, f_o =836.6MHz				
Temperature (℃)	Power Supplied (V_{DC})	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)
-30	3.7	23	0.02749	2.5
-20		20	0.02391	2.5
-10		20	0.02391	2.5
0		18	0.02152	2.5
10		18	0.02152	2.5
20		17	0.02032	2.5
30		19	0.02271	2.5
40		19	0.02271	2.5
50		25	0.02988	2.5
25	V min.= 3.5	25	0.02988	2.5
25	V max.= 4.2	28	0.03347	2.5

WCDMA Mode

Middle Channel, f_o =836.6MHz				
Temperature (℃)	**Power Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
-30	3.7	-7	-0.00837	2.5
-20		-7	-0.00837	2.5
-10		-7	-0.00837	2.5
0		-4	-0.00478	2.5
10		-4	-0.00478	2.5
20		-3	-0.00359	2.5
30		-5	-0.00598	2.5
40		-5	-0.00598	2.5
50		-7	-0.00837	2.5
25	V min.= 3.5	-7	-0.00837	2.5
25	V max.= 4.2	-9	-0.01076	2.5

PCS Band (Part 24E)

GSM Mode

Middle Channel, f_o =1880.0 MHz				
Temperature (℃)	**Power Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Result**
-30	3.7	17	0.00904	pass
-20		13	0.00691	pass
-10		13	0.00691	pass
0		7	0.00372	pass
10		4	0.00213	pass
20		2	0.00106	pass
30		5	0.00266	pass
40		9	0.00479	pass
50		12	0.00638	pass
25	V min.= 3.5	12	0.00638	pass
25	V max.= 4.2	21	0.01117	pass

EDGE Mode

Middle Channel, f_o =1880.0 MHz				
Temperature (℃)	**Power Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Result**
-30	3.7	-12	-0.00638	pass
-20		-8	-0.00426	pass
-10		-8	-0.00426	pass
0		-3	-0.00160	pass
10		-3	-0.00160	pass
20		1	0.00053	pass
30		-5	-0.00266	pass
40		-5	-0.00266	pass
50		-7	-0.00372	pass
25	V min.= 3.5	-13	-0.00691	pass
25	V max.= 4.2	-19	-0.01011	pass

WCDMA Mode

Middle Channel, f_o =1880.0 MHz				
Temperature (℃)	**Power Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Result**
-30	3.7	-5	-0.00266	pass
-20		-5	-0.00266	pass
-10		-3	-0.00160	pass
0		-3	-0.00160	pass
10		-3	-0.00160	pass
20		-1	-0.00053	pass
30		-2	-0.00106	pass
40		-2	-0.00106	pass
50		-5	-0.00266	pass
25	V min.= 3.5	-5	-0.00266	pass
25	V max.= 4.2	-6	-0.00319	pass

AWS Band (Part 27)

WCDMA Mode

Middle Channel, f_o =1732.6 MHz				
Temperature (℃)	**Voltage Supplied (V_{DC})**	**Frequency Error (Hz)**	**Frequency Error (ppm)**	**Limit (ppm)**
-30	3.7	-5	-0.00289	pass
-20		-5	-0.00289	pass
-10		-4	-0.00231	pass
0		-4	-0.00231	pass
10		-4	-0.00231	pass
20		-2	-0.00115	pass
30		-3	-0.00173	pass
40		-3	-0.00173	pass
50		-5	-0.00289	pass
25	V min.= 3.5	-5	-0.00289	pass
25	V max.= 4.2	-6	-0.00346	pass

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